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ACTIVE OPTICAL MISS-DISTANCE INDICATOR

Santa Barbara Research Center

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Harry Diamond Laboratories

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SBRC

FINAL STUDY REPORT

ACTIVE OPTICAL MISS-DISTANCE INDICATOR

Prepared for:

HARRY DIAMOND LABS
CONNECTICUT AND VAN NESS ST., N.W.
WASHINGTON, D.C. 20438

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SANTA BARBARA RESEARCH CENTER

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Section I

INTRODUCTION

Santa Barbara Research Center (SBRC) has been engaged in the development and manufacturing of IR devices and instruments since 1964. Particularly applicable to the design and development of the Active Optical Miss-Distance Indicator (AOMDI) is SBRC's experience with active optical communicators and various active optical fuzes. The concept of the AOMDI is closely related to the active optical fan beam fuzes. The first such fuze was developed for the Air Force to be used on the AIM-4H missile. A second fuze of greater range was developed for the Harry Diamond Labs and was intended to be used on the Chaparral missile. A third fuze is being developed at the present time for the Navy's AIM-9L missile.

All these active optical fuzes are based on the principle of geometric range cutoff and use solid state GaAs laser diodes as radiation sources. Geometric cutoff offers the advantage of simpler electronics and better accuracy at close ranges as compared to range gating.

The Active Optical Miss-Distance Indicator can be described as an arrangement of three optical fuzes of different ranges. It uses the principle of geometrical cutoff in three optical receivers with overlapping range intervals to produce five intervals of distance ("bins"). The greater angular coverage required by the AOMDI is obtained by combining nine basic quadrants in a configuration that results in a good approximation of 4π steradian coverage.

The present technological limits (mainly in the area of laser technology) restrict the greatest distance that can be indicated. However, greater distance can eventually be achieved by using electronic range gating for the outermost distance interval and by using more advanced and more powerful laser diodes.

In the following section the results of a study of the performance of an Active Optical Miss-Distance Indicator are presented. For this study assumed values of all parameters influencing performance correspond to the best presently available. Concurrent with the study a demonstration model of one quadrant of the AOMDI was built. The purpose of this task was to verify some of the findings of the study. However, as the demonstration model employs parts of existing designs of active optical fuzes it is not optimized and its performance falls short of that predicted in the study. The test results obtained with the demonstration model are the subject of a separate report.

The study of the performance of the active optical fuze concludes with a discussion of future growth areas and recommendations on how to achieve future improvements.

Section II

DESCRIPTION OF THE AOMDI SYSTEM

General

The total Active Optical Miss-Distance Indicator System (AOMDI) consists of 9 electrically identical quadrants and an electronic interface circuit which adapts the output signals to the telemetry system. Each quadrant consists of an optical subsystem and an electronic subsystem.

Nine quadrants are necessary to obtain a good approximation to $4\pi r$ coverage. Because it is difficult to visualize the arrangement of the 9 quadrants and to convey an adequate picture of the AOMDI system without the use of a three-dimensional model, the description presented here will be built up step by step starting with a single quadrant, progressing to an arrangement of 3, 6, and finally 9 quadrants.

One Quadrant

One quadrant of the AOMDI system consists of 3 optical transmitters, 3 receivers, and the associated electronic circuits.

The three transmitters use GaAs laser diodes as radiation sources. The limited power handling capability of the presently available GaAs laser diodes makes it necessary to use three diodes and consequently three transmitters to achieve the required pulse repetition rate and pulse duration. Expected future advances in the field of GaAs laser diodes and the use of cooling techniques will make it possible to reduce the number of required transmitters for the final implementation of the AOMDI.

Three receivers are used to obtain the desired distance information. Five intervals of distance must be distinguished. These intervals are called "bins" and range from 2-5, 5-10, 10-15, 15-25 and 25-50 feet. The principle on which the distance measurements are based is called "geometrical cut-off". As each of the receivers works on the same principle it suffices to describe one receiver only. The two other receivers serve only to increase the number of distinguishable distance intervals, or bins.

The transmitter beam is shaped by its anamorphic optics like a conical fan (see Figure 2.1) with a fan angle ϕ of 90°. The axis of the cone coincides with the baseline which connects transmitter and receiver. The vertex angle of the transmitter cone equals 90° - δ, where δ is the transmitter fan declination angle as shown in Figure 2.2 which shows the transmitter and receiver geometry in a plane containing the baseline and both the transmitter and the receiver axes. A plane perpendicular to the baseline intersects the transmitter fan in a circle. As the thickness of the transmitter beam is very small it can be disregarded for this discussion.

The field of view of the receiver is also shaped like a fan but the thickness of the fan increases with distance. Figure 2.3 shows how the transmitter beam pattern intersects with the receiver field of view. The divergence of the receiver field of view is called elevation field angle ψ. The receiver fan angle γ equals the transmitter fan angle. The receiver elevation field is bounded by part of a plane perpendicular to the baseline and a part of a cone with a vertex angle equal to 90° - ψ.

A target located in the field of view of the receiver and irradiated by the transmitter (part of the target must, therefore, be between R_N and R_F) reflects part of the transmitter signal into the receiver. This signal is detected and amplified. It is an indication that a target is in the distance interval (R_N,R_F) and in an angular interval ($-\frac{\gamma}{2},\frac{\gamma}{2}$). More information about the target distance can be obtained if more (in this case three) receivers are combined with the transmitter. Figure 2.4 shows the geometrical relationships in a plane containing the baseline and the axes of the transmitter and the three receivers of the system. The distances of the receivers from the transmitter are chosen so that the receiver fields of view overlap. In this manner, 3 distinguishable intervals, or bins, of distance are obtained. If the target is in the 2-5 ft. bin, receiver 1 produces an output; if the target is in the 5-10 ft. bin, receivers 1 and 2 produce an output signal, and so on.

The baseline b is obtained from $b = R_F \tan \delta - \frac{d}{2}$, (2.1)

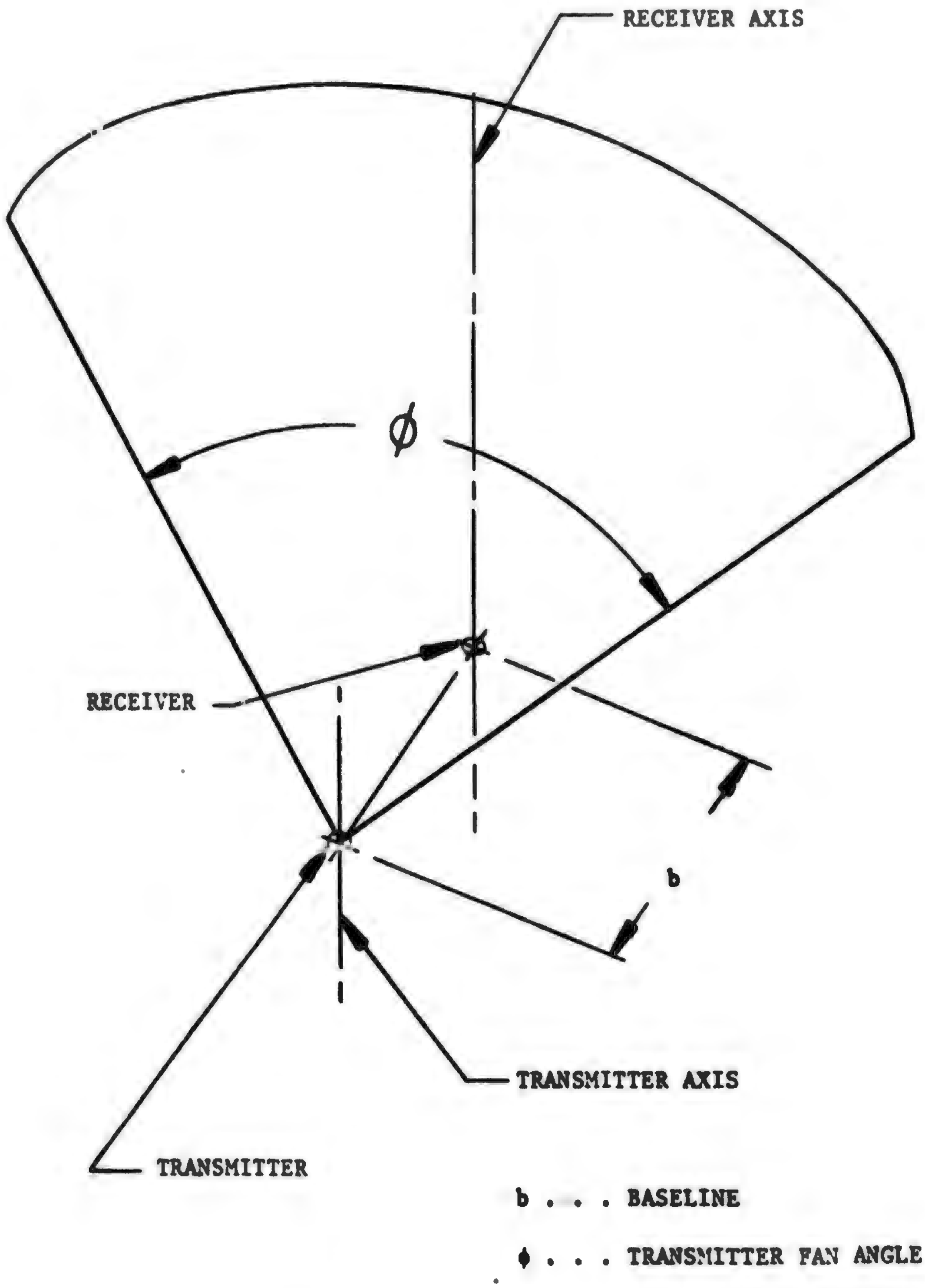
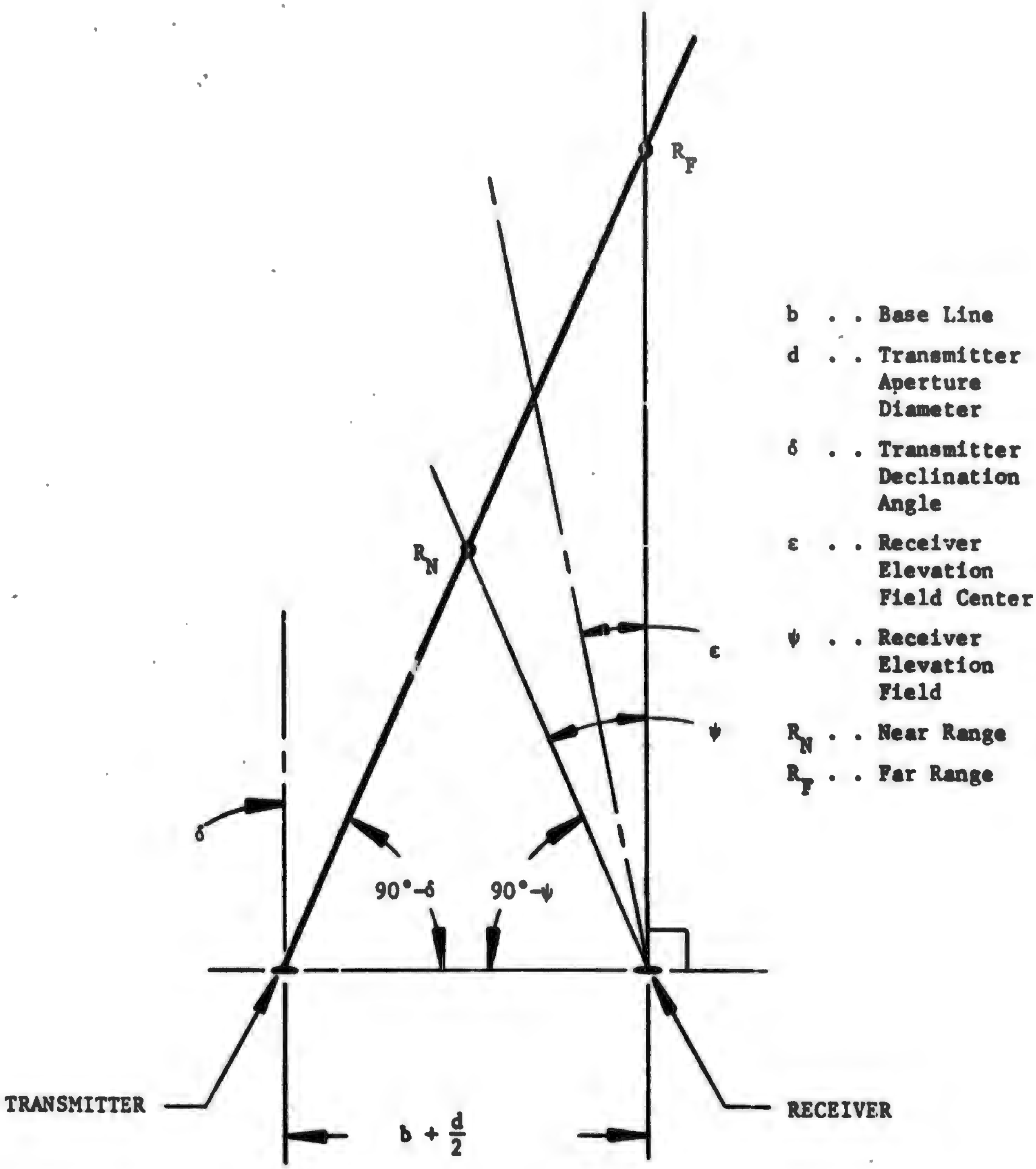
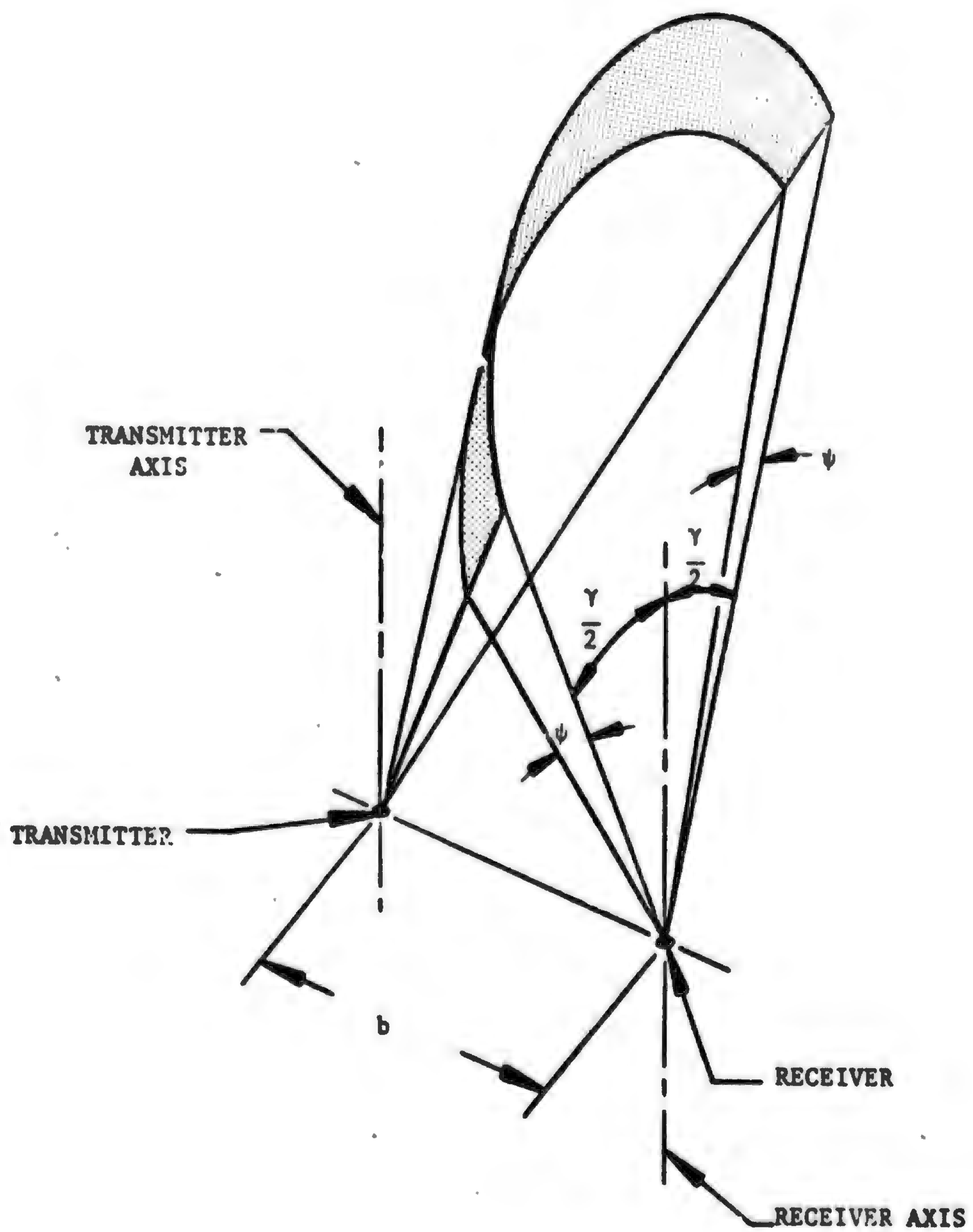

RECEIVER AXIS
ϕ
RECEIVER
b
TRANSMITTER AXIS
TRANSMITTER
b . . . BASELINE
ϕ . . . TRANSMITTER FAN ANGLE

FIGURE 2.1



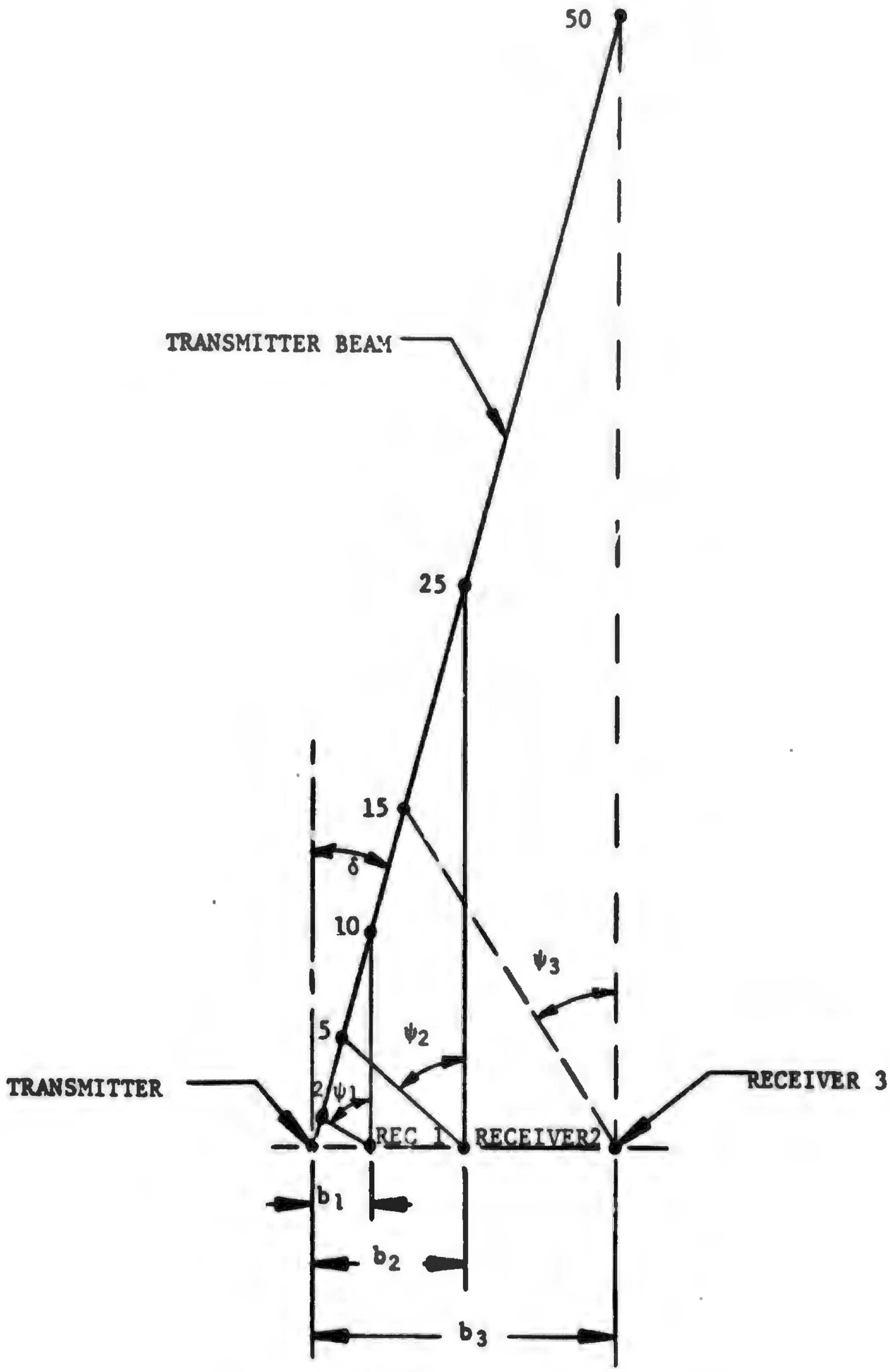
R_F
R_N
ε
ψ
δ
90°−δ
90°−ψ
TRANSMITTER
RECEIVER
b + d/2
b . . Base Line
d . . Transmitter Aperture Diameter
δ . . Transmitter Declination Angle
ε . . Receiver Elevation Field Center
ψ . . Receiver Elevation Field
R_N . . Near Range
R_F . . Far Range

FIGURE 2.2



TRANSMITTER AXIS
ψ
γ
2
γ
2
ψ
TRANSMITTER
b
RECEIVER
RECEIVER AXIS

FIGURE 2.3



50
TRANSMITTER BEAM
25
15
δ
10
ψ3
5
ψ2
TRANSMITTER
2
ψ1
RECEIVER 3
REC 1
RECEIVER2
b1
b2
b3

FIGURE 2.4

where R_F is the far range of the receiver. The far range is the greatest target distance from which the receiver can receive a reflected signal. Similarly, the near range R_N is the shortest distance from which a target can produce a signal. The receiver elevation field can then be calculated from

$$\tan \psi = \frac{b + \frac{d}{2}}{R_N} - \tan \delta, \quad (2.2)$$

or, substituting $b + \frac{d}{2} = R_F \cdot \tan \delta$ obtained from (2.1) in (2.2):

$$\tan \psi = \left(\frac{R_F}{R_N} - 1\right) \tan \delta \quad (2.3)$$

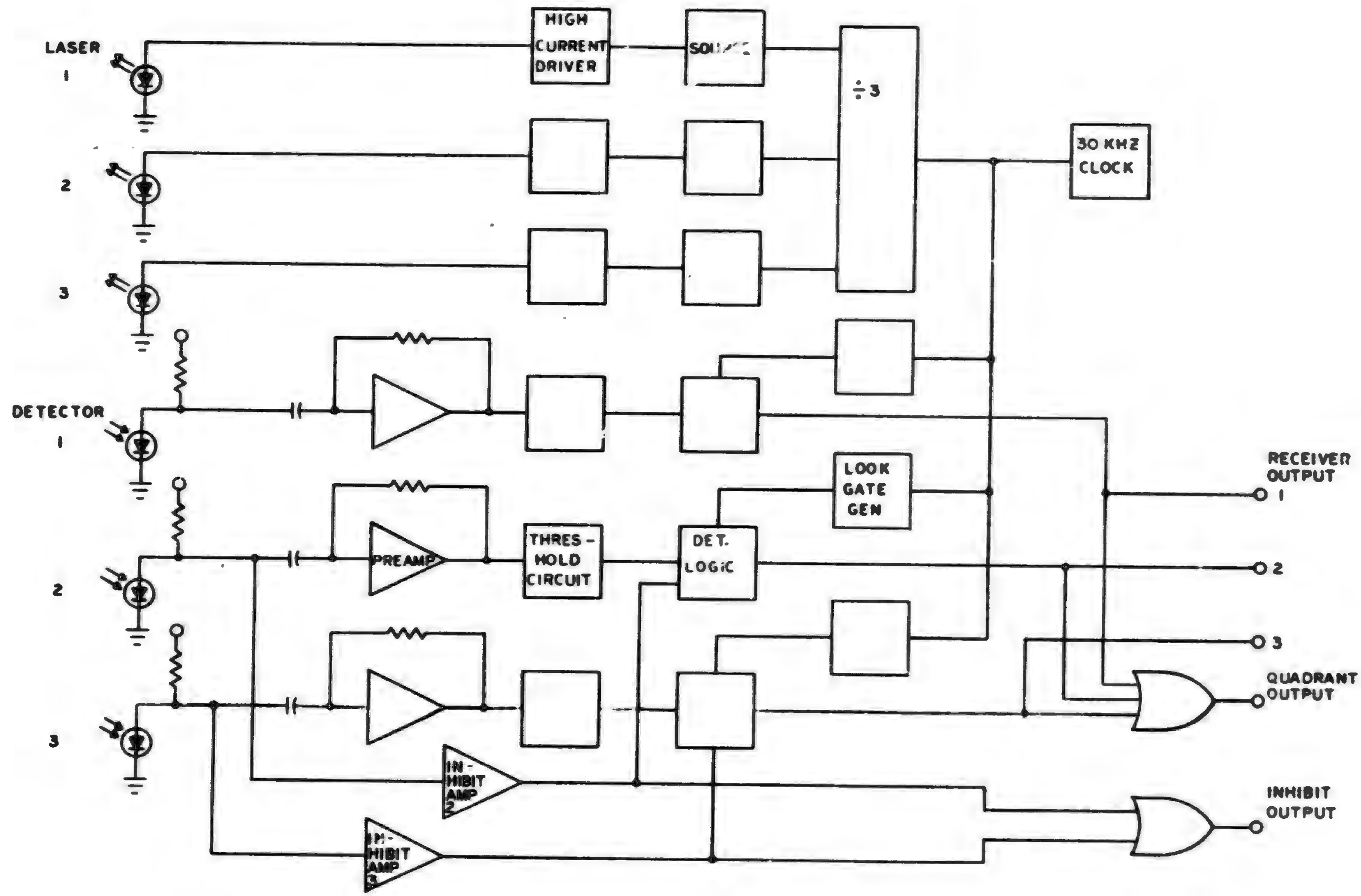
Assuming a transmitter declination angle of 10mrad the following values are obtained:

1st Receiver:	$b = 1.2$ in, $\psi = 2.29°$
	$R_N = 2$ ft., $R_F = 10$ ft.
2nd Receiver:	$b = 3.0$ in., $\psi = 2.29°$
	$R_N = 5$ ft., $R_F = 25$ ft.
3rd Receiver:	$b = 6.0$ in., $\psi = 1.34°$
	$R_N = 15$ ft., $R_F = 50$ ft.

The above values are used in the radiometric calculations of Section 4.

A block diagram of the electronic circuits of the transmitters and receivers of one quadrant is shown in Figure 2.5. Three transmitters are shown in the block diagram, but when more powerful lasers become available it will be possible to use only one transmitter and the circuit can then be simplified by omitting the divide-by-three counter.

The heart of the system is the clock. It steps the divide-by-three counter which sequentially turns on the source circuits and the high current drivers. The high current drivers deliver current pulses to the laser diodes. As the 3 transmitters are adjusted such that their fan beam



LASER
1
2
3
DETECTOR
1
2
3
HIGH CURRENT DRIVER
÷3
30 KHZ CLOCK
LOOK GATE GEN
THRES-HOLD CIRCUIT
PREAMP
DET. LOGIC
IN-HIBIT AMP 2
IN-HIBIT AMP 3
RECEIVER OUTPUT 1
2
3
QUADRANT OUTPUT
INHIBIT OUTPUT

FIGURE 2.5

patterns coincide, the 3 sequentially fired laser diodes have the same effect as one transmitter operating at three times the pulse repetition rate.

The clock signal is also used to synchronize the three receiver circuits. The look-gate generators deliver an enable signal to the detection logic circuits. These signals are delayed differently in each receiver. The delay corresponds to the time it takes a light pulse to travel to a target at near range and back. Before this time has elapsed, no signal is expected to arrive and the detection logic is disabled. During the look-gate period which corresponds to the difference between the time it takes a signal to travel to a target at far range and back, and the delay time, the detection logic is enabled, ready to receive a signal from the threshold circuit. Only during this period of time can a noise threshold crossing affect the circuit. The effective false indication rate is thereby considerably reduced (see Section 3, "Performance Requirements").

A returning light pulse is detected by the Si PIN-diode detector which causes a current pulse to flow into the preamplifier. The preamplifier delivers a signal to the threshold circuit where, after further amplification, the signal is compared to a preset level. If the signal exceeds this level, a pulse is generated and delivered to the detection logic. The detection logic must receive at least two pulses in sequence to produce an output signal (2-out-of-2 logic). One such output signal is produced by each of the 3 receivers, depending on the target location.

It should be noted that the 3 receivers differ in noise level and range. The thresholds and look-gate periods must, therefore, be adjusted individually. The outputs of the three receivers are not only used individually, but are also applied to an OR-gate. This OR-gate will produce an output whenever a signal is detected in its quadrants. Later, when discussing the complete system, it will be shown how this and other OR-gates are used to keep the number of required telemetry channels to a minimum.

Figure 2.5 shows two inhibit amplifiers. They are DC coupled to the detectors of receivers 2 and 3 and their outputs are applied to the detection logic circuits. When a certain DC current flowing through the detectors is reached, the outputs of the amplifiers produce a signal which inhibits the detection logic circuits. This scheme serves to prevent false indications caused by excessive noise currents. This noise current in turn is generated by the DC-current through the detector and the DC current is caused by unwanted background originating radiant power (sun, extremely bright clouds). The threshold crossings of such high level noise would erroneously be interpreted as distance indication. To avoid confusion caused by misinterpretation, the detection logic circuits are inhibited and an inhibit output signal is produced whenever high level background power is detected. Receiver 1, the inner-most receiver does not require an inhibit amplifier. It produces a sufficiently high S/N ratio even under the worst condition when the sun is fully in its field of view.

System of 9 Quadrants

For the description of the system each quadrant is represented by a sector of a circle of radius R_F (far range of the third or outermost, receiver). The central angle subtended by the arch of this sector equals the transmitter fan angle ϕ and the receiver fan angle γ.

First three quadrants are assembled to form a corner of a cube as shown in Figure 2.6. The diagonal of the cube is chosen as axis of this configuration. The angle α between the diagonal and one of the sides a, b, and c equals 54.6°. A second set of three quadrants is assembled to form a mirror image of the first (see Figure 2.7). Both sets of quadrants are aligned with respect to each other such that the sides a and a', and the axis xx' come to lie in the same plane. They are then moved towards each other so that A and A' coincide (see Figure 2.8). Three more quadrants are now added with their vertices located in A to fill the void between a and a', b and b', and c and c'. It should be noted that the angle θ (Figure 2.8) between sides a and a', b and b', and c and c' is less than 90°. The quadrant used in these 3 positions needs no greater fan angle than 70.8°, but for reasons of simplicity, all quadrants will have a fan angle of 90°. Also, due to the finite dimensions of the optics and of the carrier vehicle, it is not possible

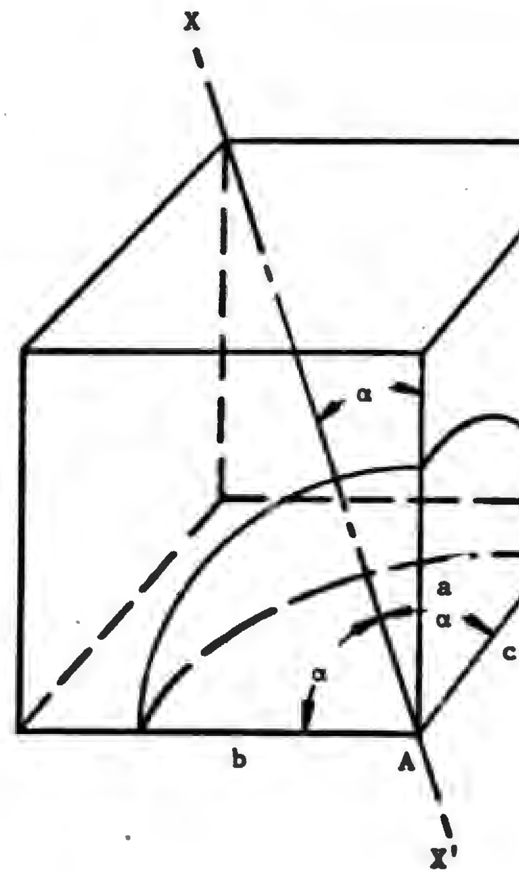


FIGURE 2.6

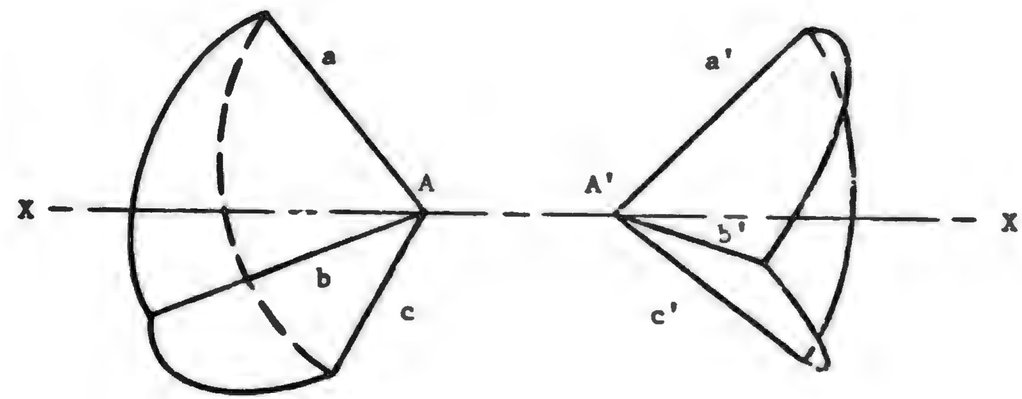


FIGURE 2.7

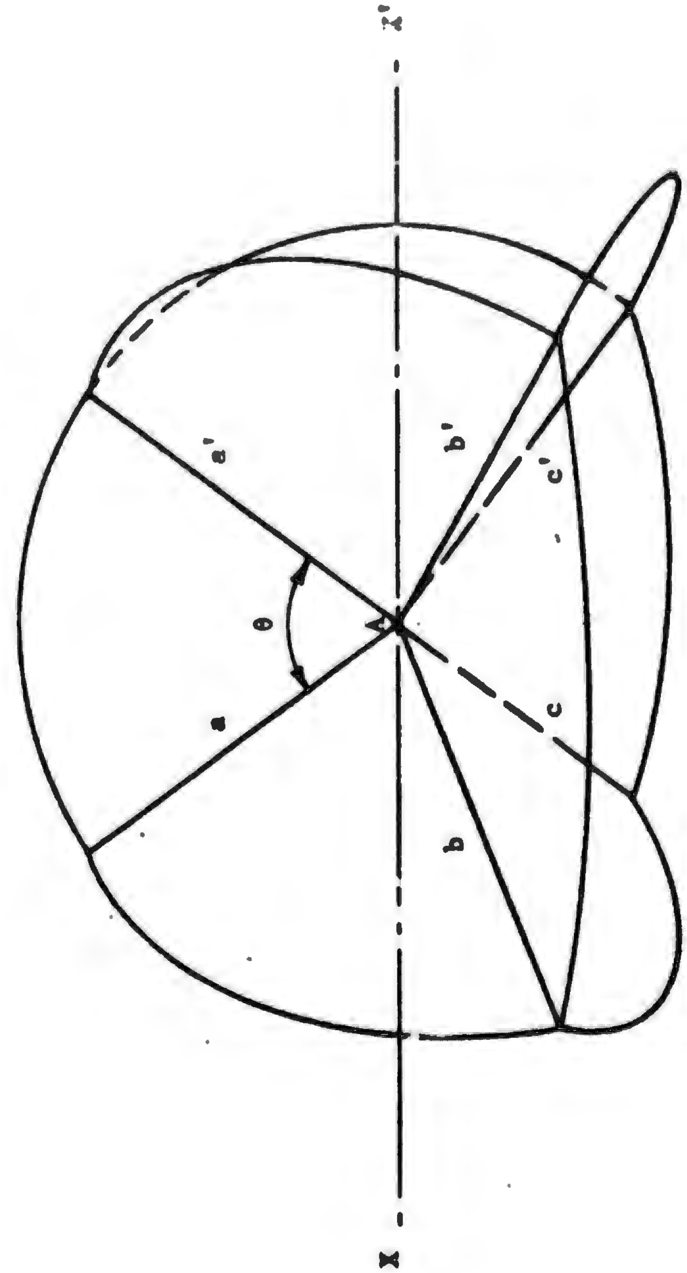


FIGURE 2.8

to make the vertices of all quadrants coincide. This is, however, of little consequence as the displacement of the vertices of the quadrants with respect to one another is known and can be used in the determination of the miss-distance.

The AOMDI system produces 27 receiver signals and 9 inhibit signals (one for each quadrant). Thirty six telemetry channels would be required to transmit all possible information. This number can be reduced at the expense of some loss of information. Figure 2.9 shows a method of compressing the output data from the 9 quadrants. The outputs of the receivers 1 (innermost) of all quadrants are applied to an OR-gate. The outputs of all receivers 2 are applied to a second OR-gate and the outputs of all receivers 3 are applied to a third OR-gate. The inhibit signals of all 9 quadrants are also applied to an OR-gate. The number of required channels is now only 13. A target location is indicated by a signal in one quadrant channel and by signals in one, or two, receiver channels. The occurrence of inhibiting of any of the 9 quadrants is indicated by a signal in the inhibit channel. All output signals are 0 to 5V and can be applied to the telemetry system without interfacing.

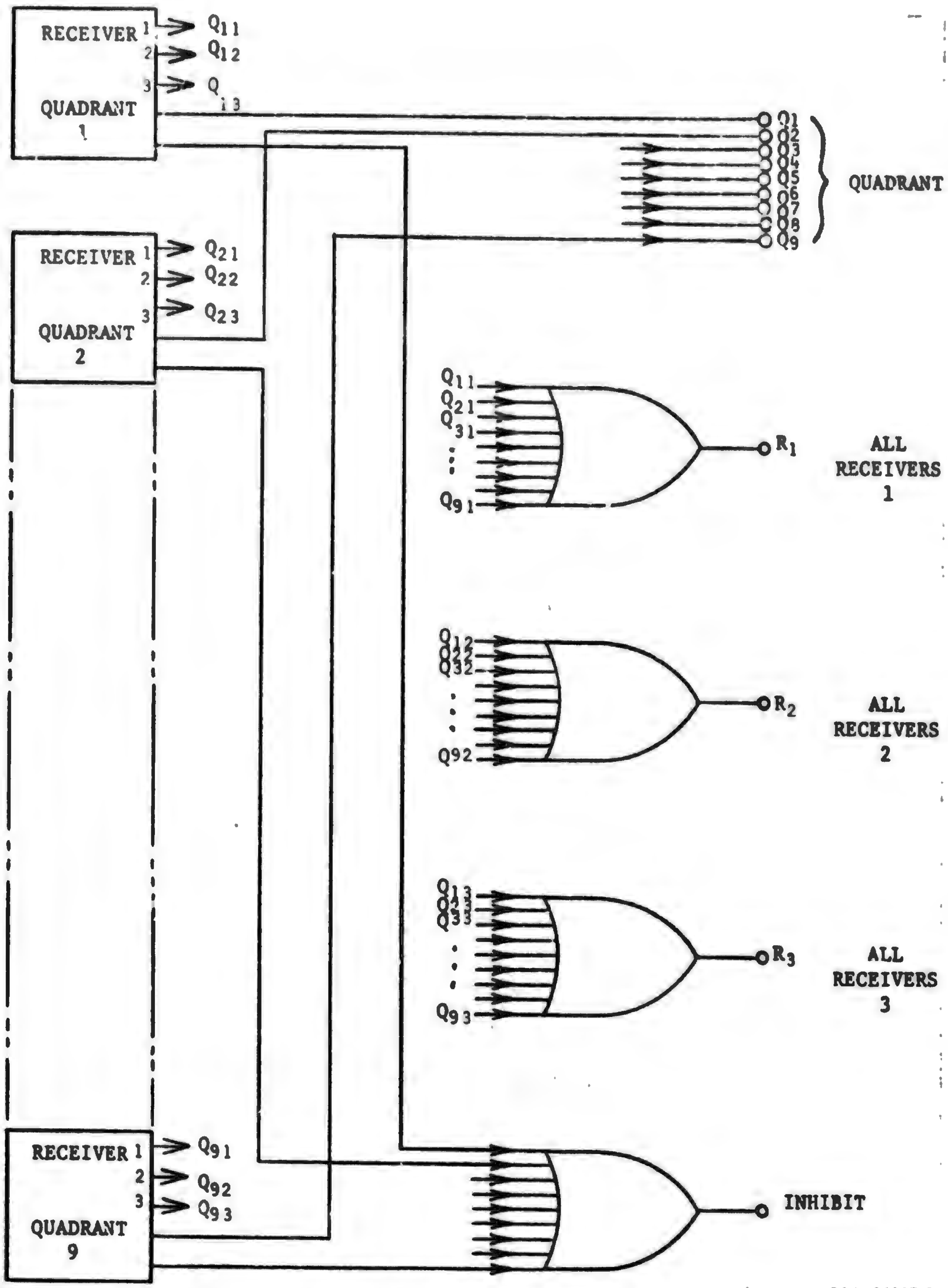

RECEIVER
QUADRANT 1
RECEIVER
QUADRANT 2
RECEIVER
QUADRANT 9
QUADRANT
ALL RECEIVERS 1
ALL RECEIVERS 2
ALL RECEIVERS 3
INHIBIT

FIGURE 2.9

Section III
PERFORMANCE REQUIREMENTS

With the number and range of the bins established, certain performance requirements must be met. The parameter describing these requirements are: the pulse repetition rate f_R, the average false indication rate $\overline{FIR}$ and the desired probability P_d of detecting a target during the shortest encounter.

The pulse repetition rate is a function of the time the smallest target to be encountered stays in the field of view of a quadrant. The limit to the pulse repetition rate obtainable from one laser diode at the present state-of-the-art is 10kHz. The detection logic used requires a minimum of two successive return pulses for an indication. With the size of the smallest target equal to 3 feet and a closing velocity of 40 kft/s the target might dwell only 75μs in the fan of a quadrant. To return 2 pulses in 75μs the pulse rate must be at least 26.7kHz. These pulse rates can be obtained by sequentially firing 3 laser diodes. Making the pulse rate of each of the three diodes equal to 10kHz, a resulting rate of 30kHz is obtained, which is slightly higher than the minimum to compensate for the finite thickness of the transmitter beam.

The average false indication rate must be specified. It determines the threshold-to-noise ratio which must be maintained at a noise level encountered during normal operation, that is when no unusually bright background is encountered. Assuming a false indication rate of .01 per sec. for a system of 9 quadrant with 3 receivers each, the false indication rate of one receiver must not exceed $\frac{.01s^{-1}}{27} = .00037s^{-1}$. As false indications are caused by noise threshold crossings at the threshold circuit, the maximum allowable noise threshold crossing rate must be obtained which in turn, determines the required threshold-to-noise ratio. If the average noise threshold crossing rate is ϕ and the look period (the period during which a signal is expected) is t_1, and if $\phi t_1 << 1$, then the number of threshold crossings can be described by a Poisson distribution. Then, the probability of N threshold crossings in the time interval t_1 is given by

$$P_{(N)} = \frac{(\phi t_1)^N}{N!} \exp\,(\phi t_1) \qquad (3.1)$$

The probability for no threshold crossing (N = 0) is then

$$P_{(0)} = \exp\,(-\phi t_1) \qquad (3.2)$$

and the probability of at least one crossing is

$$P_{(N \geq 1)} = 1 - \exp\,(-\phi t_1) \qquad (3.3)$$

The specified maximum false indication rate and the pulse repetition rate determine the maximum allowable probability of a false indication during the time interval between pulses. It is

$$P_f = \frac{\overline{FIR}}{f_R} \quad . \qquad (3.4)$$

$\frac{\overline{FIR}}{f_R}$ is the ratio of the average number of false indications in one second to the number of trials in one second, and therefore, the probability P_f that a false indication will occur during one look period t_1. This probability is imposed as an upper bound on the probability of a false indication out of the detection logic.

It must be $P_{(N \geq 1)} \leq P_f$ (3.5)

If a detection logic is used which requires the detection of n successive pulses for one indication (n-out-of-n) then the inequality for P_f becomes

$$\frac{\overline{FIR}}{f_R} = P_f \geq [\,1 - \exp\,(-\phi t_1)]^n \qquad (3.6)$$

Now ϕ can be calculated

$$\phi \leq \frac{-\ln\left(1 - \sqrt[n]{\frac{\overline{FIR}}{f_R}}\right)}{t_1} \qquad (3.7)$$

This threshold crossing rate is given by Rice[1)] as

$$\phi = \frac{1}{2\tau\sqrt{3}} \exp\left(\frac{-I_t^2}{2I_n^2}\right) \qquad (3.8)$$

where τ is the signal pulse width

I_t is the threshold

I_n is the RMS noise current

The threshold-to-noise ratio can now be obtained:

$$\frac{I_t}{I_n} = \sqrt{-2\ln 2\sqrt{3}\tau\phi} \qquad (3.9)$$

Once the threshold-to-noise ratio is established and the desired probability of detection is given, the signal-to-noise ratio required to meet these specifications can be calculated. It is

$$\sqrt[n]{P_d} = \frac{1}{2}\left[1 + \text{erf}\left(\frac{I_s - I_t}{\sqrt{2}\, I_n}\right)\right]^{2)} \qquad (3.10)$$

where P_d is the probability of an indication in each of n trials or intervals between pulses, while the greater probability $\sqrt[n]{Pd}$ (Pd <1) is the probability of detecting a signal pulse in one trial. The signal-to-noise ratio S/N is then obtained from

$$S/N = \frac{I_s}{I_n} = \sqrt{2}\, \text{erf}^{-1}\left(2\sqrt[n]{P_d} - 1\right) + \frac{I_t}{I_n} \qquad (3.11)$$

where erf^{-1} stands for the inverse error function and the error function $\text{erf}(x) = \frac{2}{\pi}\int_0^x 2^{-x2}\, dx$.

For the evaluation of the above formula a computer program was written using an approximation formula [3)] for the inverse function of $q = \frac{1}{2}\left[1-\text{erf}\left(\frac{x}{\sqrt{2}}\right)\right]$

1) Rice, S.O. "Mathematical Analysis of Random Noise," The Bel' System Technical Journal, Vol 23, No.3, July 1944, p 282 and Vol 24, No.1, January 1945, p 46.
2) RCA "Electro-Optics Handbook"
3) Hastings Inc., Cecil, "Approximations for Digital Computers" for Digital Computers", Princeton University Press, 1955

Appendix A shows the program written in Fortran IV, while Tables 3.1 through 3.3 show the printed results. From these tables it can be seen that Pd is not strongly dependent on $\overline{FIR}$. The tables also show the influence of the number of pulses, n, required for a decision on both, the threshold-to-noise ratio (TH/N) and the signal-to-noise ratio (S/N). The reduction of S/N with increasing n offers a small, or no advantage when considering the time required to obtain one indication. This time is directly proportioned to n and with increasing n leads rapidly to prohibitively high pulse repetition rates for a given closing velocity.

For calculating Tables 3.1 through 3.3, it was necessary to assume typical values for the pulse width (150ns) and the look period t_L (150ns for the outermost receiver). The pulse repetition rate was 30,000 Hz. Table 3.1 was calculated for $\overline{FIR}$ = 0.00037 1/sec, Table 2 for $\overline{FIR}$ = 0.00018 1/sec and Table 3.3 for $\overline{FIR}$ = 0.000037 1/sec.

In each table P_d was successively set to 6 values. The 3 low probabilities (.01, .005, .001) are shown only to illustrate the dependence on P_d on the S/N ratio.

The receivers of the AOMDI are exposed to noise generating radiation sources. Under normal conditions a receiver is looking at a background with the radiance of the clear sky. The receiver, when looking at this background, must produce a signal-to-noise ratio which ensures the required probability of detection. However, other radiation sources as the sun and bright clouds can enter the field of view of the receiver. These sources can cause intolerably high false indication rates and provisions must be made to report such an occurrence and block the transmission of erroneous indications. To prevent false indications, certain methods are available and will be discussed later.

S/N AS FUNCTION OF PD, FIR, FR, TLOOK, TAU AND N

FIR= 0.37E-03 1/S FR = 30000. HZ
TAU= 150. NS TL = 150. NS

N	PD	TH/N	S/N
1	0.9990	5.828	8.919
2	0.9990	3.965	7.256
3	0.9990	3.106	6.509
4	0.9990	2.570	6.051
5	0.9990	2.184	5.724
6	0.9990	1.880	5.460
1	0.9950	5.828	8.404
2	0.9950	3.965	6.772
3	0.9950	3.106	6.041
4	0.9950	2.570	5.593
5	0.9950	2.184	5.274
6	0.9950	1.880	5.024
1	0.9900	5.828	8.155
2	0.9900	3.965	6.540
3	0.9900	3.106	5.819
4	0.9900	2.570	5.377
5	0.9900	2.184	5.061
6	0.9900	1.880	4.814
1	0.1000	5.828	4.546
2	0.1000	3.965	3.487
3	0.1000	3.106	3.017
4	0.1000	2.570	2.727
5	0.1000	2.184	2.518
6	0.1000	1.880	2.351
1	0.0500	5.828	4.183
2	0.0500	3.965	3.205
3	0.0500	3.106	2.771
4	0.0500	2.570	2.503
5	0.0500	2.184	2.308
6	0.0500	1.880	2.151
1	0.0100	5.828	3.501
2	0.0100	3.965	2.683
3	0.0100	3.106	2.319
4	0.0100	2.570	2.093
5	0.0100	2.184	1.926
6	0.0100	1.880	1.790

// XEQ

TABLE 3.1

S/N AS FUNCTION OF PD, FIR, FR, TLOOK, TAU AND N

FIR= 0.18E-03 1/S   FR =   30000. HZ
TAU=   150. NS   TL =   150. NS

N	PD	TH/N	S/N
1	0.9990	5.959	9.050
2	0.9990	4.051	7.342
3	0.9990	3.180	6.583
4	0.9990	2.637	6.118
5	0.9990	2.247	5.788
6	0.9990	1.942	5.530
1	0.9950	5.959	8.536
2	0.9950	4.051	6.858
3	0.9950	3.180	6.115
4	0.9950	2.637	5.660
5	0.9950	2.247	5.337
6	0.9950	1.942	5.085
1	0.9900	5.959	8.286
2	0.9900	4.051	6.627
3	0.9900	3.180	5.892
4	0.9900	2.637	5.443
5	0.9900	2.247	5.125
6	0.9900	1.942	4.876
1	0.1000	5.959	4.679
2	0.1000	4.051	3.574
3	0.1000	3.180	3.090
4	0.1000	2.637	2.794
5	0.1000	2.247	2.581
6	0.1000	1.942	2.413
1	0.0500	5.959	4.314
2	0.0500	4.051	3.292
3	0.0500	3.180	2.844
4	0.0500	2.637	2.569
5	0.0500	2.247	2.371
6	0.0500	1.942	2.213
1	0.0100	5.959	3.633
2	0.0100	4.051	2.770
3	0.0100	3.180	2.392
4	0.0100	2.637	2.159
5	0.0100	2.247	1.990
6	0.0100	1.942	1.852

// XEQ

TABLE 3.2

S/N AS FUNCTION OF PD, FIR, FR, TLOOK, TAU AND N

FIR= 0.37E-04 1/S   FR = 30000. HZ
TAU= 150. NS   TL = 150. NS

N	PD	TH/N	S/N
1	0.9990	6.253	9.343
2	0.9990	4.245	7.536
3	0.9990	3.345	6.740
4	0.9990	2.786	6.267
5	0.9990	2.388	5.928
6	0.9990	2.078	5.666
1	0.9950	6.253	8.829
2	0.9950	4.245	7.052
3	0.9950	3.345	6.280
4	0.9950	2.786	5.809
5	0.9950	2.388	5.478
6	0.9950	2.078	5.221
1	0.9900	6.253	8.580
2	0.9900	4.245	6.821
3	0.9900	3.345	6.057
4	0.9900	2.786	5.592
5	0.9900	2.388	5.265
6	0.9900	2.078	5.012
1	0.1000	6.253	4.971
2	0.1000	4.245	3.768
3	0.1000	3.345	3.255
4	0.1000	2.786	2.943
5	0.1000	2.388	2.722
6	0.1000	2.078	2.549
1	0.0500	6.253	4.608
2	0.0500	4.245	3.486
3	0.0500	3.345	3.009
4	0.0500	2.786	2.718
5	0.0500	2.388	2.511
6	0.0500	2.078	2.349
1	0.0100	6.253	3.926
2	0.0100	4.245	2.964
3	0.0100	3.345	2.557
4	0.0100	2.786	2.308
5	0.0100	2.388	2.130
6	0.0100	2.078	1.988

TABLE 3.3

Section IV

RADIOMETRIC CONSIDERATIONS

Some of the receivers of the AOMDI will look at a radiant background (earth, clouds) at any time. The signal must be detected in the presence of noise generated by this background. The parameter that describes the performance of a receiver under such conditions is the signal-to-noise ratio (S/N) measured at the output of the receiver preamplifier. The minimum S/N ratio is obtained from the statistical theory when using the specified false alarm rate and minimum probability of detection (see Section 3, "Performance Requirements). The optical parameters, as receiver area, transmitter pulse peak, power receiver elevation field (or field of view), etc., must then be chosen to satisfy these conditions in the presence of a given noise generating background. This is done as follows:

1. The signal power incident on the detector as a function of transmitted power, optical transmittance, target size, and receiver optics aperture is derived. The limiting target is assumed to be at far range cutoff of the receiver (outer bin boundary).
2. The noise generated by the preamplifier and detector is calculated as a function of bandwidth, feedback resistor, noise factor of the first amplifier stage and detector dark current .
3. The noise power generated by the background as a function of receiver elevation field, aperture area, and optical filter bandwidth is calculated.
4. The results of these three steps are used to calculate the S/N ratio of the system for a given laser diode output power and different backgrounds.

1. Receiver Signal Power

The peak power P_2 of the beam emerging from the transmitter aperture is obtained from

$$P_2 = P_1 \times T_1 \quad (4.1)$$

where P_1 is the laser diode peak power, and T_1 is the transmitter optics transmittance.

The transmitter fan pattern is shaped in such a way that its thickness is very small as compared to the target dimensions. The irradiated area on a target is therefore a narrow band. The power P_3 incident on the target is then proportional to the angle which the length of the band on the target subtends.

$$P_3 = \frac{P_2 \cdot 2\arctan\frac{L}{2R_1}}{\phi}$$

where L is the length of target in transmitter beam (length of the irradiated band), R_1 is the range to the target, and ϕ is the transmitter fan angle. When $L << 2R_1$ the above expression can be simplified to;

$$P_3 + \frac{P_2 L}{R_1 \phi} \qquad (4.2)$$

As the radiometric caluations aim at obtaining the S/N ratio under worst conditions, R_1 is equal to R_F (the far-range) of the receiver under consideration. For receiver 1 R_F becomes 10 feet and with a target of 3 feet length $2\arctan\frac{L}{2R_1} = 0.297$.

Comparing this result to $\frac{L}{R1} = 0.300$, it can be seen that the error is only about 1%. Expression (4.2) can, therefore, be used without introducing a significant error.

Assuming the target to be a perfect diffuse reflector, the irradiance on the receiver aperture becomes

$$H_r = \frac{J}{R_1^2} = \frac{P_3 \sigma}{R_1 \pi} \qquad (4.3)$$

where J is the equivalent radiant intensity of the irradiated target area and p is the reflectivity of the target.

The power P_4 entering the receiver aperture becomes $P_4 = H_r A_R$, where A_R

is the receiver aperture area.

The power P_5 received by the detector is

$$P_5 = P_4 T_2 \tag{4.4}$$

where T_2 is the receiver optics transmittance.

Combining all formulas:

$$P_5 = \frac{P_1 T_1 T_2 \rho L A_r}{R_1^3 \phi \pi} \tag{4.5}$$

2. Amplifier and Detector Noise

It can be shown that the best circuit configuration for a wideband photodetector (current source) preamplifier is a current mode amplifier where the detector output is fed directly into the summing junction.

Noise for this type of preamplifier is set by the first stage noise figure and the feedback resistor. The value of this resistor should be as large as possible, limited only by the bandwidth requirement which must be met in the presence of stray and self-shunting capacitance.

For a one-half sinusoidal waveshape pulse of duration τ nsec, the high-frequency 3-db frequency should be:

$$f_H = \frac{1}{2\tau} \tag{4.6}$$

and low-frequency 3-db corner frequency should be

$$f_L = \frac{1}{20\tau} \tag{4.7}$$

Thus, the noise bandwidth assuming -6db/octave rolloff is

$$B = \frac{\pi}{2}\left(\frac{1}{2\tau} - \frac{1}{20\tau}\right) \tag{4.8}$$

The feedback resistor size should be self-shunting capacitance limited:

$$R_f = \frac{1}{2\pi f_H C} \tag{4.9}$$

This results in a preamplifier equivalent input noise current due to Johnson noise of

$$i_j = \sqrt{\frac{4kTB}{R_f}} \tag{4.10}$$

where k is the Boltzmann's constant = 1.38×10^{-23} J/°K, T is the ambient temperature, R_f is the preamplifier feedback resistor, and B is the equivalent noise bandwidth. Given a noise factor NF for the transistor of the first stage of the amplifier the total equivalent input noise current is

$$i_a = \sqrt{\frac{4NFTBk}{R_f}} \tag{4.11}$$

With no signal received, the noise contribution of the photodetector is due to its dark current. For a given dark current I_{co} the noise current will be

$$i_d = \sqrt{2qBI_{co}} \tag{4.12}$$

where q is the charge of the electron = 1.6×10^{-9}C. The total noise referred to the input of the preamplifier becomes now

$$i_t = \sqrt{i_d^2 + i_a^2} = \sqrt{2qBI_{co} + \frac{4NFkTB}{R_f}} \tag{4.13}$$

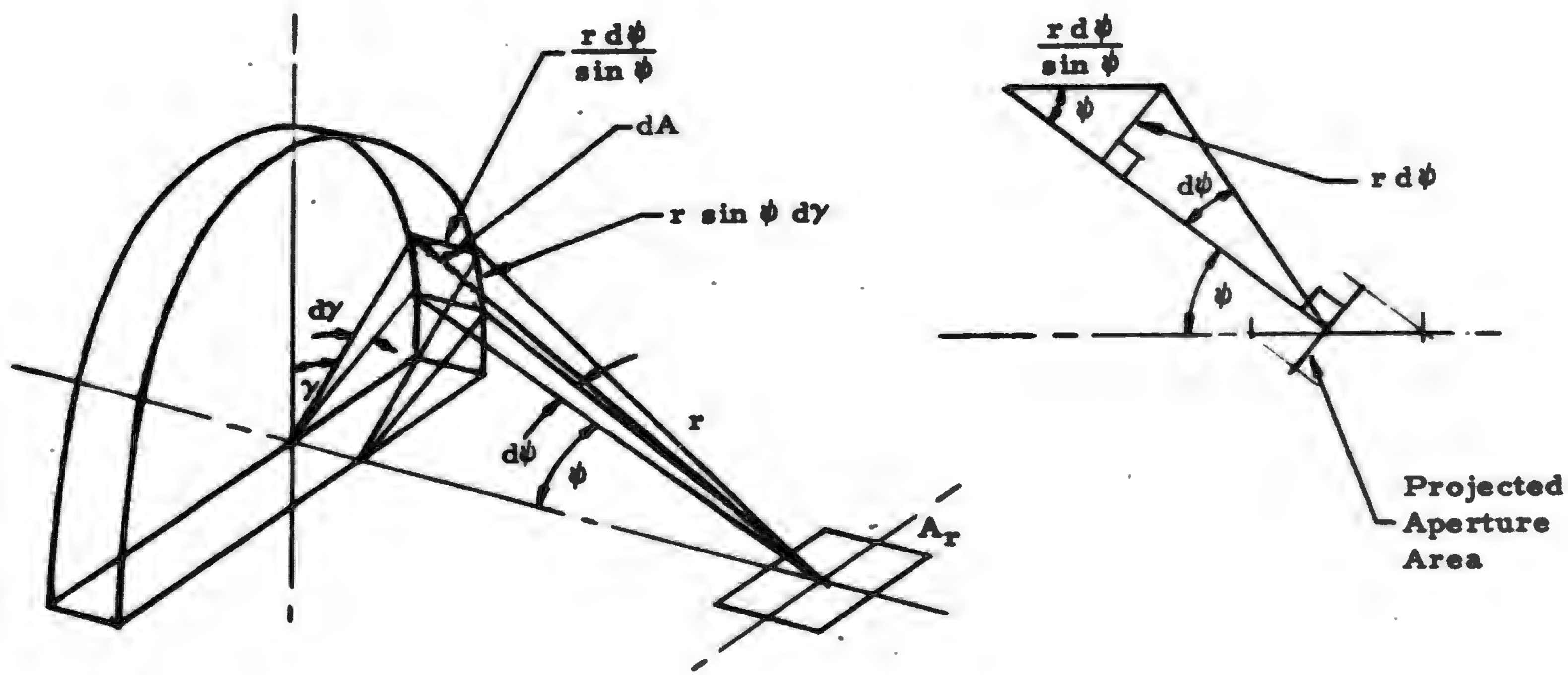
3. Background Generated Noise

Any current flowing through the detector is accompanied by the generation of shot noise. In addition to the already discussed dark current, a DC current is flowing through the detector which is caused by the received radiant power P_6 originating from the background at which the receiver is looking. This current I through the detector is given by

$$I = SP_6 \tag{4.14}$$

where S is the sensitivity (or responsivity) of the detector. The same mechanism as in the case of the dark current generated noise causes a noise current i_b to flow. This current

$$i_b = \sqrt{2qBI} \tag{4.15}$$



r dφ / sin φ
dA
r sin φ dγ
dγ
γ
dφ
φ
r
A_r
r dφ / sin φ
φ
dφ
r dφ
φ
Projected
Aperture
Area

FIGURE 4.1

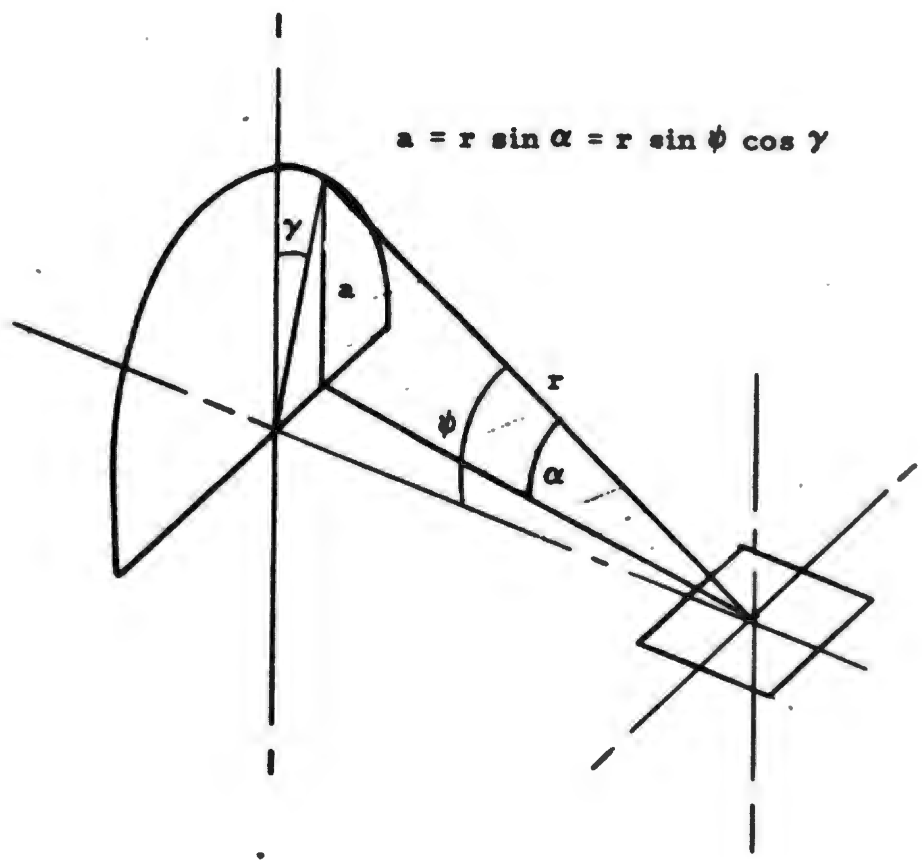


FIGURE 4.2

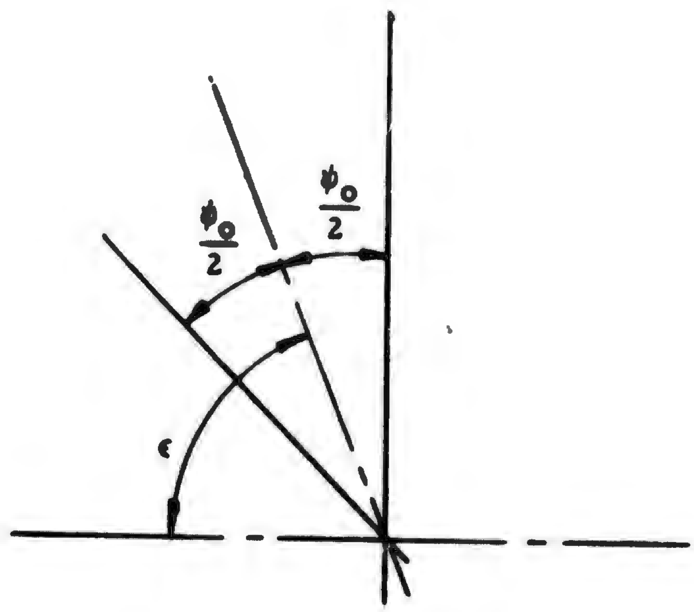


FIGURE 4.3

To obtain I, the background originating power P_6 impinging on the active area of the detector is obtained as follows.

Consider the radiant background a perfectly diffuse (Lambertian) radiator. Then, the irradiance it produces at a given point A does not depend on the shape of the surface of the radiator, but only on the solid angle it subtends as seen from A. The background can fill the field of view of the receiver. Considering the shape of the field of view, assuming a cylindrical surface as background radiator simplifies the computation of the irradiance of the receiver aperture and, consequently, P_6. Figure 4.1 shows the geometry of a receiver looking at a cylindrical radiator. The increment $dH(\lambda)$ of the spectral irradiance at the aperture A_r contributed by a surface element dA of the cylindrical radiator is

$$dH(\lambda) = \frac{N(\lambda) dA \sin\psi}{r^2} \sin \alpha \qquad (4.16)$$

where $N(\lambda)$ is the spectral radiance of the background, ψ is the elevation angle of the radius connecting A_r with dA, r is the distance between A_r and dA, and α is the angle between r and the aperture plane (Figure 4.2). From Figure 4.2 is obtained

$$\sin \alpha = \sin \psi \cos \gamma \qquad (4.17)$$

where γ is the fan spread angle.

From Figure 4.1 is obtained

$$dA = r^2 \, d\psi \, d\gamma \qquad (4.18)$$

Therefore, $dH(\lambda) = N(\lambda) \sin^2\psi \cos\gamma \, d\psi \, d\gamma$ (4.19)

$$\text{and } H(\lambda) = N(\lambda) \int_{-\gamma/2}^{+\gamma/2} \cos\gamma \, d\gamma \int_{\varepsilon-\frac{\psi}{2}}^{\varepsilon+\frac{\psi}{2}} \frac{1-\cos \quad d}{2} = \qquad (4.20)$$

$$= N(\lambda) \sin \gamma/2 (\psi - \cos 2\varepsilon \sin\psi)$$

where ε is the elevation angle of center of the elevation field as shown in Figure 4.3. It is always $\varepsilon + \frac{\psi}{2} = \frac{\pi}{2}$. The power P_6, reaching the detector is then

$$P_6' = N(\psi)\Delta\lambda T_2 A_r \sin\gamma/2(\psi - \cos 2\varepsilon \sin\psi)$$

This is the power received by a rectangular detector whose active area corresponds to the field of view of the receiver. The active area can be reduced by a mask in such a manner that the power received from a target located in the receiver's distance interval remains constant regardless of distance. The shape of this mask resembles that of a bikini (see Figure 5.4). In Section V "Optical Considerations", the equations describing the shape and the area of this mask are derived. Here, the formula describing the reduction in active area is used. As can be seen, the reduction is a function of the ratio of far-range to near-range only:

$$\frac{A_B}{A_T} = \frac{1}{2} \frac{\left(\frac{R_F}{R_N}\right)^2 - 1}{\left(\frac{R_F}{R_N}\right)^3 - \left(\frac{R_F}{R_N}\right)^2} \qquad (5.16)$$

where A_B is the active area within the mask, A_T is the area of the unmasked detector, R_F is the far-range, and R_N is the near-range of the receiver. The power P_6 reaching the reduced area now becomes,

$$P_6 = \frac{A_B}{A_T} \cdot N(\lambda) \cdot \Delta\lambda \cdot T_2 \cdot A_r \cdot \sin\gamma/2(\psi - \cos 2\varepsilon \cdot \sin\psi) \qquad (4.21)$$

where $\Delta\lambda$ is the optical filter bandwidth. The background generated noise can now be calculated;

$$i_b = \sqrt{2qBSP_6} \qquad (4.22)$$

4. Signal-to-Noise Ratio

The results of the previous three sections are used to calculate the S/N ratio of a receiver. From Section 1 the peak power received by the detector is,

$$P_5 = \frac{P_1 T_1 T_2 \rho L A_r}{\pi R_1^3 \phi} \quad .$$

When S is the responsivity of the detector (typically 0.5 A/W to 0.7A/W for PIN diodes) the input current to the preamplifier becomes,

$$i_s = SP_5 \qquad (4.23)$$

The total noise current i_t due to detector dark current, preamplifier and background is,

$$i_t = \sqrt{2qB(SP_6+I_{co}) + i_a^2} \qquad (4.24)$$

The signal-to-noise ratio now becomes,

$$\frac{i_s}{i_t} = \frac{S.P_1 T_1 T_2 \rho L A_r}{\pi R_1^3 \phi \sqrt{2qB(SP_6+I_{co}) + i_a^2}} \qquad (4.25)$$

An existing computer program in FORTRAN IV language was used to evaluate the above equation. The program not only computes and prints the S/N ratio, but also prints out several other parameters on demand. It is also possible to calculate the laser peak power P_1 for a given S/N ratio. In addition, all outputs can be obtained for either PIN diode or avalanche diode detectors. However, the latter part of the program was not used because no avalanche diode of sufficient area for this application can be obtained. The program is shown in Appendix B. The printed results of runs using typical values for the input parameters is shomw in Tables 4.1 and 4.2. The equivalent spectral radiance $N_{equ}(\lambda)$ of the sunlit earth is used to describe the background at which the MDI is looking under normal operating conditions. It is substituted in the computer program for $N(\lambda)$, the radiance of the sky. Its value is obtained from

$$N_{eqn}(\lambda) = \frac{M(\lambda)\alpha}{\pi} \cdot \frac{A_B}{A_T} \qquad (4.26)$$

where $M(\lambda)$ is the spectral solar irradiance on the surface of the earth, equal to 450 $W/m^2/m$, and α is the reflectivity of the surface of the earth, equal to 0.35. The ratio $\frac{A_B}{A_T}$ is obtained from equation (5.16) and equals 0.12 for $\frac{R_F}{R_N} = 5$ (receivers 1 and 2), and 0.195 for $\frac{R_F}{R_N} = 3.33$ (receiver 3). Then $N_{eqn}(\lambda) = 6.0\ W/m^2/\mu m/sr$ for receivers 1 and 2 and $N_{eqn}(\lambda) = 9.8\ W/m^2/\mu m/sr$ for receiver 3. The preamplifier is characterized by the shunt capacitance C of its feedback resistor and its noise factor NF. Values of C = 0.5 pF and NF = 2 can be obtained by improving existing circuits which are used on active optical fuzes. The shunt capacitance C is a very important parameter for it determines the maximum value of the feedback resistor with which the bandwidth requirement given by the duration of the laser pulse can be met.

A responsivity S of 0.5A/W and a dark current of 1μA were used in the program to describe the PIN diode detector. It should be noted that the value of 1μA applies to the largest PIN diode which is used in the third receiver with a maximum out-range of 50 ft. The two other receivers use much smaller PIN diodes with lower dark currents. Retaining the same dark current for all computations leads to somewhat lower S/N ratios than what could optimally be obtained, but as rhe figures of Tables 4.1 and 4.2 show, the S/N ratio of the two inner smaller receivers exceed the required minimum by far (compare Table 3.1 for minimum S/N ratio for a given P_d, N and $\overline{FIR}$). The visibility V was arbitrarily set to 100 miles as no atmospheric extinction is encountered at the operational altitude.

The laser peak power P_1 equals that of presently procured GaAs laser diodes. The optical filter bandwidth DL of 0.03μm corresponds to that of interference filters used on SBRC's optical communicators. Considering the wide variation of the angle of incidence at the receiver aperture, it might not be possible to maintain such a value over the entire receiver field of view. It might be necessary to turn to an absorption filter instead, whose bandwidth

1ST AND 2ND RECEIVER, EARTH AS BACKGROUND

SKY RAD.IN W/SQM/MIC.H =	6.000	AMB.TEMP.IN DEG.D,TEMP =	300.000
PREAMP.CAP.IN PF.C =	0.500	PREAMP.NOISE FIG.,NF =	2.000
AV.DC RESP.IN A/W,S1 =	0.145	AV.AC RESP.IN A/W,S2 =	0.400
AV.DARK CUR.IN NA,IAV =	0.499	PIN RESP.IN A/W,S =	0.500
PIN DARK CUR.IN PA,IPIN=	1000.000		
VISIBILITY IN MI, V =	100.000	LASER PEAK PWR IN W,P1 =	16.000
XMITT.TRANSMIT.,T1 =	0.800	RECEIV.TRANSMIT.,T2 =	0.800
LASER P.WIDTH IN NS,T =	150.000	TARG.L.IN BEAM IN M,LT =	0.900
TARGET REFL.,RHO =	0.200	REC.BEAM ELEV.,DEG,EPS =	88.850
REC.ELEV FIELD,DEG,PSI =	2.250	REC.FAN SPREAD,DEG,GAM =	90.000
TRF.FAN SPREAD,DEG PHI =	50.000		

REC.AP.AREA IN SQCM,AR =	0.250	0.500	1.000	2.000
RANGE IN FT,R1 =	10.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.919E 02	0.181E 03	0.355E 03	0.680E 03
PIN BKGD-TO-SYST.NOISE =	0.244E-01	0.488E-01	0.976E-01	0.195E 00
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.908E 02	0.177E 03	0.340E 03	0.631E 03
PIN BKGD-TO-SYST.NOISE =	0.488E-01	0.976E-01	0.195E 00	0.390E 00
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.833E 02	0.152E 03	0.264E 03	0.433E 03
PIN BKGD-TO-SYST.NOISE =	0.244E 00	0.488E 00	0.976E 00	0.195E 01
OPT.F.BW. IN MICRON,DL =	0.300			
S/N,PIN DIODE SNPIN =	0.762E 02	0.132E 03	0.216E 03	0.336E 03
PIN BKGD-TO-SYST.NOISE =	0.488E 00	0.976E 00	0.195E 01	0.390E 01
RANGE IN FT,R1 =	25.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.580E 01	0.116E 02	0.227E 02	0.435E 02
PIN BKGD-TO-SYST.NOISE =	0.244E-01	0.488E-01	0.976E-01	0.195E 00
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.581E 01	0.113E 02	0.217E 02	0.403E 02
PIN BKGD-TO-SYST.NOISE =	0.488E-01	0.976E-01	0.195E 00	0.390E 00
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.533E 01	0.975E 01	0.169E 02	0.277E 02
PIN BKGD-TO-SYST.NOISE =	0.244E 00	0.488E 00	0.976E 00	0.195E 01

TABLE 4.1

```
CPT.F.PW. IN MICRON,DL =       0.300

S/N,PIN DIODE SNPIN =      0.4?7E 01    0.84?E 01    0.1?0E 02    0.215E 02
PIN BKGD-TO-SYST.NOISE =   0.4??E 00    0.976E 00    0.1?5E 01    0.390E 01
// XEQ F??I1
```

TABLE 4.1

PAGE 2

3RD RECEIVER, EARTH AS BACKGROUND

SKY RAD.IN W/SCM/MIC,H =	9.E01	AMB.TEMP.IN DEG.K,TEMP =	300.000
PREAMP.CAP.IN PF,C =	6.500	PREAMP.NOISE FIG.,NF =	2.000
AV.DC RESP.IN A/W,S1 =	0.145	AV.AC RESP.IN A/W,S2 =	0.400
AV.DARK CUR.IN NA,IAV =	0.499	PIN RESP.IN A/W,S =	0.500
PIN DARK CUR.IN PA,IPIN =	1000.000		
VISIBILITY IN MI, V =	100.000	LASER PEAK PWR IN W,P1 =	16.000
XMITT.TRANSMIT.,T1 =	0.800	RECEIV.TRANSMIT.,T2 =	0.800
LASER P.WIDTH IN NS,T =	150.000	TARG.L.IN BEAM IN M,LT =	0.900
TARGET REFL.,RHO =	0.200	REC.BEAM ELEV.,DEG,EPS =	89.330
REC.ELEV FIELD,DEG,PSI =	1.340	REC.FAN SPREAD,DEG,GAM =	90.000
TRM.FAN SPREAD,DEG PHI =	90.000		

REC.AP.AREA IN SCM,AR =	4.000	5.000	6.000	8.000
RANGE IN FT,R1 =	40.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.196E 02	0.239E 02	0.279E 02	0.351E 02
PIN BKGD-TO-SYST.NOISE =	0.373E 00	0.466E 00	0.559E 00	0.746E 00
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.175E 02	0.209E 02	0.239E 02	0.294E 02
PIN BKGD-TO-SYST.NOISE =	0.746E 00	0.933E 00	0.111E 01	0.149E 01
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.106E 02	0.122E 02	0.135E 02	0.159E 02
PIN BKGD-TO-SYST.NOISE =	0.373E 01	0.466E 01	0.559E 01	0.746E 01
OPT.F.BW. IN MICRON,DL =	0.300			
S/N,PIN DIODE SNPIN =	0.798E 01	0.904E 01	0.998E 01	0.116E 02
PIN BKGD-TO-SYST.NOISE =	0.746E 01	0.933E 01	0.111E 02	0.149E 02
RANGE IN FT,R1 =	50.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.101E 02	0.122E 02	0.142E 02	0.180E 02
PIN BKGD-TO-SYST.NOISE =	0.373E 00	0.466E 00	0.559E 00	0.746E 00
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.900E 01	0.106E 02	0.122E 02	0.150E 02
PIN BKGD-TO-SYST.NOISE =	0.746E 00	0.933E 00	0.111E 01	0.149E 01
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.547E 01	0.624E 01	0.694E 01	0.810E 01
PIN BKGD-TO-SYST.NOISE =	0.373E 01	0.466E 01	0.559E 01	0.746E 01

TABLE 4.2

```
OPT.F.PL. IN MICRON,EL =      0.300

S/N,PIN DIODE SNPIN =      0.405E 01    0.462E 01    0.5[illegible]1E 01    0.596E 01
PIN DARK-TO-SYST.NOISE =   0.7[illegible]E 01    0.933E 01    0.111E 02    0.149E 02
```

TABLE 4.2

PAGE 2

does not show such a strong dependence on the angle of incidence. The receiver and transmitter optical transmittances were set to .8, a value observed on SBRC's active optical fuzes and communicators.

The laser pulse width is assumed to be 150ns. With a pulse repetition rate of 30kHz, this value corresponds to a duty cycle of .45% which cannot be obtained from one laser diode at the present time. Using 3 laser diodes fired sequentially makes it possible to obtain the desired pulse rate and pulse width. The duty cycle of each diode is then only .15%, a manageable figure.

For target size and reflectivity the minimum values specified are used, that is,3 ft. and 0.2 respectively.

Two different ranges are shown in Tables 4.1 and 4.2, 10 feet and 25 feet, corresponding to the far-ranges of receivers 1 and 2 respectively.

In Table 4.2 the 50 feet correspond to the far-range of receiver 3, while 40 feet were used to demonstrate the strong dependence of the S/N ratio on distance. (See expression 4.25)

The elevation field of receivers 1 and 2 was assumed to be 2.39°. This value is about half of that used on SBRC's active optical fuzes. The elevation field of receiver 3 of 1.34° was obtained by assuming a baseline of 6", a near-range of 15 ft. and a far-range of 50 ft.. Smaller elevation fields would result in short baselines, leaving not enough room for the transmitters and the receivers. For the last parameter, the receiver aperture, 8 values were assumed. Starting with .25cm^2 the other values were obtained by doubling the previous one. The aperture areas of 0.25, 0.5, 1.0 and 2cm^2 apply to receivers 1 and 2, Table 4.1, while 4, 5, 6 and 9cm^2 are reasonable values for receiver 3, Table 4.2.

Table 4.1 and 4.2 show, besides the S/N rations, another ratio, the ratio of background-generated noise power to system-generated noise power. This ratio indicates whether the system is background or system noise limited. It can be seen that for small apertures the ratios are smaller than those for large apertures as the background generated noise power is proportional to the aperture area (compare BN/SN ratio for 4cm^2

with that for $8cm^2$ area). At very low background generated noise levels the S/N ratio improves almost proportional to the increase in aperture area. When the aperture area is increased more and more so that the background generated noise dominates the expression for total noise (equation 4.24), then the S/N ratio increases only proportional to the square root of the increase of the aperture area. When looking at equation (4.21), it can be seen that P_6, the background received power, is proportional to the bandwidth $\Delta\lambda$ of the optical filter. Ideally, this bandwidth should equal the bandwidth of the laser diode which is 0.001μm. But the center wavelength shifts 0.00025μm per degree C so that a filter bandwidth of 0.015μm will be required to guarantee that no signal losses occur when the temperature of the laser diode junction changes ± 25°C. But even if this temperature shift were smaller, reducing the bandwidth much further would reduce the filter transmittance at the center of the passband, thus reducing the received signal power. As the S/N ratio is proportional to the received signal power, but much less dependent on background power ($\propto \frac{1}{\sqrt{P_6}}$), the law of diminishing returns takes over, preventing any gains once the bandwidth is reduced beyond a certain optimum. For the computer runs a $\Delta\lambda$ of 0.03μm is used to allow for the increase in bandwidth with the angle of incidence.

Increasing the optical filter bandwidth leads to a significant decrease of the S/N ratio. The effect is most pronounced in the case of the third receiver where the background generated noise dominates due to the large aperture area. Table 4.3 shows the change of the S/N ratios with optical bandwidth. The other parameters are those shown in Tables 4.1 and 4.2. Both absolute and relative values of the S/N ratios are shown.

The relative values show that the smaller receivers 1 and 2 are much less sensitive to an increase of optical bandwidth than receiver 3. Again, this stems from the lower background-noise-power-to-system-noise-power ratio of the smaller receivers. From Tables 4.1 and 4.2 we can see that for receiver 1 this ratio increases from 0.0244 to 0.488 while for receiver 3, the ratio increases from 0.373 to 4.76. The influence of 2 other important system parameters - the feedback resistor self-shunting capacitance C and the detector dark current I_{co} - is shown in Table 4.4 which summerizes the

S/N RATIO

Δλ	Receiver 1 Ar = .25 cm^2 R_1 = 10 ft.		Receiver 2 A_r = 1.0 cm^2 R_1 = 2.5 ft.		Receiver 3 A_r = 4 cm^3 R_1 = 40 ft.		Receiver 3 A_r = 4 cm^3 R = 50 ft.	
.015μm	91.9	1.01	11.6	1.03	19.8	1.13	10.1	1.12
.030μm	90.8	1.0	11.3	1.0	17.5	1.0	9.0	1.0
.15μm	83.3	0.92	9.75	0.86	10.6	0.61	5.47	0.61
.30μm	76.2	0.84	8.46	0.75	7.98	0.46	4.09	0.45

TABLE 4.3

S/N RATIO

		Receiver 1 A_r = 0.25 cm^2 R_1 = 10 ft.		Receiver 2 A_r = 0.5 cm^2 R_1 = 25 ft.		Receiver 3 A_r = 4.0 cm^2 R_1 = 50 ft.	
I_{co} = 1μA	C = 0.25pF	104	1.15	13.0	1.15	9.76	1.08
	C = 0.5pF	90.8	1.0	11.3	1.0	9.0	1.0
	C = 1.pF	74.2	0.82	9.35	0.83	7.9	0.88
C = 0.5pF	I_{co} = 0.1μA	118	1.3	14.5	1.28	10.3	1.14
	I_{co} = 1.0μA	90.8	1.0	11.3	1.0	9.0	1.0
	I_{co} = 2.0μA	75.2	0.83	9.47	0.84	7.97	0.89
C = .25pF	I_{co} = 0.1μA	155	1.71	18.6	1.65	11.5	1.28

TABLE 4.4

results of computer runs shown in Appendix C. Again, both absolute and relative values of the S/N ratios are given. The influence of the feedback resistor shunt capacitance C and the detector dark current I_{co} on the total noise power and, therefore, on the S/N ratio is most pronounced in the smaller receivers.

The last line of Table 4.4 shows the S/N ratios of receivers with the values for C and I_{co} equal to the smallest values thought to be obtainable at the present time or in the near future.

For comparison, a computer run using the parameters of the lab model was made. The results are shown in Table 4.5. The equivalent spectral radiance is obtained from (4.26)

$$N_{equ}(\lambda) = \frac{M(\lambda) . \alpha}{\pi}$$

where $M(\lambda) = 450 \ W/m^2/\mu m$ and $\alpha = 0.35$ as before.

Note, that in this case the ratio $\frac{A_B}{A_T}$ is set to 1 as the masks used in the lab model have an area ratio close to 1. The optical bandwidth $\Delta\lambda$ of 0.22µm is that of an absorption filter made of Schott Glass RG780. The laser pulse width used is 100ns and corresponds to the largest value obtained from RCA's 3-junction close confinement GaAs laser diodes, part number C30036.

The influence of the background on the S/N ratio is shown in Tables 4.6 through 4.9. As before, the values used for parameter "Sky Radiance" were obtained from expression (4.26). The ratio $\frac{A_B}{A_T}$ used was 0.12 for receivers 1 and 2, and 0.195 for receiver 3. The solar spectral irradiance $M'(\lambda)$ above the atmosphere equals 925 $W/m^2/\mu m$ and for the reflectivity α' of the clouds 0.9 was assumed. Then, $N_{equ}(\lambda) = 32 \ W/m^2/\mu m/sr$ for receivers 1 and 2, Table 4.6, and $N_{equ}(\lambda) = 51.5 \ W/m^2/\mu m/sr$ for receiver 3, Table 4.7.

For the case of the sun irradiated receiver apertures, the solar spectral irradiance above the atmosphere multiplied by the respective detector area ratio $\frac{A_B}{A_T}$ was used in place of $N_{equ}(\lambda)$. The computer program had to be slightly modified for this condition by changing the expression for P_6 to $P_6 = A_r \cdot T_2 \cdot \Delta\lambda \cdot M_{equ}(\lambda)$.

3 RECEIVERS, LAB MODEL

SKY RAD.IN W/SQM/MIC.N = 50.000
APD.TEMP.IN DEG.K,TEMP = 300.000
PREAMP.CAP.IN PF,C = 0.500
PREAMP.NOISE FIG.,NF = 2.000
AV.DC RESP.IN A/W,S1 = 0.145
AV.AC RESP.IN A/W,S2 = 0.400
AV.DARK CUR.IN NA,IAV = 0.455
PIN RESP.IN A/W,S = 0.500
PIN DARK CUR.IN NA,IPIN= 1000.000

VISIBILITY IN MI, V = 100.000
LASER PEAK PWR IN W,P1 = 16.000
OPT.F.BW. IN MICRON,EL = 0.220
XMITT.TRANSMIT.,T1 = 0.800
RECEIV.TRANSMIT.,T2 = 0.800
LASER P.WIDTH IN NS,T = 100.000
TARG.L.IN BEAM IN M,LT = 0.900
TARGET REFL.,RHO = 0.200
REC.BEAM ELEV.,DEG,BPS = 25.500
REC.FAN SPREAD,DEG,GAM = 90.000
TRM.FAN SPREAD,DEG PHI = 90.000

RANGE IN FT,R1 =	10.000	25.000	40.000	50.000
REC.ELEV FIELD,DEG,PSI =	2.670			
REC.AP.AREA IN SQCM,AR =	0.250			
S/N,PIN DIODE SNPIN =	0.349E 02	0.223E 01	0.546E 00	0.279E 00
PIN BKGD-TO-SYST.NOISE =	0.274E 01	0.274E 01	0.274E 01	0.274E 01
REC.AP.AREA IN SQCM,AR =	0.500			
S/N,PIN DIODE SNPIN =	0.521E 02	0.339E 01	0.829E 00	0.424E 00
PIN BKGD-TO-SYST.NOISE =	0.548E 01	0.548E 01	0.548E 01	0.548E 01
REC.AP.AREA IN SQCM,AR =	1.000			
S/N,PIN DIODE SNPIN =	0.782E 02	0.500E 01	0.122E 01	0.625E 00
PIN BKGD-TO-SYST.NOISE =	0.109E 02	0.109E 02	0.109E 02	0.109E 02
REC.AP.AREA IN SQCM,AR =	2.000			
S/N,PIN DIODE SNPIN =	0.112E 03	0.723E 01	0.176E 01	0.903E 00
PIN BKGD-TO-SYST.NOISE =	0.219E 02	0.219E 02	0.219E 02	0.219E 02
REC.AP.AREA IN SQCM,AR =	4.000			
S/N,PIN DIODE SNPIN =	0.161E 03	0.103E 02	0.252E 01	0.129E 01
PIN BKGD-TO-SYST.NOISE =	0.438E 02	0.438E 02	0.438E 02	0.438E 02
REC.AP.AREA IN SQCM,AR =	5.000			
S/N,PIN DIODE SNPIN =	0.181E 03	0.115E 02	0.282E 01	0.144E 01
PIN BKGD-TO-SYST.NOISE =	0.548E 02	0.548E 02	0.548E 02	0.548E 02
REC.AP.AREA IN SQCM,AR =	8.000			
S/N,PIN DIODE SNPIN =	0.229E 03	0.147E 02	0.358E 01	0.183E 01
PIN BKGD-TO-SYST.NOISE =	0.877E 02	0.877E 02	0.877E 02	0.877E 02
REC.ELEV FIELD,DEG,PSI =	4.500			

TABLE 4.5

REC.AP.AREA IN SQCM,AR =	0.250			
S/N,PIN DIODE SNPIN =	0.285E 02	0.182E 01	0.445E 00	0.228E 00
PIN BKGD-TO-SYST.NOISE =	0.462E 01	0.462E 01	0.462E 01	0.462E 01
REC.AP.AREA IN SQCM,AR =	0.500			
S/N,PIN DIODE SNPIN =	0.422E 02	0.270E 01	0.660E 00	0.338E 00
PIN BKGD-TO-SYST.NOISE =	0.924E 01	0.924E 01	0.924E 01	0.924E 01
REC.AP.AREA IN SQCM,AR =	1.000			
S/N,PIN DIODE SNPIN =	0.613E 02	0.392E 01	0.957E 00	0.490E 00
PIN BKGD-TO-SYST.NOISE =	0.184E 02	0.184E 02	0.184E 02	0.184E 02
REC.AP.AREA IN SQCM,AR =	2.000			
S/N,PIN DIODE SNPIN =	0.878E 02	0.562E 01	0.137E 01	0.702E 00
PIN BKGD-TO-SYST.NOISE =	0.369E 02	0.369E 02	0.369E 02	0.369E 02
REC.AP.AREA IN SQCM,AR =	4.000			
S/N,PIN DIODE SNPIN =	0.125E 03	0.800E 01	0.195E 01	0.999E 00
PIN BKGD-TO-SYST.NOISE =	0.739E 02	0.739E 02	0.739E 02	0.739E 02
REC.AP.AREA IN SQCM,AR =	5.000			
S/N,PIN DIODE SNPIN =	0.139E 03	0.895E 01	0.218E 01	0.111E 01
PIN BKGD-TO-SYST.NOISE =	0.924E 02	0.924E 02	0.924E 02	0.924E 02
REC.AP.AREA IN SQCM,AR =	8.000			
S/N,PIN DIODE SNPIN =	0.177E 03	0.113E 02	0.277E 01	0.141E 01
PIN BKGD-TO-SYST.NOISE =	0.147E 03	0.147E 03	0.147E 03	0.147E 03

TABLE 4.5

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1ST AND 2ND RECEIVER, CLOUDS AS BACKGROUND

SKY RAD.IN W/SCM/MIC.N =	32.000	AMB.TEMP.IN DEG.K,TEMP =	300.000
PREAMP.CAP.IN PF.C =	0.500	PREAMP.NOISE FIG.,NF =	2.000
AV.DC RESP.IN A/W,S1 =	0.145	AV.AC RESP.IN A/W,S2 =	0.400
AV.DARK CUR.IN NA,IAV =	0.499	PIN RESP.IN A/W,S =	0.500
PIN DARK CUR.IN NA,IPIN=	1000.000		
VISIBILITY IN MI, V =	100.000	LASER PEAK PWR IN W,P1 =	16.000
XMITT.TRANSMIT.,T1 =	0.800	RECEIV.TRANSMIT.,T2 =	0.800
LASER P.WIDTH IN NS,T =	150.000	TARG.L.IN BEAM IN M,LT =	0.900
TARGET REFL.,RHO =	0.200	REC.BEAM ELEV.,DEG,EPS =	88.850
REC.ELEV FIELD,DEG,PSI =	2.290	REC.FAN SPREAD,DEG,GAM =	90.000
TRM.FAN SPREAD,DEG PHI =	90.000		

REC.AP.AREA IN SQCM,AR =	0.250	0.500	1.000	2.000
RANGE IN FT,R1 =	10.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.875E 02	0.165E 03	0.301E 03	0.520E 03
PIN BKGD-TO-SYST.NOISE =	0.130E 00	0.260E 00	0.520E 00	0.104E 01
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.828E 02	0.150E 03	0.260E 03	0.423E 03
PIN BKGD-TO-SYST.NOISE =	0.260E 00	0.520E 00	0.104E 01	0.208E 01
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.613E 02	0.980E 02	0.149E 03	0.220E 03
PIN BKGD-TO-SYST.NOISE =	0.130E 01	0.260E 01	0.520E 01	0.104E 02
OPT.F.BW. IN MICRON,DL =	0.300			
S/N,PIN DIODE SNPIN =	0.490E 02	0.746E 02	0.110E 03	0.159E 03
PIN BKGD-TO-SYST.NOISE =	0.260E 01	0.520E 01	0.104E 02	0.208E 02
RANGE IN FT,R1 =	25.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.559E 01	0.106E 02	0.193E 02	0.333E 02
PIN BKGD-TO-SYST.NOISE =	0.130E 00	0.260E 00	0.520E 00	0.104E 01
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.530E 01	0.965E 01	0.166E 02	0.271E 02
PIN BKGD-TO-SYST.NOISE =	0.260E 00	0.520E 00	0.104E 01	0.208E 01
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.392E 01	0.627E 01	0.955E 01	0.140E 02
PIN BKGD-TO-SYST.NOISE =	0.130E 01	0.260E 01	0.520E 01	0.104E 02

TABLE 4.6

```
OPT.F.BW. IN MICRON,DL =      0.300

S/N,PIN DIODE SNPIN =      0.312E 01    0.477E 01    0.704E 01    0.101E 02
PIN DKGD-IC-SYST.NOISE =   0.260E 01    0.520E 01    0.104E 02    0.208E 02
// XEQ FMFC]
```

TABLE 4.6

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3RD RECEIVER, CLOUDS AS BACKGROUND

SKY RAD.IN W/SQM/MIC,N =	51.500	AMB.TEMP.IN DEG.D,TEMP =	300.000
PREAMP.CAP.IN PF,C =	6.500	PREAMP.NOISE FIG.,NF =	2.000
AV.DC RESP.IN A/W,S1 =	0.145	AV.AC RESP.IN A/W,S2 =	0.400
AV.DARK CUR.IN NA,IAV =	0.495	PIN RESP.IN A/W,S =	0.500
PIN DARK CUR.IN NA,IPIN=	1000.000		
VISIBILITY IN MI, V =	100.000	LASER PEAK PWR IN W,P1 =	10.000
XMITT.TRANSMIT.,T1 =	0.800	RECEIV.TRANSMIT.,T2 =	0.800
LASER P.WIDTH IN NS,T =	150.000	TARG.L.IN BEAM IN M,LT =	0.900
TARGET REFL.,RHO =	0.200	REC.BEAM ELEV.,DEG,EPS =	89.330
REC.ELEV FIELD,DEG,PSI =	1.340	REC.FAN SPREAD,DEG,GAM =	90.000
TRM.FAN SPREAD,DEG PHI =	90.000		

REC.AP.AREA IN SQCM,AR =	4.000	5.000	6.000	8.000
RANGE IN FT,R1 =	40.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.135E 02	0.156E 02	0.175E 02	0.209E 02
PIN BKGD-TO-SYST.NOISE =	0.196E 01	0.245E 01	0.294E 01	0.392E 01
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.104E 02	0.119E 02	0.132E 02	0.156E 02
PIN BKGD-TO-SYST.NOISE =	0.392E 01	0.490E 01	0.588E 01	0.784E 01
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.512E 01	0.575E 01	0.632E 01	0.733E 01
PIN BKGD-TO-SYST.NOISE =	0.196E 02	0.245E 02	0.294E 02	0.392E 02
OPT.F.BW. IN MICRON,DL =	0.300			
S/N,PIN DIODE SNPIN =	0.366E 01	0.410E 01	0.450E 01	0.521E 01
PIN BKGD-TO-SYST.NOISE =	0.392E 02	0.490E 02	0.588E 02	0.784E 02
RANGE IN FT,R1 =	50.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.691E 01	0.800E 01	0.899E 01	0.107E 02
PIN BKGD-TO-SYST.NOISE =	0.196E 01	0.245E 01	0.294E 01	0.392E 01
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.536E 01	0.612E 01	0.680E 01	0.800E 01
PIN BKGD-TO-SYST.NOISE =	0.392E 01	0.490E 01	0.588E 01	0.784E 01
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.262E 01	0.294E 01	0.323E 01	0.375E 01
PIN BKGD-TO-SYST.NOISE =	0.196E 02	0.245E 02	0.294E 02	0.392E 02

TABLE 4.7

```
OPT.F.BW. IN MICRON,CL =      0.300

S/N,PIN DIODE SNRIN =    0.1[illegible]7E 01   0.210E 01   0.2[illegible]0E 01   0.267E 01
PIN BKGD-TO-SYST.NOISE = 0.[illegible]2E 02   0.490E 02   0.5[illegible]8E 02   0.784E 02
```

TABLE 4.7

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1ST AND 2ND RECEIVER, SUN IRRADIATED

SKY RAD.IN W/SQM/MIC.N =	111.000	AMB.TEMP.IN DEG.K.TEMP =	300.000
PREAMP.CAP.IN PF.C =	0.500	PREAMP.NOISE FIG.,NF =	2.000
AV.DC RESP.IN A/W,S1 =	0.400	AV.AC RESP.IN A/W,S2 =	0.145
AV.DARK CUR.IN NA,IAV =	1.499	PIN RESP.IN A/W,S =	0.500
PIN DARK CUR.IN NA,IPIN=	1000.000		

VISIBILITY IN MI, V =	100.000	LASER PEAK PWR IN W,P1 =	16.000
XMITT.TRANSMIT.,T1 =	0.800	RECEIV.TRANSMIT.,T2 =	0.800
LASER P.WIDTH IN NS,T =	150.000	TARG.L.IN BEAM IN M,LT =	0.900
TARGET REFL.,RHO =	0.200	REC.BEAM ELEV.,DEG,EPS =	88.850
REC.ELEV FIELD,DEG,PSI =	2.290	REC.FAN SPREAD,DEG,GAM =	90.000
TRM.FAN SPREAD,DEG PHI =	90.000		

REC.AP.AREA IN SQCM,AR =	0.250	0.500	1.000	2.000
RANGE IN FT,R1 =	10.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.310E 02	0.451E 02	0.648E 02	0.923E 02
PIN BKGD-TO-SYST.NOISE =	0.799E 01	0.159E 02	0.319E 02	0.639E 02
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.225E 02	0.324E 02	0.461E 02	0.655E 02
PIN BKGD-TO-SYST.NOISE =	0.159E 02	0.319E 02	0.639E 02	0.127E 03
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.103E 02	0.146E 02	0.207E 02	0.294E 02
PIN BKGD-TO-SYST.NOISE =	0.799E 02	0.159E 03	0.319E 03	0.639E 03
OPT.F.BW. IN MICRON,DL =	0.300			
S/N,PIN DIODE SNPIN =	0.733E 01	0.103E 02	0.147E 02	0.208E 02
PIN BKGD-TO-SYST.NOISE =	0.159E 03	0.319E 03	0.639E 03	0.127E 04
RANGE IN FT,R1 =	25.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.198E 01	0.288E 01	0.414E 01	0.590E 01
PIN BKGD-TO-SYST.NOISE =	0.799E 01	0.159E 02	0.319E 02	0.639E 02
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.144E 01	0.207E 01	0.295E 01	0.419E 01
PIN BKGD-TO-SYST.NOISE =	0.159E 02	0.319E 02	0.639E 02	0.127E 03
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.661E 00	0.934E 00	0.132E 01	0.188E 01
PIN BKGD-TO-SYST.NOISE =	0.799E 02	0.159E 03	0.319E 03	0.639E 03

TABLE 4.8

OPT.F.BW. IN MICRONS,LL = 0.300

S/N,PIN DIODE SNPIN =	0.4[illegible]9E 00	0.664E 00	0.9[illegible]0E 00	0.133E 01
PIN BKGD-TO-SYST.NOISE =	0.155E 03	0.319E 03	0.6[illegible]9E 03	0.127E 04

TABLE 4.8

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3RD RECEIVER, SUN IRRADIATED

SKY RAD.IN W/SCM/MIC,H =	160.000	AMB.TEMP.IN DEG.D,TEMP =	300.000
PREAMP.CAP.IN PF,C =	0.500	PREAMP.NOISE FIG.,NF =	2.000
AV.DC RESP.IN A/W,S1 =	0.400	AV.AC RESP.IN A/W,S2 =	0.145
AV.DARK CUR.IN NA,IAV =	0.499	PIN RESP.IN A/W,S =	0.500
PIN DARK CUR.IN NA,IPIN=	1000.000		
VISIBILITY IN MI, V =	100.000	LASER PEAK PWR IN W,P1 =	16.000
XMITT.TRANS IT.,T1 =	0.800	RECEIV.TRANSMIT.,T2 =	0.800
LASER P.WIDTH IN NS,T =	150.000	TARG.L.IN BEAM IN M,LT =	0.900
TARGET REFL.,RHO =	0.200	REC.BEAM ELEV.,DEG,EPS =	89.330
REC.ELEV FIELD,DEG,PSI =	1.340	REC.FAN SPREAD,DEG,GAM =	90.000
TRM.FAN SPREAD,DEG PHI =	50.000		

REC.AP.AREA IN SQCM,AR =	4.000	5.000	6.000	8.000
RANGE IN FT,R1 =	40.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.161E 01	0.180E 01	0.197E 01	0.228E 01
PIN BKGD-TO-SYST.NOISE =	0.207E 03	0.259E 03	0.310E 03	0.414E 03
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.114E 01	0.127E 01	0.139E 01	0.161E 01
PIN BKGD-TO-SYST.NOISE =	0.414E 03	0.518E 03	0.621E 03	0.829E 03
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.510E 00	0.570E 00	0.625E 00	0.721E 00
PIN BKGD-TO-SYST.NOISE =	0.207E 04	0.259E 04	0.310E 04	0.414E 04
OPT.F.BW. IN MICRON,DL =	0.300			
S/N,PIN DIODE SNPIN =	0.360E 00	0.403E 00	0.442E 00	0.510E 00
PIN BKGD-TO-SYST.NOISE =	0.414E 04	0.518E 04	0.621E 04	0.829E 04
RANGE IN FT,R1 =	50.000			
OPT.F.BW. IN MICRON,DL =	0.015			
S/N,PIN DIODE SNPIN =	0.824E 00	0.922E 00	0.101E 01	0.116E 01
PIN BKGD-TO-SYST.NOISE =	0.207E 03	0.259E 03	0.310E 03	0.414E 03
OPT.F.BW. IN MICRON,DL =	0.030			
S/N,PIN DIODE SNPIN =	0.583E 00	0.652E 00	0.715E 00	0.826E 00
PIN BKGD-TO-SYST.NOISE =	0.414E 03	0.518E 03	0.621E 03	0.829E 03
OPT.F.BW. IN MICRON,DL =	0.150			
S/N,PIN DIODE SNPIN =	0.261E 00	0.292E 00	0.320E 00	0.369E 00
PIN BKGD-TO-SYST.NOISE =	0.207E 04	0.259E 04	0.310E 04	0.414E 04

TABLE 4.9

```
OPT.F.BW. IN MICRONS,DL =      0.300

S/N,PIN DIODE SPEIN =      0.174E 00   0.206E 00   0.226E 00   0.261E 00
PIN BKGD-TO-SYST.NOISE =   0.414E 04   0.518E 04   0.621E 04   0.829E 04
```

TABLE 4.9

PAGE 2

where, $M_{equ}(\lambda)$ = 111 $W/m^2/\mu m$ for receivers 1 and 2, Table 4.8 and

$M_{equ}(\lambda)$ = 180 $W/m^2/\mu m$ for receiver 3, Table 4.9.

Table 4.6 and 4.8 show that an aperture area of 0.25 cm^2 is sufficient for receiver 1 to produce a high S/N ratio even with the sun shining directly onto it. The same tables show that receiver 2 with an aperture area of 0.5 cm^2 suffices for sunlit clouds as background, while even 2 or 4 cm^2 would not result in a S/N ratio of 6.54, the required minimum.

Tables 4.7 and 4.9 show that even 8 cm^2 aperture area are insufficient for receiver 3 to produce the required minimum S/N ratio with sunlit clouds as background or looking at the sun. From Table 4.7 can be seen that with 4 cm^2 aperture and the laser peak power increased by 1.12 to 18W, the minimum S/N ratio of 6.54 can be obtained when receiver 3 is looking at sunlit clouds.

Summarizing, it can be said that the S/N ratio is the most illustrative parameter for describing the AOMDI performance. Recalling (4.25):

$$S/N = \frac{SP_1T_1T_2\,\rho\, LA_r}{\pi R_1^{\,3}\phi\,\sqrt{2qB(S\bar{P}_6 + I_{co}) + i_a^{\,2}}}\,,$$

the following conclusions can be drawn:

1. The S/N ratio is proportional to the received power and, therefore, to P_1, T_1, ρ and L.

2. The S/N ratio is proportional to T_2 and A_r for smaller receivers, with the system generated noise dominating, while for larger receivers the S/N ratio comes closer to being proportional to $\sqrt{T_2}$ and $\sqrt{A_r}$ as the background generated noise increases (the expression (4.21) shows P_6 proportional to T_2 and A_r, making the denominator of (4.25) proportional to $\sqrt{T_2}$ and $\sqrt{A_r}$).

3. The S/N ratio is inversely proportional to R_1^3 and ϕ.

4. The S/N ratio is nearly inversely proportional to the system generated noise which in turn is proportional to $\sqrt{2_q BI_{co}T + i_a^2}$ for the smaller receivers in which the background generated noise is substantially smaller than the system generated noise. The results of the computer runs shown in the tables corroborate the above conclusions.

5. A receiver 1 with 0.25 cm^2 aperture area can tolerate sunlit clouds as background and the sun in its field of view and still produce useable signals. A receiver 2 with 0.5 cm^2 aperture can only tolerate sunlit clouds as background but not the sun in its field of view, even when its aperture area is increased to 2 cm^2, and receiver 3 with even 8 cm^2 aperture area can neither tolerate sunlit clouds nor the sun. It would require 18W laser peak power and 4 cm^2 aperture area to obtain the minimum S/N ratio of 6.54 with sunlit clouds as background.

Section V

OPTICAL CONSIDERATIONS

The optical system of the AOMDI consists of 9 identical transmitter-receiver combinations or quadrants. Each of these quadrants employs one transmitter and three receivers. The emissive pattern of the transmitter and the fields of view of the receivers are shaped in such a manner that, when properly positioned relative to one another, 5 intervals of target distance can be distinguished by examining the receiver output signals. This has been described in Section II. Here, the design criteria for the individual optical systems will be discussed.

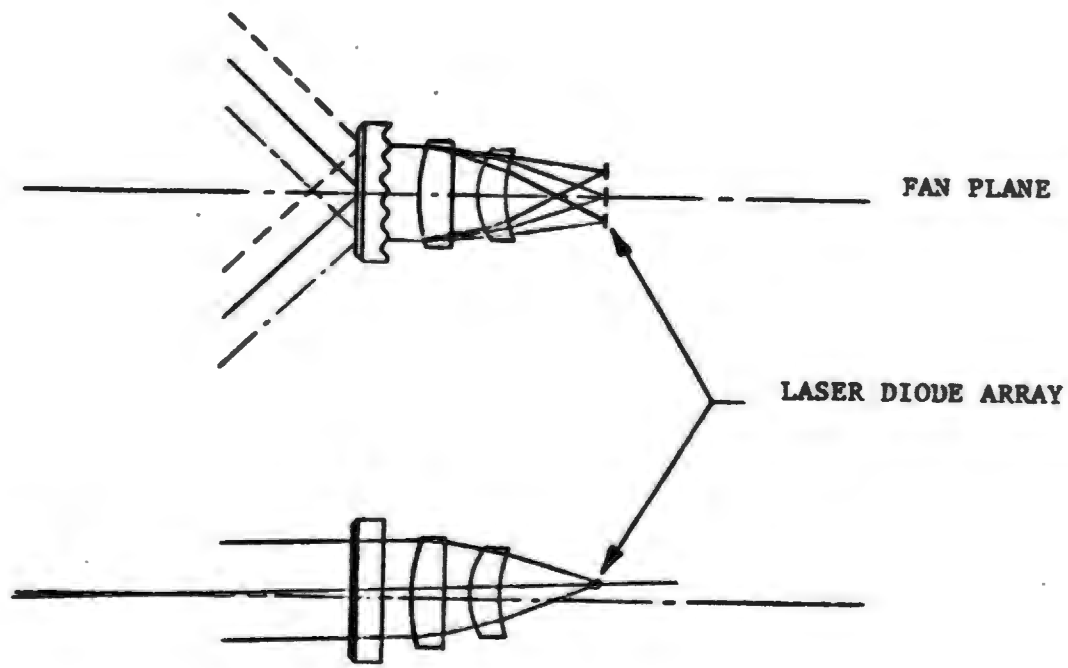
The Transmitter

As has been previously shown, the S/N ratio of the AOMDI system is directly proportional to the radiant power supplied by the transmitter to irradiate the target. The transmitter must, therefore, use a powerful radiation source together with a highly efficient optical system. The optical system must not only be highly efficient, but must also concentrate the radiant power in a very thin slice of volume. When irradiating a target the thickness of this slice of volume, or fan, determines the width of the irradiated area on the target. The receiver produces an image of this irradiated and reflecting band on the detector. The width of this image should be as small as possible for sharp geometrical cutoff which requires minimizing the transmitter fan thickness. A small but powerful radiation source for this application is the GaAs laser diode. It can be operated in a pulsed mode providing high peak radiant power concentrated in a narrow spectral range which permits using an optical filter to reduce background radiant power. The emission maximum is located well within the spectral range of sensitivity of Si-photodiodes so that these diodes can be used in the receivers. The emitting area of the GaAs laser is a linear array of three diode junctions, each approximately 0.009 in. long and 0.0004 in. wide. The emission pattern of this laser diode is contained in a solid angle which corresponds to an f number of

1.33. The transmitter, therefore, employs a spherical collimator of this f number which is followed by a nonspherical lenticular element which spreads the emissive pattern to the desired fan. The lenticular element consists of a number of cylindrical lenses each of which produces a fan in a plane which contains the three junctions (see Figure 5.1). The resulting fan pattern is the superposition of the patterns of all cylindrical lenses. Irregularities of the emissive pattern along the laser junctions are thus effectively averaged out. Figure 5.2 shows a cutaway view of SBRC's AIM-9L transmitter. The two-element collimator with a focal length of 0.4 in. produces a beam which diverges lmrad in a plane perpendicular to the fan when the laser junction is placed at its focal point. Added to this is a lmrad blur due to abberations. Both, beam divergence and blur affect only the thickness of the fan. The shape of the bin boundary function is dependent on the beam thickness as can be seen from the computer runs shown in Section VI. This dependence is quite pronounced and the aim in designing the transmitter optics should be a diffraction limited system which can be realized with a three element collimator whose focal length should be as long as permitted by the space available on the vehicle carrying the AOMDI.

<u>The Receivers</u>

Each receiver must gather a sufficient amount of power reflected by the target within its range interval to meet the requirement for the minimum S/N ratio. This means that the receiver aperture area must equal, or exceed, a minimum size. These aperture sizes for the three receivers were calculated in Section IV and are used as point of departure for the following considerations. A receiver does not need to image the irradiated part of the target. It suffices if it selects a volume in space from which it can receive target reflected radiation; and it must maximize the amount of received power. A design must be found which provides the desired selection pattern, is efficient and small. As the optical efficiency is mainly decided by the reflection losses at the interfaces of the system elements through which the incoming radiation must pass, an optical system with few elements is desirable.



TRANSMITTER OPTICS

FIGURE 5.1

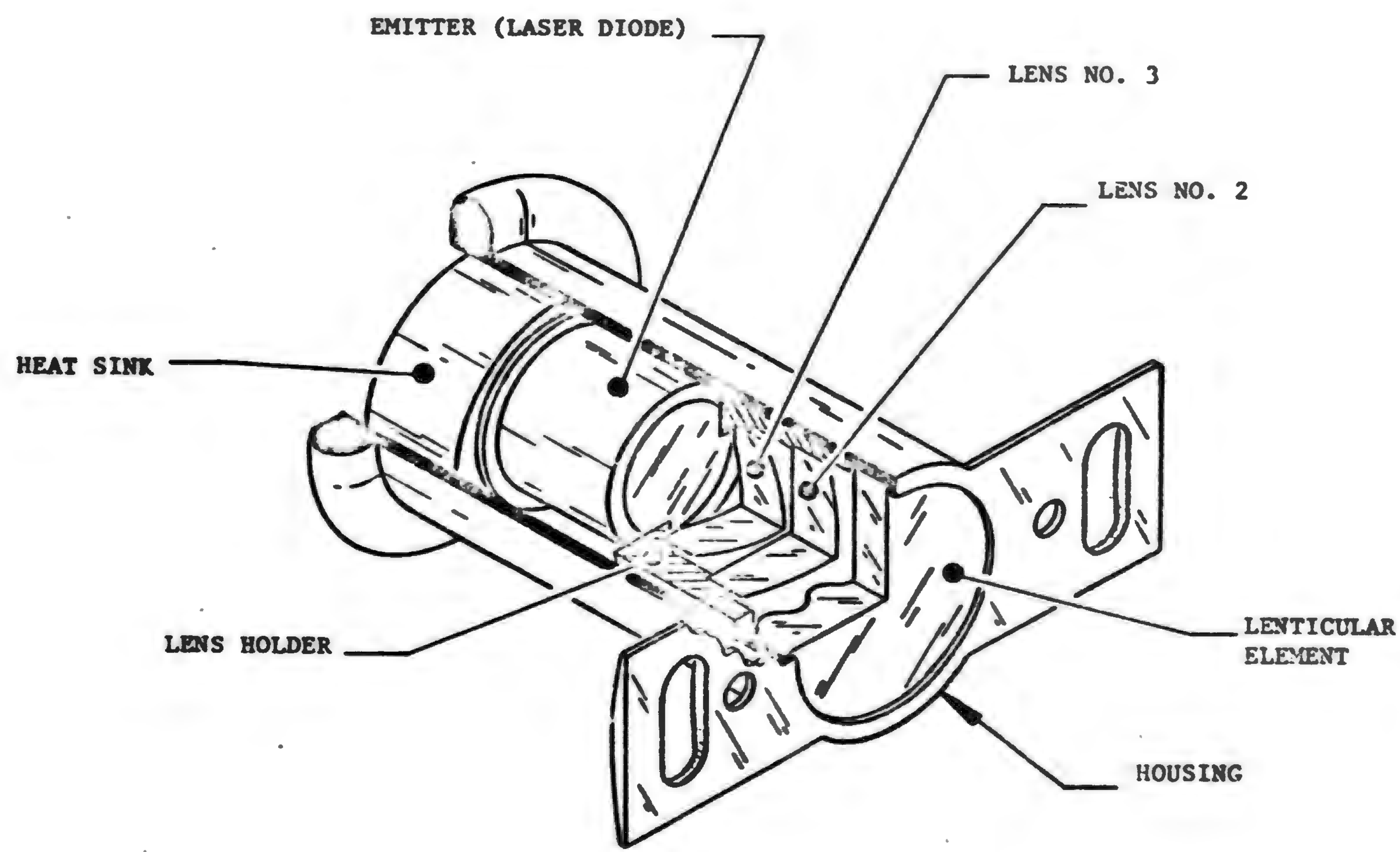


FIGURE 5.2 TRANSMITTER OPTICS ASSEMBLY

The field of view of a receiver must be matched to the fan pattern of the transmitter. This requirement suggests an anamorphic system for the receiver. Such a system which also features a minimum of elements was developed by SBRC for active optical fuzes. The design is perfectly suited for the AOMDI system. Its principle of operation is described with the aid of Figures 5.3, 5.4 and 5.5. Figure 5.3 shows the receiver as it relates to the field of view and the baseline. The receiver consists of 3 parts; the filter, the imaging element, and the detector.

The field of view is obtained in an unorthodox manner. The fan angle is determined by the critical angle of total reflection at the interface between glass n_1 and n_2 as shown in Figure 5.4 which represents a cross section of the receiver in a plane perpendicular to the system baseline. If $\sin \beta \geq \frac{n_2}{n_1}$ total reflection occurs (Figure 5.4A). As $\sin \beta = \cos \alpha' = \sqrt{1 - \sin^2 \alpha'}$, the condition for the largest angle α_o is obtained as $\sin^2 \alpha_o = n_1^2 - n_2^2$. Any ray incident on the receiver aperture at an angle $\alpha < \alpha_o$ will be trapped in the receiver. Rays for which $\alpha > \alpha_o$ will not be reflected at the interface between the glasses, pass into glass n_2 and strike an absorbing layer (Figure 5.4).

Figure 5.5 is a cross section of the receiver in a plane perpendicular to that of Figure 5.4. In it lies the directrix of the parabolic reflecting cylinder. Rays originating from one point of the target are imaged into a line in the image plane. This line is perpendicular to the plane of Figure 5.5 and is as wide as the receiver element. All points of the target which appear under the elevation angle ψ as seen from the receiver are imaged into such lines. The resulting image is the superposition of these line images. All rays having the same elevation angle ψ but differ in fan angle γ are refracted such that they come to lie in the same plane which is perpendicular to the plane of Figure 5.5. The reflector reflects these "sheets" of rays as if they were single rays. This property of the reflector is the reason for its selection in preference over a refractive system. A simple refractive cylinder would not image target points of the same evaluation angle but of different fan angle γ

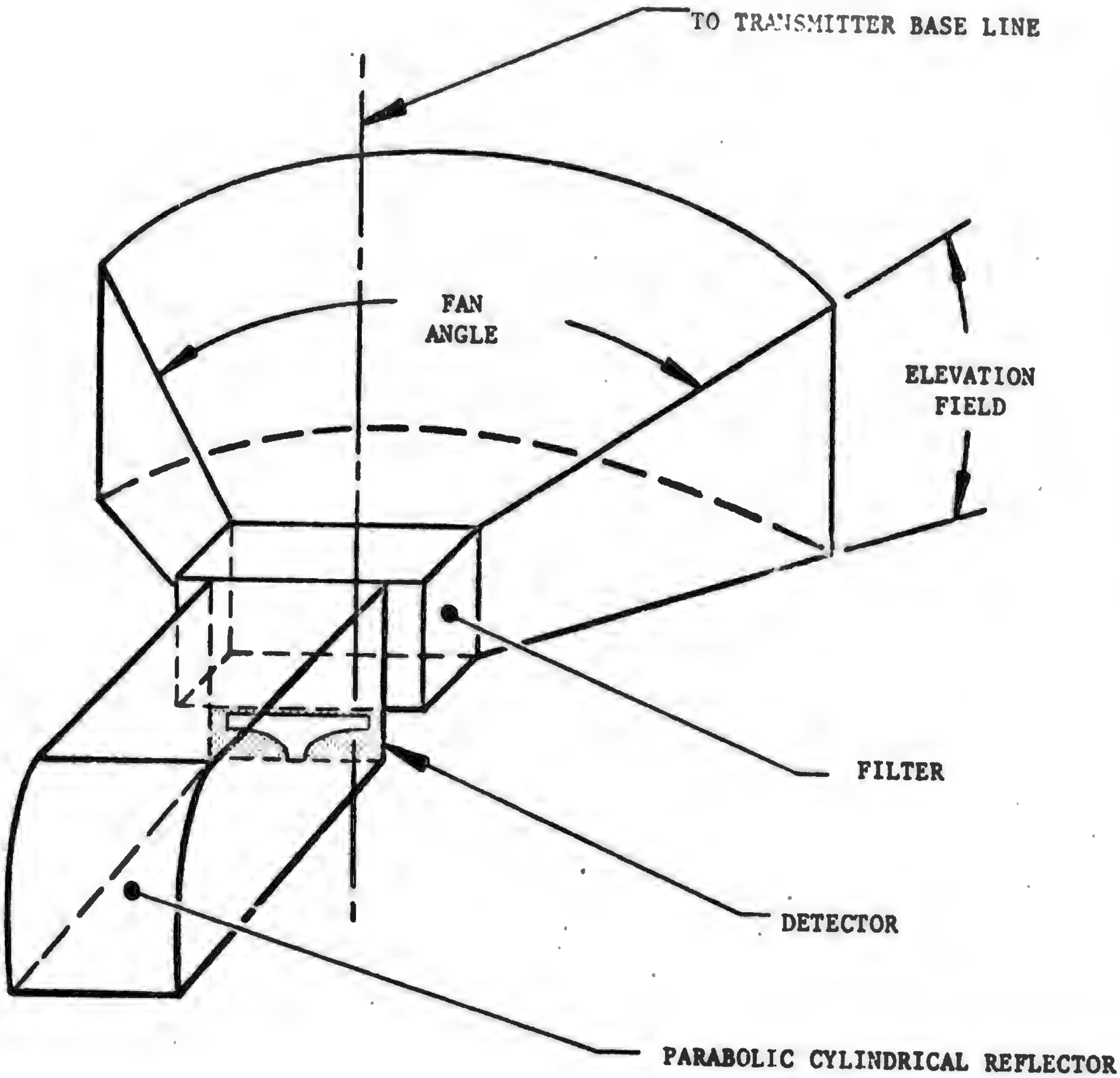

TO TRANSMITTER BASE LINE
FAN
ANGLE
ELEVATION
FIELD
FILTER
DETECTOR
PARABOLIC CYLINDRICAL REFLECTOR

FIGURE 5.3

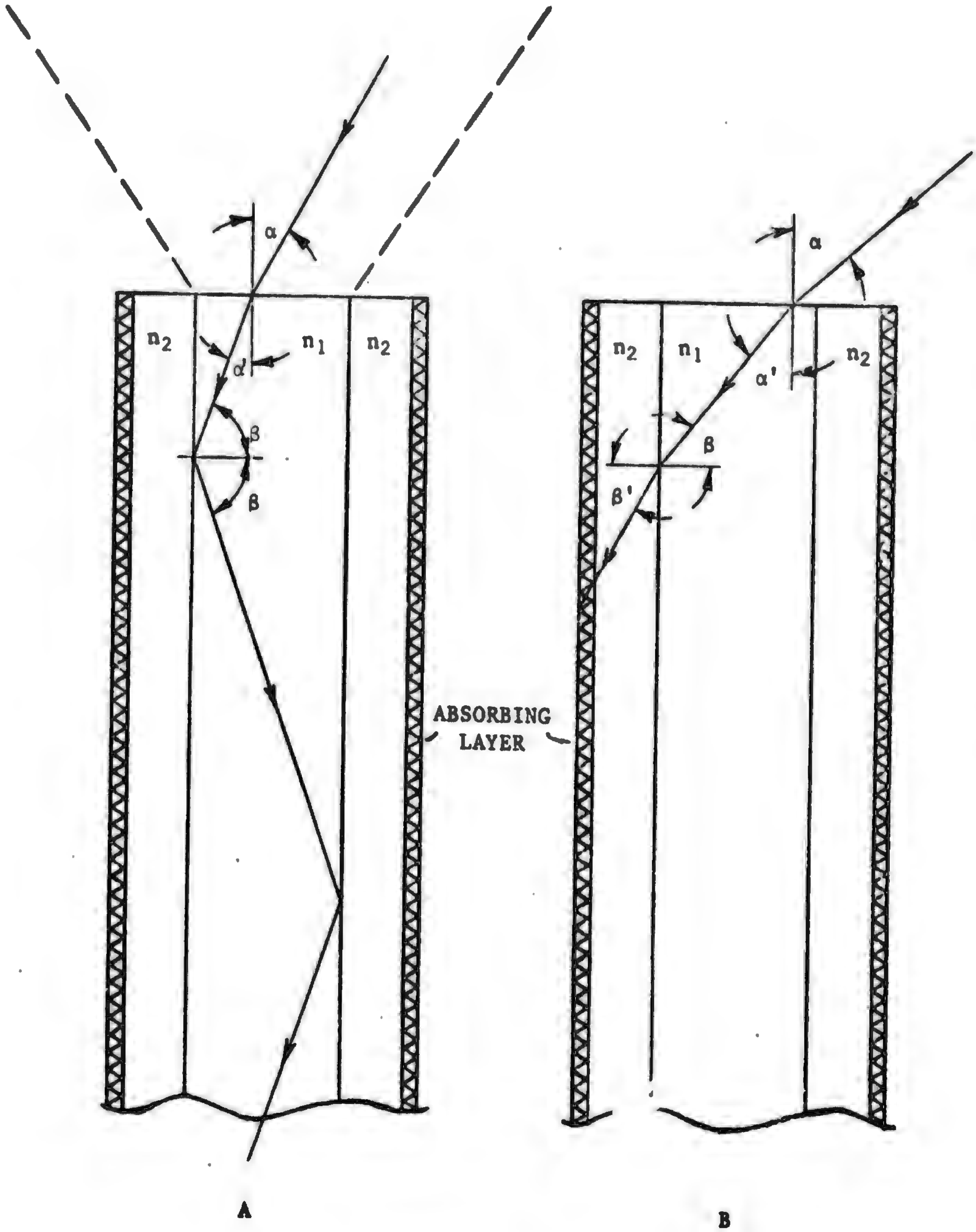


FIGURE 5.4

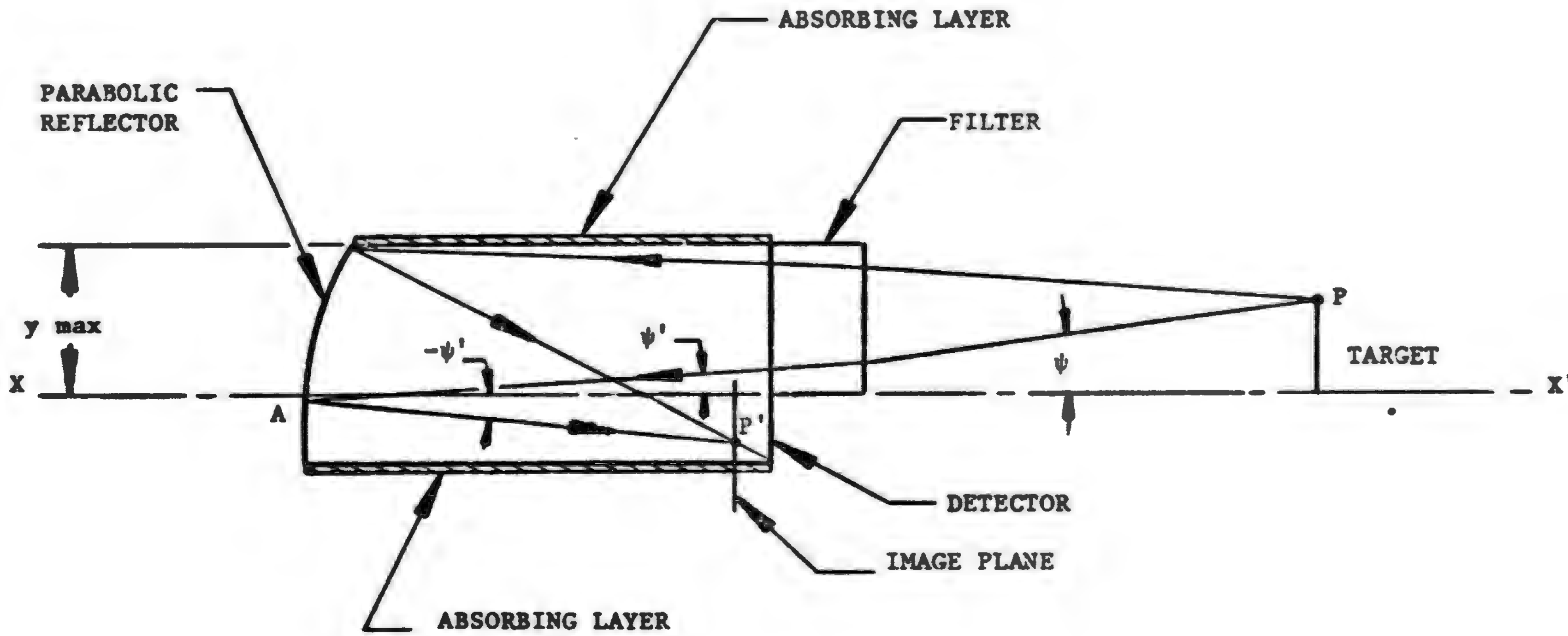

ABSORBING LAYER
PARABOLIC
REFLECTOR
FILTER
P
y max
ψ'
-ψ'
TARGET
ψ
X
X'
A
P'
DETECTOR
IMAGE PLANE
ABSORBING LAYER

FIGURE 5.5

in the same plane. An extended target would then produce a blurred image on the detector plane. The geometrical cutoff would be much softer than that obtained with a reflector. The detector can be brought into focus for one position of the target only. Since the height of the blurred image on the detector influences the sharpness of the range cutoff and since the far-range cutoff is less well defined than the near-range cutoff, the detector is placed in that image plane in which a target at the nominal far-range is imaged. Then, for this condition, the blur and its influence on the shape of the bin boundary function is minimized.

The elevation field of the receiver is determined by a field stop in the detector plane. The detector with the integral field stop is cemented to the receiver element using an optical cement with an index of refraction which minimizes the reflection losses. To minimize unwanted radiation picked up outside the elevation field, the top and bottom planes of the receiver are coated with an absorbing paint.

In Section IV, "Radiometric Considerations" it was shown that the radiant power received from the target varies as $\frac{1}{R^3}$. With a ratio of far-range-to-near-range of 5:1, the received radiation will vary with target location by 125:1. The electronics following the detector cannot accomodate such a dynamic range. A way of reducing the dynamic range was found by masking the active detector area in such a manner that with decreasing range a decreasing fraction of the target image falls on the unmasked area of the detector. The shape of the mask (Figure 5.6) is such that only when the target is at far-range does the full width of its image fall on the active detector area. From there on the shape of the mask as a function of image height reduces the image width on the active area such that the power received by the detector remains constant for target positions from far-range to near-range. The dynamic range is thereby reduced to 1. An additional advantage gained by this kind of masking is the significant reduction of the active detector area exposed to the received background radiation as discussed in Section IV. The shape of the mask resembles that of a bikini, whence it got its name. The equation that

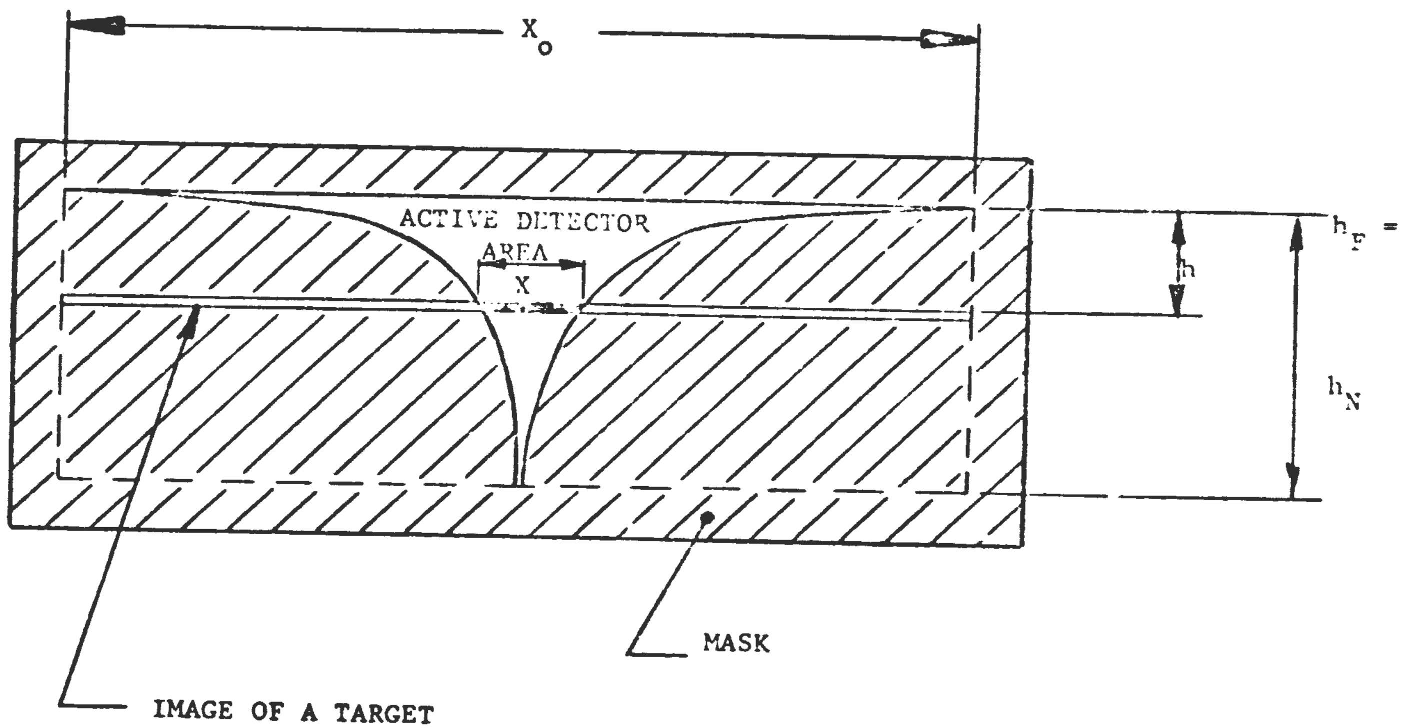


IMAGE WIDTH X FALLING INTO THE UNMASKED AREA OF THE DETECTOR:

$$X = X_o\left(\frac{\tan\delta}{\tan\delta - \frac{n_1}{p}h}\right)^3 = X_o\left(\frac{R}{R_F}\right)^3$$

FIGURE 5.6

describes it is derived in the following. From Figure 2.2 is obtained;

$$b + \frac{d}{2} = R(\mathrm{Tan}\delta + \tan\psi), \qquad (5.1)$$

and from Figure 5.5, for small angles ψ,

$$h = -p \frac{\tan\psi}{n_1} \qquad (5.2)$$

where n_1 is the index of refraction of the receiver element and p is the distance of the detector from the vertex of the parabolic reflector. The width x of the bikini as shown in Figure 5.6 must be

$$x = x_o \frac{R^3}{R_F^3} \qquad (5.3)$$

to make the received power independent of distance. From combining (5.1) and (5.2) follows

$$R = \frac{b + \frac{d}{2}}{\tan\delta \; \frac{n_1}{p} h} \; . \qquad (5.4)$$

As h = 0 for $R = R_F$, it follows that

$$R_F = \frac{b + \frac{d}{2}}{\tan\delta} \qquad (5.5)$$

and

$$\frac{R}{R_F} = \frac{\tan\delta}{\tan\delta - \frac{n_1}{p} h} \; . \qquad (5.6)$$

Then, substituting (5.6) in (5.3)

$$x = x_o \left(\frac{\tan\delta}{\tan\delta - \frac{n_1}{p} h} \right)^3 \qquad (5.7)$$

The reduction in exposed active detector area is obtained by integrating x and manipulating the result.

$$A_B = \int_{h_N}^{o} x\, dh = x_o \left(\frac{p\tan\delta}{n_1}\right)^3 \int_{h_N}^{o} \frac{dh}{\left(\frac{p\tan}{n_1} - h\right)^3} \qquad (5.8)$$

where h_N is the height of the image of a target at near-range R_n.

$$A_B = x_o \left(\frac{p\tan\delta}{n_1}\right)^3 \left[\frac{1}{2\left(\frac{p\tan\delta}{n_1} - h\right)^2}\right]_{h_N}^{o}$$

$$= \frac{x_o}{2} \left(\frac{p\tan\delta}{n_1}\right)^3 \left[\frac{1}{\left(\frac{p\tan\delta}{n_1}\right)^2} - \frac{1}{\left(\frac{p\tan\delta}{n_1}\right) - h_N)}\right] \qquad (5.9)$$

from (5.6) is obtained

$$\frac{R_F}{R_N} = \frac{\tan\delta - \frac{n_1}{p} h_N}{\tan\delta} \qquad (5.10)$$

(5.10) rearranged becomes

$$\frac{p\tan\delta}{n_1} - h_N = \frac{R_F}{R_N} \frac{p}{n_1} \tan\delta \qquad (5.11)$$

(5.11) is substituted in (5.9)

$$A_B = \frac{x_o}{2} \left(\frac{p\tan\delta}{n_1}\right)^3 \left[\frac{1}{\left(\frac{p\tan\delta}{n_1}\right)^2} - \frac{1}{\left(\frac{R_F}{R_N} \frac{p}{n_1} \tan\delta\right)}\right]$$

$$A_B = \frac{x_o}{2} \frac{p\tan\delta}{n_1} \left[1 - \frac{R_N^2}{R_F^2}\right] \tag{5.12}$$

(5.12) is the active detector area inside the bikini. To find the reduction factor, the detector area A_T without the mask must be obtained.

$$A_T = x_o |h_N| \tag{5.13}$$

(As h_N is a negative quantity, its absolute value is used)

$$|h_N| = - \frac{p\tan\delta}{n_1} \left(1 - \frac{R_F}{R_N} \right) \tag{5.14}$$

Then

$$A_T = x_o \frac{p\tan\delta}{n_1} \left(\frac{R_F}{R_N} - 1\right). \tag{5.15}$$

Now, the area ratio becomes,

$$\frac{A_B}{A_T} = \frac{\frac{x_o}{2} \frac{p\tan\delta}{n_1}}{x_o \frac{p\tan\delta}{n_1}} \cdot \frac{\frac{R_N^2}{R_F^2} - 1}{1 - \frac{R_F}{R_N}} = \frac{1}{2} \cdot \frac{\frac{R_N^2}{R_F^2} - 1}{1 - \frac{R_F}{R_N}}$$

$$\frac{A_B}{A_T} = \frac{1}{2} \cdot \frac{\left(\frac{R_F}{R_N}\right)^2 - 1}{\left(\frac{R_F}{R_N}\right)^3 - \left(\frac{R_F}{R_N}\right)^2} \tag{5.16}$$

(5.16) is the expression for the reduction factor obtained with a bikini mask. This expression is used in Section IV for calculating the equivalent radiance for the computer program.

In order to arrive at a final receiver design it is necessary to determine focal length and aperture shape (aperture size, or area, was determined in Section IV, "Radiometric Requirements").

The aperture shape, that is the ratio of height to width, influences the shape of the detector. As shown in Section IX, for a given elevation field ψ, the detector area depends on the aperture area and the speed of the optical system. The detector width always equals that of the receiver element. A very wide but low receiver would require a wide but narrow detector, and with a given speed, or f-number, result in a short focal length. Also, the number of total reflections a ray undergoes before striking the detector decreases with increasing width, thereby improving image quality and reducing losses. However, the demands on the accuracy of the shape of the bikini would increase considerably. A square aperture seems to be a good compromise for receivers 1 and 2, while for the large receiver 3 a height-to-width ratio 2:1 is better suited to keep the detector width from getting unwieldy.

The shortest recommended focal length is obtained by doubling the receiver height. This corresponds to an f-number of 2 which is large enough to keep the aberrations tolerable.

A short focal length is desirable to keep the size of the receiver small. However, when the f-number is decreased, the angle of incidence of the rays striking the glass - detector interface increases and the reflection losses increase. For this reason the f-number should be made large. This is possible with receivers 1 and 2 whose aperture areas are small and the increase in length resulting from an increase in focal length can be tolerated. The f-number of receiver 3, however, should be the smallest tolerable, that is f/2, to keep its size down.

It might be expected that the focal length influences the shape of the bin boundary functions. This influence was investigated in Section VI and found insignificant so that the focal length can be chosen freely with respect to its influence on the bin boundary function.

The simple shape of the receiver element as described above should allow making it of plastic. In larger quantities, when the initial costs of a mold can be justified, the receiver element can be produced by injection molding. However, when the receiver element is intended to be used in an environment of high level nuclear radiation, the deterioration of plastics under such conditions would make glass a better choice.

Section VI

BIN BOUNDARY FUNCTION

As it is the purpose of the AOMDI to provide information as to the presence of a target within certain intervals of distance (range) from it, the definition of these intervals is of the greatest importance for the successful operation of the AOMDI.

The 5 intervals of distance, called bins, are obtained with the aid of 3 optical receivers and 3 transmitters as described in Section 2. Each receiver can receive a signal reflected from a target which must be located within a thin slice of volume described by the receiver fan spread angle γ, the receiver elevation field ϕ and the geometrical near and far cutoff ranges (see Figures 2.1, 2.2, 2.3 & 2.4). The nominal cutoff ranges are obtained as the distances of the intersections of the transmitter beam axis with the elevation field boundaries. A nonideal transmitter beam and imperfect optical imaging lead to "soft", less well defined, cutoff ranges or bin boundaries. A boundary cannot be described by a single value of distance, but rather by a function of distance. Such functions are the sensitivity of the receiver to a return signal from a target and the probability of detecting this signal. The knowledge of these functions (called "Bin Boundary Function") is extremely useful in designing the optical system of the AOMDI. To obtain the bin boundary function a mathematical model of the receiver optics was constructed. Certain assumptions and simplifications had to be made to keep the mathematics manageable. They are:

1. The basic receiver optics design assumed for all 3 receivers is that described in the section on optical considerations. It is an anamorphic system in which total reflection is employed to obtain the desired fan spread angle. A reflective parabolic cylinder images the irradiated target on the immersed detector.
2. The bin boundary function is calculated in a plane containing the baseline, the centerline of the transmitter beam and the

centerline of the receiver fan. The reflective parabolic cylinder is perpendicular to this plane.

3. The target dimension perpendicular to the plane defined in 2 is small compared to the distance of the target from the receiver.
4. The shape of the energy distribution of the transmitter beam in the plane defined in 2 is trapezoidal.
5. The receiver image blur due to imperfections of the parabolic cylinder surface can be described by a constant angle resulting in a triangular energy distribution at the edges of the image (Figure 6.2B).
6. In certain expressions the angle is used in place of the arc tangent.
7. No aberrations are considered.
8. The optical system is not diffraction limited.
9. The elevation field of the receiver is determined by a field stop (mask) in the detector plane and is described by 2 heights (Figure 6.4).
10. The target is a perfectly diffuse (Lambertian) reflector.
11. The maximum angle under which a target in the transmitted beam appears as seen from the receiver is small, allowing to assume its cosine to be approximately 1.

The course which will be followed in obtaining the bin border function is as follows:

1. The contribution dH of one radiating surface element of the target (the object) is determinee.
2. H is obtained as an indefinite integral and the total power impinging on the detector is calculated by integrating H. As the functions describing dH and the energy distribution of the transmitter are different on different intervals, the integration must be carried out piecewise. The limits of the definite integrals correspond to the limits of those intervals.

3. The integrals which are functions of the range R are normalized with respect to the value of the power received when the target is fully in the field of view of the receiver.
4. The bin boundaries are defined as the distance at which the probability of detection drops to 25%. This corresponds to a signal equal to the threshold.
5. A computer program is used to calculate the bin boundary function and the influence of the optical parameters on the shape of the bin boundary function is studied.

1. Calculating the Increment of the Irradiance Produced by a Surface Element of the Target.

As the optical receiver uses an anamorphic system, it suffices to consider imaging in a plane containing the directrix (parabola) of the reflective cylinder, the baseline b and the centerlines of both, the transmitter and receiver fans. The target is then assumed to be a plane surface, perpendicular to the axis of the parabola. Figure 6.1 shows the geometrical relationship that exists between the target, the reflecting parabola and the image in the detector plane. The parabolic reflector at 0 produces an image $T_1'T_2'$ at f + x' of the target T_1T_2 at the range R. The detector plane intersects the axis at P. The distance between the image plane and P is Δx. A blurred image is produced in the detector plane. As the optical system is anamorphic, it images an object point into a line. The blurred (due to defocusing) image of a target point is a band of width a perpendicular to the plane containing the axis and the centerlines of receiver and transmitter fan. If y max. is the aperture height and x_p is the sag of the parabola at y max, a can be obtained from Figure 6.1:

$$a = \frac{y_{max}-t}{f + x' - x_p} \cdot \Delta x - \frac{-t}{f - x'}, \qquad (6.1)$$

where $\Delta x = p-f-x'$ and distances below the axis are counted negative.

And, if $x_p \ll f + x'$

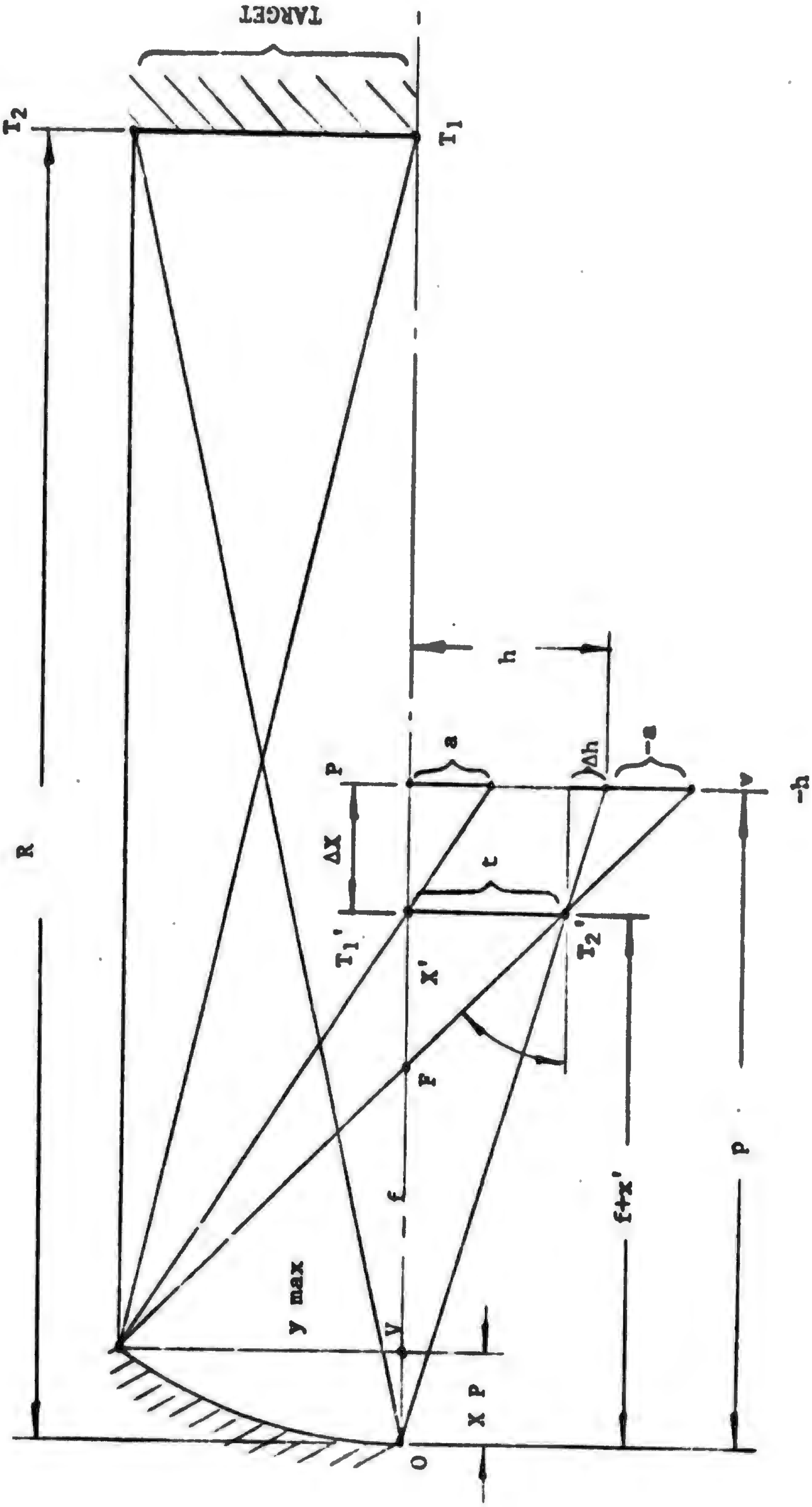


FIGURE 6.1

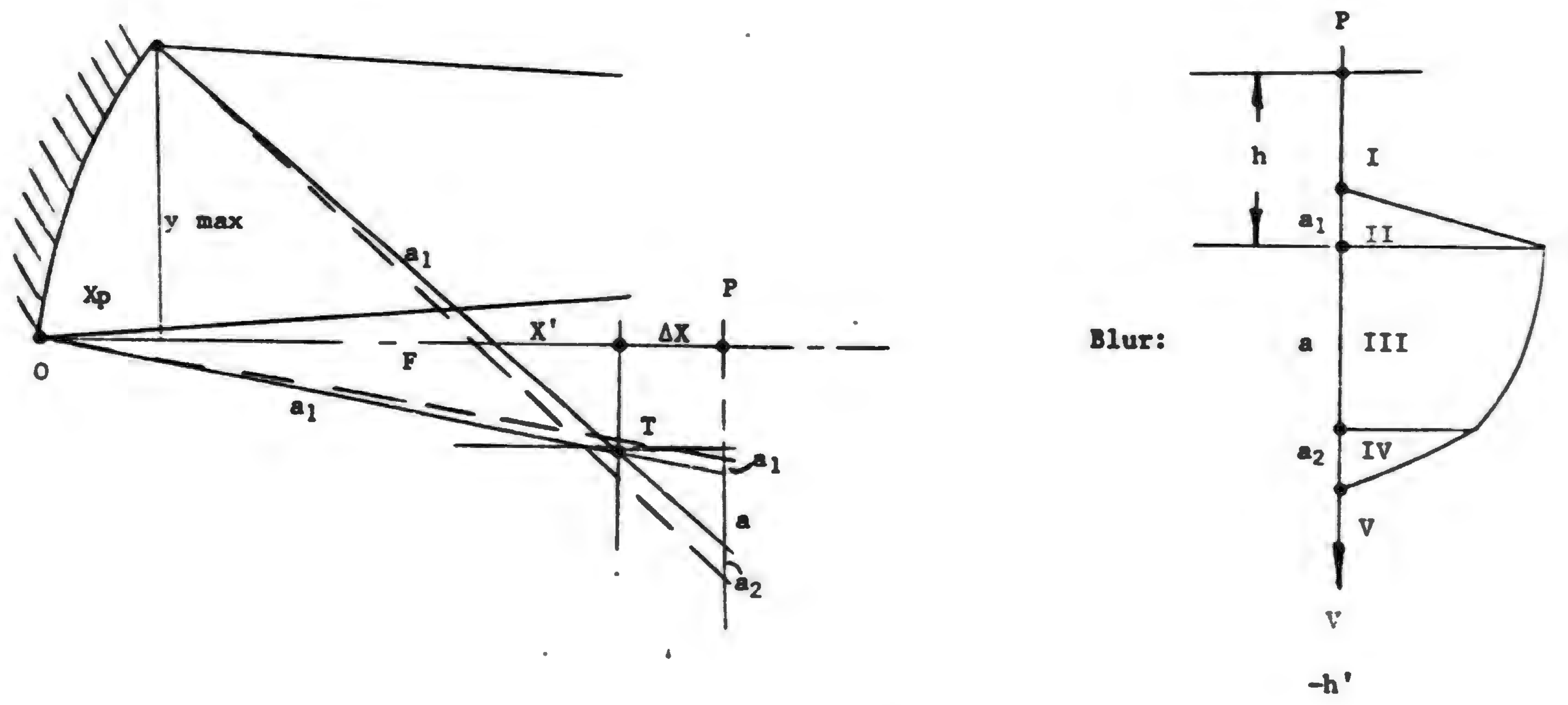


FIGURE 6.2

$$a = \frac{y_{max}}{f + x' - x_p} \Delta x, \text{ independent of } t. \quad (6.2)$$

The imperfections of the parabolic reflector cause additional blur, which is described by a blur angle σ_1 as shown in Figure 6.2. The blur band is then widened by $a_1 + a_2$. If σ_1 is very small, then

$$a_1 = p\sigma_1 \frac{1}{\cos(\arc \tan \frac{h}{p})} \quad (6.3)$$

and

$$a_2 = p\sigma_1 \frac{1}{\cos[\arc \tan(\frac{-y_{max}}{f+x'-x_p} + \frac{h}{p})]} \quad (6.4)$$

where $p = f + x' + \Delta x$.

As $\frac{h}{p} \approx 0$, $a_1 = p\sigma_1$ and

$$a_2 = \frac{p\sigma_1}{\cos[\arc \tan(\frac{-y_{max}}{f+x'-x_p})]} \quad (6.5)$$

The incremental irradiance dH at the detector plane can now be calculated by assuming that each increment $d\alpha$ contains the same increment of radiant power dP and that the blur angle causes a triangular distribution on both sides of the defocusing blur. As the results of these calculations will be normalized, the units in which dH is expressed are arbitrary. dH can be expressed as $dH = f(h' - h).N(w).L.dw$, where $N(w)$ is the radiance of the target, L.dw the surface element and L the length of target in the transmitter beam. With the above assumption, 5 regions exist in which $f(h' - h)$ must be defined (Figure 6.2B).

In Region I where $a_1 < h' - h$ $\quad f_o(h' - h) = 0 \quad$ (6.6)

In Region II, where $0 \leq h' - h \leq a_1$

$$f_1\ (h' - h) = \frac{c_1}{a_1}\ (h' - h - a_1) \qquad (6.7)$$

In Region III, where $-a \leq h' - h \leq 0$

$$f_2\ (h' - h) = \cos^2\ [\arc \tan\ (\frac{h' - h}{\Delta x} - \frac{h}{p})] \qquad (6.8)$$

The substitution of the tangent for the angle is necessary to keep the mathematics manageable. The error thus introduced is moderate as

$$\frac{|h' - h|}{|\Delta x|} \leq \frac{|a|}{|\Delta x|} = \frac{|y\ max|}{|f + x' - x_p|} \qquad \text{(Figures 6.1 \& 6.2)}$$

For an optical system of moderate speed to be used in the AOMDI

$$\frac{|y\ max|}{|f + x' - x_p|} < \frac{1}{2}\ .$$

Assuming $\frac{|h' - h|}{|\Delta x|} = 0.5$, then

$\cos^2$ (.5 rad) = $\cos^2$ (28.6°) = 0.771

and $\cos^2$ [arc tan (0.5)] = $\cos^2$ (26.55°) = .80

$$\frac{\cos^2(28.6°)}{\cos^2(26.55°)} = 0.964$$

The resulting error is about 3.6% surely quite tolerable. And with $\frac{h}{p} \approx 0$ $f_2(h' - h)$ becomes: $f_2(h' - h) = \cos^2\ (\frac{h' - h}{\Delta x})$ (6.9)

In Region IV, where $-a - a_2 \leq h' - h \leq -a$

$$f_3\ (h' - h) = \frac{c_2}{a_2}\ (h' - h + a + a_2) \qquad (6.10)$$

In Region V, where $h' - h < -a - a_2$

$$f_4(h' - h) = 0 \qquad (6.11)$$

The function $f(h'-h)$ must be continuous requiring that at the boundaries of regions $f_o(a_1) = f_3(-a-a_2) = 0$, $f_1(0) = f_2(0)$ and $f_2(-a) = f_3(-a)$, which allows to calculate c_1 and c_2 as

$$c_1 = f_2(0) = -1 \qquad (6.12)$$

and $c_2 = f_2(-a) = \cos^2 (\frac{-a}{\Delta x}) = \cos^2 (\frac{-\dot{y}\ max}{f+x'+xp})$.   (6.13)

So far only the case $\Delta x>0$ was considered. However, as the target moves towards the receiver, its image receeds from the reflector. It can pass through the detector plane making Δx first equal to zero and then negative. As a is proportional to Δx, it also becomes negative. a_1 and a_2 must be assumed to be negative to retain the same type of blur. Figure 6.3 shows this situation. The blur band now appears upside down with the 5 region defined as follows:

$$\text{I:}\quad h' - h < a_1 \qquad (6.14)$$

$$\text{II:}\quad a_1 \leq h'-h \leq 0 \qquad (6.15)$$

$$\text{III:}\quad 0 \leq h'-h \leq -a \qquad (6.16)$$

$$\text{IV:}\quad -a \leq h'-h \leq -a-a_2 \qquad (6.17)$$

$$\text{V:}\quad -a-a_2 \leq h'-h \qquad (6.18)$$

Comparing the above inequalities with those obtained for $\Delta x>0$ it becomes apparent that by changing the sign of h', h, a, a_1, and a_2 in one set of the inequalities the other set is obtained. Later, when integrating dH, advantage will be taken of this property.

The incremental irradiance dH can now be expressed as follows:

$$dH = f_1(h' - h).N(w).Ldw \qquad (6.19)$$

The radiance N(w) of the target varies over the width of the transmitter beam. This functional dependence is modeled by a trapezoidal

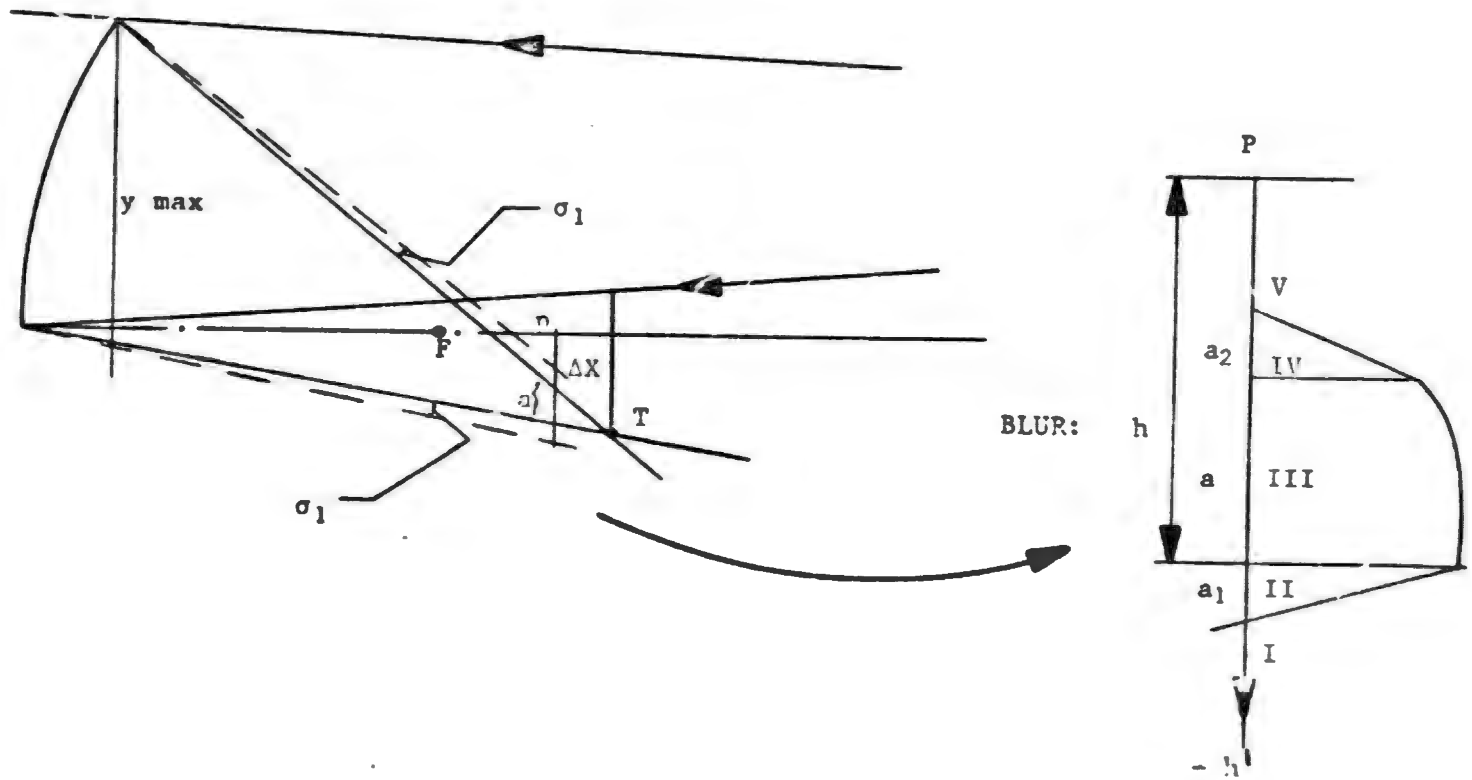


FIGURE 6.3

distribution. Figure 6.4 shows a target in the transmitter beam and how it is imaged in the detector plane. In general, the detector plane does not coincide with the image plane. The height h is, therefore, not the height of the image of a target point at w above the axis, but the intersection with the detector plane of a ray originating from a target point at a distance w above the axis and reflected at the vertex 0 of the reflector. From Figure 6.4 the relationship of h and w is obtained:

$$-\frac{h}{p} = \frac{w}{R} \qquad (6.20)$$

It is now possible to write the function N(w) = g (w) N.

5 Regions can be distinguished in the transmitter beam:

Region I: $w > w_1$

$$g_o(w) = 0 \qquad (6.21)$$

Region II: $w_1 > w > w_2$

$$g_1(w) = \frac{1}{w_2 - w_1} (w - w_1) \qquad (6.22)$$

Region III: $w_2 > w > w_3$

$$g_2(w) = 1 \qquad (6.23)$$

Region IV: $w_3 > w > w_4$ (6.24)

$$g_3(w) = \frac{1}{w_3 - w_4} (w - w_4) \qquad (6.24)$$

Region V: $w_4 > w$

$$g_4(w) = 0 \qquad (6.25)$$

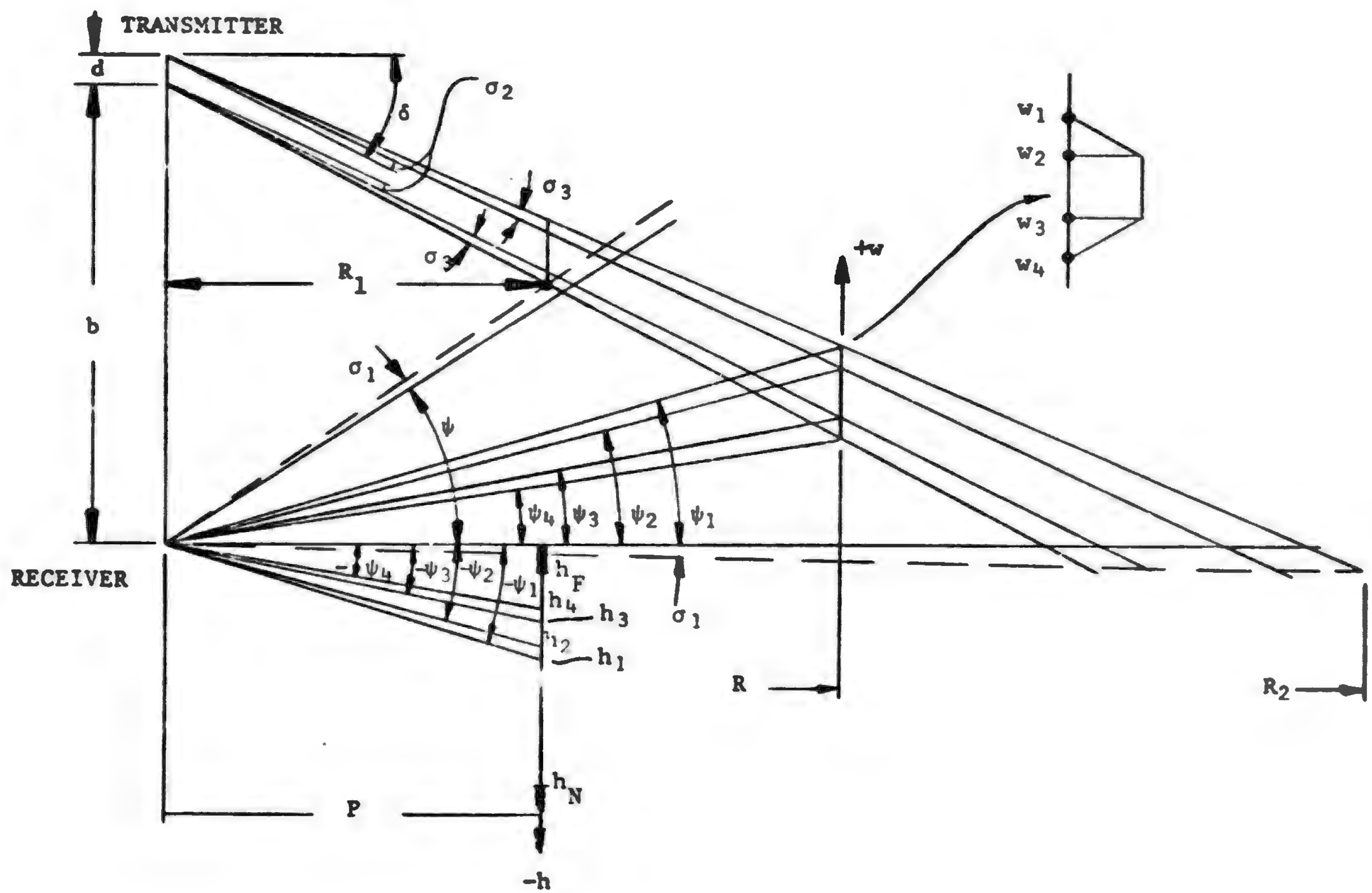

TRANSMITTER
RECEIVER
d
b
δ
σ2
σ3
σ3
R1
σ1
ψ
ψ4
ψ3
ψ2
ψ1
-ψ4
-ψ3
-ψ2
-ψ1
hF
h4
h3
h2
h1
σ1
+w
w1
w2
w3
w4
R
R2
P
hN
-h

FIGURE 6.4

Using (6.20), the functions g(w) can be expressed as functions of h:

$$g_o(h) = 0 \qquad (6.26)$$

$$g_1(h) = \frac{h_1 - h}{h_1 - h_2} = \frac{h_1 - h}{\Delta h_1} \qquad (6.27)$$

$$g_2(h) = 1 \qquad (6.28)$$

$$g_3(h) = \frac{h_4 - h}{h_4 - h_3} = \frac{h_4 - h}{\Delta h_4} \qquad (6.29)$$

$$g_4(h) = 0 \qquad (6.30)$$

The incremental irradiance dH can now be written as:

$$dH = N.g_k(h)\ f_j(h'-h)\ .\ \frac{-LR}{p}.dh \qquad (6.31)$$

The factor $\frac{-LRN}{p}$ can be omitted, for, when the final expression for the total power received by the detector is normalized, this factor cancels. dH can then be interpreted as the incremental radiant flux per unit length. The next step is the integration of dH. In its simplified form

$$dH = g_k(h)\ f_j(h'-h)\ dh. \qquad (6.32)$$

2. Calculating the Radiant Power Received by the Detector

The radiant flux or power P received by the detector is obtained by integrating dH. As $H = \frac{dP}{dh'}$, (6.33)

P becomes, $$P = \int g_k(h)\ dh \int f_j(h'-h)\ dh' \qquad (6.34)$$

This integral must be evaluated piecewise using the proper function on each interval. There are 3 different functions g_k and 3 different functions f_j. This results in 9 different integrals. For these integrals the limits of integration must be found. Note that these limits are dependent on the distance R as can be seen from the change of the ψ_i's with range R in Figure 6.4. Only radiation impinging on the detector within the field stop defined by h_P and h_N in Figure 6.4 contributes to the total power received. Outside the interval (h_P, h_N) the integral

$\int f_1(h'-h)\,dh'$ is zero.

First the integral P is shown as a sum of 3 integrals.

where, $P = P_1 + P_2 + P_3$ (6.35)

$P_1 = \int g_k(h)dh \cdot \int f_1(h'-h)\,dh'$,

$P_2 = \int g_k(h)dh \cdot \int f_2(h'-h)\,dh'$, and

$P_3 = \int g_k(h)dh \cdot \int f_3(h'-h)\,dh''$

Figure 6.5 which shows the possible locations of the blur band with respect to the boundaries h_N and h_F of the field of view (field stop in the detector plane). The limits of the integrals $f_i(h'-h)\,dh'$ are functions of h and are dependent on the interval in which h is located. Whether or not h falls into these intervals depends on the location of the image of the irradiated target area. Depending on the image location, each P_i may consist of either one definite integral or the sum of 2, 3 or 4 definite integrals.

Inspecting Figure 6.5 these definite integrals can be written:

$$P_{11} = \int_{h_N-a}^{h_N} g_k(h)\,dh \int_{h_N}^{h+a_1} f_1(h'-h)\,dh'$$

$$P_{12} = \int_{h_N}^{h_F-a_1} g_k(h)\,dh \int_{h}^{h+a_1} f_1(h'-h)\,dh'$$

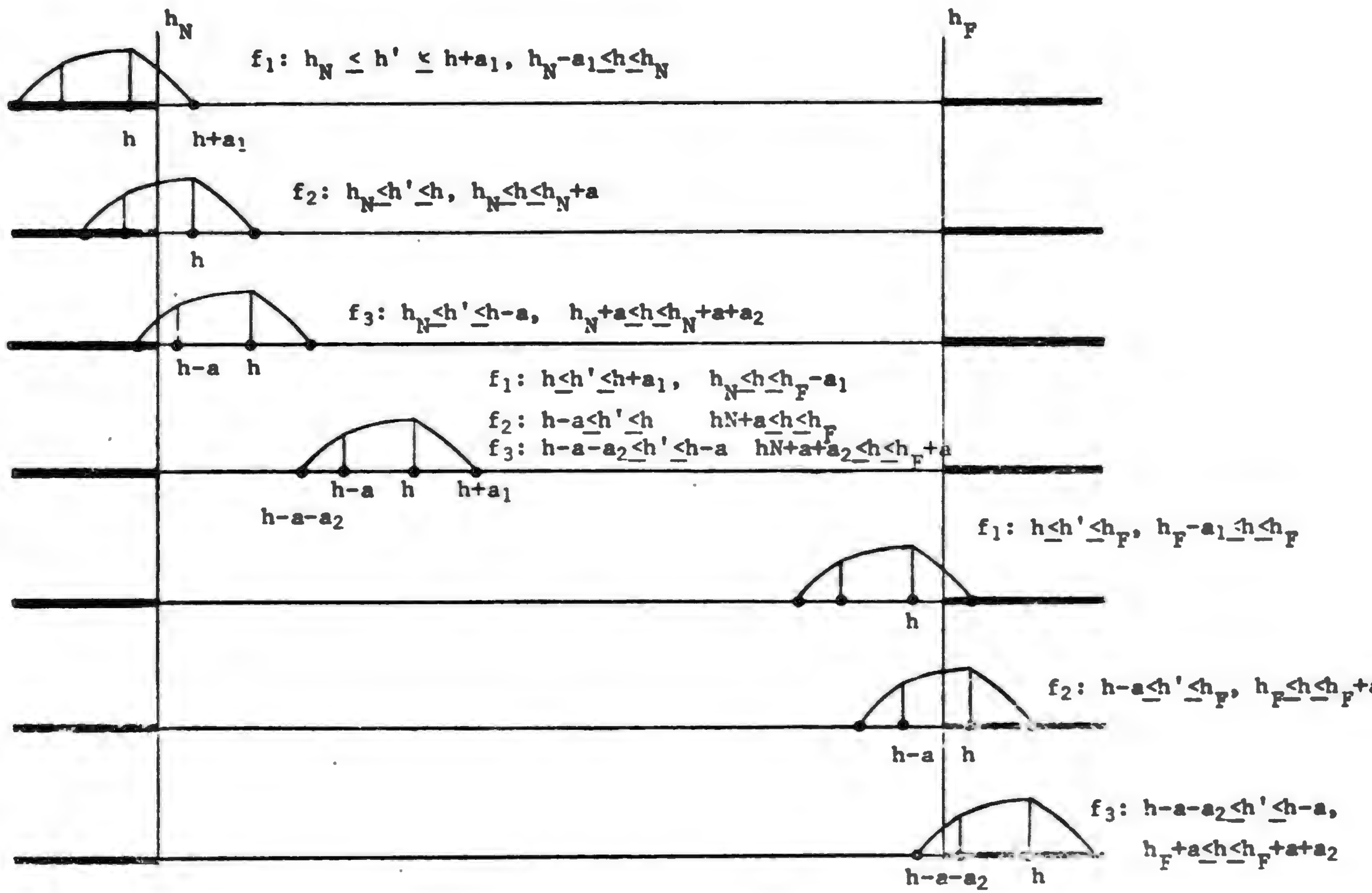
$$P_{13} = \int_{h_F-a_1}^{h_F} g_i(h)\,dh \int_{h}^{h_F} f_1(h'-h)\,dh'$$

$$P_{21} = \int_{h_N}^{h_N+a} g_i(h)\,dh \int_{h_N}^{h} f_2(h'-h)\,dh' \qquad (6.36)$$

$$P_{22} = \int_{h_N+a}^{h_F} g_i(h)\,dh \int_{h-a}^{h} f_2(h'-h)\,dh'$$

$$P_{23} = \int_{h_F}^{h_F+a} g_i(h)\,dh \int_{h-a}^{h_F} f2(h'-h)\,dh'$$

$$P_{31} = \int_{h_N+a}^{h_N+a+a_2} g_i(h)\,dh \int_{h_N}^{h-a} f_3(h'-h)\,dh'$$



hN
hF
f1: hN ≤ h' ≤ h+a1, hN-a1≤h≤hN
h
h+a1
f2: hN≤h'≤h, hN≤h≤hN+a
h
f3: hN≤h'≤h-a, hN+a≤h≤hN+a+a2
h-a
h
f1: h≤h'≤h+a1, hN≤h≤hF-a1
f2: h-a≤h'≤h hN+a≤h≤hF
f3: h-a-a2≤h'≤h-a hN+a+a2≤h≤hF+a
h-a
h
h+a1
h-a-a2
f1: h≤h'≤hF, hF-a1≤h≤hF
h
f2: h-a≤h'≤hF, hF≤h≤hF+a
h-a
h
f3: h-a-a2≤h'≤h-a,
hF+a≤h≤hF+a+a2
h-a-a2
h

FIGURE 6.5

$$P_{32} = \int_{h_N+a+a_2}^{h_F+a} g_1(h)\, dh \int_{h-a-a_2}^{h-a} f_3(h'-h)\, dh'$$

$$P_{33} = \int_{h_F+a}^{h_F+a+a_2} g_1(h)\, dh \int_{h-a-a_2}^{h_F} f_3(h'-h)\, dh'$$

It should be noted that the $g_i(h)$ are zero outside the interval on which they are defined, that is, outside the interval (h_1,h_4) in Figure 6.4, making it necessary to choose the integration limits accordingly.

Performing the first integration and omitting the limits of the second integral for simplicity, the P_{ij} become;

$$P_{11} = \frac{-c_1}{2a_1} \cdot \int g_k(h)\, (h_n-h-a_1)^2 dh$$

$$P_{12} = \frac{c_1 a_1^2}{2a_1} \cdot \int g_k(h)\, dh$$

$$P_{13} = \frac{-c_1}{2a_1} \cdot \int g_k(h)\, [a_1^2 - (h_f-h-a_1)^2]\, dh$$

$$P_{21} = \int g_k(h)\, [\frac{h-h_n}{2} + \frac{\Delta x}{4} \sin (2\frac{h-h_n}{\Delta x}]\, dh \qquad (6.37)$$

$$P_{22} = \int g_k(h)\, (\frac{a}{2} + \frac{\Delta x}{4} \sin 2\frac{a}{\Delta x})\, dh$$

$$P_{23} = \int g_k(h)\, [\frac{a}{2} + \frac{\Delta x}{4} \sin 2\frac{a}{\Delta x} - \frac{h-h_f}{2} - \frac{\Delta x}{4} \sin (2\frac{h-h_f}{\Delta x})]\, dh$$

$$P_{31} = \frac{c_2}{2a_2} \cdot \int g_k(h)\, [a_2^2 - (h_n-h+a+a_2)^2]\, dh$$

$$P_{32} = \frac{c_2 a_2^2}{2a_2} \cdot \int g_k(h)\, dh$$

$$P_{33} = \frac{c_2}{2a_2} \cdot \int g_k(h)\, (h_f-h+a-a_2)^2\, dh$$

Inspecting the above expressions, it can be seen that by substituting h_F for h_N, $P_{13} = P_{12} - P_{11}\, (h_F \to h_N)$. (6.38)

Furthermore, also by inspection, it can be seen that the integrals P_{3j} can be obtained from the P_{1j} by replacing c_1 by $-c_2$, a_1 by a_2 (where a_1 appears by itself), a_1 by $-a-a_2$ where a_1 appears within the parentheses, h_F by h_N and h_N by h_F:

$$P_{31}(-c_2,a_2,-a-a_2,h_N) = P_{13}(-c_2,a_2,-a-a_2 h_N)$$

$$P_{32}(-c_2,a_2) = P_{12}(-c_2,a_2) \tag{6.39}$$

$$P_{33}(-c_2,a_2,-a-a_2,h_F) = P_{11}(-c_2,a_2,h_F)$$

Only P_{11}, P_{12}, P_{21} and P_{22} need to be calculated. The remaining integrals P_{ij} are then obtained by replacing parameters.

Next, the P_{ij} are evaluated using the previously derived functions for the g_k's. There are three different types of g_k and each integral P_{ij} is split into 3 different kinds. First, the indefinite integrals Z_{ijk} are obtained later when the limits will have been ascertained, the definite integrals will be calculated. With $s = a_1$ and $t = a_1$ the indefinite integrals are written as functions of their parameters.

$$Z_{111}(h_1,\Delta h_1,c_1,t,h_N,s,h) = \int \frac{h_1-h}{\Delta h_1} \cdot \frac{-c_1(h_N-h-s)^2}{2t}\, dh =$$

$$= \frac{c_1(h_1-h_N+s)(h_N-h-s)^3}{6t\Delta h_1} + \frac{c_1(h_N-h-s)^4}{8t\Delta h_1}$$

$$Z_{112}(c_1,t,h_N,s,h) = \int \frac{-c_1(h_N-h-s)^2}{2t}\, dh = \frac{-c_1(h_N-h-s)^3}{6t} \tag{6.40}$$

$$Z_{113}(h_4,\Delta h_4,c_1,t,h_N,s,h) = \int \frac{h_4-h}{\Delta h_4} \frac{-c(h_N-h-s)^2}{2t}\, dh =$$

$$= Z_{111}(h_N,\Delta h_k,c_1,t,h_N,s,h)$$

$$Z_{121}(h_1,\Delta h_1,c_1,t,h) = \int \frac{h_1-h}{\Delta h_1} \cdot \frac{-c_1 t}{2} \cdot dh = \frac{c_1 t}{4\Delta h_1} \cdot (h_1-h)^2$$

$$Z_{122}(c_1,t,h) = \int \frac{-c_1 t}{2} \; dh = \frac{-c_1 th}{2} \qquad (6.41)$$

$$Z_{123}(h_4,\Delta h_4,c_1,t,h) = \int \frac{h_4-h}{\Delta h_4} \cdot \frac{-c_1 t}{2} \; dh = Z_{121}(h_4, h_4,c_1,t,h)$$

$$Z_{131}(h_1,\Delta h_1,c_1,t,h_F,s,h) = Z_{121}(h_1,\Delta h_1,c_1,t,h) - Z_{111}(h_1,\Delta h_1,c_1,t,h_F,s,h)$$

$$Z_{132}(c_1,t,h_F,s,h) = Z_{112}(c_1,t,h_F,s,h) \qquad (6.42)$$

$$Z_{133}(h_4,\Delta h_4,c_1,t,h_F\; s,h) = Z_{123}(h_4,\Delta h_4,c_1,t,h) - Z_{113}(h_4,\Delta h_4,c_1,t,h_F,s,h)$$

$$= Z_{121}(h_4,\Delta h_4,c_1,t,h) - Z_{111}(h_4,\Delta h_4,c_1,t,h_F,s,h)$$

$$Z_{211}(h_1,\Delta h_1, x,h_N,h) = \int \frac{h_1-h}{\Delta h_1} \left[\frac{h-h_N}{2} + \frac{x}{4} \sin\left(2\frac{h-h_N}{\Delta x}\right)\right] dh$$

$$= \frac{(h_1-h_N)(h-h_N)^2}{4\Delta h_1} - \frac{(h-h_N)^3}{6\Delta h_1} + \frac{(h-h_1)\Delta x^2}{8\Delta h_1} \cos\left(2\frac{h-h_N}{\Delta x}\right) \qquad (6.43)$$

$$- \frac{\Delta x^3}{16\; h_1} \sin\left(2\frac{h-h_N}{\Delta x}\right)$$

$$Z_{212}(\Delta x,h_N,h) = \int \left[\frac{h-h_N}{2} + \frac{\Delta x}{4} \sin\left(2\,\frac{h-h_N}{\Delta x}\right)\right] dh = \frac{(h-h_N)^2}{4} - \frac{\Delta x^2}{8} \cos\left(2\,\frac{h-h_N}{\Delta x}\right)$$

$$Z_{213}(h_4, h_4,\Delta x,h_N,h) = \int \frac{h_4-h}{h_4} \left[\frac{h-h_N}{2} + \frac{\Delta x}{4} \sin\left(2\,\frac{h-h_N}{\Delta x}\right)\right] dh =$$

$$Z_{211}(h_4,\Delta h_N,\Delta x,h_N,h)$$

$$Z_{221}(h_1,\Delta h_1,\Delta x,a,h) = \int \frac{h_1-h}{h_1} \left[\frac{a}{2} + \frac{\Delta x}{4} \sin\left(\frac{2a}{\Delta x}\right)\right] dh$$

$$= \frac{-(h_1-h)^2}{h_1} \left[\frac{a}{2} + \frac{\Delta x}{4} \sin\left(\frac{2a}{\Delta x}\right)\right]$$

(6.44)

$$Z_{222}(\Delta x, a, h) = \int \left[\frac{a}{2} + \frac{\Delta x}{4} \sin\left(\frac{2a}{\Delta x}\right)\right] dh = \frac{h}{2} \left[a + \frac{\Delta x}{2} \sin\left(\frac{2a}{\Delta x}\right)\right]$$

$$Z_{223}(h_4,\Delta h_4,\Delta x,a,h) = \int \frac{h_4-h}{\Delta h_4} \left[\frac{a}{2} + \frac{\Delta x}{4} \sin\left(\frac{2a}{\Delta x}\right)\right] dh$$

$$= Z_{221}(h_4,\Delta h_4,\Delta x,a,h)$$

$$Z_{231}(h_1,\Delta h_1,\Delta x,a,h) = Z_{221}(h_1,\Delta h_1,\Delta x,a,h) \quad Z_{211}(h_1,\Delta h_1,\Delta x, h_F,h)$$

$$Z_{232}(\Delta x,h_F,a,h) = Z_{222}(\Delta x,a,h) - Z_{212}(\Delta x,h_F,h) \qquad (6.45)$$

$$Z_{233}(h_4,\Delta h_4,\Delta x,h_F,a,h) = Z_{223}(h_4,\Delta h_4,\Delta x,a,h) - Z_{213}(h_4,\Delta h_4,\Delta x,h_F,h)$$

$$= Z_{231}(h_4,\Delta h_4,\Delta x,\Delta h_F,a,h)$$

Using the relationships (6.39), the integrals Z_{3jk} are easily obtained. Remembering that $s = a-a_2$. $t = a_1$ and c_1 is replaced by $-c_2$:

$$Z_{311}(h_1,\Delta h_1,-c_2,t,h_N,s,h) = Z_{131}(h_1,\Delta h_1,-c_2,t,h_N,s,h)$$

$$Z_{321}(h_1,\Delta h_1-c_2,t,h) = Z_{121}(h_1,\Delta h_1,-c_2,t,h) \qquad (6.46)$$

$$Z_{331}(h_1,\Delta h_1,-c_2,t,h_F,s,h) = Z_{111}(h_1,\Delta h_1,-c_2,t,h_F,s,h)$$

$$Z_{312}(-c_2,t,h_N,s,h) = Z_{132}(-c_2,t,h_N,s,h) \qquad (6.47)$$

$$Z_{322}(-c_2,t,h) = Z_{122}(-c_2,t,h)$$

$$Z_{332}(-c_2,t,h_F,s,h) = Z_{112}(-c_2,t,h_F,s,h) \tag{6.47}$$

$$Z_{313}(h_4,\Delta h_4,-c_2,t,h_N) = Z_{131}(h_4,\Delta h_4,-c_2,t,h_N,s,h)$$

$$Z_{323}(h_4,\Delta h_4,-c_2,t,h) = Z_{121}(h_4,\Delta h_4,-c_2,t,h) \tag{6.48}$$

$$Z_{333}(h_4,\Delta h_4,-c_2,t,h_F,s,h) = Z_{111}(h_4,\Delta h_4,-c_2,t,h_F,s,h)$$

All types of indefinite integrals Z_{ijk} have now been calculated. It remains to find the integration limits, to obtain the definite integrals as functions of the distance R of the target, and to normalize them. As defined by (6.35):

$$P = P_1 + P_2 + P_3$$

The P_i are the sums of definite integrals

$$P_i = \sum_{j=1}^{3}\sum_{k=1}^{3} P_{ijk}(x,y) \tag{6.49}$$

where x and y signify the upper and lower integration limits, respectively. It is;

$$P_{ijk}(x,y) = Z_{ijk}(x) - Z_{ijk}(y) \tag{6.50}$$

The integrals are shown as functions of the integration limits only. All the other arguments have been omitted for simplicity. In $Z_{ijk}(x)$ x is substituted for h and in $Z_{ijk}(y)$ y is substituted for h.

As the power received by the detector is a function of the location of the image of the irradiated portion of the target, the integrals will depend on the h_i's. The h_i's as functions of R are obtained from Figure 6.4.

$$h_1 = \frac{-p\tan\psi_1}{n} = \frac{-p}{n}\left[\frac{b+d}{R} - \tan(\delta - \sigma_3 - \sigma_3)\right]$$

$$h_2 = \frac{-p\tan\psi_2}{n} = \frac{-p}{n}\left[\frac{b+d}{R} - \tan(\delta - \sigma_3)\right]$$

$$h_3 = \frac{-p\tan\psi_3}{n} = \frac{-p}{n}\left[\frac{b}{R} - \tan(\delta + \sigma_2)\right]$$

$$h_4 = \frac{-p\tan\psi_4}{n} = \frac{-p}{n}\left[\frac{b}{R} - \tan(\delta + \sigma_2 + \sigma_3)\right]$$

In the above equations, n is the index of refraction of the glass of which the receiver optics are made. As the reflector is located in glass and the detector is immersed, all the tangents of the angles ψ_i are reduced by $\frac{1}{n}$ (for simplicity, in Figures 6.1, 6.2 and 6.4 reflector and detector were assumed to be in air).

The integration limits are now determined. As it is intended to evaluate the integrals with the aid of a computer, all the following expressions will be presented in a form which facilitiates programming. Being mainly a matter of relative location of the blurred image within the elevation field (or field of view), it is best to explain the process of determining the limits and the types of the integrals by graphical means. Each of the integrals P_i is first evaluated and then the sum of all P_i's is taken. The first condition the blurred image must meet is that restricting its size. The blurred image must never be greater than the field stop on the detector. This condition is nearly always satisfied and is written as;

$$(h_4 - h_1 + a + a_1 + a_2) < (h_F - h_N) \qquad (6.51)$$

For computer use the condition is rewritten as

$$h_4 > (h_F - a_1) \text{ and } h_1 < (h_N + a + a_2) \;. \qquad (6.52)$$

If both above inequalities are simultaneously fulfilled, the computer will print a warning.

As always $h_4 > h_1$, and noting that all the h's are negative quantities, the inequalities

$$h_4 \leq h_N - a_1 \text{ and } h_1 \geq h_F + a + a_2 \qquad (6.53)$$

mean that the blurred image is completely outside the field stop and all integrals P_i are zero. Figure 6.6 compares the ideal image with the actual (blurred) bone. Note that even if the ideal image is outside the detector field stop, radiation is still received by the detector because of the larger size of the blurred image.

Figure 6.7 through 6.12 show how the image moves in the detector field of view when the target moves towards the receiver. The trapezoid shown corresponds to the irradiance of an image without blur. The influence of blurring is expressed by the types of integrals and their boundaries which are defined by inequatities obtained by examining the figures.

Tables 6.1 through 6.3 list all the possible integrals. Keeping in mind that for;

$$h_1 \geq h_F,\ P_1 = 0$$

$$h_1 \geq h_F + a,\ P_1 = P_2 = 0$$

$$h_4 \leq h_N + a,\ P_3 = 0 \qquad (6.54)$$

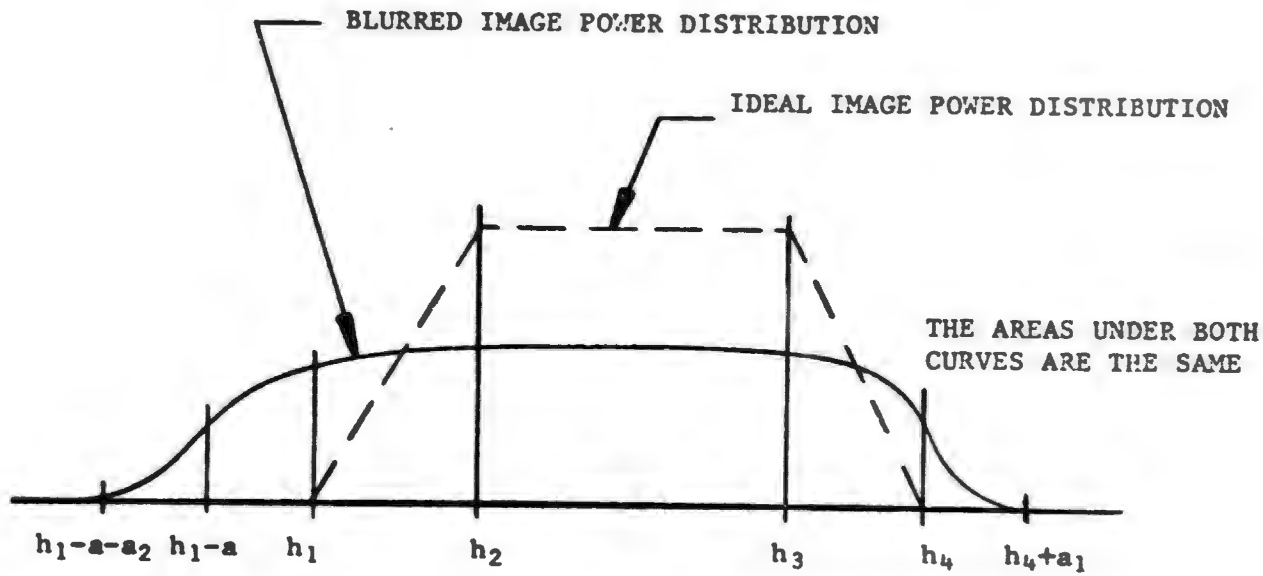
$$h_4 \leq h_N\ ,\ P_2 = P_3 = 0$$

The integral P is obtained as the sum of 3 integrals, one taken from each of the tables 6.1 through 6.3:

$$P = P_1 + P_2 + P_3$$

3. Normalizing the Integrals

The bin boundary function $I_{(R)}$ is now obtained by normalizing P and by making allowance for the range attenuation factor.



BLURRED IMAGE POWER DISTRIBUTION
IDEAL IMAGE POWER DISTRIBUTION
THE AREAS UNDER BOTH CURVES ARE THE SAME
h1-a-a2
h1-a
h1
h2
h3
h4
h4+a1

FIGURE 6.6

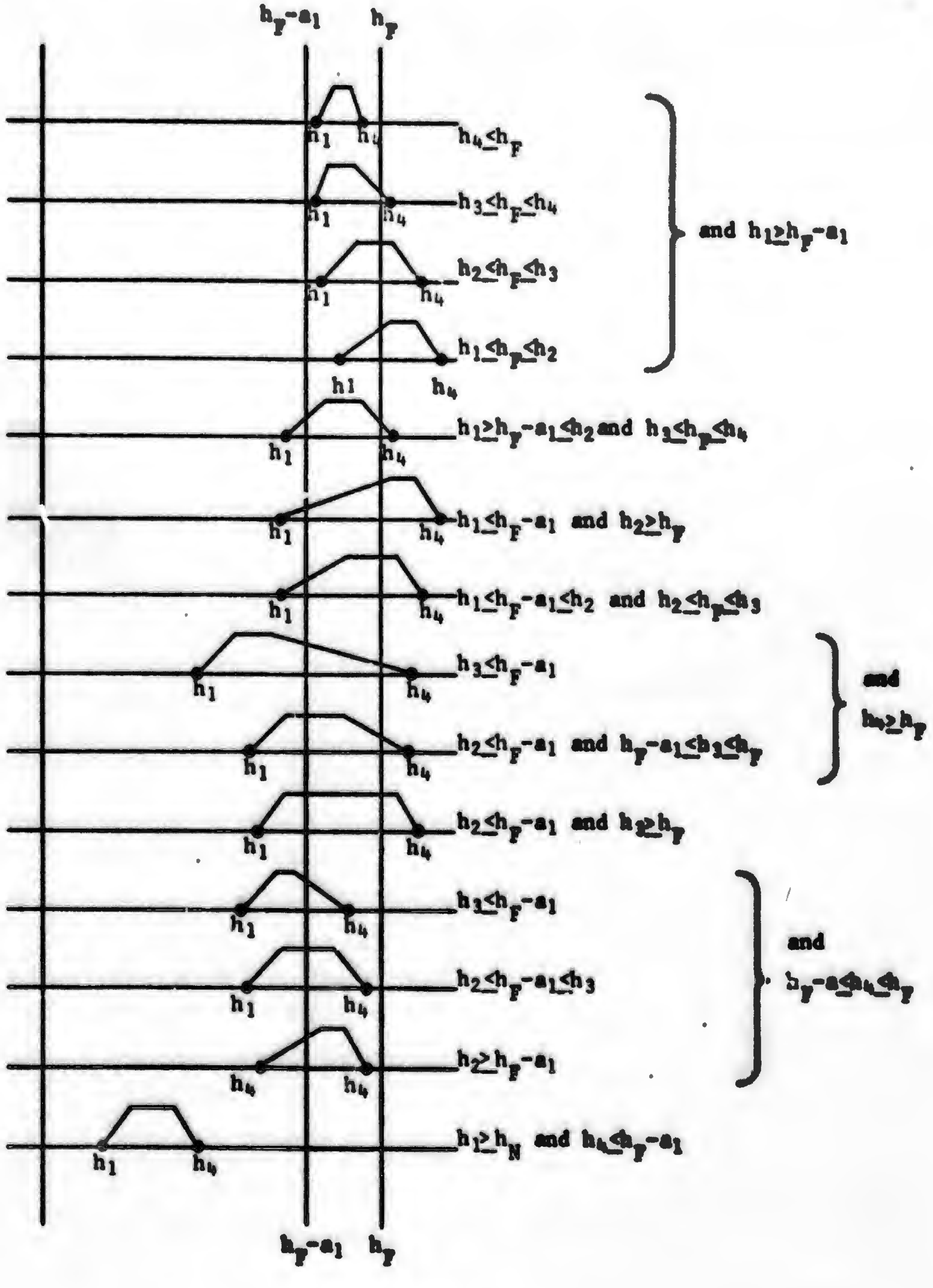
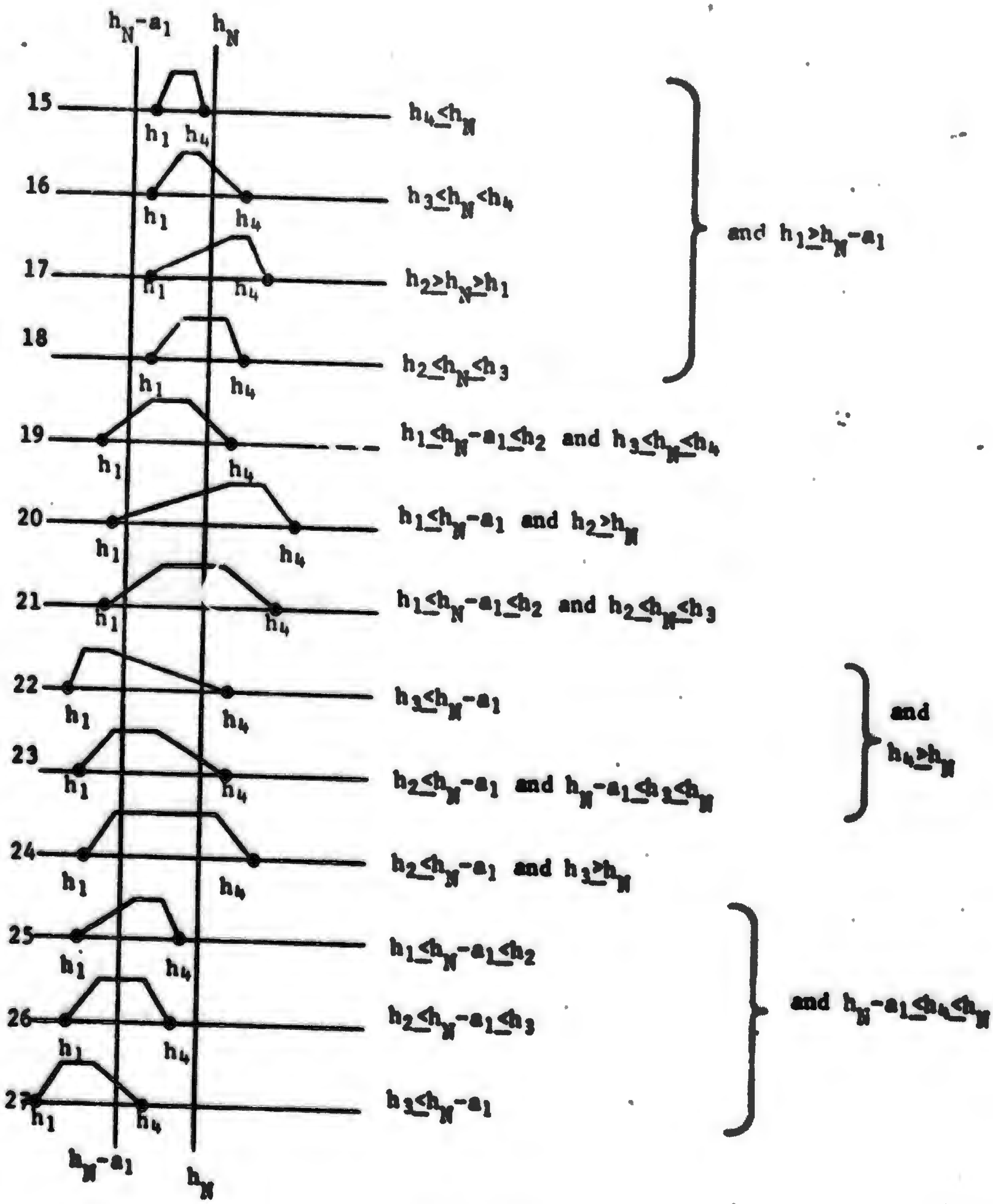
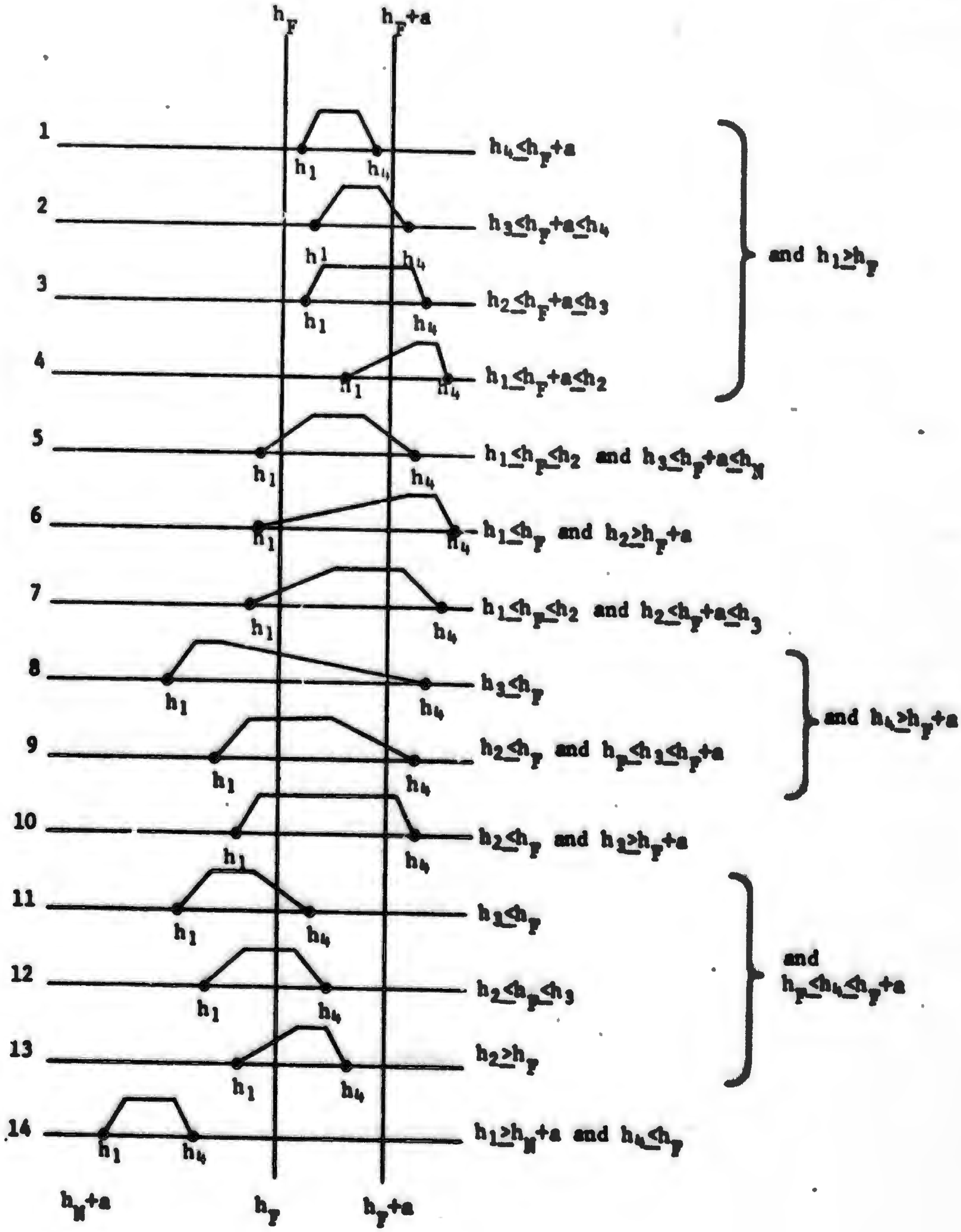

$h_F - a_1$
h_F
$h_4 \le h_F$
$h_3 \le h_F \le h_4$
$h_2 \le h_F \le h_3$
$h_1 \le h_F \le h_2$
and $h_1 \ge h_F - a_1$
$h_1 \ge h_F - a_1 \le h_2$ and $h_3 \le h_F \le h_4$
$h_1 \le h_F - a_1$ and $h_2 \ge h_F$
$h_1 \le h_F - a_1 \le h_2$ and $h_2 \le h_F \le h_3$
$h_3 \le h_F - a_1$
$h_2 \le h_F - a_1$ and $h_F - a_1 \le h_3 \le h_F$
$h_2 \le h_F - a_1$ and $h_3 \ge h_F$
and $h_4 \ge h_F$
$h_3 \le h_F - a_1$
$h_2 \le h_F - a_1 \le h_3$
$h_2 \ge h_F - a_1$
and $h_F - a_1 \le h_4 \le h_F$
$h_1 \ge h_N$ and $h_4 \le h_F - a_1$

FIGURE 6.7



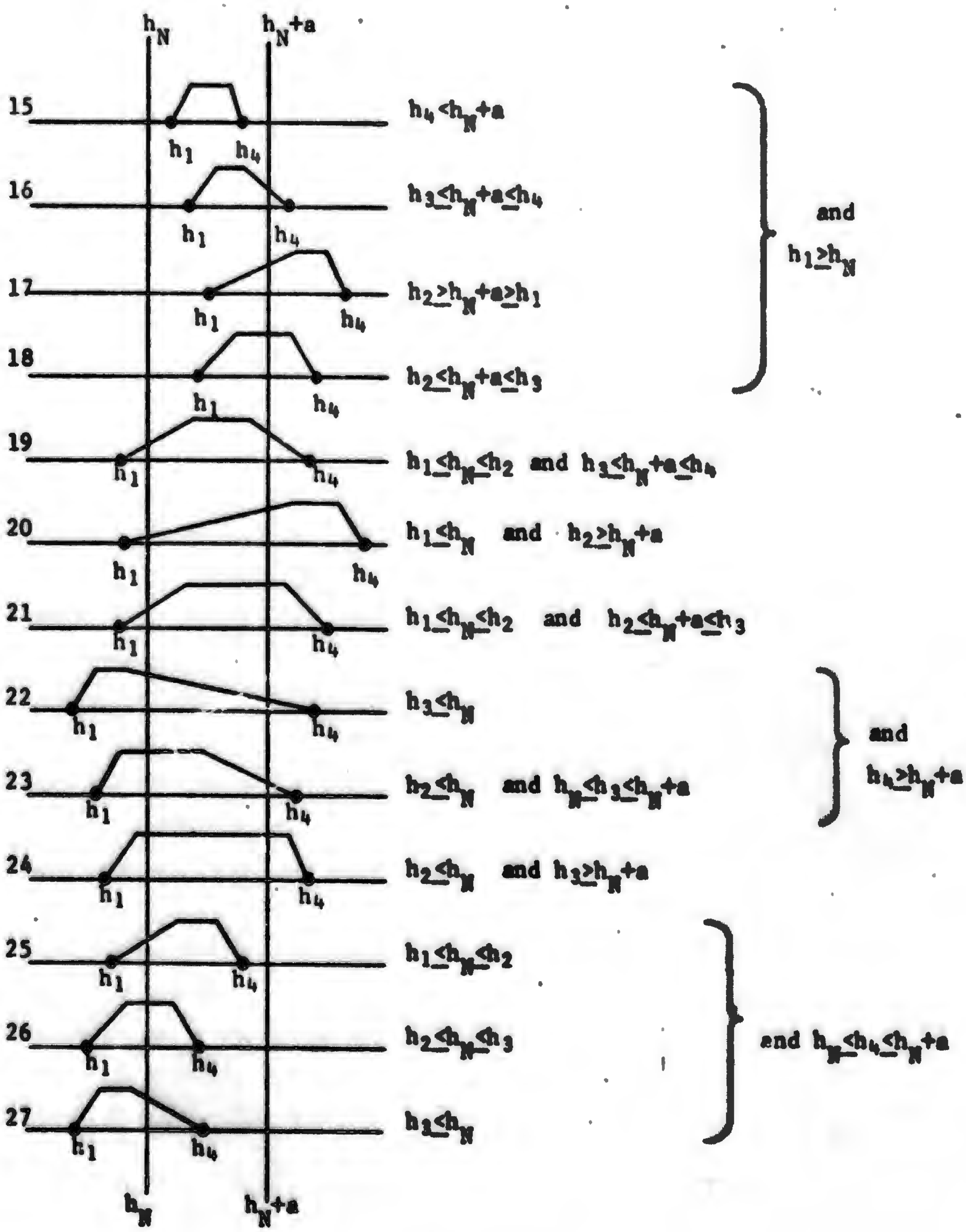
$h_N - a_1$
h_N
15
h_1 h_4
$h_4 \leq h_N$
16
h_1 h_4
$h_3 \leq h_N < h_4$
17
h_1 h_4
$h_2 \geq h_N \geq h_1$
18
h_1 h_4
$h_2 \leq h_N \leq h_3$
and $h_1 \geq h_N - a_1$
19
h_1 h_4
$h_1 \leq h_N - a_1 \leq h_2$ and $h_3 \leq h_N \leq h_4$
20
h_1 h_4
$h_1 \leq h_N - a_1$ and $h_2 \geq h_N$
21
h_1 h_4
$h_1 \leq h_N - a_1 \leq h_2$ and $h_2 \leq h_N \leq h_3$
22
h_1 h_4
$h_3 \leq h_N - a_1$
23
h_1 h_4
$h_2 \leq h_N - a_1$ and $h_N - a_1 \leq h_3 \leq h_N$
24
h_1 h_4
$h_2 \leq h_N - a_1$ and $h_3 \geq h_N$
and $h_4 \geq h_N$
25
h_1 h_4
$h_1 \leq h_N - a_1 \leq h_2$
26
h_1 h_4
$h_2 \leq h_N - a_1 \leq h_3$
27
h_1 h_4
$h_3 \leq h_N - a_1$
and $h_N - a_1 \leq h_4 \leq h_N$
$h_N - a_1$
h_N

FIGURE 6.8



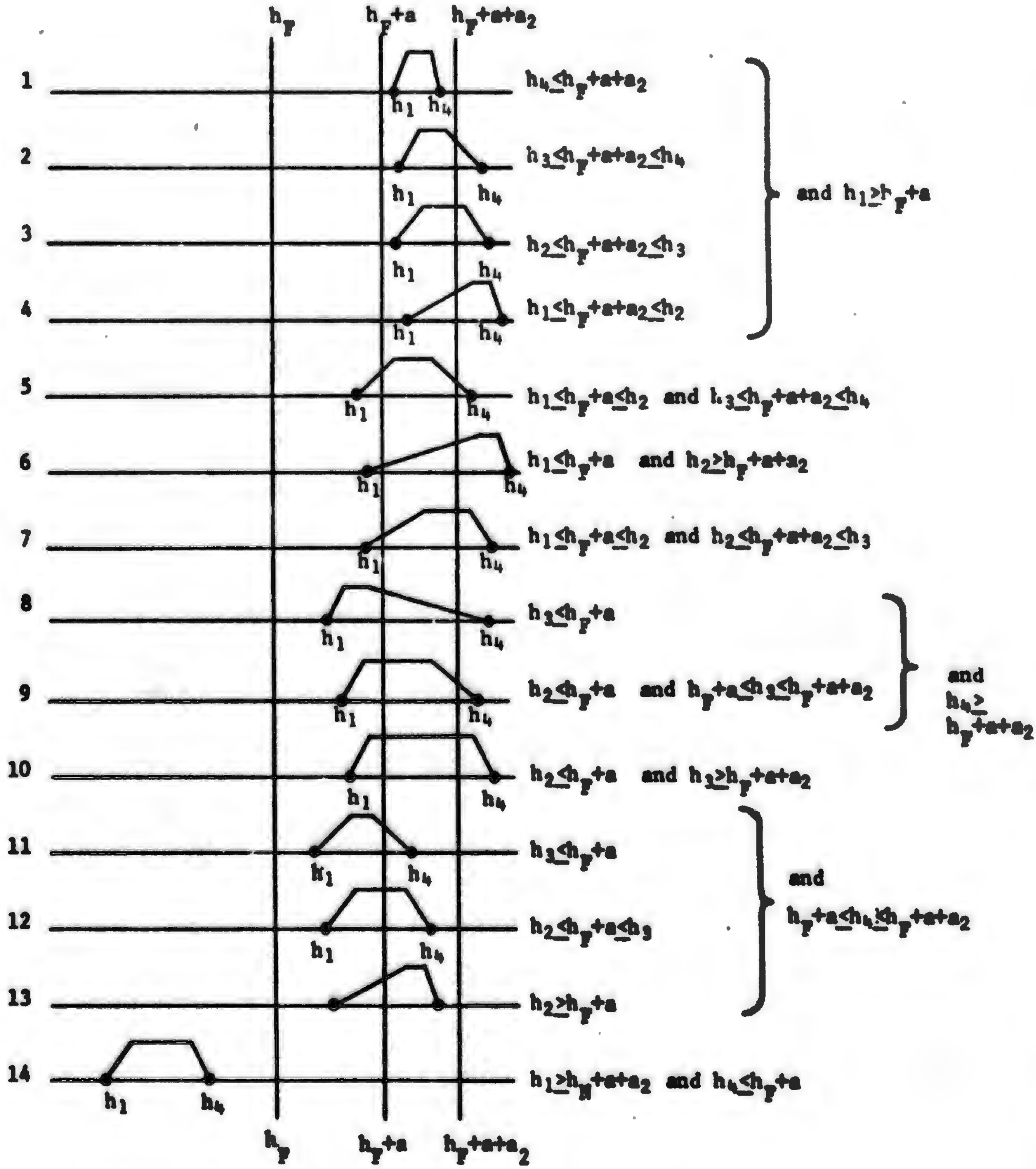
h_F
h_F+a
1
h₄≤h_F+a
2
h₃≤h_F+a≤h₄
3
h₂≤h_F+a≤h₃
4
h₁≤h_F+a≤h₂
and h₁≥h_F
5
h₁≤h_F≤h₂ and h₃≤h_F+a≤h_N
6
h₁≤h_F and h₂≥h_F+a
7
h₁≤h_F≤h₂ and h₂≤h_F+a≤h₃
8
h₃≤h_F
9
h₂≤h_F and h_F≤h₃≤h_F+a
10
h₂≤h_F and h₃≥h_F+a
and h₄≥h_F+a
11
h₃≤h_F
12
h₂≤h_F≤h₃
13
h₂≥h_F
and
h_F≤h₄≤h_F+a
14
h₁≥h_N+a and h₄≤h_F
h₁
h₄
h_N+a
h_F
h_F+a

FIGURE 6.9



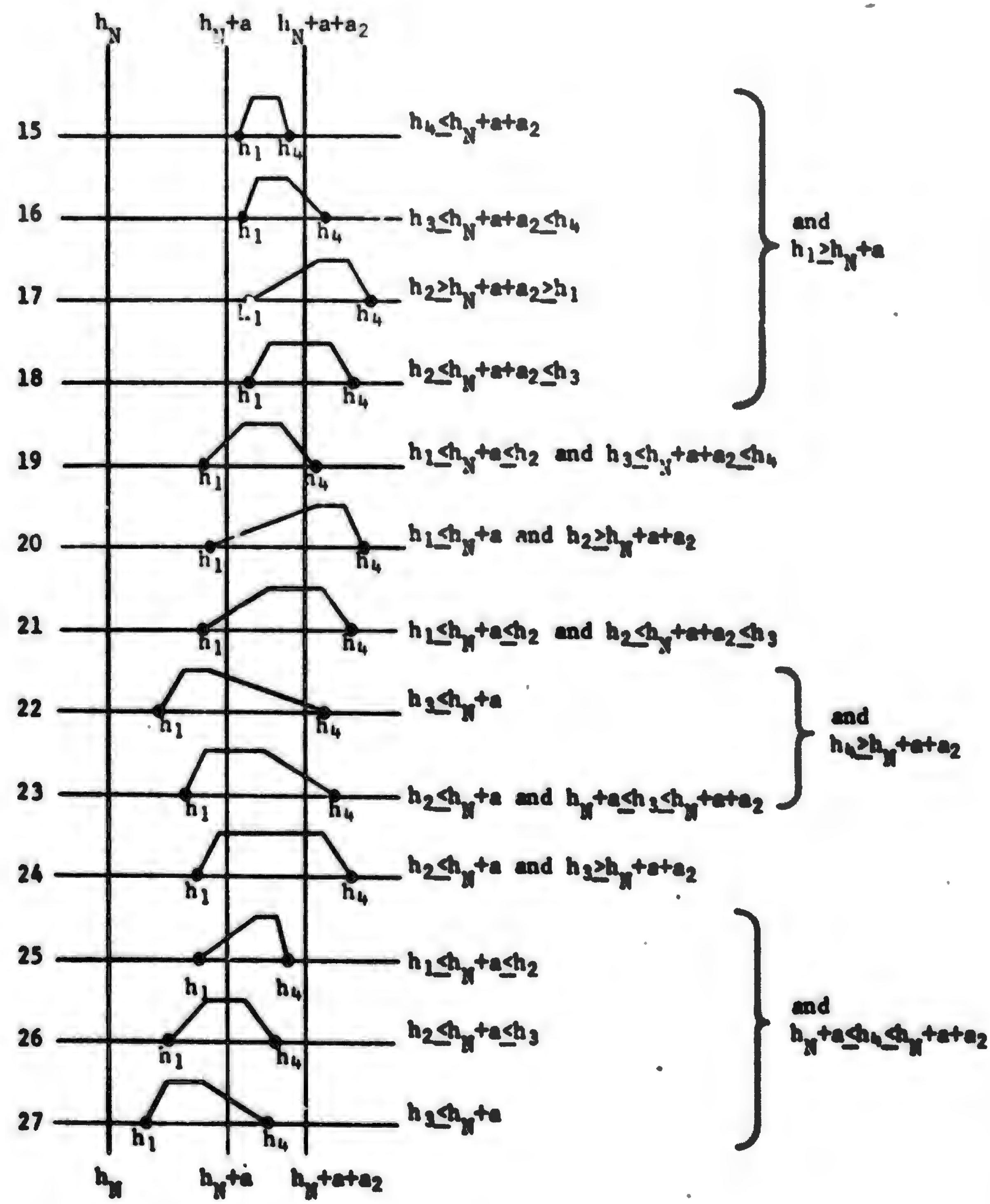
h_N
h_N+a
15
h₄<h_N+a
16
h₃≤h_N+a≤h₄
17
h₂≥h_N+a≥h₁
18
h₂≤h_N+a≤h₃
and
h₁≥h_N
19
h₁≤h_N≤h₂ and h₃≤h_N+a≤h₄
20
h₁≤h_N and h₂≥h_N+a
21
h₁≤h_N≤h₂ and h₂≤h_N+a≤h₃
22
h₃≤h_N
23
h₂≤h_N and h_N≤h₃≤h_N+a
24
h₂≤h_N and h₃≥h_N+a
and
h₄≥h_N+a
25
h₁≤h_N≤h₂
26
h₂≤h_N≤h₃
27
h₃≤h_N
and h_N≤h₄≤h_N+a
h₁
h₄

FIGURE 6.10



h_p
h_p+a
h_p+a+a2
1
h4≤hp+a+a2
2
h3≤hp+a+a2≤h4
3
h2≤hp+a+a2≤h3
4
h1≤hp+a+a2≤h2
and h1≥hp+a
5
h1≤hp+a≤h2 and h3≤hp+a+a2≤h4
6
h1≤hp+a and h2≥hp+a+a2
7
h1≤hp+a≤h2 and h2≤hp+a+a2≤h3
8
h3≤hp+a
9
h2≤hp+a and hp+a≤h3≤hp+a+a2
10
h2≤hp+a and h3≥hp+a+a2
and h4≥ hp+a+a2
11
h3≤hp+a
12
h2≤hp+a≤h3
13
h2≥hp+a
and hp+a≤h4≤hp+a+a2
14
h1≥hN+a+a2 and h4≤hp+a
h1
h4

FIGURE 6.11



h_N
h_N+a
h_N+a+a2
15
16
17
18
19
20
21
22
23
24
25
26
27
h1
h4
h4≤h_N+a+a2
h3≤h_N+a+a2≤h4
h2≥h_N+a+a2≥h1
h2≤h_N+a+a2≤h3
and
h1≥h_N+a
h1≤h_N+a≤h2 and h3≤h_N+a+a2≤h4
h1≤h_N+a and h2≥h_N+a+a2
h1≤h_N+a≤h2 and h2≤h_N+a+a2≤h3
h3≤h_N+a
h2≤h_N+a and h_N+a≤h3≤h_N+a+a2
h2≤h_N+a and h3≥h_N+a+a2
and
h4≥h_N+a+a2
h1≤h_N+a≤h2
h2≤h_N+a≤h3
h3≤h_N+a
and
h_N+a≤h4≤h_N+a+a2

FIGURE 6.12

TABLE 6.1

1. $P_1 = P_{131}(h_2,h_1) + P_{132}(h_3,h_2) + P_{133}(h_4,h_3)$

2. $P_1 = P_{131}(h_2,h_1) + P_{132}(h_3,h_2) - P_{133}(h_F,h_3)$

3. $P_1 = P_{131}(h_2,h_1) + P_{132}(h_F,h_2)$

4. $P_1 = P_{131}(h_F,h_1)$

5. $P_1 = P_{121}(h_F-a_1,h_1) + P_{131}(h_2,h_F-a_1) + P_{132}(h_3,h_2) + P_{133}(h_F,h_3)$

6. $P_1 = P_{121}(h_F-a_1,h_1) + P_{131}(h_F,h_F-a_1)$

7. $P_1 = P_{121}(h_F-a_1,h_1) + P_{131}(h_2,h_F-a_1) + P_{132}(h_F,h_2)$

8. $P_1 = P_{121}(h_2,h_1) + P_{122}(h_3,h_2) + P_{123}(h_F-a_1,h_3) + P_{133}(h_F,h_F-a_1)$

9. $P_1 = P_{121}(h_2,h_1) + P_{122}(h_F-a_1,h_2) + P_{132}(h_3,h_F-a_1) + P_{133}(h_F,h_3)$

10. $P_1 = P_{121}(h_2,h_1) + P_{122}(h_F-a_1,h_2) + P_{132}(h_F,h_F-a_1)$

11. $P_1 = P_{121}(h_2,h_1) + P_{122}(h_3,h_2) + P_{123}(h_F-a_1,h_3) + P_{133}(h_4,h_F-a_1)$

12. $P_1 = P_{121}(h_2,h_1) + P_{122}(h_F-a_1,h_2) + P_{132}(h_3,h_F-a_1) + P_{133}(h_4,h_3)$

13. $P_1 = P_{121}(h_F-a_1,h_1) + P_{131}(h_2,h_F-a_1) + P_{132}(h_3,h_2) + P_{133}(h_4,h_3)$

14. $P_1 = P_{121}(h_2,h_1) + P_{122}(h_3,h_2) + P_{123}(h_4,h_3)$

15. $P_1 = P_{111}(h_2,h_1) + P_{112}(h_3,h_2) + P_{113}(h_4,h_3)$

16. $P_1 = P_{111}(h_2,h_1) + P_{112}(h_3,h_2) + P_{113}(h_H,h_3)$

17. $P_1 = P_{111}(h_H,h_1) + P_{121}(h_2,h_H) + P_{122}(h_3,h_2) + P_{123}(h_4,h_3)$

TABLE 6.1

(Continued)

18. $P_1 = P_{111}(h_2,h_1) + P_{112}(h_N,h_2) + P_{122}(h_3,h_N) + P_{123}(h_4,h_3)$

19. $P_1 = P_{111}(h_2,h_N-a_1) + P_{112}(h_3,h_2) + P_{113}(h_N,h_3) + P_{123}(h_4,h_N)$

20. $P_1 = P_{111}(h_N,h_N-a_1) + P_{121}(h_2,h_N) + P_{122}(h_3,h_2) + P_{123}(h_4,h_3)$

21. $P_1 = P_{111}(h_2,h_N-a_1) + P_{112}(h_N,h_2) + P_{122}(h_3,h_N) + P_{123}(h_4,h_3)$

22. $P_1 = P_{113}(h_N,h_N-a_1) + P_{123}(h_4,h_N)$

23. $P_1 = P_{112}(h_3,h_4-a_1) + P_{113}(h_N,h_3) + P_{123}(h_4,h_N)$

24. $P_1 = P_{112}(h_N,h_N-a_1) + P_{122}(h_3,h_N) + P_{123}(h_4,h_3)$

25. $P_1 = P_{111}(h_2,h_N-a_1) + P_{112}(h_3,h_2) + P_{113}(h_4,h_3)$

26. $P_1 = P_{112}(h_3,h_N-a_1) + P_{113}(h_4,h_3)$

27. $P_1 = P_{113}(h_4,h_N-a_1)$

TABLE 6.2

1. $P_2 = P_{231}(h_2,h_1) + P_{232}(h_3,h_2) + P_{233}(h_4,h_3)$

2. $P_2 = P_{231}(h_2,h_1) + P_{232}(h_3,h_2) + P_{233}(h_F+a,h_3)$

3. $P_2 = P_{231}(h_2,h_1) + P_{232}(h_F+a,h_2)$

4. $P_2 = P_{231}(h_F+a,h_1)$

5. $P_2 = P_{221}(h_F,h_1) + P_{231}(h_2,h_F) + P_{232}(h_3,h_2) + P_{233}(h_F+a,h_3)$

6. $P_2 = P_{221}(h_F,h_1) + P_{231}(h_F+a,h_F)$

7. $P_2 = P_{221}(h_F,h_1) + P_{231}(h_2,h_F) + P_{232}(h_F+a,h_2)$

8. $P_2 = P_{221}(h_2,h_1) + P_{222}(h_3,h_2) + P_{223}(h_F,h_3) + P_{233}(h_F+a,h_F)$

9. $P_2 = P_{221}(h_2,h_1) + P_{222}(h_F,h_2) + P_{232}(h_3,h_F) + P_{233}(h_F+a,h_3)$

10. $P_2 = P_{221}(h_2,h_1) + P_{222}(h_F,h_2) + P_{232}(h_F+a,h_F)$

11. $P_2 = P_{221}(h_2,h_1) + P_{222}(h_3,h_2) + P_{223}(h_F,h_3) + P_{233}(h_4,h_F)$

12. $P_2 = P_{221}(h_2,h_1) + P_{222}(h_F,h_2) + P_{232}(h_3,h_F) + P_{233}(h_4,h_3)$

13. $P_2 = P_{221}(h_F,h_1) + P_{231}(h_2,h_F) + P_{232}(h_3,h_2) + P_{233}(h_4,h_3)$

14. $P_2 = P_{221}(h_2,h_1) + P_{222}(h_3,h_2) + P_{223}(h_4,h_3)$

15. $P_2 = P_{211}(h_2,h_1) + P_{212}(h_3,h_2) + P_{213}(h_4,h_3)$

16. $P_2 = P_{211}(h_2,h_1) + P_{212}(h_3,h_2) + P_{213}(h_N+a,h_3) + P_{223}(h_4,h_N+a)$

TABLE 6.2
(Continued)

17. $P_2 = P_{211}(h_N+a, h_1) + P_{221}(h_2, h_N+a) + P_{222}(h_3, h_2) + P_{223}(h_4, h_3)$

18. $P_2 = P_{211}(h_2, h_1) + P_{212}(h_N+a, h_2) + P_{222}(h_3, h_N+a) + P_{223}(h_4, h_3)$

19. $P_2 = P_{211}(h_2, h_1) + P_{212}(h_3, h_2) + P_{213}(h_N+a, h_3) + P_{223}(h_4, h_N+a)$

20. $P_2 = P_{211}(h_N+a, h_N) + P_{221}(h_2, h_N+a) + P_{222}(h_3, h_2) + P_{223}(h_4, h_3)$

21. $P_2 = P_{211}(h_2, h_N) + P_{212}(h_N+a, h_2) + P_{222}(h_3, h_N+a) + P_{223}(h_4, h_3)$

22. $P_2 = P_{213}(h_N+a, h_N) + P_{223}(h_4, h_N+a)$

23. $P_2 = P_{212}(h_3, h_N) + P_{213}(h_N+a, h_3) + P_{223}(h_4, h_N+a)$

24. $P_2 = P_{212}(h_N+a, h_N) + P_{222}(h_3, h_N+a) + P_{223}(h_4, h_3)$

25. $P_2 = P_{211}(h_2, h_N) + P_{212}(h_3, h_2) + P_{213}(h_4, h_3)$

26. $P_2 = P_{212}(h_3, h_N) + P_{213}(h_4, h_2)$

27. $P_2 = P_{213}(h_4, h_N)$

TABLE 6.3

1. $P_3 = P_{331}(h_2,h_1) + P_{332}(h_3,h_2) + P_{333}(h_4,h_3)$

2. $P_3 = P_{331}(h_2,h_1) + P_{332}(h_3,h_2) + P_{333}(h_F+a+a_2,h_3)$

3. $P_3 = P_{331}(h_2,h_1) + P_{332}(h_F+a+a_2,h_2)$

4. $P_3 = P_{331}(h_F+a+a_2,h_1)$

5. $P_3 = P_{321}(h_F+a,h_1) + P_{331}(h_2,h_F+a) + P_{332}(h_3,h_2) + P_{333}(h_F+a+a_2,h_3)$

6. $P_3 = P_{321}(h_F+a,h_1) + P_{331}(h_F+a+a_2,h_F+a)$

7. $P_3 = P_{321}(h_F+a,h_1) + P_{331}(h_2,h_F+a) + P_{332}(h_F+a+a_2,h_2)$

8. $P_3 = P_{321}(h_2,h_1) + P_{322}(h_3,h_2) + P_{323}(h_F+a,h_3) + P_{333}(f_F+a+a_2,h_F+a)$

9. $P_3 = P_{321}(h_2,h_1) + P_{322}(h_F+a,h_2) + P_{332}(h_3,h_F+a) + P_{333}(h_F+a+a_2,h_3)$

10. $P_3 = P_{321}(h_2,h_1) + P_{322}(h_F+a,h_2) + P_{332}(h_F+a+a_2,h_F+a)$

11. $P_3 = P_{321}(h_2,h_1) + P_{322}(h_3,h_2) + P_{323}(h_F+a,h_3) + P_{333}(h_4,h_F+a)$

12. $P_3 = P_{321}(h_2,h_1) + P_{322}(h_F+a,h_2) + P_{332}(h_3,h_F,+a) + P_{333}(h_4,h_3)$

13. $P_3 = P_{321}(h_F+a,h_1) + P_{331}(h_2,h_F,+a) + P_{332}(h_3,h_2) + P_{333}(h_4,h_3)$

14. $P_3 = P_{321}(h_2,h_1) + P_{322}(h_3,h_2) + P_{323}(h_4,h_3)$

15. $P_3 = P_{311}(h_2,h_1) + P_{312}(h_3,h_2) + P_{313}(h_4,h_3)$

16. $P_3 = P_{311}(h_2,h_1) + P_{312}(h_3,h_2) + P_{313}(h_N+a+a_2,h_3) + P_{323}(h_4,h_N+a+a_2)$

TABLE 6.3
(Continued)

17. $P_3 = P_{311}(h_N+a+a_2, h_1) + P_{321}(h_2, h_N+a+a_2) + P_{322}(h_3, h_2) + P_{323}(h_4, h_3)$

18. $P_3 = P_{311}(h_2, h_1) + P_{312}(h_N+a+a_2, h_2) + P_{322}(h_3, h_N+a+a_2) + P_{323}(h_4, h_3)$

19. $P_3 = P_{311}(h_2, h_N+a) + P_{312}(h_3, h_2) + P_{313}(h_N+a+a_2, h_3) + P_{323}(h_4, h_N+a+a_2)$

20. $P_3 = P_{311}(h_N+a+a_2, h_N+a) + P_{321}(h_2, h_N+a+a_2) + P_{322}(h_3, h_2) + P_{323}(h_4, h_3)$

21. $P_3 = P_{311}(h_2, h_N+a) + P_{312}(h_N+a+a_2, h_2) + P_{322}(h_3, h_N+a+a_2) + P_{323}(h_4, h_3)$

22. $P_3 = P_{313}(h_N+a+a_2, h_N+a) + P_{323}(h_4, h_N+a+a_2)$

23. $P_3 = P_{312}(h_3, h_N+a) + P_{313}(h_N+a+a_2, h_3) + P_{323}(h_4, h_N+a+a_2)$

24. $P_3 = P_{312}(h_N+a+a_2, h_N+a) + P_{322}(h_3, h_N+a+a_2) + P_{323}(h_4, h_3)$

25. $P_3 = P_{311}(h_2, h_N+a) + P_{312}(h_3, h_2) + P_{313}(h_4, h_3)$

26. $P_3 = P_{312}(h_3, h_N+a) + P_{313}(h_4, h_3)$

27. $P_3 = P_{313}(h_4, h_N+a)$

$$I(R) = \frac{P(R)}{P(R_{MID})} \cdot \left(\frac{R_F}{R}\right)^3 \text{ if } R > R_F$$

(6.55)

$$I(R) = \frac{P(R)}{P(R_{MID})} \text{ if } R_N \leq R \leq R_F$$

and $$I(R) = \frac{P(R)}{P(R_{MID})} \cdot \left(\frac{R_N}{R}\right)^3 \text{ if } R < R_N \qquad (6.55)$$

where $R_{MID} = \frac{R_F}{2}$ and R_F is the nominal far range.

The reason for omitting $\left(\frac{R_F}{R}\right)^3$ in the second expression is found in the effect of the mask (bikini) on the detector which reduces the line width of the image in the active area of the detector as the image height decreases (becomes more negative). The width is reduced by the same measure as $\left(\frac{R_F}{R}\right)^3$ increases. In this manner the dynamic range of the system is effectively limited to 1.

So far all the calculations were carried out assuming

$$\Delta x > 0.$$

When the detector plane is in front of the image plane

$$\Delta x < 0.$$

Comparing Figure 6.3 (which applies to the case $\Delta x < 0$) to Figure 6.2 it can be seen that the blur is now upside down. If all the a's are positive and the direction of integration is reversed, the integrals of the Tables 6.1 through 6.3 can be used. As a_1 and a_2 are positive, only the expression for a needs a correction. Taking the absolute value of the expression for a makes it positive in all cases. If the substitutions

$-h_4$ for h_1	$-\Delta h_1$ for Δh_4	
$-h_3$ for h_2	$-\Delta h_4$ for Δh_1	(6.56)
$-h_2$ for h_3	$-h_N$ for h_F	
$-h_1$ for h_4	$-h_F$ for h_N	

are made, the direction of integration is effectively reversed and the inequalities of Figure 6.7 through 6.12 remain valid. This approach was taken in writing the computer program (see Appendix D).

4. Defining the Bin Boundary Function

One output of the computer program is the relative sensitivity I as a function of the distance R. The second output is the probability of detection P_d, also as a function of distance. For the latter function, it is assumed that the receiver S/N ratio equals 6.54 when the target is at $\frac{R_T}{2}$ and the noise level is the highest the receiver can tolerate. The threshold level is set to a value which makes the probability of detection P_d equal to .99 and the threshold-to-noise ratio equal 3.965. As the S/N ratio is proportional to the received signal it changes with distance as the relative sensitivity I does:

$$S/N(R) = S/N\left(\frac{R_T}{2}\right) \cdot I \qquad (6.57)$$

$S/N_{(R)}$ is then used to calculate P_d with the aid of equation (3.10), Section 3.

$$\sqrt[n]{P_d} = \frac{1}{2}\left[1 + \text{erf}\left(\frac{I_s - I_t}{\sqrt{2}\, I_n}\right)\right]$$

with n = 2, after rearranging:

$$P_d(R) = \left\{\frac{1}{2}\left[1 + \text{erf}\left(\frac{S/N(R) - TH/N}{\sqrt{2}}\right)\right]\right\}^2 \qquad (6.58)$$

where TH/N is the threshold-to-noise ratio.

In the computer program an approximation was used for the error function[1)].

1) Hastings Jr., Cecil, "Approximations for Digital Computers", Princeton University Press, 1955

The probability of detection as a function of distance offers a convenient way of defining the bin boundaries. Near and far-range can be defined as the distances at which P_d becomes 0.25. It can be seen from (6.58) that for $P_d = 0.25$ the error function must be zero, or, $S/N_{(R)} = TH/N$, which means that the signal equals the threshold level. In this situation the average number of noise threshold crossings in upward and downward direction balance, resulting in a probability of 0.5 for one signal, or, in a probability of 0.25 for a signal from the 2-out-of-2 detection logic as employed by the AOMDI. The distance for which $P_d = 0.25$ is independent of the noise level, for both, $S/N_{(R)}$ and TH/N, change proportional to the noise level and their difference is always zero when the signal reaches the threshold. Decreasing the noise level while keeping the threshold level constant leads to sharper boundaries as can be seen from the computer runs.

5. Calculating the Bin Boundary Function by Computer

For calculating the bin boundary functions, it is assumed that receivers 1 and 2 have square apertures of $0.25cm^2$ and $0.5cm^2$ area, respectively, as obtained from Section 4. The focal lengths of these receivers is equal to twice the length of the side of their apertures. For receiver 3, the focal length and aperture height of the corresponding receiver of the lab model is used which has a rectangular aperture area of $4.3cm^2$.

The receiver parameters used for calculating the standard bin boundary functions to which all other functions obtained with changed parameters are compared are as follows:

<u>Receiver 1:</u>

R_N = 2 ft, R_F = 10 ft.

α = 10mrad σ_2 = 0.5mrad, σ_3 = 0.5mrad, d = 0.3"

ϕ = 40mrad (2.29°), σ_1 = 0.5 mrad, f = 0.40", p = 0.40133", y_{max} = 0.20"

n = 1.501 b = 1.2"

h_N = 0.0107 h_F = 0

Receiver 2:

$R_N = 5$ ft, $R_F = 25$ ft.

$\alpha = 10$mrad, $\sigma_2 = 0.5$mrad, $\sigma_3 = 0.5$mrad, $d = 0.3''$

$\psi = 40$mrad ($2.29°$), $\sigma_1 = 0.5$mrad, $f = .56''$, $P = .56105''$, $y_{max} = 0.28''$

$n = 1.501$ $b = 3''$

$h_N = 0.0150$ $h_F = 0$

Receiver 3:

$R_N = 15$ ft, $R_F = 50$ ft.

$\alpha = 10$mrad $\sigma_2 = 0.5$mrad, $\sigma_3 = 0.5$mrad, $d = 0.3''$

$\psi = 23.3$mrad ($1.34°$), $\sigma_1 = 0.5$mrad, $f = 2.25''$, $p = 2.25844''$, $y_{max} = 1.125''$

$n = 1.501$ $b = 6''$

$h_N = 0.0351$ $h_F = 0$

The detector location p is obtained from

$$p = \frac{f^2}{R_F} + f \qquad (6.59)$$

where all quantities are measured in inches.

The heights of the field stop (bikini) are calculated using Figure 6.4.

$$h = -p \frac{\tan\psi}{n} \qquad (6.60)$$

Where n is the index of reflection of the receiver element and ψ is the elevation angle. As the reflecting parabola and the detectors are located in glass (in Figure 6.4 it is assumed for simplicity that target, reflector and detector are all lying in air) sin ψ is reduced by $\frac{1}{n}$. Then, for small ψ

$$\frac{\sin\psi}{n} = \frac{\psi}{n} = \frac{\tan\psi}{n}$$

All receivers image a target at far range on the optical axis, as in this location the target itself must be on the axis and the corresponding h_F

is zero. When the target is located at near range it is seen from the receiver under an angle ϕ which is equal to the total elevation field. Tables 6.4, 6.5 and 6.6 show resulting standard bin boundary function for the three receivers. The distances R between which the probability of detection reaches 0.25 are underlined. Note how much faster the probability of detection drops outside the distance interval than the relative sensitivity. The probability that is indicated for I = 0 is that of threshold up-crossings of the noise in the absence of a signal.

The influence of reduced noise on the bin boundary function can be seen by comparing Tables 6.4 through 6.6 with Tables 6.7 through 6.9. For the latter the noise level is reduced by 50% which means doubling both the S/N ratio and the threshold-to-noise ratio. The distances at which the probability of detection reaches 0.25 remain the same, but the slopes of the curves become much steeper. For Tables 6.10 through 6.12 only the S/N ratio was doubled implying either a larger target or a greater target reflectivity. The tables show that a widening of the distance interval occurs with the far-boundary changing more than the near-boundary. At the same time the slopes of the curves near the boundaries become steeper.

Tables 6.13 through 6.15 show the results of computer runs with the focal lengths of each receiver doubled. Tables 6.16 through 6.18 show the influence of doubling the signal (doubling the S/N ratio) on the bin boundaries. Table 6.19 summarizes these results by showing the distance interval in feet in which the probability of detection goes to 0.25. It can be seen that the distance interval within the boundaries increases somewhat with increasing S/N ratio.

In all 3 receivers, the shift of corresponding boundaries amounts to about the same percentage. It is about 5% for the near-boundary and 8% for the far-boundary. The greater influence on the far-boundary was anticipated for the boundary function at the far-boundary stretches much further than at the near-boundary. The magnitude of the boundary shift is not significant and much smaller than what might be expected when considering the relative sensitivity only. The advantage of establishing a threshold level which must be exceeded by the signal becomes quite clear.

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0
XMIT.DEFL.IN MRAD,DELTA = 10.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.FIELD.FIELD IN MRAD,PSI = 40.0
FOCAL LENGTH IN IN.,F = 0.400
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT.,NEAR,IN IN.,HN =-0.0107
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.4013
INDEX OF REFRACTION, N = 1.5
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.237E-03	0.16944E-08
1.80	0.367E-01	0.10756E-07
1.90	0.130E 00	0.81481E-06
2.00	0.262E 00	0.15101E-03
2.10	0.437E 00	0.10108E-01
2.20	0.610E 00	0.25965E 00
2.30	0.779E 00	0.75989E 00
2.40	0.914E 00	0.95670E 00
2.50	0.988E 00	0.98752E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.996E 00	0.98936E 00
10.00	0.890E 00	0.93754E 00
11.00	0.516E 00	0.77891E-01
12.00	0.276E 00	0.24270E-03
13.00	0.129E 00	0.85224E-06
14.00	0.516E-01	0.22763E-07
15.00	0.182E-01	0.42545E-08
16.00	0.513E-02	0.21011E-08
17.00	0.980E-03	0.17607E-08
18.00	0.282E-04	0.16814E-08
19.00	0.785E-05	0.16738E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

TABLE 6-4

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DFCL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	40.0	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.665

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.992E-04	0.16823E-08
4.60	0.126E-01	0.32146E-08
4.70	0.599E-01	0.33775E-07
4.80	0.141E 00	0.14246E-05
4.90	0.254E 00	0.11296E-03
5.00	0.386E 00	0.56096E-02
5.10	0.537E 00	0.10721E 00
5.20	0.686E 00	0.49104E 00
5.30	0.816E 00	0.83714E 00
5.40	0.913E 00	0.95576E 00
5.50	0.974E 00	0.98404E 00
5.60	0.998E 00	0.98971E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.98983E 00
23.00	0.976E 00	0.98465E 00

TABLE 6.5

24.00	0.900E 00	0.9[illegible]059E 00
~~25.00~~	0.778E 00	0.7[illegible]774E 00
~~26.00~~	0.567E 00	0.1594[illegible]E 00
27.00	0.392E 00	0.657[illegible]1E-02
28.00	0.254E 00	0.11324[illegible]E-03
29.00	0.131E 00	0.21372[illegible]E-05
30.00	0.822E-01	0.5[illegible]006[illegible]E-07
31.00	0.410E-01	0.1342[illegible]E-07
32.00	0.185E-01	0.472[illegible]4[illegible]E-08
33.00	0.724E-02	0.2431[illegible]E-08
34.00	0.22[illegible]E-02	0.1[illegible]025[illegible]E-08
35.00	0.30[illegible]E-03	0.171[illegible]4[illegible]E-08
36.00	0.600E-04	0.16[illegible]7[illegible]9E-08
37.00	0.99[illegible]E-0[illegible]	0.16[illegible]73[illegible]E-08
38.00	0.000E 00	0.16[illegible]737E-08
39.00	0.000E 00	0.16[illegible]737E-08
40.00	0.000E 00	0.16[illegible]737E-08
41.00	0.000E 00	0.16[illegible]737E-08
42.00	0.000E 00	0.16[illegible]737E-08
43.00	0.000E 00	0.16[illegible]737E-08
44.00	0.000E 00	0.16[illegible]737E-08
45.00	0.000E 00	0.16[illegible]737E-08
46.00	0.000E 00	0.16[illegible]737E-08
47.00	0.000E 00	0.16[illegible]737E-08
48.00	0.000E 00	0.16[illegible]737E-08
49.00	0.000E 00	0.16[illegible]737E-08
50.00	0.000E 00	0.16[illegible]737E-08
51.00	0.000E 00	0.16[illegible]737E-08
52.00	0.000E 00	0.16[illegible]737E-08

TABLE 6.5

PAGE 2

NEAR RANGE IN FT, RN = 15.0
XMIT.DECL.IN MRAD,DELTA = 10.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 23.3
FOCAL LENGTH IN IN.,F = 2.250
REC.APERT.LGHT IN IN.,YMAX = 1.125
BIKINI HGHT,NEAR,IN IN.,HN =-0.0651
BASELINE IN IN., L = 6.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 50.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 2.25044
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.659E-01	0.45066E-07
13.40	0.885E-01	0.13164E-06
13.50	0.114E 00	0.42753E-06
13.60	0.142E 00	0.15077E-05
13.70	0.174E 00	0.56277E-05
13.80	0.208E 00	0.21639E-04
13.90	0.245E 00	0.63405E-04
14.00	0.284E 00	0.31342E-03
14.10	0.325E 00	0.11120E-02
14.20	0.366E 00	0.36019E-02
14.30	0.411E 00	0.10364E-01
14.40	0.455E 00	0.26104E-01
14.50	0.498E 00	0.57364E-01
14.60	0.540E 00	0.11082E 00
14.70	0.581E 00	0.18991E 00
14.80	0.621E 00	0.29114E 00
14.90	0.658E 00	0.40278E 00
15.00	0.692E 00	0.51005E 00
15.10	0.736E 00	0.64557E 00
15.20	0.777E 00	0.75501E 00
15.30	0.815E 00	0.83561E 00
15.40	0.849E 00	0.89121E 00
15.50	0.880E 00	0.92792E 00
15.60	0.907E 00	0.95153E 00
15.70	0.930E 00	0.96650E 00
15.80	0.950E 00	0.97595E 00
15.90	0.967E 00	0.98189E 00
16.00	0.980E 00	0.98559E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

TABLE 6.6

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.99000E 00
44.00	0.999E 00	0.99974E 00
45.00	0.993E 00	0.99872E 00
46.00	0.978E 00	0.99502E 00
47.00	0.949E 00	0.97553E 00
48.00	0.907E 00	0.95182E 00
49.00	0.854E 00	0.89082E 00
50.00	0.794E 00	0.79201E 00
51.00	0.685E 00	0.45548E 00
52.00	0.582E 00	0.19259E 00
53.00	0.488E 00	0.48507E-01
54.00	0.403E 00	0.86554E-02
55.00	0.328E 00	0.11872E-02
56.00	0.268E 00	0.15847E-03
57.00	0.210E 00	0.23178E-04
58.00	0.166E 00	0.40772E-05
59.00	0.131E 00	0.99935E-06
60.00	0.102E 00	0.24959E-06
61.00	0.794E-01	0.85931E-07
62.00	0.611E-01	0.35804E-07
63.00	0.465E-01	0.17604E-07
64.00	0.351E-01	0.95639E-08
65.00	0.261E-01	0.63462E-08
66.00	0.191E-01	0.44587E-08
67.00	0.137E-01	0.32959E-08
68.00	0.972E-02	0.27618E-08
69.00	0.672E-02	0.22673E-08
70.00	0.453E-02	0.21158E-08
71.00	0.296E-02	0.19512E-08
72.00	0.188E-02	0.18445E-08
73.00	0.114E-02	0.17758E-08
74.00	0.661E-03	0.17320E-08
75.00	0.361E-03	0.17053E-08
76.00	0.183E-03	0.16857E-08
77.00	0.847E-04	0.16811E-08
78.00	0.340E-04	0.16767E-08
79.00	0.111E-04	0.16747E-08
80.00	0.253E-05	0.16739E-08
81.00	0.272E-06	0.16737E-08

TABLE 6.6
PAGE 2

BIN PROBABILITY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.
XMIT.DEFL.IN MRAD,DELTA =	5.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.5
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.3
REC.FLDV.FIELD IN MRAD,FSI =	39.5	REC. BLUR IN MRAD,SGMA1 =	0.5
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.4013
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.0
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0107	BIKINI HGHT,FAR,IN IN.,HF =	0.000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	13.980	THRESHOLD-TO-NOISE RATIO,THN =	7.93

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.00000E 00
1.00	0.000E 00	0.00000E 00
1.10	0.000E 00	0.00000E 00
1.20	0.000E 00	0.00000E 00
1.30	0.000E 00	0.00000E 00
1.40	0.000E 00	0.00000E 00
1.50	0.000E 00	0.00000E 00
1.60	0.000E 00	0.00000E 00
1.70	0.237E-03	0.00000E 00
1.80	0.367E-01	0.00000E 00
1.90	0.130E 00	0.54210E-17
2.00	0.262E 00	0.22207E-10
2.10	0.437E 00	0.18338E-03
2.20	0.610E 00	0.26985E 00
2.30	0.779E 00	0.97669E 00
2.40	0.914E 00	0.99993E 00
2.50	0.988E 00	0.99999E 00
2.60	0.100E 01	0.99999E 00
2.70	0.100E 01	0.99999E 00
2.80	0.100E 01	0.99999E 00
2.90	0.100E 01	0.99999E 00
3.00	0.100E 01	0.99999E 00
4.00	0.100E 01	0.99999E 00
5.00	0.100E 01	0.99999E 00
6.00	0.100E 01	0.99999E 00
7.00	0.100E 01	0.99999E 00
8.00	0.100E 01	0.99999E 00
9.00	0.996E 00	0.99999E 00
10.00	0.890E 00	0.99978E 00
11.00	0.516E 00	0.14587E-01
12.00	0.276E 00	0.10280E-09
13.00	0.129E 00	0.30694E-17
14.00	0.518E-01	0.00000E 00
15.00	0.182E-01	0.00000E 00
16.00	0.514E-02	0.00000E 00
17.00	0.960E-03	0.00000E 00
18.00	0.962E-04	0.00000E 00
19.00	0.705E-06	0.00000E 00
20.00	0.000E 00	0.00000E 00
21.00	0.000E 00	0.00000E 00

TABLE 6.7

BIKINI BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	13.070	THRESHOLD-TO-NOISE RATIO,THN =	7.930

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.00000E 00
3.90	0.000E 00	0.00000E 00
4.00	0.000E 00	0.00000E 00
4.10	0.000E 00	0.00000E 00
4.20	0.000E 00	0.00000E 00
4.30	0.000E 00	0.00000E 00
4.40	0.000E 00	0.00000E 00
4.50	0.992E-04	0.00000E 00
4.60	0.126E-01	0.00000E 00
4.70	0.599E-01	0.00000E 00
4.80	0.141E 00	0.17564E-16
4.90	0.254E 00	0.85516E-11
5.00	0.386E 00	0.39504E-05
5.10	0.537E 00	0.34465E-01
5.20	0.686E 00	0.72907E 00
5.30	0.816E 00	0.99393E 00
5.40	0.913E 00	0.99993E 00
5.50	0.974E 00	0.99999E 00
5.60	0.998E 00	0.99999E 00
5.70	0.100E 01	0.99999E 00
5.80	0.100E 01	0.99999E 00
5.90	0.100E 01	0.99999E 00
6.00	0.100E 01	0.99999E 00
7.00	0.100E 01	0.99999E 00
8.00	0.100E 01	0.99999E 00
9.00	0.100E 01	0.99999E 00
10.00	0.100E 01	0.99999E 00
11.00	0.100E 01	0.99999E 00
12.00	0.100E 01	0.99999E 00
13.00	0.100E 01	0.99999E 00
14.00	0.100E 01	0.99999E 00
15.00	0.100E 01	0.99999E 00
16.00	0.100E 01	0.99999E 00
17.00	0.100E 01	0.99999E 00
18.00	0.100E 01	0.99999E 00
19.00	0.100E 01	0.99999E 00
20.00	0.100E 01	0.99999E 00
21.00	0.100E 01	0.99999E 00
22.00	0.949E 00	0.99999E 00
23.00	0.976E 00	0.99999E 00

TABLE 6.8

24.00	0.900E 00	0.99986E 00
25.00	0.778E 00	0.97037E 00
26.00	0.567E 00	0.9[illegible]963E-01
27.00	0.392E 00	0.67249E-05
28.00	0.254E 00	0.6[illegible]200E-11
29.00	0.151E 00	0.6[illegible]E-16
30.00	0.822E-01	0.00000E 00
31.00	0.410E-01	0.00000E 00
32.00	0.185E-01	0.00000E 00
33.00	0.724E-02	0.00000E 00
34.00	0.22[illegible]E-02	0.00000E 00
35.00	0.503E-03	0.00000E 00
36.00	0.600E-04	0.00000E 00
37.00	0.994E-0[illegible]	0.00000E 00
38.00	0.000E 00	0.00000E 00
39.00	0.000E 00	0.00000E 00
40.00	0.000E 00	0.00000E 00
41.00	0.000E 00	0.00000E 00
42.00	0.000E 00	0.00000E 00
43.00	0.000E 00	0.00000E 00
44.00	0.000E 00	0.00000E 00
45.00	0.000E 00	0.00000E 00
46.00	0.000E 00	0.00000E 00
47.00	0.000E 00	0.00000E 00
48.00	0.000E 00	0.00000E 00
49.00	0.000E 00	0.00000E 00
50.00	0.000E 00	0.00000E 00
51.00	0.000E 00	0.00000E 00
52.00	0.000E 00	0.00000E 00

TABLE 6.8

PAGE 2

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,F =	2.25844
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	10.000	THRESHOLD-TO-NOISE RATIO,THN =	7.930

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.659E-01	0.00000E 00
13.40	0.885E-01	0.00000E 00
13.50	0.114E 00	0.86736E-18
13.60	0.142E 00	0.21084E-16
13.70	0.174E 00	0.90455E-15
13.80	0.208E 00	0.45337E-13
13.90	0.245E 00	0.32425E-11
14.00	0.284E 00	0.23901E-09
14.10	0.325E 00	0.16075E-07
14.20	0.368E 00	0.85160E-06
14.30	0.411E 00	0.30158E-04
14.40	0.455E 00	0.57955E-03
14.50	0.498E 00	0.61580E-02
14.60	0.540E 00	0.37566E-01
14.70	0.581E 00	0.13931E 00
14.80	0.621E 00	0.33496E 00
14.90	0.658E 00	0.56914E 00
15.00	0.692E 00	0.75870E 00
15.10	0.736E 00	0.91430E 00
15.20	0.777E 00	0.97524E 00
15.30	0.815E 00	0.99373E 00
15.40	0.849E 00	0.99850E 00
15.50	0.880E 00	0.99964E 00
15.60	0.907E 00	0.99990E 00
15.70	0.930E 00	0.99997E 00
15.80	0.950E 00	0.99999E 00
15.90	0.967E 00	0.99999E 00
16.00	0.980E 00	0.99999E 00
17.00	0.100E 01	0.99999E 00
18.00	0.100E 01	0.99999E 00
19.00	0.100E 01	0.99999E 00
20.00	0.100E 01	0.99999E 00
21.00	0.100E 01	0.99999E 00
22.00	0.100E 01	0.99999E 00
23.00	0.100E 01	0.99999E 00
24.00	0.100E 01	0.99999E 00
25.00	0.100E 01	0.99999E 00
26.00	0.100E 01	0.99999E 00
27.00	0.100E 01	0.99999E 00
28.00	0.100E 01	0.99999E 00

TABLE 6.9

29.00	0.100E 01	0.99999E 00
30.00	0.100E 01	0.99999E 00
31.00	0.100E 01	0.99999E 00
32.00	0.100E 01	0.99999E 00
33.00	0.100E 01	0.99999E 00
34.00	0.100E 01	0.99999E 00
35.00	0.100E 01	0.99999E 00
36.00	0.100E 01	0.99999E 00
37.00	0.100E 01	0.99999E 00
38.00	0.100E 01	0.99999E 00
39.00	0.100E 01	0.99999E 00
40.00	0.100E 01	0.99999E 00
41.00	0.100E 01	0.99999E 00
42.00	0.100E 01	0.99999E 00
43.00	0.999E 00	0.99999E 00
44.00	0.999E 00	0.99999E 00
45.00	0.993E 00	0.99999E 00
46.00	0.978E 00	0.99999E 00
47.00	0.949E 00	0.99999E 00
48.00	0.907E 00	0.99990E 00
49.00	0.854E 00	0.99884E 00
50.00	0.794E 00	0.98801E 00
51.00	0.685E 00	0.72006E 00
52.00	0.582E 00	0.14375E 00
53.00	0.488E 00	0.37774E-02
54.00	0.403E 00	0.15455E-04
55.00	0.328E 00	0.20811E-07
56.00	0.264E 00	0.25527E-10
57.00	0.210E 00	0.60680E-13
58.00	0.166E 00	0.36450E-15
59.00	0.131E 00	0.54210E-17
60.00	0.102E 00	0.21684E-18
61.00	0.794E-01	0.00000E 00
62.00	0.611E-01	0.00000E 00
63.00	0.465E-01	0.00000E 00
64.00	0.351E-01	0.00000E 00
65.00	0.261E-01	0.00000E 00
66.00	0.191E-01	0.00000E 00
67.00	0.137E-01	0.00000E 00
68.00	0.972E-02	0.00000E 00
69.00	0.672E-02	0.00000E 00
70.00	0.453E-02	0.00000E 00
71.00	0.296E-02	0.00000E 00
72.00	0.188E-02	0.00000E 00
73.00	0.114E-02	0.00000E 00
74.00	0.661E-03	0.00000E 00
75.00	0.361E-03	0.00000E 00
76.00	0.183E-03	0.00000E 00
77.00	0.847E-04	0.00000E 00
78.00	0.340E-04	0.00000E 00
79.00	0.111E-04	0.00000E 00
80.00	0.253E-05	0.00000E 00
81.00	0.272E-06	0.00000E 00

// XEQ FPBIN

TABLE 6.9

PAGE 2

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD,DELTA = 10.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 40.0
FOCAL LENGTH IN IN.,F = 0.400
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN =-0.0107
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 13.000

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.40133
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.237E-03	0.17154E-08
1.80	0.367E-01	0.64571E-07
1.90	0.130E 00	0.14456E-03
2.00	0.262E 00	0.89176E-01
2.10	0.437E 00	0.92228E 00
2.20	0.610E 00	0.99993E 00
2.30	0.779E 00	0.99999E 00
2.40	0.914E 00	0.10000E 01
2.50	0.988E 00	0.10000E 01
2.60	0.100E 01	0.10000E 01
2.70	0.100E 01	0.10000E 01
2.80	0.100E 01	0.10000E 01
2.90	0.100E 01	0.10000E 01
3.00	0.100E 01	0.10000E 01
4.00	0.100E 01	0.10000E 01
5.00	0.100E 01	0.10000E 01
6.00	0.100E 01	0.10000E 01
7.00	0.100E 01	0.10000E 01
8.00	0.100E 01	0.10000E 01
9.00	0.996E 00	0.10000E 01
10.00	0.890E 00	0.10000E 01
11.00	0.516E 00	0.99479E 00
12.00	0.276E 00	0.13335E 00
13.00	0.129E 00	0.13639E-03
14.00	0.518E-01	0.20492E-06
15.00	0.182E-01	0.10630E-07
16.00	0.512E-02	0.28387E-08
17.00	0.980E-03	0.18522E-08
18.00	0.882E-04	0.16691E-08
19.00	0.766E-06	0.16739E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

TABLE 6.10

BIM BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD.DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,FSI =	40.0	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	13.000	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.992E-04	0.16910E-08
4.60	0.126E-01	0.61228E-08
4.70	0.599E-01	0.51945E-06
4.80	0.141E 00	0.29964E-03
4.90	0.254E 00	0.67968E-01
5.00	0.386E 00	0.74116E 00
5.10	0.537E 00	0.99785E 00
5.20	0.686E 00	0.99999E 00
5.30	0.816E 00	0.10000E 01
5.40	0.913E 00	0.10000E 01
5.50	0.974E 00	0.10000E 01
5.60	0.998E 00	0.10000E 01
5.70	0.100E 01	0.10000E 01
5.80	0.100E 01	0.10000E 01
5.90	0.100E 01	0.10000E 01
6.00	0.100E 01	0.10000E 01
7.00	0.100E 01	0.10000E 01
8.00	0.100E 01	0.10000E 01
9.00	0.100E 01	0.10000E 01
10.00	0.100E 01	0.10000E 01
11.00	0.100E 01	0.10000E 01
12.00	0.100E 01	0.10000E 01
13.00	0.100E 01	0.10000E 01
14.00	0.100E 01	0.10000E 01
15.00	0.100E 01	0.10000E 01
16.00	0.100E 01	0.10000E 01
17.00	0.100E 01	0.10000E 01
18.00	0.100E 01	0.10000E 01
19.00	0.100E 01	0.10000E 01
20.00	0.100E 01	0.10000E 01
21.00	0.100E 01	0.10000E 01
22.00	0.999E 00	0.10000E 01
23.00	0.976E 00	0.10000E 01

TABLE 6.11

24.00	0.900E 00	0.10000E 01
25.00	0.778E 00	0.99999E 00
26.00	0.567E 00	0.99948E 00
27.00	0.392E 00	0.77251E 00
28.00	0.254E 00	0.66125E-01
29.00	0.151E 00	0.54670E-03
30.00	0.822E-01	0.37405E-05
31.00	0.410E-01	0.97781E-07
32.00	0.185E-01	0.16992E-07
33.00	0.724E-02	0.39238E-08
34.00	0.229E-02	0.21190E-08
35.00	0.509E-03	0.17644E-08
36.00	0.600E-04	0.16842E-08
37.00	0.994E-06	0.16739E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

// XEQ FREIN.

TABLE 6.11

PAGE 2

BIKINI BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN = 15.0
XMIT.DECL.IN MRAD,DELTA = 10.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 23.3
FOCAL LENGTH IN IN.,F = 2.250
REC.APERT.HGHT IN IN.,YMAX = 1.125
BIKINI HGHT,NEAR,IN IN.,HN = -0.0251
BASELINE IN IN., B = 6.00
SIGNAL-TO-NOISE RATIO,SN = 13.00

FAR RANGE IN FT, RF = 50.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 2.25844
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.659E-01	0.93134E-06
13.40	0.885E-01	0.62627E-05
13.50	0.114E 00	0.45425E-04
13.60	0.142E 00	0.32624E-03
13.70	0.174E 00	0.21315E-02
13.80	0.208E 00	0.11721E-01
13.90	0.245E 00	0.50713E-01
14.00	0.284E 00	0.16352E 00
14.10	0.325E 00	0.38062E 00
14.20	0.368E 00	0.64624E 00
14.30	0.411E 00	0.85105E 00
14.40	0.455E 00	0.95385E 00
14.50	0.498E 00	0.98925E 00
14.60	0.540E 00	0.99805E 00
14.70	0.581E 00	0.99971E 00
14.80	0.621E 00	0.99996E 00
14.90	0.658E 00	0.99999E 00
15.00	0.692E 00	0.99999E 00
15.10	0.736E 00	0.99999E 00
15.20	0.777E 00	0.99999E 00
15.30	0.815E 00	0.10000E 01
15.40	0.849E 00	0.10000E 01
15.50	0.880E 00	0.10000E 01
15.60	0.907E 00	0.10000E 01
15.70	0.930E 00	0.10000E 01
15.80	0.950E 00	0.10000E 01
15.90	0.967E 00	0.10000E 01
16.00	0.980E 00	0.10000E 01
17.00	0.100E 01	0.10000E 01
18.00	0.100E 01	0.10000E 01
19.00	0.100E 01	0.10000E 01
20.00	0.100E 01	0.10000E 01
21.00	0.100E 01	0.10000E 01
22.00	0.100E 01	0.10000E 01
23.00	0.100E 01	0.10000E 01
24.00	0.100E 01	0.10000E 01
25.00	0.100E 01	0.10000E 01
26.00	0.100E 01	0.10000E 01
27.00	0.100E 01	0.10000E 01
28.00	0.100E 01	0.10000E 01

TABLE 6.12

29.00	0.100E 01	0.10000E 01
30.00	0.100E 01	0.10000E 01
31.00	0.100E 01	0.10000E 01
32.00	0.100E 01	0.10000E 01
33.00	0.100E 01	0.10000E 01
34.00	0.100E 01	0.10000E 01
35.00	0.100E 01	0.10000E 01
36.00	0.100E 01	0.10000E 01
37.00	0.100E 01	0.10000E 01
38.00	0.100E 01	0.10000E 01
39.00	0.100E 01	0.10000E 01
40.00	0.100E 01	0.10000E 01
41.00	0.100E 01	0.10000E 01
42.00	0.100E 01	0.10000E 01
43.00	0.999E 00	0.10000E 01
44.00	0.999E 00	0.10000E 01
45.00	0.993E 00	0.10000E 01
46.00	0.976E 00	0.10000E 01
47.00	0.949E 00	0.10000E 01
48.00	0.907E 00	0.10000E 01
49.00	0.854E 00	0.10000E 01
50.00	0.794E 00	0.99999E 00
51.00	0.685E 00	0.99999E 00
52.00	0.582E 00	0.99973E 00
53.00	0.488E 00	0.98465E 00
54.00	0.403E 00	0.81800E 00
55.00	0.328E 00	0.39457E 00
56.00	0.264E 00	0.92655E-01
57.00	0.210E 00	0.12706E-01
58.00	0.166E 00	0.13715E-02
59.00	0.131E 00	0.16827E-03
60.00	0.102E 00	0.18673E-04
61.00	0.794E-01	0.29661E-05
62.00	0.611E-01	0.61168E-06
63.00	0.465E-01	0.16332E-06
64.00	0.351E-01	0.55372E-07
65.00	0.261E-01	0.23165E-07
66.00	0.191E-01	0.11649E-07
67.00	0.137E-01	0.68227E-08
68.00	0.972E-02	0.45353E-08
69.00	0.672E-02	0.33405E-08
70.00	0.453E-02	0.26657E-08
71.00	0.296E-02	0.22736E-08
72.00	0.188E-02	0.20324E-08
73.00	0.114E-02	0.18836E-08
74.00	0.661E-03	0.17923E-08
75.00	0.361E-03	0.17375E-08
76.00	0.183E-03	0.17059E-08
77.00	0.847E-04	0.16885E-08
78.00	0.340E-04	0.16797E-08
79.00	0.111E-04	0.16757E-08
80.00	0.258E-05	0.16742E-08
81.00	0.272E-06	0.16738E-08

TABLE 6.12

PAGE 2

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	40.0	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.600	IMAGE DISTANCE IN IN.,P =	0.00533
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0215	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.220E-05	0.16739E-08
1.80	0.313E-01	0.82782E-08
1.90	0.127E 00	0.77562E-06
2.00	0.262E 00	0.14856E-03
2.10	0.437E 00	0.10033E-01
2.20	0.610E 00	0.20044E 00
2.30	0.781E 00	0.76322E 00
2.40	0.918E 00	0.95896E 00
2.50	0.989E 00	0.98780E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.996E 00	0.98939E 00
10.00	0.893E 00	0.94047E 00
11.00	0.517E 00	0.79304E-01
12.00	0.277E 00	0.24738E-03
13.00	0.130E 00	0.66542E-06
14.00	0.515E-01	0.22454E-07
15.00	0.172E-01	0.40501E-08
16.00	0.419E-02	0.20764E-08
17.00	0.572E-03	0.17240E-08
18.00	0.220E-04	0.16756E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

TABLE 6.13

BIM BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	40.0	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.1241
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0300	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.320E-07	0.16737E-08
4.60	0.667E-02	0.23607E-08
4.70	0.495E-01	0.20354E-07
4.80	0.129E 00	0.85175E-06
4.90	0.240E 00	0.71139E-04
5.00	0.372E 00	0.39600E-02
5.10	0.524E 00	0.87240E-01
5.20	0.674E 00	0.45079E 00
5.30	0.808E 00	0.82293E 00
5.40	0.908E 00	0.95247E 00
5.50	0.971E 00	0.98319E 00
5.60	0.997E 00	0.98959E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.98984E 00
23.00	0.977E 00	0.98492E 00

TABLE 6.14

24.00	0.903E 00	0.94887E 00
25.00	0.782E 00	0.74631E 00
26.00	0.568E 00	0.14233E 00
27.00	0.393E 00	0.66779E-02
28.00	0.254E 00	0.11510E-03
29.00	0.151E 00	0.21473E-05
30.00	0.815E-01	0.9[illegible]005E-07
31.00	0.395E-01	0.12414E-07
32.00	0.165E-01	0.39197E-08
33.00	0.568E-02	0.22443E-08
34.00	0.144E-02	0.17032E-08
35.00	0.219E-03	0.16927E-08
36.00	0.930E-05	0.16745E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

TABLE 6.14

PAGE 2

BIN BOUNDARY FUNCTION, 3RD RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 15.0
XMIT.DEFL.IN MRAD,DELTA = 10.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 23.3
FOCAL LENGTH IN IN.,F = 4.500
REC.APERT.HGHT IN IN.,YMAX = 1.125
BIKINI HGHT,NEAR,IN IN.,HN =-0.0716
BASELINE IN IN., B = 6.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 50.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 4.63375
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY 1	PROBAB.OF DETECTION
13.30	0.864E-01	0.13119E-06
13.40	0.117E 00	0.46752E-06
13.50	0.149E 00	0.15805E-05
13.60	0.184E 00	0.84954E-05
13.70	0.222E 00	0.37069E-04
13.80	0.264E 00	0.15887E-03
13.90	0.307E 00	0.64727E-03
14.00	0.353E 00	0.24267E-02
14.10	0.401E 00	0.81074E-02
14.20	0.449E 00	0.23331E-01
14.30	0.497E 00	0.56870E-01
14.40	0.544E 00	0.11746E 00
14.50	0.589E 00	0.20674E 00
14.60	0.633E 00	0.32457E 00
14.70	0.674E 00	0.45078E 00
14.80	0.711E 00	0.56809E 00
14.90	0.743E 00	0.66456E 00
15.00	0.771E 00	0.73660E 00
15.10	0.809E 00	0.82501E 00
15.20	0.844E 00	0.88467E 00
15.30	0.876E 00	0.92398E 00
15.40	0.904E 00	0.94917E 00
15.50	0.928E 00	0.96506E 00
15.60	0.948E 00	0.97509E 00
15.70	0.965E 00	0.98137E 00
15.80	0.979E 00	0.98529E 00
15.90	0.988E 00	0.98765E 00
16.00	0.994E 00	0.98899E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

TABLE 6.15

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.99000E 00
44.00	0.999E 00	0.98984E 00
45.00	0.993E 00	0.98877E 00
46.00	0.976E 00	0.98526E 00
47.00	0.951E 00	0.97613E 00
48.00	0.910E 00	0.95423E 00
49.00	0.859E 00	0.90494E 00
50.00	0.799E 00	0.80484E 00
51.00	0.690E 00	0.50321E 00
52.00	0.587E 00	0.20356E 00
53.00	0.491E 00	0.51647E-01
54.00	0.405E 00	0.89256E-02
55.00	0.329E 00	0.12273E-02
56.00	0.264E 00	0.15947E-03
57.00	0.209E 00	0.22667E-04
58.00	0.165E 00	0.58761E-05
59.00	0.129E 00	0.82191E-06
60.00	0.100E 00	0.22502E-06
61.00	0.767E-01	0.75646E-07
62.00	0.581E-01	0.30932E-07
63.00	0.433E-01	0.15016E-07
64.00	0.318E-01	0.84499E-08
65.00	0.228E-01	0.53855E-08
66.00	0.160E-01	0.38180E-08
67.00	0.110E-01	0.29485E-08
68.00	0.732E-02	0.24409E-08
69.00	0.470E-02	0.21341E-08
70.00	0.291E-02	0.19455E-08
71.00	0.172E-02	0.18295E-08
72.00	0.962E-03	0.17591E-08
73.00	0.502E-03	0.17176E-08
74.00	0.240E-03	0.16947E-08
75.00	0.102E-03	0.16826E-08
76.00	0.366E-04	0.16769E-08
77.00	0.985E-05	0.16746E-08
78.00	0.154E-05	0.16739E-08
79.00	0.567E-07	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

// XEQ FRBIN

TABLE 6.15

PAGE 2

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	9.5	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLD.FIELD IN MRAD,PSI =	39.5	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.600	IMAGE DISTANCE IN IN.,P =	0.60533
REC.APERT.LGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0214	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	13.000	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.220E-05	0.16741E-08
1.80	0.313E-01	0.38775E-07
1.90	0.127E 00	0.11774E-03
2.00	0.262E 00	0.67468E-01
2.10	0.437E 00	0.92166E 00
2.20	0.610E 00	0.99593E 00
2.30	0.781E 00	0.99999E 00
2.40	0.916E 00	0.10000E 01
2.50	0.989E 00	0.10000E 01
2.60	0.100E 01	0.10000E 01
2.70	0.100E 01	0.10000E 01
2.80	0.100E 01	0.10000E 01
2.90	0.100E 01	0.10000E 01
3.00	0.100E 01	0.10000E 01
4.00	0.100E 01	0.10000E 01
5.00	0.100E 01	0.10000E 01
6.00	0.100E 01	0.10000E 01
7.00	0.100E 01	0.10000E 01
8.00	0.100E 01	0.10000E 01
9.00	0.996E 00	0.10000E 01
10.00	0.893E 00	0.10000E 01
11.00	0.517E 00	0.99503E 00
12.00	0.277E 00	0.13544E 00
13.00	0.130E 00	0.13967E-03
14.00	0.515E-01	0.25775E-06
15.00	0.172E-01	0.96487E-08
16.00	0.419E-02	0.25787E-08
17.00	0.572E-03	0.17757E-08
18.00	0.220E-04	0.16775E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

TABLE 6.16

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 5.0 FAR RANGE IN FT, RF = 25.0
XMIT.DECL.IN MRAD,DELTA = 9.9 BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT. BLUR IN MRAD,SGMA3 = 0.50 XMIT.APERT.DIA.IN IN.,D = 0.40
REC.FLDV.FIELD IN MRAD,PSI = 39.9 REC. BLUR IN MRAD,SGMA1 = 0.50
FOCAL LENGTH IN IN.,F = 1.120 IMAGE DISTANCE IN IN.,P = 1.12416
REC.APERT.HGHT IN IN.,YMAX = 0.280 INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,NEAR,IN IN.,HN =-0.0360 BIKINI HGHT,FAR,IN IN.,HF = 0.0000
BASELINE IN IN., B = 3.00
SIGNAL-TO-NOISE RATIO,SN = 13.000 THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.320E-07	0.16737E-08
4.60	0.667E-02	0.33221E-08
4.70	0.495E-01	0.21453E-06
4.80	0.129E 00	0.13624E-03
4.90	0.240E 00	0.43254E-01
5.00	0.372E 00	0.66732E 00
5.10	0.524E 00	0.99613E 00
5.20	0.674E 00	0.99999E 00
5.30	0.808E 00	0.10000E 01
5.40	0.908E 00	0.10000E 01
5.50	0.971E 00	0.10000E 01
5.60	0.997E 00	0.10000E 01
5.70	0.100E 01	0.10000E 01
5.80	0.100E 01	0.10000E 01
5.90	0.100E 01	0.10000E 01
6.00	0.100E 01	0.10000E 01
7.00	0.100E 01	0.10000E 01
8.00	0.100E 01	0.10000E 01
9.00	0.100E 01	0.10000E 01
10.00	0.100E 01	0.10000E 01
11.00	0.100E 01	0.10000E 01
12.00	0.100E 01	0.10000E 01
13.00	0.100E 01	0.10000E 01
14.00	0.100E 01	0.10000E 01
15.00	0.100E 01	0.10000E 01
16.00	0.100E 01	0.10000E 01
17.00	0.100E 01	0.10000E 01
18.00	0.100E 01	0.10000E 01
19.00	0.100E 01	0.10000E 01
20.00	0.100E 01	0.10000E 01
21.00	0.100E 01	0.10000E 01
22.00	0.995E 00	0.10000E 01
23.00	0.977E 00	0.10000E 01

TABLE 6.17

24.00	0.903E 00	0.10000E 01
25.00	0.702E 00	0.99999E 00
26.00	0.5[illegible]E 00	0.9[illegible]947E 00
27.00	0.393E 00	0.77539E 00
28.00	0.254E 00	0.65176E-01
29.00	0.151E 00	0.55049E-03
30.00	0.815E-01	0.35413E-05
31.00	0.395E-01	0.64283E-07
32.00	0.165E-01	0.904[illegible]E-08
33.00	0.568E-02	0.30044E-08
34.00	0.144E-02	0.1[illegible]425E-08
35.00	0.21[illegible]E-03	0.17126E-08
36.00	0.930E-05	0.16753E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

TABLE 6.17

PAGE 2

BIN BOUNDARY FUNCTION, 3RD RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0716	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	13.000	THRESHOLD-TO-NOISE RATIO,TNN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.884E-01	0.62259E-05
13.40	0.117E 00	0.56176E-04
13.50	0.149E 00	0.46916E-03
13.60	0.184E 00	0.36772E-02
13.70	0.222E 00	0.21683E-01
13.80	0.264E 00	0.92660E-01
13.90	0.307E 00	0.27456E 00
14.00	0.353E 00	0.55613E 00
14.10	0.401E 00	0.81074E 00
14.20	0.449E 00	0.94535E 00
14.30	0.497E 00	0.98503E 00
14.40	0.544E 00	0.99636E 00
14.50	0.589E 00	0.99981E 00
14.60	0.633E 00	0.99996E 00
14.70	0.674E 00	0.99999E 00
14.80	0.711E 00	0.99999E 00
14.90	0.743E 00	0.99999E 00
15.00	0.771E 00	0.99999E 00
15.10	0.809E 00	0.10000E 01
15.20	0.844E 00	0.10000E 01
15.30	0.876E 00	0.10000E 01
15.40	0.904E 00	0.10000E 01
15.50	0.929E 00	0.10000E 01
15.60	0.948E 00	0.10000E 01
15.70	0.965E 00	0.10000E 01
15.80	0.979E 00	0.10000E 01
15.90	0.988E 00	0.10000E 01
16.00	0.994E 00	0.10000E 01
17.00	0.100E 01	0.10000E 01
18.00	0.100E 01	0.10000E 01
19.00	0.100E 01	0.10000E 01
20.00	0.100E 01	0.10000E 01
21.00	0.100E 01	0.10000E 01
22.00	0.100E 01	0.10000E 01
23.00	0.100E 01	0.10000E 01
24.00	0.100E 01	0.10000E 01
25.00	0.100E 01	0.10000E 01
26.00	0.100E 01	0.10000E 01
27.00	0.100E 01	0.10000E 01
28.00	0.100E 01	0.10000E 01

TABLE 6.18

29.00	0.100E 01	0.10000E 01
30.00	0.100E 01	0.10000E 01
31.00	0.100E 01	0.10000E 01
32.00	0.100E 01	0.10000E 01
33.00	0.100E 01	0.10000E 01
34.00	0.100E 01	0.10000E 01
35.00	0.100E 01	0.10000E 01
36.00	0.100E 01	0.10000E 01
37.00	0.100E 01	0.10000E 01
38.00	0.100E 01	0.10000E 01
39.00	0.100E 01	0.10000E 01
40.00	0.100E 01	0.10000E 01
41.00	0.100E 01	0.10000E 01
42.00	0.100E 01	0.10000E 01
43.00	0.999E 00	0.10000E 01
44.00	0.999E 00	0.10000E 01
45.00	0.993E 00	0.10000E 01
46.00	0.979E 00	0.10000E 01
47.00	0.951E 00	0.10000E 01
48.00	0.910E 00	0.10000E 01
49.00	0.859E 00	0.10000E 01
50.00	0.799E 00	0.99999E 00
51.00	0.690E 00	0.99979E 00
52.00	0.587E 00	0.99978E 00
53.00	0.491E 00	0.98651E 00
54.00	0.405E 00	0.82714E 00
55.00	0.329E 00	0.40171E 00
56.00	0.264E 00	0.93171E-01
57.00	0.209E 00	0.12378E-01
58.00	0.165E 00	0.12764E-02
59.00	0.125E 00	0.13132E-03
60.00	0.100E 00	0.15674E-04
61.00	0.767E-01	0.23656E-05
62.00	0.581E-01	0.46726E-06
63.00	0.433E-01	0.12057E-06
64.00	0.318E-01	0.40340E-07
65.00	0.228E-01	0.16874E-07
66.00	0.160E-01	0.85921E-08
67.00	0.110E-01	0.51619E-08
68.00	0.732E-02	0.35459E-08
69.00	0.470E-02	0.27181E-08
70.00	0.291E-02	0.22606E-08
71.00	0.172E-02	0.19995E-08
72.00	0.962E-03	0.18468E-08
73.00	0.502E-03	0.17630E-08
74.00	0.240E-03	0.17160E-08
75.00	0.102E-03	0.16916E-08
76.00	0.366E-04	0.16801E-08
77.00	0.985E-05	0.16755E-08
78.00	0.154E-05	0.16740E-08
79.00	0.567E-07	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

// XEQ FMB11

TABLE 6.18

PAGE 2

	STANDARD FOCAL LENGTH (FROM TABLES 6.4 THRU 6.6 AND 6.10 THRU 6.12)				DOUBLE FOCAL LENGTH (FROM TABLES 6.13 THRU 6.18)			
	NEAR-BOUNDARY		FAR-BOUNDARY		NEAR-BOUNDARY		FAR-BOUNDARY	
S/N	6.54	13.08	6.54	13.08	6.54	13.08	6.54	13.08
RECEIVER 1	2.1, 2.2	2.0, 2.1	10, 11	11, 12	2.1, 2.2	2.0, 2.1	10, 11	11, 12
RECEIVER 2	5.1, 5.2	4.9, 5.0	25, 26	27, 28	5.1, 5.2	4.9, 5.0	25, 26	27, 28
RECEIVER 3	14.7, 14.8	14,0, 14.1	51, 52	55, 56	14.5, 14.6	13.8, 13.9	51, 52	55, 56

TABLE 6.19

Doubling the focal length has surprisingly little influence on the shape of the bin boundary functions. Only a slight steepening of the bin boundary functions is noticeable.

To study the influence of selected system parameters on the shape of the bin boundary function a number of computer runs were made. The results of these runs were compared to those shown in Table 6.4 through 6.6 and 6.13 through 6.15. The changed parameters and the amount of change are as follows:

Transmitter Declination	$\delta = 10 \pm 1.0$ mrad
Transmitter Blur Angle	$\sigma_3 = 0.5 {+0.5 \atop -0.25}$ mrad
Receiver Blur Angle	$\sigma_1 = 0.5 {+0.5 \atop -0.25}$ mrad
Detector Distance	$p = p \pm 0.001$ in
Bikini Height, near	$h_N = h_N \pm 0.001$ in
Bikini Height, far	$h_F = h_F \pm 0.001$ in
Baseline	$b = b \pm 0{,}05$ in

One parameter was changed at a time while the others were kept at their standard values.

The effects of the parameter changes are summarized in Tables 6.20 through 6.22. The computer runs from which the tables were compiled are shown in Appendix E. All receivers react to the changes in a similar manner. The versions with double the focal length are somewhat less sensitive to the changes of lengths (p, h_N, h_F, b) then their standard counterparts. This can be understood when considering that the relative changes of these parameters decrease with increasing focal length. The angular changes affected all receivers the same way. The receivers with double the focal length tend to show steeper boundaries than those of standard focal length, but this difference is not significant and the focal length can be freely chosen as far as the bin boundaries are concerned.

		Receiver 1				
		f = 0.4"		f = 0.8"		
		Boundary		Boundary		
		Near	Far	Near	Far	REMARKS
Standard		2.1, 2.2	10, 11	2.1, 2.2	10, 11	
δ	9 mrad	2.2, 2.3	11, 12	2.2, 2.3	11, 12	Boundaries shift to greater R far boundary less steep
	11 mrad	2.1, 2.2	10, 11	2.1, 2.2	10, 11	Boundaries shift to smaller R's
σ_3	0.25 mrad	2.1, 2.2	10, 11	2.1, 2.2	10, 11	Steeper boundaries
	1.0 mrad	2.3, 2.3	10, 11	2.2, 2.3	10, 11	Less steep boundaries, near boundary shifts to greater R's
σ_1	0.25 mrad	2.1, 2.2	10, 11	2.1, 2.2	10, 11	Steeper boundaries
	1.0 mrad	2.2, 2.3	10, 11	2.1, 2.2	10, 11	Less steep boundarias, near boundary shifts to smaller R's
P	-0.001"	2.1, 2.2	10, 11	2.1, 2.2	10, 11	Near boundary less steep, far boundary steeper boundaries shift to smaller R's
	+0.001"	2.2, 2.3	11, 12	2.2, 2.3	10, 11	Near boundary steeper, far boundary less steep boundaries shift to greater R's
h_n	-0.001"	2.0, 2.1	8, 9	2.1, 2.2	9, 10	Boundaries shift to smaller R's
h_f	+0.001"	2.3, 2.4	11, 12	2.2, 2.3	11, 12	Boundaries shift to greater R's
b	1.15"	2.1, 2.2	10, 11	2.1, 2.2	10, 11	Hardly any change
	1.25"	2.2, 2.3	10, 11	2.2, 2.3	10, 11	Boundaries shift to greater R's

TABLE 6.20

RECEIVER 2						
		f = 0.56"		f = 1.12"		
		Boundary		Boundary		
		Near	Far	Near	Far	REMARKS
STANDARD		5.1, 5.2	25, 26	5.1, 5.2	25, 26	
δ	9 mrad	5.2, 5.3	27, 28	5.2, 5.3	27, 28	Boundaries shift to greater R's. far-boundary less steep
	11 mrad	5.0, 5.1	23, 24	5.0, 5.1	23, 24	Boundaries shift to smaller R's, boundaries somewhat steeper
σ_3	0.25 mrad	5.1, 5.2	25, 26	5.1, 5.2	25, 26	Steeper boundaries
	1.0 mrad	5.1, 5.2	25, 26	5.1, 5.2	25, 26	Less steep boundaries
σ_1	0.25 mrad	5.1, 5.2	25, 26	5.1, 5.2	25, 26	Steeper boundaries
	1.0 mrad	5.1, 5.2	25, 26	5.1, 5.2	25, 26	Less steep boundaries
P	-0.001"	5.0, 5.1	24, 25	5.1, 5.2	25, 26	Near-boundary less steep, far-boundary steeper; boundaries shift to smaller R's
	+0.001"	5.2, 5.3	26, 27	5.1, 5.2	26, 27	Near-boundary steeper, far-boundary less steep; boundaries shift to greater R's
h_n	-0.001"	4.8, 4.9	20, 21	5.0, 5.1	22, 23	Boundaries shift to smaller R's
h_f	+0.001"	5.4, 5.5	29, 30	5.2, 5.3	28, 29	Boundaries shift to greater R's
b	2.95"	5.0, 5.1	25, 26	5.0, 5.1	25, 26	Near-boundary shifts to smaller R's
	3.05"	5.2, 5.3	26, 27	5.2, 5.3	26, 27	Boundaries shift to greater R's

TABLE 6.21

RECEIVER 3					
	f = 2.25"		f = 4.5"		REMARKS
	Boundary Near	Boundary Far	Boundary Near	Boundary Far	
Standard	14.7, 14.8	51, 52	14.5, 14.6	51, 52	
δ 9 mrad	15.2, 15.3	55, 56	15.1, 15.2	55, 56	Boundaries shift to greater R's; near-boundary steeper, far-boundary less steep
δ 11 mrad	14.1, 14.2	47, 48	14.0, 14.1	47, 48	Boundaries shift to smaller R's, boundaries steeper
σ_3 0.25 mrad	14.7, 14.8	51, 52	14.5, 14.6	51, 52	Steeper boundaries
σ_3 1.0 mrad	14.7, 14.8	51, 52	14.5, 14.6	51, 52	Less steep boundaries
σ_1 0.25 mrad	14.7, 14.8	51, 52	14.5, 14.6	51, 52	Steeper boundaries
σ_1 1.0 mrad	14.8, 14.9	51, 52	14.5, 14.6	51, 52	Less steep boundaries
P -0.001"	14.6, 14.7	51, 52	14.5, 14.6	51, 52	Near-boundary less steep, far-boundary steeper; bojndaries shift to smaller R's
P +0.001"	14.8, 14.9	52, 53	14.5, 14.6	51, 52	Near-boundary steeper, far-boundary less steep; boundaries shift to greater R's
h_n -0.001"	14.3, 14.4	49, 50	14.3, 14.4	50, 51	Near-boundary less steep, far-boundary steeper; boundaries shift to smaller R's
h_f +0.001"	15.1, 15.2	54, 55	14.7, 14.8	53, 54	Near-boundary steeper, far-boundary less steep; boundaries shift to greater R's
b 5.95"	14.5, 14.6	51, 52	14.3, 14.4	51, 52	Near-boundary less steep, far-boundary steeper near-boundary shifts to smaller R's
b 6.05"	14.9, 15.0	52, 53	14.7, 14.8	52, 53	Boundaries somewhat steeper, boundaries shift to greater R's

TABLE 6.22

The greatest influence on the location of the bin boundaries have been changes of the transmitter declination angle δ and the location of the bikini (or field stop). At the time of assembly of the AOMDI, great care must be taken in aligning transmitters and receivers to keep errors in δ and receiver elevation angles small.

The shapes of the far-boundary functions, particularly that of receiver 3, indicate a considerable influence of the image size and, therefore, of the width of the irradiated band on the target. This width should be made as small as possible for steep boundaries and sharp cut-off.

Section VII
PREVENTING FALSE INDICATIONS

There are three major sources from which unwanted radiation is received by the AOMDI: the sun irradiated surface of the earth, sun irradiated clouds and the sun itself. At any time the surface of the earth will fill the field of view of several receivers. The geometry of the encounter can be such that the target appears in the field of view of receivers which look at the earth. The system must be capable of operating to specifications under this condition and the optical system parameters required for proper performance were determined in Section IV, "Radiometric Considerations".

Sun irradiated clouds are many times brighter than the sun irradiated surface of the earth. The degrading influence of clouds as background on the S/N ratio can be seen from Tables 4.6 and 4.7, Section IV, which show computer runs for which the background equivalent spectral radiance is assumed to equal 32.0 and 51.5 $w/m^2/sr/\mu m$ respectively. These values are obtained from equation (4.26), Section IV, which takes into consideration the reduction of the active detector area by the bikini.

The innermost, or first, receiver whose far-range is only 10 feet, produces a S/N ratio far in excess of the required 6.54:1 (See Section III, Performance Requirements), even with an aperture area of only 0.25 cm^2.

The middle, or second, receiver whose far range is 25 feet requires an aperture area of 0.5 cm^2 to exceed 6.54:1.

The outermost, or third, receiver does not meet the requirement for a S/N ratio of 6.54:1. Increasing the aperture area to 6 cm^2 or increasing the transmitter peak power to 18W would make it possible to meet the S/N ratio requirement when bright clouds are in the field of view. Things become worse when the sun itself gets into the field of view of a quadrant. The S/N ratios obtained under such conditions are shown in Tables 4.8 and 4.9 which represent the results of a slightly modified computer run using an equivalent spectral irradiance of 111 and 180 $W/m^2/\mu m$, respectively. In this case only the innermost receiver is performing well above the limit. The S/N ratios of the two other receivers are well below the minimum. Under these conditions, false indications are certain.

High level background radiation with its attendant high noise level can be dealt with in two ways. The condition of high noise and the receiver in which it occurs can be reported, leaving the affected receiver operative, or the occurrence of a high background radiation level is reported and the affected receiver is inhibited. The former method can only be employed if separate telemetry channels for all receivers are provided since in any other case when receivers of different quadrants share a channel, a signal could not be distinguished from noise. As the number of telemetry channels is limited and certain receivers must share common channels, inhibiting becomes a necessity.

Before any action preventing false indications can be taken, the high noise level, or the high level of received background power must be detected. Depending on the scheme chosen, this can be done by monitoring the DC current through the detector, by monitoring the noise level and by monitoring the threshold crossings during periods when no signal is expected (pre-look periods).

Using threshold crossings during a "pre-look" to prevent false indications is a rather conservative method. It is used on fuzes where misfirings rather than false indications must be avoided. As threshold crossings due to noise take place, even at normal noise levels, false inhibiting with loss of information can occur. Also, if a high noise level develops during the look period which follows the pre-look period, any noise threshold crossing will be interpreted as a signal, as no way of distinguishing between noise and signal threshold crossings exists.

Automatic gain control (AGC) in connection with monitoring the noise level or the DC current through the detector is another way of avoiding false indications. The gain or the threshold level is varied in such a manner that the threshold-to-RMS-noise ratio at the input of the threshold circuit is kept constant, or nearly constant, which means that the sensitivity of the system to a constant signal will vary depending on noise level. A low noise level would result in increased sensitivity and, as the bin boundary function depends on sensitivity, the boundaries would become functions of the noise level.

The last scheme of preventing false indications to be discussed employs monitoring and reporting the DC level of the detector current. An alternative would be monitoring the RMS noise level. However, the circuits required for this approach would be more complex than those for the former. When a preset DC detector current level is exceeded the logic circuits following the threshold circuit of the affected receiver are inhibited and the occurrence of inhibiting is reported. It should be noted that the noise current (or voltage) increases only with the square root of the detector current which itself is proportional to the received background power. The detector DC-current, therefore, changes more strongly than the noise it causes. This reasoning makes monitoring the detector DC current the superior choice, also when AGC is employed.

Of the three methods of preventing false indications described above, the third offers the best solution. It does not affect the system sensitivity as AGC would and it is insensitive to noise as it monitors the detector current which generates the noise rather than the noise itself. The DC current caused by background radiation is much greater than the noise peaks so that false inhibiting becomes rather unlikely.

It can be seen from Tables 4.6 through 4.9 that the 3 receivers are affected by background radiation in different ways. The innermost, or first, receiver remains operating properly even under the most severe conditions of direct sun-light falling on its aperture. It, therefore, needs no inhibiting or noise level reporting circuits.

The middle, or second, receiver can only tolerate a background of bright clouds and must be inhibited whenever this radiation level is exceeded. Between the detector current observed when the receiver field of view is filled with bright clouds and the higher detector current caused by the sun, there is no other current level that could be attributed to a third source. Therefore, whenever the detector DC current rises above that attributable to sunlit clouds it must be caused by the sun entering the field of view. Inhibiting then, should occur when the detector current reaches a value 1.5 times that of the cloud caused current. The factor 1.5 is high enough to prevent unwanted inhibiting by noise and low enough to ensure inhibiting when the sun enters the field of view.

Table 4.7 shows that the outermost, or third, receiver can not tolerate the cloud generated noise. Its inhibiting level must be set somewhat above the current caused by the surface of the earth as a background. The best value for this is that at which the S/N drops to 6.54:1, the lowest permissible value for a given false indication rate and probability of detection. This, of course, assumes that with the normal background of the sunlit earth the S/N ratio is higher than the minimum.

Section VIII
ELECTRONIC REQUIREMENTS

The electronic circuits must generate the driving current for the laser diode, detect, amplify and compare to a threshold the target reflected signal, provide the logic functions to discriminate against noise, produce a signal format which interfaces easily with the telemeter, and provide all the internal voltages by converting the voltage of the available power supply to the appropriate internal voltage levels. The IR radiation source is a linear array of GaAs laser diode chips housed in one package. The junctions of the laser diode are connected in series so that they can be operated at the same current level as a single junction. As the radiometric considerations, Section IV, show the IR pulses should be as long as possible to keep the system bandwidth narrow. Also, the peak power should be maximized as the S/N ratio is directly proportional to this parameter. The limits on pulse width and peak power are imposed by the thermal behavior of the laser diode. Self-heating of the laser diode limits the duty cycle for a given peak power. Excessive driving demanded by high peak power must be avoided to prevent irreversible damage to the junction.

The current pulses which drive the laser diodes have amplitudes of up to 40A and a duration of only 100 to 150ns. Pulses of such short duration demand circuits of minimum lead inductance. Also, the lead resistance must be kept low to keep the voltage drop from the source to the laser diode small, thereby keeping power losses low. Experience has shown that fast switching SCR's are best suited for this kind of circuit. Special care must be given to the layout of the circuit boards to keep leads short and low in inductance. Ground planes should be provided on all boards for shielding and the circuits must be housed RF-tight to prevent pickup of synchronous noise by the receivers.

The receiver geometry requires an IR detector of fairly large area, of high sensitivity in the spectral range of the laser diode emission and of low inherent noise. The Si PIN photo diode fulfills these requirements and, in addition, is rugged and easy to handle. As it has a large active area, it also has a high self capacitance. This capacitance can be kept low by operating the photo diode at a high reverse bias voltage. About -80V are sufficient to keep the capacitance of a diode of the size used in receiver 3 to about 20pf.

The preamplifier to which the photo diode is connected must provide sufficient gain to allow further signal amplification by a video amplifier and must not contribute significantly to the total system noise while still providing the minimum bandwidth for the signal pulse. A transimpedance amplifier fulfills these requirements quite well. With a laser pulse width equal to 150ns, a bandwidth of 3MHz is required for optimum performance. Assuming a realistic value of 0.5pf for the self-shunting capacitance of the feedback resistor, its value is calculated as 60KΩ. The value actually used should be lower, about 30KΩ, to make sure that it does not limit the bandwidth and a filter is used to establish a controlled bandwidth less dependent on component tolerances. This approach entails an increase of system noise above the theoretical minimum, but as under the worst conditions all three receivers are background limited, this increase is not significant. Preamplifier and video amplifier must provide enough gain to bring the smallest significant signal up to 1.65 times the threshold level. A practical value for the threshold is 1V. With a feedback resistor of the preamplifier equal to 30KΩ, the gain of the video amplifier is calculated as follows:
The minimum received power P_5 is obtained from equation (4.5)

$$P_5 = \frac{P_1 . T_1 . T_2 . \rho . L \; A_r}{R_1^{3} \; \phi\pi}$$

The photo current i_s becomes

$i_s = P_5 S$ and the output voltage of the preamplifier

$v_s = i_s . R_F$.

This voltage is calculated for receivers 1, 2 and 3 as 5.2mV, 0.66mV and 0.66mV respectively. The video amplifier of receiver 1 must provide a gain of about 300V/V, while the corresponding value for receivers 2 and 3 is 2,500V/V.

The detection logic must produce an output signal for any two input pulses it receives in sequence from the output of the threshold circuit (2-out-of-2 logic). The signal pulses arrive at the input of the detection logic delayed with respect to the clock-pulse. This delay is caused by propagation delays in the circuits and in space where the signal travels to the target and back. As these delays are known for all three receivers, the input of the detection logic is enabled only during that period of time during which a return signal is expected. This time period is called a look-gate and helps to reduce the false alarm rate of the system which would be much greater if the input of the detection logic were continuously enabled. The duration of the look-gate t_L is calculated as follows:

$$t_L = \frac{2}{c} (R_F - R_N) + \tau$$

where c is the velocity of light,
R_F is the far range,
R_N is the near range, and;
τ is the laser pulse width.

The value of t_L for receivers 1, 2 and 3 are 170ns, 190ns and 220ns respectively. Note that for receiver 1 R_N was assumed to be 0 as signals of a target in the near field must not be blocked. The beginning of the look-gate is delayed with respect to the clock depending on the propagation delay the signal suffers in the circuits and, in the case of receivers 2 and 3 only, on the time it takes the signal to travel to the target at near-range and back.

The logic circuit can be easily implemented with TTL integrated circuits which provide signal levels which readily interface with any telemetry system.

In addition to operational functions of the AOMDI, means of checking the readiness of the system should be provided. The status of the system and, if malfunctions occur, diagnostic information can be sent over the same telemetry channels which are used during the operational phase of the AOMDI. Reflectors can be mounted on the shrouds so that the radiant signals from the transmitters are received by all receivers. A failure of a receiver would be recognized by the absence of a signal on its channel. A failure of a receiver would be recognized by the absence of a signal on its channel. A failure of a transmitter would result in no signal from the quadrant in which the failure occurred. Upon detecting a failure, a sequence of tests can be initiated to diagnose the failure. Such tests can be checks of the voltage at certain points and the currents through the laser diodes.

Section IX
PARAMETRIC ANALYSIS

The S/N ratio is the most significant system performance parameter. For satisfactory performance the S/N ratio must exceed the minimum value established in Section III "Performance Requirements". A great number of parameters influence the S/N ratio. Equation (4.25) is used for studying this influence.

$$(4.25): \quad S/N = \frac{i_s}{i_n} = \frac{P_1 T_1 T_2 \; L A_r \rho}{\pi R^3{}_1 \cdot \phi \cdot \sqrt{2qB(SP_6 + I_{co}) + i^2{}_a}}$$

P_6, the background originating power appearing in the denominator of the above expression is obtained from equation (4.21).

$$(4.21): \quad P_6 = N_{(\lambda)} \Delta\lambda T_2 A_r \sin\gamma / 2(\psi - \cos 2\varepsilon \cdot \sin\psi)$$

Equation (4.25) shows that the S/N ratio depends strongest on the range, or distance, R_1. In each of the 3 receivers the S/N ratio must exceed the minimum required value when the target is located at a distance equal to the specified far-range. As the far-ranges of the receivers cannot be varied they will be considered as constants in the following analysis.

The transmitter fan angle ϕ appears in the denominator of expression (4.25). The receiver fan angle γ also appears in the denominator of (4.25), but under the root in the expression for P_6. As transmitter and receiver fans must be matched, the angles ϕ and γ must be equal. The effect of a change of ϕ is, then, enhanced by the concurrent change of γ. It appears that a small fan angle is desirable. However, since the AOMDI must cover a solid angle of $4\pi sr$ which is achieved with the aid of several quadrants, reducing the fan angle would require more quadrants for the same coverage. Nine quadrants with a fan angle of 90° were chosen as the best compromise which gives a good approximation to the desired $4\pi sr$ coverage while costs and size are kept reasonable.

The minimum target length L is specified and cannot be changed. Also specified is the target reflectivity ρ. Although ρ cannot be changed it should be noted that a considerable improvement of the S/N ratio could be obtained by increasing ρ. The specified value of 0.2 is very low and it could conceivably be increased to 0.8 by painting the target white. The system could then tolerate a much brighter background and operate more reliably.

The optical transmittances T_1 and T_2 of the transmitter and the receiver respectively can be varied very little. Their value is about 0.8 and results from the emission pattern of the laser diode in the case of T_1 and from the reflection losses at the glass-detector interface in the case of T_2. Any increase of these values would require expensive optical systems which would not justify the small possible gain. On the other hand, reducing the transmittances would result neither in significant savings nor in any tradeoff with other parameters.

Expression (4.25) shows that the S/N ratio increases with increasing laser peak power P_1 and receiver aperture A_r, and with decreasing optical filter bandwidth Δλ and elevation field angle ϕ. The latter two parameters appear in the expression for P_g under the square root, while A_r appears in the numerator and under the square root making S/N approximately proportional to A_r for background dominated noise which occurs in the outermost receiver. These parameters could be traded off for one another, but the radiometric calculations show that to meet the performance requirements their values must be chosen equal to the best presently available if the dimensions of the outermost receiver are to remain reasonable.

At the present time laser diodes suited for the intended operation at 10KHz pulse repetition rate are limited to 16W peak output power. Assuming this power, the narrowest possible optical bandwidth equal to 0.03μm and an elevation field of 1.34° (for the outermost receiver), a S/N ratio of 9.1 can be obtained (See Table 4.2) with an aperture area equal to 4 cm^2 when the receiver is looking at the earth.

A larger aperture area would ease the power requirement but it leads to a greater focal length and, consequently, receiver size. Similar, reducing the elevation field would allow to decrease P_1 or A_r. There are, however, certain limitations on such measures as will be discussed later.

The aperture area of the receiver element is rectangular and a decision as to its shape must be made. As discussed in Section V "Optical Considerations" and VI, "Bin Boundary Function", the ratio of height to width can be chosen within a wide range. The two smaller, or inner, receivers can be shaped in such a manner that the detector area is minimized. The detector area $A_d = w.h$, where w is the width of the reciver element and h is the distance from the axis of the image of a target at near-range (when at far-range, the target is imaged on the axis).

As $h \approx f.\frac{\tan \psi}{n}$ (9.1)

where n is the index of reflection of the receiver element and the elevation field,

$$A_d = w\, f\, \frac{\tan \psi}{n} \quad . \qquad (9.2)$$

The smaller w, the smaller becomes A_d. The limit on w is given by the condition that

$$y_{max} \leq \frac{f}{2} \qquad (9.3)$$

as discussed in Section V, "Optical Considerations".

Because $A_r = w\, y_{max} = \frac{wf}{2}$, (9.4)

$$w = \frac{2A_r}{f} \quad . \qquad (9.5)$$

Then, $A_d = 2A_r \frac{\tan \psi}{n}$. (9.6)

This is the smallest detctor area A_d that can be obtained with the ratio $\frac{y_{max}}{f}$ equal to 0.5.

Note that A_d does not depend on f, but solely on A_r and ψ. The focal length f can then be chosen for small size. The only restriction is that f must not be made so small that the ratio of detector width to height becomes extreme. Then, control over the shape of the bikini mask cannot be maintained.

If the width is reduced the number of total reflections the incident rays experience increases. This causes higher optical losses and, due to imperfections of the reflecting planes, a deterioration of image quality with its attendant softening of the bin boundary function.

The ratio $\frac{y_{max}}{f}$ also influences the bin boundary function. Reducing this ratio (increasing f) improves the bin boundary function, making it sharper. The dependence, however, is not very strong (see Section VI).

As mentioned before, there exist tradeoffs involving the elevation field angle ψ, the laser power P_1 and the aperture area A_r. As ψ appears under the square root of the denominator of expression (4.25), decreasing it would allow to decrease either P_1 or A_v. The price that must be paid for such a tradeoff is loss of accuracy of the bin boundaries. For, as the elevation field is decreased while the bin boundaries remain the same, the transmitter declination angle and the baseline must also be decreased. This reduces the angles at which the elevation field limits intersect with the transmitter beam. The bin boundaries, then, become less well defined and maintaining the alignment of the receivers with respect to the transmitters becomes more critical. From equation (2.1) it can be seen that the baseline b decreases with the declination angle δ. The shortest baseline permitted by the dimensions of the transmitters and receivers imposes a lower limit on the declination angle. A small declination angle makes the system more sensitive to angular misalignment. 10mrad is considered the recommendable minimum. This value was used in all the calculations involving the declination angle and lead to satisfactory results.

Section X

EXTRACTING MISS-DISTANCE

The AOMDI employs 9 quadrants to provide 4π steradian coverage. During the encounter of the target and the vehicle carrying the AOMDI, one or more quadrants may be pierced by the target. Each quadrant measures the distance to the target in its plane which is not necessarily the closest distance of the encounter. When more than one quadrant is pierced by the target, and the sequence in which this occurs is known, the uncertainty about the miss-distance is reduced. The information obtained from any one quadrant is a distance interval only. No information about the angular position of the target in a quadrant is provided. This implies that no exact trajectorial information can be obtained.

One quadrant can distinguish 5 intervals of distance. These intervals are called bins and have the following nominal boundaries.

Bin 1 2 to 5 ft.
Bin 2 5 to 10 ft.
Bin 3 10 to 15 ft.
Bin 4 15 to 25 ft.
Bin 5 25 to 50 ft.

The presence of a target in a specific bin is indicated as follows:

Bin 1 . . . . only receiver 1 produces an output signal
Bin 2 . . . . receivers 1 and 2 produce output signals
Bin 3 . . . . only receiver 2 produces an output signal
Bin 4 . . . . receivers 2 and 3 produce output signals
Bin 5 . . . . only receiver 3 produces an output signal

In addition to these 5 theoretical bins a sixth bin exists in praxis. This bin can be recognized by outputs from all three receivers. It ranges from 0 ft. to about 2 to 3 ft. and is caused by side lobes of the receivers and multiple and reflections between target and the vehicle. The possibility of only 2 receivers producing an output when the target is in the near field (within 2 to 3 ft.) introduces some uncertainty, for if only receiver 1 and 2 are on, the target distance is interpreted as being in bin 2. Similar, when in the near field closer than 2 ft. and only receivers 2 and 3 produce output signals, the target appears to be in bin 4. If receivers 1 and 3 produce output signals, no ambiguity exists, for there is no bin for which only receivers 1 and 3 produce an output signal simultaneously.

The uncertainty in indicated distance when the target is in the near field is alleviated by signals from other quadrants which are procuced due to the size of the target.

To avoid the most critical situation in which only receivers 2 and 3 are on, care must be taken in the design of the receiver optics so that receiver 1 is always on before receiver 3. This can be accomplished by shaping the receiver sidelobes carefully.

The output signals of the receivers are applied to logic circuits as described in Section II, whose outputs in turn are applied to the telemetry system.

The actual bin boundaries deviate from the nominal ones. They are best described by functions of distance as discussed in Section VI. The shapes of these functions depend not only on the geometrical configuration of transmitter beam and receiver fields of view but on signal strength as well. It is the ratio of signal to threshold as a function of distance which strongly influences the bin boundary functions.

In order to make quantitive statements about the accuracy of the indicated miss-distance, the boundaries are defined in terms of probability of detection. Let a boundary be defined as the distance at which the probability of detection drops to 90%. This probability is obtained as the product of two probabilities as the target at a boundary must be seen by two receivers. An exception is the near-boundary of the first bin and the far-boundary of the fifth bin in which cases only one receiver is involved.

Tables 10.1 and 10.2 show the boundaries of the individual receivers 1, 2 and 3 as they depend on the S/N ratio. Let the boundaries be defined as the distance intervals in which the probability of detecting a target drops to 90%. Table 10.2, which shows the distances at which the probability of detection drops to 25% was added because when compared with Table 10.1 it gives an indication of the steepness of the boundary function. The

P_d = 90%

	Receiver 1		Receiver 2		Receiver 3	
	Boundary		Boundary		Boundary	
S/N	near	far	near	far	near	far
6.54	2.3, 2.4	10, 11	5.3, 5.4	24, 25	15.4, 15.5	48, 49
13.08	2.0, 2.1	11, 12	5.0, 5.1	26, 27	14.3, 14.4	53, 54
26.16	1.9, 2.0	12, 13	4.8, 4.9	28, 29	13.8, 13.9	56, 57

Table 10.1

$P_d = 25\%$

	Receiver 1		Receiver 2		Receiver 3	
	Boundary		Boundary		Boundary	
S/N	near	far	near	far	near	far
6.54	2.1, 2.2	10, 11	5.1, 5.2	25, 26	14.7, 14.8	51, 52
13.08	2.0, 2.1	11, 12	4.9, 5.0	27, 28	14.0, 14.1	55, 56
26.16	1.9, 2.0	12, 13	4.8, 4.9	28, 29	13.6, 12.7	58, 59

Table 10.2

tables were assembled using computer runs shown in Tables 6.4 through 6.6, 6.10 through 6.12 and Appendix F. The same tables were used in assembling Tables 10.3 and 10.4 which show the dependence of the boundaries of the 5 bins on the S/N ratio.

As expected, the boundaries of the individual receivers move outward with increasing S/N ratio. The boundaries for P_d = 90% move more strongly than those for P_d = 25%. This means that the boundary functions become steeper with increasing signal strength. As a consequence, the relative shift of the boundaries decreases with increasing signal strength, a desirable feature. The boundaries of the 5 bins behave similar to those of the receivers with one exception, bin 3. The size of bin 3 shrinks with increasing S/N ratio as the far-boundary of receiver 1 moves towards greater distance, while the near boundary of receiver 3 moves in the opposite direction. From an original size of about 5 ft., bin 3 shrinks to about 1 ft. when the S/N ratio is quadrupled.

The consequences of the boundary shift with increasing S/N ratio are that a target will be indicated as being farther away from the receivers when it is near the near-boundaries of bins 1, 2, and 4, and as being nearer when it is near the far-boundaries of bins 2, 4, and 5. As the actual near-boundary of bin 1 equals 0 ft. its shift with signal strength is zero. The other boundary shifts mean an increase of uncertainty of the actual target distance. The nominal uncertainty of a bin equals its nominal size which is 5 ft. for bin 1, 2 and 3, 10 ft. for bin 4 and 25 ft. for bin 5. Table 10.3 shows that for 90% probability of detection the bin sizes approximate the nominal ones. When the S/N ratio is four times the minimum and equal to 26.16, the bin sizes and, therefore, the uncertainty of the target distance becomes 7.5 ft. for bin 2 and 14.5 ft. for bin 4. The uncertainty of the target distance in bin 2 changes little and actually diminishes slightly due to the boundary shift of receiver 2. The uncertainty in bin 5 increases to 28 ft. and both boundaries shift towards greater distances making a target appear closer than it really is. The uncertainty in bin 3 diminishes to about 1 ft. This seemingly odd behavior is explained by the boundary shifts of receivers 1 and 3. These boundaries form the boundaries of bin 3 and as they move towards each other (compare Table 10.1), bin 3 shrinks.

P_d = 90%

S/N	Bin 1		Bin 2		Bin 3		Bin 4		Bin 5	
	Boundary		Boundary		Boundary		Boundary		Boundary	
	Near	Far	Near	Far	Near	Far	Near	Far	Near	Far
6.54	2.3, 2.4	5.3, 5.4	5.3, 5.4	10, 11	10, 11	15.4, 15.5	15.4, 15.5	24, 25	24, 25	48, 49
13.08	2.0, 2.1	5.0, 5.1	5.0, 5.1	11, 12	11, 12	14.3, 14.4	14.3, 14.4	26, 27	26, 27	53, 54
26.16	1.9, 2.0	4.8, 4.9	4.8, 4.9	12, 13	12, 13	13.8, 13.9	13.8, 13.9	28, 29	28, 29	56, 57

Table 10.3

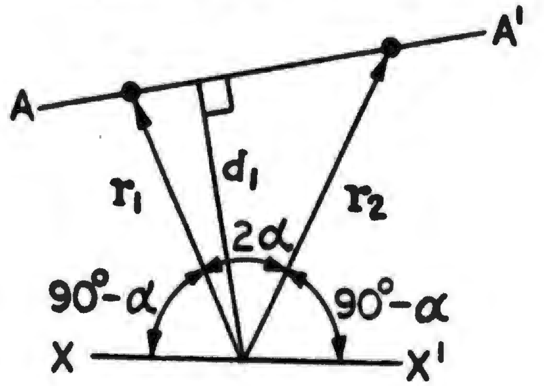
$P_d = 25\%$

	Bin 1		Bin 2		Bin 3		Bin 4		Bin 5	
	Boundary		Boundary		Boundary		Boundary		Boundary	
S/N	Near	Far	Near	Far	Near	Far	Near	Far	Near	Far
6.54	2.1, 2.2	5.1, 5.2	5.1, 5.2	10, 11	10, 11	14.7, 14.8	14.7, 14.8	25, 26	25, 26	51, 52
13.08	2.0, 2.1	4.9, 5.0	4.9, 5.0	11, 12	11, 12	14.0, 14.1	14.0, 14.1	27, 28	27, 28	55, 56
26.16	1.9, 2.0	4.8, 4.9	4.8, 4.9	12, 13	12, 13	13.6, 13.7	13.6, 13.7	28, 29	28, 29	58, 59

Table 1G.4

When more than one quadrant is pierced by the target, then the miss-distance cannot be obtained directly and must be calculated from the indication of the two quadrants. Also, when two quadrants are pierced by the target, only the shortest distance between the trajectories of the target and the vehicle carrying the AOMDI can be obtained. To calculate the actual miss-distance, more information as velocities and the angular position of the target intersection with the quadrant plane are required. In this case, the actual miss-distance is always smaller than, or equal to, the miss-distance indicated by the quadrant which is pierced first. Figure 10.1 shows the 6 basic orientations of the relative target trajectory. From them the extremes of the distances d_1 at the closest approach of the trajectories is obtained as follows:

1. Trajectory A A'



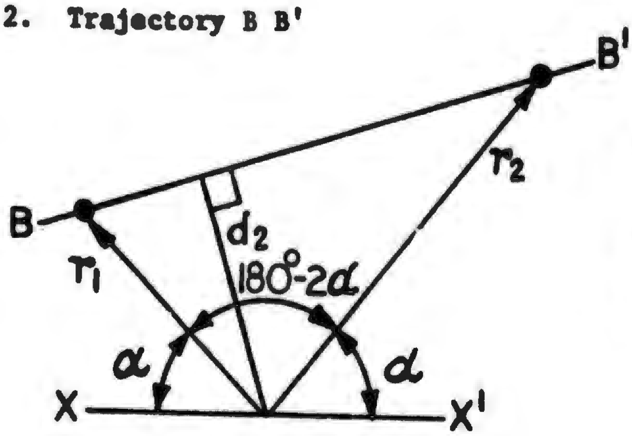
$\alpha = 35.4°$

$$d_1 = \frac{r_1 r_2 \sin 2\alpha}{\sqrt{r_1^2 + r_2^2 - 2 r_1 r_2 \cos 2\alpha}} \quad (10.1)$$

if $r_1 = r_2$

$$d_1 = r\cos\alpha = r \times 0.816 \quad (10.2)$$

2. Trajectory B B'

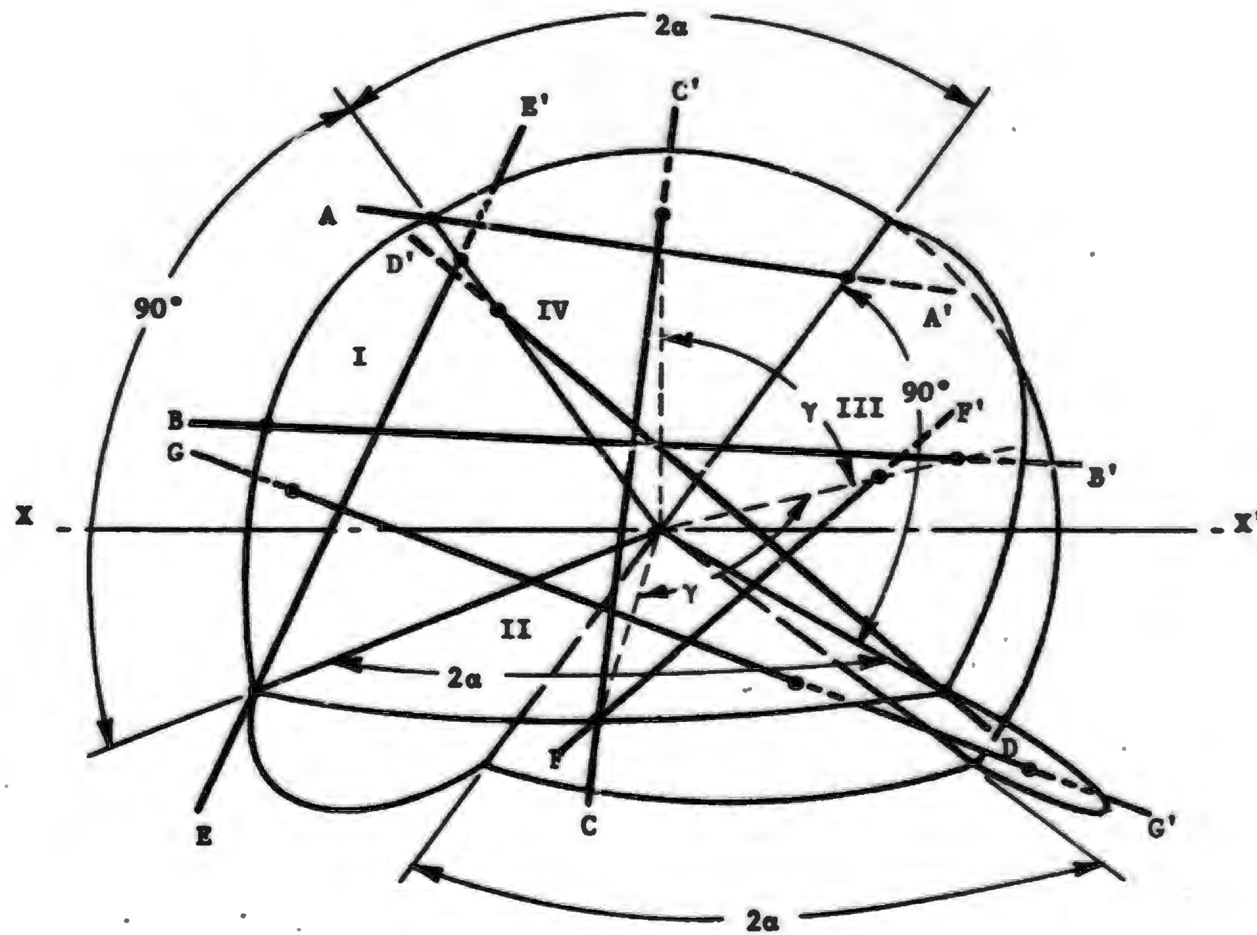


$\alpha = 35.4°$

$$d_2 = \frac{r_1 r_2 \sin 2\alpha}{\sqrt{r_1^2 + r_2^2 + 2 r_1 r_2 \cos 2\alpha}} \quad (10.3)$$

if $r_1 = r_2$

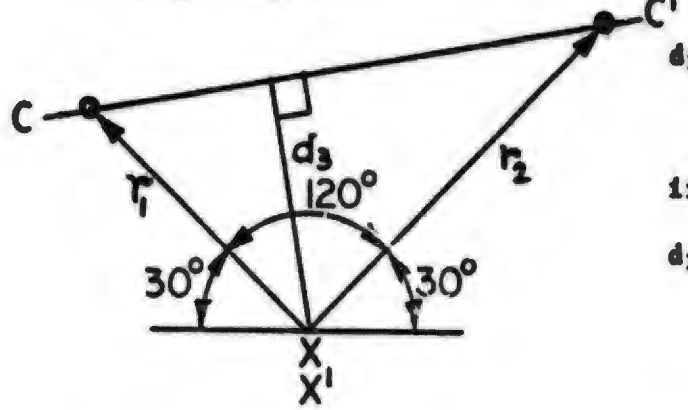
$$d_2 = r\sin\alpha = r \times 0.577 \quad (10.4)$$



Angle between planes II and IV is 120°

FIGURE 10.1

3. Trajectory C C'

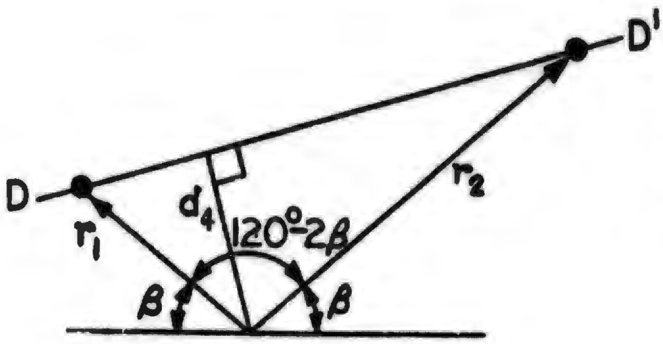


$$d_3 = \frac{r_1 r_2 \sin 120°}{\sqrt{r_1^2 + r_2^2 - 2 r_1 r_2 \cos 120°}} \qquad (10.5)$$

if $r_1 = r_2$.

$$d_3 = r\cos 60° = r \times 0.5 \qquad (10.6)$$

4. Trajectory D D'



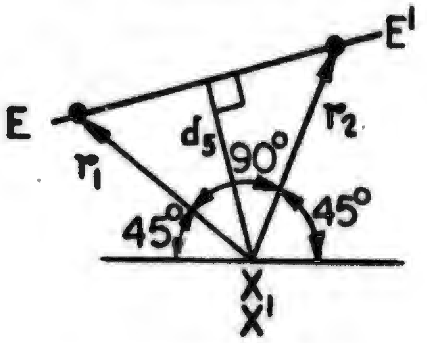
$$d_4 = \frac{r_1 r_2 \sin 2\beta}{\sqrt{r_1^2 + r_2^2 + 2 r_1 r_2 \cos 2\beta}} \qquad (10.7)$$

$\sin\beta = \cos 45°.\sin\alpha$

if $r_1 = r_2$ $\alpha = 354°$

$$d_4 = r\cos 45°.\sin\alpha = r \times 0.408 \qquad (10.8)$$

5. Trajectory E E'

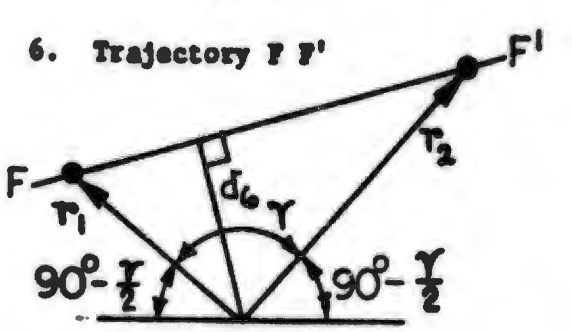


$$d_5 = \frac{r_1 r_2}{\sqrt{r_1^2 + r_2^2}} \qquad (10.9)$$

if $r_1 = r_2$

$$d_5 = \frac{r}{\sqrt{2}} = r \times 0.707 \qquad (10.10)$$

6. Trajectory F F'



$$d_6 \quad \frac{r_1 r_2 \sin\gamma}{\sqrt{r_1^2 + r_2^2 - 2 r_1 r_2 \cos\gamma}} \qquad (10.11)$$

$\cos\gamma = \sin 30° \sin\alpha$

if $r_1 = r_2$

$$d_6 = r.\cos\frac{\gamma}{2} = r\sqrt{\frac{\cos\gamma + 1}{2}} = 4 \times 0.803 \qquad (10.12)$$

Examining the trajectories, it is found that the statements made about trajectories intersecting quadrants I, III and IV also apply to the other quadrants. The distance between the trajectories is obtained in the same manner. As no angular information about a target intersection is provided by a quadrant only a distance interval rather than a specific distance is obtained. This distance interval is defined by the possible extremes of distance. In the case of a target piercing quadrants IV and III (see Figure 10.1) the longest possible distance is obtained from expression (10.1), while the shortest possible distance is obtained from expression (10.7), Similar, when quadrants I and III are pierced, longest and shortest possible distances are obtained from expressions (10.3) and (10.7) respectively. All the other trajectories result in the intermediate ranges of distance as can be seen by inspecting expressions (10.1) through (10.12). The expressions for the distances become much simpler when in both affected quadrants the same bin and, therefore, the same distance interval is indicated. This is expressed in the above equations by making $r_1 = r_2$.

It must be noted that in addition to the uncertainty due to lack of angular information, the uncertainty due to the finite size of the bins must be considered when the extremes of the possible distances between target and the vehicle carrying the AOMDI are calculated.

From Figure 10.1 can be seen that when a target intersects a quadrant near or at its edge where it intersects with the two adjacent quadrants a signal might be obtained in all three quadrants. This is caused by the size of the target and does not adversely affect the distance measurement.

Another case of piecing more than 2 quadrants is shown in Figure 10.1 where trajectory G G' pieces quadrants I, II and V. In this case, the distance is obtained by using the indications of either of the two pairs of adjacent quadrants.

When the target pierces only three adjacent quadrants and no others, the distance equals that indicated by each of the three quadrants.

The above discussion is based on the assumption that the centers of all quadrants coincide. This, however, is never the case, but considering the magnitude of uncertainty in measuring the miss-distance, no significant error is introduced as long as the physical separation of the vertices of the quadrants remains within 1 to 2 feet.

The sequence in which quadrants are pierced can be used as a rough indication of direction. But this is only possible if the telemetry system provides sufficient resolution in time. To provide an indication of direction as well as of distance, the telemetry system employed must provide 13 channels. (9 quadrant signals, 3 receiver signals and 1 inhibit signal.) Only two levels must be transmitted by each channel and the tolerances on the propagation delays of the individual channel must be such that a time difference of 33 μs must be resolved.

Section XI

THE IMPACT OF FAILURES

In the following the impace of failures of a part of the AOMDI system of 9 quadrants is discussed. The major failures are:

1. Failure of one or more quadrants.
2. Failure of one or two transmitters.
3. Failure of one or two receivers of a quadrant.
4. Failure of the inhibit circuit.

To these failures which result in a total loss of information from the affected part, partial failure modes must be added, as a decrease in transmitter power, a decrease in receiver sensitivity and a malfunctioning of the 2-out-of-2 logic.

If one or more quadrants fail a loss of angular coverage will occur. If the target pierces the inoperative quadrant only, it might pass undetected. However, if the miss-distance is small, the target (because of its size) will produce indications in other quadrants. If the target passes through two quadrants and one of them has failed, the indicated distance will be too great.

A failure of one of the three transmitters will double the minimum time required for an indication as two signal pulses in sequence and in synchronism with the clock must be received by the 2-out-of-2 logic to produce an output signal. If two transmitters fail, no output signal will be produced by the logic and the quadrant is lost.

The effect of the failure of one receiver of one quadrant on the obtainable distance information depends on which receiver has failed. If receiver 1 fails and the target is in bin 1 it is either not detected, or, if closer than 2 ft., at which distance the sidelobes of receivers pick up a signal, it is interpreted as being in bin 3, 4 or 5. However, if a target comes that close to the vehicle carrying the AOMDI, its size will generate signals in the receivers 1 of other quadrants thus reducing the chances of a wrong indication.

If the target is in bin 2 and receiver 1 fails, only receiver 2 will produce a signal and the target will be indicated as being in bin 3 which is farther than the actual target position.

A failure of receiver 2 will create a gap between bins 1 and 5 because bins 2, 3 and 4 all require a signal from receiver 2 for proper identification. A target in bin 2 will be interpreted as in bin 1, while a target in bin 4 seems to be in bin 5.

If receiver 5 fails, a target in bin 4 is indicated as too near, that is, in bin 3 (only receiver 2 has an output), while a target at a distance of more than 25 ft. cannot be acquired.

If the inhibit circuit fails and excessive noise is present, a false indication in bin 4 (receivers 2 and 3 have an output) will be produced. As the S/N ratio of receiver one is so high that even when the sun enters its field of view no false indications are expected, a failure of the inhibiting circuit will not affect bin 1.

The event of all three receivers of a quadrant producing an output signal simultaneously can always be safely interpreted as a target picked up in bin 1.

A decrease in IR power or in receiver sensitivity will reduce the probability of detecting a target at any distance. The bin boundaries will become less steep and the size of bins 2, 4 and 5 will shrink. Bin 1 will increase in size as its far boundary which is also the near boundary of receiver 2, moves towards greater distances. Bin 3 will grow as both its boundaries recede from the center.

A failure of the 2-out-of-2 logic can occur in two modes. Either no output is produced at all which amounts to a loss of all information from the affected receiver, or an output is produced for every input pulse rather than one output for 2 input signals in sequence. This condition can be recognized by the greatly increased false alarm rate which will jump from a maximum of 3.7×10^{-4} per sec. to 4.2 per sec.

As no complete AOMDI system has been built and tested, no reliability information on it is available. However, systems as the AIM-9L fuze operating on the same principle have been tested and the test results are available.

As the reliability data obtained by these tests is classified, it was put under separate cover into an addendum to the final report.

Section XII
TESTS TO BE PERFORMED

The tests to be performed on the AOMDI should be aimed at obtaining information about its sensitivity pattern (bin boundary functions). As all the quadrants of the AOMDI are of the same design, it suffices to test one quadrant only to establish the validity of the design concept. The test results should be compared to the computed predictions and, if necessary, corrections should be made to the theory on which the computer programs are based. In this manner, the usefulness of the computer programs as design tools is greatly enhanced.

Before meaningful measurements of the sensitivity pattern can be made, the system noise level must be measured and its sources must be identified. The noise contributors are the shot noise accompanying the DC current of the photodiode, the Johnson noise of the feedback resistor and the noise generated by the input transistor of the preamplifier. The measurements should be taken at the output of the video amplifier to include the effect of filtering. It should be noted that the $\frac{1}{f}$ noise of the preamplifier is effectively eliminated by capacitive coupling of the amplifiers. The coupling time constants are chosen such that the cut-on frequency of the band is a tenth (300KHz) of the cut-off frequency. The noise contribution of the preamplifier plus feedback resistor can be measured by simulating the capacitance of the photodiode at the input of the preamplifier. The noise factor NF of the preamplifier is then obtained from;

$$NF = \left(\frac{i_a}{i_j}\right)^2 \qquad (12.1)$$

where i_a is the total preamplifier noise current referred to the input without the photodiode and i_j is the Johnson noise current of the feedback resistor. This noise current is calculated by (4.10):

$$i_j = \sqrt{4kTB/R_F}$$

The RMS noise current contribution i_d of the photodiode is then obtained from

$$i_d = \sqrt{i_t^2 - i_a^2} \qquad (12.2)$$

where i_t is the total noise current referred to the input of the preamplifier with the photodiode in the circuit. i_d should be close to the theoretical RMS shot noise calculated using (4.12):

$$i_d = \sqrt{2qBI_{DC}}$$

where I_{DC} is the DC current of the photodiode which can be its dark current or the current caused by the radiant background. Before beginning measurements of the sensitivity pattern, the radiant background encountered in operation must be simulated. As it is extremely difficult to make absolute measurements on IR radiation sources, particularly when the spectral range of interest is narrow, an indirect method of simulating a radiant background is suggested. This method takes advantage of the narrow optical band in which the laser diode emits. The actual peak power can be measured by placing a calibrated photo tube, or other large area detector, in front of the transmitter aperture so that all emitted energy is collected. Next, a target of known size and reflectivity is placed at half the far range of the receiver under test. The power impinging on the receiver aperture is obtained from equations (4.1), (4.4) and (4.5) as

$$P_4 = \frac{P_2 \, \rho \, LA_F}{R_F^3 \phi \pi}$$

where P_4 is the power on the aperture,

P_2 is the peak power measured at the transmitter aperture,

ϕ is the transmitter fan angle $= \frac{\pi}{2}$, and

R_F is the far-range of the receiver.

Using R_F instead of $\frac{R_F}{2}$ in the above equation allows for the effect of the bikini mask of the receiver under test. The amplified signal V_s produced by P_4 at the output of the video amplifier is measured and related to the photo current i_s flowing through the photodiode as follows:

$$i_s = \frac{V_s}{G\ R_F} \qquad (12.3)$$

where G is the gain of the video amplifier and R_F is the feedback resistor of the preamplifier. The overall sensitivity S' of the receiver becomes

$$S' = \frac{V_s}{G\ R_F P_4} \qquad (12.4)$$

It should be noted that this sensitivity strictly applies to a narrow spectral range about 0.9μm only. The optical bandwidth of the receiver is thereby assumed to be known. The receiver is now calibrated and can be used to measure background received power. A light source irradiating the receiver aperture from the side as shown in Figure 12.1 is adjusted so that the DC photo current I_B is calculated as follows: From (4.21) the power received by the active area of the photodiode

$$P_6 = \frac{A_B}{A_T} \cdot N_{(\lambda)} . \Delta\lambda . T_2 . A_r \sin \frac{\gamma}{2} (\psi - \cos 2\varepsilon . \sin\psi)$$

Referred to the aperture this becomes

$$P_6' = \frac{P_6}{T_2} \qquad (12.5)$$

and with S' obtained from (12.4), the current through the photodiode i_B becomes

$$i_B = P_6' S'. \qquad (12.6)$$

It remains to calculate the equivalent spectral radiance $N_{(\lambda)} \cdot \frac{A_B}{A_T}$ for the cases of the sun irradiated earth and clouds as background. These

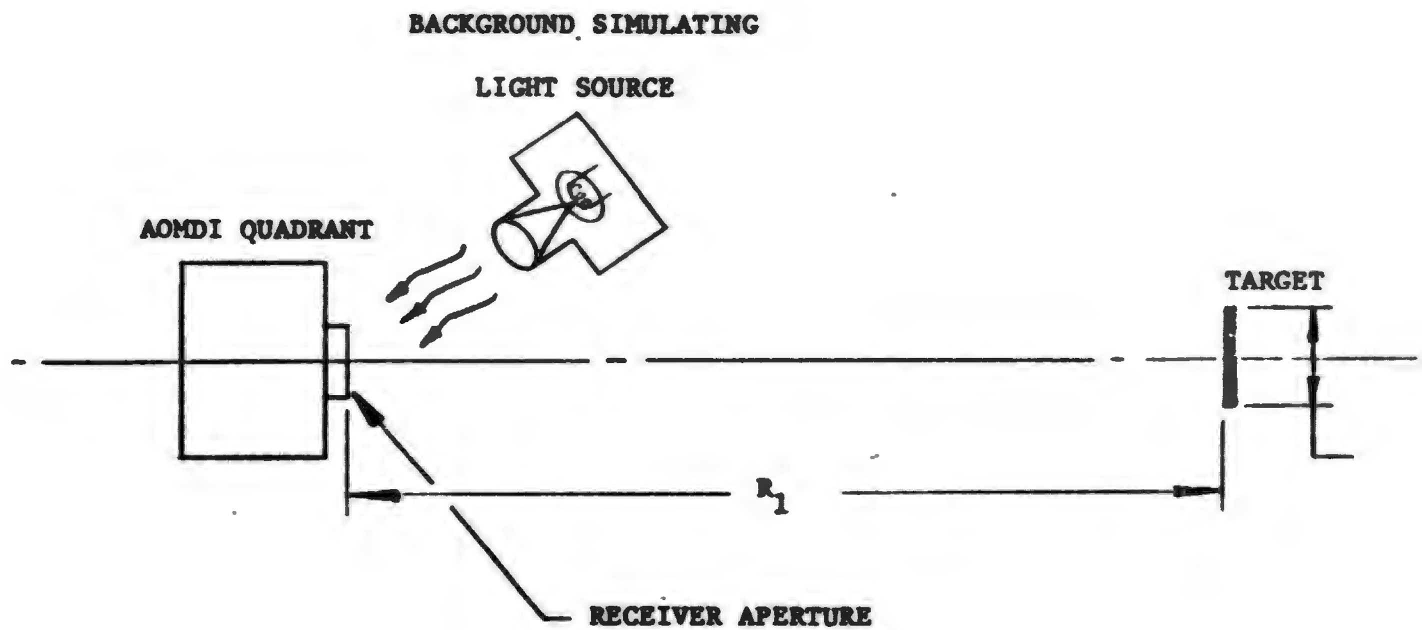

BACKGROUND SIMULATING
LIGHT SOURCE
AOMDI QUADRANT
TARGET
R_1
RECEIVER APERTURE

FIGURE 12.1

values are obtained from equations (4.26) and (5.16), using $M_{(\lambda)} = 450 w/cm^2/\mu m/sr$ and $\rho = 0.35$ for the earth as background, and $925 w/m^2/\mu m/sr$ and $\rho = 0.9$ for sunlit clouds.

When the sun is shining directly on the aperture of the receiver, the received power P_6' becomes

$$P_6' = M_{(\lambda)} \Delta\lambda A_r \qquad (12.7)$$

$M_{(\lambda)}$ is again equal to $925 W/cm^2/\mu m/sr$
The current i_B can be obtained from the voltage drop across one of the resistors in the photodiode bias current.

With the background caused photo current established, the threshold-to-noise ratio can be adjusted. This is done by adjusting the gain of the video amplifier and leaving the threshold voltage unchanged. The threshold-to-noise-is then calculated by dividing the RMS noise voltage into the threshold voltage. Another way of obtaining the threshold-to-noise ratio is measuring the false indication rate at the output of the 2-out-of-2 detection logic which must equal the specified value. The threshold-to-noise ratio is then calculated with the aid of equations (3.7) and (3.9):

$$\frac{I_t}{I_n} = \sqrt{-2\ln(\sqrt{3}\tau\phi)}$$

with $$\phi = \frac{-\ln\left(1-\sqrt[n]{\frac{FIR}{f_R}}\right)}{t_1}$$

where τ is the laser pulse width,
t_1 is the look gate,
f_R is the pulse repetition rate, and
$\overline{FIR}$ is the measured false indication rate.

With their thresholds adjusted, the receivers are ready for measuring their sensitivity pattern.

First, the sensitivity along the center of the fan should be measured. Again, the sensitivity can be obtained either directly by measuring the probability of detection at the output of the 2-out-of-2 detection logic as the ratio of pulses detected to pulses transmitted. The sensitivity, or boundary, function thus obtained can be plotted or tabulated as a function of range R_1.

The measurements as described above should be repeated for several roll angles.

Special attention should be paid to the near-field behavior of the receivers. (Under "near-field" is understood the distance interval from 0 to the near-range R_N of the receiver under test.) For these measurements a very narrow target should be used, just wide enough to accommodate the full thickness of the transmitter beam. The measurements can be conducted in the same way as before, plotting either relative sensitivity or probability of detection as functions of range.

The test results, in particular the sensitivity, on boundary function, should be compared to the theoretical ones of Section VI and the necessary corrections to the theoretical model should be made.

Section XIII
PHYSICAL CONFIGURATION

The final configuration of the AOMDI will depend on its application. Therefore, no exact statement about its size and weight can be made. Instead, only an estimate of the weight of one packaged quadrant can be made and the minimum space requirements of such a quadrant can be specified.

The weight of one quadrant is estimated to be between 8 and 10 pounds when the following conditions are met:

1. Three AIM-9L transmitters are used.
2. The receiver apertures are $0.25cm^2$, $0.5cm^2$ and $4.0cm^2$.
3. The focal length of the receivers are optimized, making the focal length of receiver 3 equal to 1.5in.
4. The electronic circuits are located as close to the optical elements as possible.
5. The baselines of the three receivers are 1.2in., 3.0in. and 6.0in., respectively.

Under the same conditions as stated above, the space requirement of one quadrant of the AOMDI is shown in Figure 13.1.

The package of one quadrant will be standardized and adaptors will be used to mount these packages in different locations on the carrier vehicle. In this manner an adaptive and flexible AOMDI system is obtained at minimum cost.

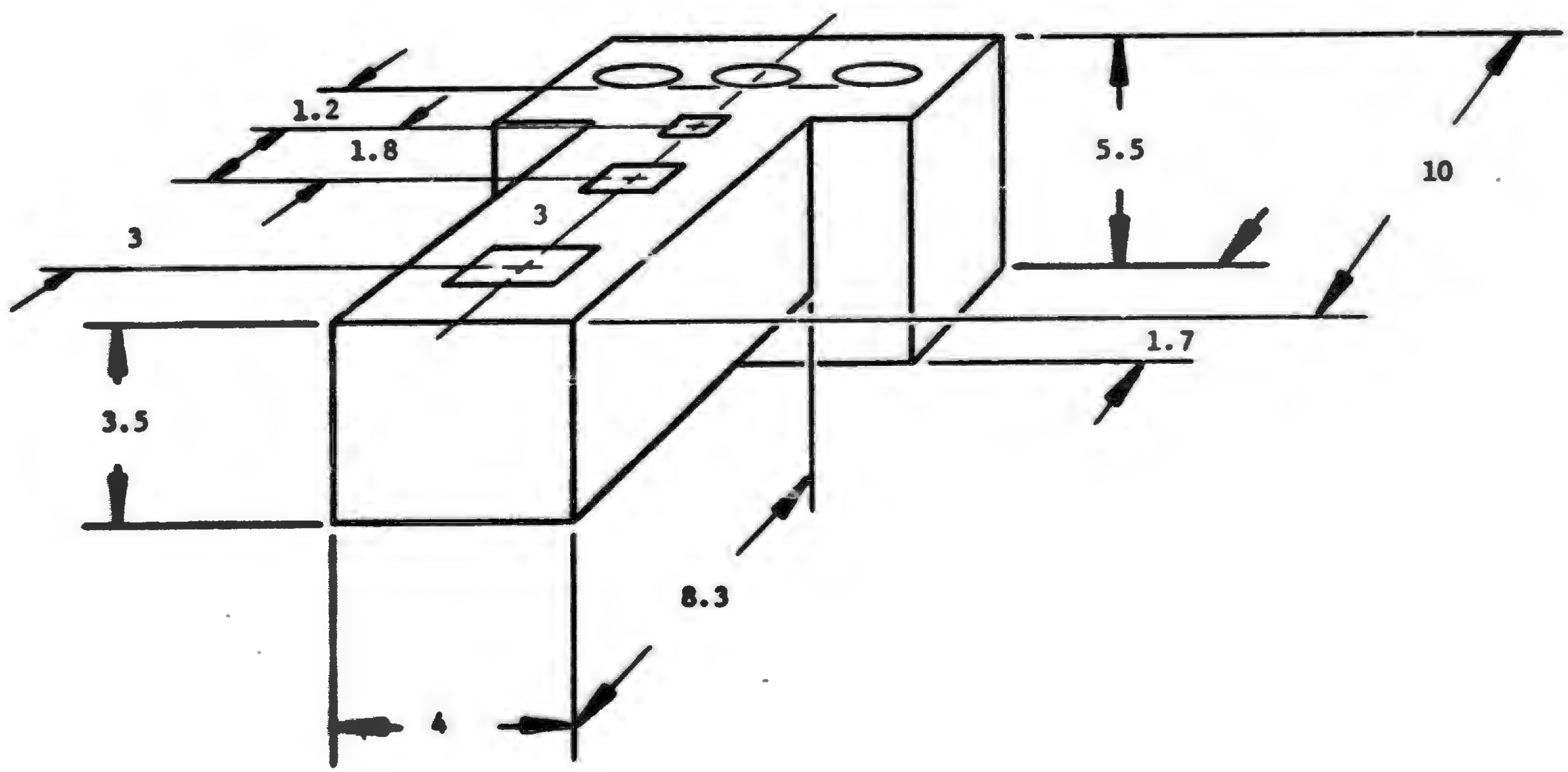


FIGURE 13.1

Section XIV
CONCLUSIONS AND RECOMMENDATIONS

The study shows that an AOMDI can be successfully implemented using currently available components and materials. This conclusion was reached with the aid of radiometric calculation and mathematical modeling of the sensitivity functions of the transmitter-receiver combinations which form the individual quadrants. It could be shown that the innermost receiver can tolerate the sun in its field of view and still keep operating properly. Receiver 2 can tolerate a background of sunlit clouds. With the same background, the S/N ratio of receiver 3 falls somewhat short of the required minimum. However, an increase in laser output power by about 13% is sufficient to bring the S/N ratio to the required minimum.

As it is desirable for greater probability of detection and sharper definition of the bin boundaries to increase the S/N ratio well beyond the minimum, all parameters should be optimized toward such an increase. The study shows that most parameters do not strongly influence the S/N ratio. The one parameter which does strongly influence the AOMDI performance is the laser output power. It is in this area where improvements should be made.

A novel optical design for the receiver optics was studied. This design is simple and has only three surfaces requiring small tolerances. The mathematical model of the sensitivity, or boundary, functions developed during the study was based on this design. However, with small modification, other more conventional optical systems can be studied using this model. While the quantitative validity of the model must still be verified by measurements on the lab model of one quadrant, qualitative conclusion can be drawn from the results obtained from computer programs based on the theoretical model. The influence of the receiver focal length and aperture shape could be studied to the advantage of future designs.

Using the knowledge and insight gained by the study and by the tests on the lab model, the next step in developing an operational AOMDI system should be taken with the goal of building a complete flight evaluation model.

In pursuing this goal efforts should be spent in the following areas:

1. Development of a more powerful IR radiation source, most likely a cryogenically cooled and fiber-optically coupled array of GaAs laser diodes.
2. Finalizing the optical designs of transmitters and receivers. The transmitter design will be greatly influenced by the configuration of the future IR source.
3. Increasing the far-range of the AOMDI by adding a 6th bin. This will be accomplished by increasing the laser power and, possible, by using range gating for this outermost bin.
4. Interfacing of the AOMDI with the telemetry system.
5. Packaging the system in modular form so that it can readily be adapted to the vehicle by which it will be carried. Small size will be stressed.
6. Testing the system performance under conditions which simulate its operational environment.
7. Final flight testing and evaluation.

APPENDIX A

```
0037    1     21 JAN 73

// JOB     1101 1002
  0000         1001          1002          0000
  0001         1002          1002          0001

V2 M01   ACTUAL 16K  CONFIG 16K

// FOR
       *EXTENDED PRECISION

C-ERRS...STMT.C......  F O R T R A N   S O U R C E   S T A T E M E N T S  ........

       C  S/N AS A FUNCTION OF PD, FIR, FR, TAU, TLOOK AND N
       C
            ETA(PD)=(-2*ALOG(PD))**.5
            GINV(PD)=ETA(PD)-(2.515517+.802853*ETA(PD)+.010328*(ETA(PD))**2)/(
           11+1.432788*ETA(PD)+.189269*(ETA(PD))**2+.001308*(ETA(PD))**3)
         25 FORMAT (E14.7)
            READ (2,25) FIR
            READ (2,25) FR
            READ (2,25) TAU
            READ (2,25) TL
          5 FORMAT ('1 S/N AS FUNCTION OF PD, FIR, FR, TAU, TLOOK AND N'/)
            WRITE (3,5)
         10 FORMAT (' FIR=',T7,E6.2,T16,'1/S',T21,'FR =',T26,F7.0,T34,'HZ'/ '
           1TAU=',T10,F5.0,T16,'MS',T21,'TL =',T28,F5.0,T34,'MS'/)
            WRITE (3,10) FIR,FR,TAU,TL
         15 FORMAT ('    N',T11,'PD',T19,'TH/N',T29,'S/N'/)
            WRITE (3,15)
        100 CONTINUE
       C
       C INSERT THE READ STATEMENT OF THE VARIED PARAMETER HERE
            READ (2,25) PD
       C
            IF(PD.EQ.0.) GO TO 200
            DO 200 N=1,6
            PHI=ALOG(1.-(FIR/FR)**(1./N))/(-TL)*1.E3
            THN=(-2*ALOG(2*3**.5*TAU*1.E-3*PHI))**.5
            SN=THN+GINV(1-(PD)**(1./N))
            IF(PD**(1./N).LT..5) SN=THN-GINV(PD**(1./N))
         20 FORMAT (I4,3X,F6.4,2X,F7.3,2X,F7.3)
            WRITE (3,20) N,PD,THN,SN
        200 CONTINUE
            IF(PD.NE.0.) GO TO 100
            CALL EXIT
            END
 VARIABLE ALLOCATIONS
    FIR(R )=01FE          FR(R )=0201          TAU(R )=0204          TL(R )=0207
    THN(R )=0210          SN(R )=0213            N(I )=0274

 STATEMENT ALLOCATIONS
    ETA=0258    GINV=0270      25=02FF         5=02C3        10=02DD        15=0205        20=031

 FEATURES SUPPORTED
  TRANSFER TRACE
  ASSIGNMENT TRACE
  ONE WORD INTEGERS
```

APPENDIX B

```
// FOR
C
C  FAN BEAM FUZE, GENERAL PROGRAM
C
      REAL LT(20),IA(20),IAV,IPIN,N,NF
      INTEGER H,OUT(20),PRINT(20),SWCH
C
      DIMENSION U(20,20),R1(20),V(20),P1(20),DL(20),T1(20),T2(20),T(20),
     1SN(20),AR(20),          RHO(20),EPS(20),PSI(20),GAM(20),PHI(20),
     2J(20),BW(20),R(20),P1AV(20),P1PIN(20),P5AV(20),P5PIN(20),P6(20), X
     3(20),SNAV(20),SNPIN(20),ESNA(20),PSNP(20),                PNAME(6,20),
     4ANAME(6,8),BNAME(6,7),CONST(6,20),QNAME(6,8),RNAME(6,2),UP(20)
C
      EQUIVALENCE (U(1,1),R1(1)),(U(1,2),V(1)),(U(1,3),P1(1)),(U(1,4),DL
     1(1)),(U(1,5),T1(1)),(U(1,6),T2(1)),(U(1,7),T(1)),(U(1,8),SN(1)),(U
     2(1,9),AR(1)),(U(1,10),LT(1)),(U(1,11),RHO(1)),(U(1,12),EPS(1)),(U(
     31,13),PSI(1)),(U(1,14),GAM(1)),(U(1,15),PHI(1))
      EQUIVALENCE (J(1),J1),(J(2),J2),(J(3),J3),(J(4),J4),(J(5),J5),(J(6
     1),J6),(J(7),J7),(J(8),J8),(J(9),J9),(J(10),J10),(J(11),J11),(J(12)
     2,J12),(J(13),J13),(J(14),J14),(J(15),J15),
     3(PNAME(1,1),ANAME(1,1)),(PNAME(1,9),BNAME(1,1))
C
      EQUIVALENCE (N,UP(2)),                    (TEMP,UP(3)),(C,UP(4)),(NF,UP(5
     1)),(S1,UP(6)),(S2,UP(7)),                   (S,UP(9)),
     2(CONST(1,1),QNAME(1,1)),(CONST(1,9),RNAME(1,1))
C
      DATA QNAME/6*'    ','SKY','RAD.','IN W','/SQM','/MIC','.M =',
     1                       'AMB.','TEMP','.IN','DEG.','C,TE','MP =',
     2'PPEA','MP.C','AP.I','N PF','.C =','    ','PREA','MP.N','OISE',' FIG'
     3,'.NF',' =','AV.D','C RE','SP.I','N A/','W,S1',' =','AV.A','C RE'
     4,'SP.I','N A/','W,S2',' =','AV.D','ARK','CUR.','IN N','A,IA','V ='
     5/
      DATA RNAME/'PIN','RESP','.IN','A/W.','S =','    ','PIN','DARK',' CUR'
     1,'.IN','NA,I','.PIN='/
C
      DATA ANAME/'RANG','E IN',' FT.','R1 =','    ','    ','VISI','BILI','T
     1Y I','N MI','. V','=','LASE','R PE','AK P','WR T','N K.','P1 =','O
     2PT.','F.BW','. IN',' MIC','RON.','DL =','XMIT','T.TR','ANSM','IT.
     3','T1 =','    ','RECE','IV.T','RANS','MIT.','.T2','=','LASE','R P.','
     4WIDT','H IN',' NS.','T =','S/N','RATI','O.SN',' =','    ','    '/
      DATA BNAME/'REC.','AP.A','REA','IN S','QCM.','AP =','TARG','.L.I',
     1'N BE','AM I','N M.','LT =','TARG','ET R','EFL.','.RHO',' =','    ','
     2REC.','BEAM',' ELE','V..D','EG.E','PS =','REC.','ELEV',' FIE','LD.
     3D','EG.P','SI =','REC.','FAN','SPRE','AD.D','EG.G','AM =','TRM.','
     4FAN','SPRE','AD.D','EG P','HI ='/
C
  699 FORMAT(5(F14.7,2X))
C  BACKGROUND CONST.
      DATA N/20./
C
C  TEMP.,CAPACITANCE,NOISE FIGURE
      DATA TEMP,C,NF/300.,2.,2./
C
C  DIODE SPECS
      DATA S1,S2,IAV,S,IPIN/.4,.145,.5E-9,.5,2.0E-6/
C
C  READ PROGRAM NAME, TYPE OF OUTPUT AND VARIED PARAMETERS
```

```
      READ(2,500)
  500 FORMAT(72H1
     1                                                                       )
      READ (2,600) SWCH
  600 FORMAT (20I3)
      READ(2,600)K1,K2,K3
C
C  READ NUMBERS OF OUTPUT PARAMETERS
      READ(2,600)OUT
C
C  READ DATA CARDS
      DO 5 I=1,15
      READ(2,700) JM, (U(K,I),K=1,JM)
    5 J(I)=JM
  700 FORMAT(I4,12X,4(E14.7,2X))
C
      UP(8)=IAV*1.E 09
      UP(10)=IPIN*1.E 09
C
C  WRITE PROGRAM NAME
      WRITE(3,500)
   99 FORMAT( )
      WRITE(3,101)
  101 FORMAT(/)
C
C  WRITE ALL NOT VARIED PARAMETERS
      DO 40 I=2,8,2
   40 WRITE(3,750)(CONST(K,I),K=1,6),UP(I),(CONST(K,I+1),K=1,6),UP(I+1)
      WRITE (3,750) (CONST(K,10),K=1,6),UP(10)
  750 FORMAT(2(1X,6A4,1X,F9.3,3X))
      WRITE (3,99)
C
      IZ=1
      DO 20 I=1,15
      IF(I-SWCH)9,20,9
    9 IF(I-K1)10,20,10
   10 IF(I-K2)11,20,11
   11 IF(I-K3)12,20,12
   12 IF(IZ-1)14,13,14
   13 WRITE(3,800)(PNAME(K,I),K=1,6),U(1,I)
      IZ=2
      GO TO 20
   14 WRITE(3,850)(PNAME(K,I),K=1,6),U(1,I)
      IZ=1
   20 CONTINUE
  800 FORMAT (1X,6A4,8(1X,F9.3,2X))
  850 FORMAT('+',T40,6A4,1XF9.3)
      WRITE (3,101)
      LIM1=J(K1)
      LIM2=J(K2)
      LIM3=J(K3)
C
C  SET  PRINT  TO SELECTED OUTPUT PARAMETERS
      KI=0
      DO 22 I=1,15
      KI=KI+1
      IF(I-OUT(KI)) 3, 2, 4
```

```
    2 PRINT(I)=I
      GO TO 22
    3 KI=KI-1
    4 PRINT(I)=0
   22 CONTINUE
C
C  WRITE FIRST VARIED PARAMETER
      WRITE(3,800)(PNAME(K,K1),K=1,6),(U(I,K1),I=1,LIM1)
C
C  WRITE SECOND VARIED PARAMETER
      DO 30 IC=1,LIM2
      WRITE(3, 99)
      WRITE(3,800)(PNAME(K,K2),K=1,6),U(IC,K2)
      J(K2)=IC
      DO 30 ID=1,LIM3
      J(K3)=ID
      DO 25 H=1,LIM1
      J(K1)=H
C
C  CALCULATIONS
      BW(H)=9./(2.*T(J7)*1.E-02)
      B=BW(H)*3.14159E 06*.5
      R(H)=T(J7)/(C*3.14159)
      SQIA=4.*1.38E-23*NF*TEMP*B/(R(H)*1.E 03)
      AT=EXP(-2.65*.304800*R1(J1)/(V(J2)*1609.35))
      P6(H)=N*DL(J4)*T2(J6)*AR(J9)*SIN(GAM(J14)*.01745)*(PSI(J13)*.01745
     1-COS(2.*.01745*EPS(J12))*SIN(PSI(J13)*.01745))*1.E-04
      IA(H)=SQRT(SQIA)
      X(H)=(SQIA/(1.6E-19*B*(S1*P6(H)+IAV)))**(1./3.)
      BSNA(H)=S1*P6(H)/(IAV+SQIA/(2.*B*X(H)*1.6E-19))
      BSNP(H)=S*P6(H)/(IPIN+SQIA/(2.*B*1.6E-19))
      IF(3-SWCH)62,60,62
   60 P5AV(H)=SQRT(3.)*IA(H)*SN(J8)/(S2*X(H))
      P1AV(H)=(R1(J1)*.3048)**3.*PHI(J15)*.01745*3.14159*P5AV(H)/(T1(J5)
     1*T2(J6)*RHO(J11)*LT(J10)*AR(J9)*1.E-04*(AT)**2.)
      P5PIN(H)=SN(J8)/S*SQRT(2.*1.6E-19*B*(S*P6(H)+IPIN)+SQIA)
      P1PIN(H)=P1AV(H)*P5PIN(H)/P5AV(H)
      GO TO 25
   62 P5AV(H)=P1(J3)*T1(J5)*T2(J6)*RHO(J11)*LT(J10)*AR(J9)*1.E-04*(AT)**
     12./((R1(J1)*.3048)**3.*PHI(J15)*.01745*3.14159)
      P5PIN(H)=P5AV(H)
      SNAV(H)=(P5AV(H)*S2*X(H))/(IA(H)*SQRT(3.))
      SNPIN(H)=(P5PIN(H)*S)/(SQRT(2.*B*1.6E-19*(S*P6(H)+IPIN)+SQIA))
   25 CONTINUE
C
C  WRITE THIRD VARIED PARAMETER
      WRITE(3, 99)
      WRITE(3,800)(PNAME(I,K3),I=1,6),U(ID,K3)
      WRITE(3, 99)
C
C  WRITE RESULTS
      IF(PRINT(1)-1)305,200,305
  200 WRITE(3,100)(BW(I),I=1,LIM1)
  100 FORMAT(' ELECTR.BW IN MHZ,BW =',T26,8(1X,E10.3,1X))
  305 IF(PRINT(2)-2)310,205,310
  205 WRITE(3,105)(R(I),I=1,LIM1)
  105 FORMAT(' FEEDBACK R.IN KOHM,R =',T26,8(1X,E10.3,1X))
```

```
310 IF(PRINT(3)-3)315,210,315
210 WRITE(3,110)(P1AV(I),I=1,LIM1)
110 FORMAT(' XMIT.PWR IN W,P1AV =',T26,8(1X,E10.3,1X))
315 IF(PRINT(4)-4)320,215,320
215 WRITE(3,115)(P1PIN(I),I=1,LIM1)
115 FORMAT(' XMIT.PWR IN W,P1PIN =',T26,8(1X,E10.3,1X))
320 IF(PRINT(5)-5)325,220,325
220 WRITE(3,120)(P5AV(I),I=1,LIM1)
120 FORMAT(' REC.PWR IN W,P5AV =',T26,8(1X,E10.3,1X))
325 IF(PRINT(6)-6)330,225,330
225 WRITE(3,125)(P5PIN(I),I=1,LIM1)
125 FORMAT(' REC.PWR IN W,P5PIN =',T26,8(1X,E10.3,1X))
330 IF(PRINT(7)-7)335,230,335
230 WRITE(3,130)(P6(I),I=1,LIM1)
130 FORMAT(' BCKGND.PWR IN W,P6 =',T26,8(1X,E10.3,1X))
335 IF(PRINT(8)-8)340,235,340
235 WRITE(3,135)(IA(I),I=1,LIM1)
135 FORMAT(' AMP.NOISE CUR. IN A,IA =',T26,8(1X,E10.3,1X))
340 IF(PRINT(9)-9)345,240,345
240 WRITE(3,140)(X(I),I=1,LIM1)
140 FORMAT(' OPT.AVAL.DIODE GAIN X =',T26,8(1X,E10.3,1X))
345 IF(PRINT(10)-10)350,245,350
245 WRITE(3,145)(SNAV(I),I=1,LIM1)
145 FORMAT(' S/N.AVAL.DIODE SNAV =',T26,8(1X,E10.3,1X))
350 IF(PRINT(11)-11)355,250,355
250 WRITE(3,150)(SNPIN(I),I=1,LIM1)
150 FORMAT(' S/N,PIN DIODE SNPIN =',T26,8(1X,E10.3,1X))
355 IF(PRINT(12)-12)360,255,360
255 WRITE(3,155)(BSNA(I),I=1,LIM1)
155 FORMAT(' AV.BKGD-TO-SYST.NOISE =',T26,8(1X,E10.3,1X))
360 IF(PRINT(13)-13) 30,260, 30
260 WRITE(3,160)(BSNP(I),I=1,LIM1)
160 FORMAT(' PIN BKGD-TO-SYST.NOISE =',T26,8(1X,E10.3,1X))
 30 CONTINUE
    CALL EXIT
    END
```

1ST AND 2ND RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC,N =        6.000    ARB.TEMP.IN DEG.K,TEMP =    300.000
PREAMP.CAP.IN PF,C =            0.250    PREAMP.NOISE FIG.,NF =        2.000
AV.DC RESP.IN A/W,S1 =          0.145    AV.AC RESP.IN A/W,S2 =        0.400
AV.DARK CUR.IN NA,IAV =         0.499    PIN RESP.IN A/W,S =           0.500
PIN DARK CUR.IN NA,IPIN=     1000.000

VISIBILITY IN MI, V =         100.000    LASER PEAK PWR IN W,PJ =     16.000
XMITT.TRANSMIT.,T1 =            0.600    RECEIV.TRANSMIT.,T2 =         0.800
LASER P.WIDTH IN NS,T =       150.000    TARG.L.IN BEAM IN M,LT =      0.900
TARGET REFL.,RHO =              0.200    REC.BEAM ELEV.,DEG,EPS =     88.650
REC.ELEV FIELD,DEG,PSI =        2.290    REC.FAN SPREAD,DEG,GAM =     90.000
TRM.FAN SPREAD,DEG PHI =       90.000


REC.AP.AREA IN SQCM,AR =        0.250        0.500          1.000          2.000

OPT.F.BW. IN MICRON,DL =        0.030

RANGE IN FT,R1 =               10.000

S/N,PIN DIODE SNPIN =       0.104E 03    0.208E 03      0.384E 03      0.699E 03
PIN BKGD-TO-SYST.NOISE =    0.655E-01    0.131E 00      0.263E 00      0.527E 00

RANGE IN FT,R1 =               25.000

S/N,PIN DIODE SNPIN =       0.670E 01    0.130E 02      0.246E 02      0.447E 02
PIN BKGD-TO-SYST.NOISE =    0.655E-01    0.131E 00      0.263E 00      0.527E 00
// XEQ FPMD1
```

3RD RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC.N =      9.600    AMB.TEMP.IN DEG.D,TEMP =    300.000
PREAMP.CAP.IN PF.C =          6.250    PREAMP.NOISE FIG.,NF =        2.000
AV.DC RESP.IN A/W,S1 =        0.145    AV.AC RESP.IN A/W,S2 =        0.400
AV.DARK CUR.IN NA,IAV =       0.499    PIN RESP.IN A/W,S =           0.500
PIN DARK CUR.IN NA,IPIN=   1000.000

VISIBILITY IN MI, V =       100.000    LASER PEAK PWR IN W,P1 =     16.000
XMITT.TRANSMIT.,T1 =          0.600    RECEIV.TRANSMIT.,T2 =         0.800
LASER P.WIDTH IN NS,T =     150.000    TARG.L.IN BEAM IN M,LT =      0.900
TARGET REFL.,RHO =            0.200    REC.BEAM ELEV.,DEG,FPS =     89.330
REC.ELEV FIELD,DEG,PSI =      1.340    REC.FAN SPREAD,DEG,GAM =     90.000
TRM.FAN SPREAD,DEG PHI =     30.000


REC.AP.AREA IN SQCM,AR =      4.000        5.000       6.000       8.000

OPT.F.BW. IN MICRON,DL =      0.020

RANGE IN FT,R1 =             40.000

S/N,PIN DIODE SNPIN =     0.190E 02    0.224E 02   0.255E 02   0.311E 02
PIN BKGD-TO-SYST.NOISE =  0.100E 01    0.126E 01   0.151E 01   0.201E 01

RANGE IN FT,R1 =             50.000

S/N,PIN DIODE SNPIN =     0.976E 01    0.115E 02   0.130E 02   0.159E 02
PIN BKGD-TO-SYST.NOISE =  0.100E 01    0.126E 01   0.151E 01   0.201E 01
// XEQ FPME1
```

1ST AND 2ND RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC,N =       0.000    AMB.TEMP.IN DEG.K,TEMP =    300.000
PREAMP.CAP.IN PF,C =           1.000    PREAMP.NOISE FIG.,NF =        2.000
AV.DC RESP.IN A/W,S1 =         0.145    AV.AC RESP.IN A/W,S2 =        0.400
AV.DARK CUR.IN NA,IAV =        0.499    PIN RESP.IN A/W,S =           0.500
PIN DARK CUR.IN NA,IPIN=    1000.000

VISIBILITY IN MI, V =        100.000    LASER PEAK PWR IN W,P1 =     16.000
XMITT.TRANSMIT.,T1 =           0.800    RECEIV.TRANSMIT.,T2 =         0.800
LASER P.WIDTH IN NS,T =      150.000    TARG.L.IN BEAM IN M,LT =      0.900
TARGET REFL.,RHO =             0.200    REC.BEAM ELEV.,DEG,EPS =     38.850
REC.ELEV FIELD,DEG,PSI =       2.250    REC.FAN SPREAD,DEG,GAM =     90.000
TRM.FAN SPREAD,DEG PHI =      56.000


REC.AP.AREA IN SQCM,AR =       0.250        0.500        1.000        2.000

OPT.F.BW. IN MICRON,LL =       0.030

RANGE IN FT,R1 =              10.000

S/N,PIN DIODE SNPIN =      0.742E 02    0.146E 03    0.284E 03    0.538E 03
PIN BKGD-TO-SYST.NOISE =   0.321E-01    0.642E-01    0.128E 00    0.256E 00

RANGE IN FT,R1 =              25.000

S/N,PIN DIODE SNPIN =      0.475E 01    0.935E 01    0.181E 02    0.344E 02
PIN BKGD-TO-SYST.NOISE =   0.321E-01    0.642E-01    0.128E 00    0.256E 00
// XEQ FPMCI
```

3RD RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC.N =       9.600    AMB.TEMP.IN DEG.D.TEMP =     300.000
PREAMP.CAP.IN PF.C =           1.000    PREAMP.NOISE FIG..NF =         2.000
AV.DC RESP.IN A/W.S1 =         0.145    AV.AC RESP.IN A/W.S2 =         0.400
AV.DARK CUR.IN NA.IAV =        0.495    PIN RESP.IN A/W.S =            0.500
PIN DARK CUR.IN NA.IPIN=    1000.000

VISIBILITY IN MI. V =        100.000    LASER PEAK PWR IN W.P1 =      16.000
XMITT.TRANSMIT..T1 =           0.800    RECEIV.TRANSMIT..T2 =          0.800
LASER P.WIDTH IN NS.T =      150.000    TARG.L.IN BEAM IN M.LT =       0.900
TARGET REFL..RHO =             0.200    REC.BEAM ELEV..DEG.EPS =      89.330
REC.ELEV FIELD.DEG.PSI =       1.340    REC.FAN SPREAD.DEG.GAM =      90.000
TRM.FAN SPREAD.DEG PHI =      90.000


REC.AP.AREA IN SQCM.AR =       4.000       5.000        6.000        8.000

OPT.F.BW. IN MICRON.DL =       0.030

RANGE IN FT.R1 =              40.000

S/N.PIN DIODE SNPIN =      0.154E 02   0.185E 02   0.214E 02   0.267E 02
PIN BKGD-TO-SYST.NOISE =   0.491E 00   0.613E 00   0.736E 00   0.982E 00

RANGE IN FT.R1 =              50.000

S/N.PIN DIODE SNPIN =      0.790E 01   0.949E 01   0.109E 02   0.137E 02
PIN BKGD-TO-SYST.NOISE =   0.491E 00   0.613E 00   0.736E 00   0.982E 00
// XEQ FMM11
```

1ST AND 2ND RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC,L =        6.000    AMB.TEMP.IN DEG.K,TEMP =    300.000
PREAMP.CAP.IN PF,C =            0.500    PREAMP.NOISE FIG.,NF =        2.000
AV.DC RESP.IN A/W,S1 =          0.145    AV.AC RESP.IN A/W,S2 =        0.400
AV.DARK CUR.IN NA,IAV =         0.499    PIN RESP.IN A/W,S =           0.500
PIN DARK CUR.IN NA,IPIN=      100.000

VISIBILITY IN MI, V =         100.000    LASER PEAK PWR IN W,P1 =     16.000
XMITT.TRANSMIT.,T1 =            0.600    RECEIV.TRANSMIT.,T2 =         0.800
LASER P.WIDTH IN NS,T =       150.000    TARG.L.IN BEAM IN M,LT =      0.900
TARGET REFL.,RHO =              0.200    REC.BEAM ELEV.,DEG,EPS =     88.850
REC.ELEV FIELD,DEG,PSI =        2.290    REC.FAN SPREAD,DEG,GAM =     90.000
TRM.FAN SPREAD,DEG PHI =       90.000

REC.AP.AREA IN SQCM,AR =        0.250        0.500        1.000        2.000

OPT.F.BW. IN MICRON,DL =        0.020

RANGE IN FT,R1 =               10.000

S/N,PIN DIODE SNPIN =       0.118E 03    0.228E 03    0.425E 03    0.760E 03
PIN BKGD-TO-SYST.NOISE =    0.859E-01    0.171E 00    0.343E 00    0.687E 00

RANGE IN FT,R1 =               25.000

S/N,PIN DIODE SNPIN =       0.757E 01    0.145E 02    0.272E 02    0.486E 02
PIN BKGD-TO-SYST.NOISE =    0.859E-01    0.171E 00    0.343E 00    0.687E 00
// XEQ FMMDI

// XEQ FMMDI
```

3RD RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC,N =        9.000    AMB.TEMP.IN DEG.K,TEMP =      300.000
PREAMP.CAP.IN PF,C =            0.500    PREAMP.NOISE FIG.,NF =          2.000
AV.DC RESP.IN A/W,S1 =          0.145    AV.AC RESP.IN A/W,S2 =          0.400
AV.DARK CUR.IN NA,IAV =         0.499    PIN RESP.IN A/W,S =             0.500
PIN DARK CUR.IN NA,IPIN=      100.000

VISIBILITY IN MI, V =         100.000    LASER PEAK PWR IN W,P1 =       16.000
XMITT.TRANSMIT.,T1 =            0.600    RECEIV.TRANSMIT.,T2 =           0.800
LASER P.WIDTH IN NS,T =       150.000    TARG.L.IN BEAM IN M,LT =        0.900
TARGET REFL.,RHO =              0.200    REC.BEAM ELEV.,DEG,EPS =       89.330
REC.ELEV FIELD,DEG,PSI =        1.340    REC.FAN SPREAD,DEG,GAM =       90.000
TRM.FAN SPREAD,DEG PHI =       90.000


REC.AP.AREA IN SQCM,AR =        4.000         5.000         6.000         8.000

OPT.F.BW. IN MICRON,DL =        0.030

RANGE IN FT,R1 =               40.000

S/N,PIN DIODE SNPIN =       0.202E 02    0.237E 02    0.268E 02    0.323E 02
PIN BKGD-TO-SYST.NOISE =    0.131E 01    0.164E 01    0.197E 01    0.262E 01

RANGE IN FT,R1 =               50.000

S/N,PIN DIODE SNPIN =       0.103E 02    0.121E 02    0.137E 02    0.165E 02
PIN BKGD-TO-SYST.NOISE =    0.131E 01    0.164E 01    0.197E 01    0.262E 01
// XEQ FMMLI
```

1ST AND 2ND RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC.N =      6.000     AMB.TEMP.IN DEG.K,TEMP =    300.000
PREAMP.CAP.IN PF,C =          0.500     PREAMP.NOISE FIG.,NF =        2.000
AV.DC RESP.IN A/W,S1 =        0.145     AV.AC RESP.IN A/W,S2 =        0.400
AV.DARK CUR.IN NA,IAV =       0.499     PIN RESP.IN A/W,S =           0.500
PIN DARK CUR.IN PA,IPIN=   2000.000

VISIBILITY IN MI, V =       100.000     LASER PEAK PWR IN W,PJ =     16.000
XMITT.TRANSMIT.,T1 =          0.800     RECEIV.TRANSMIT.,T2 =         0.800
LASER P.WIDTH IN NS,T =     150.000     TARG.L.IN BEAM IN M,LT =      0.900
TARGET REFL.,RHO =            0.200     REC.BEAM ELEV.,DEG,EPS =     88.850
REC.ELEV FIELD,DEG,PSI =      2.290     REC.FAN SPREAD,DEG,GAM =     90.000
TRM.FAN SPREAD,DEG PHI =     90.000


REC.AP.AREA IN SQCM,AR =      0.250        0.500         1.000         2.000

OPT.F.BW. IN MICRON,DL =      0.030

RANGE IN FT,R1 =             10.000

S/N,PIN DIODE SNPIN =      0.752E 02    0.146E 03    0.287E 03     0.544E 03
PIN BKGD-TO-SYST.NOISE =   0.329E-01    0.659E-01    0.131E 00     0.263E 00

RANGE IN FT,R1 =             25.000

S/N,PIN DIODE SNPIN =      0.461E 01    0.947E 01    0.183E 02     0.348E 02
PIN BKGD-TO-SYST.NOISE =   0.329E-01    0.659E-01    0.131E 00     0.263E 00
```

3RD RECEIVER, EARTH AS BACKGROUND

```
SKY RAD.IN W/SQM/MIC.N =      9.800    AMB.TEMP.IN DEG.D,TEMP =    300.000
PREAMP.CAP.IN PF.C =          0.500    PREAMP.NOISE FIG.,NF =        2.000
AV.DC RESP.IN A/W,S1 =        0.145    AV.AC RESP.IN A/W,S2 =        0.400
AV.DARK CUR.IN NA,IAV =       0.499    PIN RESP.IN A/W,S =           0.500
PIN DARK CUR.IN NA,IPIN=   2000.000

VISIBILITY IN MI, V =       100.000    LASER PEAK PWR IN W,P1 =     16.000
XMITT.TRANSMIT.,T1 =          0.?00    RECEIV.TRANSMIT.,T2 =         0.?00
LASER P.WIDTH IN NS,T =     150.000    TARG.L.IN BEAM IN M,LT =      0.500
TARGET REFL.,RHO =            0.200    REC.PEAK ELEV.,DEG,EPS =     89.330
REC.ELEV FIELD,DEG,PSI =      1.340    REC.FAN SPREAD,DEG,GAM =     90.000
TRM.FAN SPREAD,DEG PHI =     90.000

REC.AP.AREA IN SQCM,AR =      4.000       5.000       6.000       8.000

OPT.F.BW. IN MICRON,LL =      0.030

RANGE IN FT,R1 =             40.000

S/N,PIN DIODE SNPIN =     0.155E 02   0.187E 02   0.216E 02   0.269E 02
PIN BKGR-TO-SYST.NOISE =  0.504E 00   0.630E 00   0.756E 00   0.100E 01

RANGE IN FT,R1 =             50.000

S/N,PIN DIODE SNPIN =     0.797E 01   0.957E 01   0.1?0E 02   0.138E 02
PIN BKGR-TO-SYST.NOISE =  0.504E 00   0.630E 00   0.756E 00   0.100E 01
// XEQ FRMD1
```

```
1ST AND 2ND RECEIVER, EARTH AS BACKGROUND

SKY RAD.IN W/SQM/MIC,R =      0.000    AMB.TEMP.IN DEG.K,TEMP =     300.000
PREAMP.CAP.IN PF,C =          0.250    PREAMP.NOISE FIG.,NF =         2.000
AV.DC RESP.IN A/W,S1 =        0.145    AV.AC RESP.IN A/W,S2 =         0.400
AV.DARK CUR.IN NA,IAV =       0.499    PIN RESP.IN A/W,S =            0.500
PIN DARK CUR.IN NA,IPIN=    100.000

VISIBILITY IN MI, V =       100.000    LASER PEAK PWR IN W,P1 =      16.000
XMITT.TRANSMIT.,T1 =          0.200    RECEIV.TRANSMIT.,T2 =          0.800
LASER P.WIDTH IN NS,T =     150.000    S/N RATIO,SN =                 0.000
TARG.L.IN BEAM IN M,L1 =      0.900    TARGET REFL.,RHO =             0.200
REC.BEAM ELEV.,DEG,EPS =     80.850    REC.ELEV FIELD,DEG,PSI =       2.290
REC.FAN SPREAD,DEG,GAM =     90.000    TRM.FAN SPREAD,DEG PHI =      90.000

REC.AP.AREA IN SQCM,AR =      0.250       0.500       1.000       2.000

OPT.F.BW. IN MICRON,CL =      0.030

RANGE IN FT,R1 =             10.000

S/N,PIN DIODE SNPIN =     0.155E 03   0.292E 03   0.584E 03   0.890E 03
PIN BKGD-TO-SYST.NOISE =  0.156E 00   0.316E 00   0.633E 00   0.126E 01

RANGE IN FT,R1 =             25.000

S/N,PIN DIODE SNPIN =     0.996E 01   0.166E 02   0.375E 02   0.569E 02
PIN BKGD-TO-SYST.NOISE =  0.158E 00   0.316E 00   0.633E 00   0.126E 01
// XEQ FMMDI
```

```
3RD RECEIVER, EARTH AS BACKGROUND

SKY RAD.IN W/SQM/MIC.N =       9.600    AMB.TEMP.IN DEG.D.TEMP =     300.000
PREAMP.CAP.IN PF.C =           0.250    PREAMP.NOISE FIG.,NF =         2.000
AV.DC RESP.IN A/W.S1 =         0.145    AV.AC RESP.IN A/W.S2 =         0.400
AV.DARK CUR.IN NA.IAV =        0.499    PIN RESP.IN A/W.S =            0.500
PIN DARK CUR.IN NA.IPIN=     100.000

VISIBILITY IN MI. V =        100.000    LASER PEAK PWR IN W.P1 =      16.000
XMITT.TRANSMIT.,T1 =           0.600    RECEIV.TRANSMIT.,T2 =          0.600
LASER P.WIDTH IN NS,T =      150.000    TARG.L.IN BEAM IN M,LT =       0.900
TARGET REFL.,RHO =             0.200    REC.BEAM ELEV.,DEG,EPS =      89.330
REC.ELEV FIELD.DEG.PSI =       1.340    REC.FAN SPREAD.DEG,GAM =      90.000
TRM.FAN SPREAD.DEG PHI =      90.000


REC.AP.AREA IN SQCM.AR =       4.000       5.000        6.000        8.000

OPT.F.BW. IN MICRON.LL =       0.030

RANGE IN FT.R1 =              40.000

S/N.PIN PICLE SNPIN =       0.226E 02   0.260E 02   0.291E 02   0.346E 02
PIN BKGD-TC-SYST.NOISE =    0.242E 01   0.302E 01   0.363E 01   0.484E 01

RANGE IN FT.R1 =              50.000

S/N.PIN PICLE SNPIN =       0.115E 02   0.133E 02   0.149E 02   0.177E 02
PIN BKGD-TC-SYST.NOISE =    0.242E 01   0.302E 01   0.363E 01   0.484E 01
// XEQ FMMC1
```

```
C   BIN BOUNDARY FUNCTION
      REAL I,I1,I2,I3,IM,N,M
      DIMENSION H(6)
C   STATEMENT FUNCTIONS
      FFF(Z)=1.-1./(1.+.1411262*Z+.0664027*Z**2+.02743345*Z**3-.000394
     1(4*Z**4+.0032F975*Z**5)**8.
      TF(W)=SIN(W)/COS(W)
      Z111(H1,DH1,C,T,HN,S,H)=(C*(HN-H-S)**3)*((HN-H-S)/4+(H1-HN+S)/3)/(
     12.*T*DH1)
      Z112(C,T,HN,S,H)=C/(6*T)*(HN-H-S)**3
      Z121(H1,DH1,C,T,H)=C*T/(4*DH1)*(H1-H)**2
      Z122(C,T,H)=-.5*C*T*H
      Z211(H1,DH1,DX,HN,H)=(H1-HN)*(H-HN)**2/4/DH1-(H-HN)**3/6/DH1+(H-H1
     1)*DX**2/8/DH1*COS(2*(H-HN)/DX)-DX**3/16/DH1*SIN(2*(H-HN)/DX)
      Z212(DX,HN,H)=((H-HN)**2-DX**2/2*COS(2*(H-HN)/DX))/4
      Z221(H1,DH1,DX,A,H)=-(H1-H)**2/4/DH1*(A+DX/2*SIN(2*A/DX))
      Z222(DX,A,H)=H/2*(A+DX/2*SIN(2*A/DX))
      P111(X,Y)=Z111(H1,DH1,-1.,A1,HN,A1,X)-Z111(H1,DH1,-1.,A1,HN,A1,Y)
      P112(X,Y)=Z112(-1.,A1,HN,A1,X)-Z112(-1.,A1,HN,A1,Y)
      P113(X,Y)=Z111(H4,DH4,-1.,A1,HN,A1,X)-Z111(H4,DH4,-1.,A1,HN,A1,Y)
      P121(X,Y)=Z121(H1,DH1,-1.,A1,X)-Z121(H1,DH1,-1.,A1,Y)
      P122(X,Y)=Z122(-1.,A1,X)-Z122(-1.,A1,Y)
      P123(X,Y)=Z121(H4,DH4,-1.,A1,X)-Z121(H4,DH4,-1.,A1,Y)
      P131(X,Y)=Z121(H1,DH1,-1.,A1,X)-Z121(H1,DH1,-1.,A1,Y)-Z111(H1,DH1,
     1-1.,A1,HF,A1,X)+Z111(H1,DH1,-1.,A1,HF,A1,Y)
      P132(X,Y)=Z122(-1.,A1,X)-Z122(-1.,A1,Y)-Z112(-1.,A1,HF,A1,X)+Z112(
     1 -1.,A1,HF,A1,Y)
      P133(X,Y)=Z121(H4,DH4,-1.,A1,X)-Z121(H4,DH4,-1.,A1,Y)-Z111(H4,DH4,
     1-1.,A1,HF,A1,X)+Z111(H4,DH4,-1.,A1,HF,A1,Y)
      P211(X,Y)=Z211(H1,DH1,DX,HN,X)-Z211(H1,DH1,DX,HN,Y)
      P212(X,Y)=Z212(DX,HN,X)-Z212(DX,HN,Y)
      P213(X,Y)=Z211(H4,DH4,DX,HN,X)-Z211(H4,DH4,DX,HN,Y)
      P221(X,Y)=Z221(H1,DH1,DX,A,X)-Z221(H1,DH1,DX,A,Y)
      P222(X,Y)=Z222(DX,A,X)-Z222(DX,A,Y)
      P223(X,Y)=Z221(H4,DH4,DX,A,X)-Z221(H4,DH4,DX,A,Y)
      P231(X,Y)=P221(X,Y)-Z211(H1,DH1,DX,HF,X)+Z211(H1,DH1,DX,HF,Y)
      P232(X,Y)=P222(X,Y)-Z212(DX,HF,X)+Z212(DX,HF,Y)
      P233(X,Y)=P223(X,Y)-Z211(H4,DH4,DX,HF,X)+Z211(H4,DH4,DX,HF,Y)
      P331(X,Y)=Z111(H1,DH1,C,A2,HF,(-A-A2),X )-Z111(H1,DH1,C,A2,HF,(-A-
     1A2),Y)
      P332(X,Y)=Z112(C,A2,HF,(-A-A2),X)-Z112(C,A2,HF,(-A-A2),Y)
      P333(X,Y)=Z111(H4,DH4,C,A2,HF,(-A-A2),X)-Z111(H4,DH4,C,A2,HF,(-A-A
     12),Y)
      P321(X,Y)=Z121(H1,DH1,C,A2,X)-Z121(H1,DH1,C,A2,Y)
      P322(X,Y)=Z122(C,A2,X)-Z122(C,A2,Y)
      P323(X,Y)=Z121(H4,DH4,C,A2,X)-Z121(H4,DH4,C,A2,Y)
      P311(X,Y)=P321(X,Y)-Z111(H1,DH1,C,A2,HN,(-A-A2),X)+Z111(H1,DH1,C,A
     12,HN,(-A-A2),Y)
      P312(X,Y)=P322(X,Y)-Z112(C,A2,HN,(-A-A2),X)+Z112(C,A2,HN,(-A-A2),Y
     1)
      P313(X,Y)=P323(X,Y)-Z111(H4,DH4,C,A2,HN,(-A-A2),X)+Z111(H4,DH4,C,A
     12,HN,(-A-A2),Y)
C READ NAME OF PROGRAM
   60 FORMAT(72H
     1                    )
      READ(5,60)
C READ CUT-OFF RANGES
```

```
   70 FCPMAT(5(F14.7,2X))
      READ(,,70) RN,RF
C READ TRANSMITTER PARAMETERS
      READ(,,70) DELTA,SGMA2,SGMA3,D
C READ RECEIVER    PARAMETERS AND BASELINE
      READ(,,70) PSI,SGMA1,F,P,YMAX,N,B
C READ FOV STOP HEIGHTS
      READ(,,70) HN,HF
C READ S/N AND TH/N RATIOS
      READ(,,70) SN1,THN
C WRITE PROGRAM NAME
      WRITE (3,60)
 5000 FORMAT (//)
      WRITE (3,5000)
C WRITE INPUT PARAMETERS
   80 FORMAT (' NEAR RANGE IN FT, RN =',T32,F6.1,T40,'FAR RANGE IN FT, R
     1F =',T71,F7.1/' XMIT.DECL.IN MRAD,DELTA =',T31,F6.1,T40,'BEAM DIVE
     2RG.IN MRAD,SGMA2 =',T70,F6.2/' XMIT. BLUR IN MRAD,SGMA3 =',T31,F6.
     32,T40,'XMIT.APERT.DIA.IN IN.,D =',T72,F4.2/' REC.FLEV.FIELD IN MRA
     4D,PSI =',T32,F5.1,T40,'REC. BLUR IN MRAD,SGMA1 =',T71,F5.2)
      WRITE (3,80) RN,RF,DELTA,SGMA2,SGMA3,D,PSI,SGMA1
   81 FORMAT (' FOCAL LENGTH IN IN.,F =',T31,F6.3,T40'IMAGE DISTANCE IN
     1IN.,P =',T66,F8.5/' REC.APERT.HGHT IN IN.,YMAX =',T31,F6.3,T40,'IN
     2DEX OF REFRACTION, N =',T71,F5.3/' BIKINI HGHT,NEAR,IN IN.,HN =',T
     330,F7.4,T40,'BIKINI HGHT,FAR,IN IN.,HF =',T69,F7.4/' BASELINE IN I
     4N., B =',T32,F5.2)
      WRITE (3,81) F,P,YMAX,N,HN,HF,B
   82 FORMAT(' SIGNAL-TO-NOISE RATIO,SN =',T31,F6.3,T40,'THRESHOLD-TO-NO
     1ISE RATIO,THN =',T70,F6.3)
      WRITE(3,82) SN1,THN
C PRINT NAME OF OUTPUT PARAMETERS
   90 FORMAT(//' RANGE R',T12,'RELATIVE',T28,'PROBAB.OF'/' IN FT',T12,'S
     1ENSITIVITY I',T26,'DETECTION'/)
      WRITE (3,90)
C CALCULATE THE EXTREMES OF NEAR AND FAR CUT-OFF
      SGMA1=SGMA1*.001
      SGMA2=SGMA2*.001
      SGMA3=SGMA3*.001
      PSI=PSI*.001
      DELTA=DELTA*.001
      R1=B/(TG(PSI+SGMA1)+TG(DELTA+SGMA2+SGMA3))/12
      R2=(D+B)/(TG(DELTA-SGMA2-SGMA3)-TG(SGMA1))/12
C SETTING UP THE PARAMETERS OF THE DO LOOP
      J1=R1*10-10
      J2=(R2+20)*10
      J3=1
      HN1=HN
      HF1=HF
C START CALCULATING ALL R-DEPENDENT PARAMETERS
      GO TO  1002
 1001 J3=10
      J1=J+10
 1002 DO 1000 J=J1,J2,J3
C SET INITIAL VALUE OF THE INTEGRALS
      I1=0.0
      I2=0.0
      I3=0.0
```

```
      HN=HN1
      HF=HF1
      ROUT=J/10.
      R=J*12/10.
      A1=SGMA1*R
      X2=F**2/(R+N)
      XP=(YMAX)**2/4/F
      A2=A1/COS(ATAN(YMAX/(F+X2-XP)))
      DY=R-F-X2
C WHEN PROPERLY FOCUSED,A=0
      A=0.0
C WHEN OUT OF FOCUS
      IF(DX.NE.0.0) A=ABS(DX*YMAX/(F+X2-XP))
      C =-(COS(YMAX/(F+X2-XP)))**2
C CORRECTIVE FACTOR FOR RANGE
      M=(RN/R*12.)**3
      IF(R.GE.RN*12.) M=1
      IF(R.GE.RF*12.) M=(RF/R*12.)**3
C CALCULATE ALL H'S
      H1=-F/R*((B+D)/R-TG(DELTA-SGMA2-SGMA3))
      H2=-F/R*((B+D)/R-TG(DELTA-SGMA2))
      H3=-F/R*(B/R-TG(DELTA+SGMA2))
      H4=-F/R*(B/R-TG(DELTA+SGMA2+SGMA3))
      DH1= (TG(DELTA-SGMA2-SGMA3)-TG(DELTA-SGMA2))*F/R
      DH4= (TG(DELTA+SGMA2+SGMA3)-TG(DELTA+SGMA2))*F/R
      DH=H4-H1
      IF(DX.GT.0.0) GO TO 100
C CHANGING THE DIRECTION OF INTEGRATION
      H(1)=H1
      H(2)=H2
      H(3)=H3
      H(4)=H4
      H(5)=DH1
      H(6)=DH4
      H(7)=HN
      H(8)=HF
      H1=-H(4)
      H2=-H(3)
      H3=-H(2)
      H4=-H(1)
      DH1=-H(6)
      DH4=-H(5)
      HN=-H(8)
      HF=-H(7)
      DH=H4-H1
C SELECT THE INTEGRALS ACCORDING TO THE HEIGHT OF THE IMAGE
  100 IF(H4.GT.HF-A1.AND.H1.LT.HN+A+A2) GO TO 500
      IF(H4.LE.HN-A1) GO TO 400
      IF(H1.GE.HF+A+A2) GO TO 400
      IF(H1.GE.HF+A) GO TO 300
      IF(H1.GE.HF) GO TO 200
      IF(H1.GE.HF-A1) GO TO 14
      IF(H4.GE.HF) GO TO 11
      IF(H4.GE.HF-A1) GO TO 10
      IF(H1.GE.HN) GO TO 113
      IF(H1.GE.HN-A1) GO TO 6
      IF(H4.GE.HN) GO TO 3
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```
      IF(H2.GE.HN-A1) GO TO 101
      IF(H3.GE.HN-A1) GO TO 102
      GO TO 103
    3 IF(H2.GT.HN-A1.AND.H3.LT.HN) GO TO 104
      IF(H2.GT.HN) GO TO 105
      IF(H2.GT.HN-A1) GO TO 106
      IF(H3.LT.HN-A1) GO TO 107
      IF(H3.LT.HN) GO TO 108
      GO TO 109
    6 IF(H4.LT.HF) GO TO 126
      IF(H3.LT.HN) GO TO 110
      IF(H2.GT.HN) GO TO 111
      GO TO 112
   10 IF(H3.LT.HF-A1) GO TO 114
      IF(H2.LT.HF-A1) GO TO 115
      GO TO 116
   11 IF(H3.LT.HF.AND.H2.GT.HN-A1) GO TO 117
      IF(H2.GT.HF) GO TO 118
      IF(H2.GT.HF-A1) GO TO 119
      IF(H3.LT.HN-A1) GO TO 120
      IF(H3.LT.HF) GO TO 121
      GO TO 122
   14 IF(H4.LT.HF) GO TO 127
      IF(H3.LT.HF) GO TO 123
      IF(H2.LT.HF) GO TO 124
      GO TO 125
  101 I1=P111(H2,HN-A1)+P112(H3,H2)+P113(H4,H3)
      GO TO 200
  102 I1=P112(H3,HN-A1)+P113(H4,H3)
      GO TO 200
  103 I1=P113(H4,HN-A1)
      GO TO 200
  104 I1=P111(H2,HN-A1)+P112(H3,H2)+P113(HN,H3)+P123(H4,HN)
      GO TO 200
  105 I1=P111(HN,HN-A1)+P121(H2,HN)+P122(H3,H2)+P123(H4,H3)
      GO TO 200
  106 I1=P111(H2,HN-A1)+P112(HN,H2)+P122(H3,HN)+P123(H4,H3)
      GO TO 200
  107 I1=P113(HN,HN-A1)+P123(H4,HN)
      GO TO 200
  108 I1=P112(H3,HN-A1)+P113(HN,H3)+P123(H4,HN)
      GO TO 200
  109 I1=P112(HN,HN-A1)+P122(H3,HN)+P123(H4,H3)
      GO TO 200
  110 I1=P111(H2,H1)+P112(H3,H2)+P113(HN,H3)+P123(H4,HN)
      GO TO 200
  111 I1=P111(HN,H1)+P121(H1,HN)+P122(H3,H2)+P123(H4,H3)
      GO TO 200
  112 I1=P111(H2,H1)+P112(HN,H2)+P122(H3,HN)+P123(H4,H3)
      GO TO 200
  113 I1=P121(H2,H1)+P122(H3,H2)+P123(H4,H3)
      GO TO 200
  114 I1=P121(H2,H1)+P122(H3,H2)+P123(HF-A1,H3)+P133(H4,HF-A1)
      GO TO 200
  115 I1=P121(H2,H1)+P122(HF-A1,H2)+P132(H3,HF-A1)+P133(H4,H3)
      GO TO 200
  116 I1=P121(HF-A1,H1)+P131(H2,HF-A1)+P132(H3,H2)+P133(H4,H3)
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```
      GO TO 200
117   I1=P121(HF-A1,H1)+P131(H2,HF-A1)+P132(H2,H2)+P133(HF,H3)
      GO TO 200
118   I1=P121(HF-A1,H1)+P131(HF,HF-A1)
      GO TO 200
119   I1=P121(HF-A1,H1)+P131(H2,HF-A1)+P132(HF,H2)
      GO TO 200
120   I1=P121(H2,H1)+P122(H3,H2)+P123(HF-A1,H3)+P133(HF,HF-A1)
      GO TO 200
121   I1=P121(H2,H1)+P122(HF-A1,H2)+P132(H3,HF-A1)+P133(HF,H3)
      GO TO 200
122   I1=P121(H2,H1)+P122(HF-A1,H2)+P132(HF,HF-A1)
      GO TO 200
123   I1=P121(H2,H1)+P132(H3,H2)+P133(HF,H3)
      GO TO 200
124   I1=P121(H2,H1)+P122(HF,H2)
      GO TO 200
125   I1=P121(HF,H1)
      GO TO 200
126   I1=P111(H2,H1)+P112(H3,H2)+P113(H4,H3)
      GO TO 200
127   I1=P131(H2,H1)+P132(H3,H2)+P133(H4,H3)
200   IF(DX.EQ.0.0) GO TO 300
      IF(H4.LE.HF) GO TO 400
      IF(H1.GE.HF) GO TO 35
      IF(H4.GE.HF+A) GO TO 32
      IF(H4.GE.HF) GO TO 31
      IF(H1.GE.HM+A) GO TO 213
      IF(H1.GE.HM) GO TO 27
      IF(H4.GE.HM+A) GO TO 24
      IF(H2.GT.HM) GO TO 201
      IF(H3.GT.HM) GO TO 202
      GO TO 203
24    IF(H2.GT.HM.AND.H3.LT.HM+A) GO TO 204
      IF(H2.GT.HM+A) GO TO 205
      IF(H2.GT.HM) GO TO 206
      IF(H3.LT.HM) GO TO 207
      IF(H3.LT.HM+A) GO TO 208
      GO TO 209
27    IF(H4.LT.HM+A) GO TO 226
      IF(H2.LT.HM+A) GO TO 210
      IF(H2.GT.HM+A) GO TO 211
      GO TO 212
31    IF(H3.LT.HF) GO TO 214
      IF(H2.LT.HF) GO TO 215
      GO TO 216
32    IF(H3.LT.HF+A.AND.H2.GT.HF) GO TO 217
      IF(H2.GT.HF+A) GO TO 218
      IF(H2.GT.HF) GO TO 219
      IF(H3.LT.HF) GO TO 220
      IF(H3.LT.HF+A) GO TO 221
      GO TO 222
35    IF(H4.LT.HF+A) GO TO 227
      IF(H3.LT.HF+A) GO TO 223
      IF(H2.LT.HF+A) GO TO 224
      GO TO 225
201   I2=P211(H2,HM)+P212(H3,H2)+P213(H4,H3)
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```
      GO TO 300
  202 I2=P212(H3,HN)+P213(H4,H3)
      GO TO 300
  203 I2=P213(H4,HN)
      GO TO 300
  204 I2=P211(H2,HN)+P212(H3,H2)+P213(HN+A,H3)+P223(HN,HN+A)
      GO TO 300
  205 I2=P211(HN+A,HN)+P221(H2,HN+A)+P222(H3,H2)+P223(H4,H3)
      GO TO 300
  206 I2=P211(H2,HN)+P212(HN+A,H2)+P222(H3,HN+A)+P223(H4,H3)
      GO TO 300
  207 I2=P213(HN+A,HN)+P223(H4,HN+A)
      GO TO 300
  208 I2=P212(H3,HN)+P213(HN+A,H3)+P223(H4,HN+A)
      GO TO 300
  209 I2=P212(HN+A,HN)+P222(H3,HN+A)+P223(H4,H3)
      GO TO 300
  210 I2=P211(H2,H1)+P212(H3,H2)+P213(HN+A,H3)+P223(H4,HN+A)
      GO TO 300
  211 I2=P211(HN+A,H1)+P221(H2,HN+A)+P222(H3,H2)+P223(H4,H3)
      GO TO 300
  212 I2=P211(H2,H1)+P212(HN+A,H2)+P222(H3,HN+A)+P223(H4,H3)
      GO TO 300
  213 I2=P221(H2,H1)+P222(H3,H2)+P223(H4,H3)
      GO TO 300
  214 I2=P221(H2,H1)+P222(H3,H2)+P223(HF,H3)+P233(H4,HF)
      GO TO 300
  215 I2=P221(H2,H1)+P222(HF,H2)+P232(H3,HF)+P233(H4,H3)
      GO TO 300
  216 I2=P221(HF,H1)+P231(H2,HF)+P232(H3,H2)+P233(H4,H3)
      GO TO 300
  217 I2=P221(HF,H1)+P231(H2,HF)+P232(H3,H2)+P233(HF+A,H3)
      GO TO 300
  218 I2=P221(HF,H1)+P231(HF+A,HF)
      GO TO 300
  219 I2=P221(HF,H1)+P231(H2,HF)+P232(HF+A,H2)
      GO TO 300
  220 I2=P221(H2,H1)+P222(H3,H2)+P223(HF,H3)+P233(HF+A,HF)
      GO TO 300
  221 I2=P221(H2,H1)+P222(HF,H2)+P232(H3,HF)+P233(HF+A,H3)
      GO TO 300
  222 I2=P221(H2,H1)+P222(HF,H2)+P232(HF+A,HF)
      GO TO 300
  223 I2=P231(H2,H1)+P232(H3,H2)+P233(HF+A,H3)
      GO TO 300
  224 I2=P231(H2,H1)+P232(HF+A,H2)
      GO TO 300
  225 I2=P231(HF+A,H1)
      GO TO 300
  226 I2=P211(H2,H1)+P212(H3,H2)+P213(H4,H3)
      GO TO 300
  227 I2=P231(H2,H2)+P232(H3,H2)+P233(H4,H3)
  300 IF(H4.LE.HN+A) GO TO 400
      IF(H1.GE.HF+A) GO TO 56
      IF(H4.GE.HF+A+A2) GO TO 53
      IF(H4.GE.HF+A) GO TO 52
      IF(H1.GE.HN+A+A2) GO TO 312
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      IF(H1.GE.HN+A) GO TO 46
      IF(H4.GE.HN+A+A2) GO TO 45
      IF(H2.GT.HN+A) GO TO 301
      IF(H3.GT.HN+A) GO TO 302
      GO TO 303
   45 IF(H2.GT.HN+A.AND.H3.LT.HN+A+A2) GO TO 304
      IF(H2.GT.HN+A+A2) GO TO 305
      IF(H2.GT.HN+A) GO TO 306
      IF(H3.LT.HN+A) GO TO 307
      IF(H3.LT.HN+A+A2) GO TO 308
      GO TO 309
   46 IF(H4.LT.HN+A+A2) GO TO 313
      IF(H3.LT.HN+A+A2) GO TO 310
      IF(H2.GT.HN+A+A2) GO TO 311
      GO TO 312
   52 IF(H3.LT.HF+A) GO TO 314
      IF(H2.LT.HF+A) GO TO 315
      GO TO 316
   53 IF(H3.LT.HF+A+A2.AND.H2.GT.HF+A) GO TO 317
      IF(H2.GT.HF+A+A2) GO TO 318
      IF(H2.GT.HF+A) GO TO 319
      IF(H3.LT.HF+A) GO TO 320
      IF(H3.LT.HF+A+A2) GO TO 321
      GO TO 322
   56 IF(H4.LT.HF+A+A2) GO TO 327
      IF(H3.LT.HF+A+A2) GO TO 323
      IF(H2.LT.HF+A+A2) GO TO 324
      GO TO 325
  301 I3=P311(H2,HN+A)+P312(H3,H2)+P313(H4,H3)
      GO TO 400
  302 I3=P312(H3,HN+A)+P313(H4,H3)
      GO TO 400
  303 I3=P313(H4,HN+A)
      GO TO 400
  304 I3=P311(H2,HN+A)+P312(H3,H2)+P313(HN+A+A2,H3)+P323(H4,HN+A+A2)
      GO TO 400
  305 I3=P311(HN+A+A2,HN+A)+P321(H2,HN+A+A2)+P322(H3,H2)+P323(H4,H3)
      GO TO 400
  306 I3=P311(H2,HN+A)+P312(HN+A+A2,H2)+P322(H3,HN+A+A2)+P323(H4,H3)
      GO TO 400
  307 I3=P313(HN+A+A2,HN+A)+P323(H4,HN+A+A2)
      GO TO 400
  308 I3=P312(H3,HN+A)+P313(HN+A+A2,H3)+P323(H4,HN+A+A2)
      GO TO 400
  309 I3=P312(HN+A+A2,HN+A)+P322(H3,HN+A+A2)+P323(H4,H3)
      GO TO 400
  310 I3=P311(H2,H1)+P312(H3,H2)+P313(HN+A+A2,H3)+P323(H4,HN+A+A2)
      GO TO 400
  311 I3=P311(HN+A+A2,H1)+P321(H2,HN+A+A2)+P322(H3,H2)+P323(H4,H3)
      GO TO 400
  312 I3=P311(H2,H1)+P312(HN+A+A2,H2)+P322(H3,HN+A+A2)+P323(H4,H3)
      GO TO 400
  313 I3=P321(H2,H1)+P322(H3,H2)+P323(H4,H3)
      GO TO 400
  314 I3=P321(H2,H1)+P322(H3,H2)+P323(HF+A,H3)+P333(H4,HF+A)
      GO TO 400
  315 I3=P321(H2,H1)+P322(HF+A,H2)+P332(H3,HF+A)+P333(H4,H3)
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      GO TO 400
  316 I3=P321(HF+A,H1)+P331(H2,HF+A)+P332(H3,H2)+P333(H4,H3)
      GO TO 400
  317 I3=P321(HF+A,H1)+P331(H2,HF+A)+P332(H3,H2)+P333(HF+A+A2,H3)
      GO TO 400
  318 I3=P321(HF+A,H1)+P331(HF+A+A2,HF+A)
      GO TO 400
  319 I3=P321(HF+A,H1)+P331(H2,HF+A)+P332(HF+A+A2,H2)
      GO TO 400
  320 I3=P321(H2,H1)+P322(H3,H2)+P323(HF+A,H3)+P332(HF+A+A2,HF+A)
      GO TO 400
  321 I3=P321(H2,H1)+P322(HF+A,H2)+P332(H3,HF+A)+P333(HF+A+A2,H3)
      GO TO 400
  322 I3=P321(H2,H1)+P322(HF+A,H2)+P332(HF+A+A2,HF+A)
      GO TO 400
  323 I3=P321(H2,H1)+P322(H3,H2)+P323(HF+A+A2,H3)
      GO TO 400
  324 I3=P321(H2,H1)+P322(HF+A+A2,H2)
      GO TO 400
  325 I3=P331(HF+A+A2,H1)
      GO TO 400
  326 I3=P311(H2,H1)+P312(H3,H2)+P313(H4,H3)
      GO TO 400
  327 I3=P331(H2,H1)+P332(H3,H2)+P323(H4,H3)
      GO TO 400
  500 WRITE (3,600) ROUT
  600 FORMAT (1H ,T2,F6.2,T12,'IMAGE.CT.FOV')
      GO TO 700
  400 CONTINUE
      I=(I1+I3)*M
      IM=0
      IF(DX.NE.0.0) IM=I2*M
      I=(I+IM)/(P121(H2,H1)+P122(H3,H2)+P123(H4,H3)+P221(H2,H1)+P222(H3,
     1H2)+P223(H4,H3)+P321(H2,H1)+P322(H3,H2)+P323(H4,H3))
      SN=SN1+I
      PD=  ((1.+ERF((SN-THN)/2.**.5))*.5)**2
      IF((SN-THN).LT.0.) PD=  ((1.-ERF((THN-SN)/2.**.5))*.5)**2
   91 FORMAT (1H ,T2,F6.2,T13,E10.3)
      WRITE (3,91) ROUT,I
   92 FORMAT (1H+,T27,5(E12.5,2X))
  700 WRITE(3,92) PD
      IF(ROUT.GE.RN+1.AND.ROUT.LT.RN+2) GO TO 1001
 1000 CONTINUE
      CALL EXIT
      END
```

BIN BOUND, BY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	5.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BEAM IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FIELD.FIELD IN MRAD,PSI =	40.0	REC. BEAM IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40135
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0107	BIKINI HGHT.FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.546	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.146E-01	0.35546E-08
1.90	0.832E-01	0.10256E-06
2.00	0.193E 00	0.12174E-04
2.10	0.362E 00	0.30904E-02
2.20	0.532E 00	0.98724E-01
2.30	0.700E 00	0.53309E 00
2.40	0.854E 00	0.89658E 00
2.50	0.958E 00	0.97889E 00
2.60	0.999E 00	0.98983E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.904E 00	0.98885E 00
11.00	0.682E 00	0.47622E 00
12.00	0.434E 00	0.17171E-01
13.00	0.261E 00	0.14518E-03
14.00	0.197E 00	0.16036E-05
15.00	0.755E-01	0.71526E-07
16.00	0.302E-01	0.10707E-07
17.00	0.107E-01	0.39534E-08
18.00	0.704E-02	0.24072E-08
19.00	0.259E-02	0.19134E-08
20.00	0.780E-03	0.17476E-08
21.00	0.172E-03	0.16887E-08

22.00	0.221E-04	0.16737E-08
23.00	0.723E-06	0.16738E-08
24.00	0.000E 00	0.16737E-08
25.00	0.000E 00	0.16737E-08
26.00	0.000E 00	0.16737E-08
27.00	0.000E 00	0.16737E-08
28.00	0.000E 00	0.16737E-08
29.00	0.000E 00	0.16737E-08
30.00	0.000E 00	0.16737E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0 FAR RANGE IN FT, FF = 10.0
XMIT.DECL.IN MRAD,DELTA = 11.0 BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT. BLUR IN MRAD,SGMA3 = 0.50 XMIT.APERT.DIA.IN IN.,D = 0.30
REC.ELEV.FIELD IN MRAD,PSI = 39.5 REC. BLUR IN MRAD,SGMA1 = 0.50
FOCAL LENGTH IN IN.,F = 0.400 IMAGE DISTANCE IN IN.,P = 0.4013
REC.APERT.HGHT IN IN.,YMAX = 0.200 INDEX OF REFRACTION, N = 1.50
BIKINI HGHT,NEAR,IN IN.,HN =-0.0107 BIKINI HGHT,FAR,IN IN.,HF = 0.000
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540 THRESHOLD-TO-NOISE RATIO,TNN = 3.96

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.564E-02	0.22392E-08
1.80	0.696E-01	0.54013E-07
1.90	0.189E 00	0.10365E-04
2.00	0.334E 00	0.16122E-02
2.10	0.511E 00	0.72137E-01
2.20	0.687E 00	0.49413E 00
2.30	0.850E 00	0.89307E 00
2.40	0.959E 00	0.97910E 00
2.50	0.999E 00	0.98989E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.999E 00	0.98999E 00
9.00	0.904E 00	0.94926E 00
10.00	0.664E 00	0.41956E 00
11.00	0.314E 00	0.88313E-03
12.00	0.120E 00	0.55464E-06
13.00	0.341E-01	0.94965E-08
14.00	0.674E-02	0.23701E-08
15.00	0.606E-03	0.17271E-08
16.00	0.495E-05	0.16741E-08
17.00	0.000E 00	0.16737E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. FIELD IN MRAD,SGMA3 =	0.25	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,FSI =	[illegible]	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40133
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0107	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.813E-04	0.16808E-08
1.80	0.338E-01	0.92542E-08
1.90	0.126E 00	0.72606E-06
2.00	0.257E 00	0.13105E-03
2.10	0.436E 00	0.17658E-01
2.20	0.612E 00	0.26568E 00
2.30	0.785E 00	0.77225E 00
2.40	0.919E 00	0.95965E 00
2.50	0.990E 00	0.98605E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.997E 00	0.98982E 00
10.00	0.904E 00	0.95119E 00
11.00	0.526E 00	0.90290E-01
12.00	0.275E 00	0.27528E-03
13.00	0.123E 00	0.63461E-06
14.00	0.464E-01	0.17488E-07
15.00	0.149E-01	0.36036E-08
16.00	0.353E-02	0.20086E-08
17.00	0.459E-03	0.17135E-08
18.00	0.846E-05	0.16744E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	1.00	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLDV.FIELD IN MRAD,FSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40135
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0107	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.980E-03	0.17607E-08
1.80	0.420E-01	0.14646E-07
1.90	0.139E 00	0.13230E-05
2.00	0.270E 00	0.19990E-03
2.10	0.439E 00	0.18965E-01
2.20	0.605E 00	0.24902E 00
2.30	0.769E 00	0.73439E 00
2.40	0.904E 00	0.94955E 00
2.50	0.982E 00	0.98620E 00
2.60	0.999E 00	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.985E 00	0.98687E 00
10.00	0.855E 00	0.90015E 00
11.00	0.500E 00	0.59736E-01
12.00	0.270E 00	0.25527E-03
13.00	0.141E 00	0.14294E-05
14.00	0.634E-01	0.40065E-07
15.00	0.257E-01	0.62205E-08
16.00	0.937E-02	0.27071E-08
17.00	0.287E-02	0.19429E-08
18.00	0.710E-03	0.17363E-08
19.00	0.124E-03	0.16845E-08
20.00	0.108E-04	0.16747E-08
21.00	0.762E-07	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD.DELTA = 9.9
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 39.9
FOCAL LENGTH IN IN.,F = 0.400
REC.APERT.HGHT IN IN.,YMAX = 0.200
DIKINI HGHT,NEAR,IN IN.,HN = -0.0107
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.2[illegible]
IMAGE DISTANCE IN IN.,P = 0.40135
INDEX OF REFRACTION, N = 1.501
DIKINI HGHT,FAR,IN IN.,HF = 0.0000
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.128E-04	0.16746E-08
1.80	0.329E-01	0.89318E-08
1.90	0.127E 00	0.77261E-06
2.00	0.263E 00	0.15417E-03
2.10	0.437E 00	0.16291E-01
2.20	0.610E 00	0.26117E 00
2.30	0.781E 00	0.76310E 00
2.40	0.919E 00	0.95961E 00
2.50	0.991E 00	0.98823E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.999E 00	0.98996E 00
10.00	0.902E 00	0.94836E 00
11.00	0.518E 00	0.75687E-01
12.00	0.277E 00	0.24931E-03
13.00	0.129E 00	0.83334E-06
14.00	0.467E-01	0.17769E-07
15.00	0.133E-01	0.33258E-08
16.00	0.253E-02	0.18875E-08
17.00	0.122E-03	0.16844E-08
18.00	0.756E-06	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.9	BEAM LEVELG.IN MRAD,SIGMA2 =	0.50
XMIT. BLUR IN MRAD,SIGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,FSI =	39.9	REC. BLUR IN MRAD,SIGMA1 =	1.00
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40173
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0167	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.546	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB. OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.202E-02	0.18507E-08
1.80	0.449E-01	0.16147E-07
1.90	0.137E 00	0.11691E-05
2.00	0.262E 00	0.15000E-03
2.10	0.436E 00	0.17777E-01
2.20	0.609E 00	0.25745E 00
2.30	0.775E 00	0.74993E 00
2.40	0.905E 00	0.95003E 00
2.50	0.980E 00	0.98570E 00
2.60	0.995E 00	0.98995E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.979E 00	0.98551E 00
10.00	0.860E 00	0.90573E 00
11.00	0.507E 00	0.66914E-01
12.00	0.275E 00	0.23061E-03
13.00	0.136E 00	0.11261E-05
14.00	0.636E-01	0.46388E-07
15.00	0.288E-01	0.72697E-08
16.00	0.124E-01	0.31603E-08
17.00	0.508E-02	0.21753E-08
18.00	0.187E-02	0.18443E-08
19.00	0.593E-03	0.17259E-08
20.00	0.143E-03	0.16882E-08
21.00	0.215E-04	0.16756E-08

22.00	0.119E-05	0.16736E-08
23.00	0.239E-10	0.16737E-08
24.00	0.000E 00	0.16737E-08
25.00	0.000E 00	0.16737E-08
26.00	0.000E 00	0.16737E-08
27.00	0.000E 00	0.16737E-08
28.00	0.000E 00	0.16737E-08
29.00	0.000E 00	0.16737E-08
30.00	0.000E 00	0.16737E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0

XMIT.DECL.IN MRAD,DELTA = 9.9

XMIT. DIVR IN MRAD,SGMA3 = 0.50

REC.ELEV.FIELD IN MRAD,PSI = 39.9

FOCAL LENGTH IN IN.,F = 0.400

REC.APERT.HGHT IN IN.,YMAX = 0.200

RIKIND HGHT.NEAR.IN IN.,HN =-0.0107

BASELINE IN IN., B = 1.20

SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0

BEAM DIVERG.IN MRAD,SGMA2 = 0.50

XMIT.APERT.DIA.TO IN.,D = 0.20

REC. BLUR IN MRAD,SGMA1 = 0.30

IMAGE DISTANCE IN IN.,P = 0.400[illegible]

INDEX OF REFRACTION, N = 1.5[illegible]

RIKIND HGHT.FAR.IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.[illegible]

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.185E-01	0.42335E-08
1.80	0.931E-01	0.16325E-06
1.90	0.205E 00	0.14319E-04
2.00	0.337E 00	0.15583E-02
2.10	0.515E 00	0.76422E-01
2.20	0.690E 00	0.50395E 00
2.30	0.838E 00	0.87605E 00
2.40	0.940E 00	0.97156E 00
2.50	0.992E 00	0.98856E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.995E 00	0.98906E 00
9.00	0.903E 00	0.94674E 00
10.00	0.682E 00	0.47776E 00
11.00	0.332E 00	0.13542E-02
12.00	0.123E 00	0.85007E-06
13.00	0.305E-01	0.79361E-08
14.00	0.209E-02	0.18647E-08
15.00	0.434E-06	0.16737E-08
16.00	0.000E 00	0.16737E-08
17.00	0.000E 00	0.16737E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT. DECL. IN MRAD, DELTA =	5.5	BEAM DIVERG. IN MRAD, SGMA2 =	0.50
XMIT. BLUR IN MRAD, SGMA3 =	0.50	XMIT. APERT. DIA. IN IN., D =	0.40
REC. ELEV. FIELD IN DEG, PSI =	39.9	REC. BLUR IN MRAD, SGMA1 =	[illegible]
FOCAL LENGTH IN IN., F =	0.400	IMAGE DISTANCE IN IN., P =	0.402[illegible]
REC. APERT. HGHT IN IN., YMAX =	0.200	INDEX OF REFRACTION, N =	1.[illegible]
BIKINI HGHT, NEAR, IN IN., HN =	-0.0167	BIKINI HGHT, FAR, IN IN., HF =	0.0000
BASELINE IN IN., B =	1.21		
SIGNAL-TO-NOISE RATIO, SN =	6.540	THRESHOLD-TO-NOISE RATIO, THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB. OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.316E-02	0.19712E-08
1.90	0.622E-01	0.37760E-07
2.00	0.180E 00	0.97679E-05
2.10	0.359E 00	0.20377E-02
2.20	0.528E 00	0.93529E-01
2.30	0.696E 00	0.52211E 00
2.40	0.861E 00	0.90689E 00
2.50	0.977E 00	0.98479E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.996E 00	0.98974E 00
10.00	0.949E 00	0.97537E 00
11.00	0.630E 00	0.31788E 00
12.00	0.404E 00	0.86960E-02
13.00	0.247E 00	0.90902E-04
14.00	0.147E 00	0.16473E-05
15.00	0.877E-01	0.17714E-06
16.00	0.522E-01	0.25208E-07
17.00	0.310E-01	0.61359E-08
18.00	0.183E-01	0.42866E-08
19.00	0.106E-01	0.29017E-08
20.00	0.608E-02	0.22912E-08
21.00	0.334E-02	0.19695E-08

22.00	0.17[illegible]E-02	0.1832[illegible]E-06
23.00	0.854E-03	0.174[illegible]3E-06
24.00	0.3[illegible]E-03	0.17073E-06
25.00	0.15[illegible]E-03	0.16872E-08
26.00	0.54[illegible]E-04	0.16784E-08
27.00	0.15[illegible]E-04	0.167[illegible]E-06
28.00	0.31[illegible]E-05	0.1674[illegible]E-08
29.00	0.361E-06	0.16737E-08
30.00	0.35[illegible]E-06	0.16737E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08

BIN PROBE, RT FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40133
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.5117	BIKINI HGHT,FAR,IN IN.,HF =	-0.0000
BASELINE IN IN., B =	[illegible]		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.310E-02	0.19730E-08
1.70	0.745E-01	0.67955E-07
1.80	0.219E 00	0.33152E-04
1.90	0.393E 00	0.75373E-02
2.00	0.529E 00	0.95276E-01
2.10	0.716E 00	0.58368E 00
2.20	0.879E 00	0.92754E 00
2.30	0.976E 00	0.98472E 00
2.40	0.999E 00	0.99000E 00
2.50	0.100E 01	0.99000E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.951E 00	0.97625E 00
8.00	0.612E 00	0.26672E 00
9.00	0.283E 00	0.30302E-03
10.00	0.473E-01	0.18276E-07
11.00	0.614E-03	0.17270E-08
12.00	0.000E 00	0.16737E-08
13.00	0.000E 00	0.16737E-08
14.00	0.000E 00	0.16737E-08
15.00	0.000E 00	0.16737E-08
16.00	0.000E 00	0.16737E-08
17.00	0.000E 00	0.16737E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.5	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.5	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40133
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, I =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-[illegible]7	BIKINI HGHT,FAR,IN IN.,RF =	41.0[illegible]
BASELINE IN IN., G =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.000E 00	0.16737E-08
1.90	0.933E-02	0.27069E-08
2.00	0.590E-01	0.32506E-07
2.10	0.164E 00	0.37584E-05
2.20	0.319E 00	0.91559E-03
2.30	0.470E 00	0.40694E-01
2.40	0.636E 00	0.33334E 00
2.50	0.790E 00	0.70513E 00
2.60	0.914E 00	0.95644E 00
2.70	0.984E 00	0.98678E 00
2.80	0.999E 00	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.751E 00	0.66657E 00
12.00	0.578E 00	0.10556E 00
13.00	0.455E 00	0.26645E-01
14.00	0.360E 00	0.29522E-02
15.00	0.282E 00	0.29570E-03
16.00	0.219E 00	0.31350E-04
17.00	0.167E 00	0.41591E-05
18.00	0.126E 00	0.70066E-06
19.00	0.950E-01	0.17793E-06
20.00	0.704E-01	0.50206E-07
21.00	0.517E-01	0.22650E-07

22.00	0.376E-01	0.11326E-07
23.00	0.274E-01	0.67142E-08
24.00	0.200E-01	0.46723E-08
25.00	0.147E-01	0.35635E-08
26.00	0.10[illegible]E-01	0.29245E-08
27.00	0.801E-02	0.25300E-08
28.00	0.554E-02	0.22730E-08
29.00	0.440E-02	0.21012E-08
30.00	0.324E-02	0.19616E-08
31.00	0.242E-02	0.18976E-08
32.00	0.179E-02	0.18302E-08
33.00	0.132E-02	0.17922E-08
34.00	0.973E-03	0.17601E-08

MIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0
XMIT.DEFL.IN MRAD,DELTA = 5.5
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.FLEV.FIELD IN MRAD,PSI = 29.9
FOCAL LENGTH IN IN.,F = 0.400
REC.APERT.HGHT IN IN.,YMAX = 0.260
RIMIN HGHT.NEAR,IN IN.,HN =-0.0107
BASELINE IN IN., B = 1.15
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.40133
INDEX OF REFRACTION, N = 1.501
RIMIN HGHT.FAR,IN IN.,RF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.969

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.80	0.000E 00	0.16737E-08
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.536E-05	0.16742E-08
1.70	0.316E-01	0.83636E-08
1.80	0.130E 00	0.60097E-06
1.90	0.275E 00	0.23177E-03
2.00	0.411E 00	0.10286E-01
2.10	0.585E 00	0.19847E 00
2.20	0.756E 00	0.70166E 00
2.30	0.898E 00	0.94520E 00
2.40	0.941E 00	0.98596E 00
2.50	0.999E 00	0.99000E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.973E 00	0.98381E 00
10.00	0.804E 00	0.81556E 00
11.00	0.441E 00	0.15682E-01
12.00	0.220E 00	0.34076E-04
13.00	0.921E-01	0.15548E-06
14.00	0.330E-01	0.85796E-08
15.00	0.985E-02	0.27660E-08
16.00	0.210E-02	0.18656E-08
17.00	0.247E-03	0.16944E-08
18.00	0.541E-05	0.16742E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08

MIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	5.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.400	IMAGE DISTANCE IN IN.,P =	0.40133
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0107	BIKINI HGHT.FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.2[illegible]		
SIGNAL-TO-NOISE RATIO,SN =	6.5[illegible]	THRESHOLD-TO-NOISE RATIO,THN =	3.9[illegible]

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.119E-02	0.17802E-08
1.90	0.412E-01	0.13552E-07
2.00	0.130E 00	0.87896E-06
2.10	0.289E 00	0.36395E-03
2.20	0.462E 00	0.30277E-01
2.30	0.634E 00	0.32839E 00
2.40	0.801E 00	0.80910E 00
2.50	0.928E 00	0.96549E 00
2.60	0.993E 00	0.98862E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.999E 00	0.99000E 00
10.00	0.952E 00	0.97653E 00
11.00	0.587E 00	0.20460E 00
12.00	0.332E 00	0.13596E-02
13.00	0.171E 00	0.49302E-05
14.00	0.755E-01	0.71547E-07
15.00	0.297E-01	0.76080E-08
16.00	0.101E-01	0.28156E-08
17.00	0.265E-02	0.19199E-08
18.00	0.446E-03	0.17128E-08
19.00	0.301E-04	0.16763E-08
20.00	0.416E-07	0.16737E-08
21.00	0.000E 00	0.16737E-08
22.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD,DELTA = [illegible]
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.FLFV.FIELD IN MRAD,PSI = 40.0
FOCAL LENGTH IN IN.,F = 0.600
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN =-0.0215
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.60533
INDEX OF REFRACTION, I = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.103E-01	0.26453E-08
1.90	0.794E-01	0.85819E-07
2.00	0.192E 00	0.11659E-04
2.10	0.362E 00	0.30744E-02
2.20	0.532E 00	0.99044E-01
2.30	0.700E 00	0.53505E 00
2.40	0.858E 00	0.90305E 00
2.50	0.961E 00	0.97982E 00
2.60	0.999E 00	0.98987E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.994E 00	0.98890E 00
11.00	0.685E 00	0.40561E 00
12.00	0.436E 00	0.17782E-01
13.00	0.261E 00	0.14741E-03
14.00	0.147E 00	0.10246E-05
15.00	0.756E-01	0.71744E-07
16.00	0.361E-01	0.10522E-07
17.00	0.160E-01	0.38142E-08
18.00	0.626E-02	0.23115E-08
19.00	0.190E-02	0.18545E-08
20.00	0.465E-03	0.17145E-08
21.00	0.654E-04	0.16794E-08

22.00	0.286E-05	0.16746E-08
23.00	0.000E 00	0.16737E-08
24.00	0.000E 00	0.16737E-08
25.00	0.000E 00	0.16737E-08
26.00	0.000E 00	0.16737E-08
27.00	0.000E 00	0.16737E-08
28.00	0.000E 00	0.16737E-08
29.00	0.000E 00	0.16737E-08
30.00	0.000E 00	0.16737E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-06
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-06

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	1.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.600	IMAGE DISTANCE IN IN.,P =	0.60536
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0215	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,TN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.237E-02	0.17923E-08
1.80	0.643E-01	0.41872E-07
1.90	0.187E 00	0.59195E-05
2.00	0.353E 00	0.13870E-02
2.10	0.511E 00	0.71909E-01
2.20	0.687E 00	0.49468E 00
2.30	0.853E 00	0.89735E 00
2.40	0.961E 00	0.97997E 00
2.50	0.999E 00	0.98998E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.999E 00	0.98999E 00
9.00	0.907E 00	0.95158E 00
10.00	0.665E 00	0.42371E 00
11.00	0.318E 00	0.98593E-05
12.00	0.120E 00	0.56445E-06
13.00	0.332E-01	0.91723E-08
14.00	0.554E-02	0.22761E-08
15.00	0.290E-03	0.16991E-08
16.00	0.314E-07	0.16737E-08
17.00	0.000E 00	0.16737E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD,DELTA = 9.9
XMIT. BLUR IN MRAD,SGMA3 = 0.25
REC.FLFV.FIELD IN MRAD,FSI = 35.9
FOCAL LENGTH IN IN.,F = 0.800
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN =-0.0215
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = [illegible].540

FAR RANGE IN FT, FF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.80533
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.204E-01	0.71526E-08
1.90	0.122E 00	0.62154E-06
2.00	0.257E 00	0.12817E-03
2.10	0.435E 00	0.17584E-01
2.20	0.612E 00	0.26629E 00
2.30	0.786E 00	0.77616E 00
2.40	0.922E 00	0.96196E 00
2.50	0.991E 00	0.98825E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.999E 00	0.98983E 00
10.00	0.910E 00	0.95360E 00
11.00	0.527E 00	0.92333E-01
12.00	0.276E 00	0.24018E-03
13.00	0.123E 00	0.64421E-06
14.00	0.455E-01	0.17051E-07
15.00	0.137E-01	0.33917E-08
16.00	0.266E-02	0.19150E-08
17.00	0.180E-03	0.16694E-08
18.00	0.451E-07	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD,DELTA = 9.9
XMIT. BLUR IN MRAD,SGMA3 = 1.00
REC.ELEV.FIELD IN MRAD,PSI = 29.9
FOCAL LENGTH IN IN.,F = 0.600
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN =-0.0215
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, FF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.60533
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.154E-03	0.16871E-08
1.80	0.376E-01	0.11382E-07
1.90	0.137E 00	0.11778E-05
2.00	0.270E 00	0.19587E-03
2.10	0.439E 00	0.16910E-01
2.20	0.606E 00	0.24957E 00
2.30	0.770E 00	0.73694E 00
2.40	0.907E 00	0.95207E 00
2.50	0.984E 00	0.98656E 00
2.60	0.999E 00	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.985E 00	0.98702E 00
10.00	0.858E 00	0.90345E 00
11.00	0.501E 00	0.61629E-01
12.00	0.278E 00	0.25957E-03
13.00	0.142E 00	0.14496E-05
14.00	0.634E-01	0.39964E-07
15.00	0.251E-01	0.60405E-08
16.00	0.857E-02	0.26026E-08
17.00	0.233E-02	0.18861E-08
18.00	0.463E-03	0.17143E-08
19.00	0.532E-04	0.16783E-08
20.00	0.136E-05	0.16738E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD,DELTA = 9.9
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.FLEV.FIELD IN MRAD,FSI = 35.9
FOCAL LENGTH IN IN.,F = 0.600
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN =-0.0215
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.25
IMAGE DISTANCE IN IN.,P = 0.80535
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.276E-01	0.66106E-08
1.90	0.124E 00	0.66856E-06
2.00	0.262E 00	0.14891E-03
2.10	0.437E 00	0.18060E-01
2.20	0.610E 00	0.26063E 00
2.30	0.781E 00	0.76417E 00
2.40	0.922E 00	0.96150E 00
2.50	0.992E 00	0.98846E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.999E 00	0.98996E 00
10.00	0.904E 00	0.94567E 00
11.00	0.518E 00	0.75670E-01
12.00	0.277E 00	0.24816E-03
13.00	0.129E 00	0.82577E-06
14.00	0.462E-01	0.17307E-07
15.00	0.124E-01	0.31663E-08
16.00	0.170E-02	0.16277E-08
17.00	0.369E-04	0.16771E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

MIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.5	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	35.9	REC. BLUR IN MRAD,SGMA1 =	1.00
FOCAL LENGTH IN IN.,F =	0.800	IMAGE DISTANCE IN IN.,P =	0.80533
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.,FAR.IN IN.,HN =	-0.0215	BIKINI HGHT,FAR.IN IN.,HF =	0.0000
BASELINE IN IN., b =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.546	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.511E-03	0.17185E-08
1.80	0.394E-01	0.12344E-07
1.90	0.134E 00	0.10642E-05
2.00	0.262E 00	0.14552E-03
2.10	0.436E 00	0.17987E-01
2.20	0.610E 00	0.20011E 00
2.30	0.778E 00	0.75770E 00
2.40	0.909E 00	0.95311E 00
2.50	0.922E 00	0.96614E 00
2.60	0.999E 00	0.98595E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.900E 00	0.96578E 00
10.00	0.866E 00	0.91897E 00
11.00	0.511E 00	0.72105E-01
12.00	0.277E 00	0.24800E-03
13.00	0.137E 00	0.11805E-05
14.00	0.635E-01	0.40209E-07
15.00	0.277E-01	0.61895E-08
16.00	0.111E-01	0.24068E-08
17.00	0.399E-02	0.20573E-08
18.00	0.122E-02	0.17826E-08
19.00	0.280E-03	0.16982E-08
20.00	0.372E-04	0.16776E-08
21.00	0.147E-05	0.16739E-08

MIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.800	IMAGE DISTANCE IN IN.,P =	0.80433
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0215	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY 1	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.334E-03	0.17029E-08
1.80	0.442E-01	0.15666E-07
1.90	0.147E 00	0.16676E-05
2.00	0.282E 00	0.29060E-03
2.10	0.458E 00	0.27693E-01
2.20	0.632E 00	0.32166E 00
2.30	0.801E 00	0.80889E 00
2.40	0.927E 00	0.96446E 00
2.50	0.991E 00	0.98820E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.995E 00	0.98907E 00
10.00	0.853E 00	0.85705E 00
11.00	0.471E 00	0.39905E-01
12.00	0.239E 00	0.68287E-04
13.00	0.995E-01	0.21966E-06
14.00	0.301E-01	0.77927E-08
15.00	0.606E-02	0.22687E-08
16.00	0.542E-03	0.17214E-08
17.00	0.462E-05	0.16741E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

MIN BOUND BY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 2.0
XMIT.DEFL.IN MRAD,DELTA = 9.9
XMIT. BLUR IN MRAD,SGMA3 = 1.50
REC.FLDV.FIELD IN MRAD,PSI = 39.9
FOCAL LENGTH IN IN.,F = 0.800
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN =-0.0215
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.…
BEAM DIVERG.IN MRAD,SGMA2 = 0.3…
XMIT.APERT.DIA.IN IN.,D = 0.3…
REC. BLUR IN MRAD,SGMA1 = 0.5…
IMAGE DISTANCE IN IN.,P = 0.8063…
INDEX OF REFRACTION, N = 1.5[illegible]
BIKINI HGHT.FAR,IN IN.,HF = 0.000…

THRESHOLD-TO-NOISE RATIO,TNN = 3.96…

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB. OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.202E-01	0.47249E-08
1.90	0.108E 00	0.33183E-06
2.00	0.243E 00	0.73763E-04
2.10	0.416E 00	0.11399E-01
2.20	0.588E 00	0.20542E 00
2.30	0.758E 00	0.70662E 00
2.40	0.907E 00	0.95141E 00
2.50	0.987E 00	0.98730E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.997E 00	0.98955E 00
10.00	0.917E 00	0.95660E 00
11.00	0.560E 00	0.14544E 00
12.00	0.314E 00	0.20241E-03
13.00	0.160E 00	0.32060E-05
14.00	0.745E-01	0.67955E-07
15.00	0.320E-01	0.88712E-08
16.00	0.121E-01	0.21325E-08
17.00	0.369E-02	0.20252E-08
18.00	0.764E-03	0.17412E-08
19.00	0.810E-04	0.16807E-08
20.00	0.160E-05	0.16738E-08
21.00	0.000E 00	0.16737E-08

MIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FIELD.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.600	IMAGE DISTANCE IN IN.,P =	0.60535
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0224	BIKINI HGHT,FAR,IN IN.,HF =	-0.0010
BASELINE IN IN., B =	1.20		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,TN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.120E-01	0.32463E-08
1.80	0.102E 00	0.25154E-06
1.90	0.240E 00	0.93376E-04
2.00	0.395E 00	0.70176E-02
2.10	0.576E 00	0.17801E 00
2.20	0.755E 00	0.65626E 00
2.30	0.905E 00	0.95003E 00
2.40	0.985E 00	0.98704E 00
2.50	0.100E 01	0.99000E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.971E 00	0.98304E 00
9.00	0.723E 00	0.60613E 00
10.00	0.449E 00	0.23364E-01
11.00	0.150E 00	0.21245E-05
12.00	0.299E-01	0.77061E-08
13.00	0.216E-02	0.16722E-08
14.00	0.327E-05	0.16740E-08
15.00	0.000E 00	0.16737E-08
16.00	0.000E 00	0.16737E-08
17.00	0.000E 00	0.16737E-08
18.00	0.000E 00	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN [illegible] FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 2.0
XMIT.DECL.IN MRAD,DELTA = 9.9
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.FLDV.FIELD IN MRAD,PSI = 39.9
FOCAL LENGTH IN IN.,F = 0.600
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN = -0.020
BASELINE IN IN., B = 1.20
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 10.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.80533
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0010

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.154E-02	0.16129E-08
1.90	0.470E-01	0.18034E-07
2.00	0.140E 00	0.13623E-05
2.10	0.296E 00	0.46021E-03
2.20	0.465E 00	0.31604E-01
2.30	0.630E 00	0.31787E 00
2.40	0.793E 00	0.79224E 00
2.50	0.922E 00	0.96164E 00
2.60	0.999E 00	0.98786E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.746E 00	0.67234E 00
12.00	0.537E 00	0.10657E 00
13.00	0.368E 00	0.36303E-02
14.00	0.242E 00	0.74985E-04
15.00	0.153E 00	0.23251E-05
16.00	0.921E-01	0.15567E-06
17.00	0.530E-01	0.24129E-07
18.00	0.297E-01	0.76116E-08
19.00	0.161E-01	0.58373E-08
20.00	0.839E-02	0.25791E-08
21.00	0.406E-02	0.20640E-08

22.00	0.177E-02	0.18349E-08
23.00	0.685E-03	0.17341E-08
24.00	0.221E-03	0.16930E-08
25.00	0.559E-04	0.16766E-08
26.00	0.931E-05	0.16745E-08
27.00	0.593E-06	0.16736E-08
28.00	0.151E-05	0.16737E-08
29.00	0.000E 00	0.16737E-08
30.00	0.000E 00	0.16737E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, RF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.800	IMAGE DISTANCE IN IN.,P =	0.80533
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0215	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.15		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.80	0.000E 00	0.16737E-08
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.252E-01	0.60909E-06
1.80	0.126E 00	0.72403E-06
1.90	0.274E 00	0.22170E-03
2.00	0.410E 00	0.10136E-01
2.10	0.585E 00	0.19801E 00
2.20	0.757E 00	0.70214E 00
2.30	0.902E 00	0.94769E 00
2.40	0.983E 00	0.98635E 00
2.50	0.100E 01	0.99000E 00
2.60	0.100E 01	0.99000E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.974E 00	0.98415E 00
10.00	0.807E 00	0.82106E 00
11.00	0.442E 00	0.20239E-01
12.00	0.221E 00	0.34614E-04
13.00	0.523E-01	0.15688E-06
14.00	0.322E-01	0.86530E-06
15.00	0.872E-02	0.26241E-06
16.00	0.143E-02	0.18030E-08
17.00	0.885E-04	0.16814E-08
18.00	0.684E-07	0.16737E-08
19.00	0.000E 00	0.16737E-08
20.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 1ST RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	2.0	FAR RANGE IN FT, FF =	10.0
XMIT.DECL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.800	IMAGE DISTANCE IN IN.,P =	0.80533
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0218	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	1.25		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.[illegible]

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-06
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.000E 00	0.16737E-08
1.80	0.195E-03	0.16907E-08
1.90	0.370E-01	0.10555E-07
2.00	0.128E 00	0.31052E-06
2.10	0.289E 00	0.36167E-03
2.20	0.462E 00	0.30406E-01
2.30	0.635E 00	0.33022E 00
2.40	0.804E 00	0.81360E 00
2.50	0.932E 00	0.96732E 00
2.60	0.994E 00	0.98882E 00
2.70	0.100E 01	0.99000E 00
2.80	0.100E 01	0.99000E 00
2.90	0.100E 01	0.99000E 00
3.00	0.100E 01	0.99000E 00
4.00	0.100E 01	0.99000E 00
5.00	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.999E 00	0.99000E 00
10.00	0.954E 00	0.97729E 00
11.00	0.590E 00	0.20972E 00
12.00	0.333E 00	0.13829E-02
13.00	0.171E 00	0.50106E-05
14.00	0.756E-01	0.71671E-07
15.00	0.290E-01	0.73672E-08
16.00	0.911E-02	0.26767E-08
17.00	0.196E-02	0.18522E-08
18.00	0.213E-03	0.16923E-08
19.00	0.403E-05	0.16741E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08
22.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN = 5.0
XMIT.DECL.IN MRAD,DELTA = 5.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 40.0
FOCAL LENGTH IN IN.,F = 0.560
REC.APERT.HGHT IN IN.,YMAX = 0.200
BIKINI HGHT,NEAR,IN IN.,HN = -0.0150
BASELINE IN IN., B = 3.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 25.
BEAM DIVERG.IN MRAD,SGMA2 = 0.5
XMIT.APERT.DIA.IN IN.,D = 0.3
REC. BLUR IN MRAD,SGMA1 = 0.5
IMAGE DISTANCE IN IN.,P = 0.561
INDEX OF REFRACTION, N = 1.50
BIKINI HGHT,FAR,IN IN.,RF = 0.000
THRESHOLD-TO-NOISE RATIO,THN = 3.96

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.210E-03	0.16920E-08
4.70	0.135E-01	0.33657E-08
4.80	0.586E-01	0.31698E-07
4.90	0.134E 00	0.10539E-05
5.00	0.238E 00	0.65075E-04
5.10	0.381E 00	0.50374E-02
5.20	0.529E 00	0.95267E-01
5.30	0.675E 00	0.45538E 00
5.40	0.804E 00	0.81459E 00
5.50	0.903E 00	0.94852E 00
5.60	0.967E 00	0.98209E 00
5.70	0.996E 00	0.98940E 00
5.80	0.999E 00	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.999E 00	0.98991E 00

25.00	0.987E 00	0.98748E 00
26.00	0.839E 00	0.87619E 00
27.00	0.685E 00	0.46649E 00
28.00	0.540E 00	0.11097E 00
29.00	0.412E 00	0.10416E-01
30.00	0.303E 00	0.56922E-03
31.00	0.214E 00	0.27036E-04
32.00	0.144E 00	0.16169E-05
33.00	0.920E-01	0.10068E-06
34.00	0.570E-01	0.29316E-07
35.00	0.335E-01	0.92135E-08
36.00	0.187E-01	0.42716E-08
37.00	0.980E-02	0.27720E-08
38.00	0.470E-02	0.21341E-08
39.00	0.201E-02	0.18575E-08
40.00	0.734E-03	0.17385E-08
41.00	0.211E-03	0.16921E-08
42.00	0.411E-04	0.16773E-08
43.00	0.335E-05	0.16740E-08
44.00	0.505E-08	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08
53.00	0.000E 00	0.16737E-08
54.00	0.000E 00	0.16737E-08
55.00	0.000E 00	0.16737E-08
56.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN = 5.0
XMIT.DECL.IN MRAD,DELTA = 11.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 39.9
FOCAL LENGTH IN IN.,F = 0.560
REC.APERT.HGHT IN IN.,YMAX = 0.280
BIKINI HGHT,NEAR,IN IN.,HN =-0.0150
BASELINE IN IN., B = 3.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 25.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.56105
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.70	0.000E 00	0.16737E-08
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.201E-04	0.16755E-08
4.50	0.106E-01	0.28902E-08
4.60	0.584E-01	0.31445E-07
4.70	0.144E 00	0.16210E-05
4.80	0.265E 00	0.16452E-03
4.90	0.408E 00	0.95336E-02
5.00	0.539E 00	0.11030E 00
5.10	0.692E 00	0.50807E 00
5.20	0.822E 00	0.84936E 00
5.30	0.919E 00	0.95992E 00
5.40	0.976E 00	0.98520E 00
5.50	0.999E 00	0.98985E 00
5.60	0.100E 01	0.99000E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.999E 00	0.98997E 00
21.00	0.979E 00	0.98527E 00
22.00	0.882E 00	0.97047E 00

23.00	0.728E 00	0.62053E 00
24.00	0.558E 00	0.14150E 00
25.00	0.397E 00	0.64950E-02
26.00	0.214E 00	0.27004E-04
27.00	0.100E 00	0.22870E-06
28.00	0.402E-01	0.17650E-07
29.00	0.131E-01	0.52060E-08
30.00	0.305E-02	0.19599E-08
31.00	0.377E-03	0.17067E-08
32.00	0.834E-05	0.16744E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	5.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.25	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLDV.FIELD IN MRAD,FS1 =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,BN =	-0.0150	BIKINI HGHT,FAR,IN IN.,BF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.529E-05	0.16742E-08
4.60	0.958E-02	0.27422E-08
4.70	0.537E-01	0.29060E-07
4.80	0.133E 00	0.10122E-05
4.90	0.245E 00	0.80945E-04
5.00	0.381E 00	0.56087E-02
5.10	0.539E 00	0.10962E 00
5.20	0.693E 00	0.51261E 00
5.30	0.824E 00	0.85214E 00
5.40	0.920E 00	0.96076E 00
5.50	0.979E 00	0.98545E 00
5.60	0.999E 00	0.98950E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.99000E 00
23.00	0.987E 00	0.98745E 00

24.00	0.922E 00	0.96205E 00
25.00	0.801E 00	0.86936E 00
26.00	0.579E 00	0.18579E 00
27.00	0.392E 00	0.64958E-02
28.00	0.243E 00	0.77253E-04
29.00	0.136E 00	0.11476E-05
30.00	0.696E-01	0.53900E-07
31.00	0.326E-01	0.86623E-08
32.00	0.128E-01	0.37321E-08
33.00	0.409E-02	0.20673E-08
34.00	0.262E-03	0.17500E-08
35.00	0.669E-04	0.16797E-08
36.00	0.214E-07	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	5.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	1.00	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.106E-02	0.17702E-08
4.60	0.203E-01	0.47469E-08
4.70	0.732E-01	0.63971E-07
4.80	0.158E 00	0.28695E-05
4.90	0.270E 00	0.19916E-03
5.00	0.394E 00	0.68422E-02
5.10	0.535E 00	0.10303E 00
5.20	0.673E 00	0.44971E 00
5.30	0.799E 00	0.80359E 00
5.40	0.896E 00	0.94352E 00
5.50	0.962E 00	0.98034E 00
5.60	0.994E 00	0.98888E 00
5.70	0.999E 00	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.999E 00	0.98996E 00
22.00	0.989E 00	0.98780E 00
23.00	0.942E 00	0.97238E 00

24.00	0.852E 00	0.89596E 00
25.00	0.737E 00	0.64784E 00
26.00	0.547E 00	0.12213E 00
27.00	0.393E 00	0.67000E-02
28.00	0.271E 00	0.26308E-03
29.00	0.177E 00	0.62404E-05
30.00	0.108E 00	0.33556E-06
31.00	0.620E-01	0.36583E-07
32.00	0.330E-01	0.93612E-08
33.00	0.171E-01	0.40253E-08
34.00	0.799E-02	0.25272E-08
35.00	0.339E-02	0.19946E-08
36.00	0.127E-02	0.17677E-08
37.00	0.398E-03	0.17066E-08
38.00	0.912E-04	0.16817E-08
39.00	0.115E-04	0.16747E-08
40.00	0.242E-06	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08
53.00	0.000E 00	0.16737E-08
54.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	9.5	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLFV.FIELD IN MRAD,FSI =	39.5	REC. BLUR IN MRAD,SGMA1 =	0.25
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.754E-02	0.24694E-08
4.70	0.515E-01	0.22465E-07
4.80	0.134E 00	0.10291E-05
4.90	0.251E 00	0.10286E-03
5.00	0.386E 00	0.57412E-02
5.10	0.530E 00	0.10669E 00
5.20	0.689E 00	0.49853E 00
5.30	0.823E 00	0.85022E 00
5.40	0.927E 00	0.96162E 00
5.50	0.981E 00	0.98597E 00
5.60	0.995E 00	0.98997E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.99000E 00
23.00	0.992E 00	0.98845E 00

24.00	0.925E 00	0.96227E 00
25.00	0.791E 00	0.76613E 00
26.00	0.570E 00	0.16552E 00
27.00	0.393E 00	0.64052E-02
28.00	0.254E 00	0.11478E-03
29.00	0.145E 00	0.17008E-05
30.00	0.705E-01	0.56288E-07
31.00	0.204E-01	0.71265E-08
32.00	0.879E-02	0.26329E-08
33.00	0.174E-02	0.16321E-08
34.00	0.152E-03	0.16870E-08
35.00	0.533E-06	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, AND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	5.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.5	REC. BLUR IN MRAD,SGMA1 =	1.00
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56103
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.383E-06	0.16737E-08
4.50	0.314E-02	0.19653E-08
4.60	0.258E-01	0.62750E-08
4.70	0.780E-01	0.80226E-07
4.80	0.158E 00	0.26715E-05
4.90	0.262E 00	0.15307E-03
5.00	0.385E 00	0.55236E-02
5.10	0.535E 00	0.10399E 00
5.20	0.676E 00	0.46405E 00
5.30	0.799E 00	0.80455E 00
5.40	0.893E 00	0.94099E 00
5.50	0.958E 00	0.97874E 00
5.60	0.991E 00	0.98820E 00
5.70	0.999E 00	0.98994E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.998E 00	0.98971E 00
22.00	0.981E 00	0.98593E 00
23.00	0.933E 00	0.96798E 00

24.00	0.849E 00	0.99154E 00
25.00	0.738E 00	0.65169E 00
26.00	0.546E 00	0.12092E 00
27.00	0.367E 00	0.56209E-02
28.00	0.264E 00	0.15966E-03
29.00	0.173E 00	0.53586E-05
30.00	0.110E 00	0.35516E-06
31.00	0.665E-01	0.51171E-07
32.00	0.416E-01	0.13940E-07
33.00	0.249E-01	0.59610E-08
34.00	0.143E-01	0.34963E-08
35.00	0.798E-02	0.25122E-08
36.00	0.407E-02	0.20655E-08
37.00	0.193E-02	0.18492E-08
38.00	0.916E-03	0.17459E-08
39.00	0.290E-03	0.16990E-08
40.00	0.799E-04	0.16807E-08
41.00	0.143E-04	0.16750E-08
42.00	0.937E-06	0.16738E-08
43.00	0.940E-10	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08
53.00	0.000E 00	0.16737E-08
54.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56005
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	[illegible]
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.927E-03	0.17560E-08
4.50	0.211E-01	0.49291E-08
4.60	0.719E-01	0.60243E-07
4.70	0.150E 00	0.20491E-05
4.80	0.251E 00	0.10344E-03
4.90	0.372E 00	0.39505E-02
5.00	0.501E 00	0.60726E-01
5.10	0.647E 00	0.36906E 00
5.20	0.771E 00	0.74083E 00
5.30	0.870E 00	0.91727E 00
5.40	0.940E 00	0.97161E 00
5.50	0.983E 00	0.98653E 00
5.60	0.999E 00	0.98987E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.999E 00	0.98979E 00
21.00	0.981E 00	0.98598E 00
22.00	0.926E 00	0.96435E 00
23.00	0.804E 00	0.81505E 00

24.00	0.68[illegible]E 00	0.49172E 00
25.00	0.528E 00	0.93387E-01
26.00	0.334E 00	0.14152E-02
27.00	0.193E 00	0.11930E-04
28.00	0.908E-01	0.21220E-06
29.00	0.420E-01	0.14067E-07
30.00	0.134E-01	0.34463E-08
31.00	0.276E-02	0.19311E-08
32.00	0.243E-03	0.16950E-08
33.00	0.795E-06	0.16738E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

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NEAR RANGE IN FT, RN =                  5.0     FAR RANGE IN FT, RF =                 25.
XMIT.DECL.IN MRAD,DELTA =              10.0     BEAM DIVERG.IN MRAD,SGMA2 =           0.5
XMIT. BLUR IN MRAD,SGMA3 =             0.50     XMIT.APERT.DIA.IN IN.,D =             0.3
REC.FLEV.FIELD IN MRAD,PSI =           40.0     REC. BLUR IN MRAD,SGMA1 =             0.5
FOCAL LENGTH IN IN.,F =               0.560     IMAGE DISTANCE IN IN.,P =          0.5620
REC.APERT.HGHT IN IN.,YMAX =          0.200     INDEX OF REFRACTION, N =             1.50
BIKINI HGHT,NEAR,IN IN.,HN =-0.0150     BIKINI HGHT,FAR,IN IN.,HF =         0.000
BASELINE IN IN., B =                   3.00
SIGNAL-TO-NOISE RATIO,SN =            6.540     THRESHOLD-TO-NOISE RATIO,THN = 3.96
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RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.171E-09	0.16737E-08
4.70	0.525E-02	0.21545E-08
4.80	0.476E-01	0.18529E-07
4.90	0.139E 00	0.13058E-05
5.00	0.271E 00	0.20088E-03
5.10	0.421E 00	0.12761E-01
5.20	0.569E 00	0.16491E 00
5.30	0.717E 00	0.56698E 00
5.40	0.855E 00	0.89900E 00
5.50	0.953E 00	0.97697E 00
5.60	0.996E 00	0.98930E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.995E 00	0.98993E 00
23.00	0.989E 00	0.98783E 00

24.00	0.953E 00	0.97695E 00
25.00	0.891E 00	0.93655E 00
26.00	0.719E 00	0.59375E 00
27.00	0.566E 00	0.15772E 00
28.00	0.433E 00	0.16503E-01
29.00	0.321E 00	0.98726E-03
30.00	0.233E 00	0.55104E-04
31.00	0.167E 00	0.41907E-05
32.00	0.117E 00	0.50496E-06
33.00	0.826E-01	0.97301E-07
34.00	0.562E-01	0.28754E-07
35.00	0.378E-01	0.11414E-07
36.00	0.248E-01	0.59506E-08
37.00	0.157E-01	0.37635E-08
38.00	0.964E-02	0.27456E-08
39.00	0.566E-02	0.22346E-08
40.00	0.306E-02	0.19605E-08
41.00	0.155E-02	0.18136E-08
42.00	0.714E-03	0.17367E-08
43.00	0.288E-03	0.16969E-08
44.00	0.972E-04	0.16822E-08
45.00	0.247E-04	0.16759E-08
46.00	0.370E-05	0.16741E-08
47.00	0.133E-06	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,FSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0160	BIKINI HGHT,FAR,IN IN.,RF =	[illegible]
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.114E-02	0.17757E-08
4.40	0.299E-01	0.77032E-06
4.50	0.105E 00	0.28651E-06
4.60	0.223E 00	0.98380E-04
4.70	0.379E 00	0.47097E-02
4.80	0.538E 00	0.10881E 00
4.90	0.677E 00	0.46145E 00
5.00	0.783E 00	0.76855E 00
5.10	0.894E 00	0.94164E 00
5.20	0.967E 00	0.98184E 00
5.30	0.997E 00	0.98956E 00
5.40	0.100E 01	0.99000E 00
5.50	0.100E 01	0.99000E 00
5.60	0.100E 01	0.99000E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.995E 00	0.98922E 00
19.00	0.903E 00	0.94690E 00
20.00	0.703E 00	0.54422E 00
21.00	0.487E 00	0.47476E-01
22.00	0.282E 00	0.29050E-03
23.00	0.110E 00	0.51754E-06

24.00	0.330E-01	0.92530E-08
25.00	0.533E-02	0.22045E-08
26.00	0.164E-03	0.16861E-08
27.00	0.000E 00	0.16737E-08
28.00	0.000E 00	0.16737E-08
29.00	0.000E 00	0.16737E-08
30.00	0.000E 00	0.16737E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN = 5.0
XMIT.DECL.IN MRAD,DELTA = 9.5
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 39.5
FOCAL LENGTH IN IN.,F = 0.560
REC.APERT.HGHT IN IN.,YMAX = 0.280
BIKINI HGHT,NEAR,IN IN.,HN = -0.0141
BASELINE IN IN., B = 3.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 25.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 0.56105
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,RF = +0.0010

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.000E 00	0.16737E-08
4.70	0.000E 00	0.16737E-08
4.80	0.172E-02	0.14294E-08
4.90	0.220E-01	0.51734E-08
5.00	0.694E-01	0.53419E-07
5.10	0.150E 00	0.21185E-05
5.20	0.266E 00	0.17516E-03
5.30	0.407E 00	0.93109E-02
5.40	0.548E 00	0.12506E 00
5.50	0.687E 00	0.49413E 00
5.60	0.810E 00	0.82564E 00
5.70	0.904E 00	0.94527E 00
5.80	0.966E 00	0.98171E 00
5.90	0.996E 00	0.98923E 00
6.00	0.999E 00	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00

24.00	0.100E 01	0.95000E 00
25.00	0.100E 01	0.95000E 00
26.00	0.868E 00	0.92158E 00
27.00	0.793E 00	0.79214E 00
28.00	0.711E 00	0.56986E 00
29.00	0.639E 00	0.34866E 00
30.00	0.572E 00	0.16992E 00
31.00	0.505E 00	0.65467E-01
32.00	0.440E 00	0.19212E-01
33.00	0.376E 00	0.44479E-02
34.00	0.317E 00	0.67611E-03
35.00	0.264E 00	0.15975E-03
36.00	0.216E 00	0.29202E-04
37.00	0.174E 00	0.57142E-05
38.00	0.138E 00	0.12602E-05
39.00	0.102E 00	0.32663E-06
40.00	0.831E-01	0.10249E-06
41.00	0.630E-01	0.39202E-07
42.00	0.471E-01	0.16111E-07
43.00	0.349E-01	0.98613E-08
44.00	0.256E-01	0.61923E-08
45.00	0.185E-01	0.43361E-08
46.00	0.132E-01	0.33137E-08
47.00	0.936E-02	0.27114E-08
48.00	0.649E-02	0.23390E-08
49.00	0.440E-02	0.21014E-08
50.00	0.292E-02	0.19468E-08
51.00	0.189E-02	0.18456E-08
52.00	0.118E-02	0.17795E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,FSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	2.94		
SIGNAL-TO-NOISE RATIO,SN =	6.541	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.70	0.000E 00	0.16737E-08
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.865E-05	0.16745E-08
4.50	0.884E-02	0.26397E-08
4.60	0.525E-01	0.23566E-07
4.70	0.132E 00	0.57930E-06
4.80	0.246E 00	0.86366E-04
4.90	0.384E 00	0.53552E-02
5.00	0.514E 00	0.74873E-01
5.10	0.664E 00	0.42093E 00
5.20	0.796E 00	0.80200E 00
5.30	0.900E 00	0.94664E 00
5.40	0.967E 00	0.98200E 00
5.50	0.997E 00	0.98945E 00
5.60	0.100E 01	0.99000E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.999E 00	0.99000E 00
22.00	0.995E 00	0.98912E 00

23.00	0.953E 00	0.97694E 00
24.00	0.853E 00	0.89724E 00
25.00	0.719E 00	0.59406E 00
26.00	0.510E 00	0.70542E-01
27.00	0.342E 00	0.17691E-02
28.00	0.211E 00	0.24556E-04
29.00	0.119E 00	0.54497E-06
30.00	0.617E-01	0.36847E-07
31.00	0.289E-01	0.73340E-08
32.00	0.120E-01	0.31032E-08
33.00	0.414E-02	0.26729E-08
34.00	0.107E-02	0.17691E-08
35.00	0.169E-03	0.16858E-08
36.00	0.829E-05	0.16744E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56195
REC.APERT.HGHT IN IN.,YMAX =	0.200	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.NEAR.IN IN.,HN =	-0.0150	BIKINI HGHT.FAR.IN IN.,RF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.416E-03	0.17101E-08
4.70	0.170E-01	0.40137E-08
4.80	0.673E-01	0.46266E-07
4.90	0.149E 00	[illegible]
5.00	0.261E 00	0.14467E-03
5.10	0.410E 00	0.99992E-02
5.20	0.561E 00	0.14787E 00
5.30	0.706E 00	0.55897E 00
5.40	0.832E 00	0.86642E 00
5.50	0.924E 00	0.97307E 00
5.60	0.980E 00	0.98565E 00
5.70	0.999E 00	0.98987E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.98999E 00
23.00	0.990E 00	0.98605E 00
24.00	0.937E 00	0.96994E 00

25.00	0.832E 00	0.86660E 00
26.00	0.622E 00	0.29323E 00
27.00	0.442E 00	0.20313E-01
28.00	0.297E 00	0.47494E-03
29.00	0.185E 00	0.88051E-05
30.00	0.106E 00	0.29724E-06
31.00	0.560E-01	0.27939E-07
32.00	0.270E-01	0.66690E-08
33.00	0.112E-01	0.30505E-08
34.00	0.426E-02	0.20655E-08
35.00	0.120E-02	0.17834E-08
36.00	0.224E-03	0.16933E-08
37.00	0.171E-04	0.16752E-08
38.00	0.174E-07	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.30
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	40.0	REC. BLUR IN MRAD,SGMA1 =	0.30
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.12410
REC.APERT.HGHT IN IN.,YMAX =	0.260	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0300	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.208E-05	0.16739E-08
4.70	0.756E-02	0.24712E-08
4.80	0.487E-01	0.19611E-07
4.90	0.123E 00	0.64546E-06
5.00	0.226E 00	0.41429E-04
5.10	0.367E 00	0.35856E-02
5.20	0.515E 00	0.76904E-01
5.30	0.662E 00	0.41405E 00
5.40	0.796E 00	0.79791E 00
5.50	0.898E 00	0.94452E 00
5.60	0.964E 00	0.98104E 00
5.70	0.995E 00	0.98920E 00
5.80	0.999E 00	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.999E 00	0.98992E 00

25.00	0.980E 00	0.98755E 00
26.00	0.841E 00	0.87922E 00
27.00	0.688E 00	0.45718E 00
28.00	0.543E 00	0.11536E 00
29.00	0.412E 00	0.16740E-01
30.00	0.304E 00	0.57658E-03
31.00	0.214E 00	0.27352E-04
32.00	0.144E 00	0.16274E-05
33.00	0.926E-01	0.15946E-06
34.00	0.563E-01	0.26463E-07
35.00	0.323E-01	0.87019E-08
36.00	0.173E-01	0.46653E-08
37.00	0.841E-02	0.25615E-08
38.00	0.362E-02	0.20176E-08
39.00	0.132E-02	0.17921E-08
40.00	0.380E-03	0.17070E-08
41.00	0.742E-04	0.16502E-08
42.00	0.612E-05	0.16742E-08
43.00	0.105E-07	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08
53.00	0.000E 00	0.16737E-08
54.00	0.000E 00	0.16737E-08
55.00	0.000E 00	0.16737E-08
56.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	11.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.1241
REC.APERT.HGHT IN IN.,YMAX =	0.260	INDEX OF REFRACTION, N =	1.001
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0260	BIKINI HGHT,FAR,IN IN.,HF =	0.000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,HN =	3.65

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.70	0.000E 00	0.16737E-08
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.498E-02	0.21645E-06
4.60	0.476E-01	0.11507E-07
4.70	0.132E 00	0.94402E-06
4.80	0.251E 00	0.10228E-03
4.90	0.393E 00	0.67465E-02
5.00	0.526E 00	0.69580E-01
5.10	0.679E 00	0.46874E 00
5.20	0.815E 00	0.83656E 00
5.30	0.915E 00	0.95704E 00
5.40	0.976E 00	0.98446E 00
5.50	0.998E 00	0.98578E 00
5.60	0.100E 01	0.99000E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.999E 00	0.98997E 00
21.00	0.979E 00	0.98552E 00
22.00	0.886E 00	0.93405E 00

23.00	0.730E 00	0.62765E 00
24.00	0.558E 00	0.14322E 00
25.00	0.392E 00	0.61245E-02
26.00	0.214E 00	0.27423E-04
27.00	0.996E-01	0.22027E-06
28.00	0.378E-01	0.11469E-07
29.00	0.108E-01	0.29254E-08
30.00	0.194E-02	0.17505E-08
31.00	0.133E-03	0.16653E-08
32.00	0.658E-07	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	1.25	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.40
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.12416
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.001
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0300	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.963

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.425E-02	0.20647E-08
4.70	0.433E-01	0.15019E-07
4.80	0.121E 00	0.59545E-06
4.90	0.232E 00	0.52664E-04
5.00	0.367E 00	0.34696E-02
5.10	0.525E 00	0.80549E-01
5.20	0.681E 00	0.47269E 00
5.30	0.817E 00	0.83933E 00
5.40	0.916E 00	0.95708E 00
5.50	0.976E 00	0.98471E 00
5.60	0.999E 00	0.98982E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.99000E 00
23.00	0.988E 00	0.98758E 00

24.00	0.926E 00	0.96391E 00
25.00	0.806E 00	0.81902E 00
26.00	0.561E 00	0.19077E 00
27.00	0.392E 00	0.66069E-02
28.00	0.243E 00	0.74595E-04
29.00	0.136E 00	0.11429E-05
30.00	0.634E-01	0.50066E-07
31.00	0.294E-01	0.76500E-08
32.00	0.105E-01	0.24006E-08
33.00	0.269E-02	0.19237E-08
34.00	0.345E-03	0.17039E-08
35.00	0.575E-05	0.16742E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16747E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 5.0
FAR RANGE IN FT, RF = 25.0
XMIT.OFFS.IN MRAD,DELTA = 9.5
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT. BLUR IN MRAD,SGMA3 = 1.00
XMIT.APERT.DIA.IN IN.,D = 0.30
REC.ELEV.FIELD IN MRAD,PSI = 35.9
REC. BLUR IN MRAD,SGMA1 = 0.50
FOCAL LENGTH IN IN.,F = 1.120
IMAGE DISTANCE IN IN.,P = 1.1241
REC.APERT.HGHT IN IN.,YMAX = 0.200
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,NEAR,IN IN.,HN =-0.0200
BIKINI HGHT,FAR,IN IN.,HF = 0.0000
BASELINE IN IN., B = 3.00
SIGNAL-TO-NOISE RATIO,SN = 6.540
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.191E-03	0.16904E-08
4.60	0.133E-01	0.33286E-08
4.70	0.630E-01	0.39160E-07
4.80	0.146E 00	0.17690E-05
4.90	0.258E 00	0.12543E-03
5.00	0.361E 00	0.49914E-02
5.10	0.522E 00	0.84940E-01
5.20	0.661E 00	0.41091E 00
5.30	0.791E 00	0.78589E 00
5.40	0.892E 00	0.93929E 00
5.50	0.959E 00	0.97923E 00
5.60	0.993E 00	0.98863E 00
5.70	0.999E 00	0.98999E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.999E 00	0.98998E 00
22.00	0.989E 00	0.98791E 00
23.00	0.944E 00	0.97328E 00

24.00	0.855E 00	0.89555E 00
25.00	0.739E 00	0.65350E 00
26.00	0.548E 00	0.12363E 00
27.00	0.393E 00	0.67617E-02
28.00	0.271E 00	0.20583E-03
29.00	0.177E 00	0.63578E-05
30.00	0.108E 00	0.33315E-06
31.00	0.619E-01	0.37314E-07
32.00	0.327E-01	0.86559E-08
33.00	0.158E-01	0.37634E-08
34.00	0.695E-02	0.23961E-08
35.00	0.266E-02	0.19223E-08
36.00	0.867E-03	0.17505E-08
37.00	0.213E-03	0.16923E-08
38.00	0.310E-04	0.16764E-08
39.00	0.112E-05	0.16738E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08
53.00	0.000E 00	0.16737E-08
54.00	0.000E 00	0.16737E-08

BIKINI BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.2[illegible]
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.12418
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.NEAR,IN IN.,HN =	-0.0300	BIKINI HGHT.FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	0.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.294E-02	0.19452E-08
4.70	0.413E-01	0.13564E-07
4.80	0.121E 00	0.59437E-06
4.90	0.237E 00	0.61906E-04
5.00	0.372E 00	0.39730E-02
5.10	0.524E 00	0.87420E-01
5.20	0.674E 00	0.45229E 00
5.30	0.814E 00	0.83376E 00
5.40	0.916E 00	0.9[illegible]825E 00
5.50	0.974E 00	0.98522E 00
5.60	0.999E 00	0.98993E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.9[illegible]E 00	0.9[illegible]51E 00

24.00	0.924E 00	0.96314E 00
25.00	0.791E 00	0.77646E 00
26.00	0.565E 00	0.16413E 00
27.00	0.39[illegible]E 00	0.66995E-02
28.00	0.255E 00	0.11221E-03
29.00	0.145E 00	0.16519E-05
30.00	0.695E-01	0.53627E-07
31.00	0.269E-01	0.66116E-08
32.00	0.745E-02	0.24576E-08
33.00	0.115E-02	0.17766E-08
34.00	0.49[illegible]E-04	0.16761E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08

BIN BOUND,RY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 5.0
XMIT.DECL.IN MRAD,DELTA = 5.9
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 39.5
FOCAL LENGTH IN IN.,F = 1.120
REC.APERT.HGHT IN IN.,YMAX = 0.200
BINARI HGHT,NEAR,IN IN.,HN =-0.0300
BASELINE IN IN., L = 3.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 25.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 1.00
IMAGE DISTANCE IN IN.,P = 1.12410
INDEX OF REFRACTION, N = 1.50
BINARI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.860E-03	0.17458E-08
4.60	0.176E-01	0.41367E-08
4.70	0.673E-01	0.48254E-07
4.80	0.147E 00	0.11120E-05
4.90	0.251E 00	0.10372E-03
5.00	0.372E 00	0.40799E-02
5.10	0.523E 00	0.66914E-01
5.20	0.669E 00	0.43715E 00
5.30	0.795E 00	0.79491E 00
5.40	0.890E 00	0.92002E 00
5.50	0.955E 00	0.97775E 00
5.60	0.989E 00	0.98792E 00
5.70	0.999E 00	0.98991E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.996E 00	0.98972E 00
22.00	0.982E 00	0.98017E 00
23.00	0.937E 00	0.96972E 00

24.00	0.856E 00	0.90122E 00
25.00	0.748E 00	0.67804E 00
26.00	0.554E 00	0.13422E 00
27.00	0.392E 00	0.60129E-02
28.00	0.266E 00	0.17452E-03
29.00	0.174E 00	0.51607E-05
30.00	0.109E 00	0.34566E-06
31.00	0.666E-01	0.46661E-07
32.00	0.390E-01	0.12143E-07
33.00	0.213E-01	0.31546E-08
34.00	0.117E-01	0.30626E-08
35.00	0.585E-02	0.22642E-08
36.00	0.265E-02	0.19195E-08
37.00	0.104E-02	0.17665E-08
38.00	0.333E-03	0.17022E-08
39.00	0.773E-04	0.16804E-08
40.00	0.974E-05	0.16759E-08
41.00	0.197E-06	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08
53.00	0.000E 00	0.16737E-08
54.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.EFFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BEAM IN MRAD,SGMA3 =	0.10	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	39.5	REC. FIELD IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.1231
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0200	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.54	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.135E-03	0.16855E-08
4.60	0.155E-01	0.37963E-08
4.70	0.700E-01	0.51564E-07
4.80	0.157E 00	0.27998E-05
4.90	0.272E 00	0.20671E-03
5.00	0.403E 00	0.65240E-02
5.10	0.555E 00	0.13727E 00
5.20	0.704E 00	0.54594E 00
5.30	0.828E 00	0.85913E 00
5.40	0.919E 00	0.95563E 00
5.50	0.975E 00	0.98436E 00
5.60	0.998E 00	0.98969E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.995E 00	0.98976E 00
23.00	0.966E 00	0.98721E 00

24.00	0.866E 00	0.91667E 00
25.00	0.724E 00	0.60917E 00
26.00	0.509E 00	[illegible]
27.00	0.330E 00	0.26604E-02
28.00	0.207E 00	0.19053E-04
29.00	0.109E 00	0.32668E-06
30.00	0.484E-01	0.19219E-07
31.00	0.176E-01	0.41427E-08
32.00	0.490E-02	0.21554E-08
33.00	0.864E-03	0.17503E-08
34.00	0.580E-04	0.16786E-08
35.00	0.204E-07	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIF POLIT, RY FUNCTION, AND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, FF =	25.0
XMIT.APERT.IN MRAD,DELTA =	9.9	BEAM LIVING.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FIELD.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.1251
REC.APERT.HGHT IN IN.,YMAX =	0.260	INDEX OF REFRACTION, N =	1.531
BIKINI HGHT, NEAR,IN IN.,HN =	-0.0300	BIKINI HGHT.FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.166E-02	0.16246E-08
4.70	0.316E-01	0.63973E-08
4.80	0.103E 00	0.25964E-06
4.90	0.210E 00	0.22607E-04
5.00	0.341E 00	0.17160E-02
5.10	0.492E 00	0.52087E-01
5.20	0.642E 00	0.35201E 00
5.30	0.765E 00	0.77247E 00
5.40	0.899E 00	0.94245E 00
5.50	0.966E 00	0.98166E 00
5.60	0.997E 00	0.98945E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.994E 00	0.98961E 00
23.00	0.982E 00	0.98625E 00

24.00	0.924E 00	0.96314E 00
25.00	0.826E 00	0.85560E 00
26.00	0.622E 00	0.25521E 00
27.00	0.447E 00	0.22195E-01
28.00	0.304E 00	0.57650E-03
29.00	0.194E 00	0.12724E-04
30.00	0.117E 00	0.50414E-06
31.00	0.673E-01	0.46247E-07
32.00	0.356E-01	0.10231E-07
33.00	0.169E-01	0.39914E-08
34.00	0.695E-02	0.23958E-08
35.00	0.233E-02	0.18602E-08
36.00	0.576E-03	0.17244E-08
37.00	0.837E-04	0.16616E-08
38.00	0.301E-05	0.16740E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, RANGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM LEVELS.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,FSI =	39.5	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.12418
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	[illegible]	BIKINI HGHT,FAR,IN IN.,HF =	-1.0016
BASELINE IN IN., B =	5.00		
SIGNAL-TO-NOISE RATIO,SN =	6.546	THRESHOLD-TO-NOISE RATIO,THN =	2.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.152E-04	0.16750E-08
4.50	0.130E-01	0.32717E-08
4.60	0.705E-01	0.56287E-07
4.70	0.169E 00	0.45101E-05
4.80	0.301E 00	0.52671E-03
4.90	0.447E 00	0.22374E-01
5.00	0.577E 00	0.18120E 00
5.10	0.729E 00	0.62482E 00
5.20	0.854E 00	0.89242E 00
5.30	0.941E 00	0.97170E 00
5.40	0.988E 00	0.98764E 00
5.50	0.999E 00	0.98999E 00
5.60	0.100E 01	0.99000E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.995E 00	0.98964E 00
21.00	0.931E 00	0.96896E 00
22.00	0.783E 00	0.76590E 00
23.00	0.604E 00	0.24411E 00

24.00	0.427E 00	0.145[illegible]2E-01
25.00	0.263E 00	0.15334E-03
26.00	0.112E 00	0.51[illegible]30E-06
27.00	0.424E-01	0.143[illegible]0E-07
28.00	0.108E-01	0.292[illegible]8E-08
29.00	0.154E-02	0.16125E-08
30.00	0.557E-04	0.167[illegible]E-08
31.00	0.000E 00	0.16737E-08
32.00	0.000E 00	0.16737E-08
33.00	0.000E 00	0.16737E-08
34.00	0.000E 00	0.16737E-08
35.00	0.000E 00	0.16737E-08
36.00	0.000E 00	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, AND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DEFL.IN MRAD,DELTA =	9.9	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	1.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLDV.FIELD IN MRAD,PSI =	39.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.121	IMAGE DISTANCE IN IN.,P =	1.12410
REC.APERT.HGHT IN IN.,YMAX =	0.220	INDEX OF REFRACTION, N =	1.501
MINIMUM HGHT,NEAR,IN IN.,HN =	[illegible]	MINIMUM HGHT,FAR,IN IN.,HF =	0.0010
BASELINE IN IN., B =	2.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-06
3.90	0.000E 00	0.16737E-06
4.00	0.000E 00	0.16737E-06
4.10	0.000E 00	0.16737E-06
4.20	0.000E 00	0.16737E-06
4.30	0.000E 00	0.16737E-06
4.40	0.000E 00	0.16737E-06
4.50	0.000E 00	0.16737E-06
4.60	0.000E 00	0.16737E-06
4.70	0.226E-02	0.18016E-06
4.80	0.303E-01	0.79476E-06
4.90	0.980E-01	0.16213E-06
5.00	0.184E 00	0.83044E-05
5.10	0.315E 00	0.82611E-03
5.20	0.462E 00	0.30290E-01
5.30	0.609E 00	0.25658E 00
5.40	0.749E 00	0.66097E 00
5.50	0.866E 00	0.91928E 00
5.60	0.942E 00	0.97750E 00
5.70	0.987E 00	0.98743E 00
5.80	0.999E 00	0.98996E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00

24.00	0.100E 01	0.99000E 00
25.00	0.996E 00	0.9[illegible]579E 00
26.00	0.879E 00	0.[illegible]371E 00
27.00	0.740E 00	0.67933E 00
28.00	0.619E 00	0.2[illegible]E 00
29.00	0.495E 00	0.3[illegible]E-01
30.00	0.385E 00	0.5[illegible]E-02
31.00	0.290E 00	0.377[illegible]E-03
32.00	0.211E 00	0.2[illegible]444E-04
33.00	0.144E 00	0.1[illegible]32[illegible]E-05
34.00	0.100E 00	0.2[illegible]E-06
35.00	0.649E-01	0.4[illegible]00[illegible]E-07
36.00	0.403E-01	0.1[illegible]531E-07
37.00	0.238E-01	0.[illegible]E-08
38.00	0.132E-01	0.3[illegible]E-08
39.00	0.679E-02	0.2[illegible]757E-08
40.00	0.315E-02	0.19[illegible]99E-08
41.00	0.120E-02	0.17[illegible]E-08
42.00	0.436E-03	0.17121E-08
43.00	0.114E-03	0.16[illegible]E-08
44.00	0.181E-04	0.16753E-08
45.00	0.813E-06	0.16738E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN = 5.0
XMIT.DECL.IN MRAD,DELTA = 9.5
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.FLDV.FIELD IN MRAD,PSI = 39.9
FOCAL LENGTH IN IN.,F = 1.120
REC.APERT.HGHT IN IN.,YMAX = 0.260
BIKINI HGHT,NEAR,IN IN.,HN =-0.0300
BASLINE IN IN., B = 2.55
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT, RF = 25.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 1.12418
INDEX OF REFRACTION, R = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000
THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAL.OF DETECTION
3.70	0.000E 00	0.16737E-08
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.360E-02	0.20376E-08
4.60	0.419E-01	0.14026E-07
4.70	0.120E 00	0.56965E-06
4.80	0.232E 00	0.53235E-04
4.90	0.365E 00	0.36991E-02
5.00	0.500E 00	0.59716E-01
5.10	0.651E 00	0.37997E 00
5.20	0.790E 00	0.78476E 00
5.30	0.895E 00	0.94261E 00
5.40	0.964E 00	0.98098E 00
5.50	0.996E 00	0.98926E 00
5.60	0.999E 00	0.99000E 00
5.70	0.100E 01	0.99000E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.999E 00	0.99000E 00
22.00	0.995E 00	0.98916E 00

23.00	0.955E 00	0.97771E 00
24.00	0.857E 00	0.91249E 00
25.00	0.722E 00	0.68216E 00
26.00	0.511E 00	0.71602E-01
27.00	0.342E 00	0.17985E-02
28.00	0.212E 00	0.26916E-04
29.00	0.119E 00	0.56044E-06
30.00	0.60[illegible]E-01	0.34645E-07
31.00	0.270E-01	0.66547E-08
32.00	0.101E-01	0.26172E-08
33.00	0.292E-02	0.19470E-08
34.00	0.561E-03	0.17231E-08
35.00	0.467E-04	0.16778E-08
36.00	0.111E-06	0.16737E-08
37.00	0.000E 00	0.16737E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08

MIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	9.5	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMAS =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	35.9	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	1.120	IMAGE DISTANCE IN IN.,P =	1.12418
REC.APERT.LGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0200	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	4.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB.OF DETECTION
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.000E 00	0.16737E-08
4.60	0.149E-04	0.16750E-08
4.70	0.103E-01	0.28465E-08
4.80	0.571E-01	0.29556E-07
4.90	0.138E 00	0.12477E-05
5.00	0.246E 00	0.52854E-04
5.10	0.396E 00	0.72213E-02
5.20	0.547E 00	0.12266E 00
5.30	0.696E 00	0.52113E 00
5.40	0.825E 00	0.85482E 00
5.50	0.920E 00	0.96035E 00
5.60	0.977E 00	0.98495E 00
5.70	0.998E 00	0.98979E 00
5.80	0.100E 01	0.99000E 00
5.90	0.100E 01	0.99000E 00
6.00	0.100E 01	0.99000E 00
7.00	0.100E 01	0.99000E 00
8.00	0.100E 01	0.99000E 00
9.00	0.100E 01	0.99000E 00
10.00	0.100E 01	0.99000E 00
11.00	0.100E 01	0.99000E 00
12.00	0.100E 01	0.99000E 00
13.00	0.100E 01	0.99000E 00
14.00	0.100E 01	0.99000E 00
15.00	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.999E 00	0.98995E 00
23.00	0.990E 00	0.98134E 00
24.00	0.940E 00	0.97116E 00

25.00	0.837E 00	0.[illegible]312E 00
26.00	0.624E 00	0.259[illegible]E 00
27.00	0.44[illegible]E 00	0.2[illegible]4[illegible]E-01
28.00	0.29[illegible]E 00	0.4[illegible]243E-03
29.00	0.10[illegible]E 00	0.[illegible]9078E-05
30.00	0.103E 00	0.2937[illegible]E-0[illegible]
31.00	0.549E-01	0.[illegible]451E-07
32.00	0.252E-01	0.[illegible]903E-06
33.00	0.989E-02	0.7[illegible]1E-03
34.00	0.30[illegible]E-02	0.1[illegible]1E-06
35.00	0.661E-03	0.17[illegible]0E-06
36.00	0.721E-04	0.1[illegible]0E-06
37.00	0.840E-05	0.1[illegible]73[illegible]E-0[illegible]
38.00	0.000E 00	0.1[illegible]7[illegible]7E-0[illegible]
39.00	0.000E 00	0.1[illegible]737E-0[illegible]
40.00	0.000E 00	0.1[illegible]737E-08
41.00	0.000E 00	0.1[illegible]7[illegible]7E-0[illegible]
42.00	0.000E 00	0.1[illegible]737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

BIN PRIMARY REFLECTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.EFFL.IN MRAD,DELTA =	5.1	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLD.FIELD IN MRAD,FSI =	22.2	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25844
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.,NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT.FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.70	0.546E-01	0.24866E-07
13.80	0.725E-01	0.61903E-07
13.90	0.941E-01	0.17048E-06
14.00	0.112E 00	0.51103E-06
14.10	0.144E 00	0.16306E-05
14.20	0.175E 00	0.54831E-05
14.30	0.205E 00	0.16836E-04
14.40	0.236E 00	0.64949E-04
14.50	0.273E 00	0.21970E-03
14.60	0.310E 00	0.70974E-03
14.70	0.347E 00	0.21301E-02
14.80	0.387E 00	0.56166E-02
14.90	0.426E 00	0.14224E-01
15.00	0.469E 00	0.31136E-01
15.10	0.511E 00	0.72156E-01
15.20	0.560E 00	0.14587E 00
15.30	0.608E 00	0.25630E 00
15.40	0.659E 00	0.39330E 00
15.50	0.700E 00	0.52572E 00
15.60	0.743E 00	0.66340E 00
15.70	0.782E 00	0.76564E 00
15.80	0.819E 00	0.84104E 00
15.90	0.850E 00	0.89345E 00
16.00	0.880E 00	0.92646E 00
17.00	0.992E 00	0.97959E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00

33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.100E 01	0.99000E 00
45.00	0.100E 01	0.99000E 00
46.00	0.100E 01	0.99000E 00
47.00	0.999E 00	0.99000E 00
48.00	0.999E 00	0.99992E 00
49.00	0.996E 00	0.98539E 00
50.00	0.989E 00	0.98775E 00
51.00	0.917E 00	0.91882E 00
52.00	0.844E 00	0.80466E 00
53.00	0.771E 00	0.73982E 00
54.00	0.690E 00	0.52894E 00
55.00	0.620E 00	0.31010E 00
56.00	0.560E 00	0.14615E 00
57.00	0.496E 00	0.55692E-01
58.00	0.435E 00	0.17588E-01
59.00	0.379E 00	0.47922E-02
60.00	0.328E 00	0.11854E-02
61.00	0.281E 00	0.26175E-03
62.00	0.239E 00	0.60074E-04
63.00	0.203E 00	0.17530E-04
64.00	0.171E 00	0.49799E-05
65.00	0.144E 00	0.15912E-05
66.00	0.120E 00	0.57601E-06
67.00	0.101E 00	0.23568E-06
68.00	0.843E-01	0.10822E-06
69.00	0.701E-01	0.55242E-07
70.00	0.581E-01	0.31012E-07
71.00	0.480E-01	0.18941E-07
72.00	0.395E-01	0.12454E-07
73.00	0.324E-01	0.97321E-08
74.00	0.264E-01	0.64717E-08
75.00	0.215E-01	0.50317E-08
76.00	0.173E-01	0.40765E-08
77.00	0.139E-01	0.34213E-08
78.00	0.110E-01	0.29595E-08
79.00	0.875E-02	0.26268E-08
80.00	0.685E-02	0.23832E-08
81.00	0.531E-02	0.22023E-08
82.00	0.408E-02	0.20670E-08
83.00	0.310E-02	0.19651E-08
84.00	0.233E-02	0.18882E-08
85.00	0.172E-02	0.18302E-08
86.00	0.126E-02	0.17867E-08
87.00	0.907E-03	0.17541E-08
88.00	0.634E-03	0.17300E-08
89.00	0.441E-03	0.17124E-08

// XEQ [illegible]

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.
XMIT.DECL.IN MRAD,DELTA =	11.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.3
REC.ELEV.FIELD IN MRAD,FSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.5
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.5
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT,FAR,IN IN.,RF =	0.00
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.9

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
12.90	0.742E-01	0.67265E-07
13.00	0.100E 00	0.22669E-06
13.10	0.129E 00	0.85622E-06
13.20	0.162E 00	0.35076E-05
13.30	0.199E 00	0.15069E-04
13.40	0.238E 00	0.65562E-04
13.50	0.281E 00	0.27688E-03
13.60	0.326E 00	0.11106E-02
13.70	0.373E 00	0.40642E-02
13.80	0.421E 00	0.12883E-01
13.90	0.470E 00	0.34625E-01
14.00	0.518E 00	0.79851E-01
14.10	0.498E 00	0.57435E-01
14.20	0.612E 00	0.26599E 00
14.30	0.657E 00	0.39926E 00
14.40	0.701E 00	0.53725E 00
14.50	0.741E 00	0.65945E 00
14.60	0.777E 00	0.75441E 00
14.70	0.808E 00	0.82194E 00
14.80	0.833E 00	0.86771E 00
14.90	0.854E 00	0.89793E 00
15.00	0.870E 00	0.91745E 00
15.10	0.899E 00	0.94553E 00
15.20	0.924E 00	0.96314E 00
15.30	0.946E 00	0.97410E 00
15.40	0.964E 00	0.98090E 00
15.50	0.978E 00	0.98509E 00
15.60	0.988E 00	0.98760E 00
15.70	[illegible] 00	0.98899E 00
15.80	0.998E 00	0.98967E 00
15.90	0.999E 00	0.98993E 00
16.00	0.999E 00	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00

25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.999E 00	0.98997E 00
41.00	0.995E 00	0.98919E 00
42.00	0.979E 00	0.98526E 00
43.00	0.941E 00	0.97265E 00
44.00	0.884E 00	0.93249E 00
45.00	0.811E 00	0.82922E 00
46.00	0.728E 00	0.62075E 00
47.00	0.638E 00	0.34006E 00
48.00	0.545E 00	0.11875E 00
49.00	0.453E 00	0.24988E-01
50.00	0.366E 00	0.34596E-02
51.00	0.274E 00	0.22344E-03
52.00	0.201E 00	0.16624E-04
53.00	0.146E 00	0.17514E-05
54.00	0.104E 00	0.27730E-06
55.00	0.735E-01	0.64855E-07
56.00	0.505E-01	0.21347E-07
57.00	0.338E-01	0.93401E-08
58.00	0.219E-01	0.51399E-08
59.00	0.136E-01	0.33837E-08
60.00	0.818E-02	0.25516E-08
61.00	0.462E-02	0.21253E-08
62.00	0.244E-02	0.18965E-08
63.00	0.118E-02	0.17790E-08
64.00	0.509E-03	0.17183E-08
65.00	0.186E-03	0.16900E-08
66.00	0.533E-04	0.16784E-08
67.00	0.963E-05	0.16746E-08
68.00	0.578E-06	0.16738E-08
69.00	0.770E-12	0.16737E-08
70.00	0.000E 00	0.16737E-08
71.00	0.000E 00	0.16737E-08
72.00	0.000E 00	0.16737E-08
73.00	0.000E 00	0.16737E-08
74.00	0.000E 00	0.16737E-08
75.00	0.000E 00	0.16737E-08

// XEQ FMBIN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.25	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25844
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT.FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.40	0.806E-01	0.90967E-07
13.50	0.106E 00	0.29826E-06
13.60	0.135E 00	0.10773E-05
13.70	0.167E 00	0.41700E-05
13.80	0.202E 00	0.10794E-04
13.90	0.239E 00	0.66254E-04
14.00	0.280E 00	0.27115E-03
14.10	0.322E 00	0.10093E-02
14.20	0.366E 00	0.32030E-02
14.30	0.410E 00	0.99455E-02
14.40	0.423E 00	0.13524E-01
14.50	0.464E 00	0.31087E-01
14.60	0.504E 00	0.63977E-01
14.70	0.586E 00	0.16770E 00
14.80	0.621E 00	0.29032E 00
14.90	0.653E 00	0.40585E 00
15.00	0.695E 00	0.51854E 00
15.10	0.741E 00	0.65846E 00
15.20	0.783E 00	0.76921E 00
15.30	0.822E 00	0.84864E 00
15.40	0.857E 00	0.90192E 00
15.50	0.888E 00	0.93612E 00
15.60	0.915E 00	0.95755E 00
15.70	0.939E 00	0.97066E 00
15.80	0.958E 00	0.97696E 00
15.90	0.974E 00	0.98400E 00
16.00	0.985E 00	0.98702E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00

30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.999E 00	0.99000E 00
45.00	0.994E 00	0.98962E 00
46.00	0.988E 00	0.98754E 00
47.00	0.965E 00	0.97124E 00
48.00	0.927E 00	0.96447E 00
49.00	0.875E 00	0.92316E 00
50.00	0.813E 00	0.63158E 00
51.00	0.695E 00	0.53229E 00
52.00	0.592E 00	0.21458E 00
53.00	0.492E 00	0.51809E-01
54.00	0.402E 00	0.87622E-02
55.00	0.323E 00	0.10436E-02
56.00	0.257E 00	0.12667E-03
57.00	0.202E 00	0.17302E-04
58.00	0.158E 00	0.29066E-05
59.00	0.122E 00	0.62257E-06
60.00	0.941E-01	0.17106E-06
61.00	0.715E-01	0.59142E-07
62.00	0.537E-01	0.25046E-07
63.00	0.398E-01	0.12624E-07
64.00	0.290E-01	0.73657E-08
65.00	0.207E-01	0.48531E-08
66.00	0.145E-01	0.35339E-08
67.00	0.993E-02	0.27906E-08
68.00	0.657E-02	0.23508E-08
69.00	0.422E-02	0.20813E-08
70.00	0.258E-02	0.19133E-08
71.00	0.150E-02	0.18069E-08
72.00	0.808E-03	0.17452E-08
73.00	0.393E-03	0.17081E-08
74.00	0.165E-03	0.16861E-08
75.00	0.566E-04	0.16786E-08
76.00	0.140E-04	0.16750E-08
77.00	0.183E-05	0.16739E-08
78.00	0.340E-07	0.16737E-08
79.00	0.000E 00	0.16737E-08

BIM BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	1.00	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	26.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.2544
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.1351	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,TPN =	3.555

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.10	0.441E-01	0.15578E-07
13.20	0.617E-01	0.36795E-07
13.30	0.821E-01	0.97762E-07
13.40	0.105E 00	0.26655E-06
13.50	0.131E 00	0.91211E-06
13.60	0.159E 00	0.31723E-05
13.70	0.190E 00	0.10736E-04
13.80	0.222E 00	0.36003E-04
13.90	0.256E 00	0.13325E-03
14.00	0.296E 00	0.47281E-03
14.10	0.335E 00	0.14572E-02
14.20	0.375E 00	0.43419E-02
14.30	0.417E 00	0.11740E-01
14.40	0.459E 00	0.26377E-01
14.50	0.501E 00	0.60765E-01
14.60	0.542E 00	0.11486E 00
14.70	0.582E 00	0.19213E 00
14.80	0.619E 00	0.28694E 00
14.90	0.654E 00	0.38629E 00
15.00	0.688E 00	0.48496E 00
15.10	0.725E 00	0.61326E 00
15.20	0.764E 00	0.72132E 00
15.30	0.799E 00	0.80495E 00
15.40	0.832E 00	0.86577E 00
15.50	0.862E 00	0.90807E 00
15.60	0.889E 00	0.93663E 00
15.70	0.912E 00	0.95559E 00
15.80	0.933E 00	0.96865E 00
15.90	0.951E 00	0.97622E 00
16.00	0.966E 00	0.98116E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00

27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.999E 00	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.999E 00	0.99000E 00
42.00	0.999E 00	0.98996E 00
43.00	0.997E 00	0.98953E 00
44.00	0.990E 00	0.98796E 00
45.00	0.974E 00	0.98394E 00
46.00	0.947E 00	0.97464E 00
47.00	0.911E 00	0.95426E 00
48.00	0.865E 00	0.91187E 00
49.00	0.812E 00	0.83127E 00
50.00	0.755E 00	0.65642E 00
<u>51.00</u>	0.655E 00	0.39092E 00
<u>52.00</u>	0.562E 00	0.15029E 00
53.00	0.473E 00	0.40731E-01
54.00	0.403E 00	0.84671E-02
55.00	0.336E 00	0.15036E-02
56.00	0.278E 00	0.25410E-03
57.00	0.228E 00	0.44926E-04
58.00	0.185E 00	0.39369E-05
59.00	0.150E 00	0.26940E-05
60.00	0.121E 00	0.58657E-06
61.00	0.974E-01	0.19893E-06
62.00	0.778E-01	0.79721E-07
63.00	0.619E-01	0.37266E-07
64.00	0.490E-01	0.19871E-07
65.00	0.385E-01	0.11827E-07
66.00	0.301E-01	0.77605E-08
67.00	0.233E-01	0.55314E-08
68.00	0.180E-01	0.42126E-08
69.00	0.137E-01	0.33916E-08
70.00	0.104E-01	0.28545E-08
71.00	0.779E-02	0.25005E-08
72.00	0.577E-02	0.22542E-08
73.00	0.422E-02	0.20719E-08
74.00	0.305E-02	0.19602E-08
75.00	0.218E-02	0.18736E-08
76.00	0.153E-02	0.18120E-08
77.00	0.106E-02	0.17683E-08
78.00	0.722E-03	0.17375E-08
79.00	0.480E-03	0.17159E-08
80.00	0.311E-03	0.17009E-08
81.00	0.196E-03	0.16906E-08
82.00	0.119E-03	0.16841E-08
83.00	0.688E-04	0.16797E-08
84.00	0.376E-04	0.16770E-08

BIN BOUNDARY FUNCTION, SRP [illegible]

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BEAM IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	25.5	REC. FLUF IN MRAD,SGMA1 =	0.25
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25[illegible]
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
[illegible] HGHT,NEAR,IN IN.,HN =	-0.0651	[illegible] HGHT,FAR,IN IN.,HF =	0.0099
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.340	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.40	0.715E-01	0.56956E-07
13.50	0.962E-01	0.17784E-06
13.60	0.124E 00	0.66687E-06
13.70	0.155E 00	0.25665E-05
13.80	0.189E 00	0.10598E-04
13.90	0.226E 00	0.42941E-04
14.00	0.267E 00	0.17544E-03
14.10	0.309E 00	0.68770E-03
14.20	0.354E 00	0.25101E-02
14.30	0.401E 00	0.82294E-02
14.40	0.449E 00	0.23392E-01
14.50	0.497E 00	0.56647E-01
14.60	0.544E 00	0.11727E 00
14.70	0.590E 00	0.21994E 00
14.80	0.634E 00	0.32741E 00
14.90	0.674E 00	0.45047E 00
15.00	0.709E 00	0.56132E 00
15.10	0.753E 00	0.69370E 00
15.20	0.799E 00	0.79521E 00
15.30	0.832E 00	0.86651E 00
15.40	0.866E 00	0.91366E 00
15.50	0.897E 00	0.94365E 00
15.60	0.923E 00	0.91238E 00
15.70	0.945E 00	0.97386E 00
15.80	0.964E 00	0.98095E 00
15.90	0.978E 00	0.98526E 00
16.00	0.989E 00	0.98784E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00

30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.100E 01	0.99000E 00
45.00	0.999E 00	0.97991E 00
46.00	0.993E 00	0.98872E 00
47.00	0.973E 00	0.98378E 00
48.00	0.936E 00	0.96938E 00
49.00	0.884E 00	0.92234E 00
50.00	0.821E 00	0.84713E 00
51.00	0.707E 00	0.55560E 00
52.00	0.599E 00	0.23167E 00
53.00	0.499E 00	0.56320E-01
54.00	0.408E 00	0.94669E-02
55.00	0.327E 00	0.11523E-02
56.00	0.257E 00	0.12630E-03
57.00	0.199E 00	0.15177E-04
58.00	0.152E 00	0.22695E-05
59.00	0.115E 00	0.45602E-06
60.00	0.867E-01	0.12110E-06
61.00	0.640E-01	0.41262E-07
62.00	0.465E-01	0.17556E-07
63.00	0.330E-01	0.90069E-08
64.00	0.229E-01	0.54024E-08
65.00	0.153E-01	0.36834E-08
66.00	0.989E-02	0.27856E-08
67.00	0.607E-02	0.22893E-08
68.00	0.351E-02	0.20064E-08
69.00	0.188E-02	0.18453E-08
70.00	0.930E-03	0.17562E-08
71.00	0.410E-03	0.17097E-08
72.00	0.155E-03	0.16873E-08
73.00	0.464E-04	0.16778E-08
74.00	0.9[illegible]E-05	0.16749E-08
75.00	0.663E-06	0.16738E-08
76.00	0.144E-09	0.16737E-08
77.00	0.000E 00	0.16737E-08
78.00	0.000E 00	0.16737E-08
79.00	0.000E 00	0.16737E-08

// XEQ FFBIN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV,FIELD IN MRAD,PSI =	[illegible]	REC. BLUR IN MRAD,SGMA1 =	1.00
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25894
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.5[illegible]1
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	[illegible].60		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.10	0.600E-01	0.33[illegible]E-07
13.20	0.794E-01	0.86000E-07
13.30	0.101E 00	0.24127E-06
13.40	0.126E 00	0.73460E-06
13.50	0.153E 00	0.22761E-05
13.60	0.183E 00	0.80144E-05
13.70	0.214E 00	0.27423E-04
13.80	0.248E 00	0.92516E-04
13.90	0.283E 00	0.29907E-03
14.00	0.318E 00	0.96580E-03
14.10	0.355E 00	0.25267E-02
14.20	0.391E 00	0.64278E-02
14.30	0.427E 00	0.14820E-01
14.40	0.463E 00	0.30928E-01
14.50	0.499E 00	0.58562E-01
14.60	0.533E 00	0.10118E 00
14.70	0.567E 00	0.16065E 00
14.80	0.600E 00	0.23573E 00
14.90	0.632E 00	0.32152E 00
15.00	0.661E 00	0.41065E 00
15.10	0.702E 00	0.52985E 00
15.20	0.741E 00	0.65821E 00
15.30	0.776E 00	0.75592E 00
15.40	0.812E 00	0.83007E 00
15.50	0.843E 00	0.88305E 00
15.60	0.872E 00	0.91945E 00
15.70	0.897E 00	0.94387E 00
15.80	0.919E 00	0.96005E 00
15.90	0.939E 00	0.97071E 00
16.00	0.955E 00	0.97771E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00

27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.999E 00	0.98998E 00
42.00	0.996E 00	0.98968E 00
43.00	0.992E 00	0.98650E 00
44.00	0.980E 00	0.98558E 00
45.00	0.959E 00	0.97935E 00
46.00	0.930E 00	0.96636E 00
47.00	0.892E 00	0.92944E 00
48.00	0.845E 00	0.86575E 00
49.00	0.792E 00	0.78825E 00
50.00	0.733E 00	0.63712E 00
51.00	0.634E 00	0.32897E 00
52.00	0.544E 00	0.11784E 00
53.00	0.464E 00	0.31093E-01
54.00	0.393E 00	0.66906E-02
55.00	0.331E 00	0.13698E-02
56.00	0.278E 00	0.28527E-03
57.00	0.232E 00	0.53270E-04
58.00	0.194E 00	0.12477E-04
59.00	0.161E 00	0.33609E-05
60.00	0.134E 00	0.10487E-05
61.00	0.111E 00	0.37015E-06
62.00	0.922E-01	0.15624E-06
63.00	0.760E-01	0.72143E-07
64.00	0.625E-01	0.38308E-07
65.00	0.512E-01	0.22161E-07
66.00	0.419E-01	0.13986E-07
67.00	0.341E-01	0.95168E-08
68.00	0.277E-01	0.69070E-08
69.00	0.225E-01	0.52951E-08
70.00	0.181E-01	0.42513E-08
71.00	0.146E-01	0.35480E-08
72.00	0.117E-01	0.30584E-08
73.00	0.934E-02	0.27083E-08
74.00	0.741E-02	0.24526E-08
75.00	0.584E-02	0.22627E-08
76.00	0.457E-02	0.21198E-08
77.00	0.355E-02	0.20114E-08
78.00	0.274E-02	0.19286E-08
79.00	0.209E-02	0.18651E-08
80.00	0.158E-02	0.18163E-08
81.00	0.118E-02	0.17791E-08
82.00	0.866E-03	0.17506E-08
83.00	0.629E-03	0.17291E-08
84.00	0.447E-03	0.17130E-08

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. DIVR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN DRAD,FS1 =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25744
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0251	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.984E-01	0.20822E-06
13.40	0.125E 00	0.69061E-06
13.50	0.154E 00	0.24528E-05
13.60	0.186E 00	0.96900E-05
13.70	0.220E 00	0.34305E-04
13.80	0.257E 00	0.12821E-03
13.90	0.296E 00	0.46113E-03
14.00	0.337E 00	0.15431E-02
14.10	0.376E 00	0.46594E-02
14.20	0.419E 00	0.12447E-01
14.30	0.460E 00	0.29214E-01
14.40	0.440E 00	0.19466E-01
14.50	0.476E 00	0.39543E-01
14.60	0.579E 00	0.18475E 00
14.70	0.616E 00	0.27849E 00
14.80	0.653E 00	0.38467E 00
14.90	0.686E 00	0.49099E 00
15.00	0.716E 00	0.58598E 00
15.10	0.758E 00	0.70491E 00
15.20	0.796E 00	0.79691E 00
15.30	0.830E 00	0.86303E 00
15.40	0.862E 00	0.90820E 00
15.50	0.890E 00	0.93806E 00
15.60	0.915E 00	0.95741E 00
15.70	0.937E 00	0.96985E 00
15.80	0.955E 00	0.97783E 00
15.90	0.970E 00	0.98292E 00
16.00	0.982E 00	0.98614E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.999E 00	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.99000E 00
44.00	0.998E 00	0.98978E 00
45.00	0.991E 00	0.98831E 00
46.00	0.971E 00	0.98324E 00
47.00	0.935E 00	0.96890E 00
48.00	0.883E 00	0.93122E 00
49.00	0.819E 00	0.84291E 00
50.00	0.746E 00	0.67401E 00
51.00	0.630E 00	0.31725E 00
52.00	0.523E 00	0.86428E-01
53.00	0.426E 00	0.14331E-01
54.00	0.340E 00	0.16988E-02
55.00	0.267E 00	0.17725E-03
56.00	0.206E 00	0.19875E-04
57.00	0.157E 00	0.27737E-05
58.00	0.116E 00	0.51780E-06
59.00	0.883E-01	0.13055E-06
60.00	0.650E-01	0.43301E-07
61.00	0.472E-01	0.16194E-07
62.00	0.337E-01	0.93165E-08
63.00	0.236E-01	0.56085E-08
64.00	0.162E-01	0.38452E-08
65.00	0.108E-01	0.29212E-08
66.00	0.701E-02	0.24026E-08
67.00	0.438E-02	0.20987E-08
68.00	0.262E-02	0.19168E-08
69.00	0.149E-02	0.18078E-08
70.00	0.793E-03	0.17439E-08
71.00	0.389E-03	0.17076E-08
72.00	0.172E-03	0.16887E-08
73.00	0.653E-04	0.16794E-08
74.00	0.194E-04	0.16754E-08
75.00	0.379E-05	0.16741E-08
76.00	0.274E-06	0.16737E-08
77.00	0.500E-10	0.16737E-08
78.00	0.000E 00	0.16737E-08
79.00	0.000E 00	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

// XEQ FMAIN

BIN BOUNDARY FUNCTION, SRF RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.80
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.VIEW.FIELD IN MRAD,FSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.60
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25944
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.390E-01	0.12107E-07
13.40	0.571E-01	0.29501E-07
13.50	0.786E-01	0.82829E-07
13.60	0.103E 00	0.26247E-06
13.70	0.131E 00	0.91716E-06
13.80	0.162E 00	0.34441E-05
13.90	0.196E 00	0.13519E-04
14.00	0.233E 00	0.53805E-04
14.10	0.272E 00	0.21179E-03
14.20	0.314E 00	0.79649E-03
14.30	0.358E 00	0.27692E-02
14.40	0.403E 00	0.86150E-02
14.50	0.449E 00	0.23427E-01
14.60	0.495E 00	0.55090E-01
14.70	0.540E 00	0.11202E 00
14.80	0.585E 00	0.19780E 00
14.90	0.626E 00	0.30584E 00
15.00	0.668E 00	0.42069E 00
15.10	0.712E 00	0.57100E 00
15.20	0.756E 00	0.70014E 00
15.30	0.796E 00	0.79868E 00
15.40	0.834E 00	0.86828E 00
15.50	0.867E 00	0.91430E 00
15.60	0.897E 00	0.94370E 00
15.70	0.923E 00	0.96211E 00
15.80	0.945E 00	0.97353E 00
15.90	0.963E 00	0.98058E 00
16.00	0.977E 00	0.98491E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.99000E 00
44.00	0.999E 00	0.98987E 00
45.00	0.994E 00	0.98697E 00
46.00	0.982E 00	0.98607E 00
47.00	0.958E 00	0.97664E 00
48.00	0.923E 00	0.96241E 00
49.00	0.879E 00	0.92724E 00
50.00	0.827E 00	0.85751E 00
51.00	0.725E 00	0.61130E 00
52.00	0.628E 00	0.31194E 00
53.00	0.538E 00	0.10861E 00
54.00	0.456E 00	0.26757E-01
55.00	0.382E 00	0.51555E-02
56.00	0.318E 00	0.86251E-03
57.00	0.262E 00	0.15079E-03
58.00	0.215E 00	0.28103E-04
59.00	0.176E 00	0.60366E-05
60.00	0.143E 00	0.15336E-05
61.00	0.116E 00	0.40422E-06
62.00	0.935E-01	0.16645E-06
63.00	0.750E-01	0.69818E-07
64.00	0.596E-01	0.32691E-07
65.00	0.474E-01	0.18377E-07
66.00	0.373E-01	0.11140E-07
67.00	0.291E-01	0.72910E-08
68.00	0.225E-01	0.52936E-08
69.00	0.172E-01	0.40443E-08
70.00	0.129E-01	0.32622E-08
71.00	0.966E-02	0.27522E-08
72.00	0.708E-02	0.24122E-08
73.00	0.511E-02	0.21789E-08
74.00	0.361E-02	0.20175E-08
75.00	0.250E-02	0.19050E-08
76.00	0.169E-02	0.18269E-08
77.00	0.111E-02	0.17729E-08
78.00	0.707E-03	0.17361E-08
79.00	0.432E-03	0.17116E-08
80.00	0.252E-03	0.16958E-08
81.00	0.139E-03	0.16859E-08

// XEQ FMBIR

BIN BOUNDARY FUNCTION, SEG RECEIVER

NEAR RANGE IN FT. RN =	15.0	FAR RANGE IN FT. RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DTVEEG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25094
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.001
BIKINI HGHT.,NEAR,IN IN.,HN =	-0.0261	BIKINI HGHT.FAR,IN IN.,RF =	-0.0010
BASELINE IN IN., B =	0.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB.OF DETECTION
13.30	0.145E 00	0.17004E-05
13.40	0.179E 00	0.68820E-05
13.50	0.216E 00	0.28681E-04
13.60	0.255E 00	0.11915E-03
13.70	0.297E 00	0.47784E-03
13.80	0.342E 00	0.17835E-02
13.90	0.388E 00	0.59638E-02
14.00	0.435E 00	0.17353E-01
14.10	0.481E 00	0.43307E-01
14.20	0.463E 00	0.90765E-01
14.30	0.573E 00	0.17206E 00
14.40	0.617E 00	0.28096E 00
14.50	0.660E 00	0.40869E 00
14.60	0.701E 00	0.53688E 00
14.70	0.737E 00	0.64640E 00
14.80	0.769E 00	0.72523E 00
14.90	0.796E 00	0.79828E 00
15.00	0.810E 00	0.84228E 00
15.10	0.853E 00	0.89660E 00
15.20	0.884E 00	0.93201E 00
15.30	0.911E 00	0.95450E 00
15.40	0.934E 00	0.96861E 00
15.50	0.954E 00	0.97742E 00
15.60	0.970E 00	0.98291E 00
15.70	0.982E 00	0.98628E 00
15.80	0.991E 00	0.98826E 00
15.90	0.996E 00	0.98932E 00
16.00	0.998E 00	0.98980E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.999E 00	0.98999E 00
42.00	0.997E 00	0.98945E 00
43.00	0.984E 00	0.98669E 00
44.00	0.958E 00	0.97772E 00
45.00	0.908E 00	0.95226E 00
46.00	0.846E 00	0.88650E 00
47.00	0.772E 00	0.74530E 00
48.00	0.692E 00	0.50878E 00
49.00	0.607E 00	0.24212E 00
50.00	0.520E 00	0.82363E-01
51.00	0.410E 00	0.10119E-01
52.00	0.318E 00	0.86980E-03
53.00	0.242E 00	0.76287E-04
54.00	0.183E 00	0.80106E-05
55.00	0.136E 00	0.11536E-05
56.00	0.100E 00	0.23296E-06
57.00	0.734E-01	0.64549E-07
58.00	0.525E-01	0.23602E-07
59.00	0.369E-01	0.10902E-07
60.00	0.253E-01	0.61017E-08
61.00	0.169E-01	0.39854E-08
62.00	0.109E-01	0.29392E-08
63.00	0.682E-02	0.23796E-08
64.00	0.406E-02	0.20649E-08
65.00	0.229E-02	0.18847E-08
66.00	0.121E-02	0.17818E-08
67.00	0.585E-03	0.17252E-08
68.00	0.253E-03	0.16958E-08
69.00	0.932E-04	0.16810E-08
70.00	0.266E-04	0.16760E-08
71.00	0.477E-05	0.16742E-08
72.00	0.275E-06	0.16737E-08
73.00	0.460E-14	0.16737E-08
74.00	0.000E 00	0.16737E-08
75.00	0.000E 00	0.16737E-08
76.00	0.000E 00	0.16737E-08
77.00	0.000E 00	0.16737E-08
78.00	0.000E 00	0.16737E-08
79.00	0.000E 00	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

// XEQ FMBIN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEC.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25884
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0341	BIKINI HGHT,FAR,IN IN.,RF =	0.0010
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.955

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.190E-01	0.44341E-08
13.40	0.311E-01	0.81746E-08
13.50	0.463E-01	0.17437E-07
13.60	0.646E-01	0.42418E-07
13.70	0.897E-01	0.11576E-06
13.80	0.109E 00	0.34807E-06
13.90	0.136E 00	0.11801E-05
14.00	0.165E 00	0.30793E-05
14.10	0.196E 00	0.13759E-04
14.20	0.230E 00	0.49288E-04
14.30	0.266E 00	0.17413E-03
14.40	0.304E 00	0.59048E-03
14.50	0.344E 00	0.18650E-02
14.60	0.384E 00	0.53464E-02
14.70	0.424E 00	0.13683E-01
14.80	0.464E 00	0.31072E-01
14.90	0.503E 00	0.62776E-01
15.00	0.541E 00	0.11352E 00
15.10	0.590E 00	0.21125E 00
15.20	0.638E 00	0.34179E 00
15.30	0.685E 00	0.48637E 00
15.40	0.729E 00	0.62241E 00
15.50	0.769E 00	0.73497E 00
15.60	0.807E 00	0.81975E 00
15.70	0.841E 00	0.87944E 00
15.80	0.872E 00	0.91956E 00
15.90	0.899E 00	0.94574E 00
16.00	0.923E 00	0.96255E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.100E 01	0.99000E 00
45.00	0.100E 01	0.99000E 00
46.00	0.999E 00	0.98999E 00
47.00	0.998E 00	0.98972E 00
48.00	0.992E 00	0.98856E 00
49.00	0.979E 00	0.98537E 00
50.00	0.956E 00	0.97603E 00
51.00	0.870E 00	0.91727E 00
52.00	0.784E 00	0.77017E 00
53.00	0.700E 00	0.53365E 00
54.00	0.619E 00	0.28612E 00
55.00	0.543E 00	0.11574E 00
56.00	0.471E 00	0.35614E-01
57.00	0.405E 00	0.88869E-02
58.00	0.344E 00	0.18576E-02
59.00	0.290E 00	0.37654E-03
60.00	0.242E 00	0.76478E-04
61.00	0.201E 00	0.16739E-04
62.00	0.167E 00	0.41548E-05
63.00	0.137E 00	0.11574E-05
64.00	0.112E 00	0.40282E-06
65.00	0.923E-01	0.15720E-06
66.00	0.752E-01	0.70362E-07
67.00	0.610E-01	0.35611E-07
68.00	0.492E-01	0.26080E-07
69.00	0.395E-01	0.12436E-07
70.00	0.315E-01	0.83493E-08
71.00	0.250E-01	0.60063E-08
72.00	0.196E-01	0.45823E-08
73.00	0.153E-01	0.36747E-08
74.00	0.118E-01	0.30736E-08
75.00	0.901E-02	0.26634E-08
76.00	0.680E-02	0.23769E-08
77.00	0.506E-02	0.21736E-08
78.00	0.371E-02	0.20278E-08
79.00	0.268E-02	0.19226E-08
80.00	0.190E-02	0.18467E-08
81.00	0.132E-02	0.17921E-08

BIN BOUNDARY FUNCTION, SRC RECEIVER

NEAR RANGE IN FT, RN = 15.0 FAR RANGE IN FT, RF = 50.0
XMIT.DEFL.IN MRAD,DELTA = 10.0 BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT. BLUR IN MRAD,SGMA2 = 0.50 XMIT.APERT.DIA.IN IN.,D = 0.30
REC.ELEV.FIELD IN MRAD,PSI = 23.3 REC. BLUR IN MRAD,SGMA1 = 0.50
FOCAL LENGTH IN IN.,F = 2.250 IMAGE DISTANCE IN IN.,P = 2.25844
REC.APERT.HGHT IN IN.,YMAX = 1.125 INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,NEAR,IN IN.,HN =-0.0351 BIKINI HGHT,FAR,IN IN.,HF = 0.0000
BASELINE IN IN., B = [illegible]
SIGNAL-TO-NOISE RATIO,SN = 6.560 THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.20	0.749E-01	0.69498E-07
13.30	0.993E-01	0.21666E-06
13.40	0.126E 00	0.76577E-06
13.50	0.157E 00	0.27622E-05
13.60	0.190E 00	0.10708E-04
13.70	0.226E 00	0.42231E-04
13.80	0.265E 00	0.16464E-03
13.90	0.306E 00	0.61596E-03
14.00	0.348E 00	0.21363E-02
14.10	0.392E 00	0.66464E-02
14.20	0.437E 00	0.18132E-01
14.30	0.481E 00	0.42959E-01
14.40	0.460E 00	0.29234E-01
14.50	0.567E 00	0.16059E 00
14.60	0.609E 00	0.25866E 00
14.70	0.649E 00	0.37446E 00
14.80	0.687E 00	0.49189E 00
14.90	0.720E 00	0.59651E 00
15.00	0.749E 00	0.68096E 00
15.10	0.789E 00	0.78179E 00
15.20	0.825E 00	0.85443E 00
15.30	0.858E 00	0.90379E 00
15.40	0.888E 00	0.93607E 00
15.50	0.914E 00	0.95671E 00
15.60	0.937E 00	0.96978E 00
15.70	0.956E 00	0.97801E 00
15.80	0.971E 00	0.98319E 00
15.90	0.983E 00	0.98639E 00
16.00	0.991E 00	0.98829E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 0	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00

28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.98999E 00
44.00	0.997E 00	0.98859E 00
45.00	0.989E 00	0.98773E 00
46.00	0.968E 00	0.98220E 00
47.00	0.933E 00	0.96807E 00
48.00	0.886E 00	0.93436E 00
49.00	0.829E 00	0.86087E 00
50.00	0.764E 00	0.72296E 00
51.00	0.654E 00	0.39009E 00
52.00	0.552E 00	0.13111E 00
53.00	0.456E 00	0.27950E-01
54.00	0.375E 00	0.42746E-02
55.00	0.302E 00	0.55741E-03
56.00	0.241E 00	0.73423E-04
57.00	0.191E 00	0.11132E-04
58.00	0.150E 00	0.20921E-05
59.00	0.117E 00	0.49913E-06
60.00	0.913E-01	0.15013E-06
61.00	0.703E-01	0.55752E-07
62.00	0.536E-01	0.20902E-07
63.00	0.404E-01	0.13027E-07
64.00	0.301E-01	0.77867E-08
65.00	0.221E-01	0.51999E-08
66.00	0.160E-01	0.36050E-08
67.00	0.113E-01	0.29997E-08
68.00	0.786E-02	0.25106E-08
69.00	0.532E-02	0.22035E-08
70.00	0.350E-02	0.20063E-08
71.00	0.223E-02	0.18788E-08
72.00	0.137E-02	0.17966E-08
73.00	0.800E-03	0.17445E-08
74.00	0.442E-03	0.17125E-08
75.00	0.228E-03	0.16936E-08
76.00	0.107E-03	0.16831E-06
77.00	0.444E-04	0.16776E-08
78.00	0.151E-04	0.16750E-08
79.00	0.377E-05	0.16741E-08
80.00	0.497E-06	0.16738E-08
81.00	0.927E-06	0.16737E-08

// XEQ F'BIO

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	[illegible]	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. DIVR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLDV.FIELD IN MRAD,FSI =	[illegible]	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25044
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.FAR,IN IN.,HH =-0.0351		BIKINI HGHT.FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	[illegible]		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.40	0.576E-01	0.30241E-07
13.50	0.786E-01	0.82713E-07
13.60	0.102E 00	0.25304E-06
13.70	0.129E 00	0.84738E-06
13.80	0.159E 00	0.30320E-05
13.90	0.191E 00	0.11309E-04
14.00	0.226E 00	0.42821E-04
14.10	0.264E 00	0.16032E-03
14.20	0.303E 00	0.57655E-03
14.30	0.345E 00	0.19264E-02
14.40	0.387E 00	0.58034E-02
14.50	0.429E 00	0.15451E-01
14.60	0.472E 00	0.36079E-01
14.70	0.513E 00	0.74074E-01
14.80	0.554E 00	0.13482E 00
14.90	0.594E 00	0.21904E 00
15.00	0.631E 00	0.31981E 00
15.10	0.679E 00	0.46672E 00
15.20	0.724E 00	0.61782E 00
15.30	0.765E 00	0.72566E 00
15.40	0.804E 00	0.81457E 00
15.50	0.839E 00	0.87697E 00
15.60	0.871E 00	0.91863E 00
15.70	0.899E 00	0.94559E 00
15.80	0.924E 00	0.96274E 00
15.90	0.945E 00	0.97357E 00
16.00	0.962E 00	0.98040E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00

30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.999E 00	0.98995E 00
45.00	0.996E 00	0.98923E 00
46.00	0.985E 00	0.98652E 00
47.00	0.962E 00	0.98022E 00
48.00	0.926E 00	0.96354E 00
49.00	0.878E 00	0.92621E 00
50.00	0.821E 00	0.81679E 00
51.00	0.713E 00	0.57605E 00
52.00	0.612E 00	0.26536E 00
53.00	0.517E 00	0.78671E-01
54.00	0.430E 00	0.15769E-01
55.00	0.353E 00	0.21337E-02
56.00	0.286E 00	0.33619E-03
57.00	0.230E 00	0.48417E-04
58.00	0.183E 00	0.80728E-05
59.00	0.145E 00	0.16588E-05
60.00	0.114E 00	0.42571E-06
61.00	0.892E-01	0.13582E-06
62.00	0.691E-01	0.52752E-07
63.00	0.531E-01	0.24342E-07
64.00	0.404E-01	0.13024E-07
65.00	0.304E-01	0.78979E-08
66.00	0.225E-01	0.53177E-08
67.00	0.165E-01	0.39052E-08
68.00	0.118E-01	0.30797E-08
69.00	0.834E-02	0.25731E-08
70.00	0.574E-02	0.22518E-08
71.00	0.385E-02	0.20425E-08
72.00	0.251E-02	0.19057E-08
73.00	0.158E-02	0.18162E-08
74.00	0.953E-03	0.17583E-08
75.00	0.546E-03	0.17217E-08
76.00	0.295E-03	0.16995E-08
77.00	0.147E-03	0.16866E-08
78.00	0.666E-04	0.16795E-08
79.00	0.259E-04	0.16760E-08
80.00	0.802E-05	0.16744E-08
81.00	0.165E-05	0.16739E-08
82.00	0.138E-06	0.16737E-08

// XEQ F[illegible]IN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	5.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.50
REC.ELEV.FIELD IN MRAD,PSI =	23.5	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
LIMIT HGHT, NEAR,IN IN.,RN =-0.0730		LIMIT HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	0.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,TNR =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.70	0.741E-01	0.67964E-07
13.80	0.985E-01	0.20940E-06
13.90	0.125E 00	0.71927E-06
14.00	0.150E 00	0.26381E-05
14.10	0.188E 00	0.10042E-04
14.20	0.224E 00	0.38632E-04
14.30	0.261E 00	0.14604E-03
14.40	0.301E 00	0.52927E-03
14.50	0.342E 00	0.17096E-02
14.60	0.385E 00	0.54849E-02
14.70	0.428E 00	0.14857E-01
14.80	0.470E 00	0.35087E-01
14.90	0.511E 00	0.72227E-01
15.00	0.552E 00	0.13069E 00
15.10	0.602E 00	0.23914E 00
15.20	0.650E 00	0.37759E 00
15.30	0.697E 00	0.52398E 00
15.40	0.740E 00	0.65607E 00
15.50	0.780E 00	0.76169E 00
15.60	0.817E 00	0.83920E 00
15.70	0.850E 00	0.89273E 00
15.80	0.880E 00	0.92826E 00
15.90	0.906E 00	0.95129E 00
16.00	0.929E 00	0.96604E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.999E 00	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00

33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.100E 01	0.99000E 00
45.00	0.100E 01	0.99000E 00
46.00	0.100E 01	0.99000E 00
47.00	0.999E 00	0.99000E 00
48.00	0.999E 00	0.98992E 00
49.00	0.996E 00	0.98942E 00
50.00	0.989E 00	0.98785E 00
51.00	0.918E 00	0.95940E 00
52.00	0.846E 00	0.87719E 00
53.00	0.773E 00	0.76539E 00
54.00	0.701E 00	0.53891E 00
55.00	0.631E 00	0.32098E 00
56.00	0.564E 00	0.15414E 00
57.00	0.500E 00	0.59771E-01
58.00	0.439E 00	0.19102E-01
59.00	0.383E 00	0.52229E-02
60.00	0.330E 00	0.12642E-02
61.00	0.283E 00	0.30088E-03
62.00	0.240E 00	0.71192E-04
63.00	0.203E 00	0.17894E-04
64.00	0.171E 00	0.49584E-05
65.00	0.143E 00	0.19477E-05
66.00	0.119E 00	0.54875E-06
67.00	0.996E-01	0.22056E-06
68.00	0.828E-01	0.99776E-07
69.00	0.682E-01	0.50304E-07
70.00	0.560E-01	0.27956E-07
71.00	0.458E-01	0.16938E-07
72.00	0.372E-01	0.11073E-07
73.00	0.300E-01	0.77363E-08
74.00	0.240E-01	0.57270E-08
75.00	0.191E-01	0.44577E-08
76.00	0.150E-01	0.36234E-08
77.00	0.117E-01	0.30573E-08
78.00	0.901E-02	0.26634E-08
79.00	0.686E-02	0.23840E-08
80.00	0.514E-02	0.21831E-08
81.00	0.380E-02	0.20375E-08
82.00	0.277E-02	0.19314E-08
83.00	0.198E-02	0.18543E-08
84.00	0.139E-02	0.17984E-08
85.00	0.953E-03	0.17583E-08
86.00	0.637E-03	0.17296E-08
87.00	0.414E-03	0.17100E-08
88.00	0.260E-03	0.16964E-08
89.00	0.157E-03	0.16874E-08

// XEQ FMBIN

RIM BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	11.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. DIVR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FIELD.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0718	BIKINI HGHT.FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	0.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
12.90	0.973E-01	0.19836E-06
13.00	0.130E 00	0.86094E-06
13.10	0.166E 00	0.40875E-05
13.20	0.206E 00	0.20269E-04
13.30	0.250E 00	0.10044E-03
13.40	0.297E 00	0.47454E-03
13.50	0.347E 00	0.20563E-02
13.60	0.399E 00	0.78578E-02
13.70	0.453E 00	0.25429E-01
13.80	0.508E 00	0.67713E-01
13.90	0.561E 00	0.14748E 00
14.00	0.541E 00	0.11307E 00
14.10	0.662E 00	0.41434E 00
14.20	0.710E 00	0.56516E 00
14.30	0.754E 00	0.69563E 00
14.40	0.794E 00	0.79327E 00
14.50	0.828E 00	0.85924E 00
14.60	0.856E 00	0.90147E 00
14.70	0.880E 00	0.92793E 00
14.80	0.897E 00	0.94430E 00
14.90	0.910E 00	0.95419E 00
15.00	0.919E 00	0.95977E 00
15.10	0.941E 00	0.97205E 00
15.20	0.960E 00	0.97966E 00
15.30	0.975E 00	0.98434E 00
15.40	0.986E 00	0.98717E 00
15.50	0.993E 00	0.98878E 00
15.60	0.997E 00	0.98956E 00
15.70	0.999E 00	0.98991E 00
15.80	0.999E 00	0.98999E 00
15.90	0.100E 01	0.99000E 00
16.00	0.100E 01	0.99000E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00

25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.999E 00	0.98997E 00
41.00	0.995E 00	0.98923E 00
42.00	0.979E 00	0.98550E 00
43.00	0.944E 00	0.97313E 00
44.00	0.886E 00	0.93648E 00
45.00	0.817E 00	0.83961E 00
46.00	0.734E 00	0.63720E 00
47.00	0.642E 00	0.35346E 00
48.00	0.548E 00	0.12377E 00
49.00	0.454E 00	0.25612E-01
50.00	0.367E 00	0.31120E-02
51.00	0.273E 00	0.22098E-03
52.00	0.200E 00	0.15844E-04
53.00	0.144E 00	0.15532E-05
54.00	0.101E 00	0.24056E-06
55.00	0.697E-01	0.54116E-07
56.00	0.463E-01	0.17401E-07
57.00	0.296E-01	0.75829E-08
58.00	0.181E-01	0.42339E-08
59.00	0.104E-01	0.28673E-08
60.00	0.565E-02	0.22405E-08
61.00	0.281E-02	0.19352E-08
62.00	0.125E-02	0.17858E-08
63.00	0.483E-03	0.17162E-08
64.00	0.150E-03	0.16868E-08
65.00	0.319E-04	0.16765E-08
66.00	0.301E-05	0.16740E-08
67.00	0.983E-06	0.16737E-08
68.00	0.000E 00	0.16737E-08
69.00	0.000E 00	0.16737E-08
70.00	0.000E 00	0.16737E-08
71.00	0.000E 00	0.16737E-08
72.00	0.000E 00	0.16737E-08
73.00	0.000E 00	0.16737E-08
74.00	0.000E 00	0.16737E-08
75.00	0.000E 00	0.16737E-08

// XEQ F"BI:

RIM BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. DIVR IN MRAD,SGMA3 =	1.25	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	22.2	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0710	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB.OF DETECTION
13.40	0.107E 00	0.32151E-06
13.50	0.140E 00	0.15460E-05
13.60	0.176E 00	0.60425E-05
13.70	0.215E 00	0.27527E-04
13.80	0.257E 00	0.18766E-03
13.90	0.302E 00	0.55638E-03
14.00	0.350E 00	0.22219E-02
14.10	0.399E 00	0.77611E-02
14.20	0.448E 00	0.22516E-01
14.30	0.497E 00	0.58454E-01
14.40	0.509E 00	0.85431E-01
14.50	0.553E 00	0.12243E 00
14.60	0.633E 00	0.37528E 00
14.70	0.675E 00	0.45424E 00
14.80	0.713E 00	0.57606E 00
14.90	0.747E 00	0.67697E 00
15.00	0.776E 00	0.75260E 00
15.10	0.816E 00	0.82805E 00
15.20	0.852E 00	0.89545E 00
15.30	0.884E 00	0.93227E 00
15.40	0.912E 00	0.95525E 00
15.50	0.936E 00	0.96944E 00
15.60	0.956E 00	0.97816E 00
15.70	0.972E 00	0.98351E 00
15.80	0.984E 00	0.98674E 00
15.90	0.992E 00	0.98858E 00
16.00	0.997E 00	0.98951E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00

30.00	0.100E 01	0.95000E 00
31.00	0.100E 01	0.95000E 00
32.00	0.100E 01	0.95000E 00
33.00	0.100E 01	0.95000E 00
34.00	0.100E 01	0.95000E 00
35.00	0.100E 01	0.95000E 00
36.00	0.100E 01	0.95000E 00
37.00	0.100E 01	0.95000E 00
38.00	0.100E 01	0.95000E 00
39.00	0.100E 01	0.95000E 00
40.00	0.100E 01	0.95000E 00
41.00	0.100E 01	0.95000E 00
42.00	0.100E 01	0.95000E 00
43.00	0.100E 01	0.95000E 00
44.00	0.998E 00	0.95000E 00
45.00	0.99[illegible]E 00	0.97964E 00
46.00	0.988E 00	0.97765E 00
47.00	0.966E 00	0.96367E 00
48.00	0.925E 00	0.96601E 00
49.00	0.879E 00	0.92783E 00
50.00	0.819E 00	0.84277E 00
51.00	0.70[illegible]E 00	0.55292E 00
52.00	0.598E 00	0.22980E 00
53.00	0.497E 00	0.56585E-01
54.00	0.405E 00	0.89933E-02
55.00	0.325E 00	0.11064E-02
56.00	0.257E 00	0.12671E-03
57.00	0.201E 00	0.16743E-04
58.00	0.156E 00	0.26887E-05
59.00	0.120E 00	0.59505E-06
60.00	0.910E-01	0.14765E-06
61.00	0.679E-01	0.45744E-07
62.00	0.499E-01	0.20691E-07
63.00	0.356E-01	0.10326E-07
64.00	0.251E-01	0.60357E-08
65.00	0.170E-01	0.40189E-08
66.00	0.112E-01	0.29621E-08
67.00	0.710E-02	0.24138E-08
68.00	0.428E-02	0.20886E-08
69.00	0.243E-02	0.18985E-08
70.00	0.127E-02	0.17682E-08
71.00	0.599E-03	0.17264E-08
72.00	0.230E-03	0.16945E-08
73.00	0.745E-04	0.16802E-08
74.00	0.157E-04	0.16751E-08
75.00	0.140E-05	0.16739E-08
76.00	0.270E-08	0.16737E-08
77.00	0.000E 00	0.16737E-08
78.00	0.000E 00	0.16737E-08
79.00	0.000E 00	0.16737E-08

// XEQ EMBIN

BIN BOUNDARY FUNCTION, 2ND RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.RECV.IN MRAD,DELTA =	30.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	1.00	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FIELD.FIELD IN MRAD,FS1 =	[illegible]	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.HEIGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.591
BIKINI HGHT,NEAR,IN IN.,HN =	-0.1716	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB'Y.OF DETECTION
13.10	0.593E-01	0.32786E-07
13.20	0.917E-01	0.96554E-07
13.30	0.107E 00	0.31858E-06
13.40	0.136E 00	0.11506E-05
13.50	0.168E 00	0.44060E-05
13.60	0.202E 00	0.17550E-04
13.70	0.239E 00	0.67265E-04
13.80	0.279E 00	0.20032E-03
13.90	0.320E 00	0.94022E-03
14.00	0.363E 00	0.31461E-02
14.10	0.407E 00	0.94720E-02
14.20	0.453E 00	0.25523E-01
14.30	0.499E 00	0.59065E-01
14.40	0.545E 00	0.11915E 00
14.50	0.589E 00	0.20815E 00
14.60	0.631E 00	0.31850E 00
14.70	0.669E 00	0.42457E 00
14.80	0.703E 00	0.54286E 00
14.90	0.732E 00	0.63845E 00
15.00	0.757E 00	0.70464E 00
15.10	0.794E 00	0.79259E 00
15.20	0.828E 00	0.85850E 00
15.30	0.858E 00	0.90329E 00
15.40	0.886E 00	0.93413E 00
15.50	0.910E 00	0.95409E 00
15.60	0.932E 00	0.96718E 00
15.70	0.950E 00	0.97566E 00
15.80	0.965E 00	0.98124E 00
15.90	0.977E 00	0.98485E 00
16.00	0.988E 00	0.98711E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00

27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.999E 00	0.99000E 00
42.00	0.999E 00	0.99999E 00
43.00	0.997E 00	0.99958E 00
44.00	0.990E 00	0.98607E 00
45.00	0.97[illegible]E 00	0.96423E 00
46.00	0.949E 00	0.97545E 00
47.00	0.913E 00	0.95628E 00
48.00	0.869E 00	0.91615E 00
49.00	0.816E 00	0.83865E 00
50.00	0.755E 00	0.70895E 00
51.00	0.656E 00	0.40107E 00
52.00	0.565E 00	0.15512E 00
53.00	0.480E 00	0.42095E-01
54.00	0.404E 00	0.86774E-02
55.00	0.336E 00	0.15262E-02
56.00	0.278E 00	0.25495E-03
57.00	0.227E 00	0.44517E-04
58.00	0.185E 00	0.67393E-05
59.00	0.149E 00	0.20179E-05
60.00	0.120E 00	0.55688E-06
61.00	0.959E-01	0.18584E-06
62.00	0.761E-01	0.73391E-07
63.00	0.599E-01	0.33627E-07
64.00	0.468E-01	0.17853E-07
65.00	0.363E-01	0.10592E-07
66.00	0.278E-01	0.69406E-08
67.00	0.211E-01	0.49539E-08
68.00	0.159E-01	0.37916E-08
69.00	0.118E-01	0.30755E-08
70.00	0.866E-02	0.26159E-08
71.00	0.626E-02	0.23118E-08
72.00	0.445E-02	0.21064E-08
73.00	0.311E-02	0.19660E-08
74.00	0.214E-02	0.18695E-08
75.00	0.144E-02	0.18032E-08
76.00	0.947E-03	0.17576E-08
77.00	0.606E-03	0.17271E-08
78.00	0.376E-03	0.17066E-08
79.00	0.224E-03	0.16933E-08
80.00	0.127E-03	0.16848E-08
81.00	0.681E-04	0.16797E-08
82.00	0.335E-04	0.16766E-08
83.00	0.147E-04	0.16750E-08
84.00	0.549E-05	0.16742E-08

BIN BOUNDARY FUNCTION, 3RD RECEIVER, LARGE F

NEAR RANGE IN FT. RN = 15.0
XMIT.DEFL.IN MRAD,DELTA = 10.0
XMIT. DIVER IN MRAD,SGMA3 = 0.50
REC.FIELD,FIELD IN MRAD,FS) = 23.3
FOCAL LENGTH IN IN.,F = 4.500
REC.APERT.HGHT IN IN.,YMAX = 1.125
BIKINI HGHT, NEAR,IN IN.,HN =-0.0716
BASELINE IN IN., B = 6.00
SIGNAL-TO-NOISE RATIO,SN = 6.540

FAR RANGE IN FT. RF = 50.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.25
IMAGE DISTANCE IN IN.,P = 4.53375
INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.40	0.984E-01	0.20625E-06
13.50	0.120E 00	0.85158E-06
13.60	0.164E 00	0.37809E-05
13.70	0.203E 00	0.17507E-04
13.80	0.244E 00	0.61199E-04
13.90	0.289E 00	0.36294E-03
14.00	0.336E 00	0.15090E-02
14.10	0.386E 00	0.56570E-02
14.20	0.439E 00	0.18506E-01
14.30	0.491E 00	0.50943E-01
14.40	0.543E 00	0.11572E 00
14.50	0.594E 00	0.21894E 00
14.60	0.642E 00	0.35201E 00
14.70	0.686E 00	0.49095E 00
14.80	0.725E 00	0.61255E 00
14.90	0.759E 00	0.70746E 00
15.00	0.786E 00	0.77671E 00
15.10	0.826E 00	0.85499E 00
15.20	0.861E 00	0.90678E 00
15.30	0.892E 00	0.93962E 00
15.40	0.919E 00	0.95596E 00
15.50	0.942E 00	0.97248E 00
15.60	0.962E 00	0.98014E 00
15.70	0.977E 00	0.98480E 00
15.80	0.988E 00	0.98758E 00
15.90	0.995E 00	0.98910E 00
16.00	0.998E 00	0.98978E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00

30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.100E 01	0.99000E 00
45.00	0.999E 00	0.98991E 00
46.00	0.993E 00	0.98676E 00
47.00	0.974E 00	0.98401E 00
48.00	0.938E 00	0.97023E 00
49.00	0.887E 00	0.93475E 00
50.00	0.824E 00	0.85159E 00
51.00	0.709E 00	0.56172E 00
52.00	0.599E 00	0.23338E 00
53.00	0.498E 00	0.57635E-01
54.00	0.406E 00	0.92248E-02
55.00	0.325E 00	0.11024E-02
56.00	0.255E 00	0.11932E-03
57.00	0.197E 00	0.14139E-04
58.00	0.150E 00	0.20967E-05
59.00	0.113E 00	0.41136E-06
60.00	0.840E-01	0.10676E-06
61.00	0.611E-01	0.35843E-07
62.00	0.434E-01	0.15096E-07
63.00	0.300E-01	0.77240E-08
64.00	0.199E-01	0.46545E-08
65.00	0.126E-01	0.32130E-08
66.00	0.761E-02	0.24778E-08
67.00	0.425E-02	0.20853E-08
68.00	0.218E-02	0.18737E-08
69.00	0.100E-02	0.17631E-08
70.00	0.402E-03	0.17085E-08
71.00	0.131E-03	0.16851E-08
72.00	0.302E-04	0.16764E-08
73.00	0.340E-05	0.16741E-08
74.00	0.314E-07	0.16737E-08
75.00	0.000E 00	0.16737E-08
76.00	0.000E 00	0.16737E-08
77.00	0.000E 00	0.16737E-08
78.00	0.000E 00	0.16737E-08
79.00	0.000E 00	0.16737E-08

// XEQ FPBIN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	1.00
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0716	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.541	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.10	0.749E-01	0.65108E-07
13.20	0.994E-01	0.21854E-06
13.30	0.127E 00	0.75198E-06
13.40	0.157E 00	0.22241E-05
13.50	0.191E 00	0.16525E-04
13.60	0.226E 00	0.42631E-04
13.70	0.264E 00	0.16245E-03
13.80	0.304E 00	0.57426E-03
13.90	0.345E 00	0.19201E-02
14.00	0.386E 00	0.56430E-02
14.10	0.427E 00	0.14610E-01
14.20	0.467E 00	0.33450E-01
14.30	0.507E 00	0.67304E-01
14.40	0.546E 00	0.12028E 00
14.50	0.582E 00	0.19333E 00
14.60	0.618E 00	0.28320E 00
14.70	0.652E 00	0.38231E 00
14.80	0.683E 00	0.48121E 00
14.90	0.712E 00	0.57170E 00
15.00	0.737E 00	0.64867E 00
15.10	0.775E 00	0.74931E 00
15.20	0.810E 00	0.82584E 00
15.30	0.841E 00	0.88045E 00
15.40	0.870E 00	0.91786E 00
15.50	0.896E 00	0.94291E 00
15.60	0.918E 00	0.95946E 00
15.70	0.938E 00	0.97035E 00
15.80	0.954E 00	0.97750E 00
15.90	0.968E 00	0.98219E 00
16.00	0.978E 00	0.98528E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00

27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.999E 00	0.98990E 00
42.00	0.998E 00	0.98969E 00
43.00	0.992E 00	0.98657E 00
44.00	0.981E 00	0.98583E 00
45.00	0.961E 00	0.98003E 00
46.00	0.933E 00	0.96811E 00
47.00	0.897E 00	0.94376E 00
48.00	0.852E 00	0.89561E 00
49.00	0.801E 00	0.80771E 00
50.00	0.744E 00	0.66811E 00
51.00	0.645E 00	0.36225E 00
52.00	0.555E 00	0.13660E 00
53.00	0.474E 00	0.37469E-01
54.00	0.401E 00	0.62154E-02
55.00	0.338E 00	0.15996E-02
56.00	0.283E 00	0.30413E-03
57.00	0.236E 00	0.60918E-04
58.00	0.196E 00	0.13549E-04
59.00	0.162E 00	0.34489E-05
60.00	0.133E 00	0.10174E-05
61.00	0.109E 00	0.34846E-06
62.00	0.895E-01	0.13785E-06
63.00	0.727E-01	0.62380E-07
64.00	0.587E-01	0.31896E-07
65.00	0.472E-01	0.18185E-07
66.00	0.378E-01	0.11404E-07
67.00	0.301E-01	0.77638E-08
68.00	0.238E-01	0.56671E-08
69.00	0.188E-01	0.43867E-08
70.00	0.147E-01	0.35656E-08
71.00	0.114E-01	0.30177E-08
72.00	0.885E-02	0.26403E-08
73.00	0.677E-02	0.23738E-08
74.00	0.514E-02	0.21821E-08
75.00	0.385E-02	0.20425E-08
76.00	0.285E-02	0.19399E-08
77.00	0.208E-02	0.18642E-08
78.00	0.149E-02	0.18086E-08
79.00	0.105E-02	0.17677E-08
80.00	0.723E-03	0.17380E-08
81.00	0.469E-03	0.17167E-08
82.00	0.319E-03	0.17016E-08
83.00	0.201E-03	0.16913E-08
84.00	0.122E-03	0.16844E-08

BIKINI BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	13.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT./PERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,FS1 =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53275
REC.APERT.LGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0710	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.565

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.977E-01	0.20173E-06
13.40	0.127E 00	0.77263E-06
13.50	0.160E 00	0.31906E-05
13.60	0.196E 00	0.13763E-04
13.70	0.235E 00	0.59565E-04
13.80	0.277E 00	0.25056E-03
13.90	0.321E 00	0.99141E-03
14.00	0.368E 00	0.35729E-02
14.10	0.415E 00	0.11327E-01
14.20	0.463E 00	0.30735E-01
14.30	0.510E 00	0.70635E-01
14.40	0.556E 00	0.13835E 00
14.50	0.600E 00	0.23531E 00
14.60	0.642E 00	0.35306E 00
14.70	0.682E 00	0.47801E 00
14.80	0.718E 00	0.59109E 00
14.90	0.750E 00	0.68294E 00
15.00	0.776E 00	0.75202E 00
15.10	0.814E 00	0.83393E 00
15.20	0.846E 00	0.89024E 00
15.30	0.879E 00	0.92731E 00
15.40	0.906E 00	0.95111E 00
15.50	0.930E 00	0.96620E 00
15.60	0.950E 00	0.97572E 00
15.70	0.966E 00	0.98172E 00
15.80	0.979E 00	0.98546E 00
15.90	0.989E 00	0.98775E 00
16.00	0.995E 00	0.98904E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.99000E 00
44.00	0.999E 00	0.98518E 00
45.00	0.993E 00	0.98670E 00
46.00	0.977E 00	0.98454E 00
47.00	0.940E 00	0.97501E 00
48.00	0.906E 00	0.95074E 00
49.00	0.852E 00	0.89531E 00
50.00	0.789E 00	0.78262E 00
51.00	0.678E 00	0.46405E 00
52.00	0.573E 00	0.17256E 00
53.00	0.477E 00	0.39587E-01
54.00	0.390E 00	0.62046E-02
55.00	0.314E 00	0.76858E-03
56.00	0.249E 00	0.57422E-04
57.00	0.196E 00	0.12568E-04
58.00	0.153E 00	0.22326E-05
59.00	0.118E 00	0.51279E-06
60.00	0.904E-01	0.14374E-06
61.00	0.682E-01	0.50444E-07
62.00	0.507E-01	0.21613E-07
63.00	0.371E-01	0.11009E-07
64.00	0.269E-01	0.64582E-08
65.00	0.185E-01	0.43401E-08
66.00	0.126E-01	0.32094E-08
67.00	0.836E-02	0.25758E-08
68.00	0.534E-02	0.22047E-08
69.00	0.327E-02	0.19620E-08
70.00	0.191E-02	0.18475E-08
71.00	0.105E-02	0.17674E-08
72.00	0.539E-03	0.17211E-08
73.00	0.252E-03	0.16957E-08
74.00	0.103E-03	0.16828E-08
75.00	0.352E-04	0.16760E-08
76.00	0.867E-05	0.16745E-08
77.00	0.112E-05	0.16738E-08
78.00	0.197E-07	0.16737E-08
79.00	0.000E 00	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

// XEQ FROIL

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN = 15.0
XMIT.DECL.IN MRAD,DELTA = 10.0
XMIT. BLUR IN MRAD,SGMA3 = 0.50
REC.ELEV.FIELD IN MRAD,PSI = 23.3
FOCAL LENGTH IN IN.,F = 4.500
REC APERT HGHT IN IN.,YMAX = 1.125
BIKINI HGHT,NEAR,IN IN.,HN =-0.0716
BASELINE IN IN., B = 6.00
SIGNAL-TO-NOISE RATIO,SN = 6.546

FAR RANGE IN FT, RF = 50.0
BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT.APERT.DIA.IN IN.,D = 0.30
REC. BLUR IN MRAD,SGMA1 = 0.50
IMAGE DISTANCE IN IN.,P = 4.53475
INDEX OF REFRACTION, I = 1.501
BIKINI HGHT,FAR,IN IN.,HF = 0.0000

THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.795E-01	0.86275E-07
13.40	0.107E 00	0.30954E-06
13.50	0.138E 00	0.12310E-05
13.60	0.172E 00	0.52340E-05
13.70	0.210E 00	0.22936E-04
13.80	0.250E 00	0.99690E-04
13.90	0.293E 00	0.41703E-03
14.00	0.339E 00	0.16266E-02
14.10	0.386E 00	0.56982E-02
14.20	0.435E 00	0.17366E-01
14.30	0.484E 00	0.44955E-01
14.40	0.531E 00	0.98244E-01
14.50	0.578E 00	0.18307E 00
14.60	0.623E 00	0.29602E 00
14.70	0.665E 00	0.42266E 00
14.80	0.703E 00	0.54387E 00
14.90	0.736E 00	0.64561E 00
15.00	0.765E 00	0.72421E 00
15.10	0.804E 00	0.81540E 00
15.20	0.840E 00	0.87065E 00
15.30	0.872E 00	0.92038E 00
15.40	0.901E 00	0.94707E 00
15.50	0.926E 00	0.96389E 00
15.60	0.947E 00	0.97441E 00
15.70	0.964E 00	0.98099E 00
15.80	0.978E 00	0.98508E 00
15.90	0.988E 00	0.98755E 00
16.00	0.994E 00	0.98894E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.999E 00	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.99000E 00
44.00	0.999E 00	0.98985E 00
45.00	0.994E 00	0.98884E 00
46.00	0.980E 00	0.98558E 00
47.00	0.957E 00	0.97710E 00
48.00	0.915E 00	0.95720E 00
49.00	0.866E 00	0.91307E 00
50.00	0.809E 00	0.82372E 00
51.00	0.701E 00	0.53906E 00
52.00	0.600E 00	0.23517E 00
53.00	0.506E 00	0.65869E-01
54.00	0.420E 00	0.12476E-01
55.00	0.343E 00	0.16013E-02
56.00	0.276E 00	0.25564E-03
57.00	0.223E 00	0.37371E-04
58.00	0.177E 00	0.62986E-05
59.00	0.140E 00	0.13441E-05
60.00	0.110E 00	0.35349E-06
61.00	0.855E-01	0.11432E-06
62.00	0.657E-01	0.44775E-07
63.00	0.499E-01	0.20785E-07
64.00	0.374E-01	0.11162E-07
65.00	0.273E-01	0.68257E-08
66.00	0.199E-01	0.46371E-08
67.00	0.140E-01	0.34455E-08
68.00	0.968E-02	0.27558E-08
69.00	0.640E-02	0.23369E-08
70.00	0.421E-02	0.20801E-08
71.00	0.263E-02	0.19177E-08
72.00	0.157E-02	0.18159E-08
73.00	0.895E-03	0.17531E-08
74.00	0.477E-03	0.17156E-08
75.00	0.235E-03	0.16942E-08
76.00	0.103E-03	0.16828E-08
77.00	0.391E-04	0.16771E-08
78.00	0.115E-04	0.16747E-08
79.00	0.216E-05	0.16739E-08
80.00	0.140E-06	0.16737E-08
81.00	0.195E-11	0.16737E-08

// XEQ FMBIN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,PSI =	28.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0720	BIKINI HGHT,FAR,IN IN.,HF =	-0.0010
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.132E 00	0.96071E-06
13.40	0.167E 00	0.42370E-05
13.50	0.205E 00	0.19232E-04
13.60	0.246E 00	0.87123E-04
13.70	0.290E 00	0.37949E-03
13.80	0.337E 00	0.15364E-02
13.90	0.385E 00	0.55614E-02
14.00	0.435E 00	0.17545E-01
14.10	0.485E 00	0.46489E-01
14.20	0.535E 00	0.10309E 00
14.30	0.583E 00	0.19325E 00
14.40	0.625E 00	0.31327E 00
14.50	0.673E 00	0.44798E 00
14.60	0.713E 00	0.57670E 00
14.70	0.750E 00	0.68366E 00
14.80	0.781E 00	0.76391E 00
14.90	0.807E 00	0.82061E 00
15.00	0.828E 00	0.85934E 00
15.10	0.862E 00	0.90787E 00
15.20	0.891E 00	0.93916E 00
15.30	0.917E 00	0.95894E 00
15.40	0.940E 00	0.97132E 00
15.50	0.959E 00	0.97908E 00
15.60	0.974E 00	0.98391E 00
15.70	0.985E 00	0.98680E 00
15.80	0.992E 00	0.98857E 00
15.90	0.997E 00	0.98947E 00
16.00	0.999E 00	0.98986E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.99000E 00
30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.999E 00	0.99000E 00
43.00	0.998E 00	0.98969E 00
44.00	0.988E 00	0.98794E 00
45.00	0.968E 00	0.97289E 00
46.00	0.932E 00	0.96753E 00
47.00	0.882E 00	0.93044E 00
48.00	0.820E 00	0.86616E 00
49.00	0.750E 00	0.68455E 00
50.00	0.676E 00	0.44933E 00
51.00	0.558E 00	0.14260E 00
52.00	0.454E 00	0.25726E-01
53.00	0.363E 00	0.31331E-02
54.00	0.285E 00	0.32635E-03
55.00	0.222E 00	0.36044E-04
56.00	0.170E 00	0.46784E-05
57.00	0.130E 00	0.61448E-06
58.00	0.978E-01	0.20259E-06
59.00	0.725E-01	0.61791E-07
60.00	0.527E-01	0.23662E-07
61.00	0.376E-01	0.11306E-07
62.00	0.261E-01	0.63716E-08
63.00	0.177E-01	0.41482E-08
64.00	0.115E-01	0.30361E-08
65.00	0.729E-02	0.24372E-08
66.00	0.439E-02	0.20995E-08
67.00	0.250E-02	0.19053E-08
68.00	0.134E-02	0.17946E-08
69.00	0.662E-03	0.17321E-08
70.00	0.294E-03	0.16994E-08
71.00	0.112E-03	0.16835E-08
72.00	0.341E-04	0.16767E-08
73.00	0.687E-05	0.16744E-08
74.00	0.346E-06	0.16738E-08
75.00	0.350E-09	0.16737E-08
76.00	0.000E 00	0.16737E-08
77.00	0.000E 00	0.16737E-08
78.00	0.000E 00	0.16737E-08
79.00	0.000E 00	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 3RD RECEIVER, LARGE F

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0700	BIKINI HGHT,FAR,IN IN.,HF =	0.0010
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.540	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.534E-01	0.24677E-07
13.40	0.761E-01	0.73334E-07
13.50	0.102E 00	0.24872E-06
13.60	0.131E 00	0.93324E-06
13.70	0.164E 00	0.37492E-05
13.80	0.200E 00	0.15600E-04
13.90	0.238E 00	0.65025E-04
14.00	0.279E 00	0.26316E-03
14.10	0.322E 00	0.10042E-02
14.20	0.367E 00	0.35023E-02
14.30	0.413E 00	0.10609E-01
14.40	0.460E 00	0.24754E-01
14.50	0.508E 00	0.65361E-01
14.60	0.550E 00	0.12763E 00
14.70	0.593E 00	0.21729E 00
14.80	0.634E 00	0.32736E 00
14.90	0.671E 00	0.44314E 00
15.00	0.705E 00	0.54946E 00
15.10	0.748E 00	0.67980E 00
15.20	0.789E 00	0.78147E 00
15.30	0.825E 00	0.85440E 00
15.40	0.858E 00	0.90379E 00
15.50	0.888E 00	0.93602E 00
15.60	0.914E 00	0.95662E 00
15.70	0.936E 00	0.96566E 00
15.80	0.955E 00	0.97789E 00
15.90	0.971E 00	0.98306E 00
16.00	0.982E 00	0.98630E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00

29.00	0.100E 01	0.95000E 00
30.00	0.100E 01	0.95000E 00
31.00	0.100E 01	0.95000E 00
32.00	0.100E 01	0.95000E 00
33.00	0.100E 01	0.95000E 00
34.00	0.100E 01	0.95000E 00
35.00	0.100E 01	0.95000E 00
36.00	0.100E 01	0.95000E 00
37.00	0.100E 01	0.95000E 00
38.00	0.100E 01	0.95000E 00
39.00	0.100E 01	0.95000E 00
40.00	0.100E 01	0.95000E 00
41.00	0.100E 01	0.95000E 00
42.00	0.100E 01	0.95000E 00
43.00	0.100E 01	0.95000E 00
44.00	0.999E 00	0.95000E 00
45.00	0.999E 00	0.9[illegible]994E 00
46.00	0.99[illegible]E 00	0.9[illegible]936E 00
47.00	0.987E 00	0.98722E 00
48.00	0.967E 00	0.9[illegible]185E 00
49.00	0.936E 00	0.9[illegible]530E 00
50.00	0.894E 00	0.94175E 00
51.00	0.796E 00	0.79758E 00
52.00	0.700E 00	0.53517E 00
53.00	0.609E 00	0.25[illegible]6E 00
54.00	0.523E 00	0.[illegible]6300E-01
55.00	0.443E 00	0.20[illegible]64E-01
56.00	0.370E 00	0.5[illegible]E-02
57.00	0.300E 00	0.62359E-03
58.00	0.256E 00	0.10059E-03
59.00	0.203E 00	0.17772E-04
60.00	0.164E 00	0.3[illegible]743E-05
61.00	0.131E 00	0.9104[illegible]E-06
62.00	0.104E 00	0.27687E-06
63.00	0.827E-01	0.10025E-06
64.00	0.648E-01	0.42792E-07
65.00	0.503E-01	0.21135E-07
66.00	0.385E-01	0.13855E-07
67.00	0.292E-01	0.74212E-08
68.00	0.217E-01	0.51615E-08
69.00	0.159E-01	0.379[illegible]4E-08
70.00	0.114E-01	0.30193E-08
71.00	0.806E-02	0.25364E-08
72.00	0.553E-02	0.22274E-08
73.00	0.370E-02	0.20262E-08
74.00	0.239E-02	0.18944E-08
75.00	0.144E-02	0.1[illegible]084E-08
76.00	0.855E-03	0.17521E-08
77.00	0.509E-03	0.17184E-08
78.00	0.272E-03	0.16975E-08
79.00	0.134E-03	0.16854E-08
80.00	0.593E-04	0.16769E-08
81.00	0.223E-04	0.16757E-08

// XEQ [illegible]

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.FLEV.FIELD IN MRAD,FSI =	22.5	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT.NEAR,IN IN.,HN =	-0.0716	BIKINI HGHT.FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	[illegible].95		
SIGNAL-TO-NOISE RATIO,SN =	6.54[illegible]	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.20	0.994E-01	0.21839E-06
13.30	0.130E 00	0.86411E-06
13.40	0.164E 00	0.36927E-05
13.50	0.201E 00	0.10424E-04
13.60	0.241E 00	0.73151E-04
13.70	0.284E 00	0.31469E-03
13.80	0.330E 00	0.12655E-02
13.90	0.378E 00	0.46613E-02
14.00	0.427E 00	0.14600E-01
14.10	0.476E 00	0.35329E-01
14.20	0.525E 00	0.89034E-01
14.30	0.572E 00	0.17076E 00
14.40	0.618E 00	0.26302E 00
14.50	0.662E 00	0.41346E 00
14.60	0.703E 00	0.54277E 00
14.70	0.739E 00	0.65389E 00
14.80	0.771E 00	0.73958E 00
14.90	0.798E 00	0.80132E 00
15.00	0.819E 00	0.84418E 00
15.10	0.853E 00	0.89747E 00
15.20	0.884E 00	0.93224E 00
15.30	0.911E 00	0.95441E 00
15.40	0.934E 00	0.96638E 00
15.50	0.953E 00	0.97717E 00
15.60	0.969E 00	0.98267E 00
15.70	0.982E 00	0.98609E 00
15.80	0.990E 00	0.98812E 00
15.90	0.996E 00	0.98924E 00
16.00	0.998E 00	0.98977E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00

28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00
30.00	0.999E 00	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.999E 00	0.98999E 00
44.00	0.997E 00	0.98901E 00
45.00	0.989E 00	0.98783E 00
46.00	0.969E 00	0.98256E 00
47.00	0.936E 00	0.96935E 00
48.00	0.890E 00	0.93803E 00
49.00	0.834E 00	0.86944E 00
50.00	0.770E 00	0.73796E 00
51.00	0.660E 00	0.40684E 00
52.00	0.556E 00	0.13892E 00
53.00	0.461E 00	0.29639E-01
54.00	0.376E 00	0.44684E-02
55.00	0.303E 00	0.56684E-03
56.00	0.241E 00	0.72882E-04
57.00	0.190E 00	0.10738E-04
58.00	0.149E 00	0.19617E-05
59.00	0.115E 00	0.45526E-06
60.00	0.988E-01	0.13342E-06
61.00	0.674E-01	0.48462E-07
62.00	0.504E-01	0.21294E-07
63.00	0.371E-01	0.11036E-07
64.00	0.268E-01	0.65840E-08
65.00	0.189E-01	0.44215E-08
66.00	0.130E-01	0.32749E-08
67.00	0.874E-02	0.26260E-08
68.00	0.566E-02	0.22421E-08
69.00	0.353E-02	0.20092E-08
70.00	0.211E-02	0.18668E-08
71.00	0.119E-02	0.17805E-08
72.00	0.634E-03	0.17296E-08
73.00	0.310E-03	0.17008E-08
74.00	0.130E-03	0.16856E-08
75.00	0.509E-04	0.16782E-08
76.00	0.148E-04	0.16750E-08
77.00	0.272E-05	0.16740E-08
78.00	0.167E-06	0.16737E-08
79.00	0.302E-12	0.16737E-08
80.00	0.000E 00	0.16737E-08
81.00	0.000E 00	0.16737E-08

// XEQ FMBIN

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, FF =	50.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM LIVELG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	4.500	IMAGE DISTANCE IN IN.,P =	4.53375
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, M =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0716	BIKINI HGHT,FAR,IN IN.,HF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	6.546	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROB.OF DETECTION
13.40	0.783E-01	0.81532E-07
13.50	0.105E 00	0.28367E-06
13.60	0.135E 00	0.10930E-05
13.70	0.168E 00	0.44973E-05
13.80	0.205E 00	0.19107E-04
13.90	0.244E 00	0.80977E-04
14.00	0.286E 00	0.32150E-03
14.10	0.330E 00	0.12714E-02
14.20	0.376E 00	0.44204E-02
14.30	0.423E 00	0.13475E-01
14.40	0.470E 00	0.35173E-01
14.50	0.516E 00	0.78076E-01
14.60	0.561E 00	0.14868E 00
14.70	0.605E 00	0.24685E 00
14.80	0.645E 00	0.36282E 00
14.90	0.683E 00	0.48013E 00
15.00	0.716E 00	0.58412E 00
15.10	0.759E 00	0.70897E 00
15.20	0.799E 00	0.80373E 00
15.30	0.835E 00	0.87028E 00
15.40	0.867E 00	0.91461E 00
15.50	0.896E 00	0.94320E 00
15.60	0.921E 00	0.96132E 00
15.70	0.943E 00	0.97272E 00
15.80	0.961E 00	0.97988E 00
15.90	0.975E 00	0.98436E 00
16.00	0.986E 00	0.98710E 00
17.00	0.100E 01	0.99000E 00
18.00	0.100E 01	0.99000E 00
19.00	0.100E 01	0.99000E 00
20.00	0.100E 01	0.99000E 00
21.00	0.100E 01	0.99000E 00
22.00	0.100E 01	0.99000E 00
23.00	0.100E 01	0.99000E 00
24.00	0.100E 01	0.99000E 00
25.00	0.100E 01	0.99000E 00
26.00	0.100E 01	0.99000E 00
27.00	0.100E 01	0.99000E 00
28.00	0.100E 01	0.99000E 00
29.00	0.100E 01	0.99000E 00

30.00	0.100E 01	0.99000E 00
31.00	0.100E 01	0.99000E 00
32.00	0.100E 01	0.99000E 00
33.00	0.100E 01	0.99000E 00
34.00	0.100E 01	0.99000E 00
35.00	0.100E 01	0.99000E 00
36.00	0.100E 01	0.99000E 00
37.00	0.100E 01	0.99000E 00
38.00	0.100E 01	0.99000E 00
39.00	0.100E 01	0.99000E 00
40.00	0.100E 01	0.99000E 00
41.00	0.100E 01	0.99000E 00
42.00	0.100E 01	0.99000E 00
43.00	0.100E 01	0.99000E 00
44.00	0.999E 00	0.98995E 00
45.00	0.996E 00	0.98938E 00
46.00	0.986E 00	0.98706E 00
47.00	0.963E 00	0.97078E 00
48.00	0.928E 00	0.96549E 00
49.00	0.882E 00	0.92043E 00
50.00	0.826E 00	0.85617E 00
51.00	0.719E 00	0.59326E 00
52.00	0.617E 00	0.27923E 00
53.00	0.521E 00	0.83871E-01
54.00	0.433E 00	0.16795E-01
55.00	0.355E 00	0.25464E-02
56.00	0.287E 00	0.34347E-03
57.00	0.230E 00	0.48011E-04
58.00	0.182E 00	0.77806E-05
59.00	0.143E 00	0.15535E-05
60.00	0.112E 00	0.38893E-06
61.00	0.867E-01	0.12114E-06
62.00	0.663E-01	0.46088E-07
63.00	0.501E-01	0.20941E-07
64.00	0.372E-01	0.11101E-07
65.00	0.272E-01	0.67151E-08
66.00	0.194E-01	0.45407E-08
67.00	0.136E-01	0.33695E-08
68.00	0.927E-02	0.26978E-08
69.00	0.612E-02	0.22554E-08
70.00	0.390E-02	0.20475E-08
71.00	0.239E-02	0.18944E-08
72.00	0.140E-02	0.17954E-08
73.00	0.772E-03	0.17415E-08
74.00	0.396E-03	0.17064E-08
75.00	0.186E-03	0.16895E-08
76.00	0.766E-04	0.16804E-08
77.00	0.260E-04	0.16760E-08
78.00	0.639E-05	0.16743E-08
79.00	0.823E-06	0.16738E-08
80.00	0.139E-07	0.16737E-08
81.00	0.000E 00	0.16737E-08
82.00	0.000E 00	0.16737E-08

// XEQ FMBII

APPENDIX F

BIN BOUNDARY FUNCTION, 1ST RECEIVER

NEAR RANGE IN FT, RN = 2.0	FAR RANGE IN FT, RF = 10.0
XMIT.DECL.IN MRAD,DELTA = 10.0	BEAM DIVERG.IN MRAD,SGMA2 = 0.50
XMIT. BLUR IN MRAD,SGMA3 = 0.50	XMIT.APERT.DIA.IN IN.,D = 0.30
REC.ELEV.FIELD IN MRAD,FSI = 40.0	REC. BLUR IN MRAD,SGMA1 = 0.50
FOCAL LENGTH IN IN.,F = 0.400	IMAGE DISTANCE IN IN.,P = 0.40133
REC.APERT.HGHT IN IN.,YMAX = 0.200	INDEX OF REFRACTION, N = 1.501
BIKINI HGHT,NEAR,IN IN.,HN =-0.0107	BIKINI HGHT,FAR,IN IN.,HF = 0.0000
BASELINE IN IN., B = 1.20	
SIGNAL-TO-NOISE RATIO,SN = 26.160	THRESHOLD-TO-NOISE RATIO,THN = 3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
0.90	0.000E 00	0.16737E-08
1.00	0.000E 00	0.16737E-08
1.10	0.000E 00	0.16737E-08
1.20	0.000E 00	0.16737E-08
1.30	0.000E 00	0.16737E-08
1.40	0.000E 00	0.16737E-08
1.50	0.000E 00	0.16737E-08
1.60	0.000E 00	0.16737E-08
1.70	0.237E-03	0.17581E-08
1.80	0.367E-01	0.17829E-05
1.90	0.130E 00	0.85329E-01
2.00	0.262E 00	0.99636E 00
2.10	0.437E 00	0.10000E 01
2.20	0.610E 00	0.10000E 01
2.30	0.779E 00	0.10000E 01
2.40	0.914E 00	0.10000E 01
2.50	0.988E 00	0.10000E 01
2.60	0.100E 01	0.10000E 01
2.70	0.100E 01	0.10000E 01
2.80	0.100E 01	0.10000E 01
2.90	0.100E 01	0.10000E 01
3.00	0.100E 01	0.10000E 01
4.00	0.100E 01	0.10000E 01
5.00	0.100E 01	0.10000E 01
6.00	0.100E 01	0.10000E 01
7.00	0.100E 01	0.10000E 01
8.00	0.100E 01	0.10000E 01
9.00	0.996E 00	0.10000E 01
10.00	0.890E 00	0.10000E 01
11.00	0.516E 00	0.10000E 01
12.00	0.276E 00	0.99692E 00
13.00	0.129E 00	0.80941E-01
14.00	0.518E-01	0.20620E-04
15.00	0.182E-01	0.62663E-07
16.00	0.513E-02	0.47803E-08
17.00	0.980E-03	0.20494E-08
18.00	0.882E-04	0.17046E-08
19.00	0.786E-06	0.16740E-08
20.00	0.000E 00	0.16737E-08
21.00	0.000E 00	0.16737E-08

BIN BOUNDARY FUNCTION, 2ND RECEIVER

NEAR RANGE IN FT, RN =	5.0	FAR RANGE IN FT, RF =	25.0
XMIT.DECL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	40.0	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	0.560	IMAGE DISTANCE IN IN.,P =	0.56105
REC.APERT.HGHT IN IN.,YMAX =	0.280	INDEX OF REFRACTION, N =	1.001
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0150	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	3.00		
SIGNAL-TO-NOISE RATIO,SN =	26.160	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
3.80	0.000E 00	0.16737E-08
3.90	0.000E 00	0.16737E-08
4.00	0.000E 00	0.16737E-08
4.10	0.000E 00	0.16737E-08
4.20	0.000E 00	0.16737E-08
4.30	0.000E 00	0.16737E-08
4.40	0.000E 00	0.16737E-08
4.50	0.992E-04	0.17085E-08
4.60	0.126E-01	0.21629E-07
4.70	0.599E-01	0.60135E-04
4.80	0.141E 00	0.15788E 00
4.90	0.254E 00	0.99271E 00
5.00	0.386E 00	0.99999E 00
5.10	0.537E 00	0.10000E 01
5.20	0.686E 00	0.10000E 01
5.30	0.816E 00	0.10000E 01
5.40	0.913E 00	0.10000E 01
5.50	0.974E 00	0.10000E 01
5.60	0.998E 00	0.10000E 01
5.70	0.100E 01	0.10000E 01
5.80	0.100E 01	0.10000E 01
5.90	0.100E 01	0.10000E 01
6.00	0.100E 01	0.10000E 01
7.00	0.100E 01	0.10000E 01
8.00	0.100E 01	0.10000E 01
9.00	0.100E 01	0.10000E 01
10.00	0.100E 01	0.10000E 01
11.00	0.100E 01	0.10000E 01
12.00	0.100E 01	0.10000E 01
13.00	0.100E 01	0.10000E 01
14.00	0.100E 01	0.10000E 01
15.00	0.100E 01	0.10000E 01
16.00	0.100E 01	0.10000E 01
17.00	0.100E 01	0.10000E 01
18.00	0.100E 01	0.10000E 01
19.00	0.100E 01	0.10000E 01
20.00	0.100E 01	0.10000E 01
21.00	0.100E 01	0.10000E 01
22.00	0.999E 00	0.10000E 01
23.00	0.976E 00	0.10000E 01

24.00	0.900E 00	0.10000E 01
25.00	0.778E 00	0.10000E 01
26.00	0.567E 00	0.10000E 01
27.00	0.392E 00	0.99905E 00
28.00	0.254E 00	0.99275E 00
29.00	0.151E 00	0.24533E 00
30.00	0.822E-01	0.12164E-02
31.00	0.410E-01	0.37254E-05
32.00	0.185E-01	0.66824E-07
33.00	0.724E-02	0.73360E-08
34.00	0.228E-02	0.26759E-08
35.00	0.509E-03	0.16598E-08
36.00	0.600E-04	0.16547E-08
37.00	0.994E-06	0.16741E-08
38.00	0.000E 00	0.16737E-08
39.00	0.000E 00	0.16737E-08
40.00	0.000E 00	0.16737E-08
41.00	0.000E 00	0.16737E-08
42.00	0.000E 00	0.16737E-08
43.00	0.000E 00	0.16737E-08
44.00	0.000E 00	0.16737E-08
45.00	0.000E 00	0.16737E-08
46.00	0.000E 00	0.16737E-08
47.00	0.000E 00	0.16737E-08
48.00	0.000E 00	0.16737E-08
49.00	0.000E 00	0.16737E-08
50.00	0.000E 00	0.16737E-08
51.00	0.000E 00	0.16737E-08
52.00	0.000E 00	0.16737E-08

// XEQ FMB11

BIN BOUNDARY FUNCTION, 3RD RECEIVER

NEAR RANGE IN FT, RN =	15.0	FAR RANGE IN FT, RF =	50.0
XMIT.DEFL.IN MRAD,DELTA =	10.0	BEAM DIVERG.IN MRAD,SGMA2 =	0.50
XMIT. BLUR IN MRAD,SGMA3 =	0.50	XMIT.APERT.DIA.IN IN.,D =	0.30
REC.ELEV.FIELD IN MRAD,PSI =	23.3	REC. BLUR IN MRAD,SGMA1 =	0.50
FOCAL LENGTH IN IN.,F =	2.250	IMAGE DISTANCE IN IN.,P =	2.25844
REC.APERT.HGHT IN IN.,YMAX =	1.125	INDEX OF REFRACTION, N =	1.501
BIKINI HGHT,NEAR,IN IN.,HN =	-0.0351	BIKINI HGHT,FAR,IN IN.,RF =	0.0000
BASELINE IN IN., B =	6.00		
SIGNAL-TO-NOISE RATIO,SN =	26.160	THRESHOLD-TO-NOISE RATIO,THN =	3.965

RANGE R IN FT	RELATIVE SENSITIVITY I	PROBAB.OF DETECTION
13.30	0.659E-01	0.15654E-03
13.40	0.805E-01	0.24605E-02
13.50	0.114E 00	0.27065E-01
13.60	0.142E 00	0.16866E 00
13.70	0.174E 00	0.52597E 00
13.80	0.208E 00	0.86922E 00
13.90	0.245E 00	0.98599E 00
14.00	0.284E 00	0.99948E 00
14.10	0.325E 00	0.99999E 00
14.20	0.368E 00	0.99999E 00
14.30	0.411E 00	0.10000E 01
14.40	0.455E 00	0.10000E 01
14.50	0.498E 00	0.10000E 01
14.60	0.540E 00	0.10000E 01
14.70	0.581E 00	0.10000E 01
14.80	0.621E 00	0.10000E 01
14.90	0.658E 00	0.10000E 01
15.00	0.692E 00	0.10000E 01
15.10	0.736E 00	0.10000E 01
15.20	0.777E 00	0.10000E 01
15.30	0.815E 00	0.10000E 01
15.40	0.849E 00	0.10000E 01
15.50	0.880E 00	0.10000E 01
15.60	0.907E 00	0.10000E 01
15.70	0.930E 00	0.10000E 01
15.80	0.950E 00	0.10000E 01
15.90	0.967E 00	0.10000E 01
16.00	0.980E 00	0.10000E 01
17.00	0.100E 01	0.10000E 01
18.00	0.100E 01	0.10000E 01
19.00	0.100E 01	0.10000E 01
20.00	0.100E 01	0.10000E 01
21.00	0.100E 01	0.10000E 01
22.00	0.100E 01	0.10000E 01
23.00	0.100E 01	0.10000E 01
24.00	0.100E 01	0.10000E 01
25.00	0.100E 01	0.10000E 01
26.00	0.100E 01	0.10000E 01
27.00	0.100E 01	0.10000E 01
28.00	0.100E 01	0.10000E 01

29.00	0.100E 01	0.10000E 01
30.00	0.100E 01	0.10000E 01
31.00	0.100E 01	0.10000E 01
32.00	0.100E 01	0.10000E 01
33.00	0.100E 01	0.10000E 01
34.00	0.100E 01	0.10000E 01
35.00	0.100E 01	0.10000E 01
36.00	0.100E 01	0.10000E 01
37.00	0.100E 01	0.10000E 01
38.00	0.100E 01	0.10000E 01
39.00	0.100E 01	0.10000E 01
40.00	0.100E 01	0.10000E 01
41.00	0.100E 01	0.10000E 01
42.00	0.100E 01	0.10000E 01
43.00	0.999E 00	0.10000E 01
44.00	0.999E 00	0.10000E 01
45.00	0.993E 00	0.10000E 01
46.00	0.978E 00	0.10000E 01
47.00	0.949E 00	0.10000E 01
48.00	0.907E 00	0.10000E 01
49.00	0.854E 00	0.10000E 01
50.00	0.794E 00	0.10000E 01
51.00	0.685E 00	0.10000E 01
52.00	0.582E 00	0.10000E 01
53.00	0.488E 00	0.10000E 01
54.00	0.403E 00	0.99999E 00
55.00	0.328E 00	0.99999E 00
56.00	0.264E 00	0.99672E 00
57.00	0.210E 00	0.86038E 00
58.00	0.166E 00	0.42597E 00
59.00	0.131E 00	0.87304E-01
60.00	0.102E 00	0.98365E-02
61.00	0.794E-01	0.87705E-03
62.00	0.611E-01	0.80860E-04
63.00	0.465E-01	0.90856E-05
64.00	0.351E-01	0.13524E-05
65.00	0.261E-01	0.27370E-06
66.00	0.191E-01	0.74668E-07
67.00	0.137E-01	0.26685E-07
68.00	0.972E-02	0.12044E-07
69.00	0.672E-02	0.66049E-08
70.00	0.453E-02	0.42404E-08
71.00	0.296E-02	0.30830E-08
72.00	0.188E-02	0.24661E-08
73.00	0.114E-02	0.21192E-08
74.00	0.661E-03	0.19191E-08
75.00	0.361E-03	0.18037E-08
76.00	0.183E-03	0.17380E-08
77.00	0.847E-04	0.17033E-08
78.00	0.340E-04	0.16856E-08
79.00	0.111E-04	0.16776E-08
80.00	0.253E-05	0.16740E-08
81.00	0.272E-06	0.16738E-08