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ACOUSTIC RAYTRACING TO FIXED GROUND RECEIVERS (PROGRAM AIRRAY). (U)
APR 80 E B WRIGHT
NRL-MR-4185

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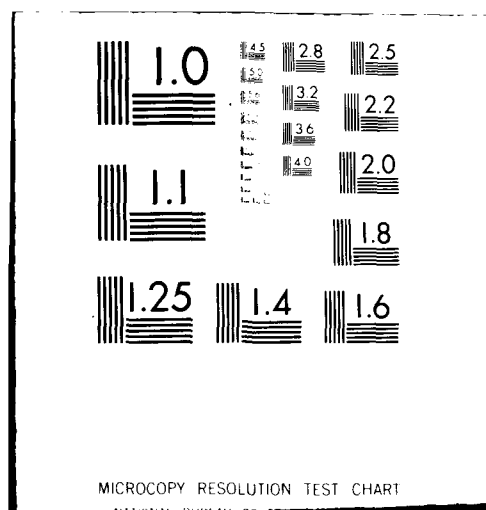
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ACOUSTIC RAYTRACING TO FIXED GROUND RECEIVERS (PROGRAM AIRRAY)

INTRODUCTION

AIRRAY is a FORTRAN-IV program which adapts some of the techniques used for some time in underwater acoustic ray computations to atmospheric ray tracing. The basic ray path integration algorithm of R. J. Thompson,^{1,2} which has been incorporated into this program, computes the paths of sound rays reaching the ground from a source at an arbitrary altitude, and traveling in a fixed vertical plane. The effect of the horizontal component of the wind in the source-receiver plane, at each altitude, is considered in the program; other wind components are neglected. The present program is designed to find all eigenrays (rays connecting source and receiver) reaching a set of equally-spaced receivers along the ground track, either directly or by multiple surface reflection, and compute their travel times, ray intensity levels, ray angles and number of surface reflections. Eigenrays are found, and their trajectory parameters are computed, by linear interpolation in the set of rays traced to the ground. After the eigenrays along a user-specified set of tracks have been computed, a table of CW transmission losses vs. range and bearing is computed by random-phase addition; or, for a given bearing, a table of transmission loss vs. range and source altitude may be computed.

Since this program will often be used to model explosive or moving sources of sound, the eigenray listing may be a more useful output than the transmission loss table. The transmission loss calculation is strictly valid only for a stationary continuous source; however, the table may

Manuscript submitted November 18, 1979.

still be useful in indicating the locations of shadow zones on the ground. Transmission losses greater than 120 dB are not printed, so that high-loss regions stand out in the table as blank areas.

The physical input data required is a weather profile, i.e., a table of temperature, wind speed, and wind direction as functions of altitude. The receivers are always on the ground, and the ground is flat, although it may be at an arbitrary elevation with respect to sea level, where the weather profile is assumed to start.

THEORY

An outline of the theory will be found in Refs. 1 and 2. It is of interest here, however, to show a comparison between the equations used here and those of single-profile underwater acoustic ray tracing with currents neglected, where Snell's law applies. The basic differential equations in the Snell's law case are :³

$$\frac{dx}{dt} = \frac{c^2}{c_m} \quad (1A)$$

$$\frac{dz}{dt} = \pm c \sqrt{1 - \frac{c^2}{c_m^2}} \quad (1B)$$

and an invariant quantity along the trajectory of a ray is

$$c_m = \frac{c}{\cos \theta} \quad (2)$$

In the present model of an atmosphere with wind, the differential equations are

$$\frac{dx}{dt} = \frac{u(1 + ku) - kc^2}{1 + ku} \quad (3A)$$

$$\frac{dz}{dt} = \pm \frac{c\sqrt{(1 + ku)^2 - k^2c^2}}{1 + ku} \quad (3B)$$

and the invariant quantity along a ray trajectory is

$$k = \frac{1}{c^2 - u^2} \left[u - \frac{c^2}{\sqrt{c^2 + (c^2 - u^2) \tan^2 \theta}} \right] \quad (4)$$

In all of the equations above, x and z are the horizontal and vertical coordinates, respectively, $c = c(z)$ is the soundspeed, $u = u(z)$ is the in-plane component of wind speed, and θ is the ray angle with the horizontal. Note that the present model is not the small-angle model sometimes used, where Eqs. 1 and 2 are used with the still-air sound speed c being replaced by $c + u$ at every altitude in the vertical plane.⁴ The present model treats the wind component in the plane exactly (Eqs. 3A and 3B), although neglecting the ordinarily smaller effect of crosswind.

The interpolating function used here is piecewise-linear; i.e., the ray path equations are solved in closed form in each profile layer, under the assumption that c and u vary linearly with z within the layer, and are continuous at layer boundaries.

INPUTS AND OUTPUTS

The input card deck structure for AIRRAY is as follows:

Card 1: Any alphanumeric title in cols 1-72.

Card 2: DR, R2, (H(I), I = 1, 8)

FORMAT (10F8)

DR is the initial receiver range (and range increment) in km.

R2 is the final range in km.

H is the array of source altitudes in m.

Additional source altitudes may be entered following card 2 in format (10F8), up to a total of 30. Always terminate the array of source altitudes with a blank or negative number, using an extra card if necessary. Note that the source altitudes entered are measured from ground level.

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Card 3: (B (I), I = 1, 16) FORMAT (16F5)

Card 3A: (B (I), I = 17, 30) FORMAT (16F5)

B is the array of track bearings (source to receivers). Use card 3A if more than 16 are to be computed. Always terminate the bearing input with a negative number unless the full 30 are entered.

Card 4: (Y (I), T (I), D (I), W (I), I = 1, 50) FORMAT (4F8)

Y is the array of weather profile altitudes in m. (Y is measured from sea level—see below.)

T is the array of temperatures in degrees C.

D is the array of wind directions (bearings from which the wind blows) in degrees.

W is the array of wind speeds in knots.

The weather profile is read in, one altitude per card, from sea level up. The last altitude should be above 100,000 m, and its temperature should be the maximum on the profile. Always terminate the profile input with a blank card, unless all 50 altitudes are used. Since the first weather profile card is for sea level, the first profile altitude is always 0. If a non-zero ground elevation is desired, enter it in m. in the Y-position on the first profile card. The rest of the altitudes in the profile will be reduced to altitudes above ground level in the program. Source altitudes are always measured from ground level when entered.

The program finds and lists all eigenrays for a track (source-receiver bearing) before going on to the next track. (The listing for each eigenray includes the number of ground reflections the ray has had up to the receiver point, and the ray's source and receiver angles, travel time, intensity level, and mean horizontal speed.) After all tracks for a given source altitude are

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done, a table of transmission loss in dB vs. range and bearing is computed by random-phase addition of eigenrays at each receiver, and printed. Then the program proceeds to the next source altitude and repeats the computations for the same set of bearings.

If only one bearing is entered, transmission loss is tabulated vs. range and source altitude rather than range and bearing. In this case the table is not printed until the very end.

Appendix A is a listing of the program; Appendix B is a listing of a sample data deck with the resulting output.

REFERENCES

- [1] Thompson, R. J.: *Ray Theory for an Inhomogeneous Moving Medium*, J. Acoust. Soc. Am. 51, 1675-1682 (1972).
- [2] Thompson, R. J.: *Computing Sound Ray Paths in the Presence of Wind*, Sandia Lab. Report SC-RR-67-53 (1967). Sandia Laboratory, Albuquerque, N.M. 87115.
- [3] Wright, E. B.: *Acoustic Transmission Loss by Single-Profile Ray Tracing*, NRL Report 7815 (1974). Naval Research Lab., Washington, D.C. 20375.
- [4] Roberts, B. G. and E. H. Bebb: *Atmospheric Ray Tracing* NRL Memorandum Report 2865 (1974). Naval Research Lab., Washington, D.C. 20375.

Appendix A

SOURCE LISTING
 STATEMENT
 ASC FAST FORTRAN COMPILER
 CP OPTIONS = (U)
 PROGRAM AIR RAY
 ATMOSPHERIC RAYTRACE PROGRAM INCLUDING WIND IN STRATIFIED WEATHER PROFILE.
 E 8 WRIGHT CODE 8160
 RELEASE FTX0526.P214
 DATE = 09/20/79(79.263)

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WASHINGTON DC
(202) 767-2261

SEE ALSO R J THOMPSON, SANDIA LAB REPORT SC-RR-67-53
OR JASA 51, 1675-1682(1972).

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0007	COMMON /CYCLE/ ZDOWN(50), XDOWN(50), TDOWN(50), ODOWN(50), 1 ZUP(50), XUP(50), TUP(50), OUP(50)				
0008	COMMON /PATH/ X(200), Y(200), 1 Z(200), ANG(400), MHITS(400),				
0009	1 RANG(200), LINE(200), XVEL(20,400), XLEVE(20,400)				
0010	COMMON /WTS/ DB(50), MH(50), HGR(50), 1 ISUPRX, IBRG, IH, NDOWN				
0011	COMMON /STRND/ H(20), 1 UAC(50), UC(50), UUC(50), UUB(50),				
0012	DIMENSION CCA(50), CCB(50), CCA(50), CCB(50),				
0013	1 UUBA(50), UUBB(50), S(50), S(50),				
0014	DIMENSION LINE(61), LNE(50), IPRESH(30)				
0015	DATA LPOINT /				
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CSN	STATEMENT	CP OPTIONS = (U)	DATE = 09/20/79(79.263)	TIME = 14323031
0047	DO 50 INESH=1,MMESH			
0048	IF (MMESH.EQ.1) IPRESH(INESH) = DEG(INESH) + .5			
0049	CONTINUE			
0050	50 CONTINUE			
0051	51 IF (MMESH.EQ.1) PRINT 2042 TITLE, MMESH (IPRESH(INESH)), INESH=1, MMESH			
0052	IF (MMESH.EQ.1) AND (ID.ME.NE.0) GO TO 501			
0053	IF (MMESH.EQ.1) PRINT 506, TITLE, DEG(1), (IPRESH(INESH)), INESH=1, MMESH			
0054	PRINT 505			
0055	NP = 0			
0056	DO 300 IP=1,MM			
0057	DO 300 IP=1,MM			
0058	LYNE(INESH) = IP			
0059	LYNE(INESH) = 10LANK			
0060	CONTINUE			
0061	300 CONTINUE			
0062	DO 400 INESH=1,MMESH			
0063	IF (DO(1,INESH).GE.DORAX) GO TO 400			
0064	MMESH = DO(1,INESH) + .5			
0065	ENCODE(1,MMESH,LYNE(INESH)) MM			
0066	CONTINUE			
0067	PRINT 503, NP, LYNE			
0068	NP = NP + 01			
0069	CONTINUE			
0070	500 IF (IN-DETECT) STOP			
0071	MM = DETECT			
0072	MM = MM*(10)			
0073	MMESH = MM			
0074	MMESH = MMESH			
0075	1003 IF (MMESH.EQ.1) 1003,1004,1005			
0076	CONTINUE			
0077	1004 GO TO 1005			
0078	MMESH = 1			
0079	GO TO 1006			
0080	MMESH = 1			
0081	MMESH = 1			
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DATE = 09/20/79(79.263)

ASC FAST FORTRAN COMPILER
CP OPTIONS = (U)

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SUBROUTINE DINTGCG1, C2, U1, U2, Z1, Z2, R, XX, TY, DXX

APPLICI RELOA-M-22

DATA C1, C2, U1, U2, Z1, Z2, XX, TY, DXX

F=Z1/C2

A=U1/C2

B=U2/C2

C=U1/C1

D=U2/C1

E=U1/C1

F=U2/C1

G=U1/C1

H=U2/C1

I=U1/C1

J=U2/C1

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L=U2/C1

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N=U2/C1

O=U1/C1

P=U2/C1

Q=U1/C1

R=U2/C1

S=U1/C1

T=U2/C1

U=U1/C1

V=U2/C1

W=U1/C1

X=U2/C1

Y=U1/C1

Z=U2/C1

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AB=U2/C1

AC=U1/C1

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DATE = 09/20/79(79.263)

ASC FAST FORTRAN COMPILER
CP OPTIONS = (U)

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DATE = 09/20/79(79.263)

MASC FAST FORTRAN COMPILER
COMP OPTIONS = (U)

**SOURCE LISTING
STATEMENT**

[illegible]

MS2	0001	0005	0007
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00009 LEGENDARYS=ABS(ANGLE(ISDOWN))
00010 MEXIA = 0
00011 DO I=1,KD
00012 DO J=1,KD
00013 X(XNEXT) = XDOWN(I)
00014 Y(YNEXT) = ZDOWN(I)
00015 CONTINUE
00016 DO 200 I=1,KD
00017 XO = X(KD)
00018 YO = Y(KD)
00019 DO 200 I=2,KD
00020 DO 200 I=2,KD
00021 MEXI = MEXI + 1
00022 IF I=KD - 1 + 1
00023 X(XNEXT) = XO - XDOWN(II)
00024 Y(YNEXT) = ZDOWN(II)
00025 CONTINUE
00026 LCYC = KD
00027 XCYC = X(KD)
00028 MCYC = 1
00029 IF(CYC=1) TDOWN(KD)
00030 DO 300 I=1,KD
00031 MEXI = MEXI + 1
00032 Y(YNEXT) = YO + XUP(I)
00033 CONTINUE
00034 DO 300 I=1,KD
00035 LCYC = LCYC + 1
00036 XCYC = XCYC + X(KD)
00037 MCYC = MCYC + 1
00038 IF(MCYC=6) TUP(KU)
00039 DO 400 I=1,KU
00040 LCYC = LCYC + 1
00041 XCYC = XCYC + X(KU)
00042 MCYC = MCYC + 1
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00179 DO 400 I=1,KU
00180 LCYC = LCYC + 1
00181 XCYC = XCYC + X(KU)
00182 MCYC = MCYC + 1
00183 IF(MCYC=6) TUP(KU)
00184 DO 400 I=1,KU
00185 LCYC = LCYC + 1
00186 XCYC = XCYC + X(KU)
00187 MCYC = MCYC + 1
00188 IF(MCYC=6) TUP(KU)
00189 DO 400 I=1,KU
00190 LCYC = LCYC + 1
00191 XCYC = XCYC + X(KU)
00192 MCYC = MCYC + 1
00193 IF(MCYC=6) TUP(KU)
00194 DO 400 I=1,KU
00195 LCYC = LCYC + 1
00196 XCYC = XCYC + X(KU)
00197 MCYC = MCYC + 1
00198 IF(MCYC=6) TUP(KU)
00199 DO 400 I=1,KU
00200 LCYC = LCYC + 1
00201 XCYC = XCYC + X(KU)
00202 MCYC = MCYC + 1
00203 IF(MCYC=6) TUP(KU)
00204 DO 400 I=1,KU
00205 LCYC = LCYC + 1
00206 XCYC = XCYC + X(KU)
00207 MCYC = MCYC + 1
00208 IF(MCYC=6) TUP(KU)
00209 DO 400 I=1,KU
00210 LCYC = LCYC + 1
00211 XCYC = XCYC + X(KU)
00212 MCYC = MCYC + 1
00213 IF(MCYC=6) TUP(KU)
00214 DO 400 I=1,KU
00215 LCYC = LCYC + 1
00216 XCYC = XCYC + X(KU)
00217 MCYC = MCYC + 1
00218 IF(MCYC=6) TUP(KU)
00219 DO 400 I=1,KU
00220 LCYC = LCYC + 1
00221 XCYC = XCYC + X(KU)
00222 MCYC = MCYC + 1
00223 IF(MCYC=6) TUP(KU)
00224 DO 400 I=1,KU
00225 LCYC = LCYC + 1
00226 XCYC = XCYC + X(KU)
00227 MCYC = MCYC + 1
00228 IF(MCYC=6) TUP(KU)
00229 DO 400 I=1,KU
00230 LCYC = LCYC + 1
00231 XCYC = XCYC + X(KU)
00232 MCYC = MCYC + 1
00233 IF(MCYC=6) TUP(KU)
00234 DO 400 I=1,KU
00235 LCYC = LCYC + 1
00236 XCYC = XCYC + X(KU)
00237 MCYC = MCYC + 1
00238 IF(MCYC=6) TUP(KU)
00239 DO 400 I=1,KU
00240 LCYC = LCYC + 1
00241 XCYC = XCYC + X(KU)
00242 MCYC = MCYC + 1
00243 IF(MCYC=6) TUP(KU)
00244 DO 400 I=1,KU
00245 LCYC = LCYC + 1
00246 XCYC = XCYC + X(KU)
00247 MCYC = MCYC + 1
00248 IF(MCYC=6) TUP(KU)
00249 DO 400 I=1,KU
00250 LCYC = LCYC + 1
00251 XCYC = XCYC + X(KU)
00252 MCYC = MCYC + 1
00253 IF(MCYC=6) TUP(KU)
00254 DO 400 I=1,KU
00255 LCYC = LCYC + 1
00256 XCYC = XCYC + X(KU)
00257 MCYC = MCYC + 1
00258 IF(MCYC=6) TUP(KU)
00259 DO 400 I=1,KU
00260 LCYC = LCYC + 1
00261 XCYC = XCYC + X(KU)
00262 MCYC = MCYC + 1
00263 IF(MCYC=6) TUP(KU)
00264 DO 400 I=1,KU
00265 LCYC = LCYC + 1
00266 XCYC = XCYC + X(KU)
00267 MCYC = MCYC + 1
00268 IF(MCYC=6) TUP(KU)
00269 DO 400 I=1,KU
00270 LCYC = LCYC + 1
00271 XCYC = XCYC + X(KU)
00272 MCYC = MCYC + 1
00273 IF(MCYC=6) TUP(KU)
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ASC FAST FORTRAN COMPILER
CP OPTIONS = (U)

**SOURCE LISTING
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0003 NEXT = NEXT + 1
0004 I = I + 1
0005 X(NEXT) = X(CYC - XUP(CII))
0006 Y(NEXT) = Y(CYC - XUP(CII))
0007 Z(NEXT) = Z(CYC - XUP(CII))
0008 DO 400 DCYC = DO + D0 + D1 + D1
0009 LCYC = NEXT
0010 DO 500 MCYC = 2*MCVCS
0011 I = 1
0012 LCYC = NEXT
0013 Y(NEXT) = Y(CYC + X(NEXT-LCYC))
0014 Z(NEXT) = Z(CYC - LCYC)
0015 CONTINUE
0016 CONTINUE
0017 LAST = NEXT
0018 LAST = NEXT
0019 PRINT 901: ISODOWN, ISUP, LCYC, LAST
0020 PRINT 902: ANGLE(CISODOWN)
0021 PRINT 902: CX(1), Y(1), I=1, LAST)
0022 C***** PLOT RAY TRAJECTORIES (UP AND DOWN) FROM X,Y ARRAYS HERE.
0023 IF (CII) ISODOWN = TO
0024 IF (CII) ISUP = TO
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ASC FAST FORTRAN COMPILER
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**SOURCE LISTING
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ASC FAST FORTRAN COMPILER
CP OPTIONS = (U)

SOURCE LISTING
STATEMENT

CSN

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0001 SUBROUTINE EIGRAY (R2, HGT(30), DRG(30), MR, MHGT, MBRG
0002 COMMON /FANS/ R1, XT(50), DYHXT(50), NDTH(50), MFANS
0003 COMMON /GROUND/ ANGLE(400), GAMGLE(400), MHITS(400)
0004 1 RANGE(20,400) = TIME(20,400), XLEVEL(20,400)
0005 1 COMMON /EIGEN/ NINT(500), NREFL(40,500), TINT(40,500),
0006 1 COMMON /RVCB/ XINT(500), HGB(50), ISUPRX, IBRG, IM, NDOVN
0007 1 COMMON /SIGMO/ H(12), HGB(30)
0008 DATA NAXEIG /40/
0009 ***** FIMS THE EIGENWAYS TO THE EQUALLY-SPACED RECEIVERS BY INTER-
0010 POLATION BETWEEN NEIGHBORING RAYS WHERE THEY INTERPOSE A RECEIVER
0011 AT THE GROUND. NOTE THAT INTERPOLATION IS VALID ONLY BETWEEN
0012 RAYS OF THE SAME FIRM AND HAVING THE SAME NUMBER OF GROUND HITS.
0013 ***** THE INTERPOLATED EIGENWAYS ARE SIGNED IN COMMON BLOCK EIGEN-
0014 INDEXED BY RANGE INCREMENT AND EIGENWAY NUMBER. FOR A GIVEN RANGE,
0015 THEY WILL BE ARRANGED IN ORDER OF INCREASING RANGE. THE RANGE
0016 PRECISION IS ONE MILE. THE SOURCE, NOT THE TARGET, IS PLACED ON 40 ARRIVALS
0017 FOR EACH RANGE INCREMENT, AND EIGENWAYS AFTER 40TH WILL BE LOST.
0018 DO EIGENWAY = 1, 500
0019 NINT(1) = 0
0020 CONTINUE = NDOVN
0021 ISUP = NDOVN
0022 DO 5000 NF=1, MFANS
0023 NRAYS = NDTH(NF)
0024 DO 4000 NRAY=2, NRAYS
0025 ISDOWN = ISDOWN + 1
0026 NTHITS(1) = NTHITS(1) + 1
0027 NTHITS(2) = NTHITS(2) + 1
0028 NTHITS(3) = NTHITS(3) + 1
0029 NTHITS(4) = NTHITS(4) + 1
0030 NTHITS(5) = NTHITS(5) + 1
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00035      YINT(MEIG,MR), XLINT(MEIG,MR)
00036      FORMATTED, 4110, 412-4)
00037      CONTINUE
00038      ISUP = ISUP + 1
00039      IF (ISUP .GE. ISUPMX) GO TO 4000
00040      NH = NRG(NHITS(ISUP), NHITS(ISUP+1))
00041      DO 3000 NH=1,NHIT
00042      MAR = ANX1(RANGE(NH,ISUP), RANGE(NH,ISUP+1))
00043      IF (MARX .GT. MAR) MAR = MR
00044      MINR = ANX1(RANGE(NH,ISUP)+1., RANGE(NH,ISUP+1)+1.)
00045      IF (MINR .GT. MARX) MARX = MR
00046      DO 2000 MR=1,MAR
00047      ATZ(MR) = ATZ(MR)+MEIG
00048      MEIG = MEIG*(MR+1)
00049      ODX = (MR-RANGE(NH,ISUP))/(RANGE(NH,ISUP+1)-RANGE(NH,ISUP))
00050      MRREFL(MEIG,MR) = MR - 1
00051      THINT(MEIG,MR) = (ANGLE(ISUP+1) - ANGLE(ISUP))*ODX +
00052      1 GINT(MEIG,MR) = (GANGLE(ISUP+1) - GANGLE(ISUP))*ODX +
00053      1 YINT(MEIG,MR) = (YIME(NH,ISUP+1) - YIME(NH,ISUP))*ODX + GANGLE(ISUP)
00054      1 XLINT(MEIG,MR) = (XLEVEL(NH,ISUP+1) - XLEVEL(NH,ISUP))*ODX +
00055      1 PRINT 9969 ISUP, MEIG, MR, MRREFL(MEIG,MR), THINT(MEIG,MR),
00056      1 YINT(MEIG,MR), XLINT(MEIG,MR)
00057      CONTINUE
00058      ISUP = ISUP + 1
00059      ISODN = ISODN - 1
00060      CONTINUE
00061      IF (ISODN .EQ. 0)
00062      1 PRINT 9970, NMRH(CIN), BRG(CBRG)
00063      1 MEIG = BRG
00064      IF (CARG .EQ. 1) IMESH = IM
00065      DO 10000 I=1,MR
00066      XIM(I,IMESH) = 1-E-20
00067      XIM(I,IMESH) = 1-E-20
00068      MEIGS = IMINT(I)
00069      IF (MEIGS .EQ. 0) GO TO 6001
00070      DO 6000 MEIG=1,MEIGS
00071      XINT(I,IMESH) = XINT(I,IMESH) + XLINT(MEIG,I)
00072      ALINT(MEIG,IM) = 19.5*ALOG10(XINT(MEIG,I))
00073      ALLINT(MEIG,IM) = 19.5*ALOG10(XINT(MEIG,I))
00074      IME = GINT(MEIG,IM)
00075      IF (IME .GT. NMRH(CIN)) BRG(CBRG) = IMEIG
00076      1 PRINT 9971, MEIG, IME, IMEIG, MRREFL(MEIG,I),
00077      1 YINT(MEIG,I), XLINT(MEIG,I), IMEIG, MRREFL(MEIG,I),

```

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PAGE 0003
TIME = 14:23:13

RELEASE FTFX0526.P214
DATE = 09/20/79(79-263)

ASC FAST FORTRAN COMPILER
CD OPTIONS = (11)

EIGRAY	SOURCE LISTING
CSM	STATEMENT

[illegible]

Appendix B

EVAN B. WRIGHT

Figure 1 is a contour plot showing the distribution of the number of stars (N) versus the number of galaxies (NG) in the sample. The x-axis is labeled 'NG' and ranges from 0 to 12. The y-axis is labeled 'N' and ranges from 0 to 3000. The plot shows a dense cluster of points at low NG and low N, with a few points extending to higher NG values. The contours represent the density of the distribution.

NRL MEMORANDUM REPORT 4185

09/24/79

INPUT DATA AND DERIVED PROFILE FOR RAYTRACE
THE CURVED-EARTH CORRECTION CHANGES ALTITUDES SLIGHTLY.

NYC 12/2/77

1	0.00	8.00	230.00	9.72	0.00	336.29	5.00
2	85.00	7.30	236.00	12.05	85.00	335.86	6.20
3	782.00	1.80	275.00	29.35	781.95	332.52	15.10
4	1149.00	-0.90	280.00	36.54	1148.90	330.86	18.80
5	1399.00	-1.30	276.00	40.82	1398.85	330.61	21.00
6	1647.00	0.40	271.00	45.68	1646.79	331.63	23.50
7	1874.00	0.80	266.00	50.35	1873.72	331.86	25.90
8	2948.00	-3.10	243.00	66.48	2947.32	329.43	34.20
9	3840.00	-6.20	238.00	82.81	3838.84	327.49	42.60
10	4689.00	-12.40	235.00	87.67	4687.28	323.62	45.10
11	5356.00	-14.70	238.00	102.25	5353.75	322.16	52.60
12	7525.00	-26.80	240.00	138.98	7520.56	314.42	71.50
13	11887.00	-61.00	240.00	84.56	11875.93	291.58	43.50
14	13000.00	-63.00	240.00	75.81	12986.77	290.16	39.00
15	18000.00	-65.00	250.00	34.99	17974.65	288.54	18.00
16	23600.00	-64.00	290.00	19.44	23556.45	288.98	10.00
17	35100.00	-41.00	300.00	38.88	35003.77	303.91	20.00
18	46800.00	-14.00	260.00	174.95	46629.13	320.50	90.00
19	60000.00	-26.00	260.00	213.82	59719.54	312.35	110.00
20	65000.00	-35.00	260.00	213.82	64671.03	306.37	110.00
21	85000.00	-66.00	260.00	58.32	84438.42	284.84	30.00
22	100000.00	-45.00	260.00	77.75	99224.19	298.23	40.00
23	150000.00	40.00	260.00	77.75	148253.37	346.66	40.00

EVAN B. WRIGHT

SOURCE ALTITUDE (ABOVE GROUND LEVEL)= 1000.00 M.
BEARING= 15.00

ALTITUDE (M)	WIND COMPONENT (M/SEC)	SOUND SPEED (M/SEC)	SUM (M/SEC)
148263.375	16.904	346.659	363.563
99224.187	16.904	298.229	315.132
84438.625	12.680	284.843	297.522
64671.031	46.488	306.370	352.857
59719.543	46.488	312.350	358.837
46629.133	38.037	320.504	358.541
35803.773	-5.177	403.908	298.731
23556.445	-0.872	288.983	288.111
17974.648	10.325	288.545	298.869
12986.770	27.577	490.155	317.732
11875.934	30.760	291.583	322.343
7520.562	50.556	314.420	364.976
5353.750	38.471	322.157	360.628
4687.277	34.550	323.622	358.171
3838.844	31.157	327.490	358.646
2947.318	22.884	329.431	352.316
1873.724	8.433	331.857	340.290
1646.787	5.685	331.627	337.312
1398.846	3.285	330.607	333.892
1148.896	1.638	330.864	332.502
999.921	2.117	331.535	333.652
781.952	2.622	332.519	335.141
84.999	4.678	335.865	340.543
0.000	4.096	336.288	340.384

ALL RAYS WITH SOURCE ANGLE GREATER THAN 11.5088 DEGREES STRIKE THE GROUND.

LIST OF CRITICAL ANGLES WITH FAN PARAMETERS.

1	11.5088	9.9387	0.4969	21
2	21.4474	2.3864	0.4773	6
3	23.8339	36.1661	3.5023	73

NRL MEMORANDUM REPORT 4185

EIGENRAYS AT GROUND RECEIVERS FOR SOURCE HEIGHT=				1000.00 M				TRACING TOWARD AZIMUTH				15.00
				NEIG	NREFL	RANGE(KM)	SANGLE	RANGLE	TIME(SEC)	LEVEL	CHMEAN	
1000.00	15.00	3	1	0	30.00	19.45	-15.83	88.69	-92.30	338.25		
1000.00	15.00	6	1	2	60.00	-14.49	-9.00	179.99	-87.17	333.35		
1000.00	15.00	6	2	2	60.00	-17.19	-12.93	179.98	-87.10	333.37		
1000.00	15.00	6	3	1	60.00	19.03	-15.31	178.27	-99.31	336.57		
1000.00	15.00	7	1	2	70.00	-19.53	-15.93	208.34	-98.45	335.99		
1000.00	15.00	8	1	2	80.00	12.76	-5.78	239.50	-92.28	334.03		
1000.00	15.00	8	2	2	80.00	16.87	-12.50	239.42	-92.30	334.15		
1000.00	15.00	8	3	0	80.00	22.64	-19.65	228.25	-105.19	350.49		
1000.00	15.00	9	1	3	90.00	-13.37	-7.04	269.71	-93.55	333.70		
1000.00	15.00	9	2	3	90.00	-18.48	-14.61	269.57	-93.68	333.87		
1000.00	15.00	9	3	2	90.00	18.91	-15.16	267.84	-100.60	336.02		
1000.00	15.00	10	1	3	100.00	-19.20	-15.52	297.92	-102.59	335.66		
1000.00	15.00	10	2	2	100.00	19.85	-16.33	296.11	-101.73	337.71		
1000.00	15.00	11	1	3	110.00	12.55	-5.31	329.23	-96.22	334.11		
1000.00	15.00	11	2	3	110.00	17.75	-13.67	329.02	-95.96	334.33		
1000.00	15.00	11	3	3	110.00	-20.33	-16.91	326.13	-101.71	337.29		
1000.00	15.00	12	1	4	120.00	-12.99	-6.29	359.43	-96.92	333.86		
1000.00	15.00	12	2	4	120.00	-18.53	-14.68	359.14	-96.76	334.14		
1000.00	15.00	12	3	3	120.00	18.86	-15.09	357.41	-101.67	335.75		
1000.00	15.00	13	1	4	130.00	-19.84	-15.33	387.50	-105.46	335.48		
1000.00	15.00	13	2	3	130.00	19.48	-15.88	385.72	-104.42	337.03		
1000.00	15.00	14	1	4	140.00	18.24	-14.31	418.60	-98.46	334.45		
1000.00	15.00	14	2	4	140.00	-19.80	-16.27	415.76	-104.30	336.73		
1000.00	15.00	14	3	3	140.00	20.36	-16.95	413.89	-104.19	338.25		
1000.00	15.00	15	1	5	150.00	-12.84	-5.95	449.17	-99.12	333.95		
1000.00	15.00	15	2	5	150.00	-18.56	-14.72	448.70	-99.06	334.30		
1000.00	15.00	15	3	4	150.00	18.82	-15.35	446.98	-102.90	335.58		
1000.00	15.00	16	1	5	160.00	-18.95	-15.22	477.08	-106.77	335.37		
1000.00	15.00	16	2	4	160.00	19.30	-15.65	475.30	-106.71	336.63		
1000.00	15.00	16	3	1	160.00	22.58	-19.58	457.57	-111.43	349.67		
1000.00	15.00	17	1	6	170.00	-14.57	-9.13	509.76	-92.60	333.49		
1000.00	15.00	17	2	6	170.00	-15.92	-11.18	509.75	-93.07	333.49		
1000.00	15.00	17	3	5	170.00	18.48	-14.62	508.18	-100.39	334.53		
1000.00	15.00	17	4	5	170.00	-19.51	-15.91	505.37	-106.40	336.39		
1000.00	15.00	17	5	4	170.00	19.94	-16.43	503.54	-106.14	337.61		
1000.00	15.00	17	6	2	170.00	-22.70	-19.72	487.37	-111.23	348.81		

EVAN B. WRIGHT

1000.00	15.00	18	1	6	100.00	-12.73	-5.70	530.91	-100.93	334.01
1000.00	15.00	18	2	6	100.00	-16.59	-14.75	530.27	-100.90	334.40
1000.00	15.00	18	3	5	100.00	18.80	-15.03	536.55	-104.06	335.40
1000.00	15.00	18	4	5	100.00	-20.23	-16.79	533.54	-106.15	337.37
1000.00	15.00	19	1	6	190.00	13.48	-7.25	569.24	-97.93	333.70
1000.00	15.00	19	2	6	190.00	16.26	-11.66	569.19	-97.80	333.01
1000.00	15.00	19	3	6	190.00	-18.91	-15.16	566.65	-106.48	335.31
1000.00	15.00	19	4	5	190.00	19.18	-15.50	564.08	-108.56	336.35
1000.00	15.00	20	1	7	200.00	-13.76	-7.76	599.46	-98.52	333.63
1000.00	15.00	20	2	7	200.00	-17.01	-12.49	599.38	-98.80	333.60
1000.00	15.00	20	3	6	200.00	18.51	-14.66	597.74	-101.95	334.59
1000.00	15.00	20	4	6	200.00	-19.35	-15.71	594.95	-108.25	336.16
1000.00	15.00	20	5	5	200.00	19.68	-16.11	593.15	-107.86	337.19
1000.00	15.00	21	1	7	210.00	-12.65	-5.52	628.64	-102.47	334.05
1000.00	15.00	21	2	7	210.00	-18.60	-14.77	621.84	-102.42	334.40
1000.00	15.00	21	3	6	210.00	18.79	-15.01	626.12	-105.11	335.40
1000.00	15.00	21	4	6	210.00	-19.89	-16.38	623.18	-107.77	336.96
1000.00	15.00	21	5	5	210.00	20.27	-16.84	621.31	-107.71	338.00
1000.00	15.00	22	1	7	220.00	13.18	-6.64	658.96	-100.32	333.86
1000.00	15.00	22	2	7	220.00	16.92	-12.57	658.82	-100.46	333.93
1000.00	15.00	24	3	7	220.00	-18.88	-15.12	654.22	-106.87	335.26
1000.00	15.00	22	4	6	220.00	19.10	-15.40	654.46	-110.10	336.15

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1000.00	15.00	23	1	8	230.00	-13.41	-7.11	689.18	-100.96	333.73
1000.00	15.00	23	2	8	230.00	-17.55	-13.41	688.98	-101.05	333.82
1000.00	15.00	23	3	7	230.00	18.54	-14.69	687.31	-103.28	334.64
1000.00	15.00	23	4	7	230.00	-19.24	-15.37	684.53	-109.83	335.99
1000.00	15.00	23	5	6	230.00	19.49	-15.88	682.75	-109.29	336.87
1000.00	15.00	24	1	8	240.00	-12.58	-5.38	718.38	-103.80	334.09
1000.00	15.00	24	2	8	240.00	-18.61	-14.79	717.41	-103.72	334.54
1000.00	15.00	24	3	7	240.00	18.78	-14.99	715.69	-106.06	335.34
1000.00	15.00	24	4	7	240.00	-19.67	-16.11	712.79	-109.23	336.70
1000.00	15.00	24	5	6	240.00	19.97	-16.48	710.96	-109.05	337.57
1000.00	15.00	24	6	3	240.00	-22.46	-19.44	689.04	-115.34	348.31
1000.00	15.00	24	7	2	240.00	22.55	-19.55	686.90	-115.03	349.40
1000.00	15.00	25	1	8	250.00	12.98	-6.26	748.69	-102.31	333.92
1000.00	15.00	25	2	8	250.00	17.35	-13.15	748.42	-102.20	334.04
1000.00	15.00	25	3	8	250.00	-18.86	-15.09	745.78	-107.44	335.22
1000.00	15.00	25	4	7	250.00	19.04	-15.32	744.04	-111.42	336.80
1000.00	15.00	25	5	7	250.00	-20.19	-16.14	740.96	-109.07	337.40
1000.00	15.00	25	6	3	250.00	-22.64	-19.55	716.69	-114.89	348.82
1000.00	15.00	25	7	2	250.00	22.73	-19.75	714.54	-114.60	349.87
1000.00	15.00	26	1	9	260.00	-13.21	-6.72	778.90	-102.55	333.80
1000.00	15.00	26	2	9	260.00	-17.91	-13.98	778.58	-102.69	333.94
1000.00	15.00	26	3	8	260.00	18.55	-14.71	776.88	-104.44	334.67
1000.00	15.00	26	4	8	260.00	-19.15	-15.47	774.11	-111.18	335.87
1000.00	15.00	26	5	7	260.00	19.37	-15.74	772.34	-110.65	336.64
1000.00	15.00	26	6	3	260.00	-22.81	-19.85	744.34	-114.48	349.30
1000.00	15.00	27	1	9	270.00	-12.53	-5.27	808.11	-104.98	334.11
1000.00	15.00	27	2	9	270.00	-18.62	-14.80	806.98	-104.85	334.58
1000.00	15.00	27	3	8	270.00	18.77	-14.98	805.25	-106.93	335.30
1000.00	15.00	27	4	8	270.00	-19.50	-15.90	802.40	-110.47	336.49
1000.00	15.00	27	5	7	270.00	19.77	-16.23	800.57	-110.31	337.26
1000.00	15.00	28	1	9	280.00	12.88	-6.05	838.43	-103.60	333.96
1000.00	15.00	28	2	10	280.00	-14.62	-9.21	839.52	-94.13	333.52
1000.00	15.00	28	3	10	280.00	-15.63	-10.76	839.52	-94.16	333.52
1000.00	15.00	28	4	9	280.00	17.67	-13.56	838.02	-103.59	334.12
1000.00	15.00	28	5	9	280.00	-18.84	-15.07	835.35	-108.06	335.19
1000.00	15.00	28	6	8	280.00	18.99	-15.26	833.62	-112.57	335.88
1000.00	15.00	28	7	8	280.00	-19.94	-16.43	830.61	-110.24	337.10
1000.00	15.00	28	8	7	280.00	20.22	-16.78	828.72	-110.21	337.87

EVAN B. WRIGHT

1000.00	15.00	29	1	10	290.00	-13.04	-6.40	868.63	-104.03	333.86
1000.00	15.00	29	2	10	290.00	-18.17	-14.22	868.16	-103.99	334.04
1000.00	15.00	29	3	9	290.00	18.57	-14.73	866.45	-105.47	334.70
1000.00	15.00	29	4	9	290.00	-19.09	-15.39	863.69	-112.36	335.77
1000.00	15.00	29	5	8	290.00	19.29	-15.63	861.92	-111.87	336.46
1000.00	15.00	29	6	8	290.00	-20.41	-17.01	858.73	-110.22	337.71
1000.00	15.00	30	1	10	300.00	13.80	-7.83	898.99	-100.49	333.71
1000.00	15.00	30	2	10	300.00	16.03	-11.33	898.96	-100.90	333.72
1000.00	15.00	30	3	10	300.00	-18.63	-14.81	896.55	-105.86	334.62
1000.00	15.00	30	4	9	300.00	18.76	-14.37	894.82	-107.73	335.26
1000.00	15.00	30	5	9	300.00	-19.39	-15.77	891.99	-111.66	336.33
1000.00	15.00	30	6	8	300.00	19.62	-16.04	890.18	-111.41	337.01
1000.00	15.00	31	1	10	310.00	12.80	-5.87	928.16	-104.75	333.99
1000.00	15.00	31	2	11	310.00	-13.93	-8.06	929.22	-101.49	333.61
1000.00	15.00	31	3	11	310.00	-16.52	-12.02	929.16	-101.64	333.63
1000.00	15.00	31	4	10	310.00	17.93	-13.91	927.61	-104.78	334.19
1000.00	15.00	31	5	10	310.00	-18.82	-15.35	924.92	-108.68	335.16
1000.00	15.00	31	6	9	310.00	18.95	-15.21	923.20	-112.70	335.79
1000.00	15.00	31	7	9	310.00	-19.76	-16.22	920.21	-111.36	336.80
1000.00	15.00	31	8	8	310.00	20.00	-16.51	918.37	-111.24	337.55
1000.00	15.00	32	1	11	320.00	-12.95	-6.20	958.36	-105.14	333.90
1000.00	15.00	32	2	11	320.00	-18.37	-14.48	957.73	-105.12	334.12
1000.00	15.00	32	3	10	320.00	18.58	-14.74	956.02	-106.39	334.72
1000.00	15.00	32	4	10	320.00	-19.04	-15.32	953.27	-113.40	335.69
1000.00	15.00	32	5	9	320.00	19.22	-15.54	951.50	-112.94	336.31
1000.00	15.00	32	6	9	320.00	-20.16	-16.71	948.38	-111.25	337.42
1000.00	15.00	32	7	8	320.00	20.42	-17.02	946.49	-111.24	338.09
1000.00	15.00	32	8	4	320.00	-22.47	-19.46	918.37	-117.80	348.44
1000.00	15.00	32	9	3	320.00	22.54	-19.54	916.22	-117.56	349.26
1000.00	15.00	33	1	11	330.00	13.46	-7.21	988.71	-103.08	333.77
1000.00	15.00	33	2	11	330.00	16.56	-12.07	988.59	-103.09	333.81
1000.00	15.00	33	3	11	330.00	-18.64	-14.82	986.11	-106.76	334.65
1000.00	15.00	33	4	10	330.00	18.75	-14.96	984.39	-108.46	335.23
1000.00	15.00	33	5	10	330.00	-19.31	-15.66	981.57	-112.75	336.20
1000.00	15.00	33	6	9	330.00	19.49	-15.89	979.78	-112.39	336.81
1000.00	15.00	33	7	4	330.00	-22.61	-19.61	946.02	-117.46	348.83
1000.00	15.00	33	8	3	330.00	22.67	-19.69	943.87	-117.24	349.63
1000.00	15.00	34	1	11	340.00	12.74	-5.73	1017.90	-105.78	334.02
1000.00	15.00	34	2	12	340.00	-13.62	-7.51	1018.93	-103.40	333.68
1000.00	15.00	34	3	12	340.00	-16.99	-12.67	1018.78	-103.61	333.73
1000.00	15.00	34	4	11	340.00	18.13	-14.16	1017.19	-105.78	334.25
1000.00	15.00	34	5	11	340.00	-18.81	-15.04	1014.49	-109.28	335.14
1000.00	15.00	34	6	10	340.00	18.93	-15.19	1012.77	-112.52	335.71
1000.00	15.00	34	7	10	340.00	-19.62	-16.04	1009.82	-112.35	336.69
1000.00	15.00	34	8	9	340.00	19.83	-16.30	1007.99	-112.22	337.30
1000.00	15.00	34	9	4	340.00	-22.74	-19.76	973.67	-117.14	349.20
1000.00	15.00	34	10	3	340.00	22.80	-19.84	971.52	-116.94	349.97

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1000.00	15.00	35	1	12	350.00	-12.88	-6.05	1048.10	-106.07	333.94
1000.00	15.00	35	2	12	350.00	-18.48	-14.62	1047.31	-106.09	334.19
1000.00	15.00	35	3	11	350.00	18.59	-14.76	1045.59	-107.23	334.74
1000.00	15.00	35	4	11	350.00	-19.00	-15.27	1042.85	-114.33	335.62
1000.00	15.00	35	5	10	350.00	19.16	-15.47	1041.08	-113.90	336.19
1000.00	15.00	35	6	10	350.00	-19.96	-16.47	1038.03	-112.17	337.18
1000.00	15.00	35	7	9	350.00	20.19	-16.75	1036.14	-112.15	337.79
1000.00	15.00	36	1	12	360.00	13.29	-6.87	1078.44	-104.41	333.82
1000.00	15.00	36	2	12	360.00	16.93	-12.59	1078.21	-104.59	333.89
1000.00	15.00	36	3	12	360.00	-18.64	-14.82	1075.68	-107.58	334.67
1000.00	15.00	36	4	11	360.00	18.75	-14.96	1073.96	-109.13	335.21
1000.00	15.00	36	5	11	360.00	-19.25	-15.58	1071.15	-113.73	336.09
1000.00	15.00	36	6	10	360.00	19.40	-15.78	1069.37	-113.36	336.65
1000.00	15.00	36	7	10	360.00	-20.34	-16.93	1066.15	-112.16	337.67
1000.00	15.00	37	1	12	370.00	12.69	-5.61	1107.63	-106.71	334.05
1000.00	15.00	37	2	13	370.00	-13.42	-7.13	1108.65	-104.88	333.74
1000.00	15.00	37	3	13	370.00	-17.32	-13.10	1108.39	-104.93	333.82
1000.00	15.00	37	4	12	370.00	18.29	-14.38	1106.77	-106.68	334.31
1000.00	15.00	37	5	12	370.00	-18.80	-15.03	1104.06	-109.86	335.13
1000.00	15.00	37	6	11	370.00	18.91	-15.16	1102.33	-112.59	335.65
1000.00	15.00	37	7	11	370.00	-19.50	-15.90	1099.43	-113.24	336.54
1000.00	15.00	37	8	10	370.00	19.70	-16.14	1097.60	-113.12	337.10
1000.00	15.00	38	1	13	380.00	-12.82	-5.92	1137.84	-106.93	333.97
1000.00	15.00	38	2	12	380.00	-18.96	-15.23	1132.43	-114.94	335.56
1000.00	15.00	38	3	13	380.00	-18.50	-14.64	1136.88	-106.93	334.25
1000.00	15.00	38	4	12	380.00	18.40	-14.77	1135.15	-108.00	334.76
1000.00	15.00	38	5	11	380.00	19.11	-15.41	1130.66	-114.77	336.09
1000.00	15.00	38	6	11	380.00	-19.82	-16.28	1127.64	-113.07	336.99
1000.00	15.00	38	7	10	380.00	20.01	-16.53	1125.79	-112.98	337.54
1000.00	15.00	39	1	13	390.00	13.14	-6.59	1168.16	-105.66	333.86
1000.00	15.00	39	2	14	390.00	-14.65	-8.25	1169.28	-94.39	335.54
1000.00	15.00	39	3	14	390.00	-15.54	-10.62	1169.28	-99.01	333.54
1000.00	15.00	39	4	13	390.00	17.22	-12.97	1167.82	-105.73	333.96
1000.00	15.00	39	5	13	390.00	-18.65	-14.83	1165.25	-108.33	334.69
1000.00	15.00	39	6	12	390.00	18.74	-14.95	1163.53	-109.76	335.19
1000.00	15.00	39	7	12	390.00	-19.19	-15.51	1160.73	-114.61	336.00
1000.00	15.00	39	8	11	390.00	19.34	-15.69	1158.95	-114.26	336.51
1000.00	15.00	39	9	11	390.00	-20.15	-16.69	1155.79	-112.99	337.43
1000.00	15.00	39	10	10	390.00	20.35	-16.94	1153.91	-112.98	337.98
1000.00	15.00	40	1	13	400.00	12.64	-5.51	1197.37	-107.57	334.07
1000.00	15.00	40	2	14	400.00	-13.28	-6.87	1198.38	-105.92	333.78
1000.00	15.00	40	3	14	400.00	-17.58	-13.45	1197.98	-106.07	333.89
1000.00	15.00	40	4	13	400.00	18.43	-14.56	1196.35	-107.50	334.35
1000.00	15.00	40	5	13	400.00	-18.79	-15.02	1193.63	-110.41	335.11
1000.00	15.00	40	6	12	400.00	18.89	-15.14	1191.90	-112.77	335.60
1000.00	15.00	40	7	12	400.00	-19.42	-15.80	1189.02	-114.11	336.41
1000.00	15.00	40	8	11	400.00	19.59	-16.00	1187.21	-113.93	336.93
1000.00	15.00	40	9	5	400.00	-22.48	-19.46	1147.69	-119.72	348.53
1000.00	15.00	40	10	4	400.00	22.54	-19.53	1145.54	-119.52	349.18

EVAN B. WRIGHT

SOURCE ALTITUDE (ABOVE GROUND LEVEL)= 1500.00 M.
BEARING= 15.00

ALTITUDE (M)	WIND COMPONENT (M/SEC)	SOUND SPEED (M/SEC)	SUN (M/SEC)
148263.375	16.904	346.659	363.563
99224.187	16.904	298.229	315.132
84638.625	12.680	484.843	497.522
64671.031	46.488	306.370	352.857
59719.543	45.486	312.350	358.837
46629.133	38.037	320.504	358.541
35003.773	-5.177	303.928	298.731
23556.445	-0.872	288.983	288.111
17974.648	10.325	288.545	298.869
12986.770	27.577	290.155	317.732
11875.934	30.760	291.563	322.543
7520.562	50.556	314.420	364.976
5353.750	38.471	322.157	360.628
4687.277	34.550	323.622	358.171
3838.844	31.157	327.490	358.646
2947.318	22.884	329.431	352.316
1873.724	8.433	331.857	340.290
1646.787	5.685	331.627	337.312
1499.823	4.215	331.022	335.237
1398.846	3.285	330.607	333.892
1148.896	1.638	330.864	332.502
999.921	2.117	331.535	333.652
781.952	2.622	332.519	335.141
84.999	4.678	335.865	340.543
0.000	4.096	336.288	340.384

ALL RAYS WITH SOURCE ANGLE GREATER THAN 10.0630 DEGREES STRIKE THE GROUND.

LIST OF CRITICAL ANGLES WITH FAN PARAMETERS.

1	10.0630	10.6195	0.5057	22
2	20.6824	2.4579	0.4916	6
3	23.1403	36.8597	0.4981	75

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EIGENRAYS AT GROUND RECEIVERS FOR SOURCE HEIGHT= 1500.00 M										TRACING TOWARD AZIMUTH 15.00	
	MEIG	NREFL	RANGE(KM)	SANGLE	RANGLE	TIME(SEC)	LEVEL	CHREAN			
1500.00 15.00	3	1	0	30.00	19.06	-16.37	88.18	-91.82	340.21		
1500.00 15.00	4	1	1	40.00	-19.52	-16.91	119.23	-92.00	335.47		
1500.00 15.00	5	1	1	50.00	15.57	-12.08	149.36	-88.60	334.76		
1500.00 15.00	6	1	1	60.00	18.37	-15.54	177.77	-98.60	337.51		
1500.00 15.00	7	1	2	70.00	-18.47	-15.67	208.84	-98.65	335.18		
1500.00 15.00	8	1	2	80.00	16.81	-13.64	238.97	-93.44	334.78		
1500.00 15.00	8	2	0	80.00	21.99	-19.73	227.66	-104.90	351.40		
1500.00 15.00	9	1	3	90.00	-12.98	-8.42	270.07	-91.05	333.25		
1500.00 15.00	9	2	3	90.00	-16.52	-13.28	270.04	-91.33	333.29		
1500.00 15.00	9	3	2	90.00	18.15	-15.28	267.35	-102.61	336.63		
1500.00 15.00	9	4	1	90.00	-22.12	-19.88	258.63	-104.87	347.99		
1500.00 15.00	10	1	3	100.00	-18.20	-15.35	298.42	-102.71	335.10		
1500.00 15.00	10	2	2	100.00	19.19	-16.52	295.60	-101.47	338.29		
1500.00 15.00	11	1	3	110.00	17.42	-14.40	328.55	-96.52	334.81		
1500.00 15.00	11	2	3	110.00	-19.34	-16.70	326.65	-101.54	336.75		
1500.00 15.00	12	1	4	120.00	-12.16	-7.08	359.79	-95.42	333.53		
1500.00 15.00	12	2	4	120.00	-17.46	-14.45	359.62	-95.74	333.68		
1500.00 15.00	12	3	3	120.00	18.07	-15.19	356.92	-102.58	336.21		
1500.00 15.00	13	1	4	130.00	-18.10	-15.22	388.00	-103.88	335.05		
1500.00 15.00	13	2	3	130.00	18.77	-16.02	385.21	-104.14	337.48		
1500.00 15.00	14	1	4	140.00	17.66	-14.69	418.12	-98.80	334.83		
1500.00 15.00	14	2	4	140.00	-18.85	-16.12	416.27	-104.18	336.32		
1500.00 15.00	15	1	5	150.00	-11.83	-6.48	449.51	-98.00	333.69		
1500.00 15.00	15	2	5	150.00	-17.67	-14.70	449.19	-98.26	333.93		
1500.00 15.00	15	3	4	150.00	18.03	-15.14	446.49	-103.40	335.95		
1500.00 15.00	16	1	5	160.00	12.27	-7.26	479.16	-95.50	333.92		
1500.00 15.00	16	2	5	160.00	15.01	-11.33	479.13	-95.82	333.94		
1500.00 15.00	16	3	5	160.00	-18.05	-15.16	477.57	-103.47	335.03		
1500.00 15.00	16	4	4	160.00	18.54	-15.75	474.81	-106.33	336.98		
1500.00 15.00	16	5	2	160.00	-21.68	-19.39	460.30	-111.98	347.60		
1500.00 15.00	16	6	1	160.00	21.89	-19.62	456.98	-111.25	350.12		
1500.00 15.00	17	1	5	170.00	17.69	-14.73	507.69	-100.59	334.85		
1500.00 15.00	17	2	5	170.00	-18.58	-15.80	505.87	-106.33	336.05		
1500.00 15.00	17	3	4	170.00	19.22	-16.55	503.02	-105.93	337.96		
1500.00 15.00	17	4	2	170.00	-21.95	-19.69	487.95	-111.24	348.40		

EVAN B. WRIGHT

1500.00	15.00	18	1	6	180.00	-11.62	-6.08	539.25	-100.06	333.80
1500.00	15.00	18	2	6	180.00	-17.70	-14.74	538.76	-100.16	334.10
1500.00	15.00	18	3	5	180.00	18.00	-15.10	536.06	-104.34	335.78
1500.00	15.00	18	4	5	180.00	-19.31	-16.66	534.07	-105.97	337.03
1500.00	15.00	19	1	6	190.00	11.86	-6.54	568.89	-98.72	333.98
1500.00	15.00	19	2	6	190.00	15.84	-12.42	568.76	-98.94	334.06
1500.00	15.00	19	3	6	190.00	-18.01	-15.12	567.13	-104.30	335.02
1500.00	15.00	19	4	5	190.00	18.40	-15.58	564.39	-108.18	336.65
1500.00	15.00	20	1	7	200.00	-13.13	-8.66	599.83	-96.09	333.43
1500.00	15.00	20	2	7	200.00	-15.31	-11.73	599.82	-96.18	333.43
1500.00	15.00	20	3	6	200.00	17.71	-14.76	597.26	-102.08	334.86
1500.00	15.00	20	4	6	200.00	-18.43	-15.62	595.46	-108.20	335.88
1500.00	15.00	20	5	5	200.00	18.93	-16.21	592.64	-107.61	337.48
1500.00	15.00	21	1	7	210.00	-11.50	-5.85	628.98	-101.63	333.87
1500.00	15.00	21	2	7	210.00	-17.72	-14.76	628.33	-101.73	334.22
1500.00	15.00	21	3	6	210.00	17.98	-15.08	625.63	-105.27	335.66
1500.00	15.00	21	4	6	210.00	-18.99	-16.28	623.70	-107.63	336.70
1500.00	15.00	21	5	5	210.00	19.55	-16.94	620.78	-107.52	338.28
1500.00	15.00	22	1	7	220.00	11.64	-6.12	658.62	-100.84	334.03
1500.00	15.00	22	2	7	220.00	16.36	-13.09	658.37	-100.94	334.16
1500.00	15.00	22	3	7	220.00	-17.99	-15.09	656.70	-105.18	335.01
1500.00	15.00	22	4	6	220.00	18.30	-15.46	653.97	-109.73	336.41
1500.00	15.00	22	5	6	220.00	-19.64	-17.04	651.84	-107.55	337.51
1500.00	15.00	23	1	8	230.00	-12.51	-7.66	689.54	-99.64	333.55
1500.00	15.00	23	2	8	230.00	-16.17	-12.84	689.44	-99.89	333.60
1500.00	15.00	23	3	7	230.00	17.73	-14.78	686.83	-103.37	334.87
1500.00	15.00	23	4	7	230.00	-18.32	-15.50	685.04	-109.75	335.75
1500.00	15.00	23	5	6	230.00	18.72	-15.97	682.25	-109.04	337.12
1500.00	15.00	24	1	8	240.00	-11.42	-5.69	718.72	-102.93	333.93
1500.00	15.00	24	2	8	240.00	-17.73	-14.78	717.90	-103.06	334.31
1500.00	15.00	24	3	7	240.00	17.96	-15.06	715.20	-106.14	335.57
1500.00	15.00	24	4	7	240.00	-18.77	-16.02	713.31	-109.07	336.46
1500.00	15.00	24	5	6	240.00	19.23	-16.57	710.44	-108.86	337.82
1500.00	15.00	24	6	3	240.00	-21.72	-19.43	689.62	-115.37	348.02
1500.00	15.00	24	7	2	240.00	21.85	-19.58	686.30	-114.88	349.70
1500.00	15.00	25	1	8	250.00	11.51	-5.88	748.35	-102.41	334.07
1500.00	15.00	25	2	8	250.00	16.74	-13.56	747.97	-102.50	334.24
1500.00	15.00	25	3	8	250.00	-17.97	-15.37	746.27	-106.03	335.00
1500.00	15.00	25	4	7	250.00	18.22	-15.37	743.55	-111.05	336.22
1500.00	15.00	25	5	7	250.00	-19.30	-16.65	741.49	-108.89	337.16
1500.00	15.00	25	6	3	250.00	-21.89	-19.63	717.27	-114.88	348.54
1500.00	15.00	25	7	2	250.00	22.03	-19.78	713.95	-114.44	350.16

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1500.00	15.00	26	1	9	260.00	-12.19	-7.12	779.26	-101.56	333.65
1500.00	15.00	26	2	9	260.00	-16.66	-13.46	779.04	-101.87	333.74
1500.00	15.00	26	3	8	260.00	17.74	-14.79	776.40	-104.49	334.88
1500.00	15.00	26	4	8	260.00	-18.24	-15.40	774.62	-111.08	335.65
1500.00	15.00	26	5	7	260.00	18.58	-15.80	771.84	-110.35	336.86
1500.00	15.00	26	6	3	260.00	-22.07	-19.83	744.92	-114.43	349.03
1500.00	15.00	27	1	9	270.00	-11.36	-5.56	808.46	-104.07	333.97
1500.00	15.00	27	2	9	270.00	12.62	-7.85	808.92	-99.08	333.78
1500.00	15.00	27	3	9	270.00	14.79	-11.04	808.90	-99.11	333.79
1500.00	15.00	27	4	9	270.00	-17.75	-14.60	807.47	-104.23	334.38
1500.00	15.00	27	5	8	270.00	17.95	-15.04	804.77	-106.95	335.50
1500.00	15.00	27	6	8	270.00	-18.61	-15.84	802.91	-110.35	336.28
1500.00	15.00	27	7	7	270.00	19.01	-16.30	800.06	-110.08	337.48
1500.00	15.00	28	1	9	280.00	11.44	-5.72	838.09	-103.63	334.09
1500.00	15.00	28	2	9	280.00	17.03	-13.92	837.56	-103.78	334.31
1500.00	15.00	28	3	9	280.00	-17.96	-15.05	835.84	-106.83	334.99
1500.00	15.00	28	4	8	280.00	18.16	-15.30	833.13	-112.20	336.08
1500.00	15.00	28	5	8	280.00	-19.05	-16.36	831.12	-110.09	336.89
1500.00	15.00	28	6	7	280.00	19.48	-16.86	828.20	-110.02	338.08

EVAN B. WRIGHT

1500.00	15.00	29	1	10	290.00	-11.98	-6.75	868.99	-103.07	333.72
1500.00	15.00	29	2	10	290.00	-16.99	-13.87	868.63	-103.32	333.86
1500.00	15.00	29	3	9	290.00	17.75	-14.81	865.97	-105.49	334.09
1500.00	15.00	29	4	8	290.00	-18.18	-15.33	864.20	-112.23	335.57
1500.00	15.00	29	5	8	290.00	18.48	-15.68	861.42	-111.56	336.65
1500.00	15.00	29	6	8	290.00	-19.54	-16.93	859.25	-110.05	337.50
1500.00	15.00	30	1	10	300.00	-11.31	-5.45	898.20	-105.08	334.00
1500.00	15.00	30	2	10	300.00	12.24	-7.21	898.64	-101.61	333.84
1500.00	15.00	30	3	10	300.00	15.46	-11.92	898.54	-101.87	333.87
1500.00	15.00	30	4	10	300.00	-17.76	-14.81	897.04	-105.26	334.43
1500.00	15.00	30	5	9	300.00	17.94	-15.03	894.34	-107.70	335.44
1500.00	15.00	30	6	9	300.00	-18.51	-15.71	892.49	-111.56	336.14
1500.00	15.00	30	7	8	300.00	18.84	-16.11	889.67	-111.18	337.20
1500.00	15.00	31	1	10	310.00	11.37	-5.59	927.83	-104.71	334.11
1500.00	15.00	31	2	11	310.00	-13.24	-8.82	929.60	-98.47	333.48
1500.00	15.00	31	3	11	310.00	-14.95	-11.25	929.59	-98.86	333.48
1500.00	15.00	31	4	10	310.00	17.25	-14.19	927.14	-104.88	334.36
1500.00	15.00	31	5	10	310.00	-17.95	-15.04	925.41	-107.58	334.99
1500.00	15.00	31	6	9	310.00	18.13	-15.26	922.71	-112.40	335.97
1500.00	15.00	31	7	9	310.00	-18.88	-16.15	920.73	-111.20	336.69
1500.00	15.00	31	8	8	310.00	19.24	-16.58	917.85	-111.04	337.74
1500.00	15.00	31	9	3	310.00	21.70	-19.41	887.97	-117.81	349.11
1500.00	15.00	32	1	11	320.00	-11.84	-6.50	958.72	-104.23	333.78
1500.00	15.00	32	2	11	320.00	-17.25	-14.19	958.21	-104.55	333.95
1500.00	15.00	32	3	10	320.00	-18.14	-15.27	953.78	-112.92	335.51
1500.00	15.00	32	4	10	320.00	17.76	-14.82	955.53	-106.39	334.89
1500.00	15.00	32	5	9	320.00	18.40	-15.59	951.00	-112.63	336.49
1500.00	15.00	32	6	9	320.00	-19.29	-16.64	948.90	-111.07	337.23
1500.00	15.00	32	7	8	320.00	19.67	-17.09	945.97	-111.05	338.28
1500.00	15.00	32	8	4	320.00	-21.73	-19.45	918.94	-117.81	348.23
1500.00	15.00	32	9	3	320.00	21.84	-19.56	915.63	-117.44	349.49
1500.00	15.00	33	1	11	330.00	-11.27	-5.37	987.93	-104.00	334.03
1500.00	15.00	33	2	11	330.00	12.00	-6.79	988.36	-103.41	333.89
1500.00	15.00	33	3	11	330.00	15.90	-12.50	988.16	-103.54	333.95
1500.00	15.00	33	4	11	330.00	-17.77	-14.82	986.61	-106.18	334.48
1500.00	15.00	33	5	10	330.00	17.93	-15.02	983.91	-108.39	335.40
1500.00	15.00	33	6	10	330.00	-18.43	-15.61	982.07	-112.64	336.02
1500.00	15.00	33	7	9	330.00	18.70	-15.94	979.28	-112.16	336.98
1500.00	15.00	33	8	4	330.00	-21.87	-19.60	946.59	-117.44	348.62
1500.00	15.00	33	9	3	330.00	21.97	-19.71	943.28	-117.10	349.84
1500.00	15.00	34	1	11	340.00	11.32	-5.48	1017.57	-105.67	334.13
1500.00	15.00	34	2	12	340.00	-12.69	-7.97	1019.30	-102.07	333.56
1500.00	15.00	34	3	12	340.00	-15.67	-12.19	1019.22	-102.41	333.59
1500.00	15.00	34	4	11	340.00	17.43	-14.62	1016.72	-105.84	334.41
1500.00	15.00	34	5	11	340.00	-17.94	-15.03	1014.98	-108.28	334.98
1500.00	15.00	34	6	10	340.00	18.10	-15.23	1012.28	-112.21	335.88
1500.00	15.00	34	7	10	340.00	-18.73	-15.98	1010.34	-112.18	336.52
1500.00	15.00	34	8	9	340.00	19.06	-16.36	1007.48	-112.80	337.48
1500.00	15.00	34	9	4	340.00	-22.00	-19.75	974.24	-117.09	348.99
1500.00	15.00	34	10	3	340.00	22.10	-19.86	970.93	-116.78	350.18

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1500.00	15.00	35	1	12	350.00	-11.72	-6.28	1048.45	-105.30	333.83
1500.00	15.00	35	2	12	350.00	-17.45	-14.43	1047.79	-105.58	334.04
1500.00	15.00	35	3	11	350.00	-18.11	-15.24	1043.35	-112.50	335.46
1500.00	15.00	35	4	11	350.00	17.77	-14.82	1045.10	-107.20	334.90
1500.00	15.00	35	5	10	350.00	18.34	-15.51	1040.58	-113.50	336.35
1500.00	15.00	35	6	10	350.00	-19.09	-16.41	1038.54	-112.01	337.01
1500.00	15.00	35	7	9	350.00	19.44	-16.81	1035.62	-111.96	337.96
1500.00	15.00	35	8	4	350.00	-22.13	-19.90	1001.89	-116.78	349.34
1500.00	15.00	36	1	12	360.00	-11.23	-5.29	1077.67	-106.84	334.05
1500.00	15.00	36	2	12	360.00	11.86	-6.53	1078.09	-104.59	333.92
1500.00	15.00	36	3	12	360.00	16.24	-12.93	1077.77	-104.84	334.02
1500.00	15.00	36	4	12	360.00	-17.77	-14.83	1076.17	-107.01	334.52
1500.00	15.00	36	5	11	360.00	17.92	-15.01	1073.47	-109.04	335.36
1500.00	15.00	36	6	11	360.00	-18.36	-15.53	1071.65	-113.60	335.93
1500.00	15.00	36	7	10	360.00	18.60	-15.83	1068.87	-113.09	336.80
1500.00	15.00	36	8	10	360.00	-19.49	-16.87	1066.67	-111.98	337.50
1500.00	15.00	37	1	12	370.00	11.28	-5.40	1107.31	-106.55	334.14
1500.00	15.00	37	2	13	370.00	-12.40	-7.49	1109.02	-103.80	333.63
1500.00	15.00	37	3	13	370.00	-16.10	-12.76	1108.84	-104.15	333.68
1500.00	15.00	37	4	12	370.00	17.59	-14.61	1106.30	-106.72	334.45
1500.00	15.00	37	5	12	370.00	-17.93	-15.02	1104.55	-108.93	334.98
1500.00	15.00	37	6	11	370.00	18.08	-15.20	1101.84	-112.27	335.80
1500.00	15.00	37	7	11	370.00	-18.62	-15.85	1099.94	-113.09	336.38
1500.00	15.00	37	8	10	370.00	18.91	-16.19	1097.09	-112.89	337.26
1500.00	15.00	38	1	13	380.00	-11.62	-6.09	1138.18	-106.30	333.87
1500.00	15.00	38	2	13	380.00	12.84	-8.20	1138.68	-100.87	333.72
1500.00	15.00	38	3	13	380.00	14.69	-10.89	1138.67	-101.46	333.72
1500.00	15.00	38	4	13	380.00	-17.61	-14.64	1137.37	-106.51	334.10
1500.00	15.00	38	5	12	380.00	-18.09	-15.21	1132.92	-112.43	335.42
1500.00	15.00	38	6	12	380.00	17.77	-14.83	1134.67	-107.95	334.90
1500.00	15.00	38	7	11	380.00	18.29	-15.45	1130.17	-114.45	336.23
1500.00	15.00	38	8	11	380.00	-18.95	-16.23	1128.15	-112.90	336.83
1500.00	15.00	38	9	10	380.00	19.24	-16.58	1125.27	-112.79	337.70
1500.00	15.00	39	1	13	390.00	-11.20	-5.23	1167.41	-107.61	334.07
1500.00	15.00	39	2	13	390.00	11.74	-6.30	1167.82	-105.68	333.96
1500.00	15.00	39	3	13	390.00	16.50	-13.27	1167.38	-105.90	334.08
1500.00	15.00	39	4	13	390.00	-17.78	-14.84	1165.74	-107.78	334.55
1500.00	15.00	39	5	12	390.00	17.92	-15.01	1163.04	-109.64	335.33
1500.00	15.00	39	6	12	390.00	-18.30	-15.47	1161.23	-114.47	335.85
1500.00	15.00	39	7	11	390.00	18.53	-15.74	1158.45	-113.99	336.46
1500.00	15.00	39	8	11	390.00	-19.29	-16.63	1156.32	-112.81	337.28
1500.00	15.00	39	9	10	390.00	19.60	-17.00	1153.39	-112.80	338.13
1500.00	15.00	39	10	4	390.00	21.72	-19.43	1117.30	-119.71	349.06
1500.00	15.00	40	1	13	400.00	11.25	-5.32	1197.04	-107.35	334.16
1500.00	15.00	40	2	14	400.00	-12.19	-7.13	1198.74	-105.11	333.69
1500.00	15.00	40	3	14	400.00	-16.42	-13.15	1198.45	-105.37	333.77
1500.00	15.00	40	4	13	400.00	-17.92	-15.01	1194.11	-109.54	334.96
1500.00	15.00	40	5	12	400.00	18.06	-15.18	1191.41	-112.45	335.74
1500.00	15.00	40	6	13	400.00	17.65	-14.68	1195.87	-107.49	334.48
1500.00	15.00	40	7	12	400.00	-18.54	-15.76	1189.52	-113.99	336.27
1500.00	15.00	40	8	11	400.00	18.79	-16.05	1186.70	-113.70	337.07
1500.00	15.00	40	9	11	400.00	-19.65	-17.06	1184.44	-112.81	337.71
1500.00	15.00	40	10	5	400.00	-21.74	-19.46	1148.26	-119.41	348.35
1500.00	15.00	40	11	4	400.00	21.83	-19.55	1144.95	-119.41	349.36

EVAN B. WRIGHT

SOURCE ALTITUDE (ABOVE GROUND LEVEL)= 2000.00 M.
BEARING= 15.00

ALTITUDE (M)	WIND COMPONENT (M/SEC)	SOUND SPEED (M/SEC)	SUM (M/SEC)
148243.375	15.904	346.659	363.563
99224.187	16.904	298.229	315.132
84438.625	12.680	284.843	297.522
64671.031	45.488	306.370	352.857
59719.543	46.488	312.350	358.837
46629.133	38.037	320.504	358.561
35003.773	-5.177	303.908	298.731
23556.445	-0.872	288.983	288.111
17974.648	13.325	288.545	298.869
12986.770	27.577	290.155	317.732
11875.934	30.760	291.583	322.343
7520.562	51.556	314.420	364.976
5353.750	38.171	322.157	360.628
4687.277	34.550	323.622	358.171
3838.044	31.157	327.490	358.646
2947.318	22.884	329.431	352.316
1999.686	9.937	331.572	341.509
1873.724	8.433	331.857	340.290
1646.787	5.685	331.627	337.312
1499.823	4.215	331.022	335.237
1398.846	3.285	330.607	333.892
1148.896	1.638	330.864	332.502
999.921	2.117	331.535	333.652
781.952	2.622	332.519	335.141
84.999	4.678	335.865	340.563
0.000	4.096	336.288	340.384

ALL RAYS WITH SOURCE ANGLE GREATER THAN 0.000 DEGREES STRIKE THE GROUND.

LIST OF CRITICAL ANGLES WITH FAN PARAMETERS.

1	0.0000	17.5203	0.5006	36
2	17.5203	2.8310	0.4718	7
3	20.3513	39.6487	0.5019	80

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EIGENRAYS AT GROUND RECEIVERS FOR SOURCE HEIGHT= 2000.00 M										TRACING TOWARD AZIMUTH 15.00	
		NEIG	NREFL	RANGE(M)	SAMPLE	RANGE	TIME(SEC)	LEVEL	CNMEAN		
2000.00	15.00	1	1	0	10.00	-7.09	-8.51	30.27	-77.46	330.31	
2000.00	15.00	2	1	0	20.00	11.10	-12.10	59.40	-82.26	336.73	
2000.00	15.00	3	1	0	30.00	16.27	-17.03	87.74	-90.93	341.93	
2000.00	15.00	4	1	1	40.00	-4.88	-6.75	119.99	-85.15	333.35	
2000.00	15.00	4	2	1	40.00	-15.33	-16.13	119.69	-91.25	334.19	
2000.00	15.00	5	1	1	50.00	13.18	-14.07	149.00	-89.34	335.57	
2000.00	15.00	6	1	1	60.00	15.04	-15.84	177.37	-97.18	338.28	
2000.00	15.00	7	1	2	70.00	-3.98	-6.12	209.73	-88.99	333.77	
2000.00	15.00	7	2	2	70.00	-14.56	-15.39	209.29	-98.20	334.47	
2000.00	15.00	7	3	0	70.00	18.60	-19.30	199.48	-106.55	350.92	
2000.00	15.00	8	1	2	80.00	13.71	-14.57	238.58	-93.83	335.32	
2000.00	15.00	8	2	1	80.00	-18.58	-19.28	231.49	-107.29	345.59	
2000.00	15.00	8	3	0	80.00	19.11	-19.80	227.15	-103.92	352.19	
2000.00	15.00	9	1	2	90.00	14.66	-15.48	266.96	-101.14	337.13	
2000.00	15.00	9	2	1	90.00	-19.09	-19.79	259.16	-104.31	347.27	
2000.00	15.00	10	1	3	100.00	-3.51	-5.82	299.46	-91.57	333.94	
2000.00	15.00	10	2	3	100.00	-14.41	-15.24	298.87	-102.45	334.59	
2000.00	15.00	10	3	2	100.00	16.00	-16.77	295.17	-100.58	338.78	
2000.00	15.00	11	1	3	110.00	13.81	-14.66	328.16	-97.24	335.20	
2000.00	15.00	11	2	3	110.00	-15.69	-16.47	327.13	-100.66	336.26	
2000.00	15.00	12	1	4	120.00	-7.72	-9.05	360.05	-90.86	333.29	
2000.00	15.00	12	2	4	120.00	-12.53	-13.45	360.02	-92.19	333.31	
2000.00	15.00	12	3	3	120.00	14.52	-15.34	356.55	-104.16	336.56	
2000.00	15.00	13	1	4	130.00	-3.22	-5.65	389.19	-93.51	334.02	
2000.00	15.00	13	2	4	130.00	5.28	-7.05	389.21	-90.65	334.01	
2000.00	15.00	13	3	4	130.00	10.28	-11.35	389.18	-92.61	334.03	
2000.00	15.00	13	4	4	130.00	-14.33	-15.16	388.45	-105.34	334.66	
2000.00	15.00	13	5	3	130.00	15.42	-16.21	384.81	-103.13	337.83	
2000.00	15.00	14	1	4	140.00	13.87	-14.72	417.75	-99.88	335.13	
2000.00	15.00	14	2	4	140.00	-15.16	-15.96	416.75	-103.30	335.93	

EVAN B. WRIGHT

2000.00	15.00	15	1	5	150.00	-6.31	-7.86	449.75	-94.02	333.51
2000.00	15.00	15	2	5	150.00	-13.62	-14.48	449.61	-96.16	333.62
2000.00	15.00	15	3	4	150.00	16.44	-15.27	446.13	-106.50	336.22
2000.00	15.00	15	4	4	150.00	-16.35	-17.11	444.90	-103.19	337.15
2000.00	15.00	15	5	1	150.00	18.71	-19.42	428.80	-111.78	349.81
2000.00	15.00	16	1	5	160.00	-3.02	-5.54	478.93	-95.08	334.08
2000.00	15.00	16	2	5	160.00	4.38	-6.39	478.94	-93.43	334.07
2000.00	15.00	16	3	5	160.00	11.64	-12.61	478.82	-96.33	334.16
2000.00	15.00	16	4	5	160.00	-14.29	-15.12	478.04	-107.53	334.70
2000.00	15.00	16	5	4	160.00	15.08	-15.89	474.43	-105.19	337.25
2000.00	15.00	16	6	2	160.00	-18.70	-19.41	460.81	-112.09	347.21
2000.00	15.00	16	7	1	160.00	18.95	-19.65	456.49	-110.32	350.50
2000.00	15.00	17	1	5	170.00	13.91	-14.76	507.33	-102.04	335.09
2000.00	15.00	17	2	5	170.00	-14.89	-15.70	506.35	-105.50	335.73
2000.00	15.00	17	3	4	170.00	15.94	-16.72	502.61	-105.04	338.23
2000.00	15.00	17	4	2	170.00	-18.94	-19.64	488.50	-110.56	348.01
2000.00	15.00	17	5	1	170.00	19.28	-19.97	484.11	-109.94	351.16
2000.00	15.00	18	1	6	180.00	-5.53	-7.24	539.47	-95.93	333.66
2000.00	15.00	18	2	6	180.00	-13.70	-14.56	539.19	-98.60	333.83
2000.00	15.00	18	3	5	180.00	14.38	-15.21	535.71	-108.38	336.00
2000.00	15.00	18	4	5	180.00	-15.76	-16.54	534.57	-105.08	336.72
2000.00	15.00	18	5	2	180.00	-19.27	-19.97	516.12	-110.12	348.75
2000.00	15.00	19	1	6	190.00	-2.87	-5.46	568.66	-96.39	334.12
2000.00	15.00	19	2	6	190.00	3.89	-6.07	568.67	-95.22	334.11
2000.00	15.00	19	3	6	190.00	12.43	-13.35	568.43	-98.62	334.26
2000.00	15.00	19	4	6	190.00	-14.26	-15.09	567.62	-109.29	334.73
2000.00	15.00	19	5	5	190.00	14.89	-15.70	564.02	-106.99	336.86
2000.00	15.00	20	1	6	200.00	13.93	-14.78	596.91	-103.86	335.04
2000.00	15.00	20	2	6	200.00	-14.72	-15.54	595.95	-107.29	335.60
2000.00	15.00	20	3	5	200.00	15.55	-16.34	592.25	-106.63	337.69
2000.00	15.00	21	1	7	210.00	-5.02	-6.85	629.20	-97.36	333.76
2000.00	15.00	21	2	7	210.00	-13.76	-15.42	628.78	-100.63	333.98
2000.00	15.00	21	3	6	210.00	14.35	-15.18	625.30	-109.94	335.84
2000.00	15.00	21	4	6	210.00	-15.39	-16.19	624.20	-106.73	336.43
2000.00	15.00	21	5	5	210.00	16.32	-17.08	620.38	-106.68	338.50
2000.00	15.00	22	1	7	220.00	-2.76	-5.40	658.40	-97.53	334.14
2000.00	15.00	22	2	7	220.00	3.58	-5.86	658.40	-96.62	334.14
2000.00	15.00	22	3	7	220.00	12.98	-13.87	658.02	-100.39	334.33
2000.00	15.00	22	4	7	220.00	-14.24	-15.07	657.26	-108.76	334.75
2000.00	15.00	22	5	6	220.00	14.74	-15.56	653.62	-108.49	336.59
2000.00	15.00	22	6	6	220.00	-16.17	-16.94	652.35	-106.68	337.24
2000.00	15.00	22	7	2	220.00	18.59	-19.30	630.44	-116.34	348.96
2000.00	15.00	23	1	7	230.00	-0.18	-4.63	487.66	-91.70	334.47
2000.00	15.00	23	2	7	230.00	0.13	-4.44	487.65	-91.00	334.47
2000.00	15.00	23	3	8	230.00	-1.99	-9.28	489.83	-94.44	333.42
2000.00	15.00	23	4	8	230.00	-11.03	-12.04	489.82	-95.53	333.42
2000.00	15.00	23	5	7	230.00	13.96	-14.80	486.49	-105.44	338.04
2000.00	15.00	23	6	7	230.00	-14.60	-15.42	485.54	-108.00	335.90
2000.00	15.00	23	7	6	230.00	15.29	-16.09	481.87	-108.05	337.31
2000.00	15.00	23	8	3	230.00	-18.58	-19.29	462.45	-116.59	347.20
2000.00	15.00	23	9	2	230.00	18.75	-19.45	458.13	-115.87	349.48

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2000.00	15.00	24	1	8	240.00	-4.64	-6.58	718.92	-98.54	333.83
2000.00	15.00	24	2	8	240.00	6.59	-8.09	718.90	-95.03	333.81
2000.00	15.00	24	3	8	240.00	9.96	-11.05	718.97	-90.09	333.81
2000.00	15.00	24	4	8	240.00	-13.81	-14.66	718.36	-102.37	334.09
2000.00	15.00	24	5	7	240.00	14.32	-15.15	714.88	-111.27	335.72
2000.00	15.00	24	6	7	240.00	-15.14	-15.94	713.82	-108.15	334.22
2000.00	15.00	24	7	6	240.00	15.92	-16.69	710.04	-107.97	338.01
2000.00	15.00	24	8	3	240.00	-18.74	-19.45	690.14	-115.27	347.76
2000.00	15.00	24	9	2	240.00	18.91	-19.61	685.81	-114.09	349.95
2000.00	15.00	25	1	8	250.00	-2.67	-5.35	748.13	-98.53	334.16
2000.00	15.00	25	2	8	250.00	3.36	-5.73	748.13	-97.76	334.16
2000.00	15.00	25	3	8	250.00	13.38	-14.25	747.61	-101.82	334.40
2000.00	15.00	25	4	8	250.00	-14.22	-15.06	746.79	-112.02	334.77
2000.00	15.00	25	5	7	250.00	14.63	-15.46	743.22	-109.78	336.38
2000.00	15.00	25	6	7	250.00	-15.78	-16.56	742.00	-108.00	336.93
2000.00	15.00	25	7	3	250.00	-18.90	-19.60	717.82	-114.26	348.28
2000.00	15.00	25	8	2	250.00	19.10	-19.80	713.46	-113.60	350.41
2000.00	15.00	26	1	8	260.00	-0.43	-4.65	777.39	-94.29	334.45
2000.00	15.00	26	2	8	260.00	0.68	-4.68	777.38	-94.43	334.46
2000.00	15.00	26	3	9	260.00	-6.83	-8.30	779.53	-97.68	333.54
2000.00	15.00	26	4	9	260.00	-12.14	-13.08	779.44	-99.31	333.57
2000.00	15.00	26	5	8	260.00	13.97	-14.82	776.08	-106.82	335.82
2000.00	15.00	26	6	8	260.00	-14.54	-15.36	775.13	-110.23	335.43
2000.00	15.00	26	7	7	260.00	15.10	-15.90	771.49	-109.28	337.01
2000.00	15.00	26	8	7	260.00	-16.48	-17.24	770.10	-108.07	337.62
2000.00	15.00	26	9	3	260.00	-19.10	-19.79	745.47	-113.73	348.77
2000.00	15.00	26	10	2	260.00	19.34	-20.03	741.07	-113.46	350.84
2000.00	15.00	27	1	9	270.00	-4.36	-6.38	808.65	-99.54	333.89
2000.00	15.00	27	2	9	270.00	5.69	-7.36	808.69	-97.57	333.87
2000.00	15.00	27	3	9	270.00	11.07	-12.07	808.61	-99.49	333.90
2000.00	15.00	27	4	9	270.00	-13.84	-14.69	807.94	-103.89	334.18
2000.00	15.00	27	5	8	270.00	14.29	-15.13	804.46	-112.44	335.63
2000.00	15.00	27	6	8	270.00	-14.98	-15.79	803.42	-109.47	336.06
2000.00	15.00	27	7	7	270.00	15.62	-16.41	799.70	-109.12	337.63
2000.00	15.00	27	8	3	270.00	-19.33	-20.02	773.08	-113.58	349.25
2000.00	15.00	28	1	9	280.00	-2.60	-5.32	837.87	-99.43	334.18
2000.00	15.00	28	2	9	280.00	3.19	-5.63	837.87	-98.78	334.18
2000.00	15.00	28	3	9	280.00	13.63	-14.49	837.19	-103.08	334.45
2000.00	15.00	28	4	9	280.00	-14.21	-15.05	836.37	-113.12	334.78
2000.00	15.00	28	5	8	280.00	14.57	-15.39	832.80	-111.02	336.21
2000.00	15.00	28	6	8	280.00	-15.51	-16.29	831.64	-109.19	336.68
2000.00	15.00	28	7	7	280.00	16.20	-16.97	827.82	-109.16	338.24
2000.00	15.00	29	1	9	290.00	-0.63	-4.67	867.13	-96.91	334.44
2000.00	15.00	29	2	9	290.00	0.86	-4.71	867.11	-96.00	334.44
2000.00	15.00	29	3	10	290.00	-6.16	-7.74	869.24	-99.28	333.63
2000.00	15.00	29	4	10	290.00	-12.76	-13.67	869.05	-101.28	333.70
2000.00	15.00	29	5	9	290.00	13.99	-14.83	865.46	-108.05	335.01
2000.00	15.00	29	6	9	290.00	-14.49	-15.32	864.71	-111.48	335.37
2000.00	15.00	29	7	8	290.00	14.96	-15.77	861.09	-110.45	336.78
2000.00	15.00	29	8	8	290.00	-16.09	-16.86	859.79	-109.16	337.29
2000.00	15.00	29	9	3	290.00	18.53	-19.24	832.08	-119.47	348.52

EVAN B. WRIGHT

2000.00	15.00	30	1	10	300.00	-4.13	-6.22	898.36	-100.43	333.93
2000.00	15.00	30	2	10	300.00	5.15	-6.95	898.41	-99.05	333.92
2000.00	15.00	30	3	10	300.00	11.74	-12.71	898.24	-101.40	333.99
2000.00	15.00	30	4	10	300.00	-13.87	-14.72	897.52	-105.24	334.25
2000.00	15.00	30	5	9	300.00	14.28	-15.11	894.04	-113.47	335.55
2000.00	15.00	30	6	9	300.00	-14.85	-15.67	893.01	-110.63	335.94
2000.00	15.00	30	7	8	300.00	15.41	-16.20	889.32	-118.20	337.34
2000.00	15.00	30	8	4	300.00	-18.52	-19.23	884.09	-119.67	347.19
2000.00	15.00	30	9	3	300.00	18.65	-19.35	859.76	-118.35	348.93
2000.00	15.00	31	1	10	310.00	-2.54	-5.29	927.60	-100.22	334.19
2000.00	15.00	31	2	10	310.00	3.05	-5.56	927.60	-99.67	334.19
2000.00	15.00	31	3	10	310.00	13.67	-14.53	926.77	-104.26	334.49
2000.00	15.00	31	4	10	310.00	-14.20	-15.04	925.95	-114.10	334.79
2000.00	15.00	31	5	9	310.00	14.53	-15.35	922.39	-112.14	336.08
2000.00	15.00	31	6	9	310.00	-15.30	-16.10	921.26	-110.28	336.50
2000.00	15.00	31	7	8	310.00	15.90	-16.68	917.48	-110.15	337.88
2000.00	15.00	31	8	4	310.00	-18.64	-19.35	891.77	-118.52	347.62
2000.00	15.00	31	9	3	310.00	18.77	-19.47	887.45	-117.46	349.32
2000.00	15.00	32	1	10	320.00	-0.76	-4.59	956.86	-97.97	334.43
2000.00	15.00	32	2	10	320.00	1.00	-4.74	956.85	-97.36	334.43
2000.00	15.00	32	3	11	320.00	-5.69	-7.37	958.95	-100.43	333.70
2000.00	15.00	32	4	11	320.00	-13.20	-14.08	958.64	-102.77	333.81
2000.00	15.00	32	5	10	320.00	14.00	-14.84	955.24	-109.16	334.99
2000.00	15.00	32	6	10	320.00	-14.45	-15.28	954.29	-112.58	335.33
2000.00	15.00	32	7	9	320.00	14.85	-15.67	950.68	-111.48	336.60
2000.00	15.00	32	8	9	320.00	-15.80	-16.58	949.44	-110.18	337.04
2000.00	15.00	32	9	8	320.00	16.43	-17.19	945.57	-110.23	338.42
2000.00	15.00	32	10	4	320.00	-18.76	-19.57	919.46	-117.60	348.03
2000.00	15.00	32	11	3	320.00	18.89	-19.59	915.14	-116.72	349.67
2000.00	15.00	33	1	11	330.00	-3.94	-6.10	988.12	-101.21	333.97
2000.00	15.00	33	2	11	330.00	4.78	-6.67	988.14	-100.14	333.96
2000.00	15.00	33	3	11	330.00	12.24	-13.77	987.85	-102.84	334.06
2000.00	15.00	33	4	11	330.00	-13.89	-14.74	987.11	-106.45	334.31
2000.00	15.00	33	5	10	330.00	14.26	-15.10	983.63	-114.39	335.49
2000.00	15.00	33	6	10	330.00	-14.75	-15.57	982.61	-111.66	335.84
2000.00	15.00	33	7	9	330.00	15.24	-16.04	978.94	-111.17	337.10
2000.00	15.00	33	8	9	330.00	-16.34	-17.10	977.54	-110.23	337.58
2000.00	15.00	33	9	4	330.00	-18.89	-19.58	947.15	-116.85	348.42
2000.00	15.00	33	10	3	330.00	19.02	-19.71	942.81	-116.17	350.62

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2000.00	15.00	34	1	11	340.00	-2.49	-5.27	1017.34	-100.95	334.20
2000.00	15.00	34	2	11	340.00	2.95	-5.50	1017.34	-130.45	334.21
2000.00	15.00	34	3	12	340.00	-8.14	-9.42	1019.61	-96.89	333.46
2000.00	15.00	34	4	12	340.00	-10.42	-11.48	1019.61	-97.36	333.46
2000.00	15.00	34	5	11	340.00	13.71	-14.57	1016.36	-105.34	334.53
2000.00	15.00	34	6	11	340.00	-14.19	-15.03	1015.53	-114.98	334.80
2000.00	15.00	34	7	10	340.00	14.49	-15.31	1011.97	-113.15	335.98
2000.00	15.00	34	8	10	340.00	-15.13	-15.94	1010.88	-111.25	336.34
2000.00	15.00	34	9	9	340.00	15.67	-16.45	1007.13	-111.06	337.59
2000.00	15.00	34	10	4	340.00	-19.01	-19.71	974.82	-116.27	348.78
2000.00	15.00	34	11	3	340.00	19.19	-19.88	970.42	-116.06	350.36
2000.00	15.00	35	1	11	350.00	-0.87	-4.71	1046.60	-98.94	334.42
2000.00	15.00	35	2	11	350.00	1.11	-4.76	1046.59	-98.54	334.42
2000.00	15.00	35	3	12	350.00	-5.34	-7.09	1048.68	-101.37	333.75
2000.00	15.00	35	4	12	350.00	7.15	-8.54	1048.75	-97.38	333.73
2000.00	15.00	35	5	12	350.00	9.77	-10.87	1048.75	-98.18	333.73
2000.00	15.00	35	6	12	350.00	-13.52	-14.39	1048.22	-103.97	333.90
2000.00	15.00	35	7	11	350.00	14.01	-14.85	1044.82	-110.16	334.98
2000.00	15.00	35	8	11	350.00	-14.42	-15.25	1043.87	-113.56	335.29
2000.00	15.00	35	9	10	350.00	14.76	-15.58	1048.28	-112.41	336.45
2000.00	15.00	35	10	10	350.00	-15.57	-16.36	1039.08	-111.10	336.84
2000.00	15.00	35	11	9	350.00	16.13	-16.90	1035.26	-111.08	338.08
2000.00	15.00	35	12	4	350.00	-19.19	-19.88	1002.43	-116.15	349.15

EVAN B. WRIGHT

2000.00	15.00	36	1	12	360.00	-3.79	-6.00	1077.05	-101.93	334.00
2000.00	15.00	36	2	12	360.00	4.49	-6.67	1077.87	-101.06	333.99
2000.00	15.00	36	3	12	360.00	12.63	-13.54	1077.45	-104.05	334.12
2000.00	15.00	36	4	12	360.00	-13.91	-14.74	1076.69	-107.55	334.34
2000.00	15.00	36	5	11	360.00	14.25	-15.00	1073.21	-115.23	335.44
2000.00	15.00	36	6	11	360.00	-14.67	-15.49	1072.21	-112.58	335.76
2000.00	15.00	36	7	10	360.00	15.10	-15.90	1068.55	-112.05	336.90
2000.00	15.00	36	8	10	360.00	-16.04	-16.81	1067.22	-111.10	337.32
2000.00	15.00	37	1	12	370.00	-2.45	-5.25	1107.00	-101.62	334.21
2000.00	15.00	37	2	12	370.00	2.86	-5.45	1107.07	-101.18	334.21
2000.00	15.00	37	3	13	370.00	-7.12	-8.54	1109.30	-100.05	333.54
2000.00	15.00	37	4	13	370.00	-11.45	-12.43	1109.25	-101.30	333.54
2000.00	15.00	37	5	12	370.00	13.74	-14.60	1105.94	-106.33	334.54
2000.00	15.00	37	6	12	370.00	-14.18	-15.02	1105.12	-115.78	334.81
2000.00	15.00	37	7	11	370.00	14.46	-15.28	1101.55	-114.06	335.89
2000.00	15.00	37	8	11	370.00	-15.02	-15.82	1100.48	-112.19	336.22
2000.00	15.00	37	9	10	370.00	15.49	-16.28	1096.76	-111.93	337.34
2000.00	15.00	37	10	4	370.00	18.59	-19.29	1061.40	-120.03	348.59
2000.00	15.00	38	1	12	380.00	-0.96	-4.73	1136.33	-99.03	334.41
2000.00	15.00	38	2	12	380.00	1.19	-4.70	1136.32	-99.42	334.41
2000.00	15.00	38	3	13	380.00	-5.04	-4.87	1130.40	-102.19	333.80
2000.00	15.00	38	4	13	380.00	6.31	-7.86	1130.46	-99.98	333.70
2000.00	15.00	38	5	13	380.00	10.73	-11.74	1130.41	-101.52	333.80
2000.00	15.00	38	6	13	380.00	-13.64	-14.50	1137.80	-105.03	333.90
2000.00	15.00	38	7	12	380.00	14.01	-14.86	1134.41	-111.08	334.90
2000.00	15.00	38	8	12	380.00	-14.40	-15.23	1133.46	-114.45	335.26
2000.00	15.00	38	9	11	380.00	14.69	-15.51	1129.88	-113.26	336.32
2000.00	15.00	38	10	11	380.00	-15.40	-16.19	1120.70	-111.99	336.67
2000.00	15.00	38	11	10	380.00	15.89	-16.67	1124.91	-111.90	337.80
2000.00	15.00	38	12	5	380.00	-18.58	-19.29	1093.41	-120.98	347.54
2000.00	15.00	38	13	4	380.00	18.68	-19.39	1089.09	-120.02	348.92
2000.00	15.00	39	1	13	390.00	-3.65	-5.91	1167.58	-102.59	334.02
2000.00	15.00	39	2	13	390.00	4.26	-6.31	1167.60	-101.05	334.02
2000.00	15.00	39	3	13	390.00	12.93	-13.83	1167.04	-105.04	334.18
2000.00	15.00	39	4	13	390.00	-13.92	-14.77	1166.27	-108.55	334.40
2000.00	15.00	39	5	12	390.00	14.61	-15.43	1161.80	-113.44	335.49
2000.00	15.00	39	6	12	390.00	-14.24	-15.87	1162.79	-116.00	335.40
2000.00	15.00	39	7	11	390.00	15.00	-15.81	1158.15	-112.92	336.74
2000.00	15.00	39	8	11	390.00	-15.81	-16.59	1156.87	-111.92	337.12
2000.00	15.00	39	9	10	390.00	16.32	-17.08	1153.02	-111.95	338.24
2000.00	15.00	39	10	5	390.00	-18.48	-19.38	1121.10	-120.14	347.87
2000.00	15.00	39	11	4	390.00	18.78	-19.48	1116.77	-119.33	349.22
2000.00	15.00	40	1	13	400.00	-2.41	-5.23	1196.81	-102.25	334.22
2000.00	15.00	40	2	13	400.00	2.79	-5.41	1196.81	-101.84	334.22
2000.00	15.00	40	3	14	400.00	-6.54	-8.05	1199.01	-101.49	333.61
2000.00	15.00	40	4	14	400.00	-12.05	-12.99	1198.87	-103.18	333.65
2000.00	15.00	40	5	13	400.00	13.76	-14.62	1195.52	-107.24	334.58
2000.00	15.00	40	6	13	400.00	-14.18	-15.02	1194.70	-116.51	334.81
2000.00	15.00	40	7	12	400.00	14.43	-15.26	1191.13	-114.89	335.81
2000.00	15.00	40	8	12	400.00	-14.92	-15.73	1190.07	-113.05	336.11
2000.00	15.00	40	9	11	400.00	15.34	-16.13	1186.38	-112.73	337.16
2000.00	15.00	40	10	11	400.00	-16.25	-17.01	1184.99	-111.95	337.56
2000.00	15.00	40	11	5	400.00	-18.78	-19.68	1148.78	-119.45	348.19
2000.00	15.00	40	12	4	400.00	19.00	-19.58	1144.46	-118.74	349.51

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SOURCE ALTITUDE (ABOVE GROUND LEVEL)= 2500.00 M.			
BEARING=	15.00	WIND COMPONENT	SOUND SPEED
ALTITUDE	(M)	(M/SEC)	(M/SEC)
148263.375	16.904	346.659	363.563
99224.187	16.904	298.229	315.132
84438.625	12.680	284.843	297.522
64671.031	46.488	306.370	352.857
59719.543	46.488	312.350	358.837
46629.133	38.037	320.504	358.541
35003.773	-5.177	303.908	298.731
23556.445	-0.872	288.983	288.111
17974.648	10.325	288.545	298.869
12986.770	27.577	290.155	317.732
11875.934	30.760	291.583	322.343
7520.562	50.556	314.420	364.976
5353.750	38.471	322.157	360.628
4687.277	34.550	323.622	358.171
3838.844	31.157	327.490	358.646
2947.318	22.884	329.431	352.316
2499.510	16.474	330.443	346.917
1999.686	9.937	331.572	341.509
1873.724	8.433	331.857	340.290
1646.787	5.685	331.627	337.312
1499.823	4.215	331.022	335.237
1398.846	3.285	330.607	333.892
1148.896	1.638	330.864	332.502
999.921	2.117	331.535	333.652
781.952	2.622	332.519	335.141
84.999	4.678	335.865	340.543
0.000	4.096	336.288	340.384

ALL RAYS WITH SOURCE ANGLE GREATER THAN 0.000 DEGREES STRIKE THE GROUND.

LIST OF CRITICAL ANGLES WITH FAN PARAMETERS.

1	0.000	14.3379	0.4944	30
2	14.3379	3.3215	0.4745	8
3	17.6594	42.3406	0.4981	86

EVAN B. WRIGHT

EIGENRAYS AT GROUND RECEIVERS FOR SOURCE HEIGHT=				2500.00 M				TRACING TOWARD AZIMUTH				15.00	
				MEIG	MREFL	RANGE(LN)	SANGLE	RANGLE	TIME(SEC)	LEVEL	CHNREAN		
2500.00	15.00		1	1	0	10.00	-7.54	-13.45	30.46	-76.08	328.27		
2500.00	15.00		2	1	0	20.00	9.69	-14.79	59.14	-84.66	338.17		
2500.00	15.00		4	1	1	40.00	-3.46	-11.61	120.11	-84.39	333.02		
2500.00	15.00		4	2	1	40.00	-10.42	-15.29	120.04	-91.26	333.21		
2500.00	15.00		5	1	1	50.00	9.84	-14.89	148.74	-92.31	336.16		
2500.00	15.00		6	1	1	60.00	11.79	-16.27	177.04	-95.88	338.92		
2500.00	15.00		7	1	2	70.00	-0.55	-11.08	209.79	-87.94	333.67		
2500.00	15.00		7	2	2	70.00	-10.19	-15.13	209.64	-98.12	333.91		
2500.00	15.00		7	3	0	70.00	15.69	-19.36	199.04	-98.45	351.69		
2500.00	15.00		8	1	2	80.00	9.89	-14.92	238.33	-96.78	335.67		
2500.00	15.00		8	2	2	80.00	-12.99	-17.19	237.86	-96.11	336.33		
2500.00	15.00		8	3	1	80.00	-15.52	-19.21	231.94	-97.40	344.92		
2500.00	15.00		8	4	0	80.00	16.35	-19.91	226.70	-103.04	352.89		
2500.00	15.00		9	1	2	90.00	11.10	-15.77	266.66	-99.57	337.51		
2500.00	15.00		9	2	1	90.00	-16.09	-19.69	259.62	-103.81	346.66		
2500.00	15.00		10	1	3	100.00	4.72	-12.06	299.46	-88.07	333.93		
2500.00	15.00		10	2	3	100.00	-10.12	-15.08	299.23	-101.88	334.19		
2500.00	15.00		10	3	2	100.00	12.87	-17.09	294.82	-99.63	339.18		
2500.00	15.00		11	1	3	110.00	9.91	-14.94	327.93	-99.98	335.44		
2500.00	15.00		11	2	3	110.00	-11.70	-16.21	327.52	-99.53	335.86		
2500.00	15.00		12	1	3	120.00	10.78	-15.55	356.26	-102.34	336.83		
2500.00	15.00		13	1	4	130.00	7.39	-13.36	389.11	-92.77	334.10		
2500.00	15.00		13	2	4	130.00	-10.09	-15.06	388.83	-104.49	334.34		
2500.00	15.00		13	3	3	130.00	12.03	-16.46	384.49	-101.97	338.11		
2500.00	15.00		14	1	4	140.00	9.93	-14.95	417.52	-102.47	335.31		
2500.00	15.00		14	2	4	140.00	-11.15	-15.80	417.14	-102.20	335.62		
2500.00	15.00		14	3	1	140.00	15.53	-19.23	400.67	-102.17	349.41		
2500.00	15.00		15	1	4	150.00	10.60	-15.41	445.86	-104.50	336.43		
2500.00	15.00		15	2	4	150.00	-12.63	-16.91	445.32	-102.09	336.84		
2500.00	15.00		15	3	2	150.00	-15.44	-19.15	433.57	-102.17	345.97		
2500.00	15.00		15	4	1	150.00	15.76	-19.42	428.38	-107.27	350.15		

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2500.00	15.00	16	1	5	160.00	8.79	-14.20	478.73	-95.69	334.22
2500.00	15.00	16	2	5	160.00	-10.07	-15.05	478.42	-106.49	334.43
2500.00	15.00	16	3	4	160.00	11.55	-16.10	474.13	-103.92	337.46
2500.00	15.00	16	4	2	160.00	-15.68	-19.35	461.28	-105.53	346.86
2500.00	15.00	16	5	1	160.00	16.10	-19.70	456.04	-109.45	350.84
2500.00	15.00	17	1	5	170.00	9.94	-14.96	507.12	-104.51	335.23
2500.00	15.00	17	2	5	170.00	-10.85	-15.59	506.75	-104.36	335.47
2500.00	15.00	17	3	4	170.00	12.65	-16.93	502.28	-104.03	338.45
2500.00	15.00	17	4	2	170.00	-15.97	-19.59	488.96	-109.90	347.67
2500.00	15.00	17	5	1	170.00	16.49	-20.03	483.66	-109.18	351.49
2500.00	15.00	18	1	6	180.00	-2.80	-11.43	539.69	-92.78	333.52
2500.00	15.00	18	2	6	180.00	-9.52	-14.68	539.64	-94.42	333.55
2500.00	15.00	18	3	5	180.00	10.47	-15.33	535.46	-106.26	336.16
2500.00	15.00	18	4	5	180.00	-11.95	-16.40	534.98	-103.94	336.46
2500.00	15.00	18	5	2	180.00	-16.35	-19.91	516.60	-109.42	348.43
2500.00	15.00	19	1	6	190.00	9.51	-14.67	568.33	-97.80	334.31
2500.00	15.00	19	2	6	190.00	-10.06	-15.04	568.02	-108.12	334.50
2500.00	15.00	19	3	5	190.00	11.23	-15.87	563.75	-105.60	337.03
2500.00	15.00	19	4	5	190.00	-13.20	-17.35	563.08	-104.17	337.43
2500.00	15.00	20	1	6	200.00	9.95	-14.96	596.71	-106.23	335.17
2500.00	15.00	20	2	6	200.00	-10.67	-15.47	596.35	-106.15	335.37
2500.00	15.00	20	3	5	200.00	12.12	-16.53	591.95	-105.52	337.87
2500.00	15.00	21	1	7	210.00	-0.99	-11.12	629.37	-94.78	333.67
2500.00	15.00	21	2	7	210.00	-9.59	-14.72	629.24	-96.65	333.74
2500.00	15.00	21	3	6	210.00	10.41	-15.28	625.06	-107.83	335.97
2500.00	15.00	21	4	6	210.00	-11.53	-16.08	624.61	-105.57	336.21
2500.00	15.00	21	5	5	210.00	13.08	-17.26	620.05	-105.73	338.68
2500.00	15.00	21	6	2	210.00	15.48	-19.18	602.30	-105.23	348.66
2500.00	15.00	22	1	7	220.00	9.57	-14.71	657.93	-99.41	334.38
2500.00	15.00	22	2	7	220.00	-10.05	-15.03	657.61	-109.48	334.54
2500.00	15.00	22	3	6	220.00	11.01	-15.71	653.36	-107.03	336.72
2500.00	15.00	22	4	6	220.00	-12.52	-16.83	652.78	-105.59	337.02
2500.00	15.00	22	5	3	220.00	-15.42	-19.13	635.20	-105.30	346.35
2500.00	15.00	22	6	2	220.00	15.63	-19.31	630.01	-107.42	349.20
2500.00	15.00	23	1	7	230.00	9.95	-14.97	686.30	-107.72	335.13
2500.00	15.00	23	2	7	230.00	-10.55	-15.38	685.95	-107.63	335.30
2500.00	15.00	23	3	6	230.00	11.75	-16.25	681.59	-106.85	337.45
2500.00	15.00	23	4	3	230.00	-15.57	-19.26	662.91	-107.11	346.95
2500.00	15.00	23	5	2	230.00	15.79	-19.44	657.73	-112.06	349.69
2500.00	15.00	24	1	8	240.00	5.71	-12.49	719.04	-94.21	333.78
2500.00	15.00	24	2	8	240.00	-9.64	-14.76	718.03	-98.55	333.80
2500.00	15.00	24	3	7	240.00	10.36	-15.24	716.45	-109.18	335.83
2500.00	15.00	24	4	7	240.00	-11.25	-15.88	714.23	-107.00	336.03
2500.00	15.00	24	5	6	240.00	12.56	-16.85	709.74	-106.93	338.15
2500.00	15.00	24	6	3	240.00	-15.73	-19.39	698.62	-110.27	347.51
2500.00	15.00	24	7	2	240.00	16.02	-19.63	695.38	-113.14	350.17

EVAN B. WRIGHT

2500.00	15.00	25	1	8	250.00	9.62	-14.74	747.52	-100.64	334.44
2500.00	15.00	25	2	8	250.00	-10.04	-15.03	747.20	-110.66	334.50
2500.00	15.00	25	3	7	250.00	10.86	-15.60	742.97	-108.33	336.49
2500.00	15.00	25	4	7	250.00	-12.06	-16.48	742.44	-106.87	336.73
2500.00	15.00	25	5	3	250.00	-15.93	-19.56	718.30	-113.45	340.04
2500.00	15.00	25	6	2	250.00	16.26	-19.83	713.03	-112.79	350.62
2500.00	15.00	26	1	8	260.00	9.96	-14.97	775.90	-109.03	335.10
2500.00	15.00	26	2	8	260.00	-10.46	-15.32	775.55	-108.94	335.25
2500.00	15.00	26	3	7	260.00	11.48	-16.05	771.22	-108.03	337.13
2500.00	15.00	26	4	7	260.00	-12.93	-17.14	770.55	-107.02	337.42
2500.00	15.00	26	5	3	260.00	-16.18	-19.77	745.95	-113.07	340.55
2500.00	15.00	26	6	2	260.00	16.54	-20.07	740.62	-112.73	351.06
2500.00	15.00	27	1	9	270.00	7.35	-13.34	808.68	-97.79	333.88
2500.00	15.00	27	2	9	270.00	-9.68	-14.79	808.43	-100.19	333.98
2500.00	15.00	27	3	8	270.00	10.32	-15.22	804.25	-110.35	335.72
2500.00	15.00	27	4	8	270.00	-11.04	-15.73	803.85	-108.25	335.89
2500.00	15.00	27	5	7	270.00	12.17	-16.56	799.40	-108.03	337.75
2500.00	15.00	27	6	3	270.00	-16.45	-19.99	773.56	-112.89	349.04
2500.00	15.00	28	1	9	280.00	9.65	-14.77	837.11	-102.13	334.48
2500.00	15.00	28	2	9	280.00	-10.04	-15.02	836.80	-111.70	334.61
2500.00	15.00	28	3	8	280.00	10.75	-15.52	832.57	-109.48	336.31
2500.00	15.00	28	4	8	280.00	-11.73	-16.23	832.08	-108.04	336.51
2500.00	15.00	28	5	7	280.00	12.89	-17.11	827.51	-108.18	338.36
2500.00	15.00	28	6	3	280.00	15.45	-19.16	803.93	-107.53	348.29
2500.00	15.00	29	1	10	290.00	-6.75	-12.07	869.60	-92.37	333.49
2500.00	15.00	29	2	10	290.00	-7.07	-13.18	869.60	-93.32	333.49
2500.00	15.00	29	3	9	290.00	9.96	-14.97	865.49	-110.20	335.07
2500.00	15.00	29	4	9	290.00	-10.41	-15.28	865.14	-110.14	335.20
2500.00	15.00	29	5	8	290.00	11.28	-15.90	860.84	-109.12	336.88
2500.00	15.00	29	6	8	290.00	-12.47	-16.78	860.24	-108.08	337.12
2500.00	15.00	29	7	4	290.00	-15.41	-19.12	836.83	-107.60	346.55
2500.00	15.00	29	8	3	290.00	15.57	-19.26	831.64	-108.94	348.71

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2500.00	15.00	30	1	10	300.00	8.31	-13.90	898.30	-99.88	333.96
2500.00	15.00	30	2	10	300.00	-9.72	-14.81	898.02	-101.65	334.07
2500.00	15.00	30	3	9	300.00	10.29	-15.20	893.84	-111.39	335.63
2500.00	15.00	30	4	9	300.00	-10.89	-15.62	893.45	-109.39	335.78
2500.00	15.00	30	5	8	300.00	11.87	-16.34	889.05	-109.83	337.44
2500.00	15.00	30	6	8	300.00	-13.24	-17.38	888.30	-108.27	337.72
2500.00	15.00	30	7	4	300.00	-15.52	-19.22	864.54	-108.85	347.00
2500.00	15.00	30	8	3	300.00	15.68	-19.35	859.36	-111.05	349.10
2500.00	15.00	31	1	10	310.00	9.69	-14.79	926.71	-103.29	334.52
2500.00	15.00	31	2	10	310.00	-10.03	-15.02	926.39	-112.63	334.63
2500.00	15.00	31	3	9	310.00	10.66	-15.46	922.17	-110.50	336.16
2500.00	15.00	31	4	9	310.00	-11.47	-16.04	921.71	-109.09	336.33
2500.00	15.00	31	5	8	310.00	12.51	-16.81	917.20	-109.11	337.99
2500.00	15.00	31	6	4	310.00	-15.64	-19.32	892.25	-110.60	347.43
2500.00	15.00	31	7	3	310.00	15.80	-19.45	887.07	-115.31	349.47
2500.00	15.00	32	1	11	320.00	-2.49	-11.35	959.27	-96.81	333.59
2500.00	15.00	32	2	11	320.00	-8.77	-14.19	959.23	-98.86	333.68
2500.00	15.00	32	3	10	320.00	9.97	-14.98	955.89	-111.25	335.05
2500.00	15.00	32	4	10	320.00	-10.37	-15.25	954.74	-111.20	335.17
2500.00	15.00	32	5	9	320.00	11.12	-15.79	950.45	-110.10	336.68
2500.00	15.00	32	6	9	320.00	-12.12	-16.52	949.89	-109.86	336.88
2500.00	15.00	32	7	8	320.00	13.16	-17.32	945.27	-109.28	338.53
2500.00	15.00	32	8	4	320.00	-15.76	-19.41	919.97	-113.59	347.84
2500.00	15.00	32	9	3	320.00	15.98	-19.60	914.72	-115.72	349.83
2500.00	15.00	33	1	11	330.00	9.00	-14.33	987.91	-101.45	334.04
2500.00	15.00	33	2	11	330.00	-9.74	-14.82	987.61	-102.95	334.14
2500.00	15.00	33	3	10	330.00	10.26	-15.18	983.44	-112.32	335.56
2500.00	15.00	33	4	10	330.00	-10.78	-15.55	983.05	-110.43	335.69
2500.00	15.00	33	5	9	330.00	11.64	-16.17	978.69	-109.96	337.19
2500.00	15.00	33	6	9	330.00	-12.79	-17.03	978.01	-109.18	337.42
2500.00	15.00	33	7	4	330.00	-15.91	-19.54	947.64	-115.95	348.23
2500.00	15.00	33	8	3	330.00	16.16	-19.75	942.37	-115.45	350.10
2500.00	15.00	34	1	11	340.00	9.71	-14.80	1016.30	-104.35	334.55
2500.00	15.00	34	2	11	340.00	-10.03	-15.02	1015.99	-113.47	334.65
2500.00	15.00	34	3	10	340.00	10.58	-15.40	1011.77	-111.42	336.04
2500.00	15.00	34	4	10	340.00	-11.29	-15.91	1011.32	-110.88	336.19
2500.00	15.00	34	5	9	340.00	12.20	-16.58	1008.86	-109.98	337.68
2500.00	15.00	34	6	4	340.00	-15.34	-19.07	977.85	-108.52	347.70
2500.00	15.00	34	7	4	340.00	-16.10	-19.70	975.29	-115.67	348.61
2500.00	15.00	34	8	3	340.00	16.35	-19.91	970.00	-115.27	350.52
2500.00	15.00	35	1	12	350.00	-1.19	-11.14	1048.95	-98.33	333.67
2500.00	15.00	35	2	12	350.00	-9.50	-14.66	1048.83	-100.98	333.71
2500.00	15.00	35	3	11	350.00	9.97	-14.98	1044.68	-112.21	335.03
2500.00	15.00	35	4	11	350.00	-10.33	-15.23	1044.33	-112.15	335.14
2500.00	15.00	35	5	10	350.00	10.99	-15.69	1040.87	-110.98	336.52
2500.00	15.00	35	6	10	350.00	-11.84	-16.32	1039.54	-109.97	336.69
2500.00	15.00	35	7	9	350.00	12.78	-17.02	1034.97	-110.89	338.17
2500.00	15.00	35	8	4	350.00	-15.43	-19.15	1005.56	-109.36	348.06
2500.00	15.00	35	9	4	350.00	-16.28	-19.85	1002.94	-115.40	348.98
2500.00	15.00	35	10	3	350.00	16.56	-20.09	997.58	-115.24	350.05

EVAN B. WRIGHT

2500.00	15.00	36	1	12	360.00	-9.76	-14.84	1077.21	-104.12	334.20
2500.00	15.00	36	2	12	360.00	9.50	-14.66	1077.52	-102.70	334.10
2500.00	15.00	36	3	11	360.00	10.24	-15.16	1073.03	-113.17	335.50
2500.00	15.00	36	4	11	360.00	-10.69	-15.88	1072.66	-111.36	335.62
2500.00	15.00	36	5	10	360.00	11.45	-16.03	1068.32	-110.81	336.98
2500.00	15.00	36	6	10	360.00	-12.44	-16.76	1067.69	-110.01	337.18
2500.00	15.00	36	7	5	360.00	-15.40	-19.12	1038.46	-109.43	346.67
2500.00	15.00	36	8	4	360.00	15.53	-19.22	1033.28	-110.40	348.41
2500.00	15.00	36	9	4	360.00	-16.50	-20.03	1030.52	-115.36	349.34
2500.00	15.00	37	1	12	370.00	9.73	-14.82	1105.90	-105.33	334.57
2500.00	15.00	37	2	12	370.00	-10.03	-15.02	1105.58	-114.23	334.67
2500.00	15.00	37	3	11	370.00	10.52	-15.36	1101.37	-112.25	335.94
2500.00	15.00	37	4	11	370.00	-11.13	-15.80	1100.94	-110.97	336.08
2500.00	15.00	37	5	10	370.00	11.95	-16.39	1096.51	-110.78	337.43
2500.00	15.00	37	6	10	370.00	-13.05	-17.23	1095.77	-110.16	337.66
2500.00	15.00	37	7	5	370.00	-15.49	-19.19	1066.17	-110.38	347.04
2500.00	15.00	37	8	4	370.00	15.62	-19.30	1060.99	-111.78	348.73
2500.00	15.00	38	1	13	380.00	-0.21	-11.07	1138.63	-99.70	333.73
2500.00	15.00	38	2	13	380.00	0.29	-11.08	1138.63	-97.32	333.74
2500.00	15.00	38	3	13	380.00	6.20	-12.73	1138.61	-98.24	333.74
2500.00	15.00	38	4	13	380.00	-9.54	-14.69	1138.42	-102.07	333.79
2500.00	15.00	38	5	12	380.00	9.97	-14.98	1134.28	-113.08	335.02
2500.00	15.00	38	6	12	380.00	-10.31	-15.21	1133.93	-113.01	335.12
2500.00	15.00	38	7	11	380.00	10.89	-15.62	1129.67	-111.84	336.38
2500.00	15.00	38	8	11	380.00	-11.63	-16.15	1129.17	-110.82	336.53
2500.00	15.00	38	9	10	380.00	12.47	-16.79	1124.66	-110.84	337.88
2500.00	15.00	38	10	5	380.00	-15.59	-19.27	1093.89	-111.60	347.39
2500.00	15.00	38	11	4	380.00	15.72	-19.38	1088.70	-113.81	349.04
2500.00	15.00	39	1	13	390.00	-9.78	-14.85	1166.80	-105.20	334.25
2500.00	15.00	39	2	13	390.00	9.53	-14.68	1167.11	-103.62	334.16
2500.00	15.00	39	3	12	390.00	10.22	-15.15	1162.62	-113.94	335.45
2500.00	15.00	39	4	12	390.00	-10.62	-15.43	1162.26	-112.20	335.55
2500.00	15.00	39	5	11	390.00	11.30	-15.92	1157.93	-111.62	336.81
2500.00	15.00	39	6	11	390.00	-12.15	-16.55	1157.35	-110.81	336.98
2500.00	15.00	39	7	10	390.00	13.01	-17.20	1152.74	-110.97	338.33
2500.00	15.00	39	8	5	390.00	-15.68	-19.35	1121.60	-113.30	347.72
2500.00	15.00	39	9	4	390.00	15.81	-19.46	1116.41	-117.75	349.33
2500.00	15.00	40	1	13	400.00	9.75	-14.83	1195.49	-106.24	334.59
2500.00	15.00	40	2	13	400.00	-10.03	-15.02	1195.18	-114.94	334.68
2500.00	15.00	40	3	12	400.00	10.47	-15.32	1190.97	-113.03	335.86
2500.00	15.00	40	4	12	400.00	-11.01	-15.70	1190.55	-111.78	335.98
2500.00	15.00	40	5	11	400.00	11.75	-16.25	1186.15	-111.54	337.23
2500.00	15.00	40	6	11	400.00	-12.70	-16.37	1185.46	-110.90	337.42
2500.00	15.00	40	7	5	400.00	-15.77	-19.43	1149.31	-116.13	348.04
2500.00	15.00	40	8	4	400.00	15.95	-19.58	1144.06	-117.71	349.63

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SOURCE ALTITUDE (ABOVE GROUND LEVEL)= 3000.00 M.
BEARING= 15.00

ALTITUDE (M)	WIND COMPONENT (M/SEC)	SOUND SPEED (M/SEC)	SUN (M/SEC)
148263.375	16.904	346.659	363.563
99224.187	15.904	298.229	315.132
8438.625	12.680	284.843	297.522
64871.031	66.488	306.370	352.857
59719.543	66.488	312.350	358.837
46629.133	38.037	320.504	358.541
35003.773	-5.177	303.908	298.731
23556.445	-0.872	288.983	288.111
17974.648	10.325	288.545	298.869
12986.770	27.577	290.155	317.732
11875.934	37.760	291.583	322.343
7520.562	50.556	314.420	364.976
5353.750	38.471	322.157	360.628
4687.277	34.550	323.622	358.171
3838.844	31.157	327.490	358.646
2999.294	23.343	329.318	352.661
2947.318	22.884	329.431	352.316
2499.510	15.474	330.443	346.917
1999.686	9.937	331.572	341.509
1873.124	8.433	331.857	340.290
1646.787	5.685	331.627	337.312
1499.823	4.215	331.022	335.237
1398.846	3.285	330.607	333.892
1148.896	1.638	330.864	332.502
999.921	2.117	331.535	333.652
781.952	2.622	332.519	335.141
84.999	4.678	335.865	340.543
0.000	4.096	336.288	340.384

ALL RAYS WITH SOURCE ANGLE GREATER THAN 0.000 DEGREES STRIKE THE GROUND.

LIST OF CRITICAL ANGLES WITH FAN PARAMETERS.

1	0.0000	10.1275	0.5064	21
2	10.1275	4.2919	3.4769	10
3	14.4194	45.5806	3.5009	92

EVAN B. WRIGHT

3000.00	15.00	18	1	5	180.00	3.59	-15.51	535.25	-101.26	336.29
3000.00	15.00	18	2	5	180.00	-5.53	-16.09	535.20	-100.39	336.32
3000.00	15.00	18	3	2	180.00	-12.70	-19.85	516.98	-108.38	348.18
3000.00	15.00	19	1	5	190.00	5.48	-16.07	563.50	-102.35	337.18
3000.00	15.00	19	2	5	190.00	-7.96	-17.08	563.34	-101.72	337.27
3000.00	15.00	19	3	2	190.00	-13.25	-20.21	544.56	-108.35	348.90
3000.00	15.00	20	1	6	200.00	0.37	-15.08	596.51	-96.64	335.28
3000.00	15.00	20	2	6	200.00	-1.68	-15.17	596.51	-97.21	335.28
3000.00	15.00	20	3	5	200.00	7.16	-16.73	591.68	-103.19	338.02
3000.00	15.00	20	4	2	200.00	11.38	-19.00	574.24	-102.38	348.28
3000.00	15.00	20	5	2	200.00	11.63	-19.15	574.23	-100.61	348.29
3000.00	15.00	21	1	6	210.00	3.20	-15.42	624.84	-102.27	336.08
3000.00	15.00	21	2	6	210.00	-4.72	-15.82	624.81	-101.52	336.10
3000.00	15.00	21	3	5	210.00	8.69	-17.47	619.74	-103.95	338.85
3000.00	15.00	21	4	2	210.00	11.79	-19.25	601.95	-102.35	348.87
3000.00	15.00	22	1	6	220.00	4.92	-15.88	653.12	-103.37	336.84
3000.00	15.00	22	2	6	220.00	-6.82	-16.59	653.02	-102.75	336.90
3000.00	15.00	22	3	3	220.00	-11.15	-18.86	635.58	-106.95	346.14
3000.00	15.00	22	4	3	220.00	-11.64	-19.17	635.56	-102.29	346.15
3000.00	15.00	22	5	2	220.00	11.95	-19.36	629.66	-105.27	349.39
3000.00	15.00	23	1	7	230.00	-0.40	-15.38	686.10	-98.37	335.23
3000.00	15.00	23	2	7	230.00	-1.02	-15.11	686.10	-93.24	335.23
3000.00	15.00	23	3	6	230.00	6.43	-16.43	681.33	-104.15	337.58
3000.00	15.00	23	4	6	230.00	-8.62	-17.43	681.10	-103.71	337.69
3000.00	15.00	23	5	3	230.00	-11.82	-19.28	663.27	-104.15	346.76
3000.00	15.00	23	6	2	230.00	12.13	-19.47	657.36	-112.24	349.88
3000.00	15.00	24	1	7	240.00	2.88	-15.35	714.44	-103.11	335.93
3000.00	15.00	24	2	7	240.00	-4.12	-15.64	714.42	-102.48	335.94
3000.00	15.00	24	3	6	240.00	7.81	-17.34	709.45	-104.84	338.29
3000.00	15.00	24	4	3	240.00	-11.98	-19.38	690.99	-107.47	347.33
3000.00	15.00	24	5	2	240.00	12.43	-19.67	685.02	-111.85	350.35
3000.00	15.00	25	1	7	250.00	4.47	-15.74	742.73	-104.26	336.60
3000.00	15.00	25	2	7	250.00	-6.01	-16.26	742.66	-103.67	336.63
3000.00	15.00	25	3	6	250.00	9.10	-17.68	737.48	-105.48	338.99
3000.00	15.00	25	4	3	250.00	-12.20	-19.52	718.68	-112.37	347.86
3000.00	15.00	25	5	2	250.00	12.75	-19.88	712.65	-111.67	350.80
3000.00	15.00	26	1	7	260.00	5.85	-16.20	770.96	-105.01	337.24
3000.00	15.00	26	2	7	260.00	-7.63	-16.95	770.88	-104.55	337.31
3000.00	15.00	26	3	3	260.00	-12.51	-19.72	746.34	-111.95	348.37
3000.00	15.00	26	4	2	260.00	13.10	-20.11	740.24	-111.65	351.24
3000.00	15.00	27	1	8	270.00	2.61	-15.30	884.03	-103.86	335.81
3000.00	15.00	27	2	8	270.00	-3.65	-15.52	884.02	-103.30	335.81
3000.00	15.00	27	3	7	270.00	7.12	-16.72	799.12	-105.65	337.87
3000.00	15.00	27	4	7	270.00	-9.10	-17.48	798.83	-105.32	337.99
3000.00	15.00	27	5	3	270.00	11.35	-18.98	775.88	-105.40	347.99
3000.00	15.00	27	6	3	270.00	11.63	-19.16	775.87	-103.34	348.00
3000.00	15.00	27	7	3	270.00	-12.85	-19.95	773.95	-111.83	348.86

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EIGENRAYS AT GROUND RECEIVERS FOR SOURCE HEIGHT=				3000.00 M			TRACING TOWARD AZIMUTH			15.00	
		NEIG	MREFL	RANGE(KM)	SANGLE	RANGLE	TIME(SEC)	LEVEL			CHNMEAN
3000.00	15.00	2	1	0	20.00	4.06	-15.63	58.96	-86.08		339.23
3000.00	15.00	5	1	1	50.00	2.81	-15.34	148.55	-91.48		336.50
3000.00	15.00	6	1	1	60.00	7.40	-16.85	176.78	-93.87		339.41
3000.00	15.00	7	1	0	70.00	12.07	-19.43	198.68	-100.90		352.32
3000.00	15.00	8	1	2	80.00	2.13	-15.22	238.15	-94.24		335.93
3000.00	15.00	8	2	2	80.00	-6.31	-16.38	238.12	-92.41		335.97
3000.00	15.00	8	3	1	80.00	-11.69	-19.19	232.30	-94.21		344.39
3000.00	15.00	8	4	0	80.00	13.00	-20.04	226.32	-101.90		353.49
3000.00	15.00	9	1	2	90.00	5.76	-16.17	266.42	-94.56		337.81
3000.00	15.00	9	2	1	90.00	-12.28	-19.57	280.00	-102.92		346.16
3000.00	15.00	10	1	2	100.00	8.72	-17.48	294.53	-97.99		339.52
3000.00	15.00	10	2	1	100.00	-13.34	-20.27	287.60	-102.44		347.70
3000.00	15.00	11	1	3	110.00	1.65	-15.16	327.74	-95.89		335.64
3000.00	15.00	11	2	3	110.00	-9.14	-15.65	327.73	-94.70		335.64
3000.00	15.00	12	1	3	120.00	4.77	-15.83	356.04	-98.51		337.04
3000.00	15.00	12	2	3	120.00	-8.57	-17.41	355.89	-97.52		337.19
3000.00	15.00	13	1	3	130.00	7.22	-16.76	384.23	-99.74		338.34
3000.00	15.00	13	2	1	130.00	11.44	-19.04	372.61	-97.82		348.89
3000.00	15.00	13	3	1	130.00	11.62	-19.15	372.60	-96.63		348.90
3000.00	15.00	14	1	4	140.00	1.25	-15.13	417.33	-96.73		335.47
3000.00	15.00	14	2	4	140.00	-3.01	-15.38	417.33	-96.21		335.47
3000.00	15.00	14	3	1	140.00	11.86	-19.30	400.31	-99.52		349.72
3000.00	15.00	15	1	4	150.00	4.09	-15.63	445.64	-100.03		336.59
3000.00	15.00	15	2	4	150.00	-6.71	-16.54	445.57	-99.07		336.65
3000.00	15.00	15	3	2	150.00	-11.67	-19.18	433.93	-99.15		345.68
3000.00	15.00	15	4	1	150.00	12.11	-19.46	428.02	-108.68		350.45
3000.00	15.00	16	1	4	160.00	6.22	-16.34	473.88	-101.16		337.64
3000.00	15.00	16	2	2	160.00	-11.91	-19.33	461.64	-102.43		346.59
3000.00	15.00	16	3	1	160.00	12.56	-19.75	455.68	-108.11		351.12
3000.00	15.00	17	1	5	170.00	0.86	-15.10	506.92	-96.63		335.36
3000.00	15.00	17	2	5	170.00	-2.27	-15.25	506.92	-97.07		335.36
3000.00	15.00	17	3	4	170.00	8.10	-17.17	501.99	-102.09		338.65
3000.00	15.00	17	4	2	170.00	-12.22	-19.53	489.34	-108.88		347.41
3000.00	15.00	17	5	1	170.00	13.07	-20.09	483.28	-108.07		351.76

EVAN B. WRIGHT

3000.00	15.00	28	1	8	280.00	4.10	-15.64	832.33	-105.04	336.40
3000.00	15.00	28	2	8	280.00	-5.38	-16.03	832.28	-104.49	336.42
3000.00	15.00	28	3	7	280.00	8.30	-17.27	827.21	-106.23	338.49
3000.00	15.00	28	4	3	280.00	11.75	-19.23	803.58	-104.58	348.44
3000.00	15.00	28	5	3	280.00	-13.22	-20.19	801.52	-111.83	349.33
3000.00	15.00	29	1	8	290.00	5.38	-16.03	860.59	-105.77	336.98
3000.00	15.00	29	2	8	290.00	-6.86	-16.61	860.46	-105.32	337.03
3000.00	15.00	29	3	4	290.00	-11.18	-18.87	837.22	-108.81	346.39
3000.00	15.00	29	4	4	290.00	-11.66	-19.17	837.19	-104.59	346.40
3000.00	15.00	29	5	3	290.00	11.87	-19.31	831.29	-106.32	348.85
3000.00	15.00	30	1	9	300.00	2.37	-15.26	893.62	-104.44	335.71
3000.00	15.00	30	2	9	300.00	-3.26	-15.43	893.62	-103.99	335.71
3000.00	15.00	30	3	8	300.00	6.55	-16.48	888.78	-106.38	337.54
3000.00	15.00	30	4	8	300.00	-8.21	-17.23	888.56	-106.03	337.63
3000.00	15.00	30	5	4	300.00	-11.78	-19.25	864.91	-105.89	346.86
3000.00	15.00	30	6	3	300.00	11.99	-19.38	859.01	-109.28	349.24
3000.00	15.00	31	1	9	310.00	3.78	-15.55	921.93	-105.74	336.25
3000.00	15.00	31	2	9	310.00	-4.87	-15.87	921.90	-105.22	336.26
3000.00	15.00	31	3	8	310.00	7.65	-16.96	916.90	-106.92	338.09
3000.00	15.00	31	4	4	310.00	-11.90	-19.32	892.62	-107.77	347.29
3000.00	15.00	31	5	3	310.00	12.14	-19.48	886.70	-114.76	349.61
3000.00	15.00	32	1	9	320.00	4.98	-15.90	950.20	-106.46	336.77
3000.00	15.00	32	2	9	320.00	-6.25	-16.35	950.11	-106.02	336.80
3000.00	15.00	32	3	8	320.00	8.68	-17.46	944.95	-107.44	338.64
3000.00	15.00	32	4	4	320.00	-12.02	-19.40	920.33	-111.13	347.70
3000.00	15.00	32	5	3	320.00	12.36	-19.62	914.36	-114.46	349.97
3000.00	15.00	33	1	10	330.00	2.17	-15.23	983.21	-104.99	335.63
3000.00	15.00	33	2	10	330.00	-2.94	-15.37	983.21	-104.58	335.63
3000.00	15.00	33	3	9	330.00	6.08	-16.29	978.42	-107.04	337.28
3000.00	15.00	33	4	9	330.00	-7.49	-16.88	978.25	-106.68	337.34
3000.00	15.00	33	5	4	330.00	-12.19	-19.51	948.02	-114.86	348.09
3000.00	15.00	33	6	3	330.00	12.59	-19.77	942.01	-114.21	350.31
3000.00	15.00	34	1	10	340.00	3.52	-15.49	1011.53	-106.36	336.12
3000.00	15.00	34	2	10	340.00	-4.46	-15.74	1011.50	-105.89	336.13
3000.00	15.00	34	3	9	340.00	7.10	-16.71	1006.57	-107.56	337.78
3000.00	15.00	34	4	9	340.00	-8.63	-17.44	1006.30	-107.28	337.87
3000.00	15.00	34	5	4	340.00	11.33	-18.97	977.52	-107.66	347.82
3000.00	15.00	34	6	4	340.00	11.64	-19.16	977.50	-105.41	347.83
3000.00	15.00	34	7	4	340.00	-12.42	-19.66	975.68	-114.54	348.48
3000.00	15.00	34	8	3	340.00	12.85	-19.95	969.61	-114.18	350.66
3000.00	15.00	35	1	10	350.00	4.65	-15.79	1039.81	-107.10	336.60
3000.00	15.00	35	2	10	350.00	-5.74	-16.16	1039.74	-106.67	336.62
3000.00	15.00	35	3	9	350.00	8.06	-17.15	1034.66	-108.04	338.27
3000.00	15.00	35	4	4	350.00	11.73	-19.22	1005.21	-106.37	348.19
3000.00	15.00	35	5	4	350.00	-12.66	-19.82	1003.31	-114.34	348.85
3000.00	15.00	35	6	3	350.00	13.12	-20.12	997.20	-114.17	350.98

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3000.00	15.00	36	1	11	360.00	1.98	-15.21	1072.81	-105.38	335.57
3000.00	15.00	36	2	11	360.00	-2.68	-15.31	1072.81	-105.12	335.57
3000.00	15.00	36	3	10	360.00	5.67	-16.14	1068.05	-107.66	337.06
3000.00	15.00	36	4	10	360.00	-6.89	-16.62	1067.91	-107.30	337.11
3000.00	15.00	36	5	9	360.00	8.97	-17.62	1062.69	-108.50	338.76
3000.00	15.00	36	6	5	360.00	-11.19	-18.88	1038.85	-110.38	346.54
3000.00	15.00	36	7	5	360.00	-11.65	-19.17	1038.83	-106.41	346.55
3000.00	15.00	36	8	4	360.00	11.83	-19.28	1032.92	-107.62	348.52
3000.00	15.00	36	9	4	360.00	-12.93	-20.00	1030.91	-114.30	349.21
3000.00	15.00	36	10	3	360.00	13.39	-20.31	1024.75	-114.23	351.31
3000.00	15.00	37	1	11	370.00	3.28	-15.44	1101.13	-106.92	336.02
3000.00	15.00	37	2	11	370.00	-4.11	-15.64	1101.11	-106.50	336.03
3000.00	15.00	37	3	10	370.00	6.63	-16.51	1096.23	-108.15	337.52
3000.00	15.00	37	4	10	370.00	-7.96	-17.11	1096.01	-107.86	337.59
3000.00	15.00	37	5	5	370.00	-11.75	-19.23	1066.54	-107.41	346.92
3000.00	15.00	37	6	4	370.00	11.92	-19.34	1060.64	-109.37	348.85
3000.00	15.00	37	7	4	370.00	-13.20	-20.18	1058.48	-114.31	349.56
3000.00	15.00	38	1	11	380.00	4.35	-15.71	1129.42	-107.66	336.46
3000.00	15.00	38	2	11	380.00	-5.31	-16.01	1129.36	-107.26	336.47
3000.00	15.00	38	3	10	380.00	7.53	-16.91	1124.35	-108.60	337.97
3000.00	15.00	38	4	10	380.00	-8.96	-17.61	1124.04	-108.38	338.07
3000.00	15.00	38	5	5	380.00	-11.85	-19.29	1094.25	-108.72	347.27
3000.00	15.00	38	6	4	380.00	12.02	-19.40	1088.35	-112.37	349.15
3000.00	15.00	39	1	12	390.00	1.81	-15.18	1162.40	-105.73	335.51
3000.00	15.00	39	2	12	390.00	-2.43	-15.27	1162.40	-105.51	335.51
3000.00	15.00	39	3	11	390.00	5.32	-16.01	1157.67	-108.22	336.88
3000.00	15.00	39	4	11	390.00	-6.39	-16.41	1157.56	-107.87	336.92
3000.00	15.00	39	5	10	390.00	8.39	-17.32	1152.42	-109.03	338.42
3000.00	15.00	39	6	5	390.00	-11.94	-19.35	1121.96	-110.61	347.60
3000.00	15.00	39	7	4	390.00	12.14	-19.48	1116.04	-116.71	349.45
3000.00	15.00	40	1	12	400.00	3.08	-15.39	1190.73	-107.43	335.93
3000.00	15.00	40	2	12	400.00	-3.81	-15.56	1190.71	-107.03	335.93
3000.00	15.00	40	3	11	400.00	6.23	-16.35	1185.87	-108.69	337.30
3000.00	15.00	40	4	11	400.00	-7.39	-16.84	1185.70	-108.40	337.35
3000.00	15.00	40	5	5	400.00	-12.04	-19.41	1149.68	-114.01	347.92
3000.00	15.00	40	6	4	400.00	12.32	-19.60	1143.70	-116.46	349.74

[illegible]