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ADAPTIVE PROCESSING EXPERIMENT (APE) PHASE II

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EVALUATION

This contractual effort was performed in support of the RADC-ESD OTH Technology Program (TPO 6). This effort represents the initial investigations into the use and expected performance of digital beamforming and adaptive beamforming techniques, both hardware and software, for OTH radar receive systems. The achievement of very low sidelobe antennas and decreased ECM vulnerability of OTH radars will depend upon the use of these techniques. The concepts, hardware, and software employed in and developed through this effort are being incorporated into RADC's Ava/Dexter experimental OTH Radar Facility.

William F. McCullough
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1.0 INTRODUCTION AND CONCLUSIONS

BACKGROUND

Extensive interest has developed in the last several years over the possibility of spatial filtering, whereby an antenna's aperture illumination function is adaptively controlled to produce pattern nulls in the direction of undesired interference. Implicit in the ability to adaptively control the illumination function, however, is the requirement to measure the structure of the spatial interference. This in turn necessitates a multiplicity of receivers--one for each adaptive degree of freedom in the system.

SYSTEM DEGRADATION

Many types of systematic errors (e.g., element spacing mismatch, variation in element pattern mismatch, mutual coupling, etc.) even when not known a priori, can be automatically compensated for in an adaptive beam-forming network. Element-to-element receiver mismatch on the other hand imposes an inherent limitation on the achievable beam pattern sidelobe level as well as the achievable cancellation ratio against a broadband interference source. This problem becomes acute when the pulse length of the transmitted waveform approaches a small fraction of the aperture size. In such cases a point interference source has an effective spatial spread proportional to the receiver bandwidth. Both the sidelobe level and the achievable cancellation ratio against broad-band interference sources are degraded when the receiver mismatch is uncompensated. Section 3.0 quantifies this degradation as a function of the amount of receiver mismatch.

CONCLUSIONS

The receiver equalization technique employed is to solve for the set of weights in a tapped delay line transversal filter that minimizes the mean square error residue between a reference receiver's frequency response and the response of any other receiver. The conclusions of the study are as follows.

1. System Degradation - The achievable sidelobe level and the cancellation ratio against broadband interference sources may be seriously degraded by receiver mismatch.

2. Sidelobe Level - The achievable peak response to RMS sidelobe level is given by:

$$R = \frac{G}{|E|^2} \quad (1)$$

where

G = antenna gain

$|E|^2$ = normalized mean square error residue.

(Equation (1) of Section 3.0)

3. Transversal Filter Performance - The achievable improvement in $|E|^2$, the normalized mean square error residue is quantified in Section 4.0 as a function of the tap spacing and number of taps in the transversal filter.

For 16 taps spaced at $\tau = \frac{1}{2.5B}$, where B is the 3 dB receiver bandwidth, the improvement is over 30 dB. Indeed it was found that $|E|^2$ decreased from approximately -(30-35 dB) to -63 dB. This latter figure is also the noise floor of the calibration system as corroborated by spectral analysis.

4. Receiver Error Sources - The primary source of receiver mismatch was probably pole location errors. This is strongly suggested by the fact that the receiver transfer function has 8 complex poles (6 pole Butterworth plus 2 additional poles) and that 16 real taps reduced the error residue to negligible proportions.

2.0 TSC EFFORTS

Sections 3.0 through 6.0 of this report describe the engineering services performed by Technology Service Corporation (TSC) under Contract No. F30602-75-C-0264 to RADC, Griffiss Air Force Base, Rome, New York, in support of their Adaptive Processing Program - Phase II.

The scope of the effort consisted of three major tasks. The first task was to examine the impact of receiver passband phase and amplitude tracking errors on the performance of a radar system using digital beamforming. Secondly, we wished to develop a potential solution to the receiver tracking problem and, thirdly, it was desired to evaluate the effectiveness of the candidate solution in reducing the impact of the errors on system performance.

3.0 PERFORMANCE DEGRADATION DUE TO RECEIVER MISMATCH

BACKGROUND

There are two deleterious effects caused by receiver mismatch in a multi-channel beam forming network; sidelobe degradation and the inability to cancel point source wideband interference via spatial nulls.

3.1 Sidelobe Degradation

The most reasonable model for receiver mismatch is to assume that each receiver's frequency response is the sum of an ideal unperturbed response and a noise like error term in both phase and amplitude. This model is also obtained if one assumes that the primary reason for the mismatch is a random error in the pole locations of the filters. It will be shown that, without receiver equalization, the achievable peak response to RMS sidelobe level with any aperture weighting is limited to:

$$R = \frac{G}{|E|^2}$$

Where:

R = Peak response to RMS sidelobe ratio

G = Antenna gain

$|E|^2$ = Normalized mean square error residue between any two receivers

Assume that (N) receivers (R_i) are used to form a beam with a set of deterministic weights (W_i), ($1 \leq i \leq N$). Then assuming that the normalized error power between any two receivers is $|E|^2$, viz:

$$|E|_{ik}^2 = \frac{\int_0^\infty |R_i - R_k|^2 dx}{\int_0^\infty |R_i|^2 dx} \quad (1)$$

Where:

R_i and R_k are the outputs of receivers (i) and (k) respectively, and the variable of integration (x), denotes frequency from a wideband interference source. (Wide bandwidth is construed to mean larger bandwidth than the receiver pass-band.)

The output of the beam forming network at any in-band frequency (x) is given by:

$$B_p = \sum_{i=1}^N W_i R_{i_p} = \sum_{i=1}^N W_i (R_i + EN_i) \quad (2)$$

Where:

R_i = Output of receiver (i) with no error

R_{i_p} = Output of error perturbed receiver (i)

N_i = Zero mean, unit variance Gaussian variable

E = Normalized RMS error defined by (1)

then for a linear array with spacing (d)

$$R_i = \exp \left[j \left(\frac{2\pi dx_i}{c} \right) \sin \theta \right] \quad (3)$$

Where:

C = Velocity of light

θ = Angle of wideband interference off of boresite

since $N_i N_k = 0$ for $i \neq k$, it follows that at all in band frequencies (x), the frequency response in voltage is given by:

$$B_p(x) = \sum_{i=1}^N W_i \exp \left[\frac{j2\pi dx_i}{c} \sin \theta \right] + EN_0 \left(\sum_{i=1}^N |W_i|^2 \right)^{1/2} \quad (4)$$

Where:

N_0 = Zero mean unit variance Gaussian variable.

The mean response in power is given by:

$$\overline{H_p(x)} = H_c(x) + |E|^2 \sum_{i=1}^N |W_i|^2 \quad (5)$$

Where:

$\overline{H_p(x)}$ = Expected value of the perturbed response

$H_c(x)$ = Ideal response with no receiver mismatch

The error perturbation term is completely broadband [independent of the frequency (x)].

The achievable peak response to RMS sidelobe level is then limited by the broadband error term viz:

$$R = \frac{H_c \text{ (Boresite)}}{H_c(x) + |E|^2 \sum_{i=1}^N |w_i|^2} \quad (6)$$

or

$$\bar{R} = \frac{\left(\sum_{i=1}^N w_i \right)^2}{H_c(x) + |E|^2 \sum_{i=1}^N |w_i|^2} \quad (7)$$

$$\left(\sum_{i=1}^N w_i \right)^2 / \sum_{i=1}^N |w_i|^2 \text{ is the antenna gain at boresite and}$$

$H_c(x)$ may be made arbitrarily small by proper choice of the deterministic weighting function, it follows that the peak response to RMS sidelobe level is given by:

$$\bar{R} \geq \frac{G}{|E|^2} \quad (8)$$

Where:

G = Antenna gain

$|E|^2$ = Normalized error power given by (1)

3.2 Adaptive Cancellation

It is apparent that in addition to limiting the achievable sidelobe level--receiver mismatch precludes any possibility of adaptively forming a deep spatial null. Since the error term in (5) is broadband, it is impossible to spatially cancel it. (See Appendix H.)

4.0 RECEIVER MATCHING

BACKGROUND

This section derives a transversal filter to be used on a given receiver such that it "optimally" tracks a reference receiver. The criterion of optimality in this case is that the normalized mean power residue between the receivers be as small as possible for a given number of transversal filter taps and spacing.

The actual receivers used in the RADC system were 6 pole Butterworth filters. As such the computer program was organized to align both theoretically derived 6 pole Butterworth filters and the actual receivers measured by Raytheon.

4.1 Analysis

Each element of the receiving array feeds a separate amplifier and A/D converter. The digital outputs from the element channels are then combined in a digital processor which performs the functions of beamforming and pulse compression. The amplifiers in the individual array element channels must be carefully matched in order to achieve low antenna sidelobe levels over the entire frequency band. This section describes a method of matching amplifier transfer functions very accurately, utilizing a digital transversal filter in each channel.

The technique for matching the channel responses is illustrated schematically in Figure 4-1. The analog amplifier in each channel will be represented by a Butterworth filter in the following analysis. At the output of this filter, the signal $y_k(t)$ is converted to digital form, where each digital sample is a complex number retaining both amplitude and phase information. The subscript k on the variable, of Figure 4-1 represents the channel number. A set of consecutive samples of each $y_k(t)$ is weighted and added as shown in Figure 4-1. The delay line, weighting multipliers, and adder in Figure 4-1 comprise a transversal filter for matching the channel response. The channel-to-channel match is achieved by selection of the set of weights, W_{kn} . The following analysis outlines a method of achieving a least-mean-square match between two channels by optimum choice of the W_{kn} .

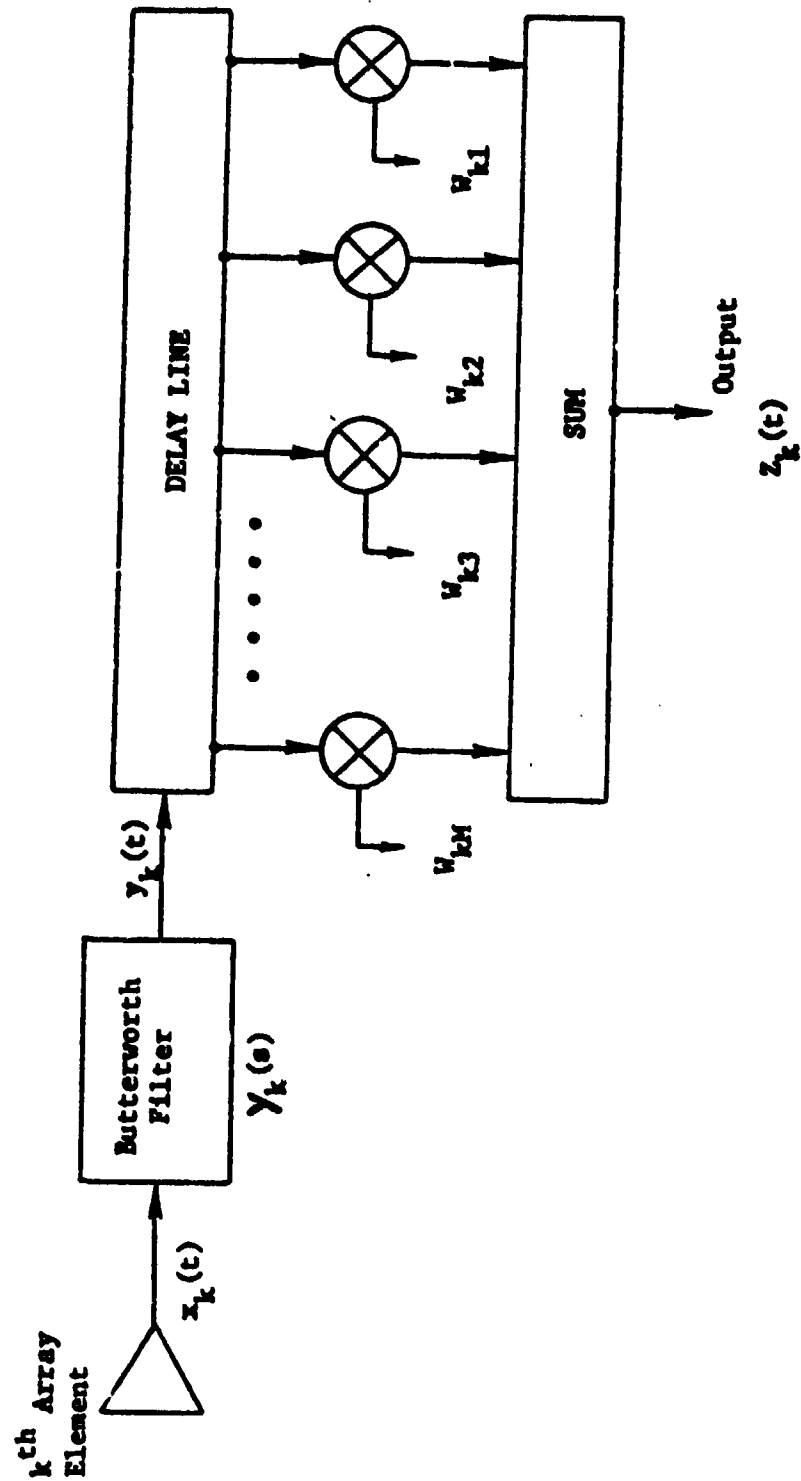


Figure 4-1. Schematic of Equalizing Circuit

In the following discussion, two channels will be considered: a reference channel ($k=1$), and a second channel ($k=2$) in which the weights are to be optimized. It is assumed that the Butterworth filter response in the reference channel is that of an ideal N -pole filter given by:

$$Y_1(s) = \left(\frac{B}{2}\right)^N \prod_{n=1}^N \frac{1}{(s-s_{1n})} \quad (1)$$

Where:

$$s = j2\pi f$$

f = frequency

$$s_{1n} = n^{\text{th}} \text{ pole} = B/2 \exp \left\{ j\pi \left(\frac{1}{2} + \frac{2n-1}{2N} \right) \right\}$$

B = filter bandwidth

An alternative representation of this transfer function is

$$Y_1(s) = \sum_{n=1}^N \frac{A_{1n}}{(s-s_{1n})} \quad (2)$$

$$A_{1n} = \left(\frac{B}{2}\right)^N \prod_{\substack{j=1 \\ j \neq n}}^N \frac{1}{(s_{1n}-s_{1j})}$$

The impulse response of this filter is

$$h_1(t) = \sum_{n=1}^N A_{1n} e^{s_{1n}t} \quad (3)$$

The filter in channel 2 is represented by the same expansion (Equations 1, 2, and 3), except that the poles in the second channel are in error and differ from the reference channel poles by a few percent.

The output of the transversal filter in channel k is

$$z_k(t) = \sum_{n=1}^M w_{kn} y_k(t - n\tau) \quad (4)$$

Where:

τ = spacing between taps

M = number of taps in each delay line.

While it is convenient to represent this transversal filter by continuous functions of time (Equation 4), it should be recalled that this signal processing will be performed digitally. The transversal filter in the reference channel can be used to narrow the channel passband by weighting all taps, e.g., with Chebyshev weights to achieve low sidelobes. If all tap weights are zero except for one, the transversal filter introduces a delay but does not change the overall channel response. In the following analysis, both cases are included since tapped delay lines are assumed in both channels 1 and 2. The examples consider the case where all channel 1 taps are zero except the center tap, i.e., the case where the transversal filter in channel 2 is used to match the channel 2 response to the Butterworth filter of channel 1.

To compute optimum weights, w_{2n} , assume that the same signal is fed into channels 1 and 2. It is convenient to consider wideband white noise, $n(t)$, as this input, although a set of signals across the receiver passband will suffice. For the input $x_k(t) = n(t)$, the Butterworth filter output is

$$\begin{aligned} y_k(t) &= \int_0^{\infty} n(t-u) h_k(u) du \\ &= \sum_{n=1}^N A_{kn} \int_0^{\infty} e^{-s_{kn}u} n(t-u) du \end{aligned} \quad (5)$$

The transversal filter output in the k^{th} channel, from Equations 4 and 5, is

$$z_k(t) = \sum_{m=1}^M w_{km} \sum_{n=1}^N A_{kn} \int_0^{\infty} e^{-s_{kn}u} n(t-u-m\tau) du \quad (6)$$

The weights in channel 2, W_{2n} , are selected to minimize the noise power in the difference $z_2(t) - z_1(t)$.

$$P = E \{ |z_2(t) - z_1(t)|^2 \} \quad (7)$$

where E denotes the expectation or average.

This expression has the following form

$$\begin{aligned} P &= E \{ z_2^*(t) z_2(t) - z_2^*(t) z_1(t) - z_2(t) z_1^*(t) + z_1^*(t) z_1(t) \} \\ &= W_2^{*T} M_2 W_2 - W_2^{*T} M_{12} W_1 - W_2^T M_{12}^* W_1^* + W_1^{*T} M_1 W_1 \end{aligned} \quad (8)$$

Where:

W_k = column vector of weights W_{kn}

* denotes complex conjugate

T denotes transpose

M_k = covariance matrix with elements $M_k(m, n)$

$M_k(m, n) = E \{ y_k^*(t - m\tau) y_k(t - n\tau) \}$

M_{12} = matrix with elements $E \{ y_1^*(t - m\tau) y_2(t - n\tau) \}$

The derivation of Equation 8 can be illustrated by expanding the first term

$$\begin{aligned} E \{ z_k^*(t) z_k(t) \} &= E \left\{ \sum_{n=1}^N \sum_{n'=1}^N \sum_{n''=1}^N \sum_{n'''=1}^N W_{kn}^* W_{kn'}, A_{kn}^* A_{kn''}, \right. \\ &\quad \int_0^{\tau} du_1 \int_0^{\tau} du_2 e^{(s_{kn}^* u_1 + s_{kn'} u_2)} \\ &\quad \left. n^*(t - u_1 - m\tau) n(t - u_2 - m'\tau) \right\} \end{aligned} \quad (9)$$

This is a quadratic form $W_k^{*T} M_k W_k$, where the elements of M are

$$M_k(m, m') = E \left\{ \sum_{n, n'=1}^N A_{kn}^* A_{kn'} \int_0^{\infty} \int_0^{\infty} n^*(t-u_1-m\tau) n(t-u_2-m'\tau) e^{(s_{kn}^* u_1 + s_{kn'} u_2)} du_1 du_2 \right\} \quad (10)$$

Consider a white noise process, $n(t)$, for which

$$E n^*(t) n(t+\tau) = \delta(\tau) \quad (11)$$

The elements of the matrix M_k , from Equation 10, are

$$M_k(m, m') = \sum_{n, n'=1}^N A_{kn}^* A_{kn'} \int_0^{\infty} e^{s_{kn}^* u_1 + s_{kn'} (u_1 + m\tau - m'\tau)} du_1 \quad (12)$$

$$= - \sum_{n, n'=1}^N \frac{A_{kn}^* A_{kn'}}{(s_{kn}^* + s_{kn'})} e^{s_{kn'} (m - m')\tau} ; m \geq m'$$

Note that in deriving Equation 12, both $u_1 \geq 0$ and $u_2 \geq 0$, so this equation is correct only when $m \geq m'$. When $m \leq m'$

$$M_k(m, m') = - \sum_{n, n'=1}^N \frac{A_{kn}^* A_{kn'}}{(s_{kn}^* + s_{kn'})} e^{s_{kn}^* (m' - m)\tau} \quad m \leq m' \quad (12a)$$

In performing the above integrations, note that $\text{Real}(s_{kn}) < 0$. Similar expressions can be derived for the cross-covariance matrix in Equation 8, M_{12} .

Next we select a set of weights for the transversal filter in channel 2, W_2 , which minimizes the noise power in the output, $Z_2(t) - Z_1(t)$. This output power is given by Equation 8, where the covariance matrices are computed for white noise into the two filters. The set of weights, W_2 , which

minimizes P of Equation 8 also provides the best least-mean-square fit of the two channel responses.

The set of weights which minimizes Equation 8 is

$$W_2 = M_2^{-1} M_{12} W_1 \quad (13)$$

For these weights, a small perturbation in the W_{2n} , denoted by the column vector δW_2 , gives $\delta P = 0$.

$$\delta P = \delta W_2^{*T} (M_2 W_2 - M_{12} W_1) + (W_2^{*T} M_2 - W_1^{*T} M_{12}) \delta W_2 \quad (14)$$

= 0 when Equation 13 is satisfied.

When the weights W_2 satisfy Equation 13, the power in the output $[Z_2(t) - Z_1(t)]$ is

$$P = W_1^{*T} M_1 W_1 - W_2^{*T} M_{12} W_1 \quad (15)$$

The method outlined in this section was used to match the receiver channels in the OTH receiving array. Since the filter outputs are available in digital form, the various covariance matrices in Equation 13 were computed from sample data. It has been shown⁽¹⁾ that, when weights are computed directly from a sample covariance matrix as suggested above, a modest number of data samples will provide an excellent estimate of the optimum weights. The number of samples in the sample covariance matrix required to achieve within 3 dB of the LMS residue is roughly $N_s = 2N$, where N_s = number of samples and N = number of taps.

Note that the expression $M_{12} W_1$ in Equation 13 can be obtained directly by cross-correlating the channel 2 tap outputs with the output $Z_1(t)$ of channel 1.

The following sections contain examples of this filter matching technique. Results show that excellent filter match can be obtained by optimizing weights on the digital transversal filters.

(1) I. S. Reed, J. D. Mallett, and L. E. Brennan, "Rapid Convergence Rate in Adaptive Arrays," to appear in IEEE Trans. AES.

4.2 Example of Filter Matching

A FORTRAN program was written to obtain quantitative estimates of the filter matching which can be achieved as a function of several parameters, viz., number of taps, tap spacing, and initial mismatch. Results have been very encouraging. One example is detailed here to show that sufficiently accurate channel matching can be achieved for the OTM receiving array to meet antenna sidelobe specifications. The program used in these studies is listed in Appendix F.

The reference filter of channel 1 is an 8-pole Butterworth filter with poles equally spaced along a circle in the left half of the s -plane. Filter 2 is obtained by displacing each of the 8 poles by a randomly generated amount from the ideal pole location of channel 1. Each s_{n2} is obtained from the corresponding s_{n1} by

$$s_{n2} = s_{n1} (1 + .03r) \quad (16)$$

where r is a random number uniformly distributed on the interval $(-1,1)$ and having a uniformly distributed random phase on $(0,2\pi)$. The pole locations for the two filters are shown in Table 1. The coefficients A_{kn} for each filter were computed from Equation 2.

In this particular example, the 3 dB bandwidth of filter 1 is 100 Hz. The initial mismatch, R_0 , between the two filters was computed by numerical integration.

$$R_0 = \frac{\int_{-B/2}^{B/2} |Y_2(s) - Y_1(s)|^2 df}{\int_{-B/2}^{B/2} |Y_1(s)|^2 df} \quad (17)$$

In this example $R_0 = .0015$. The rms phase error between the two filters, averaged over the interval $(-B/2, B/2)$, i.e., between the 3 dB points of filter 1, was 1.27° .

The preceding equations were then used to compute an optimum set of tap weights for channel 2. The response of the channel 1 Butterworth filter was not modified by the transversal filter in this channel, i.e., all tap weights except one in channel 1 were set to zero. The resulting tap weights for the 2 channels are shown in Table 2.

Table 1. Poles of Butterworth Filters

<u>Reference Channel 1</u>				<u>Channel 2</u>			
<u>Real</u>		<u>Imaginary</u>		<u>Real</u>		<u>Imaginary</u>	
-6.128	E+02	3.081	E+02	-6.017	E+02	3.065	E+02
-1.745	E+02	2.612	E+02	-1.745	E+02	2.551	E+02
-2.612	E+02	1.745	E+02	-2.597	E+02	1.814	E+02
-3.081	E+02	6.128	E+02	-3.088	E+02	6.036	E+01
-3.081	E+02	-8.128	E+01	-3.084	E+02	-6.132	E+01
-2.612	E+02	-1.745	E+02	-2.557	E+02	-1.733	E+02
-1.745	E+02	-2.612	E+02	-1.698	E+02	-2.620	E+02
-6.128	E+01	-3.081	E+02	-6.565	E+01	-3.081	E+02

Table 2. Optimum Tap Weights

	<u>Channel 1</u>		<u>Channel 2</u>	
	<u>Real</u>	<u>Imaginary</u>	<u>Real</u>	<u>Imaginary</u>
1	0.000	0.000	.00009	-.00003
2	0.000	0.000	-.00021	.00007
3	0.000	0.000	.00038	-.00013
4	0.000	0.000	-.00064	.00021
5	0.000	0.000	.00102	-.00033
6	0.000	0.000	-.00171	.00051
7	0.000	0.000	.00335	-.00082
8	1.000	0.000	.98030	.00300
9	0.000	0.000	-.02163	-.01159
10	0.000	0.000	.00813	.00685
11	0.000	0.000	.00404	.00290
12	0.000	0.000	-.00359	-.00684
13	0.000	0.000	.00021	.00482
14	0.000	0.000	.00165	-.00105
15	0.000	0.000	-.00156	-.00096
16	0.000	0.000	.00069	.00093

The spacing between taps in this particular example was $\tau = .7/3$. Sixteen tap weights were optimized. The mismatch after optimization of the transversal filter in channel 2 was reduced by 34.2 dB. The normalized mean square residue, as in Equation 17 with $Y_k(s)$ representing the product of Butterworth and transversal filters, was reduced to 5.6×10^{-7} . The rms phase error after matching was reduced to $.02^\circ$.

This example illustrates the excellent channel-to-channel match which can be achieved using digital transversal filters in each channel. The FORTRAN program can be used to explore other cases of interest.

4.3 Alignment of RADC Receivers

The equations used for obtaining the optimum weights from the measured data supplied by RADC are listed below.

Definitions

I_s^k = Output of receiver (k) measured at frequency (X_s) at output of FFT (in phase component)

Q_s^k = Same for quadrature component

τ = Tap spacing

$\bar{w}_K = \begin{pmatrix} w_1 \\ w_2 \\ \vdots \\ w_N \end{pmatrix}$ = Adaptive weight vector for receiver (k)

$\bar{\delta} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$ = Weight vector for reference receiver (middle tap = 1)

$N = 2L + 1 = \# \text{ of taps (odd)}^*$

$R = \# \text{ receivers}$

$(1 \leq K \leq R)$ (Complex receivers)

$R = 16 \text{ nominal}$

$P = \# \text{ measured frequencies}$

$(1 \leq s \leq P) \quad P = 20 \text{ nominal}$

* For mathematical convenience only. The calculations could be carried through with an even number of taps also.

STEPS FOR ADAPTIVE PROCESSINGGIVEN
 I_s^k
 Q_s^k
AMPLITUDE
 $A_s^k(I)$
 $A_s^k(Q)$
PHASE
 $\phi_s^k(I)$
 $\phi_s^k(Q)$

$$1 \leq k \leq 16$$

$$1 \leq s \leq 20, \quad 15-110 \text{ Hz at } 5 \text{ Hz increments}$$

1. 60 Hz Reference AlignmentAmplitude Alignment

$$A_s^k(I)_{\text{NEW}} = A_s^k(I) \cdot \frac{A_{60 \text{ Hz}}^1(I)}{A_{60 \text{ Hz}}^k(I)} \quad (1)$$

$$A_s^k(Q)_{\text{NEW}} = A_s^k(Q) \cdot \frac{A_{60 \text{ Hz}}^1(I)}{A_{60 \text{ Hz}}^k(Q)} \quad (2)$$

Phase Alignment

$$\phi_s^k(I)_{\text{NEW}} = \phi_s^k(I) + \phi_{60 \text{ Hz}}^1(I) - \phi_{60 \text{ Hz}}^k(I) \quad (3)$$

$$\phi_s^k(Q)_{\text{NEW}} = \phi_s^k(Q) + \phi_{60 \text{ Hz}}^1(I) - \phi_{60 \text{ Hz}}^k(Q) \quad (4)$$

2. Complex Receiver Formation

Let

$$I_s^k_{\text{NEW}} = \textcircled{I}_s^k$$

$$Q_s^k_{\text{NEW}} = \textcircled{Q}_s^k$$

The outputs of the (i^{th}) tap for tap spacing (τ) is

$$\textcircled{I}_s^k(i\tau) = A_s^k(I)_{\text{NEW}} \cos [\phi_s^k(I)_{\text{NEW}} + 2\pi x_s(i\tau)] \quad (5)$$

$$\textcircled{Q}^k_s(i\tau) = A^k_s(Q)_{\text{NEW}} \cos \left[\phi^k_s(Q)_{\text{NEW}} + 2\pi x_s(i\tau) \right], (0 \leq i \leq 2L) \quad (6)$$

$$\textcircled{Z}^k_s(i\tau) = \textcircled{I}^k_s(i\tau) + j \textcircled{Q}^k_s(i\tau) \quad (7)$$

Let

$$\textcircled{Z}^k_s = \begin{pmatrix} \textcircled{Z}^k_s(0) \\ \textcircled{Z}^k_s(\tau) \\ \vdots \\ \textcircled{Z}^k_s(i\tau) \end{pmatrix} \quad (8)$$

= complex receiver output (H_k) for frequency (x_s)

ADAPTATION

Definitions:

$$\bar{w}_K = \begin{pmatrix} 1 \\ w_2 \\ w \\ \vdots \\ \vdots \\ w_{2L+1} \end{pmatrix}_K = \text{Adaptive weight vector for receiver (K)}$$

$$\bar{\delta} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 1_L \\ 0 \\ 0 \\ 0 \end{pmatrix} = \text{Weight vector for reference receiver (middle tap = 1)}$$

M_{kk} = Covariance matrix for receiver (K) output

M_{rr} = Covariance matrix for reference output

M_{kr} = Cross covariance matrix of receive (K) and reference

From (8)

$$M_{kk} = \sum_{s=1}^P \overline{z_s^k} \overline{z_s^k}^* \quad (9)$$

$$M_{rr} = \sum_{s=1}^P \overline{z_s^r} \overline{z_s^r}^* \quad (10)$$

$$M_{kr} = \sum_{s=1}^P \overline{z_s^k} \overline{z_s^r}^* \quad (11)$$

Adaptive Weight Formation

$$\overline{w}_k (\text{opt}) = M_{kk}^{-1} M_{kr} \overline{\delta} \quad (12)$$

Mean Square Error Residue

$\overline{R}_k$ = Mean normalized square power residue
for filter (k) after adaptation

R_k = Normalized mean square power residue before adaptation

Residue After Adaptation

$$\overline{R}_k = \frac{\overline{\delta}^* \left[M_{rr} - M_{kr}^{-1} M_{kk} M_{kr} \right] \overline{\delta}}{\overline{\delta}^* M_{rr} \overline{\delta}} \quad (13)$$

Residue Prior to Adaptation

$$R_k = \frac{\sum_{s=1}^P \left[\overline{z_s^k} - \overline{z_s^r} \right] \left[\overline{z_s^k} - \overline{z_s^r} \right]^*}{\overline{\delta}^* M_{rr} \overline{\delta}} \quad (14)$$

5.0 RESULTS

5.1 RADC Receiver Data

The method described in Section 4.0 was applied to the RADC Dexter data acquisition system. This system consists of 32 homodyne receivers configured as 16 complex receivers with I&Q outputs. Each receiver output (I&Q) has its own I.F. filter with a nominal bandwidth of 15 to 110 Hz. Measurements were taken of the phase and amplitude responses of all 32 receiver channels by stepping a synthesizer across the passband of all channels simultaneously and recording the sampled outputs on magnetic tape. A 256 point FFT was then run on each channel and phase and amplitudes calculated from the outputs. The amplitude response of Receiver #1, I-channel, is shown in Figure 5-1. Using this channel as a reference, all other receiver channels were compared with it and error curves in both phase and amplitude were computed. An example of this is shown in Figure 5-2 where the phase and amplitude errors between Receiver #2, I-channel and the reference are plotted. (It should be noted that in all cases the channels were exactly matched at the 60-Hz point in the passband. This can be done with no loss in generality.) The object of the optimization is to minimize the total error power. The magnitude of the complex error vector is plotted for the above example in Figure 5-3. To get a single measure of the error magnitude, this is integrated over the bandwidth and normalized. The final measure is error power out of the reference channel for a white noise input. (It is a measure of total distortion.) For the example given, this number is -30.39 dB. In a similar manner, the normalized error was computed for all other receivers and channels using Receiver #1, I-channel, as the reference. This result is shown in Figure 5-4. If the error is averaged over all the receivers, a net mismatch can be calculated. For the data shown, this is -31.78 dB.

The achievable improvement in the error was computed by designing filters of various lengths (4, 8, 12, 16 taps) and computing the residual error remaining at the output of the filter. To illustrate this, the

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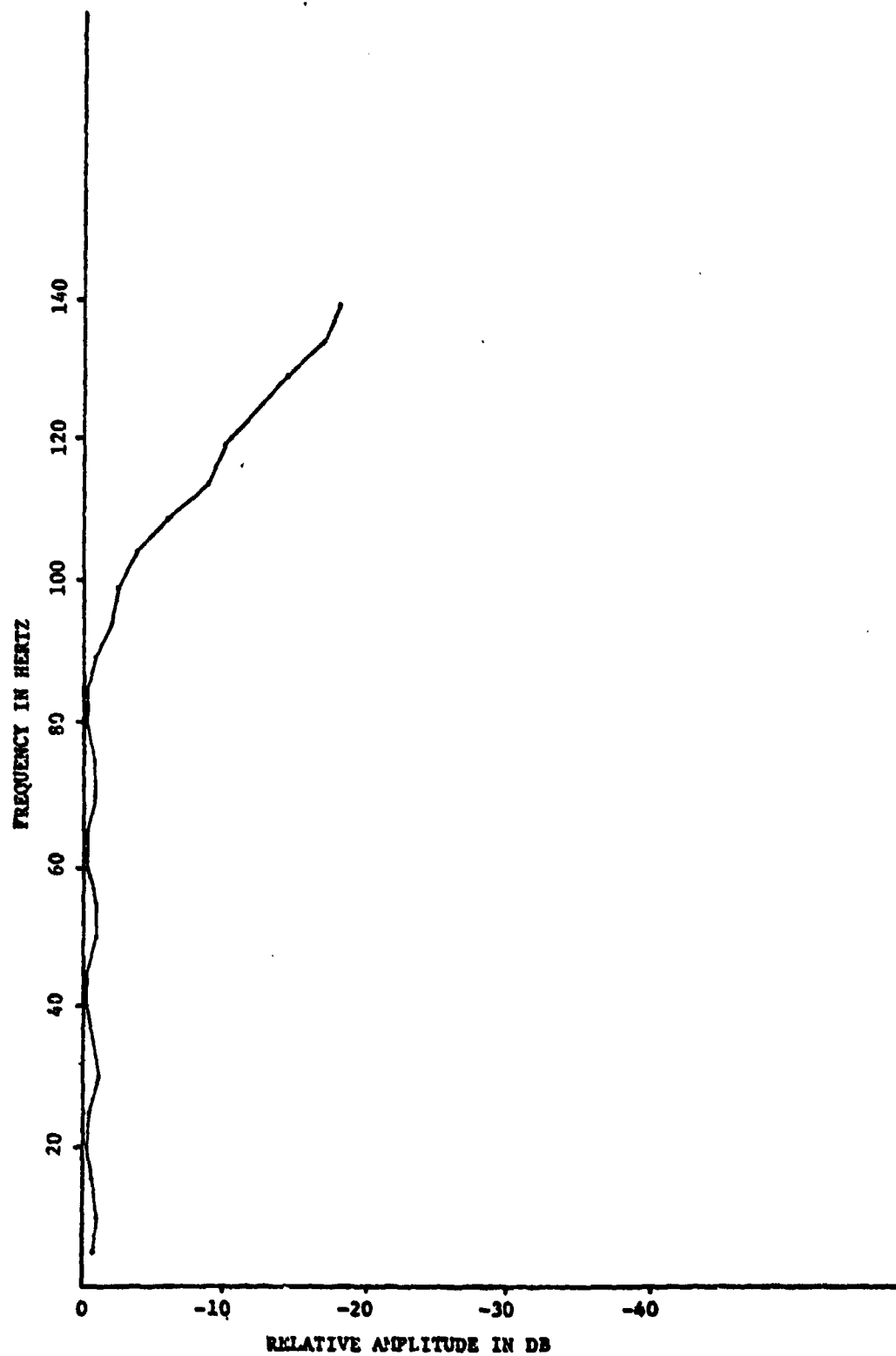


Figure 5-1. Amplitude Response of Receiver #1, I-Channel

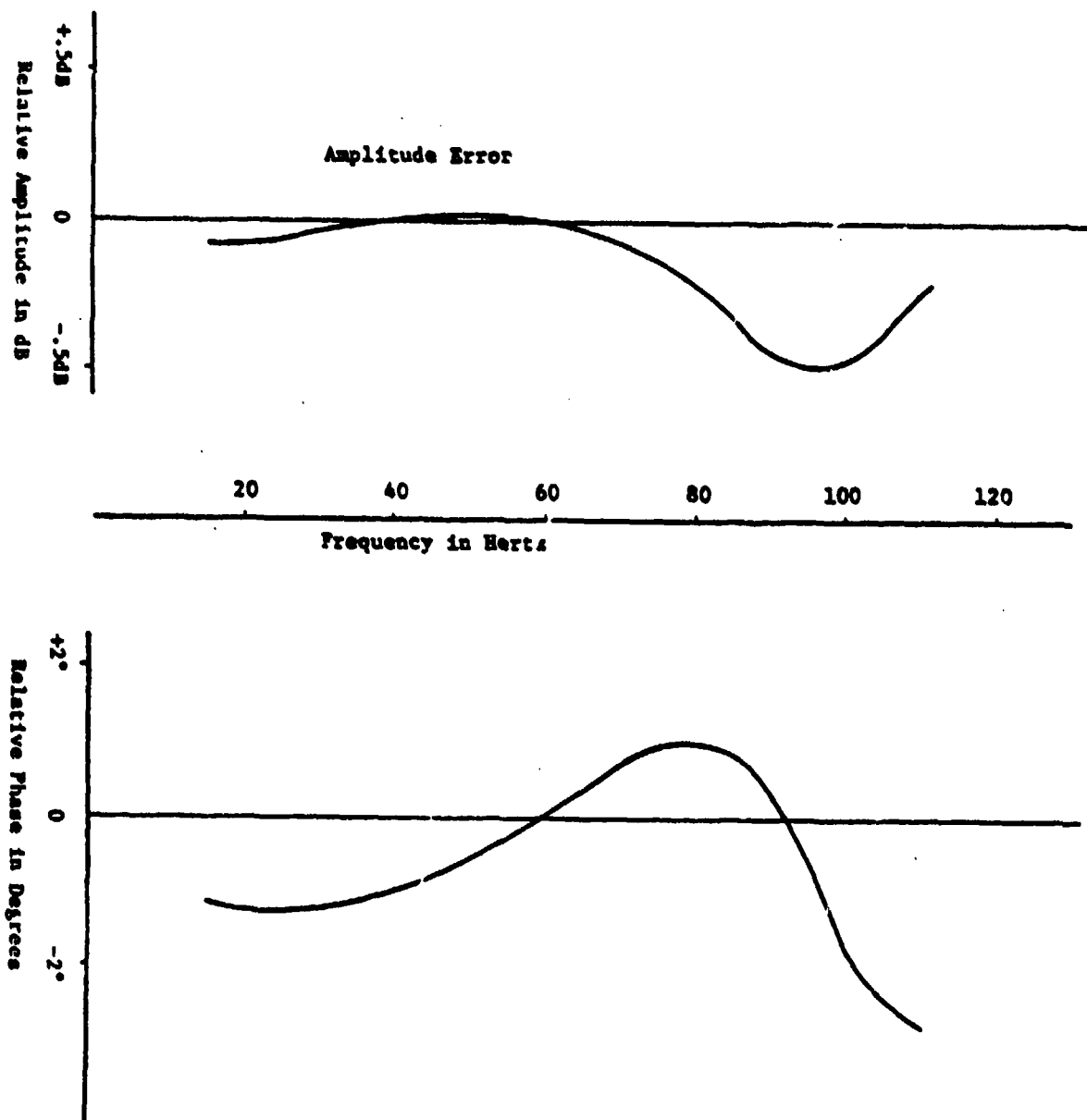


Figure 5-2. Amplitude and Phase Errors vs. Frequency for Receiver #1, I-Channel and Receiver #2, I-Channel

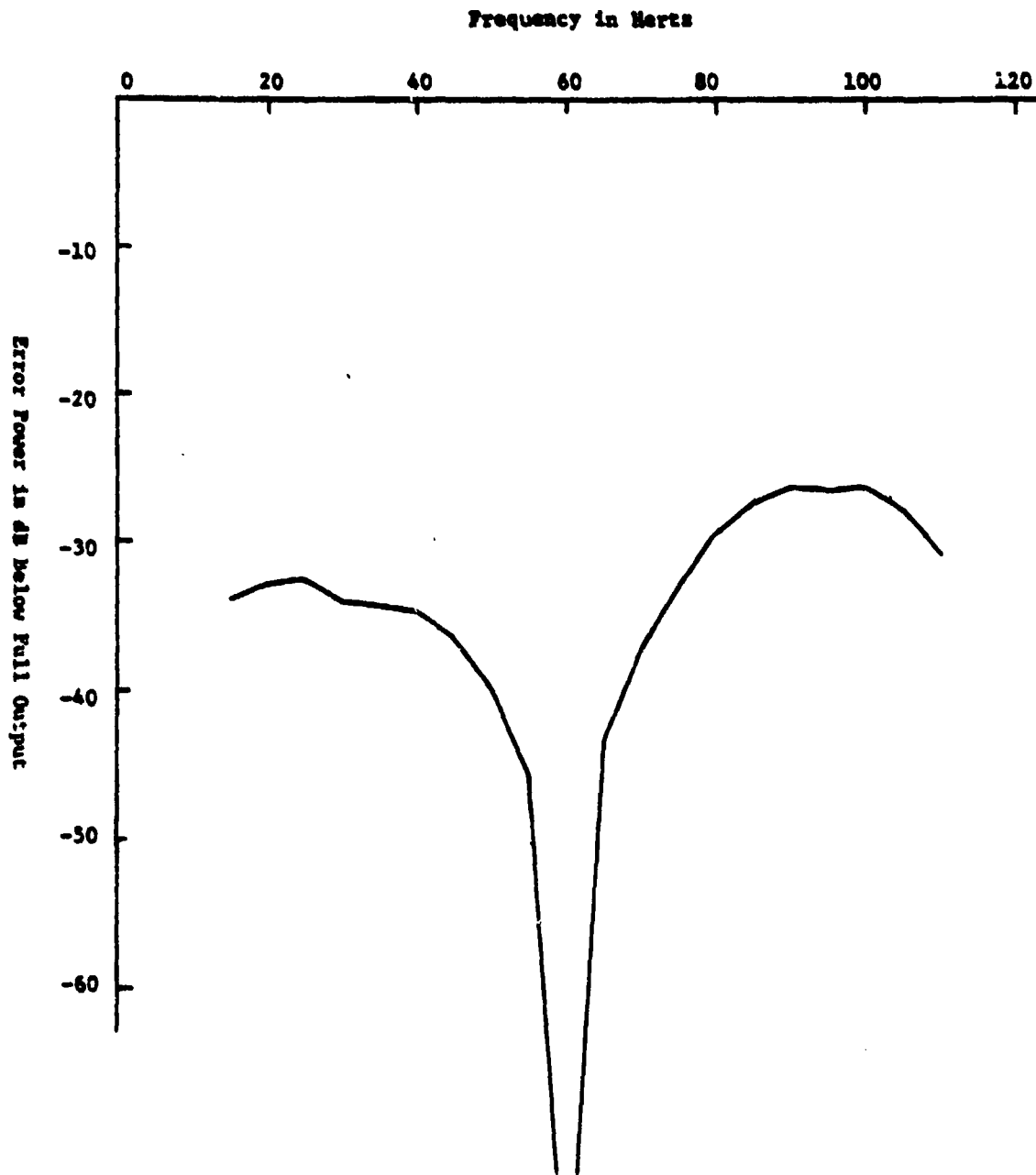


Figure 5-3. Error Power versus Frequency for Receiver #1, I-Channel vs. Receiver #2, I-Channel

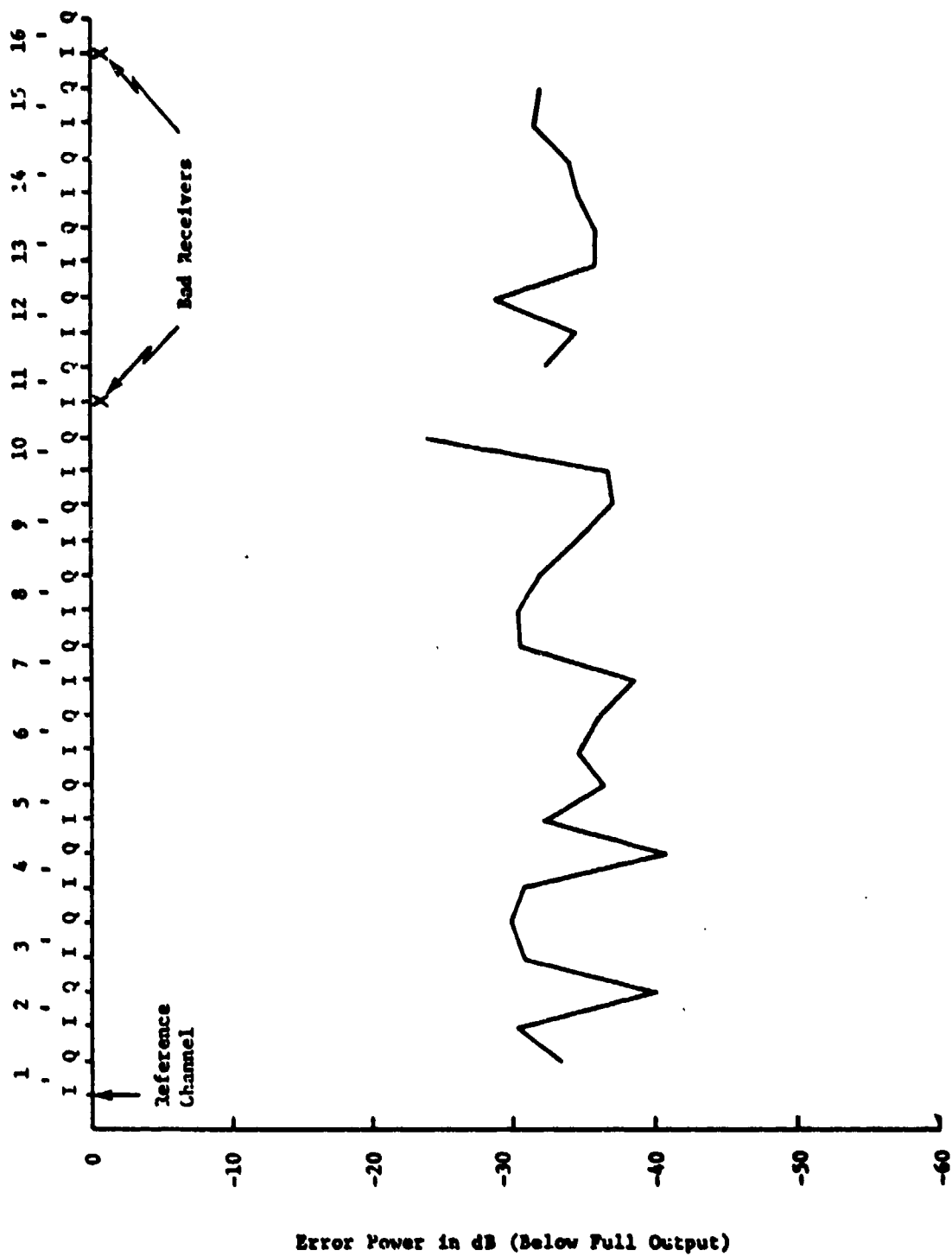


Figure 5-4. Error Power versus Receiver Channel

example of Figure 5-2 will be used. Taking Receiver #1, I-channel, as the reference and Receiver #2, I-channel as the channel to be matched to the reference, an 8-tap filter was designed. The phase and amplitude errors remaining after the filter, are shown in Figure 5-5, along with the input errors for comparison. When these numbers were converted to power and integrated over the bandpass, the results shows an improvement of 7.81 dB for this example. This procedure was repeated for all receiver channels and for 4, 8, 12, and 16 tap filter designs. The residual errors obtained are shown in Figure 5-6. (Note that the results for 16 taps show a characteristic flatness around 63 dB. This is due to the signal-to-noise limit of the input data. Actual improvements for 16 taps are probably in excess of this limit.

If the data of Figure 5-6 are averaged over all receivers, the results may be plotted as a design parameter curve showing residual error versus filter length. This is done in Figure 5-7.

Finally, Appendix G shows all of the results with designed filters for all receivers and channels and for 4, 8, 12, and 16 taps.

5.2 Alternative Uses of the Transversal Filter

In considering the utility of a digital transversal filter for equalization, the possibility of its application for other purposes comes to mind. Three areas where this may offer specific gains are given here as examples.

5.2.1 Response Synthesis

The filter may be used to synthesize some desired overall frequency response. This could include

- Removal of in-band ripple caused by the analog filter response
- Steepen the roll-off characteristics of the receiver bandpass
- Tailor the receiver bandpass to approximate a Gaussian response to prevent ringing.

5.2.2 Adaptivity

The filter may service directly in a signal processor that adaptively sets the filter weights (e.g., a Griffith's algorithm).

5.2.3 Deterministic Range Patterns

The filter may be used to vary the antenna beam pattern with range in a frequency compression system in some desired deterministic fashion.

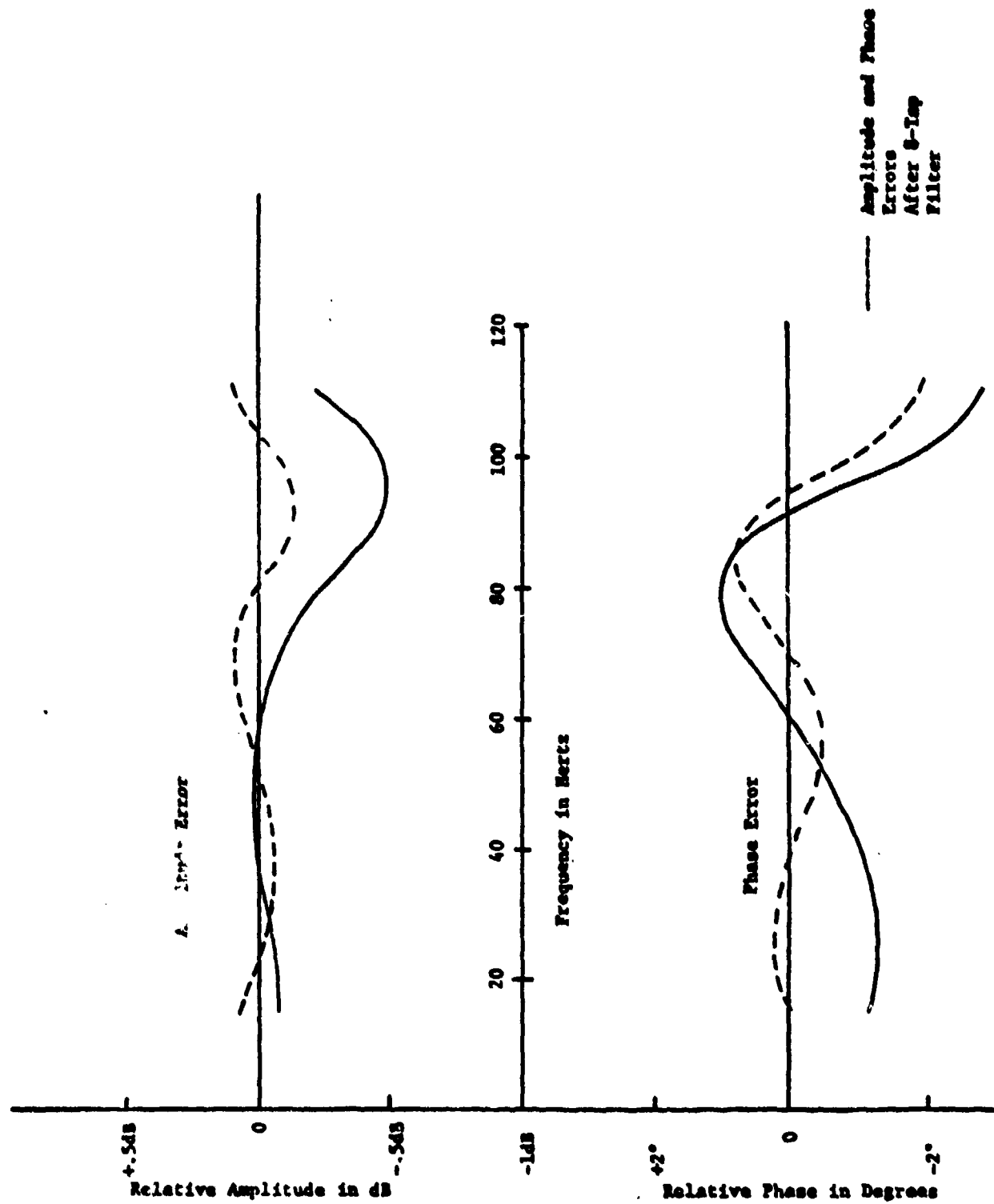


Figure 5-5. Amplitude and Phase Errors versus Frequency for Receiver #1, I-Channel and Receiver #2, I-Channel

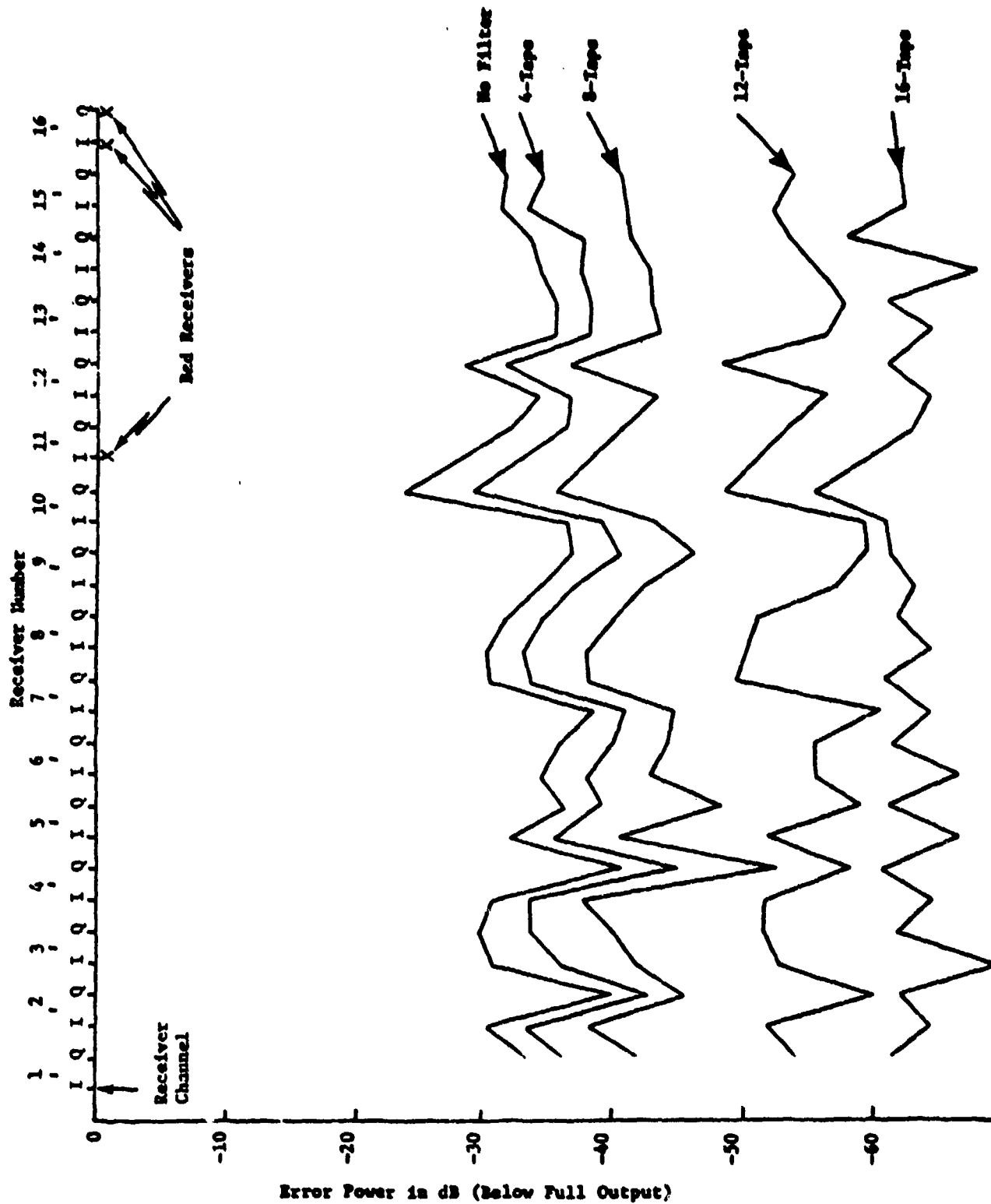


Figure 5-6. Error Power versus Receiver Channel

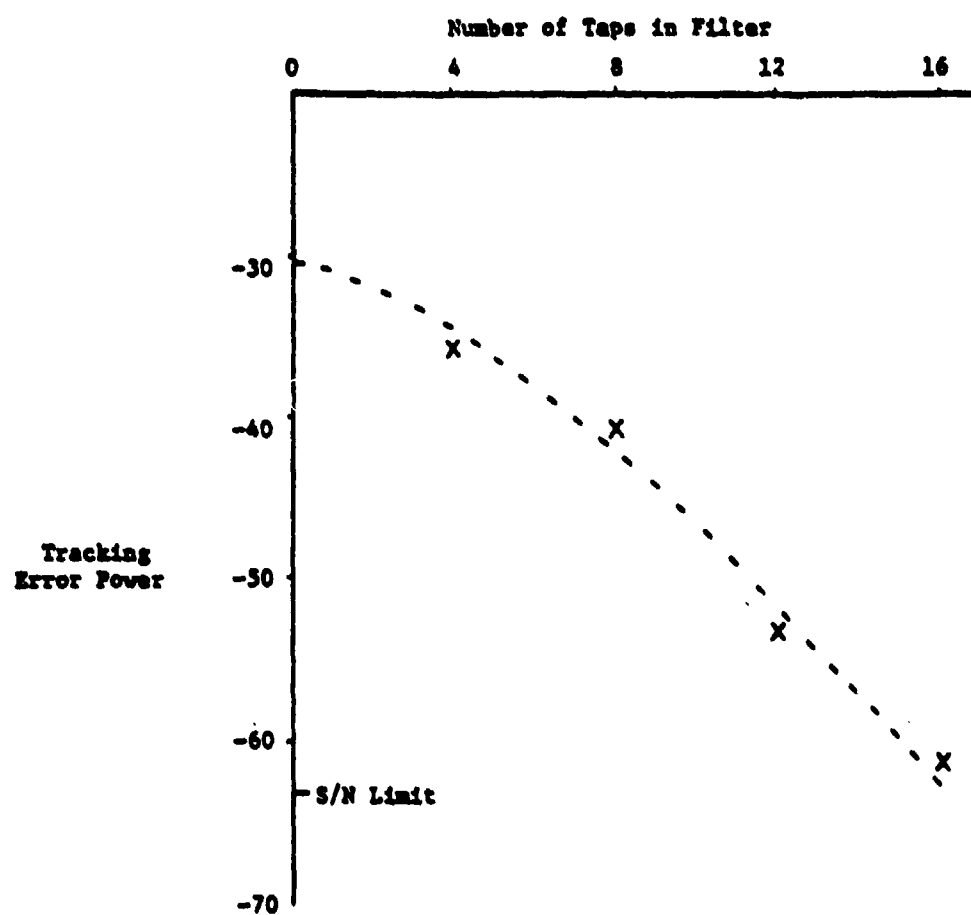


Figure 5-7. Residual Error Power versus Equalization Filter Length

6.0 RECOMMENDATIONS

The specific recommendations for work that remains to be done in the area of receiver filter tracking are:

- Use SRI's system to confirm design parameters on more conventional radar receivers.
- Demonstrate tracking improvement through increased range and spatial sidelobe control on WARF or RADC system.
- Evaluate limitations, with respect to receiver tracking, of PRS and determine impact on potential performance using adaptive technology.

7.0 RAYTHEON EFFORTS

Section 8.0 through 9.0 of this report describe the engineering services performed by Raytheon Company under subcontract to Technology Service Corporation in support of the RADC Adaptive Processing Program - Phase II. There were two primary tasks associated with this effort:

1. Adaptive Processing Software
2. Data Collection and Analysis Program

The first task was to upgrade the software package developed in the Phase I Program by adding a calibration procedure to use a near-field monopole source and by adding a Radar Processing mode. The Radar Processing Mode displays the Amplitude versus I.F. frequency for a fixed steer direction using either adaptive or conventional beamforming techniques. This mode is identified as the Radar mode because it processes the data in the manner in which an OTH radar operates. The addition of this mode will enable a determination of the capabilities of adaptive processing techniques to improve the performance of an OTH radar in the HF environment. The second task was to collect data using a 16-element array and Data Acquisition system at Dexter, New York, to: (1) provide data to checkout the software package; (2) to provide TSC with data which was required to develop and generate the equalization filters, and (3) to measure the performance of the 16-element array with OTH sources using conventional beamforming techniques.

Also included in the first task was the transfer of the off-line data processing programs developed under both Phase I and II to the Sigma-5 computer at RADC. This provides RADC with a complete in-house data processing capability. The transfer of these programs to the Sigma-5 has been successfully completed and we would like to thank the personnel at the Data Reduction Center at RADC for their cooperation in this task.

8.0 ADAPTIVE PROCESSING SOFTWARE

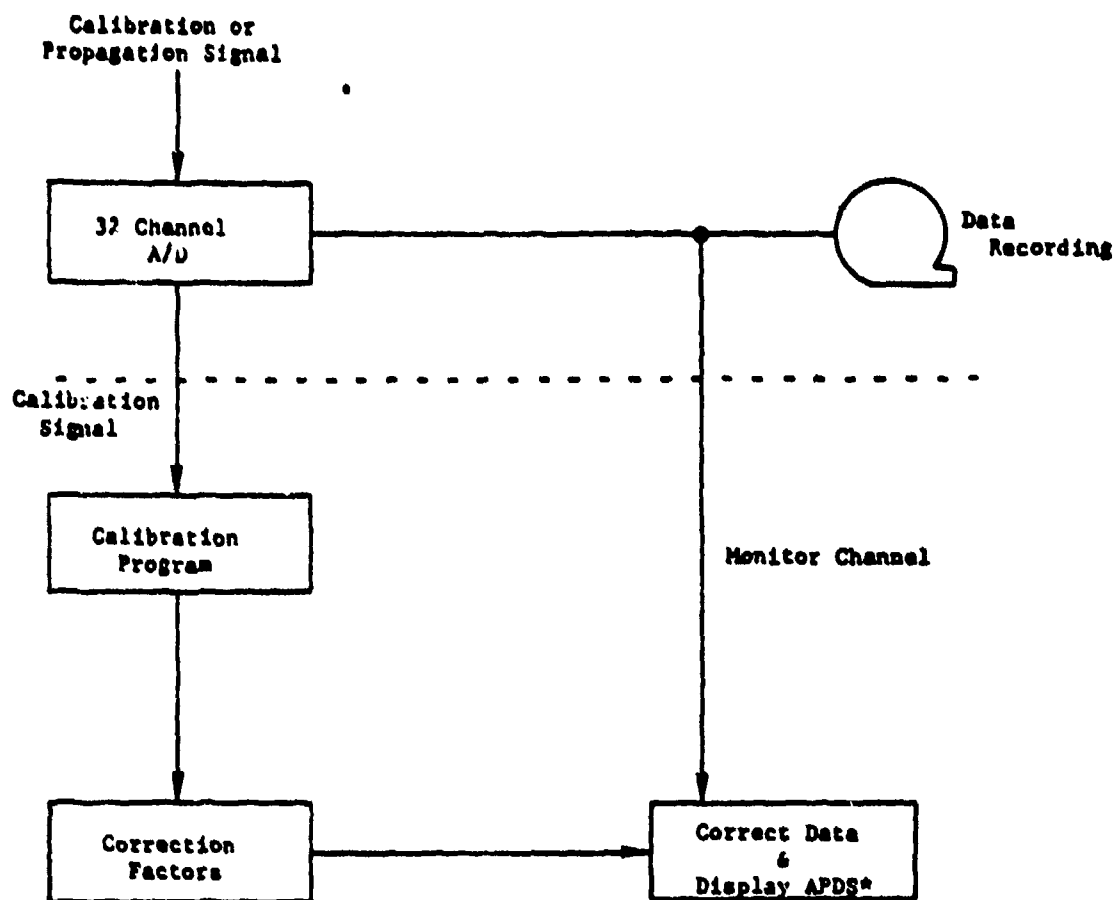
8.1 INTRODUCTION

Under the Phase I program, software was designed and implemented to process and display data collected on a temporary 16-element array at Dexter. This array was built especially for this program so that when the new 384-element planar array at Dexter was completed digital beamforming techniques developed in this program could be readily utilized on the new array. The software developed included a real-time operating system as well as an off-line data processing capability.

During the Phase II program, the off-line software was modified and augmented with additional capabilities. Before discussing the off-line software, the on-line system will be briefly described. Figure 8-1 shows a schematic block diagram of the on-line system. The output from each of the 32 receivers (I and Q receivers for each of the 16 elements) is digitized at a 250 samples/second rate. The digital data is recorded directly on 9 track/800 bpi tape in two's-complement binary format without processing. This is a very attractive feature as the data can be processed at a later date, using the off-line programs, with a variety of parameters and algorithms. The only limitation is the 200 Hz RF bandwidth and a sampling rate of 250 Hz for each receiver. In order to fully utilize this feature, calibration signals must be recorded during each data collection period. This allows a complete calibration to be implemented when the data is processed on the off-line system. During the data collection, a monitor channel is available which calibrates and displays the Angular Power Density Spectra, ADPS, for selected data.

The off-line processing software is schematically shown in Figure 8-2. The software has three major components:

1. Calibration: Uses either an internal test signal or a near-field monopole as a source to match phase and amplitude of the element ports receiver subsystems. Correction factors are generated and stored for later application to the data.



* APDS - Angular Power Density Spectra

Figure 8-1. On-Line Data Recording System

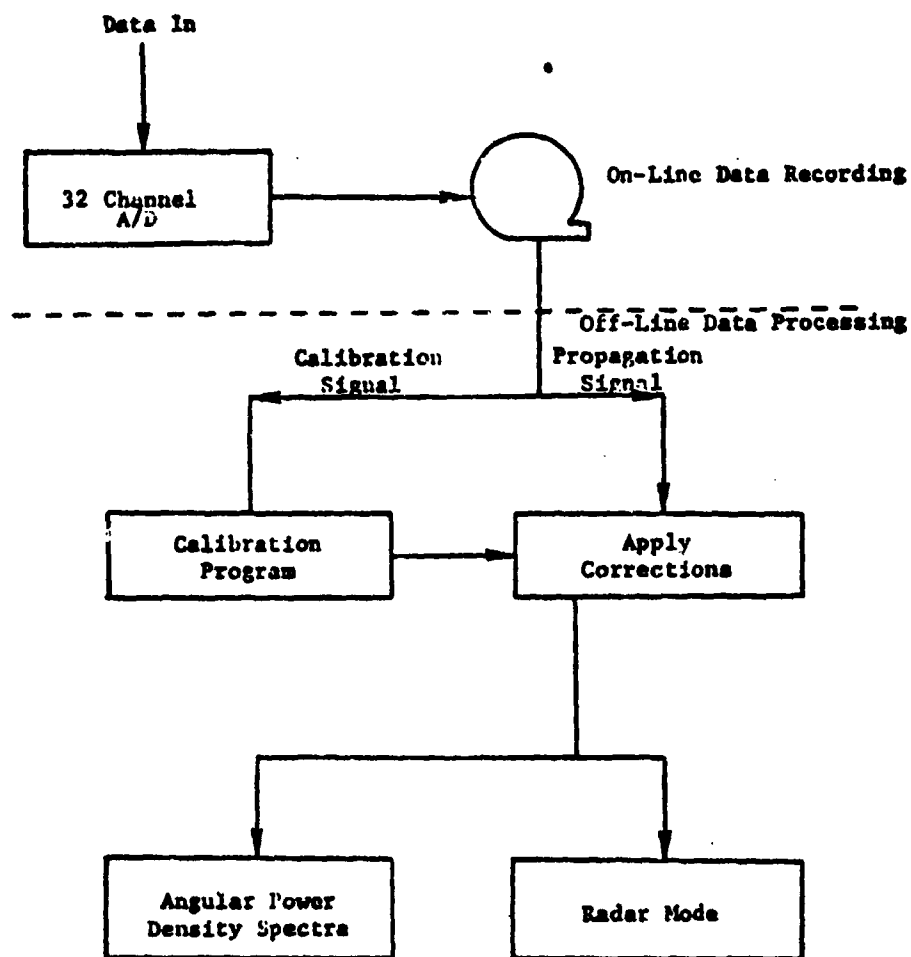


Figure 8-2. Off-Line Data Processing

2. Angular Power Density Spectra (APDS): Generates the APDS using either adaptive or conventional (FFT) beamforming techniques.

3. Radar Mode: Generates amplitude versus frequency at fixed steer directions using either adaptive or conventional beamforming techniques.

Appendices A-E contain listings of the programs that comprise the off-line processing software. The programs and their nomenclature by which they are identified are listed in Table 8-1. These programs are currently operational on the Sigma-5 at RADC.

Table 8-1. Off-Line Adaptive Processing Software Programs

Appendix A:	Calibration - MCALT
Appendix B:	Conventional Angular Power Density Spectra - CONV
Appendix C:	Adaptive Angular Power Density Spectra -ADAPT
Appendix D:	Radar Processing with Conventional Techniques - RCONVT
Appendix E:	Radar Processing with Adaptive Techniques - RADAPT

8.2 Calibration (MCALT)

The 32 receivers in the Data Acquisition System were designed and measured to track within $\pm$ one percent in phase and $\pm$ one percent in amplitude with each other. Calibration procedures were implemented to remove systematic phase and amplitude errors introduced by the antenna and receiver subsystem, i.e., to maintain orthogonality between corresponding I and Q channels and amplitude and phase match between elements. Two calibration signals are available. One is an internal test signal which feeds an identical phase and amplitude reference signal into each of the 32 receivers. This will remove systematic errors in the receiver subsystem but not the antenna subsystem. A monopole located 600 m in front of the 16-element array can be used to calibrate the antenna subsystem as well as the receiver subsystem. The monopole, however, presents a spherical wavefront to the antenna and for it to provide a plane wave source, the calibration program was modified to remove the spherical nature of the signal wavefront from the reference monopole. Figure 8-3 is a block diagram of

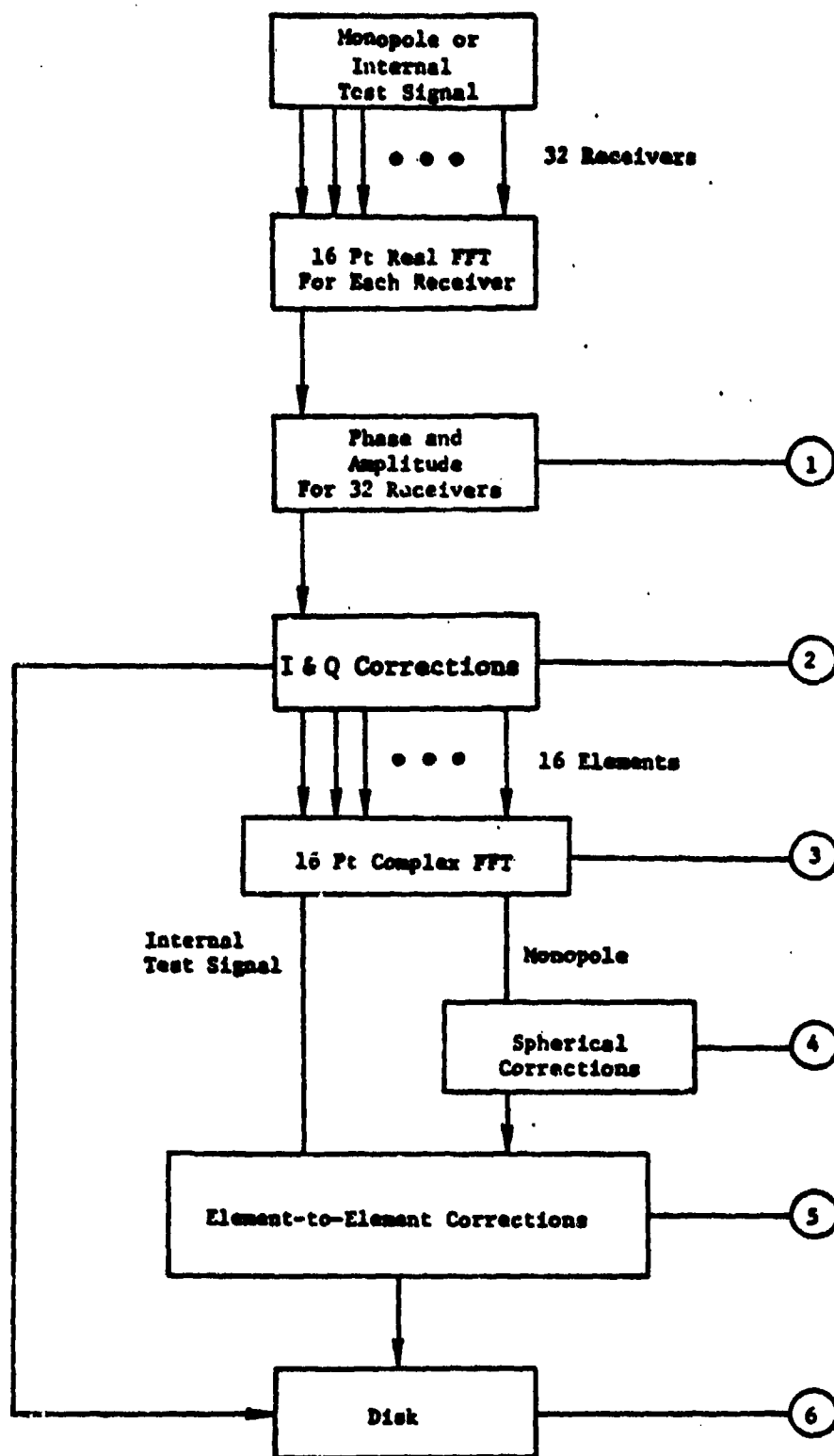


Figure 8-3. Calibration Procedures

the calibration procedure. The numbered points indicate where calibration data is displayed and hard copies available. The calibration program requires as input the time in hours, minutes, and seconds to specify the data on the tape to be used for calibration. In addition, the number of data sets (LTMS) used in averaging the correction factors is specified. Each data set is 16 time samples or 0.064 s. The calibration source is also specified as Internal or Monopole. If the monopole source is used, the operating frequency in MHz of the monopole is also specified.

A 16 pt real FFT is performed to determine the phase and amplitude of the calibration tone for each of the 32 receivers. A single frequency tone is used for calibrating the receivers. This procedure matches the 32 receivers at only one point in the 100 Hz filter bandwidth. A digital equalization filter technique has been developed by TSC (Section 5.0 of this report) to correct for variations between receivers across the bandwidth of each filter. At this point, (1) and (2) in Figure 8-3, correction factors are generated which produce orthogonal and equal amplitude I and Q channels. The I channel of each receiver pair is left uncorrected and the phase and amplitude of the Q channel is adjusted. The receivers are numbered 1 to 32 with the odd numbers being the I channels and the corresponding Q channel the next even number. A 16 pt complex FFT is applied to each port of the receive subsystem on the same data set used to obtain the I and Q corrections after the corrections are applied. This determines the phase and amplitude of each element of the array, (3) in Figure 8-3. Up to this point, there is no difference between the procedures for the monopole or internal test signal. The different procedure for each will be described separately below.

8.2.1 Internal Calibration Signal

The internal calibration signal is injected into the 32 receivers with equal phase and amplitude. This corresponds to a plane wave at boresight. For a plane wave at boresight, the response at all the elements must be of equal phase and amplitude. Defining the signal at each element as $S_n = A_n e^{i\phi_n}$ the correction factor for element n is $Z_n = \Delta A_n e^{i\Delta\phi_n}$ where $\Delta A_n = A_1/A_n$ and $\Delta\phi_n = \phi_1 - \phi_n$. Multiplying S_n by Z_n we get $A_1 e^{i\phi_1}$ for all n .

These correction factors, Z_n , insure that all the elements have the same phase and amplitude response for a plane wave at boresight; see (5) in Figure 8-3. The correction factors for each I-Q pair and element matching are stored on the disk. These corrections are then applied to data before the Angular Power Density Spectra or the radar maps are generated.

8.2.2 Monopole Calibration

A monopole was located in front of the 16-element array. Figure 8-4 shows the position of the monopole with respect to the 16-element array. The distances from the monopole to the front posts of the 1st and 16th element were surveyed.* A spherical wavefront from the monopole is also shown with the distance between the wavefront and each element shown in the Table. Before the systematic phase and amplitude corrections between elements can be determined, a factor has to be applied to the spherical wavefront to make it appear as a plane wave. A correction factor based on a spherical calibration signal would distort the measurement of a plane wave source.

The signal measured at the n^{th} element is $A_n e^{i\phi_n}$. In order to make the spherical wave look like a plane wave, the monopole signal is phase retarded at each element by $\delta\phi_n = 2\pi d_{ns}/\lambda$ where d_{ns} is the distance between the wave front and the n^{th} element. The element-to-element correction factor for the monopole source is $Z_n = \Delta A_n e^{i\Delta\phi_n}$ where $\Delta A_n = A_1/A_n$ and $\Delta\phi_n = \phi_1 - (\phi_n - \delta\phi_n)$. With this correction factor both the antenna and receiver subsystems are calibrated as in paragraph 8.2.1.

Figure 8-5 shows a conventional APDS for the OTH signal from WWV at 10 MHz using calibration factors obtained from the monopole with and without spherical corrections. Correcting for the spherical wavefront of the monopole signal improves the angular resolution of the conventional (FFT) APDS.

8.3 ANGULAR POWER DENSITY SPECTRA

The angular power density spectra (APDS) of the received energy is determined using either conventional or adaptive beamforming techniques. Figure 8-6 shows a block diagram of the APDS software for both the adaptive and conventional techniques.

* The elements were 220 foot long single-wire Beverage elements with a spacing of 18.288 m. The element phase centers were chosen to be approximately 2/3 of the length of the element back from the front posts.

Calculated d_{n_s} , Meters	
El#	d_{n_s} Meters
1, 16	0.0
2, 15	4.033
3, 14	7.512
4, 13	10.427
5, 12	12.770
6, 11	14.534
7, 10	15.713
8, 9	16.303

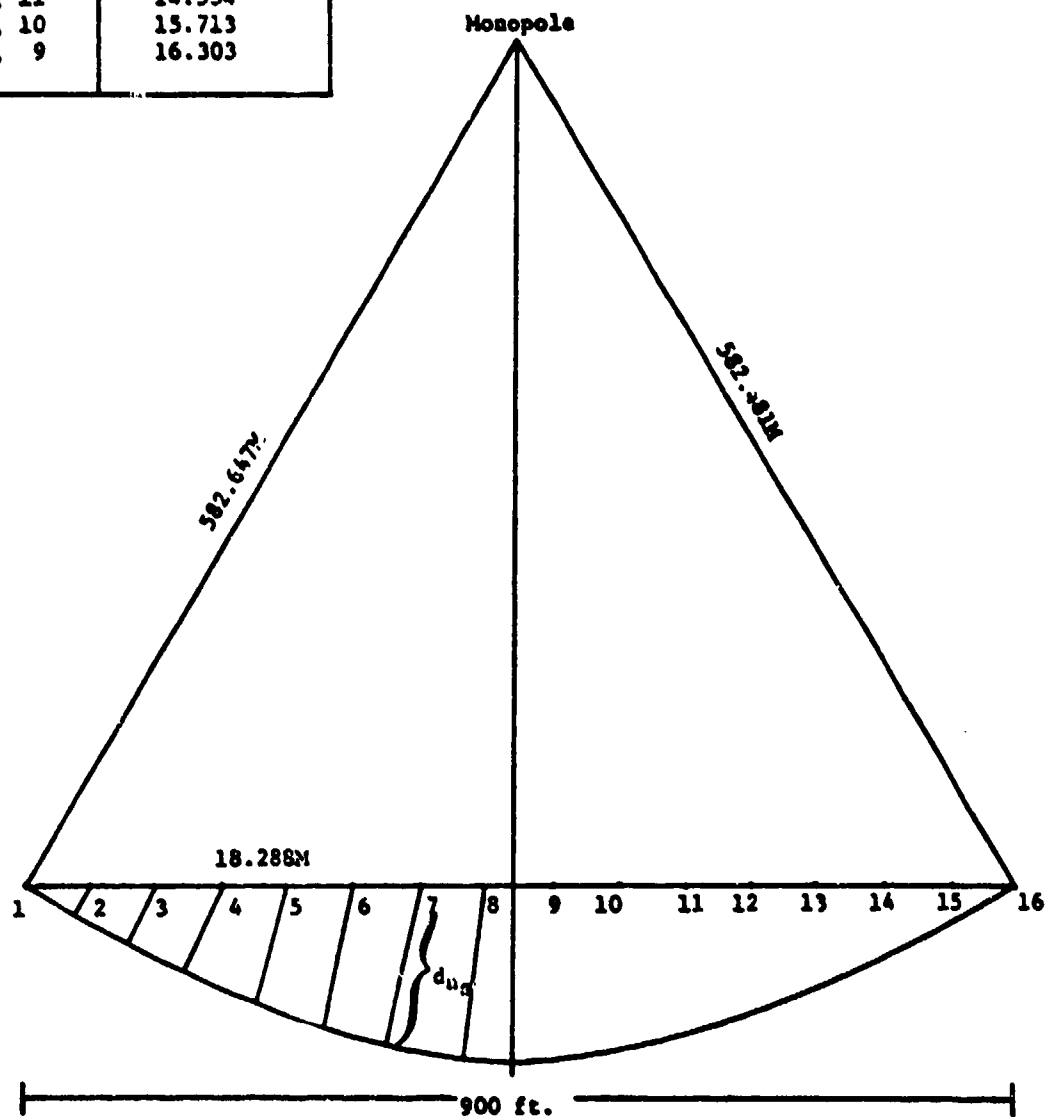


Figure 8-4. Location of Monopole with Respect to 16-Element Array

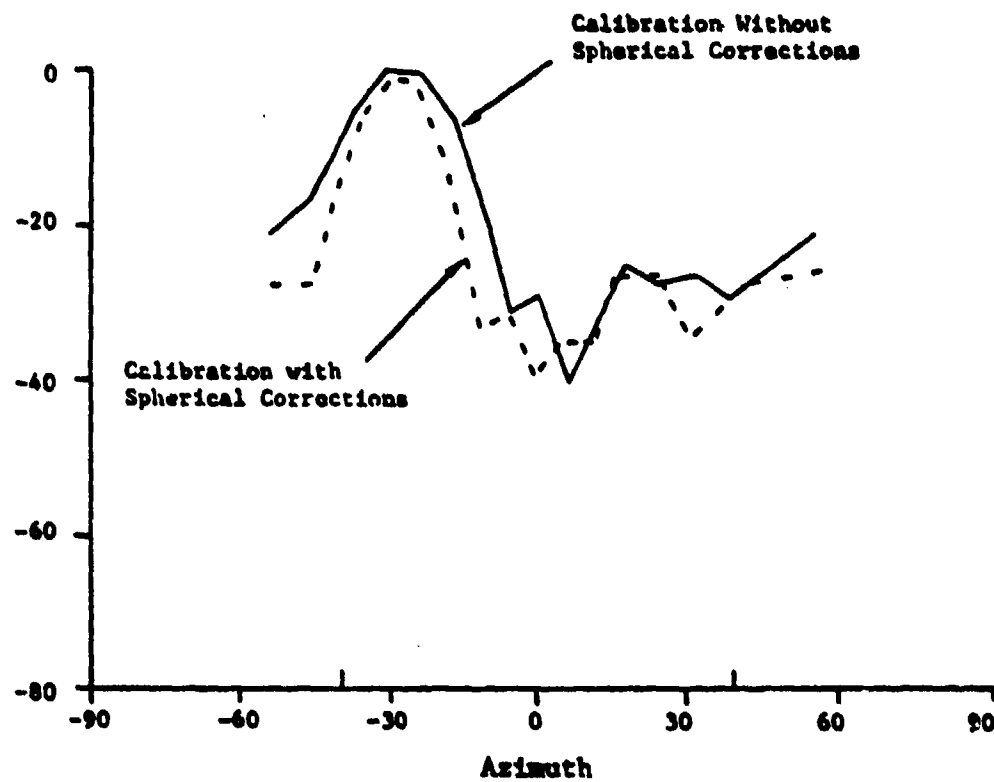


Figure 8-5. Conventional APDS of WV Using Monopole Calibrations with and Without Spherical Corrections

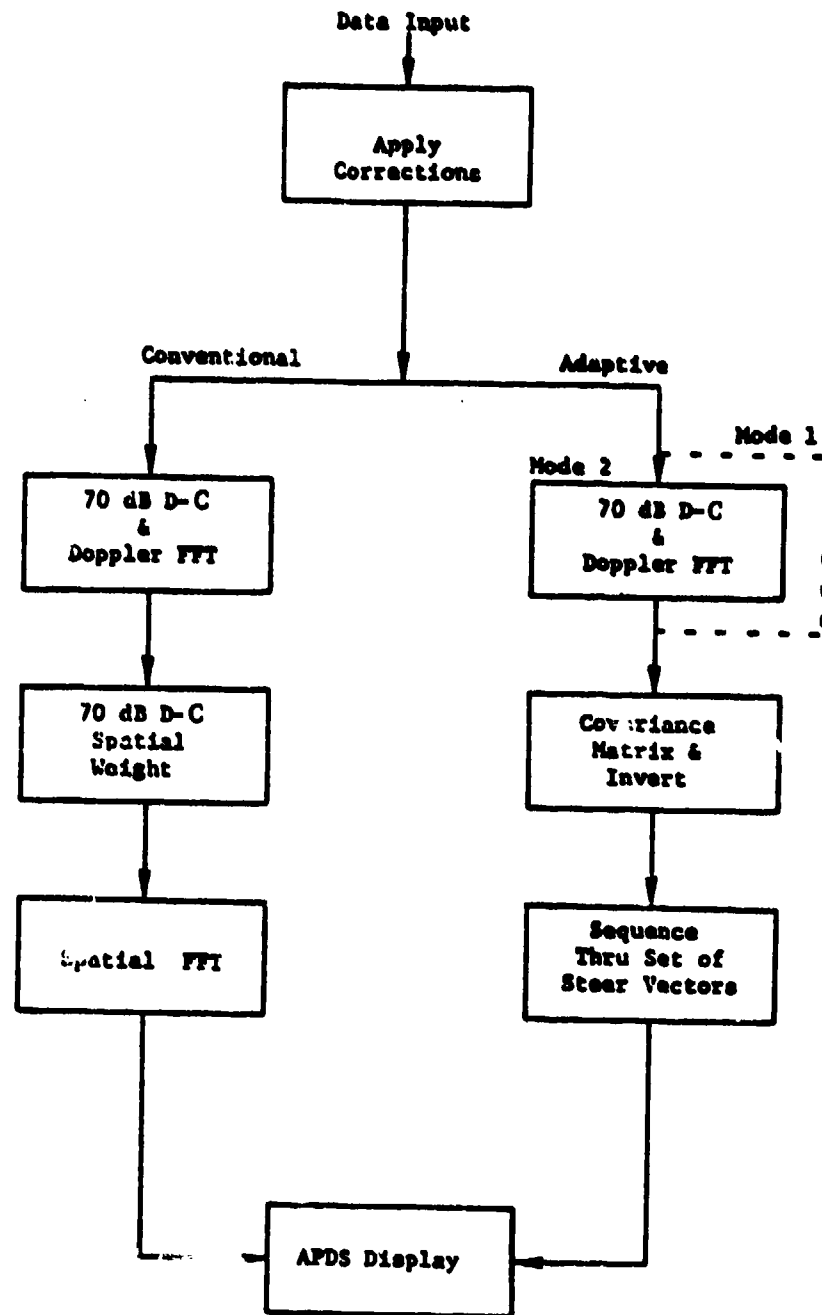


Figure 8-6. Processing Required to Produce Conventional and Adaptive Angular Power Density Spectra

8.3.1 Conventional APDS (CONVT)

The conventional APDS is generated by the program CONVT. The input data is the time (hours, minutes, seconds) and the operating frequency. After the corrections are applied to the data, 16 time samples from each element are time-weighted with a 70 dB Dolph-Chebyshev (D-C) weighting function and a 16 pt complex FFT for each element is performed. This gives an effective 64 ms coherent integration period. For Element #1, the Doppler bin, where the peak signal occurs, is identified. The phase and amplitude for this Doppler bin is determined for the 16 elements. The 16 phase and amplitudes for this doppler bin are then spatially FFT'd using a 70 dB D-C weighting function. The 16 amplitude outputs from the spatial FFT form the APDS when plotted against the azimuths of the 16 FFT beam outputs.

Conventional (FFT) beamforming with a 16 pt spatial FFT provides 16 independent beam positions. The direction of the beams in sine (i.e. μ) space is defined by $\mu_n = \pm M/2 - n\lambda/Md$ where M is the number of elements, n is an integer from 0 to $\pm M/2$, and θ_n is the azimuth of the n^{th} beam measured from boresight. The angle at which the FFT formed APDS will begin to repeat is when $n = \pm M/2$ or $\mu = \pm 1/2 \lambda/d$. For $\lambda = 2d$ this occurs at $\pm 90^\circ$ in angle space, and for $\lambda < 2d$ the azimuthal angle coverage of the APDS is reduced. An FFT APDS beam position at the far right ($n = M/2$) is the same as the beam position on the far left of boresight. For successive values of $n = 0, 1, 2, \dots, M/2$, the beam positions are equally spaced in sine space up to the point where the FFT APDS begins to repeat. The same is true on the left of boresight. The output of the FFT APDS is 17-beam positions (two-beam positions are identical for $n = M/2$) equally spaced in sine space. Figure 8-5 shows the APDS for an OTH source (WWV) at 10 MHz. The source occurs at approximately 30° to the right of boresight. For APDS maps presented in this report, a negative beam position angle is to the right of boresight. The antenna boresight was 240°T and 30° to the right of boresight on the APDS corresponds to an azimuth of 270°T . The calculated direction to WWV from Dexter is 271.3°T . At 10 MHz and for an element spacing of 18.288 m the APDS covers azimuths $\pm 55^\circ$ from boresight. The 17 data points at the output of the spatial FFT are formed within this $\pm 55^\circ$ region. Also the points are equally spaced. Finally the maximum

steer $\theta_{\max}$ for an array with no grating lobes in visible space is specified by the condition

$$\theta_{\max} = \pm \sin^{-1} (\lambda/d - 1)$$

This maximum steer is indicated on the display by two vertical ticks on the horizontal axis which for a frequency of 10 MHz occur at $\pm 39.8^\circ$.

8.3.2 Adaptive APDS (ADAPT)

The input parameters for the adaptive APDS program are time (hours, minutes, seconds), mode (1 = normal, 2 = spectral preprocessing of data), operating frequency, element configuration, and NGROUP. NGROUP is the number of sample groups used to generate the covariance matrix. Each sample group contains 16 complex time samples per array element. In the normal mode an NGROUP of 2 is usually selected. The normal mode indicates that the covariance matrix is determined for the entire filter bandwidth. In the preprocessing mode, a 16 pt complex FFT is performed on each element output and the peak signal is resolved in frequency. The covariance matrix is generated for a specific frequency cell in the filter bandwidth. (For a 16 pt FFT in mode 2, an NGROUP of 32 is required.

This report cannot discuss in detail the algorithms used in producing the adaptive APDS maps. A brief discussion will follow so that the computer programs in Appendix D can be followed. At a specified look direction the output of the beamformer is $y = W^*X$ where X is an N element complex column vector which represents the output of the N element array. W^* is the transpose conjugate of the weighting function for a specific look direction. For conventional beamforming $W^* = V^*$ where V is the unit vector in a specified steer direction. For adaptive beamforming it has been shown that the set of weights that optimize the SNR for a given look direction is:

$$W = \frac{F^{-1} V}{(V^* F^{-1} V)/M}$$

where F^{-1} is the inverse of the covariance matrix F , M is the number of elements, and $(V^* F^{-1} V)/M$ is a normalisation factor. The power density in a given look direction is defined as yy^* . Using the definition of $y = W^* X$ we can show that:

$$yy^* = W^* XX^* W$$

$$= \frac{V^* F^{-1*} XX^* F^{-1} V}{\frac{(V^* F^{-1} V)}{M} \frac{(V^* F^{-1} V)}{M}}$$

Since

$$XX^* = F, F^* = F, \text{ and } (F^{-1})^* = F^{-1}$$

$$yy^* = V^* F^{-1} F F^{-1} V = M^2 \frac{V^* F^{-1} V}{(V^* F^{-1} V)^2}$$

$\therefore$

$$yy^* = \frac{M^2}{V^* F^{-1} V}$$

This defines the power density for a given look direction. The APDS is obtained by calculating $1/(V^* F^{-1} V)$ for 65 look directions equally spaced in sine space from -1 to +1. The APDS for WWV at 10 MHz using Adaptive weights as generated by the adaptive algorithm described above is illustrated in Figure 8-7.

8.4 Radar Processing

An HF/OTH radar detects targets after range/Doppler processing. Evaluation of conventional and adaptive beamforming techniques for OTH radars requires processing of the data in a radar detection mode. For this reason, the off-line adaptive processing software has been augmented with a radar processing mode. This mode displays amplitude versus frequency for a fixed steer direction. The beamforming weights can be generated with either conventional weights or adaptively calculated. Figure 8-8 is a block diagram of the radar processing mode. The data is represented by an N element column vector X. The beamformer multiplies this column vector by a weighting function row vector determined either adaptively or conventionally. The output of the beamformer is a time series of the complex scalar y. This time series is weighted and FFT'd. The output is the amplitude versus frequency for a selected azimuth. In the current program, the size of the FFT varies from 16 to 256 complex points which for a sample rate of 250 complex samples/second represents a coherent integration time which varies from 0.064 to 1.024 seconds.

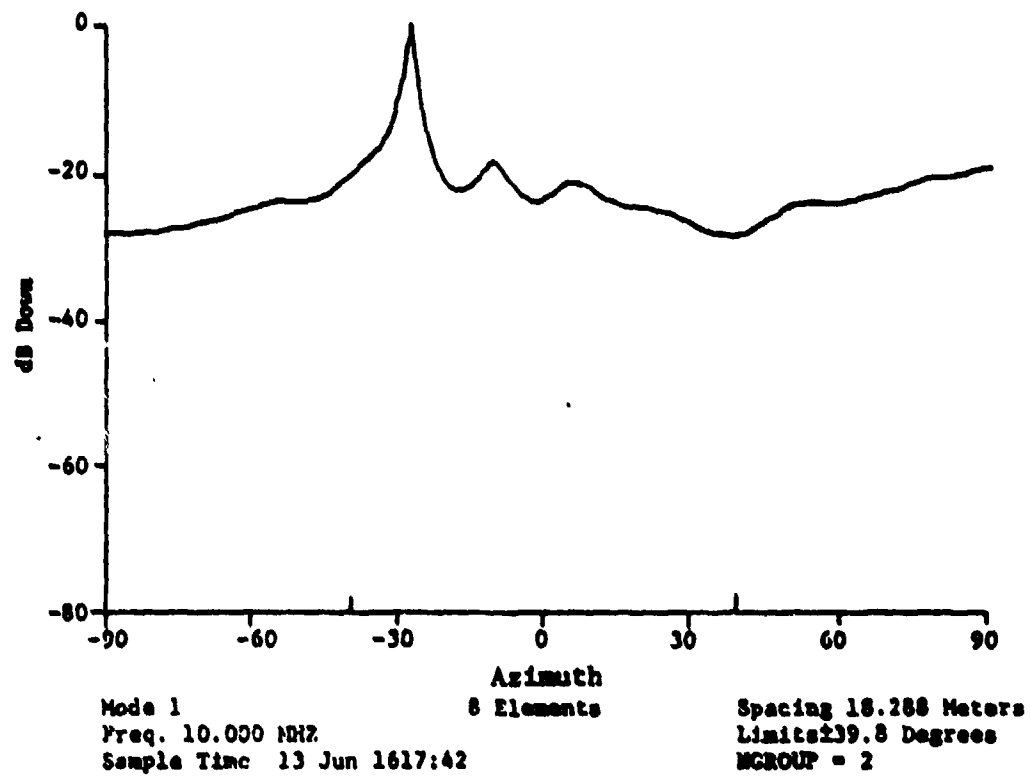


Figure 8-7. Example of Angular Power Density Spectra Using Adaptive Weights

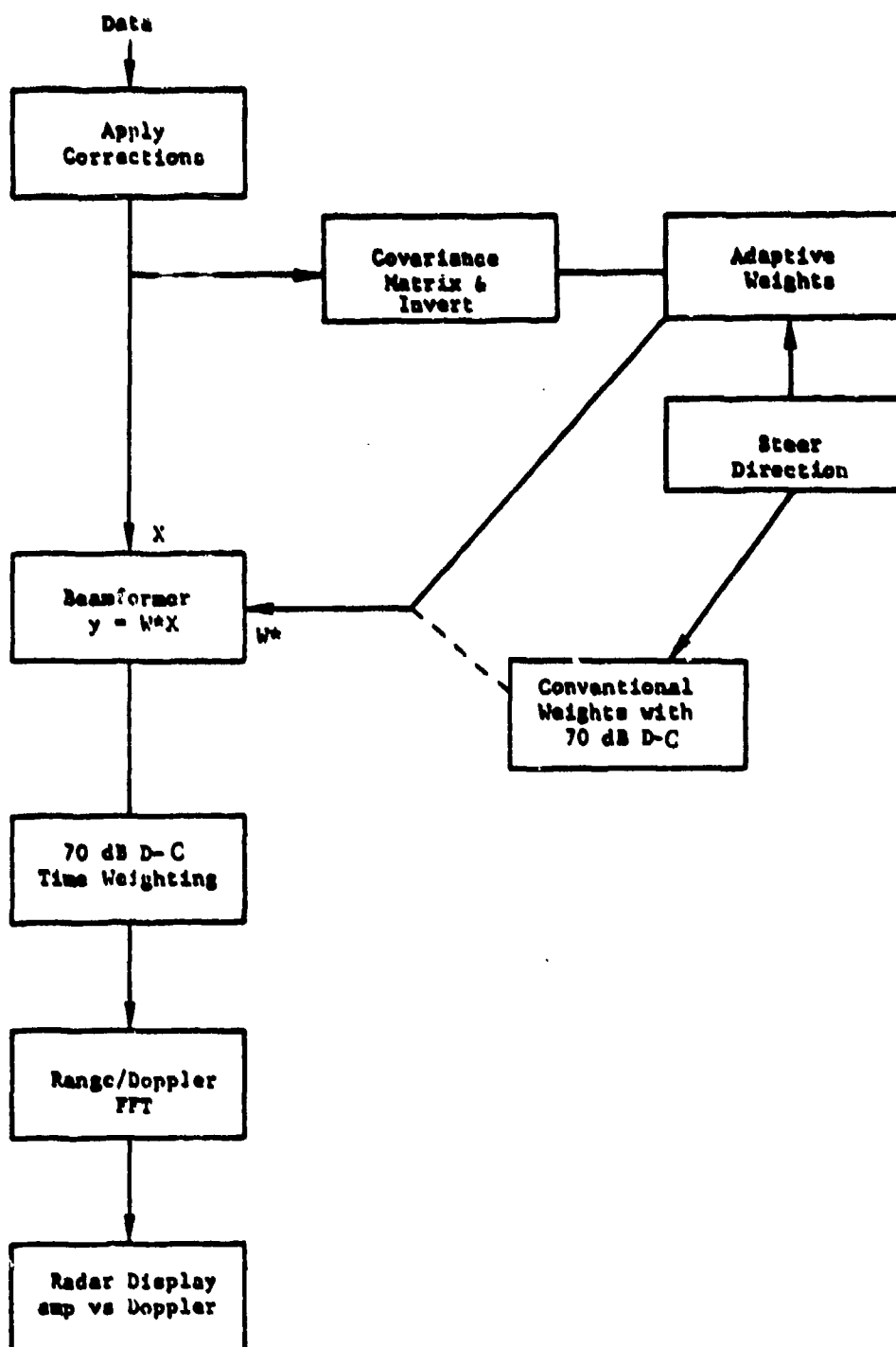


Figure 8-8. Block Diagram of Radar Processing for Adaptive and Conventional Beamforming

8.4.1 Conventional Beamforming (PCONVT)

The steer direction specified determines the steer vector V . For conventional beamforming $W = V$. In addition, a 70 dB D-C spatial weighting function is applied across the 16-element array. The program can easily be generalized to apply different spatial weightings if required. In addition, the number of elements can be variable and from 1 to N elements can be used. This is done by weighting with 0 those elements which are not desired. Depending on the desired frequency resolution, a time series of complex scalars, y , are obtained from the output of the beamformer. A 70 dB D-C time window, which is specified by the size of the FFT, is applied to the data. The amplitude output of the resultant FFT is displayed. Figure 8-9 shows the output of the radar mode with a 256 pt FFT for a 50 Hz test tone at boresight. The horizontal axis shows both the FFT cell number and its associated frequency cell in the 250 Hz band as determined by the sampling rate. In addition to the sample time and the steer direction (relative to boresight) the peak signal is shown. The data when plotted is scaled so that the peak signal occurs at 0 dB. The value of the peak signal can be used to compare signal levels at the same FFT cell for different steer directions. This assumes that the same data set is used to produce the radar maps at the selected steers.

Figure 8-10 shows the output of the radar processing mode at 0° and -27.95° for WWV signals at 10 MHz. The signal from WWV at the 0° steer is 39.1 dB below the signal at the -27.9° steer. The conventional APDS for this time period (see Figure 5) is in agreement as it shows a slightly less than 40 dB sidelobe level at 0° when compared to the peak of the APDS.

8.4.2 Adaptive Beamforming (RADAPT)

For the radar mode using adaptive weights, data is read in, stored onto the disk, and added to the covariance matrix, as in ADAPT. The matrix is then inverted and the weights in a given look direction are

$$W = F^{-1}V / ((V^*F^{-1}V)/M)$$

and the output of the beamformer is

$$y = W^* X.$$

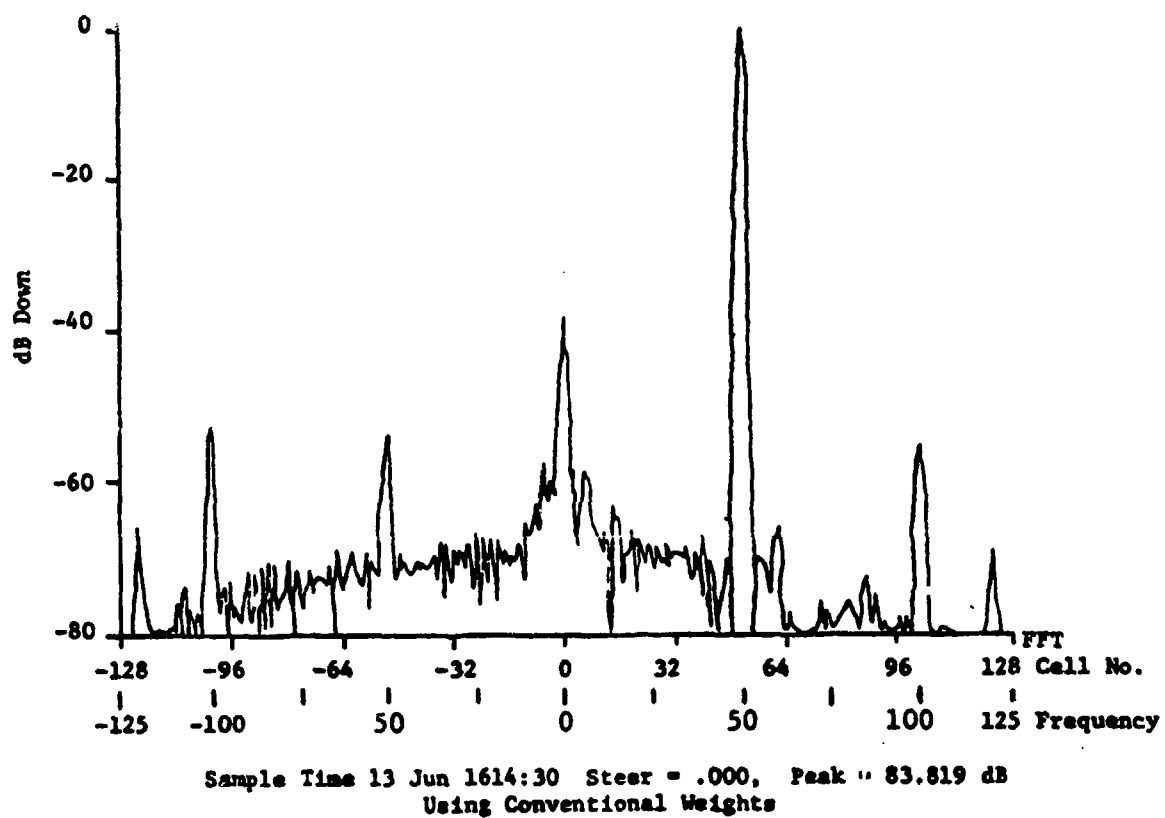


Figure 8-9. Radar Map with Conventional Weights of
a 50 Hz Test Tone at Boresight

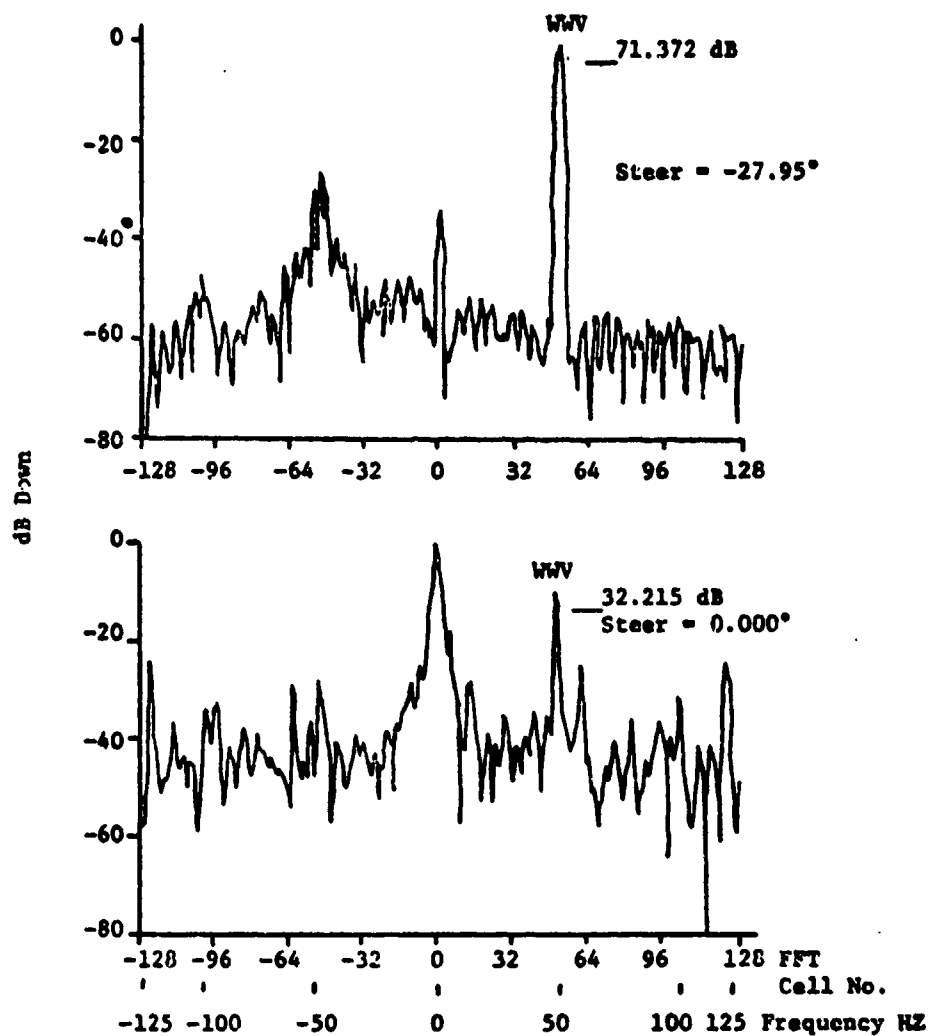


Figure 8-10. Conventional Radar Map of 10 MHz WWV Signal at 0° and -27.95° Steer

As for the conventional mode, a time series of 'y' is obtained and time windowed with a 70 dB D-C weights prior to the FFT. The weights can be generated for any look direction by the appropriate selection of the steer vector. In order to expedite the generation of radar maps using adaptive weights, the inverse of the covariance matrix is determined for a set of data and may be used for several azimuths without regenerating the covariance matrix.

The number of samples used to generate the covariance matrix is specified by NGROUP. In the adaptive radar mode, the number of time samples used is the doppler/range FFT size. The NGROUP required is specified by $2^4 \times \text{NGROUP} = \text{FFT size}$. For example, a 256 point FFT requires an NGROUP of 16. The covariance matrix is a 16 x 16 matrix (for 16-element array) which is formed by the expectation value of $\overline{x_i x_j}$. x_i is the complex signal at the i^{th} element and i and j are running indices representing the 16 elements. For an NGROUP of 16, 256 values of x_i are used to determine the expectation value of $\overline{x_i x_j}$. This approach ensures that the weights generated from a given data set are used on the same data set to generate the adaptive radar mode. The approach described above although specified at a 16-element array can be generalized to any number of elements. Figure 8-11 shows an adaptive radar map of WWV at 10 MHz using adaptive weights for an 8-element array. Indicated on the figure is the element configuration utilized.

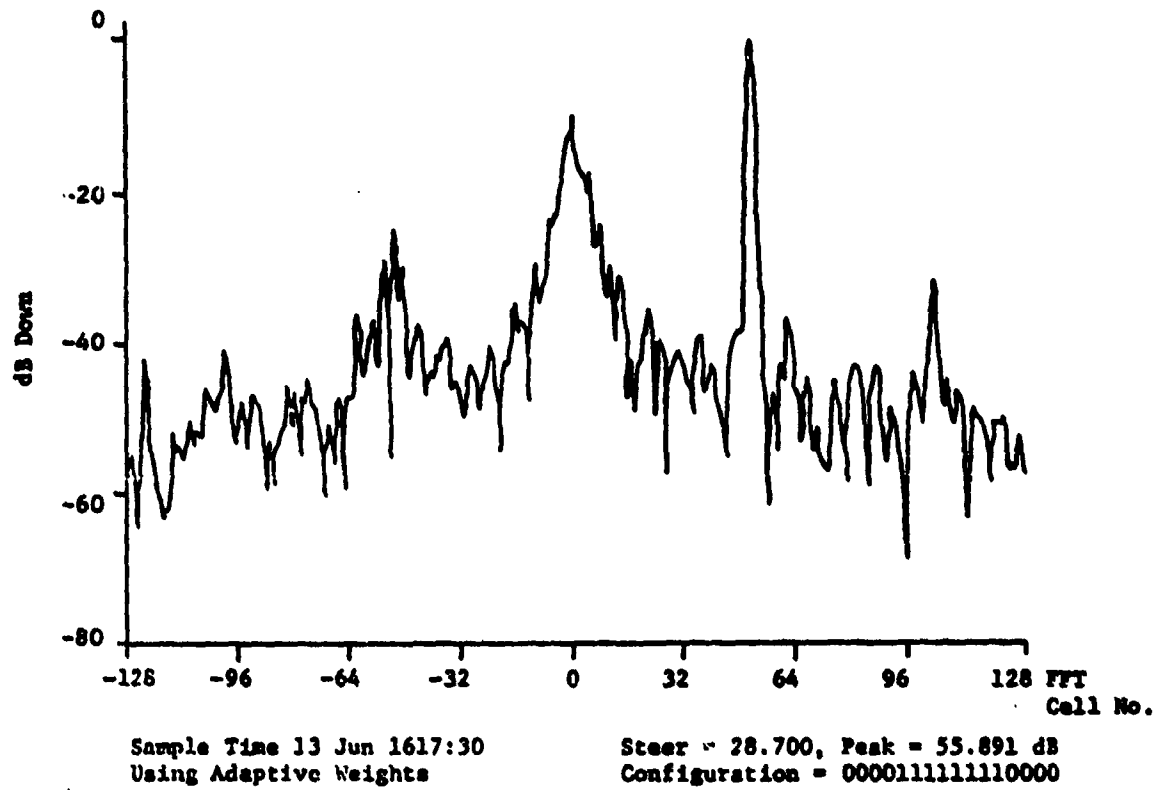


Figure 8-11. Adaptive Radar Map of a 10 MHz
WWV Signal at -28.7° Steer

9.0 EXPERIMENTAL PROGRAM

A limited experimental program was undertaken during this phase of the Adaptive Processing Program. The objective of the program was to:

1. Provide data necessary for implementation of Equalization Filter by TSC.
2. To provide data to check-out off-line adaptive processing software described in section two of this report.
3. To measure sidelobe levels with OTH sources achievable with the 16-element array using conventional beamforming.

Table 9-1 lists the data collected during the Phase II Adaptive Processing Program. The data for the equalization filter consisted of the output of the 32 receivers for CW Test Tones from 5 to 150 Hz in 5 Hz frequency increments. The data for each CW Test Tone was time weighted (with 70 dB D-C weighting) and processed with a 512 point real FFT. The phase and amplitude of the test tone for each receiver was determined and referenced to Receiver 1. The results were forwarded to TSC for use in the construction of the digital equalization filter.

The WWV data was used to verify operation of the off-line software. This has been discussed in detail in Section 8.0 of this report. The data was also used to determine sidelobe levels achievable with the 16-element array for the OTH source. Figure 8-5 of this report illustrated a typical angular power density spectra of WWV which shows a 40 dB sidelobe response. Finally, two controlled CW sources (SRI and UI) were explored to determine performance of Adaptive and Conventional Processing in the presence of two sources. Unfortunately, transmitter difficulties at the University of Illinois prevented the observation of the two controlled CW sources.

Table 9-1. Data Collected During Phase II
Adaptive Processing Program

<u>Date</u>	<u>Time</u>	<u>Comments</u>
14 June 1975	1528:20 - 1544Z	Filter Equalisation Data
14 June 1975	1611:30 - 1634Z	WWV at 10 MHz
28 August 1975	2336:30 - 2355Z	WWV at 10 MHz
29 August 1975	0011 - 0027Z	SRI ⁽¹⁾ & UI ⁽²⁾ : CW at 7.8 MHz
29 August 1975	0030:52 - 004:40Z	SRI & UI CW at 9:835 MHz
29 August 1975	0105:30 - 0121:15Z	SRI & UI: CW at 7:800 MHz
29 August 1975	0135:30 - 0149:30Z	SRI & UI: CW at 9:835 MHz

(1) SRI: Stanford Research Institute - CW Transmitter at
Los Lunas, New Mexico

(2) UI: University of Illinois - CW Transmitter in
Champaign, Illinois

LIST OF APPENDICES

- A. Calibration Program
- B. Conventional Angular Power Density Spectra
- C. Adaptive Angular Power Density Spectra
- D. Radar Processing with Conventional Beamforming
- E. Radar Processing with Adaptive Beamforming
- F. Equalization Filter Design Program
- G. Equalization Filter Design Results
- H. Adaptive Processing Wide Bandwidth Considerations

APPENDIX A
CALIBRATION PROGRAM

9 SEPTEMBER 1975 1600 WITH CORRECTED MONOPOLE CORRECTIONS

```

DIMENSION IQCOR(16),DELPH(16),PHIOUT(16),YPOINT(16),OUTRUF(64),
*WRUF(523),DOLPH(16),XAW(16),XPH(16),IR(8),IV(6)
DIMENSION DIST(8),SPHCOR(16)

```

```
COMMON IBUF1(262),IBUF2(262),INBUF(523),ISAMPL(32),QSAMPL(32),
* AM(32),PH(32),CTIME(6),STIME(6)
```

```

EQUIVALENCE (INRUF(1),WRUF(1))
EQUIVALENCE (OUTRUF(1),IQCOR(1)),(OUTRUF(17),DELPH(1)),
* (OUTRUF(33),ZCORR(1)),(PHIOUT(1),YPOINT(1))

```

```
DATA (DOLPH(I),I=1,16)/0.21266,0.05237,0.13904,0.28431,0.48131,  
* 0.69921,0.889,1.0,1.0,0.889,0.69921,0.48131,0.28431,0.13904,  
* 0.05237,0.21266/  
DATA (IR(I),I=1,8)/ZAAA,ZAAA,ZAAC,ZCAC,ZCEC,ZCCC,ZACE,  
* ZCAE/  
DATA (IV(I),I=1,6)/ZAAA,ZAAA,ZAAZ,ZAAD,ZACC,ZADZ/  
DATA (ID9(I),I=1,6)/ZAAA,ZAAA,ZAAC,ZCAC,ZCCZ,ZD7CE/  
DATA (DIST(I),I=1,8)/0.0,4.033,7.512,10.427,  
1 12.770,14.534,15.713,16.303/  
DATA IDUM,ICOLON,RAD,IFIRST,NSAMP,VCHAN/ZAAA,ZAAZ,57.29578,  
*0.512,32/
```

$$\text{TAN(DUMMY)} = \text{SIN(DUMMY)} / \text{COS(DUMMY)}$$

```

1 CONTINUE
  DO 3 I=1,16
    CORA(I)=0.0
    ELPH(I)=0.0
3  ZZCORR(I)=CMPLY(0.0,0.0)
    CALL BURST

```

LTIMES = NUMBER OF TIMES WANT TO AVERAGE THE CORRECTION FACTORS

```

      WRITE(13,111)
111  FORMAT('TIME HR,MIN,SEC; LTIMES(3A2,I5)')
      READ(13,112) IHR,IMIN,ISEC,LTIMES
112  FORMAT(3A2,I5)
      WRITE(13,105)
105  FORMAT('SOURCE? 0=INTERNAL 1=MONDPOLE (I1)')
      READ(13,106) ISOURC
106  FORMAT(I1)
      IF(ISOURC.EQ.0)GO TO 1101

```

MONOPOLE TEST TONE SOURCE
COMPUTE PHASE DISTANCES

C	WRITE(13,137)	00062
107	FORMAT('INPUT OPERATING FREQUENCY (F6.3)')	00063
	READ(13,109)FREQ	00064
108	FORMAT(F6.3)	00065
	XLAMDA=299.7925/FREQ	00066
	DO 50 I=1,8	00067
	SPHCOR(I)=6.28318*DIST(I)/XLAMDA	00068
50	SPHCOR(17-I)=SPHCOR(I)	00069
1101	IFILE=+1	00070
	CALL ROTAPE(IFILE)	00071
	CALL TMASCI(CTIME)	00072
	IF(CTIME(4).NE.IHR.OR.CTIME(5).NE.IMIN.OR.CTIME(6).NE.	00073
	I ISEC) GO TO 1101	00074
	DO 6800 LT=1,LTIMES	00075
C		00076
C	OUTPUT LT COUNT ON THE RIR SET RIR TO 71	00077
C		00078
	CALL RIRDOT(LT)	00079
C		00080
C	READ A RECORD	00081
C		00082
	IF(LT.EQ.1) GO TO 1105	00083
	IFILE=+1	00084
	CALL ROTAPE(IFILE)	00085
	CALL TMASCI(CTIME)	00086
1105	DO 16 I=1,NSAMP	00087
	16 WBUF(I)=FLOAT(INBUF(I))	00088
C		00089
C	PERFORM 16 PT. DFT ON EACH RECEIVER	00090
C		00091
	DO 6700 ICORR=1,2	00092
	DO 6600 IEL=1,16	00093
	ICONST=2*IEL-1	00094
	IF(ICORR.EQ.1)GO TO 4	00095
	ANGLR=(90.-DELPH(IEI))/RAD	00096
	COSANG=COS(ANGLR)	00097
	TANANG=TAN(ANGLR)	00098
4	CONTINUE	00099
	DO 69 I=1,16	00100
	IRXWD=ICONST+32*(I-1)	00101
	I2=2*I	00102
	I2M=I2-1	00103
	ISAMPL(I2M)=WBUF(IRXWD)	00104
	ISAMPL(I2)=1.0	00105
	QSAMPL(I2M)=WBUF(IRXWD+1)	00106
	QSAMPL(I2)=0.0	00107
	IF(ICORR.EQ.1)GO TO 69	00108
	QSAMPL(I2M)=QSAMPL(I2M)*ICORA(IEI)/COSANG-ISAMPL(I2M)*TANANG	00109
69	CONTINUE	00110
C		00111
C	THE ISAMPL ARRAY NOW CONTAINS 16 SAMPLES (IMAGINARY PART SET = 0.0)	00112
C	FOR A DFT ON THE I-CHANNEL	00113
C	SAME FOR THE QSAVPL ARRAY	00114
C		00115
C	WINDOW PRIOR TO FFT	00116
C		00117
	DO 691 I=1,16	00118
	I2=2*I	00119
	ZSAMPL=CMPLX(ISAMPL(I2-1),ISAMPL(I2))*CMPLX(DOLPH(I),0.0)	00120
	ISAMPL(I2-1)=REAL(ZSAMPL)	00121
	ISAMPL(I2)=ATMAG(ZSAMPL)	00122
		00123

```

      ZSAMPL=CMPLX(QSAMPL(I2-1),QSAMPL(I2))*CMPLX(DOLPH(I),0.0)
      QSAMPL(I2-1)=REAL(ZSAMPL)
691  QSAMPL(I2)=AIMAG(ZSAMPL)
C
C  NOW PERFORM A DFT ON THE I-CHANNEL, THEN THE Q-CHANNEL
C
      CALL FORT(4,-1,ISAMPL,IFERR)
      CALL FORT(4,-1,QSAMPL,IFERR)
C
C  THE ISAMPL ARRAY NOW CONTAINS 16 COMPLEX (32 TOTAL) SPECTRAL VALUES
C  FOR ONE I-CHANNEL RECEIVER
C  SAME FOR THE QSAMPL ARRAY
C  NOW GET SPECTRA - AMPLITUDE AND PHASE VS. FREQUENCY
C
      DO 66 JCHANL=1,2
      DO 68 I=1,16
      I2=2*I-1
      IF(JCHANL.EQ.2)GO TO 681
      CALL AMPHAS(ISAMPL(I2),ISAMPL(I2+1),XAM(I),XPH(I))
      GO TO 68
681  CALL AMPHAS(QSAMPL(I2),QSAMPL(I2+1),XAM(I),XPH(I))
      68  CONTINUE
C
C  FIND MAXIMUM AMPLITUDE - THIS IS THE CAL TONE
C  SKIP XAM(1) = D.C.      DO ONLY THE FIRST HALF NUMBER OF PTS
C  DUE TO THIS BEING A REAL FFT
C
      NPIS=0
      KOUNT=2
      CALL FNDMAX(XAM,NPTS,KOUNT)
      IF(JCHANL.EQ.2)GO TO 665
      AM(ICONST)=XAM(KOUNT)/3276.7
      PH(ICONST)=XPH(KOUNT)
      GO TO 66
665  AM(ICONST+1)=XAM(KOUNT)/3276.7
      PH(ICONST+1)=XPH(KOUNT)
      66  CONTINUE
6699  CONTINUE
C
C  AM ARRAY CONTAINS AMPLITUDE VALUES(VOLTS) FOR ALL RECEIVERS, 1-32 IN
C  ORDER I(1), Q(1), I(2), Q(2) ... I(16), Q(16)
C  PH ARRAY CONTAINS PHASE VALUES(DEGREES) FOR ALL RECEIVERS IN THE
C  SAME ORDER
C  NOW PLOT AMPLITUDES
C
500  CALL SSWTCH(2,IUP)
      IF(IUP.EQ.1)GO TO 500
      CALL BURST
      WRITE(13,120)(CTIME(I),I=1,5),ICOL70,CTIME(6),LT
100  FORMAT(22X,'CORRECTION TIME ',3A2,3X,2A2,A1,A2,11X,I3)
      CALL TKWAIT
      CALL TKPLOT(0,0,0)
      XSTART=7.6
      YSTART=3.3
      CALL AXIS(XSTART,YSTART,IR,-16,6.0,2.0,1.001,5.001)
      CALL AXIS(XSTART,YSTART,IV,+12,2.0,90.0,2.001,1.001)
      DO 70 I=1,32
      X=FLOAT(I-1)*0.2+XSTART
      Y=AM(I)/1.2+YSTART
      IF(I.GT.1)GO TO 699
      CALL PLOT(X,Y,3)
      GO TO 70

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699 CALL PLOT(X,Y,2)
70 CONTINUE

C
C
C

PRINT OUT PHASE VALUES - A I'S ABOVE A U'S

```
DO 72 JPAIR=1,16
J=2*JPAIR
IF(ICORR.EQ.2)GO TO 719
IQCORR(JPAIR)=AM(J-1)/AM(J)
DELPH(JPAIR)=ABS(PH(J-1)-PH(J))
IF(DELPH(JPAIR).GE.180.)DELPH(JPAIR)=360.-DELPH(JPAIR)
PHIOUT(JPAIR)=DELPH(JPAIR)
CORR(JPAIR)=CORR(JPAIR)+IQCORR(JPAIR)
ELPH(JPAIR)=ELPH(JPAIR)+DELPH(JPAIR)
GO TO 72
719 PHIOUT(JPAIR)=ABS(PH(J-1)-PH(J))
IF(PHIOUT(JPAIR).GE.180.)PHIOUT(JPAIR)=360.-PHIOUT(JPAIR)
72 CONTINUE
CALL PLOT(1,0,2,2,-1)
WRITE(13,101) (PH(I),I=1,16,2),(PH(I),I=2,16,2),(PHIOUT(I),I=1,16),
* (PH(I),I=17,32,2),(PH(I),I=18,32,2),(PHIOUT(I),I=17,32)
101 FORMAT(23X,21HRECEIVER PHASE ANGLES,2(/2X,2H I,2F8.1,/2X,2H O,
* 2F8.1,/1X,3HDIFF,2F8.1))
6700 CONTINUE
```

C
C
C
C
C

FINISHED I-Q CORRECTIONS NOW FIND ELEMENT-ELEMENT CORRECTIONS

DO A COMPLEX DFT ON EACH ELEMENT

```
DO 6800 ICORR=1,2
ZCORR1=ZCORR(1)
DO 5000 IEL=1,16
ANGLR=(90.-DELPH(IEI))/RAD
COSANG=COS(ANGLR)
TANANG=TAN(ANGLR)
IF(ICORR.NE.2)GO TO 5122
ZCORR(IEI)=ZCORR1/ZCORR(IEI)
ZCORR(IEI)=ZCORR(IEI)+ZCORR(IEI)
5102 ICONST=2*IEL-1
DO 5120 I=1,16
IRXWD=ICONST+32*(I-1)
I2=2*I
I2M=I2-1
ISAMPL(I2M)=WRUF(IRXWD)
ISAMPL(I2)=WRUF(IRXWD+1)*IQCORR(IEI)/COSANG-ISAMPL(I2M)*TANANG
```

C
C
C

WINDOW PRIOR TO FFT

```
ZSAMPL=CMPLX(ISAMPL(I2M),ISAMPL(I2))*CMPLX(DOLPH(1),0.0)
IF(ICORR.EQ.2)ZSAMPL=ZSAMPL*ZCORR(IEI)
ISAMPL(I2M)=REAL(ZSAMPL)
5100 ISAMPL(I2)=AIMAG(ZSAMPL)
CALL FORT(4,-1,ISAMPL,IFERR)
```

C
C
C

GET AMP AND PHASE OF CAL TONE

```
DO 5101 I=1,16
I2=2*I-1
5101 CALL AMPHAS(ISAMPL(I2),ISAMPL(I2+1),XAM(I),XPH(I))
NPTS=16
KOUNT=2
CALL FNDMAX(XAM,NPTS,KOUNT)
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```

KOUNT2=2*KOUNT
ZTEMP(TEL)=CMPLX(1SAMPL(KOUNT2-1),1SAMPL(KOUNT2))
IF(ICORR.GT.1)GO TO 4999
ZCORR(TEL)=ZTEMP(TEL)
4999 AM(TEL)=XAM(KOUNT)/3276.7
5000 PH(TEL)=XPH(KOUNT)
C
C PRINT OUT 16 ELEMENT AMPLITUDES AND PHASES
C
501 CALL SSWTCH(2,IUP)
IF(IUP.EQ.1)GO TO 501
CALL PLTE2F
IF(ICORR.GT.1.OR.ISOURCE.NE.1)GO TO 6799
CJ
C COMPUTE AND PLOT MONOPOLE CORRECTIONS
C
DO 6799 I=1,16
PH(I)=PH(I)+SPHCR(I)*RAD
IF(PH(I).GT.360) PH(I)=PH(I)-360.
6799 CONTINUE
CALL SPHCOM(ZCORR,SPHCR)
5002 CALL SSWTCH(2,IUP)
IF(IUP.EQ.1)GO TO 5002
CALL PLTE2F
CALL PLOT(1,0,2.6,-1)
WRITE(13,115)
115 FORMAT(/6X,'WITH MONOPOLE CORRECTIONS')
6799 CONTINUE
6800 CONTINUE
C
C NOW AVERAGE CORRECTION FACTORS OVER LTIMES AND
C SAVE LATEST CORRECTION FACTORS ON DISC
C
FLTLT=LTIMES
DO 6812 I=1,16
IQCOR(I)=COR(I)/FLTLT
DELPH(I)=FLPH(I)/FLTLT
ZTEMP1=REAL(ZZCORR(I))/FLTLT
ZTEMP2=ATMAG(ZZCORR(I))/FLTLT
6812 ZCORR(I)=CMPLX(ZTEMP1,ZTEMP2)
ISECT=1
CALL DSKOUT(OUTBUF,ISECT,64)
C
C TASK COMPLETE NOW CHECK SS2 IF UP, WAIT IF DOWN COMPUTE
C A NEW SET OF CALIBRATION CORRECTION FACTORS
C
502 CALL SSWTCH(2,IUP)
IF(IUP.EQ.1)GO TO 502
CALL BURST
WRITE(13,6811)IQCOR,DELPH,ZCORR
6811 FORMAT(/7/2(/1X,BF9.4),/2(/1X,BF9.3),/2(/1X,4(2F7.4,4X)))
503 CALL SSWTCH(2,IUP)
IF(IUP.EQ.1)GO TO 503
GO TO 1
C
SMCALT EQU F.MAIN NAME THE PROGRAM MCALT
S NTRY MCALT
S LIRR MCALT
END

```

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```

SUBROUTINE SPHCOM(Z,SPHCOM)

00300

S LARR SPHCOM

00300

COMPLEX Z(16)

00310

REAL CARS,COS

00311

DIMENSION SPHCOM(16)

00312

COMMON IDUM(1047),DUM(96),PH(32),IDUM1(12)

00313

DO 1 I=1,16

00314

Q1=CARS(Z(I))

00315

Q3=PH(I)/57.29578

00316

Q4=Q1+COS(Q3)

00317

Q5=Q1+SIN(Q3)

00318

1 Z(I)=CMPLX(Q4,Q5)

00319

RETURN

00320

END

00321

S	SUBROUTINE RDTAPE(IFILE)	00323
S	NTRY RDTAPE	00324
S	LIAR RDTAPE	00325
C		00326
C	TAPE READ ROUTINE FOR CORRECTION FACTORS GENERATION ONLY USING	00327
C	PROGRAM CALT	00328
C		00329
	COMMON IBUF1(262),IBUF2(262),INBUF(523)	00330
	DATA ICOLON/ZRAAO/	00331
	5 NWORDS=523	00332
	IUNIT=9	00333
	IEOF=0	00334
	10 CALL INP7(INBUF,NWORDS,IUNIT,IFILE,NWR)	00335
	IF(IFILE)1,2,3	00336
C	PARITY ERROR ON TAPE	00337
	1 WRITE(3,100)NWR	00338
	100 FORMAT(/5X,'TAPE PARITY',I5,'WORDS READ')	00339
	GO TO 10	00340
C	END OF FILE CONDITION	00341
	3 WRITE(3,101)	00342
	101 FORMAT(/5X,'TAPE EOF')	00343
	IEOF=IEOF+1	00344
	IF(IEOF.GE.2)STOP	00345
	GO TO 10	00346
C	NORMAL READ	00347
	2 IF(NWR.EQ.10)GO TO 4	00348
	IF(NWR.NE.523)WRITE(3,102)NWR	00349
	102 FORMAT(/15X,23HRECORD LENGTH INCORRECT,I5,11H WORDS READ)	00350
	CALL TMOVE(INBUF(513))	00351
	RETURN	00352
	4 WRITE(13,104)(INBUF(I),I=1,6),ICOLON,INBUF(7)	00353
	104 FORMAT(/2X,A2,3X,3A2,3X,2A2,A1,A2)	00354
	IFILE=+1	00355
	GO TO 5	00356
	END	00357

SUBROUTINE RIRDOT(K)

S	NTRY	RIRDOT		00359
S	LIBR	RIRDOT		00360
	I=K			00361
1111	CONTINUE			00362
S	D	R.MACH,0		00363
S	LDW	I	FETCH NUMBER OF TIMES THRU LOOP	00364
S	DOT	7,1		00365
S	SMB	R.EXEC		00366
S	JSX	R.EXEC		00367
	RETURN			00368
	END			00369
				00370

SUBROUTINE PLTE2E

NTRY PLTE2E

LIBR PLTE2E

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S
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SUBROUTINE PLTE2E PLOTS AMPLITUDE AND PRINTS OUT PHASES AND
DIFFERENCES FOR 16 ELEMENTS

REAL PHIOUT(16),DIFRAD(16),DIFVLT(16),TOTERR(16)

INTEGER CTIME,STIME,IV(6),IE(7)

COMMON IDUMMY(1111),AM(32),PH(32),CTIME(6),STIME(6)

DATA RAD,ICOLON/57.29578,ZBAA0/

DATA (IV(I),I=1,6)/ZA0A0,ZA0A0,ZA0A0,ZA0D6,ZCFCC,ZD4D3/

DATA (IE(I),I=1,7)/ZA0A0,ZA0C5,ZCCC5,ZCDC5,ZCED4,ZA0CE,ZCFAE/

CALL BURST

WRITE(13,100)(CTIME(I),I=1,5),ICOLON,CTIME(6)

100 FORMAT(22X,'CORRECTION TIME ',3A2,3X,2A2,A1,A2)

CALL TKWAIT

CALL TKPLOT(0,0,0)

XSTART=2.

YSTART=3.3

CALL AXIS(XSTART,YSTART,IE,-14,3.0,0.0,1.0,5.0)

CALL AXIS(XSTART,YSTART,IV,+12,2.0,00.0,0.001,1.0)

DO 5002 I=1,16

X=FLOAT(I-1)*0.2+XSTART

Y=AM(I)/1.7+YSTART

IF(I.GT.1)GO TO 5001

CALL PLOT(X,Y,3)

GO TO 5002

5001 CALL PLOT(X,Y,2)

5002 CONTINUE

DO 5003 I=1,16

PHIOUT(I)=PH(I)-PH(1)

IF(PHIOUT(I).LT.-180.0)PHIOUT(I)=PHIOUT(I)+180.0

IF(PHIOUT(I).GT.180.0)PHIOUT(I)=PHIOUT(I)-180.0

DIFRAD(I)=PHIOUT(I)/RAD

DIFVLT(I)=1.0-(AM(I)/AM(1))

5003 TOTERR(I)=SQRT(DIFRAD(I)**2+DIFVLT(I)**2)

CALL PLOT(0,0,2.6,-1)

WRITE(13,1)AM(1),PH(1),(PH(I),I=1,8),(PHIOUT(I),I=1,8),

*(DIFRAD(I),I=1,8),(DIFVLT(I),I=1,8),(TOTERR(I),I=1,8),

*(PH(I),I=9,16),(PHIOUT(I),I=9,16),(DIFRAD(I),I=9,16),(DIFVLT(I),

*I=9,16),(TOTERR(I),I=9,16)

1 FORMAT(6X,'ELEMENT PHASE AND AMPLITUDES',5X,'ELEMENT 1 AMP',F7.2,

* /50X,3HPPHS,F7.2,2(/1X,6HPPHASE ,BF8.2,/3X,4HDIF ,BF8.4,/7HERRPHS

* ,BF8.4,/7HERRVLT ,BF8.4,/7HTOTERR ,BF8.4))

RETURN

END

```

SUBROUTINE AMPHAS(X,Y,A,P)
S      NTRY  AMPHAS
S      LIBR  AMPHAS
RAD=57.29578
A=SQRT(X*X+Y*Y)
P=0.0
IF(Y.EQ.0.0)RETURN
IF(X.LT.0.0)GO TO 67
P=ATAN(Y/X)*RAD
IF(Y.LT.0.0)P=360.0+P
RETURN
67 P=180.0+ATAN(Y/X)*RAD
RETURN
END

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S      SUBROUTINE FNDMAX(XAM,NPTS,KOUNT)
S      NTRY FNDMAX
S      LIAR FNDMAX
      DIMENSION XAM(16)
      K=KOUNT+1
      PMAX=XAM(KOUNT)
      DO 1 I=K,NPTS
      IF(XAM(I).LT.PMAX)GO TO 1
      PMAX=XAM(I)
      KOUNT=I
1 CONTINUE
      RETURN
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APPENDIX B
CONVENTIONAL ANGULAR POWER DENSITY SPECTRA

PROGRAM CONV

THIS PROGRAM IS CALLED 'CONVT'
 RETRIEVES CORRECTION FACTORS FROM DISK (PREVIOUSLY GENERATED BY
 PROGRAM 'MCALT'), READS DATA AND APPLIES SAID CORRECTION
 FACTORS, COMPUTES AND PLOTS CONVENTIONAL MAPS ON THE TEKTRONIX
 CRT USING DATA COLLECTED ON THE
 16 ELEMENT ARRAY AT RADC, DEXTER, NEW YORK.
 READS TAPE INPUT ONLY

4 SEPTEMBER 1975 WITH KOUNT FIX AND SPC=18.288

REAL ISAMPL(32), IQCORR(16), DELPH(16), BUF(64), COSANG(16),
 * TANANG(16), XAM(16), XPH(16)

REAL COS, AM(16), PH(16), YPOINT(17)

REAL XPOINT(17)

INTEGER CTIME(6), WRUF(523), IAZ(6), IDR(6)

INTEGER KNTST(16), KNTCNT(16)

COMPLEX ZCORR(16), ZTEMP(16), DOLPH(16), ZSAMPL

COMMON IBUF1(262), IBUF2(262), INBUF(523)

EQUIVALENCE (INBUF(1), WRUF(1))

EQUIVALENCE (BUF(1), IQCORR(1)), (BUF(17), DELPH(1)),

* (BUF(33), ZCORR(1))

DATA (DOLPH(I), I=1, 16) / (0.01266, 0.0), (0.05237, 0.0), (0.13904, 0.0),

* (0.28431, 0.0), (0.48131, 0.0), (0.69921, 0.0), (0.889, 0.0), (1.0, 0.0),

* (1.0, 0.0), (0.889, 0.0), (0.69921, 0.0), (0.48131, 0.0), (0.28431, 0.0),

* (0.13904, 0.0), (0.05237, 0.0), (0.01266, 0.0) /

DATA (IAZ(I), I=1, 6) / ZAA00, ZAA00, ZC10A, ZC9CD, ZD5D4, ZC8A0 /

DATA (IDR(I), I=1, 6) / ZAA00, ZAA00, ZAA04, ZC2A0, ZC4CF, ZD7CF /

DATA PI, RAD, NSAMP, NCHAN, ICOLON / 3.14159, 57.29578, 512, 32, ZRAA0 /

DATA IDUM / ZAA00 /

TAN(DUMMY) = SIN(DUMMY) / COS(DUMMY)

ARSIN(DUMMY) = ATAN(DUMMY / SQRT(1.0 - DUMMY**2))

RETRIEVE CORRECTION FACTORS FROM DISK
 COMPUTE ELEMENTAL PHASE ANGLE CORRECTIONS

ISECT=1

CALL DSKIN(BUF, ISECT, 64)

DO 91 IEL=1, 16

ANGLR = (90.0 - DELPH(IEL)) / RAD

COSANG(IEL) = COS(ANGLR)

91 TANANG(IEL) = TAN(ANGLR)

INPUT DESIRED TIME AND SEARCH TAPE FOR IT

1 CALL BURST

WRITE(13, 100)

100 FORMAT('INPUT DESIRED TIME--HR, MIN, SEC; FREQ (3A2, F7.3)')

READ(13, 101) IHR, IMIN, ISEC, FREQ

101 FORMAT(3A2, F7.3)

UMAX = 300. / (FREQ * 2. * 18.288)

WRITE(13, 20057)

20057 FORMAT(' SPACING=18.288 M')

UMAX = 1

IF(XU.LT.0.) XU=0.	00061
IF(XU.GT.1.) XU=1.	00062
XANGL=ARSIN(XU)*RAD	00063
XUL=3.5-XANGL/30.	00064
XUR=3.5+XANGL/30.	00065
XPOINT(9)=3.5	00066
DO 1010 IP=1,8	00067
UTHET=FLOAT(IP)*UMAX/8.	00068
THIN=3.	00069
IF(UTHET.LT.1.) THIN=RAD*ARSIN(UTHET)/30.	00070
XPOINT(IP+9)=3.5+THIN	00071
IPP=9-IP	00072
XPOINT(IPP)=3.5-THIN	00073
1010 CONTINUE	00074
10 IFILE=+1	00075
11 CALL ROTAPE(IFILE)	00076
CALL TMASCI(CTIME)	00077
IF(CTIME(4).NE.IHR.OR.CTIME(5).NE.IMIN.OR.	00078
1 CTIME(6).NE.ISEC) GO TO 10	00079
GO TO 15	00080
2 IFILE=+1	00081
CALL ROTAPE(IFILE)	00082
CALL TMASCI(CTIME)	00083
15 DO 16 I=1,NSAMP	00084
16 WRUF(I)=FLOAT(INBUF(I))	00085
C	00086
C APPLY ALL CORRECTION FACTORS TO NEW SAMPLES, ADD WEIGHTS AND	00087
C DO A COMPLEX FFT	00088
C WINDOW PRIOR TO FFT	00089
C	00090
DO 5995 I=1,16	00091
5995 KNTCNT(I)=1	00092
DO 6000 IEL=1,16	00093
ANGLR=(90.-DELPH(IEI))/RAD	00094
COSANG=COS(ANGLR)	00095
TANANG=TAN(ANGLR)	00096
ICONST=2*IEL-1	00097
DO 6001 I=1,16	00098
IRXWD=ICONST+32*(I-1)	00099
I2=2*I	00100
I2M=I2-1	00101
ISAMPL(I2M)=WRUF(IRXWD)	00102
ISAMPL(I2)=WRUF(IRXWD+1)*TCORA(IEI)/COSANG-ISAMPL(I2M)*TANANG	00103
ZSAMPL=CMPLX(ISAMPL(I2M),ISAMPL(I2))*ZCORR(IEI)*DOLPH(I)	00104
ISAMPL(I2M)=REAL(ZSAMPL)	00105
6001 ISAMPL(I2)=AIMAG(ZSAMPL)	00106
CALL FORT(4,-1,ISAMPL,IFERR)	00107
DO 40 I=1,16	00108
I2=2*I-1	00109
40 CALL AMPHAS(ISAMPL(I2),ISAMPL(I2+1),XAM(I),XPH(I))	00110
NPTS=16	00111
KOUNT=2	00112
CALL FNDMAX(XAM,NPTS,KOUNT)	00113
KOUNT2=2*KOUNT	00114
KNTCNT(KOUNT)=KNTCNT(KOUNT)+1	00115
KNTST(IEI)=KOUNT	00116
6000 ZTEMP(IEI)=CMPLX(ISAMPL(KOUNT2-1),ISAMPL(KOUNT2))	00117
KMAX=2	00118
DO 6003 I=3,16	00119
IF(KNTCNT(I).LT.KNTCNT(KMAX)) GO TO 6003	00120
KMAX=I	00121
6003 CONTINUE	00122

KOUNT=KMAX	00123
KOUNT2=KOUNT*2	00124
DO 6005 IEL=1,16	00125
IF(KNTST(IEI).EQ.KOUNT) GO TO 6005	00126
ANGLR=(90.-DELPH(IEI))/RAD	00127
COSANG=COS(ANGLR)	00128
TANANG=TAN(ANGLR)	00129
ICONST=2*IEL-1	00130
DO 6201 I=1,16	00131
IRXWD=ICONST+32*(I-1)	00132
I2=2*I	00133
I2M=I2-1	00134
ISAMPL(I2M)=WBUFF(IRXWD)	00135
ISAMPL(I2)=WBUFF(IRXWD+1)*IQCORA(IEI)/COSANG-ISAMPL(I2M)*TANANG	00136
ZSAMPL=CMPLY(ISAMPL(I2M),ISAMPL(I2))*ZCORR(IEI)*DOLPH(I)	00137
ISAMPL(I2M)=REAL(ZSAMPL)	00138
6201 ISAMPL(I2)=AIMAG(ZSAMPL)	00139
CALL FORT(4,-1,ISAMPL,IFERR)	00140
ZTEMP(IEI)=CMPLY(ISAMPL(KOUNT2-1),ISAMPL(KOUNT2))	00141
6005 CONTINUE	00142
C	00143
C APPLY 70DB D-T WINDOW AND FFT ACROSS THE 16 ELEMENTS	00144
C	00145
DO 31 I=1,16	00146
ZTEMP(I)=ZTEMP(I)*DOLPH(I)	00147
I2=2*I	00148
ISAMPL(I2-1)=REAL(ZTEMP(I))	00149
31 ISAMPL(I2)=AIMAG(ZTEMP(I))	00150
CALL FORT(4,-1,ISAMPL,IFERR)	00151
DO 32 I=1,16	00152
I2=2*I-1	00153
32 CALL AMPHAS(ISAMPL(I2),ISAMPL(I2+1),XAM(I),XPH(I))	00154
NPTS=16	00155
KOUNT=1	00156
C	00157
C FIND PEAK AND PLOT CONVENTIONAL MAP	00158
C	00159
CALL FNDMAX(XAM,NPTS,KOUNT)	00160
PEAK=XAM(KOUNT)	00161
PKLG=20.*ALOG10(PEAK)	00162
DO 300 I=1,16	00163
IF(XAM(I).LT.1.0E-20)XAM(I)=1.0E-20	00164
300 XAM(I)=PKLG-20.*ALOG10(XAM(I))	00165
502 CALL SSWTCH(2,IUP)	00166
IF(IUP.EQ.1)GO TO 502	00167
CALL BURST	00168
CALL TKPLOT(2,0,0)	00169
YSTART=1.4	00170
CALL AXIS(.5,YSTART,IAZ,-11,6.0,0.0,-90.,30.001)	00171
CALL AXIS(.5,YSTART,IDB,+12,4.0,0.0,-90.0,20.001)	00172
DO 35 I=1,8	00173
35 YPOINT(I)=XAM(I+8)	00174
DO 36 I=9,17	00175
36 YPOINT(I)=XAM(I-8)	00176
DO 33 I=1,17	00177
X=XPOINT(I)	00178
Y=(YSTART+4.0)-(YPOINT(I)/20.0)	00179
IF(Y.LT.YSTART)Y=YSTART	00180
IF(I.GT.1)GO TO 34	00181
CALL PLOT(X,Y,3)	00182
GO TO 33	00183
CALL PLOT(X,Y,2)	00184

```

33 CONTINUE
  CALL PLOT(XIIR,YSTART+.1,3)
  CALL PLOT(XIIR,YSTART,2)
  CALL PLOT(XIIL,YSTART+.1,3)
  CALL PLOT(XIIL,YSTART,2)
  CALL PLOT(2,0,0.5,-1)
  WRITE(13,102)(CTIME(I),I=1,5),ICOL7N,CTIME(6),KMAX
102  FORMAT(9X,'SAMPLE TIME',3X,3A2,3X,2A2,A1,A2,9X,'KMAX=',I2)
  CALL TKWAIT
C
C  SS2 UP = WAIT
C
500 CALL SSWTCH(2,IUP)
  IF(IUP.EQ.1)GO TO 600
C  SS1 DOWN=CONTINUE PROCESSING      UP=INPUT NEW TIME
C  SS1 UP=CONTINUE PROCESSING
C
  CALL SSWTCH(1,IUP)
  IF(IUP.EQ.1)GO TO 1
  GO TO 2
SCONVT  EQU  F.MAIN      NAME THE PROGRAM CONVT
S       NTRY  CONVT
S       LIAR  CONVT
      END

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SUBROUTINE RDTAPE(IFILE)

 NTRY RDTAPE

 LIBR RDTAPE

TAPE READ ROUTINE FOR CORRECTION FACTORS GENERATION ONLY USING
PROGRAM CALT

COMMON IRUF1(262),IRUF2(262),INRUF(523)

DATA ICOLON/ZBAAQ/

5 NWORDS=523

 IUNIT=9

 IEOF=0

10 CALL INP7(INRUF,NWORDS,IUNIT,IFILE,NWR)

 IF(IFILE)1,2,3

C PARITY ERROR ON TAPE

1 WRITE(3,100)NWR

100 FORMAT(/5X,'TAPE PARITY',I5,'WORDS READ')

 GO TO 10

C END OF FILE CONDITION

3 WRITE(3,101)

101 FORMAT(/5X,'TAPE EOF')

 IEOF=IEOF+1

 IF(IEOF.GE.2)STOP

 GO TO 10

C NORMAL READ

2 IF(NWR.EQ.1)GO TO 4

 IF(NWR.NE.523)WRITE(3,102)NWR

102 FORMAT(/15X,23HRECORD LENGTH INCORRECT,I5,11H WORDS READ)

 CALL TMOVE(INRUF(513))

 RETURN

4 WRITE(13,104)(INRUF(I),I=1,6),ICOLON,INRUF(7)

104 FORMAT(/2X,A2,3X,3A2,3X,2A2,A1,A2)

 IFILE=+1

 GO TO 5

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APPENDIX C
ADAPTIVE ANGULAR POWER DENSITY SPECTRA

PROGRAM ADAPT

THIS PROGRAM IS CALLED 'ADAPT'
IT GENERATES AND PLOTS A ONE-DIMENSIONAL ADAPTIVE MAP USING THE
16 ELEMENT ARRAY AT RADC, DEXTER, NEW YORK.
READS TAPE INPUT ONLY

25 AUGUST 1975

1030

```

REAL IQCORR(16), DELPH(16), RUF(64), SAMPL(32), COSANG(16), TANANG(16)
REAL AM(16), COS
INTEGER IAZ(11), IDR(6), STIME(6), DIM(523)
COMPLEX ZCORR(16), ZSAMPL, DOLPH(16)

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COMMON IRUF1(262), IRUF2(262), INRUF(523), DRPOW(65), MELEM, DUMD(32),
* AL(272), TOL, VS(32), WT(32), REPI, REPO, AMP, POSD, UTHFT, SPFL, MA(64),
* BL(272)

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EQUIVALENCE (INRUF(1), DIM(1))
EQUIVALENCE (RUF(1), IQCORR(1)), (RUF(17), DELPH(1)),
* (RUF(33), ZCORR(1)), (DRPOW(1), SAMPL(1)), (DRPOW(33), COSANG(1)),
* (DRPOW(49), TANANG(1))

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```

DATA (DOLPH(1), I=1, 16)/(0.01266, 0.0), (0.05237, 0.0), (0.13904, 0.0),
* (0.28431, 0.0), (0.48131, 0.0), (0.69921, 0.0), (0.880, 0.0), (1.0, 0.0),
* (1.0, 0.0), (0.880, 0.0), (0.69921, 0.0), (0.48131, 0.0), (0.28431, 0.0),
* (0.13904, 0.0), (0.05237, 0.0), (0.01266, 0.0)/
DATA(IAZ(1), I=1, 11)/74000, 74000, 74000, 74000, 74000, 74000, 74000,
* 74000, 74000, 74000, 74000/
DATA(IDR(1), I=1, 6)/74000, 74000, 74000, 74000, 74000, 74000/
DATA PI, RAD, NSAMP, NCHAN, TCOLON/3.14159, 57.29578, 512, 32, 74000/
DATA IDUM/74000/

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ARSIN(DUMMY)=ATAN2(DUMMY, SQRT(1.0-DUMMY**2))

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TAN(DUMMY)=SIN(DUMMY)/COS(DUMMY)

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C
TOL=1.3E-16
1 CONTINUE
DO 20 I=1, 272
AL(I)=0.0
20 BL(I)=0.0
IDSPLA=0

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CHECK SSA - IF UP USE FORMER PARAMETERS

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CALL SSATCH(0, IUP)
IF(IUP.EQ.1)GO TO 166
CALL BURST
WRITE(13, 4)
4 FORMAT(37HMODE? FREQ? EL. SPACING? (12, 2F7.3))
READ(13, 44)MODE, FREQ, SPACE
44 FORMAT(12, 2F7.3)
IF(MODE.LE.3)GO TO 3
XLAMDA=320.0/FREQ
SSPL=SPACE/XLAMDA*2.0*PI
SPFL=SSPL
XK=SSPL/PI
XU=2.0/XK-1.0
33XU LE 0.0)GO TO 97

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      IF(XU.GT.1.0)XU=1.0
      XANGL=ARSIN(XU)*RAD
      GO TO 98
07  XANGL=0.0
08  CONTINUE
111  WRITE(13,6)
06  FORMAT(' TIME HR,MIN,SEC; NO OF ELEMENT (3A2,I3)')
      READ(13,113) IHR,IMIN,ISEC,MELEM
113  FORMAT(3A2,I3)
      IF(MELEM.GT.16)GO TO 111
      112 WRITE(13,8)
08  FORMAT(16HCONFIGURATION X)
      READ(13,9)(MA(I),I=1,16)
09  FORMAT(16I1)
      DO 701 I=17,64
0701 MA(I)=0
      ISUM=0
      DO 71 I=1,64
      71 ISUM=ISUM+MA(I)
      IF(ISUM.EQ.MELEM)GO TO 711
      WRITE(13,72)MA
      72 FORMAT(64I1,/20X,19HCONFIGURATION ERROR)
      GO TO 112
      711 WRITE(13,12)
      12 FORMAT('NGROUP? (I5)')
      READ(13,11)NGROUP
      11 FORMAT(I5)
      MELEM2=2*MELEM
1167 IFILE=1
      CALL ROTP(IFILE)
      CALL TMASCT(STIME)
      IF(STIME(4).NE.IHR.OR.STIME(5).NE.IMIN.OR.STIME(6)
      1 .NE.ISEC) GO TO 1167
      IFIRST=0
C
C  RETRIEVE CORRECTION FACTORS FROM DISK
C  COMPUTE ELEMENTAL PHASE ANGLE CORRECTIONS
C
166 ISECT=1
      CALL DSKIN(HUF,ISECT,64)
      DO 91 IEL=1,16
      ANGLR=(90.0-DELPH(IEI))/RAD
      COSANG(IEI)=COS(ANGLR)
      91 TANANG(IEI)=TAN(ANGLR)
      IF(MODE.EQ.2)GO TO 5099
C
C  APPLY CORRECTION FACTORS
C
      DO 93 N=1,NGROUP
      CALL RIHDOT(N)
      IF(IFIRST.EQ.0) GO TO 1168
      IFILE=+1
      CALL ROTP(IFILE)
      CALL TMASCT(STIME)
1168 IFIRST=1
      DO 93 NPULSE=1,16
      INORD=32*(NPULSE-1)
      DO 912 IEL=1,MELEM
      I2=2*IEL
      IDNUM=I2+INORD
      SAMPL(I2-1)=FLOAT(DUM(IDNUM-1))
      SAMPL(I2)=FLOAT(DUM(IDNUM))*ICORA(IEI)/COSANG(IEI)-SAMPL(I2-1)

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1 *TANANG(TEL)
ZSAMPL=CMPLX(SAMPL(I2-1),SAMPL(I2))*ZCORR(TEL)
SAMPL(I2-1)=REAL(ZSAMPL)
912 SAMPL(I2)=AIMAG(ZSAMPL)
DO 931 K=1,MELEM2
931 DUMD(K)=SAMPL(K)
C
C GENERATE THE COVARIANCE MATRIX
C
93 CALL ADCRM
GO TO 6010
C
C MODE 2
C GET SAMPLES FOR EACH I-Q PAIR, CORRECT, AND APPLY WINDOW
C
5909 DO 930 N=1,NGROUP
IFILE=+1
CALL RDTP(IFILE)
CALL TMASCI(STIME)
DO 6000 IEL=1,MELEM
ICONST=2*IEL-1
DO 6001 J=1,16
JR=ICONST+32*(J-1)
J2=2+J
SAMPL(J2-1)=FLOAT(DUM(JR))
SAMPL(J2)=FLOAT(DUM(JR+1))*TQCORA(TEL)/COSANG(TEL)-SAMPL(J2-1)
* *TANANG(TEL)
ZSAMPL=CMPLX(SAMPL(J2-1),SAMPL(J2))*ZCORR(TEL)*DOLPH(J)
SAMPL(J2-1)=REAL(ZSAMPL)
6001 SAMPL(J2)=AIMAG(ZSAMPL)
C
C DO COMPLEX FFT - DISPLAY THE FIRST SPECTRUM
C
CALL FORT(4,-1,SAMPL,JEFFR)
DO 6002 J=1,16
J2=2+J
CALL AMPHAT(SAMPL(J2-1),SAMPL(J2),AM(J),PH)
6002 AM(J)=AM(J)/3276.7
IF(IDSPLA.GE.1)GO TO 6008
IDSPLA=1
CALL TXPLOT(0,0,0)
503 CALL SWITCH(2,IUP)
IF(IUP.EQ.1)GO TO 503
CALL BURST
XSTART=1.5
YSTART=2.5
CALL AXIS(XSTART,YSTART,IDUM,-2,4,0,0,0.01,4,0)
CALL AXIS(XSTART,YSTART,IDUM,+2,3,0,0,0.01,4,0)
DO 6003 J=1,16
X=FLOAT(1)/4.0+XSTART
Y=AM(J)/4.0+YSTART
IF(I.GT.1)GO TO 6004
CALL PLOT(X,Y,3)
GO TO 6003
6004 CALL PLOT(X,Y,2)
6003 CONTINUE
C
C NOW CHOOSE DESIRED CELL
C
CALL PLOT(4,0,1,0,-1)
WRITE(13,203)AM
203 FORMAT(PE7,1)

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WRITE(13,222)	00185
202 FORMAT(/'INPUT CELL NO. (I2)')	00186
READ(13,113)ICELL	00187
JCELL=2*ICELL-1	00188
6008 DUMD(ICONST)=SAMPL(JCELL)	00189
DUMD(ICONST+1)=SAMPL(JCELL+1)	00190
6000 CONTINUE	00191
C	00192
C GENERATE COVARIANCE MATRIX	00193
C	00194
930 CALL ADCRMT	00195
6010 CONTINUE	00196
C	00197
C	00198
C	00199
C INVERT THE COVARIANCE MATRIX	00200
C	00201
DO 94 I=1,272	00202
94 BL(I)=AL(I)	00203
CALL CHLKYA	00204
CALL INVTL	00205
CALL HINVL	00206
C	00207
C CHECK GOODNESS	00208
C	00209
CALL MULHM	00210
CALL PRPKE	00211
AMP=1.0	00212
C	00213
C	00214
C	00215
C 64 STEERS + BORESITE = 65 TOTAL LOOKS	00216
C	00217
C DO ALL STEERS EXCEPT BORESITE. BEGIN AT U=-1 AND STEP ALONG	00218
C TOWARDS BORESITE. FOR EACH -AZIMUTH DO A +AZIMUTH BY SETTING	00219
C IMAGINARY PART OF STEER VECTOR VS TO A - VALUE AND CONTINUE.	00220
C	00221
UINCR=2.0/64.0	00222
USTART=-1.0	00223
DO 75 I=1,32	00224
CALL RIRDOT(I)	00225
FI=FLOAT(I-1)	00226
UTHET=USTART+(FI*UINCR)	00227
CALL SGEN3	00228
DO 96 K=1,MELEM2	00229
96 VS(K)=DUMD(K)	00230
CALL HXV	00231
CALL VSRXW	00232
DBPOW(I)=1.0/REPI	00233
C	00234
C DO + SIDE OF AZIMUTH	00235
C	00236
DO 64 K=1,MELEM	00237
64 VS(2*K)=-VS(2*K)	00238
CALL HXV	00239
CALL VSRXW	00240
ISUR=66-I	00241
75 DBPOW(ISUR)=1.0/REPI	00242
C	00243
C FINISHED ALL STEERS. NOW DO BORESITE	00244
C	00245
DO 65 K=1,MELEM	00246

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K2=2*K
VS(K2-1)=1.1
65 VS(K2)=1.1
CALL MXV
CALL VSRX
ORPOW(33)=1.2/REPI
PEAK=ORPOW(1)
DO 123 I=2,65
IF(ORPOW(I).GT.PEAK)PEAK=ORPOW(I)
123 CONTINUE
XGLG=12.2+ALOG12(PEAK)
DO 124 I=1,65
IF(ORPOW(I).LT.1.2E-20)ORPOW(I)=1.2E-20
124 ORPOW(I)=XGLG-12.2+ALOG12(ORPOW(I))
WRITE(13,271)ORPOW
271 FORMAT(271,'ORPOW',271/(RFQ,1))
C
C   PLOT THE ADAPTIVE ADP
C
522 CALL SSATCH(2,IUP)
IF(IUP.EQ.1)GO TO 500
CALL FIRST
CALL PLOT(2,0,0)
XSTART=2.5
YSTART=1.4
CALL AXIS(XSTART,YSTART,IAZ,-11,6.,7.,-92.,30.001)
CALL AXIS(XSTART,YSTART,IDH,+12,4.2,90.0,-80.0,20.201)
DO 125 I=1,65
XX=FLOAT(I-33)/32.
Y=3.5+SIGN(3.,XX)
IF(ABS(XX).LT.1.) X=3.5+ARCSIN(XX)*RAD/30.
Y=(YSTART+4.0)-(ORPOW(I)/20.0)
IF(Y.LT.YSTART)Y=YSTART
IF(I.GT.1)GO TO 1041
CALL PLOT(X,Y,3)
GO TO 105
1041 CALL PLOT(X,Y,2)
105 CONTINUE
XMOV=XANGL/30.
XMID=XSTART+3.0
XULEFT=XMID-XMOV
XURITE=XMID+XMOV
CALL PLOT(XULEFT,YSTART+2.1,3)
CALL PLOT(XULEFT,YSTART,2)
CALL PLOT(XURITE,YSTART+2.1,3)
CALL PLOT(XURITE,YSTART,2)
CALL PLOT(2,0,0,8,-1)
WRITE(13,122)MODE,MELEM,SPACE,FREQ,XANGL,(STIME(I),I=1,5),ICOLON,
* STIME(6),NGROUP
102 FORMAT(12X,4HMODE,I2,5X,I2,9H ELEMENTS,5X,7HSPACING,F7.3,
* 7H METERS,/12X,4HFREQ,F7.3,4H MHZ,12X,6HLIMITS,F5.1,8H DEGREES,
* /12X,13HSAMPLE TIME ,3A2,3X,2A2,A1,A2,5X,'NGROUP=',I4)
501 CALL SSWTCH(2,IUP)
IF(IUP.EQ.1)GO TO 501
GO TO 1
2 STOP
SADAPT EQU F.MAIN NAMES THE PROGRAM ADAPT
S NTRY ADAPT
S LIRR ADAPT
END

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	SUBROUTINE RDTP(IFILE)	00308
S	NTRY RDTP	00309
S	LIBR RDTP	00310
	COMMON IBUF1(262),IBUF2(262),INBUF(523),DRPOW(65),MELEM,	00311
	* DUMD(32),AL(272),TOL,VS(32),WT(32),RFP1,REPQ,AMP,PNSD,	00312
	* UTHET,SPEL,MA(64),RL(272)	00313
	DATA ICOLON/ZBAA0/	00314
5	NWORDS=523	00315
	IUNIT=9	00316
	IEOF=0	00317
10	CALL INP7(INBUF,NWORDS,IUNIT,IFILE,NWR)	00318
	IF(IFILE)1,2,3	00319
C	PARITY ERROR ON TAPE	00320
	1 WRITE(13,100)NWR	00321
100	FORMAT(/5X,'TAPE PARITY',I5,'WORDS READ')	00322
	GO TO 10	00323
C	END OF FILE CONDITION	00324
	3 WRITE(13,101)	00325
101	FORMAT(/5X,'TAPE EOF')	00326
	IEOF=IEOF+1	00327
	IF(IEOF.GE.2)STOP	00328
	GO TO 10	00329
C	NORMAL READ	00330
	2 IF(NWR.EQ.10)GO TO 4	00331
	IF(NWR.NE.523)WRITE(3,102)NWR	00332
102	FORMAT(/15X,23HRECORD LENGTH INCORRECT,I5,11H WORDS READ)	00333
	CALL TIMOVE(INBUF(513))	00334
	RETURN	00335
	4 CONTINUE	00336
	WRITE(13,104)(INBUF(I),I=1,6),ICOLON,INBUF(7)	00337
104	FORMAT(/2X,A2,3X,3A2,3X,2A2,A1,A2)	00338
	IFILE=+1	00339
	GO TO 5	00340
		00341

APPENDIX D
RADAR PROCESSING WITH CONVENTIONAL BEAMFORMING

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C      PROGRAM RCONVT
C
C      THIS PROGRAM IS CALLED 'RCONVT'
C      RETRIEVES CORRECTION FACTORS FROM DISK (PREVIOUSLY GENERATED BY
C      PROGRAM 'MCALT'), READS DATA AND APPLIES SAID CORRECTION
C      FACTORS, COMPUTES AND PLOTS CONVENTIONAL DOPPLER SPECTRA ON THE TEK.
C      CRT USING DATA COLLECTED ON THE
C      16 ELEMENT ARRAY AT RADC, DEXTER, NEW YORK.
C      READS TAPE INPUT ONLY
C
C      17 SEPTEMBER 1975      1500
C
C      REAL ISAMPL(32), IQCOR(16), DELPH(16), RUF(64), COSANG(16),
C      * TANANG(16), XAM(16), XPH(16)
C      *, FFTD(512)
C      COMMON IBUF1(262), IBUF2(262), INBUF(523), DRPOW(65), MELEM, DUMD(32),
C      * AL(272), TOL, VS(32), WT(32), REPT, REPO, AMP, POSD, UTHFT, SPEL, MA(64),
C      * BL(272)
C      INTEGER CTIME(6), WRUF(523), IZ(6), IDB(6)
C      COMPLEX ZCORR(16), ZTEMP(16), DOLPH(16), ZSAMPL
C      * , STWT(16)
C
C      REAL COS, AM(16), PH(16), YPOINT(16)
C      REAL DLPTIM(248)
C      INTEGER IPT(5)
C      EQUIVALENCE (INBUF(1), WRUF(1))
C
C      EQUIVALENCE (RUF(1), IQCOR(1)), (RUF(17), DELPH(1)),
C      * (RUF(33), ZCORR(1))
C
C      DATA (DOLPH(I), I=1, 16)/(0.01266, 0.0), (0.05237, 0.0), (0.13904, 0.0),
C      * (0.28431, 0.0), (0.48131, 0.0), (0.69921, 0.0), (0.889, 0.0), (1.0, 0.0),
C      * (1.0, 0.0), (0.889, 0.0), (0.69921, 0.0), (0.48131, 0.0), (0.28431, 0.0),
C      * (0.13904, 0.0), (0.05237, 0.0), (0.01266, 0.0)/
C      DATA (IZ(I), I=1, 6)/ZAAAA, ZAAAA, ZAAC1, ZDAC9, ZCDD5, ZD4CR/
C      DATA (IDB(I), I=1, 6)/ZAAAA, ZAAAA, ZAAC4, ZC2A0, ZC4CF, ZD7CE/
C      DATA PI, RAD, NSAMP, NCHAN, ICOLON/3.14159, 57.29578, 512, 32, ZBAAA/
C      DATA IDUM/ZAAAA/
C      DATA IPT/0, 8, 24, 56, 120/
C      DATA NTP/0/
C
C      TAN(DUMMY)=SIN(DUMMY)/COS(DUMMY)
C
C      ARSIN(DUMMY)=ATAN(DUMMY/SQRT(1.-DUMMY**2))
C
C      COMPUTE DOLPH WEIGHTS
C      DO 911 M=4, 8
C      II=IPT(M-3)+1
C      N=2**M
C      CALL RIBDOT(N)
C      CALL DLPH(DLPTIM(II), N, 70., INDO)
C      RETRIEVE CORRECTION FACTORS FROM DISK
C      COMPUTE ELEMENTAL PHASE ANGLE CORRECTIONS
C
C      ISECT=1
C      CALL DSKIN(RUF, ISECT, 64)
C      DO 91 IEL=1, 16
C      ANGLR=(90.0-DELPH(IEL))/RAD
C      COSANG(IEL)=COS(ANGLR)
C      91 TANANG(IEL)=TAN(ANGLR)

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C		00061
C	INPUT DESIRED TIME AND SEARCH TAPE FOR IT	00062
C		00063
	1 CALL BURST	00064
C		00065
C	CHECK SSQ - IF UP USE FORMER PARAMETERS	00066
C		00067
	CALL SSWTCH(0,IUP)	00068
	IF(IUP.EQ.1) GO TO 711	00069
	WRITE(13,4)	00070
4	FORMAT(' INPUT FREQ (F7.3)')	00071
	READ(13,44) FREQ	00072
44	FORMAT(F7.3)	00073
	SPACE=18.288	00074
	XLAMDA=300.0/FREQ	00075
	SSPL=SPACE/XLAMDA*2.0*PI	00076
	SPEL=SSPL	00077
	XK=SSPL/PI	00078
	XU=2.0/XK-1.0	00079
	IF(XU.LE.0.0)GO TO 97	00080
	IF(XU.GT.1.0)XU=1.0	00081
	XANGL=ARSIN(XU)*RAD	00082
	GO TO 98	00083
97	XANGL=0.0	00084
98	CONTINUE	00085
	MELEM=16	00086
	DO 71 I=1,16	00087
71	MA(I)=1	00088
	DO 72 I=17,64	00089
72	MA(I)=0	00090
	ISUM=16	00091
711	MELEM2=2*MELEM	00092
	WRITE(13,100)	00093
100	FORMAT('INPUT DESIRED TIME HR,MIN,SEC(3A2)')	00094
	READ(13,101)IHR,IMIN,ISEC	00095
101	FORMAT(3A2)	00096
	WRITE(13,1111)	00097
1111	FORMAT(' INPUT LOG BASE 2 OF NTIMES, STEER(I1,F7.3)')	00098
	READ(13,1112) NTIMES,STEER	00099
1112	FORMAT(I1,F7.3)	00100
	UTHET=SIN(STEER/RAD)	00101
	POSD=UTHET	00102
	NTIMES=2**NTIMES	00103
	CALL SGEN3	00104
	NNT=NTIMES/16	00105
	DO 1113 K=1,MELEM	00106
	K2=2*K	00107
1113	STWT(K)=CMPLX(DUMD(K2-1),-DUMD(K2))	00108
	10 IFILE=+1	00109
	11 CALL ROTAPE(IFILE)	00110
	CALL TMASCI(CTIME)	00111
	IF(CTIME(4).NE.IHR.OR.CTIME(5).NE.IMIN.OR.CTIME(6).NE.	00112
	1 ISEC) GO TO 10	00113
1120	DO 6002 ITIMES=1,NNT	00114
	CALL RIRDOT(ITIMES)	00115
	IF(ITIMES.EQ.1) GO TO 15	00116
	CALL ROTAPE(IFILE)	00117
	CALL TMASCI(CTIME)	00118
15	DO 16 I=1,NSAMP	00119
	16 WBUF(I)=FLOAT(INBUF(I))	00120
C		00121
C	APPLY ALL CORRECTION FACTORS TO NEW SAMPLES, ADD WEIGHTS AND	00122

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C STEER AND STORE
C
  ITT=(ITIMES-1)*32
  DO 5995 IE=1,32
    II=IE+ITT
5995  FFTD(II)=0.
    DO 6000 IEL=1,16
      ICONST=2*IEL-1
      DO 6001 I=1,16
        IRXWD=ICONST+32*(I-1)
        I2=2*I
        I2M=I2-1
        ISAMPL(I2M)=WBUF(IRXWD)
        ISAMPL(I2)=WBUF(IRXWD+1)+IQCORA(IEFL)/COSANG(IEFL)-
1      ISAMPL(I2M)*TANANG(IEFL)
        ZSAMPL=CMPLY(ISAMPL(I2M),ISAMPL(I2))*ZCORR(IEFL)*DOLPH(IEFL)
1      *STWT(IEFL)
        II=I2+ITT
      FFTD(II-1)=REAL(ZSAMPL)+FFTD(II-1)
6001  FFTD(II)=AIMAG(ZSAMPL)+FFTD(II)
6000  CONTINUE
C IF DESIRED, TIME SERIES MAY BE WRITTEN ON TAPE HERE
C
C MULTIPLY BY DOLPH WEIGHTS
  IP=IPT(MTIMES-3)
  DO 6005 I=1,NTIMES
    I2=2*I
    II=I+IP
    IF(I2.GT.NTIMES) II=NTIMES+1-I+IP
    FFTD(I2-1)=FFTD(I2-1)*DLPTIM(II)
6005  FFTD(I2)=FFTD(I2)*DLPTIM(II)
C
C TAKE FFT AND PLOT SPECTRUM
  CALL FORT2(MTIMES,-1,FFTD,IFERR)
502  CALL SSWTCH(2,IUP)
    IF(IUP.EQ.1)GO TO 502
    CALL BURST
    CALL TKPLOT(0,0,0)
    YSTART=1.4
    XSTART=.5
    CALL AXIS(XSTART,YSTART,IDR,12,4,0,90,0,-90,0,20,0,1)
    CALL PLOT(XSTART,YSTART-.07,3)
    DO 5021 I=1,8
      CALL PLOT(XSTART,YSTART,2)
      XSTART=XSTART+.75
      CALL PLOT(XSTART,YSTART,2)
      CALL PLOT(XSTART,YSTART-.07,2)
5021  CONTINUE
      NSTR=NTIMES/2
      NSTP=NSTR/4
      XSTART=XSTART-.1
      YSTART=1.2
      DO 5022 I=1,9
        FN=NSTR+.1*ISIGN(1,NSTR)
        CALL NUMBER(XSTART,YSTART,.1,FN,0.,-1)
        NSTR=NSTR-NSTP
5022  XSTART=XSTART-.75
      XSTART=.5
      YSTART=1.4
      VP2=NTIMES/2
      SCN=6./FLOAT(NTIMES)
      PEAK=0.

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DO 5023 I=1,NTIMES
  J=2*I
  FFTD(I)=FFTD(J-1)**2+FFTD(J)**2
5023  PEAK=AMAX1(PEAK,FFTD(I))
      SHFT=YSTART+4.-ALOG10(PEAK)*.5
      DRMIN=PEAK*.1E-8
      IPEN=3
      X=XSTART
      DO 5024 I=1,NP2
        J=I+NP2
        Y=YSTART
        IF(FFTD(J).GT.DRMIN) Y=SHFT+ALOG10(FFTD(J))**.5
        CALL PLOT(X,Y,IPEN)
        X=X+SCN
5024  IPEN=2
      NP2=NP2+1
      DO 5025 I=1,NP2
        Y=YSTART
        IF(FFTD(I).GT.DRMIN) Y=SHFT+ALOG10(FFTD(I))**.5
        CALL PLOT(X,Y,2)
5025  X=X+SCN
      CALL PLOT(X,.,.5,-1)
      PKDB=10.*ALOG10(PEAK)
      WRITE(13,102) (CTIME(I),I=1,5),ICOLON,CTIME(6),STFER,PKDB
102  FORMAT(5X,'SAMPLE TIME ',3A2,2X,2A2,A1,A2,3X,'STFER=',F7.3,
1    ' ',PEAK='F7.3,' DR'/10X,'USING CONVENTIONAL WEIGHTS')
      CALL TKWAIT
C
C  SS2 UP = WAIT
C
600  CALL SSWTCH(2,IUP)
      IF(IUP.EQ.1)GO TO 600
C  SS1 DOWN=CONTINUE PROCESSING      UP=INPUT NEW TIME
C  SS1 UP=CONTINUE PROCESSING
C
      CALL SSWTCH(1,IUP)
      IF(IUP.EQ.1)GO TO 1
      IFILE=1
      CALL ROTAPE(IFILE)
      CALL TMASCT(CTIME)
      GO TO 1120
SRCONVT  EQU  F.MAIN
S        NTRY  RCONVT
S        LIBR  RCONVT
      END

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SUBROUTINE FORT2(M,IFS,A,IFERR)

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LIBR FORT2

DIMENSION A(512),S(128),K(16)

EQUIVALENCE (K(15),K1),(K(14),K2),(K(13),K3),(K(12),K4)

EQUIVALENCE (K(11),K5),(K(10),K6),(K(9),K7),(K(8),K8)

EQUIVALENCE (K(7),K9),(K(6),K10),(K(5),K11),(K(4),K12)

EQUIVALENCE (K(3),K13),(K(2),K14),(K(1),K15)

DATA NP/0/

IF(M)2,2,3

3 IF(M-15) 5,5,2

2 IFERR=1

1 RETURN

5 IFERR=0

N=2*M

10 IF(N-NP)20,20,12

12 IFERR=1

GO TO 200

20 K(1)=2*N

N2 = K(1)

DO 22 L=2,M

22 K(L)=K(L-1)/2

DO 24 L=M,14

24 K(L+1)=2

IJ=2

J3 = 2

DO 30 J4=J3,K4,K3

DO 30 J5=J4,K5,K4

DO 30 J6=J5,K6,K5

DO 30 J7=J6,K7,K6

DO 30 J8=J7,K8,K7

DO 30 J9=J8,K9,K8

DO 30 J10=J9,K10,K9

DO 30 J11=J10,K11,K10

DO 30 J12=J11,K12,K11

DO 30 J13=J12,K13,K12

J14=J13

26 JI=J14

27 IF(IJ-JI)20,20,20

28 T=A(IJ-1)

A(IJ-1)=A(JI-1)

A(JI-1)=T

T=A(IJ)

A(IJ)=A(JI)

A(JI)=T

29 IJ=IJ+2

JI=JI+K14

IF(JI,LE,K15) GO TO 27

J14=J14+K13

IF(J14,LE,K14) GO TO 26

30 CONTINUE

IF(IFS)32,2,36

32 FN=N

DO 34 I=1,N

A(2*I-1) = A(2*I-1)/FN

34 A(2*I)=-A(2*I)/FN

36 DO 40 I=1,N,2

T = A(2*I-1)

A(2*I-1) = T + A(2*I+1)

A(2*I+1)=T-A(2*I+1)

T=A(2*I)

A(2*I) = T + A(2*I+2)

40 A(2*I+2)=T - A(2*I+2)

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      IF(M-1) 2,1 ,50
50  LEXP1=2
      LEXP=A
      NPL= 2**MT
60  DO 130 L=2,M
      DO 80 I=2,N2,LEXP
      I1=I + LEXP1
      I2=I1+ LEXP1
      I3 =I2+LEXP1
      T=A(I-1)
      A(I-1) = T +A(I2-1)
      A(I2-1) = T-A(I2-1)
      T =A(I)
      A(I) = T+A(I2)
      A(I2) = T-A(I2)
      T= -A(I3)
      TI = A(I3-1)
      A(I3-1) =A(I1-1) - T
      A(I3 ) = A(I1 ) - TI
      A(I1-1) = A(I1-1) +T
80  A(I1) = A(I1 ) +TI
      IF(L-2) 120,120,90
90  KLAST=N2-LEXP
      JJ=NPL
      DO 110 J=4,LEXP1,2
      NPJJ=NT-JJ
      UR=S(NPJJ)
      UI=S(JJ)
      ILAST=J+KLAST
      DO 100 I= J,ILAST,LEXP
      I1=I+LEXP1
      I2=I1+LEXP1
      I3=I2+LEXP1
      T=A(I2-1)*UR-A(I2)*UI
      TI=A(I2-1)*UI+A(I2)*UR
      A(I2-1)=A(I-1)-T
      A(I2 )=A(I ) - TI
      A(I-1) =A(I-1)+T
      A(I) =A(I)+TI
      T=-A(I3-1)*UI-A(I3)*UR
      TI=A(I3-1)*UR-A(I3)*UI
      A(I3-1)=A(I1-1)-T
      A(I3) =A(I1 )-TI
      A(I1-1)=A(I1-1)+T
100  A(I1) =A(I1) +TI
110  JJ=JJ+NPL
120  LEXP1=2*LEXP1
      LEXP = 2*LEXP
      NPL = NPL/2
130  CONTINUE
140  IF(IFS)145,2,1
145  DO 150 I=1,N
150  A(2*I) =-A(2*I)
160  GO TO 1
200  NP=N
      MP=M
      NT=N/4
      MT=M-2
      IF(MT)260,260,205
205  THETA=.7853981634
210  JSTEP = NT
      JOIF = NT/2

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S(JDIF) = SIN(THETA)
IF (MT=2) 260, 220, 220
220 DO 250 L=2, MT
    THETA = THETA/2.
    JSTEP2 = JSTEP
    JSTEP = JDIF
    JDIF = JDIF/2
    S(JDIF) = SIN(THETA)
    JC1 = NT - JDIF
    S(JC1) = COS(THETA)
    JLAST = NT - JSTEP2
    IF (JLAST - JSTEP) 250, 230, 230
230 DO 240 J = JSTEP, JLAST, JSTEP
    JC = NT - J
    JD = J + JDIF
240 S(JD) = S(J) * S(JC1) + S(JDIF) * S(JC)
250 CONTINUE
260 IF (IFS) 20, 1, 20
END

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SUBROUTINE DLPH(WT,N,SLL,INDQ)
S      LIAR  DLPH
      DIMENSION WT(256)
      IF(N.EQ.1) GO TO 310
C      N IS FULL WINDOW SIZE, EVEN OR ODD
C      COMPUTES HALF WINDOW, EVEN OR ODD
C      N IS INTEGER, SLL IS REAL
C      IF INDQ IS SET TO 1 POSSIBLE OVERFLOW
C      RESULTS NOT NEC. VALID
      FN = FLOAT(N)
      S = 10.**(.SLL/20.)
      VAR1 = 3LOG(S+SQRT(S**2-1.))
      AA=EXP(2.*VAR1/(FN-1.))
      A=((AA-1.)/(AA+1.))**2
      WT(1) = 1.
      N2 = (N+1)/2
      INDQ=0
      DO 300 K = 2,N2
      FK = FLOAT(K)
      R = 0.0
      K1 = K-1
      CD=1.
      DO 200 J = 1,K1
      FJ = FLOAT(J)
      IF(J.NE.1) CD=CD*((FK-FJ)/(FJ-1.))
      CD=CD+A*((FN-FK+1.-FJ)/FJ)
      IF(CD.GT.1.E35) GO TO 205
200    R=R+CD
      GO TO 200
205    INDQ=1
290    WT(K) = (FN-1.0)*R/(FN-FK)
300    CONTINUE
      DO 315 K = 1,N2
      WT(K) = WT(K)/WT(N2)
      RETURN
310    WT(1)=1.
      RETURN
      END

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APPENDIX E
RADAR PROCESSING WITH ADAPTIVE BEAMFORMING

PROGRAM RADAPT

THIS PROGRAM IS CALLED 'RADAPT' IT GENERATES ADAPTIVE WEIGHTS
AND APPLIES THEM TO GENERATE DOPPLER SPECTRA, USING DATA FROM THE
16 ELEMENT ARRAY AT RADC, DEXTER, NEW YORK.
READS TAPE INPUT ONLY

23 SEPTEMBER 1975 1500

REAL IQCORR(16), DELPH(16), RUF(64), SAMPL(32), COSANG(16), TANANG(16)
REAL AM(16), COS
INTEGER IAZ(11), IDR(6), STIME(6), DUM(523)
COMPLEX ZCORR(16), ZSAMPL, DOLPH(16)
COMPLEX STWT(16)
INTEGER WRUF(523), CTIME(6)
REAL FFTD(512), ISAMPL(32)
DIMENSION DLPTIM(248), IPT(5)

COMMON IBUF1(262), IBUF2(262), INRUF(523), DRPOW(65), MELEM, DUMD(32),
* AL(272), TOL, VS(32), WT(32), REPI, REPO, AMP, POSD, UTHET, SPEL, MA(64),
* BL(272)

EQUIVALENCE (INRUF(1), DUM(1), WRUF(1)), (CTIME(1), STIME(1))
EQUIVALENCE (RUF(1), IQCORR(1)), (RUF(17), DELPH(1)),
* (RUF(33), ZCORR(1)), (DRPOW(1), SAMPL(1)), (DRPOW(33), COSANG(1)),
* (DRPOW(49), TANANG(1))

DATA (DOLPH(I), I=1, 16) / (0.01266, 0.0), (0.05237, 0.0), (0.13904, 0.0),
* (0.28431, 0.0), (0.48131, 0.0), (0.69921, 0.0), (0.889, 0.0), (1.0, 0.0),
* (1.0, 0.0), (0.889, 0.0), (0.69921, 0.0), (0.48131, 0.0), (0.28431, 0.0),
* (0.13904, 0.0), (0.05237, 0.0), (0.01266, 0.0) /
DATA (IAZ(I), I=1, 11) / ZAAAA, ZAAAA, ZC1DA, ZC9CD, ZD5D4, ZC8A0, ZAAAA,
* ZAA05, ZAA03, ZD0C1, ZC3C5 /
DATA (IDR(I), I=1, 6) / ZAAAA, ZAAAA, ZAA04, ZC2A0, ZC4CF, ZD7CE /
DATA PI, RAD, NSAMP, NCHAN, ICOLON / 3.14159, 57.29578, 512, 32, ZAAAA /
DATA IDUM / ZAAAA /
DATA NTP / 0 /
DATA IPT / 0, 8, 24, 56, 120 /

ARSIN(DUMMY) = ATAN2(DUMMY, SQRT(1.0 - DUMMY**2))

TAN(DUMMY) = SIN(DUMMY) / COS(DUMMY)

DO 911 M=4, 8
II = IPT(M-3) + 1
N = 2**M
CALL RI8DOT(N)
911 CALL DLPH(DLPTIM(II), N, 72., INDR)
TOL = 1.0E-26
ISECT = 1
CALL DSKIN(RUF, ISECT, 64)
DO 91 IEL=1, 16
ANGLR = (90. - DELPH(IEI)) / RAD
COSANG(IEI) = COS(ANGLR)
91 TANANG(IEI) = TAN(ANGLR)
1 DO 20 I=1, 272
AL(I) = 0.0
20 BL(I) = 0.0
IDSPLA = 0

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	CALL BURST	00061
	WRITE(13,4)	00062
4	FORMAT('FREQ?(F7.3)')	00063
	READ(13,44) FREQ	00064
44	FORMAT(F7.3)	00065
	SPACE=18.288	00066
	XLAMDA=300.0/FREQ	00067
	SSPL=SPACE/XLAMDA*2.0*PI	00068
	SPEL=SSPL	00069
	XK=SSPL/PI	00070
	XU=2.0/XK-1.0	00071
	IF(XU.LE.0.0)GO TO 97	00072
	IF(XU.GT.1.0)XU=1.0	00073
	XANGL=ARSIN(XU)*RAD	00074
	GO TO 98	00075
97	XANGL=0.0	00076
98	CONTINUE	00077
111	WRITE(13,6)	00078
6	FORMAT(' TIME HR,MIN,SEC; NO OF ELEMENT (3A2,I3)')	00079
	READ(13,113) IHR,IMIN,ISEC,MELEM	00080
113	FORMAT(3A2,I3)	00081
	IF(MELEM.GT.16)GO TO 111	00082
112	WRITE(13,8)	00083
8	FORMAT(16HCONFIGURATION X)	00084
	READ(13,9)(MA(I),I=1,16)	00085
9	FORMAT(16I1)	00086
	DO 701 I=17,64	00087
701	MA(I)=0	00088
	ISUM=0	00089
	DO 71 I=1,64	00090
71	ISUM=ISUM+MA(I)	00091
	IF(ISUM.EQ.MELEM)GO TO 711	00092
	WRITE(13,72)MA	00093
72	FORMAT(64I1,/2AX,19HCONFIGURATION ERROR)	00094
	GO TO 112	00095
711	WRITE(13,10)	00096
10	FORMAT(' NGROUP,LOG BASE 2 OF NTIMES,STEER? (2I2,F7.3)')	00097
	READ(13,11) NGROUP,MTIMES,STEER	00098
11	FORMAT(2I2,F7.3)	00099
	NTIMES=2**MTIMES	00100
	NGROUP=MIN2(NGROUP,NTIMES/16)	00101
	MELEM2=2*MELEM	00102
1167	IFILE=1	00103
	CALL RDTP(IFILE)	00104
	CALL TMASCI(STIME)	00105
	IF(STIME(4).NE.IHR.OR.STIME(5).NE.IMIN.OR.STIME(6)	00106
	1.NE.ISEC) GO TO 1167	00107
	IFIRST=0	00108
C		00109
166	CONTINUE	00110
C		00111
C		00112
C	APPLY CORRECTION FACTORS	00113
C		00114
	ISECT=10	00115
	DO 93 N=1,NGROUP	00116
	CALL RIHOUT(N)	00117
	IF(IFIRST.EQ.0) GO TO 1168	00118
	IFILE=+1	00119
	CALL RDTP(IFILE)	00120
	CALL TMASCI(STIME)	00121
1168	IFIRST=1	00122

CALL DSKOUT(DUM,ISECT,523)	00123
DO 93 NPULSE=1,16	00124
IWORD=32*(NPULSE-1)	00125
DO 912 IEL=1,MELEM	00126
I2=2*IEL	00127
IDNUM=I2+IWORD	00128
SAMPL(I2-1)=FLOAT(DUM(IDNUM-1))	00129
SAMPL(I2)=FLOAT(DUM(IDNUM))*IQCORA(IEL)/COSANG(IEL)-SAMPL(I2-1)	00130
1 *TANANG(IEL)	00131
ZSAMPL=CMPLX(SAMPL(I2-1),SAMPL(I2))*ZCORR(IEL)	00132
SAMPL(I2-1)=REAL(ZSAMPL)	00133
912 SAMPL(I2)=AIMAG(ZSAMPL)	00134
DO 931 K=1,MELEM2	00135
931 DUMD(K)=SAMPL(K)	00136
C	00137
C GENERATE THE COVARIANCE MATRIX	00138
C	00139
93 CALL ADCRMT	00140
C	00141
C	00142
C	00143
C INVERT THE COVARIANCE MATRIX	00144
C	00145
DO 94 I=1,272	00146
94 BL(I)=AL(I)	00147
CALL CHLKYA	00148
CALL INVTL	00149
CALL HINVL	00150
C	00151
C CHECK GOODNESS	00152
C	00153
CALL MULHM	00154
CALL PRPKE	00155
20156 AMP=1.0	00156
UTHET=SIN(STEER/RAD)	00157
POSD=UTHET	00158
CALL SGEN3	00159
DO 9666 K=1,MELEM2	00160
9666 VS(K)=DUMD(K)	00161
CALL HXV	00162
CALL VSRXW	00163
VT=0	00164
DO 96 K=1,16	00165
IF(MA(K).EQ.1) GO TO 996	00166
STWT(K)=(0.,0.)	00167
GO TO 96	00168
996 VT=VT+1	00169
K2=2*MT	00170
STWT(K)=CMPLX(WT(K2-1)/REPI,-WT(K2)/REPI)	00171
96 CONTINUE	00172
WRITE(13,997) STWT	00173
997 FORMAT(/(4E15.7))	00174
NNT=NTIMES/16	00175
ISECT=10	00176
1120 DO 6000 ITIMES=1,NNT	00177
CALL RIBDOT(ITIMES)	00178
IF(ITIMES.GT.NGROUP) GO TO 20213	00179
CALL DSKIN(INBUF,ISECT,523)	00180
GO TO 20214	00181
20213 IFILE=1	00182
CALL RDTP(IFILE)	00183
CALL SMART(CTIME)	00184

C
C APPLY ALL CORRECTION FACTORS TO NEW SAMPLES, ADD WEIGHTS AND
C STEER AND STORE
C

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      ITT=(ITIMES-1)*32
      DO 5995 IE=1,32
      II=IE+ITT
5995  FFTD(II)=0.
      DO 6000 IEL=1,16
      ICONST=2*IEL-1
      DO 6001 I=1,16
      IRXWD=ICONST+32*(I-1)
      I2=2*I
      I2M=I2-1
      ISAMPL(I2M)=WBUF(IRXWD)
      ISAMPL(I2)=WBUF(IRXWD+1)*IQCORA(IEI)/COSANG(IEI)-
1  ISAMPL(I2M)*TANANG(IEI)
      ZSAMPL=CMPLX(ISAMPL(I2M),ISAMPL(I2))*ZCORR(IEI)*STNT(IEI)
      II=I2+ITT
      FFTD(II-1)=REAL(ZSAMPL)+FFTD(II-1)
6001  FFTD(II)=AIMAG(ZSAMPL)+FFTD(II)
6000  CONTINUE
C  IF DESIRED, TIME SERIES MAY BE WRITTEN ON TAPE HERE
C
C  MULTIPLY TIME SERIES BY DOLPH WEIGHTS
      IP=IPT(MTIMES-3)
      DO 6005 I=1,NTIMES
      I2=2*I
      II=I+IP
      IF(I2.GT.NTIMES) II=NTIMES+1-I+IP
      FFTD(I2-1)=FFTD(I2-1)*DLPTIM(II)
6005  FFTD(I2)=FFTD(I2)*DLPTIM(II)
C
C  TAKE FFT AND PLOT SPECTRUM
      CALL FORT2(MTIMES,-1,FFTD,IFRRR)
502  CALL SSWTCH(2,IUP)
      IF(IUP.EQ.1)GO TO 502
      CALL BURST
      CALL TKPLOT(0,0,0)
      YSTART=1.4
      XSTART=.5
      CALL AXIS(XSTART,YSTART,IDB,12,4.0,90.0,-90.0,20.071)
      CALL PLOT(XSTART,YSTART-.07,3)
      DO 5021 I=1,8
      CALL PLOT(XSTART,YSTART,2)
      XSTART=XSTART+.75
      CALL PLOT(XSTART,YSTART,2)
      CALL PLOT(XSTART,YSTART-.07,2)
5021  CONTINUE
      NSTR=NTIMES/2
      NSTP=NSTR/4
      XSTART=XSTART-.1
      YSTART=1.2
      DO 5022 I=1,9
      FN=NSTR+.1*ISIGN(1,NSTR)
      CALL NUMBER(XSTART,YSTART,.1,FN,0.,-1)
      NSTR=NSTR-NSTP
5022  XSTART=XSTART-.75
      XSTART=.5
      YSTART=1.4
      NP2=NTIMES/2
      SCN=6./FLOAT(NTIMES)

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PEAK=0.
DO 5023 I=1,NTIMES
  J=2*1
  FFTD(I)=FFTD(J-1)**2+FFTD(J)**2
5023  PEAK=AMAX1(PEAK,FFTD(I))
      SHFT=YSTART+4,-ALOG10(PEAK)*.5
      DRMIN=1.E-8*PEAK
      IPEN=3
      X=XSTART
      DO 5024 I=1,NP2
        J=I+NP2
        Y=YSTART
        IF(FFTD(J).GT.DRMIN) Y=SHFT+ALOG10(FFTD(J))*5
        CALL PLOT(X,Y,IPEN)
        X=X+SCN
5024  IPEN=2
      NP2=NP2+1
      DO 5025 I=1,NP2
        Y=YSTART
        IF(FFTD(I).GT.DRMIN) Y=SHFT+ALOG10(FFTD(I))*5
        CALL PLOT(X,Y,2)
5025  X=X+SCN
      CALL PLOT(0.,.5,-1)
      PKDR=10.*ALOG10(PEAK)
      WRITE(13,102)(CTIME(I),I=1,5),ICOLON,CTIME(6),STEER,PKDR
102  1 , (MA(I),I=1,16)
      FORMAT(5X,'SAMPLE TIME ',3A2,2X,2A2,A1,A2,3X,'STEER=',
1    F7.3,' ',PEAK='F7.3,' DR'/5X,'USING ADAPTIVE WEIGHTS
2    ' CONFIGURATION='1,16I1)
      CALL TKWAIT
C
C  SS2 UP = WAIT
C
600  CALL SSWTCH(2,IUP)
      IF(IUP.EQ.1)GO TO 600
C  SS3 DOWN=GO ON, UP= CHANGE ONLY STEER
C
      CALL SSWTCH(3,IUP)
      IF(IUP.NE.1) GO TO 630
      CALL BURST
      WRITE(13,610)
610  FORMAT('STEER=? (F7.3)')
      READ(13,620) STEER
620  FORMAT(F7.3)
      GO TO 20156
630  CONTINUE
C  SS1 DOWN=CONTINUE PROCESSING
C  SS1 UP=CONTINUE PROCESSING
C
      CALL SSWTCH(1,IUP)
      IF(IUP.EQ.1)GO TO 1
      GO TO 166
SRADAPT  EQU  F.MAIN
S        NTRY RADAPT
S        LIBR RADAPT
END

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```

APPENDIX F
EQUALIZATION FILTER DESIGN PROGRAM

PROGRAM FILTRN

96

CALL FILTRM

END

SUBROUTINE FILTRM

```

* NP=NUMBER OF POLES
* NT=NUMBER OF TAPS
* A(J,N)=N-TH COEFFICIENT IN J-TH BUTTERWORTH FILTER
* SP(J,N)=N-TH POLE IN J-TH BUTTERWORTH FILTER
* B=BANDWIDTH OF BUTTERWORTH FILTERS
* TAU=TAP SPACING IN DELAY LINE
* W(J,N)=N-TH TAP WEIGHT IN J-TH DELAY LINE
* N1=COMPLEX REF CHANNEL
* N2=CHANNEL TO BE MATCHED
* NF=NUMBER OF FREQS
* NS=NUMBER OF NORMALIZATION FREQ
* IR=0 USES POLES
* IR=1 INPUTS MEASURED FREQ
* IS=1=1 AMP PER CHANNEL
* IS=2=2 AMP PER CHANNEL
  COMPLEX A(2,10),SP(2,10),W(2,20),CP,C(20,20),C1(20,20),C2(20,20)
  COMPLEX XX,YY,SV(20),D(20,20)
  COMPLEX B1(101),B2(101),P(20),SS(101)
  COMPLEX CA,CB,CC,CD
  COMPLEX CPT
  COMMON/A/B1,B2,IXT,II,SS,IR,FY,CPT,IS
  DIMENSION FY(101)
  NAMELIST/INPUT/NP,NT,B,TAU,II,IS,N1,N3,NF,NS,IR,IDUMP,N4
1  READ INPUT
  IF(NT.EQ.0) GO TO 900
  DO 100 N2=N3,N4,1
  II=2*NF
15  FORMAT(2I5,2F10.4)
  PI=4.*ATAN(1.)
  RAD=PI/180.
  CP=CMPLX(0.,PI)
  CPT=2.*CP*TAU
  WRITE(6,78)
78  FORMAT(1H1,/'*      PROGRAM FOR EVALUATING FILTER MATCH*')
  WRITE(6,79)
79  FORMAT(1X,/'*      FILTER COEFFICIENTS *')
  B=2.*PI*B
  IXT=0
*  SELECT TAP WEIGHTS FOR REFERENCE FILTER
*
  DO 50 J=1,NT
  W(1,J)=1.
  IF(J.NE.NT/2) W(1,J)=0.
50  CONTINUE
  IF(IR.EQ.1) CALL DATA(N1,N2,NS,NF,JF,RAD)
  IF(IR.EQ.1) GO TO 300
*
*  COMPUTE POLE LOCATIONS FOR BUTTERWORTH FILTERS
*
  UUU=RANF(3.)
  DO 10 N=1,NP
  SP(1,N)=B/2.*CEXP(CP*(.5+(2.*N-1)/2./NP))
  Y=RANF(0.)
  YY=CEXP(2.*CP*Y)
  X=RANF(0.)
10  SP(2,N)=SP(1,N)*(1.+06*YY*(X=.5))
*
*  COMPUTE COEFFICIENTS OF BUTTERWORTH FILTERS

```

```

DO 20 K=1,2
DO 20 N=1,NP
A(K,N)=0.
DO 30 J=1,NP
IF(J.EQ,N) GO TO 30
A(K,N)=A(K,N)+1./((SP(K,N)-BP(K,J))
30 CONTINUE
20 A(K,N)=A(K,N)*(B/2.)*NP

```

PRINT PARAMETERS OF FILTERS

```

DO 40 N=1,NP
40 WRITE(6,41) SP(1,N),SP(2,N),A(1,N),A(2,N)
41 FORMAT(8E15,6)
WRITE(6,89) B,TAU
89 FORMAT(///* BANDWIDTH=,F10.2,* TIME DELAY=,F10.4///)

```

COMPUTE COVARIANCE MATRIX OF TAP OUTPUTS

```

DO 60 K=1,NT
DO 60 L=1,NT
C(K,L)=0.
C1(K,L)=0.
C2(K,L)=0.
DO 61 M=1,NP
DO 61 N=1,NP
XX=CONJG(A(2,M))*A(2,N)/(CONJG(SP(2,M))+SP(2,N))
YY=SP(2,N)*(K=L)
IF(K.LT,L) YY=CONJG(SP(2,M))*(L=K)
C(K,L)=C(K,L)+XX*CEXP(YY*TAU)
XX=CONJG(A(2,M))*A(1,N)/(CONJG(SP(2,M))+SP(1,N))
YY=SP(1,N)*(K=L)
IF(K.LT,L) YY=CONJG(SP(2,M))*(L=K)
C1(K,L)=C1(K,L)+XX*CEXP(YY*TAU)
XX=CONJG(A(1,M))*A(1,N)/(CONJG(SP(1,M))+SP(1,N))
YY=SP(1,N)*(K=L)
IF(K.LT,L) YY=CONJG(SP(1,M))*(L=K)
C2(K,L)=C2(K,L)+XX*CEXP(YY*TAU)
61 CONTINUE
D(K,L)=C(K,L)
60 CONTINUE
PRINT 200,((C(K,L),L=1,NT),K=1,NT)
PRINT 200,((C1(K,L),L=1,NT),K=1,NT)
PRINT 200,((C2(K,L),L=1,NT),K=1,NT)
101 CONTINUE

```

INVERT COVARIANCE MATRIX M

```

CALL MATINV(C,NT)

```

COMPUTE STEERING VECTOR

```

DO 70 M=1,NT
SV(M)=0.
DO 71 N=1,NT
71 SV(M)=SV(M)+C1(M,N)*W(1,N)
70 CONTINUE

```

COMPUTE LMS TAP WEIGHTS

```

      DO 60 M=1,NT
      W(2,M)=0.
      DO 61 N=1,NT
      61 W(2,M)=W(2,M)+C(M,N)*SV(N)
      60 CONTINUE

```

```

      PRINT THE FILTER WEIGHTS

```

```

      DO 62 J=1,NT
      62 WRITE(6,83) J,W(1,J),W(2,J)
      83 FORMAT(15,4F15.5)
      WRITE(6,84)
      84 FORMAT(1X,/)

```

```

      COMPUTE POWER IN OUTPUT

```

```

      YY=0.
      XX=0.
      DO 90 M=1,NT
      DO 90 N=1,NT
      XX=XX+CONJG(W(1,M))*C2(M,N)*W(1,N)
      XX=XX+W(2,M)*CONJG(C1(M,N)*W(1,N))
      YY=YY+CONJG(W(2,M))*C1(M,N)*W(1,N)
      YY=YY+CONJG(W(2,M))*D(M,N)*W(2,N)
      90 CONTINUE
      YY=YY+XX
      POUT=CAHS(XX)
      PRFF=CAHS(YY)

```

```

      PRINT FILTER RESPONSE

```

```

      E=H/2./PI
      CALL FILFLT(SP,A,W,NP,NT,E,TAU,CP,NF,N1,N2)

```

```

      300 CONTINUE
      COMPUTE COVAR MAT USING FREQ

```

```

      IF(IXT.GE.1) GO TO 100
      IXT=IXT+1
      IJI=IM/2+1
      DO 62 K=1,NT
      DO 62 L=K,NT
      CA=CH=CC=CD=0.
      YY=CPT*(K-L)
      DO 63 I=1,IJ
      XX=CEXP(YY+FY(I))
      CA=CA+XX*CONJG(H2(I))*H2(I)
      CH=CH+XX*CONJG(H2(I))*H1(I)
      CC=CC+XX*CONJG(H1(I))*H1(I)
      CD=CD+CONJG(XX)*CONJG(H2(I))*H1(I)
      63 CONTINUE
      C(K,L)=CA
      D(K,L)=CA
      C1(K,L)=CH
      C2(K,L)=CC
      IF(K.EQ.L) GO TO 64
      C(L,K)=CONJG(CA)
      D(L,K)=C(L,K)
      C1(L,K)=CD
      C2(L,K)=CONJG(CC)
      64 CONTINUE
      62 CONTINUE

```

```

201  FORMAT(IX,2I2,10F11.3)          99
    IF(IDUMP.EQ.0) GO TO 101
    PRINT 200,(H1(I),I=1,11)
    PRINT 200,(H2(I),I=1,11)
    PRINT 200,((C(K,L),L=1,NT),K=1,NT)
    PRINT 200,((C1(K,L),L=1,NT),K=1,NT)
    PRINT 200,((C2(K,L),L=1,NT),K=1,NT)
200  FORMAT(IX, 8F11.3)
    GO TO 101
100  CONTINUE
    GO TO 1
900  CONTINUE
    RETURN
    END
    SUBROUTINE DATA(N1,N2,NS,NF,JF,RAU)
C    HEAD AND SELECT DATA
C    NC(1),NC(3) ARE ICUMP OF REC CHANNELS
C    NC(2),NC(4) ARE QCUMP OF REC CHANNELS
C    N1,N2 DESIGNATE REF AND OTHER CH
C    NF=NUMBER OF FRECS
C    NS=SELECTED NORMALIZATION FREQ
    DIMENSION NC(4),DA(8,10),A(4,30),P(4,30),C(4,2)
    COMPLEX B1(101),B2(101)
    COMPLEX SS(101)
    COMMON/A/H1,H2,IY1,IY,SS,IR,FY,CPT,IS
    COMPLEX CC
    COMPLEX CPT
    DIMENSION FY(101),FX(101)
C
    REWIND 9
    J1=18*2
    JF=8
    NC(1)=N1*2-1
    NC(2)=N1*2
    NC(3)=N2*2-1
    NC(4)=N2*2
    IF(18.EQ.1) NC(2)=N2
    IF(18.EQ.1) NC(1)=N1
    DO 1 M=1,NF
    DO 2 K=1,JF
2    READ(9,8) KK,F,(DA(K,J),J=1,JF)
    AC=DA(1,1)
    PC=DA(5,1)
    FX(M)=F
    J2=JF/2
    DO 3 I=1,J1
    N=(NC(I)-1)/JF+1
    JJ=MOD(NC(I)-1,JF)+1
    A(I,M)=DA(N,JJ)
    P(I,M)=DA(N+J2,JJ)
    IF(N.EQ.1.AND.JJ.EQ.1) GO TO 7
    A(I,M)=A(I,M)+AC
    P(I,M)=P(I,M)+PC
7    CONTINUE
3    CONTINUE
1    CONTINUE
    DO 30 I=1,NF
    FY(I)=FX(NF+1-I)
30   FY(NF+1)=FX(I)
    DO 6 I=1,J1
    C(I,1)=A(I,NS)
6    C(I,2)=P(I,NS)

```

C

100

```

DO 4 J=1,NF
DO 5 I=1,J1
A(I,J)=A(I,J)-C(I,1)
P(I,J)=P(I,J)-C(I,2)
IF(I1,EQ,2)P(I,J)=P(I,J)+40.
5 CONTINUE
20 FORMAT(/)
4 CONTINUE
PRINT 20
DO 10 M=1,NF
DO 10 N=1,2
AMP=10.+(A(N,M)/20.)
A1=AMP *COS(P(N,M)*RAD)
L=N+1
IF(I8,EQ,2) A2=10.+(A(L,M)/20.)*COS(P(L,M)*RAD)
IF(I8,EQ,1) A2=AMP*SIN(P(N,M)*RAD)
IF(N,EQ,2) GO TO 11
CC=CMPLX(A1,A2)
R1(NF+1-M)=CONJG(CC)
R1(NF+M)=CC
GO TO 10
11 CONTINUE
CC=CMPLX(A1,A2)
R2(NF+1-M)=CONJG(CC)
R2(NF+M)=CC
10 CONTINUE
8 FORMAT(I1,F5.0,8F9.4)
9 FORMAT(1X,8F9.4)
21 FORMAT(1X,8E12.3)
RETURN
END

SUBROUTINE FILPLT(SP,A,w,NP,NT,H,TAU,CP,NF,N1,N2)
* BUTTERWORTH FILTER, REFERENCE CHANNEL 1
* BUTTERWORTH FILTER, CHANNEL 2
* OVERALL CHANNEL 1 RESPONSE
* OVERALL CHANNEL 2 RESPONSE
DIMENSION FY(101)
COMMON/A/B1,B2,1X1,11,SS,1X,FY,CPT,18
COMPLEX CPT
COMPLEX A(2,10),w(2,10),w(2,20),B1(101),B2(101),C1(101),C2(101)
COMPLEX SS(101)
COMPLEX CP,S
COMPLEX FRESP
COMPLEX AAA
R1=R2=R3=R4=R5=R6=R7=0.
AMPTOT1=AMPTOT2=0.
111=11=1
PRINT 900,N1,N2,NT
900 FORMAT(* CORRECTION FILTER FOR RECEIVERS *,I2,* AND *,
1I2,* WITH *,I2,* TAPS *)
PRINT 901,TAU
901 FORMAT(* FOR A TAP SPACING OF *,F9.4,* SECS. *)
PRINT 902
902 FORMAT(* FREQ PHASE AMPLITUDE TOTAL FILTER
1FILTER *)
PRINT 903
903 FORMAT(* ERROR ERROR MS ERROR PHASE
1AMPL. *)
PRINT 904
904 FORMAT(* (HZ) (DEGREES) (DB) (DB POWER) (DEGREES)
1(DH) *)

```

```

005  FORMAT(  BEFORE AFTER  BEFORE AFTER  BEFORE AFTER *)
      PRINT 905
      DO 10 K=1,11
      IF(IR.EQ.1) GO TO 1
      FREQ=H+2.*H*(K-1)/111
      FY(K)=FREQ
      A=2.*CP*FREQ
      BS(K)=S
      H1(K)=H2(K)=0.
      DO 11 N=1,NP
      H1(K)=H1(K)+A(1,N)/(S-SP(1,N))
      H2(K)=H2(K)+A(2,N)/(S-SP(2,N))
11  CONTINUE
      GO TO 2
1  CONTINUE
      FREQ=FY(K)
2  CONTINUE
      IF(FREQ.LE.0.) GO TO 10
      C1(K)=C2(K)=0.
      DO 12 N=1,NT
      C1(K)=C1(K)+CEXP(-CPT*FREQ*N)*W(1,N)
      C2(K)=C2(K)+CEXP(-CPT*FREQ*N)*W(2,N)
12  CONTINUE
      C1(K)=C1(K)*B1(K)
      C2(K)=C2(K)*H2(K)
      R1=H1+CAHS(H1(K)-H2(K))*2
      R2=H2+CAHS(C1(K)-C2(K))*2
      R3=H3+CAHS(B1(K))*2
      R4=H4+CAHS(C1(K))*2
      A1=CAHS(R1(K))
      A2=CAHS(R2(K))
      AMPTOT1=(A2/A1-1.)*2+AMPTOT1
      A3=CAHS(C1(K))
      A4=CAHS(C2(K))
      AMPTOT2=(A4/A3-1.)*2+AMPTOT2
      P1=REAL(H1(K))
      IF(P1.EQ.0.) P1=1000000.
      P1=ATAN2(AIMAG(H1(K)),P1)
      P2=REAL(H2(K))
      IF(P2.EQ.0.) P2=1000000.
      P2=ATAN2(AIMAG(H2(K)),P2)
      P3=REAL(C1(K))
      IF(P3.EQ.0.) P3=1000000.
      P3=ATAN2(AIMAG(C1(K)),P3)
      P4=REAL(C2(K))
      IF(P4.EQ.0.) P4=1000000.
      P4=ATAN2(AIMAG(C2(K)),P4)
      R5=B/2.
      IF(FREQ.LT.-95 .OR. FREQ.GT.85 ) GO TO 30
      RP1=RP1+(P1-P2)*2
      RP2=RP2+(P3-P4)*2
30  CONTINUE
      ADR1=20.*ALOG10(A2/A1)
      ADR2=20.*ALOG10(A4/A3)
      APH1=(P2-P1)*57.2958
      APH2=(P4-P3)*57.2958
      ATOT1=CAHS(H2(K)-H1(K))
      IF(ATOT1.LE.1.E-10) ATOT1=1.E-10
      ATOT1=20.*ALOG10(ATOT1)
      ATOT2=CAHS(C2(K)-C1(K))
      IF(ATOT2.LE.1.E-10) ATOT2=1.E-10
      ATOT2=20.*ALOG10(ATOT2)

```

```

FRESP=0.
EE=ALOG(10.)
DO 950 KK=1,NT
PI=3.14159265
AA=1.*FLOAT(KK-1)*2.*PI*FREQ*TAU
AAA=CMPLX(COS(AA),SIN(AA))
950  FRESP=2*(KK)*AAA+FRESP
WT=2.*PI*FREQ*TAU
FILPH=APH2-APH1
FILAMP=CAUS(FRESP)
IF(FILAMP.LE.1.E=10) FILAMP=1.E=10
FILAMP=20.*ALOG10(FILAMP)
PRINT 906,FREQ,APH1,APH2,ADB1,ADB2,ATOT1,ATOT2,FILPH,FILAMP
906  FORMAT(1X,F5.1,6F7.2,2F9.2)
10  CONTINUE
AMPTOT1=20.*ALOG10(SQRT(AMPTOT1/FLOAT(NF))+1.)
AMPTOT2=20.*ALOG10(SQRT(AMPTOT2/FLOAT(NF))+1.)
RA1=10.*ALOG10(R1/R3)
RA2=10.*ALOG10(R2/R4)
RP1=180./PI*SQRT(RP1/FLOAT(NF))
RP2=180./PI*SQRT(RP2/FLOAT(NF))
RRR=RA1-RA2
PRINT 907,RP1,RP2,AMPTOT1,AMPTOT2,RA1,RA2
907  FORMAT(* TOTAL*,6F7.2)
PRINT 908,RRR
908  FORMAT(* NET REDUCTION OF MISMATCH ERROR= *,F7.2,*DB.*)
RETURN
END

```

APPENDIX G
EQUALIZATION FILTER DESIGN RESULTS

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00460	-.00000
2	1.00000	0.00000	1.01299	.00000
3	0.00000	0.00000	-.00462	.00000
4	0.00000	0.00000	-.00394	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 2 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.42	-.33	-.13	-.12	-35.40	-36.76	.15	.01
20.0	-.62	-.49	-.13	-.11	-34.29	-36.44	.19	.02
25.0	-.70	-.58	-.12	-.08	-34.45	-37.47	.21	.04
30.0	-.86	-.64	-.11	-.06	-35.02	-38.61	.22	.05
35.0	-.89	-.67	-.09	-.02	-35.12	-38.90	.22	.07
40.0	-.81	-.60	-.07	.02	-35.89	-39.32	.20	.08
45.0	-.68	-.51	-.05	.05	-37.76	-39.43	.17	.10
50.0	-.63	-.50	-.02	.09	-39.62	-37.97	.13	.12
55.0	-.34	-.25	-.02	.11	-44.81	-37.76	.08	.13
60.0	0.00	.03	0.00	.14	-200.00	-35.74	.03	.14
65.0	.30	.27	-.01	.14	-45.32	-35.43	-.03	.15
70.0	.60	.52	-.04	.12	-39.44	-35.93	-.08	.16
75.0	.82	.75	-.07	.09	-35.73	-36.13	-.13	.16
80.0	1.14	.99	-.14	.03	-31.66	-35.00	-.17	.17
85.0	1.15	.95	-.22	-.05	-29.88	-35.04	-.20	.17
90.0	.91	.69	-.30	-.13	-29.28	-35.11	-.22	.17
95.0	.29	.07	-.33	-.17	-30.16	-36.18	-.22	.17
100.0	-.27	-.48	-.33	-.16	-30.73	-36.06	-.21	.17
105.0	-.81	-.99	-.26	-.10	-33.26	-37.29	-.19	.16
110.0	-.96	-1.11	-.17	-.01	-37.68	-40.05	-.15	.16
TOTAL	.45	.33	.16	.10	-33.32	-36.09		

NET REDUCTION OF MISMATCH ERROR= 2.77DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00973	.00000
2	1.00000	0.00000	1.01715	-.00000
3	0.00000	0.00000	-.01540	.00000
4	0.00000	0.00000	-.00162	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 3 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
	15.0	-1.10	-.92	-.07	-.13	-33.90		
20.0	-1.10	-.96	-.07	-.12	-32.90	-33.26	.24	-.05
25.0	-1.28	-1.00	-.06	-.09	-32.75	-34.01	.28	-.03
30.0	-1.22	-.90	-.04	-.05	-34.11	-36.35	.32	-.01
35.0	-1.15	-.81	-.02	-.01	-34.27	-37.36	.34	.01
40.0	-1.01	-.66	-.01	.03	-34.98	-38.42	.36	.04
45.0	-.84	-.48	.00	.07	-36.69	-38.88	.36	.06
50.0	-.61	-.25	.01	.10	-40.14	-38.66	.36	.09
55.0	-.31	.04	.01	.13	-45.75	-37.07	.35	.12
60.0	0.00	.33	0.00	.15	-200.00	-34.82	.33	.15
65.0	.36	.67	-.03	.15	-43.09	-33.59	.31	.17
70.0	.70	.98	-.07	.13	-37.03	-33.39	.28	.20
75.0	.90	1.23	-.15	.08	-33.02	-33.17	.25	.22
80.0	1.07	1.29	-.24	.00	-29.46	-32.86	.22	.25
85.0	.86	1.03	-.35	-.09	-27.32	-33.66	.18	.27
90.0	.26	.42	-.46	-.17	-26.46	-34.39	.15	.29
95.0	-.69	-.57	-.50	-.20	-26.65	-33.99	.13	.30
100.0	-1.77	-1.68	-.47	-.16	-26.48	-31.53	.10	.32
105.0	-2.51	-2.43	-.36	-.04	-28.08	-30.96	.08	.33
110.0	-2.81	-2.76	-.23	.11	-31.01	-31.83	.05	.34
TOTAL	1.24	1.17	.23	.11	-30.39	-33.33		

NET REDUCTION OF MISMATCH ERRORS 2.94DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00244	-.00000
2	1.00000	0.00000	1.00468	.00000
3	0.00000	0.00000	-.00517	.00000
4	0.00000	0.00000	-.00142	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 4 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.28	-.17	.01	-.02	-46.41	-48.14	.11	-.03
20.0	-.36	-.22	-.00	-.02	-43.86	-46.44	.14	-.02
25.0	-.41	-.24	-.00	-.02	-43.01	-46.76	.17	-.02
30.0	-.43	-.24	-.01	-.02	-43.24	-47.35	.19	-.01
35.0	-.44	-.24	-.01	-.01	-42.67	-47.89	.20	.00
40.0	-.38	-.17	-.01	.01	-43.53	-50.22	.21	.01
45.0	-.30	-.10	-.01	.02	-45.58	-52.31	.20	.02
50.0	-.35	-.15	.00	.03	-45.08	-47.68	.20	.03
55.0	-.17	.02	-.00	.03	-51.19	-48.45	.18	.04
60.0	0.00	.17	0.00	.05	-200.00	-43.99	.17	.05
65.0	.13	.28	-.02	.04	-50.67	-43.32	.14	.06
70.0	.23	.35	-.04	.03	-45.22	-43.71	.12	.06
75.0	.28	.37	-.06	.01	-42.27	-44.05	.10	.07
80.0	.35	.42	-.10	-.02	-37.81	-42.06	.08	.08
85.0	.22	.27	-.13	-.05	-36.30	-42.74	.06	.08
90.0	-.04	-.00	-.16	-.07	-35.63	-42.38	.04	.08
95.0	-.49	-.46	-.14	-.06	-36.42	-41.47	.03	.09
100.0	-.73	-.71	-.11	-.02	-37.24	-40.14	.01	.09
105.0	-.93	-.92	-.04	.05	-39.05	-38.81	.01	.09
110.0	-.83	-.83	.04	.13	-42.26	-39.47	.00	.09
TOTAL	.43	.40	.07	.04	-40.03	-42.81		
NET REDUCTION OF MISMATCH ERROR					2.78DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01603	-.00000
2	1.00000	0.00000	1.01125	-.00000
3	0.00000	0.00000	-.02052	.00000
4	0.00000	0.00000	-.00335	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 5 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.06	-.85	.14	-.09	-32.38	-35.28	.22	-.23
20.0	-1.14	-.87	.12	-.08	-32.07	-34.89	.28	-.20
25.0	-1.13	-.81	.11	-.06	-32.61	-36.00	.32	-.17
30.0	-1.03	-.68	.10	-.04	-34.24	-38.72	.35	-.14
35.0	-.92	-.55	.09	-.02	-34.87	-40.60	.37	-.10
40.0	-.77	-.41	.07	.01	-35.89	-42.76	.36	-.06
45.0	-.61	-.25	.06	.04	-38.01	-44.04	.35	-.02
50.0	-.46	-.14	.04	.06	-41.24	-42.88	.32	.02
55.0	-.21	.08	.02	.09	-47.41	-40.41	.29	.06
60.0	0.00	.20	0.00	.11	-200.00	-37.74	.24	.11
65.0	.25	.45	-.04	.11	-44.46	-36.45	.20	.15
70.0	.49	.63	-.08	.10	-38.52	-36.22	.15	.18
75.0	.73	.82	-.14	.08	-34.49	-35.90	.10	.22
80.0	.80	.86	-.22	.03	-30.86	-36.11	.05	.25
85.0	.74	.76	-.31	-.03	-28.46	-37.17	.01	.28
90.0	.43	.41	-.40	-.10	-27.39	-37.99	-.02	.30
95.0	-.20	-.23	-.47	-.14	-27.36	-37.24	-.04	.32
100.0	-.98	-1.03	-.49	-.14	-27.05	-34.48	-.05	.34
105.0	-1.61	-1.69	-.45	-.09	-28.34	-33.67	-.05	.36
110.0	-2.01	-2.06	-.38	-.01	-31.01	-34.70	-.05	.37
TOTAL	.92	.84	.24	.08	-30.98	-36.17		
NET REDUCTION OF MISMATCH ERROR:					5.19DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01461	.00000
2	1.00000	0.00000	1.01480	-.00000
3	0.00000	0.00000	-.02009	.00000
4	0.00000	0.00000	-.00493	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 6 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-1.67 -1.36	.04	-.14 -30.81 -31.16	.32	-.16
20.0	-1.59 -1.20	.04	-.12 -30.83 -32.00	.40	-.16
25.0	-1.48 -1.02	.04	-.09 -31.63 -33.92	.46	-.13
30.0	-1.37 -.87	.03	-.06 -33.13 -36.43	.50	-.09
35.0	-1.24 -.72	.04	-.02 -33.47 -38.31	.52	-.06
40.0	-1.04 -.52	.04	.02 -34.53 -40.47	.52	-.01
45.0	-.80 -.30	.03	.06 -36.81 -41.27	.50	.03
50.0	-.69 -.23	.03	.10 -38.75 -38.91	.46	.07
55.0	-.34 .07	.01	.12 -44.86 -37.38	.41	.11
60.0	0.00 .34	0.00	.15 -200.00 -34.64	.34	.15
65.0	.32 .59	.04	.15 -42.93 -33.81	.27	.19
70.0	.60 .80	-.09	.13 -37.13 -34.14	.20	.22
75.0	.83 .96	-.15	.10 -33.45 -34.37	.13	.25
80.0	1.06 1.12	-.25	.03 -29.37 -33.91	.06	.28
85.0	.96 .97	-.35	-.05 -27.22 -34.87	.01	.30
90.0	.59 .56	-.46	-.14 -26.22 -35.29	-.03	.32
95.0	-.23 -.30	-.53	-.19 -26.35 -34.90	-.06	.34
100.0	-1.02 -1.10	-.54	-.19 -26.22 -33.03	-.08	.35
105.0	-1.86 -1.94	-.48	-.12 -27.63 -32.35	-.08	.36
110.0	-2.23 -2.30	-.39	-.02 -30.58 -33.73	-.07	.37
TOTAL	1.15 1.02	.25	.11 -29.91 -33.86		
NET REDUCTION OF MISMATCH ERRORS			3.95DB.		

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01011	.00000
2	1.00000	0.00000	1.01651	-.00000
3	0.00000	0.00000	-.01496	-.00000
4	0.00000	0.00000	-.00078	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 7 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.85	-.72	-.05	-.11	-36.34	-35.30	.13	-.06
20.0	-.90	-.81	-.05	-.10	-34.75	-34.72	.17	-.05
25.0	-1.06	-.95	-.04	-.08	-34.49	-35.37	.21	-.03
30.0	-1.02	-.78	-.03	-.05	-35.70	-37.56	.24	-.02
35.0	-.90	-.74	-.02	-.01	-35.55	-38.17	.26	.01
40.0	-.91	-.63	-.01	.02	-35.95	-38.93	.27	.03
45.0	-.74	-.46	-.00	.05	-37.80	-39.86	.28	.05
50.0	-.55	-.26	.01	.09	-41.05	-39.78	.29	.08
55.0	-.29	-.00	.01	.11	-46.51	-38.13	.29	.11
60.0	0.00	.28	0.00	.14	-200.00	-35.67	.28	.14
65.0	.34	.61	-.03	.14	-43.54	-34.34	.27	.16
70.0	.67	.92	-.07	.12	-37.31	-34.03	.25	.19
75.0	.90	1.27	-.14	.07	-33.14	-33.36	.23	.21
80.0	1.04	1.25	-.24	.00	-29.71	-33.14	.21	.24
85.0	.70	.98	-.35	-.09	-27.52	-33.94	.19	.26
90.0	.20	.37	-.44	-.16	-26.69	-34.70	.16	.28
95.0	-.77	-.63	-.49	-.19	-26.83	-34.14	.14	.30
100.0	-1.81	-1.69	-.45	-.13	-26.78	-31.77	.12	.31
105.0	-2.60	-2.51	-.33	-.01	-28.24	-30.72	.09	.32
110.0	-2.86	-2.79	-.19	.14	-31.17	-31.53	.07	.33
TOTAL	1.20	1.15	.21	.10	-30.83	-33.84		
NET REDUCTION OF MISMATCH ERRORS					3.01DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00425	-.00000
2	1.00000	0.00000	1.00118	-.00000
3	0.00000	0.00000	.00356	.00000
4	0.00000	0.00000	-.00536	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 6 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.50	-.37	-.10	-.06	-36.68	-41.00	.22	.04
20.0	-.55	-.27	-.09	-.04	-37.01	-43.09	.28	.04
25.0	-.53	-.21	-.08	-.03	-38.00	-46.50	.31	.05
30.0	-.56	-.22	-.08	-.02	-38.53	-47.73	.33	.06
35.0	-.52	-.19	-.06	.00	-39.21	-50.00	.33	.06
40.0	-.43	-.12	-.05	.02	-40.53	-50.59	.31	.07
45.0	-.34	-.07	-.04	.03	-42.71	-48.80	.27	.07
50.0	-.37	-.15	-.02	.05	-44.04	-45.03	.22	.07
55.0	-.18	-.03	-.02	.05	-49.22	-45.43	.15	.07
60.0	0.00	.08	0.00	.06	-200.00	-42.45	.08	.06
65.0	.15	.15	-.00	.05	-51.70	-44.21	.00	.05
70.0	.25	.17	-.01	.03	-47.54	-46.83	-.07	.04
75.0	.33	.19	-.01	.02	-45.18	-49.14	-.14	.03
80.0	.43	.23	-.03	-.02	-41.69	-46.99	-.20	.01
85.0	.42	.18	-.03	-.04	-41.53	-45.18	-.25	-.01
90.0	.36	.09	-.04	-.06	-43.07	-43.64	-.27	-.02
95.0	.18	-.11	-.01	-.05	-51.75	-46.28	-.28	-.04
100.0	.24	-.03	.03	-.03	-47.24	-51.75	-.27	-.06
105.0	.27	.03	.08	.01	-43.15	-64.76	-.24	-.07
110.0	.56	.36	.13	.04	-40.88	-48.00	-.20	-.09
TOTAL	.40	.19	.06	.04	-40.79	-45.16		
NET REDUCTION OF MISMATCH ERRORS					4.36DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01175	-.00000
2	1.00000	0.00000	1.01390	.00000
3	0.00000	0.00000	-.01246	-.00000
4	0.00000	0.00000	-.00240	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 9 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.55	-.44	-.01	-.10	-40.61	-37.55	.11	-.09
20.0	-.75	-.61	-.02	-.09	-37.42	-36.24	.14	-.07
25.0	-.85	-.69	-.02	-.08	-36.59	-36.66	.16	-.06
30.0	-.83	-.67	-.02	-.05	-37.52	-38.53	.17	-.03
35.0	-.81	-.65	-.01	-.02	-37.33	-39.16	.17	-.01
40.0	-.74	-.58	-.01	.01	-37.68	-39.72	.16	.02
45.0	-.63	-.48	-.00	.04	-39.30	-40.18	.14	.04
50.0	-.48	-.36	.00	.08	-42.23	-40.07	.12	.07
55.0	-.24	-.15	.00	.10	-48.16	-38.69	.09	.10
60.0	0.00	.06	0.00	.13	-200.00	-36.60	.06	.13
65.0	.32	.34	-.02	.13	-44.55	-35.49	.02	.15
70.0	.64	.63	-.06	.12	-38.33	-35.36	-.01	.18
75.0	.99	.95	-.11	.09	-34.05	-34.63	-.04	.20
80.0	1.13	1.06	-.19	.03	-30.56	-34.34	-.07	.22
85.0	1.07	.99	-.29	-.05	-28.48	-34.79	-.09	.24
90.0	.70	.60	-.38	-.13	-27.65	-35.60	-.10	.25
95.0	-.00	-.11	-.44	-.17	-27.87	-35.82	-.11	.27
100.0	-.84	-.94	-.44	-.16	-27.91	-34.35	-.10	.28
105.0	-1.52	-1.61	-.38	-.09	-29.58	-34.06	-.09	.29
110.0	-1.85	-1.93	-.29	.01	-32.66	-35.25	-.08	.30
TOTAL	.87	.83	.20	.10	-32.04	-35.55		
NET REDUCTION OF MISMATCH ERRORS					3.51DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00004	-.00000
2	1.00000	0.00000	1.00670	.00000
3	0.00000	0.00000	.00143	-.00000
4	0.00000	0.00000	-.00595	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 10 WITH 4 TAPS
FOR A TAP SPACING OF .0000 SECS.

FREQ (HZ)	PHASE FROM (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MIS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.60	-.40	-.13	-.10	-34.87	-37.58	.20	.03
20.0	-.65	-.41	-.13	-.08	-34.62	-38.33	.25	.04
25.0	-.67	-.39	-.11	-.06	-35.39	-40.50	.28	.05
30.0	-.71	-.43	-.11	-.04	-36.02	-41.82	.28	.06
35.0	-.71	-.44	-.09	-.01	-36.34	-42.55	.27	.08
40.0	-.62	-.38	-.07	.02	-37.42	-43.04	.24	.09
45.0	-.50	-.31	-.05	.04	-39.57	-42.81	.19	.10
50.0	-.49	-.37	-.03	.07	-41.44	-40.13	.12	.10
55.0	-.24	-.19	-.02	.09	-46.85	-40.16	.05	.11
60.0	0.00	-.04	0.00	.11	-200.00	-37.92	-.04	.11
65.0	.23	.11	-.00	.10	-47.72	-38.21	-.12	.11
70.0	.46	.26	-.01	.09	-42.21	-39.47	-.20	.10
75.0	.68	.41	-.03	.07	-38.85	-39.98	-.27	.10
80.0	.94	.50	-.06	.02	-34.86	-39.19	-.33	.09
85.0	1.00	.62	-.10	-.03	-33.55	-38.82	-.37	.07
90.0	.94	.54	-.15	-.09	-33.31	-37.92	-.34	.06
95.0	.61	.22	-.16	-.12	-35.19	-38.94	-.39	.05
100.0	.42	.05	-.16	-.12	-36.51	-39.17	-.37	.03
105.0	.15	-.18	-.11	-.09	-41.17	-42.62	-.33	.02
110.0	.19	-.07	-.06	-.05	-48.46	-50.72	-.26	.01
TOTAL	.60	.36	.09	.08	-36.43	-39.15		
NET REDUCTION OF MISMATCH ERROR					2.72DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00847	-.00000
2	1.00000	0.00000	1.00978	.00000
3	0.00000	0.00000	-.00955	-.00000
4	0.00000	0.00000	-.00226	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 11 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0040 SECS.			TOTAL		FILTER		FILTER	
FREQ	PHASE	AMPLITUDE	MS ERROR		PHASE	AMPL.		
(HZ)	ERROR	ERROR	(DB POWER)		(DEGREES)	(DB)		
	(DEGREES)	(DB)	BEFORE	AFTER				
15.0	-.44	-.33	.00	-.07	-42.51	-40.32	.11	-.08
20.0	-.61	-.47	-.00	-.07	-39.37	-38.87	.14	-.06
25.0	-.68	-.52	-.01	-.06	-38.54	-39.13	.16	-.05
30.0	-.67	-.50	-.01	-.04	-39.43	-41.14	.17	-.03
35.0	-.67	-.49	-.00	-.01	-39.00	-41.55	.18	-.01
40.0	-.61	-.49	-.00	.01	-39.43	-42.21	.17	.01
45.0	-.51	-.35	.00	.03	-41.10	-42.81	.16	.03
50.0	-.37	-.24	.00	.06	-44.44	-42.93	.13	.05
55.0	-.19	-.08	.00	.08	-50.08	-41.34	.11	.07
60.0	0.00	.08	0.00	.09	-200.00	-39.19	.08	.09
65.0	.26	.30	-.02	.10	-46.22	-38.13	.05	.11
70.0	.50	.51	-.04	.00	-40.52	-37.78	.01	.13
75.0	.77	.75	-.04	.06	-36.24	-37.06	-.02	.15
80.0	.83	.79	-.14	.02	-33.08	-37.00	-.04	.16
85.0	.74	.67	-.22	-.04	-31.06	-37.88	-.06	.18
90.0	.44	.36	-.28	-.10	-30.28	-38.50	-.08	.19
95.0	-.11	-.19	-.32	-.13	-30.57	-38.41	-.08	.20
100.0	-.72	-.80	-.31	-.11	-30.70	-36.72	-.08	.20
105.0	-1.15	-1.22	-.26	-.05	-32.65	-36.71	-.08	.21
110.0	-1.30	-1.37	-.18	.03	-36.13	-38.14	-.06	.21
TOTAL	.66	.62	.15	.07	-39.64	-38.19		
NET REDUCTION OF MISMATCH ERROR					3.55DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00803	-.00000
2	1.00000	0.00000	1.00000	.00000
3	0.00000	0.00000	-.00742	-.00000
4	0.00000	0.00000	-.00306	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 12 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.18	-.07	.03	-.05	-47.15	-45.55	.11	-.07
20.0	-.36	-.23	.01	-.05	-43.66	-42.98	.13	-.06
25.0	-.45	-.31	.00	-.04	-42.11	-42.82	.15	-.05
30.0	-.51	-.36	-.01	-.04	-41.68	-42.85	.15	-.03
35.0	-.53	-.38	-.01	-.02	-41.05	-43.34	.15	-.01
40.0	-.47	-.34	-.01	-.00	-41.51	-44.40	.13	.01
45.0	-.40	-.30	-.01	.02	-42.90	-45.13	.10	.03
50.0	-.46	-.39	-.01	.04	-42.53	-42.08	.07	.05
55.0	-.22	-.19	-.01	.06	-48.74	-42.90	.03	.07
60.0	0.00	-.01	0.00	.09	-200.00	-39.87	-.01	.09
65.0	.21	.15	-.01	.09	-47.98	-39.38	-.06	.10
70.0	.42	.33	-.04	.08	-41.82	-39.65	-.10	.12
75.0	.59	.46	-.07	.06	-38.38	-39.79	-.13	.13
80.0	.82	.66	-.12	.02	-33.86	-38.55	-.16	.14
85.0	.84	.65	-.18	-.03	-31.92	-38.48	-.18	.15
90.0	.63	.44	-.24	-.08	-31.19	-38.86	-.20	.16
95.0	.15	-.04	-.27	-.11	-31.88	-39.77	-.20	.16
100.0	-.23	-.41	-.27	-.10	-32.39	-39.54	-.18	.17
105.0	-.63	-.77	-.22	-.05	-34.75	-40.06	-.16	.17
110.0	-.76	-.89	-.15	.02	-39.08	-41.86	-.13	.17
TOTAL	.50	.44	.13	.06	-36.11	-40.20		
NET REDUCTION OF MISMATCH ERRORS					4.09DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00260	.00000
2	1.00000	0.00000	1.00515	-.00000
3	0.00000	0.00000	-.00604	-.00000
4	0.00000	0.00000	-.00136	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 13 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.40	-.36	-.00	-.03	-41.62	-42.79	.13		-.03
20.0	-.54	-.38	-.00	-.03	-40.36	-42.37	.16		-.03
25.0	-.54	-.35	-.00	-.02	-40.51	-43.42	.19		-.02
30.0	-.51	-.30	-.00	-.01	-41.77	-45.99	.21		-.01
35.0	-.40	-.25	-.00	-.00	-41.82	-47.26	.23		-.00
40.0	-.42	-.20	-.00	.01	-42.37	-48.64	.24		.01
45.0	-.35	-.11	.00	.02	-40.30	-49.65	.24		.02
50.0	-.25	-.02	.00	.03	-47.81	-49.37	.23		.03
55.0	-.13	.00	.00	.04	-53.61	-46.02	.22		.04
60.0	0.00	.20	0.00	.05	-200.00	-43.16	.20		.05
65.0	.16	.30	-.01	.05	-49.99	-41.74	.18		.06
70.0	.20	.45	-.03	.04	-44.36	-41.54	.16		.07
75.0	.20	.43	-.07	.01	-41.42	-42.84	.14		.08
80.0	.38	.40	-.10	-.02	-37.19	-40.91	.12		.08
85.0	.22	.32	-.15	-.06	-35.22	-41.31	.09		.09
90.0	-.12	-.05	-.14	-.08	-34.60	-41.31	.07		.09
95.0	-.57	-.52	-.17	-.07	-35.11	-40.20	.06		.10
100.0	-.96	-.92	-.12	-.02	-35.42	-37.92	.04		.10
105.0	-1.10	-1.16	-.05	.06	-36.95	-36.95	.03		.10
110.0	-1.00	-1.07	.03	.14	-40.06	-37.92	.02		.11
TOTAL	.55	.51	.07	.05	-38.62	-41.03			
NET REDUCTION OF MISMATCH ERRORS					2.42DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01159	.00000
2	1.00000	0.00000	1.01921	-.00000
3	0.00000	0.00000	-.01458	.00000
4	0.00000	0.00000	-.00029	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 14 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.28	-.21	-.08	-.12	-40.11	-36.95	.07	-.05
20.0	-.66	-.56	-.08	-.11	-36.65	-35.77	.10	-.03
25.0	-.87	-.75	-.07	-.08	-35.49	-35.85	.12	-.02
30.0	-1.01	-.88	-.06	-.06	-35.25	-36.31	.13	.00
35.0	-1.04	-.89	-.04	-.02	-34.97	-36.51	.15	.02
40.0	-.94	-.78	-.03	.02	-35.55	-37.20	.16	.05
45.0	-.78	-.61	-.02	.06	-37.33	-38.10	.17	.07
50.0	-.70	-.53	.00	.10	-38.97	-37.30	.17	.10
55.0	-.36	-.19	-.00	.12	-44.59	-37.19	.17	.13
60.0	0.00	.17	0.00	.15	-200.00	-34.84	.17	.15
65.0	.36	.52	-.03	.15	-42.92	-33.98	.17	.18
70.0	.68	.84	-.08	.13	-37.16	-33.90	.16	.21
75.0	.96	1.11	-.14	.09	-33.23	-33.64	.15	.24
80.0	1.18	1.32	-.24	.02	-29.17	-32.63	.14	.26
85.0	1.04	1.16	-.35	-.07	-27.06	-33.14	.13	.29
90.0	.55	.66	-.47	-.16	-26.08	-33.84	.11	.31
95.0	-.41	-.31	-.53	-.20	-26.33	-34.40	.10	.33
100.0	-1.33	-1.25	-.52	-.17	-26.32	-32.85	.08	.34
105.0	-2.21	-2.15	-.43	-.07	-27.84	-31.91	.07	.36
110.0	-2.56	-2.51	-.30	.07	-30.94	-32.79	.05	.37
TOTAL	1.08	1.05	.24	.11	-30.48	-33.89		
NET REDUCTION OF MISMATCH ERROR=					3.42DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00945	.00000
2	1.00000	0.00000	1.01944	-.00000
3	0.00000	0.00000	-.01134	-.00000
4	0.00000	0.00000	-.00195	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 15 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.53	-.41	-.14	-.15	-34.80	-34.67	.12	-.01
20.0	-.86	-.72	-.14	-.14	-33.15	-33.90	.15	.00
25.0	-1.06	-.89	-.12	-.10	-32.80	-34.24	.17	.02
30.0	-1.13	-.95	-.10	-.06	-33.69	-35.70	.19	.04
35.0	-1.13	-.94	-.08	-.02	-33.74	-36.04	.19	.06
40.0	-1.05	-.86	-.05	.03	-34.23	-36.21	.19	.08
45.0	-.89	-.71	-.03	.07	-36.05	-36.54	.18	.10
50.0	-.67	-.50	-.01	.11	-39.37	-36.73	.17	.13
55.0	-.35	-.20	-.00	.15	-44.94	-35.68	.15	.15
60.0	0.00	.12	0.00	.17	-200.00	-33.90	.12	.17
65.0	.41	.51	-.02	.17	-42.33	-33.09	.09	.19
70.0	.83	.90	-.06	.15	-36.27	-32.98	.06	.22
75.0	1.25	1.28	-.13	.10	-32.18	-32.41	.04	.24
80.0	1.39	1.41	-.23	.02	-28.92	-32.03	.01	.25
85.0	1.26	1.25	-.35	-.08	-26.90	-32.49	-.01	.27
90.0	.77	.74	-.46	-.18	-26.16	-33.12	-.03	.28
95.0	-.15	-.18	-.52	-.22	-26.52	-33.61	-.04	.29
100.0	-1.18	-1.22	-.50	-.20	-26.66	-32.40	-.04	.30
105.0	-2.01	-2.05	-.41	-.10	-28.36	-32.12	-.04	.31
110.0	-2.34	-2.37	-.28	.04	-31.59	-33.41	-.04	.32
TOTAL	1.11	1.07	.24	.13	-30.25	-33.12		
NET REDUCTION OF MISMATCH ERROR=					2.88DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00784	.00000
2	1.00000	0.00000	1.01637	.00000
3	0.00000	0.00000	-.00818	-.00000
4	0.00000	0.00000	-.00263	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 16 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0000 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.45	-.34	-.13	-.13	-35.85	-36.07	.11		-.00
20.0	-.60	-.56	-.12	-.12	-34.50	-35.59	.14		.01
25.0	-.83	-.68	-.11	-.09	-34.46	-36.32	.15		.02
30.0	-.91	-.75	-.10	-.06	-34.91	-37.32	.16		.04
35.0	-.93	-.77	-.08	-.02	-35.00	-37.66	.16		.06
40.0	-.86	-.71	-.06	.02	-35.58	-37.96	.15		.08
45.0	-.72	-.59	-.04	.06	-37.51	-38.40	.13		.10
50.0	-.67	-.56	-.02	.10	-39.28	-37.20	.11		.12
55.0	-.34	-.27	-.01	.12	-44.84	-37.03	.07		.14
60.0	0.00	.04	0.00	.15	-200.00	-34.90	.04		.15
65.0	.33	.33	-.02	.15	-44.17	-34.43	.00		.17
70.0	.68	.64	-.05	.14	-38.11	-34.61	-.04		.19
75.0	.97	.90	-.10	.10	-34.48	-34.58	-.07		.20
80.0	1.26	1.16	-.18	.03	-30.42	-33.58	-.10		.21
85.0	1.26	1.14	-.27	-.05	-28.38	-33.60	-.12		.22
90.0	.93	.60	-.37	-.14	-27.58	-34.08	-.13		.23
95.0	.18	.05	-.43	-.19	-28.03	-34.90	-.13		.24
100.0	-.56	-.69	-.43	-.19	-28.23	-34.30	-.13		.24
105.0	-1.30	-1.42	-.37	-.12	-30.09	-34.57	-.11		.25
110.0	-1.64	-1.73	-.26	-.01	-33.53	-36.19	-.09		.25
TOTAL	.87	.82	.21	.11	-31.77	-34.74			
NET REDUCTION OF MISMATCH ERROR=					2.97DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00450	.00000
2	1.00000	0.00000	1.00924	.00000
3	0.00000	0.00000	-.00732	.00000
4	0.00000	0.00000	-.00393	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 17 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)			
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.16	-.95	-.06	-.10	-33.74	-34.35	.21	-.04
20.0	-1.05	-.78	-.05	-.08	-34.16	-35.55	.27	-.03
25.0	-.96	-.65	-.05	-.06	-35.17	-37.62	.31	-.01
30.0	-.88	-.55	-.04	-.04	-36.72	-40.47	.34	.00
35.0	-.81	-.46	-.03	-.01	-37.17	-42.20	.34	.02
40.0	-.70	-.37	-.02	.02	-37.96	-43.47	.34	.04
45.0	-.58	-.26	-.01	.04	-39.88	-43.28	.32	.06
50.0	-.42	-.14	-.01	.07	-43.35	-42.35	.28	.08
55.0	-.22	.02	.00	.09	-49.00	-40.10	.24	.09
60.0	0.00	.19	0.00	.11	-200.00	-37.83	.19	.11
65.0	.26	.34	-.01	.11	-46.37	-36.94	.13	.12
70.0	.52	.59	-.04	.09	-40.44	-37.02	.07	.13
75.0	.70	.81	-.08	.06	-36.24	-36.67	.02	.14
80.0	.83	.80	-.14	.01	-33.38	-36.98	-.03	.14
85.0	.73	.65	-.21	-.06	-31.41	-37.44	-.07	.15
90.0	.38	.28	-.27	-.12	-30.83	-37.61	-.10	.15
95.0	-.21	-.32	-.29	-.14	-31.45	-37.40	-.11	.15
100.0	-.83	-.95	-.26	-.11	-31.91	-35.94	-.12	.15
105.0	-1.27	-1.38	-.18	-.03	-33.97	-35.82	-.11	.15
110.0	-1.34	-1.43	-.09	.06	-37.77	-37.48	-.09	.15
TOTAL	.78	.71	.13	.08	-34.46	-36.98		
NET REDUCTION OF MISMATCH ERROR=					2.52DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00444	-.00000
2	1.00000	0.00000	1.00393	-.00000
3	0.00000	0.00000	-.00960	.00000
4	0.00000	0.00000	-.00321	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 18 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.11	-.87	.05	-.05	-34.07	-36.15	.24	-.10
20.0	-.96	-.66	.05	-.04	-34.86	-38.20	.30	-.09
25.0	-.81	-.46	.05	-.02	-36.33	-41.60	.35	-.07
30.0	-.74	-.35	.04	-.02	-38.11	-44.58	.39	-.06
35.0	-.64	-.23	.04	-.00	-38.84	-48.45	.41	-.04
40.0	-.49	-.07	.03	.01	-40.53	-53.86	.42	-.02
45.0	-.35	.06	.02	.02	-43.46	-50.61	.41	.00
50.0	-.34	.04	.02	.04	-44.39	-46.92	.39	.02
55.0	-.13	.22	.01	.04	-52.75	-44.44	.36	.04
60.0	0.00	.32	0.00	.05	-200.00	-41.57	.32	.05
65.0	.13	.40	-.03	.04	-48.55	-41.28	.27	.07
70.0	.22	.44	-.05	.03	-43.28	-42.03	.22	.08
75.0	.25	.42	-.08	.01	-40.41	-43.13	.17	.09
80.0	.26	.38	-.13	-.02	-36.36	-42.86	.12	.10
85.0	.11	.20	-.16	-.05	-34.72	-43.76	.08	.11
90.0	-.17	-.12	-.19	-.07	-34.05	-42.50	.05	.12
95.0	-.61	-.59	-.18	-.06	-34.67	-40.14	.02	.12
100.0	-.78	-.78	-.15	-.02	-35.46	-39.26	-.00	.12
105.0	-1.02	-1.03	-.04	.04	-37.33	-38.16	-.01	.13
110.0	-.93	-.94	-.02	.10	-41.51	-39.64	-.02	.13
TOTAL	.61	.52	.04	.04	-37.00	-40.66		
NET REDUCTION OF MISMATCH ERRORS					3.66DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00330	.00000
2	1.00000	0.00000	1.00663	-.00000
3	0.00000	0.00000	-.00667	-.00000
4	0.00000	0.00000	-.00231	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 19 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.61	-.45	-.02	-.06	-39.52	-40.19	.16	-.04
20.0	-.62	-.41	-.02	-.05	-39.00	-40.59	.21	-.03
25.0	-.63	-.39	-.02	-.04	-39.07	-42.02	.24	-.02
30.0	-.59	-.33	-.01	-.02	-40.49	-45.17	.26	-.01
35.0	-.60	-.32	-.01	-.00	-39.97	-45.41	.28	.01
40.0	-.53	-.25	.00	.02	-40.57	-46.04	.28	.02
45.0	-.45	-.17	.00	.04	-42.17	-45.46	.28	.03
50.0	-.37	-.11	.01	.05	-44.35	-44.32	.26	.05
55.0	-.16	.07	.01	.07	-51.05	-42.64	.24	.06
60.0	0.00	.21	0.00	.07	-200.00	-40.85	.21	.07
65.0	.19	.37	-.02	.06	-47.46	-40.42	.17	.08
70.0	.36	.50	-.05	.04	-41.74	-40.54	.14	.09
75.0	.50	.60	-.09	.01	-37.80	-40.10	.10	.10
80.0	.53	.60	-.14	-.04	-34.45	-38.85	.07	.11
85.0	.33	.37	-.20	-.08	-32.63	-38.57	.04	.11
90.0	-.01	.01	-.22	-.11	-32.61	-38.95	.02	.12
95.0	-.53	-.53	-.20	-.08	-34.06	-39.56	-.00	.12
100.0	-1.07	-1.09	-.14	-.02	-34.44	-36.57	-.01	.12
105.0	-1.21	-1.22	-.04	.08	-36.91	-36.08	-.02	.12
110.0	-1.12	-1.14	.04	.16	-39.71	-36.97	-.02	.12
TOTAL	.61	.57	.09	.07	-36.87	-39.35		
NET REDUCTION OF MISMATCH ERROR					2.48DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.05350	.00000
2	1.00000	0.00000	1.01509	-.00000
3	0.00000	0.00000	-.05313	-.00000
4	0.00000	0.00000	-.00963	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 20 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
15.0	-4.06	-3.21	.46	-.19	-21.07	-24.79	.85	-.65	
20.0	-3.57	-2.49	.45	-.15	-21.51	-26.59	1.08	-.59	
25.0	-3.11	-1.85	.43	-.09	-22.55	-29.50	1.26	-.52	
30.0	-2.62	-1.23	.39	-.04	-24.55	-33.98	1.39	-.43	
35.0	-2.20	-.73	.35	.01	-25.35	-38.20	1.46	-.34	
40.0	-1.60	-.20	.30	.06	-26.68	-41.95	1.49	-.24	
45.0	-1.23	.23	.23	.10	-29.22	-38.37	1.47	-.13	
50.0	-.78	.62	.17	.14	-33.20	-35.06	1.40	-.03	
55.0	-.38	.91	.09	.16	-39.04	-32.92	1.30	.07	
60.0	0.00	1.17	0.00	.17	-200.00	-30.96	1.17	.17	
65.0	.39	1.41	-.12	.14	-36.36	-30.53	1.02	.26	
70.0	.61	1.48	-.25	.09	-30.87	-31.50	.87	.34	
75.0	.67	1.38	-.39	.03	-27.40	-32.83	.71	.42	
80.0	.67	1.23	-.55	-.06	-23.94	-32.84	.56	.49	
85.0	.23	.65	-.70	-.15	-22.08	-33.71	.42	.55	
90.0	-.59	-.22	-.82	-.21	-21.54	-32.82	.30	.60	
95.0	-1.88	-1.67	-.85	-.20	-21.94	-30.48	.20	.65	
100.0	-3.12	-2.99	-.74	-.11	-22.02	-27.62	.13	.69	
105.0	-4.15	-4.08	-.65	.06	-23.50	-26.42	.07	.72	
110.0	-4.66	-4.62	-.50	.24	-26.11	-27.07	.03	.74	
TOTAL	2.34	2.03	.46	.13	-23.84	-29.43			
NET REDUCTION OF MISMATCH ERROR=					5.59DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.26440	.00000
2	1.00000	0.00000	.04134	-.00000
3	0.00000	0.00000	-.03303	.00000
4	0.00000	0.00000	-.00171	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 21 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MISMATCH (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	217.45	-119.10	-.35	-11.47	5.11	.98	-336.56	-11.11
20.0	66.77	97.53	-.86	-11.83	.56	.67	30.76	-10.96
25.0	38.46	76.19	-.57	-11.37	-3.93	-.31	37.74	-10.80
30.0	-20.62	23.75	-.09	-10.73	-9.80	-3.41	44.37	-10.64
35.0	-69.11	341.56	-.36	-10.87	.52	-3.09	410.67	-10.50
40.0	-87.96	-31.27	-.83	-11.22	2.51	-2.13	56.69	-10.39
45.0	-237.62	184.85	-.69	-11.01	4.48	2.09	422.47	-10.31
50.0	244.41	-47.51	.33	-9.96	4.00	-2.46	-291.92	-10.29
55.0	-65.37	8.21	.03	-10.28	.11	-3.69	73.58	-10.31
60.0	0.00	79.03	0.00	-10.38	-200.00	-.10	79.03	-10.38
65.0	-265.36	179.15	-.62	-11.14	3.09	2.16	444.51	-10.52
70.0	215.25	-54.67	.08	-10.62	5.17	-1.74	-269.92	-10.71
75.0	-40.12	55.04	-.04	-10.99	-3.73	-1.79	95.83	-10.95
80.0	-68.35	33.48	-.59	-11.65	.84	-1.84	101.83	-11.26
85.0	-94.05	-57.78	-.63	-12.24	5.76	-.86	-251.83	-11.61
90.0	84.85	-69.90	.20	-11.81	5.48	-1.16	114.95	-12.01
95.0	-27.76	94.50	.92	-11.52	-7.49	-1.32	122.26	-12.44
100.0	-68.34	61.66	1.89	-11.00	-.03	-3.05	130.20	-12.89
105.0	-254.65	-115.80	3.48	-9.85	2.50	-2.13	138.85	-13.33
110.0	-196.00	312.25	5.23	-8.50	3.14	-7.78	508.25	-13.73
TOTAL	15.56	134.46	1.79	4.69	2.91	-.36		
NET REDUCTION OF MISMATCH ERROR					3.27DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01203	-.00000
2	1.00000	0.00000	1.01262	.00000
3	0.00000	0.00000	-.01648	-.00000
4	0.00000	0.00000	-.00202	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 22 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.84	-.68	.05	-.08	-36.12	-36.66	.18	-.13
20.0	-.95	-.72	.04	-.07	-35.10	-36.23	.22	-.12
25.0	-.95	-.69	.04	-.06	-35.33	-37.44	.26	-.10
30.0	-.92	-.63	.03	-.05	-36.54	-39.13	.29	-.07
35.0	-.89	-.58	.03	-.02	-36.39	-40.21	.31	-.04
40.0	-.75	-.43	.03	.01	-37.32	-42.24	.32	-.02
45.0	-.60	-.28	.02	.04	-39.45	-43.79	.32	.02
50.0	-.55	-.24	.02	.07	-40.82	-41.62	.31	.05
55.0	-.26	.03	.01	.09	-47.20	-40.66	.29	.08
60.0	0.00	.27	0.00	.11	-200.00	-37.29	.27	.11
65.0	.26	.49	-.03	.11	-44.49	-36.32	.24	.14
70.0	.48	.68	-.08	.09	-38.78	-36.37	.20	.17
75.0	.65	.82	-.13	.06	-35.03	-36.41	.17	.20
80.0	.80	.93	-.22	.01	-30.92	-35.64	.14	.22
85.0	.64	.75	-.30	-.05	-28.85	-36.73	.11	.25
90.0	.25	.33	-.39	-.12	-27.83	-37.20	.08	.27
95.0	-.52	-.46	-.43	-.14	-28.04	-36.67	.06	.28
100.0	-1.19	-1.15	-.41	-.11	-28.05	-34.61	.04	.30
105.0	-1.86	-1.84	-.35	-.03	-29.50	-33.36	.02	.31
110.0	-2.09	-2.08	-.25	.07	-32.63	-34.35	.01	.32
TOTAL	.92	.86	.20	.08	-32.02	-36.25		
NET REDUCTION OF MISMATCH ERRORS					4.25DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00047	-.00000
2	1.00000	0.00000	1.01083	.00000
3	0.00000	0.00000	.00007	-.00000
4	0.00000	0.00000	-.000437	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 23 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE FROM (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.47	-.32	-.14	-.12	-33.53	-36.99	.15	.06
20.0	-.64	-.46	-.17	-.10	-32.92	-36.83	.18	.07
25.0	-.74	-.54	-.15	-.08	-33.35	-37.86	.20	.08
30.0	-.74	-.58	-.13	-.05	-34.70	-39.74	.21	.09
35.0	-.80	-.60	-.11	-.01	-35.02	-39.95	.20	.10
40.0	-.74	-.56	-.08	.02	-35.83	-39.84	.17	.11
45.0	-.63	-.50	-.06	.06	-37.86	-39.38	.14	.11
50.0	-.48	-.39	-.04	.09	-41.32	-39.13	.09	.12
55.0	-.25	-.22	-.02	.11	-46.91	-38.04	.03	.13
60.0	0.00	-.03	0.00	.13	-200.00	-36.41	-.03	.13
65.0	.31	.22	-.00	.13	-45.18	-36.25	-.09	.13
70.0	.64	.49	-.02	.11	-39.36	-36.62	-.15	.13
75.0	.99	.79	-.05	.07	-35.35	-36.37	-.20	.13
80.0	1.11	.87	-.10	.02	-32.84	-36.19	-.24	.12
85.0	1.10	.82	-.17	-.05	-31.27	-36.01	-.27	.11
90.0	.85	.57	-.23	-.12	-31.20	-36.05	-.29	.11
95.0	.37	.08	-.25	-.15	-32.50	-36.89	-.29	.10
100.0	-.17	-.44	-.22	-.14	-33.98	-37.40	-.27	.09
105.0	-.54	-.78	-.16	-.08	-37.43	-39.37	-.24	.08
110.0	-.56	-.75	-.07	.00	-43.79	-43.46	-.19	.07
TOTAL	.67	.55	.13	.09	-34.38	-36.91		
NET REDUCTION OF MISMATCH FROM					2.54DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01339	-.00000
2	1.00000	0.00000	1.02273	.00000
3	0.00000	0.00000	-.01609	-.00000
4	0.00000	0.00000	-.00264	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 24 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.89	-.73	-.12	-.17	-34.10	-32.87	.16	-.06
20.0	-1.13	-.92	-.11	-.15	-32.48	-32.41	.20	-.04
25.0	-1.26	-1.02	-.10	-.12	-32.25	-33.16	.24	-.02
30.0	-1.31	-1.06	-.09	-.08	-32.83	-34.53	.26	.01
35.0	-1.31	-1.04	-.07	-.03	-32.76	-35.06	.27	.04
40.0	-1.10	-.93	-.05	.02	-33.30	-35.64	.27	.07
45.0	-1.00	-.74	-.03	.07	-35.09	-36.23	.25	.10
50.0	-.88	-.64	-.01	.13	-37.04	-35.30	.23	.14
55.0	-.46	-.26	-.00	.16	-42.43	-34.70	.20	.17
60.0	0.00	.17	0.00	.20	-200.00	-32.51	.17	.20
65.0	.43	.56	-.03	.21	-41.79	-31.62	.13	.23
70.0	.90	1.00	-.08	.19	-35.35	-31.58	.09	.26
75.0	1.27	1.33	-.15	.14	-31.56	-31.58	.06	.29
80.0	1.61	1.63	-.27	.04	-27.50	-30.67	.02	.32
85.0	1.54	1.54	-.41	-.07	-25.34	-30.92	-.01	.34
90.0	.99	.96	-.50	-.20	-24.48	-31.67	-.03	.36
95.0	-.13	-.17	-.64	-.27	-24.73	-32.12	-.04	.37
100.0	-1.25	-1.30	-.64	-.25	-24.74	-30.54	-.05	.39
105.0	-2.32	-2.37	-.55	-.15	-26.31	-30.59	-.05	.40
110.0	-2.86	-2.91	-.41	.00	-29.31	-31.71	-.04	.41
TOTAL	1.31	1.25	.30	.15	-28.67	-31.78		

NET REDUCTION OF MISMATCH ERRORS 3.11DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00193	-.00000
2	1.00000	0.00000	1.00000	.00000
3	0.00000	0.00000	.00019	-.00000
4	0.00000	0.00000	-.00412	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 25 WITH 4 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.22	-.10	-.13	-.09	-36.76	-39.84	.12	.04
20.0	-.41	-.27	-.13	-.08	-35.75	-39.43	.14	.04
25.0	-.56	-.40	-.12	-.07	-35.66	-39.85	.15	.05
30.0	-.58	-.43	-.10	-.04	-36.96	-41.89	.15	.06
35.0	-.64	-.50	-.09	-.02	-36.87	-41.45	.14	.07
40.0	-.61	-.50	-.07	.01	-37.44	-41.07	.11	.08
45.0	-.53	-.46	-.05	.04	-39.27	-40.57	.07	.09
50.0	-.49	-.39	-.03	.07	-42.45	-40.40	.02	.10
55.0	-.29	-.26	-.01	.09	-48.08	-39.29	-.03	.11
60.0	0.00	-.09	0.00	.11	-200.00	-37.80	-.09	.11
65.0	.29	.14	-.00	.11	-46.01	-37.57	-.15	.11
70.0	.58	.38	-.01	.10	-40.26	-37.99	-.20	.11
75.0	.92	.66	-.04	.07	-36.17	-37.59	-.25	.11
80.0	1.06	.77	-.09	.02	-33.51	-37.17	-.29	.11
85.0	1.05	.74	-.14	-.04	-32.08	-37.02	-.31	.10
90.0	.85	.53	-.20	-.11	-32.01	-36.95	-.32	.09
95.0	.42	.10	-.22	-.14	-33.46	-37.94	-.32	.08
100.0	-.06	-.35	-.20	-.12	-35.19	-38.73	-.29	.08
105.0	-.38	-.64	-.13	-.06	-39.13	-41.10	-.26	.07
110.0	-.37	-.57	-.05	.01	-46.83	-45.76	-.20	.06
TOTAL	.58	.46	.11	.08	-35.82	-38.55		
NET REDUCTION OF MISMATCH ERRORS					2.54DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00070	.00000
2	1.00000	0.00000	1.00939	-.00000
3	0.00000	0.00000	-.00125	.00000
4	0.00000	0.00000	-.00259	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 26 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.65	-.51	-.15	-.09	-33.89	-37.44	.14	.06
20.0	-.66	-.49	-.14	-.07	-34.02	-38.30	.18	.07
25.0	-.65	-.45	-.12	-.05	-34.98	-40.26	.21	.07
30.0	-.70	-.44	-.11	-.04	-35.76	-41.30	.22	.08
35.0	-.70	-.47	-.09	-.01	-36.36	-42.06	.23	.08
40.0	-.63	-.41	-.07	.02	-37.34	-42.46	.23	.09
45.0	-.51	-.30	-.05	.04	-39.57	-42.84	.21	.09
50.0	-.47	-.24	-.02	.07	-41.93	-40.90	.19	.10
55.0	-.25	-.04	-.02	.09	-47.20	-40.62	.16	.10
60.0	0.00	.13	0.00	.10	-200.00	-38.32	.13	.10
65.0	.24	.33	-.01	.10	-47.23	-38.01	.09	.10
70.0	.43	.49	-.03	.08	-42.31	-38.63	.05	.10
75.0	.60	.66	-.05	.05	-38.58	-38.42	.02	.10
80.0	.77	.76	-.10	-.01	-34.80	-37.43	-.01	.10
85.0	.68	.64	-.15	-.06	-33.41	-37.57	-.04	.09
90.0	.37	.31	-.20	-.11	-33.06	-37.62	-.06	.09
95.0	-.23	-.30	-.20	-.12	-34.37	-38.45	-.07	.08
100.0	-.62	-.70	-.16	-.09	-35.47	-38.29	-.07	.08
105.0	-1.01	-1.08	-.04	-.01	-37.60	-38.00	-.07	.07
110.0	-1.00	-1.06	.02	.09	-40.92	-39.31	-.06	.07
TOTAL	.61	.56	.11	.07	-35.89	-38.32		
NET REDUCTION OF MISMATCH ERRORS					2.42DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00736	-.00000
2	1.00000	0.00000	1.00960	.00000
3	0.00000	0.00000	-.00802	-.00000
4	0.00000	0.00000	-.00349	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 27 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.62	-.46	-.02	-.04	-39.37	-38.11	.15	-.06
20.0	-.73	-.54	-.03	-.08	-37.55	-37.63	.19	-.05
25.0	-.78	-.57	-.03	-.06	-37.16	-38.37	.21	-.03
30.0	-.76	-.54	-.02	-.04	-38.17	-40.49	.23	-.02
35.0	-.73	-.50	-.02	-.01	-38.18	-41.35	.23	.00
40.0	-.65	-.47	-.01	.01	-38.73	-42.05	.21	.02
45.0	-.58	-.38	-.01	.04	-40.49	-42.23	.14	.05
50.0	-.40	-.24	-.00	.06	-43.91	-42.12	.15	.07
55.0	-.20	-.09	.00	.09	-49.50	-40.25	.11	.09
60.0	0.00	.06	0.00	.10	-200.00	-38.31	.06	.10
65.0	.29	.30	-.01	.11	-45.63	-37.33	.01	.12
70.0	.54	.51	-.04	.10	-40.13	-37.36	-.04	.14
75.0	.83	.75	-.06	.07	-35.88	-36.86	-.08	.15
80.0	.93	.81	-.14	.02	-32.81	-36.73	-.12	.16
85.0	.86	.71	-.21	-.04	-30.99	-37.33	-.15	.17
90.0	.58	.42	-.28	-.11	-30.24	-37.61	-.16	.17
95.0	.05	-.12	-.31	-.13	-30.83	-37.96	-.17	.18
100.0	-.55	-.71	-.30	-.12	-31.25	-36.88	-.16	.18
105.0	-1.01	-1.16	-.24	-.06	-33.31	-36.99	-.15	.18
110.0	-1.14	-1.26	-.16	.03	-37.27	-38.88	-.12	.18
TOTAL	.68	.01	.18	.08	-34.58	-37.70		
NET REDUCTION OF MISMATCH ERRORS					3.13DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.01004	-.00000
2	1.00000	0.00000	1.01224	.00000
3	0.00000	0.00000	-.01141	-.00000
4	0.00000	0.00000	-.00031	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 28 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.47	-.43	.01	-.06	-41.82	-40.24	.04	-.07
20.0	-.35	-.30	.02	-.04	-43.76	-42.86	.05	-.06
25.0	-.47	-.40	-.01	-.05	-41.77	-40.59	.06	-.05
30.0	-.60	-.52	-.02	-.05	-40.26	-40.11	.07	-.03
35.0	-.59	-.51	-.01	-.03	-40.11	-40.99	.08	-.01
40.0	-.45	-.37	.00	.01	-42.02	-43.62	.08	.01
45.0	-.40	-.32	-.00	.03	-43.14	-44.03	.08	.03
50.0	-.37	-.29	.00	.05	-44.42	-42.69	.08	.05
55.0	-.18	-.10	-.00	.07	-50.64	-41.90	.08	.07
60.0	0.00	.08	0.00	.10	-200.00	-38.95	.08	.10
65.0	.26	.33	-.03	.09	-44.96	-38.43	.08	.12
70.0	.50	.57	-.06	.08	-39.74	-37.59	.07	.14
75.0	.70	.76	-.10	.06	-36.03	-37.01	.06	.16
80.0	.76	.82	-.18	.00	-32.12	-36.78	.06	.19
85.0	.63	.68	-.26	-.05	-29.99	-37.39	.05	.20
90.0	.25	.29	-.33	-.11	-29.07	-37.92	.04	.22
95.0	-.45	-.42	-.37	-.13	-29.31	-37.54	.04	.24
100.0	-.84	-.81	-.34	-.09	-29.90	-37.39	.03	.25
105.0	-1.51	-1.49	-.27	-.01	-31.44	-35.26	.02	.26
110.0	-1.80	-1.78	-.19	.09	-34.28	-35.49	.02	.27
TOTAL	.71	.70	.17	.07	-33.84	-37.94		

NET REDUCTION OF MISMATCH ERROR= 4.09DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00426	.00000
2	1.00000	0.00000	1.01586	-.00000
3	0.00000	0.00000	-.00161	.00000
4	0.00000	0.00000	-.00542	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 29 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.50	-.43	-.23	-.17	-31.41	-33.86	.16	.06
20.0	-.81	-.62	-.21	-.15	-30.90	-33.89	.19	.07
25.0	-.93	-.73	-.19	-.11	-31.32	-34.93	.20	.08
30.0	-1.00	-.79	-.17	-.07	-32.66	-36.81	.20	.10
35.0	-1.03	-.84	-.14	-.02	-32.91	-36.91	.19	.11
40.0	-.96	-.81	-.10	.03	-33.72	-36.77	.15	.13
45.0	-.82	-.72	-.07	.07	-35.76	-36.42	.10	.14
50.0	-.73	-.70	-.04	.12	-37.99	-35.57	.04	.16
55.0	-.33	-.36	-.02	.15	-44.95	-35.04	-.03	.17
60.0	0.00	-.11	0.00	.18	-200.00	-33.57	-.11	.17
65.0	.43	.25	-.00	.19	-42.36	-33.12	-.19	.19
70.0	.91	.66	-.02	.17	-36.33	-33.39	-.26	.19
75.0	1.24	.92	-.07	.12	-33.37	-33.85	-.32	.19
80.0	1.63	1.26	-.14	.05	-29.70	-32.73	-.37	.19
85.0	1.68	1.28	-.23	-.05	-27.98	-32.61	-.40	.18
90.0	1.41	.99	-.33	-.16	-27.66	-32.80	-.41	.18
95.0	.77	.36	-.39	-.22	-28.47	-33.40	-.41	.17
100.0	.03	-.35	-.39	-.23	-29.25	-33.61	-.38	.16
105.0	-.64	-.97	-.33	-.17	-31.80	-35.30	-.33	.16
110.0	-.91	-1.17	-.23	-.08	-36.22	-38.87	-.26	.15
TOTAL	.95	.79	.20	.14	-31.24	-33.69		

NET REDUCTION OF MISMATCH ERROR= 2.45DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00926	.00000
2	1.00000	0.00000	1.01366	.00000
3	0.00000	0.00000	-.01169	-.00000
4	0.00000	0.00000	-.00528	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 30 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)		
	BEFORE	AFTER	BEFORE	AFTER			
15.0	-1.02	-.76	-.05	-.14	-34.82 -34.06	.26	-.08
20.0	-1.13	-.80	-.05	-.12	-33.66 -34.19	.32	-.07
25.0	-1.14	-.77	-.04	-.09	-33.87 -35.71	.37	-.04
30.0	-1.18	-.78	-.04	-.06	-34.35 -37.24	.40	-.02
35.0	-1.12	-.72	-.03	-.01	-34.46 -38.34	.40	.01
40.0	-.99	-.60	-.01	.03	-35.18 -39.20	.39	.04
45.0	-.78	-.43	-.01	.06	-37.32 -39.61	.36	.07
50.0	-.65	-.35	.01	.11	-39.55 -37.96	.31	.10
55.0	-.34	-.10	.00	.13	-45.07 -37.10	.24	.13
60.0	0.00	.17	0.00	.15	-200.00 -34.97	.17	.15
65.0	.36	.46	-.03	.15	-42.99 -34.51	.10	.17
70.0	.67	.69	-.07	.12	-37.47 -35.01	.02	.19
75.0	.97	.92	-.13	.08	-33.63 -35.12	-.04	.21
80.0	1.18	1.07	-.21	.01	-29.90 -34.44	-.10	.22
85.0	1.11	.96	-.30	-.07	-28.00 -34.50	-.15	.23
90.0	.75	.56	-.39	-.15	-27.40 -34.66	-.18	.24
95.0	-.00	-.20	-.42	-.18	-28.23 -35.09	-.20	.25
100.0	-.65	-.85	-.40	-.15	-28.83 -35.02	-.20	.25
105.0	-1.30	-1.48	-.32	-.07	-31.00 -34.93	-.18	.25
110.0	-1.51	-1.66	-.21	.04	-34.81 -36.42	-.15	.25
TOTAL	.93	.82	.19	.11	-31.70 -34.95		
NET REDUCTION OF MISMATCH ERROR			3.25DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.24821	.00000
2	1.00000	0.00000	.04488	-.00000
3	0.00000	0.00000	-.02846	.00000
4	0.00000	0.00000	.00537	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 31 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	218.54	-120.26	.19	-11.13	5.36	1.06	-338.80	-11.33
20.0	67.16	95.34	-.20	-11.49	.91	.62	28.18	-11.29
25.0	39.64	74.72	.01	-11.23	-3.43	-.38	35.08	-11.24
30.0	-18.64	23.22	.75	-10.44	-9.96	-3.53	41.86	-11.19
35.0	-66.71	341.78	.26	-10.87	.56	-3.09	408.50	-11.13
40.0	-87.24	-32.27	-.13	-11.21	2.12	-2.09	54.97	-11.08
45.0	-238.85	182.41	.00	-11.03	4.76	2.09	421.26	-11.03
50.0	244.41	-48.24	.61	-10.39	4.15	-2.35	-292.64	-11.00
55.0	-65.42	7.85	.56	-10.44	.40	-3.63	73.28	-11.00
60.0	0.00	79.04	0.00	-11.04	-200.00	-.12	79.04	-11.04
65.0	-265.22	179.46	-.01	-11.13	3.39	2.17	444.68	-11.12
70.0	215.34	-54.39	.52	-10.73	5.39	-1.75	-269.73	-11.25
75.0	-40.46	55.41	.60	-10.85	-3.44	-1.79	95.87	-11.45
80.0	-67.53	34.04	-.03	-11.74	1.01	-1.84	101.57	-11.71
85.0	194.21	-58.29	-.17	-12.21	5.99	-.84	-252.51	-12.04
90.0	-184.19	-70.42	.69	-11.75	5.71	-1.14	113.77	-12.44
95.0	-27.51	93.05	1.81	-11.10	-6.56	-1.33	120.56	-12.91
100.0	-68.10	59.94	2.16	-11.27	.12	-3.12	128.04	-13.43
105.0	-254.87	-118.45	3.69	-10.30	2.63	-2.12	136.42	-13.98
110.0	-194.80	311.05	5.84	-8.63	3.58	-7.67	505.85	-14.52
TOTAL	156.55	134.21	2.03	4.69	3.16	-.36		
NET REDUCTION OF MISMATCH ERRORS					3.52DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00970	.00000
2	1.00000	0.00000	1.02030	-.00000
3	0.00000	0.00000	-.00922	.00000
4	0.00000	0.00000	-.00280	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 32 WITH 4 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.58	-.48	-.16	-.16	-33.77	-34.35	.10	.01
20.0	-.80	-.66	-.16	-.14	-32.75	-33.99	.12	.02
25.0	-.92	-.79	-.14	-.11	-32.89	-34.79	.14	.04
30.0	-1.05	-.91	-.13	-.08	-33.29	-35.59	.14	.05
35.0	-1.06	-.93	-.11	-.03	-33.49	-36.03	.14	.08
40.0	-.98	-.86	-.08	.02	-34.17	-36.39	.12	.10
45.0	-.83	-.74	-.06	.06	-35.97	-36.70	.10	.12
50.0	-.75	-.68	-.03	.11	-38.13	-35.70	.07	.14
55.0	-.39	-.36	-.02	.15	-43.58	-35.22	.03	.17
60.0	0.00	-.01	0.00	.19	-200.00	-33.19	-.01	.19
65.0	.44	.39	-.01	.19	-42.05	-32.52	-.05	.21
70.0	.86	.78	-.05	.18	-36.35	-32.62	-.08	.23
75.0	1.26	1.15	-.11	.13	-32.54	-32.46	-.12	.24
80.0	1.62	1.47	-.21	.05	-28.57	-31.49	-.14	.26
85.0	1.60	1.44	-.33	-.06	-26.56	-31.59	-.16	.27
90.0	1.19	1.02	-.46	-.18	-25.76	-32.01	-.17	.28
95.0	.23	.06	-.54	-.25	-26.22	-32.84	-.17	.29
100.0	-.74	-.90	-.54	-.24	-26.43	-32.25	-.16	.30
105.0	-1.70	-1.85	-.45	-.15	-24.21	-32.35	-.14	.30
110.0	-2.13	-2.24	-.32	-.02	-31.56	-33.46	-.12	.31
TOTAL	1.00	1.04	.25	.14	-24.97	-32.82		

NET REDUCTION OF MISMATCH ERROR= 2.85DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00353	-.00000
2	0.00000	0.00000	.01487	.00000
3	0.00000	0.00000	-.00659	-.00000
4	1.00000	0.00000	1.02045	.00000
5	0.00000	0.00000	-.00678	.00000
6	0.00000	0.00000	.00226	.00000
7	0.00000	0.00000	-.00223	-.00000
8	0.00000	0.00000	.00255	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 2 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.48	.14	-.13	.05	-35.40	-44.63	.63	.18
20.0	-.68	.11	-.13	.02	-34.29	-51.55	.79	.15
25.0	-.70	.11	-.12	-.01	-34.45	-54.16	.90	.11
30.0	-.86	.08	-.11	-.03	-35.02	-48.37	.95	.08
35.0	-.89	.03	-.09	-.04	-35.12	-47.40	.92	.05
40.0	-.81	.01	-.07	-.04	-35.89	-47.38	.81	.03
45.0	-.68	-.05	-.05	-.03	-37.76	-49.85	.63	.02
50.0	-.63	-.25	-.02	-.00	-39.62	-48.02	.39	.02
55.0	-.34	-.23	-.02	.01	-44.81	-47.99	.11	.03
60.0	0.00	-.17	0.00	.04	-200.00	-44.80	-.17	.04
65.0	.30	-.13	-.01	.05	-45.32	-44.27	-.43	.06
70.0	.60	-.02	-.04	.05	-39.44	-45.88	-.62	.08
75.0	.88	.15	-.07	.03	-35.73	-47.33	-.73	.11
80.0	1.16	.40	-.14	-.00	-31.60	-42.92	-.76	.14
85.0	1.15	.45	-.22	-.05	-29.88	-40.41	-.70	.17
90.0	.91	.32	-.30	-.09	-29.20	-39.46	-.59	.21
95.0	.29	-.15	-.33	-.08	-30.10	-41.99	-.44	.25
100.0	-.27	-.55	-.33	-.03	-30.73	-42.03	-.28	.30
105.0	-.81	-.96	-.26	.08	-33.76	-37.85	-.15	.34
110.0	-.96	-1.01	-.17	.21	-37.60	-36.09	-.05	.38
TOTAL	.45	.05	.16	.07	-33.32	-42.14		
NET REDUCTION OF MISMATCH ERROR=					8.82DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.01066	.00000
2	0.00000	0.00000	.01378	-.00000
3	0.00000	0.00000	-.00972	.00000
4	1.00000	0.00000	1.02477	-.00000
5	0.00000	0.00000	-.01712	.00000
6	0.00000	0.00000	.00598	-.00000
7	0.00000	0.00000	-.00612	.00000
8	0.00000	0.00000	.00427	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 3 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.10	-.02	-.07	.07	-33.90	-41.64	1.08	.14
20.0	-1.19	.13	-.07	.02	-32.96	-49.25	1.32	.09
25.0	-1.28	.17	-.06	-.02	-32.75	-49.40	1.45	.04
30.0	-1.22	.24	-.04	-.05	-34.11	-44.33	1.46	-.00
35.0	-1.15	.18	-.02	-.06	-34.27	-43.11	1.33	-.03
40.0	-1.01	.06	-.01	-.06	-34.98	-43.58	1.28	-.05
45.0	-.84	-.11	.00	-.04	-36.69	-46.50	.73	-.04
50.0	-.61	-.28	.01	-.01	-40.14	-46.78	.33	-.02
55.0	-.31	-.38	.01	.03	-45.75	-43.29	-.07	.02
60.0	0.00	-.41	0.00	.06	-200.00	-40.09	-.41	.06
65.0	.36	-.28	-.03	.08	-43.09	-39.86	-.64	.10
70.0	.70	-.02	-.07	.07	-37.03	-41.90	-.72	.15
75.0	.99	.24	-.15	.05	-33.02	-42.66	-.65	.19
80.0	1.07	.64	-.24	-.01	-29.46	-38.90	-.43	.23
85.0	.85	.74	-.35	-.07	-27.32	-36.13	-.11	.28
90.0	.26	.52	-.46	-.13	-26.46	-35.95	.26	.33
95.0	-.69	-.09	-.50	-.12	-26.65	-38.84	.60	.38
100.0	-1.77	-.92	-.47	-.04	-26.48	-37.66	.85	.43
105.0	-2.51	-1.54	-.36	.12	-28.08	-33.91	.96	.48
110.0	-2.81	-1.89	-.23	.30	-31.01	-32.10	.92	.53
TOTAL	1.24	.66	.23	.09	-30.39	-38.20		
NET REDUCTION OF MISMATCH ERRORS					7.81DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00479	-.00000
2	0.00000	0.00000	.00188	-.00000
3	0.00000	0.00000	-.00117	-.00000
4	1.00000	0.00000	1.00570	-.00000
5	0.00000	0.00000	-.00458	.00000
6	0.00000	0.00000	-.00001	-.00000
7	0.00000	0.00000	-.00115	.00000
8	0.00000	0.00000	.00120	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 4 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.28	.10	.01	.03	-46.41	-47.41	.38	.03
20.0	-.36	.10	-.00	.01	-43.86	-52.86	.46	.01
25.0	-.41	.09	-.00	-.00	-43.01	-55.35	.50	-.00
30.0	-.43	.07	-.01	-.03	-43.24	-50.47	.50	-.02
35.0	-.44	.01	-.01	-.03	-42.67	-49.86	.45	-.02
40.0	-.38	-.02	-.01	-.03	-43.53	-49.92	.36	-.02
45.0	-.30	-.06	-.01	-.02	-45.58	-52.08	.24	-.01
50.0	-.35	-.23	.00	-.00	-45.08	-48.59	.12	-.00
55.0	-.17	-.17	-.00	.01	-51.19	-50.24	-.01	.02
60.0	0.00	-.11	0.00	.03	-200.00	-47.15	-.11	.03
65.0	.13	-.04	-.02	.04	-50.67	-47.29	-.17	.05
70.0	.23	.05	-.04	.03	-45.22	-49.10	-.18	.07
75.0	.28	.13	-.06	.02	-42.27	-49.83	-.14	.08
80.0	.35	.9	-.10	-.01	-37.81	-45.69	-.06	.09
85.0	.22	.27	-.13	-.03	-36.30	-44.09	.06	.09
90.0	.04	.14	-.16	-.06	-35.63	-43.34	.18	.10
95.0	-.49	-.19	-.14	-.05	-36.42	-45.53	.29	.10
100.0	-.73	-.36	-.11	-.01	-37.24	-46.09	.37	.10
105.0	-.93	-.53	-.04	.06	-39.05	-42.48	.40	.10
110.0	-.83	-.46	.04	.13	-42.26	-41.17	.37	.09
TOTAL	.43	.22	.07	.04	-40.03	-45.86		

NET REDUCTION OF MISMATCH ERROR= 5.83DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00506	.00000
2	0.00000	0.00000	.01135	-.00000
3	0.00000	0.00000	-.01863	-.00000
4	1.00000	0.00000	1.01762	-.00000
5	0.00000	0.00000	-.02352	.00000
6	0.00000	0.00000	.00277	-.00000
7	0.00000	0.00000	-.00641	.00000
8	0.00000	0.00000	.00249	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 5 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.06	-.13	.14	.04	-32.38	-45.88	.93	-.10
20.0	-1.14	-.02	.12	.01	-32.07	-57.80	1.13	-.11
25.0	-1.13	.09	.11	-.01	-32.61	-54.26	1.22	-.12
30.0	-1.03	.19	.10	-.02	-34.24	-48.29	1.21	-.12
35.0	-.92	.18	.09	-.03	-34.87	-46.88	1.10	-.12
40.0	-.77	.11	.07	-.03	-35.89	-48.06	.89	-.10
45.0	-.61	.00	.06	-.02	-38.01	-53.40	.61	-.08
50.0	-.46	-.17	.04	-.00	-41.24	-50.97	.29	-.05
55.0	-.21	-.24	.02	.01	-47.41	-47.56	-.03	-.01
60.0	0.00	-.30	0.00	.03	-208.00	-43.94	-.30	.03
65.0	.25	-.24	-.04	.04	-48.46	-44.16	-.49	.07
70.0	.49	-.09	-.08	.04	-38.52	-46.85	-.58	.12
75.0	.73	.17	-.14	.03	-34.49	-47.53	-.55	.17
80.0	.80	.38	-.22	.00	-30.86	-43.52	-.43	.22
85.0	.74	.52	-.31	-.04	-28.46	-39.89	-.22	.27
90.0	.43	.44	-.40	-.07	-27.39	-39.53	.01	.33
95.0	-.20	.05	-.47	-.08	-27.36	-43.02	.24	.39
100.0	-.98	-.56	-.49	-.03	-27.05	-41.78	.42	.46
105.0	-1.64	-1.13	-.45	.07	-28.34	-36.99	.51	.52
110.0	-2.01	-1.51	-.38	.19	-31.01	-35.07	.50	.57
TOTAL	.92	.49	.24	.06	-30.98	-41.85		
NET REDUCTION OF MISMATCH ERRORS					10.87DB:			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00800	.00000
2	0.00000	0.00000	.01542	-.00000
3	0.00000	0.00000	-.01667	.00000
4	1.00000	0.00000	1.02207	-.00000
5	0.00000	0.00000	-.02326	.00000
6	0.00000	0.00000	.00250	-.00000
7	0.00000	0.00000	-.00706	.00000
8	0.00000	0.00000	.00208	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 6 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.67	-.36	.04	.04	-30.81	-42.35	1.31	-.00
20.0	-1.59	-.03	.04	.02	-30.83	-54.32	1.57	-.03
25.0	-1.48	.20	.04	-.00	-31.63	-48.97	1.69	-.05
30.0	-1.37	.29	.03	-.03	-33.13	-45.08	1.66	-.06
35.0	-1.24	.25	.04	-.03	-33.47	-45.11	1.69	-.07
40.0	-1.04	.16	.04	-.03	-34.53	-46.39	1.20	-.07
45.0	-.80	.02	.03	-.03	-34.81	-50.12	.82	-.06
50.0	-.69	-.29	.03	-.00	-38.75	-46.68	.40	-.04
55.0	-.34	-.34	.01	.01	-44.86	-44.85	-.00	-.00
60.0	0.00	-.35	0.00	.04	-200.00	-42.48	-.35	.04
65.0	.32	-.27	-.04	.05	-42.93	-42.88	-.59	.09
70.0	.60	-.10	-.09	.05	-37.13	-45.60	-.70	.14
75.0	.83	.15	-.15	.04	-33.45	-46.52	-.68	.19
80.0	1.06	.51	-.25	-.00	-29.37	-40.89	-.54	.25
85.0	.96	.64	-.35	-.04	-27.22	-38.20	-.32	.31
90.0	.59	.53	-.46	-.09	-26.22	-37.93	-.06	.37
95.0	-.23	-.04	-.53	-.09	-26.35	-41.49	.19	.44
100.0	-1.02	-.64	-.54	-.04	-26.22	-40.60	.39	.50
105.0	-1.86	-1.36	-.48	.08	-27.63	-35.38	.49	.56
110.0	-2.23	-1.73	-.39	.22	-30.58	-33.70	.50	.61
TOTAL	1.15	.59	.25	.07	-29.91	-40.15		
NET REDUCTION OF MISMATCH ERRORS					10.24DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.01023	-.00000
2	0.00000	0.00000	.01179	-.00000
3	0.00000	0.00000	-.00984	.00000
4	1.00000	0.00000	1.02328	-.00000
5	0.00000	0.00000	-.01642	-.00000
6	0.00000	0.00000	.00622	-.00000
7	0.00000	0.00000	-.00571	.00000
8	0.00000	0.00000	.00460	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 7 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.85	.06	-.05	.08	-36.34	-41.14	.91	.12
20.0	-.99	.13	-.05	.03	-34.75	-43.55	1.12	.07
25.0	-1.06	.18	-.04	-.02	-34.49	-48.50	1.24	.02
30.0	-1.02	.23	-.03	-.05	-35.70	-44.32	1.25	-.02
35.0	-.99	.15	-.02	-.06	-35.55	-42.64	1.15	-.04
40.0	-.91	.02	-.01	-.06	-35.95	-43.06	.93	-.05
45.0	-.74	-.12	-.00	-.04	-37.80	-46.01	.62	-.04
50.0	-.55	-.29	.01	-.01	-41.05	-46.49	.26	-.01
55.0	-.29	-.29	.01	.03	-46.51	-43.03	-.10	.02
60.0	0.00	-.41	0.00	.06	-800.00	-39.71	-.41	.06
65.0	.34	-.28	-.03	.08	-43.54	-39.45	-.62	.11
70.0	.67	-.02	-.07	.08	-37.31	-41.64	-.69	.15
75.0	.99	.38	-.14	.05	-33.14	-41.84	-.60	.19
80.0	1.04	.66	-.24	-.01	-29.71	-38.69	-.38	.23
85.0	.79	.74	-.35	-.08	-27.52	-35.94	-.06	.27
90.0	.20	.51	-.44	-.13	-26.69	-35.72	.31	.31
95.0	-.77	-.12	-.49	-.13	-26.83	-38.36	.65	.36
100.0	-1.81	-.91	-.45	-.04	-26.78	-37.82	.90	.41
105.0	-2.60	-1.59	-.33	.12	-28.24	-33.59	1.01	.46
110.0	-2.86	-1.90	-.19	.31	-31.17	-31.92	.95	.50
TOTAL	1.20	.67	.21	.10	-30.83	-37.94		
NET REDUCTION OF MISMATCH ERRORS					7.11DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00296	=.00000
2	0.00000	0.00000	.00341	=.00000
3	0.00000	0.00000	.00513	=.00000
4	1.00000	0.00000	1.00211	=.00000
5	0.00000	0.00000	.00451	=.00000
6	0.00000	0.00000	-.00482	=.00000
7	0.00000	0.00000	.00109	=.00000
8	0.00000	0.00000	-.00130	=.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 8 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.59	-.07	-.10	.01	-36.68	-56.69	.52	.10
20.0	-.55	.06	-.09	.01	-37.01	-58.70	.60	.09
25.0	-.51	.11	-.08	.00	-38.00	-54.42	.63	.08
30.0	-.54	.05	-.08	-.01	-38.53	-58.33	.60	.07
35.0	-.52	.01	-.06	-.01	-39.21	-60.29	.53	.05
40.0	-.43	.00	-.05	-.01	-40.53	-54.27	.43	.04
45.0	-.34	-.03	-.04	-.01	-42.71	-57.49	.31	.03
50.0	-.37	-.18	-.02	-.00	-44.04	-50.93	.19	.02
55.0	-.18	-.11	-.02	-.00	-49.22	-55.20	.08	.02
60.0	0.00	-.03	0.00	.01	-200.00	-55.11	-.03	.01
65.0	.15	.03	-.00	.01	-51.70	-55.49	-.11	.02
70.0	.25	.06	-.01	.01	-47.54	-55.11	-.19	.02
75.0	.33	.08	-.01	.01	-45.18	-54.13	-.25	.02
80.0	.43	.13	-.03	-.00	-41.69	-52.84	-.30	.02
85.0	.49	.08	-.03	-.01	-41.53	-53.74	-.35	.02
90.0	.34	-.01	-.04	-.03	-43.07	-50.54	-.38	.01
95.0	.18	-.22	-.01	-.02	-51.75	-49.12	-.40	-.01
100.0	.24	-.15	.03	-.00	-47.29	-53.84	-.39	-.03
105.0	.27	-.09	.08	.02	-43.15	-53.56	-.36	-.06
110.0	.54	.25	.13	.04	-40.88	-49.19	-.31	-.08
TOTAL	.40	.11	.06	.02	-40.79	-52.91		
NET REDUCTION OF MISMATCH ERROR					12.12DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00442	-.00000
2	0.00000	0.00000	.01390	.00000
3	0.00000	0.00000	-.01404	-.00000
4	1.00000	0.00000	1.02158	.00000
5	0.00000	0.00000	-.01343	-.00000
6	0.00000	0.00000	.00434	-.00000
7	0.00000	0.00000	-.00473	-.00000
8	0.00000	0.00000	.00369	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 9 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.55	.11	-.01	.06	-40.61	-43.36	.66	.07
20.0	-.75	.07	-.02	.02	-37.42	-52.92	.82	.04
25.0	-.85	.09	-.02	-.01	-36.59	-53.27	.93	.01
30.0	-.83	.14	-.02	-.04	-37.52	-47.22	.97	-.02
35.0	-.81	.11	-.01	-.04	-37.33	-45.64	.92	-.03
40.0	-.74	.04	-.01	-.04	-37.68	-46.17	.79	-.04
45.0	-.63	-.06	-.00	-.03	-39.30	-49.75	.57	-.03
50.0	-.48	-.20	.00	-.01	-42.23	-49.87	.29	-.01
55.0	-.24	-.26	.00	.02	-48.18	-46.48	-.02	.02
60.0	0.00	-.31	0.00	.04	-200.00	-42.53	-.31	.04
65.0	.32	-.23	-.02	.06	-44.55	-42.20	-.55	.08
70.0	.64	-.06	-.06	.05	-38.33	-44.57	-.70	.11
75.0	.99	.25	-.11	.04	-34.05	-44.78	-.74	.14
80.0	1.13	.47	-.19	-.00	-30.66	-41.70	-.66	.18
85.0	1.07	.57	-.29	-.05	-28.48	-38.47	-.50	.23
90.0	.70	.42	-.38	-.10	-27.65	-38.09	-.28	.28
95.0	-.00	-.05	-.44	-.10	-27.87	-40.73	-.05	.34
100.0	-.84	-.69	-.44	-.03	-27.91	-40.16	.15	.41
105.0	-1.52	-1.23	-.38	.09	-29.58	-35.88	.29	.47
110.0	-1.85	-1.53	-.29	.24	-32.66	-33.96	.33	.53
TOTAL	.87	.52	.20	.07	-52.04	-40.39		
NET REDUCTION OF MISMATCH ERROR					8.35DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00129	-.00000
2	0.00000	0.00000	.01143	.00000
3	0.00000	0.00000	-.00154	-.00000
4	1.00000	0.00000	1.01172	.00000
5	0.00000	0.00000	.00015	-.00000
6	0.00000	0.00000	-.00224	.00000
7	0.00000	0.00000	-.00037	-.00000
8	0.00000	0.00000	.00009	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 10 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)			
	BEFORE	AFTER	BEFORE	AFTER	BEFORE			
15.0	-.60	-.03	-.13	.02	-34.87	-54.40	.57	.15
20.0	-.66	.04	-.13	.01	-34.62	-56.70	.69	.13
25.0	-.67	.10	-.11	.00	-35.39	-55.12	.77	.11
30.0	-.71	.07	-.11	-.02	-36.02	-54.18	.76	.09
35.0	-.71	.03	-.09	-.02	-36.34	-54.63	.74	.07
40.0	-.62	.02	-.07	-.02	-37.42	-54.81	.64	.05
45.0	-.50	-.00	-.05	-.02	-37.57	-55.12	.49	.04
50.0	-.40	-.18	-.03	-.00	-41.44	-50.95	.32	.03
55.0	-.24	-.12	-.02	-.00	-44.85	-54.03	.12	.02
60.0	0.00	-.09	0.00	.02	-200.00	-50.72	-.04	.02
65.0	.23	-.06	-.00	.02	-47.72	-51.29	-.24	.03
70.0	.46	-.01	-.01	.02	-42.21	-53.02	-.47	.03
75.0	.68	.07	-.03	.02	-38.85	-51.68	-.61	.05
80.0	.94	.22	-.06	.00	-34.86	-48.18	-.71	.06
85.0	1.00	.22	-.10	-.02	-33.55	-47.06	-.78	.08
90.0	.94	.15	-.15	-.05	-33.31	-45.38	-.79	.10
95.0	.61	-.15	-.16	-.04	-35.19	-46.97	-.76	.12
100.0	.42	-.27	-.16	-.02	-34.51	-47.86	-.70	.14
105.0	.15	-.45	-.11	.04	-41.17	-44.28	-.60	.15
110.0	.10	-.28	-.06	.11	-48.48	-43.14	-.47	.17
TOTAL	.60	.17	.09	.03	-34.43	-48.39		
NET REDUCTION OF MISMATCH ERROR					11.96DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00413	-.00000
2	0.00000	0.00000	.00952	.00000
3	0.00000	0.00000	-.00960	-.00000
4	1.00000	0.00000	1.01499	.00000
5	0.00000	0.00000	-.01133	-.00000
6	0.00000	0.00000	.00259	.00000
7	0.00000	0.00000	-.00345	-.00000
8	0.00000	0.00000	.00267	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 11 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.44	.10	.00	.05	-42.51	-45.19	.55	.04
20.0	-.61	.07	-.00	.01	-39.37	-53.91	.68	.02
25.0	-.68	.08	-.01	-.01	-38.54	-53.95	.76	-.00
30.0	-.67	.11	-.01	-.03	-39.43	-49.40	.78	-.02
35.0	-.67	.07	-.00	-.04	-39.06	-47.87	.74	-.03
40.0	-.61	.01	-.00	-.03	-39.43	-48.20	.62	-.03
45.0	-.51	-.07	.00	-.02	-41.10	-51.35	.44	-.02
50.0	-.37	-.15	.00	-.00	-44.44	-51.99	.22	-.01
55.0	-.19	-.21	.00	.02	-50.08	-48.36	-.02	.01
60.0	0.00	-.24	0.00	.04	-200.00	-44.63	-.24	.04
65.0	.26	-.16	-.02	.04	-46.22	-44.77	-.41	.06
70.0	.50	-.02	-.04	.04	-40.52	-46.39	-.51	.09
75.0	.77	.23	-.09	.03	-36.24	-46.29	-.53	.11
80.0	.83	.37	-.14	-.00	-33.08	-43.78	-.47	.14
85.0	.74	.40	-.22	-.04	-31.06	-41.16	-.33	.17
90.0	.44	.24	-.28	-.08	-30.26	-40.61	-.16	.21
95.0	-.11	-.08	-.32	-.07	-30.57	-43.02	.03	.25
100.0	-.72	-.54	-.31	-.02	-30.70	-42.32	.18	.29
105.0	-1.15	-.87	-.26	.07	-32.65	-38.67	.27	.33
110.0	-1.30	-1.00	-.18	.19	-36.13	-36.87	.30	.37
TOTAL	.66	.37	.15	.06	-34.64	-42.89		
NET REDUCTION OF MISMATCH ERRORS					8.24DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00117	-.00000
2	0.00000	0.00000	.00845	.00000
3	0.00000	0.00000	-.00976	-.00000
4	1.00000	0.00000	1.01256	.00000
5	0.00000	0.00000	-.00927	-.00000
6	0.00000	0.00000	.00077	.00000
7	0.00000	0.00000	-.00209	-.00000
8	0.00000	0.00000	.00187	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 12 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.18	.17	.03	.04	-47.15	-45.47	.35	.01
20.0	-.36	.09	.01	.01	-43.66	-53.72	.45	.00
25.0	-.45	.06	.00	-.01	-42.11	-57.28	.52	-.01
30.0	-.51	.04	-.01	-.03	-41.68	-50.09	.55	-.02
35.0	-.53	.02	-.01	-.03	-41.05	-49.22	.54	-.02
40.0	-.47	.01	-.01	-.03	-41.51	-49.53	.48	-.02
45.0	-.40	-.03	-.01	-.02	-42.90	-52.21	.37	-.01
50.0	-.46	-.24	-.01	-.00	-42.53	-48.28	.22	.00
55.0	-.22	-.16	-.01	.01	-48.74	-50.71	.05	.02
60.0	0.00	-.13	0.00	.04	-200.00	-46.43	-.13	.04
65.0	.21	-.09	-.01	.04	-47.98	-46.36	-.29	.05
70.0	.42	.01	-.04	.04	-41.82	-48.33	-.42	.07
75.0	.59	.10	-.07	.03	-38.38	-49.75	-.49	.09
80.0	.82	.31	-.12	-.01	-33.86	-45.13	-.51	.12
85.0	.84	.36	-.18	-.04	-31.92	-42.39	-.47	.14
90.0	.63	.24	-.24	-.07	-31.19	-41.73	-.39	.18
95.0	.15	-.14	-.27	-.06	-31.88	-44.01	-.29	.21
100.0	-.23	-.42	-.27	-.02	-32.39	-44.48	-.19	.25
105.0	-.63	-.73	-.22	.06	-34.75	-40.21	-.10	.29
110.0	-.76	-.79	-.15	.17	-39.08	-38.20	-.03	.32
TOTAL	.50	.30	.13	.05	-36.11	-44.23		

NET REDUCTION OF MISMATCH ERROR= 8.12DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00630	.00000
2	0.00000	0.00000	.00219	.00000
3	0.00000	0.00000	-.00104	.00000
4	1.00000	0.00000	1.00630	.00000
5	0.00000	0.00000	-.00538	-.00000
6	0.00000	0.00000	.00031	-.00000
7	0.00000	0.00000	-.00189	-.00000
8	0.00000	0.00000	.00116	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 13 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL NB ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.40 .03	-.00 .04	-41.62 -47.91	.52	.04
20.0	-.54 .08	-.00 .01	-40.36 -53.71	.62	.02
25.0	-.54 .11	-.00 -.01	-40.51 -53.52	.66	-.00
30.0	-.51 .12	-.00 -.02	-41.77 -50.55	.63	-.02
35.0	-.40 .06	-.00 -.03	-41.82 -49.18	.55	-.03
40.0	-.43 -.01	-.00 -.03	-42.37 -49.22	.42	-.03
45.0	-.35 -.09	.00 -.02	-44.30 -51.50	.26	-.02
50.0	-.25 -.17	.00 -.01	-47.81 -51.16	.09	-.01
55.0	-.13 -.19	.00 .01	-53.61 -49.17	-.07	.01
60.0	0.00 -.18	0.00 .03	-200.00 -46.19	-.16	.03
65.0	.16 -.08	-.01 .04	-49.99 -46.18	-.24	.05
70.0	.29 .05	-.03 .04	-44.38 -47.38	-.24	.07
75.0	.20 .13	-.07 .02	-41.42 -49.79	-.16	.09
80.0	.38 .34	-.10 -.01	-37.19 -44.46	-.04	.10
85.0	.22 .34	-.15 -.04	-35.22 -42.39	.12	.11
90.0	-.12 .16	-.18 -.07	-34.60 -42.61	.28	.11
95.0	-.57 -.14	-.17 -.06	-35.11 -44.85	.43	.11
100.0	-.96 -.44	-.12 -.01	-35.42 -44.29	.52	.11
105.0	-1.10 -.64	-.05 .06	-36.95 -41.10	.55	.11
110.0	-1.09 -.58	.03 .14	-40.06 -40.12	.50	.11
TOTAL	.55 .26	.07 .05	-38.62 -44.68		

NET REDUCTION OF MISMATCH ERROR = 6.27DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00665	.00000
2	0.00000	0.00000	.01559	-.00000
3	0.00000	0.00000	-.01317	.00000
4	1.00000	0.00000	1.02813	-.00000
5	0.00000	0.00000	-.01725	.00000
6	0.00000	0.00000	.00808	-.00000
7	0.00000	0.00000	-.00484	.00000
8	0.00000	0.00000	.00565	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 14 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.28	.37	-.08	.08	-40.11	-39.18	.65		.16
20.0	-.66	.19	-.08	.03	-36.65	-47.06	.84		.10
25.0	-.87	.12	-.07	-.02	-35.49	-51.27	.99		.05
30.0	-1.01	.05	-.06	-.06	-35.25	-44.46	1.06		.01
35.0	-1.04	.01	-.04	-.07	-34.97	-42.92	1.05		-.02
40.0	-.94	-.01	-.03	-.06	-35.55	-43.20	.92		-.03
45.0	-.78	-.08	-.02	-.04	-37.33	-46.40	.70		-.02
50.0	-.70	-.31	.00	-.00	-38.97	-46.01	.39		-.00
55.0	-.36	-.32	-.00	.03	-44.59	-44.42	.04		.03
60.0	0.00	-.29	0.00	.07	-200.00	-40.61	-.29		.07
65.0	.36	-.19	-.03	.08	-42.92	-40.31	-.55		.11
70.0	.68	-.03	-.08	.07	-37.16	-42.17	-.70		.15
75.0	.96	.24	-.14	.04	-33.23	-44.07	-.72		.19
80.0	1.18	.59	-.24	-.01	-29.17	-39.55	-.59		.23
85.0	1.04	.69	-.35	-.07	-27.06	-36.51	-.35		.28
90.0	.55	.52	-.47	-.13	-26.08	-35.72	-.04		.34
95.0	-.41	-.13	-.53	-.12	-26.33	-38.67	.27		.40
100.0	-1.33	-.80	-.52	-.04	-26.32	-38.76	.53		.47
105.0	-2.21	-1.55	-.43	.12	-27.84	-33.84	.67		.55
110.0	-2.56	-1.89	-.30	.32	-30.94	-31.83	.67		.61
TOTAL	1.08	.64	.24	.10	-30.48	-38.20			
NET REDUCTION OF MISMATCH ERROR=					7.72DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00731	-.00000
2	0.00000	0.00000	.01842	.00000
3	0.00000	0.00000	-.01131	.00000
4	1.00000	0.00000	1.02952	.00000
5	0.00000	0.00000	-.01422	-.00000
6	0.00000	0.00000	.00716	-.00000
7	0.00000	0.00000	-.00482	-.00000
8	0.00000	0.00000	.00533	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 15 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.53	.27	-.14	.08	-34.80	-39.96	.81	.22
20.0	-.86	.16	-.14	.03	-35.15	-47.75	1.02	.16
25.0	-1.06	.12	-.12	-.02	-32.40	-50.32	1.18	.10
30.0	-1.13	.11	-.10	-.05	-33.69	-45.35	1.25	.05
35.0	-1.13	.08	-.08	-.06	-33.74	-43.08	1.21	.01
40.0	-1.05	-.01	-.05	-.06	-34.23	-43.24	1.05	-.01
45.0	-.89	-.11	-.03	-.04	-36.05	-46.48	.78	-.01
50.0	-.67	-.25	-.01	-.01	-39.37	-47.93	.42	.01
55.0	-.35	-.32	-.00	.03	-44.94	-44.23	.02	.03
60.0	0.00	-.36	0.00	.06	-200.00	-40.38	-.36	.06
65.0	.41	-.25	-.02	.08	-42.33	-39.97	-.67	.10
70.0	.83	-.02	-.06	.07	-36.27	-41.94	-.86	.14
75.0	1.25	.35	-.13	.05	-32.18	-42.48	-.90	.18
80.0	1.30	.60	-.23	-.01	-28.92	-39.51	-.80	.22
85.0	1.26	.68	-.35	-.08	-26.90	-36.47	-.57	.27
90.0	.77	.49	-.46	-.13	-26.16	-35.84	-.27	.33
95.0	-.15	-.11	-.52	-.13	-26.52	-38.46	.04	.39
100.0	-1.18	-.87	-.50	-.04	-26.66	-38.15	.31	.46
105.0	-2.01	-1.53	-.41	.12	-28.36	-33.87	.48	.53
110.0	-2.34	-1.82	-.28	.31	-31.59	-32.00	.52	.60
TOTAL	1.11	.64	.24	.10	-30.25	-38.22		
NET REDUCTION OF MISMATCH ERROR=					7.97DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00380	.00000
2	0.00000	0.00000	.01701	-.00000
3	0.00000	0.00000	-.01053	.00000
4	1.00000	0.00000	1.02540	-.00000
5	0.00000	0.00000	-.01127	-.00000
6	0.00000	0.00000	.00510	.00000
7	0.00000	0.00000	-.00365	-.00000
8	0.00000	0.00000	.00388	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 16 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.45	.18	-.13	.06	-35.85	-42.91	.63	.19
20.0	-.53	.11	-.12	.02	-34.50	-50.32	.81	.14
25.0	-.83	.11	-.11	-.01	-34.46	-53.55	.94	.10
30.0	-.91	.09	-.10	-.04	-34.91	-46.79	1.00	.06
35.0	-.93	.05	-.08	-.05	-35.00	-45.61	.99	.03
40.0	-.86	.01	-.06	-.05	-35.58	-45.67	.88	.02
45.0	-.72	-.04	-.04	-.03	-37.51	-48.82	.68	.01
50.0	-.67	-.27	-.02	-.00	-39.28	-47.40	.40	.02
55.0	-.34	-.26	-.01	.02	-44.84	-46.75	.08	.03
60.0	0.00	-.24	0.00	.05	-200.00	-42.92	-.24	.05
65.0	.33	-.18	-.02	.06	-44.17	-42.61	-.51	.07
70.0	.68	-.03	-.05	.05	-38.11	-44.60	-.71	.10
75.0	.97	.16	-.10	.04	-34.48	-46.21	-.81	.14
80.0	1.26	.46	-.18	-.01	-30.42	-41.76	-.80	.17
85.0	1.26	.58	-.27	-.05	-28.38	-38.48	-.68	.22
90.0	.93	.43	-.37	-.10	-27.56	-37.76	-.50	.27
95.0	.18	-.10	-.43	-.10	-28.03	-40.42	-.28	.33
100.0	-.56	-.65	-.43	-.04	-28.23	-40.53	-.08	.40
105.0	-1.30	-1.23	-.37	.09	-30.09	-35.84	.07	.46
110.0	-1.64	-1.49	-.26	.26	-33.53	-33.74	.15	.52
TOTAL	.87	.51	.21	.08	-31.77	-40.30		
NET REDUCTION OF MISMATCH ERROR=					8.53DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00691	.00000
2	0.00000	0.00000	.00944	-.00000
3	0.00000	0.00000	-.00454	.00000
4	1.00000	0.00000	1.01382	-.00000
5	0.00000	0.00000	-.00827	.00000
6	0.00000	0.00000	.00039	.00000
7	0.00000	0.00000	-.00372	.00000
8	0.00000	0.00000	.00119	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 17 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)			
	BEFORE	AFTER	BEFORE	AFTER				
15.0	-1.16	-.25	-.06	.04	-33.74	-44.57	.91	.09
20.0	-1.04	.03	-.05	.01	-34.16	-55.17	1.08	.07
25.0	-.96	.19	-.05	-.01	-35.17	-49.45	1.15	.04
30.0	-.88	.24	-.04	-.02	-36.72	-47.08	1.12	.02
35.0	-.81	.19	-.03	-.03	-37.17	-46.67	.99	.00
40.0	-.70	.08	-.02	-.03	-37.98	-48.08	.78	-.01
45.0	-.58	-.07	-.01	-.02	-39.88	-50.57	.51	-.01
50.0	-.42	-.21	-.01	-.01	-43.35	-49.19	.21	-.00
55.0	-.22	-.28	-.00	.01	-49.00	-46.37	-.07	.01
60.0	0.00	-.30	0.00	.03	-200.00	-43.70	-.30	.03
65.0	.26	-.20	-.01	.04	-46.37	-44.08	-.46	.06
70.0	.52	-.02	-.04	.05	-40.44	-46.03	-.54	.08
75.0	.79	.27	-.08	.03	-36.24	-45.18	-.52	.11
80.0	.83	.41	-.14	.00	-33.38	-42.84	-.42	.14
85.0	.73	.47	-.21	-.04	-31.41	-40.32	-.26	.16
90.0	.38	.30	-.27	-.08	-30.83	-40.20	-.08	.19
95.0	-.21	-.10	-.29	-.08	-31.45	-42.71	.10	.21
100.0	-.83	-.59	-.26	-.02	-31.91	-41.65	.24	.23
105.0	-1.27	-.95	-.18	.07	-33.97	-38.13	.32	.25
110.0	-1.34	-1.00	-.09	.18	-37.77	-36.92	.33	.27
TOTAL	.78	.40	.13	.06	-34.46	-42.30		
NET REDUCTION OF MISMATCH ERROR					7.84DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00717	-.00000
2	0.00000	0.00000	.00208	.00000
3	0.00000	0.00000	-.00280	-.00000
4	1.00000	0.00000	1.00464	.00000
5	0.00000	0.00000	-.00893	.00000
6	0.00000	0.00000	-.00200	-.00000
7	0.00000	0.00000	-.00269	.00000
8	0.00000	0.00000	-.00039	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 18 WITH 8 TAPS
FOR A TAP SPACING OF .0045 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-1.11 -.28	.05 .02	-34.07 -45.73	.83	-.04
20.0	-.96 -.00	.05 .01	-34.86 -59.57	.96	-.04
25.0	-.81 .18	.05 .00	-36.33 -50.35	.99	-.05
30.0	-.74 .18	.04 -.02	-38.11 -49.67	.92	-.05
35.0	-.64 .13	.04 -.02	-38.84 -50.78	.77	-.06
40.0	-.49 .08	.03 -.02	-40.53 -52.17	.57	-.05
45.0	-.35 -.02	.02 -.02	-43.46 -54.48	.34	-.04
50.0	-.34 -.22	.02 -.00	-44.39 -48.85	.12	-.02
55.0	-.13 -.19	.01 .00	-52.75 -49.88	-.06	-.00
60.0	0.00 -.18	0.00 .02	-200.00 -47.77	-.18	.02
65.0	.13 -.10	-.03 .02	-48.55 -49.67	-.23	.05
70.0	.22 .02	-.05 .02	-43.28 -51.90	-.20	.08
75.0	.25 .13	-.08 .02	-40.41 -50.19	-.11	.10
80.0	.26 .28	-.13 -.00	-36.38 -46.21	.02	.12
85.0	.11 .28	-.16 -.02	-34.72 -44.87	.17	.13
90.0	-.17 .15	-.19 -.04	-34.05 -45.41	.32	.14
95.0	-.61 -.17	-.18 -.03	-34.67 -47.79	.43	.14
100.0	-.78 -.28	-.15 -.01	-35.46 -48.02	.50	.14
105.0	-1.02 -.51	-.09 .04	-37.33 -43.46	.51	.13
110.0	-.93 -.48	-.02 .09	-41.51 -43.08	.45	.12
TOTAL	.61 .23	.04 .03	-37.00 -46.95		
NET REDUCTION OF MISMATCH ERRORS			9.95DB.		

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00002	.00000
2	0.00000	0.00000	.00313	-.00000
3	0.00000	0.00000	-.00007	.00000
4	1.00000	0.00000	1.00799	-.00000
5	0.00000	0.00000	-.00519	.00000
6	0.00000	0.00000	-.00046	-.00000
7	0.00000	0.00000	-.00088	.00000
8	0.00000	0.00000	.00122	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 19 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.61	.01	-.02	.05	-39.52	-45.52	.62	.06
20.0	-.62	.12	-.02	.01	-39.00	-51.41	.74	.04
25.0	-.63	.15	-.02	-.01	-39.07	-50.87	.78	.01
30.0	-.59	.17	-.01	-.03	-40.49	-48.04	.76	-.02
35.0	-.60	.07	-.01	-.04	-39.97	-46.73	.67	-.03
40.0	-.53	-.02	.00	-.04	-40.57	-47.45	.52	-.04
45.0	-.45	-.12	.00	-.02	-42.17	-49.02	.33	-.03
50.0	-.37	-.25	.01	-.01	-44.35	-47.83	.12	-.01
55.0	-.16	-.23	.01	.02	-51.05	-47.34	-.06	.01
60.0	0.00	-.21	0.00	.04	-200.00	-44.37	-.21	.04
65.0	.19	-.10	-.02	.05	-47.46	-44.47	-.29	.07
70.0	.36	.05	-.05	.05	-41.74	-45.73	-.31	.10
75.0	.50	.25	-.09	.03	-37.80	-46.04	-.25	.12
80.0	.53	.40	-.14	-.01	-34.45	-42.88	-.13	.13
85.0	.33	.36	-.20	-.05	-32.63	-40.89	.03	.14
90.0	-.01	.19	-.22	-.08	-32.61	-40.85	.21	.14
95.0	-.53	-.17	-.20	-.06	-34.06	-44.20	.36	.14
100.0	-1.07	-.60	-.14	-.01	-34.44	-41.66	.47	.13
105.0	-1.21	-.70	-.04	.08	-36.91	-39.78	.51	.12
110.0	-1.12	-.65	.04	.15	-39.71	-39.45	.48	.11
TOTAL	.61	.31	.09	.05	-36.87	-43.24		
NET REDUCTION OF MISMATCH ERROR					6.37DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.02558	-.00000
2	0.00000	0.00000	.00701	.00000
3	0.00000	0.00000	-.02897	.00000
4	1.00000	0.00000	1.01877	-.00000
5	0.00000	0.00000	-.05229	-.00000
6	0.00000	0.00000	-.00330	-.00000
7	0.00000	0.00000	-.01178	.00000
8	0.00000	0.00000	-.00019	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 20 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-4.06	-1.08	.46	.05	-21.07	-34.43	2.98		-.42
20.0	-3.57	-.11	.45	.02	-21.51	-50.06	3.46		-.43
25.0	-3.11	.45	.43	-.00	-22.55	-42.16	3.56		-.43
30.0	-2.62	.70	.39	-.03	-24.55	-38.73	3.31		-.42
35.0	-2.20	.56	.35	-.05	-25.35	-39.40	2.76		-.40
40.0	-1.60	.31	.30	-.05	-26.68	-41.98	2.00		-.35
45.0	-1.23	-.07	.23	-.04	-24.22	-45.81	1.16		-.28
50.0	-.78	-.42	.17	-.01	-33.20	-43.25	.36		-.18
55.0	-.38	-.67	.09	.02	-39.04	-39.02	-.29		-.06
60.0	0.00	-.69	0.00	.06	-200.00	-36.98	-.69		.06
65.0	.39	-.44	-.12	.08	-36.36	-38.61	-.82		.19
70.0	.61	-.07	-.25	.07	-30.87	-41.83	-.68		.32
75.0	.67	.36	-.39	.05	-27.40	-42.03	-.31		.44
80.0	.67	.89	-.55	-.01	-23.94	-36.08	.22		.54
85.0	.23	1.04	-.70	-.08	-22.08	-33.87	.81		.63
90.0	-.59	.78	-.82	-.13	-21.54	-34.65	1.37		.69
95.0	-1.88	-.06	-.85	-.12	-21.94	-39.18	1.81		.73
100.0	-3.12	-1.05	-.79	-.04	-22.02	-36.65	2.07		.75
105.0	-4.15	-2.07	-.65	.11	-23.50	-31.83	2.08		.76
110.0	-4.66	-2.81	-.50	.27	-26.11	-30.43	1.84		.76
TOTAL	2.34	.99	.46	.09	-23.84	-35.98			
NET REDUCTION OF MISMATCH ERRORS					12.14DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.09515	.00000
2	0.00000	0.00000	-.06125	-.00000
3	0.00000	0.00000	.23299	.00000
4	1.00000	0.00000	.01362	-.00000
5	0.00000	0.00000	-.05957	.00000
6	0.00000	0.00000	-.02749	-.00000
7	0.00000	0.00000	-.00908	.00000
8	0.00000	0.00000	-.03857	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 21 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)		FILTER AMPL. (DB)		
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	
15.0	217.45	-107.04	-.35	-22.53	5.11	-.05	-324.50	-22.17	
20.0	66.77	92.42	-.86	-17.82	.56	.25	25.66	-16.96	
25.0	38.46	61.47	-.57	-14.28	-3.93	-.76	23.02	-13.71	
30.0	-20.62	3.10	-.09	-11.75	-9.80	-3.43	23.72	-11.66	
35.0	-69.11	-42.10	-.36	-10.80	.52	-2.24	27.01	-10.43	
40.0	-87.96	-55.09	-.83	-10.61	2.51	-1.20	32.87	-9.78	
45.0	-237.62	163.76	-.69	-10.16	4.48	2.23	401.38	-9.47	
50.0	244.41	-63.41	.33	-8.42	4.00	-1.66	-307.82	-9.25	
55.0	-65.37	-1.32	.03	-8.91	.11	-4.43	64.05	-8.94	
60.0	0.00	75.36	0.00	-8.52	-200.00	-.22	75.36	-8.52	
65.0	-265.36	-180.32	-.62	-8.76	3.09	2.74	85.04	-8.14	
70.0	215.24	-51.83	.08	-7.69	5.17	-2.25	-267.08	-7.47	
75.0	-40.79	58.70	-.04	-8.20	-3.73	-1.84	99.49	-8.16	
80.0	-68.35	37.20	-.54	-9.39	.84	-2.30	105.55	-8.79	
85.0	194.05	-53.36	-.63	-10.53	5.76	-1.21	-247.91	-9.90	
90.0	-184.85	-64.44	.20	-11.23	5.46	-1.42	120.41	-11.43	
95.0	-27.76	-255.77	.92	-12.27	-7.44	-1.06	-228.01	-13.19	
100.0	-68.34	78.97	1.89	-12.60	-.03	-2.31	147.31	-14.69	
105.0	-254.65	266.73	3.48	-11.91	2.50	-3.22	523.38	-15.39	
110.0	-196.00	-20.84	5.23	-10.11	3.14	-8.70	175.16	-15.34	
TOTAL	156.56	113.25	1.74	-4.70	2.91	-.41			
NET REDUCTION OF MISMATCH ERROR					3.32DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00706	-.00000
2	0.00000	0.00000	.00964	.00000
3	0.00000	0.00000	-.01258	-.00000
4	1.00000	0.00000	1.01802	.00000
5	0.00000	0.00000	-.01820	-.00000
6	0.00000	0.00000	.00342	.00000
7	0.00000	0.00000	-.00511	-.00000
8	0.00000	0.00000	.00287	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 22 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.							
FREQ	PHASE	AMPLITUDE	TOTAL	FILTER	FILTER		
(HZ)	ERROR	ERROR	MS ERROR	PHASE	AMPL.		
(DEGREES)	(DB)	(DB)	(DB POWER)	(DEGREES)	(DB)		
	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.86	-.03	.05	-36.12	-44.66	.83	.00
20.0	-.95	.06	.04	-.02	-35.10	-52.63	1.01
25.0	-.95	.15	.04	-.01	-35.33	-51.05	1.10
30.0	-.92	.18	.03	-.04	-36.54	-46.05	1.10
35.0	-.89	.11	.03	-.04	-36.39	-45.83	1.00
40.0	-.75	.06	.03	-.04	-37.32	-46.34	.81
45.0	-.60	-.04	.02	-.03	-39.45	-49.65	.56
50.0	-.55	-.28	.02	-.00	-40.82	-46.81	.26
55.0	-.26	-.29	.01	.02	-47.20	-45.85	-.03
60.0	0.00	-.28	0.00	.05	-200.00	-42.66	-.28
65.0	.26	-.19	-.03	.05	-44.49	-43.00	-.44
70.0	.48	-.03	-.08	.05	-38.78	-45.20	-.51
75.0	.65	.19	-.13	.03	-35.03	-46.44	-.46
80.0	.80	.48	-.22	-.01	-30.92	-41.30	-.31
85.0	.64	.55	-.30	-.05	-28.85	-38.87	-.09
90.0	.25	.42	-.39	-.09	-27.83	-38.38	.17
95.0	-.52	-.11	-.43	-.09	-28.04	-41.62	.41
100.0	-1.10	-.60	-.41	-.03	-28.05	-41.30	.58
105.0	-1.86	-1.20	-.35	.08	-29.50	-36.24	.67
110.0	-2.00	-1.46	-.25	.22	-32.63	-34.53	.63
TOTAL	.92	.50	.20	.07	-32.02	-40.81	
NET REDUCTION OF MISMATCH ERROR			8.79DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00365	-.00000
2	0.00000	0.00000	.01342	.00000
3	0.00000	0.00000	-.00218	-.00000
4	1.00000	0.00000	1.01728	.00000
5	0.00000	0.00000	-.00130	-.00000
6	0.00000	0.00000	.00094	.00000
7	0.00000	0.00000	-.00127	-.00000
8	0.00000	0.00000	.00196	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 23 WITH 6 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)		FILTER AMPL. (DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0	-.47	.13	-.18	.04	-33.53	-45.40	.60		.22	
20.0	-.64	.19	-.17	.01	-32.92	-52.18	.74		.18	
25.0	-.74	.10	-.15	-.01	-33.35	-53.83	.84		.14	
30.0	-.78	.09	-.13	-.03	-34.70	-50.39	.87		.11	
35.0	-.80	.04	-.11	-.03	-35.02	-48.29	.83		.07	
40.0	-.74	-.02	-.06	-.03	-35.83	-47.95	.72		.05	
45.0	-.63	-.09	-.05	-.02	-37.86	-50.22	.54		.03	
50.0	-.48	-.17	-.04	-.01	-41.32	-51.02	.31		.03	
55.0	-.25	-.20	-.02	.01	-46.91	-48.86	.05		.03	
60.0	0.00	-.21	0.00	.04	-200.00	-45.00	-.21		.04	
65.0	.31	-.13	-.00	.05	-45.18	-44.85	-.44		.05	
70.0	.64	.02	-.02	.05	-39.36	-46.05	-.62		.06	
75.0	.90	.26	-.05	.03	-35.35	-45.75	-.73		.08	
80.0	1.11	.34	-.10	-.00	-32.84	-44.34	-.77		.10	
85.0	1.10	.37	-.17	-.05	-31.27	-41.57	-.73		.12	
90.0	.85	.22	-.23	-.08	-31.20	-40.77	-.64		.15	
95.0	.37	-.14	-.25	-.08	-32.50	-42.71	-.51		.17	
100.0	-.17	-.34	-.22	-.02	-33.98	-42.42	-.37		.20	
105.0	-.54	-.78	-.16	.07	-37.43	-39.34	-.24		.23	
110.0	-.56	-.69	-.07	.19	-43.79	-37.85	-.14		.26	
TOTAL	.67	.31	.13	.06	-34.36	-43.26				

NET REDUCTION OF MISMATCH ERRORS 8.88DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00710	-.00000
2	0.00000	0.00000	.02218	.00000
3	0.00000	0.00000	-.01683	-.00000
4	1.00000	0.00000	1.03447	.00000
5	0.00000	0.00000	-.02054	-.00000
6	0.00000	0.00000	.00820	.00000
7	0.00000	0.00000	-.00671	-.00000
M	0.00000	0.00000	.00561	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 24 WITH M TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.89	.11	-.12	.08	-34.10	-40.54	1.00		.20
20.0	-1.13	.13	-.11	.03	-32.48	-47.69	1.26		.14
25.0	-1.26	.18	-.16	-.02	-32.25	-48.93	1.44		.08
30.0	-1.31	.20	-.09	-.06	-32.83	-43.53	1.51		.04
35.0	-1.31	.14	-.07	-.07	-32.76	-42.19	1.45		.00
40.0	-1.19	.06	-.05	-.06	-33.30	-42.69	1.25		-.01
45.0	-1.00	-.07	-.03	-.04	-35.04	-45.83	.93		-.01
50.0	-.88	-.56	-.01	-.00	-37.04	-44.70	.51		.00
55.0	-.46	-.41	-.00	.03	-42.43	-42.80	.06		.03
60.0	0.00	-.38	0.00	.07	-200.00	-39.72	-.38		.07
65.0	.43	-.30	.73	.08	-41.74	-39.04	-.74		.11
70.0	.90	-.05	-.08	.08	-35.35	-41.21	-.96		.16
75.0	1.27	.26	-.15	.05	-31.58	-42.48	-1.01		.21
80.0	1.61	.70	-.27	-.01	-27.50	-38.11	-.91		.27
85.0	1.54	.88	-.41	-.08	-25.34	-34.87	-.67		.33
90.0	.90	.64	-.56	-.15	-24.48	-34.52	-.34		.41
95.0	-.13	-.13	-.64	-.14	-24.73	-37.32	-.00		.50
100.0	-1.25	-.96	-.64	-.05	-24.74	-37.15	.28		.59
105.0	-2.32	-1.85	-.55	.13	-26.31	-32.39	.47		.68
110.0	-2.86	-2.34	-.41	.36	-29.31	-30.34	.52		.77
TOTAL	1.31	.78	.30	.11	-28.67	-36.94			
NET REDUCTION OF MISMATCH ERRORS					8.26DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00207	-.00000
2	0.00000	0.00000	.01147	.00000
3	0.00000	0.00000	-.00330	-.00000
4	1.00000	0.00000	1.01440	.00000
5	0.00000	0.00000	-.00119	-.00000
6	0.00000	0.00000	.00045	.00000
7	0.00000	0.00000	-.00081	-.00000
8	0.00000	0.00000	.00196	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 25 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.22	.20	-.13	.04	-36.76	-44.77	.42	.17
20.0	-.41	.12	-.13	.01	-35.75	-51.75	.53	.14
25.0	-.56	.06	-.12	-.01	-35.66	-56.41	.61	.11
30.0	-.58	.07	-.10	-.02	-36.96	-51.06	.65	.08
35.0	-.64	.01	-.09	-.03	-36.87	-48.78	.64	.06
40.0	-.61	-.03	-.07	-.03	-37.44	-48.40	.57	.04
45.0	-.53	-.09	-.05	-.02	-39.27	-50.72	.44	.03
50.0	-.42	-.15	-.03	-.01	-42.45	-51.77	.26	.03
55.0	-.22	.17	-.01	.01	-48.08	-41.15	.05	.03
60.0	0.00	-.18	0.00	.03	-200.00	-46.00	-.18	.03
65.0	.29	-.10	-.00	.04	-46.01	-45.52	-.39	.04
70.0	.58	.02	-.01	.04	-40.22	-46.71	-.56	.05
75.0	.92	.23	-.04	.03	-36.17	-46.40	-.68	.07
80.0	1.06	.32	-.09	-.00	-33.51	-44.96	-.74	.08
85.0	1.05	.32	-.14	-.04	-32.08	-42.47	-.73	.10
90.0	.85	.19	-.20	-.08	-32.01	-41.35	-.67	.12
95.0	.42	-.14	-.22	-.07	-33.46	-43.19	-.56	.15
100.0	-.06	-.50	-.20	-.02	-35.19	-43.10	-.44	.18
105.0	-.36	-.70	-.13	.07	-39.13	-40.16	-.32	.20
110.0	-.37	-.58	-.05	.18	-46.83	-38.62	-.21	.23
TOTAL	.58	.28	.11	.05	-35.82	-43.92		
NET REDUCTION OF MISMATCH ERROR=					8.10DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00593	.00000
2	0.00000	0.00000	.00856	.00000
3	0.00000	0.00000	.00122	.00000
4	1.00000	0.00000	1.01343	-.00000
5	0.00000	0.00000	-.00137	.00000
6	0.00000	0.00000	.00113	.00000
7	0.00000	0.00000	-.00150	.00000
8	0.00000	0.00000	.00156	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 26 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MC ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.65	-.02	-.15	.04	-33.89	-47.21	.63	.19
20.0	-.66	.10	-.14	.02	-34.02	-51.49	.76	.16
25.0	-.65	.18	-.12	-.00	-34.98	-50.15	.83	.12
30.0	-.70	.13	-.11	-.03	-35.76	-48.27	.83	.08
35.0	-.70	.06	-.09	-.04	-36.36	-47.92	.77	.05
40.0	-.63	-.00	-.07	-.03	-37.34	-48.07	.63	.03
45.0	-.51	-.07	-.05	-.03	-39.57	-49.65	.44	.02
50.0	-.47	-.25	-.02	-.00	-41.93	-48.00	.23	.02
55.0	-.25	-.24	-.02	.01	-47.20	-47.67	.00	.03
60.0	0.00	-.19	0.00	.04	-200.00	-44.98	-.19	.04
65.0	.24	-.10	-.01	.05	-47.23	-45.07	-.34	.05
70.0	.43	.00	-.03	.04	-42.31	-46.42	-.43	.07
75.0	.64	.20	-.05	.03	-38.58	-46.41	-.44	.08
80.0	.77	.39	-.10	-.01	-34.80	-43.19	-.38	.10
85.0	.68	.40	-.15	-.04	-33.41	-41.20	-.27	.11
90.0	.37	.24	-.20	-.08	-33.06	-40.50	-.13	.12
95.0	-.23	-.21	-.20	-.07	-34.37	-42.81	.02	.13
100.0	-.62	-.48	-.16	-.02	-35.47	-43.30	.14	.14
105.0	-1.01	-.80	-.08	.07	-37.60	-39.24	.21	.15
110.0	-1.00	-.76	.02	.18	-40.92	-37.88	.23	.16
TOTAL	.61	.33	.11	.06	-35.89	-43.14		

NET REDUCTION OF MISMATCH ERROR= 7.25DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00430	-.00000
2	0.00000	0.00000	.01063	.00000
3	0.00000	0.00000	-.00853	-.00000
4	1.00000	0.00000	1.01508	.00000
5	0.00000	0.00000	-.00973	-.00000
6	0.00000	0.00000	.00143	.00000
7	0.00000	0.00000	-.00316	-.00000
8	0.00000	0.00000	.00213	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 27 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.62	.03	-.02	.04	-39.37	-46.55	.65	.07
20.0	-.73	.06	-.03	.01	-37.55	-54.16	.79	.04
25.0	-.78	.09	-.03	-.01	-37.16	-54.09	.87	.02
30.0	-.76	.12	-.02	-.02	-38.17	-49.75	.89	-.00
35.0	-.73	.09	-.02	-.03	-38.18	-47.96	.82	-.01
40.0	-.65	.03	-.01	-.03	-38.73	-48.50	.68	-.02
45.0	-.54	-.06	-.01	-.02	-40.49	-51.46	.48	-.02
50.0	-.40	-.16	-.00	-.01	-43.91	-51.57	.24	-.00
55.0	-.20	-.22	.00	.01	-49.50	-48.11	-.02	.01
60.0	0.00	-.25	0.00	.03	-200.00	-44.63	-.25	.03
65.0	.29	-.16	-.01	.04	-45.63	-44.74	-.44	.06
70.0	.50	-.02	-.04	.04	-40.13	-46.38	-.57	.08
75.0	.83	.23	-.08	.03	-35.86	-46.28	-.60	.11
80.0	.93	.37	-.14	-.00	-32.81	-43.70	-.56	.14
85.0	.86	.41	-.21	-.04	-30.89	-41.16	-.45	.17
90.0	.58	.29	-.28	-.08	-30.24	-40.51	-.30	.20
95.0	.05	-.08	-.31	-.07	-30.83	-43.11	-.13	.24
100.0	-.55	-.53	-.30	-.02	-31.25	-42.45	.02	.28
105.0	-1.01	-.89	-.24	.07	-33.31	-38.63	.12	.31
110.0	-1.14	-.97	-.16	.19	-37.27	-36.97	.17	.34
TOTAL	.68	.37	.14	.06	-34.58	-42.95		
NET REDUCTION OF MISMATCH ERROR=					8.37DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00484	-.00000
2	0.00000	0.00000	.00798	-.00000
3	0.00000	0.00000	-.01059	-.00000
4	1.00000	0.00000	1.01674	.00000
5	0.00000	0.00000	-.01277	-.00000
6	0.00000	0.00000	.00412	.00000
7	0.00000	0.00000	-.00342	-.00000
8	0.00000	0.00000	.00277	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 28 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.47	-.01	.01	.05	-41.82	-44.76	.46	.04
20.0	-.35	.23	.02	.03	-43.76	-45.33	.57	.01
25.0	-.47	.17	-.01	-.02	-41.77	-48.71	.64	-.01
30.0	-.60	.06	-.02	-.05	-40.26	-45.73	.65	-.03
35.0	-.59	.02	-.01	-.05	-40.11	-45.09	.60	-.04
40.0	-.45	.04	.00	-.03	-42.02	-48.39	.49	-.04
45.0	-.40	-.08	.00	-.03	-43.14	-49.60	.32	-.02
50.0	-.37	-.25	.00	-.00	-44.42	-47.84	.12	-.00
55.0	-.18	-.27	-.00	.02	-50.64	-46.28	-.09	.02
60.0	0.00	-.27	0.00	.05	-200.00	-42.59	-.27	.05
65.0	.26	-.15	-.03	.05	-44.96	-44.00	-.40	.08
70.0	.50	.03	-.06	.05	-39.74	-44.93	-.46	.11
75.0	.70	.26	-.10	.04	-36.03	-44.66	-.43	.14
80.0	.76	.44	-.18	-.01	-32.12	-42.13	-.32	.17
85.0	.63	.48	-.26	-.05	-29.99	-39.55	-.15	.20
90.0	.25	.29	-.33	-.09	-29.07	-39.14	.05	.24
95.0	-.45	-.21	-.37	-.09	-29.31	-41.27	.24	.28
100.0	-.84	-.45	-.34	-.02	-29.90	-43.96	.39	.32
105.0	-1.51	-1.04	-.27	.09	-31.44	-37.12	.47	.36
110.0	-1.80	-1.34	-.19	.21	-34.28	-35.16	.46	.40
TOTAL	.71	.45	.17	.07	-33.84	-41.29		

NET REDUCTION OF MISMATCH ERRORS 7.45DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00252	.00000
2	0.00000	0.00000	.02128	-.00000
3	0.00000	0.00000	-.00779	.00000
4	1.00000	0.00000	1.02655	-.00000
5	0.00000	0.00000	-.00505	.00000
6	0.00000	0.00000	.00308	-.00000
7	0.00000	0.00000	-.00251	.00000
8	0.00000	0.00000	.00320	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 29 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.59	.12	-.23	.05	-31.41	-44.14	.71	.28
20.0	-.81	.10	-.21	.02	-30.90	-51.41	.90	.23
25.0	-.93	.11	-.19	-.01	-31.32	-52.81	1.04	.18
30.0	-1.00	.12	-.17	-.03	-32.66	-48.54	1.11	.14
35.0	-1.03	.07	-.14	-.04	-32.91	-46.51	1.10	.09
40.0	-.96	.02	-.10	-.04	-33.72	-46.55	.98	.06
45.0	-.82	-.05	-.07	-.03	-35.76	-49.68	.77	.04
50.0	-.73	-.27	-.04	-.01	-37.99	-47.14	.47	.03
55.0	-.33	-.22	-.02	.02	-44.95	-48.10	.11	.03
60.0	0.00	-.26	0.00	.04	-200.00	-43.68	-.26	.04
65.0	.43	-.18	-.00	.05	-42.38	-43.05	-.61	.05
70.0	.91	.01	-.02	.05	-36.33	-44.57	-.90	.08
75.0	1.24	.15	-.07	.04	-33.37	-46.42	-1.09	.10
80.0	1.63	.45	-.14	.00	-29.70	-41.96	-1.18	.14
85.0	1.68	.53	-.23	-.05	-27.98	-39.09	-1.16	.18
90.0	1.41	.36	-.33	-.10	-27.66	-38.45	-1.05	.23
95.0	.77	-.11	-.39	-.10	-28.47	-40.41	-.87	.29
100.0	.03	-.65	-.39	-.04	-29.25	-40.57	-.67	.36
105.0	-.64	-1.12	-.33	.09	-31.80	-36.54	-.48	.42
110.0	-.91	-1.22	-.23	.25	-36.22	-34.60	-.31	.48
TOTAL	.95	.45	.20	.08	-31.24	-40.92		
NET REDUCTION OF MISMATCH ERROR=					9.68DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00707	-.00000
2	0.00000	0.00000	.01445	-.00000
3	0.00000	0.00000	-.01015	.00000
4	1.00000	0.00000	1.02079	.00000
5	0.00000	0.00000	-.01324	-.00000
6	0.00000	0.00000	.00101	.00000
7	0.00000	0.00000	-.00340	-.00000
8	0.00000	0.00000	.00221	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 30 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-1.02 -.02	-.05 .05	-34.82 -44.64	1.00	.11
20.0	-1.13 .08	-.05 .02	-33.66 -51.46	1.21	.07
25.0	-1.14 .19	-.04 -.01	-33.87 -49.35	1.33	.03
30.0	-1.18 .15	-.04 -.04	-34.35 -46.91	1.34	.00
35.0	-1.12 .11	-.03 -.04	-34.46 -45.87	1.23	-.02
40.0	-.99 .03	-.01 -.04	-35.18 -46.15	1.02	-.03
45.0	-.78 -.05	-.01 -.03	-37.32 -48.51	.73	-.03
50.0	-.65 -.26	.01 -.00	-39.55 -47.41	.39	-.01
55.0	-.34 -.30	.00 .02	-45.07 -45.60	.04	.01
60.0	0.00 -.28	0.00 .05	-200.00 -42.67	-.28	.05
65.0	.36 -.18	-.03 .06	-42.99 -42.81	-.53	.08
70.0	.67 -.02	-.07 .05	-37.47 -44.48	-.69	.12
75.0	.97 .23	-.13 .04	-33.63 -45.21	-.74	.17
80.0	1.18 .49	-.21 -.01	-29.90 -41.30	-.69	.21
85.0	1.11 .56	-.30 -.05	-28.00 -38.60	-.55	.25
90.0	.75 .38	-.39 -.10	-27.40 -38.08	-.37	.29
95.0	-.00 -.17	-.42 -.09	-28.23 -41.06	-.16	.33
100.0	-.65 -.64	-.40 -.03	-28.83 -40.93	.02	.37
105.0	-1.30 -1.16	-.32 .09	-31.00 -36.33	.14	.41
110.0	-1.51 -1.32	-.21 .23	-34.81 -34.75	.20	.44
TOTAL	.93 .48	.19 .07	-31.70 -40.71		
NET REDUCTION OF MISMATCH ERROR=			9.01DB.		

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.08933	.00000
2	0.00000	0.00000	-.06177	-.00000
3	0.00000	0.00000	.22002	.00000
4	1.00000	0.00000	.01635	-.00000
5	0.00000	0.00000	-.05308	.00000
6	0.00000	0.00000	-.02242	-.00000
7	0.00000	0.00000	-.00538	.00000
8	0.00000	0.00000	-.04001	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 31 WITH 8 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE FROM (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	218.54	-111.90	.19	-22.04	5.36	.01	-330.45	-22.23
20.0	67.16	88.87	-.20	-17.36	.91	.19	21.71	-17.16
25.0	39.64	59.34	.01	-14.01	-3.43	-.84	19.70	-14.02
30.0	-18.64	2.04	.75	-11.31	-9.96	-3.59	20.67	-12.06
35.0	-66.71	-42.54	.26	-10.67	.56	-2.25	24.17	-10.93
40.0	-87.24	-56.89	-.13	-10.50	2.78	-1.13	30.36	-10.37
45.0	-238.85	160.59	.00	-10.13	4.76	2.21	399.44	-10.14
50.0	244.41	-64.57	.61	-9.33	4.15	-1.57	-308.98	-9.95
55.0	-65.42	-1.78	.56	-9.03	.40	-4.36	63.65	-9.60
60.0	0.00	75.37	0.00	-9.08	-200.00	-.24	75.37	-9.08
65.0	-265.22	-180.21	-.01	-8.61	3.39	2.78	85.01	-8.60
70.0	215.34	-52.11	.52	-7.84	5.39	-2.24	-267.45	-8.36
75.0	-40.46	58.18	.60	-7.92	-3.44	-1.90	98.63	-8.52
80.0	-67.53	36.60	-.03	-9.18	1.01	-2.39	104.14	-9.15
85.0	194.21	-55.63	-.17	-10.46	5.99	-1.13	-249.84	-10.29
90.0	-184.19	-66.06	.69	-11.23	5.71	-1.35	118.13	-11.92
95.0	-27.51	-257.63	1.81	-12.00	-6.56	-1.09	-230.12	-13.81
100.0	-68.10	78.17	2.16	-13.24	.12	-2.34	146.27	-15.41
105.0	-254.87	266.88	3.69	-12.33	2.63	-3.25	523.75	-16.02
110.0	-194.80	-18.66	5.89	-9.88	3.56	-8.86	176.13	-15.76
TOTAL	156.55	113.30	2.03	4.69	3.16	-.41		
NET REDUCTION OF MISMATCH ERROR					3.57DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00424	.00000
2	0.00000	0.00000	.02115	-.00000
3	0.00000	0.00000	-.01340	.00000
4	1.00000	0.00000	1.03171	-.00000
5	0.00000	0.00000	-.01343	.00000
6	0.00000	0.00000	.00690	-.00000
7	0.00000	0.00000	-.00491	.00000
8	0.00000	0.00000	.00488	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 32 WITH 8 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.58	.15	-.16	.07	-33.77	-41.48	.73		.23
20.0	-.80	.14	-.16	.03	-32.75	-48.32	.94		.18
25.0	-.92	.17	-.14	-.01	-32.89	-49.63	1.10		.13
30.0	-1.05	.12	-.13	-.05	-33.29	-45.11	1.17		.08
35.0	-1.06	.09	-.11	-.06	-33.49	-43.54	1.15		.05
40.0	-.98	.04	-.08	-.06	-34.17	-43.72	1.02		.03
45.0	-.83	-.06	-.06	-.04	-35.97	-46.61	.77		.02
50.0	-.75	-.31	-.03	-.01	-38.13	-45.98	.44		.02
55.0	-.39	-.34	-.02	.02	-43.58	-44.34	.05		.04
60.0	0.00	-.34	0.00	.06	-200.00	-40.69	-.34		.06
65.0	.44	-.24	-.01	.07	-42.05	-40.43	-.68		.09
70.0	.86	-.06	-.05	.07	-36.35	-42.19	-.92		.12
75.0	1.26	.23	-.11	.05	-32.54	-43.72	-1.03		.16
80.0	1.62	.61	-.21	-.01	-28.57	-39.37	-1.01		.20
85.0	1.60	.74	-.33	-.07	-26.56	-36.26	-.86		.26
90.0	1.19	.56	-.46	-.13	-25.76	-35.49	-.63		.33
95.0	.23	-.13	-.54	-.13	-26.22	-38.19	-.36		.41
100.0	-.74	-.84	-.54	-.05	-26.43	-38.29	-.11		.49
105.0	-1.70	-1.62	-.45	.12	-28.21	-33.51	.08		.57
110.0	-2.13	-1.94	-.32	.33	-41.56	-31.55	.18		.65
TOTAL	1.09	.67	.25	.10	.97	-38.08			
NET REDUCTION OF MISMATCH ERROR					11DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00518	-.00000
2	0.00000	0.00000	-.00870	.00000
3	0.00000	0.00000	.00816	-.00000
4	0.00000	0.00000	.00914	.00000
5	0.00000	0.00000	-.00193	-.00000
6	1.00000	0.00000	1.01555	.00000
7	0.00000	0.00000	-.00339	-.00000
8	0.00000	0.00000	-.00113	.00000
9	0.00000	0.00000	-.00033	-.00000
10	0.00000	0.00000	.00070	.00000
11	0.00000	0.00000	-.00004	-.00000
12	0.00000	0.00000	.00064	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 2 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0040 INCHES		TOTAL		FILTER		FILTER	
FREQ	PHASE	AMPLITUDE		MS ERROR		PHASE	AMPL.
(HZ)	ERROR	ERROR		(DB POWER)		(DEGREES)	(DB)
	(DEGREES)	(DB)					
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	
15.0	-.48	.10	-.13	.01	-35.40	-52.58	.58
20.0	-.68	.02	-.13	-.01	-34.29	-61.27	.70
25.0	-.79	-.03	-.12	-.01	-34.45	-58.11	.77
30.0	-.88	-.06	-.11	-.01	-35.02	-54.81	.80
35.0	-.89	-.08	-.09	.00	-35.12	-57.77	.81
40.0	-.81	-.01	-.07	.01	-35.89	-57.88	.80
45.0	-.68	.06	-.05	.01	-37.76	-55.24	.74
50.0	-.63	-.02	-.02	.01	-39.62	-58.38	.61
55.0	-.34	.06	-.02	-.01	-44.81	-57.82	.40
60.0	0.00	.08	0.00	-.01	-200.00	-55.12	.08
65.0	.10	-.00	-.01	-.02	-45.32	-54.77	-.30
70.0	.60	-.10	-.04	-.01	-39.44	-54.27	-.70
75.0	.88	-.14	-.07	.01	-35.73	-51.77	-1.02
80.0	1.16	-.00	-.14	.02	-31.66	-54.31	-1.16
85.0	1.15	.07	-.22	.02	-29.88	-53.10	-1.08
90.0	.91	.14	-.30	-.01	-29.28	-52.11	-.77
95.0	.29	-.00	-.33	-.02	-30.16	-54.78	-.29
100.0	-.27	-.03	-.33	-.02	-30.73	-54.30	.24
105.0	-.81	-.13	-.26	.00	-33.26	-56.06	.68
110.0	-.96	-.06	-.17	.03	-37.68	-53.47	.90
TOTAL	.45	.03	.16	.01	-33.32	-54.12	
NET REDUCTION OF MISMATCH ERROR=					20.81DB.		

NET REDUCTION OF MISMATCH ERROR = 20.81DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00079	.00000
2	0.00000	0.00000	-.01345	-.00000
3	0.00000	0.00000	.01853	.00000
4	0.00000	0.00000	.00490	-.00000
5	0.00000	0.00000	-.00268	.00000
6	1.00000	0.00000	1.01733	-.00000
7	0.00000	0.00000	-.01225	.00000
8	0.00000	0.00000	.00095	-.00000
9	0.00000	0.00000	-.00370	.00000
10	0.00000	0.00000	.00165	-.00000
11	0.00000	0.00000	-.00131	.00000
12	0.00000	0.00000	.00078	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 3 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.10	.05	-.07	.02	-33.90	-51.62	1.15	.09
20.0	-1.10	.08	-.07	-.01	-32.96	-54.70	1.27	.06
25.0	-1.28	-.02	-.06	-.02	-32.75	-53.03	1.26	.04
30.0	-1.22	-.04	-.04	-.01	-34.11	-55.65	1.17	.03
35.0	-1.15	-.09	-.02	.00	-34.27	-56.36	1.06	.03
40.0	-1.01	-.06	-.01	.01	-34.98	-54.14	.95	.02
45.0	-.84	-.00	.00	.02	-36.69	-53.33	.84	.02
50.0	-.61	.08	.01	.01	-40.14	-55.25	.69	.00
55.0	-.31	.13	.01	-.01	-45.75	-53.11	.44	-.01
60.0	0.00	.07	0.00	-.02	-200.00	-52.37	.07	-.02
65.0	.36	-.02	-.03	-.02	-43.09	-52.68	-.38	.01
70.0	.70	-.12	-.07	-.01	-37.03	-53.11	-.83	.07
75.0	.90	-.13	-.15	.01	-33.02	-51.63	-1.12	.16
80.0	1.07	-.06	-.24	.02	-29.46	-50.32	-1.13	.27
85.0	.85	.07	-.35	.02	-27.32	-52.59	-.78	.37
90.0	.26	.18	-.46	-.01	-26.46	-50.22	-.09	.44
95.0	-.60	.12	-.50	-.03	-26.65	-50.13	.81	.47
100.0	-1.77	-.06	-.47	-.02	-26.48	-52.38	1.71	.45
105.0	-2.51	-.14	-.36	.01	-28.08	-55.26	2.37	.37
110.0	-2.81	-.24	-.23	.04	-31.01	-49.97	2.57	.27
TOTAL	1.24	.10	.23	.02	-30.39	-51.82		
NET REDUCTION OF MISMATCH ERROR=					21.43DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00279	-.00000
2	0.00000	0.00000	-.00609	-.00000
3	0.00000	0.00000	.00767	-.00000
4	0.00000	0.00000	-.00214	-.00000
5	0.00000	0.00000	.00170	-.00000
6	1.00000	0.00000	1.00208	-.00000
7	0.00000	0.00000	-.00243	.00000
8	0.00000	0.00000	-.00271	-.00000
9	0.00000	0.00000	.00013	.00000
10	0.00000	0.00000	-.00048	-.00000
11	0.00000	0.00000	.00020	.00000
12	0.00000	0.00000	-.00002	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 4 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.28	.04	.01	.00	-46.41	-61.17	.32	-.00
20.0	-.36	.01	-.00	-.00	-43.86	-70.25	.37	-.00
25.0	-.41	-.02	-.00	-.00	-43.01	-64.60	.39	-.00
30.0	-.43	-.03	-.01	-.01	-43.24	-60.43	.40	.00
35.0	-.44	-.04	-.01	.00	-42.67	-63.11	.40	.01
40.0	-.38	.01	-.01	.00	-43.53	-65.32	.39	.01
45.0	-.30	.06	-.01	.00	-45.58	-59.38	.36	.01
50.0	-.35	-.05	.00	.01	-45.08	-60.30	.30	.00
55.0	-.17	.02	-.00	-.01	-51.19	-63.14	.14	-.00
60.0	0.00	.04	0.00	-.00	-200.00	-63.62	.04	-.00
65.0	.13	.00	-.02	-.01	-50.67	-63.55	-.13	.01
70.0	.23	-.05	-.04	-.00	-45.22	-60.35	-.28	.03
75.0	.28	-.08	-.06	.01	-42.27	-56.72	-.35	.07
80.0	.35	.03	-.10	.00	-37.81	-62.93	-.32	.10
85.0	.22	.05	-.13	.01	-36.30	-58.17	-.16	.13
90.0	-.04	.06	-.16	-.01	-35.63	-58.36	.10	.15
95.0	-.40	-.08	-.14	-.00	-36.42	-58.54	.41	.14
100.0	-.73	-.03	-.11	-.00	-37.24	-65.86	.70	.10
105.0	-.93	-.04	-.04	.00	-39.05	-65.34	.89	.04
110.0	-.83	.09	.04	.01	-42.26	-61.23	.92	-.03
TOTAL	.43	.05	.07	.00	-40.03	-60.55		

NET REDUCTION OF MISMATCH ERRORS 20.52DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00637	.00000
2	0.00000	0.00000	-.00771	-.00000
3	0.00000	0.00000	.01064	.00000
4	0.00000	0.00000	.00628	-.00000
5	0.00000	0.00000	-.01424	.00000
6	1.00000	0.00000	1.01359	-.00000
7	0.00000	0.00000	-.02073	.00000
8	0.00000	0.00000	.00036	-.00000
9	0.00000	0.00000	-.00531	.00000
10	0.00000	0.00000	.00155	-.00000
11	0.00000	0.00000	-.00179	.00000
12	0.00000	0.00000	.00077	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 5 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.04	.03	.14	.02	-32.38	-53.80	1.09	-.12
20.0	-1.14	.04	.12	-.01	-32.07	-58.54	1.18	-.13
25.0	-1.13	.01	.11	-.02	-32.61	-54.77	1.14	-.13
30.0	-1.03	-.02	.10	-.01	-34.24	-58.46	1.01	-.11
35.0	-.92	-.06	.09	.00	-34.87	-60.01	.86	-.09
40.0	-.77	-.06	.07	.01	-35.89	-55.76	.71	-.06
45.0	-.61	-.01	.06	.02	-38.01	-55.05	.60	-.04
50.0	-.44	.02	.04	.01	-41.24	-60.57	.48	-.03
55.0	-.21	.11	.02	-.00	-47.41	-54.97	.32	-.03
60.0	0.00	.08	0.00	-.01	-200.00	-54.05	.08	-.01
65.0	.25	.01	-.04	-.02	-44.46	-54.02	-.24	.02
70.0	.40	-.09	-.08	-.01	-38.52	-55.56	-.57	.07
75.0	.73	-.11	-.14	.01	-34.49	-53.83	-.83	.15
80.0	.80	-.10	-.22	.02	-30.86	-50.73	-.90	.24
85.0	.74	.03	-.31	.02	-28.46	-54.61	-.72	.32
90.0	.43	.16	-.40	-.01	-27.39	-51.52	-.27	.40
95.0	-.20	.16	-.47	-.02	-27.36	-50.19	.35	.45
100.0	-.98	.02	-.49	-.02	-27.05	-53.44	1.00	.46
105.0	-1.64	-.15	-.45	.00	-28.34	-54.97	1.49	.45
110.0	-2.01	-.35	-.38	.04	-31.01	-48.06	1.66	.42
TOTAL	.92	.11	.24	.02	-30.98	-52.90		
NET REDUCTION OF MISMATCH ERRORS					21.91DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00815	.00000
2	0.00000	0.00000	-.00939	-.00000
3	0.00000	0.00000	.01426	.00000
4	0.00000	0.00000	.00903	-.00000
5	0.00000	0.00000	-.01114	.00000
6	1.00000	0.00000	1.01769	-.00000
7	0.00000	0.00000	-.01966	.00000
8	0.00000	0.00000	-.00078	-.00000
9	0.00000	0.00000	-.00552	.00000
10	0.00000	0.00000	.00056	-.00000
11	0.00000	0.00000	-.00211	.00000
12	0.00000	0.00000	.00029	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 6 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.67	-.10	.04	.01	-30.81	-52.97	1.57	-.03
20.0	-1.59	.08	.04	-.00	-30.83	-56.00	1.68	-.05
25.0	-1.48	.10	.04	-.01	-31.63	-53.57	1.58	-.05
30.0	-1.37	.01	.03	-.02	-33.13	-55.49	1.38	-.05
35.0	-1.24	-.10	.04	-.00	-33.47	-55.52	1.14	-.04
40.0	-1.04	-.09	.04	.01	-34.53	-53.94	.95	-.03
45.0	-.80	-.00	.03	.01	-36.81	-57.20	.80	-.02
50.0	-.69	-.03	.03	.01	-38.75	-57.07	.66	-.02
55.0	-.34	.11	.01	-.01	-44.86	-54.35	.45	-.02
60.0	0.00	.14	0.00	-.01	-200.00	-51.56	.14	-.01
65.0	.32	.05	-.04	-.02	-42.93	-53.26	-.27	.02
70.0	.60	-.11	-.09	-.01	-37.13	-53.15	-.71	.08
75.0	.83	-.20	-.15	.01	-33.45	-49.06	-1.04	.16
80.0	1.06	-.08	-.25	.02	-29.37	-51.89	-1.13	.27
85.0	.96	.05	-.45	.02	-27.22	-52.72	-.92	.37
90.0	.50	.20	-.46	-.01	-26.22	-49.61	-.39	.45
95.0	-.23	.10	-.53	-.02	-26.35	-51.76	.34	.50
100.0	-1.03	.07	-.54	-.02	-26.22	-52.40	1.09	.51
105.0	-1.46	-.20	-.48	.00	-27.63	-52.82	1.66	.48
110.0	-2.23	-.36	-.39	.04	-30.58	-47.93	1.87	.43
TOTAL	1.15	.14	.25	.02	-29.91	-51.73		
NET REDUCTION OF MISMATCH ERROR					21.33DB.			

NET REDUCTION OF MISMATCH ERRORS 21.43DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00078	-.00000
2	0.00000	0.00000	-.01407	-.00000
3	0.00000	0.00000	.01808	.00000
4	0.00000	0.00000	.00257	-.00000
5	0.00000	0.00000	-.00258	.00000
6	1.00000	0.00000	1.01552	-.00000
7	0.00000	0.00000	-.01135	-.00000
8	0.00000	0.00000	.00093	-.00000
9	0.00000	0.00000	-.00312	-.00000
10	0.00000	0.00000	.00180	-.00000
11	0.00000	0.00000	-.00110	-.00000
12	0.00000	0.00000	.00089	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 7 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.85	.08	-.05	.02	-36.54	-50.87	.93	.07
20.0	-.90	.05	-.05	-.01	-34.75	-57.10	1.03	.04
25.0	-1.06	-.02	-.04	-.02	-34.49	-52.20	1.03	.02
30.0	-1.02	-.04	-.03	-.01	-35.70	-56.72	.98	.02
35.0	-.90	-.09	-.02	.00	-35.55	-56.42	.90	.02
40.0	-.91	-.07	-.01	.01	-35.05	-53.68	.83	.03
45.0	-.74	.02	-.00	.02	-37.80	-52.97	.76	.02
50.0	-.55	.08	.01	.01	-41.05	-55.02	.63	.00
55.0	-.29	.13	.01	-.01	-46.51	-53.31	.41	-.01
60.0	0.00	.07	0.00	-.02	-200.00	-52.88	.07	-.02
65.0	.34	-.03	-.03	-.02	-43.54	-52.40	-.37	.01
70.0	.67	-.13	-.07	-.01	-37.31	-52.37	-.80	.06
75.0	.90	-.10	-.14	.01	-33.14	-52.98	-1.09	.16
80.0	1.04	-.05	-.24	.03	-29.71	-49.94	-1.09	.26
85.0	.70	.06	-.35	.02	-27.52	-53.22	-.73	.36
90.0	.20	.17	-.44	-.01	-26.69	-50.63	-.03	.43
95.0	-.77	.10	-.49	-.03	-26.83	-49.95	.87	.45
100.0	-1.81	-.03	-.45	-.02	-26.78	-53.70	1.78	.42
105.0	-2.60	-.16	-.33	.01	-28.24	-53.94	2.44	.34
110.0	-2.86	-.22	-.19	.04	-31.17	-50.54	2.64	.23
TOTAL	1.20	.10	.21	.02	-30.83	-51.90		

NET REDUCTION OF MISMATCH ERROR= 21.08DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00104	-.00000
2	0.00000	0.00000	-.00245	-.00000
3	0.00000	0.00000	.00418	-.00000
4	0.00000	0.00000	.00188	-.00000
5	0.00000	0.00000	.00649	-.00000
6	1.00000	0.00000	1.00014	-.00000
7	0.00000	0.00000	.00574	.00000
8	0.00000	0.00000	-.00658	-.00000
9	0.00000	0.00000	.00207	.00000
10	0.00000	0.00000	-.00269	-.00000
11	0.00000	0.00000	.00075	.00000
12	0.00000	0.00000	-.00101	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 8 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0040 INCHES			TOTAL		FILTER		FILTER	
FREQ	PHASE	AMPLITUDE	MS ERROR		PHASE	AMPL.		
(HZ)	ERROR	ERROR	(DB POWER)		(DEGREES)	(DB)		
	(DEGREES)	(DB)	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.59	-.07	-.10	-.01	-56.68	-57.88	.52	.09
20.0	-.55	.03	-.09	.00	-37.01	-65.21	.57	.09
25.0	-.53	.04	-.08	.01	-38.00	-58.13	.57	.09
30.0	-.56	-.02	-.08	-.00	-38.53	-69.35	.54	.07
35.0	-.52	-.03	-.06	-.00	-39.21	-67.37	.49	.06
40.0	-.43	.02	-.05	-.00	-40.53	-68.56	.45	.05
45.0	-.30	.05	-.04	-.01	-42.71	-59.79	.39	.03
50.0	-.37	-.07	-.02	.00	-44.04	-58.87	.30	.02
55.0	-.18	-.01	-.02	-.00	-49.22	-68.86	.17	.01
60.0	0.00	.02	0.00	.01	-200.00	-60.31	.02	.01
65.0	.15	.01	-.00	.00	-51.70	-72.82	-.14	.01
70.0	.25	-.02	-.01	-.00	-47.54	-67.92	-.27	.01
75.0	.33	-.03	-.01	.00	-45.18	-65.93	-.36	.01
80.0	.43	.04	-.03	-.01	-41.69	-60.60	-.39	.02
85.0	.42	.05	-.03	-.00	-41.53	-61.38	-.38	.03
90.0	.36	.02	-.04	-.01	-43.07	-63.58	-.35	.03
95.0	.18	-.14	-.01	.01	-51.75	-53.54	-.32	.01
100.0	.24	-.05	.03	.01	-47.29	-59.46	-.30	-.02
105.0	.27	-.01	.08	.00	-43.15	-70.89	-.28	-.08
110.0	.56	.31	.13	-.02	-40.98	-50.66	-.25	-.14
TOTAL	.40	.08	.06	.01	-40.79	-58.51		
NET REDUCTION OF MISMATCH ERROR=					17.72DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00673	-.00000
2	0.00000	0.00000	-.01018	.00000
3	0.00000	0.00000	.01033	-.00000
4	0.00000	0.00000	.00726	.00000
5	0.00000	0.00000	-.00858	-.00000
6	1.00000	0.00000	1.01609	.00000
7	0.00000	0.00000	-.01171	-.00000
8	0.00000	0.00000	.00097	.00000
9	0.00000	0.00000	-.00290	-.00000
10	0.00000	0.00000	.00197	-.00000
11	0.00000	0.00000	-.00099	-.00000
12	0.00000	0.00000	.00102	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 4 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)		FILTER AMPL. (DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0	-.55	.13	-.01	.02	-40.61	-49.71	.68		.93	
20.0	-.75	.02	-.02	-.01	-37.42	-56.26	.77		.01	
25.0	-.85	-.05	-.02	-.02	-36.59	-52.66	.79		.00	
30.0	-.83	-.05	-.02	-.01	-37.52	-55.49	.78		.00	
35.0	-.81	-.07	-.01	.00	-37.33	-58.47	.74		.01	
40.0	-.78	-.04	-.01	.01	-37.68	-54.99	.70		.02	
45.0	-.63	.02	-.00	.02	-39.30	-53.39	.65		.02	
50.0	-.48	.06	.00	.01	-42.23	-57.10	.54		.01	
55.0	-.24	.12	.00	-.00	-48.18	-54.17	.35		-.01	
60.0	0.00	.05	0.00	-.02	-200.00	-53.70	.05		-.02	
65.0	.32	-.03	-.02	-.02	-44.55	-52.97	-.34		-.00	
70.0	.60	-.12	-.06	-.01	-38.33	-53.17	-.76		.05	
75.0	.99	-.09	-.11	.01	-34.05	-54.34	-1.08		.12	
80.0	1.13	-.06	-.19	.02	-30.66	-50.44	-1.19		.21	
85.0	1.07	.06	-.24	.02	-28.48	-52.90	-1.02		.30	
90.0	.70	.15	-.38	-.01	-27.65	-51.82	-.55		.37	
95.0	-.00	.11	-.44	-.03	-27.87	-50.14	.11		.41	
100.0	-.84	-.02	-.44	-.03	-27.91	-52.80	.82		.42	
105.0	-1.52	-.14	-.38	.01	-29.58	-55.22	1.37		.38	
110.0	-1.85	-.25	-.29	.04	-32.66	-49.26	1.60		.33	
TOTAL	.87	.10	.20	.02	-52.04	-52.17				
NET REDUCTION OF MISMATCH ERROR=					20.13DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00286	-.00000
2	0.00000	0.00000	-.00419	.00000
3	0.00000	0.00000	.00385	-.00000
4	0.00000	0.00000	.00846	.00000
5	0.00000	0.00000	.00102	-.00000
6	1.00000	0.00000	1.00905	.00000
7	0.00000	0.00000	.00214	-.00000
8	0.00000	0.00000	-.00425	.00000
9	0.00000	0.00000	.00090	-.00000
10	0.00000	0.00000	-.00120	.00000
11	0.00000	0.00000	.00031	-.00000
12	0.00000	0.00000	-.00029	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 10 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR 1 TYP SPACING OF 10040 HZ									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER		FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE		AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)		(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.60	-.00	-.13	.00	-34.87	-69.58	.60		.14
20.0	-.65	.02	-.13	-.00	-34.62	-67.99	.68		.12
25.0	-.67	.03	-.11	.00	-35.39	-65.40	.70		.11
30.0	-.71	-.03	-.11	-.01	-36.02	-60.18	.68		.10
35.0	-.71	-.06	-.09	-.00	-36.34	-59.95	.65		.09
40.0	-.62	-.01	-.07	.00	-37.42	-65.73	.61		.07
45.0	-.50	.05	-.05	.00	-39.57	-60.29	.55		.06
50.0	-.40	-.05	-.03	.01	-41.44	-59.39	.44		.04
55.0	-.24	.04	-.02	-.01	-46.85	-61.04	.28		.02
60.0	0.00	.05	0.00	.00	-200.00	-61.14	.05		.00
65.0	.23	.00	-.00	-.01	-47.72	-61.96	-.23		-.00
70.0	.46	-.06	-.01	-.01	-42.21	-57.61	-.52		.01
75.0	.68	-.09	-.03	.01	-38.85	-56.26	-.76		.03
80.0	.94	.02	-.06	.00	-34.86	-63.66	-.92		.07
85.0	1.00	.05	-.10	.01	-33.55	-57.33	-.95		.11
90.0	.94	.08	-.15	-.01	-33.31	-56.95	-.86		.14
95.0	.61	-.06	-.16	-.01	-35.19	-59.46	-.68		.16
100.0	.42	-.03	-.16	-.01	-36.51	-61.65	-.45		.15
105.0	.15	-.09	-.11	.00	-41.17	-59.63	-.23		.12
110.0	.19	.12	-.06	.01	-48.48	-57.77	-.07		.07
TOTAL	.60	.06	.09	.01	-36.43	-59.31			
NET REDUCTION OF MISMATCH ERROR=					22.87DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00481	-.00000
2	0.00000	0.00000	-.00796	.00000
3	0.00000	0.00000	.00850	-.00000
4	0.00000	0.00000	.00428	.00000
5	0.00000	0.00000	-.00546	-.00000
6	1.00000	0.00000	1.01052	.00000
7	0.00000	0.00000	-.00841	-.00000
8	0.00000	0.00000	-.00048	.00000
9	0.00000	0.00000	-.00191	-.00000
10	0.00000	0.00000	.00101	.00000
11	0.00000	0.00000	-.00044	-.00000
12	0.00000	0.00000	.00046	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 11 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.44	.10	.00	.01	-42.51	-52.59	.54	.01
20.0	-.61	.01	-.00	-.01	-39.37	-62.58	.62	-.00
25.0	-.68	-.04	-.01	-.01	-38.54	-55.12	.64	-.01
30.0	-.67	-.04	-.01	-.01	-39.43	-59.65	.63	-.00
35.0	-.67	-.06	-.00	.00	-39.06	-60.33	.61	.01
40.0	-.61	-.03	-.00	.01	-39.43	-58.71	.58	.01
45.0	-.51	.02	.00	.01	-41.10	-56.74	.53	.01
50.0	-.37	.06	.00	.01	-44.44	-58.54	.43	.00
55.0	-.19	.08	.00	-.00	-50.08	-57.58	.27	-.01
60.0	0.00	.02	0.00	-.01	-200.00	-58.21	.02	-.01
65.0	.26	-.03	-.02	-.01	-46.22	-55.37	-.28	.00
70.0	.50	-.09	-.04	-.00	-40.52	-56.05	-.59	.04
75.0	.77	-.04	-.09	.01	-36.24	-59.27	-.81	.09
80.0	.83	-.03	-.14	.02	-33.08	-54.30	-.86	.16
85.0	.74	.04	-.22	.01	-31.06	-56.76	-.70	.23
90.0	.44	.10	-.28	-.01	-30.26	-54.96	-.34	.28
95.0	-.11	.05	-.32	-.02	-30.57	-54.29	.16	.30
100.0	-.72	-.05	-.31	-.02	-30.70	-55.90	.67	.30
105.0	-1.15	-.09	-.26	.01	-32.65	-59.20	1.06	.26
110.0	-1.30	-.10	-.18	.03	-36.13	-54.82	1.21	.21
TOTAL	.66	.06	.15	.01	-34.54	-55.74		
NET REDUCTION OF MISMATCH ERROR=					21.09DB.			

1	0.00000	0.00000	.00381	-.00000
2	0.00000	0.00000	-.00687	.00000
3	0.00000	0.00000	.00484	-.00000
4	0.00000	0.00000	.00398	.00000
5	0.00000	0.00000	-.00620	-.00000
6	1.00000	0.00000	1.00872	.00000
7	0.00000	0.00000	-.00669	-.00000
8	0.00000	0.00000	-.00168	.00000
9	0.00000	0.00000	-.00066	-.00000
10	0.00000	0.00000	.00042	.00000
11	0.00000	0.00000	-.00002	-.00000
12	0.00000	0.00000	.00055	.00000

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.18	.11	.03	.01	-47.15	-52.61	.29	-.02
20.0	-.36	-.00	.01	-.01	-43.66	-63.36	.36	-.02
25.0	-.45	-.04	.00	-.01	-42.11	-58.42	.41	-.01
30.0	-.51	-.07	-.01	-.01	-41.68	-55.72	.45	.00
35.0	-.53	-.05	-.01	.00	-41.05	-61.33	.48	.01
40.0	-.47	.02	-.01	.01	-41.51	-58.81	.49	.02
45.0	-.40	.07	-.01	.01	-42.90	-55.99	.47	.02
50.0	-.46	-.05	-.01	.01	-42.53	-58.01	.41	.01
55.0	-.22	.06	-.01	-.01	-48.74	-58.28	.27	.00
60.0	0.00	.05	0.00	-.00	-200.00	-58.36	.06	-.00
65.0	.21	-.00	-.01	-.01	-47.98	-57.04	-.21	.00
70.0	.42	-.07	-.04	-.01	-41.82	-57.12	-.49	.03
75.0	.59	-.13	-.07	.01	-38.38	-52.85	-.72	.08
80.0	.82	-.00	-.12	.01	-33.86	-57.58	-.82	.13
85.0	.84	.07	-.18	.01	-31.92	-53.86	-.76	.19
90.0	.63	.10	-.24	-.01	-31.19	-55.06	-.53	.24
95.0	.15	-.02	-.27	-.02	-31.88	-56.37	-.18	.26
100.0	-.23	-.01	-.27	-.02	-32.39	-57.16	.22	.25
105.0	-.63	-.09	-.22	.00	-34.75	-59.73	.54	.22
110.0	-.76	-.06	-.15	.03	-39.08	-55.09	.70	.18
TOTAL	.50	.06	.13	.01	-36.11	-55.73		
NET REDUCTION OF MISMATCH ERROR=					19.63DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00365	.00000
2	0.00000	0.00000	-.00662	-.00000
3	0.00000	0.00000	.00971	.00000
4	0.00000	0.00000	-.00222	.00000
5	0.00000	0.00000	.00228	.00000
6	1.00000	0.00000	1.00239	-.00000
7	0.00000	0.00000	-.00294	-.00000
8	0.00000	0.00000	-.00256	-.00000
9	0.00000	0.00000	-.00049	-.00000
10	0.00000	0.00000	-.00058	-.00000
11	0.00000	0.00000	-.00004	-.00000
12	0.00000	0.00000	-.00004	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 13 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.40	.02	-.00	.01	-41.62	-62.70	.51	.01
20.0	-.54	.01	-.00	-.00	-40.36	-69.30	.55	.00
25.0	-.54	.00	-.00	-.01	-40.51	-62.70	.54	-.00
30.0	-.51	-.01	-.00	-.00	-41.77	-68.10	.50	.00
35.0	-.40	-.03	-.00	.00	-41.82	-65.58	.46	.00
40.0	-.43	-.03	-.00	.00	-42.37	-63.04	.41	.01
45.0	-.35	.01	.00	.01	-44.30	-62.15	.36	.00
50.0	-.25	.03	.00	.00	-47.81	-66.26	.28	-.00
55.0	-.13	.04	.00	-.00	-53.61	-62.39	.17	-.00
60.0	0.00	.01	0.00	-.00	-200.00	-65.44	.01	-.00
65.0	.16	-.01	-.01	-.01	-49.99	-63.30	-.16	.01
70.0	.20	-.03	-.03	-.00	-44.38	-64.78	-.32	.03
75.0	.20	-.10	-.07	.00	-41.42	-54.97	-.40	.07
80.0	.38	.03	-.10	.01	-37.19	-59.60	-.35	.11
85.0	.22	.07	-.15	.00	-35.22	-57.96	-.16	.15
90.0	-.12	.04	-.18	-.01	-34.60	-60.33	.16	.17
95.0	-.57	-.02	-.17	-.01	-35.11	-61.56	.55	.16
100.0	-.96	-.06	-.12	-.00	-35.42	-61.83	.91	.12
105.0	-1.10	-.05	-.05	.01	-36.95	-63.12	1.14	.05
110.0	-1.00	.09	.03	.00	-40.06	-61.80	1.17	-.03
TOTAL	.55	.04	.07	.00	-38.62	-60.00		
NET REDUCTION OF MISMATCH ERROR=					22.29DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00756	.00000
2	0.00000	0.00000	-.01357	-.00000
3	0.00000	0.00000	.01418	.00000
4	0.00000	0.00000	.00698	-.00000
5	0.00000	0.00000	-.00632	.00000
6	1.00000	0.00000	1.02101	-.00000
7	0.00000	0.00000	-.01245	.00000
8	0.00000	0.00000	.00341	-.00000
9	0.00000	0.00000	-.00239	.00000
10	0.00000	0.00000	.00345	-.00000
11	0.00000	0.00000	-.00058	.00000
12	0.00000	0.00000	.00196	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 14 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.28	.22	-.08	.03	-40.11	-46.29	.51	.10
20.0	-.66	.01	-.08	-.01	-36.65	-57.16	.66	.07
25.0	-.87	-.08	-.07	-.02	-35.49	-50.90	.79	.04
30.0	-1.01	-.13	-.06	-.02	-35.25	-50.09	.89	.04
35.0	-1.04	-.10	-.04	.00	-34.97	-55.40	.93	.05
40.0	-.94	-.09	-.03	.02	-35.55	-52.79	.93	.05
45.0	-.78	.09	-.02	.02	-37.33	-50.55	.86	.04
50.0	-.70	.01	.00	.02	-38.97	-54.73	.72	.02
55.0	-.36	.10	-.00	-.01	-44.59	-54.13	.46	-.01
60.0	0.00	.09	0.00	-.02	-200.00	-51.53	.09	-.02
65.0	.35	-.01	-.03	-.03	-42.92	-50.12	-.36	.00
70.0	.68	-.14	-.08	-.01	-37.16	-51.52	-.82	.06
75.0	.96	-.18	-.14	.02	-33.23	-49.02	-1.14	.16
80.0	1.18	-.04	-.24	.03	-29.17	-49.13	-1.21	.27
85.0	1.04	.09	-.35	.03	-27.06	-49.57	-.95	.38
90.0	.55	.20	-.47	-.01	-26.08	-48.92	-.35	.46
95.0	-.41	.07	-.53	-.03	-26.33	-49.37	.48	.49
100.0	-1.33	.02	-.52	-.03	-26.32	-50.06	1.35	.48
105.0	-2.21	-.20	-.43	.01	-27.84	-52.53	2.01	.43
110.0	-2.56	-.30	-.30	.06	-30.94	-46.94	2.26	.36
TOTAL	1.08	.13	.24	.02	-30.48	-49.60		

NET REDUCTION OF MISMATCH ERROR= 19.15DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00800	-.00000
2	0.00000	0.00000	-.01362	-.00000
3	0.00000	0.00000	.01482	-.00000
4	0.00000	0.00000	.00960	.00000
5	0.00000	0.00000	-.00429	.00000
6	1.00000	0.00000	1.02218	-.00000
7	0.00000	0.00000	-.00928	-.00000
8	0.00000	0.00000	.00224	-.00000
9	0.00000	0.00000	-.00225	-.00000
10	0.00000	0.00000	.00268	-.00000
11	0.00000	0.00000	-.00064	-.00000
12	0.00000	0.00000	.00150	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 15 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ		PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)		(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
		BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0		-.53	.19	-.14	.03	-34.80	-47.06	.73	.17
20.0		-.86	.02	-.14	-.01	-33.15	-57.49	.88	.13
25.0		-1.06	-.08	-.12	-.03	-32.80	-50.01	.98	.10
30.0		-1.13	-.10	-.10	-.02	-33.69	-52.59	1.04	.08
35.0		-1.13	-.09	-.08	.00	-33.74	-56.82	1.05	.08
40.0		-1.05	-.04	-.05	.02	-34.23	-53.53	1.02	.07
45.0		-.89	.04	-.03	.02	-36.05	-51.13	.93	.05
50.0		-.67	.09	-.01	.01	-39.37	-53.96	.76	.02
55.0		-.35	.12	-.00	-.01	-44.94	-53.38	.47	-.01
60.0		0.00	.05	0.00	-.02	-200.00	-52.12	.05	-.02
65.0		.41	-.05	-.02	-.02	-42.33	-50.45	-.46	-.00
70.0		.83	-.14	-.06	-.01	-36.27	-51.77	-.97	.05
75.0		1.25	-.10	-.13	.02	-32.18	-52.61	-1.35	.15
80.0		1.39	-.05	-.23	.03	-28.92	-48.72	-1.44	.26
85.0		1.26	.07	-.35	.02	-26.90	-51.39	-1.19	.37
90.0		.77	.18	-.46	-.01	-26.16	-49.80	-.58	.45
95.0		-.16	.11	-.52	-.04	-26.52	-48.75	.26	.48
100.0		-1.18	-.04	-.50	-.03	-26.66	-51.30	1.14	.47
105.0		-2.01	-.18	-.41	.01	-28.36	-53.24	1.83	.42
110.0		-2.34	-.24	-.26	.05	-31.59	-48.49	2.10	.34
TOTAL		1.11	.12	.24	.02	-30.25	-50.34		
NET REDUCTION OF MISMATCH ERROR=						20.10DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00050	-.00000
2	0.00000	0.00000	-.01042	-.00000
3	0.00000	0.00000	.00974	.00000
4	0.00000	0.00000	.01025	-.00000
5	0.00000	0.00000	-.00494	.00000
6	1.00000	0.00000	1.01960	-.00000
7	0.00000	0.00000	-.00733	-.00000
8	0.00000	0.00000	.00141	.00000
9	0.00000	0.00000	-.00161	-.00000
10	0.00000	0.00000	.00208	.00000
11	0.00000	0.00000	-.00050	-.00000
12	0.00000	0.00000	.00125	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 16 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.45	.14	-.13	.02	-35.85	-49.83	.59	.15
20.0	-.69	.02	-.12	-.01	-34.50	-54.65	.71	.12
25.0	-.83	-.04	-.11	-.02	-34.46	-54.43	.79	.09
30.0	-.91	-.08	-.10	-.02	-34.91	-52.53	.84	.08
35.0	-.93	-.08	-.08	.00	-35.00	-57.14	.85	.08
40.0	-.86	-.03	-.06	.01	-35.58	-55.28	.84	.08
45.0	-.72	.06	-.04	.02	-37.51	-52.78	.78	.06
50.0	-.67	-.01	-.02	.01	-39.28	-56.17	.66	.03
55.0	-.34	.09	-.01	-.01	-44.84	-55.12	.43	.00
60.0	0.00	.10	0.00	-.01	-200.00	-53.14	.10	-.01
65.0	.33	-.00	-.02	-.02	-44.17	-51.91	-.34	-.00
70.0	.68	-.11	-.05	-.01	-38.11	-53.03	-.79	.04
75.0	.97	-.18	-.10	.01	-34.48	-49.82	-1.15	.11
80.0	1.26	-.05	-.18	.02	-30.42	-50.92	-1.30	.20
85.0	1.26	.09	-.27	.02	-28.38	-50.47	-1.17	.29
90.0	.93	.17	-.37	-.01	-27.58	-50.48	-.75	.37
95.0	.18	.06	-.43	-.03	-28.03	-50.85	-.12	.40
100.0	-.56	.01	-.43	-.03	-28.23	-51.37	.57	.40
105.0	-1.30	-.17	-.37	.00	-30.09	-54.00	1.13	.37
110.0	-1.64	-.25	-.26	.05	-33.53	-48.35	1.39	.32
TOTAL	.87	.11	.21	.02	-31.77	-51.42		

NET REDUCTION OF MISMATCH ERRORS 19.66db.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00612	.00000
2	0.00000	0.00000	-.00816	.00000
3	0.00000	0.00000	.01185	.00000
4	0.00000	0.00000	.00374	-.00000
5	0.00000	0.00000	.00009	.00000
6	1.00000	0.00000	1.00888	-.00000
7	0.00000	0.00000	-.00499	.00000
8	0.00000	0.00000	-.00316	.00000
9	0.00000	0.00000	-.00196	.00000
10	0.00000	0.00000	-.00094	.00000
11	0.00000	0.00000	-.00081	.00000
12	0.00000	0.00000	-.00050	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 17 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.16	-.09	-.06	.01	-33.74	-55.57	1.07	.06
20.0	-1.05	.07	-.05	-.00	-34.16	-58.20	1.12	.05
25.0	-.96	.07	-.05	-.01	-35.17	-56.64	1.04	.04
30.0	-.88	.00	-.04	-.01	-36.72	-64.58	.89	.03
35.0	-.81	-.06	-.03	-.00	-37.17	-59.37	.74	.03
40.0	-.70	-.07	-.02	.00	-37.96	-57.42	.63	.03
45.0	-.58	-.02	-.01	.01	-39.88	-60.24	.56	.02
50.0	-.42	.04	-.01	.00	-43.35	-62.10	.46	.01
55.0	-.22	.09	-.00	-.00	-49.00	-56.78	.31	.00
60.0	0.00	.05	0.00	-.00	-200.00	-54.19	.05	-.00
65.0	.26	-.01	-.01	-.01	-46.37	-59.06	-.27	.00
70.0	.52	-.08	-.04	-.00	-40.44	-56.77	-.60	.03
75.0	.79	-.05	-.08	.00	-36.24	-61.08	-.83	.08
80.0	.83	-.05	-.14	.01	-33.38	-55.47	-.88	.15
85.0	.73	.04	-.21	.01	-31.41	-58.59	-.69	.21
90.0	.38	.10	-.27	-.01	-30.83	-55.00	-.28	.26
95.0	-.21	.05	-.29	-.01	-31.45	-57.26	.25	.28
100.0	-.83	-.05	-.26	-.01	-31.91	-60.92	.78	.25
105.0	-1.27	-.10	-.18	.01	-33.97	-58.19	1.18	.19
110.0	-1.34	-.03	-.09	.01	-37.77	-62.86	1.31	.10
TOTAL	.78	.06	.13	.01	-54.46	-57.43		
NET REDUCTION OF MISMATCH ERROR=					22.97DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00350	-.00000
2	0.00000	0.00000	-.00457	.00000
3	0.00000	0.00000	.00988	.00000
4	0.00000	0.00000	-.00130	.00000
5	0.00000	0.00000	-.00026	-.00000
6	1.00000	0.00000	1.00160	-.00000
7	0.00000	0.00000	-.00715	.00000
8	0.00000	0.00000	-.00424	-.00000
9	0.00000	0.00000	-.00176	.00000
10	0.00000	0.00000	-.00188	-.00000
11	0.00000	0.00000	-.00066	.00000
12	0.00000	0.00000	-.00084	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 10 WITH 12 TAPS FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-1.11	-.13	.05	-.00	-34.07	-52.95	.98		-.06
20.0	-.96	.05	.05	.00	-30.86	-60.62	1.01		-.05
25.0	-.81	.10	.05	.00	-36.33	-54.66	.91		-.05
30.0	-.74	.01	.04	-.00	-38.11	-66.24	.75		-.04
35.0	-.64	-.05	.04	-.00	-38.84	-61.68	.59		-.04
40.0	-.40	-.03	.03	-.00	-40.53	-65.16	.46		-.03
45.0	-.35	.01	.02	-.00	-43.46	-69.21	.36		-.03
50.0	-.34	-.06	.02	.00	-44.39	-59.43	.28		-.02
55.0	-.13	.05	.01	-.00	-52.75	-61.72	.18		-.01
60.0	0.00	.04	0.00	.00	-200.00	-60.83	.04		.00
65.0	.13	.02	-.03	-.00	-48.55	-67.78	-.11		.02
70.0	.22	-.03	-.05	-.00	-43.28	-64.17	-.25		.05
75.0	.25	-.06	-.08	.00	-40.41	-58.63	-.31		.09
80.0	.26	.00	-.13	-.00	-36.38	-79.52	-.26		.12
85.0	.11	.04	-.16	.00	-34.72	-62.91	-.07		.16
90.0	-.17	.04	-.19	-.01	-34.05	-60.83	.21		.18
95.0	-.61	-.08	-.18	.00	-34.67	-58.97	.53		.18
100.0	-.78	.03	-.15	.00	-35.46	-67.66	.81		.15
105.0	-1.02	-.04	-.04	.00	-37.33	-65.14	.98		.09
110.0	-.93	.05	-.02	-.01	-41.51	-64.65	.98		.02
TOTAL	.61	.06	.09	.00	-37.00	-59.61			
NET REDUCTION OF MISMATCH ERROR=					22.60DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00405	-.00000
2	0.00000	0.00000	-.00917	-.00000
3	0.00000	0.00000	.01190	.00000
4	0.00000	0.00000	-.00229	-.00000
5	0.00000	0.00000	.00288	.00000
6	1.00000	0.00000	1.00315	-.00000
7	0.00000	0.00000	-.00247	.00000
8	0.00000	0.00000	-.00404	-.00000
9	0.00000	0.00000	.00063	.00000
10	0.00000	0.00000	-.00101	-.00000
11	0.00000	0.00000	-.00023	.00000
12	0.00000	0.00000	-.00019	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 19 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ		PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE		FILTER AMPL.	
(HZ)		(DEGREES)		(DB)		(DB POWER)		(DEGREES)		(DB)	
		BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0		-.61	-.02	-.02	.01	-39.52	-63.15		.60		.02
20.0		-.62	.03	-.02	-.00	-39.00	-63.02		.65		.02
25.0		-.63	.01	-.02	-.00	-39.07	-65.70		.64		.01
30.0		-.59	.01	-.01	-.00	-40.44	-74.69		.60		.01
35.0		-.60	-.05	-.01	-.00	-39.47	-62.40		.55		.01
40.0		-.53	-.02	.00	.00	-40.57	-63.50		.51		.00
45.0		-.45	.01	.00	.00	-42.17	-65.98		.46		-.00
50.0		-.37	-.00	.01	.00	-44.35	-82.36		.37		-.01
55.0		-.16	.06	.01	-.00	-51.05	-59.39		.23		-.01
60.0		0.00	.02	0.00	-.00	-200.00	-64.57		.02		-.00
65.0		.19	-.02	-.02	-.01	-47.46	-62.15		-.21		.02
70.0		.36	-.06	-.05	.00	-41.74	-59.58		-.43		.05
75.0		.50	-.04	-.09	.01	-37.80	-59.85		-.54		.10
80.0		.53	.03	-.14	.01	-34.45	-58.79		-.50		.15
85.0		.33	.04	-.20	-.00	-32.63	-62.57		-.29		.19
90.0		-.01	.06	-.22	-.01	-32.61	-56.58		.07		.21
95.0		-.53	-.01	-.20	-.00	-34.06	-69.14		.51		.19
100.0		-1.07	-.14	-.14	.00	-34.44	-54.19		.93		.14
105.0		-1.21	.01	-.04	.01	-36.91	-59.04		1.21		.05
110.0		-1.12	.15	.04	-.01	-39.71	-56.22		1.27		-.05
TOTAL		.61	.06	.09	.01	-36.87	-59.67				
NET REDUCTION OF MISMATCH ERROR						22.79DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.01346	.00000
2	0.00000	0.00000	-.01485	-.00000
3	0.00000	0.00000	.03562	.00000
4	0.00000	0.00000	-.00304	.00000
5	0.00000	0.00000	-.02064	.00000
6	1.00000	0.00000	1.01060	-.00000
7	0.00000	0.00000	-.04708	-.00000
8	0.00000	0.00000	-.00855	-.00000
9	0.00000	0.00000	-.00986	.00000
10	0.00000	0.00000	-.00247	-.00000
11	0.00000	0.00000	-.00469	-.00000
12	0.00000	0.00000	-.00055	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 20 WITH 12 TAPS FOR A TAP SPACING OF .0040 SECS.								
FREQ	PHASE	AMPLITUDE	TOTAL	FILTER	FILTER			
(HZ)	ERROR	ERROR	MS ERROR	PHASE	AMPL,			
	(DEGREES)	(DB)	(DB POWER)	(DEGREES)	(DB)			
	BEFORE	AFTER	BEFORE	AFTER				
15.0	-4.06	-.44	.46	.01	-21.07	-42.62	3.63	-.46
20.0	-3.57	.20	.45	-.00	-21.51	-49.04	3.76	-.45
25.0	-3.11	.29	.43	-.00	-22.55	-46.01	3.40	-.43
30.0	-2.62	.14	.39	-.01	-24.55	-52.34	2.75	-.40
35.0	-2.20	-.14	.35	.00	-25.35	-52.75	2.06	-.35
40.0	-1.69	-.20	.30	.01	-26.68	-48.82	1.49	-.29
45.0	-1.23	-.14	.23	.01	-29.22	-52.11	1.09	-.23
50.0	-.78	.04	.17	.01	-33.20	-61.34	.81	-.16
55.0	-.38	.15	.09	-.01	-39.04	-51.95	.53	-.09
60.0	0.00	.17	0.00	-.00	-200.00	-50.48	.17	-.00
65.0	.39	.10	-.12	-.01	-36.36	-52.54	-.28	.11
70.0	.61	-.10	-.25	-.01	-30.87	-54.97	-.71	.24
75.0	.67	-.26	-.39	.01	-27.40	-46.94	-.94	.40
80.0	.67	-.12	-.55	.01	-23.94	-51.37	-.79	.57
85.0	.23	.04	-.70	.01	-22.08	-58.22	-.19	.71
90.0	-.50	.22	-.82	-.01	-21.54	-48.58	.81	.81
95.0	-1.88	.16	-.85	-.01	-21.94	-51.65	2.03	.83
100.0	-3.12	.09	-.79	-.01	-22.02	-57.51	3.20	.79
105.0	-4.15	-.15	-.65	.01	-23.50	-53.84	4.00	.67
110.0	-4.66	-.53	-.50	.00	-26.11	-46.57	4.13	.50
TOTAL	2.34	.22	.46	.01	-23.84	-48.80		
NET REDUCTION OF MISMATCH ERROR:			24.96DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.30852	-.00000
2	0.00000	0.00000	-.17582	.00000
3	0.00000	0.00000	-.22721	-.00000
4	0.00000	0.00000	-.22615	.00000
5	0.00000	0.00000	.11007	-.00000
6	1.00000	0.00000	-.17456	.00000
7	0.00000	0.00000	-.16556	-.00000
8	0.00000	0.00000	-.22111	.00000
9	0.00000	0.00000	-.08914	-.00000
10	0.00000	0.00000	-.21837	.00000
11	0.00000	0.00000	.02582	-.00000
12	0.00000	0.00000	-.28801	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 21 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0040 INCHES			TOTAL		FILTER		FILT	
FREQ	PHASE	AMPLITUDE	MS ERROR		PHASE		AMPL.	
(HZ)	ERROR	ERROR	(DB POWER)		(DEGREES)		(DB)	
	(DEGREES)	(DB)	BEFORE	AFTER	BEFORE	AFTER		
15.0	217.45	47.61	-.35	-7.28	5.11	-2.45	-169.85	-6.93
20.0	66.77	33.39	-.86	-13.41	.56	-1.49	-33.38	-12.55
25.0	38.46	26.94	-.57	-5.24	-3.93	-4.96	-11.52	-4.67
30.0	-20.62	-20.78	-.09	-4.10	-9.80	-7.36	-.16	-4.01
35.0	-69.11	-44.83	-.36	-6.52	.52	-2.97	24.27	-6.16
40.0	-87.96	-21.20	-.83	-7.48	2.51	-4.03	66.76	-6.66
45.0	-237.62	-146.11	-.69	-5.48	4.48	3.30	91.51	-4.79
50.0	244.41	-18.83	.33	-4.39	4.00	-7.26	-263.24	-4.72
55.0	-65.37	-336.23	.03	-7.44	.11	-4.52	-270.87	-7.46
60.0	0.00	57.07	0.00	-12.88	-200.00	-.94	57.07	-12.88
65.0	-265.36	94.93	-.62	-15.14	3.09	.29	360.28	-14.57
70.0	215.25	201.51	.08	-16.34	5.17	.69	-13.74	-16.42
75.0	-40.70	38.78	-.04	-18.63	-3.73	-1.38	79.56	-18.59
80.0	-68.35	38.86	-.59	-6.38	.84	-2.48	107.21	-7.78
85.0	194.05	301.84	-.63	-4.01	5.76	-1.24	107.79	-3.38
90.0	-184.85	-79.10	.20	-2.20	5.46	.51	105.75	-2.40
95.0	-27.76	76.70	.92	-3.78	-7.49	-1.28	104.46	-4.70
100.0	-68.34	-310.96	1.89	-11.90	-.03	-3.51	-242.63	-13.70
105.0	-254.65	-8.26	3.48	-7.12	2.50	-8.46	246.39	-10.60
110.0	-196.00	52.24	5.23	1.45	3.14	-6.03	248.24	-3.78
TOTAL	156.56	141.49	1.79	4.03	2.91	-1.13		
NET REDUCTION OF MISMATCH ERROR=			4.05DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00647	-.00000
2	0.00000	0.00000	-.00980	.00000
3	0.00000	0.00000	.01266	-.00000
4	0.00000	0.00000	.00322	.00000
5	0.00000	0.00000	-.00745	-.00000
6	1.00000	0.00000	1.01266	.00000
7	0.00000	0.00000	-.01472	-.00000
8	0.00000	0.00000	-.00013	.00000
9	0.00000	0.00000	-.00345	-.00000
10	0.00000	0.00000	.00108	.00000
11	0.00000	0.00000	-.00116	-.00000
12	0.00000	0.00000	.00068	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 22 WITH 12 TAPS									
FOR A TAP SPACING OF .0040 SECS.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER		FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE		AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)		(DL)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.86	.03	.05	.01	-36.12	-55.38	.89		-.04
20.0	-.95	.03	.04	-.01	-35.10	-60.97	.98		-.05
25.0	-.95	.02	.04	-.01	-35.33	-58.44	.97		-.05
30.0	-.92	-.03	.03	-.02	-36.54	-55.30	.89		-.04
35.0	-.89	-.09	.03	.00	-36.39	-56.91	.80		-.03
40.0	-.75	-.04	.03	.01	-37.32	-56.64	.72		-.02
45.0	-.60	.04	.02	.01	-39.45	-55.94	.63		-.01
50.0	-.55	-.02	.02	.01	-40.82	-58.31	.52		-.01
55.0	-.26	.09	.01	-.01	-47.20	-55.71	.35		-.01
60.0	0.00	.09	0.00	-.01	-200.00	-54.71	.09		-.01
65.0	.26	.02	-.03	-.02	-44.49	-54.35	-.24		.02
70.0	.48	-.10	-.08	-.01	-38.78	-54.68	-.57		.07
75.0	.65	-.15	-.13	.01	-35.03	-51.08	-.80		.14
80.0	.80	-.03	-.22	.02	-30.92	-53.84	-.83		.23
85.0	.64	.05	-.30	.02	-28.85	-53.53	-.59		.32
90.0	.25	.15	-.39	-.01	-27.83	-51.55	-.10		.38
95.0	-.52	.04	-.43	-.02	-28.04	-54.05	.56		.41
100.0	-1.19	.04	-.41	-.02	-28.05	-54.90	1.23		.39
105.0	-1.86	-.15	-.35	.00	-24.50	-55.23	1.72		.35
110.0	-2.09	-.23	-.25	.03	-32.63	-50.87	1.86		.28
TOTAL	.92	.09	.20	.01	-32.02	-53.80			
NET REDUCTION OF MISMATCH ERROR=					21.79DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00448	-.00000
2	0.00000	0.00000	-.00794	.00000
3	0.00000	0.00000	.00741	-.00000
4	0.00000	0.00000	.00809	.00000
5	0.00000	0.00000	.00203	-.00000
6	1.00000	0.00000	1.01259	.00000
7	0.00000	0.00000	.00186	-.00000
8	0.00000	0.00000	-.00248	.00000
9	0.00000	0.00000	.00062	-.00000
10	0.00000	0.00000	-.00009	.00000
11	0.00000	0.00000	.00028	-.00000
12	0.00000	0.00000	.00012	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 23 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.47	.09	-.18	.01	-33.53	-54.02	.56	.19
20.0	-.64	.01	-.17	-.01	-32.92	-63.45	.65	.16
25.0	-.74	-.03	-.15	-.01	-33.35	-57.51	.71	.14
30.0	-.78	-.05	-.13	-.01	-34.70	-59.50	.73	.13
35.0	-.80	-.06	-.11	.00	-35.02	-60.23	.74	.11
40.0	-.74	-.02	-.08	.01	-35.83	-61.20	.72	.09
45.0	-.63	.03	-.06	.01	-37.86	-57.69	.66	.07
50.0	-.48	.06	-.04	.00	-41.32	-59.58	.54	.04
55.0	-.25	.07	-.02	-.00	-46.91	-58.69	.32	.01
60.0	0.00	.01	0.00	-.01	-200.00	-62.14	.01	-.01
65.0	.31	-.04	-.00	-.01	-45.18	-56.12	-.36	-.01
70.0	.64	-.08	-.02	-.00	-39.36	-56.57	-.73	.01
75.0	.99	-.02	-.05	.01	-35.35	-64.01	-1.01	.06
80.0	1.11	-.01	-.10	.02	-32.84	-54.87	-1.13	.12
85.0	1.16	.05	-.17	.01	-31.27	-57.14	-1.04	.18
90.0	.85	.09	-.23	-.01	-31.20	-55.82	-.77	.22
95.0	.37	.01	-.25	-.02	-32.50	-56.49	-.36	.23
100.0	-.17	-.09	-.22	-.01	-33.98	-56.62	.09	.21
105.0	-.54	-.09	-.16	.01	-37.43	-58.86	.45	.16
110.0	-.56	.09	-.07	.02	-43.79	-57.24	.64	.09
TOTAL	.67	.06	.13	.01	-34.38	-56.98		

NET REDUCTION OF MISMATCH ERROR = 22.60DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.01010	-.00000
2	0.00000	0.00000	-.01531	.00000
3	0.00000	0.00000	.01614	-.00000
4	0.00000	0.00000	.01215	.00000
5	0.00000	0.00000	-.00856	-.00000
6	1.00000	0.00000	1.02678	.00000
7	0.00000	0.00000	-.01485	-.00000
8	0.00000	0.00000	.00286	.00000
9	0.00000	0.00000	-.00390	-.00000
10	0.00000	0.00000	.00310	.00000
11	0.00000	0.00000	-.00136	-.00000
12	0.00000	0.00000	.00166	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 24 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.89 .13	-.12	.03 -34.10 -48.18	1.02	.14
20.0	-1.13 .05	-.11	-.01 -32.48 -56.00	1.17	.10
25.0	-1.26 -.02	-.10	-.02 -32.25 -51.06	1.23	.08
30.0	-1.31 -.08	-.09	-.03 -32.83 -50.64	1.23	.07
35.0	-1.31 -.12	-.07	.00 -32.76 -53.91	1.19	.07
40.0	-1.19 -.06	-.05	.02 -33.30 -51.45	1.13	.07
45.0	-1.00 .05	-.03	.03 -35.09 -50.30	1.05	.06
50.0	-.88 .02	-.01	.02 -37.04 -53.75	.89	.03
55.0	-.46 .14	-.00	-.01 -42.43 -51.95	.60	-.01
60.0	0.00 .15	0.00	-.02 -200.00 -48.75	.15	-.02
65.0	.43 -.01	-.03	-.03 -41.79 -49.43	-.44	-.00
70.0	.90 -.15	-.08	-.01 -35.35 -50.61	-1.05	.06
75.0	1.27 -.26	-.15	.02 -31.58 -46.59	-1.53	.17
80.0	1.61 -.08	-.27	.03 -27.50 -47.64	-1.69	.31
85.0	1.54 .12	-.41	.03 -25.34 -48.00	-1.42	.44
90.0	.99 .25	-.56	-.01 -24.48 -47.38	-.74	.54
95.0	-.13 .11	-.64	-.04 -24.73 -47.52	.24	.60
100.0	-1.25 .02	-.64	-.04 -24.74 -48.76	1.27	.60
105.0	-2.32 -.23	-.55	.01 -26.31 -51.15	2.09	.55
110.0	-2.86 -.44	-.41	.07 -29.31 -44.98	2.42	.47
TOTAL	1.31 .16	.30	.03 -28.67 -48.48		

NET REDUCTION OF MISMATCH ERRORS 19.81DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00388	-.00000
2	0.00000	0.00000	-.00740	.00000
3	0.00000	0.00000	.00596	-.00000
4	0.00000	0.00000	.00654	.00000
5	0.00000	0.00000	.00058	-.00000
6	1.00000	0.00000	1.01003	.00000
7	0.00000	0.00000	.00178	-.00000
8	0.00000	0.00000	-.00275	.00000
9	0.00000	0.00000	.00102	-.00000
10	0.00000	0.00000	.00003	.00000
11	0.00000	0.00000	.00050	-.00000
12	0.00000	0.00000	.00019	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 25 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE FROM (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.22	.12	-.13	.01	-36.76	-52.35	.34	.14
20.0	-.41	.01	-.13	-.01	-35.75	-63.93	.42	.12
25.0	-.56	-.07	-.12	-.01	-35.60	-55.16	.49	.11
30.0	-.58	-.04	-.10	-.01	-36.96	-60.58	.54	.10
35.0	-.64	-.05	-.09	.00	-36.87	-61.04	.58	.09
40.0	-.61	-.01	-.07	.01	-37.44	-61.46	.60	.08
45.0	-.53	.04	-.05	.01	-39.27	-57.28	.57	.06
50.0	-.42	.06	-.03	.00	-42.45	-60.11	.47	.04
55.0	-.22	.06	-.01	-.00	-48.08	-59.78	.28	.01
60.0	0.00	.01	0.00	-.01	-200.00	-61.34	.01	-.01
65.0	.29	-.05	-.00	-.01	-46.01	-56.36	-.33	-.01
70.0	.58	-.08	-.01	-.01	-40.22	-56.45	-.67	.01
75.0	.92	-.02	-.04	.01	-36.17	-62.55	-.93	.05
80.0	1.06	.00	-.09	.01	-33.51	-55.58	-1.06	.10
85.0	1.05	.05	-.14	.01	-32.08	-57.12	-1.00	.15
90.0	.85	.08	-.20	-.01	-32.01	-56.28	-.77	.19
95.0	.42	-.00	-.22	-.02	-33.46	-56.78	-.42	.20
100.0	-.06	-.09	-.20	-.01	-35.19	-56.36	-.03	.19
105.0	-.38	-.09	-.13	.01	-39.13	-59.40	.30	.14
110.0	-.37	.11	-.05	.02	-46.83	-56.41	.48	.07
TOTAL	.58	.06	.11	.01	-35.82	-56.72		

NET REDUCTION OF MISMATCH ERROR 20.91DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00472	.00000
2	0.00000	0.00000	-.00801	.00000
3	0.00000	0.00000	.01022	.00000
4	0.00000	0.00000	.00314	.00000
5	0.00000	0.00000	.00542	.00000
6	1.00000	0.00000	1.00864	.00000
7	0.00000	0.00000	.00174	.00000
8	0.00000	0.00000	-.00239	.00000
9	0.00000	0.00000	.00032	.00000
10	0.00000	0.00000	-.00060	.00000
11	0.00000	0.00000	.00003	.00000
12	0.00000	0.00000	-.00014	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 26 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.65 .02	-.15 .01	-33.89 -63.62	.63	.16
20.0	-.66 .04	-.14 -.00	-34.02 -63.82	.70	.14
25.0	-.65 .05	-.12 -.00	-34.98 -61.40	.70	.12
30.0	-.70 .03	-.11 -.01	-35.76 -57.70	.67	.10
35.0	-.70 .07	-.09 -.00	-36.36 -59.02	.63	.09
40.0	-.63 .03	-.07 .01	-37.34 -60.64	.60	.07
45.0	-.51 .04	-.05 .01	-39.57 -60.52	.55	.06
50.0	-.47 .01	-.02 .01	-41.93 -60.89	.46	.03
55.0	-.25 .05	-.02 -.00	-47.20 -59.73	.30	.01
60.0	0.00 .06	0.00 -.00	-200.00 -59.53	.06	-.00
65.0	.24 .00	-.01 -.01	-47.23 -58.70	-.24	-.00
70.0	.43 .09	-.03 -.01	-42.31 -55.44	-.53	.02
75.0	.64 .09	-.05 .01	-38.58 -55.25	-.73	.06
80.0	.77 .01	-.10 .01	-34.80 -60.14	-.76	.11
85.0	.68 .07	-.15 .01	-33.41 -55.94	-.61	.16
90.0	.37 .09	-.20 -.01	-33.06 -54.48	-.27	.19
95.0	-.23 .07	-.20 -.01	-34.37 -57.93	.16	.19
100.0	-.62 .02	-.16 -.01	-35.47 -63.04	.60	.16
105.0	-1.01 .08	-.08 .01	-37.60 -59.61	.93	.09
110.0	-1.00 .05	.02 .01	-40.92 -62.04	1.05	-.01
TOTAL	.61 .06	.11 .01	-35.89 -58.02		
NET REDUCTION OF MISMATCH ERRORS 22.12DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00511	-.00000
2	0.00000	0.00000	-.00781	.00000
3	0.00000	0.00000	.00879	-.00000
4	0.00000	0.00000	.00541	.00000
5	0.00000	0.00000	-.00427	-.00000
6	1.00000	0.00000	1.01062	.00000
7	0.00000	0.00000	-.00670	-.00000
8	0.00000	0.00000	-.00165	.00000
9	0.00000	0.00000	-.00154	-.00000
10	0.00000	0.00000	.00043	.00000
11	0.00000	0.00000	-.00043	-.00000
12	0.00000	0.00000	.00030	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 27 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.62	.06	-.02	.01	-39.37	-55.03	.68	.04
20.0	-.73	.03	-.03	-.01	-37.55	-62.19	.75	.02
25.0	-.78	-.02	-.03	-.01	-37.16	-56.85	.76	.02
30.0	-.76	-.04	-.02	-.01	-38.17	-59.76	.72	.02
35.0	-.73	-.06	-.02	.00	-38.18	-60.64	.67	.02
40.0	-.65	-.03	-.01	.01	-38.73	-58.87	.62	.02
45.0	-.54	.01	-.01	.01	-40.49	-57.12	.56	.02
50.0	-.40	.06	-.00	.00	-43.91	-59.52	.45	.01
55.0	-.20	.08	.00	-.00	-49.50	-57.95	.28	-.00
60.0	0.00	.02	0.00	-.01	-200.00	-58.46	.02	-.01
65.0	.29	-.02	-.01	-.01	-45.63	-56.65	-.30	.00
70.0	.54	-.09	-.04	-.01	-40.13	-55.96	-.63	.03
75.0	.83	-.04	-.08	.01	-35.88	-59.80	-.88	.09
80.0	.93	-.03	-.14	.02	-32.81	-54.42	-.96	.15
85.0	.84	.04	-.21	.01	-30.84	-57.18	-.82	.22
90.0	.58	.10	-.28	-.01	-30.74	-54.71	-.48	.27
95.0	.05	.05	-.31	-.02	-30.83	-55.32	.00	.29
100.0	-.55	-.04	-.30	-.01	-31.25	-57.49	.51	.29
105.0	-1.01	-.10	-.24	.00	-33.31	-58.20	.91	.24
110.0	-1.14	-.07	-.16	.03	-37.27	-55.66	1.07	.18
TOTAL	.68	.06	.14	.01	-34.56	-56.45		
NET REDUCTION OF MISMATCH ERROR					21.87DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00533	-.00000
2	0.00000	0.00000	-.00977	-.00000
3	0.00000	0.00000	.00986	-.00000
4	0.00000	0.00000	.00157	-.00000
5	0.00000	0.00000	-.00586	-.00000
6	1.00000	0.00000	1.01123	.00000
7	0.00000	0.00000	-.00946	-.00000
8	0.00000	0.00000	.00027	.00000
9	0.00000	0.00000	-.00173	-.00000
10	0.00000	0.00000	.00002	-.00000
11	0.00000	0.00000	-.00061	-.00000
12	0.00000	0.00000	.00042	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 28 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.47	-.03	.01	.01	-41.82	-60.26	.44	-.00
20.0	-.35	.13	.02	.01	-43.76	-51.92	.48	-.01
25.0	-.47	.02	-.01	-.02	-41.77	-54.81	.49	-.01
30.0	-.60	-.12	-.02	-.02	-40.26	-51.01	.48	.00
35.0	-.59	-.12	-.01	-.00	-40.11	-53.98	.47	.01
40.0	-.45	.01	.00	.02	-42.02	-52.85	.46	.02
45.0	-.40	.05	-.00	.01	-43.14	-55.91	.45	.01
50.0	-.37	.02	.00	.01	-44.42	-62.20	.39	.00
55.0	-.18	.08	-.00	-.01	-50.64	-56.66	.26	-.01
60.0	0.00	.03	0.00	-.01	-200.00	-60.05	.03	-.01
65.0	.26	-.01	-.03	-.02	-44.96	-52.89	-.27	.01
70.0	.50	-.07	-.06	-.00	-39.74	-57.75	-.57	.05
75.0	.70	-.07	-.10	.02	-36.03	-53.70	-.77	.12
80.0	.76	-.03	-.18	.02	-32.12	-54.79	-.79	.20
85.0	.63	.05	-.26	.01	-29.99	-55.82	-.58	.27
90.0	.25	.09	-.33	-.01	-29.07	-54.52	-.15	.32
95.0	-.45	-.04	-.37	-.02	-29.31	-53.74	.41	.35
100.0	-.84	.14	-.34	-.01	-29.90	-53.48	.98	.33
105.0	-1.51	-.11	-.27	.01	-31.44	-56.80	1.40	.28
110.0	-1.80	-.27	-.19	.02	-34.28	-51.14	1.52	.21
TOTAL	.71	.10	.17	.01	-33.84	-53.69		

NET REDUCTION OF MISMATCH ERROR = 19.85DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00640	.00000
2	0.00000	0.00000	-.00484	-.00000
3	0.00000	0.00000	.00830	.00000
4	0.00000	0.00000	.01468	-.00000
5	0.00000	0.00000	-.00223	.00000
6	1.00000	0.00000	1.02094	-.00000
7	0.00000	0.00000	-.00049	.00000
8	0.00000	0.00000	-.00080	-.00000
9	0.00000	0.00000	-.00021	.00000
10	0.00000	0.00000	.00109	-.00000
11	0.00000	0.00000	-.00007	.00000
12	0.00000	0.00000	.00060	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 29 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.59	.12	-.23	.02	-31.41	-50.81	.70	.25
20.0	-.81	.02	-.21	-.01	-30.90	-60.61	.83	.21
25.0	-.93	-.03	-.19	-.02	-31.32	-53.46	.90	.18
30.0	-1.00	-.06	-.17	-.01	-32.66	-55.76	.93	.15
35.0	-1.03	-.08	-.14	-.00	-32.91	-57.02	.94	.14
40.0	-.96	-.03	-.10	.01	-33.72	-56.47	.93	.12
45.0	-.82	.05	-.07	.02	-35.76	-53.10	.87	.09
50.0	-.73	-.01	-.04	.01	-37.99	-60.16	.73	.05
55.0	-.33	.13	-.02	-.00	-44.95	-53.28	.46	.01
60.0	0.00	.06	0.00	-.01	-200.00	-54.40	.06	-.01
65.0	.43	-.02	-.00	-.02	-42.38	-53.23	-.45	-.02
70.0	.91	-.07	-.02	-.01	-36.33	-55.80	-.99	.01
75.0	1.29	-.14	-.07	.01	-33.37	-50.05	-1.43	.08
80.0	1.63	-.02	-.11	.02	-29.70	-51.03	-1.65	.16
85.0	1.68	.09	-.23	.02	-27.48	-51.99	-1.60	.25
90.0	1.41	.18	-.33	-.01	-27.66	-51.78	-1.26	.33
95.0	.77	.07	-.34	-.03	-28.47	-51.06	-.70	.37
100.0	.03	-.04	-.39	-.02	-29.25	-52.91	-.07	.37
105.0	-.64	-.17	-.33	.00	-31.80	-53.49	.47	.33
110.0	-.91	-.12	-.23	.04	-36.22	-50.90	.79	.27
TOTAL	.95	.09	.20	.02	-31.24	-52.42		

NET REDUCTION OF MISMATCH ERROR: 21.18DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00658	-.00000
2	0.00000	0.00000	-.01016	-.00000
3	0.00000	0.00000	.01289	-.00000
4	0.00000	0.00000	.00769	-.00000
5	0.00000	0.00000	-.00471	.00000
6	1.00000	0.00000	1.01505	.00000
7	0.00000	0.00000	-.00940	-.00000
8	0.00000	0.00000	-.00243	.00000
9	0.00000	0.00000	-.00137	-.00000
10	0.00000	0.00000	.00007	.00000
11	0.00000	0.00000	-.00068	-.00000
12	0.00000	0.00000	.00046	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 30 WITH 12 TAPS
FOR A TAP SPACING OF .0000 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.02	.02	-.05	.01	-34.82	-55.41	1.04	.07
20.0	-1.13	.04	-.05	-.01	-33.66	-60.44	1.16	.05
25.0	-1.14	.04	-.04	-.01	-33.87	-56.72	1.18	.03
30.0	-1.18	-.06	-.04	-.01	-34.35	-55.48	1.13	.03
35.0	-1.12	-.09	-.03	.00	-34.46	-56.81	1.04	.03
40.0	-.90	-.05	-.01	.01	-35.18	-56.49	.94	.02
45.0	-.78	.04	-.01	.01	-37.32	-56.60	.83	.02
50.0	-.65	.01	.01	.01	-39.55	-57.87	.67	.00
55.0	-.34	.08	.00	-.01	-45.07	-56.59	.42	-.01
60.0	0.00	.07	0.00	-.01	-200.00	-55.47	.07	-.01
65.0	.36	.01	-.03	-.02	-42.99	-54.46	-.35	.01
70.0	.67	-.11	-.07	-.01	-37.47	-54.01	-.78	.06
75.0	.97	-.13	-.13	.01	-33.63	-52.17	-1.10	.14
80.0	1.18	-.03	-.21	.02	-29.90	-53.47	-1.21	.23
85.0	1.11	.08	-.30	.01	-28.00	-53.40	-1.04	.32
90.0	.75	.14	-.39	-.01	-27.40	-51.54	-.60	.38
95.0	-.00	.00	-.42	-.02	-28.23	-55.05	.01	.40
100.0	-.65	.00	-.40	-.02	-28.83	-57.10	.66	.38
105.0	-1.30	-.13	-.32	.01	-31.00	-55.86	1.17	.32
110.0	-1.51	-.13	-.21	.03	-34.81	-53.94	1.38	.24
TOTAL	.93	.08	.19	.01	-31.70	-54.33		

NET REDUCTION OF MISMATCH ERRORS 22.63DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.28582	-.00000
2	0.00000	0.00000	-.17060	.00000
3	0.00000	0.00000	-.21258	-.00000
4	0.00000	0.00000	-.21714	.00000
5	0.00000	0.00000	.10214	-.00000
6	1.00000	0.00000	-.16284	.00000
7	0.00000	0.00000	-.15544	-.00000
8	0.00000	0.00000	-.20606	.00000
9	0.00000	0.00000	-.08053	-.00000
10	0.00000	0.00000	-.21014	.00000
11	0.00000	0.00000	.02116	-.00000
12	0.00000	0.00000	-.26644	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 31 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF 0.075 INCHES									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER		FILTER
(HZ)	ERROR		ERROR		MS ERROR		PHASE		AMPL.
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)		(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	218.54	49.26	.19	-7.22	5.36	-2.33	-169.28		-7.41
20.0	67.16	32.53	-.20	-13.14	.91	-1.56	-34.63		-12.44
25.0	39.64	27.37	.01	-5.12	-3.43	-4.98	-12.27		-5.12
30.0	-18.64	-19.83	.75	-3.69	-9.46	-7.88	-1.19		-4.44
35.0	-66.71	-44.46	.26	-8.36	.56	-3.04	22.25		-6.62
40.0	-87.24	-22.47	-.13	-7.51	2.78	-3.94	64.77		-7.39
45.0	-238.85	-147.94	.00	-5.55	4.76	3.31	90.91		-5.55
50.0	244.41	-18.67	.61	-4.80	4.15	-6.92	-263.08		-5.41
55.0	-65.42	-335.34	.56	-7.51	.40	-4.42	-269.91		-8.08
60.0	0.00	59.86	0.00	-13.53	-200.00	-.79	59.86		-13.53
65.0	-265.22	97.69	-.01	-15.59	3.34	.34	362.91		-15.57
70.0	215.34	204.58	.52	-16.80	5.39	.61	-10.76		-17.32
75.0	-40.46	37.78	.60	-18.10	-3.44	-1.44	78.23		-14.70
80.0	-67.53	38.07	-.03	-8.44	1.01	-2.51	105.60		-8.41
85.0	194.21	300.76	-.17	-4.20	5.94	-1.14	106.54		-4.07
90.0	-184.10	-74.57	.69	-2.40	5.71	.49	104.61		-3.09
95.0	-27.51	75.77	1.81	-3.58	-6.56	-1.31	103.28		-5.39
100.0	-68.10	-312.44	2.16	-12.32	.12	-3.51	-244.33		-14.49
105.0	-254.87	-4.14	3.69	-7.63	2.63	-8.07	245.73		-11.32
110.0	-194.80	52.44	5.84	1.46	3.58	-6.00	247.23		-4.43
TOTAL	156.55	101.64	2.03	4.05	3.16	-1.12			
NET REDUCTION OF MISMATCH ERROR					4.26DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00874	.00000
2	0.00000	0.00000	-.01343	-.00000
3	0.00000	0.00000	.01211	.00000
4	0.00000	0.00000	.01235	-.00000
5	0.00000	0.00000	-.00606	.00000
6	1.00000	0.00000	1.02447	-.00000
7	0.00000	0.00000	-.00828	.00000
8	0.00000	0.00000	.00213	-.00000
9	0.00000	0.00000	-.00225	.00000
10	0.00000	0.00000	.00257	-.00000
11	0.00000	0.00000	-.00079	.00000
12	0.00000	0.00000	.00148	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 32 WITH 12 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.58	.13	-.16	.03	-33.77	-48.78	.72	.19
20.0	-.80	.04	-.16	-.01	-32.75	-57.55	.84	.15
25.0	-.92	-.01	-.14	-.02	-32.89	-52.12	.91	.12
30.0	-1.05	-.11	-.13	-.02	-34.24	-50.41	.94	.11
35.0	-1.06	-.11	-.11	.00	-33.44	-54.43	.95	.11
40.0	-.98	-.04	-.08	.02	-34.17	-52.81	.94	.10
45.0	-.83	.06	-.06	.02	-35.97	-51.14	.89	.08
50.0	-.75	.02	-.03	.02	-38.13	-54.46	.77	.05
55.0	-.39	.13	-.02	-.01	-43.58	-52.98	.52	.01
60.0	0.00	.11	0.00	-.02	-200.00	-51.03	.11	-.02
65.0	.44	.01	-.01	-.03	-42.05	-49.86	-.43	-.01
70.0	.86	-.15	-.05	-.01	-36.35	-50.76	-1.01	.04
75.0	1.26	-.21	-.11	.02	-32.54	-48.08	-1.48	.13
80.0	1.62	-.06	-.21	.03	-28.57	-48.66	-1.67	.24
85.0	1.60	.10	-.33	.03	-26.56	-48.88	-1.50	.36
90.0	1.19	.23	-.46	-.01	-25.76	-47.99	-.96	.45
95.0	.23	.09	-.54	-.04	-25.22	-48.50	-.14	.50
100.0	-.74	.01	-.54	-.04	-26.43	-49.73	.74	.50
105.0	-1.70	-.23	-.45	.01	-28.21	-51.29	1.47	.46
110.0	-2.13	-.32	-.32	.06	-31.56	-46.54	1.81	.39
TOTAL	1.09	.14	.25	.03	-29.97	-49.44		
NET REDUCTION OF MISMATCH ERROR					19.47DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00037	-.00000
2	0.00000	0.00000	-.00256	.00000
3	0.00000	0.00000	.00604	-.00000
4	0.00000	0.00000	-.01084	.00000
5	0.00000	0.00000	.00423	-.00000
6	0.00000	0.00000	.00674	.00000
7	0.00000	0.00000	-.00089	-.00000
8	1.00000	0.00000	1.01324	.00000
9	0.00000	0.00000	-.00247	-.00000
10	0.00000	0.00000	-.00313	.00000
11	0.00000	0.00000	.00041	-.00000
12	0.00000	0.00000	-.00085	.00000
13	0.00000	0.00000	.00043	-.00000
14	0.00000	0.00000	-.00023	.00000
15	0.00000	0.00000	.00024	-.00000
16	0.00000	0.00000	-.00013	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 2 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL NS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.44	.02	-.13	-.00	-35.40	-69.49	.50	.13
20.0	-.68	-.02	-.13	-.00	-34.24	-68.58	.60	.13
25.0	-.79	-.01	-.12	.00	-34.45	-66.24	.74	.12
30.0	-.86	.01	-.11	-.00	-35.02	-66.81	.87	.11
35.0	-.89	-.01	-.09	.00	-35.12	-77.93	.88	.09
40.0	-.81	.02	-.07	.00	-35.44	-67.64	.83	.07
45.0	-.68	.03	-.05	-.00	-37.70	-64.81	.71	.05
50.0	-.63	-.09	-.02	.00	-39.62	-56.41	.54	.03
55.0	-.34	-.01	-.02	-.00	-44.81	-60.72	.32	.01
60.0	0.00	.05	0.00	.00	-200.00	-54.37	.05	.00
65.0	.30	.03	-.01	-.00	-45.32	-64.24	-.27	.01
70.0	.60	-.02	-.01	-.00	-39.44	-65.24	-.62	.03
75.0	.88	-.07	-.07	.00	-35.73	-58.40	-.95	.08
80.0	1.15	.01	-.14	.00	-31.60	-71.43	-1.15	.14
85.0	1.15	.02	-.22	.00	-24.48	-64.40	-1.13	.22
90.0	.91	.06	-.30	-.01	-29.26	-58.70	-.85	.20
95.0	.29	-.07	-.33	-.00	-30.16	-60.50	-.35	.33
100.0	-.27	-.02	-.33	.00	-30.73	-70.32	.25	.33
105.0	-.81	-.03	-.26	.01	-33.26	-63.14	.77	.27
110.0	-.96	.11	-.17	-.01	-37.68	-54.54	1.07	.16
TOTAL	.45	.01	.16	.00	-33.32	-61.60		

NET REDUCTION OF MISMATCH ERROR 28.48DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00037	-.00000
2	0.00000	0.00000	-.00256	.00000
3	0.00000	0.00000	.00604	-.00000
4	0.00000	0.00000	-.01089	.00000
5	0.00000	0.00000	.00923	-.00000
6	0.00000	0.00000	.00678	.00000
7	0.00000	0.00000	-.00089	-.00000
8	1.00000	0.00000	1.01328	.00000
9	0.00000	0.00000	-.00247	-.00000
10	0.00000	0.00000	-.00313	.00000
11	0.00000	0.00000	.00041	-.00000
12	0.00000	0.00000	-.00085	.00000
13	0.00000	0.00000	.00043	-.00000
14	0.00000	0.00000	-.00023	.00000
15	0.00000	0.00000	.00024	-.00000
16	0.00000	0.00000	-.00013	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 2 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.48	.92	-.13	-.00	-35.40	-69.49	.50	.13
20.0	-.68	-.02	-.13	-.00	-34.29	-68.58	.66	.13
25.0	-.79	-.01	-.12	.00	-34.45	-66.26	.79	.12
30.0	-.86	.01	-.11	-.00	-35.02	-66.81	.87	.11
35.0	-.89	-.01	-.09	.00	-35.12	-77.93	.88	.09
40.0	-.81	.02	-.07	.00	-35.89	-67.64	.83	.07
45.0	-.68	.03	-.05	-.00	-37.76	-64.81	.71	.05
50.0	-.63	-.09	-.02	.00	-39.62	-56.41	.54	.03
55.0	-.34	-.01	-.02	-.00	-44.81	-66.72	.32	.01
60.0	0.00	.05	0.00	.00	-200.00	-59.37	.05	.00
65.0	.30	.03	-.01	-.00	-45.32	-64.28	-.27	.01
70.0	.60	-.02	-.04	-.00	-39.44	-65.28	-.62	.03
75.0	.88	-.07	-.07	.00	-35.73	-58.40	-.95	.08
80.0	1.16	.01	-.14	.00	-31.66	-71.93	-1.15	.14
85.0	1.15	.02	-.22	.00	-29.88	-64.90	-1.13	.22
90.0	.91	.06	-.30	-.01	-29.28	-58.70	-.85	.29
95.0	.29	-.07	-.33	-.00	-30.16	-60.50	-.35	.33
100.0	-.27	-.07	-.33	.00	-30.73	-70.32	.25	.33
105.0	-.81	-.03	-.26	.01	-33.26	-63.18	.77	.27
110.0	-.96	.11	-.17	-.01	-37.68	-59.54	1.07	.16
TOTAL	.45	.01	.16	.00	-33.32	-61.80		

NET REDUCTION OF MISMATCH ERROR: 28.48DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00061	.00000
2	0.00000	0.00000	-.00357	-.00000
3	0.00000	0.00000	.00993	.00000
4	0.00000	0.00000	-.01650	-.00000
5	0.00000	0.00000	.01978	.00000
6	0.00000	0.00000	.00165	-.00000
7	0.00000	0.00000	-.00158	.00000
8	1.00000	0.00000	1.01424	-.00000
9	0.00000	0.00000	-.01159	.00000
10	0.00000	0.00000	-.00173	-.00000
11	0.00000	0.00000	-.00313	.00000
12	0.00000	0.00000	-.00040	-.00000
13	0.00000	0.00000	-.00111	.00000
14	0.00000	0.00000	-.00035	-.00000
15	0.00000	0.00000	-.00027	.00000
16	0.00000	0.00000	-.00024	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 3 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)		FILTER AMPL. (DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0	-1.10	-.02	-.07	-.00	-33.90	-69.55	1.08		.07	
20.0	-1.10	.03	-.07	-.00	-32.96	-65.73	1.22		.07	
25.0	-1.28	-.02	-.06	.00	-32.75	-66.40	1.26		.06	
30.0	-1.22	.02	-.04	-.00	-34.11	-71.62	1.23		.04	
35.0	-1.15	-.00	-.02	-.00	-34.27	-74.68	1.15		.02	
40.0	-1.01	.00	-.01	-.00	-34.98	-71.18	1.02		.01	
45.0	-.84	-.01	.00	.00	-36.69	-73.71	.83		-.00	
50.0	-.61	-.01	.01	.00	-40.14	-68.93	.60		-.01	
55.0	-.31	.01	.01	.00	-45.75	-72.03	.32		-.01	
60.0	0.00	.01	0.00	.00	-200.00	-79.17	.01		.00	
65.0	.36	.01	-.03	-.00	-43.09	-69.17	-.35		.02	
70.0	.70	-.01	-.07	-.00	-57.03	-68.41	-.71		.07	
75.0	.99	-.01	-.15	.00	-33.02	-71.47	-1.00		.15	
80.0	1.07	-.01	-.24	.00	-29.46	-65.72	-1.08		.25	
85.0	.85	.01	-.35	.00	-27.32	-69.23	-.84		.36	
90.0	.26	.04	-.48	-.01	-26.46	-60.27	-.23		.45	
95.0	-.69	-.01	-.50	-.00	-26.65	-67.15	.69		.49	
100.0	-1.77	-.08	-.47	.00	-26.46	-59.37	1.70		.47	
105.0	-2.51	.02	-.36	.01	-28.08	-59.94	2.53		.38	
110.0	-2.81	.07	-.23	-.01	-31.01	-60.43	2.88		.22	
TOTAL	1.24	.03	.23	.00	-30.39	-64.59				

NET REDUCTION OF MISMATCH ERROR= 34.20DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00019	-.00000
2	0.00000	0.00000	-.00072	-.00000
3	0.00000	0.00000	.00283	-.00000
4	0.00000	0.00000	-.00671	-.00000
5	0.00000	0.00000	.00779	-.00000
6	0.00000	0.00000	-.00287	-.00000
7	0.00000	0.00000	.00186	-.00000
8	1.00000	0.00000	1.00134	-.00000
9	0.00000	0.00000	-.00226	-.00000
10	0.00000	0.00000	-.00340	-.00000
11	0.00000	0.00000	.00031	-.00000
12	0.00000	0.00000	-.00107	-.00000
13	0.00000	0.00000	.00038	.00000
14	0.00000	0.00000	-.00042	-.00000
15	0.00000	0.00000	.00021	.00000
16	0.00000	0.00000	-.00017	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 4 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.28	.00	.01	-.00	-46.41	-76.74	.28	-.01
20.0	-.36	-.01	-.00	.00	-43.86	-78.61	.36	.00
25.0	-.41	.00	-.00	.00	-43.01	-67.42	.41	.00
30.0	-.43	.00	-.01	-.00	-43.24	-66.25	.43	.01
35.0	-.44	-.01	-.01	-.00	-42.67	-73.29	.43	.01
40.0	-.38	.02	-.01	.00	-43.53	-71.29	.39	.01
45.0	-.30	.04	-.01	-.00	-45.58	-64.25	.34	.00
50.0	-.35	-.09	.00	.00	-45.08	-56.88	.26	.00
55.0	-.17	-.00	-.00	-.00	-51.19	-68.06	.17	.00
60.0	0.00	.04	0.00	.00	-200.00	-61.64	.04	.00
65.0	.13	.03	-.02	-.00	-50.67	-64.78	-.10	.01
70.0	.23	-.02	-.04	-.00	-45.22	-65.46	-.25	.03
75.0	.28	-.07	-.06	.00	-42.27	-58.26	-.34	.06
80.0	.35	.01	-.10	.00	-37.81	-71.87	-.33	.10
85.0	.22	.03	-.13	.00	-36.30	-64.32	-.19	.13
90.0	-.04	.04	-.16	-.01	-35.63	-59.78	.09	.15
95.0	-.40	-.07	-.14	.00	-36.42	-59.99	.42	.14
100.0	-.73	-.01	-.11	.00	-37.24	-72.54	.72	.11
105.0	-.93	-.02	-.04	.01	-39.05	-66.20	.90	.04
110.0	-.83	.09	.04	-.01	-42.26	-61.29	.92	-.04
TOTAL	.43	.04	.07	.00	-40.03	-62.56		
NET REDUCTION OF MISMATCH ERROR					22.53DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00109	-.00000
2	0.00000	0.00000	-.00301	-.00000
3	0.00000	0.00000	.00776	.00000
4	0.00000	0.00000	-.01023	-.00000
5	0.00000	0.00000	.01208	.00000
6	0.00000	0.00000	.00369	-.00000
7	0.00000	0.00000	-.01301	.00000
8	1.00000	0.00000	1.01122	-.00000
9	0.00000	0.00000	-.01981	.00000
10	0.00000	0.00000	-.00159	-.00000
11	0.00000	0.00000	-.00477	.00000
12	0.00000	0.00000	.00017	-.00000
13	0.00000	0.00000	-.00170	.00000
14	0.00000	0.00000	.00016	-.00000
15	0.00000	0.00000	-.00050	.00000
16	0.00000	0.00000	.00010	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 5 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR A TAP SPACING OF .0040 SECS.				TOTAL		FILTER		FILTER		
FREQ	PHASE		AMPLITUDE		MS ERROR		PHASE		AMPL.	
(HZ)	ERROR		ERROR		(DB POWER)		(DEGREES)		(DB)	
	(DEGREES)		(DB)		BEFORE	AFTER				
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0	-1.06	-.00	.14	.00	-32.38	-75.49	1.06		-.14	
20.0	-1.14	.01	.12	-.00	-32.07	-70.33	1.15		-.12	
25.0	-1.13	-.01	.11	-.00	-32.61	-75.38	1.12		-.11	
30.0	-1.03	.00	.10	.00	-34.24	-72.43	1.03		-.10	
35.0	-.92	-.00	.09	.00	-34.87	-76.82	.91		-.09	
40.0	-.77	.00	.07	-.00	-35.89	-75.71	.78		-.07	
45.0	-.61	.01	.06	-.00	-38.01	-72.39	.62		-.06	
50.0	-.46	-.03	.04	-.00	-41.24	-67.57	.43		-.04	
55.0	-.21	.01	.02	.00	-47.41	-72.50	.23		-.02	
60.0	0.00	-.00	0.00	.00	-200.00	-69.28	-.00		.00	
65.0	.25	.00	-.04	-.00	-44.46	-78.12	-.25		.03	
70.0	.40	-.00	-.08	-.00	-38.52	-69.57	-.49		.08	
75.0	.73	.02	-.14	-.00	-34.49	-70.61	-.71		.14	
80.0	.80	-.02	-.22	.00	-30.86	-68.48	-.82		.22	
85.0	.74	-.00	-.31	.00	-28.46	-70.77	-.75		.31	
90.0	.43	.02	-.40	-.00	-27.39	-67.24	-.41		.40	
95.0	-.20	.00	-.47	-.00	-27.36	-74.10	.20		.47	
100.0	-.98	-.03	-.49	.00	-27.05	-64.35	.96		.49	
105.0	-1.64	.01	-.45	.01	-28.34	-67.68	1.65		.45	
110.0	-2.01	.01	-.38	-.00	-31.01	-71.72	2.02		.38	
TOTAL	.92	.01	.24	.00	-30.98	-70.09				
NET REDUCTION OF MISMATCH ERRORS					39.11DB.					

NET REDUCTION OF MISMATCH ERROR = 39.11DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00177	.00000
2	0.00000	0.00000	-.00318	-.00000
3	0.00000	0.00000	.01002	.00000
4	0.00000	0.00000	-.01222	-.00000
5	0.00000	0.00000	.01618	.00000
6	0.00000	0.00000	.00604	-.00000
7	0.00000	0.00000	-.00947	.00000
8	1.00000	0.00000	1.01488	-.00000
9	0.00000	0.00000	-.01838	.00000
10	0.00000	0.00000	-.00319	-.00000
11	0.00000	0.00000	-.00472	.00000
12	0.00000	0.00000	-.00124	-.00000
13	0.00000	0.00000	-.00191	.00000
14	0.00000	0.00000	-.00067	-.00000
15	0.00000	0.00000	-.00065	.00000
16	0.00000	0.00000	-.00039	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 6 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.67	-.05	.04	-.00	-30.81	-61.28	1.62	-.04
20.0	-1.59	.05	.04	.00	-30.83	-61.49	1.64	-.04
25.0	-1.48	.03	.04	.00	-31.63	-63.49	1.51	-.04
30.0	-1.37	-.03	.03	-.01	-33.13	-62.52	1.34	-.04
35.0	-1.24	-.05	.04	-.00	-33.47	-61.77	1.20	-.04
40.0	-1.04	.01	.04	.00	-34.53	-70.94	1.05	-.04
45.0	-.80	.06	.03	-.00	-36.81	-59.04	.87	-.03
50.0	-.60	-.06	.03	.00	-38.75	-59.09	.62	-.03
55.0	-.34	-.01	.01	-.00	-44.86	-68.42	.33	-.02
60.0	0.00	.02	0.00	.00	-200.00	-66.37	.02	.00
65.0	.32	.02	-.04	-.00	-42.93	-66.73	-.30	.04
70.0	.60	-.01	-.09	-.00	-37.13	-65.83	-.61	.09
75.0	.83	-.05	-.15	.00	-33.45	-61.12	-.88	.16
80.0	1.06	.02	-.25	.00	-29.37	-67.67	-1.03	.25
85.0	.96	.01	-.35	.00	-27.22	-67.65	-.95	.35
90.0	.59	.04	-.46	-.01	-26.22	-60.58	-.55	.45
95.0	-.23	-.07	-.53	-.00	-26.35	-59.45	.16	.53
100.0	-1.02	.02	-.54	.00	-26.22	-68.51	1.04	.54
105.0	-1.86	-.01	-.48	.01	-27.63	-63.22	1.84	.49
110.0	-2.23	.03	-.39	-.01	-30.58	-63.76	2.26	.38
TOTAL	1.15	.04	.25	.00	-29.01	-62.03		

NET REDUCTION OF MISMATCH ERRORS 32.12DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00047	-.00000
2	0.00000	0.00000	-.00352	-.00000
3	0.00000	0.00000	.00981	-.00000
4	0.00000	0.00000	-.01703	-.00000
5	0.00000	0.00000	.01924	-.00000
6	0.00000	0.00000	-.00056	-.00000
7	0.00000	0.00000	-.00156	.00000
8	1.00000	0.00000	1.01255	-.00000
9	0.00000	0.00000	-.01054	-.00000
10	0.00000	0.00000	-.00164	-.00000
11	0.00000	0.00000	-.00258	-.00000
12	0.00000	0.00000	-.00015	-.00000
13	0.00000	0.00000	-.00088	-.00000
14	0.00000	0.00000	-.00016	-.00000
15	0.00000	0.00000	-.00019	-.00000
16	0.00000	0.00000	-.00012	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 7 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.85 -.00	-.05 -.00	-36.34 -84.42	.85	.05
20.0	-.90 -.00	-.05 -.00	-34.75 -88.85	.98	.05
25.0	-1.06 -.01	-.04 -.00	-34.49 -75.97	1.05	.04
30.0	-1.02 .03	-.03 -.00	-35.70 -65.68	1.05	.03
35.0	-.99 -.00	-.02 -.00	-35.55 -75.19	.99	.02
40.0	-.91 -.02	-.01 -.00	-35.95 -67.89	.89	.01
45.0	-.74 -.00	-.00 -.00	-37.80 -81.53	.74	.00
50.0	-.55 -.00	.01 .00	-41.05 -71.96	.55	-.00
55.0	-.29 .02	.01 .00	-46.51 -70.19	.30	-.01
60.0	0.00 .01	0.00 .00	-200.00 -73.06	.01	.00
65.0	.34 .00	-.03 -.00	-43.54 -69.99	-.34	.02
70.0	.67 -.03	-.07 -.00	-37.31 -63.54	-.70	.07
75.0	.99 .01	-.14 .00	-33.14 -71.33	-.98	.14
80.0	1.04 -.01	-.24 .01	-29.71 -63.63	-1.05	.24
85.0	.79 .00	-.35 .00	-27.52 -72.44	-.79	.35
90.0	.20 .04	-.44 -.01	-26.69 -60.95	-.16	.44
95.0	-.77 -.02	-.49 -.01	-26.83 -63.35	.75	.48
100.0	-1.81 -.04	-.45 .00	-26.78 -63.00	1.76	.45
105.0	-2.60 -.01	-.33 .01	-28.24 -60.22	2.59	.34
110.0	-2.86 .07	-.19 -.01	-31.17 -59.75	2.93	.18
TOTAL	1.20 .02	.21 .01	-30.83 -64.85		
NET REDUCTION OF MISMATCH ERRORS			34.02DB.		

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00036	-.00000
2	0.00000	0.00000	.00066	-.00000
3	0.00000	0.00000	.00068	.00000
4	0.00000	0.00000	-.00206	-.00000
5	0.00000	0.00000	.00385	.00000
6	0.00000	0.00000	.00214	-.00000
7	0.00000	0.00000	.00626	.00000
8	1.00000	0.00000	1.00025	-.00000
9	0.00000	0.00000	.00562	.00000
10	0.00000	0.00000	-.00662	-.00000
11	0.00000	0.00000	.00208	.00000
12	0.00000	0.00000	-.00289	-.00000
13	0.00000	0.00000	.00068	.00000
14	0.00000	0.00000	-.00133	-.00000
15	0.00000	0.00000	.00028	.00000
16	0.00000	0.00000	-.00057	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 8 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.50	-.04	-.10	-.00	-36.68	-62.91	.55	.09
20.0	-.55	.03	-.09	.00	-37.01	-64.08	.58	.09
25.0	-.53	.03	-.08	.01	-38.00	-61.90	.56	.08
30.0	-.56	-.03	-.08	-.01	-38.53	-61.25	.52	.07
35.0	-.52	-.03	-.06	-.00	-39.21	-64.67	.49	.06
40.0	-.43	.02	-.05	.00	-40.53	-70.01	.45	.05
45.0	-.38	.05	-.04	.00	-42.71	-62.00	.38	.04
50.0	-.37	-.07	-.02	.01	-44.04	-57.34	.24	.03
55.0	-.18	-.01	-.02	-.00	-49.22	-67.07	.18	.01
60.0	0.00	.04	0.00	.00	-200.00	-63.52	.04	.00
65.0	.15	.03	-.00	-.00	-51.70	-62.60	-.12	-.00
70.0	.25	-.02	-.01	-.00	-47.54	-66.80	-.27	.01
75.0	.33	-.06	-.01	.01	-45.18	-58.42	-.39	.02
80.0	.43	.00	-.03	.00	-41.69	-74.77	-.43	.03
85.0	.42	.03	-.03	.00	-41.53	-64.52	-.39	.03
90.0	.36	.06	-.04	-.01	-43.07	-57.66	-.31	.03
95.0	.18	-.07	-.01	.00	-51.73	-59.95	-.25	.01
100.0	.24	-.01	.03	.00	-47.29	-66.98	-.26	-.03
105.0	.27	-.06	.08	.01	-43.15	-61.39	-.33	-.07
110.0	.56	.15	.13	-.01	-40.88	-56.97	-.41	-.14
TOTAL	.40	.05	.06	.00	-40.79	-60.83		
NET REDUCTION OF MISMATCH ERRORS					20.0400.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00051	-.00000
2	0.00000	0.00000	-.00338	.00000
3	0.00000	0.00000	.00785	-.00000
4	0.00000	0.00000	-.01298	.00000
5	0.00000	0.00000	.01162	-.00000
6	0.00000	0.00000	.00432	.00000
7	0.00000	0.00000	-.00740	-.00000
8	1.00000	0.00000	1.01335	.00000
9	0.00000	0.00000	-.01074	-.00000
10	0.00000	0.00000	-.00136	.00000
11	0.00000	0.00000	-.00221	-.00000
12	0.00000	0.00000	.00028	.00000
13	0.00000	0.00000	-.00065	-.00000
14	0.00000	0.00000	.00016	-.00000
15	0.00000	0.00000	-.00002	-.00000
16	0.00000	0.00000	.00012	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 9 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.55	.03	-.01	.00	-40.61	-66.60	.57	.01
20.0	-.75	-.02	-.02	-.00	-37.42	-65.54	.73	.02
25.0	-.85	-.02	-.02	.00	-36.59	-68.62	.83	.02
30.0	-.83	.03	-.02	.00	-37.52	-66.91	.86	.02
35.0	-.81	.01	-.01	.00	-37.33	-71.54	.83	.01
40.0	-.74	-.00	-.01	-.00	-37.68	-77.18	.74	.01
45.0	-.63	-.01	-.00	-.00	-39.30	-73.97	.62	-.00
50.0	-.48	-.02	.00	-.00	-42.23	-67.97	.46	-.00
55.0	-.24	.02	.00	.00	-48.18	-68.03	.26	-.00
60.0	0.00	.01	0.00	.00	-200.00	-70.37	.01	.00
65.0	.32	.01	-.02	-.00	-44.55	-78.45	-.31	.02
70.0	.64	-.02	-.06	-.00	-38.33	-64.53	-.66	.05
75.0	.99	.02	-.11	-.00	-34.05	-71.54	-.98	.11
80.0	1.13	-.02	-.19	.00	-30.66	-66.46	-1.15	.19
85.0	1.07	.01	-.29	.00	-28.46	-64.16	-1.07	.29
90.0	.70	.03	-.38	-.00	-27.65	-64.43	-.67	.38
95.0	-.00	-.00	-.34	-.00	-27.87	-67.66	-.00	.44
100.0	-.84	-.04	-.44	.00	-27.91	-65.61	.80	.44
105.0	-1.52	.00	-.38	.01	-29.58	-64.83	1.52	.39
110.0	-1.85	.04	-.29	-.01	-32.66	-65.28	1.89	.28
TOTAL	.87	.02	.20	.00	-32.04	-66.82		
NET REDUCTION OF MISMATCH ERRORS					34.78DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00024	-.00000
2	0.00000	0.00000	-.00098	.00000
3	0.00000	0.00000	.00331	-.00000
4	0.00000	0.00000	-.00517	.00000
5	0.00000	0.00000	.00446	-.00000
6	0.00000	0.00000	.00730	.00000
7	0.00000	0.00000	.00167	-.00000
8	1.00000	0.00000	1.00785	.00000
9	0.00000	0.00000	.00278	-.00000
10	0.00000	0.00000	-.00539	.00000
11	0.00000	0.00000	.00148	-.00000
12	0.00000	0.00000	-.00219	.00000
13	0.00000	0.00000	.00076	-.00000
14	0.00000	0.00000	-.00099	.00000
15	0.00000	0.00000	.00035	-.00000
16	0.00000	0.00000	-.00046	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 10 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.60	-.01	-.13	-.00	-34.87	-70.37	.59	.13
20.0	-.65	.00	-.13	.00	-34.62	-75.69	.66	.13
25.0	-.67	.02	-.11	.01	-35.39	-63.03	.69	.12
30.0	-.71	-.01	-.11	-.01	-36.02	-63.34	.70	.10
35.0	-.71	-.03	-.09	-.00	-36.34	-65.89	.68	.09
40.0	-.62	.01	-.07	.00	-37.42	-70.16	.64	.07
45.0	-.50	.05	-.05	-.00	-39.57	-61.64	.54	.05
50.0	-.49	-.08	-.03	.01	-41.44	-56.82	.41	.03
55.0	-.24	.00	-.02	-.01	-46.85	-64.50	.24	.02
60.0	0.00	.03	0.00	.00	-200.00	-62.63	.03	.00
65.0	.23	.03	-.00	-.00	-47.72	-65.07	-.21	.00
70.0	.46	-.02	-.01	-.00	-42.21	-65.30	-.48	.01
75.0	.68	-.06	-.03	.01	-38.85	-58.79	-.74	.03
80.0	.94	.01	-.06	.00	-34.86	-72.89	-.92	.06
85.0	1.00	.02	-.10	.00	-33.55	-67.03	-.98	.10
90.0	.94	.05	-.15	-.01	-33.31	-58.65	-.89	.14
95.0	.61	-.06	-.16	-.00	-35.19	-61.03	-.68	.16
100.0	.42	-.00	-.16	.00	-36.51	-71.01	-.43	.16
105.0	.15	-.06	-.11	.01	-41.17	-61.12	-.21	.12
110.0	.19	.13	-.06	-.01	-48.48	-58.01	-.06	.05
TOTAL	.60	.05	.09	.00	-36.43	-61.59		
NET REDUCTION OF MISMATCH ERRORS					25.15DB,			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00011	-.00000
2	0.00000	0.00000	-.00221	.00000
3	0.00000	0.00000	.00539	-.00000
4	0.00000	0.00000	-.00980	.00000
5	0.00000	0.00000	.00922	-.00000
6	0.00000	0.00000	.00231	.00000
7	0.00000	0.00000	-.00477	-.00000
8	1.00000	0.00000	1.00063	.00000
9	0.00000	0.00000	-.00702	-.00000
10	0.00000	0.00000	-.00212	.00000
11	0.00000	0.00000	-.00145	-.00000
12	0.00000	0.00000	-.00025	.00000
13	0.00000	0.00000	-.00016	-.00000
14	0.00000	0.00000	-.00023	.00000
15	0.00000	0.00000	.00013	-.00000
16	0.00000	0.00000	-.00003	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 11 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.44	.02	.00	.00	-42.51	-70.09	.46	-.00
20.0	-.61	-.02	-.00	-.00	-39.37	-68.31	.89	.00
25.0	-.68	-.01	-.01	-.00	-36.54	-73.96	.67	.01
30.0	-.67	.03	-.01	.00	-37.43	-66.51	.70	.01
35.0	-.67	.01	-.00	.00	-39.06	-79.71	.67	.00
40.0	-.61	-.01	-.00	-.00	-39.43	-73.49	.60	-.00
45.0	-.51	-.01	.00	-.00	-41.10	-74.17	.50	-.00
50.0	-.37	-.01	.00	.00	-44.44	-79.70	.37	-.00
55.0	-.10	.02	.00	.00	-50.08	-70.94	.21	-.00
60.0	0.00	.00	0.00	.00	-200.00	-73.07	.00	.00
65.0	.26	.01	-.02	-.00	-40.22	-70.35	-.25	.01
70.0	.50	-.02	-.00	-.00	-40.52	-67.62	-.52	.04
75.0	.77	.02	-.09	.00	-36.24	-70.62	-.75	.09
80.0	.83	-.01	-.14	.00	-33.06	-68.41	-.85	.15
85.0	.74	-.00	-.22	.00	-31.06	-73.52	-.74	.22
90.0	.44	.03	-.28	-.00	-30.28	-64.09	-.41	.28
95.0	-.11	.00	-.32	-.00	-30.57	-70.30	.11	.32
100.0	-.72	-.04	-.31	.00	-30.70	-64.65	.68	.31
105.0	-1.15	-.00	-.26	.01	-32.65	-65.48	1.14	.26
110.0	-1.30	.05	-.18	-.01	-36.13	-64.36	1.35	.17
TOTAL	.66	.02	.15	.00	-34.64	-67.93		

NET REDUCTION OF MISMATCH ERRORS 33.29DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00016	-.00000
2	0.00000	0.00000	-.00194	.00000
3	0.00000	0.00000	.00440	-.00000
4	0.00000	0.00000	-.00848	.00000
5	0.00000	0.00000	.00560	-.00000
6	0.00000	0.00000	.00226	.00000
7	0.00000	0.00000	-.00545	-.00000
8	1.00000	0.00000	1.00708	.00000
9	0.00000	0.00000	-.00602	-.00000
10	0.00000	0.00000	-.00330	.00000
11	0.00000	0.00000	-.00011	-.00000
12	0.00000	0.00000	-.00065	.00000
13	0.00000	0.00000	.00034	-.00000
14	0.00000	0.00000	-.00002	.00000
15	0.00000	0.00000	.00024	-.00000
16	0.00000	0.00000	.00004	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 12 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERRR (DEGREES)	AMPLITUDE ERRR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.18 .03	.03	.00	-47.15 -64.96	.21
20.0	-.36 -.03	.01	-.00	-43.60 -65.20	.33
25.0	-.45 -.01	.00	.00	-42.11 -68.65	.44
30.0	-.51 -.00	-.01	-.00	-41.68 -68.99	.51
35.0	-.53 .00	-.01	.00	-41.05 -74.85	.53
40.0	-.47 .03	-.01	.00	-41.51 -65.20	.50
45.0	-.40 .03	-.01	-.00	-42.00 -63.94	.44
50.0	-.42 -.12	-.01	.00	-42.53 -54.40	.35
55.0	-.22 .01	-.01	-.00	-44.74 -66.33	.22
60.0	0.00 .05	0.00	.01	-200.00 -59.33	.05
65.0	.21 .03	-.01	-.00	-47.98 -65.25	-.18
70.0	.42 -.01	-.00	-.00	-41.82 -66.32	-.43
75.0	.50 -.04	-.07	.00	-38.38 -57.64	-.67
80.0	.82 .01	-.12	-.00	-33.86 -75.38	-.81
85.0	.84 .04	-.18	.00	-31.92 -61.61	-.80
90.0	.63 .04	-.24	-.00	-31.19 -61.99	-.59
95.0	.16 -.07	-.27	-.00	-31.88 -60.32	-.22
100.0	-.23 -.01	-.27	.00	-32.39 -76.72	.22
105.0	-.63 -.02	-.22	.00	-34.75 -70.20	.61
110.0	-.76 .07	-.15	-.00	-39.08 -63.96	.83
TOTAL	.50 .04	.13	.00	-36.11 -61.04	
NET REDUCTION OF MISMATCH ERRORS					25.53DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00018	.000000
2	0.00000	0.00000	-.00091	.000000
3	0.00000	0.00000	.00366	.000000
4	0.00000	0.00000	-.00746	.000000
5	0.00000	0.00000	.00976	.000000
6	0.00000	0.00000	-.00321	.000000
7	0.00000	0.00000	.00234	.000000
8	1.00000	0.00000	1.00138	.000000
9	0.00000	0.00000	-.00269	-.000000
10	0.00000	0.00000	-.00351	.000000
11	0.00000	0.00000	-.00044	-.000000
12	0.00000	0.00000	-.00140	.000000
13	0.00000	0.00000	.00000	-.000000
14	0.00000	0.00000	-.00061	.000000
15	0.00000	0.00000	.00001	-.000000
16	0.00000	0.00000	-.00037	.000000

CORRECTION FILTER FOR RECEIVERS 1 AND 13 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ		PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
(HZ)		BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0		-.46	-.00	-.00	-.00	-41.62	-72.22	.49	-.00
20.0		-.54	-.00	-.00	.00	-40.36	-69.40	.54	.01
25.0		-.54	.00	-.00	.00	-40.51	-78.11	.54	.01
30.0		-.51	.01	-.00	-.00	-41.77	-72.81	.53	.00
35.0		-.49	.00	-.00	-.00	-41.82	-70.28	.49	.00
40.0		-.43	-.01	-.00	-.00	-42.37	-75.60	.43	-.00
45.0		-.35	-.01	.00	.00	-44.30	-68.45	.34	.00
50.0		-.25	-.01	.00	.00	-47.81	-76.10	.25	.00
55.0		-.13	.01	.00	.00	-53.61	-76.35	.13	-.00
60.0		0.00	.01	0.00	-.00	-200.00	-79.83	.01	-.00
65.0		.16	.02	-.01	-.00	-49.44	-65.50	-.14	.01
70.0		.20	.01	-.03	-.00	-44.38	-72.44	-.28	.03
75.0		.29	-.08	-.07	.00	-41.42	-57.45	-.37	.07
80.0		.38	.02	-.10	.00	-37.14	-64.33	-.36	.11
85.0		.22	.04	-.15	.00	-35.22	-63.54	-.19	.15
90.0		-.12	.01	-.18	-.01	-34.60	-62.80	.14	.17
95.0		-.57	-.02	-.17	-.00	-35.11	-66.37	.55	.16
100.0		-.96	-.04	-.12	.01	-35.42	-63.18	.93	.13
105.0		-1.19	-.02	-.05	.01	-36.95	-64.33	1.17	.05
110.0		-1.09	.10	.03	-.01	-40.06	-59.59	1.18	-.04
TOTAL		.58	.03	.07	.00	-38.62	-64.38		
NET REDUCTION OF MISMATCH ERROR=						25.77DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00054	.00000
2	0.00000	0.00000	-.00436	-.00000
3	0.00000	0.00000	.00900	.00000
4	0.00000	0.00000	-.01711	-.00000
5	0.00000	0.00000	.01567	.00000
6	0.00000	0.00000	.00333	-.00000
7	0.00000	0.00000	-.00474	.00000
8	1.00000	0.00000	1.01764	-.00000
9	0.00000	0.00000	-.01110	.00000
10	0.00000	0.00000	.00059	-.00000
11	0.00000	0.00000	-.00137	.00000
12	0.00000	0.00000	.00141	-.00000
13	0.00000	0.00000	-.00001	.00000
14	0.00000	0.00000	.00103	-.00000
15	0.00000	0.00000	.00020	.00000
16	0.00000	0.00000	.00045	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 14 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ		PHASE		AMPLITUDE		TOTAL		FILTER		FILTER	
		ERROR		ERROR		MS ERROR		PHASE		AMPL.	
(HZ)		(DEGREES)		(DB)		(DB POWER)		(DEGREES)		(DB)	
		BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0		-.28	.05	-.08	.00	-40.11	-61.08	.33			.08
20.0		-.66	-.05	-.08	-.00	-36.65	-60.01	.61			.07
25.0		-.87	-.01	-.07	.00	-35.44	-60.58	.86			.07
30.0		-1.01	.01	-.06	-.00	-35.25	-71.39	1.02			.06
35.0		-1.04	.01	-.04	.00	-34.97	-67.68	1.05			.05
40.0		-.94	.03	-.03	.00	-35.55	-66.36	.96			.03
45.0		-.78	.03	-.02	-.00	-37.33	-63.67	.80			.01
50.0		-.70	-.10	.00	.00	-38.97	-55.71	.60			.00
55.0		-.36	-.01	-.00	-.00	-44.54	-68.50	.35			-.00
60.0		0.00	.05	0.00	.01	-200.00	-58.82	.05			.01
65.0		.36	.04	-.03	-.00	-42.92	-62.35	-.31			.03
70.0		.68	-.03	-.08	-.00	-37.16	-63.48	-.70			.07
75.0		.96	-.07	-.14	.00	-34.23	-54.07	-1.03			.14
80.0		1.18	.01	-.24	.00	-29.17	-77.31	-1.17			.24
85.0		1.04	.02	-.35	.01	-27.06	-61.55	-1.01			.36
90.0		.55	.06	-.47	-.01	-26.08	-59.14	-.50			.46
95.0		-.41	-.07	-.53	-.00	-26.33	-59.66	.34			.52
100.0		-1.33	-.01	-.52	.00	-26.32	-80.32	1.32			.52
105.0		-2.21	-.02	-.43	.01	-27.84	-64.97	2.19			.43
110.0		-2.56	.07	-.30	-.01	-30.94	-63.03	2.63			.29
TOTAL		1.08	.05	.24	.00	-30.48	-61.16				
NET REDUCTION OF MISMATCH ERRORS						30.69DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00032	-.00000
2	0.00000	0.00000	-.00041	-.00000
3	0.00000	0.00000	.000917	-.00000
4	0.00000	0.00000	-.01702	-.00000
5	0.00000	0.00000	.01623	-.00000
6	0.00000	0.00000	.00605	-.00000
7	0.00000	0.00000	-.00247	-.00000
8	1.00000	0.00000	1.01885	-.00000
9	0.00000	0.00000	-.00815	-.00000
10	0.00000	0.00000	-.00059	-.00000
11	0.00000	0.00000	-.00140	-.00000
12	0.00000	0.00000	.00017	-.00000
13	0.00000	0.00000	-.00016	-.00000
14	0.00000	0.00000	.00045	-.00000
15	0.00000	0.00000	.00017	-.00000
16	0.00000	0.00000	.00022	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 15 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FOR THE SPECTRA OF				TOTAL		FILTER		FILTER		
FREQ	PHASE		AMPLITUDE		MS ERROR		PHASE		AMPL.	
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)		(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0	-.53	.04	-.14	.00	-34.80	-64.55	.57		.14	
20.0	-.86	-.04	-.14	.00	-33.15	-63.37	.83		.14	
25.0	-1.06	-.02	-.12	.00	-32.80	-70.13	1.04		.12	
30.0	-1.13	.02	-.10	.00	-33.64	-66.61	1.16		.10	
35.0	-1.13	.03	-.08	.00	-33.74	-67.16	1.16		.08	
40.0	-1.05	-.00	-.05	.00	-34.23	-72.98	1.05		.05	
45.0	-.89	-.02	-.03	.00	-36.05	-67.76	.87		.03	
50.0	-.67	-.02	-.01	.00	-39.37	-68.94	.64		.01	
55.0	-.35	.02	-.00	.00	-44.94	-69.43	.36		.00	
60.0	0.00	.02	0.00	.00	-200.00	-66.28	.02		.00	
65.0	.41	.01	-.02	.00	-42.33	-71.33	-.41		.02	
70.0	.83	-.02	-.06	.00	-36.27	-63.87	-.86		.06	
75.0	1.25	.01	-.13	.00	-32.16	-76.49	-1.24		.13	
80.0	1.30	-.02	-.23	.00	-24.92	-64.42	-1.41		.23	
85.0	1.26	.00	-.35	.00	-26.90	-67.47	-1.26		.35	
90.0	.77	.05	-.46	.01	-26.16	-60.32	-.72		.45	
95.0	-.15	-.01	-.52	.01	-26.52	-65.79	.14		.51	
100.0	-1.18	-.05	-.50	.00	-26.60	-62.76	1.13		.50	
105.0	-2.01	-.02	-.41	.01	-26.36	-62.70	1.99		.42	
110.0	-2.34	.04	-.26	.01	-31.59	-60.84	2.42		.27	
TOTAL	1.11	.03	.24	.00	-30.25	-64.53				
NET REDUCTION OF MISMATCH ERRORS					34.28DB.					

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00002	.00000
2	0.00000	0.00000	-.00360	-.00000
3	0.00000	0.00000	.00794	.00000
4	0.00000	0.00000	-.01345	-.00000
5	0.00000	0.00000	.01143	.00000
6	0.00000	0.00000	.00709	-.00000
7	0.00000	0.00000	-.00335	.00000
8	1.00000	0.00000	1.01684	-.00000
9	0.00000	0.00000	-.00597	-.00000
10	0.00000	0.00000	-.00111	-.00000
11	0.00000	0.00000	-.00057	-.00000
12	0.00000	0.00000	.00022	-.00000
13	0.00000	0.00000	.00008	-.00000
14	0.00000	0.00000	.00032	-.00000
15	0.00000	0.00000	.00016	-.00000
16	0.00000	0.00000	.00014	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 16 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.45 .03	-.13 .00	-35.85 -65.43	.48	.13
20.0	-.69 -.03	-.12 -.00	-34.50 -64.81	.67	.12
25.0	-.83 -.01	-.11 .00	-34.46 -67.70	.82	.11
30.0	-.91 .00	-.10 -.00	-34.91 -68.50	.92	.10
35.0	-.93 .00	-.08 .00	-35.00 -70.78	.94	.08
40.0	-.86 .02	-.06 .00	-35.58 -69.94	.88	.06
45.0	-.72 .04	-.04 -.00	-37.51 -63.47	.75	.04
50.0	-.67 -.10	-.02 .00	-39.28 -56.24	.57	.02
55.0	-.34 -.01	-.01 -.00	-44.84 -67.07	.34	.01
60.0	0.00 .04	0.00 .01	-200.00 -59.70	.04	.01
65.0	.33 .03	-.02 -.00	-44.17 -65.54	-.31	.02
70.0	.68 -.01	-.05 -.00	-38.11 -65.49	-.69	.04
75.0	.97 -.07	-.10 .00	-34.48 -58.99	-1.04	.10
80.0	1.26 .00	-.18 .00	-30.42 -97.28	-1.26	.18
85.0	1.26 .03	-.27 .00	-28.38 -61.82	-1.23	.28
90.0	.93 .05	-.37 -.00	-27.58 -60.92	-.88	.37
95.0	.18 -.06	-.43 -.00	-28.03 -60.62	-.25	.43
100.0	-.56 -.01	-.43 .00	-28.23 -75.07	.55	.44
105.0	-1.30 -.01	-.37 .01	-30.09 -65.90	1.29	.37
110.0	-1.64 .07	-.26 -.01	-33.53 -63.40	1.71	.26
TOTAL	.87 .04	.21 .00	-31.77 -62.28		

NET REDUCTION OF MISMATCH ERROR= 30.51DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00057	.00000
2	0.00000	0.00000	-.00156	.00000
3	0.00000	0.00000	.00676	.00000
4	0.00000	0.00000	-.00965	.00000
5	0.00000	0.00000	.01254	.00000
6	0.00000	0.00000	.00205	.00000
7	0.00000	0.00000	.00069	.00000
8	1.00000	0.00000	1.00718	.00000
9	0.00000	0.00000	-.00452	.00000
10	0.00000	0.00000	-.00471	.00000
11	0.00000	0.00000	-.00166	.00000
12	0.00000	0.00000	-.00223	.00000
13	0.00000	0.00000	-.00071	.00000
14	0.00000	0.00000	-.00136	.00000
15	0.00000	0.00000	-.00025	.00000
16	0.00000	0.00000	-.00064	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 17 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.16	-.05	-.06	-.00	-33.74	-60.21	1.11	.05
20.0	-1.05	.04	-.05	.00	-34.16	-61.39	1.10	.06
25.0	-.96	.03	-.05	.00	-35.17	-64.84	.99	.05
30.0	-.88	-.01	-.04	-.00	-36.72	-70.95	.87	.04
35.0	-.81	-.03	-.03	-.00	-37.17	-64.11	.78	.03
40.0	-.70	-.01	-.02	-.00	-37.98	-72.84	.69	.02
45.0	-.58	.01	-.01	.00	-39.88	-68.86	.59	.02
50.0	-.42	.01	-.01	.00	-43.35	-70.04	.43	.01
55.0	-.22	.02	-.00	.00	-49.00	-70.81	.23	.00
60.0	0.00	-.00	0.00	-.00	-200.00	-81.17	-.00	-.00
65.0	.26	-.01	-.01	-.00	-46.37	-65.19	-.27	.01
70.0	.52	-.02	-.04	-.00	-40.44	-68.48	-.54	.04
75.0	.79	.03	-.08	.00	-36.24	-65.33	-.76	.08
80.0	.83	-.02	-.14	.01	-33.38	-61.96	-.85	.14
85.0	.73	.01	-.21	.00	-31.41	-75.28	-.72	.21
90.0	.38	.03	-.27	-.01	-30.83	-59.98	-.35	.26
95.0	-.21	-.01	-.29	-.00	-31.45	-67.07	.20	.28
100.0	-.83	-.04	-.26	.01	-31.91	-61.85	.79	.26
105.0	-1.27	-.02	-.18	.01	-33.97	-61.25	1.25	.19
110.0	-1.34	.09	-.09	-.01	-37.77	-58.82	1.43	.07
TOTAL	.78	.03	.13	.01	-34.46	-63.20		
NET REDUCTION OF MISMATCH ERRORS					28.75DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00037	.00000
2	0.00000	0.00000	-.00013	-.00000
3	0.00000	0.00000	.00371	.00000
4	0.00000	0.00000	-.00496	.00000
5	0.00000	0.00000	.01007	.00000
6	0.00000	0.00000	-.00171	.00000
7	0.00000	0.00000	-.00010	.00000
8	1.00000	0.00000	1.00113	-.00000
9	0.00000	0.00000	-.00705	.00000
10	0.00000	0.00000	-.00479	-.00000
11	0.00000	0.00000	-.00171	.00000
12	0.00000	0.00000	-.00238	-.00000
13	0.00000	0.00000	-.00068	.00000
14	0.00000	0.00000	-.00127	-.00000
15	0.00000	0.00000	-.00021	.00000
16	0.00000	0.00000	-.00060	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 18 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.11	-.06	.05	-.00	-34.07	-59.11	1.05	-.06
20.0	-.96	.05	.05	.00	-34.86	-60.70	1.00	-.05
25.0	-.81	.05	.05	.00	-36.33	-59.68	.86	-.05
30.0	-.74	-.04	.04	-.01	-38.11	-60.82	.71	-.04
35.0	-.64	-.05	.04	-.00	-38.84	-61.19	.59	-.04
40.0	-.49	.01	.03	.00	-40.53	-76.69	.50	-.03
45.0	-.35	.05	.02	.00	-43.46	-60.96	.40	-.02
50.0	-.34	-.06	.02	.01	-44.39	-59.03	.29	-.02
55.0	-.13	.02	.01	-.00	-52.75	-67.00	.15	-.01
60.0	0.00	.01	0.00	.00	-200.00	-74.09	.01	.00
65.0	.13	.01	-.03	-.01	-48.55	-64.63	-.12	.02
70.0	.22	-.01	-.05	-.00	-43.28	-69.54	-.23	.05
75.0	.25	-.04	-.08	.01	-40.41	-59.68	-.28	.09
80.0	.86	.01	-.13	.00	-36.38	-70.74	-.24	.13
85.0	.11	.03	-.16	.00	-34.72	-65.90	-.08	.16
95.0	-.61	-.09	-.18	.00	-34.67	-58.29	.52	.18
100.0	-.78	.04	-.15	.00	-35.46	-64.35	.82	.15
105.0	-1.02	-.03	-.09	.01	-37.33	-64.31	.99	.10
110.0	-.93	.06	-.02	-.01	-41.51	-62.58	.98	.01
TOTAL	.61	.04	.09	.00	-37.00	-61.31		
NET REDUCTION OF MISMATCH ERROR=					24.30DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00048	.00000
2	0.00000	0.00000	-.00054	.00000
3	0.00000	0.00000	.00369	.00000
4	0.00000	0.00000	-.00869	.00000
5	0.00000	0.00000	.01150	.00000
6	0.00000	0.00000	-.00295	.00000
7	0.00000	0.00000	.00247	.00000
8	1.00000	0.00000	1.00243	.00000
9	0.00000	0.00000	-.00286	.00000
10	0.00000	0.00000	-.00475	.00000
11	0.00000	0.00000	.00029	.00000
12	0.00000	0.00000	-.00165	.00000
13	0.00000	0.00000	-.00046	.00000
14	0.00000	0.00000	-.00069	.00000
15	0.00000	0.00000	-.00020	.00000
16	0.00000	0.00000	-.00045	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 19 WITH 16 TAPS FOR A TAP SPACING OF .0040 SEC.									
FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER	
(HZ)	ERROR		ERROR		MS ERROR		PHASE	AMPL.	
	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.61	-.03	-.02	-.00	-39.52	-65.73	.59		.01
20.0	-.62	.02	-.02	.00	-39.00	-67.88	.64		.02
25.0	-.63	.00	-.02	.00	-39.07	-68.54	.64		.02
30.0	-.59	.02	-.01	-.00	-40.49	-68.63	.62		.01
35.0	-.60	-.02	-.01	-.01	-39.97	-62.71	.58		.00
40.0	-.53	-.00	.00	-.00	-40.57	-74.93	.53		-.00
45.0	-.45	.00	.00	.00	-42.17	-70.93	.45		-.00
50.0	-.37	-.03	.01	.00	-44.35	-63.30	.34		-.00
55.0	-.14	.03	.01	.00	-51.05	-64.21	.20		-.00
60.0	0.00	.02	0.00	-.00	-200.00	-68.94	.02		-.00
65.0	.19	.00	-.02	-.01	-47.46	-61	-.19		.02
70.0	.36	-.03	-.05	-.00	-41.74	-61	-.34		.05
75.0	.50	-.03	-.09	.00	-37.80	-63.09	-.53		.10
80.0	.53	.01	-.14	.01	-34.45	-59.91	-.52		.13
85.0	.33	.01	-.20	-.00	-32.63	-70.36	-.32		.19
90.0	-.01	.05	-.22	-.01	-32.61	-57.84	.06		.21
95.0	-.53	.00	-.20	-.00	-34.06	-73.69	.53		.20
100.0	-1.07	-.11	-.14	.00	-34.44	-55.86	.96		.14
105.0	-1.21	.02	-.04	.01	-36.91	-58.86	1.22		.05
110.0	-1.12	.12	.04	-.02	-39.71	-56.68	1.24		-.06
TOTAL	.61	.04	.09	.01	-36.87	-61.32			
NET REDUCTION OF MISMATCH ERRORS					24.45DB.				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00245	.00000
2	0.00000	0.00000	-.00262	.00000
3	0.00000	0.00000	.01525	.00000
4	0.00000	0.00000	-.01731	.00000
5	0.00000	0.00000	.03704	-.00000
6	0.00000	0.00000	-.00568	.00000
7	0.00000	0.00000	-.01972	.00000
8	1.00000	0.00000	1.00811	.00000
9	0.00000	0.00000	-.04674	-.00000
10	0.00000	0.00000	-.01071	.00000
11	0.00000	0.00000	-.01012	.00000
12	0.00000	0.00000	-.00410	.00000
13	0.00000	0.00000	-.00555	-.00000
14	0.00000	0.00000	-.00145	.00000
15	0.00000	0.00000	-.00220	-.00000
16	0.00000	0.00000	-.00121	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 20 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE ERROR		AMPLITUDE ERROR		TOTAL MS ERROR		FILTER PHASE	FILTER AMPL.
(HZ)	(DEGREES)		(DB)		(DB POWER)		(DEGREES)	(DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-4.06	-.18	.46	-.01	-21.07	-50.24	3.88	-.47
20.0	-3.57	.16	.45	.01	-21.51	-50.44	3.73	-.44
25.0	-3.11	.07	.43	.01	-22.55	-56.32	3.18	-.42
30.0	-2.62	-.04	.39	-.01	-24.55	-58.75	2.57	-.39
35.0	-2.20	-.12	.35	-.01	-25.35	-53.25	2.08	-.35
40.0	-1.60	-.01	.30	.00	-26.68	-75.80	1.68	-.30
45.0	-1.23	.05	.23	.00	-29.22	-60.04	1.29	-.23
50.0	-.78	.06	.17	.01	-33.20	-57.78	.84	-.16
55.0	-.38	-.01	.09	-.00	-39.04	-73.14	.37	-.09
60.0	0.00	-.05	0.00	.00	-200.00	-61.19	-.05	.00
65.0	.30	.01	-.12	-.01	-36.36	-59.40	-.38	.11
70.0	.61	.01	-.25	-.00	-30.87	-67.30	-.60	.25
75.0	.67	-.04	-.39	.01	-27.40	-58.14	-.71	.40
80.0	.67	.05	-.55	.01	-23.94	-58.60	-.62	.56
85.0	.23	.01	-.70	.00	-22.08	-73.22	-.22	.70
90.0	-.59	.01	-.82	-.01	-21.54	-56.00	.60	.80
95.0	-1.88	-.08	-.85	-.01	-21.94	-57.41	1.79	.84
100.0	-3.12	.01	-.79	.01	-22.02	-61.68	3.12	.80
105.0	-4.15	.07	-.65	.02	-23.50	-54.50	4.21	.67
110.0	-4.66	-.03	-.50	-.03	-26.11	-55.97	4.63	.47
TOTAL	2.34	.07	.46	.01	-23.84	-55.72		
NET REDUCTION OF MISMATCH ERROR					31.88DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.06656	-.00000
2	0.00000	0.00000	-.44161	.00000
3	0.00000	0.00000	-.30999	-.00000
4	0.00000	0.00000	-.53044	.00000
5	0.00000	0.00000	-.24234	.00000
6	0.00000	0.00000	-.63814	.00000
7	0.00000	0.00000	.08258	.00000
8	1.00000	0.00000	-.61676	.00000
9	0.00000	0.00000	-.21480	.00000
10	0.00000	0.00000	-.64348	.00000
11	0.00000	0.00000	-.14090	.00000
12	0.00000	0.00000	-.58114	.00000
13	0.00000	0.00000	-.03589	.00000
14	0.00000	0.00000	-.56564	.00000
15	0.00000	0.00000	-.12638	.00000
16	0.00000	0.00000	-.21027	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 21 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	217.45	35.79	-.35	-1.29	5.11	-4.89	-181.67	-.94
20.0	66.77	36.91	-.86	-5.67	.56	-3.45	-29.85	-4.81
25.0	38.46	19.73	-.57	.01	-3.93	-9.36	-18.73	.58
30.0	-20.62	-23.44	-.09	-2.16	-9.80	-8.35	-2.83	-2.08
35.0	-69.11	-9.83	-.36	-6.13	.52	-6.08	59.28	-5.77
40.0	-87.96	-347.70	-.83	-2.93	2.51	-4.36	-259.74	-2.10
45.0	-237.62	-129.65	-.49	-2.88	4.48	3.80	107.97	-2.19
50.0	244.41	-12.68	.33	-7.30	4.00	-5.34	-257.09	-7.63
55.0	-65.37	-44.95	.03	-16.80	.11	-1.36	15.42	-16.83
60.0	0.00	-18.81	0.00	-9.63	-200.00	-3.15	-18.81	-9.63
65.0	-265.36	99.36	-.62	-9.76	3.09	.87	364.72	-9.13
70.0	215.25	-91.28	.08	-8.50	5.17	.16	-306.53	-8.59
75.0	-40.79	-306.69	-.04	-5.92	-3.73	-2.44	-265.91	-5.88
80.0	-68.35	51.36	-.59	-4.46	.84	-2.03	119.71	-3.87
85.0	194.04	-32.89	-.63	-4.10	5.76	-4.55	-226.94	-3.48
90.0	-184.85	303.76	.20	-5.56	5.46	-2.45	490.61	-5.76
95.0	-27.76	63.25	.92	-9.95	-7.49	-2.67	91.00	-10.87
100.0	-68.34	318.67	1.89	-8.79	-.03	-4.47	387.01	-10.68
105.0	-254.65	64.21	3.48	-13.42	2.59	-4.19	318.86	-16.90
110.0	-196.00	10.89	5.23	2.39	3.14	-14.11	206.89	-2.84
TOTAL	156.56	152.26	1.79	3.64	2.91	-1.91		
NET REDUCTION OF MISMATCH ERRORS					4.82DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00002	-.00000
2	0.00000	0.00000	-.00267	.00000
3	0.00000	0.00000	.00701	-.00000
4	0.00000	0.00000	-.01206	.00000
5	0.00000	0.00000	.01390	-.00000
6	0.00000	0.00000	.00064	.00000
7	0.00000	0.00000	-.00636	-.00000
8	1.00000	0.00000	1.01043	.00000
9	0.00000	0.00000	-.01385	-.00000
10	0.00000	0.00000	-.00202	.00000
11	0.00000	0.00000	-.00267	-.00000
12	0.00000	0.00000	-.00032	.00000
13	0.00000	0.00000	-.00094	-.00000
14	0.00000	0.00000	-.00004	.00000
15	0.00000	0.00000	-.00024	-.00000
16	0.00000	0.00000	-.00005	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 22 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.86	-.00	.05	-.00	-36.12	-83.83	.85	-.05
20.0	-.95	-.00	.04	-.00	-35.10	-80.38	.94	-.04
25.0	-.95	.01	.04	.00	-35.33	-65.77	.96	-.04
30.0	-.92	.00	.03	-.01	-36.54	-65.24	.92	-.03
35.0	-.89	-.03	.03	.00	-36.39	-66.60	.86	-.03
40.0	-.75	.01	.03	.00	-37.32	-72.29	.77	-.03
45.0	-.60	.04	.02	-.00	-39.45	-62.29	.64	-.02
50.0	-.55	-.08	.02	.00	-40.82	-58.01	.47	-.02
55.0	-.26	.00	.01	-.00	-47.20	-66.88	.27	-.01
60.0	0.00	.03	0.00	.00	-200.00	-62.69	.03	.00
65.0	.26	.02	-.03	-.00	-44.49	-65.74	-.23	.03
70.0	.48	-.02	-.08	-.00	-38.78	-65.81	-.49	.07
75.0	.65	-.05	-.13	.00	-35.03	-60.65	-.70	.14
80.0	.80	.02	-.22	.00	-30.92	-68.31	-.77	.22
85.0	.64	.01	-.30	.00	-28.85	-64.97	-.63	.30
90.0	.25	.04	-.39	-.01	-27.83	-60.29	-.21	.38
95.0	-.52	-.07	-.43	-.00	-28.04	-59.44	.45	.42
100.0	-1.19	.02	-.41	.00	-28.05	-69.70	1.20	.42
105.0	-1.86	-.02	-.35	.01	-29.50	-60.10	1.85	.35
110.0	-2.09	.05	-.25	-.01	-32.63	-64.65	2.14	.24
TOTAL	.92	.03	.20	.00	-32.02	-63.09		
NET REDUCTION OF MISMATCH ERRORS					31.07DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00020	-.00000
2	0.00000	0.00000	-.00176	.00000
3	0.00000	0.00000	.00479	-.00000
4	0.00000	0.00000	-.00946	.00000
5	0.00000	0.00000	.00836	-.00000
6	0.00000	0.00000	.00637	.00000
7	0.00000	0.00000	.00251	-.00000
8	1.00000	0.00000	1.01088	.00000
9	0.00000	0.00000	.00234	-.00000
10	0.00000	0.00000	-.00403	.00000
11	0.00000	0.00000	.00106	-.00000
12	0.00000	0.00000	-.00136	.00000
13	0.00000	0.00000	.00065	-.00000
14	0.00000	0.00000	-.00068	.00000
15	0.00000	0.00000	.00036	-.00000
16	0.00000	0.00000	-.00026	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 23 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ	PHASE		AMPLITUDE		TOTAL		FILTER	FILTER
(HZ)	(DEG.)	(DB)	BEFORE	AFTER	MS ERROR	(DB POWER)	PHASE	AMPL.
			BEFORE	AFTER	BEFORE	AFTER	(DEGREES)	(DB)
15.0	-.47	.01	-.18	-.00	-33.53	-74.77	.48	.18
20.0	-.64	-.02	-.17	.00	-32.92	-70.78	.62	.17
25.0	-.74	-.00	-.15	.00	-33.35	-78.08	.74	.15
30.0	-.78	.02	-.13	.00	-34.70	-71.09	.80	.13
35.0	-.80	.00	-.11	-.00	-35.02	-75.97	.80	.11
40.0	-.74	.00	-.08	-.00	-35.83	-74.52	.74	.08
45.0	-.63	-.01	-.06	.00	-37.86	-72.63	.62	.06
50.0	-.48	-.01	-.04	.00	-41.32	-72.62	.47	.04
55.0	-.25	.01	-.02	.00	-46.91	-72.87	.27	.02
60.0	0.00	.01	0.00	.00	-200.00	-69.87	.01	.00
65.0	.31	.00	-.00	-.00	-45.18	-67.72	-.31	-.00
70.0	.64	-.02	-.02	-.00	-39.30	-67.54	-.66	.02
75.0	.90	.02	-.05	.00	-35.35	-71.58	-.97	.05
80.0	1.11	-.03	-.10	.01	-32.84	-61.57	-1.14	.11
85.0	1.10	.01	-.17	.00	-31.27	-75.34	-1.09	.17
90.0	.85	.05	-.23	-.01	-31.20	-60.27	-.81	.22
95.0	.37	.00	-.25	-.00	-32.50	-68.21	-.37	.25
100.0	-.17	-.06	-.22	.00	-33.98	-60.88	.11	.23
105.0	-.54	-.05	-.16	.01	-37.43	-62.47	.50	.16
110.0	-.56	.13	-.07	-.01	-43.79	-58.00	.69	.06
TOTAL	.67	.04	.13	.00	-34.38	-64.74		
NET REDUCTION OF MISMATCH ERRORS					30.37DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00133	-.00000
2	0.00000	0.00000	-.00520	.00000
3	0.00000	0.00000	.01223	-.00000
4	0.00000	0.00000	-.01971	.00000
5	0.00000	0.00000	.01851	-.00000
6	0.00000	0.00000	.00757	.00000
7	0.00000	0.00000	-.00641	-.00000
8	1.00000	0.00000	1.02251	.00000
9	0.00000	0.00000	-.01308	-.00000
10	0.00000	0.00000	-.00076	.00000
11	0.00000	0.00000	-.00264	-.00000
12	0.00000	0.00000	.00043	.00000
13	0.00000	0.00000	-.00078	-.00000
14	0.00000	0.00000	.00033	.00000
15	0.00000	0.00000	-.00016	-.00000
16	0.00000	0.00000	.00008	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 24 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.89	.02	-.12	.00	-34.10	-70.14	.91	.12
20.0	-1.13	-.02	-.11	-.00	-32.48	-69.25	1.11	.11
25.0	-1.26	-.01	-.10	.00	-32.25	-68.15	1.25	.10
30.0	-1.31	.00	-.09	-.00	-32.83	-69.60	1.32	.09
35.0	-1.31	-.00	-.07	.00	-32.76	-77.26	1.31	.07
40.0	-1.19	.02	-.05	.00	-33.30	-69.71	1.21	.05
45.0	-1.00	.04	-.03	-.00	-35.09	-63.11	1.04	.03
50.0	-.88	-.10	-.01	.00	-37.04	-56.15	.78	.01
55.0	-.46	-.01	-.00	-.00	-42.43	-69.22	.45	.00
60.0	0.00	.05	0.00	.00	-200.00	-59.31	.05	.00
65.0	.43	.02	-.03	-.00	-41.79	-67.49	-.41	.02
70.0	.90	-.00	-.08	-.01	-35.35	-64.88	-.91	.07
75.0	1.27	-.08	-.15	.00	-31.56	-57.14	-1.35	.16
80.0	1.61	.01	-.27	.00	-27.50	-74.50	-1.60	.28
85.0	1.54	.05	-.41	.01	-25.34	-59.56	-1.50	.42
90.0	.99	.05	-.56	-.01	-24.48	-59.49	-.94	.55
95.0	-.13	-.09	-.64	-.00	-24.73	-57.45	.04	.64
100.0	-1.25	-.01	-.64	.00	-24.74	-72.08	1.23	.64
105.0	-2.32	.00	-.55	.01	-26.31	-61.46	2.32	.56
110.0	-2.86	.06	-.41	-.01	-29.31	-61.73	2.92	.40
TOTAL	1.31	.04	.30	.00	-28.67	-61.27		

NET REDUCTION OF MISMATCH ERRORS 32.59DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	-.00035	-.00000
2	0.00000	0.00000	-.00169	.00000
3	0.00000	0.00000	.00406	-.00000
4	0.00000	0.00000	-.00883	.00000
5	0.00000	0.00000	.00632	-.00000
6	0.00000	0.00000	.00493	.00000
7	0.00000	0.00000	.00101	-.00000
8	1.00000	0.00000	1.00843	.00000
9	0.00000	0.00000	.00223	-.00000
10	0.00000	0.00000	-.00421	.00000
11	0.00000	0.00000	.00146	-.00000
12	0.00000	0.00000	-.00117	.00000
13	0.00000	0.00000	.00090	-.00000
14	0.00000	0.00000	-.00055	.00000
15	0.00000	0.00000	.00047	-.00000
16	0.00000	0.00000	-.00018	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 25 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.22	.02	-.13	-.00	-36.76	-68.32	.24	.13
20.0	-.41	-.02	-.13	.00	-35.75	-68.65	.39	.13
25.0	-.56	-.03	-.12	.00	-35.66	-68.96	.53	.12
30.0	-.58	.04	-.10	.00	-36.96	-64.05	.62	.10
35.0	-.64	.01	-.09	-.00	-36.87	-73.58	.65	.09
40.0	-.61	-.00	-.07	-.00	-37.44	-75.09	.61	.07
45.0	-.53	-.02	-.04	.00	-39.27	-70.51	.52	.05
50.0	-.42	-.02	-.03	-.00	-42.45	-70.05	.40	.03
55.0	-.22	.01	-.01	.00	-48.08	-71.21	.24	.02
60.0	0.00	.02	0.00	.00	-200.00	-69.20	.02	.00
65.0	.20	.01	-.00	-.00	-46.01	-68.62	-.28	-.00
70.0	.58	-.03	-.01	-.00	-40.22	-65.63	-.61	.01
75.0	.92	.00	-.04	.00	-36.17	-74.39	-.91	.04
80.0	1.06	-.02	-.09	.00	-33.51	-63.95	-1.08	.09
85.0	1.05	.01	-.14	.00	-32.08	-73.62	-1.05	.15
90.0	.85	.05	-.20	-.01	-32.01	-60.13	-.81	.19
95.0	.42	.00	-.22	-.00	-33.46	-64.06	-.42	.22
100.0	-.06	-.06	-.20	.00	-35.19	-60.85	.00	.20
105.0	-.38	-.05	-.13	.01	-39.13	-62.56	.33	.14
110.0	-.37	.13	-.05	-.01	-46.83	-57.77	.50	.05
TOTAL	.58	.04	.11	.00	-35.82	-64.31		

NET REDUCTION OF MISMATCH ERROR = 28.49DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00020	.00000
2	0.00000	0.00000	-.00136	.00000
3	0.00000	0.00000	.00014	.00000
4	0.00000	0.00000	-.00027	.00000
5	0.00000	0.00000	.01075	.00000
6	0.00000	0.00000	.00169	.00000
7	0.00000	0.00000	.00594	.00000
8	1.00000	0.00000	1.00718	.00000
9	0.00000	0.00000	.00222	.00000
10	0.00000	0.00000	-.00375	.00000
11	0.00000	0.00000	.00072	.00000
12	0.00000	0.00000	-.00174	.00000
13	0.00000	0.00000	.00030	.00000
14	0.00000	0.00000	-.00091	.00000
15	0.00000	0.00000	.00012	.00000
16	0.00000	0.00000	-.00046	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 26 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)		FILTER AMPL. (DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER				
15.0	-.65	-.03	-.15	-.00	-33.89	-64.16	.62		.15	
20.0	-.66	.01	-.14	.00	-34.02	-67.07	.68		.14	
25.0	-.65	.04	-.12	.01	-34.98	-61.16	.69		.13	
30.0	-.70	-.02	-.11	-.01	-35.76	-61.77	.69		.11	
35.0	-.70	-.03	-.09	-.00	-36.36	-65.96	.67		.09	
40.0	-.63	-.00	-.07	.00	-37.34	-62.18	.63		.07	
45.0	-.51	.04	-.05	.00	-39.57	-63.65	.55		.05	
50.0	-.47	-.05	-.02	.01	-41.93	-59.23	.42		.03	
55.0	-.25	.00	-.02	-.00	-47.20	-69.36	.25		.01	
60.0	0.00	.03	0.00	.00	-200.00	-64.78	.03		.00	
65.0	.24	.03	-.01	-.00	-47.23	-62.76	-.72		.00	
70.0	.43	-.04	-.03	-.00	-42.31	-62.50	-.47		.02	
75.0	.64	-.04	-.05	.01	-38.58	-59.65	-.68		.06	
80.0	.77	.01	-.10	.00	-34.80	-69.61	-.76		.11	
85.0	.68	.03	-.15	.00	-33.41	-64.03	-.64		.16	
90.0	.37	.05	-.29	-.01	-33.06	-57.58	-.32		.19	
95.0	-.23	-.09	-.20	-.00	-34.37	-58.16	.14		.20	
100.0	-.62	.00	-.16	.00	-35.47	-66.93	.62		.17	
105.0	-1.01	-.03	-.08	.01	-37.60	-61.73	.98		.09	
110.0	-1.00	.10	.02	-.01	-40.92	-58.65	1.10		-.03	
TOTAL	.61	.04	.11	.01	-35.89	-61.34				

NET REDUCTION OF MISMATCH ERROR: 25.45DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00020	-.00000
2	0.00000	0.00000	-.00207	.00000
3	0.00000	0.00000	.00570	-.00000
4	0.00000	0.00000	-.00958	.00000
5	0.00000	0.00000	.00952	-.00000
6	0.00000	0.00000	.00350	.00000
7	0.00000	0.00000	-.00359	-.00000
8	1.00000	0.00000	1.00879	.00000
9	0.00000	0.00000	-.00611	-.00000
10	0.00000	0.00000	-.00326	.00000
11	0.00000	0.00000	-.00108	-.00000
12	0.00000	0.00000	-.00082	.00000
13	0.00000	0.00000	-.00016	-.00000
14	0.00000	0.00000	-.00042	.00000
15	0.00000	0.00000	.00008	-.00000
16	0.00000	0.00000	-.00013	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 27 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-.62	.00	-.02	-.00	-39.37	-86.11	.62	.02
20.0	-.73	-.00	-.03	.00	-37.55	-84.57	.72	.03
25.0	-.78	-.00	-.03	.00	-37.16	-81.15	.78	.03
30.0	-.76	.01	-.02	.00	-38.17	-73.47	.78	.02
35.0	-.73	.00	-.02	-.00	-38.18	-78.10	.73	.02
40.0	-.65	-.00	-.01	-.00	-38.73	-77.59	.65	.01
45.0	-.54	-.01	-.01	.00	-40.49	-75.14	.54	.01
50.0	-.40	-.00	-.00	-.00	-43.91	-82.74	.39	.00
55.0	-.20	.01	.00	.00	-49.50	-70.69	.22	.00
60.0	0.00	-.00	0.00	.00	-200.00	-79.38	-.00	.00
65.0	.29	.01	-.01	-.00	-45.63	-69.90	-.27	.01
70.0	.54	-.02	-.04	-.00	-40.13	-66.85	-.57	.04
75.0	.83	.02	-.08	.00	-35.86	-71.54	-.82	.08
80.0	.93	-.01	-.14	.00	-32.81	-66.46	-.93	.14
85.0	.84	-.00	-.21	.00	-30.89	-74.65	-.56	.21
90.0	.58	.03	-.28	-.01	-30.24	-62.26	-.55	.27
95.0	.05	-.00	-.31	-.00	-30.83	-72.84	-.05	.31
100.0	-.55	-.03	-.30	.00	-31.25	-65.08	.52	.30
105.0	-1.01	-.02	-.24	.01	-33.31	-66.57	.99	.25
110.0	-1.14	.07	-.16	-.01	-37.27	-62.52	1.21	.15
TOTAL	.68	.02	.14	.00	-34.58	-68.18		
NET REDUCTION OF MISMATCH ERRORS					33.60DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00036	-.00000
2	0.00000	0.00000	-.00222	-.00000
3	0.00000	0.00000	.00603	-.00000
4	0.00000	0.00000	-.01152	-.00000
5	0.00000	0.00000	.01061	-.00000
6	0.00000	0.00000	-.00020	-.00000
7	0.00000	0.00000	-.00521	-.00000
8	1.00000	0.00000	1.00964	-.00000
9	0.00000	0.00000	-.00898	-.00000
10	0.00000	0.00000	-.00102	-.00000
11	0.00000	0.00000	-.00145	-.00000
12	0.00000	0.00000	-.00026	-.00000
13	0.00000	0.00000	-.00056	-.00000
14	0.00000	0.00000	.00009	-.00000
15	0.00000	0.00000	-.00021	-.00000
16	0.00000	0.00000	.00032	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 28 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

IN THE SPECTRUM OF 10040 SECS.									
FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER			
15.0	-.47	-.11	.01	-.01	-41.82	-54.10	.36	-.02	
20.0	-.35	.11	.02	.01	-43.76	-52.46	.46	-.00	
25.0	-.47	.05	-.01	-.00	-41.77	-61.51	.51	.01	
30.0	-.60	-.07	-.02	-.01	-40.26	-57.06	.53	.01	
35.0	-.50	-.07	-.01	-.00	-40.11	-58.66	.52	.01	
40.0	-.45	.04	.00	.01	-42.02	-58.47	.49	.01	
45.0	-.40	.03	-.00	-.00	-43.14	-64.14	.43	-.00	
50.0	-.37	-.03	.00	-.00	-44.42	-66.53	.35	-.00	
55.0	-.18	.02	-.00	-.00	-50.64	-67.33	.20	-.00	
60.0	0.00	-.01	0.00	.01	-200.00	-62.85	-.01	.01	
65.0	.26	-.00	-.03	-.01	-44.96	-62.47	-.26	.02	
70.0	.50	-.02	-.00	-.00	-39.74	-68.93	-.51	.06	
75.0	.70	-.00	-.10	.01	-36.03	-64.02	-.70	.11	
80.0	.76	.01	-.18	.00	-32.12	-73.18	-.75	.18	
85.0	.03	.03	-.26	.00	-29.99	-64.98	-.60	.26	
90.0	.25	.01	-.33	-.01	-29.07	-64.16	-.24	.33	
95.0	-.45	-.13	-.37	-.00	-29.31	-54.23	.32	.36	
100.0	-.84	.11	-.34	.01	-29.90	-55.74	.95	.35	
105.0	-1.51	-.01	-.27	.01	-31.44	-64.68	1.50	.28	
110.0	-1.80	-.04	-.19	-.01	-34.28	-63.07	1.76	.18	
TOTAL	.71	.06	.17	.01	-33.84	-58.27			
NET REDUCTION OF MISMATCH ERROR					24.43DB				

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00036	.00000
2	0.00000	0.00000	-.00325	-.00000
3	0.00000	0.00000	.00753	.00000
4	0.00000	0.00000	-.01262	-.00000
5	0.00000	0.00000	.00467	.00000
6	0.00000	0.00000	.01172	-.00000
7	0.00000	0.00000	-.00093	.00000
8	1.00000	0.00000	1.01812	-.00000
9	0.00000	0.00000	.00014	.00000
10	0.00000	0.00000	-.00325	-.00000
11	0.00000	0.00000	.00067	.00000
12	0.00000	0.00000	-.00060	-.00000
13	0.00000	0.00000	.00046	.00000
14	0.00000	0.00000	-.00043	-.00000
15	0.00000	0.00000	.00019	.00000
16	0.00000	0.00000	-.00010	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 29 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.50 .02	-.23 .00	-31.41 -67.87	.61	.23
20.0	-.81 -.02	-.21 -.00	-30.90 -68.18	.78	.21
25.0	-.93 -.01	-.19 .00	-31.32 -72.46	.92	.19
30.0	-1.00 .01	-.17 .00	-32.66 -72.08	1.01	.17
35.0	-1.03 .00	-.14 -.00	-32.91 -88.25	1.03	.14
40.0	-.96 .02	-.10 -.00	-33.72 -70.55	.97	.10
45.0	-.82 .02	-.07 .00	-35.76 -67.59	.84	.07
50.0	-.73 -.09	-.04 -.00	-37.99 -56.35	.64	.04
55.0	-.33 .04	-.02 .00	-44.95 -64.43	.36	.02
60.0	0.00 .01	0.00 .00	-200.00 -70.20	.01	.00
65.0	.43 .02	-.00 -.00	-42.38 -69.19	-.42	-.00
70.0	.91 .02	-.02 -.00	-36.33 -64.98	-.89	.02
75.0	1.24 -.09	-.07 -.00	-33.37 -57.02	-1.33	.07
80.0	1.63 .01	-.14 .00	-29.70 -66.59	-1.62	.14
85.0	1.68 .03	-.23 .00	-27.98 -65.09	-1.66	.24
90.0	1.41 .04	-.33 .00	-27.66 -62.04	-1.37	.33
95.0	.77 -.03	-.39 -.00	-28.47 -64.72	-.79	.39
100.0	.03 -.04	-.39 .00	-29.25 -63.59	-.07	.40
105.0	-.64 -.04	-.33 .01	-31.20 -62.83	.61	.34
110.0	-.91 .12	-.23 -.01	-36.22 -58.79	1.03	.22
TOTAL	.95 .05	.20 .00	-31.24 -62.48		

NET REDUCTION OF MISMATCH ERRORS 31.24DB.

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00053	-.00000
2	0.00000	0.00000	-.00254	.00000
3	0.00000	0.00000	.00748	-.00000
4	0.00000	0.00000	-.01237	.00000
5	0.00000	0.00000	.01389	-.00000
6	0.00000	0.00000	.00532	.00000
7	0.00000	0.00000	-.00381	-.00000
8	1.00000	0.00000	1.01278	.00000
9	0.00000	0.00000	-.00866	-.00000
10	0.00000	0.00000	-.00493	.00000
11	0.00000	0.00000	-.00086	-.00000
12	0.00000	0.00000	-.00147	.00000
13	0.00000	0.00000	-.00045	-.00000
14	0.00000	0.00000	-.00042	.00000
15	0.00000	0.00000	-.00012	-.00000
16	0.00000	0.00000	-.00026	.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 30 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	-1.02	-.02	-.05	-.00	-34.82	-68.49	1.00	.05
20.0	-1.13	.00	-.05	.00	-33.66	-77.99	1.13	.05
25.0	-1.14	.04	-.04	.00	-33.87	-62.18	1.17	.05
30.0	-1.18	-.02	-.04	-.00	-34.35	-65.59	1.16	.04
35.0	-1.12	-.02	-.03	-.00	-34.46	-67.98	1.10	.02
40.0	-.90	.00	-.01	-.00	-35.18	-87.19	.99	.01
45.0	-.78	.04	-.01	-.00	-37.32	-63.14	.82	.01
50.0	-.65	-.05	.01	.01	-39.55	-59.85	.60	-.00
55.0	-.34	-.01	.00	-.00	-45.07	-71.18	.34	-.00
60.0	0.00	.02	0.00	.00	-200.00	-66.18	.02	.00
65.0	.36	.03	-.03	-.00	-42.99	-63.02	-.33	.02
70.0	.67	-.03	-.07	-.00	-37.47	-64.28	-.70	.07
75.0	.97	-.04	-.13	.00	-33.63	-61.74	-1.01	.13
80.0	1.18	.00	-.21	.00	-29.90	-68.01	-1.17	.22
85.0	1.11	.03	-.30	.00	-28.00	-63.63	-1.08	.31
90.0	.75	.04	-.39	-.01	-27.40	-57.67	-.70	.38
95.0	-.00	-.08	-.42	-.00	-28.23	-58.71	-.08	.42
100.0	-.65	.00	-.40	.01	-28.83	-66.60	.65	.41
105.0	-1.30	-.02	-.32	.01	-31.00	-62.87	1.28	.33
110.0	-1.51	.08	-.21	-.01	-34.81	-60.24	1.59	.20
TOTAL	.93	.04	.19	.00	-31.70	-62.37		
NET REDUCTION OF MISMATCH ERROR=					30.67DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.07472	-.00000
2	0.00000	0.00000	-.40668	.00000
3	0.00000	0.00000	-.27651	-.00000
4	0.00000	0.00000	-.49417	.00000
5	0.00000	0.00000	-.21496	-.00000
6	0.00000	0.00000	-.59706	.00000
7	0.00000	0.00000	.08371	-.00000
8	1.00000	0.00000	-.56636	.00000
9	0.00000	0.00000	-.18847	-.00000
10	0.00000	0.00000	-.59286	.00000
11	0.00000	0.00000	-.12385	-.00000
12	0.00000	0.00000	-.54377	.00000
13	0.00000	0.00000	-.02685	-.00000
14	0.00000	0.00000	-.52292	.00000
15	0.00000	0.00000	-.11162	.00000
16	0.00000	0.00000	-.19456	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 31 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)		AMPLITUDE ERROR (DB)		TOTAL MS ERROR (DB POWER)		FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER		
15.0	218.54	36.42	.19	-1.43	5.36	-4.7	-182.12	-1.62
20.0	67.16	36.32	-.20	-5.80	.91	-3.47	-30.83	-5.59
25.0	39.64	20.04	.01	-.08	-3.43	-9.27	-19.61	-.09
30.0	-18.64	-22.89	.75	-1.85	-9.96	-8.68	-4.25	-2.60
35.0	-66.71	-11.13	.26	-6.19	.56	-5.96	55.58	-6.45
40.0	-87.24	-348.94	-.13	-3.09	2.78	-9.32	-261.70	-2.96
45.0	-238.85	-131.88	.00	-3.00	4.76	3.83	106.97	-3.00
50.0	244.41	-12.44	.61	-7.83	4.15	-5.03	-256.85	-8.44
55.0	-65.42	-52.80	.56	-17.70	.40	-1.23	12.63	-18.26
60.0	0.00	-21.11	0.00	-10.41	-200.00	-2.77	-21.11	-10.41
65.0	-265.22	98.11	-.01	-9.79	3.39	.82	363.34	-9.78
70.0	215.34	-92.57	.52	-8.61	5.39	.21	-307.91	-9.13
75.0	-40.44	-307.74	.60	-5.85	-3.44	-2.54	-267.29	-6.45
80.0	-67.53	51.13	-.03	-4.48	1.01	-2.06	118.67	-4.44
85.0	194.21	-33.49	-.17	-4.23	5.99	-4.41	-227.71	-4.07
90.0	-184.19	305.57	.69	-5.72	5.71	-2.42	489.76	-6.42
95.0	-27.51	60.52	1.81	-9.68	-6.50	-2.83	88.02	-11.49
100.0	-68.10	317.20	2.16	-8.56	.12	-4.43	385.31	-10.73
105.0	-254.87	70.52	3.69	-13.21	2.63	-3.99	325.39	-16.90
110.0	-194.80	11.12	5.89	2.34	3.58	-14.20	205.92	-3.55
TOTAL	156.55	152.58	2.03	3.67	3.16	-1.87		
NET REDUCTION OF MISMATCH ERROR=					5.03DB.			

PROGRAM FOR EVALUATING FILTER MATCH

FILTER COEFFICIENTS

1	0.00000	0.00000	.00108	.00000
2	0.00000	0.00000	-.00464	-.00000
3	0.00000	0.00000	.01058	.00000
4	0.00000	0.00000	-.01735	-.00000
5	0.00000	0.00000	.01423	.00000
6	0.00000	0.00000	.00825	-.00000
7	0.00000	0.00000	-.00411	.00000
8	1.00000	0.00000	1.02062	-.00000
9	0.00000	0.00000	-.00663	.00000
10	0.00000	0.00000	-.00116	-.00000
11	0.00000	0.00000	-.00102	.00000
12	0.00000	0.00000	.00012	-.00000
13	0.00000	0.00000	-.00014	.00000
14	0.00000	0.00000	.00024	-.00000
15	0.00000	0.00000	.00007	.00000
16	0.00000	0.00000	.00007	-.00000

CORRECTION FILTER FOR RECEIVERS 1 AND 32 WITH 16 TAPS
FOR A TAP SPACING OF .0040 SECS.

FREQ (HZ)	PHASE ERROR (DEGREES)	AMPLITUDE ERROR (DB)	TOTAL MS ERROR (DB POWER)	FILTER PHASE (DEGREES)	FILTER AMPL. (DB)
	BEFORE AFTER	BEFORE AFTER	BEFORE AFTER		
15.0	-.58 .02	-.16 .00	-33.77 -71.69	.60	.16
20.0	-.80 -.02	-.16 -.00	-32.75 -68.23	.78	.16
25.0	-.92 .01	-.14 .00	-32.89 -67.99	.94	.15
30.0	-1.05 -.02	-.13 -.00	-33.29 -66.45	1.03	.13
35.0	-1.06 -.00	-.11 .00	-33.49 -74.05	1.06	.11
40.0	-.98 .02	-.08 .00	-34.17 -67.25	1.00	.08
45.0	-.83 .03	-.06 -.00	-35.97 -63.56	.87	.06
50.0	-.75 -.09	-.03 .00	-38.13 -56.87	.66	.03
55.0	-.39 -.01	-.02 -.00	-43.58 -70.27	.38	.01
60.0	0.00 .03	0.00 .01	-200.00 -61.35	.03	.01
65.0	.44 .04	-.01 -.00	-42.05 -62.12	-.40	.01
70.0	.86 -.02	-.05 -.01	-36.35 -64.11	-.88	.05
75.0	1.26 -.07	-.11 .00	-32.54 -58.93	-1.33	.11
80.0	1.62 .00	-.21 .00	-28.57 -75.86	-1.61	.21
85.0	1.60 .03	-.33 .01	-26.56 -61.65	-1.58	.34
90.0	1.19 .06	-.46 -.01	-25.76 -58.09	-1.13	.45
95.0	.23 -.08	-.54 -.00	-26.22 -58.83	-.31	.53
100.0	-.74 -.01	-.54 .00	-26.43 -70.52	.72	.54
105.0	-1.70 -.03	-.45 .01	-28.21 -61.88	1.67	.46
110.0	-2.13 .09	-.32 -.01	-31.56 -59.93	2.22	.31
TOTAL	1.09 .04	.25 .00	-29.97 -61.62		

NET REDUCTION OF MISMATCH ERROR = 31.65DB.

APPENDIX H
ADAPTIVE PROCESSING WIDE BANDWIDTH CONSIDERATIONS

APPENDIX H

WIDE BANDWIDTH CONSIDERATIONS

H.1 Background

The ability of a wide bandwidth system to successfully cancel strong spatial interference sources is examined. It is heuristically reasonable that a conventional sidelobe cancellor approach will have seriously degraded performance since zero's of the pattern, at a given frequency, will be displaced for other frequency components within the receiver passband.

Conclusions

● Successful Adaptation

An adaptive receiving array can successfully reject broadband interference from both point sources such as RFI and spatially extended sources such as auroral return.

● Frequency-Spatial Equivalence

A point source in a broadband system is mathematically equivalent to a spatially extended narrowband source, where the equivalent spatial distribution depends upon the receiver passband characteristics.

● Additional Degrees of Freedom for Adaptation

Since a broadband system senses broadband interference as an equivalent narrowband spatially extended source, more than one adaptive degree of freedom must be dedicated to such a source for successful spatial nulling. The number of degrees of freedom that must be utilized depends upon the bandwidth and strength of the source, the passband characteristics of the receiver, the length of the receiving array and the angle off boresite of the source.

● Worst Case Design - Point Source

The worst case occurs when the equivalent spatial spread of a wideband-noise like signal is maximized. This occurs in a PRS-like system when the full aperture is used at low frequency and the instantaneous receiver bandwidth is 100 KHz. In such a case, a maximum of two zero's, and hence two adaptive degrees of freedom are required to assure cancellation of a source spatially spread by $\Delta\theta_{\max} = 2.6^\circ$.

● Aurora

Spatially spread aurora can be modeled as a large number of spatially contiguous point scatterers. As such, the effect of 100 KHz bandwidth operation is to effectively further spread each edge of the aurora by $\Delta\theta_{\max}/2 = 1.3^\circ$. As such, the performance is degraded very little over what is achievable when operating with a lower bandwidth.

H.2 Analysis

Consider an N-element line array. Let the array lie along x-axis of (x, y, z) coordinate system and the position of the k^{th} element of array be $\bar{a}_k = kd\bar{i}$, where $\bar{i}$ denotes a unit vector along x-axis, and (d) is the element spacing.

The incoming interfering signal has the discrete spectral representation

$$e(t) = \sum_m A_m e^{2\pi i f_m t} \quad (1)$$

where A_m denotes the complex amplitude of the m^{th} spectral component. If this signal is transmitted from position

$$\bar{r} = x_0\bar{i} + y_0\bar{j} + z_0\bar{k},$$

then the signal at the k^{th} element is $e(t - \tau_k)$ where τ_k is the time to transmit a radio wave from $\bar{r}$ to $\bar{a}_k$. Evidently

$$\begin{aligned} \tau_T &= \frac{1}{c} \sqrt{(\bar{r} - \bar{a}_k) \cdot (\bar{r} - \bar{a}_k)} \\ &= \frac{r}{c} \sqrt{1 - \frac{1}{r^2} [2(\bar{a}_k \cdot \bar{r}) - (\bar{a}_k \cdot \bar{a}_k)]} \\ &\approx \frac{1}{c}(r) - \frac{1}{cr}(\bar{a}_k \cdot \bar{r}) \end{aligned} \quad (2)$$

is the far field approximation, where $(\bar{a}_k \cdot \bar{r})$ denotes the scalar product of position vectors $\bar{a}_k$ and $\bar{r}$ is,

$$(\bar{a}_k \cdot \bar{r}) = Kd r \sin \theta_0 \quad (3)$$

where θ_0 is azimuth from bore-sight (the y-axis direction). Combining (1), (2) and (3), the signal at the k^{th} element is approximately

$$\begin{aligned} s(t - \tau_k) &= I A_m e^{j2\pi f_m(t - \tau_k)} \\ &= I A_m e^{j2\pi f_m(t - \frac{r}{c} + kd \sin \theta_0)} \\ &= I A_m e^{j2\pi f_m(t' + kd \sin \theta_0)} \end{aligned}$$

where $t' = t - r/c$, the "retarded" time. Replacing t' by t , the interference arriving at the k^{th} element from direction θ_0 in the far field is

$$s_k(t) = I A_m e^{j2\pi f_m(t + kd \sin \theta_0)} \quad (4)$$

In the limit spectral representation (4) can be shown to be equivalent to spectral representation

$$s_k(t) = \int_0^\infty e^{j2\pi f(t + kd \sin \theta_0)} d\alpha(t) \quad (5)$$

with $\alpha(t)$, a stochastic process of orthogonal increments with the properties

$$E\bar{\alpha}(t') \alpha(t) = G(t) \delta(t' - t) dt$$

$$E\bar{\alpha}(t') \alpha(t) = 0$$

where E is expected value operator, $\delta(t)$ is the Dirac delta function, and $G(f)$ is the one-sided power spectrum. If the spectrum of the interference is band limited to interval $-w/2 + f_0 < f < w/2 + f_0$ where f_0 is the center frequency and w is bandwidth, then the spectral representation in the form of (5) reduces to

$$\begin{aligned}
 S_k(t) &= \int_{-w/2 + f_0}^{w/2 + f_0} e^{2\pi i f(t + h d \sin \theta_0)} d(f) \\
 &= e^{2\pi i f_0 t} \int_{-w/2}^{w/2} e^{2\pi i f(t + h d \sin \theta_0)} d(f + f_0) \quad (6)
 \end{aligned}$$

by a simple change of variable. If one expands $e^{2\pi i f t}$ as a Fourier series on the interval $-w/2 < t < w/2$, i.e.

$$e^{2\pi i f t} = \sum_{n=-\infty}^{\infty} e^{2\pi i n t / w} \left[\frac{\sin \pi w (t - n/w)}{\pi w (t - n/w)} \right]$$

Then (6) is equivalent to the well known sampling theorem

$$S_k(t) = \sum_{n=-\infty}^{\infty} S_k(n/w) \left[\frac{\sin \pi w (t - n/w)}{\pi w (t - n/w)} \right] \quad (7)$$

This theorem shows that the sampling interval for the complex signal at the k^{th} antenna element need be no less than

$$T = 1/w$$

Now at each sampling time, i.e., $t_n = n/w$ for some n , an antenna beam is the sampled data filter

$$u = \sum_{k=1}^M \bar{w}_k x_k \quad (9)$$

where x_k is the signal at the k^{th} antenna element at time $t_n = n/w$ and $\bar{w}_k$ are the antenna weights. If the interference in direction θ_0 were a single sine wave of frequency f_0 , then by (4), the interference part of x_k would be

$$S_k(n/w) = A e^{2\pi i f_0 (n/w + kd \sin \theta_0)} \quad (10)$$

for $k = 1, 2, \dots, N$. In order to reduce the magnitude of interference (10) in the antenna (9) one must choose the weights w_k in (9) so that a zero of the pattern tends to cancel interference (10), i.e., so that

$$A \sum_{k=1}^N w_k e^{2\pi i f_0 kd \sin \theta_0}$$

is small, and have at the same time a main beam which still points in the desired direction.

If the interference is broad band, by (4)

$$\begin{aligned} S_k(n/w) &= \sum A_m e^{2\pi i (f_m n/w + kd \sin \theta_0)} \\ &= \sum B_m e^{2\pi i f_m kd \sin \theta_0} \end{aligned} \quad (11)$$

where B_m are the complex numbers

$$B_m = A_m e^{2\pi i f_m (n/w)}$$

Evidently the component of (11), related to frequency f_m , can be referenced to the center frequency f_0 as follows

$$\begin{aligned} S_k(n/w) &= \sum B_m e^{2\pi i f_m kd \sin \theta_0} \\ &= \sum B_m e^{2\pi i f_0 (f_m/f_0) kd \sin \theta_0} \\ &= \sum B_m e^{2\pi i f_0 kd \sin \theta_0 (m)} \end{aligned} \quad (12)$$

This suggests a possible replacement of the frequency dependence f_m by an angular dependence defined by

$$\begin{aligned}\sin \theta_o(m) &= \left(\frac{f_m}{f_o} \right) \sin \theta_o \\ &= \left(\frac{f_o + (f_m - f_o)}{f_o} \right) \sin \theta_o \\ &= \sin \theta_o + \left(\frac{f_m - f_o}{f_o} \right) \sin \theta_o\end{aligned}\quad (13)$$

If one lets $\theta_o(m) = \theta_o + \Delta\theta_m$ and assumes $((f_m - f_o)/f_o)$ is small, then by Taylor's expansion

$$\sin(\theta_o + \Delta\theta_m) = \sin \theta_o + (\cos \theta_o) \Delta\theta_m$$

+ higher order terms.

From this one can see by (13) that

$$\Delta\theta_m = \left(\frac{f_m - f_o}{f_o} \right) \tan \theta_o$$

Substituting in (12) yields

$$S_k(n/w) = \sum B_m e^{2\pi i f_o k d \sin \left[\theta_o + \frac{(f_m - f_o)}{f_o} \tan \theta_o \right]} \quad (14)$$

This is the desired mapping of the frequency components of the interference into an equivalent angular interference pattern coming in directions

$$\theta_o(m) = \theta_o + \left| (f_m - f_o)/f_o \right| \tan \theta_o \quad (15)$$

corresponding to the frequency f_m .

In order to minimize interference in the form of (14), one must place, by adaptivity or otherwise, a set of antenna nulls over the angular region

occupied by the directions $\theta_o(m)$, given in (15). The angular extent of this region about θ_o is bounded by

$$\begin{aligned}\Delta\theta &= \max_m |\theta_o(m) - \theta_o| \\ &= \max_m \frac{(f_m - f_o)}{f_o} \tan \theta_o \\ &= \frac{\Delta f}{f_o} \tan \theta_o\end{aligned}$$

If f_o is at the center of the interference band of bandwidth w , then

$$\Delta\theta = \frac{(w/2f_o) \tan \theta_o}{1} \quad (16)$$

This is the angular extent of the interference when mapped from frequency into the angular domain by (14).