Interaction Notes

Note 210

May 6, 1974

WT-MBA/LLL1B: A COMPUTER PROGRAM FOR THE TIME DOMAIN ELECTROMAGNETIC RESPONSE OF THIN-WIRE STRUCTURES

J. A. Landt
E. K. Miller

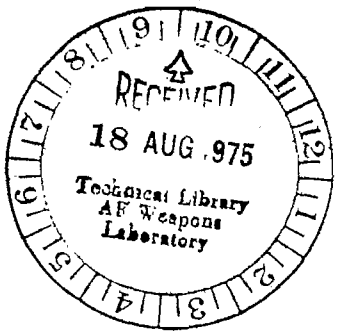
Lawrence Livermore Laboratory
Livermore, California

M. Van Blaricum

University of Illinois
Urbana, Illinois

ABSTRACT

This report is a user's manual for the Fortran computer code WT-MBA/LLL1B, and represents a major extension of the code TWTD.[1] WT-MBA/LLL1B computes the currents on thin-wire structures using a moment method solution of an electric field integral equation. Subroutines are included to compute the radiated far fields and the frequency response of the structure through a fast Fourier transform.



*This work was performed under the auspices of the Atomic Energy Commission for the Defense Nuclear Agency.

Contents

WT-MBA/LLL1B: A COMPUTER PROGRAM FOR THE TIME-DOMAIN ELECTROMAGNETIC RESPONSE OF THIN-WIRE STRUCTURES

Introduction

The thin-wire time-domain (WT-MBA/LLL1B) computer code will compute the induced currents on, and the radiated or scattered fields from, an arbitrary thin-wire antenna or scatterer which has been excited with a specified, time-varying electric field. This code is an update of the code TWTD originally developed by MB Associates, San Ramon, California. The first LLL modification of this code was reported in Ref. 1. The LLL1B designation indicates that this is the second major revision of this code at Lawrence Livermore Laboratory. The "WT" of the name stands for wire time domain.

The code solves an electric field integral equation that has been reduced by the subsectional collocation version of the method of moments to a form that can be handled on the digital computer as an initial value problem.[2,3] The program computes a solution by setting up a geometry-dependent matrix that relates the applied electric field to the induced currents and solves the matrix equation as an initial-value problem in time for the time-dependent induced current distribution. The induced currents are then used to find the time-dependent radiated or scattered fields. For the antenna case, the current at the source segment is computed to some specified time, beyond which it is extrapolated using a frequency and a damping constant obtained from the computed waveform. The discrete Fourier transform is then used to obtain the spectral characteristics of the input admittance and impedance. For both the antenna and the scatterer, the radiated or scattered fields are similarly extrapolated in time and the antenna gain or radar cross-section, normalized to the square of the wavelength, is then obtained using the Fourier transform.

The major extensions included in WT-MBA/LLL1B are:

- Resistive loading of the structure
- Antenna gain calculations

- Correction of errors in the computation of the radiated far fields
- Capability of analyzing structures having junctions where more than two wires come together.

This report contains a functional description of the program and instructions for its use. The seasoned user may refer directly to the "Problem Solution" section to construct the required input data deck. Additional information about program options is given in the section "Detailed Description of Subroutines." A source listing of the program is included along with samples of input data and the resulting output for a linear dipole and a wire model of a 747 aircraft.

This program is designed for use on the CDC-7600 computer at Lawrence Livermore Laboratory and thus uses some library routines (including a complete plotting routine) that are unique to that system. However, with the use of the information in this report, the program may be easily adapted for use on other machines. A glossary has been included to identify those items of coding that are unique to LLL. Additional examples of application of this code can be found in Refs. 4 through 8.

Program Description

The WT-MBA/LLL1B code will compute the induced currents on, and the radiated or scattered fields from, any thin-wire antenna or scatterer whose structure can be modeled using short straight wire segments. The user must specify the geometry of the structure and the value of the electric field applied to the center of each segment. If the structure is used as an antenna, the user specifies only field data for those segments used to drive the antenna and all other segments will be set with an electric field of zero. If the structure is used as a scatterer, the electric field pulse is incident on the scatterer from a direction specified by the user. For both types of structures, the induced current on each segment is then calculated and used to compute the radiated or scattered fields. The radiated and scattered fields may be viewed from any orientation direction specified by the user. All time-dependent values may be transformed to the frequency domain so that spectral characteristics can be studied. The number of segments available in the code listed in Appendix A is limited to 60, but can easily be changed by the user (refer to the source listings comment cards for details; lines A49 to A67 apply). Most of the core storage is devoted to the storage of several large arrays. The core required varies approximately by N^2 where N is the number of segments. Presently on a CDC-7600, approximately 370,000 octal 60-bit words are required for the analysis of a 60-segment structure (with a plane of symmetry) and for 600 time steps. The source deck consists of approximately 2000 cards. As a result of this already large number of cards, several optional data generator subroutines have been removed that were originally included in TWTD. The data generators that were removed were replaced by a general purpose data generator to extend the applicability of the code.

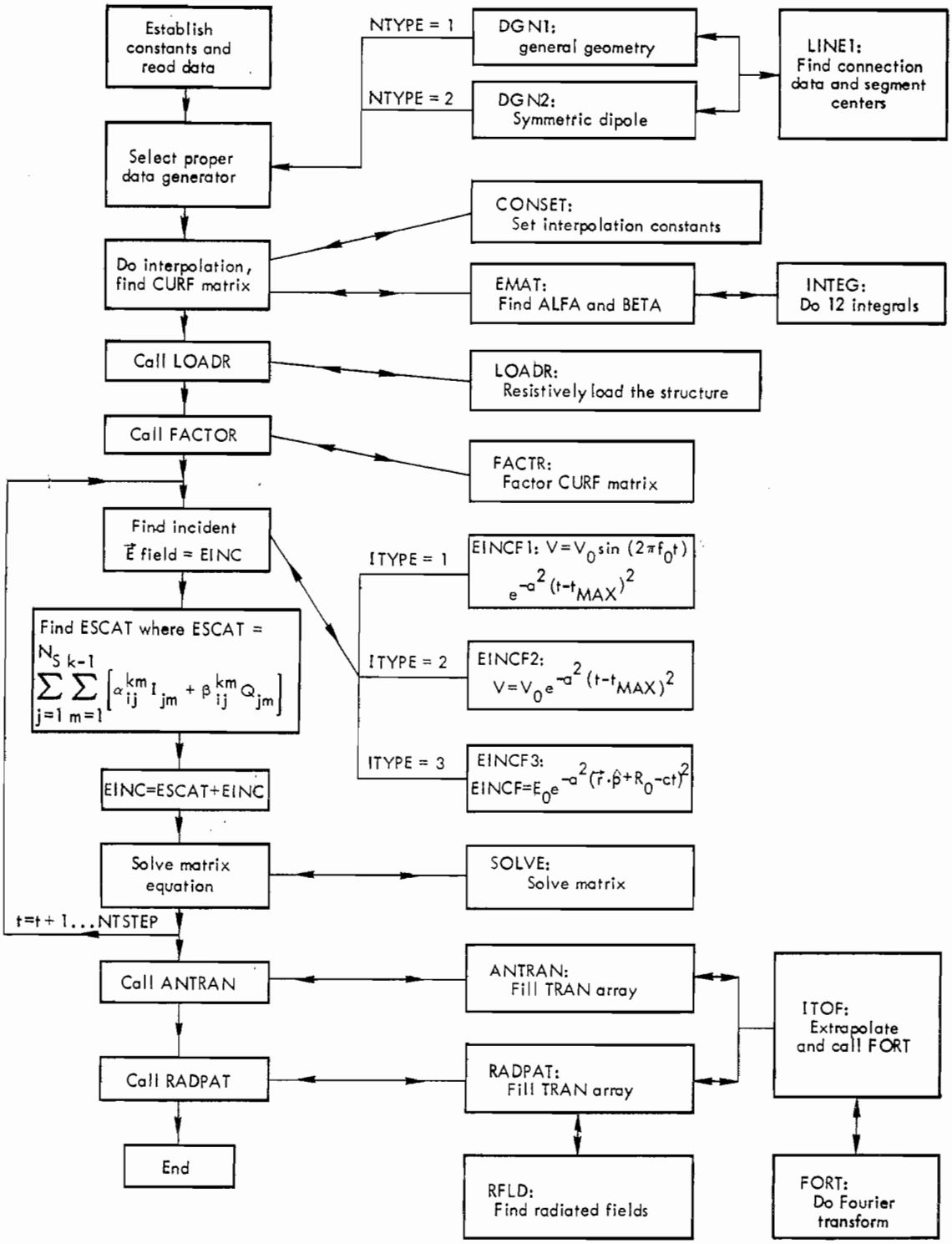


Fig. 1. WT-MBA/LLL1B flow diagram.

Program Flow

The main program is divided into three parts, each of which calls subroutines to do the bulk of the calculations (refer to Fig. 1). The first part of the program reads input data and establishes the geometry and connection data of the structure and then stores this information in arrays in a common block. The second part of the program does the interpolation and establishes the matrix equation for the electric-field integral equation. It then solves the matrix equation to give a time-history of the induced currents. The final part, which is optional, extrapolates the currents at the source segments and/or the radiated fields and then Fourier transforms these values to the frequency domain to obtain spectral characteristics of quantities such as input admittance and radar cross-section.

Comment cards have been placed at appropriate places in the MAIN program. Thus, by referring to the listing of MAIN, a comparison can be made between the actual Fortran code and the flow diagram in order to determine the functional operation of the program.

Brief Description of Subroutines

Part 1

DGN1 - Reads appropriate data cards and sets up the geometry data for an arbitrary array of straight wires which may or may not be connected electrically.

DGN2 - Reads appropriate data cards and sets up the geometry data for a single linear dipole symmetric about its center.

LINE1 - Called from the data generator subroutines, it establishes the X, Y, Z center corrdinates and orientation of the specified segment and establishes the connection data for each segment in a straight wire.

CONSET - Called from MAIN, it calculates and stores the interpolation constants.

Part 2

EINCF1 - This subroutine is first entered from MAIN at ESET1 and at that time reads data cards containing incident field parameters. It is later called from MAIN again and this time establishes an incident field for an antenna source at the specified time.

EINCF2 - Similar to EINCF1 except that the incident field pulse shape differs.

EINCF3 - Similar to EINCF1 except that it establishes an incident field for a scatterer.

EMAT - Called from MAIN, it in turn calls INTEG and then sets up the ALFA and BETA arrays which are coefficients in the matrix equation.

INTEG - Called from EMAT, INTEG does the twelve integrals of the path length for the calculation of ALFA and BETA.

LOADR - Modifies the CURF matrix to resistivily load the wire segments.

FACTR - Factors and finds the determinant of the matrix CURF.

SOLVE - Solves the matrix equation for the induced currents.

Part 3

ANTRAN - Called from MAIN, ANTRAN fills the TRAN array with values of the current on the source segment and then calls ITOF.

RADPAT - Called from MAIN, RADPAT fills the TRAN array with values of the radiated or scattered fields which are established in a call to RFLD. It then prints out these values and calls ITOF.

ITOF - Called from either ANTRAN or RADPAT, ITOF fills the rest of the TRAN array with extrapolated values of the source segment currents or the radiated field values depending on which subroutine it was called from. It then calls FORT which returns the array A which contains the frequency domain values. If called from ANTRAN, ITOF establishes the admittances and impedances and prints out these values. If called from RADPAT, ITOF establishes either the antenna gain or the radar cross-section and prints out these values.

FORT - Performs Fourier synthesis or, given a vector of complex data, it does Fourier analysis.

RFLD - Called from RADPAT, RFLD establishes the time-varying radiated or scattered fields.

Detailed Description of Subroutines

DGN1 - DGN1 is a general purpose data generator. It strings straight wires between specified locations (referred to as nodes in the source listing). No symmetry is used, and consequently, the present version is limited to 30 segments. First, the node locations are established through data supplied by the user. Second, the user specifies how wires are located between these nodes. For each node, the variables that are read from a data card are:

INOD = A number to identify the node.

IC = 0 if the node is at the end of a wire.

= -1 if the node is located at a junction of two or more wires.

Ax, Ay, Az = x, y, z coordinates of the node in meters.

ICONT = 0 for the last node data card.

= 1 if more data cards for nodes follow.

For each wire, the variables that are read from each data card are:

WRAD = Wire radius in meters.

NSEG = Number of segments into which this wire is divided.

INOD1 = The number of the node at the first end of the wire.

INOD2 = The number of the node at the other end of the wire.

ICONT = 0 for the last wire data card

= 1 if more data cards for wires follow.

Other variables used in DGN1 are:

COCAM = Total wire length in meters.

N=NP = Total number of segments, $1 \leq N \leq 30$

DGN2 - DGN2 is a data generator used to establish the geometry data for a single symmetric linear dipole. If only one dipole is to be used, DGN2 is recommended because it takes advantage of symmetry for the computation and storage of interaction constants and thus cuts down on total computer time. It should be noted, however, that the total number of segments used must be an even number. The exciting field need not be symmetric, however. The variables that are read include the following:

COLAM = The dipole length in meters

ALF = The orientation angle, α, in degrees (see Fig. 2).

BUT = The orientation angle, β, in degrees

XC, YC, ZC = The X, Y, Z coordinates of the center of the dipole

SOEL = The ratio of wire radius to the dipole length

N = The number of total segments, must be an even integer, $2 \leq N \leq 60$

Other variables used in the routine include:

NP = N/2 = half of the total number of segments

B = The wire radius in meters

WLEN = COLAM

AL = α in radians

BT = β in radians

LINE1

Subroutine LINE1 is called from the data generators and establishes the X, Y, and Z coordinates of the center of each segment and the connection data of each segment for a straight wire. LINE1 is given the following arguments from the data generators.

X1, Y1, Z1 = The X, Y, Z coordinate of the first end of the line to be divided into segments.

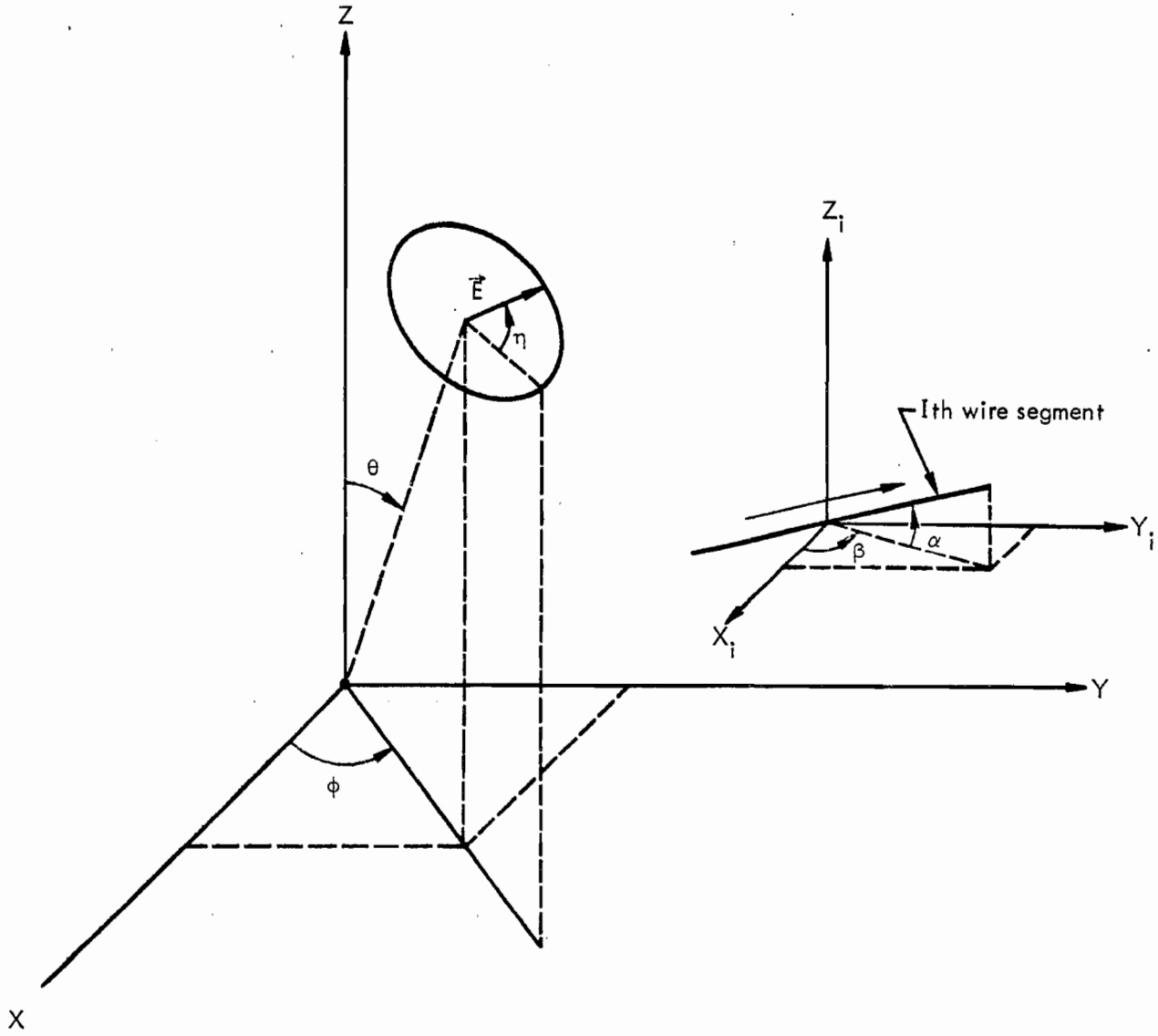


Fig. 2. Coordinate systems including local coordinate frame of Ith wire segment and the electric field orientation.

I1 = The number to be given to the first segment in the line.

EL = The length of the line in meters

ALF = The orientation angle, α, of the line

BUT = The orientation angle, β, of the line

NSEG = The number of segments into which the line is to be divided, $1 \leq NSEG \leq 60$

A = The wire radius.

LINE1 then returns the value of I2 where I2 equals the number of the last segment in the line. The routine LINE1 stores the values of the center coordinates and the connection data in the common block DATA as described in the section on the connection data. The variables X2, Y2, and Z2 are the coordinates at the other end of the wire and are also returned.

LINE2

Subroutine LINE1 can be entered at the point LINE2. The function of this subroutine is the same as LINE1, the only difference being that X2, Y2, and Z2 are given (instead of ALF and BUT) and ALF and BUT are returned.

CONSET

Subroutine CONSET is called from MAIN and uses the structure geometry to establish the values of the interpolation constants. The interpolation constants are stored in the common block INTERP so that they can be used later in the calculations of ALFA and BETA, which are the coefficients of the currents and charges, respectively, in the current equation.

EINCF1

Subroutine EINCF1 establishes an incident field for an antenna source segment. The field has a cw carrier centered at FZ HZ and a Gaussian envelope. The subroutine is first entered from MAIN at the entry point ESET1 where it reads in the following data information:

AN = The spread parameter for the Gaussian waveform

FZ = The center frequency of the spectrum in Hz

TMAX = tmax for the Gaussian waveform

NSORCS = The number of source segments to which the field is to be applied

VSORC(I) = The amplitude in volts of the field to be applied to the source segment I. ITOF assumes that $\sum$ VSORC(I) = 1.

ISORCI = The index number of the source segment to which the source is to be applied.

These values are stored in the common block ENSET and later when MAIN calls EINCF1 they are used to establish the following incident field on the Ith segment.

$$EINC(I) = \frac{VSORC(I)}{SI(I)} \exp\left\{-[AN(T-TMAX)]^2\right\} \sin\left[2\pi \cdot FZ \cdot (T-TMAX)\right]$$

where SI(I) equals the length in meters of the Ith segment.

EINCF2

EINCF2 establishes an incident Gaussian pulse on the antenna source segments and puts a zero incident field value on the rest of the segments in the structure. EINCF2 is first entered from MAIN at ESET2 where the following values are read in:

AN = The spread parameter for the Gaussian pulse

TMAX = tmax for the Gaussian pulse

NSORCS = The number of source segments to receive the incident pulse

VSORC(I) = The magnitude in volts of the incident pulse to be applied to the Ith segment. ITOF assumes that $\sum$ VSORC(I) = 1.

ISORCI = The index number of the source segment to which the source is to be applied.

The above values are stored in the common block ENSET and later, when MAIN calls EINCF2, they are used to establish the following field on the Ith segment:

$$EINC(I) = \frac{VSORC(I)}{SI(I)} \exp\left\{-[AN(T-TMAX)]^2\right\}$$

where SI(I) is the length in meters of the Ith segment.

EINCF3

Subroutine EINCF3 establishes an incident plane wave with the form of a Gaussian pulse for scattering problems. EINCF3 is first entered from MAIN at ESET3 and the following values are read in:

THET = θ, PHI = ϕ = The orientation angles for the direction of the incident plane wave (see Fig. 2).

ET = The polarization angle of the incident E field (see Fig. 2).

RZERO = The distance from the origin toward the source of the field maximum at T = 0.

AN = The spread parameter for the Gaussian waveform divided by the speed of light.

From these values the following values are calculated and stored in the common block TESNE.

PX = $\sin\theta\cos\phi$

PY = $\sin\theta\cos\phi$

PZ = $-\cos\theta$

EX = $\cos\theta\cos\phi\cos\eta - \sin\phi\sin\eta$

EY = $\cos\theta\sin\phi\cos\eta + \cos\phi\sin\eta$

EZ = $-\sin\theta\cos\eta$

AN2 = AN • AN

EINCF3 is then called from MAIN and establishes an incident field of the following form of the Ith segment:

$$EINC(I) = V \exp\left[-AN2(\bar{r}\cdot\hat{p} + R_0 - cT)^2\right]$$

where

$$\bar{r}\cdot p = X(I)\cdot PX + Y(I)\cdot PY + Z(I)\cdot PZ$$

R_0 = RZERO

V = $\cos[\alpha(I)]\cos[\beta(I)]\,EX + \cos[\alpha(I)]\sin[\beta(I)]\,EY + \sin[\alpha(I)]\,EZ$

c = the speed of light

and where

X(I), Y(I), Z(I) = The center coordinate of the Ith segment

$\alpha(I)$, $\beta(I)$ = The orientation angles of the Ith segment

EMAT

Subroutine EMAT is called from MAIN in order to calculate the values of the ALFA and BETA arrays (which are the coefficients of the currents and charges, respectively) in the equation for the induced current. EMAT first calls INTEG which returns the integrals taken over the segment I. Using the values of the integrals and the interpolation constants previously calculated in CONSET, the routine then calculates ALFA (L, M) and BETA (L, M) where L and M range from 1 to 3. These arrays are returned to MAIN through common block EMATS.

INTEG

The INTEG subroutine is called from subroutine EMAT in order to calculate the values of the twelve integrals for the segment I of length SI(I). The subroutine returns the integral values through the common block INTG.

LOADR

LOADR resistively loads the structure. Either individual segments or the entire structure may be loaded. The variables read are:

IOP = 1 for loading entire structure
2 for loading specific segments

NL = the number of segments to be loaded if IOP=2

Z1 = The wire resistivity in Ω/m if IOP = 1

If IOP = 2, NL additional cards are read. Each card contains the following information:

IL = number of the segment to be loaded

ZL = resistance of this segment in Ω.

FACTR

FACTR is the subroutine called from MAIN in order to factor the CURF matrix into a unit lower triangular matrix and upper triangular matrix using the Gauss-Doolittle algorithm.[9] The arguments given FACTR from MAIN are:

N = The total number of segments

A = The CURF matrix

NDIM = The number of columns in the CURF matrix.

Arguments which are returned are:

A = The CURF matrix in factored form

D and P = d and p arrays as described in Ref. 9.

SOLVE

Subroutine SOLVE is called from MAIN to solve the matrix equation for the induced currents and to return the current values to MAIN. The arguments supplied from MAIN are:

N = The total number of segments

A = The CURF matrix

P = The IP array or p array as defined in FACTR

B = The EINC array

NDIM = The number of columns in the CURF matrix.

The values of the resulting induced currents are returned through the array EINC.

ANTRAN

The subroutine ANTRAN is called from MAIN if the spectral characteristics of the input admittance and impedance are wanted. ANTRAN fills the TRAN array with the values of the source currents at each time step. These values are then sent as arguments to the subroutine ITOF which extrapolates the currents out in time and does a Fourier transform to obtain the input admittance and impedance as functions of frequency.

RADPAT

The routine RADPAT is called from MAIN if values of the radiated or scattered fields and the radar cross-section are required. Subroutine RADPAT first reads in the following information from the data deck:

THETA = θ
PHI = ϕ } = The orientation angles for the observation of the radiated fields.

ETA = The polarization angle of the radiated E field of interest

STIME = The value of the time at which the radiated field calculation is to begin

DTIME = The time between adjacent time steps

NTIME = The total number of time steps to be taken

1TRAN = 1, if the Fourier transform of the radiated fields is to be taken for radar cross section

= 2 for antenna gain (ANTRAN must be called first)

= 0 otherwise

NFLD = 1, if additional data cards follow for more observation information

= 0 otherwise

RADPAT then calls subroutine RFLD which calculates the values of the radiated E-fields. The E-fields are polarized at the angles ETA and ETA + $\pi/2$ and are designated ERP and ERQ, respectively. The array TRAN is then filled with the values of ERP and if ITRAN = 1 or 2 then the ITOF routine is called. ITOF then extrapolates the radiated field values out in time and transforms them to the frequency domain to obtain the values of the radar cross-section or antenna gain.

RFLD

Subroutine RFLD is called from RADPAT to determine the values of the radiated or scattered fields. RFLD uses the values of the induced currents on the segments to calculate the field values. The fields which are calculated are the far field values. The interpolation constants used in RFLD are those previously calculated in CONSET. The arguments which are given to RFLD from RADPAT are:

T = The time at which the radiated fields are to be found

THET = θ
PHI = ϕ } = Observation angles for the fields

ET = The polarization angle.

RFLD then returns the values of ERP and ERQ to RADPAT.

ITOF

The ITOF subroutine is called from either ANTRAN or RADPAT and extrapolates (in time) the values of the source currents or radiated fields, respectively. ITOF then takes the Fourier transform of these values and plots the input admittance as a function of frequency, if called from ANTRAN, or plots the radar cross-section or antenna gain if called from RADPAT. Resistive loading of the source segments (LOADR) is automatically corrected by ITOF in finding the antenna admittance, impedance, and gain.

An outline of the extrapolation procedure used in ITOF is as follows:

1) Let NT equal the total number of time steps previously contained in TRAN and let $N = 2^M$ where $1 \leq M \leq 10$.
2) Let t_b equal the time step 3 and find values of the function at t_b, $t_b - 1 = t_a$, and $t_b + 1 = t_c$.
3) Check to see if the sign of the function at t_a does not equal the sign of the function at t_b in order to establish if a zero-crossing has occurred.
4) If the above is true, find the time of the zero-crossing by the equation

$$T_{ZERO} = t_a + \Delta t \left| \frac{t_a}{t_a - t_b} \right|$$

5) If a zero-crossing did not occur, check to see if a maximum or minimum occurs between t_a and t_c.
6) If a maximum or minimum does exist, find the time at the maximum or minimum and the value of the function at that time by:

$$T_{MAX,MIN} = t_b - 0.5\,\Delta t \frac{(t_c - t_a)}{(t_a - 2\,t_b + t_c)}$$

$$A_{MAX,MIN} = (0.5\,t_a - t_b + 0.5\,t_c) \frac{t_{MAX} - t_b}{\Delta t} + (t_c - t_a) \cdot 0.5 \frac{t_{MAX} - t_b}{\Delta t} + t_b.$$

7) Now let $t_a = t_b$, $t_b = t_c$, and $t_c = t_c + 1$ and repeat steps 3 through 6 until all maximums, minimums, and zero-crossings are found.
8) Find the value of the attenuation constant as follows:
   a) Find the first two adjacent maximums where the value of $f(t - 1)$ is greater than, and opposite in sign to, $f(t)$
   b) Find the ratio $-f(t) / f(t - 1)$
   c) Use this ratio to find where:

$$f(t) = e^{-\alpha t}$$

$$f(t - 1) = e^{-\alpha(t-1)}$$

$$= \log \frac{f(t)}{f(t - 1)} \; / \; (t - 1) - t$$

   d) Find all α's and calculate an average α
   e) Designate time t of the first good maximum found at t_{good}.

9) Calculate the period of oscillation

a) Find the time of the first zero-crossing which is greater than t_{good}

b) PERIOD = T

where

$$T = \frac{2(t_{last\ zero\text{-}crossing} - t_{good})}{\text{Number of time steps between } t_{last} \text{ and } t_{good}}$$

c) OMEGA = $\omega = 2\pi/T$

10) Find A_{MX} where

$$A_{MX} = \frac{f(t_{NT})}{\sin \omega\, t_{NT-1} - t_{NT}}$$

where

$$t_{NT} = \Delta t \cdot NT$$

11) Extrapolate the function from t_{NT} to t_N by

$$f(t_i) + A_{MX} \exp\left[-\alpha(t_{i-1} - t_{N-1})\right] \sin[\omega(t_{i-1} - t_N)].$$

Some of the constants and variables used in ITOF are defined as follows:

NT	=	NTSTEP
AN	=	The Gaussian pulse spread constant
N	=	The dimension of TRAN array = 2^M where $1 \leq M \leq 10$
ITZ	=	The total number of zero-crossings
TZERO	=	The time at each zero-crossing
ITM	=	The number of maximums found
TEXT	=	The time at which the maximum was found
AMX	=	The magnitude of the function at TEXT
ALFA	=	The attenuation constant
PERI	=	The period
OMEGA	=	The angular frequency
TENT	=	Time at the next-to-last time step (or t_{NT-1})
ISSS	=	The index of the first good usable maximum
DFREQ	=	$1/(\Delta t\, N)$
WLAM	=	The wavelength in meters.

FORT

FORT is the Fourier transform subroutine called from ITOF. FORT does either Fourier synthesis or does Fourier analysis. A complete description of FORT is given in the list of the routine.

Structural Geometry and Connection Data

The structural geometry for the antennas and the scatterers is described in terms of the three-dimensional coordinates of each straight wire segment making up the structure. The data, as calculated in subroutine LINE1, are stored in the program as the X, Y, Z coordinates of the center of each segment, the length of each segment, and the two angles (ALP and BET) specifying the orientation and direction of each segment. Because interpolation between adjacent segments is used in the program, it is necessary to store data indicating which segments are connected together.

All of the geometry and connection data is stored in the common block DATA so that it can be made accessible to all parts of the program. The format of the common block is as follows:

```
COMMON/DATA/N, NP, X(NCOL), Y(NCOL), Z(NCOL), SI(NCOL), BI(NCOL),
    ALP(NCOL), BET (NCOL), ICON1(NCOL), ICON2(NCOL), COLAM
```

where

NCOL = The number of columns in the CURF MATRIX (60 used in the listing).

N = The total number of segments in the structure

NP = The total number of segments used as observation points in the interpolation. Symmetry conditions dictate the value of NP.

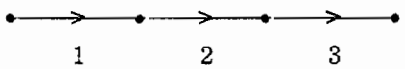
Arrays X(I), Y(I), and Z(I) contain, respectively, the X, Y, and Z center coordinates of the Ith segment. All lengths are in meters.

Array SI(I) contains the length, in meters, of the Ith segment.

Array BI(I) contains the radius, in meters, of the Ith segment.

Arrays ALP(I) and BET(I) contain the connection data. The connection data must conform to the following rules. Given a positive reference direction for the Ith segment defined by the arrow in Fig. 2, ICON1(I) must contain the number of the segment connected to the negative end of the Ith segment. ICON2(I) is established in a similar manner but refers to the positive endpoint. An unconnected segment end is assigned a value of zero and that connected to a junction is assigned the negative number unique to that junction. These conventions are guaranteed by the data generators listed here.

EXAMPLE:



ICON1(1) = 0 ICON1(2) = 1 ICON1(3) = 2
ICON2(1) = 2 ICON2(2) = 3 ICON2(3) = 0

COLAM equals the total length of wire in the structure in meters.

Storage of Constants and Data

WT-MBA/LLL1B computes the current on each segment of the structure for each time step and stores this data. Various constants are required in this procedure. The location of these constants and computed data are summarized here.

In the block ARRAY:

CUR (I, J) = current in amperes on the Ith segment at the Jth time step.
CIN (I, J) = The time integral of CUR (I, J)
CURF = The impedance matrix which includes effects of interpolation and segments located within the same time step.
IP = An array used in pivoting by FACTR and SOLVE

In the block EQUIV:

EC = Constants relating the field on an observation segment to the current on another segment at the proper retarded time.
EQ = like EC except for charge
IRET (I, J) = The retarded time (in integer time steps) between the segment I and J.

The storage of other data has been discussed in the individual discussions of the subroutines.

Problem Solution

The analysis of a structure using WT-MBA/LLL1B consists of exercising the code using an input data deck designed for that particular problem. The construction of this data deck depends on:

- specifying the structure geometry
- specifying the exciting fields
- specifying the loading of the structure
- specifying what is to be done with the output.

The input data read by the program enables the user to select options and to establish the parameters for the structure geometry and the applied fields. The number and format of the data deck depends on the structure and incident field selected for use. The first twelve data cards have the same format for each run. They are

used to label the plots and printouts and to establish options for the rest of the program. The remaining data cards change from one set of data to the next and are described below.

A. LABELS, CARDS 1 THROUGH 11

Data cards 1-11 are used for labeling the printouts and plots and, although they have no effect on the numerical results, they must be included. Cards 1 through 11 are all read in under the format (8A10). Thus columns 1-80 on each card are read in and stored in the appropriate array. The cards should be punched with the following information:

CARD NO.	ARRAY	INPUT INFORMATION
1	COM	The title of the problem to be run
2	XLAB	TIME
3	YLAB	CURRENT (AMPERES)
4	LAB	TIME RESPONSE, etc.
5	X1LAB	FREQUENCY
6	Y1LAB	ADMITTANCE-MHO-REAL PART
7	LAB1	FREQUENCY RESPONSE
8	Y2LAB	SCATTERED FIELDS
9	Y3LAB	SIGMA/LAMBDA SQUARED (DB)
10	Y4LAB	ADMITTANCE - MHO - IMAGINARY PART
11	Y5LAB	ANTENNA GAIN (DB)

B. CONTROL, CARD 12

The twelfth card, which is read in MAIN, contains the following variables:

DT, NTSTEP, NPRINT, NTYPE, IRPAT, ITANT, ITYPE, MFORT, NITE
FORMAT (E10.3, 8I5)

where

DT = the length of one time-step (in sec). DT ≥ DLM/C where DLM is the length of the longest segment and c = 3×10^8 m/s.

NTSTEP = the total number of time steps (not to exceed 600)

NPRINT = 2 if the CURF matrix and currents are to be printed
= 1 if the currents only are to be printed
= 0 otherwise

NTYPE = 1 if DGN1 is to be used
= 2 if DGN2 is to be used

IRPAT = 1 if subroutine RADPAT is to be called so that the radiated or scattered fields may be calculated
= 0 otherwise

ITANT = 1 if subroutine ANTRAN is to be called so that the source current values can be extrapolated and transformed

1TYPE = 1 if an incident field of the form established in EINCF1 is to be used
= 2 if EINCF2 is to be used
= 3 if EINCF3 is to be used

MFORT = is used to find the dimension j of the TRAN array, where

$j=2^{MFORT}$, $1 \leq MFORT \leq 10$

NITE = 1 to output the results
= 0 to keep the output
} LLL options, see glossary.

C. STRUCTURAL GEOMETRY

One of the following sets of cards is to be included, depending upon NTYPE.

If NTYPE = 1, DGN1 is called and two sets of cards are read. The first set are the node locations as described on page 5:

INOD, IC, AX, AY, AZ, ICONT FORMAT (2I4, 3E12.4, I4)

The second set contain the wire connection data:

WRAD, NSEG, INOD1, INOD2, ICONT FORMAT (E12.4, 4I5)

If NTYPE = 2, DGN2 is called and one card is read:

COLAM, ALF, BUT, XC, YC, ZC, SOEL, N FORMAT (7E10.5, I5)

D. EXCITATION

The next series of input cards depends on the form of the incident field which is to be used. EINCF1 and EINCF2 both establish incident fields for an antenna source on several segments. Thus the number of cards used for these two subroutines is NSORCS+1, where NSORCS is the number of sources to be established on the antenna. EINCF3, on the other hand, establishes an incident field in the form of a plane wave which is used with scatterers. Only one card is needed for input if ITYPE = 3. One of these sets of cards is to be included. ITOF assumes that the sum of VSORC(I) is 1 for EINCF1 and EINCF2.

For EINCF1 (ITYPE = 1)

AN, FZ, TMAX, NSORCS
FORMAT (3E10.3, I5)

VSORC(I), ISORCI This format is repeated NSORCS times.
FORMAT (E10.3, I5)

For EINCF2 (ITYPE = 2)

AN, TMAX, NSORCS

FORMAT (2F10.3, I5)

VSORC(I) ISORCI This format is repeated NSORCS times.

FORMAT (E10.3, I5)

For EINCF3 (ITYPE = 3)

THET, PHI, ET, RZERO, A

FORMAT (5F10.5)

E. RESISTIVE LOADING

The next series of cards describes how the wire is loaded. A card must be included even if there is no loading. Data read in is:

IOP, NL, Z1

FORMAT (2I5, E11.3)

and if IOP = 2, NL cards of the form:

IL, Z1

FORMAT (I5, E11.3)

If no loading is desired, typical data would be:

IOP = 1

NL = not used, i.e., any number

Z1 = 0.0

F. OPTIONAL OUTPUT

The final series of data cards is used only if the subroutine RADPAT is to be called, if IRPAT = 1. The number of cards needed here depends on the number of different observation angles for which the radiated or scattered fields are to be calculated. The cards have the form:

THETA, PHI, ETA, STIME, DTIME, NTIME, ITRAN, NFLD

FORMAT (3F10.5, 2E10.3, 3I5)

Source Listing of Program

Appendix A is a complete listing of the source deck of the WT-MBA/LLL1B program. All routines not included in the listing are standard library functions supplied by the computer system used. Some of those not common to other systems are discussed in the glossary.

Description of Output Data

Appendices B, C, and D provide samples of the output for a linear dipole using each EINCF subroutine, and appendix E illustrates the use of multiple junctions by considering a wire model of a 747 aircraft.

(1) The title of the program as listed on the first input card is printed.

(2) The twelfth input card is printed as it was read.

(3) The thirteenth input card is printed as it was read.

(4) A complete listing of the geometry and connection data is printed as it is stored in the common block DATA.

(5) All the input cards which are read in from the appropriate EINCF subroutine are printed.

(6) The loading input cards are printed as read.

(7) The CURF MATRIX is printed if NPRINT = 2.

(8) A list of all the segment number is given.

(9) The value of the determinant of the CURF matrix is printed.

(10) The time (in μsec) it took to set up the matrix equation is printed.

(11) The value of the time step and the values of the induced currents and the integral of the induced currents on each segment are printed if NPRINT = 1 or 2.

(12) The elapsed time (in μsec) since the setting up of the matrix equation.

13-14 Appear only if ITANT equals 1

(13) The complete TRAN array is printed. This includes the currents and the extrapolated currents on the source segment.

(14) The spectral characteristics of the admittance and impedance are printed.

15-18 Appear only if IRPAT equals 1

(15) The values read in on the first data card containing the radiated field orientation data are printed.

(16) The values of the time and the corresponding fields (ERP and ERQ) as calculated for the above orientation data are printed.

(17) The complete TRAN array is printed. This includes the above ERP values and the extrapolated ERP values.

(18) The values of the radar cross-section or antenna gain (in decibels) is printed here as returned from the Fourier transform.

15-18 Repeat for each set of radiated field orientation data read in. The computer plots of the calculated results as obtained from the PEEK routine are also included.

Guidelines

USE OF PRESENT CODE

The user should view WT-MBA/LLL1B as an experimental tool. If used properly, the code will produce good results generally with less computer time than would be required if a frequency domain code were used to generate the same data. If used improperly, WT-MBA/LLL1B will produce poor or meaningless data. Fortunately, when this occurs, it is generally easily identified. The most common indicator is one of diverging currents (i.e., when the currents grow exponentially with time). This happens because the user has attempted to analyze an ill-defined problem and has caused the solution to become numerically unstable. Each computer run should be viewed as an experiment. It is not always possible to predict the success or failure of the experiment. The examples given in the Appendicies illustrate the use of the code and provide data for verification purposes. The glossary also provides discussion of terms that will aid the user. Finally, the guidelines given below will help the user avoid typical pitfalls and aid in efficient use of WT-MBA/LLL1B.

Time Increment

The first entry on the 12th data card is the time increment (DT). Because of storage requirements, DT should be chosen equal to or larger than the length of the largest segment divided by the velocity of light. Note that this condition is checked and DT is automatically reset if needed.

Applied Fields

For both antenna and scattering cases, the applied fields or voltages should be well behaved. No hard and fast guidelines have been developed, but poor performance can be expected if care is not taken in choosing the parameters for the subroutines EINCF. For example, good results are generally obtained if TMAX = 10 • DT and A = 3/TMAX in EINCF2. This choice guarantees about 10 samples of the gaussian voltage above the 10% level, and that the applied voltage is small at the first time step.

Segment Size

Poor results are obtained if a segment is too fat. Good results have been obtained on a CDC 7600 for segments that are at least as long as their diameter. Large discontinuities in segment radius should be avoided.

Segment Placement

Poor results will be obtained if the center of any segment lies inside the volume of another segment.

Junctions

The code has been found to work well if the segments connected to a junction are about the same radius and length. Extensive verification of this has not been done, so if this guideline is violated, view the results with skepticism until verified by some other means.

Loading

Often, resistively loading the source segments (for antenna cases) may permit terminating the calculation in fewer time steps due to the dampening provided. The subroutine ITOF automatically corrects for this loading to supply the unloaded antenna parameters in the frequency domain. See the examples as an illustration of this feature.

Frequency Consideration

Although this is a time-domain code, the choice of a model for the object to be studied should be guided by the highest frequency for which valid data is required. The sampling theorem states that at least two samples (in the time domain) per cycle are required to adequately sample the highest frequency of a function. In general, numerical solutions require more. Again, no rules have been developed theoretically, but it has been verified through use of the code that at least 12 samples/cycle are needed for good accuracy (several %), and relaxing to 6 samples/cycle reduces the accuracy to values ~ 10%. At frequencies higher than this, accuracy diminishes quickly.

POSSIBLE CODE MODIFICATIONS

The analysis of a given problem is generally repeated only to verify the source deck that is being used. Recognizing this, DGN1 was constructed as a general purpose data generator. With DGN1, any structure (for which the code is applicable) can be analyzed if the proper data cards are read in. These data cards can be generated by hand, or can be generated by a code written by the user, thus maintaining the integrity of WT-MBA/LLL1B. Also recognizing that this feature will not accommodate all user's, the following guidelines on modifying the code are provided.

Size

The code can be easily expanded or contracted by changing the variables in the PARAMETER statement in each subroutine. See the source listing of MAIN (lines A48 - A67) for details.

Symmetry

Presently, if symmetry is used, this information is given to MAIN by the data generators through the variables N and NP. For two-fold symmetry, NP = N/2. For no symmetry, NP = N, etc. Efficient use of core would be to adjust NROW and NCOL (see size above) to adapt to the given problem. Table 1 outlines the limits on the number of segments given an NROW and an NCOL:

Table 1. Limits on number of segments given an NROW and an NCOL.

Size of NROW	Size of NCOL	Maximum Number of Segments
NROW	NCOL = NROW	NCOL
NROW	NCOL = 2 · NROW	NCOL if DGN uses 2-fold symmetry
NROW	NCOL = 2 · NROW	NROW if DGN uses no symmetry

Note that DGN1 can be modified to use symmetry simply by replacing line P61 in the source listing by NP = N/2. Also note that DGN1 does not guarantee this symmetry and extreme care should be used in the construction of the data deck. If questions exist, run the same problem both with and without the symmetry to verify that the proper procedure is being used. Then, and only then, can the number of segments be increased (the main reason for the use of symmetry) with confidence.

Output

The currents are available in the array CUR. ANTRAN can be modified easily to find the spectrum of any of these currents. One example would be to calculate the transfer admittance of a structure when illuminated by a plane wave. To do this, change line G15 to TRAN(ITIME) = CUR (J, ITIME) where J is the segment of interest. ANTRAN will call ITOF and calculate the transfer admittances.

Open Circuit Voltage

WT-MBA/LLL1B can be used to find open circuit voltages simply by loading the segment (where the open circuit is to be modeled) by a very large resistance (i.e., 10^6 Ω). The open circuit voltage is then 10^6 times the current on that segment.

Ground

WT-MBA/LLL1B analyzes only structures in free space. A perfect ground is analyzed by explicitly using image theory. The appropriate segments for the image are required, and the EINCF and ITOF subroutines must be modified to properly account for both the incident and image fields.

Other Waveforms

WT-MBA/LLL1B has been exercised for a number of driving waveforms (including numerical data) in addition to those given in the source listing. These require straightforward changes in EINCF and also in ITOF if the spectral characteristics are desired.

Other Data Generators

Additional data generators can be constructed as long as they follow the conventions outlined earlier. WT-MBA/LLL1B does have a limited number of built-in checks, but it is always wise to look carefully at the numbers coming out of the data generator (always printed at the beginning of the output) to verify that the new data generator is supplying the required data.

Acknowledgements

The theoretical and numerical methods used in this program were originally developed by G. J. Burke, E. K. Miller, and A. J. Poggio at M. B. Associates, San Ramon, California.

References

1. M. Van Blaricum and E. K. Miller, "TWTD: A Computer Program for the Time-Domain Analysis of Thin-Wire Structures," Lawrence Livermore Laboratory Rept. UCRL-51277, (1972).
2. E. K. Miller, A. J. Poggio, and G. J. Burke, "An Integro-Differential Equation Technique for the Time-Domain Analysis of Thin-Wire Structures, Part I – The Numerical Method," J. Comput. Phys., 12, 24 (May, 1973).
3. A. J. Poggio, E. K. Miller, and D. J. Burke, "An Integro-Differential Equation Technique for the Time-Domain Analysis of Thin-Wire Structures, Part II – Numerical Results," J. Comput. Phys., 12, 210 (June, 1973).
4. E. K. Miller and M. L. Van Blaricum, "The Short-Pulse Response of a Straight Wire," IEEE Trans. Antennas Propagat., AP-21, 396 (1973).
5. J. A. Landt and E. K. Miller, "Short Pulse Response of a Circular Loop," IEEE Trans. Antennas Propagat., AP-22, 114 (1974).
6. J. A. Landt, E. K. Miller, and F. J. Deadrick, "Time-Domain Computer Models of Thin-Wire Scatterers," Interaction Note 206, November 1973.
7. J. A. Landt and E. K. Miller, "EMP-Induced Skin Currents on Aircraft," Interaction Note 211, June 1974.
8. J. A. Landt and E. K. Miller, "The Transient Characteristics of the Conical Spiral Antenna, Interaction Note 208, March 1974.
9. A. Ralston, A First Course in Numerical Methods, (McGraw-Hill, New York, N.Y., 1965).

Glossary

AMINMX:	Finds the maximum and minimum of an array.
ASSIGN:	Assigns a tape number to a given data file.
CODE ANALYSIS:	A feature of LLL compilers to aid in debugging.
CRTID:	To identify graphical output.
EXIT:	Empties output data buffers.
KEEP80:	Assigns a name to graphical output and keeps the file on disk.
LCM:	Designates that the blocks are in "large core memory."
LOGF:	Is the natural log.
00TM1:	To keep track of timing.
PEEK:	A plotting routine. Contains many system calls functional only at LLL.
PLOTE:	Empties plotting buffers.

Appendix A
Source Listing

```
      PROGRAM TWTDA (INPUT,HSP)                                          A    1
      LCM (ARRAY),(EQUIV)                                                A    2
      CODE ANALYSIS                                                      A    3
      CALL CRTID (5HTWTDA,1)                                             A    4
C                                                                        A    5
C  FIRST VERSION NOTES ADDED 2/12/74                                     A    6
C                                                                        A    7
C  THIS IS TWTDA OR WT-MBA/LLL1B                                         A    8
C                                                                        A    9
C                                                                        A   10
C  ORIGINALLY PROGRAMED BY JERRY BURKE AT MB ASSOCIATES AND              A   11
C  ADAPTED TO LLL COMPUTERS BY MIKE VAN BLARICUM                         A   12
C                                                                        A   13
C  THIS IS A PROGRAM TO COMPUTE THE CURRENTS ON THIN WIRE                A   14
C  STRUCTURES -- FORMULATION BASED ON ELECTRIC FIELD INTEGRAL            A   15
C  EQUATION IN THE TIME DOMAIN                                           A   16
C                                                                        A   17
C  USER'S MANUAL IS UCRL-51585                                           A   18
C                                                                        A   19
C  MANUAL, DECK, AND HELP AVAILABLE FROM:                                A   20
C                                                                        A   21
C        JERRY LANDT   L156                                              A   22
C        LAWRENCE LIVERMORE LABORATORY                                   A   23
C        PO BOX 808                                                      A   24
C        LIVERMORE, CA. 94550                                            A   25
C                                                                        A   26
C   PHONE AREA CODE 415   447-1100                                       A   27
C                                                                        A   28
C                                                                        A   29
C                                                                        A   30
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + A   31
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + A   32
C                                                                        A   33
C        UPDATED APRIL 1974 BY JERRY LANDT AT LLL                        A   34
C        LARGE BLOCKS OF CODING MODIFIED SET OFF BY + + + + AS HERE      A   35
C                                                                        A   36
C        ADAPTED TO ANALYZE STRUCTURES WITH JUNCTIONS OF WIRES           A   37
C        AND RESISTIVE LOADING                                           A   38
C                                                                        A   39
C        SUBROUTINES THAT WERE MODIFIED SIGNIFICANTLY ARE :              A   40
C                                                                        A   41
C        MAIN                                                            A   42
C        CONSET                                                          A   43
C        RFLD                                                            A   44
C        ITOF                                                            A   45
C        LINE1                                                           A   46
C                                                                        A   47
C                                                                        A   48
C        IN ADDITION ALL DIMENSION, COMMON, ETC. STATEMENTS WERE         A   49
C        CHANGED TO PERMIT EASIER EXPANSION OR CONTRACTION OF CODE SIZE  A   50
C                                                                        A   51
C                                                                        A   52
```

```
C  NROW=NO OF ROWS  --  LESS THAN OR EQ. TO NCOL                          A  53
C  NCOL=NO OF COLUMNS                                                     A  54
C  NROCL=NROW*NCOL                                                        A  55
C  NRCF=5*NROCL                                                           A  56
C  NTS=NO OF TIME STEPS                                                   A  57
C  NTC=NCOL*NTS                                                           A  58
C  ITRH=NO IN FFT/2                                                       A  59
C  ITR=NO IN FFT                                                          A  60
C  ITRT=2*NO IN FFT                                                       A  61
C                                                                         A  62
C                                                                         A  63
C        SET UP HERE FOR 60 SEGMENTS WITH 2-FOLD SYMMETRY AND             A  64
C        600 TIME STEPS WITH 1024 IN THE FFT                              A  65
C                                                                         A  66
      PARAMETER (NROW=30,NCOL=60,NROCL=1800,NRCF=9000,                    A  67
     $NTS=600,NTC=36000,ITRH=512)                                         A  68
      COMMON/EQUIV/EC(NROW,NCOL,5),EQ(NROW,NCOL,5),IRET(NROW,NCOL)        A  69
      DIMENSION ECEQ(NRCF),EQEQ(NRCF),IRETEQ(NROCL),CUREQ(NTC),           A  70
     $CINEQ(NTC)                                                          A  71
      DIMENSION COM(8)                                                    A  72
      COMMON/OUT/SOCUR(NTS),AWAVE(ITRH),ATIME(NTS),GNOT(ITRH),            A  73
     $SCAFLD(NTS),OGA(ITRH),XTIMSCA(NTS),GNOTI(ITRH),XLAB(4),YLAB(4),     A  74
     $LAB(8),LAB1(8),X1LAB(4),Y1LAB(4),Y2LAB(4),Y3LAB(4),                 A  75
     $Y4LAB(4),Y5LAB(4)                                                   A  76
      COMMON/ITYP/ ITYPE                                                  A  77
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),         A  78
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                   A  79
      COMMON/INTERP/AT(3,NCOL),BT(3,NCOL),CT(3,NCOL),ES(3),FS(3),GS(3),   A  80
     $E(3),H(3),QI1,QI2,QI3                                               A  81
      COMMON/SCOMP/SX(NCOL),SY(NCOL),SZ(NCOL)                             A  82
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                  A  83
      COMMON/EINC/EINC(NCOL),A,RZERO                                      A  84
      COMMON/ARRAY/CUR(NCOL,NTS),CIN(NCOL,NTS),CURF(NCOL,NCOL),IP(NCOL)   A  85
      COMMON/EMATS/ALFA(3,3),BETA(3,3),RX,RY,RZ,R2,TAU,I,J                A  86
      COMMON/ENSET/VSORC(20),AN,TMAX,NSORCS,ISORC(20),WZ                  A  87
      EQUIVALENCE(EC,ECEQ),(EQ,EQEQ),(IRET,IRETEQ),(CUR,CUREQ),           A  88
     $(CIN,CINEQ)                                                         A  89
C                                                                         A  90
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +  A  91
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +  A  92
C                                                                         A  93
C                                                                         A  94
      CALL OOTIM                                                          A  95
 5    AN=0.0                                                              A  96
      A=0.0                                                               A  97
      DO 1 KK=1,NROCL                                                     A  98
      IRETEQ=0                                                            A  99
 1    CONTINUE                                                            A 100
      DO 2 II=1,NTC                                                       A 101
      CUREQ(II)=0.                                                        A 102
      CINEQ(II)=0.                                                        A 103
 2    CONTINUE                                                            A 104
      DO 4 II=1,NCOL                                                      A 105
      DO 3 JJ=1,NCOL                                                      A 106
      CURF(II,JJ)=0.                                                      A 107
 3    CONTINUE                                                            A 108
      IP(II)=0                                                            A 109
 4    CONTINUE                                                            A 110
      VEL=3.E+8                                                           A 111
      PI=3.141592654                                                      A 112
      TA=PI/180.                                                          A 113
      TD=180./PI                                                          A 114
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C      READ THE FIRST 12 DATA CARDS, THEY ARE LABELS FOR PLOTS
C      DATA CARD  1 GIVES LABLE OF THE PROBLEM
C      DATA CARD 2 IS :TIME - L/C:
C      DATA CARD 3 IS :SOURCE CURRENT:
C      DATA CARD 4 IS :TIME RESPONSE:
C      DATA CARD 5 IS  :L/WAVELENGTH:
C      DATA CARD 6 IS :ADMITTANCE - MHO- REAL PART:
C      DATA CARD 7 IS :FREQUENCY RESPONSE:
C      DATA CARD 8 IS :SCATTERED FIELDS:
C      DATA CARD 9 IS :SIGMA/LAMBDA SQUARED - DB:
C      DATA CARD 10 IS : ADMITTANCE - MHO-IMAGINARY PART:
C      DATA CARD 11 IS :ANTENNA GAIN -- DB:
C      DATA CARD 12 IS :DT,NTSTEP,NPRINT,IRPAT,ITANT,ITYPE,MFORT,NITE
      READ (2,59) (COM(I),I=1,8)
      IF (EOF,2) 57,6
  6   READ (2,59) (XLAB(I),I=1,4)
      READ (2,59) (YLAB(I),I=1,4)
      READ (2,59) (LAB(I),I=1,8)
      READ (2,59) (X1LAB(I),I=1,4)
      READ (2,59) (Y1LAB(I),I=1,4)
      READ (2,59) (LAB1(I),I=1,8)
      READ (2,59) (Y2LAB(I),I=1,4)
      READ (2,59) (Y3LAB(I),I=1,4)
      READ (2,59) (Y4LAB(I),I=1,4)
      READ (2,59) (Y5LAB(I),I=1,4)
      READ (2,61) DT,NTSTEP,NPRINT,NTYPE,IRPAT,ITANT,ITYPE,MFORT,NITE
      IF (NITE.EQ.1) GO TO 125
      CALL ASSIGN (3,15,3RTDO)
      CALL KEEP80 (4RTDPO)
 125  WRITE (3,58)
      WRITE (3,60) (COM(I),I=1,8)
      WRITE (3,61) DT,NTSTEP,NPRINT,NTYPE,IRPAT,ITANT,ITYPE,MFORT,NITE
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C         GO TO PROPER DATA GENERATOR SELECTED BY NTYPE
C         AND PRINT VALUES DETERMINED IN THE DATA GENERATOR
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      GO TO (7,8), NTYPE
  7   CALL DGN1
      GO TO 12
  8   CALL DGN2
 12   WRITE (3,62)
      NOP=N/NP
      DO 13 I=1,N
      AD=ALP(I)*TD
      BD=BET(I)*TD
      WRITE (3,63) X(I),Y(I),Z(I),SI(I),BI(I),AD,BD,ICON1(I),I,ICON2(I)
 13   CONTINUE
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C         RESET DT IF OUT OF BOUNDS
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      CALL AMINMX (SI,1,N,1,SIMN,SIMX,M1,M2)
      SIMXX=DT*VEL*1.0001
      IF (SIMXX.GE.SIMX) GO TO 126
      DT=SIMX/VEL
      WRITE (3,70) DT
 126  RATIO=WLEN/VEL
      CALL CONSET
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C       GO TO PROPER EINCF SELECTED BY ITYPE
C      DIFFERENCE BETWEEN EINCF1, EINCF2, EINCF3, IS AS FOLLOWS
C      EINCF1 IS FOR INCIDENT FIELD FOR AN ANTENNA SOURCE VOLTAGE
C      V=VO*SIN(2.*PI*FZ)*EXP(-(A*(T-TMAX))**2)
C      WHERE CENTER FREQUENCY OF SPECTRUM IS FZ
C      EINCF2 IS FOR INCIDENT FIELD FOR GAUSSIAN ANTENNA SOURCE ON
C      SEVERAL SEGMENTS OF FORM: V=VO*EXP(-(A*(T-TMAX))**2)
C      EINCF3 IS FOR SCATTERING WITH AN INCIDENT GAUSSIAN PULSE OF FORM:
C      EINC=EO*EXP(-(A*(RDOTP+RO-C*T))**2)
C      TO USE ONE OF THE ABOVE PUT A 1,2,3 ON ELEVENTH DATA CARD FOR
C      EINCF1,EINCF2,EINCF3,RESPECTIVELY
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      GO TO (14,15,16), ITYPE
 14   CALL ESET1 (DUM)
      GO TO 17
 15   CALL ESET2 (DUM)
      GO TO 17
 16   CALL ESET3 (DUM)
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C       START THE INTERPOLATION PROCEDURE BY CALCULATING R,K,TAU
C       AND FILLING THE CURF MATRIX. NP IS THE NUMBER OF OBSERVATION
C       POINTS AND N IS THE NUMBER OF TOTAL SEGMENTS
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 17   DO 18 I=1,NP
      XI=X(I)
      YI=Y(I)
      ZI=Z(I)
      DO 18 J=1,N
      RX=XI-X(J)
      RY=YI-Y(J)
      RZ=ZI-Z(J)
      R=SQRT(RX*RX+RY*RY+RZ*RZ)
      K=R/(VEL*DT)+.5
      IF (K.EQ.0) K=1
      IRET(I,J)=K
      CURF(I,J)=0.
      DO 18 M=1,5
      EC(I,J,M)=0.
      EQ(I,J,M)=0.
 18   CONTINUE
      DO 32 I=1,NP
      XI=X(I)
      YI=Y(I)
      ZI=Z(I)
      DO 32 J=1,N
      RX=XI-X(J)
      RY=YI-Y(J)
      RZ=ZI-Z(J)
      R2=RX*RX+RY*RY+RZ*RZ
      R=SQRT(R2)
      K=IRET(I,J)
      TAU=K*DT
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C       CALL EMAT TO GET VALUES OF ALFA AND BETA
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      CALL EMAT
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
C
```

```
C  THIS IS DESIGNED TO HANDLE MULTIPLE JUNCTIONS BY SIMPLY PERFORMING      A 233
C  THE INTERPOLATION FOR EACH SEGMENT CONNECTED TO A GIVEN JUNCTION        A 234
C  IN ESCENCE THIS IS AS IF THE INTERPOLATION IS TO THE SUM OF THE         A 235
C  CURRENTS ACROSS THE JUNCTION -- THIS HAS BEEN FOUND TO WORK IN          A 236
C  THE FREQ. DOMAIN CODE                                                  A 237
C                                                                         A 238
C  DO SELF TERMS -- IE THOSE WITHOUT SIG1 OR SIG2                         A 239
      DO 102 M=1,3                                                       A 240
      KXX=M+1                                                            A 241
      KK=K-M+2                                                           A 242
      IF (KK.EQ.0) GO TO 101                                             A 243
      EC(I,J,KXX)=EC(I,J,KXX)+ALFA(2,M)                                  A 244
      EQ(I,J,KXX)=EQ(I,J,KXX)+BETA(2,M)                                  A 245
      GO TO 102                                                          A 246
 101  CURF(I J)=CURF(I,J)+ALFA(2,3)+BETA(2,3)*Q13                        A 247
      EQ(I,J,KXX)=EQ(I,J,KXX)+BETA(2,M)                                  A 248
 102  CONTINUE                                                           A 249
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    A 250
C  DO JC1 TERMS -- IE INTERPOLATION AT THE ICON1 END OF THE JTH SEGMENT   A 251
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    A 252
      L=N+1                                                              A 253
      JC1=ICON1(J)                                                       A 254
      IF (JC1.NE.0) GO TO 103                                            A 255
      KKM=0                                                              A 256
      GO TO 111                                                          A 257
 103  IF (JC1.LT.0) GO TO 106                                            A 258
      IF (ICON2(JC1).NE.J) GO TO 104                                     A 259
      SIG1=1.                                                            A 260
      GO TO 110                                                          A 261
 104  IF (ICON1(JC1).NE.J) GO TO 105                                     A 262
      SIG1=-1.                                                           A 263
      GO TO 110                                                          A 264
 105  CALL EXIT                                                          A 265
C--------WE HAVE A JUNCTION AT THE ICON1 END OF THE JTH SEGMENT          A 266
 106  JUN1=JC1                                                           A 267
      L=0                                                                A 268
 107  L=L+1                                                              A 269
      IF (L.GT.N) GO TO 114                                              A 270
      IF (ICON2(L).NE.JUN1) GO TO 108                                    A 271
C--------WE HAVE A SEGMENT CONNECTED TO J AT THE JUNCTION                A 272
      IF (L.EQ.J) GO TO 107                                              A 273
      SIG1=1.                                                            A 274
      GO TO 109                                                          A 275
C--------IF OTHER END NOT CONNECTED, TRY NEXT SEGMENT                    A 276
 108  IF (ICON1(L).NE.JUN1) GO TO 107                                    A 277
      IF (L.EQ.J) GO TO 107                                              A 278
      SIG1=-1.                                                           A 279
 109  JC1=L                                                              A 280
 110  KM=IRET(I,JC1)                                                     A 281
      KKM=KM-K                                                           A 282
      IF (IABS(KKM).LE.1) GO TO 111                                      A 283
      WRITE (3,64) I,J,JC1,KKM                                           A 284
 111  DO 113 M=1,3                                                       A 285
      KMX=KKM+M+1                                                        A 286
      KK=K-M+2                                                           A 287
      IF (JC1.EQ.0) GO TO 113                                            A 288
      IF (KK.EQ.0) GO TO 112                                             A 289
      EC(I,JC1,KMX)=EC(I,JC1,KMX)+ALFA(I,M)*SIG1                         A 290
      EQ(I,JC1,KMX)=EQ(I,JC1,KMX)+BETA(I,M)*SIG1                         A 291
      GO TO 113                                                          A 292
```

```
 112  CURF(I,JC1)=CURF(I,JC1)+(ALFA(I,3)+BETA(I,3)*QI3)*SIG1                A 293
      EQ(I,JC1,KMX)=EQ(I,JC1,KMX)+BETA(I,M)*SIG1                            A 294
 113  CONTINUE                                                              A 295
      IF (L.LT.N) GO TO 107                                                 A 296
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    A 297
C  NOW DO THE ICON2 TERMS -- IE THE OTHER END OF THE JTH SEGMENT            A 298
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    A 299
 114  L=N+1                                                                 A 300
      JC2=ICON2(J)                                                          A 301
      IF (JC2.NE.0) GO TO 115                                               A 302
      KKP=0                                                                 A 303
      GO TO 122                                                             A 304
 115  IF (JC2.LT.0) GO TO 117                                               A 305
      IF (ICON1(JC2).NE.J) GO TO 116                                        A 306
      SIG2=1.                                                               A 307
      GO TO 121                                                             A 308
 116  IF (ICON2(JC2).NE.J) GO TO 105                                        A 309
      SIG2=-1.                                                              A 310
      GO TO 121                                                             A 311
C--------A JUNCTION AT THE ICON2 END OF THE JTH SEGMENT                     A 312
 117  JUN2=JC2                                                              A 313
      L=0                                                                   A 314
 118  L=L+1                                                                 A 315
      IF (L.GT.N) GO TO 32                                                  A 316
      IF (ICON1(L).NE.JUN2) GO TO 119                                       A 317
C--------WE HAVE A SEGMENT CONNECTED TO J AT THE JUNCTION                   A 318
      IF (L.EQ.J) GO TO 118                                                 A 319
      SIG2=1.                                                               A 320
      GO TO 120                                                             A 321
C--------IF OTHER END NOT CONNECTED, TRY NEXT SEGMENT                       A 322
 119  IF (ICON2(L).NE.JUN2) GO TO 118                                       A 323
      IF (L.EQ.J) GO TO 118                                                 A 324
      SIG2=-1.                                                              A 325
 120  JC2=L                                                                 A 326
 121  KP=IRET(I,JC2)                                                        A 327
      KKP=KP-K                                                              A 328
      IF (IABS(KKP).LE.1) GO TO 122                                         A 329
      WRITE (3,64) I,J,JC2,KKP                                              A 330
 122  DO 124 M=1,3                                                          A 331
      KPX=KKP+M+1                                                           A 332
      KK=K-M+2                                                              A 333
      IF (JC2.EQ.0) GO TO 124                                               A 334
      IF (KK.EQ.0) GO TO 123                                                A 335
      EC(I,JC2,KPX)=EC(I,JC2,KPX)+ALFA(3,M)*SIG2                            A 336
      EQ(I,JC2,KPX)=EQ(I,JC2,KPX)+BETA(3,M)*SIG2                            A 337
      GO TO 124                                                             A 338
 123  CURF(I,JC2)=CURF(I,JC2)+(ALFA(3,3)+BETA(3,3)*QI3)*SIG2                A 339
      EQ(I,JC2,KPX)=EQ(I,JC2,KPX)+BETA(3,M)*SIG2                            A 340
 124  CONTINUE                                                              A 341
      IF (L.LT.N) GO TO 118                                                 A 342
 32   CONTINUE                                                              A 343
      IF (N.EQ.NP) GO TO 36                                                 A 344
      K=NOP-1                                                               A 345
C--------FILL CURF MATRIX TO BE SQUARE BY SYMMETRY CONDITIONS                A 346
      DO 35 I=1,NP                                                          A 347
      DO 35 J=1,N                                                           A 348
      ESCAT=CURF(I,J)                                                       A 349
      DO 35 LBJ=1,K                                                         A 350
      JFK=LBJ*NP                                                            A 351
      IOP=I+JFK                                                             A 352
      JOP=J+JFK                                                             A 353
```

```
      IF (JOP.GT.N) JOP=JOP-N                                          A 354
      CURF(IOP,JOP)=ESCAT                                              A 355
 35   CONTINUE                                                         A 356
 36   CONTINUE                                                         A 357
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  A 358
C        CALL LOADR FOR RESISTIVE LOADING                              A 359
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  A 360
      CALL LOADR                                                       A 361
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +  A 362
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +  A 363
C--------PRINT CURF MATRIX IF SO DESIRED                               A 364
      IF (NPRINT.LE.1) GO TO 34                                        A 365
      WRITE (3,71)                                                     A 366
      DO 33 I=1,NP                                                     A 367
      WRITE (3,65) I,(CURF(I,J),J=1,N)                                 A 368
 33   CONTINUE                                                         A 369
C--------CALL THE FACTR SUBROUTINE                                     A 370
 34   CALL FACTR (N,CURF,IP,NCOL)                                      A 371
      DO 37 I=1,N                                                      A 372
      CIN(I,1)=0.                                                      A 373
 37   CONTINUE                                                         A 374
      CALL OOTIM (ITM2)                                                A 375
      WRITE (3,66) ITM2                                                A 376
      TIME=TSTART-DT                                                   A 377
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  A 378
C       LOOP TO STEP THROUGH ALL TIME STEPS TO FIND INCIDENT           A 379
C       FIELDS AT THAT TIME STEP AND THE VALUES OF THE CURRENTS        A 380
C       AND CHARGES AT THAT TIME STEP                                  A 381
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  A 382
      DO 56 ITIME=1,NTSTEP                                             A 383
      TIME=TIME+DT                                                     A 384
      GO TO (38,39,40), ITYPE                                          A 385
 38   CALL EINCF1 (TIME)                                               A 386
      GO TO 41                                                         A 387
 39   CALL EINCF2 (TIME)                                               A 388
      GO TO 41                                                         A 389
 40   CALL EINCF3 (TIME)                                               A 390
 41   IF (ITIME.EQ.1) GO TO 50                                         A 391
      ITIM5=ITIME-5                                                    A 392
      ITIM1=ITIME-1                                                    A 393
      KXX=ITIME-3                                                      A 394
      DO 49 I=1,NP                                                     A 395
      IJDX=I-NROW                                                      A 396
      IJMJX=IJDX-NROCL                                                 A 397
      DO 48 J=1,N                                                      A 398
      IJMJX=IJMJX+NROW                                                 A 399
      IJDX=IJDX+NROW                                                   A 400
      K=KXX-IRETEQ(IJDX)                                               A 401
      M1=1                                                             A 402
      IF (K.GT.-1) GO TO 42                                            A 403
      M1=1-K                                                           A 404
      IF (M1.GT.5) GO TO 48                                            A 405
 42   M2=5                                                             A 406
      IF (K.LT.ITIM5) GO TO 43                                         A 407
      M2=ITIM1-K                                                       A 408
 43   JFK=-NP                                                          A 409
      IJMMX=NROCL*(M1-1)                                               A 410
      JOPKK=NCOL*(K+M1-2)                                              A 411
      DO 47 LBJ=1,NOP                                                  A 412
      JFK=JFK+NP                                                       A 413
      IOP=I+JFK                                                        A 414
```

```
      JOP=J+JFK                                                          A 415
      IF (JOP.GT.N) JOP=JOP-N                                            A 416
      ESCAT=0.                                                           A 417
      JOPKKX=JOP+JOPKK                                                   A 418
      IJMDX=IJMJX+IJMMX                                                  A 419
      IF (M1.GT.M2) GO TO 45                                             A 420
      DO 44 M=M1,M2                                                      A 421
      JOPKKX=JOPKKX+NCOL                                                 A 422
      IJMDX=IJMDX+NROCL                                                  A 423
      ESCAT=ESCAT+ECEQ(IJMDX)*CUREQ(JOPKKX)+EQEQ(IJMDX)*CINEQ(JOPKKX)    A 424
 44   CONTINUE                                                           A 425
      IF (M2.EQ.5) GO TO 46                                              A 426
 45   IJMDX=IJMDX+NROCL                                                  A 427
      JOPKKX=JOPKKX+NCOL                                                 A 428
      ESCAT=ESCAT+EQEQ(IJMDX)*CINEQ(JOPKKX)                              A 429
 46   EINC(IOP)=EINC(IOP)+ESCAT                                          A 430
 47   CONTINUE                                                           A 431
 48   CONTINUE                                                           A 432
 49   CONTINUE                                                           A 433
C--------ALL THE VALUES OF THE MATRIX EQUATION AT GIVEN TIME STEP        A 434
C--------ARE READY TO BE SOLVED                                          A 435
 50   DO 51 I=1,N                                                        A 436
      EINC(I)=-EINC(I)                                                   A 437
 51   CONTINUE                                                           A 438
C--------CALL THE SOLVE SUBROUTINE TO SOLVE MATRIX EQUATION              A 439
C--------FOR THE GIVEN TIME STEP                                         A 440
      CALL SOLVE (N,CURF,IP,EINC,NCOL)                                   A 441
C--------STORE THE CURRENTS ON SEGMENT NO. 1 FOR PLOTTING                A 442
C--------ATIME IS A NORMALIZED TIME                                      A 443
      ATIME(ITIME)=TIME/RATIO                                            A 444
      SOCUR(ITIME)=EINC(1)                                               A 445
      IMAX=ITIME                                                         A 446
C--------PRINT OUT ALL VALUES OF CURRENT CALCULATED                      A 447
      IF (NPRINT.EQ.0) GO TO 127                                         A 448
      WRITE (3,67) ITIME,TIME,(EINC(I),I=1,N)                            A 449
C--------FILL CUR AND CIN ARRAYS                                         A 450
 127  DO 52 I=1,N                                                        A 451
      CUR(I,ITIME)=EINC(I)                                               A 452
      CIN(I,ITIME)=CIN(I,ITIME)+QI3*EINC(I)                              A 453
 52   CONTINUE                                                           A 454
      IF (NPRINT.EQ.0) GO TO 128                                         A 455
      WRITE (3,68) (CIN(I,ITIME),I=1,N)                                  A 456
 128  IF (ITIME.EQ.NTSTEP) GO TO 56                                      A 457
      IF (ITIME.EQ.1) GO TO 54                                           A 458
C--------FILL THE PART OF THE CIN ARRAY FOR THE NEXT TIME STEP THAT      A 459
C--------CAN BE DONE WITH PRESENT DATA                                   A 460
      DO 53 J=1,N                                                        A 461
      CIN(J,ITIME+1)=CIN(J,ITIME)+QI1*CUR(J,ITIME-1)+QI2*CUR(J,ITIME)    A 462
 53   CONTINUE                                                           A 463
      GO TO 56                                                           A 464
 54   DO 55 J=1,N                                                        A 465
      CIN(J,ITIME+1)=CIN(J,ITIME)+QI2*CUR(J,ITIME)                       A 466
 55   CONTINUE                                                           A 467
 56   CONTINUE                                                           A 468
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  A 469
C        THIS IS END OF TIME STEPPING LOOP                               A 470
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  A 471
      ATMAX=ATIME(IMAX)                                                  A 472
      CALL AMINMX (SOCUR,1,IMAX,1,SOCMIN,SOCMAX,M1,M2)                   A 473
      CALL PEEK (1,1,9,2,1H*,ATIME,SOCUR,IMAX,0.,ATMAX,SOCMIN,SOCMAX,    A 474
     $XLAB,YLAB,LAB,IND)                                                 A 475
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      CALL OOTIM (ITM2)
      WRITE (3,69) ITM2
C--------FIND ANTENNA DRIVING POINT ADMITTANCE IF DESIRED
      IF (ITANT.NE.0) CALL ANTRAN
C--------FIND ANTENNA GAIN OR RADAR CROSS SECTION
      IF (IRPAT.NE.0) CALL RADPAT
      CALL OOTIM (ITM2)
      WRITE (3,69) ITM2
      GO TO 5
 57   CALL PLOTE
      CALL EXIT
C
 58   FORMAT (1H1)
 59   FORMAT (8A10)
 60   FORMAT (//,1X,8A10)
 61   FORMAT (E10.3,8I5)
 62   FORMAT (?       X(I)        Y(I)        Z(I)        SI(I)        BI(I)?,
     $?     ALP(I)     BET(I)?)
 63   FORMAT (7F10.5,3I5)
 64   FORMAT(? RETARDED TIMES FROM SEGMENT?,I5,? TO SEGMENTS?,I5,? AND?
     $,I5,? DIFFER BY ?,I5,? TIME STEPS?)
 65   FORMAT (/,1X,?I=?,I3,/,(1X,10E11.3))
 66   FORMAT(? TIME IN MICROSEC. FOR MATRIX SETUP?,I9)
 67   FORMAT(/?TIME STEP?,I5,?  TIME=?,E10.3,? CURRENT-?,/(1X,10E11.3))
 68   FORMAT (/?INT. OF CUR.?/(1X,10E11.3))
 69   FORMAT (? RUNNING TIME IN MICROSECONDS =?,I9)
 70   FORMAT (//,?TROUBLE WITH TIME INCREMENT, CHANGED TO DT= ?,E14.6)
 71   FORMAT (/,?CURF MATRIX ELEMENTS INCLUDING LOADING?)
      END
```

```
      SUBROUTINE EINCF1 (T)
      CODE ANALYSIS
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C     EINCF1 IS FOR INCIDENT FIELD FOR AN ANTENNA SOURCE VOLTAGE OF FORM
C     V=VO*SIN(2*PI*FZ)*EXP(-(A*(T-TMAX))**2)
C     WHERE CENTER FREQUENCY OF SPECTRUM IS FZ
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      PARAMETER (NCOL=60)
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT
      COMMON/EINC/EINC(NCOL),A,RZERO
      COMMON/ENSET/VSORC(20),AN,TMAX,NSORCS,ISORC(20),WZ
      DO 1 I=1,N
      EINC(I)=0.
 1    CONTINUE
      ARG=AN*(T-TMAX)
      ARG=EXP(-ARG*ARG)*SIN(WZ*(T-TMAX))
      DO 2 I=1,NSORCS
      ISORCI=ISORC(I)
      EINC(ISORCI)=VSORC(I)*ARG
 2    CONTINUE
      RETURN
      ENTRY ESET1
      READ (2,4) AN,FZ,TMAX,NSORCS
      WRITE (3,4) AN,FZ,TMAX,NSORCS
      DO 3 I=1,NSORCS
      READ (2,5) VSORC(I),ISORCI
```

```
      WRITE (3,6) VSORC(I),ISORCI                                    B  29
      ISORC(I)=ISORCI                                                B  30
      VSORC(I)=VSORC(I)/SI(ISORCI)                                   B  31
 3    CONTINUE                                                       B  32
      TSTART=0.                                                      B  33
      WZ=FZ*6.283185308                                              B  34
      RETURN                                                         B  35
C                                                                    B  36
 4    FORMAT (3E10.3,I5)                                             B  37
 5    FORMAT (E10.3,I5)                                              B  38
 6    FORMAT (1X,E10.3,I5)                                           B  39
      END                                                            B  40


      SUBROUTINE EINCF2 (T)                                          C   1
      CODE ANALYSIS                                                  C   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  C   3
C      INCIDENT FIELD FOR GAUSSIAN ANTENNA SOURCE ON SEVERAL SEGMENTS. C   4
C       OF FORM: V=VO*EXP(-(A*(T-TMAX))**2)                          C   5
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  C   6
      PARAMETER (NCOL=60)                                            C   7
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),    C   8
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM              C   9
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT             C  10
      COMMON/EINC/EINC(NCOL),A,RZERO                                 C  11
      COMMON/ENSET/VSORC(20),AN,TMAX,NSORCS,ISORC(20),WZ             C  12
      DO 1 I=1,N                                                     C  13
      EINC(I)=0.                                                     C  14
 1    CONTINUE                                                       C  15
      ARG=AN*(T-TMAX)                                                C  16
      ARG=EXP(-ARG*ARG)                                              C  17
      DO 2 I=1,NSORCS                                                C  18
      ISORCI=ISORC(I)                                                C  19
      EINC(ISORCI)=VSORC(I)*ARG                                      C  20
 2    CONTINUE                                                       C  21
      RETURN                                                         C  22
      ENTRY ESET2                                                    C  23
      READ (2,4) AN,TMAX,NSORCS                                      C  24
      WRITE (3,5) AN,TMAX,NSORCS                                     C  25
      DO 3 I=1,NSORCS                                                C  26
      READ (2,6) VSORC(I),ISORCI                                     C  27
      WRITE (3,6) VSORC(I),ISORCI                                    C  28
      ISORC(I)=ISORCI                                                C  29
      VSORC(I)=VSORC(I)/SI(ISORCI)                                   C  30
 3    CONTINUE                                                       C  31
      TSTART=0.                                                      C  32
      A=AN/VEL                                                       C  33
      RZERO=TMAX*VEL                                                 C  34
      RETURN                                                         C  35
C                                                                    C  36
 4    FORMAT (2E10.3,I5)                                             C  37
 5    FORMAT (1X,2E10.3,I5)                                          C  38
 6    FORMAT (E10.3,I5)                                              C  39
      END                                                            C  40

      SUBROUTINE EINCF3 (T)                                          D   1
      CODE ANALYSIS                                                  D   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  D   3
C       EINCF3 IS FOR SCATTERING WITH AN INCIDENT GAUSSIAN PULSE     D   4
C       OF FORM: EINC=EO*EXP(-(A*(RDOTP+RO-C*T))**2)                 D   5
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      PARAMETER (NCOL=60)
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM
      COMMON/SCOMP/SX(NCOL),SY(NCOL),SZ(NCOL)
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT
      COMMON/EINC/EINC(NCOL),A,RZERO
      COMMON/TESNE/PX,PY,PZ,EX,EY,EZ,AN2
      DO 1 I=1,N
      ARG=X(I)*PX+Y(I)*PY+Z(I)*PZ+RZERO-T*VEL
      EINC(I)=EXP(-AN2*ARG*ARG)*(SX(I)*EX+SY(I)*EY+SZ(I)*EZ)
 1    CONTINUE
      RETURN
      ENTRY ESET3
      READ (2,2) THET,PHI,ET,RZERO,A
      WRITE (3,2) THET,PHI,ET,RZERO,A
      AN2=A*A
      ST=SIN(THET*0.01745329)
      CT=COS(THET*0.01745329)
      SP=SIN(PHI*0 01745329)
      CP=COS(PHI*0.01745329)
      SE=SIN(ET*0.01745329)
      CE=COS(ET*0.01745329)
      PX=-ST*CP
      PY=-ST*SP
      PZ=-CT
      EX=CT*CP*CE-SP*SE
      EY=CT*SP*CE+CP*SE
      EZ=-ST*CE
      TSTART=0.
      RETURN
C
 2    FORMAT (5F10.5)
      END


      SUBROUTINE CONSET
      CODE ANALYSIS
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C        THIS SUBROUTINE SETS SOME CONSTANTS
C
C        WILL HANDLE JUNCTIONS WHERE SEVERAL WIRES INTERSECT
C
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      PARAMETER (NCOL=60)
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM
      COMMON/INTERP/AT(3,NCOL),BT(3,NCOL),CT(3,NCOL),ES(3),FS(3),GS(3),
     $E(3),H(3),QI1,QI2,QI3
      COMMON/SCOMP/SX(NCOL),SY(NCOL),SZ(NCOL)
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT
      DO 5 I=1,N
      CALF=COS(ALP(I))
      SX(I)=CALF*COS(BET(I))
      SY(I)=CALF*SIN(BET(I))
      SZ(I)=SIN(ALP(I))
      IM=ICON1(I)
      IP=ICON2(I)
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +
```

```
C                                                                       E  25
C--------MULTIPLE JUNCTION -- USES AVERAGE SEGMENT LENGTH               E  26
C                                                                       E  27
      S=SI(I)                                                           E  28
      SIM=0.                                                            E  29
      SIP=0.                                                            E  30
      IF (IM.GE.0) GO TO 30                                             E  31
C---------A JUNCTION AT THE ICONI END OF THE ITH SEGMENT                E  32
      NJUN=0                                                            E  33
      DO 20 J=1,N                                                       E  34
      IF (J.EQ.I) GO TO 20                                              E  35
      JC1=ICON1(J)                                                      E  36
      JC2=ICON2(J)                                                      E  37
      IF (IM.EQ.JC1) GO TO 10                                           E  38
      IF (IM.EQ.JC2) GO TO 10                                           E  39
      GO TO 20                                                          E  40
 10   SIM=SIM+SI(J)                                                     E  41
      NJUN=NJUN+1                                                       E  42
 20   CONTINUE                                                          E  43
      SIM=SIM/NJUN                                                      E  44
C---------TRY THE OTHER END OF THE ITH SEGMENT                         E  45
 30   IF (IP.GE.0) GO TO 60                                             E  46
      NJUN=0                                                            E  47
      DO 50 J=1,N                                                       E  48
      IF (J.EQ.I) GO TO 50                                              E  49
      JC1=ICON1(J)                                                      E  50
      JC2=ICON2(J)                                                      E  51
      IF (IP.EQ.JC1) GO TO 40                                           E  52
      IF (IP.EQ.JC2) GO TO 40                                           E  53
      GO TO 50                                                          E  54
 40   SIP=SIP+SI(J)                                                     E  55
      NJUN=NJUN+1                                                       E  56
 50   CONTINUE                                                          E  57
      SIP=SIP/NJUN                                                      E  58
 60   IF (IM.GT.0) SIM=SI(IM)                                           E  59
      IF (IP.GT.0) SIP=SI(IP)                                           E  60
      DM=0.5*(S+SIM)                                                    E  61
      DP=0.5*(S+SIP)                                                    E  62
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   E  63
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   E  64
      D1=DM*(DM+DP)                                                     E  65
      D2=-DM*DP                                                         E  66
      D3=DP*(DM+DP)                                                     E  67
      AT(1,I)=1./D1                                                     E  68
      AT(2,I)=1./D2                                                     E  69
      AT(3,I)=1./D3                                                     E  70
      BT(1,I)=-DP/D1                                                    E  71
      BT(2,I)=(DM-DP)/D2                                                E  72
      BT(3,I)=DM/D3                                                     E  73
      CT(1,I)=0.                                                        E  74
      CT(2,I)=-DP*DM/D2                                                 E  75
      CT(3,I)=0.                                                        E  76
 5    CONTINUE                                                          E  77
      ES(1)=1./(2.*DT*DT)                                               E  78
      ES(2)=-2.*ES(1)                                                   E  79
      ES(3)=ES(1)                                                       E  80
      FS(3)=.5/DT                                                       E  81
      FS(1)=-FS(3)                                                      E  82
      FS(2)=0.                                                          E  83
      GS(1)=0.                                                          E  84
      GS(2)=1.                                                          E  85
```

```
      GS(3)=0.                                                          E  86
      C2=1./(VEL*VEL)                                                   E  87
      E(1)=ES(1)*C2                                                     E  88
      E(2)=ES(2)*C2                                                     E  89
      E(3)=ES(3)*C2                                                     E  90
      C2=-2./VEL                                                        E  91
      H(1)=ES(1)*C2                                                     E  92
      H(2)=ES(2)*C2                                                     E  93
      H(3)=ES(3)*C2                                                     E  94
      QI1=((ES(1)*DT/3.+.5*FS(1))*DT+GS(1))*DT                          E  95
      QI2=((ES(2)*DT/3.+.5*FS(2))*DT+GS(2))*DT                          E  96
      QI3=((ES(3)*DT/3.+.5*FS(3))*DT+GS(3))*DT                          E  97
      RETURN                                                            E  98
      END                                                               E  99


      SUBROUTINE LOADR                                                  F   1
      LCM (ARRAY)                                                       F   2
      CODE ANALYSIS                                                     F   3
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   F   4
C         THIS SUBROUTINE LOADS THE STRUCTURE WITH PURE RESISTANCE ONLY  F   5
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   F   6
      PARAMETER (NCOL=60,NTS=600)                                       F   7
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),       F   8
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                 F   9
      COMMON/ARRAY/CUR(NCOL,NTS),CIN(NCOL,NTS),CURF(NCOL,NCOL),IP(NCOL) F  10
      COMMON/ENSET/VSORC(20),AN,TMAX,NSORCS,ISORC(20),WZ                F  11
      COMMON/ITYP/ ITYPE                                                F  12
      COMMON/LODR/ZLOAD                                                 F  13
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   F  14
C   IOP=OPTION,   1= ALL LOADED, 2=  SEVERAL LOADED (OR ONLY ONE)       F  15
C   ZI=  OHMS/METER OF WIRE IF LOADING ENTIRE STRUCTURE(OPTION 1)       F  16
C   NL= NO. OF LOADED SEGMENTS FOR OPTION 2                           F  17
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   F  18
      ZLOAD=0.                                                          F  19
      READ(2,100) IOP,NL,ZI                                             F  20
  100 FORMAT (2I5,E11.3)                                                F  21
      WRITE (3,100) IOP,NL,ZI                                           F  22
      GO TO (1,2) IOP                                                   F  23
    1 DO 10 I=1,N                                                       F  24
      CURF(I,I)=CURF(I,I)-ZI                                            F  25
   10 CONTINUE                                                          F  26
      GO TO 1000                                                        F  27
    2 DO 20 I=1,NL                                                      F  28
C - - - - - - - - - - - -  - - - - - - - - - - - - - - - - - - - - -   F  29
C   IL= NO OF LOADED SEGMENT,  ZL= LOAD IN OHMS                        F  30
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   F  31
      READ (2,200) IL,ZL                                                F  32
  200 FORMAT (I5,E11.3)                                                 F  33
      WRITE (3,200) IL,ZL                                               F  34
C--------KEEP TRACK OF SOURCE REGION LOADING FOR ITOF                   F  35
      IF (ITYPE.EQ.3) GO TO 40                                          F  36
      DO 30 J=1,NSORCS                                                  F  37
      IS=ISORC(J)                                                       F  38
      IF (IS.NE.IL) GO TO 30                                            F  39
      ZLOAD=ZLOAD+ZL                                                    F  40
   30 CONTINUE                                                          F  41
   40 ZL=ZL/SI(IL)                                                      F  42
      CURF(IL,IL)=CURF(IL,IL)-ZL                                        F  43
   20 CONTINUE                                                          F  44
 1000 RETURN                                                            F  45
      END                                                               F  46
```

```
      SUBROUTINE ANTRAN                                                 G   1
      LCM (ARRAY)                                                       G   2
      CODE ANALYSIS                                                     G   3
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   G   4
C        THIS SUBROUTINE FILLS THE TRAN ARRAY WITH THE CURRENTS ON      G   5
C        SEGMENT NO. ISORC(1) FOR ANTENNA ADMITTANCE                    G   6
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   G   7
      PARAMETER (NCOL=60,NTS=600,ITR=1024)                              G   8
      DIMENSION TRAN(ITR)                                               G   9
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                G  10
      COMMON/ENSET/VSORC(20),AN,TMAX,NSORCS,ISORC(20),WZ                G  11
      COMMON/ARRAY/CUR(NCOL,NTS),CIN(NCOL,NTS),CURF(NCOL,NCOL),IP(NCOL) G  12
      NSORC=ISORC(1)                                                    G  13
      DO 1 I=1,NTSTEP                                                   G  14
      TRAN(I)=CUR(NSORC,I)                                              G  15
 1    CONTINUE                                                          G  16
      CALL ITOF (TRAN,NTSTEP,DT,MFORT,2)                                G  17
      RETURN                                                            G  18
      END                                                               G  19


      SUBROUTINE RADPAT                                                 H   1
      CODE ANALYSIS                                                     H   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   H   3
C       SUBROUTINE TO FILL TRAN ARRAY WITH VALUES OF FAR FIELDS         H   4
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   H   5
      PARAMETER (NCOL=60,NTS=600,ITRH=512,ITR=1024)                     H   6
      DIMENSION TRAN(ITR)                                               H   7
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                H   8
      COMMON/OUT/SOCUR(NTS),AWAVE(ITRH),ATIME(NTS),GNOT(ITRH),          H   9
     $SCAFLD(NTS),OGA(ITRH),XTIMSCA(NTS),GNOTI(ITRH),XLAB(4),YLAB(4),   H  10
     $LAB(8),LAB1(8),XILAB(4),YILAB(4),Y2LAB(4),Y3LAB(4),               H  11
     $Y4LAB(4),Y5LAB(4)                                                 H  12
      PI=3.141592654                                                    H  13
      TA=PI/180.                                                        H  14
 1    READ (2,4) THETA,PHI,ETA,STIME,DTIME,NTIME,ITRAN,NFLD             H  15
      WRITE (3,5)                                                       H  16
      WRITE (3,6)                                                       H  17
      WRITE (3,4) THETA,PHI,ETA,STIME,DTIME,NTIME,ITRAN,NFLD            H  18
      WRITE (3,7)                                                       H  19
      THET=THETA*TA                                                     H  20
      PHY=PHI*TA                                                        H  21
      ET=ETA*TA                                                         H  22
      TIME=STIME-DTIME                                                  H  23
      DO 2 I=1,NTIME                                                    H  24
      TIME=TIME+DTIME                                                   H  25
      XTIMSCA(I)=TIME/RATIO                                             H  26
      IMAX=I                                                            H  27
      CALL RFLD (TIME,THET,PHY,ET,ERP,ERQ                               H  28
      TRAN(I)=ERP                                                       H  29
      SCAFLD(I)=ERP                                                     H  30
      WRITE (3,8) I,TIME,ERP,ERQ                                        H  31
 2    CONTINUE                                                          H  32
      XTIMAX=XTIMSCA(IMAX)                                              H  33
      CALL AMINMX (SCAFLD,1,IMAX,1,SCAMIN,SCAMAX,M1,M2)                 H  34
      CALL PEEK (1,1,9,2,1H*,XTIMSCA,SCAFLD,IMAX,0.,XTIMAX,SCAMIN,SCAMAX H  35
     $,XLAB,Y2LAB,LAB,IND)                                              H  36
C--------PLOT ONLY OPTION                                              H  37
      IF (ITRAN.EQ.0) GO TO 3                                           H  38
      WRITE (3,9)                                                       H  39
      IF (ITRAN.EQ.2) GO TO 110                                         H  40
```

```
C--------RADAR CROSS SECTION IN ITOF                                    H  41
      CALL ITOF (TRAN,NTIME,DTIME,MFORT,1)                              H  42
      GO TO 3                                                           H  43
C--------ANTENNA GAIN IN ITOF                                           H  44
 110  CALL ITOF (TRAN,NTIME,DTIME,MFORT,3)                              H  45
 3    IF (NFLD.NE.0) GO TO 1                                            H  46
      RETURN                                                            H  47
C                                                                       H  48
 4    FORMAT (3F10.5,2E10.3,3I5)                                        H  49
 5    FORMAT (1H1,?FAR FIELDS?/)                                        H  50
 6    FORMAT (?     THETA      PHI      ETA        ST         DT    NT?)  H  51
 7    FORMAT (/?    I        TIME            EP              EQ?)       H  52
 8    FORMAT (1X,I5,E10.3,2E15.4)                                       H  53
 9    FORMAT (///? TRANSFORMED FIELDS?/)                                H  54
      END                                                               H  55


      SUBROUTINE RFLD (T,THET,PHI,ET,ERP,ERQ)                           I   1
      LCM (ARRAY)                                                       I   2
      CODE ANALYSIS                                                     I   3
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   I   4
C     SUBROUTINE TO EVALUATE VALUES OF RADIATED FIELDS                  I   5
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   I   6
C                                                                       I   7
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   I   8
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   I   9
C  THIS IS DESIGNED TO HANDLE MULTIPLE JUNCTIONS BY SIMPLY PERFORMING    I  10
C  THE INTERPOLATION FOR EACH SEGMENT CONNECTED TO A GIVEN JUNCTION      I  11
C  IN ESCENCE THIS IS AS IF THE INTERPOLATION IS TO THE SUM OF THE       I  12
C  CURRENTS ACROSS THE JUNCTION -- THIS HAS BEEN FOUND TO WORK IN        I  13
C  THE FREQ. DOMAIN CODE                                                I  14
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   I  15
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   I  16
C                                                                       I  17
      PARAMETER (NCOL=60,NTS=600)                                       I  18
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),       I  19
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                 I  20
      COMMON/INTERP/AT(3,NCOL),BT(3,NCOL),CT(3,NCOL),ES(3),FS(3),GS(3),  I  21
     $E(3),H(3),QI1,QI2,QI3                                             I  22
      COMMON/SCOMP/SX(NCOL),SY(NCOL),SZ(NCOL)                           I  23
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                I  24
      COMMON/ARRAY/CUR(NCOL,NTS),CIN(NCOL,NTS),CURF(NCOL,NCOL),IP(NCOL) I  25
      DIMENSION A(3),B(3),C(3),P(3),G(3),F(3)                           I  26
      STH=SIN(THET)                                                     I  27
      CTH=COS(THET)                                                     I  28
      SP=SIN(PHI)                                                       I  29
      CP=COS(PHI)                                                       I  30
      SE=SIN(ET)                                                        I  31
      CE=COS(ET)                                                        I  32
      ERX=STH*CP                                                        I  33
      ERY=STH*SP                                                        I  34
      ERZ=CTH                                                           I  35
      EPX=CTH*CP*CE-SP*SE                                               I  36
      EPY=CTH*SP*CE+CP*SE                                               I  37
      EPZ=-STH*CE                                                       I  38
      EQX=-CTH*CP*SE-SP*CE                                              I  39
      EQY=-CTH*SP*SE+CP*CE                                              I  40
      EQZ=STH*SE                                                        I  41
      ERP=0.                                                            I  42
      ERQ=0.                                                            I  43
      DO 4 I=1,N                                                        I  44
```

```
      JC1=ICON1(I)                                                      I  45
      JC2=ICON2(I)                                                      I  46
      XI=X(I.                                                           I  47
      YI=Y(I)                                                           I  48
      ZI=Z(I)                                                           I  49
      SXI=SX(I)                                                         I  50
      SYI=SY(I)                                                         I  51
      SZI=SZ(I)                                                         I  52
      AL=-(ERX*XI+ERY*YI+ERZ*ZI)                                        I  53
      BL=-(ERX*SXI+ERY*SYI+ERZ*SZI)                                     I  54
      TRET=T-AL/VEL                                                     I  55
      TAU=TRET-TSTART                                                   I  56
      IF (TAU.EQ.0) TAU=1.E-100                                         I  57
      SNGCNG=TAU/ABS(TAU)                                               I  58
      K=TAU/DT+(SNGCNG*0.5)                                             I  59
      K=K+1                                                             I  60
      IF (K.LT.0) GO TO 4                                               I  61
      TAU=T-TSTART-(K-1)*DT                                             I  62
      DO 1 L=1,3                                                        I  63
      A(L)=AT(L,I)                                                      I  64
      B(L)=BT(L,I)                                                      I  65
      C(L)=CT(L,I)                                                      I  66
      P(L)=2.*ES(L)*TAU+FS(L)                                           I  67
      G(L)=(ES(L)*TAU+FS(L))*TAU+GS(L)                                  I  68
      F(L)=-P(L)/VEL                                                    I  69
 1    CONTINUE                                                          I  70
      EL=SI(I)                                                          I  71
      ELC=EL*EL*EL/12.                                                  I  72
      KM2=K-2                                                           I  73
      SDOTP=SXI*EPX+SYI*EPY+SZI*EPZ                                     I  74
      SDOTQ=SXI*EQX+SYI*EQY+SZI*EQZ                                     I  75
      T3=0.                                                             I  76
C                                                                       I  77
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   I  78
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   I  79
C                                                                       I  80
C--------DO SELF TERMS -- IE THOSE WITHOUT SIG1 OR SIG2                  I  81
      DO 102 M=1,3                                                      I  82
      MX=KM2+M                                                          I  83
      IF (MX.LT.1) GO TO 102                                            I  84
      IF (MX.GT.NTSTEP) GO TO 20                                        I  85
      T1=H(M)*AL+P(M)                                                   I  86
      T2=H(M)*BL                                                        I  87
      T3=T3+((A(2)*T1+B(2)*T2)*ELC+C(2)*T1*EL)*CUR(I,MX)                I  88
 102  CONTINUE                                                          I  89
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   I  90
C  DO JC1 TERMS -- IE INTERPOLATION AT THE ICON1 END OF THE ITH SEGMENT  I  91
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   I  92
      L=N+1                                                             I  93
      IF (JC1.NE.0) GO TO 103                                           I  94
      GO TO 114                                                         I  95
 103  IF (JC1.LT.0) GO TO 106                                           I  96
      IF (ICON2(JC1).NE.I) GO TO 104                                    I  97
      SIG1=1.                                                           I  98
      GO TO 110                                                         I  99
 104  IF (ICON1(JC1).NE.I) GO TO 105                                    I 100
      SIG1=-1.                                                          I 101
      GO TO 110                                                         I 102
 105  CALL EXIT                                                         I 103
C--------WE HAVE A JUNCTION AT THE ICON1 END OF THE ITH SEGMENT         I 104
 106  JUN1=JC1                                                          I 105
```

```
      L=0                                                                  | 106
  107 L=L+1                                                                | 107
      IF (L.GT.N) GO TO 114                                                | 108
      IF (ICON2(L).NE.JUN1) GO TO 108                                      | 109
C--------WE HAVE A SEGMENT CONNECTED TO I AT THE JUNCTION                  | 110
      IF (L.EQ.I) GO TO 107                                                | 111
      SIG1=1.                                                              | 112
      GO TO 109                                                            | 113
C--------IF OTHER END NOT CONNECTED, TRY NEXT SEGMENT                     | 114
  108 IF (ICON1(L).NE.JUN1) GO TO 107                                      | 115
      IF (L.EQ.I) GO TO 107                                                | 116
      SIG1=-1.                                                             | 117
  109 JC1=L                                                                | 118
  110 CONTINUE                                                             | 119
      DO 201 M=1,3                                                         | 120
      MX=KM2+M                                                             | 121
      IF (MX.LT.1) GO TO 201                                               | 122
      IF (MX.GT.NTSTEP) GO TO 20                                           | 123
      T1=H(M)*AL+P(M)                                                      | 124
      T2=H(M)*BL                                                           | 125
      T3=T3+((A(I)*T1+B(I)*T2)*ELC+C(I)*T1*EL)*CUR(JC1,MX)*SIG1            | 126
  201 CONTINUE                                                             | 127
      IF (L.LT.N) GO TO 107                                                | 128
C--------NOW DO THE ICON2 TERMS -- IE THE OTHER END OF THE ITH SEGMENT     | 129
  114 L=N+1                                                                | 130
      IF (JC2.NE.0) GO TO 115                                              | 131
      GO TO 125                                                            | 132
  115 IF (JC2.LT.0) GO TO 117                                              | 133
      IF (ICON1(JC2).NE.I) GO TO 116                                       | 134
      SIG2=1.                                                              | 135
      GO TO 121                                                            | 136
  116 IF (ICON2(JC2).NE.1) GO TO 105                                       | 137
      SIG2=-1.                                                             | 138
      GO TO 121                                                            | 139
C--------A JUNCTION AT THE ICON2 END OF THE ITH SEGMENT                   | 140
  117 JUN2=JC2                                                             | 141
      L=0                                                                  | 142
  118 L=L+1                                                                | 143
      IF (L.GT.N) GO TO 125                                                | 144
      IF (ICON1(L).NE.JUN2) GO TO 119                                      | 145
C--------WE HAVE A SEGMENT CONNECTED TO I AT THE JUNCTION                  | 146
      IF (L.EQ.I) GO TO 118                                                | 147
      SIG2=1.                                                              | 148
      GO TO 120                                                            | 149
C--------IF OTHER END NOT CONNECTED, TRY NEXT SEGMENT                     | 150
  119 IF (ICON2(L).NE.JUN2) GO TO 118                                      | 151
      IF (L.EQ.I) GO TO 118                                                | 152
      SIG2=-1.                                                             | 153
  120 JC2=L                                                                | 154
  121 CONTINUE                                                             | 155
      DO 124 M=1,3                                                         | 156
      MX=KM2+M                                                             | 157
      IF (MX.LT.1) GO TO 124                                               | 158
      IF (MX.GT.NTSTEP) GO TO 20                                           | 159
      T1=H(M)*AL+P(M)                                                      | 160
      T2=H(M)*BL                                                           | 161
      T3=T3+((A(3)*T1+B(3)*T2)*ELC+C(3)*T1*EL)*CUR(JC2,MX)*SIG2            | 162
  124 CONTINUE                                                             | 163
      IF (L.LT.N) GO TO 118                                                | 164
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + | 165
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + | 166
```

```
  125  ERP=ERP+T3*SDOTP                                                  I 167
       ERQ=ERQ+T3*SDOTQ                                                  I 168
  4    CONTINUE                                                          I 169
       ERP=-1.E-7*ERP                                                    I 170
       ERQ=-1.E-7*ERQ                                                    I 171
       RETURN                                                            I 172
  20   WRITE (3,21) T,THET,PHI,ET                                        I 173
  21   FORMAT (? FLD. INTERVAL EXCEEDS TIME ARRAY?,E10.3,3F10.5)         I 174
       RETURN                                                            I 175
       END                                                               I 176


       SUBROUTINE ITOF (TRAN,NT,DT,M,MODE)                               J   1
       CODE ANALYSIS                                                     J   2
C                                                                        J   3
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   J   4
C        THIS IS A SUBROUTINE TO FIND THE FREQUENCY RESPONSE BY          J   5
C        PERFORMING A FOURIER TRANSFORM OF THE TIME DOMAIN DATA          J   6
C                                                                        J   7
C        RADAR CROSS SECTIN IS MODE=1                                    J   8
C        ANTENNA DRIVING POINT ADMITTANCE IS MODE=2                      J   9
C        ANTENNA GAIN IS MODE=3 -- MODE=2 MUST BE CALLED FIRST           J  10
C                                                                        J  11
C        AN EXTRAPOLATION BY A DAMPED SINUSIOD                           J  12
C        WILL BE PERFORMED IF POSSIBLE                                   J  13
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   J  14
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   J  15
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   J  16
C        THIS REMOVES THE EFFECTS OF DRIVING POINT LOADING FOR ANTENNAS  J  17
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   J  18
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +   J  19
C                                                                        J  20
      PARAMETER (NCOL=60,ITR=1024,ITRH=512,ITRT=2048,NTS=600)            J  21
      COMPLEX FJ,XIN,CURC,FRAN,XMLTT                                     J  22
      DIMENSION TRAN(ITR),A(ITRT),S(ITRH),FRAN(ITR)                      J  23
      DIMENSION TZERO(100),AMAX(100),TEXT(100)                           J  24
      DIMENSION CURCEQ(2)                                                J  25
      COMMON/ITYP/ ITYPE                                                 J  26
      COMMON/OUT/SOCUR(NTS),AWAVE(ITRH),ATIME(NTS),GNOT(ITRH),           J  27
     $SCAFLD(NTS),OGA(ITRH),XTIMSCA(NTS),GNOTI(ITRH),XLAB(4),YLAB(4),    J  28
     $LAB(8),LAB1(8),X1LAB(4),Y1LAB(4),Y2LAB(4),Y3LAB(4),                J  29
     $Y4LAB(4),Y5LAB(4)                                                  J  30
      COMMON/ENSET/VSORC(20),AN,TMAX,NSORCS,ISORC(20),WZ                 J  31
      COMMON/EINC/EINC(NCOL),AAA,RZERO                                   J  32
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                 J  33
      COMMON/LODR/ZLOAD                                                  J  34
      EQUIVALENCE (FRAN,A),(CURC,CURCEQ)                                 J  35
      IF (TMAX.EQ.0.0) TMAX=RZERO/VEL                                    J  36
      IF (AN.EQ.0.0) AN=AAA*VEL                                          J  37
C---------SET SOME CONSTANTS                                            J  38
      FJ=CMPLX(0.,1.)                                                    J  39
      PI=3.141592654                                                     J  40
      TP=2.*PI                                                           J  41
      N=2**M                                                             J  42
      N2=2*N                                                             J  43
      NOT=N/2                                                            J  44
      IF (NT.LT.N) GO TO 1                                               J  45
      NT=N                                                               J  46
      GO TO 13                                                           J  47
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C        EXTRAPOLATION NEXT
C        SET VALUES TO FIND ZEROS AND MAXIMUMS
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 1    NTM=NT-1
      NTP=NT+1
      ITZ=0
      ITM=0
      DO 4 I=3,NTM
      TRA=TRAN(I-1)
      TRB=TRAN(I)
      TRC=TRAN(I+1)
      IF (TRA.EQ.0) GO TO 2
      IF (TRA*TRB.GT.0.) GO TO 2
C--------FIND ZEROS AND THEIR TIME VALUES
      ITZ=ITZ+1
      TIMB=(I-1)*DT
      TIMA=TIMB-DT
      TZERO(ITZ)=TIMA+DT*ABS(TRA/(TRA-TRB))
C--------FIND THE MAXIMUMS AND THEIR TIME VALUES
 2    ATRA=ABS(TRA)
      ATRB=ABS(TRB)
      ATRC=ABS(TRC)
      IF (ATRB.GT.ATRA.AND.ATRB.GE.ATRC) GO TO 3
      GO TO 4
 3    ITM=ITM+1
      TIMB=(I-1)*DT
      TMAXI=-.5*DT*(TRC-TRA)/(TRA-2.*TRB+TRC)
      TEXT(ITM)=TMAXI+TIMB
      TMODT=TMAXI/DT
      AMAX(ITM)=(.5*TRA-TRB+.5*TRC)*TMODT*TMODT+(TRC-TRA)*.5*TMODT+TRB
 4    CONTINUE
C--------SET ALPHA, THE ATTENUATION CONSTANT
      ALFA=0.
      ICOUNT=0
      ISSS=2
      AMAXL=AMAX(2)
      DO 7 I=3,ITM
      AMAXI=AMAX(I)
      IF (AMAXI*AMAXL.GE.0.) GO TO 5
      ICOUNT=ICOUNT+1
      AMAXR=-AMAXI/AMAXL
      IF (AMAXR.GT.1.) GO TO 5
      ALFA=ALFA+LOGF(AMAXR)/(TEXT(I-1)-TEXT(I))
      GO TO 6
 5    ICOUNT=0
      ISSS=I
      ALFA=0.
 6    AMAXL=AMAXI
 7    CONTINUE
      IF (ICOUNT.LT.2) GO TO 11
      ALFA=ALFA/ICOUNT
      TMAXI=TEXT(ISSS)
C--------CALCULATE PERIOD AND ANGULAR FREQUENCY
      DO 8 I=1,ITZ
      ICOUNT=I
      IF (TZERO(I).GT.TMAXI) GO TO 9
 8    CONTINUE
      GO TO 11
 9    PERI=2.*(TZERO(ITZ)-TZERO(ICOUNT))/(ITZ-ICOUNT)
```

```
      OMEGA=TP/PERI                                                    J 108
      TZERX=TZERO(ITZ)                                                 J 109
      TEND=(NT-1)*DT                                                   J 110
      AMX=TRAN(NT)/SIN(OMEGA*(TEND-TZERX))                             J 111
      WRITE (3,28) ALFA,OMEGA                                          J 112
C---------DO ACTUAL EXTRAPOLATION OF TRANSFORM ARRAY                   J 113
      DO 10 I=NTP,N                                                    J 114
      TIM=(I-1)*DT                                                     J 115
      TRAN(I)=AMX*EXP(-ALFA*(TIM-TEND))*SIN(OMEGA*(TIM-TZERX))         J 116
 10   CONTINUE                                                         J 117
      GO TO 13                                                         J 118
 11   WRITE (3,29)                                                     J 119
      DO 12 I=NTP,N                                                    J 120
      TRAN(I)=0.                                                       J 121
 12   CONTINUE                                                         J 122
 13   WRITE (3,30) (TRAN(I),I=1,N)                                     J 123
 14   CONST=DT*N*AN/SQRT(PI)                                           J 124
      ANT=2.*AN                                                        J 125
      DO 15 I=1,N2                                                     J 126
      A(I)=0.                                                          J 127
 15   CONTINUE                                                         J 128
      DO 16 I=1,N                                                      J 129
      A(2*I-1)=TRAN(I)                                                 J 130
 16   CONTINUE                                                         J 131
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    J 132
C        CALL FORT TO PERFORM THE FOURIER TRANSFORM                    J 133
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    J 134
      CALL FORT (A,M,S,-1,IFERR)                                       J 135
      DFREQ=1./(DT*N)                                                  J 136
      GO TO (17,18,100), MODE                                          J 137
 17   WRITE (3,31)                                                     J 138
      GO TO 19                                                         J 139
 18   WRITE (3,32)                                                     J 140
      GO TO 19                                                         J 141
 100  WRITE (3,210)                                                    J 142
 19   DO 24 I=1,NOT                                                    J 143
      I2=2*I                                                           J 144
      AR=A(I2-1)*CONST                                                 J 145
      AI=A(I2)*CONST                                                   J 146
      FREQ=(I-1)*DFREQ                                                 J 147
      W=FREQ*TP                                                        J 148
C---------CORRECT TRANSFORM BY SPECTRUM OF INPUT WAVEFORM USED         J 149
      GO TO (110,120,120), ITYPE                                       J 150
 110  IF (W.EQ.0) GO TO 24                                             J 151
      ARG=(W-WZ)/ANT                                                   J 152
      XI=2.*EXP(ARG*ARG)/(1.-EXP(-W*WZ/(AN*AN)))                       J 153
      XMLTT=CMPLX(-SIN(W*TMAX),COS(W*TMAX))                            J 154
      XIN=XI*XMLTT                                                     J 155
      GO TO 130                                                        J 156
 120  ARG=W/ANT                                                        J 157
      XIN=EXP(ARG*ARG)*CEXP(FJ*W*TMAX)                                 J 158
 130  IF (CABS(XIN).GT.1.E+10) GO TO 24                                J 159
      CURC=CMPLX(AR,AI)*XIN                                            J 160
      A(I2-1)=REAL(CURC)                                               J 161
      A(I2)=AIMAG(CURC)                                                J 162
      AWAVE(I)=(WLEN*FREQ)/VEL                                         J 163
C---------CALCULATE THE DESIRED RESPONSE DEPENDING ON MODE             J 164
      GO TO (20,23,140), MODE                                          J 165
 20   IF (I.EQ.1) GO TO 21                                             J 166
      WLAM=3.E+8/FREQ                                                  J 167
      GO TO 22                                                         J 168
```

```
 21    WLAM=1.E+100                                                          J 169
 22    EMAG=CABS(FRAN(I))                                                    J 170
       IF(EMAG.EQ.0.) GO TO 24                                               J 171
       EMAG2=EMAG*EMAG                                                       J 172
       SIGA=4.*PI*EMAG2/(WLAM*WLAM)                                          J 173
       OG=10.0*(LOGF(SIGA)/LOGF(10.0))                                       J 174
       OGA(I)=OG                                                             J 175
       WRITE (3,33) I,FREQ,WLAM,EMAG,SIGA,OG                                 J 176
       GO TO 24                                                              J 177
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +    J 178
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +    J 179
 23    ADMAG=CABS(FRAN(I))                                                   J 180
       IF(ADMAG.EQ.0.) GO TO 24                                              J 181
       CURC=1./FRAN(I)                                                       J 182
       CURCEQ(I)=CURCEQ(I)-ZLOAD                                             J 183
       ZMAG=CABS(CURC)                                                       J 184
       IF(ZMAG.EQ.0.) GO TO 24                                               J 185
       FRAN(I)=1./CURC                                                       J 186
       ADMAG=1./ZMAG                                                         J 187
       GNOT(I)=A(2*I-1)                                                      J 188
       GNOTI(I)=A(2*I)                                                       J 189
       GNMAX=2.5E-2                                                          J 190
       GNOTIMX=2.0E-2                                                        J 191
       GNOTIMN=-2.0E-2                                                       J 192
       WRITE (3,34) I,FREQ,A(2*I-1),A(2*I),ADMAG,CURCEQ(1),CURCEQ(2),ZMAG    J 193
       GO TO 24                                                              J 194
 140   IF (I.EQ.1) GO TO 221                                                 J 195
       WLAM=3.E+8/FREQ                                                       J 196
       GO TO 222                                                             J 197
 221   WLAM=1.E+100                                                          J 198
 222   EMAG=CABS(FRAN(I))                                                    J 199
       EMAG2=EMAG*EMAG                                                       J 200
       CURC=1./CMPLX(GNOT(I),GNOTI(I))                                       J 201
       IF(CURCEQ(1).EQ.0.) GO TO 24                                          J 202
       GAIN=EMAG2*((CURCEQ(1)+ZLOAD)**2+CURCEQ(2)**2)/(30.*CURCEQ(1))        J 203
       IF(GAIN.LE.0.) GO TO 24                                               J 204
       DGAIN=10.*(LOGF(GAIN)/LOGF(10.))                                      J 205
       OGA(I)=DGAIN                                                          J 206
       WRITE (3,33) I,FREQ,WLAM,EMAG,GAIN,DGAIN                              J 207
 24    CONTINUE                                                              J 208
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +    J 209
C + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + +    J 210
       IMAX=NOT/2                                                            J 211
       AWMAX=AWAVE(IMAX)                                                     J 212
C--------PLOT THE RESULTS                                                   J 213
       GO TO (26,25,150), MODE                                               J 214
 25    CALL PEEK (1,1,9,2,1H*,AWAVE,GNOT,IMAX,0.0,AWMAX,0.,GNMAX,X1LAB,      J 215
      $Y1LAB,LAB1,IND)                                                       J 216
       CALL PEEK (1,1,9,2,1H*,AWAVE,GNOTI,IMAX,0.0,AWMAX,GNOTIMN,GNOTIMX,    J 217
      $X1LAB,Y4LAB,LAB1,IND)                                                 J 218
       GO TO 27                                                              J 219
 26    CALL PEEK (1,1,9,2,1H*,AWAVE,OGA,IMAX,0.,AWMAX,-30.,20.,X1LAB,        J 220
      $Y3LAB,LAB1,IND)                                                       J 221
       GO TO 27                                                              J 222
 150   CALL PEEK (1,1,9,2,1H*,AWAVE,OGA,IMAX,0.,AWMAX,-30.,20.,              J 223
      $X1LAB,Y5LAB,LAB1,IND)                                                 J 224
 27    RETURN                                                                J 225
C                                                                           J 226
 28    FORMAT (2E15.5//)                                                     J 227
 29    FORMAT (? EXTRAPOLATION OF TIME FUNCTION NOT POSSIBLE?)               J 228
 30    FORMAT (/? TRAN ARRAY VALUES.?,/(1X,10E11.3))                         J 229
```

```
 31   FORMAT (5X,?I?,11X,?FREQ.?,9X,?LAM.?,12X,?EMAG?,8X,?SIG/L?,11X,?OG  J 230
     $?)                                                                  J 231
 32   FORMAT (?1I?,5X,?FREQ.?,16X,?-ADMITTANCE-?,25X,?-IMPEDANCE-?/,24X,  J 232
     $?R?,11X,?I?,9X,?MAG.?,11X,?R?,11X,?I?,9X,?MAG.?)                   J 233
 33   FORMAT (1X,I5,3X,2E13.5,3X,2E13.5,F13.5)                            J 234
 34   FORMAT (1X,I4,E12.4,2(E13.5,2E12.5))                                J 235
 210  FORMAT (5X,?I?,11X,?FREQ?,9X,?LAM.?,12X,?EMAG?,                    J 236
     $8X,?ANT. GAIN?,7X,?GAIN-DB?)                                        J 237
      END                                                                 J 238


      SUBROUTINE FORT (A,M,S,IFS,IFERR)                                   K   1
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   K   2
C     FOURIER TRANSFORM SUBROUTINE, PROGRAMMED IN SYSTEM/360,             K   3
C     BASIC PROGRAMMING SUPPORT, FORTRAN IV. FORM C28-6504                K   4
C     THIS DECK SET UP FOR IBSYS ON IBM 7094.                             K   5
C                                                                         K   6
C     DOES EITHER FOURIER SYNTHESIS,I.E.,COMPUTES COMPLEX FOURIER SERIES  K   7
C     GIVEN A VECTOR OF N COMPLEX FOURIER AMPLITUDES,OR, GIVEN A VECTOR   K   8
C     OF COMPLEX DATA X DOES FOURIER ANALYSIS, COMPUTING AMPLITUDES.      K   9
C     A IS A COMPLEX VECTOR OF LENGTH N=2**M COMPLEX NOS. OR 2*N REAL     K  10
C     NUMBERS. A IS TO BE SET BY USER.                                    K  11
C     M  IS AN INTEGER 0.LT.M.LE.13, SET BY USER.                         K  12
C     S IS A VECTOR S(J)= SIN(2*PI*J/NP ), J=1,2,....,NP/4-1,             K  13
C     COMPUTED BY PROGRAM.                                                K  14
C     IFS IS A PARAMETER TO BE SET BY USER AS FOLLOWS-                    K  15
C     IFS=0 TO SET NP=2**M AND SET UP SINE TABLE.                         K  16
C     IFS=1 TO SET N=NP=2**M, SET UP SIN TABLE, AND DO FOURIER            K  17
C     SYNTHESIS, REPLACING THE VECTOR A BY                                K  18
C                                                                         K  19
C     X(J)= SUM OVER K=0,N-1 OF A(K)*EXP(2*PI*I/N)**(J*K),                K  20
C     J=0,N-1, WHERE I=SQRT(-1)                                           K  21
C                                                                         K  22
C     THE  X'S  ARE STORED WITH   RE X(J) IN CELL  2*J+1                  K  23
C     AND  IM X(J)  IN CELL  2*J+2  FOR  J=0,1,2,....,N-1.                K  24
C     THE  A'S  ARE STORED IN THE SAME MANNER.                            K  25
C                                                                         K  26
C     IFS=-1   TO SET  N=NP=2**M,SET UP SIN TABLE, AND DO FOURIER         K  27
C     ANALYSIS, TAKING THE INPUT VECTOR A AS X AND                        K  28
C     REPLACING IT BY THE A  SATISFYING THE ABOVE FOURIER SERIES.         K  29
C     IFS=+2 TO DO FOURIER SYNTHESIS ONLY, WITH A PRE-COMPUTED S.         K  30
C     IFS=-2 TO DO FOURIER ANALYSIS ONLY, WITH A PRE-COMPUTED S.          K  31
C     IFERR   IS SET BY PROGRAM TO-                                       K  32
C     =0 IF NO ERROR DETECTED.                                            K  33
C     =1 IF M IS OUT OF RANGE., OR, WHEN IFS=+2,-2, THE                   K  34
C     PRE-COMPUTED S TABLE IS NOT LARGE ENOUGH.                           K  35
C     =-1 WHEN IFS =+1,-1, MEANS ONE IS RECOMPUTING S TABLE               K  36
C     UNNECESSARILY.                                                      K  37
C                                                                         K  38
C     NOTE- AS STATED ABOVE, THE MAXIMUM VALUE OF M FOR THIS PROGRAM      K  39
C     ON THE IBM 7094 IS 13. FOR 360 MACHINES HAVING GREATER STORAGE      K  40
C     CAPACITY, ONE MAY INCREASE THIS LIMIT BY REPLACING 13 IN            K  41
C     STATEMENT 3 BELOW BY LOG2 N, WHERE N IS THE MAX. NO. OF             K  42
C     COMPLEX NUMBERS ONE CAN STORE IN HIGH-SPEED CORE.  ONE MUST         K  43
C     ALSO ADD MORE  DO  STATEMENTS TO THE BINARY SORT ROUTINE            K  44
C     FOLLOWING STATEMENT  24  AND CHANGE THE EQUIVALENCE STATEMENTS      K  45
C     FOR THE  K'S.                                                       K  46
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   K  47
```

```
      DIMENSION A(1), S(1), K(14)                                        K  48
      EQUIVALENCE (K(13),K1), (K(12),K2), (K(11),K3), (K(10),K4)         K  49
      EQUIVALENCE (K(9),K5), (K(8),K6), (K(7),K7), (K(6),K8)             K  50
      EQUIVALENCE (K(5),K9), (K(4),K10), (K(3),K11), (K(2),K12)          K  51
      EQUIVALENCE (K(1),K13), (K(1),N2)                                  K  52
      IF (M) 2,2,1                                                       K  53
    1 IF (M-13) 4,4,2                                                    K  54
    2 IFERR=1                                                            K  55
    3 RETURN                                                             K  56
    4 IFERR=0                                                            K  57
      N=2**M                                                             K  58
      IF (IABS(IFS)-1) 25,25,5                                           K  59
C     WE ARE DOING TRANSFORM ONLY. SEE IF PRE-COMPUTED                   K  60
C     S TABLE IS SUFFICIENTLY LARGE                                      K  61
    5 IF (N-NP) 7,7,6                                                    K  62
    6 IFERR=1                                                            K  63
      GO TO 25                                                           K  64
C     SCRAMBLE A, BY SANDE'S METHOD                                      K  65
    7 K(1)=2*N                                                           K  66
      DO 8 L=2,M                                                         K  67
      K(L)=K(L-1)/2                                                      K  68
    8 CONTINUE                                                           K  69
      DO 9 L=M,12                                                        K  70
      K(L+1)=2                                                           K  71
    9 CONTINUE                                                           K  72
C     NOTE EQUIVALENCE OF KL AND K(14-L)                                 K  73
C     BINARY SORT-                                                       K  74
      IJ=2                                                               K  75
      DO 11 J1=2,K1,2                                                    K  76
      DO 11 J2=J1,K2,K1                                                  K  77
      DO 11 J3=J2,K3,K2                                                  K  78
      DO 11 J4=J3,K4,K3                                                  K  79
      DO 11 J5=J4,K5,K4                                                  K  80
      DO 11 J6=J5,K6,K5                                                  K  81
      DO 11 J7=J6,K7,K6                                                  K  82
      DO 11 J8=J7,K8,K7                                                  K  83
      DO 11 J9=J8,K9,K8                                                  K  84
      DO 11 J10=J9,K10,K9                                                K  85
      DO 11 J11=J10,K11,K10                                              K  86
      DO 11 J12=J11,K12,K11                                              K  87
      DO 11 JI=J12,K13,K12                                               K  88
      IF (IJ-JI) 10,11,11                                                K  89
   10 T=A(IJ-1)                                                          K  90
      A(IJ-1)=A(JI-1)                                                    K  91
      A(JI-1)=T                                                          K  92
      T=A(IJ)                                                            K  93
      A(IJ)=A(JI)                                                        K  94
      A(JI)=T                                                            K  95
   11  IJ=IJ+2                                                           K  96
      IF (IFS) 12,2,14                                                   K  97
C     DOING FOURIER ANALYSIS,SO DIV. BY N AND CONJUGATE.                 K  98
   12 FN=N                                                               K  99
      DO 13 I=1,N                                                        K 100
      A(2*I-1)=A(2*I-1)/FN                                               K 101
      A(2*I)=-A(2*I)/FN                                                  K 102
   13 CONTINUE                                                           K 103
C     SPECIAL CASE- L=1                                                  K 104
   14 DO 15 I=1,N,2                                                      K 105
      T=A(2*I-1)                                                         K 106
      A(2*I-1)=T+A(2*I+1)                                                K 107
      A(2*I+1)=T-A(2*I+1)                                                K 108
```

```
      T=A(2*I)                                                          K 109
      A(2*I)=T+A(2*I+2)                                                 K 110
      A(2*I+2)=T-A(2*I+2)                                               K 111
 15   CONTINUE                                                          K 112
      IF (M-1) 2,3,16                                                   K 113
C     SET FOR L=2                                                       K 114
 16   LEXP1=2                                                           K 115
C     LEXP1=2**(L-1)                                                    K 116
      LEXP=8                                                            K 117
C     LEXP=2**(L+1)                                                     K 118
      NPL=2**MT                                                         K 119
C     NPL = NP* 2**-L                                                   K 120
      DO 22 L=2,M                                                       K 121
C     SPECIAL CASE- J=0                                                 K 122
      DO 17 I=2,N2,LEXP                                                 K 123
      I1=I+LEXP1                                                        K 124
      I2=I1+LEXP1                                                       K 125
      I3=I2+LEXP1                                                       K 126
      T=A(I-1)                                                          K 127
      A(I-1)=T+A(I2-1)                                                  K 128
      A(I2-1)=T-A(I2-1)                                                 K 129
      T=A(I)                                                            K 130
      A(I)=T+A(I2)                                                      K 131
      A(I2)=T-A(I2)                                                     K 132
      T=-A(I3)                                                          K 133
      TI=A(I3-1)                                                        K 134
      A(I3-1)=A(I1-1)-T                                                 K 135
      A(I3)=A(I1)-TI                                                    K 136
      A(I1-1)=A(I1-1)+T                                                 K 137
      A(I1)=A(I1)+TI                                                    K 138
 17   CONTINUE                                                          K 139
      IF (L-2) 21,21,18                                                 K 140
 18   KLAST=N2-LEXP                                                     K 141
      JJ=NPL                                                            K 142
      DO 20 J=4,LEXP.,2                                                 K 143
      NPJJ=N1-JJ                                                        K 144
      UR=S(NPJJ)                                                        K 145
      UI=S(JJ)                                                          K 146
      ILAST=J+KLAST                                                     K 147
      DO 19 I=J,ILAST,LEXP                                              K 148
      I1=I+LEXP1                                                        K 149
      I2=I1+LEXP1                                                       K 150
      I3=I2+LEXP1                                                       K 151
      T=A(I2-1)*UR-A(I2)*UI                                             K 152
      TI=A(I2-1)*UI+A(I2)*UR                                            K 153
      A(I2-1)=A(I-1)-T                                                  K 154
      A(I2)=A(I)-TI                                                     K 155
      A(I-1)=A(I-1)+T                                                   K 156
      A(I)=A(I)+TI                                                      K 157
      T=-A(I3-1)*UI-A(I3)*UR                                            K 158
      TI=A(I3-1)*UR-A(I3)*UI                                            K 159
      A(I3-1)=A(I1-1)-T                                                 K 160
      A(I3)=A(I1)-TI                                                    K 161
      A(I1-1)=A(I1-1)+T                                                 K 162
      A(I1)=A(I1)+TI                                                    K 163
 19   CONTINUE                                                          K 164
C     END OF I LOOP                                                     K 165
      JJ=JJ+NPL                                                         K 166
 20   CONTINUE                                                          K 167
C     END OF J LOOP                                                     K 168
 21   LEXP1=2*LEXP1                                                     K 169
```

```
      LEXP=2*LEXP                                                        K 170
      NPL=NPL/2                                                          K 171
 22   CONTINUE                                                           K 172
C     END OF L LOOP                                                      K 173
      IF (IFS) 23,2,3                                                    K 174
C     DOING FOURIER ANALYSIS. REPLACE A BY CONJUGATE.                    K 175
 23   DO 24 I=1,N                                                        K 176
      A(2*I)=-A(2*I)                                                     K 177
 24   CONTINUE                                                           K 178
      GO TO 3                                                            K 179
C     RETURN                                                             K 180
C     MAKE TABLE OF S(J)=SIN(2*PI*J/NP),J=1,2,....NT-1,NT=NP/4           K 181
 25   NP=N                                                               K 182
      MP=M                                                               K 183
      NT=N/4                                                             K 184
      MT=M-2                                                             K 185
      IF (MT) 31,31,26                                                   K 186
 26   THETA=.785398!634                                                  K 187
C     THETA=PI/2**(L+1)     FOR L=1                                      K 188
      JSTEP=NT                                                           K 189
C     JSTEP = 2**( MT-L+1 ) FOR L=1                                      K 190
      JDIF=NT/2                                                          K 191
C     JDIF = 2**(MT-L)  FOR L=1                                          K 192
      S(JDIF)=SIN(THETA)                                                 K 193
      IF (MT-2) 31,27,27                                                 K 194
 27   DO 30 L=2,MT                                                       K 195
      THETA=THETA/2.                                                     K 196
      JSTEP2=JSTEP                                                       K 197
      JSTEP=JDIF                                                         K 198
      JDIF=JDIF/2                                                        K 199
      S(JDIF)=SIN(THETA)                                                 K 200
      JC1=NT-JDIF                                                        K 201
      S(JC1)=COS(THETA)                                                  K 202
      JLAST=NT-JSTEP2                                                    K 203
      IF (JLAST-JSTEP) 30,28,28                                          K 204
 28   DO 29 J=JSTEP,JLAST,JSTEP                                          K 205
      JC=NT-J                                                            K 206
      JD=J+JDIF                                                          K 207
 29   S(JD)=S(J)*S(JC1)+S(JDIF)*S(JC)                                    K 208
 30   CONTINUE                                                           K 209
 31   IF (IFS) 7,3,7                                                     K 210
      END                                                                K 211


      SUBROUTINE EMAT                                                    L   1
      CODE ANALYSIS                                                      L   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    L   3
C        A SUBROUTINE TO SET CONSTANTS AND CALL INTEG TO FIND THE        L   4
C        VALUES OF THE REQUIRED INTEGRALS FOR MAIN TO USE IN             L   5
C        CALCULATING THE TANGENTIAL FIELDS ON AN OBSERVATION SEGMENT     L   6
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    L   7
      PARAMETER (NCOL=60)                                                L   8
      DIMENSION A(3),B(3),C(3),P(3),G(3),F(3)                            L   9
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),        L  10
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                  L  11
      COMMON/INTERP/AT(3,NCOL),BT(3,NCOL),CT(3,NCOL),ES(3),FS(3),GS(3),  L  12
     $E(3),H(3),QI1,QI2,QI3                                              L  13
      COMMON/SCOMP/SX(NCOL),SY(NCOL),SZ(NCOL)                            L  14
      COMMON/INTG/X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12                 L  15
      COMMON/EMATS/ALFA(3,3),BETA(3,3),RX,RY,RZ,R2,TAU,I,J               L  16
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                 L  17
```

```
      SXJ=SX(J)                                                          L  18
      SYJ=SY(J)                                                          L  19
      SZJ=SZ(J)                                                          L  20
      SXI=SX(I)                                                          L  21
      SYI=SY(I)                                                          L  22
      SZI=SZ(I)                                                          L  23
      DO 1 L=1,3                                                         L  24
      A(L)=AT(L,J)                                                       L  25
      B(L)=BT(L,J)                                                       L  26
      C(L)=CT(L,J)                                                       L  27
      P(L)=2.*ES(L)*TAU+FS(L)                                            L  28
      G(L)=(ES(L)*TAU+FS(L))*TAU+GS(L)                                   L  29
      F(L)=-P(L)/VEL                                                     L  30
1     CONTINUE                                                           L  31
      BCON=-2.*(RX*SXJ+RY*SYJ+RZ*SZJ)                                    L  32
      CCON=R2+BI(J)*BI(J)                                                L  33
      CALL INTEG (SI(J),BCON,CCON)                                       L  34
      DO 2 L=1,3                                                         L  35
      DO 2 M=1,3                                                         L  36
      T1=H(M)*(A(L)*X9+C(L)*X1)+P(M)*(A(L)*X10+B(L)*X6+C(L)*X2)          L  37
      T2=2.*A(L)*(F(M)*X6+G(M)*X7)+B(L)*(E(M)*X1+F(M)*X2+G(M)*X3)        L  38
      T3=2.*A(L)*(E(M)*X9+F(M)*X10+G(M)*X11)+B(L)*(F(M)*X6+G(M)*X7)      L  39
      T4=2.*A(L)*(E(M)*X6+F(M)*X7+G(M)*X8)+B(L)*(E(M)*X2+F(M)*X3+G(M)*X4 L  40
     $)                                                                  L  41
      T5=2.*A(L)*(E(M)*X10+F(M)*X11+G(M)*X12)+B(L)*(E(M)*X6+F(M)*X7+G(M) L  42
     $*X8)                                                               L  43
      T1=-(T1-VEL*T3)*1.E-7                                              L  44
      T2=-VEL*T2*1.E-7                                                   L  45
      EMX=SXJ*T1+RX*T2                                                   L  46
      EMY=SYJ*T1+RY*T2                                                   L  47
      EMZ=SZJ*T1+RZ*T2                                                   L  48
      ALFA(L,M)=EMX*SXI+EMY*SYI+EMZ*SZI                                  L  49
      T4=-VEL*VEL*T4*1.E-7                                               L  50
      T5=VEL*VEL*T5*1.E-7                                                L  51
      QMX=RX*T4+SXJ*T5                                                   L  52
      QMY=RY*T4+SYJ*T5                                                   L  53
      QMZ=RZ*T4+SZJ*T5                                                   L  54
      BETA(L,M)=QMX*SXI+QMY*SYI+QMZ*SZI                                  L  55
2     CONTINUE                                                           L  56
      RETURN                                                             L  57
      END                                                                L  58


      SUBROUTINE INTEG (EL,B,C)                                          M   1
      CODE ANALYSIS                                                      M   2
      COMMON /INTG/ X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12               M   3
      S2=EL*.5                                                           M   4
      S1=-S2                                                             M   5
      R1S=(S1+B)*S1+C                                                    M   6
      R2S=(S2+B)*S2+C                                                    M   7
      R1=SQRT(R1S)                                                       M   8
      R2=SQRT(R2S)                                                       M   9
      B2=B*B                                                             M  10
      HB=.5*B                                                            M  11
      DE1=S1+HB                                                          M  12
      DE2=S2+HB                                                          M  13
      DIS=4.*C-B2                                                        M  14
      ALR=LOGF(R2/R1)                                                    M  15
      LIM=0                                                              M  16
      IF (B.EQ.0) GO TO 2                                                M  17
      XLIM=DIS/ABS(B)                                                    M  18
```

```
      IF (XLIM.GT.1.E-5) GO TO 2                                        M  19
      LIM=1                                                             M  20
      DIH=0.                                                            M  21
      IF (DE1*DE2.GT.0) GO TO 1                                         M  22
      WRITE (3,10) B,C                                                  M  23
      CALL EXIT                                                         M  24
    1 DE1S=DE1*DE1                                                      M  25
      DE2S=DE2*DE2                                                      M  26
      GO TO 3                                                           M  27
    2 DIH=SQRT(DIS)                                                     M  28
    3 X1=EL                                                             M  29
      IF (DE1.LT.0) GO TO 4                                             M  30
      X2=LOGF((R2+DE2)/(R1+DE1))                                        M  31
      GO TO 5                                                           M  32
    4 X2=LOGF((R1-DE1)/(R2-DE2))                                        M  33
    5 IF (LIM.EQ.1) GO TO 6                                             M  34
      T2=ATAN(2.*DE2/DIH)                                               M  35
      T1=ATAN(2.*DE1/DIH)                                               M  36
      X3=2.*(T2-T1)/DIH                                                 M  37
      X4=4.*(DE2/R2-DE1/R1)/DIS                                         M  38
      GO TO 7                                                           M  39
    6 X3=1./DE1-1./DE2                                                  M  40
      X4=.5*ABS((DE2/DE1-DE1/DE2)/(R1*R2))                              M  41
    7 X5=0.                                                             M  42
      X6=R2-R1-HB*X2                                                    M  43
      X7=ALR-HB*X3                                                      M  44
      IF (LIM.EQ.1) GO TO 8                                             M  45
      X8=-2.*((B*S2+2.*C)/R2-(B*S1+2.*C)/R1)/DIS                        M  46
      GO TO 9                                                           M  47
    8 X8=.25*(B/DE2S-B/DE1S)+X3                                         M  48
      IF (DE1.LT.0) X8=-X8                                              M  49
    9 X9=EL*EL*EL/12.                                                   M  50
      X10=.5*((S2-1.5*B)*R2-(S1-1.5*B)*R1)+.125*(3.*B2-4.*C)*X2         M  51
      X11=S2-S1-B*ALR+.5*(B2-2.*C)*X3                                   M  52
      X12=X2-B*X8-C*X4                                                  M  53
      RETURN                                                            M  54
C                                                                       M  55
   10 FORMAT (?INTEGRATION ATTEMPTED OVER SINGULARITY B,C=?,2E15.6)     M  56
      END                                                               M  57


      LCM (A),(P)                                                       N   1
      SUBROUTINE FACTR (N,A,P,NDIM)                                     N   2
      CODE ANALYSIS                                                     N   3
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   N   4
C     SUBROUTINE TO FACTOR A MATRIX INTO A UNIT LOWER TRIANGULAR MATRIX  N   5
C     UPPER TRIANGULAR MATRIX USING THE GAUSS-DOOLITTLE ALGORITHM FROM  N   6
C     PAGES 411-416 OF A. RALSTON--A FIRST COURSE IN NUMERICAL ANALYSIS. N   7
C     COMMENTS BELOW REFER TO COMMENTS IN RALSTONS TEXT                 N   8
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   N   9
      DIMENSION A(NDIM,NDIM), P(NDIM)                                   N  10
      COMMON /SCRATM/ D(200)                                            N  11
      INTEGER R,P,RM1,RP1,PJ,PR                                         N  12
      IFLG=0                                                            N  13
      DO 9 R=1,N                                                        N  14
C                                                                       N  15
C     STEP 1                                                            N  16
C                                                                       N  17
      DO 1 K=1,N                                                        N  18
      D(K)=A(K,R)                                                       N  19
    1 CONTINUE                                                          N  20
```

```
C                                                                       N  21
C     STEPS 2 AND 3                                                     N  22
C                                                                       N  23
      RM1=R-1                                                           N  24
      IF (RM1.LT.1) GO TO 4                                             N  25
      DO 3 J=1,RM1                                                      N  26
      PJ=P(J)                                                           N  27
      A(J,R)=D(PJ)                                                      N  28
      D(PJ)=D(J)                                                        N  29
      JP1=J+1                                                           N  30
      DO 2 I=JP1,N                                                      N  31
      D(I)=D(I)-A(I,J)*A(J,R)                                           N  32
 2    CONTINUE                                                          N  33
 3    CONTINUE                                                          N  34
 4    CONTINUE                                                          N  35
C                                                                       N  36
C     STEP 4                                                            N  37
C                                                                       N  38
      DMAX=ABS(D(R))                                                    N  39
      P(R)=R                                                            N  40
      RP1=R+1                                                           N  41
      IF (RP1.GT.N) GO TO 6                                             N  42
      DO 5 I=RP1,N                                                      N  43
      ELMAG=ABS(D(I))                                                   N  44
      IF (ELMAG.LT.DMAX) GO TO 5                                        N  45
      DMAX=ELMAG                                                        N  46
      P(R)=I                                                            N  47
 5    CONTINUE                                                          N  48
 6    CONTINUE                                                          N  49
      IF (DMAX.LT.1.E-10) IFLG=1                                        N  50
      PR=P(R)                                                           N  51
      A(R,R)=D(PR)                                                      N  52
      D(PR)=D(R)                                                        N  53
C                                                                       N  54
C     STEP 5                                                            N  55
C                                                                       N  56
      IF (RP1.GT.N) GO TO 8                                             N  57
      DO 7 I=RP1,N                                                      N  58
      A(I,R)=D(I)/A(R,R)                                                N  59
 7    CONTINUE                                                          N  60
 8    CONTINUE                                                          N  61
      IF (IFLG.EQ.0) GO TO 9                                            N  62
      WRITE (3,12) R,DMAX                                               N  63
      IFLG=0                                                            N  64
 9    CONTINUE                                                          N  65
      WRITE (3,13) (P(R),R=1,N)                                         N  66
      DETER=1.                                                          N  67
      DO 10 R=1,N                                                       N  68
      DMAG=ABS(DETER)                                                   N  69
      IF (DMAG.GT.1.0E300.OR.DMAG.LT.1.0E-270) GO TO 11                 N  70
      DETER=DETER*A(R,R)                                                N  71
 10   CONTINUE                                                          N  72
      WRITE (3,14) DETER                                                N  73
      DMAG=ABS(DETER)                                                   N  74
      IF (DMAG.EQ.0.) CALL EXIT                                         N  75
      RETURN                                                            N  76
 11   WRITE (3,15) DMAG,R                                               N  77
      RETURN                                                            N  78
C                                                                       N  79
 12   FORMAT (1H ,?PIVOT(?,13,?)=?,E16.8)                               N  80
 13   FORMAT (1H ,2414)                                                 N  81
```

```
 14   FORMAT (1H0,?DETERMINANT=?,E16.8)                                  N  82
 15   FORMAT (1H0,?DETERMINANT MAGNITUDE=?,E16.8,?    AT    R=?,I3)      N  83
      END                                                                N  84


      LCM (A),(P)                                                        O   1
      SUBROUTINE SOLVE (N,A,P,B,NDIM)                                    O   2
      CODE ANALYSIS                                                      O   3
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   O   4
C SUBROUTINE TO SOLVE THE MATRIX EQUATION LU*X=B WHERE L IS A UNIT LOWER  O   5
C TRIANGULAR MATRIX AND U IS AN UPPER TRIANGULAR MATRIX BOTH OF WHICH AR  O   6
C IN A.  THE RHS VECTOR B IS INPUT AND THE SOLUTION IS RETURNED THROUGH   O   7
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   O   8
      DIMENSION A(NDIM,NDIM), P(NDIM), B(NDIM)                           O   9
      COMMON /SCRATM/ Y(200)                                             O  10
      INTEGER P,PI                                                       O  11
C                                                                        O  12
C      FOWARD SUBSTITUTION                                               O  13
C                                                                        O  14
      DO 3 I=1,N                                                         O  15
      PI=P(I)                                                            O  16
      Y(I)=B(PI)                                                         O  17
      B(PI)=B(I)                                                         O  18
      IP1=I+1                                                            O  19
      IF (IP1.GT.N) GO TO 2                                              O  20
      DO 1 J=IP1,N                                                       O  21
      B(J)=B(J)-A(J,I)*Y(I)                                              O  22
 1    CONTINUE                                                           O  23
 2    CONTINUE                                                           O  24
 3    CONTINUE                                                           O  25
C                                                                        O  26
C      BACKWARD SUBSTITUTION                                             O  27
C                                                                        O  28
      DO 6 K=1,N                                                         O  29
      I=N-K+1                                                            O  30
      SUM=0.                                                             O  31
      IP1=I+1                                                            O  32
      IF (IP1.GT.N) GO TO 5                                              O  33
      DO 4 J=IP1,N                                                       O  34
      SUM=SUM+A(I,J)*B(J)                                                O  35
 4    CONTINUE                                                           O  36
 5    CONTINUE                                                           O  37
      B(I)=(Y(I)-SUM)/A(I,I)                                             O  38
 6    CONTINUE                                                           O  39
      RETURN                                                             O  40
      END                                                                O  41


      SUBROUTINE DGN1                                                    P   1
      CODE ANALYSIS                                                      P   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   P   3
C        THIS IS A GENERAL PURPOSE DATA GENERATOR                        P   4
C        THIS DATA GENERATOR STRINGS STRAIGHT WIRES BETWEEN THE NODES    P   5
C        FOR MULTIPLE JUNCTIONS, USES NO SYMMETRY                        P   6
C        THUS LIMITED TO NROW NUMBER OF SEGMENTS                         P   7
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   P   8
      PARAMETER (NCOL=60)                                                P   9
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),        P  10
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                  P  11
      COMMON/CONST/VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT                 P  12
      DIMENSION ICON(NCOL),XN(NCOL),YN(NCOL),ZN(NCOL)                    P  13
      WRITE (3,1000)                                                     P  14
```

```
 1000 FORMAT (///?COLOCATION PROGRAM FOR MULTIPLE JUNCTIONS?/)          P  15
      N=0                                                              P  16
      NP=0                                                             P  17
      I2=0                                                             P  18
      COLAM=0.                                                         P  19
C--------READ IN THE NODE DATA                                        P  20
C         INOD-A NUMBER TO IDENTIFY THE NODE (IE 1,2,3,ETC)           P  21
C         IC=0 IF THIS NODE IS THE END OF A WIRE                       P  22
C         IC=-1 IF THIS NODE IS AT A JUNCTION OF WIRES                 P  23
C         AX,AY,AZ=X,Y,Z COORDINATES OF THIS NODE IN METERS            P  24
C         ICONT=0 IF THIS IS THE LAST NODE TO BE READ IN               P  25
  1    READ (2,1010) INOD,IC,AX,AY,AZ,ICONT                            P  26
      WRITE(3,1010) INOD,IC,AX,AY,AZ,ICONT                            P  27
 1010 FORMAT (2I4,3E12.4,I4)                                          P  28
      ICON(INOD)=-INOD                                                 P  29
      IF (IC.EQ.0) ICON(INOD)=0                                        P  30
      XN(INOD)=AX                                                      P  31
      YN(INOD)=AY                                                      P  32
      ZN(INOD)=AZ                                                      P  33
      IF (ICONT.GT.0) GO TO 1                                          P  34
C--------READ IN THE WIRE DATA                                        P  35
C         WRAD=RADIUS OF THIS WIRE IN METERS                           P  36
C         NSEG=NUMBER OF SEGMENTS ON THIS WIRE                         P  37
C         INOD1=NUMBER OF THE NODE AT THE FIRST END OF THIS WIRE       P  38
C         INOD2=NUMBER OF THE NODE AT THE OTHER END OF THIS WIRE       P  39
C         ICONT=0 IF THIS IS THE LAST WIRE TO BE STRUNG                P  40
 10    READ (2,1020) WRAD,NSEG,INOD1,INOD2,ICONT                       P  41
      WRITE(3,1020) WRAD,NSEG,INOD1,INOD2,ICONT                       P  42
 1020 FORMAT (E12.4,4I5)                                              P  43
C--------STRING THE WIRES BETWEEN THE NODES                           P  44
      I1=I2+1                                                          P  45
      IC1=ICON(INOD1)                                                  P  46
      X1=XN(INOD1)                                                     P  47
      Y1=YN(INOD1)                                                     P  48
      Z1=ZN(INOD1)                                                     P  49
      IC2=ICON(INOD2)                                                  P  50
      X2=XN(INOD2)                                                     P  51
      Y2=YN(INOD2)                                                     P  52
      Z2=ZN(INOD2)                                                     P  53
      CALL LINE2 (X1,Y1,Z1,I1,EL,ALF,BUT,X2,Y2,Z2,I2,NSEG,1,WRAD)      P  54
      ICON1(I1)=IC1                                                    P  55
      ICON2(I2)=IC2                                                    P  56
      COLAM=COLAM+EL                                                   P  57
C--------DO THE NEXT WIRE                                            P  58
      IF (ICONT.GT.0) GO TO 10                                         P  59
      N=I2                                                             P  60
      NP=N                                                             P  61
C--------THIS MAKES RATIO=1 AND PLOTS TIME IN SEC AND FREQUENCY IN HZ  P  62
      WLEN=3.E8                                                        P  63
      WRITE (3,1030) COLAM                                             P  64
 1030 FORMAT (?TOTAL LENGTH=?,E13.5,? METERS?)                        P  65
      WRITE (3,1040)                                                   P  66
 1040 FORMAT (?  NO SYMMETRY USED?//)                                 P  67
      RETURN                                                           P  68
      END                                                              P  69

      SUBROUTINE DGN2                                                  Q   1
      CODE ANALYSIS                                                    Q   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  Q   3
C        DATA GENERATOR FOR A DIPOLE USING TWO-FOLD SYMMETRY           Q   4
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  Q   5
```

```
      PARAMETER (NCOL=60)                                                Q   6
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL),SI(NCOL),BI(NCOL),        Q   7
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                  Q   8
      COMMON /CONST/ VEL,DT,TSTART,NTSTEP,WLEN,RATIO,MFORT               Q   9
      WRITE (3,1)                                                        Q  10
      PI=3.141592654                                                     Q  11
      READ (2,2) COLAM,ALF,BUT,XC,YC,ZC,SOEL,N                           Q  12
      WRITE (3,2) COLAM,ALF,BUT,XC,YC,ZC,SOEL,N                          Q  13
C--------THIS PLOTS NORMALIZED TIME -- T*C/L AND                         Q  14
C--------NORMALIZED FREQUENCY -- WLEN/WAVELENGTH                         Q  15
      WLEN=COLAM                                                         Q  16
      NP=N/2                                                             Q  17
      B=SOEL*COLAM                                                       Q  18
      AL=ALF*0.01745329252                                               Q  19
      BT=BUT*0.01745329252                                               Q  20
      ELO2=COLAM*.5                                                      Q  21
      CALL LINE1 (XC,YC,ZC,1,ELO2,AL,BT,X2,Y2,Z2,I2,NP,1,B)              Q  22
      I1=I2+1                                                            Q  23
      ICON1(1)=I1                                                        Q  24
      ICON2(I2)=0                                                        Q  25
      AL=-AL                                                             Q  26
      BT=BT+PI                                                           Q  27
      CALL LINE1 (XC,YC,ZC,I1,ELO2,AL,BT,X2,Y2,Z2,I2,NP,1,B)             Q  28
      ICON1(I1)=1                                                        Q  29
      ICON2(I2)=0                                                        Q  30
      RETURN                                                             Q  31
C                                                                        Q  32
 1    FORMAT (///?COLLOCATION PROGRAM FOR LINEAR DIPOLES SYMMETRIC?      Q  33
     1? ABOUT CENTER?/)                                                  Q  34
 2    FORMAT (7F10.5,I5)                                                 Q  35
      END                                                                Q  36


      SUBROUTINE LINE1(X1,Y1,Z1,I1,EL,ALF,BUT,X2,Y2,Z2,I2,NSEG,NB,A)     R   1
      CODE ANALYSIS                                                      R   2
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    R   3
C        THIS SUBROUTINE STRINGS STRAIGHT WIRES SETTING ICON1            R   4
C        AND ICON2 EXCEPT FOR ICON1 OF THE FIRST SEGMENT AND             R   5
C        ICON2 OF THE LAST SEGMENT                                       R   6
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    R   7
      PARAMETER (NCOL=60)                                                R   8
      COMMON/DATA/N,NP,X(NCOL),Y(NCOL),Z(NCOL) SI(NCOL),BI(NCOL),        R   9
     $ALP(NCOL),BET(NCOL),ICON1(NCOL),ICON2(NCOL),COLAM                  R  10
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    R  11
C        FOR LINE1, ENTER X1, Y1, Z1, I1, EL(LENGTH), ALF, BUT,          R  12
C        NSEG, AND A(WIRE RADIUS)                                        R  13
C        LINE1 RETURNS X2, Y2, Z2, I2                                    R  14
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    R  15
      CA=COS(ALF)                                                        R  16
      SA=SIN(ALF)                                                        R  17
      CAB=CA*COS(BUT)                                                    R  18
      SAB=CA*SIN(BUT)                                                    R  19
      X2=X1+EL*CAB                                                       R  20
      Y2=Y1+EL*SAB                                                       R  21
      Z2=Z1+EL*SA                                                        R  22
      GO TO 1                                                            R  23
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    R  24
        START HERE FOR CALL TO LINE2                                     R  25
C       FOR LINE2 ENTER X1, Y1, Z1, I1, X2, Y2, Z2, NSEG, AND A          R  26
C       LINE2 RETURNS ALF, BUT, I2, AND EL                               R  27
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    R  28
```

```
      ENTRY LINE2(X1,Y1,Z1,I1,EL,ALF,BUT,X2,Y2,Z2,I2,NSEG,NB,A)          R  29
      XINC=X2-X1                                                        R  30
      YINC=Y2-Y1                                                        R  31
      ZINC=Z2-Z1                                                        R  32
      ELXY=SQRT(XINC*XINC+YINC*YINC)                                    R  33
      EL=SQRT(XINC*XINC+YINC*YINC+ZINC*ZINC)                            R  34
      SA=ZINC/EL                                                        R  35
      CA=ELXY/EL                                                        R  36
      IF (SA.EQ.0.) GO TO 4                                             R  37
      SAA=ABS(SA)                                                       R  38
      SAA=SA/SAA                                                        R  39
      CAA=ABS(CA)                                                       R  40
      IF (CAA.LT.1.E-10) GO TO 3                                        R  41
4     ALF=ASIN(SA)                                                      R  42
      SB=YINC/ELXY                                                      R  43
      CB=XINC/ELXY                                                      R  44
      BUT=ATAN2(SB,CB)                                                  R  45
      GO TO 2                                                           R  46
3     SB=0.                                                             R  47
      CB=1.                                                             R  48
      BUT=0.                                                            R  49
      ALF=3.141592654*SAA/2.                                            R  50
2     CAB=CA*CB                                                         R  51
      SAB=CA*SB                                                         R  52
1     I2=I1+(NSEG-1)*NB                                                 R  53
      SI(I1)=EL/NSEG                                                    R  54
      SO2=SI(I1)/2.0                                                    R  55
      X(I1)=X1+SO2*CAB                                                  R  56
      Y(I1)=Y1+SO2*SAB                                                  R  57
      Z(I1)=Z1+SO2*SA                                                   R  58
      ALP(I1)=ALF                                                       R  59
      BET(I1)=BUT                                                       R  60
      BI(I1)=A                                                          R  61
      IS=I1+NB                                                          R  62
      ICON1(I1)=I1-NB                                                   R  63
      ICON2(I1)=IS                                                      R  64
      XINC=SI(I1)*CAB                                                   R  65
      YINC=SI(I1)*SAB                                                   R  66
      ZINC=SI(I1)*SA                                                    R  67
      IF(IS.GT.I2) GO TO 11                                             R  68
      DO 10 I=IS,I2,NB                                                  R  69
      IL=I-NB                                                           R  70
      X(I)=X(IL)+XINC                                                   R  71
      Y(I)=Y(IL)+YINC                                                   R  72
      Z(I)=Z(IL)+ZINC                                                   R  73
      SI(I)=SI(I1)                                                      R  74
      BI(I)=A                                                           R  75
      ALP(I)=ALF                                                        R  76
      BET(I)=BUT                                                        R  77
      ICON1(I)=IL                                                       R  78
      ICON2(I)=I+NB                                                     R  79
10    CONTINUE                                                          R  80
11    CONTINUE                                                          R  81
      RETURN                                                            R  82
      END                                                               R  83

      SUBROUTINE PEEK (NCRT, NF, LG, KP, AP, X, Y, NXY, XMIN, XMAX,     S   1
     1                 YMIN, YMAX, ALABX, ALABY, ALABTT,       IND)     S   2
C                                                                       S   3
C  THIS IS MODIFIED TO PLOT MEDIUM SIZE CHARACTERS  -- USE WITH BPLOT    S   4
C  FOR LARGER LABELS ALSO                                               S   5
```

```
C                                                                       S   6
                                                                        S   7
C   VERSION 10/15/70. 09:30.                                           S   8
C   ARTHUR L EDWARDS, BLDG 111, RM 485, L-34, EXT 7483, LRL, LIVERMORE. S   9
C                                                                       S  10
C                                                                       S  11
C   PEEK MAKES A PLOT THAT CAN BE TRIMMED TO 8-1/2 BY 11 INCHES.        S  12
C        LABELS, TITLE, SCALES, LIMITS, PLOTTING CHARACTERS, AND        S  13
C        INTERPOLATION ARE INPUT OPTIONS.                               S  14
C   THE FOLLOWING ARGUMENTS MUST BE SPECIFIED...                        S  15
C        NCRT, NF, LG, KP, AP, X, Y, NXY, XMIN, XMAX, YMIN, YMAX,       S  16
C        ALABX, ALABY, ALABTT.                                          S  17
C   ARRAYS X, Y, ALABX, ALABY, AND ALABTT MUST BE DIMENSIONED IN THE    S  18
C        CALLING PROGRAM, X AND Y AT LEAST AS BIG AS NXY, ALABX AND     S  19
C        ALABY AT LEAST 4, AND ALABTT AT LEAST 8.                       S  20
C   WARNING... PEEK MAY CHANGE THE VALUES OF NCRT AND IND, SO THESE     S  21
C        MUST BE VARIABLES IN CALLING PROGRAM, NOT CONSTANTS.           S  22
C                                                                       S  23
C                              GLOSSARY                                 S  24
C   ALABX           LABEL FOR X AXIS, 4 WORDS, 40 CHARACTERS.           S  25
C   ALABY           LABEL FOR Y AXIS, 4 WORDS, 40 CHARACTERS.           S  26
C   ALABTT          TITLE OF PLOT, 8 WORDS, 80 CHARACTERS.              S  27
C   AP              CHARACTER TO BE PLOTTED AT X, Y COORDINATES.        S  28
C   APP             SAME AS AP, EXCEPT CHARACTER * USED IF AP IS BLANK. S  29
C   KP              PLOT CHARACTERS IF POSITIVE, INTERPOLATE IF 0 OR 2. S  30
C   LG              SCALE TYPE, 1, 2, 3, OR 4, FOR X-Y SCALES TO BE     S  31
C   LG +              LINEAR-LINEAR, LOG-LOG, LINEAR-LOG, OR LOG-LINEAR.S  32
C   LG +2             ADD 4 TO GET SCALES, GRID, 8 TO GET SCALES, TICS. S  33
C   NCRT            INITIALIZE DD80, MAKE TITLE PAGE IF NEGATIVE OR 0.  S  34
C   NCRT +            MAKE PLOT IF 0 OR POSITIVE.                       S  35
C   NF              INDICATES FRAME RESTORE, NEW MAPX CALL, AND NEW AXIS S  36
C   NF +              LABELS AND PLOT TITLE, IF POSITIVE, NONE IF ZERO. S  37
C   NXY             NUMBER OF PAIRS OF VALUES (X,Y).                    S  38
C   X               VARIABLE WITH VALUE LOCATED ON HORIZONTAL AXIS.     S  39
C   XMAX            MAXIMUM VALUE OF X TO BE PLOTTED.                   S  40
C   XMIN            MINIMUM VALUE OF X TO BE PLOTTED.                   S  41
C   Y               VARIABLE WITH VALUE LOCATED ON VERTICAL AXIS.       S  42
C   YMAX            MAXIMUM VALUE OF Y TO BE PLOTTED.                   S  43
C   YMIN            MINIMUM VALUE OF Y TO BE PLOTTED.                   S  44
C                                                                       S  45
C   ARRAYS DIMENSIONED IN CALLING PROGRAM.                              S  46
      DIMENSION X(1), Y(1), ALABX(4), ALABY(4), ALABTT(8)               S  47
C                                                                       S  48
C   INITIALIZE DD80 AND MAKE ID PAGE IF NCRT IS NEGATIVE OR 0.          S  49
      IF(NCRT)100,100,105                                               S  50
  100 CALL CRTID (2HAE, 1) $CALL FRAME $IF(NCRT)102,105,600             S  51
  102 NCRT = 1 $GO TO 700                                               S  52
  105 NCRT = 1                                                          S  53
C                                                                       S  54
C   TEST INPUT ARGUMENTS FOR ERRORS.                                    S  55
      IF(NF)610,110,110                                                 S  56
  110 IF((LG - 1)*(12 - LG))620,120,120                                 S  57
  120 IF(NXY)630,630,130                                                S  58
  130 IF(XMAX - XMIN)640,640,140                                        S  59
  140 IF(YMAX - YMIN)650,650,150                                        S  60
  150 CONTINUE                                                          S  61
C                                                                       S  62
C   START A NEW FRAME IF NF IS POSITIVE.                                S  63
      IF(NF)600,220,215                                                 S  64
```

```
  215 CALL FRAME                                                        S  65
C                                                                       S  66
C   SPECIFY MAPPING, SCALE LIMITS, AND IF SPECIFIED, PLOT AXES, AND TICS S  67
C        OR GRID LINES.  DESIGNED TO FIT WITHIN MARGINS ON 8.5-11 IN.   S  68
      CALL MAPX (LG, XMIN, XMAX, YMIN, YMAX, 0.26, 0.98, 0.17, 0.99)    S  69
C                                                                       S  70
C   LABEL X AXIS WITH 30 MEDIUM CHARACTERS.                             S  71
      CALL SETCH (27.6,2.7,1,0,2,0)                                     S  72
      WRITE (100,8260) (ALABX(N), N = 1,3)                              S  73
 8260 FORMAT (8A10)                                                     S  74
C                                                                       S  75
C   LABEL Y AXIS WITH 30 MEDIUM CHARACTERS.                             S  76
      CALL SETCH (5.3,24.9,1,0,2,1)                                     S  77
      WRITE (100,8260) (ALABY(N), N = 1,3)                              S  78
C                                                                       S  79
C   WRITE OUT TABLE TITLE (60 MEDIUM CHARACTERS).                       S  80
      CALL SETCH (4.,1.,1,0,2,0)                                        S  81
      WRITE (100,8260) (ALABTT(N), N = 1,6)                             S  82
C                                                                       S  83
C   PLOT CHARACTER APP AT DATA POINTS IF KP IS POSITIVE.                S  84
C   USE SMALL PLOTTING SYMBOLS, UPRIGHT, AT LEAST 2 RASTER POINTS APART. S  85
  220 IF(KP)240,240,230                                                 S  86
  230 CALL SETPCH (0,0,1,0,2)                                           S  87
      APP = AP  $  IF(AP.OR. 1H  .AND. AP .NE. 1H  ) 235,232,235        S  88
  232 APP = 1H*                                                         S  89
  235 CALL POINTC (APP, X, Y, NXY)                                      S  90
  240 CONTINUE                                                          S  91
C                                                                       S  92
C   INTERPOLATE BETWEEN POINTS WITH DOTTED LINE IF KP IS 0 OR 2.        S  93
      IF(KP*(KP - 2))260,250,260                                        S  94
  250 CALL TRACE (X,Y,NXY)                                              S  95
  260 CONTINUE                                                          S  96
C                                                                       S  97
C   ALL PLOTTING DONE.  JUMP TO RETURN.                                 S  98
      GO TO 700                                                         S  99
C                                                                       S 100
C   ERROR JUMPS.                                                        S 101
C   FATAL OR ILLOGICAL ERROR.                                           S 102
  600 CALL DUMP $GO TO 700                                              S 103
C   NF IS NEGATIVE.                                                     S 104
  610 IND = -1 $GO TO 700                                               S 105
C   LG IS NOT IN RANGE FROM 1 TO 12.                                    S 106
  620 IND = -2 $GO TO 700                                               S 107
C   NXY IS ZERO OR NEGATIVE.                                            S 108
  630 IND = -3 $GO TO 700                                               S 109
C   XMAX IS NOT GREATER THAN XMIN.                                      S 110
  640 IND = -4 $GO TO 700                                               S 111
C   YMAX IS NOT GREATER THAN YMIN.                                      S 112
  650 IND = -5 $GO TO 700                                               S 113
C                                                                       S 114
C   END OF PEEK.  RETURN TO CALLING PROGRAM.                            S 115
  700 RETURN                                                            S 116
      END                                                               S 117
```

Appendix B
Linear Dipole Antenna with Gaussian Modulated Sinusoidal Voltage

```
 1 M BY 0.001 M RAD DIPOLE
TIME (1./C)
SOURCE CURRENT (AMPERES)
 1 M BY .001 M RAD DIPOLE -- GAUS MOD VOLTS -- 200 OHMS
 1./WAVELENGTH
CONDUCTANCE (MHO)
 1 M BY .001 M RAD DIPOLE
RADIATED FIELDS (V/M)
SIGMA/LAMBDA**2 (DB)
SUSCEPTANCE (MHO)
ANTENNA GAIN (DB)
3.334E-10,128,2,2,1,1,1,8,0,
1.,0.,0.,0.,0.,0.,0.001,10,
4.5E8,3.E8,6.667E-9,2,
0.5,1,
-0.5,6,
2,2,0.,
1,100.,
6,100.,
0.,0.,0.,-3.334E-10,3.334E-10,120,2,0,
 1 M BY 0.001 M RAD DIPOLE
3.334E-10  128    2    2    1    1    1    8    0


COLLOCATION PROGRAM FOR LINEAR DIPOLES SYMMETRIC ABOUT CENTER
   1.00000   0.        0.        0.        0.        0.        0.00100   10
      X(I)       Y(I)       Z(I)       SI(I)      BI(I)    ALP(I)    BET(I)
   0.05000   0.        0.        0.10000   0.00100   0.        0.          6    1    2
   0.15000   0.        0.        0.10000   0.00100   0.        0.          1    2    3
   0.25000   0.        0.        0.10000   0.00100   0.        0.          2    3    4
   0.35000   0.        0.        0.10000   0.00100   0.        0.          3    4    5
   0.45000   0.        0.        0.10000   0.00100   0.        0.          4    5    0
  -0.05000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    1    6    7
  -0.15000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    6    7    8
  -0.25000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    7    8    9
  -0.35000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    8    9   10
  -0.45000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    9   10    0
 4.500E+08 3.000E+08 6.667E-09    2
  5.000E-01    1
 -5.000E-01    6
    2    2  0.
    1  1.000E+02
    6  1.000E+02

CURF MATRIX ELEMENTS INCLUDING LOADING

 I=  1
  -6.782E+03  7.636E+02  1.095E+01  0.         0.        -7.636E+02 -1.095E+01  0.         0.         0.

 I=  2
   7.636E+02 -5.782E+03  7.636E+02  1.095E+01  0.        -1.095E+01  0.         0.         0.         0.

 I=  3
   1.095E+01  7.636E+02 -5.782E+03  7.636E+02  1.095E+01  0.         0.         0.         0.         0.

 I=  4
   0.         1.095E+01  7.636E+02 -5.778E+03  7.417E+02  0.         0.         0.         0.         0.

 I=  5
   0.         0.         1.095E+01  1.058E+03 -7.461E+03  0.         0.         0.         0.         0.
    1   2   3   4   5   6   7   8   9  10

0DETERMINANT=  8.20043697E+37
 TIME IN MICROSEC. FOR MATRIX SETUP   178688

TIME STEP    1  TIME= 0.        CURRENT-
  -6.552E-11 -8.953E-12 -1.333E-12 -1.969E-13 -2.987E-14  6.552E-11  8.953E-12  1.333E-12  1.969E-13  2.987E-14
```

```
INT. OF CUR.
 -9.102E-21 -1.244E-21 -1.851E-22 -2.735E-23 -4.149E-24  9.102E-21  1.244E-21  1.851E-22  2.735E-23  4.149E-24

TIME STEP    2  TIME= 3.334E-10 CURRENT-
  1.473E-07  2.010E-08  2.986E-09  4.406E-10  6.676E-11 -1.473E-07 -2.010E-08 -2.986E-09 -4.406E-10 -6.676E-11

INT. OF CUR.
  2.044E-17  2.789E-18  4.144E-19  6.113E-20  9.263E-21 -2.044E-17 -2.789E-18 -4.144E-19 -6.113E-20 -9.263E-21

TIME STEP    3  TIME= 6.668E-10 CURRENT-
  6.214E-07  1.535E-07  3.341E-08  6.521E-09  1.167E-09 -6.214E-07 -1.535E-07 -3.341E-08 -6.521E-09 -1.167E-09

INT. OF CUR.
  1.395E-16  2.858E-17  5.719E-18  1.065E-18  1.862E-19 -1.395E-16 -2.858E-17 -5.719E-18 -1.065E-18 -1.862E-19

TIME STEP    4  TIME= 1.000E-09 CURRENT-
  1.467E-06  5.488E-07  1.691E-07  4.394E-08  9.313E-09 -1.467E-06 -5.488E-07 -1.691E-07 -4.394E-08 -9.313E-09

INT. OF CUR.
  4.774E-16  1.384E-16  3.655E-17  8.606E-18  1.738E-18 -4.774E-16 -1.384E-16 -3.655E-17 -8.606E-18 -1.738E-18

TIME STEP    5  TIME= 1.334E-09 CURRENT-
  2.101E-06  1.228E-06  5.249E-07  1.795E-07  4.502E-08 -2.101E-06 -1.228E-06 -5.249E-07 -1.795E-07 -4.502E-08

INT. OF CUR.
  1.078E-15  4.267E-16  1.461E-16  4.313E-17  1.003E-17 -1.078E-15 -4.267E-16 -1.461E-16 -4.313E-17 -1.003E-17

TIME STEP    6  TIME= 1.667E-09 CURRENT-
  5.933E-07  1.669E-06  1.089E-06  4.958E-07  1.462E-07 -5.933E-07 -1.669E-06 -1.089E-06 -4.958E-07 -1.462E-07

INT. OF CUR.
  1.587E-15  9.162E-16  4.093E-16  1.507E-16  4.008E-17 -1.587E-15 -9.162E-16 -4.093E-16 -1.507E-16 -4.008E-17

TIME STEP    7  TIME= 2.000E-09 CURRENT-
 -6.378E-06  2.630E-07  1.346E-06  9.314E-07  3.277E-07  6.378E-06 -2.630E-07 -1.346E-06 -9.314E-07 -3.277E-07

INT. OF CUR.
  7.742E-16  1.290E-15  8.237E-16  3.853E-16  1.168E-16 -7.742E-16 -1.290E-15 -8.237E-16 -3.853E-16 -1.168E-16

TIME STEP    8  TIME= 2.334E-09 CURRENT-
 -2.126E-05 -5.691E-06 -1.656E-07  9.452E-07  4.603E-07  2.126E-05  5.691E-06  1.656E-07 -9.452E-07 -4.603E-07

INT. OF CUR.
 -3.614E-15  5.112E-16  1.070E-15  7.098E-16  2.496E-16  3.614E-15 -5.112E-16 -1.070E-15 -7.098E-16 -2.496E-16

TIME STEP    9  TIME= 2.667E-09 CURRENT-
 -4.007E-05 -1.818E-05 -5.787E-06 -8.239E-07  9.715E-08  4.007E-05  1.818E-05  5.787E-06  8.239E-07 -9.715E-08

INT. OF CUR.
 -1.373E-14 -3.287E-15  1.915E-16  7.796E-16  3.563E-16  1.373E-14  3.287E-15 -1.915E-16 -7.796E-16 -3.563E-16

TIME STEP   10  TIME= 3.001E-09 CURRENT-
 -4.609E-05 -3.406E-05 -1.708E-05 -6.318E-06 -1.567E-06  4.609E-05  3.406E-05  1.708E-05  6.318E-06  1.567E-06

INT. OF CUR.
 -2.845E-14 -1.190E-14 -3.464E-15 -3.075E-16  1.473E-16  2.845E-14  1.190E-14  3.464E-15  3.075E-16 -1.473E-16

TIME STEP   11  TIME= 3.334E-09 CURRENT-
 -1.092E-05 -3.983E-05 -3.096E-05 -1.635E-05 -5.237E-06  1.092E-05  3.983E-05  3.096E-05  1.635E-05  5.237E-06

INT. OF CUR.
 -3.909E-14 -2.450E-14 -1.140E-14 -3.960E-15 -9.312E-16  3.909E-14  2.450E-14  1.140E-14  3.960E-15  9.312E-16

TIME STEP   12  TIME= 3.667E-09 CURRENT-
  8.827E-05 -1.186E-05 -3.513E-05 -2.704E-05 -1.021E-05 -8.827E-05  1.186E-05  3.513E-05  2.704E-05  1.021E-05

INT. OF CUR.
 -2.798E-14 -3.405E-14 -2.269E-14 -1.117E-14 -3.470E-15  2.798E-14  3.405E-14  2.269E-14  1.117E-14  3.470E-15

TIME STEP   13  TIME= 4.001E-09 CURRENT-
  2.366E-04  7.070E-05 -8.212E-06 -2.628E-05 -1.259E-05 -2.366E-04 -7.070E-05  8.212E-06  2.628E-05  1.259E-05

INT. OF CUR.
  2.482E-14 -2.576E-14 -3.078E-14 -2.038E-14 -7.343E-15 -2.482E-14  2.576E-14  3.078E-14  2.038E-14  7.343E-15

TIME STEP   14  TIME= 4.334E-09 CURRENT-
```

```
   3.570E-04  1.999E-04  6.906E-05  4.980E-06 -4.667E-06 -3.570E-04 -1.999E-04 -6.906E-05 -4.980E-06  4.667E-06

INT. OF CUR.
   1.245E-13  1.806E-14 -2.203E-14 -2.478E-14 -1.051E-14 -1.245E-13 -1.806E-14  2.203E-14  2.478E-14  1.051E-14

TIME STEP   15  TIME= 4.668E-09 CURRENT-
   3.281E-04  3.162E-04  1.905E-04  8.078E-05  2.161E-05 -3.281E-04 -3.162E-04 -1.905E-04 -8.078E-05 -2.161E-05

INT. OF CUR.
   2.429E-13  1.045E-13  2.001E-14 -1.172E-14 -8.190E-15 -2.429E-13 -1.045E-13 -2.001E-14  1.172E-14  8.190E-15

TIME STEP   16  TIME= 5.001E-09 CURRENT-
   6.138E-05  3.166E-04  3.023E-04  1.881E-04  6.587E-05 -6.138E-05 -3.166E-04 -3.023E-04 -1.881E-04 -6.587E-05

INT. OF CUR.
   3.144E-13  2.132E-13  1.024E-13  3.223E-14  5.893E-15 -3.144E-13 -2.132E-13 -1.024E-13 -3.223E-14 -5.893E-15

TIME STEP   17  TIME= 5.334E-09 CURRENT-
  -4.019E-04  1.119E-04  3.063E-04  2.686E-04  1.089E-04  4.019E-04 -1.119E-04 -3.063E-04 -2.686E-04 -1.089E-04

INT. OF CUR.
   2.631E-13  2.903E-13  2.069E-13  1.091E-13  3.507E-14 -2.631E-13 -2.903E-13 -2.069E-13 -1.091E-13 -3.507E-14

TIME STEP   18  TIME= 5.668E-09 CURRENT-
  -8.561E-04 -2.901E-04  1.092E-04  2.278E-04  1.116E-04  8.561E-04  2.901E-04 -1.092E-04 -2.278E-04 -1.116E-04

INT. OF CUR.
   5.317E-14  2.661E-13  2.817E-13  1.953E-13  7.295E-14 -5.317E-14 -2.661E-13 -2.817E-13 -1.953E-13 -7.295E-14

TIME STEP   19  TIME= 6.001E-09 CURRENT-
  -1.024E-03 -7.389E-04 -2.972E-04 -9.929E-06  3.295E-05  1.024E-03  7.389E-04  2.972E-04  9.929E-06 -3.295E-05

INT. OF CUR.
  -2.682E-13  9.584E-14  2.562E-13  2.371E-13  9.931E-14  2.682E-13 -9.584E-14 -2.562E-13 -2.371E-13 -9.931E-14

TIME STEP   20  TIME= 6.335E-09 CURRENT-
  -7.433E-04 -9.945E-04 -7.775E-04 -4.207E-04 -1.329E-04  7.433E-04  9.945E-04  7.775E-04  4.207E-04  1.329E-04

INT. OF CUR.
  -5.753E-13 -1.985E-13  7.909E-14  1.701E-13  8.507E-14  5.753E-13  1.985E-13 -7.909E-14 -1.701E-13 -8.507E-14

TIME STEP   21  TIME= 6.668E-09 CURRENT-
  -1.103E-04 -8.702E-04 -1.081E-03 -8.324E-04 -3.253E-04  1.103E-04  8.702E-04  1.081E-03  8.324E-04  3.253E-04

INT. OF CUR.
  -7.274E-13 -5.199E-13 -2.356E-13 -3.879E-14  9.436E-15  7.274E-13  5.199E-13  2.356E-13  3.879E-14 -9.436E-15

TIME STEP   22  TIME= 7.001E-09 CURRENT-
   5.472E-04 -3.718E-04 -9.702E-04 -9.771E-04 -4.265E-04 -5.472E-04  3.718E-04  9.702E-04  9.771E-04  4.265E-04

INT. OF CUR.
  -6.552E-13 -7.373E-13 -5.890E-13 -3.479E-13 -1.184E-13  6.552E-13  7.373E-13  5.890E-13  3.479E-13  1.184E-13

TIME STEP   23  TIME= 7.335E-09 CURRENT-
   8.803E-04  2.845E-04 -3.859E-04 -6.502E-04 -3.261E-04 -8.803E-04 -2.845E-04  3.859E-04  6.502E-04  3.261E-04

INT. OF CUR.
  -4.083E-13 -7.562E-13 -8.282E-13 -6.322E-13 -2.495E-13  4.083E-13  7.562E-13  8.282E-13  6.322E-13  2.495E-13

TIME STEP   24  TIME= 7.668E-09 CURRENT-
   7.580E-04  8.037E-04  4.735E-04  1.113E-04 -1.203E-05 -7.580E-04 -8.037E-04 -4.735E-04 -1.113E-04  1.203E-05

INT. OF CUR.
  -1.225E-13 -5.710E-13 -8.213E-13 -7.341E-13 -3.118E-13  1.225E-13  5.710E-13  8.213E-13  7.341E-13  3.118E-13

TIME STEP   25  TIME= 8.002E-09 CURRENT-
   3.521E-04  9.986E-04  1.230E-03  9.771E-04  3.843E-04 -3.521E-04 -9.986E-04 -1.230E-03 -9.771E-04 -3.843E-04

INT. OF CUR.
   7.044E-14 -2.616E-13 -5.345E-13 -5.556E-13 -2.520E-13 -7.044E-14  2.616E-13  5.345E-13  5.556E-13  2.520E-13

TIME STEP   26  TIME= 8.335E-09 CURRENT-
   4.008E-07  8.841E-04  1.528E-03  1.481E-03  6.440E-04 -4.008E-07 -8.841E-04 -1.528E-03 -1.481E-03 -6.440E-04

INT. OF CUR.
   1.277E-13  6.085E-14 -6.198E-14 -1.358E-13 -7.680E-14 -1.277E-13 -6.085E-14  6.198E-14  1.358E-13  7.680E-14

TIME STEP   27  TIME= 8.668E-09 CURRENT-
  -4.290E-05  6.166E-04  1.238E-03  1.314E-03  6.001E-04  4.290E-05 -6.166E-04 -1.238E-03 -1.314E-03 -6.001E-04
```

```
INT. OF CUR.
   1.120E-13  3.153E-13  4.156E-13  3.489E-13  1.390E-13 -1.120E-13 -3.153E-13 -4.156E-13 -3.489E-13 -1.390E-13

TIME STEP   28  TIME= 9.002E-09 CURRENT-
   2.191E-04  3.490E-04  5.219E-04  5.484E-04  2.623E-04 -2.191E-04 -3.490E-04 -5.219E-04 -5.484E-04 -2.623E-04

INT. OF CUR.
   1.329E-13  4.762E-13  7.208E-13  6.761E-13  2.910E-13 -1.329E-13 -4.762E-13 -7.208E-13 -6.761E-13 -2.910E-13

TIME STEP   29  TIME= 9.335E-09 CURRENT-
   5.456E-04  1.340E-04 -2.643E-04 -3.871E-04 -1.743E-04 -5.456E-04 -1.340E-04  2.643E-04  3.871E-04  1.743E-04

INT. OF CUR.
   2.586E-13  5.553E-13  7.657E-13  7.077E-13  3.084E-13 -2.586E-13 -5.553E-13 -7.657E-13 -7.077E-13 -3.084E-13

TIME STEP   30  TIME= 9.669E-09 CURRENT-
   6.413E-04 -5.667E-05 -7.685E-04 -9.765E-04 -4.561E-04 -6.413E-04  5.667E-05  7.685E-04  9.765E-04  4.561E-04

INT. OF CUR.
   4.629E-13  5.675E-13  5.857E-13  4.708E-13  1.990E-13 -4.629E-13 -5.675E-13 -5.857E-13 -4.708E-13 -1.990E-13

TIME STEP   31  TIME= 1.000E-08 CURRENT-
   3.646E-04 -2.471E-04 -8.215E-04 -9.489E-04 -4.419E-04 -3.646E-04  2.471E-04  8.215E-04  9.489E-04  4.419E-04

INT. OF CUR.
   6.409E-13  5.168E-13  3.081E-13  1.327E-13  4.109E-14 -6.409E-13 -5.168E-13 -3.081E-13 -1.327E-13 -4.109E-14

TIME STEP   32  TIME= 1.034E-08 CURRENT-
  -1.777E-04 -4.058E-04 -5.024E-04 -4.293E-04 -1.884E-04  1.777E-04  4.058E-04  5.024E-04  4.293E-04  1.884E-04

INT. OF CUR.
   6.795E-13  4.071E-13  7.709E-14 -1.107E-13 -7.061E-14 -6.795E-13 -4.071E-13 -7.709E-14  1.107E-13  7.061E-14

TIME STEP   33  TIME= 1.067E-08 CURRENT-
  -7.020E-04 -4.722E-04 -6.817E-05  1.819E-04  1.077E-04  7.020E-04  4.722E-04  6.817E-05 -1.819E-04 -1.077E-04

INT. OF CUR.
   5.323E-13  2.582E-13 -2.122E-14 -1.545E-13 -8.523E-14 -5.323E-13 -2.582E-13  2.122E-14  1.545E-13  8.523E-14

TIME STEP   34  TIME= 1.100E-08 CURRENT-
  -9.312E-04 -4.211E-04  2.053E-04  4.948E-04  2.553E-04  9.312E-04  4.211E-04 -2.053E-04 -4.948E-04 -2.553E-04

INT. OF CUR.
   2.518E-13  1.060E-13  6.104E-15 -3.341E-14 -2.059E-14 -2.518E-13 -1.060E-13 -6.104E-15  3.341E-14  2.059E-14

TIME STEP   35  TIME= 1.134E-08 CURRENT-
  -7.672E-04 -2.932E-04  1.803E-04  3.685E-04  1.889E-04  7.672E-04  2.932E-04 -1.803E-04 -3.685E-04 -1.889E-04

INT. OF CUR.
  -4.222E-14 -1.521E-14  7.867E-14  1.227E-13  5.940E-14  4.222E-14  1.521E-14 -7.867E-14 -1.227E-13 -5.940E-14

TIME STEP   36  TIME= 1.167E-08 CURRENT-
  -3.423E-04 -1.651E-04 -7.718E-05 -4.348E-05 -1.245E-05  3.423E-04  1.651E-04  7.718E-05  4.348E-05  1.245E-05

INT. OF CUR.
  -2.344E-13 -9.161E-14  1.023E-13  1.848E-13  9.257E-14  2.344E-13  9.161E-14 -1.023E-13 -1.848E-13 -9.257E-14

TIME STEP   37  TIME= 1.200E-08 CURRENT-
   7.760E-05 -9.212E-05 -3.600E-04 -4.361E-04 -2.011E-04 -7.760E-05  9.212E-05  3.600E-04  4.361E-04  2.011E-04

INT. OF CUR.
  -2.784E-13 -1.329E-13  3.015E-14  1.043E-13  5.662E-14  2.784E-13  1.329E-13 -3.015E-14 -1.043E-13 -5.662E-14

TIME STEP   38  TIME= 1.234E-08 CURRENT-
   2.686E-04 -7.751E-05 -4.651E-04 -5.611E-04 -2.612E-04 -2.686E-04  7.751E-05  4.651E-04  5.611E-04  2.612E-04

INT. OF CUR.
  -2.143E-13 -1.596E-13 -1.123E-13 -6.931E-14 -2.402E-14  2.143E-13  1.596E-13  1.123E-13  6.931E-14  2.402E-14

TIME STEP   39  TIME= 1.267E-08 CURRENT-
   1.813E-04 -8.420E-05 -3.227E-04 -3.653E-04 -1.702E-04 -1.813E-04  8.420E-05  3.227E-04  3.653E-04  1.702E-04

INT. OF CUR.
  -1.316E-13 -1.860E-13 -2.505E-13 -2.327E-13 -1.001E-13  1.316E-13  1.860E-13  2.505E-13  2.327E-13  1.001E-13

TIME STEP   40  TIME= 1.300E-08 CURRENT-
  -5.275E-05 -7.052E-05 -2.641E-05  7.474E-06  3.546E-06  5.275E-05  7.052E-05  2.641E-05 -7.474E-06 -3.546E-06
```

INT. OF CUR.
-1.061E-13 -2.123E-13 -3.130E-13 -2.972E-13 -1.302E-13 1.061E-13 2.123E-13 3.130E-13 2.972E-13 1.302E-13

TIME STEP 41 TIME= 1.334E-08 CURRENT-
-2.306E-04 -1.779E-05 2.461E-04 3.279E-04 1.532E-04 2.306E-04 1.779E-05 -2.461E-04 -3.279E-04 -1.532E-04

INT. OF CUR.
-1.549E-13 -2.281E-13 -2.757E-13 -2.399E-13 -1.034E-13 1.549E-13 2.281E-13 2.757E-13 2.399E-13 1.034E-13

TIME STEP 42 TIME= 1.367E-08 CURRENT-
-2.177E-04 6.379E-05 3.547E-04 4.257E-04 1.984E-04 2.177E-04 -6.379E-05 -3.547E-04 -4.257E-04 -1.984E-04

INT. OF CUR.
-2.349E-13 -2.213E-13 -1.710E-13 -1.081E-13 -4.193E-14 2.349E-13 2.213E-13 1.710E-13 1.081E-13 4.193E-14

TIME STEP 43 TIME= 1.400E-08 CURRENT-
-2.327E-05 1.456E-04 2.762E-04 2.824E-04 1.292E-04 2.327E-05 -1.456E-04 -2.762E-04 -2.824E-04 -1.292E-04

INT. OF CUR.
-2.801E-13 -1.864E-13 -6.067E-14 1.669E-14 1.586E-14 2.801E-13 1.864E-13 6.067E-14 -1.669E-14 -1.586E-14

TIME STEP 44 TIME= 1.434E-08 CURRENT-
2.271E-04 1.967E-04 9.866E-05 2.375E-05 4.257E-06 -2.271E-04 -1.967E-04 -9.866E-05 -2.375E-05 -4.257E-06

INT. OF CUR.
-2.477E-13 -1.285E-13 4.564E-15 7.092E-14 3.964E-14 2.477E-13 1.285E-13 -4.564E-15 -7.092E-14 -3.964E-14

TIME STEP 45 TIME= 1.467E-08 CURRENT-
3.853E-04 1.993E-04 -5.036E-05 -1.732E-04 -9.123E-05 -3.853E-04 -1.993E-04 5.036E-05 1.732E-04 9.123E-05

INT. OF CUR.
-1.431E-13 -6.112E-14 1.182E-14 4.428E-14 2.433E-14 1.431E-13 6.112E-14 -1.182E-14 -4.428E-14 -2.433E-14

TIME STEP 46 TIME= 1.500E-08 CURRENT-

3.736E-04 1.580E-04 -8.586E-05 -1.955E-04 -1.016E-04 -3.736E-04 -1.580E-04 8.586E-05 1.955E-04 1.016E-04

INT. OF CUR.
-1.184E-14 -3.462E-16 -1.404E-14 -2.204E-14 -1.019E-14 1.184E-14 3.462E-16 1.404E-14 2.204E-14 1.019E-14

TIME STEP 47 TIME= 1.534E-08 CURRENT-
2.198E-04 9.744E-05 -7.769E-06 -5.586E-05 -3.273E-05 -2.198E-04 -9.744E-05 7.769E-06 5.586E-05 3.273E-05

INT. OF CUR.
9.102E-14 4.276E-14 -3.280E-14 -6.844E-14 -3.479E-14 -9.102E-14 -4.276E-14 3.280E-14 6.844E-14 3.479E-14

TIME STEP 48 TIME= 1.567E-08 CURRENT-
2.630E-05 4.775E-05 1.129E-04 1.315E-04 5.956E-05 -2.630E-05 -4.775E-05 -1.129E-04 -1.315E-04 -5.956E-05

INT. OF CUR.
1.331E-13 6.666E-14 -1.646E-14 -5.716E-14 -3.097E-14 -1.331E-13 -6.666E-14 1.646E-14 5.716E-14 3.097E-14

TIME STEP 49 TIME= 1.600E-08 CURRENT-
-9.950E-05 2.552E-05 1.869E-04 2.368E-04 1.116E-04 9.950E-05 -2.552E-05 -1.869E-04 -2.368E-04 -1.116E-04

INT. OF CUR.
1.191E-13 7.812E-14 3.481E-14 6.504E-15 -1.319E-15 -1.191E-13 -7.812E-14 -3.481E-14 -6.504E-15 1.319E-15

TIME STEP 50 TIME= 1.634E-08 CURRENT-
-1.078E-04 2.507E-05 1.630E-04 1.986E-04 9.386E-05 1.078E-04 -2.507E-05 -1.630E-04 -1.986E-04 -9.386E-05

INT. OF CUR.
8.124E-14 8.595E-14 9.585E-14 8.306E-14 3.487E-14 -8.124E-14 -8.595E-14 -9.585E-14 -8.306E-14 -3.487E-14

TIME STEP 51 TIME= 1.667E-08 CURRENT-
-2.674E-05 2.619E-05 5.514E-05 5.245E-05 2.440E-05 2.674E-05 -2.619E-05 -5.514E-05 -5.245E-05 -2.440E-05

INT. OF CUR.
5.634E-14 9.445E-14 1.345E-13 1.279E-13 5.602E-14 -5.634E-14 -9.445E-14 -1.345E-13 -1.279E-13 -5.602E-14

TIME STEP 52 TIME= 1.700E-08 CURRENT-
6.527E-05 1.139E-05 -7.269E-05 -1.052E-04 -4.978E-05 -6.527E-05 -1.139E-05 7.269E-05 1.052E-04 4.978E-05

INT. OF CUR.
6.246E-14 1.012E-13 1.322E-13 1.194E-13 5.192E-14 -6.246E-14 -1.012E-13 -1.322E-13 -1.194E-13 -5.192E-14

TIME STEP 53 TIME= 1.734E-08 CURRENT-
9.494E-05 -2.147E-05 -1.506E-04 -1.846E-04 -8.604E-05 -9.494E-05 2.147E-05 1.506E-04 1.846E-04 8.604E-05

```
INT. OF CUR.
   9.090E-14  9.998E-14  9.357E-14  6.896E-14  2.823E-14 -9.090E-14 -9.998E-14 -9.357E-14 -6.896E-14 -2.823E-14

TIME STEP   54  TIME= 1.767E-08 CURRENT-
   3.944E-05 -5.970E-05 -1.458E-04 -1.549E-04 -7.064E-05 -3.944E-05  5.970E-05  1.458E-04  1.549E-04  7.064E-05

INT. OF CUR.
   1.157E-13  8.660E-14  4.188E-14  9.332E-15  6.706E-16 -1.157E-13 -8.660E-14 -4.188E-14 -9.332E-15 -6.706E-16

TIME STEP   55  TIME= 1.800E-08 CURRENT-
  -8.505E-05 -8.646E-05 -7.821E-05 -5.352E-05 -2.183E-05  6.505E-05  8.646E-05  7.821E-05  5.352E-05  2.183E-05

INT. OF CUR.
   1.128E-13  6.191E-14  2.799E-15 -2.741E-14 -1.567E-14 -1.128E-13 -6.191E-14 -2.799E-15  2.741E-14  1.567E-14

TIME STEP   56  TIME= 1.834E-08 CURRENT-
  -1.531E-04 -9.175E-05 -1.115E-06  4.690E-05  2.593E-05  1.531E-04  9.175E-05  1.115E-06 -4.690E-05 -2.593E-05

INT. OF CUR.
   7.593E-14  3.161E-14 -1.069E-14 -2.849E-14 -1.496E-14 -7.593E-14 -3.161E-14  1.069E-14  2.849E-14  1.496E-14

TIME STEP   57  TIME= 1.867E-08 CURRENT-
  -1.748E-04 -7.681E-05  3.661E-05  8.613E-05  4.432E-05  1.748E-04  7.681E-05 -3.661E-05 -8.613E-05 -4.432E-05

INT. OF CUR.
   1.942E-14  2.948E-15 -3.680E-15 -4.608E-15 -2.433E-15 -1.942E-14 -2.948E-15  3.680E-15  4.608E-15  2.433E-15

TIME STEP   58  TIME= 1.900E-08 CURRENT-
  -1.248E-04 -5.135E-05  1.971E-05  5.028E-05  2.679E-05  1.248E-04  5.135E-05 -1.971E-05 -5.028E-05 -2.679E-05

INT. OF CUR.
  -3.252E-14 -1.871E-14  7.225E-15  2.022E-14  1.042E-14  3.252E-14  1.871E-14 -7.225E-15 -2.022E-14 -1.042E-14

TIME STEP   59  TIME= 1.934E-08 CURRENT-
  -3.943E-05 -2.714E-05 -2.952E-05 -2.634E-05 -1.050E-05  3.943E-05  2.714E-05  2.952E-05  2.634E-05  1.050E-05

INT. OF CUR.
  -6.088E-14 -3.176E-14  6.488E-15  2.534E-14  1.368E-14  6.088E-14  3.176E-14 -6.488E-15 -2.534E-14 -1.368E-14

TIME STEP   60  TIME= 1.967E-08 CURRENT-
   3.081E-05 -1.209E-05 -7.123E-05 -8.831E-05 -4.104E-05 -3.081E-05  1.209E-05  7.123E-05  8.831E-05  4.104E-05

INT. OF CUR.
  -6.189E-14 -3.805E-14 -1.052E-14  5.821E-15  4.906E-15  6.189E-14  3.805E-14  1.052E-14 -5.821E-15 -4.906E-15

TIME STEP   61  TIME= 2.000E-08 CURRENT-
   5.348E-05 -7.057E-06 -7.549E-05 -9.577E-05 -4.546E-05 -5.348E-05  7.057E-06  7.549E-05  9.577E-05  4.546E-05

INT. OF CUR.
  -4.652E-14 -4.096E-14 -3.602E-14 -2.638E-14 -1.024E-14  4.652E-14  4.096E-14  3.602E-14  2.638E-14  1.024E-14

TIME STEP   62  TIME= 2.034E-08 CURRENT-
   3.006E-05 -6.613E-06 -3.920E-05 -4.727E-05 -2.277E-05 -3.006E-05  6.613E-06  3.920E-05  4.727E-05  2.277E-05

INT. OF CUR.
  -3.132E-14 -4.311E-14 -5.626E-14 -5.178E-14 -2.237E-14  3.132E-14  4.311E-14  5.626E-14  5.178E-14  2.237E-14

TIME STEP   63  TIME= 2.067E-08 CURRENT-
  -1.080E-05 -3.283E-06  1.572E-05  2.379E-05  1.095E-05  1.080E-05  3.283E-06 -1.572E-05 -2.379E-05 -1.095E-05

INT. OF CUR.
  -2.762E-14 -4.484E-14 -6.069E-14 -5.632E-14 -2.464E-14  2.762E-14  4.484E-14  6.069E-14  5.632E-14  2.464E-14

TIME STEP   64  TIME= 2.100E-08 CURRENT-
  -3.498E-05  7.120E-06  5.861E-05  7.410E-05  3.470E-05  3.498E-05 -7.120E-06 -5.861E-05 -7.410E-05 -3.470E-05

INT. OF CUR.
  -3.572E-14 -4.440E-14 -4.797E-14 -3.942E-14 -1.675E-14  3.572E-14  4.440E-14  4.797E-14  3.942E-14  1.675E-14

TIME STEP   65  TIME= 2.134E-08 CURRENT-
  -2.441E-05  2.258E-05  6.922E-05  7.835E-05  3.624E-05  2.441E-05 -2.258E-05 -6.922E-05 -7.835E-05 -3.624E-05

INT. OF CUR.
  -4.658E-14 -3.959E-14 -2.576E-14 -1.273E-14 -4.313E-15  4.658E-14  3.959E-14  2.576E-14  1.273E-14  4.313E-15

TIME STEP   66  TIME= 2.167E-08 CURRENT-
   1.410E-05  3.643E-05  4.818E-05  4.227E-05  1.851E-05 -1.410E-05 -3.643E-05 -4.818E-05 -4.227E-05 -1.851E-05
```

```
INT. OF CUR.
 -4.908E-14 -2.970E-14 -5.313E-15  8.498E-15  5.349E-15  4.908E-14  2.970E-14  5.313E-15 -8.498E-15 -5.349E-15

TIME STEP   67  TIME= 2.200E-08 CURRENT-
  5.605E-05  4.217E-05  1.384E-05 -5.477E-06 -4.466E-06 -5.605E-05 -4.217E-05 -1.384E-05  5.477E-06  4.466E-06

INT. OF CUR.
 -3.748E-14 -1.638E-14  5.395E-15  1.495E-14  7.836E-15  3.748E-14  1.638E-14 -5.395E-15 -1.495E-14 -7.836E-15

TIME STEP   68  TIME= 2.234E-08 CURRENT-
  7.640E-05  3.777E-05 -1.097E-05 -3.416E-05 -1.795E-05 -7.640E-05 -3.777E-05  1.097E-05  3.416E-05  1.795E-05

INT. OF CUR.
 -1.480E-14 -2.767E-15  5.609E-15  7.817E-15  3.835E-15  1.480E-14  2.767E-15 -5.609E-15 -7.817E-15 -3.836E-15

TIME STEP   69  TIME= 2.267E-08 CURRENT-
  6.494E-05  2.652E-05 -1.328E-05 -2.988E-05 -1.548E-05 -6.494E-05 -2.652E-05  1.328E-05  2.988E-05  1.548E-05

INT. OF CUR.
  9.649E-15  8.140E-15  9.427E-16 -3.774E-15 -2.180E-15 -9.649E-15 -8.140E-15 -9.427E-16  3.774E-15  2.180E-15

TIME STEP   70  TIME= 2.300E-08 CURRENT-
  3.094E-05  1.432E-05  3.539E-06 -1.208E-06 -1.404E-06 -3.094E-05 -1.432E-05 -3.539E-06  1.208E-06  1.404E-06

INT. OF CUR.
  2.626E-14  1.498E-14 -1.212E-15 -9.633E-15 -5.318E-15 -2.626E-14 -1.498E-14  1.212E-15  9.633E-15  5.318E-15

TIME STEP   71  TIME= 2.334E-08 CURRENT-
 -4.715E-06  5.830E-06  2.417E-05  2.948E-05  1.355E-05  4.715E-06 -5.830E-06 -2.417E-05 -2.948E-05 -1.355E-05

INT. OF CUR.
  3.068E-14  1.823E-14  3.302E-15 -4.977E-15 -3.318E-15 -3.068E-14 -1.823E-14 -3.302E-15  4.977E-15  3.318E-15

TIME STEP   72  TIME= 2.367E-08 CURRENT-
 -2.359E-05  2.189E-06  3.270E-05  4.161E-05  1.961E-05  2.359E-05 -2.189E-06 -3.270E-05 -4.161E-05 -1.961E-05

INT. OF CUR.
  2.549E-14  1.943E-14  1.312E-14  7.389E-15  2.456E-15 -2.549E-14 -1.943E-14 -1.312E-14 -7.389E-15 -2.456E-15

TIME STEP   73  TIME= 2.400E-08 CURRENT-
 -2.033E-05  1.385E-06  2.278E-05  2.860E-05  1.367E-05  2.033E-05 -1.385E-06 -2.278E-05 -2.860E-05 -1.367E-05

INT. OF CUR.
  1.756E-14  1.995E-14  2.288E-14  1.979E-14  8.337E-15 -1.756E-14 -1.995E-14 -2.288E-14 -1.979E-14 -8.337E-15

TIME STEP   74  TIME= 2.434E-08 CURRENT-
 -3.792E-06  2.791E-07  4.397E-07 -1.479E-08  2.518E-07  3.792E-06 -2.791E-07 -4.397E-07  1.479E-08 -2.518E-07

INT. OF CUR.
  1.317E-14  2.024E-14  2.710E-14  2.499E-14  1.087E-14 -1.317E-14 -2.024E-14 -2.710E-14 -2.499E-14 -1.087E-14

TIME STEP   75  TIME= 2.467E-08 CURRENT-
  1.071E-05 -3.214E-06 -2.126E-05 -2.633E-05 -1.214E-05 -1.071E-05  3.214E-06  2.126E-05  2.633E-05  1.214E-05

INT. OF CUR.
  1.438E-14  1.981E-14  2.361E-14  2.053E-14  8.855E-15 -1.438E-14 -1.981E-14 -2.361E-14 -2.053E-14 -8.855E-15

TIME STEP   76  TIME= 2.500E-08 CURRENT-
  1.195E-05 -8.976E-06 -3.108E-05 -3.589E-05 -1.659E-05 -1.195E-05  8.976E-06  3.108E-05  3.589E-05  1.659E-05

INT. OF CUR.
  1.852E-14  1.784E-14  1.455E-14  9.696E-15  3.845E-15 -1.852E-14 -1.784E-14 -1.455E-14 -9.696E-15 -3.845E-15

TIME STEP   77  TIME= 2.534E-08 CURRENT-
 -9.105E-07 -1.494E-05 -2.605E-05 -2.595E-05 -1.173E-05  9.105E-07  1.494E-05  2.605E-05  2.595E-05  1.173E-05

INT. OF CUR.
  2.076E-14  1.386E-14  4.618E-15 -1.154E-15 -1.134E-15 -2.076E-14 -1.386E-14 -4.618E-15  1.154E-15  1.134E-15

TIME STEP   78  TIME= 2.567E-08 CURRENT-

 -1.927E-05 -1.844E-05 -1.200E-05 -5.622E-06 -1.925E-06  1.927E-05  1.844E-05  1.200E-05  5.622E-06  1.925E-06

INT. OF CUR.
  1.754E-14  8.231E-15 -1.976E-15 -6.705E-15 -3.547E-15 -1.754E-14 -8.231E-15  1.976E-15  6.705E-15  3.547E-15

TIME STEP   79  TIME= 2.601E-08 CURRENT-
 -3.169E-05 -1.788E-05  1.214E-06  1.122E-05  6.128E-06  3.169E-05  1.788E-05 -1.214E-06 -1.122E-05 -6.128E-06
```

```
INT. OF CUR.
  8.885E-15  2.065E-15 -3.752E-15 -5.676E-15 -2.797E-15 -8.885E-15 -2.065E-15  3.752E-15  5.676E-15  2.797E-15

TIME STEP   80  TIME= 2.634E-08 CURRENT-
 -3.122E-05 -1.367E-05  6.162E-06  1.505E-05  7.841E-06  3.122E-05  1.367E-05 -6.162E-06 -1.505E-05 -7.841E-06

INT. OF CUR.
 -1.959E-15 -3.295E-15 -2.292E-15 -9.355E-16 -2.927E-16  1.959E-15  3.295E-15  2.292E-15  9.355E-16  2.927E-16

TIME STEP   81  TIME= 2.667E-08 CURRENT-
 -1.905E-05 -7.930E-06  1.797E-06  5.918E-06  3.264E-06  1.905E-05  7.930E-06 -1.797E-06 -5.918E-06 -3.264E-06

INT. OF CUR.
 -1.066E-14 -6.937E-15 -7.068E-16  2.921E-15  1.733E-15  1.066E-14  6.937E-15  7.068E-16 -2.921E-15 -1.733E-15

TIME STEP   82  TIME= 2.701E-08 CURRENT-
 -2.803E-06 -3.102E-06 -6.888E-06 -8.042E-06 -3.618E-06  2.803E-06  3.102E-06  6.888E-06  8.042E-06  3.618E-06

INT. OF CUR.
 -1.442E-14 -8.751E-15 -1.435E-15  2.701E-15  1.738E-15  1.442E-14  8.751E-15  1.435E-15 -2.701E-15 -1.738E-15

TIME STEP   83  TIME= 2.734E-08 CURRENT-
  8.760E-06 -5.060E-07 -1.280E-05 -1.680E-05 -7.950E-06 -8.760E-06  5.060E-07  1.280E-05  1.680E-05  7.950E-06

INT. OF CUR.
 -1.330E-14 -9.291E-15 -4.794E-15 -1.585E-15 -2.609E-16  1.330E-14  9.291E-15  4.794E-15  1.585E-15  2.609E-16

TIME STEP   84  TIME= 2.767E-08 CURRENT-
  1.100E-05  2.047E-07 -1.143E-05 -1.492E-05 -7.141E-06 -1.100E-05 -2.047E-07  1.143E-05  1.492E-05  7.141E-06

INT. OF CUR.
 -9.745E-15 -9.289E-15 -9.035E-15 -7.169E-15 -2.919E-15  9.745E-15  9.289E-15  9.035E-15  7.169E-15  2.919E-15

TIME STEP   85  TIME= 2.801E-08 CURRENT-
  5.533E-06  4.362E-07 -3.353E-06 -4.259E-06 -2.123E-06 -5.533E-06 -4.362E-07  3.353E-06  4.259E-06  2.123E-06

INT. OF CUR.
 -6.775E-15 -9.169E-15 -1.169E-14 -1.061E-14 -4.581E-15  6.775E-15  9.169E-15  1.169E-14  1.061E-14  4.581E-15

TIME STEP   86  TIME= 2.834E-08 CURRENT-
 -1.713E-06  1.483E-06  6.666E-06  8.189E-06  3.734E-06  1.713E-06 -1.483E-06 -6.666E-06 -8.189E-06 -3.734E-06

INT. OF CUR.
 -6.089E-15 -8.871E-15 -1.119E-14 -1.001E-14 -4.336E-15  6.089E-15  8.871E-15  1.119E-14  1.001E-14  4.336E-15

TIME STEP   87  TIME= 2.867E-08 CURRENT-
 -4.793E-06  3.659E-06  1.311E-05  1.521E-05  6.997E-06  4.793E-06 -3.659E-06 -1.311E-05 -1.521E-05 -6.997E-06

INT. OF CUR.
 -7.289E-15 -8.045E-15 -7.792E-15 -5.955E-15 -2.475E-15  7.289E-15  8.045E-15  7.792E-15  5.955E-15  2.475E-15

TIME STEP   88  TIME= 2.901E-08 CURRENT-
 -1.460E-06  6.229E-06  1.312E-05  1.370E-05  6.219E-06  1.460E-06 -6.229E-06 -1.312E-05 -1.370E-05 -6.219E-06

INT. OF CUR.
 -8.510E-15 -6.408E-15 -3.241E-15 -8.990E-16 -1.593E-16  8.510E-15  6.408E-15  3.241E-15  8.990E-16  1.593E-16
TIME STEP   89  TIME= 2.934E-08 CURRENT-
  5.933E-06  8.020E-06  7.931E-06  5.973E-06  2.507E-06 -5.933E-06 -8.020E-06 -7.931E-06 -5.973E-06 -2.507E-06

INT. OF CUR.
 -7.877E-15 -4.011E-15  4.138E-16  2.554E-15  1.377E-15  7.877E-15  4.011E-15 -4.138E-16 -2.554E-15 -1.377E-15

TIME STEP   90  TIME= 2.967E-08 CURRENT-
  1.252E-05  8.190E-06  1.481E-06 -2.425E-06 -1.489E-06 -1.252E-05 -8.190E-06 -1.481E-06  2.425E-06  1.489E-06

INT. OF CUR.
 -4.778E-15 -1.264E-15  2.018E-15  3.164E-15  1.554E-15  4.778E-15  1.264E-15 -2.018E-15 -3.164E-15 -1.554E-15

TIME STEP   91  TIME= 3.001E-08 CURRENT-
  1.428E-05  6.695E-06 -2.303E-06 -6.441E-06 -3.365E-06 -1.428E-05 -6.695E-06  2.303E-06  6.441E-06  3.365E-06

INT. OF CUR.
 -1.762E-16  1.264E-15  1.806E-15  1.564E-15  6.863E-16  1.762E-16 -1.264E-15 -1.806E-15 -1.564E-15 -6.863E-16

TIME STEP   92  TIME= 3.034E-08 CURRENT-
  1.044E-05  4.243E-06 -1.874E-06 -4.486E-06 -2.362E-06 -1.044E-05 -4.243E-06  1.874E-06  4.486E-06  2.362E-06
```

```
INT. OF CUR.
   4.101E-15  3.114E-15  9.930E-16 -4.233E-16 -3.485E-16 -4.101E-15 -3.114E-15 -9.930E-16  4.233E-16  3.485E-16

TIME STEP   93  TIME= 3.067E-08 CURRENT-
   3.500E-06  1.839E-06  1.408E-06  1.102E-06  3.951E-07 -3.500E-06 -1.839E-06 -1.408E-06 -1.102E-06 -3.951E-07

INT. OF CUR.
   6.511E-15  4.126E-15  8.360E-16 -1.088E-15 -7.252E-16 -6.511E-15 -4.126E-15 -8.360E-16  1.088E-15  7.252E-16

TIME STEP   94  TIME= 3.101E-08 CURRENT-
  -2.640E-06  2.342E-07  4.579E-06  6.039E-06  2.840E-06  2.640E-06 -2.342E-07 -4.579E-06 -6.039E-06 -2.840E-06

INT. OF CUR.
   6.632E-15  4.449E-15  1.837E-15  1.203E-16 -1.772E-16 -6.632E-15 -4.449E-15 -1.837E-15 -1.203E-16  1.772E-16

TIME STEP   95  TIME= 3.134E-08 CURRENT-
  -5.184E-06 -4.296E-07  5.147E-06  7.006E-06  3.367E-06  5.184E-06  4.296E-07 -5.147E-06 -7.006E-06 -3.367E-06

INT. OF CUR.
   5.228E-15  4.391E-15  3.531E-15  2.405E-15  9.107E-16 -5.228E-15 -4.391E-15 -3.531E-15 -2.405E-15 -9.107E-16

TIME STEP   96  TIME= 3.167E-08 CURRENT-
  -3.886E-06 -5.769E-07  2.572E-06  3.582E-06  1.769E-06  3.886E-06  5.769E-07 -2.572E-06 -3.582E-06 -1.769E-06

INT. OF CUR.
   3.609E-15  4.209E-15  4.905E-15  4.292E-15  1.826E-15 -3.609E-15 -4.209E-15 -4.905E-15 -4.292E-15 -1.826E-15

TIME STEP   97  TIME= 3.201E-08 CURRENT-
  -7.767E-07 -8.216E-07 -1.648E-06 -1.862E-06 -8.068E-07  7.767E-07  8.216E-07  1.648E-06  1.862E-06  8.068E-07

INT. OF CUR.
   2.782E-15  3.978E-15  5.105E-15  4.635E-15  2.014E-15 -2.782E-15 -3.978E-15 -5.105E-15 -4.635E-15 -2.014E-15

TIME STEP   98  TIME= 3.234E-08 CURRENT-
   1.422E-06 -1.520E-06 -5.129E-06 -5.991E-06 -2.752E-06 -1.422E-06  1.520E-06  5.129E-06  5.991E-06  2.752E-06

INT. OF CUR.
   2.915E-15  3.600E-15  3.954E-15  3.289E-15  1.403E-15 -2.915E-15 -3.600E-15 -3.954E-15 -3.289E-15 -1.403E-15

TIME STEP   99  TIME= 3.267E-08 CURRENT-
   1.066E-06 -2.550E-06 -6.139E-06 -6.659E-06 -3.041E-06 -1.066E-06  2.550E-06  6.139E-06  6.659E-06  3.041E-06
INT. OF CUR.
   3.400E-15  2.931E-15  2.007E-15  1.084E-15  3.910E-16 -3.400E-15 -2.931E-15 -2.007E-15 -1.084E-15 -3.910E-16

TIME STEP  100  TIME= 3.301E-08 CURRENT-
  -1.550E-06 -3.441E-06 -4.553E-06 -4.048E-06 -1.773E-06  1.550E-06  3.441E-06  4.553E-06  4.048E-06  1.773E-06

INT. OF CUR.
   3.383E-15  1.929E-15  1.527E-16 -7.916E-16 -4.548E-16 -3.383E-15 -1.929E-15 -1.527E-16  7.916E-16  4.548E-16

TIME STEP  101  TIME= 3.334E-08 CURRENT-
  -4.631E-06 -3.720E-06 -1.721E-06 -2.208E-07  5.326E-08  4.631E-06  3.720E-06  1.721E-06  2.208E-07 -5.326E-08

INT. OF CUR.
   2.365E-15  7.179E-16 -9.279E-16 -1.537E-15 -7.571E-16 -2.365E-15 -7.179E-16  9.279E-16  1.537E-15  7.571E-16

TIME STEP  102  TIME= 3.367E-08 CURRENT-
  -6.188E-06 -3.227E-06  5.395E-07  2.389E-06  1.276E-06  6.188E-06  3.227E-06 -5.395E-07 -2.389E-06 -1.276E-06

INT. OF CUR.
   5.191E-16 -4.615E-16 -1.109E-15 -1.142E-15 -5.186E-16 -5.191E-16  4.615E-16  1.109E-15  1.142E-15  5.186E-16

TIME STEP  103  TIME= 3.401E-08 CURRENT-
  -5.302E-06 -2.186E-06  1.096E-06  2.488E-06  1.288E-06  5.302E-06  2.186E-06 -1.096E-06 -2.488E-06 -1.288E-06

INT. OF CUR.
  -1.464E-15 -1.379E-15 -7.891E-16 -2.590E-16 -5.751E-17  1.464E-15  1.379E-15  7.891E-16  2.590E-16  5.751E-17

TIME STEP  104  TIME= 3.434E-08 CURRENT-
  -2.569E-06 -1.036E-06  7.309E-08  5.236E-07  3.110E-07  2.569E-06  1.036E-06 -7.309E-08 -5.236E-07 -3.110E-07

INT. OF CUR.
  -2.828E-15 -1.919E-15 -5.504E-16  3.003E-16  2.365E-16  2.828E-15  1.919E-15  5.504E-16 -3.003E-16 -2.365E-16

TIME STEP  105  TIME= 3.467E-08 CURRENT-
   4.314E-07 -1.665E-07 -1.420E-06 -1.852E-06 -8.589E-07 -4.314E-07  1.665E-07  1.420E-06  1.852E-06  8.589E-07
```

```
INT. OF CUR.
 -3.191E-15 -2.112E-15 -7.619E-16  9.036E-17  1.505E-16  3.191E-15  2.112E-15  7.619E-16 -9.036E-17 -1.505E-16

TIME STEP  106  TIME= 3.501E-08 CURRENT-
  2.209E-06  2.783E-07 -2.134E-06 -2.960E-06 -1.418E-06 -2.209E-06 -2.783E-07  2.134E-06  2.960E-06  1.418E-06

INT. OF CUR.
 -2.717E-15 -2.081E-15 -1.376E-15 -7.470E-16 -2.461E-16  2.717E-15  2.081E-15  1.376E-15  7.470E-16  2.461E-16

TIME STEP  107  TIME= 3.534E-08 CURRENT-
  2.220E-06  4.136E-07 -1.483E-06 -2.132E-06 -1.046E-06 -2.220E-06 -4.136E-07  1.483E-06  2.132E-06  1.046E-06

INT. OF CUR.
 -1.930E-15 -1.957E-15 -2.017E-15 -1.650E-15 -6.828E-16  1.930E-15  1.957E-15  2.017E-15  1.650E-15  6.828E-16

TIME STEP  108  TIME= 3.567E-08 CURRENT-
  1.039E-06  4.866E-07  1.739E-07  1.815E-08 -3.462E-08 -1.039E-06 -4.866E-07 -1.739E-07 -1.815E-08  3.462E-08

INT. OF CUR.
 -1.354E-15 -1.806E-15 -2.263E-15 -2.039E-15 -8.806E-16  1.354E-15  1.806E-15  2.263E-15  2.039E-15  8.806E-16

TIME STEP  109  TIME= 3.601E-08 CURRENT-
 -1.755E-07  6.945E-07  1.874E-06  2.123E-06  9.605E-07  1.755E-07 -6.945E-07 -1.874E-06 -2.123E-06 -9.605E-07

INT. OF CUR.
 -1.209E-15 -1.612E-15 -1.923E-15 -1.680E-15 -7.258E-16  1.209E-15  1.612E-15  1.923E-15  1.680E-15  7.258E-16

TIME STEP  110  TIME= 3.634E-08 CURRENT-

 -4.788E-07  1.064E-06  2.711E-06  2.994E-06  1.368E-06  4.788E-07 -1.064E-06 -2.711E-06 -2.994E-06 -1.368E-06

INT. OF CUR.
 -1.343E-15 -1.324E-15 -1.135E-15 -7.931E-16 -3.212E-16  1.343E-15  1.324E-15  1.135E-15  7.931E-16  3.212E-16

TIME STEP  111  TIME= 3.667E-08 CURRENT-
  3.106E-07  1.449E-06  2.371E-06  2.318E-06  1.039E-06 -3.106E-07 -1.449E-06 -2.371E-06 -2.318E-06 -1.039E-06

INT. OF CUR.
 -1.402E-15 -9.054E-16 -2.552E-16  1.355E-16  1.005E-16  1.402E-15  9.054E-16  2.552E-16 -1.355E-16 -1.005E-16

TIME STEP  112  TIME= 3.701E-08 CURRENT-
  1.612E-06  1.644E-06  1.241E+06  7.273E-07  2.768E-07 -1.612E-06 -1.644E-06 -1.241E-06 -7.273E-07 -2.768E-07

INT. OF CUR.
 -1.095E-15 -3.846E-16  3.690E-16  6.684E-16  3.318E-16  1.095E-15  3.846E-16 -3.690E-16 -6.684E-16 -3.318E-16

TIME STEP  113  TIME= 3.734E-08 CURRENT-
  2.544E-06  1.520E-06  8.129E-08 -7.063E-07 -4.019E-07 -2.544E-06 -1.520E-06 -8.129E-08  7.063E-07  4.019E-07

INT. OF CUR.
 -3.925E-16  1.516E-16  5.903E-16  6.676E-16  3.086E-16  3.925E-16 -1.516E-16 -5.903E-16 -6.676E-16 -3.086E-16

TIME STEP  114  TIME= 3.767E-08 CURRENT-
  2.514E-06  1.110E-06 -4.767E-07 -1.185E-06 -6.156E-07 -2.514E-06 -1.110E-06  4.767E-07  1.185E-06  6.156E-07

INT. OF CUR.
  4.775E-16  5.980E-16  5.076E-16  3.258E-16  1.261E-16 -4.775E-16 -5.980E-16 -5.076E-16 -3.258E-16 -1.261E-16

TIME STEP  115  TIME= 3.801E-08 CURRENT-
  1.545E-06  5.793E-07 -2.808E-07 -6.225E-07 -3.274E-07 -1.545E-06 -5.793E-07  2.808E-07  6.225E-07  3.274E-07

INT. OF CUR.
  1.180E-15  8.830E-16  3.604E-16 -4.418E-18 -4.505E-17 -1.180E-15 -8.830E-16 -3.604E-16  4.418E-18  4.505E-17

TIME STEP  116  TIME= 3.834E-08 CURRENT-
  1.983E-07  1.215E-07  3.256E-07  4.109E-07  1.848E-07 -1.983E-07 -1.215E-07 -3.256E-07 -4.109E-07 -1.848E-07

INT. OF CUR.
  1.481E-15  9.978E-16  3.565E-16 -5.278E-17 -7.506E-17 -1.481E-15 -9.978E-16 -3.565E-16  5.278E-17  7.506E-17

TIME STEP  117  TIME= 3.867E-08 CURRENT-
 -8.270E-07 -1.508E-07  7.912E-07  1.138E-06  5.461E-07  8.270E-07  1.508E-07 -7.912E-07 -1.138E-06 -5.461E-07

INT. OF CUR.
  1.368E-15  9.878E-16  5.466E-16  2.139E-16  5.097E-17 -1.368E-15 -9.878E-16 -5.466E-16 -2.139E-16 -5.097E-17

TIME STEP  118  TIME= 3.901E-08 CURRENT-
 -1.120E-06 -2.500E-07  7.311E-07  1.080E-06  5.284E-07  1.120E-06  2.500E-07 -7.311E-07 -1.080E-06 -5.284E-07
```

```
INT. OF CUR.
   1.023E-15  9.162E-16  8.149E-16  6.054E-16  2.406E-16 -1.023E-15 -9.162E-16 -8.149E-16 -6.054E-16 -2.406E-16

TIME STEP  119  TIME= 3.934E-08 CURRENT-
  -7.576E-07 -2.758E-07  1.474E-07  3.137E-07  1.693E-07  7.576E-07  2.758E-07 -1.474E-07 -3.137E-07 -1.693E-07

INT. OF CUR.
   6.914E-16  8.265E-16  9.759E-16  8.575E-16  3.664E-16 -6.914E-16 -8.265E-16 -9.759E-16 -8.575E-16 -3.664E-16

TIME STEP  120  TIME= 3.967E-08 CURRENT-
  -1.78P[illegible]07 -3.320E-07 -6.179E-07 -6.547E-07 -2.878E-07  1.788E-07  3.320E-07  6.179E-07  6.547E-07  2.878E-07

INT. OF CUR.
   5.293E-16  7.260E-16  9.025E-16  8.062E-16  3.494E-16 -5.293E-16 -7.260E-16 -9.025E-16 -8.062E-16 -3.494E-16

TIME STEP  121  TIME= 4.001E-08 CURRENT-
   1.383E-07 -4.584E-07 -1.135E-06 -1.250E-06 -5.679E-07 -1.383E-07  4.584E-07  1.135E-06  1.250E-06  5.679E-07

INT. OF CUR.
   5.298E-16  5.962E-16  6.034E-16  4.784E-16  2.018E-16 -5.298E-16 -5.962E-16 -6.034E-16 -4.784E-16 -2.018E-16

TIME STEP  122  TIME= 4.034E-08 CURRENT-
  -2.255E-08 -6.144E-07 -1.158E-06 -1.185E-06 -5.344E-07  2.255E-08  6.144E-07  1.158E-06  1.185E-06  5.344E-07

INT. OF CUR.
   5.624E-16  4.182E-16  2.075E-16  5.424E-17  9.357E-18 -5.624E-16 -4.182E-16 -2.075E-16 -5.424E-17 -9.357E-18

TIME STEP  123  TIME= 4.067E-08 CURRENT-
  -5.208E-07 -7.163E-07 -7.515E-07 -5.945E-07 -2.525E-07  5.208E-07  7.163E-07  7.515E-07  5.945E-07  2.525E-07

INT. OF CUR.
   4.812E-16  1.948E-16 -1.229E-16 -2.569E-16 -1.287E-16 -4.812E-16 -1.948E-16  1.229E-16  2.569E-16  1.287E-16

TIME STEP  124  TIME= 4.101E-08 CURRENT-
  -9.979E-07 -6.961E-07 -2.074E-07  1.009E-07  7.694E-08  9.979E-07  6.961E-07  2.074E-07 -1.009E-07 -7.694E-08

INT. OF CUR.
   2.274E-16 -4.402E-17 -2.865E-16 -3.421E-16 -1.593E-16 -2.274E-16  4.402E-17  2.865E-16  3.421E-16  1.593E-16

TIME STEP  125  TIME= 4.134E-08 CURRENT-
  -1.131E-06 -5.445E-07  1.585E-07  4.880E-07  2.563E-07  1.131E-06  5.445E-07 -1.585E-07 -4.880E-07 -2.563E-07

INT. OF CUR.
  -1.370E-16 -2.545E-16 -2.897E-16 -2.354E-16 -9.959E-17  1.370E-16  2.545E-16  2.897E-16  2.354E-16  9.959E-17

TIME STEP  126  TIME= 4.167E-08 CURRENT-
  -8.300E-07 -3.147E-07  1.969E-07  4.065E-07  2.095E-07  8.300E-07  3.147E-07 -1.969E-07 -4.065E-07 -2.095E-07

INT. OF CUR.
  -4.759E-16 -3.999E-16 -2.214E-16 -7.325E-17 -1.565E-17  4.759E-16  3.999E-16  2.214E-16  7.325E-17  1.565E-17

TIME STEP  127  TIME= 4.201E-08 CURRENT-
  -2.666E-07 -8.923E-08 -1.407E-08  8.151E-09  1.053E-08  2.666E-07  8.923E-08  1.407E-08 -8.151E-09 -1.053E-08

INT. OF CUR.
  -6.660E-16 -4.671E-16 -1.840E-16  4.675E-18  2.526E-17  6.660E-16  4.671E-16  1.840E-16 -4.675E-18 -2.526E-17

TIME STEP  128  TIME= 4.234E-08 CURRENT-
   2.593E-07  6.713E-08 -2.537E-07 -3.819E-07 -1.834E-07 -2.593E-07 -6.713E-08  2.537E-07  3.819E-07  1.834E-07

INT. OF CUR.
  -6.662E-16 -4.689E-16 -2.278E-16 -5.786E-17 -3.699E-18  6.662E-16  4.689E-16  2.278E-16  5.786E-17  3.699E-18
 RUNNING TIME IN MICROSECONDS =   672723
 EXTRAPOLATION OF TIME FUNCTION NOT POSSIBLE

 TRAN ARRAY VALUES.
  -6.552E-11  1.473E-07  6.214E-07  1.467E-06  2.101E-06  5.933E-07 -6.378E-06 -2.126E-05 -4.007E-05 -4.609E-05
  -1.092E-05  8.827E-05  2.366E-04  3.570E-04  3.281E-04  6.138E-05 -4.019E-04 -8.561E-04 -1.024E-03 -7.433E-04
  -1.103E-04  5.472E-04  8.803E-04  7.580E-04  3.521E-04  4.008E-07 -4.290E-05  2.191E-04  5.456E-04  6.413E-04
   3.646E-04 -1.777E-04 -7.020E-04 -9.312E-04 -7.672E-04 -3.423E-04  7.760E-05  2.686E-04  1.813E-04 -5.275E-05
  -2.306E-04 -2.177E-04 -2.327E-05  2.271E-04  3.853E-04  3.736E-04  2.198E-04  2.630E-05 -9.950E-05 -1.078E-04
  -2.674E-05  6.527E-05  9.494E-05  3.944E-05 -6.505E-05 -1.531E-04 -1.748E-04 -1.248E-04 -3.943E-05  3.081E-05
   5.348E-05  3.006E-05 -1.080E-05 -3.498E-05 -2.441E-05  1.410E-05  5.605E-05  7.640E-05  6.494E-05  3.094E-05
  -4.715E-06 -2.359E-05 -2.033E-05 -3.792E-06  1.071E-05  1.195E-05 -9.105E-07 -1.927E-05 -3.169E-05 -3.122E-05
  -1.90[illegible]-05 -2.803E-06  8.760E-06  1.100E-05  5.533E-06 -1.713E-06 -4.793E-06 -1.460E-06  5.933E-06  1.252E-05
   1.428E-05  1.044E-05  3.500E-06 -2.640E-06 -5.184E-06 -3.886E-06 -7.767E-07  1.422E-06  1.066E-06 -1.550E-06
  -4.631E-06 -6.188E-06 -5.302E-06 -2.569E-06  4.314E-07  2.209E-06  2.220E-06  1.039E-06 -1.755E-07 -4.788E-07
   3.106E-07  1.612E-06  2.544E-06  2.514E-06  1.545E-06  1.983E-07 -8.270E-07 -1.120E-06 -7.576E-07 -1.788E-07
```

1.383E-07	-2.255E-08	-5.208E-07	-9.979E-07	-1.131E-06	-8.300E-07	-2.666E-07	2.593E-07	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.				

11	FREQ.	-ADMITTANCE-			-IMPEDANCE-		
		R	I	MAG.	R	I	MAG.
2	1.1716E+07	-1.88593E-05	2.02600E-04	2.03476E-04	-4.55512E+02	-4.89343E+03	4.91458E+03
3	2.3433E+07	1.57624E-05	3.42103E-04	3.42466E-04	1.34396E+02	-2.91690E+03	2.92000E+03
4	3.5149E+07	-1.04496E-05	5.41679E-04	5.41779E-04	-3.56003E+01	-1.84543E+03	1.84577E+03
5	4.6866E+07	1.03177E-05	7.62031E-04	7.62101E-04	1.77648E+01	-1.31204E+03	1.31216E+03
6	5.8582E+07	6.92991E-06	1.00231E-03	1.00233E-03	6.89774E+00	-9.97652E+02	9.97676E+02
7	7.0298E+07	2.29659E-05	1.32142E-03	1.32162E-03	1.31483E+01	-7.56531E+02	7.56645E+02
8	8.2015E+07	5.91186E-05	1.71219E-03	1.71321E-03	2.01421E+01	-5.83353E+02	5.83700E+02
9	9.3731E+07	1.28254E-04	2.27475E-03	2.27836E-03	2.47074E+01	-4.38216E+02	4.38911E+02
10	1.0545E+08	3.35492E-04	3.12804E-03	3.14598E-03	3.38978E+01	-3.16054E+02	3.17866E+02
11	1.1716E+08	9.43546E-04	4.59418E-03	4.69007E-03	4.28948E+01	-2.08857E+02	2.13216E+02
12	1.2888E+08	3.59123E-03	7.28963E-03	8.12623E-03	5.43831E+01	-1.10389E+02	1.23058E+02
13	1.4060E+08	1.35996E-02	3.73662E-03	1.41036E-02	6.83702E+01	-1.87854E+01	7.09040E+01
14	1.5231E+08	7.06397E-03	-5.77481E-03	9.12404E-03	8.48544E+01	6.93686E+01	1.09601E+02
15	1.6403E+08	2.96946E-03	-4.40033E-03	5.30854E-03	1.05372E+02	1.56148E+02	1.88376E+02
16	1.7575E+08	1.71518E-03	-3.19334E-03	3.62481E-03	1.30539E+02	2.43038E+02	2.75877E+02
17	1.8746E+08	1.18428E-03	-2.42997E-03	2.70319E-03	1.62069E+02	3.32541E+02	3.69933E+02
18	1.9918E+08	9.10207E-04	-1.91396E-03	2.11936E-03	2.02642E+02	4.26109E+02	4.71839E+02
19	2.1090E+08	7.46796E-04	-1.53758E-03	1.70935E-03	2.55589E+02	5.26233E+02	5.85019E+02
20	2.2261E+08	6.41407E-04	-1.24374E-03	1.39939E-03	3.27536E+02	6.35116E+02	7.14599E+02
21	2.3433E+08	5.68875E-04	-1.00225E-03	1.15245E-03	4.28328E+02	7.54635E+02	8.67720E+02
22	2.4604E+08	5.17167E-04	-7.93480E-04	9.47138E-04	5.76506E+02	8.84523E+02	1.05581E+03
23	2.5776E+08	4.79564E-04	-6.05467E-04	7.72381E-04	8.03866E+02	1.01491E+03	1.29470E+03
24	2.6948E+08	4.52512E-04	-4.28557E-04	6.23240E-04	1.16498E+03	1.10331E+03	1.60452E+03
25	2.8119E+08	4.34294E-04	-2.55848E-04	5.04053E-04	1.70935E+03	1.00700E+03	1.98392E+03
26	2.9291E+08	4.24271E-04	-7.96524E-05	4.31684E-04	2.27674E+03	4.27433E+02	2.31651E+03
27	3.0463E+08	4.24206E-04	1.07058E-04	4.37506E-04	2.21619E+03	-5.59305E+02	2.28568E+03
28	3.1634E+08	4.36334E-04	3.13985E-04	5.37563E-04	1.50994E+03	-1.08655E+03	1.86025E+03
29	3.2806E+08	4.68978E-04	5.54235E-04	7.26028E-04	8.89705E+02	-1.05145E+03	1.37736E+03
30	3.3978E+08	5.35754E-04	8.45778E-04	1.00119E-03	5.34486E+02	-8.43776E+02	9.98816E+02
31	3.5149E+08	6.70679E-04	1.21973E-03	1.39196E-03	3.46150E+02	-6.29522E+02	7.18414E+02
32	3.6321E+08	9.54961E-04	1.71458E-03	1.96258E-03	2.47931E+02	-4.45145E+02	5.09533E+02
33	3.7493E+08	1.60019E-03	2.35709E-03	2.84894E-03	1.97153E+02	-2.90409E+02	3.51008E+02
34	3.8664E+08	3.13857E-03	2.85273E-03	4.24130E-03	1.74475E+02	-1.58585E+02	2.35776E+02
35	3.9836E+08	5.52940E-03	1.45206E-03	5.71688E-03	1.69184E+02	-4.44291E+01	1.74921E+02
36	4.1007E+08	5.13575E-03	-1.67939E-03	5.40336E-03	1.75904E+02	5.75207E+01	1.85070E+02
37	4.2179E+08	3.22518E-03	-2.51295E-03	4.08861E-03	1.92932E+02	1.50326E+02	2.44582E+02
38	4.3351E+08	2.10983E-03	-2.28077E-03	3.10698E-03	2.18560E+02	2.36269E+02	3.21856E+02
39	4.4522E+08	1.53320E-03	-1.91829E-03	2.45572E-03	2.54240E+02	3.18096E+02	4.07213E+02
40	4.5694E+08	1.22225E-03	-1.59912E-03	2.01273E-03	3.01710E+02	3.94740E+02	4.96838E+02
41	4.6866E+08	1.03518E-03	-1.33369E-03	1.68829E-03	3.63178E+02	4.67909E+02	5.92315E+02
42	4.8037E+08	9.25113E-04	-1.10227E-03	1.43904E-03	4.46737E+02	5.32283E+02	6.94909E+02
43	4.9209E+08	8.60997E-04	-9.02388E-04	1.24725E-03	5.53475E+02	5.80082E+02	8.01767E+02
44	5.0381E+08	8.30824E-04	-7.11073E-04	1.09357E-03	6.94731E+02	5.94596E+02	9.14437E+02
45	5.1552E+08	8.40868E-04	-5.32039E-04	9.95050E-04	8.49255E+02	5.37346E+02	1.00497E+03
46	5.2724E+08	8.81754E-04	-3.55092E-04	9.50569E-04	9.75844E+02	3.92984E+02	1.05200E+03
47	5.3895E+08	9.85634E-04	-1.79368E-04	1.00182E-03	9.82053E+02	1.78716E+02	9.98182E+02
48	5.5067E+08	1.15564E-03	-3.80951E-05	1.15627E-03	8.64383E+02	2.84940E+01	8.64853E+02
49	5.6239E+08	1.41655E-03	4.95492E-05	1.41742E-03	7.05077E+02	-2.46627E+01	7.05508E+02
50	5.7410E+08	1.74572E-03	-4.29412E-05	1.74625E-03	5.72482E+02	1.40819E+01	5.72655E+02
51	5.8582E+08	1.96443E-03	-3.19043E-04	1.99016E-03	4.95972E+02	8.05510E+01	5.02471E+02
52	5.9754E+08	2.00310E-03	-6.89332E-04	2.11840E-03	4.46364E+02	1.53608E+02	4.72055E+02
53	6.0925E+08	1.78807E-03	-9.64757E-04	2.03173E-03	4.33162E+02	2.33714E+02	4.92190E+02
54	6.2097E+08	1.59953E-03	-1.03881E-03	1.90726E-03	4.39717E+02	2.85574E+02	5.24313E+02
55	6.3269E+08	1.39351E-03	-1.10713E-03	1.77978E-03	4.39924E+02	3.49516E+02	5.61867E+02
56	6.4440E+08	1.24713E-03	-9.81229E-04	1.58687E-03	4.95257E+02	3.89662E+02	6.30172E+02
57	6.5612E+08	1.24716E-03	-1.01525E-03	1.60815E-03	4.82249E+02	3.92574E+02	6.21834E+02
58	6.6784E+08	1.05114E-03	-9.06411E-04	1.38798E-03	5.45628E+02	4.70502E+02	7.20473E+02
59	6.7955E+08	1.28354E-03	-8.22597E-04	1.52452E-03	5.52264E+02	3.53935E+02	6.55946E+02
60	F.3127E+08	9.93120E-04	-1.03806E-03	1.43661E-03	4.81198E+02	5.02971E+02	6.96083E+02
61	7.0298E+08	1.16300E-03	-5.22987E-04	1.27518E-03	7.15216E+02	3.21624E+02	7.84204E+02
62	7.1470E+08	1.22152E-03	-1.40086E-03	1.85863E-03	3.53600E+02	4.05516E+02	5.38030E+02
63	7.2642E+08	4.39829E-04	-4.12971E-04	6.03320E-04	1.20834E+03	1.13455E+03	1.65750E+03

64	7.3813E+08	2.44575E-03	-1.25839E-03	2.75050E-03	3.23288E+02	1.66339E+02	3.63571E+02
65	7.4985E+08	-6.74201E-04	-1.10891E-03	1.29777E-03	-4.00305E+02	6.58409E+02	7.70550E+02
66	7.6157E+08	1.69073E-03	2.81045E-03	3.27982E-03	1.57172E+02	-2.61262E+02	3.04895E+02
67	7.7328E+08	-2.35812E-03	-2.87803E-03	3.72072E-03	-1.70338E+02	2.07893E+02	2.68765E+02
68	7.8500E+08	-2.59478E-03	1.51311E-03	3.00373E-03	-2.87594E+02	-1.67706E+02	3.32920E+02
69	7.9672E+08	-6.68899E-03	-2.17996E-03	7.03525E-03	-1.35145E+02	4.40443E+01	1.42141E+02
70	8.0843E+08	-3.90249E-03	-1.53953E-05	3.90252E-03	-2.56243E+02	1.01088E+00	2.56245E+02
71	8.2015E+08	-5.70082E-03	3.49911E-04	5.71155E-03	-1.74755E+02	-1.07263E+01	1.75084E+02
72	8.3186E+08	-4.75992E-03	-3.29876E-04	4.77134E-03	-2.09083E+02	1.44900E+01	2.09585E+02
73	8.4358E+08	-5.02072E-03	2.15437E-04	5.02534E-03	-1.98809E+02	-8.53081E+00	1.98991E+02
74	8.5530E+08	-5.05200E-03	-1.18274E-04	5.05338E-03	-1.97833E+02	4.63154E+00	1.97887E+02
75	8.6701E+08	-4.95164E-03	3.91665E-05	4.95180E-03	-2.01940E+02	-1.59731E+00	2.01947E+02
76	8.7873E+08	-5.03630E-03	-4.58947E-06	5.03630E-03	-1.98558E+02	1.80942E-01	1.98558E+02
77	8.9045E+08	-4.98363E-03	-5.52329E-06	4.98363E-03	-2.00657E+02	2.22385E-01	2.00657E+02
78	9.0216E+08	-5.00616E-03	7.56825E-06	5.00616E-03	-1.99754E+02	-3.01985E-01	1.99754E+02
79	9.1388E+08	-4.99897E-03	-4.40618E-06	4.99897E-03	-2.00041E+02	1.76320E-01	2.00041E+02
80	9.2560E+08	-4.99921E-03	2.33826E-06	4.99921E-03	-2.00032E+02	-9.35602E-02	2.00032E+02
81	9.3731E+08	-5.00079E-03	-7.91595E-07	5.00079E-03	-1.99968E+02	3.16538E-02	1.99968E+02
82	9.4903E+08	-4.99942E-03	1.36253E-07	4.99942E-03	-2.00023E+02	-5.45139E-03	2.00023E+02
83	9.6075E+08	-5.00025E-03	5.93565E-08	5.00025E-03	-1.99990E+02	-2.37402E-03	1.99990E+02
84	9.7246E+08	-4.99990E-03	-9.44599E-08	4.99990E-03	-2.00004E+02	3.77854E-03	2.00004E+02

1FAR FIELDS

THETA	PHI	ETA	ST	DT	NT		
0.	0.	0.	-3.334E-10	3.334E-10	120	2	0

I	TIME	EP	EQ
1	-3.334E-10	2.2804E-09	4.6772E-19
2	0.	-5.1255E-06	-1.0512E-15
3	3.334E-10	-2.4474E-05	-5.0197E-15
4	6.668E-10	-6.2002E-05	-1.2717E-14
5	1.000E-09	-9.7761E-05	-2.0051E-14
6	1.334E-09	-5.2293E-05	-1.0725E-14
7	1.667E-09	2.2835E-04	4.6835E-14
8	2.000E-09	8.9202E-04	1.8295E-13
9	2.334E-09	1.8371E-03	3.7679E-13
10	2.667E-09	2.3770E-03	4.8752E-13
11	3.001E-09	1.1421E-03	2.3425E-13
12	3.334E-09	-3.2974E-03	-6.7630E-13
13	3.667E-09	-1.0927E-02	-2.2412E-12
14	4.001E-09	-1.8657E-02	-3.8265E-12
15	4.334E-09	-2.0224E-02	-4.1479E-12
16	4.668E-09	-9.0506E-03	-1.8563E-12
17	5.001E-09	1.6550E-02	3.3943E-12
18	5.334E-09	4.9104E-02	1.0071E-11
19	5.668E-09	7.2751E-02	1.4921E-11
20	6.001E-09	7.0473E-02	1.4454E-11
21	6.335E-09	3.4446E-02	7.0649E-12
22	6.668E-09	-2.6978E-02	-5.5332E-12
23	7.001E-09	-9.0711E-02	-1.8605E-11
24	7.335E-09	-1.2886E-01	-2.6428E-11
25	7.668E-09	-1.2217E-01	-2.5056E-11
26	8.002E-09	-7.0207E-02	-1.4400E-11
27	8.335E-09	7.1280E-03	1.4620E-12
28	8.668E-09	7.8065E-02	1.6011E-11
29	9.002E-09	1.1396E-01	2.3373E-11
30	9.335E-09	1.0343E-01	2.1214E-11
31	9.669E-09	5.7682E-02	1.1831E-11
32	1.000E-08	3.3897E-03	6.9522E-13
33	1.034E-08	-3.2667E-02	-6.7000E-12
34	1.067E-08	-3.7913E-02	-7.7760E-12
35	1.100E-08	-1.8671E-02	-3.8295E-12
36	1.134E-08	6.5251E-03	1.3383E-12
37	1.167E-08	1.9540E-02	4.0078E-12
38	1.200E-08	1.2953E-02	2.6566E-12
39	1.234E-08	-7.4282E-03	-1.5235E-12
40	1.267E-08	-2.7965E-02	-5.7357E-12
41	1.300E-08	-3.6268E-02	-7.4386E-12
42	1.334E-08	-2.8343E-02	-5.8132E-12
43	1.367E-08	-1.0005E-02	-2.0521E-12
44	1.400E-08	7.6715E-03	1.5734E-12
45	1.434E-08	1.5568E-02	3.1930E-12
46	1.467E-08	1.1748E-02	2.4096E-12
47	1.500E-08	1.6371E-03	3.3577E-13
48	1.534E-08	-6.4144E-03	-1.3156E-12
49	1.567E-08	-6.7917E-03	-1.3930E-12
50	1.600E-08	2.5779E-04	5.2872E-14
51	1.634E-08	9.6420E-03	1.9776E-12

52	1.667E-08	1.5298E-02	3.1375E-12
53	1.700E-08	1.4056E-02	2.8829E-12
54	1.734E-08	7.1585E-03	1.4682E-12
55	1.767E-08	-1.0924E-03	-2.2404E-13
56	1.800E-08	-6.2738E-03	-1.2868E-12
57	1.834E-08	-6.4233E-03	-1.3174E-12
58	1.867E-08	-2.8116E-03	-5.7666E-13
59	1.900E-08	1.2911E-03	2.6481E-13
60	1.934E-08	2.8781E-03	5.9030E-13
61	1.967E-08	1.0187E-03	2.0894E-13
62	2.000E-08	-2.8305E-03	-5.8053E-13
63	2.034E-08	-6.0376E-03	-1.2383E-12
64	2.067E-08	-6.5935E-03	-1.3523E-12
65	2.100E-08	-4.2946E-03	-8.8083E-13
66	2.134E-08	-6.4568E-04	-1.3243E-13
67	2.167E-08	2.2772E-03	4.6706E-13
68	2.200E-08	3.1463E-03	6.4531E-13
69	2.234E-08	2.0476E-03	4.1996E-13
70	2.267E-08	1.9526E-04	4.0047E-14
71	2.300E-08	-9.8031E-04	-2.0106E-13
72	2.334E-08	-7.2864E-04	-1.4944E-13
73	2.367E-08	6.6665E-04	1.3673E-13
74	2.400E-08	2.2050E-03	4.5224E-13
75	2.434E-08	2.8760E-03	5.8986E-13
76	2.467E-08	2.2837E-03	4.6840E-13
77	2.500E-08	8.2123E-04	1.6844E-13
78	2.534E-08	-6.5727E-04	-1.3481E-13
79	2.567E-08	-1.4053E-03	-2.8822E-13
80	2.601E-08	-1.2145E-03	-2.4909E-13
81	2.634E-08	-4.5840E-04	-9.4017E-14
82	2.667E-08	2.2523E-04	4.6194E-14
83	2.701E-08	3.6612E-04	7.5091E-14
84	2.734E-08	-7.5403E-05	-1.5465E-14
85	2.767E-08	-7.4914E-04	-1.5365E-13
86	2.801E-08	-1.1879E-03	-2.4364E-13
87	2.834E-08	-1.1119E-03	-2.2805E-13
88	2.867E-08	-5.7653E-04	-1.1825E-13
89	2.901E-08	1.0131E-04	2.0778E-14
90	2.934E-08	5.6385E-04	1.1565E-13
91	2.967E-08	6.2782E-04	1.2877E-13
92	3.001E-08	3.6702E-04	7.5276E-14
93	3.034E-08	2.9725E-05	6.0966E-15
94	3.067E-08	-1.3766E-04	-2.8233E-14
95	3.101E-08	-4.1178E-05	-8.4455E-15
96	3.134E-08	2.2471E-04	4.6087E-14
97	3.167E-08	4.6253E-04	9.4885E-14
98	3.201E-08	5.0987E-04	1.0457E-13
99	3.234E-08	3.3576E-04	6.8864E-14
100	3.267E-08	4.4713E-05	9.1706E-15
101	3.301E-08	-2.0352E-04	-4.1743E-14
102	3.334E-08	-2.9584E-04	-6.0676E-14
103	3.367E-08	-2.2519E-04	-4.6187E-14
104	3.401E-08	-7.8200E-05	-1.6039E-14
105	3.434E-08	3.1266E-05	6.4126E-15
106	3.467E-08	3.4815E-05	7.1405E-15
107	3.501E-08	-5.5735E-05	-1.1431E-14
108	3.534E-08	-1.6729E-04	-3.4311E-14
109	3.567E-08	-2.1932E-04	-4.4982E-14
110	3.601E-08	-1.7521E-04	-3.5936E-14
111	3.634E-08	-6.0077E-05	-1.2322E-14
112	3.667E-08	6.1570E-05	1.2628E-14
113	3.701E-08	1.2931E-04	2.6521E-14
114	3.734E-08	1.2203E-04	2.5029E-14
115	3.767E-08	6.4542E-05	1.3237E-14
116	3.801E-08	5.5170E-06	1.1315E-15
117	3.834E-08	-1.5553E-05	-3.1899E-15
118	3.867E-08	9.1496E-06	1.8766E-15
119	3.901E-08	5.5920E-05	1.1469E-14
120	3.934E-08	8.8868E-05	1.8227E-14

TRANSFORMED FIELDS.

1.07727E+09 3.07147E+09

TRAN ARRAY VALUES.

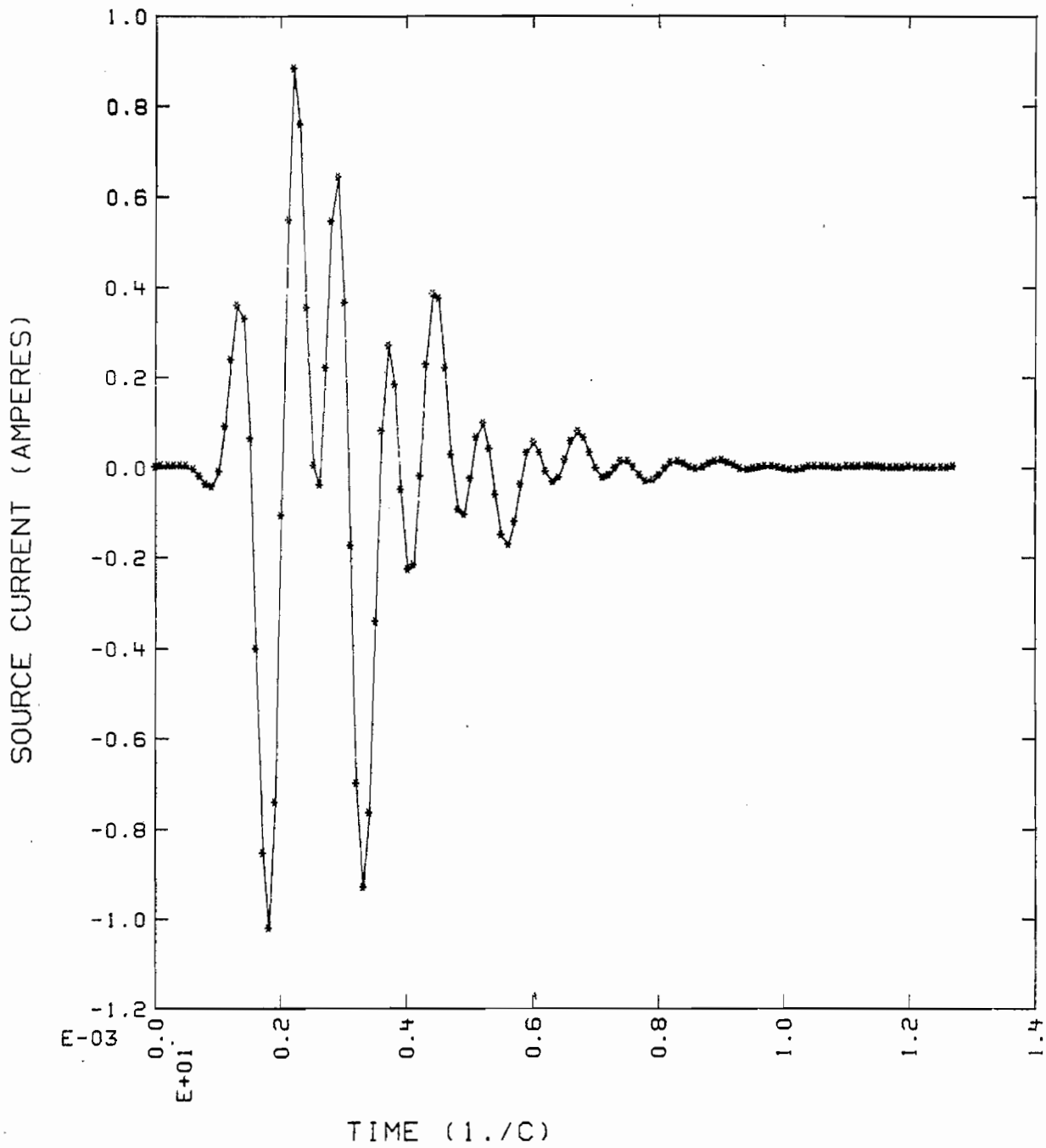
2.280E-09 -5.126E-06 -2.447E-05 -6.200E-05 -9.776E-05 -5.229E-05 2.284E-04 8.920E-04 1.837E-03 2.377E-03
1.142E-03 -3.297E-03 -1.093E-02 -1.866E-02 -2.022E-02 -9.051E-03 1.655E-02 4.910E-02 7.275E-02 7.047E-02

```
 3.445E-02 -2.698E-02 -9.071E-02 -1.289E-01 -1.222E-01 -7.021E-02  7.128E-03  7.807E-02  1.140E-01  1.034E-01
 5.768E-02  3.390E-03 -3.267E-02 -3.791E-02 -1.867E-02  6.525E-03  1.954E-02  1.295E-02 -7.428E-03 -2.797E-02
-3.627E-02 -2.834E-02 -1.001E-02  7.672E-03  1.557E-02  1.175E-02  1.637E-03 -6.414E-03 -6.792E-03  2.578E-04
 9.642E-03  1.530E-02  1.406E-02  7.158E-03 -1.092E-03 -6.274E-03 -6.423E-03 -2.812E-03  1.291E-03  2.878E-03
 1.019E-03 -2.830E-03 -6.038E-03 -6.594E-03 -4.295E-03 -6.457E-04  2.277E-03  3.146E-03  2.048E-03  1.953E-04
-9.803E-04 -7.286E-04  6.666E-04  2.205E-03  2.876E-03  2.284E-03  8.212E-04 -6.573E-04 -1.405E-03 -1.214E-03
-4.584E-04  2.252E-04  3.661E-04 -7.540E-05 -7.491E-04 -1.188E-03 -1.112E-03 -5.765E-04  1.013E-04  5.638E-04
 6.278E-04  3.670E-04  2.972E-05 -1.377E-04 -4.118E-05  2.247E-04  4.626E-04  5.099E-04  3.358E-04  4.471E-05
-2.035E-04 -2.958E-04 -2.252E-04 -7.820E-05  3.127E-05  3.481E-05 -5.574E-05 -1.673E-04 -2.193E-04 -1.752E-04
-6.008E-05  6.157E-05  1.293E-04  1.220E-04  6.454E-05  5.517E-06 -1.555E-05  9.150E-06  5.592E-05  8.887E-05
-2.888E-05 -6.430E-05 -3.261E-05  7.675E-06  2.147E-05  1.185E-05 -1.866E-06 -7.131E-06 -4.268E-06  3.779E-07
 2.355E-06  1.526E-06 -4.041E-08 -7.734E-07 -5.418E-07 -1.635E-08  2.523E-07  1.912E-07  1.579E-08 -8.174E-08
-6.705E-08 -8.830E-09  2.628E-08  2.339E-08  4.168E-09 -8.377E-09 -8.114E-09 -1.808E-09  2.644E-09  2.801E-09
 7.447E-10 -8.249E-10 -9.621E-10 -2.963E-10  2.539E-10  3.288E-10  1.150E-10 -7.685E-11 -1.119E-10 -4.375E-11
 2.277E-11  3.787E-11  1.639E-11 -6.561E-12 -1.276E-11 -6.063E-12  1.817E-12  4.275E-12  2.218E-12 -4.738E-13
-1.426E-12 -8.041E-13  1.112E-13  4.728E-13  2.891E-13 -2.063E-14 -1.559E-13 -1.032E-13  1.123E-15  5.111E-14
 3.656E-14  1.629E-15 -1.664E-14 -1.288E-14 -1.236E-15  5.382E-15  4.511E-15  6.511E-16 -1.727E-15 -1.571E-15
-2.989E-16  5.489E-16  5.443E-16  1.276E-16 -1.728E-16 -1.876E-16 -5.202E-17  5.372E-17  6.437E-17  2.054E-17
-1.647E-17 -2.197E-17 -7.926E-18  4.959E-18  7.465E-18  3.002E-18 -1.460E-18 -2.524E-18 -1.121E-18  4.167E-19
 8.490E-19  4.133E-19 -1.138E-19 -2.842E-19 -1.508E-19  2.904E-20  9.462E-20  5.455E-20 -6.530E-21 -3.134E-20
-1.957E-20  1.069E-21  1.032E-20  6.970E-21  3.039E-23 -3.376E-21 -2.466E-21 -1.446E-22  1.098E-21  8.674E-22
 9.470E-23 -3.542E-22 -3.033E-22 -4.756E-23  1.134E-22  1.055E-22  2.133E-23 -3.595E-23 -3.650E-23 -8.977E-24
 1.128E-23  1.257E-23  3.625E-24 -3.495E-24 -4.305E-24 -1.422E-24  1.067E-24  1.468E-24  5.457E-25 -3.194E-25
-4.980E-25 -2.058E-25  9.334E-26  1.681E-25  7.657E-26 -2.638E-26
```

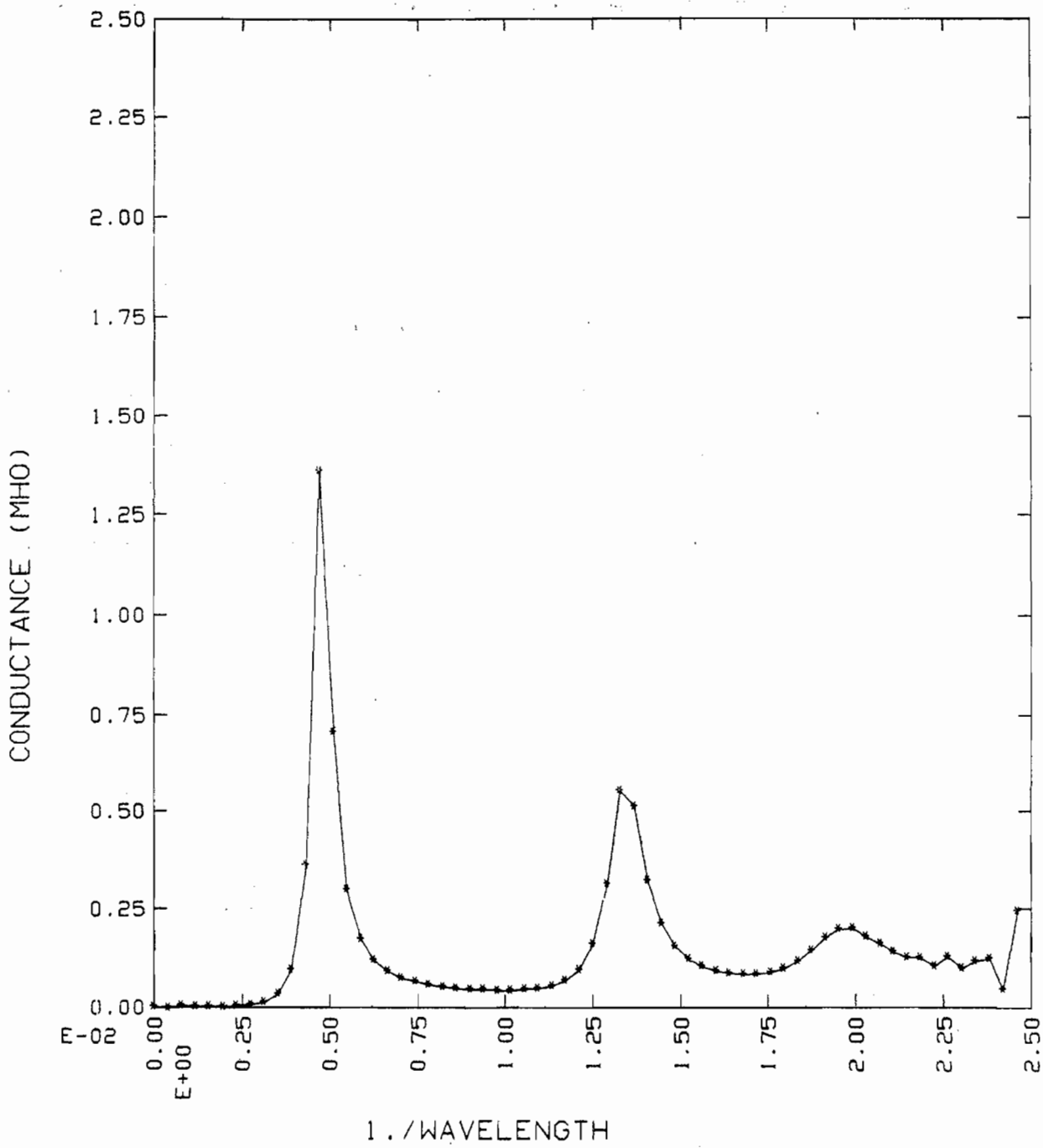
I	FREQ	LAM.	EMAG	ANT. GAIN	GAIN-DB
3	2.34328E+07	1.28026E+01	3.05159E-03	1.99094E-02	-17.00942
5	4.68656E+07	6.40128E+00	1.20446E-02	4.81509E-01	-3.17395
6	5.85820E+07	5.12102E+00	2.06709E-02	2.14357E+00	3.31138
7	7.02984E+07	4.26752E+00	3.18079E-02	1.58456E+00	1.99908
8	8.20148E+07	3.65787E+00	4.77424E-02	1.46645E+00	1.66267
9	9.37313E+07	3.20064E+00	7.04200E-02	1.62257E+00	2.10203
10	1.05448E+08	2.84501E+00	1.00733E-01	1.54259E+00	1.88252
11	1.17164E+08	2.56051E+00	1.40899E-01	1.58313E+00	1.99517
12	1.28880E+08	2.32774E+00	1.83619E-01	1.58911E+00	2.01155
13	1.40597E+08	2.13376E+00	2.12446E-01	1.59257E+00	2.02100
14	1.52313E+08	1.96962E+00	2.18635E-01	1.61403E+00	2.07910
15	1.64030E+08	1.82894E+00	2.09026E-01	1.62588E+00	2.11087
16	1.75746E+08	1.70701E+00	1.95531E-01	1.64330E+00	2.15718
17	1.87463E+08	1.60032E+00	1.83192E-01	1.66812E+00	2.22228
18	1.99179E+08	1.50618E+00	1.72822E-01	1.68855E+00	2.27513
19	2.10895E+08	1.42251E+00	1.64943E-01	1.71904E+00	2.35286
20	2.22612E+08	1.34764E+00	1.58866E-01	1.75087E+00	2.43254
21	2.34328E+08	1.28026E+00	1.54272E-01	1.78598E+00	2.51875
22	2.46045E+08	1.21929E+00	1.51124E-01	1.82936E+00	2.62300
23	2.57761E+08	1.16367E+00	1.48936E-01	1.87437E+00	2.72856
24	2.69477E+08	1.11327E+00	1.47800E-01	1.92542E+00	2.84525
25	2.81194E+08	1.06688E+00	1.47654E-01	1.98103E+00	2.96892
26	2.92910E+08	1.02420E+00	1.48330E-01	2.03484E+00	3.08531
27	3.04627E+08	9.84812E-01	1.50127E-01	2.08508E+00	3.19123
28	3.16343E+08	9.48338E-01	1.52978E-01	2.12049E+00	3.26436
29	3.28059E+08	9.14469E-01	1.56992E-01	2.11734E+00	3.25791
30	3.39776E+08	8.82935E-01	1.62477E-01	2.06030E+00	3.13931
31	3.51492E+08	8.53504E-01	1.68973E-01	1.90971E+00	2.80968
32	3.63209E+08	8.25972E-01	1.75671E-01	1.65463E+00	2.18701
33	3.74925E+08	8.00160E-01	1.79590E-01	1.32001E+00	1.20577
34	3.86641E+08	7.75913E-01	1.73583E-01	9.52013E-01	-0.21357
35	3.98358E+08	7.53092E-01	1.51818E-01	6.27912E-01	-2.02101
36	4.10074E+08	7.31575E-01	1.17745E-01	3.79921E-01	-4.20307
37	4.21791E+08	7.11253E-01	8.28849E-02	2.10079E-01	-6.77618
38	4.33507E+08	6.92030E-01	5.53804E-02	1.08059E-01	-9.66339
39	4.45223E+08	6.73819E-01	3.47297E-02	4.86305E-02	-13.13091
40	4.56940E+08	6.56542E-01	2.01081E-02	1.82051E-02	-17.39807
41	4.68656E+08	6.40128E-01	1.00363E-02	4.95634E-03	-23.04839
42	4.80373E+08	6.24515E-01	2.17743E-03	2.48201E-04	-36.05197
43	4.92089E+08	6.09646E-01	3.37673E-03	6.20937E-04	-32.06953
44	5.03805E+08	5.95468E-01	8.04309E-03	3.58217E-03	-24.45853
45	5.15522E+08	5.81935E-01	1.25943E-02	8.65173E-03	-20.62897
46	5.27238E+08	5.69003E-01	1.69537E-02	1.50908E-02	-18.21288
47	5.38955E+08	5.56633E-01	2.49123E-02	3.01066E-02	-15.21338
48	5.50671E+08	5.44790E-01	3.23790E-02	4.58360E-02	-13.38793
49	5.62388E+08	5.33440E-01	4.43134E-02	7.61037E-02	-11.18594
50	5.74104E+08	5.22553E-01	5.70731E-02	1.13214E-01	-9.46099
51	5.85820E+08	5.12102E-01	6.45740E-02	1.37563E-01	-8.61500
52	5.97537E+08	5.02061E-01	7.54624E-02	1.87700E-01	-7.26535
53	6.09253E+08	4.92406E-01	7.73786E-02	2.09881E-01	-6.78026
54	6.20970E+08	4.83115E-01	7.36710E-02	2.01927E-01	-6.94805
55	6.32686E+08	4.74169E-01	8.31879E-02	2.78778E-01	-5.54742
56	6.44402E+08	4.65548E-01	6.97430E-02	2.07956E-01	-6.82028

57	6.56119E+08	4.57234E-01	7.07674E-02	2.14471E-01	-6.68631
58	6.67835E+08	4.49213E-01	8.53953E-02	3.46304E-01	-4.60543
59	6.79552E+08	4.41468E-01	3.69537E-02	5.69684E-02	-12.44366
60	6.91268E+08	4.33985E-01	9.13559E-02	4.14528E-01	-3.82446
61	7.02984E+08	4.26752E-01	8.67148E-02	3.29797E-01	-4.81754
62	7.14701E+08	4.19756E-01	7.09244E-02	2.23307E-01	-6.51098
63	7.26417E+08	4.12986E-01	1.94169E-01	3.40158E+00	5.31681
64	7.38134E+08	4.06430E-01	2.03650E-01	1.28927E+00	1.10343
66	7.61566E+08	3.93925E-01	6.29498E-01	1.64578E+01	12.16371

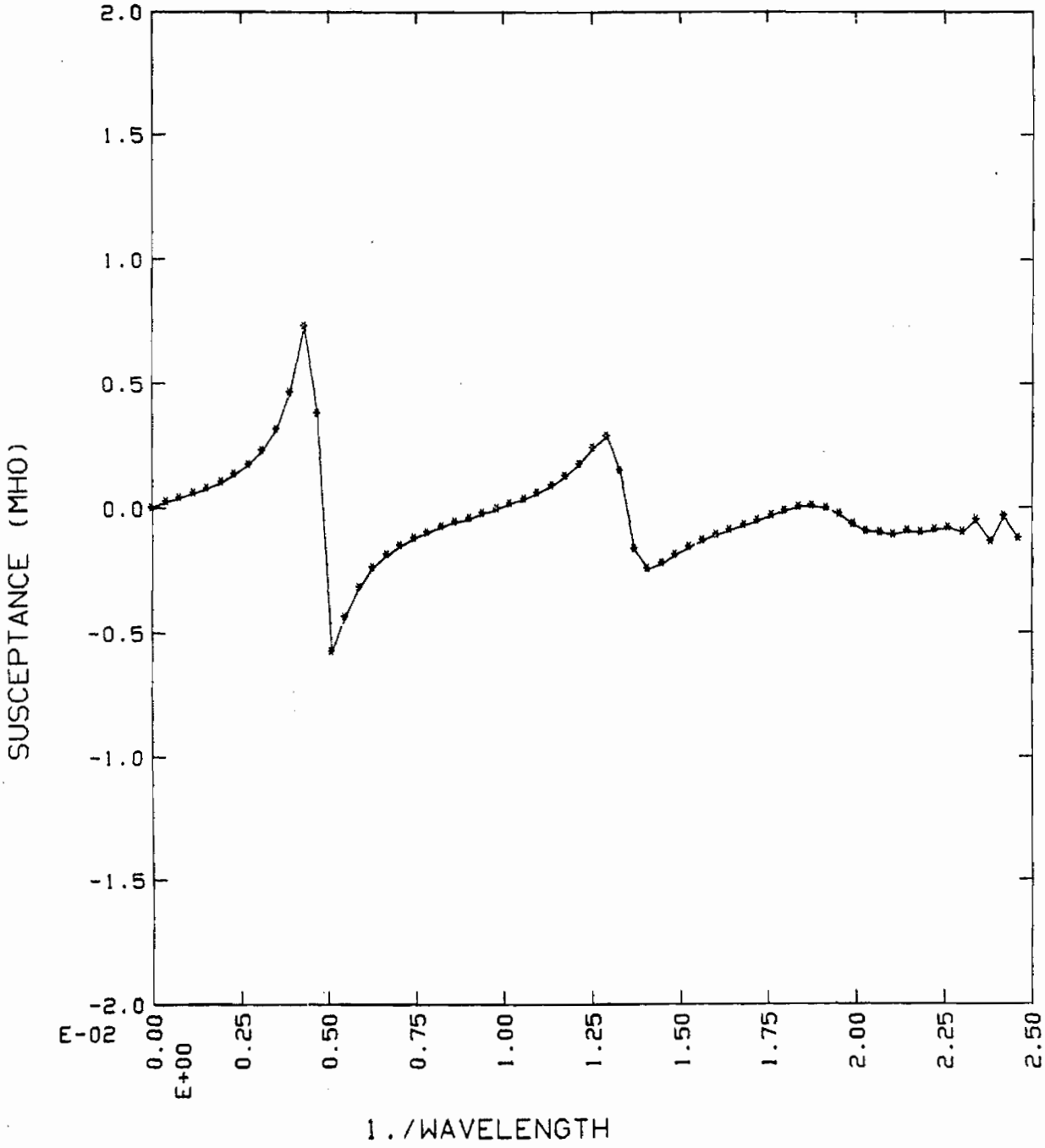
RUNNING TIME IN MICROSECONDS = 682349



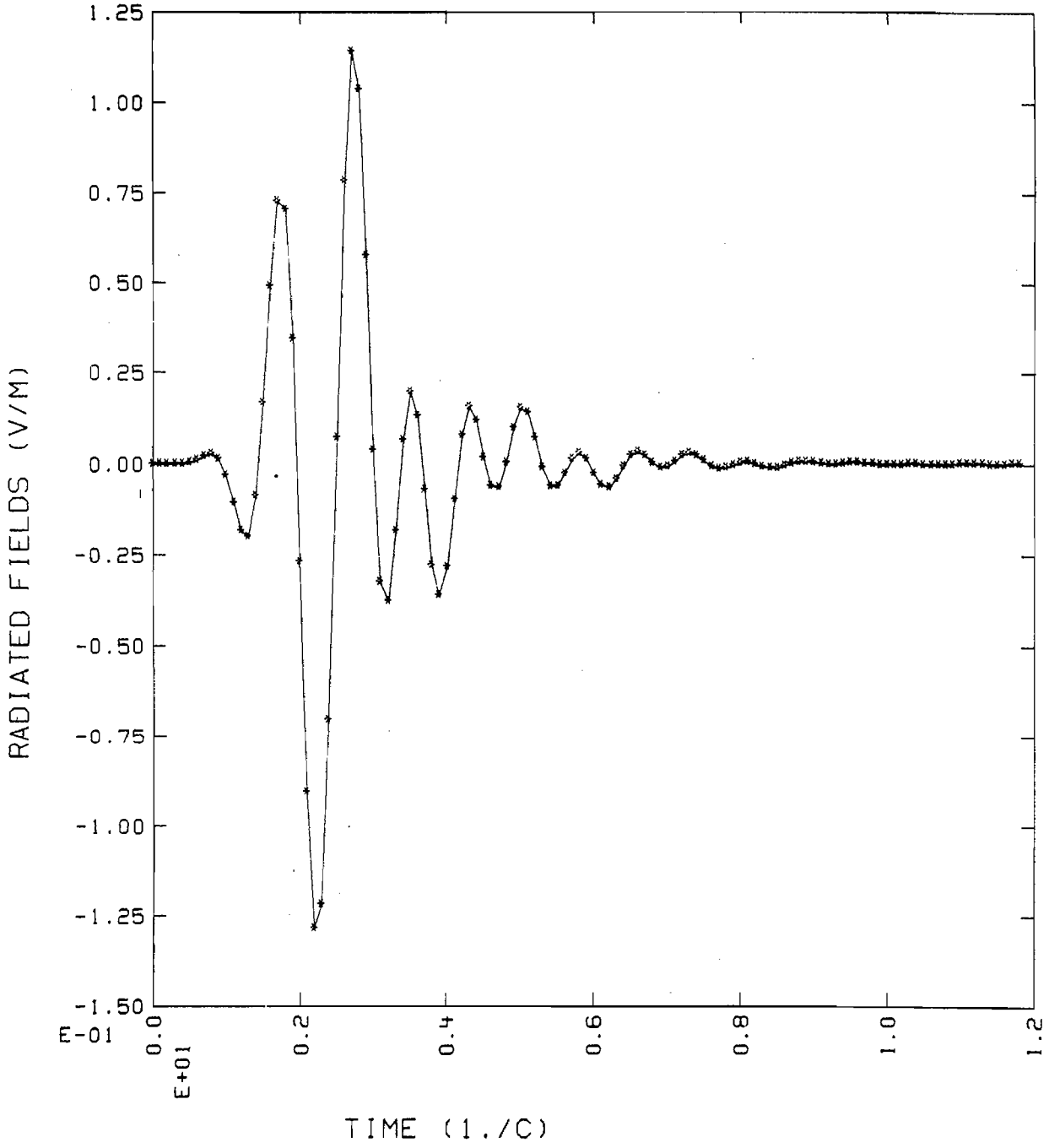
1 M BY .001 M RAD DIPOLE -- GAUS MOD VOLTS -- 200 OHMS



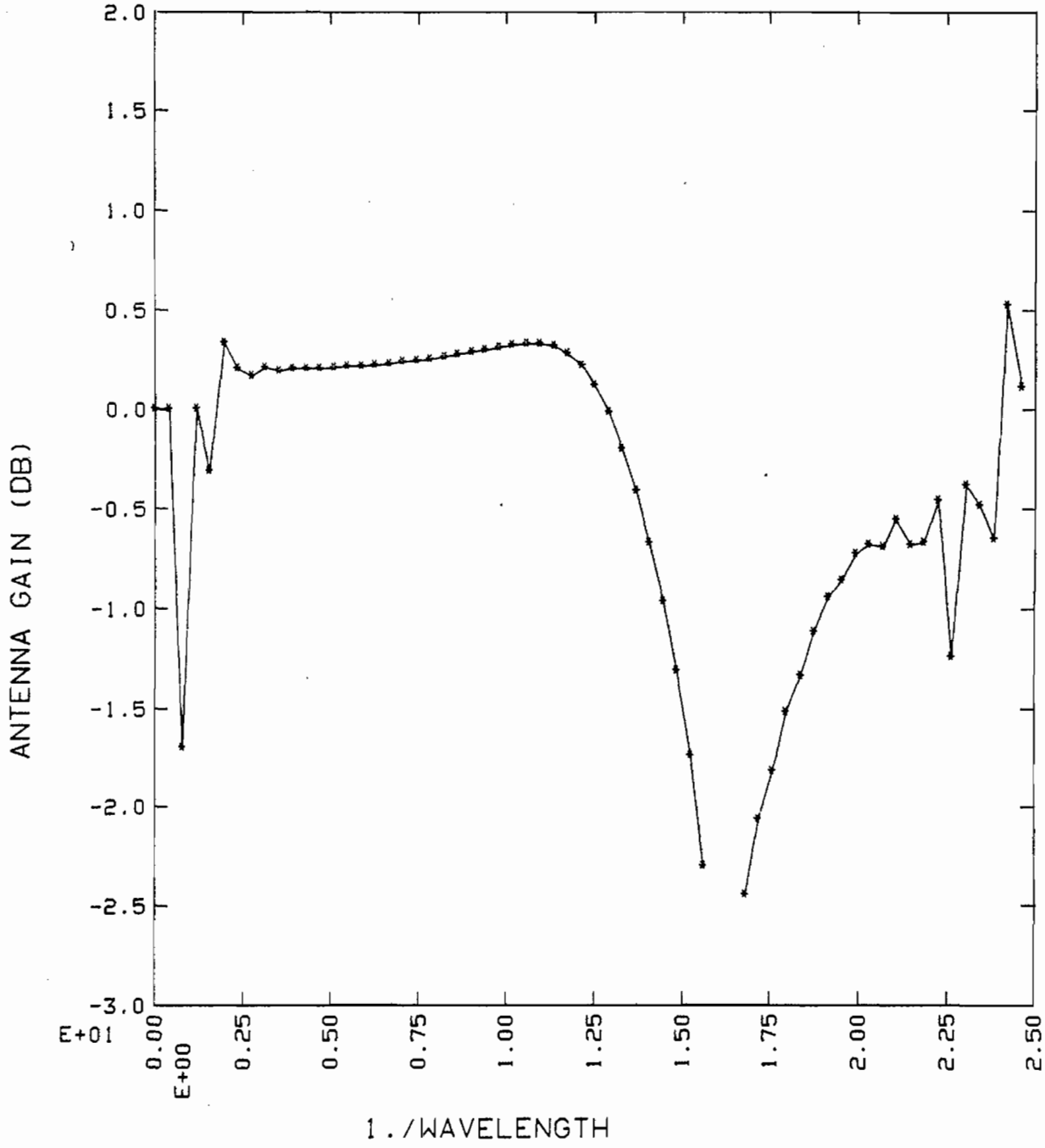
1 M BY .001 M RAD DIPOLE



1 M BY .001 M RAD DIPOLE



1 M BY .001 M RAD DIPOLE -- GAUS MOD VOLTS -- 200 OHMS



M BY .001 M RAD DIPOLE

Appendix C
Linear Dipole Antenna with Gaussian Voltage and a 600 ohm Load

```
 1 M BY .001 M RAD DIPOLE
TIME (1./C)
SOURCE CURRENT (AMPERES)
 1 M BY .001 M RAD DIPOLE -- GAUSSIAN VOLTAGE -- 600 OHMS
 1./WAVELENGTH
CONDUCTANCE (MHO)
 1 M BY .001 M RADIUS DIPOLE ANTENNA
RADIATED FIELDS (V/M)
SIGMA/LAMBDA**2 (DB)
SUSCEPTANCE (MHO)
ANTENNA GAIN(DB)
3.334E-10,150,0,2,1,1,2,8,0,
1.,0.,0.,0.,0.,0.,0.001,10,
9.1E8,3.334E-9,2,
0.5,1,
-0.5,6,
2,2,0.,
1,300.,
6,300.,
0.,0.,0.,-3.334E-10,3.334E-10,130,2,0,


  1 M BY .001 M RAD DIPOLE
 3.334E-10  150    0    2    1    1    2    8    0


COLLOCATION PROGRAM FOR LINEAR DIPOLES SYMMETRIC ABOUT CENTER
   1.00000   0.        0.        0.        0.        0.       0.00100   10
      X(I)       Y(I)       Z(I)       SI(I)      BI(I)    ALP(I)    BET(I)
   0.05000   0.        0.        0.10000   0.00100   0.        0.          6    1    2
   0.15000   0.        0.        0.10000   0.00100   0.        0.          1    2    3
   0.25000   0.        0.        0.10000   0.00100   0.        0.          2    3    4
   0.35000   0.        0.        0.10000   0.00100   0.        0.          3    4    5
   0.45000   0.        0.        0.10000   0.00100   0.        0.          4    5    0
  -0.05000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    1    6    7
  -0.15000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    6    7    8
  -0.25000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    7    8    9
  -0.35000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    8    9   10
  -0.45000  -0.00000   0.        0.10000   0.00100  -0.      180.00000    9   10    0
  9.100E+08 3.334E-09    2
 5.000E-01    1
-5.000E-01    6
    2    2  0.
    1  3.000E+02
    6  3.000E+02
    1   2   3   4   5   6   7   8   9  10

0DETERMINANT=  1.39226030E+38
 TIME IN MICROSEC. FOR MATRIX SETUP   218898
 RUNNING TIME IN MICROSECONDS =   501360
   4.16182E+08    2.35693E+09


 TRAN ARRAY VALUES.
  6.355E-08  3.888E-07  1.875E-06  7.551E-06  2.535E-05  7.092E-05  1.653E-04  3.209E-04  5.183E-04  6.950E-04
  7.710E-04  7.018E-04  5.139E-04  2.833E-04  7.872E-05 -7.787E-05 -2.045E-04 -3.272E-04 -4.540E-04 -5.683E-04
 -6.383E-04 -6.357E-04 -5.546E-04 -4.186E-04 -2.710E-04 -1.527E-04 -8.214E-05 -5.075E-05 -3.566E-05 -1.757E-05
  9.041E-06  3.787E-05  5.930E-05  6.742E-05  6.207E-05  4.750E-05  3.011E-05  1.606E-05  8.770E-06  7.593E-06
  8.763E-06  8.300E-06  4.645E-06 -8.626E-07 -5.614E-06 -7.778E-06 -7.224E-06 -5.082E-06 -2.744E-06 -1.151E-06
 -6.001E-07 -8.675E-07 -1.417E-06 -1.669E-06 -1.296E-06 -4.142E-07  5.162E-07  1.032E-06  9.808E-07  5.693E-07
  1.416E-07 -7.256E-08 -5.170E-08  9.227E-08  2.320E-07  2.884E-07  2.384E-07  1.069E-07 -4.432E-08 -1.436E-07
 -1.502E-07 -8.079E-08  5.620E-09  5.206E-08  4.113E-08 -3.061E-09 -4.269E-08 -5.514E-08 -4.143E-08 -1.575E-08
  7.952E-09  2.153E-08  2.224E-08  1.206E-08 -2.321E-09 -1.207E-08 -1.173E-08 -3.050E-09  6.775E-09  1.112E-08
```

```
 8.552E-09  2.481E-09 -2.624E-09 -4.501E-09 -3.536E-09 -1.279E-09  9.065E-10  2.192E-09  2.168E-09  9.278E-10
-7.882E-10 -1.913E-09 -1.789E-09 -6.647E-10  5.554E-10  1.082E-09  7.948E-10  1.419E-10 -3.598E-10 -4.988E-10
-3.596E-10 -1.104E-10  1.304E-10  2.858E-10  2.944E-10  1.488E-10 -6.348E-11 -2.035E-10 -1.884E-10 -5.548E-11
 8.051E-11  1.292E-10  8.594E-11  8.971E-12 -4.447E-11 -5.690E-11 -4.172E-11 -1.621E-11  1.002E-11  2.931E-11
 3.242E-11  1.618E-11 -9.071E-12 -2.536E-11 -2.227E-11 -5.383E-12  1.052E-11  1.508E-11  9.195E-12  5.486E-13
-4.727E-12 -5.680E-12 -4.219E-12 -1.809E-12  1.038E-12  3.448E-12  3.956E-12  1.970E-12 -1.158E-12 -3.087E-12
-2.923E-12 -1.258E-12  6.668E-13  1.773E-12  1.677E-12  7.199E-13 -3.848E-13 -1.019E-12 -9.622E-13 -4.120E-13
 2.221E-13  5.854E-13  5.521E-13  2.358E-13 -1.282E-13 -3.364E-13 -3.168E-13 -1.350E-13  7.395E-14  1.933E-13
 1.818E-13  7.724E-14 -4.267E-14 -1.110E-13 -1.043E-13 -4.421E-14  2.462E-14  6.379E-14  5.984E-14  2.530E-14
-1.421E-14 -3.665E-14 -3.433E-14 -1.448E-14  8.198E-15  2.106E-14  1.970E-14  8.286E-15 -4.730E-15 -1.210E-14
-1.130E-14 -4.742E-15  2.729E-15  6.951E-15  6.485E-15  2.714E-15 -1.575E-15 -3.994E-15 -3.721E-15 -1.553E-15
 9.084E-16  2.294E-15  2.135E-15  8.887E-16 -5.241E-16 -1.318E-15 -1.225E-15 -5.086E-16  3.023E-16  7.574E-16
 7.029E-16  2.910E-16 -1.744E-16 -4.351E-16 -4.033E-16 -1.665E-16  1.006E-16  2.500E-16  2.314E-16  9.530E-17
-5.804E-17 -1.436E-16 -1.328E-16 -5.454E-17  3.348E-17  8.252E-17  7.617E-17  3.121E-17 -1.931E-17 -4.741E-17
-4.370E-17 -1.786E-17  1.114E-17  2.724E-17  2.507E-17  1.022E-17 -6.425E-18 -1.565E-17 -1.439E-17 -5.847E-18
 3.709E-18  8.990E-18  8.254E-18  3.345E-18 -2.137E-18 -5.165E-18 -4.736E-18 -1.914E-18  1.233E-18  2.967E-18
 2.717E-18  1.095E-18 -7.110E-19 -1.705E-18 -1.559E-18 -6.267E-19
```

	FREQ.	-ADMITTANCE-			-IMPEDANCE-		
		R	I	MAG.	R	I	MAG.
1	0.	-1.29023E-13	0.	1.29023E-13	-7.75057E+12	-0.	7.75057E+12
2	1.1716E+07	1.06515E-08	1.72109E-04	1.72109E-04	3.59586E-01	-5.81026E+03	5.81026E+03
3	2.3433E+07	1.75438E-07	3.50548E-04	3.50548E-04	1.42767E+00	-2.85268E+03	2.85268E+03
4	3.5149E+07	9.52133E-07	5.42540E-04	5.42541E-04	3.23469E+00	-1.84318E+03	1.84318E+03
5	4.6866E+07	3.33983E-06	7.57384E-04	7.57391E-04	5.82216E+00	-1.32031E+03	1.32032E+03
6	5.8582E+07	9.40644E-06	1.00833E-03	1.00837E-03	9.25093E+00	-9.91656E+02	9.91699E+02
7	7.0298E+07	2.35691E-05	1.31603E-03	1.31624E-03	1.36041E+01	-7.59615E+02	7.5973 E+02
8	8.2015E+07	5.59626E-05	1.71569E-03	1.71661E-03	1.89914E+01	-5.82235E+02	5.82545E+02
9	9.3731E+07	1.32510E-04	2.27323E-03	2.27709E-03	2.55558E+01	-4.38412E+02	4.39157E+02
10	1.0545E+08	3.30987E-04	3.12664E-03	3.14411E-03	3.34823E+01	-3.18280E+02	3.18055E+02
11	1.1716E+08	9.48179E-04	4.59843E-03	4.69517E-03	4.30118E+01	-2.08597E+02	2.12985E+02
12	1.2888E+08	3.58621E-03	7.27938E-03	8.11482E-03	5.44600E+01	-1.10544E+02	1.23231E+02
13	1.4060E+08	1.36258E-02	3.74066E-03	1.41299E-02	6.82469E+01	-1.87358E+01	7.07720E+01
14	1.5231E+08	7.05847E-03	-5.76861E-03	9.11586E-03	8.49406E+01	6.94187E+01	1.09699E+02
15	1.6403E+08	2.97128E-03	-4.40248E-03	5.31134E-03	1.05326E+02	1.56059E+02	1.88277E+02
16	1.7575E+08	1.71417E-03	-3.19306E-03	3.62408E-03	1.30514E+02	2.43114E+02	2.75932E+02
17	1.8746E+08	1.18491E-03	-2.42997E-03	2.70348E-03	1.62122E+02	3.32473E+02	3.69894E+02
18	1.9918E+08	9.09985E-04	-1.91414E-03	2.11944E-03	2.02579E+02	4.26121E+02	4.71824E+02
19	2.1090E+08	7.46943E-04	-1.53742E-03	1.70926E-03	2.55664E+02	5.26229E+02	5.85048E+02
20	2.2261E+08	6.41395E-04	-1.24382E-03	1.39946E-03	3.27496E+02	6.35095E+02	7.14562E+02
21	2.3433E+08	5.68893E-04	-1.00216E-03	1.15237E-03	4.28394E+02	7.54659E+02	8.67774E+02
22	2.4604E+08	5.17152E-04	-7.93522E-04	9.47166E-04	5.76456E+02	8.84518E+02	1.05578E+03
23	2.5776E+08	4.79564E-04	-6.05392E-04	7.72322E-04	8.03988E+02	1.01494E+03	1.29480E+03
24	2.6948E+08	4.52515E-04	-4.28637E-04	6.23297E-04	1.18478E+03	1.10331E+03	1.60437E+03
25	2.8119E+08	4.34236E-04	-2.55762E-04	5.03960E-04	1.70976E+03	1.00703E+03	1.98429E+03
26	2.9291E+08	4.24373E-04	-7.97301E-05	4.31798E-04	2.27608E+03	4.27623E+02	2.31590E+03
27	3.0463E+08	4.24053E-04	1.07076E-04	4.37362E-04	2.21685E+03	-5.59768E+02	2.28643E+03
28	3.1634E+08	4.36522E-04	3.14048E-04	5.37752E-04	1.50953E+03	-1.08600E+03	1.85959E+03
29	3.2806E+08	4.68818E-04	5.54051E-04	7.25785E-04	8.89997E+02	-1.05180E+03	1.37782E+03
30	3.3978E+08	5.35838E-04	8.46100E-04	1.00150E-03	5.34232E+02	-8.43563E+02	9.98500E+02
31	3.5149E+08	6.70806E-04	1.21930E-03	1.39164E-03	3.46371E+02	-6.29585E+02	7.18575E+02
32	3.6321E+08	9.54526E-04	1.71510E-03	1.96282E-03	2.47757E+02	-4.45170E+02	5.09470E+02
33	3.7493E+08	1.60125E-03	2.35667E-03	2.84919E-03	1.97250E+02	-2.90305E+02	3.50977E+02
34	3.8664E+08	3.13658E-03	2.85329E-03	4.24021E-03	1.74454E+02	-1.58697E+02	2.35837E+02
35	3.9836E+08	5.53325E-03	3.45043E-03	5.72020E-03	1.69106E+02	-4.43278E+01	1.74819E+02
36	4.1007E+08	5.13350E-03	1.67680E-03	5.40041E-03	1.76019E+02	5.74946E+01	1.85171E+02
37	4.2179E+08	3.22713E-03	-2.51531E-03	4.09159E-03	1.92766E+02	1.50247E+02	2.44404E+02
38	4.3351E+08	2.10820E-03	-2.27988E-03	3.10521E-03	2.18654E+02	2.36445E+02	3.22040E+02
39	4.4522E+08	1.53509E-03	-1.91867E-03	2.45719E-03	2.54246E+02	3.17777E+02	4.06969E+02
40	4.5694E+08	1.22087E-03	-1.59974E-03	2.01238E-03	3.01474E+02	3.95027E+02	4.96923E+02
41	4.6866E+08	1.03641E-03	-1.33251E-03	1.68811E-03	3.63689E+02	4.67592E+02	5.92378E+02
42	4.8037E+08	9.24908E-04	-1.10384E-03	1.44011E-03	4.45971E+02	5.32249E+02	6.94391E+02
43	4.9209E+08	8.60540E-04	-9.00549E-04	1.24560E-03	5.54644E+02	5.80431E+02	8.02827E+02
44	5.0381E+08	8.32381E-04	-7.12267E-04	1.09553E-03	6.93546E+02	5.93465E+02	9.12802E+02
45	5.1552E+08	8.38471E-04	-5.31453E-04	9.92712E-04	8.50828E+02	5.39286E+02	1.00734E+03
46	5.2724E+08	8.84275E-04	-3.53982E-04	9.52494E-04	9.74681E+02	3.90172E+02	1.04988E+03
47	5.3895E+08	9.83188E-04	-1.82228E-04	9.99933E-04	9.83320E+02	1.82252E+02	1.00007E+03
48	5.5067E+08	1.15597E-03	-3.36287E-05	1.15646E-03	8.64344E+02	2.51450E+01	8.64710E+02
49	5.6239E+08	1.41887E-03	4.31165E-05	1.41952E-03	7.04137E+02	-2.13973E+01	7.04462E+02
50	5.7410E+08	1.73877E-03	-3.77253E-05	1.73917E-03	5.74850E+02	1.24723E+01	5.74985E+02
51	5.8582E+08	1.97698E-03	-3.23647E-04	2.00330E-03	4.92619E+02	8.06454E+01	4.99176E+02
52	5.9754E+08	1.98661E-03	-6.92022E-04	2.10369E-03	4.48900E+02	1.56371E+02	4.75356E+02
53	6.0925E+08	1.80838E-03	-9.54295E-04	2.04473E-03	4.32532E+02	2.28251E+02	4.89063E+02
54	6.2097E+08	1.58498E-03	-1.06257E-03	1.90820E-03	4.35288E+02	2.91819E+02	5.24055E+02
55	6.3269E+08	1.39870E-03	-1.06823E-03	1.75997E-03	4.51561E+02	3.44869E+02	5.68192E+02
56	6.4440E+08	1.26811E-03	-1.02541E-03	1.63082E-03	4.76810E+02	3.85556E+02	6.13189E+02
57	6.5612E+08	1.18778E-03	-9.67973E-04	1.53225E-03	5.05913E+02	4.12290E+02	6.52634E+02

58	6.6784E+08	1.14674E-03	-9.16176E-04	1.46779E-03	5.32280E+02	4.25259E+02	6.81298E+02
59	6.7955E+08	1.13144E-03	-8.83063E-04	1.43525E-03	5.49254E+02	4.28681E+02	6.96741E+02
60	6.9127E+08	1.12509E-03	-8.74606E-04	1.42505E-03	5.54024E+02	4.30679E+02	7.01731E+02
61	7.0298E+08	1.11083E-03	-8.86583E-04	1.42126E-03	5.49923E+02	4.38907E+02	7.03601E+02
62	7.1470E+08	1.07937E-03	-9.05951E-04	1.40918E-03	5.43547E+02	4.56215E+02	7.09631E+02
63	7.2642E+08	1.03261E-03	-9.19358E-04	1.38257E-03	5.40209E+02	4.80960E+02	7.23290E+02
64	7.3813E+08	9.78653E-04	-9.20310E-04	1.34340E-03	5.42270E+02	5.09943E+02	7.44378E+02
65	7.4985E+08	9.25004E-04	-9.09050E-04	1.29692E-03	5.49941E+02	5.40456E+02	7.71057E+02
66	7.6157E+08	8.75806E-04	-8.88836E-04	1.24782E-03	5.62472E+02	5.70840E+02	8.01395E+02
67	7.7328E+08	8.32357E-04	-8.63153E-04	1.19910E-03	5.78889E+02	6.00308E+02	8.33956E+02
68	7.8500E+08	7.94413E-04	-8.34677E-04	1.15229E-03	5.98303E+02	6.28627E+02	8.67835E+02
69	7.9672E+08	7.61162E-04	-8.05231E-04	1.10805E-03	6.19958E+02	6.55852E+02	9.02490E+02
70	8.0843E+08	7.31712E-04	-7.76037E-04	1.06660E-03	6.43186E+02	6.82149E+02	9.37558E+02
71	8.2015E+08	7.05303E-04	-7.47974E-04	1.02806E-03	6.67321E+02	7.07694E+02	9.72701E+02
72	8.3186E+08	6.81377E-04	-7.21725E-04	9.92553E-04	6.91640E+02	7.32595E+02	1.00750E+03
73	8.4358E+08	6.59608E-04	-6.97873E-04	9.60265E-04	7.15325E+02	7.56822E+02	1.04138E+03
74	8.5530E+08	6.39934E-04	-6.76922E-04	9.31525E-04	7.37473E+02	7.80099E+02	1.07351E+03
75	8.6701E+08	6.22569E-04	-6.59301E-04	9.07191E-04	7.57135E+02	8.01807E+02	1.10279E+03
76	8.7873E+08	6.08043E-04	-6.45318E-04	8.86652E-04	7.73442E+02	8.20858E+02	1.12784E+03
77	8.9045E+08	5.97210E-04	-6.35105E-04	8.71790E-04	7.85784E+02	8.35644E+02	1.14707E+03
78	9.0216E+08	5.91295E-04	-6.28511E-04	8.62934E-04	7.94051E+02	8.44029E+02	1.15884E+03
79	9.1388E+08	5.91894E-04	-6.24953E-04	8.60758E-04	7.98880E+02	8.43500E+02	1.16177E+03
80	9.2560E+08	6.01015E-04	-6.23189E-04	8.65784E-04	8.01799E+02	8.31381E+02	1.15502E+03
81	9.3731E+08	6.21027E-04	-6.20928E-04	8.78195E-04	8.05246E+02	8.05119E+02	1.13870E+03
82	9.4903E+08	6.54503E-04	-6.14259E-04	8.97608E-04	8.12340E+02	7.62404E+02	1.11407E+03
83	9.6075E+08	7.03665E-04	-5.96742E-04	9.22629E-04	8.26630E+02	7.01023E+02	1.08386E+03
84	9.7246E+08	7.68923E-04	-5.58149E-04	9.50144E-04	8.51735E+02	6.18261E+02	1.05247E+03
85	9.8418E+08	8.45547E-04	-4.83549E-04	9.74048E-04	8.91204E+02	5.09660E+02	1.02664E+03
86	9.9589E+08	9.17315E-04	-3.54952E-04	9.83594E-04	9.43171E+02	3.66892E+02	1.01668E+03
87	1.0076E+09	9.49089E-04	-1.60778E-04	9.62611E-04	1.02425E+03	1.73511E+02	1.03884E+03
88	1.0193E+09	8.89651E-04	8.23927E-05	8.93458E-04	1.11448E+03	-1.03214E+02	1.11925E+03
89	1.0310E+09	7.03782E-04	3.13113E-04	7.70292E-04	1.18612E+03	-5.27704E+02	1.29821E+03
90	1.0428E+09	4.15121E-04	4.53981E-04	6.15162E-04	1.09697E+03	-1.19966E+03	1.62559E+03
91	1.0545E+09	9.51240E-05	4.72985E-04	4.82456E-04	4.08672E+02	-2.03204E+03	2.07273E+03
92	1.0662E+09	-1.96529E-04	3.95956E-04	4.42048E-04	-1.00575E+03	-2.02634E+03	2.26221E+03
93	1.0779E+09	-4.40188E-04	2.68001E-04	5.15354E-04	-1.65740E+03	-1.00908E+03	1.94041E+03
94	1.0896E+09	-6.43259E-04	1.24394E-04	6.55176E-04	-1.49854E+03	-2.89789E+02	1.52631E+03
95	1.1013E+09	-8.21063E-04	-1.34335E-05	8.21173E-04	-1.21761E+03	1.99214E+01	1.21777E+03
96	1.1131E+09	-9.86948E-04	-1.32145E-04	9.95755E-04	-9.96381E+02	1.33274E+02	1.00426E+03
97	1.1248E+09	-1.14823E-03	-2.21783E-04	1.16945E-03	-8.39582E+02	1.62167E+02	8.55100E+02
98	1.1365E+09	-1.30455E-03	-2.74415E-04	1.33310E-03	-7.34065E+02	1.54412E+02	7.50130E+02
99	1.1482E+09	-1.44820E-03	-2.86417E-04	1.47626E-03	-6.64518E+02	1.31424E+02	6.77390E+02
100	1.1599E+09	-1.56760E-03	-2.61746E-04	1.58930E-03	-6.20617E+02	1.03626E+02	6.29209E+02
101	1.1716E+09	-1.65365E-03	-2.12348E-04	1.66723E-03	-5.94914E+02	7.63940E+01	5.99798E+02
102	1.1834E+09	-1.70478E-03	-1.53833E-04	1.71170E-03	-5.81850E+02	5.25041E+01	5.84214E+02
103	1.1951E+09	-1.72687E-03	-9.92858E-05	1.72972E-03	-5.77175E+02	3.31844E+01	5.78128E+02
104	1.2068E+09	-1.72939E-03	-5.59034E-05	1.73029E-03	-5.77635E+02	1.86723E+01	5.77937E+02
105	1.2185E+09	-1.72132E-03	-2.54267E-05	1.72151E-03	-5.80823E+02	8.57971E+00	5.80886E+02
106	1.2302E+09	-1.70919E-03	-6.32541E-06	1.70920E-03	-5.85065E+02	2.16522E+00	5.85069E+02
107	1.2419E+09	-1.69692E-03	4.15331E-06	1.69692E-03	-5.89300E+02	-1.44234E+00	5.89301E+02
108	1.2537E+09	-1.68643E-03	8.77538E-06	1.68645E-03	-5.92953E+02	-3.08545E+00	5.92961E+02
109	1.2654E+09	-1.67837E-03	9.80995E-06	1.67840E-03	-5.95797E+02	-3.48240E+00	5.95807E+02
110	1.2771E+09	-1.67269E-03	8.91046E-06	1.67271E-03	-5.97824E+02	-3.18463E+00	5.97832E+02
111	1.2898E+09	-1.66901E-03	7.17903E-06	1.66903E-03	-5.99146E+02	-2.57715E+00	5.99152E+02
112	1.3005E+09	-1.66686E-03	5.28474E-06	1.66687E-03	-5.99923E+02	-1.90204E+00	5.99926E+02
113	1.3122E+09	-1.66578E-03	3.58458E-06	1.66579E-03	-6.00315E+02	-1.29181E+00	6.00316E+02
114	1.3240E+09	-1.66539E-03	2.22883E-06	1.66539E-03	-6.00459E+02	-8.03609E-01	6.00459E+02
115	1.3357E+09	-1.66539E-03	1.24205E-06	1.66539E-03	-6.00459E+02	-4.47824E-01	6.00460E+02
116	1.3474E+09	-1.66558E-03	5.82026E-07	1.66558E-03	-6.00390E+02	-2.09802E-01	6.00390E+02
117	1.3591E+09	-1.66584E-03	1.79477E-07	1.66584E-03	-6.00298E+02	-6.46758E-02	6.00298E+02
118	1.3708E+09	-1.66609E-03	-3.82299E-08	1.66609E-03	-6.00209E+02	1.37723E-02	6.00209E+02
119	1.3825E+09	-1.66629E-03	-1.34402E-07	1.66629E-03	-6.00135E+02	4.84063E-02	6.00135E+02

IFAR FIELDS

THETA	PHI	ETA	ST	DT	NT		
0.	0.	0.	-3.334E-10	3.334E-10	130	2	0

I	TIME	EP	EQ
1	-3.334E-10	-2.2118E-06	-4.5363E-16
2	0.	-1.4760E-05	-3.0272E-15
3	3.334E-10	-7.2329E-05	-1.4835E-14
4	6.668E-10	-2.9659E-04	-6.0830E-14
5	1.000E-09	-1.0160E-03	-2.0837E-13
6	1.334E-09	-2.9074E-03	-5.9631E-13
7	1.667E-09	-6.9479E-03	-1.4250E-12
8	2.000E-09	-1.3841E-02	-2.8388E-12
9	2.334E-09	-2.2888E-02	-4.6943E-12

10	2.667E-09	-3.1084E-02	-6.3753E-12
11	3.001E-09	-3.3708E-02	-6.9135E-12
12	3.334E-09	-2.6685E-02	-5.4731E-12
13	3.667E-09	-9.2025E-03	-1.8874E-12
14	4.001E-09	1.5377E-02	3.1538E-12
15	4.334E-09	4.0662E-02	8.3397E-12
16	4.668E-09	5.9373E-02	1.2177E-11
17	5.001E-09	6.5659E-02	1.3467E-11
18	5.334E-09	5.7330E-02	1.1758E-11
19	5.668E-09	3.7222E-02	7.6343E-12
20	6.001E-09	1.2391E-02	2.5414E-12
21	6.335E-09	-9.0652E-03	-1.8593E-12
22	6.668E-09	-2.1748E-02	-4.4605E-12
23	7.001E-09	-2.4869E-02	-5.1007E-12
24	7.335E-09	-2.1426E-02	-4.3944E-12
25	7.668E-09	-1.5748E-02	-3.2300E-12
26	8.002E-09	-1.1243E-02	-2.3059E-12
27	8.335E-09	-9.3088E-03	-1.9092E-12
28	8.668E-09	-9.4244E-03	-1.9330E-12
29	9.002E-09	-9.9611E-03	-2.0430E-12
30	9.335E-09	-9.3167E-03	-1.9108E-12
31	9.669E-09	-6.8728E-03	-1.4096E-12
32	1.000E-08	-3.2707E-03	-6.7082E-13
33	1.034E-08	1.3560E-04	2.7811E-14
34	1.067E-08	2.2055E-03	4.5235E-13
35	1.100E-08	2.6408E-03	5.4164E-13
36	1.134E-08	1.9651E-03	4.0303E-13
37	1.167E-08	1.0293E-03	2.1111E-13
38	1.200E-08	4.7950E-04	9.8346E-14
39	1.234E-08	5.0093E-04	1.0274E-13
40	1.267E-08	8.8416E-04	1.8134E-13
41	1.300E-08	1.2648E-03	2.5942E-13
42	1.334E-08	1.3591E-03	2.7875E-13
43	1.367E-08	1.0879E-03	2.2314E-13
44	1.400E-08	5.7360E-04	1.1765E-13
45	1.434E-08	4.5380E-05	9.3074E-15
46	1.467E-08	-2.8935E-04	-5.9346E-14
47	1.500E-08	-3.4874E-04	-7.1526E-14
48	1.534E-08	-2.0308E-04	-4.1651E-14
49	1.567E-08	-1.1146E-05	-2.2861E-15
50	1.600E-08	8.8349E-05	1.8120E-14
51	1.634E-08	5.3616E-05	1.0997E-14
52	1.667E-08	-6.1539E-05	-1.2622E-14
53	1.700E-08	-1.6842E-04	-3.4543E-14
54	1.734E-08	-2.0648E-04	-4.2349E-14
55	1.767E-08	-1.6797E-04	-3.4450E-14
56	1.800E-08	-8.4708E-05	-1.7374E-14
57	1.834E-08	-8.6121E-07	-1.7663E-16
58	1.867E-08	4.9491E-05	1.0151E-14
59	1.900E-08	5.4352E-05	1.1148E-14
60	1.934E-08	2.5206E-05	5.1697E-15
61	1.967E-08	-1.1978E-05	-2.4566E-15
62	2.000E-08	-3.2456E-05	-6.6566E-15
63	2.034E-08	-2.6375E-05	-5.4095E-15
64	2.067E-08	-1.9161E-06	-3.9298E-16
65	2.100E-08	2.3127E-05	4.7434E-15
66	2.134E-08	3.4207E-05	7.0158E-15
67	2.167E-08	2.8118E-05	5.7670E-15
68	2.200E-08	1.2106E-05	2.4828E-15
69	2.234E-08	-3.1955E-06	-6.5541E-16
70	2.267E-08	-1.0724E-05	-2.1995E-15
71	2.300E-08	-9.5545E-06	-1.9596E-15
72	2.334E-08	-3.1956E-06	-6.5542E-16
73	2.367E-08	3.5827E-06	7.3480E-16
74	2.400E-08	7.1494E-06	1.4663E-15
75	2.434E-08	6.1725E-06	1.2660E-15
76	2.467E-08	1.8047E-06	3.7013E-16
77	2.500E-08	-3.1181E-06	-6.3953E-16
78	2.534E-08	-5.7725E-06	-1.1839E-15
79	2.567E-08	-5.0479E-06	-1.0353E-15
80	2.601E-08	-2.0301E-06	-4.1637E-16
81	2.634E-08	1.0584E-06	2.1709E-16
82	2.667E-08	2.5003E-06	5.1282E-16
83	2.701E-08	2.0092E-06	4.1209E-16
84	2.734E-08	4.7354E-07	9.7123E-17
85	2.767E-08	-9.4133E-07	-1.9307E-16
86	2.801E-08	-1.5236E-06	-3.1248E-16
87	2.834E-08	-1.2068E-06	-2.4750E-16

88	2.867E-08	-3.6528E-07	-7.4918E-17
89	2.901E-08	4.9057E-07	1.0061E-16
90	2.934E-08	9.5407E-07	1.9568E-16
91	2.967E-08	8.6854E-07	1.7814E-16
92	3.001E-08	3.7003E-07	7.5894E-17
93	3.034E-08	-2.0399E-07	-4.1837E-17
94	3.067E-08	-5.1993E-07	-1.0664E-16
95	3.101E-08	-4.4893E-07	-9.2075E-17
96	3.134E-08	-1.2039E-07	-2.4692E-17
97	3.167E-08	2.0618E-07	4.2288E-17
98	3.201E-08	3.3684E-07	6.9087E-17
99	3.234E-08	2.5004E-07	5.1283E-17
100	3.267E-08	5.7611E-08	1.1816E-17
101	3.301E-08	-1.0806E-07	-2.2163E-17
102	3.334E-08	-1.7545E-07	-3.5985E-17
103	3.367E-08	-1.4404E-07	-2.9543E-17
104	3.401E-08	-5.4528E-08	-1.1184E-17
105	3.434E-08	4.0295E-08	8.2645E-18
106	3.467E-08	9.4767E-08	1.9437E-17
107	3.501E-08	8.7214E-08	1.7888E-17
108	3.534E-08	3.0862E-08	6.3298E-18
109	3.567E-08	-3.4077E-08	-6.9893E-18
110	3.601E-08	-6.7323E-08	-1.3808E-17
111	3.634E-08	-5.4912E-08	-1.1262E-17
112	3.667E-08	-1.4261E-08	-2.9248E-18
113	3.701E-08	2.3707E-08	4.8622E-18
114	3.734E-08	3.7932E-08	7.7798E-18
115	3.767E-08	2.7717E-08	5.6848E-18
116	3.801E-08	6.4755E-09	1.3281E-18
117	3.834E-08	-1.1295E-08	-2.3167E-18
118	3.867E-08	-1.8303E-08	-3.7540E-18
119	3.901E-08	-1.4782E-08	-3.0318E-18
120	3.934E-08	-5.0208E-09	-1.0298E-18
121	3.967E-08	5.4566E-09	1.1191E-18
122	4.001E-08	1.1573E-08	2.3736E-18
123	4.034E-08	1.0605E-08	2.1750E-18
124	4.067E-08	3.8625E-09	7.9220E-19
125	4.101E-08	-3.8999E-09	-7.9986E-19
126	4.134E-08	-7.7803E-09	-1.5957E-18
127	4.167E-08	-6.1710E-09	-1.2657E-18
128	4.201E-08	-1.3722E-09	-2.8143E-19
129	4.234E-08	2.8447E-09	5.8345E-19
130	4.268E-08	4.1880E-09	8.5895E-19

TRANSFORMED FIELDS

4.16930E+08 2.37415E+09

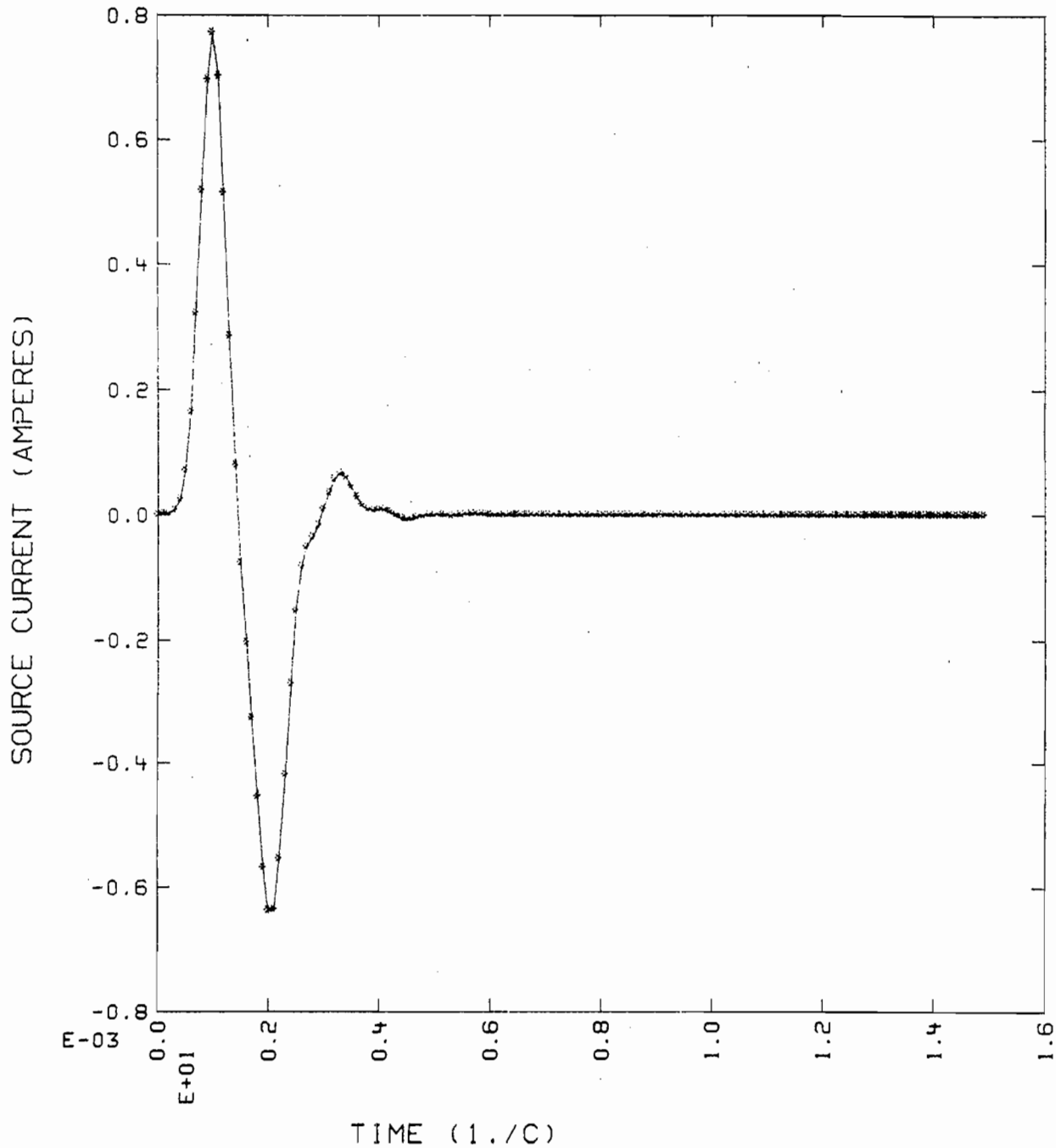
TRAN ARRAY VALUES.

-2.212E-06	-1.476E-05	-7.233E-05	-2.966E-04	-1.016E-03	-2.907E-03	-6.948E-03	-1.384E-02	-2.289E-02	-3.108E-02
-3.371E-02	-2.669E-02	-9.203E-03	1.538E-02	4.066E-02	5.937E-02	6.566E-02	5.733E-02	3.722E-02	1.239E-02
-9.065E-03	-2.175E-02	-2.487E-02	-2.143E-02	-1.575E-02	-1.124E-02	-9.309E-03	-9.424E-03	-9.961E-03	-9.317E-03
-6.873E-03	-3.271E-03	1.356E-04	2.206E-03	2.641E-03	1.965E-03	1.029E-03	4.795E-04	5.009E-04	8.842E-04
1.265E-03	1.359E-03	1.088E-03	5.736E-04	4.538E-05	-2.893E-04	-3.487E-04	-2.031E-04	-1.115E-05	8.835E-05
5.362E-05	-6.154E-05	-1.684E-04	-2.065E-04	-1.680E-04	-8.471E-05	-8.612E-07	4.949E-05	5.435E-05	2.521E-05
-1.198E-05	-3.246E-05	-2.637E-05	-1.916E-06	2.313E-05	3.421E-05	2.812E-05	1.211E-05	-3.196E-06	-1.072E-05
-9.555E-06	-3.196E-06	3.583E-06	7.149E-06	6.173E-06	1.805E-06	-3.118E-06	-5.772E-06	-5.048E-06	-2.030E-06
1.058E-06	2.500E-06	2.009E-06	4.735E-07	-9.413E-07	-1.524E-06	-1.207E-06	-3.653E-07	4.906E-07	9.541E-07
8.685E-07	3.700E-07	-2.040E-07	-5.199E-07	-4.489E-07	-1.204E-07	2.062E-07	3.368E-07	2.500E-07	5.761E-08
-1.081E-07	-1.755E-07	-1.440E-07	-5.453E-08	4.030E-08	9.477E-08	8.721E-08	3.086E-08	-3.408E-08	-6.732E-08
-5.491E-08	-1.426E-08	2.371E-08	3.793E-08	2.772E-08	6.475E-09	-1.130E-08	-1.830E-08	-1.478E-08	-5.021E-09
5.457E-09	1.157E-08	1.060E-08	3.863E-09	-3.900E-09	-7.780E-09	-6.171E-09	-1.372E-09	2.845E-09	4.188E-09
3.210E-09	7.548E-10	-1.508E-09	-2.416E-09	-1.813E-09	-3.879E-10	8.984E-10	1.393E-09	1.023E-09	1.966E-10
-5.343E-10	-8.023E-10	-5.767E-10	-9.779E-11	3.171E-10	4.619E-10	3.248E-10	4.748E-11	-1.879E-10	-2.658E-10
-1.828E-10	-2.228E-11	1.112E-10	1.528E-10	1.028E-10	9.935E-12	-6.567E-11	-8.784E-11	-5.771E-11	-4.062E-12
3.873E-11	5.045E-11	3.237E-11	1.391E-12	-2.282E-11	-2.896E-11	-1.814E-11	-2.586E-13	1.342E-11	1.661E-11
1.015E-11	-1.609E-13	-7.887E-12	-9.524E-12	-5.677E-12	2.695E-13	4.629E-12	5.457E-12	3.169E-12	-2.561E-13
-2.713E-12	-3.125E-12	-1.767E-12	2.051E-13	1.589E-12	1.788E-12	9.838E-13	-1.509E-13	-9.296E-13	-1.023E-12
-5.469E-13	1.056E-13	5.433E-13	5.845E-13	3.035E-13	-7.142E-14	-3.172E-13	-3.339E-13	-1.682E-13	4.717E-14
1.850E-13	1.906E-13	9.300E-14	-3.060E-14	-1.079E-13	-1.087E-13	-5.133E-14	1.957E-14	6.281E-14	6.200E-14
2.827E-14	-1.238E-14	-3.655E-14	-3.532E-14	-1.553E-14	7.757E-15	2.125E-14	2.011E-14	8.511E-15	-4.823E-15
-1.234E-14	-1.145E-14	-4.651E-15	2.979E-15	7.166E-15	6.508E-15	2.534E-15	-1.829E-15	-4.157E-15	-3.698E-15
-1.376E-15	1.118E-15	2.409E-15	2.100E-15	7.442E-16	-6.802E-16	-1.396E-15	-1.192E-15	-4.008E-16	4.123E-16
8.078E-16	6.758E-16	2.148E-16	-2.490E-16	-4.673E-16	-3.829E-16	-1.145E-16	1.499E-16	2.701E-16	2.168E-16
6.064E-17	-9.002E-17	-1.560E-16	-1.227E-16	-3.187E-17	5.391E-17				

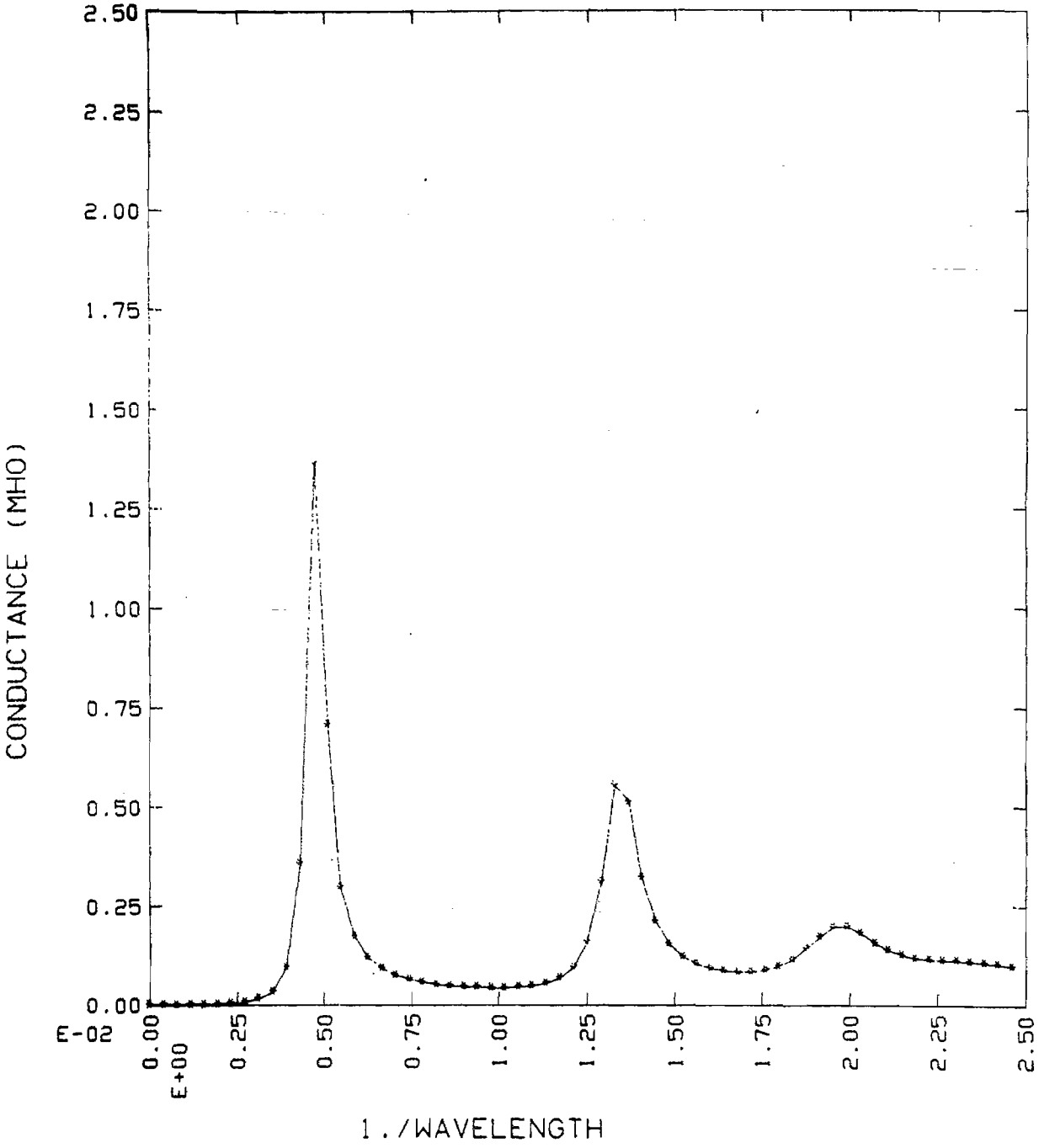
I	FREQ	LAM.	EMAG	ANT. GAIN	GAIN-DB
2	1.17164E+07	2.56051E+01	6.91877E-04	1.51404E+00	1.80136
3	2.34328E+07	1.28026E+01	2.78101E-03	1.53479E+00	1.86048
4	3.51492E+07	8.53504E+00	6.30336E-03	1.53998E+00	1.87515
5	4.68656E+07	6.40128E+00	1.13026E-02	1.54340E+00	1.88479
6	5.85820E+07	5.12102E+00	1.78023E-02	1.54684E+00	1.89445
7	7.02984E+07	4.26752E+00	2.57637E-02	1.55081E+00	1.90558
8	8.20148E+07	3.65787E+00	3.50323E-02	1.55556E+00	1.91886
9	9.37313E+07	3.20064E+00	4.52914E-02	1.56128E+00	1.93481
10	1.05448E+08	2.84501E+00	5.60527E-02	1.56815E+00	1.95386
11	1.17164E+08	2.56051E+00	6.67163E-02	1.57634E+00	1.97650
12	1.28880E+08	2.32774E+00	7.66950E-02	1.58605E+00	2.00318
13	1.40597E+08	2.13376E+00	8.55491E-02	1.59751E+00	2.03442
14	1.52313E+08	1.96962E+00	9.30647E-02	1.61093E+00	2.07078
15	1.64030E+08	1.82894E+00	9.92434E-02	1.62661E+00	2.11283
16	1.75746E+08	1.70701E+00	1.04235E-01	1.64483E+00	2.16121
17	1.87463E+08	1.60032E+00	1.08257E-01	1.66593E+00	2.21657
18	1.99179E+08	1.50618E+00	1.11538E-01	1.69028E+00	2.27959
19	2.10895E+08	1.42251E+00	1.14283E-01	1.71829E+00	2.35095
20	2.22612E+08	1.34764E+00	1.16661E-01	1.75037E+00	2.43130
21	2.34328E+08	1.28026E+00	1.18804E-01	1.78694E+00	2.52111
22	2.46045E+08	1.21929E+00	1.20810E-01	1.82835E+00	2.62059
23	2.57761E+08	1.16387E+00	1.22744E-01	1.87472E+00	2.72937
24	2.69477E+08	1.11327E+00	1.24638E-01	1.92576E+00	2.84601
25	2.81194E+08	1.06688E+00	1.26483E-01	1.98027E+00	2.96724
26	2.92910E+08	1.02420E+00	1.28212E-01	2.03540E+00	3.08650
27	3.04627E+08	9.84812E-01	1.29670E-01	2.08532E+00	3.19173
28	3.16343E+08	9.48338E-01	1.30568E-01	2.11924E+00	3.26181
29	3.28059E+08	9.14469E-01	1.30421E-01	2.11914E+00	3.26160
30	3.39776E+08	8.82935E-01	1.28511E-01	2.05893E+00	3.13641
31	3.51492E+08	8.53504E-01	1.23933E-01	1.90972E+00	2.80970
32	3.63209E+08	8.25972E-01	1.15869E-01	1.65612E+00	2.19093
33	3.74925E+08	8.00160E-01	1.04087E-01	1.31801E+00	1.19919
34	3.86641E+08	7.75913E-01	8.93527E-02	9.53383E-01	-0.20733
35	3.98358E+08	7.53092E-01	7.32573E-02	6.27818E-01	-2.02166
36	4.10074E+08	7.31575E-01	5.75065E-02	3.79207E-01	-4.21124
37	4.21791E+08	7.11253E-01	4.32949E-02	2.11027E-01	-6.75662
38	4.33507E+08	6.92030E-01	3.11591E-02	1.07473E-01	-9.68699
39	4.45223E+08	6.73819E-01	2.11576E-02	4.87539E-02	-13.11991
40	4.56940E+08	6.56542E-01	1.31915E-02	1.83849E-02	-17.35538
41	4.68656E+08	6.40128E-01	6.71136E-03	4.73654E-03	-23.24539
42	4.80373E+08	6.24515E-01	1.75736E-03	3.17932E-04	-34.97666
43	4.92089E+08	6.09646E-01	2.59450E-03	6.75638E-04	-31.70285
44	5.03805E+08	5.95468E-01	6.03485E-03	3.64536E-03	-24.50340
45	5.15522E+08	5.81935E-01	9.43601E-03	8.35703E-03	-20.77948
46	5.27238E+08	5.69003E-01	1.33213E-02	1.59725E-02	-17.96626
47	5.38955E+08	5.56633E-01	1.81511E-02	2.83683E-02	-15.47157
48	5.50671E+08	5.44790E-01	2.40472E-02	4.78339E-02	-13.20265
49	5.62388E+08	5.33440E-01	3.06079E-02	7.54487E-02	-11.22348
50	5.74104E+08	5.22553E-01	3.69992E-02	1.09578E-01	-9.60277
51	5.85820E+08	5.12102E-01	4.23851E-02	1.45912E-01	-8.35909
52	5.97537E+08	5.02061E-01	4.63517E-02	1.79422E-01	-7.46125
53	6.09253E+08	4.92406E-01	4.89428E-02	2.06427E-01	-6.85234
54	6.20970E+08	4.83115E-01	5.04100E-02	2.25145E-01	-6.47538
55	6.32686E+08	4.74169E-01	5.09858E-02	2.35015E-01	-6.28904
56	6.44402E+08	4.65548E-01	5.07853E-02	2.35871E-01	-6.27325
57	6.56119E+08	4.57234E-01	4.98037E-02	2.27660E-01	-6.42714
58	6.67835E+08	4.49213E-01	4.79729E-02	2.10837E-01	-6.76054
59	6.79552E+08	4.41468E-01	4.52817E-02	1.87222E-01	-7.27643
60	6.91268E+08	4.33995E-01	4.19236E-02	1.60445E-01	-7.94674
61	7.02984E+08	4.26752E-01	3.83518E-02	1.35068E-01	-8.69449
62	7.14701E+08	4.19756E-01	3.51269E-02	1.14702E-01	-9.40428
63	7.26417E+08	4.12986E 01	3.26562E-02	1.00771E-01	-9.96663
64	7.38134E+08	4.06430E-01	3.10560E-02	9.27725E-02	-10.32581
65	7.49850E+08	4.00080E-01	3.02048E-02	8.92772E-02	-10.49260
66	7.61566E+08	3.93925E-01	2.98759E-02	8.87164E-02	-10.51996
67	7.73283E+08	3.87956E-01	2.98368E-02	8.97144E-02	-10.47138
68	7.84999E+08	3.82166E-01	2.99033E-02	9.12240E-02	-10.39891
69	7.96716E+08	3.76546E-01	2.99559E-02	9.25615E-02	-10.33570
70	8.08432E+08	3.71089E-01	2.99386E-02	9.34075E-02	-10.29618
71	8.20148E+08	3.65787E-01	2.98368E-02	9.36913E-02	-10.28301
72	8.31865E+08	3.60635E-01	2.96627E-02	9.35048E-02	-10.29166
73	8.43581E+08	3.55627E-01	2.94369E-02	9.29880E-02	-10.31573
74	8.55298E+08	3.50755E-01	2.91865E-02	9.23072E-02	-10.34765
75	8.67014E+08	3.46015E-01	2.89379E-02	9.16039E-02	-10.38086
76	8.78731E+08	3.41402E-01	2.87182E-02	9.09978E-02	-10.40969
77	8.90447E+08	3.36909E-01	2.85531E-02	9.05664E-02	-10.43033
78	9.02163E+08	3.32534E-01	2.84619E-02	9.03126E-02	-10.44252

79	9.13880E+08	3.28271E-01	2.84614E-02	9.01889E-02	-10.44847
80	9.25596E+08	3.24115E-01	2.85482E-02	8.99988E-02	-10.45763
81	9.37313E+08	3.20064E-01	2.87154E-02	8.95295E-02	-10.48034
82	9.49029E+08	3.16113E-01	2.89176E-02	8.83902E-02	-10.53596
83	9.60745E+08	3.12258E-01	2.91093E-02	8.63345E-02	-10.63816
84	9.72462E+08	3.08495E-01	2.91889E-02	8.30177E-02	-10.80829
85	9.84178E+08	3.04823E-01	2.90664E-02	7.84764E-02	-11.05261
86	9.95895E+08	3.01237E-01	2.85848E-02	7.27161E-02	-11.38369
87	1.00761E+09	2.97734E-01	2.76253E-02	6.62707E-02	-11.78679
88	1.01933E+09	2.94312E-01	2.64211E-02	5.97438E-02	-12.23707
89	1.03104E+09	2.90967E-01	2.37577E-02	5.50205E-02	-12.59475
90	1.04276E+09	2.87698E-01	2.10295E-02	5.80385E-02	-12.36284
91	1.05448E+09	2.84501E-01	1.90415E-02	1.52204E-01	-8.17574

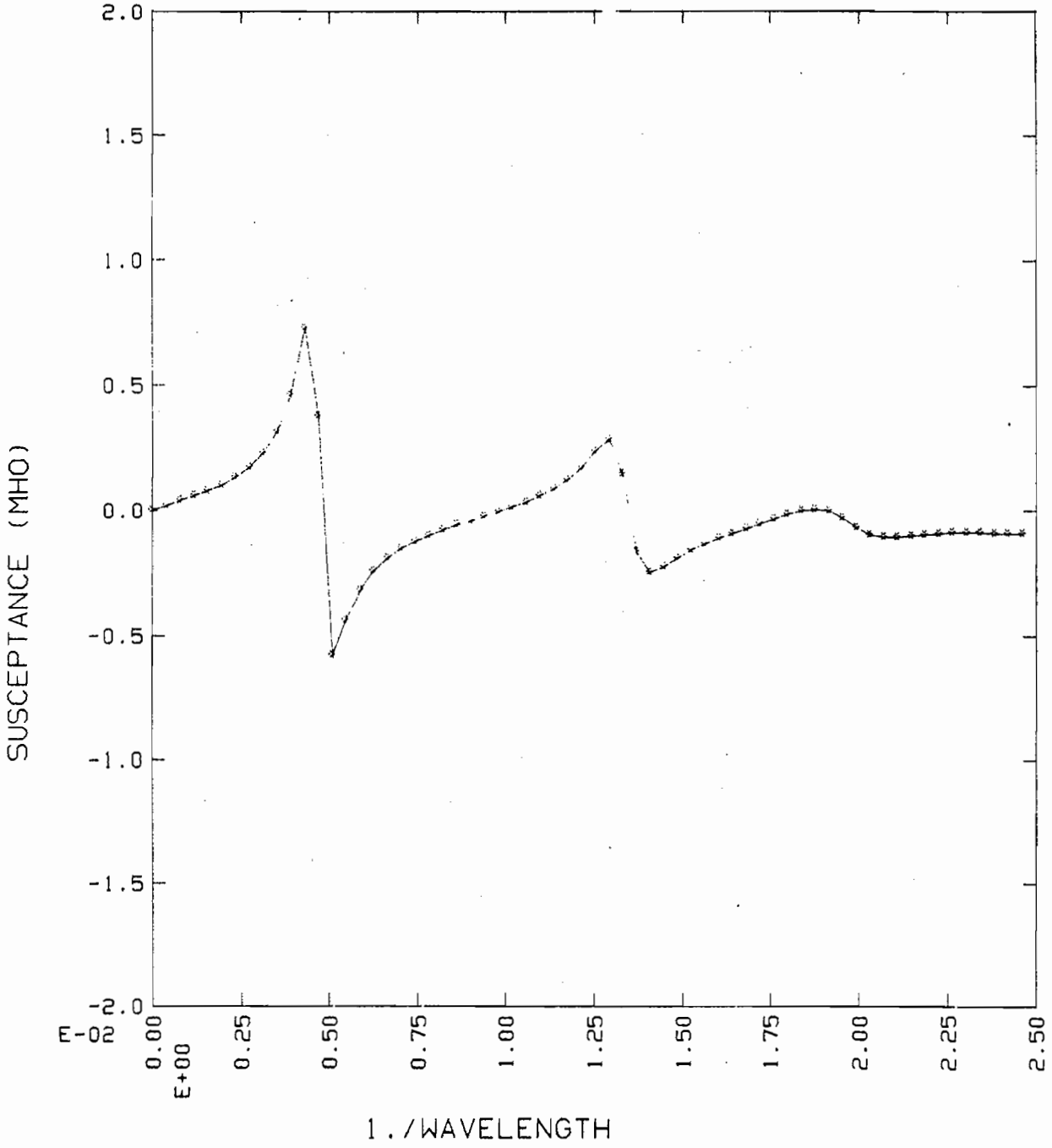
RUNNING TIME IN MICROSECONDS = 559277



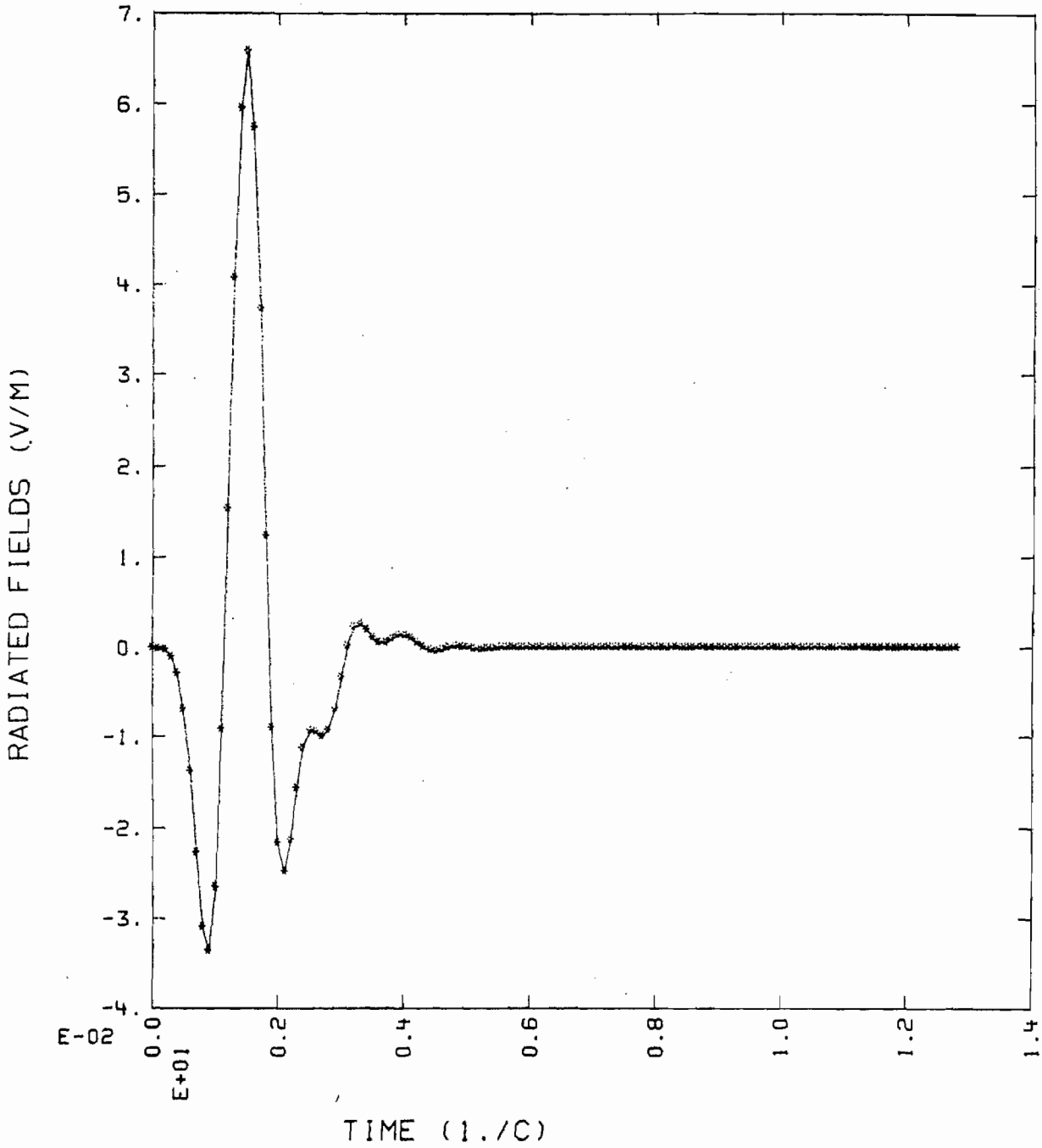
M BY .001 M RAD DIPOLE -- GAUSSIAN VOLTAGE -- 600 OHMS



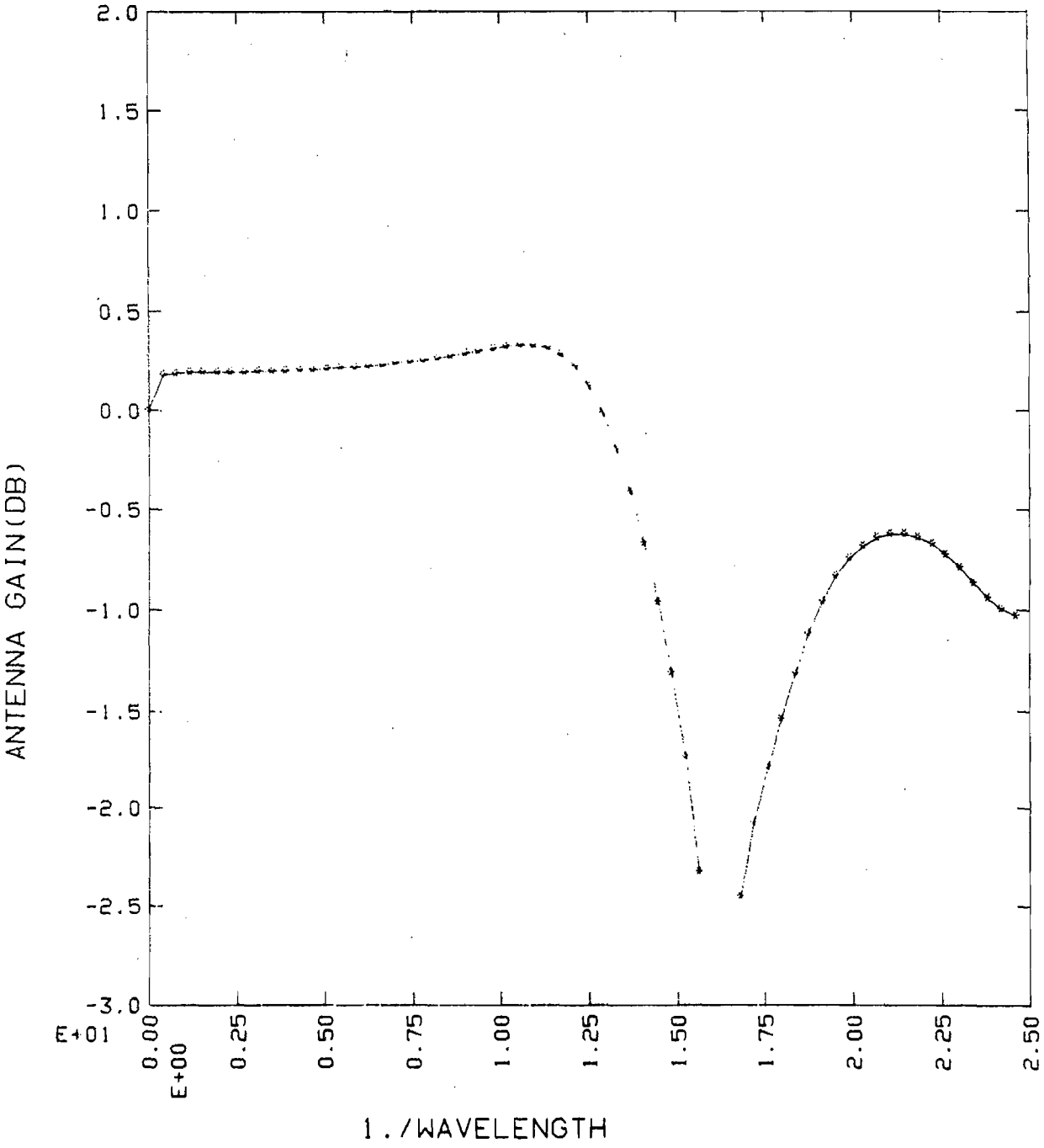
1 M BY .001 M RADIUS DIPOLE ANTENNA



1 M BY .001 M RADIUS DIPOLE ANTENNA



1 M BY .001 M RAD DIPOLE -- GAUSSIAN VOLTAGE -- 600 OHMS



1 M BY .001 M RADIUS DIPOLE ANTENNA

Appendix D
Linear Dipole Scatterer

```
 1 M BY .001 M RAD DIPOLE
TIME (1./C)
CENTER CURRENT (AMPERES)
 1 M BY .001 M RAD DIPOLE -- GAUSSIAN PLANE WAVE BROADSIDE
 1./WAVELENGTH
CONDUCTANCE (MHO)
 1 M BY .001 M RADIUS DIPOLE  -- BACKSCATTER CROSS SECTION
RADIATED FIELDS (V/M)
SIGMA/LAMBDA**2 (DB)
SUSCEPTANCE (MHO)
ANTENNA GAIN(DB)
3.334E-10,200,0,2,1,0,3,8,0,
1.,0.,0.,0.,0.,0.,0.001,10,
0.,0.,0.,1.,3.03,
1,1.0.,
0.,0.,0.,3.334E-10,3.334E-10,180,1.0,

 1 M BY .001 M RAD DIPOLE
3.334E-10  200    0    2    1    0    3    8    0


COLLOCATION PROGRAM FOR LINEAR DIPOLES SYMMETRIC ABOUT CENTER
   1.00000   0.          0.          0.          0.          0.          0.00100   10
      X(I)        Y(I)        Z(I)        S(I)        B(I)      ALP(I)      BET(I)
   0.05000   0.          0.          0.10000   0.00100   0.          0.          6    1    2
   0.15000   0.          0.          0.10000   0.00100   0.          0.          1    2    3
   0.25000   0.          0.          0.10000   0.00100   0.          0.          2    3    4
   0.35000   0.          0.          0.10000   0.00100   0.          0.          3    4    5
   0.45000   0.          0.          0.10000   0.00100   0.          0.          4    5    0
  -0.05000  -0.00000     0.          0.10000   0.00100  -0.        180.00000    1    6    7
  -0.15000  -0.00000     0.          0.10000   0.00100  -0.        180.00000    6    7    8
  -0.25000  -0.00000     0.          0.10000   0.00100  -0.        180.00000    7    8    9
  -0.35000  -0.00000     0.          0.10000   0.00100  -0.        180.00000    8    9   10
  -0.45000  -0.00000     0.          0.10000   0.00100  -0.        180.00000    9   10    0
   0.          0.          0.          1.00000   3.03000
    1    1  0.
    1   2   3   4   5   6   7   8   9  10

DDETERMINANT=  5.89825460E+37
 TIME IN MICROSEC. FOR MATRIX SETUP   251676
 RUNNING TIME IN MICROSECONDS =   681259

IFAR FIELDS
     THETA       PHI       ETA        ST          DT     NT
   0.          0.          0.       3.334E-10 3.334E-10  180    1    0

    I       TIME            EP              EQ
    1 3.334E-10     -1.0803E-04     -2.2157E-14
    2 6.668E-10     -4.3894E-04     -9.0026E-14
    3 1.000E-09     -1.4899E-03     -3.0557E-13
    4 1.334E-09     -4.2146E-03     -8.6442E-13
    5 1.667E-09     -9.9119E-03     -2.0329E-12
    6 2.000E-09     -1.9294E-02     -3.9572E-12
    7 2.334E-09     -3.0814E-02     -6.3200E-12
    8 2.667E-09     -3.9619E-02     -8.1258E-12
    9 3.001E-09     -3.9108E-02     -8.0210E-12
   10 3.334E-09     -2.5141E-02     -5.1564E-12
   11 3.667E-09      3.2412E-04      6.6478E-14
   12 4.001E-09      2.9797E-02      6.1114E-12
   13 4.334E-09      5.4751E-02      1.1229E-11
   14 4.668E-09      7.0028E-02      1.4363E-11
   15 5.001E-09      7.4872E-02      1.5356E-11
   16 5.334E-09      7.1013E-02      1.4565E-11
   17 5.668E-09      6.0378E-02      1.2384E-11
   18 6.001E-09      4.4182E-02      9.0618E-12
   19 6.335E-09      2.3403E-02      4.7999E-12
   20 6.668E-09     -3.3600E-04     -6.8914E-14
   21 7.001E-09     -2.4355E-02     -4.9952E-12
```

22	7.335E-09	-4.5368E-02	-9.3049E-12
23	7.668E-09	-6.0518E-02	-1.2412E-11
24	8.002E-09	-6.8363E-02	-1.4021E-11
25	8.335E-09	-6.9172E-02	-1.4187E-11
26	8.668E-09	-6.4367E-02	-1.3202E-11
27	9.002E-09	-5.5493E-02	-1.1382E-11
28	9.335E-09	-4.3472E-02	-8.9160E-12
29	9.669E-09	-2.8603E-02	-5.8664E-12
30	1.000E-08	-1.1209E-02	-2.2989E-12
31	1.034E-08	7.6764E-03	1.5744E-12
32	1.067E-08	2.6126E-02	5.3584E-12
33	1.100E-08	4.1768E-02	8.5665E-12
34	1.134E-08	5.2564E-02	1.0781E-11
35	1.167E-08	5.7462E-02	1.1785E-11
36	1.200E-08	5.6587E-02	1.1606E-11
37	1.234E-08	5.0949E-02	1.0450E-11
38	1.267E-08	4.1849E-02	8.5833E-12
39	1.300E-08	3.0358E-02	6.2264E-12
40	1.334E-08	1.7145E-02	3.5164E-12
41	1.367E-08	2.7239E-03	5.5867E-13
42	1.400E-08	-1.2120E-02	-2.4859E-12
43	1.434E-08	-2.6090E-02	-5.3510E-12
44	1.467E-08	-3.7541E-02	-7.6996E-12
45	1.500E-08	-4.4987E-02	-9.2269E-12
46	1.534E-08	-4.7625E-02	-9.7680E-12
47	1.567E-08	-4.5554E-02	-9.3431E-12
48	1.600E-08	-3.9595E-02	-8.1210E-12
49	1.634E-08	-3.0869E-02	-6.3312E-12
50	1.667E-08	-2.0394E-02	-4.1827E-12
51	1.700E-08	-8.9223E-03	-1.8300E-12
52	1.734E-08	2.9495E-03	6.0494E-13
53	1.767E-08	1.4547E-02	2.9836E-12
54	1.800E-08	2.4955E-02	5.1184E-12
55	1.834E-08	3.3078E-02	6.7844E-12
56	1.867E-08	3.7917E-02	7.7767E-12
57	1.900E-08	3.8909E-02	7.9802E-12
58	1.934E-08	3.6129E-02	7.4100E-12
59	1.967E-08	3.0229E-02	6.1999E-12
60	2.000E-08	2.2165E-02	4.5460E-12
61	2.034E-08	1.2882E-02	2.6421E-12
62	2.067E-08	3.1334E-03	6.4265E-13
63	2.100E-08	-6.5004E-03	-1.3332E-12
64	2.134E-08	-1.5463E-02	-3.1714E-12
65	2.167E-08	-2.3099E-02	-4.7377E-12
66	2.200E-08	-2.8675E-02	-5.8812E-12
67	2.234E-08	-3.1539E-02	-6.4686E-12
68	2.267E-08	-3.1344E-02	-6.4286E-12
69	2.300E-08	-2.8190E-02	-5.7818E-12
70	2.334E-08	-2.2607E-02	-4.6367E-12
71	2.367E-08	-1.5383E-02	-3.1550E-12
72	2.400E-08	-7.3453E-03	-1.5065E-12
73	2.434E-08	8.0363E-04	1.6483E-13
74	2.467E-08	8.5200E-03	1.7475E-12
75	2.500E-08	1.5346E-02	3.1475E-12
76	2.534E-08	2.0824E-02	4.2709E-12
77	2.567E-08	2.4477E-02	5.0202E-12
78	2.601E-08	2.5902E-02	5.3126E-12
79	2.634E-08	2.4910E-02	5.1091E-12
80	2.667E-08	2.1627E-02	4.4357E-12
81	2.701E-08	1.6497E-02	3.3836E-12
82	2.734E-08	1.0173E-02	2.0866E-12
83	2.767E-08	3.3551E-03	6.8812E-13
84	2.801E-08	-3.3420E-03	-6.8545E-13
85	2.834E-08	-9.4368E-03	-1.9355E-12
86	2.867E-08	-1.4555E-02	-2.9852E-12
87	2.901E-08	-1.8373E-02	-3.7683E-12
88	2.934E-08	-2.0598E-02	-4.2246E-12
89	2.967E-08	-2.1004E-02	-4.3079E-12
90	3.001E-08	-1.9517E-02	-4.0030E-12
91	3.034E-08	-1.6285E-02	-3.3401E-12
92	3.067E-08	-1.1683E-02	-2.3963E-12
93	3.101E-08	-6.2486E-03	-1.2816E-12
94	3.134E-08	-5.6238E-04	-1.1534E-13
95	3.167E-08	4.8533E-03	9.9541E-13
96	3.201E-08	9.5907E-03	1.9670E-12
97	3.234E-08	1.3351E-02	2.7383E-12
98	3.267E-08	1.5912E-02	3.2635E-12
99	3.301E-08	1.7101E-02	3.5074E-12

100	3.334E-08	1.6815E-02	3.4488E-12
101	3.367E-08	1.5061E-02	3.0891E-12
102	3.401E-08	1.2000E-02	2.4612E-12
103	3.434E-08	7.9526E-03	1.6311E-12
104	3.467E-08	3.3575E-03	6.8862E-13
105	3.501E-08	-1.3107E-03	-2.6883E-13
106	3.534E-08	-5.6218E-03	-1.1530E-12
107	3.567E-08	-9.2404E-03	-1.8952E-12
108	3.601E-08	-1.1934E-02	-2.4476E-12
109	3.634E-08	-1.3553E-02	-2.7797E-12
110	3.667E-08	-1.4011E-02	-2.8737E-12
111	3.701E-08	-1.3284E-02	-2.7246E-12
112	3.734E-08	-1.1430E-02	-2.3443E-12
113	3.767E-08	-8.6146E-03	-1.7669E-12
114	3.801E-08	-5.1139E-03	-1.0489E-12
115	3.834E-08	-1.2847E-03	-2.6348E-13
116	3.867E-08	2.4911E-03	5.1092E-13
117	3.901E-08	5.8673E-03	1.2034E-12
118	3.934E-08	8.5765E-03	1.7590E-12
119	3.967E-08	1.0442E-02	2.1417E-12
120	4.001E-08	1.1370E-02	2.3320E-12
121	4.034E-08	1.1329E-02	2.3237E-12
122	4.067E-08	1.0346E-02	2.1220E-12
123	4.101E-08	8.5092E-03	1.7452E-12
124	4.134E-08	5.9813E-03	1.2268E-12
125	4.167E-08	2.9986E-03	6.1501E-13
126	4.201E-08	-1.4952E-04	-3.0667E-14
127	4.234E-08	-3.1594E-03	-6.4799E-13
128	4.268E-08	-5.7584E-03	-1.1810E-12
129	4.301E-08	-7.7388E-03	-1.5872E-12
130	4.334E-08	-8.9719E-03	-1.8401E-12
131	4.368E-08	-9.4031E-03	-1.9286E-12
132	4.401E-08	-9.0382E-03	-1.8537E-12
133	4.434E-08	-7.9330E-03	-1.6271E-12
134	4.468E-08	-6.1913E-03	-1.2698E-12
135	4.501E-08	-3.9667E-03	-8.1358E-13
136	4.534E-08	-1.4605E-03	-2.9955E-13
137	4.568E-08	1.0939E-03	2.2436E-13
138	4.601E-08	3.4580E-03	7.0925E-13
139	4.634E-08	5.4212E-03	1.1119E-12
140	4.668E-08	6.8266E-03	1.4001E-12
141	4.701E-08	7.5845E-03	1.5556E-12
142	4.734E-08	7.6692E-03	1.5730E-12
143	4.768E-08	7.1094E-03	1.4581E-12
144	4.801E-08	5.9762E-03	1.2257E-12
145	4.834E-08	4.3774E-03	8.9781E-13
146	4.868E-08	2.4540E-03	5.0331E-13
147	4.901E-08	3.7577E-04	7.7071E-14
148	4.934E-08	-1.6700E-03	-3.4251E-13
149	4.968E-08	-3.4982E-03	-7.1748E-13
150	5.001E-08	-4.9492E-03	-1.0151E-12
151	5.034E-08	-5.9084E-03	-1.2118E-12
152	5.068E-08	-6.3167E-03	-1.2955E-12
153	5.101E-08	-6.1694E-03	-1.2653E-12
154	5.134E-08	-5.5081E-03	-1.1297E-12
155	5.168E-08	-4.4099E-03	-9.0447E-13
156	5.201E-08	-2.9793E-03	-6.1106E-13
157	5.234E-08	-1.3424E-03	-2.7533E-13
158	5.268E-08	3.5876E-04	7.3582E-14
159	5.301E-08	1.9753E-03	4.0513E-13
160	5.334E-08	3.3652E-03	6.9020E-13
161	5.368E-08	4.4101E-03	9.0451E-13
162	5.401E-08	5.0291E-03	1.0315E-12
163	5.434E-08	5.1870E-03	1.0639E-12
164	5.468E-08	4.8935E-03	1.0037E-12
165	5.501E-08	4.1965E-03	8.6071E-13
166	5.534E-08	3.1730E-03	6.5078E-13
167	5.568E-08	1.9197E-03	3.9373E-13
168	5.601E-08	5.4696E-04	1.1218E-13
169	5.634E-08	-8.2775E-04	-1.6977E-13
170	5.668E-08	-2.0870E-03	-4.2804E-13
171	5.701E-08	-3.1235E-03	-6.4063E-13
172	5.734E-08	-3.8515E-03	-7.8993E-13
173	5.768E-08	-4.2105E-03	-8.6479E-13
174	5.801E-08	-4.2011E-03	-8.6165E-13
175	5.834E-08	-3.8245E-03	-7.8441E-13
176	5.868E-08	-3.1367E-03	-6.4333E-13
177	5.901E-08	-2.2102E-03	-4.5331E-13
178	5.935E-08	-1.1320E-03	-2.3218E-13

179 5.968E-08 3.2020E-06 6.5672E-16
180 6.001E-08 1.0995E-03 2.2551E-13

TRANSFORMED FIELDS
5.40974E+07 8.88889E+08

TRAN ARRAY VALUES.

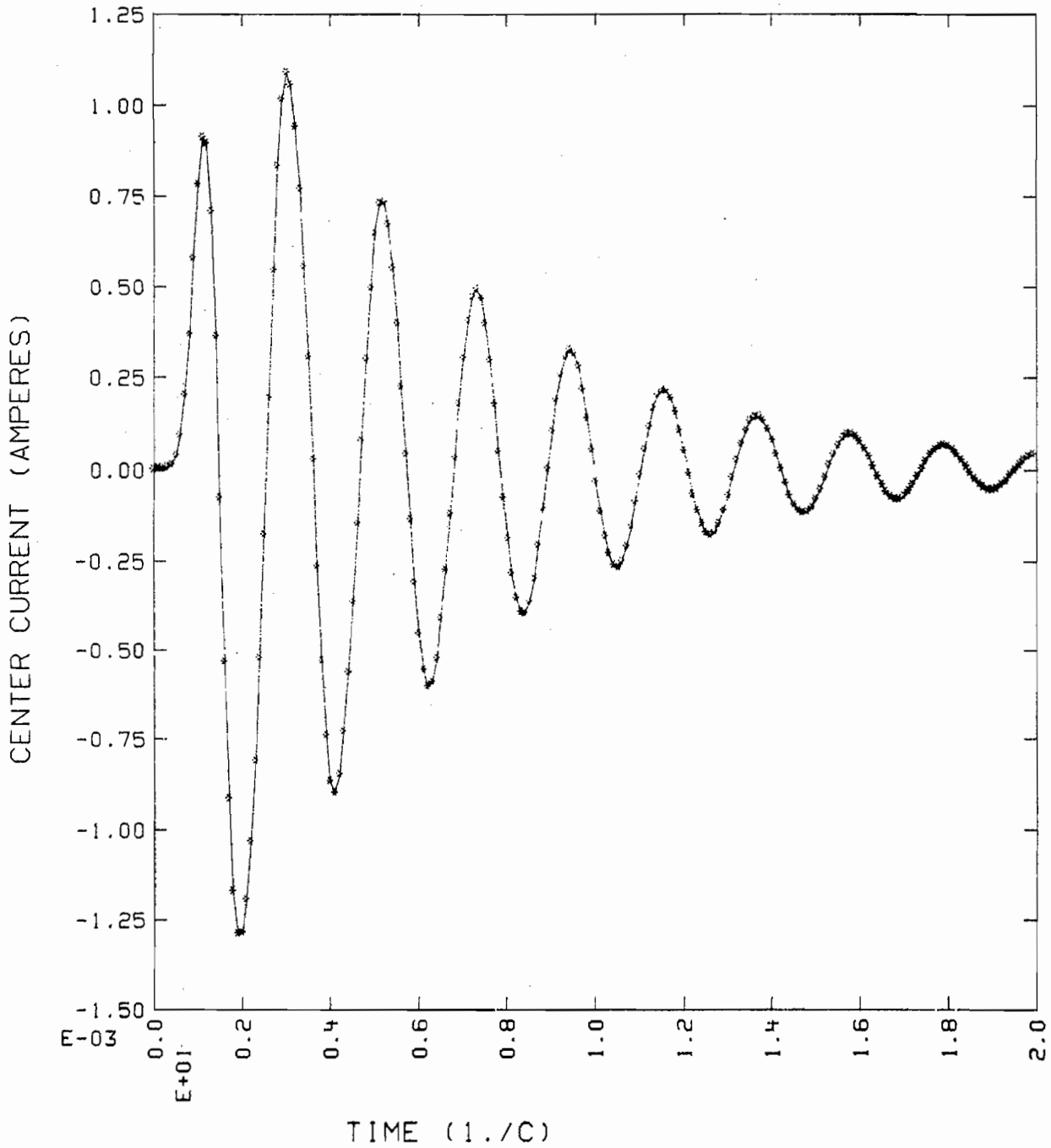
-1.080E-04	-4.389E-04	-1.490E-03	-4.215E-03	-9.912E-03	-1.929E-02	-3.081E-02	-3.962E-02	-3.911E-02	-2.514E-02
3.241E-04	2.980E-02	5.475E-02	7.003E-02	7.487E-02	7.101E-02	6.038E-02	4.418E-02	2.340E-02	-3.360E-04
-2.435E-02	-4.537E-02	-6.052E-02	-6.836E-02	-6.917E-02	-6.437E-02	-5.549E-02	-4.347E-02	-2.860E-02	-1.121E-02
7.676E-03	2.613E-02	4.177E-02	5.256E-02	5.746E-02	5.659E-02	5.095E-02	4.185E-02	3.036E-02	1.714E-02
2.724E-03	-1.212E-02	-2.609E-02	-3.754E-02	-4.499E-02	-4.763E-02	-4.555E-02	-3.960E-02	-3.087E-02	-2.039E-02
-8.922E-03	2.949E-03	1.455E-02	2.496E-02	3.308E-02	3.792E-02	3.891E-02	3.613E-02	3.023E-02	2.216E-02
1.288E-02	3.133E-03	-6.500E-03	-1.546E-02	-2.310E-02	-2.867E-02	-3.154E-02	-3.134E-02	-2.819E-02	-2.261E-02
-1.538E-02	-7.345E-03	8.036E-04	8.520E-03	1.535E-02	2.082E-02	2.448E-02	2.590E-02	2.491E-02	2.163E-02
1.650E-02	1.017E-02	3.355E-03	-3.342E-03	-9.437E-03	-1.455E-02	-1.837E-02	-2.060E-02	-2.100E-02	-1.952E-02
-1.629E-02	-1.168E-02	-6.249E-03	-5.624E-04	4.853E-03	9.591E-03	1.335E-02	1.591E-02	1.710E-02	1.682E-02
1.506E-02	1.200E-02	7.953E-03	3.358E-03	-1.311E-03	-5.622E-03	-9.240E-03	-1.193E-02	-1.355E-02	-1.401E-02
-1.328E-02	-1.143E-02	-8.615E-03	-5.114E-03	-1.285E-03	2.491E-03	5.867E-03	8.576E-03	1.044E-02	1.137E-02
1.133E-02	1.035E-02	8.509E-03	5.981E-03	2.999E-03	-1.495E-04	-3.159E-03	-5.758E-03	-7.739E-03	8.972E-03
-9.403E-03	-9.038E-03	-7.933E-03	-6.191E-03	-3.967E-03	-1.460E-03	1.094E-03	3.458E-03	5.421E-03	6.827E-03
7.584E-03	7.669E-03	7.109E-03	5.976E-03	4.377E-03	2.454E-03	3.758E-04	-1.670E-03	-3.498E-03	-4.949E-03
-5.908E-03	-6.317E-03	-6.169E-03	-5.508E-03	-4.410E-03	-2.979E-03	-1.342E-03	3.588E-04	1.975E-03	3.365E-03
4.410E-03	5.029E-03	5.187E-03	4.893E-03	4.197E-03	3.173E-03	1.920E-03	5.470E-04	-8.277E-04	-2.087E-03
-3.124E-03	-3.851E-03	-4.216E-03	-4.201E-03	-3.825E-03	-3.137E-03	-2.210E-03	-1.132E-03	3.202E-06	1.100E-03
2.062E-03	2.814E-03	3.297E-03	3.480E-03	3.357E-03	2.950E-03	2.304E-03	1.482E-03	5.627E-04	-3.727E-04
-1.243E-03	-1.975E-03	-2.512E-03	-2.814E-03	-2.863E-03	-2.665E-03	-2.244E-03	-1.648E-03	-9.270E-04	-1.540E-04
6.048E-04	1.285E-03	1.830E-03	2.199E-03	2.366E-03	2.323E-03	2.083E-03	1.672E-03	1.131E-03	5.130E-04
-1.275E-04	-7.344E-04	-1.257E-03	-1.652E-03	-1.892E-03	-1.961E-03	-1.858E-03	-1.600E-03	-1.213E-03	-7.357E-04
-2.121E-04	3.113E-04	7.893E-04	1.183E-03	1.460E-03	1.603E-03	1.602E-03	1.464E-03	1.205E-03	8.516E-04
4.375E-04	4.170E-07	-4.212E-04	-7.916E-04	-1.081E-03	-1.267E-03	-1.338E-03	-1.291E-03	-1.135E-03	-8.867E-04
-5.711E-04	-2.177E-04	1.419E-04	4.766E-04	7.585E-04	9.652E-04	1.082E-03	1.101E-03	1.025E-03	8.636E-04
6.337E-04	3.575E-04	8.035E-05	-2.314E-04	-4.930E-04	-7.029E-04				

I	FREQ.	LAM.	EMAG	SIG/L	OG
1	0.	1.00000+100	3.28799E-04	1.35854-206	-2058.66928
2	1.17164E+07	2.56051E+01	8.08895E-04	1.25413E-08	-79.01659
3	2.34328E+07	1.28026E+01	2.24055E-03	3.84880E-07	-64.14675
4	3.51492E+07	8.53504E+00	4.74055E-03	3.87665E-06	-54.11543
5	4.68656E+07	6.40128E+00	8.59372E-03	2.26485E-05	-46.44961
6	5.85820E+07	5.12102E+00	1.41909E-02	9.64975E-05	-40.15484
7	7.02984E+07	4.26752E+00	2.22254E-02	3.40847E-04	-34.67441
8	8.20148E+07	3.65787E+00	3.40602E-02	1.08955E-03	-29.62752
9	9.37313E+07	3.20064E+00	5.22196E-02	3.34505E-03	-24.75597
10	1.05448E+08	2.84501E+00	8.21826E-02	1.04858E-02	-19.79399
11	1.17164E+08	2.56051E+00	1.38681E-01	3.68630E-02	-14.33410
12	1.28880E+08	2.32774E+00	2.69303E-01	1.68200E-01	-7.74175
13	1.40597E+08	2.13376E+00	5.23446E-01	7.56246E-01	-1.21337
14	1.52313E+08	1.96962E+00	3.75006E-01	4.55533E-01	-3.41480
15	1.64030E+08	1.82894E+00	2.42331E-01	2.20613E-01	-6.56370
16	1.75746E+08	1.70701E+00	1.83423E-01	1.45093E-01	-8.38355
17	1.87463E+08	1.60032E+00	1.51717E-01	1.12945E-01	-9.47134
18	1.99179E+08	1.50618E+00	1.32082E-01	9.66369E-02	-10.14857
19	2.10895E+08	1.42251E+00	1.18814E-01	8.76669E-02	-10.57164
20	2.22612E+08	1.34764E+00	1.09110E-01	8.23738E-02	-10.84211
21	2.34328E+08	1.28026E+00	1.01576E-01	7.91040E-02	-11.01801
22	2.46045E+08	1.21929E+00	9.55321E-02	7.71424E-02	-11.12707
23	2.57761E+08	1.16387E+00	9.04193E-02	7.58444E-02	-11.20076
24	2.69477E+08	1.11327E+00	8.58826E-02	7.47863E-02	-11.26178
25	2.81194E+08	1.06688E+00	8.17871E-02	7.38496E-02	-11.31652
26	2.92910E+08	1.02420E+00	7.78997E-02	7.26956E-02	-11.38492
27	3.04627E+08	9.84812E-01	7.40218E-02	7.09940E-02	-11.48778
28	3.16343E+08	9.48338E-01	7.01115E-02	6.86850E-02	-11.63138
29	3.28059E+08	9.14469E-01	6.59604E-02	6.53790E-02	-11.84562
30	3.39776E+08	8.82935E-01	6.13139E-02	6.05986E-02	-12.17530
31	3.51492E+08	8.53504E-01	5.61487E-02	5.43848E-02	-12.64522
32	3.63209E+08	8.25972E-01	5.06045E-02	4.71692E-02	-13.26342
33	3.74925E+08	8.00160E-01	4.68916E-02	4.31565E-02	-13.64954
34	3.86641E+08	7.75913E-01	5.63534E-02	6.62864E-02	-11.78575
35	3.98358E+08	7.53092E-01	9.03511E-02	1.80876E-01	-7.42619
36	4.10074E+08	7.31575E-01	1.10994E-01	2.89282E-01	-5.38709

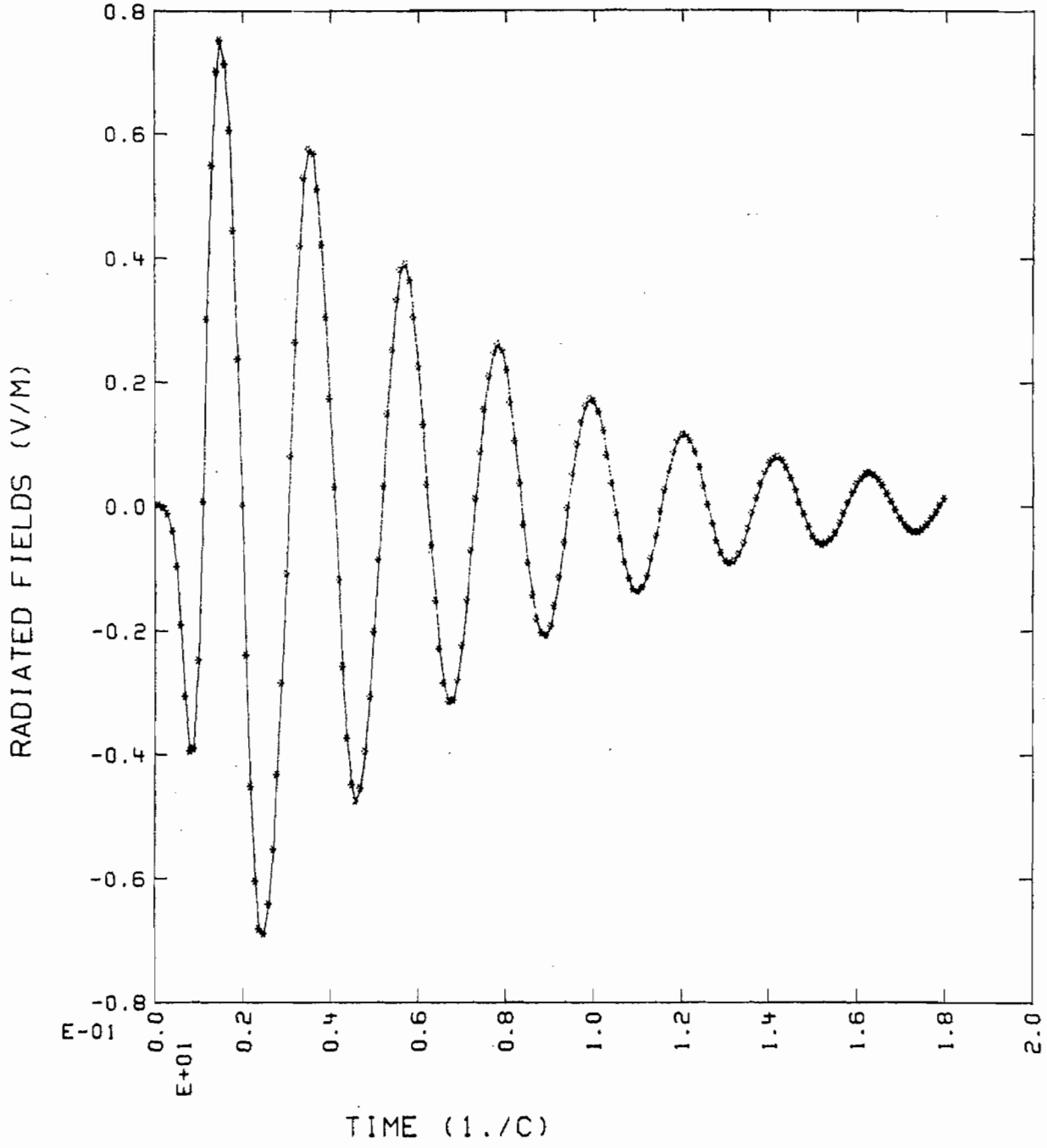
37	4.21791E+08	7.11253E-01	1.05169E-01	2.74750E-01	-5.61062
38	4.33507E+08	6.92030E-01	9.59298E-02	2.41472E-01	-6.17133
39	4.45223E+08	6.73819E-01	8.86168E-02	2.17348E-01	-6.62845
40	4.56940E+08	6.56542E-01	8.29425E-02	2.00558E-01	-6.97760
41	4.68656E+08	6.40128E-01	7.86276E-02	1.89595E-01	-7.22173
42	4.80373E+08	6.24515E-01	7.52217E-02	1.82310E-01	-7.39190
43	4.92089E+08	6.09646E-01	7.23167E-02	1.76820E-01	-7.52467
44	5.03805E+08	5.95468E-01	6.99523E-02,	1.73419E-01	-7.60902
45	5.15522E+08	5.81935E-01	6.79855E-02	1.71512E-01	-7.65706
46	5.27238E+08	5.69003E-01	6.62161E-02	1.70180E-01	-7.69092
47	5.38955E+08	5.56633E-01	6.48562E-02	1.70599E-01	-7.68024
48	5.50671E+08	5.44790E-01	6.40608E-02	1.73755E-01	-7.60063
49	5.62388E+08	5.33440E-01	6.41315E-02	1.81628E-01	-7.40818
50	5.74104E+08	5.22553E-01	6.58580E-02	1.99602E-01	-6.99835
51	5.85820E+08	5.12102E-01	6.90508E-02	2.28472E-01	-6.41167
52	5.97537E+08	5.02061E-01	7.18504E-02	2.57368E-01	-5.89445
53	6.09253E+08	4.92406E-01	7.30028E-02	2.76211E-01	-5.58759
54	6.20970E+08	4.83115E-01	7.24975E-02	2.82979E-01	-5.48247
55	6.32686E+08	4.74169E-01	7.06304E-02	2.78822E-01	-5.54673
56	6.44402E+08	4.65548E-01	6.80414E-02	2.68428E-01	-5.71172
57	6.56119E+08	4.57234E-01	6.48915E-02	2.53109E-01	-5.96692
58	6.67835E+08	4.49213E-01	6.08603E-02	2.30661E-01	-6.37026
59	6.79552E+08	4.41468E-01	5.61690E-02	2.03426E-01	-6.91594
60	6.91268E+08	4.33985E-01	5.07271E-02	1.71683E-01	-7.65260
61	7.02984E+08	4.26752E-01	4.37755E-02	1.32227E-01	-8.78679
62	7.14701E+08	4.19756E-01	3.54683E-02	8.97218E-02	-10.47102
63	7.26417E+08	4.12986E-01	2.68557E-02	5.31389E-02	-12.74587
64	7.38134E+08	4.06430E-01	2.12096E-02	3.42218E-02	-14.65697
65	7.49850E+08	4.00080E-01	2.69863E-02	5.71744E-02	-12.42799
66	7.61566E+08	3.93925E-01	4.49147E-02	1.63365E-01	-7.86840
67	7.73283E+08	3.87956E-01	7.17821E-02	4.30206E-01	-3.66324
68	7.84999E+08	3.82166E-01	1.06248E-01	9.71286E-01	-0.12653
69	7.96716E+08	3.76546E-01	1.48226E-01	1.94726E+00	2.89423
70	8.08432E+08	3.71089E-01	2.00623E-01	3.67297E+00	5.65018
71	8.20148E+08	3.65787E-01	2.64943E-01	6.59258E+00	8.19056
72	8.31865E+08	3.60635E-01	3.41393E-01	1.12611E+01	10.51582
73	8.43581E+08	3.55627E-01	4.35664E-01	1.88592E+01	12.75524
74	8.55298E+08	3.50755E-01	5.53846E-01	3.13314E+01	14.95980
75	8.67014E+08	3.46015E-01	6.97822E-01	5.11104E+01	17.08510
76	8.78731E+08	3.41402E-01	8.77660E-01	8.30485E+01	19.19332
77	8.90447E+08	3.36909E-01	1.10997E+00	1.36397E+02	21.34806
78	9.02163E+08	3.32534E-01	1.40320E+00	2.23758E+02	23.49778
79	9.13880E+08	3.28271E-01	1.77475E+00	3.67299E+02	25.65020
80	9.25596E+08	3.24115E-01	2.26363E+00	6.12943E+02	27.87420
81	9.37313E+08	3.20064E-01	2.89997E+00	1.03163E+03	30.13523
82	9.49029E+08	3.16113E-01	3.71657E+00	1.73705E+03	32.39811
83	9.60745E+08	3.12258E-01	4.79724E+00	2.96597E+03	34.72166
84	9.72462E+08	3.08495E-01	6.23479E+00	5.13282E+03	37.10356
85	9.84178E+08	3.04823E-01	8.10549E+00	8.88533E+03	39.48673
86	9.95895E+08	3.01237E-01	1.05821E+01	1.55072E+04	41.90534
87	1.00761E+09	2.97734E-01	1.39221E+01	2.74766E+04	44.38963
88	1.01933E+09	2.94312E-01	1.83415E+01	4.88048E+04	46.88463
89	1.03104E+09	2.90967E-01	2.42018E+01	8.69393E+04	49.39216
90	1.04276E+09	2.87698E-01	3.21671E+01	1.57094E+05	51.96160
91	1.05448E+09	2.84501E-01	4.28966E+01	2.85684E+05	54.55886
92	1.06619E+09	2.81375E-01	5.72122E+01	5.19536E+05	57.15616
93	1.07791E+09	2.78317E-01	7.67480E+01	9.55578E+05	59.80266
94	1.08963E+09	2.75324E-01	1.03503E+02	1.77595E+06	62.49431
95	1.10134E+09	2.72395E-01	1.39599E+02	3.30049E+06	65.18578
96	1.11306E+09	2.69528E-01	1.88993E+02	6.17867E+06	67.90895
97	1.12478E+09	2.86720E-01	2.57545E+02	1.17167E+07	70.68804
98	1.13649E+09	2.63970E-01	3.51402E+02	2.22694E+07	73.47708
99	1.14821E+09	2.61277E-01	4.80346E+02	4.24734E+07	76.28117
100	1.15992E+09	2.58638E-01	6.60974E+02	8.20721E+07	79.14196
101	1.17164E+09	2.56051E-01	9.12330E+02	1.59536E+08	82.02860
102	1.18336E+09	2.53516E-01	1.26006E+03	3.10442E+08	84.91980
103	1.19507E+09	2.51031E-01	1.75012E+03	6.10790E+08	87.85892
104	1.20679E+09	2.48593E-01	2.44272E+03	1.21333E+09	90.83980
105	1.21851E+09	2.46203E-01	3.41102E+03	2.41208E+09	93.82392
106	1.23022E+09	2.43858E-01	4.78187E+03	4.83204E+09	96.84131
107	1.24194E+09	2.41558E-01	6.74477E+03	9.79720E+09	99.91102
108	1.25366E+09	2.39300E-01	9.52627E+03	1.99145E+10	102.99169
109	1.26537E+09	2.37084E-01	1.34841E+04	4.06488E+10	106.09048
110	1.27709E+09	2.34909E-01	1.92076E+04	8.40148E+10	109.24356
111	1.28880E+09	2.32774E-01	2.74405E+04	1.74633E+11	112.42126
112	1.30052E+09	2 30677E-01	3.92399E+04	3.63628E+11	115.60657
113	1.31224E+09	2.28617E-01	5.64249E+04	7.65481E+11	118.83935
114	1.32395E+09	2.26594E-01	8.15107E+04	1.62608E+12	122.11142

115	1.33567E+09	2.24606E-01	1.17828E+05	3.45829E+12	125.38861
116	1.34739E+09	2.22653E-01	1.71018E+05	7.41375E+12	128.70038
117	1.35910E+09	2.20734E-01	2.49671E+05	1.60771E+13	132.06209
118	1.37082E+09	2.18847E-01	3.64992E+05	3.49538E+13	135.43494
119	1.38254E+09	2.16993E-01	5.34865E+05	7.63500E+13	138.82809

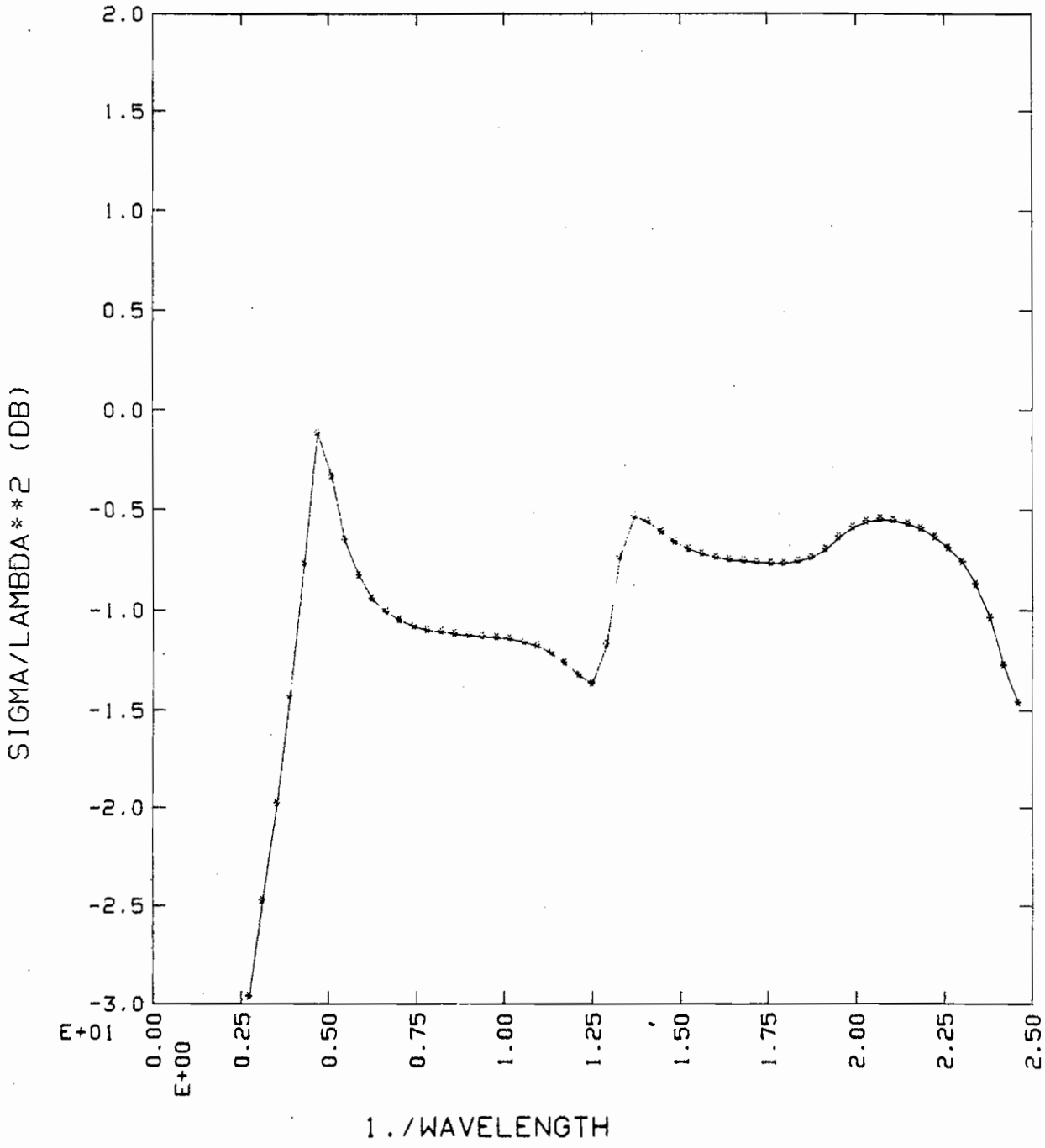
RUNNING TIME IN MICROSECONDS = 340754



1 M BY .001 M RAD DIPOLE -- GAUSSIAN PLANE WAVE BROADSIDE



1 M BY .001 M RAD DIPOLE -- GAUSSIAN PLANE WAVE BROADSIDE



1 M BY .001 M RADIUS DIPOLE -- BACKSCATTER CROSS SECTION

Appendix E
Cylindrical Model of a 747 Aircraft and a 200 ohm Load

```
20 SEGMENT MODEL OF A 747 AIRCRAFT
TIME (SEC) -- GAUSSIAN AT 0 0 180 DEG
BULK AXIAL CURRENT (AMPERES)
CURRENT ON FUSELAGE BEHIND WINGS OF A 747 AIRCRAFT
C
C
C
C
C
C
C
2.4E-8,100,1,1,0,0,3,8,0,
1,-1,0.,0.,0.,1,
2,0,-38.,0.,0.,1,
3,0,24.,0.,0.,1,
4,0,-20.,30.,0.,1,
5,0,-20.,-30.,0.,0,
2.,6,1,2,1,
2.,4,3,1,1,
2.,5,4,1,1,
2.,5,1,5,0,
0.,0.,180.,72.,4.2E-2,
1,1,0.,

20 SEGMENT MODEL OF A 747 AIRCRAFT
2.400E-08  100    1    1    0    0    3    8    0


COLOCATION PROGRAM FOR MULTIPLE JUNCTIONS
   1  -1  0.           0.           0.           1
   2   0 -3.8000E+01   0.           0.           1
   3   0  2.4000E+01   0.           0.           1
   4   0 -2.0000E+01   3.0000E+01   0.           1
   5   0 -2.0000E+01  -3.0000E+01   0.           0
  2.0000E+00    6    1    2    1
  2.0000E+00    4    3    1    1
  2.0000E+00    5    4    1    1
  2.0000E+00    5    1    5    0
TOTAL LENGTH=  1.3411IE+02 METERS
  NO SYMMETRY USED

     X(I)        Y(I)        Z(I)        S(I)        B(I)     ALP(I)     BET(I)
  -3.16667    0.          0.          6.33333    2.00000    0.        180.00000   -1    1    2
  -9.50000    0.          0.          6.33333    2.00000    0.        180.00000    1    2    3
 -15.83333    0.          0.          6.33333    2.00000    0.        180.00000    2    3    4
 -22.16667    0.          0.          6.33333    2.00000    0.        180.00000    3    4    5
 -28.50000    0.          0.          6.33333    2.00000    0.        180.00000    4    5    6
 -34.83333    0.          0.          6.33333    2.00000    0.        180.00000    5    6    0
  21.00000    0.          0.          6.00000    2.00000    0.        180.00000    0    7    8
  15.00000    0.          0.          6.00000    2.00000    0.        180.00000    7    8    9
   9.00000    0.          0.          6.00000    2.00000    0.        180.00000    8    9   10
   3.00000    0.          0.          6.00000    2.00000    0.        180.00000    9   10   -1
 -18.00000   27.00000     0.          7.21110    2.00000    0.        -56.30993    0   11   12
 -14.00000   21.00000     0.          7.21110    2.00000    0.        -56.30993   11   12   13
 -10.00000   15.00000     0.          7.21110    2.00000    0.        -56.30993   12   13   14
  -6.00000    9.00000     0.          7.21110    2.00000    0.        -56.30993   13   14   15
  -2.00000    3.00000     0.          7.21110    2.00000    0.        -56.30993   14   15   -1
  -2.00000   -3.00000     0.          7.21110    2.00000    0.       -123.69007   -1   16   17
  -6.00000   -9.00000     0.          7.21110    2.00000    0.       -123.69007   16   17   18
 -10.00000  -15.00000     0.          7.21110    2.00000    0.       -123.69007   17   18   19
 -14.00000  -21.00000     0.          7.21110    2.00000    0.       -123.69007   18   19   20
 -18.00000  -27.00000     0.          7.21110    2.00000    0.       -123.69007   19   20    0


TROUBLE WITH TIME INCREMENT, CHANGED TO DT=   2.403701E-08
   0.          0.        180.00000   72.00000    0.04200
```

```
    1    1  0.
    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20

0DETERMINANT=  3.89734188E+24
 TIME IN MICROSEC. FOR MATRIX SETUP   404098

TIME STEP     1  TIME= 0.          CURRENT-
   4.508E-06  6.072E-06  6.168E-06  6.185E-06  6.024E-06  5.963E-06  5.983E-06  6.003E-06  6.225E-06  6.584E-06
  -3.301E-06 -3.378E-06 -3.409E-06 -3.378E-06 -1.639E-06  1.639E-06  3.378E-06  3.409E-06  3.378E-06  3.301E-06

INT. OF CUR.
   4.515E-14  6.081E-14  6.177E-14  6.195E-14  6.034E-14  5.972E-14  5.993E-14  6.012E-14  6.234E-14  6.594E-14
  -3.306E-14 -3.383E-14 -3.415E-14 -3.383E-14 -1.642E-14  1.642E-14  3.383E-14  3.415E-14  3.383E-14  3.306E-14

TIME STEP     2  TIME= 2.404E-08 CURRENT-
   2.848E-05  3.616E-05  3.892E-05  3.947E-05  3.705E-05  3.403E-05  3.399E-05  3.680E-05  4.012E-05  4.357E-05
  -1.904E-05 -2.095E-05 -2.157E-05 -1.926E-05 -9.577E-06  9.577E-06  1.926E-05  2.157E-05  2.095E-05  1.904E-05
INT. OF CUR.
   4.026E-13  5.203E-13  5.505E-13  5.564E-13  5.280E-13  4.961E-13  4.963E-13  5.249E-13  5.639E-13  6.078E-13
  -2.766E-13 -2.977E-13 -3.048E-13 -2.809E-13 -1.386E-13  1.386E-13  2.809E-13  3.048E-13  2.977E-13  2.766E-13

TIME STEP     3  TIME= 4.807E-08 CURRENT-
   1.408E-04  1.756E-04  1.887E-04  1.917E-04  1.782E-04  1.591E-04  1.588E-04  1.775E-04  1.976E-04  2.155E-04
  -8.922E-05 -1.006E-04 -1.032E-04 -9.144E-05 -4.744E-05  4.744E-05  9.144E-05  1.032E-04  1.006E-04  8.922E-05

INT. OF CUR.
   2.260E-12  2.846E-12  3.051E-12  3.096E-12  2.894E-12  2.623E-12  2.620E-12  2.881E-12  3.173E-12  3.452E-12
  -1.469E-12 -1.635E-12 -1.677E-12 -1.499E-12 -7.639E-13  7.639E-13  1.499E-12  1.677E-12  1.635E-12  1.469E-12

TIME STEP     4  TIME= 7.211E-08 CURRENT-
   5.755E-04  7.068E-04  7.628E-04  7.738E-04  7.123E-04  6.235E-04  6.236E-04  7.133E-04  8.065E-04  8.863E-04
  -3.497E-04 -4.013E-04 -4.130E-04 -3.615E-04 -1.909E-04  1.909E-04  3.615E-04  4.130E-04  4.013E-04  3.497E-04

INT. OF CUR.
   1.022E-11  1.267E-11  1.364E-11  1.384E-11  1.281E-11  1.135E-11  1.134E-11  1.280E-11  1.434E-11  1.570E-11
  -6.363E-12 -7.225E-12 -7.424E-12 -6.546E-12 -3.417E-12  3.417E-12  6.546E-12  7.424E-12  7.224E-12  6.363E-12

TIME STEP     5  TIME= 9.615E-08 CURRENT-
   1.972E-03  2.378E-03  2.578E-03  2.613E-03  2.378E-03  2.028E-03  2.032E-03  2.394E-03  2.757E-03  3.052E-03
  -1.138E-03 -1.337E-03 -1.380E-03 -1.188E-03 -6.436E-04  6.436E-04  1.188E-03  1.380E-03  1.337E-03  1.138E-03

INT. OF CUR.
   3.891E-11  4.745E-11  5.130E-11  5.203E-11  4.768E-11  4.133E-11  4.137E-11  4.785E-11  5.448E-11  6.003E-11
  -2.319E-11 -2.684E-11 -2.766E-11 -2.406E-11 -1.283E-11  1.283E-11  2.406E-11  2.766E-11  2.684E-11  2.319E-11

TIME STEP     6  TIME= 1.202E-07 CURRENT-
   5.681E-03  6.705E-03  7.288E-03  7.373E-03  6.614E-03  5.463E-03  5.495E-03  6.717E-03  7.911E-03  8.827E-03
  -3.066E-03 -3.703E-03 -3.837E-03 -3.252E-03 -1.821E-03  1.821E-03  3.252E-03  3.837E-03  3.703E-03  3.066E-03

INT. OF CUR.
   1.263E-10  1.513E-10  1.641E-10  1.662E-10  1.506E-10  1.273E-10  1.277E-10  1.521E-10  1.763E-10  1.956E-10
  -7.143E-11 -8.454E-11 -8.737E-11 -7.495E-11 -4.100E-11  4.100E-11  7.495E-11  8.737E-11  8.454E-11  7.143E-11

TIME STEP     7  TIME= 1.442E-07 CURRENT-
   1.381E-02  1.589E-02  1.725E-02  1.736E-02  1.530E-02  1.215E-02  1.231E-02  1.576E-02  1.907E-02  2.149E-02
  -6.802E-03 -8.499E-03 -8.848E-03 -7.403E-03 -4.326E-03  4.326E-03  7.403E-03  8.848E-03  8.499E-03  6.802E-03

INT. OF CUR.
   3.516E-10  4.131E-10  4.484E-10  4.530E-10  4.051E-10  3.325E-10  3.350E-10  4.127E-10  4.885E-10  5.461E-10
  -1.864E-10 -2.263E-10 -2.347E-10 -1.988E-10 -1.122E-10  1.122E-10  1.988E-10  2.347E-10  2.263E-10  1.864E-10

TIME STEP     8  TIME= 1.683E-07 CURRENT-
   2.841E-02  3.177E-02  3.418E-02  3.405E-02  2.934E-02  2.221E-02  2.286E-02  3.094E-02  3.866E-02  4.409E-02
  -1.233E-02 -1.605E-02 -1.684E-02 -1.400E-02 -8.623E-03  8.623E-03  1.400E-02  1.684E-02  1.605E-02  1.233E-02

INT. OF CUR.
   8.460E-10  9.725E-10  1.053E-09  1.057E-09  9.308E-10  7.388E-10  7.503E-10  9.616E-10  1.165E-09  1.314E-09
  -4.128E-10 -5.159E-10 -5.375E-10 -4.512E-10 -2.642E-10  2.642E-10  4.512E-10  5.375E-10  5.159E-10  4.128E-10

TIME STEP     9  TIME= 1.923E-07 CURRENT-
   4.968E-02  5.376E-02  5.676E-02  5.546E-02  4.633E-02  3.307E-02  3.512E-02  5.088E-02  6.600E-02  7.631E-02
  -1.800E-02 -2.464E-02 -2.622E-02 -2.189E-02 -1.438E-02  1.437E-02  2.189E-02  2.622E-02  2.464E-02  1.800E-02

INT. OF CUR.
   1.771E-09  1.988E-09  2.134E-09  2.124E-09  1.834E-09  1.402E-09  1.444E-09  1.935E-09  2.408E-09  2.742E-09
  -7.771E-10 -1.003E-09 -1.052E-09 -8.799E-10 -5.377E-10  5.377E-10  8.799E-10  1.052E-09  1.003E-09  7.771E-10
```

```
TIME STEP   10  TIME= 2.163E-07 CURRENT-
  7.415E-02  7.735E-02  7.890E-02  7.447E-02  5.955E-02  3.943E-02  4.467E-02  7.006E-02  9.478E-02  1.113E-01
 -2.042E-02 -2.990E-02 -3.269E-02 -2.739E-02 -1.981E-02  1.981E-02  2.739E-02  3.269E-02  2.990E-02  2.042E-02

INT. OF CUR.
  3.253E-09  3.561E-09  3.766E-09  3.690E-09  3.114E-09  2.282E-09  2.408E-09  3.390E-09  4.337E-09  4.992E-09
 -1.245E-09 -1.665E-09 -1.766E-09 -1.483E-09 -9.493E-10  9.493E-10  1.483E-09  1.766E-09  1.665E-09  1.245E-09

TIME STEP   11  TIME= 2.404E-07 CURRENT-
  9.470E-02  9.485E-02  9.153E-02  8.132E-02  6.077E-02  3.624E-02  4.708E-02  8.059E-02  1.139E-01  1.360E-01
 -1.640E-02 -2.675E-02 -3.105E-02 -2.834E-02 -2.190E-02  2.190E-02  2.834E-02  3.105E-02  2.675E-02  1.640E-02

INT. OF CUR.
  5.290E-09  5.643E-09  5.833E-09  5.587E-09  4.585E-09  3.211E-09  3.525E-09  5.218E-09  6.865E-09  7.984E-09
 -1.701E-09 -2.363E-09 -2.548E-09 -2.172E-09 -1.457E-09  1.457E-09  2.172E-09  2.548E-09  2.363E-09  1.701E-09

TIME STEP   12  TIME= 2.644E-07 CURRENT-
  1.031E-01  9.870E-02  8.762E-02  7.006E-02  4.642E-02  2.309E-02  4.104E-02  7.649E-02  1.125E-01  1.362E-01
 -5.773E-03 -1.341E-02 -1.885E-02 -2.037E-02 -1.769E-02  1.769E-02  2.037E-02  1.885E-02  1.341E-02  5.773E-03

INT. OF CUR.
  7.691E-09  7.996E-09  8.019E-09  7.442E-09  6.904E-09  3.944E-09  4.601E-09  7.136E-09  9.627E-09  1.130E-08
 -1.980E-09 -2.866E-09 -3.169E-09 -2.774E-09 -1.946E-09  1.946E-09  2.774E-09  3.169E-09  2.866E-09  1.980E-09

TIME STEP   13  TIME= 2.884E-07 CURRENT-
  9.352E-02  8.498E-02  6.683E-02  4.394E-02  2.184E-02  5.587E-03  2.866E-02  5.696E-02  8.604E-02  1.045E-01
  7.441E-03  5.877E-03  9.096E-04 -4.734E-03 -6.284E-03  6.284E-03  4.734E-03 -9.096E-04 -5.877E-03 -7.441E-03

INT. OF CUR.
  1.009E-08  1.024E-08  9.909E-09  8.842E-09  6.745E-09  4.297E-09  5.451E-09  8.770E-09  1.206E-08  1.426E-08
 -1.966E-09 -2.968E-09 -3.400E-09 -3.091E-09 -2.248E-09  2.248E-09  3.091E-09  3.400E-09  2.960E-09  1.966E-09

TIME STEP   14  TIME= 3.125E-07 CURRENT-
  6.501E-02  5.488E-02  3.523E-02  1.359E-02 -1.758E-03 -8.230E-03  1.246E-02  2.555E-02  3.831E-02  4.489E-02
  1.735E-02  2.287E-02  2.115E-02  1.460E-02  9.940E-03 -9.940E-03 -1.460E-02 -2.115E-02 -2.287E-02 -1.735E-02

INT. OF CUR.
  1.203E-08  1.195E-08  1.116E-08  9.542E-09  6.984E-09  4.258E-09  5.953E-09  9.786E-09  1.360E-08  1.611E-08
 -1.661E-09 -2.618E-09 -3.136E-09 -2.980E-09 -2.214E-09  2.214E-09  2.980E-09  3.136E-09  2.618E-09  1.661E-09

TIME STEP   15  TIME= 3.365E-07 CURRENT-
  2.161E-02  1.374E-02  8.582E-04 -1.097E-02 -1.576E-02 -1.376E-02 -6.953E-03 -1.293E-02 -2.103E-02 -2.937E-02
  2.035E-02  3.111E-02  3.507E-02  3.196E-02  2.616E-02 -2.616E-02 -3.196E-02 -3.507E-02 -3.111E-02 -2.035E-02

INT. OF CUR.
  1.310E-08  1.280E-08  1.160E-08  9.562E-09  6.755E-09  3.977E-09  6.026E-09  9.952E-09  1.383E-08  1.633E-08
 -1.194E-09 -1.952E-09 -2.448E-09 -2.416E-09 -1.780E-09  1.780E-09  2.416E-09  2.448E-09  1.952E-09  1.194E-09

TIME STEP   16  TIME= 3.606E-07 CURRENT-
 -2.865E-02 -3.089E-02 -3.092E-02 -2.751E-02 -2.064E-02 -1.285E-02 -2.955E-02 -5.379E-02 -8.071E-02 -1.011E-01
  1.745E-02  3.024E-02  3.989E-02  4.241E-02  3.751E-02 -3.751E-02 -4.241E-02 -3.989E-02 -3.024E-02 -1.745E-02

INT. OF CUR.
  1.303E-08  1.260E-08  1.123E-08  9.084E-09  6.299E-09  3.644E-09  5.594E-09  9.154E-09  1.261E-08  1.476E-08
 -7.281E-10 -1.196E-09 -1.529E-09 -1.509E-09 -1.005E-09  1.005E-09  1.509E-09  1.529E-09  1.196E-09  7.281E-10

TIME STEP   17  TIME= 3.846E-07 CURRENT-
 -7.589E-02 -7.152E-02 -5.867E-02 -4.126E-02 -2.429E-02 -1.188E-02 -5.277E-02 -9.111E-02 -1.302E-01 -1.557E-01
  1.283E-02  2.493E-02  3.724E-02  4.393E-02  4.141E-02 -4.141E-02 -4.393E-02 -3.724E-02 -2.493E-02 -1.283E-02

INT. OF CUR.
  1.177E-08  1.136E-08  1.015E-08  8.251E-09  5.757E-09  3.347E-09  4.606E-09  7.406E-09  1.006E-08  1.163E-08
 -3.608E-10 -5.243E-10 -5.865E-10 -4.530E-10 -4.176E-11  4.174E-11  4.530E-10  5.865E-10  5.243E-10  3.608E-10

TIME STEP   18  TIME= 4.086E-07 CURRENT-
 -1.115E-01 -1.028E-01 -8.301E-02 -5.832E-02 -3.438E-02 -1.666E-02 -7.076E-02 -1.169E-01 -1.605E-01 -1.850E-01
  1.010E-02  2.010E-02  3.094E-02  3.919E-02  3.810E-02 -3.810E-02 -3.819E-02 -3.094E-02 -2.010E-02 -1.010E-02

INT. OF CUR.
  9.496E-09  9.248E-09  8.436E-09  7.061E-09  5.064E-09  3.015E-09  3.111E-09  4.882E-09  6.523E-09  7.489E-09
 -8.909E-11  1.596E-11  2.403E-10  5.486E-10  9.282E-10 -9.282E-10 -5.486E-10 -2.403E-10 -1.597E-11  8.908E-11

TIME STEP   19  TIME= 4.327E-07 CURRENT-
 -1.311E-01 -1.225E-01 -1.038E-01 -7.943E-02 -5.183E-02 -2.798E-02 -7.725E-02 -1.240E-01 -1.660E-01 -1.873E-01
  9.740E-03  1.730E-02  2.421E-02  2.884E-02  2.924E-02 -2.923E-02 -2.884E-02 -2.421E-02 -1.730E-02 -9.740E-03

INT. OF CUR.
  6.549E-09  6.517E-09  6.183E-09  5.414E-09  4.043E-09  2.492E-09  1.309E-09  1.948E-09  2.550E-09  2.962E-09
  1.446E-10  4.614E-10  9.039E-10  1.361E-09  1.749E-09 -1.749E-09 -1.361E-09 -9.039E-10 -4.614E-10 -1.446E-10
```

```
TIME STEP   20  TIME= 4.567E-07 CURRENT
 -1.357E-01 -1.310E-01 -1.188E-01 -9.906E-02 -7.045E-02 -4.115E-02 -6.954E-02 -1.102E-01 -1.467E-01 -1.660E-01
  9.669E-03  1.503E-02  1.804E-02  1.853E-02  1.629E-02 -1.629E-02 -1.853E-02 -1.804E-02 -1.503E-02 -9.669E-03

INT. OF CUR.
  3.314E-09  3.448E-09  3.496E-09  3.266E-09  2.576E-09  1.665E-09 -4.839E-10 -9.085E-10 -1.258E-09 -1.331E-09
  3.773E-10  8.490E-10  1.411E-09  1.933E-09  2.304E-09 -2.304E-09 -1.933E-09 -1.411E-09 -8.490E-10 -3.773E-10

TIME STEP   21  TIME= 4.807E-07 CURRENT-
 -1.296E-01 -1.298E-01 -1.244E-01 -1.095E-01 -8.170E-02 -4.964E-02 -5.048E-02 -8.028E-02 -1.089E-01 -1.274E-01
  7.857E-03  1.115E-02  1.115E-02  7.246E-03  2.539E-04 -2.538E-04 -7.246E-03 -1.115E-02 -1.115E-02 -7.857E-03

INT. OF CUR.
  1.043E-10  2.941E-10  5.541E-10  7.409E-10  7.323E-10  5.642E-10 -1.949E-09 -3.230E-09 -4.367E-09 -4.891E-09
  5.914E-10  1.167E-09  1.763E-09  2.244E-09  2.509E-09 -2.509E-09 -2.244E-09 -1.763E-09 -1.167E-09 -5.914E-10

TIME STEP   22  TIME= 5.048E-07 CURRENT-
 -1.171E-01 -1.200E-01 -1.178E-01 -1.058E-01 -8.023E-02 -4.948E-02 -2.697E-02 -4.413E-02 -6.319E-02 -7.945E-02
  4.044E-03  4.637E-03  1.529E-03 -6.366E-03 -1.739E-02  1.739E-02  6.366E-03 -1.529E-03 -4.637E-03 -4.044E-03

INT. OF CUR.
 -2.874E-09 -2.725E-09 -2.380E-09 -1.875E-09 -1.239E-09 -6.444E-10 -2.889E-09 -4.737E-09 -6.451E-09 -7.397E-09
  7.384E-10  1.362E-09  1.921E-09  2.260E-09  2.306E-09 -2.306E-09 -2.260E-09 -1.921E-09 -1.362E-09 -7.384E-10

TIME STEP   23  TIME= 5.288E-07 CURRENT-
 -9.975E-02 -1.021E-01 -9.917E-02 -8.808E-02 -6.630E-02 -4.101E-02 -6.033E-03 -1.113E-02 -1.938E-02 -2.976E-02
 -8.611E-04 -4.333E-03 -1.144E-02 -2.213E-02 -3.381E-02  3.381E-02  2.213E-02  1.144E-02  4.333E-03  8.611E-04

INT. OF CUR.
 -5.489E-09 -5.410E-09 -5.012E-09 -4.233E-09 -3.025E-09 -1.749E-09 -3.280E-09 -5.395E-09 -7.440E-09 -8.713E-09
  7.789E-10  1.370E-09  1.808E-09  1.921E-09  1.689E-09 -1.689E-09 -1.921E-09 -1.808E-09 -1.370E-09 -7.789E-10

TIME STEP   24  TIME= 5.529E-07 CURRENT-
 -7.686E-02 -7.653E-02 -7.128E-02 -6.085E-02 -4.458E-02 -2.752E-02  8.765E-03  1.375E-02  1.650E-02  1.493E-02
 -6.231E-03 -1.468E-02 -2.572E-02 -3.688E-02 -4.532E-02  4.532E-02  3.688E-02  2.572E-02  1.468E-02  6.231E-03

INT. OF CUR.
 -7.623E-09 -7.571E-09 -7.079E-09 -6.042E-09 -4.374E-09 -2.582E-09 -3.235E-09 -5.347E-09 -7.459E-09 -8.881E-09
  6.946E-10  1.145E-09  1.364E-09  1.210E-09  7.277E-10 -7.277E-10 -1.210E-09 -1.364E-09 -1.145E-09 -6.946E-10

TIME STEP   25  TIME= 5.769E-07 CURRENT-
 -4.740E-02 -4.460E-02 -3.827E-02 -3.010E-02 -2.086E-02 -1.279E-02  1.802E-02  3.057E-02  4.275E-02  5.002E-02
 -1.180E-02 -2.439E-02 -3.722E-02 -4.592E-02 -4.889E-02  4.889E-02  4.592E-02  3.722E-02  2.439E-02  1.180E-02

INT. OF CUR.
 -9.130E-09 -9.040E-09 -8.406E-09 -7.142E-09 -5.164E-09 -3.069E-09 -2.902E-09 -4.799E-09 -6.727E-09 -8.081E-09
  4.783E-10  6.738E-10  6.023E-10  2.038E-10 -4.204E-10  4.204E-10 -2.038E-10 -6.023E-10 -6.738E-10 -4.783E-10

TIME STEP   26  TIME= 6.009E-07 CURRENT-
 -1.216E-02 -8.700E-03 -4.193E-03 -6.690E-04  7.170E-04  4.432E-04  2.419E-02  4.174E-02  6.020E-02  7.345E-02
 -1.649E-02 -3.055E-02 -4.179E-02 -4.596E-02 -4.360E-02  4.360E-02  4.596E-02  4.179E-02  3.055E-02  1.649E-02
INT. OF CUR.
 -9.857E-09 -9.688E-09 -8.919E-09 -7.509E-09 -5.402E-09 -3.214E-09 -2.388E-09 -3.918E-09 -5.472E-09 -6.574E-09
  1.366E-10  6.398E-12 -3.612E-10 -9.184E-10 -1.550E-09  1.550E-09  9.184E-10  3.612E-10 -6.392E-12 -1.366E-10

TIME STEP   27  TIME= 6.250E-07 CURRENT-
  2.550E-02  2.758E-02  2.776E-02  2.495E-02  1.853E-02  1.102E-02  2.877E-02  4.898E-02  7.011E-02  8.547E-02
 -1.812E-02 -3.036E-02 -3.741E-02 -3.689E-02 -3.110E-02  3.110E-02  3.689E-02  3.741E-02  3.036E-02  1.812E-02

INT. OF CUR.
 -9.702E-09 -9.462E-09 -8.631E-09 -7.209E-09 -5.163E-09 -3.071E-09 -1.749E-09 -2.820E-09 -3.891E-09 -4.641E-09
 -2.856E-10 -7.384E-10 -1.331E-09 -1.932E-09 -2.462E-09  2.462E-09  1.932E-09  1.331E-09  7.384E-10  2.856E-10

TIME STEP   28  TIME= 6.490E-07 CURRENT-
  6.060E-02  6.025E-02  5.543E-02  4.624E-02  3.281E-02  1.916E-02  3.140E-02  5.219E-02  7.314E-02  8.763E-02
 -1.483E-02 -2.264E-02 -2.496E-02 -2.139E-02 -1.464E-02  1.464E-02  2.139E-02  2.496E-02  2.264E-02  1.483E-02

INT. OF CUR.
 -8.662E-09 -8.399E-09 -7.623E-09 -6.345E-09 -4.539E-09 -2.704E-09 -1.022E-09 -1.596E-09 -2.156E-09 -2.541E-09
 -6.913E-10 -1.390E-09 -2.097E-09 -2.646E-09 -3.020E-09  3.020E-09  2.646E-09  2.097E-09  1.390E-09  6.913E-10

TIME STEP   29  TIME= 6.730E-07 CURRENT-
  8.854E-02  8.603E-02  7.742E-02  6.337E-02  4.438E-02  2.570E-02  3.091E-02  5.042E-02  6.936E-02  8.160E-02
 -6.986E-03 -9.048E-03 -7.603E-03 -3.211E-03  2.522E-03 -2.522E-03  3.211E-03  7.603E-03  9.048E-03  6.986E-03

INT. OF CUR.
 -6.855E-09 -6.628E-09 -6.015E-09 -5.019E-09 -3.606E-09 -2.161E-09 -2.668E-10 -3.529E-10 -4.296E-10 -4.908E-10
 -9.626E-10 -1.783E-09 -2.498E-09 -2.947E-09 -3.167E-09  3.167E-09  2.947E-09  2.498E-09  1.783E-09  9.626E-10
```

```
TIME STEP   30  TIME= 6.971E-07 CURRENT-
  1.067E-01  1.031E-01  9.274E-02  7.612E-02  5.353E-02  3.114E-02  2.688E-02  4.334E-02  5.902E-02  6.863E-02
  2.680E-03  6.440E-03  1.057E-02  1.444E-02  1.834E-02 -1.834E-02 -1.444E-02 -1.057E-02 -6.440E-03 -2.680E-03

INT. OF CUR.
 -4.489E-09 -4.337E-09 -3.956E-09 -3.334E-09 -2.424E-09 -1.476E-09  4.349E-10  7.846E-10  1.126E-09  1.329E-09
 -1.018E-09 -1.818E-09 -2.464E-09 -2.811E-09 -2.913E-09  2.913E-09  2.811E-09  2.464E-09  1.818E-09  1.018E-09

TIME STEP   31  TIME= 7.211E-07 CURRENT-
  1.148E-01  1.111E-01  1.006E-01  8.356E-02  5.952E-02  3.509E-02  1.996E-02  3.183E-02  4.309E-02  4.984E-02
  1.079E-02  1.936E-02  2.586E-02  2.947E-02  3.200E-02 -3.200E-02 -2.947E-02 -2.586E-02 -1.936E-02 -1.079E-02

INT. OF CUR.
 -1.806E-09 -1.745E-09 -1.618E-09 -1.404E-09 -1.059E-09 -6.769E-10  1.004E-09  1.697E-09  2.365E-09  2.764E-09
 -8.530E-10 -1.503E-09 -2.020E-09 -2.278E-09 -2.304E-09  2.304E-09  2.278E-09  2.020E-09  1.503E-09  8.530E-10

TIME STEP   32  TIME= 7.451E-07 CURRENT-
  1.137E-01  1.102E-01  1.005E-01  8.441E-02  6.088E-02  3.637E-02  1.134E-02  1.760E-02  2.354E-02  2.719E-02
  1.525E-02  2.686E-02  3.581E-02  4.053E-02  4.292E-02 -4.292E-02 -4.053E-02 -3.581E-02 -2.686E-02 -1.525E-02

INT. OF CUR.
  9.592E-10  9.313E-10  8.157E-10  6.279E-10  3.969E-10  1.872E-10  1.383E-09  2.296E-09  3.173E-09  3.698E-09
 -5.327E-10 -9.365E-10 -1.269E-09 -1.428E-09 -1.398E-09  1.398E-09  1.428E-09  1.269E-09  9.365E-10  5.327E-10

TIME STEP   33  TIME= 7.692E-07 CURRENT-
  1.038E-01  1.007E-01  9.207E-02  7.767E-02  5.630E-02  3.387E-02  2.201E-03  2.644E-03  3.115E-03  3.759E-03
  1.593E-02  2.861E-02  3.965E-02  4.657E-02  4.982E-02 -4.982E-02 -4.657E-02 -3.965E-02 -2.861E-02 -1.593E-02

INT. OF CUR.
  3.590E-09  3.482E-09  3.147E-09  2.591E-09  1.817E-09  1.039E-09  1.547E-09  2.541E-09  3.495E-09  4.071E-09
 -1.504E-10 -2.583E-10 -3.494E-10 -3.715E-10 -2.754E-10  2.754E-10  3.715E-10  3.494E-10  2.583E-10  1.504E-10

TIME STEP   34  TIME= 7.932E-07 CURRENT-
  8.526E-02  8.262E-02  7.536E-02  6.330E-02  4.566E-02  2.742E-02 -6.271E-03 -1.092E-02 -1.510E-02 -1.678E-02
  1.406E-02  2.609E-02  3.796E-02  4.664E-02  5.091E-02 -5.091E-02 -4.664E-02 -3.796E-02 -2.609E-02 -1.406E-02

INT. OF CUR.
  5.880E-09  5.702E-09  5.176E-09  4.301E-09  3.055E-09  1.784E-09  1.497E-09  2.439E-09  3.347E-09  3.909E-09
  2.151E-10  4.077E-10  5.943E-10  7.607E-10  9.469E-10 -9.470E-10 -7.607E-10 -5.943E-10 -4.077E-10 -2.151E-10

TIME STEP   35  TIME= 8.173E-07 CURRENT-
  5.827E-02  5.643E-02  5.116E-02  4.247E-02  3.022E-02  1.798E-02 -1.279E-02 -2.101E-02 -2.829E-02 -3.137E-02
  1.107E-02  2.122E-02  3.196E-02  4.044E-02  4.479E-02 -4.479E-02 -4.044E-02 -3.196E-02 -2.122E-02 -1.107E-02

INT. OF CUR.
  7.622E-09  7.390E-09  6.711E-09  5.585E-09  3.976E-09  2.335E-09  1.264E-09  2.048E-09  2.815E-09  3.318E-09
  5.193E-10  9.810E-10  1.443E-09  1.820E-09  2.112E-09 -2.112E-09 -1.820E-09 -1.443E-09 -9.810E-10 -5.193E-10

TIME STEP   36  TIME= 8.413E-07 CURRENT-
  2.441E-02  2.366E-02  2.130E-02  1.737E-02  1.212E-02  7.129E-03 -1.618E-02 -2.603E-02 -3.470E-02 -3.859E-02
  7.810E-03  1.512E-02  2.277E-02  2.866E-02  3.158E-02 -3.158E-02 -2.866E-02 -2.277E-02 -1.512E-02 -7.810E-03

INT. OF CUR.
  8.630E-09  8.365E-09  7.593E-09  6.313E-09  4.490E-09  2.640E-09  9.095E-10  1.473E-09  2.044E-09  2.463E-09
  7.468E-10  1.420E-09  2.107E-09  2.662E-09  3.044E-09 -3.044E-09 -2.662E-09 -2.107E-09 -1.420E-09 -7.468E-10

TIME STEP   37  TIME= 8.653E-07 CURRENT-
 -1.292E-02 -1.245E-02 -1.121E-02 -9.295E-03 -6.544E-03 -3.728E-03 -1.599E-02 -2.557E-02 -3.425E-02 -3.882E-02
  4.335E-03  8.022E-03  1.121E-02  1.296E-02  1.318E-02 -1.318E-02 -1.296E-02 -1.121E-02 -8.022E-03 -4.335E-03

INT. OF CUR.
  8.775E-09  8.507E-09  7.720E-09  6.413E-09  4.558E-09  2.681E-09  5.157E-10  8.418E-10  1.202E-09  1.518E-09
  8.932E-10  1.700E-09  2.521E-09  3.170E-09  3.592E-09 -3.592E-09 -3.170E-09 -2.521E-09 -1.700E-09 -8.932E-10

TIME STEP   38  TIME= 8.894E-07 CURRENT-
 -4.903E-02 -4.742E-02 -4.259E-02 -3.476E-02 -2.412E-02 -1.377E-02 -1.287E-02 -2.080E-02 -2.855E-02 -3.372E-02
  3.204E-04 -1.915E-04 -1.908E-03 -4.524E-03 -7.265E-03  7.265E-03  4.524E-03  1.908E-03  1.915E-04 -3.204E-04

INT. OF CUR.
  8.028E-09  7.785E-09  7.071E-09  5.881E-09  4.188E-09  2.469E-09  1.630E-10  2.759E-10  4.368E-10  6.359E-10
  9.502E-10  1.797E-09  2.636E-09  3.275E-09  3.667E-09 -3.667E-09 -3.275E-09 -2.636E-09 -1.797E-09 -9.502E-10

TIME STEP   39  TIME= 9.134E-07 CURRENT-
 -7.922E-02 -7.672E-02 -6.906E-02 -5.649E-02 -3.933E-02 -2.254E-02 -8.384E-03 -1.402E-02 -2.025E-02 -2.545E-02
 -4.367E-03 -9.269E-03 -1.544E-02 -2.152E-02 -2.639E-02  2.639E-02  2.152E-02  1.544E-02  9.269E-03  4.367E-03

INT. OF CUR.
  6.475E-09  6.281E-09  5.719E-09  4.777E-09  3.420E-09  2.030E-09 -9.516E-11 -1.466E-10 -1.549E-10 -8.150E-11
  9.029E-10  1.685E-09  2.428E-09  2.961E-09  3.260E-09 -3.260E-09 -2.961E-09 -2.428E-09 -1.685E-09 -9.029E-10
```

```
TIME STEP   40  TIME= 9.374E-07 CURRENT-
 -1.000E-01 -9.695E-02 -8.768E-02 -7.231E-02 -5.086E-02 -2.944E-02 -4.240E-03  2.560E-03  1.180E-02  1.607E-02
 -9.315E-03 -1.824E-02 -2.782E-02 -3.589E-02 -4.149E-02  4.149E-02  3.589E-02  2.782E-02  1.824E-02  9.315E-03

INT. OF CUR.
  4.302E-09  4.176E-09  3.820E-09  3.217E-09  2.329E-09  1.401E-09 -2.462E-10 -4.054E-10 -5.403E-10 -5.827E-10
  7.390E-10  1.354E-09  1.906E-09  2.265E-09  2.436E-09 -2.436E-09 -2.265E-09 -1.906E-09 -1.354E-09 -7.390E-10

TIME STEP   41  TIME= 9.615E-07 CURRENT-
 -1.097E-01 -1.064E-01 -9.676E-02 -8.054E-02 -5.732E-02 -3.358E-02 -1.388E-03 -2.730E-03 -4.756E-03 -7.290E-03
 -1.363E-02 -2.561E-02 -3.722E-02 -4.579E-02 -5.086E-02  5.086E-02  4.579E-02  3.722E-02  2.561E-02  1.363E-02

INT. OF CUR.
  1.759E-09  1.710E-09  1.584E-09  1.365E-09  1.019E-09  6.383E-10 -3.113E-10 -5.259E-10 -7.364E-10 -8.622E-10
  4.620E-10  8.234E-10  1.118E-09  1.275E-09  1.315E-09 -1.315E-09 -1.275E-09 -1.118E-09 -8.234E-10 -4.620E-10

TIME STEP   42  TIME= 9.855E-07 CURRENT-
 -1.084E-01 -1.051E-01 -9.582E-02 -8.028E-02 -5.762E-02 -3.411E-02  2.502E-04  4.237E-04  3.535E-04 -3.492E-04
 -1.630E-02 -2.981E-02 -4.187E-02 -4.992E-02 -5.383E-02  5.383E-02  4.992E-02  4.187E-02  2.981E-02  1.630E-02

INT. OF CUR.
 -8.857E-10 -8.539E-10 -7.505E-10 -5.851E-10 -3.750E-10 -1.826E-10 -3.225E-10 -5.502E-10 -7.855E-10 -9.503E-10
  9.885E-11  1.509E-10  1.570E-10  1.127E-10  4.363E-11 -4.363E-11 -1.127E-10 -1.570E-10 -1.509E-10 -9.885E-11

TIME STEP   43  TIME= 1.010E-06 CURRENT-
 -9.705E-02 -9.382E-02 -8.543E-02 -7.161E-02 -5.153E-02 -3.069E-02  1.282E-03  2.434E-03  3.611E-03  4.107E-03
 -1.657E-02 -2.972E-02 -4.100E-02 -4.773E-02 -5.048E-02  5.048E-02  4.773E-02  4.100E-02  2.972E-02  1.657E-02

INT. OF CUR.
 -3.376E-09 -3.264E-09 -2.948E-09 -2.427E-09 -1.700E-09 -9.693E-10 -3.029E-10  5.136E-10 -7.341E-10 -9.002E-10
 -3.010E-10 -5.732E-10 -8.517E-10 -1.074E-09 -1.223E-09  1.223E-09  1.074E-09  8.517E-10  5.732E-10  3.010E-10

TIME STEP   44  TIME= 1.034E-06 CURRENT-
 -7.688E-02 -7.400E-02 -6.693E-02 -5.572E-02 -3.993E-02 -2.379E-02  2.076E-03  3.664E-03  5.233E-03  6.047E-03
 -1.415E-02 -2.506E-02 -3.421E-02 -3.949E-02 -4.143E-02  4.143E-02  3.949E-02  3.421E-02  2.506E-02  1.415E-02

INT. OF CUR.
 -5.484E-09 -5.299E-09 -4.795E-09 -3.972E-09 -2.810E-09 -1.631E-09 -2.621E-10 -4.387E-10 -6.246E-10 -7.731E-10
 -6.756E-10 -1.241E-09 -1.767E-09 -2.134E-09 -2.339E-09  2.339E-09  2.134E-09  1.767E-09  1.241E-09  6.756E-10

TIME STEP   45  TIME= 1.058E-06 CURRENT-
 -4.946E-02 -4.730E-02 -4.225E-02 -3.467E-02 -2.456E-02 -1.459E-02  2.478E-03  4.025E-03  5.358E-03  5.892E-03
 -9.386E-03 -1.652E-02 -2.259E-02 -2.623E-02 -2.765E-02  2.765E-02  2.623E-02  2.259E-02  1.652E-02  9.386E-03

INT. OF CUR.
 -7.017E-09 -6.770E-09 -6.120E-09 -5.069E-09 -3.593E-09 -2.097E-09 -2.065E-10 -3.446E-10 -4.943E-10 -6.254E-10
 -9.632E-10 -1.748E-09 -2.459E-09 -2.934E-09 -3.178E-09  3.178E-09  2.934E-09  2.459E-09  1.748E-09  9.63[illegible]E-10

TIME STEP   46  TIME= 1.082E-06 CURRENT-
 -1.682E-02 -1.587E-02 -1.377E-02 -1.089E-02 -7.494E-03 -4.468E-03  2.153E-03  3.284E-03  4.105E-03  4.240E-03
 -3.149E-03 -5.610E-03 -7.947E-03 -9.629E-03 -1.050E-02  1.050E-02  9.629E-03  7.947E-03  5.610E-03  3.149E-03

INT. OF CUR.
 -7.824E-09 -7.539E-09 -6.801E-09 -5.622E-09 -3.981E-09 -2.328E-09 -1.494E-10 -2.546E-10 -3.778E-10 -5.007E-10
 -1.117E-09 -2.019E-09 -2.832E-09 -3.372E-09 -3.644E-09  3.644E-09  3.372E-09  2.832E-09  2.019E-09  1.117E-09

TIME STEP   47  TIME= 1.106E-06 CURRENT-
  1.806E-02  1.739E-02  1.580E-02  1.322E-02  9.432E-03  5.421E-03  1.053E-03  1.503E-03  1.759E-03  1.678E-03
  3.362E-03  5.786E-03  7.530E-03  8.216E-03  8.200E-03 -8.200E-03 -8.216E-03 -7.530E-03 -5.786E-03 -3.362E-03

INT. OF CUR.
 -7.813E-09 -7.524E-09 -6.778E-09 -5.594E-09 -3.958E-09 -2.316E-09 -1.093E-10 -1.949E-10 -3.051E-10 -4.277E-10
 -1.115E-09 -2.018E-09 -2.839E-09 -3.391E-09 -3.674E-09  3.674E-09  3.391E-09  2.839E-09  2.018E-09  1.115E-09

TIME STEP   48  TIME= 1.130E-06 CURRENT-
  5.127E-02  4.895E-02  4.358E-02  3.553E-02  2.482E-02  1.428E-02 -4.643E-04 -8.127E-04 -1.104E-03 -1.206E-03
  9.034E-03  1.593E-02  2.170E-02  2.501E-02  2.621E-02 -2.621E-02 -2.501E-02 -2.170E-02 -1.593E-02 -9.034E-03

INT. OF CUR.
 -6.976E-09 -6.724E-09 -6.061E-09 -5.005E-09 -3.543E-09 -2.077E-09 -1.014E-10 -1.856E-10 -2.962E-10 -4.214E-10
 -9.641E-10 -1.754E-09 -2.485E-09 -2.990E-09 -3.260E-09  3.260E-09  2.990E-09  2.485E-09  1.754E-09  9.641E-10

TIME STEP   49  TIME= 1.154E-06 CURRENT-
  7.863E-02  7.507E-02  6.667E-02  5.410E-02  3.760E-02  2.160E-02 -1.861E-03 -2.915E-03 -3.678E-03 -3.716E-03
  1.316E-02  2.357E-02  3.278E-02  3.859E-02  4.109E-02 -4.109E-02 -3.859E-02 -3.278E-02 -2.357E-02 -1.316E-02

INT. OF CUR.
 -5.403E-09 -5.222E-09 -4.727E-09 -3.920E-09 -2.788E-09 -1.643E-09 -1.296E-10 -2.308E-10 -3.542E-10 -4.813E-10
 -6.943E-10 -1.275E-09 -1.824E-09 -2.219E-09 -2.445E-09  2.445E-09  2.219E-09  1.824E-09  1.275E-09  6.943E-10
```

```
TIME STEP   50  TIME= 1.178E-06 CURRENT-
   9.665E-02  9.253E-02  8.249E-02  6.716E-02  4.680E-02  2.693E-02 -2.683E-03 -4.124E-03 -5.142E-03 -5.065E-03
   1.549E-02  2.806E-02  3.955E-02  4.719E-02  5.072E-02 -5.072E-02 -4.719E-02 -3.955E-02 -2.806E-02 -1.549E-02

INT. OF CUR.
  -3.278E-09 -3.190E-09 -2.919E-09 -2.452E-09 -1.766E-09 -1.055E-09 -1.854E-10 -3.172E-10 -4.625E-10 -5.892E-10
  -3.463E-10 -6.479E-10 -9.465E-10 -1.178E-09 -1.331E-09  1.331E-09  1.178E-09  9.465E-10  6.479E-10  3.463E-10

TIME STEP   51  TIME= 1.202E-06 CURRENT-
   1.033E-01  9.929E-02  8.916E-02  7.320E-02  5.139E-02  2.975E-02 -2.678E-03 -4.022E-03 -4.900E-03 -4.583E-03
   1.603E-02  2.918E-02  4.141E-02  4.973E-02  5.376E-02 -5.376E-02 -4.973E-02 -4.141E-02 -2.918E-02 -1.603E-02

INT. OF CUR.
  -8.524E-10 -8.636E-10 -8.380E-10 -7.509E-10 -5.766E-10 -3.692E-10 -2.515E-10 -4.177E-10 -5.866E-10 -7.088E-10
   3.613E-11  4.688E-11  3.647E-11 -7.930E-13 -6.183E-11  6.184E-11  7.965E-13 -3.646E-11 -4.688E-11 -3.613E-11

TIME STEP   52  TIME= 1.226E-06 CURRENT-
   9.829E-02  9.490E-02  8.592E-02  7.127E-02  5.054E-02  2.952E-02 -1.781E-03 -2.496E-03 -2.749E-03 -2.006E-03
   1.483E-02  2.700E-02  3.830E-02  4.604E-02  4.995E-02 -4.995E-02 -4.604E-02 -3.830E-02 -2.700E-02 -1.483E-02

INT. OF CUR.
   1.594E-09  1.493E-09  1.286E-09  1.001E-09  6.595E-10  3.493E-10 -3.068E-10 -4.989E-10 -6.823E-10 -7.922E-10
   4.105E-10  7.288E-10  1.004E-09  1.163E-09  1.198E-09 -1.198E-09 -1.163E-09 -1.004E-09 -7.288E-10 -4.105E-10

TIME STEP   53  TIME= 1.250E-06 CURRENT-
   8.290E-02  8.037E-02  7.329E-02  6.136E-02  4.397E-02  2.596E-02 -9.257E-05  2.857E-04  1.066E-03  2.360E-03
   1.200E-02  2.175E-02  3.068E-02  3.679E-02  4.006E-02 -4.006E-02 -3.679E-02 -3.068E-02 -2.175E-02 -1.200E-02

INT. OF CUR.
   3.792E-09  3.620E-09  3.219E-09  2.611E-09  1.807E-09  1.023E-09 -3.310E-10 -5.280E-10 -7.059E-10 -7.915E-10
   7.362E-10  1.321E-09  1.843E-09  2.169E-09  2.292E-09 -2.292E-09 -2.169E-09 -1.843E-09 -1.321E-09 -7.362E-10

TIME STEP   54  TIME= 1.274E-06 CURRENT-
   5.935E-02  5.775E-02  5.295E-02  4.464E-02  3.228E-02  1.929E-02  2.134E-03  3.879E-03  5.884E-03  7.710E-03
   7.721E-03  1.390E-02  1.947E-02  2.332E-02  2.562E-02 -2.562E-02 -2.332E-02 -1.947E-02 -1.390E-02 -7.721E-03

INT. OF CUR.
   5.513E-09  5.296E-09  4.751E-09  3.899E-09  2.733E-09  1.573E-09 -3.075E-10 -4.796E-10 -6.244E-10 -6.725E-10
   9.761E-10  1.754E-09  2.452E-09  2.900E-09  3.091E-09 -3.091E-09 -2.900E-09 -2.452E-09 -1.754E-09 -9.761E-10

TIME STEP   55  TIME= 1.298E-06 CURRENT-
   3.044E-02  2.976E-02  2.742E-02  2.328E-02  1.702E-02  1.037E-02  4.493E-03  7.600E-03  1.076E-02  1.297E-02
   2.395E-03  4.276E-03  6.003E-03  7.368E-03  8.558E-03 -8.558E-03 -7.368E-03 -6.003E-03 -4.276E-03 -2.395E-03

INT. OF CUR.
   6.608E-09  6.358E-09  5.728E-09  4.725E-09  3.333E-09  1.934E-09 -2.281E-10 -3.419E-10 -4.245E-10 -4.237E-10
   1.100E-09  1.976E-09  2.763E-09  3.274E-09  3.507E-09 -3.507E-09 -3.274E-09 -2.763E-09 -1.976E-09 -1.100E-09

TIME STEP   56  TIME= 1.322E-06 CURRENT-
  -8.608E-04 -5.824E-04 -2.883E-04  2.146E-05  3.150E-04  5.223E-04  6.485E-03  1.066E-02  1.467E-02  1.709E-02
  -3.345E-03 -5.953E-03 -8.126E-03 -9.212E-03 -9.118E-03  9.118E-03  9.212E-03  8.126E-03  5.953E-03  3.345E-03

INT. OF CUR.
   6.968E-09  6.713E-09  6.058E-09  5.009E-09  3.544E-09  2.067E-09 -9.545E-11 -1.211E-10 -1.170E-10 -6.011E-11
   1.089E-09  1.957E-09  2.739E-09  3.253E-09  3.502E-09 -3.502E-09 -3.253E-09 -2.739E-09 -1.957E-09 -1.089E-09

TIME STEP   57  TIME= 1.346E-06 CURRENT-
  -3.149E-02 -3.015E-02 -2.711E-02 -2.232E-02 -1.564E-02 -8.886E-03  7.651E-03  1.238E-02  1.677E-02  1.919E-02
  -8.707E-03 -1.545E-02 -2.121E-02 -2.454E-02 -2.544E-02  2.544E-02  2.454E-02  2.121E-02  1.545E-02  8.707E-03

INT. OF CUR.
   6.578E-09  6.342E-09  5.727E-09  4.739E-09  3.359E-09  1.965E-09  7.610E-11  1.585E-10  2.645E-10  3.600E-10
   9.436E-10  1.699E-09  2.384E-09  2.845E-09  3.084E-09 -3.084E-09 -2.845E-09 -2.384E-09 -1.699E-09 -9.436E-10

TIME STEP   58  TIME= 1.370E-06 CURRENT-
  -5.833E-02 -5.598E-02 -5.022E-02 -4.132E-02 -2.905E-02 -1.674E-02  7.714E-03  1.235E-02  1.658E-02  1.876E-02
  -1.292E-02 -2.295E-02 -3.163E-02 -3.683E-02 -3.860E-02  3.860E-02  3.683E-02  3.163E-02  2.295E-02  1.292E-02

INT. OF CUR.
   5.491E-09  5.300E-09  4.790E-09  3.967E-09  2.816E-09  1.654E-09  2.630E-10  4.592E-10  6.700E-10  8.412E-10
   6.814E-10  1.233E-09  1.744E-09  2.101E-09  2.307E-09 -2.307E-09 -2.101E-09 -1.744E-09 -1.233E-09 -6.814E-10

TIME STEP   59  TIME= 1.394E-06 CURRENT-
  -7.846E-02 -7.514E-02 -6.787E-02 -5.514E-02 -3.868E-02 -2.234E-02  6.647E-03  1.052E-02  1.399E-02  1.561E-02
  -1.544E-02 -2.751E-02 -3.808E-02 -4.458E-02 -4.704E-02  4.704E-02  4.458E-02  3.808E-02  2.751E-02  1.544E-02

INT. OF CUR.
   3.834E-09  3.712E-09  3.366E-09  2.798E-09  1.995E-09  1.180E-09  4.378E-10  7.377E-10  1.042E-09  1.260E-09
   3.371E-10  6.210E-10  8.981E-10  1.114E-09  1.269E-09 -1.269E-09 -1.114E-09 -8.981E-10 -6.210E-10 -3.371E-10
```

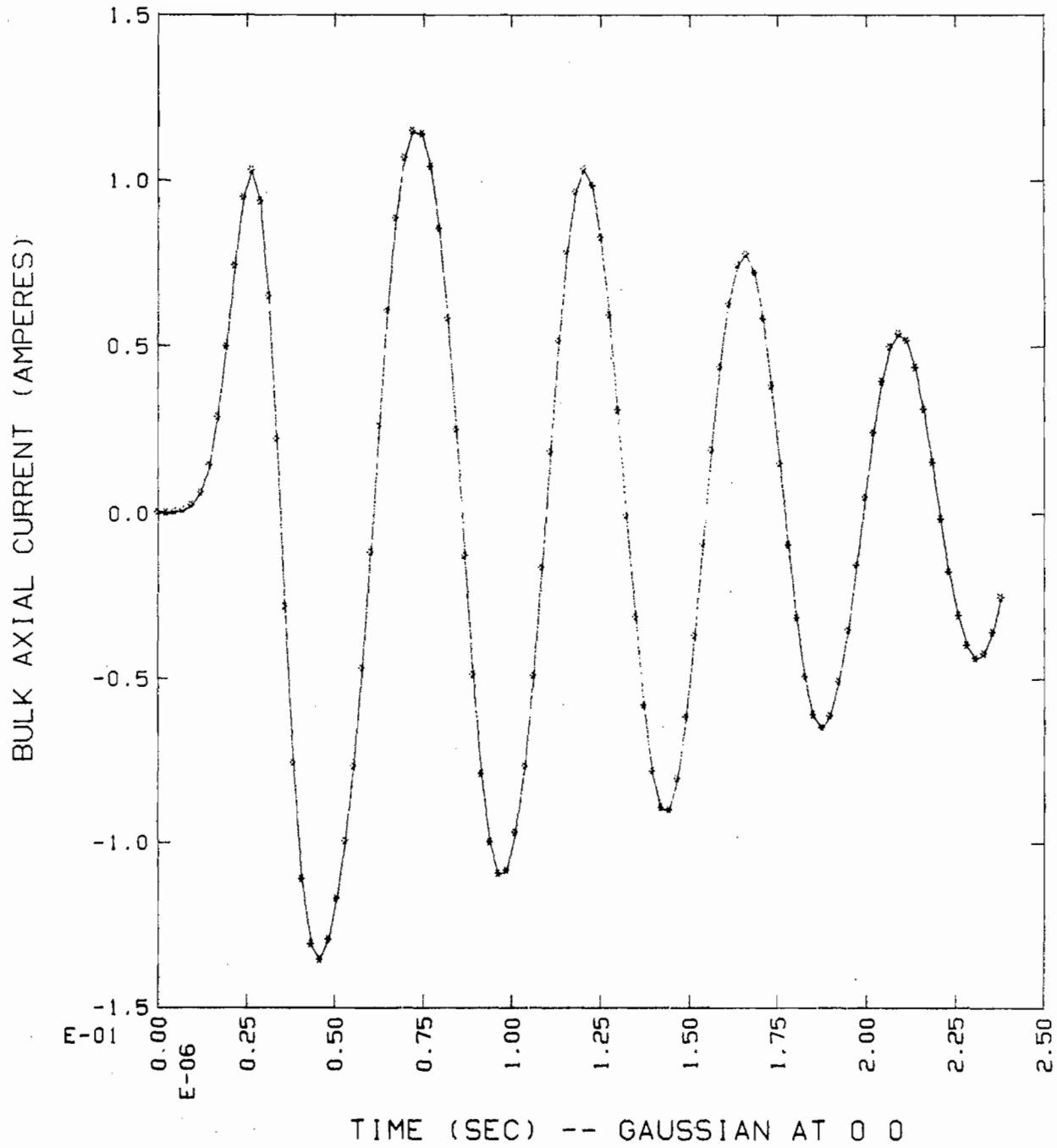
```
TIME STEP   60  TIME= 1.418E-06 CURRENT-
  -8.951E-02 -8.570E-02 -7.660E-02 -6.265E-02 -4.389E-02 -2.537E-02  4.616E-03  7.132E-03  9.268E-03  1.002E-02
  -1.599E-02 -2.860E-02 -3.977E-02 -4.680E-02 -4.970E-02  4.970E-02  4.680E-02  3.977E-02  2.860E-02  1.599E-02

INT. OF CUR.
   1.797E-09  1.762E-09  1.622E-09  1.369E-09  9.934E-10  6.013E-10  5.751E-10  9.530E-10  1.326E-09  1.573E-09
  -4.460E-11 -6.028E-11 -4.715E-11  4.599E-12  9.451E-11 -9.452E-11 -4.603E-12  4.715E-11  6.028E-11  4.460E-11

TIME STEP   61  TIME= 1.442E-06 CURRENT-
  -9.018E-02 -8.645E-02 -7.737E-02 -6.334E-02 -4.443E-02 -2.573E-02  1.976E-03  2.586E-03  2.959E-03  2.592E-03
  -1.458E-02 -2.614E-02 -3.651E-02 -4.321E-02 -4.626E-02  4.626E-02  4.321E-02  3.651E-02  2.614E-02  1.458E-02

INT. OF CUR.
  -3.835E-10 -3.270E-10 -2.460E-10 -1.586E-10 -7.730E-11 -1.808E-11  6.546E-10  1.072E-09  1.476E-09  1.728E-09
  -4.160E-10 -7.252E-10 -9.738E-10 -1.089E-09 -1.071E-09  1.071E-09  1.089E-09  9.738E-10  7.252E-10  4.160E-10

TIME STEP   62  TIME= 1.466E-06 CURRENT-
  -8.054E-02 -7.746E-02 -6.965E-02 -5.732E-02 -4.039E-02 -2.350E-02 -1.277E-03 -2.597E-03 -4.188E-03 -5.757E-03
  -1.142E-02 -2.052E-02 -2.879E-02 -3.434E-02 -3.720E-02  3.720E-02  3.434E-02  2.879E-02  2.052E-02  1.142E-02

INT. OF CUR.
  -2.456E-09 -2.316E-09 -2.030E-09 -1.622E-09 -1.106E-09 -6.149E-10  6.626E-10  1.073E-09  1.463E-09  1.692E-09
  -7.319E-10 -1.292E-09 -1.768E-09 -2.032E-09 -2.085E-09  2.085E-09  2.032E-09  1.768E-09  1.292E-09  7.319E-10

TIME STEP   63  TIME= 1.490E-06 CURRENT-
  -6.205E-02 -6.003E-02 -5.445E-02 -4.524E-02 -3.218E-02 -1.890E-02 -4.498E-03 -7.817E-03 -1.130E-02 -1.396E-02
  -6.905E-03 -1.248E-02 -1.768E-02 -2.144E-02 -2.381E-02  2.381E-02  2.144E-02  1.768E-02  1.248E-02  6.905E-03

INT. OF CUR.
  -4.187E-09 -3.986E-09 -3.536E-09 -2.867E-09 -1.986E-09 -1.129E-09  5.934E-10  9.482E-10  1.277E-09  1.454E-09
  -9.548E-10 -1.694E-09 -2.333E-09 -2.710E-09 -2.827E-09  2.827E-09  2.710E-09  2.333E-09  1.694E-09  9.548E-10

TIME STEP   64  TIME= 1.514E-06 CURRENT-
  -3.726E-02 -3.646E-02 -3.361E-02 -2.843E-02 -2.059E-02 -1.233E-02 -7.388E-03 -1.242E-02 -1.747E-02 -2.094E-02
  -1.612E-03 -3.052E-03 -4.649E-03 -6.248E-03 -7.900E-03  7.900E-03  6.248E-03  4.649E-03  3.052E-03  1.612E-03

INT. OF CUR.
  -5.394E-09 -5.158E-09 -4.606E-09 -3.762E-09 -2.628E-09 -1.508E-09  4.498E-10  7.037E-10  9.293E-10  1.033E-09
  -1.059E-09 -1.883E-09 -2.605E-09 -3.047E-09 -3.213E-09  3.213E-09  3.047E-09  2.605E-09  1.883E-09  1.059E-09

TIME STEP   65  TIME= 1.538E-06 CURRENT-
  -9.287E-03 -9.673E-03 -9.627E-03 -8.796E-03 -6.849E-03 -4.423E-03 -9.540E-03 -1.576E-02 -2.185E-02 -2.577E-02
   3.790E-03  6.559E-03  8.633E-03  9.284E-03  8.497E-03 -8.497E-03 -9.284E-03 -8.633E-03 -6.559E-03 -3.790E-03

INT. OF CUR.
  -5.959E-09 -5.719E-09 -5.132E-09 -4.215E-09 -2.962E-09 -1.712E-09  2.449E-10  3.625E-10  4.531E-10  4.668E-10
  -1.033E-09 -1.841E-09 -2.558E-09 -3.012E-09 -3.207E-09  3.207E-09  3.012E-09  2.558E-09  1.841E-09  1.033E-09

TIME STEP   66  TIME= 1.562E-06 CURRENT-
   1.864E-02  1.724E-02  1.470E-02  1.136E-02  7.435E-03  3.897E-03 -1.062E-02 -1.734E-02 -2.380E-02 -2.773E-02
   8.624E-03  1.516E-02  2.054E-02  2.328E-02  2.341E-02 -2.341E-02 -2.328E-02 -2.054E-02 -1.516E-02 -8.624E-03
INT. OF CUR.
  -5.847E-09 -5.628E-09 -5.072E-09 -4.185E-09 -2.956E-09 -1.720E-09  4.641E-13 -3.891E-11 -1.005E-10 -1.820E-10
  -8.825E-10 -1.578E-09 -2.204E-09 -2.617E-09 -2.821E-09  2.821E-09  2.617E-09  2.204E-09  1.578E-09  8.825E-10

TIME STEP   67  TIME= 1.586E-06 CURRENT-
   4.353E-02  4.131E-02  3.660E-02  2.964E-02  2.049E-02  1.158E-02 -1.044E-02 -1.687E-02 -2.294E-02 -2.644E-02
   1.230E-02  2.171E-02  2.967E-02  3.413E-02  3.515E-02 -3.515E-02 -3.413E-02 -2.967E-02 -2.171E-02 -1.230E-02

INT. OF CUR.
  -5.094E-09 -4.919E-09 -4.450E-09 -3.689E-09 -2.618E-09 -1.532E-09 -2.552E-10 -4.542E-10 -6.679E-10 -8.396E-10
  -6.287E-10 -1.131E-09 -1.595E-09 -1.921E-09 -2.110E-09  2.110E-09  1.921E-09  1.595E-09  1.131E-09  6.287E-10

TIME STEP   68  TIME= 1.610E-06 CURRENT-
   6.283E-02  6.003E-02  5.366E-02  4.392E-02  3.073E-02  1.763E-02 -8.984E-03 -1.433E-02 -1.926E-02 -2.189E-02
   1.440E-02  2.548E-02  3.503E-02  4.066E-02  4.245E-02 -4.245E-02 -4.066E-02 -3.503E-02 -2.548E-02 -1.440E-02

INT. OF CUR.
  -3.804E-09 -3.690E-09 -3.356E-09 -2.797E-09 -1.996E-09 -1.178E-09 -4.912E-10 -8.333E-10 -1.181E-09 -1.427E-09
  -3.046E-10 -5.585E-10 -8.102E-10 -1.014E-09 -1.169E-09  1.169E-09  1.014E-09  8.102E-10  5.585E-10  3.046E-10

TIME STEP   69  TIME= 1.635E-06 CURRENT-
   7.462E-02  7.151E-02  6.413E-02  5.267E-02  3.700E-02  2.137E-02 -6.394E-03 -9.959E-03 -1.311E-02 -1.450E-02
   1.471E-02  2.610E-02  3.608E-02  4.222E-02  4.456E-02 -4.456E-02 -4.222E-02 -3.608E-02 -2.610E-02 -1.471E-02

INT. OF CUR.
  -2.137E-09 -2.095E-09 -1.927E-09 -1.625E-09 -1.174E-09 -7.048E-10 -6.783E-10 -1.129E-09 -1.575E-09 -1.870E-09
   4.878E-11  6.774E-11  5.307E-11 -7.443E-12 -1.129E-10  1.129E-10  7.445E-12 -5.307E-11 -6.774E-11 -4.878E-11
```

```
TIME STEP   70  TIME= 1.659E-06 CURRENT-
   7.775E-02  7.465E-02  6.704E-02  5.512E-02  3.878E-02  2.248E-02  2.943E-03  4.282E-03  5.145E-03  5.113E-03
   1.325E-02  2.360E-02  3.282E-02  3.872E-02  4.134E-02 -4.134E-02 -3.872E-02 -3.282E-02 -2.360E-02 -1.325E-02

INT. OF CUR.
  -2.885E-10 -3.212E-10 -3.352E-10 -3.167E-10 -2.546E-10 -1.726E-10  7.922E-10  1.302E-09  1.798E-09  2.110E-09
   3.884E-10  6.714E-10  8.898E-10  9.755E-10  9.302E-10 -9.302E-10 -9.755E-10 -8.898E-10 -6.714E-10 -3.884E-10

TIME STEP   71  TIME= 1.683E-06 CURRENT-
   7.203E-02  6.929E-02  6.232E-02  5.130E-02  3.615E-02  2.102E-02  9.815E-04  2.193E-03  3.682E-03  5.165E-03
   1.026E-02  1.836E-02  2.573E-02  3.069E-02  3.326E-02 -3.326E-02 -3.069E-02 -2.573E-02 -1.836E-02 -1.026E-02

INT. OF CUR.
   1.529E-09  1.426E-09  1.235E-09  9.748E-10  6.548E-10  3.553E-10 -8.167E-10 -1.328E-09 -1.817E-09 -2.111E-09
   6.740E-10  1.181E-09  1.601E-09  1.819E-09  1.837E-09 -1.837E-09 -1.819E-09 -1.601E-09 -1.181E-09 -6.740E-10

TIME STEP   72  TIME= 1.707E-06 CURRENT-
   5.827E-02  5.624E-02  5.076E-02  4.193E-02  2.966E-02  1.734E-02  4.904E-03  8.531E-03  1.229E-02  1.506E-02
   6.120E-03  1.106E-02  1.572E-02  1.915E-02  2.137E-02 -2.137E-02 -1.915E-02 -1.572E-02 -1.106E-02 -6.120E-03

INT. OF CUR.
   3.112E-09  2.950E-09  2.608E-09  2.106E-09  1.454E-09  8.207E-10 -7.460E-10 -1.199E-09 -1.625E-09 -1.867E-09
   8.731E-10  1.539E-09  2.105E-09  2.425E-09  2.501E-09 -2.501E-09 -2.425E-09 -2.105E-09 -1.539E-09 -8.731E-10

TIME STEP   73  TIME= 1.731E-06 CURRENT-
   3.829E-02  3.723E-02  3.390E-02  2.827E-02  2.019E-02  1.194E-02  8.319E-03  1.397E-02  1.959E-02  2.335E-02
   1.347E-03  2.597E-03  4.060E-03  5.584E-03  7.201E-03 -7.201E-03 -5.584E-03 -4.060E-03 -2.597E-03 -1.347E-03

INT. OF CUR.
   4.285E-09  4.085E-09  3.636E-09  2.959E-09  2.059E-09  1.176E-09 -5.860E-10 -9.269E-10 -1.239E-09 -1.402E-09
   9.642E-10  1.705E-09  2.346E-09  2.726E-09  2.849E-09 -2.849E-09 -2.726E-09 -2.346E-09 -1.705E-09 -9.642E-10

TIME STEP   74  TIME= 1.755E-06 CURRENT-
   1.463E-02  1.465E-02  1.383E-02  1.196E-02  8.859E-03  5.453E-03  1.077E-02  1.780E-02  2.464E-02  2.897E-02
  -3.488E-03 -5.995E-03 -7.830E-03 -8.327E-03 -7.450E-03  7.450E-03  8.327E-03  7.830E-03  5.995E-03  3.488E-03

INT. OF CUR.
   4.928E-09  4.716E-09  4.216E-09  3.448E-09  2.412E-09  1.387E-09 -3.547E-10 -5.417E-10 -7.029E-10 -7.679E-10
   9.386E-10  1.665E-09  2.301E-09  2.694E-09  2.847E-09 -2.847E-09 -2.694E-09 -2.301E-09 -1.665E-09 -9.386E-10

TIME STEP   75  TIME= 1.779E-06 CURRENT-
  -9.803E-03 -8.735E-03 -7.069E-03 -5.117E-03 -3.085E-03 -1.424E-03  1.194E-02  1.950E-02  2.678E-02  3.121E-02
  -7.812E-03 -1.369E-02 -1.850E-02 -2.087E-02 -2.077E-02  2.077E-02  2.087E-02  1.850E-02  1.369E-02  7.812E-03

INT. OF CUR.
   4.987E-09  4.789E-09  4.299E-09  3.531E-09  2.482E-09  1.436E-09 -7.917E-11 -8.919E-11 -7.913E-11 -3.781E-11
   8.017E-10  1.426E-09  1.982E-09  2.340E-09  2.505E-09 -2.505E-09 -2.340E-09 -1.982E-09 -1.426E-09 -8.017E-10

TIME STEP   76  TIME= 1.803E-06 CURRENT-
  -3.213E-02 -3.020E-02 -2.639E-02 -2.104E-02 -1.431E-02 -7.945E-03  1.166E-02  1.888E-02  2.574E-02  2.978E-02
  -1.112E-02 -1.957E-02 -2.668E-02 -3.054E-02 -3.116E-02  3.116E-02  3.054E-02  2.668E-02  1.957E-02  1.112E-02

INT. OF CUR.
   4.479E-09  4.317E-09  3.893E-09  3.215E-09  2.272E-09  1.323E-09  2.073E-10  3.768E-10  5.584E-10  7.026E-10
   5.722E-10  1.023E-09  1.434E-09  1.717E-09  1.875E-09 -1.875E-09 -1.717E-09 -1.434E-09 -1.023E-09 -5.722E-10

TIME STEP   77  TIME= 1.827E-06 CURRENT-
  -4.989E-02 -4.739E-02 -4.199E-02 -3.402E-02 -2.356E-02 -1.337E-02  1.000E-02  1.601E-02  2.164E-02  2.481E-02
  -1.302E-02 -2.298E-02 -3.143E-02 -3.625E-02 -3.749E-02  3.749E-02  3.625E-02  3.143E-02  2.298E-02  1.302E-02

INT. OF CUR.
   3.484E-09  3.376E-09  3.064E-09  2.547E-09  1.813E-09  1.065E-09  4.705E-10  8.006E-10  1.134E-09  1.366E-09
   2.793E-10  5.068E-10  7.291E-10  9.061E-10  1.042E-09 -1.042E-09 -9.061E-10 -7.291E-10 -5.068E-10 -2.793E-10

TIME STEP   78  TIME= 1.851E-06 CURRENT-
  -6.128E-02 -5.852E-02 -5.223E-02 -4.266E-02 -2.979E-02 -1.709E-02  7.171E-03  1.126E-02  1.500E-02  1.691E-02
  -1.330E-02 -2.348E-02 -3.225E-02 -3.744E-02 -3.915E-02  3.915E-02  3.744E-02  3.225E-02  2.348E-02  1.330E-02

INT. OF CUR.
   2.136E-09  2.091E-09  1.921E-09  1.617E-09  1.165E-09  6.951E-10  6.792E-10  1.132E-09  1.579E-09  1.873E-09
  -4.022E-11 -5.718E-11 -4.420E-11  1.139E-11  1.110E-10 -1.110E-10 -1.139E-11  4.420E-11  5.718E-11  4.022E-11

TIME STEP   79  TIME= 1.875E-06 CURRENT-
  -6.531E-02 -6.260E-02 -5.613E-02 -4.607E-02 -3.235E-02 -1.868E-02  3.515E-03  5.213E-03  6.602E-03  7.016E-03
  -1.195E-02 -2.114E-02 -2.916E-02 -3.412E-02 -3.612E-02  3.612E-02  3.412E-02  2.916E-02  2.114E-02  1.195E-02

INT. OF CUR.
   5.994E-10  6.207E-10  6.058E-10  5.400E-10  4.110E-10  2.609E-10  8.093E-10  1.333E-09  1.843E-09  2.165E-09
  -3.470E-10 -5.992E-10 -7.902E-10 -8.577E-10 -8.030E-10  8.030E-10  8.577E-10  7.902E-10  5.992E-10  3.470E-10
```

```
TIME STEP   80  TIME= 1.899E-06 CURRENT-
  -6.178E-02 -5.942E-02 -5.347E-02 -4.406E-02 -3.107E-02 -1.804E-02 -5.393E-04 -1.434E-03 -2.554E-03 -3.693E-03
  -9.178E-03 -1.629E-02 -2.266E-02 -2.683E-02 -2.891E-02  2.891E-02  2.683E-02  2.266E-02  1.629E-02  9.178E-03

INT. OF CUR.
  -9.431E-10 -8.603E-10 -7.246E-10 -5.541E-10 -3.589E-10 -1.849E-10  8.459E-10  1.379E-09  1.893E-09  2.206E-09
  -6.038E-10 -1.054E-09 -1.420E-09 -1.598E-09 -1.593E-09  1.593E-09  1.598E-09  1.420E-09  1.054E-09  6.038E-10

TIME STEP   81  TIME= 1.923E-06 CURRENT-
  -5.135E-02 -4.959E-02 -4.481E-02 -3.708E-02 -2.626E-02 -1.534E-02 -4.524E-03 -7.901E-03 -1.139E-02 -1.394E-02
  -5.370E-03 -9.626E-03 -1.363E-02 -1.658E-02 -1.850E-02  1.850E-02  1.658E-02  1.363E-02  9.626E-03  5.370E-03

INT. OF CUR.
  -2.317E-09 -2.184E-09 -1.918E-09 -1.539E-09 -1.055E-09 -5.902E-10  7.849E-10  1.267E-09  1.725E-09  1.993E-09
  -7.807E-10 -1.369E-09 -1.861E-09 -2.126E-09 -2.169E-09  2.169E-09  2.126E-09  1.861E-09  1.369E-09  7.807E-10

TIME STEP   82  TIME= 1.947E-06 CURRENT-
  -3.542E-02 -3.415E-02 -3.136E-02 -2.614E-02 -1.865E-02 -1.100E-02 -7.977E-03 -1.343E-02 -1.887E-02 -2.252E-02
  -1.036E-03 -2.016E-03 -3.256E-03 -4.648E-03 -6.190E-03  6.190E-03  4.648E-03  3.256E-03  2.016E-03  1.036E-03
INT. OF CUR.
  -3.371E-09 -3.204E-09 -2.843E-09 -2.307E-09 -1.600E-09 -9.099E-10  3.336E-10  1.009E-09  1.358E-09  1.552E-09
  -8.587E-10 -1.511E-09 -2.067E-09 -2.384E-09 -2.470E-09  2.470E-09  2.384E-09  2.067E-09  1.511E-09  8.587E-10

TIME STEP   83  TIME= 1.971E-06 CURRENT-
  -1.600E-02 -1.591E-02 -1.485E-02 -1.267E-02 -9.252E-03 -5.611E-03 -1.049E-02 -1.737E-02 -2.412E-02 -2.843E-02
   3.273E-03  5.584E-03  7.186E-03  7.482E-03  6.497E-03 -6.497E-03 -7.482E-03 -7.186E-03 -5.584E-03 -3.273E-03

INT. OF CUR.
  -3.996E-09 -3.816E-09 -3.405E-09 -2.778E-09 -1.939E-09 -1.112E-09  4.098E-10  6.352E-10  8.369E-10  9.340E-10
  -8.318E-10 -1.468E-09 -2.020E-09 -2.351E-09 -2.467E-09  2.467E-09  2.351E-09  2.020E-09  1.468E-09  8.318E-10

TIME STEP   84  TIME= 1.995E-06 CURRENT-
   4.539E-03  3.745E-03  2.717E-03  1.684E-03  7.837E-04  1.647E-04 -1.175E-02 -1.926E-02 -2.651E-02 -3.098E-02
   7.045E-03  1.227E-02  1.645E-02  1.835E-02  1.803E-02 -1.803E-02 -1.835E-02 -1.645E-02 -1.227E-02 -7.045E-03

INT. OF CUR.
  -4.136E-09 -3.965E-09 -3.552E-09 -2.912E-09 -2.042E-09 -1.178E-09  1.400E-10  1.908E-10  2.228E-10  2.131E-10
  -7.067E-10 -1.252E-09 -1.733E-09 -2.038E-09 -2.170E-09  2.170E-09  2.038E-09  1.733E-09  1.252E-09  7.067E-10

TIME STEP   85  TIME= 2.019E-06 CURRENT-
   2.374E-02  2.218E-02  1.926E-02  1.525E-02  1.031E-02  5.671E-03 -1.163E-02 -1.887E-02 -2.577E-02 -2.989E-02
   9.860E-03  1.729E-02  2.346E-02  2.670E-02  2.704E-02 -2.704E-02 -2.670E-02 -2.346E-02 -1.729E-02 -9.860E-03

INT. OF CUR.
  -3.793E-09 -3.651E-09 -3.286E-09 -2.707E-09 -1.908E-09 -1.107E-09 -1.439E-10 -2.720E-10 -4.118E-10 -5.257E-10
  -5.016E-10 -8.932E-10 -1.249E-09 -1.491E-09 -1.623E-09  1.623E-09  1.491E-09  1.249E-09  8.932E-10  5.016E-10

TIME STEP   86  TIME= 2.043E-06 CURRENT-
   3.938E-02  3.728E-02  3.289E-02  2.652E-02  1.827E-02  1.031E-02 -1.013E-02 -1.625E-02 -2.201E-02 -2.530E-02
   1.142E-02  2.010E-02  2.745E-02  3.157E-02  3.250E-02 -3.250E-02 -3.157E-02 -2.745E-02 -2.010E-02 -1.142E-02

INT. OF CUR.
  -3.027E-09 -2.929E-09 -2.654E-09 -2.200E-09 -1.561E-09 -9.134E-10 -4.082E-10 -6.986E-10 -9.921E-10 -1.196E-09
  -2.433E-10 -4.394E-10 -6.312E-10 -7.838E-10 -9.003E-10  9.003E-10  7.838E-10  6.312E-10  4.394E-10  2.433E-10

TIME STEP   87  TIME= 2.067E-06 CURRENT-
   4.978E-02  4.742E-02  4.216E-02  3.428E-02  2.383E-02  1.360E-02 -7.454E-03 -1.175E-02 -1.570E-02 -1.779E-02
   1.159E-02  2.044E-02  2.805E-02  3.250E-02  3.386E-02 -3.386E-02 -3.250E-02 -2.805E-02 -2.044E-02 -1.159E-02

INT. OF CUR.
  -1.945E-09 -1.902E-09 -1.743E-09 -1.463E-09 -1.050E-09 -6.233E-10 -6.219E-10 -1.039E-09 -1.450E-09 -1.720E-09
   3.616E-11  5.274E-11  4.264E-11 -5.851E-12 -9.452E-11  9.452E-11  5.851E-12 -4.264E-11 -5.274E-11 -3.616E-11

TIME STEP   88  TIME= 2.091E-06 CURRENT-
   5.395E-02  5.162E-02  4.616E-02  3.776E-02  2.642E-02  1.519E-02 -3.925E-03 -5.912E-03 -7.613E-03 -8.288E-03
   1.038E-02  1.834E-02  2.526E-02  2.949E-02  3.111E-02 -3.111E-02 -2.949E-02 -2.526E-02 -1.834E-02 -1.038E-02

INT. OF CUR.
  -6.861E-10 -6.993E-10 -6.710E-10 -5.883E-10 -4.405E-10 -2.740E-10 -7.603E-10 -1.254E-09 -1.734E-09 -2.037E-09
   3.031E-10  5.237E-10  6.901E-10  7.470E-10  6.946E-10 -6.946E-10 -7.470E-10 -6.901E-10 -5.237E-10 -3.031E-10

TIME STEP   89  TIME= 2.115E-06 CURRENT-
   5.170E-02  4.967E-02  4.464E-02  3.671E-02  2.583E-02  1.495E-02  1.550E-05  5.366E-04  1.251E-03  2.053E-03
   7.965E-03  1.410E-02  1.954E-02  2.305E-02  2.473E-02 -2.473E-02 -2.305E-02 -1.954E-02 -1.410E-02 -7.965E-03

INT. OF CUR.
   5.986E-10  5.304E-10  4.312E-10  3.158E-10  1.938E-10  9.191E-11 -8.082E-10 -1.320E-09 -1.812E-09 -2.114E-09
   5.260E-10  9.178E-10  1.234E-09  1.385E-09  1.373E-09 -1.373E-09 -1.385E-09 -1.234E-09 -9.178E-10 -5.260E-10
```

```
TIME STEP   90  TIME= 2.139E-06 CURRENT-
  4.358E-02  4.207E-02  3.801E-02  3.144E-02  2.225E-02  1.298E-02  3.888E-03  6.816E-03  9.825E-03  1.199E-02
  4.654E-03  8.285E-03  1.165E-02  1.407E-02  1.562E-02 -1.562E-02 -1.407E-02 -1.165E-02 -8.285E-03 -4.654E-03
INT. OF CUR.
  1.754E-09  1.644E-09  1.435E-09  1.143E-09  7.777E-10  4.311E-10 -7.611E-10 -1.231E-09 -1.678E-09 -1.944E-09
  6.795E-10  1.190E-09  1.614E-09  1.837E-09  1.863E-09 -1.863E-09 -1.837E-09 -1.614E-09 -1.190E-09 -6.795E-10

TIME STEP   91  TIME= 2.163E-06 CURRENT-
  3.077E-02  2.992E-02  2.726E-02  2.274E-02  1.623E-02  9.564E-03  7.232E-03  1.218E-02  1.710E-02  2.036E-02
  8.757E-04  1.650E-03  2.612E-03  3.709E-03  4.981E-03 -4.981E-03 -3.709E-03 -2.612E-03 -1.650E-03 -8.757E-04

INT. OF CUR.
  2.656E-09  2.519E-09  2.227E-09  1.801E-09  1.245E-09  7.049E-10 -6.264E-10 -1.001E-09 -1.352E-09 -1.552E-09
  7.469E-10  1.311E-09  1.787E-09  2.053E-09  2.114E-09 -2.114E-09 -2.053E-09 -1.787E-09 -1.311E-09 -7.469E-10

TIME STEP   92  TIME= 2.187E-06 CURRENT-
  1.494E-02  1.483E-02  1.381E-02  1.177E-02  8.579E-03  5.184E-03  9.663E-03  1.602E-02  2.223E-02  2.619E-02
 -2.895E-03 -4.976E-03 -6.443E-03 -6.744E-03 -5.879E-03  5.879E-03  6.744E-03  6.443E-03  4.976E-03  2.895E-03

INT. OF CUR.
  3.212E-09  3.062E-09  2.727E-09  2.221E-09  1.547E-09  8.840E-10 -4.215E-10 -6.588E-10 -8.754E-10 -9.877E-10
  7.226E-10  1.271E-09  1.741E-09  2.017E-09  2.104E-09 -2.104E-09 -2.017E-09 -1.741E-09 -1.271E-09 -7.226E-10

TIME STEP   93  TIME= 2.211E-06 CURRENT-
 -1.976E-03 -1.353E-03 -6.588E-04 -7.836E-05  2.800E-04  4.058E-04  1.091E-02  1.790E-02  2.466E-02  2.884E-02
 -6.195E-03 -1.078E-02 -1.442E-02 -1.604E-02 -1.566E-02  1.566E-02  1.604E-02  1.442E-02  1.078E-02  6.195E-03

INT. OF CUR.
  3.370E-09  3.226E-09  2.887E-09  2.363E-09  1.654E-09  9.520E-10 -1.719E-10 -2.473E-10 -3.065E-10 -3.199E-10
  6.124E-10  1.080E-09  1.488E-09  1.741E-09  1.843E-09 -1.843E-09 -1.741E-09 -1.488E-09 -1.080E-09 -6.124E-10

TIME STEP   94  TIME= 2.235E-06 CURRENT-
 -1.796E-02 -1.670E-02 -1.443E-02 -1.138E-02 -7.664E-03 -4.189E-03  1.086E-02  1.766E-02  2.416E-02  2.808E-02
 -8.636E-03 -1.510E-02 -2.040E-02 -2.310E-02 -2.324E-02  2.324E-02  2.310E-02  2.040E-02  1.510E-02  8.636E-03

INT. OF CUR.
  3.128E-09  3.008E-09  2.704E-09  2.224E-09  1.565E-09  9.062E-10  9.250E-11  1.844E-10  2.862E-10  3.711E-10
  4.324E-10  7.659E-10  1.066E-09  1.266E-09  1.371E-09 -1.371E-09 -1.266E-09 -1.066E-09 -7.659E-10 -4.324E-10

TIME STEP   95  TIME= 2.259E-06 CURRENT-
 -3.118E-02 -2.945E-02 -2.592E-02 -2.086E-02 -1.435E-02 -8.078E-03  9.549E-03  1.536E-02  2.085E-02  2.404E-02
 -9.952E-03 -1.745E-02 -2.373E-02 -2.715E-02 -2.778E-02  2.778E-02  2.715E-02  2.373E-02  1.745E-02  9.952E-03

INT. OF CUR.
  2.532E-09  2.448E-09  2.214E-09  1.833E-09  1.298E-09  7.574E-10  3.404E-10  5.852E-10  8.327E-10  1.004E-09
  2.068E-10  3.708E-10  5.301E-10  6.559E-10  7.514E-10 -7.514E-10 -6.559E-10 -5.301E-10 -3.708E-10 -2.068E-10

TIME STEP   96  TIME= 2.284E-06 CURRENT-
 -4.018E-02 -3.819E-02 -3.388E-02 -2.749E-02 -1.907E-02 -1.085E-02  7.147E-03  1.131E-02  1.517E-02  1.728E-02
 -1.003E-02 -1.762E-02 -2.409E-02 -2.780E-02 -2.882E-02  2.882E-02  2.780E-02  2.409E-02  1.762E-02  1.003E-02

INT. OF CUR.
  1.866E-09  1.627E-09  1.489E-09  1.246E-09  8.923E-10  5.276E-10  5.432E-10  9.092E-10  1.270E-09  1.506E-09
 -3.586E-11 -5.505E-11 -5.054E-11 -1.127E-11  6.414E-11 -6.414E-11  1.127E-11  5.054E-11  5.505E-11  3.586E-11

TIME STEP   97  TIME= 2.308E-06 CURRENT-
 -4.405E-02 -4.207E-02 -3.753E-02 -3.062E-02 -2.136E-02 -1.224E-02  3.958E-03  6.025E-03  7.840E-03  8.656E-03
 -8.903E-03 -1.568E-02 -2.155E-02 -2.509E-02 -2.636E-02  2.636E-02  2.509E-02  2.155E-02  1.568E-02  8.903E-03

INT. OF CUR.
  6.436E-10  6.526E-10  6.217E-10  5.408E-10  4.015E-10  2.473E-10  6.782E-10  1.120E-09  1.550E-09  1.822E-09
 -2.658E-10 -4.595E-10 -6.049E-10 -6.536E-10 -6.061E-10  6.061E-10  6.535E-10  6.049E-10  4.595E-10  2.658E-10

TIME STEP   98  TIME= 2.332E-06 CURRENT-
 -4.255E-02 -4.082E-02 -3.661E-02 -3.003E-02 -2.107E-02 -1.216E-02  3.746E-04  1.517E-04 -2.429E-04 -7.872E-04
 -6.753E-03 -1.193E-02 -1.651E-02 -1.945E-02 -2.081E-02  2.081E-02  1.945E-02  1.651E-02  1.193E-02  6.753E-03
INT. OF CUR.
 -4.079E-10 -3.540E-10 -2.784E-10 -1.955E-10 -1.136E-10  4.896E-11  7.311E-10  1.195E-09  1.643E-09  1.918E-09
 -4.560E-10 -7.949E-10 -1.067E-09 -1.195E-09 -1.179E-09  1.179E-09  1.195E-09  1.067E-09  7.949E-10  4.560E-10

TIME STEP   99  TIME= 2.356E-06 CURRENT-
 -3.611E-02 -3.482E-02 -3.142E-02 -2.595E-02 -1.832E-02 -1.065E-02 -3.171E-03 -5.604E-03 -8.108E-03 -9.914E-03
 -3.871E-03 -6.877E-03 -9.664E-03 -1.167E-02 -1.295E-02  1.295E-02  1.167E-02  9.664E-03  6.877E-03  3.871E-03

INT. OF CUR.
 -1.363E-09 -1.273E-09 -1.105E-09 -8.753E-10 -5.920E-10 -3.259E-10  6.974E-10  1.130E-09  1.542E-09  1.789E-09
 -5.852E-10 -1.024E-09 -1.385E-09 -1.573E-09 -1.590E-09  1.590E-09  1.573E-09  1.385E-09  1.024E-09  5.852E-10
```

```
TIME STEP  100  TIME= 2.380E-06 CURRENT-
  -2.570E-02 -2.499E-02 -2.277E-02 -1.899E-02 -1.354E-02 -7.962E-03 -6.259E-03 -1.056E-02 -1.483E-02 -1.766E-02
  -6.236E-04 -1.176E-03 -1.898E-03 -2.770E-03 -3.829E-03  3.829E-03  2.770E-03  1.898E-03  1.176E-03  6.236E-04

INT. OF CUR.
  -2.114E-09 -1.999E-09 -1.763E-09 -1.421E-09 -9.790E-10 -5.521E-10  5.832E-10  9.338E-10  1.264E-09  1.454E-09
  -6.399E-10 -1.122E-09 -1.526E-09 -1.749E-09 -1.794E-09  1.794E-09  1.749E-09  1.526E-09  1.122E-09  6.399E-10
 RUNNING TIME IN MICROSECONDS =  1866420
 RUNNING TIME IN MICROSECONDS =      430
```



CURRENT ON FUSELAGE BEHIND WINGS OF A 747 AIRCRAFT