EXAMPLE 3

INSTITUTE FOR TELECOMMUNICATIONS SCIENCES

GROUND WAVE VOICE OF AMERICA(GWVOA)
over Smooth and Irregular Homogeneous or Inhomogeneous
Earth with Linear Atmosphere
Version 6.1, 4/01/86
FRI 25 APR 1986 12:18:57

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CHOOSE FROM THE MENU:
     H=HELP
     D=PROGRAM DESCRIPTION
     C=CONCISE DIALOG
     V=VERBOSE DIALOG
     E=EDIT DATA
     S=SUMMARY OF DATA
     P=PROCEED
     Q=QUIT

MENU(VERBOSE)=?

     1 - RECEIVED SIGNAL/NOISE; SINGLE FREQ & DIRECTION (SN)
     2 - RECEIVED SIGNAL/NOISE; MULTIPLE INPUT          (NM)
     3 - ACHIEVABLE DISTANCE; MULTIPLE INPUT            (DM)
PROCESSING OPTION( 1) >?
INPUT DATA
CR TO SPECIFY DEFAULT OPTIONS AS SHOWN IN PARENS

     1 - DISTANCE UNIT = KM, HEIGHT UNIT = METERS
     2 - DISTANCE UNIT = MILES, HEIGHT, UNIT = FT.
METRIC OR ENGLISH( 1) >?

RF FREQUENCY (  .01 TO 30.00 )
 1) RF FREQUENCY( 5.00 MHZ)? .2

TRANSMITTER ANTENNA HEIGHT (    0.0 TO  12000.0 )
 2) TRANSMITTER ANTENNA HEIGHT(   2.0 M. )?  0

RECEIVER ANTENNA HEIGHT (     0.0 TO  12000.0 )
 3) RECEIVER ANTENNA HEIGHT(     2.0 M. )? 0

     1 - LATS AND LONGS OF BOTH ANTENNAS
     2 - LAT&LONG OF TRANSMITTER, BEARING AND DISTANCE TO RECEIVER
 4) ANTENNA RANGE OPTIONS          ( 1) >?2

DISTANCE BETWEEN ANTENNAS (    1.00 TO 21000.00 )
 5) DISTANCE BETWEEN ANTENNAS(  100.00 KM.)? 20

TRANSMITTER LATITUDE (-89.99 TO  89.99 )
INPUTS OF THE FORM X,Y,Z IMPLY DEGREES,MINUTES,SECONDS
INPUTS OF THE FORM X.Y IMPLY DECIMAL DEGREES
 6) TRANSMITTER LATITUDE(  40.03 )?
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EXAMPLE 3 (cont.)

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TRANSMITTER LONGITUDE (-180.00 TO  180.00 )
 7) TRANSMITTER LONGITUDE(-105.30 )?

BEARING (  0.00 TO 360.00 )
10) BEARING( 10.00  )?

     1 - VERTICAL  (V)
     2 - HORIZONTAL(H)
14) ANTENNA POLARIZATION          ( 1) >?

     1 - VERTICAL MONOPOLE                (VM)
     2 - 3 MONOPOLE ARRAY                 (3M)
     3 - 4 MONOPOLE ARRAY                 (4M)
     4 - 6 MONOPOLE ARRAY                 (6M)
     5 - FERRITE LOOP                     (FL)
     6 - FIELD STRENGTH OPTION            (FS)
     7 - USER GAIN INPUT                  (UG)
15) TRANSMITTER ANTENNA TYPE         ( 1) >?

TRANSMITTER MONOPOLE LENGTH (  15.000 TO 1050.000 )
TRANSMITTER MONOPOLE LENGTH(  15.000 M. )>? 30

     1 - YES(Y)
     2 - NO (N)
DO YOU WANT A GROUND SCREEN( 1) >?

TRANSMITTER GROUND SCREEN RADIUS (     15.000 TO 100000.000 )
TRANSMITTER GROUND SCREEN RADIUS(     15.000 M. )>? 100

TRANSMITTER NUMBER OF RADIALS (  5. TO 360.  )
TRANSMITTER NUMBER OF RADIALS(  5. )>? 60

TRANSMITTER MONOPOLE EFFICIENCY (  1.00 TO 100.00%)
TRANSMITTER MONOPOLE EFFICIENCY(100.00%)>? 25

     1 - VERTICAL MONOPOLE                (VM)
     2 - 3 MONOPOLE ARRAY                 (3M)
     3 - 4 MONOPOLE ARRAY                 (4M)
     4 - 6 MONOPOLE ARRAY                 (6M)
     5 - FERRITE LOOP                     (FL)
     6 - FIELD STRENGTH OPTION            (FS)
     7 - USER GAIN INPUT                  (UG)
16) RECEIVER ANTENNA TYPE            ( 1) >?

RECEIVER    MONOPOLE LENGTH (  15.000 TO 1050.000 )
RECEIVER    MONOPOLE LENGTH(  30.000 M. )>?

     1 - YES(Y)
     2 - NO (N)
DO YOU WANT A GROUND SCREEN( 1) >?
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EXAMPLE 3 (cont.)

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RECEIVER    GROUND SCREEN RADIUS (    15.000 TO 100000.000 )
RECEIVER    GROUND SCREEN RADIUS(   100.000 m. )>?

RECEIVER    NUMBER OF RADIALS (  5. TO 360. )
RECEIVER    NUMBER OF RADIALS( 60. )>?

RECEIVER    MONOPOLE EFFICIENCY (  1.00 TO 100.00%)
RECEIVER    MONOPOLE EFFICIENCY( 25.00%)>?

ACTUAL TRANSMITTER INPUT POWER (     .0001 TO 10000.0000 )
18) ACTUAL TRANSMITTER INPUT POWER(    1.0000 Kw)? 2

21) LOCAL TIME OF DAY (FORMAT HHMM)
    UP TO 24 VALUES.  999 INDICATES END OF LIST.
TIME      NO. 1>1200
TIME      NO. 2>999

22) SEASONS
    UP TO 4 VALUES, 999 INDICATES END OF LIST.
1 - DEC,JAN,FEB(DJF)
2 - MAR,APR,MAY(MAM)
3 - JUN,JUL,AUG(JJA)
4 - SEP,OCT,NOV(SON)
SEASON    NO. 1>1
SEASON    NO. 2>999

REQUIRED RELIABILITY (   .01 TO 100.00%)
23) REQUIRED RELIABILITY(90.00%)?

     1 - 127.2   BUSINESS
     2 - 131.5   RESIDENTIAL
     3 - 136.8   RURAL
     4 - 150.4   QUIET RURAL
24) MAN MADE NOISE(-DBW) AT 1 MHZ ( 1) >?4

     1 - SMOOTH EARTH            (SE  )
     2 - SMOOTH EARTH, MIXED PATH(SEMP)
     3 - IRREG. EARTH, MIXED PATH(IEMP)
26) PROCESSING METHOD             ( 1) >?3

EARTH RADIUS RATIO ( .500 TO 3.000 )
27) EARTH RADIUS RATIO(1.333 )?

     1 - SINGLE CALCULATION AT THE RECEIVER
     2 - INCREMENTAL CALCULATIONS BETWEEN XMITTER AND RECEIVER
28) TYPE OF OUTPUT                ( 1) >?

32)  GROUND CONSTANTS
YOU MAY SPECIFY UP TO 50 GROUND SEGMENTS
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     1 - YES(Y)
     2 - NO (N)
WILL YOU WANT TO DEFINE A SLAB ON ANY OF THE GROUND SEGMENTS?( 2) >?1
YOUR TOTAL DISTANCE IS          20.000 KM.
SIGMA = CONDUCTIVITY(.00001 - 100. SIEMENS/METER)
EPSILON = RELATIVE PERMITTIVITY (1 - 100)
SEGMENT NO.  1

SIGMA (    .0000001 TO 100.0000000 )
SIGMA(    .1000000 )>? .01

EPSILON (  1.000 TO 100.000 )
EPSILON(  1.000 )>? 10

SEGMENT LENGTH (       0.000 TO 1000000.000 )
SEGMENT LENGTH(       1.000 KM.)>? 5

     1 - YES(Y)
     2 - NO (N)
DO YOU WANT A SLAB ON THIS SEGMENT?( 2) >?1
SLAB INPUT

SIGMA (  .000010 TO 100.00000 )
SIGMA( 1.000000 )>? .0005

EPSILON (  1.000 TO 100.000 )
EPSILON(  1.000 )>? 5

SLAB THICKNESS (  0.000 TO 700.000 )
SLAB THICKNESS(  1.000 M. )>? 10
DISTANCE REMAINING IS    15.00 KM.
SEGMENT NO.  2

SIGMA (    .0000001 TO 100.0000000 )
SIGMA(    .1000000 )>? .05

EPSILON (  1.000 TO 100.000 )
EPSILON(  1.000 )>? 15

SEGMENT LENGTH (       0.000 TO 1000000.000 )
SEGMENT LENGTH(       1.000 KM.)>? 5

     1 - YES(Y)
     2 - NO (N)
DO YOU WANT A SLAB ON THIS SEGMENT?( 1) >?2
DISTANCE REMAINING IS    10.00 KM.
SEGMENT NO.  3

SIGMA (    .0000001 TO 100.0000000 )
SIGMA(    .1000000 )>? .01
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EXAMPLE 3 (cont.)

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EPSILON ( 1.000 TO 100.000 )
EPSILON( 1.000 )>? 15

SEGMENT LENGTH (      0.000 TO 1000000.000 )
SEGMENT LENGTH(      1.000 KM.)>? 10

     1 - YES(Y)
     2 - NO (N)
DO YOU WANT A SLAB ON THIS SEGMENT?( 2) >?1
SLAB INPUT

SIGMA (  .000010 TO 100.00000 )
SIGMA( 1.000000 )>? .001

EPSILON (  1.000 TO 100.000 )
EPSILON(  1.000 )>? 15

SLAB THICKNESS (  0.000 TO 700.000 )
SLAB THICKNESS(  1.000 M. )>? 5

MENU(SUMMARY)=? P

     1 - OBTAIN TERRAIN DATA FROM FILE
     2 - INPUT TERRAIN DATA MANUALLY
TERRAIN DATA MANAGEMENT( 1) >?2
YOU WILL BE ASKED FOR ALTITUDE VALUES AT POINT BETWEEN XMITTER AND RCVR.
THESE POINTS ARE DETERMINED BY THE SIZE OF INTERVAL YOU SPECIFY.
INTERVAL SIZE(   1.00000 KM.)>? 2
 1) ALTITUDE AT      0.000 KM. FROM XMITTER(    0.00 M. )? 50
 2) AT      2.000 KM.(    0.00 M. )? 40
 3) AT      4.000 KM.(    0.00 M. )? 30
 4) AT      6.000 KM.(    0.00 M. )? 50
 5) AT      8.000 KM.(    0.00 M. )? 40
 6) AT     10.000 KM.(    0.00 M. )? 20
 7) AT     12.000 KM.(    0.00 M. )? 40
 8) AT     14.000 KM.(    0.00 M. )? 40
 9) AT     16.000 KM.(    0.00 M. )? 50
10) AT     18.000 KM.(    0.00 M. )? 70
11) AT     20.000 KM.(    0.00 M. )? 60

     1 - OBTAIN TERRAIN DATA FROM FILE
     2 - INPUT TERRAIN DATA MANUALLY
     3 - SUMMARY OF TERRAIN DATA
     4 - EDIT TERRAIN DATA
     5 - ALL DONE
TERRAIN DATA MANAGEMENT( 2) >?4
DATA NUMBER>?7

ALTITUDE AT     12.000 KM. FOR XMITTER (     0.00 TO 40000.00)
 7) ALTITUDE AT     12.000 KM. FROM XMITTER(   40.00 M. )? 45
DATA NUMBER>?
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```
     1 - OBTAIN TERRAIN DATA FROM FILE
     2 - INPUT TERRAIN DATA MANUALLY
     3 - SUMMARY OF TERRAIN DATA
     4 - EDIT TERRAIN DATA
     5 - ALL DONE
TERRAIN DATA MANAGEMENT( 4) >?5
                        APPROX. RELATIVE ERROR
                           (FIELD STRENGTH)
                           WRT MEASURED DATA
         RUN TIME          MEAN    STND. DEV.
           (SEC)           (dB)       (dB)
IEMP          4.3           -.4       4.7
SEMP          9.6           2.8       4.2
SE            4.0           2.8       4.2

     1 - YES(Y)
     2 - NO (N)
DO YOU WISH TO PROCESS THIS DATA SET( 1) >?

INPUT TITLE, 1 TO 80 CHARACTERS
EXAMPLE 3
CALCULATION IN PROGRESS
EXAMPLE 3

PROCESSING METHOD = IRREG. EARTH, MIXED PATH

RF FREQUENCY =   .20
TRANSMITTER ANTENNA HEIGHT =    0.0
RECEIVER ANTENNA HEIGHT    =    0.0
TRANSMITTER SITE    BEARING          DISTANCE          RECEIVER SITE
40.03N - 105.30W     10.0      20.0KM    12.4MI   40.21N - 105.26W
ANTENNA POLARIZATION = VERTICAL
TRANSMITTER ANTENNA TYPE = VERTICAL MONOPOLE
TRANSMITTER MONOPOLE LENGTH                      30.0000
TRANSMITTER GROUND SCREEN RADIUS                100.0000
TRANSMITTER NUMBER OF RADIALS                    60.0000
TRANSMITTER MONOPOLE EFFICIENCY       25.0000%
RECEIVER ANTENNA TYPE    = VERTICAL MONOPOLE
RECEIVER    MONOPOLE LENGTH                      30.0000
RECEIVER    GROUND SCREEN RADIUS                100.0000
RECEIVER    NUMBER OF RADIALS                    60.0000
RECEIVER    MONOPOLE EFFICIENCY       25.0000%
EFFECTIVE EARTH RADIUS/ACTUAL EARTH RADIUS = 1.333
ACTUAL TRANSMITTER INPUT POWER =   2.0000KW
TRANSMITTER ANTENNA GAIN = -18.     RECEIVER ANTENNA GAIN = -18.
MAN MADE NOISE(-DBW) AT 1 MHZ =  150.40DBW
REQUIRED RELIABILITY = 90.0%
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EXAMPLE 3 (cont.)

GROUND SEGMENT AND SLAB DATA

NO.	SIGMA	EPSILON	KM. FROM XMITTER	LENGTH (KM.)	SLAB SIGMA	SLAB EPSILON	SLAB THICKNESS (M.)
1	.0100	10.00	0.00	5.00	.0005	5.00	10.00
2	.0500	15.00	5.00	5.00			
3	.0100	15.00	10.00	10.00	.0010	15.00	5.00

DEC,JAN,FEB 1200LT

NO.	DISTANCE FROM XMITTER (KM.)	TRANSMISSION LOSS (DB)	RECEIVED POWER (DBW)	E FIELD (DBU)	NOISE (DBW/HZ)	RECEIVED S/N DENS (DB)
1	20.00	109.8	-112.8	-7.6	-132.0	19.1

PRESS CR TO CONTINUE

1 - YES(Y)
2 - NO (N)
DO YOU WISH TO PROCESS ANOTHER DATA SET(1) >?2
PROGRAM GWVOA COMPLETED