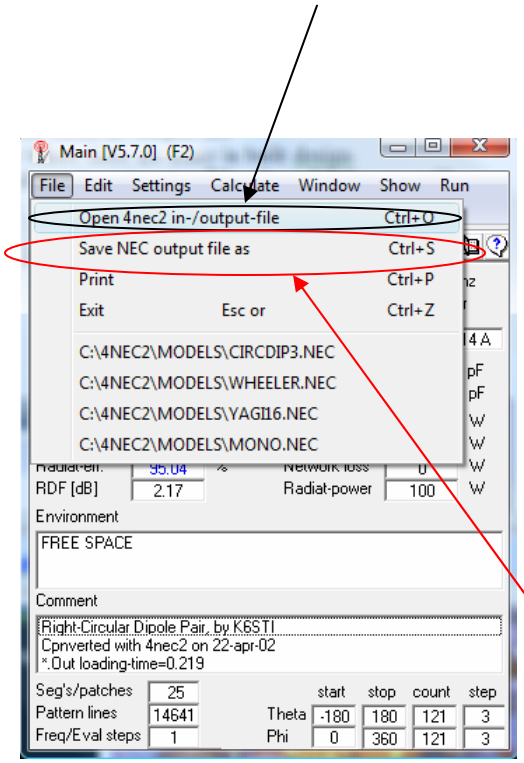
NEC Tutorial

1) Download the folder 4-nec2 from the class website.
2) Run the program 4nec2
3) Open a design eg: File> Open 4nec2 in-/output-file

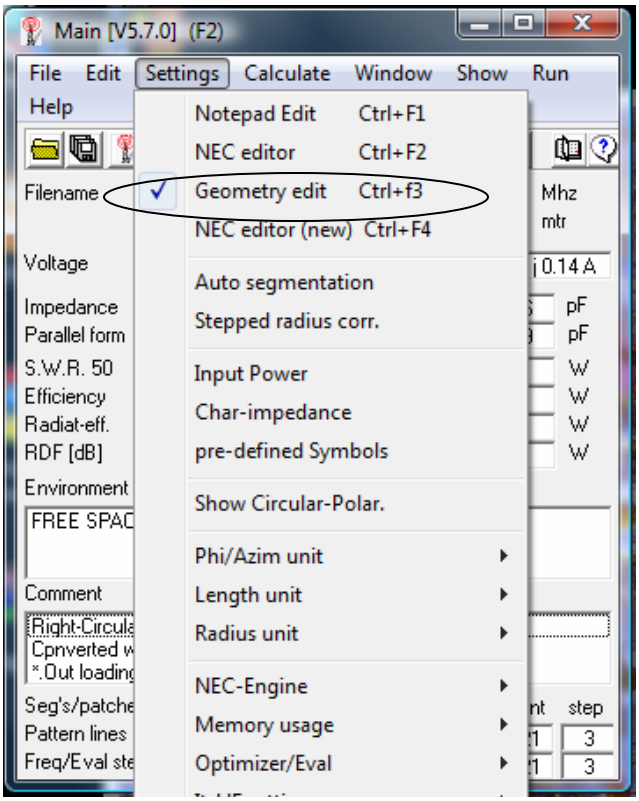


4) Step 3 takes you to a folder where there are many in built design.
5) Open one of the designs and save it again using **File> Save NEC output file as** and give it an apt file name.
6) Start your design:

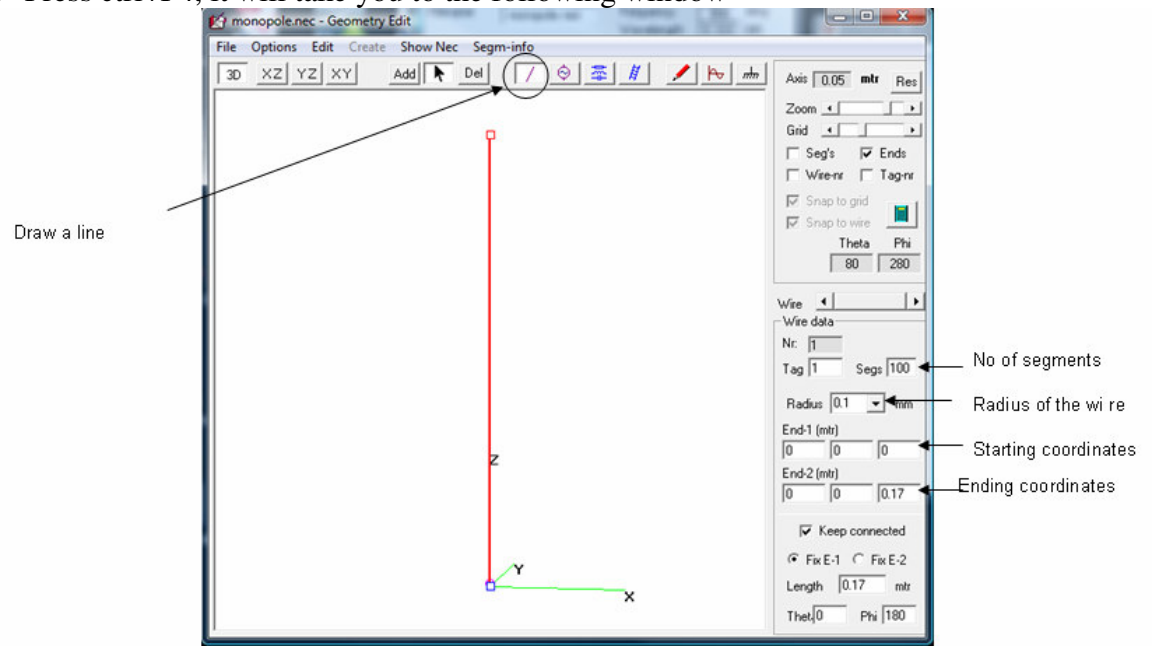
Example 1

Design a half-wave monopole antenna at 900 MHz.(Assuming that you have already calculated the wavelength and the length of the dipole in meters)

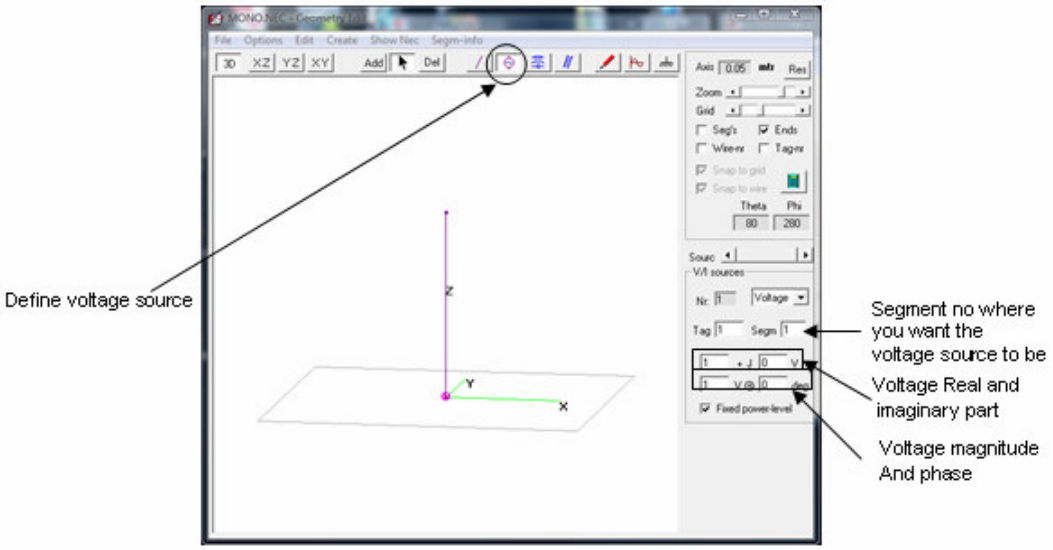
a) Select the Geometry edit from the drop- down menu as shown in the figure below



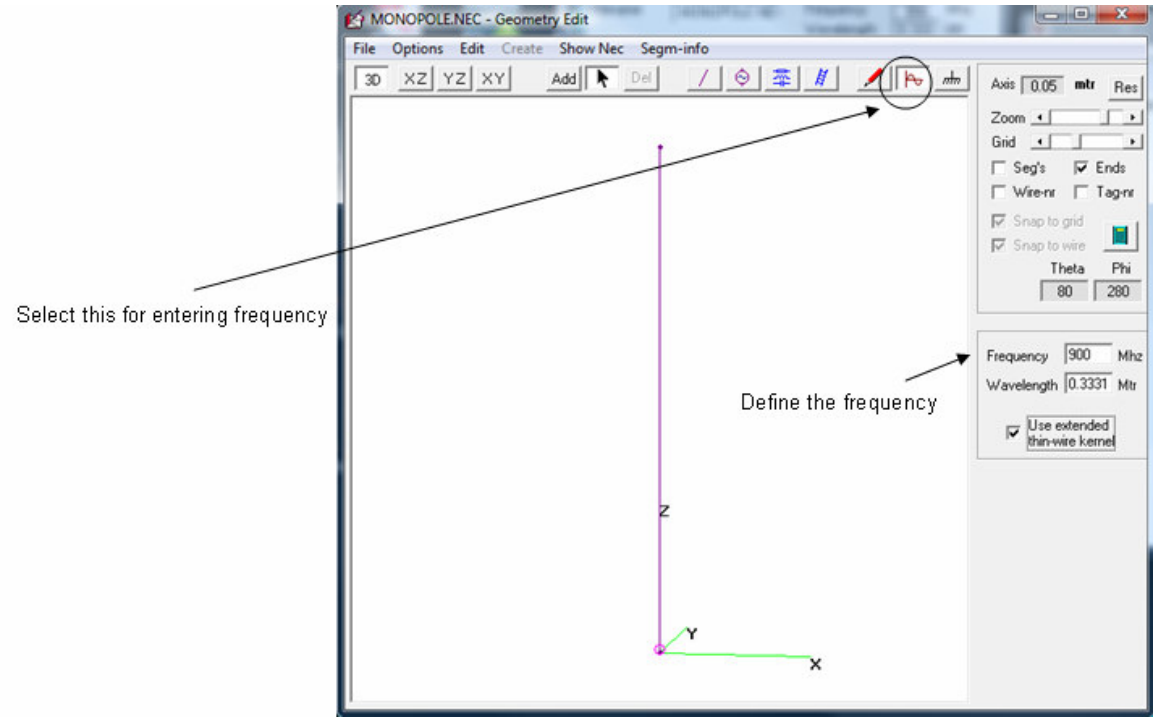
b) Press ctrl+F4, it will take you to the following window



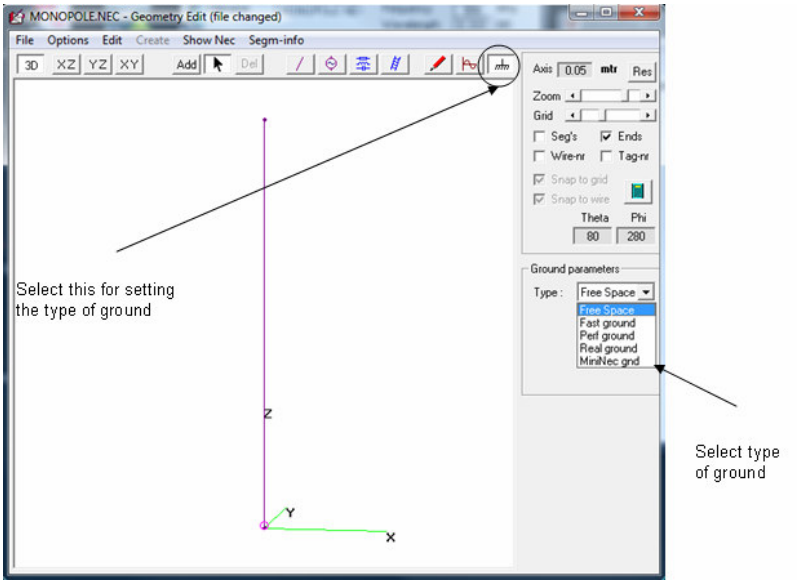
c) Define the wire parameters as shown above
d) Define the voltage parameters as shown below



e) Define the frequency terms as shown below

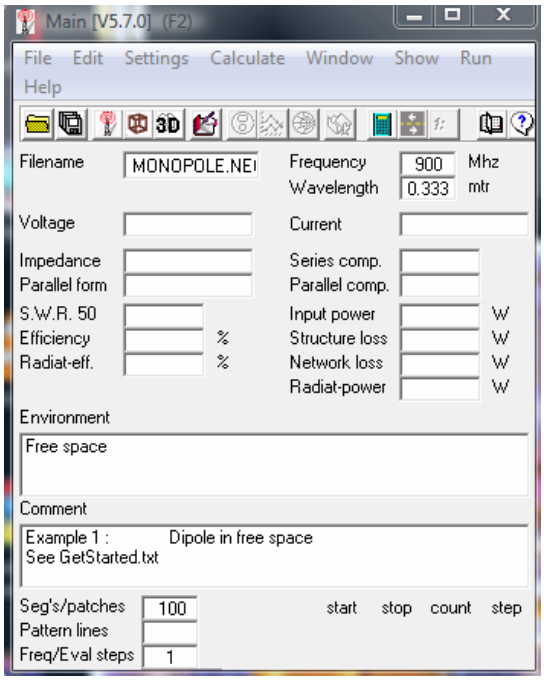


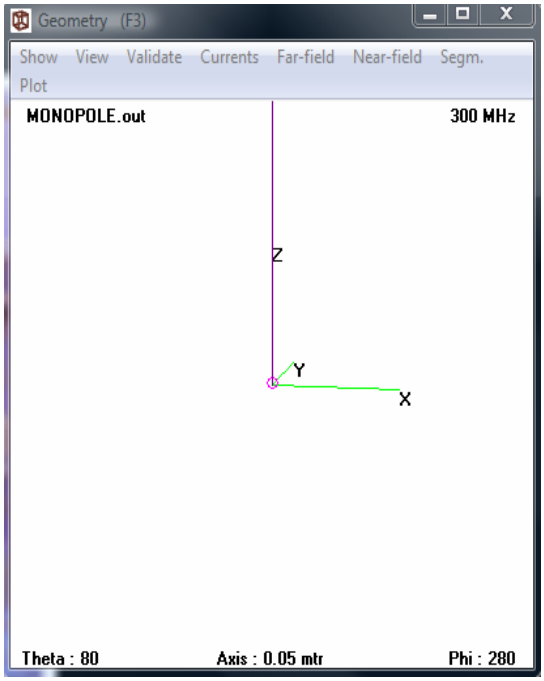
f) Select the type of ground



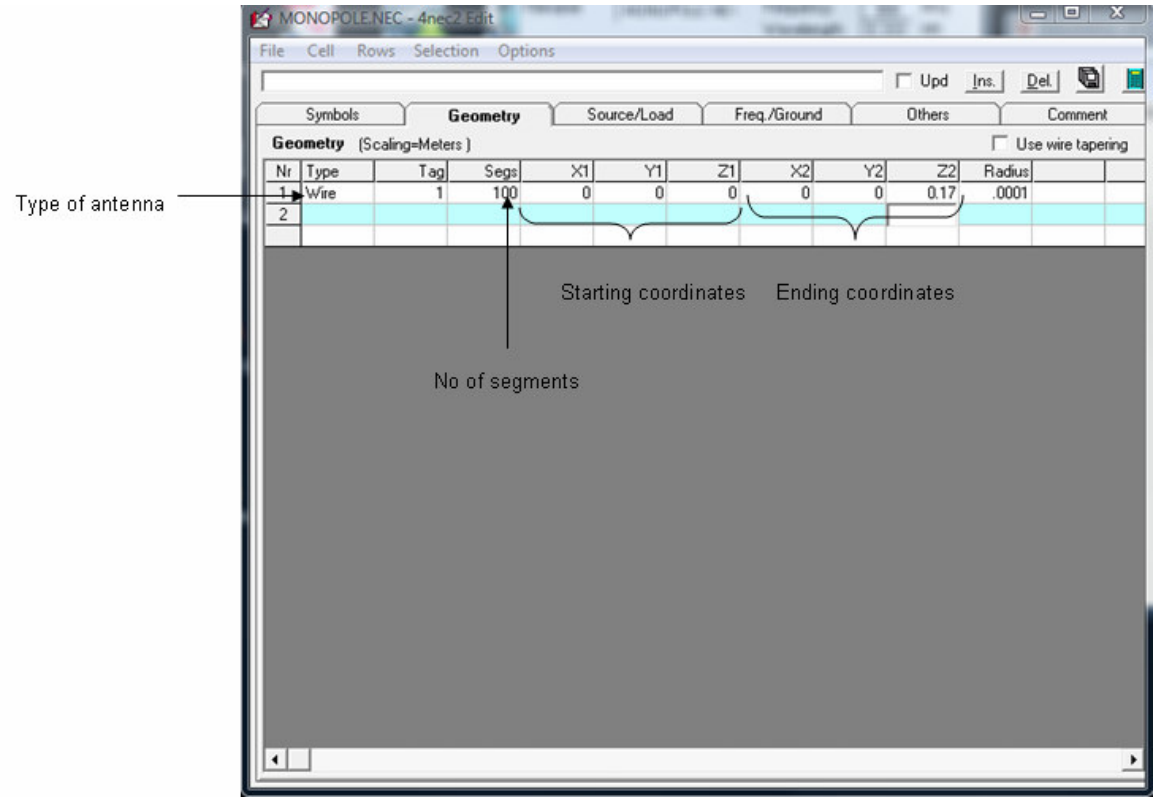
g) Save the design using **File > Save**

h) Once you have saved the design then the following window will show up

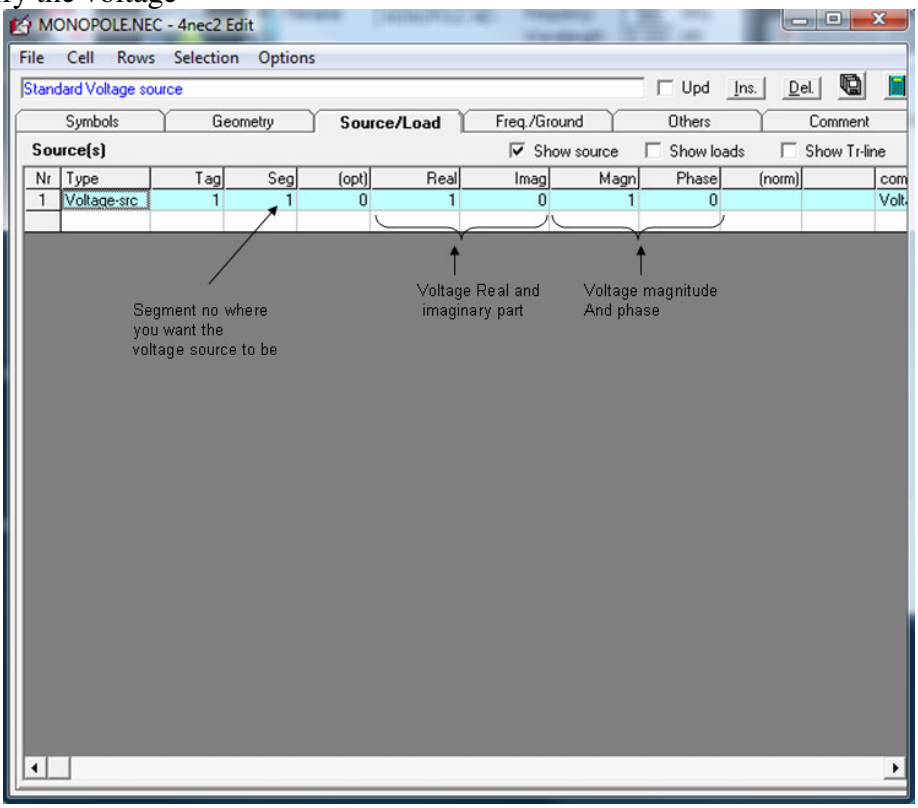




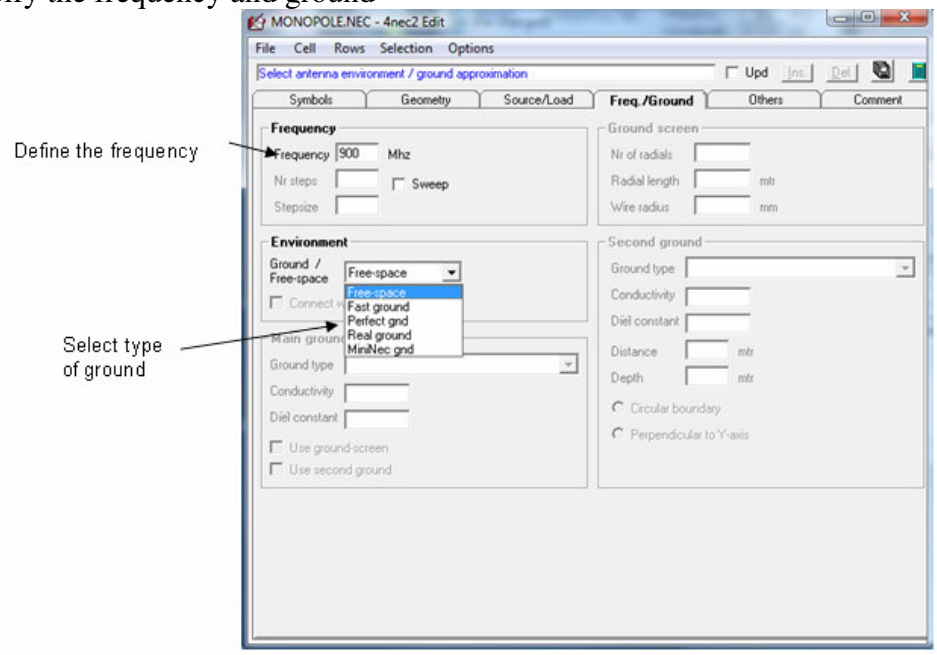
i) Another method of designing antennas (Press F3, the following window will open)

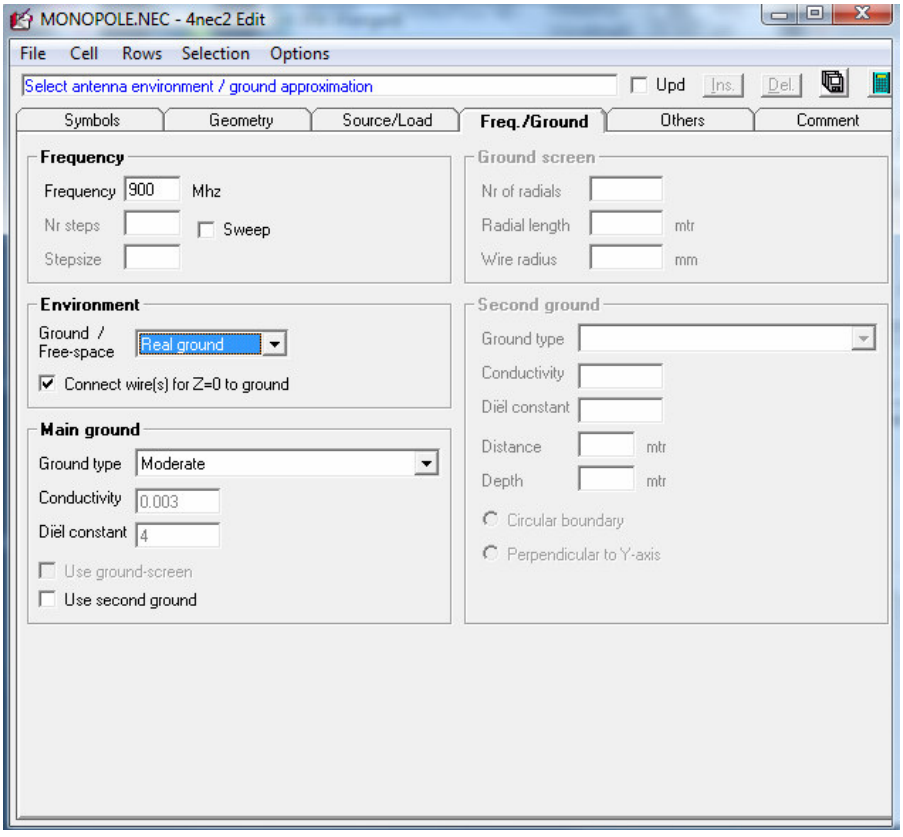


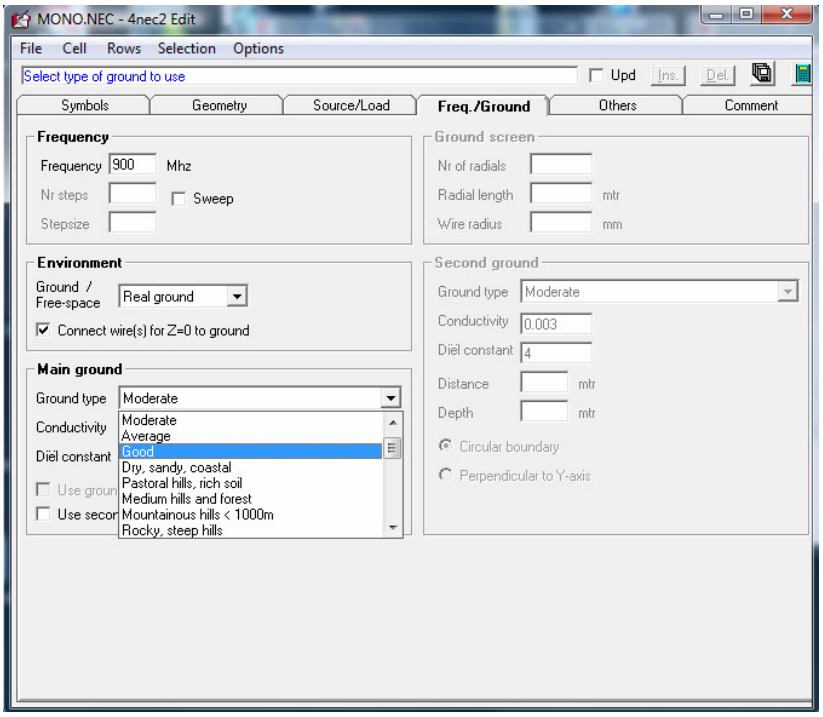
j) Specify the voltage



k) Specify the frequency and ground

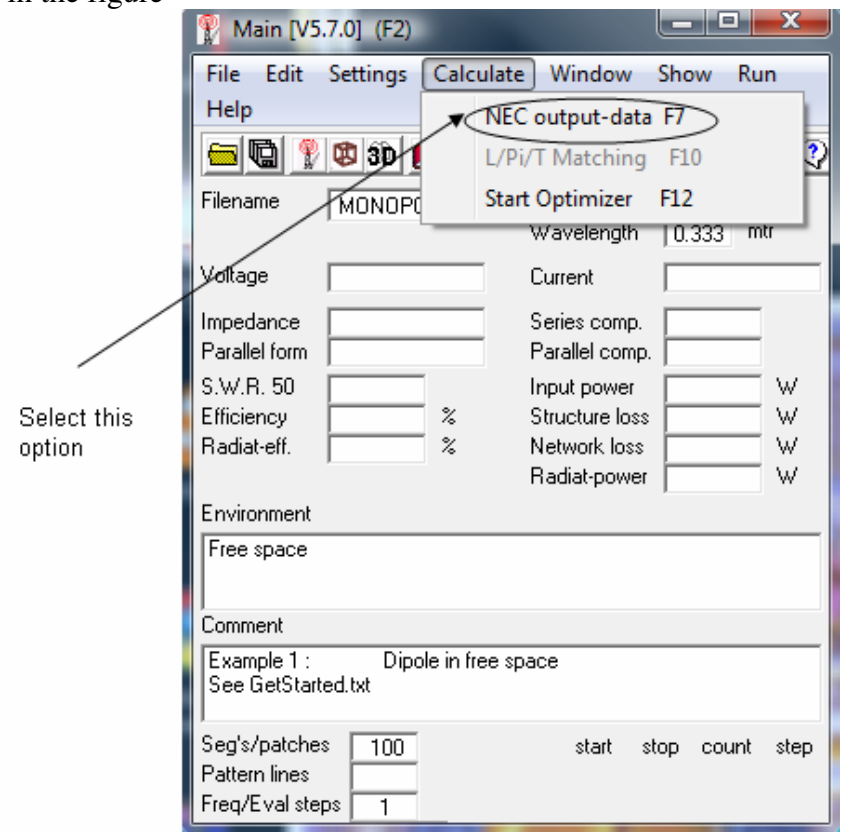




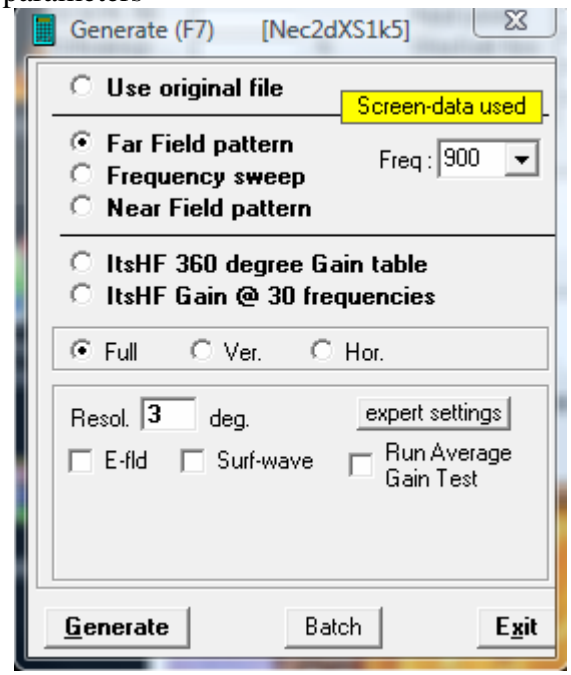


If you specify real ground you can choose the ground type and specify the conductivity and dielectric constant for the ground

l) The next step is calculation of radiation pattern and other terms. Choose the option shown in the figure



m) Generating output parameters



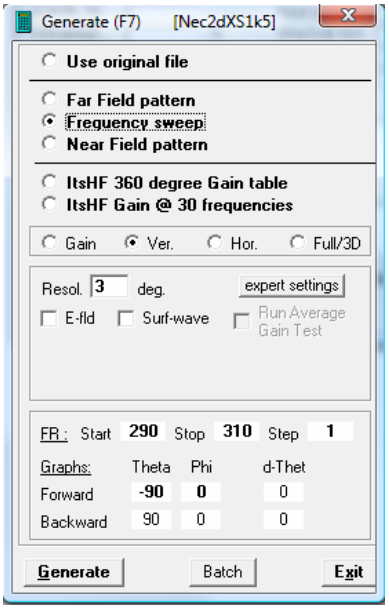
Far Field pattern: Used for calculating Far field antenna parameter
Frequency sweep: Used for calculating antenna parameters for a range of frequencies
ItsHF 360 degree Gain table: Generates gain table over 360 degree
ItsHF Gain @ 30 frequencies: shows the gain at various frequencies

n) Far field pattern

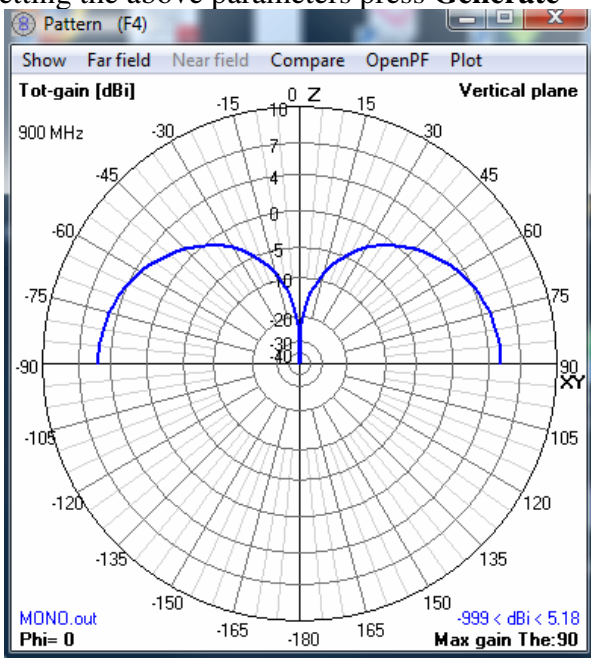
If you choose this option in the figure above, enter the Resolution

o) Frequency sweep

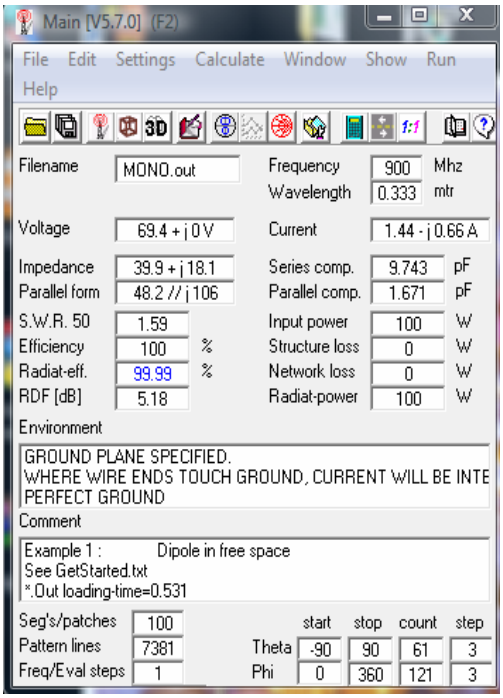
Set the start and stop frequency



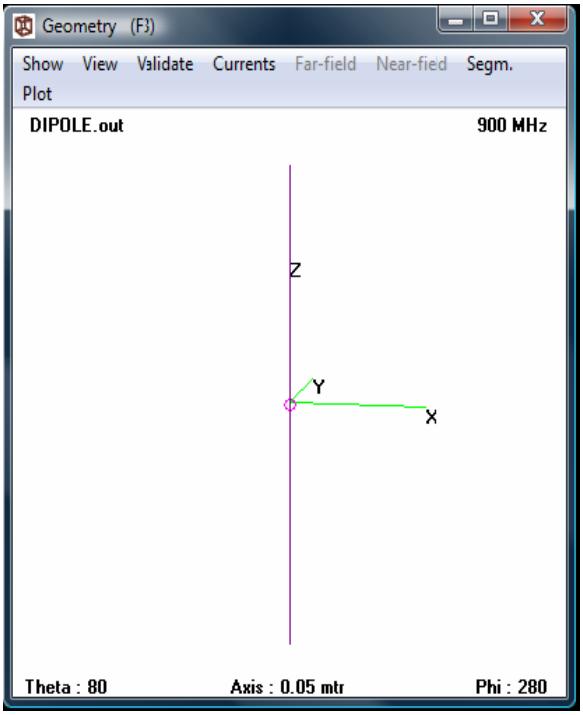
p) After setting the above parameters press **Generate**

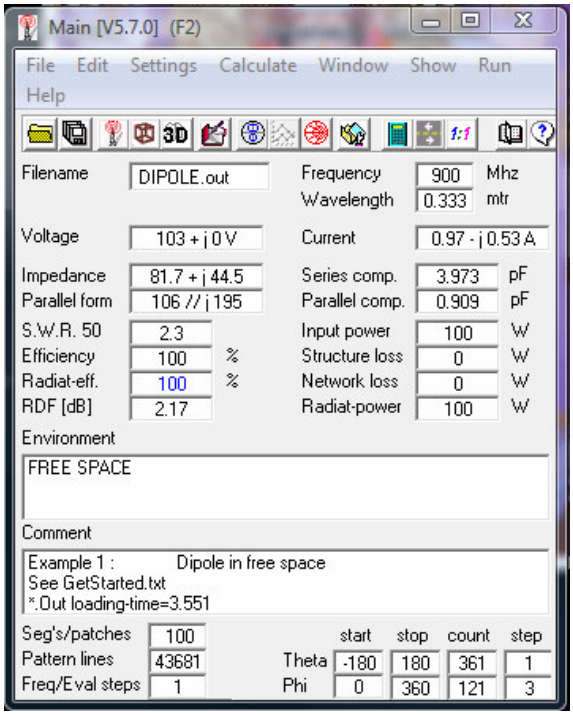


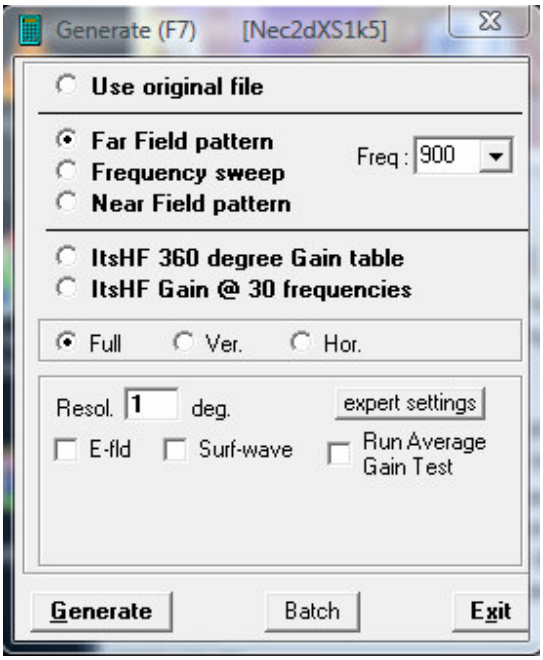
(Far field pattern)

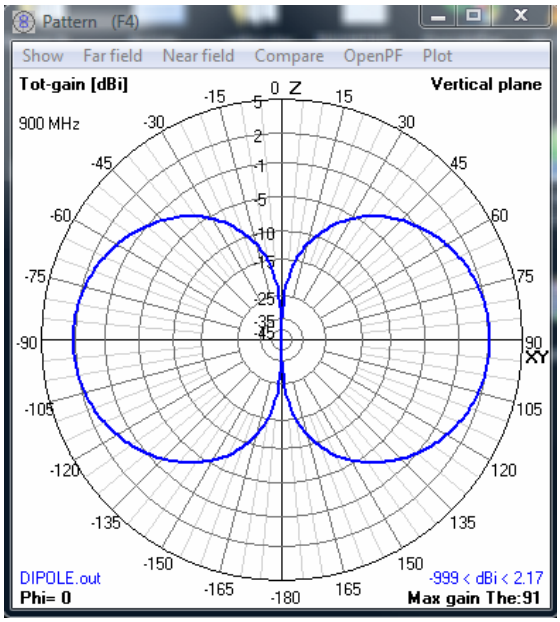


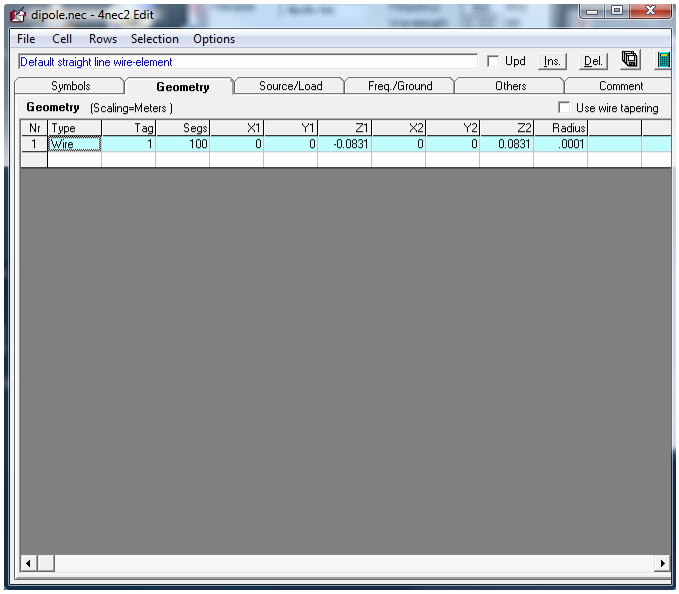
Example 2:


Geometry (F3)
Show View Validate Currents Far-field Near-fied Segm.
Plot
DIPOLE.out
900 MHz
Z
Y
X
Theta : 80
Axis : 0.05 mtr
Phi : 280

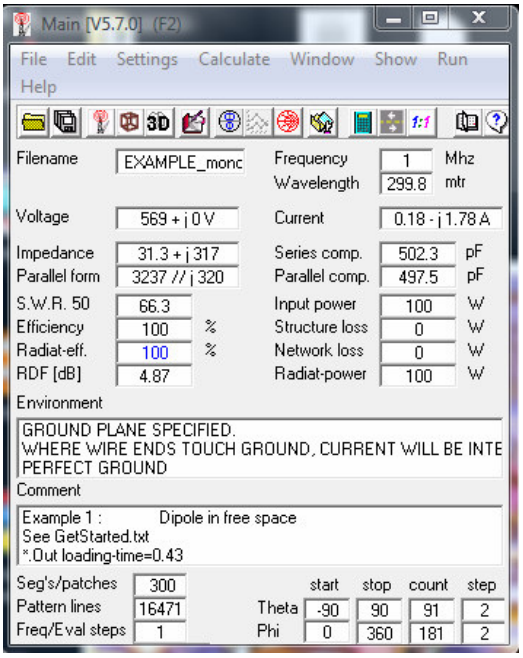

Main [V5.7.0] (F2)
File Edit Settings Calculate Window Show Run
Help
Filename DIPOLE.out
Frequency 900 Mhz
Wavelength 0.333 mtr
Voltage 103 + j 0 V
Current 0.97 - j 0.53 A
Impedance 81.7 + j 44.5
Parallel form 106 // j 195
Series comp. 3.973 pF
Parallel comp. 0.909 pF
S.W.R. 50 2.3
Efficiency 100 %
Radiat-eff. 100 %
RDF [dB] 2.17
Input power 100 W
Structure loss 0 W
Network loss 0 W
Radiat-power 100 W
Environment
FREE SPACE
Comment
Example 1 : Dipole in free space
See GetStarted.txt
*.Out loading-time=3.551
Seg's/patches 100
Pattern lines 43681
Freq/Eval steps 1
start stop count step
Theta -180 180 361 1
Phi 0 360 121 3

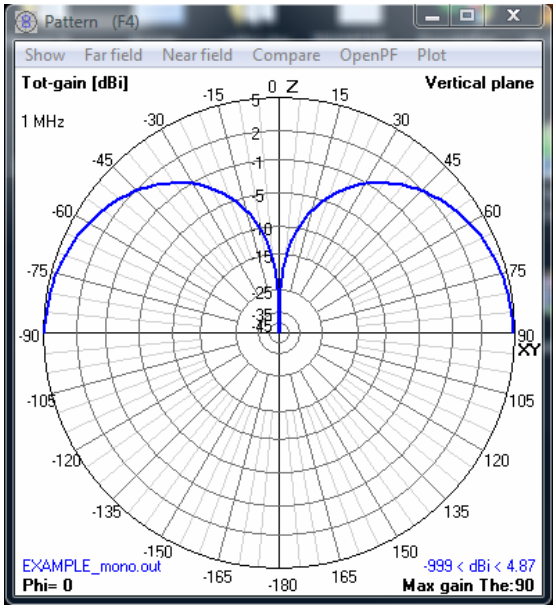

Generate (F7) [Nec2dXS1k5]
Use original file
Far Field pattern
Frequency sweep
Near Field pattern
Freq : 900
ItsHF 360 degree Gain table
ItsHF Gain @ 30 frequencies
Full Ver. Hor.
Resol. 1 deg.
expert settings
E-fld Surf-wave Run Average Gain Test
Generate
Batch
Exit

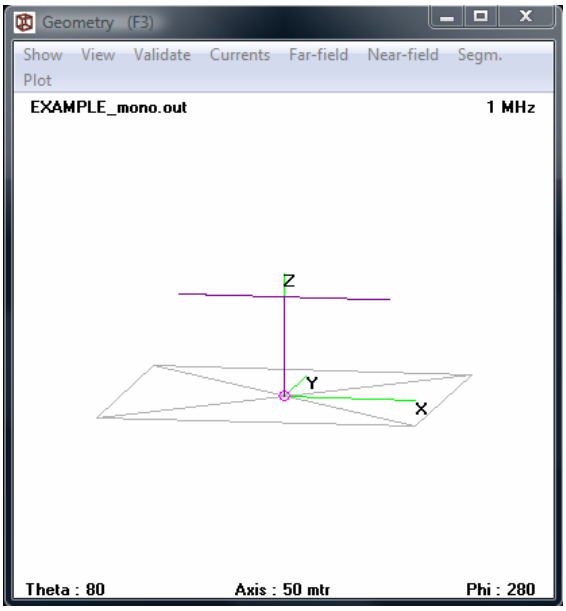

Pattern (F4)
Show Far field Near field Compare OpenPF Plot
Tot-gain [dBi]
Vertical plane
900 MHz
0 Z
15
30
45
60
75
90
XY
105
120
135
150
165
-180
-165
-150
-135
-120
-105
-90
-75
-60
-45
-30
-15
5
2
1
-5
-10
-15
-25
-35
-45
DIPOLE.out
Phi= 0
-999 < dBi < 2.17
Max gain The:91

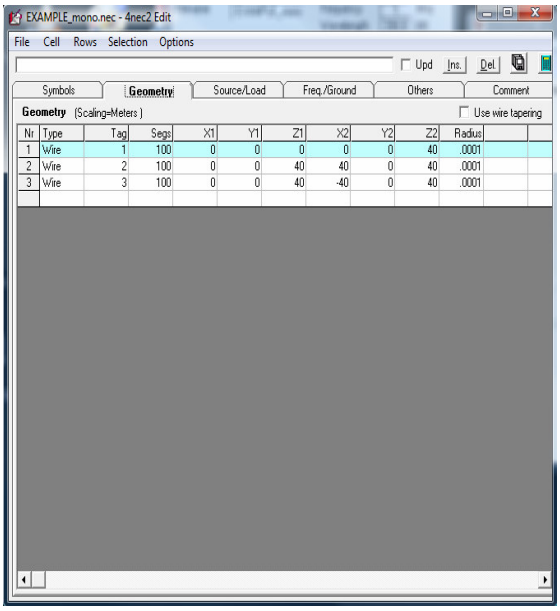

dipole.nec - 4nec2 Edit
File Cell Rows Selection Options
Default straight line wire-element
Upd Ins. Del.
Symbols Geometry Source/Load Freq./Ground Others Comment
Geometry (Scaling=Meters)
Use wire tapering
Nr Type Tag Segs X1 Y1 Z1 X2 Y2 Z2 Radius
1 Wire 1 100 0 0 -0.0831 0 0 0.0831 .0001

Example 3

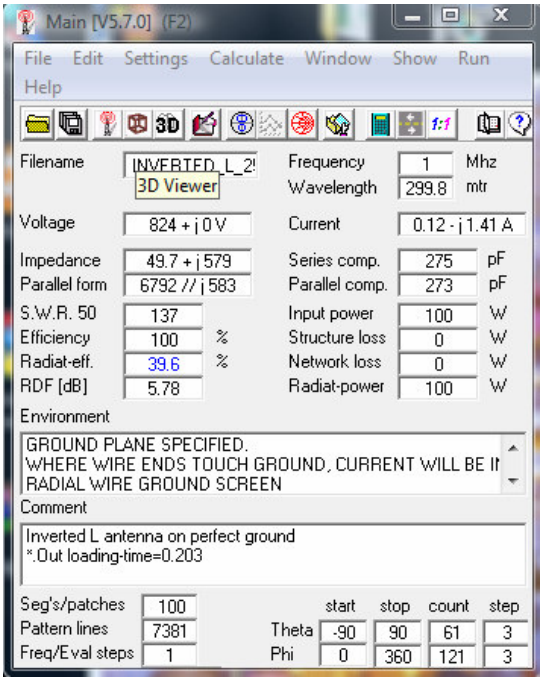

Main [V5.7.0] (F2)
File Edit Settings Calculate Window Show Run
Help
Filename EXAMPLE_monc
Frequency 1 Mhz
Wavelength 299.8 mtr
Voltage 569 + j 0 V
Current 0.18 - j 1.78 A
Impedance 31.3 + j 317
Series comp. 502.3 pF
Parallel form 3237 // j 320
Parallel comp. 497.5 pF
S.W.R. 50 66.3
Input power 100 W
Efficiency 100 %
Structure loss 0 W
Radiat-eff. 100 %
Network loss 0 W
RDF [dB] 4.87
Radiat-power 100 W
Environment
GROUND PLANE SPECIFIED.
WHERE WIRE ENDS TOUCH GROUND, CURRENT WILL BE INTE
PERFECT GROUND
Comment
Example 1 : Dipole in free space
See GetStarted.txt
*.Out loading-time=0.43
Seg's/patches 300
Pattern lines 16471
Freq/Eval steps 1
start stop count step
Theta -90 90 91 2
Phi 0 360 181 2

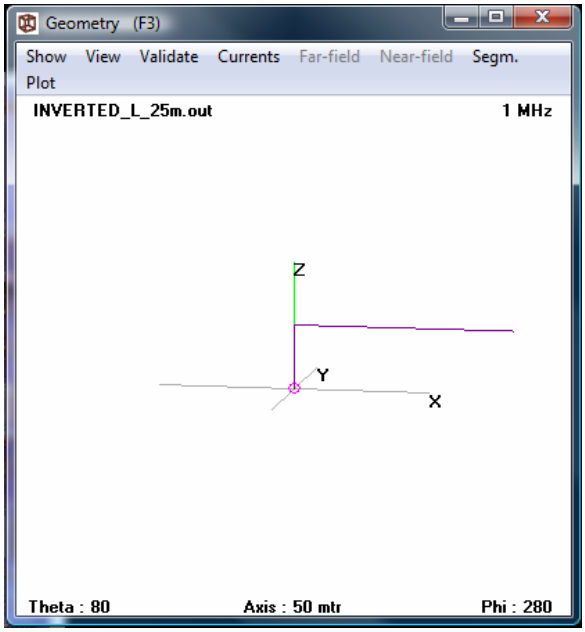

Pattern (F4)
Show Far field Near field Compare OpenPF Plot
Tot-gain [dBi]
Vertical plane
1 MHz
0 Z
15
30
45
60
75
90
XY
105
120
135
150
165
180
-15
-30
-45
-60
-75
-90
-105
-120
-135
-150
-165
EXAMPLE_mono.out
-999 < dBi < 4.87
Phi= 0
Max gain The:90

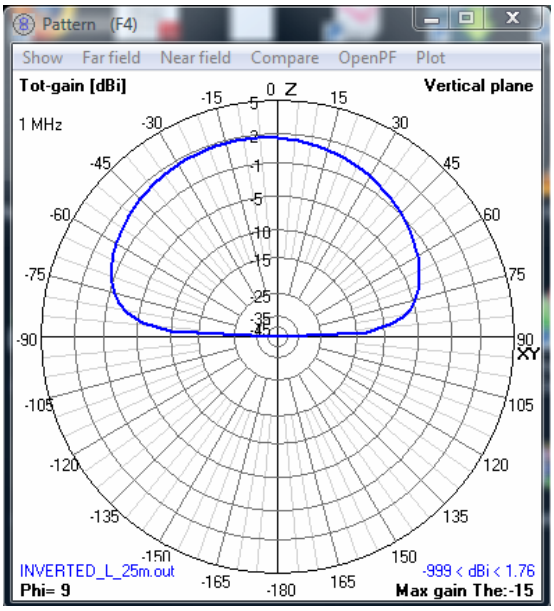

Geometry (F3)
Show View Validate Currents Far-field Near-field Segm.
Plot
EXAMPLE_mono.out
1 MHz
Z
Y
X
Theta : 80
Axis : 50 mtr
Phi : 280

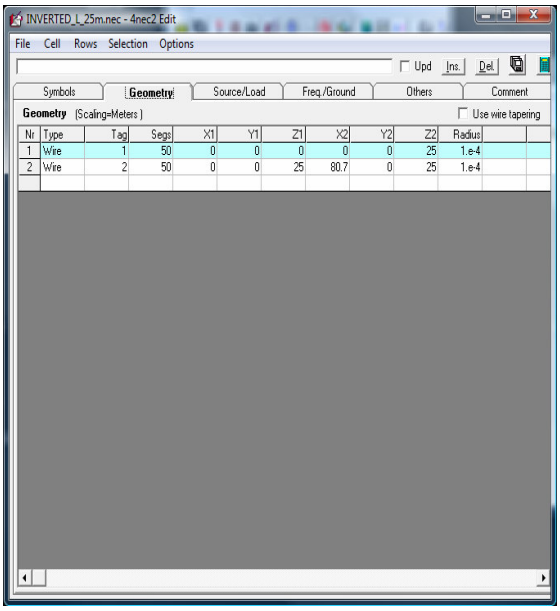

EXAMPLE_mono.nec - 4nec2 Edit
File Cell Rows Selection Options
Upd Ins. Del
Symbols Geometry Source/Load Freq./Ground Others Comment
Geometry (Scaling=Meters)
Use wire tapering
Nr Type Tag Segs X1 Y1 Z1 X2 Y2 Z2 Radius
1 Wire 1 100 0 0 0 0 0 40 .0001
2 Wire 2 100 0 0 40 40 0 40 .0001
3 Wire 3 100 0 0 40 -40 0 40 .0001

Example 4

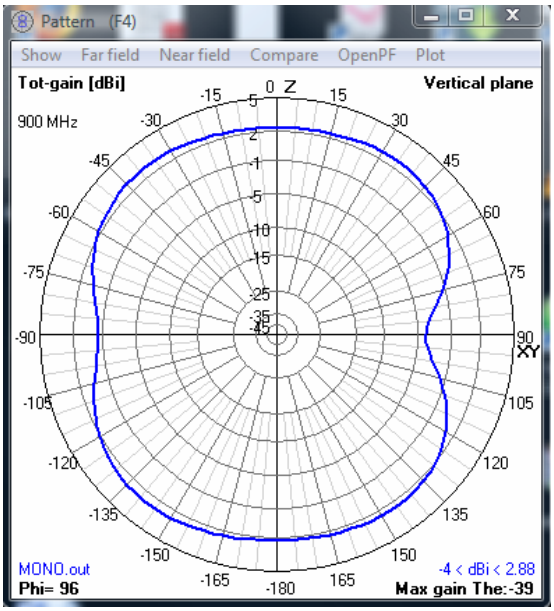

Main [V5.7.0] (F2)
File Edit Settings Calculate Window Show Run
Help
Filename
3D Viewer
Frequency 1 Mhz
Wavelength 299.8 mtr
Voltage 824 + j 0 V
Current 0.12 - j 1.41 A
Impedance 49.7 + j 579
Series comp. 275 pF
Parallel form 6792 // j 583
Parallel comp. 273 pF
S.W.R. 50 137
Input power 100 W
Efficiency 100 %
Structure loss 0 W
Radiat-eff. 39.6 %
Network loss 0 W
RDF [dB] 5.78
Radiat-power 100 W
Environment
GROUND PLANE SPECIFIED.
WHERE WIRE ENDS TOUCH GROUND, CURRENT WILL BE I
RADIAL WIRE GROUND SCREEN
Comment
Inverted L antenna on perfect ground
*.Out loading-time=0.203
Seg's/patches 100
Pattern lines 7381
Freq/Eval steps 1
start stop count step
Theta -90 90 61 3
Phi 0 360 121 3

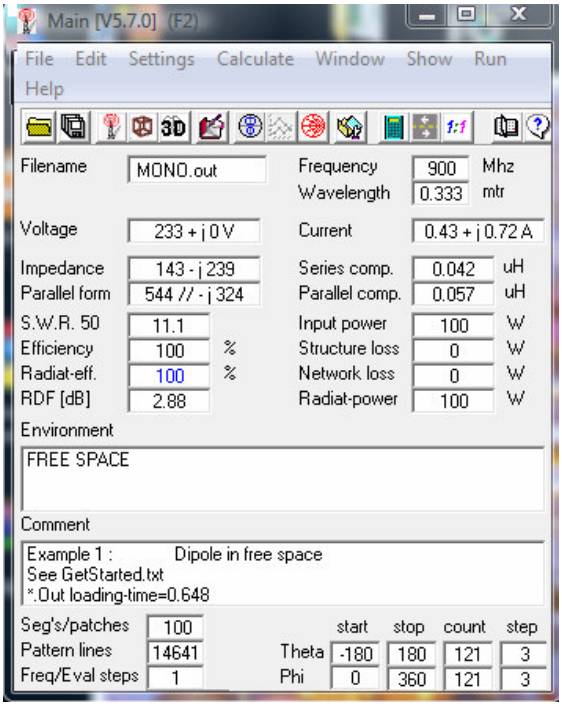

Geometry (F3)
Show View Validate Currents Far-field Near-field Segm.
Plot
INVERTED_L_25m.out
1 MHz
Z
Y
X
Theta : 80
Axis : 50 mtr
Phi : 280

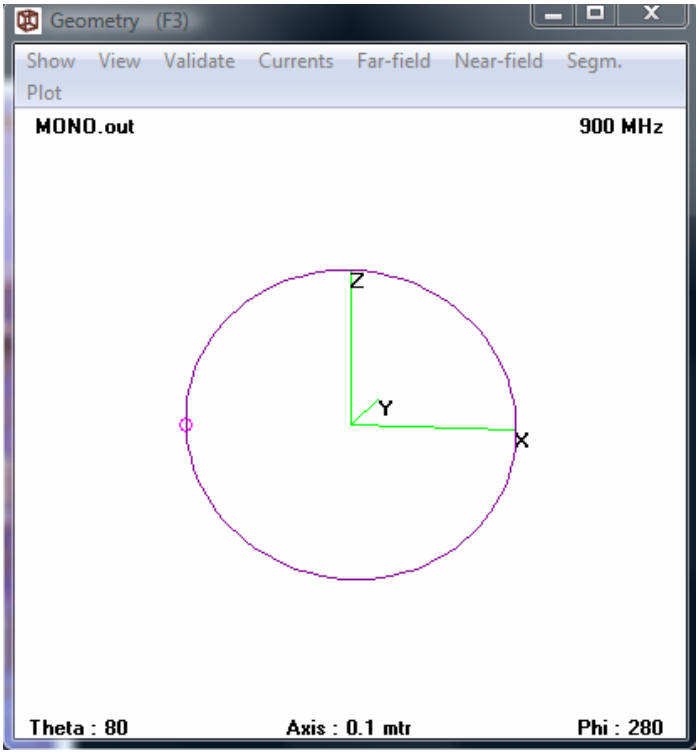




Example 5 (Circular loop)







To set parameters for the above circular loop: