


NEW FASANT

ULTRA-CONFORMED REFLECTORS: Training Example 3

Version 5.7.5.11.06.2014

www.fasant.com - webmaster@fasant.com
Parque Científico y Tecnológico de Guadalajara Avda. Buendía 11 - 19005
Guadalajara

This section presents the design and analysis of an ultra-conformed subreflector using the free mode at several frequencies.

Go to *Layout*  *Create Subreflector* and choose the *Free design* option. Click *Next*.

Set the frequency to 15GHz and the periodicity to 0.5λ . Choose a plane shape. Set the z-coordinate of the subreflector center to 0.15m and the feed position to 0.3m. Choose circular arrangement and set the radius to 0.15m. Click *OK*.

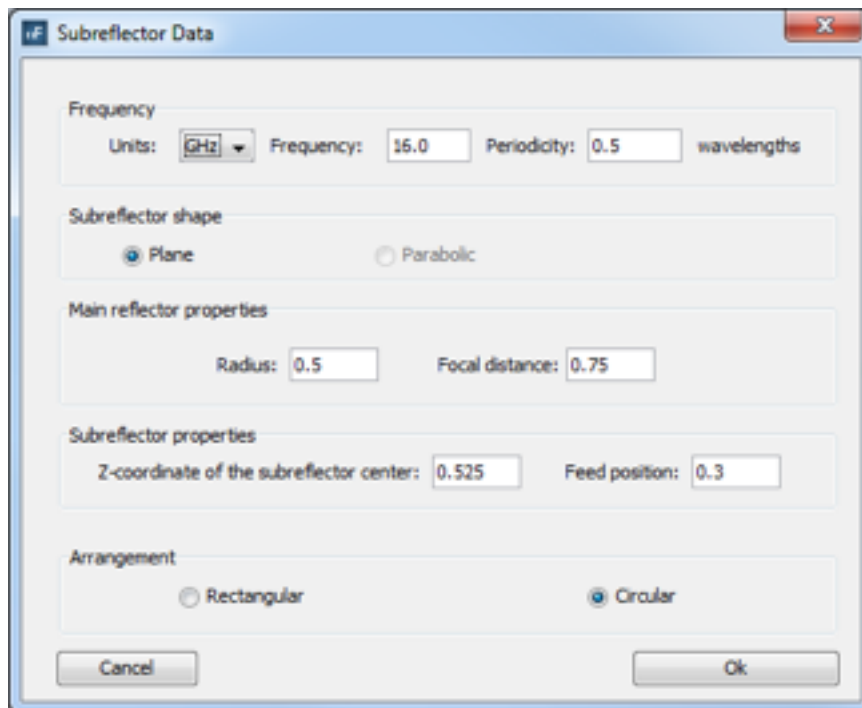


Figure 1 Subreflector properties (guided design)

When clicking *OK*, the geometry of the subreflector will be displayed in the main screen.

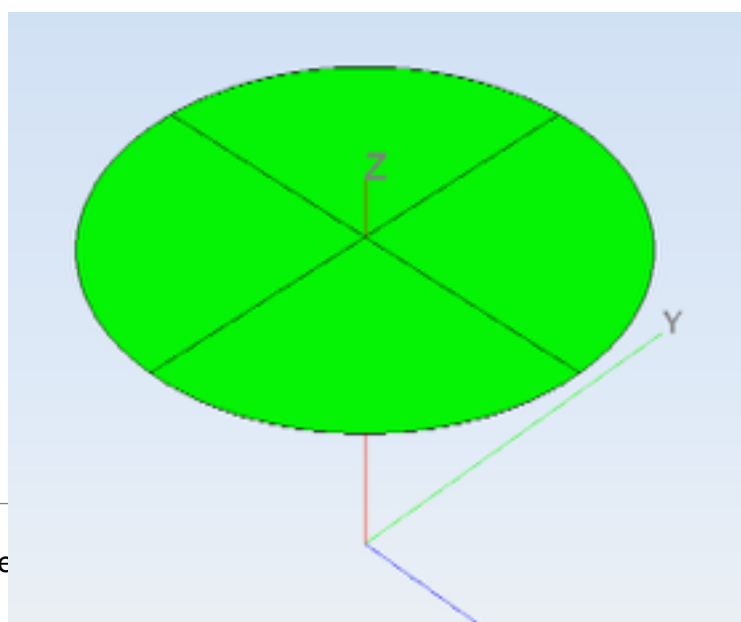



Figure 2 Geometry of the subreflector

Now go to **Simulation**  **Parameters** to set the frequencies 15GHz, 15.5GHz and 16GHz as follows:

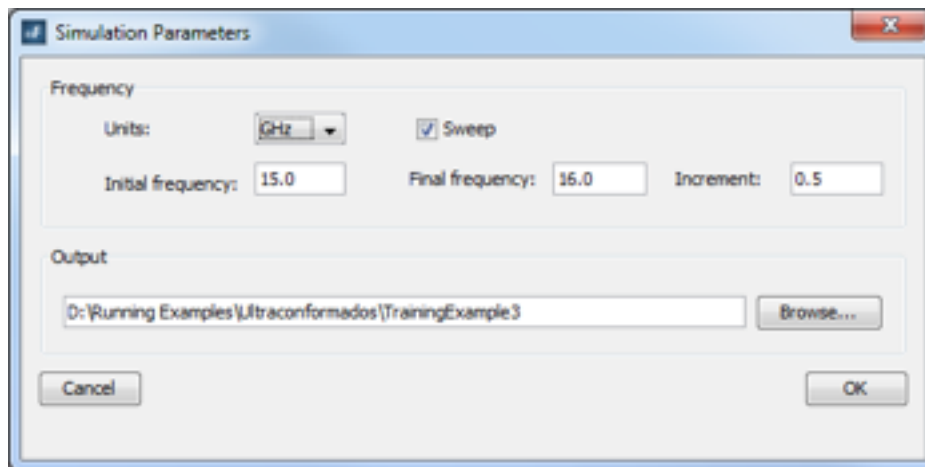



Figure 3 Simulation parameters

Next, set the solver configuration. Go to **Solver**  **Parameters**. The solution method in this example is the Method of Moments, the relative error in the iterative process is set to 0.01, and the maximum number of iterations is set to 5000. Click **OK**.

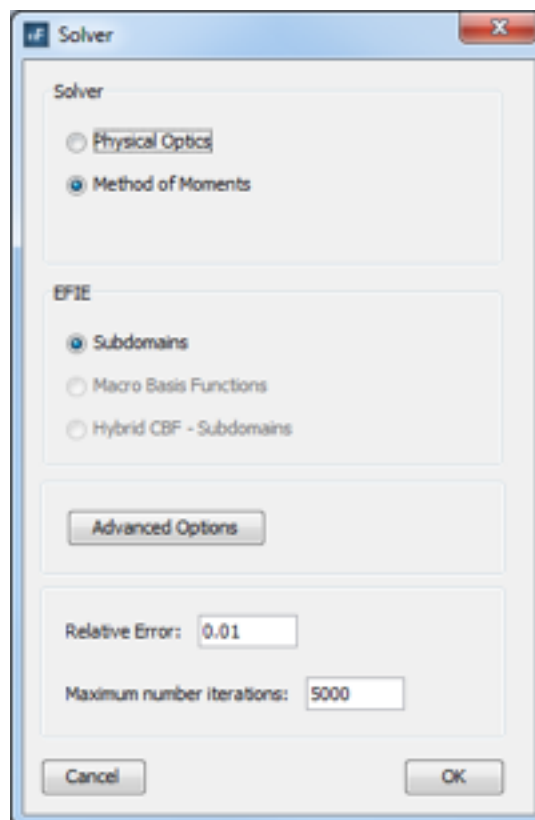



Figure 4 Solver parameters

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 Then, go to **Antennas**  **Set Feed Antenna Pattern File**. Set one antenna in the next displayed window and click **OK**.

A new window will be displayed to set the antenna properties. First, click on *Browse* and select the file called BOC0677.dia, which is located in the *DiaFiles* folder. Note that the coordinates of the antenna position are automatically set considering the parameters that were indicated when the subreflector was generated (0.0, 0.0, 0.3). Finally, the antenna orientation is defined by means of the director cosines. They also are automatically calculated. The feed antenna always points to the subreflector center (0.0, 0.0, 0.0). Click *OK*.

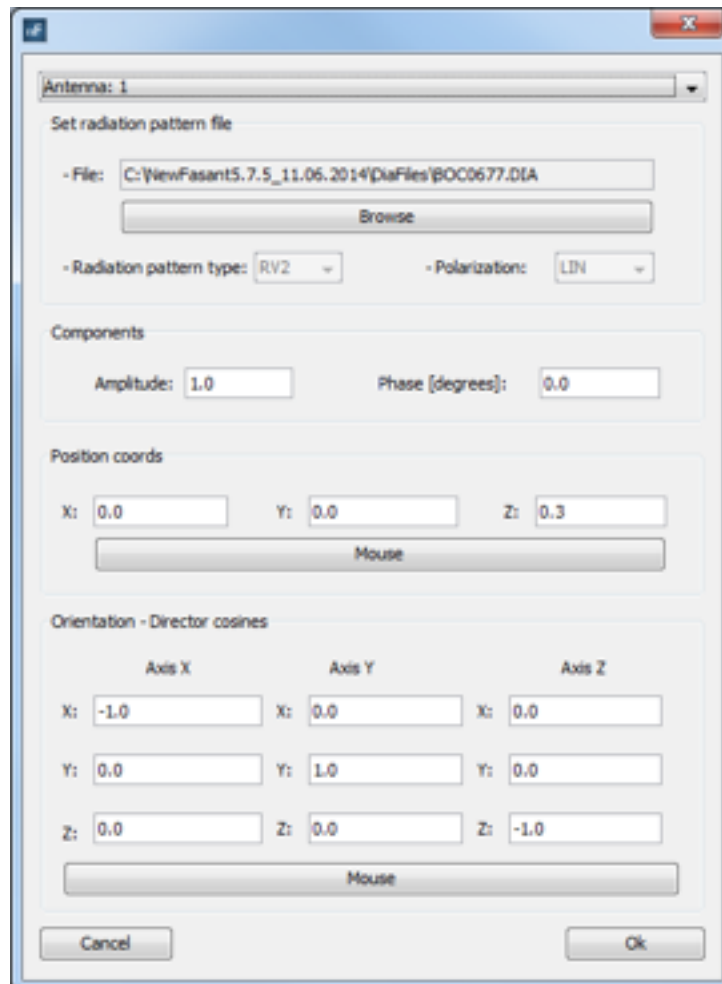


Figure 5 Radiation pattern file parameters box

Note that the antenna is displayed in the main screen in red color. Its reference axes are depicted in green color.

Select *Meshing* *Create and Visualize Mesh* to mesh the geometry. Set the operating frequency and the number of processors and click *OK*.

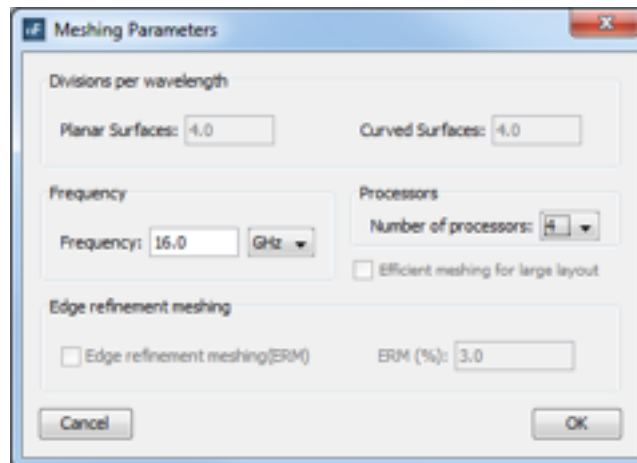



Figure 6 Meshing parameters

Once the meshing has finished, it will be displayed in the main screen.

Go to *Calculate*  *Execute* and select the number of processors.

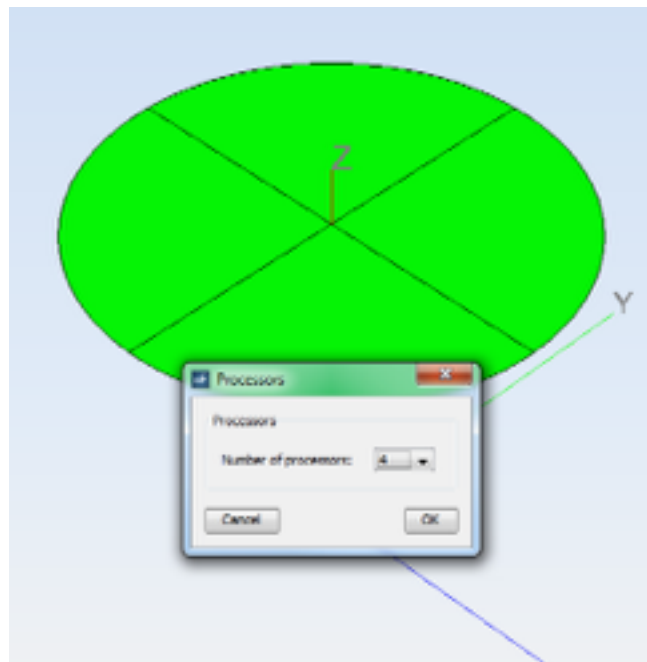


Figure 7 Set the number of processors

Click *OK* to run the simulation.



Figure 8 Simulation in progress

When the simulation finishes, go to *Show Results* *View File Text* to visualize the results.

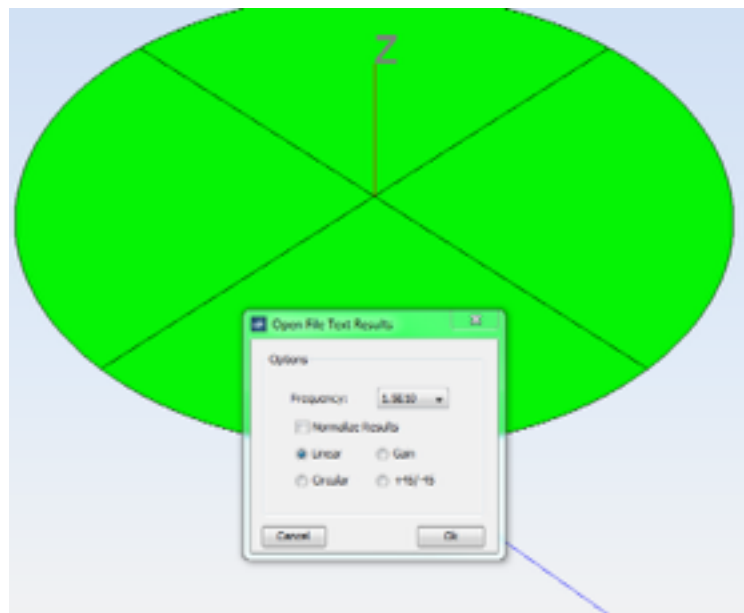


Figure 9 Open File Text Results

Click *OK*. The text file that contains the results will be displayed in a new window:

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| ILTA(deg) | FI (deg) | LIMTA(deg) | LIMTA(deg) | LFMI(deg) | LFMI(deg) | LITOTAL(deg) |
|-----------|----------|------------|------------|------------|------------|--------------|
| 0.00 | 90.00 | -.3232E+02 | 0.1055E+03 | -.8986E+01 | 0.1657E+03 | -.8966E+01 |
| 0.00 | -89.50 | -.3174E+02 | 0.1114E+03 | -.8989E+01 | 0.1657E+03 | -.8966E+01 |
| 0.00 | -89.00 | -.3112E+02 | 0.1166E+03 | -.8993E+01 | 0.1658E+03 | -.8966E+01 |
| 0.00 | -88.50 | -.3048E+02 | 0.1211E+03 | -.8997E+01 | 0.1658E+03 | -.8966E+01 |
| 0.00 | -88.00 | -.2984E+02 | 0.1259E+03 | -.9002E+01 | 0.1658E+03 | -.8966E+01 |
| 0.00 | -87.50 | -.2922E+02 | 0.1281E+03 | -.9007E+01 | 0.1658E+03 | -.8966E+01 |
| 0.00 | -87.00 | -.2861E+02 | 0.1313E+03 | -.9013E+01 | 0.1659E+03 | -.8966E+01 |
| 0.00 | -86.50 | -.2801E+02 | 0.1338E+03 | -.9020E+01 | 0.1659E+03 | -.8966E+01 |
| 0.00 | -86.00 | -.2747E+02 | 0.1366E+03 | -.9028E+01 | 0.1659E+03 | -.8966E+01 |
| 0.00 | -85.50 | -.2691E+02 | 0.1388E+03 | -.9036E+01 | 0.1660E+03 | -.8966E+01 |
| 0.00 | -85.00 | -.2642E+02 | 0.1397E+03 | -.9045E+01 | 0.1660E+03 | -.8966E+01 |
| 0.00 | -84.50 | -.2591E+02 | 0.1411E+03 | -.9054E+01 | 0.1660E+03 | -.8966E+01 |
| 0.00 | -84.00 | -.2546E+02 | 0.1426E+03 | -.9065E+01 | 0.1660E+03 | -.8966E+01 |
| 0.00 | -83.50 | -.2501E+02 | 0.1439E+03 | -.9075E+01 | 0.1661E+03 | -.8966E+01 |
| 0.00 | -83.00 | -.2458E+02 | 0.1450E+03 | -.9087E+01 | 0.1661E+03 | -.8966E+01 |
| 0.00 | -82.50 | -.2417E+02 | 0.1460E+03 | -.9099E+01 | 0.1661E+03 | -.8966E+01 |
| 0.00 | -82.00 | -.2377E+02 | 0.1470E+03 | -.9112E+01 | 0.1662E+03 | -.8966E+01 |
| 0.00 | -81.50 | -.2338E+02 | 0.1478E+03 | -.9125E+01 | 0.1662E+03 | -.8966E+01 |
| 0.00 | -81.00 | -.2300E+02 | 0.1486E+03 | -.9140E+01 | 0.1662E+03 | -.8966E+01 |
| 0.00 | -80.50 | -.2264E+02 | 0.1493E+03 | -.9155E+01 | 0.1663E+03 | -.8966E+01 |
| 0.00 | -80.00 | -.2234E+02 | 0.1500E+03 | -.9170E+01 | 0.1663E+03 | -.8966E+01 |
| 0.00 | -79.50 | -.2201E+02 | 0.1508E+03 | -.9187E+01 | 0.1663E+03 | -.8966E+01 |
| 0.00 | -79.00 | -.2170E+02 | 0.1513E+03 | -.9204E+01 | 0.1664E+03 | -.8966E+01 |
| 0.00 | -78.50 | -.2140E+02 | 0.1517E+03 | -.9221E+01 | 0.1664E+03 | -.8966E+01 |
| 0.00 | -78.00 | -.2111E+02 | 0.1521E+03 | -.9240E+01 | 0.1664E+03 | -.8966E+01 |
| 0.00 | -77.50 | -.2082E+02 | 0.1527E+03 | -.9259E+01 | 0.1664E+03 | -.8966E+01 |
| 0.00 | -77.00 | -.2053E+02 | 0.1531E+03 | -.9279E+01 | 0.1665E+03 | -.8966E+01 |
| 0.00 | -76.50 | -.2024E+02 | 0.1535E+03 | -.9299E+01 | 0.1665E+03 | -.8966E+01 |
| 0.00 | -76.00 | -.2002E+02 | 0.1539E+03 | -.9320E+01 | 0.1665E+03 | -.8966E+01 |
| 0.00 | -75.50 | -.1978E+02 | 0.1543E+03 | -.9341E+01 | 0.1665E+03 | -.8966E+01 |
| 0.00 | -75.00 | -.1953E+02 | 0.1546E+03 | -.9363E+01 | 0.1666E+03 | -.8966E+01 |
| 0.00 | -74.50 | -.1928E+02 | 0.1549E+03 | -.9385E+01 | 0.1666E+03 | -.8966E+01 |
| 0.00 | -74.00 | -.1907E+02 | 0.1553E+03 | -.9412E+01 | 0.1667E+03 | -.8966E+01 |
| 0.00 | -73.50 | -.1884E+02 | 0.1556E+03 | -.9441E+01 | 0.1667E+03 | -.8966E+01 |
| 0.00 | -73.00 | -.1863E+02 | 0.1558E+03 | -.9469E+01 | 0.1667E+03 | -.8966E+01 |
| 0.00 | -72.50 | -.1842E+02 | 0.1561E+03 | -.9498E+01 | 0.1668E+03 | -.8966E+01 |
| 0.00 | -72.00 | -.1821E+02 | 0.1563E+03 | -.9516E+01 | 0.1668E+03 | -.8966E+01 |
| 0.00 | -71.50 | -.1801E+02 | 0.1566E+03 | -.9544E+01 | 0.1668E+03 | -.8966E+01 |
| 0.00 | -71.00 | -.1782E+02 | 0.1568E+03 | -.9572E+01 | 0.1669E+03 | -.8966E+01 |
| 0.00 | -70.50 | -.1763E+02 | 0.1570E+03 | -.9601E+01 | 0.1669E+03 | -.8966E+01 |
| 0.00 | -70.00 | -.1744E+02 | 0.1572E+03 | -.9631E+01 | 0.1669E+03 | -.8966E+01 |
| 0.00 | -69.50 | -.1726E+02 | 0.1575E+03 | -.9661E+01 | 0.1670E+03 | -.8966E+01 |
| 0.00 | -69.00 | -.1708E+02 | 0.1576E+03 | -.9694E+01 | 0.1670E+03 | -.8966E+01 |
| 0.00 | -68.50 | -.1691E+02 | 0.1578E+03 | -.9726E+01 | 0.1670E+03 | -.8966E+01 |
| 0.00 | -68.00 | -.1674E+02 | 0.1580E+03 | -.9759E+01 | 0.1671E+03 | -.8966E+01 |
| 0.00 | -67.50 | -.1658E+02 | 0.1582E+03 | -.9793E+01 | 0.1671E+03 | -.8966E+01 |
| 0.00 | -67.00 | -.1641E+02 | 0.1584E+03 | -.9828E+01 | 0.1671E+03 | -.8966E+01 |
| 0.00 | -66.50 | -.1626E+02 | 0.1586E+03 | -.9863E+01 | 0.1672E+03 | -.8966E+01 |
| 0.00 | -66.00 | -.1610E+02 | 0.1587E+03 | -.9900E+01 | 0.1672E+03 | -.8966E+01 |
| 0.00 | -65.50 | -.1594E+02 | 0.1588E+03 | -.9937E+01 | 0.1673E+03 | -.8966E+01 |
| 0.00 | -65.00 | -.1580E+02 | 0.1590E+03 | -.9975E+01 | 0.1673E+03 | -.8966E+01 |
| 0.00 | -64.50 | -.1566E+02 | 0.1591E+03 | -.1001E+02 | 0.1673E+03 | -.8966E+01 |
| 0.00 | -64.00 | -.1551E+02 | 0.1592E+03 | -.1005E+02 | 0.1674E+03 | -.8966E+01 |
| 0.00 | -63.50 | -.1537E+02 | 0.1594E+03 | -.1009E+02 | 0.1674E+03 | -.8966E+01 |
| 0.00 | -63.00 | -.1524E+02 | 0.1595E+03 | -.1013E+02 | 0.1674E+03 | -.8966E+01 |
| 0.00 | -62.50 | -.1510E+02 | 0.1596E+03 | -.1018E+02 | 0.1675E+03 | -.8966E+01 |
| 0.00 | -62.00 | -.1497E+02 | 0.1597E+03 | -.1022E+02 | 0.1675E+03 | -.8966E+01 |
| 0.00 | -61.50 | -.1484E+02 | 0.1598E+03 | -.1027E+02 | 0.1675E+03 | -.8966E+01 |
| 0.00 | -61.00 | -.1472E+02 | 0.1600E+03 | -.1031E+02 | 0.1676E+03 | -.8966E+01 |
| 0.00 | -60.50 | -.1460E+02 | 0.1601E+03 | -.1035E+02 | 0.1676E+03 | -.8966E+01 |
| 0.00 | -60.00 | -.1447E+02 | 0.1602E+03 | -.1040E+02 | 0.1677E+03 | -.8966E+01 |
| 0.00 | -59.50 | -.1435E+02 | 0.1603E+03 | -.1044E+02 | 0.1677E+03 | -.8966E+01 |
| 0.00 | -59.00 | -.1424E+02 | 0.1604E+03 | -.1049E+02 | 0.1678E+03 | -.8966E+01 |

Figure 10 Results file

Select **Show Results** **View Currents**. Select units in dB and click **OK**. The current distribution will be shown in the main screen. The frequency can be changed in the left panel.

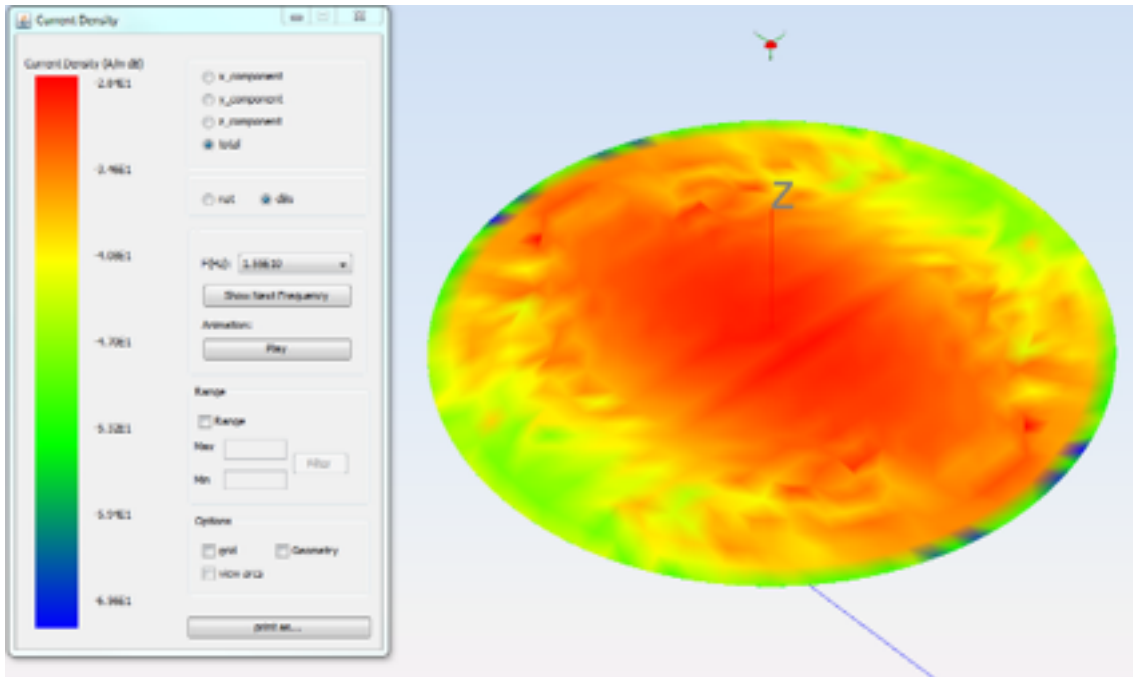


Figure 11 Current distributions in dB

Next, select *Show Results*  *View 3D Pattern* to display the 3D radiation pattern.

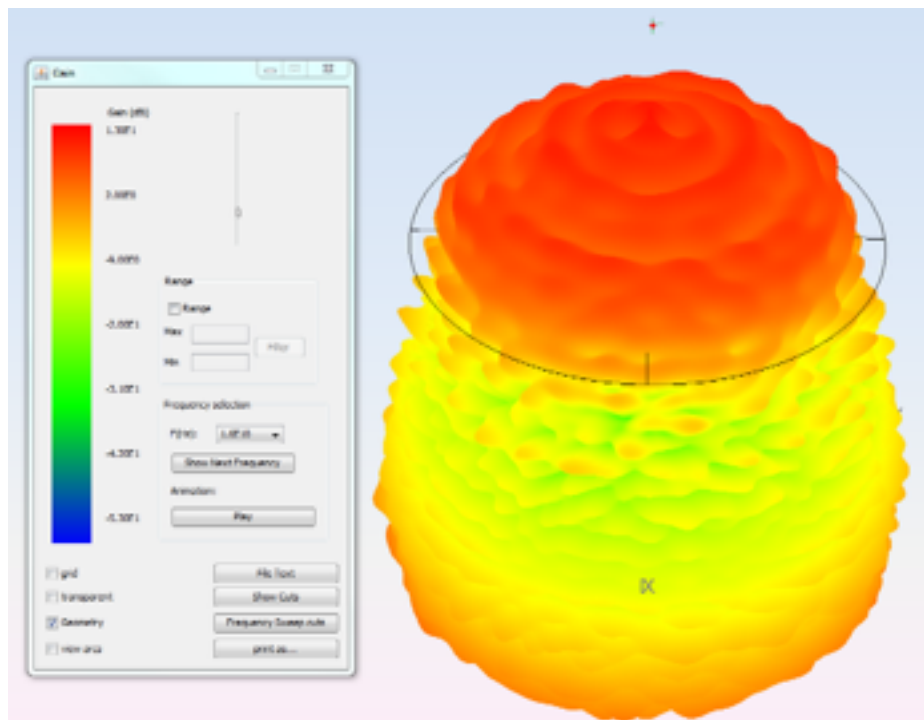


Figure 12 3D radiation pattern

In that panel, click on *Show Cuts* and a new window will be displayed:

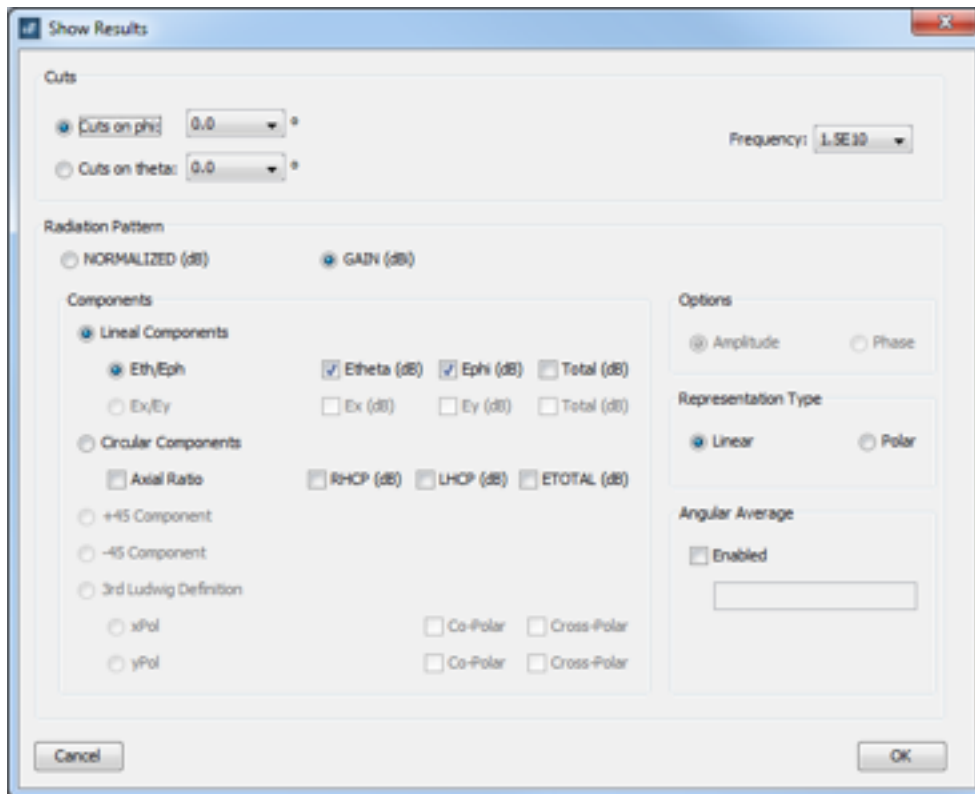


Figure 13 Show Results

Click *Ok* to show the 2D plot.

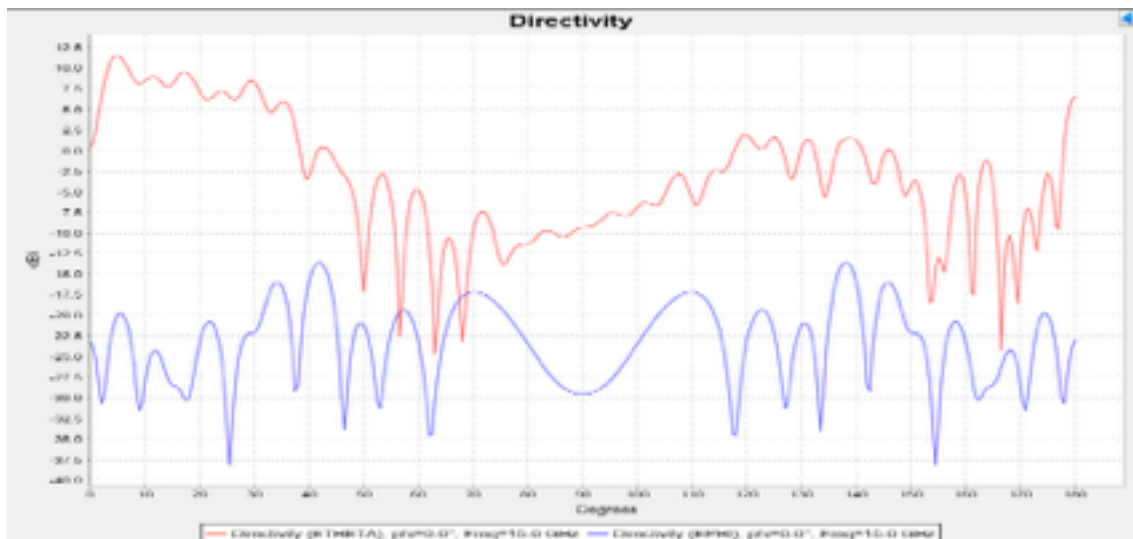


Figure 14 Directivity at 15GHz

Click on the blue arrow in the top right part of the plot and select 16GHz. Click on *Add*. The results at 16GHz are added to the same plot to compare the behavior of the antenna at both frequencies.

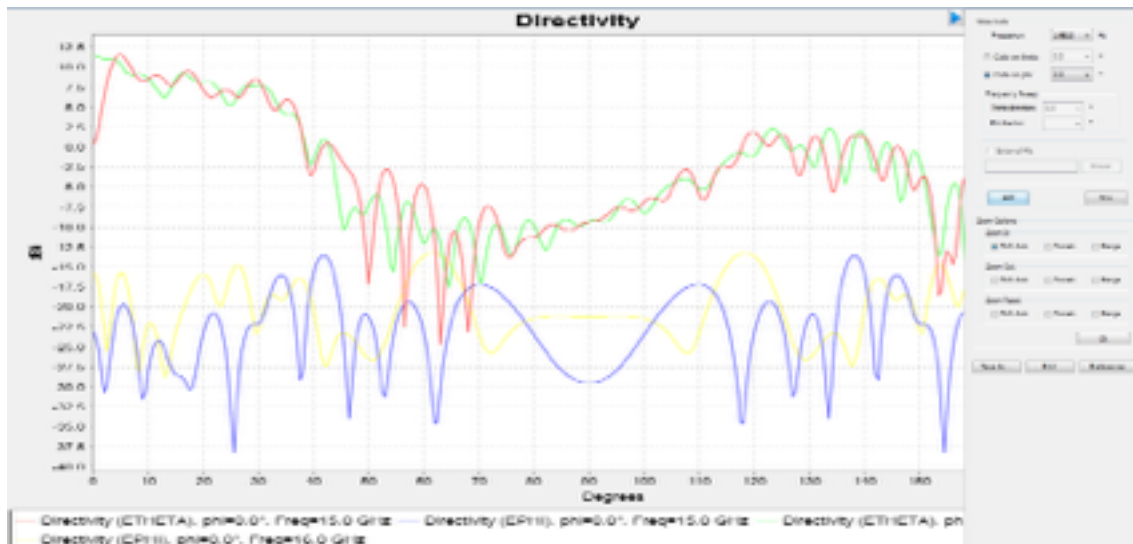


Figure 15 Directivity at 15GHz and 16GHz

The user can also compare the results for a specific direction given by theta and phi at several frequencies in the same graph. This option is available in the *Frequency Sweep Cuts* button:

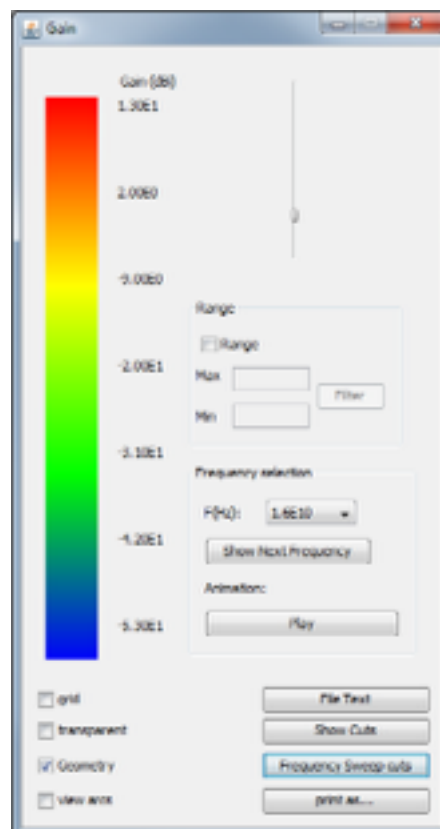


Figure 16 Show results

Click Ok to display the new plot. Note that the x-axis is referencing to the frequency in this case.

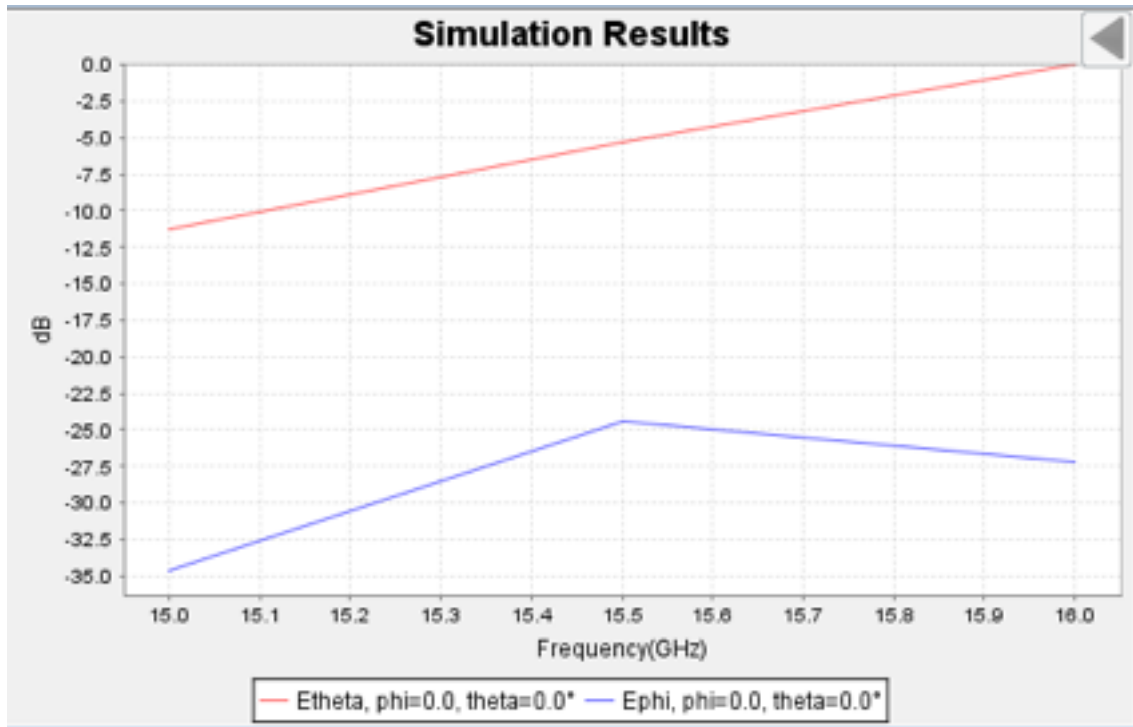


Figure 17 Frequency sweep cuts