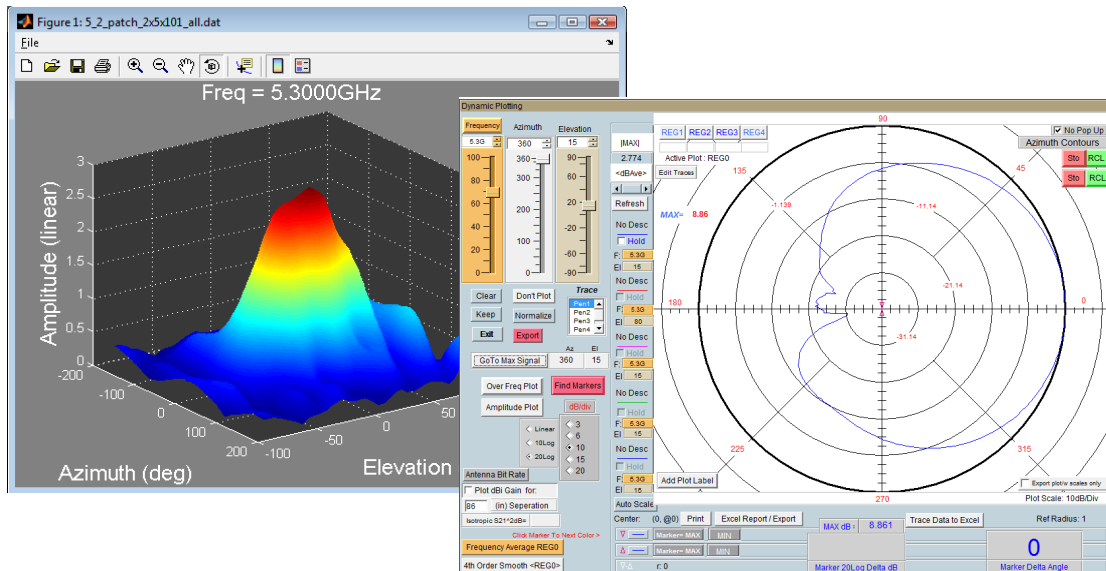


Antenna Gain Measurements: Gain Transfer Method



When measuring antennas, the initial measurement is for the entire link including any uncorrected losses/gains such as path loss and reference antenna gain. These factors can be corrected using the gain transfer function. This application note will illustrate the proper procedure for making the initial measurement and performing gain transfer using the DAMS antenna measurement software.

Process Outline:

1. Define and perform initial measurement
2. Generate path loss data
3. Import and generate reference antenna data
4. Perform Gain Transfer

Measurement Parameters:

Antenna Type:	Patch
Measured Frequency:	4.6 to 5.6 Ghz. @ 101 points
Measured Angle:	Az: 0 to 360 degrees @ 2 degrees per measurement El: -90 to +90 degrees @ 5 degrees per measurement
Path Distance:	36 inches
Reference Antenna:	1 to 18 Ghz. dual ridge horn
Cable Correction:	VNA calibration

Measuring the Antenna

Before you begin: Recall or perform a vector cal (OSLT) on your network analyzer for the cable loss using the DAMS measurement system as port 2 and the reference antenna cable as port 1.

1. Configure extents to:
0-360 Deg. x 5 Deg. / meas.

2. Press "Measure Azimuth Cut" to begin the measurement.

3. Once the measurement has completed, press proceed to data processing.

NOTE: The Amplitude(log), and Polar (linear) plot can be used during measurement to verify data collected is correct or within tolerances.

Storing Measurement Data

When entering the Data Processing section after making a new measurement the data is stored and displayed in the active register (reg0). The default description is titled "New Measurement <completion date/time>". At this point we will store the data to a register then save reg 1-4 for a hard copy of the original measured data. The steps below illustrate this procedure.

Typical post-measurement procedure:

1. Store data to Reg 1
2. Change description if desired
3. Save Reg 1-4 to disk

Active Register containing new measurement

1. Store to Reg1

2. Reg1 Description

3. Save Reg. 1-4

The screenshot displays the 'Antenna Measurement Studio v5.8' interface. The 'Active Register' section shows a 'New Measurement' from 2/18/2009 at 2:17:45 AM, with data stored in 'Reg1'. The 'Data Registers' section on the left shows four registers (Reg 1-4) with their respective descriptions and data storage status. The 'Data Manipulation Options' section includes a calculator and various data processing tools. The bottom of the interface shows a table of data points for the active register.

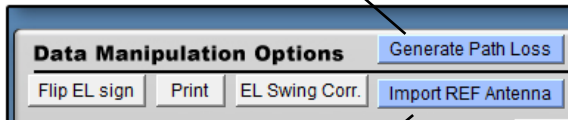
Active Register Mag	Active Register Phase
000: 3.6m	000: 151.6
0001: 3.631m	0001: 151.9
0002: 3.679m	0002: 151.2
0003: 3.681m	0003: 150.8
0004: 3.724m	0004: 149.7
0005: 3.766m	0005: 150.1
0006: 3.742m	0006: 149.7

Path Loss and Reference Antenna Data

The Path Loss and Reference Antenna data is calculated based on the data that is currently in the Active Register (reg 0) When completed the data will be accessible to any functions that require it. The data can also be recalled into the active register for modification or copying to another file. An .RPL file will be generated along-side the original Reg 1-4.DAT file that you save.

⚠ IMPORTANT: The .RPL and .DAT files must be moved together to view on another computer.

Generate the path loss for your measurement, Enter the correct distance, select the unit of measurement and press "Calculate", Press continue to return.



Import reference antenna data from .txt file. The format of the file is as follows:

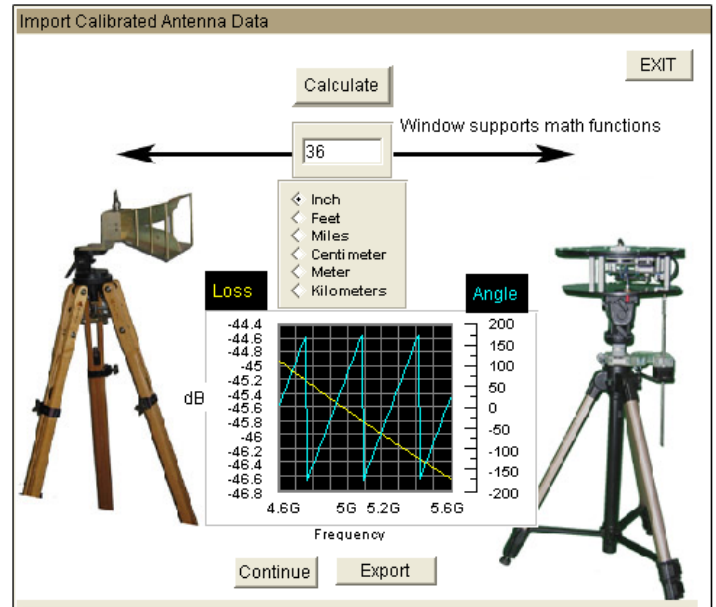
<freq in GHz> <tab> <dBi gain>

Each line being a new frequency the frequencies of your measurement MUST fall within the limits of the imported reference file.

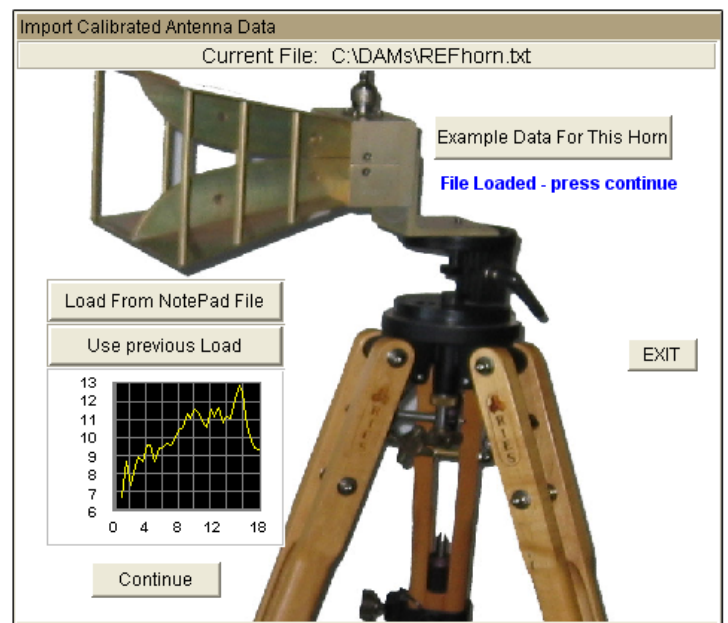
Sample reference file:

(FREQ)	(GAIN)
1	6.7
1.5	8.7
2	7.3
2.5	8.1
3	8.9
3.5	8.7
4	9.6
4.5	9.6
5	8.7

Path Loss Module



Reference Antenna Module



Gain Transfer

The gain transfer function will use the previously generated path loss and reference data to calculate the dBi gain of the measured antenna across all angles and frequencies. Corrected data will be stored into Reg4 and the Active Register (reg0).

After calculating, save reg-1-4 to the hard drive this file will contain original and calculated data including path and REF. data.

Gain Transfer Module

To Perform Gain Transfer:

1. Measurement data must be present in Reg 1
2. Path loss and REF buttons must be green indicating data is present.
3. Run Gain Transfer function

Resultant AUT Gain Data (Also in Reg0)

Active Register	Mag	Phase
000:	001:	002:
0000: 3.6m	3.521m	3.425m
0001: 3.631m	3.548m	3.434m
0002: 3.679m	3.584m	3.452m
0003: 3.681m	3.64m	3.516m
0004: 3.724m	3.623m	3.496m
0005: 3.766m	3.592m	3.562m
0006: 3.742m	3.611m	3.503m

Data processing page after Gain Transfer has been completed

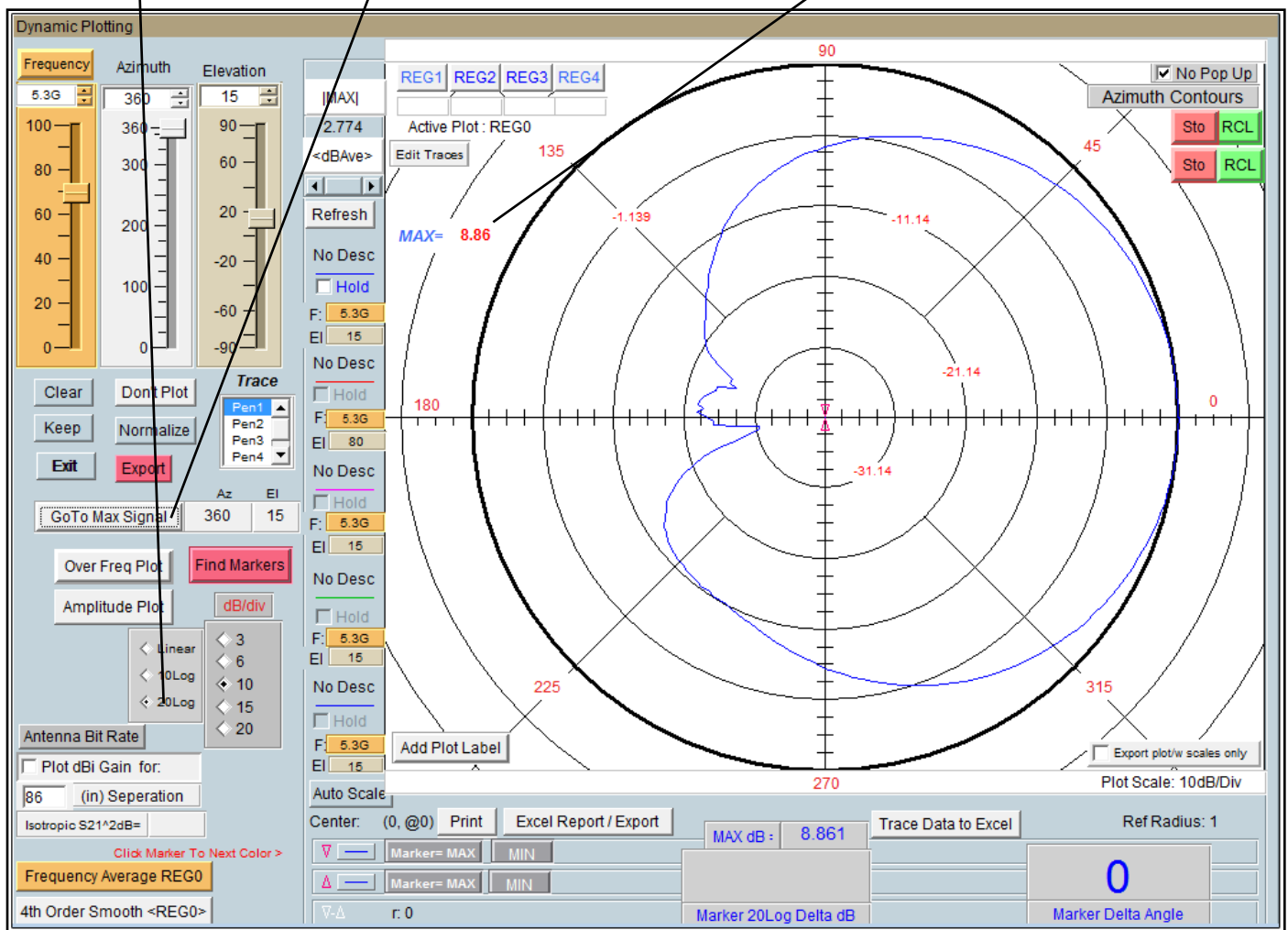
Antenna Gain Pattern

Once the gain transfer has been completed the antenna pattern can be plotted in a number of ways, the quickest way to analyze the max gain positions and frequencies is with the polar plot. Up to 4 antenna traces can be plotted at one time. The radiation pattern for any frequency or axis can be displayed simply by moving the sliders to the desired setting.

Locating maximum gain frequency / angle:

1. Select 20Log to view the gain in dB.
2. Press "Go to Max signal" and plot will be changed to plot with the maximum gain.
3. Max gain value for specified frequency/cut will be displayed left of polar plot.

1. Display 20Log 2. Go to Max (Max Gain for displayed pattern / freq.)



Antenna azimuth pattern showing a peak gain of 8.86 dBi at 15 degrees elevation