



**Diamond Engineering**  
Automated Measurement Systems



## DAMS Antenna Measurement Systems Guide

Supports most popular hardware



## System Overview

### **LOW COST**

Outsourcing your antenna measurement needs to an outside lab can become very costly over time. By using our system, you can design and measure your own antennas or devices in-house quickly and efficiently, even using your own GPIB enabled instruments. We currently support a wide range of VNA's, signal generators, power meters, voltmeters, and spectrum analyzers, therefore unique instrument purchases are not required. With systems starting under \$13k you simply can not find better value.

### **ADVANCED SOFTWARE**

Our measurement systems utilize our advanced Antenna Measurement Studio which measures the AUT over multiple frequencies and displays the measured data in various formats. For example, our software can include a complete 3D spherical view of the AUT and isotropic or dipole overlay at any measured frequency.

### **EASY TO USE**

If you have a compatible GPIB instrument, a PC, and a reference antenna, our system will include everything you need to make accurate automated measurements. We also offer all customers personal assistance in order to help make taking measurements as painless and efficient as possible. Antenna Measurement Studio software only further compliments our systems by automating many tasks while enabling users to easily manipulate, print or save your measurement results.

### **VERSATILITY**

Whether you are trying to analyze a simple polar plot or you need a fully virtual simulator, our system can handle your tasks quickly and cost-effectively.

### **INSTRUMENT COMPATIBILITY**

Our software supports many common instruments from Copper Mountain, Anritsu, Keysight / Agilent /HP, Rohde & Schwarz, and Advantest. Visit [www.DiamondEng.net](http://www.DiamondEng.net) for a complete list of supported instruments. If your instrument is not listed but has a GPIB or Ethernet Port, contact us for more information.

### **THE COMPLETE PACKAGE**

Our system comes complete with all items necessary to accurately measure any type of antenna. All systems include a positioner platform, platform controller, precision RF cables, Antenna Measurement Studio software, and all mounting hardware and tools. In short, our systems provide you with a complete solution that is both powerfully versatile *and* easy-to-use.

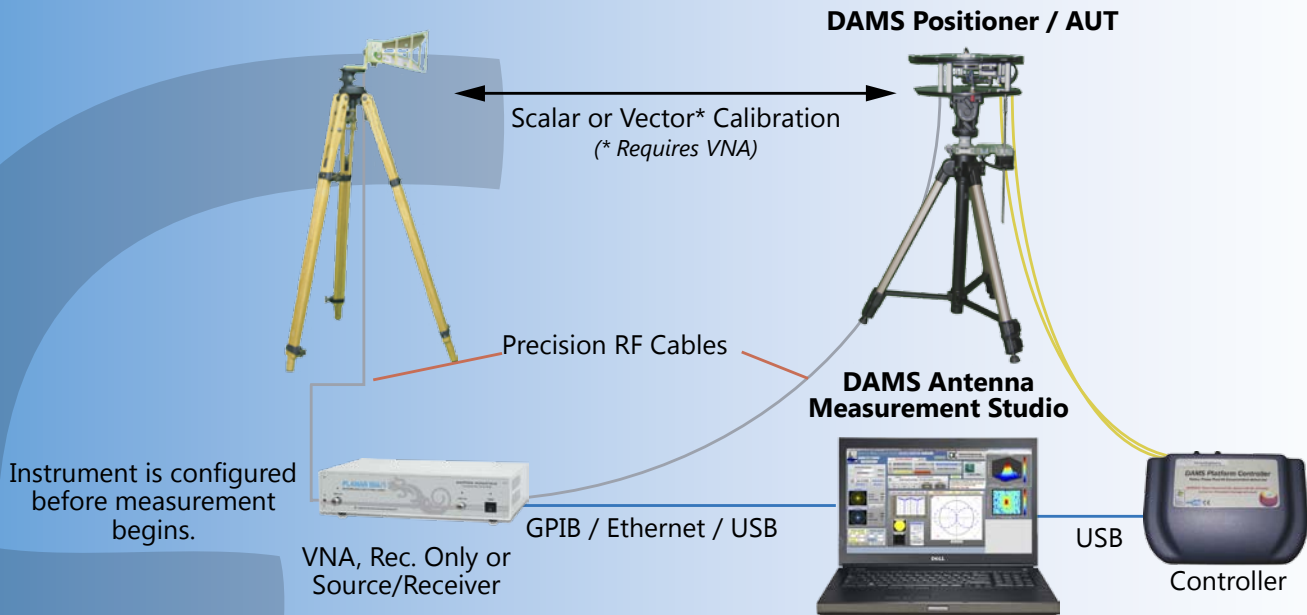


*All necessary components included!*

## Typical Measurement Layout

Below is a typical measurement setup using a Vector Network Analyzer (VNA) and a stationary calibrated horn with the basic DAMS System.

The measurement PC instructs the positioner to move, which triggers a sweep from the VNA and then reads the data into the DAMS software. This process is repeated until the measurement has been completed.



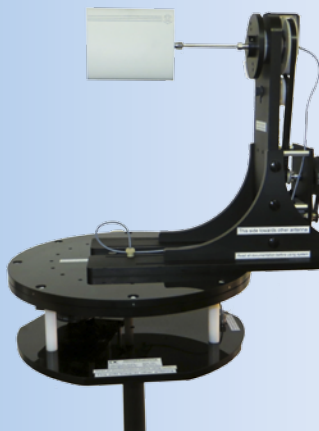
## Positioner Configurations

### Standard AZ/EL DAMS



- Az 0-360 El +/- 45 or +/- 90
- Ideal for Single Cuts
- Semi-Spherical Measurement capable
- Upgradable to 3D Spherical

### DAMS w/ FSM Mount



- Az 0-360 El +/-180
- Phi over Theta configuration
- Carbon Fiber Tripod
- Keeps AUT Centered
- Full 3D spherical measurements for Efficiency, TRP, TIS, etc.

### D6050 Floor Mount



- Az 0-360 El +/- 180
- Phi over Theta configuration
- 5 Axis Option (AZ, EL, X, Y, Z)
- Keeps AUT Centered
- Optimal AUT->Positioner space
- Full 3D spherical measurements

# DAMS x000 Standard Measurement System

## Positioner Features:

- Up to .125 degree azimuth resolution (DAMS 5000)
- Up to .0625 degree azimuth resolution (DAMS 6000/7000)
- 360 degree continuous azimuth range
- +/- 45 degree elevation range @ .10 degree per step
- DC -6 GHz measurement range (DAMS 5000)
- DC-18 GHz measurement range (DAMS 6000)
- DC-40 GHz measurement range (DAMS 7000)
- DC-50 GHz measurement range (DAMS 7000-50)
- Low-noise rotary joint (SMA, 2.92mm, 2.4mm)
- 85% Acrylic / Delrin® construction for minimal reflections
- Up to 3-year warranty on parts and labor

## Optional Accessories:

- FSM Spherical Mount
- Laser tool for accurate alignment\*
- Digital level for precise setup\*
- Advanced processing module\*

\* Included with DAMS 6x00/7x00 systems

20 Pound  
Capacity!



# D6050 Multi-Axis Positioner

NEW!

## Positioner Features:

- Configurable up to 50 GHz coax and 110GHz WR10 Waveguide
- Adjustable Z axis for precision AUT Centering
- High Resolution  
.025 Deg - Theta / Turntable, .025 Deg - Phi/Roll
- Weight Capacity - Turntable-150 Lb, Phi/Roll-25 Lb
- Low-noise coaxial rotary joints.
- Precision Stepper motors
- Upgradable to 4-5 Axis for automated phase measurements
- Includes 2 x 15' RF Cables
- 24" Diameter turntable plate, 10" Diameter roll plate
- Casters for portability
- 3 year parts & labor warranty

## Available Models and Options:

- D6050-6 DC-6 GHz
- D6050-18 DC-18 GHz
- D6050-40 DC-40 GHz
- D6050-50 DC-50 GHz
- D6050-mmW-CFX - Compatible with Copper Mountain CobaltFX mmW VNA
- OPT 3A Automated Z axis -
- OPT 4A Automated Z and X axis with pseudo Y axis

mmW Waveguide  
Support!



Supports most GPIB and Ethernet enabled instruments

## DAMS x100 Heavy Duty Measurement System

### Positioner Features:

- .25 degree azimuth resolution (DAMS 5100)
- .10 degree azimuth resolution (DAMS 6100/7100)
- 360 degree rotation
- +/- 90 degree elevation range @ 0.1 degree per step
- DC-6 GHz measurement range (DAMS 5100)
- DC-18 GHz measurement range (DAMS 6100)
- DC-40 GHz measurement range (DAMS 7100)
- DC-50 GHz measurement range (DAMS 7100-50)
- Low-noise rotary joint (SMA, 2.92mm, 2.4mm)
- Aluminum construction with steel gears and precision bearings for long life and reliability
- Quick and efficient technical support
- Includes all accessories
- 24" Acrylic or Aluminum thrust plate
- Ultra heavy-duty tripod for maximum stability
- 3 year parts & labor warranty

150 Pound  
Capacity!



## DAMS x250 Ultra-Heavy-Duty Measurement System

### Positioner Features:

- 250 ft-lb Elevation torque
- .01 degree azimuth / elevation resolution
- 360 degree azimuth rotation
- +/- 90 degree elevation range
- Ultra-high torque stepper drive system
- Encoded position feedback
- DC-6 GHz measurement range (DAMS 5250)
- DC-18 GHz measurement range (DAMS 6250)
- DC-40 GHz measurement range (DAMS 7250)
- DC-50 GHz measurement range (DAMS 7250-50)
- Low-noise rotary SMA joint
- Aluminum construction with steel gears and precision bearings for long life and reliability
- Includes all accessories
- 30" aluminum or acrylic AUT mounting plate
- Ultra-heavy-duty tripod for maximum stability
- 3 year parts & labor warranty

250 Pound  
Capacity!



Visit us on the web: <http://www.DiamondEng.net>

# FSM - Full Spherical Mounts

The Full Spherical Mount (FSM) is an additional phi/roll axis which can be added to any DAMS System to create a phi/theta and unobstructed Az/el positioning system. The mount and ball bearing are constructed of Delrin® for low reflectivity. The mount is required for unobstructed gain, efficiency, TRP/TIS and 3D spherical measurements to resolutions as low as 0.0625 degrees. The belt driven system plugs directly into the DAMS platform controller.

## Features include:

- Low reflection - 90% Non-Metallic construction
- 18, 40, and 50 GHz models available
- Adjustable position for AUT and Phase centering
- Carbon Fiber Tripod (x000 series systems)

## FSM-5 Full Spherical Mount

For small antennas and devices up to 5 lb (2.3 kg)

### Features:

- Available for x000, x100, and x250 positioners
- 6" azimuth adjustment for centering
- 12" elevation height
- 0.062 degree movement resolution
- 5 lb (2.3 kg) load capacity
- DAMS pro software license key

## FSM-10 Full Spherical Mount

For medium antennas and devices up to 10 lb (4.5 kg)

### Features:

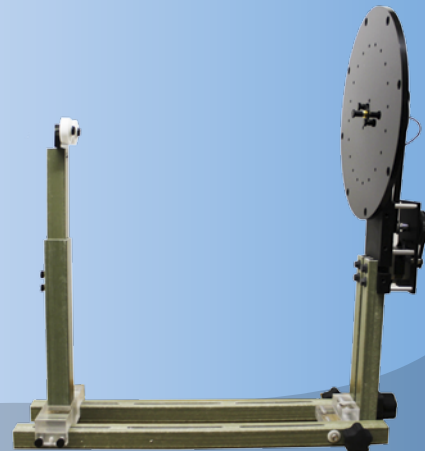
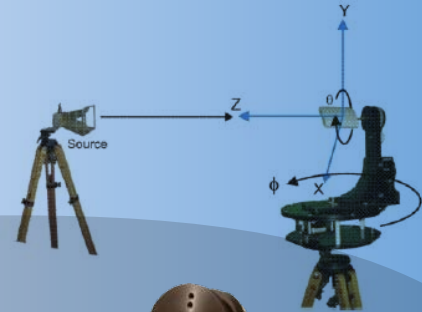
- Available for x000, x100, and x250 positioners
- 12-15" azimuth adjustment for centering
- 16" elevation height
- 0.062 degree movement resolution
- 10 lb. (4.5 kg) load capacity
- 12" Aut plate and support rollers for heavy loads
- DAMS pro software license key

## FSM-25 Full Spherical Mount

For small antennas and devices up to 25 lb (11.4 kg)

### Features:

- Available for x100, and x250 positioners
- 12-15" azimuth adjustment for centering
- 18" elevation height
- 0.062 degree movement resolution
- 25 lb (11.4 kg) load capacity
- 10" Aut plate and support rollers for heavy loads



# Ultra Broadband Calibrated Antennas

## Horn Features

- Ultra Broadband Design
- Special lens for broadband high gain
- Silver plated elements
- Low VSWR
- Monotonically increasing gain
- Constant phase center
- Light Weight Construction
- Built-in alignment laser
- Individual calibration data
- Custom calibration distances
- 2 year Warranty

**Ultra Broadband!  
500 MHz - 40 GHz!**

## Ideal For

- Antenna Gain Measurements
- 5G Measurements
- RCS / Time Domain
- Material Measurement



## Available Models and Options

### 18 GHz

- DE0518 500 MHz to 18 GHz
- DE0718 700 MHz to 18 GHz

### 26 GHz

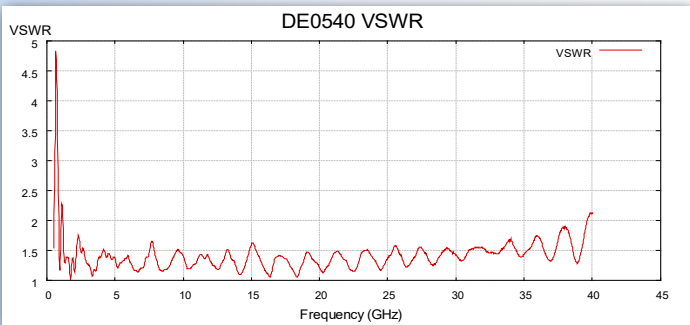
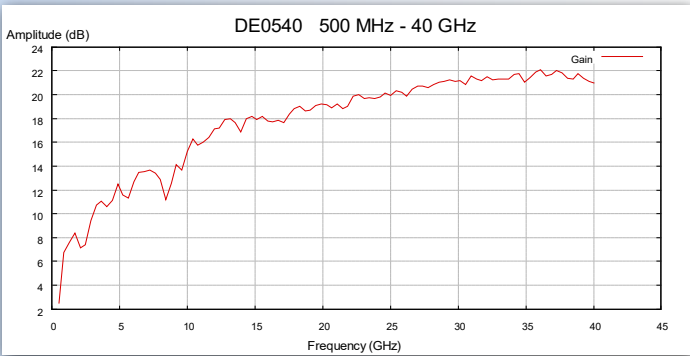
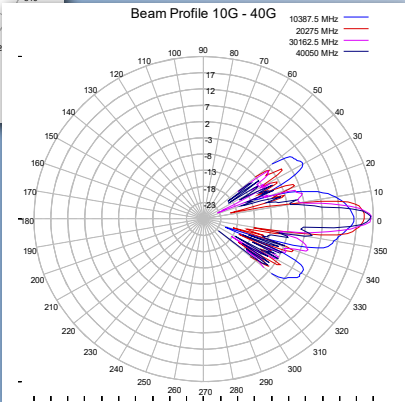
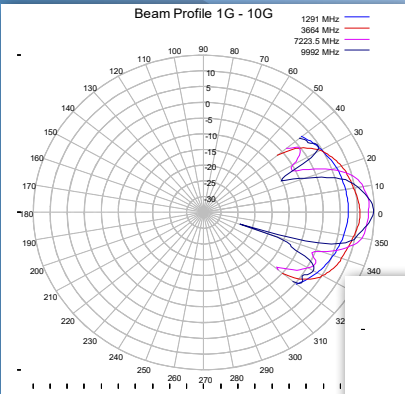
- DE0526 500 MHz to 26 GHz
- DE0726 700 MHz to 26 GHz

### 30 GHz

- DE0530 500 MHz to 30 GHz
- DE0740 700 MHz to 30 GHz

### 40 GHz **NEW!**

- DE0540 500 MHz to 40 GHz
- DE0740 700 MHz to 40 GHz



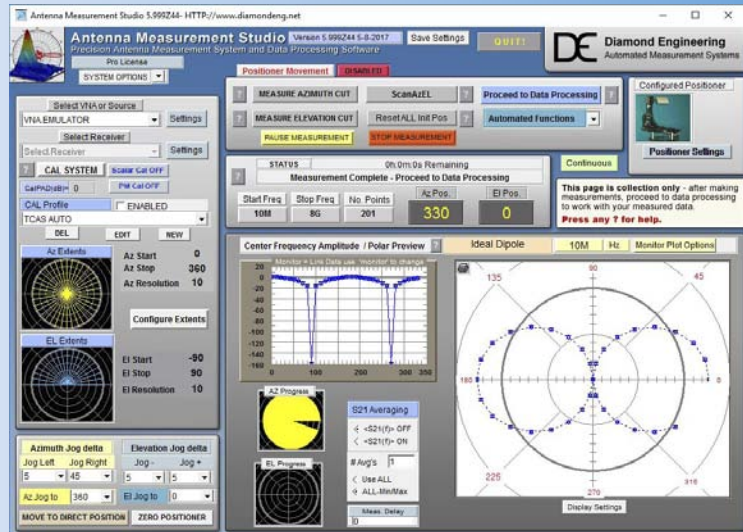
# Powerful Measurement Software

Download our fully functional demo software at [www.DiamondEng.net](http://www.DiamondEng.net)

Antenna Measurement Studio is our powerful software that can thoroughly characterize any antenna using a wide variety of processing and display features.

## Standard Features:

- One-touch antenna profiling
- Multiple S-parameters (S21, S11, etc.)
- Multiple trace plots
- Basic 3D plots
- Reference antenna import feature
- Data Export / Import function
- Exportable vector plots
- Over frequency measurements
- Various calibration methods
- Fully configurable positioner settings
- Extensive plotting features
- Data set manipulation



## Advanced Processing Modules:

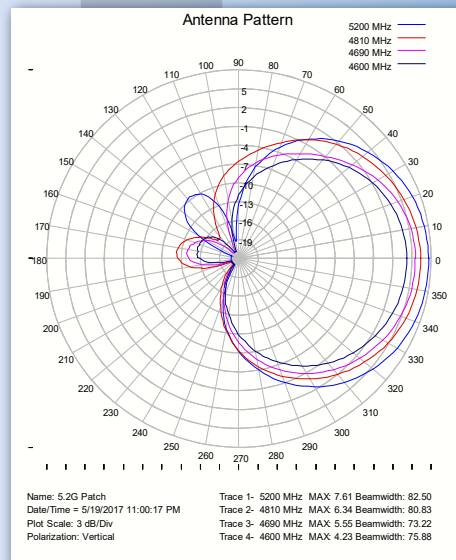
- Efficiency / TRP Calculation
- RCS Calculation
- Phase Center
- TIS (Total Isotropic Sensitivity)
- Advanced spherical 3D plots
- Exclusive data set calculator

## Supported Instrument Configurations:

- Single VNA
- Receive only for self generating sources\*
- Separate source and receive instruments\*

\* Supported receivers: spectrum analyzer, power meter or voltmeter with detector diode.

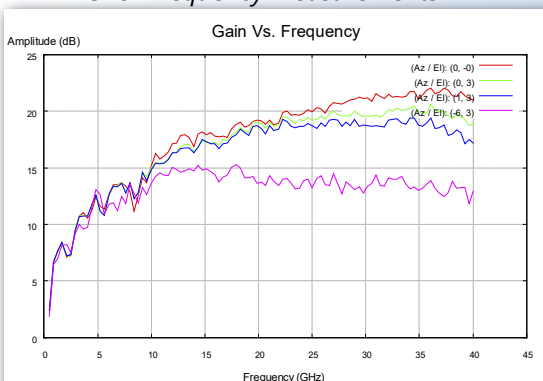
Multi-Trace Vector Plots



Excel Export

Trace Data	Trace1	1405 MHz
Position	Log Mag	Phase
0	-37.2299	177.5048
15	-38.1906	171.7011
30	-38.9944	163.9343
45	-40.3098	158.2648
60	-41.9215	153.8587
75	-43.2861	147.6873
90	-44.5965	152.9351
105	-44.7738	160.4573
120	-44.9808	170.1201
135	-43.7191	-179.832
150	-42.7079	-173.121
165	-40.5114	-163.59
180	-38.8676	-157.669
195	-37.5324	-153.113
210	-36.7321	-145.131
225	-35.8956	-140.481
240	-35.4421	-140.53
255	-35.3265	-140.488
270	-34.9052	-141.213
285	-35.1585	-144.624
300	-35.4502	-152.212
315	-35.5977	-159.31
330	-36.0928	-168.532
345	-36.7746	-177.066
360	-37.6857	178.7483

Over Frequency Measurements



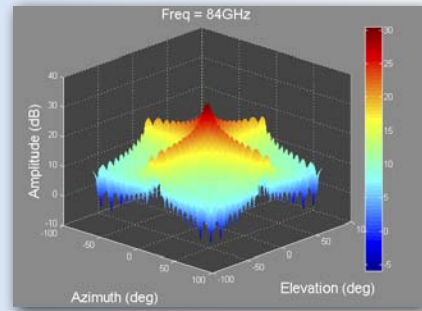
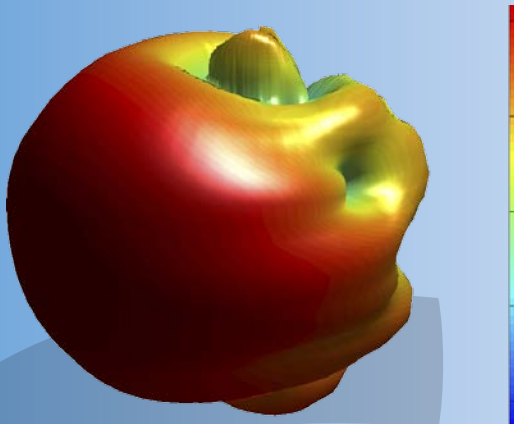
## New Features for 2017 / 2018

- Calibration Profiles with automatic gain calculation
- TIS (Total Isotropic Sensitivity) measurement
- Phase center measurement
- MSI / Planet export for site planning software
- Compatible with Windows 7, 8, and 10
- Support for latest analyzers from Keysight, Anritsu, Copper Mountain, and Rohde & Schwarz

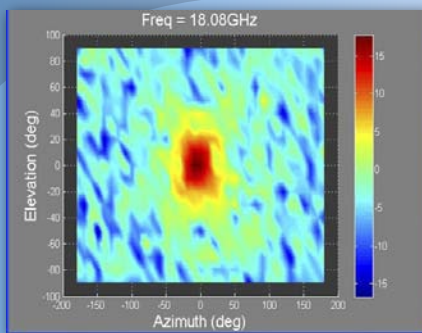


# 3D / SPHERICAL PLOTTING

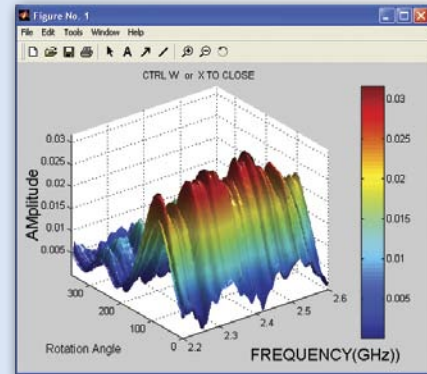
Built in MatLab Runtime to generate powerful 3D Plots



3D Az/El Plot



Color map Plot



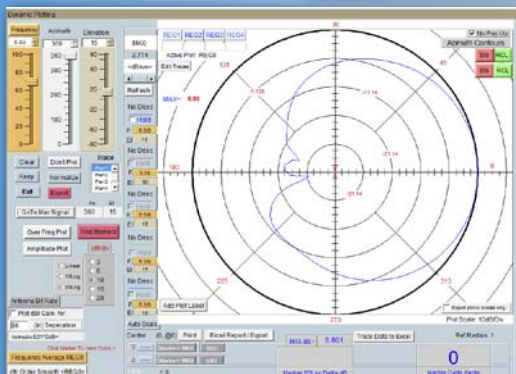
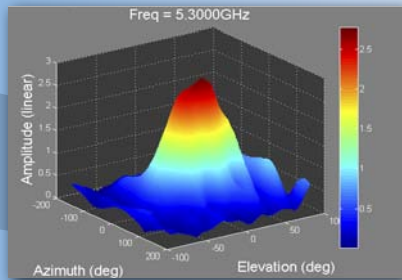
3D Amplitude Plot

## GAIN CALCULATION FEATURES

A number of gain calculation modules are provided from linear gain transfer to remove path loss and reference antenna gain to the 3-point method using the FRIIS transmission formula.

### Modules:

- Linear gain transfer
- Circular gain via linear H-V
- Gain Substitution
- Total power factor
- 3 point method



## DATA EXPORT

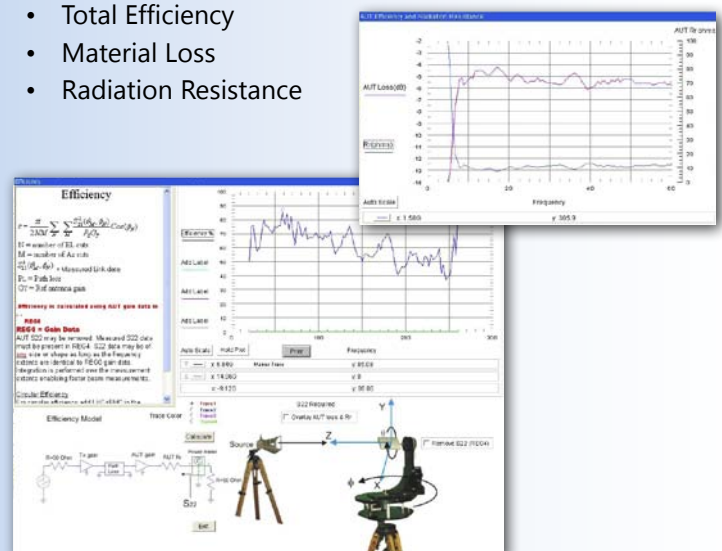
Export single cuts or entire datasets in multiple formats

- Direct to Microsoft Excel
- .TXT / .S1P
- MSI / Planet for site planning

## ANTENNA EFFICIENCY

Complete antenna efficiency module includes:

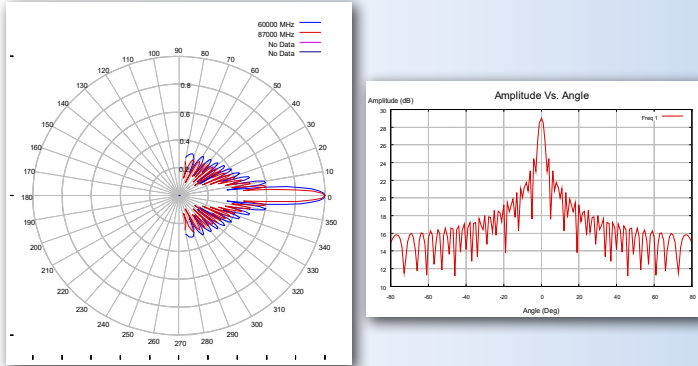
- Total Efficiency
- Material Loss
- Radiation Resistance



# Advanced Software Features

## RCS MEASUREMENT MODULE

Process measured RCS data using direct or gated S11/S21. Compare measured data against simulated ideal structures such as spheres and plates.



## PHASE CENTER OFFSET

By varying the Z, X and Y position of the antenna over multiple sweeps, the data can be processed to find the x,y,z PCO (Phase Center Offset). this is especially useful for broadband antennas and precision satellite navigation systems. Our multiple axis positioners such as the 5 Axis D6050 or FSM equipped systems with motorized Z Axis make this process accurate and easy with automated positioning.

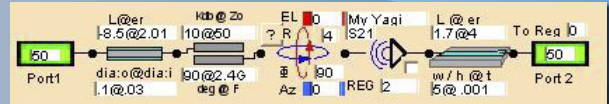
## 3RD PARTY CONTROLLER SUPPORT

Features expanded support for 3rd party positioners and controllers. Don't see your's listed? Contact us for more details!

- Sunol AZEL2B Positioner
- Sunol SC110V Controller
- Frankonia EMC Turntables
- M2 RC2800
- INNCO CO3000 Controller
- Scientific Atlanta 2012 / 4139
- Galil Motion Controllers
- Custom Applications - Ask us!

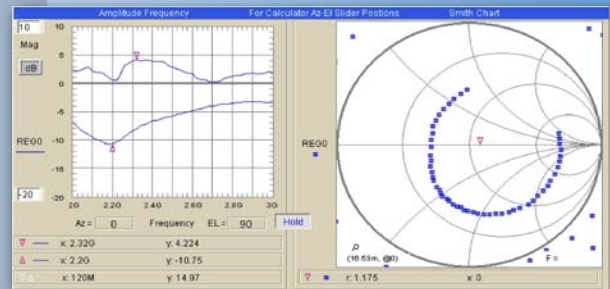
## ANTENNA NETWORK SIMULATOR

A full feature two-port simulator with wave analysis. Fully customizable drag-and-drop elements enable users to create diversified simulations. Three main objects include schematic, amplitude (or Smith chart) and an array calculator.



### Other Features:

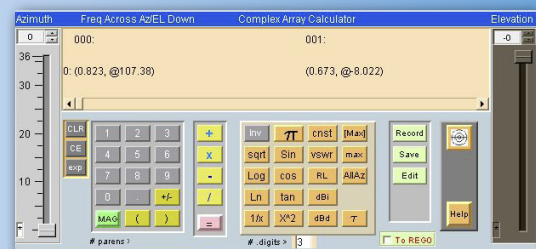
- Analyze networks, including path-loss or phase
- Create phased arrays or sector arrays
- Create matching circuits for measured antennas
- Use the antenna emulation library for ideal networks



## COMPLEX SCIENTIFIC CALCULATOR

Perform complex calculations on partial or entire datasets using standard scientific operations or antenna related functions. Calculations can be performed between individual datasets

- Linear / Log conversion
- VSWR, dBi, dBd
- Individual mag or phase editing
- Data clipping
- Averaging



# Supported Instruments

All DAMS Systems and software support a wide-array of VNAs, PNAs, signal generators, power meters and spectrum analyzers. If your instrument has a GPIB or Ethernet port, it will most likely work. USB compatibility is device specific.

Popular instruments compatible with DAMS:

## **VECTOR NETWORK ANALYZERS**

Copper Mountain Planar Series (804/304)  
Copper Mountain TR5048 / S5048 Series  
Copper Mountain Cobalt / Cobalt FX  
HP / Agilent 8510x Series  
HP / Agilent 8714 Series  
HP / Agilent 8720 Series  
HP / Agilent 8753 Series  
Keysight 507x Series ENA's  
Keysight N52xx/836x Series PNA's  
Keysight N99xx Fieldfox  
Anritsu Sitemaster  
Anritsu 46xx Series Analyzers  
(VectorStar, Shockline, and Scorpion)  
Anritsu 37xx Series Analyzers (Lightning)  
Rohde & Schwarz ZVx, ZNx Series

## **SIGNAL GENERATORS**

Keysight Agilent/HP Models  
Anritsu Models  
R&S SMP/SML Series

## **POWER METERS**

Elva DPM-10  
HP 436A / 437B Series  
Keysight EPM Series  
Anritsu ML2438A / Others  
Boonton USB

## **SPECTRUM ANALYZERS**

Anritsu Sitemaster  
Anritsu MS27xx Series  
Anritsu MT82xx Series  
Keysight N99XX Fieldfox  
Agilent E440x Series  
HP856x Series  
Rohde & Schwarz FSx Series



Scan me for a complete list of supported instruments.



## **Featured Customers**

U.S. Army, Navy, and USAF  
Motorola  
L3 Communications  
Honeywell  
3M  
Delphi  
Ball Aerospace  
Microsoft  
University of Wisconsin



TDK (Ireland)  
Boeing  
Ubiquity Networks  
Manchester University  
Lockheed Martin  
Samsung  
LG  
GE Research  
Qualcomm

# Product List

## Standard x000 Series - Up to 20 lb capacity (9 kg)



Product Code	Frequency
D5000	DC-6 GHz
D6000	DC-18 GHz
D7000	DC-40 GHz
D7000-50	DC-50 GHz

## Floor Mount D6050-x - Up to 150 lb\* capacity (90 kg)



Product Code	Frequency
D6050-6	DC-6 GHz
D6050-18	DC-18 GHz
D6050-40	DC-40 GHz
D6050-50	DC-50 GHz
D6050-CFX-mmW	Milimeter Wave

## Heavy Duty x100 Series - Up to 150 lb capacity (90 kg)



Product Code	Frequency
D5100	DC-6 GHz
D6100	DC-18 GHz
D7100	DC-40 GHz
D7100-50	DC-50 GHz

## Heavy Duty x250 Series - Up to 250 lb capacity (113 kg)



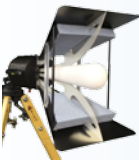
Product Code	Frequency
D5250	DC-6 GHz
D6250	DC-18 GHz
D7250	DC-40 GHz
D7250-50	DC-50 GHz

## Full Spherical Mount - Up to 10 lb capacity (4.5 kg)



Product Code	Frequency
DFSM5-18/40/50	DC-18/40/50 GHz
DFSM10-18/40/50	DC-18/40/50 GHz
DFSM25-18/40/50	DC-18/40/50 GHz

## Ultra Broadband Reference Antenna - Up to 40 GHz



Product Code	Frequency
DE 0518 / 0718	500 / 700 MHz - 18 GHz
DE 0526 / 0726	500 / 700 MHz - 26 GHz
DE 0530 / 0730	500 / 700 MHz - 30 GHz
DE 0540 / 0740	500 / 700 MHz - 40 GHz

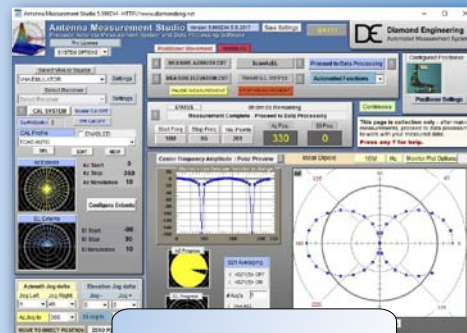
## Optional Accessories

Pre-Configured Desktop PC  
 Pre-Configured Laptop PC  
 DAMS Simulator Addon  
 DAMS P100 Polarizer  
 Automated Z Slide (x100+FSM)  
 Platform Development Kit

## Product Code

DEPC-D  
 DEPC-L  
 SIMULATOR  
 P100

Contact us about your custom application!



Download our fully functional demo software at [www.DiamondEng.net](http://www.DiamondEng.net)

Visit us on your Smart Phone!



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