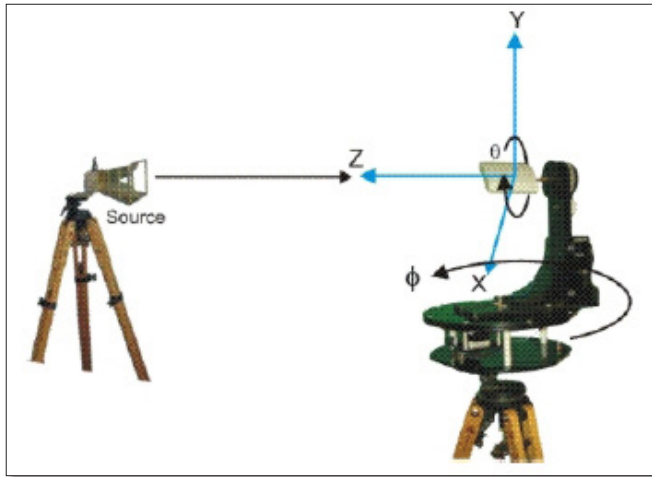




**Diamond Engineering**

Automated Measurement Systems

## Full Spherical Mount (FSM-5)



## Features and Specifications

# Introduction

## Introduction

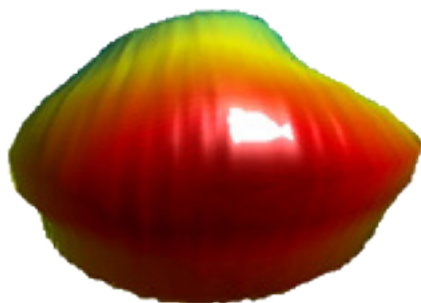
The Diamond Engineering Full Spherical Mount (FSM5) is an optional add-on for the DAMS Series platforms to add an additional axis of rotation capability. The structure utilizes Delrin ball bearings and a completely non-metallic design (with the only exception being the motor body itself). The FSM5 enables full spherical measurements to fine resolutions of up to 0.1 degrees. The mount is ideal for unobstructed gain data and efficiency with a low radar cross section which registers at less than -20dBsm. The belt-driven system is a plug-and-play substitution to the DAMS elevations motor option.

## Features

- Low reflection (90% Delrin construction)
- Wide frequency range options (DC to 18 GHz or DC to 40 GHz)
- 6-inch horizontal adjustment for AUT/DUT centering
- 12-inch vertical height
- Up to 0.1 degree movement resolution
- 5- or 10-pound load options (FSM-5 or FSM-10)
- CTIA and general efficiency software features
- Runs from existing DAMS Platform azimuth plug

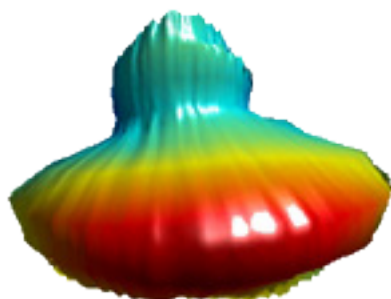
### Same patch antenna measured *with* FSM

Freq = 5 GHz Az = -10 EL = 25



### Path antenna measured *without* FSM

Freq = 5 GHz Az = -10 EL = 25

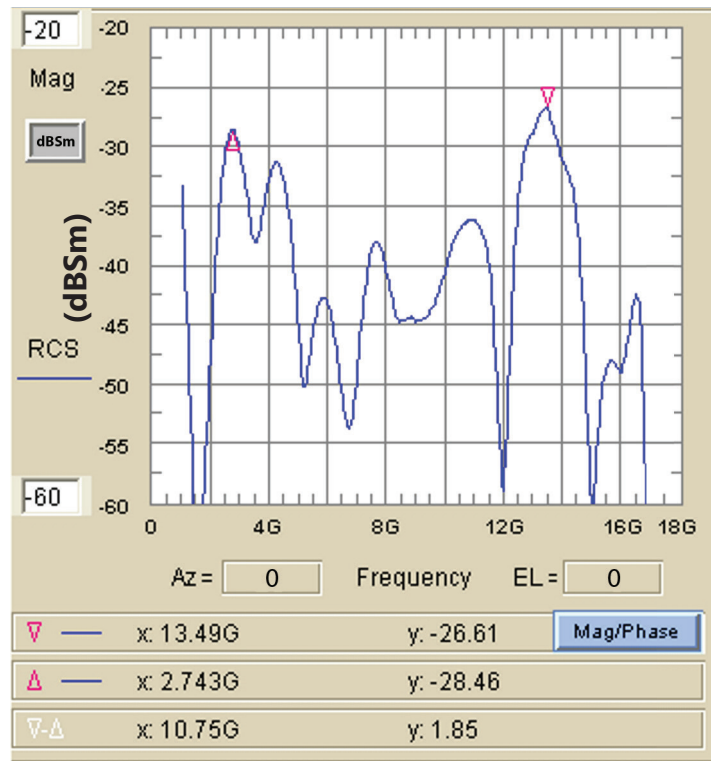
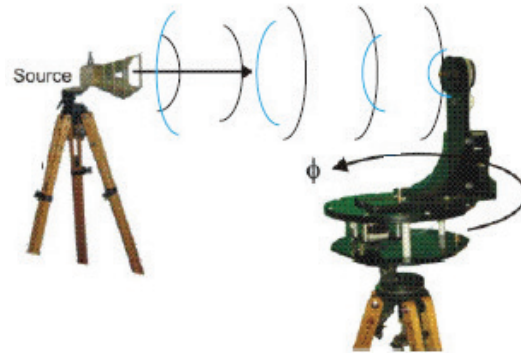


# Low Radar Cross Section Profile

## Overview

An object's RCS profile is a principal concern when designing for low-reflection and/or stealth applications. Naturally, you'll want an accurate way to measure this without concerns of the measurement device itself adding artifacts or noise. The Full Spherical Mount option enables quick and efficient Radar Cross Section (RCS) profile measurements of your AUT/ DUT with minimal positioner reflectivity. The extremely low-reflection design - combined with wide frequency range capabilities of DC to 40 GHz - makes the FSM ideal for obtaining accurate RCS measurements.

### Typical Radar Cross Section Data at 1-Meter

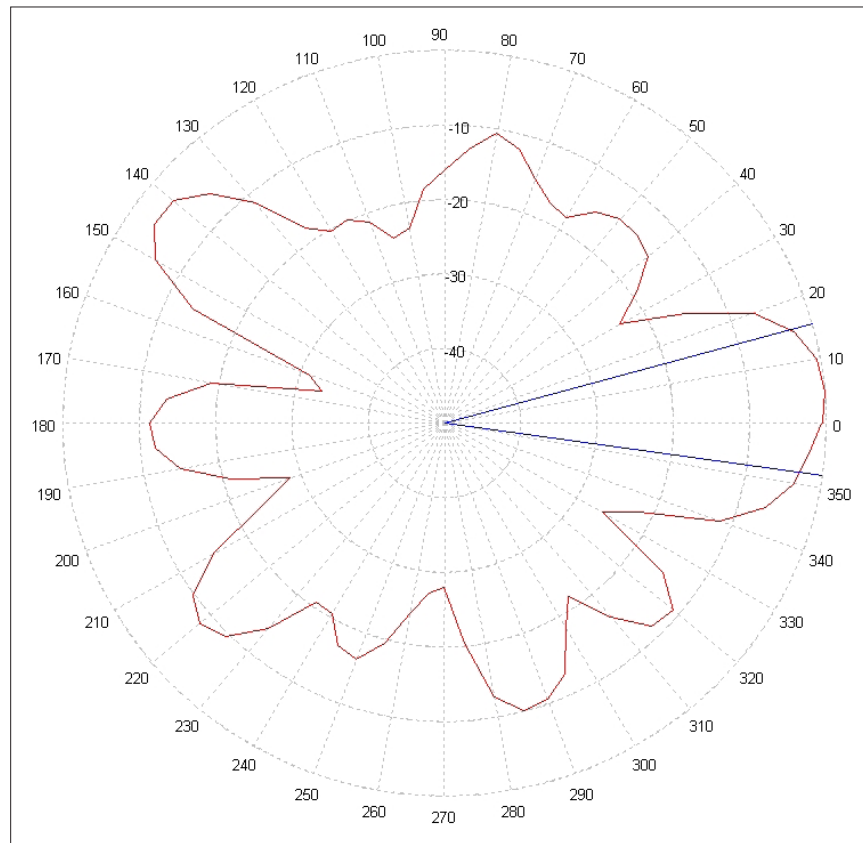


*Our amplitude frequency feature illustrates which frequencies the amplitude of your RCS profile are highest and lowest at as gathered from the measurement data.*

# Plot Examples

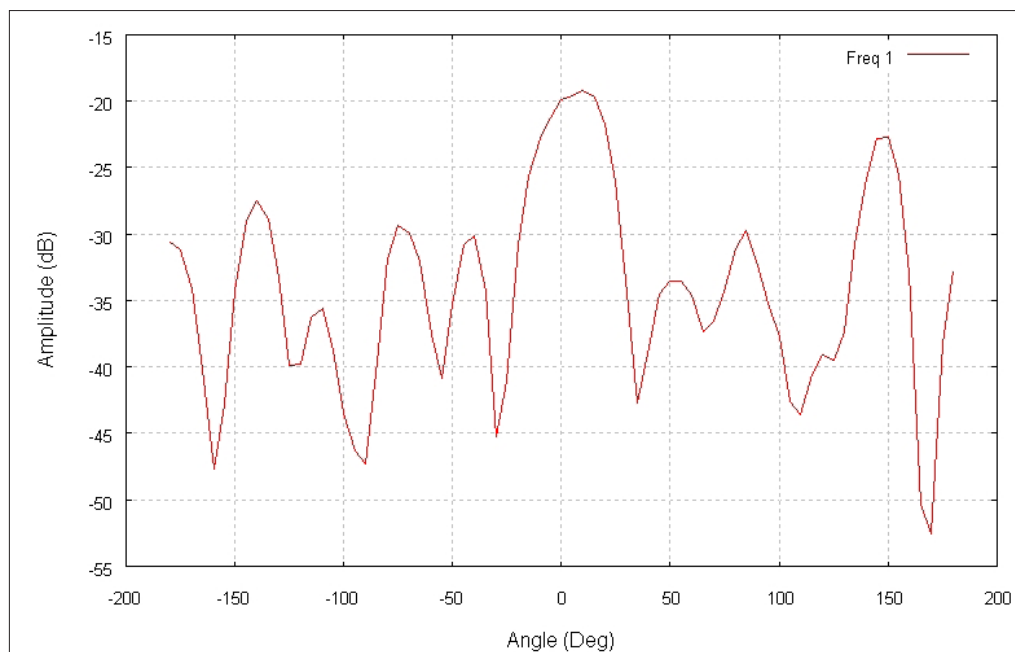
## Polar Plot Example

DAMS FSM typical RCS profile measured



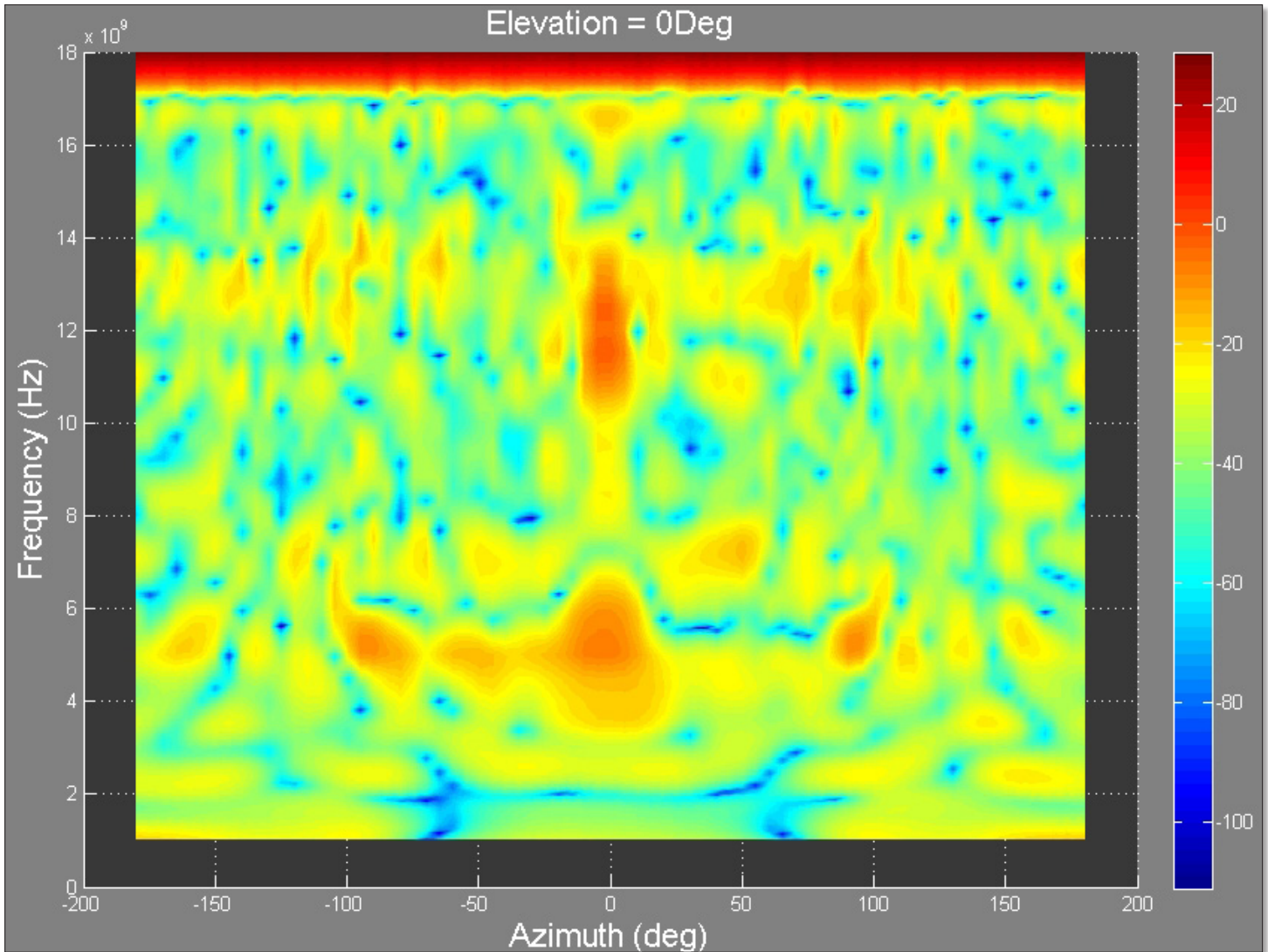
## Amplitude vs. Angle

DAMS FSM typical RCS profile measured

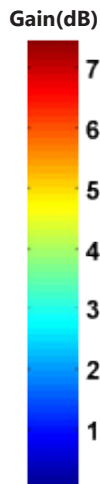
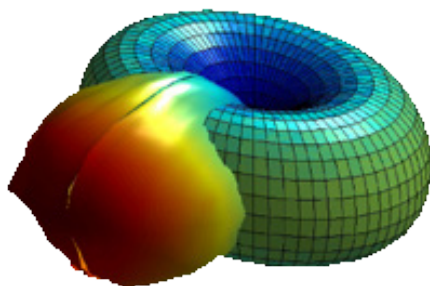


### Color Chart

Measured DAMS RCS profile processed with simulator and advance plotting

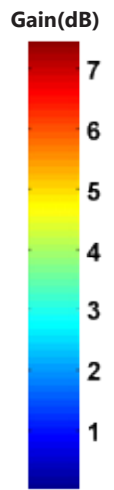
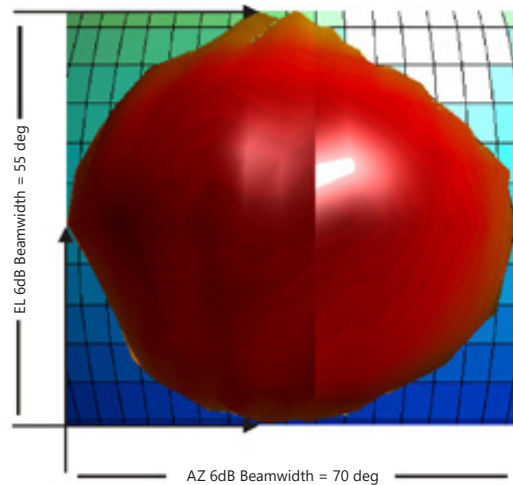


Spherical plot of AUT (Patch) gain with ideal 3dBd dipole



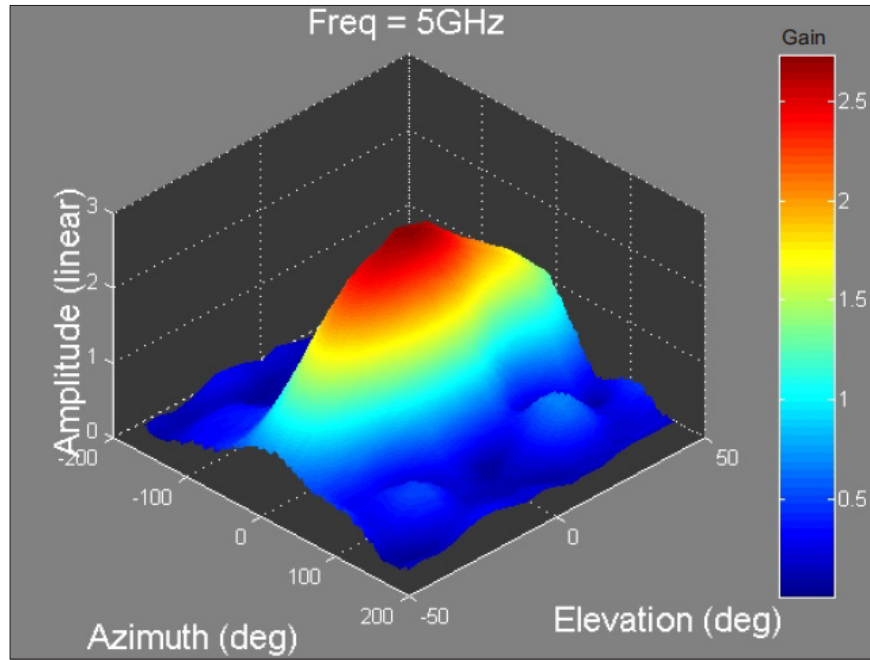
Spherical plot of AUT (Patch) 6dB beamwidth using 6dB gain Iso-sphere

Freq = 5GHz AZ = 0 EL = 0



Iso-Sphere grid set to 5 deg/div AZ and EL

## Linear AZ-EL Plot of AUT



## Polar Plot of Patch AUT showing all AZ EL contours relative to Max Gain



# Efficiency Measurement Functions

Efficiency with AUT S22 removed

### Efficiency

$$\epsilon = \frac{\pi}{2NM} \sum_N \sum_M \frac{S_{21}^2(\theta_M, \phi_N)}{P_L G_T} \cos(\phi_N)$$

N = number of EL cuts  
M = number of Az cuts  
 $S_{21}^2(\theta_M, \phi_N)$  = Measured Link data  
PL = Path loss  
GT = Ref antenna gain

**Efficiency is calculated using AUT gain data in REG0**

**REG0 = Gain Data**

AUT S22 may be removed. Measured S22 data must be present in REG4. S22 data may be of any size or shape as long as the frequency extents are identical to REG0 gain data. Integration is performed over the measurement extents enabling faster beam measurements.

Circular Efficiency  
For circular efficiency add LHC+RHC in the

Efficiency %

Frequency

Auto Scale | Hold Plot | Print

—	x: 2.52G	Marker Trace	y: 0
—	x: 2.52G		y: 0
	x: 0		y: 0

### Efficiency Model

Trace Color: Trace1 (red), Trace2 (cyan), Trace3 (magenta), Trace4 (green)

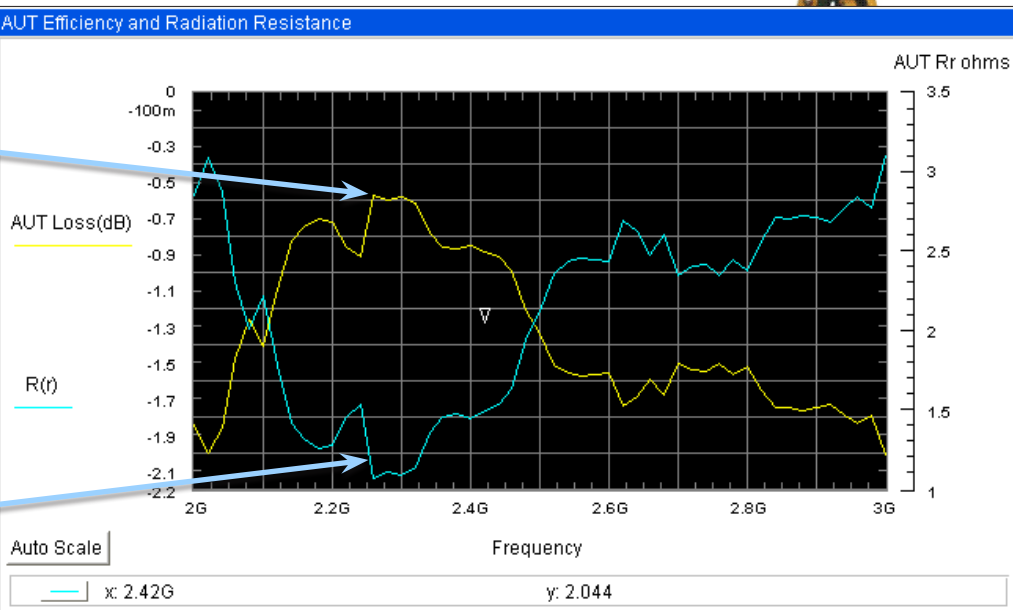
Calculate | Exit

S22 Required

 Overlay AUT loss & Rr

Remove S22 (REG4)

AUT Rad R



AUT Loss

## More Information

### Software

For more information about our software, including screen shots, full specifications of capabilities and the ability to download a demo version, please visit:

[http://www.DiamondEng.net/PDF/software\\_specs.pdf](http://www.DiamondEng.net/PDF/software_specs.pdf)

### Broadband Reference Horns

For more information about our broadband reference horns, please visit:

[http://www.DiamondEng.net/PDF/de0726\\_datasheet.pdf](http://www.DiamondEng.net/PDF/de0726_datasheet.pdf)

### Power Amplifiers

For more information about our broadband power amplifiers, please visit:

<http://www.DiamondEng.net/power-amplifiers>



**Diamond Engineering**

Automated Measurement Systems

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