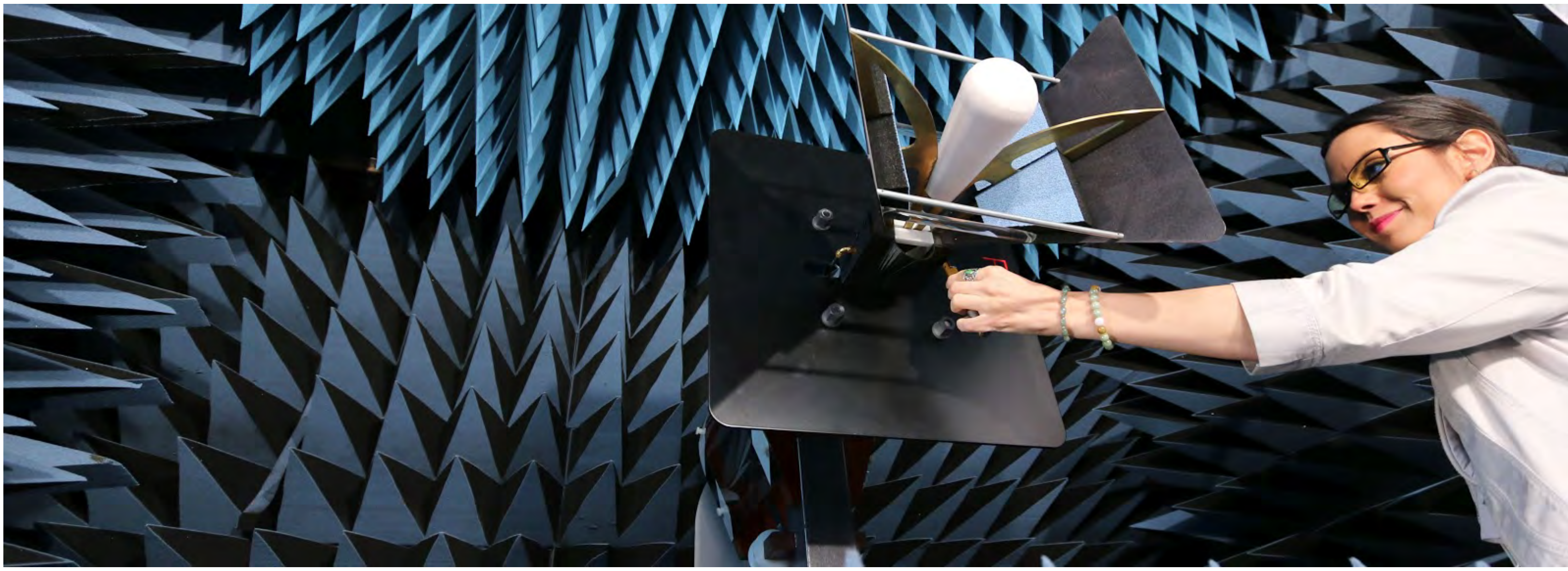
Antenna Gain Measurement Report CE3807A, for 3M Supplied PCB PIFA Antenna

This summary contains 3D pattern swept gain results for a customer supplied sample antenna.

Glenn Robb, Principal Engineer
Antenna Test Lab Co.
www.AntennaTestLab.com



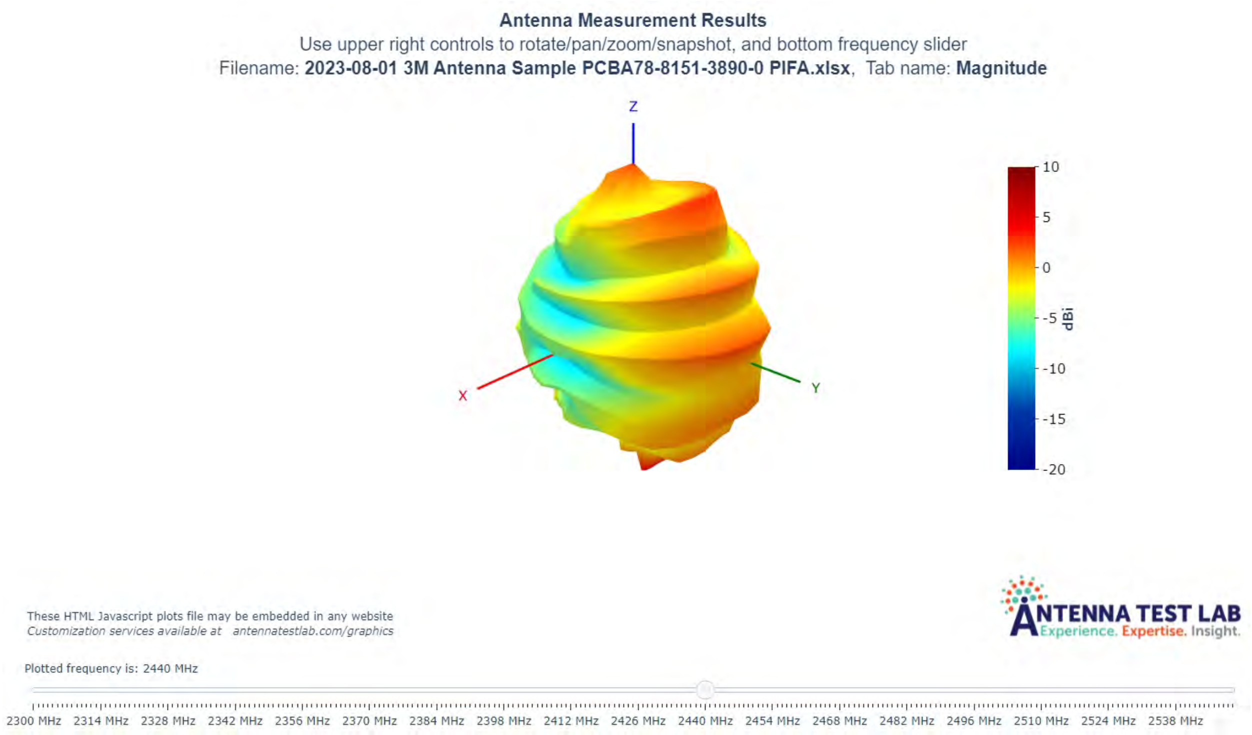
Testing Summary

On August 1st, 2023, a sample antenna was evaluated for gain vs frequency. In the 2400 to 2480 MHz band, the antenna's peak observed gain was +4.66 dBi.

Detailed Test Results

3D Gain Patterns

The antenna was evaluated from 2300 to 2550 MHz in 1 MHz steps (251 data points). Absolute gain was measured on a spherical grid of 10 degree steps (in both theta and phi), or approximately 650 directions. The diagram below shows the antenna's 3D gain pattern at 2440 MHz.



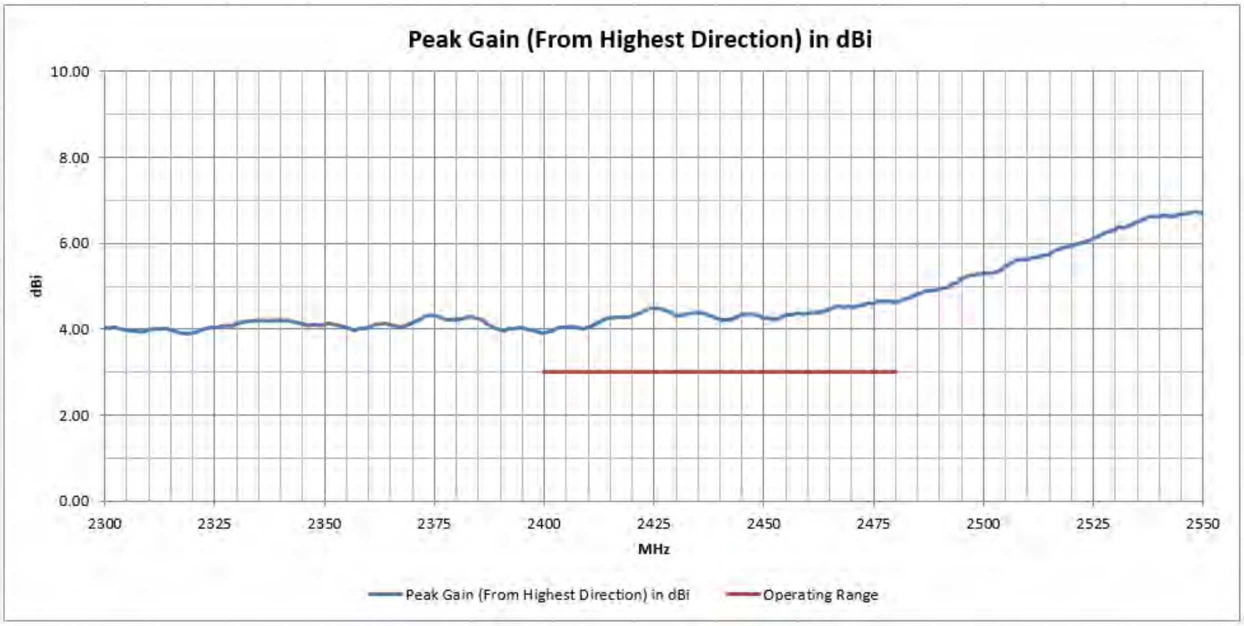
Antenna Measurement Results
Use upper right controls to rotate/pan/zoom/snapshot, and bottom frequency slider
Filename: **2023-08-01 3M Antenna Sample PCBA78-8151-3890-0 PIFA.xlsx**, Tab name: **Magnitude**

These HTML Javascript plots file may be embedded in any website
Customization services available at antennatestlab.com/graphics

Plotted frequency is: 2440 MHz

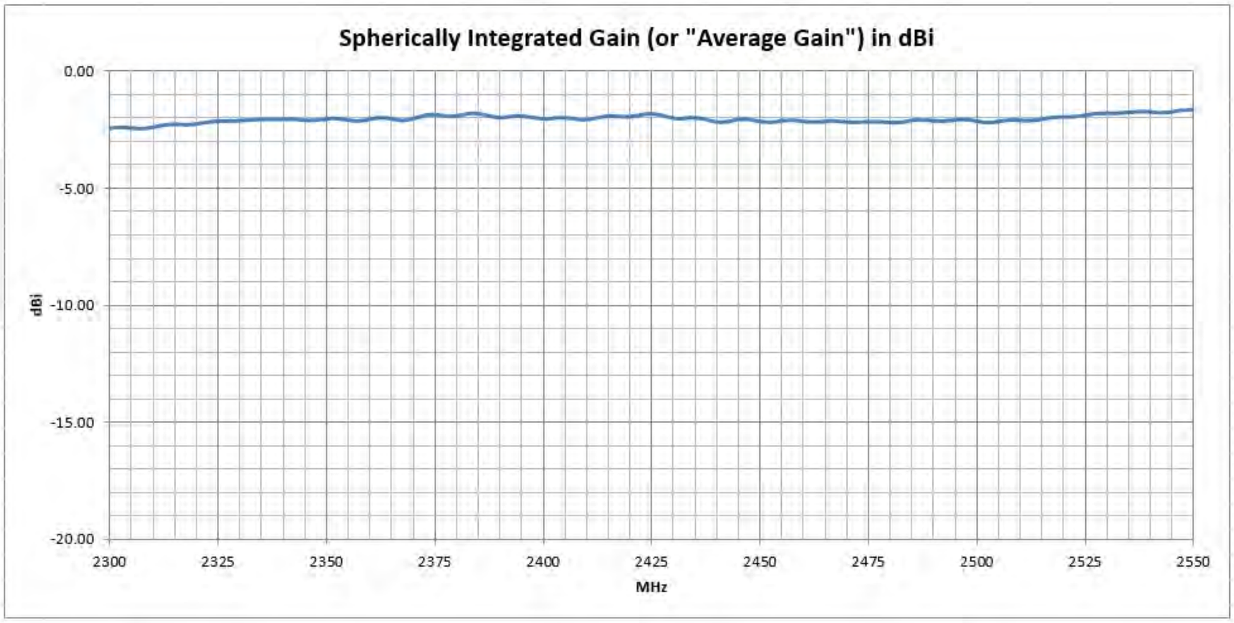
Peak Gain vs Frequency Graph

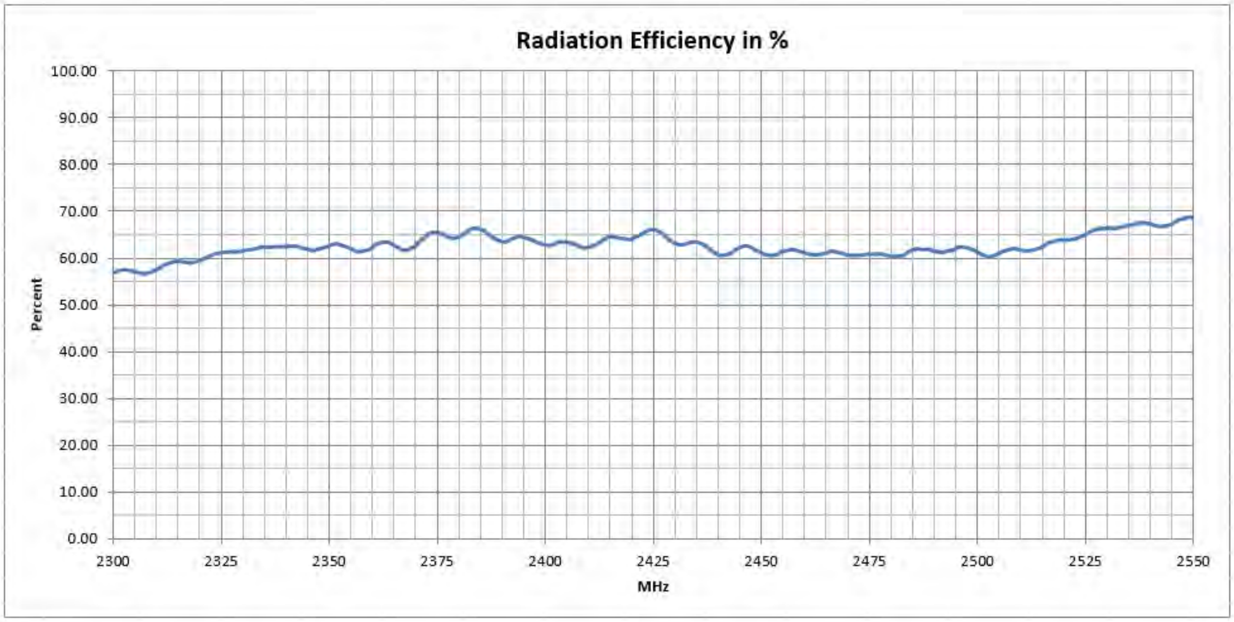
The diagram below shows the antenna's peak observed gain at each test frequency. In the 2400 to 2480 MHz band, the antenna's peak observed gain was +4.66 dBi.



Average Gain vs Frequency Graph

The diagram below shows the antenna's calculated average gain at each test frequency. Average gain is reported in dBi and as a linear percentage (equivalent to radiation efficiency).

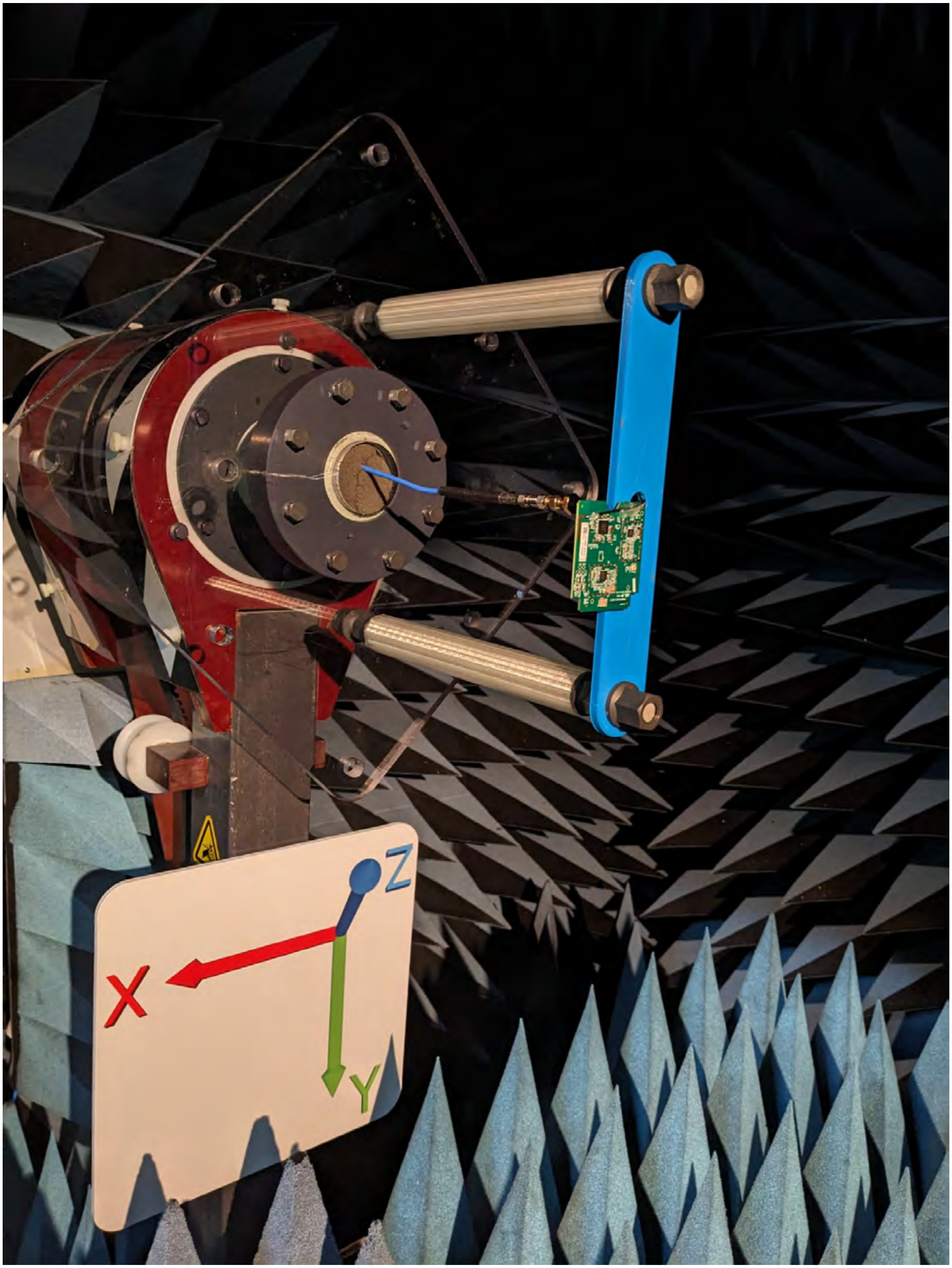




Testing Details

Photographs

The following photos depict the Antenna’s test orientation and installation on the laboratory positioner.


Z
X
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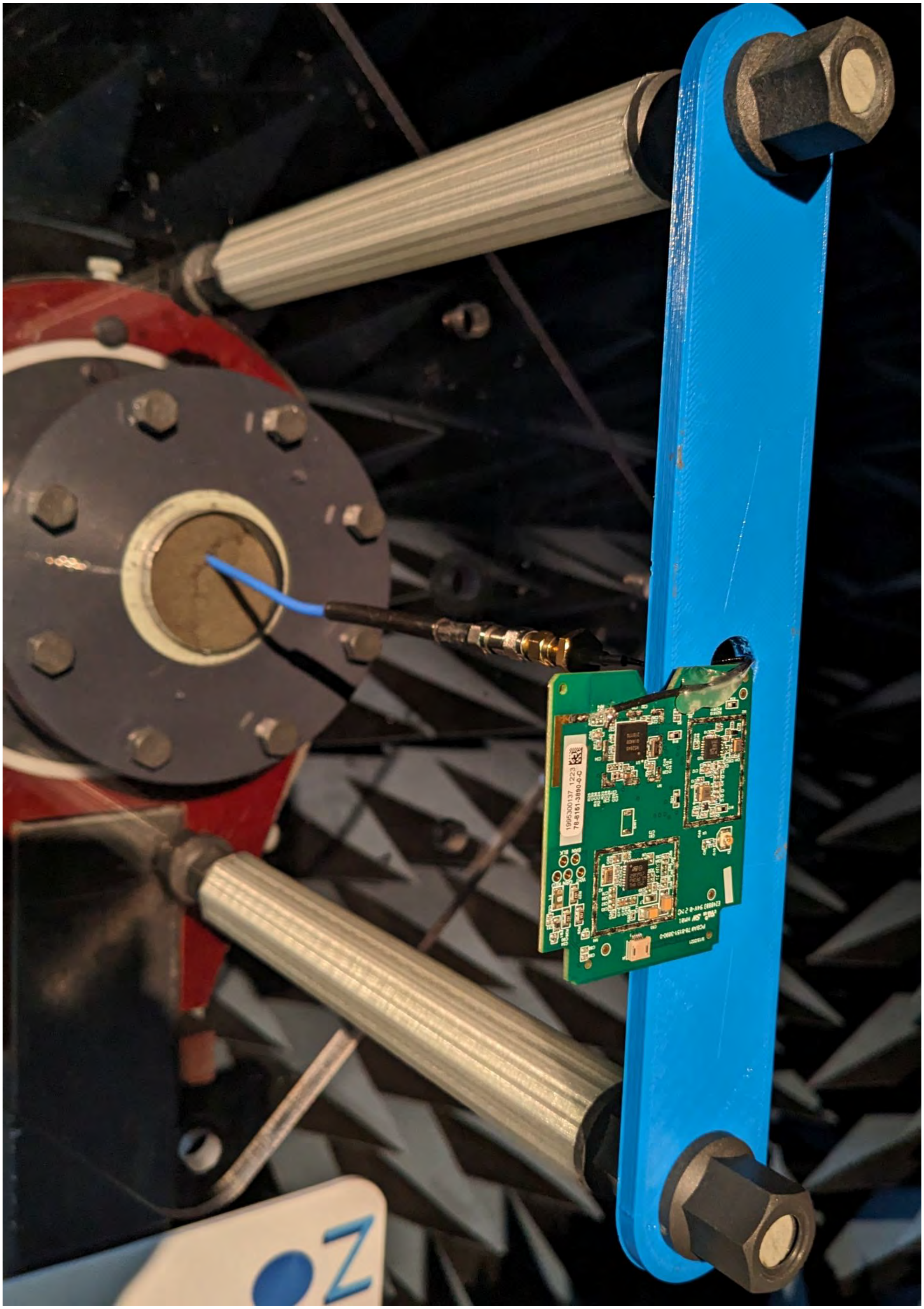
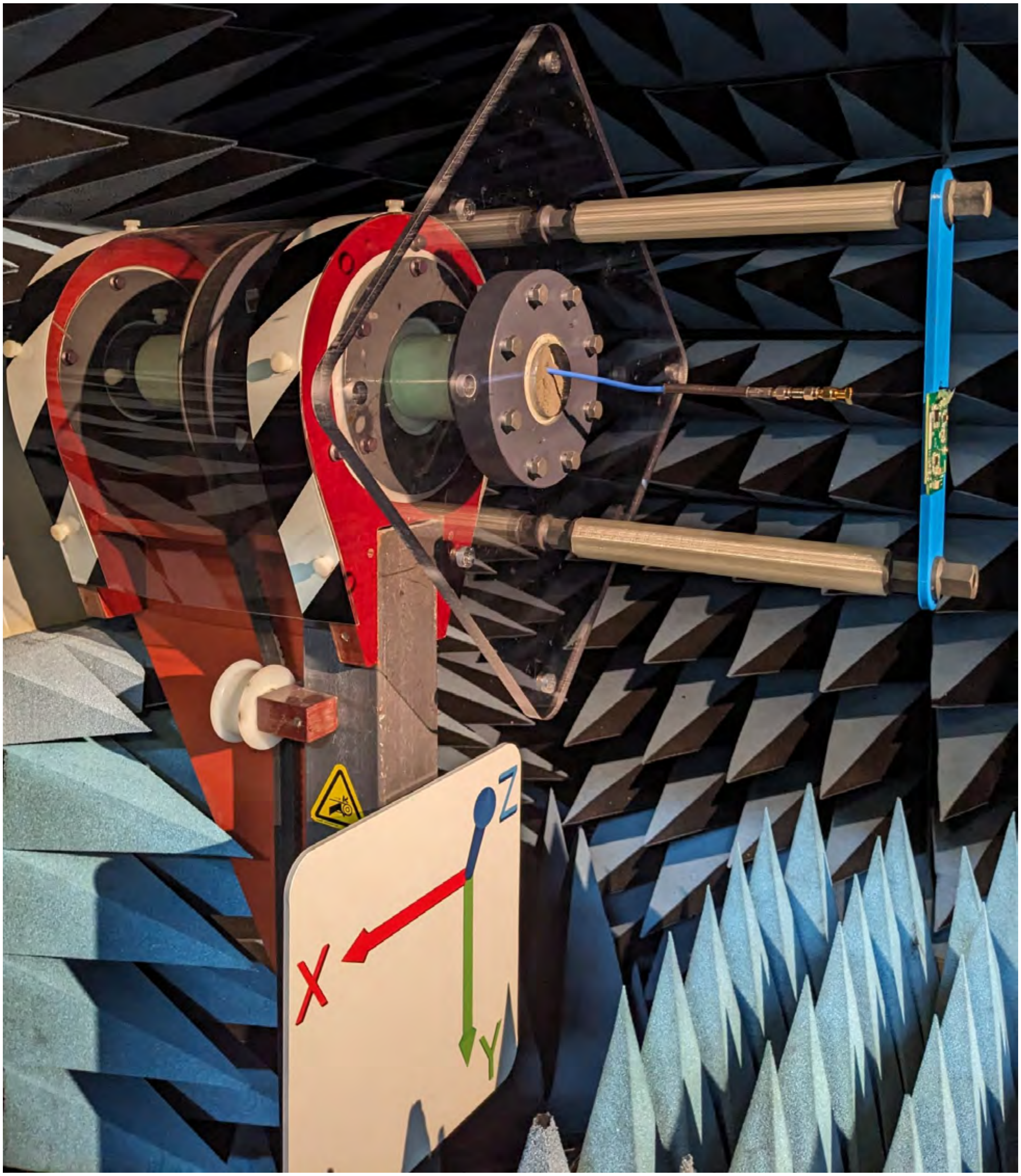


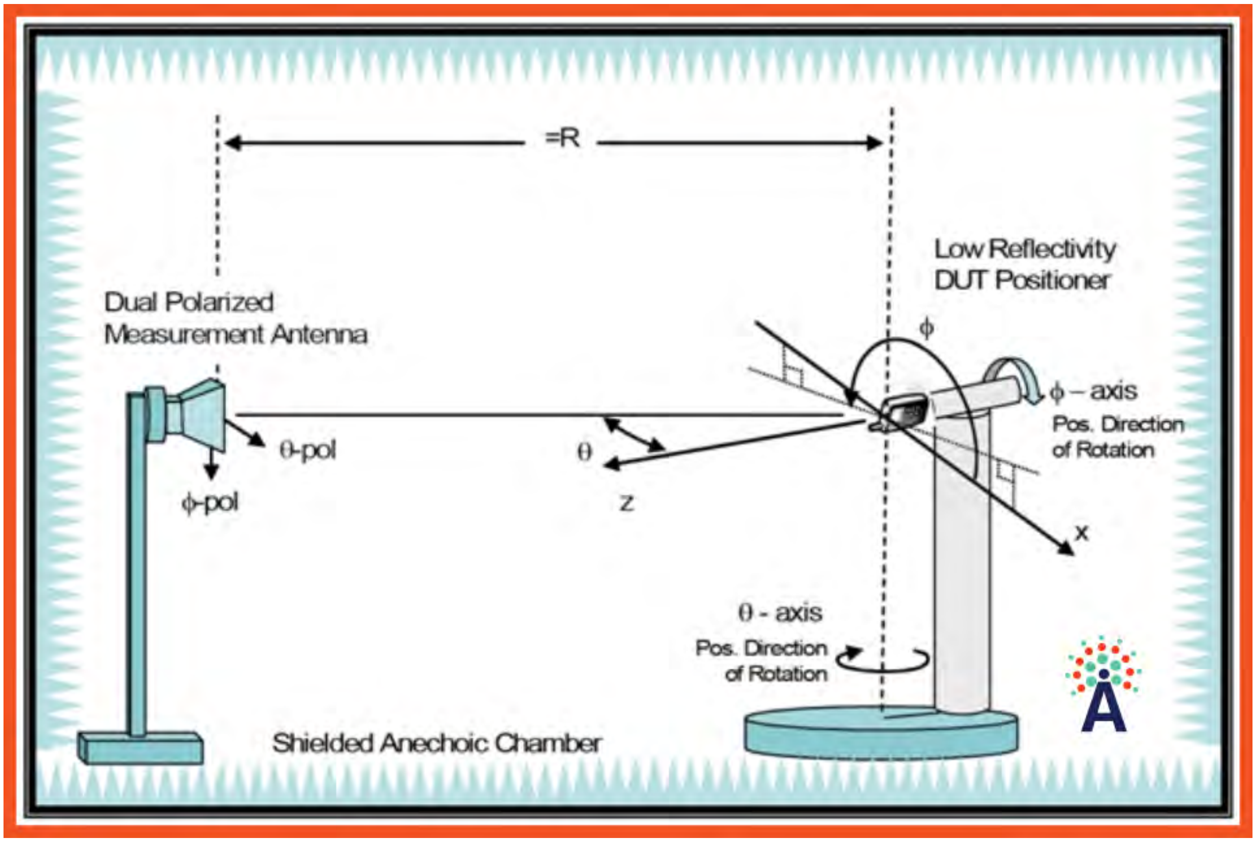

Z
X
Y

Test Procedure Reference

This evaluation followed IEEE Std 149-2021, IEEE Recommended Practice for Antenna Measurements, more commonly called “Substitution Method Testing”. Please refer to section 8.4 Gain-transfer measurements, subsection 8.4.1 Measurement of linearly-polarized antennas, within IEEE 149-2021.

Test Procedure Summary

An unknown antenna’s gain is measured by exciting the **AUT** (Antenna Under Test) with a swept RF signal in our anechoic chamber. The substitution method involves setting up our known calibrated laboratory reference antenna over a radiated path in the chamber, then **normalizing** (or “zeroing”) that path loss to 0 dB. We also normalize the received phase to zero degrees. In other words, the signal level (magnitude) and relative delay time are normalized (“zeroed”) as a sort of starting point for comparison measurements.



The Quad Ridge Chamber Antenna

The "chamber antenna", sometimes called the "Source Antenna" is an open boundary quad-ridge Vivaldi horn antenna. It is actually two antennas that occupy the same space. The gain/phase normalization described above is actually done twice. Once for the vertical ridges, and again for the horizontal ridges, since they are different antennas with slightly different gain and phase.

The Substitution

Then we exchange our reference antenna for your Antenna Under Test (AUT), and re-measure the path gain/loss and phase changes relative to the previously normalized reference path. In other words, your AUT will have gain higher, the same, or lower than our reference antenna (a relative measurement).

By simply adding our reference antenna's calibrated gain (in dBi) to these path change measurements, we determine the AUT's gain in dBi.

Test Equipment Used

The following laboratory equipment was used during this antenna evaluation. Please note that this equipment is NOT under any calibration program. The results presented here are not certified or traceable to any calibrated reference standard or laboratory accreditation.

Vector Network Analyzer	Rohde & Schwarz ZVK modified for extreme dynamic range and isolation with removed couplers and relays (modified, and thus not commercially calibrate-able)
Positioner	Az/El by Sunol Sciences model ELAZ75
Anechoic chamber	Rectangular (22 feet long) with 18-inch pyramidal absorber over ferrite tile, sized to allow a 3 meter test range
Broadband Reference Horn Antenna 300 MHz to 30 GHz	Open-boundary dielectric lens mode-suppressed double ridge guide horn antenna, custom made and similar to Diamond Engineering model DE0530
Broadband Reference Horn Antenna 18 to 40 GHz	Double ridge guide horn by Q-par, model WBH18-40K
Source Horn 300 MHz to 6 GHz	Fei Teng Wireless Technology Co Model HR-03M06G01-NF
Source Horn 1.5 to 18 GHz	EDO model AS-48461
Source Horn 18 to 40 GHz	A-INFOMW p/n LB-SJ-180400
Other RF Hardware	All other items such as cables and LNAs in the test chain are simply "normalized" as part of the reference-antenna substitution process, and are not relevant to measurement accuracy

Contact Us

All antennas are evaluated by Glenn Robb of Antenna Test Lab Co, located at 2210 E Millbrook Rd, STE 113, Raleigh NC, 27604.

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About the Author

Glenn Robb is a Founder and Principal Engineer at Antenna Test Lab Co, www.AntennaTestLab.com

Glenn is an Electrical Engineer who has been working professionally with antennas for 35 years. He has a passion for testing antennas and providing customer insights. Day to day, he runs the anechoic chamber at Antenna Test Lab Co and is responsible for hundreds of customer antenna evaluations per quarter. Glenn also designed all of the lab's custom software and test hardware configurations for accuracy, speed, and cost-effectiveness.

Anaren Integrated Radio

66089 U.FL Antenna Series

66089-xxxx

The 66089 series antennas are designed for quick connection to Anaren Integrated Radio modules, and have been certified to meet "intentional radiator" requirements for low power non-licensed devices (FCC, IC, and ETSI). The 66089 series antennas are intended for applications where an embedded antenna module is not practical—such a radio module mounted inside a shielded enclosure.

Specifications

PERFORMANCE CHARACTERISTICS:

Impedance:	50 ohms
Frequency Range:	See table
Gain:	3 dBI
VSWR:	1.7 max
Radiation:	Omni directional

Module	Band ID	Antenna Element	Center Frequency	FCC (IC)	ETSI
A1101R04C	04	173±1 mm	425 MHz		X
A1101R08C	08	86±1 mm	866 MHz		X
A1101R09C	09	82±1 mm	915 MHz	X	
A25xxE24C A25xxR24C	24	30±1 mm	2.442 GHz	X	X
A110LR09C	89	84±1 mm	898 MHz	X	X

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Nomenclature

66089-XX06

① ②

1	Band	See "Band ID" in table
2	Lead Length	06 = 6mm 'standard' 30 = 30mm 'extended'

To view the entire available family of AIR Modules & Development options, please visit our website at:

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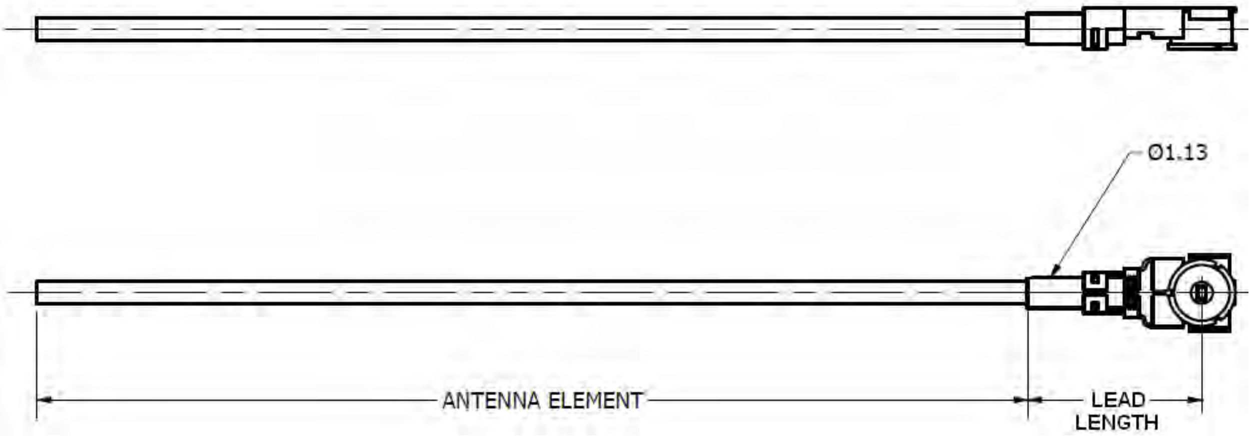
Layout



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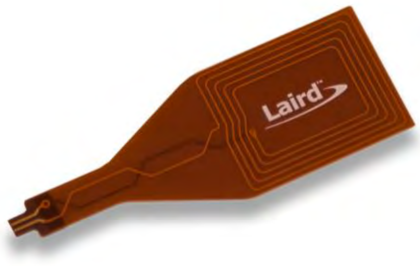
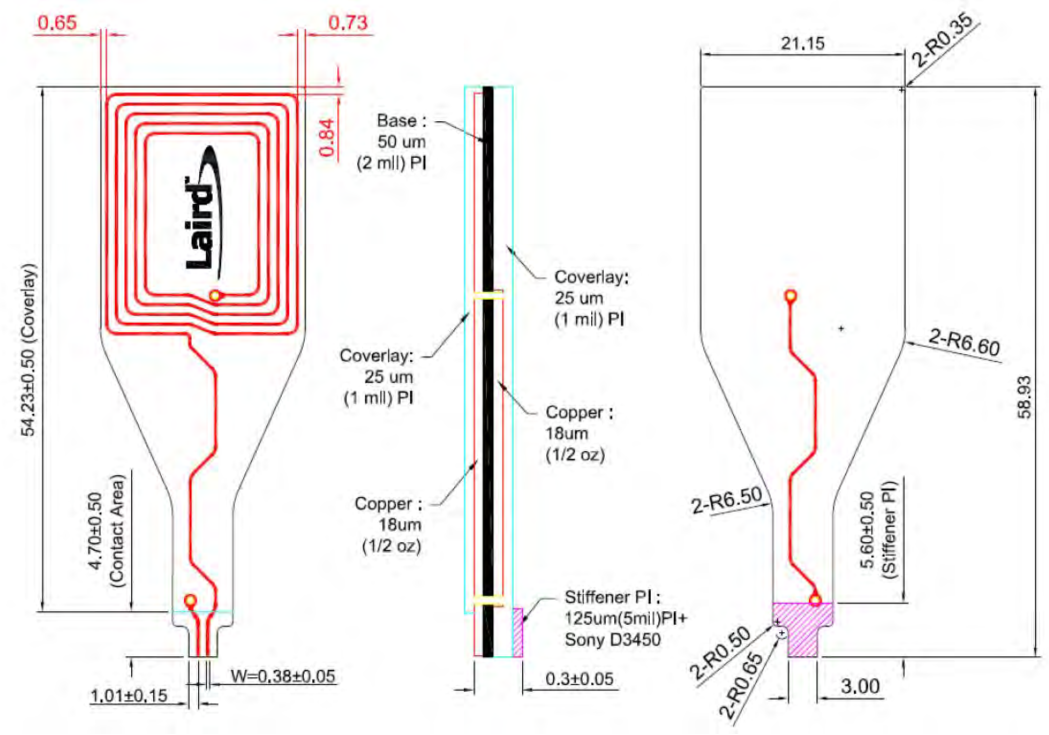
NFC Flex PCB Antenna



This NFC flex PCB antenna is included with the DVK-BL6xx products.
It was tested with the BL65xx series of modules for NFC applications and use.

ELECTRICAL SPECIFICATIONS	
Operating Frequency (MHz)	13.56
NFC Antenna Type	Coiled Inductor
NFC Antenna Interface	Differential NFC port
NFC Printed Antenna Coil Inductance (uH)	0.72
Host Board NFC Antenna Mating Connector	Manufacturer - Molex MPN - 512810594 Description - FFC/FPC connector, right-angle, SMD/90d, dual contact, 1.2 mm mated height
Dimensions – mm (inches)	58.93 x 21.15 x 0.3 (2.32 x 0.83 x 0.01) (dimensions include the contact area)



1 ADDITIONAL ASSISTANCE

Please contact your local Laird Connectivity sales representative or our support team for further assistance:

Support Center https://www.lairdconnect.com/resources/support

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