

M3000B Wi-Fi Antenna Specifications

1. Inseego Custom Antenna Part#'s:

- WiFi Ant #0 Part Number: 12023299
- WiFi Ant #1 Part Number: 12023300

2. Construction:

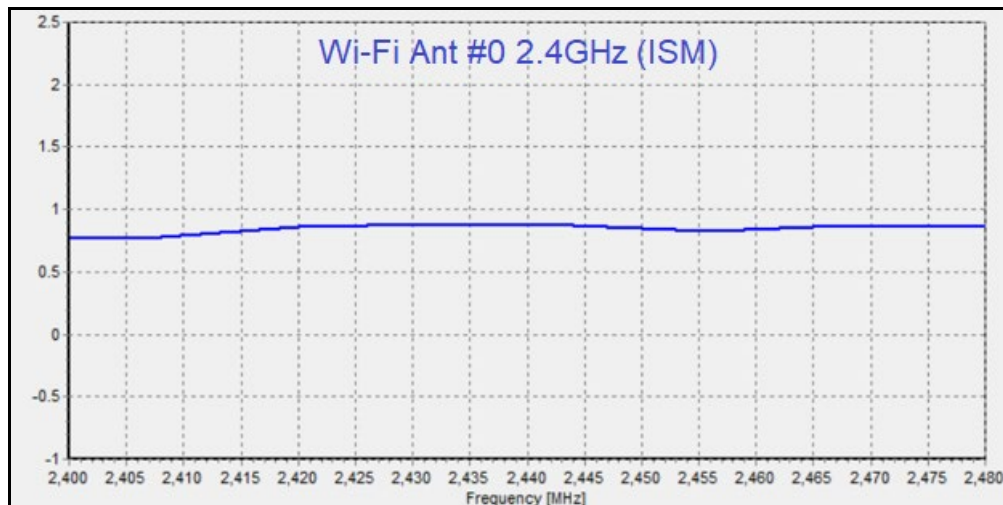
- Flexible Printed Circuit (FPC) Design consisting of Copper, Polyimide, and Adhesive

3. Antenna Passive Pk Gain Results Table:

Wi-Fi Ant #0	Frequency Range	Pk Gain
ISM	2440MHz (2412MHz to 2462MHz)	0.9 dBi
UNI-1	5200MHz (5170MHz to 5250MHz)	3.1 dBi
UNI-3	5700MHz (5735MHz to 5835MHz)	3.9 dBi
Wi-Fi Ant #1	Frequency Range	Pk Gain
ISM	2440MHz (2412MHz to 2462MHz)	4.3 dBi
UNI-1	5200MHz (5170MHz to 5250MHz)	4.5 dBi
UNI-3	5700MHz (5735MHz to 5835MHz)	6.4 dBi

4. Antenna Passive Gain (dBi) Charts:

- Antenna Engineer: Matt Salvino
- Passive Measurement Date: 03-22-2022

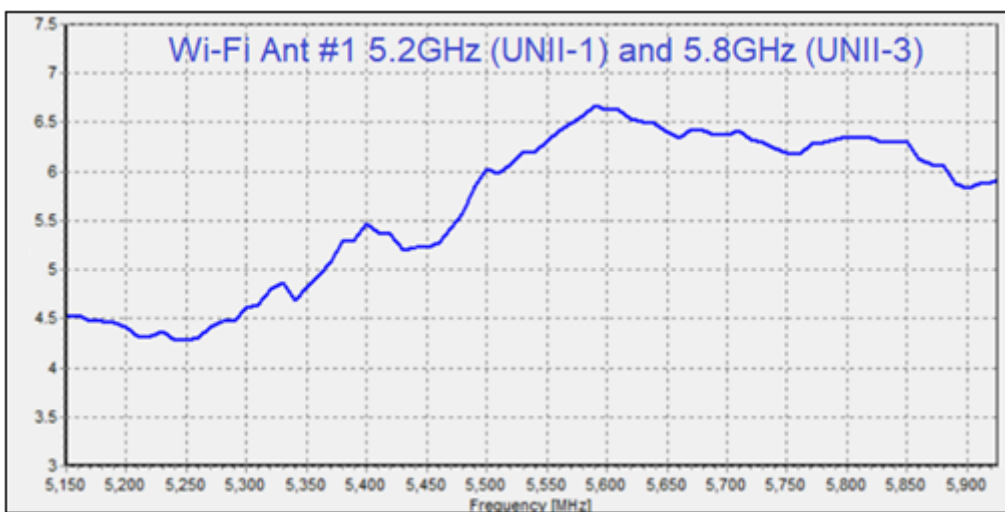
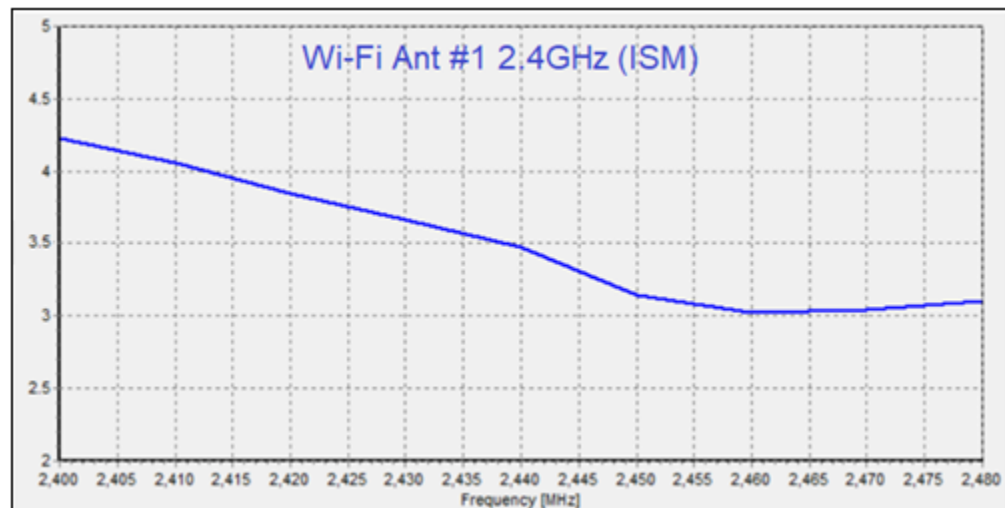
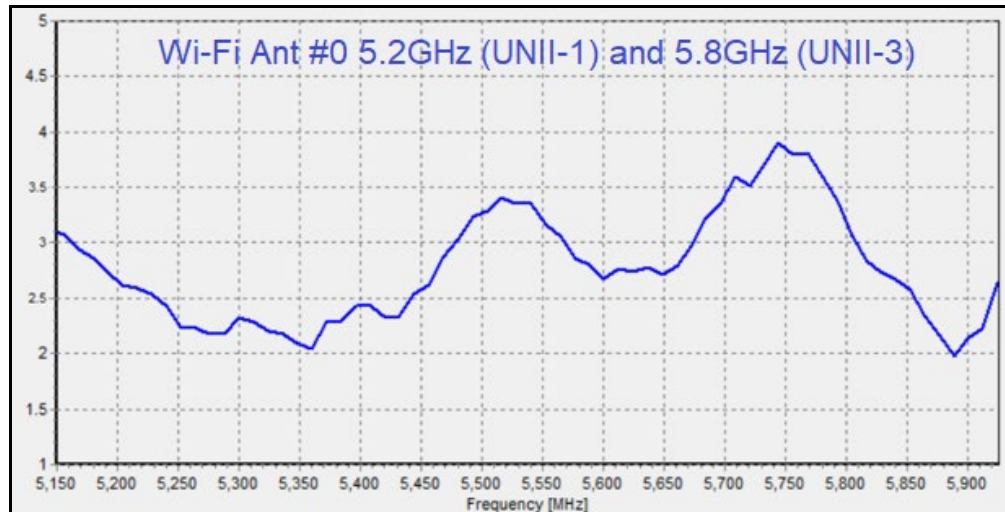


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5. Measurement Setup Illustration:

Passive Performance Test System components and diagram:

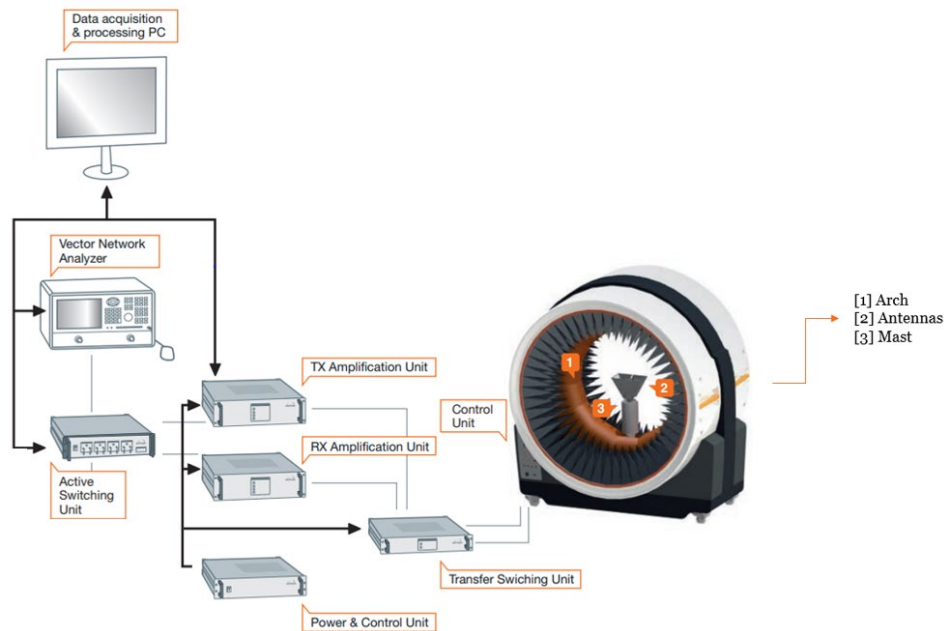
Frequency Bands: 600 MHz to 10 GHz

Max. Size of DUT: 450mm for spherical set-up

Max. Weight of DUT: 10 kgs

The system is capable of the following measurements:

- Gain
- Directivity
- Beamwidth
- Cross polar discrimination
- Sidelobe levels
- 3D radiation pattern
- Radiation pattern in any polarization (linear or circular)
- Antenna efficiency test



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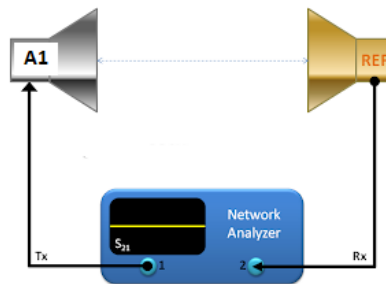
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Gain Measurement method Explained:

- a) **Calibration:** Use Two Antennas (one has to have a known gain [In this case Ref]) to measure and record the S parameter S_{21} which is the input/output relation ship between the ports on the Network analyzer
 - a. Normalize the calibration to produce 0 DB reference on the network Analyzer.
 - b. All cable loss factors are accounted for in the system

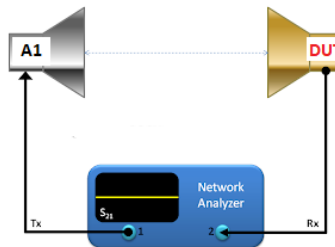
Notes : A1 represents Arch antennas in system

The software instructs the VNA to produce a sweep signal over the frequency range specified. The it will generate the signal is a swept CW between the start and end frequency and pausing at predetermined points long enough to collect measurement.



Calibration diagram

- b) **DUT Measurements:** Replace reference Antenna with DUT Antenna (maintaining the same conditions) distance etc.



DUT Measurement diagram

- c) Remeasure S_{21} response which now represents the gain relative to reference antenna. Collect $G(Rel)$.

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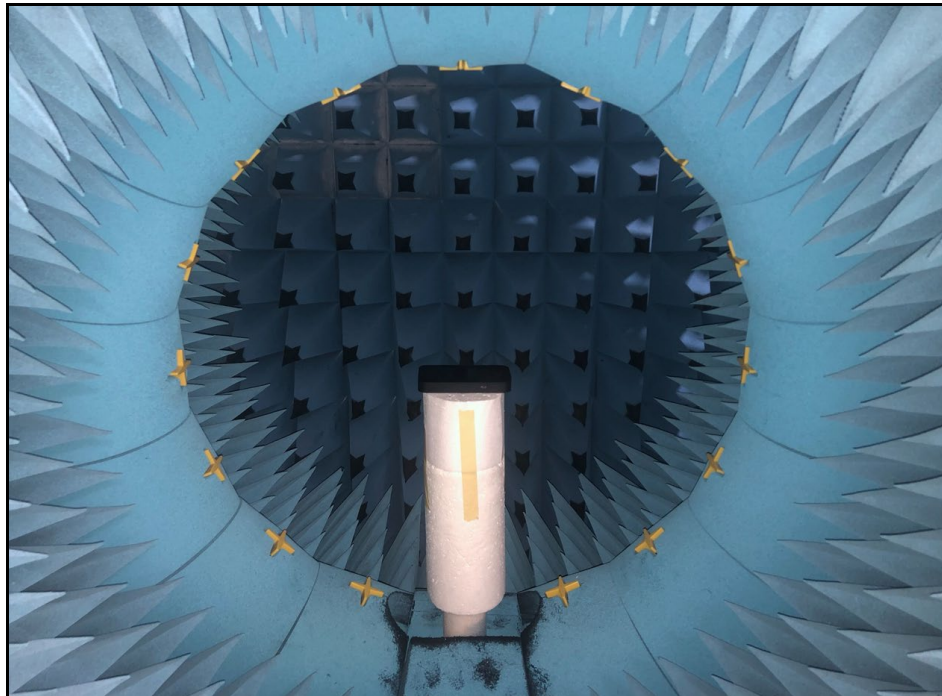
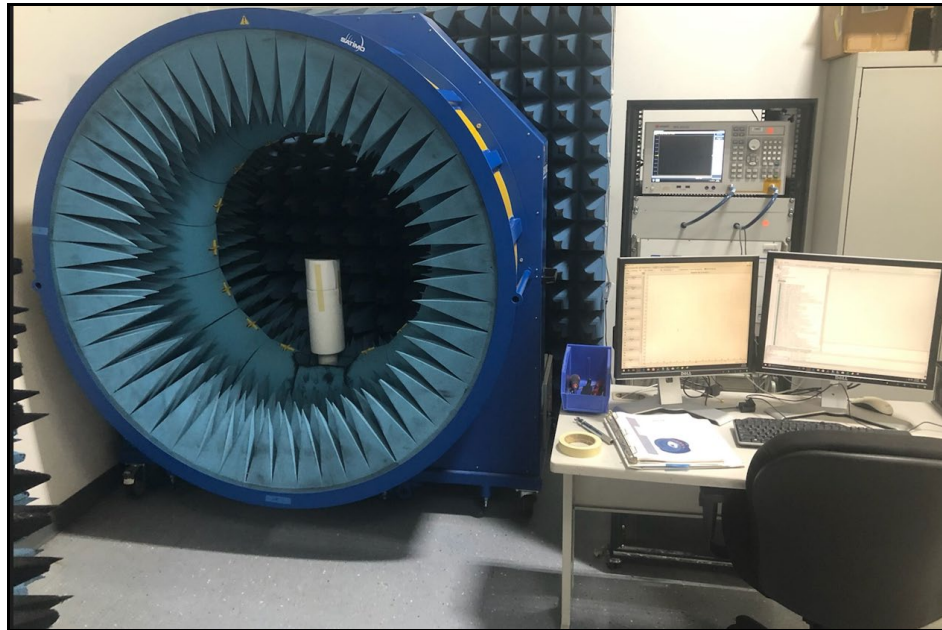
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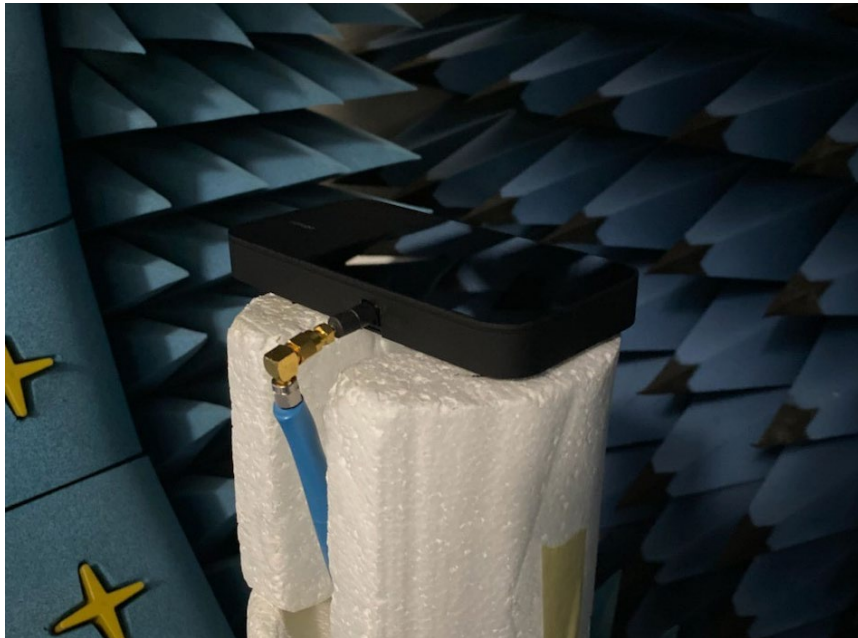
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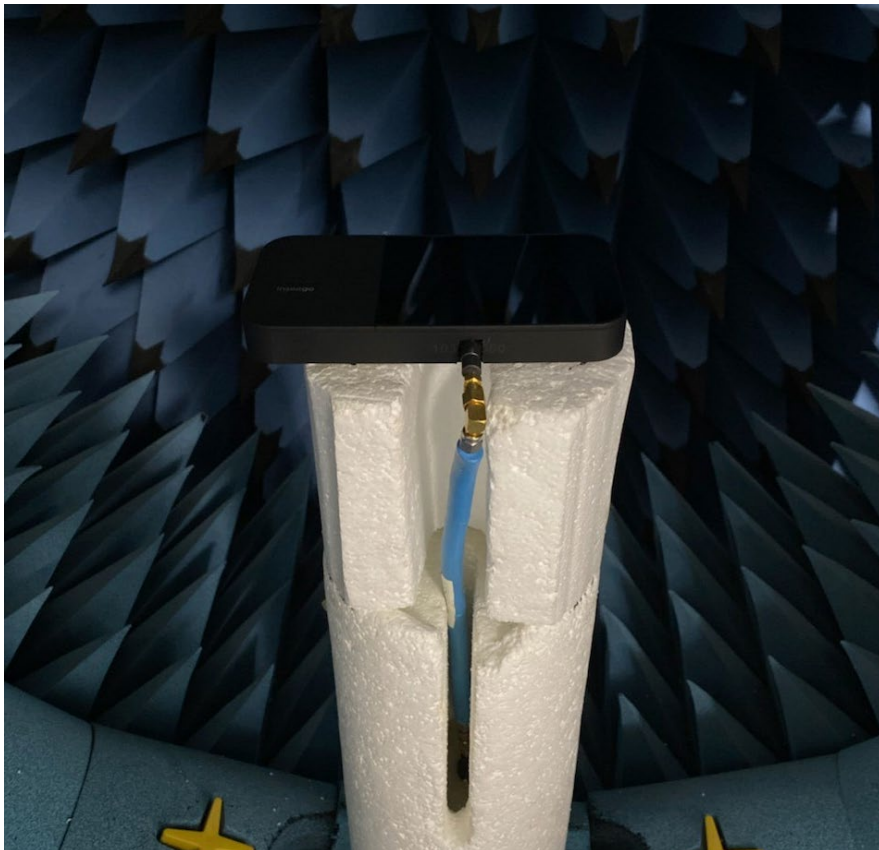
d) Calculate $G(Dut)=G(ref)+ G(rel)$

Note that the system used in the chamber is automated. (the measurement is taken at multiple locations by rotating the DUT and the arch)





DUT connection Photo 1



DUT connection Photo 2

6. Measurement Equipment calibration:

- MVG StarLab Multi-Probe Compact Passive Antenna Measurement Chamber Calibration Certificate:




Calibration Certificate

Manufacturer's Name : MVG Industries

Manufacturer's Address : 13, rue du Zéphir
Parc d'Activité de l'Océane
91140 Villejust
FRANCE

Declares that product

Customer name : INSEEGO

Product Name: SL v1

Serial Number : C253

Calibration date 19/02/2022

Has been calibrated according MVG procedure and \ Or according ISO 9001 requirements.

19 February, 2022 MVG Quality Manager



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- E5071C Network Analyzer Calibration Certificate:

Certificate of Calibration



ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 1-13571508236-1



Model Number	E5071C
Manufacturer	Keysight Technologies Inc
Description	ENA Series Network analyzer
Serial Number	MY46103762
Date of Calibration	17 Dec 2020
Procedure	STE-50114528-C.06.06
Temperature	(23 ± 5) °C
Humidity	(50 ± 30) %RH

Customer
Inseego Corp
9710 Scranton Rd Ste 200
SAN DIEGO CA 92121-1744
United States

Location of Calibration
Keysight Technologies Inc
10090 Foothills Blvd.
Roseville CA 95747-7102
UNITED STATES

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

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