



Antenna Test Report

Model: Multiband Antenna - by Aquana/GEOSPACE



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Revision History: Rev A, June 19, 2023 – Original Document

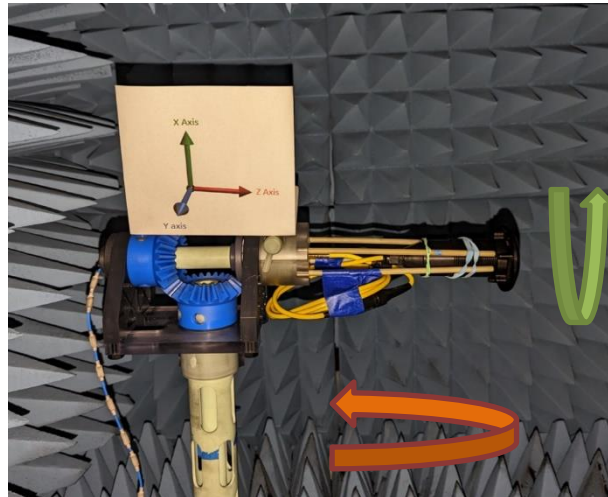
Rev B, May 23, 2024 – Included test equipment list, Test method, Antenna information, Data Sheet, and photo of antenna.

This test report represents passive antenna testing results for the Aquana / Geospace new LTE and LoRa antenna.

1. PHOTOS OF DEVICE UNDER TEST

In the photos below the device is in the test chamber for passive antenna testing.

Theta turn table position



Phi positioner rotation

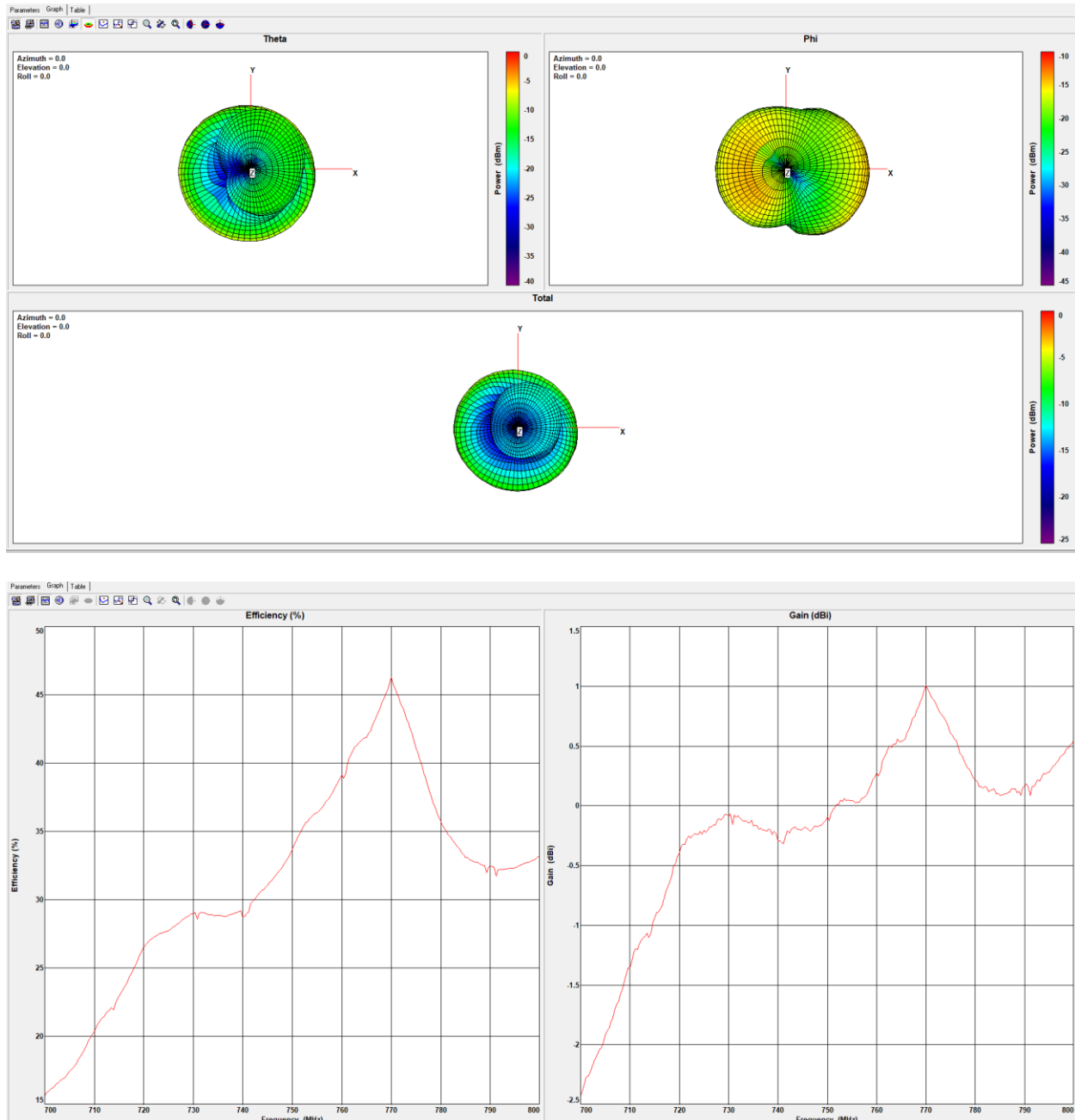
Theta turn table position



2. TEST DATA

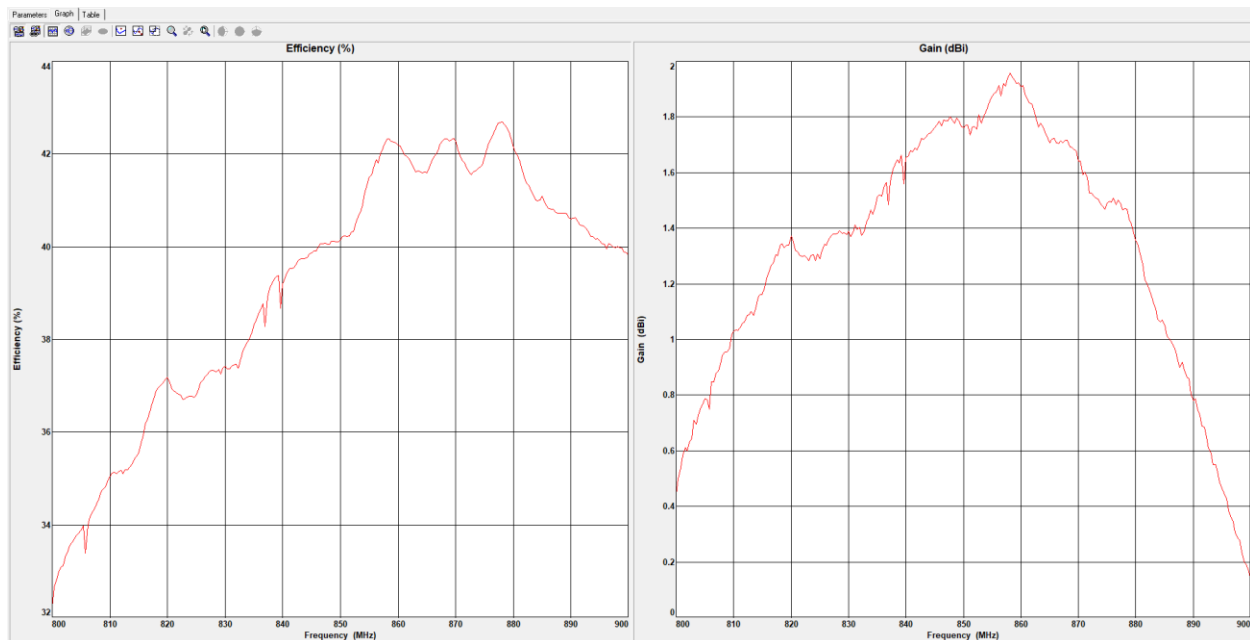
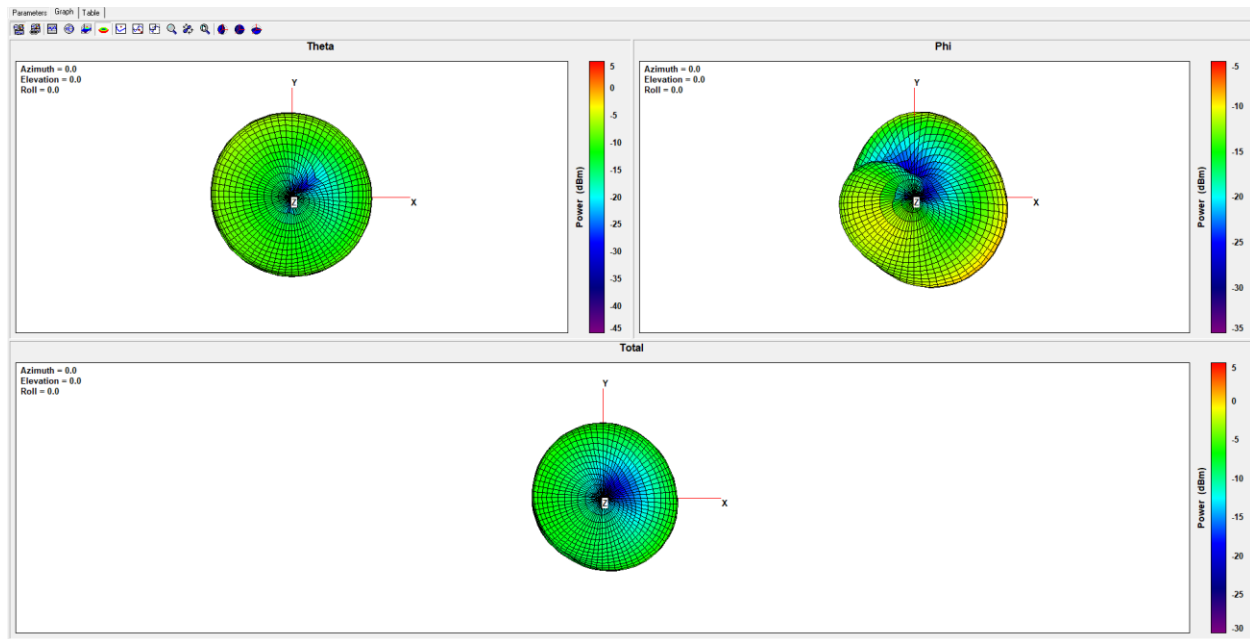
The following data represent the results from the passive antenna testing. The data files and a viewer will be provided separately.

2.1 700–800 MHz



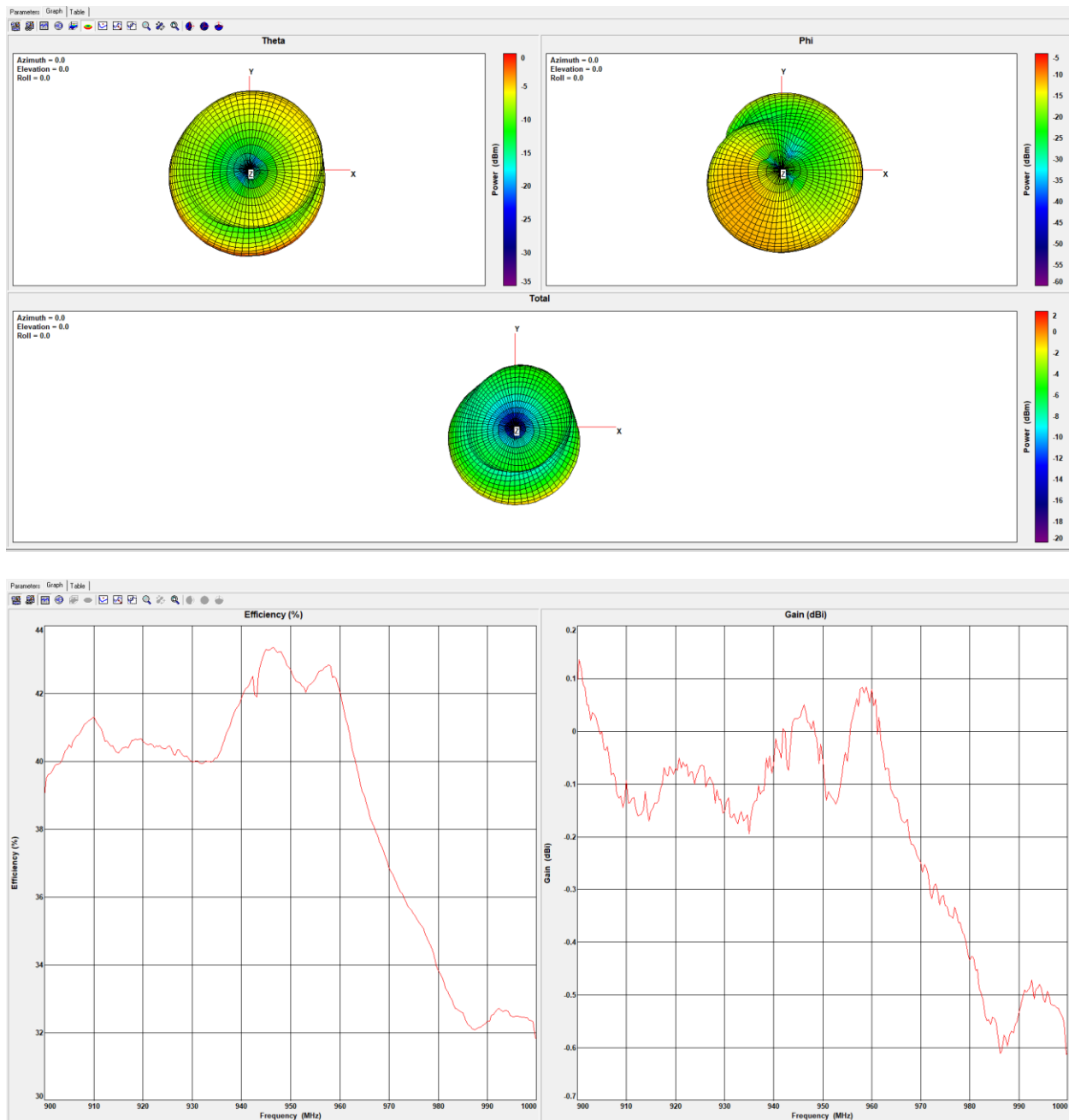
Peak efficiency is 46.7 %, and peak gain is 1.008 dBi

2.2 800–900 MHz



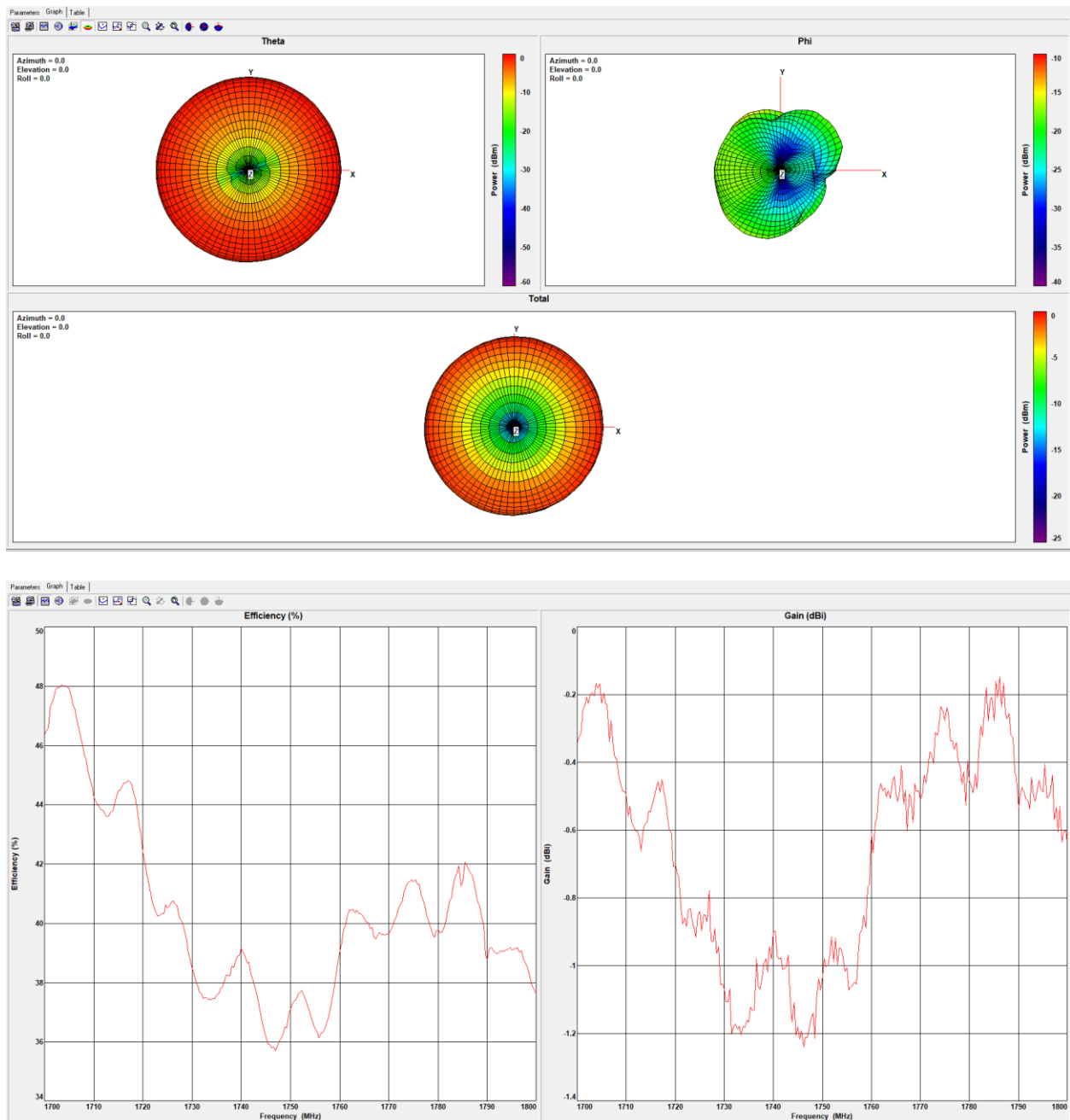
Peak efficiency is 42.68 %, and peak gain is 1.95 dBi

2.3 900 – 1000 MHz



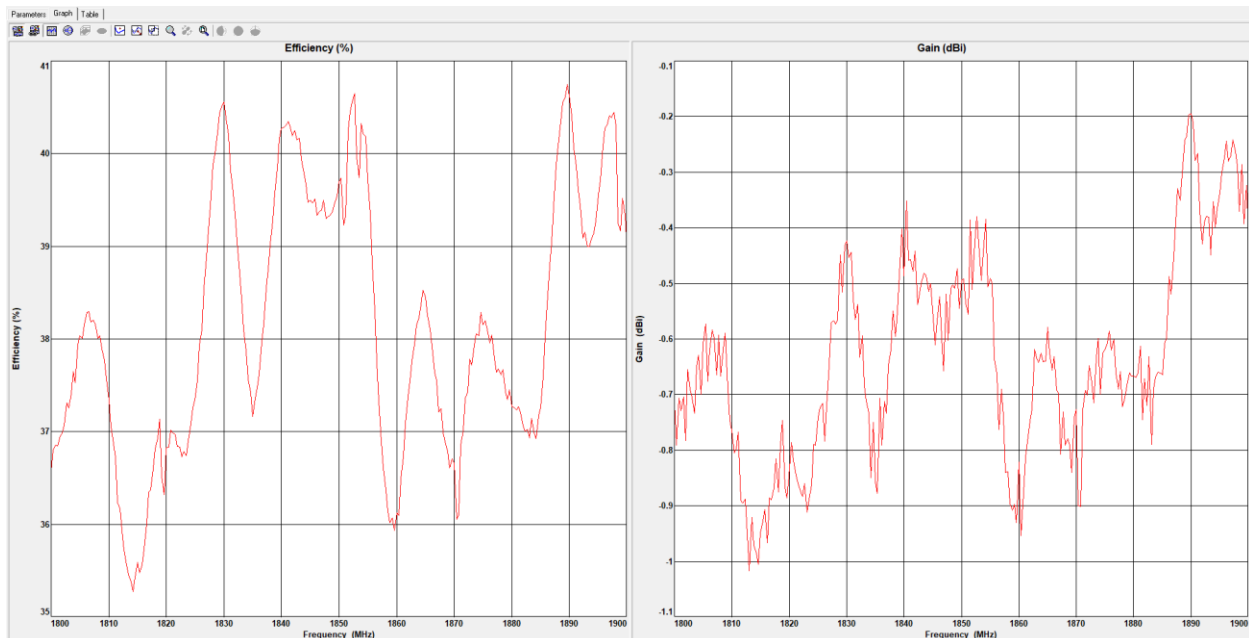
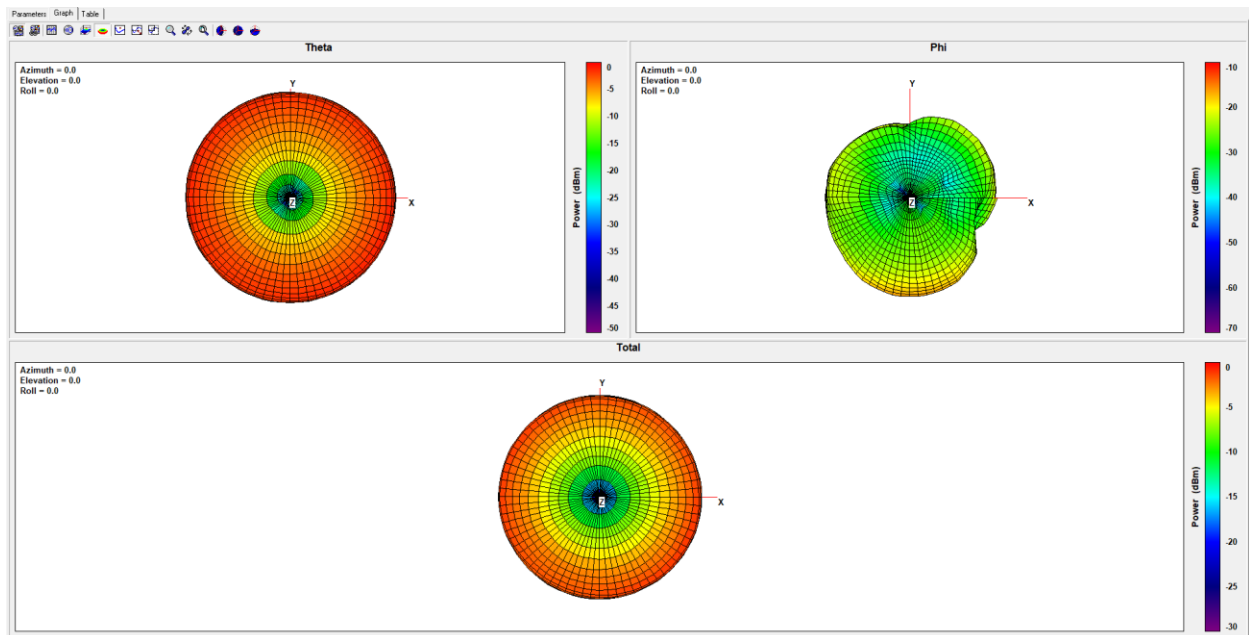
Peak efficiency is 43.36 %, and peak gain is 0.13 dBi

2.4 1700–1800 MHz



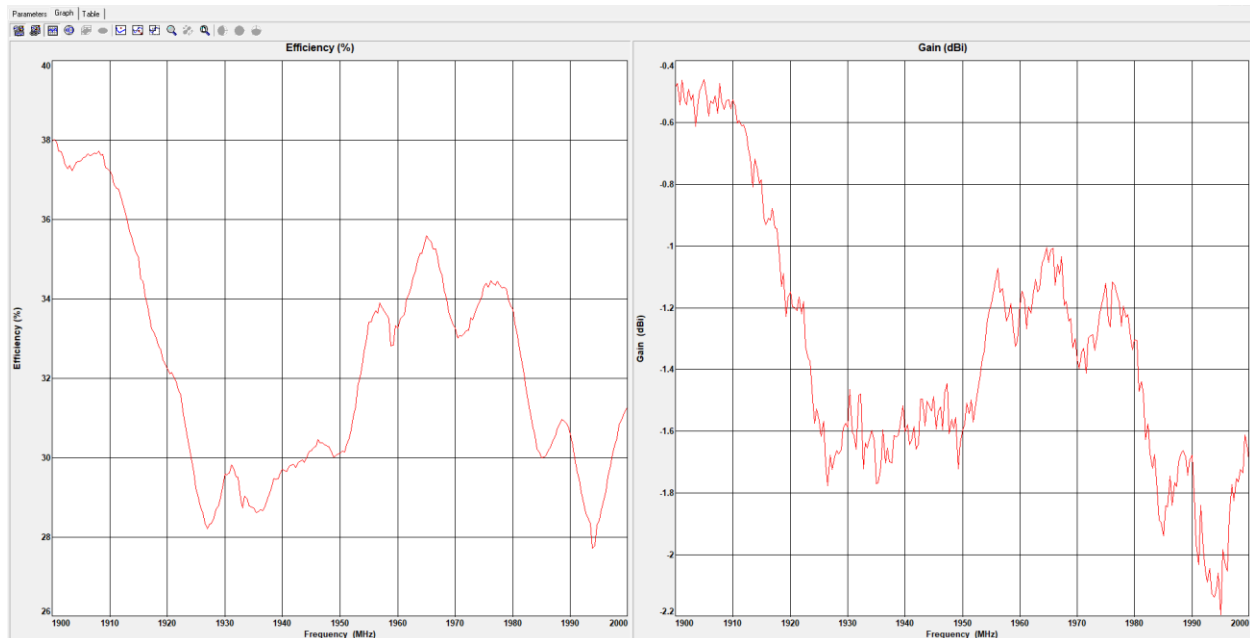
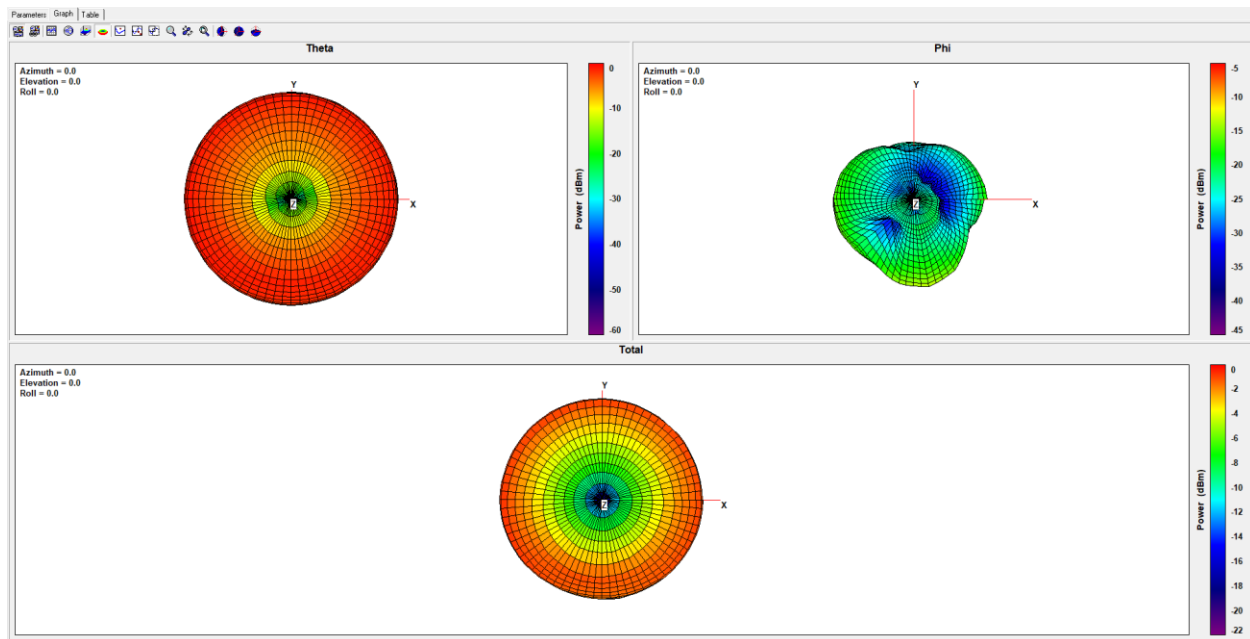
Peak efficiency is 48.04 %, and peak gain is -0.14 dBi

2.5 1800 – 1900 MHz



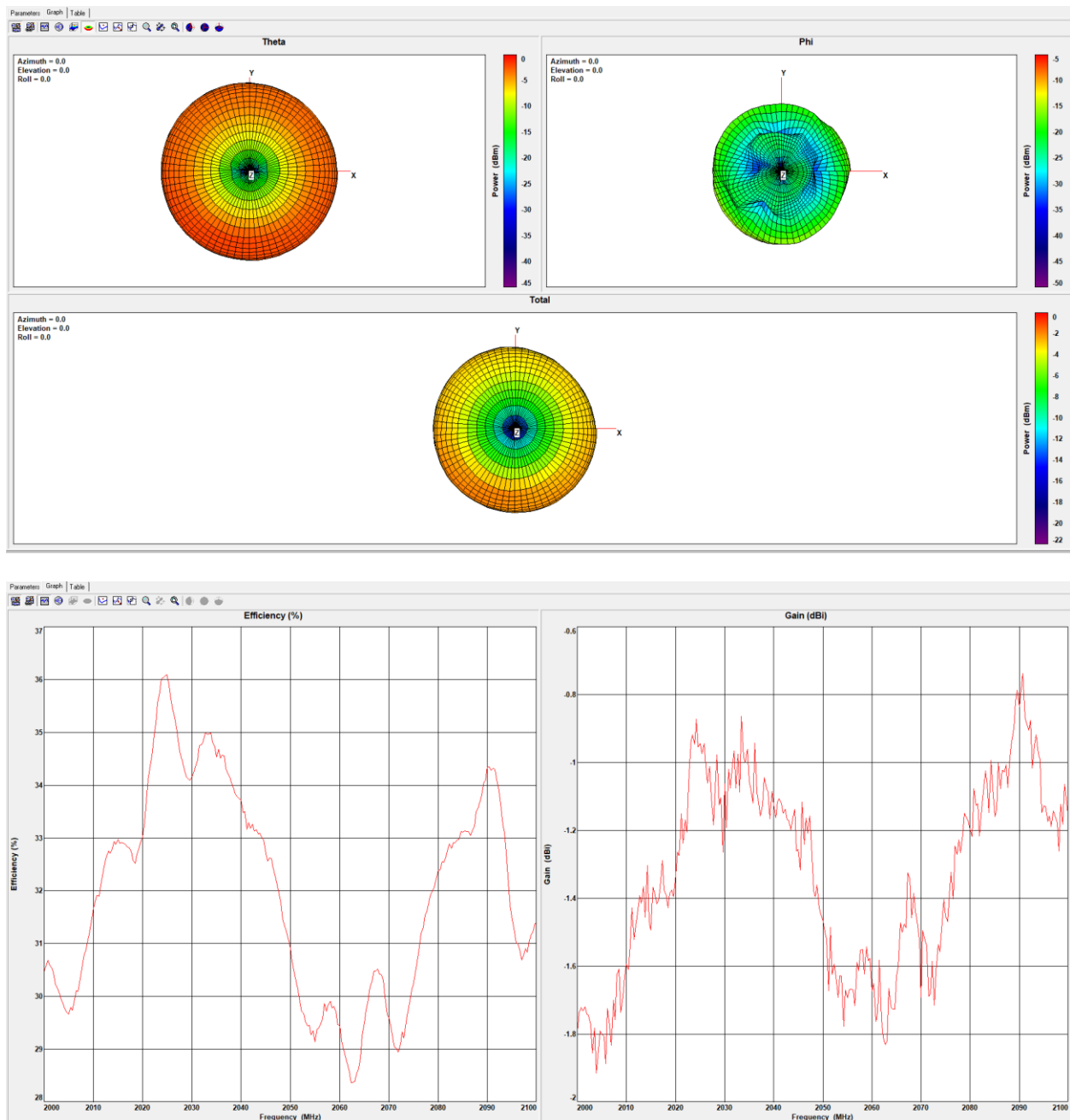
Peak efficiency is 40.7 %, and peak gain is -0.19 dBi

2.6 1900 – 2000 MHz



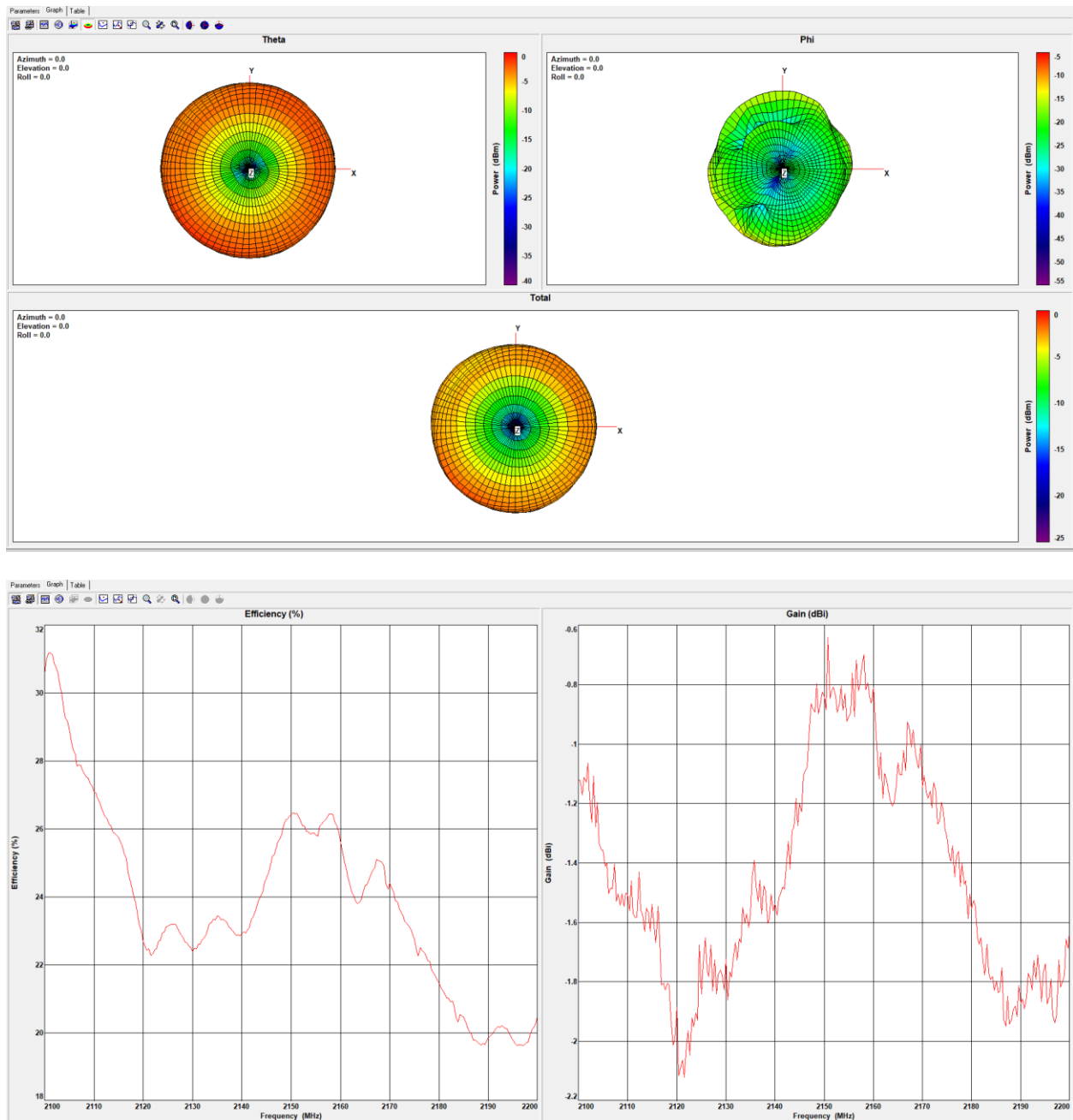
Peak efficiency is 38.00 %, and peak gain is -0.46 dBi

2.7 2000–2100 MHz



Peak efficiency is 36.09 %, and peak gain is -0.73 dBi

2.8 2100–2200 MHz



Peak efficiency is 31.17 %, and peak gain is -0.64 dBi

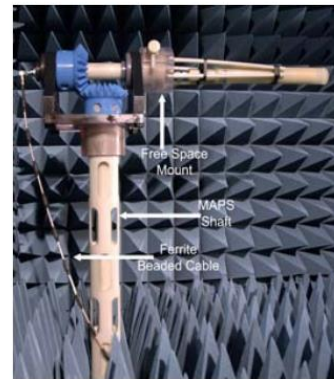
3. SUMMARY

The antenna testing shows that the antenna is very omni directional, and that the gain is not high, which typically means that it is omnidirectional.

Overall, the antenna performed well, with good efficiency and uniformity.

4. TEST DESCRIPTION AND METHOD

The test system used for testing in this report is the ETS Lindgren AMS-8050 fully anechoic RF enclosure chamber. The test system is automated with ETS-Lindgrens EMQuest Data Acquisition and Analysis EMQ-100 Antenna Pattern Measurement Software. This system and software create 2D and 3D antenna pattern measurements. The measuring antenna is model 8050 Dual Polarized Antenna. The reference antennas are from ETS-Lindgren 3126 Series Dipole, for system measuring and storing for AUT (Antenna Under Test) testing for pathloss.



Multi-Axis Positioner Installed in AMS-8050

TEST EQUIPMENT LIST FOR ANTENNA TESTING.

The test equipment is not calibrated on a schedule or traceable. The method used for testing is a substitution method. The pathloss calibration was performed October 2022. The chamber is calibrated for pathloss and uses the reference antennas from ETS-Lindgren to provide the substitute antenna data to compare to the AUT antenna.:

Chamber	ETS Lindgren 8050 Fully Anechoic
Measuring antenna	ETS Lindgren 8050 Dual Polarized Antenna
Reference Antennas	ETS-Lindgren 3126 Series Dipole (3126-800, 3126-900, 3126-1850, 3126-2150, 3126-2500)
Network Analyzer	R&S ZVL Network Analyzer 9kHz to 6GHz
Computer automation	Dell Computer Precision Tower 5820 with EMQuest EMQ-100 automation
RF Switch/amplifiers/filters	ETS Lindgren EMCenter

5. ANTENNA DESCRIPTION TECHNICAL INFORMATION

Multiband Antenna

External, omnidirectional antenna with multiband design

Product Features

- LTE-M/LoRaWAN Multiband Antenna w/ 5ft waterproof cable
- Through or Under lid mounted, Polymer lids only
- Cylindrical monopole antenna

Electrical Specifications

Frequency Bands (MHz)	698-960/1710-2155
Impedance	50Ω
Power Handling	
VSWR	<1.3:1 Typical. 2.5:1 Max
Peak Gain	<2dbi
Efficiency	48%
Polarization	Vertical

Mechanical Specifications

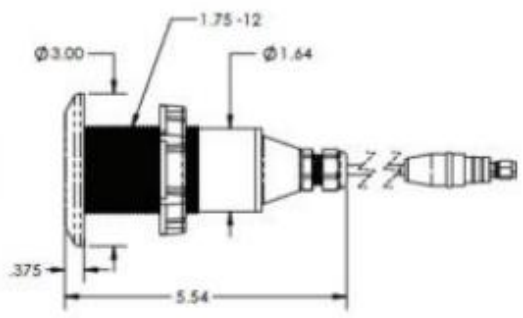
Height	5.54 in (14.07 cm)
Connector	RPSMA Waterproof w/Sealing Boot
Cable	RG58
Operational Range	-40 to 158° F (-40 to 70° C)
Mounting Type	Through lid/Wall Bracket*
Water Submersion	IP68

*Wall bracket (461-05790-01) to be purchased

Specifications are subject to change at the sole discretion of Aquana, LLC.
2311150



Model: Multiband Antenna



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