

Report No. QEC-2408070

August 28, 2024

Antenna Tuning Report

Customer:

Draeger

JTI Chip Antenna P/N:

2450AT18D0100001E

Prepared By: Arlan Fajardo

Approved By: Antonio Guilin

RF Applications Engineer

Johanson Technology Inc.

aguilin@johansontechnology.com

Tel: (805) 389-1166 ext.1506

www.johansontechnology.com

By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

1. Abstract:

This measurement report includes antenna return loss, matching network, radiated efficiency, and radiation patterns for the Johanson Technology antenna P/N. **2450AT18D0100001E** installed on Draeger modules, with the following cases:

Case1: Center edge mount

Case2: Corner mount

Antenna Gain Table Summary

Unit in dBi	XY-plane		XZ-plane		YZ-plane		Efficiency
	Peak	Avg.	Peak	Avg.	Peak	Avg.	
Case1@2403MHz	0.93	-2.68	0.76	-4.39	-6.86	-9.01	46.45%
Case1@2443MHz	1.63	-1.78	2.01	-3.25	-5.20	-7.74	56.72%
Case1@2483MHz	0.13	-3.26	0.60	-4.72	-6.88	-9.14	39.30%
Case2@2403MHz	-3.28	-4.70	-2.19	-4.84	0.44	-3.38	41.49%
Case2@2443MHz	-3.93	-4.97	-2.80	-5.20	-0.03	-3.82	37.57%
Case2@2483MHz	-6.58	-7.69	-5.79	-7.80	-2.77	-6.63	19.87%

2. Summary:

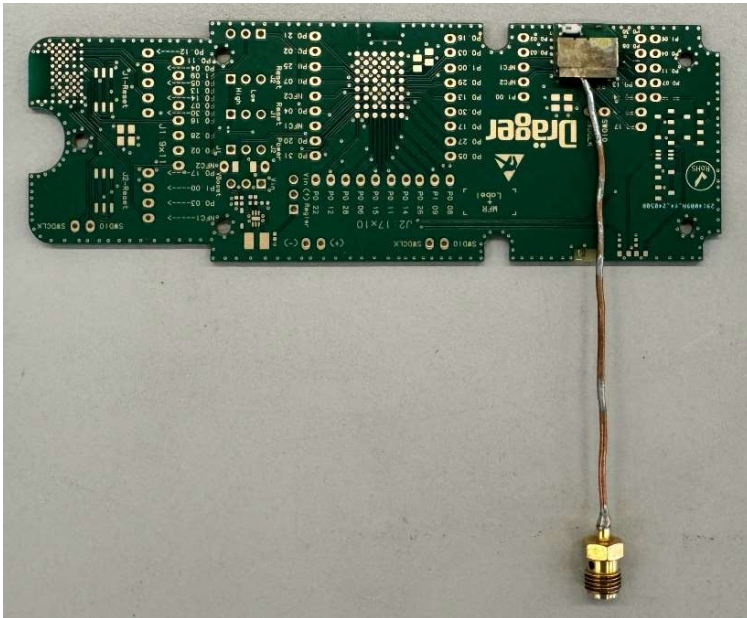
After impedance matching on Case1 (center edge mount), the antenna gains and efficiency are listed on the above table. The same matching circuit was installed on Case2 (corner mount) and measured. Both cases use the same matching circuit. It is suggested that the customer verify the system performance by the recommended matching circuit.

3. PCBA structure and 3D plane definition:

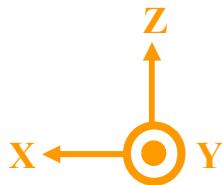
2450AT18D0100001E



Case1



Case2



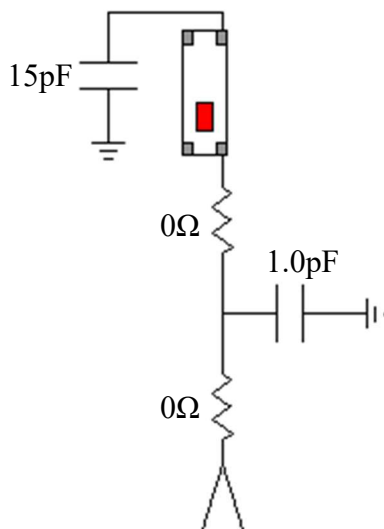
By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

4. Final optimized antenna matching circuit results:

Using the matching network shown below, the antenna measurements shown in Gain Table were measured.

2450AT18D0100001E

Case1&Case2



Johanson Technology Part Numbers Used:

Case1&Case2	15pF	1.0pF	0Ω
(2450AT18D0100001E)	QLCD250Q150J1GV001T	QLCD250Q1R0B1GV001T	-

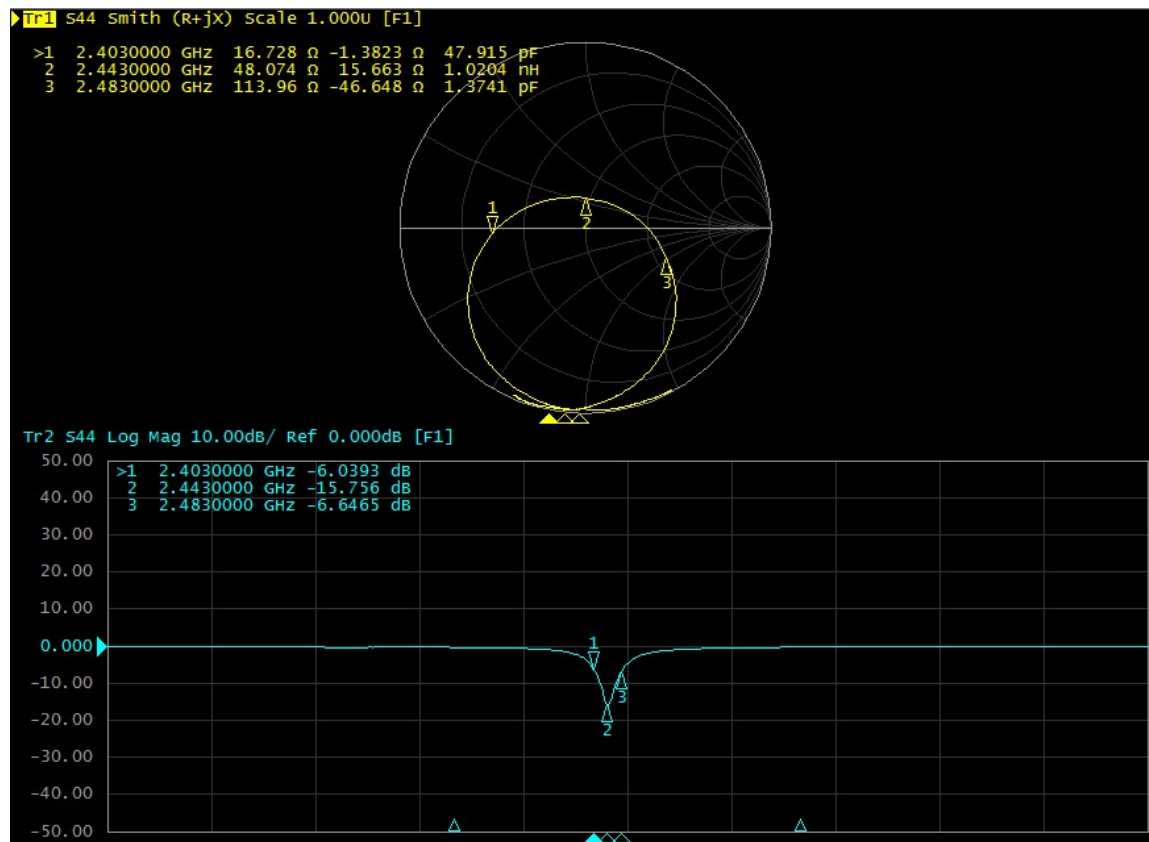
By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

5. Measurement results:

A. Return Loss / VSWR:

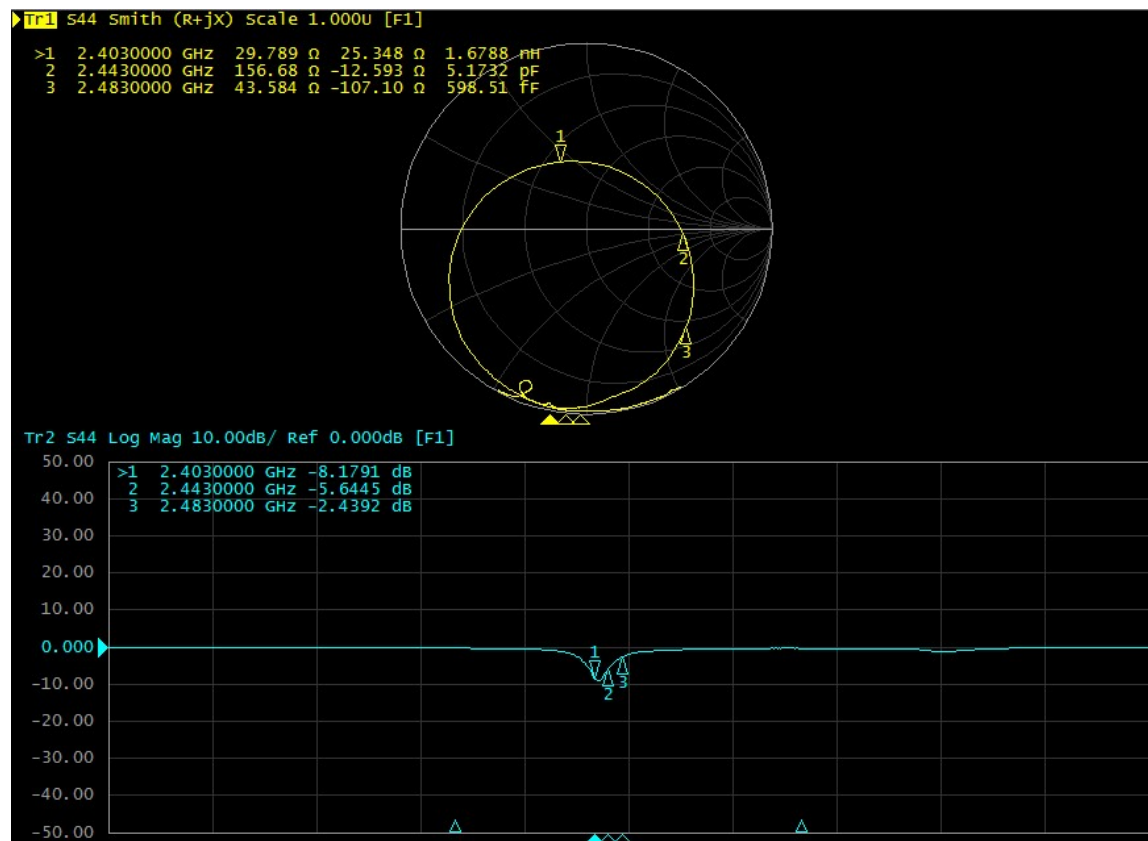
- ◆ **Instrument:** Keysight ENA series network analyzer-E5071C
- ◆ **Calibration method:** Ecal – Auto Port extension
- ◆ **Return Loss with matching circuit**

Case1 Return Loss



By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

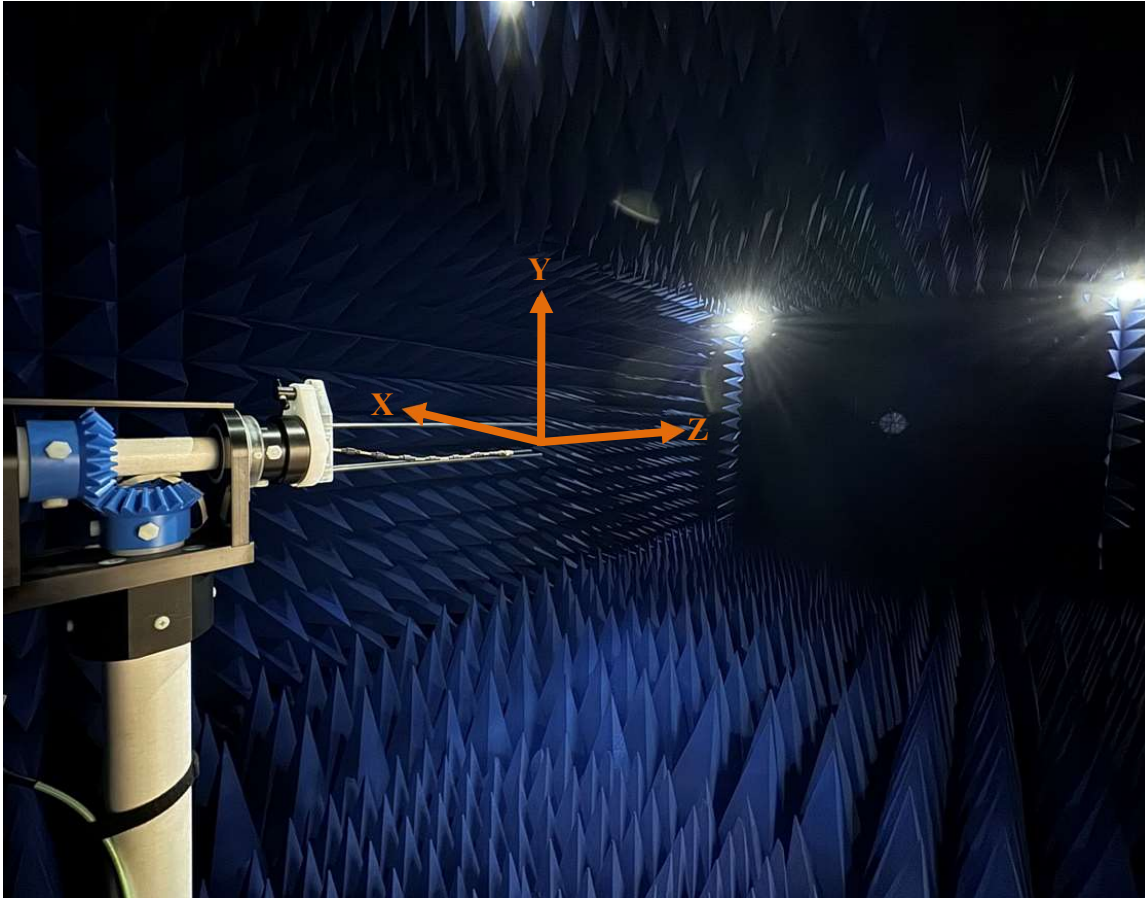
Case2 Return Loss



By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

B. Radiation Patterns:

- ◆ **Instrument (Anechoic Chamber):** BWant MS10 far field antenna measurement system
- ◆ **Scanning direction**

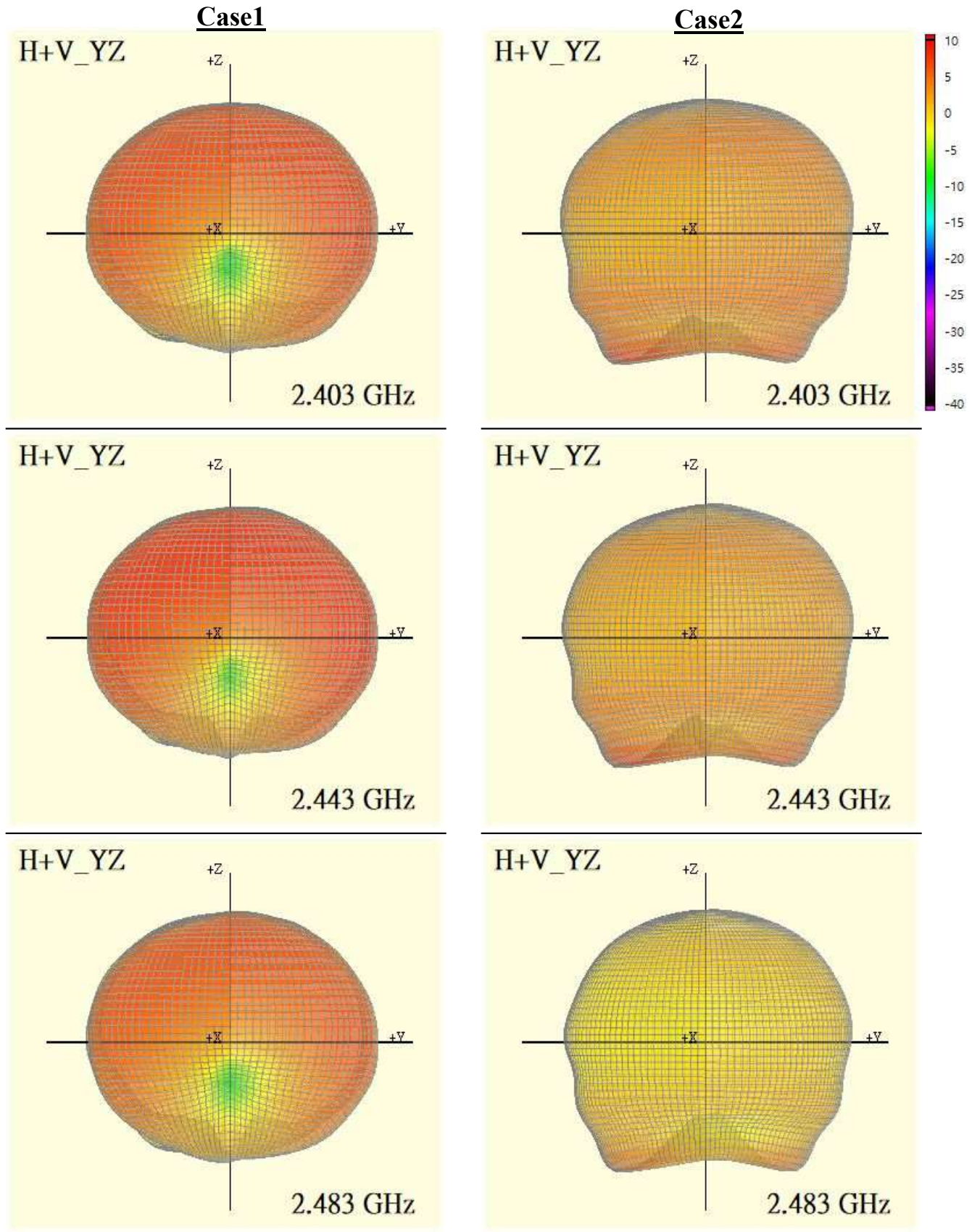


◆ Plane definition

XY-plane	Theta=90°
XZ-plane	Phi=0°
YZ-plane	Phi=90°

By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

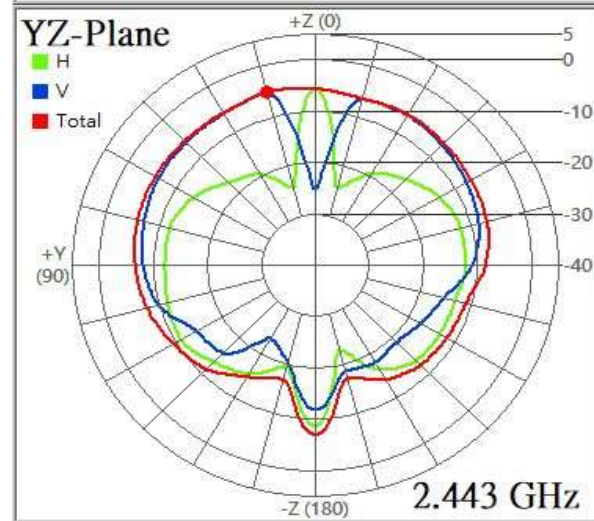
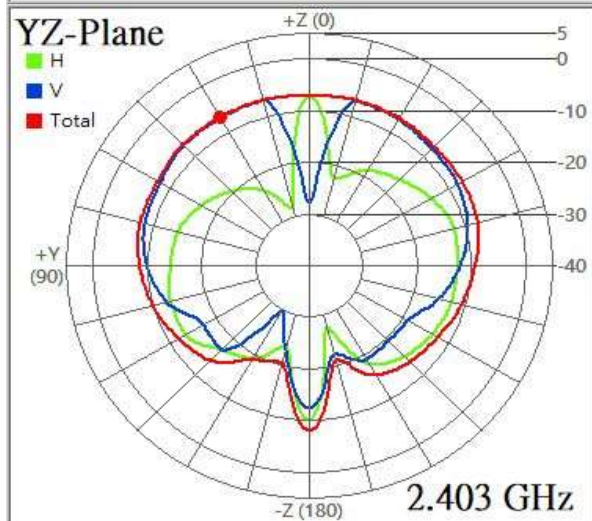
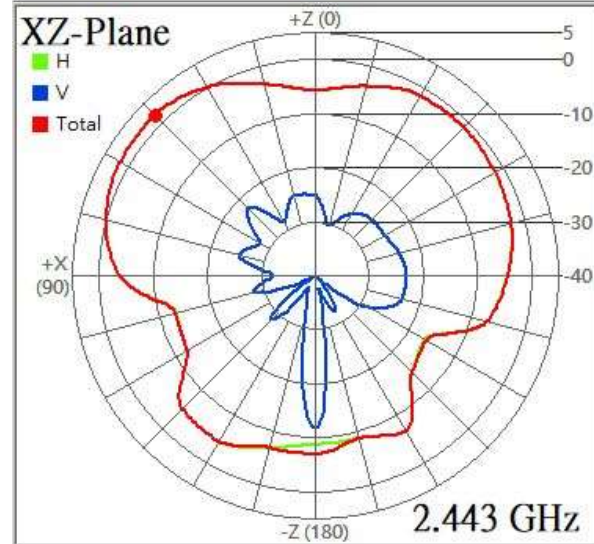
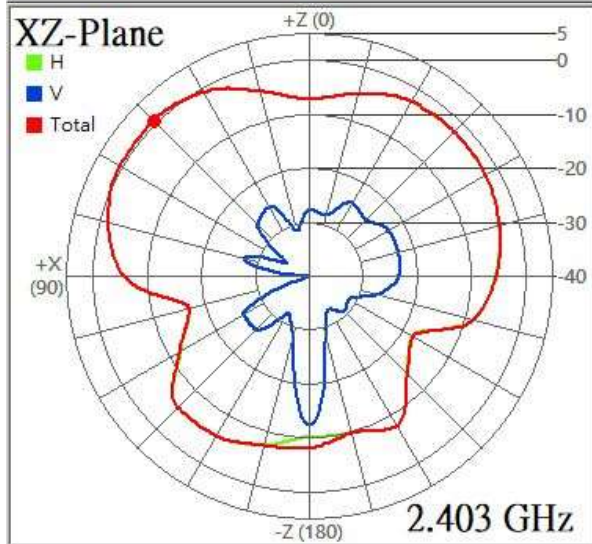
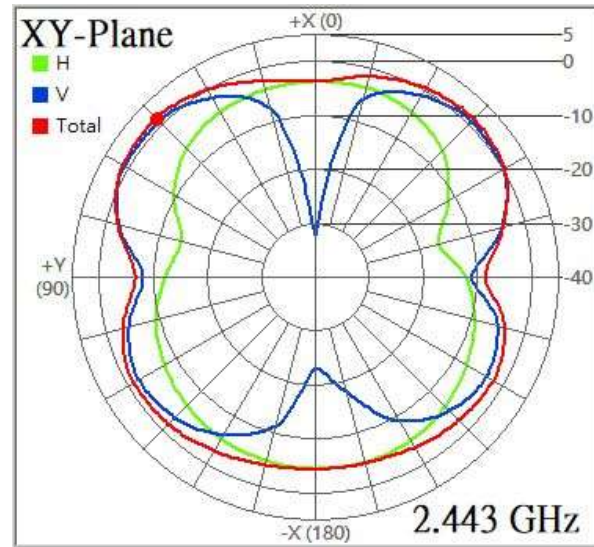
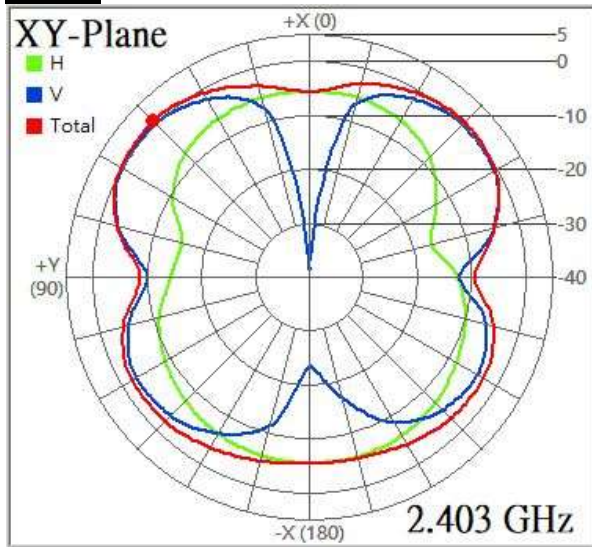
◆ **Measured 3D Radiation Pattern**



By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

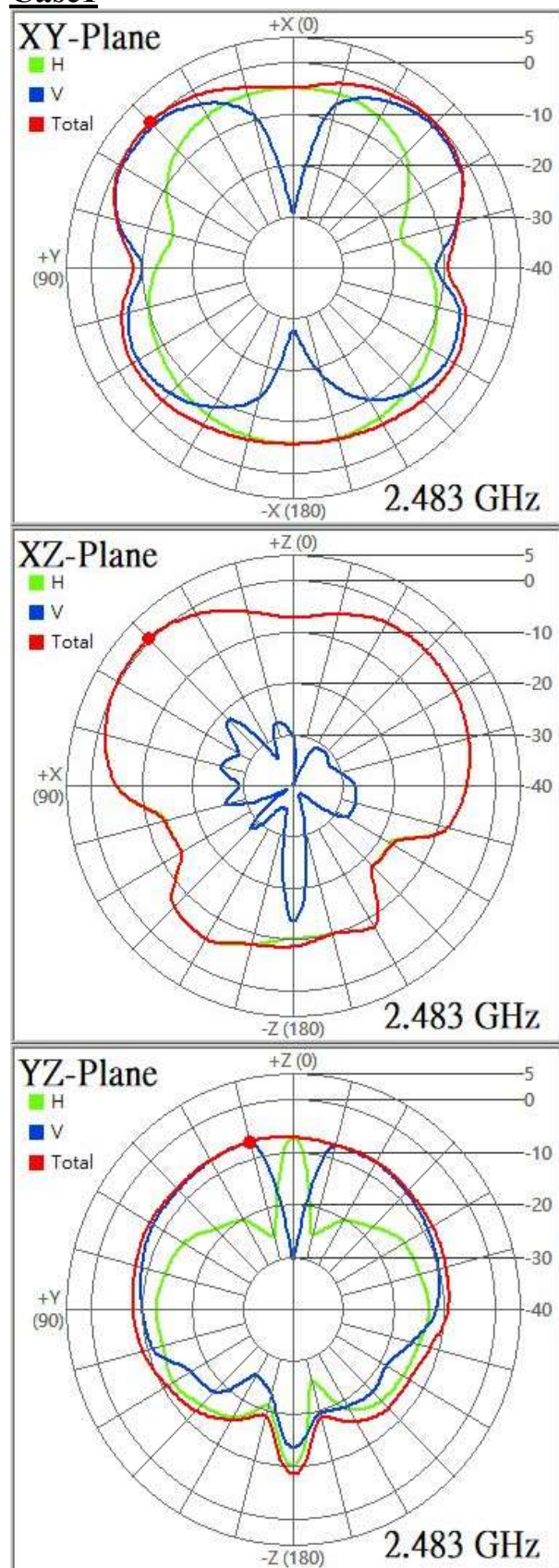
◆ **Measured 2-D Cut Radiation Pattern**

Case1



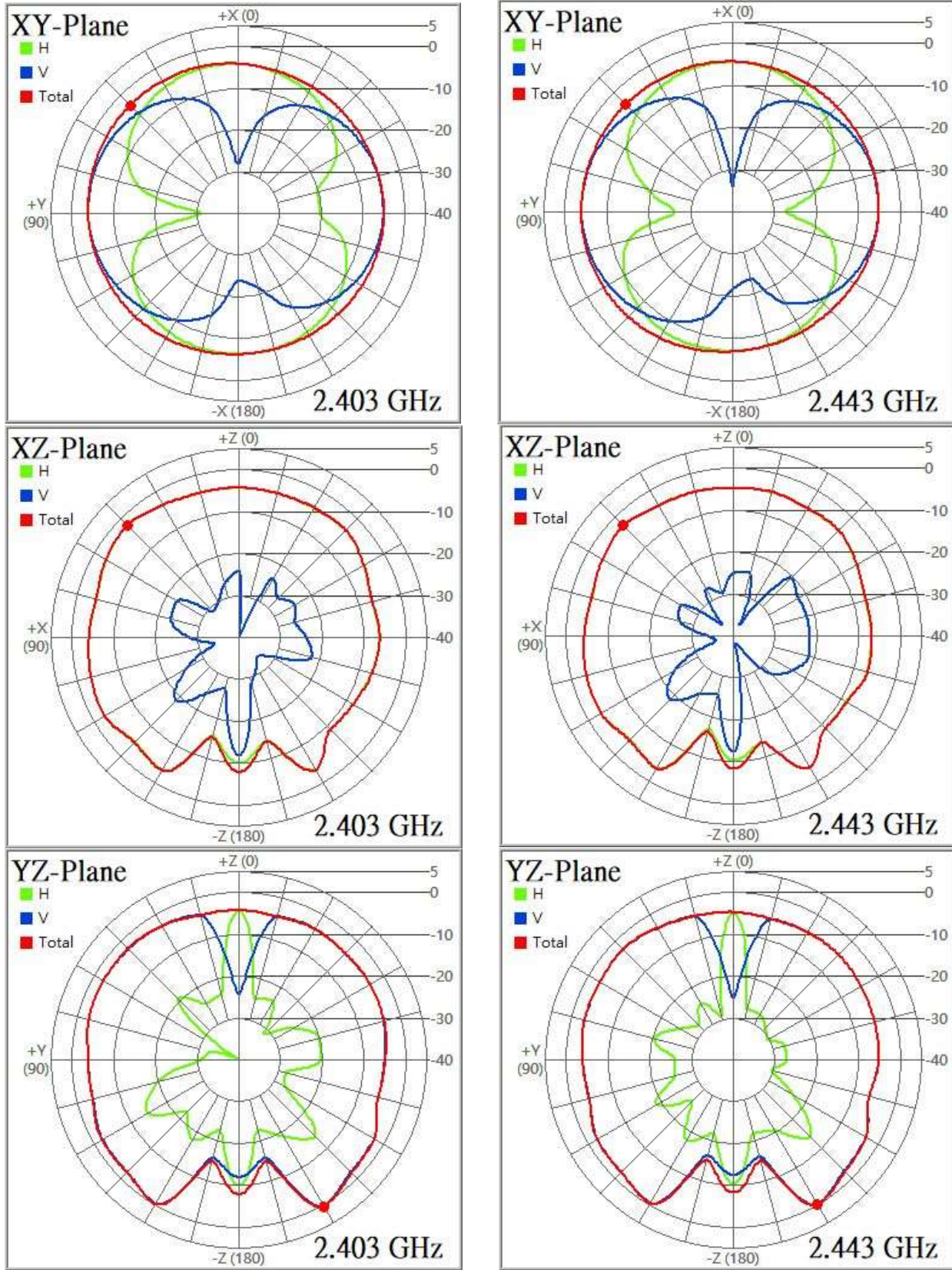
By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

Case1



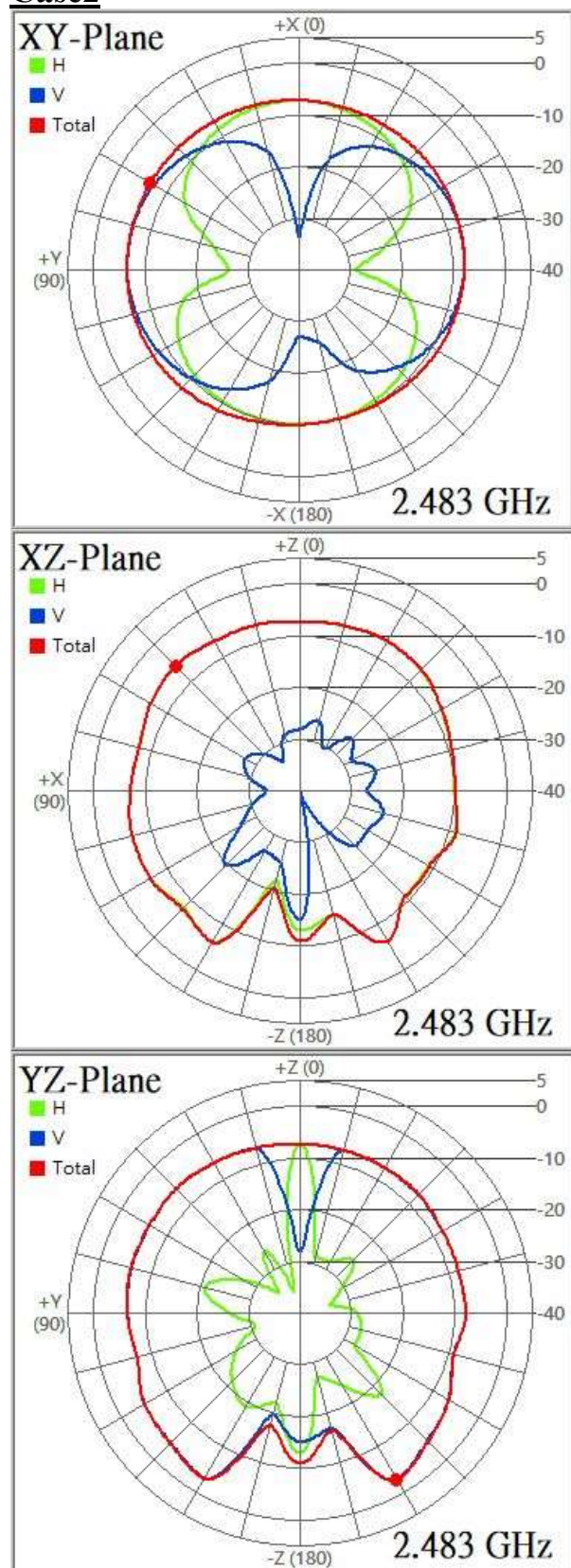
By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

Case2



By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

Case2



By using the proposed L/C matching network on the PCB assembly described in this report, the client should expect the antenna performance to resemble the results shown here in a mass production scenario. The client must always corroborate the system performance by re-verifying the tuning/gain if any changes in PCB layout, encasement, CM, vendor, supplier, materials, etc as this may cause the current L/C values to no longer be valid. Johanson Technology, Inc. is not responsible for the system performance and the client must make sure to adequately plan for these events.

6. Appendix

- a. Antenna Datasheet:

<https://www.johansontechnology.com/antennas>

- b. Johanson Chip RF Inductors:

<https://www.johansontechnology.com/ceramic-inductors>

- c. Johanson Chip RF Capacitors (High-Q):

<https://www.johansontechnology.com/high-q-multi-layer-capacitors>

Printed Wednesday, August 28, 2024