Report on the Testing of

The Coca Cola Company Antennas

Prepared for: The Coa-Cola Company
One Coca-Cola Plaza NW
Atlanta, GA 30313 USA

America

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FCC Accreditation Designation Number US1233
FCC Test Site Registration Number 967699
Innovation, Science, and Economic Development Canada Lab Code 23932

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the standards listed above.

A2LA Cert. No. 2955.09

ACCREDITATION

Our A2LA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our A2LA Accreditation.

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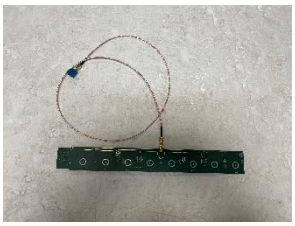
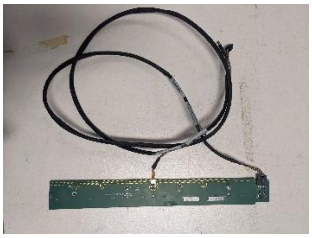
1 Introduction

1.1 Antennas Information

Antenna (EUT)	Antenna Type	Antenna Port	Image
*1	Trace	1	
*2	Trace	2	
3	Trace	3	
4	Trace	0	
5	Trace	1	

6	Trace	3	

Note: "*" - Antennas 1 and 2 are identical. Therefore, pre-scans were performed to determine the worst-case antenna. Based on the pre-scan results, Antenna 2 is the worst case.

1.2 Frequencies Tested

Low	**902.75 MHz**
Middle	**914.75 MHz**
High	**927.25 MHz**

2 Antenna Pattern Details

Conducted antenna pattern measurements across all three channels (Low, Mid, and High) in each of the three orientations (X, Y, and Z) for both horizontal and vertical polarities. The antenna gain results shown in section 2.6 were based on the worst-case orientation for all channels.

2.1 Test Method

The evaluation was performed using the Gain Transfer method.
The evaluation was performed in a 3-m Semi-Anechoic chamber lined with RF absorbers above the ground plane.

The antenna under test (AUT) was placed at a height of 1.5 m above the ground plane on the turntable at 3 m separation distance from the receive antenna. The AUT was connected to a signal generator set to transmit at the low, middle and high channels of the operating frequency band. The signal generator output was set to a level providing sufficient dynamic range for the measurements, i.e. 5dBm.

The AUT was evaluated in 3 orthogonal orientations. The AUT was rotated through 360° to determine the worst azimuth and then receive antenna height was varied from 1m to 4m for both H&V Polarizations, so that maximum level would be detected. Radiation pattern with a peak detector was made using a resolution bandwidth RBW of 3 kHz and a video bandwidth VBW of 10 kHz and the maximum measured level was noted down for both H&V polarizations.

The AUT was replaced with a reference antenna. With the RF output level of the signal generator Unchanged, the receive antenna height was varied from 1m to 4m to determine the highest amplitude level. The maximum values were collected for both H&V Polarizations.

The AUT gain was calculated using the gain of the Reference Antenna and the relative gain between the AUT and the reference antenna.

Sample Calculation:

G_{Rel} (dB) = E_{Ref} (dBuV) – E_{AUT} (dBuV)
G_{AUT} (dBi) = G_{Ref} (dBi) – G_{Rel} (dB)

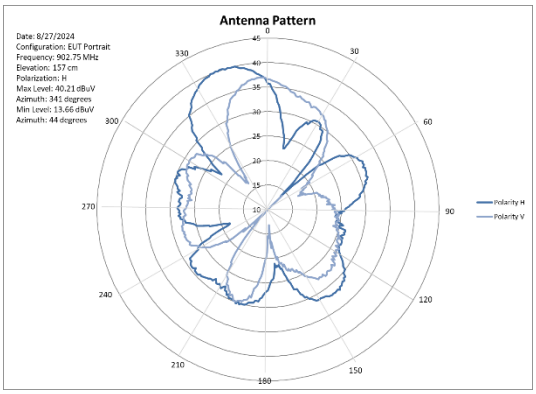
Where G_{Rel} – Relative Gain
E_{Ref} - Field Strength of reference antenna
E_{AUT} – Field Strength of Antenna Under Test
G_{AUT} – Gain of Antenna Under Test
G_{Ref} - Reference Antenna Gain

Example Calculation: Horizontal Polarization of Antenna 2 – Z Orientation

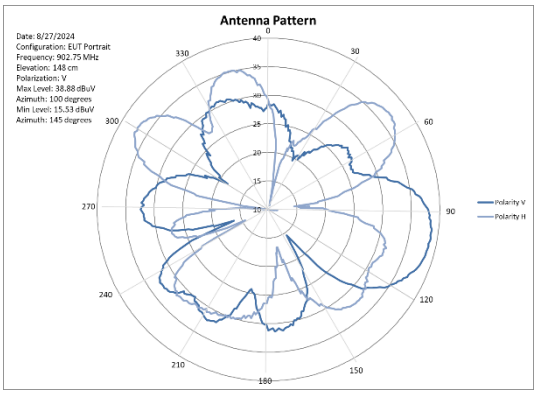
G_{Rel} = 81.89 – 40.21 = 41.68 dB
G_{AUT} (dBi) = 6.5 dBi – 41.68 dB
= -35.18 dBi

Note: The value 6.5 dBi in the above calculation is the known antenna gain of the substitution antenna.

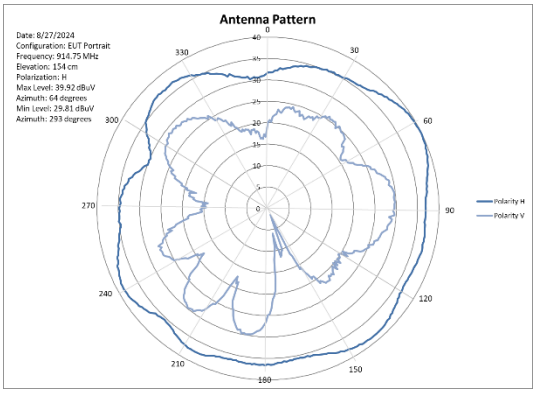
2.2 Antenna Pattern Details – Antenna 2



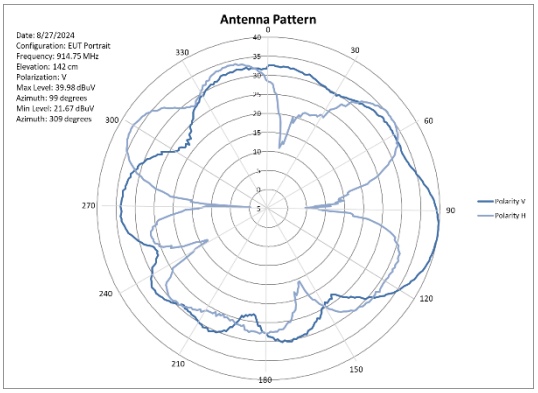
LCH-902.75MHz – H Polarity – Z worst Orientation



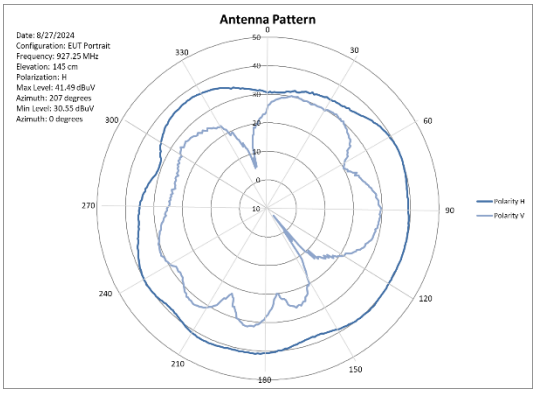
LCH – 902.75 MHz - V polarity – Y worst Orientation



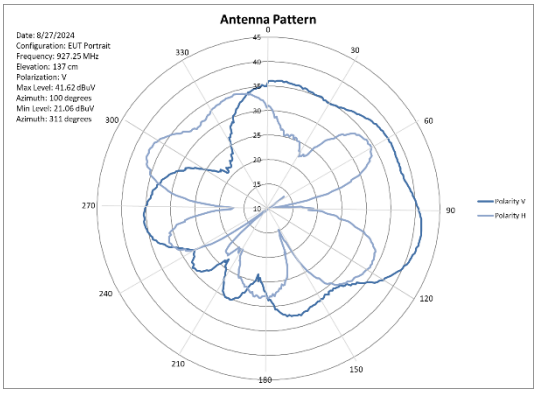
MCH-914.75MHz – H Polarity – X worst Orientation



MCH – 914.75 MHz - V polarity – Y worst Orientation

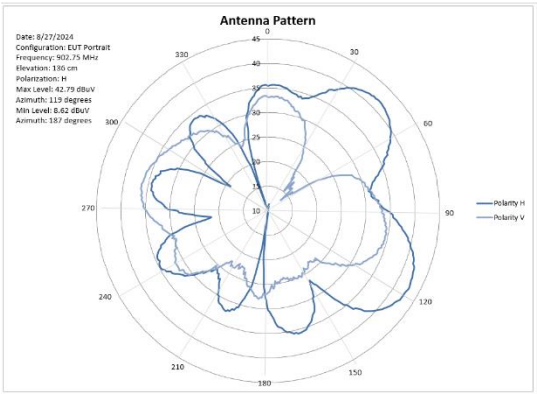


HCH-927.25MHz – H Polarity – X worst Orientation

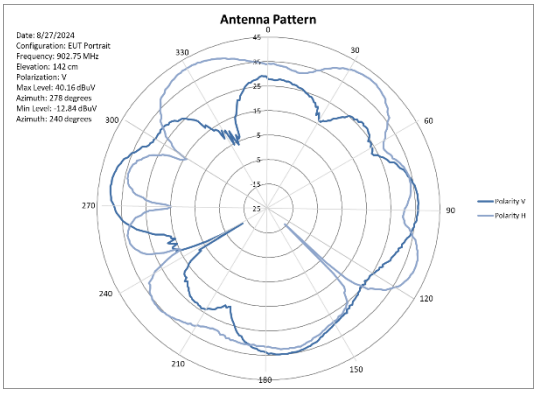


HCH – 927.25 MHz - V polarity – Y worst Orientation

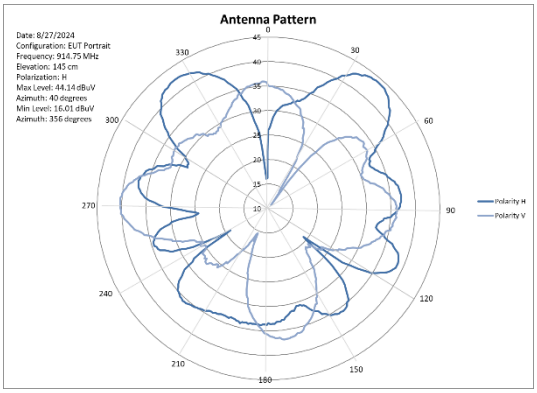
2.3 Antenna Pattern Details – Antenna 3



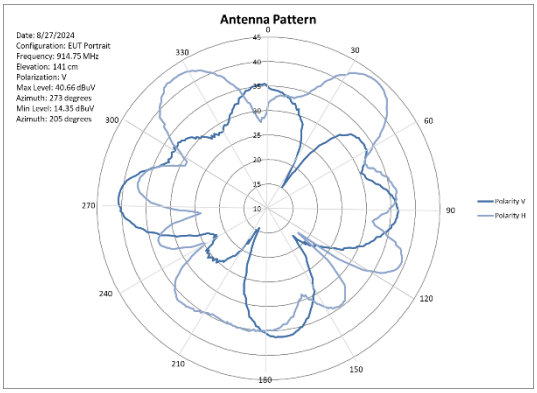
LCH-902.75MHz – H Polarity – Y worst Orientation



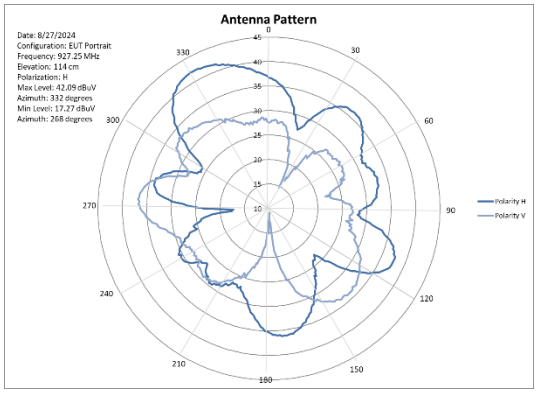
LCH – 902.75 MHz - V polarity – Y worst Orientation



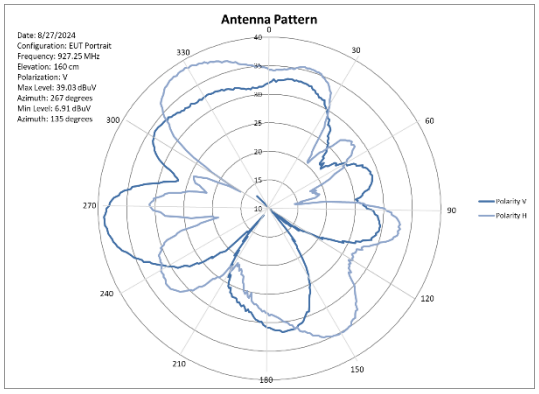
MCH-914.75MHz – H Polarity – Y worst Orientation



MCH – 914.75 MHz - V polarity – Y worst Orientation

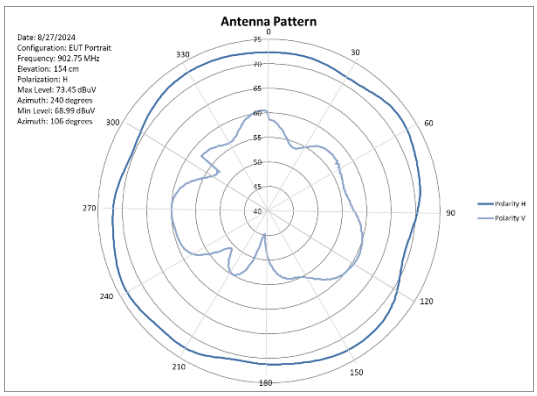


HCH-927.25MHz – H Polarity – Y worst Orientation

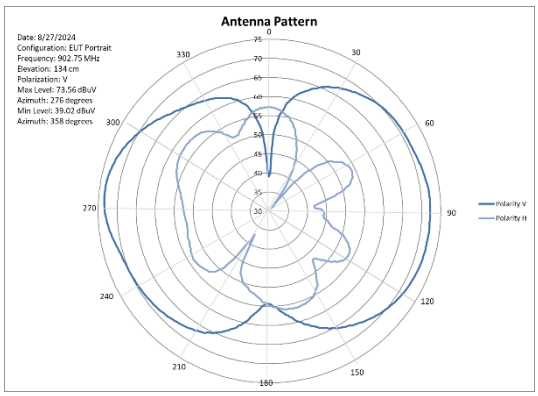


HCH – 927.25 MHz - V polarity – Y worst Orientation

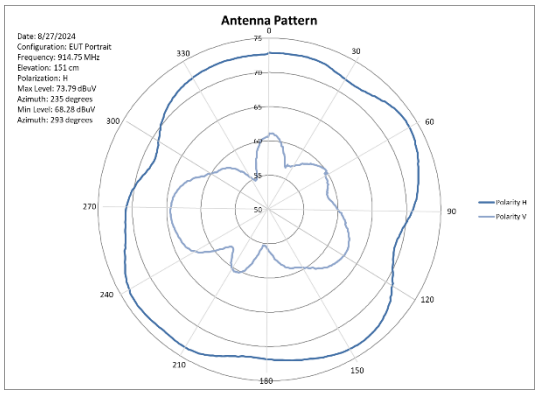
2.4 Antenna Pattern Details – Antenna 4



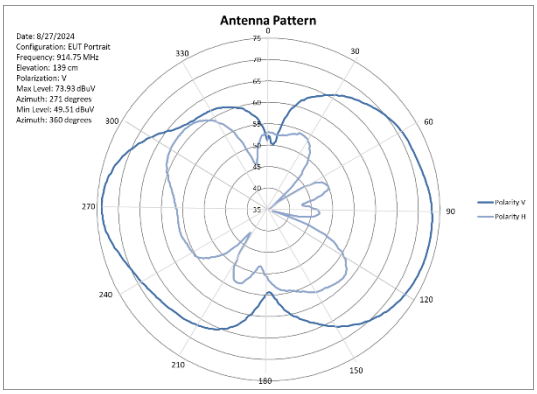
LCH-902.75MHz – H Polarity – Z worst Orientation



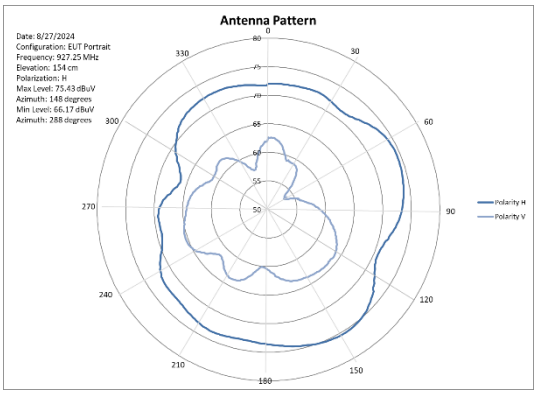
LCH – 902.75 MHz - V polarity – Y worst Orientation



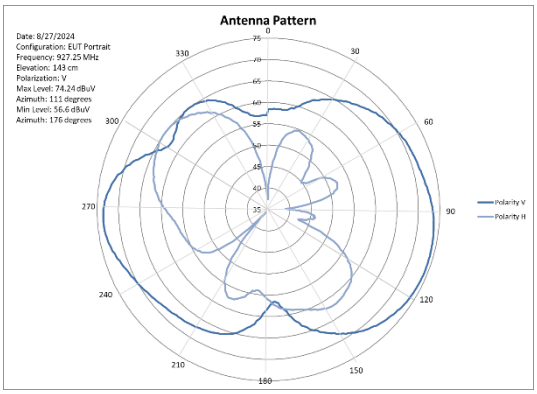
MCH-914.75MHz – H Polarity – Z worst Orientation



MCH – 914.75 MHz - V polarity – Y worst Orientation

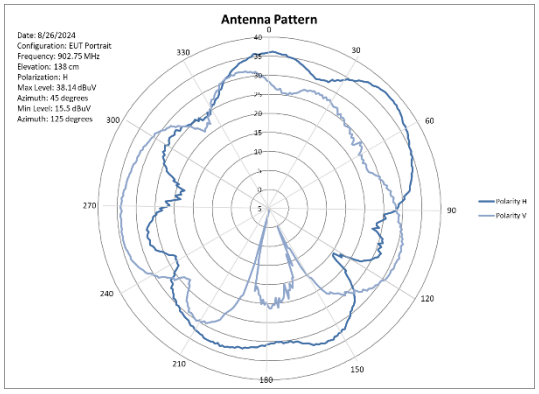


HCH-927.25MHz – H Polarity – Z worst Orientation

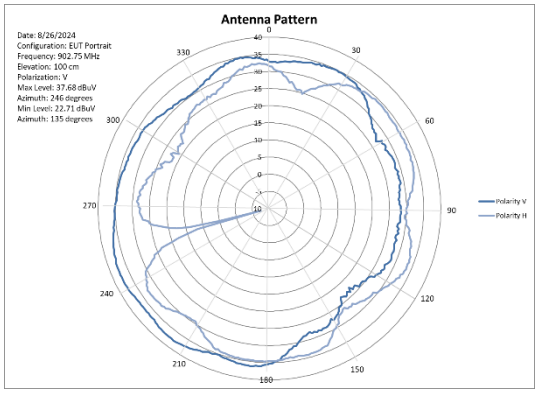


HCH – 927.25 MHz - V polarity – Y worst Orientation

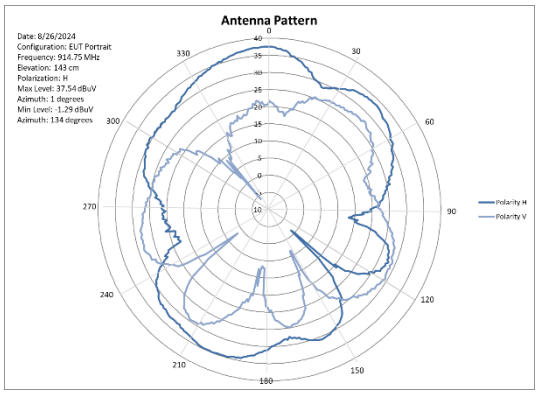
2.5 Antenna Pattern Details – Antenna 5



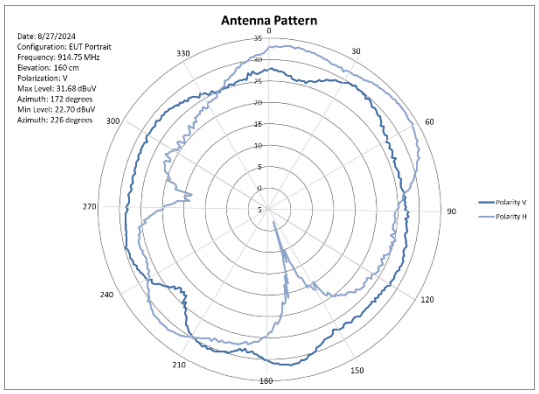
LCH-902.75MHz – H Polarity – Y worst Orientation



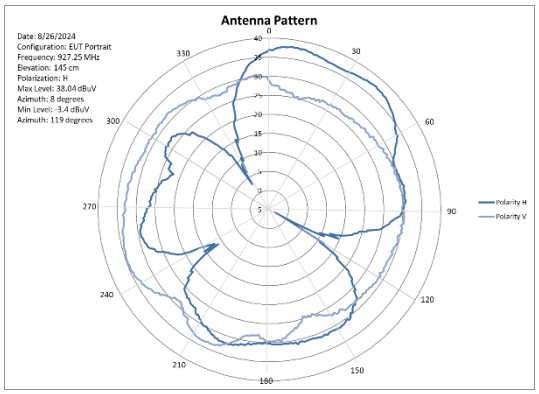
LCH – 902.75 MHz - V polarity – Y worst Orientation



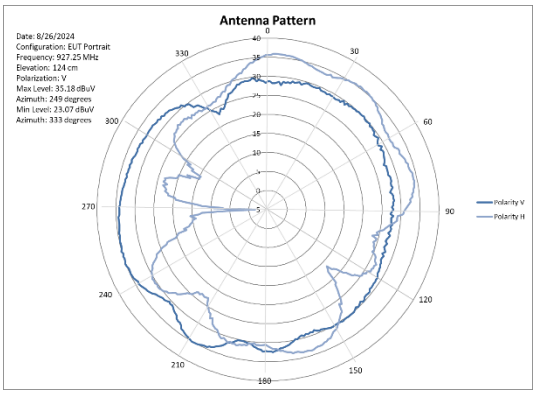
MCH-914.75MHz – H Polarity – X worst Orientation



MCH – 914.75 MHz - V polarity – Z worst Orientation

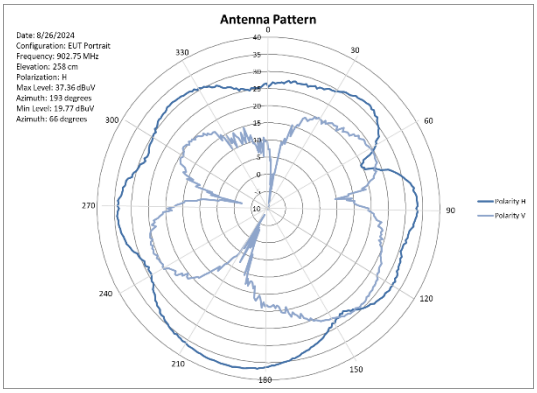


HCH-927.25MHz – H Polarity – Y worst Orientation

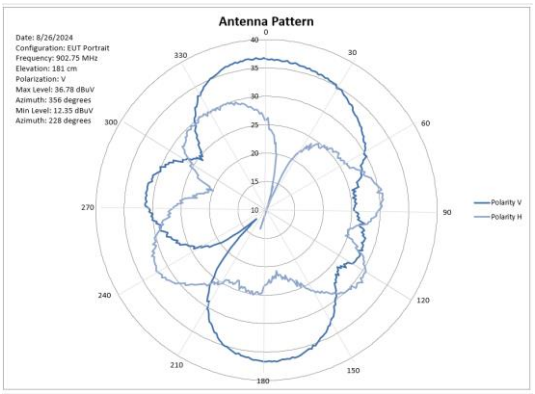


HCH – 927.25 MHz - V polarity – Y worst Orientation

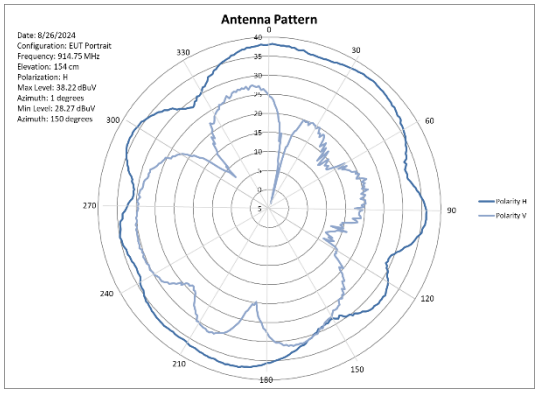
2.6 Antenna Pattern Details – Antenna 6



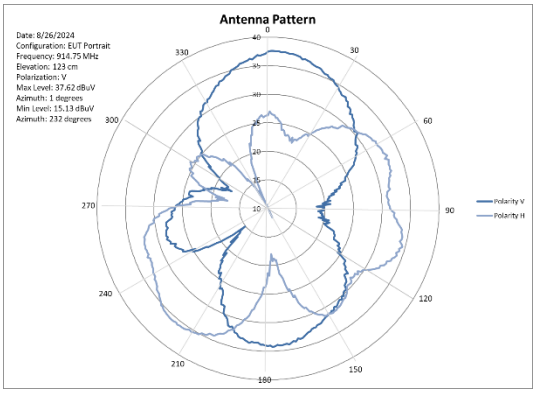
LCH-902.75MHz – H Polarity – X worst Orientation



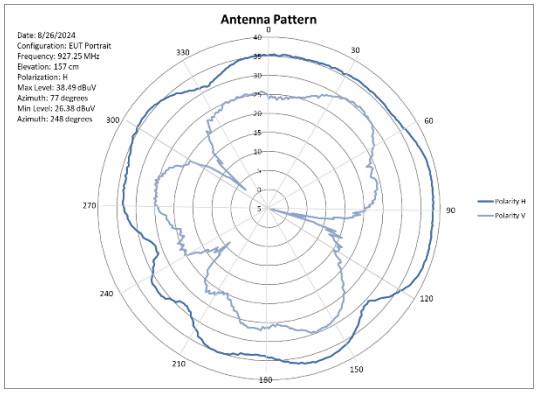
LCH – 902.75 MHz - V polarity – Z worst Orientation



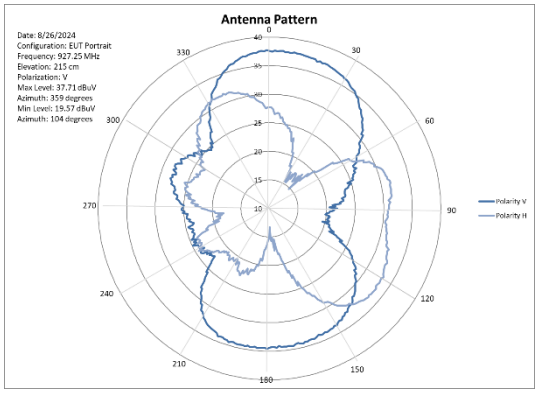
MCH-914.75MHz – H Polarity – X worst Orientation



MCH – 914.75 MHz - V polarity – Z worst Orientation



HCH-927.25MHz – H Polarity – X worst Orientation



HCH – 927.25 MHz - V polarity – Z worst Orientation

2.7 Antenna Gain Results

Antenna(EUT)	Frequency (MHz)	Worst EUT orientation	Measured Value(H) dBuV	Measured Value(V) dBuV	Substitution Value(H) dBuV	Substitution Value (V) dBuV	Delta (dBuV)	Antenna Gain of Substitution antenna (dBi)	Antenna gain of EUT (dBi)
2	902.75	Z	40.21		81.89		41.68	6.5	-35.18
	902.75	Y		38.88		81.42	42.54	6.5	-36.04
	914.75	X	39.92		81.9		41.98	6.6	-35.38
	914.75	Y		39.98		81.41	41.43	6.6	-34.83
	927.25	X	41.49		81.82		40.33	6.8	-33.53
	927.25	Y		41.62		81.44	39.82	6.8	-33.02
3	902.75	Z	42.79		81.89		39.10	6.5	-32.60
	902.75	Y		40.16		81.42	41.26	6.5	-34.76
	914.75	Y	44.14		81.9		37.76	6.6	-31.16
	914.75	Y		40.66		81.41	40.75	6.6	-34.15
	927.25	Y	42.09		81.82		39.73	6.8	-32.93
	927.25	Y		39.03		81.44	42.41	6.8	-35.61
4	902.75	Z	73.45		81.89		8.44	6.5	-1.94
	902.75	Y		73.56		81.42	7.86	6.5	-1.36
	914.75	Z	73.79		81.9		8.11	6.6	-1.51
	914.75	Y		73.93		81.41	7.48	6.6	-0.88
	927.25	Z	75.43		81.82		6.39	6.8	0.41
	927.25	Y		74.24		81.44	7.20	6.8	-0.40
5	902.75	Y	38.14		81.89		43.75	6.5	-37.25
	902.75	Y		37.68		81.42	43.74	6.5	-37.24
	914.75	X	37.54		81.9		44.36	6.6	-37.76
	914.75	Z		31.68		81.41	49.73	6.6	-43.13
	927.25	Y	38.04		81.82		43.78	6.8	-36.98
	927.25	Y		35.18		81.44	46.26	6.8	-39.46
6	902.75	X	37.36		81.89		44.53	6.5	-38.03
	902.75	Z		36.78		81.42	44.64	6.5	-38.14
	914.75	X	38.22		81.9		43.68	6.6	-37.08
	914.75	Z		37.62		81.41	43.79	6.6	-37.19
	927.25	X	38.49		81.82		43.33	6.8	-36.53
	927.25	Z		37.71		81.44	43.73	6.8	-36.93

3 Final Antenna Gain Table

Antenna	Final Antenna Gain (dBi)
2	-33.02
3	-31.16
4	0.41
5	-36.98
6	-36.53

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4 Test Equipment Used

Table 4-1 –Equipment List

Asset ID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
853	Teseq	CBL6112D	BiLog Antenna	51616	7/26/2023	7/26/2025
889	Com Power	PAM 103	Pre-amplifier	18020215	10/02/2023	10/02/2024
882	Rohde & Schwarz	ESW44	ESW44 EMI TEST RECEIVER	101961	6/18/2024	6/18/2025
22	Teledyne Storm Microwave	90-195-456	BSAC Cable	N/A	07/15/2024	07/15/2025
20	Teledyne Storm Microwave	R-90-195-036	BSAC Cable	N/A	07/15/2024	07/15/2025
21	Teledyne Storm Microwave	R-90-195-072	BSAC Cable	N/A	07/15/2024	07/15/2025
277	EMCO	93146	LPA	9904-5199	03/07/2024	03/07/2026
AEMC00609	Rohde & Schwarz	SMB100A	Signal Generator	175334	6/20/2024	6/20/2025
827	Rohde & Schwarz	RF Cable set	TS8997 Rack cable set	N/A	01/02/2024	01/02/2025

N/A – Not Applicable

5 Test Setup Photos

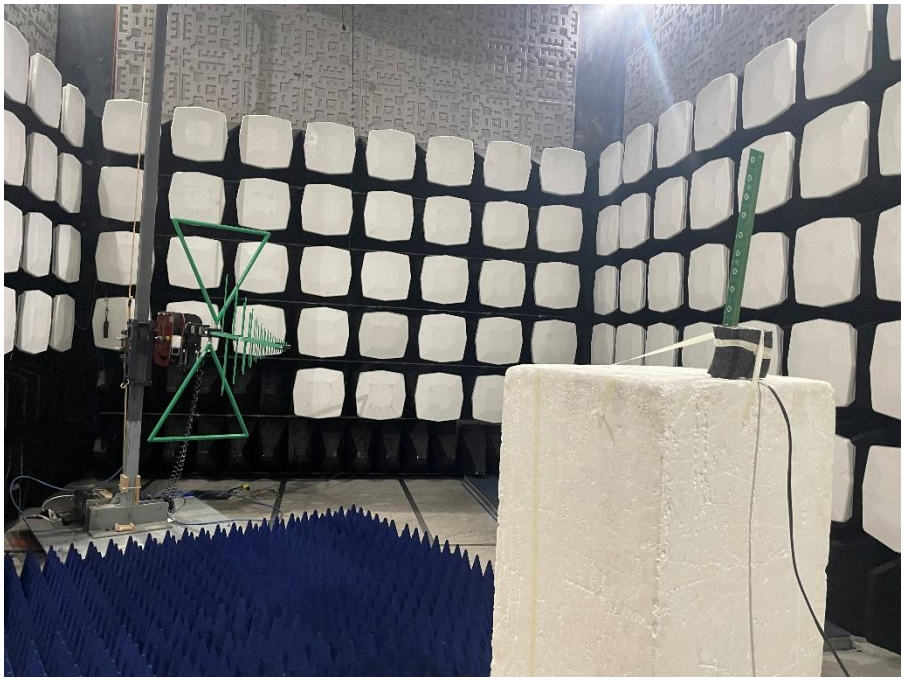

Figure 5.1-Reference test setup of an antenna – X- Orientation

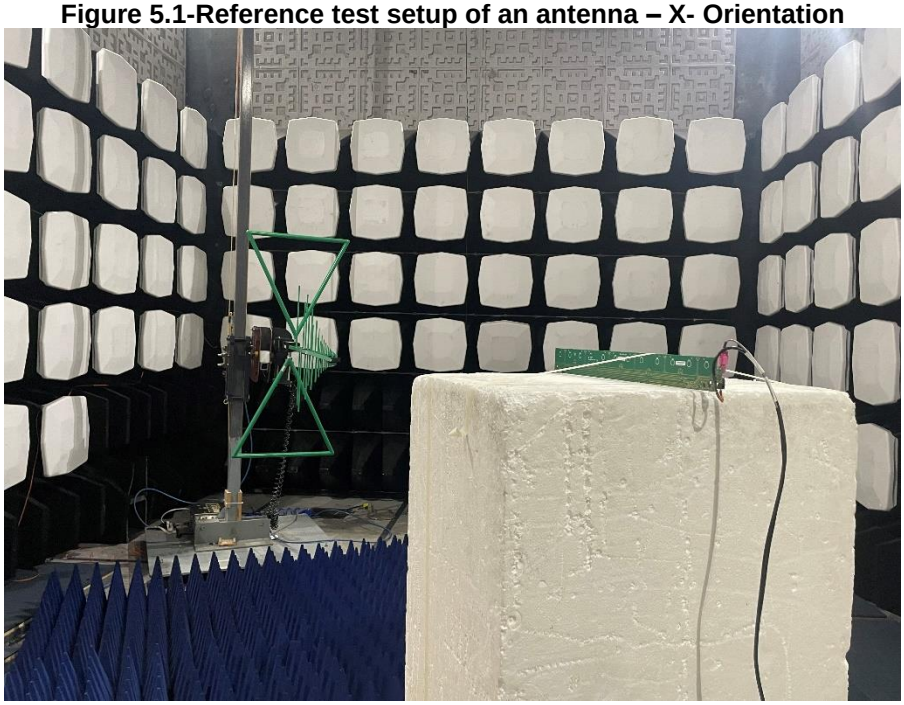

Figure 5.2-Reference test setup of an antenna – Y- Orientation

Figure 5.3-Reference test setup of an antenna – Z- Orientation

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