3D Antenna Measurement Summary Report

REPORT NO.: ORBBDJ-WTW-P24090476

MODEL NAME: WAN223216F2451SH08

TESTED DATE: 2024.10.1

ISSUED: 2024.10.28

APPLICANT : TUL Corporation

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ISSUED BY: Bureau Veritas Consumer Products Services (Hong Kong) Limited, Taoyuan Branch Mobile Communications Laboratory

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RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
ORBBDJ-WTW-P24090476	Original release	2024.10.28

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GENERAL INFORMATION

APPLICANT:	TUL Corporation
MANUFACTURER:	TUL Corporation
MODEL NAME:	WAN223216F2451SH08
MEASUREMENT STATNDARD	ANSI/IEEE Std 149 2021

TESTED BY : Leo Chen / Engineer **, DATE :** 2024.10.28

PREPARED BY : Johnny Liu / Supervisor **, DATE :** 2024.10.28

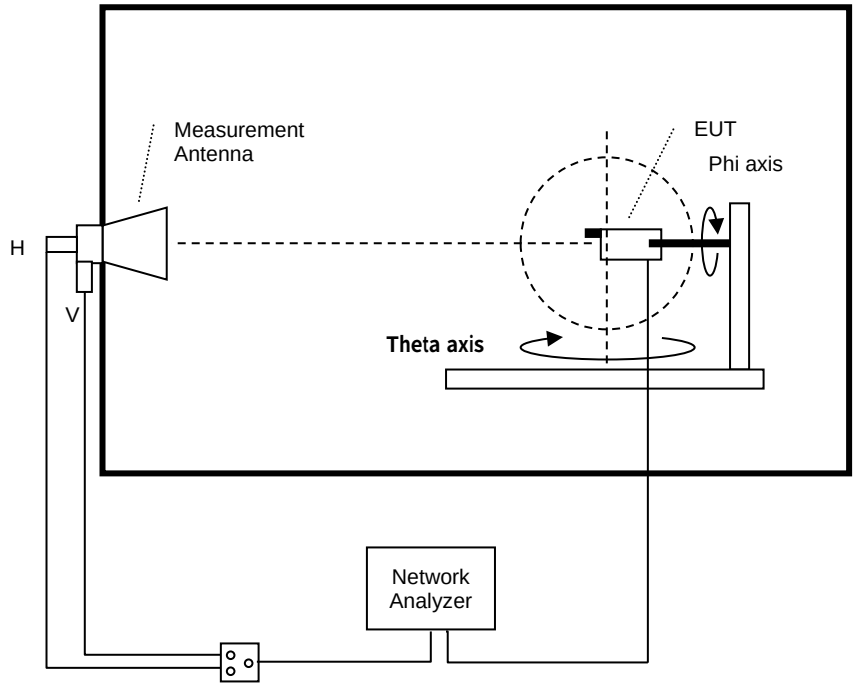
APPROVED BY : Ken Chan / Manager **, DATE :** 2024.10.28

1. Test Methods

The Antenna Gain Test is performed according to The ANSI/IEEE Std 149 12.3.1 Antenna Gain (Small size (< 42cm) Linear Polarization Antennas), using a two-axis support device and one fixed measurement antenna. The EUT is positioned along the required MAPS centerline fixture holder. The EUT is then stepped between 0 and 180 degrees along the theta axis in 15-degree increments. At each theta position, the phi axis is stepped from 0-360 degrees in 15-degree increments. Data is recorded using the Network analyzer for both theta and phi polarizations at each position. Depending on the protocol, an appropriate filter is used in the EMQuest software to process the data. Upon completion of the test, test results (angular dependent EIRP) is calculated at each measurement point and the required value is automatically calculated. This test procedure is repeated for frequency and configuration as required.

2. Description of the anechoic chamber:

Length: 7.32 m
Width: 3.66 m
Height: 3.51 m



3. Test Equipment List

TYPE OF EQUIPMENT	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
(OTA3-HY) ETS Anechoic Chamber	ETS-Lindgren AMS-8500	CT0000411-1132	N/A
Measurement Software	ETS-Lindgren EMQuest V1.14 build 31654	1281	N/A
Multi-Axis Positioning System	ETS-Lindgren 2090-OPTI	00086248	N/A
Switch Control	Agilent 3499A	MY42005285	N/A
Network Analyzer	Agilent E5071C	MY46104190	2025/5/29

4. Measurement Uncertainty

Expanded Uncertainty for Measurement (k=2 or 95.45% Confidence Level) at Passive antenna test over frequency range:.

FREQUENCY RANGE	MEASUREMENT UNCERTAINTY
780~2200 MHz	1.40 dB
2200~3000 MHz	1.72 dB
3000~6000 MHz	3.86 dB

5. Testing Setup Photograph

Please refer to another document - Test Setup and EUT photographs. (APPENDIX.)

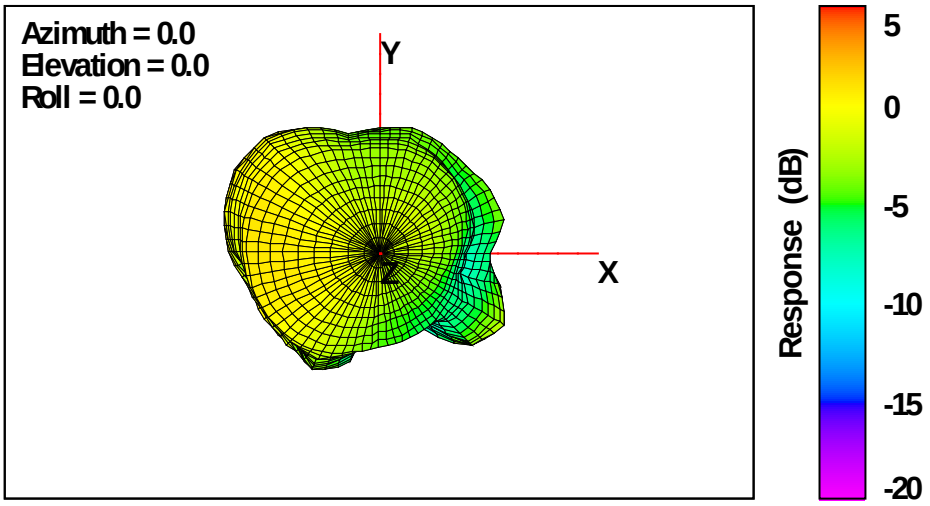
6. Antenna Radiation Performance

Frequency (MHz)	2402	2403	2440	2441	2480
Average Gain (dBi)	-2.65	-2.66	-2.53	-2.52	-2.69
Peak Gain (dBi)	1.98	1.98	2.38	2.42	2.46
Efficiency (%)	54.37	54.20	55.87	55.98	53.84

7. 3D Antenna Patterns

2402MHz

Total



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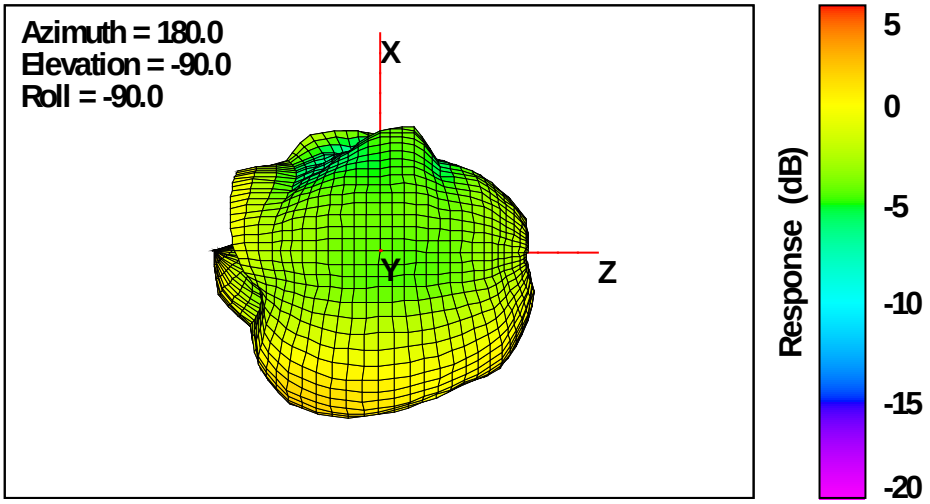

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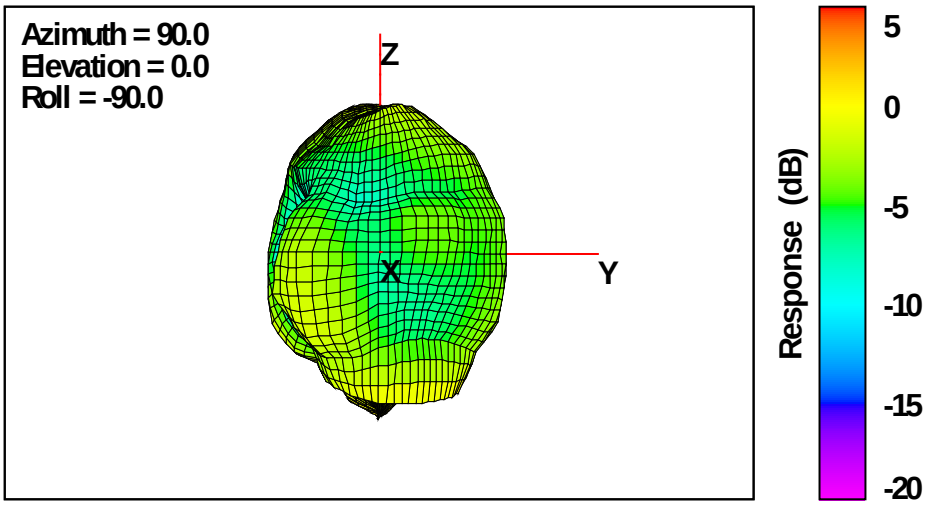
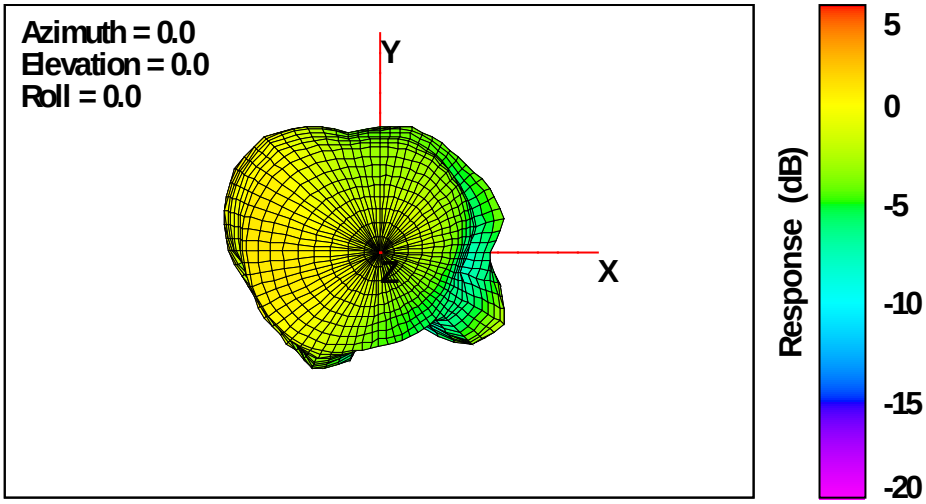


2403MHz

Total



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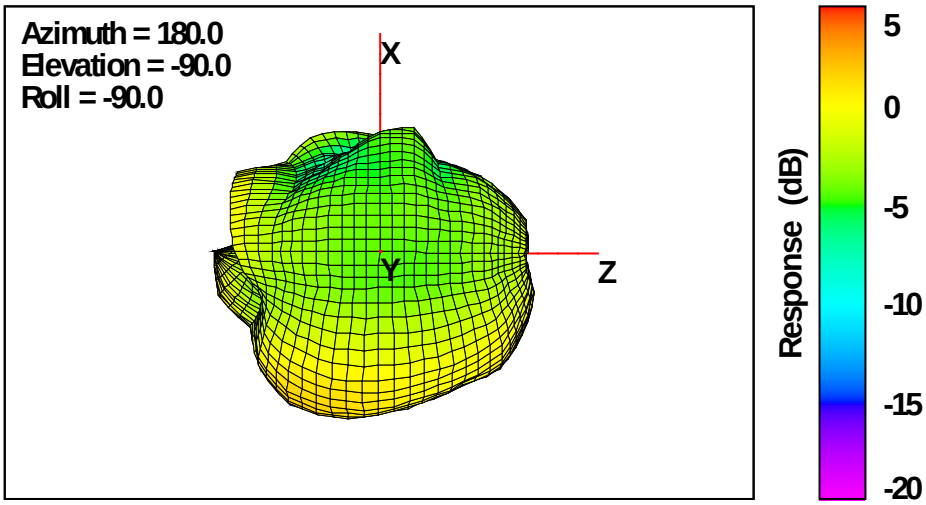

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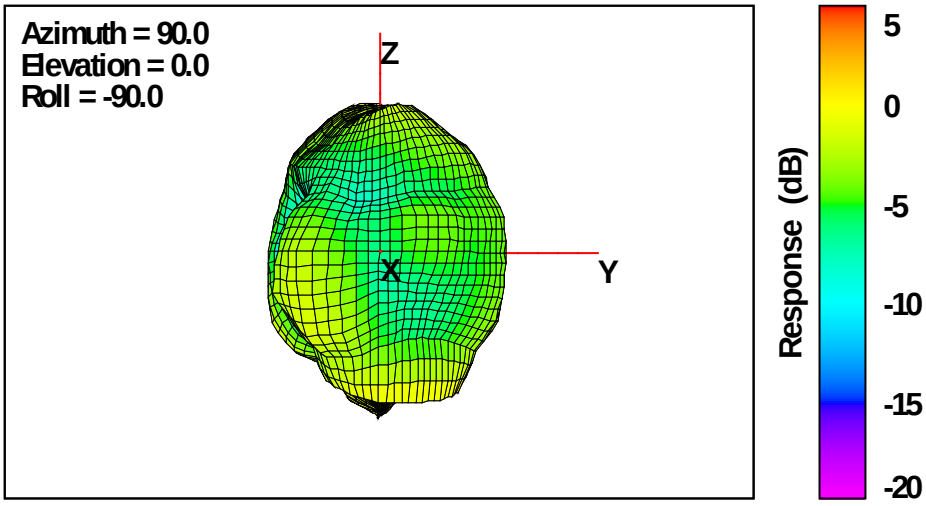
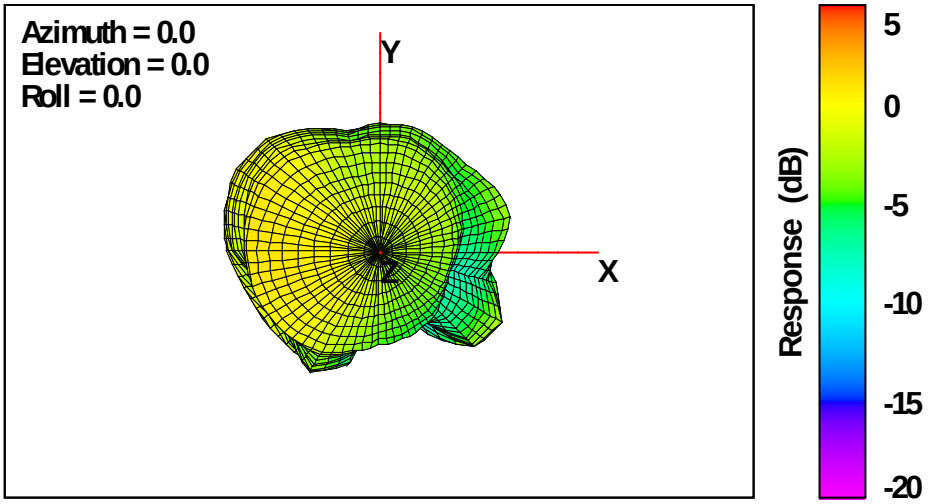


2440MHz

Total



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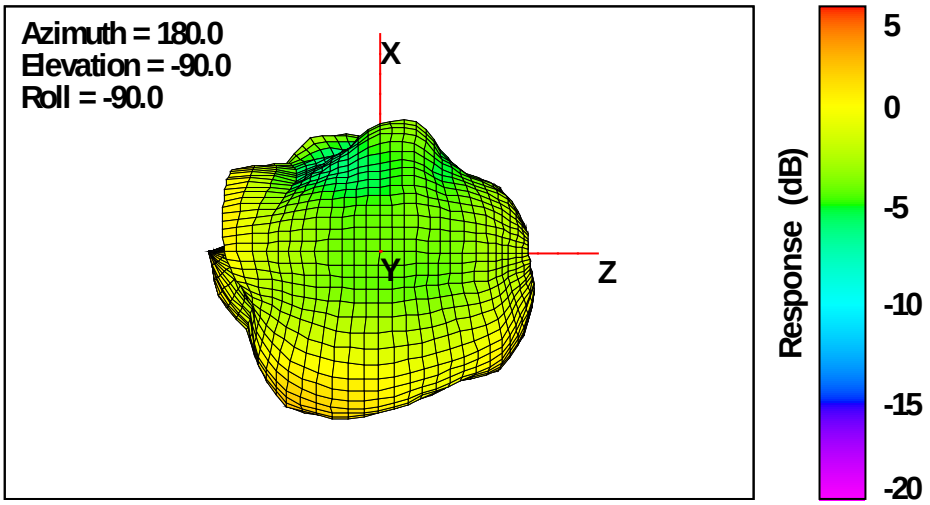

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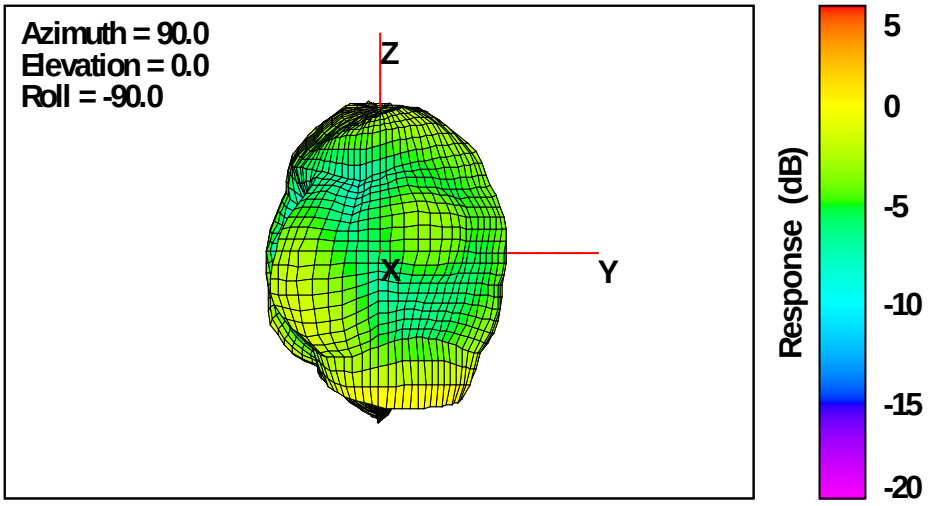

2441MHz

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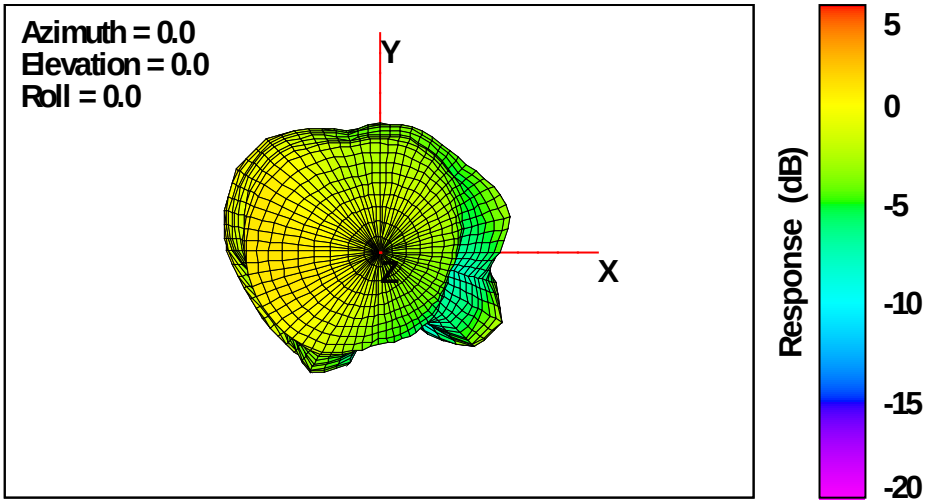

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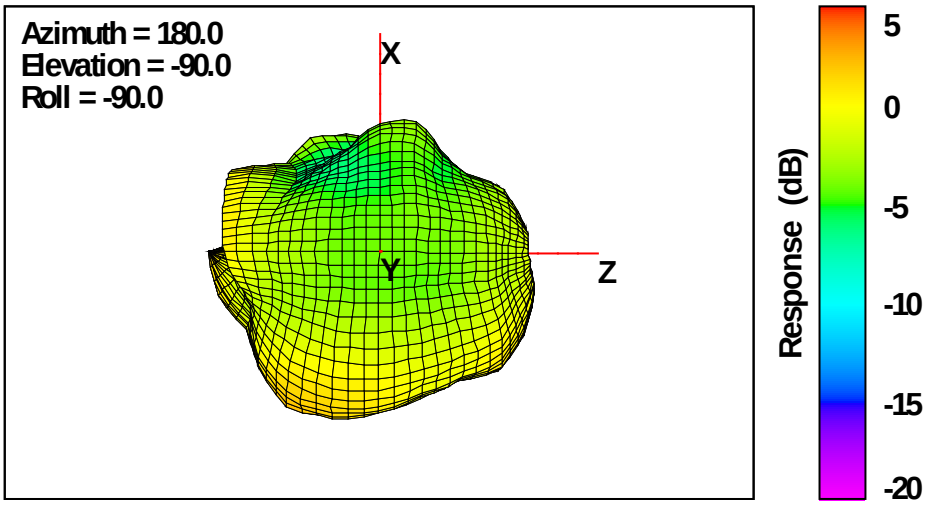

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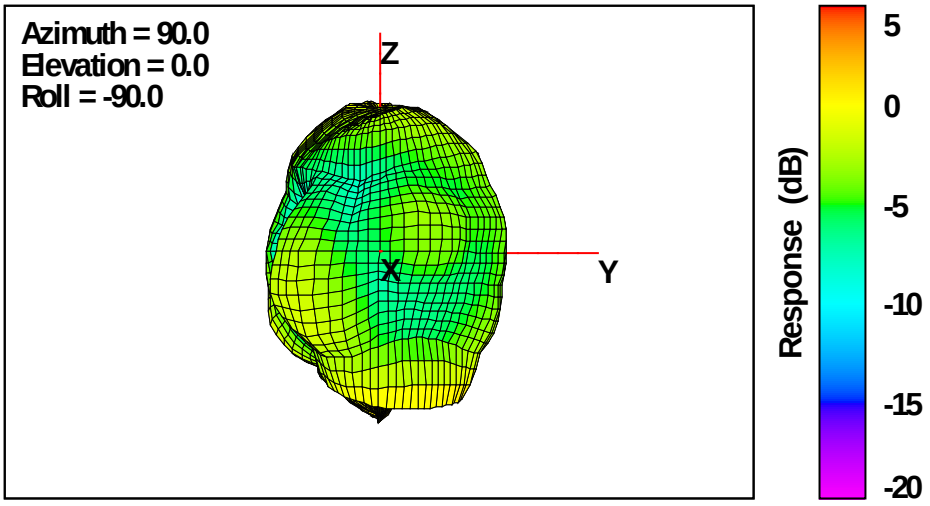
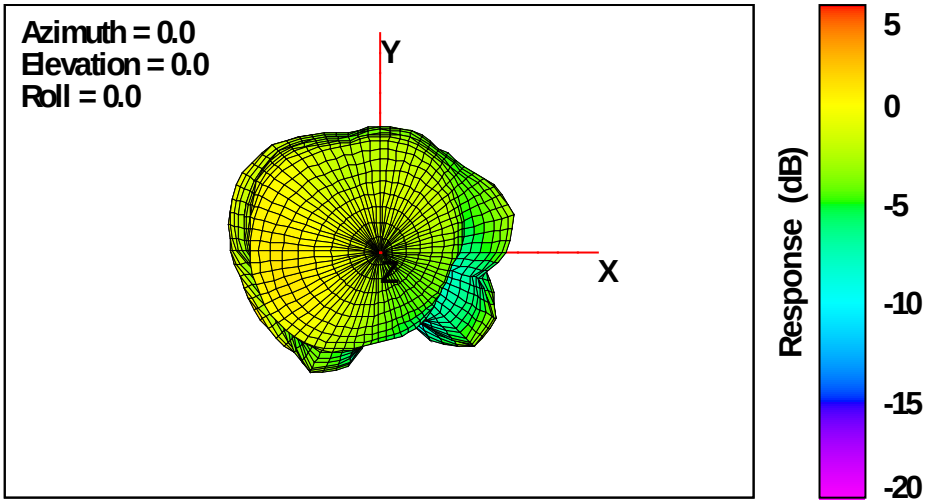


2480MHz

Total



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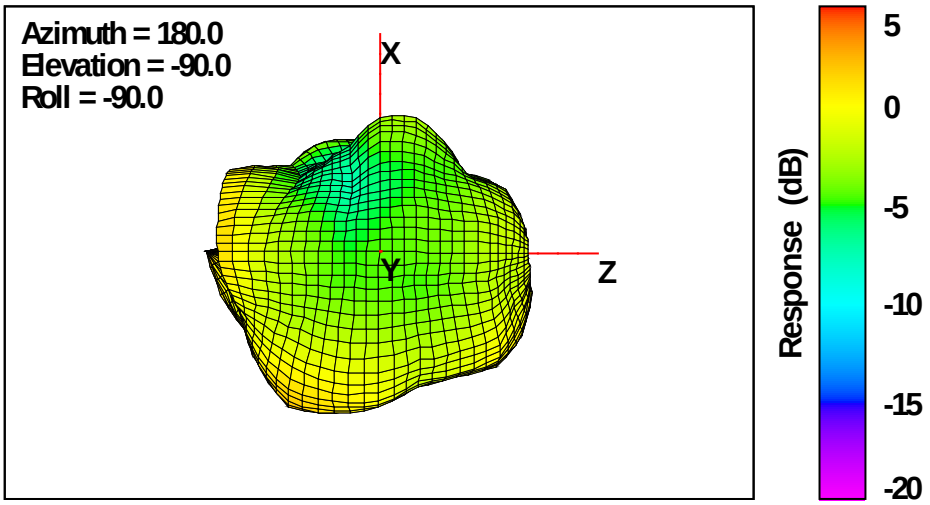

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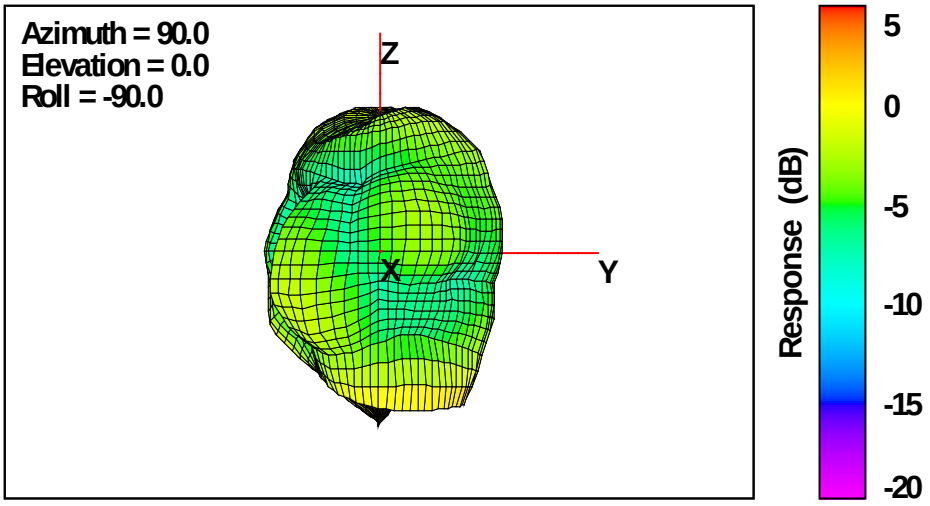

APPENDIX. EUT photographs

Please refer to another document - Test Setup and EUT photographs. (APPENDIX.)