

Radio Test Report

For the

Manufacturer: Scram Systems

Model Name/Number: GPS910-VZW bracelets

Device Type: GPS910-VZW bracelets

Report: WIR133261-PassiveAntennaTesting Rev. 1.0

September 25, 2024

Prepared For:

**Scram Systems
6251 Greenwood Plaza Blvd. Ste. 300
Greenwood Village, CO 80110
USA.**



Prepared By:
Eurofins E&E North America
3162 Belick St,
Santa Clara CA, 95054

Radio Test Data

For the

Manufacturer: Scram Systems

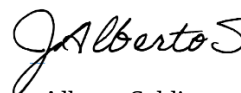
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Ryan Claypool
OTA Technical Manager



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Report Status Sheet

Revision	Report Date	Reason for Revision
1.0	September 25, 2024	Initial Issue.

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1. Executive Summary

Eurofins E&E North America was contracted by Scram Systems to perform Passive Antenna Testing in the GPS910-VZW bracelets under the Scram Systems purchase order number PO Credit Card.

The services performed will include:

- Testing each antenna in an accredited test environment, providing the characteristics of the antenna.

Deliverables:

- Report detailing the results of each antenna includes: Radiation Pattern, Efficiency and Peak Gain.

Requirements:

- Sample prototype to be tested

2. Equipment Configuration

2.1. Overview

This document describes the test setups, test methods, required test equipment used to perform Passive Antenna Testing. The objective of the testing was to verify the antenna efficiency and peak gain of the antenna in the GPS910-VZW bracelet.

2.1.1. Equipment Under Test (EUT) Information

Manufacture:	Scram systems	
Model:	GPS910-VZW bracelets	
Serial number / ESN(s) / IMEI(s):	SN: GM10000E0	
Primary Mechanical Mode:	Monoblock	
Device Type:	GPS910-VZW bracelets	
Antenna Type:	-	
Radio Mode(s)	746-787 MHz and 1710-2160 MHz Antenna efficiency.	
Band/Frequency Range	746-787 MHz and 1710-2160 MHz	
EUT Specifications:	Device Code:	GPS910-VZW bracelets
	Primary Power:	N/A
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Alberto Saldivar, and Otoniel Velazquez	
Report Date(s):	September 24, 2024	

2.1.2. References

ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories
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2.2. Test Site

All testing was performed in a limited access test laboratory facility located at Eurofins E&E North America, 3162 Belick St., Santa Clara, CA 95054. All testing performed at Eurofins E&E North America. Was conducted in the Environmental Simulation Lab. All equipment used in making physical determinations is accurate and bears recent traceability to the National Standards and Technology.

2.3. EUTs used for Testing

2.3.1. EUTs Used for Each Test

Serial Number/ ESN/IMEI	CATL and Chamber used	Radio Mode(s)	Band/Frequency Range(s)	Test Type(s)	Test Condition(s)
GM10000E0	OTA4	746-787 MHz and 1710-2160 MHz Antenna efficiency.	746-787 MHz and 1710-2160 MHz	Passive Antenna Testing	Forearm

2.4. Test Equipment Used During Testing

2.4.1. Passive Antenna Testing

MET Asset #	Equipment	Manufacturer	Model Number	Last Cal Date	Cal Due Date
1S4853	Vector Network Analyzer	R&S	ZNB40	05/02/2024	05/02/2025
Note 1: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

2.4.2. Measurement Software

Description	Manufacturer	Name	Version
OTA software	ETS	EMQuest	1.17

3. Result Summary

3.1. Project Summary

Customer:	Scram Systems
EUT Name/Model:	GPS910-VZW bracelets
Job Number	# 133261
Test Standard:	n/a
Test Name	OTA Passive Antenna Testing
Test Dates:	September 25, 2024
Laboratory	Eurofins E&E North America, 3162 Belick St., Santa Clara, CA 95054
Test Engineer:	Alberto Saldivar
Test Results:	Completed
Additional Notes:	

4. Summation Test Report

4.1. Antenna Efficiency and Peak Gain Tables

4.1.1. Dipole antenna GPS910-VZW bracelets Efficiency and Peak Gain from 746 MHz to 2160 MHz

Frequency [MHz]	Antenna Efficiency [%]	Antenna Peak Gain [dBi]
746	10.38	-6.13
756	8.98	-6.72
766	7.56	-7.61
776	7.19	-7.78
786	6.77	-8.11
1710	25.20	-0.72
1720	23.20	-1.02
1730	19.25	-1.58
1740	17.79	-1.77
1750	16.85	-1.86
1760	16.45	-1.76
1770	16.21	-1.74
1780	16.25	-1.6
1790	15.95	-1.62
1800	15.45	-1.76
1810	14.70	-2.03
1820	14.65	-2.25
1830	13.93	-2.68
1840	13.20	-3
1850	13.03	-3.02
1860	12.51	-2.96

Frequency [MHz]	Antenna Efficiency [%]	Antenna Peak Gain [dBi]
1870	12.64	-2.87
1880	13.40	-2.61
1890	13.86	-2.32
1900	14.11	-1.98
1910	13.94	-1.84
1920	14.24	-1.53
1930	14.50	-1.42
1940	15.45	-1.09
1950	15.84	-1.09
1960	16.97	-0.84
1970	17.46	-0.74
1980	17.75	-0.71
1990	17.84	-0.78
2000	18.67	-0.65
2010	19.83	-0.38
2020	20.52	-0.2
2030	20.98	-0.18
2040	21.97	-0.05
2050	22.00	-0.02
2060	21.77	-0.06
2070	20.86	-0.28
2080	20.34	-0.44
2090	19.43	-0.58
2100	17.91	-0.93
2110	16.81	-1.26
2120	16.39	-1.48
2130	15.56	-1.8
2140	14.94	-2.18
2150	14.58	-2.42
2160	14.82	-2.56

4.2. GPS910-VZW bracelets Efficiency and Peak Gain Plot

Figure 1; Antenna Efficiency from 746MHz to 2160 MHz

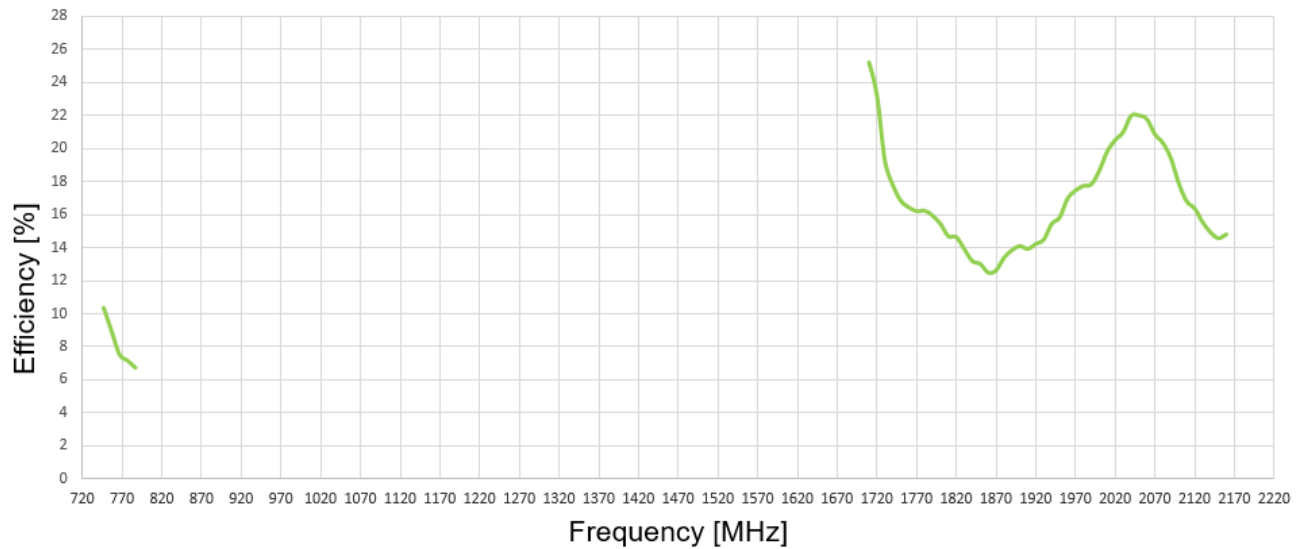
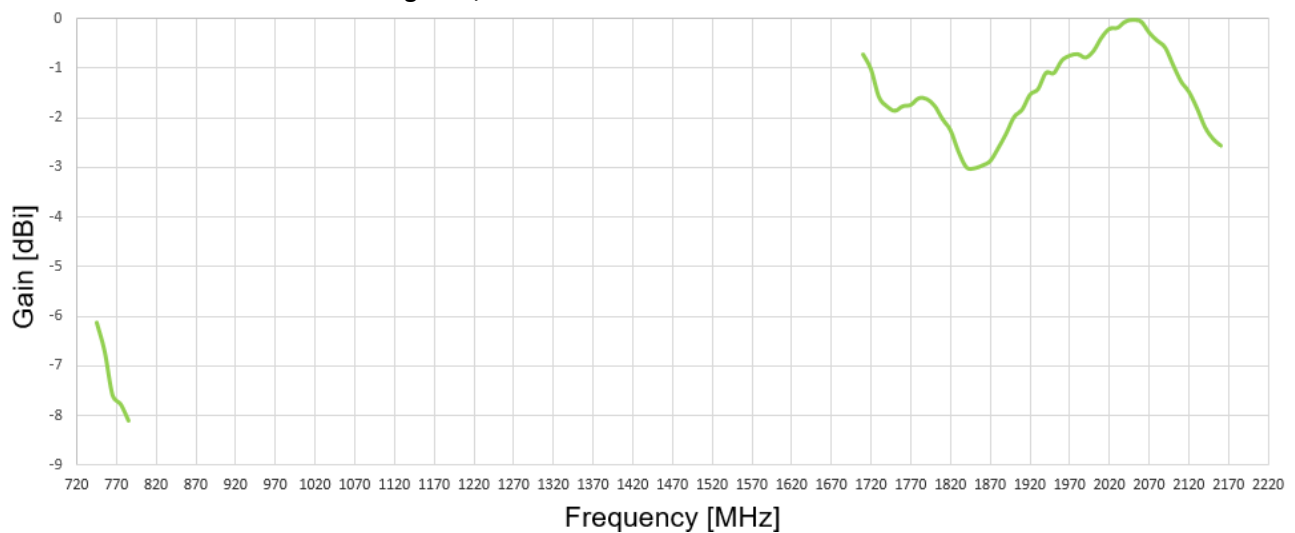
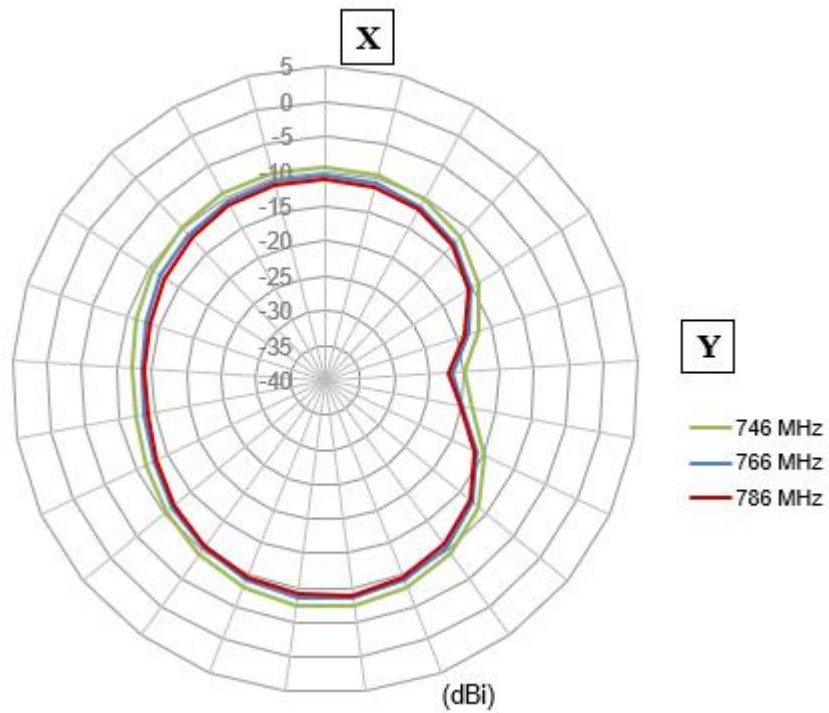


Figure 2; Antenna Peak Gain from 746MHz to 2160 MHz



4.3. 3D and 2D Antenna Patterns

4.3.1. 2D Antenna Patterns



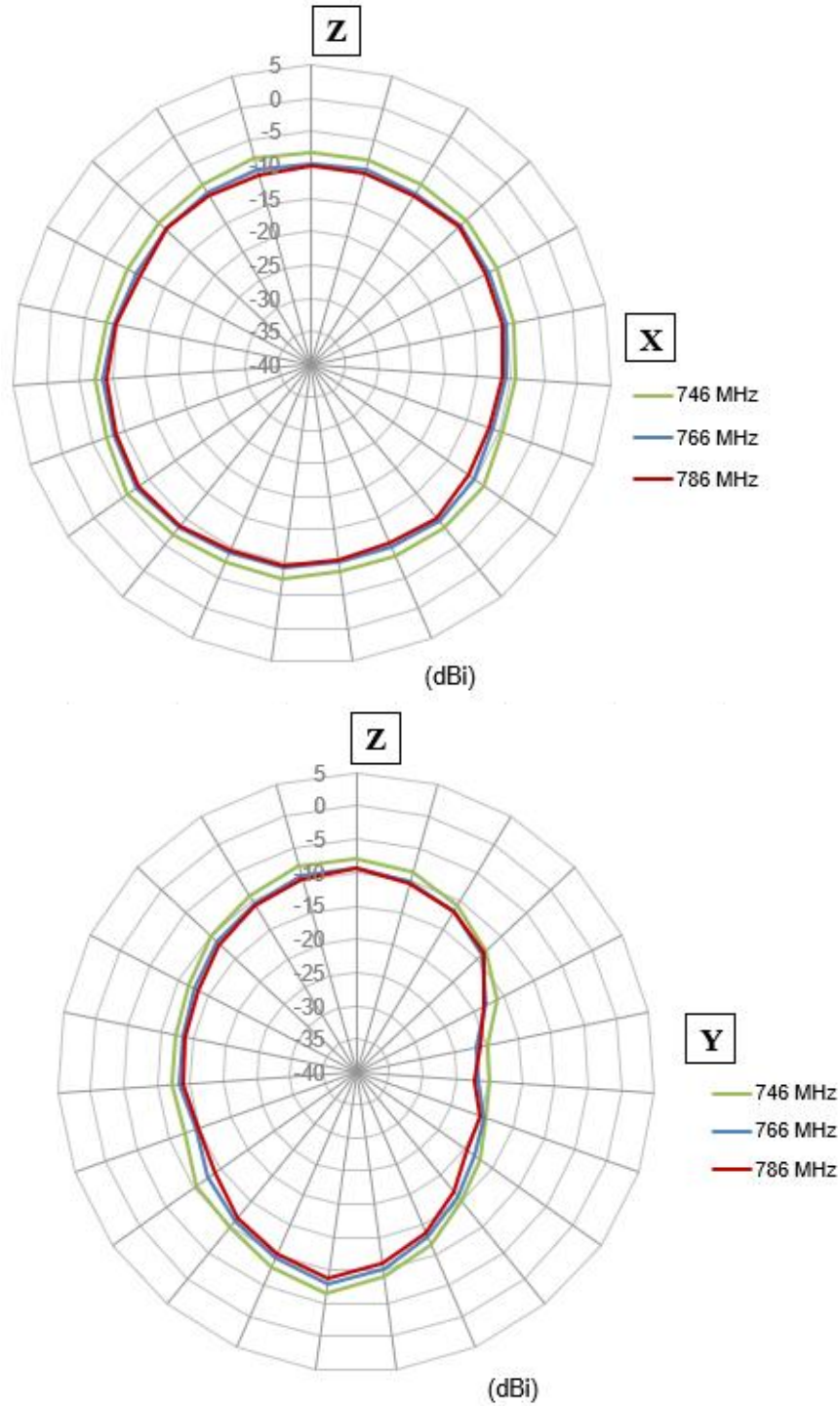
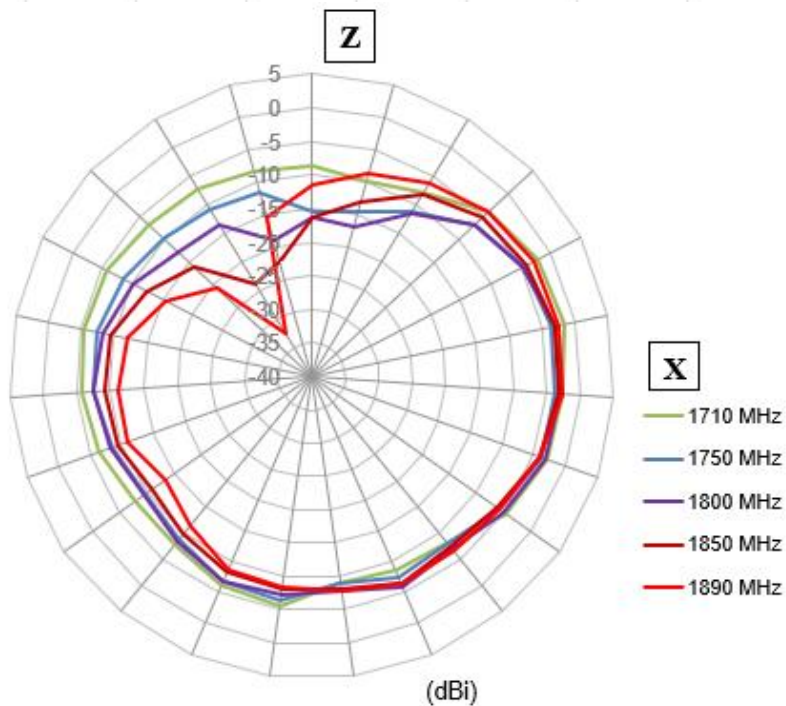
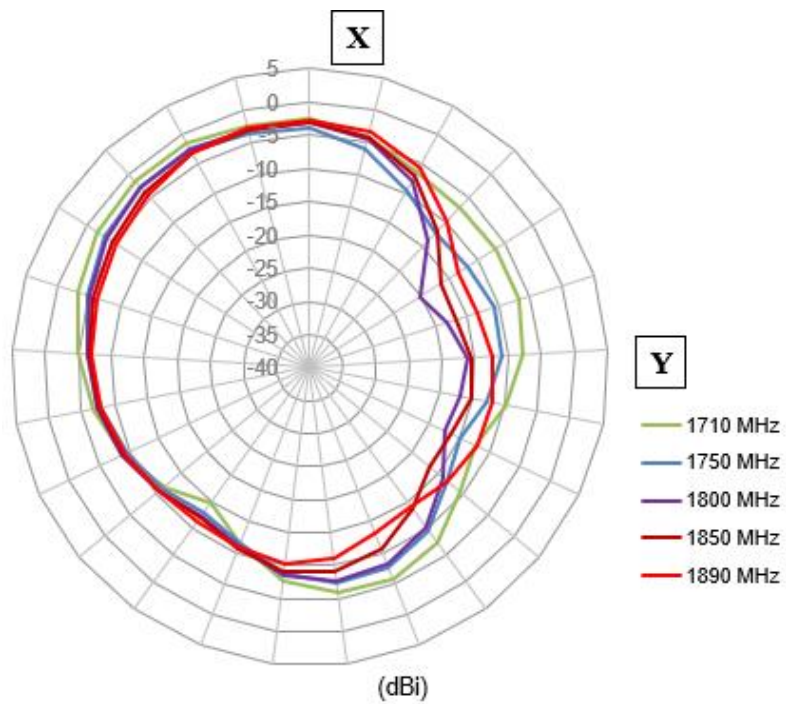


Figure 3; 2D Radiation Patterns from 700MHz



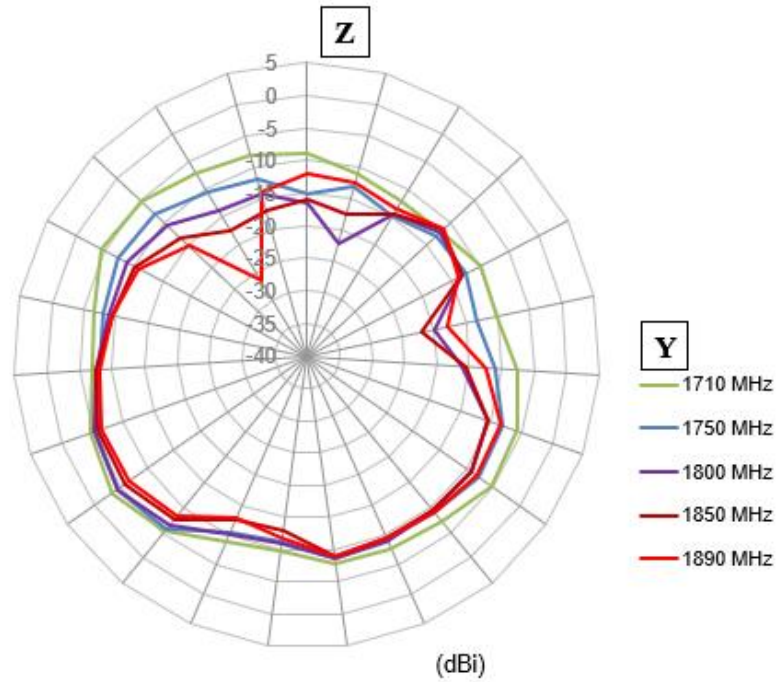
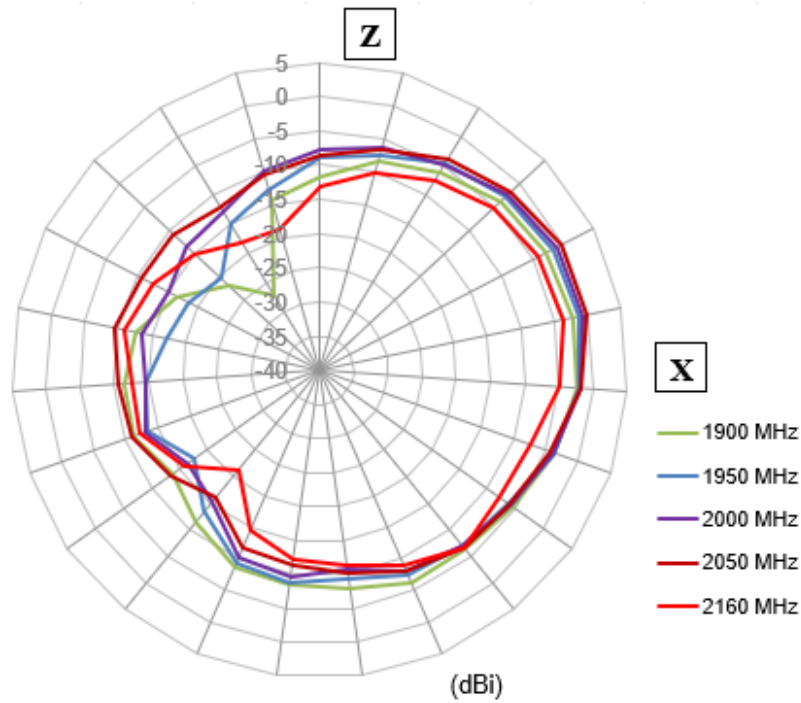
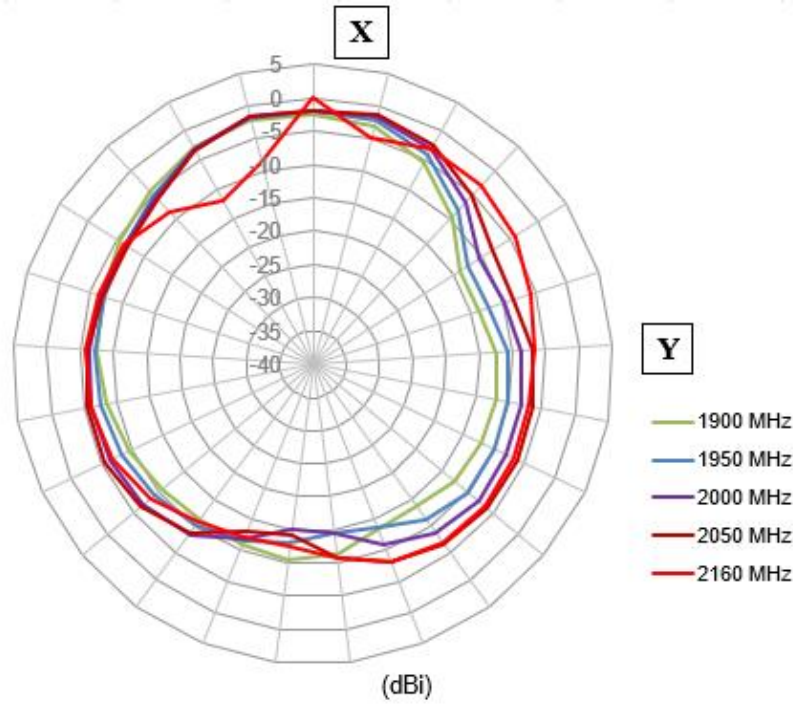


Figure 4; 2D Radiation Patterns from 1700MHz to 1800 MHz



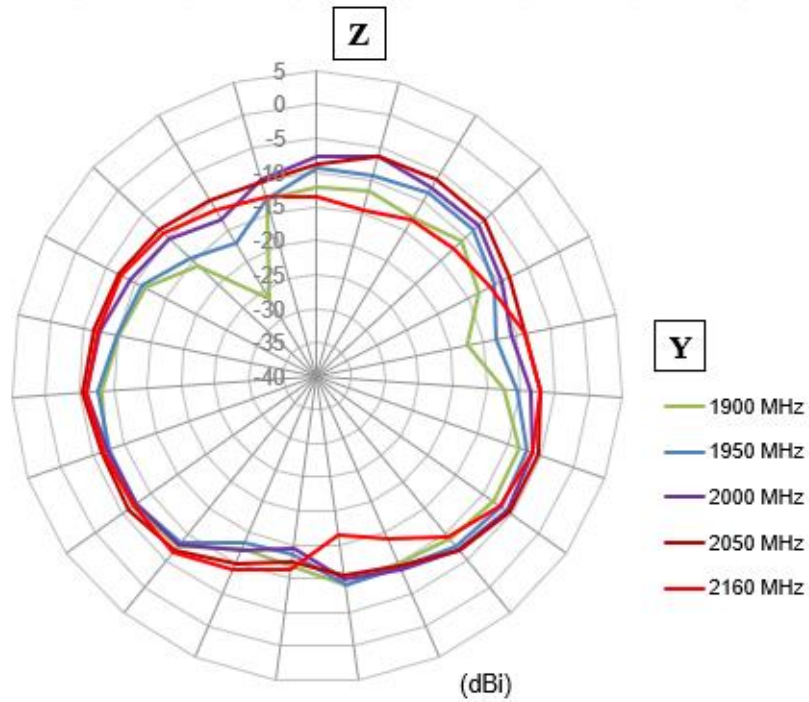


Figure 5; 2D Radiation Patterns from 1900MHz to 2160 MHz

4.4. Measurement Uncertainty

4.4.1. Measurement Uncertainty

OTA 4 Forearm	
Band	Expanded Uncertainty [dB]
Cellular 699 – 798 MHz	1.56
Cellular 1695 – 1780 MHz	1.61
Cellular 1850 – 2020 MHz	1.60
Cellular 2300 – 2800 MHz	1.68

ANNEX A EUT photos

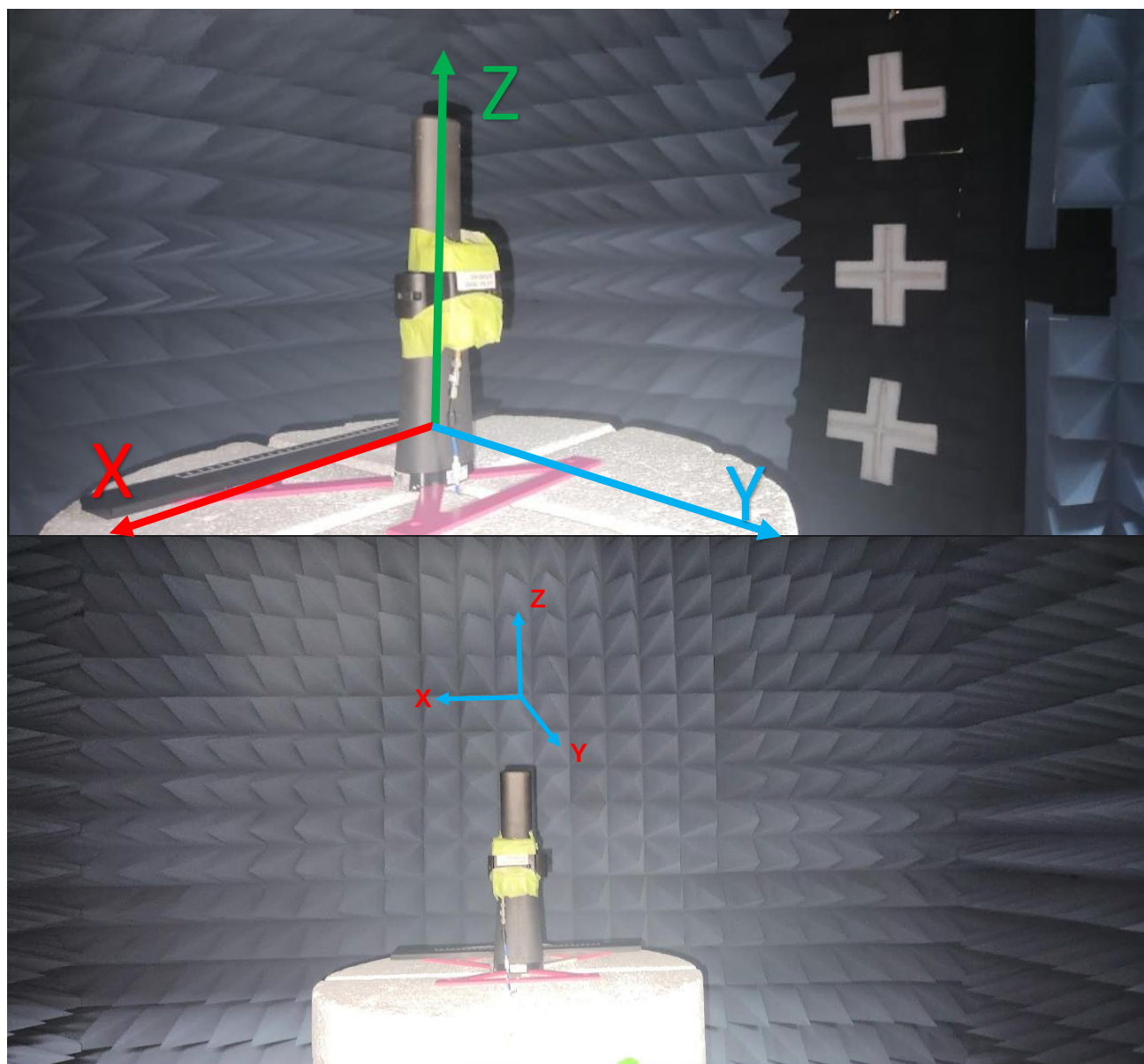


Figure 6; GPS910-VZW bracelets OTA setup

END OF REPORT