

# Antenna Report

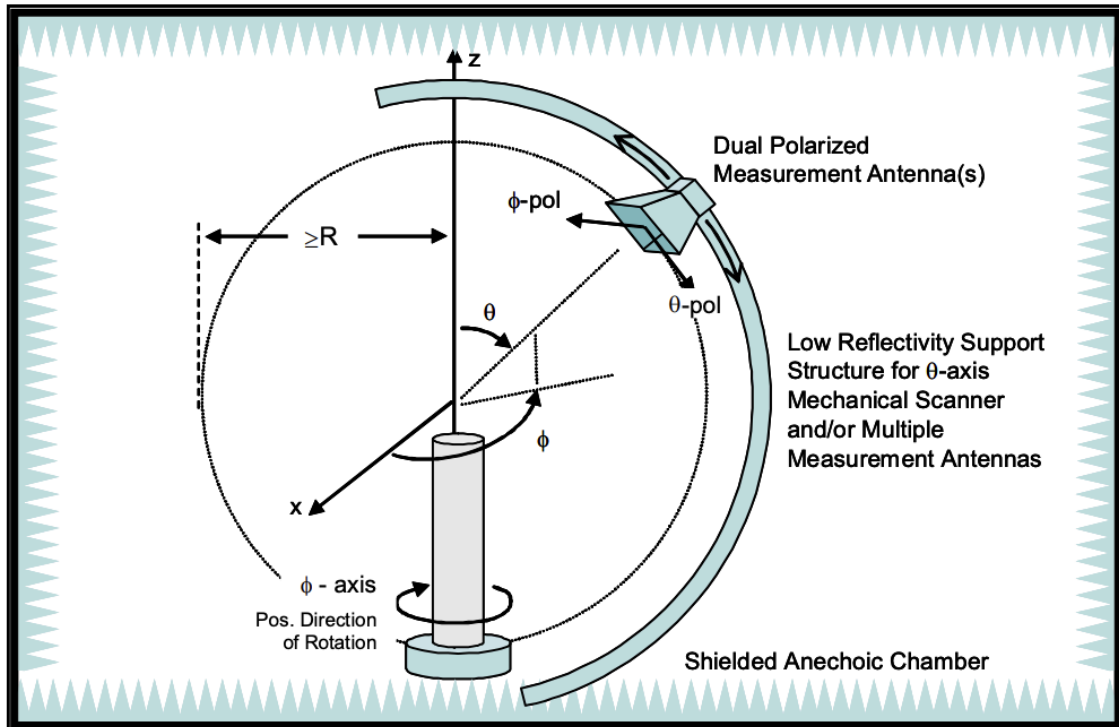
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4/2/2024

# 1. Test Method

The antenna gains are obtained through measurements in a fully anechoic OTA chamber with a 3D positioner.

Measurements are taken in discrete steps in theta and phi direction, data is being recorded using the spectrum analyzer (active) or network analyzer (passive) for both theta and phi polarizations at each position resulting in a 3D gain pattern. Step size is <30 deg along both axes.

Gain is either derived directly through spatial averaging of VNA S21 measurements (passive measurement) or by the ratio of spatial averaging of 3D EIRP/TRP measurements vs the conducted power (active measurement).



Measurements were obtained through an active non-signalling measurement (test mode) plus measured conductive RF power.

## 2. Test Setup

See separate appendix document for pictures of the test setup in this filing.

## 3. Test Equipment

Site Description	Chamber Manufacturer	Type
8923 Multi Probe Anechoic Chamber	ETS-Lindgren	Fully Anechoic
Site location:	US-MTV-STLN-2011-1M4	

Description	Manufacturer	Model
Network Analyzer	Rohde and Schwarz	ZNB8
Spectrum Analyzer	Rohde and Schwarz	FSW8
Signaling Equipment	Rohde and Schwarz	CMW500

## 4. Other information

Equipment calibration status	<ul style="list-style-type: none"><li>- Calibration date of the Model# : Sep 6, 2023</li><li>- Due of next calibration : Sep 6, 2024</li></ul>
Test dates	<ul style="list-style-type: none"><li>- April 9th, 2024</li></ul>
Names of test personnel	<ul style="list-style-type: none"><li>- Justin Deng : justindeng@google.com</li></ul>

## 5. Antenna Type

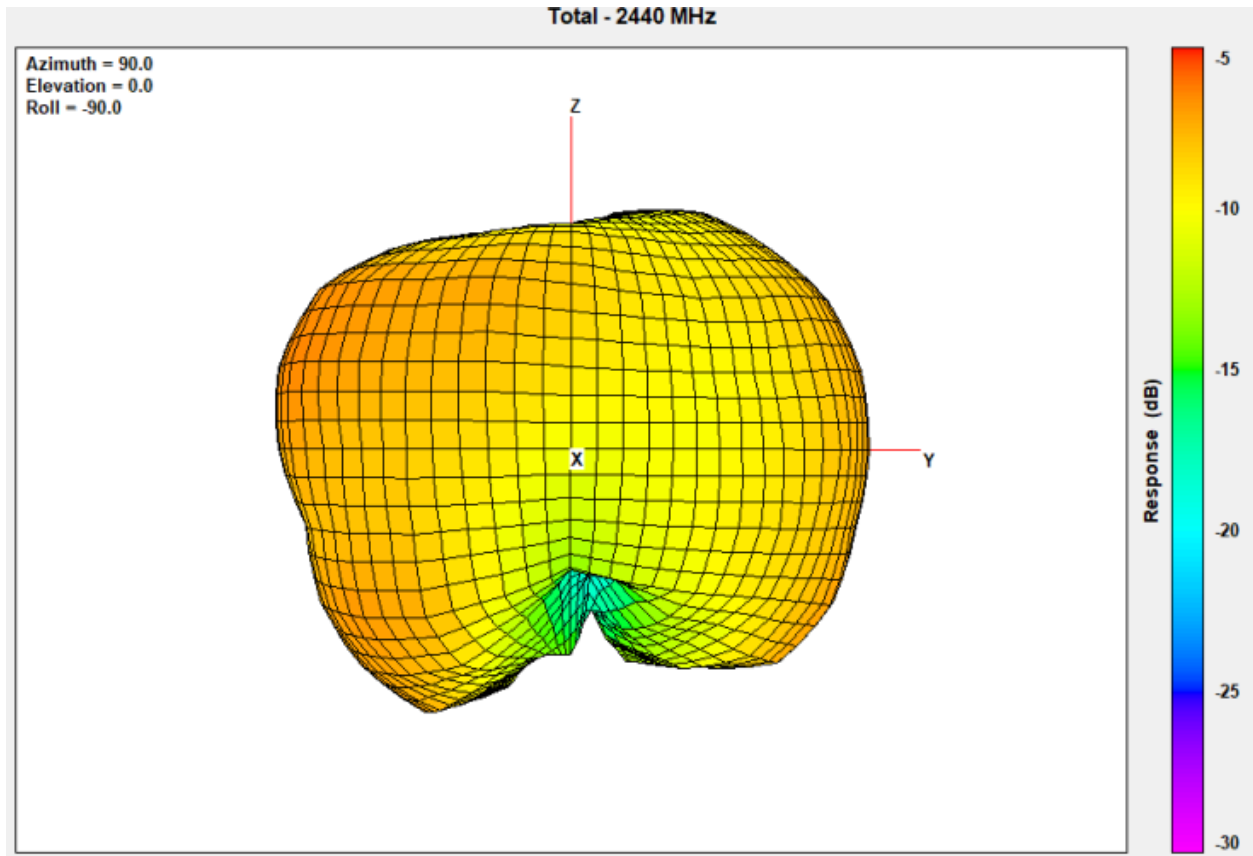
Antenna	Supported band	Type
Bottom	LTE/UMTS LB	Monopole
Top	WLAN 2.4GHz/BT WLAN 5GHz UWB CH5, CH9 LTE/UMTS MB/HB	PIFA

## 6. WLAN/BT/UWB Peak Antenna Gain

Wireless Technology	Global 1-SKU		TOP ANT
	Band	Frequency (MHz)	Peak ANT Gain (Passive)
Wi-Fi/BT/BLE	2G	2400-2483.5	-6.1
	5G	5150-5850	-1.9
UNII-4	5G	5850-5895	-1.4
UWB	CH5	6250-6750	-0.2
	CH9	7750-8250	0.4

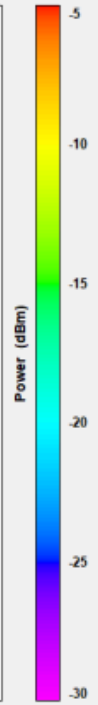
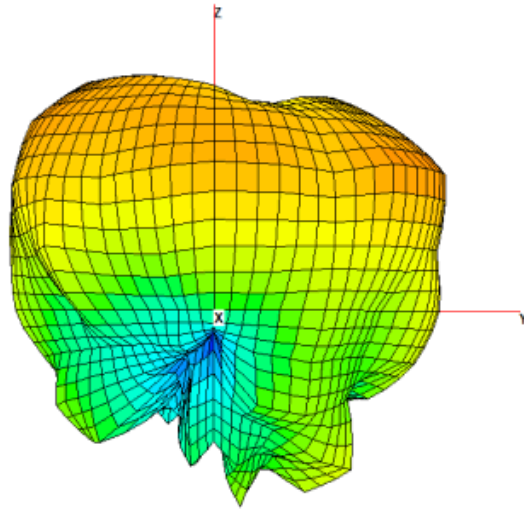
## Appendix: Radiation Plots

- Wi-Fi, BT/BLE



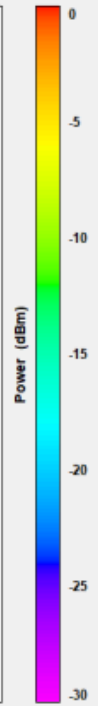
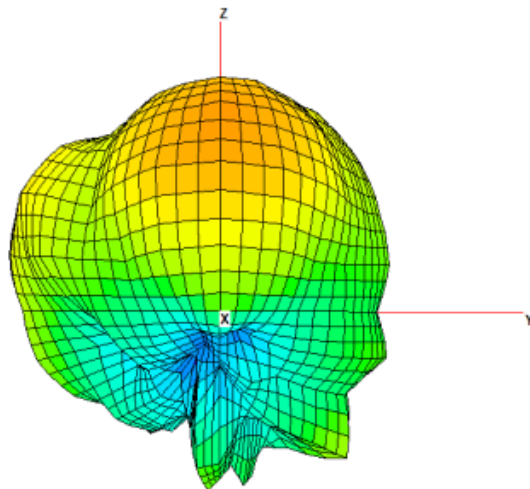
Total Power - 5500 MHz

Azimuth = 90.0  
Elevation = 0.0  
Roll = -90.0



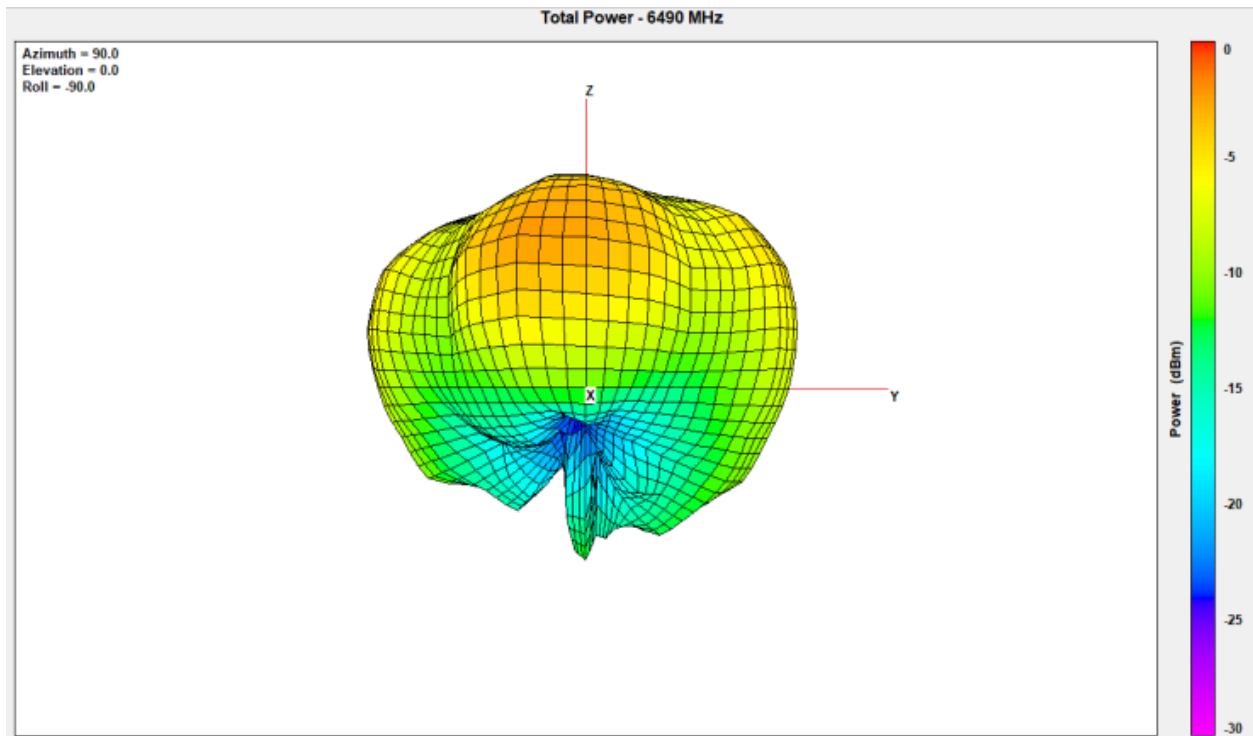
Total Power - 5880 MHz

Azimuth = 90.0  
Elevation = 0.0  
Roll = -90.0



- UWB

- 6490 MHz ( CH5 ) :



- 7990 MHz ( CH9):

