Antenna Report

FCC ID: A4RGE2AE

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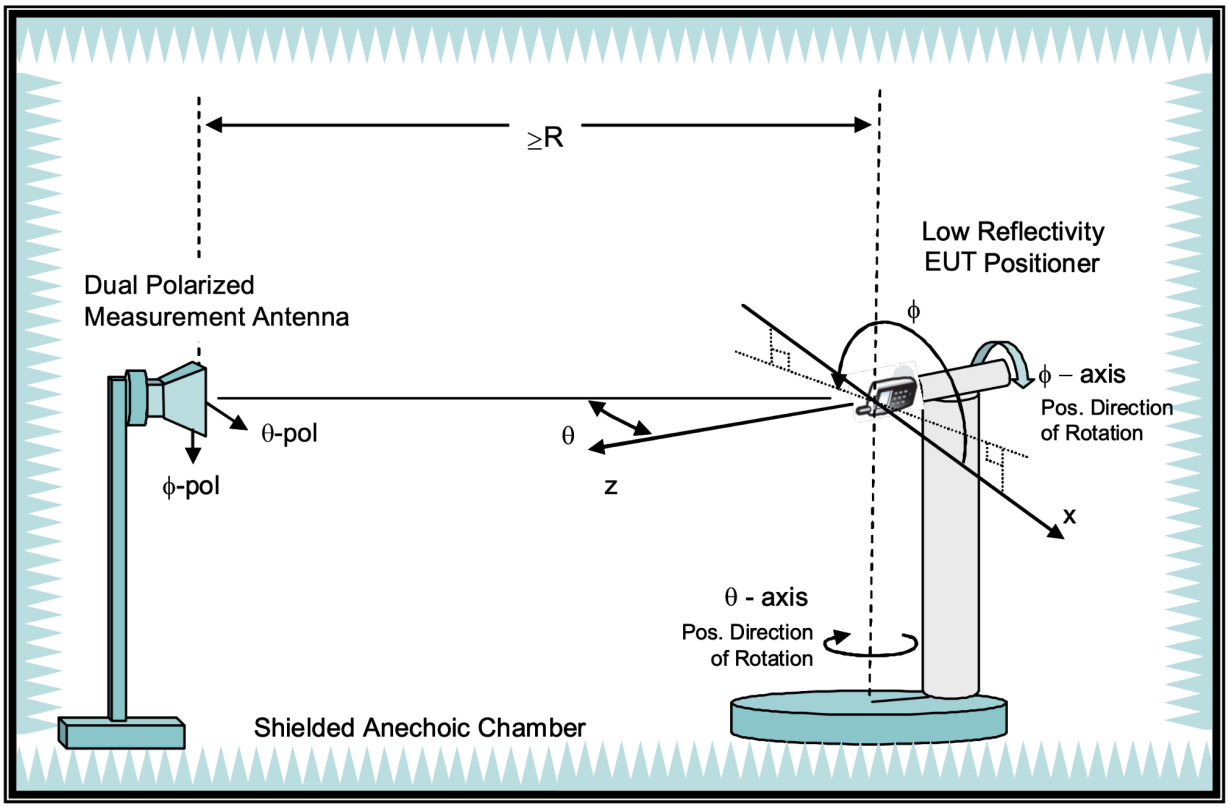
Google LLC

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 Equipment

Site Description	Chamber Manufacturer	Type
AMS-8923 Multi Probe Anechoic Chamber	ETS-Lindgren	Fully Anechoic

Site location:	1600 Amphitheatre Parkway Mountain View, CA 94043

Description	Manufacturer	Model
Network Analyzer	-	-
Spectrum Analyzer	Rohde & Schwarz	FSV7
Signaling Equipment	-	-

3. Test Setup

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

4. Antenna Type

Antenna Name	Antenna Type
Ant3	IFA
Ant4	ILA
Ant8	ILA

5. WLAN/BT Antennas

Ant	Band	Frequency Band	Peak Gain(dBi)
Ant4	WiFi/BT 2.4 GHz	2402 MHz	**-2.8**
		2412 MHz	**-2.8**
		2437 MHz	**-1.8**
		2462 MHz	**-1.7**
		2480 MHz	**-1.6**
Ant3	WiFi/BT 2.4 GHz	2402 MHz	**-2.1**
		2412 MHz	**-2.1**
		2437 MHz	**-1.0**
		2462 MHz	**-0.4**

Ant	Band	Frequency Band	Peak Gain(dBi)
		2480 MHz	**-0.5**
Ant4	UNII-1	5180 MHz	**-2.6**
	UNII-2A	5280 MHz	**-1.5**
	UNII-2C	5500 MHz	**-0.3**
	UNII-3	5820 MHz	**1.2**
	UNII-4	5887 MHz	**0.5**
	UNII-5	6175 MHz	**-0.6**
	UNII-6	6475 MHz	**-1.5**
	UNII-7	6700 MHz	**-1.9**
	UNII-8	7000 MHz	**-1.4**
Ant8	UNII-1	5180 MHz	**-4.0**
	UNII-2A	5280 MHz	**-4.0**
	UNII-2C	5500 MHz	**-4.9**
	UNII-3	5820 MHz	**-3.5**
	UNII-4	5887 MHz	**-3.5**
	UNII-5	6175 MHz	**-3.5**
	UNII-6	6475 MHz	**-3.5**
	UNII-7	6700 MHz	**-3.5**
	UNII-8	7000 MHz	**-3.5**