Prüfbericht-Nr.: *Test report no.:*	ULR-TC568821300000113F	**Auftrags-Nr.:** *Order no.*:	146600935 0010	Seite 1 von 46 *Page 1 of 46*
Kunden-Referenz-Nr.: *Client reference no.:*	2133653	**Auftragsdatum:** *Order date:*	2021-09-02	
Auftraggeber: *Client:*	ZOLL Medical Corporation 269 Mill Road Chelmsford, MA 01824, USA.			
Prüfgegenstand: *Test item:*	ZOLL Mobile Hotspot	**Product Type**	Mobile Hotsopt	
Bezeichnung.: *Identification .:*	8016-000117-01			
Auftrags-Inhalt: *Order content*:	Testing and issue of Test Report and Grant Certificate			
Prüfgrundlage: *Test specification:*	FCC Part 2 & Part 27 RSS GEN, RSS 130 Issue 2, RSS 139 Issue 3			
Wareneingangsdatum: *Date of sample receipt:*	2021-09-07			
Prüfmuster-Nr & Serien-Nr.: *Test sample no & serial no.*:	A003124554-001 A003124554-011 ZMCHUS20000001			
Prüfzeitraum: *Testing period:*	2021-09-14 - 2021-09-30			
Ort der Prüfung: *Place of testing:*	Wireless laboratory, Bangalore			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (India) Pvt.Ltd., 27/B, 2nd Cross, Electronic City Phase1 Bangalore -560 100, India FCC Test site registration number: 496599 ISED Test site registration number: 3466E-1			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*		**genehmigt von:** *authorized by:*	
Datum: *Date:* 2021-10-08		**Ausstellatum:** *Issue date:* 2022-03-22	
Stellung */ Position:*	**Shrinivas Naikar** Engineer	**Stellung** */ Position:*	**Lokesh Ramu** **Manager**

Sonstiges */ Other:*	FCC ID: ZKP-ZOLLMCH0001 IC: 9702A-ZOLLMCH0001

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	**Prüfmuster vollständig und unbeschädigt** ***Test item complete and undamaged***

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

Test Item	FCC Clause	ISED Clause	Results
Conducted Output Average Power and Peak to Average Power ratio	§2.1046 §27.50	RSS 130 Issue 2, Section 4.6.1 RSS 139 Issue 3, Section 6.5 RSS Gen Issue 5, Section 6.12	N/T
Equivalent Isotropic Radiated Power (EIRP) / Effective Radiated Power (ERP)	§27.50	RSS 130 Issue 2, Section 4.6.3 RSS 139 Issue 3, Section 6.5	N/T
Field strength of spurious radiation	§2.1053 §27.53	RSS 130 Issue 2, Section 4.7.1 RSS 139 Issue 3, Section 6.6	Pass
Frequency Stability	2.1055 27.54	RSS 130 Issue 2, Section 4.5 RSS Gen Issue 5, Section 6.11 RSS 139 Issue 3, Section 6.4	N/T
Emission Babwidth and Occupied Bandwidth	2.1049	RSS Gen Issue 5, Section 6.7	N/T
Band Edge	27.53	RSS 130 Issue 2, Section 4.7 RSS 139 Issue 3, Section 6.6	N/T
Spurious emissions at antenna terminals	2.1051 27.53	RSS 130 Issue 2, Section 4.7 RSS Gen Issue 5, Section 6.13 RSS 139 Issue 3, Section 6.6	N/T
Conducted Emissions on a.c Power Lines	FCC 15.207	RSS-Gen Issue 5, Section 8.8	Pass

Note:
N/T: Not Tested

ZOLL Mobile Hotspot product uses certified RF modules with FCC IDs: XMR201808EC25AF and IC:10224A-2018EC25AF, hence the above mentioned test cases are excluded and which can be found in the module test report of respective FCC and IC Ids

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568821300000113F	01	Initial issue of report	2021-12-09
ULR-TC568821300000113F	02	Module name updated	2022-03-22

Table of Contents

1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1: TEST SETUP PHOTOS

2: EUT EXTERNAL PHOTOS

3: EUT INTERNAL PHOTOS

4: FCC LABEL AND LABEL LOCATION

5: BLOCK DIAGRAM

6: SPECIFICATION OF EUT

7: SCHEMATIC DIAGRAM

8: BILL OF MATERIAL

9: USER MANUAL

10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
   27/B, 2nd Cross,
   ElectronicCityPhase1
   Bangalore – 560 100,
   India

2. TUV Rheinland (India) Private Limited
   108 , Beside ISBR Business School,
   Electronic city Phase I
   Bangalore - 560 100.
   India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
Radio Communication tester	Rohde & Schwarz	CMW 500	1201.000 2K50	-	24.08.2022	Yearly	Radiated Spurious Emission
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73 SP5	27.01.2022	Yearly	
Loop Antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	27/04/2022	Yearly	
Baloon and Bicorical Antenna	Schwarzbeck	BBA 9106+VHBB 9124	9124-1117	-	03/03/2022	Yearly	
Log-Periodic Antenna	Schwarzbeck	VUSLP 9111B	9111B-324	-	04/03/2022	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	11.05.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	29.07.2022	Yearly	Conducted AC Power line Test
LISN	Rohde & Schwarz	ENV216	100022	-	10.07.2022	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

ZOLL Mobile Hotspot devices are used to connect portable Defibrillator and ventilator devices to the cloud via Wi-Fi, and then send real-time data to the cloud for processing via cellular network.
It use for relay LTE over Wi-Fi.

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

Cellular Operator		**ZOLL Mobile Hotspot**				
Radio Protocol		LTE & WCDMA				
LTE E-UTRA operating bands		Band	Bandwidth (MHz)	UL Frequency (MHz)	DL Frequency (MHz)	Modulation
		4	1.4, 3, 5, 10, 15, 20	1710.7 - 1754.3	2110.7-2154.3	QPSK, 16QAM
		12	1.4, 3, 5, 10	699 - 716	729 - 746	QPSK, 16QAM
		13	5, 10	777 - 787	746 - 756	QPSK, 16QAM
		66	1.4, 3, 5, 10, 15, 20	1710 – 1780	2110 – 2200	QPSK, 16QAM
		71	5, 10, 15, 20	663 – 698	617 – 652	QPSK, 16QAM
WCDMA/HSDPA/HSUPA		4	-	1712.40-1752.60	2112.40-2152.60	QPSK
Transmitted Power for LTE (dBm)		Band	Power Class	Max. Conducted Average. Output Power		
		4	Power Class 3: 23dBm	26.08dBm Refer module report number R1806A0301-R3V1		
		12	Power Class 3: 23dBm	20.48dBm Refer module report number R1806A0301-R3V1		
		13	Power Class 3: 23dBm	23.63dBm Refer module report number R1806A0301-R3V1		
		66	Power Class 3: 23dBm	27.51dBm Refer module report number R1806A0301-R3V1		
		71	Power Class 3: 23dBm	22.72dBm Refer module report number R1806A0301-R3V1		
Transmitted Power for WCDMA (dBm)		4	Power Class 3: 24dBm	25.62dBm Refer module report number R1806A0301-R3V1		
Antenna Type		Main Antenna - Chip Antenna Diversity Antenna - External Flat Bar Antenna				
Number of Antenna		Main – 1 & Diversity – 1				
Antenna Gain		Refer Table 4				
Supply Voltage to Product		5V DC, 0.5A Battery and USB Type C Port Powered 1. Primary - Battery (3.7V, 4000mAh) 2. Secondary - USB Type C (5V, 0.5A)				
Environmental conditions	Storage	-20ºC to +60º C				
	Operating	-10ºC to +50º C				
EUT Dimension (L X W X H**)**		134.2mm x 80.7mm x 27.9mm (LxWxH)				

Antenna Type	Frequency Range (MHz)	Antenna Gain (dBi)
Chip Antenna	617-698	0.81
	698-960	1.1
	1710-2690	2.4
External/ Diversity Antenna	617 - 698	-1.1
	698 - 806	1.8
	824 - 960	2.8
	1427 - 1518	1.6
	1710 - 2200	3.0
	2300 - 2690	4.7

Table 4: Antenna Gain

***Disclaimer:**
The information/data is supplied by the client and the same is considered to arrive at the final value.
Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 5: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±3 ℃
Supply Voltages	±3 %
Time	±5 %

Note: The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channels

4.2 UUT Operation and Software

Hardware Version Identification number (HVIN) : Rev2.0
Software version : v1.0.3

4.3 Special Accessories and Auxiliary Equipment

-None

4.4 Simultaneous Transmission

Combinationations of Simultaneous Operations performed	**WiFi-LTE**
	WiFi- WCDMA

Note: Simultaneous Operation was performed with the above mentioned combination and worst case test results are mentionrd in this report.

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 List of frequencies

Table 6: List of Center frequencies

Protocal	Band	UL Frequency (MHz)	DL Frequency (MHz)
LTE	4	1710 - 1754.9	2110 - 2154.9
	12	699 - 716	729 - 746
	13	777 – 786.9	746 – 755.9
	14	788 – 797.9	758 – 767.9
	66	1710 – 1779.9	2110 – 2199.9
	71	663 – 697.9	617 – 651.9
WCDMA	4	1712.40-1752.60	2112.40-2152.60

Note:

TUV Sample Identification number : A003124554-001 – Radiated test Sample
A003124554-011 – Conducted test Sample

4.7 Report references

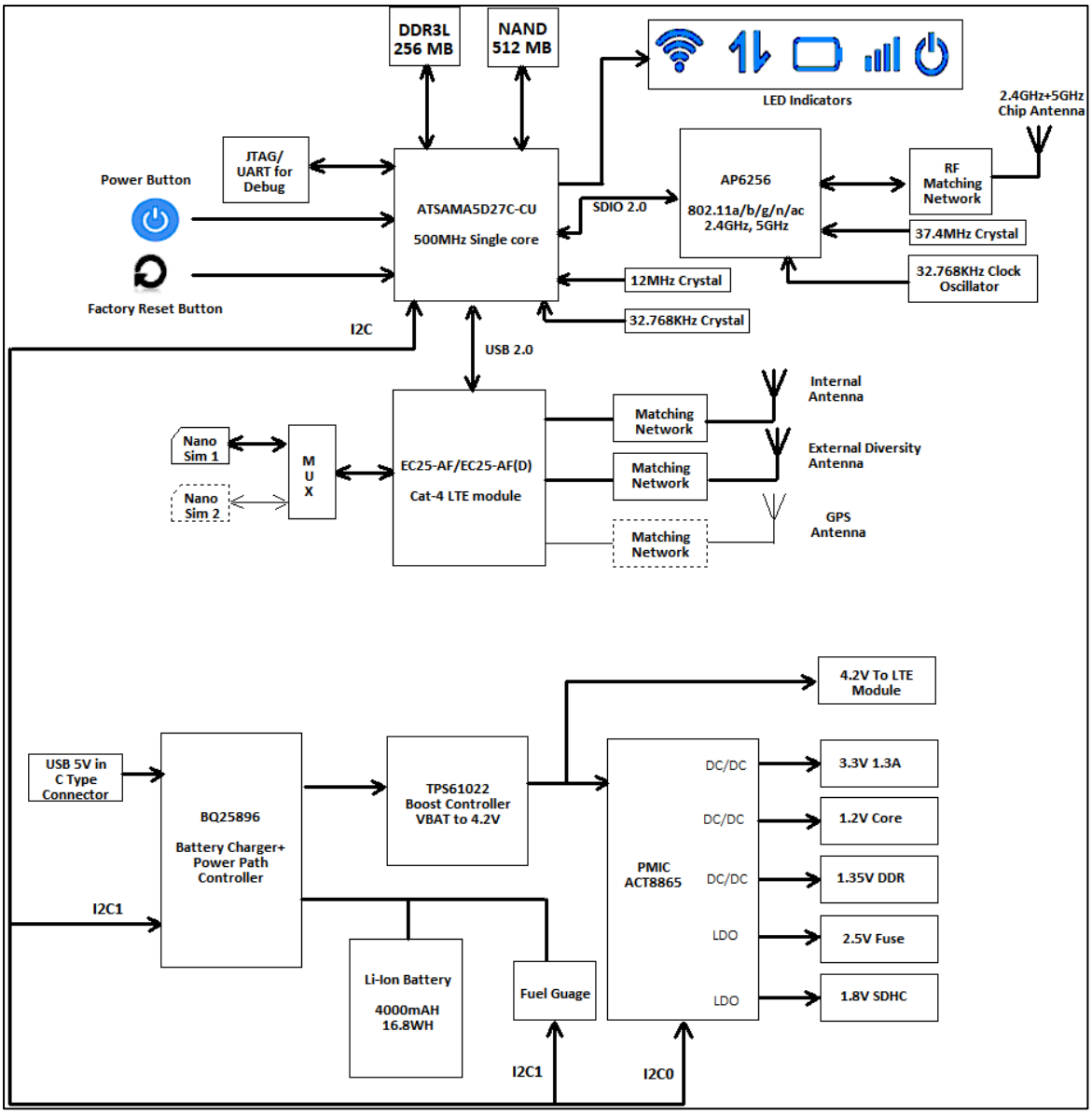
Note: ZOLL Mobile Hotspot has multiple protocols. All the supported wireless protocols and their respective test results are issued in saparate test reports, following table lists the report numbers.

Radio Protocol	Report Number
RF test report for Wi-Fi (2.4GHz)	ULR-TC568821300000109F
RF test report for Wi-Fi (5GHz)	ULR-TC568821300000110F
RF test report for FCC Part 22	ULR-TC568821300000111F
RF test report for FCC Part 24	ULR-TC568821300000112F
RF test report for FCC Part 27-(This report)	ULR-TC568821300000113F
RF test report for FCC Part 90	ULR-TC568821300000114F

5 Operational Description of the product

ZOLL Mobile Hotspot design based on Microchip's ATSAMA5D27C processor. The ZOLL Mobile Hotspot device features a 256 MB of DDR3L RAM and 512 MB of NAND Flash to store the data files and configurations.
The ATSAMA5D27C CPU is powered using the Open WRT Linux distribution. The " EC25-AF/EC25-AF(D) CAT 4 LTE Module" will be connected to ATSAMA5D27C CPU over the USB 2.0 interface to support the cellular connectivity. The EC25-AF/EC25-AF(D) is Cat4 LTE module supporting AT&T, T-Mobile, Verizon and First Net networks. It supports all major US bands. The EC25-AF/EC25-AF(D) module has 2 Antenna connections including external diversity antenna. Here internal antenna is chip antenna and a u.FL connector is on board for an External diversity Antenna. The LTE module also supports GPS and it is optional in current design. ZOLL Mobile Hotspot have dual SIM supports.The system also have Wi-Fi module AP6256 which is interfaced with the processor using SDIO 3.0 interface. Wi-Fi will be used to connect portable Defibrillator and ventilator devices to cloud. It supports 2.4GHz and 5GHz bands.The modem device is battery operated, and the main processor ATSAMA5D27C will be connected to the fuel gauge to monitor the battery status and power consumption of the entire system. The power management section is also responsible for moderating the power drawn from the defibrillator device and comply with the requirement (that the power consumption over USB must not exceed 0.5A at the peak time). Additionally, the power management section is also responsible for generating the necessary input power for several sections of the modem device. The BQ25896 is a Battery Charger with Boost converter to provide constant power to the system with the efficiency greater than 80%. The 4.2V from TPS61022 is given to PMIC which generates 3.3V, 1.25V, 1.8V, 2.5V and 1.35V for Processor, NAND Flash and Wi-Fi module, Core voltage of processor, Fuse voltage and DDR3L power supply.

6 Block Diagram of the product



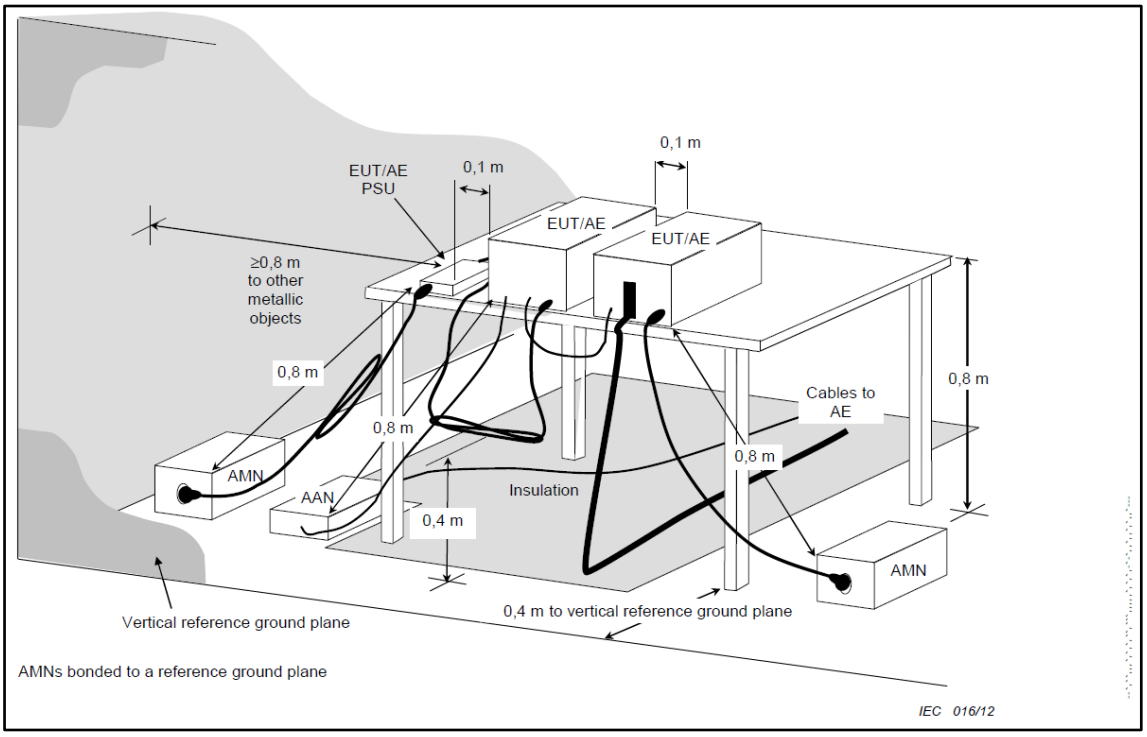
7 TEST METHODOLOGY

7.1 Conducted Spurious Emission Test on AC Power Line

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the referance ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both method are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

7.1.1 Test Setup Configuration



7.2 Radiated Emission Test

Frequency Range 9 kHz - 30 MHz

Test performed as per ANSI C63.4-2014 section 8.3

The loop Antenna was placed at 1m above the ground plane & EUT is 3 meters far from the measuring antenna. With 3m measurement distance, correction data were applied to the measured results. The test arrangement, measuring antenna guidelines and operational configurations in 8.2.1 and 8.2.2, shall be followed. The measurement antenna shall be positioned with its plane perpendicular to the ground at the Specified distance, when perpendicular to the ground plane, the lowest height of the magnetic antenna shall be 1 m above the ground and shall be positioned at the specified distance from the EUT. EUT & its associates are placed on non-conducting table of 0.8m height which is placed on the turn table, For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable. The report shall list worst case emission results, for each of the parallel & perpendicular orientations.

7.2.1 Test Setup Configuration

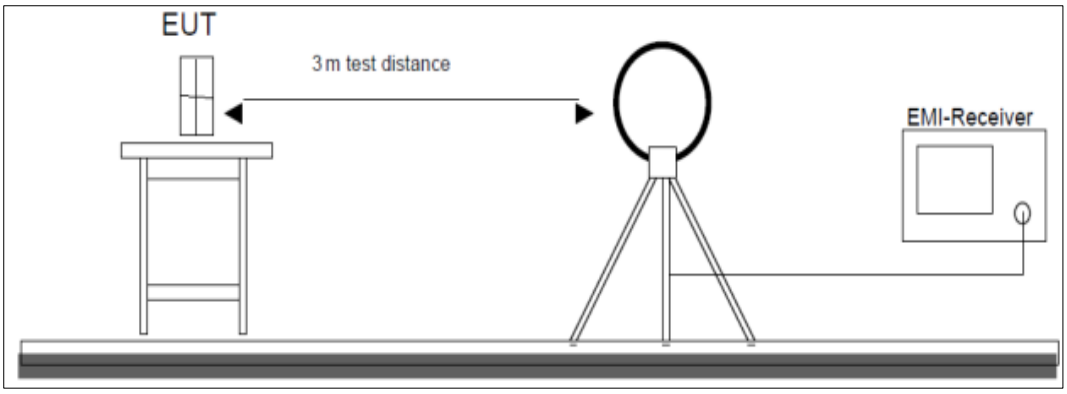


Figure 1: Frequency Range 9 kHz- 30 MHz

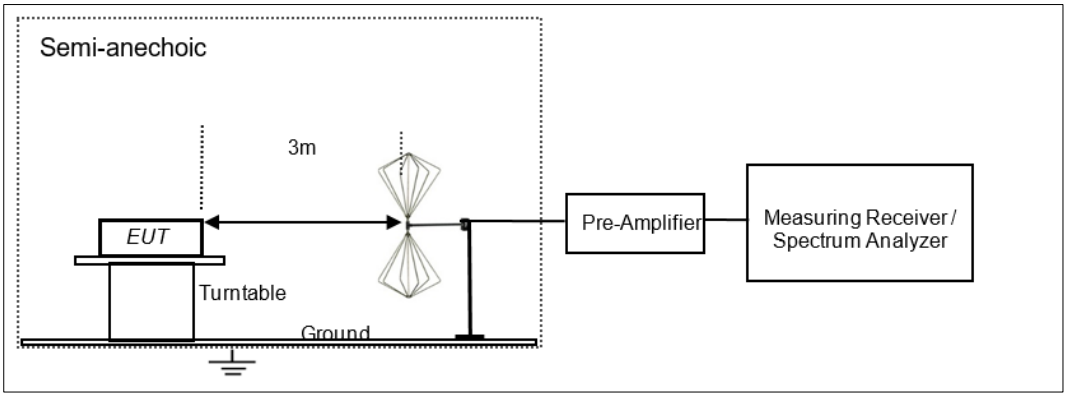


Figure 2: Frequency Range 30 MHz – 200 MHz

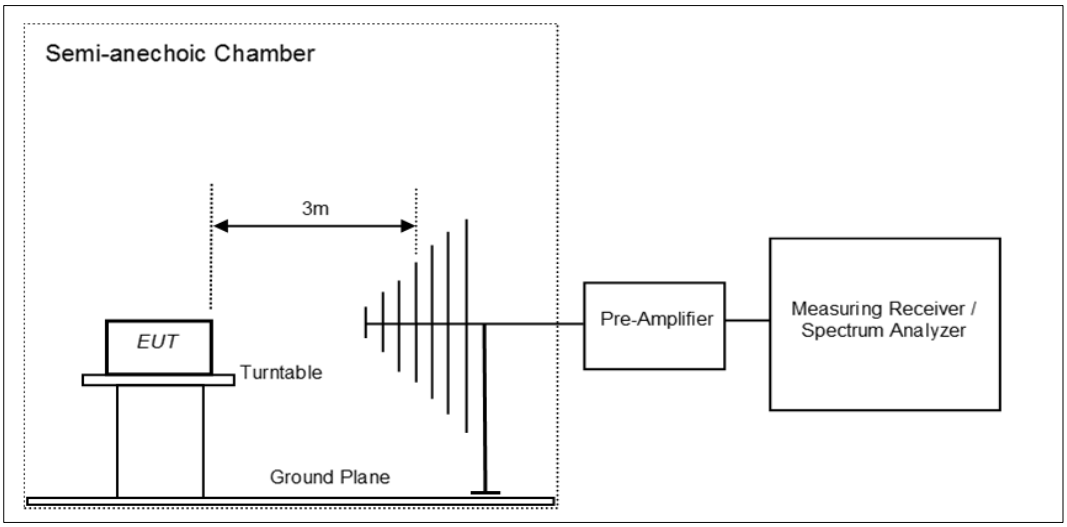


Figure 3: Frequency Range 200 MHz - 1GHz

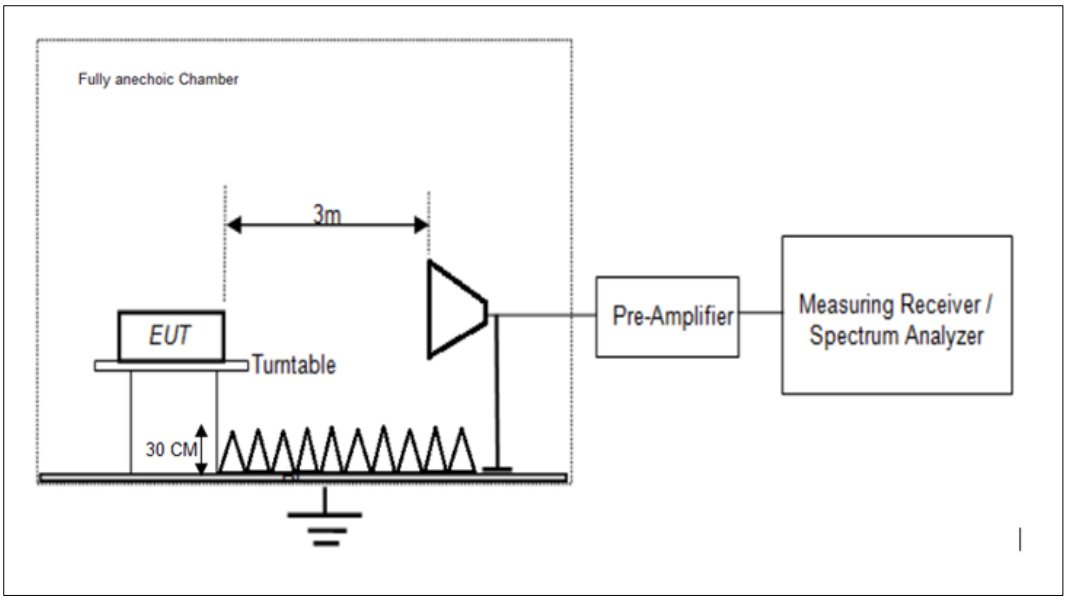


Figure 4: Frequency Range above 1 GHz

Frequency Range 30MHz to 10th harmonics of the highest fundamental frequency

Test performed as per ANSI C63.26-2015

Radiated spurious emission test are performed as below.

All the radiated emission measurements are performed in accordance with common requirement specified in 5.5.2 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method (as defined in Annex B of ANSI C63.26-2015).

The equipment under test is placed on non-conductive table at 3m away from the receive antenna in accordance with above mentioned standard. Turn table is rotated through 360 degree, and receiver antenna height is varied in order to determine the level of maximum emission. The maximum emission level and position of the maximized emission is recorded with use of spectrum analyzer.

Using pre-test site path loss to determine EUT emission power:

1) EUT emission powers are calculated using the following equation:

Emission Power = EUT_{Prec} [dBm EIRP/ ERP] + P_L [dB]

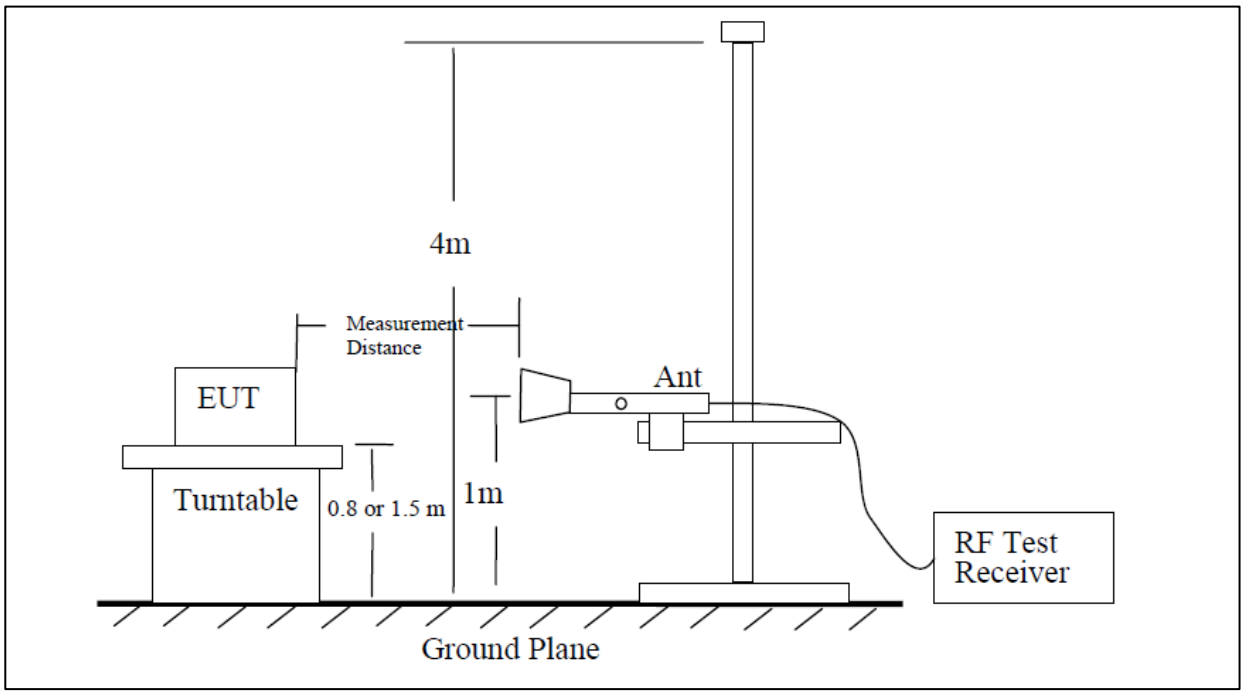
where

EUT_{Prec} = power of the emission measured at the test receiver during EUT measurements.

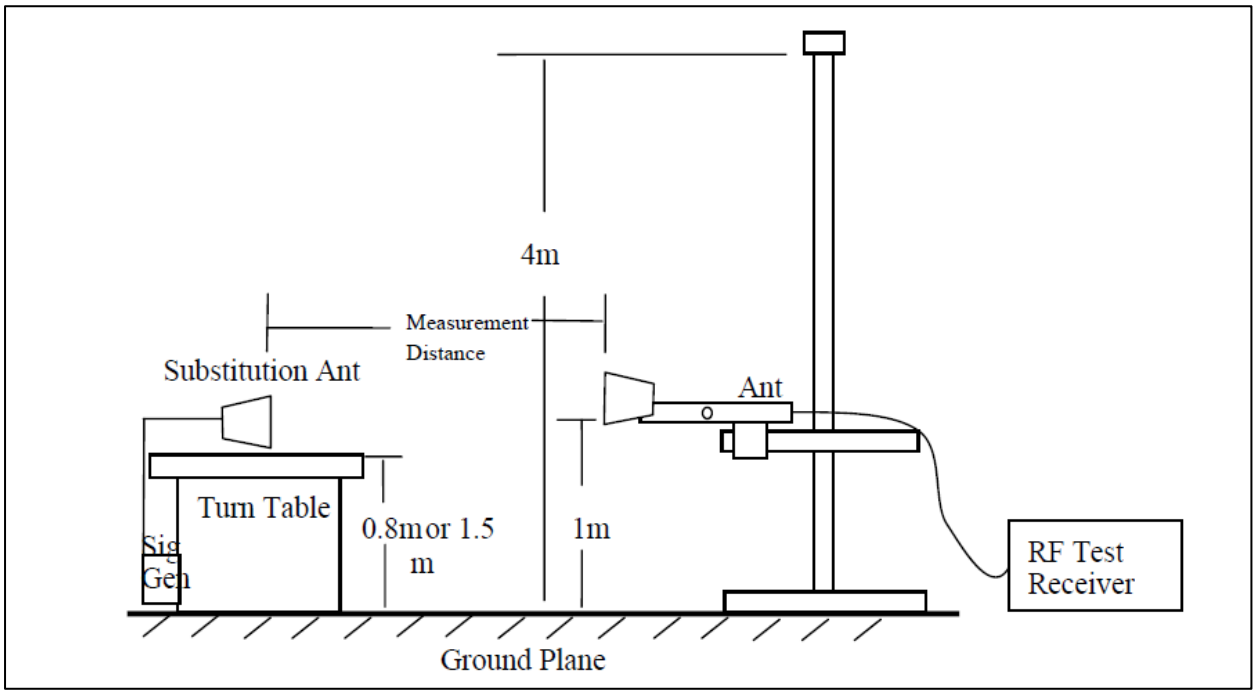
PL = path loss determined on the frequency of the EUT emission or calculated using linear interpolation between site characterization frequencies.

2) This is the level to be compared against the regulatory limit as it is the emission power referenced back to the EUT on the test site.

Test site-up for radiated measurements



Substitution method set-up for radiated emission



8 TEST RESULTS

8.1 Field Strength of Spurious Radiation

Result ***Pass***

Specification	FCC Part §2.1053 & §27.53 (h) (g) (f) RSS 130 Issue 2, Section 4.7.1 RSS 139 Issue 3, Section 6.6
Test Method / Procedure	As per subclause 5.5 of ANSI C63.26-2015 As per subclause 7 in 971168 D01 Power Meas License Digital Systems v03r01
Measurement Bandwidth (RBW)	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector Function	Peak
Measuring Distance	3 m
Requirement	The power of any emission outside the authorized frequency range must be attenuated below the transmitting power (P) by a factor of atleast 43+10log(P) dB
Test setup	Reffer TEST METHODOLOGY

Environmental conditions:

Temperature (Norm) = + 24 °C Voltage = Internal Battery + 5.0 V DC Relative humidity = 62 %

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Spurious emission limit is derived using the following equation: 43 + 10*log(P) = 43 + 10*log(P) = -13
   P is average power in W

Test results:

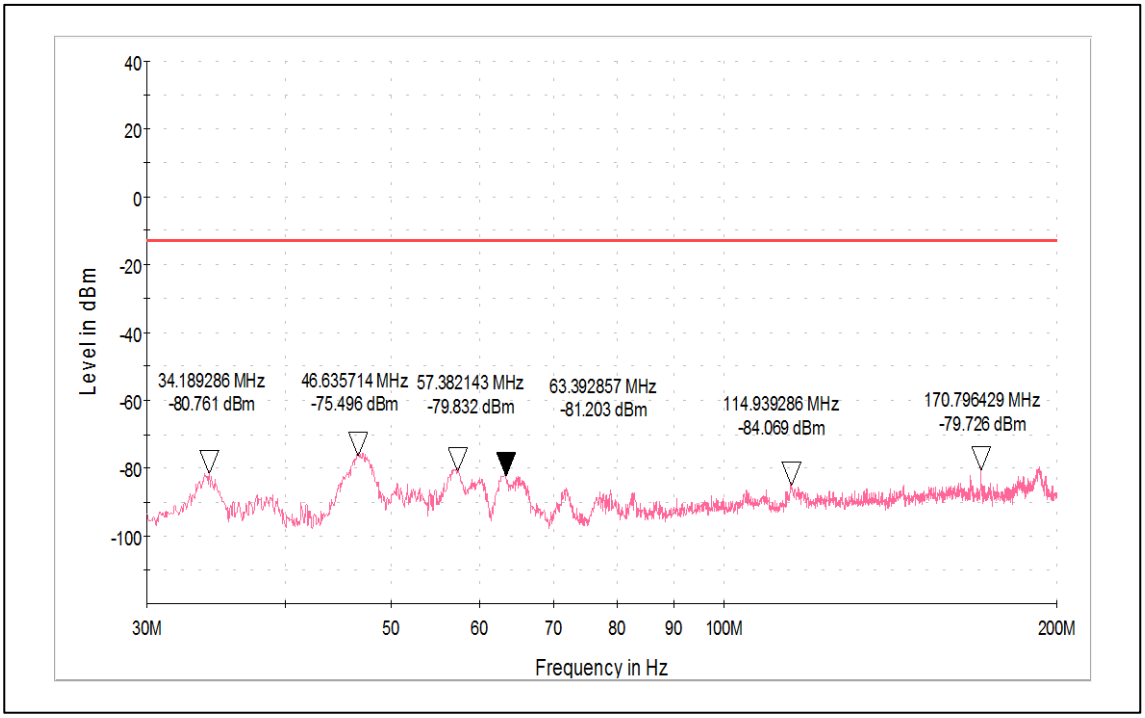
Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, henve not reported

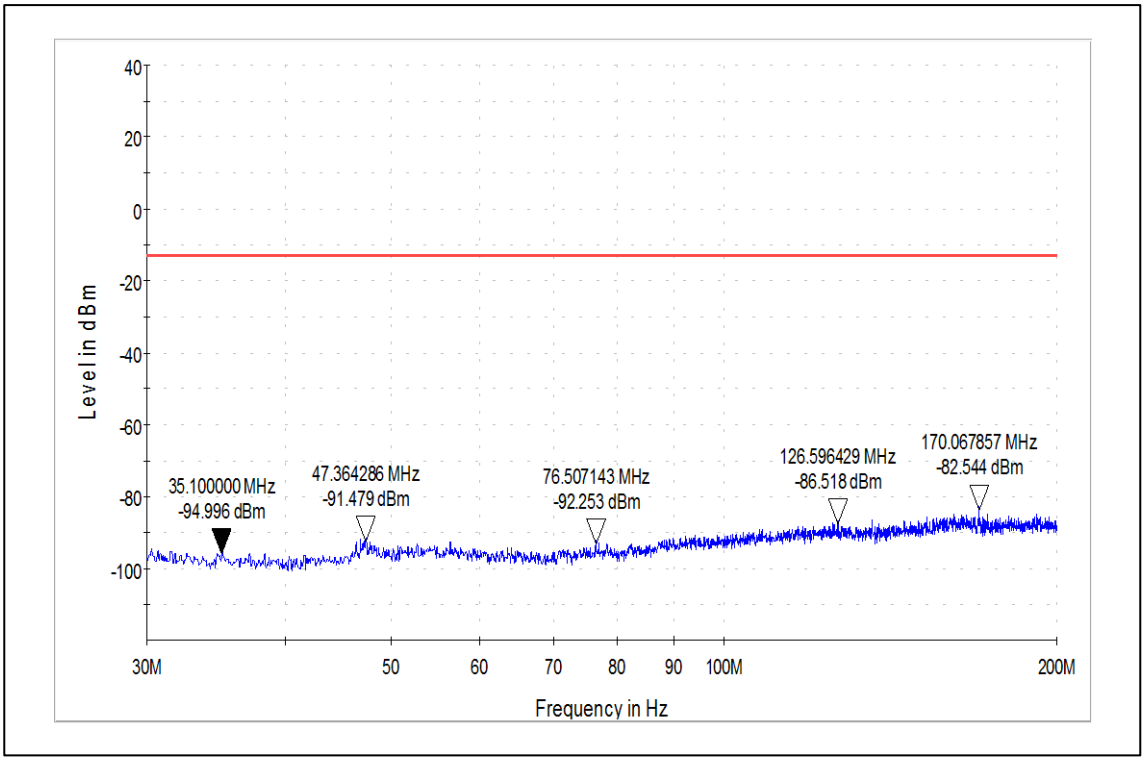
Test results for frequency range 30MHz – 200MHz

Antenna polarization	Measured Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)
Vertical	34.18	-80.76	-13	-67.76
	57.38	-79.83	-13	-66.83
	114.93	-84.06	-13	-71.06
	170.79	-79.72	-13	-66.72
Horizontal	35.10	-94.99	-13	-81.99
	76.50	-92.25	-13	-79.25
	126.59	-86.51	-13	-73.51
	170.06	-82.54	-13	-69.54

Plots for frenquency range 30MHz to 200MHz



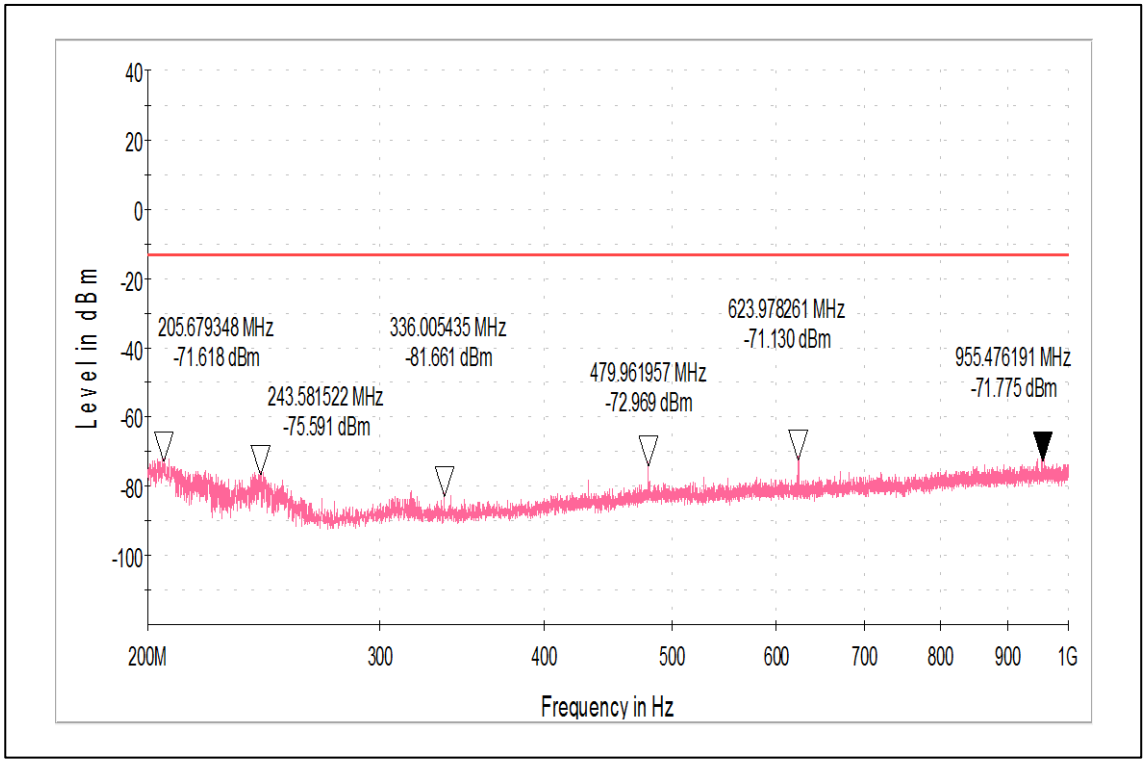
Frequency Range: 30MHz-200MHz **Polarization:Vertical**



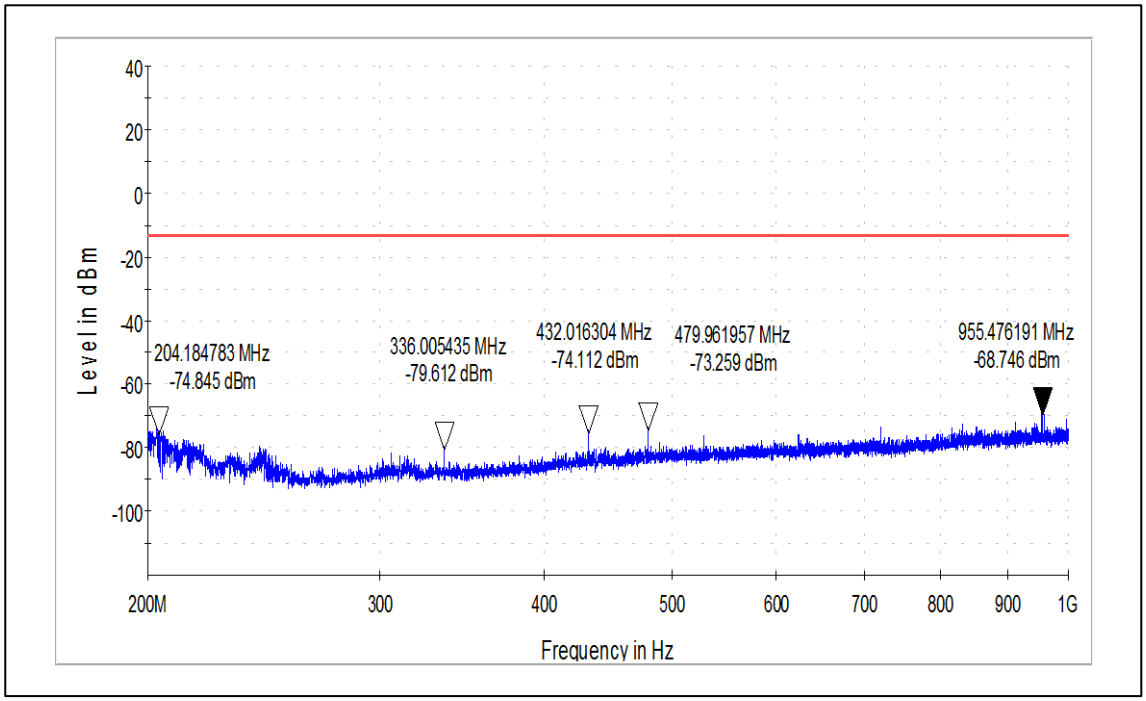
Frequency Range: 30MHz-200MHz **Polarization:Horizontal**

Test results for frequency range 200MHz – 1GHz

Antenna polarization	Measured Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)
Vertical	205.67	-71.61	-13	-58.61
	336.00	-81.66	-13	-68.66
	479.96	-72.96	-13	-59.96
	623.97	-71.13	-13	-58.13
Horizontal	204.18	-74.84	-13	-61.84
	336.00	-79.61	-13	-66.61
	432.01	-74.11	-13	-61.11
	955.47	-68.74	-13	-55.74



Frequency Range: 200MHz-1GHz **Polarization:Vertical**



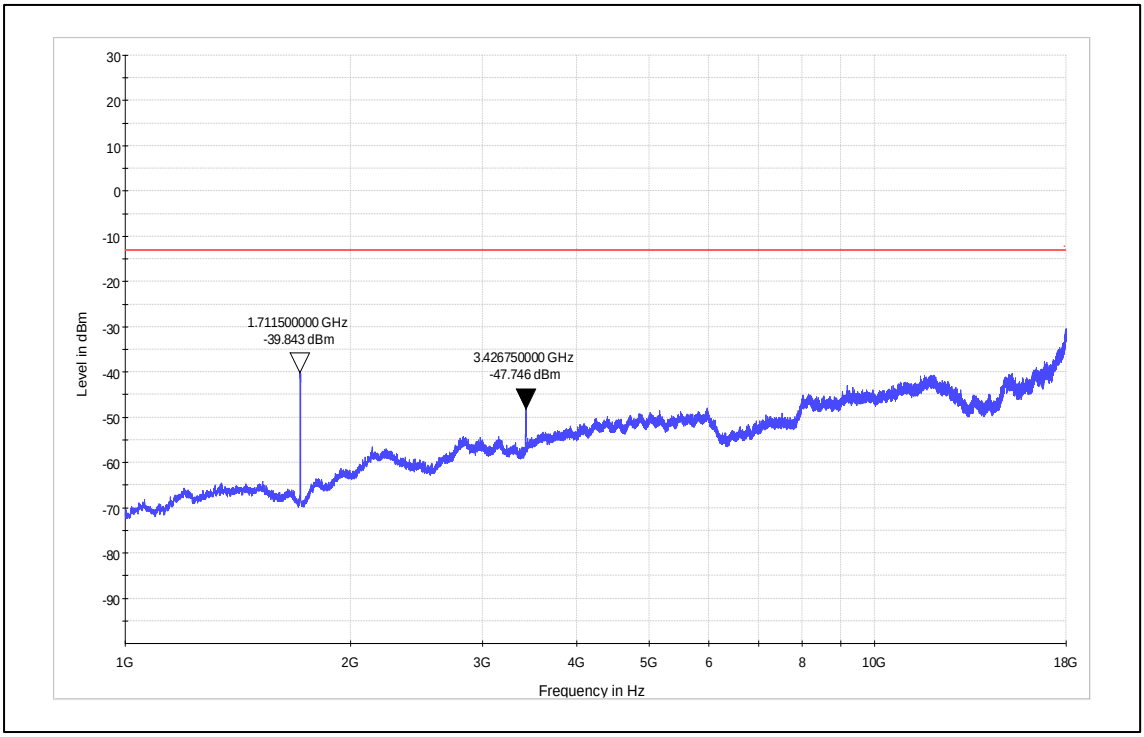
Frequency Range: 200MHz-1GHz **Polarization:Horizontal**

Above 1GHz Test results:

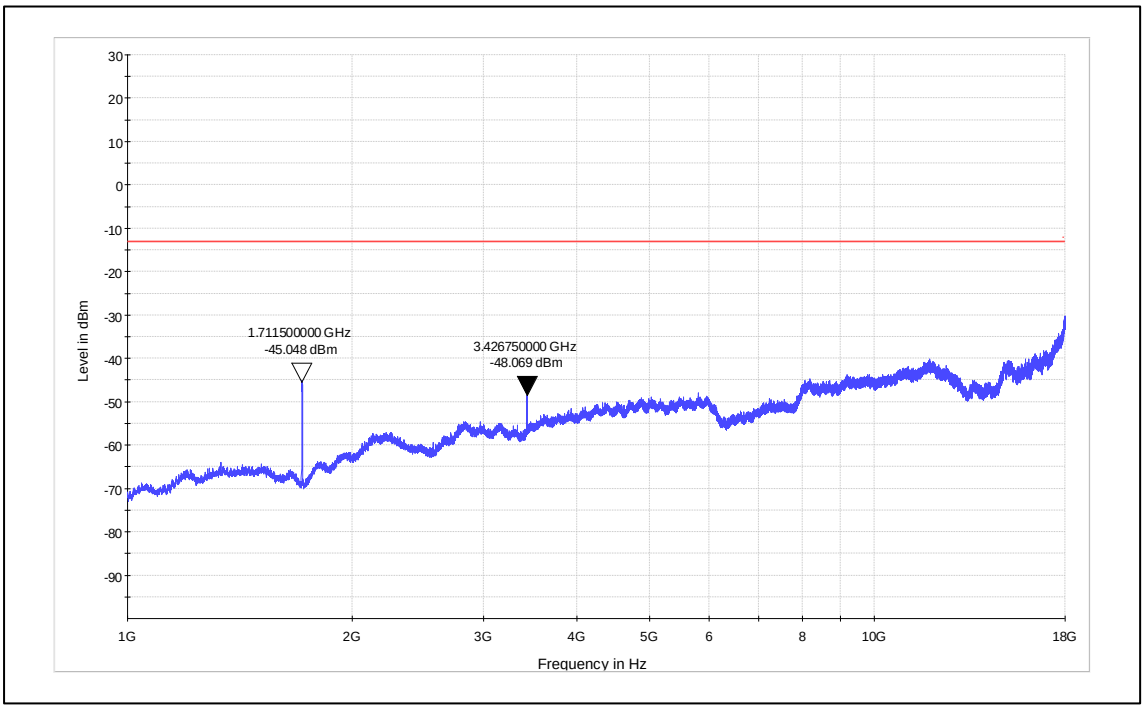
WCDMA Band 4:

MODE	Channel Frequency (MHz)	Measured Frequency (MHz	Antenna Polarization	ERP Level (dBm)	Limit	Margin
RMC	1712.4	3424.8	Vertical	-47.74	-13	-34.74
		5137.2		-50.35	-13	-37.35
		6849.6		-54.24	-13	-41.24
		3424.8	Horizontal	-48.06	-13	-35.06
		5137.2		-51.38	-13	-38.38
		6849.6		-54.61	-13	-41.61
	1732.6	3465.2	Vertical	-45.60	-13	-32.60
		5197.8		-51.50	-13	-38.50
		6930.4		-52.87	-13	-39.87
		3465.2	Horizontal	-44.58	-13	-31.58
		5197.8		-51.30	-13	-38.30
		6930.4		-52.54	-13	-39.54
	1752.6	3505.2	Vertical	-49.04	-13	-36.04
		5257.8		-51.63	-13	-38.63
		7010.4		-53.14	-13	-40.14
		3505.2	Horizontal	-51.02	-13	-38.02
		5257.8		-51.77	-13	-38.77
		7010.4		-53.54	-13	-40.54

Worst case Plots:
WCDMA Band 4:
Channel frequency: 1712.4MHz



Frequency Range: 1GHz-18GHz **Polarization: Vertical**



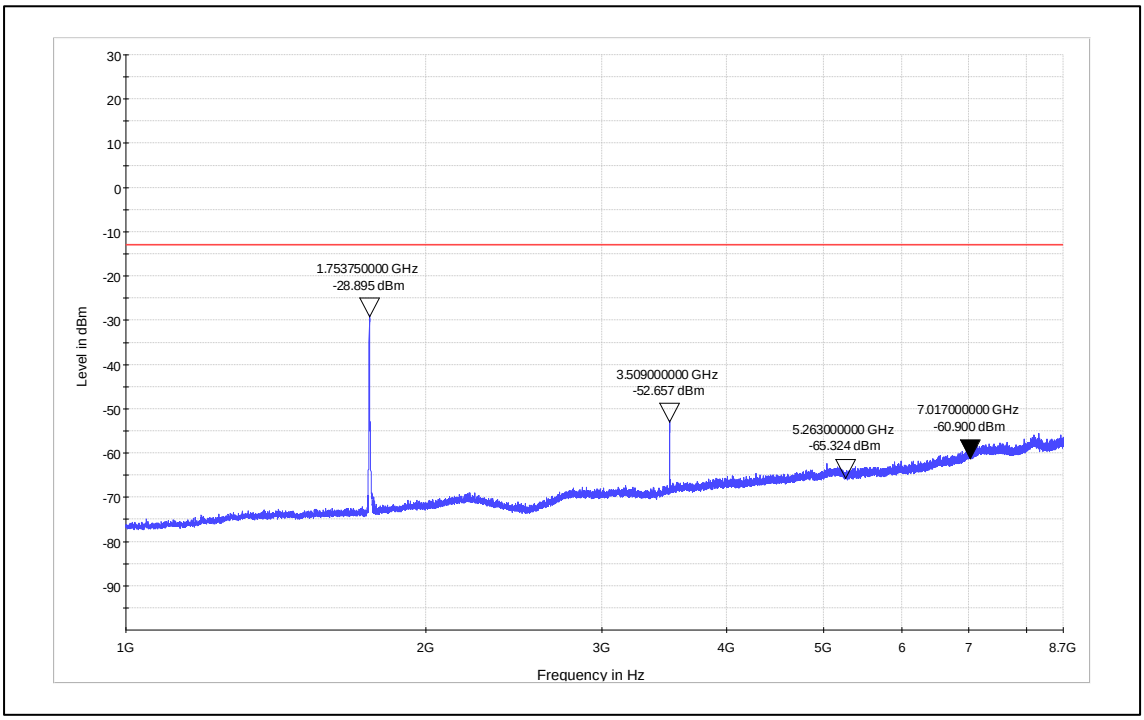
Frequency Range: 1GHz-18GHz **Polarization:Horizontal**

LTE Band 4:

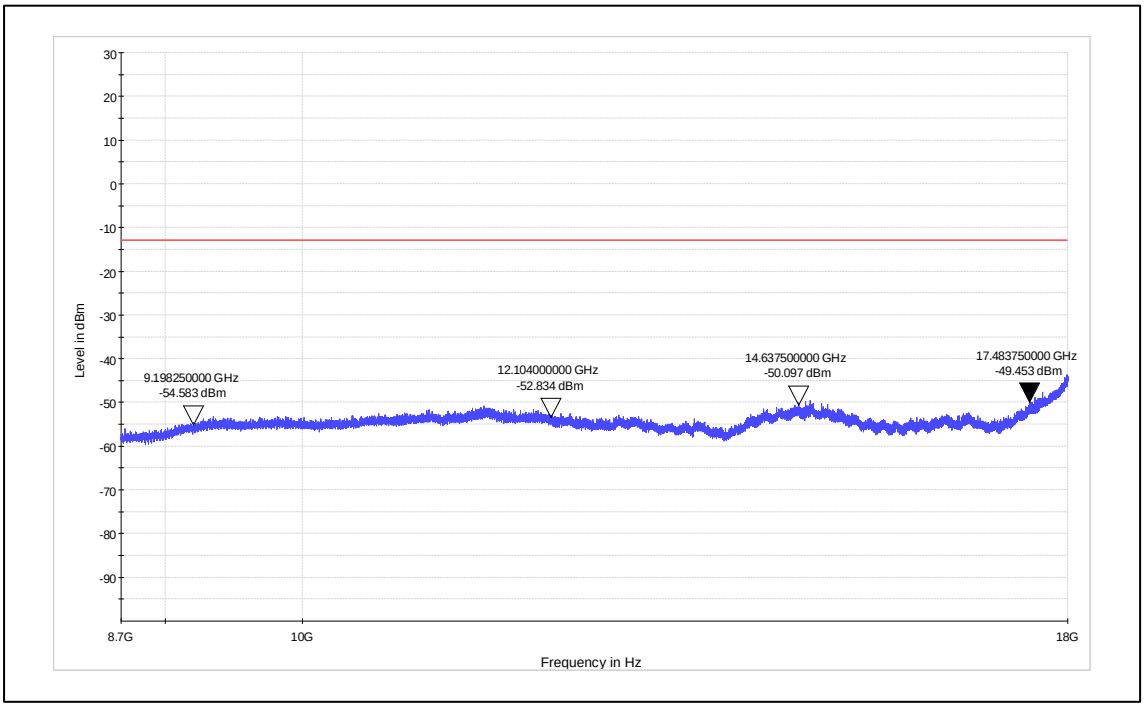
Modulation	Channel Bandwidth (MHz)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	ERP Level (dBm	Limit (dBm)	Margin (dB)
QPSK	1.4	1710.7	3421.4	Vertical	-63.59	-13	-50.59
			5132.1		-64.64	-13	-51.64
			6842.8		-61.52	-13	-48.52
			8553.5		No Harmonic Found		
			3421.4	Horizontal	-62.95	-13	-49.95
			5132.1		-64.73	-13	-51.73
			6842.8		-62.06	-13	-49.06
			8553.5		No Harmonic Found		
		1732.5	3465.0	Vertical	-60.30	-13	-47.30
			5197.5		-64.12	-13	-51.12
			6930.0		-61.19	-13	-48.19
			8662.5		No Harmonic Found		
			3465.0	Horizontal	-57.29	-13	-44.29
			5197.5		-63.47	-13	-50.47
			6930.0		-61.22	-13	-48.22
			8662.5		No Harmonic Found		
		1754.2	3508.4	Vertical	-52.65	-13	-39.65
			5262.6		-65.32	-13	-52.32
			7016.8		-60.90	-13	-47.90
			8771.0		No Harmonic Found		
			3508.4	Horizontal	-48.55	-13	-35.55
			5262.6		-65.10	-13	-52.10
			7016.8		-60.58	-13	-47.58
			8771.0		No Harmonic Found		

Worst case Plots:

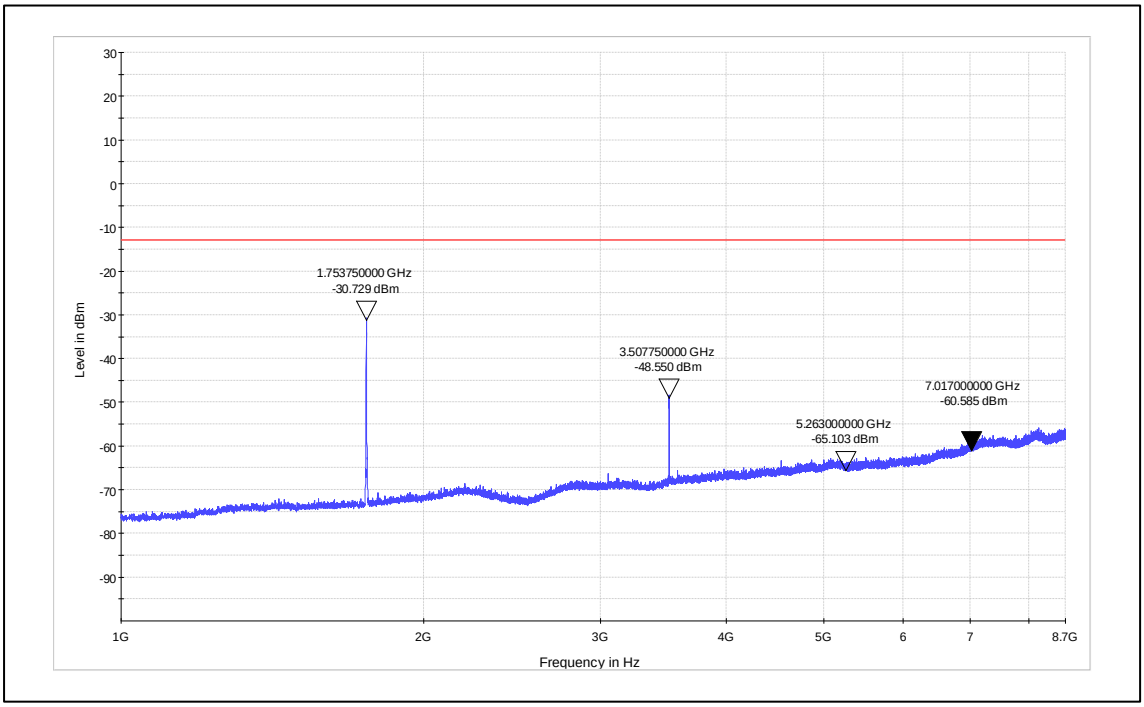
LTE Band 4:
Channel frequency: 1754.2MHz



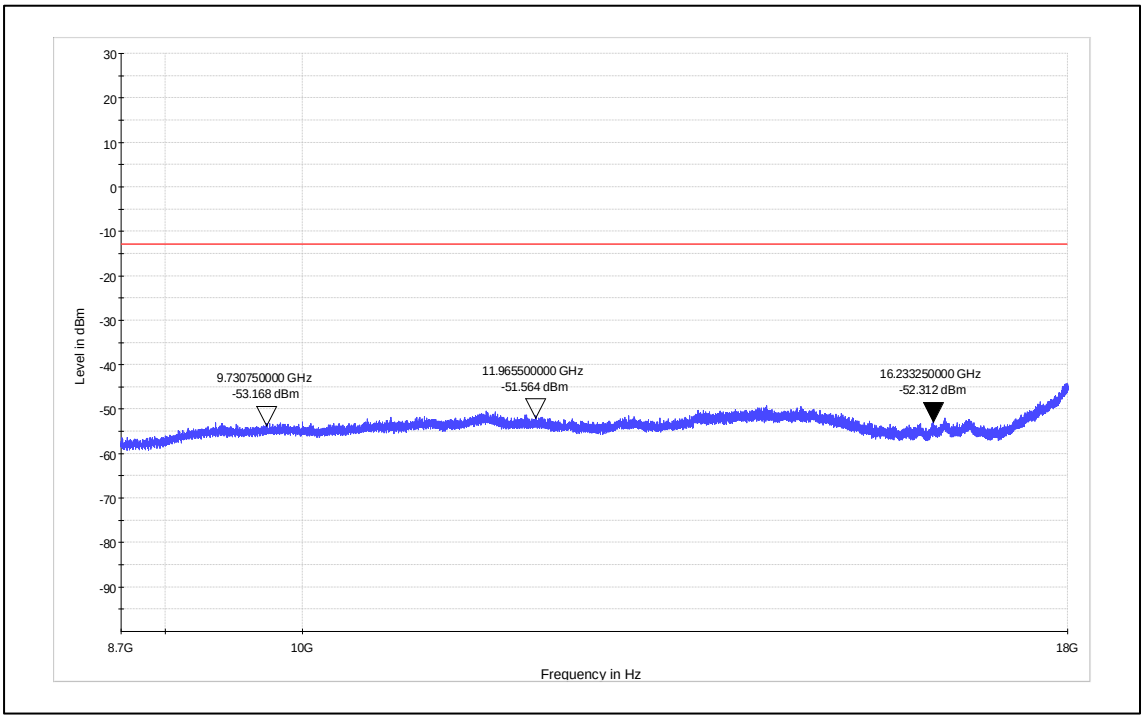
Frequency Range: 1GHz-8.7GHz **Polarization: Vertical**



Frequency Range: 8.7GHz-18GHz **Polarization: Vertical**



Frequency Range: 1GHz-8.7GHz **Polarization:Horizontal**



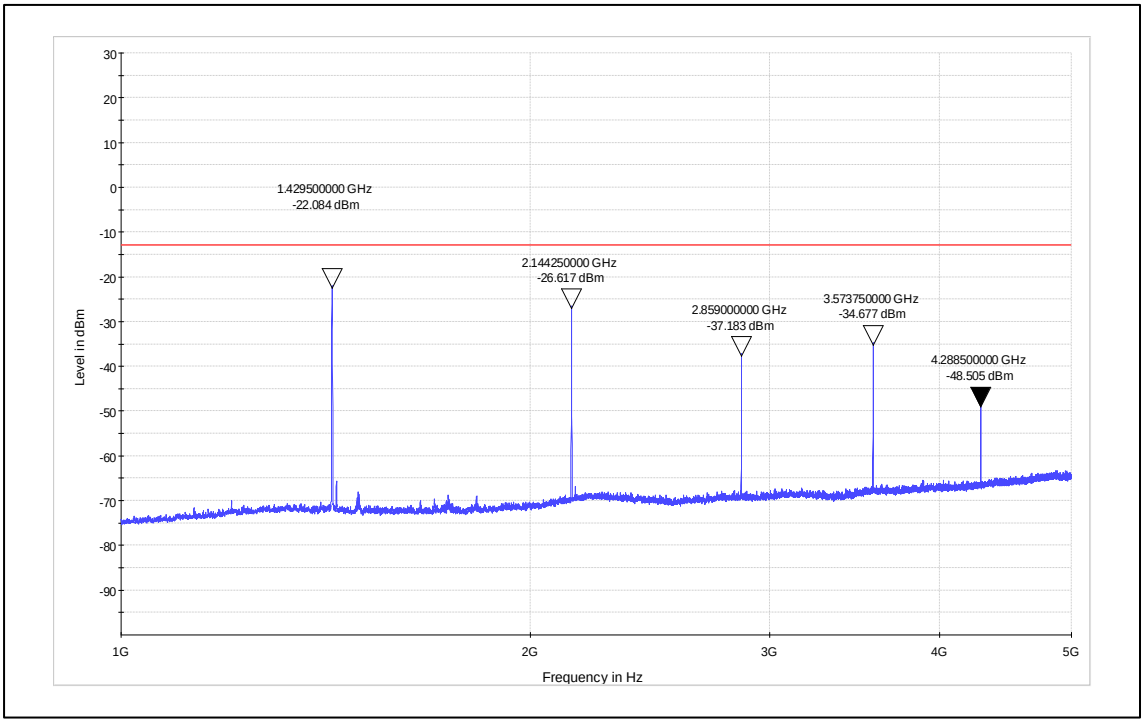
Frequency Range: 8.7GHz-18GHz **Polarization:Horizontal**

LTE Band 12:

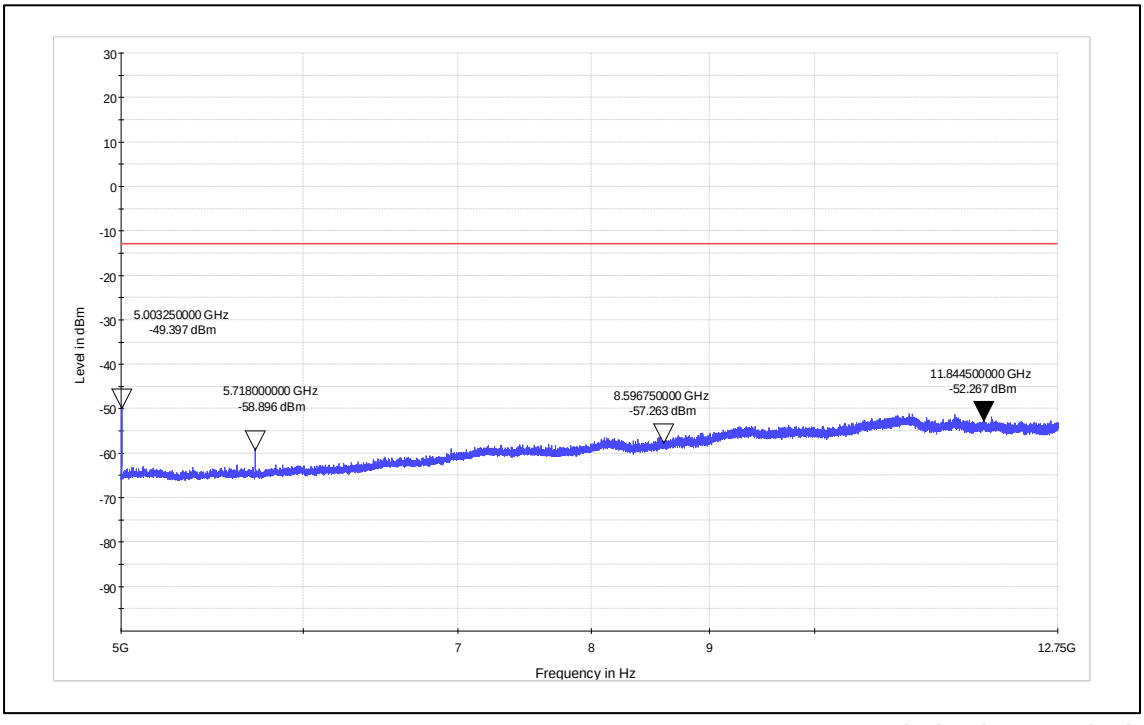
Modulation	Channel Bandwidth (MHz)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	ERP Level (dBm	Limit (dBm)	Margin (dB)
QPSK	1.4	669.7	1399.4	Vertical	-22.38	-13	-9.38
			2099.1		-30.83	-13	-17.83
			2798.8		-38.98	-13	-25.98
			3498.5		-38.80	-13	-25.80
			4198.2		-52.67	-13	-39.67
			4897.9		-53.15	-13	-40.15
			5597.6		-60.55	-13	-47.55
			1399.4	Horizontal	-19.45	-13	-6.45
			2099.1		-29.85	-13	-16.85
			2798.8		-35.09	-13	-22.09
			3498.5		-32.27	-13	-19.27
			4198.2		-52.27	-13	-39.27
			4897.9		-54.03	-13	-41.03
			5597.6		-64.73	-13	-51.73
		707.5	1415.0	Vertical	-22.07	-13	-9.07
			2122.5		-28.48	-13	-15.48
			2830.0		-38.77	-13	-25.77
			3537.5		-35.94	-13	-22.94
			4245.0		-52.70	-13	-39.70
			4952.5		-50.52	-13	-37.52
			5660.0		-59.41	-13	-46.41
			1415.0	Horizontal	-19.15	-13	-6.15
			2122.5		-28.05	-13	-15.05
			2830.0		-35.45	-13	-22.45
			3537.5		-32.01	-13	-19.01
			4245.0		-51.22	-13	-38.22
			4952.5		-49.53	-13	-36.53
			5660.0		-61.62	-13	-48.62
		715.2	1430.4	Vertical	-22.08	-13	-9.08
			2145.6		-26.61	-13	-13.61
			2860.8		-37.18	-13	-24.18
			3576.0		-34.67	-13	-21.67
			4291.2		-48.50	-13	-35.50
			5006.4		-49.39	-13	-36.39
			5721.6		-58.89	-13	-45.89
			1430.4	Horizontal	-19.47	-13	-6.47
			2145.6		-26.46	-13	-13.46
			2860.8		-36.24	-13	-23.24
			3576.0		-30.9	-13	-17.90
			4291.2		-50.85	-13	-37.85
			5006.4		-48.97	-13	-35.97
			5721.6		-61.28	-13	-48.28

Worst case Plots:

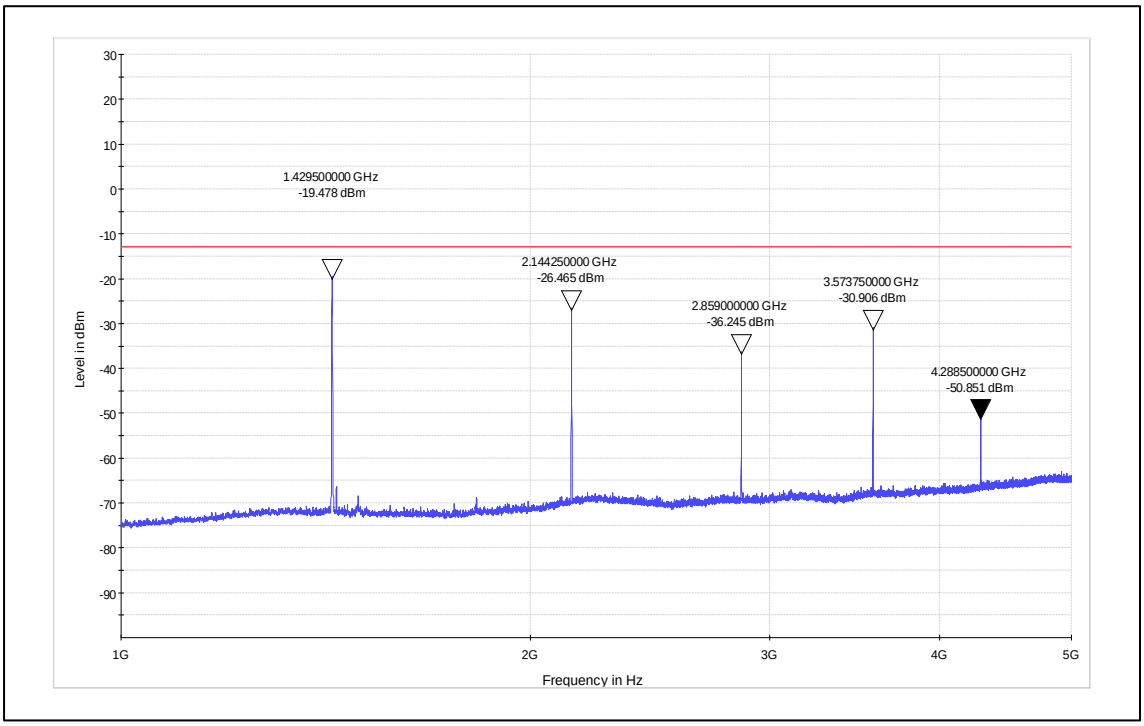
LTE Band 12:
Channel frequency: 715.2MHz



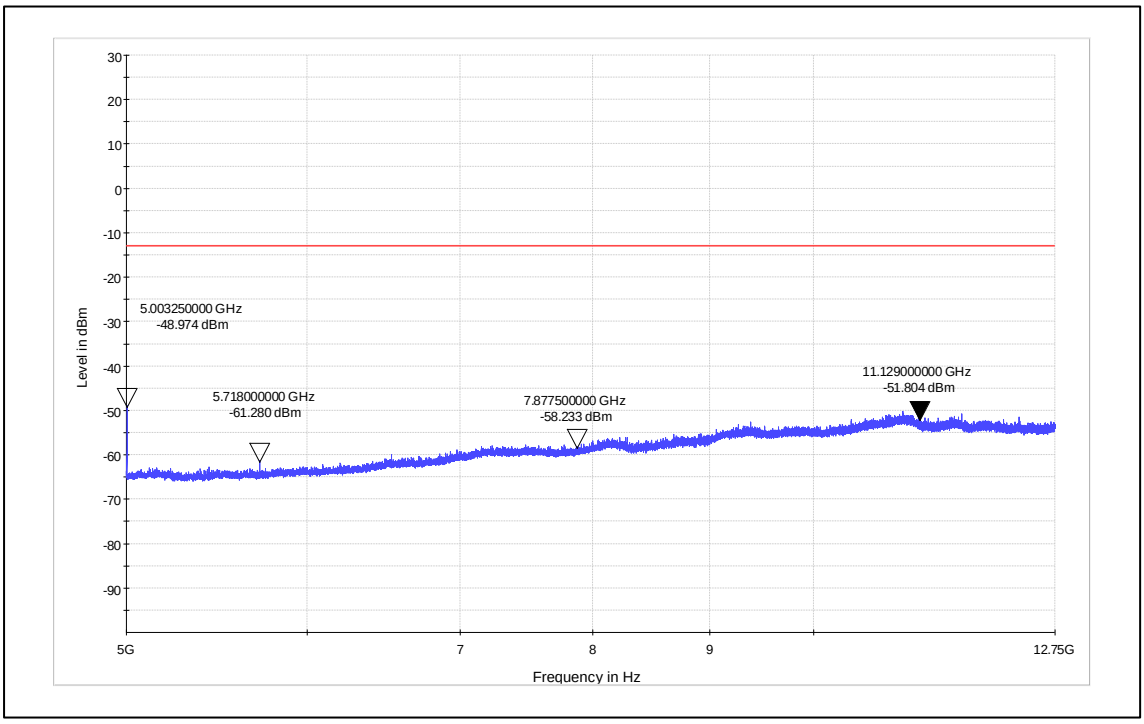
Frequency Range: 1GHz-5GHz **Polarization: Vertical**



Frequency Range: 5GHz-12.75GHz **Polarization: Vertical**



Frequency Range: 1GHz-5GHz **Polarization:Horizontal**



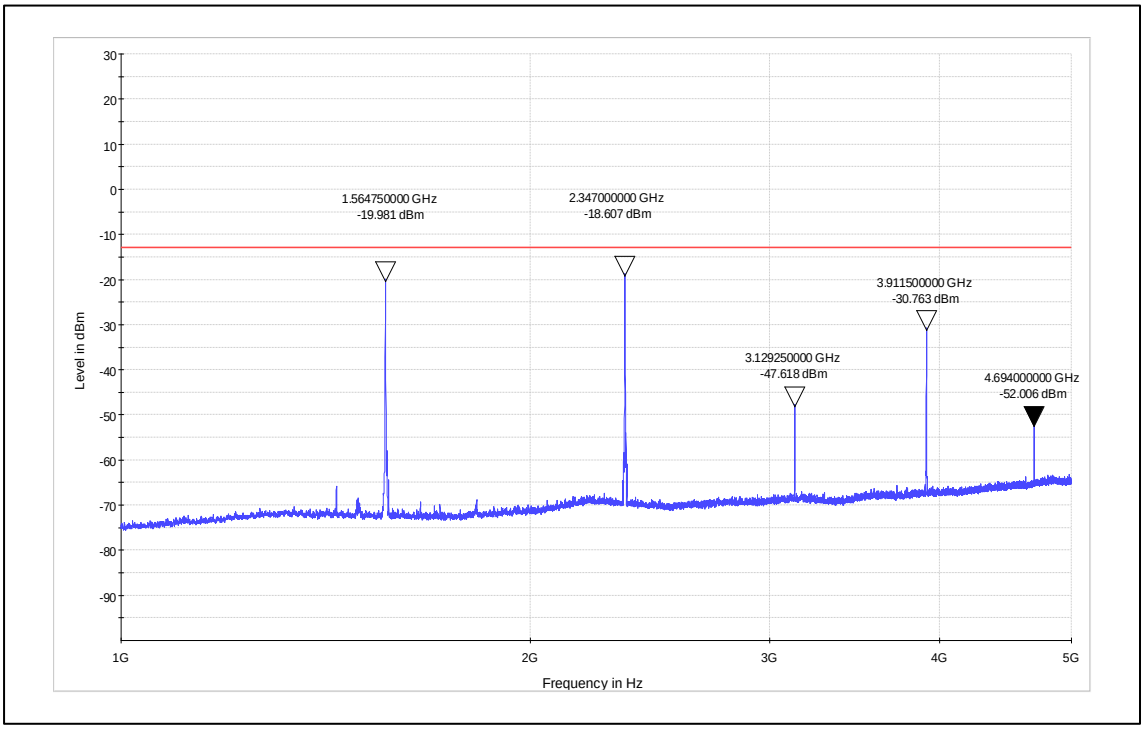
Frequency Range: 5GHz-12.75GHz **Polarization:Horizontal**

LTE Band 13:

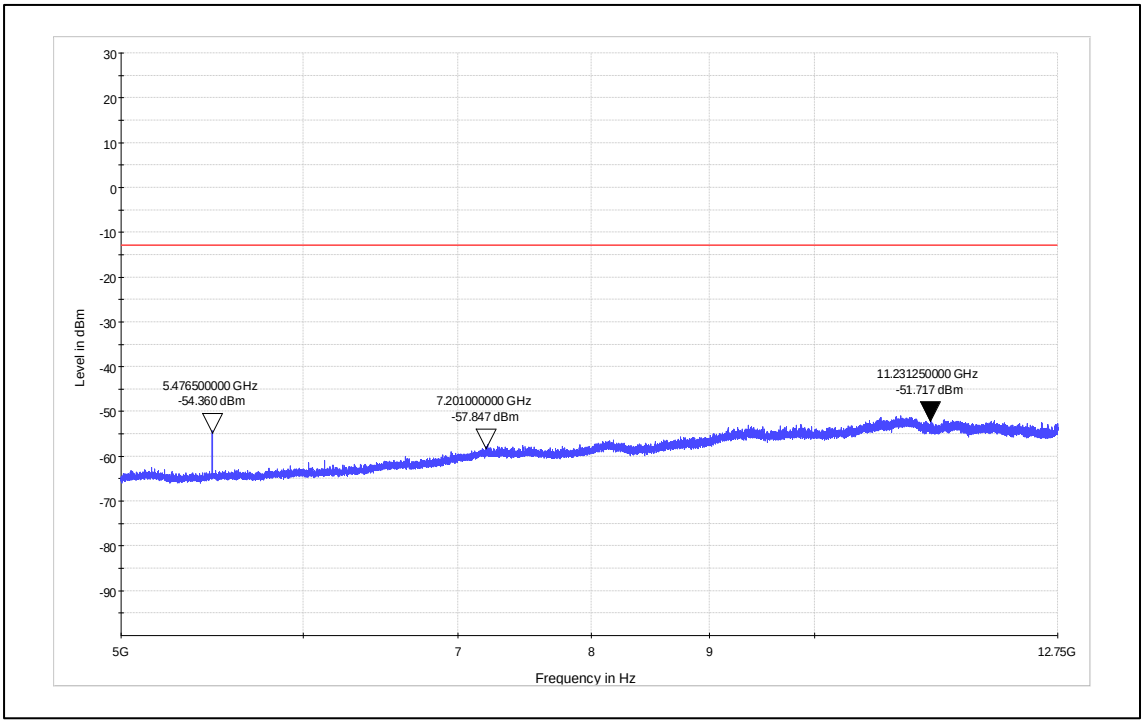
Modulation	Channel Bandwidth (MHz)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	ERP Level (dBm	Limit (dBm)	Margin (dB)
QPSK	5	779.5	1559.0	Vertical	-19.74	-13	-6.74
			2338.5		-18.63	-13	-5.63
			3118.0		-47.74	-13	-34.74
			3897.5		-29.37	-13	-16.37
			4677.0		-51.79	-13	-38.79
			5456.5		-55.12	-13	-42.12
			1559.0	Horizontal	-16.51	-13	-3.51
			2338.5		-19.21	-13	-6.21
			3118.0		-41.20	-13	-28.2
			3897.5		-31.29	-13	-18.29
			4677.0		-51.57	-13	-38.57
			5456.5		-59.27	-13	-46.27
		782	1564.0	Vertical	-19.64	-13	-6.64
			2346.0		-18.27	-13	-5.27
			3128.0		-46.02	-13	-33.02
			3910.0		-30.09	-13	-17.09
			4692.0		-51.92	-13	-38.92
			5474.0		-55.10	-13	-42.10
			1564.0	Horizontal	-15.99	-13	-2.99
			2346.0		-18.85	-13	-5.85
			3128.0		-41.05	-13	-28.05
			3910.0		-32.24	-13	-19.24
			4692.0		-52.14	-13	-39.14
			5474.0		-58.31	-13	-45.31
		784.5	1569.0	Vertical	-19.98	-13	-6.98
			2353.5		-18.60	-13	-5.60
			3138.0		-47.61	-13	-34.61
			3922.5		-30.76	-13	-17.76
			4707.0		-52.00	-13	-39.00
			5491.5		-54.36	-13	-41.36
			1569.0	Horizontal	-15.43	-13	-2.43
			2353.5		-18.55	-13	-5.55
			3138.0		-41.34	-13	-28.34
			3922.5		-33.46	-13	-20.46
			4707.0		-52.14	-13	-39.14
			5491.5		-59.02	-13	-46.02

Worst case Plots:

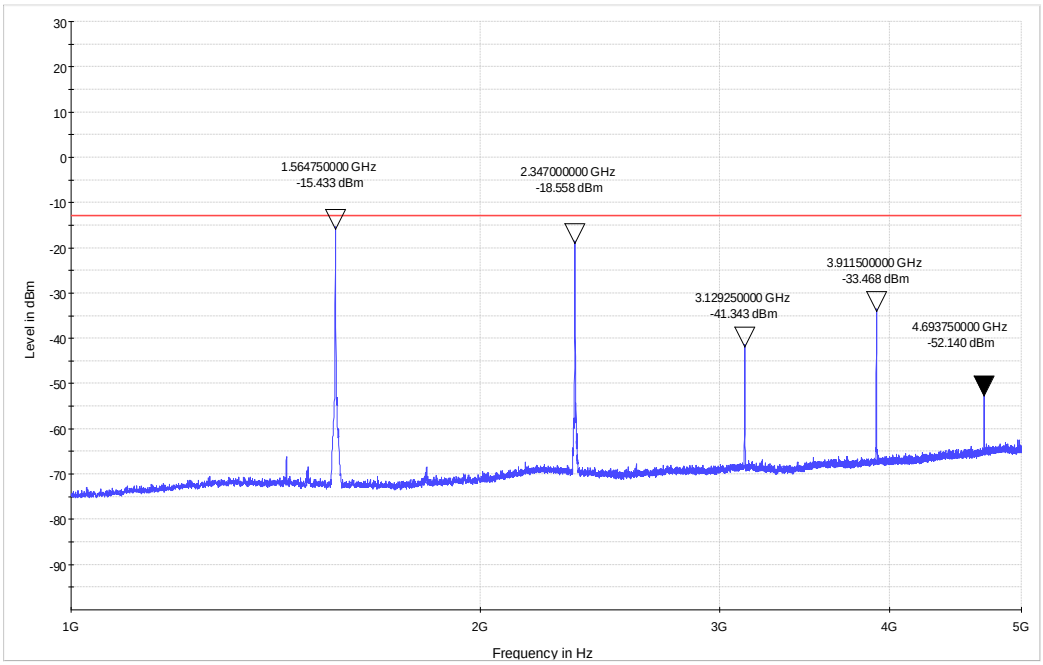
LTE Band 13:
Channel frequency: 784.5MHz



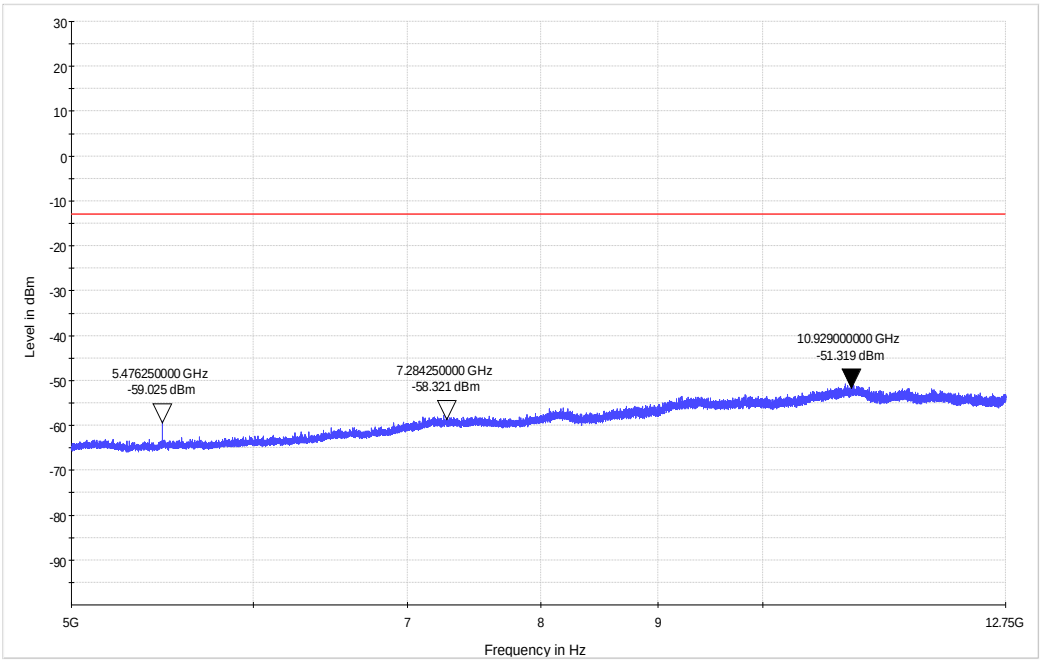
Frequency Range: 1GHz-5GHz **Polarization: Vertical**



Frequency Range: 5GHz-12.75GHz **Polarization: Vertical**



Frequency Range: 1GHz-5GHz **Polarization:Horizontal**



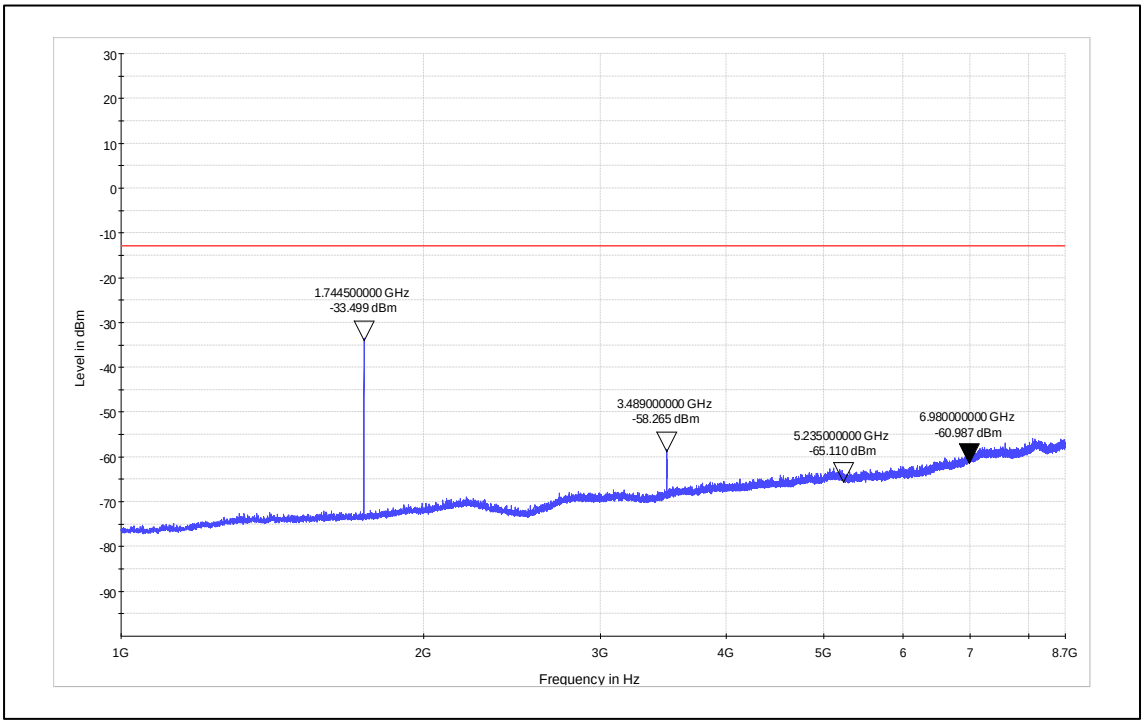
Frequency Range: 5GHz-12.75GHz **Polarization:Horizontal**

LTE Band 66:

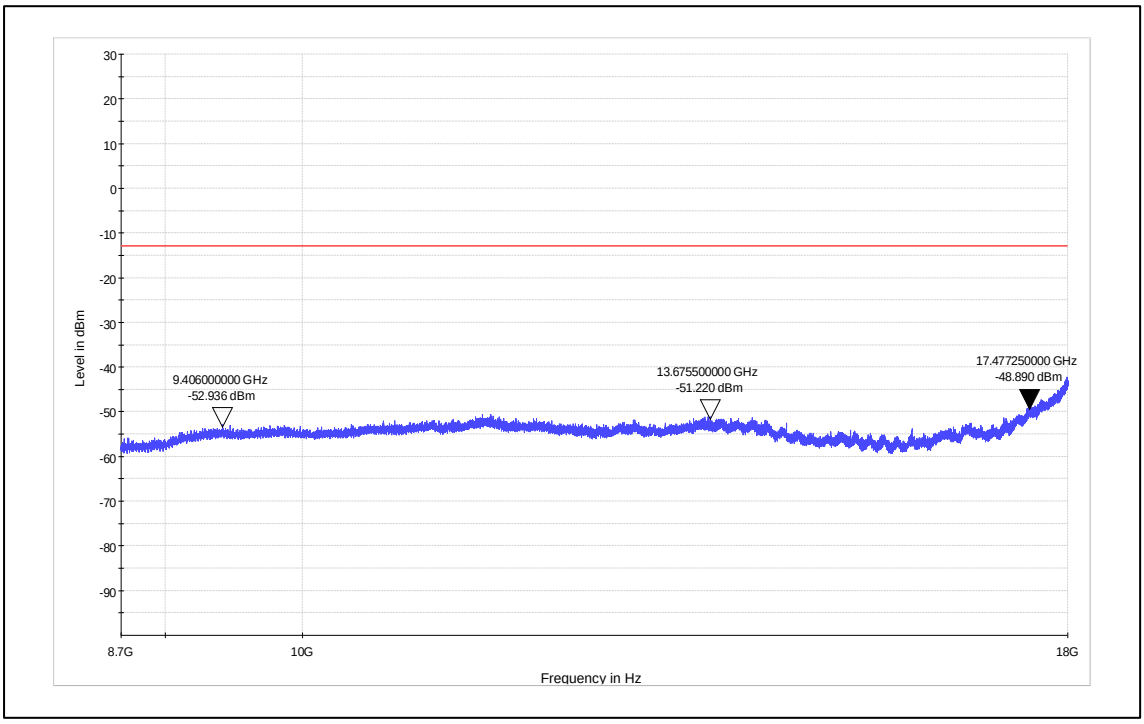
Modulation	Channel Bandwidth (MHz)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	ERP Level (dBm	Limit (dBm)	Margin (dB)
QPSK	1.4	1710.7	3422.0	Vertical	-61.70	-13	-48.70
			5133.0		-64.77	-13	-51.77
			6844.0		-62.04	-13	-49.04
			8555.0		No Harmonic Found		
			3422.0	Horizontal	-65.15	-13	-52.15
			5133.0		-64.30	-13	-51.30
			6844.0		-61.68	-13	-48.68
			8555.0		No Harmonic Found		
		1745	3490.0	Vertical	-58.26	-13	-45.26
			5235.0		-65.11	-13	-52.11
			6980.0		-60.98	-13	-47.98
			8725.0		No Harmonic Found		
			3490.0	Horizontal	-54.14	-13	-41.14
			5235.0		-64.72	-13	-51.72
			6980.0		-61.24	-13	-48.24
			8725.0		No Harmonic Found		
		1779.3	3558.4	Vertical	-59.18	-13	-46.18
			5337.6		-64.95	-13	-51.95
			7116.8		-60.05	-13	-47.05
			8896.0		No Harmonic Found		
			3558.4	Horizontal	-58.52	-13	-45.52
			5337.6		-65.35	-13	-52.35
			7116.8		-59.92	-13	-46.92
			8896.0		No Harmonic Found		

Worst case Plots:

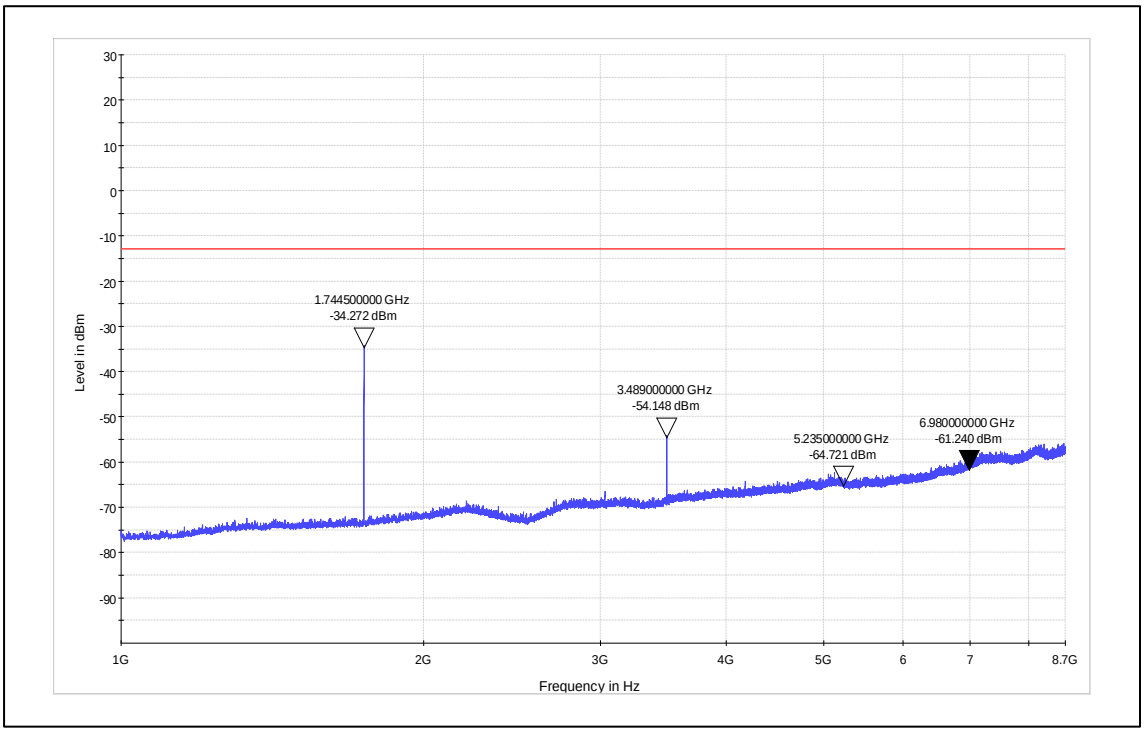
LTE Band 66:
Channel frequency: 1745MHz



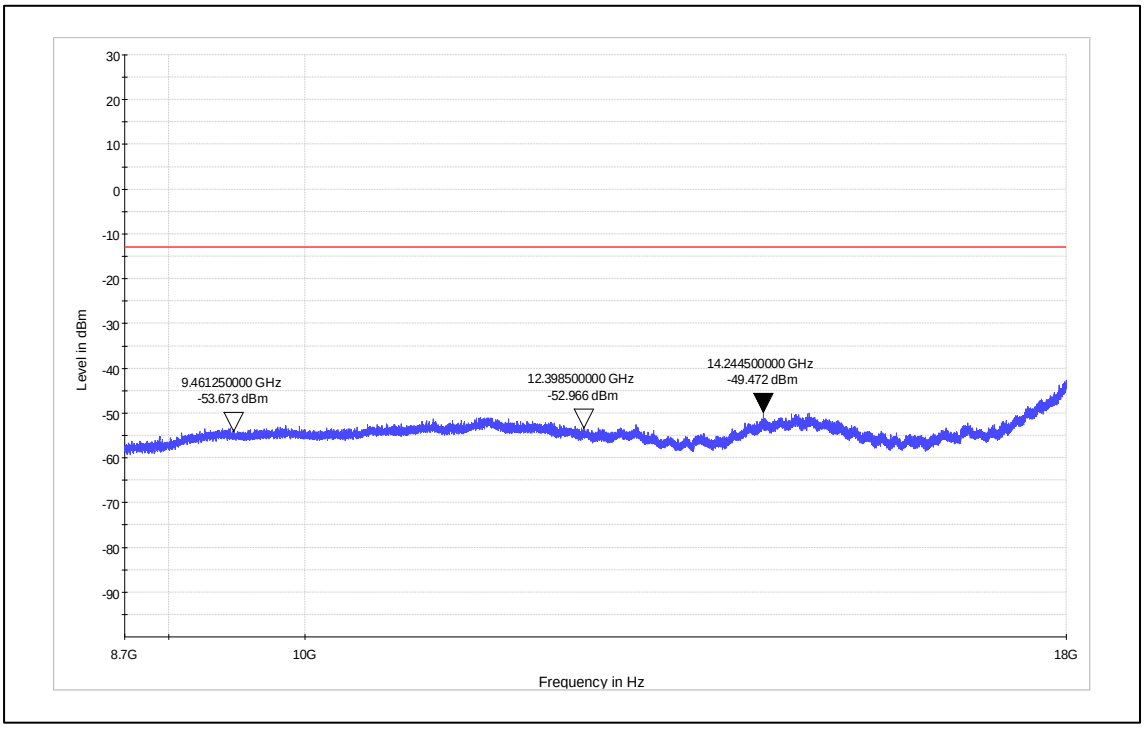
Frequency Range: 1GHz-8.7GHz **Polarization: Vertical**



Frequency Range: 8.7GHz-18GHz **Polarization: Vertical**



Frequency Range: 1GHz-8.7GHz **Polarization:Horizontal**



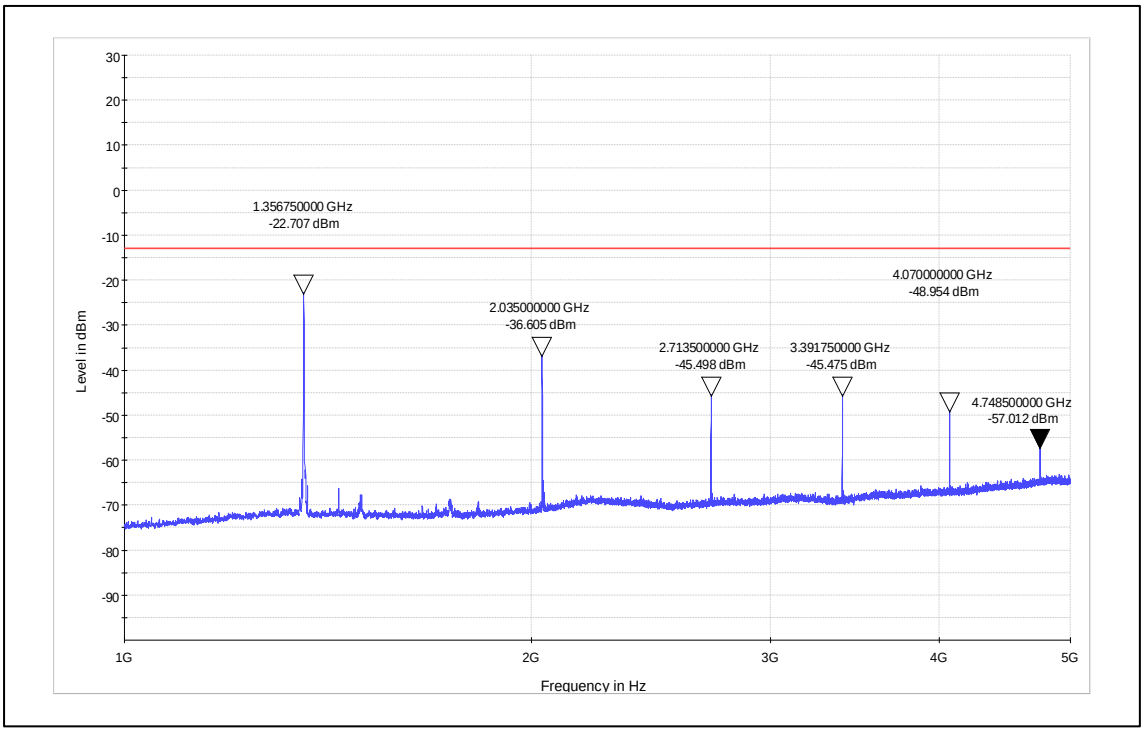
Frequency Range: 8.7GHz-18GHz **Polarization:Horizontal**

LTE Band 71:

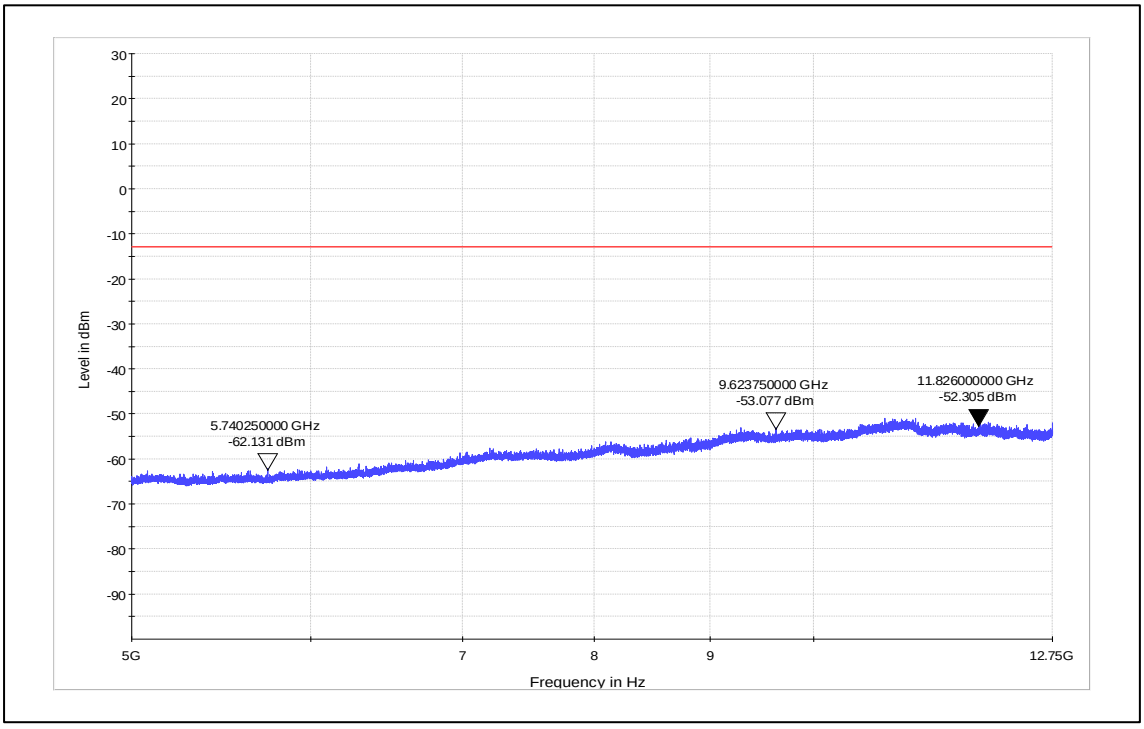
Modulation	Channel Bandwidth (MHz)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	ERP Level (dBm	Limit (dBm)	Margin (dB)
QPSK	5	665.5	1331.0	Vertical	-44.62	-13	-31.62
			1996.5		-50.23	-13	-37.23
			2662.0		-50.49	-13	-37.49
			3327.5		-62.15	-13	-49.15
			3993.0		-64.69	-13	-51.69
			4658.5		-62.38	-13	-49.38
			1331.0	Horizontal	-39.49	-13	-26.49
			1996.5		-52.71	-13	-39.71
			2662.0		-48.29	-13	-35.29
			3327.5		-57.03	-13	-44.03
			3993.0		-61.75	-13	-48.75
			4658.5		-62.72	-13	-49.72
		680.5	1361.0	Vertical	-22.70	-13	-9.70
			2041.5		-36.60	-13	-23.60
			2722.0		-49.49	-13	-36.49
			3402.5		-45.47	-13	-32.47
			4083.0		-48.95	-13	-35.95
			4763.5		-57.01	-13	-44.01
			1361.0	Horizontal	-17.84	-13	-4.84
			2041.5		-36.25	-13	-23.25
			2722.0		-40.96	-13	-27.96
			3402.5		-38.06	-13	-25.06
			4083.0		-47.17	-13	-34.17
			4763.5		-56.04	-13	-43.04
		695.5	1390.4	Vertical	-33.69	-13	-20.69
			2085.6		-29.65	-13	-16.65
			2780.8		-41.16	-13	-28.16
			3476.0		-36.89	-13	-23.89
			4171.2		-56.05	-13	-43.05
			4866.4		-50.46	-13	-37.46
			1390.4	Horizontal	-34.82	-13	-21.82
			2085.6		-35.56	-13	-22.56
			2780.8		-43.45	-13	-30.45
			3476.0		-32.54	-13	-19.54
			4171.2		-57.53	-13	-44.53
			4866.4		-54.55	-13	-41.55

Worst case Plots:

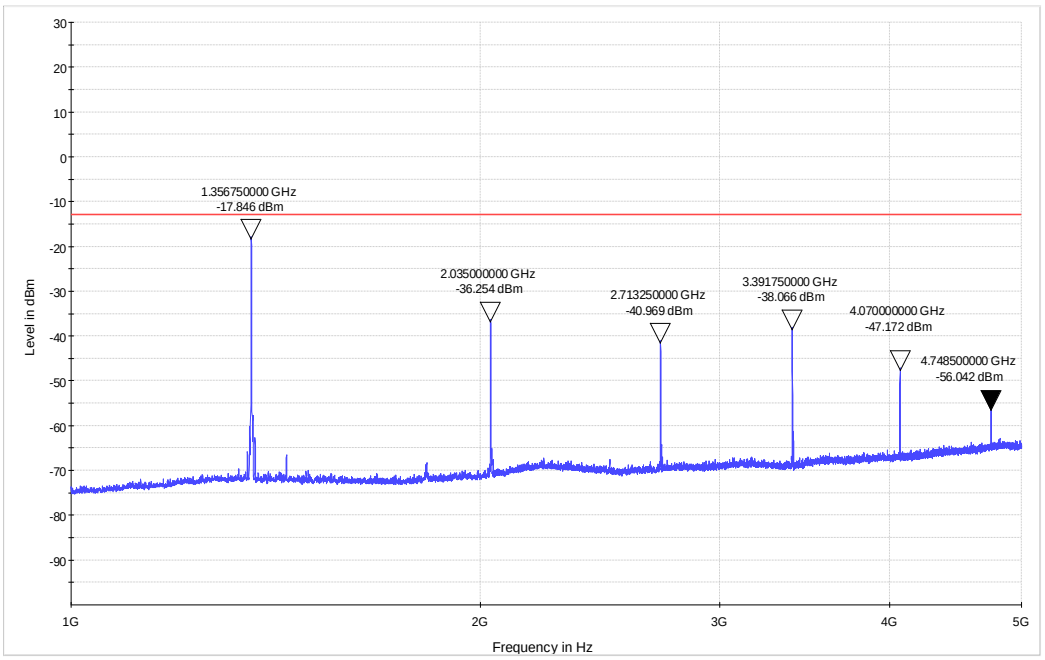
LTE Band 71:
Channel frequency: 680.5MHz



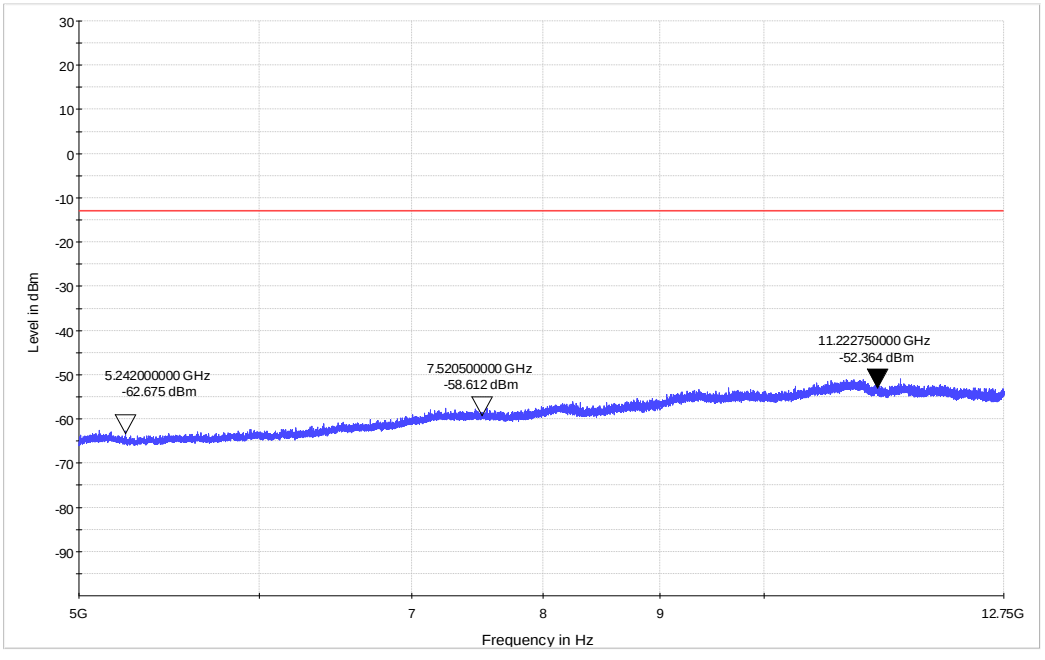
Frequency Range: 1GHz-5GHz **Polarization: Vertical**



Frequency Range: 5GHz-12.75GHz **Polarization: Vertical**



Frequency Range: 1GHz-5GHz **Polarization:Horizontal**



Frequency Range: 5GHz-12.75GHz **Polarization:Horizontal**

8.1.1 RSE Test Results of Simultaneous Operation with Cellular and Non-Cellular:

Note: Simultaneous Operation was performed As specified under the section 4.4 and worst case test results are mentionrd in this report.

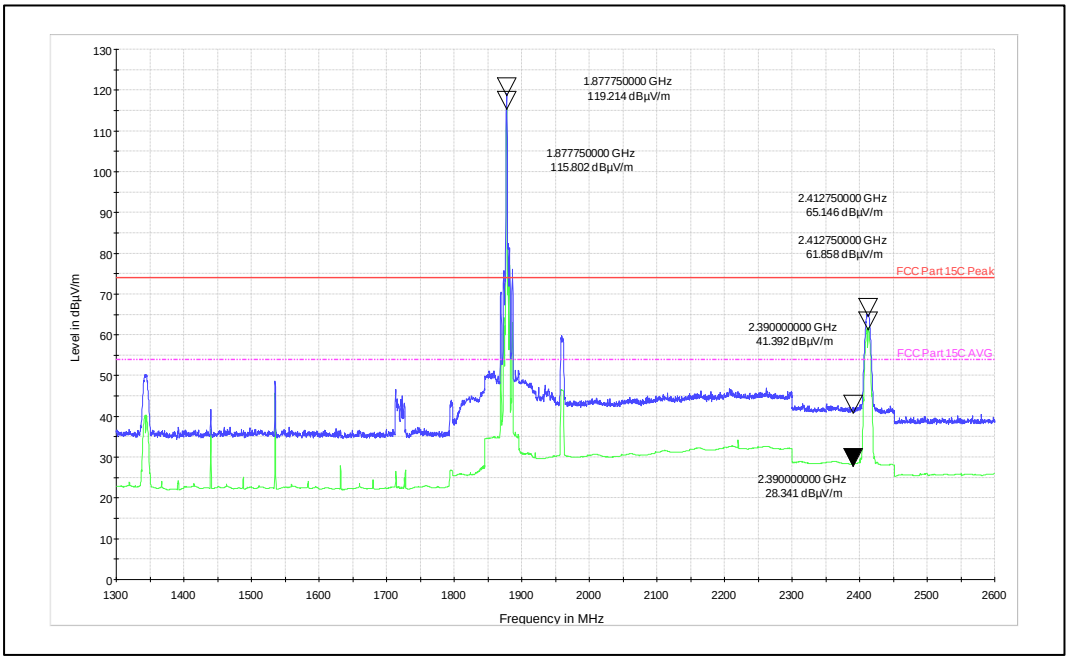
Worst case result for Wifi and WCDMA
Combination: WCDMA Band 4 and WiFi

Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	1691.5(Pk)	84.63	-	-
	1691.5(Ak)	76.66	-	-
	2390.0(Pk)	64.78	74*	-9.22
	2390.0(Av)	44.45	54*	-9.55
	2412.0(Pk)	72.13	-	-
	2412.0(Av)	63.18	-	-
	3391.2(Pk)	57.18	74	-16.82
	3391.2(Av)	47.18	54	-6.82
	4239.0(Pk)	47.00	74	-27.00
	4239.0(AV)	35.19	54	-18.81
	5087.5(Pk)	52.92	74	-21.08
	5087.5(Av)	40.53	54	-13.47
Horizontal	1691.5(Pk)	90.05	-	-
	1691.5(Av)	82.12	-	-
	2390.0(Pk)	56.4	74*	-17.60
	2390.0(Av)	38.31	54*	-15.69
	2412.0(Pk)	70.75	-	-
	2412.0(Av)	61.83	-	-
	3391.2(Pk)	45.62	74	-28.38
	3391.2(Av)	35.33	54	-18.67
	4824.0(Pk)	44.93	74	-29.07
	4824.0(Av)	31.39	54	-22.61

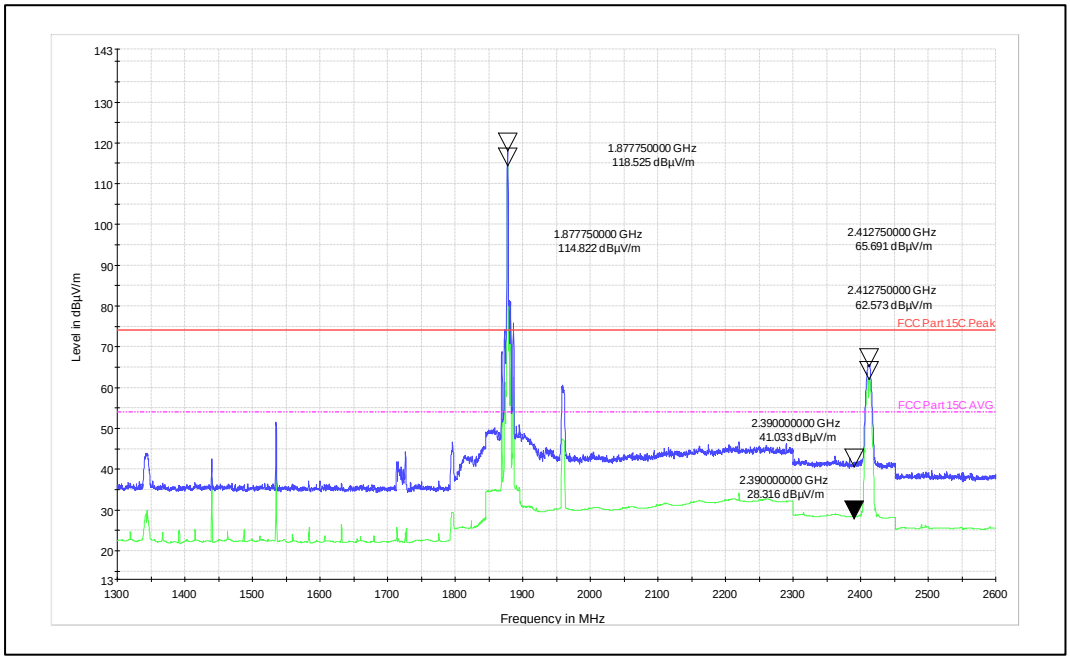
Worst case result for Wifi and LTE
Combination: LTE Band 2 and WiFi

Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	1877.7(Pk)	119.21	-	-
	1877.7(Av)	115.80	-	-
	2390.0(Pk)	41.03	74*	-32.97
	2390.0(Av)	28.31	54*	-25.69
	2412.0(Pk)	65.14	-	-
	2412.0(Av)	61.85	-	-
	3755.5(Pk)	57.18	74	-16.82
	3755.5(Av)	47.18	54	-6.82
	5633.2(Pk)	47.00	74	-27.00
	5633.2(AV)	35.19	54	-18.81
	5087.5(Pk)	No harmonics Found		
	5087.5(Av)			
Horizontal	1877.7(Pk)	118.52	-	-
	1877.7(Av)	114.82	-	-
	2390.0(Pk)	41.03	74*	-32.97
	2390.0(Av)	28.31	54*	-25.69
	2412.0(Pk)	65.69	-	-
	2412.0(Av)	62.57	-	-
	3755.5(Pk)	45.62	74	-28.38
	3755.5(Av)	35.33	54	-18.67
	5633.2(Pk)	50.52	74	-23.48
	5633.2(AV)	40.06	54	-13.94

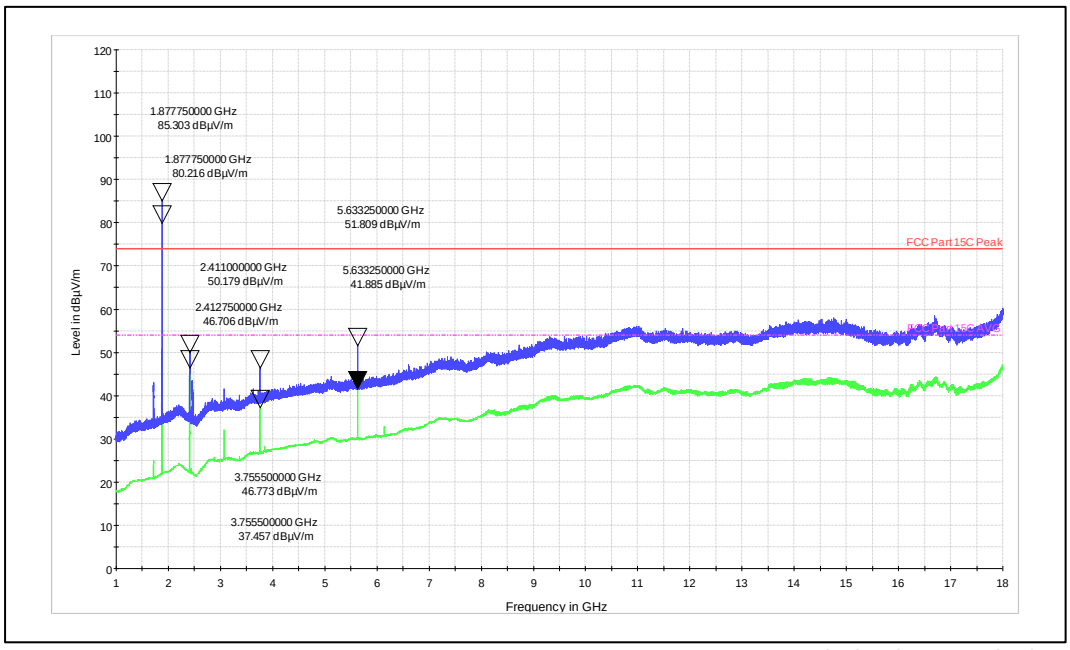
Worst Case Plots:



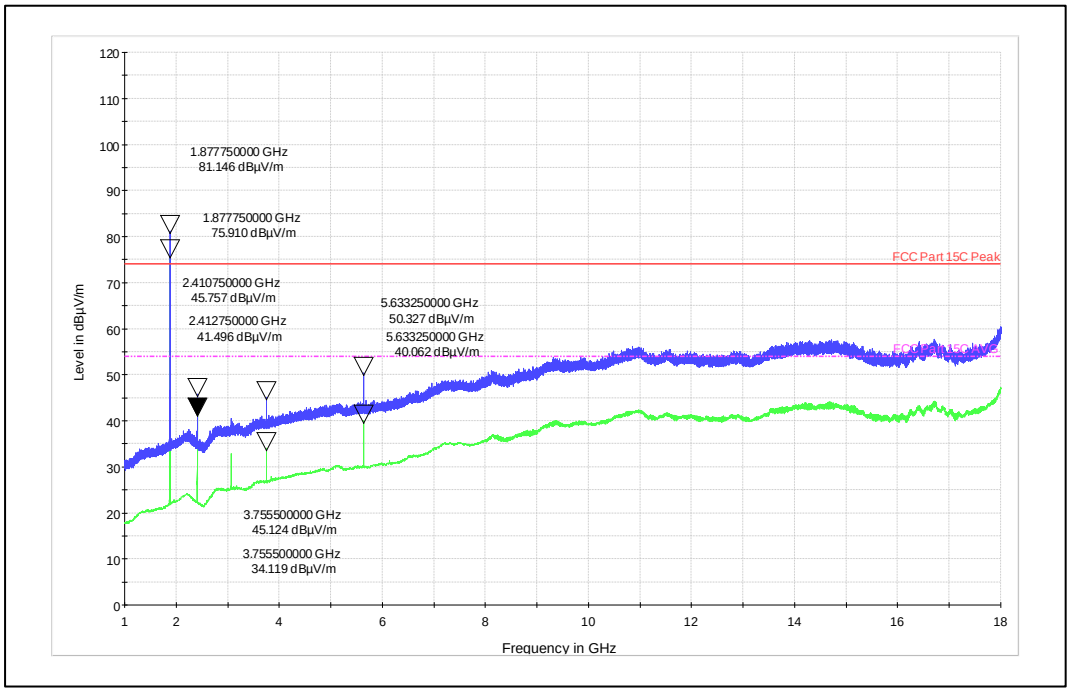
Fundamental Frequency(LTE-1880.0MHz , Wi-Fi 2412MHz) Polarization: Vertical



Fundamental Frequency(LTE-1880.0MHz , Wi-Fi 2412MHz) Polarization: Horizontal



Frequency range: 1GHz to 18GHz Polarization: Vertical



Frequency range: 1GHz to 18GHz Polarization: Horizontal

9 Conducted Spurious Emission Test on AC Power Line

Result ***Pass***

Test Specification	:	FCC Part 15 Section 15.207 / RSS Gen Issue 5 Section 8.8
Test Method	:	ANSI C 63.10-2013
Testing Location	:	Screened room
Measurement Bandwidth	:	9kHz
Frequency Range	:	150kHz – 30MHz
Supply Voltage	:	110VAC,60Hz
Test Method	:	Reffer TEST METHODOLOGY

***Note: The product has tested with AC to DC adapter**

Limits of section 15.207

Frequency of emission (MHz)	QP Limit (dBµV)	AV Limit (dBµV/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

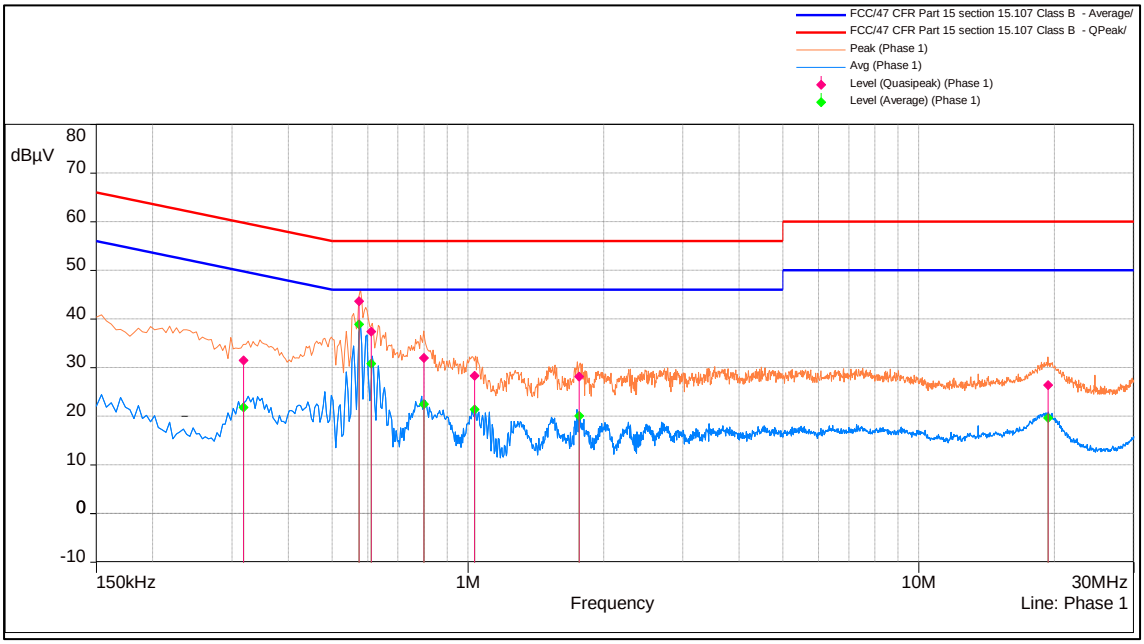
* Decreases with the logarithm of the frequency

Test Conditions:

Normal Temperature = +24°C Voltage (V norm) = 110V AC (5.0V DC through AC to DC Adapter)
Relative Humidity = 64%

Test Result:

Power: 110V 60Hz_LINE



Line Graph

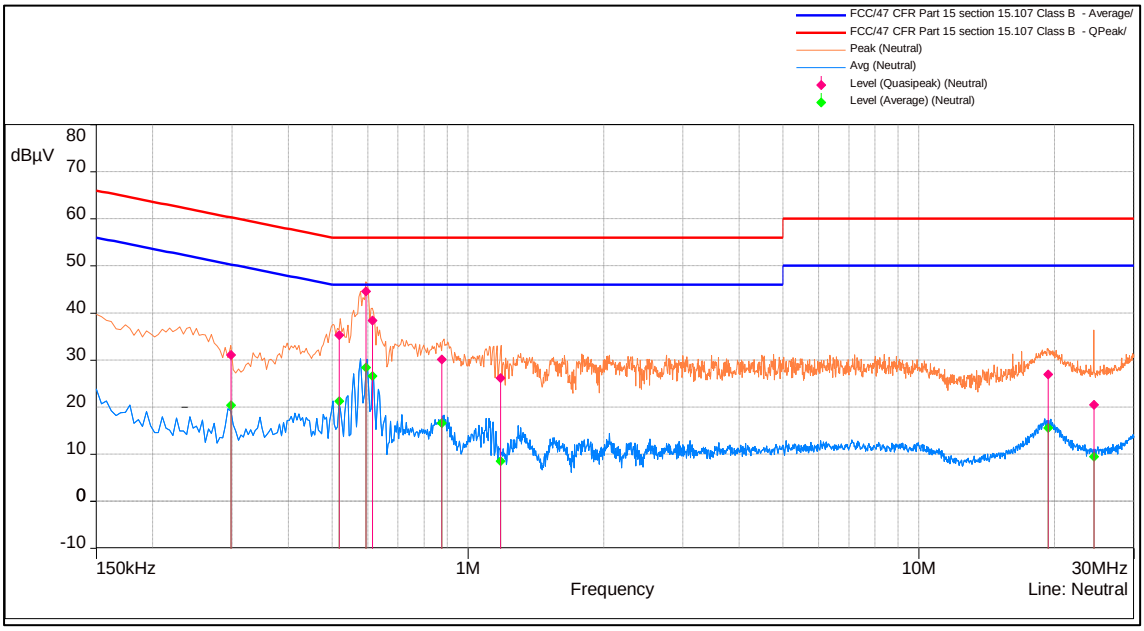
Quasipeak (15)										
Frequency (MHz)	**SR**	**Level (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Pos**	**Measuring time**	**RBW**	**Meas Time**	**Comments**	**Correction (dB)**
0.57515	1	43.67	56	-12.33	Phase 1	1	9k	0.02	Pass	20.22
0.61195	1	37.43	56	-18.57	Phase 1	1	9k	0.02	Pass	20.28
0.7962	1	31.98	56	-24.02	Phase 1	1	9k	0.02	Pass	20.61
1.03435	1	28.37	56	-27.63	Phase 1	1	9k	0.02	Pass	20.42
1.76485	1	28.2	56	-27.8	Phase 1	1	9k	0.02	Pass	20.48
0.3187	1	31.48	59.76	-28.28	Phase 1	1	9k	0.02	Pass	20.06
19.33855	1	26.43	60	-33.57	Phase 1	1	9k	0.02	Pass	20.2

Line Table

Average (15)										
Frequency (MHz)	**S R**	**Level (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Pos**	**Measuring time**	**RBW**	**Meas .Time**	**Comments**	**Correction (dB)**
0.57515	1	38.96	46	-7.04	Phase 1	1	9k	0.02	Pass	20.22
0.61195	1	30.86	46	-15.14	Phase 1	1	9k	0.02	Pass	20.28
0.7962	1	22.48	46	-23.52	Phase 1	1	9k	0.02	Pass	20.61
1.03435	1	21.44	46	-24.56	Phase 1	1	9k	0.02	Pass	20.42
1.76485	1	20.13	46	-25.87	Phase 1	1	9k	0.02	Pass	20.48
0.3187	1	21.86	49.76	-27.9	Phase 1	1	9k	0.02	Pass	20.06
19.33855	1	19.66	50	-30.34	Phase 1	1	9k	0.02	Pass	20.2

Line Table

Power: 110V 60Hz_NEUTRAL



Neutral Graph

Quasipeak (15)										
Frequency (MHz)	**SR**	**Level (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Pos**	**Measuring time**	**RBW**	**Meas Time**	**Comments**	**Correction (dB)**
0.5924	2	44.61	56	-11.39	Neutral	1	9k	0.02	Pass	20.39
0.6155	2	38.38	56	-17.62	Neutral	1	9k	0.02	Pass	20.43
0.51795	2	35.29	56	-20.71	Neutral	1	9k	0.02	Pass	20.27
0.8734	2	30.1	56	-25.9	Neutral	1	9k	0.02	Pass	20.66
0.29665	2	31.06	60.3	-29.24	Neutral	1	9k	0.02	Pass	19.96
1.1833	2	26.16	56	-29.84	Neutral	1	9k	0.02	Pass	20.51
19.35055	2	26.98	60	-33.02	Neutral	1	9k	0.02	Pass	20.44
24.44805	2	20.51	60	-39.49	Neutral	1	9k	0.02	Pass	20.57

Neutral Table

Average (15)										
Frequency (MHz)	**SR**	**Level (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Pos**	**Measuring time**	**RBW**	**Meas. Time**	**Comments**	**Correction (dB)**
0.5924	2	28.4	46	-17.6	Neutral	1	9k	0.02	Pass	20.39
0.6155	2	26.64	46	-19.36	Neutral	1	9k	0.02	Pass	20.43
0.51795	2	21.26	46	-24.74	Neutral	1	9k	0.02	Pass	20.27
0.8734	2	16.59	46	-29.41	Neutral	1	9k	0.02	Pass	20.66
0.29665	2	20.42	50.3	-29.88	Neutral	1	9k	0.02	Pass	19.96
19.35055	2	15.6	50	-34.4	Neutral	1	9k	0.02	Pass	20.44
1.1833	2	8.51	46	-37.49	Neutral	1	9k	0.02	Pass	20.51
24.44805	2	9.48	50	-40.52	Neutral	1	9k	0.02	Pass	20.57

Neutral Table

10 LIST OF TABLES

*****END OF TEST REPORT*****