



Report No.:SZ11110049W02



FCC Part 15C TEST REPORT

Issued to

Sensixa Ltd.

For

ear worn Activity Recognition Sensor

Model Name : e-AR Lite
Trade Name : Sensixa Ltd
Brand Name : e-AR
FCC ID : XSH-EARL1
Standard : 47 CFR Part 15 Subpart C
Test date : 2011-11-22 to 2012-01-16
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2012.1.17

CTIA Authorized Test Lab

LAB CODE 20081223-00

IEEE 1725

OTA

OFTA

電訊管理局



GCF
Official Observer of
Global Certification Forum

Bluetooth
BQTF

FCC
Reg. No.
741109

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DIRECTORY

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Change History		
Issue	Date	Reason for change
1.0	Jan 17, 2012	First edition

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-09 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.249(a)	Band Edge	PASS
2	15.207	Conducted Emission	PASS
3	15.249(a) (e)	Radiated Emission	PASS

Note 1: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.4 2009;

Note 2: The EUT configuration of the Conducted Emission test is: EUT + Base Station + PC + PC Power.

During the test, the EUT was connected with Base Station via mini USB port, Base Station was connected with PC via USP port. The EUT was powered by PC via Base Station.

Note 3: This EUT is for Tx only, and the Base Station is for Rx & charging function. This report is intention of applying for FCC 15.249 (DXX) Certification only.

1.3. Facilities and Accreditations

1.3.1. Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at 3/F, Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15C Requirements

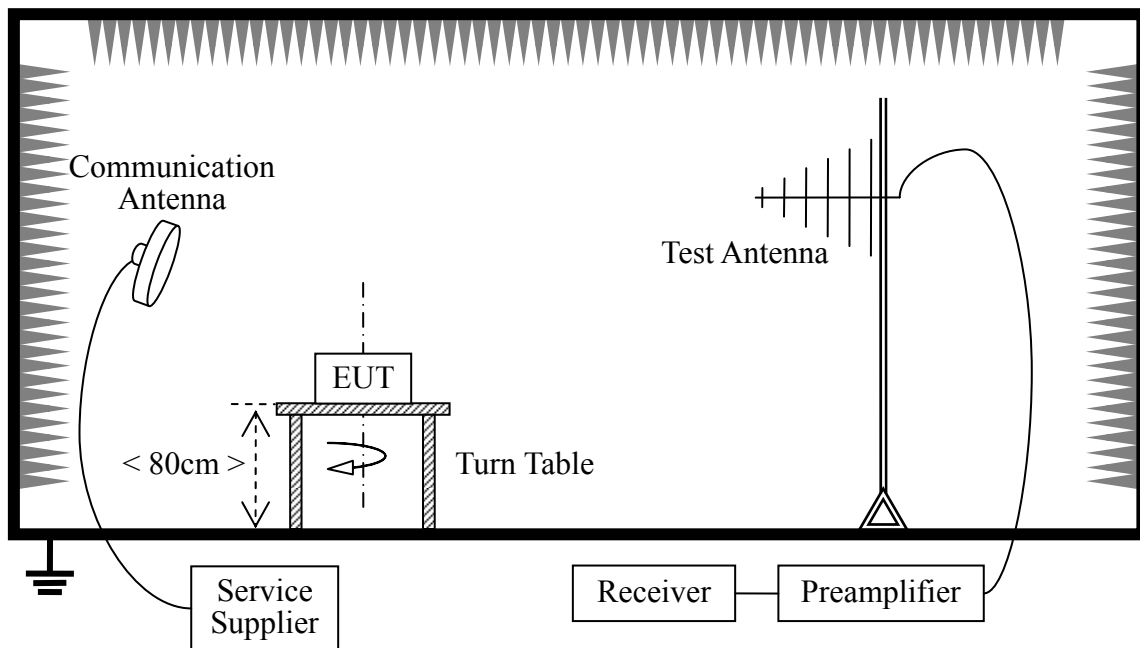
2.1. Band Edge

2.1.1. Requirement

According to FCC section 15.247(a), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.1.2. Test Description

A. Test Setup



The Module of the EUT is powered by the Battery charged with the AC Adapter. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2011.5	1year
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2011.5	1year
Test Antenna	Schwarzbeck	BBHA 9120C	9120C-384	2011.5	1year

2.1.3. Test Result

The lowest and highest channels are tested to verify the band edge emissions.

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

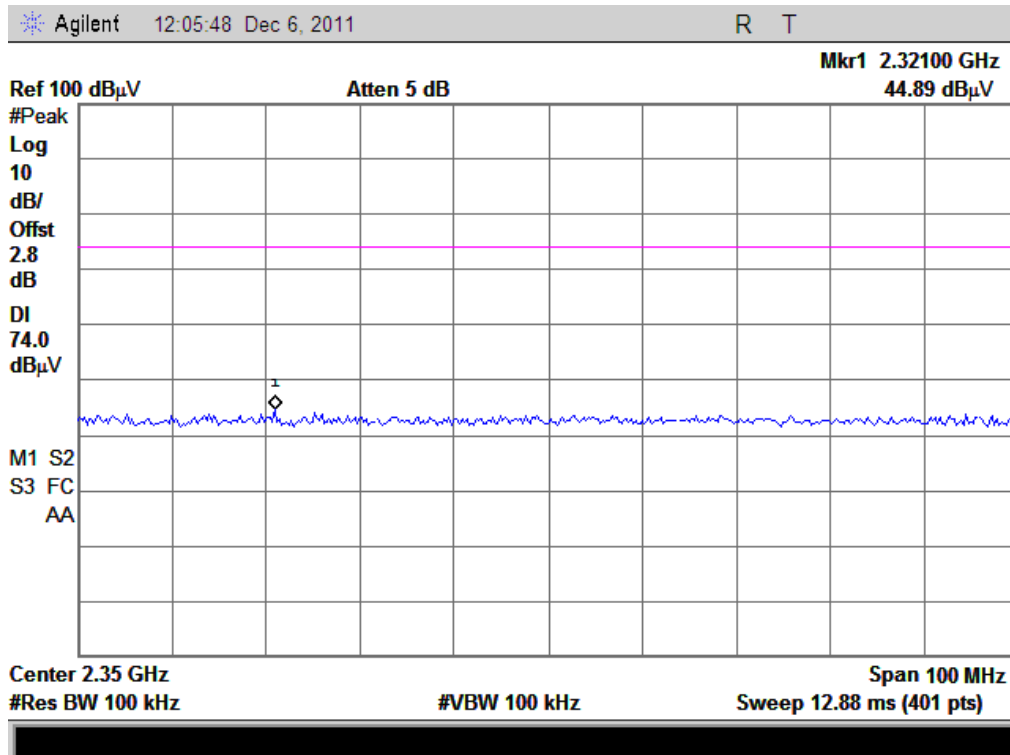
2.1.3.1. GFSK Test mode

The lowest and highest channels are tested to verify the band edge emissions.

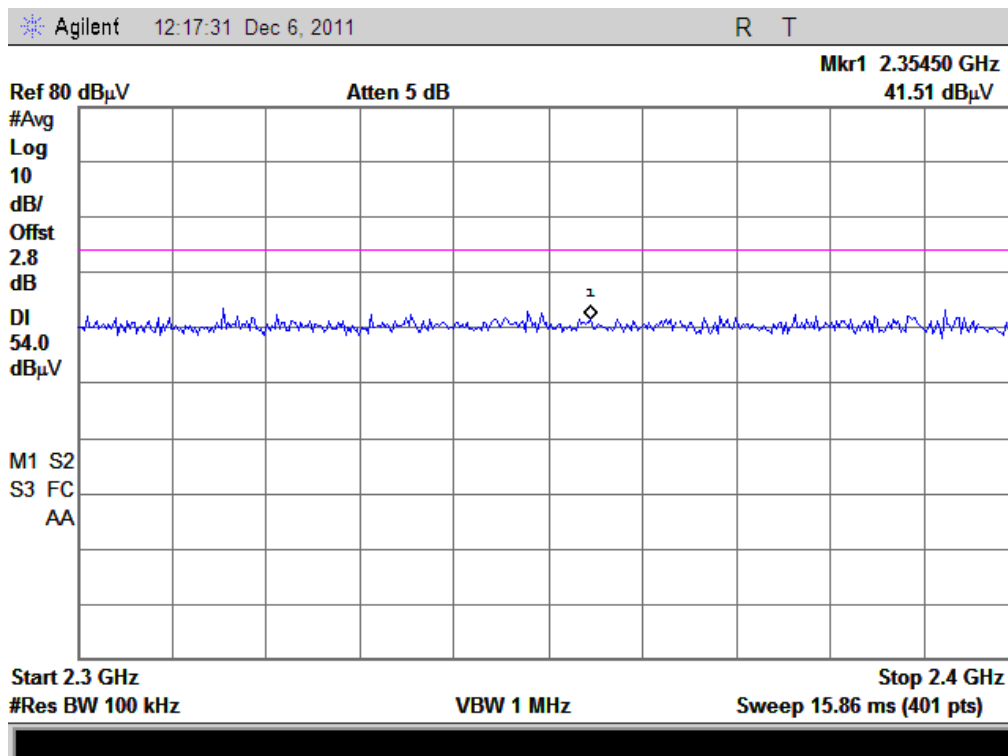
A. Test Verdict:

Channel	Frequency (MHz)	Receiver Reading U_R (dBuV)		A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)		Limit (dB μ V/ m)		Verdict
		PK	AV			PK	AV	PK	AV	
5	2405	44.89	41.51	-30.93	32.56	46.52	43.14	74	54	PASS
78	2478	43.6	42.66	-29.05	32.5	47.05	46.11	74	54	PASS

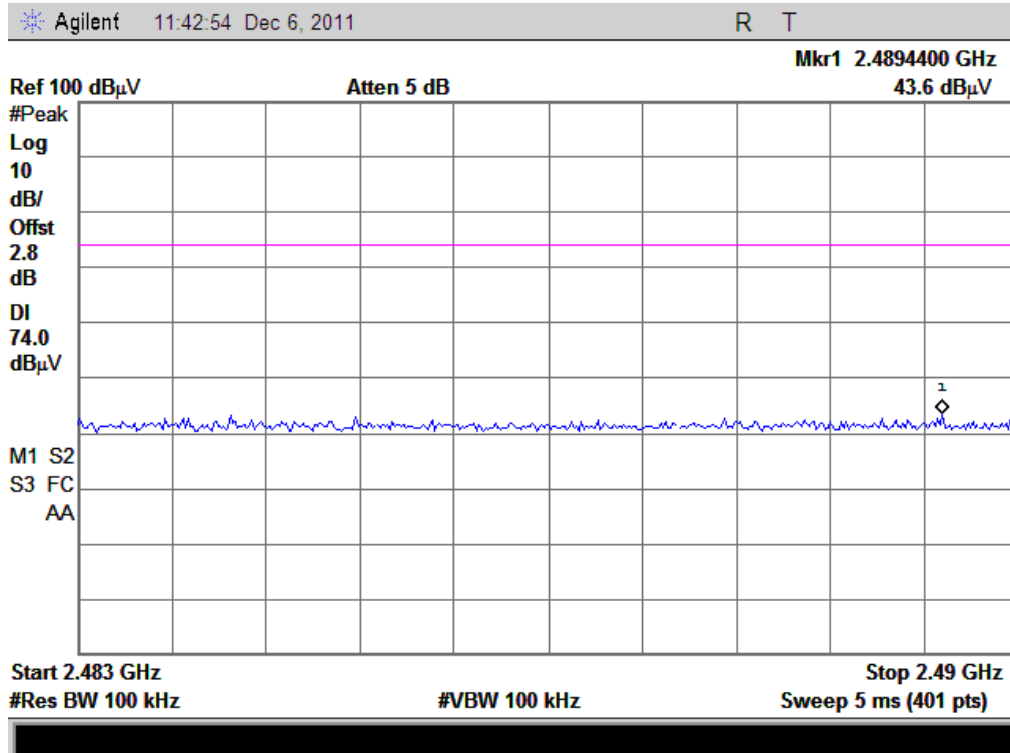
B. Test Plots:



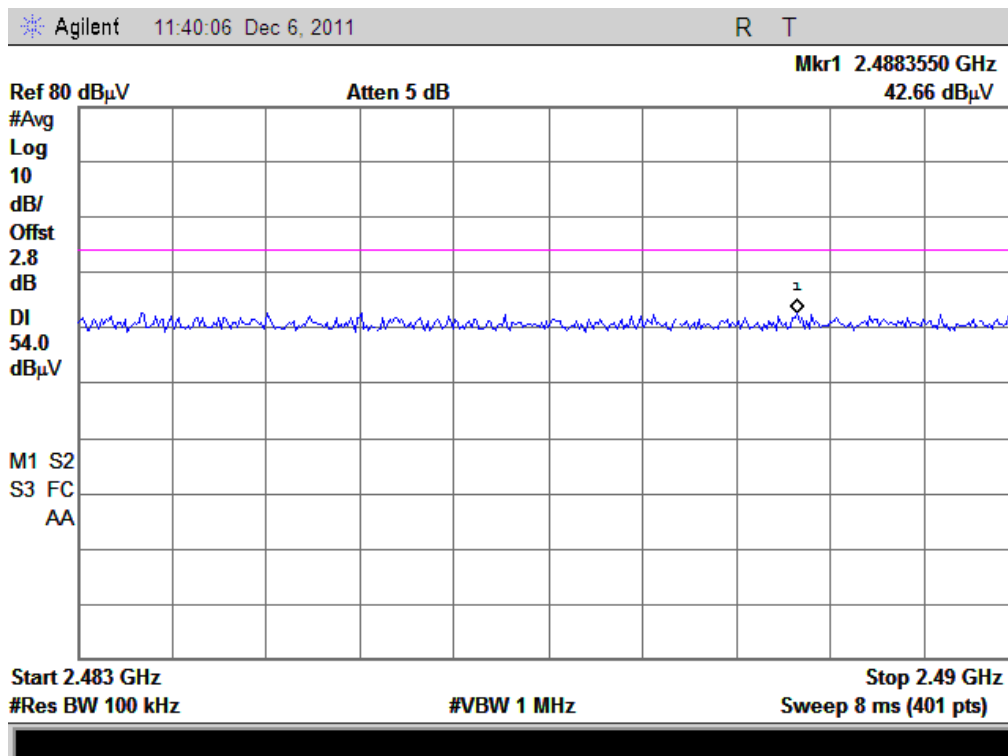
(Plot A1: Channel = 5 PEAK)



(Plot A2: Channel = 5 AVG)



(Plot B1: Channel = 78 PEAK)



(Plot B2: Channel = 78 AVG)

2.2. Conducted Emission

2.2.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

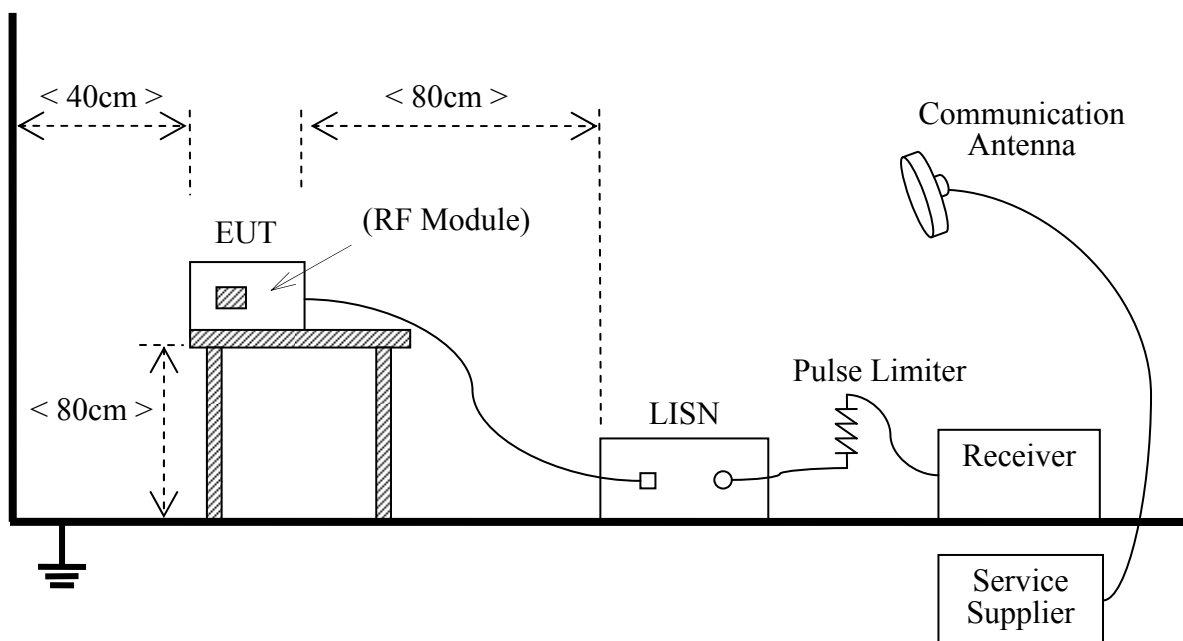
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.2.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

The EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated to correct the reading. During the measurement, the EUT was worked on the normal working model.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2011.05	1year
LISN	Schwarzbeck	NSLK 8127	812744	2011.05	1year
Service Supplier	R&S	CMU200	100448	2011.05	1year
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)

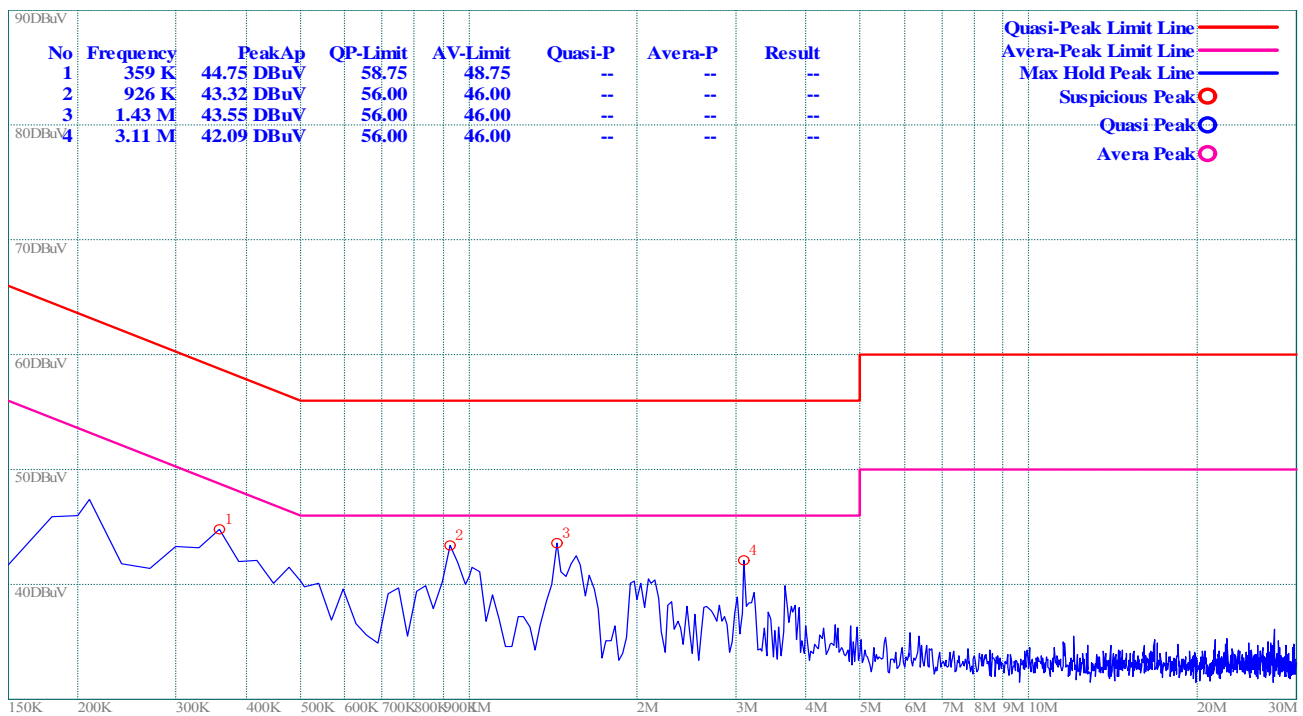
2.2.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

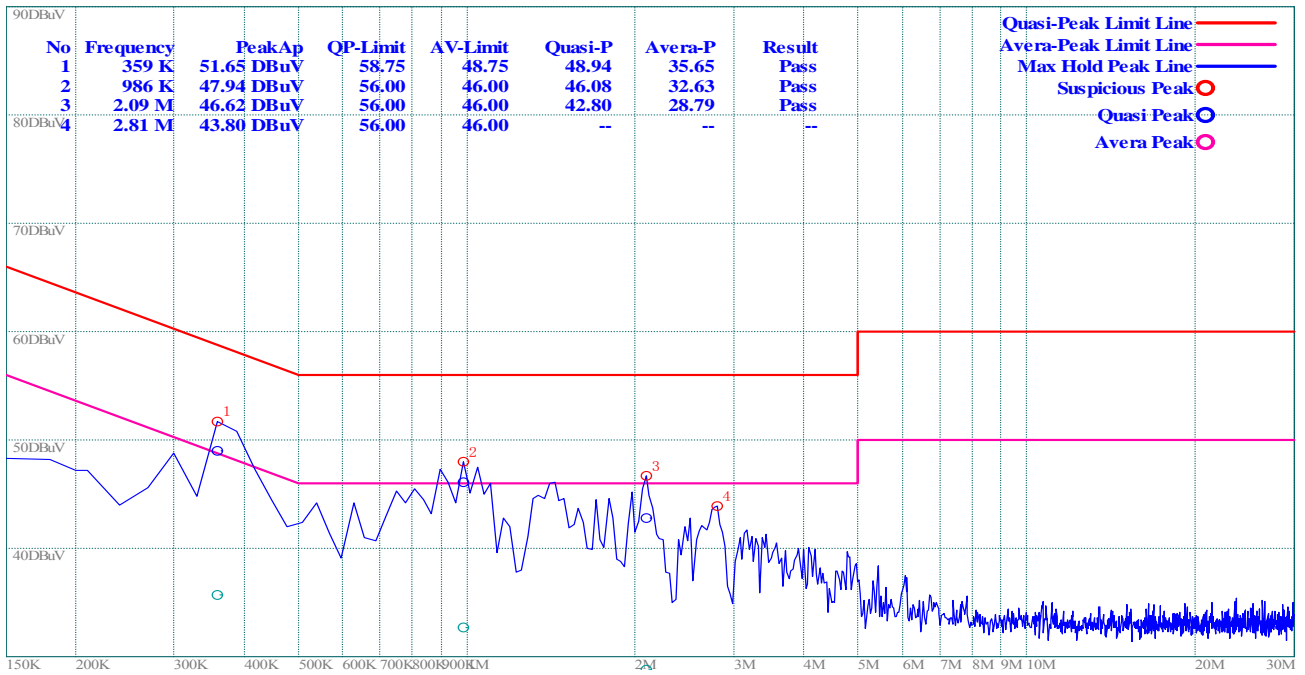
A. Test setup:

The EUT configuration of the emission tests is EUT + Charger.

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

2.3. Radiated Emission

2.3.1. Requirement

According to FCC section 15.249(a) (e), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.249 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Fundamental Frequency(MHz)	Field strength of fundamental (milli-volts/meter)	Strength of harmonics (microvolts / meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

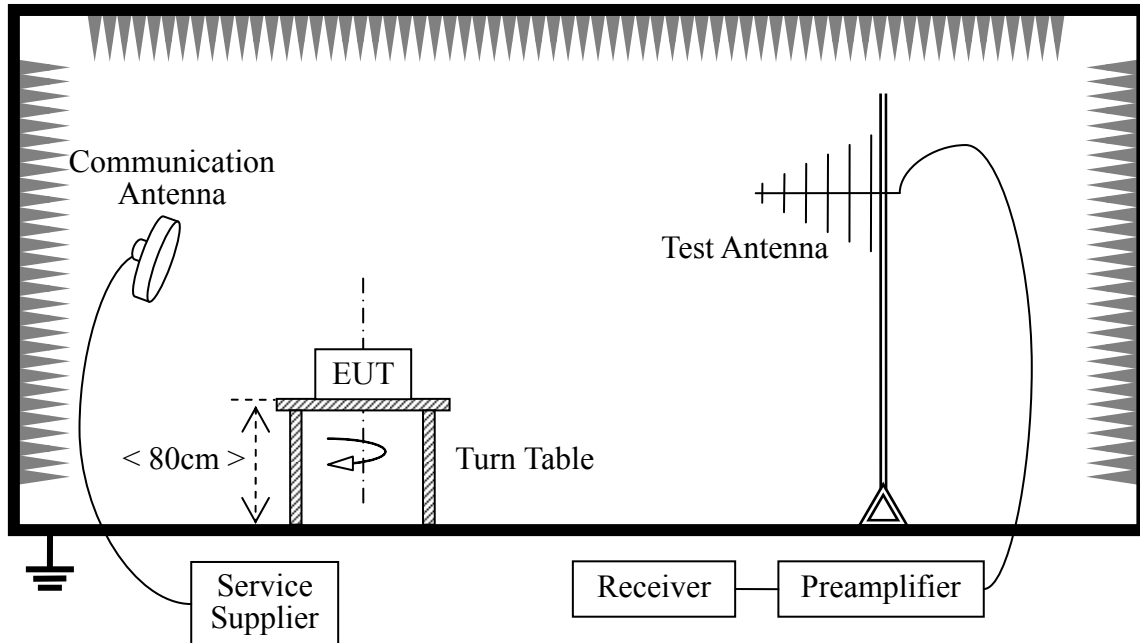
Note:

1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

2.3.2. Test Description

A. Test Setup:



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The EUT of the EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT was worked on the normal working model.

For the Test Antenna:

- In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2011.05	1year
Receiver	Agilent	E7405A	US44210471	2011.05	1year
Semi-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2011.05	2year
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2011.05	1year
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2011.05	1year
Test Antenna - circular	R&S	AC004R1	0749.3000.03	2011.05	1year

2.3.3. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak (or average) measurement.

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

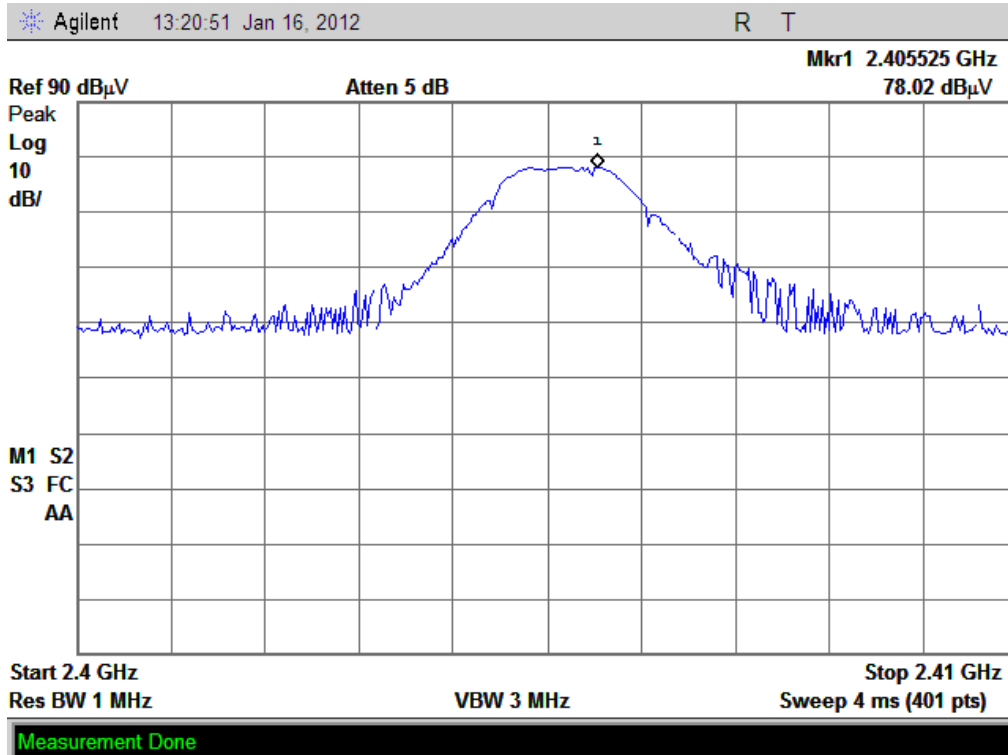
A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

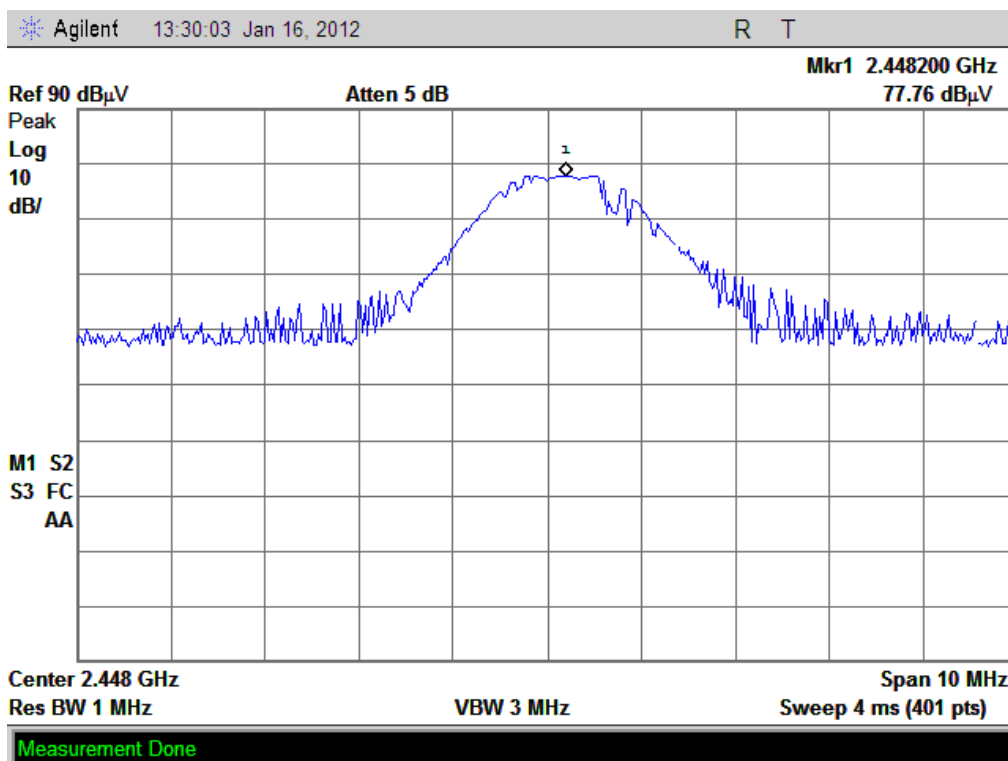
2.3.3.1. Test Verdict of The Fundamental Emissions:

The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

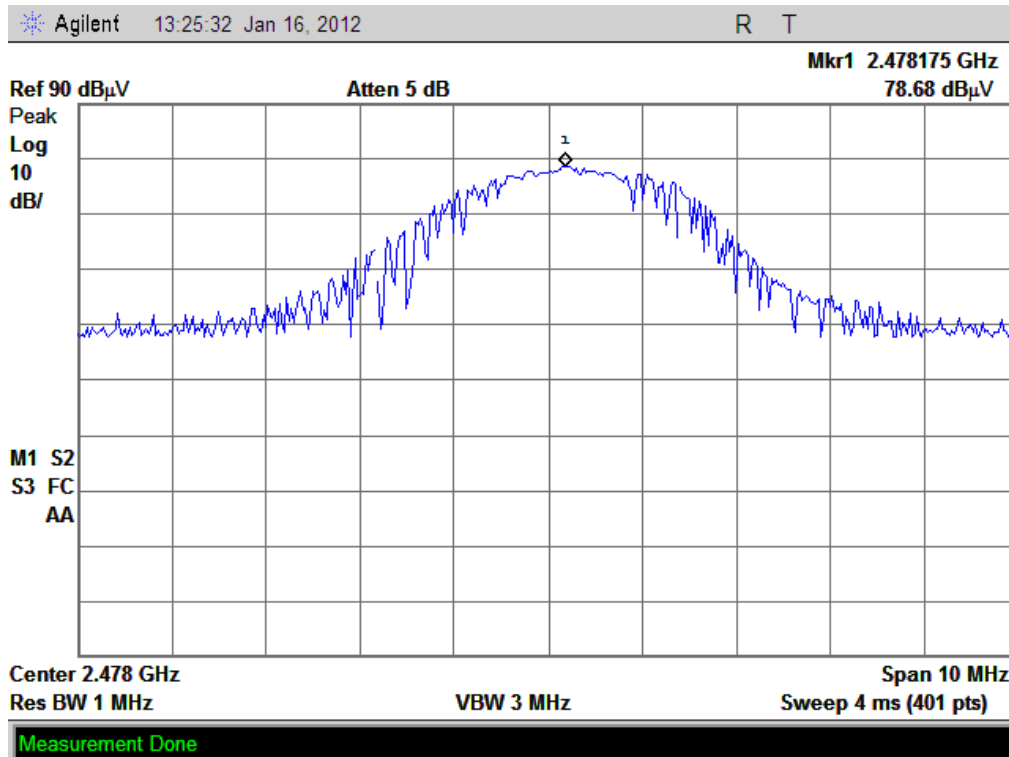
Channel	Frequency (MHz)	Receiver Reading U_R (dBuV)		A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)		Limit (dB μ V/m)		Verdict
		PK	AV			PK	AV	PK	AV	
5	2405	78.02	N/A	-30.93	32.56	79.65	N/A	114	94	PASS
48	2449	77.76	N/A	-29.17	32.53	81.12	N/A	114	94	PASS
78	2478	78.68	N/A	-29.05	32.5	82.13	N/A	114	94	PASS



Fundamental Emission Channel=2405



Fundamental Emission Channel=2448

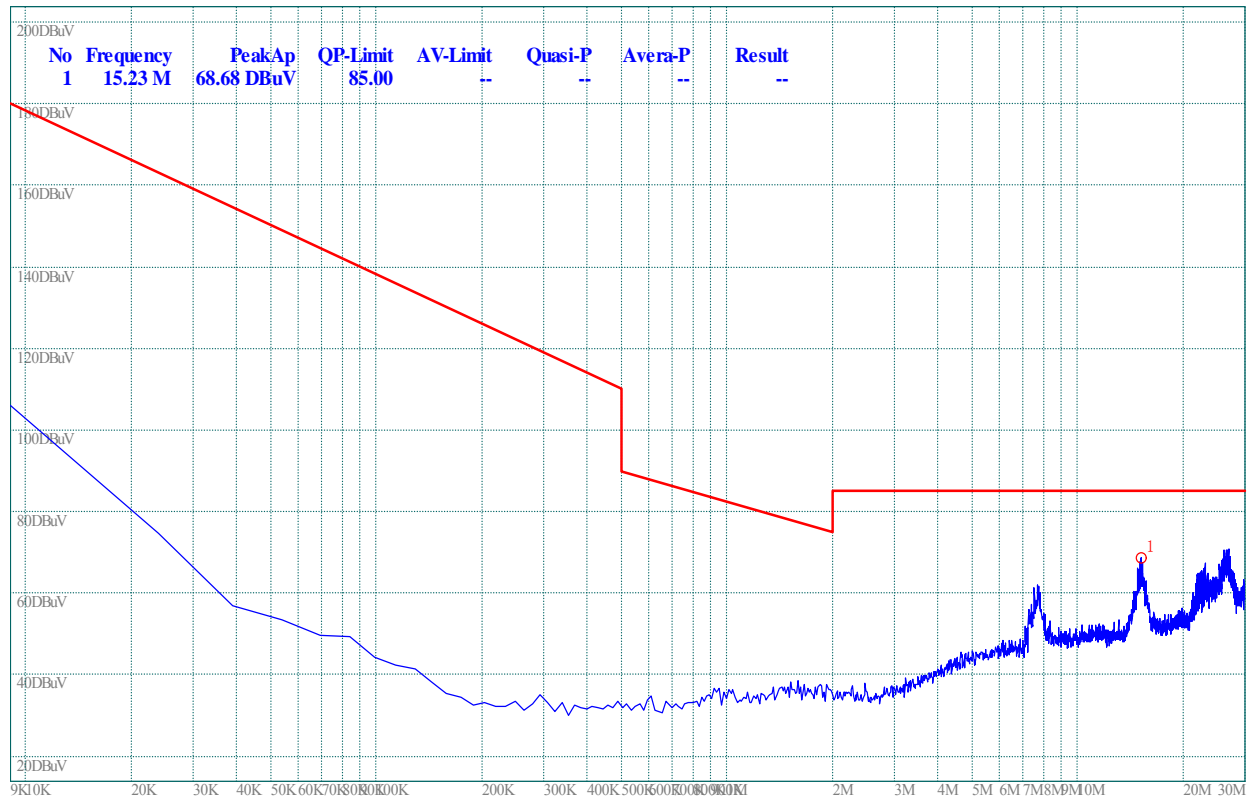


Fundamental Emission Channel=2479

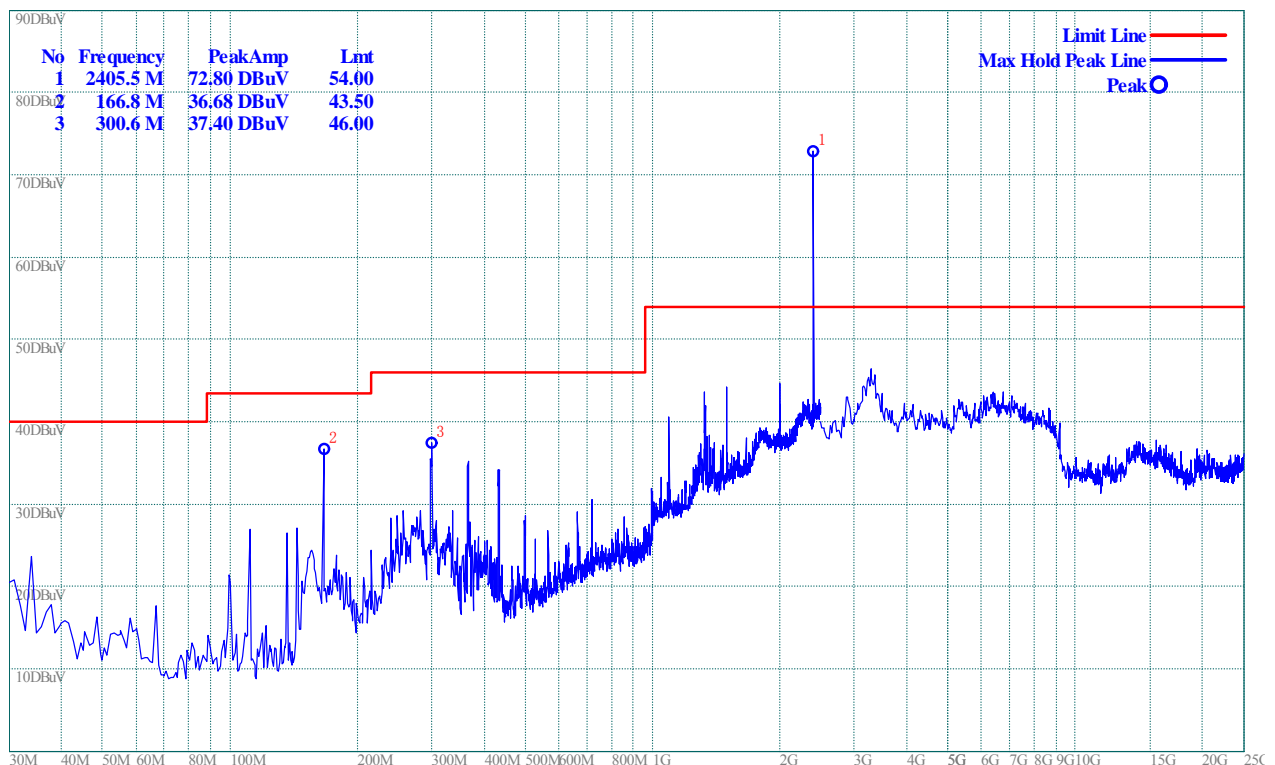
2.3.3.2. Test Plots for the Whole Measurement Frequency Range:

The test is searched using Peak (PK), if the emission levels more than the AV limits, and that have narrow margins from the AV limits will be re-measured with PK and AV detectors.

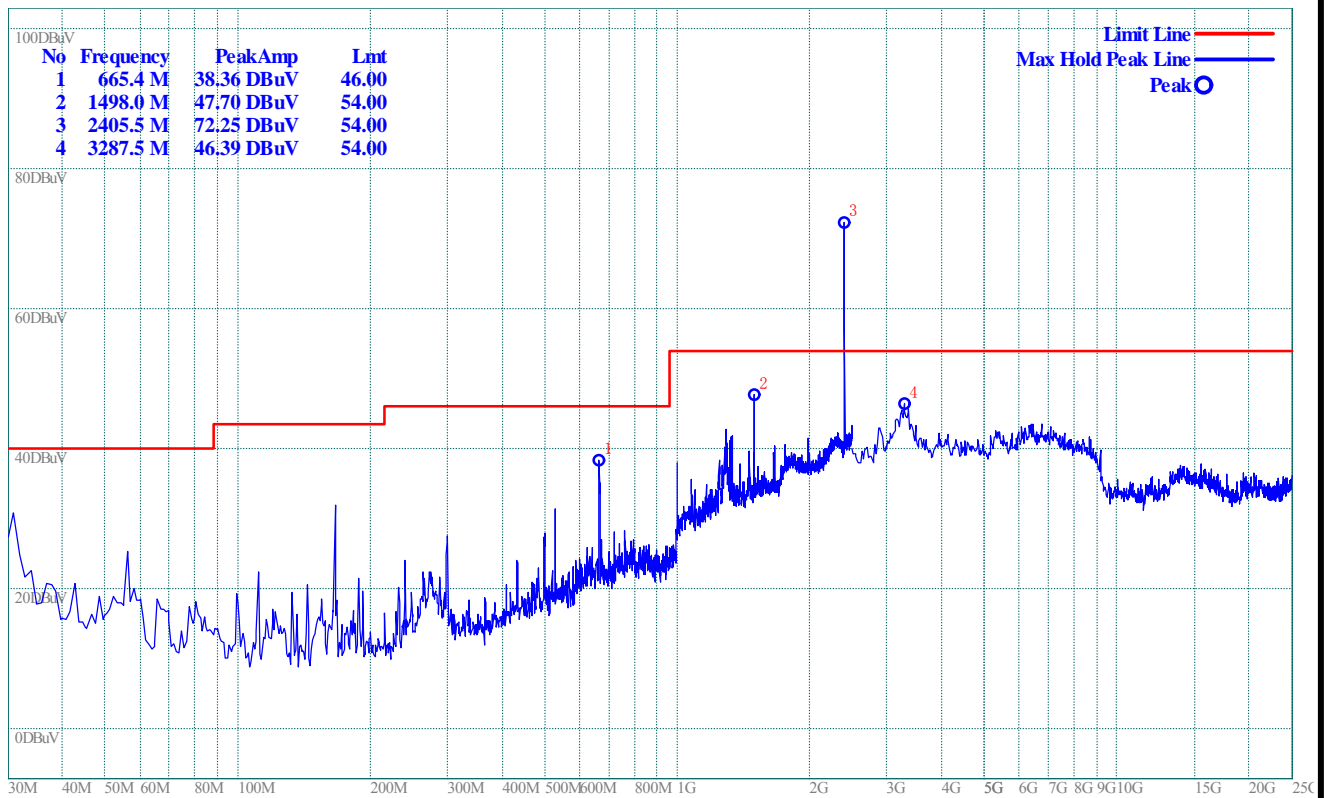
Plots for Channel = 5



(Plot A.1: 9kHz to 30MHz)

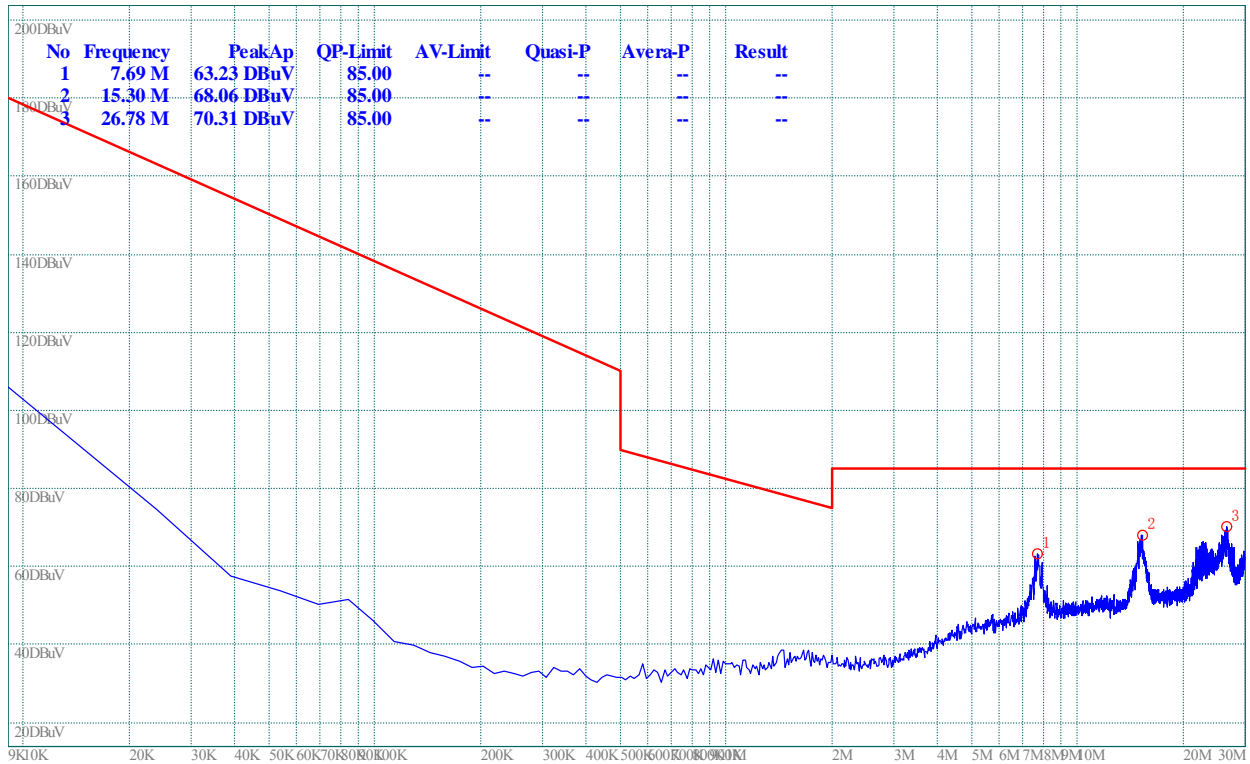


(Plot A.2: Antenna Horizontal, 30MHz to 25GHz)

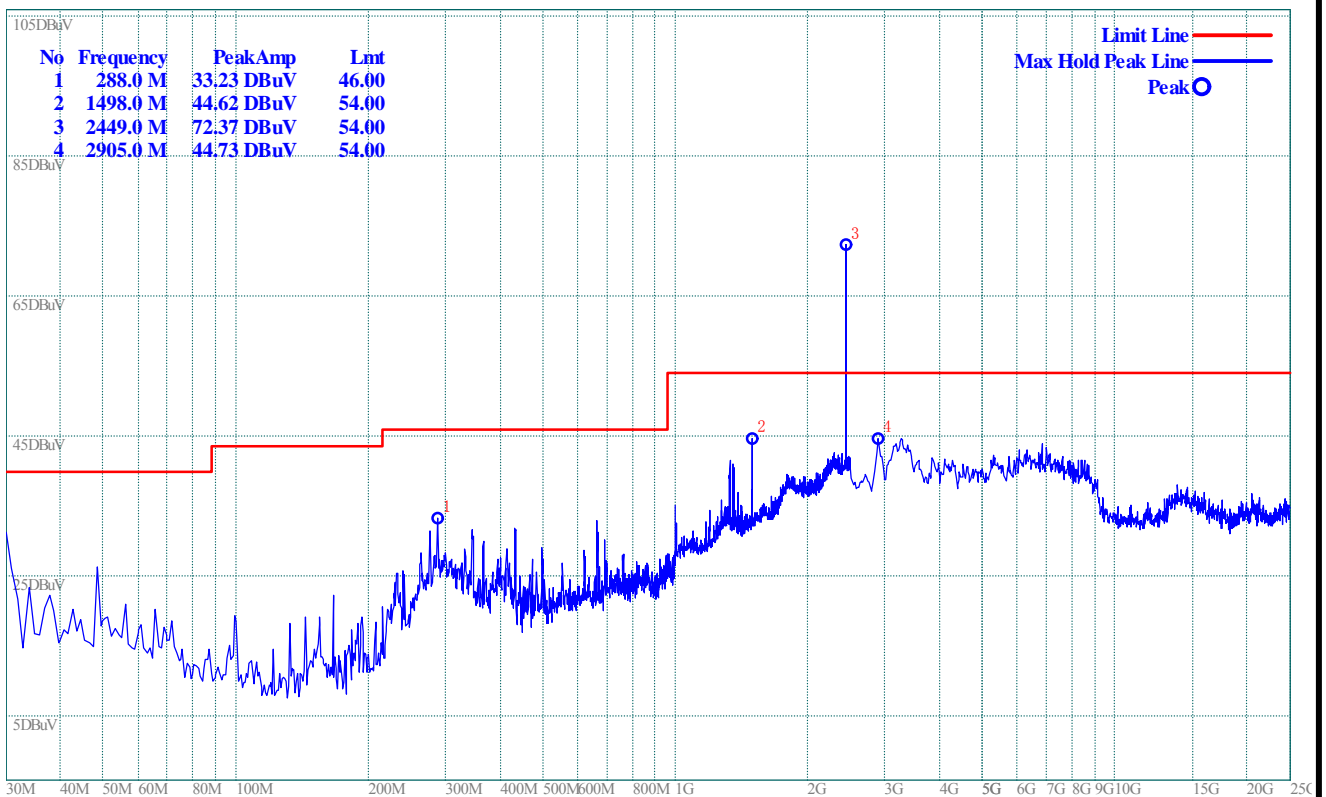


(Plot A.3: Antenna Vertical, 30MHz to 25GHz)

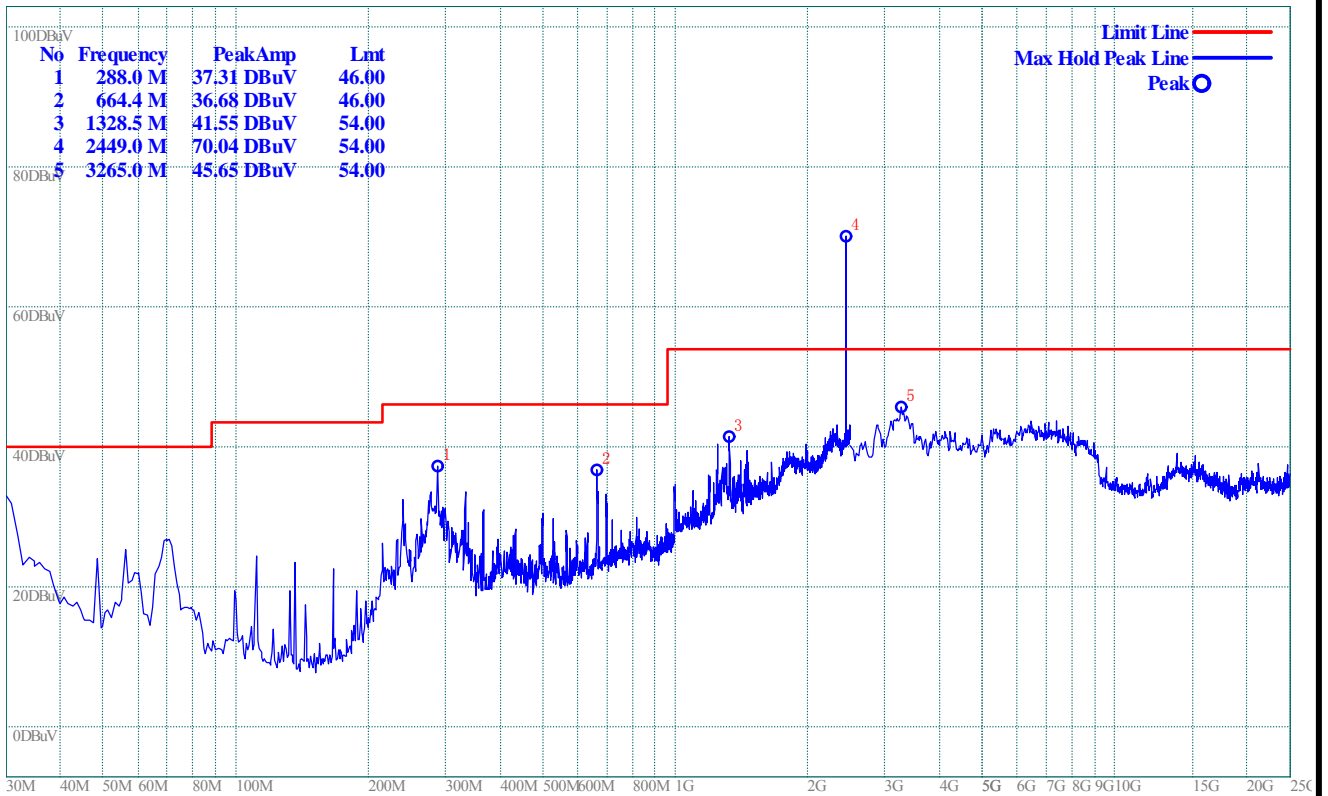
Plot for Channel = 48



(Plot B.1: 9kHz to 30MHz)

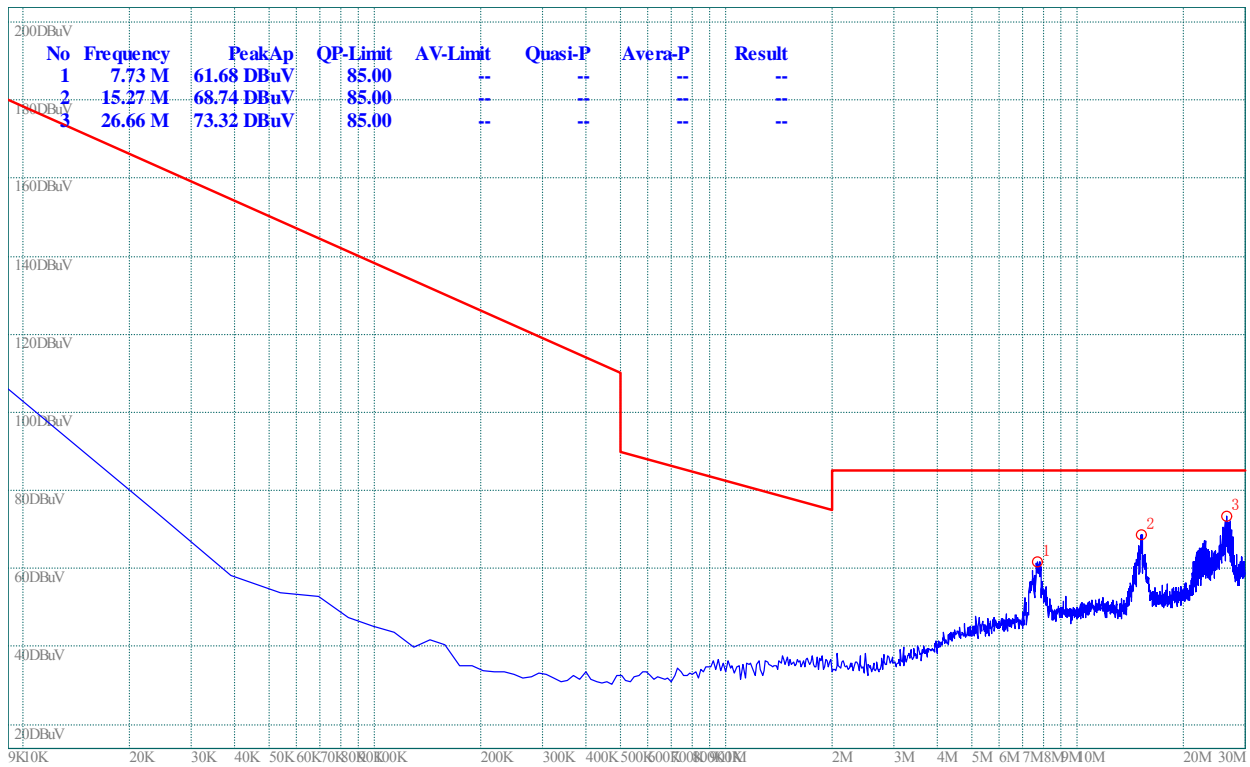


(Plot B.2: Antenna Horizontal, 30MHz to 25GHz)

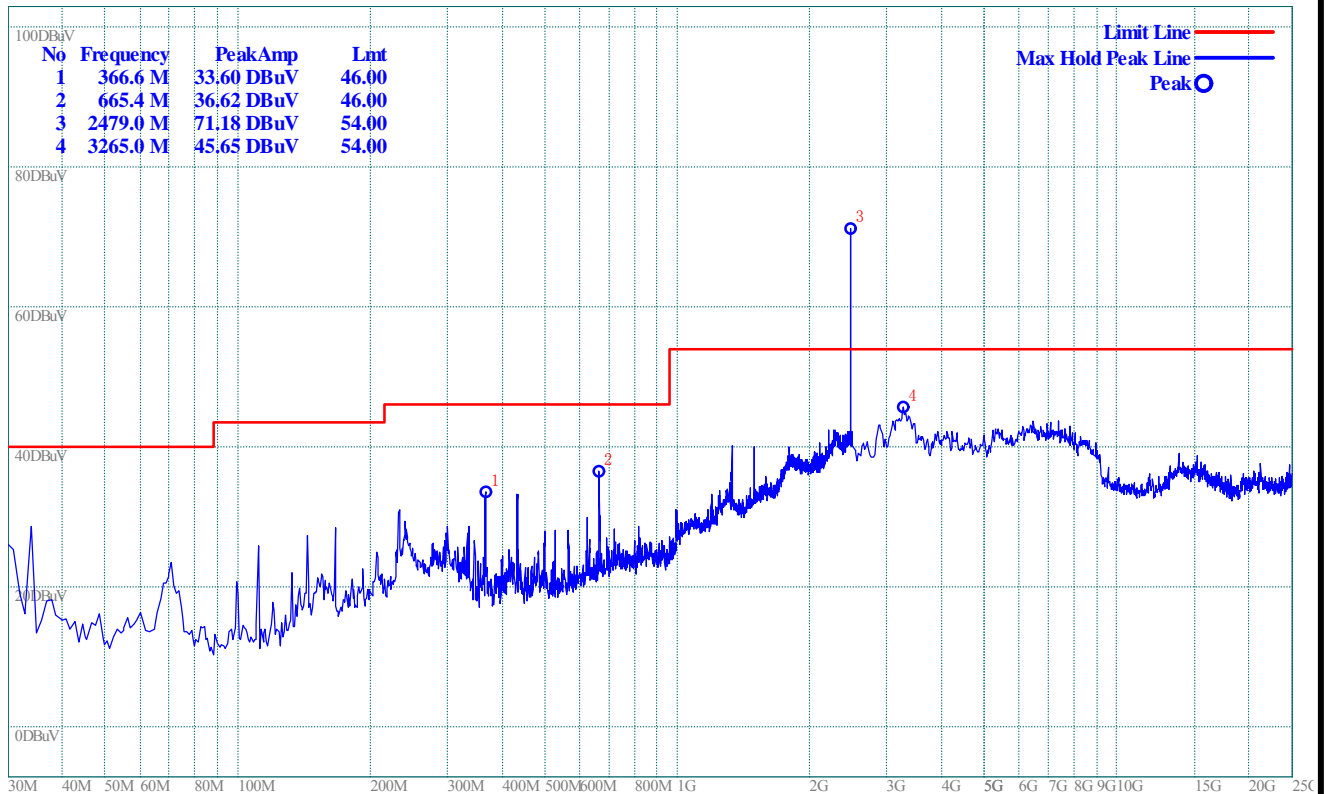


(Plot B.3: Antenna Vertical, 30MHz to 25GHz)

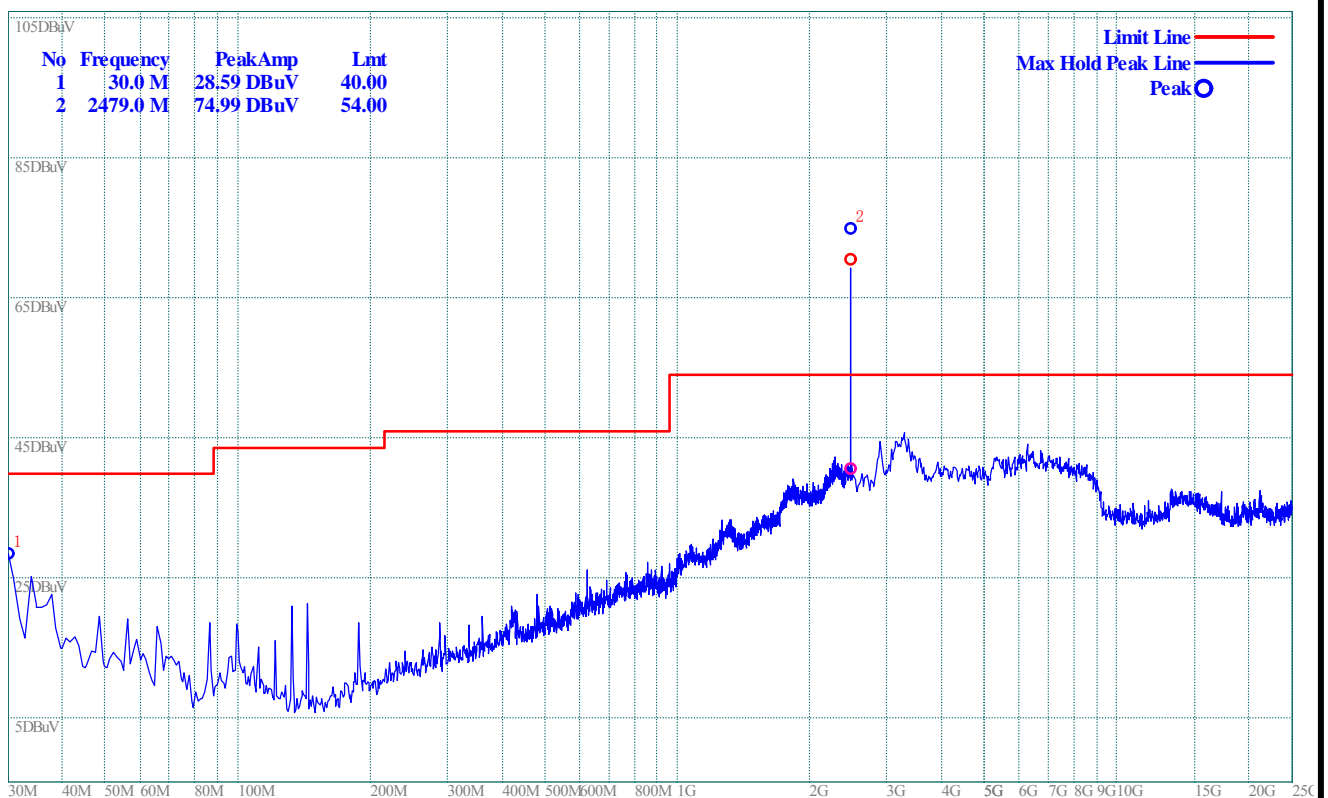
Plot for Channel = 78



(Plot C.1: 9kHz to 30MHz)



(Plot C.2: Antenna Horizontal, 30MHz to 25GHz)



(Plot C.5: Antenna Vertical, 30MHz to 25GHz)

** END OF REPORT **