

47 CFR PART 15 SUBPART C

TEST REPORT

of

RFID active tag

Trade Name: CSL
Brand Name: CSL
Model Name: CS506
Report No.: SZ10070083E01
FCC ID.: UB4CS506

prepared for

Convergence Systems Ltd.

20/F, Chung Nam Building, No.1 Lockhard Road, Hong Kong

prepared by
Shenzhen Morlab Communications Technology Co., Ltd.

Morlab Laboratory

3/F, Electronic Testing Building, Shahe Road, Xili,
Nanshan District, Shenzhen, 518055 P. R. China

Tel: +86 755 86130398

Fax: +86 755 86130218



Bluetooth

CTIA

Authorized Test Lab

LAB CODE 20081223-00

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1. TEST CERTIFICATION

Equipment under Test: RFID active tag

Brand Name: CSL

Model Name: CS506

FCC ID: UB4CS506

Applicant: Convergence Systems Ltd.

20/F, Chung Nam Building, No.1 Lockhard Road, Hong Kong

Manufacturer: Nam Tai Electronics(Shenzhen) Co. Ltd.

No.38 Luogang Road, Luogang Industrial Zone, Bu Ji, Shen Zhen, China

Test Standards: 47 CFR Part 15 Subpart C

Test Date(s): December 20, 2010 – December 27, 2010

Test Result: PASS

* We Hereby Certify That:

The equipment under test was tested by Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory. The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the requirement of related FCC rules.

The test results of this report only apply for the tested sample equipment identified above. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

Tested by:


Cao Shaodong

Dated:

2011.1.14

Reviewed by:


Huang Pulong

Dated:

2011.1.14

Approved by:


Zeng Dexin

Dated:

2011.1.14



2. GENERAL INFORMATION

2.1 EUT Description

EUT Type: RFID active tag
Model Name: CS506
Serial No.....: (n.a, marked #1 by test site)
Hardware Version: v2.4
Software Version: v66
Modulation Type.....: Chirp Spread Spectrum(CSS)
Frequency: The frequency block is 2400MHz to 2483.5MHz.
Power Supply: The power is provided via the SDIO interface of platform(such as a PDA).

Note 1: The EUT is an active RFID tag operating in the 2.4GHz band. The power is provided via the SDIO interface of platform(such as a PDA). The only one channel number of the Module used and tested in this report .

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

2.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Wi-Fi, 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	15.247(b)	Peak Output Power	PASS
2	15.247(a)	Bandwidth	PASS
3	15.247(c)	Conducted Spurious Emission	PASS
4	15.247(c)	Band Edge	PASS
5	15.207	Conducted Emission	PASS
6	15.209 15.247(c)	Radiated Emission	PASS
7	15.247(d)	Power spectral density (PSD)	PASS

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.4 2003.

2.3 Facilities and Accreditations

2.3.1 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 L1659.

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.

2.3.2 Test Environment Conditions

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

Temperature (°C):	20 - 25
Relative Humidity (%):	40 - 60
Atmospheric Pressure (kPa):	96

3. 47 CFR PART 15C REQUIREMENTS

3.1 Peak Output Power

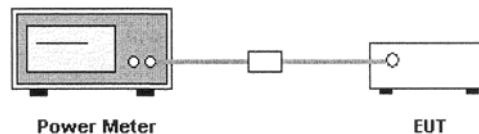
3.1.1 Requirement

According to FCC section 15.247(b)(1), for digital modulation systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other digital modulation systems in the 2400MHz to 2483.5MHz band, it is 1 Watts.

3.1.2 Test Description

The measured output power was calculated by the reading of the Power Meter and calibration.

A. Test Setup:



The power of the EUT is provided via the SDIO interface of platform(such as a PDA), is coupled to the Power Meter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

3.1.3 Test Result

The EUT operates at continuous transmit mode. The 1 channel is selected to perform testing to verify the conducted RF output peak power of the Module.

3.1.3.1 Test mode

A. Test Verdict:

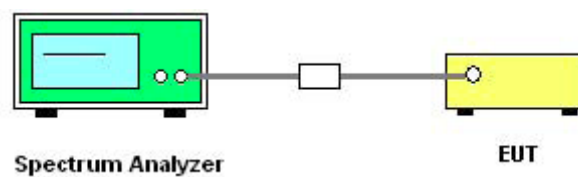
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2440	12.90	0.02	30	1	PASS

3.2 Bandwidth

3.2.1 Definition

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.

3.2.2 Test Description



The power of the EUT is provided via the SDIO interface of platform(such as a PDA); the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

3.2.2.1 Test Result

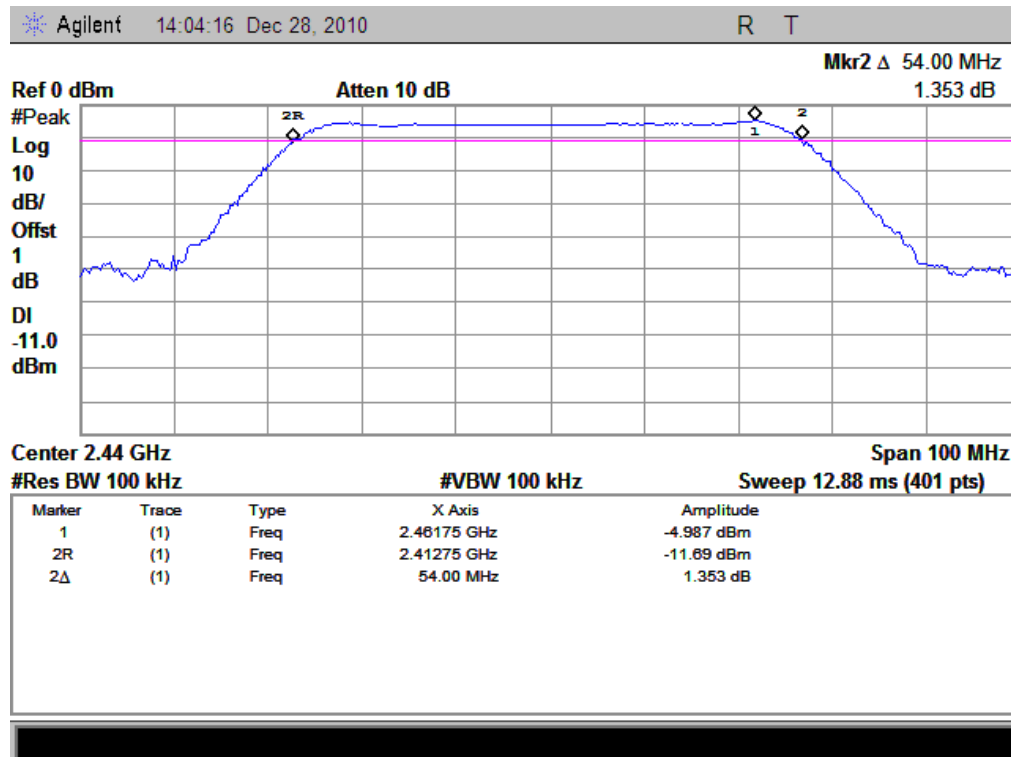
The 1 channel is selected to perform testing to record the 6 dB bandwidth of the Module.

3.2.3.1 Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits(kHz)	Result
1	2440	54.00	Plot A	≥ 500	PASS

B. Test Plot:



(Plot A: Channel 1: 2412MHz)

3.3 Conducted Spurious Emissions

3.3.1 Requirement

According to FCC section 15.247(c), 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.

3.3.2 Test Description

See section 3.1.2 of this report.

3.3.3 Test Result

The EUT operates at continuous transmit mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The 1 channel is tested to verify the spurious emissions.

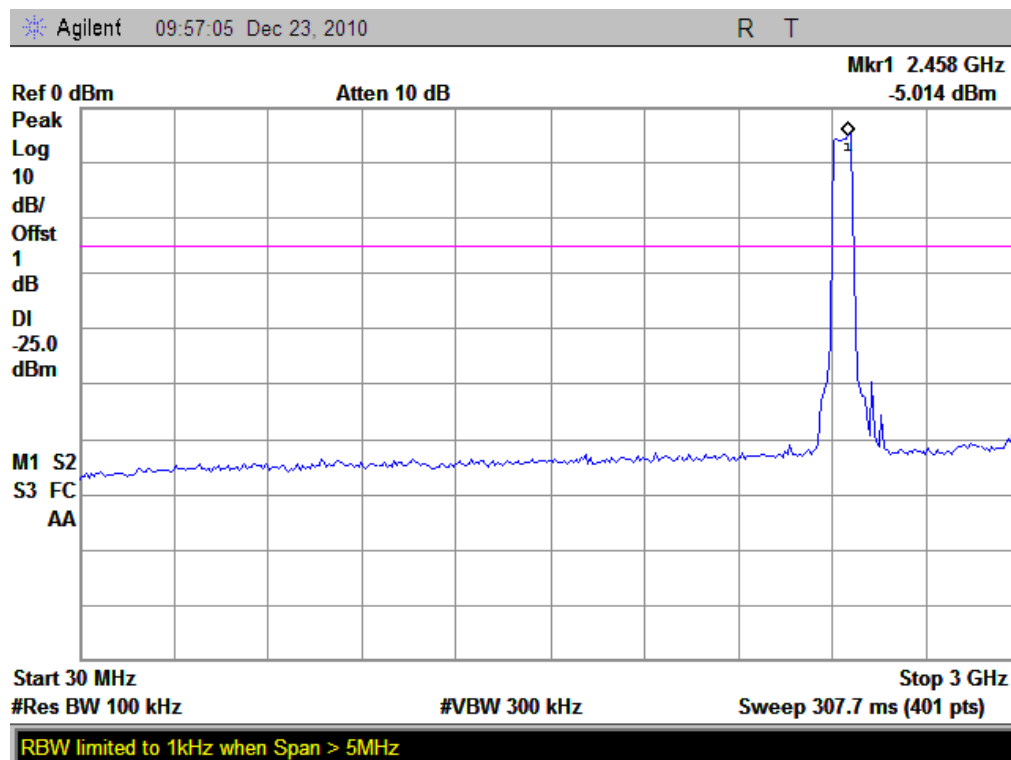
3.3.3.1 Test mode

A. Test Verdict:

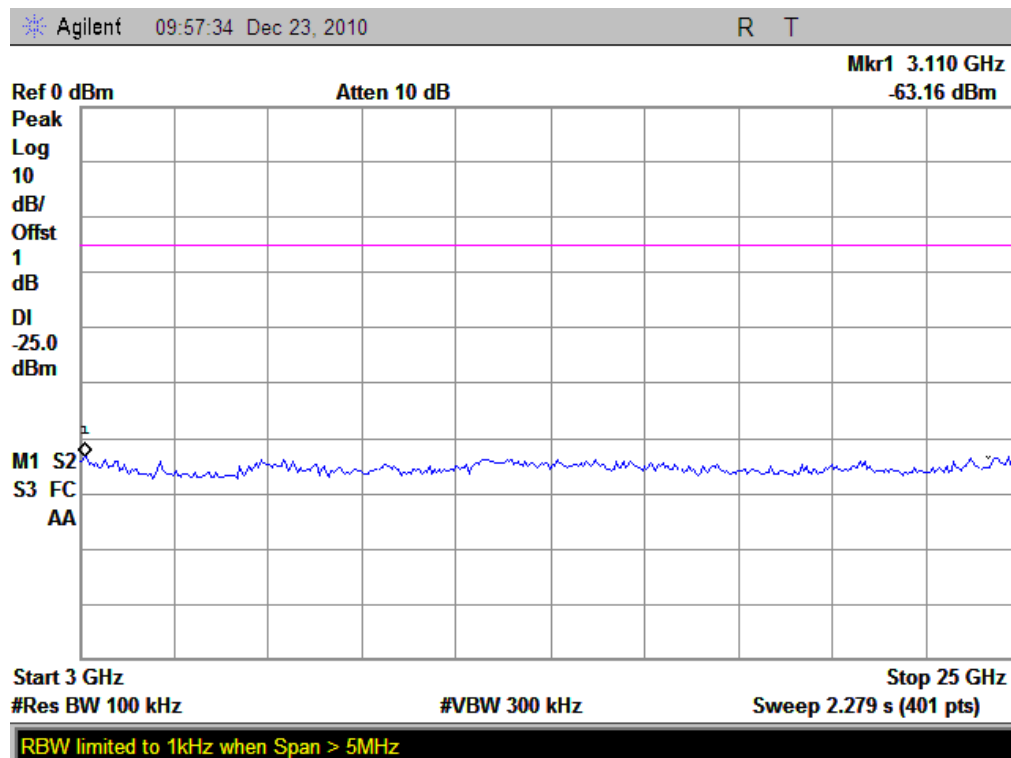
Channel	Frequency (MHz)	Measured Out of Band Emission (dBm)	Max. Band	Refer to Plot	Limit (dBm)		Verdict
					Carrier Level	Calculated -20dBc Limit	
1	2440	-63.16		Plot A.1/A.2	-5.014	-25	PASS

B. Test Plot:

Note: the power of the Module transmitting frequency should be ignored.



(Plot A.1: Channel = 1, 30MHz to 3GHz)



(Plot A.2: Channel = 1, 3GHz to 25GHz)

3.4 Power spectral density (PSD)

3.4.1 Requirement

According to FCC section 15.247(d), the same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used.

3.4.2 Test Description

See section 3.2.2 of this report.

3.4.3 Test Result

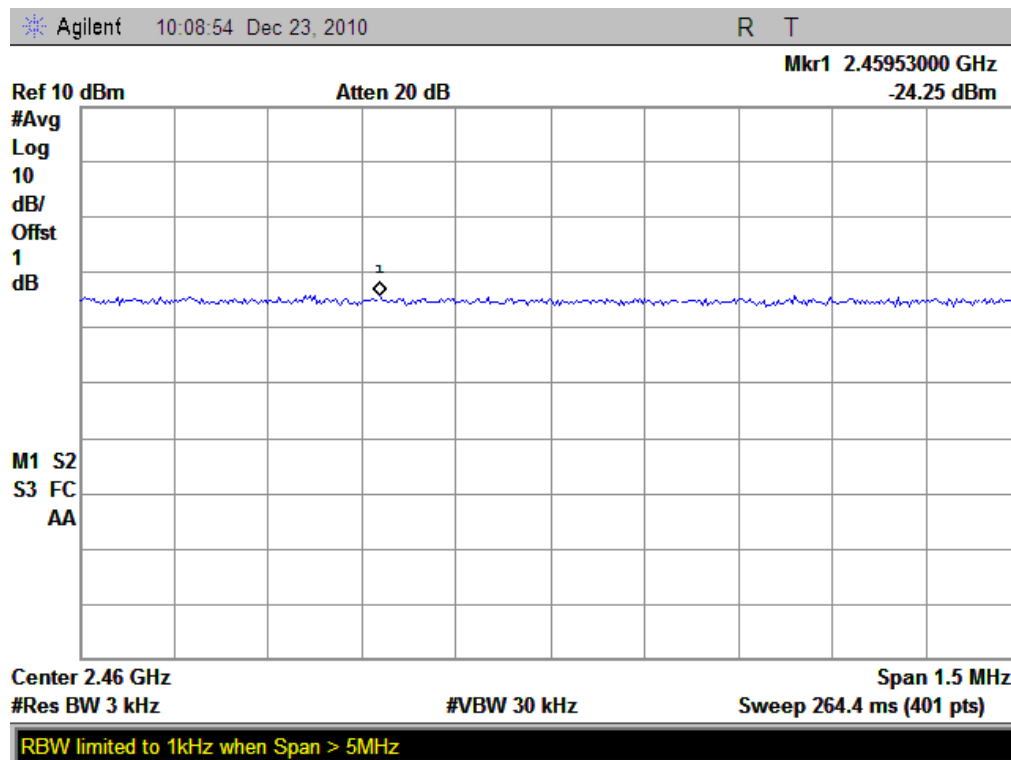
The 1 channel is tested to verify the band edge emissions.

3.4.3.1 Test mode

A. Test Verdict:

Spectral power density (dBm/MHz)			
Channel	Frequency	Test Result	Test plot
1	2440	-24.25	Plot A
Measurement uncertainty: $\pm 1.3\text{dB}$			

Test Plot:



(Plot A: Channel = 1)

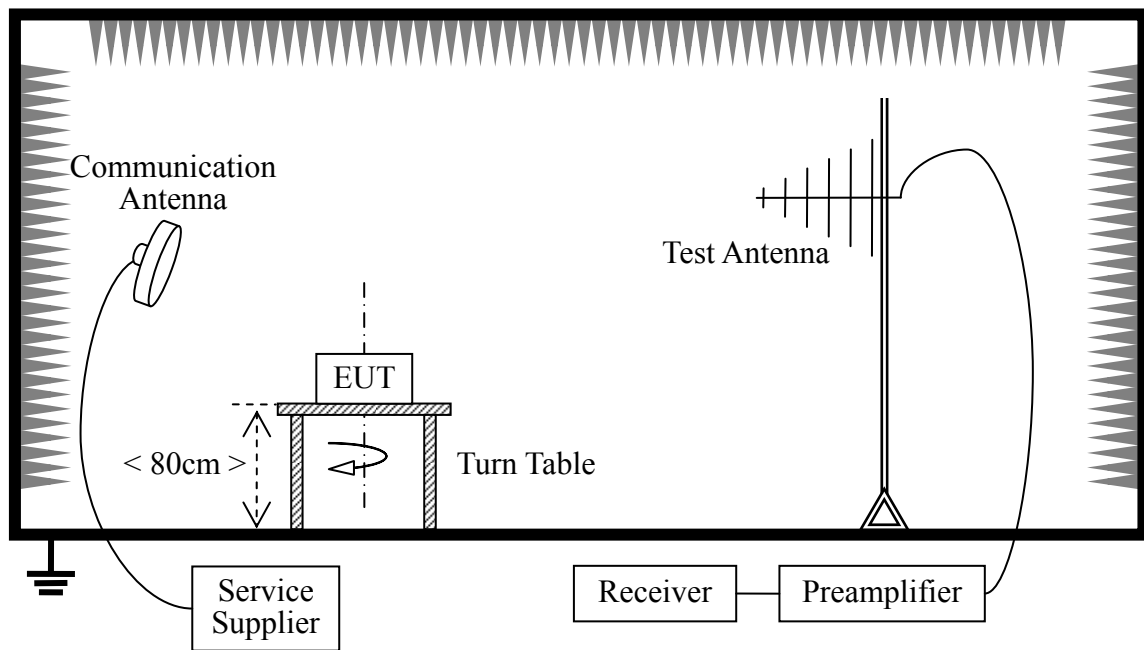
3.5 Band Edge

3.5.1 Requirement

According to FCC section 15.247(c), 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.

3.5.2 Test Description

A. Test Setup



The power of the EUT is provided via the SDIO interface of platform(such as a PDA). 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
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Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2009.9	2year
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2009.8	2year
Test Antenna	Schwarzbeck	BBHA 9120C	9120C-384	2009.8	2year

3.5.3 Test Result

The EUT operates at continuous transmit mode. The 1 channel is tested to verify the band edge emissions.

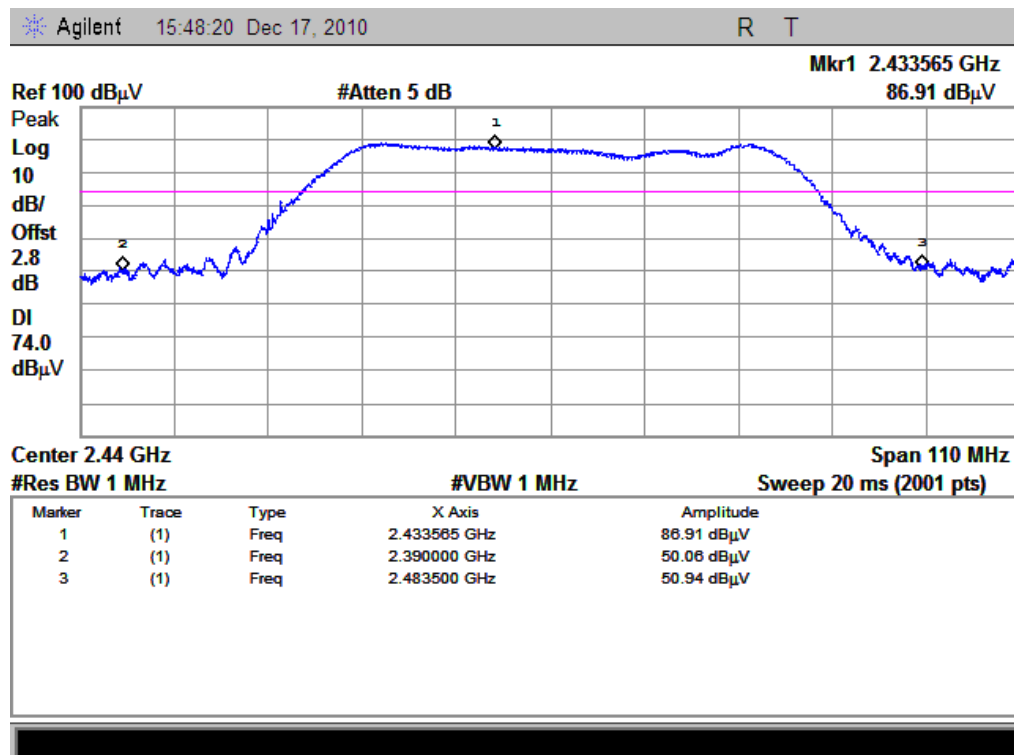
3.5.3.1 Test mode

The 1 channel is tested to verify the band edge emissions.

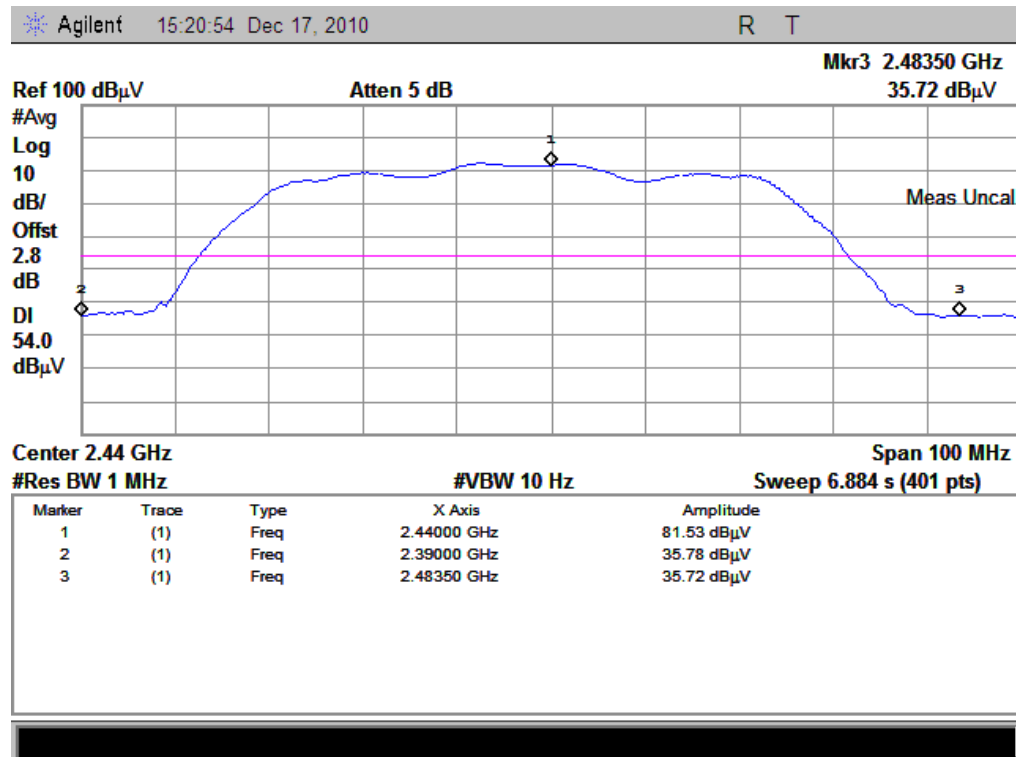
A. Test Verdict:

Channel	Frequency (MHz)	Max. Emission in the Restricted Bands (dB μ V/m)		Limit (dB μ V/m)		Verdict
		PK	AV	PK	AV	
1	2440	50.06	35.78	74	54	PASS

B. Test Plot:



(Plot A1: Channel = 1 PEAK)



(Plot A2: Channel = 1 AVG)

3.6 Conducted Emission

3.6.1 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).

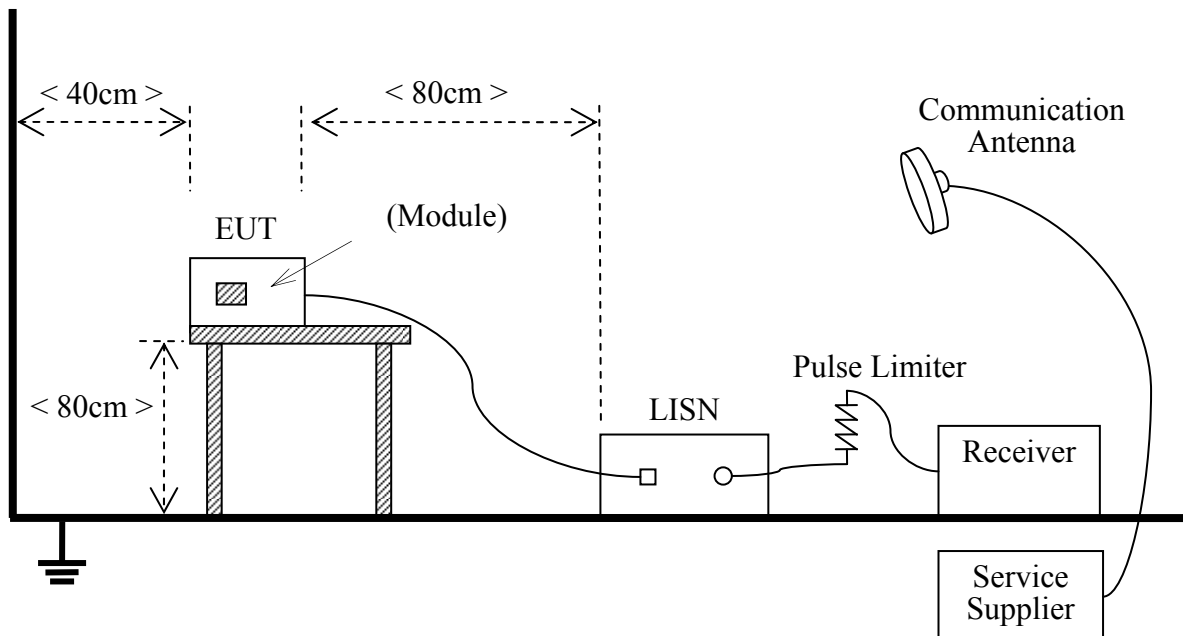
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

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

3.6.2 Test Description

A. Test Setup:



The power of the EUT is provided via the SDIO interface of platform(such as a PDA). The PDA 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 programmed to be in

continuously transmit mode.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2009.07	2year
LISN	Schwarzbeck	NSLK 8127	812744	2009.08	2year
Service Supplier	R&S	CMU200	100448	2009.10	2year
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)

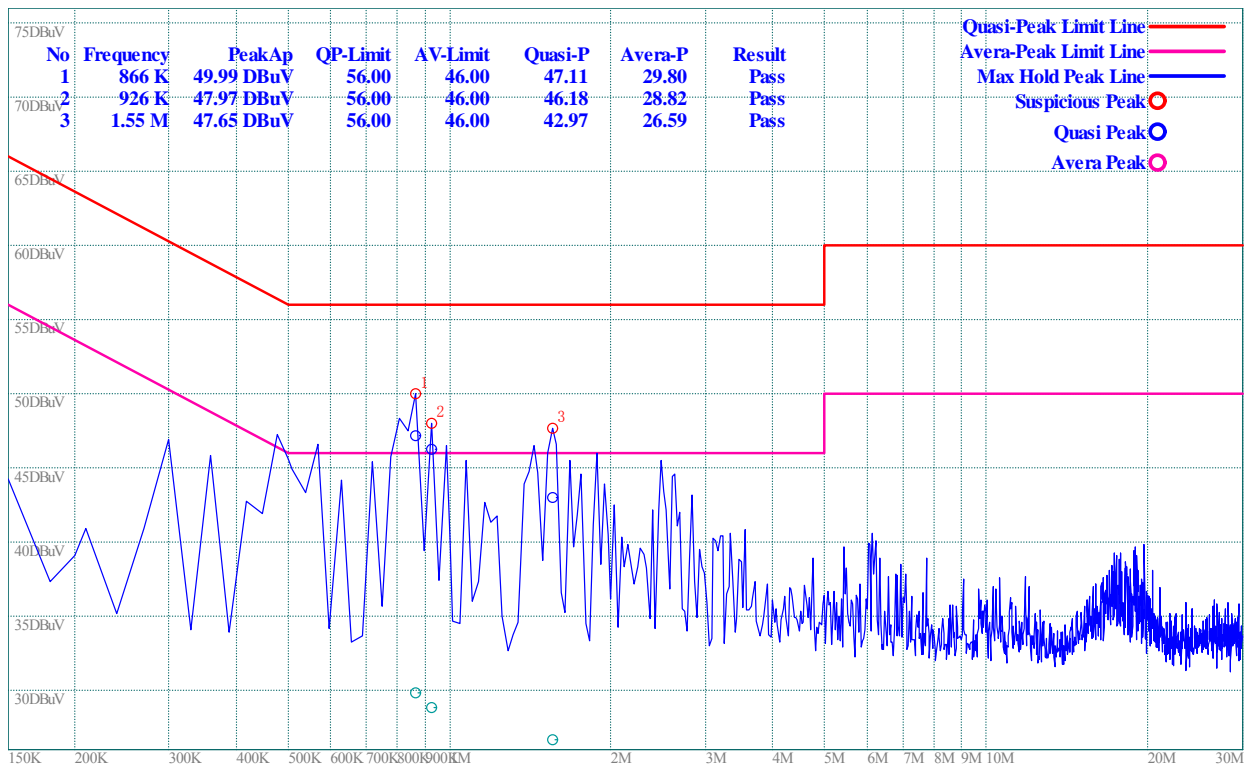
3.6.3 Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; 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.

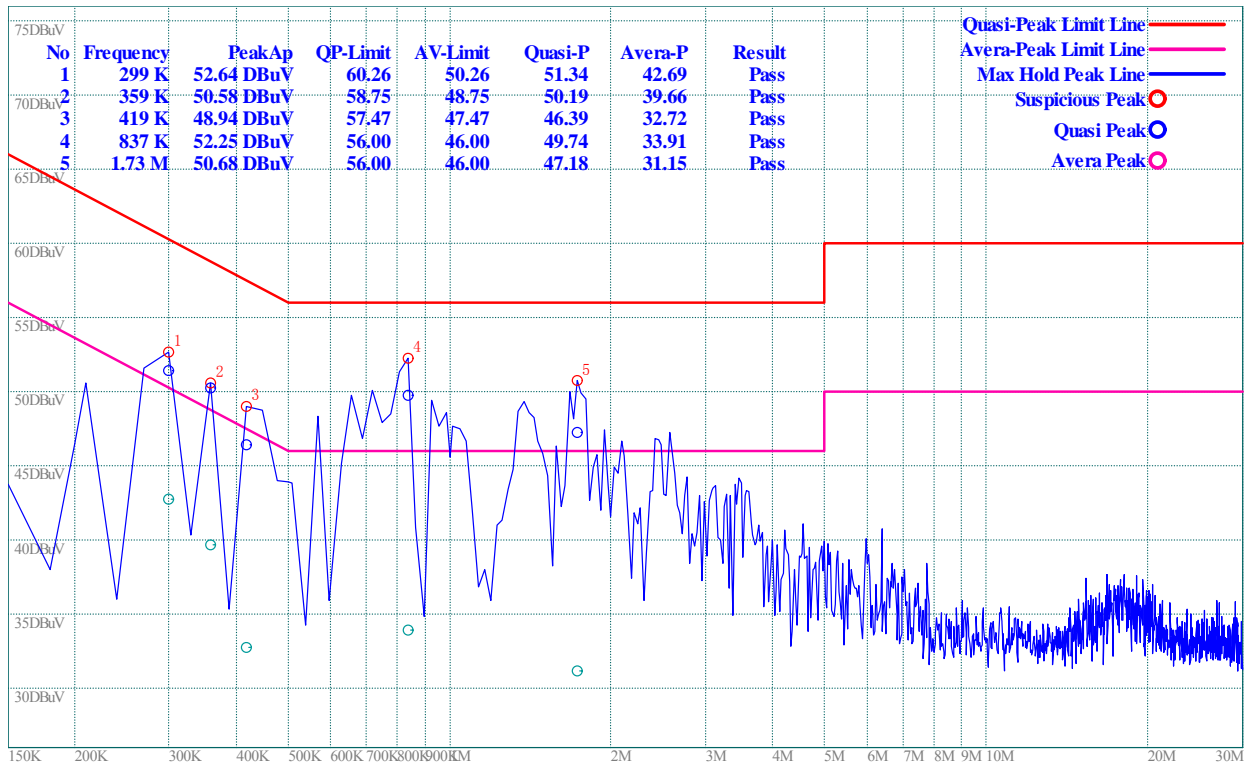
3.6.3.1 Test mode

A. Test setup: The EUT configuration of the emission tests is EUT + PDA + AC Adapter.

B. Test Plot:



(Plot A: L Phase)



(Plot B: N Phase)

3.7 Radiated Emission

3.7.1 Requirement

According to FCC section 15.247(c), 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).

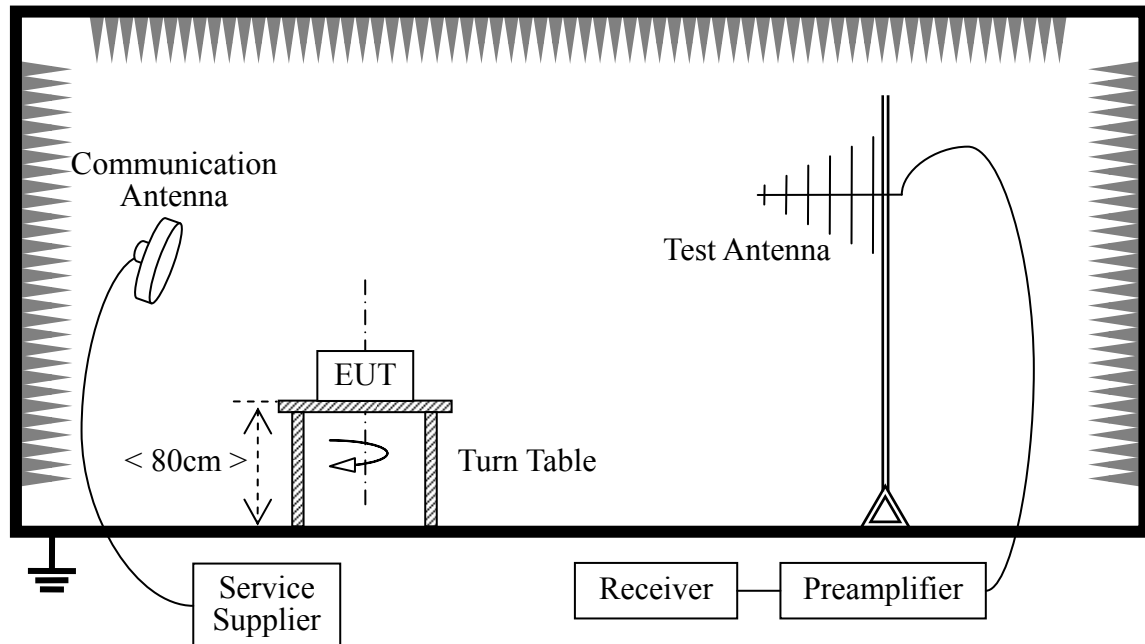
According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

3.7.2 Test Description

A. Test Setup:



The power of the EUT is provided via the SDIO interface of platform(such as a PDA). The PDA 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 programmed to be in continuously transmit mode.

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	2009.10	2year
Receiver	Agilent	E7405A	US44210471	2009.07	2year
Semi-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2009.08	2year
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2009.07	2year
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2009.07	2year

3.7.3 Test Result

3.7.3.1 Test mode

The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors.

A. Test Verdict for Harmonics:

The Fundamental Emissions

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

Channel	Frequency (MHz)	Fundamental Emission (dB μ V/m)		Antenna Polarization	Refer to Plot
		PK	AV		
1	2440	94.4	88.3	Horizontal	Plot A.3
		91.7	86.5	Vertical	Plot A.6

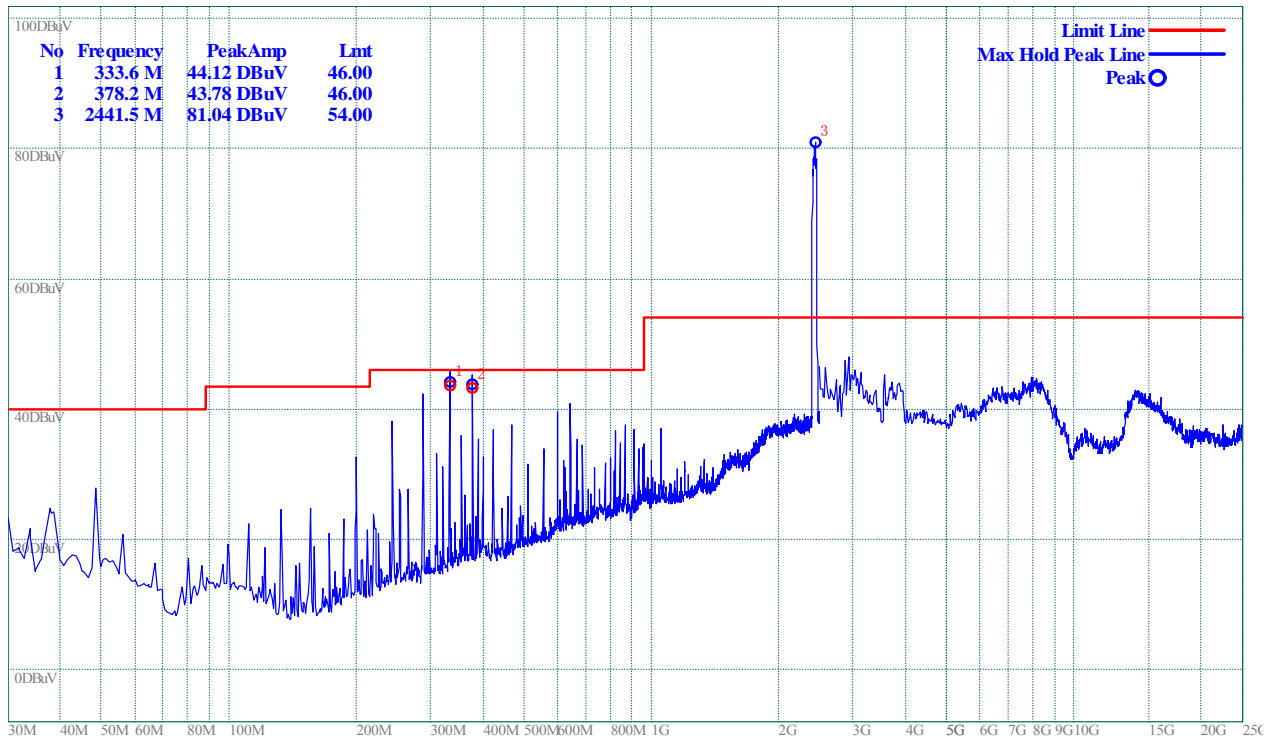
Also refer to following plots for the emissions falling in the restricted bands.

B. Test Plot for the Whole Measurement Frequency Range:

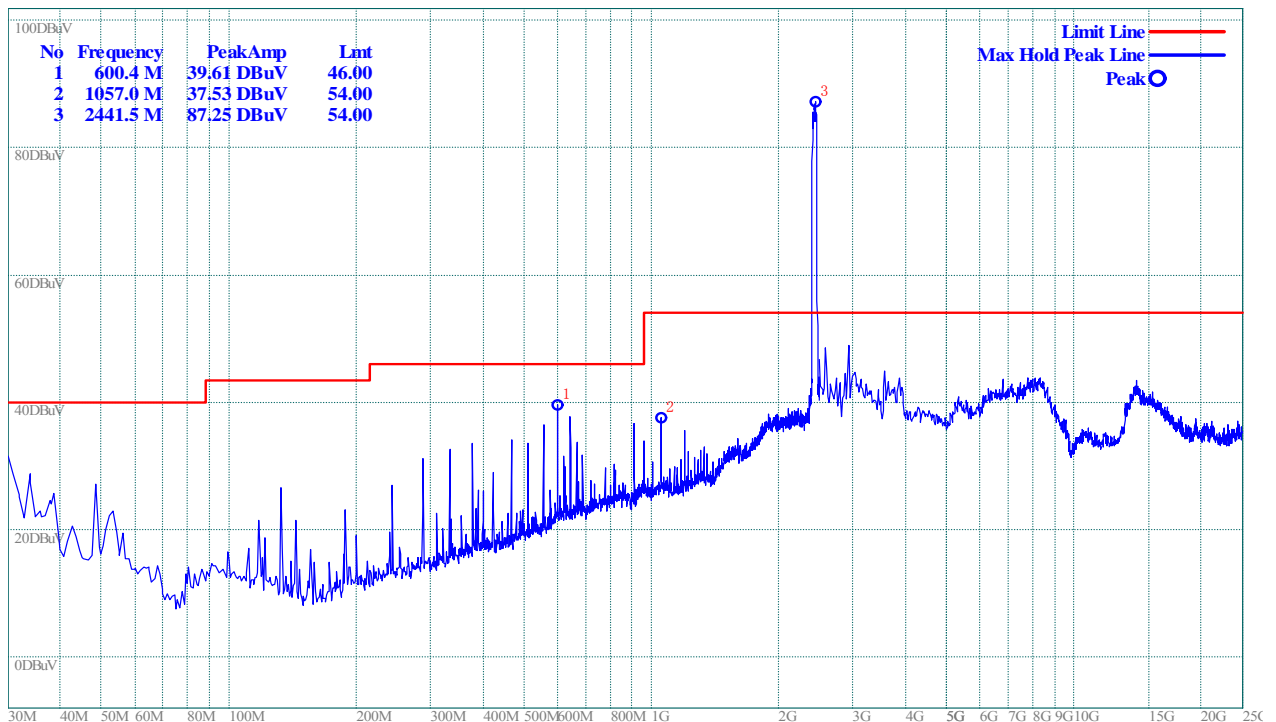
Plots for Channel = 1



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



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



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

** END OF REPORT **