FCC TEST REPORT

Issued to

CONVERGENCE SYSTEMS LIMITED

For

RFID Reader

Model Name:	CS469-2
Trade Name:	CSL
Brand Name:	CSL
FCC ID:	UB4CS469C1GEN2
Standard:	47 CFR Part 15 Subpart B
Test date:	November 11, 2013 – November 22, 2013
Issue date:	December 31, 2013

By

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Date 2013.12.31	*Date* 2013.12.31	*Date* 2013.12.31

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Change History		
Issue	Date	Reason for change
1.0	December 31, 2013	First edition

1. GENERAL INFORMATION

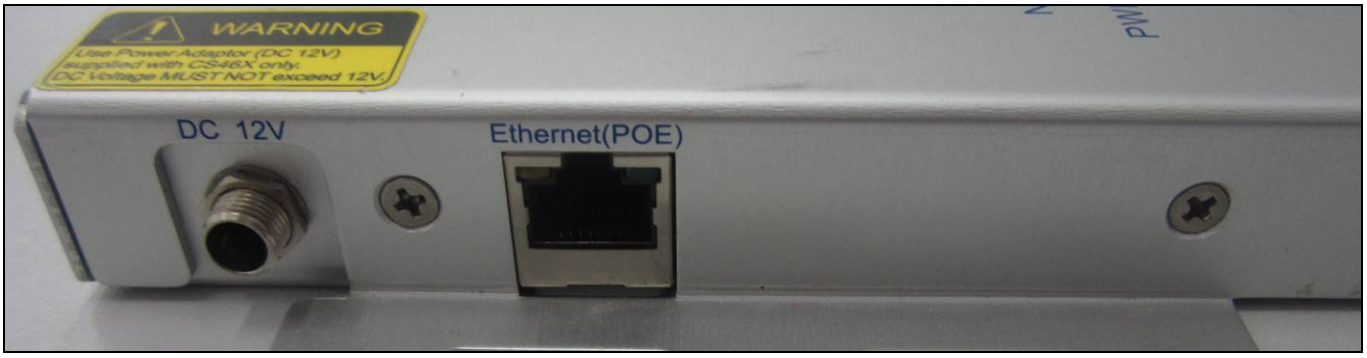
1.1 EUT Description

EUT Type:	RFID Reader
Serial No:	(n.a., marked #1 by test site)
Hardware Version:	3.0
Software Version:	1.5.20
Applicant:	CONVERGENCE SYSTEMS LIMITED 20/F, Chung Nam Building, No.1 Lockhart Road, Wanchai, Hong Kong
Manufacturer:	DongGuan DongHongXingYe Electronics Science and Technology Limited 1 Jianxiang Street, Hanxishui, Chashan Town Dongguan, Guangdong, China

Ancillary Equipment:	**AC Adapter**	
	Brand Name:	Yunsheng
	Model No.:	YS04-120250D
	Serial No.:	(n.a. marked #1 by test site)
	Rated Input:	~ 100-240V, 1000mA, 50/60Hz
	Rated Output:	⎓ 12V, 2500mA, 30W

NOTE:

1. The EUT is a RFID Reader which supports 902~928MHz ISM band, the ports of the EUT are shown as follow:



2. Please refer to Annex A for the photographs of the EUT. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15(10-1-12 Edition)	Radio Frequency Devices

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

No.	Section	Description	Result
1	15.107	Conducted Emission	PASS
2	15.109	Radiated Emission	PASS

NOTE: The tests were performed according to the method of measurements prescribed in ANSI C63.4-2009.

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 FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China 518101. The test site is constructed in conformance with the requirements of ANSI C63.4-2009 and CISPR Publication 22:2008; the FCC registration number is 695796.

1.3.2 Facilities

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

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

1.3.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:	±1.8dB
Uncertainty of Radiated Emission:	±3.1dB

2. TEST CONDITIONS SETTING

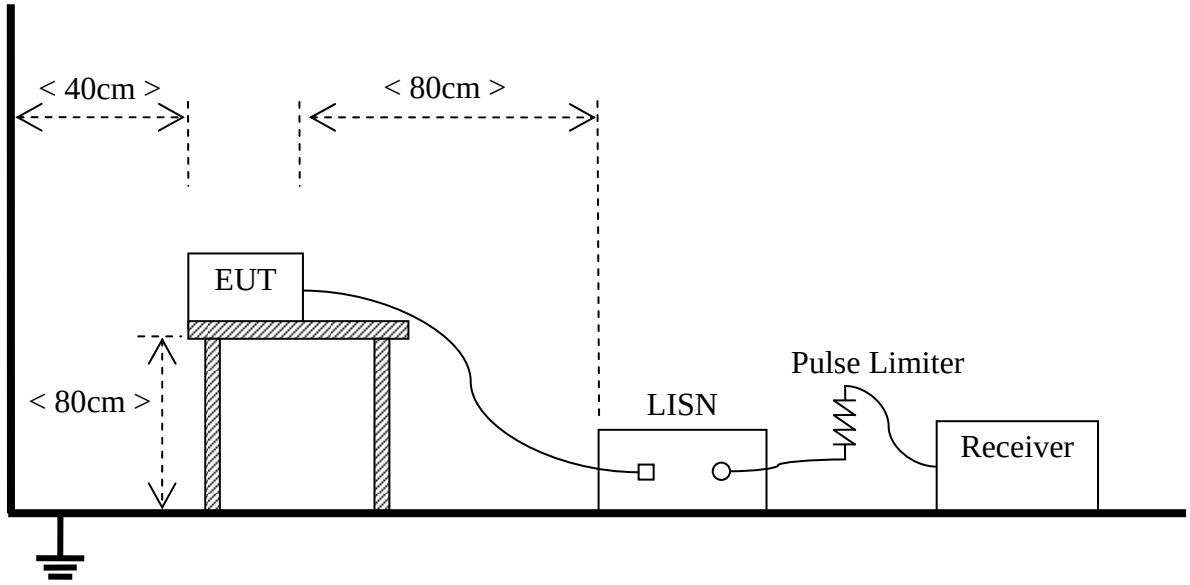
2.1 Test Mode

1	**The first test mode (Ethernet)**
	The EUT configuration of the emission tests is EUT + Adapter + PC+ Printer. During the measurement, the EUT was powered by its adapter and connected with a PC via the Ethernet port, the data is transmitting between the PC and the EUT, the EUT was kept working normally as a unintentional device.
2	**The second test mode (USB)**
	The EUT configuration of the emission tests is EUT + Adapter + PC+ Printer. During the measurement, the EUT was powered by its adapter and connected with a PC via the Mini USB port, the data is transmitting between the PC and the EUT, the EUT was kept working normally as a unintentional device.
Note: All test modes are performed, only the worst case(Ethernet) is recorded in this report.	

2.2 Test Setup and Equipments List

2.2.1 Conducted Emission

A. Test Setup:



The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50Ω/50μH of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

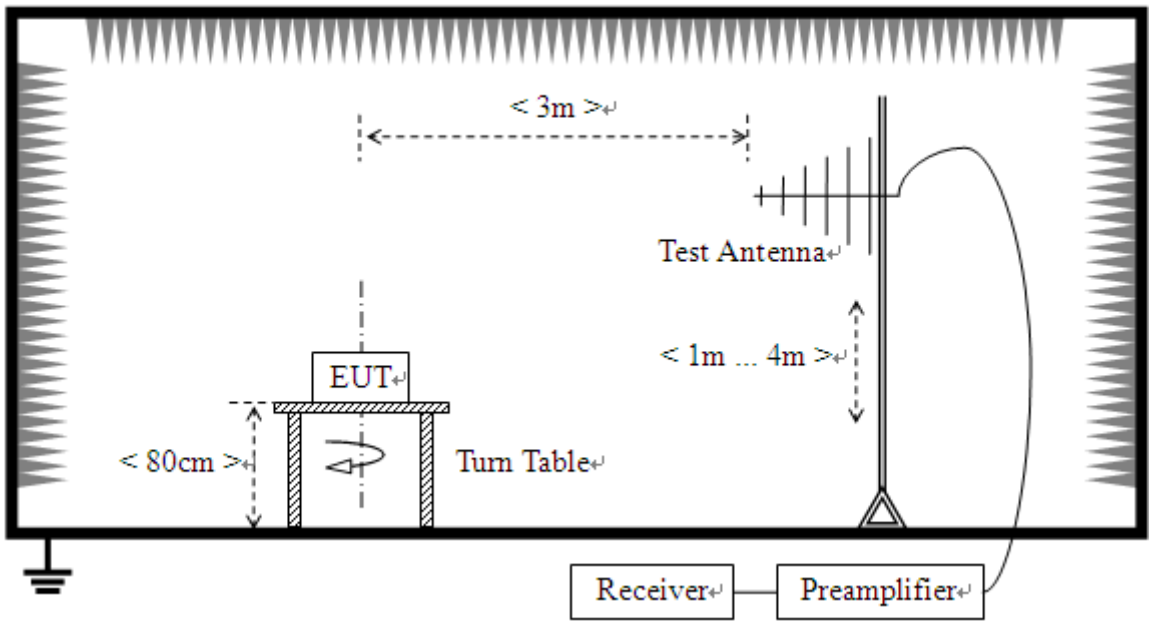
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Due. Date
Receiver	Narda	PMM 9010	595WX11007	12/11/2013	11/11/2014
EMC Analyzer	Agilent	E7405A	US44210471	12/05/2013	11/05/2014
LISN	Schwarzbeck	NSLK 8127	812744	12/05/2013	11/05/2014
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)
System Simulator	Agilent	E5515C	GB43130131	12/05/2013	11/05/2014
PC	Lenovo	ThinkPadT61	ZZF3077	(n.a.)	(n.a.)
Printer	Canon	iP2780	QC3-2772-DB01	(n.a.)	(n.a.)

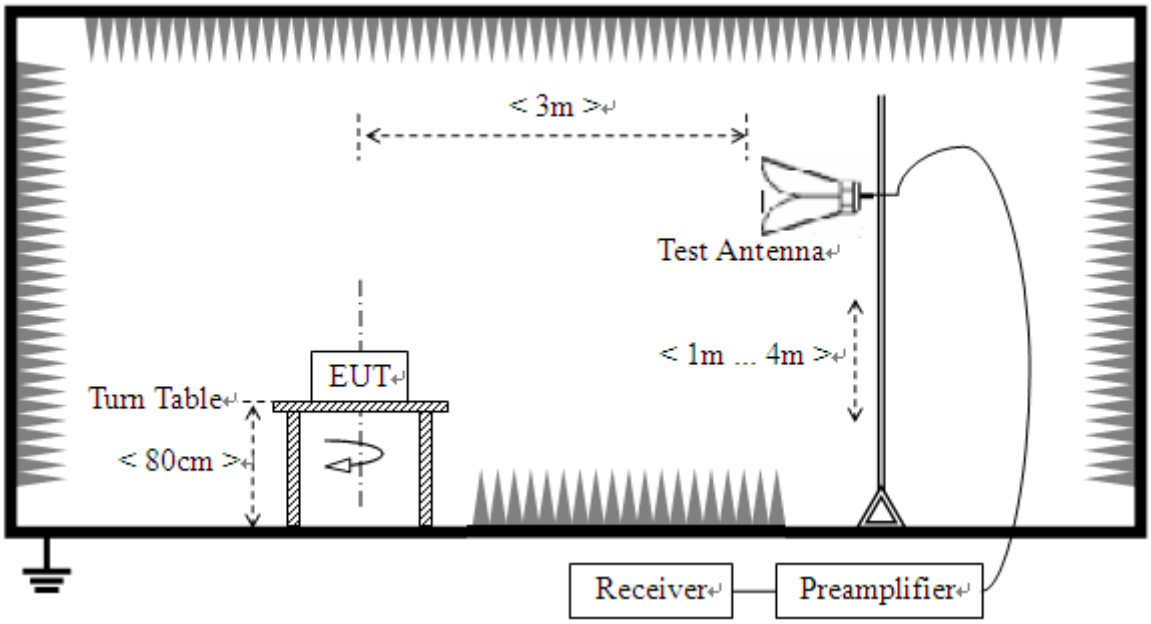
2.2.2 Radiated Emission

A. Test Setup:

1) For radiated emissions from 30MHz to1GHz



2) For radiated emissions above 1GHz



The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table,

and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

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	Due. Date
EMC Analyzer	Agilent	E7405A	US44210471	12/05/2013	11/05/2014
Semi-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	12/05/2012	11/05/2014
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	12/05/2012	11/05/2014
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	12/05/2012	11/05/2014
PC	Lenovo	ThinkPadT61	ZZF3077	(n.a.)	(n.a.)
Printer	Canon	iP2780	QC3-2772-DB01	(n.a.)	(n.a.)

3. 47 CFR PART 15B REQUIREMENTS

3.1 Conducted Emission

3.1.1 Requirement

According to FCC section 15.107, 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 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

a) The limit subjects to the Class B digital device.

b) The lower limit shall apply at the band edges.

c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

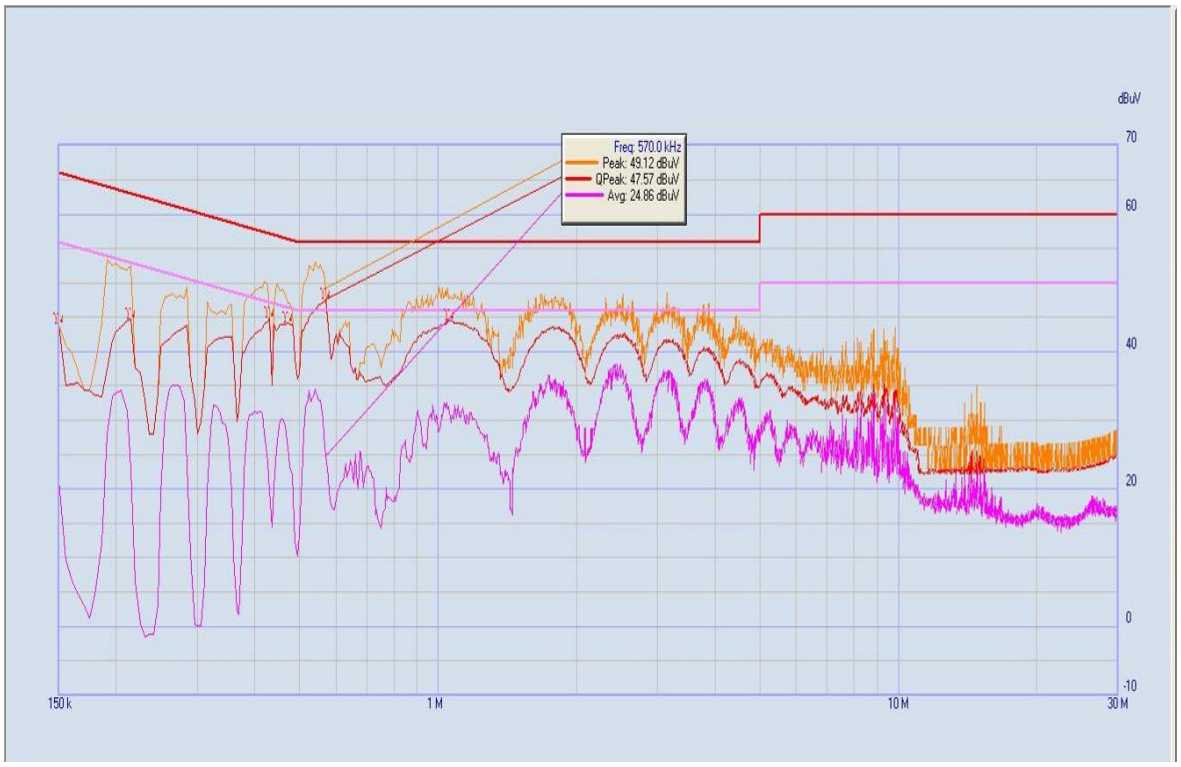
3.1.2 Test Description

See section 2.2.1 of this report.

3.1.3 Test Result

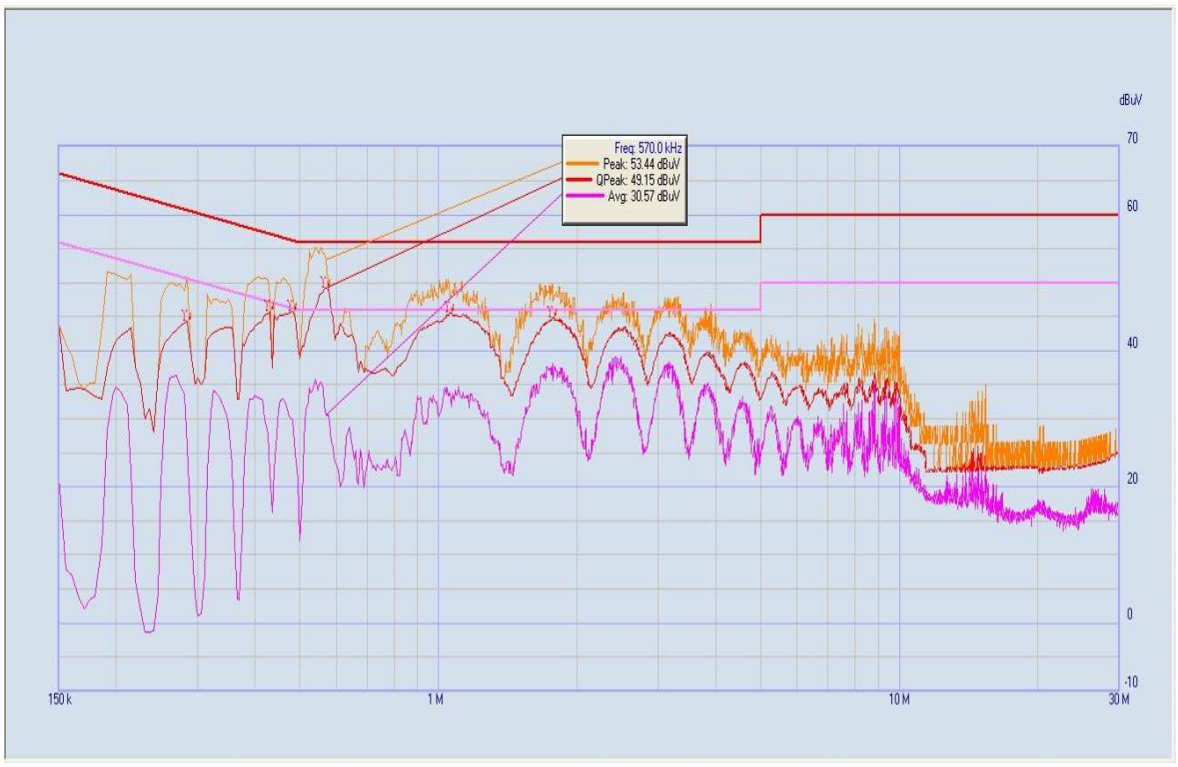
The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines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

A. Test Plot and Suspicious Points:



(Plot A: L Phase)

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.15	43.89	43.95	66.00	56.00	Line	PASS
2	0.215	44.77	30.02	64.14	54.14		PASS
3	0.43	44.79	26.34	58.00	48.00		PASS
4	0.47	44.11	22.51	56.86	46.86		PASS
5	0.57	47.57	24.86	56.00	46.00		PASS
6	1.06	44.48	21.15	56.00	46.00		PASS



(Plot B: N Phase)

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.19	41.58	33.14	64.86	54.86	Neutral	PASS
2	0.285	50.88	33.95	62.14	52.14		PASS
3	0.405	50.89	27.68	58.71	48.71		PASS
4	0.46	50.59	30.04	57.14	47.14		PASS
5	0.54	55.28	30.24	56.00	46.00		PASS
6	1.035	50.56	37.57	56.00	46.00		

Test Result: PASS

3.2 Radiated Emission

3.2.1 Requirement

According to FCC section 15.109(a), the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	μV/m	Dist	(μV/m)	(dBμV/m)
30.0 - 88.0	100	3m	100	20log 100
88.0 - 216.0	150	3m	150	20log 150
216.0 - 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

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.

Note:

1) The tighter limit shall apply at the boundary between two frequency range.
2) Limitation expressed in dBμV/m is calculated by 20log Emission Level(μV/m).
3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^{2.}$
   Example:
   F.S Limit at 30m distance is 30μV/m, then F.S Limitation at 3m distance is adjusted as
   $Ld1 = L1 = 30\mu V/m * (10)^2 = 100 * 30\mu V/m$

3.2.2 Test Description

See section 2.2.2 of this report.

3.2.3 Frequency range of measurement

Highest frequency generated or used in the device is the highest speed of the processor. According to 15.33(b)(1), the frequency range of radiated measurement for the EUT is listed in the following table:

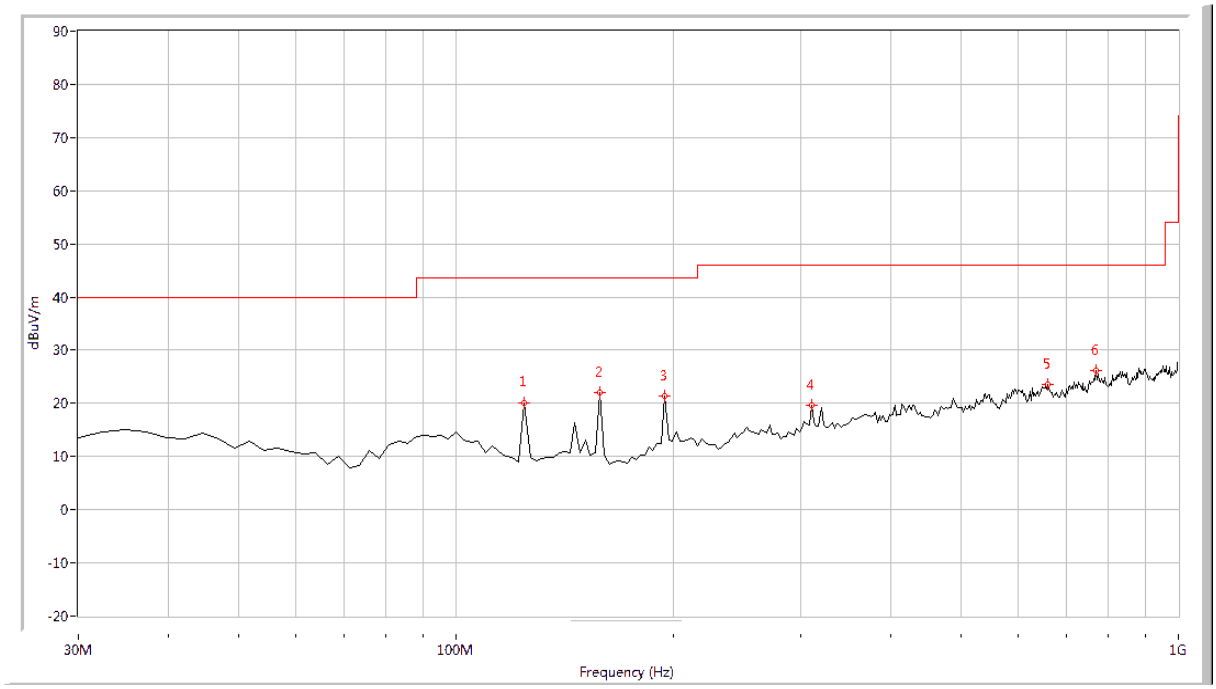
Frequency	Frequency generated or used in the device	Frequency range of radiated measurement in the report
Highest	48MHz	1GHz

3.2.4 Test Result

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. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

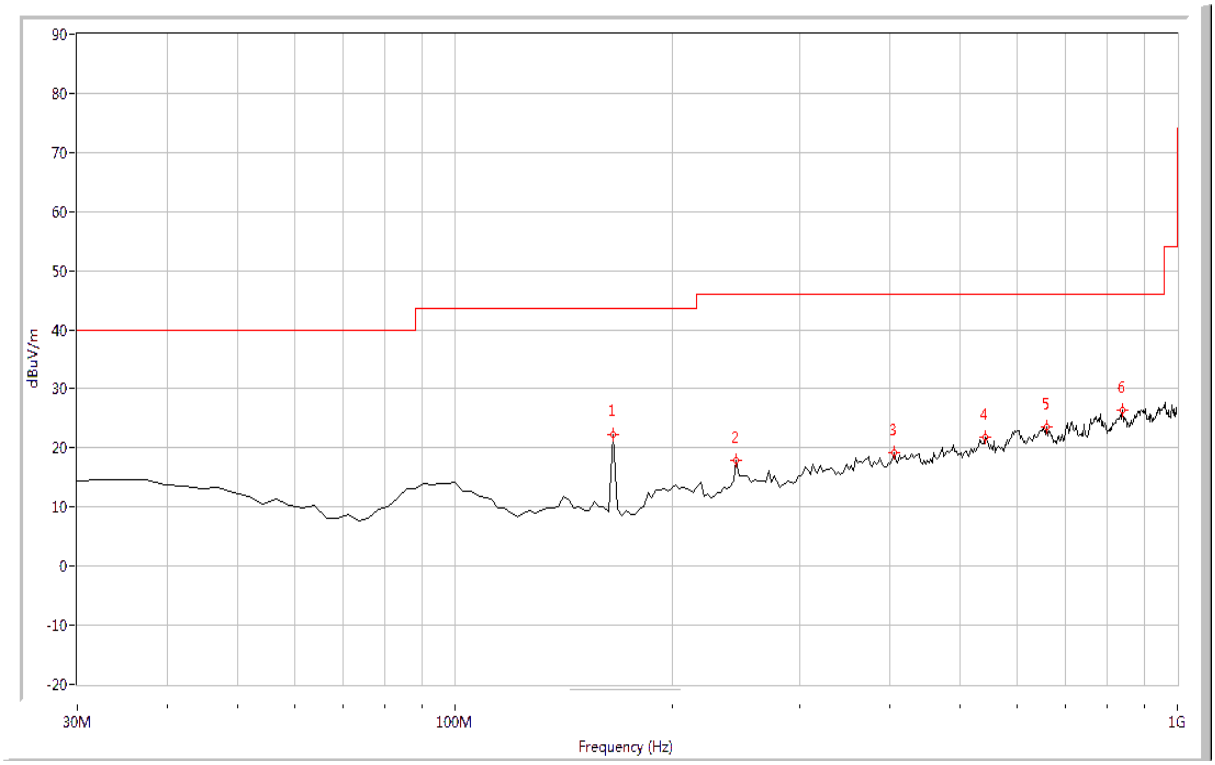
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

A. Test Plots and Suspicious Points:



(Plot A: 30MHz – 1GHz, Test Antenna Vertical)

NO.	Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
1	124.339	N.A	20.01	N.A	N.A	43.5	N.A	Vertical	Pass
2	158.204	N.A	21.96	N.A	N.A	43.5	N.A	Vertical	Pass
3	194.489	N.A	21.36	N.A	N.A	43.5	N.A	Vertical	Pass
4	310.599	N.A	19.70	N.A	N.A	46.0	N.A	Vertical	Pass
5	658.928	N.A	23.48	N.A	N.A	46.0	N.A	Vertical	Pass
6	770.200	N.A	26.07	N.A	N.A	46.0	N.A	Vertical	Pass



(Plot B: 30MHz – 1GHz, Test Antenna Horizontal)

NO.	Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
1	165.461	N.A	22.34	N.A	N.A	43.5	N.A	Horizontal	Pass
2	245.287	N.A	17.95	N.A	N.A	46.0	N.A	Horizontal	Pass
3	404.938	N.A	19.15	N.A	N.A	46.0	N.A	Horizontal	Pass
4	542.818	N.A	21.73	N.A	N.A	46.0	N.A	Horizontal	Pass
5	658.928	N.A	23.50	N.A	N.A	46.0	N.A	Horizontal	Pass
6	840.349	N.A	26.31	N.A	N.A	46.0	N.A	Horizontal	Pass

Test Result: PASS

****END OF REPORT ****