Report No.:SZ12120206W04

FCC Part 15C TEST REPORT

Issued to

Taxèia Technology Co., Ltd.

For

Receptor

Model Name	:	TT-230U
Trade Name	:	Professor X
Brand Name	:	Professor X
FCC ID	:	RHLTT230U
Standard	:	47 CFR Part 15 Subpart C
Test date	:	2012-11-16 to 2013-5-8
Issue date	:	2013-5-8

by

Shenzhen MORLAB Communication Technology Co., Ltd.

Tested by Nie Quan	*Approved by* Zeng Dexin	*Review by* Peng Huarui
Nie Quan	*Zeng Dexin*	*Peng Huarui*
(Test Engineer)	*(Department Manager)*	*(Project Manager)*
Date 2013.5.8	*Date* 2013.5.8	*Date* 2013.5.8

Shenzhen MORLAB Communication Technology Co., Ltd. Tel: +86 755 36698555 Fax: +86 755 36698615
FL.3, Building A, FeiYang Science Park, No.8 LongChang Road,Block 67, BaoAn District,ShenZhen, GuangDong Province,P. R. China 518101

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	May 8, 2013	First edition

1. General Information

1.1. EUT Description

EUT Type ..... :	Receptor
Serial No..... :	(n.a, marked #1 by test site)
Hardware Version ..... :	V1.2
Software Version ..... :	V1.0.0.5
Applicant ..... :	Taxeia Technology Co., Ltd. Room 6D-19, 6F, No.5, Sec.5, Xinyi Rd., Xinyi Dist., Taipei City 11011, Taiwan.
Manufacturer ..... :	Xiamen Intretech INC. No.588,Jiahe Road,Xiamen,Fujian,China
Frequency Range..... :	The frequency range used is 2420(+/- 2.5Mhz)
Modulation Type ..... :	QPSK
Antenna Type..... :	PCB Antenna
Antenna Gain..... :	0dBi

Note 1: The EUT is a Receptor, it contains 2.4G Module operating at 2.4GHz ISM band, they are all tested in this report.

Note 2: The EUT has two parts: TT-230(Remote) and TT-230U (Wireless mini-receiver), this test report is for TT-230U.

Note 2: 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 C 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 in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.249(d)	Band Edge	PASS
3	15.207	Conducted Emission	PASS
4	15.209	Radiated Emission	PASS
	15.249(a)	Field Strength	

NOTE:

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Equipment in the range of 9 kHz to 40GHz for FCC ID Certification,.

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.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

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. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. **Result:** Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

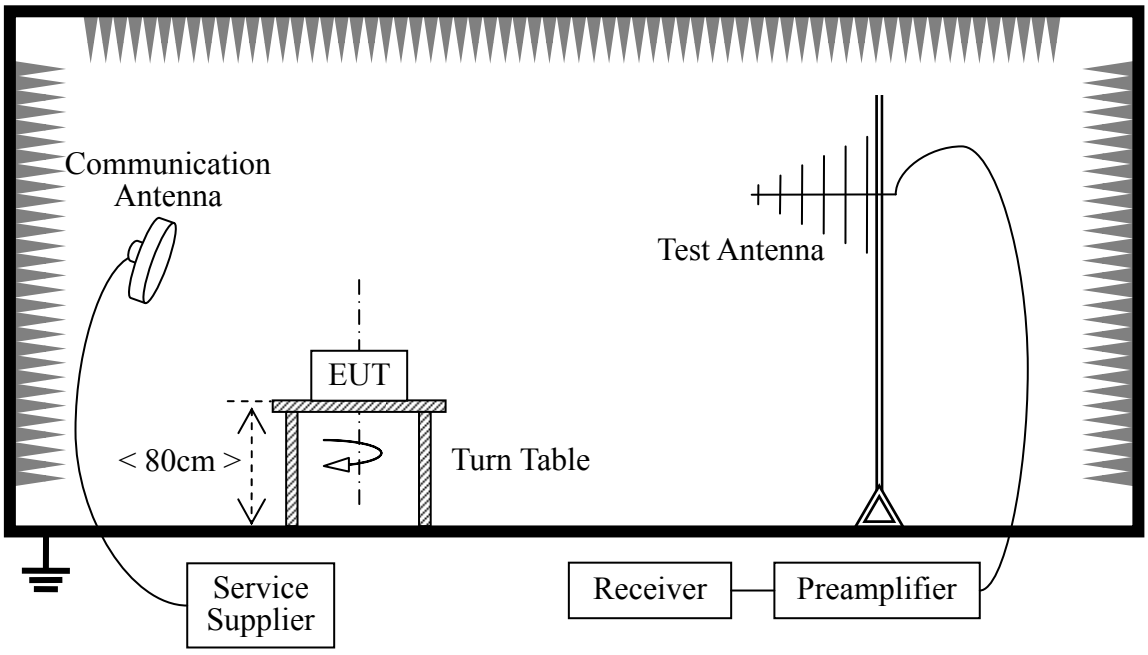
2.2. Band Edge

2.2.1. Requirement

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

2.2.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is powered by the Battery. 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 Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna:

Horn 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
System Simulator	R&S	CMU200	100448	2012.05	2013.05
Receiver	Agilent	E7405A	US44210471	2012.05	2013.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05	2013.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2012.05	2013.05

2.2.1. Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak /AV

Trace = max hold

Allow the trace to stabilize.

2.2.2. Test Result

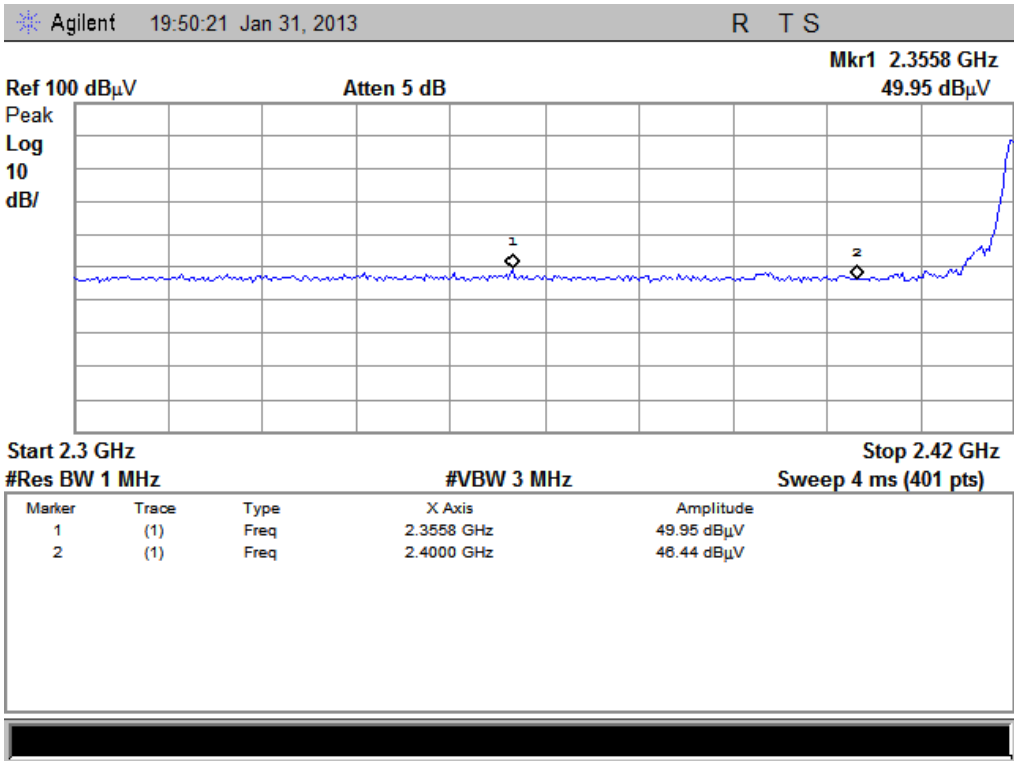
The Bluetooth Module operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

The measurement results are obtained as below:
$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m

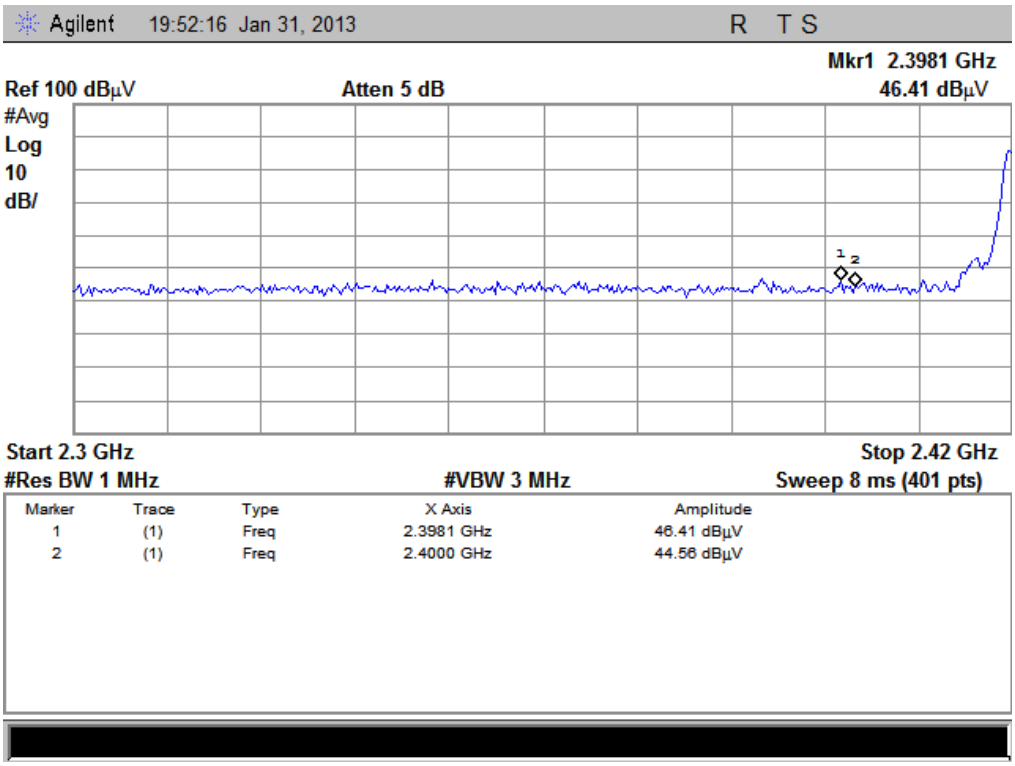
A. Test Verdict:

Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	Antenna polarization	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
2355.80	PK	49.95	H	-30.93	32.56	51.58	74	Pass
2398.10	AV	46.41	H	-30.93	32.56	48.04	54	Pass
2344.40	PK	41.02	V	-30.93	32.56	42.65	74	Pass
2363.30	AV	37.23	V	-30.93	32.56	38.86	54	Pass
2498.80	PK	48.39	H	-29.05	32.50	51.84	74	Pass
2490.20	AV	45.60	H	-29.05	32.50	49.05	54	Pass
2487.00	PK	40.11	V	-30.93	32.56	41.74	74	Pass
2495.20	AV	39.02	V	-30.93	32.56	40.65	54	Pass

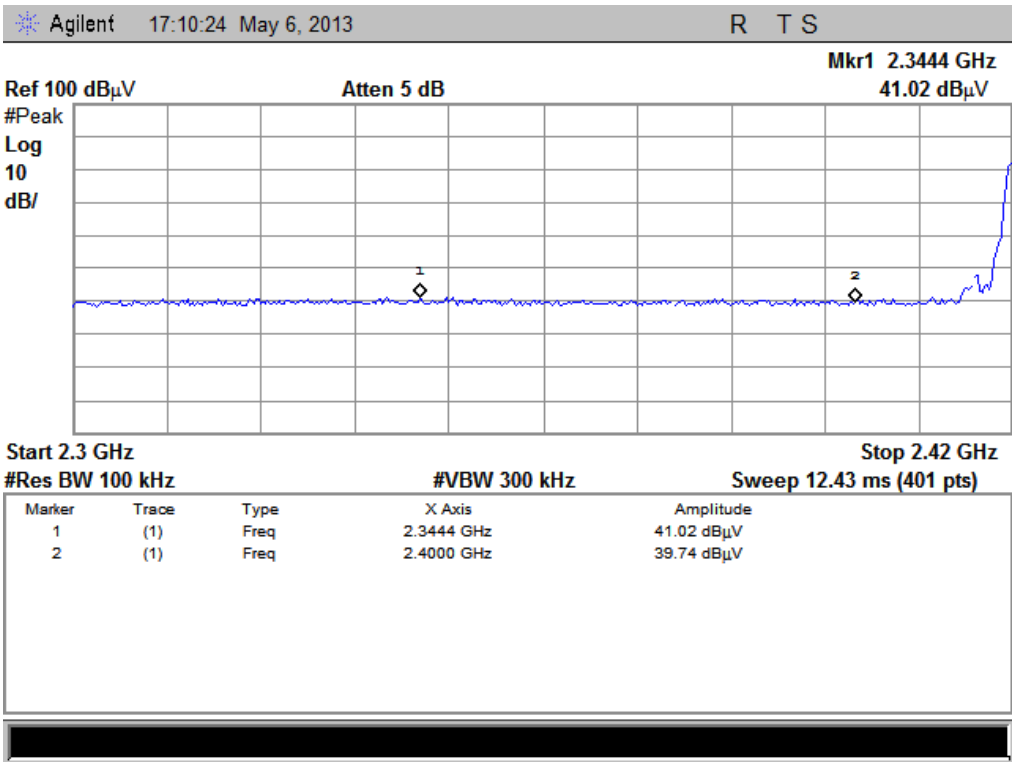
B. Test Plots:



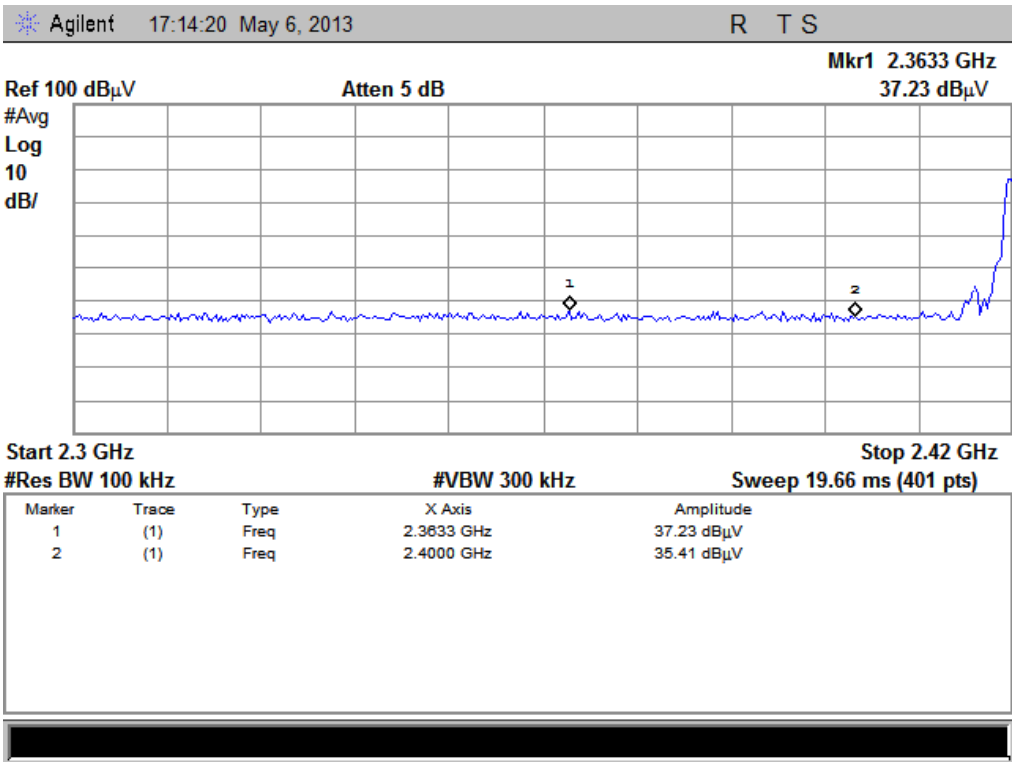
(Plot A1: PEAK, Antenna Horizontal)



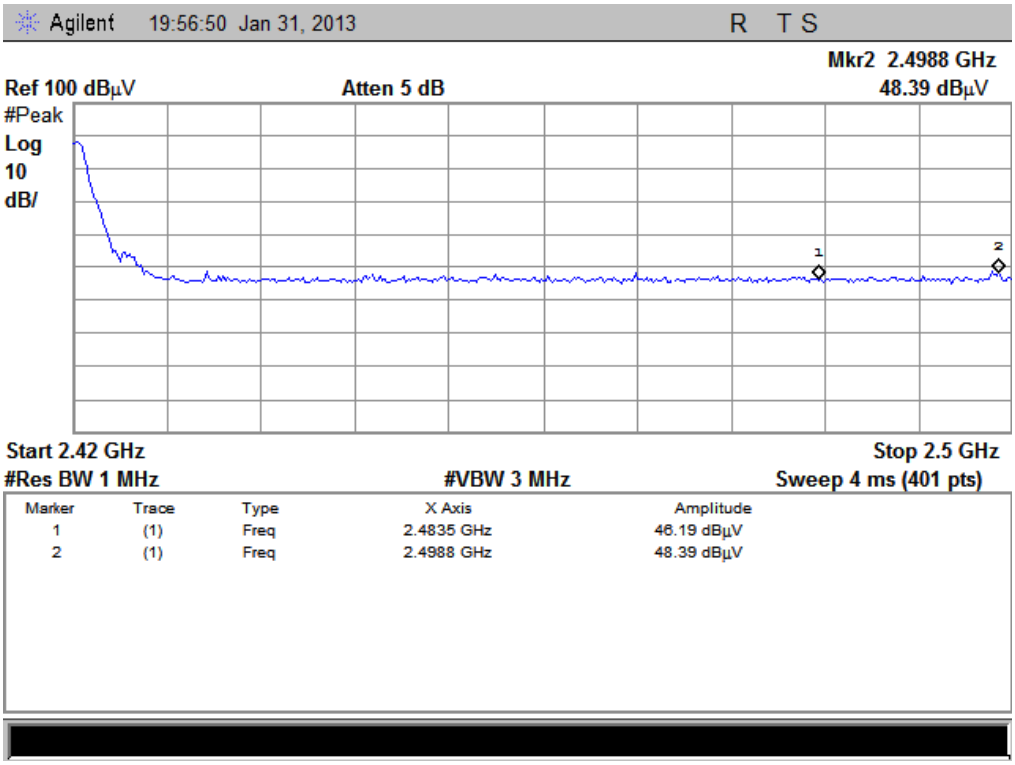
(Plot A2: AVERAGE, Antenna Horizontal)



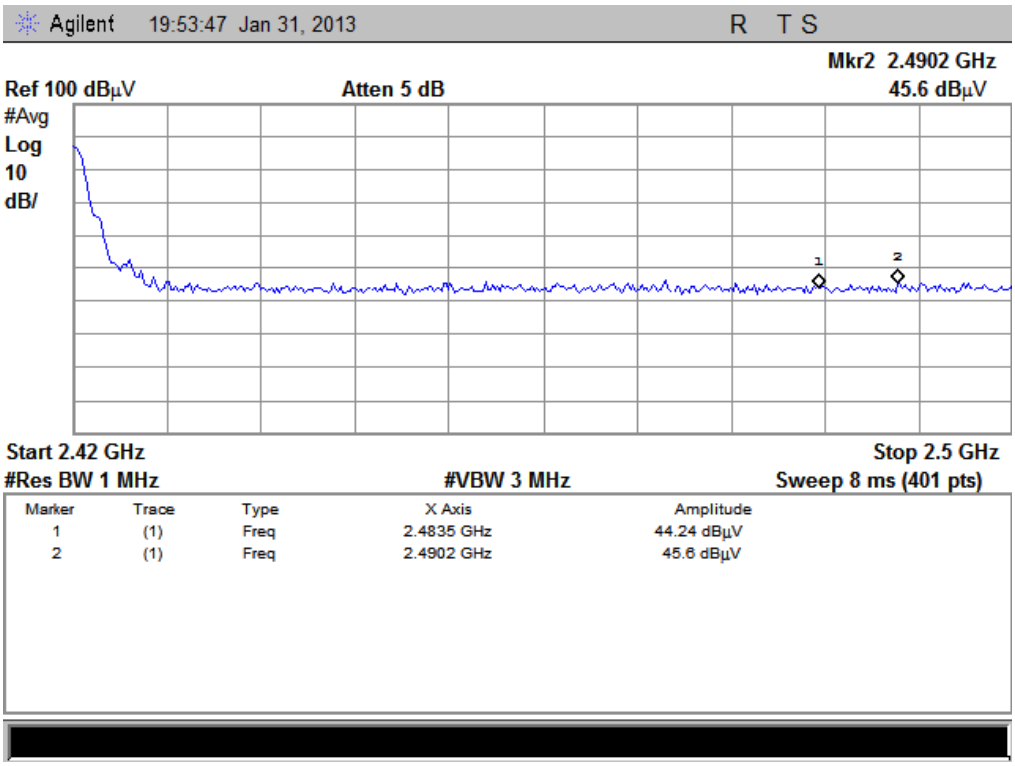
(Plot A3: PEAK, Antenna Vertical)



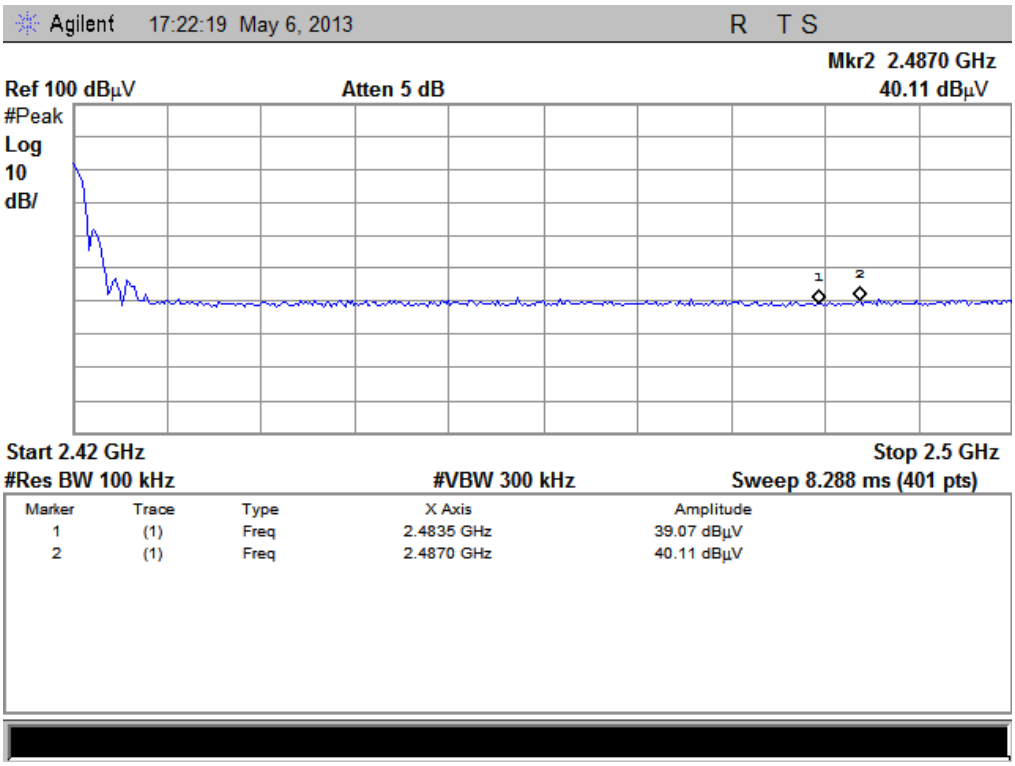
(Plot A4: AVERAGE, Antenna Vertical)



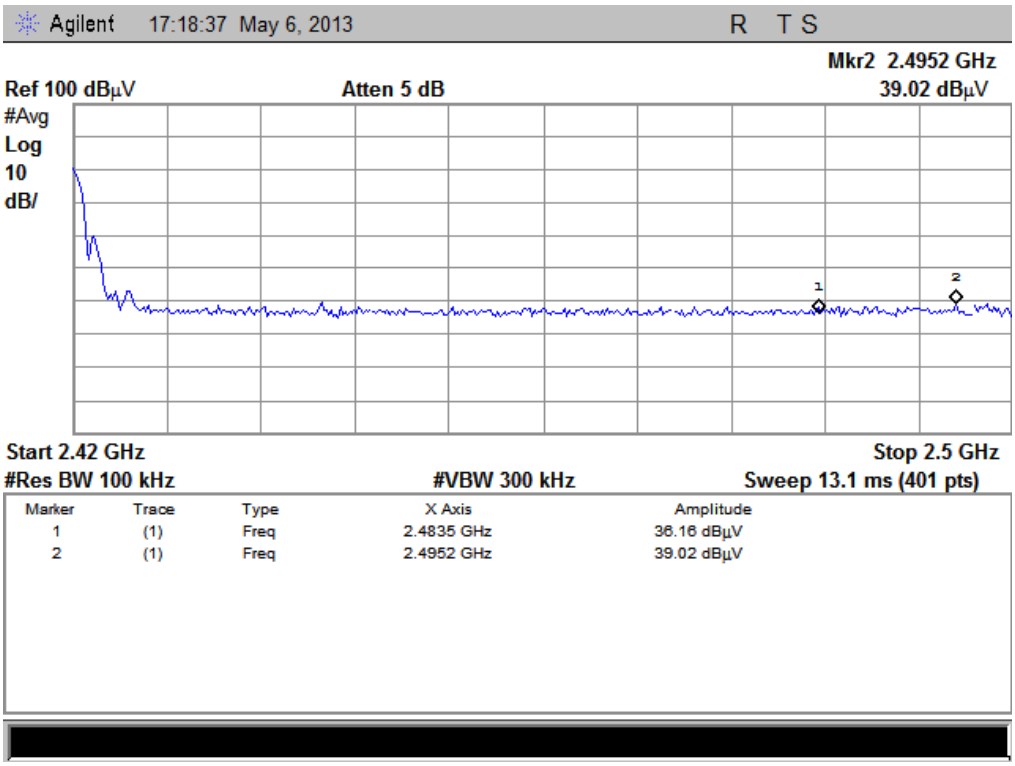
(Plot B1: PEAK, Antenna Horizontal)



(Plot B2: AVERAGE, Antenna Horizontal)



(Plot B3: PEAK, Antenna Vertical)



(Plot A4: AVERAGE, Antenna Vertical)

2.3. Conducted Emission

2.3.1. Requirement

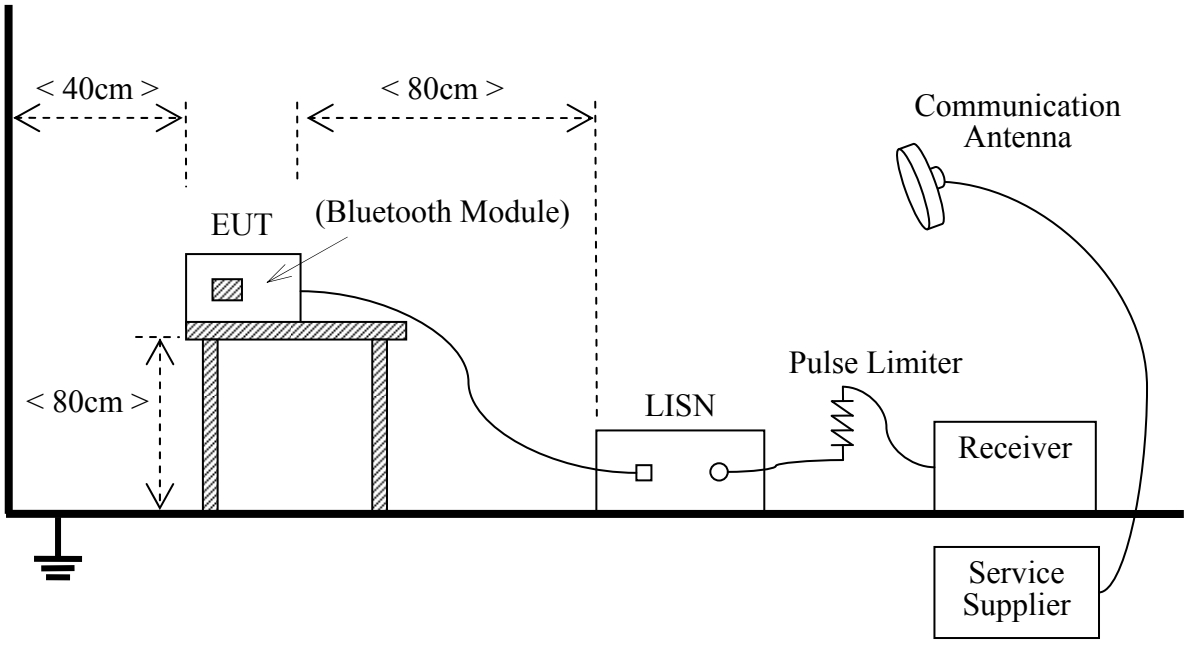
According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following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

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 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.

2.3.2. 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

Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2012.05	2013.05
LISN	Schwarzbeck	NSLK 8127	812744	2012.05	2013.05

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Service Supplier	R&S	CMU200	100448	2012.05	2013.05
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	2012.05	2013.05

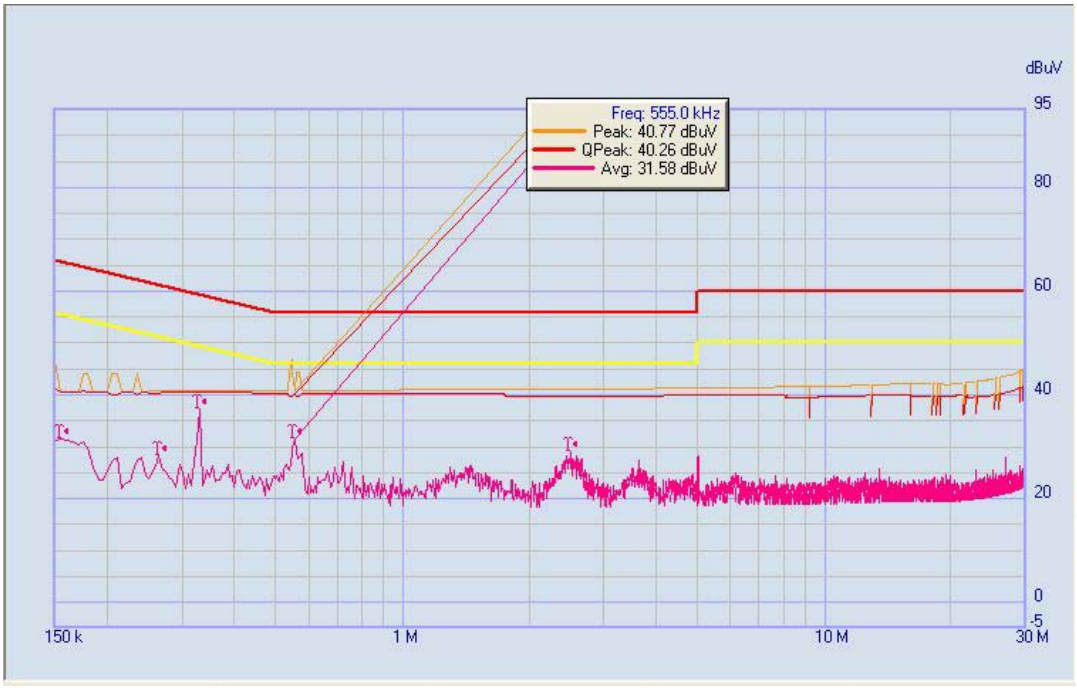
2.3.3. Test Result

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.

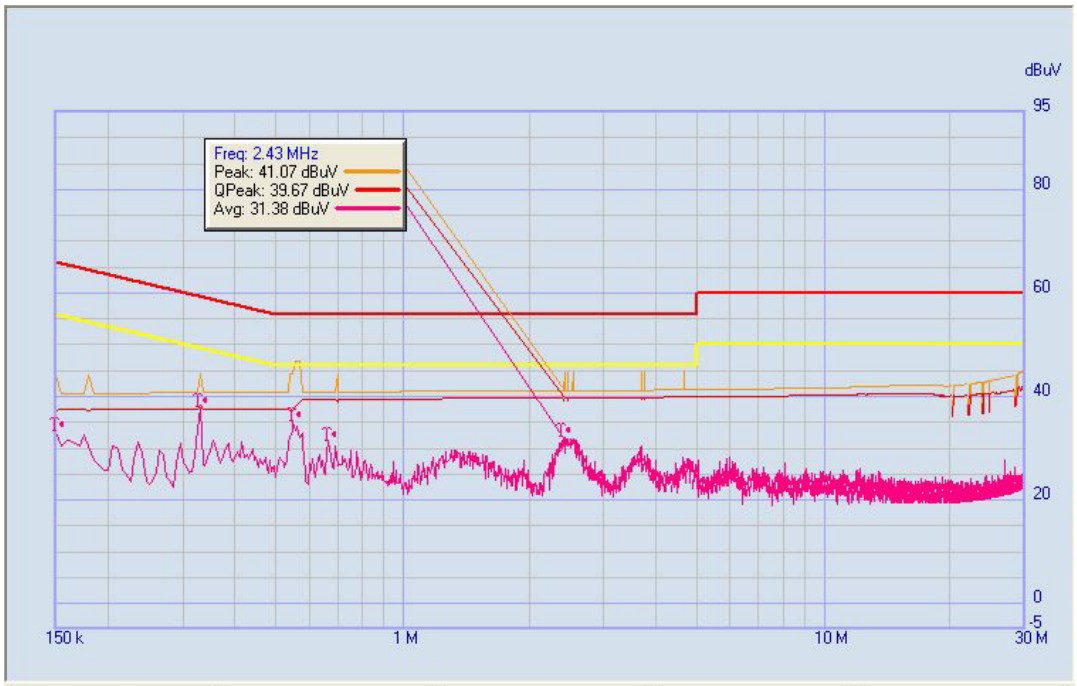
A. Test setup:

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

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

2.4. Field strength

2.4.1. Requirement

According to section 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902~928	50mV/m (94dBμV/m)	500μV/m (54dBμV/m)	3
2400~2483.5	50mV/m (94dBμV/m)	500μV/m (54dBμV/m)	3
5725~5875	50mV/m (94dBμV/m)	500μV/m (54dBμV/m)	3

According to section 15.249(d), Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	μV/m	Dist	(uV/m)	(dBuV/m)
0.009 - 0.490	2400/F(KHz)	300m	10000* 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 - 1.705	2400/F(KHz)	30m	100* 2400/F(KHz)	20log 2400/F(KHz) + 40
1.705 - 30.00	30	30m	100*30	20log 30 + 40
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

According to section 15.249(e), for frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Note:

1) The tighter limit shall apply at the boundary between two frequency range.
2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).
3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^{2.}$

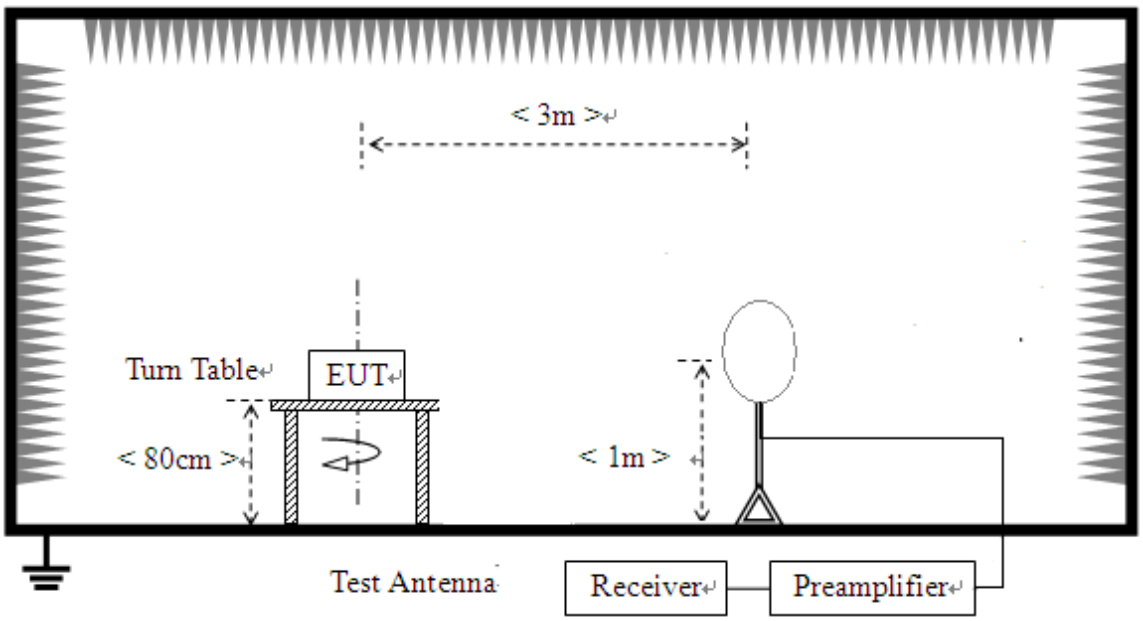
   Example: F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as

   $Ld1 = L1 = 30uV/m * (10)^2 = 100 * 30uV/m$

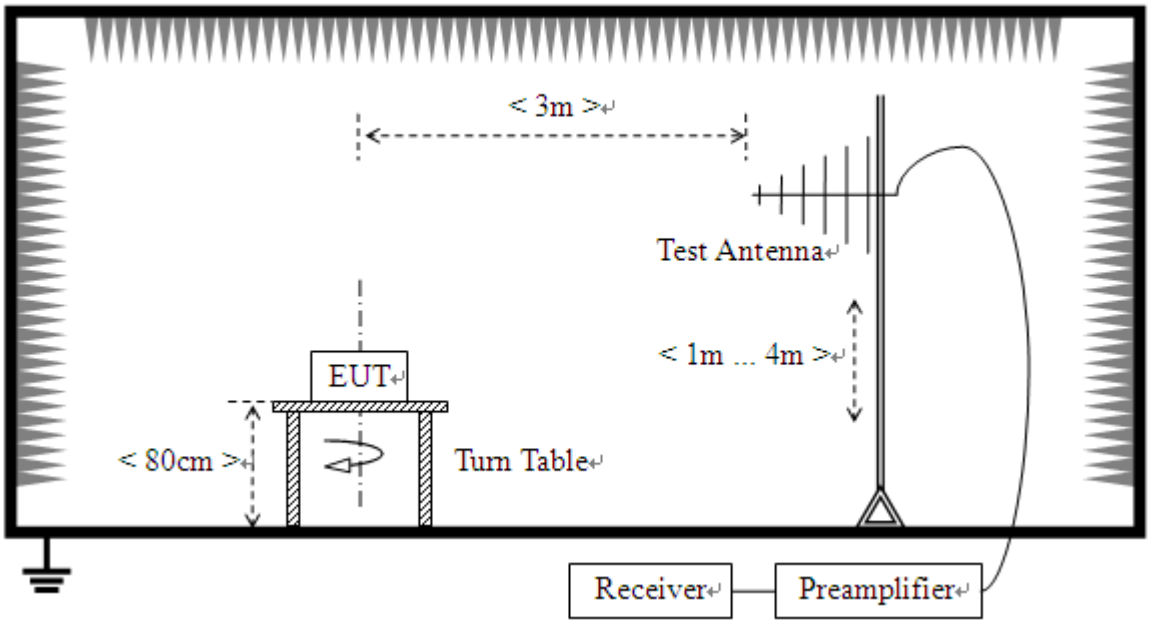
2.4.2. Test Description

A. Test Setup:

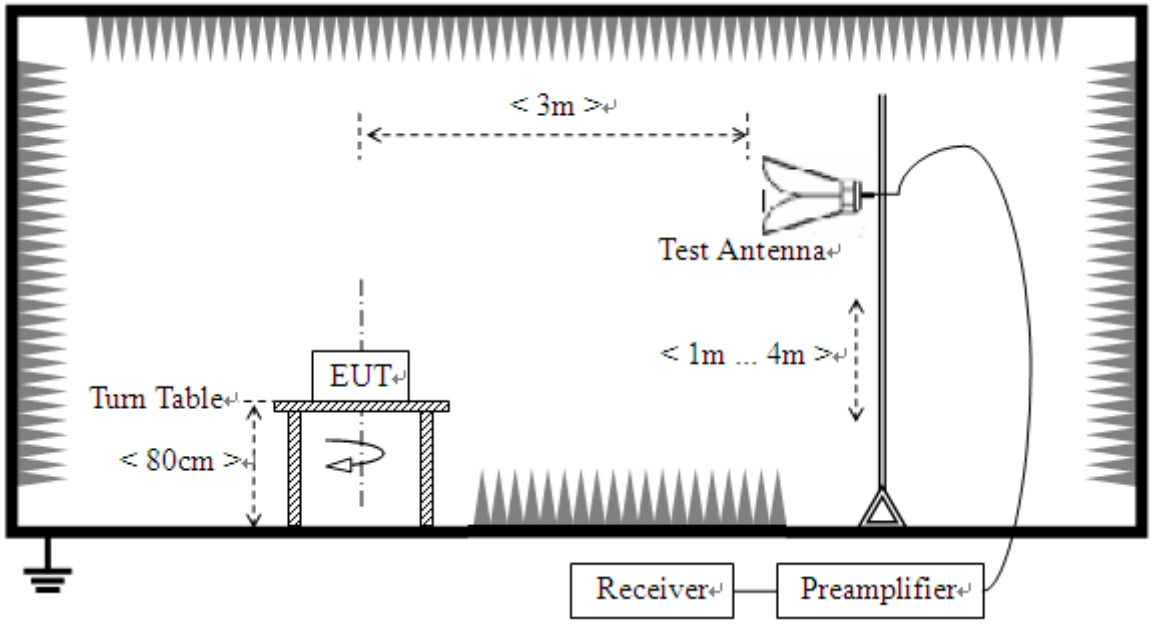
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2012.05	2013.05
Receiver	Agilent	E7405A	US44210471	2012.05	2013.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05	2014.05
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2012.05	2013.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2012.05	2013.05
Test Antenna - Horn	R&S	HL050S7	71688	2012.05	2013.05
Test Antenna - Loop	Schwarzbeck	FMZB 1519	1519-022	2012.05	2013.05

2.4.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.4.4. 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 limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

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

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

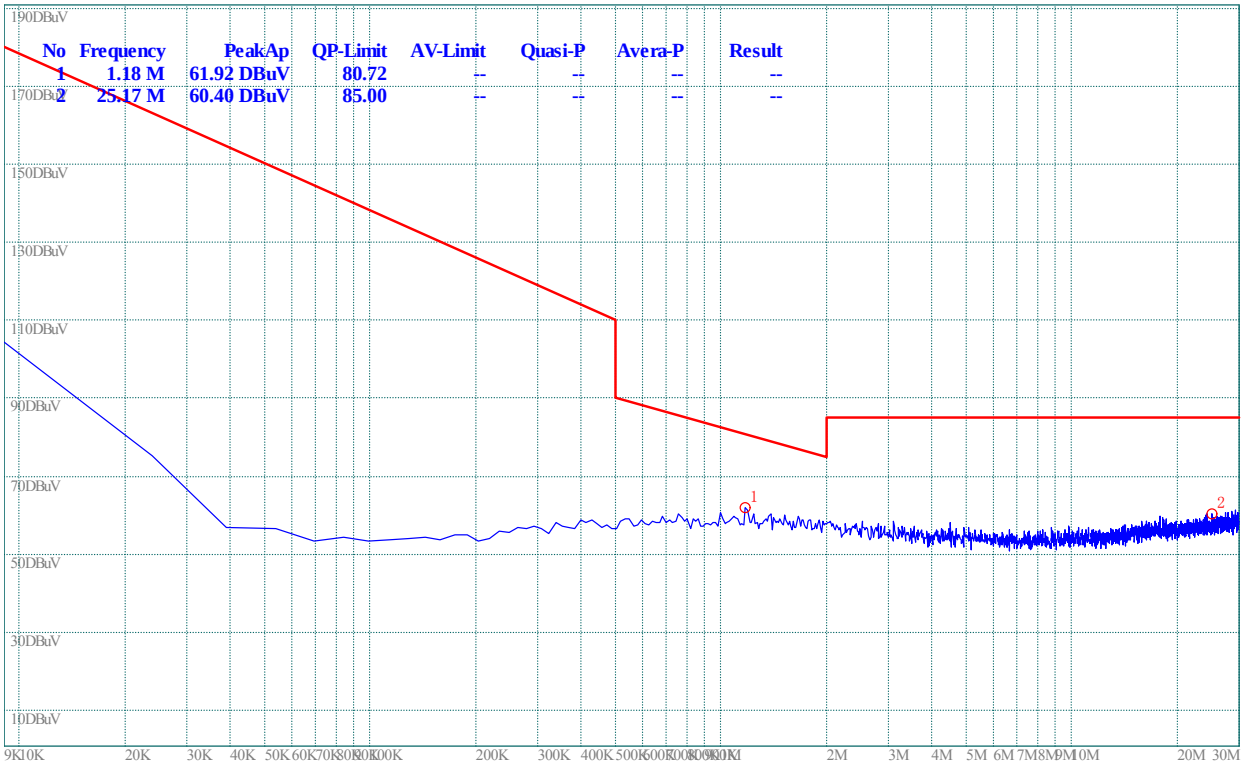
G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

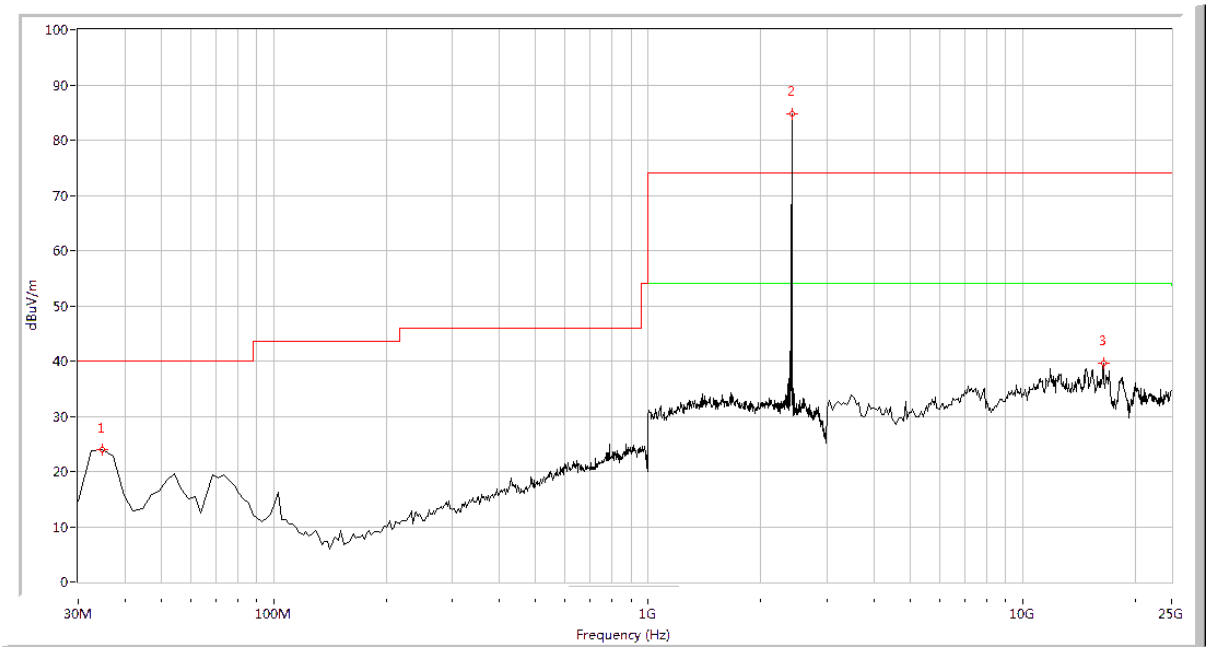
During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

A. Test Plots for the Whole Measurement Frequency Range:

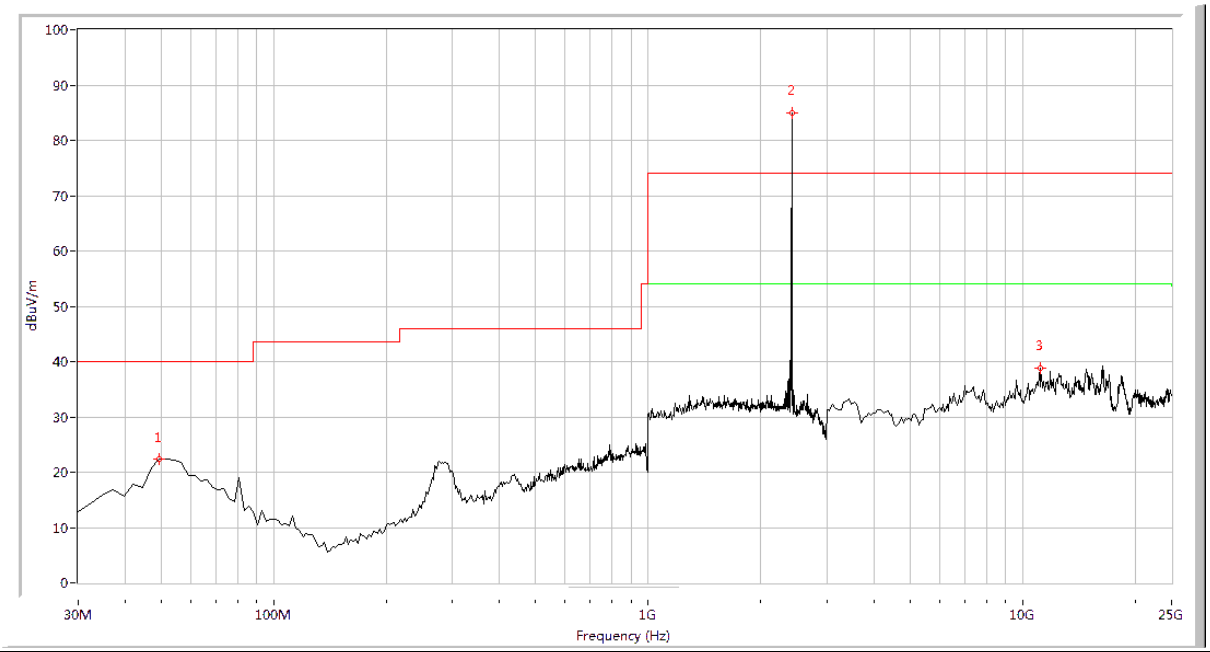


(Plot A.0: 9kHz to 30MHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
34.838	24.00	N.A	17.21	N.A	40.0	N.A	275.9	Horizontal	PASS
2420.000	84.83	N.A	70.37	114.0	N.A	94.0	288.4	Horizontal	PASS
16441.397	39.57	N.A	30.77	74.0	N.A	54.0	354.9	Horizontal	PASS

(Plot A.1: 30MHz to 25GHz, Antenna Horizontal)

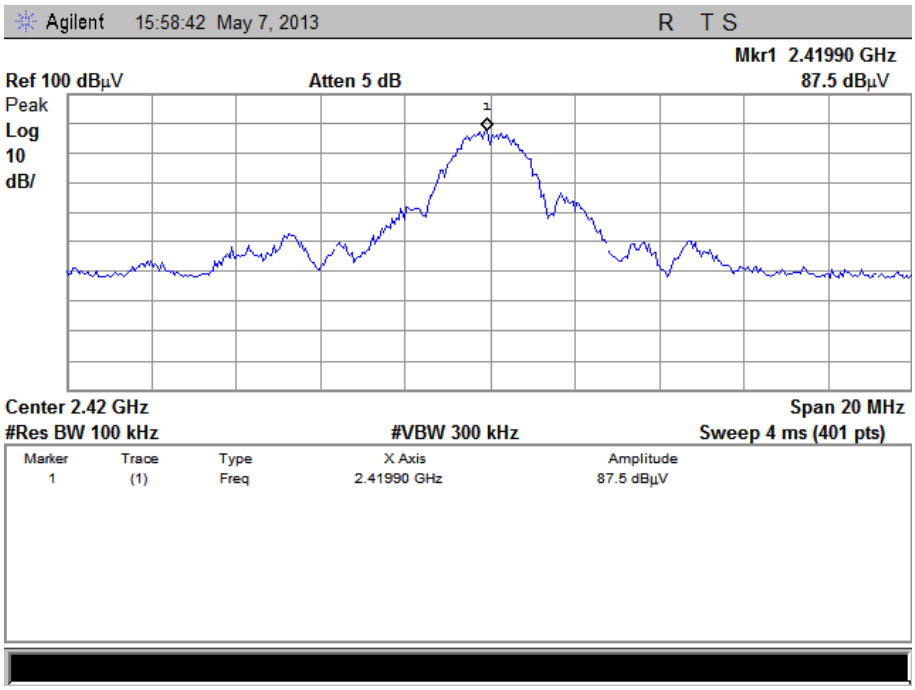


Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
49.352	22.36	N.A	38.12	N.A	40.0	N.A	129.1	Vertical	PASS
2420.0000	84.98	N.A	71.50	114.0	N.A	94.0	278.4	Vertical	PASS
11119.701	38.73	N.A	31.82	74.0	N.A	54.0	-0.0	Vertical	PASS

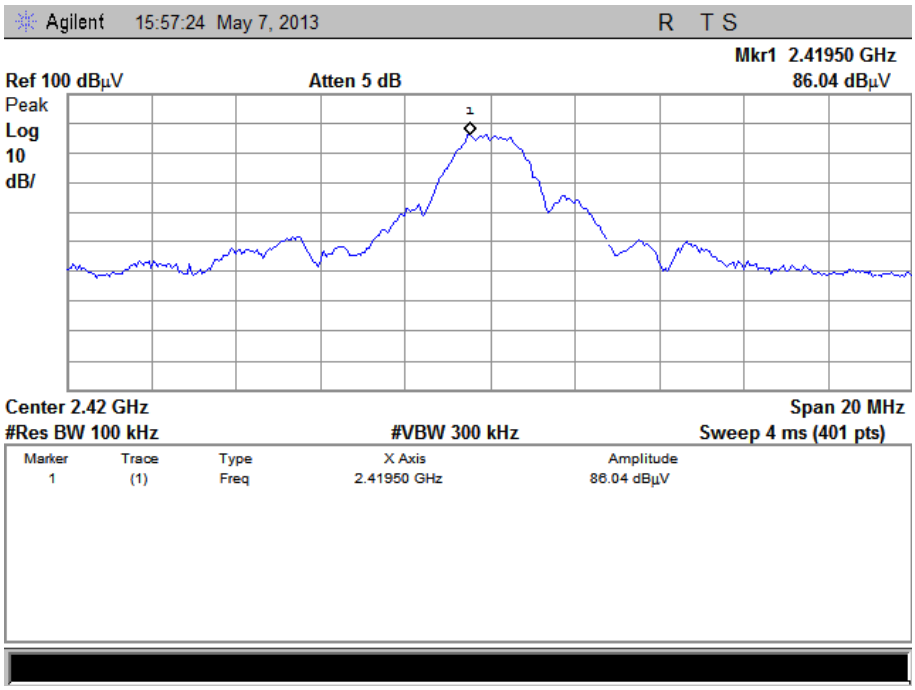
(Plot A.2: 30MHz to 25GHz, Antenna Vertical)

B. Test Plots for Field strength of Fundamental:

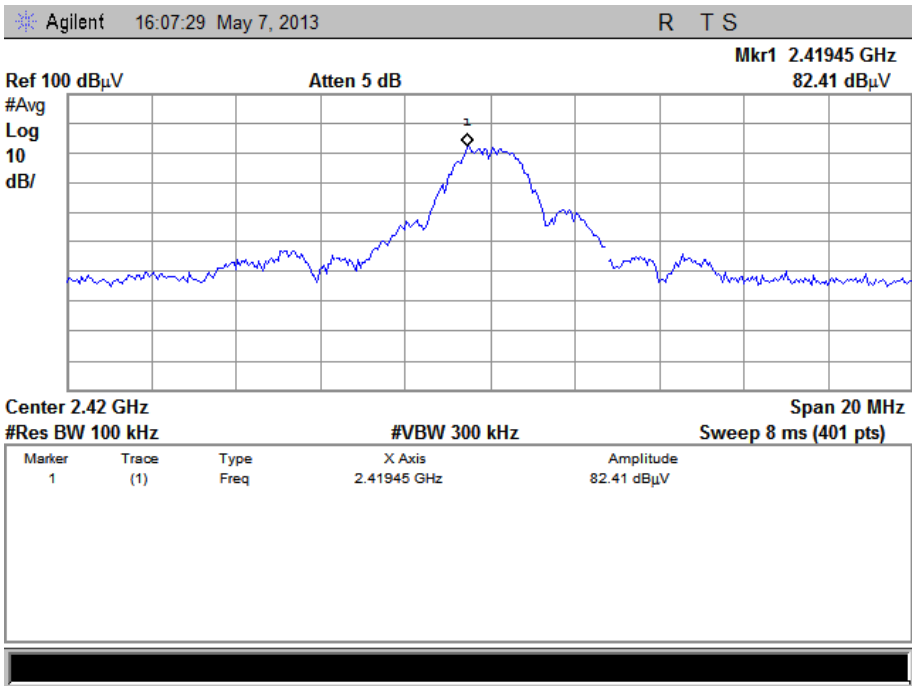
Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	Antenna polarization	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
2420	PK	87.50	H	-30.93	32.56	89.13	114	Pass
		86.04	V	-30.93	32.56	87.67		Pass
	AV	82.41	H	-30.93	32.56	84.04	94	Pass
		85.19	V	-30.93	32.56	86.82		Pass



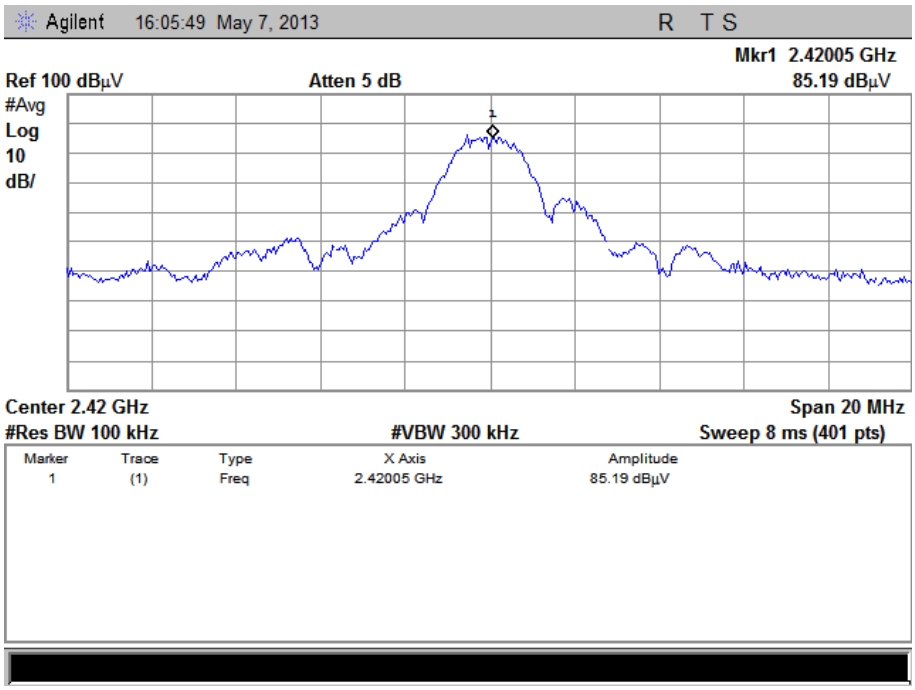
(Plot A.1: PEAK, Antenna Horizontal)



(Plot A.2: PEAK, Antenna Vertical)



(Plot A.3: AVERAGE, Antenna Horizontal)



(Plot A.4: AVERAGE, Antenna Vertical)

** END OF REPORT **