


# MEASUREMENT REPORT


(FCC : Part 15 Subpart C 15.225 / ANSI C63.4-2003)



Product.....: QPROX  
Trade Name.....: CASTLES TECHNOLOGY  
Model No.....: QP3000S  
Applicant.....: CASTLES TECHNOLOGY CO., LTD  
Applicant Address.....: 2F, No.205, Sec.3, Beixin Rd., Xindian  
District, New Taipei City 23143, Taiwan  
(R.O.C.)

<b>Report Number</b>	MLT1210P15005
<b>Applicant</b>	CASTLES TECHNOLOGY CO., LTD
<b>Product</b>	QPROX
<b>Sample Received Date</b>	2012/10/29
<b>Sample Tested Date</b>	2012/10/29 ~ 2012/11/16

<b>Report Prepared By</b>	Jesse Tien
<b>Signature</b>	
<b>Date Prepared</b>	2012/11/19

<b>Report Authorized By</b>	Roger Chen
<b>Signature</b>	
<b>Date Authorized</b>	2012/11/19

Test By

**Max Light Technology Co., Ltd.**  
 Room 5, 8F, No.125, Section 3 Roosevelt Road,  
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 laboratory.

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## History of Test Report

Original Report Issue Date: Nov. 19, 2012

No additional attachment

additional attachments were issued as in the following record:

Attachment No.	Issue Date	Description
MLT1210P15005	Nov. 19, 2012	Original report

## CERTIFICATION

We here by verify that :


The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4-2003. All test were conducted by


MLT(Max Light Technology Co., Ltd) Room 5, 8F, No.125, Section 3 Roosevelt Road, Taipei, Taiwan, R.O.C Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with Class B radiated and conducted emission limit of FCC Rules Part 15 Subpart C (15.225).

<b>Applicant Name</b>	CASTLES TECHNOLOGY CO., LTD
<b>Applicant Address</b>	2F, No.205, Sec.3, Beixin Rd., Xindian District, New Taipei City 23143, Taiwan (R.O.C.)
<b>Manufacturer Name</b>	CASTLES TECHNOLOGY CO., LTD
<b>Manufacturer Address</b>	2F, No.205, Sec.3, Beixin Rd., Xindian District, New Taipei City 23143, Taiwan (R.O.C.)

<b>Equipment</b>	QPROX
<b>Model No</b>	QP3000S
<b>FCC ID</b>	WIYQP3000S

<b>Report Prepared By</b>	Jesse Tien
<b>Signature</b>	

<b>Report Authorized By</b>	Roger Chen
<b>Signature</b>	

## 1. General

### 1.1 Introduction

The following measurement report is submitted on behalf of CASTLES TECHNOLOGY CO., LTD In support of a Class B Digital Device certification in accordance with Part2 Subpart J and Part 15 Subpart C of the Commission's and Regulations.

### 1.2 Customer Details

<b>Applicant Name</b>	CASTLES TECHNOLOGY CO., LTD
<b>Applicant Address</b>	2F, No.205, Sec.3, Beixin Rd., Xindian District, New Taipei City 23143, Taiwan (R.O.C.)
<b>Manufacturer Name</b>	CASTLES TECHNOLOGY CO., LTD
<b>Manufacturer Address</b>	2F, No.205, Sec.3, Beixin Rd., Xindian District, New Taipei City 23143, Taiwan (R.O.C.)

### 1.3 Technical data of EUT

<b>Equipment</b>	QPROX
<b>Model No</b>	QP3000S
<b>FCC ID</b>	WIYQP3000S
<b>Power Type</b>	1. USB mode: Powered by PC 2. RS232 mode: Powered By AC adapter Model : PA1015-2T2 Input : AC100-240V , 50/60Hz , 0.4A Output : DC12V , 1A , 12W
<b>Type of Modulation</b>	Pulse code
<b>Type of Antenna</b>	Loop antenna
<b>Frequency of Channel</b>	1 Channel, 13.56MHz

Note: During testing the EUT was operated at Tx or Rx mode for each emission measured. This was done in order to ensure that maximum emission levels were attained.

## 1.4 Summary Of Tests

### Description of Standards and Results

Emission		
Test Item	Standard	Result
Conducted Emission Requirements	Part 15 15.207	PASS
Radiated Emission Requirements	Part 15 15.225(a)(b)(c)(d) Part 15 15.205 , 15.209	PASS
Frequency Tolerance Requirements	Part 15 15.225(e)	PASS
Bandwidth Emission Requirements	Part 15 15.215	PASS

### 47 CFR Part 15 Subpart C (1.705MHz to 30MHz Emission Limit)

Frequency (MHz)	Field Strength (30m) (uV/30m)	Field Strength (3m) (dBuV/m)
1.705 to 13.110	30	69.5
13.110 to 13.410	106	80.5
13.410 to 13.553	334	90.5
13.553 to 13.567	15848	124.0
13.567 to 13.710	334	90.5
13.710 to 14.010	106	80.5
14.010 to 30.000	30	69.5

**Note :** Use quasi-peak meter.

$$\text{Distance Factor Limit (3m)} = \text{Limit (30m)} + 40\log(30/3)$$

### 15.209 Radiated Emission Limits: General Requirements

Frequency (MHz)	Field Strength (uV/ m)	dBuV/m	Distance (m)
0.009 – 0.490	2400/F(kHz)		300
0.490 – 1.705	24000/F(kHz)		30
1.705 – 30.0	30	29.5	30
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

## 1.5 Description of Support Equipment

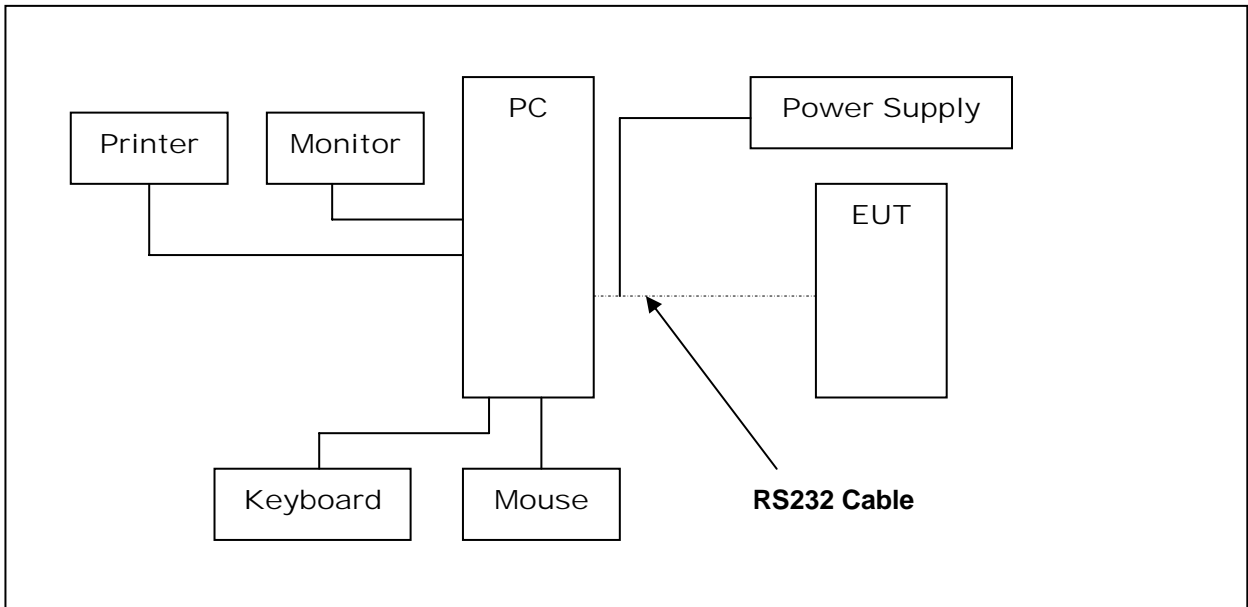
In order to construct the minimum system which required by the ANSI C63.4-2003, following equipments were used as the support units.

Component	Manufacturer	Model No.	Serial No.	FCC ID
Monitor	IBM	6934-AC1	23-CB387	FCC DOC
Computer	Dell	DCSM	7LDZX1S	FCC DOC
Keyboard	Dell	SK-8115	MY-0DJ325-71619-88 5-0166	FCC DOC
Mouse	Dell	MOC5UO	HOYO2HZ4	FCC DOC
Printer	HP	C4562B	H946151BZ	B94C2164X
Modem	D-Link	DFM-560EL	ES0025A000007	FCC DOC

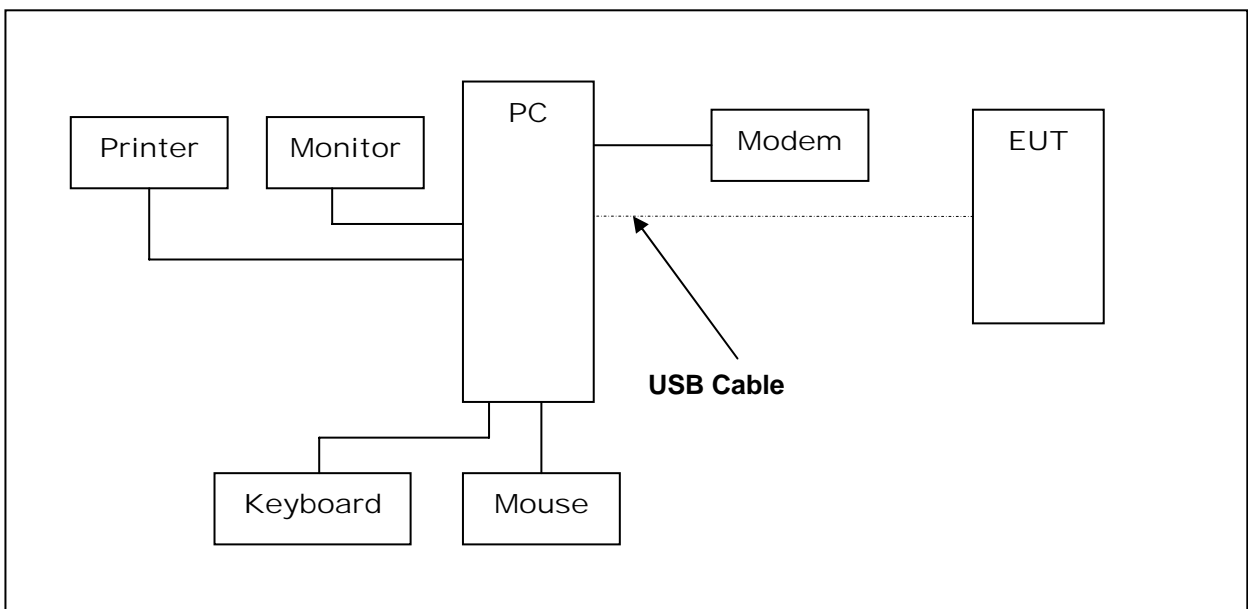
## 1.6 Configuration of System Under Test

See next page





Communicated with RS232 cable



Communicated with USB cable



## **1.7 Test Procedure**

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4: 2003 "Measurement of Intentional Radiators."

## **1.8 General Test Condition**

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions which the EUT was considered likely to encounter in normal use were investigated.

The maximum operating frequency of the EUT is 96MHz, it is not great than 108MHz, the measurement of radiated emissions frequency only shall be made up to 1GHz.

## 2. Conducted Emissions Requirements

### 2.1 General & Setup

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3825/2 Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPER quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 2.5.

### 2.2 Test Equipment List

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cal. Date
1.	HP	Spectrum Analyzer	73412A00110	8591EM	2012/3/22	2013/3/22
2.	EMCO	LISN	2658	3825/2	2012/3/3	2013/3/3
3.	TESEQ	ISN	24810	ISN T8	2012/4/26	2013/4/26

### 2.3 Test condition

EUT tested in accordance with the specifications given by the manufacturer, and exercised in the most unfavorable manner.

## 2.4 Conducted Emissions Limits

### FCC Part 15

Frequency range (MHz)	Limits (dBuV)			
	Class A		Class B	
	QP	Avg.	QP	Avg.
0.15 to 0.50	79	66	66 to 56	56 to 46
0.50 to 5.0	73	60	56	46
5.0 to 30	73	60	60	50

## 2.5 Measurement Data Of Conducted Emissions

### 2.5.1 Conducted Emissions

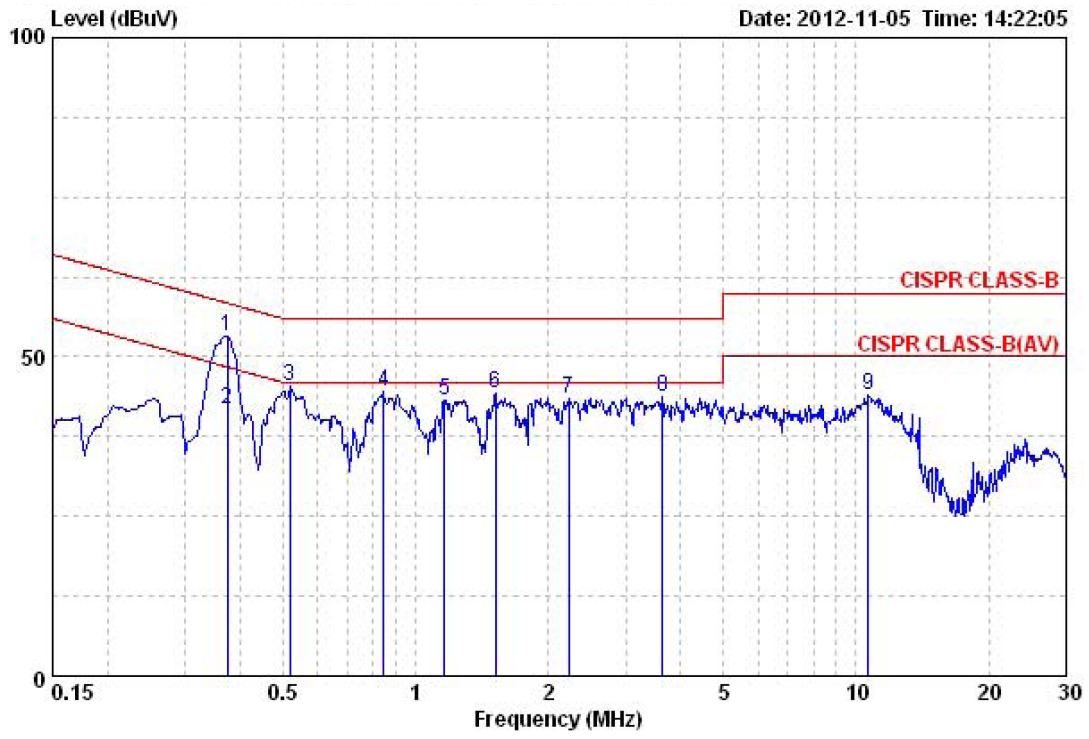
The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NEUTRAL conductor of the EUT power.

Test Mode : Transmit (RS232)

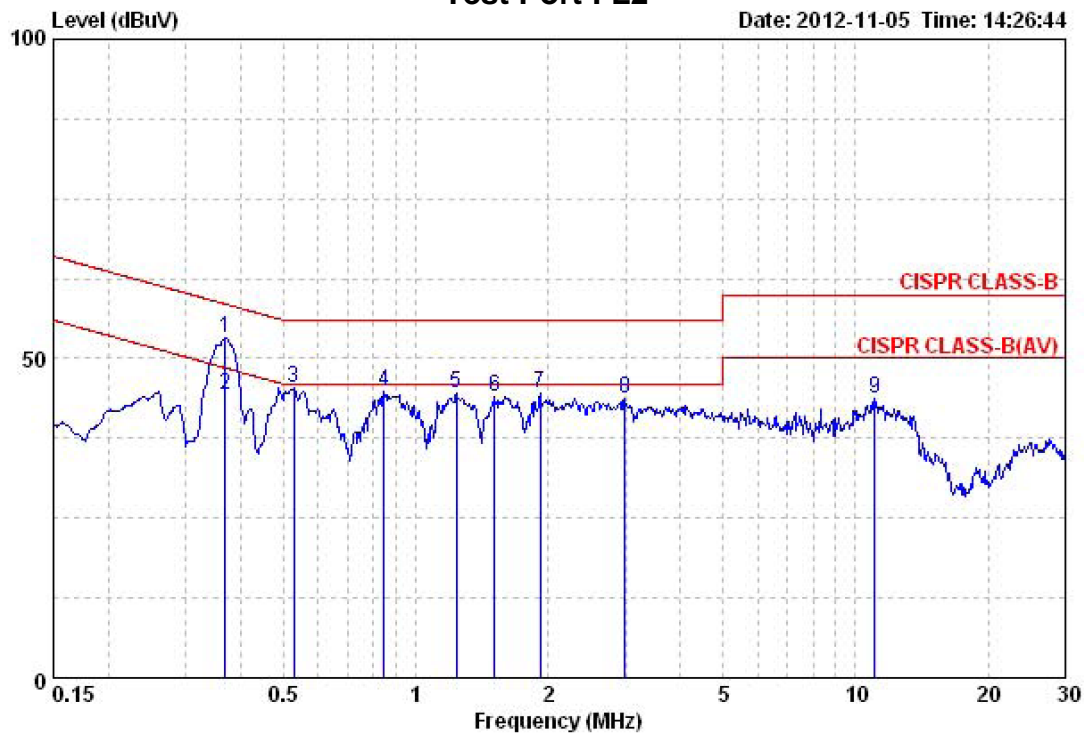
Conducted Emissions (Class B)										
Test Port	Freq (MHz)	Read(dBuV)		Factor	Limits (dBuV)		Amplitude (dBuV)		Margin (dBuV)	
		QP	AV		QP	AV	QP	AV	QP	AV
L1	0.3731	52.17	40.58	1.15	58.43	48.43	53.32	41.73	-5.11	-6.70
	0.5182	44.11	--	1.22	56.00	46.00	45.33	--	-10.67	--
	0.8483	43.47	--	1.23	56.00	46.00	44.70	--	-11.30	--
	1.1660	41.94	--	1.32	56.00	46.00	43.26	--	-12.74	--
	1.5190	42.89	--	1.39	56.00	46.00	44.28	--	-11.72	--
	2.2250	41.62	--	1.76	56.00	46.00	43.38	--	-12.62	--
	3.6420	41.76	--	2.00	56.00	46.00	43.76	--	-12.24	--
L2	0.3692	52.05	43.21	1.09	58.52	48.52	53.14	44.30	-5.38	-4.22
	0.5293	44.26	--	1.13	56.00	46.00	45.39	--	-10.61	--
	0.8483	43.54	--	1.21	56.00	46.00	44.75	--	-11.25	--
	1.2360	43.18	--	1.30	56.00	46.00	44.48	--	-11.52	--
	1.5110	42.56	--	1.37	56.00	46.00	43.93	--	-12.07	--
	1.9180	43.15	--	1.49	56.00	46.00	44.64	--	-11.36	--
	2.9930	41.78	--	1.84	56.00	46.00	43.62	--	-12.38	--

- Notes :**
- 1.L1: One end & Ground L2: The other end & Ground
  - 2.Height of table on which the EUT was placed : 0.8 m.
  - 3.The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
  - 4.The above test results are obtained under the normal condition.

**Test Port : L1**



**Test Port : L2**



### 2.5.2 Conducted Emissions

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NEUTRAL conductor of the EUT power.

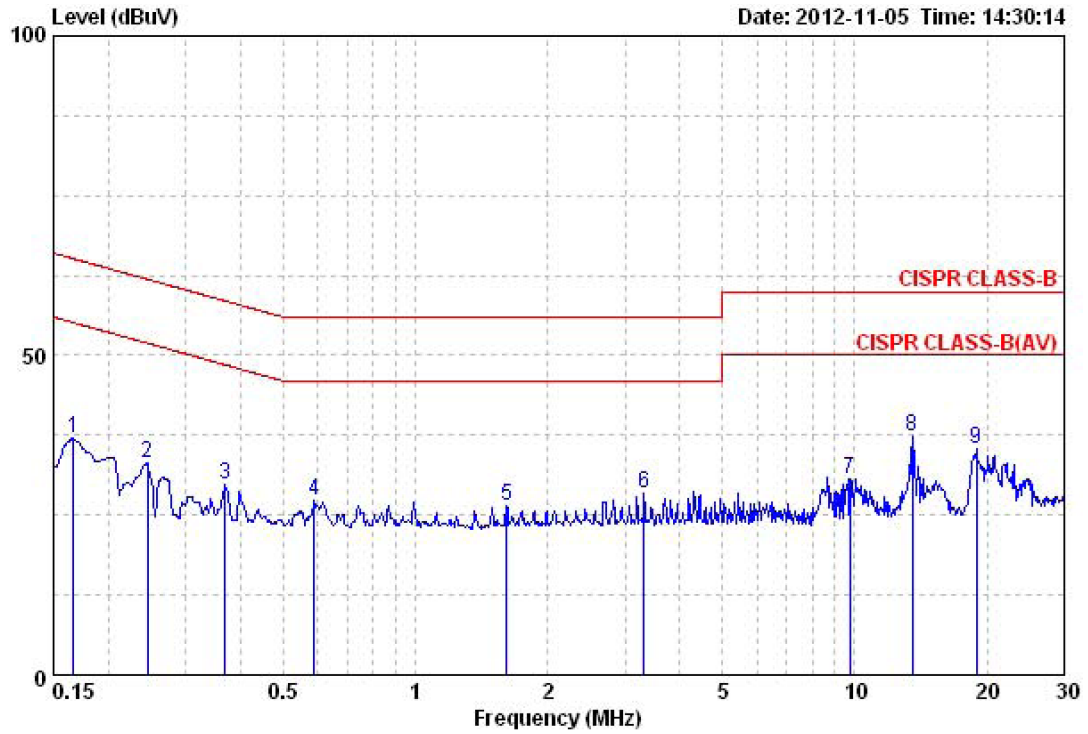
Test Mode : Transmit (USB)

Conducted Emissions (Class B)										
Test Port	Freq (MHz)	Read(dBuV)		Factor	Limits (dBuV)		Amplitude (dBuV)		Margin (dBuV)	
		QP	AV		QP	AV	QP	AV	QP	AV
L1	0.1668	35.96	--	1.05	65.12	55.12	37.01	--	-28.11	--
	0.2455	32.04	--	1.14	61.91	51.91	33.18	--	-28.73	--
	0.3692	28.65	--	1.15	58.52	48.52	29.80	--	-28.72	--
	0.5885	26.17	--	1.24	56.00	46.00	27.41	--	-28.59	--
	3.3100	26.57	--	1.96	56.00	46.00	28.53	--	-27.47	--
	13.5510	35.18	--	2.06	60.00	50.00	37.24	--	-22.76	--
	18.9200	33.12	--	2.16	60.00	50.00	35.28	--	-24.72	--
L2	0.2455	35.27	--	1.09	61.91	51.91	36.36	--	-25.55	--
	0.2744	32.30	--	1.09	60.98	50.98	33.39	--	-27.59	--
	0.3731	30.90	--	1.09	58.43	48.43	31.99	--	-26.44	--
	0.5436	27.47	--	1.13	56.00	46.00	28.60	--	-27.40	--
	0.8757	28.28	--	1.21	56.00	46.00	29.49	--	-26.51	--
	10.0720	26.64	--	1.96	60.00	50.00	28.60	--	-31.40	--
	20.5940	32.55	--	2.18	60.00	50.00	34.73	--	-25.27	--

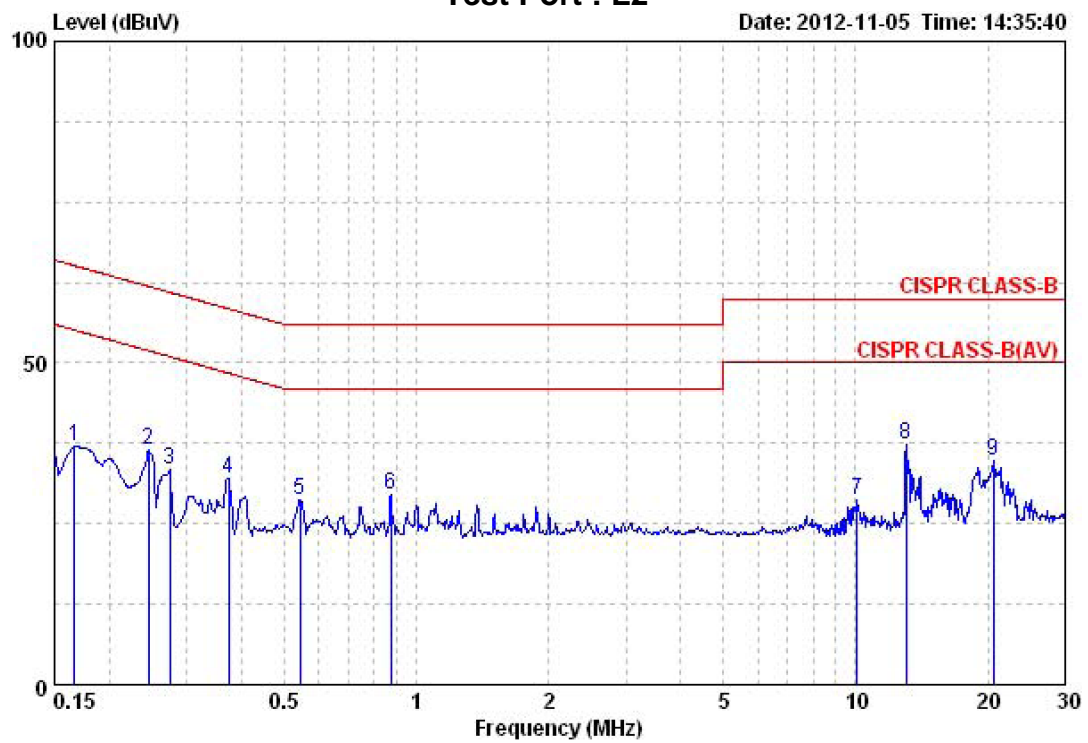
- Notes :**
- 1.L1: One end & Ground L2: The other end & Ground
  - 2.Height of table on which the EUT was placed : 0.8 m.
  - 3.The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
  - 4.The above test results are obtained under the normal condition.



**Test Port : L1**



**Test Port : L2**



## 3. Radiated Emissions Requirements

### 3.1 General & Setup

Prior to open-field testing, the EUT was placed in a shielded enclosure and scanned at a close distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency.

The exact system configuration which produced the highest emissions was noted so it could be reproduced later during the open-field tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

### 3.2 Test Procedure

Final radiation measurements were made on a three-meter, open-field test site. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 50 kHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 5 GHz is investigated.

For measurements from 30 MHz to 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For frequency range below 30MHz the Loop antenna was used at 3 m measurement distance with antenna heights of 1 m to 4 m and antenna loop front and side faced to the EUT. The axis of the antenna was rotated to maximize the emission. A CISPR quasi-peak detector is used for measurements below 30MHz and RBW / VBW is 9kHz / 30kHz.

The limit 1.75MHz to 30MHz in 15.225(a)(b)(c)(d) are specified at 30 meters, and measurements were made at 3 meters, the limit is translated to 3 meters by using a formula as follows:

$$\text{Limit}_{3\text{m}} = \text{Limit}_{30\text{m}} + (40\log(30\text{m}/3) = 40\text{dB})$$

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

### 3.3 Test Equipment List

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cal. Date
1.	Agilent	Spectrum Analyzer	US40240137	E7403A	2012/1/31	2013/1/31
2.	MLT	Pre Amplifier	20110209	PREAMP6G-01	2012/3/3	2013/3/3
3.	MLT	Pre Amplifier	20110301	PREAMP6G-02	2012/3/3	2013/3/3
4.	EMCO	Biconilog Antenna	00059739	3142C	2012/9/6	2013/9/6
5.	ETS	Loop Antenna	1493	6507	2012/11/9	2013/11/9
6.	EMCO	Biconilog Antenna	00044568	3142C	2012/9/6	2013/9/6

### 3.4 Measurement Data Of Radiated Emissions

#### 3.4.1 Open Field Radiated Emissions (1.7MHz to 30MHz )

The highest peak values of radiated emissions from the EUT transmit level, at various antenna heights and antenna polarization are recorded on the following

Test Mode : Transmitter

Radiated Emissions (VERTICAL) X Axis									
Frequency (MHz)	Amplitude (dBuV/m)	Read (dBuV/m)	Factor (dB)	Ant. Pos. (cm)	Table (Deg)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
9.879	39.13	57.57	-18.44	100	240	40	39.13	69.5	-30.37
13.416	36.59	55.18	-18.59	100	240	40	36.59	90.5	-53.91
13.558	62.22	80.81	-18.59	100	240	40	62.22	124	-61.78
13.671	43.75	62.35	-18.60	100	240	40	43.75	90.5	-46.75
15.680	35.50	54.75	-19.25	100	240	40	35.50	69.5	-34.00
20.265	40.67	60.02	-19.35	100	240	40	40.67	69.5	-28.83
25.812	36.25	56.52	-20.27	100	240	40	36.25	69.5	-33.25

Radiated Emissions (HORIZONTAL) X Axis									
Frequency (MHz)	Amplitude (dBuV/m)	Read (dBuV/m)	Factor (dB)	Ant. Pos. (cm)	Table (Deg)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.842	49.57	65.20	-15.63	220	270	40	49.57	69.5	-19.93
11.577	36.52	55.03	-18.51	220	270	40	36.52	69.5	-32.98
13.218	34.26	52.84	-18.58	220	270	40	34.26	80.5	-46.24
13.558	59.54	78.13	-18.59	220	270	40	59.54	124	-64.46
13.671	40.90	59.50	-18.60	220	270	40	40.90	90.5	-49.60
19.076	50.71	70.03	-19.32	220	270	40	50.71	69.5	-18.79
23.519	43.12	63.25	-20.13	220	270	40	43.12	69.5	-26.38

Radiated Emissions (VERTICAL) Y Axis									
Frequency (MHz)	Amplitude (dBuV/m)	Read (dBuV/m)	Factor (dB)	Ant. Pos. (cm)	Table (Deg)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.728	50.26	65.82	-15.56	100	20	40	50.26	69.5	-19.24
13.331	35.73	54.31	-18.58	100	20	40	35.73	80.5	-44.77
13.558	75.75	94.34	-18.59	100	20	40	75.75	124	-48.25
13.671	41.64	60.24	-18.60	100	20	40	41.64	90.5	-48.86
18.256	41.03	60.34	-19.31	100	20	40	41.03	69.5	-28.47
23.972	40.70	60.86	-20.16	100	20	40	40.70	69.5	-28.80
27.651	35.71	56.09	-20.38	100	20	40	35.71	69.5	-33.79

Radiated Emissions (HORIZONTAL) Y Axis									
Frequency (MHz)	Amplitude (dBuV/m)	Read (dBuV/m)	Factor (dB)	Ant. Pos. (cm)	Table (Deg)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.813	50.96	66.57	-15.61	190	70	40	50.96	69.5	-18.54
12.596	35.69	54.24	-18.55	190	70	40	35.69	69.5	-33.81
13.416	35.04	53.63	-18.59	190	70	40	35.04	90.5	-55.46
13.558	71.27	89.86	-18.59	190	70	40	71.27	124	-52.73
17.859	38.50	57.80	-19.30	190	70	40	38.50	69.5	-31.00
23.972	37.88	58.04	-20.16	190	70	40	37.88	69.5	-31.62
25.812	33.04	53.31	-20.27	190	70	40	33.04	69.5	-36.46

Radiated Emissions (VERTICAL) Z Axis									
Frequency (MHz)	Amplitude (dBuV/m)	Read (dBuV/m)	Factor (dB)	Ant. Pos. (cm)	Table (Deg)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.785	49.55	65.14	-15.59	100	270	40	49.55	69.5	-19.95
11.945	43.33	61.86	-18.53	100	270	40	43.33	69.5	-26.17
13.558	76.27	94.86	-18.59	100	270	40	76.27	124	-47.73
13.671	41.55	60.15	-18.60	100	270	40	41.55	90.5	-48.95
18.425	41.47	60.78	-19.31	100	270	40	41.47	69.5	-28.03
22.133	41.32	61.37	-20.05	100	270	40	41.32	69.5	-28.18
27.651	35.31	55.69	-20.38	100	270	40	35.31	69.5	-34.19

Radiated Emissions (HORIZONTAL) Z Axis									
Frequency (MHz)	Amplitude (dBuV/m)	Read (dBuV/m)	Factor (dB)	Ant. Pos. (cm)	Table (Deg)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.757	49.45	65.04	-15.59	100	0	40	49.45	69.5	-20.05
11.124	40.55	59.05	-18.50	100	0	40	40.55	69.5	-28.95
13.558	71.85	90.44	-18.59	100	0	40	71.85	124	-52.15
17.463	40.07	59.36	-19.29	100	0	40	40.07	69.5	-29.43
20.689	39.80	59.18	-19.38	100	0	40	39.80	69.5	-29.70
21.991	37.64	57.68	-20.04	100	0	40	37.64	69.5	-31.86
23.972	35.97	56.13	-20.16	100	0	40	35.97	69.5	-33.53

- Notes :**
1. Amplitude = Reading Amplitude + Factor  
Factor = Amp gain+ Cable loss + Ant factor (Auto calculate in spectrum analyzer)
  2. Ant (cm ) = Antenna height.
  3. Distance of Measurement : 3 Meter
  4. Dist(dB) =  $40\log(30/3) = 40\text{dB}$  ( 30 = 30m , 3 = 3m )
  5. Height of table for EUT placed: 0.8 Meter.
  6. Actual Amp = Amplitude – Dist (30m to 3m )
  7. Margin= .Actual Amp – Limits

### 3.4.2 Open Field Radiated Emissions (30MHz to 1GHz )

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following

Test Mode : Worst case (RS-232 X Axis)

Radiated Emissions (VERTICAL)Class B							
Frequency (MHz)	Read (dBuV/m)	Factor	Ant. (cm)	Table (Degree)	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
35.40	49.93	-23.09	100	166	26.84	30	-3.16
40.60	50.93	-25.88	100	200	25.05	30	-4.95
108.01	58.00	-31.09	100	297	26.91	30	-3.09
144.00	55.38	-30.97	100	155	24.41	30	-5.59
162.70	50.99	-28.77	100	329	22.22	30	-7.78
180.00	55.31	-28.80	100	99	26.51	30	-3.49
324.03	51.02	-23.53	100	323	27.49	37	-9.51
488.11	46.67	-18.66	100	26	28.01	37	-8.99
623.68	41.23	-12.79	100	40	28.44	37	-8.56

Radiated Emissions (HORIZONTAL)Class B							
Frequency (MHz)	Read (dBuV/m)	Factor	Ant. (cm)	Table (Degree)	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
40.80	46.64	-25.60	400	256	21.04	30	-8.96
54.23	49.47	-29.60	400	220	19.87	30	-10.13
108.00	53.01	-31.09	400	242	21.92	30	-8.08
162.73	48.44	-28.92	400	312	19.52	30	-10.48
180.01	55.07	-28.60	400	107	26.47	30	-3.53
203.38	50.79	-28.38	400	283	22.41	30	-7.59
643.70	40.12	-14.39	100	307	25.73	37	-11.27
696.20	41.22	-13.26	100	277	27.96	37	-9.04
749.17	41.00	-11.78	100	155	29.22	37	-7.78

- Notes :**
1. Margin= Amplitude - Limits
  2. Distance of Measurement : 3 Meter
  3. Height of table for EUT placed: 0.8 Meter.
  4. Amplitude= Reading – Amp gain+ Cable loss + Ant factor  
(Auto calculate in spectrum analyzer)
  5. Pre amplifier Gain :38dB to 42dB

### 3.4.3 Open Field Radiated Emissions (30MHz to 1GHz )

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following

Test Mode : Worst case (RS-232 Y Axis)

Radiated Emissions (VERTICAL)Class B							
Frequency (MHz)	Read (dBuV/m)	Factor	Ant. (cm)	Table (Degree)	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
35.35	49.99	-23.09	100	160	26.90	30	-3.10
40.60	54.90	-25.88	100	250	29.02	30	-0.98
108.12	60.09	-31.09	100	297	29.00	30	-1.00
144.00	55.84	-30.97	100	150	24.87	30	-5.13
162.80	51.23	-28.77	100	335	22.46	30	-7.54
180.10	55.63	-28.80	100	100	26.83	30	-3.17
324.20	51.30	-23.53	100	330	27.77	37	-9.23
488.11	46.85	-18.66	100	30	28.19	37	-8.81
623.60	41.40	-12.79	100	50	28.61	37	-8.39

Radiated Emissions (HORIZONTAL)Class B							
Frequency (MHz)	Read (dBuV/m)	Factor	Ant. (cm)	Table (Degree)	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
40.80	51.81	-25.60	400	260	26.21	30	-3.79
54.10	49.30	-29.60	400	210	19.70	30	-10.30
108.12	53.11	-31.09	400	250	22.02	30	-7.98
144.01	49.59	-30.64	400	160	18.95	30	-11.05
162.80	48.50	-28.92	400	320	19.58	30	-10.42
180.00	55.00	-28.60	400	110	26.40	30	-3.60
203.38	50.95	-28.38	400	285	22.57	30	-7.43
696.00	41.55	-13.26	100	280	28.29	37	-8.71
750.00	41.10	-11.78	100	160	29.32	37	-7.68

- Notes :**
1. Margin= Amplitude - Limits
  2. Distance of Measurement : 3 Meter
  3. Height of table for EUT placed: 0.8 Meter.
  4. Amplitude= Reading –Amp gain+ Cable loss + Ant factor  
(Auto calculate in spectrum analyzer)
  5. Pre amplifier Gain :38dB to 42dB



### 3.4.4 Open Field Radiated Emissions (30MHz to 1GHz )

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following

Test Mode : Worst case (RS-232 Z Axis)

Radiated Emissions (VERTICAL)Class B							
Frequency (MHz)	Read (dBuV/m)	Factor	Ant. (cm)	Table (Degree)	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
35.35	49.99	-23.09	100	160	26.90	30	-3.10
40.60	54.90	-25.88	100	250	29.02	30	-0.98
108.12	60.09	-31.09	100	297	29.00	30	-1.00
144.00	55.84	-30.97	100	150	24.87	30	-5.13
162.80	51.23	-28.77	100	335	22.46	30	-7.54
180.10	55.63	-28.80	100	100	26.83	30	-3.17
324.20	51.30	-23.53	100	330	27.77	37	-9.23
488.11	46.85	-18.66	100	30	28.19	37	-8.81
623.60	41.40	-12.79	100	50	28.61	37	-8.39

Radiated Emissions (HORIZONTAL)Class B							
Frequency (MHz)	Read (dBuV/m)	Factor	Ant. (cm)	Table (Degree)	Amplitude (dBuV/m)	Limits (dBuV/m)	Margin (dB)
40.80	51.81	-25.60	400	260	26.21	30	-3.79
54.10	49.30	-29.60	400	210	19.70	30	-10.30
108.12	53.11	-31.09	400	250	22.02	30	-7.98
144.01	49.59	-30.64	400	160	18.95	30	-11.05
162.80	48.50	-28.92	400	320	19.58	30	-10.42
180.00	55.00	-28.60	400	110	26.40	30	-3.60
203.38	50.95	-28.38	400	285	22.57	30	-7.43
696.00	41.55	-13.26	100	280	28.29	37	-8.71
750.00	41.10	-11.78	100	160	29.32	37	-7.68

- Notes :**
1. Margin= Amplitude - Limits
  2. Distance of Measurement : 3 Meter
  3. Height of table for EUT placed: 0.8 Meter.
  4. Amplitude= Reading –Amp gain+ Cable loss + Ant factor  
(Auto calculate in spectrum analyzer)
  5. Pre amplifier Gain :38dB to 42dB

## 4. Frequency Tolerance Requirements

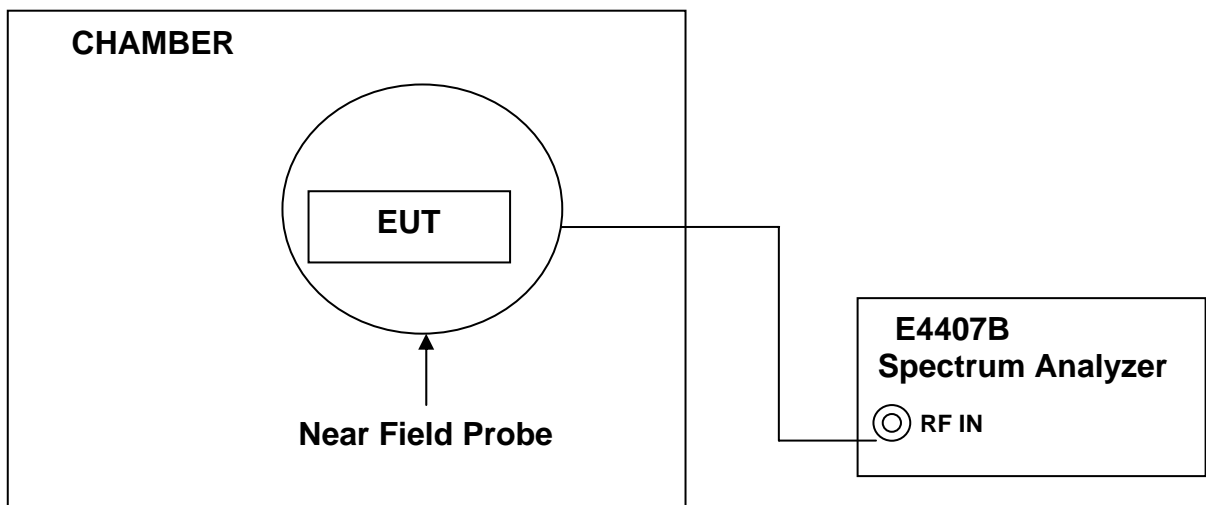
### 4.1 Test Condition & Setup

15.225(e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 23 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

The resolution bandwidth of the spectrum analyzer was set to 10Hz., “span” set to 2kHz.

The detector function was set to peak and hold mode read frequency.

### 4.2 Test Instruments Configuration



### 4.3 Test Equipment List

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cal. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2012/1/31	2013/1/31
2.	EM	Probe	107328	EM-6992	N/A	N/A
34.	GIANT FORCE	CHAMBER	GP-94272-1	GTH-064S	2012/7/25	2013/7/25

## 4.4 Test Results

Test Mode : RS-323

Test Conditions		Result		Limit
Temperature °C	Voltage (AC)	Frequency (MHz)	Tolerance ±%	<0.01%
+23°C	120V	13.558687	0.0096838	PASS
-20°C	102V	13.558760	0.0091454	PASS
	138V	13.558760	0.0091454	PASS
+55°C	102V	13.558737	0.0093150	PASS
	138V	13.558675	0.0097723	PASS

Test Mode : USB

Test Conditions		Result		Limit
Temperature °C	Voltage (AC)	Frequency (MHz)	Tolerance ±%	<0.01%
+23°C	120V	13.558675	0.0097723	PASS
-20°C	102V	13.558760	0.0091454	PASS
	138V	13.558775	0.0090347	PASS
+55°C	102V	13.558750	0.0092191	PASS
	138V	13.558760	0.0091454	PASS

**Note** :1. AC input : 120V/60Hz (100%)

: 102V/60Hz (85%)

: 138V/60Hz (115%)

2. Operation frequency 13.56MHz

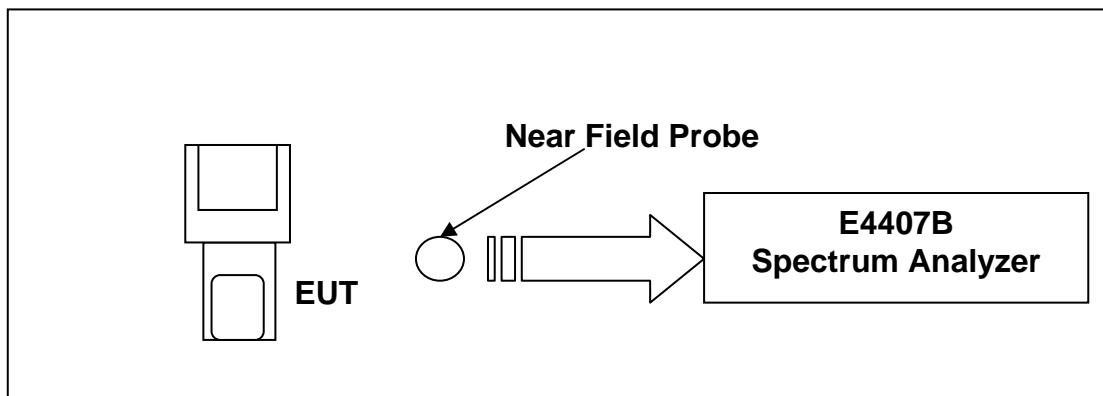
## 5. Transmitter Bandwidth Measurements

### 5.1 Test Condition & Setup

The transmitter bandwidth measurements were performed in a shielded enclosure. The EUT was placed on a wooded table which is 0.8 meters height and a near field probe was used at a testing, EUT was set to transmit continuously.

The resolution bandwidth of the spectrum analyzer was set to 1kHz. The detector function was set to peak and hold mode to clearly observe the components. The maximum permitted bandwidth at 13.553MHz to 13.567MHz with respect to the reference level specified of the center frequency of the EUT.

### 5.2 Test Instruments Configuration



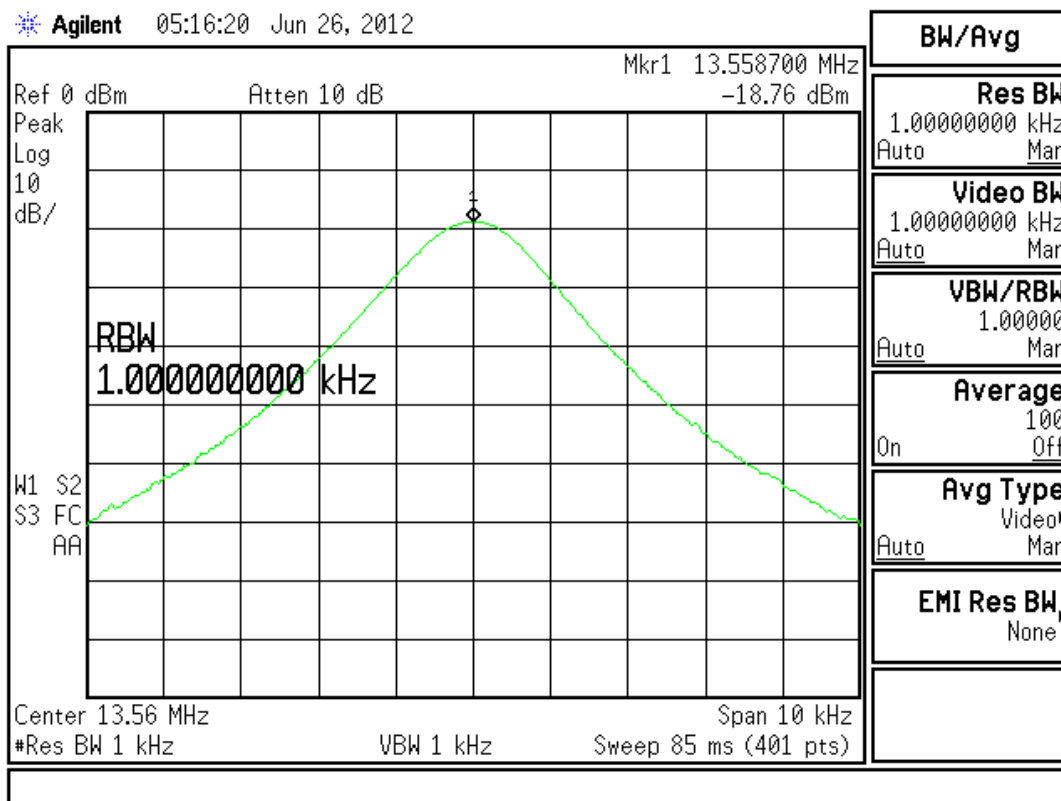
### 5.3 Test Equipment List

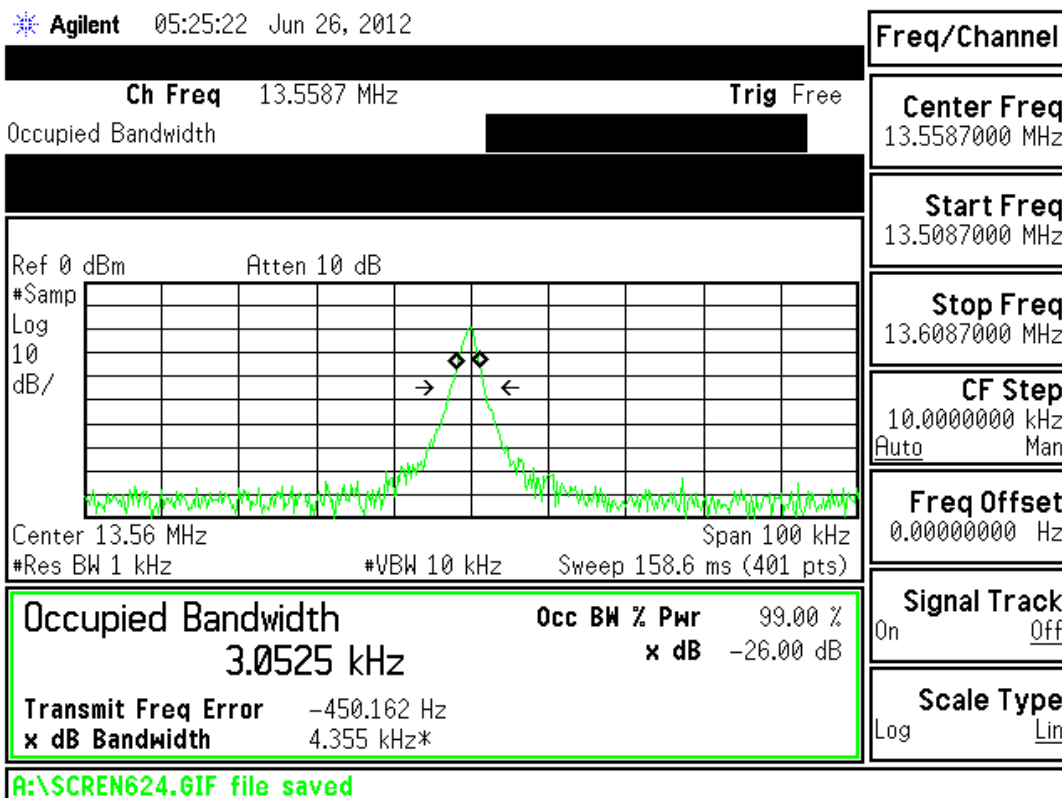
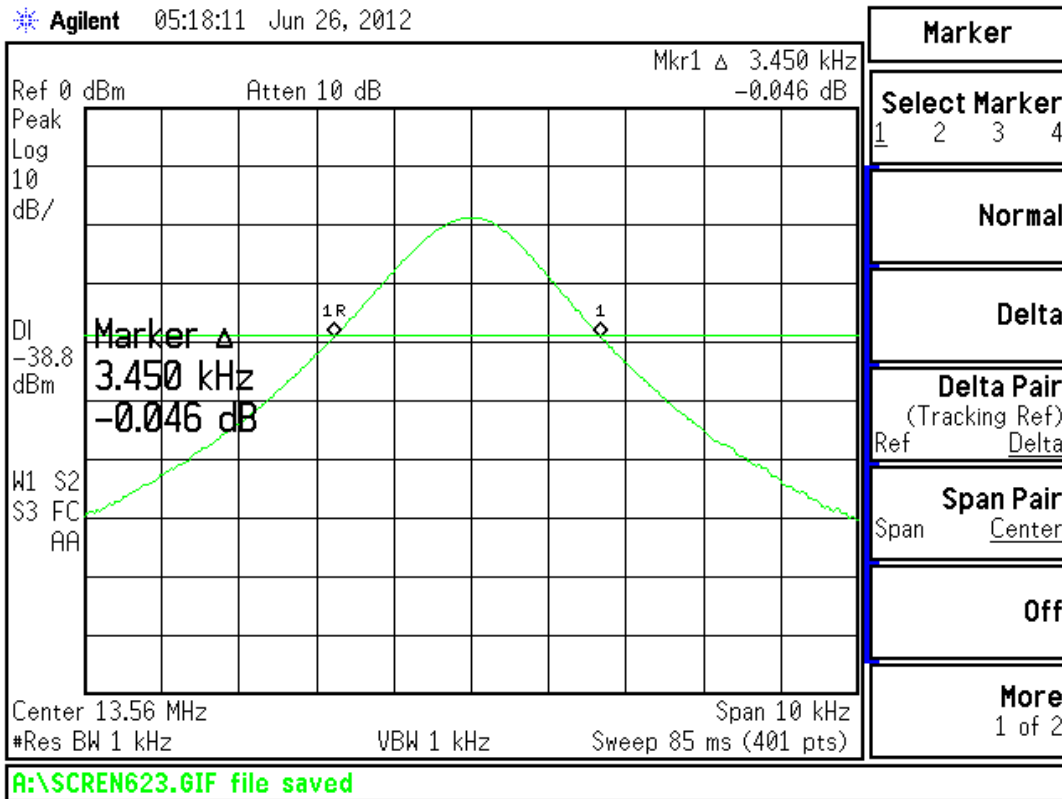
Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cal. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2012/1/31	2013/1/31
2.	EM	Probe	107328	EM-6992	N/A	N/A

### 5.4 Test Results

<b>Operation Frequency</b>	13.558700	MHz
<b>20dB Bandwidth Measurement</b>	3.450	kHz
<b>99% Occupied Bandwidth</b>	3.0525	kHz

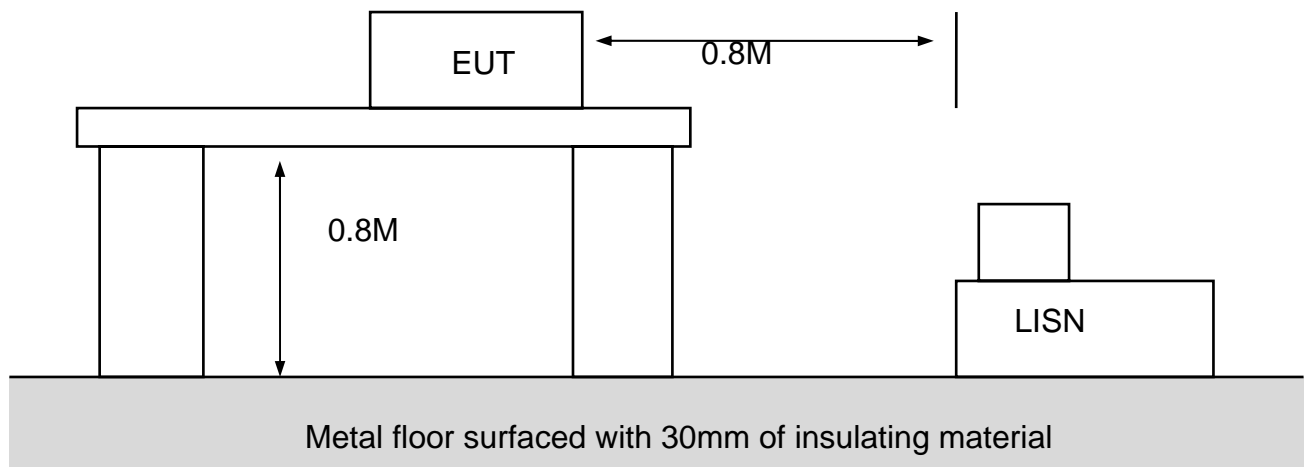
### 5.5 Test Graphs



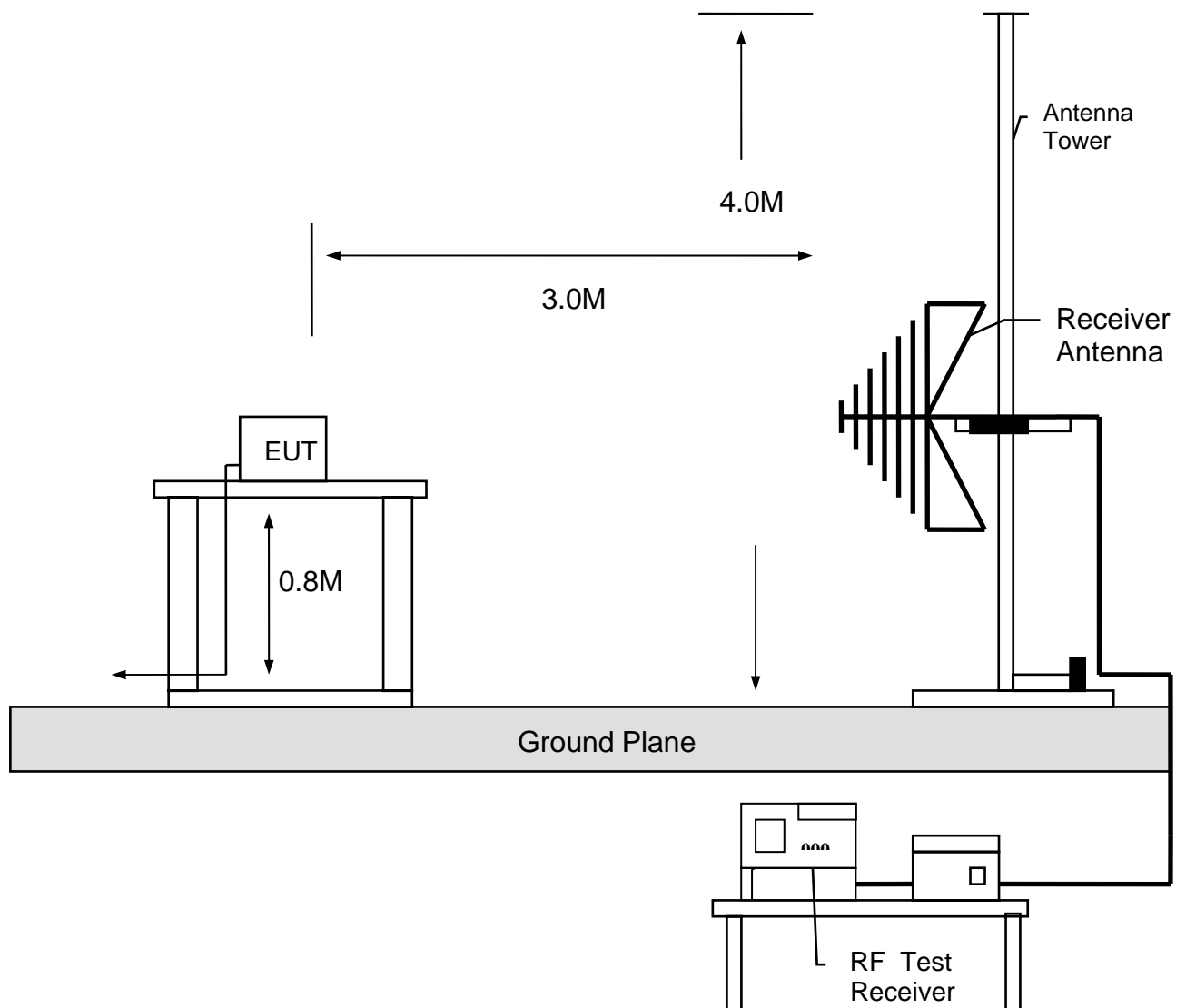


## Appendix I - EUT Test SETUP

### MEASUREMENT OF POWER LINE CONDUCTED RFI VOLTAGE



### MEASUREMENT OF RADIATED EMISSION





## Appendix II - Brand / Trade Name & Model No. Multiple Listee

Model No.	Trade Name
N/A	N/A