FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : Dual Channel Transmitter
FCC ID. : Y4O-TWR1
Model No. : TWR1
Working Frequency : 610~640 MHz

for

APPLICANT : inMusic Brands, Inc.
ADDRESS : 200 SCENIC VIEW DRIVE, SUITE 201, CUMBERLAND, Rhode Island, 02864, USA

Test Performed by

ELECTRONICS TESTING CENTER (ETC) , TAIWAN
NO. 34. LIN 5, DINGFU VIL., LINKOU DIST.,
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.
TEL : (02)26023052 FAX : (02)26010910
http:// www.etc.org.tw ; e-mail:emc@etc.org.tw

Report Number : 13-05-RBF-008-04

TEST REPORT CERTIFICATION

Applicant	:	inMusic Brands, Inc. 200 SCENIC VIEW DRIVE, SUITE 201, CUMBERLAND, Rhode Island, 02864, USA
Manufacturer	:	MASCOT ELECTRIC CO., LTD. No. 85 Chang Hsing First Street, Tai-tzu Village, Jen-Te Hsian, Tainan Hsien Taiwan
Description of EUT	:	
a) Type of EUT	:	Dual Channel Transmitter
b) Trade Name	:	ALTO
c) Model No.	:	TWR1
d) FCC ID	:	Y4O-TWR1
e) Working Frequency	:	610~640 MHz
f) Power Supply	:	External Adaptor，12 VDC/500 mA

Regulation Applied: FCC Rules and Regulations Part 74 Subpart H

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Issued Date : Jun. 25, 2013

Test Engineer : 

(Vincent Chang, Engineer)

Approve & Authorized Signer : 

S. S. Liou, Section Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	:	Dual Channel Transmitter
b) Trade Name	:	ALTO
c) Model No.	:	TWR1
d) FCC ID	:	Y4O-TWR1
e) Working Frequency	:	610~640 MHz
f) Power Supply	:	External Adaptor，12 VDC/500 mA
g) Emission Designator	:	78K6F3E 2M+2DK=2x(5kHz)+2x(34.3kHz)x1=78.6kHz

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4 (2003). Test also follow “TIA-603-C(2004)-Land Mobile FM or PM Communications Equipment Measurement and Performance Standsrds” and section 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055 of Part 2 of CFR 47.

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at NO. 34. LIN 5, DINGFU VIL., LINKOU DIST.,NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Jan. 11, 2011.

2. REQUIREMENTS OF PROVISIONS

2.1 Definition

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Frequencies Available

According to sec. 74.802 of Part 74, the following frequencies are available for low power auxiliary station :

Frequencies (MHz)

26.100-26.480	455.000-456.000
54.000-72.000	470.000-488.000
76.000-88.000	488.000-494.000
161.625-161.775	494.000-608.000
174.000-216.000	614.000-806.000
450.000-451.000	944.000-952.000

2.3 Requirements for Radio Equipment on Certification

(1) RF Output Power
For transmitters, the power output shall be measured at the RF output terminals.

(2) Modulation Characteristics
For Voice Modulated Communication Equipment, a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted.

(3) Occupied Bandwidth
For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

(4) Spurious Emissions at Antenna Terminals
The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

(5) Field Strength of Spurious Emissions

Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation.

(6) Frequencies Tolerance

a) The frequency stability shall be measured with variation of ambient temperature.
b) The frequency stability shall be measured with variation of primary supply voltage.

2.4 Labeling Requirement

Each equipment for which a type acceptance application is filed on or after May 1,1981, shall bear an identification plate or label pursuant to §2.925（Identification of equipment） and §2.926（FCC identifier）.

3. OUTPUT POWER MEASUREMENT

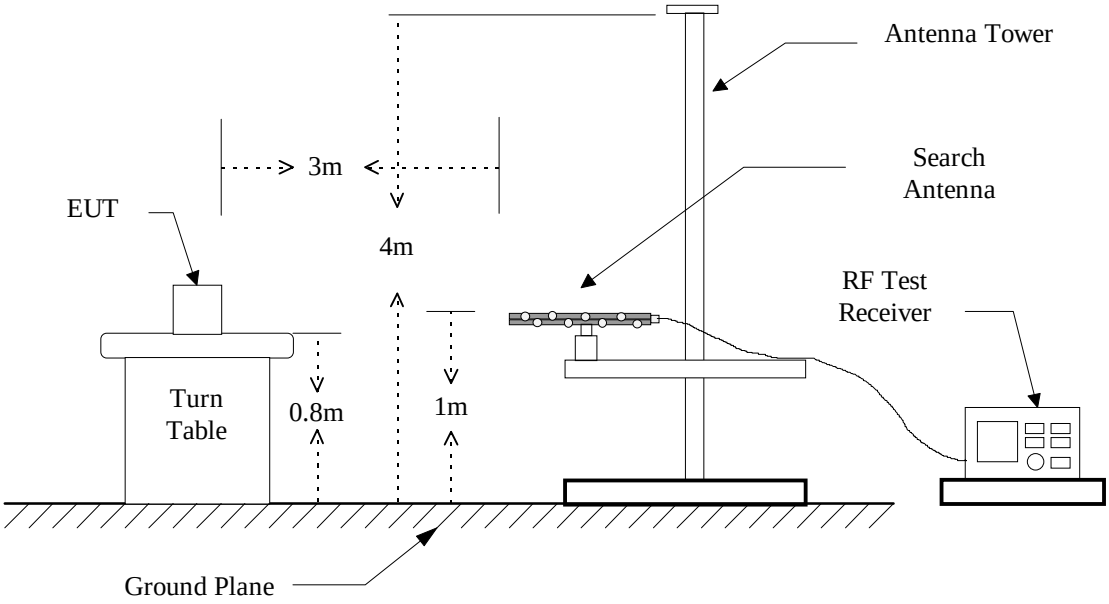
3.1 Provision Applicable

According to §74.861(e)(1)(ii), the output power shall not exceed 250 milliwatts.

3.2 Measurement Procedure

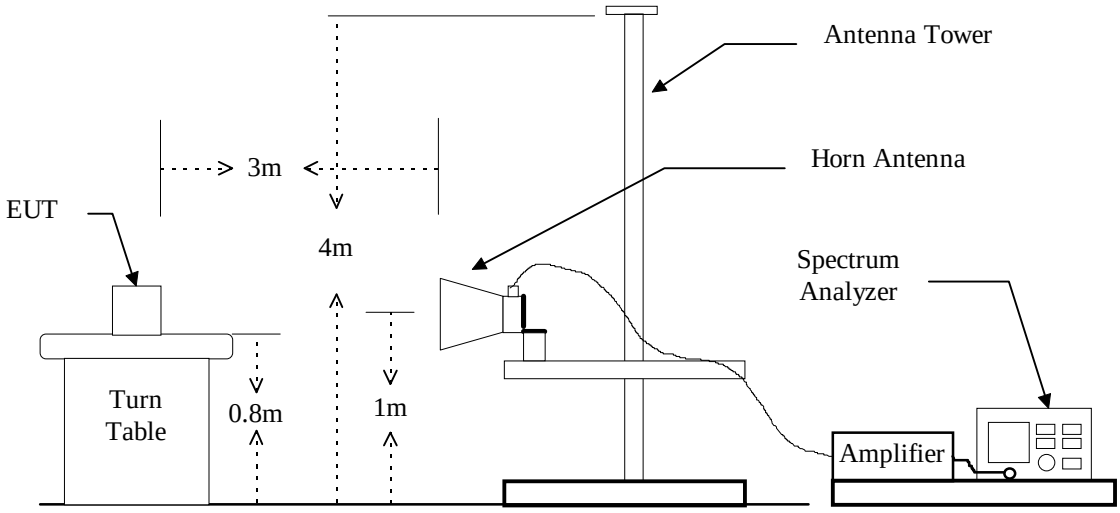
1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 °, and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.
7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

Figure 1 : Frequencies measured below 1 GHz configuration



Note: For substitution method, replace the EUT with a tuned dipole antenna relative to each frequency and connect to a standard signal generator (SG) via a low loss cable.

Figure 2 : Frequencies measured above 1 GHz configuration



Note: For substitution method, replace the EUT with a horn antenna and connect to a standard signal generator (SG) via a low loss cable.

3.3 Test Data

Operated mode : TX
Temperature : 22 °C
Test Date : Jun. 17, 2013
Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
610.175	84.9	11.1	2.2	----	8.9	7.762	250

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
624.625	85.9	12.2	2.3	----	9.9	9.772	250

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
639.700	85.2	11.8	2.4	----	9.4	8.710	250

Note: For measured frequency below 1GHz, a tuned dipole antenna is used.

3.4 Result Calculation

Result calculation is as following :

Result = SG Reading + Cable Loss + Antenna Gain Corrected

Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

$$mW = \log^{-1}\left[\frac{\text{Result(dBm)}}{10}\right]$$

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2013/05/14	2014/05/13
Dipole Antenna	Schwarzbeck	897;898	2012/09/07	2013/09/07
Log-periodic Antenna	EMCO	3146	2012/10/17	2013/10/17
Amplifier	HP	8447D	2013/05/03	2014/05/02
Signal generator	HP	83732B	2012/09/06	2013/09/06

4. MODULATION CHARACTERISTICS

4.1 Provisions Applicable

According to § 2.1047 (a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be measured.

4.2 Measurement Method

A) Modulation Limit

1. Position the EUT as shown in figure 3, adjust the audio input frequency to 100 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.

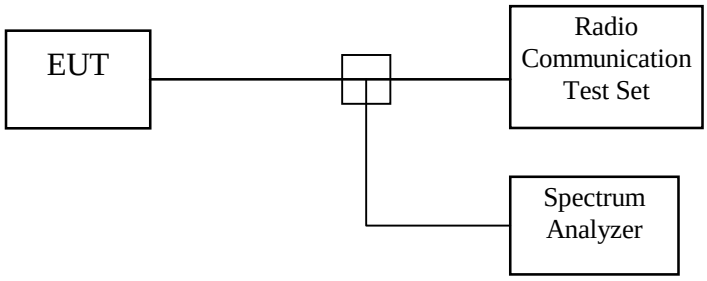
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

B) Frequency response of all circuits

1. Position the EUT as shown in figure 3.

2. Vary the modulating frequency from 100 Hz to 15000 Hz with constant input voltage (derived from 5.4(a) of this test report), and observe the change in output.

Figure 3 : Modulation characteristic measurement configuration



4.3 Measurement Instrument

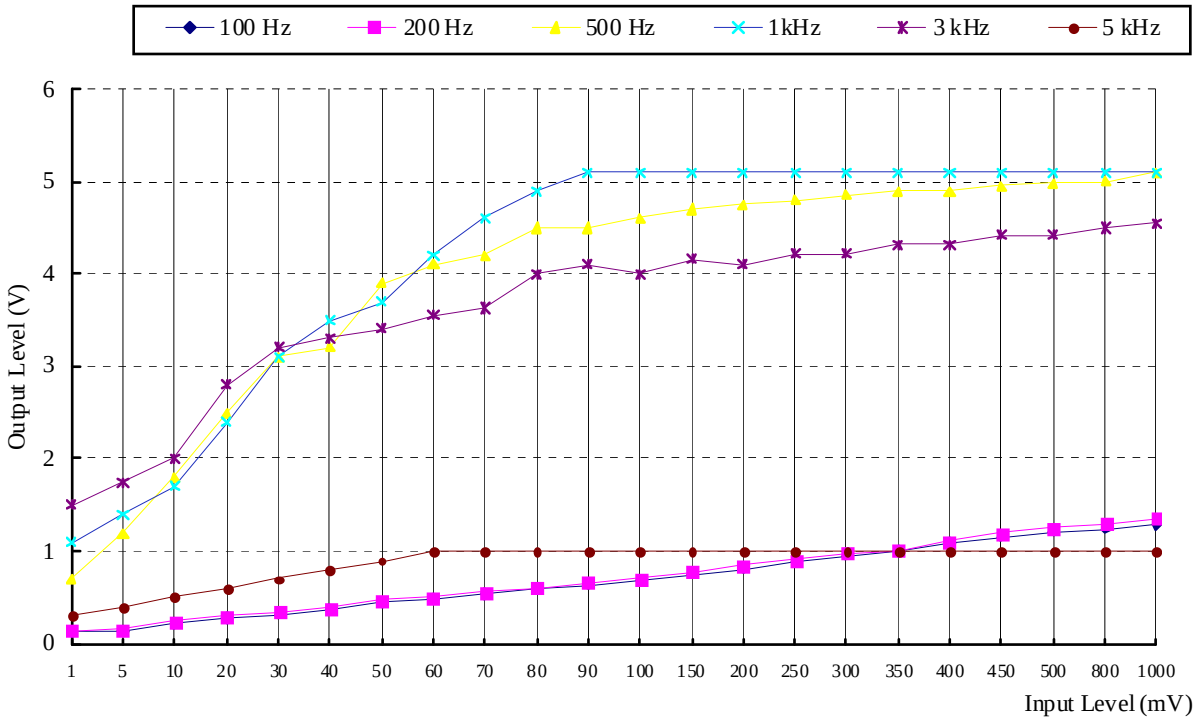
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2013/05/13	2014/05/12
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20

4.4 Measurement Result

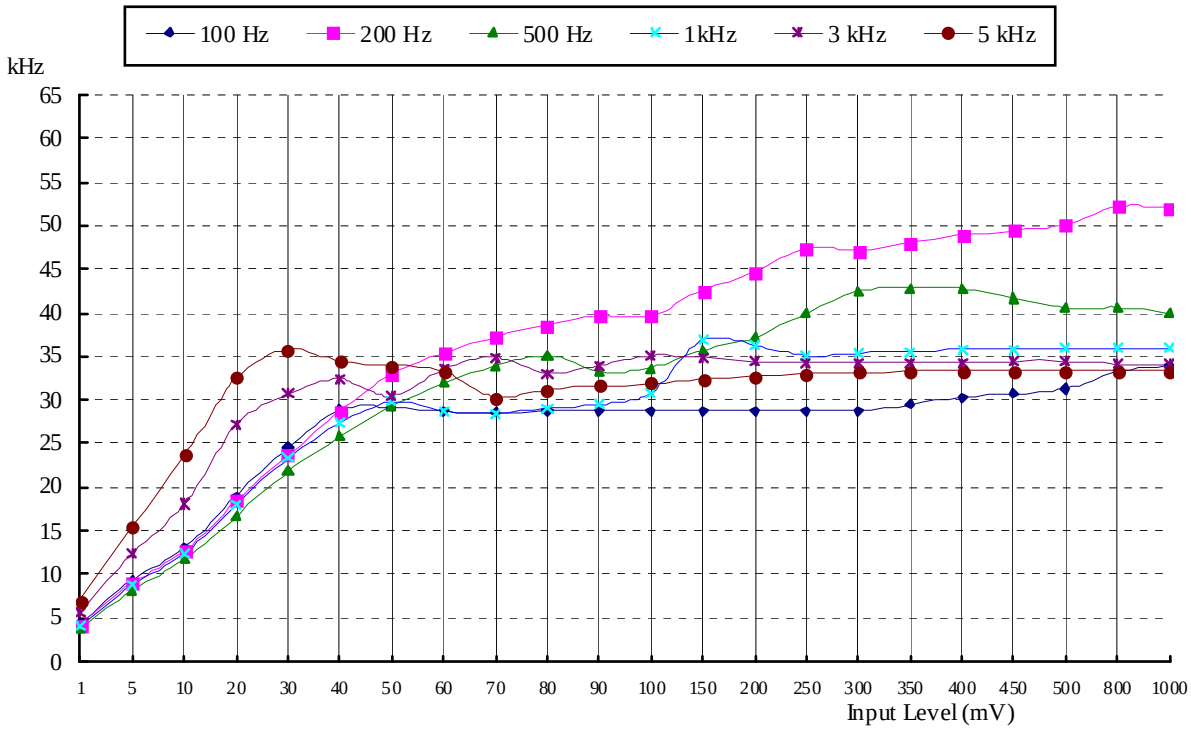
RF Frequency : 610.175MHz;

Test Date : Jun. 24, 2013 Temperature : 25 °C Humidity : 55 %

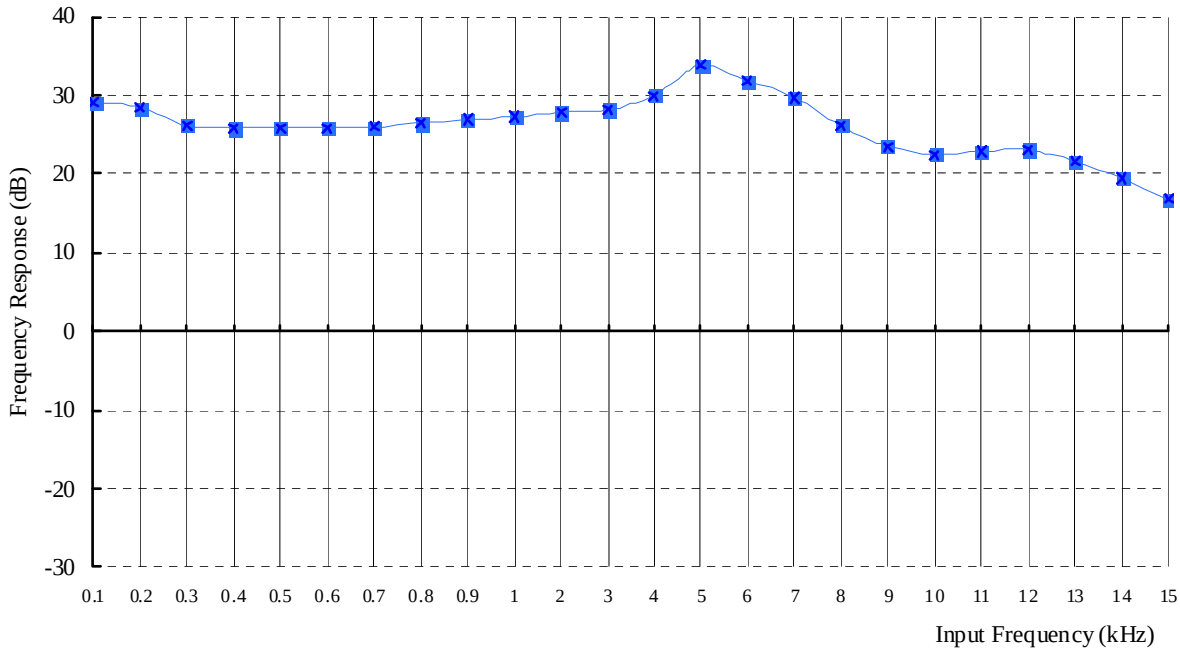
A). Frequency response



B). Modulation Limit



C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.
According to §74.861(e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

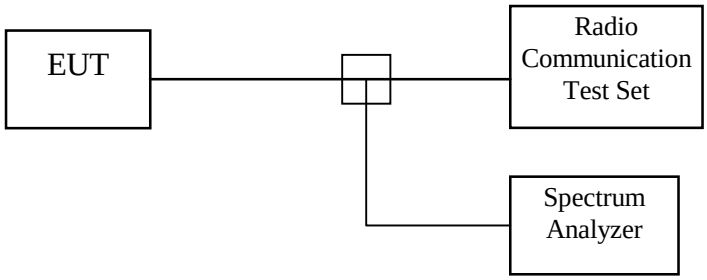
5.2 Measurement Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT as shown in figure 4, and Install new batteries in the EUT. Turn on the EUT ant set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

3. Apply a 2.5 kHz modulation signal to EUT and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 2. This is the occupied bandwidth specified.

Figure 4 : Occupied bandwidth measurement configuration



5.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2013/05/13	2014/05/12
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20

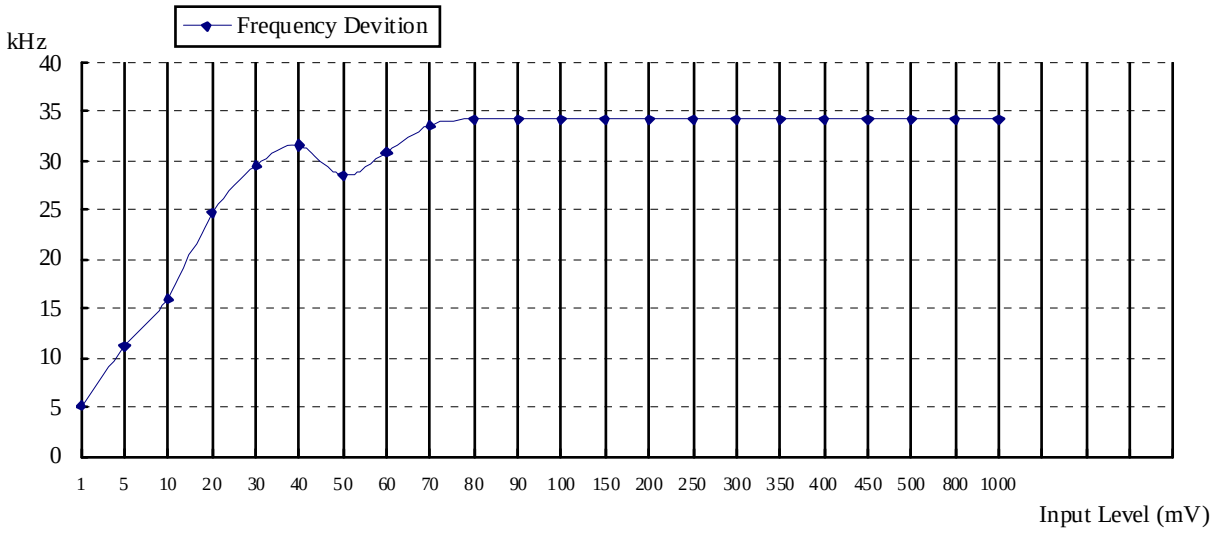
5.4 Bandwidth Measured

5.4.1 Input Level Derived

RF Frequency : 610.175MHz;

Test Date : Jun. 24, 2013 Temperature : 25 °C Humidity : 55 %

Input Audio Frequency : 2.5 kHz, Sine Wave

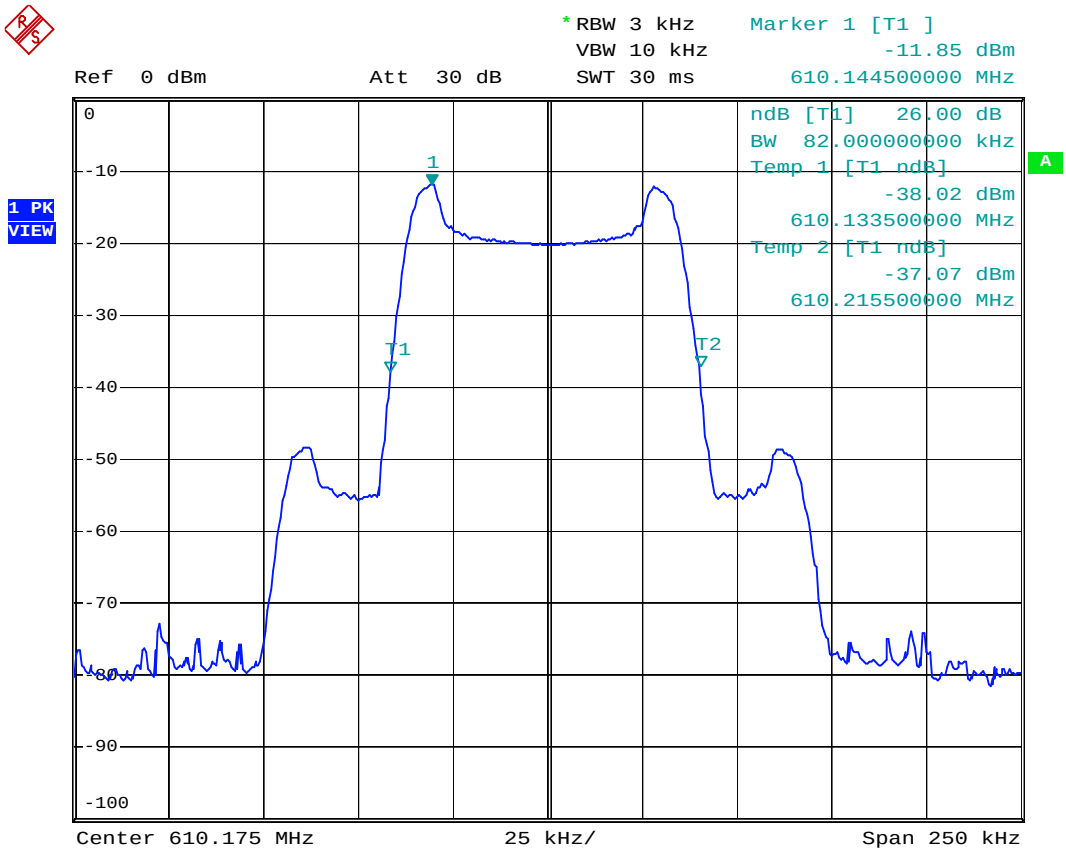


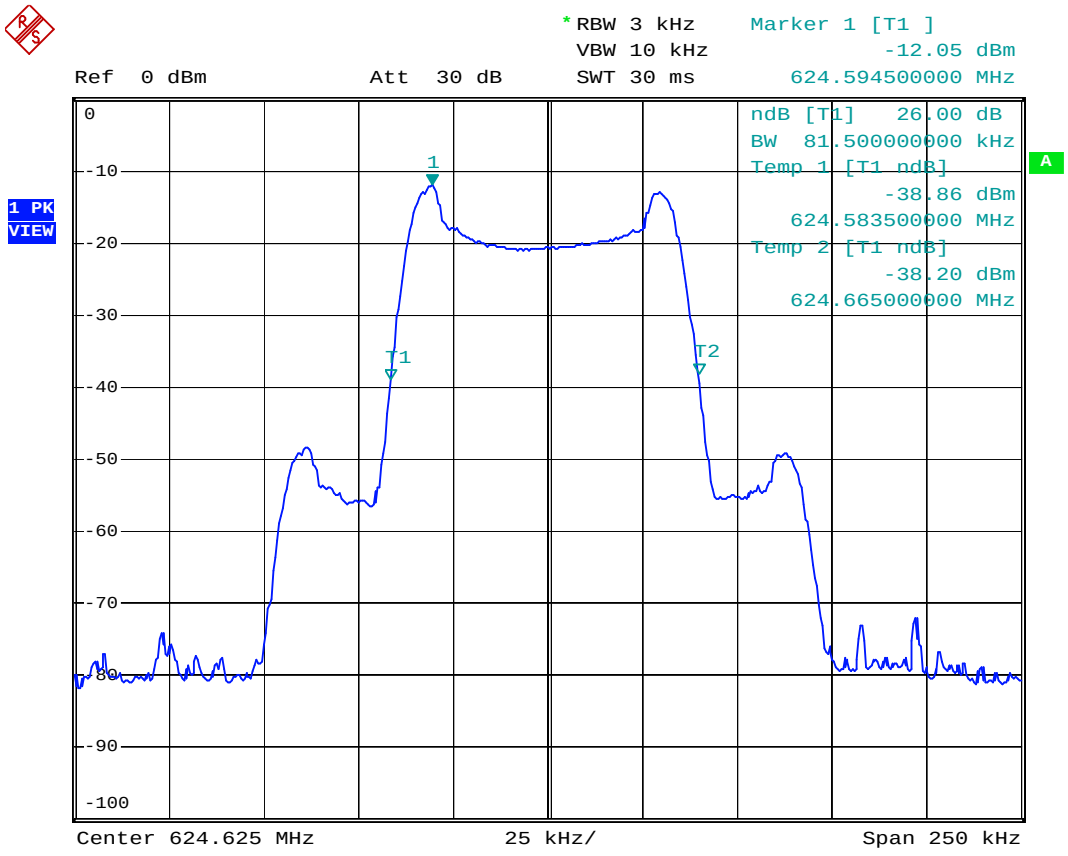
The Level input to produce 50% modulation is 10 mV, therefore the magnitude 16 dB greater than it is 63 mV.

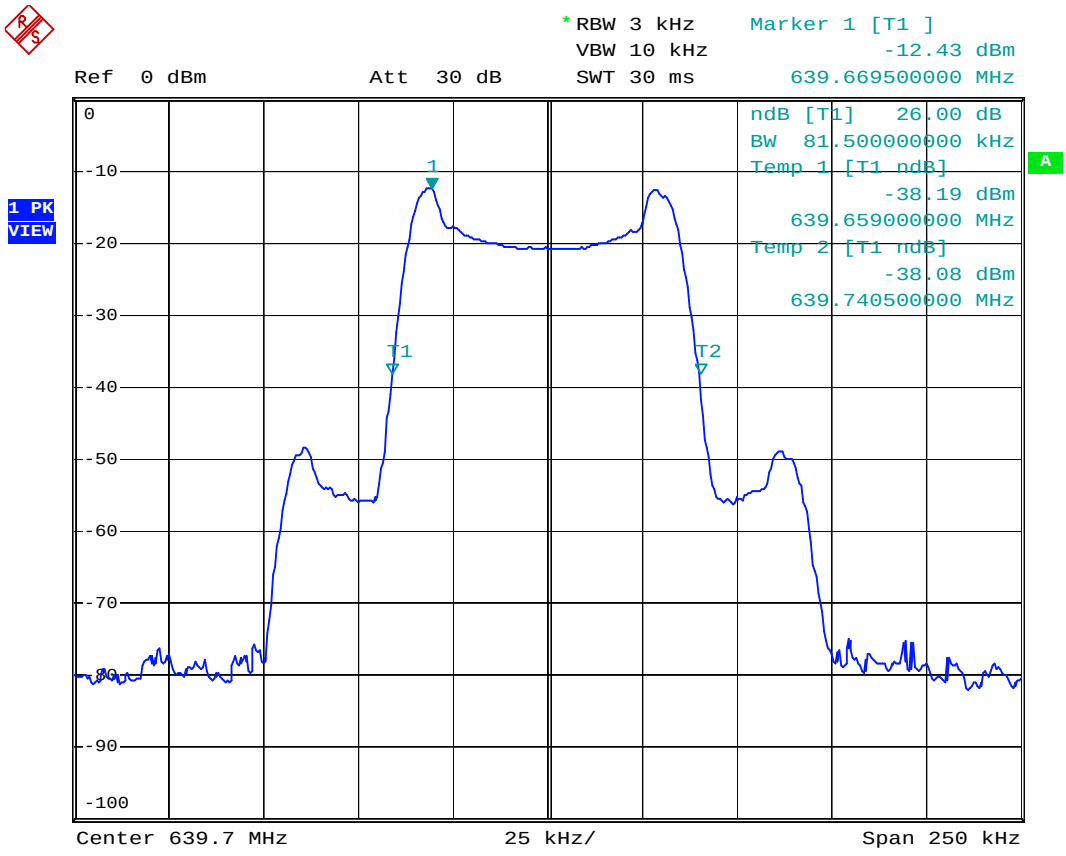
5.4.2 Occupied Bandwidth Plotted

Test Date : Jun. 24, 2013 Temperature : 25 °C Humidity : 55 %

RF Frequency (MHz)	26 dB Bandwidth (kHz)
610.175	82.0
624.625	81.5
639.700	81.5


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-11.85 dBm
610.144500000 MHz
Ref 0 dBm
Att 30 dB
ndB [T1] 26.00 dB
BW 82.000000000 kHz
Temp 1 [T1 ndB]
-38.02 dBm
610.133500000 MHz
Temp 2 [T1 ndB]
-37.07 dBm
610.215500000 MHz
1 PK
VIEW
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
1
T1
T2
Center 610.175 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-12.05 dBm
624.594500000 MHz
Ref 0 dBm
Att 30 dB
ndB [T1] 26.00 dB
BW 81.500000000 kHz
Temp 1 [T1 ndB]
-38.86 dBm
624.583500000 MHz
Temp 2 [T1 ndB]
-38.20 dBm
624.665000000 MHz
1 PK
VIEW
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
1
T1
T2
Center 624.625 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-12.43 dBm
639.669500000 MHz
Ref 0 dBm
Att 30 dB
ndB [T1] 26.00 dB
BW 81.500000000 kHz
Temp 1 [T1 ndB]
-38.19 dBm
639.659000000 MHz
Temp 2 [T1 ndB]
-38.08 dBm
639.740500000 MHz
1 PK
VIEW
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
1
T1
T2
Center 639.7 MHz
25 kHz/
Span 250 kHz

6. FIELD STRENGTH OF EMISSION

6.1 Provisions Applicable

According to §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to §74.861(e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the follwing sceedule:

(i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(iii) on any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth shall be attenuated below the unmodulated carrier by at least 43 plus 10 Log(output power in watts) dB.

6.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 °, and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.

7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

6.3 Measuring Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20
Double Ridged Antenna	EMCO	3115	2013/04/29	2014/04/28
Double Ridged Antenna	EMCO	3115	2013/04/29	2014/04/28
Log-periodic Antenna	EMCO	3146	2012/10/07	2013/10/06
Biconical Antenna	EMCO	3110	2012/10/07	2013/10/06
Dipole Antenna	Schwarzbeck	897;898	2012/09/07	2013/09/07
Amplifier	HP	8449B	2013/01/09	2014/01/08
Amplifier	HP	8447D	2013/05/03	2014/05/02
Signal generator	HP	83732B	2012/09/06	2013/09/06

Measuring instrument setup in frequency band measured is as following :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz

6.4 Measuring Data

6.4.1. Emission Test Data

a. Tx Frequency: 610.175MHz

Operated mode : TX Test Date :Jun. 17, 2013
Temperature : 22°C Humidity : 65

Unmodulated carrier output power is 8.9 dBm , or 7.762 mW (ERP).
The limit of spurious or harmonics is calculated as following :

8.9-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1220.350	63.8	61.8	-47.8	-49.8	6.6	-2.0	2.3	-45.5	-47.5	-13.0	-32.5
1830.525	54.4	51.2	-54.5	-57.6	8.4	-2.0	2.9	-51.0	-54.1	-13.0	-38.0
2440.700	---	---	---	---	9.3	-2.0	3.3	---	---	-13.0	---
3050.875	---	---	---	---	9.1	-2.0	3.8	---	---	-13.0	---
3661.050	---	---	---	---	9.3	-2.0	4.1	---	---	-13.0	---
4271.225	---	---	---	---	9.9	-2.0	4.5	---	---	-13.0	---
4881.400	---	---	---	---	10.2	-2.0	4.8	---	---	-13.0	---
5491.575	---	---	---	---	10.3	-2.0	5.1	---	---	-13.0	---
6101.750	---	---	---	---	10.9	-2.0	5.4	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading +Cable Loss +Antenna Gain +Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

b. Tx Frequency: 624.625 MHz

Operated mode : TX Test Date :Jun. 17, 2013
Temperature : 22°C Humidity : 65

Unmodulated carrier output power is 9.9 dBm , or 9.772 mW (ERP).
The limit of spurious or harmonics is calculated as following :
9.9-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1249.250	64.5	62.1	-47.0	-49.4	6.7	-2.0	2.3	-44.6	-47.0	-13.0	-31.6
1873.875	54.8	51.5	-53.9	-57.2	8.4	-2.0	2.9	-50.4	-53.7	-13.0	-37.4
2498.500	---	---	---	---	9.4	-2.0	3.4	---	---	-13.0	---
3123.125	---	---	---	---	9.1	-2.0	3.8	---	---	-13.0	---
3747.750	---	---	---	---	9.3	-2.0	4.2	---	---	-13.0	---
4372.375	---	---	---	---	10.1	-2.0	4.5	---	---	-13.0	---
4997.000	---	---	---	---	10.1	-2.0	4.9	---	---	-13.0	---
5621.625	---	---	---	---	10.4	-2.0	5.2	---	---	-13.0	---
6246.250	---	---	---	---	11.0	-2.0	5.4	---	---	-13.0	---

Note :
1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :
   Result = SG Reading +Cable Loss +Antenna Gain +Antenna Gain Corrected
   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

c. Tx Frequency: 639.700 MHz

Operated mode : TX Test Date :Jun. 17, 2013
Temperature : 22°C Humidity : 65

Unmodulated carrier output power is 9.4 dBm , or 8.710 mW (ERP).
The limit of spurious or harmonics is calculated as following :

9.4-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1279.400	63.6	61.2	-47.8	-50.2	6.9	-2.0	2.4	-45.3	-47.7	-13.0	-32.3
1919.100	54.1	50.8	-54.4	-57.7	8.4	-2.0	2.9	-50.9	-54.2	-13.0	-37.9
2558.800	---	---	---	---	9.4	-2.0	3.4	---	---	-13.0	---
3198.500	---	---	---	---	9.2	-2.0	3.9	---	---	-13.0	---
3838.200	---	---	---	---	9.3	-2.0	4.2	---	---	-13.0	---
4477.900	---	---	---	---	10.3	-2.0	4.6	---	---	-13.0	---
5117.600	---	---	---	---	10.1	-2.0	4.9	---	---	-13.0	---
5757.300	---	---	---	---	10.6	-2.0	5.2	---	---	-13.0	---
6397.000	---	---	---	---	11.2	-2.0	5.5	---	---	-13.0	---

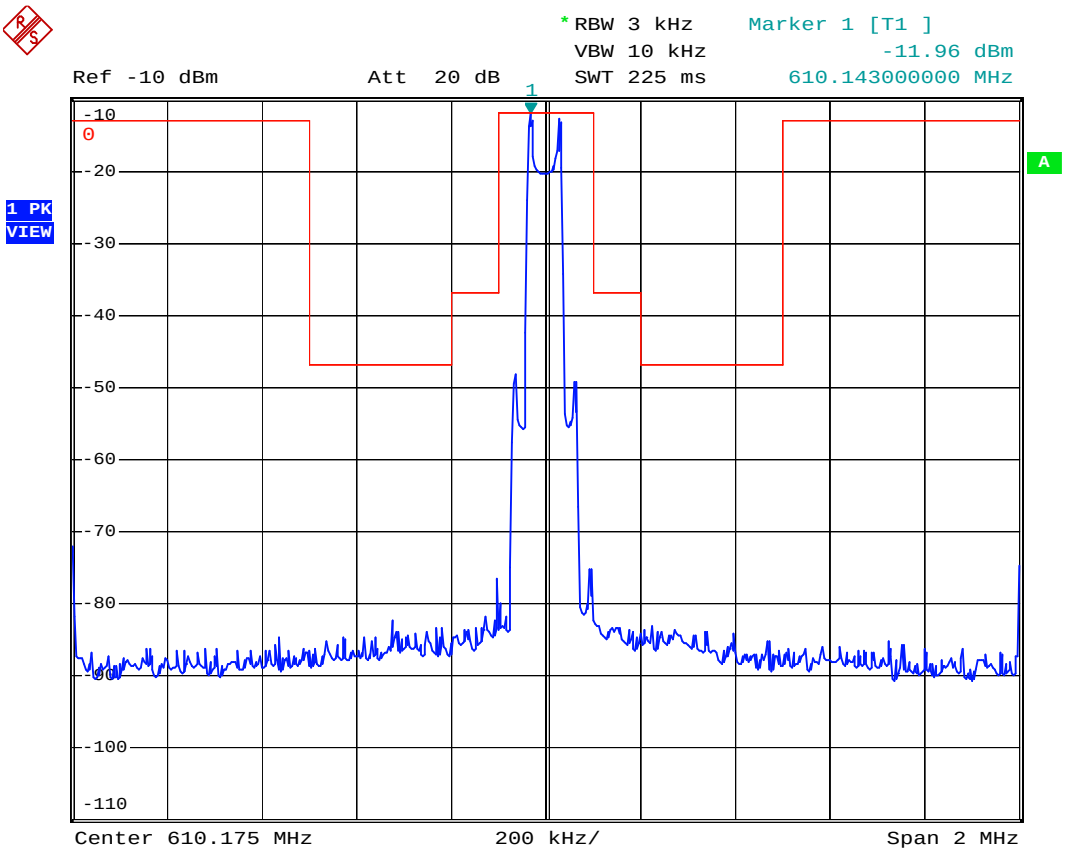
Note :

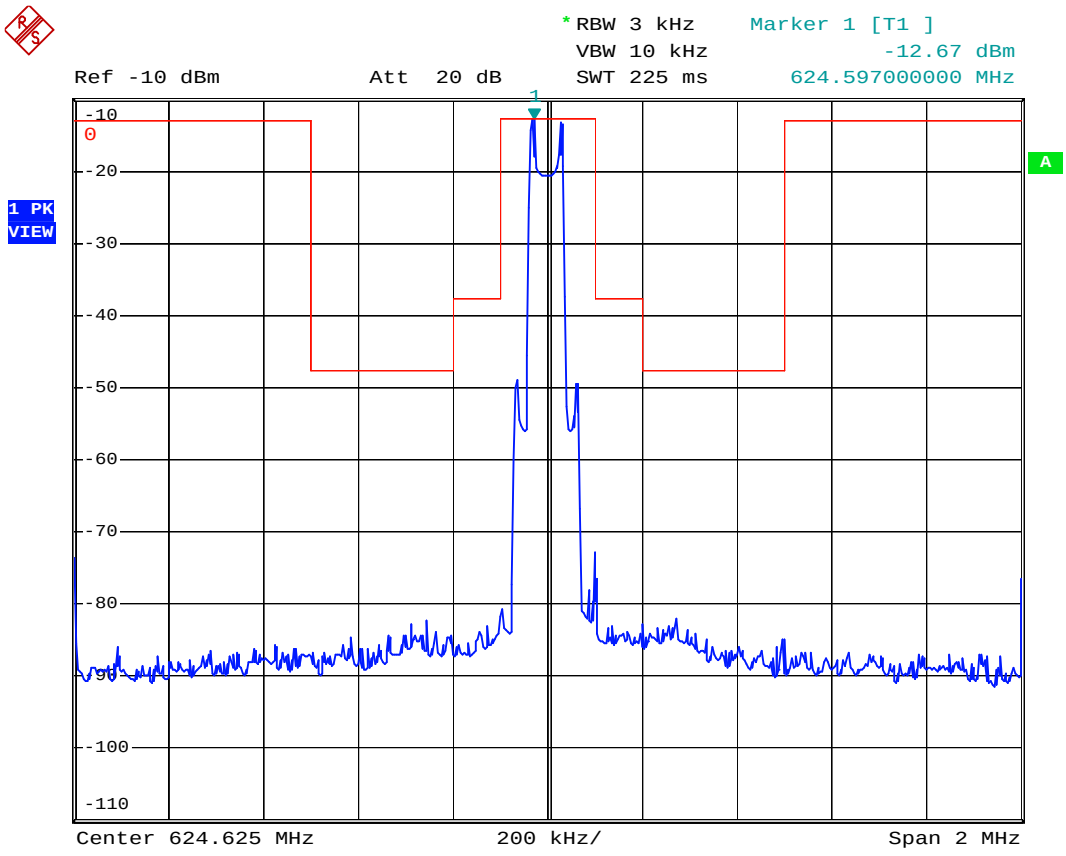
1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

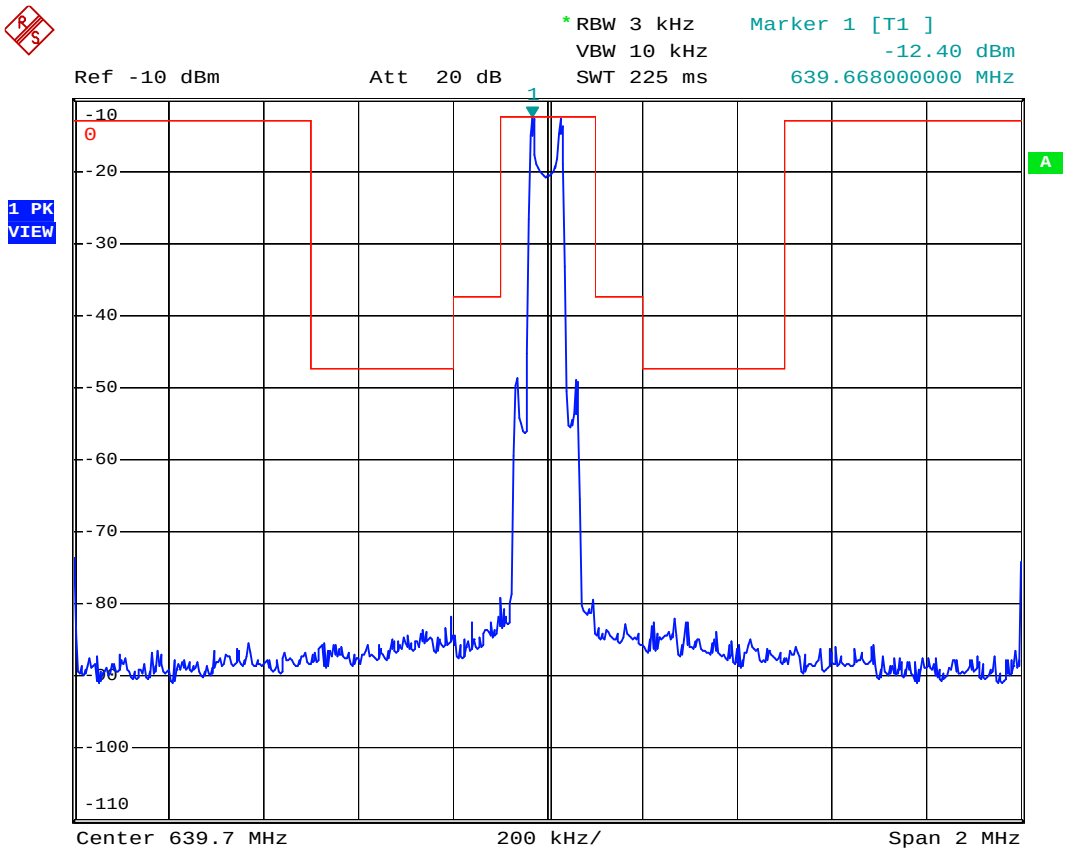
   Result = SG Reading +Cable Loss +Antenna Gain +Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

6.4.2 Emission mask plots



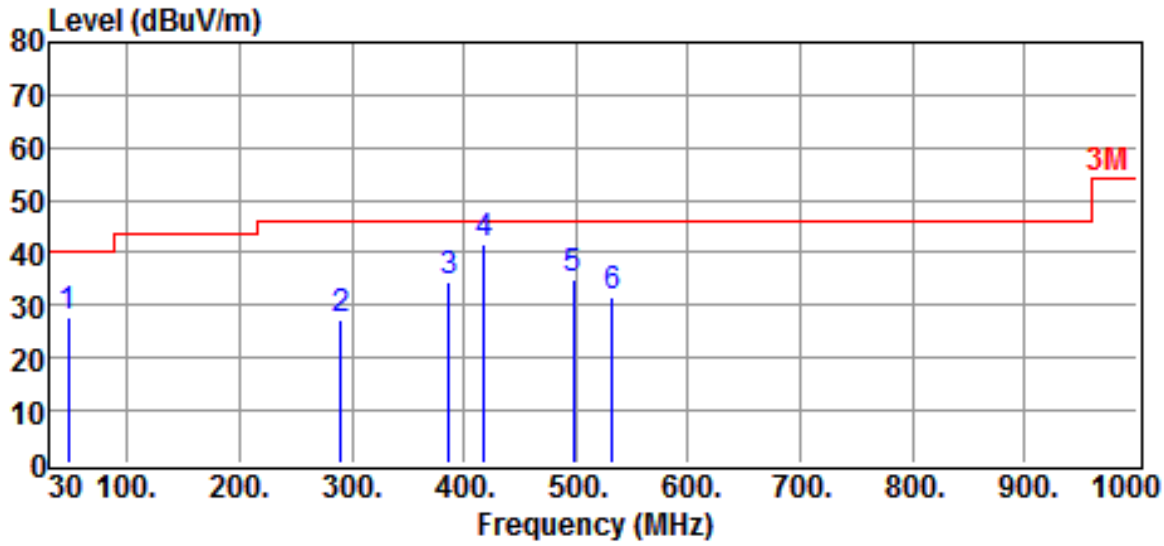

*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-12.67 dBm
624.597000000 MHz
Ref -10 dBm
Att 20 dB
1 PK
VIEW
A
-10
0
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 624.625 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-12.40 dBm
639.668000000 MHz
Ref -10 dBm
Att 20 dB
1 PK
VIEW
A
-10
0
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 639.7 MHz
200 kHz/
Span 2 MHz

6.5 Other Emission

a) Emission frequencies below 1 GHz

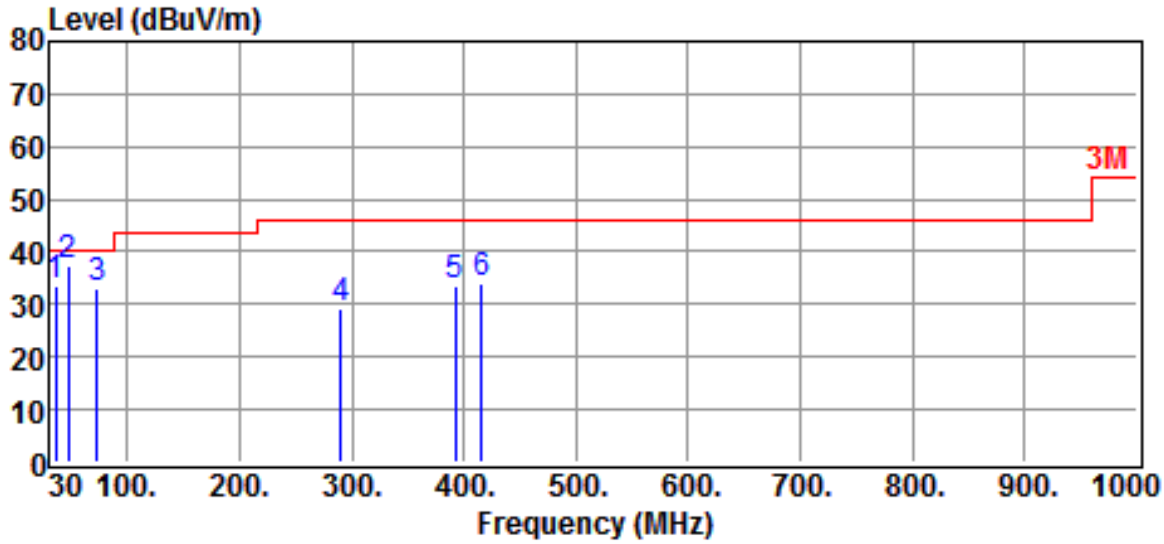
Test Date : Jun. 19, 2013 Temperature : 22 °C Humidity : 65 %



Site	:OPEN SITE	Date	:2013-06-25
Limit	:3M	Ant. Pol.	:HORIZONTAL
EUT	:Transmitter	Temp.	:25
Power Rating	:AC 120V / 60Hz	Humi.	:65
Model	:TWR1	Engineer.	:VC
Test Mode	:TX MODE		
Test Mode	:		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
47.4600	15.3	12.3	27.6	40.0	-12.4	QP
289.9600	3.8	23.6	27.4	46.0	-18.6	QP
386.9600	15.9	18.8	34.7	46.0	-11.3	QP
418.0000	21.9	19.6	41.5	46.0	-4.5	QP
497.5400	13.4	21.5	34.9	46.0	-11.1	QP
532.4600	9.7	22.1	31.8	46.0	-14.2	QP

Note :
1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The expanded uncertainty of the radiated emission tests is 3.53 dB.
4. The margin value=Limit - Result



Site	:OPEN SITE	Date	:2013-06-25
Limit	:3M	Ant. Pol.	:VERTICAL
EUT	:Transmitter	Temp.	:25
Power Rating	:AC 120V / 60Hz	Humi.	:65
Model	:TWR1	Engineer.	:VC
Test Mode	:TX MODE		
Test Mode	:		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
35.8200	19.5	14.0	33.5	40.0	-6.5	QP
47.4600	25.2	12.3	37.5	40.0	-2.5	QP
72.6800	22.8	10.4	33.2	40.0	-6.8	QP
289.9600	5.9	23.6	29.5	46.0	-16.5	QP
392.7800	14.4	18.9	33.3	46.0	-12.7	QP
416.0600	14.5	19.5	34.0	46.0	-12.0	QP

Note :
1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The expanded uncertainty of the radiated emission tests is 3.53 dB.
4. The margin value=Limit - Result

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

6.6 Radiated Measurement Photos

7. FREQUENCY STABILITY MEASUREMENT

7.1 Provisions Applicable

According to §2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃to +50℃centigrade, and according to §2.1055 (d)(2), the frequency stability shall be measured with variation of primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

According to §74.861(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

7.2 Measurement Procedure

A) Frequency stability versus environmental temperature

1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃shall be used.

2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.

3. Set the temperature of chamber to 50℃. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.

4. Repeat step 2 with a 10℃decreased per stage until the lowest temperature -30℃is measured, record all measurement frequencies.

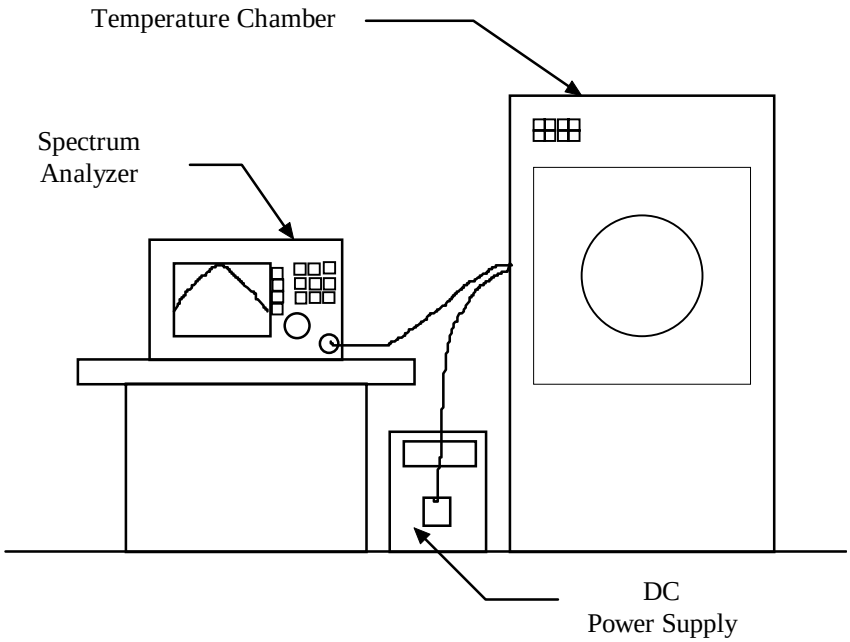
B) Frequency stability versus input voltage

1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃shall be used. Install new batteries in the EUT.

2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.

3. For non hand carried, battery operated device, supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency.

Figure 5 : Frequency stability measurement configuration



7.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20
Temperature Chamber	MALLIER	MCT-2X-M	2013/05/03	2014/05/02

7.4 Measurement Data

Test Date : Jun. 18, 2012 Temperature : 25 °C Humidity : 65 %

A. Tx Frequency 610.175MHz

A1. Frequency stability versus enviroment tempture

Reference Frequency :610.175 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vac)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	120	610.1798	0.00079	610.1802	0.00086	610.1606	-0.00237
40		610.1775	0.00041	610.1567	-0.00300	610.1778	0.00047
30		610.1566	-0.00301	610.1801	0.00084	610.1599	-0.00247
20		610.1799	0.00080	610.1596	-0.00252	610.1699	-0.00083
10		610.1779	0.00048	610.1888	0.00226	610.1959	0.00343
0		610.1522	-0.00373	610.1765	0.00024	610.1834	0.00138
-10		610.1837	0.00143	610.1976	0.00370	610.1865	0.00188
-20		610.1875	0.00205	610.1704	-0.00076	610.1620	-0.00213
-30		610.1627	-0.00202	610.1617	-0.00218	610.1805	0.00091

A2. Frequency stability versus supplied voltage (85% - 115%)

Reference Frequency : 610.175 MHz		Limit：0.005%					
Enviroment	Power	Frequency measured with time elapsed					
Tempture	Supplied	2 minute		5 minute		10 minute	
(℃)	(Vac)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	102	610.1955	0.00337	610.1796	0.00076	610.1525	-0.00369
25	138	610.1843	0.00152	610.1973	0.00365	610.1930	0.00295

Test Date : Jun. 18, 2012 Temperature : 25 °C Humidity : 65 %

B. Tx Frequency 624.625MHz

B1. Frequency stability versus enviroment tempture

Reference Frequency : 624.625MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	120	624.6106	-0.00231	624.6268	0.00029	624.6408	0.00253
40		624.6189	-0.00098	624.6294	0.00071	624.6436	0.00298
30		624.6108	-0.00227	624.6368	0.00190	624.6329	0.00126
20		624.6231	-0.00031	624.6314	0.00103	624.6239	-0.00018
10		624.6273	0.00036	624.6385	0.00217	624.6149	-0.00162
0		624.6176	-0.00118	624.6186	-0.00103	624.6126	-0.00199
-10		624.6044	-0.00330	624.6323	0.00116	624.6446	0.00314
-20		624.6059	-0.00306	624.6016	-0.00374	624.6115	-0.00215
-30		624.6475	0.00361	624.6245	-0.00007	624.6265	0.00024

B2. Frequency stability versus supplied voltage (85% - 115%)

Reference Frequency : 624.625MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	102	624.6032	-0.00349	624.6065	-0.00296	624.6090	-0.00257
25	138	624.6439	0.00302	624.6081	-0.00271	624.6369	0.00191

Test Date : Jun. 18, 2012 Temperature : 25 °C Humidity : 65 %

C. Tx Frequency 639.700MHz

C1. Frequency stability versus enviroment tempture

Reference Frequency : 639.700 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	120	639.6950	-0.00078	639.6758	-0.00379	639.6923	-0.00121
40		639.6978	-0.00034	639.7041	0.00064	639.7170	0.00266
30		639.6991	-0.00014	639.7071	0.00111	639.6914	-0.00134
20		639.6787	-0.00334	639.7181	0.00283	639.7196	0.00306
10		639.7028	0.00044	639.7025	0.00039	639.6969	-0.00048
0		639.6836	-0.00256	639.7155	0.00243	639.6973	-0.00042
-10		639.7036	0.00057	639.7078	0.00121	639.7112	0.00175
-20		639.6863	-0.00215	639.6887	-0.00177	639.6927	-0.00113
-30		639.7049	0.00077	639.7119	0.00186	639.6922	-0.00122

C2. Frequency stability versus supplied voltage (85% - 115%)

Reference Frequency : 639.700 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	102	639.6789	-0.00329	639.6904	-0.00150	639.7060	0.00093
25	138	639.7230	0.00360	639.7033	0.00052	639.7163	0.00255

8 CONDUCTED EMISSION MEASUREMENT

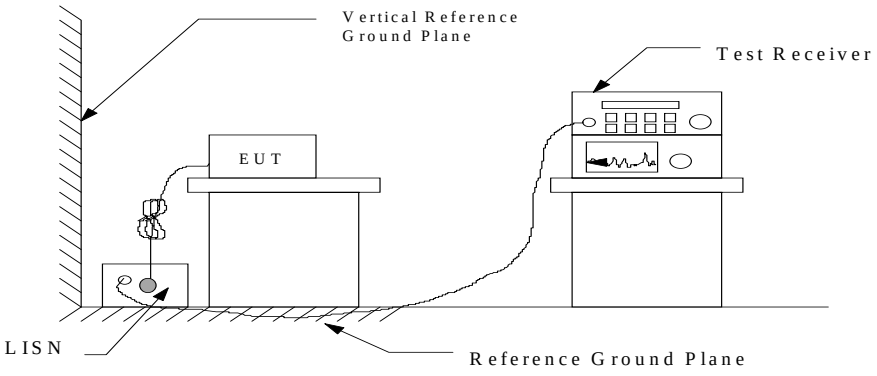
8.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to §15.107(a) and §15.207(a) respectively .

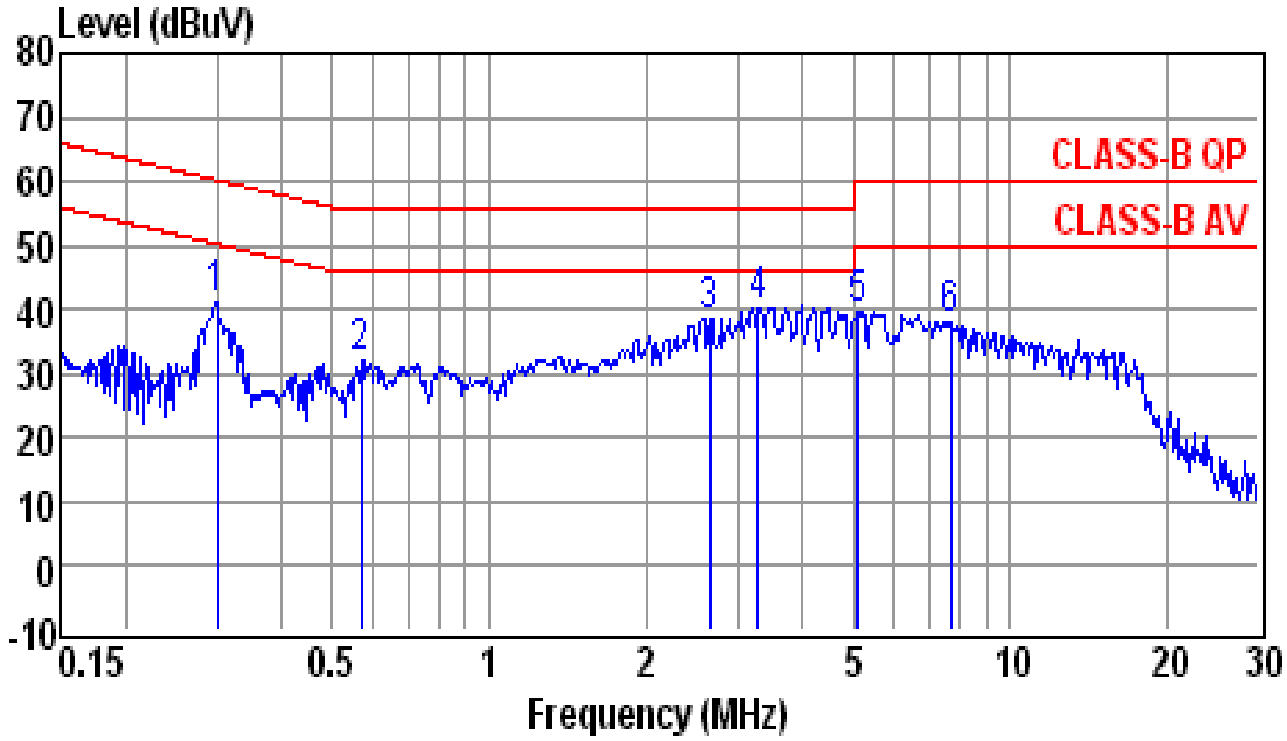
8.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then records the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



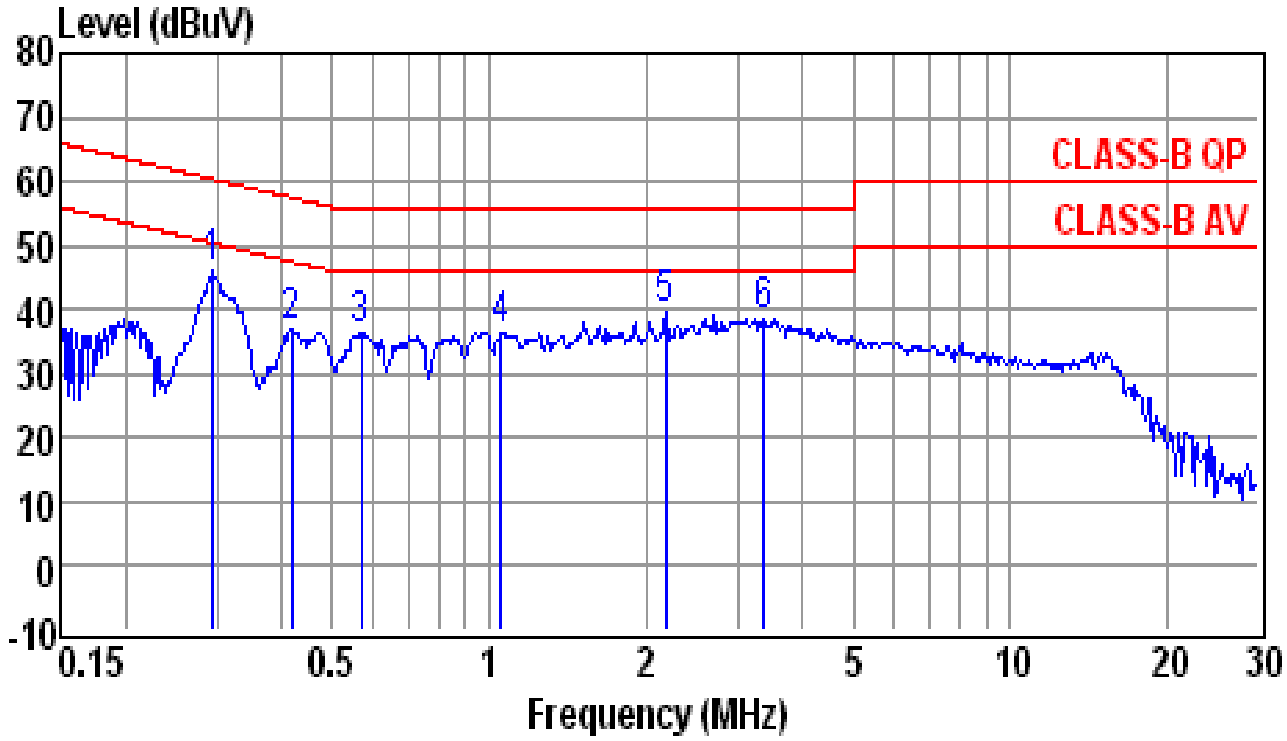
8.3 Conducted Emission Data



Site	: conducted #1	Date	: 06-25-2013
Condition	: CLASS-B QP	LISN	: NEUTRAL
Tem / Hum	: 25 ℃ / 65%	Test Mode	: VC
EUT	: TWR1	Power Rating	: 120Vac/60Hz
Memo	: Tx MODE	Memo	:

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.3003	31.1	10.3	41.4	60.2	-18.8	QP
0.5671	21.7	10.3	32.0	56.0	-24.0	QP
2.6500	28.0	10.5	38.5	56.0	-17.5	QP
3.2930	29.8	10.5	40.3	56.0	-15.7	QP
5.1120	29.2	10.5	39.7	60.0	-20.3	QP
7.6870	27.3	10.6	37.9	60.0	-22.1	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss



Site	: conducted #1	Date	: 06-25-2013
Condition	: CLASS-B QP	LISN	: LINE
Tem / Hum	: 25 ℃ / 65%	Test Mode	: VC
EUT	: TWR1	Power Rating	: 120Vac/60Hz
Memo	: Tx MODE	Memo	:

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.2955	35.5	10.3	45.8	60.4	-14.6	QP
0.4171	26.5	10.3	36.8	57.5	-20.7	QP
0.5671	26.1	10.3	36.4	56.0	-19.6	QP
1.0540	25.9	10.4	36.3	56.0	-19.7	QP
2.1780	28.9	10.5	39.4	56.0	-16.6	QP
3.3640	27.8	10.5	38.3	56.0	-17.7	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

8.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

RESULT = 22.5 + 0.1 = 22.6 dB μ V
Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]
= 13.48 μ V

8.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2012/07/16	2013/07/15
LISN	EMCO	3625/2	2013/05/07	2014/05/06
LISN	Rohde & Schwarz	ESH2-Z5	2013/04/12	2014/04/11

8.6 Photos of Conduction Measuring Setup