FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : XS Wireless (Bodypack Transmitter)
FCC ID. : DMOXSWSK
Model No. : SK 20
Working Frequency : 548MHz-572MHz; 606MHz-608MHz; 614MHz-638MHz

for

APPLICANT : Sennheiser Electric Corp.
ADDRESS : 1 Enterprise Drive, Old Lyme, CT 06371, USA

Test Performed by

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

Report Number : 11-07-RBF-116-10

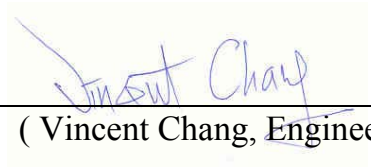
TEST REPORT CERTIFICATION

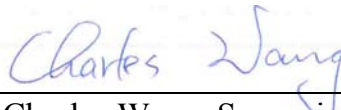
Applicant	:	Sennheiser Electric Corp. 1 Enterprise Drive, Old Lyme, CT 06371, USA
Manufacturer	:	Mascot Electric Co., Ltd. NO. 85, CHANGXING 1ST ST., RENDE DIST., TAINAN CITY 717, TAIWAN
Description of EUT	:	
a) Type of EUT	:	XS Wireless (Bodypack Transmitter)
b) Trade Name	:	SENNHEISER
c) Model No.	:	SK 20
d) FCC ID	:	DMOXSWSK
e) Working Frequency	:	548MHz-572MHz; 606MHz-608MHz; 614MHz-638MHz
f) Power Supply	:	DC 1.5V Battery*2

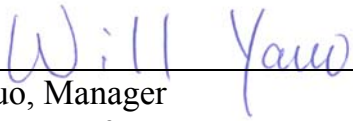
Regulation Applied: FCC Rules and Regulations Part 74 Subpart H

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 : Aug. 25, 2011

Test Engineer : 
(Vincent Chang, Engineer)

Check By : 
(Charles Wang, Supervisor)

Approve & Authorized : 
Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	:	XS Wireless (Bodypack Transmitter)
b) Trade Name	:	SENNHEISER
c) Model No.	:	SK 20
f) FCC ID	:	DMOXSWSK
g) Working Frequency	:	548MHz-572MHz; 606MHz-608MHz; 614MHz-638MHz
h) Power Supply	:	DC 1.5V Battery*2
i) Emission Designator	:	120KF3E 2M+2DK=2x(20kHz)+2x(40kHz)x1=120kHz

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/ELA 603-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, LINKOU DIST., NEW TAIPEI COUNTY, 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

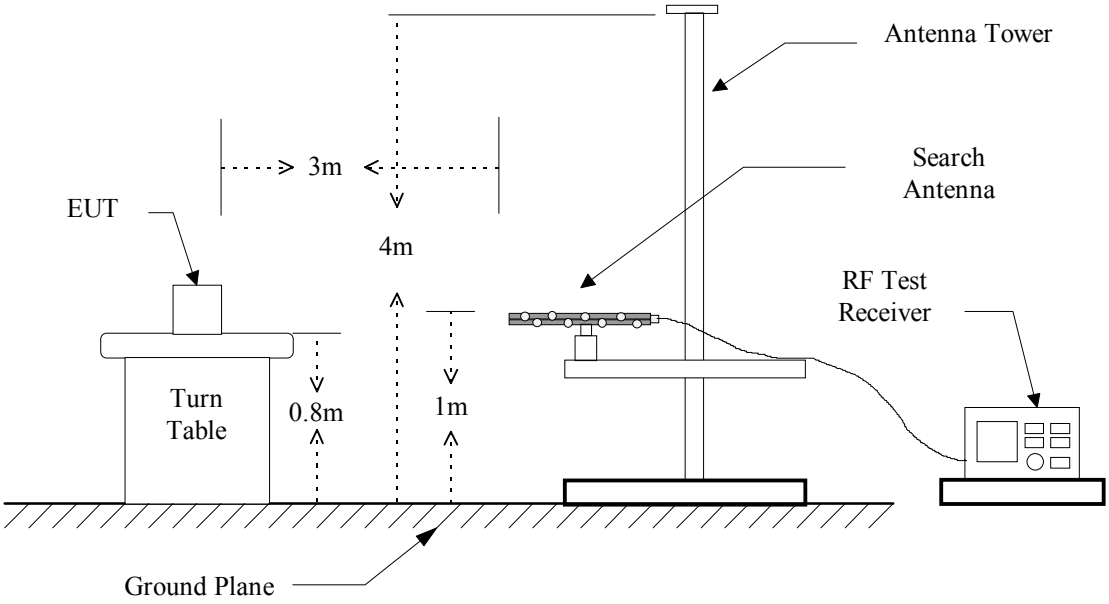
3.1 Provision Applicable

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

3.2 Measurement Procedure

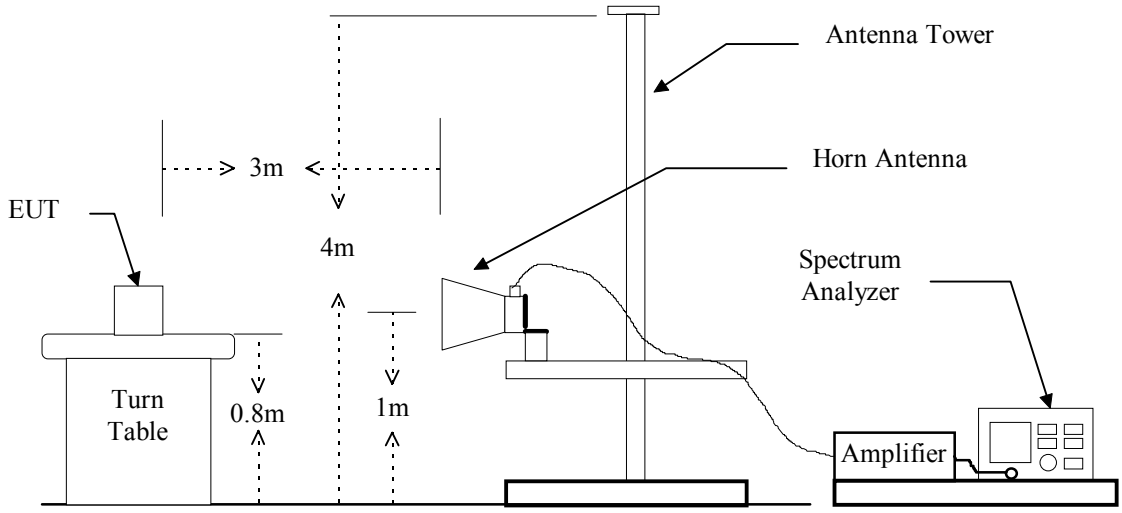
1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna 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

Band 548 – 638 MHz

Operated mode : TX Test Date : Aug. 01, 2011

Temperature : 28 °C Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
548.0	84.1	11.6	2.0	----	9.6	9.20	250

Frequency (MHz)	Meter Reading (dB μV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
572.0	83.8	11.3	2.2	----	9.1	8.128	250

Frequency (MHz)	Meter Reading (dB μV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
606.0	81.6	11.4	2.2	----	9.2	8.318	250

Frequency (MHz)	Meter Reading (dB μV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
608.0	81.3	11.1	2.2	----	8.9	7.762	250

Frequency (MHz)	Meter Reading (dB μV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
614.0	81.5	11.1	2.3	----	8.8	7.586	250

Frequency (MHz)	Meter Reading (dB μV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
638.0	81.3	10.3	2.3	----	8.0	6.310	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.

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

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2011/05/09	2012/05/08
Dipole Antenna	Schwarzbeck	897;898	2009/09/03	2011/09/02
Log-periodic Antenna	EMCO	3146	2010/10/11	2011/10/10
Amplifier	HP	8447D	2011/05/27	2012/05/25
Signal generator	HP	8656B	2010/12/09	2011/12/08

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.

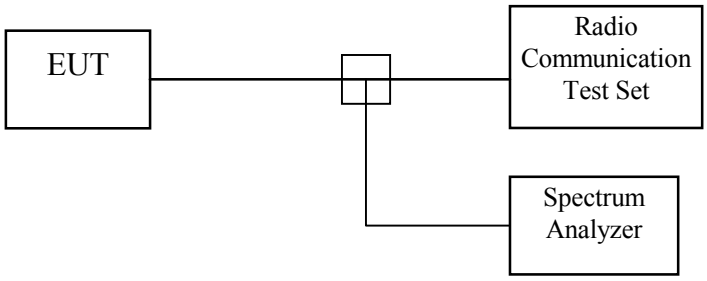
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

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



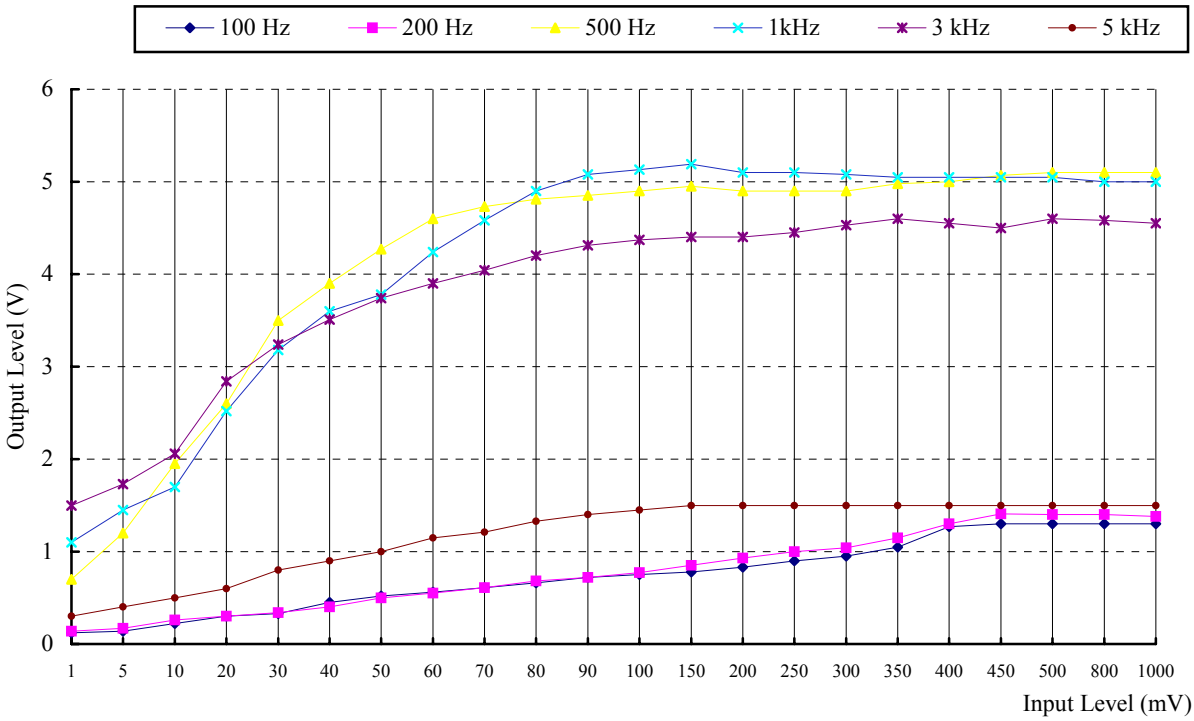
4.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2010/12/10	2011/12/09
Spectrum Analyzer	Rohde & Schwarz	FSP40	2010/09/17	2011/09/16

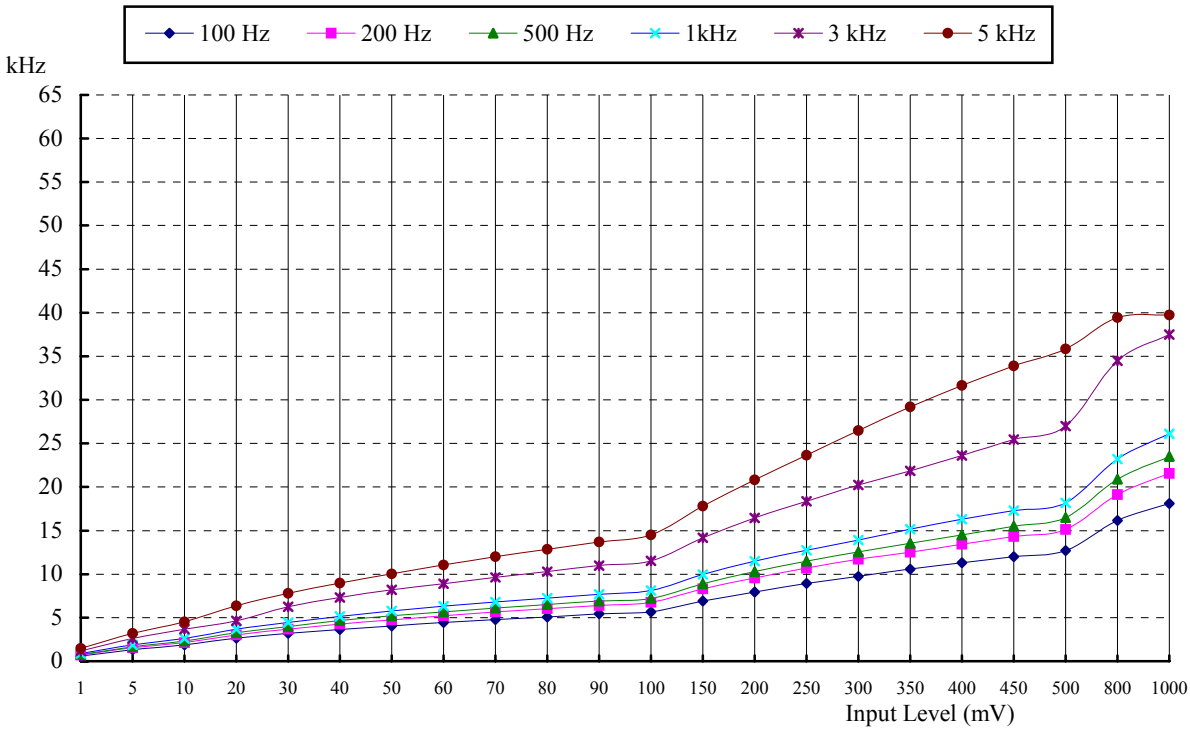
4.4 Measurement Result

RF Frequency : 548MHz-638 MHz

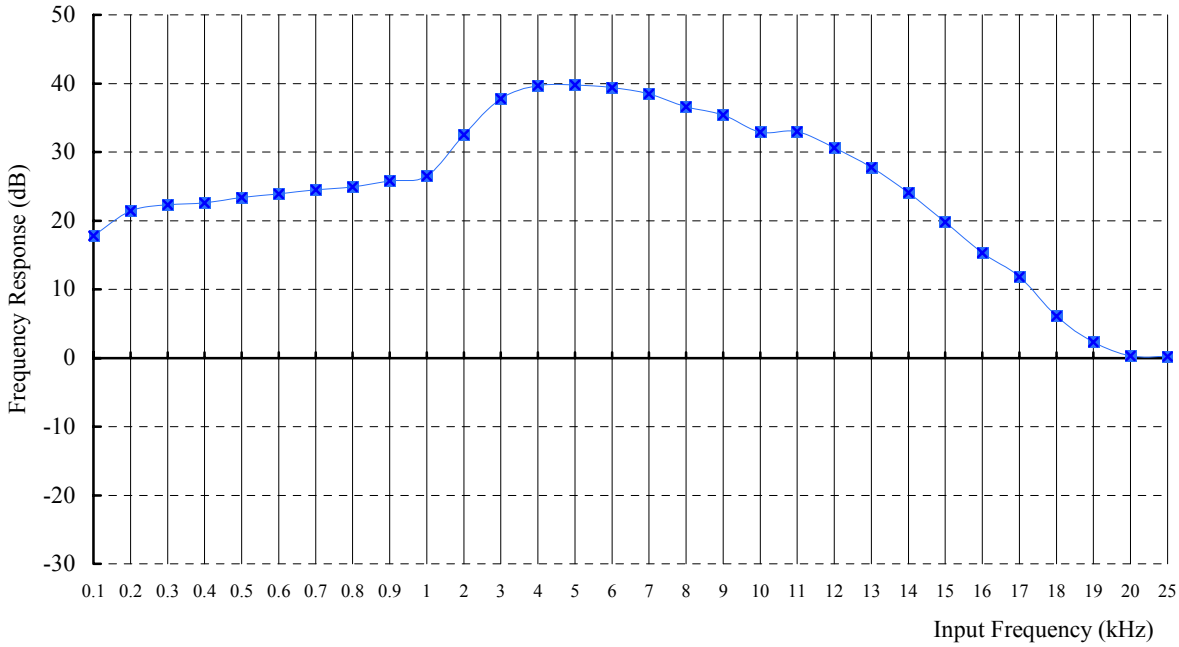
A). Frequency response



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.

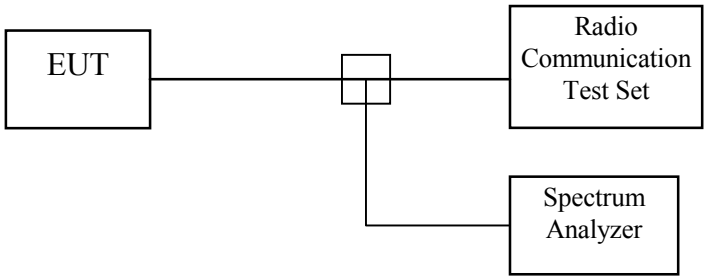
5.2 Measurement Method

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

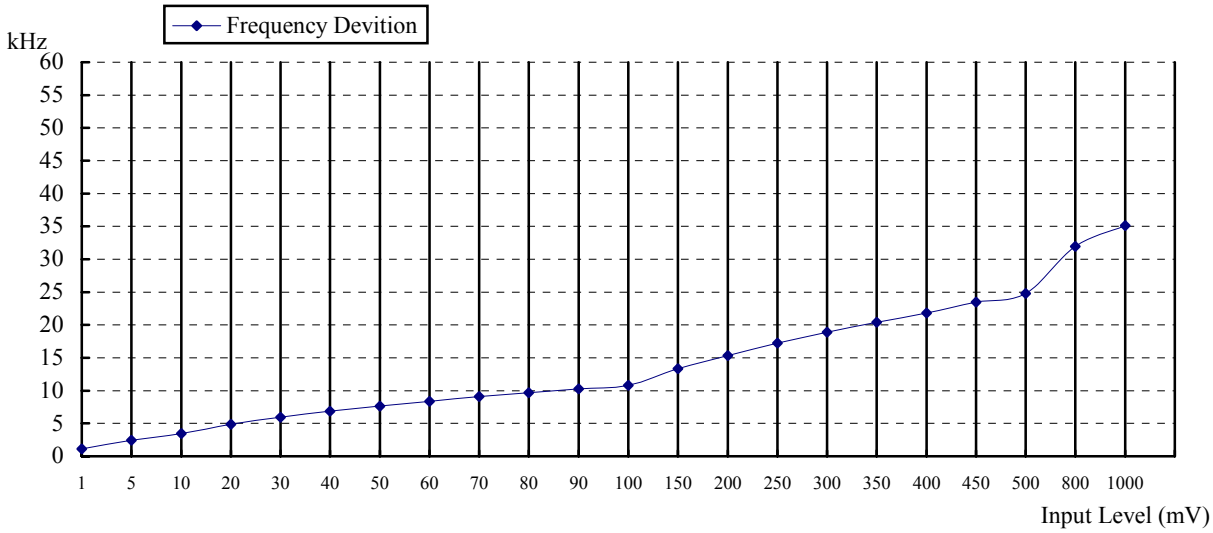
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2010/12/10	2011/12/09
Spectrum Analyzer	Rohde & Schwarz	FSP40	2010/09/17	2011/09/16

5.4 Bandwidth Measured

5.4.1 Input Level Derived

RF Frequency : 548-638MHz

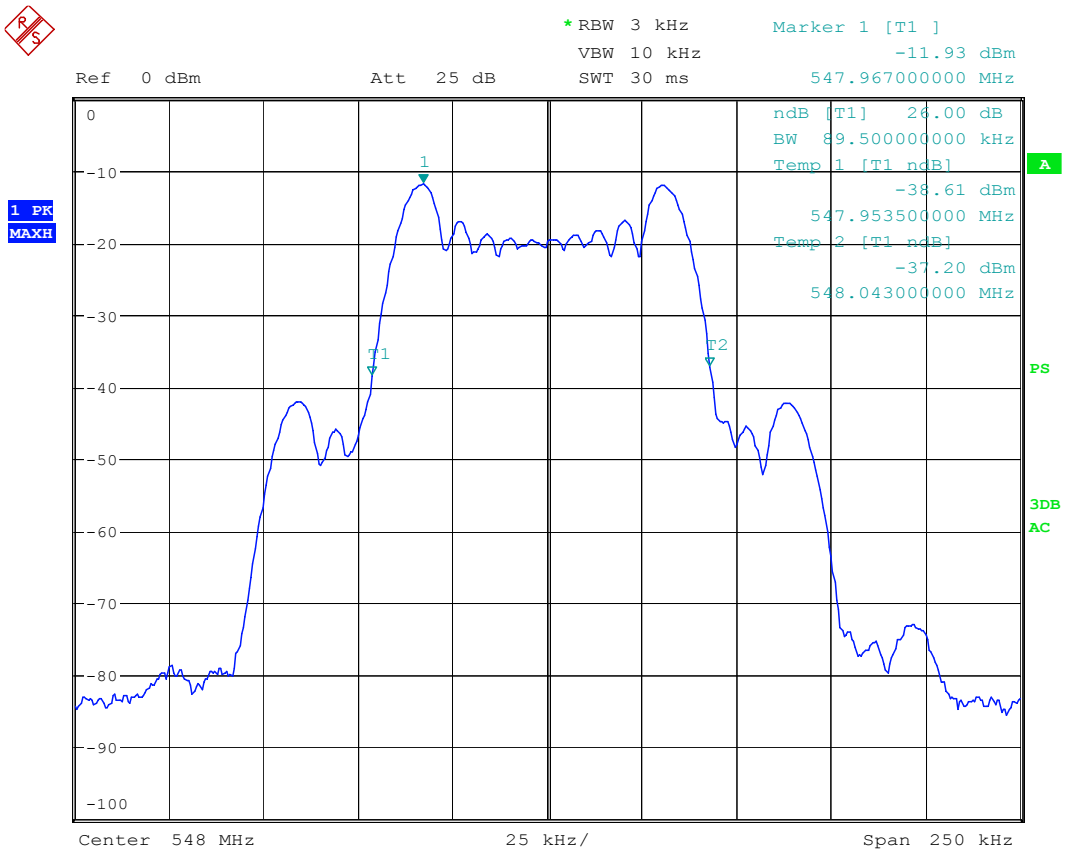
Input Audio Frequency : 2.5 kHz, Sine Wave

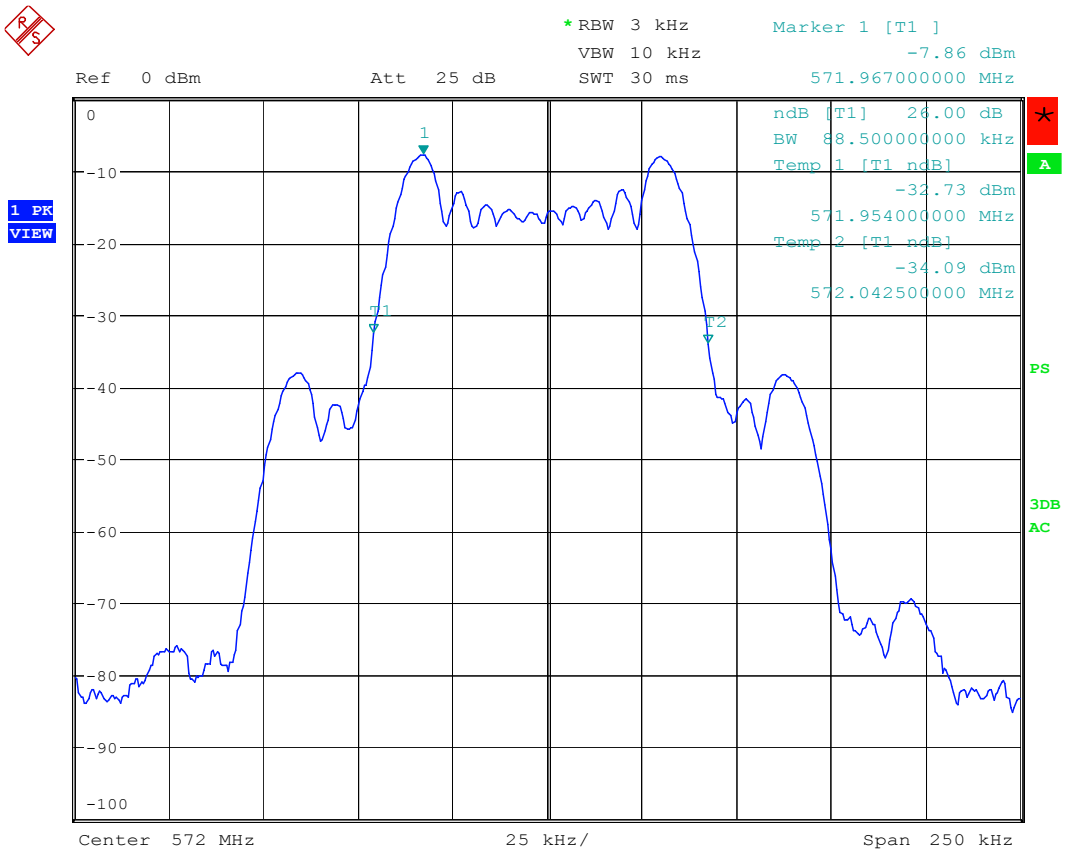


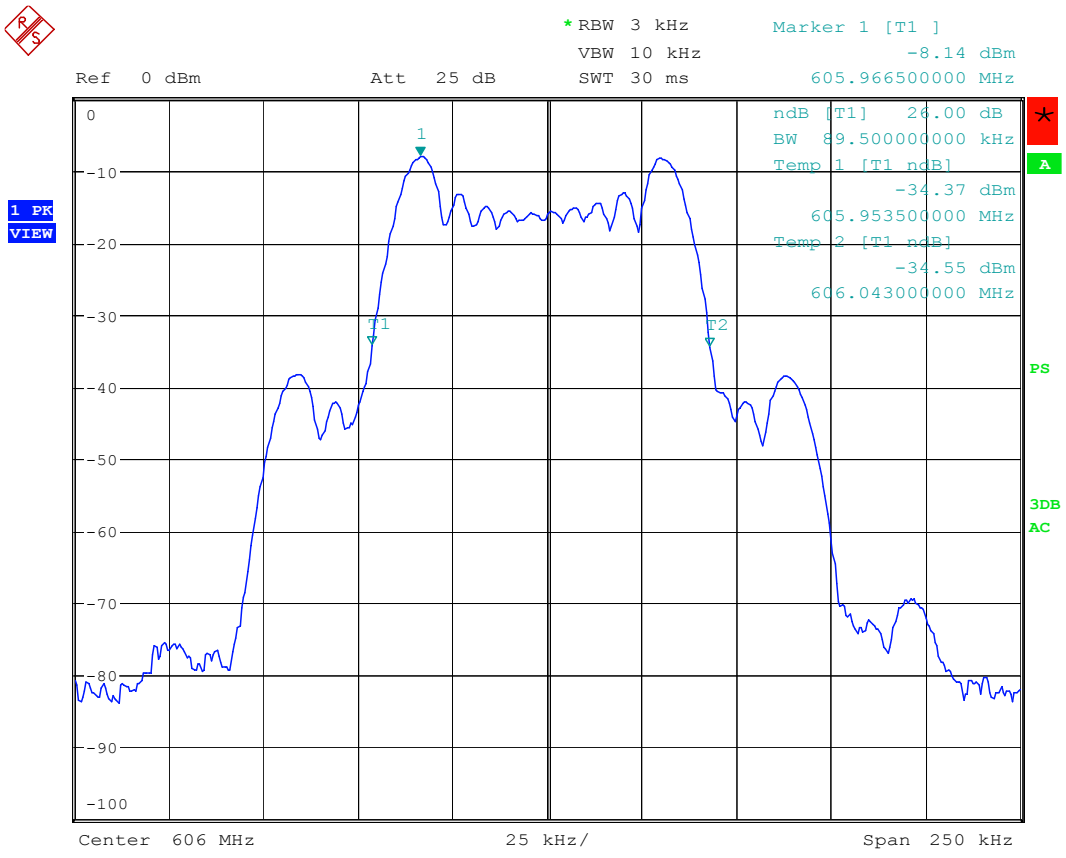
The Level input to produce 50% modulation is 200 mV, therefore the magnitude 16 dB greater than it is 1261.9 mV.

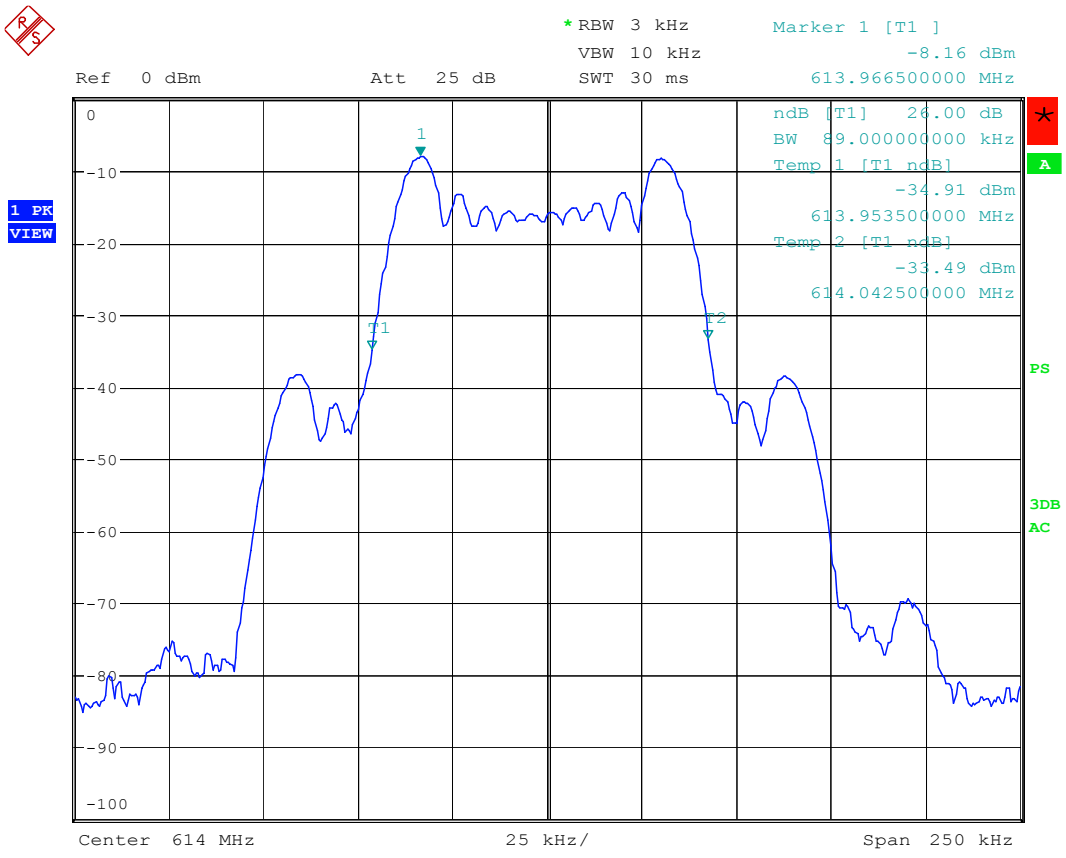
5.4.2 Occupied Bandwidth Plotted

RF Frequency (MHz)	26 dB Bandwidth (kHz)
548	89.5
542	88.5
606	89.5
614	89.0
638	89.0

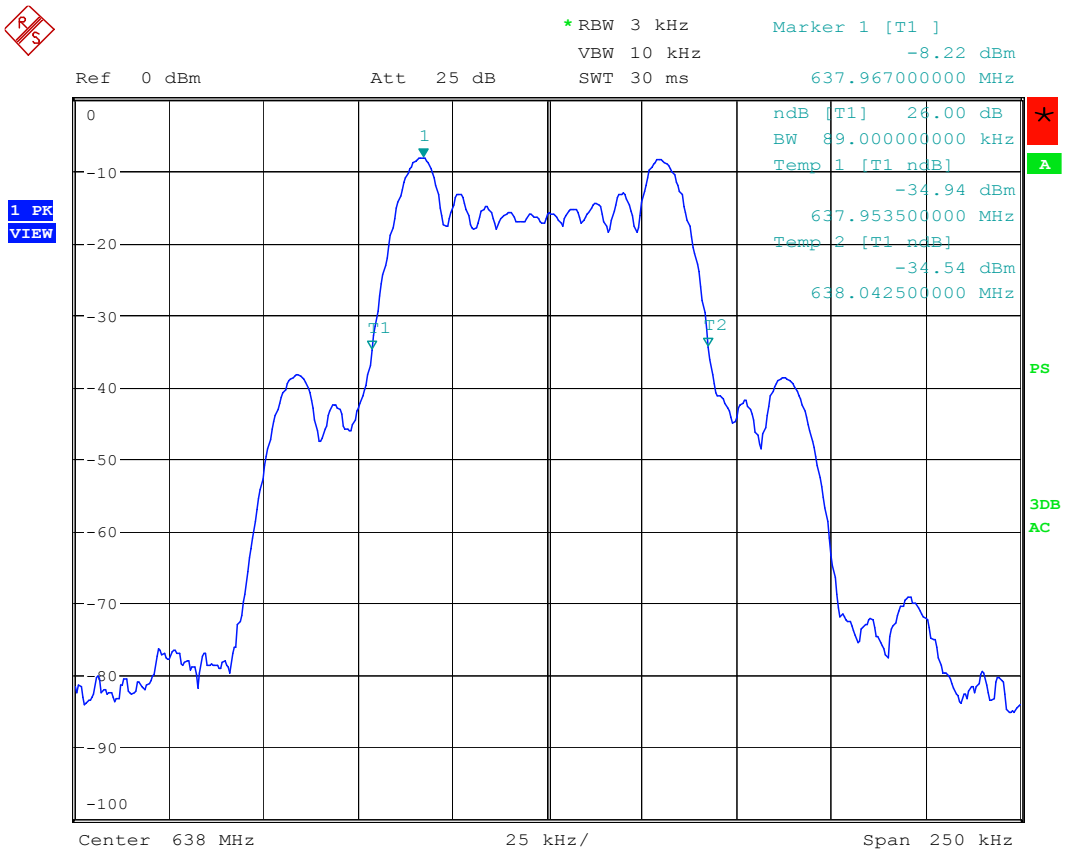

* RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-11.93 dBm
547.967000000 MHz
ndB [T1] 26.00 dB
BW 89.500000000 kHz
Temp 1 [T1 ndB]
-38.61 dBm
547.953500000 MHz
Temp 2 [T1 ndB]
-37.20 dBm
548.043000000 MHz
Ref 0 dBm
Att 25 dB
1 PK
MAXH
A
PS
3DB
AC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
T1
T2
Center 548 MHz
25 kHz/
Span 250 kHz


* RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-7.86 dBm
571.967000000 MHz
ndB [T1] 26.00 dB
BW 88.500000000 kHz
Temp 1 [T1 ndB]
-32.73 dBm
571.954000000 MHz
Temp 2 [T1 ndB]
-34.09 dBm
572.042500000 MHz
Ref 0 dBm
Att 25 dB
1 PK
VIEW
PS
3DB
AC
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 572 MHz
25 kHz/
Span 250 kHz


* RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-8.14 dBm
605.966500000 MHz
ndB [T1] 26.00 dB
BW 89.500000000 kHz
Temp 1 [T1 ndB]
-34.37 dBm
605.953500000 MHz
Temp 2 [T1 ndB]
-34.55 dBm
606.043000000 MHz
Ref 0 dBm
Att 25 dB
1 PK
VIEW
A
PS
3DB
AC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
T1
T2
Center 606 MHz
25 kHz/
Span 250 kHz


* RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-8.16 dBm
613.966500000 MHz
Ref 0 dBm
Att 25 dB
ndB [T1] 26.00 dB
BW 89.000000000 kHz
Temp 1 [T1 ndB]
-34.91 dBm
613.953500000 MHz
Temp 2 [T1 ndB]
-33.49 dBm
614.042500000 MHz
1 PK
VIEW
PS
3DB
AC
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
T1
T2
Center 614 MHz
25 kHz/
Span 250 kHz

I


* RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-8.22 dBm
637.967000000 MHz
ndB [T1] 26.00 dB
BW 89.000000000 kHz
Temp 1 [T1 ndB]
-34.94 dBm
637.953500000 MHz
Temp 2 [T1 ndB]
-34.54 dBm
638.042500000 MHz
Ref 0 dBm
Att 25 dB
1 PK VIEW
PS
3DB
AC
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
T1
T2
Center 638 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	2010/09/17	2011/09/16
Double Ridged Antenna	EMCO	3115	2011/05/30	2012/05/25
Double Ridged Antenna	EMCO	3115	2011/05/30	2012/05/25
Log-periodic Antenna	EMCO	3146	2010/10/11	2011/10/10
Biconical Antenna	EMCO	3110	2010/10/11	2011/10/10
Dipole Antenna	Schwarzbeck	897;898	2009/09/03	2011/09/02
Amplifier	HP	8449B	2010/12/28	2011/12/29
Amplifier	HP	8447D	2011/05/27	2012/05/25
Signal generator	HP	8656B	2010/12/09	2011/12/08

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: 548MHz

Operated mode : TX
Test Date : Aug. 01, 2011
Temperature : 28 °C
Humidity : 65 %

Unmodulated carrier output power is 9.6 dBm , or 9.120 mW (ERP).
The limit of spurious or harmonics is calculated as following :

9.6-[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)
1096.000	---	---	---	---	5.5	-2.0	1.33	---	---	-13.0	---
1644.000	---	---	---	---	9.2	-2.0	1.33	---	---	-13.0	---
2192.000	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
2740.000	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
3288.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3836.000	---	---	---	---	9.6	-2.0	2.16	---	---	-13.0	---
4384.000	---	---	---	---	10.6	-2.0	2.16	---	---	-13.0	---
4932.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5480.000	---	---	---	---	10.9	-2.0	2.58	---	---	-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.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

b. Tx Frequency: 572MH

Operated mode : TX Test Date : Aug. 01, 2011
Temperature : 28 °C Humidity : 65 %

Unmodulated carrier output power is 9.1 dBm , or 8.128 mW (ERP).
The limit of spurious or harmonics is calculated as following :
9.1-[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)
1144.000	---	---	---	---	6.0	-2.0	1.33	---	---	-13.0	---
1716.000	---	---	---	---	9.3	-2.0	1.33	---	---	-13.0	---
2288.000	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2860.000	---	---	---	---	9.6	-2.0	1.75	---	---	-13.0	---
3432.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
4004.000	---	---	---	---	9.5	-2.0	2.16	---	---	-13.0	---
4576.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5148.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5720.000	---	---	---	---	11.3	-2.0	2.58	---	---	-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.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

c. Tx Frequency: 606MHz

Operated mode : TX Test Date : Aug. 01, 2011
Temperature : 28 °C Humidity : 65 %

Unmodulated carrier output power is 9.2 dBm , or 8.318 mW (ERP).
The limit of spurious or harmonics is calculated as following :

9.2-[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)
1212.000	---	---	---	---	6.4	-2.0	1.33	---	---	-13.0	---
1818.000	---	---	---	---	9.3	-2.0	1.33	---	---	-13.0	---
2424.000	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
3030.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3636.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
4242.000	---	---	---	---	10.1	-2.0	2.16	---	---	-13.0	---
4848.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5454.000	---	---	---	---	10.9	-2.0	2.58	---	---	-13.0	---
6060.000	---	---	---	---	11.9	-2.0	2.58	---	---	-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.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

d. Tx Frequency: 614MHz

Operated mode : TX Test Date : Aug. 01, 2011
Temperature : 28 °C Humidity : 65 %

Unmodulated carrier output power is 8.8 dBm , or 7.586 mW (ERP).
The limit of spurious or harmonics is calculated as following :

8.8-[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)
1228.000	---	---	---	---	6.4	-2.0	1.33	---	---	-13.0	---
1842.000	---	---	---	---	9.3	-2.0	1.33	---	---	-13.0	---
2456.000	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3070.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3684.000	---	---	---	---	9.6	-2.0	2.16	---	---	-13.0	---
4298.000	---	---	---	---	10.3	-2.0	2.16	---	---	-13.0	---
4912.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5526.000	---	---	---	---	10.9	-2.0	2.58	---	---	-13.0	---
6140.000	---	---	---	---	12.0	-2.0	2.58	---	---	-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.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

e. Tx Frequency: 638MHz

Operated mode : TX Test Date : Aug. 01, 2011
Temperature : 28 °C Humidity : 65 %

Unmodulated carrier output power is 8.0 dBm , or 6.310 mW (ERP).
The limit of spurious or harmonics is calculated as following :

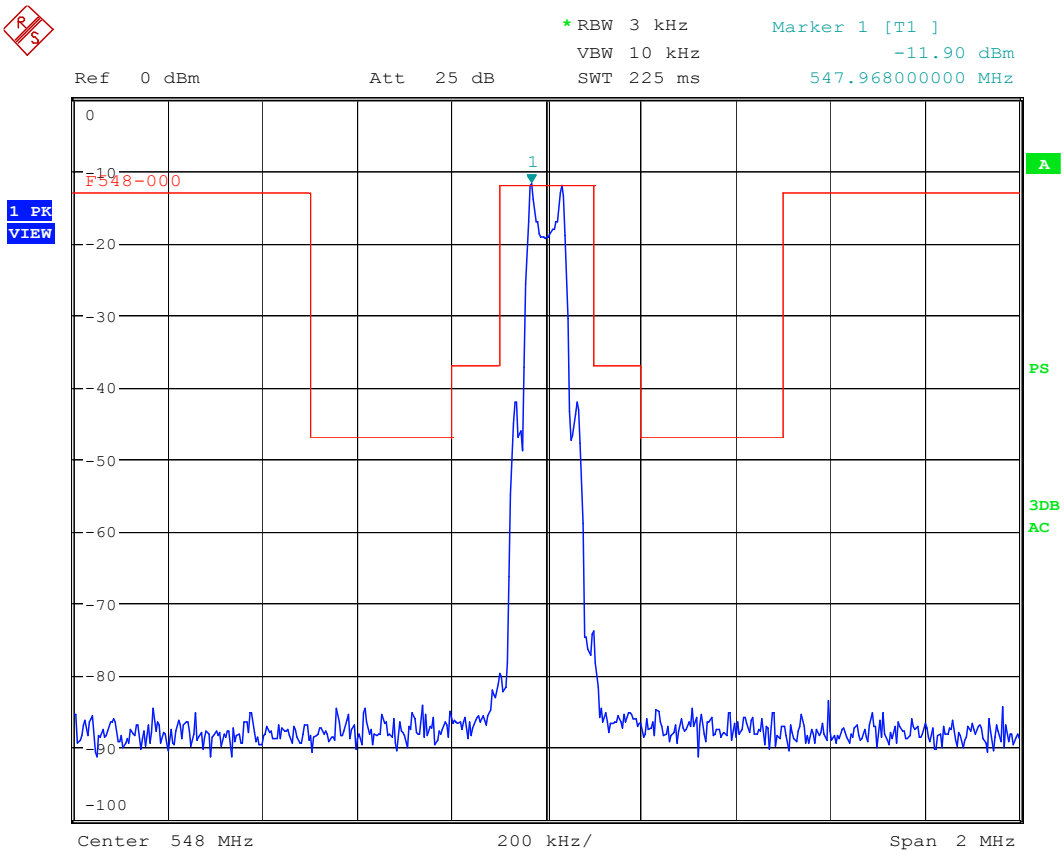
8.0-[43+10log(carrier output power in W)], or -13dBm

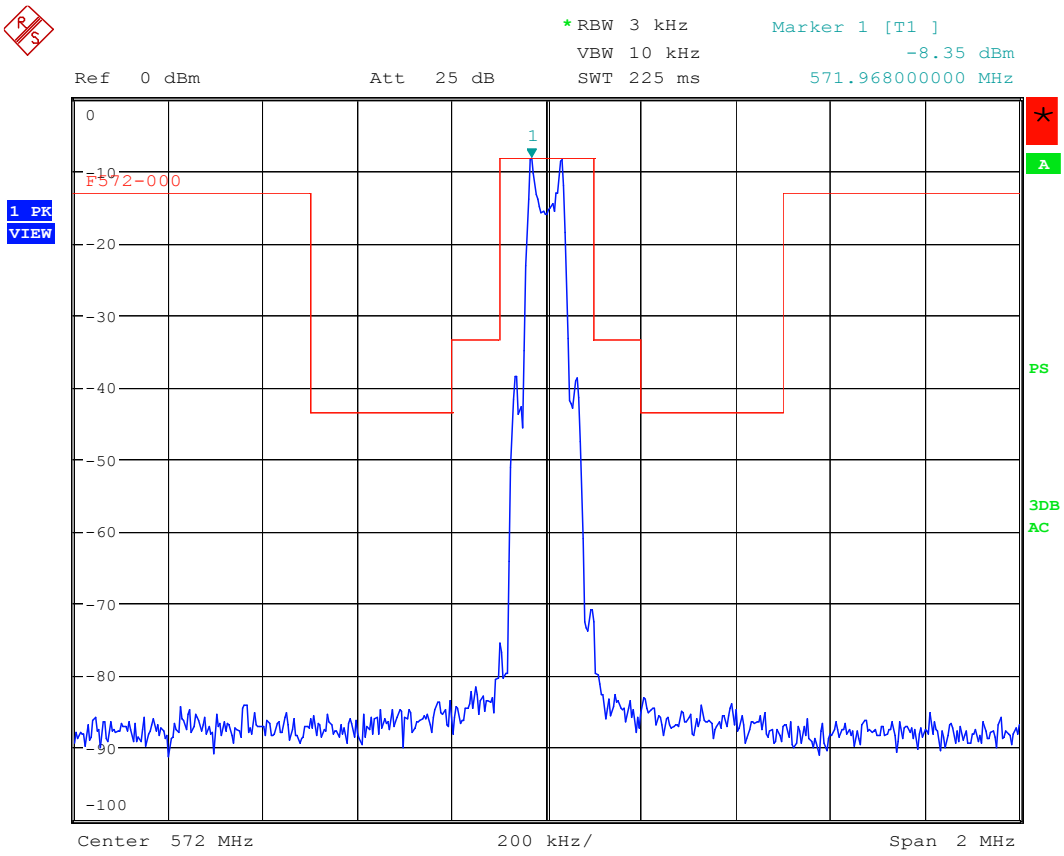
Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1276.000	---	---	---	---	7.3	-2.0	1.33	---	---	-13.0	---
1914.000	---	---	---	---	9.4	-2.0	1.75	---	---	-13.0	---
2552.000	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3190.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3828.000	---	---	---	---	9.6	-2.0	2.16	---	---	-13.0	---
4466.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5104.000	---	---	---	---	10.9	-2.0	2.16	---	---	-13.0	---
5742.000	---	---	---	---	11.3	-2.0	2.58	---	---	-13.0	---
6380.000	---	---	---	---	12.1	-2.0	2.58	---	---	-13.0	---

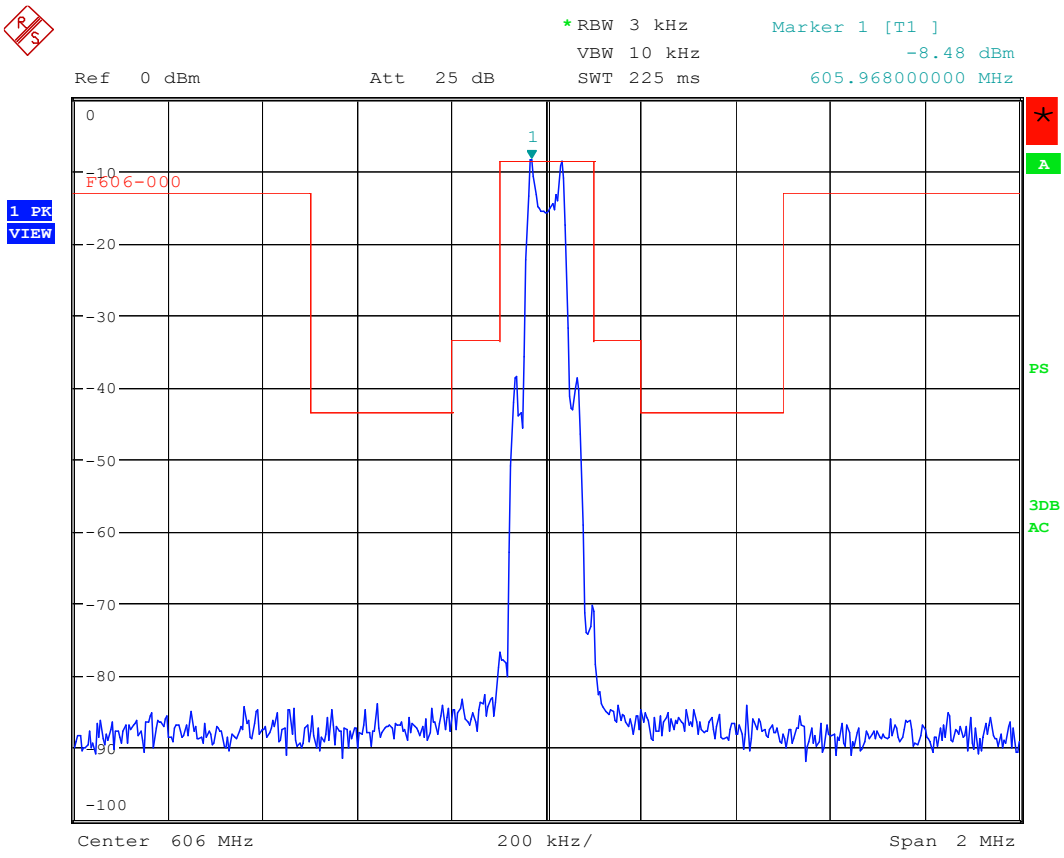
Note :

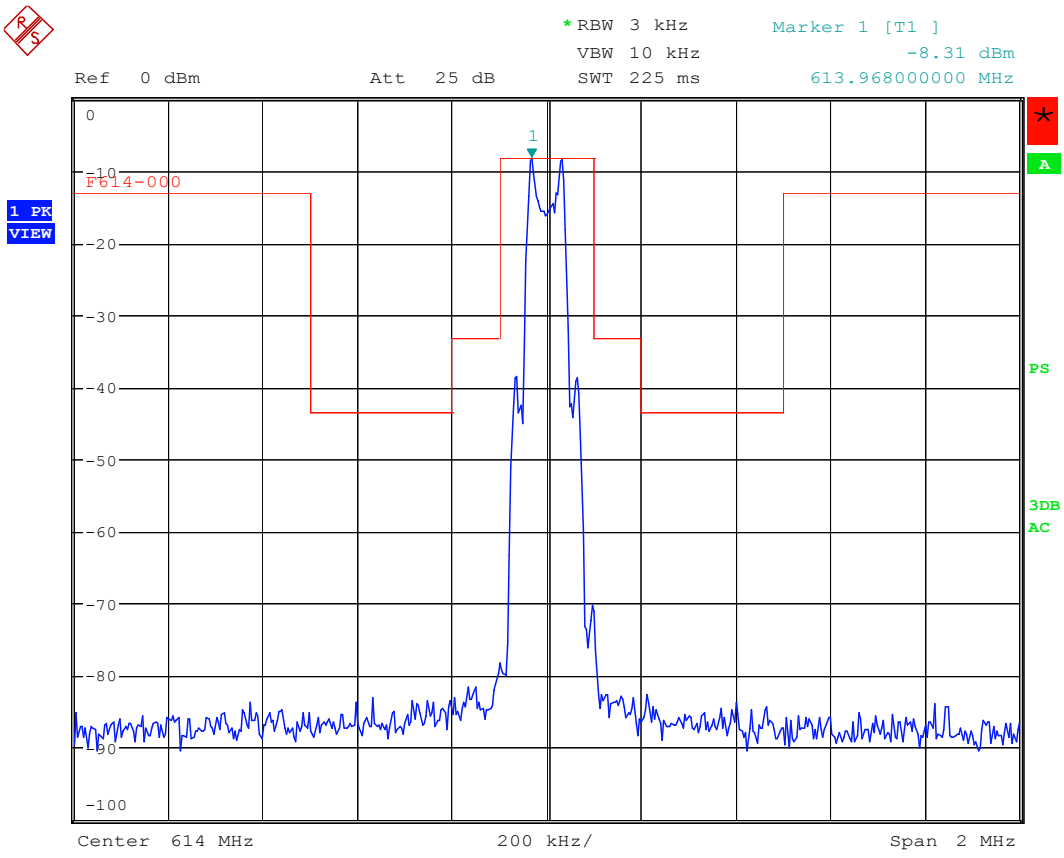
1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :
   Result = SG Reading +Cable Loss +Antenna Gain +Antenna Gain Corrected
   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

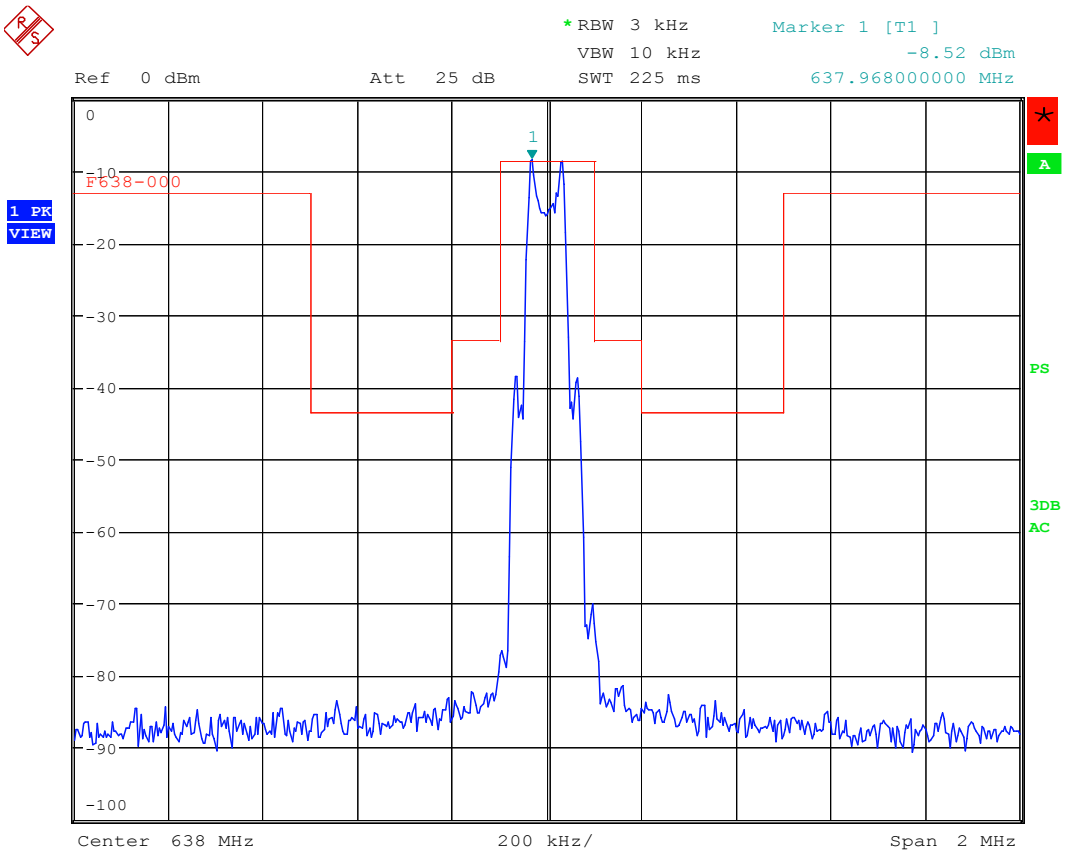
6.4.2 Emission mask plots




*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.35 dBm
571.968000000 MHz
Ref 0 dBm
Att 25 dB
1 PK
VIEW
F572-000
PS
3DB
AC
Center 572 MHz
200 kHz/
Span 2 MHz


* RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.48 dBm
605.968000000 MHz
Ref 0 dBm
Att 25 dB
1 PK
VIEW
F606-000
PS
3DB
AC
Center 606 MHz
200 kHz/
Span 2 MHz


* RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.31 dBm
613.968000000 MHz
Ref 0 dBm
Att 25 dB
1 PK
VIEW
F614-000
PS
3DB
AC
Center 614 MHz
200 kHz/
Span 2 MHz


* RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.52 dBm
637.968000000 MHz
Ref 0 dBm
Att 25 dB
1 PK
VIEW
F638-000
A
PS
3DB
AC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 638 MHz
200 kHz/
Span 2 MHz

6.5 Other Emission

a) Emission frequencies below 1 GHz

Test Date : Aug. 01, 2011 Temperature : 28 °C Humidity : 65 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
48.90	H	10.5	11.6	22.1	40.0	-17.9	88	1.5
151.50	V	6.3	14.6	20.9	43.5	-22.6	194	1.0
170.94	V	7.3	15.1	22.4	43.5	-21.1	175	1.0
193.89	V	5.1	18.0	23.1	43.5	-20.4	182	1.0
242.49	H	3.9	19.9	23.8	46.0	-22.2	94	1.5
269.49	V	3.5	22.3	25.8	46.0	-20.2	175	1.0

Note :

1. Remark "---" means that the emissions level is too low to be measured.
2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

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°C to +50°C 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°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C 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°C. 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°C decreased per stage until the lowest temperature -30°C is measured, record all measurement frequencies.

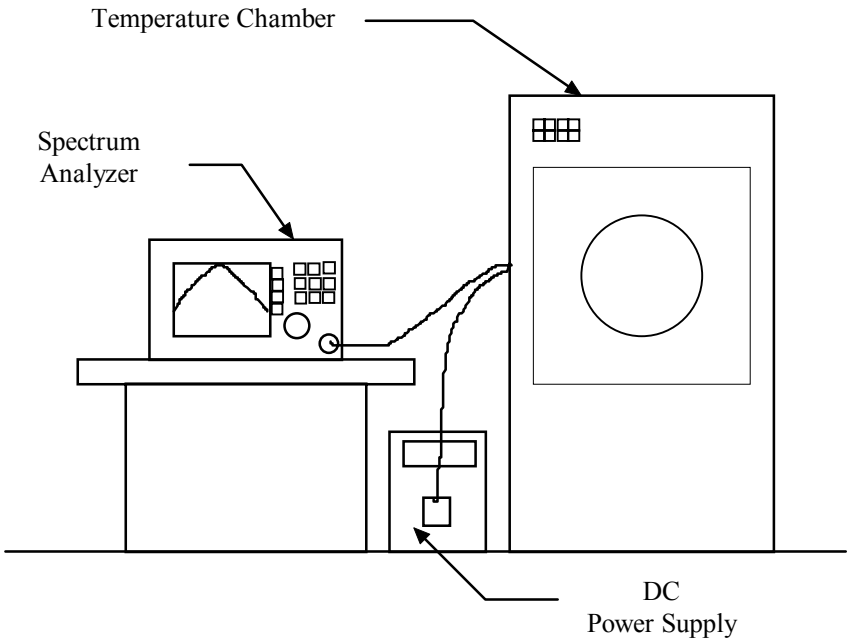
B) Frequency stability versus input voltage

1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C 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	2010/09/17	2011/09/16
Temperature Chamber	MALLIER	MCT-2X-M	2010/12/28	2011/12/27

7.4 Measurement Data

A. Tx Frequency 548MHz

A1. Frequency stability versus enviroment tempture

Reference Frequency :548 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0Vdc	547.9970	-0.00054	547.9879	-0.00221	547.9911	-0.00163
40		548.0155	0.00282	547.9986	-0.00026	548.0172	0.00315
30		547.9856	-0.00264	547.9895	-0.00192	548.0094	0.00172
20		548.0058	0.00106	547.9806	-0.00355	548.0039	0.00072
10		547.9861	-0.00253	548.0131	0.00238	548.0154	0.00281
0		547.9876	-0.00225	548.0006	0.00011	548.0198	0.00361
-10		547.9908	-0.00167	548.0151	0.00275	547.9943	-0.00104
-20		547.9851	-0.00271	547.9794	-0.00376	547.9800	-0.00366
-30		548.0081	0.00148	547.9935	-0.00118	547.9805	-0.00357

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

Reference Frequency : 548 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.55	548.0174	0.00318	548.0145	0.00264	548.0184	0.00336
25	3.45	547.9816	-0.00336	547.9831	-0.00309	547.9979	-0.00039

B. Tx Frequency 572MHz

B1. Frequency stability versus enviroment tempture

Reference Frequency : 572 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0Vdc	572.0151	0.00263	572.0025	0.00043	571.9955	-0.00079
40		572.0074	0.00130	572.0159	0.00278	571.9939	-0.00106
30		572.0059	0.00102	571.9875	-0.00218	571.9936	-0.00111
20		571.9825	-0.00306	571.9788	-0.00370	571.9951	-0.00086
10		572.0168	0.00294	572.0197	0.00345	572.0187	0.00327
0		571.9926	-0.00130	572.0008	0.00014	571.9995	-0.00009
-10		571.9826	-0.00304	572.0072	0.00126	572.0145	0.00254
-20		572.0054	0.00095	572.0132	0.00231	571.9982	-0.00032
-30		571.9975	-0.00044	572.0181	0.00316	572.0215	0.00375

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

Reference Frequency : 572 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.55	572.0042	0.00073	572.0198	0.00345	572.0083	0.00145
25	3.45	572.0184	0.00321	572.0203	0.00355	572.0028	0.00050

C. Tx Frequency 606MHz

C1. Frequency stability versus enviroment tempture

Reference Frequency : 606 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0Vdc	605.9959	-0.00068	605.9921	-0.00130	606.0187	0.00309
40		605.9914	-0.00142	606.0011	0.00017	605.9926	-0.00122
30		605.9930	-0.00115	605.9933	-0.00110	605.9970	-0.00050
20		605.9941	-0.00097	605.9856	-0.00238	605.9953	-0.00078
10		605.9868	-0.00218	605.9790	-0.00346	605.9972	-0.00047
0		606.0202	0.00333	605.9933	-0.00111	605.9962	-0.00062
-10		606.0008	0.00013	606.0000	0.00000	605.9936	-0.00106
-20		605.9867	-0.00219	606.0087	0.00143	605.9945	-0.00090
-30		605.9936	-0.00105	606.0199	0.00328	606.0158	0.00260

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

Reference Frequency : 606 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.55	606.0162	0.00267	605.9848	-0.00251	605.9874	-0.00209
25	3.45	605.9876	-0.00205	605.9956	-0.00073	606.0096	0.00158

D. Tx Frequency 614MHz

D1. Frequency stability versus enviroment tempture

Reference Frequency : 614 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0Vdc	614.0141	0.00230	613.9889	-0.00180	614.0220	0.00358
40		613.9800	-0.00325	613.9950	-0.00082	614.0024	0.00039
30		614.0072	0.00117	614.0059	0.00097	614.0193	0.00315
20		614.0153	0.00249	614.0061	0.00100	613.9833	-0.00273
10		614.0054	0.00088	613.9801	-0.00325	613.9799	-0.00328
0		614.0163	0.00266	613.9967	-0.00054	613.9836	-0.00268
-10		614.0080	0.00131	614.0169	0.00276	614.0134	0.00219
-20		614.0028	0.00045	613.9790	-0.00341	614.0036	0.00059
-30		613.9932	-0.00111	614.0080	0.00130	614.0115	0.00187

D2. Frequency stability versus supplied voltage (85% - 115%)

Reference Frequency : 614 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.55	614.0216	0.00351	614.0088	0.00143	613.9766	-0.00381
25	3.45	614.0149	0.00243	614.0166	0.00271	614.0151	0.00247

E. Tx Frequency 638MHz

E1. Frequency stability versus enviroment tempture

Reference Frequency : 638 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0Vdc	638.0009	0.00014	638.0080	0.00126	638.0128	0.00201
40		638.0217	0.00340	638.0146	0.00229	638.0032	0.00050
30		638.0006	0.00009	638.0072	0.00112	637.9920	-0.00126
20		637.9886	-0.00178	637.9919	-0.00126	637.9955	-0.00071
10		638.0215	0.00337	637.9977	-0.00035	638.0220	0.00344
0		637.9768	-0.00364	637.9927	-0.00115	638.0037	0.00057
-10		637.9805	-0.00306	638.0080	0.00125	637.9918	-0.00129
-20		637.9887	-0.00178	637.9822	-0.00279	638.0019	0.00030
-30		638.0156	0.00245	638.0074	0.00116	638.0158	0.00248

E2. Frequency stability versus supplied voltage (85% - 115%)

Reference Frequency : 638 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.55	637.9861	-0.00218	637.9932	-0.00106	638.0120	0.00189
25	3.45	638.0242	0.00380	638.0045	0.00071	637.9851	-0.00234

8 CONDUCTED EMISSION MEASUREMENT

8.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by DC battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.