

FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : UHF PLL Handheld Transmitter

FCC ID. : INGMH-35

Model No. : Mh-35

Working Frequency : 502~607.875, 614.125~697.875 MHz

for

APPLICANT : JTS Professional Co., Ltd.

ADDRESS : No. 148, Industry 9th Road, Tali Dist., Taichung City 41280

Taiwan, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER (ETC) , TAIWAN

NO. 34. LIN 5, DINGFU VIL., LINKOU DIST.,

NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.

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Report Number : 12-09-RBF-014-01

TEST REPORT CERTIFICATION

Applicant : JTS Professional Co., Ltd.
No. 148, Industry 9th Road, Tali Dist., Taichung City 41280
Taiwan, R.O.C.

Manufacturer : JTS Professional Co., Ltd.
No. 148, Industry 9th Road, Tali Dist., Taichung City 41280
Taiwan, R.O.C.

Description of EUT :

a) Type of EUT : UHF PLL Handheld Transmitter

b) Trade Name : JTS

c) Model No. : Mh-35

d) FCC ID : INGMH-35

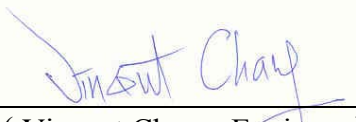
e) Working Frequency : 502~607.875, 614.125~697.875 MHz


f) Power Supply : DC 1.5V Battery*1

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 : Oct. 16, 2012

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	:	UHF PLL Handheld Transmitter
b) Trade Name	:	JTS
c) Model No.	:	Mh-35
d) FCC ID	:	INGMH-35
e) Working Frequency	:	502~607.875, 614.125~697.875 MHz
f) Power Supply	:	DC 1.5V Battery*1
g) Emission Designator	:	80K4F3E 2M+2DK=2x(3kHz)+2x(37.2kHz)x1=80.4kHz

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 Standards" 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 independent sideband transmitter, when modulated 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

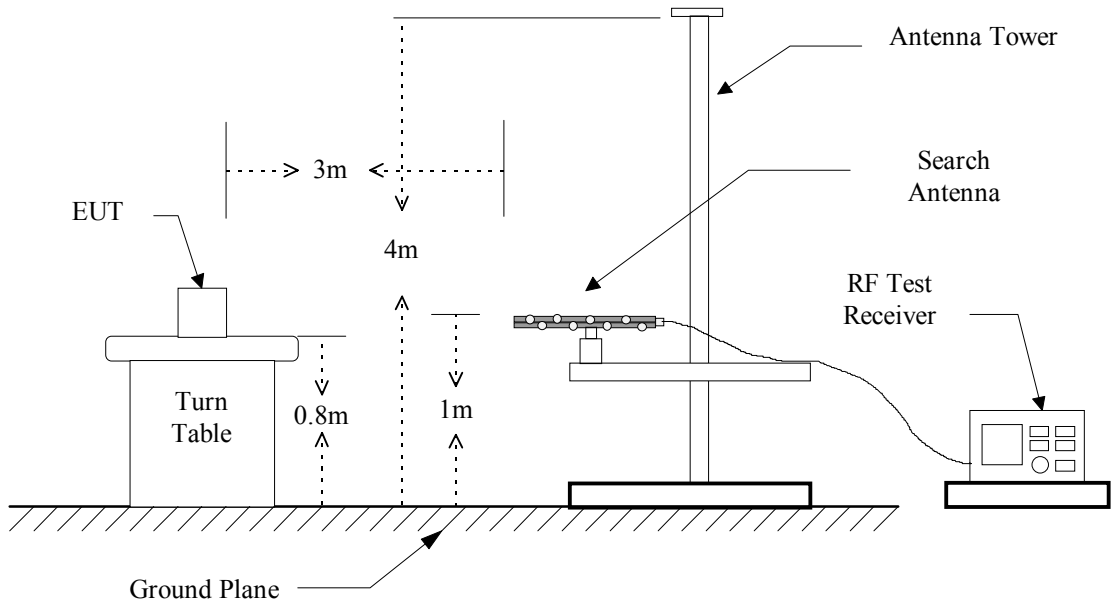
3.1 Provision Applicable

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

3.2 Measurement Procedure

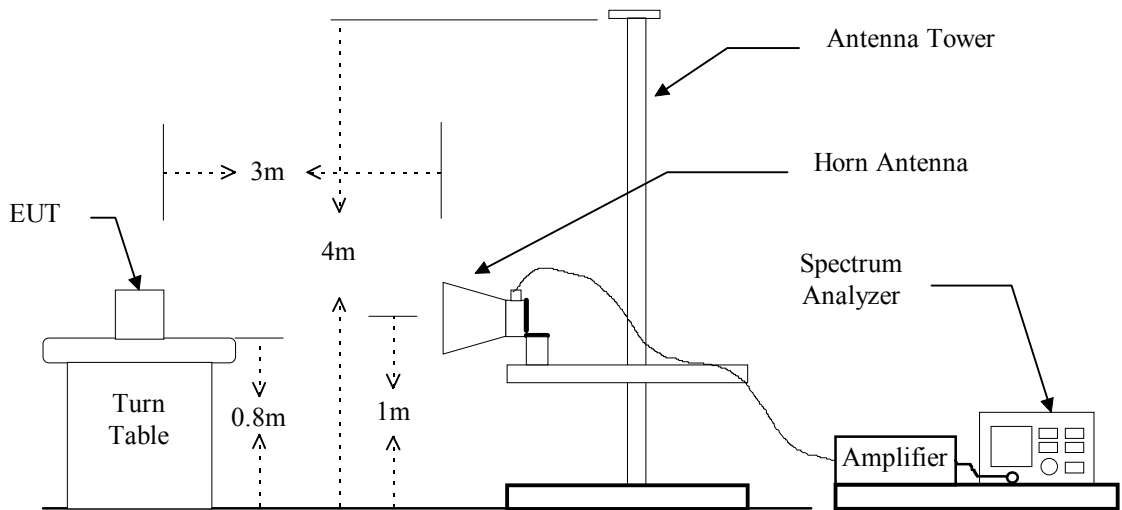
1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna 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 502 –697.875MHz

Operated mode : TX

Test Date : Sep. 17, 2012

Temperature : 26 °C

Humidity : 58 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
502.000	80.9	8.0	2.0	----	6.0	3.981	250

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
607.875	80.5	10.3	2.2	----	8.1	6.457	250

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
614.125	80.1	9.7	2.3	----	7.4	5.495	250

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
697.875	80.3	10.7	2.3	----	8.4	6.918	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.

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

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2012/04/26	2013/04/26
Dipole Antenna	Schwarzbeck	897;898	2012/09/07	2013/09/07
Log-periodic Antenna	EMCO	3146	2011/11/04	2012/11/03
Amplifier	HP	8447D	2012/05/16	2013/05/16
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

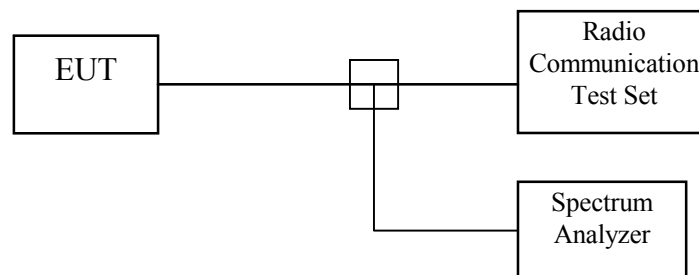
A) Modulation Limit

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	2012/05/04	2013/05/07
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20

4.4 Measurement Result

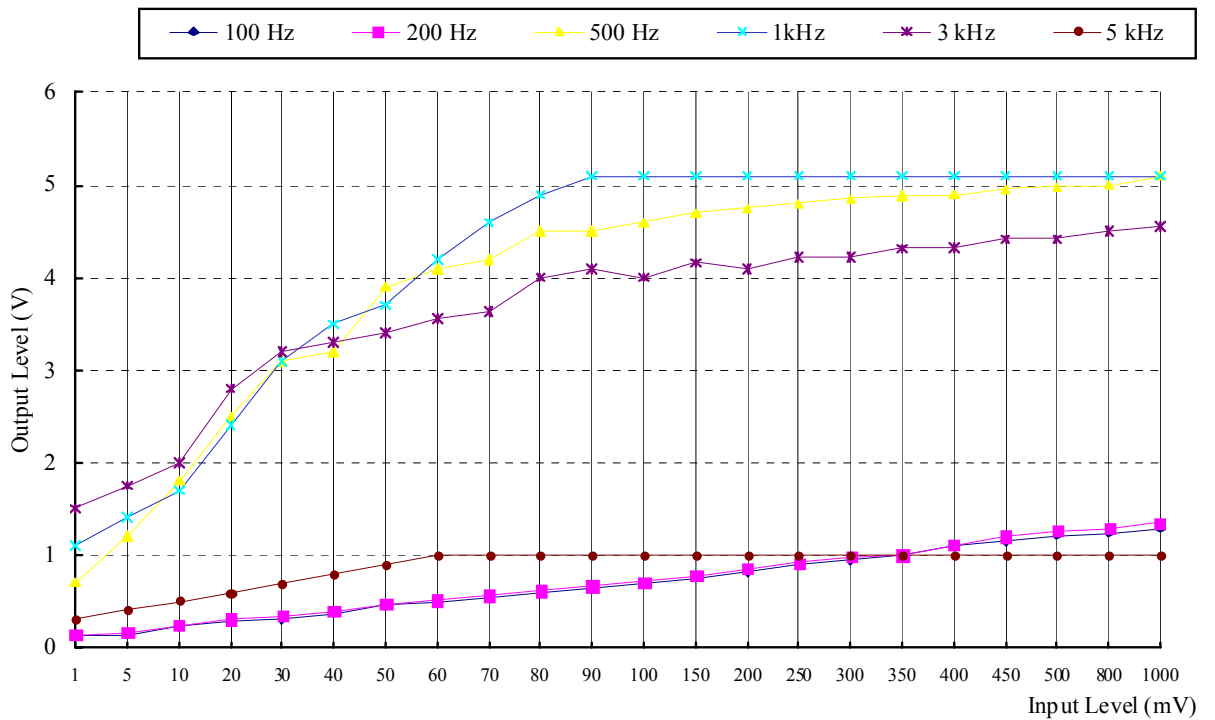
RF Frequency : 502MHz;

Test Date : Sep. 21, 2012

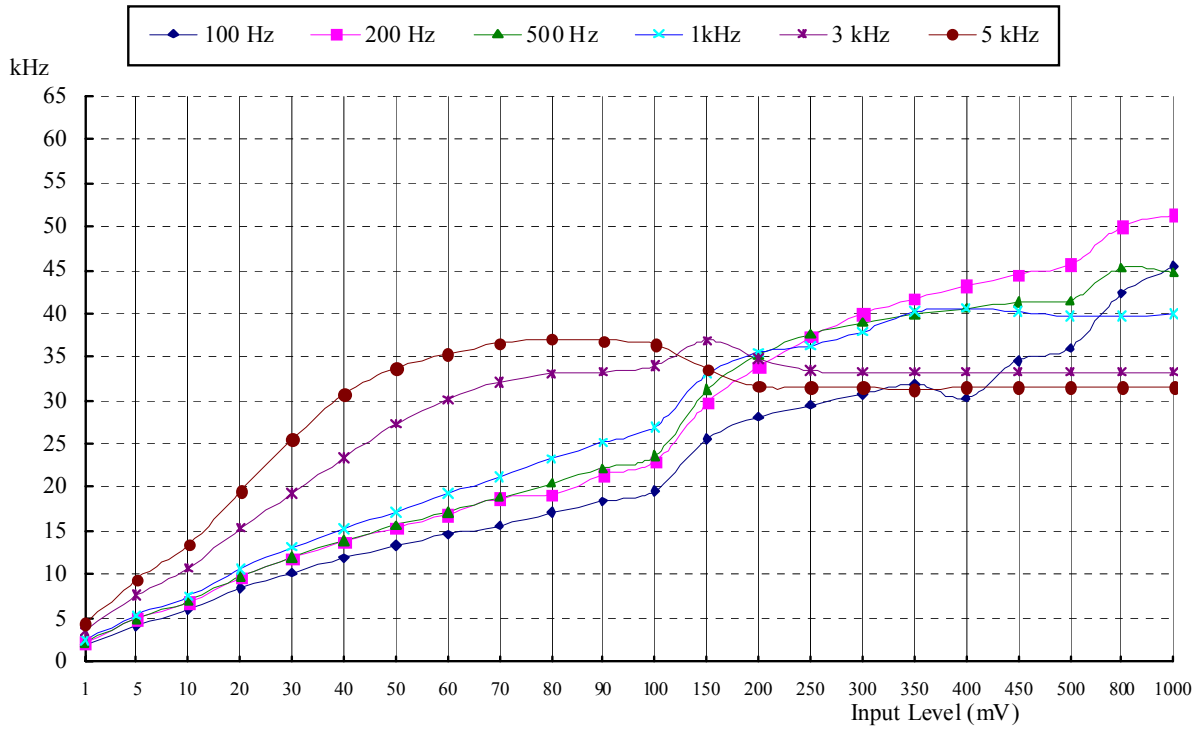
Temperature : 26 °C

Humidity : 58 %

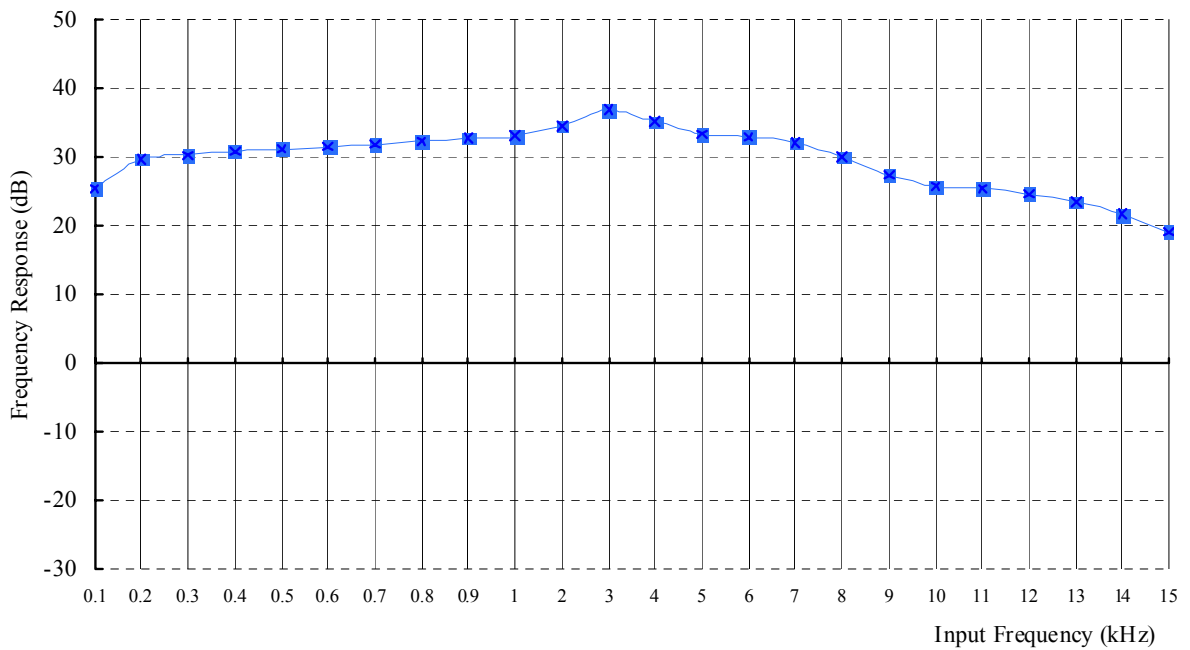
A). Frequency response



B). Modulation Limit



C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

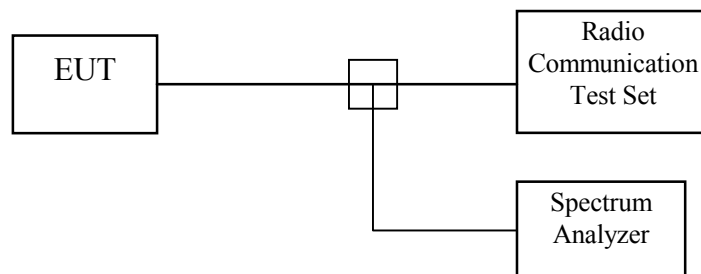
According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or independent sideband transmitter, when modulated by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

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 and 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	2012/05/04	2013/05/07
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20

5.4 Bandwidth Measured

5.4.1 Input Level Derived

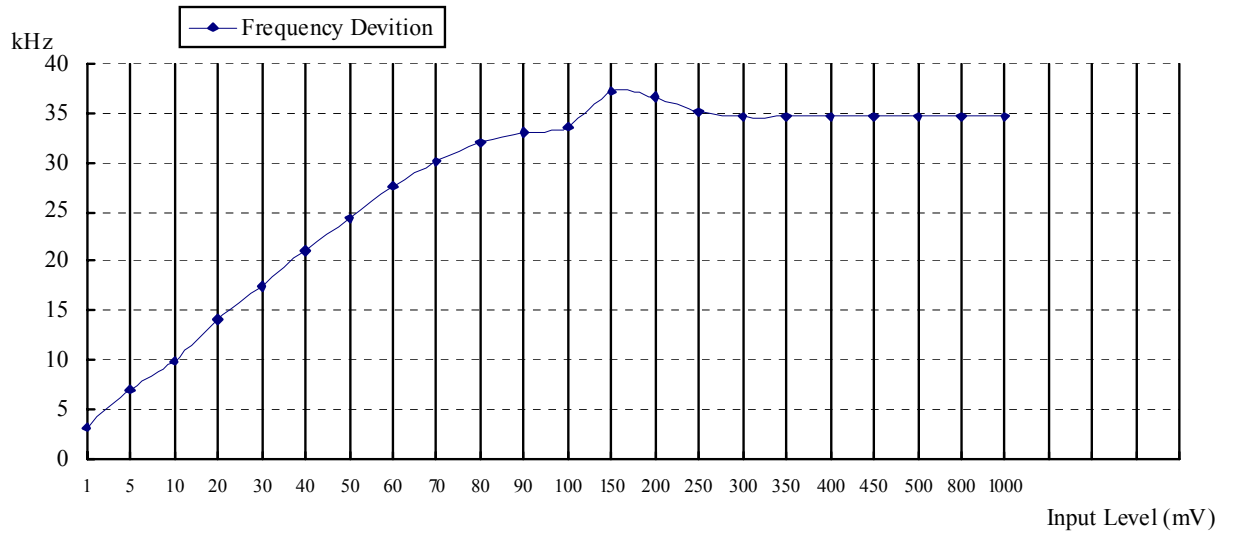
RF Frequency : 502MHz;

Test Date : Sep. 21, 2012

Temperature : 26 °C

Humidity : 58 %

Input Audio Frequency : 2.5 kHz, Sine Wave



The Level input to produce 50% modulation is 35 mV, therefore the magnitude 16 dB greater than it is 220 mV.

5.4.2 Occupied Bandwidth Plotted

Test Date : Sep 21, 2012

Temperature : 26 °C

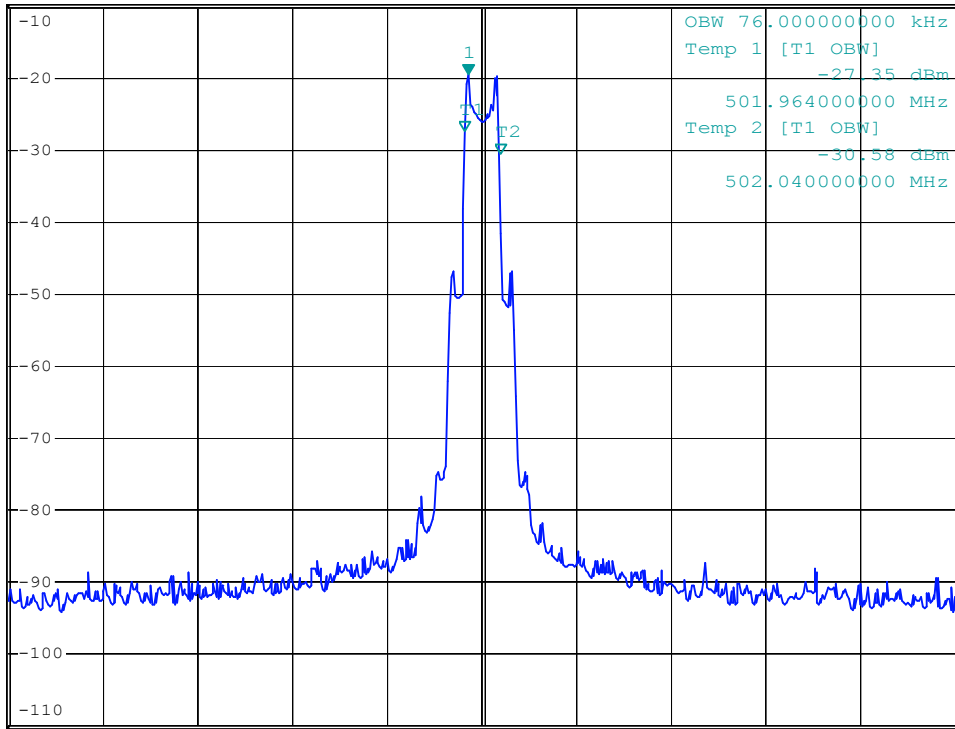
Humidity : 58 %

RF Frequency (MHz)	26 dB Bandwidth (kHz)
502.0	76
607.8	76
614.1	76
697.8	76

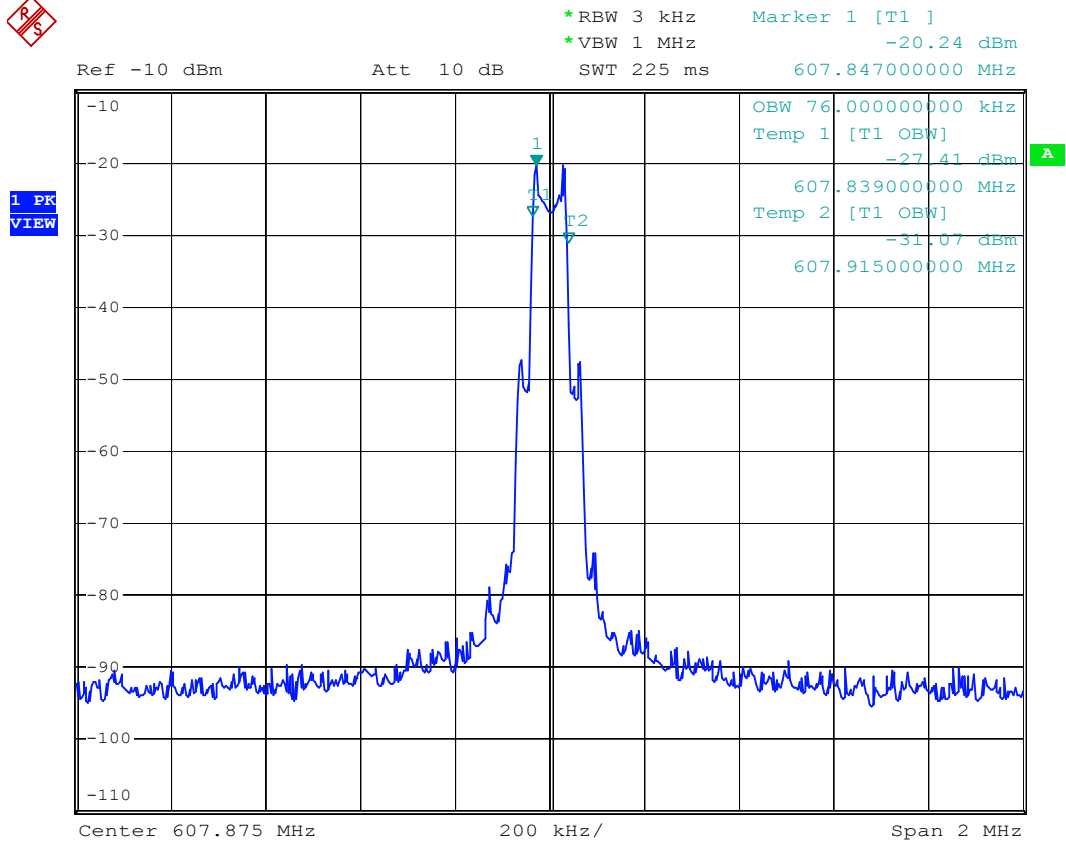


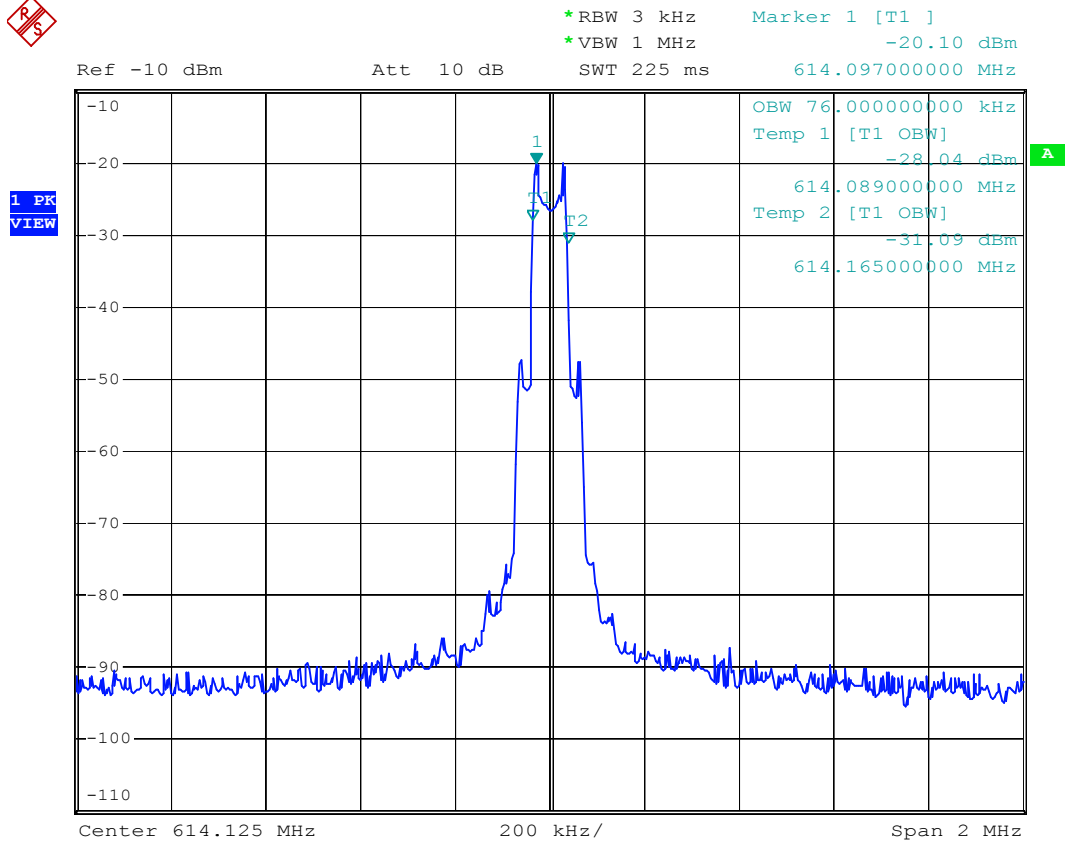
*RBW 3 kHz Marker 1 [T1]
*VBW 1 MHz -19.69 dBm
Ref -10 dBm Att 10 dB SWT 225 ms 501.972000000 MHz

1 PK
VIEW



Center 502 MHz 200 kHz/ Span 2 MHz





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 following schedule:

- (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	2012/05/18	2013/05/18
Double Ridged Antenna	EMCO	3115	2012/05/18	2013/05/18
Log-periodic Antenna	EMCO	3146	2011/11/04	2012/11/03
Biconical Antenna	EMCO	3110	2011/11/04	2012/11/03
Dipole Antenna	Schwarzbeck	897;898	2012/09/07	2013/09/07
Amplifier	HP	8449B	2011/12/28	2012/12/27
Amplifier	HP	8447D	2012/05/16	2013/05/16
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: 502MHz

Operated mode : TX

Test Date : Sep. 21, 2012

Temperature : 26 °C

Humidity : 58 %

Unmodulated carrier output power is 6.0 dBm , or 3.981 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$6.0 - [43 + 10 \log(\text{carrier output power in W})], \text{ or } -13 \text{ dBm}$$

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm)		Limit (dBm)	Margin (dB)
	H	V	H	V				H	V		
1004.000	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
1506.000	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2008.000	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
2510.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3012.000	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
3514.000	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
4016.000	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
4518.000	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
5020.000	---	---	---	---	12.1	-2.0	2.60	---	---	-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 :

$$\text{Result} = \text{SG Reading} + \text{Cable Loss} + \text{Antenna Gain} + \text{Antenna Gain Corrected}$$
 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: 607.875 MHz

Operated mode : TX

Test Date : Sep. 21, 2012

Temperature : 26 °C

Humidity : 58 %

Unmodulated carrier output power is 8.1 dBm , or 6.457 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$8.1-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

Frequency (MHz)	Meter Reading (dBUV)		SG Reading (dBm)		Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm)		Limit (dBm)	Margin (dB)
	H	V	H	V				H	V		
1215.750	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
1823.625	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2431.500	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3039.375	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3647.250	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4255.125	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
4863.000	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5470.875	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
6078.750	---	---	---	---	12.1	-2.0	2.60	---	---	-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 :

$$\text{Result} = \text{SG Reading} + \text{Cable Loss} + \text{Antenna Gain} + \text{Antenna Gain Corrected}$$

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: 614.125MHz

Operated mode : TX

Test Date : Sep. 21, 2012

Temperature : 26 °C

Humidity : 58 %

Unmodulated carrier output power is 7.4 dBm , or 5.495 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$7.4-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm)		Limit (dBm)	Margin (dB)
	H	V	H	V				H	V		
1228.250	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
1842.375	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2456.500	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3070.625	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
3684.750	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4298.875	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
4913.000	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
5527.125	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
6141.250	---	---	---	---	12.1	-2.0	2.60	---	---	-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 :

$$\text{Result} = \text{SG Reading} + \text{Cable Loss} + \text{Antenna Gain} + \text{Antenna Gain Corrected}$$

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: 697.875MHz

Operated mode : TX
Temperature : 26 °C

Test Date : Sep. 21, 2012
Humidity : 58 %

Unmodulated carrier output power is 8.4 dBm , or 6.918 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$8.4-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm)		Limit (dBm)	Margin (dB)
	H	V	H	V				H	V		
1395.750	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
2093.625	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2791.500	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3489.375	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
4187.250	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
4885.125	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
5583.000	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
6280.875	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
6978.750	---	---	---	---	12.1	-2.0	2.60	---	---	-13.0	---

Note :

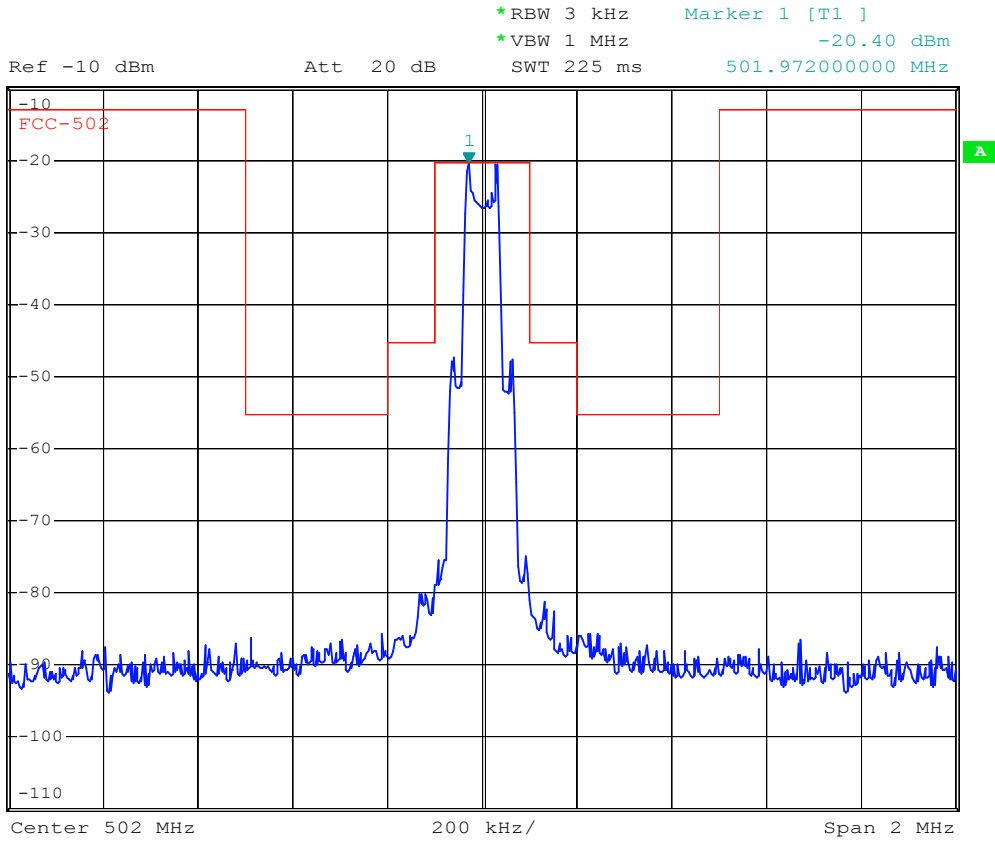
1. Remark “---“ means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

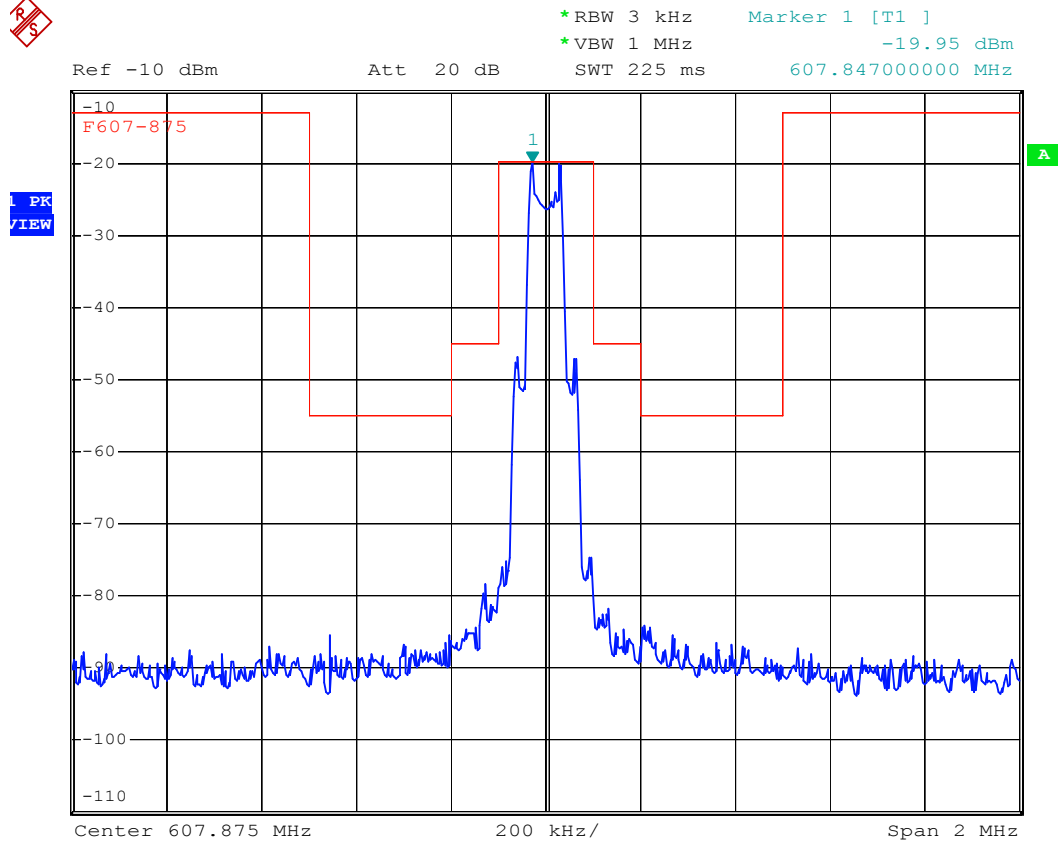
$$\text{Result} = \text{SG Reading} + \text{Cable Loss} + \text{Antenna Gain} + \text{Antenna Gain Corrected}$$
 Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

6.4.2 Emission mask plots



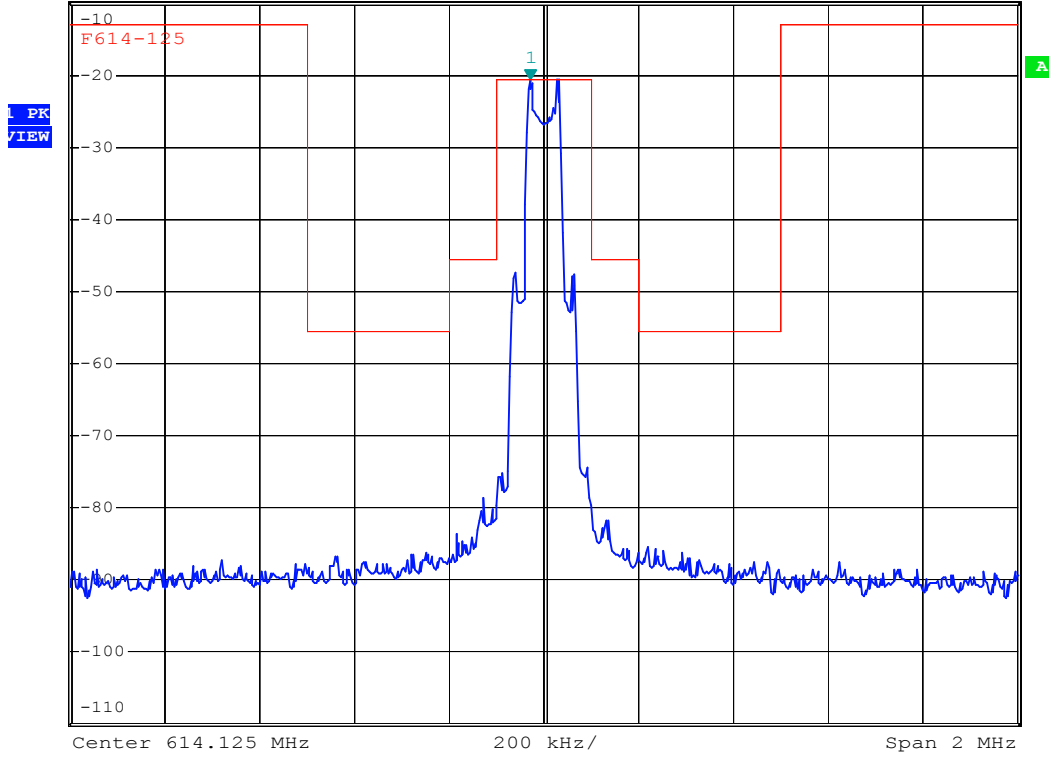
1 PK
VIEW







Ref -10 dBm Att 20 dB *RBW 3 kHz Marker 1 [T1]
*VBW 1 MHz -20.54 dBm
SWT 225 ms 614.097000000 MHz



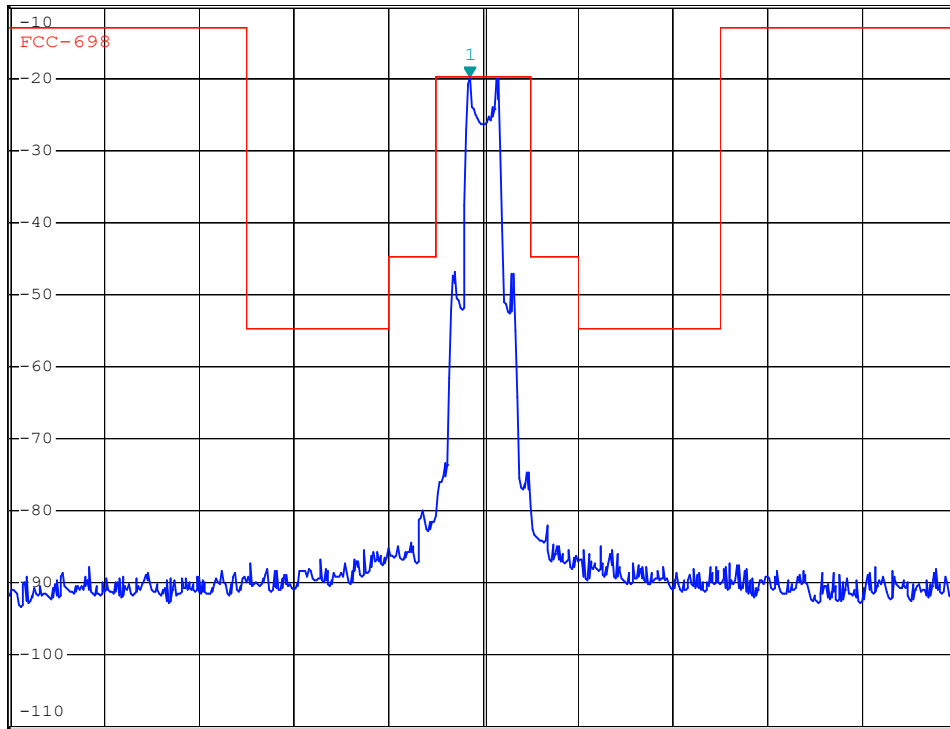


*RBW 3 kHz Marker 1 [T1]
*VBW 1 MHz -19.83 dBm
SWT 225 ms 697.847000000 MHz

Ref -10 dBm

Att 20 dB

1 PK
VIEW



Center 697.875 MHz

200 kHz/

Span 2 MHz

6.5 Other Emission

a) Emission frequencies below 1 GHz

Test Date : Sep. 24, 2012

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)
39.45	V	4.5	13.7	18.2	40.0	-21.8	179	1.0
118.56	V	6.8	12.4	19.2	43.5	-24.3	180	1.0
155.25	V	6.3	14.2	20.5	43.5	-23.0	195	1.0
190.25	V	6.3	16.6	22.9	43.5	-20.6	188	1.0
224.00	V	6.0	18.5	24.5	46.0	-21.5	195	1.0
295.62	V	6.1	20.3	26.4	46.0	-19.6	188	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 $+50^{\circ}\text{C}$ 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

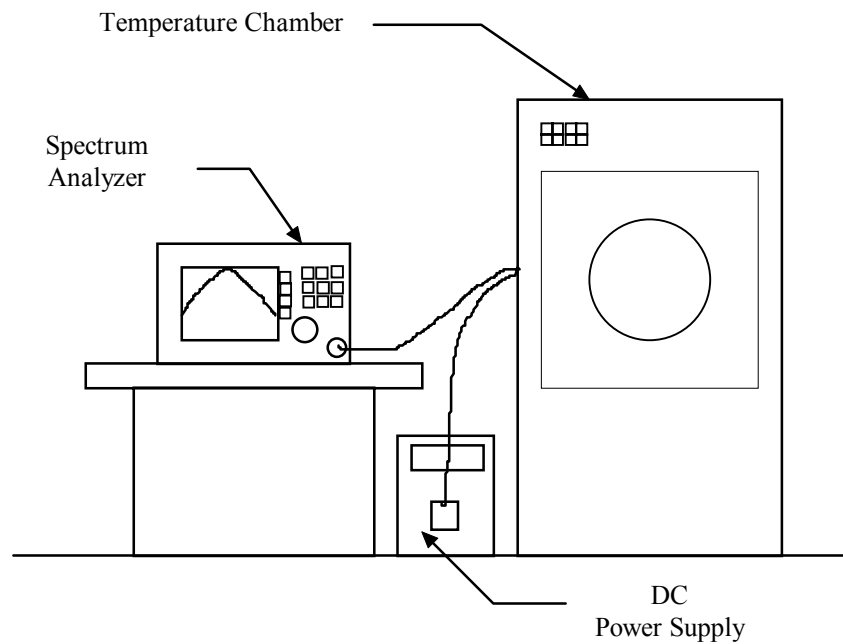
1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15°C to 25°C . Otherwise, an environmental chamber set for a temperature of 20°C shall be used.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW 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	2012/09/20	2013/09/20
Temperature Chamber	MALLIER	MCT-2X-M	2012/05/03	2013/05/03

7.4 Measurement DataTest Date : Sep. 24, 2012Temperature : 28 °CHumidity : 65 %**A. Tx Frequency 502MHz****A1. Frequency stability versus environment temperature**

Reference Frequency :502 MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	501.9821	-0.00356	502.0127	0.00253	502.0174	0.00348
40		502.0143	0.00285	502.0120	0.00239	501.9868	-0.00262
30		501.9833	-0.00332	502.0107	0.00213	501.9917	-0.00166
20		501.9831	-0.00338	501.9880	-0.00239	501.9940	-0.00120
10		502.0150	0.00299	501.9930	-0.00139	501.9995	-0.00011
0		501.9909	-0.00181	502.0024	0.00049	502.0193	0.00384
-10		502.0000	0.00000	502.0089	0.00178	501.9935	-0.00130
-20		501.9876	-0.00247	501.9997	-0.00006	502.0066	0.00131
-30		501.9907	-0.00186	501.9950	-0.00099	502.0085	0.00169

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

Reference Frequency : 502 MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	502.0167	0.00332	501.9819	-0.00361	501.9928	-0.00144
25	1.72	501.9986	-0.00027	502.0036	0.00071	501.9958	-0.00084

Test Date : Sep. 24, 2012Temperature : 28 °CHumidity : 65 %**B. Tx Frequency 607.875MHz****B1. Frequency stability versus environment temperature**

Reference Frequency : 607.875MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	607.8811	0.00100	607.8803	0.00087	607.8822	0.00119
40		607.8555	-0.00321	607.8665	-0.00141	607.8982	0.00382
30		607.8728	-0.00036	607.8690	-0.00099	607.8748	-0.00003
20		607.8934	0.00303	607.8899	0.00245	607.8979	0.00376
10		607.8900	0.00247	607.8856	0.00175	607.8566	-0.00303
0		607.8803	0.00087	607.8964	0.00352	607.8704	-0.00075
-10		607.8798	0.00080	607.8607	-0.00235	607.8967	0.00356
-20		607.8885	0.00222	607.8617	-0.00219	607.8630	-0.00197
-30		607.8782	0.00053	607.8657	-0.00153	607.8812	0.00102

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

Reference Frequency : 607.875MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	607.8826	0.00124	607.8610	-0.00231	607.8931	0.00298
25	1.72	607.8539	-0.00348	607.8911	0.00265	607.8534	-0.00355

Test Date : Sep. 24, 2012Temperature : 28 °CHumidity : 65 %**C. Tx Frequency 614.125MHz****C1. Frequency stability versus environment temperature**

Reference Frequency : 614.125 MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	614.1042	-0.00338	614.1192	-0.00095	614.1407	0.00256
40		614.1417	0.00271	614.1103	-0.00240	614.1469	0.00356
30		614.1205	-0.00073	614.1466	0.00351	614.1253	0.00005
20		614.1227	-0.00038	614.1339	0.00145	614.1268	0.00029
10		614.1327	0.00125	614.1110	-0.00228	614.1448	0.00322
0		614.1107	-0.00232	614.1372	0.00199	614.1311	0.00100
-10		614.1321	0.00116	614.1131	-0.00194	614.1256	0.00010
-20		614.1063	-0.00304	614.1371	0.00197	614.1102	-0.00241
-30		614.1112	-0.00224	614.1068	-0.00297	614.1122	-0.00209

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

Reference Frequency : 614.125 MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	614.1163	-0.00142	614.1422	0.00280	614.1155	-0.00154
25	1.72	614.1337	0.00141	614.1346	0.00156	614.1244	-0.00009

Test Date : Sep. 24, 2012Temperature : 28 °CHumidity : 65 %**D. Tx Frequency 697.875MHz****D1. Frequency stability versus environment temperature**

Reference Frequency : 697.875 MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	697.8920	0.00244	697.8674	-0.00109	697.8731	-0.00027
40		697.8766	0.00023	697.8543	-0.00296	697.8619	-0.00187
30		697.8483	-0.00383	697.8575	-0.00250	697.9011	0.00374
20		697.8547	-0.00291	697.8980	0.00329	697.8629	-0.00174
10		697.8889	0.00199	697.8971	0.00317	697.8863	0.00162
0		697.8948	0.00284	697.9007	0.00368	697.8926	0.00252
-10		697.8842	0.00132	697.8997	0.00354	697.8674	-0.00109
-20		697.8559	-0.00274	697.8582	-0.00240	697.8885	0.00194
-30		697.8758	0.00011	697.8733	-0.00025	697.8692	-0.00083

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

Reference Frequency : 697.875 MHz		Limit : 0.005%					
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	697.8683	-0.00096	697.8720	-0.00043	697.8539	-0.00302
25	1.72	697.8946	0.00281	697.9005	0.00365	697.8897	0.00211

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.