FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : Wireless Tour Guide Transmitter
FCC ID. : INGTG-64T
Model No. : TG-64T; TG-64TA; TG-16T; TG-16TA
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 : 12-07-RBF-017-01

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	:	Wireless Tour Guide Transmitter
b) Trade Name	:	JTS
c) Model No.	:	TG-64T; TG-64TA; TG-16T; TG-16TA
d) FCC ID	:	INGTG-64T
e) Working Frequency	:	502~607.875, 614.125~697.875 MHz
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 : Jan. 21, 2013

Test Engineer : 

(Vincent Chang, Engineer)

Approve & Authorized Signer : 

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

Table of Contents Page

1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	:	Wireless Tour Guide Transmitter
b) Trade Name	:	JTS
c) Model No.	:	TG-64T; TG-64TA; TG-16T; TG-16TA
d) FCC ID	:	INGTG-64T
e) Working Frequency	:	502~607.875, 614.125~697.875 MHz
f) Power Supply	:	DC 1.5V Battery*2
g) Emission Designator	:	78K6F3E 2M+2DK=2x(5kHz)+2x(34.3kHz)x1=78.6kHz
i) Model Difference	:	All serial models are the same PCB design with only the following difference. TG-64T: Internal antenna / 64 channel selection. TG-64TA: External antenna / 64 channel selection. TG-16T: Internal antenna / 16 channel selection. TG-16TA: External antenna / 16 channel selection.

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

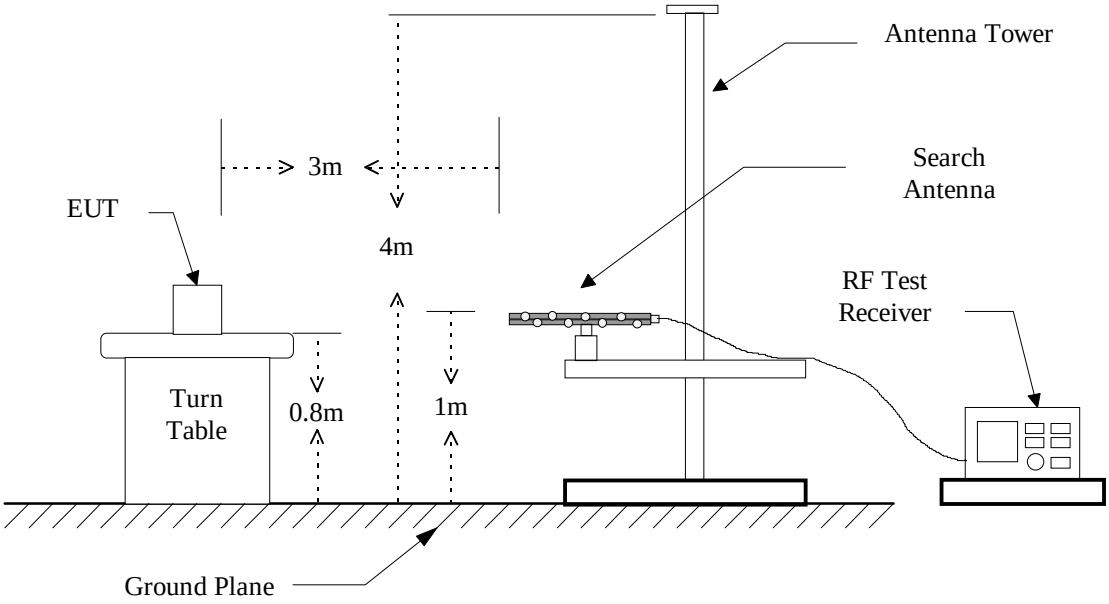
3.1 Provision Applicable

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

3.2 Measurement Procedure

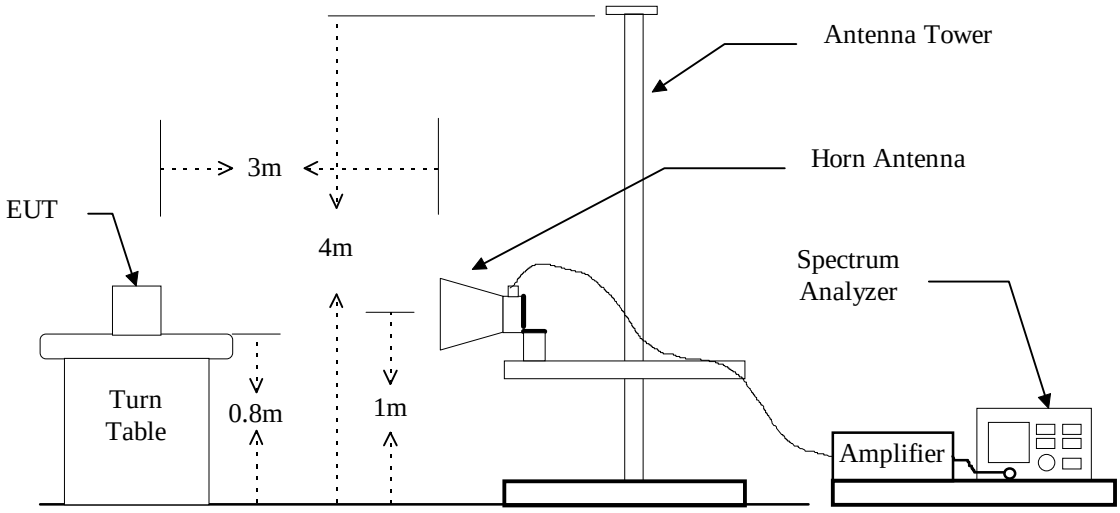
1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna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

Model: TG-64LT
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	80.1	7.2	2.0	----	5.2	3.311	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	79.8	9.6	2.0	----	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)
614.125	80.8	10.4	2.3	----	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)
697.875	80.4	10.8	2.3	----	8.5	7.079	250

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

Model: TG-64T
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	78.5	5.6	2.0	----	3.6	2.291	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	78.7	8.5	2.0	----	6.3	4.266	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	78.9	8.5	2.3	----	6.2	4.169	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	78.4	8.8	2.3	----	6.5	4.467	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	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.

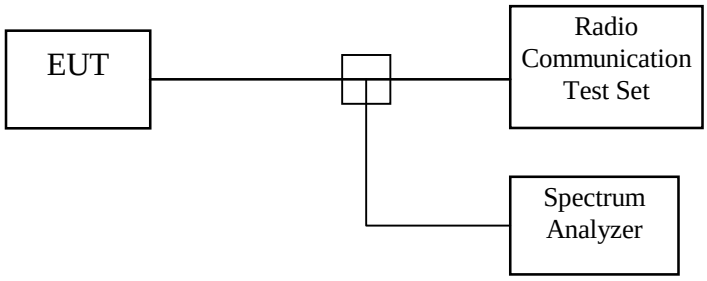
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

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

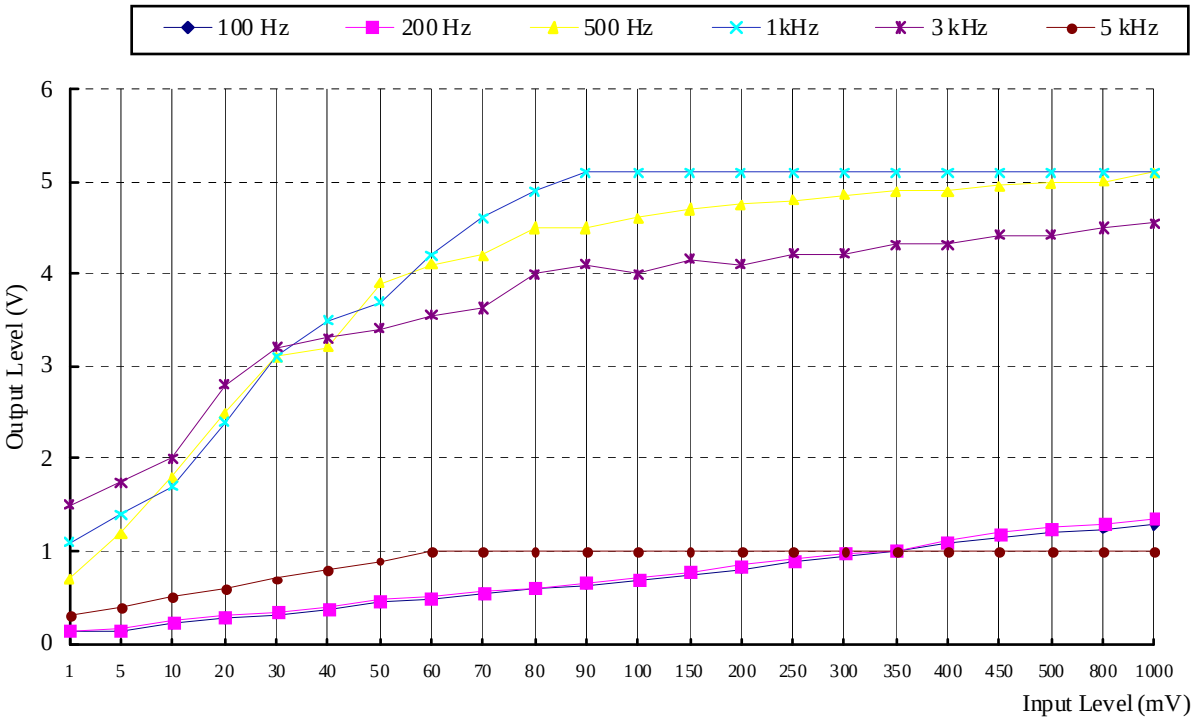
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2012/05/04	2013/05/07
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/09/20	2013/09/20

4.4 Measurement Result

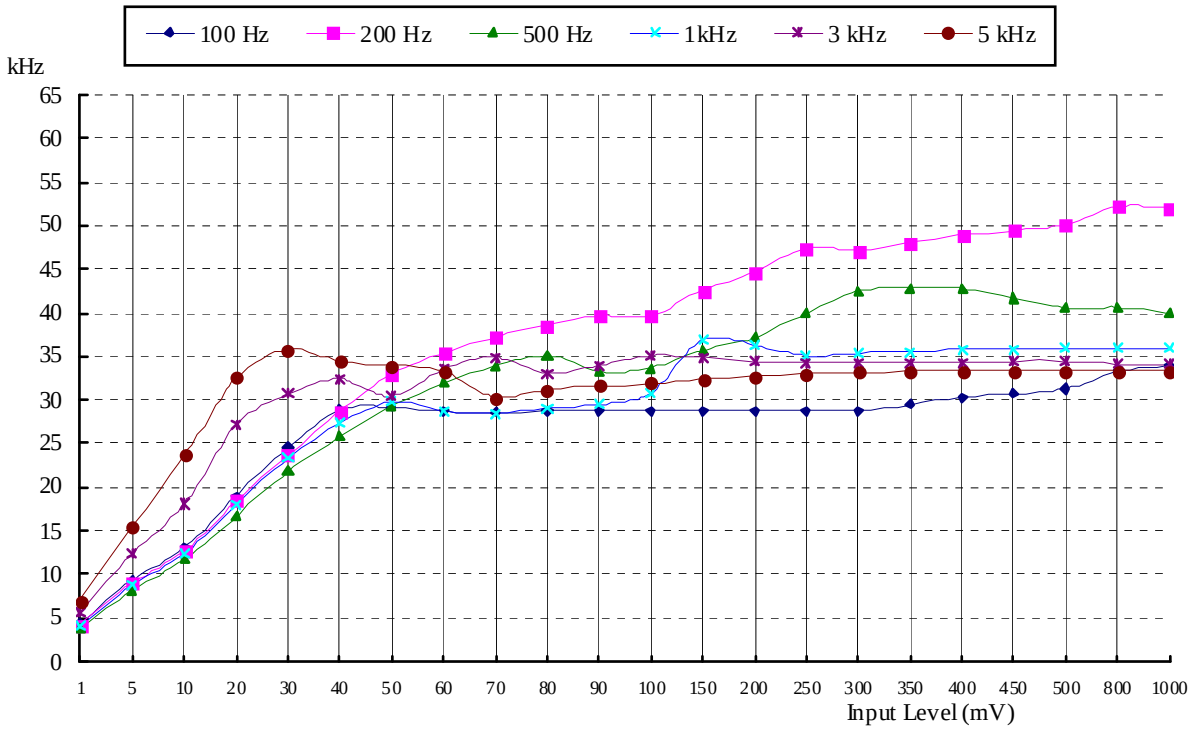
RF Frequency : 502MHz;

Test Date : Sep. 21, 2012 Temperature : 26 °C Humidity : 58 %

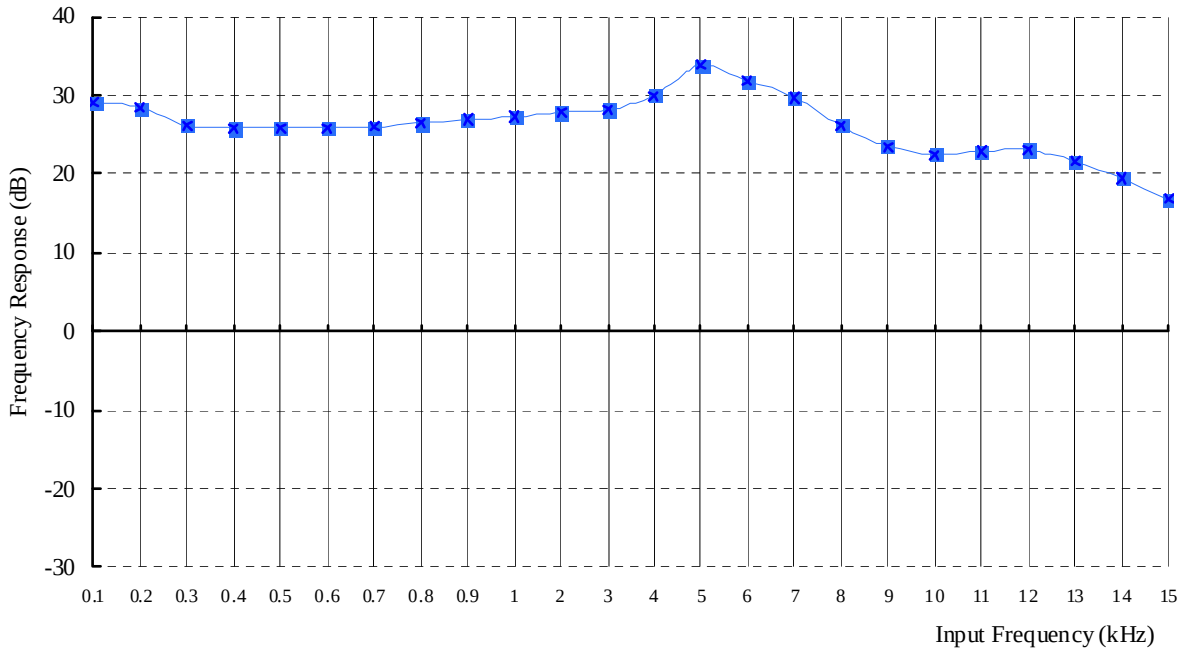
A). Frequency response



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 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.

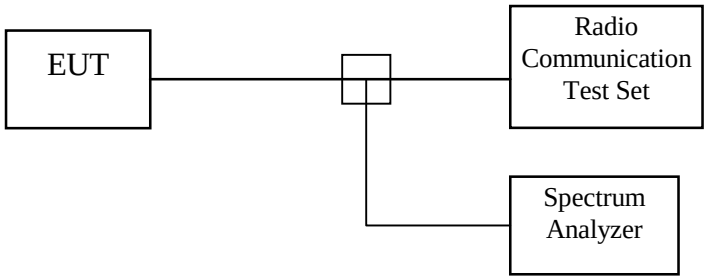
5.2 Measurement Method

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

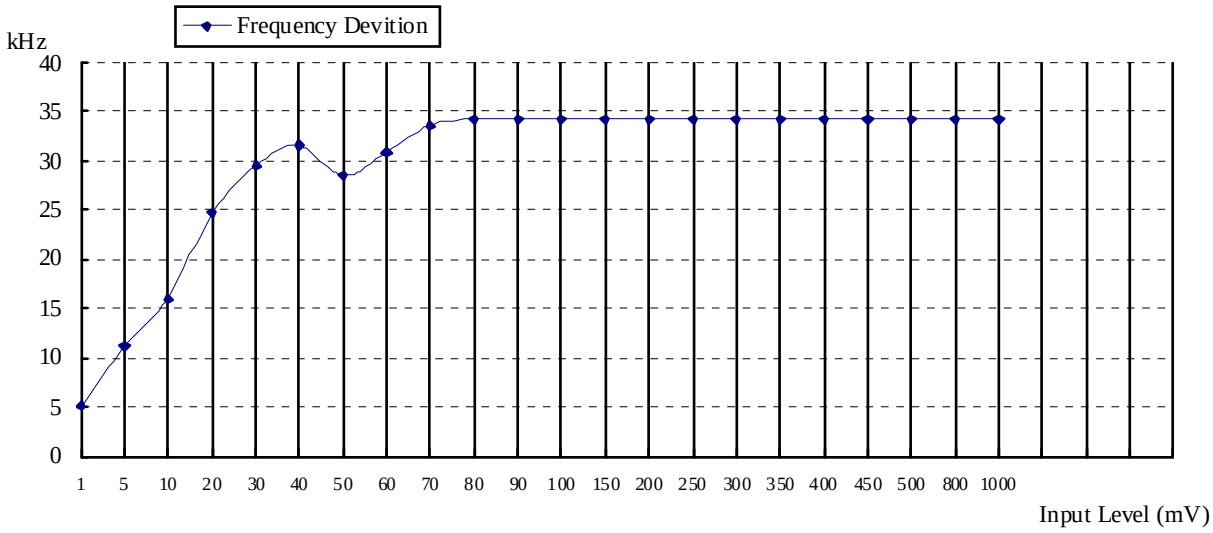
5.4 Bandwidth Measured

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

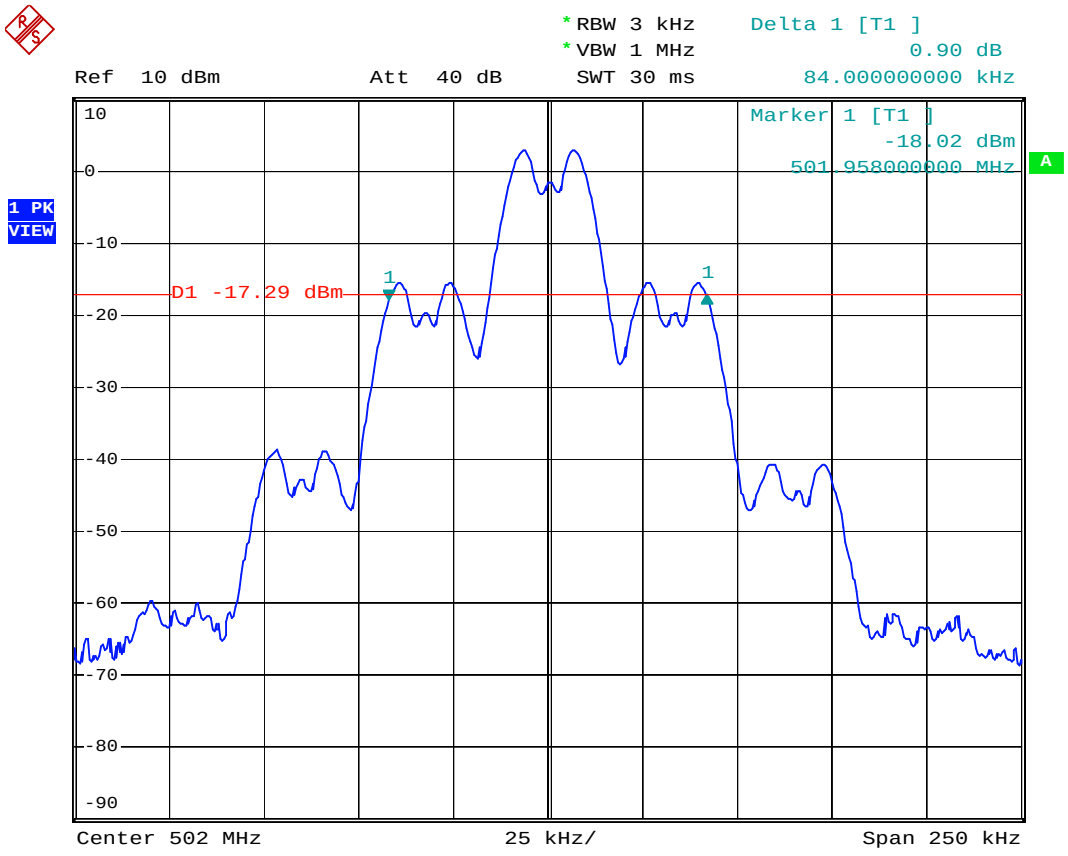


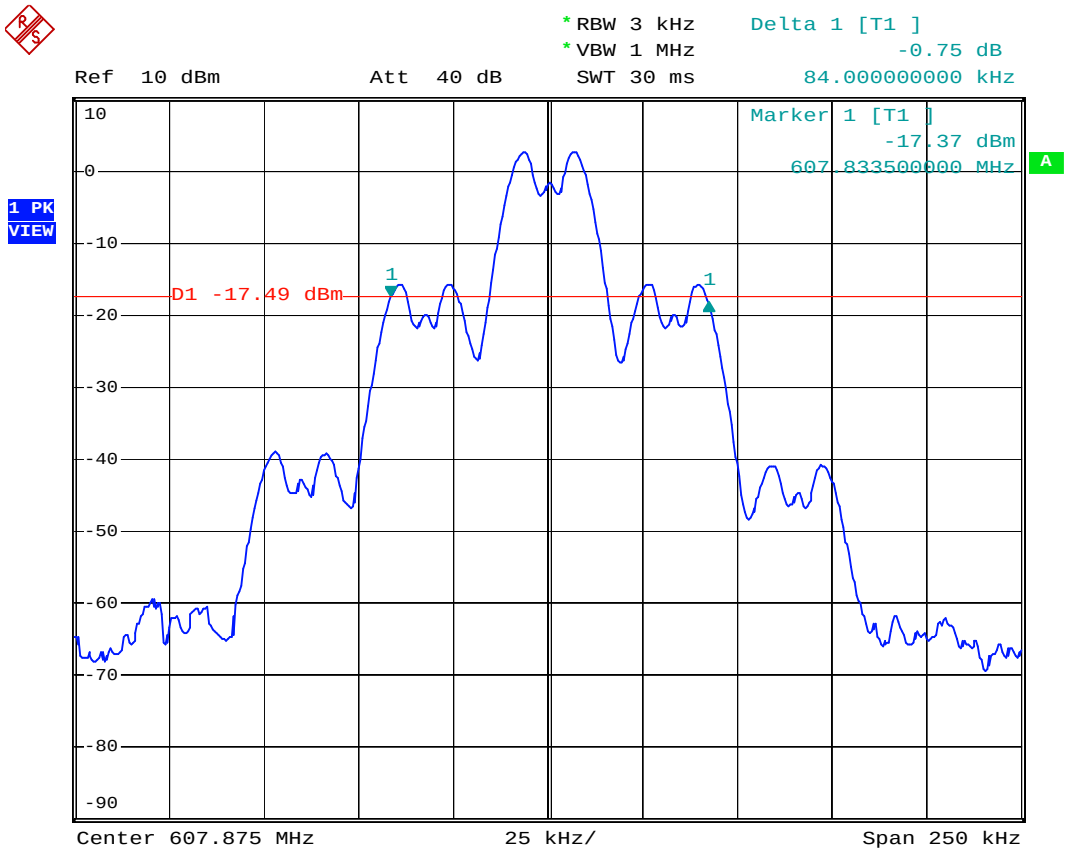
The Level input to produce 50% modulation is 10 mV, therefore the magnitude 16 dB greater than it is 63 mV.

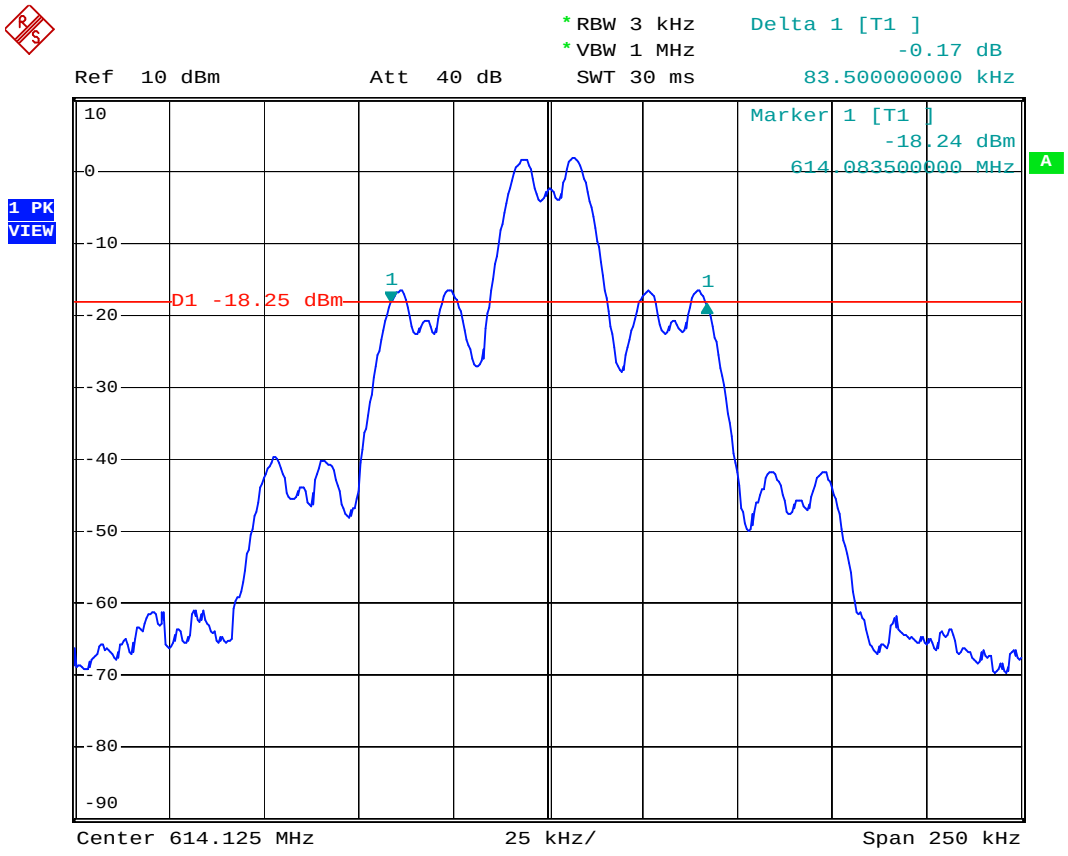
5.4.2 Occupied Bandwidth Plotted

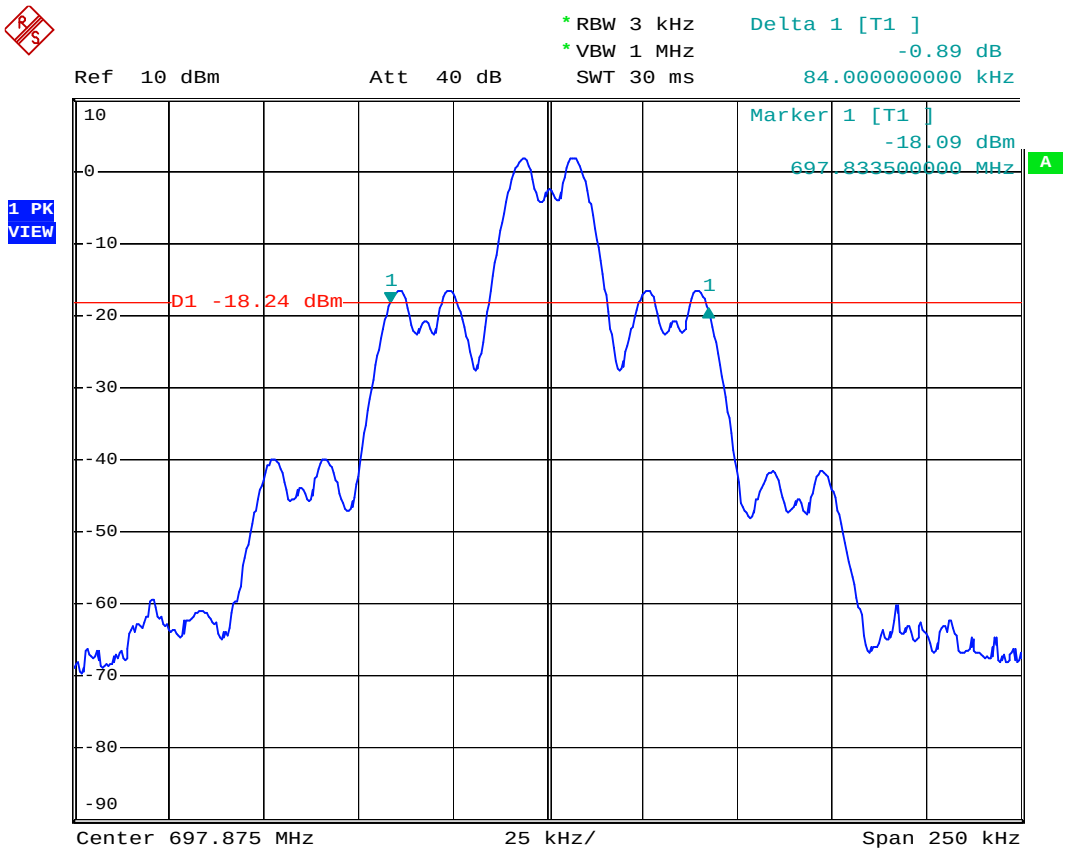
Test Date : Sep. 21, 2012 Temperature : 26 °C Humidity : 58 %

RF Frequency (MHz)	26 dB Bandwidth (kHz)
502.0	84
607.875	84
614.125	83.5
697.875	84


*RBW 3 kHz
*VBW 1 MHz
SWT 30 ms
Delta 1 [T1]
0.90 dB
84.000000000 kHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-18.02 dBm
501.958000000 MHz
A
1 PK
VIEW
D1 -17.29 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 502 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
*VBW 1 MHz
SWT 30 ms
Delta 1 [T1]
-0.75 dB
84.000000000 kHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-17.37 dBm
607.833500000 MHz
A
1 PK
VIEW
D1 -17.49 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 607.875 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
*VBW 1 MHz
SWT 30 ms
Delta 1 [T1]
-0.17 dB
83.500000000 kHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-18.24 dBm
614.083500000 MHz
A
1 PK
VIEW
D1 -18.25 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 614.125 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
*VBW 1 MHz
SWT 30 ms
Delta 1 [T1]
-0.89 dB
84.000000000 kHz
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
-18.09 dBm
697.833500000 MHz
1 PK
VIEW
A
D1 -18.24 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 697.875 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	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+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)
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 :

   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: 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+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)
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 :

   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: 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+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)
1228.250	---	---	---	---	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 :

   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: 697.875MHz

Operated mode : TX Test Date :Sep. 21, 2012
Temperature : 26 °C 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+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)
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	---

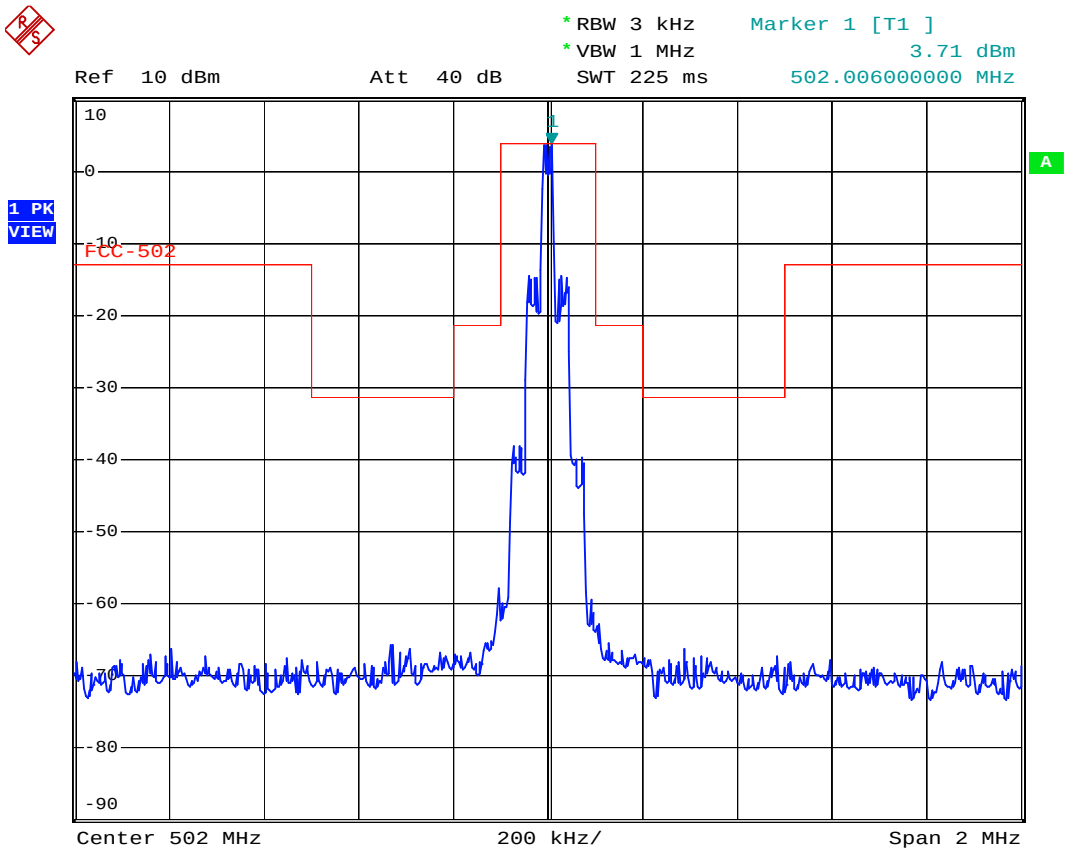
Note :

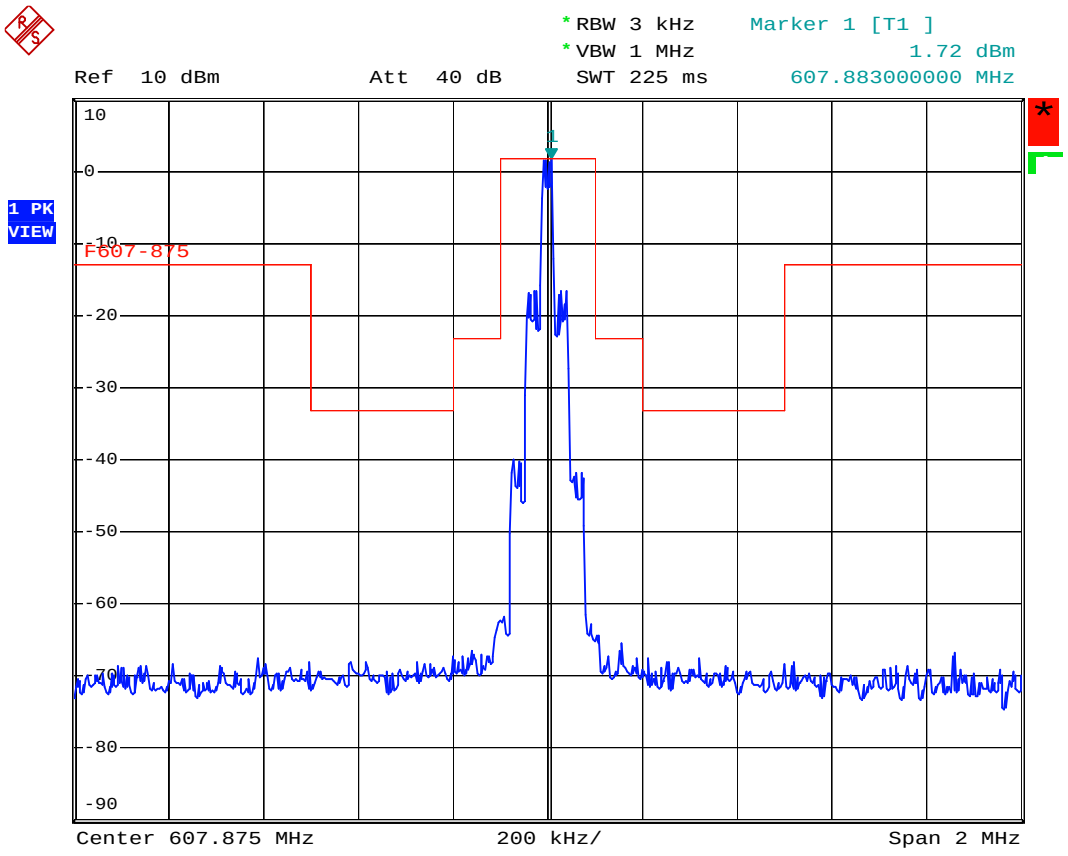
1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

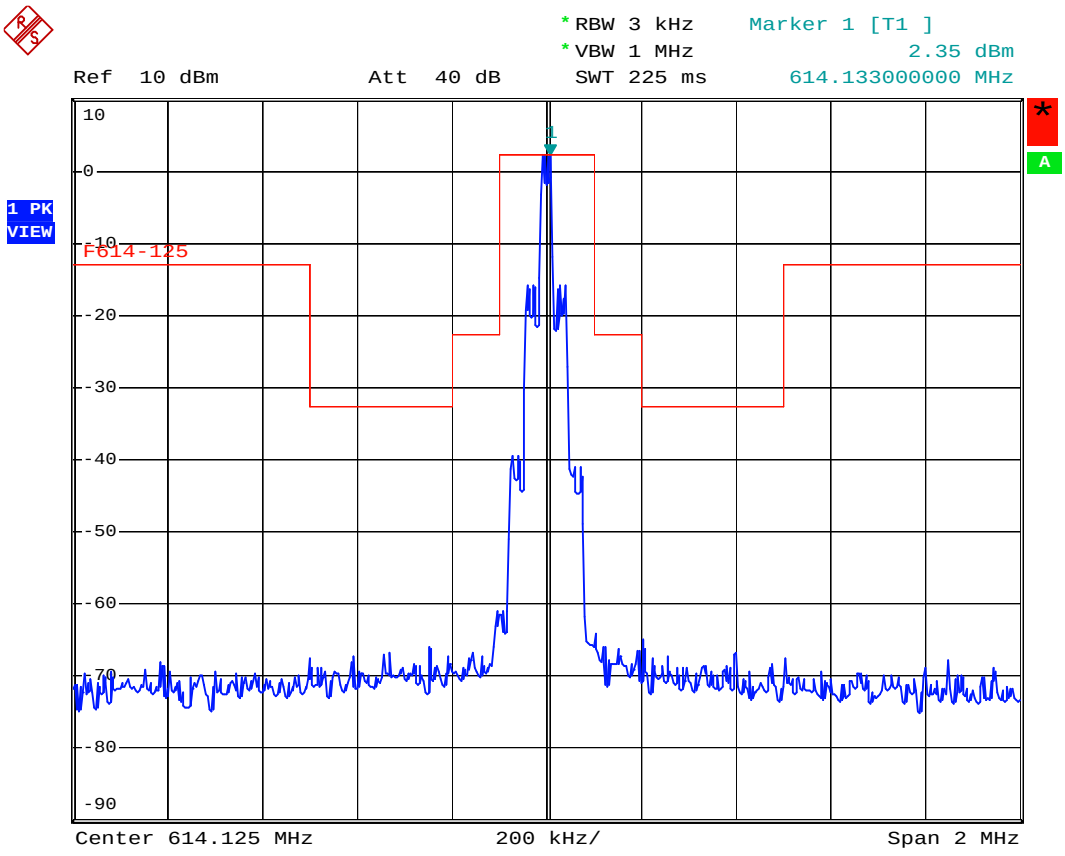
   Result = SG Reading +Cable Loss +Antenna Gain +Antenna Gain Corrected

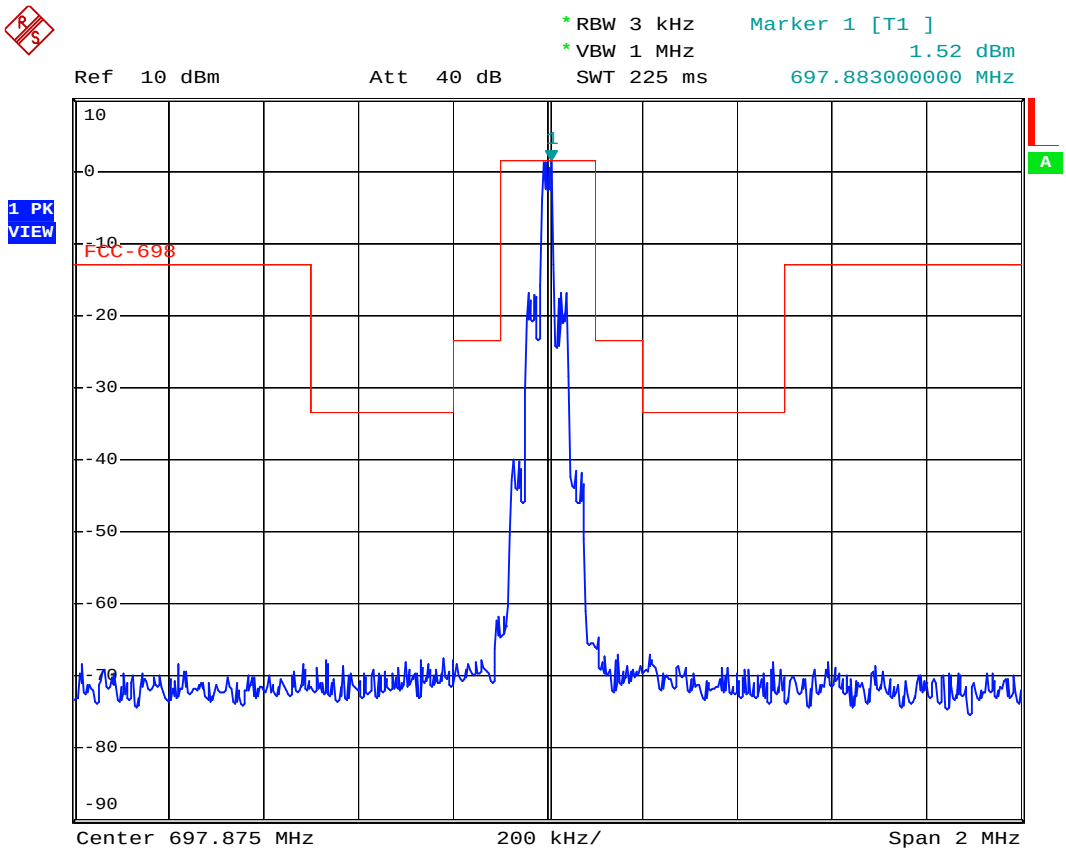
   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

6.4.2 Emission mask plots




*RBW 3 kHz
*VBW 1 MHz
SWT 225 ms
Marker 1 [T1]
1.72 dBm
607.883000000 MHz
Ref 10 dBm
Att 40 dB
1 PK
VIEW
F607-875
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 607.875 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
*VBW 1 MHz
SWT 225 ms
Marker 1 [T1]
2.35 dBm
614.133000000 MHz
Ref 10 dBm
Att 40 dB
1 PK
VIEW
F614-125
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
A
Center 614.125 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
*VBW 1 MHz
SWT 225 ms
Marker 1 [T1]
1.52 dBm
697.883000000 MHz
Ref 10 dBm
Att 40 dB
1 PK
VIEW
FCC-698
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
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 %

Test Model:TG-64TA

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)
38.25	V	4.1	13.9	18.0	40.0	-22.0	179	1.0
122.56	V	7.6	12.6	20.2	43.5	-23.3	180	1.0
149.65	V	7.7	14.2	21.9	43.5	-21.6	195	1.0
182.92	V	7.7	15.5	23.2	43.5	-20.3	188	1.0
225.69	V	6.8	18.6	25.4	46.0	-20.6	195	1.0
284.12	V	3.9	23.0	26.9	46.0	-19.1	188	1.0

Test Model: TG-64T

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)
36.65	V	3.5	14.1	17.6	40.0	-22.4	182	1.0
119.65	V	7.2	12.4	19.6	43.5	-23.9	188	1.0
138.55	V	7.9	13.6	21.5	43.5	-22.0	175	1.0
188.52	V	7.5	16.3	23.8	43.5	-19.7	192	1.0
225.68	V	7.4	18.6	26.0	46.0	-20.0	188	1.0
278.65	V	4.9	22.6	27.5	46.0	-18.5	192	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.

Test Date : Sep. 24, 2012 Temperature : 28 °C Humidity : 65 %

Test Model: TG-64RA

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)
38.25	V	5.7	13.9	19.6	40.0	-20.4	182	1.0
122.56	V	7.3	12.6	19.9	43.5	-23.6	178	1.0
149.65	V	7.0	14.2	21.2	43.5	-22.3	190	1.0
182.92	V	7.6	15.5	23.1	43.5	-20.4	188	1.0
225.69	V	6.3	18.6	24.9	46.0	-21.1	170	1.0
284.12	V	3.9	23.0	26.9	46.0	-19.1	179	1.0

Test Model: TG-64R

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)
36.65	V	5.1	14.1	19.2	40.0	-20.8	188	1.0
119.65	V	7.7	12.4	20.1	43.5	-23.4	180	1.0
138.55	V	7.9	13.6	21.5	43.5	-22.0	175	1.0
188.52	V	6.6	16.3	22.9	43.5	-20.6	177	1.0
225.68	V	7.0	18.6	25.6	46.0	-20.4	189	1.0
278.65	V	4.9	22.6	27.5	46.0	-18.5	192	1.0

Note :

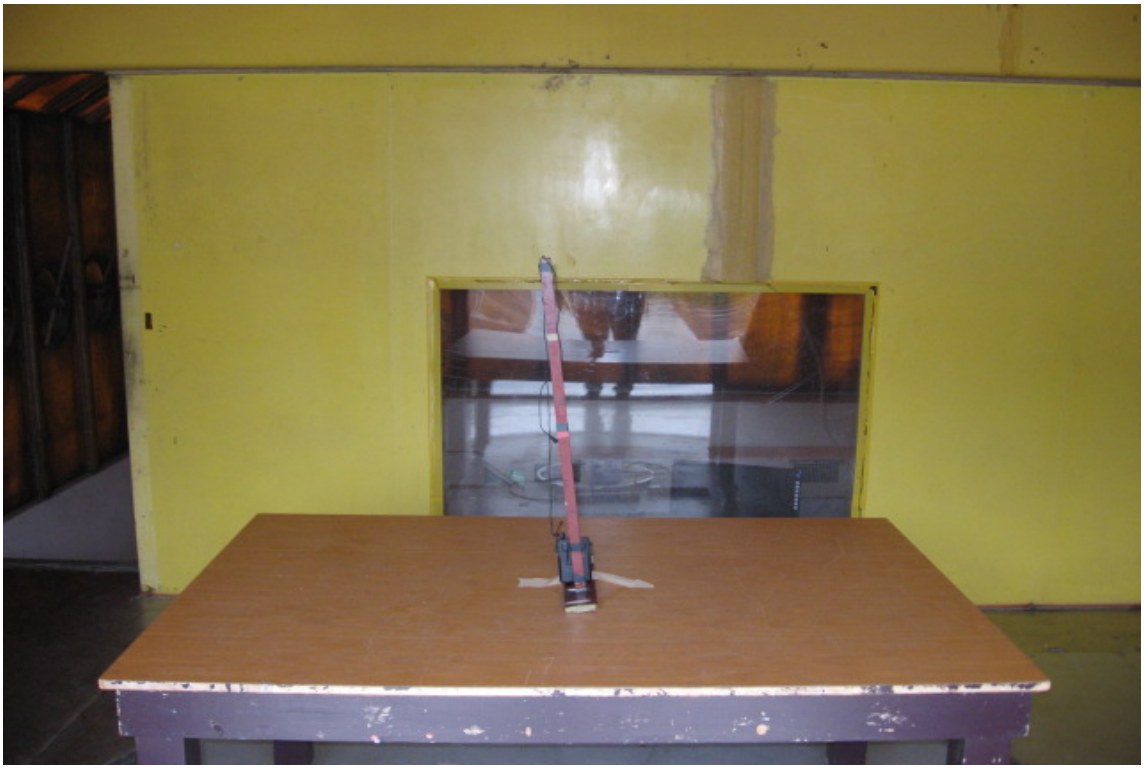
1. Remark "---" means that the emissions level is too low to be measured.
2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

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

Test Model:TG-64TA



Test Model: TG-64T

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.

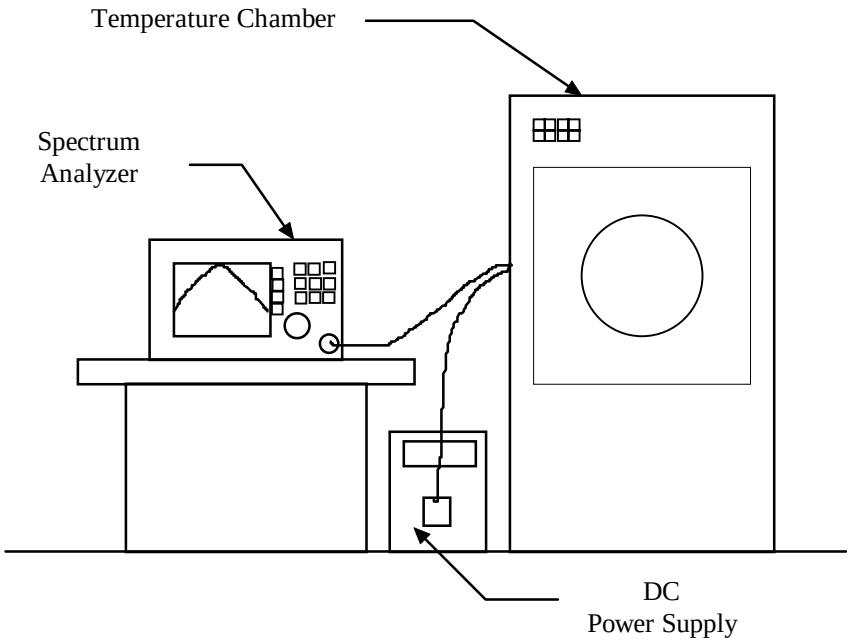
B) Frequency stability versus input voltage

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	2012/05/03	2013/05/03

7.4 Measurement Data

Test Date : Sep. 24, 2012 Temperature : 28 °C Humidity : 65 %

A. Tx Frequency 502MHz

A1. Frequency stability versus enviroment tempture

Reference Frequency :502 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	501.9951	-0.00098	501.9853	-0.00293	501.9917	-0.00165
40		502.0054	0.00108	502.0088	0.00176	501.9916	-0.00166
30		502.0145	0.00289	502.0048	0.00096	502.0098	0.00195
20		502.0023	0.00045	501.9876	-0.00247	502.0151	0.00301
10		502.0114	0.00227	501.9823	-0.00353	501.9849	-0.00302
0		502.0087	0.00173	502.0150	0.00298	502.0174	0.00346
-10		501.9974	-0.00053	501.9948	-0.00104	502.0193	0.00384
-20		501.9973	-0.00053	501.9845	-0.00308	502.0030	0.00061
-30		502.0151	0.00301	502.0178	0.00354	502.0166	0.00332

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

Reference Frequency : 502 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	502.0104	0.00207	501.9869	-0.00262	501.9943	-0.00114
25	1.72	502.0041	0.00082	501.9973	-0.00054	501.9984	-0.00031

Test Date : Sep. 24, 2012 Temperature : 28 °C Humidity : 65 %

B. Tx Frequency 607.875MHz

B1. Frequency stability versus enviroment tempture

Reference Frequency : 607.875MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	607.8705	-0.00074	607.8666	-0.00139	607.8835	0.00140
40		607.8886	0.00224	607.8736	-0.00022	607.8702	-0.00079
30		607.8823	0.00120	607.8718	-0.00052	607.8809	0.00097
20		607.8590	-0.00264	607.8753	0.00005	607.8518	-0.00381
10		607.8906	0.00256	607.8521	-0.00377	607.8758	0.00014
0		607.8810	0.00098	607.8625	-0.00206	607.8864	0.00188
-10		607.8740	-0.00017	607.8808	0.00095	607.8710	-0.00066
-20		607.8543	-0.00341	607.8581	-0.00277	607.8775	0.00042
-30		607.8884	0.00220	607.8596	-0.00254	607.8665	-0.00140

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

Reference Frequency : 607.875MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	607.8548	-0.00332	607.8608	-0.00234	607.8518	-0.00381
25	1.72	607.8558	-0.00315	607.8720	-0.00049	607.8861	0.00182

Test Date : Sep. 24, 2012 Temperature : 28 °C Humidity : 65 %

C. Tx Frequency 614.125MHz

C1. Frequency stability versus enviroment tempture

Reference Frequency : 614.125 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	614.1121	-0.00211	614.1253	0.00006	614.1258	0.00014
40		614.1158	-0.00150	614.1259	0.00015	614.1463	0.00348
30		614.1441	0.00311	614.1200	-0.00082	614.1017	-0.00380
20		614.1091	-0.00259	614.1113	-0.00223	614.1049	-0.00327
10		614.1402	0.00247	614.1191	-0.00096	614.1475	0.00367
0		614.1135	-0.00188	614.1307	0.00093	614.1280	0.00049
-10		614.1352	0.00166	614.1273	0.00037	614.1138	-0.00183
-20		614.1424	0.00283	614.1334	0.00137	614.1424	0.00284
-30		614.1150	-0.00162	614.1403	0.00249	614.1107	-0.00233

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

Reference Frequency : 614.125 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	614.1305	0.00089	614.1249	-0.00002	614.1090	-0.00261
25	1.72	614.1303	0.00086	614.1286	0.00058	614.1377	0.00208

Test Date : Sep. 24, 2012 Temperature : 28 °C Humidity : 65 %

D. Tx Frequency 697.875MHz

D1. Frequency stability versus enviroment tempture

Reference Frequency : 697.875 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5Vdc	697.8504	-0.00352	697.8713	-0.00054	697.8568	-0.00261
40		697.8539	-0.00302	697.8666	-0.00120	697.8743	-0.00011
30		697.8868	0.00170	697.8958	0.00297	697.9003	0.00363
20		697.8847	0.00139	697.8699	-0.00074	697.8986	0.00338
10		697.8514	-0.00337	697.8745	-0.00007	697.8840	0.00130
0		697.8755	0.00007	697.8661	-0.00128	697.8892	0.00204
-10		697.8912	0.00232	697.8646	-0.00149	697.8634	-0.00166
-20		697.8509	-0.00345	697.8684	-0.00095	697.8742	-0.00011
-30		697.8808	0.00083	697.8795	0.00065	697.8976	0.00324

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

Reference Frequency : 697.875 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.27	697.8687	-0.00091	697.8883	0.00191	697.8720	-0.00043
25	1.72	697.8554	-0.00281	697.8777	0.00039	697.8535	-0.00307

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.