

FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : Wireless Handheld Microphone
FCC ID : NTMEJ-701TS-A
Model No. : EJ-701TS-A
Working Frequency : 640~664MHz

for

APPLICANT : OKAYO ELECTRONICS CO., LTD.
ADDRESS : No.2, Gongye 10th Rd., Dali Dist., Taichung 41280, Taiwan

Test Performed by

ELECTRONICS TESTING CENTER (ETC) , TAIWAN
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Report Number : 12-12-RBF-018-05

TEST REPORT CERTIFICATION

Applicant : OKAYO ELECTRONICS CO., LTD.
No.2, Gongye 10th Rd., Dali Dist., Taichung 41280, Taiwan

Manufacturer : OKAYO ELECTRONICS CO., LTD.
No.2, Gongye 10th Rd., Dali Dist., Taichung 41280, Taiwan

Description of EUT :

a) Type of EUT : Wireless Handheld Microphone

b) Trade Name : OKAYO

c) Model No. : EJ-701TS-A

d) Serial Model No. : EJ-701TS; EJ-701TM

e) FCC ID : NTMEJ-701TS-A

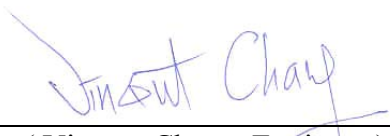
f) Working Frequency : 640~664MHz

g) Power Supply : 1.2V(Ni-MH) x 2 AA type rechargeable batteries /
1.5V x 2 AA Alkaline disposable

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 : Mar. 18, 2014

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 : Wireless Handheld Microphone
 b) Trade Name : OKAYO
 c) Model No. : EJ-701TS-A
 d) Serial Model No. : EJ-701TS; EJ-701TM
 e) FCC ID : NTMEJ-701TS-A
 f) Working Frequency : 640~664MHz
 g) Power Supply : 1.2V(Ni-MH) x 2 AA type rechargeable batteries /
 1.5V x 2 AA Alkaline disposable
 h) Emission Designator : 120KF3E
 $2M+2DK = 2 \times (4\text{kHz}) + 2 \times (56\text{kHz}) \times 1 = 120\text{kHz}$
 i) Model Difference : EJ-701TS-A, EJ-701TS and EJ-701TM are the same circuit and PCB design. The difference is as following:

	EJ-701TS-A	EJ-701TS	EJ-701TM
IR	Yes	No	No
Microphone	Dynamic	Dynamic	Condenser

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 is FCC 2.948 listed and accepted in a letter dated Jan. 29, 2014.

Registration Number: 90589

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	614.000-698.000
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

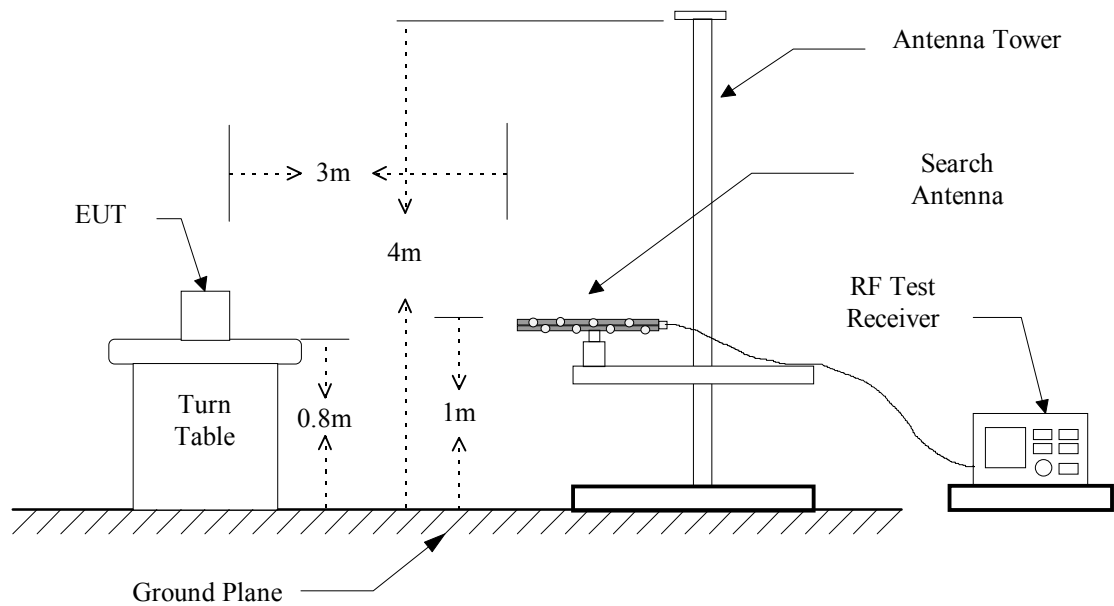
3.1 Provision Applicable

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

3.2 Measurement Procedure

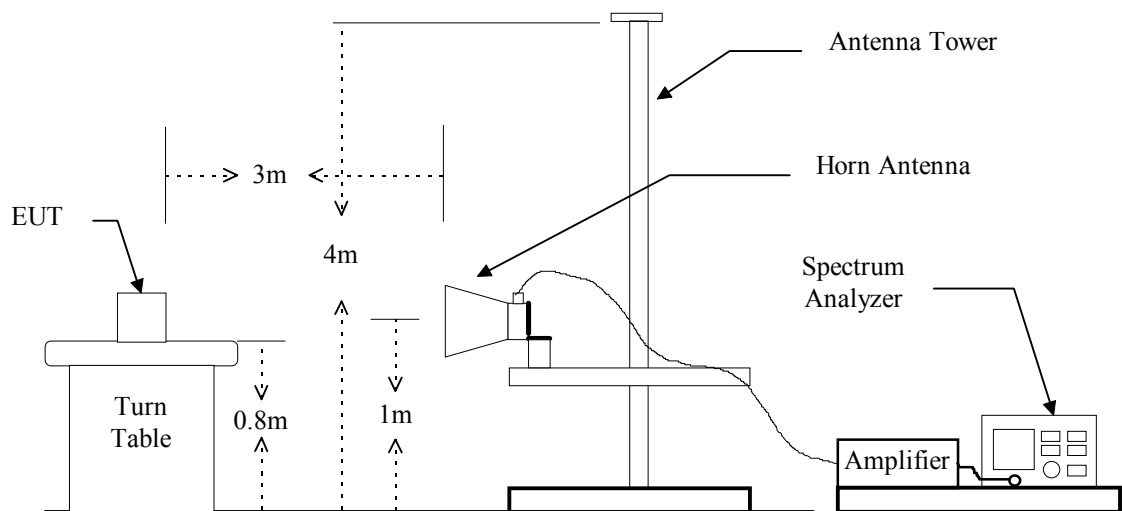
1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna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

Operated mode : TX
 Temperature : 25 °C

Test Date : Feb. 27, 2014
 Humidity : 65 %

Frequency (MHz)	Meter Reading (dBμV/m)		SG Reading (dBm)		Amp Gain (dB)	Antenna Gain(dB)	Cable Loss(dB)	Result (dBm)		Result (max)(mW)	Limit 10dBm(10mW)
	H	V	H	V				H	V		
640.100	76.90	81.60	3.60	40.50	---	---	2.40	1.20	8.10	6.457	10.00

Frequency (MHz)	Meter Reading (dBμV/m)		SG Reading (dBm)		Amp Gain (dB)	Antenna Gain(dB)	Cable Loss(dB)	Result (dBm)		Result (max)(mW)	Limit 10dBm(10mW)
	H	V	H	V				H	V		
652.100	77.20	81.90	4.20	10.50	---	---	2.40	1.80	8.10	6.457	10.00

Frequency (MHz)	Meter Reading (dBμV/m)		SG Reading (dBm)		Amp Gain (dB)	Antenna Gain(dB)	Cable Loss(dB)	Result (dBm)		Result (max)(mW)	Limit 10dBm(10mW)
	H	V	H	V				H	V		
663.900	77.30	82.00	4.70	11.40	---	---	2.30	2.40	9.10	8.128	10.00

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	2013/05/14	2014/05/13
Dipole Antenna	Schwarzbeck	897;898	2013/09/07	2014/09/07
Log-periodic Antenna	EMCO	3146	2013/10/16	2014/10/15
Amplifier	HP	8447D	2013/05/03	2014/05/02
Signal generator	HP	83732B	2013/09/05	2014/09/04

4. MODULATION CHARACTERISTICS

4.1 Provisions Applicable

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

4.2 Measurement Method

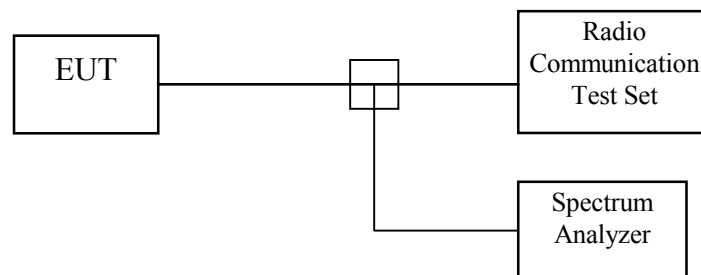
A) Modulation Limit

1. Position the EUT as shown in figure 3, adjust the audio input frequency to 100 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

B) Frequency response of all circuits

1. Position the EUT as shown in figure 3.
2. Vary the modulating frequency from 100 Hz to 15000 Hz with constant input voltage (derived from 5.4(a) of this test report), and observe the change in output.

Figure 3 : Modulation characteristic measurement configuration



4.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2013/05/13	2014/05/12
Spectrum Analyzer	Rohde & Schwarz	FSP40	2014/01/21	2015/01/20

4.4 Measurement Result

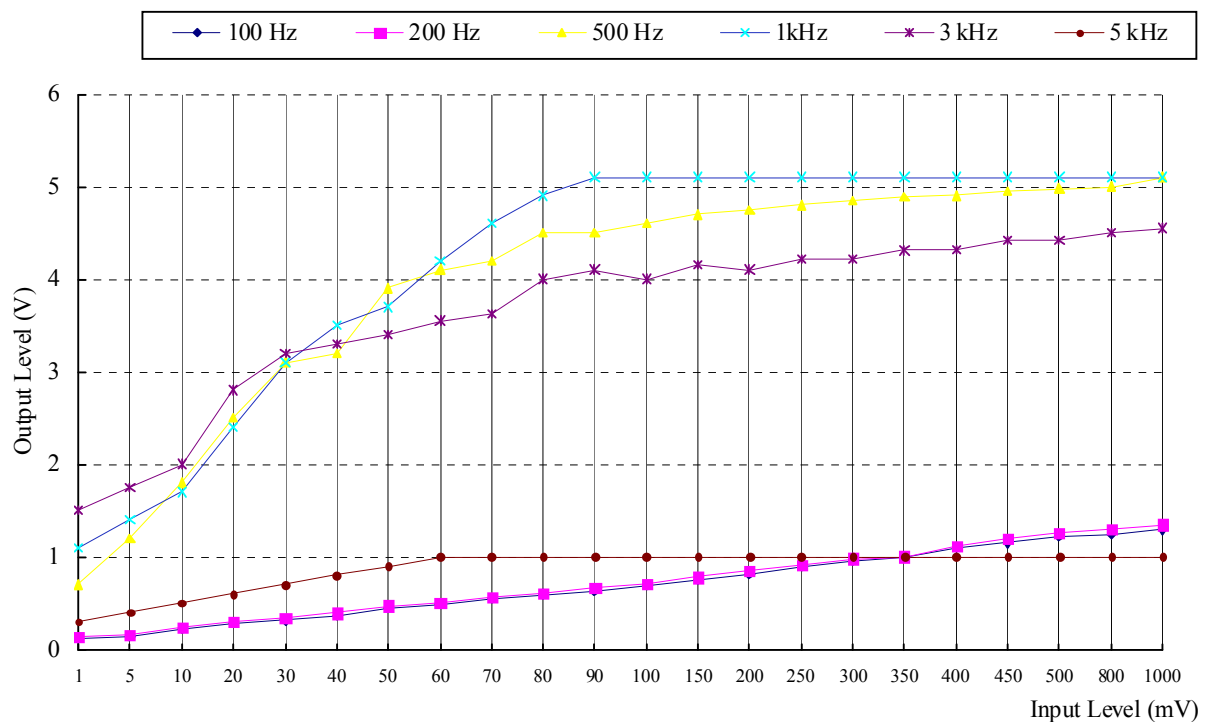
Test Mode: MIC IN
RF Frequency : 640~664MHz

Test Date : Feb. 27, 2014

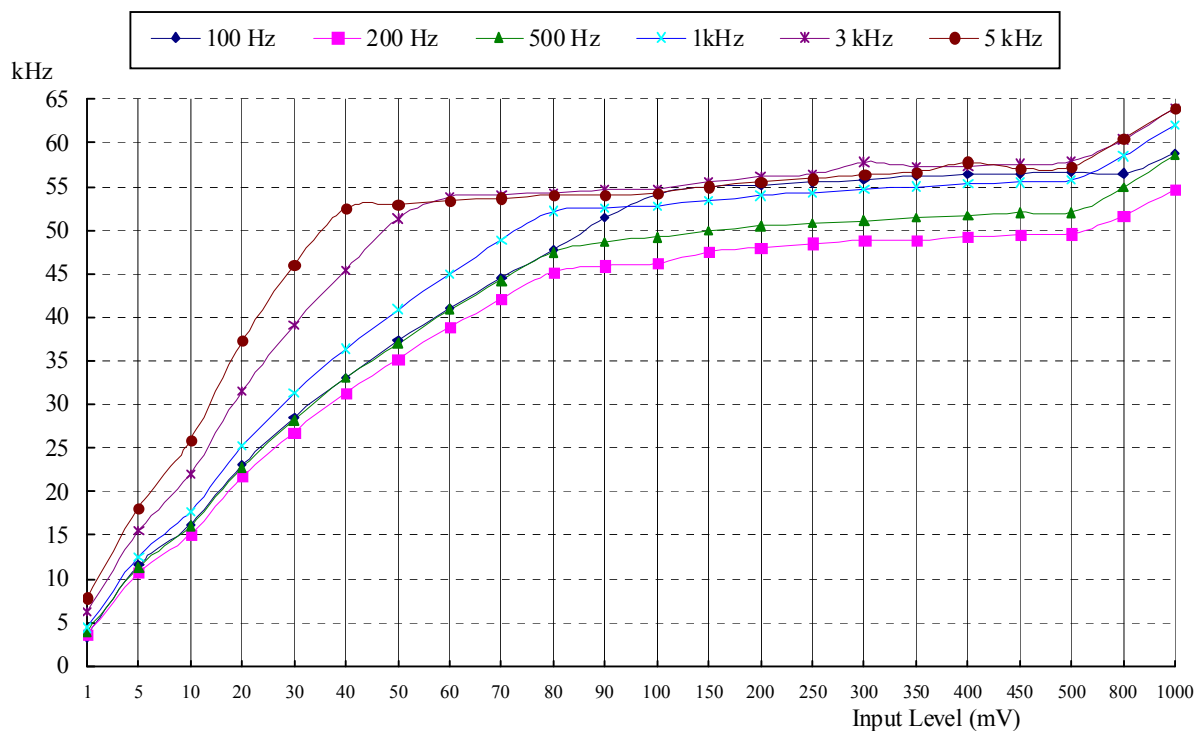
Temperature : 23 °C

Humidity : 60 %

A). Frequency response

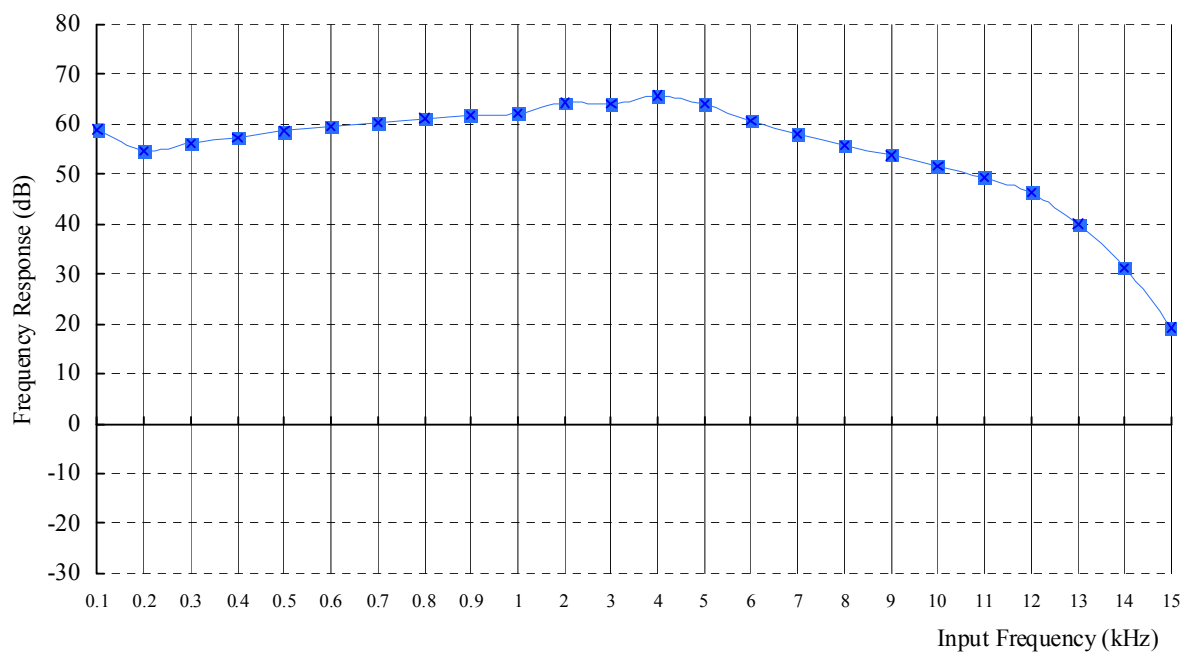


Test Mode: Mic
RF Frequency : 640~664MHz
B). Modulation Limit



Test Mode: Mic
RF Frequency : 640~664MHz

C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

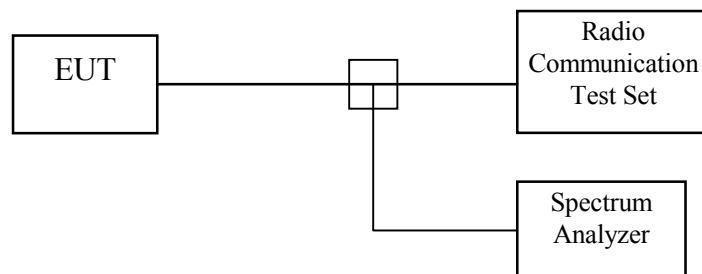
According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulated by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

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 ant set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Apply a 2.5 kHz modulation signal to EUT and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 2. This is the occupied bandwidth specified.

Figure 4 : Occupied bandwidth measurement configuration



5.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2013/05/13	2014/05/12
Spectrum Analyzer	Rohde & Schwarz	FSP40	2014/01/21	2015/01/20

5.4 Bandwidth Measured

5.4.1 Input Level Derived

Test Mode: Mic

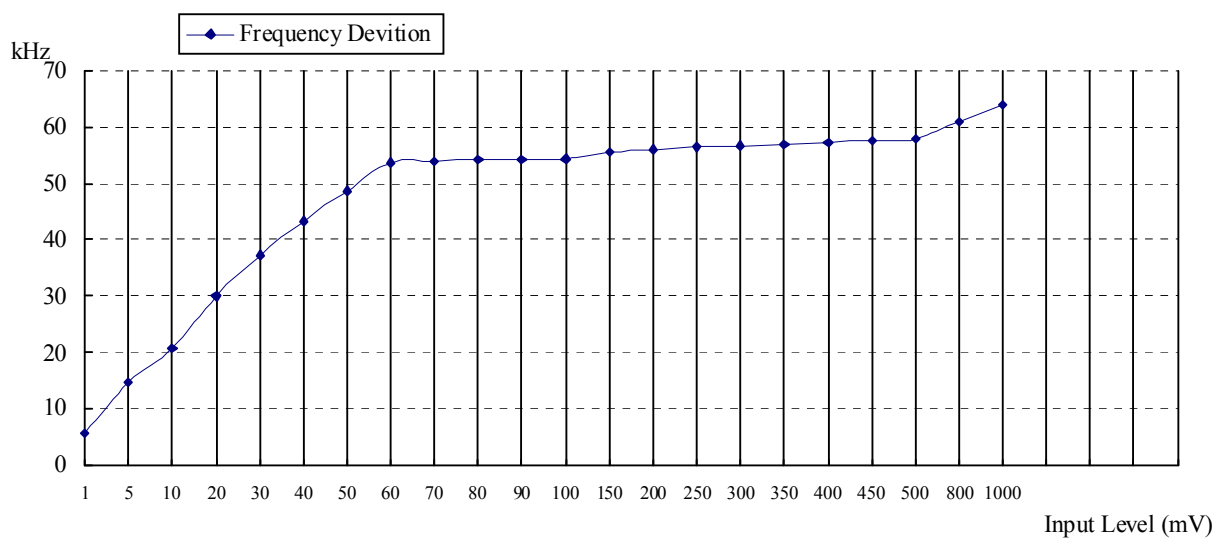
RF Frequency : 640~664MHz

Test Date : Feb. 26, 2014

Temperature : 24 °C

Humidity : 55 %

Input Audio Frequency : 2.5 kHz, Sine Wave



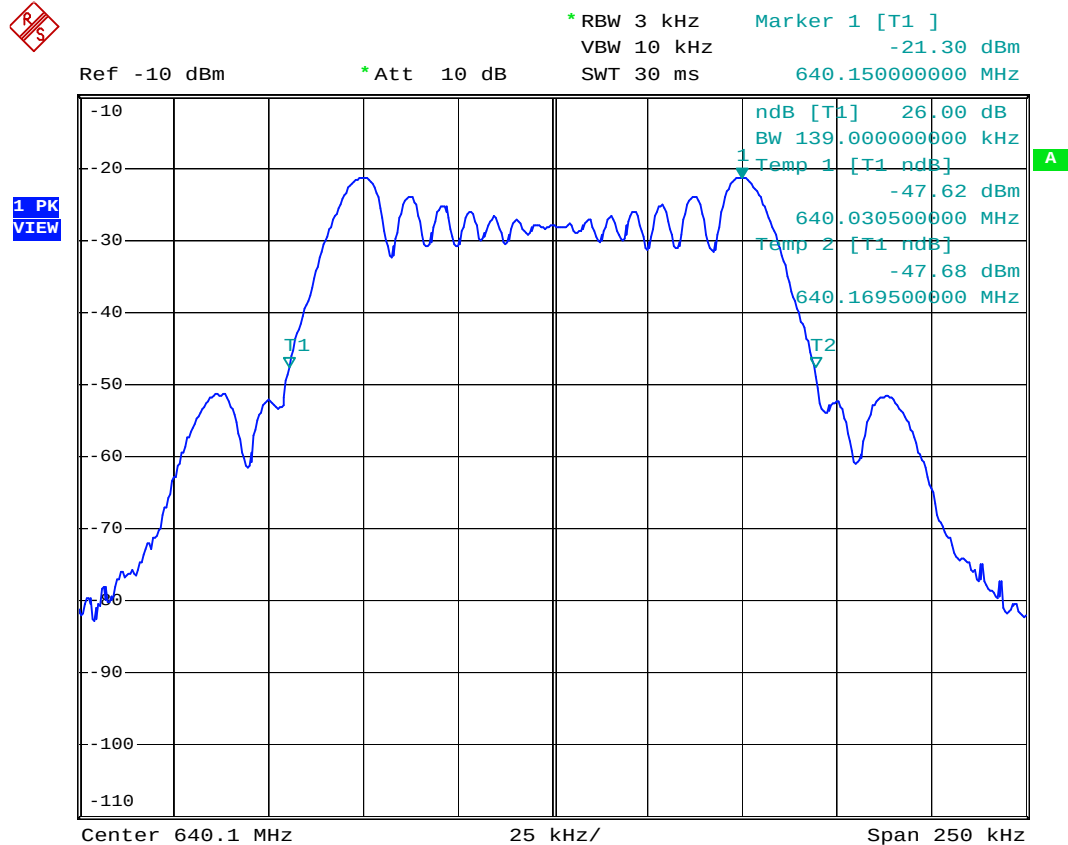
Mic

The Level input to produce 50% modulation is 26 mV, therefore the magnitude 16 dB greater than it is 164.05 mV.

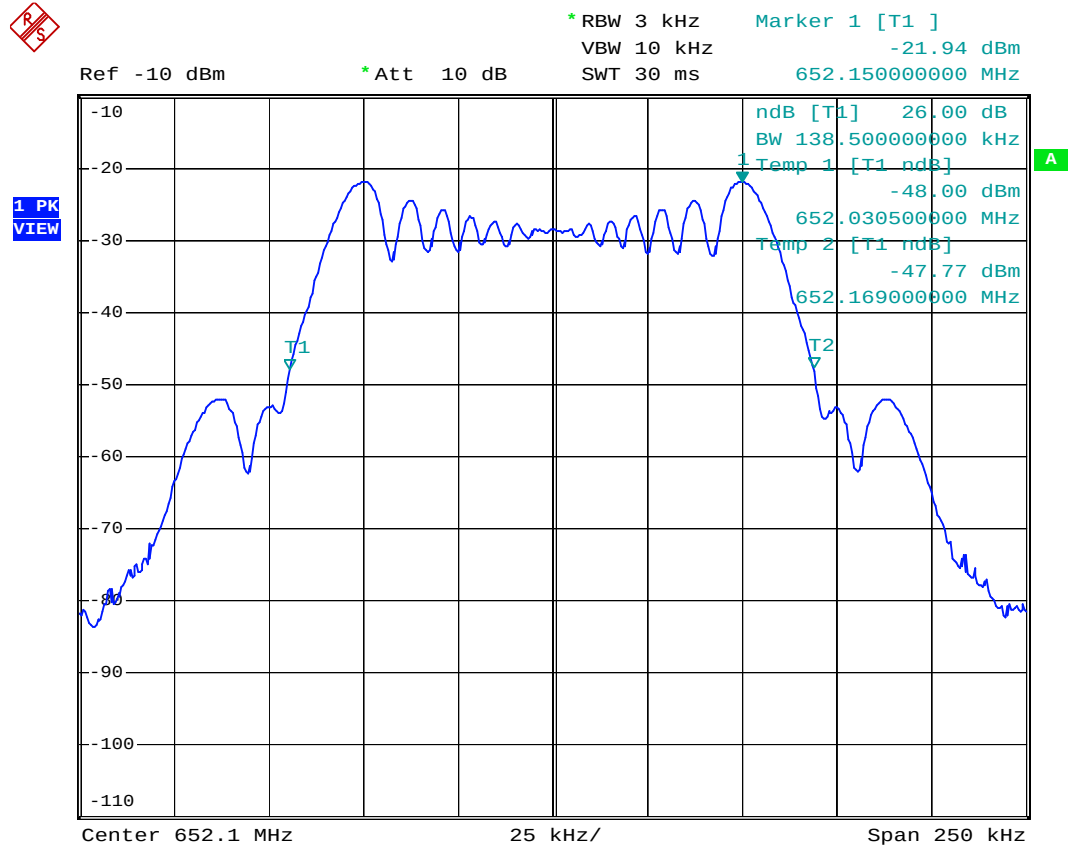
5.4.2 Occupied Bandwidth PlottedTest Date : Feb. 26, 2014Temperature : 24 °CHumidity : 55 %

RF Frequency (MHz)	26 dB Bandwidth (kHz)
640.1	139
652.1	138
663.9	138

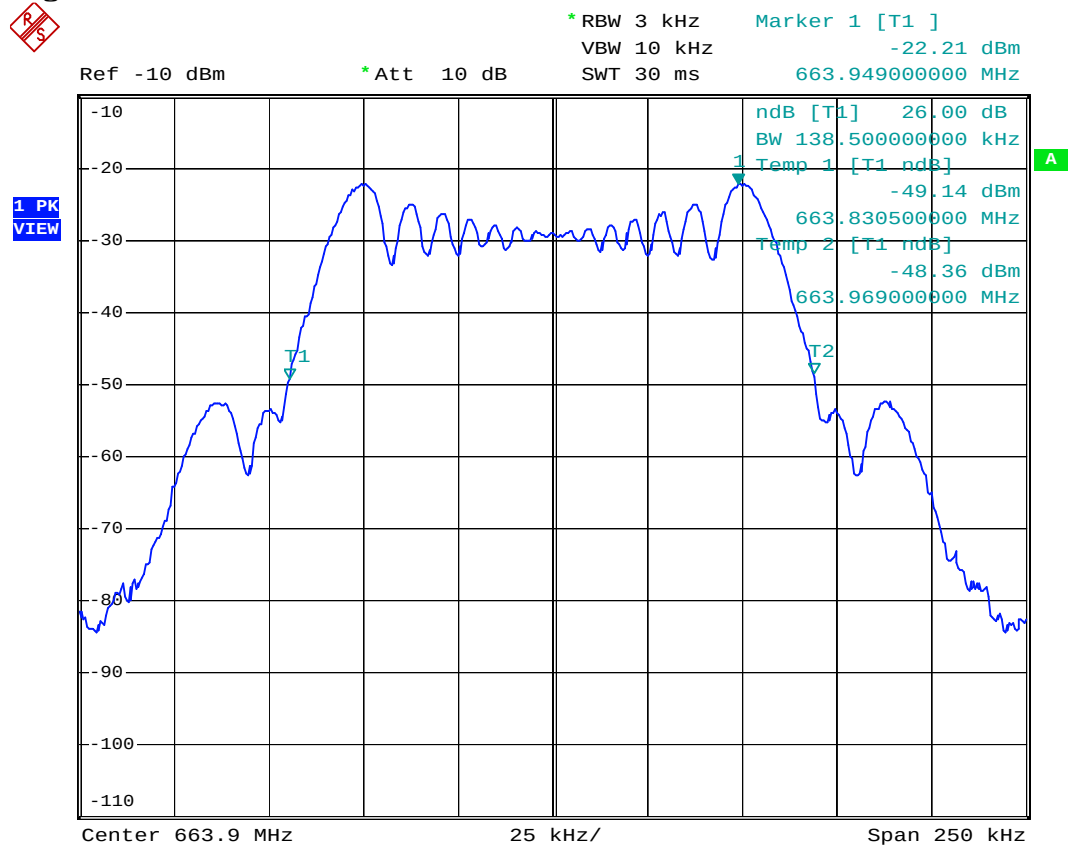
Low Channel



Middle Channel



High Channel



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	2014/01/21	2015/01/20
Double Ridged Antenna	EMCO	3115	2013/04/29	2014/04/28
Double Ridged Antenna	EMCO	3115	2013/04/29	2014/04/28
Log-periodic Antenna	EMCO	3146	2013/10/16	2014/10/15
Biconical Antenna	EMCO	3110	2013/10/16	2014/10/15
Dipole Antenna	Schwarzbeck	897;898	2013/09/07	2014/09/07
Amplifier	HP	8449B	2014/01/15	2015/01/14
Amplifier	HP	8447D	2013/05/03	2014/05/02
Signal generator	HP	83732B	2013/09/05	2014/09/04

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: 640.1MHz

Operated mode : TX
Temperature : 23°C

Test Date : Feb. 27, 2014
Humidity : 60%

Unmodulated carrier output power is 8.1 dBm , or 6.456 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$6.456 - [43 + 10 \log(\text{carrier output power in W})], \text{ or } -13 \text{ dBm}$$

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		
1280.200	---	---	---	---	---	6.9	2.4	---	---	-13.0	---
1920.300	---	---	---	---	---	7.5	2.9	---	---	-13.0	---
2560.400	---	---	---	---	---	9.3	3.4	---	---	-13.0	---
3200.500	---	---	---	---	---	9.1	3.8	---	---	-13.0	---
3840.600	---	---	---	---	---	9.1	4.2	---	---	-13.0	---
4480.700	---	---	---	---	---	10.1	4.6	---	---	-13.0	---
5120.800	---	---	---	---	---	9.7	4.9	---	---	-13.0	---
5760.900	---	---	---	---	---	10.4	5.2	---	---	-13.0	---
6401.000	---	---	---	---	---	10.9	5.5	---	---	-13.0	---

Note :

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

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

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

b. Tx Frequency: 652.1 MHz

Operated mode : TX
Temperature : 23°C

Test Date : Feb. 27, 2014
Humidity : 60%

Unmodulated carrier output power is 8.1 dBm , or 6.456 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$6.456 - [43 + 10 \log(\text{carrier output power in W})], \text{ or } -13 \text{ dBm}$$

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		
1304.200	---	---	---	---	---	7.0	2.4	---	---	-13.0	---
1956.300	---	---	---	---	---	7.5	3.0	---	---	-13.0	---
2608.400	---	---	---	---	---	9.2	3.4	---	---	-13.0	---
3260.500	---	---	---	---	---	9.2	3.9	---	---	-13.0	---
3912.600	---	---	---	---	---	9.0	4.3	---	---	-13.0	---
4564.700	---	---	---	---	---	10.0	4.6	---	---	-13.0	---
5216.800	---	---	---	---	---	9.8	5.0	---	---	-13.0	---
5868.900	---	---	---	---	---	10.6	5.2	---	---	-13.0	---
6521.000	---	---	---	---	---	10.9	5.5	---	---	-13.0	---

Note :

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

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

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

c. Tx Frequency: 663.9 MHz

Operated mode : TX
 Temperature : 23°C

Test Date : Feb. 27, 2014
 Humidity : 60%

Unmodulated carrier output power is 9.1 dBm , or 8.128 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$8.128 - [43 + 10 \log(\text{carrier output power in W})], \text{ or } -13 \text{ dBm}$$

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		
1327.800	---	---	---	---	---	7.0	2.4	---	---	-13.0	---
1991.700	---	---	---	---	---	7.5	3.0	---	---	-13.0	---
2655.600	---	---	---	---	---	9.2	3.5	---	---	-13.0	---
3319.500	---	---	---	---	---	9.2	3.9	---	---	-13.0	---
3983.400	---	---	---	---	---	8.9	4.3	---	---	-13.0	---
4647.300	---	---	---	---	---	10.0	4.7	---	---	-13.0	---
5311.200	---	---	---	---	---	9.8	5.0	---	---	-13.0	---
5975.100	---	---	---	---	---	10.8	5.3	---	---	-13.0	---
6639.000	---	---	---	---	---	10.8	5.6	---	---	-13.0	---

Note :

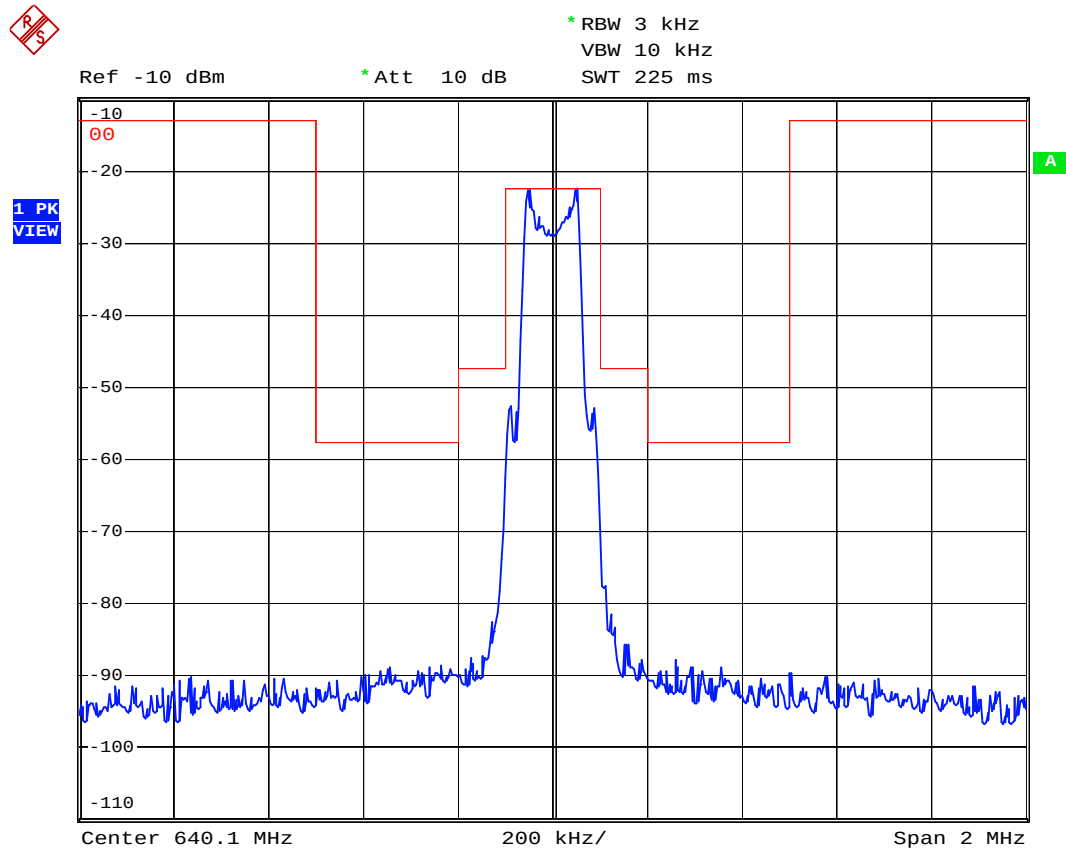
1. Remark “---“ means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

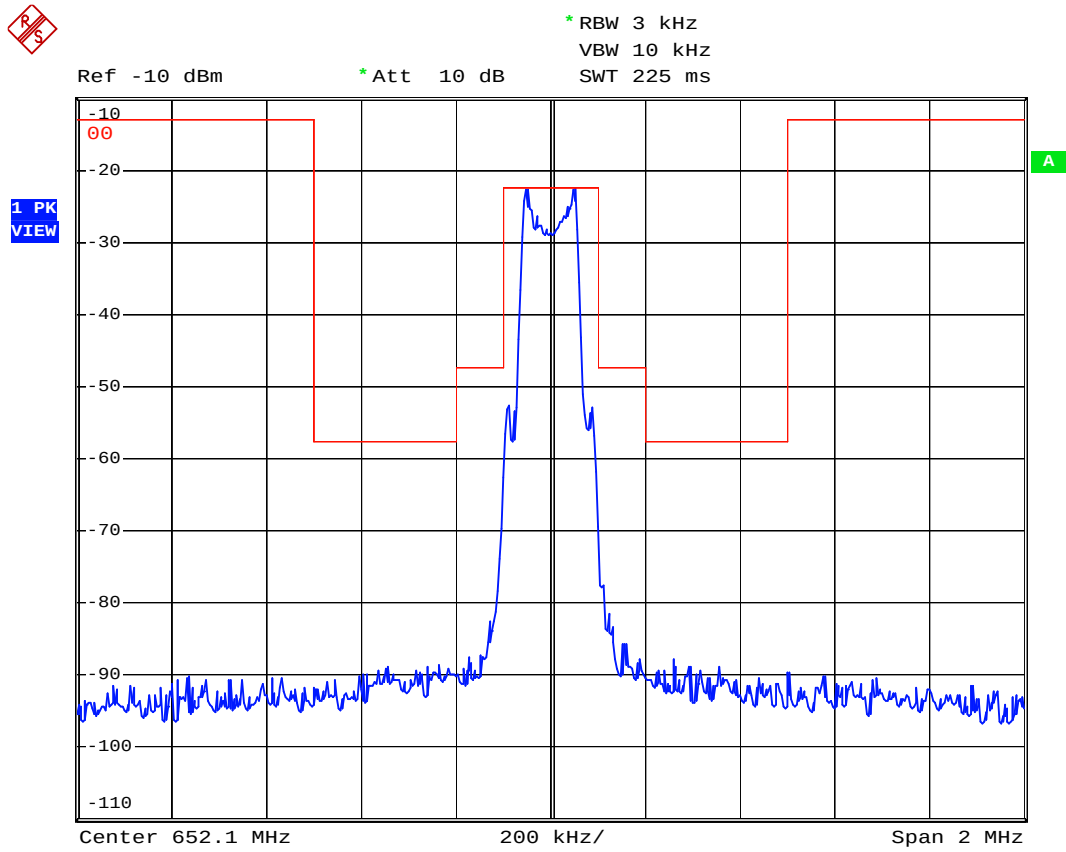
$$\text{Result} = \text{SG Reading} + \text{Cable Loss} + \text{Antenna Gain} + \text{Antenna Gain Corrected}$$

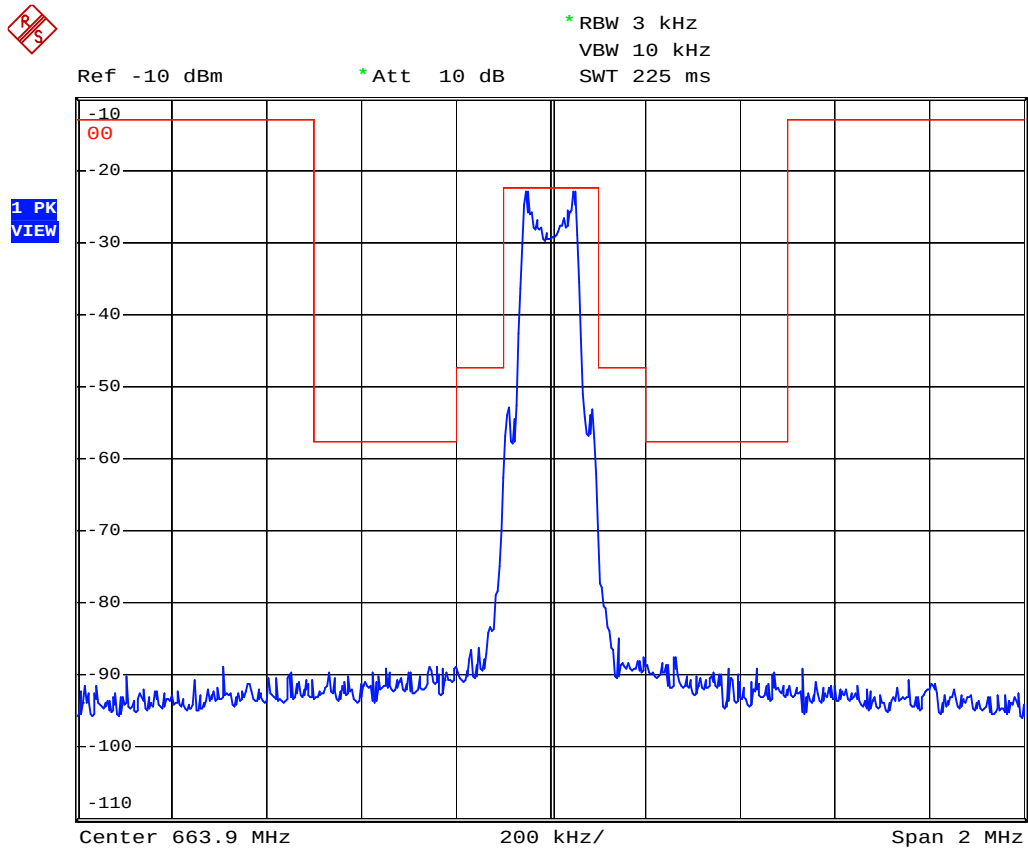
Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

6.4.2 Emission mask plots

Test Mode: Mic In







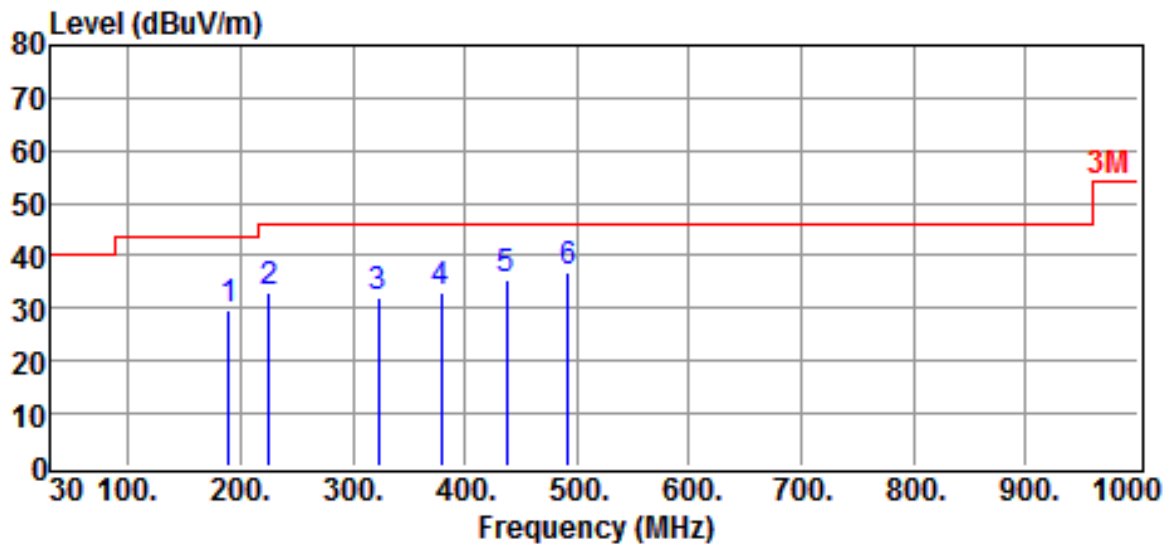
6.5 Other Emission

a) Emission frequencies below 1 GHz

Test Date : Feb. 26, 2014

Temperature : 25 °C

Humidity : 65 %

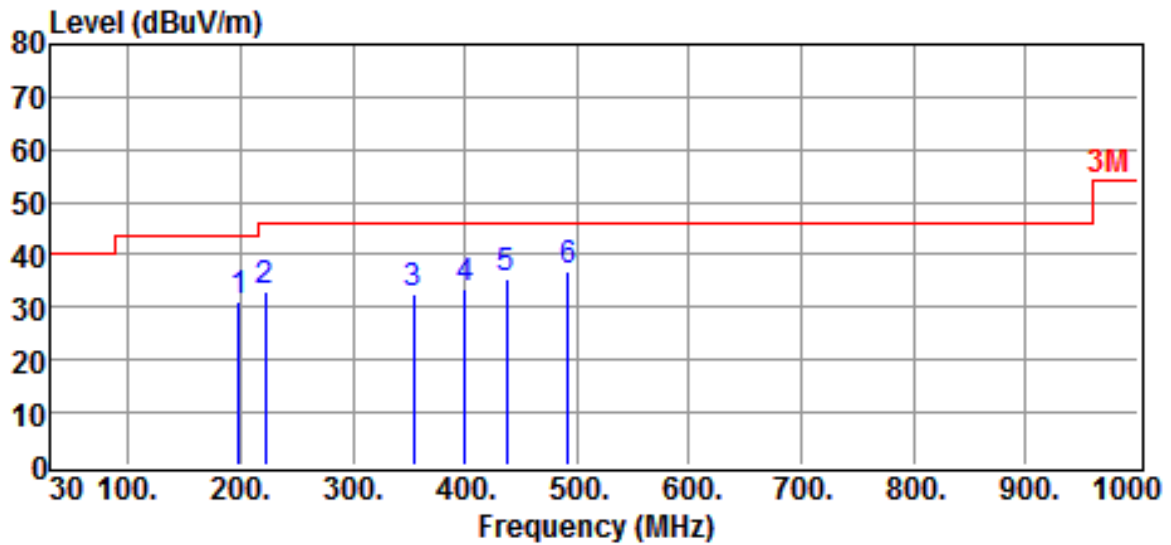


Site	:OPEN SITE	Date	:2014-02-26
Limit	:3M	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Handheld Microphone	Temp.	:25°C
Power Rating	:DC 3V	Humi.	:65%
Model	:EJ-701TS-A	Engineer.	:VC
Test Mode	:TX MODE		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
189.0800	13.5	16.1	29.6	43.5	-13.9	QP
225.9400	14.2	18.8	33.0	46.0	-13.0	QP
322.9400	14.2	17.8	32.0	46.0	-14.0	QP
379.2000	14.5	18.5	33.0	46.0	-13.0	QP
437.4000	15.4	20.1	35.5	46.0	-10.5	QP
491.7200	15.4	21.4	36.8	46.0	-9.2	QP

Note :

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



Site	:OPEN SITE	Date	:2014-02-26
Limit	:3M	Ant. Pol.	:VERTICAL
EUT	:Wireless Handheld Microphone	Temp.	:25°C
Power Rating	:DC 3V	Humi.	:65%
Model	:EJ-701TS-A	Engineer.	:VC
Test Mode	:TX MODE		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
198.7800	14.2	16.9	31.1	43.5	-12.4	QP
222.0600	14.5	18.6	33.1	46.0	-12.9	QP
353.9800	14.9	17.9	32.8	46.0	-13.2	QP
400.5400	14.4	19.1	33.5	46.0	-12.5	QP
437.4000	15.4	20.1	35.5	46.0	-10.5	QP
491.7200	15.4	21.4	36.8	46.0	-9.2	QP

Note :

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

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

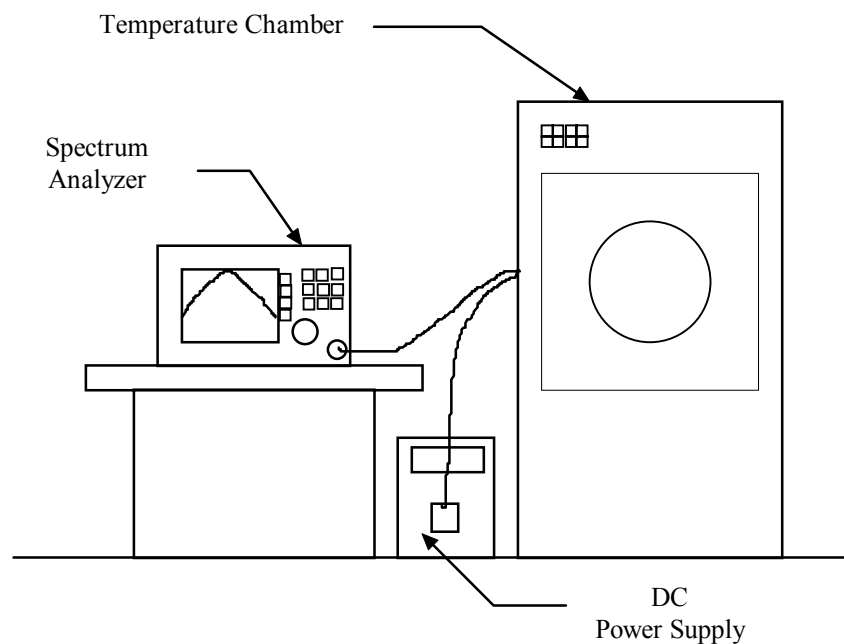
1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C shall be used.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW 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	2014/01/21	2015/01/20
Temperature Chamber	MALLIER	MCT-2X-M	2013/05/02	2014/05/01

7.4 Measurement DataTest Date : Feb. 27, 2014Temperature : 23 °CHumidity : 60 %**A. Tx Frequency 640.100MHz****A1. Frequency stability versus enviroment tempture**

Reference Frequency :640.100 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0	640.0765	-0.00367	640.0802	-0.00309	640.0828	-0.00268
40		640.0797	-0.00316	640.0827	-0.00270	640.0826	-0.00271
30		640.0818	-0.00284	640.0774	-0.00352	640.0963	-0.00059
20		640.1000	0.00000	640.0823	-0.00276	640.0881	-0.00185
10		640.1119	0.00186	640.1096	0.00149	640.1076	0.00118
0		640.1159	0.00248	640.1018	0.00029	640.1197	0.00307
-10		640.1161	0.00251	640.1222	0.00346	640.1138	0.00215
-20		640.1137	0.00214	640.1191	0.00298	640.1219	0.00342
-30		640.1219	0.00342	640.1208	0.00325	640.1126	0.00197

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

Reference Frequency :640.100 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.6	640.0923	-0.00121	640.0933	-0.00105	640.0870	-0.00204
25	3.0	640.0904	-0.00150	640.0925	-0.00117	640.0871	-0.00202
25	3.4	640.0995	-0.00007	640.0997	-0.00005	640.0971	-0.00046

Test Date : Feb. 27, 2014Temperature : 23 °CHumidity : 60 %**B. Tx Frequency 652.100MHz****B1. Frequency stability versus enviroment tempture**

Reference Frequency :652.100 MHz		Limit : 0.005%					
Enviroment Tempature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0	652.0832	-0.00258	652.0808	-0.00295	652.0797	-0.00311
40		652.0871	-0.00198	652.0917	-0.00127	652.0817	-0.00281
30		652.0936	-0.00098	652.0936	-0.00098	652.1102	0.00156
20		652.1046	0.00071	652.1037	0.00056	652.1044	0.00067
10		652.1074	0.00113	652.1144	0.00221	652.1140	0.00215
0		652.1180	0.00275	652.1128	0.00196	652.1175	0.00268
-10		652.1185	0.00283	652.1027	0.00041	652.1077	0.00118
-20		652.1169	0.00259	652.1178	0.00273	652.1057	0.00087
-30		652.1246	0.00378	652.1208	0.00320	652.1161	0.00247

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

Reference Frequency :652.100 MHz		Limit : 0.005%					
Enviroment Tempature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.6	652.0923	-0.00118	652.0895	-0.00161	652.0778	-0.00341
25	3.0	652.0985	-0.00023	652.0915	-0.00131	652.0974	-0.00040
25	3.4	652.0924	-0.00117	652.0887	-0.00174	652.0921	-0.00122

Test Date : Feb. 27, 2014Temperature : 23 °CHumidity : 60 %**C. Tx Frequency 663.900MHz****C1. Frequency stability versus enviroment tempture**

Reference Frequency : 663.900 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0	663.8757	-0.00366	663.8797	-0.00306	663.8788	-0.00319
40		663.8790	-0.00316	663.8851	-0.00224	663.8793	-0.00312
30		663.8834	-0.00250	663.8889	-0.00167	663.8910	-0.00136
20		663.8963	-0.00056	663.8987	-0.00019	663.8934	-0.00099
10		663.8935	-0.00098	663.8930	-0.00106	663.8950	-0.00075
0		663.9016	0.00025	663.9064	0.00097	663.9078	0.00117
-10		663.9042	0.00063	663.9068	0.00103	663.9129	0.00195
-20		663.9189	0.00285	663.9149	0.00224	663.9181	0.00272
-30		663.9217	0.00327	663.9211	0.00318	663.9219	0.00330

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

Reference Frequency : 663.900 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	2.6	663.8874	-0.00190	663.8898	-0.00153	663.8932	-0.00103
25	3.0	663.8921	-0.00119	663.8873	-0.00191	663.8833	-0.00251
25	3.4	663.8993	-0.00010	663.8887	-0.00171	663.8886	-0.00172

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.