

FCC Part 74 Subpart H
EMI TEST REPORT
of

E.U.T. : Plug-in UHF Wireless Audio
Link Transmitter Module
FCC ID. : NTMTX-701
MODEL : TX-701
Working Frequency : 740-806MHz

for

APPLICANT : E-J ELECTRONICS CO., LTD.
ADDRESS : 4F, No. 11, Lane 125, Sec. 1, Kuo Kwang Road,
Ta Li City, Taichung Hsien, Taiwan, R.O.C.
Test Performed by

ELECTRONICS TESTING CENTER (ETC) , TAIWAN
NO. 34, LIN 5, DINGFU TSUEN, LINKOU SHIANG
TAIPEI COUNTY, TAIWAN, 24442, R.O.C.

TEL : (02)26023052 FAX : (02)26010910
[http:// www.etc.org.tw](http://www.etc.org.tw) ; e-mail:r00@etc.org.tw

Report Number : 06-11-RBF-137-04

TEST REPORT CERTIFICATION

Applicant : E-J ELECTRONICS CO., LTD.
4F, No. 11, Lane 125, Sec. 1, Kuo Kwang Road, Ta Li City,
Taichung Hsien, Taiwan, R.O.C.

Manufacturer : E-J ELECTRONICS CO., LTD.
4F, No. 11, Lane 125, Sec. 1, Kuo Kwang Road, Ta Li City,
Taichung Hsien, Taiwan, R.O.C.

Description of EUT :

- a) Type of EUT : Plug-in UHF Wireless Audio Link
Transmitter Module
- b) Trade Name : OKAYO
- c) Model No. : TX-701
- d) FCC ID : NTMTX-701
- e) Working Frequency : 740-806MHz
- f) Power Supply : DC 12V

Regulation Applied: FCC Rules and Regulations Part 74 Subpart H (2005)

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 : Feb. 16, 2007

Test Engineer : Vincent Chang
(Vincent Chang)

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

Table of Contents

Page

1. GENERAL INFORMATION	1
1.1 PRODUCT DESCRIPTION	1
1.2 TEST METHODOLOGY	1
1.3 TEST FACILITY	1
2. REQUIREMENTS OF PROVISIONS	2
2.1 DEFINITION	2
2.2 FREQUENCIES AVAILABLE	2
2.3 REQUIREMENTS FOR RADIO EQUIPMENT ON CERTIFICATION	2
2.4 LABELING REQUIREMENT	3
3. OUTPUT POWER MEASUREMENT	4
3.1 PROVISION APPLICABLE	4
3.2 MEASUREMENT PROCEDURE	4
3.3 TEST DATA	6
3.4 RESULT CALCULATION	8
3.5 TEST EQUIPMENT	8
4. MODULATION CHARACTERISTICS	9
4.1 PROVISIONS APPLICABLE	9
4.2 MEASUREMENT METHOD	9
4.3 MEASUREMENT INSTRUMENT	10
4.4 MEASUREMENT RESULT	10
5. OCCUPIED BANDWIDTH OF EMISSION	14
5.1 PROVISIONS APPLICABLE	14
5.2 MEASUREMENT METHOD	14
5.3 OCCUPIED BANDWIDTH TEST EQUIPMENT	14
5.4 BANDWIDTH MEASURED	15
5.4.1 Input Level Derived	15
5.4.2 Occupied Bandwidth Plotted	16
6. FIELD STRENGTH OF EMISSION	17
6.1 PROVISIONS APPLICABLE	17
6.2 MEASUREMENT PROCEDURE	17
6.3 MEASURING INSTRUMENT	18
6.4 MEASURING DATA	19
6.5 OTHER EMISSION	25
6.6 RADIATED MEASUREMENT PHOTOS	26
7. FREQUENCY STABILITY MEASUREMENT	27
7.1 PROVISIONS APPLICABLE	27
7.2 MEASUREMENT PROCEDURE	27
7.3 MEASUREMENT INSTRUMENT	28
7.4 MEASUREMENT DATA	29
8 CONDUCTED EMISSION MEASUREMENT	31
8.1 STANDARD APPLICABLE	31
APPENDIX 1 : OCCUPIED EMISSION BANDWIDTH PLOTTED DATA	1
APPENDIX 2 : EMISSION MASK PLOTTED DATA	8

1. GENERAL INFORMATION

1.1 Product Description

- a) Type of EUT : Plug-in UHF Wireless Audio Link Transmitter Module
- b) Trade Name : OKAYO
- c) Model No. : TX-701
- d) FCC ID : NTMTX-701
- e) Working Frequency : 740-806MHz
- f) Power Supply : DC 12V

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4 (2003). 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 TSUEN, LINKOU SHIANG TAIPEI COUNTY, TAIWAN, 24442, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Oct. 20, 2005.

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	614.000-806.000
174.000-216.000	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 2 : Frequencies measured below 1 GHz configuration

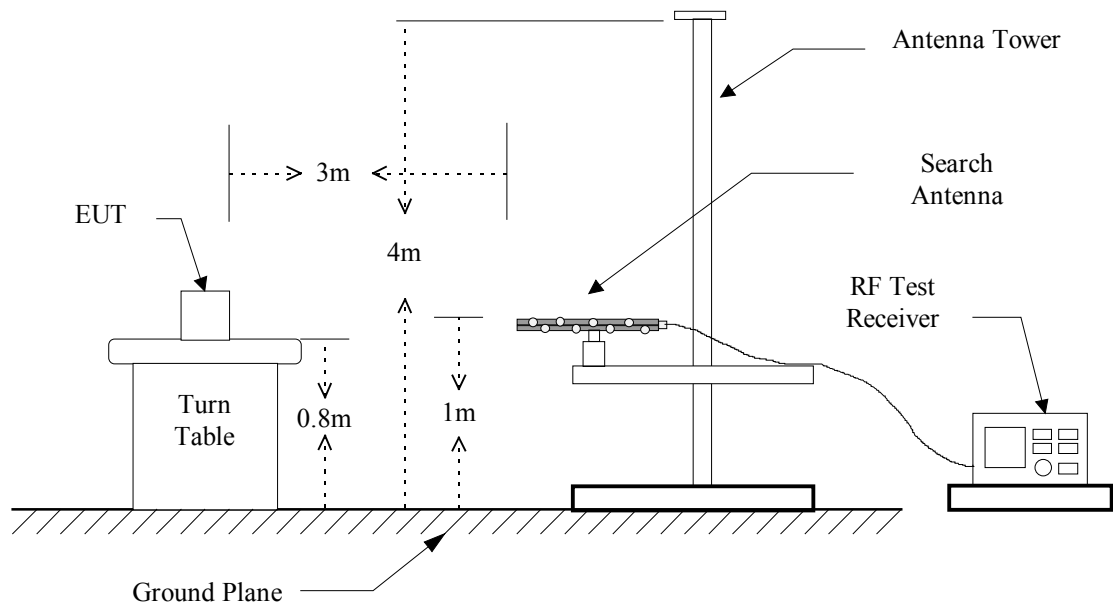
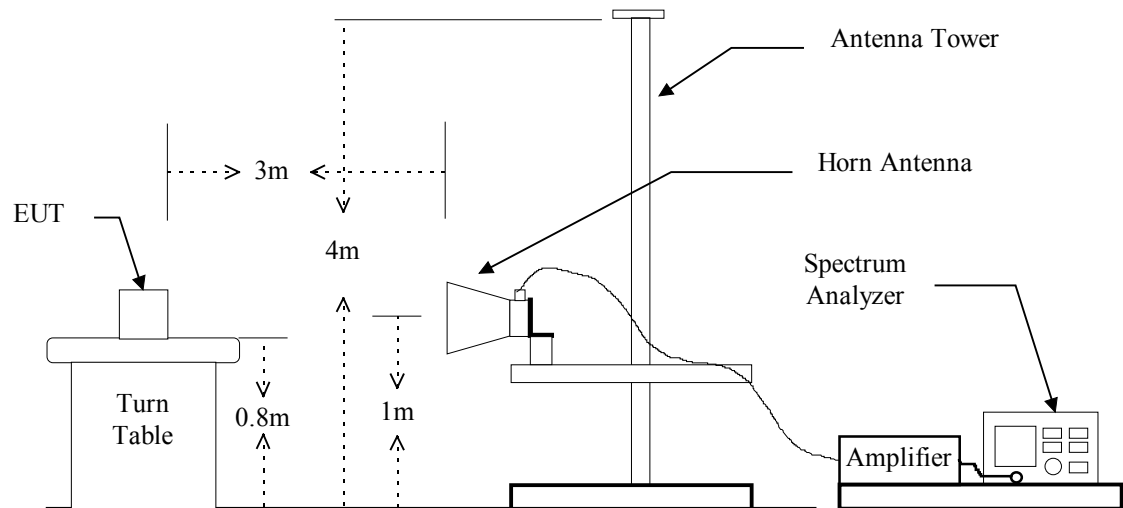


Figure 1 : Frequencies measured above 1 GHz configuration



3.3 Test Data

Tx Frequency Rang : 740-752MHz

A. Channel Low (ERP)

Operated mode : TX
Temperature : 20 °C

Test Date : Dec. 25, 2006
Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
740.400	80.7	10.8	-2.5	----	8.3	6.76	250

B. Channel Mid (ERP)

Operated mode : TX
Temperature : 20 °C

Test Date : Dec. 25, 2006
Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
746.100	79.3	9.4	-2.5	----	6.9	4.90	250

C. Channel High (ERP)

Operated mode : TX
Temperature : 20 °C

Test Date : Dec. 25, 2006
Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
751.500	78.1	8.2	-2.5	----	5.7	3.72	250

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

Tx Frequency Rang : 794-806MHz**A. Channel Low (ERP)**

Operated mode : TX
 Temperature : 20 °C

Test Date : Dec. 25, 2006
 Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
794.400	79.2	11.6	-2.6	----	9.0	7.94	250

B. Channel Mid (ERP)

Operated mode : TX
 Temperature : 20 °C

Test Date : Dec. 25, 2006
 Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
800.100	78.9	11.3	-2.6	----	8.7	7.41	250

C. Channel High (ERP)

Operated mode : TX
 Temperature : 20 °C

Test Date : Dec. 25, 2006
 Humidity : 65 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
805.500	78.0	10.2	-2.6	----	7.6	5.75	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.	Next Cal. Date
EMI Test Receiver	R & S	ESCI	12/24/2007
Plotter	HP	7440A	N/A
Dipole Antenna	EMCO	3121C	06/06/2007
Signal generator	HP	8656B	11/20/2007

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) Frequency response of audio circuits

1. Position the EUT as shown in figure 3.
2. Vary the modulating frequency from 100 Hz to 5000 Hz with varying the input voltage from 0V to maximum permitted input voltage, and observe the change in output.

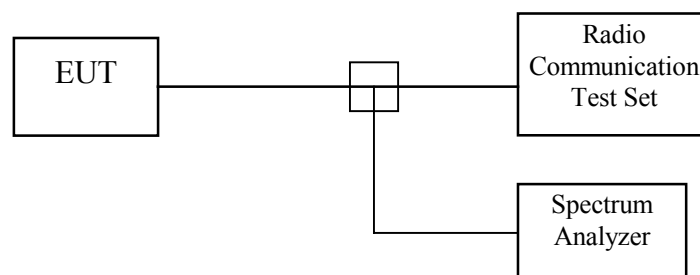
B) Modulation Limit

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.

C) 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



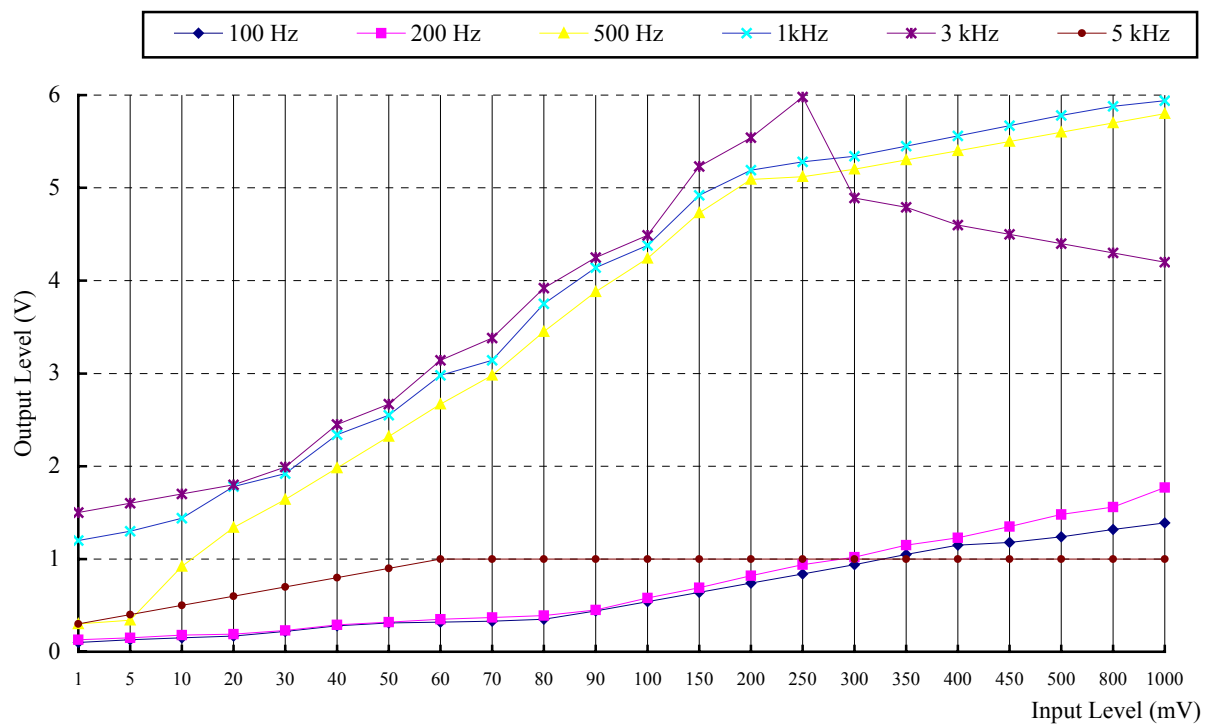
4.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Radio Communication Test Set	Marconi	2955B	06/26/2007
Spectrum Analyzer	Rohde & Schwarz	FSP40	08/07/2007

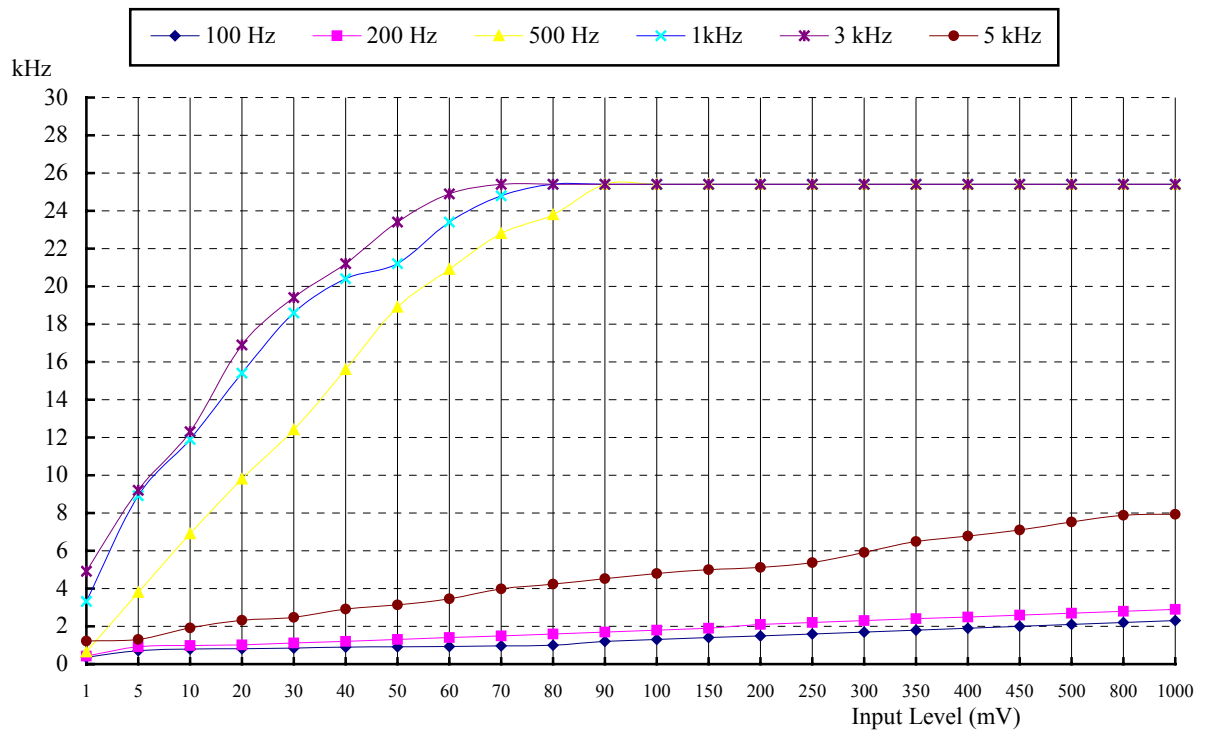
4.4 Measurement Result

Tx Frequency Rang : 740-752MHz Band

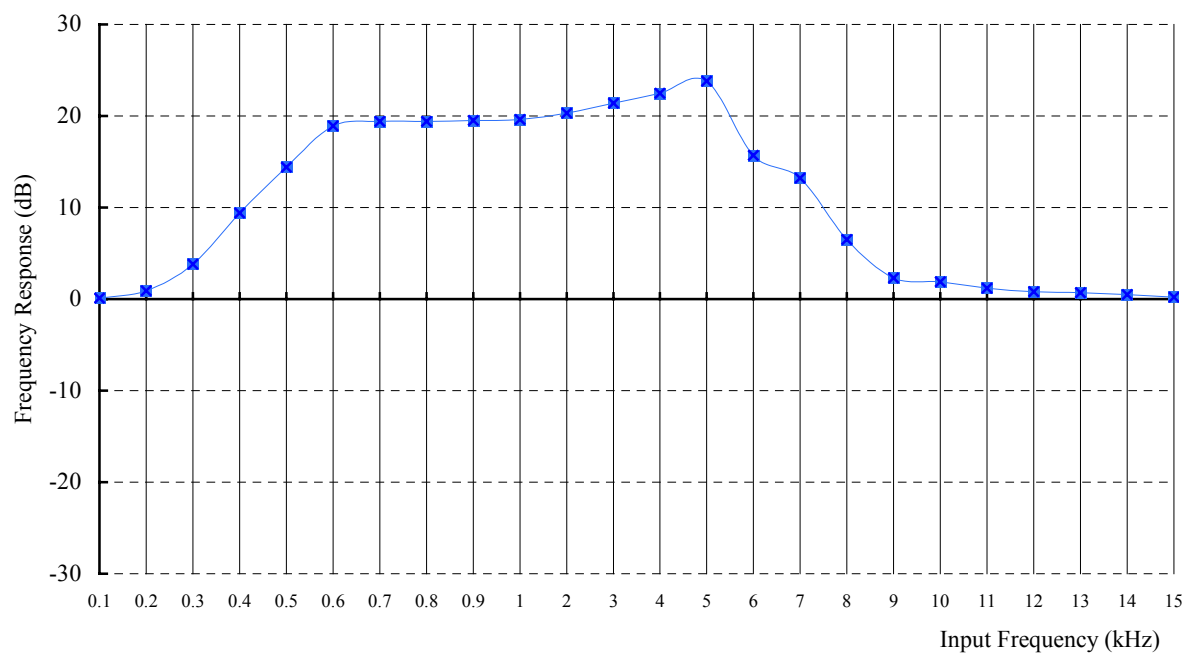
A). Frequency response

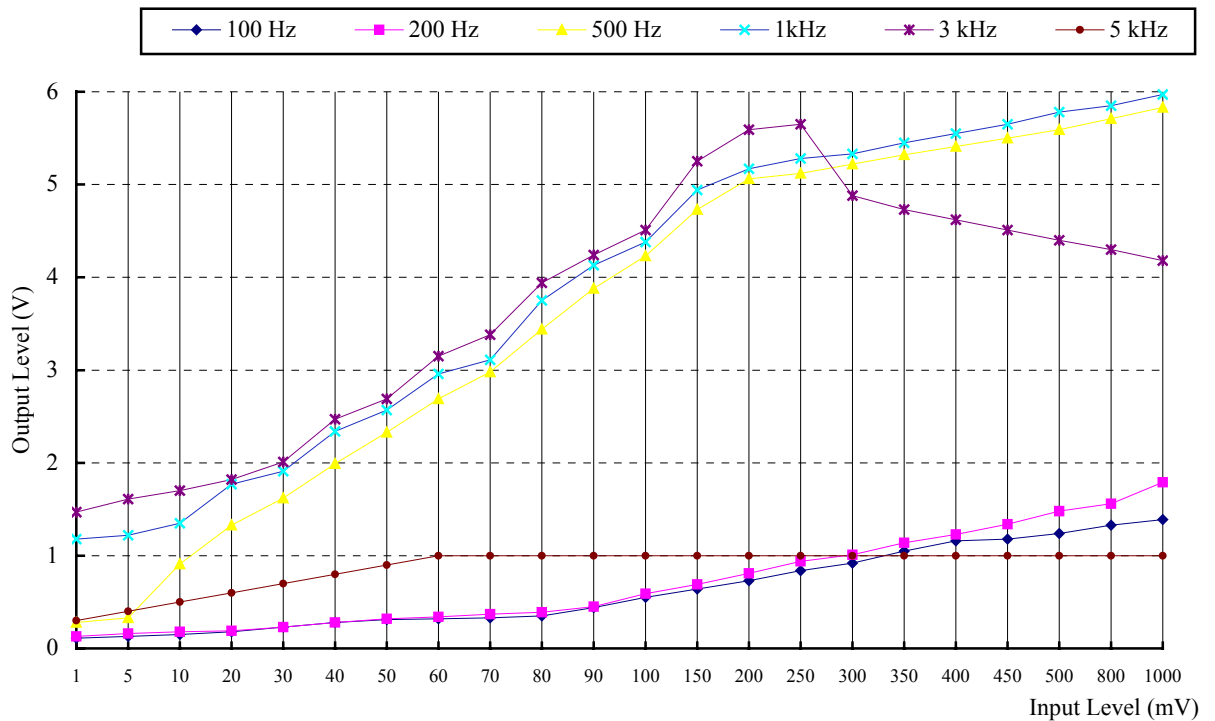
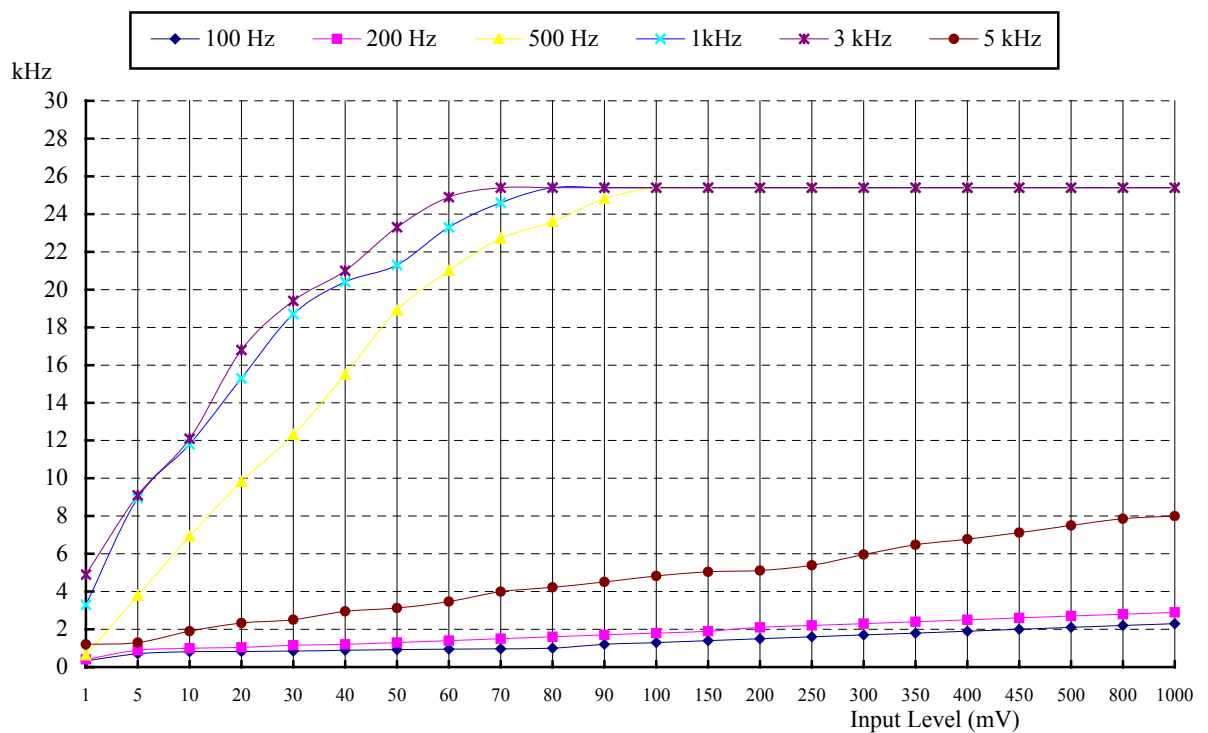


B). Modulation Limit

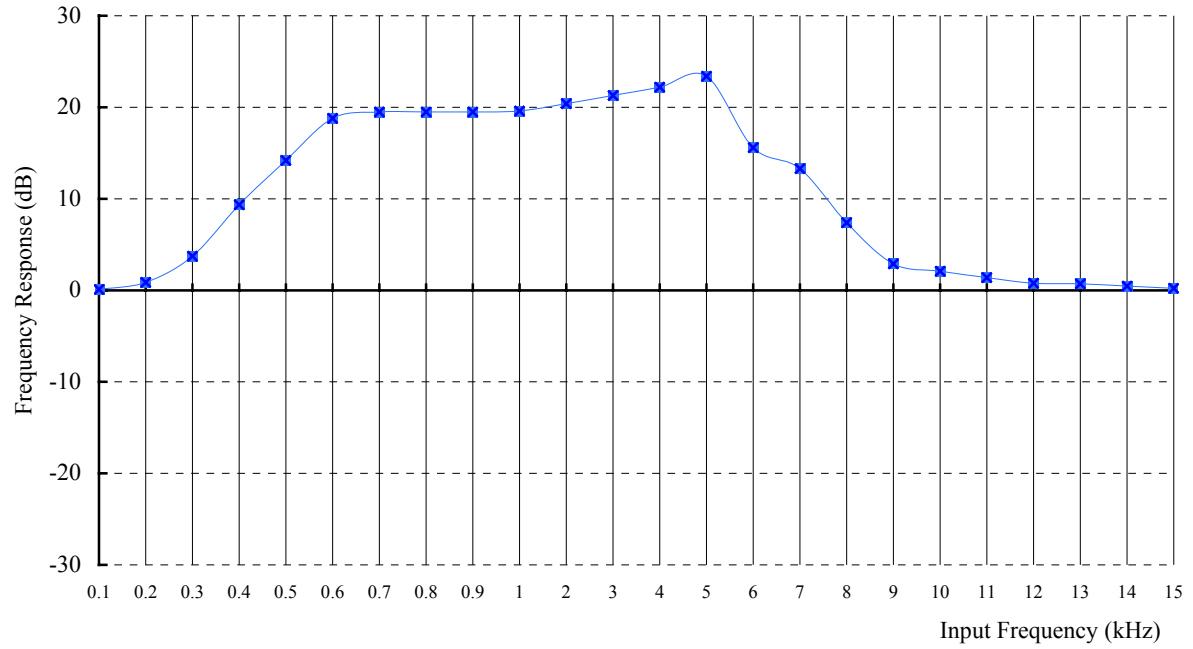


C). Frequency response of all circuits



Tx Frequency Rang : 794-806MHz Band**A). Frequency response****B). Modulation Limit**

C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

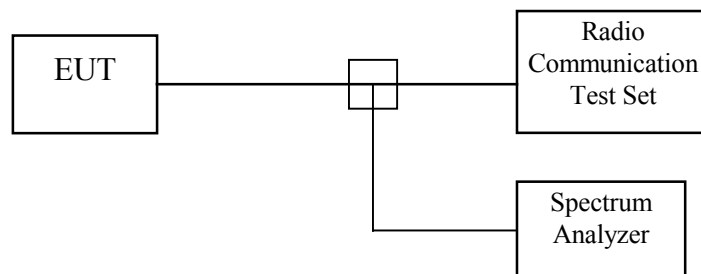
According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or independent sideband transmitter, when modulated by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

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

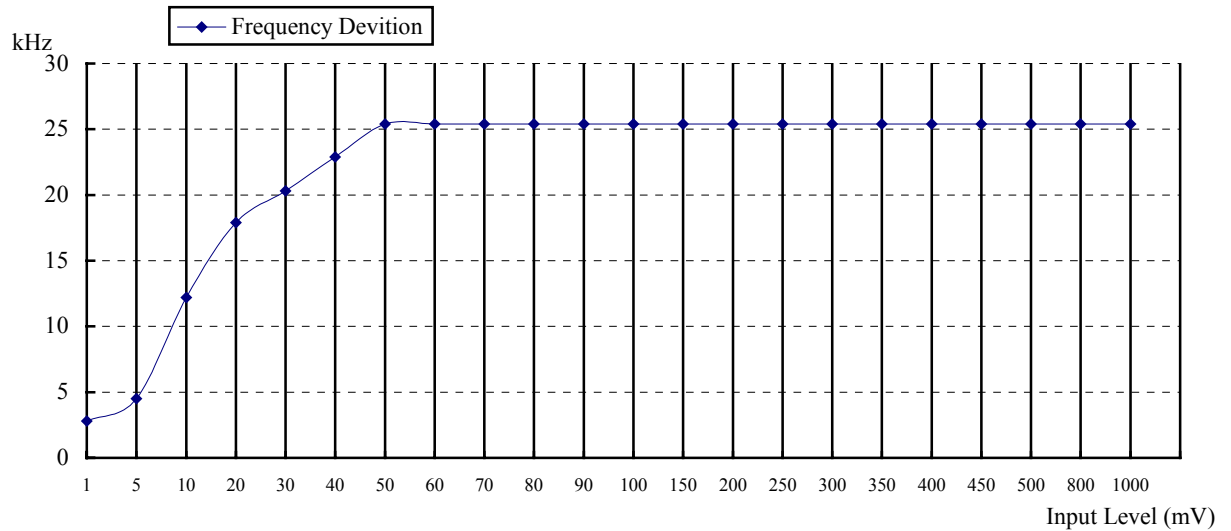
Equipment	Manufacturer	Model No.	Next Cal. Date
Radio Communication Test Set	Marconi	2955B	06/26/2007
Spectrum Analyzer	Rohde & Schwarz	FSP40	08/07/2007

5.4 Bandwidth Measured

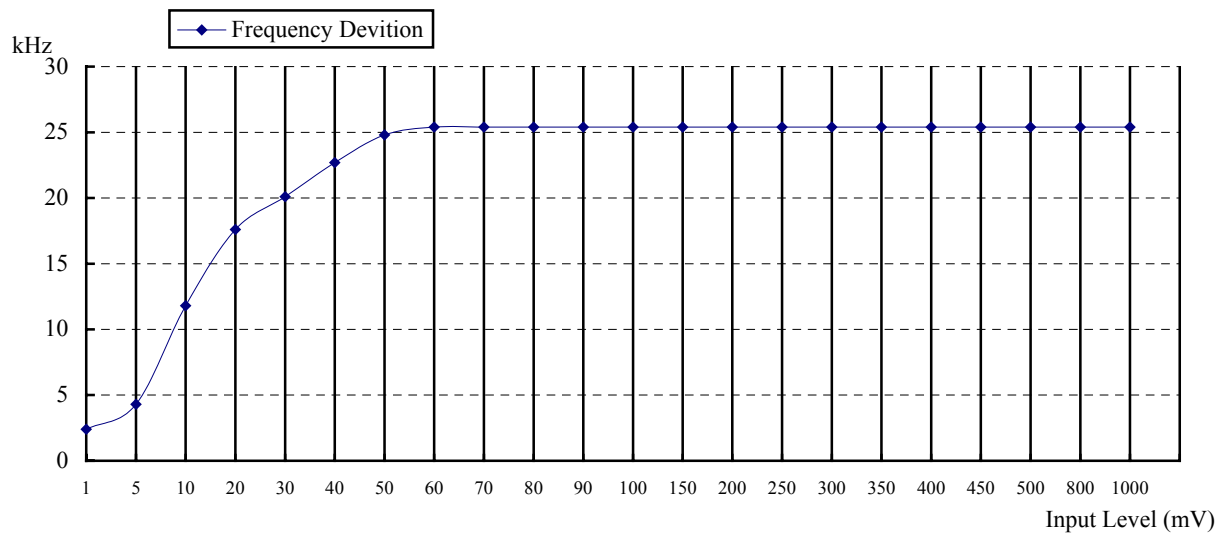
5.4.1 Input Level Derived

1. 740-752MHz Band

Input Audio Frequency : 2.5 kHz, Sine Wave



2. 794-806MHz Band



The Level input to produce 50% modulation is 15 mV, therefore the magnitude 16 dB greater than it is 95 mV.

5.4.2 Occupied Bandwidth Plotted

1. 740-752MHz

The Channel Low 26 dB Bandwidth is 141KHz.

The Channel Mid 26 dB Bandwidth is 150KHz.

The Channel High 26 dB Bandwidth is 149.5KHz.

2. 794-806MHz

The Channel Low 26 dB Bandwidth is 140.5KHz.

The Channel Mid 26 dB Bandwidth is 149.5KHz.

The Channel High 26 dB Bandwidth is 149.5KHz.

Please see appendix 1 for plotted data.

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.	Next Cal. Date
Spectrum Analyzer	Hewlett-Packard	8564E	08/08/2007
Horn Antenna	EMCO	3115	04/26/2007
Log periodic Antenna	EMCO	3146	10/12/2007
Biconical Antenna	EMCO	3110	06/21/2007
Preamplifier	Hewlett-Packard	8449B	10/08/2007
Preamplifier	Hewlett-Packard	8447D	04/27/2007

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

Tx Frequency Rang : 740-752MHz

A. Channel Low

Operated mode : TX(740.4MHz)

Test Date : Dec. 25, 2006

Temperature : 20 °C

Humidity : 65 %

Unmodulated carrier output power is 8.3 dBm , or 6.76 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$8.3-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

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)
1480.800	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
2221.200	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
2961.600	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3702.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
4442.400	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
5182.800	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
5923.200	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
6663.600	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
7404.000	---	---	---	---	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. Channel Mid

Operated mode : TX(746.1MHz) Test Date : Dec. 25, 2006
 Temperature : 20 °C Humidity : 65 %

Unmodulated carrier output power is 6.9 dBm , or 4.90 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$6.9-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

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)
1492.200	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2238.300	---	---	---	---	9.4	-2.0	1.7	---	---	-13.0	---
2984.400	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
3730.500	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4476.600	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5222.700	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5968.800	---	---	---	---	11.0	-2.0	2.6	---	---	-13.0	---
6714.900	---	---	---	---	12.1	-2.0	2.6	---	---	-13.0	---
7461.000	---	---	---	---	11.6	-2.0	2.9	---	---	-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. Channel High

Operated mode : TX(751.5MHz) Test Date : Dec. 25, 2006
 Temperature : 20 °C Humidity : 65 %

Unmodulated carrier output power is 5.7 dBm , or 3.72 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$5.7-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

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		
1503.000	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2254.500	---	---	---	---	9.3	-2.0	1.7	---	---	-13.0	---
3006.000	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
3757.500	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4509.000	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5260.500	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6012.000	---	---	---	---	11.9	-2.0	2.5	---	---	-13.0	---
6763.500	---	---	---	---	11.8	-2.0	2.5	---	---	-13.0	---
7515.000	---	---	---	---	11.5	-2.0	2.9	---	---	-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. Emission mask plots

Please see appendix 2 for plotted data.

Tx Frequency Rang : 794-806MHz**A. Channel Low**

Operated mode : TX(794.4MHz)
 Temperature : 20 °C

Test Date : Dec. 25, 2006
 Humidity : 65 %

Unmodulated carrier output power is 9.0 dBm , or 7.94 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$9.0-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

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		
1588.800	---	---	---	---	6.4	-2.0	1.30	---	---	-13.0	---
2383.200	---	---	---	---	9.3	-2.0	1.75	---	---	-13.0	---
3177.600	---	---	---	---	9.2	-2.0	1.75	---	---	-13.0	---
3972.000	---	---	---	---	9.7	-2.0	1.75	---	---	-13.0	---
4766.400	---	---	---	---	9.6	-2.0	2.10	---	---	-13.0	---
5560.800	---	---	---	---	10.6	-2.0	2.10	---	---	-13.0	---
6355.200	---	---	---	---	10.9	-2.0	2.10	---	---	-13.0	---
7149.600	---	---	---	---	10.9	-2.0	2.60	---	---	-13.0	---
7944.000	---	---	---	---	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. Channel Mid

Operated mode : TX(800.1MHz) Test Date : Dec. 25, 2006
 Temperature : 20 °C Humidity : 65 %

Unmodulated carrier output power is 8.7 dBm , or 7.41 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$8.7-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

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		
1600.200	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2400.300	---	---	---	---	9.4	-2.0	1.7	---	---	-13.0	---
3200.400	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
4000.500	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4800.600	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5600.700	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6400.800	---	---	---	---	11.0	-2.0	2.6	---	---	-13.0	---
7200.900	---	---	---	---	12.1	-2.0	2.6	---	---	-13.0	---
8001.000	---	---	---	---	11.6	-2.0	2.9	---	---	-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. Channel High

Operated mode : TX(805.5MHz) Test Date : Dec. 25, 2006
 Temperature : 20 °C Humidity : 65 %

Unmodulated carrier output power is 7.6 dBm , or 5.75 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$7.6-[43+10\log(\text{carrier output power in W})], \text{ or } -13\text{dBm}$$

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		
1611.000	---	---	---	---	9.1	-2.0	1.3	---	---	-13.0	---
2416.500	---	---	---	---	9.3	-2.0	1.7	---	---	-13.0	---
3222.000	---	---	---	---	9.7	-2.0	1.7	---	---	-13.0	---
4027.500	---	---	---	---	9.6	-2.0	2.1	---	---	-13.0	---
4833.000	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
5638.500	---	---	---	---	10.9	-2.0	2.1	---	---	-13.0	---
6444.000	---	---	---	---	11.9	-2.0	2.5	---	---	-13.0	---
7249.500	---	---	---	---	11.8	-2.0	2.5	---	---	-13.0	---
8055.000	---	---	---	---	11.5	-2.0	2.9	---	---	-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. Emission mask plots

Please see appendix 2 for plotted data.

6.5 Other Emission**1. (Power 1)**

a) Emission frequencies below 1 GHz

Test Date : Dec. 20, 2006Temperature : 20 °CHumidity : 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)
45.180	V	42.6	-13.0	29.6	40.0	-10.4	180	1.0
188.920	V	40.7	-8.5	32.2	43.5	-11.3	192	1.0
275.180	V	34.9	-3.1	31.8	46.0	-14.2	175	1.0
338.920	V	41.8	-8.8	33.0	46.0	-13.0	188	1.0
445.180	V	39.4	-5.6	33.8	46.0	-12.2	192	1.0
558.910	V	40.8	-5.2	35.6	46.0	-10.4	179	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.

2. (Power 2)

a) Emission frequencies below 1 GHz

Test Date : Dec. 20, 2006Temperature : 20 °CHumidity : 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)
38.140	V	41.1	-11.4	29.7	40.0	-10.3	175	1.0
77.130	V	46.6	-15.4	31.2	40.0	-8.8	188	1.0
188.920	V	41.3	-8.5	32.8	43.5	-10.7	192	1.0
245.170	V	38.6	-4.2	34.4	46.0	-11.6	175	1.0
389.240	V	41.2	-6.2	35.0	46.0	-11.0	188	1.0
459.180	V	42.3	-5.2	37.1	46.0	-8.9	194	1.0

Note :

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

b) Emission frequencies above 1 GHz

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

6.6 Radiated Measurement Photos



7. FREQUENCY STABILITY MEASUREMENT

7.1 Provisions Applicable

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

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

7.2 Measurement Procedure

A) Frequency stability versus environmental temperature

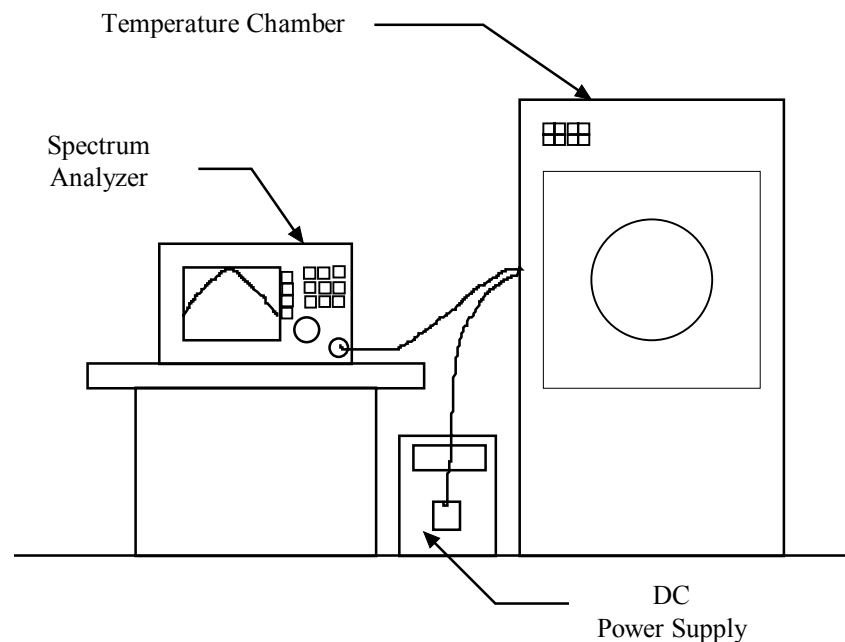
1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C shall be used.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. Set the temperature of chamber to 50°C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measurement frequencies.

B) Frequency stability versus input voltage

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

2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. For non hand carried, battery operated device, supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency. For battery operated only device, supply the EUT primary voltage at the battery operating end point which is specified by the manufacturer and record the frequency.

Figure 5 : Frequency stability measurement configuration



7.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	HP	8564E	08/08/2007
Temperature Chamber	MALLIER	MCT-2X-M	11/26/2007

7.4 Measurement Data**Tx Frequency Rang : 746.1MHz****A1. Frequency stability versus enviroment tempture**

Reference Frequency : 746.1 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	746.1134	0.00180	746.0777	-0.00300	746.0753	-0.00330
40		746.0864	-0.00182	746.0794	-0.00276	746.1110	0.00148
30		746.0988	-0.00016	746.0744	-0.00344	746.0715	-0.00382
20		746.0715	-0.00382	746.0916	-0.00112	746.0858	-0.00190
10		746.0818	-0.00244	746.1201	0.00270	746.0800	-0.00269
0		746.1082	0.00110	746.0752	-0.00333	746.1065	0.00087
-10		746.1139	0.00187	746.0971	-0.00039	746.0863	-0.00183
-20		746.1215	0.00288	746.1044	0.00059	746.1078	0.00105
-30		746.0969	-0.00042	746.0739	-0.00349	746.1181	0.00243

A2. Frequency stability versus end-point supplied voltage (4.8Vdc)

Reference Frequency : 746.1 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	End-point	746.1098	0.00131	746.0984	-0.00022	746.1128	0.00171

Tx Frequency Rang : 800.1MHz**B1. Frequency stability versus enviroment tempture**

Reference Frequency : 800.1 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	800.0732	-0.00335	800.1238	0.00298	800.1037	0.00046
40		800.1056	0.00070	800.0948	-0.00065	800.0988	-0.00016
30		800.0792	-0.00260	800.0704	-0.00370	800.1221	0.00276
20		800.0966	-0.00043	800.1110	0.00138	800.0749	-0.00314
10		800.1092	0.00115	800.0795	-0.00256	800.1284	0.00355
0		800.1194	0.00242	800.1283	0.00354	800.0893	-0.00134
-10		800.0943	-0.00072	800.1012	0.00015	800.1128	0.00160
-20		800.1217	0.00271	800.1205	0.00256	800.0695	-0.00382
-30		800.0770	-0.00287	800.1133	0.00166	800.1191	0.00239

B2. Frequency stability versus end-point supplied voltage (4.8Vdc)

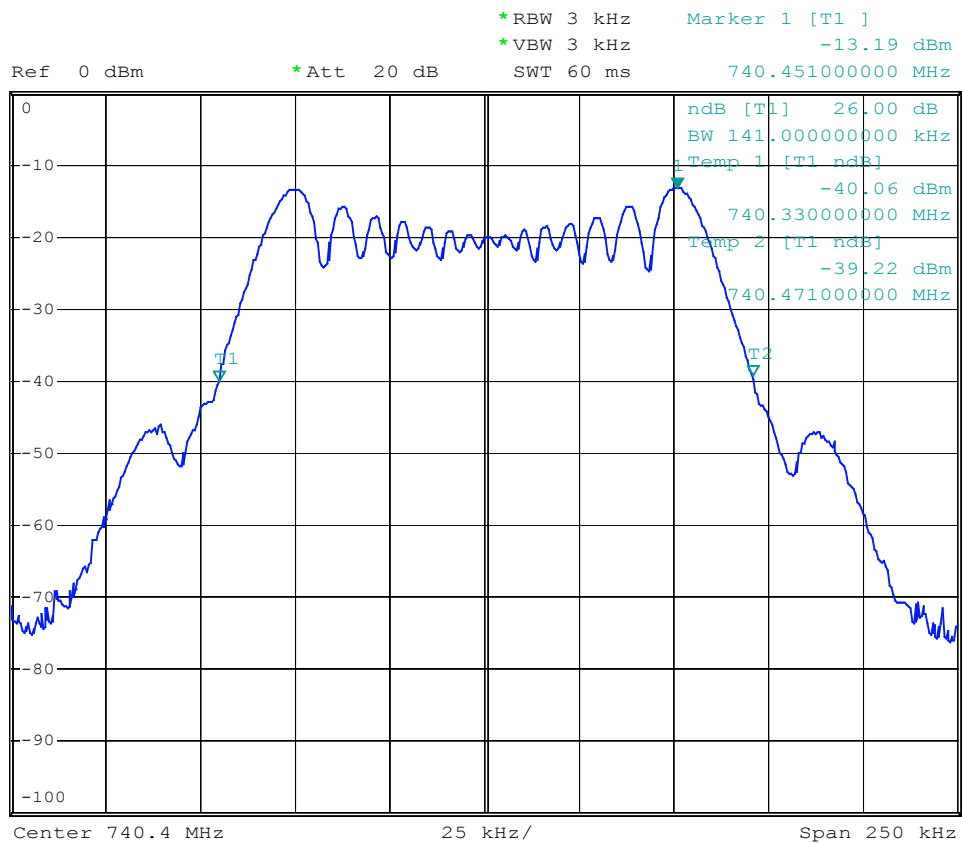
Reference Frequency : 800.1 MHz		Limit : 0.005%					
Enviroment Tempture (°C)	Power Supplied (Vac)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-point	800.1079	0.00098	800.1269	0.00336	800.0715	-0.00356

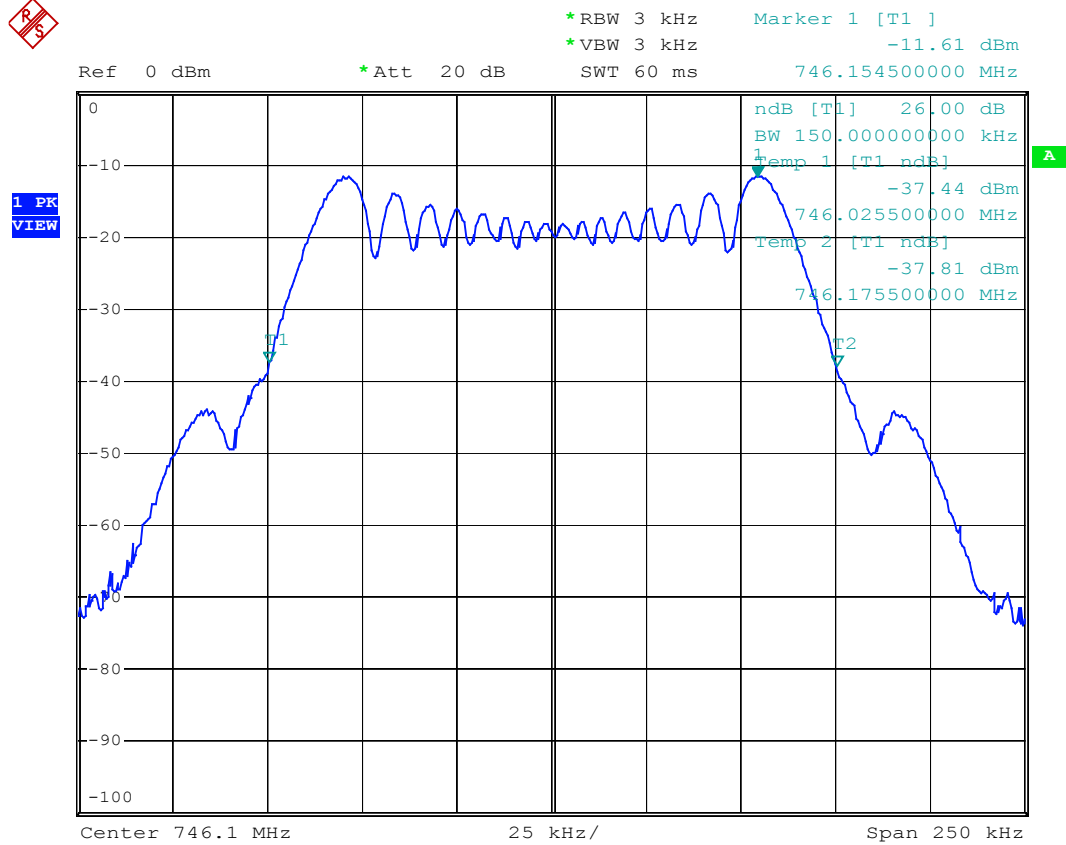
8 CONDUCTED EMISSION MEASUREMENT

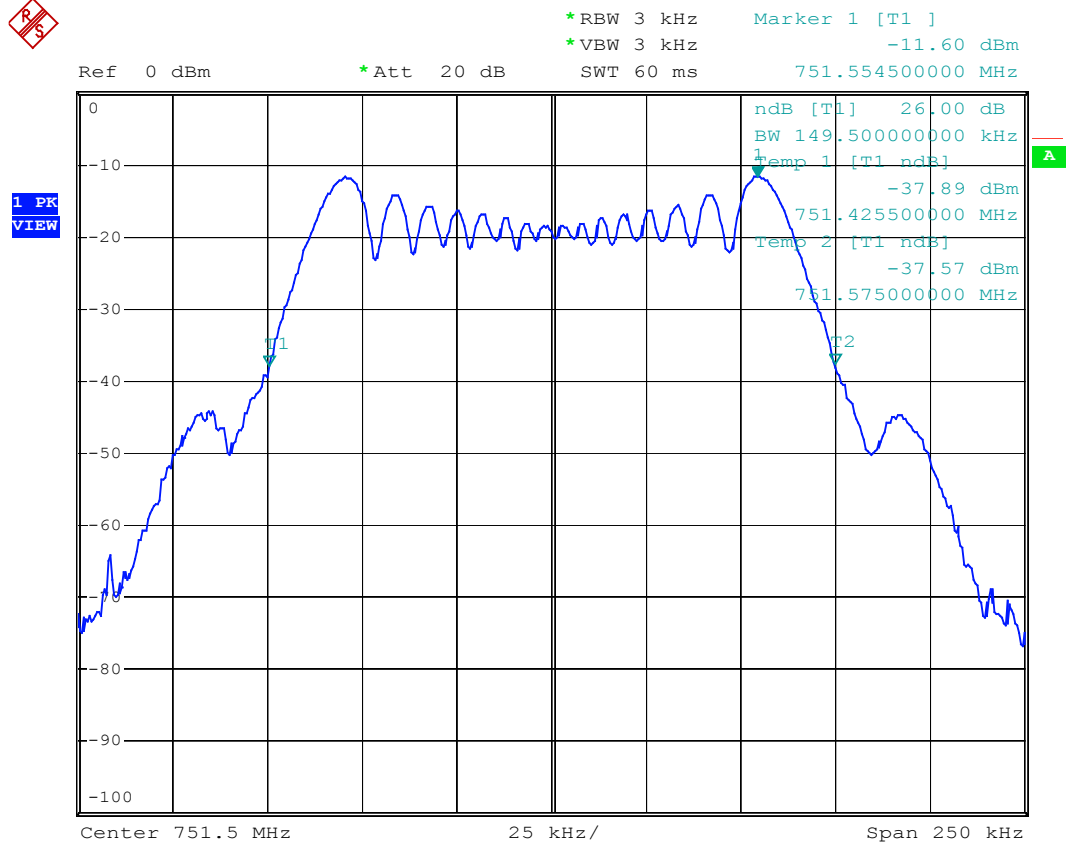
8.1 Standard Applicable

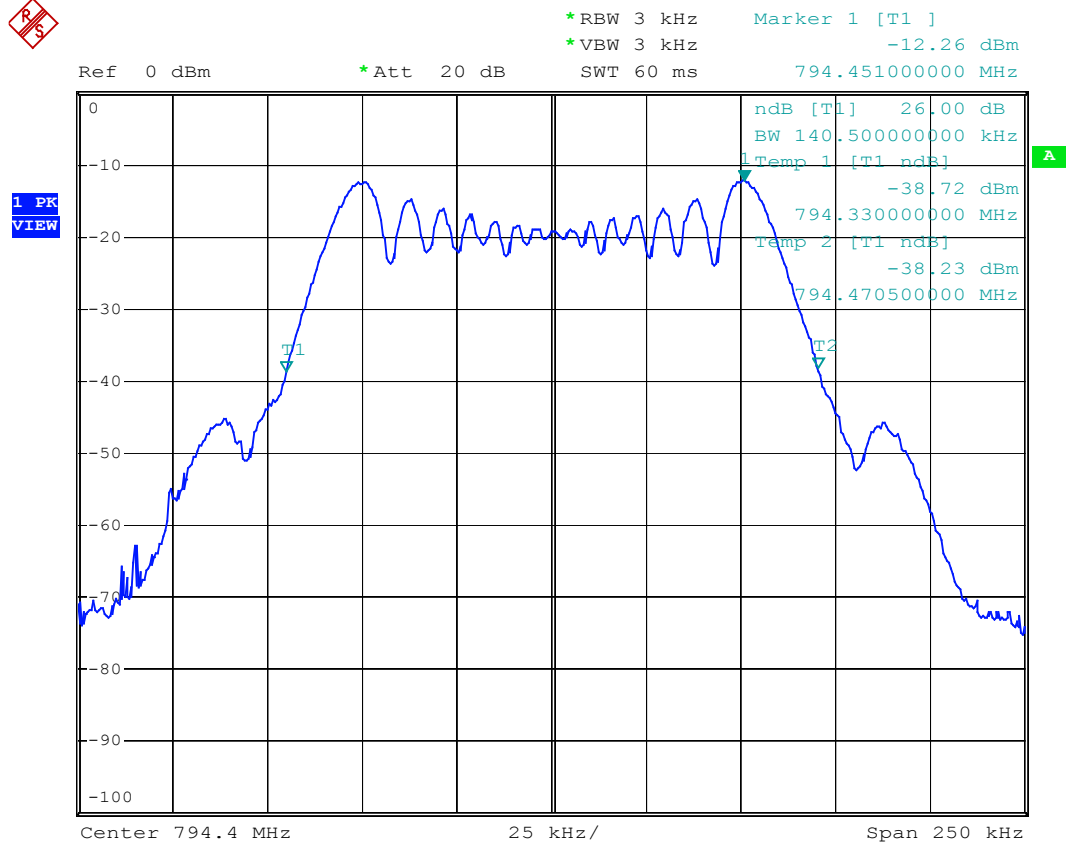
This EUT is excused from investigation of conducted emission, for it is powered by DC 12V battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

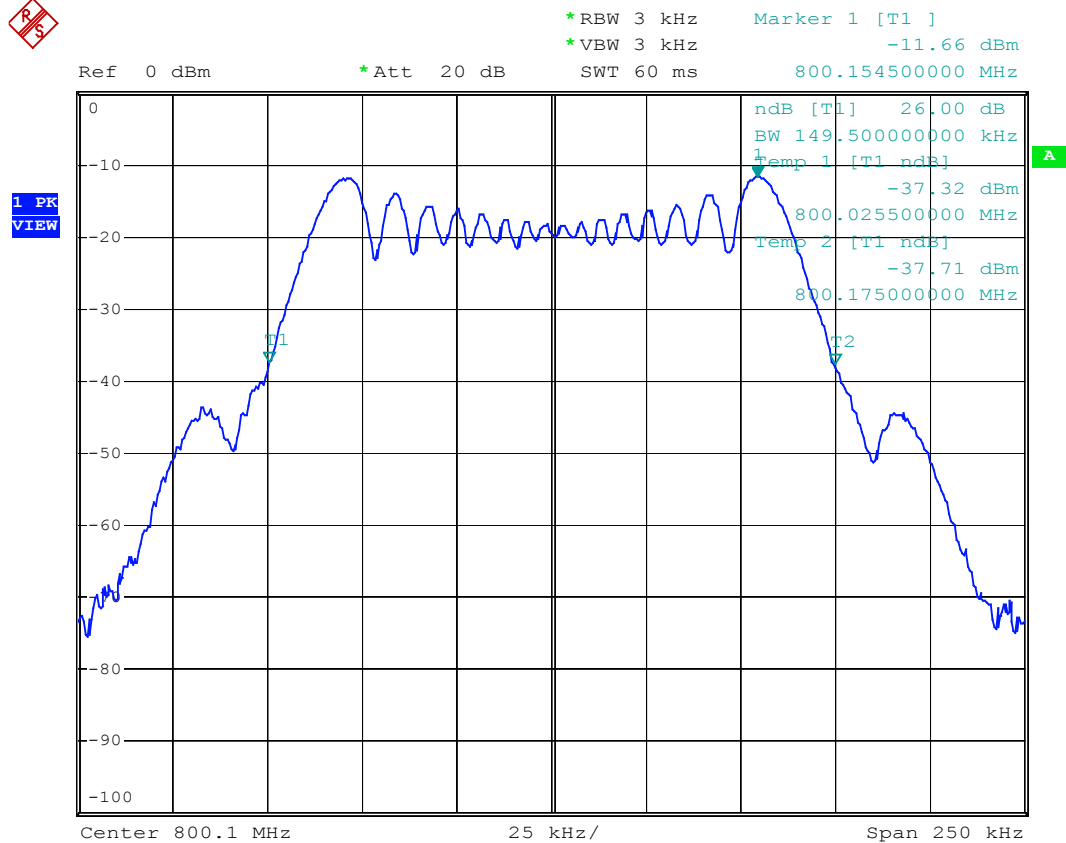
Appendix 1 : Occupied Emission Bandwidth Plotted Data

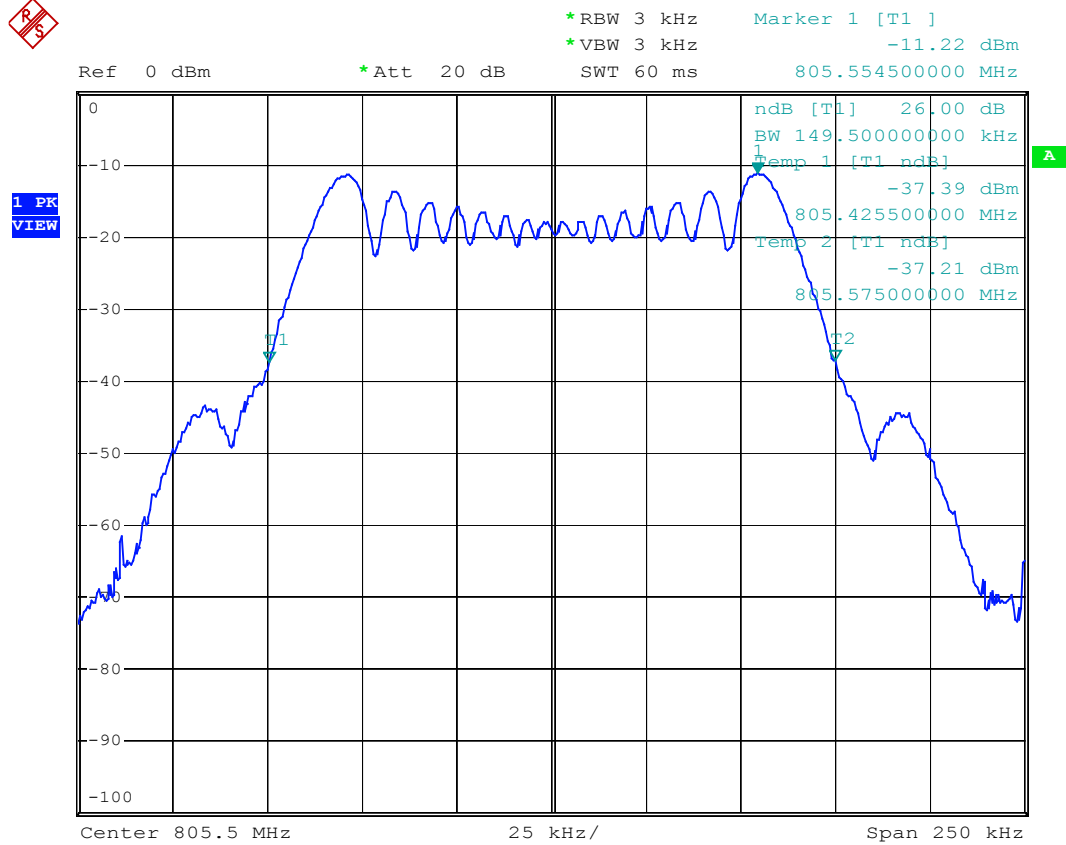
740.4MHz1 PK
VIEW

746.1MHz

751.5MHz

794.4MHz

800.1MHz

805.5MHz

Appendix 2 : Emission Mask Plotted Data

740.4MHz

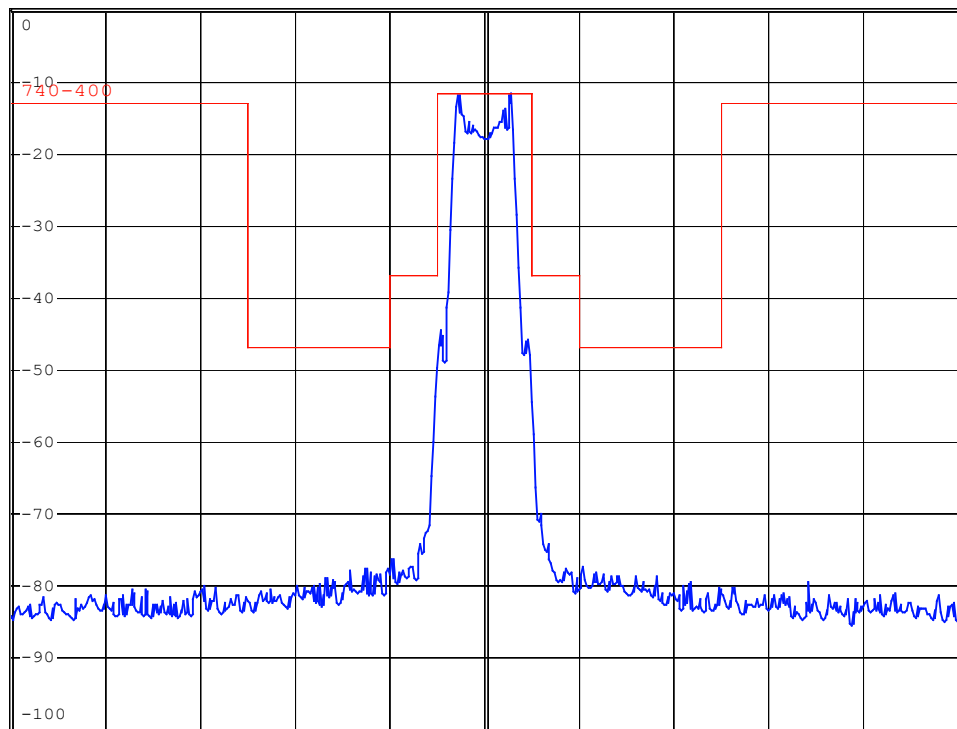
*RBW 3 kHz

*VBW 3 kHz

Ref 0 dBm

*Att 20 dB

SWT 225 ms

1 PK
VIEW

Center 740.4 MHz

200 kHz/

Span 2 MHz

746.1MHz

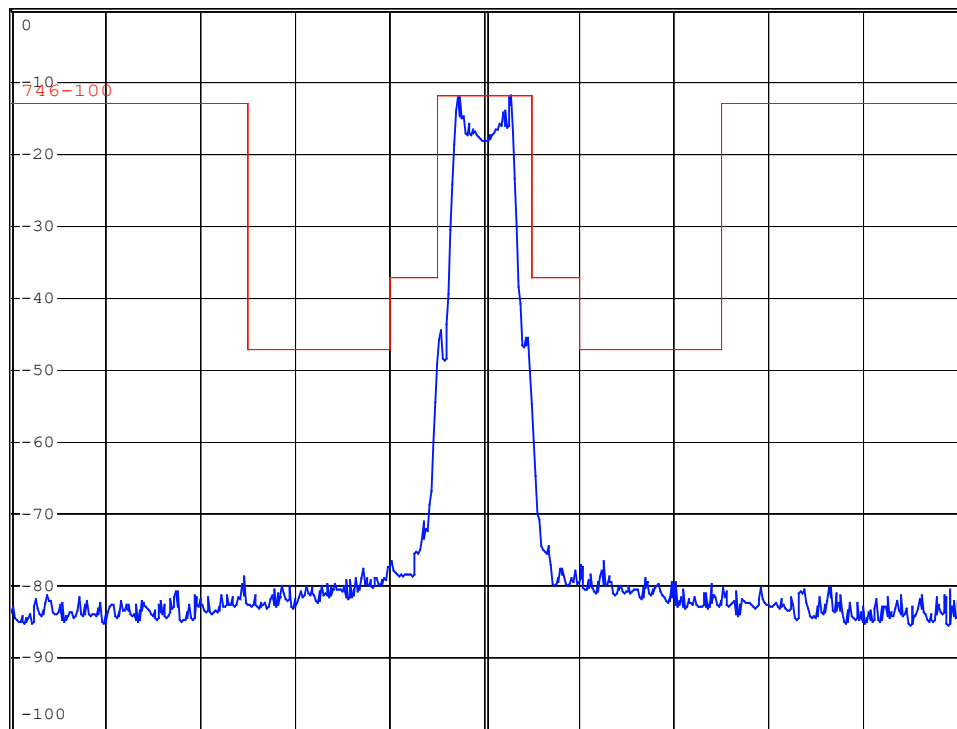
*RBW 3 kHz

*VBW 3 kHz

Ref 0 dBm

*Att 20 dB

SWT 225 ms

1 PK
VIEW

Center 746.1 MHz

200 kHz/

Span 2 MHz

751.5MHz

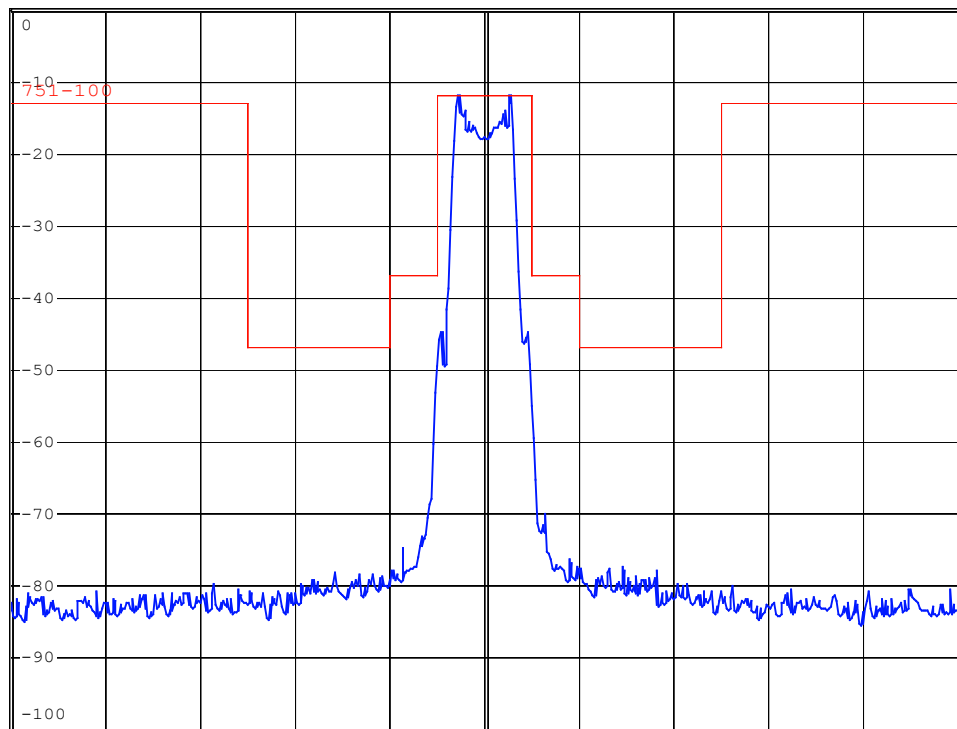
*RBW 3 kHz

*VBW 3 kHz

Ref 0 dBm

*Att 20 dB

SWT 225 ms

1 PK
VIEW

Center 751.5 MHz

200 kHz/

Span 2 MHz

794.4MHz

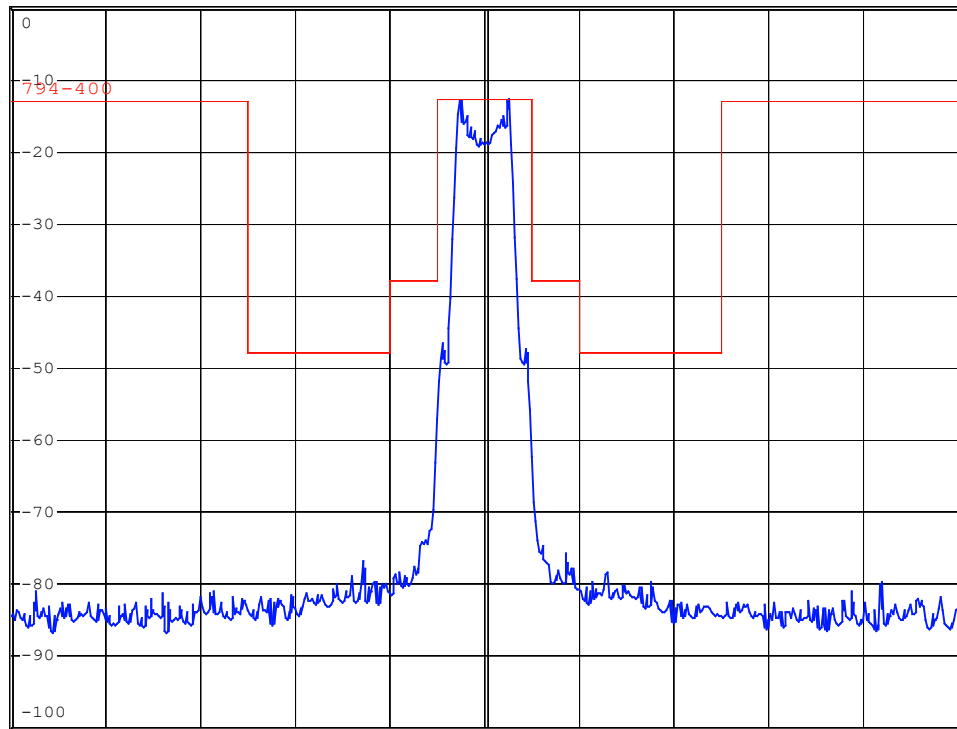
*RBW 3 kHz

*VBW 3 kHz

Ref 0 dBm

*Att 20 dB

SWT 225 ms

1 PK
VIEW

Center 794.4 MHz

200 kHz/

Span 2 MHz

800.1MHz

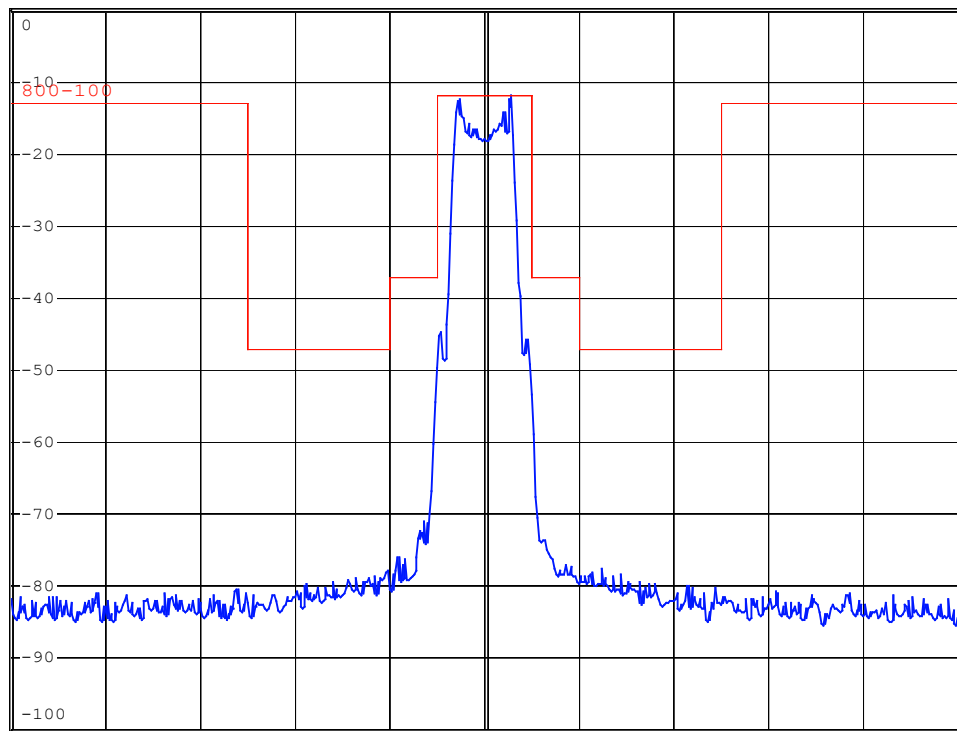
*RBW 3 kHz

*VBW 3 kHz

Ref 0 dBm

*Att 20 dB

SWT 225 ms

1 PK
VIEW

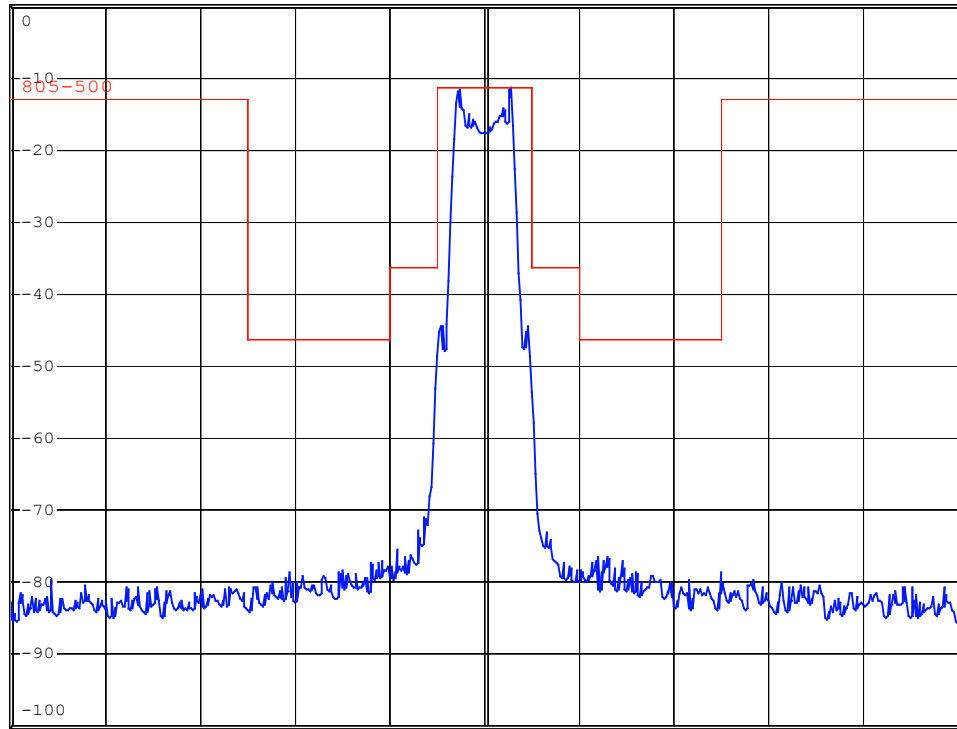
Center 800.1 MHz

200 kHz/

Span 2 MHz

805.5MHz*RBW 3 kHz
*VBW 3 kHz

Ref 0 dBm *Att 20 dB SWT 225 ms

1 PK
VIEW

Center 805.5 MHz 200 kHz/ Span 2 MHz