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CNASL1225

FCC PART 95 TEST REPORT

FCC Part 95 Subpart J

Report Reference No.....:	**WE11080013**
FCC ID.....:	**ZB4-810TR**
Compiled by (position+printed name+signature)..:	File administrators Eric Zhang
Supervised by (position+printed name+signature)..:	Test Engineer Wenliang Li
Approved by (position+printed name+signature)..:	Manager Jeffrey Lu
Date of issue.....:	Aug 26, 2011
Testing Laboratory Name .....:	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address .....:	Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Applicant's name.....:	**frank communications**
Address .....:	115 w. 35th, Hays, Kansas 67601
Test specification:	
Standard .....:	**FCC Part 95 Subpart J: PERSONAL RADIO SERVICES- Multi-Use Radio Service (MURS)**
TRF Originator.....:	Shenzhen Huatongwei International Inspection CO., Ltd
Master TRF.....:	Dated 2006-06

Test item description .....:	Hot Shot Wireless Controller
Trade Mark .....:	/
Model/Type reference.....:	810-t rev 2
Listed Models .....:	/
Manufacturer	**Hot Shot Systems**
Ratings .....:	AC 120V/60Hz
Modulation .....:	FM
Channel Separation.....	25KHz
Rated Power	2 Watts(33.01dBm)
Operation Frequency	154.6000 MHz
Result.....:	**Positive**

T E S T R E P O R T

Test Report No. :	WE11080013	Aug 26, 2011 Date of issue

Equipment under Test	:	Hot Shot Wireless Controller
Model /Type	:	810-t rev 2
Listed Models	:	/
Applicant	:	**frank communications**
Address	:	115 w. 35th, Hays, Kansas 67601
Manufacturer	:	**Hot Shot Systems**
Address	:	1005 e. 17th, Hays, Kansas 67601

Test Result according to the standards on page 9:	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 95 Subpart J: PRIVATE LAND MOBILE RADIO SERVICES- Multi-Use Radio Service (MURS).

TIA/EIA 603: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

ANSI C63.4-2009: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

FCC Rules Part 15 Subpart B: RADIO FREQUENCY DEVICES- Unintentional Radiators.

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Aug 12, 2011
Testing commenced on	:	Aug 12, 2011
Testing concluded on	:	Aug 26, 2011

2.2. Product Description

The **frank communications**'s Model: **810-t rev 2** or the "EUT" as referred to in this report; more general information as follows:

Name of EUT	Hot Shot Wireless Controller	
Model Number	810-t rev 2	
FCC ID	ZB4-810TR	
Rated Output Power	2 Watts(33.01dBm)	
Modilation Type	FM for Analog Voice	
	Analog	16K0F3E for 25KHz Channel Separation
Channel Separation	Analog Voice	25KHz
Antenna Type	External	
Frequency	154.6000 MHz	
Maximum Output Power	Analog	1.99 W for 25 KHz Channel Separation

2.3. Equipment under Test

Power supply system utilised

Power supply voltage	:	●	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		○	Other (specified in blank below)		

Test frequency list

Modulation Type	Test Frequency
FM	154.6000 MHz

2.4. Short description of the Equipment under Test (EUT)

154.6000 MHz V frequency band Hot Shot Wireless Controller (810-t rev 2).

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

2.5. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.6. EUT operation mode

The EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.7. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.8. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **ZB4-810TR** filing to comply with FCC Part 95 Subpart J Rules

2.9. Modifications

No modifications were implemented to meet testing criteria.

2.10. Note

1. The EUT is a 154.6000 MHz frequency band Hot Shot Wireless Controller (810-t rev 2),The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 95 Subpart J	WE11080013
MPE	FCC OET 65	WE11080014

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Huatongwei International Inspection Co., Ltd
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: August 02, 2007. Valid time is until March 29, 2012.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time to Sep 30, 2011.

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date July 01, 2009.

IC-Registration No.: 5377

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377 on Jan 24h, 2011.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

NEMKO-Aut. No.: ELA125

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025:2005 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10; the Authorization is valid through July 07, 2013.

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: December 20, 2009. Valid time is until December 19, 2012.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: December 20, 2009. Valid time is until December 19, 2012.

DNV

Shenzhen Huatongwei International Inspection Co Ltd has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025(2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until 24 Augest, 2013.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

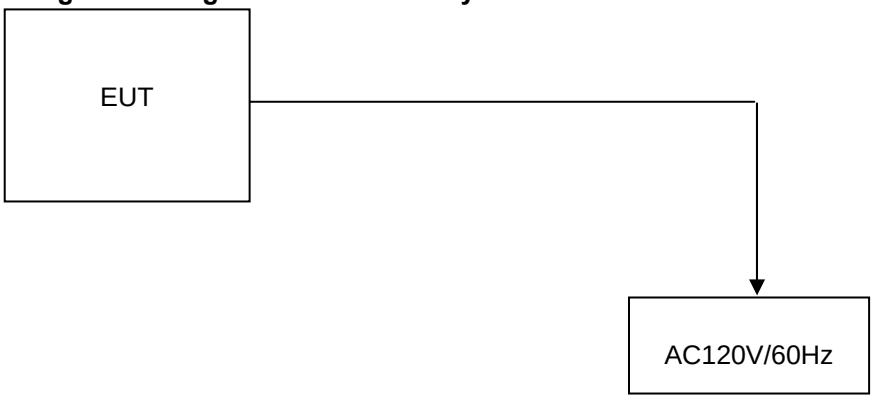


Table 2-1 Equipment Used in Tested System

3.5. Discription of Tested Modes

The EUT (Hot Shot Wireless Controller) has been tested under normal operating condition.

3.6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	150 Hz	(1)
Transmitter power conducted	0.30 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-12.75 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)
Emission Mask	---------	(1)
Modulation Characteristic	---------	(1)
Transmitter Frequency Behavior	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.7. Test Description

FCC Rules	Description of Test	Test Result
§ 15.107	Conducted Emission	Complies
§ 15.109	Receiver Radiated Spurious Emssion	Complies
§ 15.109	Receiver Conducted Spurious Emssion	Complies
§ 95.639	Maximum Transmitter Power	Complies
§ 95.632	Occupied Bandwidth	Complies
§ 95.632	Emission Mask	Complies
§ 95.632	Frequency Stability	Complies
§ 95.635	Transmitter Radiated Spurious Emssion	Complies
§ 95.635	Spurious Emssion On Antenna Port	Complies

3.8. Equipments Used during the Test

AC Power Conducted Emission				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	23/10/2011
EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	23/10/2011
Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	23/10/2011
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	23/10/2011

Frequency Stability				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Communication Test Set	HP	HP8920B	US35010135	23/10/2011
Signal Generator	Rohde&Schwarz	SMT03	100059	23/10/2011
Climate Chamber	ESPEC	EL-10KA	05107008	23/10/2011

Transmitter Radiated Spurious Emssion & Occupied Bandwidth & Emission Mask & Receiver Radiated Spurious Emssion				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Ultra-Broadband Antenna	Rohde&Schwarz	HL562	100015	23/10/2011
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	23/10/2011
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
HORN ANTENNA	Rohde&Schwarz	HF906	100039	23/10/2011
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	23/10/2011
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	20/02/2012

Maximum Transmitter Power & Spurious Emssion On Antenna Port				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	Rohde&Schwarz	ESI 26	100009	23/10/2011
Attenuator	R&S	ESH3-22	100449	23/10/2011
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	20/02/2012
High-Pass Filter	Anritsu	MP526B	6220875256	23/10/2011
High-Pass Filter	Anritsu	MP526D	6220878392	23/10/2011

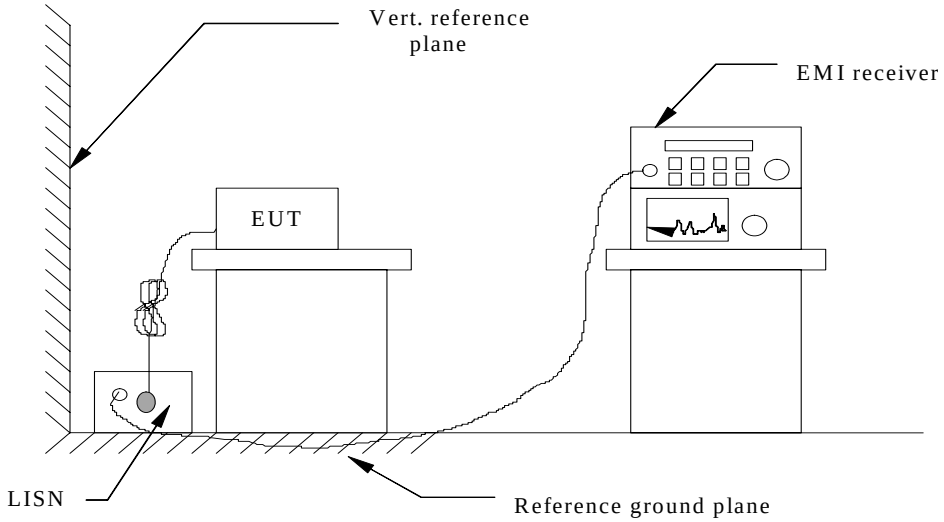
4. TEST CONDITIONS AND RESULTS

4.1. Conducted Emissions Test

TEST APPLICABLE

The EUT was tested according to ANSI C63.4 - 2009. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 u Henry as specified by section 5.1 of ANSI C63.4 - 2009. Cables and peripherals were moved to find the maximum emission levels for each frequency.

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
2 Support equipment, if needed, was placed as per ANSI C63.4-2009.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009.
4 If a EUT received DC power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

Conducted Power Line Emission Limit

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

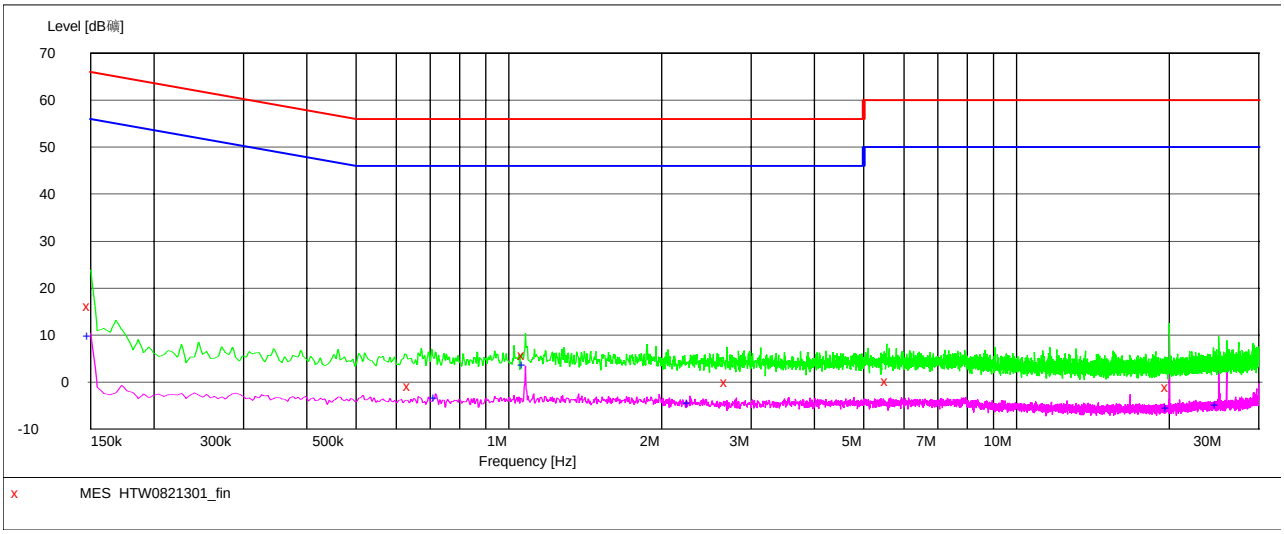
For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

TEST RESULTS

For FM Mudolation @ 25 KHz @ Transmitter

SCAN TABLE: "Voltage (9K-30M) FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0821301_fin"

8/21/2011 4:52PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	16.10	10.1	66	49.9	QP	L1	GND
0.640500	-0.80	10.1	56	56.8	QP	L1	GND
1.077000	5.80	10.2	56	50.2	QP	L1	GND
2.701500	0.00	10.2	56	56.0	QP	L1	GND
5.590500	0.30	10.2	60	59.7	QP	L1	GND
20.004000	-1.00	10.4	60	61.0	QP	L1	GND

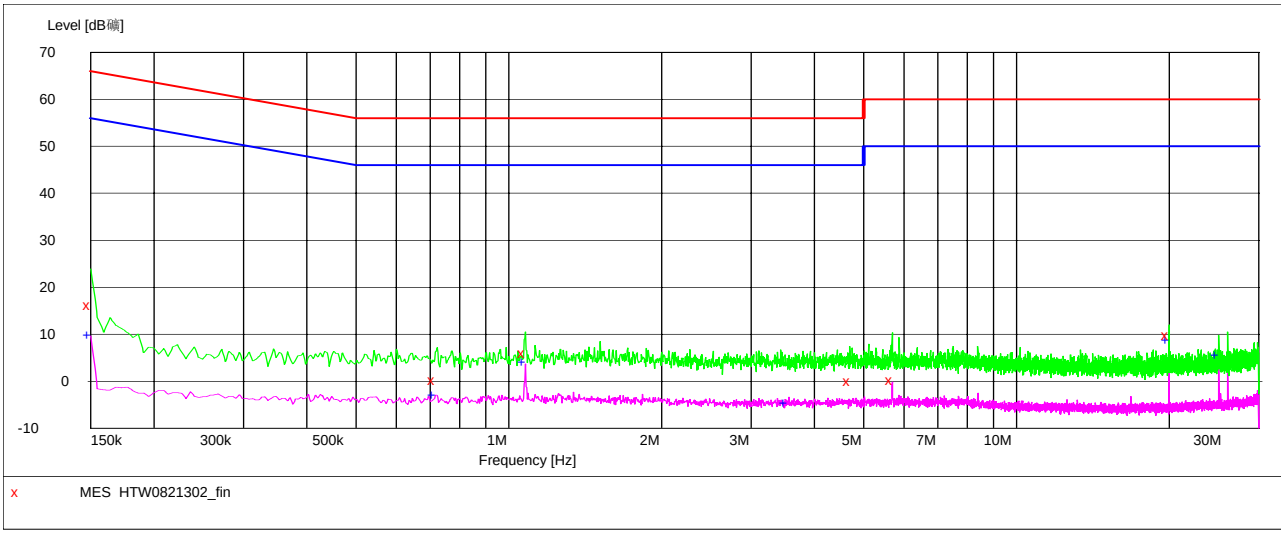
MEASUREMENT RESULT: "HTW0821301_fin2"

8/21/2011 4:52PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	9.70	10.1	56	46.3	AV	L1	GND
0.721500	-3.40	10.1	46	49.4	AV	L1	GND
1.077000	3.70	10.2	46	42.3	AV	L1	GND
2.278500	-4.60	10.2	46	50.6	AV	L1	GND
20.004000	-5.50	10.4	50	55.5	AV	L1	GND
25.003500	-5.00	10.7	50	55.0	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M) FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0821302_fin"

8/21/2011 4:55PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	16.30	10.1	66	49.7	QP	N	GND
0.717000	0.30	10.1	56	55.7	QP	N	GND
1.077000	6.00	10.2	56	50.0	QP	N	GND
4.717500	0.10	10.2	56	55.9	QP	N	GND
5.712000	0.30	10.2	60	59.7	QP	N	GND
20.004000	9.80	10.4	60	50.2	QP	N	GND

MEASUREMENT RESULT: "HTW0821302_fin2"

8/21/2011 4:55PM

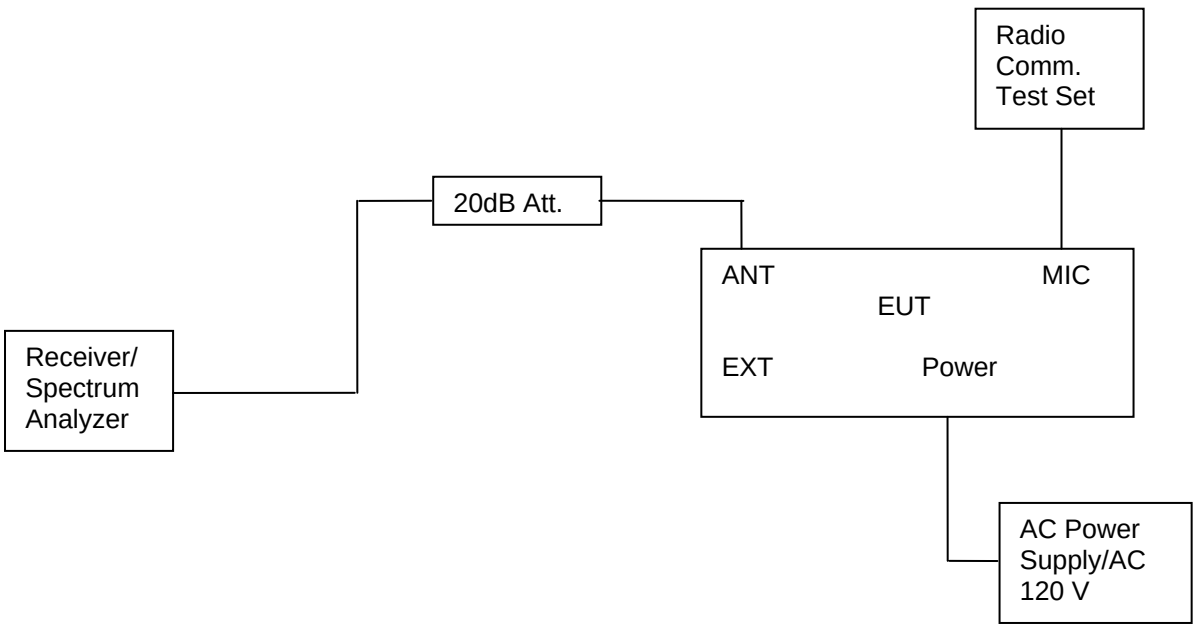
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	9.80	10.1	56	46.2	AV	N	GND
0.717000	-2.90	10.1	46	48.9	AV	N	GND
1.077000	4.10	10.2	46	41.9	AV	N	GND
3.534000	-4.60	10.2	46	50.6	AV	N	GND
20.004000	8.70	10.4	50	41.3	AV	N	GND
25.003500	5.50	10.7	50	44.5	AV	N	GND

4.2. Occupied Bandwidth and Emission Mask Test

TEST APPLICABLE

(a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.
(b). For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
(1) On any frequency from the center of the authorized bandwidth foto 5.625 kHz removed from fo: Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least 7.27(fd-2.88 kHz) dB.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 12.5 kHz: at least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
(c). Emission Mask 2: For transmitters that are equipped with an audio low-pass filter pursuant to §95.635(e), the power of any emission must be below the unmodulated carrier power (P) as follows:
(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.
(d). Emission Mask 3, For transmitters designed to operate with a 25 kHz chan-nel bandwidth that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:
(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 5 kHz, but not more than 10 kHz: at least 83 log (fd/5) dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 10 kHz, but not more than 250 percent of the authorized band-width: at least 29 log (fd2/11) dB or 50 dB, whichever is the lesser attenu-ation.
(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the author-ized bandwidth: at least 43 + 10 log (P) dB.

TEST CONFIGURATION



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).

3 Set EUT as normal operation.
4 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
5 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
6 Set SPA Center Frequency=fundamental frequency, RBW=100Hz, VBW=1 KHz, span=50 KHz for 12.5 channel spacing.

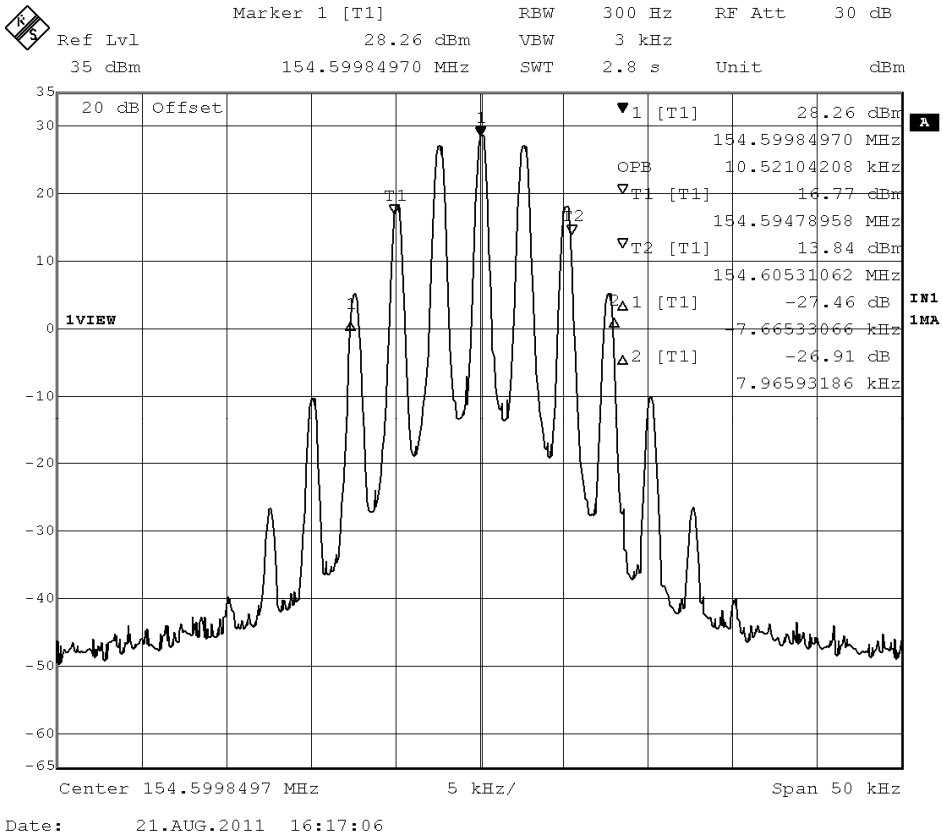
TEST RESULTS

4.2.1 Occupied Bandwidth

Modulation Type	Channel Sparation	Test Frequency	99% Occupied Bandwidth	26dB Occupied Band width
FM	25KHz	154.6000 MHz	10.52 KHz	15.63 KHz
Limit		20 KHz for 25 KHz Channel Separtion		
Test Results		Compliance		

Plots of 99% and 26dB Bandwidth Measurement

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	25 KHz	154.6000	10.52	15.63	20	Complicance



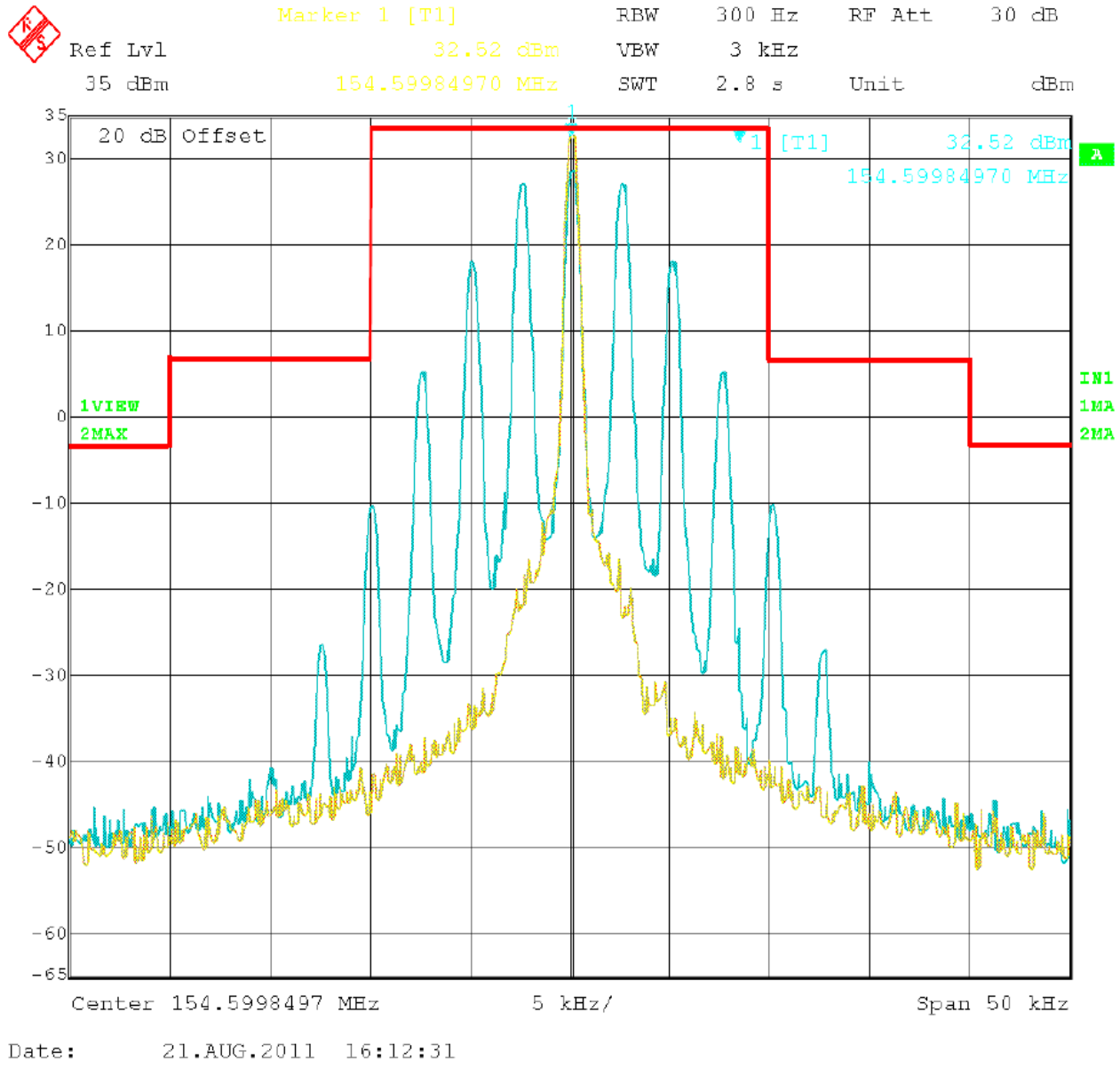
4.2.2 Emission Mask

Modulation Type	Channel Sparation	Test Frequency	FCC Applicable Mask	RBW
FM	25KHz	154.6000 MHz	2	300Hz
Test Results		Compliance		

Plots of Emission Mask Measurement

Referred as the attached plot hereinafter
Note: The yellow curve represents unmodulated signal.
The green curve represents modulated signal.

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	25 KHz	154.6000	2	300Hz	2.5	Complicance



25 kHz Channel Spacing, 154.6000 MHz, 2500 Hz Audio Modulation Only

4.3. Transmitter Radiated Spurious Emssion

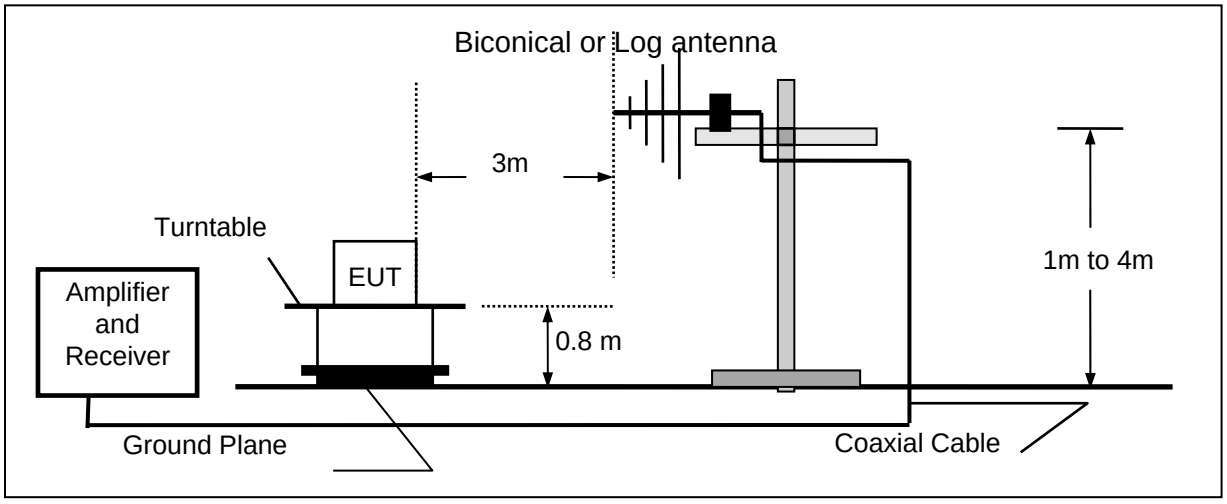
TEST APPLICABLE

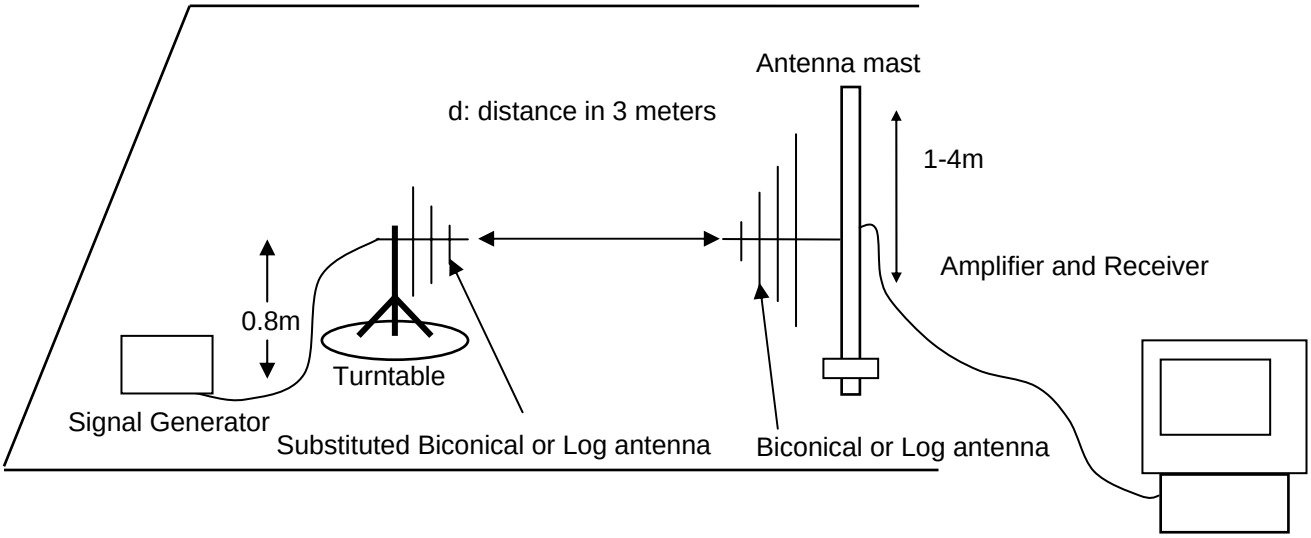
According to the TIA/EIA 603 test method, and according to Section 95.635, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

(a). for transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
(1) On any frequency from the center of the authorized bandwidth foto 5.625 kHz removed from fo: Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least 7.27(fd-2.88 kHz) dB.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 12.5 kHz: at least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
(b). Emission Mask 2: For transmitters that are equipped with an audio low-pass filter pursuant to §95.635(e), the power of any emission must be below the unmodulated carrier power (P) as follows:
(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.
(c). Emission Mask 3, For transmitters designed to operate with a 25 kHz chan-nel bandwidth that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:
(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 5 kHz, but not more than 10 kHz: at least 83 log (fd/5) dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 10 kHz, but not more than 250 percent of the authorized band-width: at least 29 log (fd2/11) dB or 50 dB, whichever is the lesser attenu-ation.
(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the author-ized bandwidth: at least 43 + 10 log (P) dB.

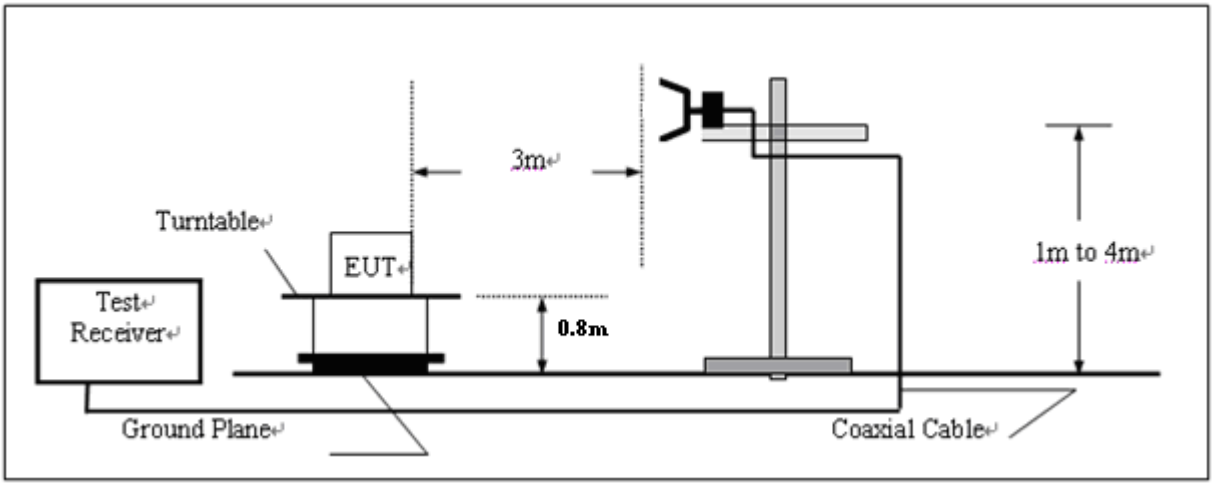
TEST CONFIGURATION

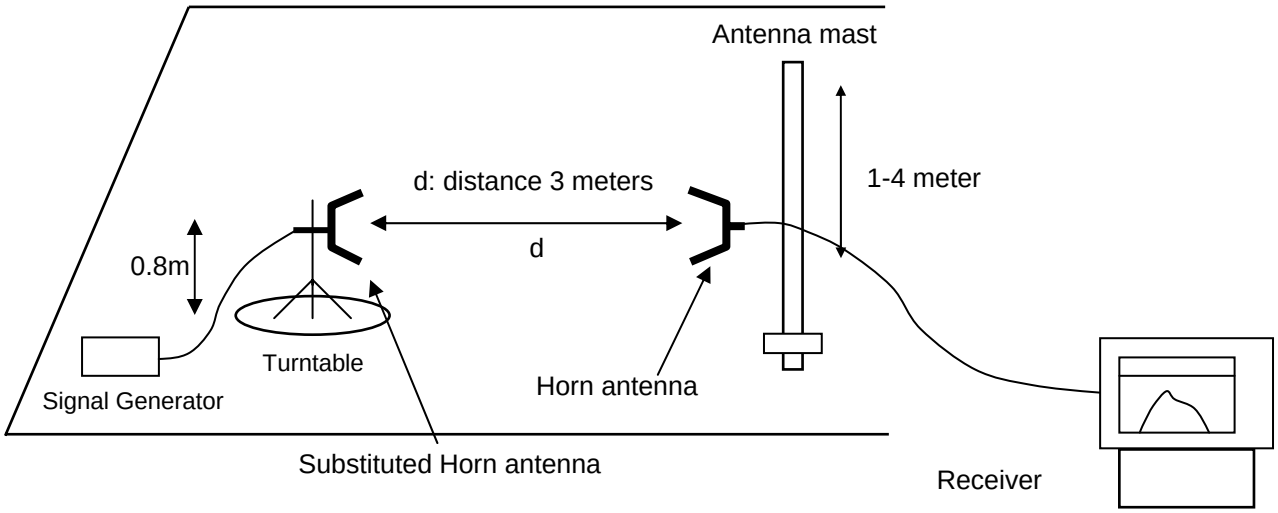
Below 1GHz





Above 1GHz





TEST PROCEDURE

1 On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
2 The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.

3 The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as in dicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4 The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5 The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
6 The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7 The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
8 The maximum signal level detected by the measuring receiver shall be noted.
9 The measurement shall be repeated with the test antenna set to horizontal polarization.
10 Replace the antenna with a proper Antenna (substitution antenna).
11 The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
12 The substitution antenna shall be connected to a calibrated signal generator.
13 If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
14 The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
15 The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
16 The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
17 The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization

TEST RESULTS

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211, 90.210, 95.635 and RSS Gen, RSS 119 Issue 11 (25 kHz bandwidth only):
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 25 kHz at least:
Low: 50 + 10 log (Pwatts) = 43+ 10 log (1.99) =45.98 dB
High: 50 + 10 log (Pwatts) = 43+ 10 log (1.99) =45.98 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 33.01 dBm.
Limit (dBm) =33.01-43-10log10 (1.99) = -13 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 2 GHz.
3. *** means that the emission level is too low to be measured or at least 20 dB down than the limit.

Test Channel		Low Channel		Test Frequency		154.6000 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
309.2000	60.42	Peak	H	250	236	-36.71	-13	23.71
618.4000	57.22	Peak	H	100	138	-39.34	-13	26.34
773.0000	50.45	Peak	H	100	100	-47.55	-13	34.55
…	…		H					
463.8000	50.68	Peak	V	124	312	-46.19	-13	33.19
618.4000	63.93	Peak	V	108	46	-32.18	-13	19.18
773.0000	53.32	Peak	V	100	110	-43.45	-13	30.45
…	…		V			…		

4.4. Spurious Emssion on Antenna Port

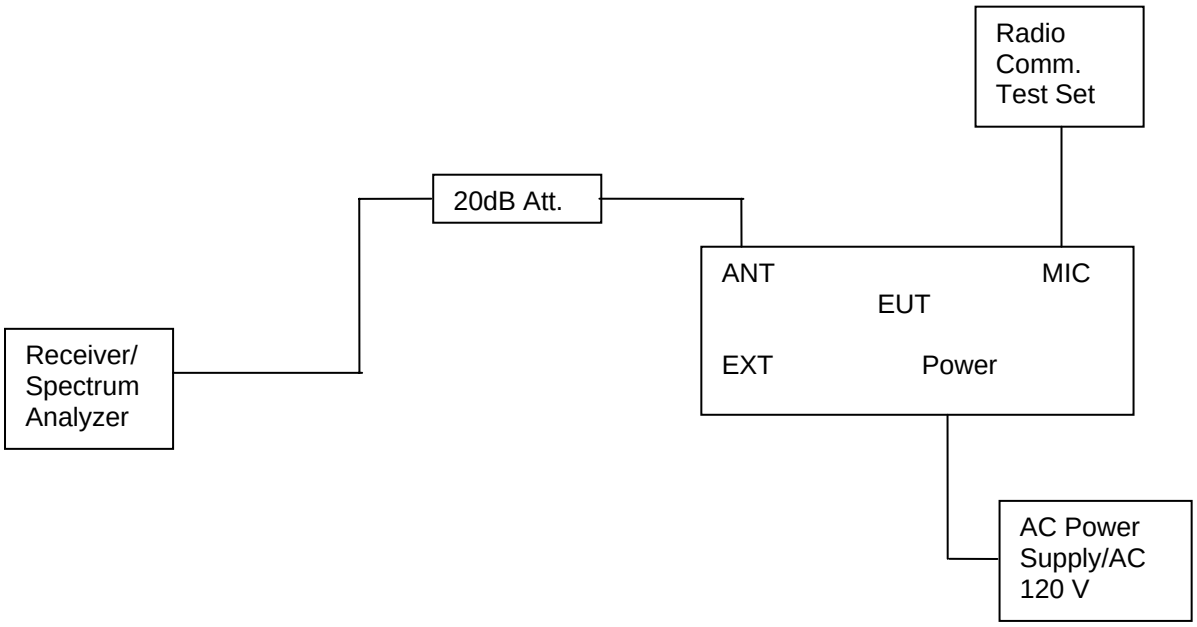
TEST APPLICABLE

The same as Section 4.3

TEST PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10^{th} Harmonic.
The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST CONFIGURATION



TEST RESULTS

Modulation Type: FM

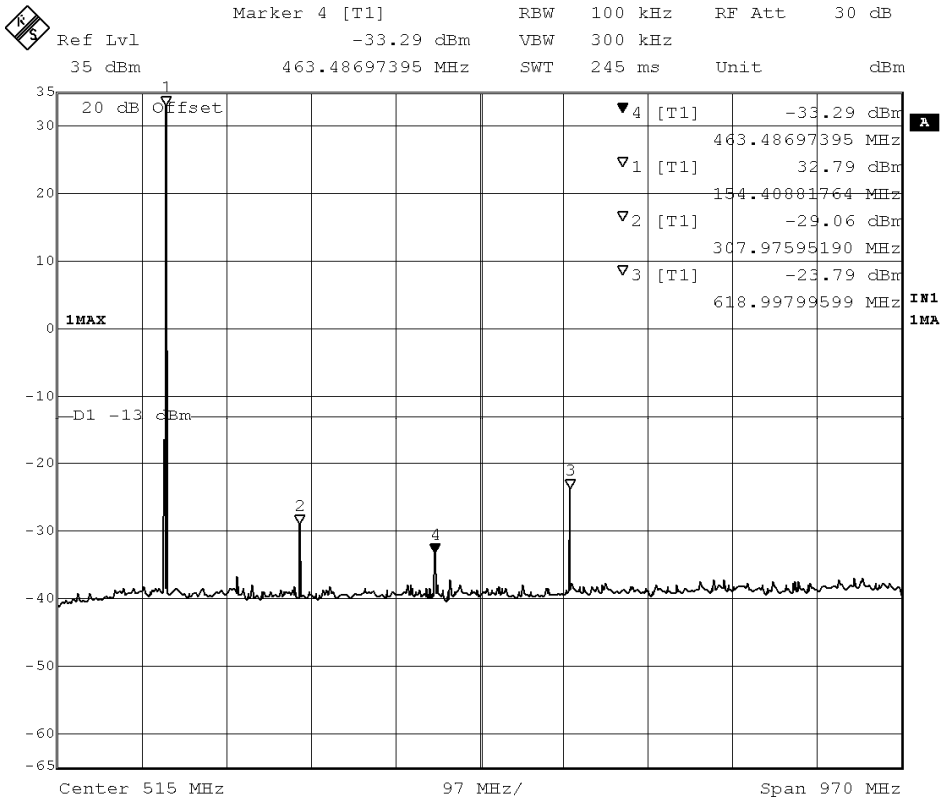
FCC Part 22.359, 74.462, 80.211, 90.210, 95.635 and RSS Gen, RSS 119 Issue 11 (25 kHz bandwidth only):
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 25 kHz at least:
Low: 50 + 10 log (Pwatts) = 43+ 10 log (1.99) =45.98 dB
High: 50 + 10 log (Pwatts) = 43+ 10 log (1.99) =45.98 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)

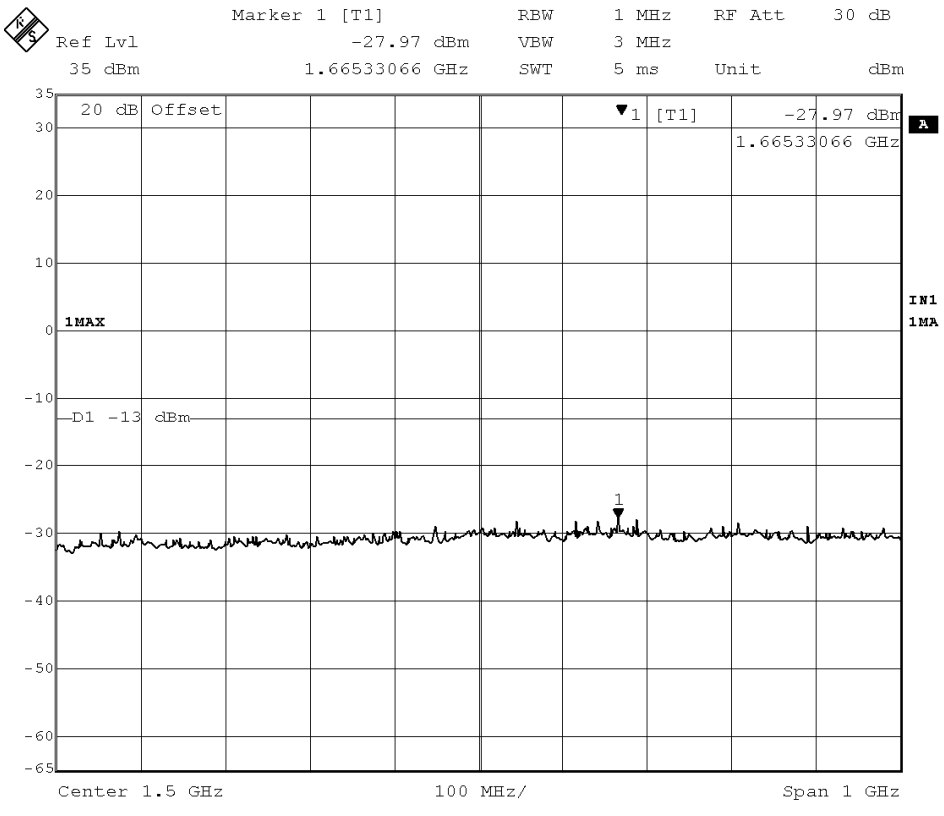
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 33.01 dBm.
Limit (dBm) =33.01-43-10log10 (1.99) = -13 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30MHz to 2GHz.

Modulation Type	Channel Sparation	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
			Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	25KHz	154.6000	618.70	-23.79	1665.33	-27.97	-13dBm
Test Results			Compliance				

Plots of Spurious Emission on Antenna Port Measurement





4.5. Frequency Stability Test

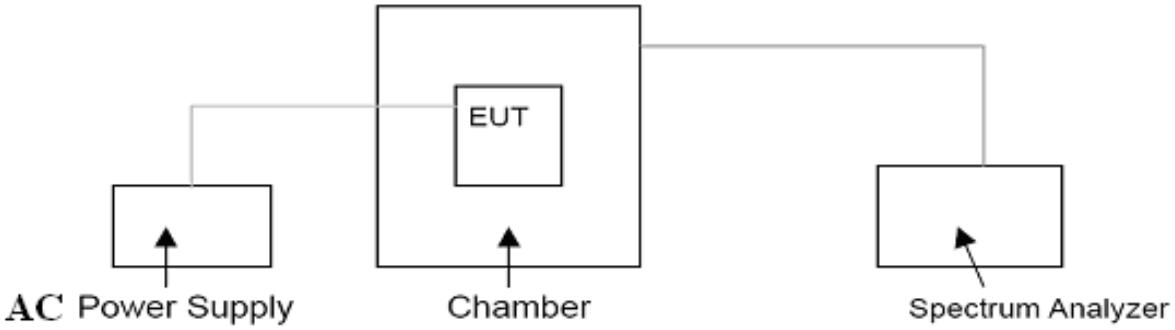
TEST APPLICABLE

1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃ centigrade.
2 According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3 Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
4 According to §95.632, MURS transmitters must maintain a frequency stability of 5.0 ppm, or 2.0 ppm if designed to operate with a 6.25 kHz bandwidth.

TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external AC power supply. The RF output was directly connected to Spectrum Analyzer ESI 26. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST CONFIGURATION



TEST LIMITS

According to 95.632, Transmitters used must have minimum frequency stability as specified in the following table.

MURS transmitters must maintain a frequency stability of 5.0 ppm, or 2.0 ppm if designed to operate with a 6.25 kHz bandwidth.

TEST RESULTS

Modulation Type	Channel Separation	Test conditions		Frequency error (ppm)
		Voltage(V)	Temp(℃)	
Analog/FM	25KHz	120V	-30	1.71
			-20	1.54
			-10	1.32
			0	1.20
			10	1.12
			20	0.97
			30	0.97
			40	1.32
			50	1.23
		102V (85% Rated)	20	1.12
		138V (115% Rated)	20	1.20
Limit			5.0 ppm	
Conclusion			Complies	

4.6. Maximum Transmitter Power

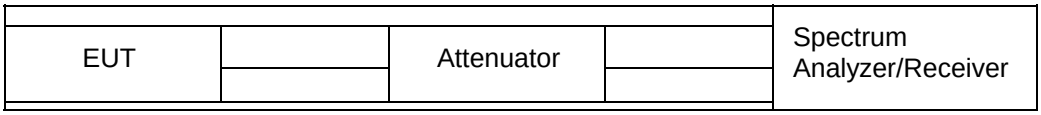
TEST APPLICABLE

Per FCC «2.1046 and «95.639(h): No MURS unit, under any condition of modulation, shall exceed 2 Watts transmitter power output.

TEST PROCEDURE

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted bellow:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.
The EUT connect to the Receiver through 20 dB attenuator.
Measurement with Spectrum Analyzer ESI 26 conducted, external power supply with AC 120V/60Hz stabilized supply voltage.

TEST CONFIGURATION



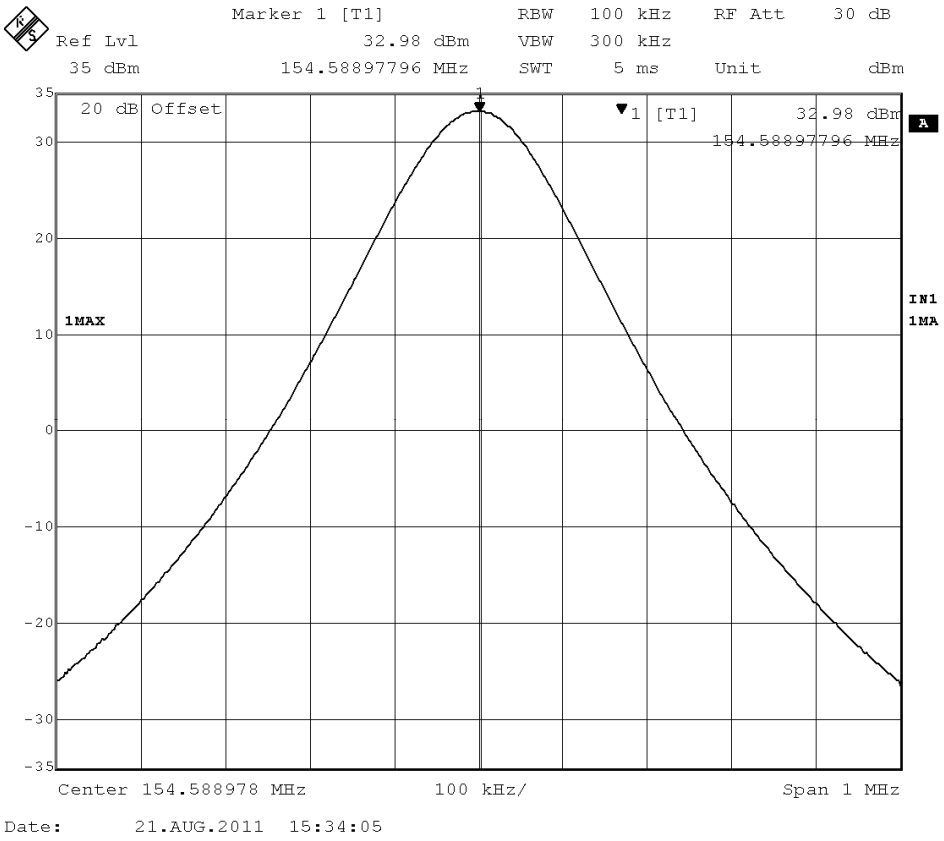
The EUT was directly connected to a RF Communication
Test set by a 20 dB attenuator

TEST RESULTS

Modulation Type	Channel Separation	Test Channel	Test Frequency	Output Power Test Results (dBm)
Analog/FM	25KHz	One Channel	154.6000	32.98
Limit	Not exceed 2 Watts			
Test Results	Complicance			

Plots of Maximum Transmitter Power Measurement

Modulation Type	Channel Separation	Frequency (MHz)	Measurement (dBm)	FCC Limit (dBm)	Results
FM	25KHz	154.6000	32.98	33.01	Cpmplicance



4.7. Receiver Radiated Spurious Emssion

TEST APPLICABLE

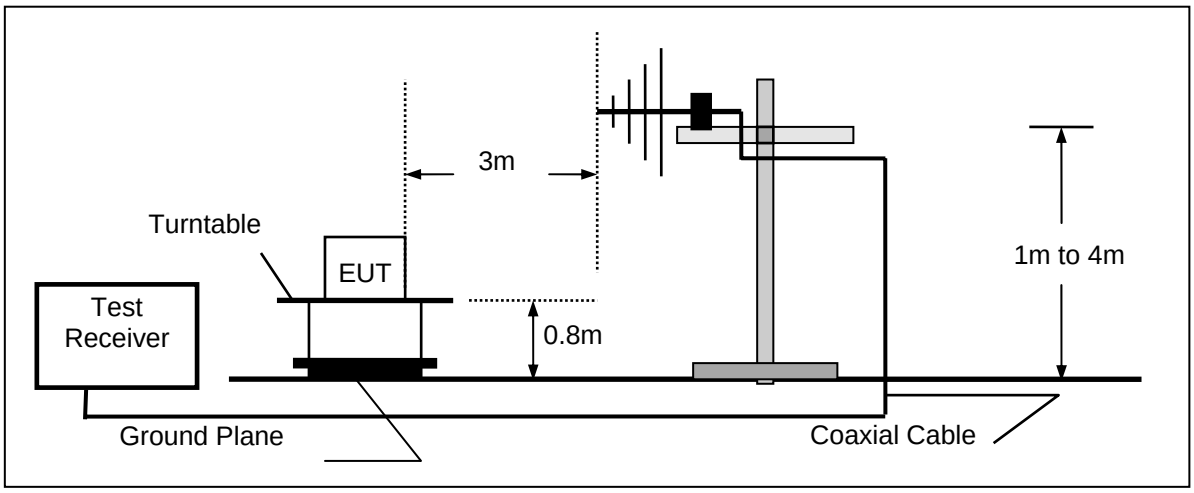
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

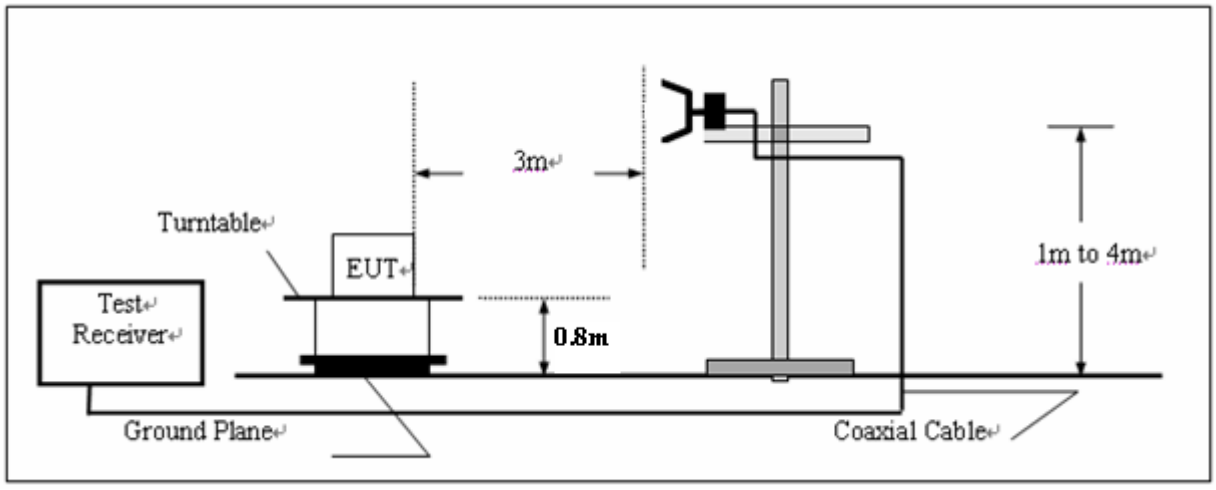
Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4 Repeat above procedures until all frequency measurements have been completed.

RECEIVER RADIATED SPOUIOUS LIMIT

For unintentional device, according to § 15.109(a) and RSS-Gen, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

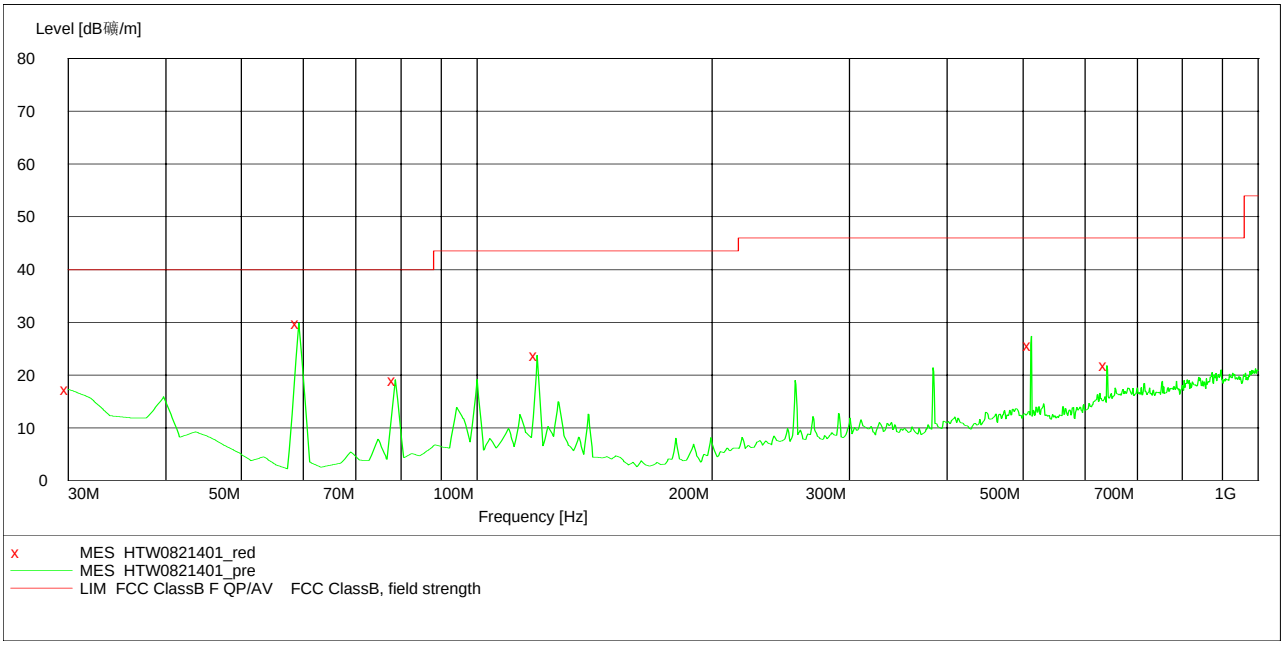
TEST RESULTS

The Radiated Measurement are performed to the one channels, shall be scanned from 30 MHz to the 5th harmonic of the highest oscillator frequency in the digital devices or 1 GHz whichever is higher.

Modulation Type	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
FM	25 KHz	154.6000	H	383.79	30.10	46.00
			V	59.16	29.80`	40.00
Test Results			Compliance			

SWEEP TABLE: "test (30M-1G)"

```
Short Description:           Field Strength
Start      Stop       Detector  Meas.     IF        Transducer
Frequency  Frequency            Time      Bandw.
30.0 MHz   1.0 GHz    MaxPeak   Coupled   100 kHz   HL562
```



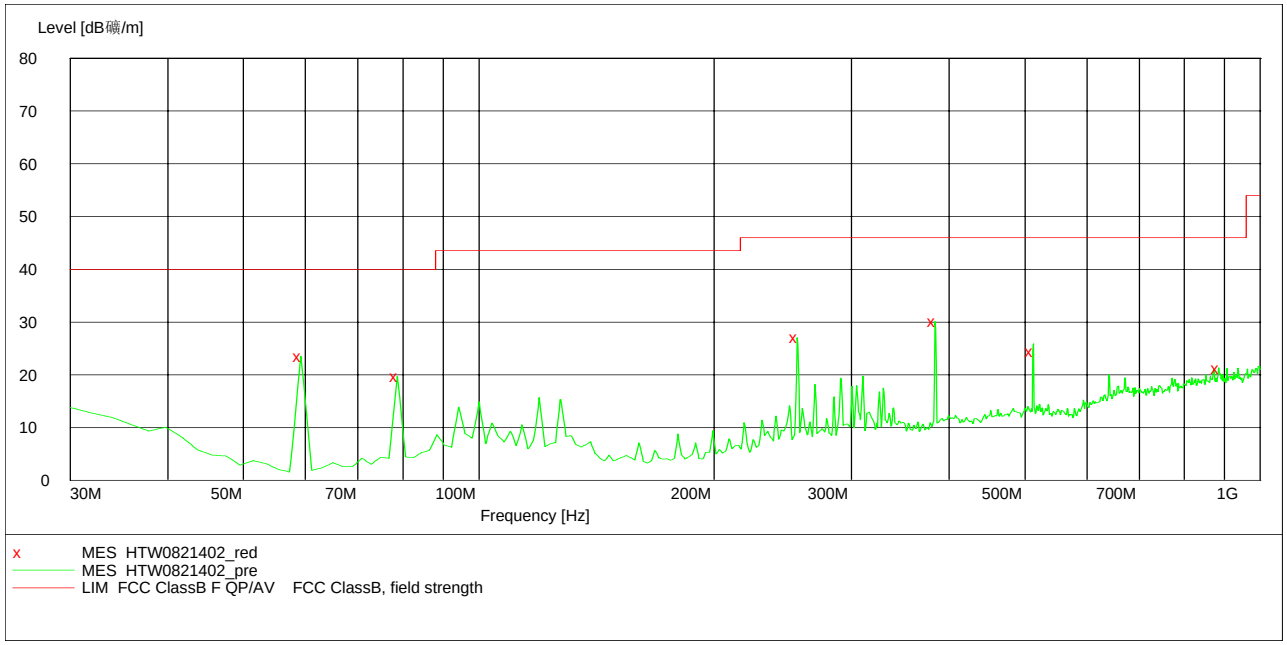
MEASUREMENT RESULT: "HTW0821401_red"

8/21/2011 6:26PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	17.30	-22.2	40.0	22.7	Peak	100.0	219.00	VERTICAL
59.158317	29.80	-35.8	40.0	10.2	Peak	100.0	261.00	VERTICAL
78.597194	19.10	-33.2	40.0	20.9	Peak	100.0	267.00	VERTICAL
119.418838	23.70	-30.4	43.5	19.8	Peak	100.0	207.00	VERTICAL
512.084168	25.70	-24.1	46.0	20.3	Peak	100.0	107.00	VERTICAL
640.380762	21.80	-21.7	46.0	24.2	Peak	100.0	196.00	VERTICAL

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	HL562



MEASUREMENT RESULT: "HTW0821402_red"

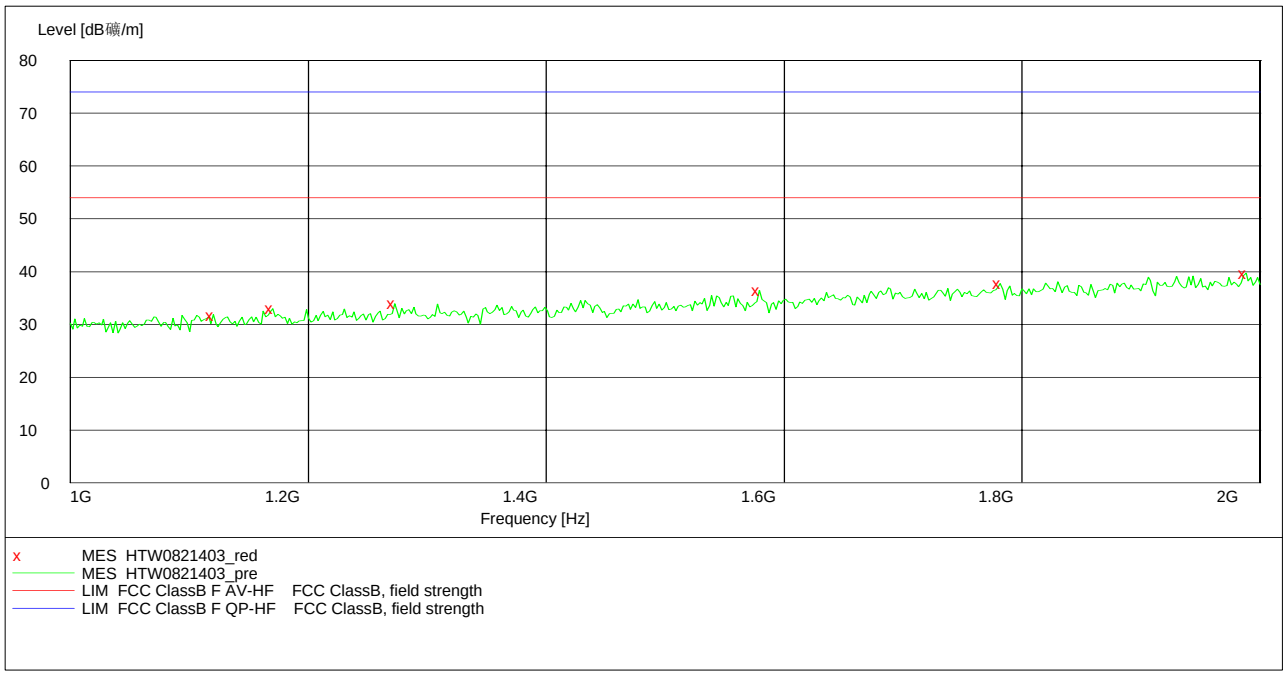
8/21/2011 6:29PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
59.158317	23.60	-35.8	40.0	16.4	Peak	300.0	188.00	HORIZONTAL
78.597194	19.70	-33.2	40.0	20.3	Peak	300.0	223.00	HORIZONTAL
255.490982	27.00	-29.3	46.0	19.0	Peak	100.0	83.00	HORIZONTAL
383.787575	30.10	-27.0	46.0	15.9	Peak	100.0	41.00	HORIZONTAL
512.084168	24.50	-24.1	46.0	21.5	Peak	100.0	59.00	HORIZONTAL
885.310621	21.30	-18.3	46.0	24.7	Peak	100.0	338.00	HORIZONTAL

Modulation Type	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
FM	25 KHz	154.6000	H	1987.98	39.70	54.00
			V	1987.98	39.50	54.00
Test Results			Compliance			

SWEEP TABLE: "test (1G-18G) P"

```
Short Description:            EN 55022 Field Strength
Start      Stop       Detector  Meas.     IF        Transducer
Frequency  Frequency            Time      Bandw.
1.0 GHz    18.0 GHz   MaxPeak   Coupled   1 MHz     HF906 2011
```



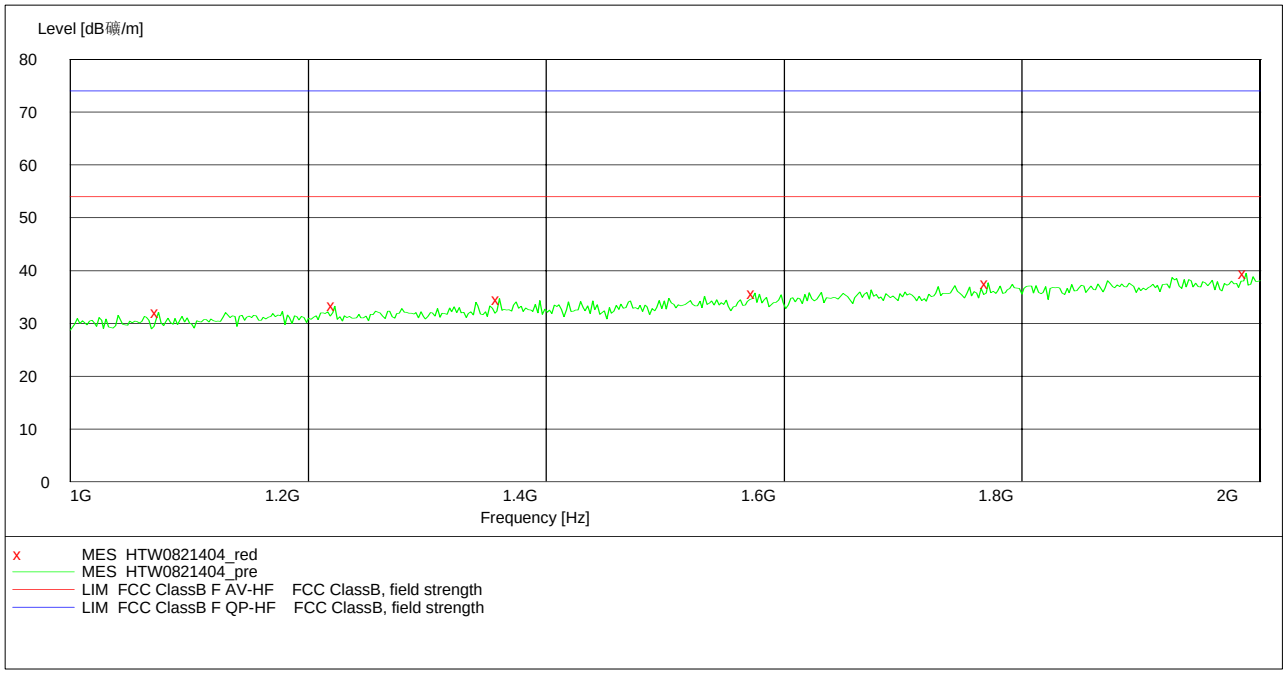
MEASUREMENT RESULT: "HTW0821403_red"

8/21/2011 6:32PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1120.240481	31.80	-8.7	54.0	22.2	Peak	100.0	189.00	HORIZONTAL
1170.340681	33.00	-8.3	54.0	21.0	Peak	100.0	295.00	HORIZONTAL
1272.545090	33.90	-7.5	54.0	20.1	Peak	100.0	270.00	HORIZONTAL
1579.158317	36.50	-5.2	54.0	17.5	Peak	100.0	136.00	HORIZONTAL
1781.563126	37.80	-3.2	54.0	16.2	Peak	100.0	346.00	HORIZONTAL
1987.975952	39.70	-1.5	54.0	14.3	Peak	100.0	83.00	HORIZONTAL

SWEEP TABLE: "test (1G-18G) P"

Short Description:		EN 55022 Field Strength			
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	HF906 2011



MEASUREMENT RESULT: "HTW0821404_red"

8/21/2011 6:34PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1074.148297	32.10	-9.1	54.0	21.9	Peak	100.0	29.00	VERTICAL
1222.444890	33.30	-7.9	54.0	20.7	Peak	100.0	349.00	VERTICAL
1360.721443	34.60	-6.9	54.0	19.4	Peak	100.0	0.00	VERTICAL
1575.150301	35.80	-5.2	54.0	18.2	Peak	100.0	354.00	VERTICAL
1771.543086	37.70	-3.3	54.0	16.3	Peak	100.0	125.00	VERTICAL
1987.975952	39.50	-1.5	54.0	14.5	Peak	100.0	232.00	VERTICAL

4.8. Receiver Conducted Spurious Emssion

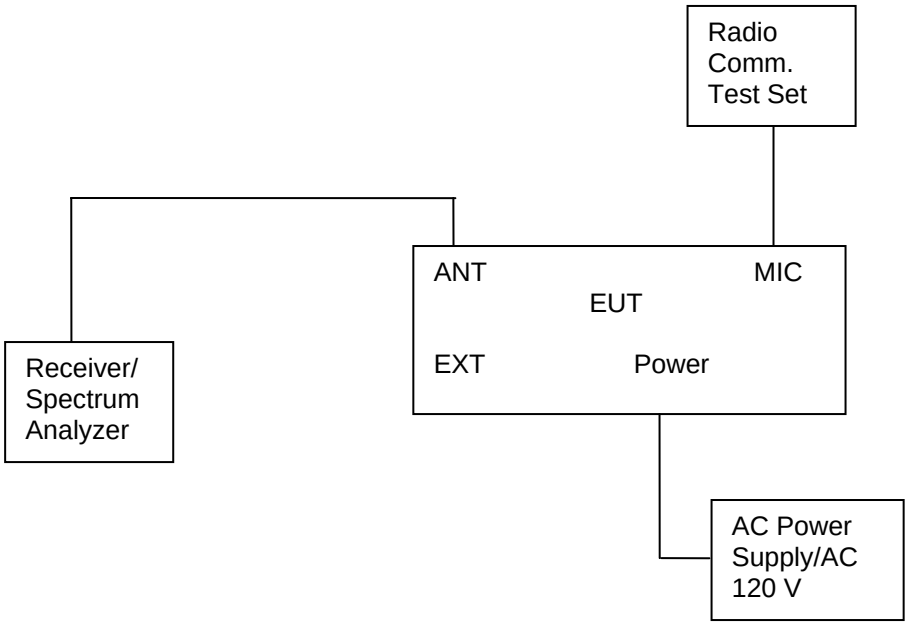
TEST APPLICABLE

The same as Section 4.3

TEST PROCEDURE

The spectrum analyzer was connected to the RF output power of the EUT, the EUT was setup in receiving mode; The RBW of the spectrum analyzer was set to 100 kHz and the VBW set to 300 KHz below the test frequency 1GHz. While the RBW of the spectrum analyzer was set to the 1MHz and VBW set to the 3MHz from 1GHz to the 10^{th} harmonic.

TEST CONFIGURATION



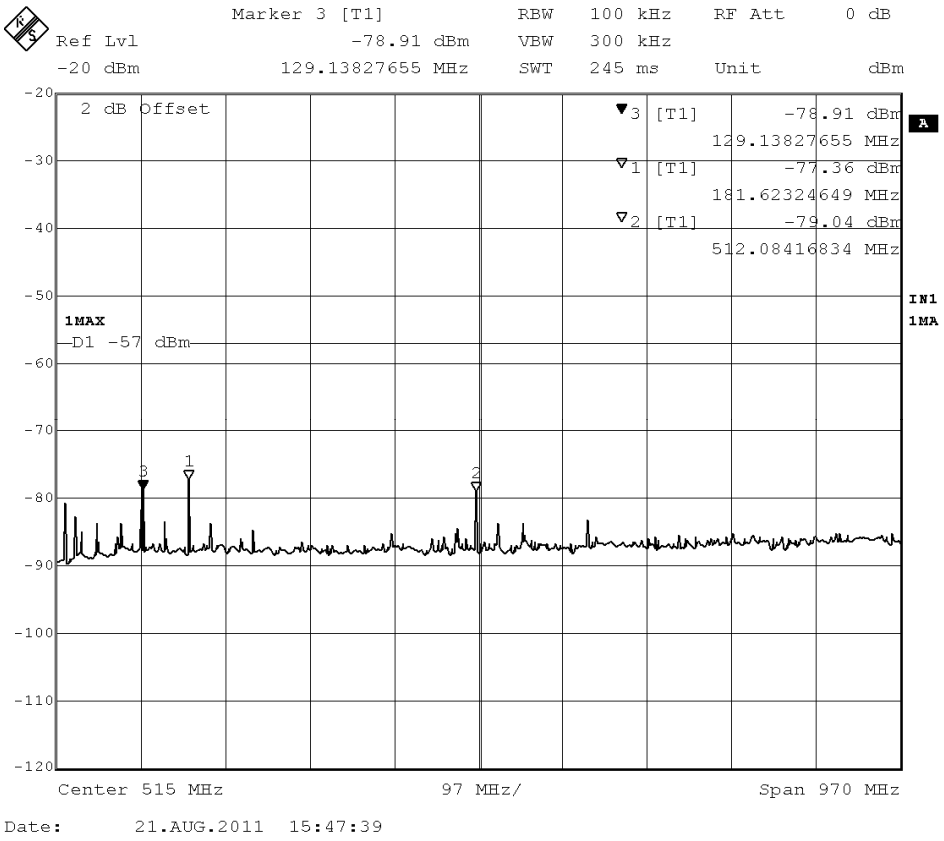
LIMIT

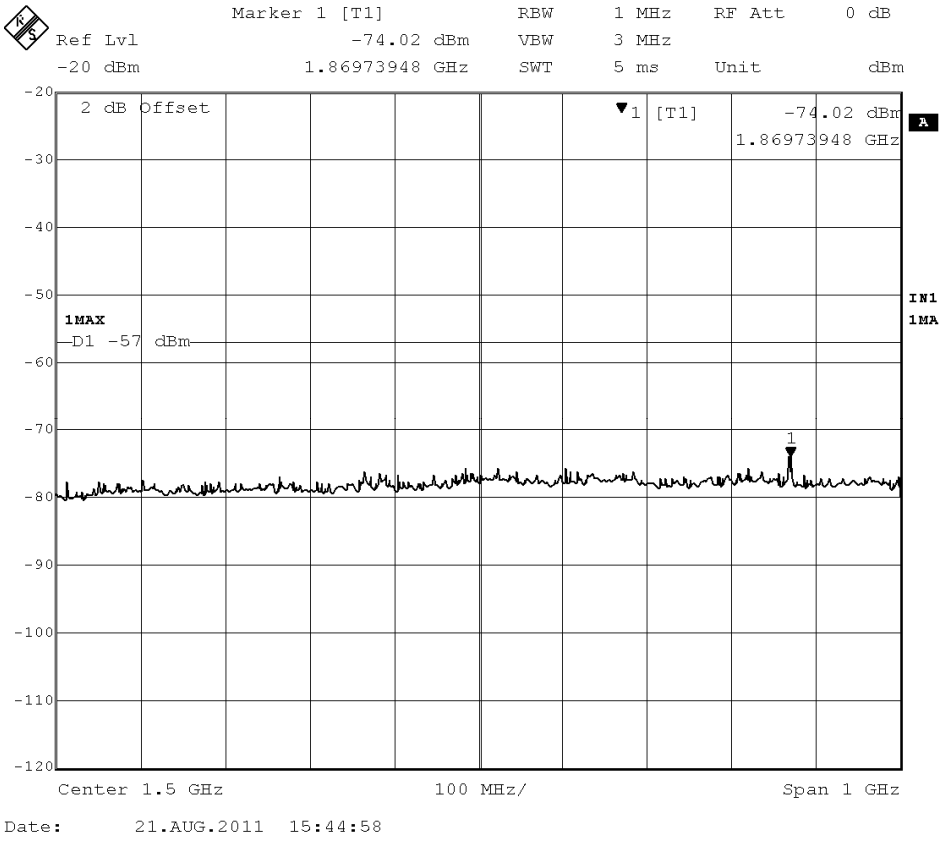
The power at the antenna terminal shall not exceed 2.0 nanowatts (-57dBm).

TEST RESULTS

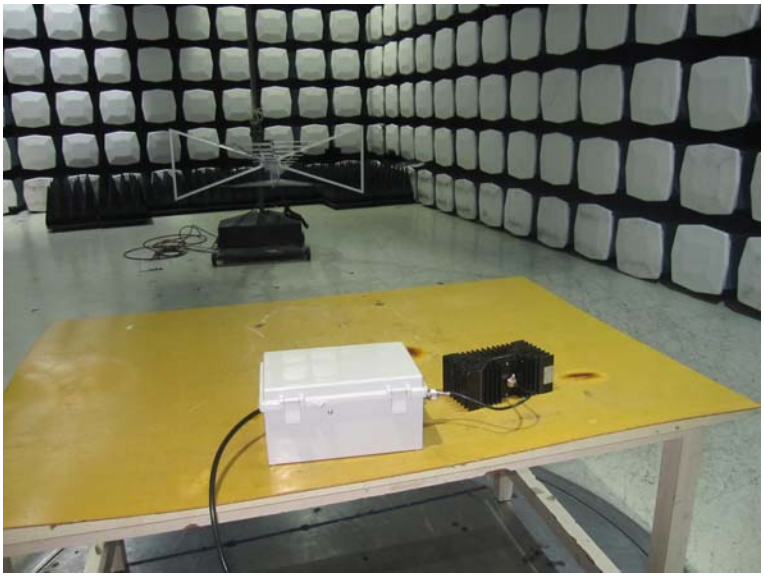
The Receiver Conducted Spurious Emssions Measurement is performed to the one channel, and the EUT shall be scanned from 30 MHz to the 2 GHz.

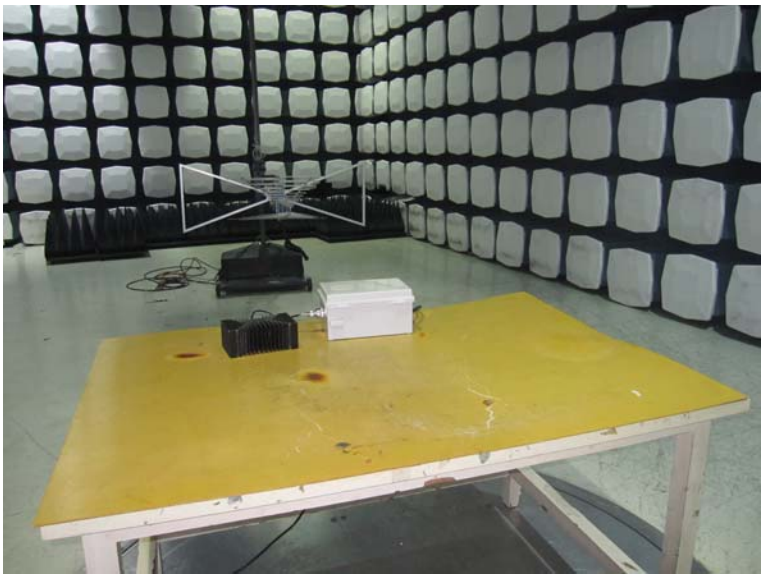
Modulation Type	Channel Sparation	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
			Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	25KHz	154.6000	181.62	-77.36	1869.74	-74.02	-57dBm
Test Results			Compliance				

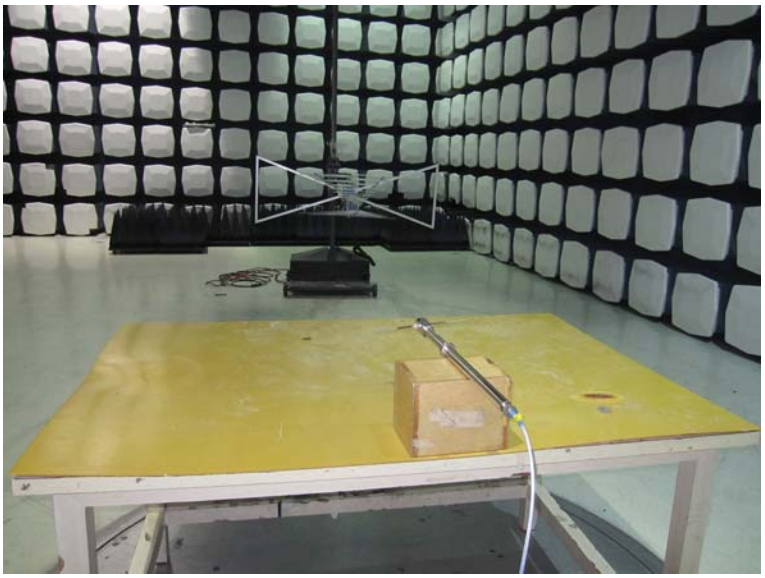


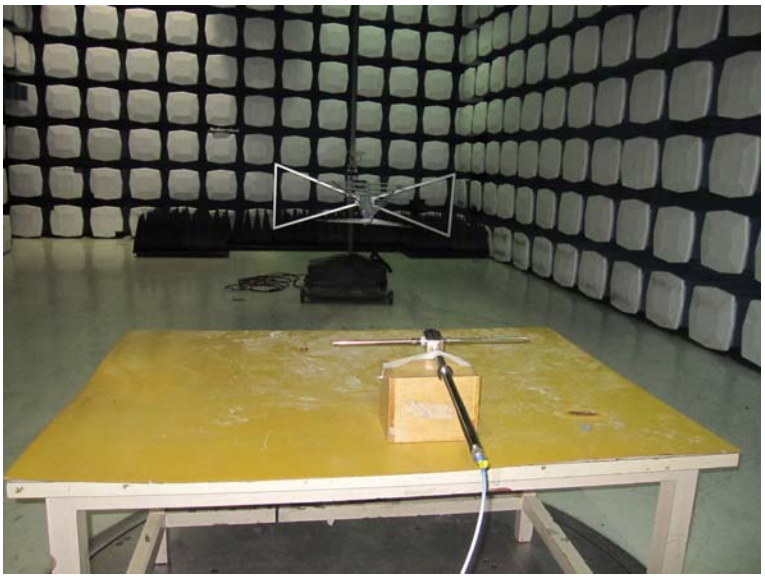


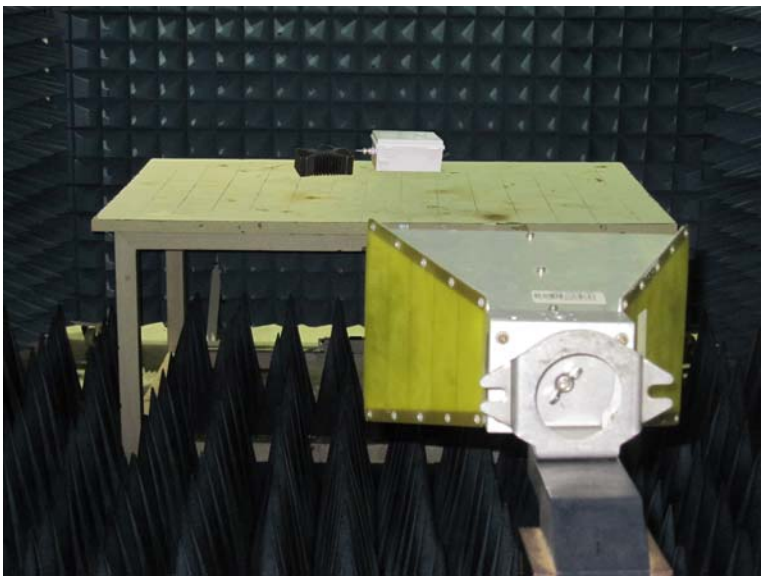
5. Test Setup Photos of the EUT

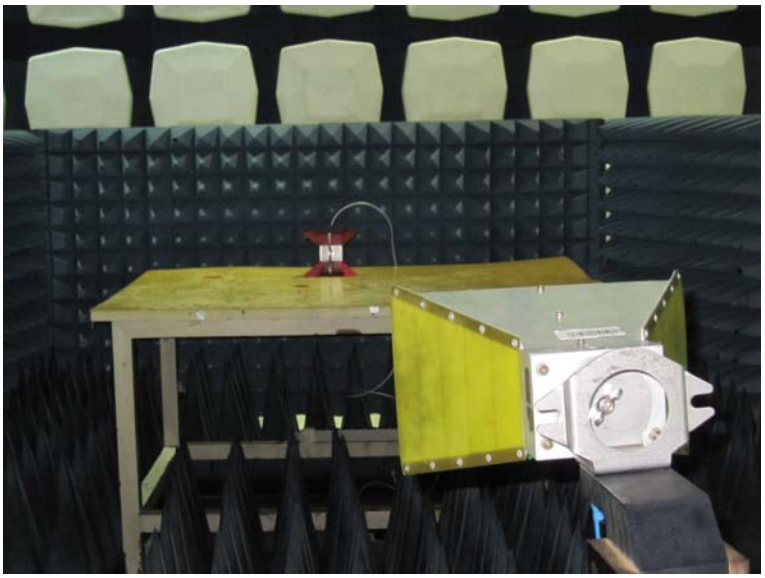


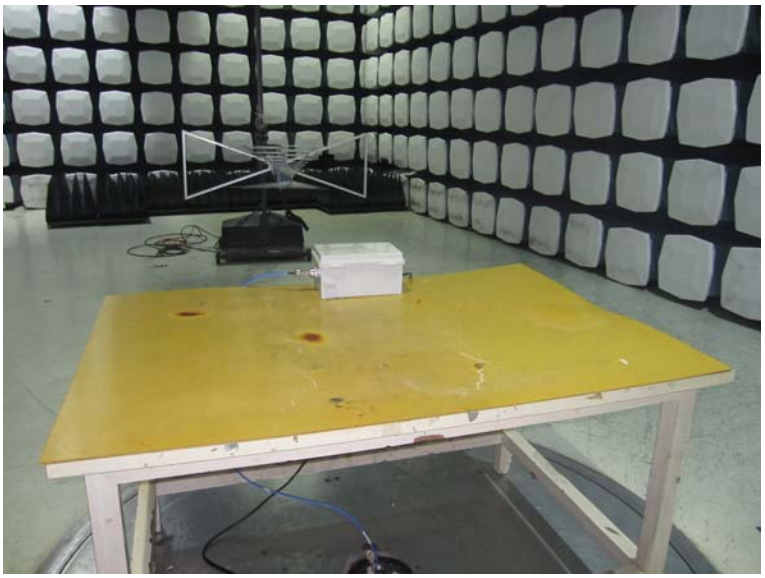


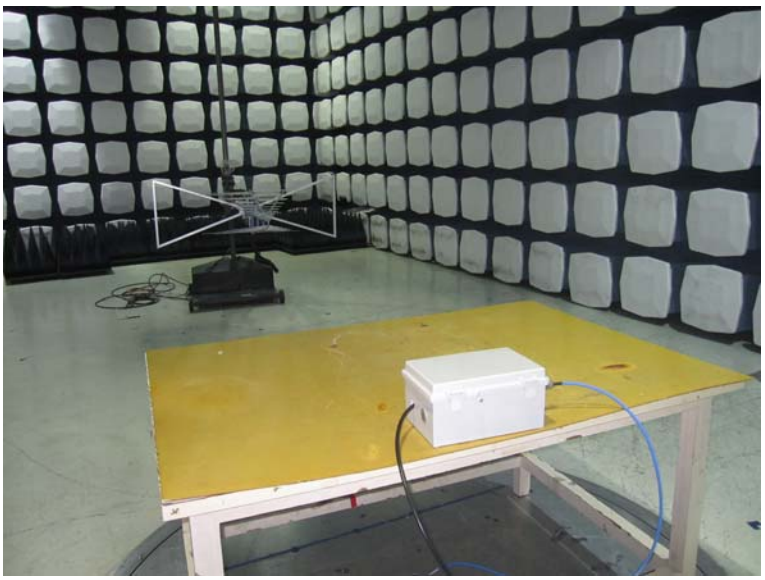


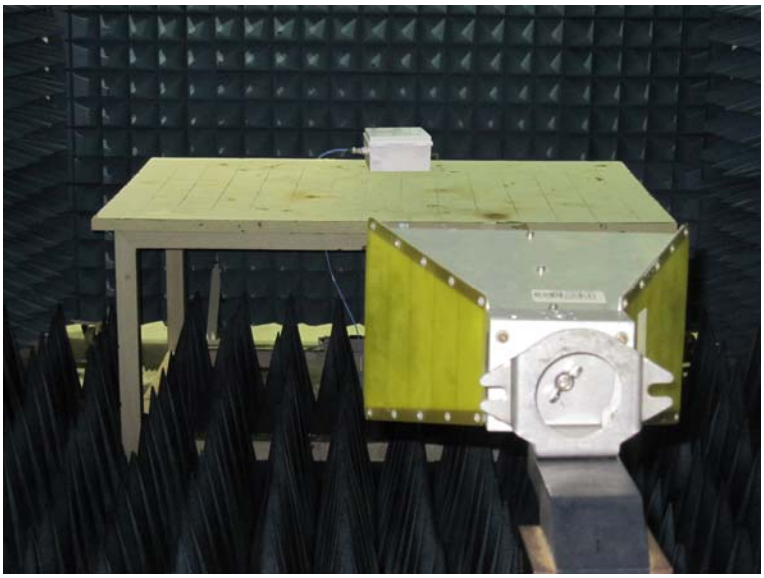








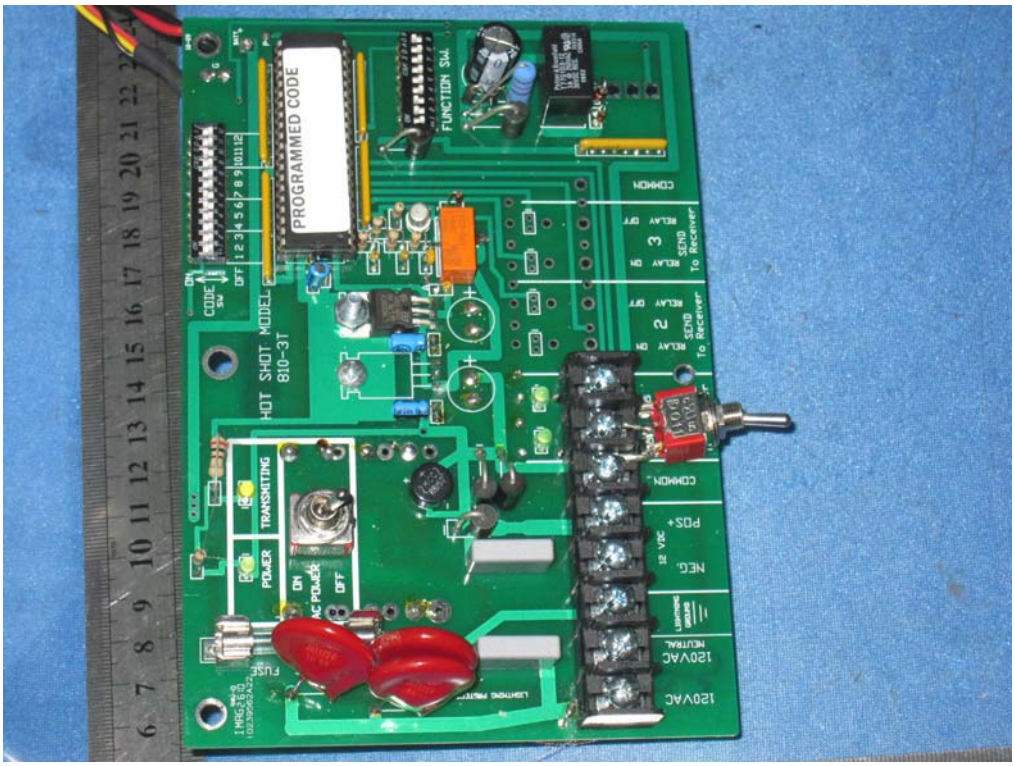


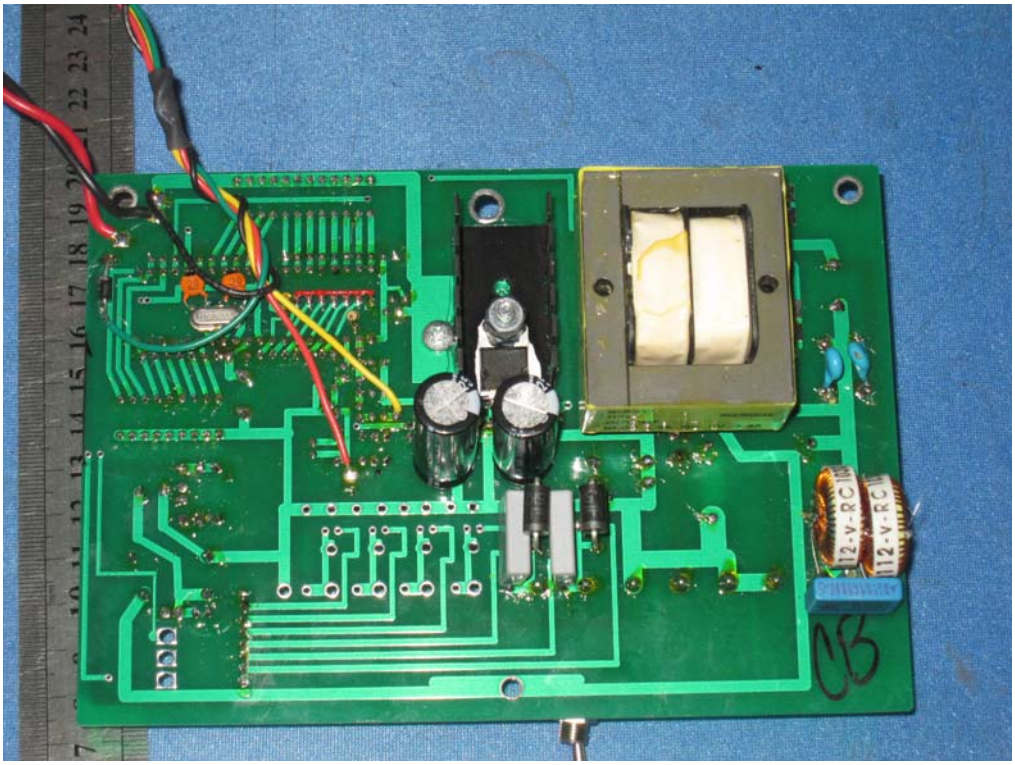


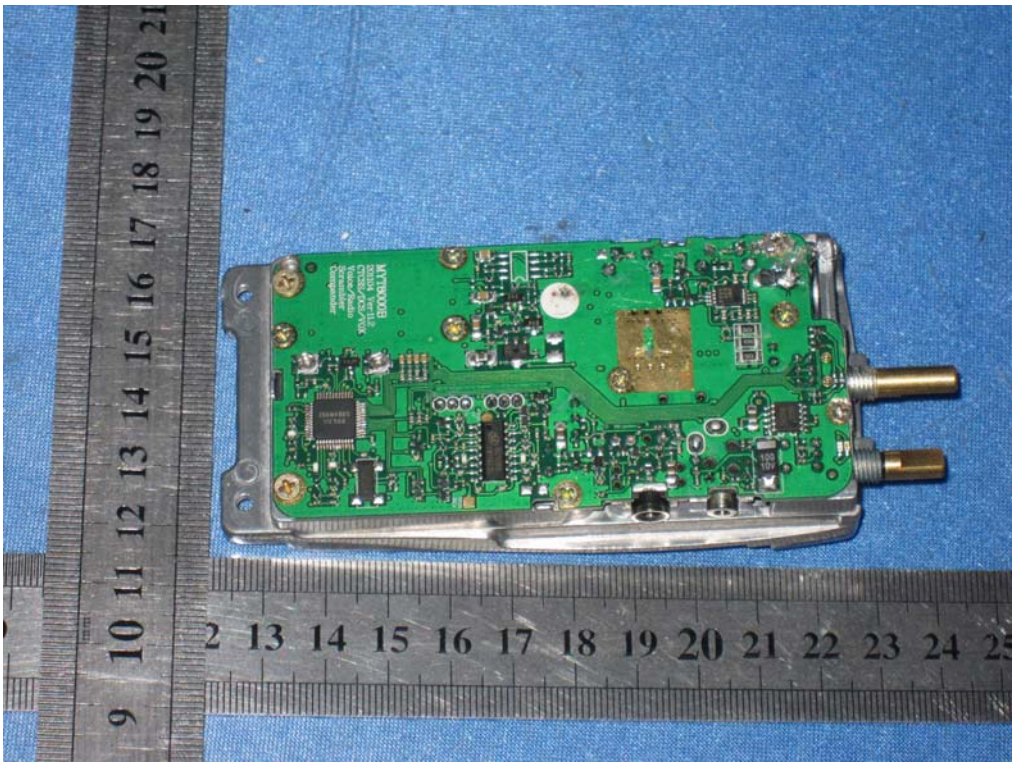
6. External and Internal Photos of the EUT

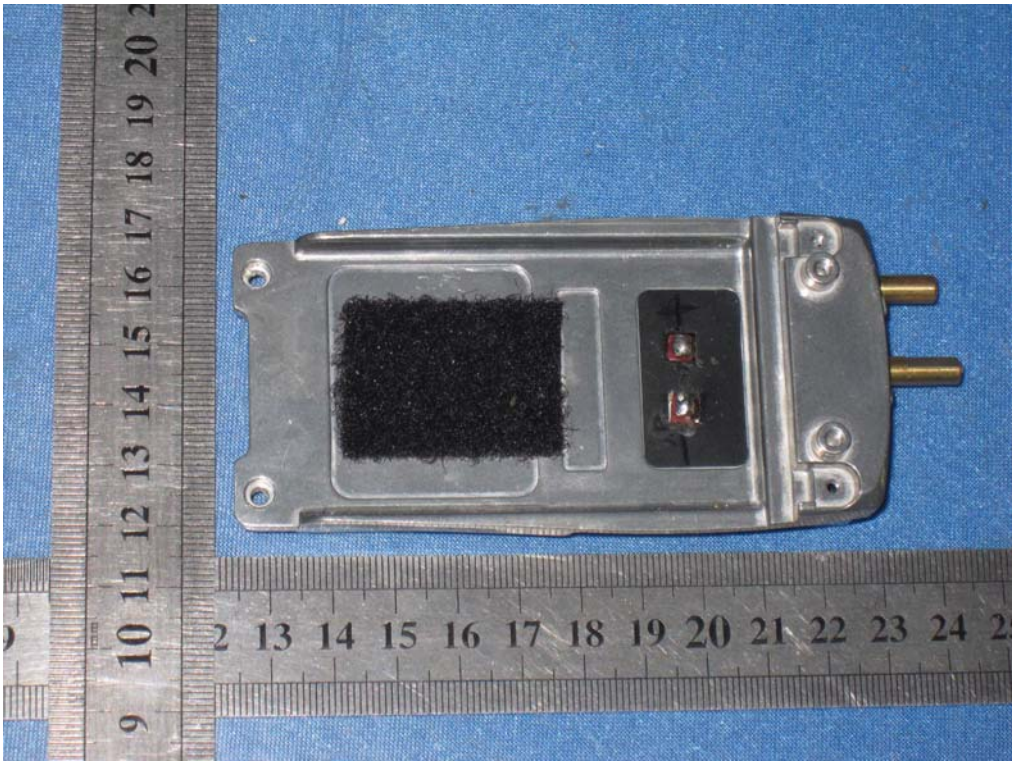
External photos of the EUT

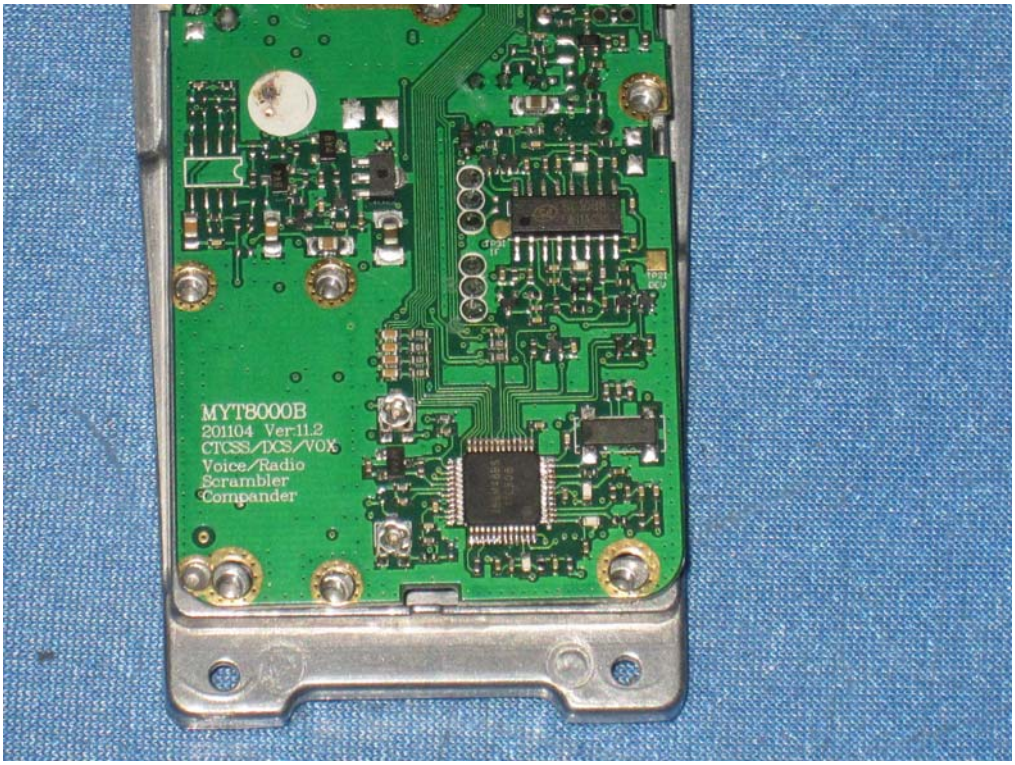
Internal Photos




12-V-RC
12-V-RC



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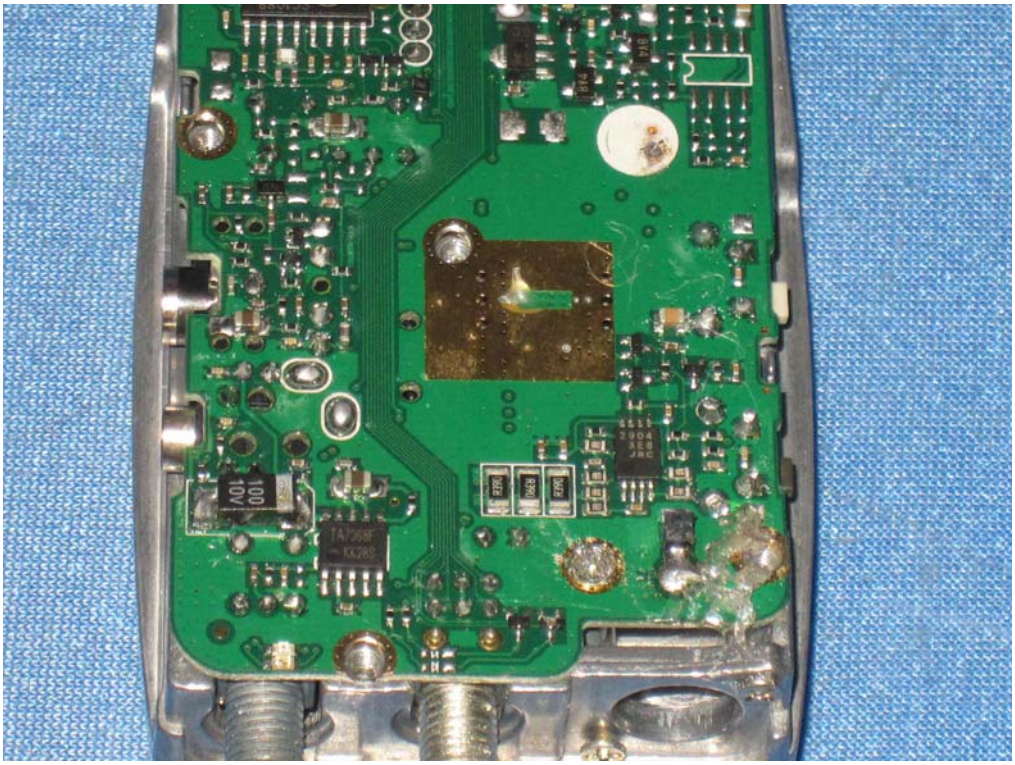
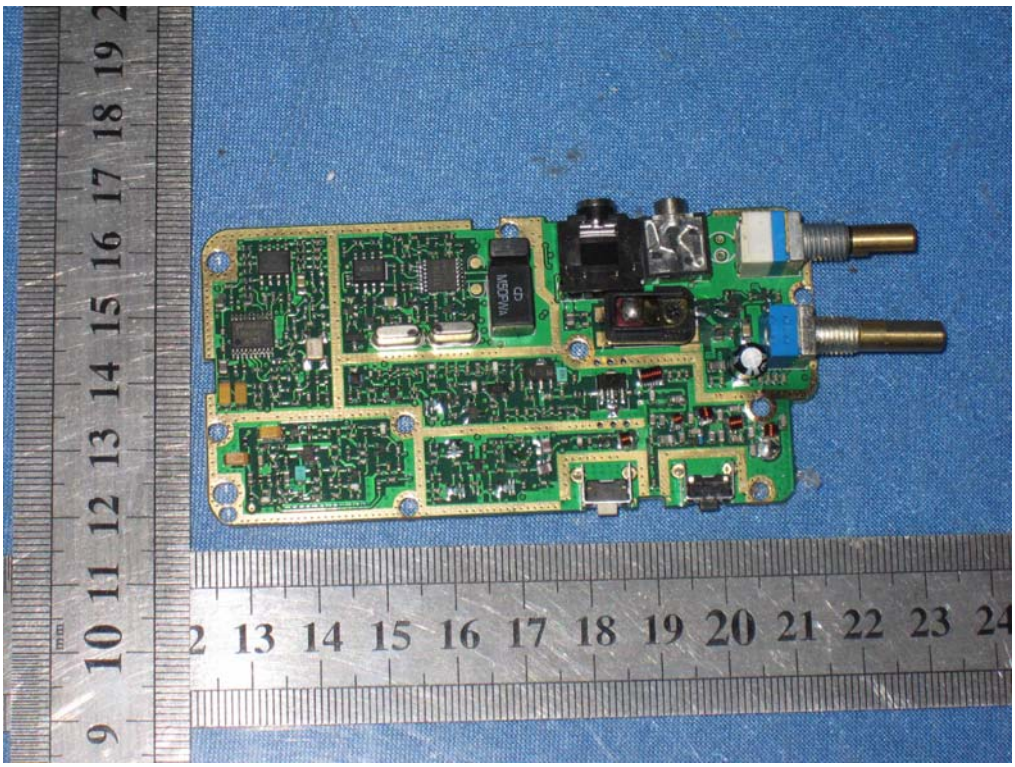
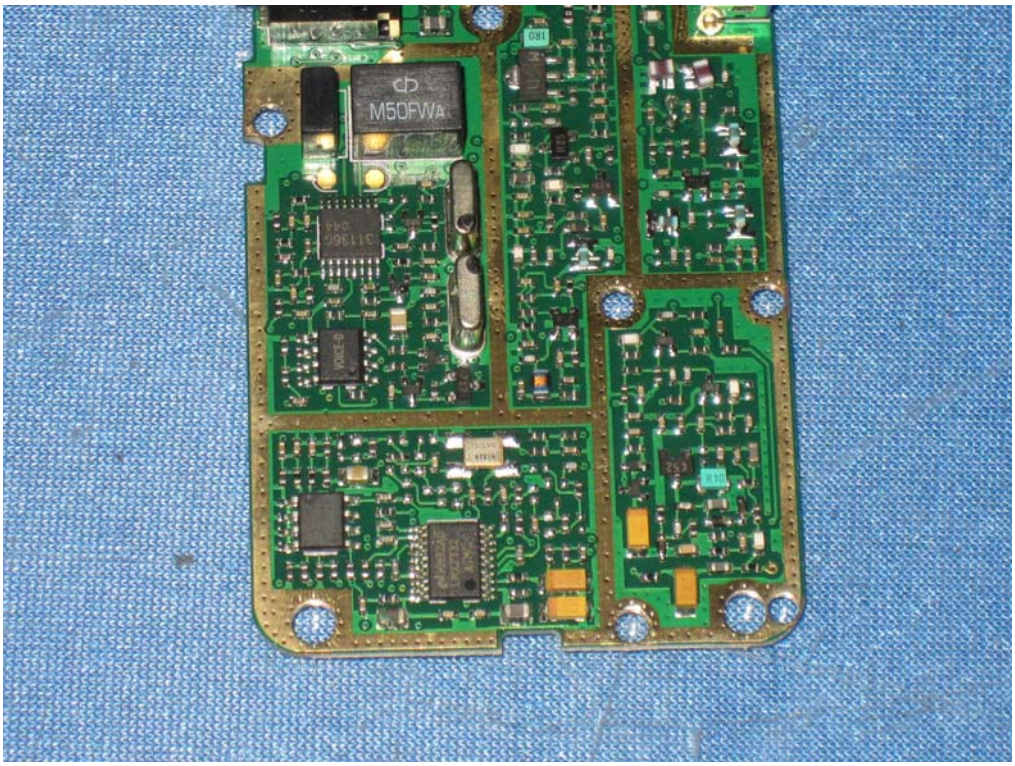
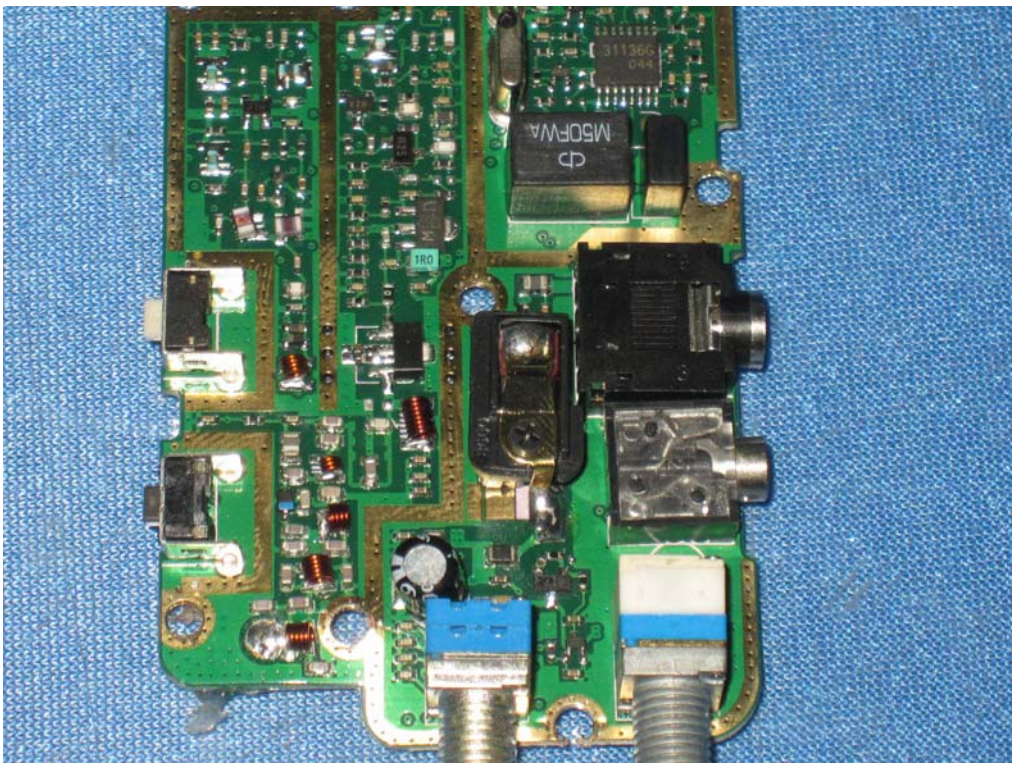
201104 Ver:11.2
CTCSS/DCS/VOX
Voice/Radio
Scrambler
Compander









.....End of Report.....