FCC PART 90 TEST REPORT

FCC Part 90

Report Reference No.....:	**WE11060040**
FCC ID: .....:	**YAM-TM628HU1**
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 15, 2011
Testing Laboratory Name .....:	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address .....:	Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Applicant's name.....:	**Hytera Communications Corporation Ltd.**
Address .....:	HYT Tower,Hi-Tech Industrial Park North,Nanshan District,Shenzhen China.518057
Test specification:	
Standard .....:	**FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES**
TRF Originator.....:	Shenzhen Huatongwei International Inspection CO., Ltd
Master TRF.....:	Dated 2006-06

Test item description .....:	Mobile Radio
Trade Mark .....:	HYT
Manufacturer .....:	**Hytera Communications Corporation Ltd.**
Model/Type reference.....:	TM-628HU(1)
Listed Models .....:	/
Ratings .....:	DC 13.60 V
Modulation .....:	FM
Channel Separation.....	12.5KHz&25KHz
Rated Power	45 Watts(46.53 dBm)/5 Watts(36.99 dBm)
Operation Frequency Range	From 400 MHz to 470 MHz
Result.....:	**Positive**

T E S T R E P O R T

Test Report No. :	WE11060040	Aug 15,2011 Date of issue

Equipment under Test	:	Mobile Radio
Model /Type	:	TM-628HU(1)
Listed Models	:	/
Applicant	:	**Hytera Communications Corporation Ltd.**
Address	:	HYT Tower,Hi-Tech Industrial Park North,Nanshan District,Shenzhen China.518057
Manufacturer	:	**Hytera Communications Corporation Ltd.**
Address	:	HYT Tower,Hi-Tech Industrial Park North,Nanshan District,Shenzhen China.518057

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 90: PRIVATE LAND MOBILE RADIO SERVICES.

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

PART 15 Subpart B: RADIO FREQUENCY DEVICES- Subpart B—Unintentional Radiators

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	June 24, 2011
Testing commenced on	:	June 24, 2011
Testing concluded on	:	Aug 15, 2011

2.2. Product Description

The Hytera Communications Corporation Ltd.'s Model: TM-628HU(1) or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Mobile Radio	
Model Number	TM-628HU(1)	
FCC ID:	YAM-TM628HU1	
Rated Output Power	45 Watts(46.53dBm)/ 5 Watts(36.99 dBm)	
Modilation Type	FM for Analog Voice	
Emission Designator	Analog	11K0F3E for 12.5KHz Channel Separation
Channel Separation	Analog Voice	12.5KHz
Antenna Type	External	
Frequency Range	From 400 MHz to 470 MHz	
Maximum Transmitter Power	Analog	46.45 W for 12.5 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)		

DC 13.60V

Test frequency list

Modulation Type	Test Channel	Test Frequency
Analog/FM	Low Channel	400.5000 MHz
	Middle Channel	435.5000 MHz
	High Channel	469.5000 MHz

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

400-470 MHz U frequency band Mobile Radio (TM-628HU(1)).

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) :	3
		Shield :	Unshield
		Detachable :	Undetachble
○	Multimeter	Manufacturer :	/
		Model No. :	/

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

This submittal(s) (test report) is intended for **FCC ID: YAM-TM628HU1** filing to comply with FCC Part 90 Rules

2.9. Modifications

No modifications were implemented to meet testing criteria.

2.10. Note

1. The EUT is is a U frequency band (400-470 MHz) Mobile Radio,The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 90	WE11060040
MPE	FCC OET 65 C	WE11060041

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 24th, 2014.

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, 2014.

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

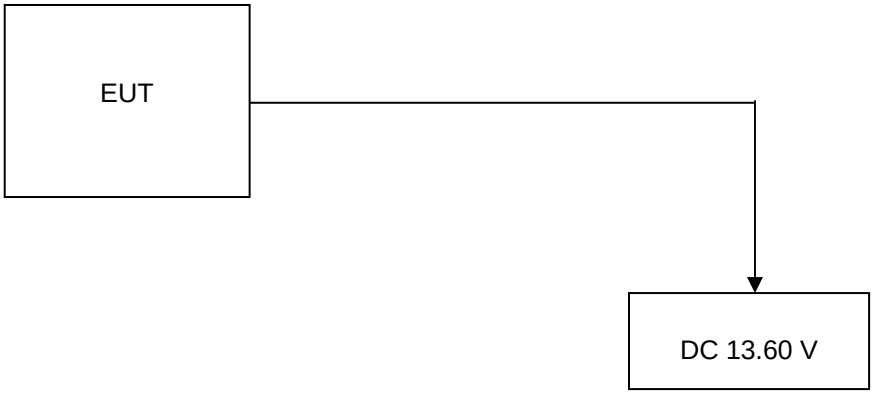


Table 2-1 Equipment Used in Tested System

3.5. Discription of Tested Modes

The EUT (Mobile Radio) has been tested under normal operating condition. Three channels (the high, the middle and the low) are chosen for testing at each channel separation (12.5 KHz).

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 Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 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=2.

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
§ 90.205	Maximum Transmitter Power	Complies
§ 90.207	Modulation Characteristic	Complies
§ 90.209	Occupied Bandwidth	Complies
§ 90.210	Emission Mask	Complies
§ 90.213	Frequency Stability	Complies
§ 90.214	Transmitter Frequency Behavior	Complies
§ 90.210	Transmitter Radiated Spurious Emssion	Complies
§ 90.210	Spurious Emssion On Antenna Port	Complies
§ 2.1091	RF Exposure Evaluation	Complies

3.8. Equipments Used during the Test

DC Power Conducted Emission				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Artificial Mains	Rohde&Schwarz	ESH2-Z6	100210	23/10/2011
Artificial Mains	Rohde&Schwarz	ESH2-Z6	100211	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

Modulation Characteristic				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	19/02/2012

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	19/02/2012

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

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	19/02//2012
High-Pass Filter	Anritsu	MP526B	6220875256	23/10/2011
High-Pass Filter	Anritsu	MP526D	6220878392	23/10/2011

Transient Frequency Behavior				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Signal Generator	Rohde&Schwarz	SMT03	100059	23/10/2011
Storage Oscilloscope	Tektronix	TDS3054B	B033027	23/10/2011
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	19/02//2012

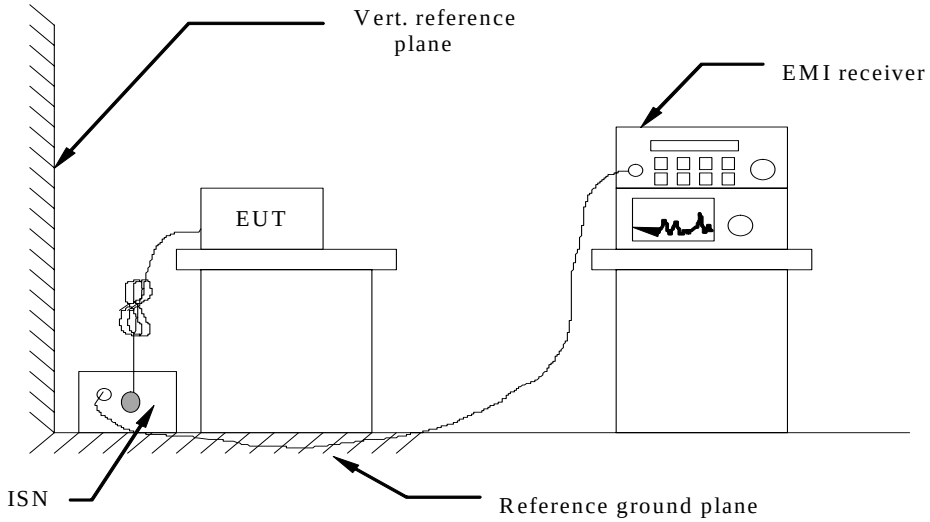
4. TEST CONDITIONS AND RESULTS

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) and RSS-Gen Section 7.2.2 for 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

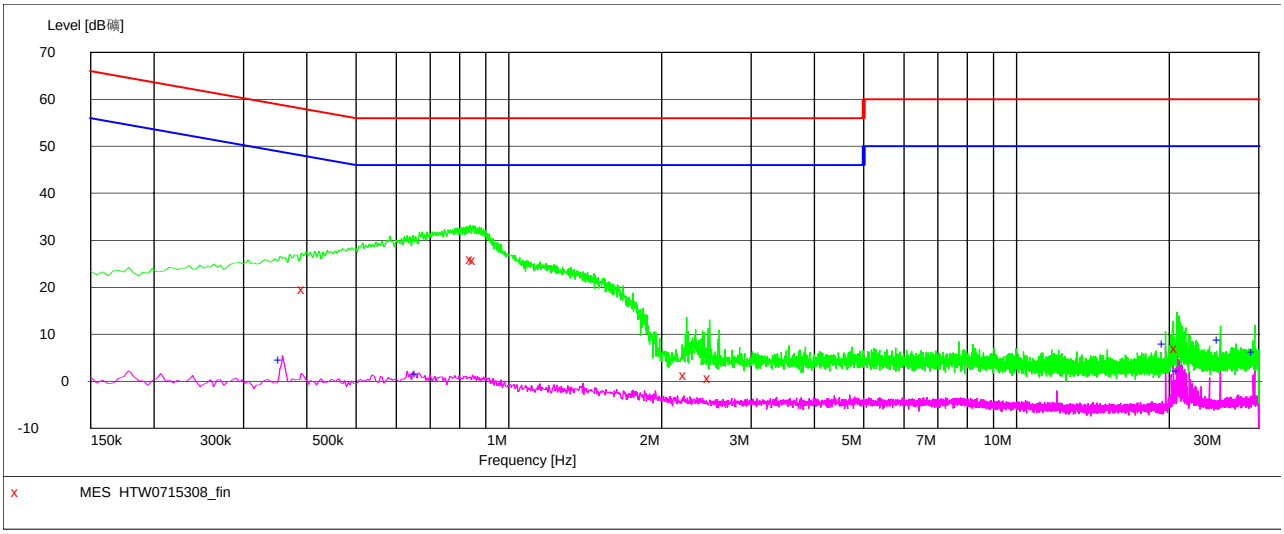
For intentional device, according to §15.207(a) and RSS-Gen Section 7.2.2 for Line Conducted Emission Limit is same as above table.

TEST RESULTS

For FM Mudolation @ 12.5 KHz TX Mode

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

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0715308_fin"

7/15/2011 3:13PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.397500	19.60	10.1	58	38.3	QP	+	GND
0.852000	25.90	10.1	56	30.1	QP	+	GND
0.861000	25.80	10.1	56	30.2	QP	+	GND
2.247000	1.30	10.2	56	54.7	QP	+	GND
2.503500	0.60	10.2	56	55.4	QP	+	GND
20.845500	7.00	10.4	60	53.0	QP	+	GND

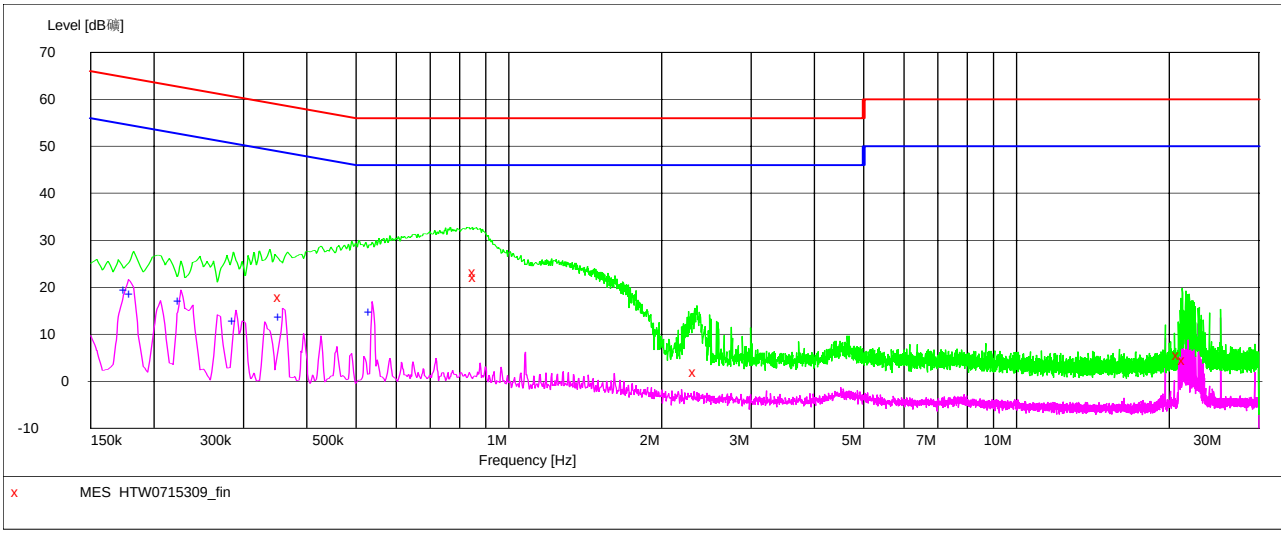
MEASUREMENT RESULT: "HTW0715308_fin2"

7/15/2011 3:13PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.357000	4.60	10.1	49	44.2	AV	+	GND
0.663000	1.60	10.1	46	44.4	AV	+	GND
19.662000	7.90	10.4	50	42.1	AV	+	GND
20.922000	2.20	10.4	50	47.8	AV	+	GND
25.201500	8.80	10.7	50	41.2	AV	+	GND
29.494500	6.20	10.9	50	43.8	AV	+	GND

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

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0715309_fin"

7/15/2011 3:17PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.357000	17.90	10.1	59	40.9	QP	-	GND
0.861000	23.20	10.1	56	32.8	QP	-	GND
0.865500	22.10	10.1	56	33.9	QP	-	GND
2.346000	2.00	10.2	56	54.0	QP	-	GND
21.025500	5.50	10.4	60	54.5	QP	-	GND
21.574500	4.40	10.5	60	55.6	QP	-	GND

MEASUREMENT RESULT: "HTW0715309_fin2"

7/15/2011 3:17PM

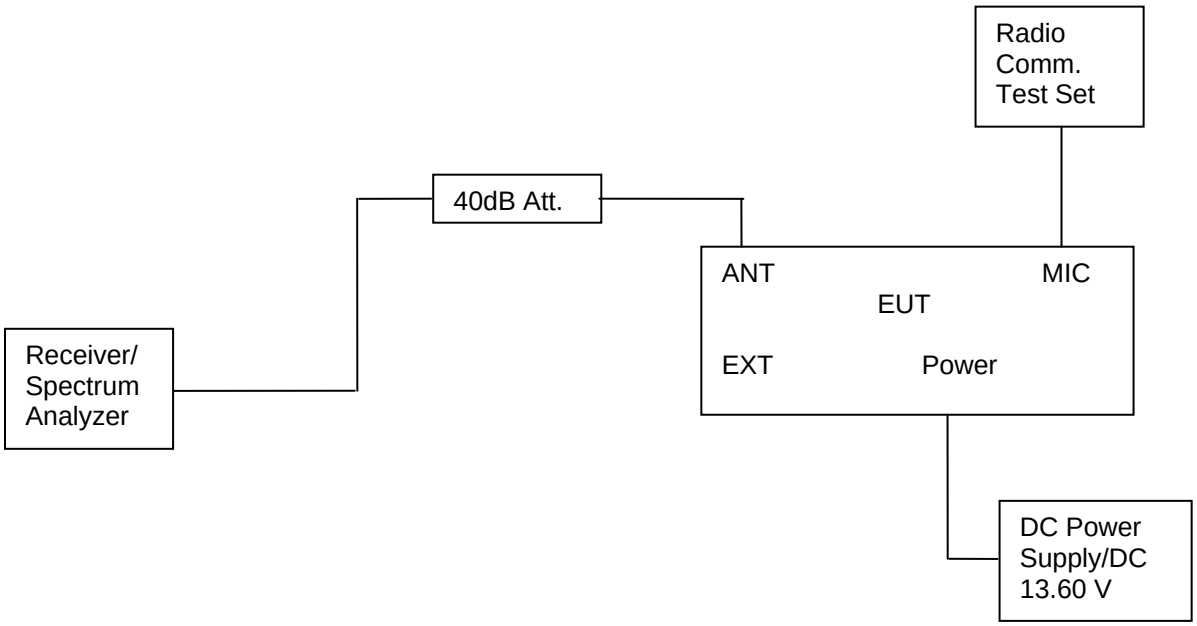
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.177000	19.30	10.1	55	35.3	AV	-	GND
0.181500	18.60	10.1	54	35.8	AV	-	GND
0.226500	17.10	10.1	53	35.5	AV	-	GND
0.289500	12.90	10.1	51	37.6	AV	-	GND
0.357000	13.60	10.1	49	35.2	AV	-	GND
0.537000	14.60	10.1	46	31.4	AV	-	GND

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). Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), 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 D, 12.5 kHz channel bandwidth equipment: 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 f0 to 5.625 kHz removed from f_0: Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in 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 (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

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) and 5 kHz (25 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=300Hz, VBW=3 KHz span=50 KHz for 25 KHz channel spacing, while RBW=100Hz, VBW=1 KHz, span=50 KHz for 12.5 channel spacing.

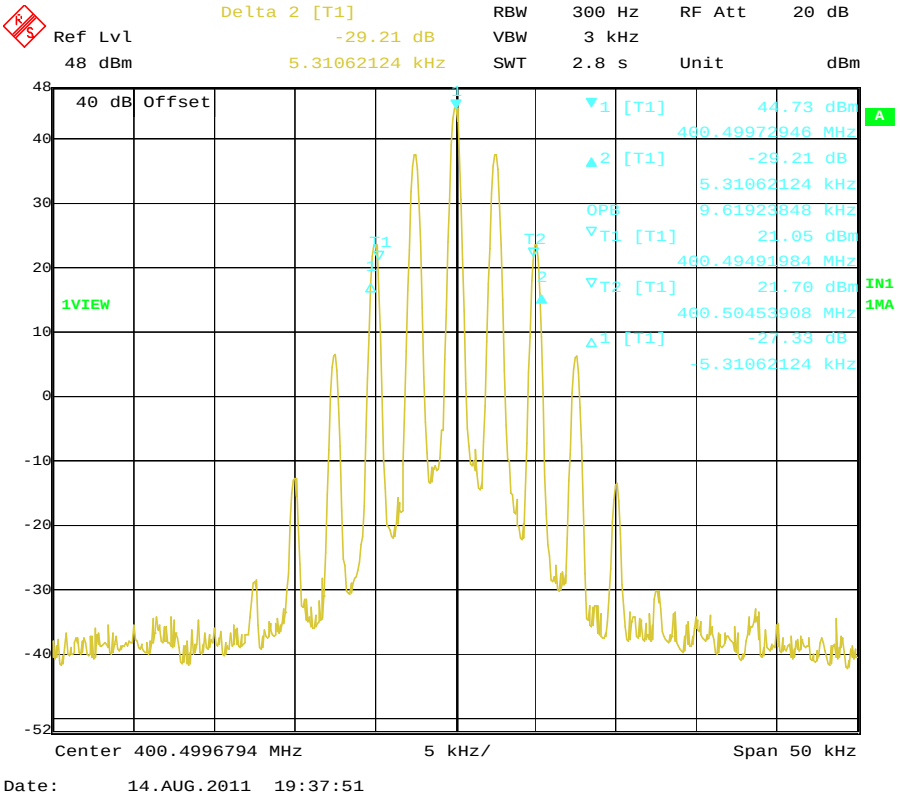
TEST RESULTS

4.2.1 Occupied Bandwidth

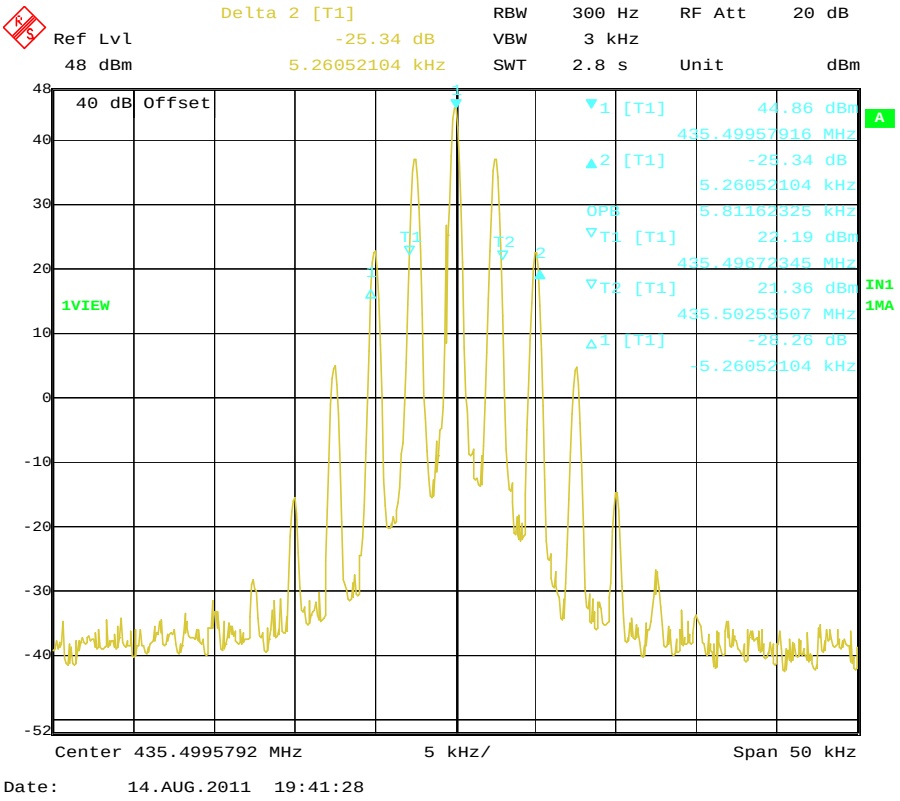
Modulation Type	Channel Sparation	Test Channel	Test Frequency	99% Occupied Bandwidth	26dB Occupied Band width
FM	12.5KHz	Low	400.5000 MHz	9.62 KHz	10.62 KHz
		Middle	435.5000 MHz	5.81 KHz	10.52 KHz
		High	469.5000 MHz	5.81 KHz	10.42 KHz
Limit		11.25KHz for 12.5KHz Channel Separtion			
Test Results		Compliance			

Plots of 99% and 26dB Bandwidth Measurement

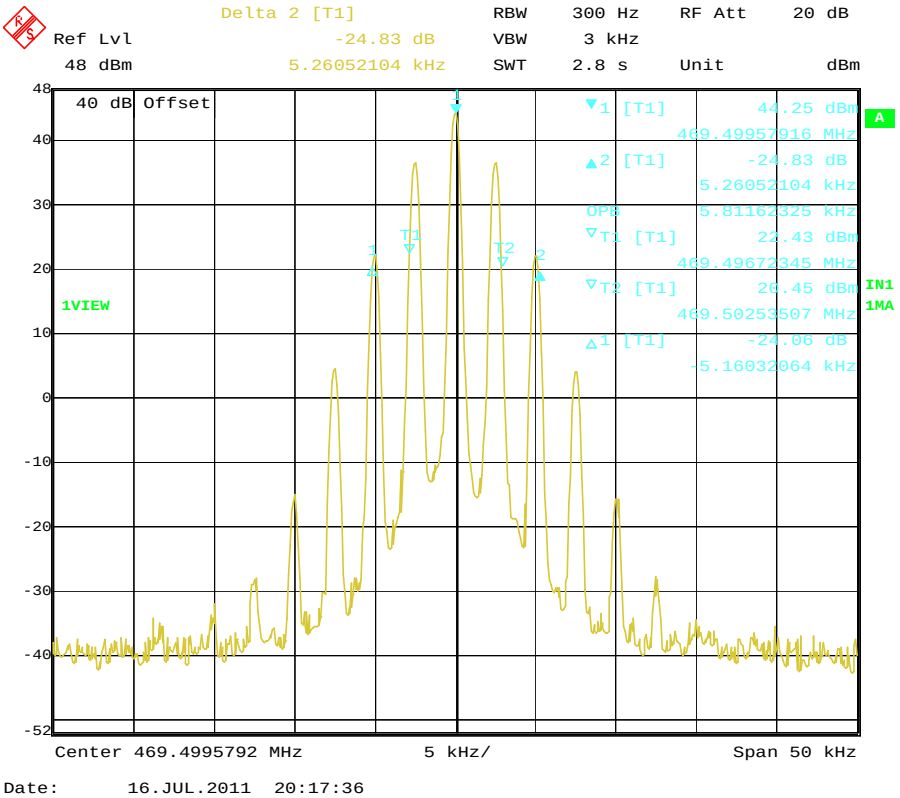
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	400.5000	9.62	10.62	11.25	Complicance



Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	435.5000	5.81	10.52	11.25	Complicance



Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	469.5000	5.81	10.42	11.25	Complicance



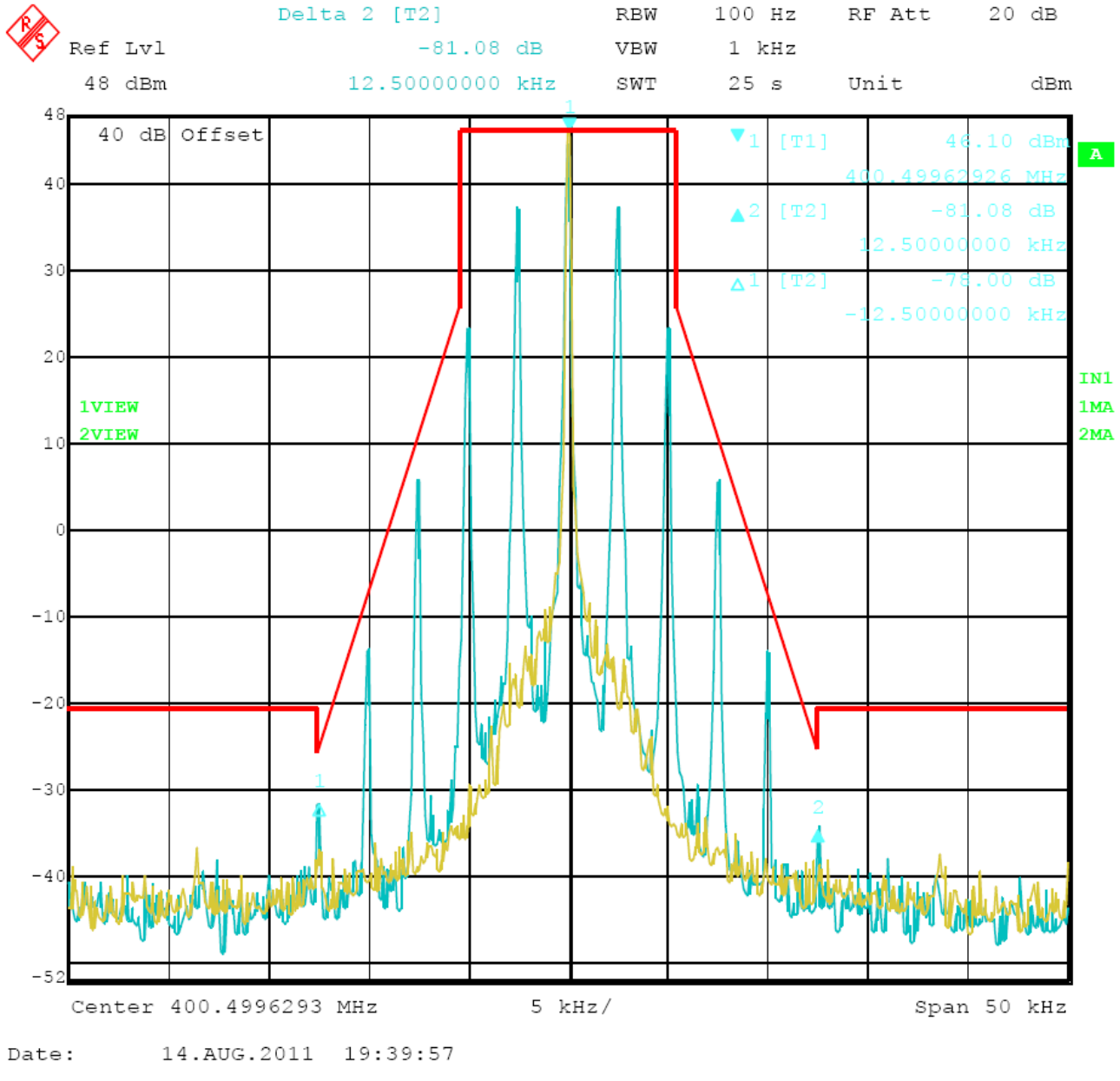
4.2.2 Emission Mask

Modulation Type	Channel Sparation	Test Channel	Test Frequency	FCC Applicable Mask	RBW
FM	12.5KHz	Low	406.5000 MHz	D	100 Hz
		Middle	435.5000 MHz	D	100 Hz
		High	469.5000 MHz	D	100 Hz
Test Results		Compliance			

Plots of Emission Mask Measurement

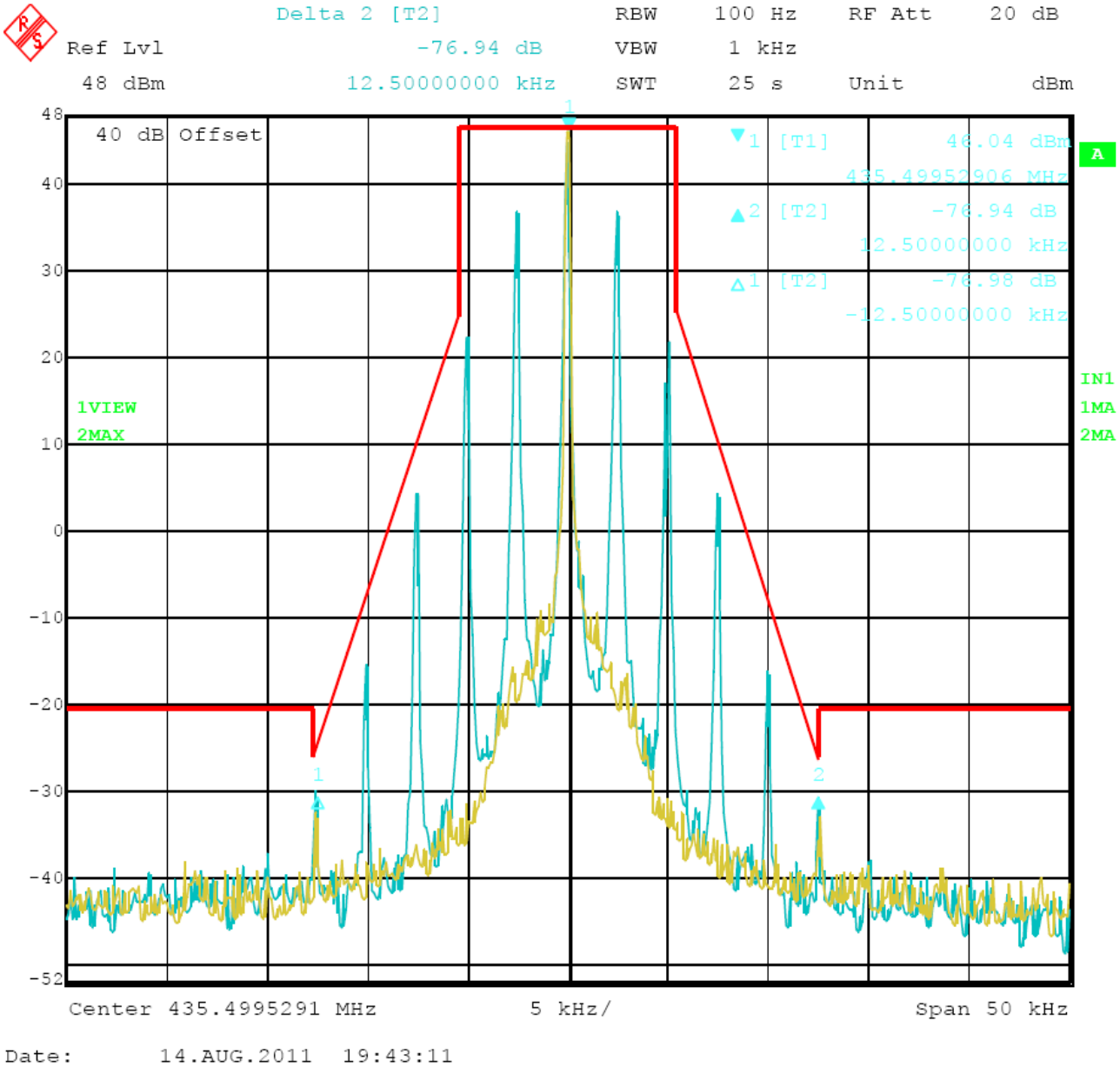
Referred as the attached plot hereinafter
Note: The yellow curve represents unmodulated signal.
The green curve represents modulated signal.

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	400.5000	D	100Hz	2.5	Complicance



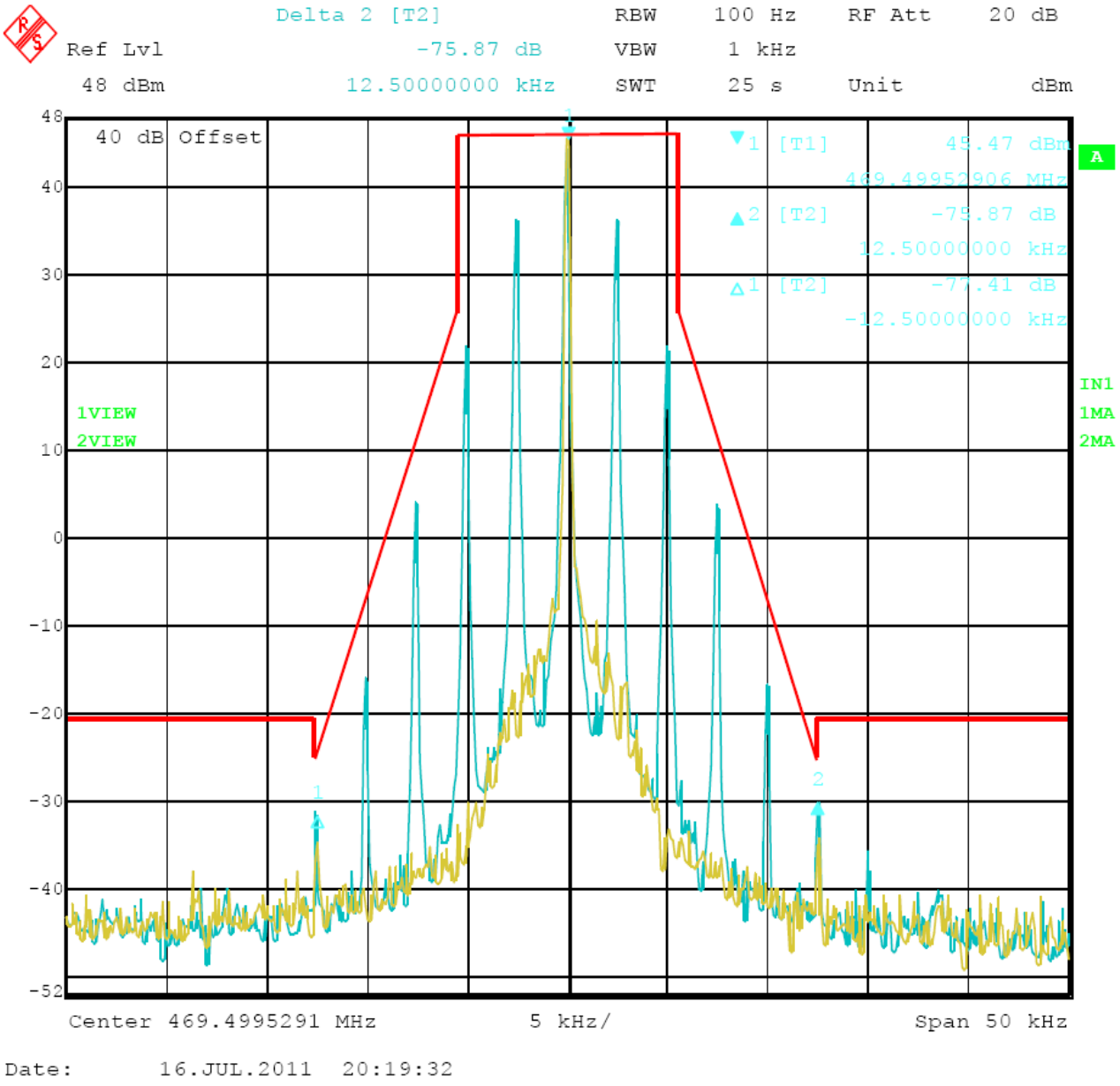
12.5 kHz Channel Spacing, 400.5000 MHz, 2500 Hz Audio Modulation Only

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	435.5000	D	100Hz	2.5	Complicance



12.5 kHz Channel Spacing, 435.5000 MHz, 2500 Hz Audio Modulation Only

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	469.5000	D	100Hz	2.5	Complicance



12.5 kHz Channel Spacing, 469.5000 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 90.210, 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:

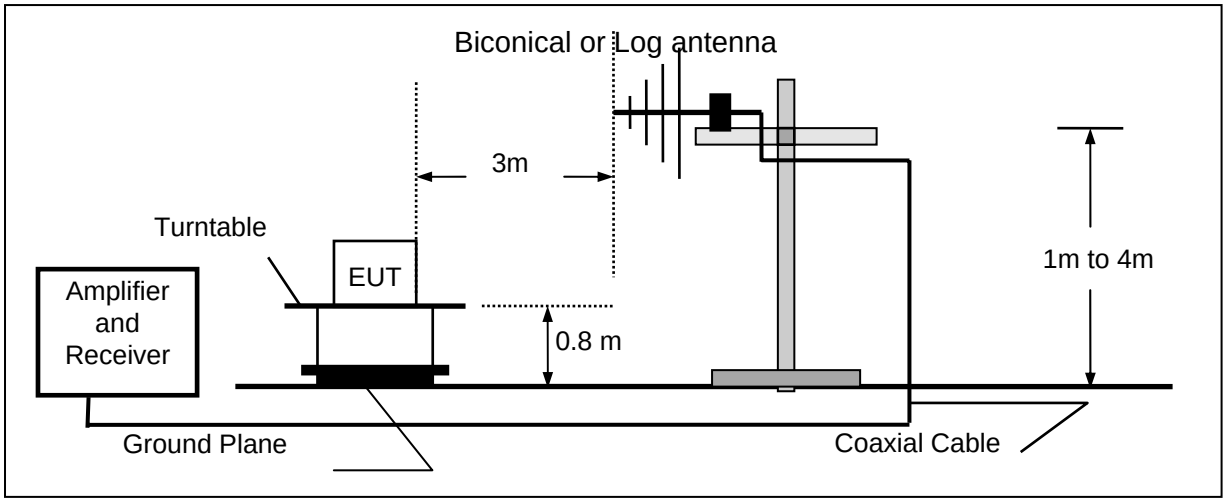
1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
3 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

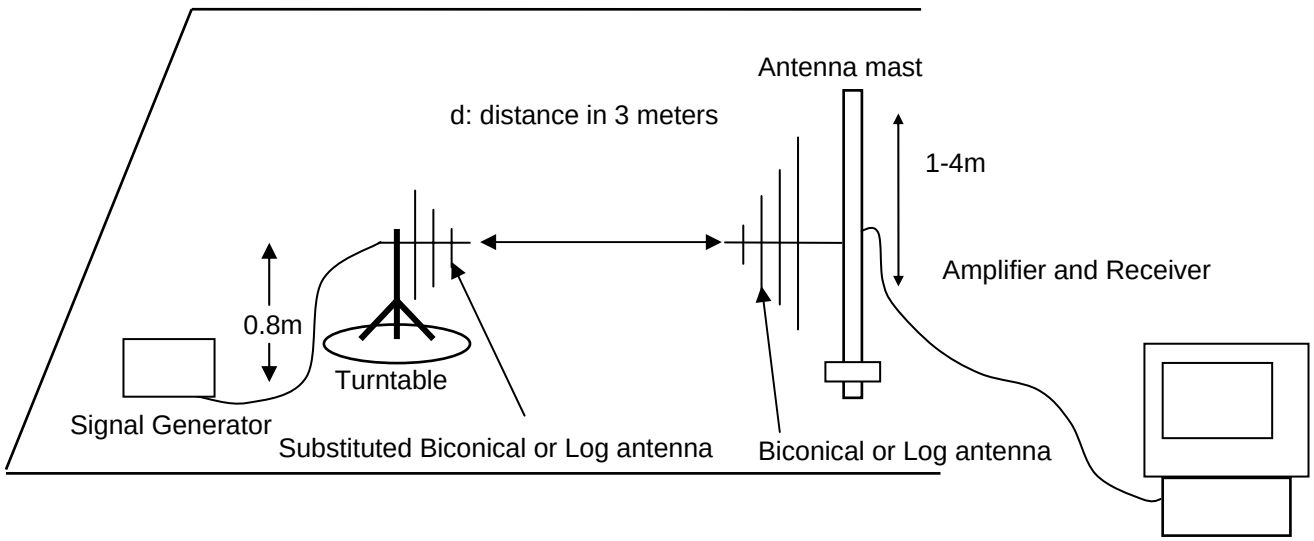
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

1 On any frequency removed from the assigned frequency by more than 50 percent, but no 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 no 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+10Log (P) dB.

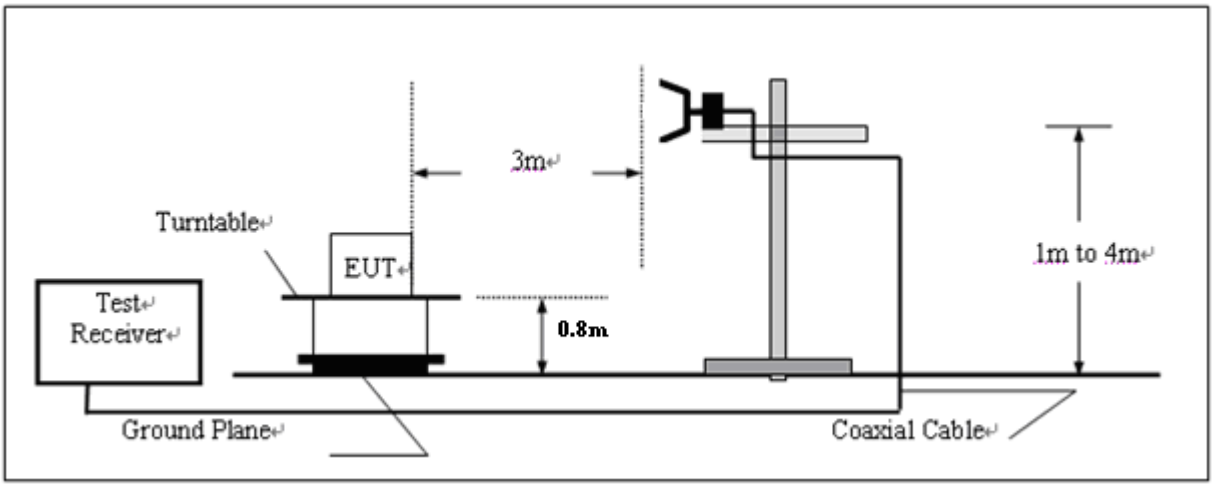
TEST CONFIGURATION

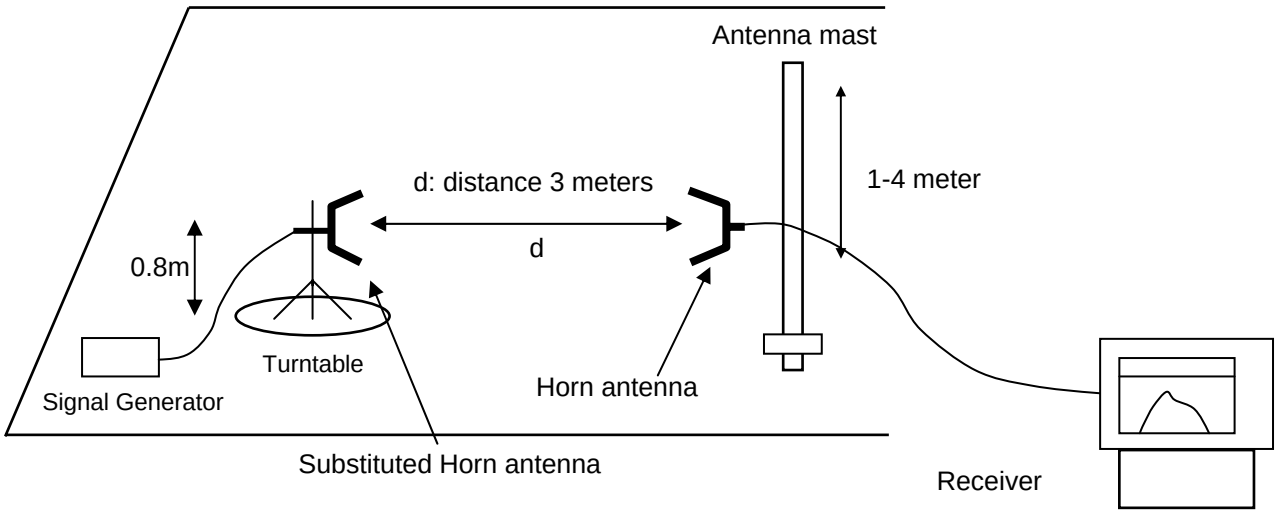
Below 1GHz





Above 1GHz





TEST PROCEDURE

1 Set the EMI Receiver (for measuring E-Field) and Receiver (for measuring EIRP) as follows:
Center Frequency: equal to the signal source
Resolution BW: 100 KHz
Video BW: VBW > RBW
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
2 Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor+Amplifier Gain
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB)
3 The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
4 Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
DIPOLE antenna for frequency from 30-1000 MHz or
HORN antenna for frequency above 1 GHz}.
5 Mount the transmitting antenna at 1.0 meter high from the ground plane.
6 Use one of the following antenna as a receiving antenna:
DIPOLE antenna for frequency from 30-1000 MHz or
HORN antenna for frequency above 1 GHz}.
7 If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
8 Adjust both transmitting and receiving antenna in a VERTICAL polarization.
9 Tune the EMI Receivers to the test frequency.
10 Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
11 The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
12 Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

13 Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
14 Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
$P = P_1 - L_1 = (P_2 + L_2) – L_1 = P_3 + A + L_2 - L_1$
$EIRP = P + G1 = P_3 + L_2 - L_1 + A + G_1$
$ERP = EIRP – 2.15$ dB
Total Correction factor in EMI Receiver = $L_2 – L_1 + G_1$
Where:
P: Actual RF Power fed into the substitution antenna port after corrected.
P_1: Power output from the signal generator
P_2: Power measured at attenuator A input
P_3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
15 Adjust both transmitting and receiving antenna in a Horizontal polarization, then repeat step (11) to (14).
16 Repeat step (4) to (16) for different test frequency
17 Repeat steps (3) to (12) with the substitution antenna oriented in horizontal polarization.
18 Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

TEST RESULTS

The Transmitter Radiated Spurious Emssion was performed to the Rated high power (45Watt) and Rated low power (5Watt) the datum that reported below is the worst case (Rated high power) of the two rated power conditions.

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 9 (12.5 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 12.5 kHz at least:
Low: 50 + 10 log (Pwatts) = 50 + 10 log (46.45) =66.67 dB
High: 50 + 10 log (Pwatts) = 50 + 10 log (44.36) =66.47 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-50-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 46.53 dBm.
Limit (dBm) =46.53-50-10log10 (46.45) = -20 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 5 GHz.
3. ******* means that the emission level is too low to be measured or at least 20 dB down than the limit.

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		Low Channel		Test Frequency		400.5000 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)
801.00	71.62	Peak	H	301	151	-25.03	-20	5.03
1201.500	74.81	Peak	H	118	177	-21.53	-20	1.53
	64.13	Peak	H	122	172	-32.65	-20	12.65
…	…		H					
801.00	71.35	Peak	V	100	171	-25.54	-20	5.54
1201.500	75.68	Peak	V	100	157	-21.32	-20	1.32
2002.500	68.87	Peak	V	100	135	-27.25	-20	7.25
…	…		V					

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		High Channel		Test Frequency		435.5000 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)
871.00	74.33	Peak	H	113	215	-22.43	-20	2.43
1742.00	69.97	Peak	H	100	192	-26.07	-20	6.07
2613.00	69.79	Peak	H	100	49	-26.76	-20	6.76
…	…		H					
871.00	74.09	Peak	V	100	358	-22.32	-20	2.32
1742.00	72.36	Peak	V	100	5	-24.30	-20	4.30
2613.00	70.86	Peak	V	100	156	-25.89	-20	5.89
…	…		V					

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		High Channel		Test Frequency		469.5000 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)
939.00	75.49	Peak	H	159	111	-20.96	-20	0.96
2347.50	73.64	Peak	H	100	289	-23.36	-20	3.36
3286.50	70.48	Peak	H	127	5	-26.33	-20	6.33
…	…		H					
939.00	75.91	Peak	V	200	134	-21.09	-20	1.09
1408.50	68.68	Peak	V	156	209	-28.16	-20	8.16
2347.50	72.76	Peak	V	100	86	-24.13	-20	4.13
…	…		V					

4.4. Spurious Emssion on Antenna Port

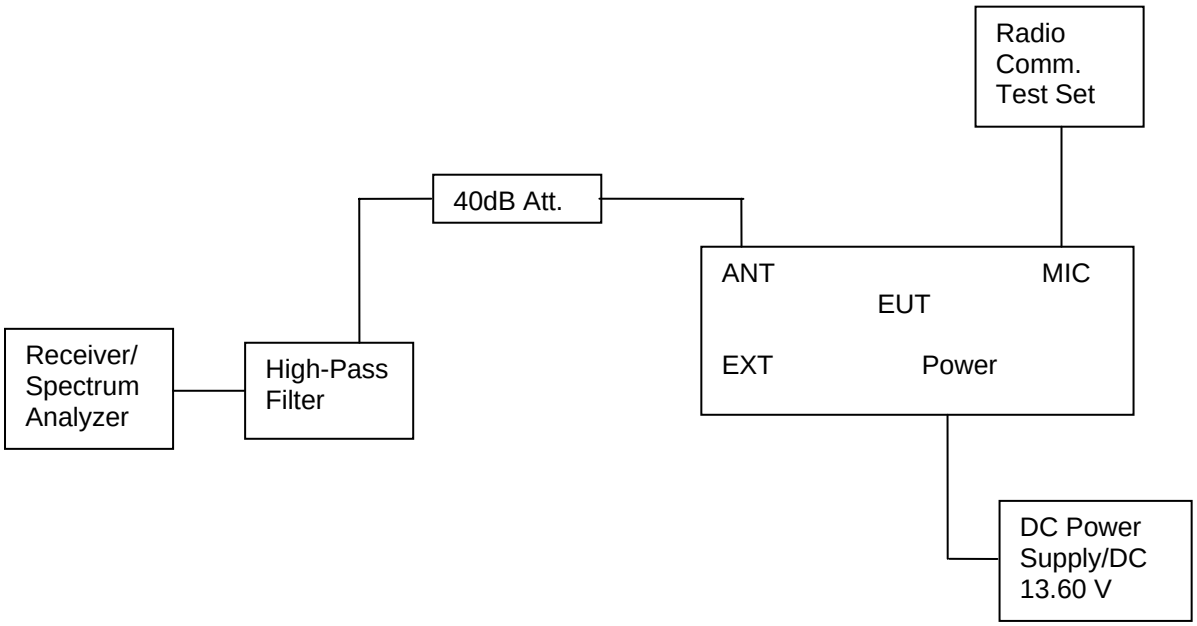
TEST APPLICABLE

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 and 90.210 and RSS Gen, RSS 119 Issue 9 (12.5 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 12.5 kHz at least:
Low: 50 + 10 log (Pwatts) = 50 + 10 log (46.45) =66.67 dB
High: 50 + 10 log (Pwatts) = 50 + 10 log (44.36) =66.47 dB
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-50-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 46.53 dBm.
Limit (dBm) =46.53-50-10log10 (46.45) = -20 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30MHz to 5 GHz.

For Rated High Power (45 Watt)

Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz	
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)
FM	12.5KHz	Low	400.5000	972.60	-25.77	1200.40	-25.70
		Middle	435.5000	985.42	-26.75	2915.83	-27.38
		High	469.5000	556.64	-27.00	4655.31	-27.01
Limit		-20dBm for 12.5KHz Channel Separtion					
Test Results		Compliance					

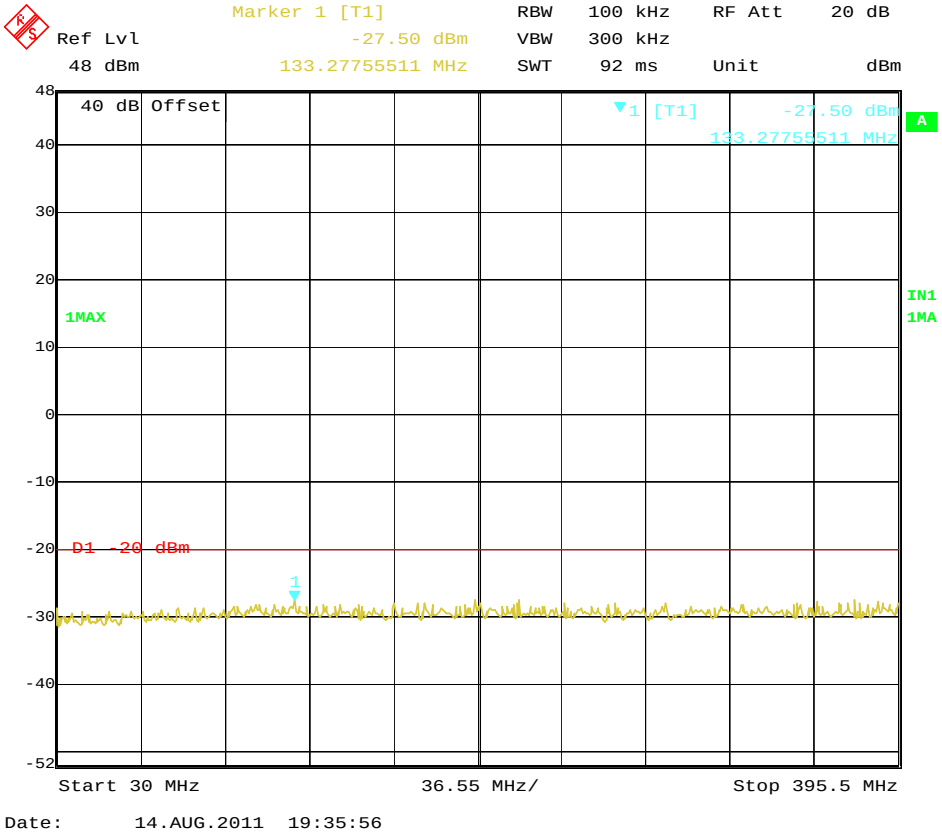
For Rated Low Power (5 Watt)

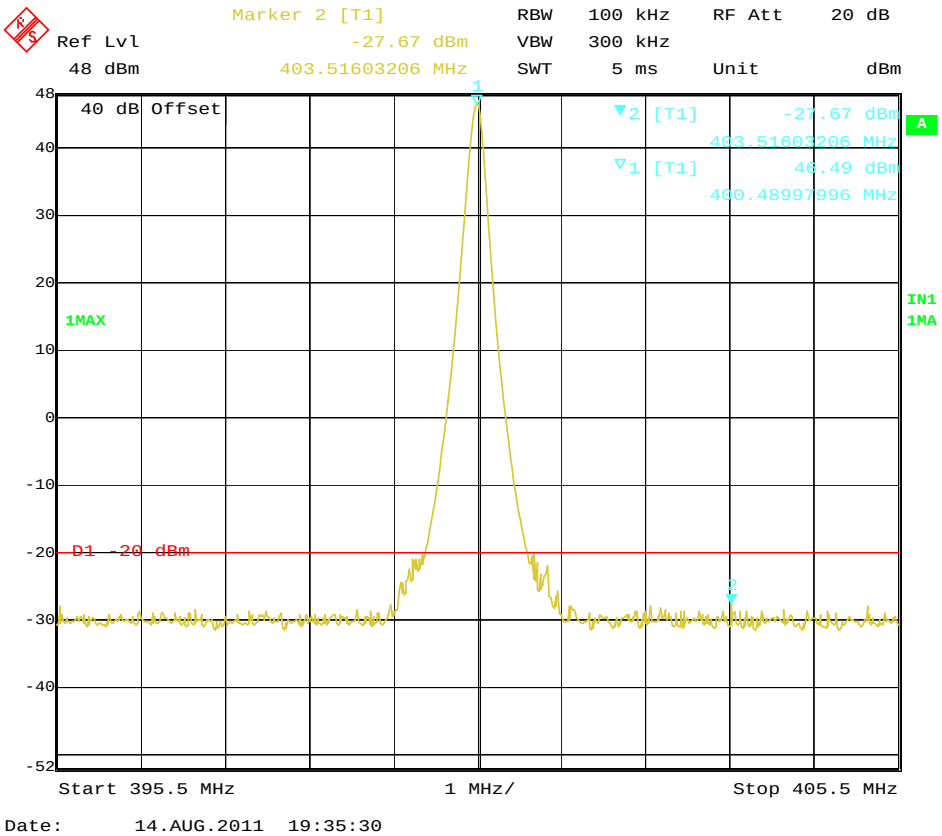
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz	
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)
FM	12.5KHz	Low	400.5000	848.38	-26.30	1200.40	-24.03
		Middle	435.5000	871.70	-26.00	2603.21	-27.21
		High	469.5000	968.90	-25.98	2795.59	-27.29
Limit		-20dBm for 12.5KHz Channel Separtion					
Test Results		Compliance					

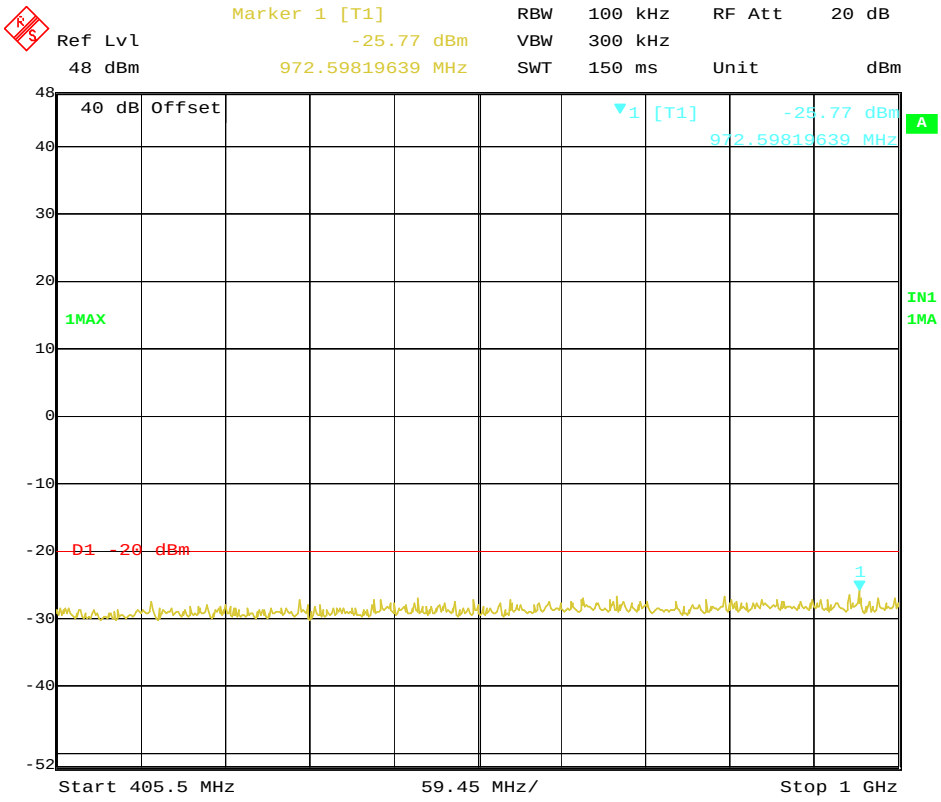
Plots of Spurious Emission on Antenna Port Measurement

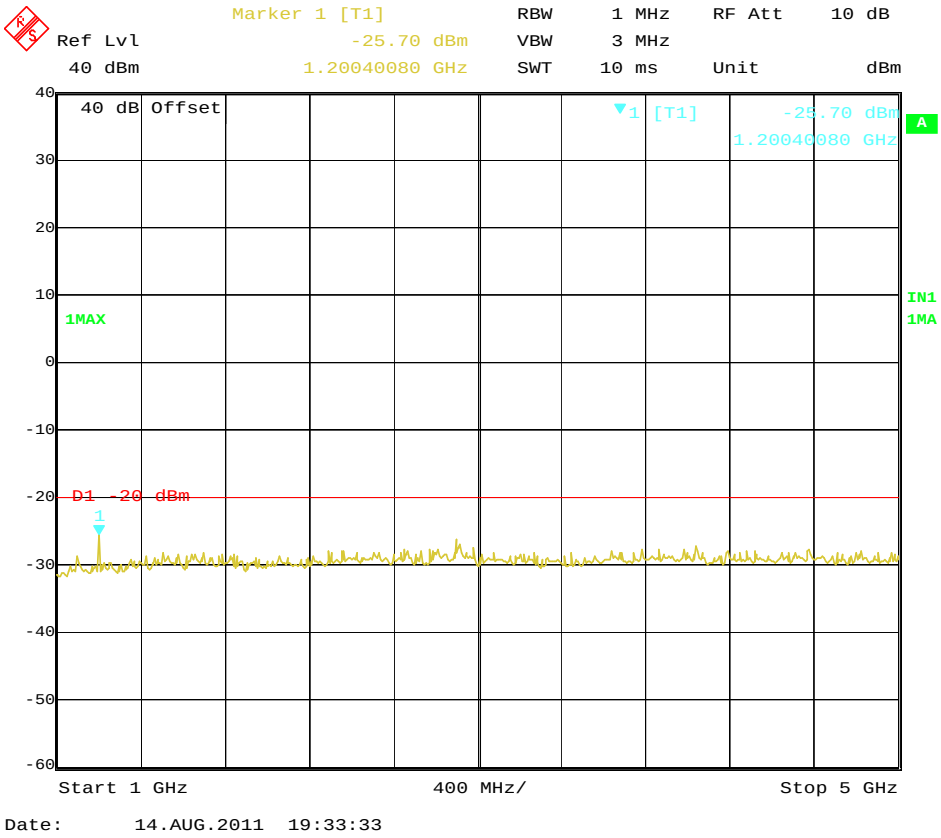
For Rated High Power (45 Watt)

Modulation Type	Channel Sparation	Test Channel	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	12.5KHz	Low	400.5000	972.60	-25.77	1200.40	-25.70	-20dBm
Test Results				Compliance				

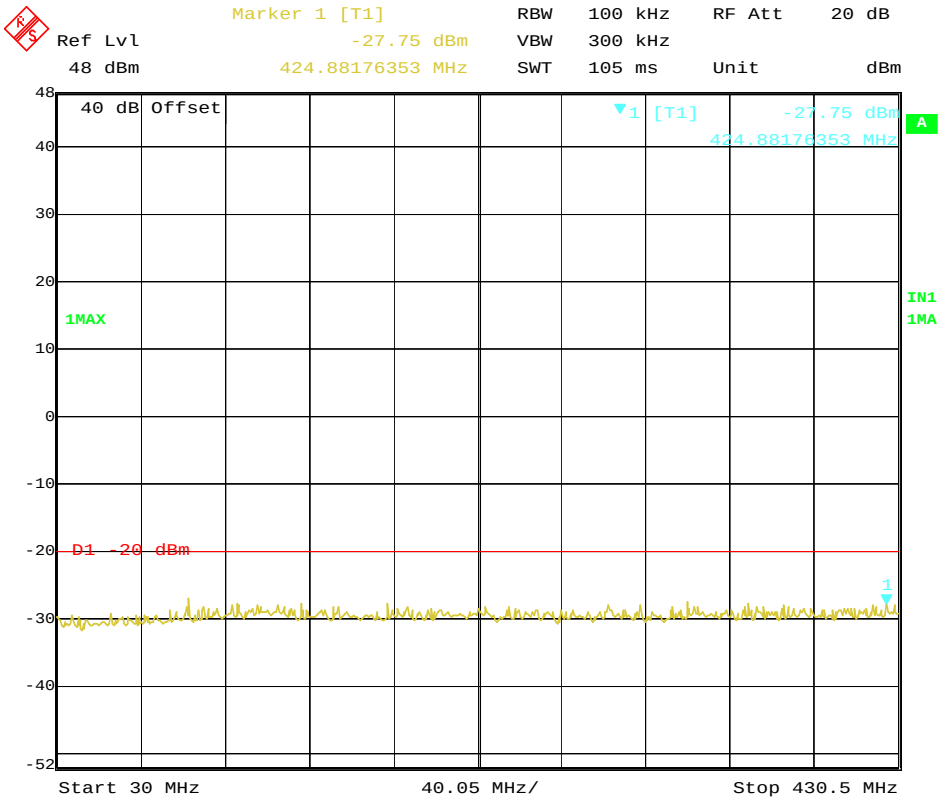


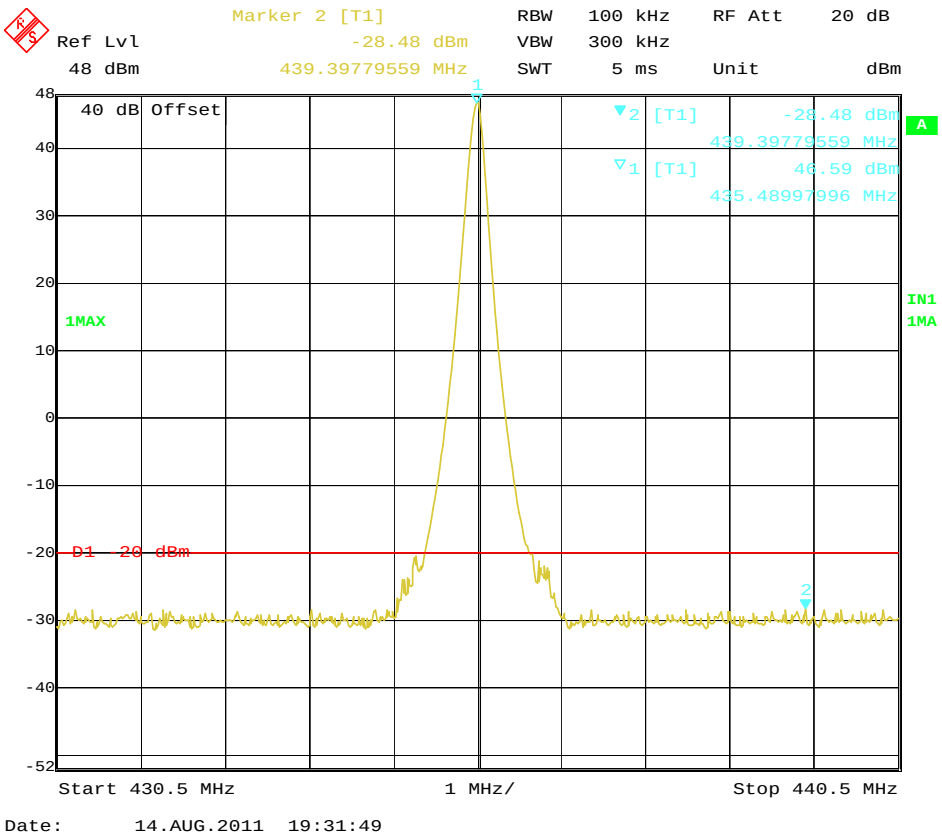


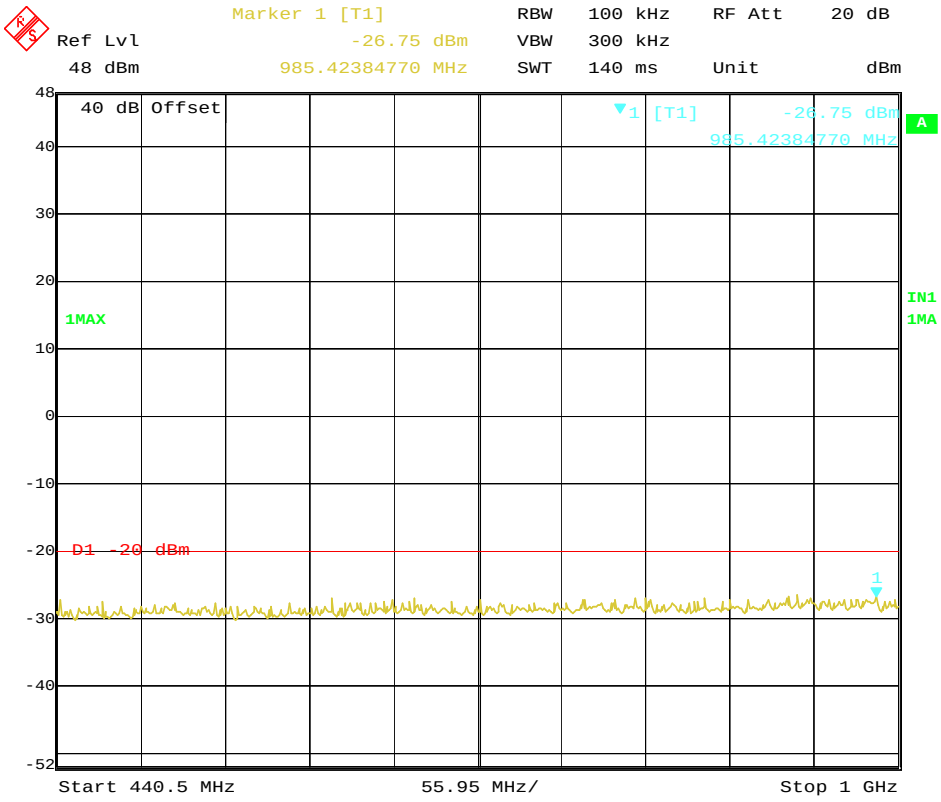

Marker 1 [T1]
RBW 100 kHz
RF Att 20 dB
Ref Lvl
-25.77 dBm
VBW 300 kHz
48 dBm
972.59819639 MHz
SWT 150 ms
Unit dBm
40 dB Offset
1 [T1]
-25.77 dBm
972.59819639 MHz
A
IN1
1MA
1MAX
D1 -20 dBm
Start 405.5 MHz
59.45 MHz/
Stop 1 GHz
Date: 14.AUG.2011 19:34:27


Marker 1 [T1]
RBW 1 MHz
RF Att 10 dB
Ref Lvl
-25.70 dBm
VBW 3 MHz
40 dBm
1.20040080 GHz
SWT 10 ms
Unit dBm
40 dB Offset
1 [T1]
-25.70 dBm
1.20040080 GHz
A
IN1
1MA
1MAX
D1 -20 dBm
Start 1 GHz
400 MHz/
Stop 5 GHz
Date: 14.AUG.2011 19:33:33

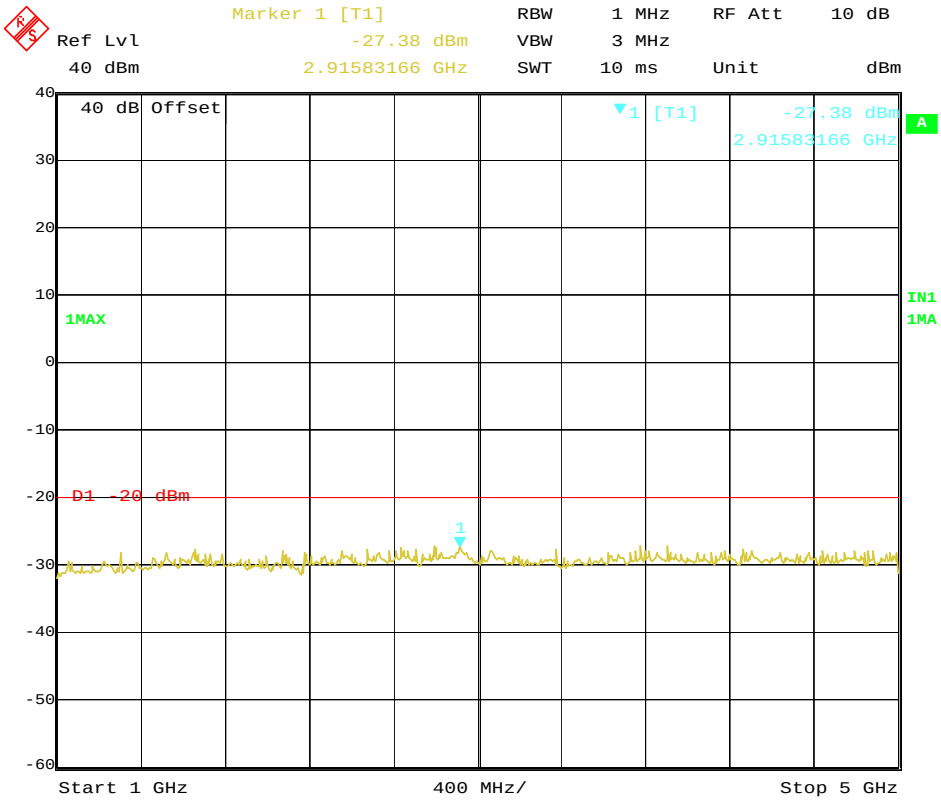
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	435.5000	985.42	-26.75	2915.83	-27.38	-20dBm
Test Results				Compliance				





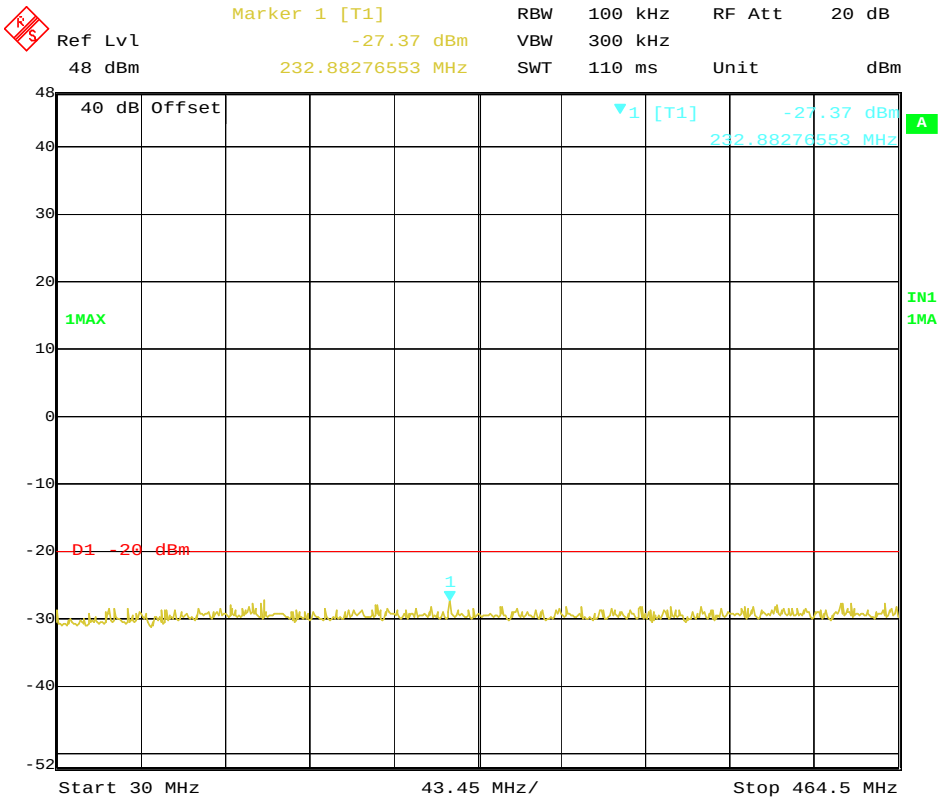


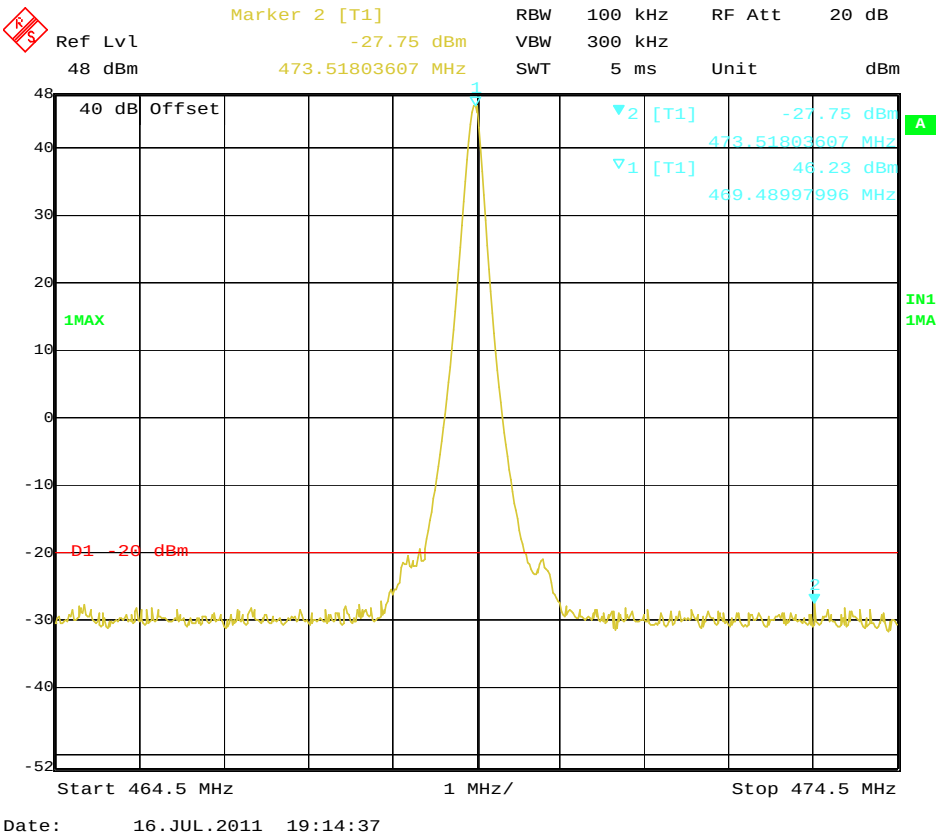
Date: 14.AUG.2011 19:32:40

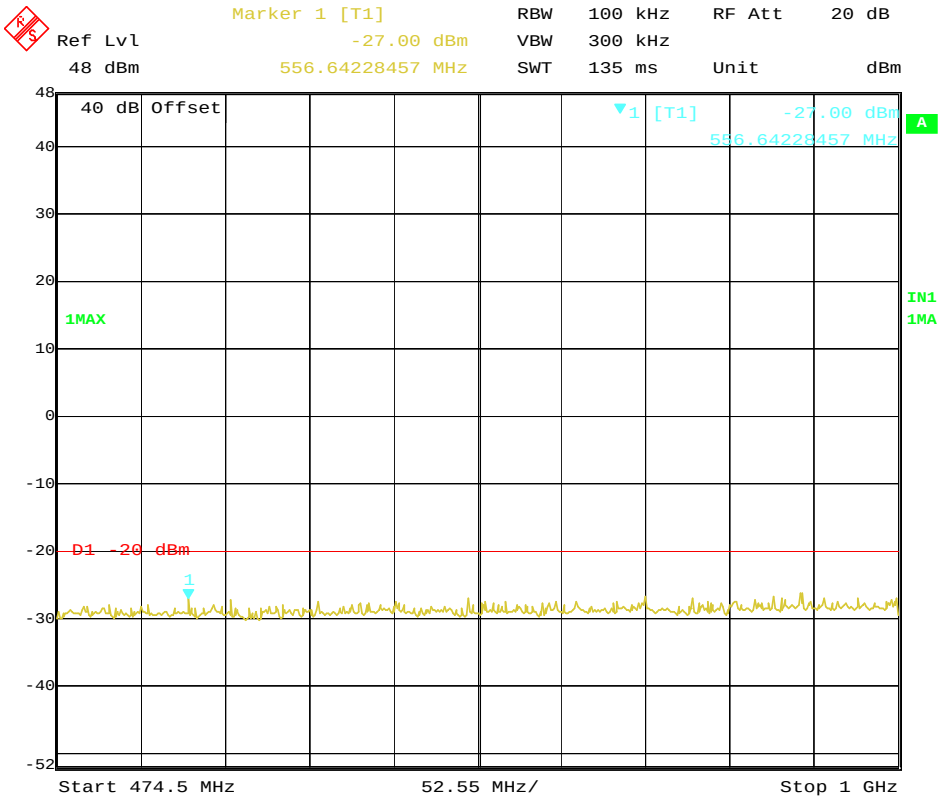


Date: 14.AUG.2011 19:33:09

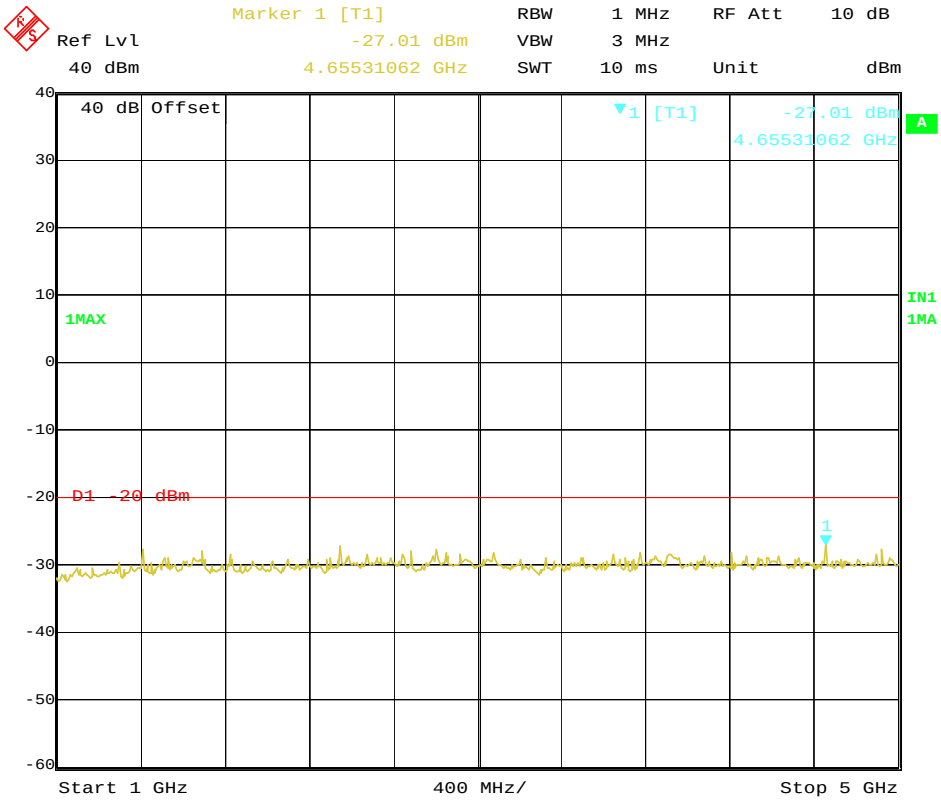
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	High	469.5000	556.64	-27.00	4655.31	-27.01	-20dBm
Test Results				Compliance				







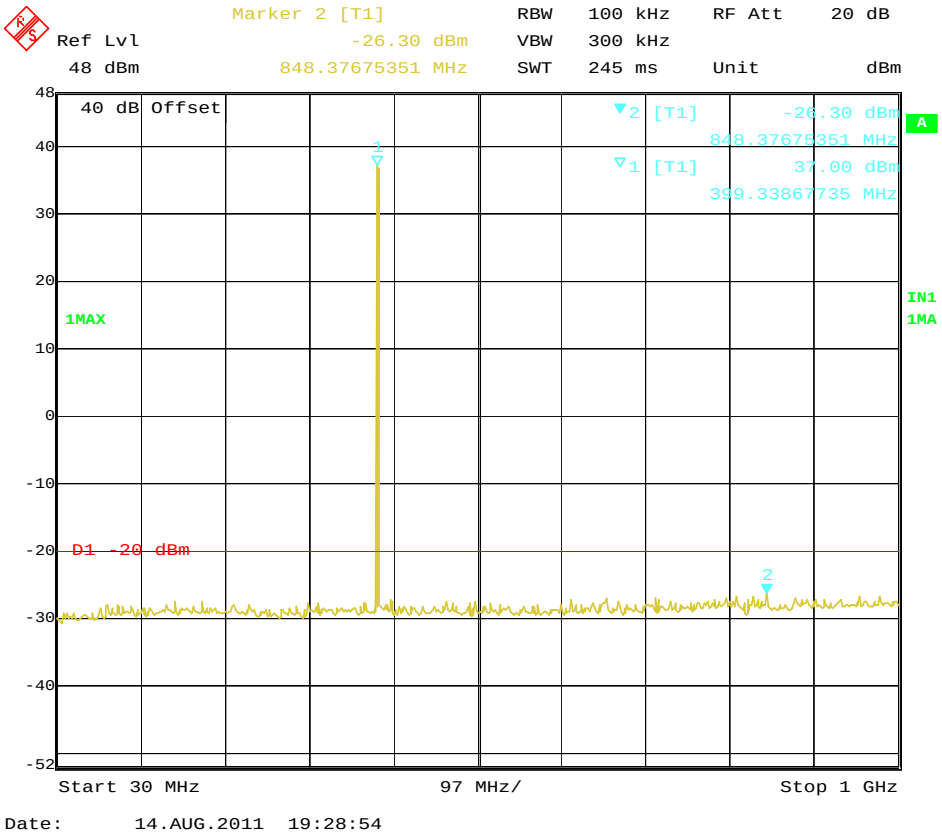
Date: 16.JUL.2011 19:15:33

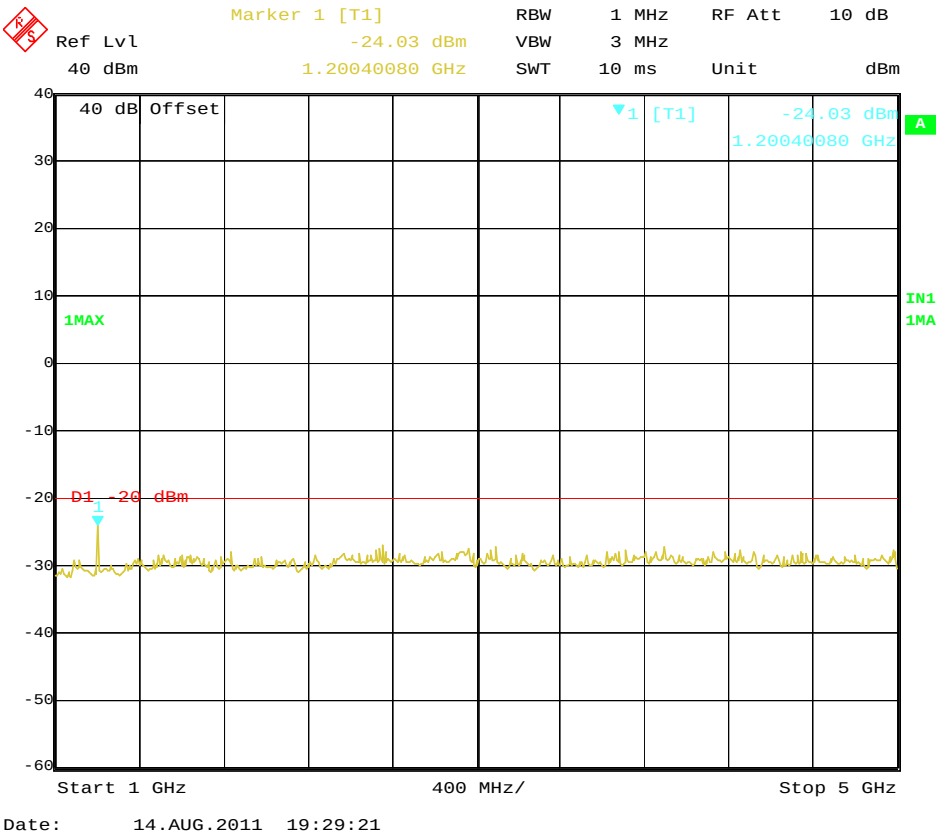


Date: 16.JUL.2011 19:16:11

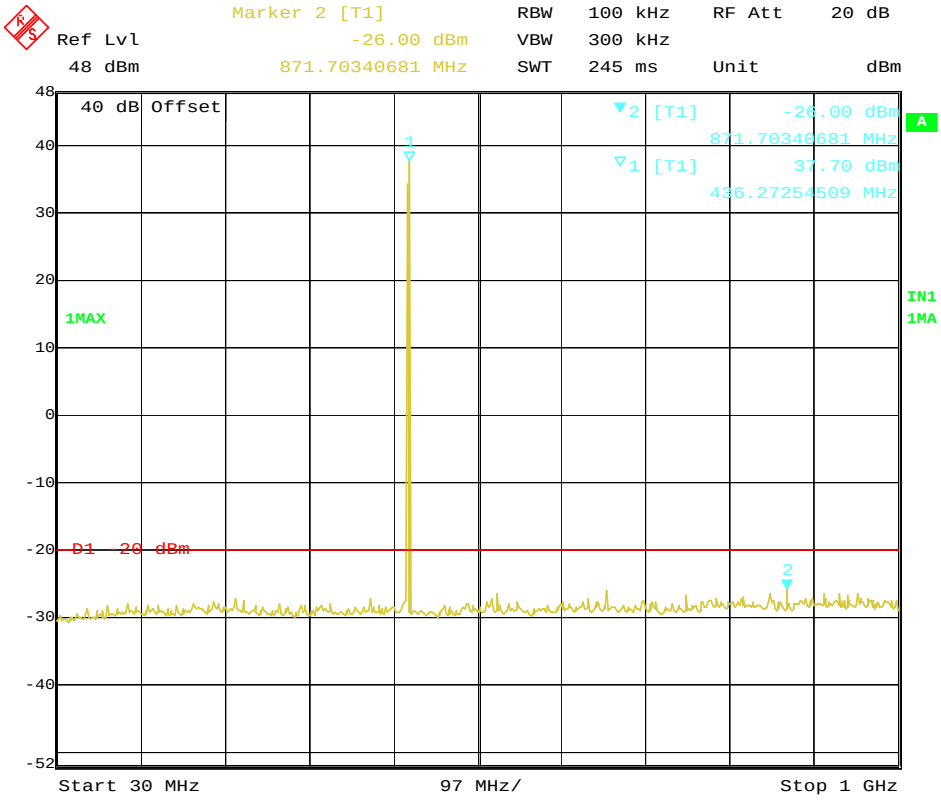
For Rated Low Power (5Watt)

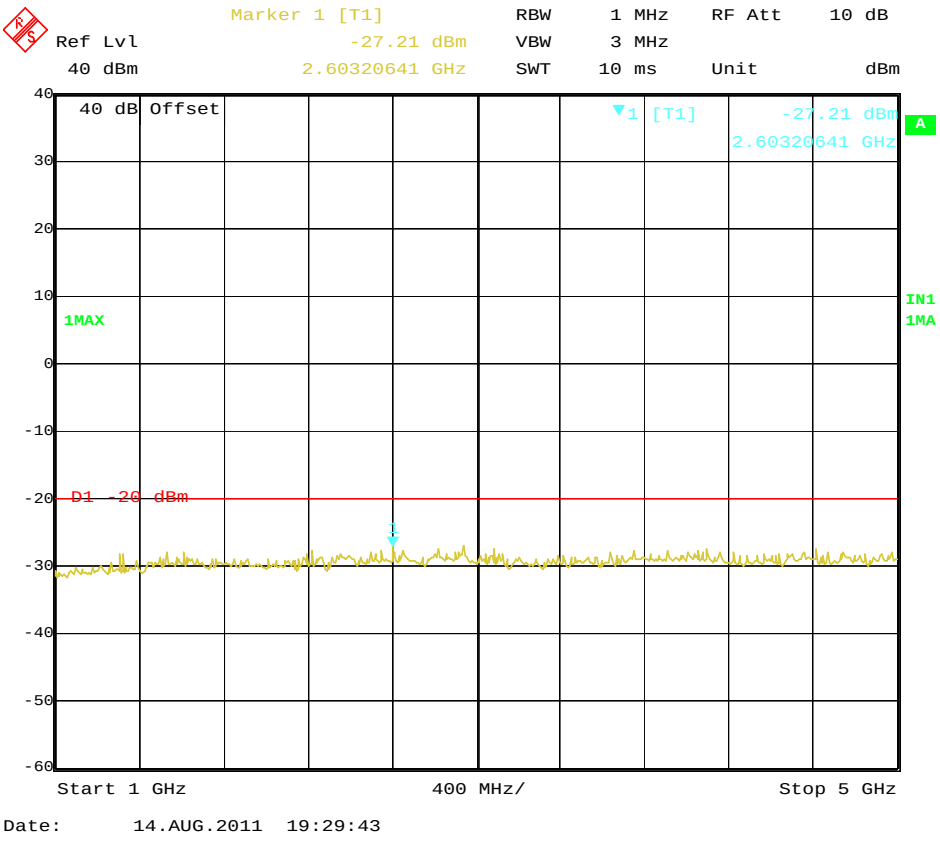
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	400.5000	848.38	-26.30	1200.40	-24.03	-20dBm
Test Results				Compliance				



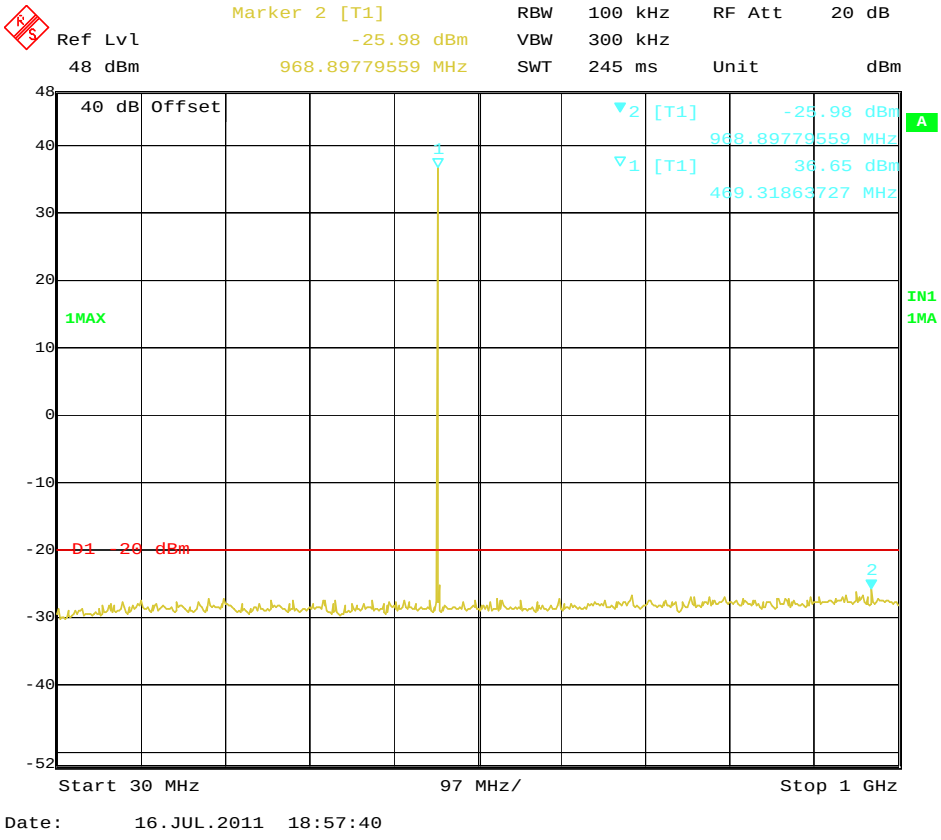


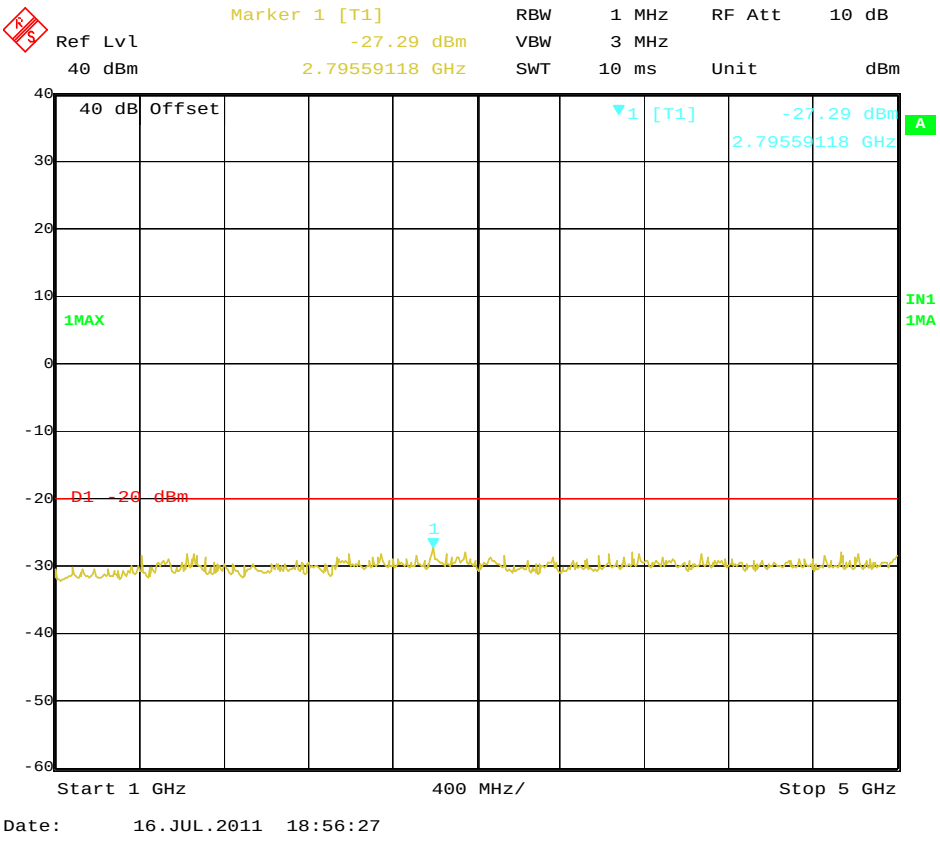
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	435.5000	871.70	-26.00	2603.21	-27.21	-20dBm
Test Results				Compliance				





Modulation Type	Channel Sparation	Test Channel	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	12.5KHz	High	469.5000	968.90	-25.98	2795.59	-27.29	-20dBm
Test Results				Compliance				





4.5. Modulation Charcateristics

TEST APPLICABLE

According toCFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

TEST PROCEDURE

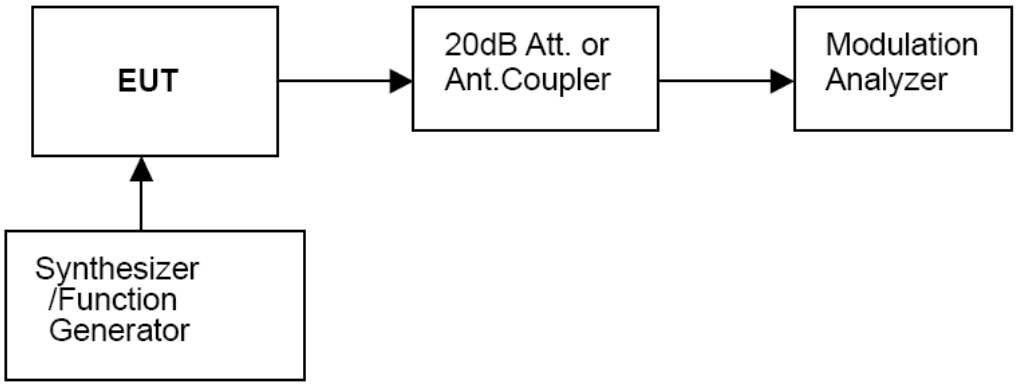
Modulation Limit

1 Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0dB) and vary the input level from –20 to +20dB. Record the frequency deviation obtained as a function of the input level.
2 Repeat step 1 with input frequency changing to 300, 1004, 1500 and 2500Hz in sequence.

Audio Frequency Response

1 Configure the EUT as shown in figure 1.
2 Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).
3 Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation.
4 Audio Frequency Response =20log10 (Deviation of test frequency/Deviation of 1 KHz reference).

TEST CONFIGURATION

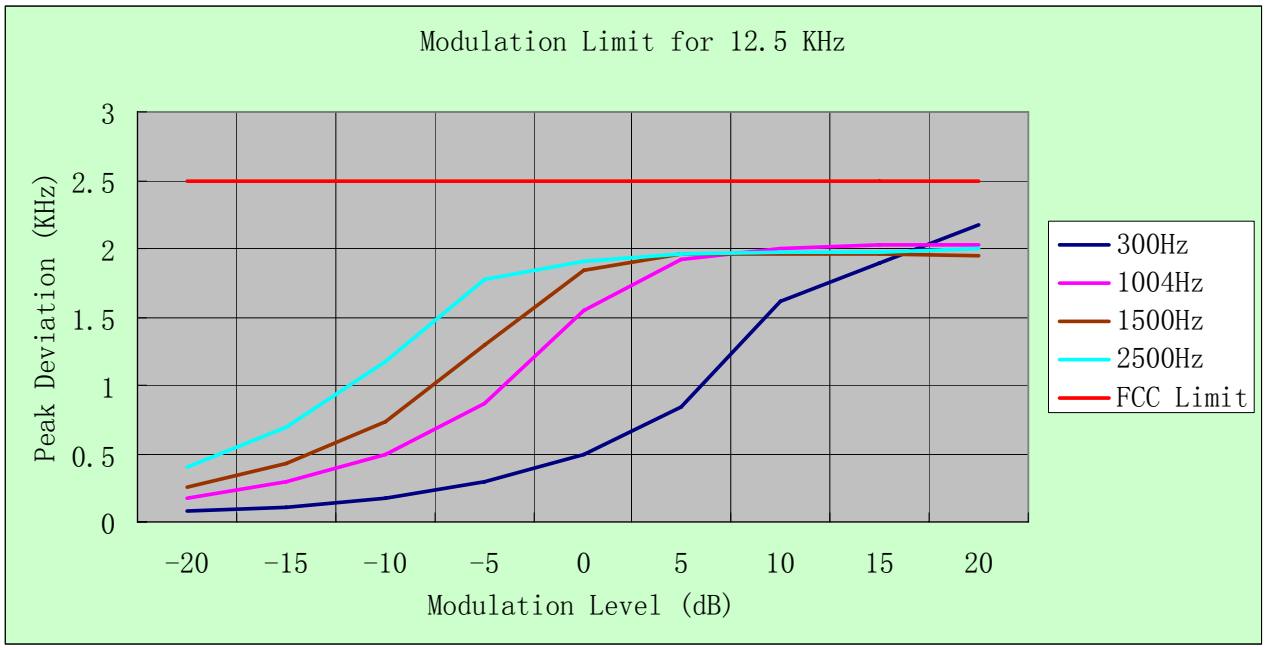


TEST RESULTS

Modulation Type: FM

12.5 KHz Channel Separation

Modulation Level(dB)	Peak Freq. Deviation At 300 Hz(KHz)	Peak Freq. Deviation At 1004 H(KHz)	Peak Freq. Deviation At 1500 Hz(KHz)	Peak Freq. Deviation At 2500 Hz(KHz)
-20	0.08	0.18	0.26	0.40
-15	0.11	0.30	0.43	0.69
-10	0.18	0.50	0.74	1.18
-5	0.29	0.87	1.30	1.78
0	0.49	1.55	1.84	1.91
+5	0.84	1.92	1.96	1.96
+10	1.61	2.00	1.96	1.97
+15	1.89	2.03	1.96	1.98
+20	2.18	2.03	1.95	2.00



b). Audio Frequency Response:

Rule Part No.: Part 2.1407(a) (b)

Method of Measurement:

The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 300-3000Hz shall be submitted and Audio Post Limiter Low Pass Filter Response from 3.0 KHz to 50KHz.However, the audio frequency response should test from 100Hz to 5.0 KHz according to FCC Part 90.

Modulation Type: FM

The audio frequency response curve is show below.and

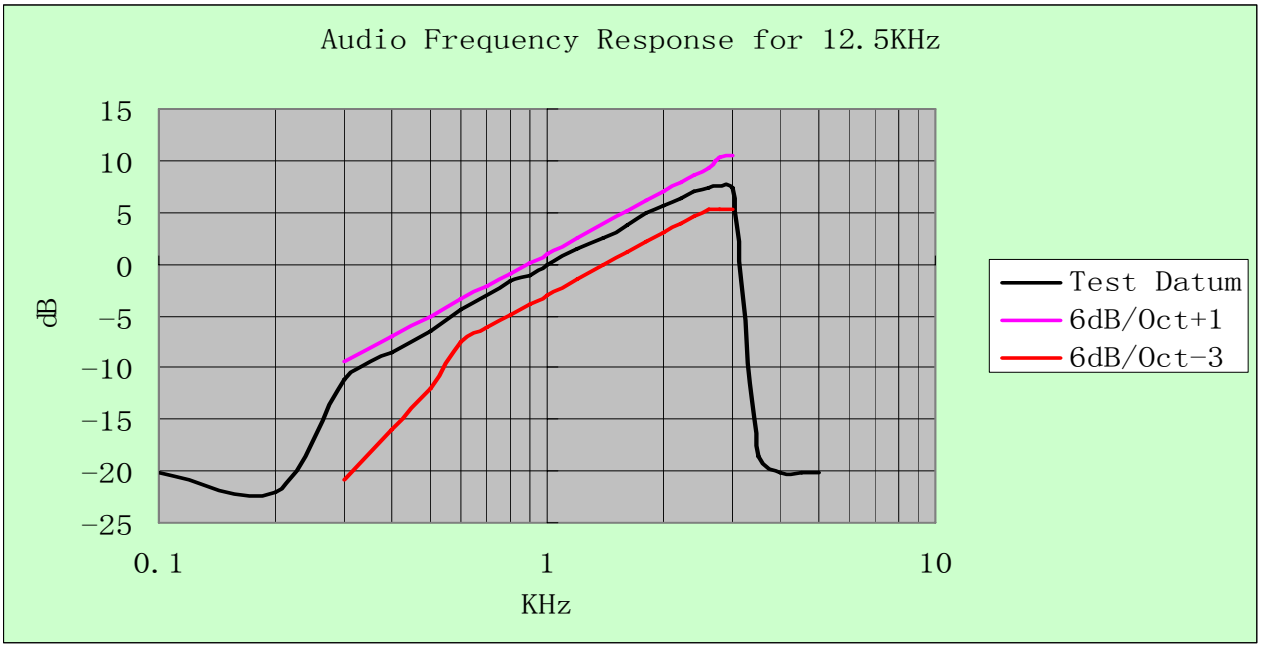
Test Audio Level (1 KHz and 20% maximum deviation) for 12.5 KHz channel separation is 2.32mv.

Note:

1 Not applicable to new standard. However, tests are conducted under FCC's recommendation.
2 The Audio Frequency Response is identical for 12.5 KHz channel separation

12.5 KHz Channel Separation

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Refenerce Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.05	0.51	-20.17
0.2	0.04	0.51	-22.11
0.3	0.14	0.51	-11.22
0.4	0.19	0.51	-8.57
0.5	0.24	0.51	-6.54
0.6	0.31	0.51	-4.32
0.7	0.36	0.51	-3.02
0.8	0.42	0.51	-1.68
0.9	0.45	0.51	-1.08
1.0	0.51	0.51	0.00
1.2	0.60	0.51	1.42
1.4	0.68	0.51	2.50
1.6	0.79	0.51	3.81
1.8	0.90	0.51	4.94
2.0	0.98	0.51	5.68
2.2	1.06	0.51	6.36
2.4	1.15	0.51	7.07
2.6	1.19	0.51	7.36
2.7	1.21	0.51	7.51
2.8	1.22	0.51	7.58
3.0	1.19	0.51	7.36
3.5	0.06	0.51	-18.58
4.0	0.05	0.51	-20.17
4.5	0.05	0.51	-20.17
5.0	0.05	0.51	-20.17



4.6. Frequency Stability Test

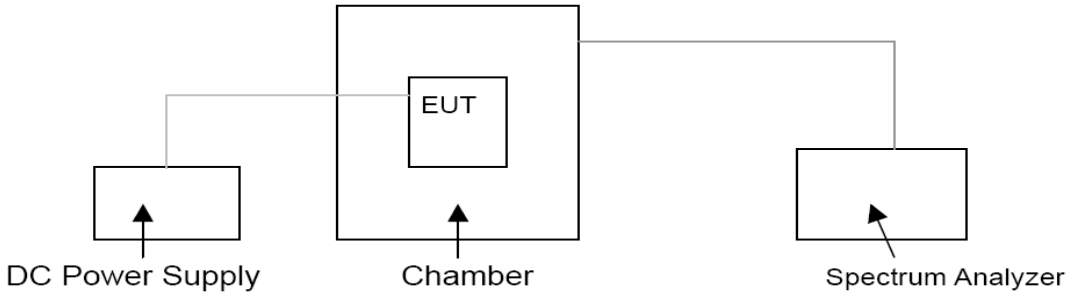
TEST APPLICABLE

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 +60℃ 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 90.213, the frequency stability limit is 2.5 ppm for 12.5 KHz channel separation.

TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external DC 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 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

Frequency Range (MHz)	Channel Bandwidth (KHz)	Frequency Tolerance (ppm)		
		Fixed and Base Stations	Mobile Stations	
			> 2 W	≤ 2 W
150-174 MHz	6.25	1.0	2.0	2.0
	12.5	2.5	5.0	5.0
	25	5.0	5.0	50.0*
421-512 MHz	6.25	0.5	1.0	1.0
	12.5	1.5	2.5	2.5
	25	2.5	5.0	5.0

- Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

TEST RESULTS

Modulation Type	Channel Separation	Test conditions		Frequency error (ppm)		
		Voltage(V)	Temp(℃)	Low Channel	Middle Channel	High Channel
Analog/FM	12.5KHz	13.60	-30	1.61	1.55	1.35
			-20	1.45	1.44	1.35
			-10	1.45	1.32	1.31
			0	1.27	1.12	1.29
			10	1.12	1.12	1.21
			20	0.81	0.97	0.94
			30	0.81	0.97	0.90
			40	1.23	1.21	1.21
			50	1.27	1.21	1.27
		11.0 (85% Rated)	20	0.81	1.05	1.02
		15.6 (115% Rated)	20	1.22	1.21	1.15
Limit			2.5 ppm			
Conclusion			Complies			

4.7. Maximum Transmitter Power

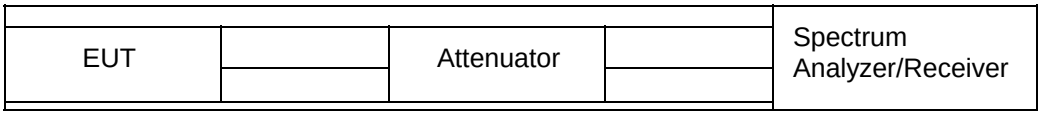
TEST APPLICABLE

Per FCC «2.1046 and «90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.

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 40 dB attenuator.
Measurement with Spectrum Analyzer ESI 26 conducted, external power supply with 13.60 V stabilized supply voltage.

TEST CONFIGURATION



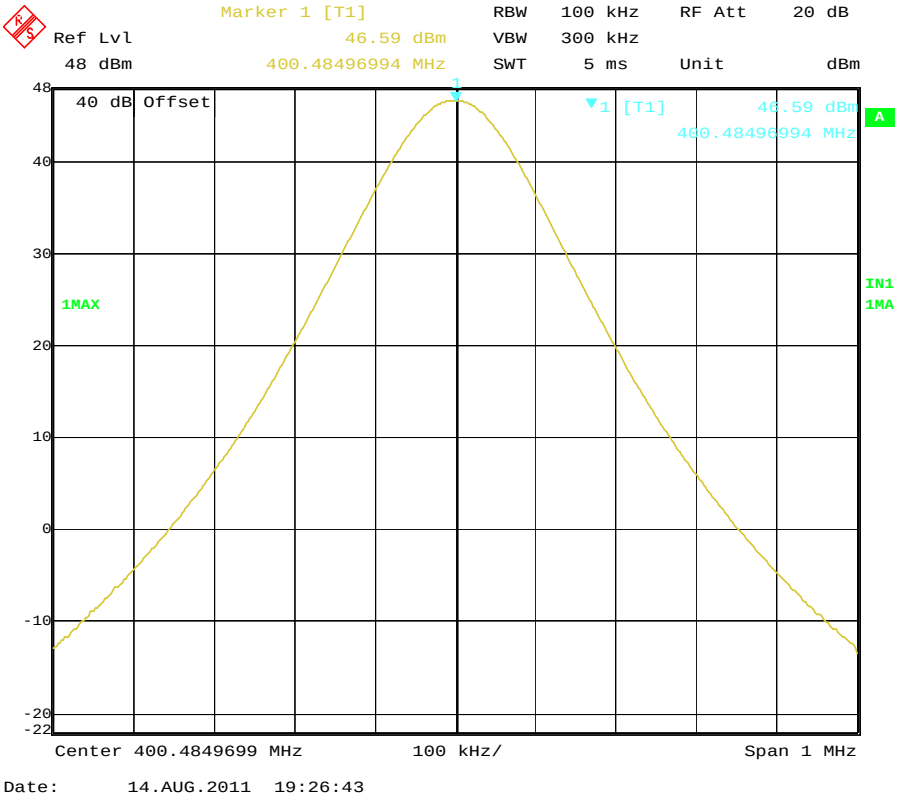
The EUT was directly connected to a RF Communication
Test set by a 40 dB attenuator

TEST RESULTS

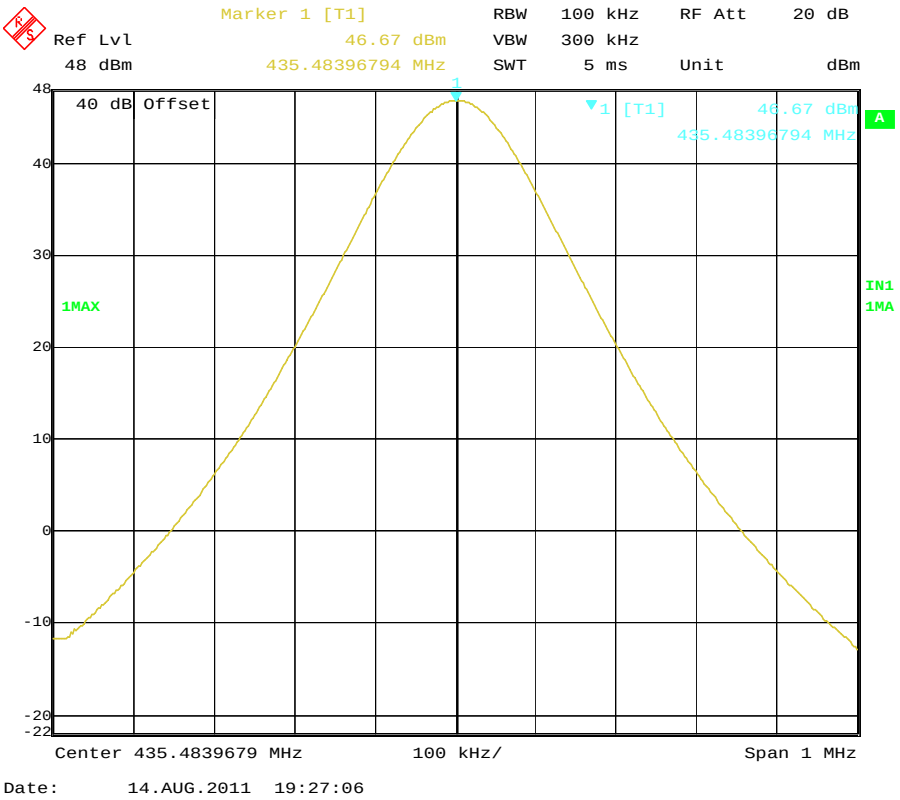
Modulation Type	Channel Separation	Test Channel	Test Frequency	Maximum Transmitter Power at Rated High Power Level(dBm)	Maximum Transmitter Power at Rated Low Power Level(dBm)
Analog/FM	12.5KHz	Low Channel	429.5000 MHz	46.59	37.13
		Middle Channel	450.5000 MHz	46.67	37.89
		High Channel	469.5000 MHz	46.47	36.73
Limit		The limit is dependent upon the station's antenna HAAT and required service area.			
Test Results		Complicance			

Plots of Maximum Transmitter Power Measurement

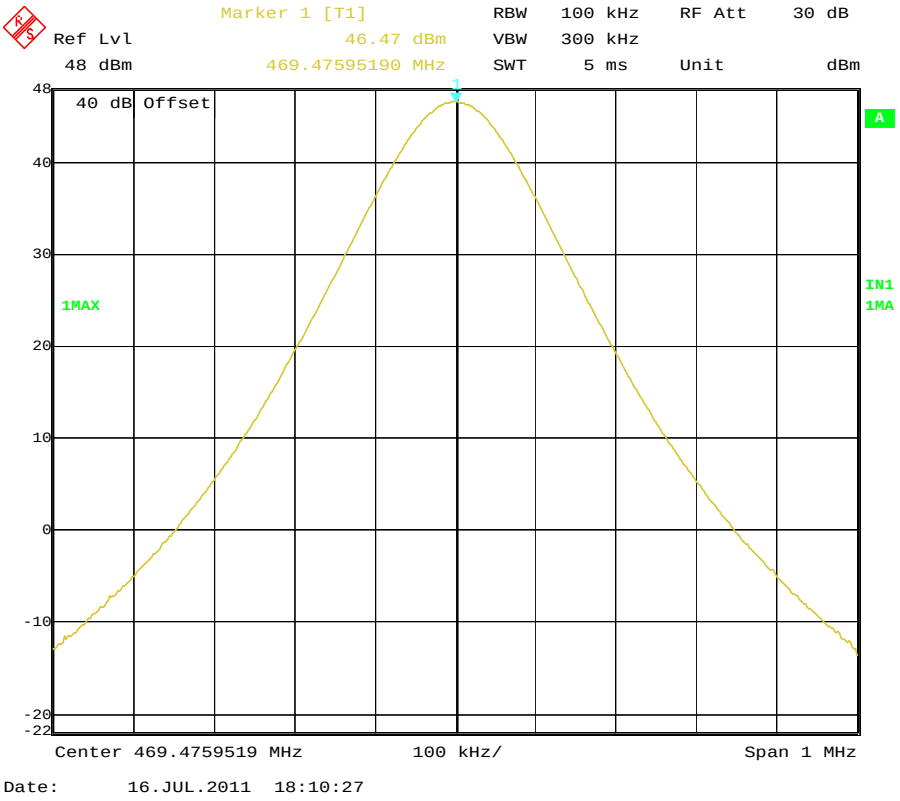
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	400.5000	45	46.59	Varies	Complicance



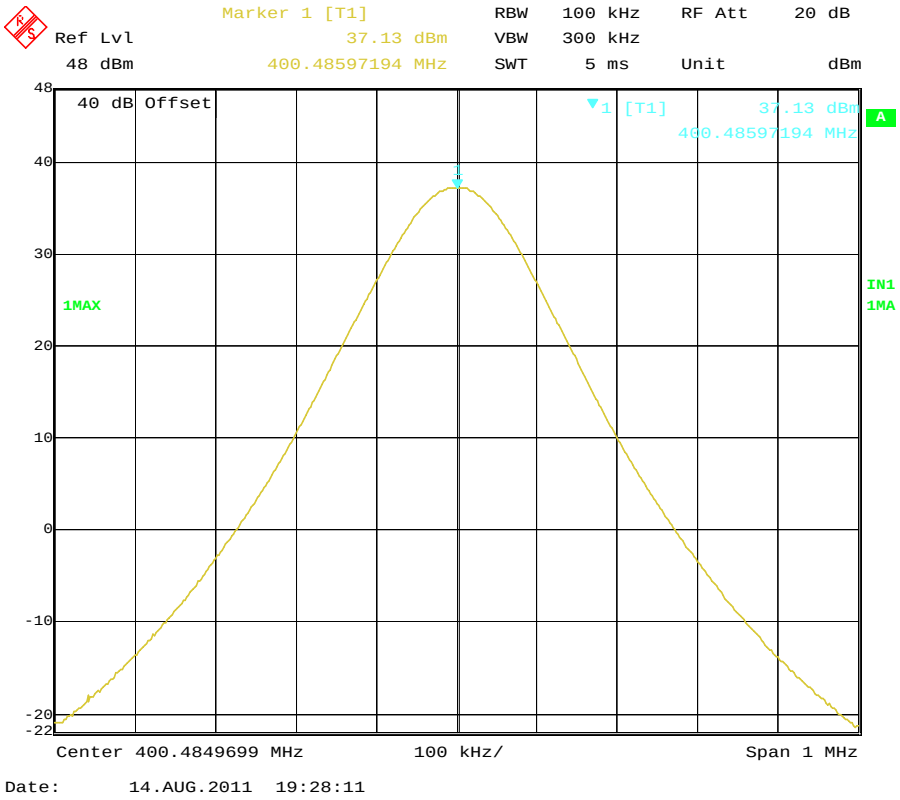
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	435.5000	45	46.67	Varies	Complicance



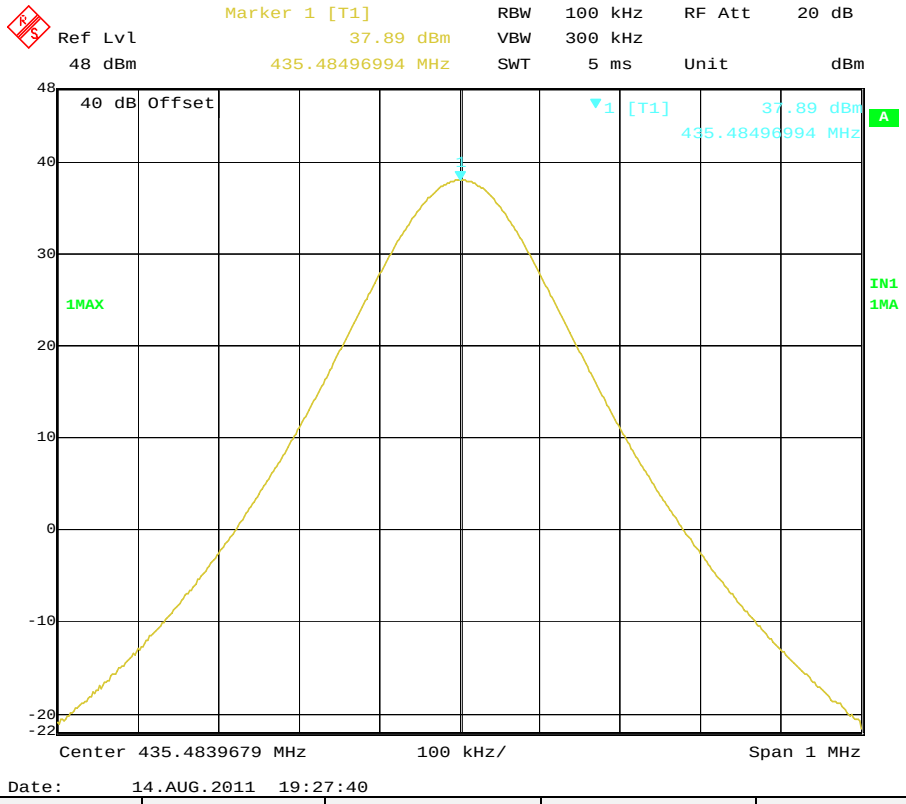
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	469.5000	45	46.47	Varies	Complicance



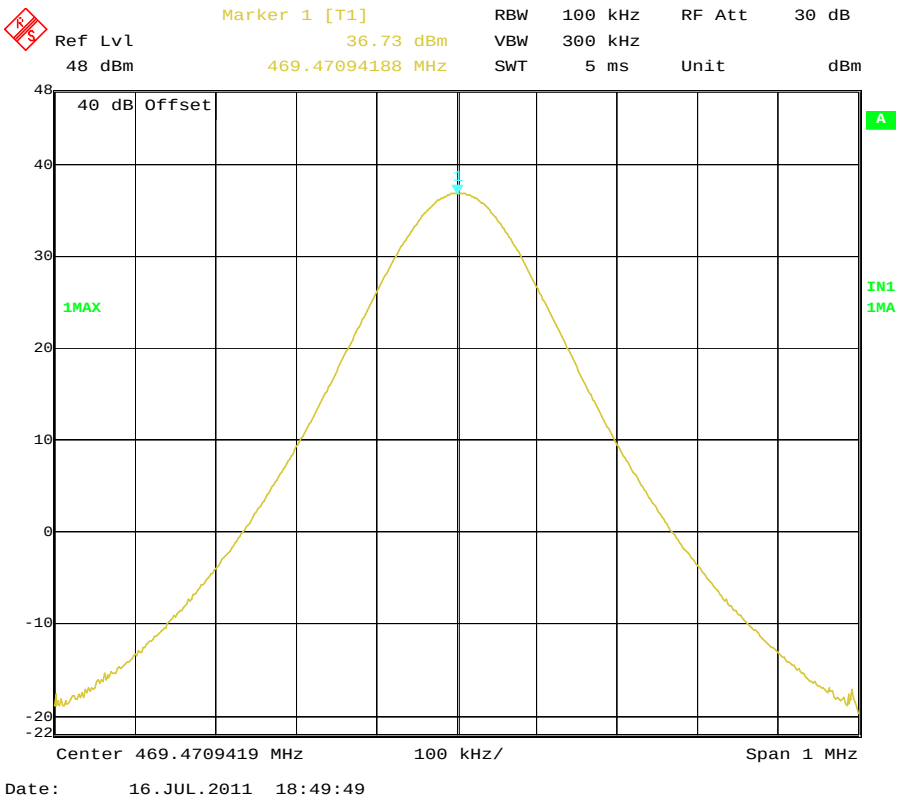
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	400.5000	5	37.13	Varies	Complicance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	435.5000	5	37.89	Varies	Complicance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	469.5000	5	36.73	Varies	Complicance



4.8. Transmitter Frequency Behavior

TEST APPLICABLE

Section 90.214
Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

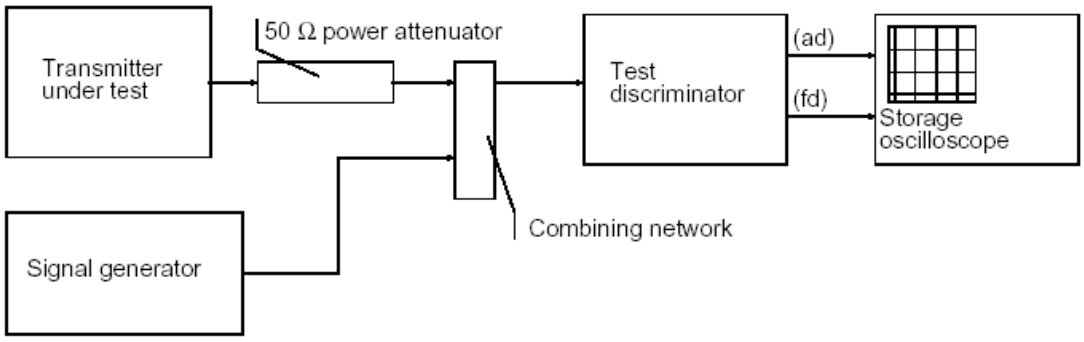
Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t_1 [4]	± 25.0 KHz	5.0 ms	10.0 ms
t_2	± 12.5 KHz	20.0 ms	25.0 ms
t_3 [4]	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels			
t_1 [4]	± 12.5 KHz	5.0 ms	10.0 ms
t_2	± 6.25 KHz	20.0 ms	25.0 ms
t_3 [4]	± 12.5 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels			
t_1 [4]	±6.25 KHz	5.0 ms	10.0 ms
t_2	±3.125 KHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 KHz	5.0 ms	10.0 ms

1. t_{on} is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
   t_1 is the time period immediately following t_{on}.
   t_2 is the time period immediately following t_1.
   t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
   t_{off} is the instant when the 1 KHz test signal starts to rise.
2. During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

TEST PROCEDURE

TIA/EIA-603 2.2.19

TEST CONFIGURATION

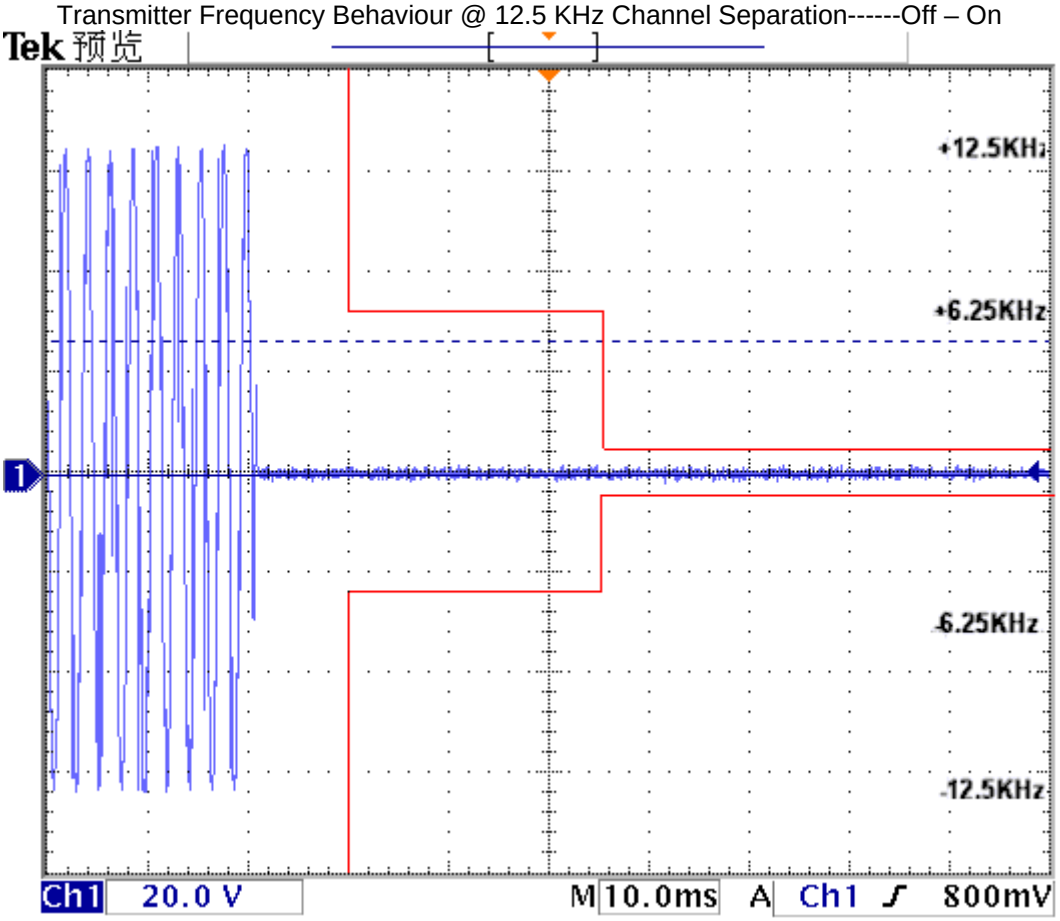


TEST RESULTS

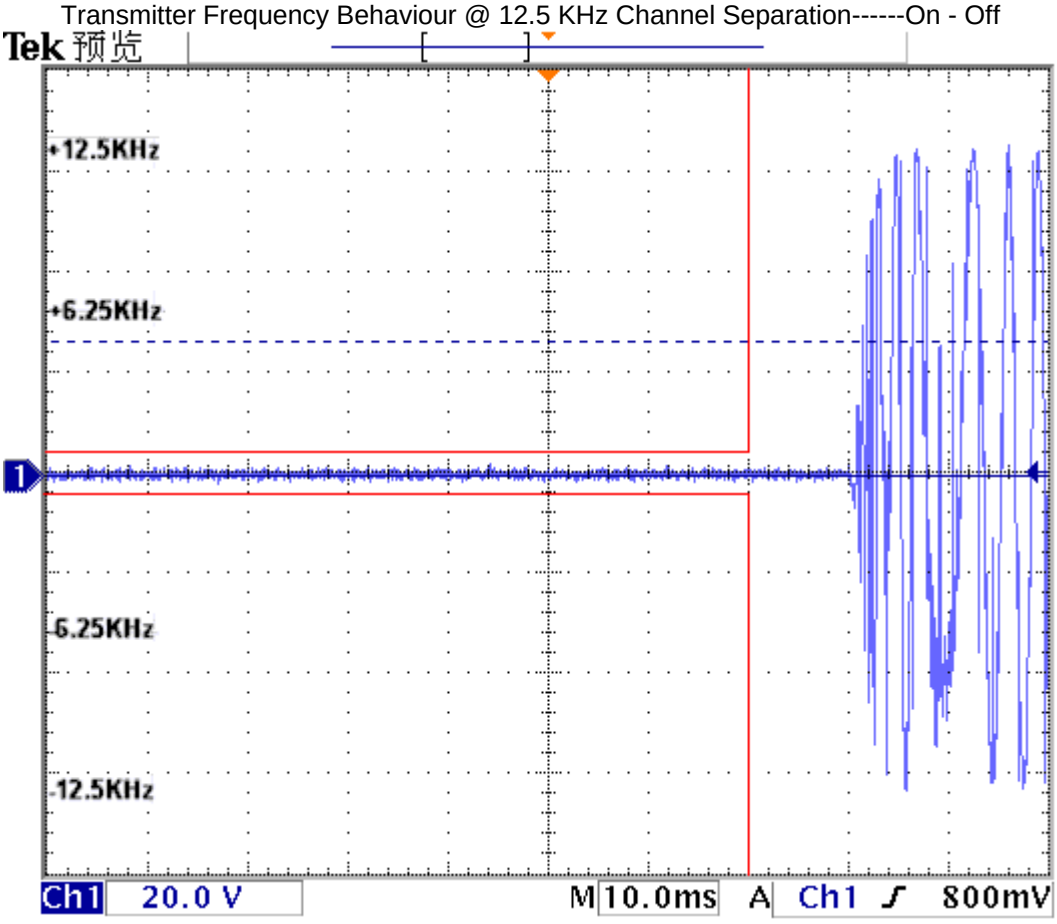
Please refer to the following plots.

Modulation Type: FM

Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------Off – On



Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------On - Off



4.9. Receiver Radiated Spurious Emssion

TEST APPLICABLE

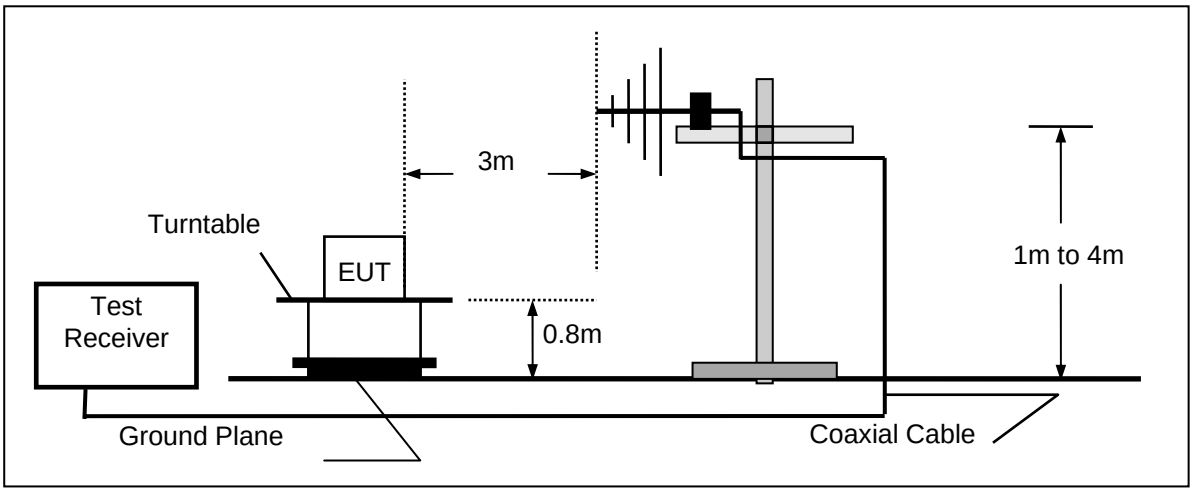
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

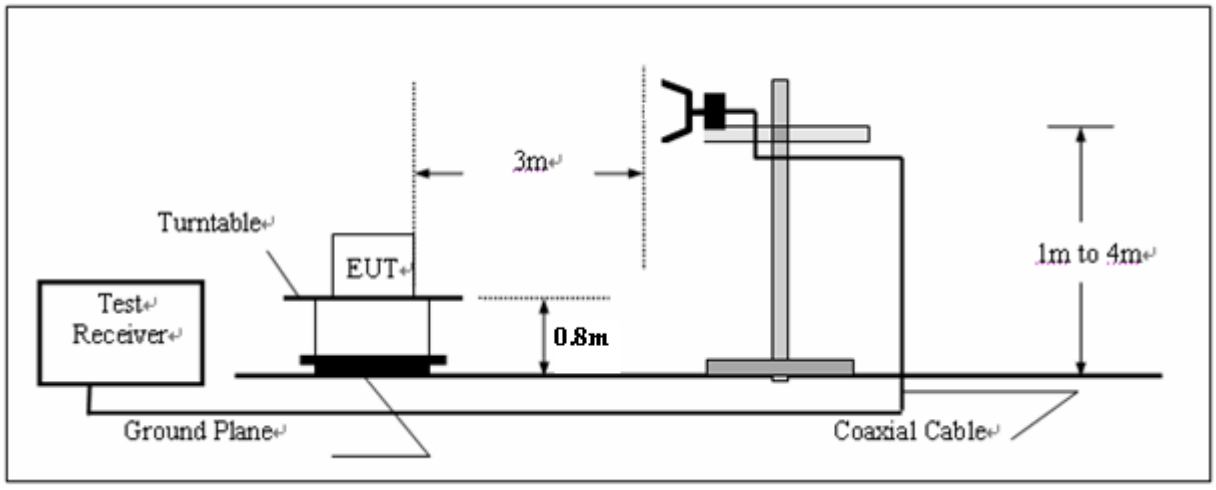
Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

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.

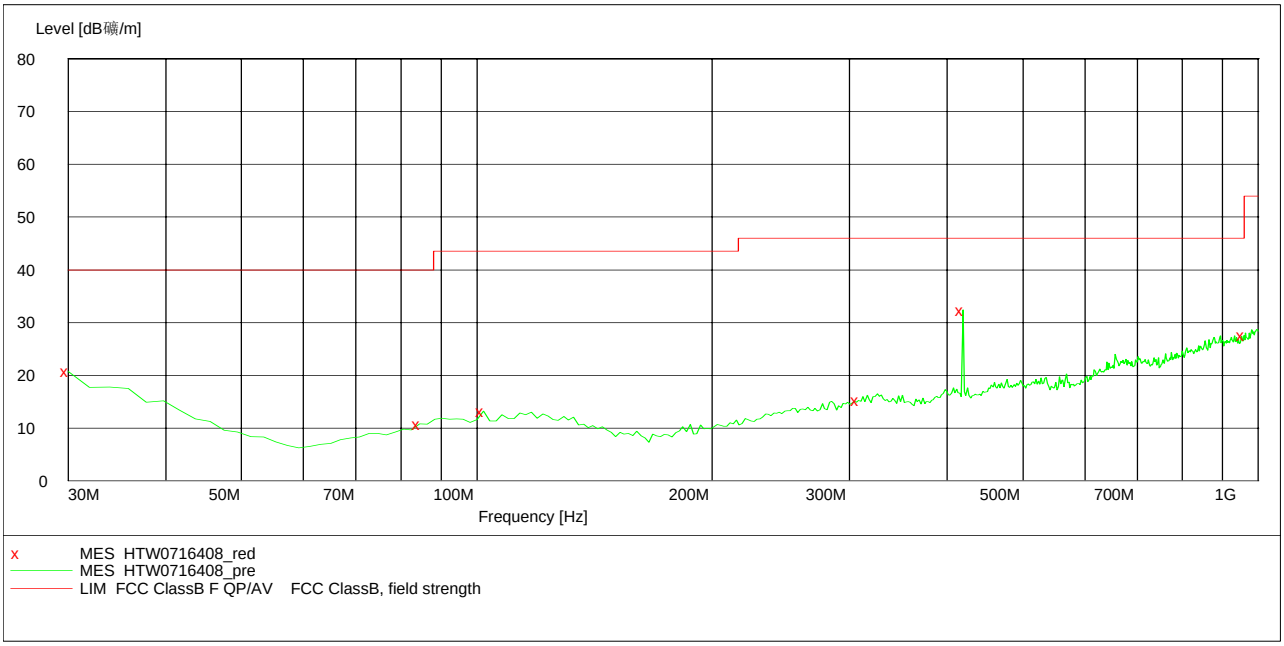
TEST RESULTS

The Radiated Measurement are performed to the three channels (the high channel, the middle channel and the low channel), the datum recorded below is the worst case for each channel separation;and the EUT 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	12.5 KHz	469.5000	H	418.78	32.40	46.00
			V	418.78	31.10	46.00
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   120 kHz    HL562
```



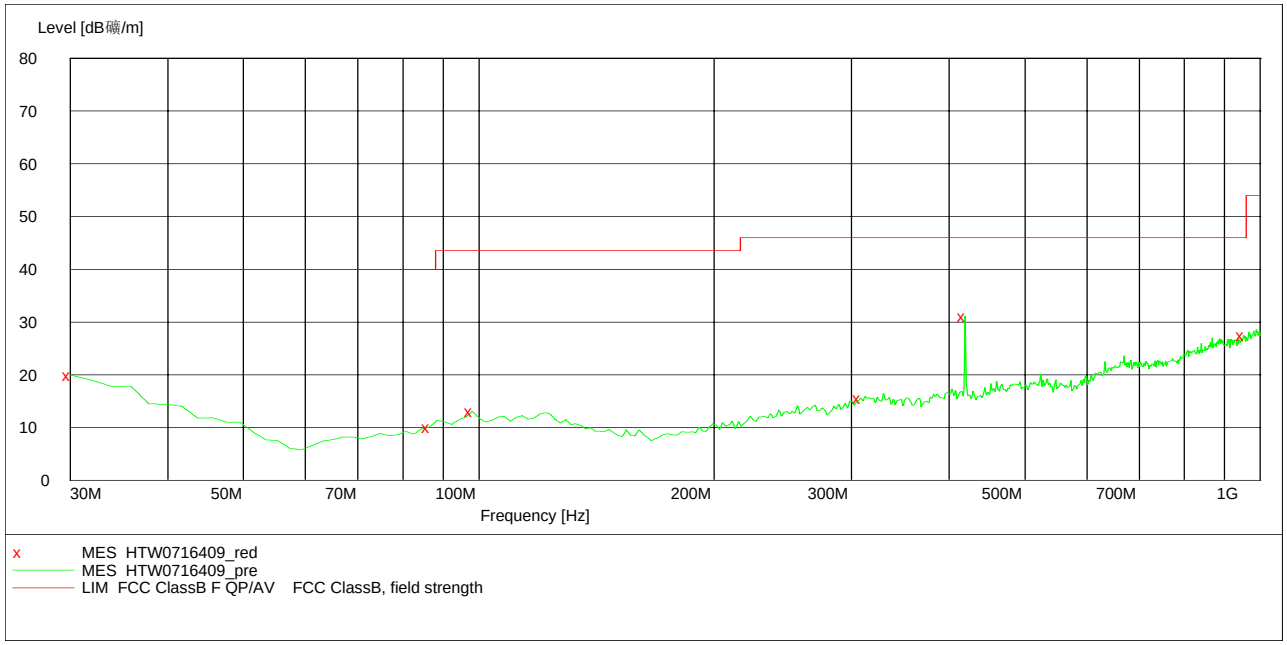
MEASUREMENT RESULT: "HTW0716408_red"

```
7/16/2011  10:46PM
   Frequency     Level  Transd   Limit  Margin  Det.  Height  Azimuth Polarization
         MHz    dBµV/m      dB  dBµV/m      dB            cm      deg

   30.000000     20.70   -11.5    40.0    19.3  Peak    100.0     3.00  HORIZONTAL
   84.428858     10.80   -21.5    40.0    29.2  Peak    300.0   107.00  HORIZONTAL
  101.923848     13.20   -20.3    43.5    30.3  Peak    100.0   268.00  HORIZONTAL
  307.975952     15.20   -17.2    46.0    30.8  Peak    300.0    53.00  HORIZONTAL
  418.777555     32.40   -16.0    46.0    13.6  Peak    100.0   268.00  HORIZONTAL
  959.178357     27.60    -6.7    46.0    18.4  Peak    300.0   252.00  HORIZONTAL
```

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	120 kHz	HL562



MEASUREMENT RESULT: "HTW0716409_red"

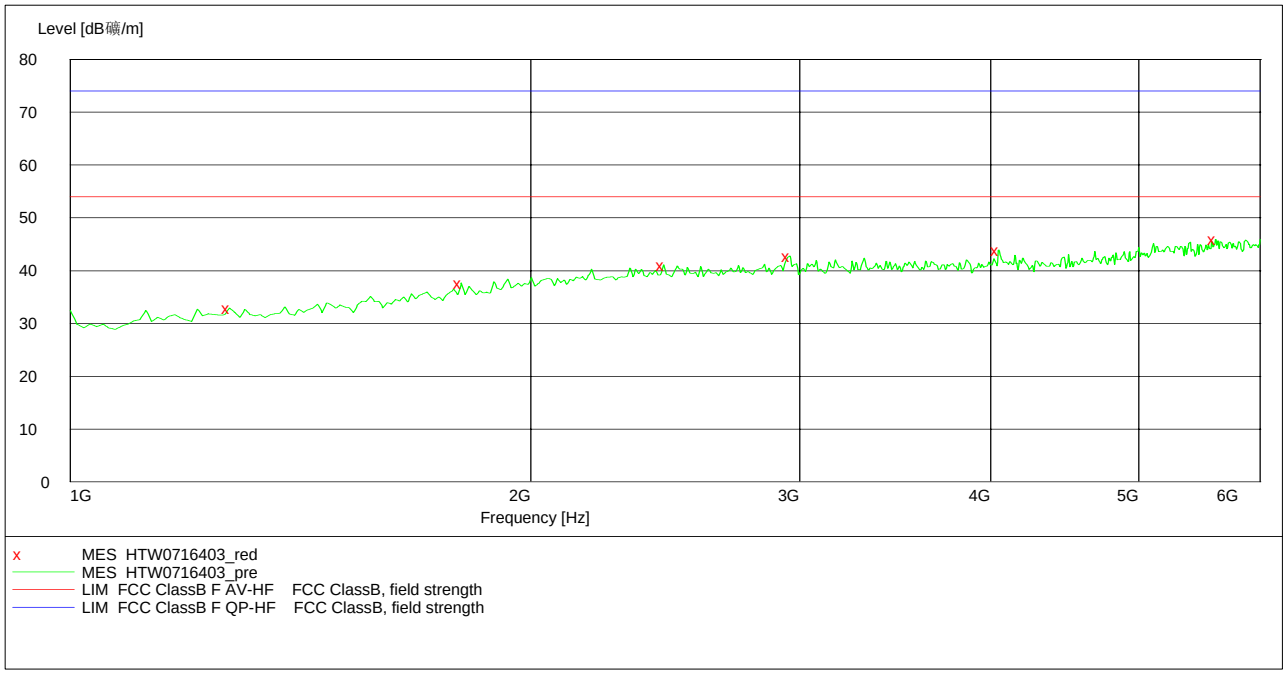
7/16/2011 10:47PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	20.00	-11.5	40.0	20.0	Peak	100.0	269.00	VERTICAL
86.372745	10.10	-21.2	40.0	29.9	Peak	100.0	252.00	VERTICAL
98.036072	13.10	-20.4	43.5	30.4	Peak	100.0	89.00	VERTICAL
307.975952	15.60	-17.2	46.0	30.4	Peak	100.0	194.00	VERTICAL
418.777555	31.10	-16.0	46.0	14.9	Peak	100.0	235.00	VERTICAL
951.402806	27.40	-7.2	46.0	18.6	Peak	100.0	83.00	VERTICAL

Modulation Type	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
FM	12.5 KHz	469.5000	H	5609.22	46.00	54.00
			V	5809.62	46.60	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
```



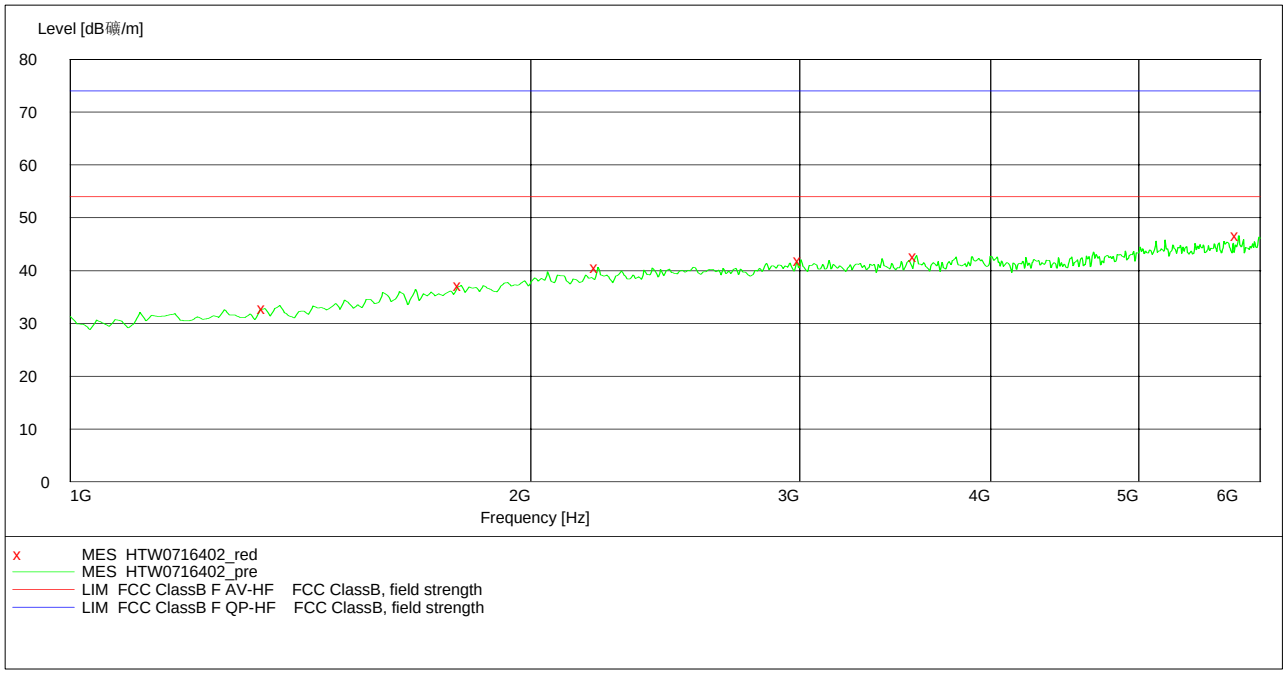
MEASUREMENT RESULT: "HTW0716403_red"

7/16/2011 10:35PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1270.541082	32.90	-7.6	54.0	21.1	Peak	100.0	247.00	HORIZONTAL
1801.603206	37.70	-3.0	54.0	16.3	Peak	100.0	221.00	HORIZONTAL
2442.885772	41.10	0.6	54.0	12.9	Peak	100.0	177.00	HORIZONTAL
2953.907816	42.80	2.0	54.0	11.2	Peak	100.0	356.00	HORIZONTAL
4046.092184	43.90	3.6	54.0	10.1	Peak	100.0	76.00	HORIZONTAL
5609.218437	46.00	6.7	54.0	8.0	Peak	100.0	359.00	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: "HTW0716402_red"

7/16/2011 10:33PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1340.681363	32.80	-7.0	54.0	21.2	Peak	100.0	80.00	VERTICAL
1801.603206	37.20	-3.0	54.0	16.8	Peak	100.0	201.00	VERTICAL
2212.424850	40.60	-0.4	54.0	13.4	Peak	100.0	103.00	VERTICAL
3004.008016	42.00	2.1	54.0	12.0	Peak	100.0	221.00	VERTICAL
3575.150301	42.80	2.8	54.0	11.2	Peak	100.0	119.00	VERTICAL
5809.619238	46.60	7.1	54.0	7.4	Peak	100.0	150.00	VERTICAL

4.10. Receiver Conducted Spurious Emssion

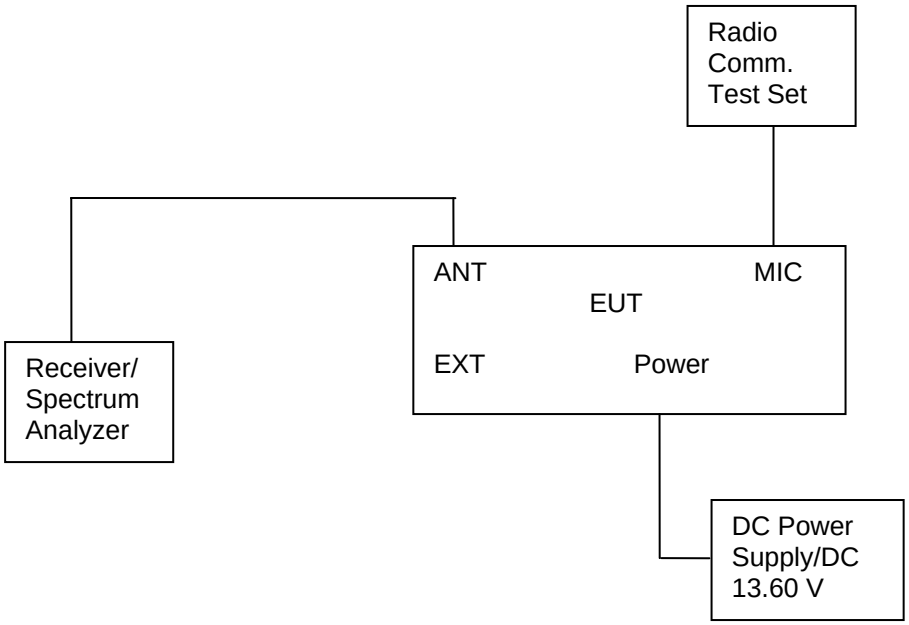
TEST APPLICABLE

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



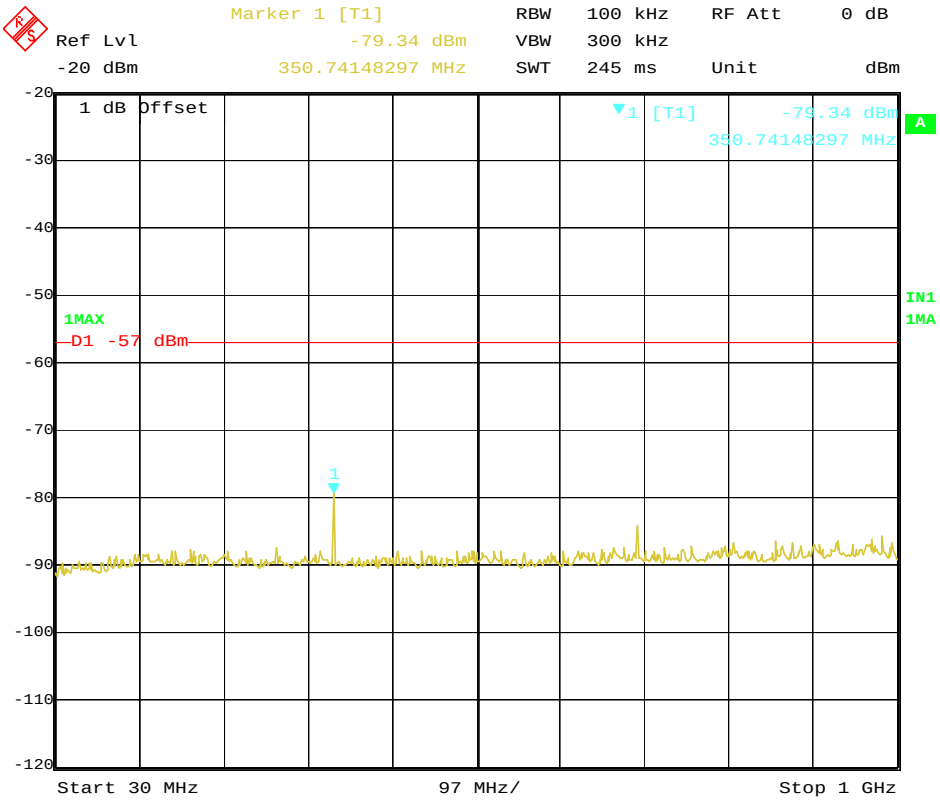
LIMIT

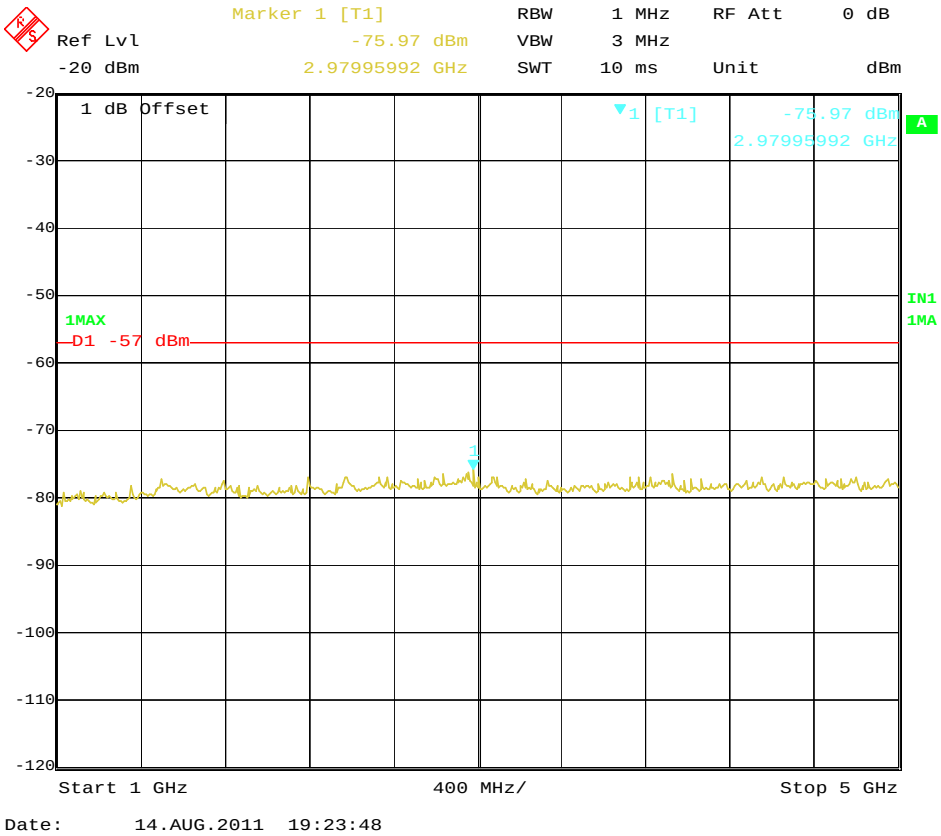
The power at the antenna terminal shall not exceed 2.0 nanowatts (-57dBm).

TEST RESULTS

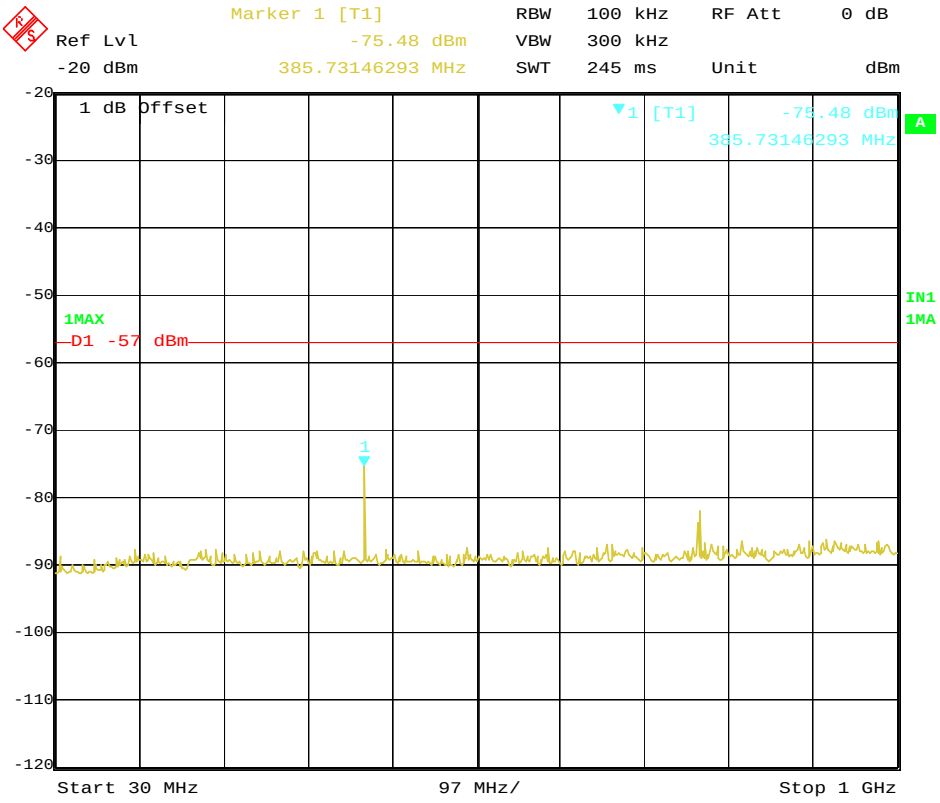
The Receiver Conducted Spurious Emssions Measurement is performed to the three channels (the high channel, the middle channel and the low channel), the datums recorded below were for the three channels; and the EUT shall be scanned from 30 MHz to the 5 GHz.

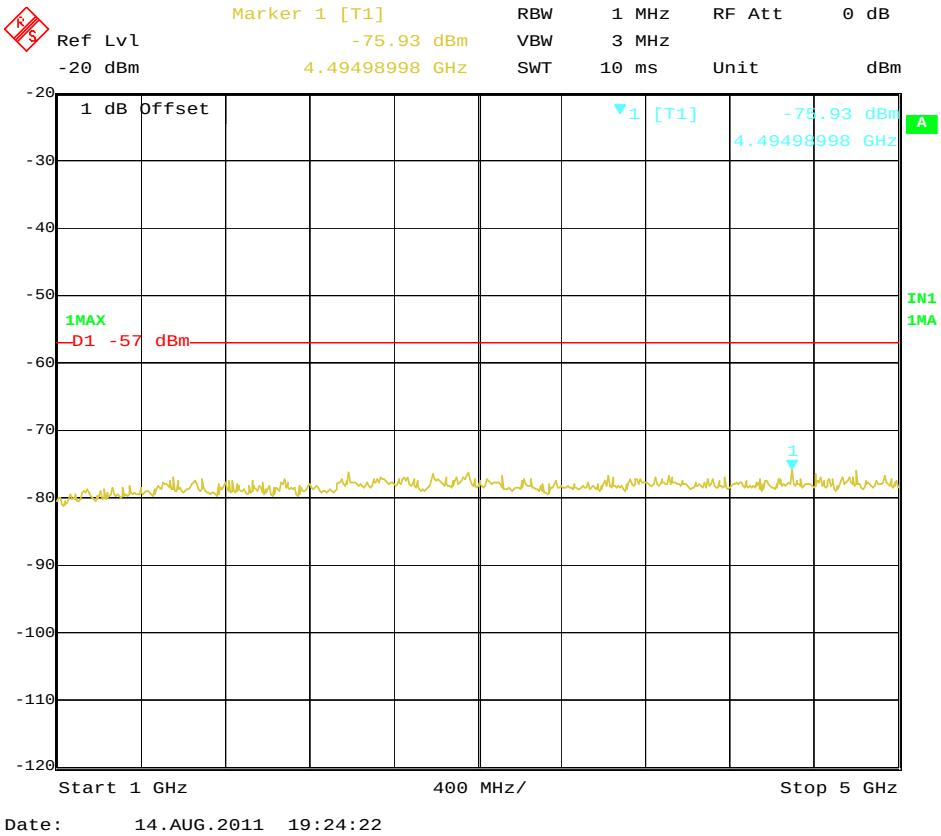
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	400.5000	350.74	-79.34	2979.96	-75.97	-57dBm
Test Results				Compliance				



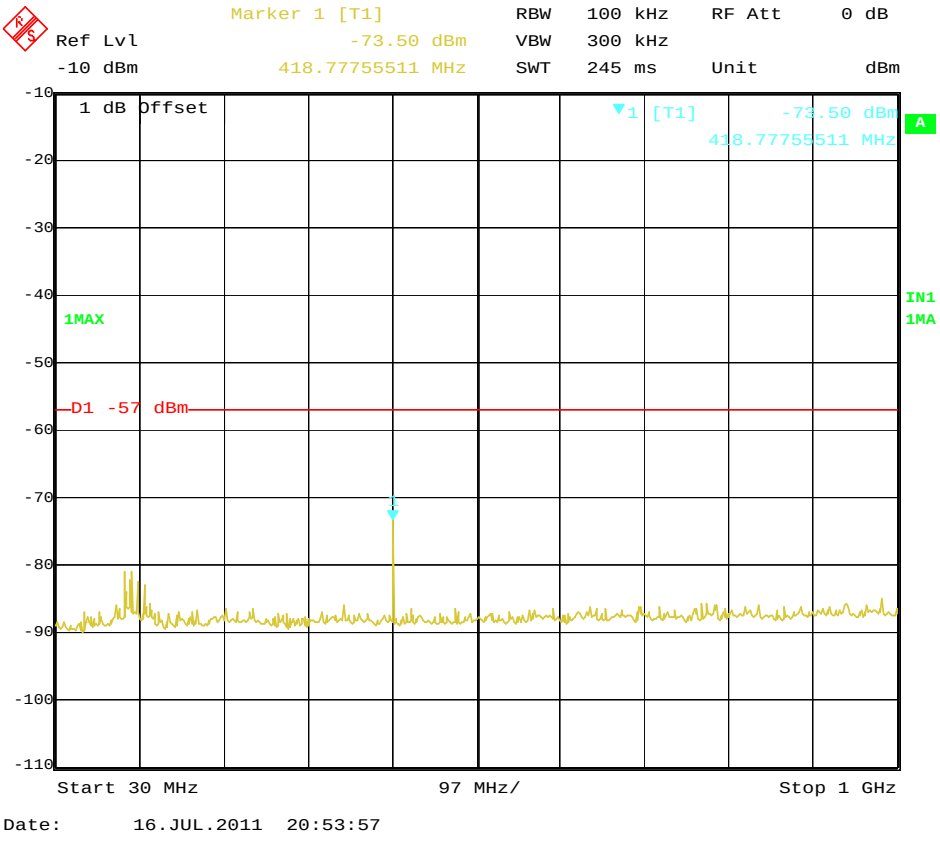


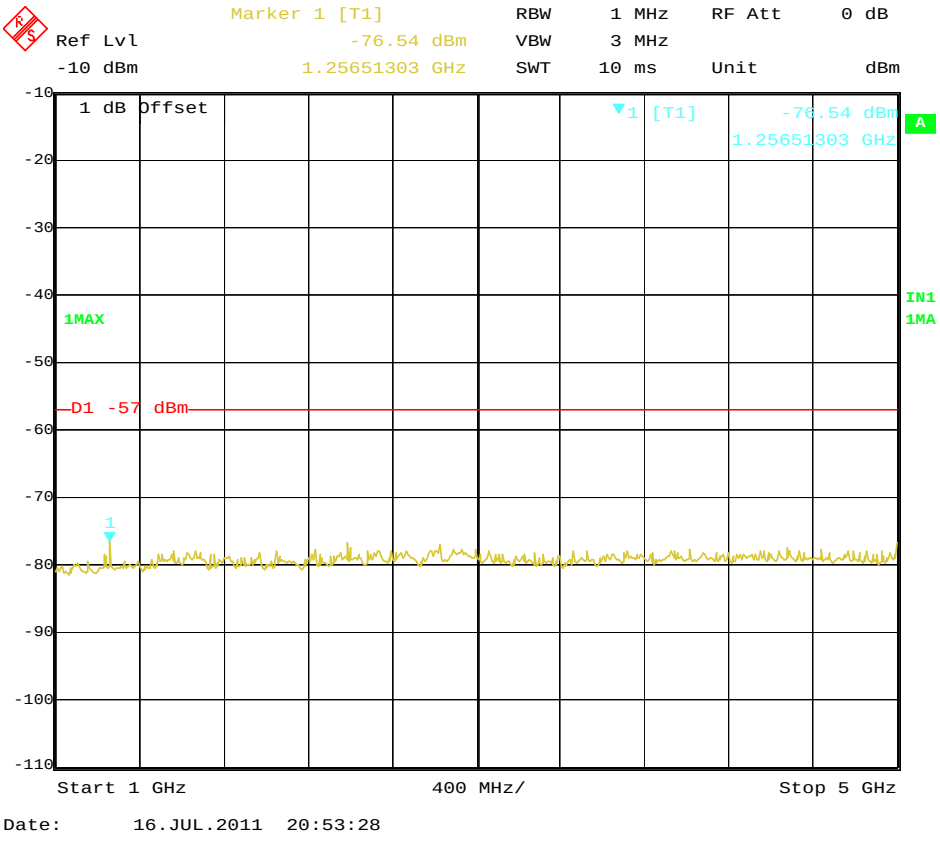
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	435.5000	385.73	-75.48	4494.99	-75.93	-57dBm
Test Results				Compliance				



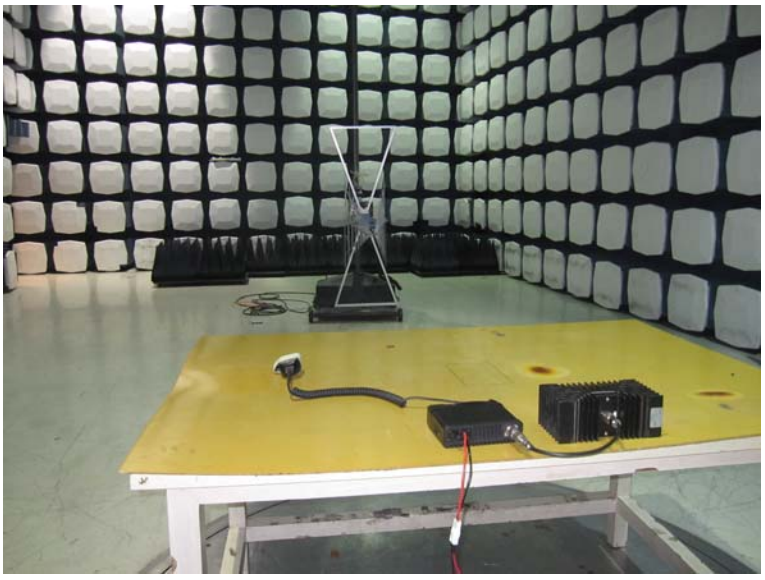


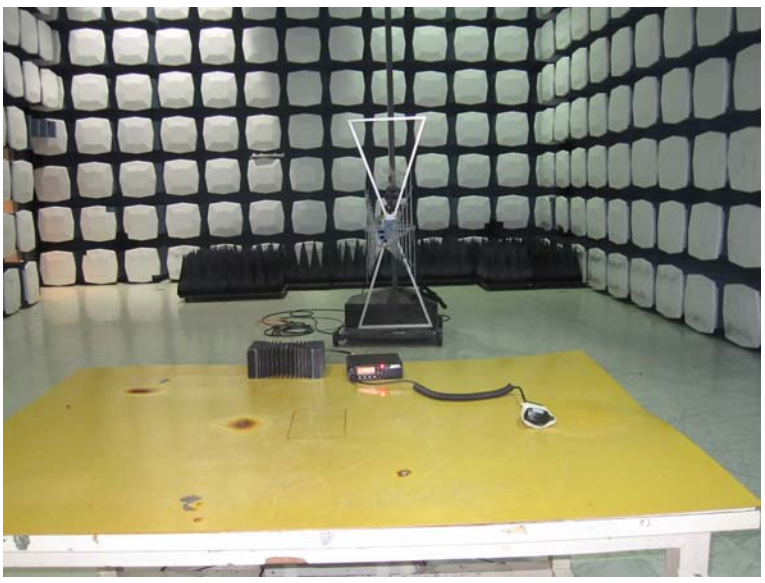
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	High	469.5000	418.78	-73.50	1256.51	-76.54	-57dBm
Test Results				Compliance				

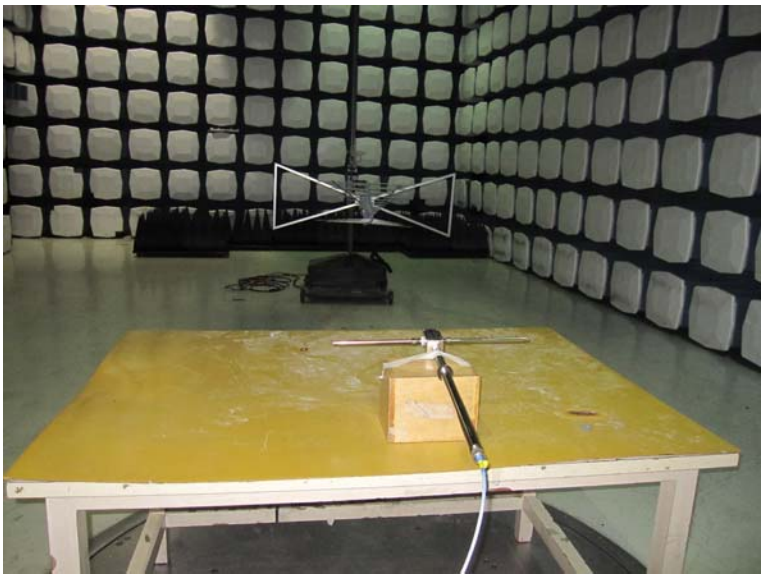


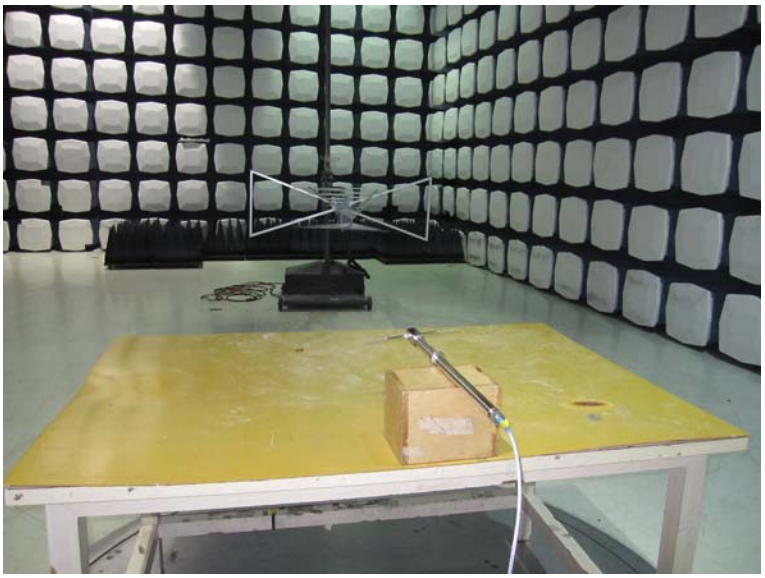


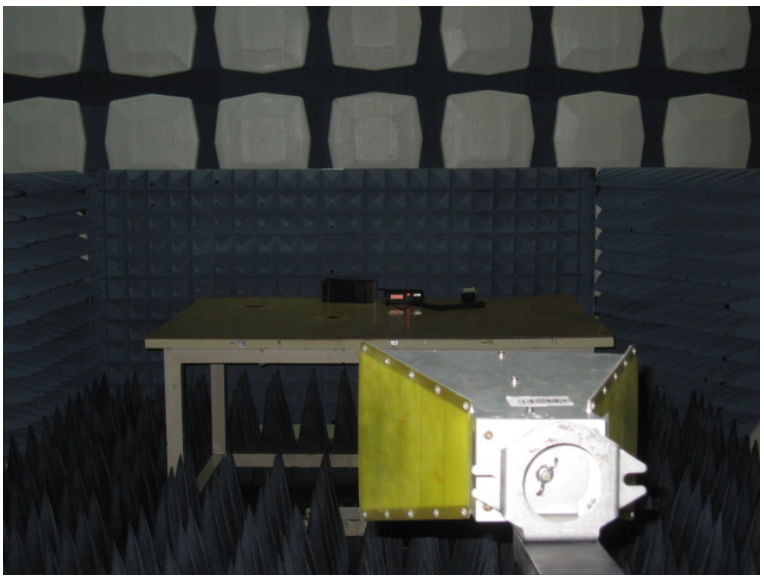
5. Test Setup Photos of the EUT

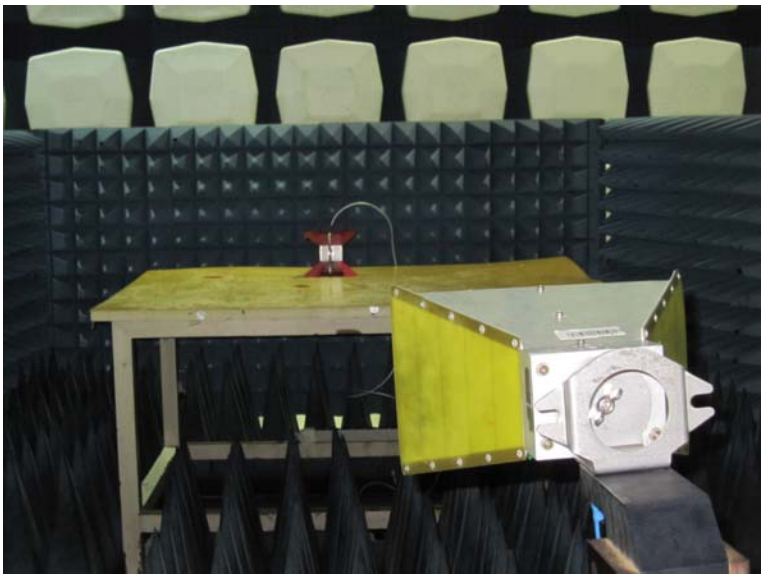


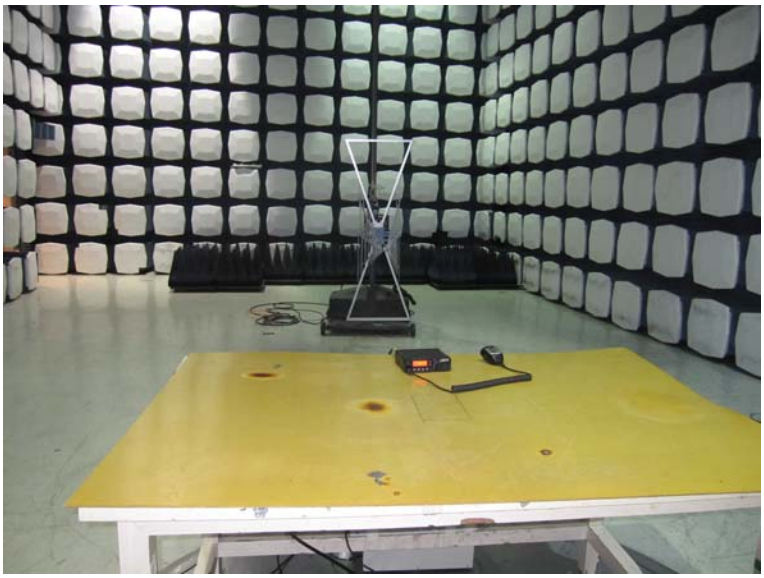


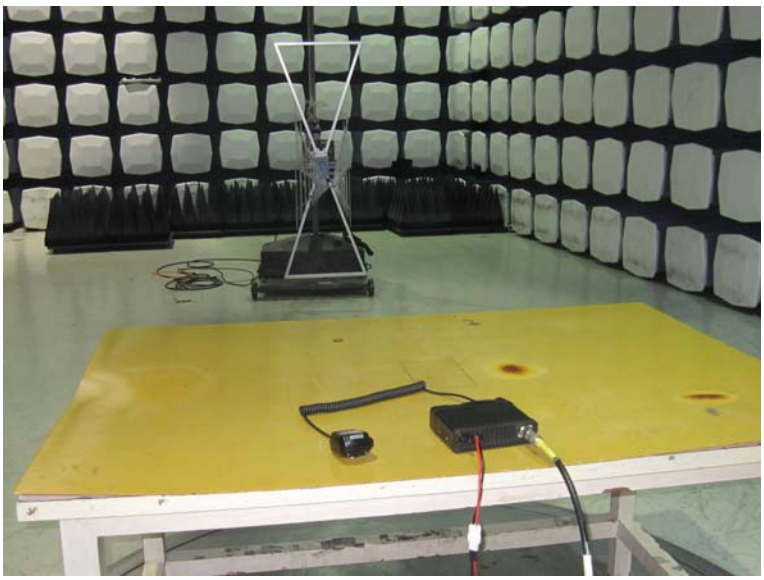


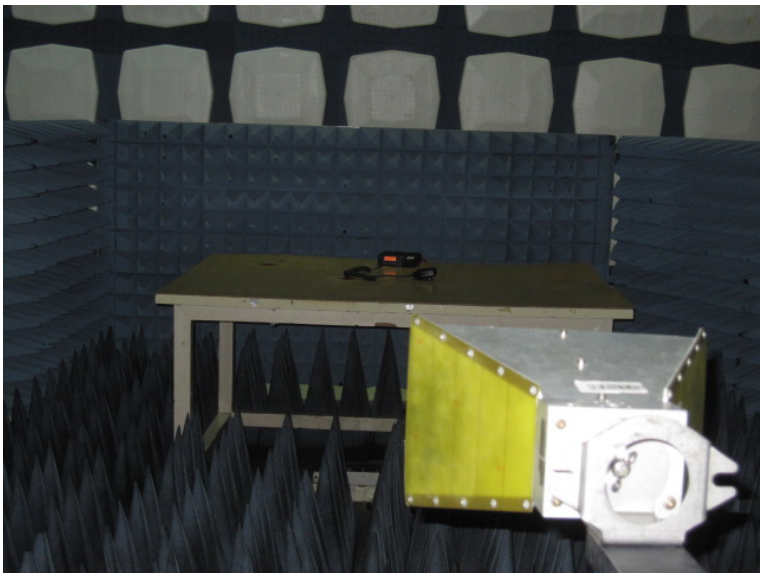










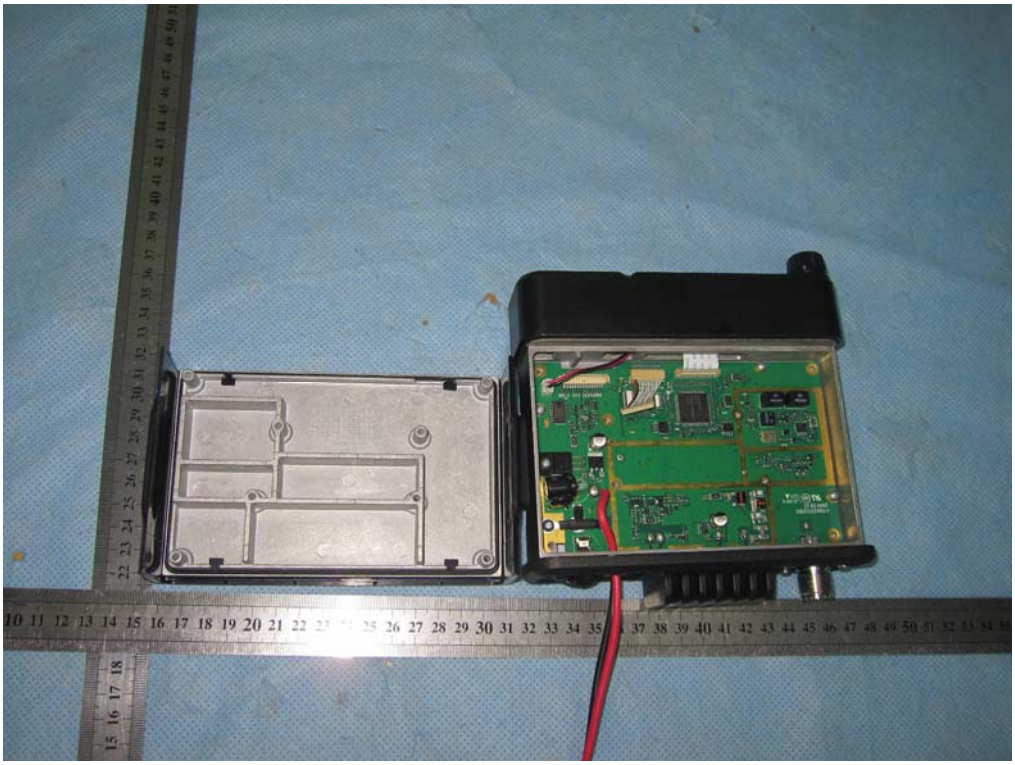


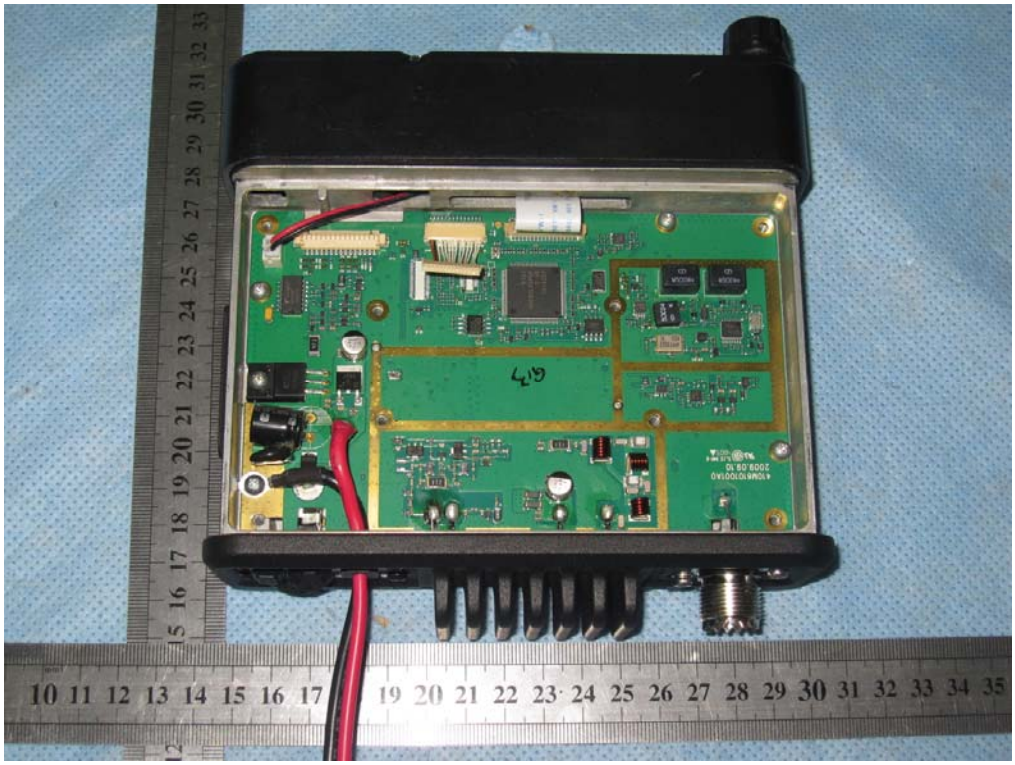
6. External and Internal Photos of the EUT

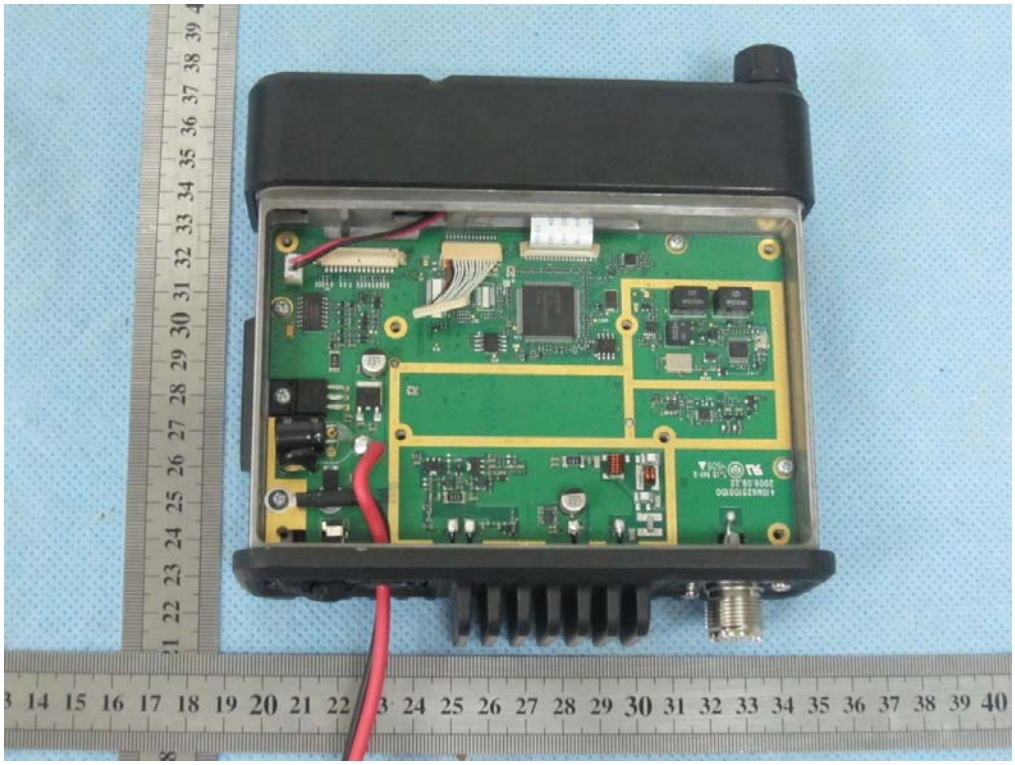
External Photos

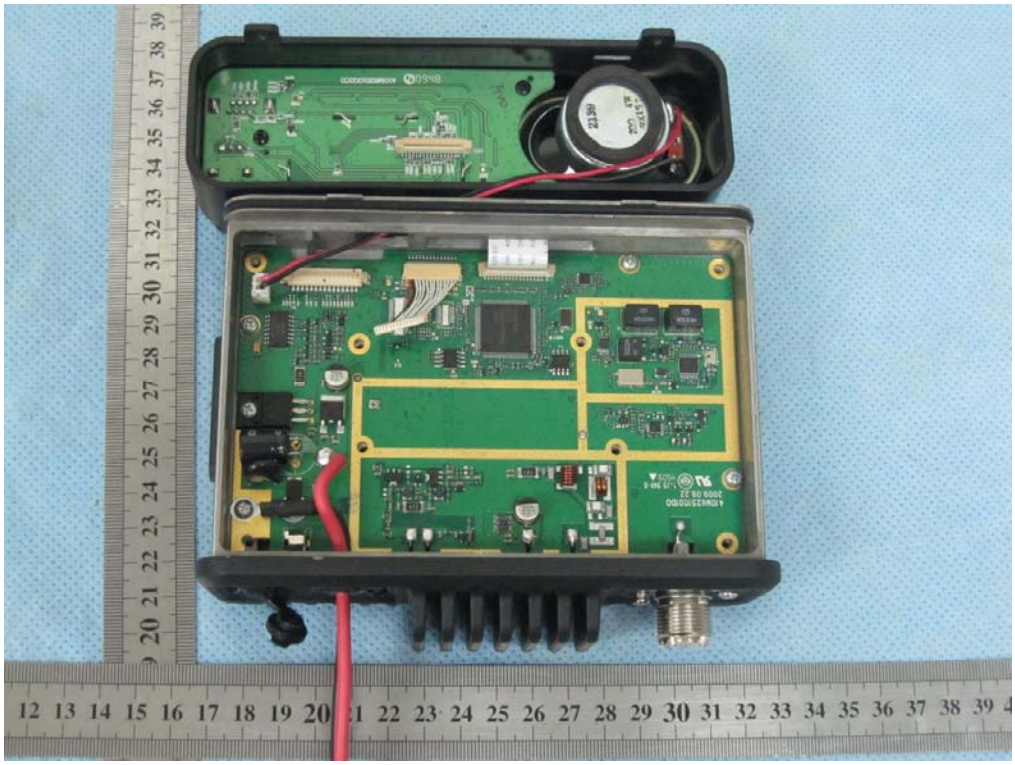

HYT
P1
P2
P3
P4

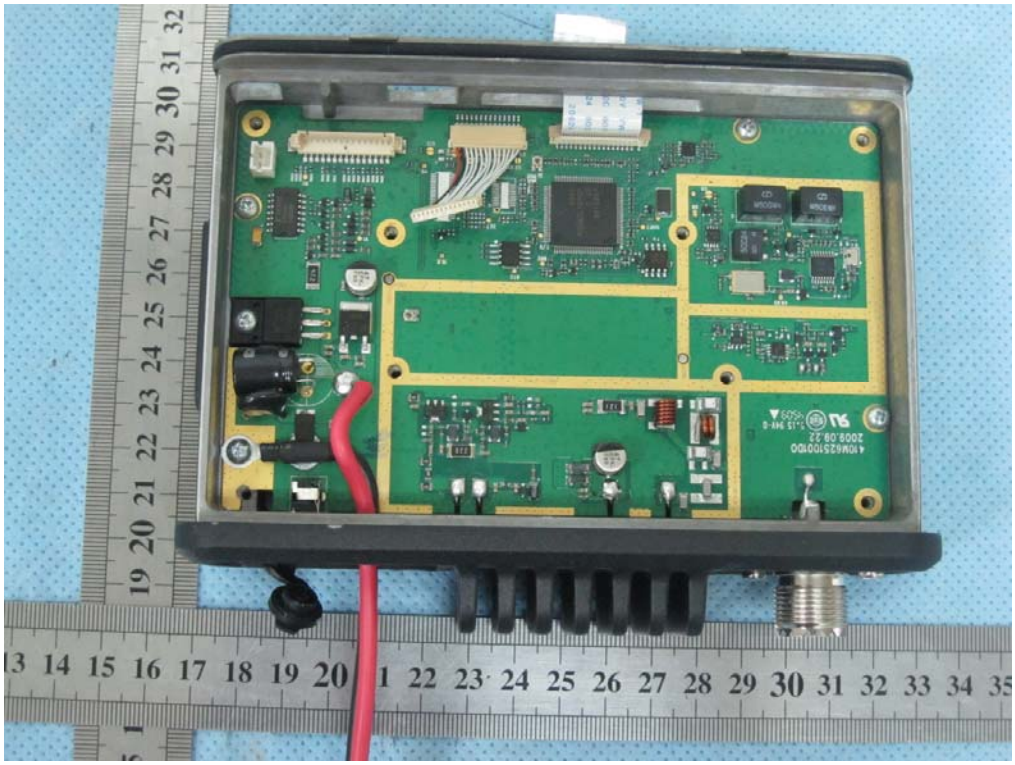
Internal Photos

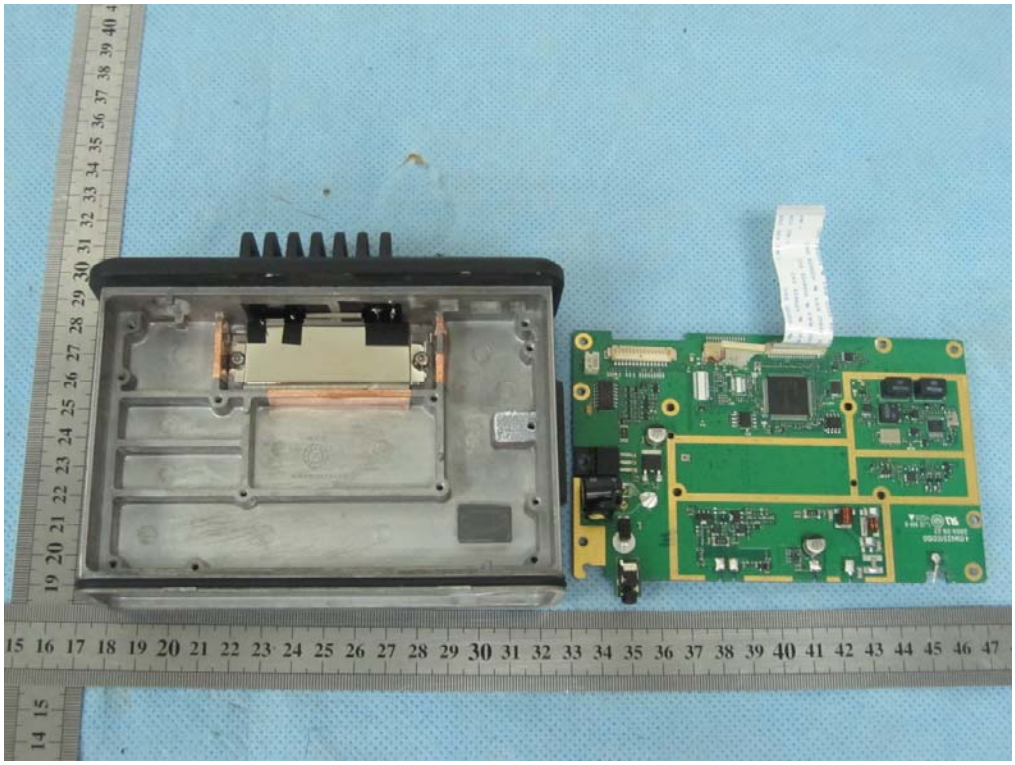


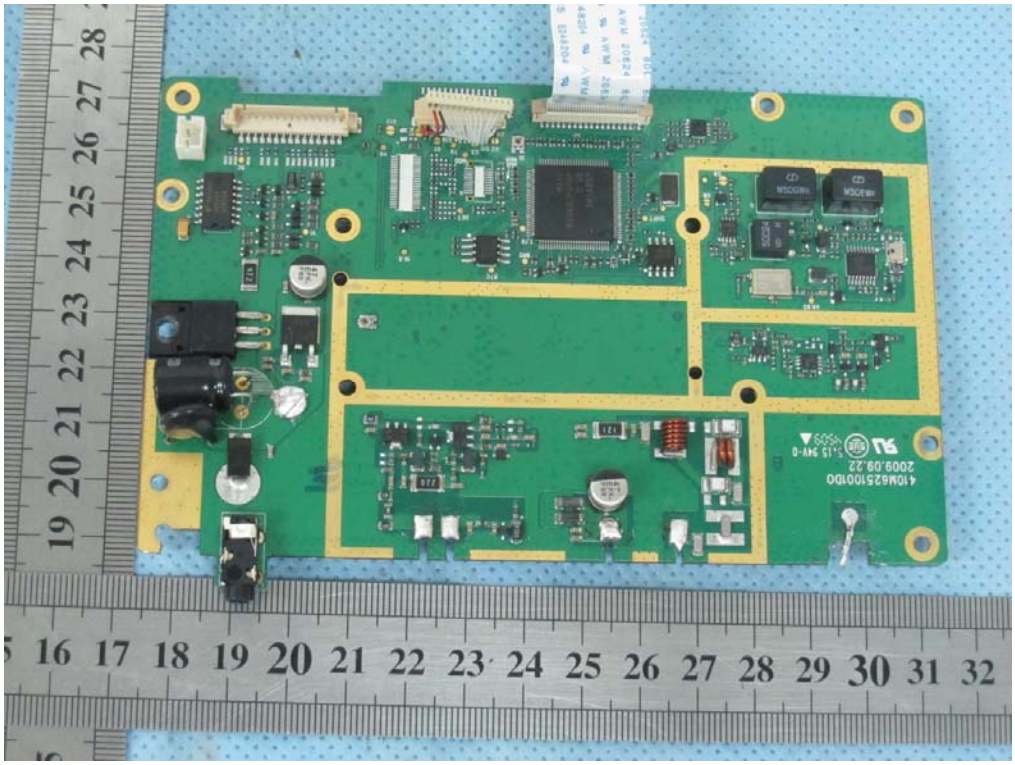


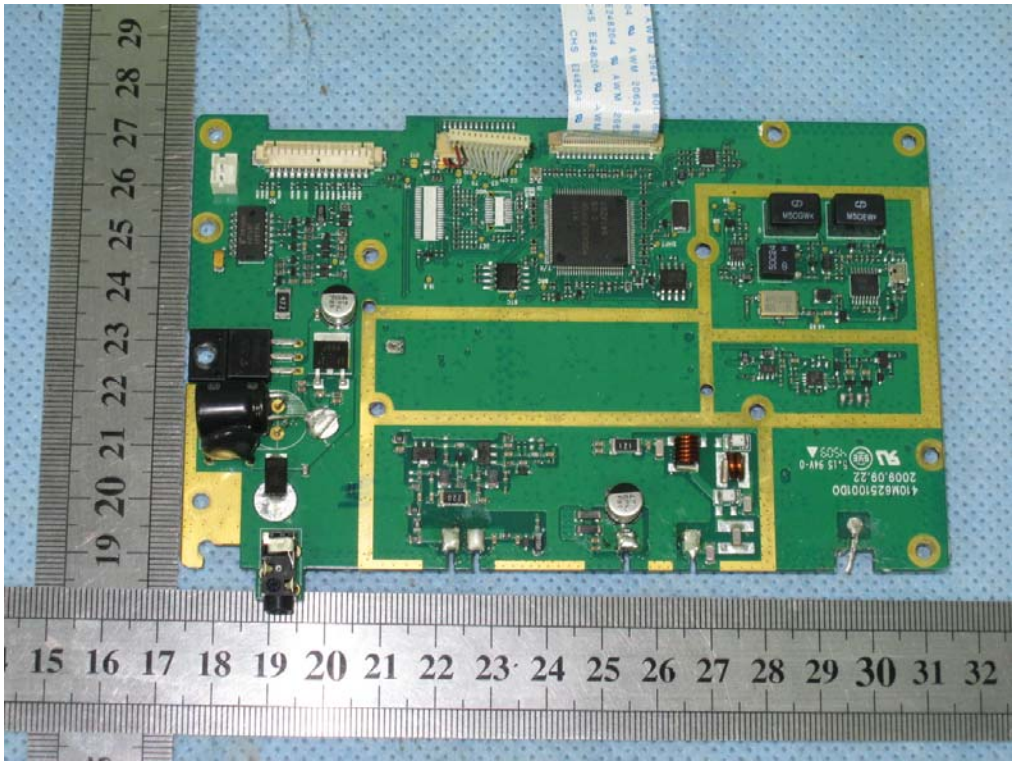


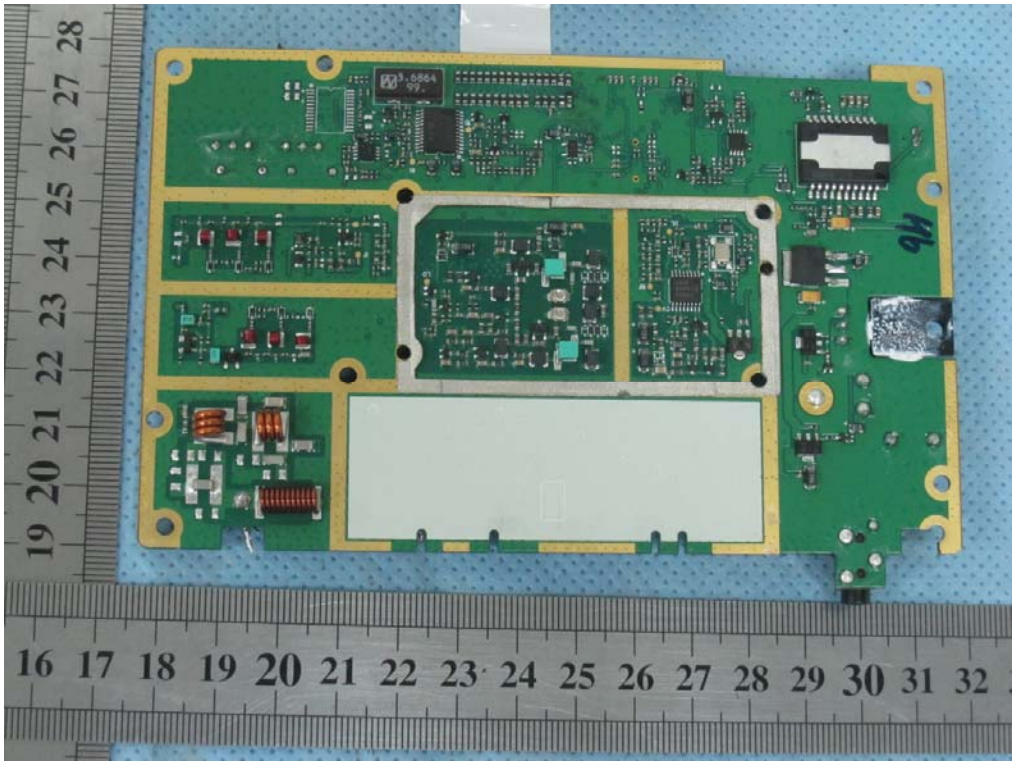


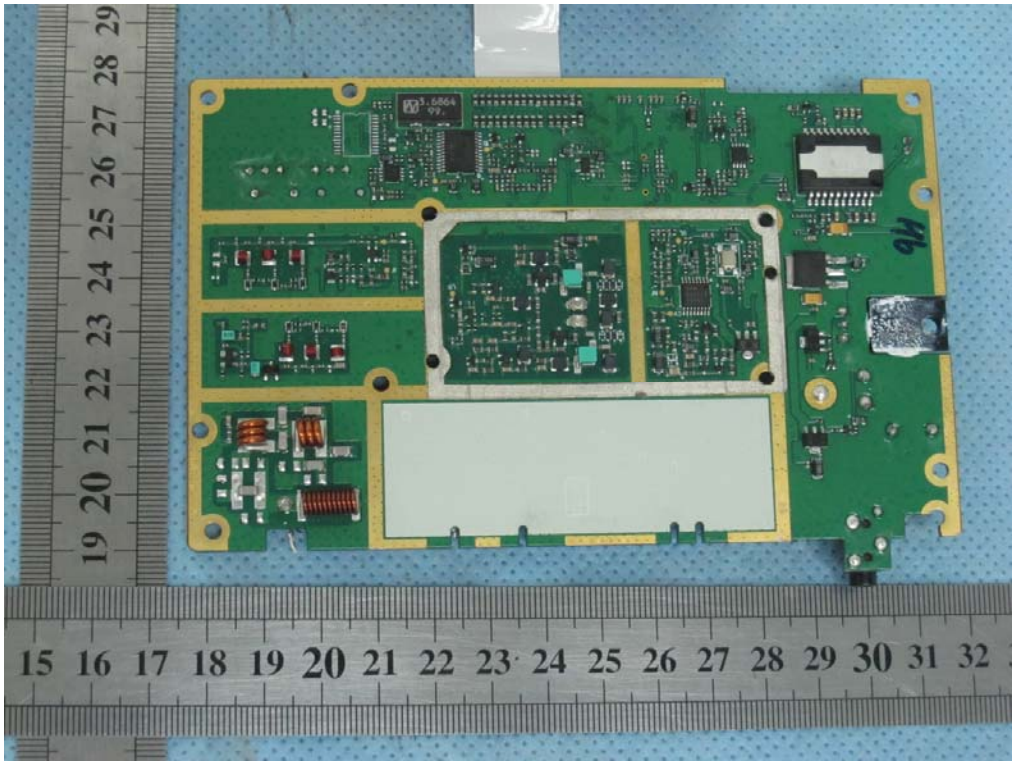


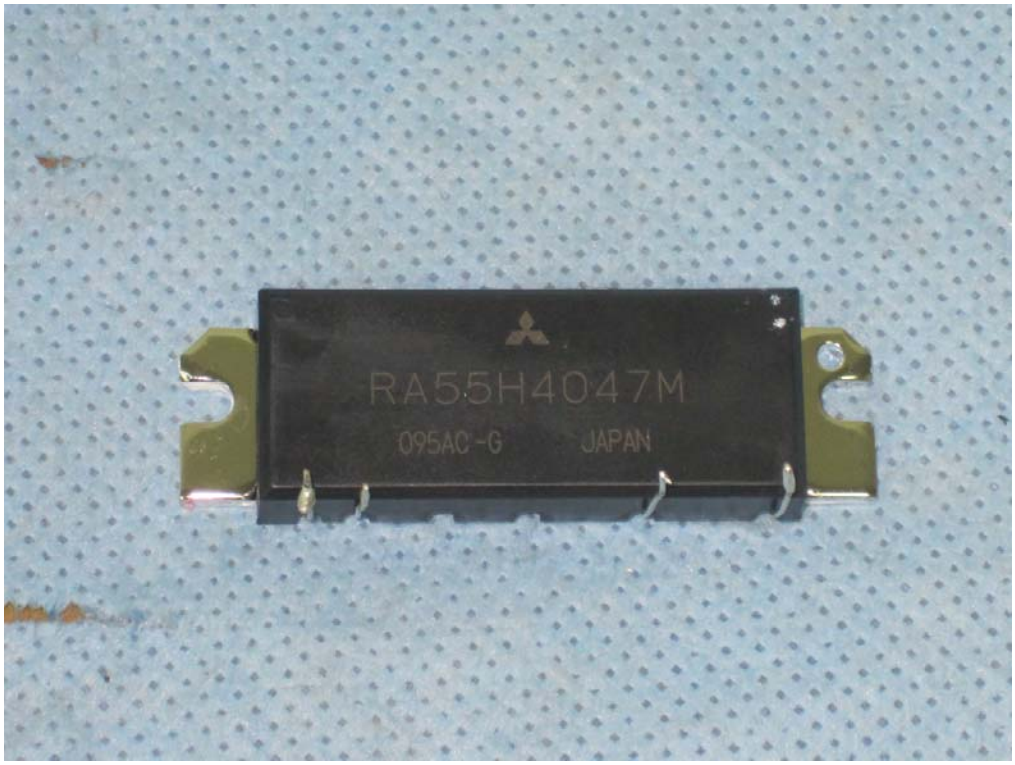


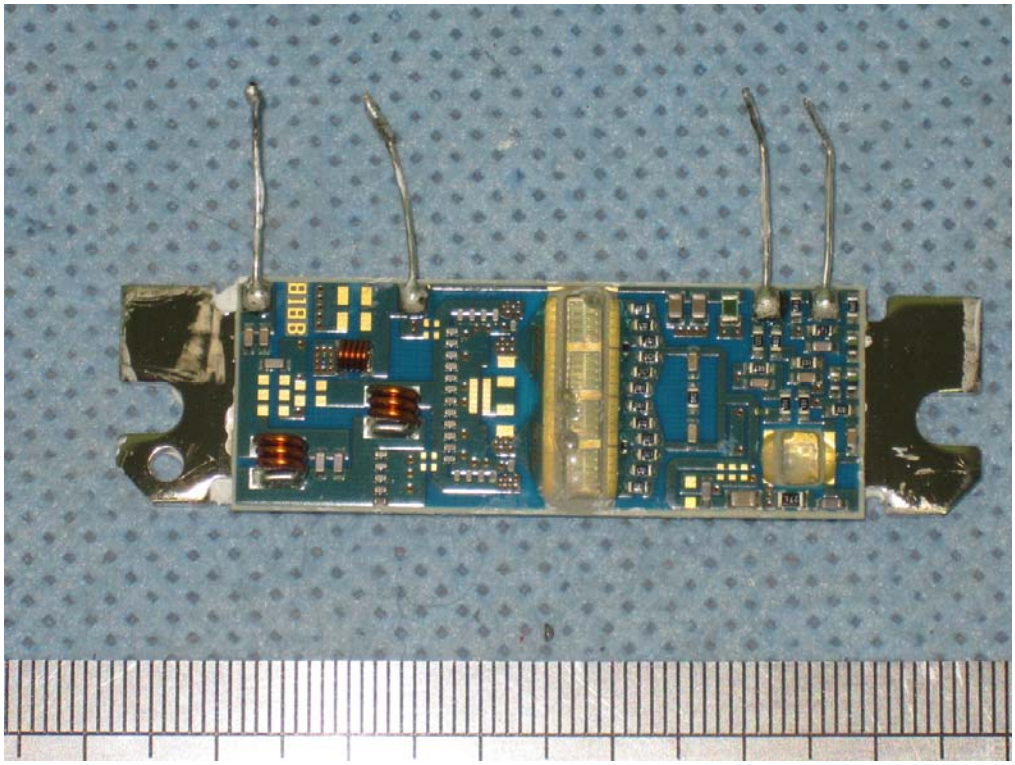


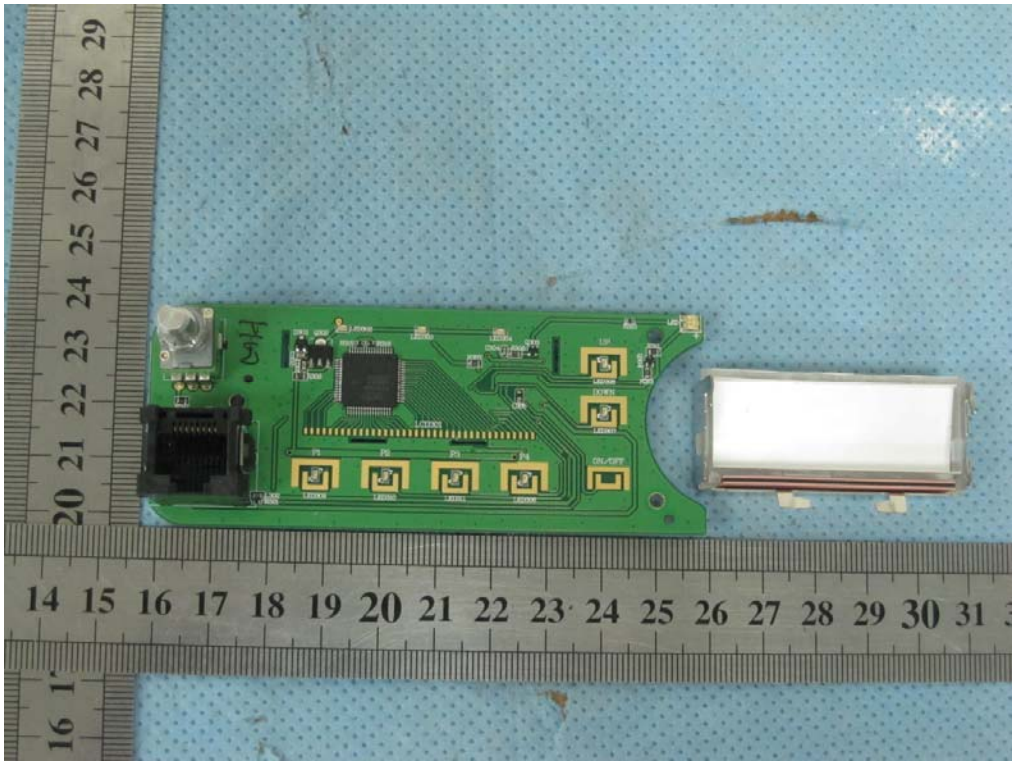


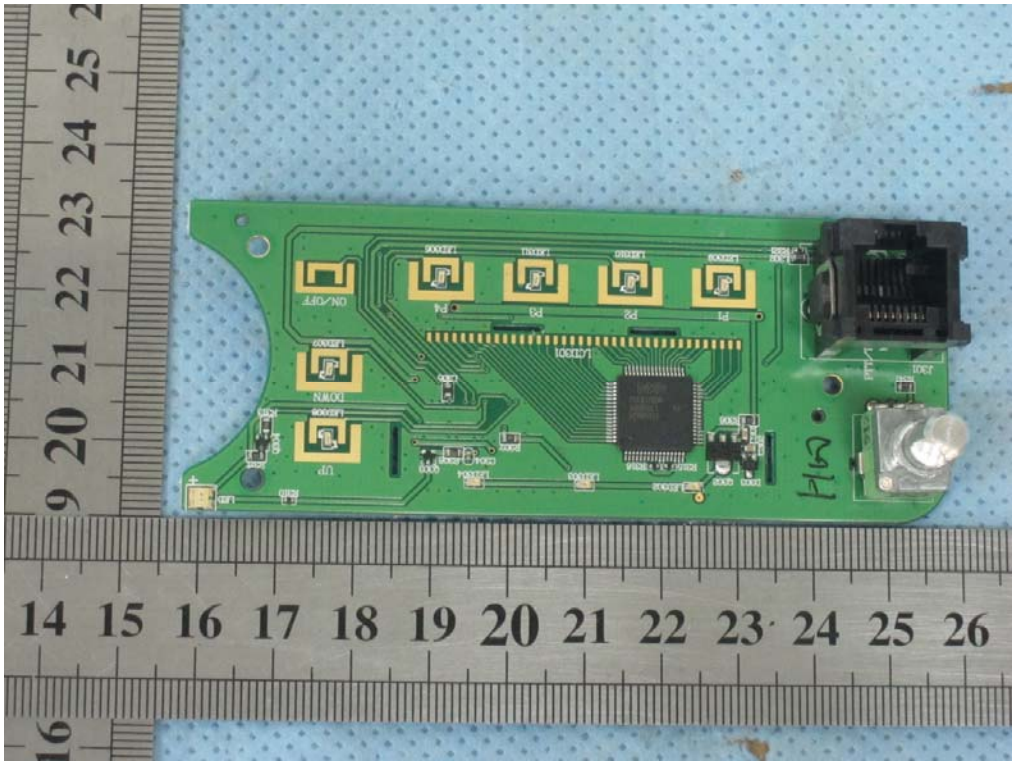


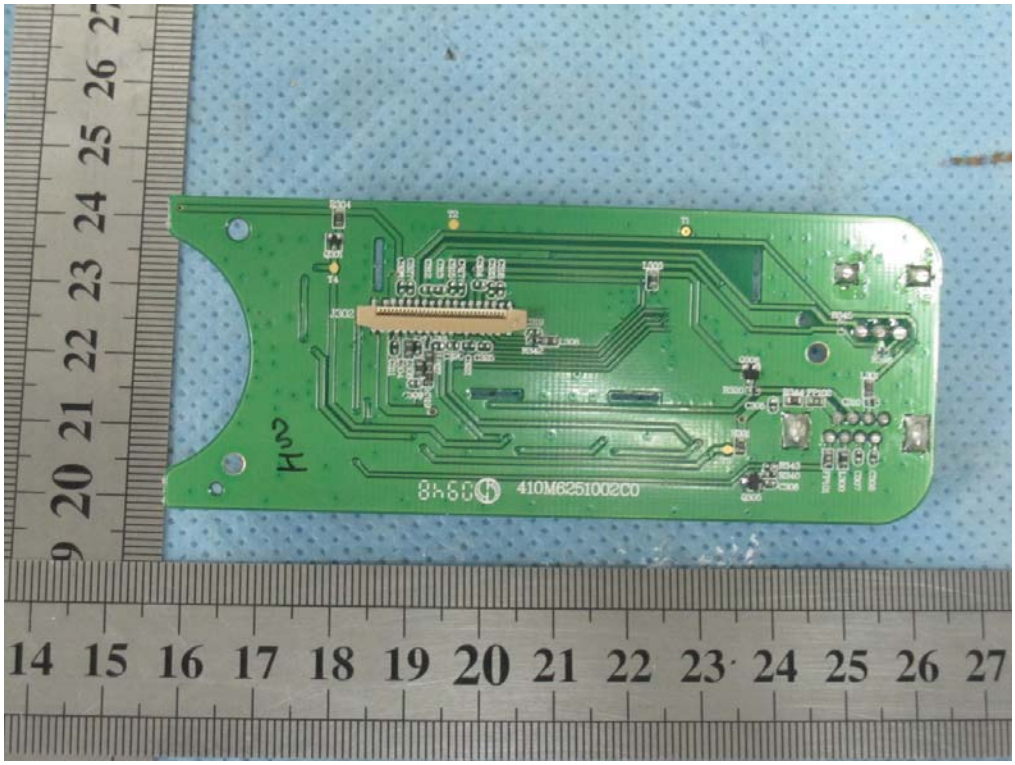



RA55H4047M
095AC-G
JAPAN









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