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FCC PART 90 and RSS-119 TEST REPORT

FCC Part 90 and RSS-119

Report Reference No.....:	**WE10050032**
FCC ID.....:	**YAM-TM628HU1**
IC. .....:	**8913A-TM628HU1**
Compiled by (position+printed name+signature) .:	File administrators Xiankun Ding
Supervised by (position+printed name+signature) .:	Test Engineer Wenliang Li
Approved by (position+printed name+signature) .:	Manager Jimmy Li
Date of issue.....:	June 01, 2010
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** **RSS-119 Issue 10: Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz**
TRF Originator.....:	Shenzhen Huatongwei International Inspection CO., Ltd
Master TRF.....:	Dated 2006-06

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Test item description .....:	Mobile Radio
Trade Mark .....:	HYT
Model/Type reference .....:	TM-628HU(1)
Listed Models .....:	/
Ratings .....:	DC 13.60V
Modulation .....:	FM
Result .....:	**Positive**

T E S T R E P O R T

Test Report No. :	**WE10050032**	June 01, 2010 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 4:	**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.

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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 90: PRIVATE LAND MOBILE RADIO SERVICES.

RSS-119 Issue 10 April 2010: Spectrum Management and Telecommunications Radio Standards Specification Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz.

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.

2 . SUMMARY

2.1. General Remarks

Date of receipt of test sample : May 28, 2010

Testing commenced on : May 28, 2010

Testing concluded on : June 1 2010

2.2. Product Description

The Hytera Communications Corporation Ltd.'s Model: TM-628HU (1) or the "EUT" as referred to in this report is a single channel Mobile Radio designed for voice communication. It is designed by way of utilizing the FM modulation achieves the system operating.

* The test data gathered are from typical production samples provided by the manufacturer.

A major technical description of EUT is described as following:

a). Modulation: FM
b). Rated Transmitter Power: 45W/5W
c). Antenna Designation: Detachable
d). Power Supply: DC 13.60 V by battery
e). Operating Frequency Range
Frequency Range: 400-470MHz
f). Maximum Transmitter Power: 47.32 W for 25 KHz channel separation
46.88 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 from Battery

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

400-470MHz 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) :	/
	Shield :	/
	Detachable :	/
○ Multimeter	Manufacturer :	/
	Model No. :	/

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

This submittal(s) (test report) is intended for FCC ID: **YAM-TM628HU1** and IC: **8913A-TM628HU1** filing to comply with FCC Part 90 Rules and RSS-119.

2.9. Modifications

No modifications were implemented to meet testing criteria.

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 February 13th, 2009.

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, 2011.

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, 2011.

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 09 July, 2010.

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

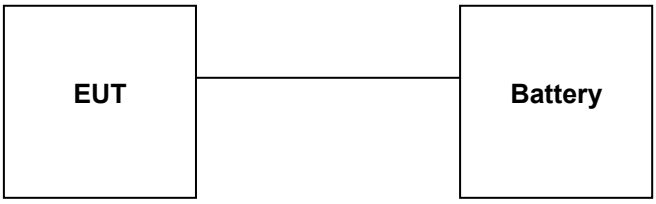


Table 2-1 Equipment Used in Tested System

3.5. Discription of Tested Modes

The EUT (Mobile Radio) has been tested under normal operating condition. Three channels (the top, the middle and the bottom) are chosen for testing at each channel separation (12.5 KHz/ 25KHz).

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	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.24 dB	(1)
Radiated Emission	1~18GHz	5.16 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.39 dB	(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	RSS-119	Description of Test	Test Result
§ 15.107	RSS-Gen	Conducted Emission	N/A
§ 15.109	RSS-Gen	Receiver Radiated Spurious Emssion	Complies
§ 15.109	RSS-Gen	Receiver Conducted Spurious Emssion	Complies
§ 90.205	§ 5.4	Maximum Transmitter Power	Complies
§ 90.207	§ 5.13	Modulation Characteristic	Complies
§ 90.209	§ 5.5	Occupied Bandwidth	Complies
§ 90.210	§ 5.8	Emission Mask	Complies
§ 90.213	§ 5.3	Frequency Stability	Complies
§ 90.214	§ 5.9	Transmitter Frequency Behavior	Complies
§ 90.210	§ 5.8	Transmitter Radiated Spurious Emssion	Complies
§ 90.210	§ 5.8	Spurious Emssion On Antenna Port	Complies
§ 2.1091	RSS-102	RF Exposure Evaluation	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	11/2010
EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	11/2010
Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	11/2010
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	11/2010

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	11/2010
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	11/2010
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	11/2010
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/2010

Modulation Characteristic				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Modulation Analyzer	HP	8901B	3104A03367	11/2010
Signal Generator	Rohde&Schwarz	SMT03	100059	11/2010
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/2010

Frequency Stability				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Communication Test Set	HP	HP8920B	US35010135	11/2010
Signal Generator	Rohde&Schwarz	SMT03	100059	11/2010
Climate Chamber	ESPEC	EL-10KA	05107008	11/2010

Maximum Transmitter Power ＆ Spurious Emssion On Antenna Port				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Receiver	Rohde&Schwarz	ESI 26	100009	11/2010
Attenuator	R&S	ESH3-22	100449	11/2010
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/2010
High-Pass Filter	Anritsu	MP526B	6220875256	11/2010
High-Pass Filter	Anritsu	MP526D	6220878392	11/2010

Transient Frequency Behavior				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Signal Generator	Rohde&Schwarz	SMT03	100059	11/2010
Storage Oscilloscope	Tektronix	TDS3054B	B033027	11/2010
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/2010

4. TEST CONDITIONS AND RESULTS

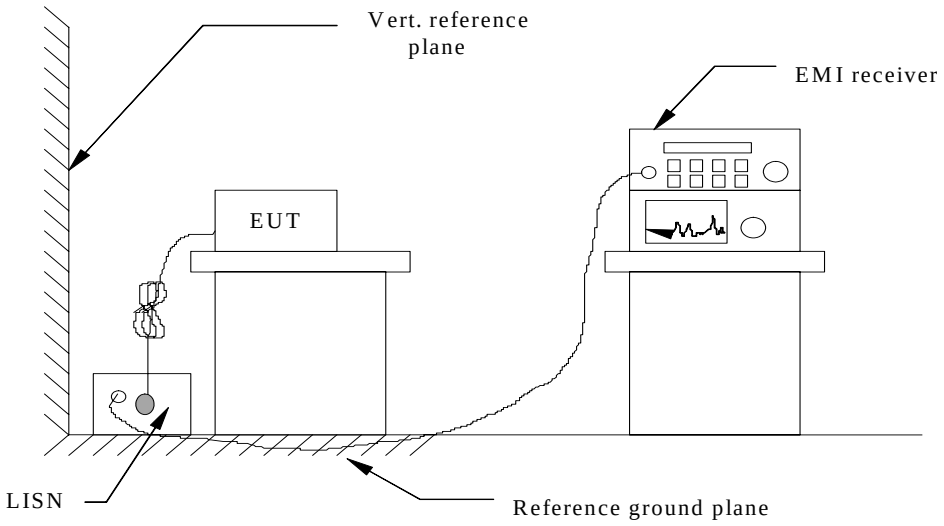
4.1. Conducted Emissions Test

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.

Note: The EUT will not be operated during charging the battery with the power adapter.

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

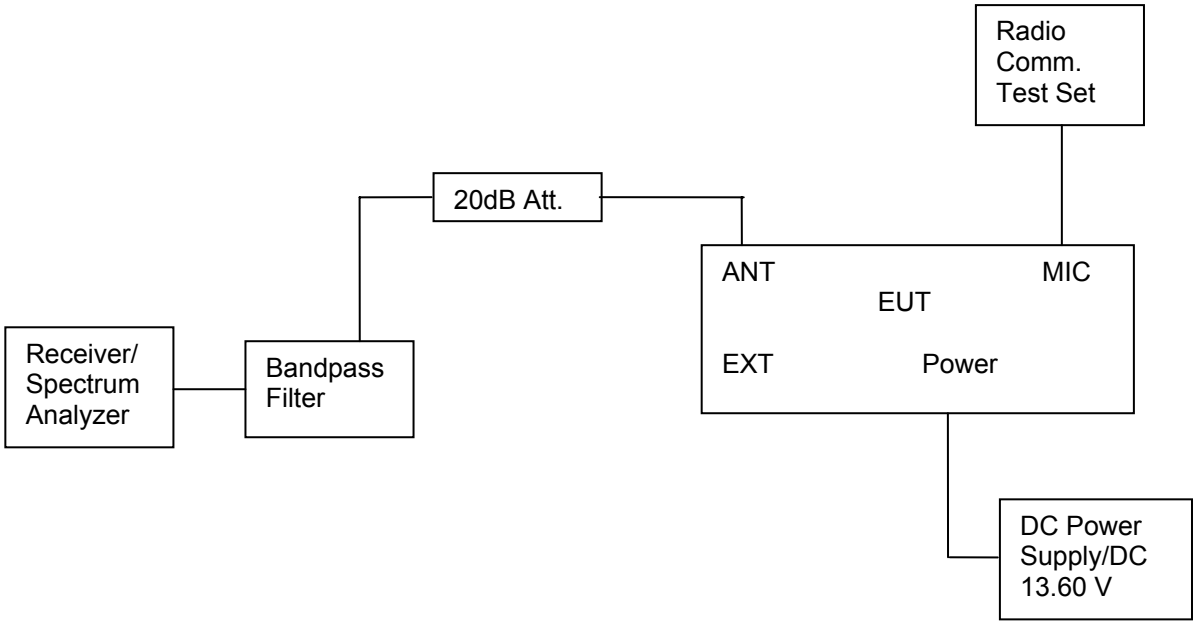
N/A (As to the EUT was powered by battery)

4.2. Occupied Bandwidth and Emission Mask Test

TEST APPLICABLE

1 According to FCC Part 90 Section 90.209: The authorized bandwidth shall be 11.25 KHz for 12.5 KHz and 20 KHz for 25 KHz.
2 For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0dB.
3 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (fd 2.88 kHz) dB.
4 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:
5 50 + 10 log (Pwatts) = 50 + 10 log (46.88) =66.71 dB
6 For 25 KHz:
43 + 10 log (Pwatts) = 43 + 10 log (47.32) =59.75 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) 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=300Hz, span=50 KHz for 12.5 channel spacing.

TEST RESULTS

4.2.1 Occupied Bandwidth

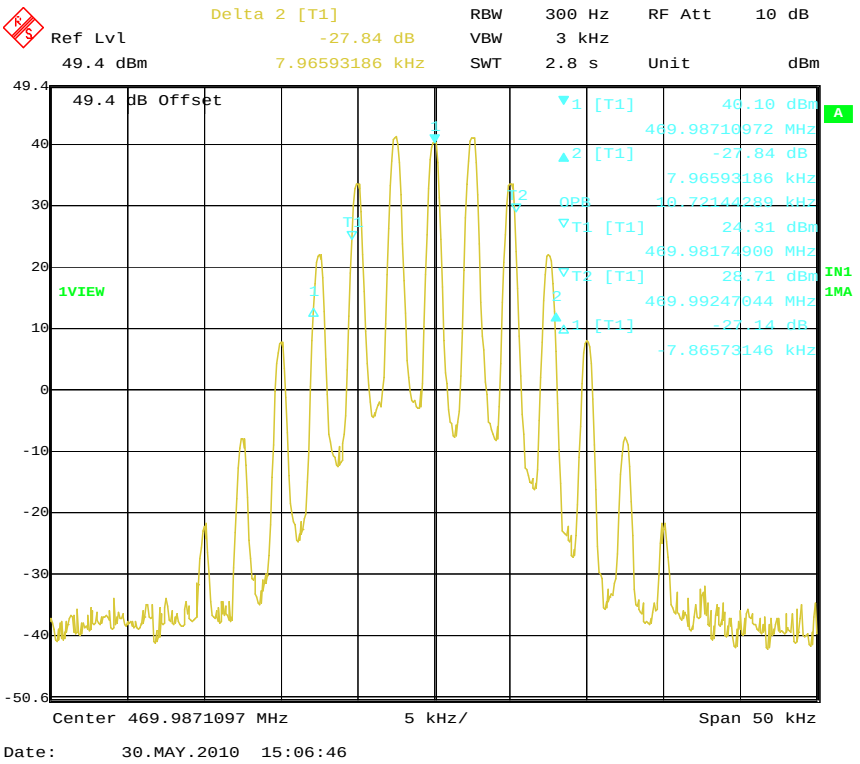
99% Bandwidth Measurement Result						
Operation Frequency	12.5 KHz Channel Separation			25KHz Channel Separation		
	Test Data	Limits	Result	Test Data	Limits	Result
Bottom Channel	7.52KHz	11.25KHz	Pass	14.43KHz	20.00KHz	Pass
Middle Channel	5.71KHz	11.25KHz	Pass	10.82KHz	20.00KHz	Pass
Top Channel	5.81KHz	11.25KHz	Pass	10.72KHz	20.00KHz	Pass

26dB Bandwidth Measurement Result						
Operation Frequency	12.5 KHz Channel Separation			25KHz Channel Separation		
	Test Data	Limits	Result	Test Data	Limits	Result
Bottom Channel	10.52KHz	11.25KHz	Pass	15.83KHz	20.00KHz	Pass
Middle Channel	10.42KHz	11.25KHz	Pass	15.63KHz	20.00KHz	Pass
Top Channel	10.42KHz	11.25KHz	Pass	15.83KHz	20.00KHz	Pass

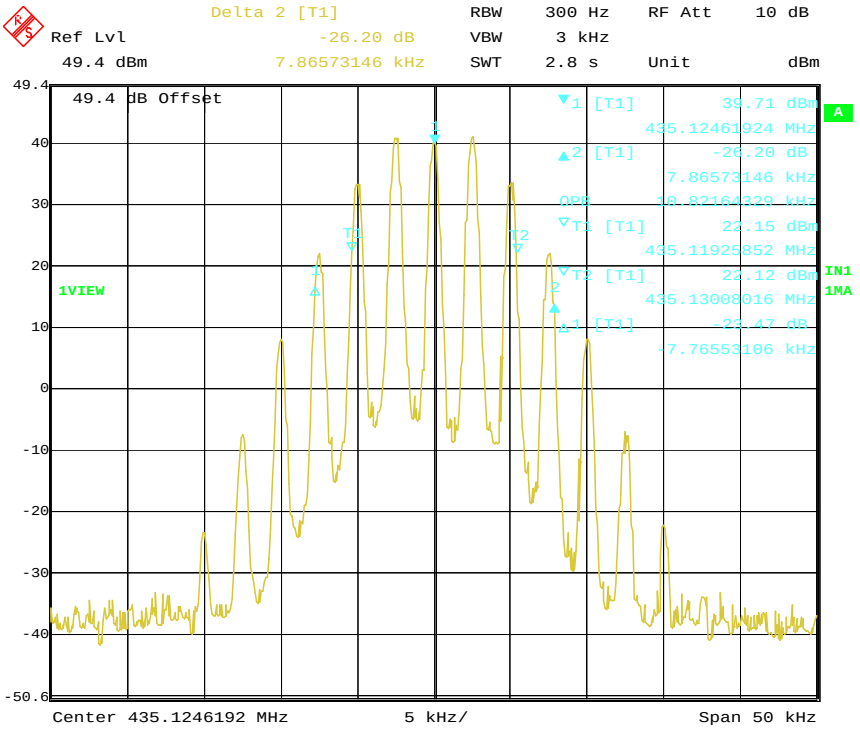
Photos of 99% and 26dB Bandwidth Measurement

For 25 KHz:

Top Channel

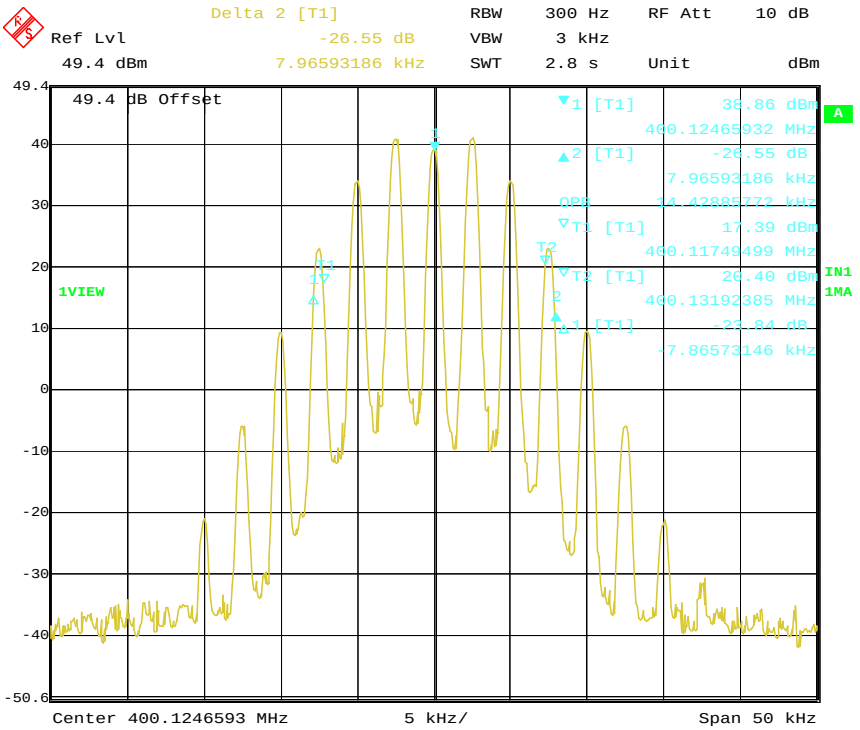


Middle Channel



Date: 30.MAY.2010 15:08:38

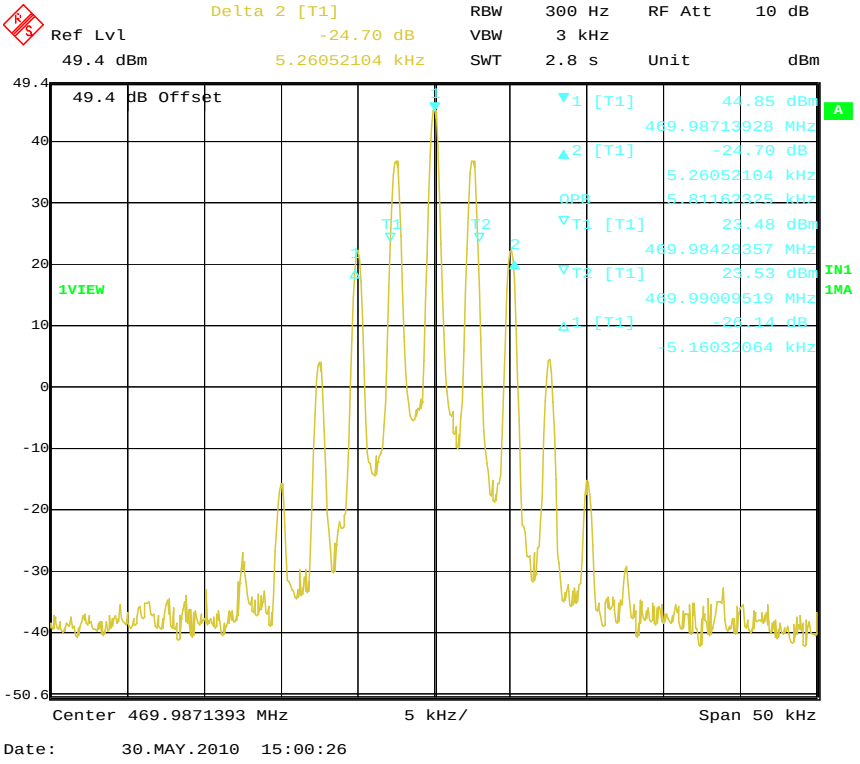
Bottom Channel



Date: 30.MAY.2010 15:10:35

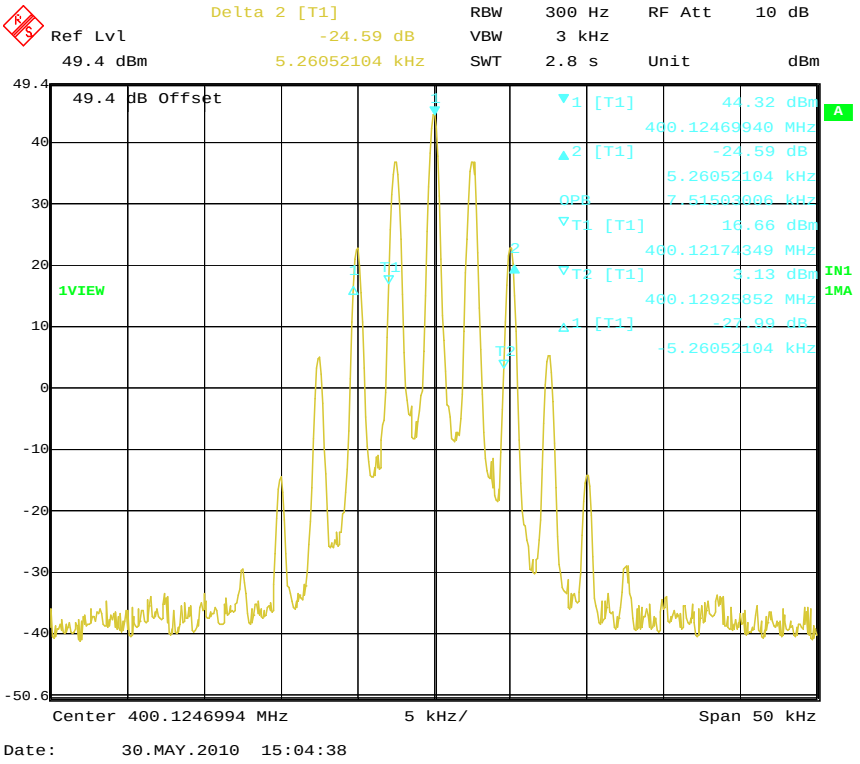
For 12.5 KHz:

Top Channel



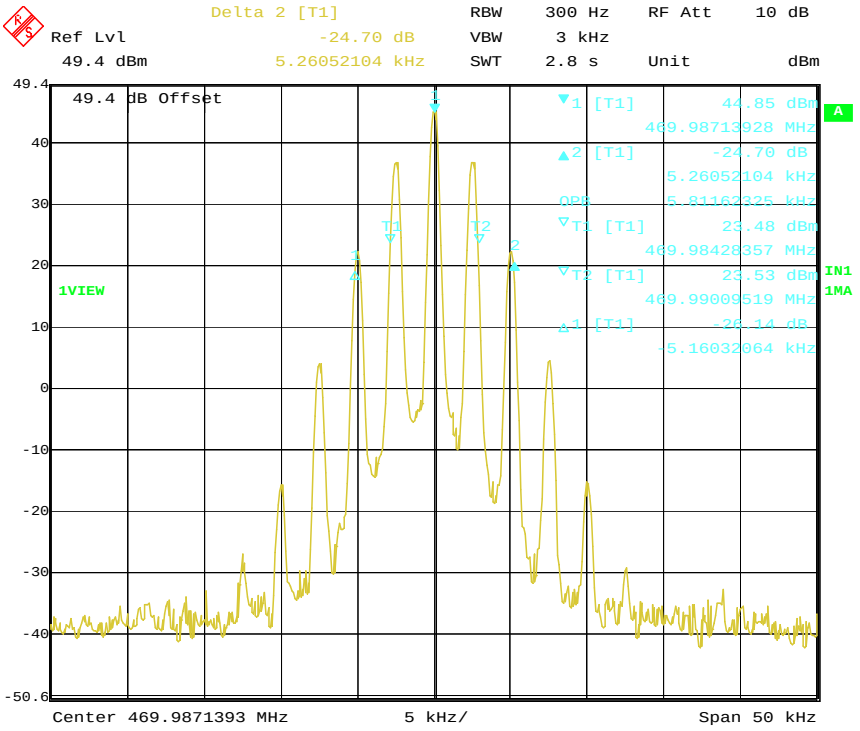
Date: 30.MAY.2010 15:00:26

Middle Channel



Date: 30.MAY.2010 15:04:38

Bottom Channel



Date: 30.MAY.2010 15:00:26

4.2.2 Emission Mask

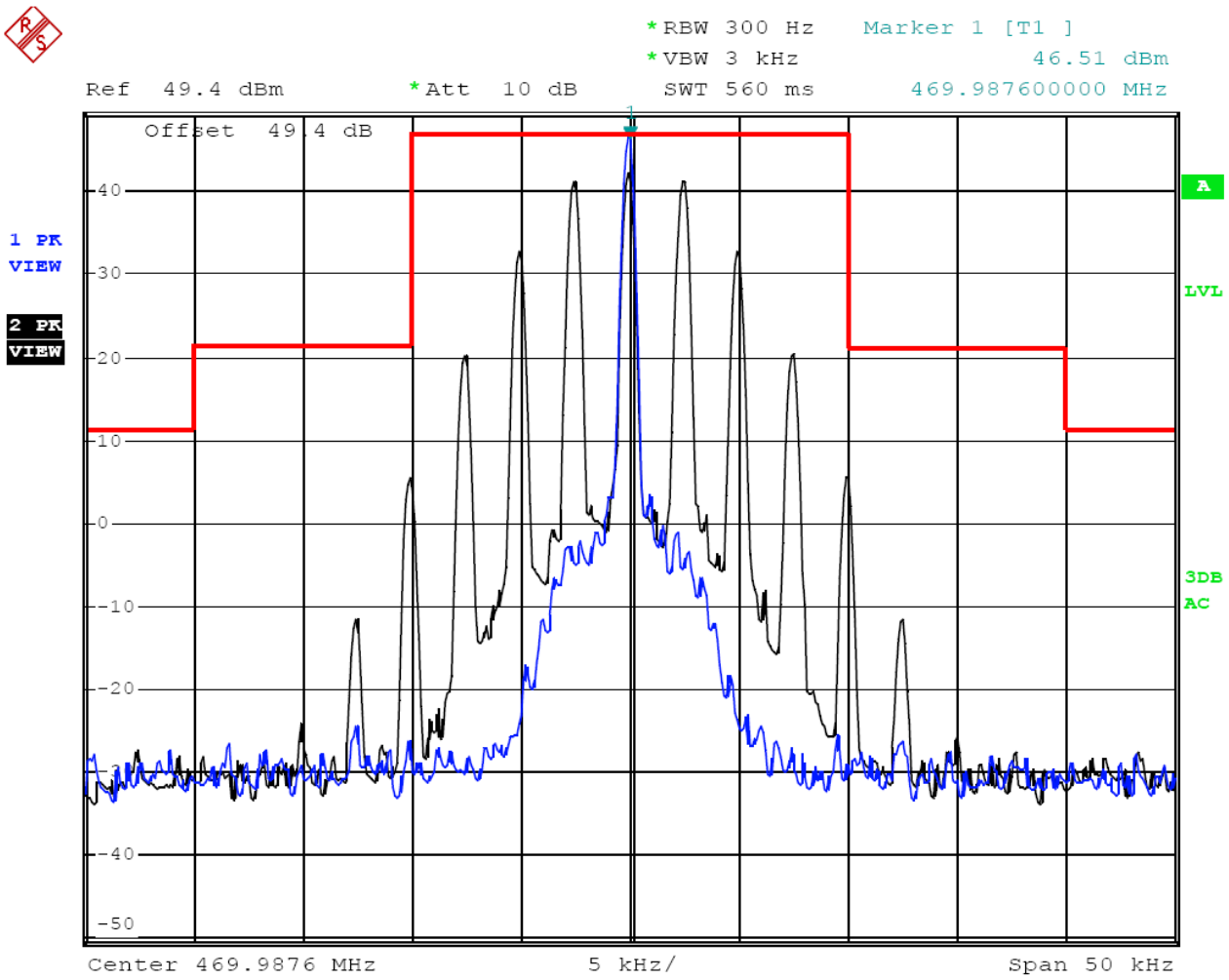
Emission Mask Measurement Result				
Operation Frequency	12.5 KHz Channel Separation			
	Frequency offset (KHz)	Test datum (dBc)	Limit (dBc)	Results
Bottom Channel	+12.5	-78.07	At least -70dBc	Compliance
	-12.5	-78.87	At least -70dBc	Compliance
Middle Channel	+12.5	-77.07	At least -70dBc	Compliance
	-12.5	-79.63	At least -70dBc	Compliance
Top Channel	+12.5	-74.01	At least -70dBc	Compliance
	-12.5	-73.37	At least -70dBc	Compliance

Photos of Emission Mask Measurement

Referred as the attached plot hereinafter
Note: The blue curve represents unmodulated signal.
The black curve represents modulated signal.

For 25 KHz:

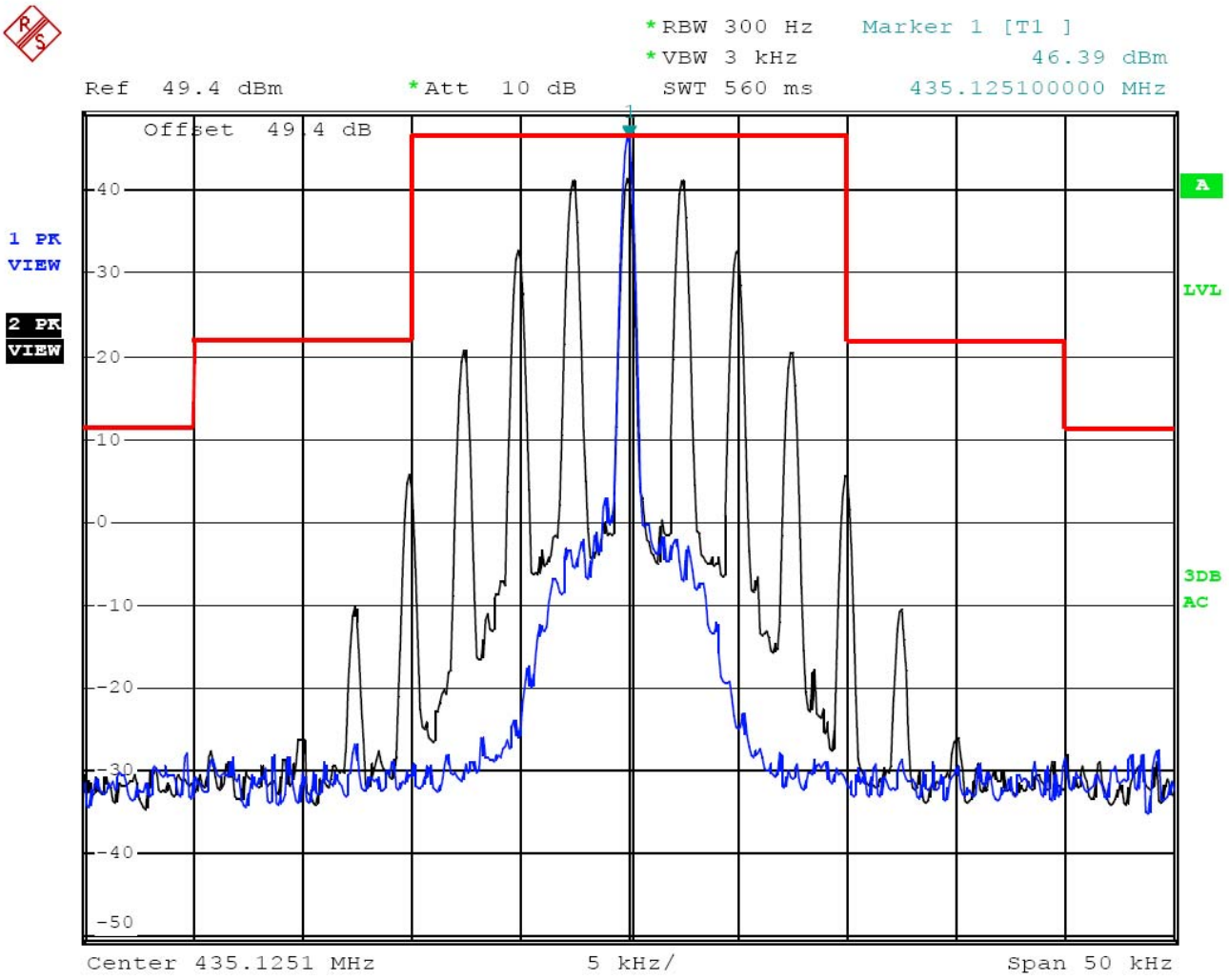
Emission Mask of Top Channel



Date: 30.MAY.2010 20:11:01

25 kHz Channel Spacing, 469.9875 MHz, 2500 Hz Audio Modulation Only

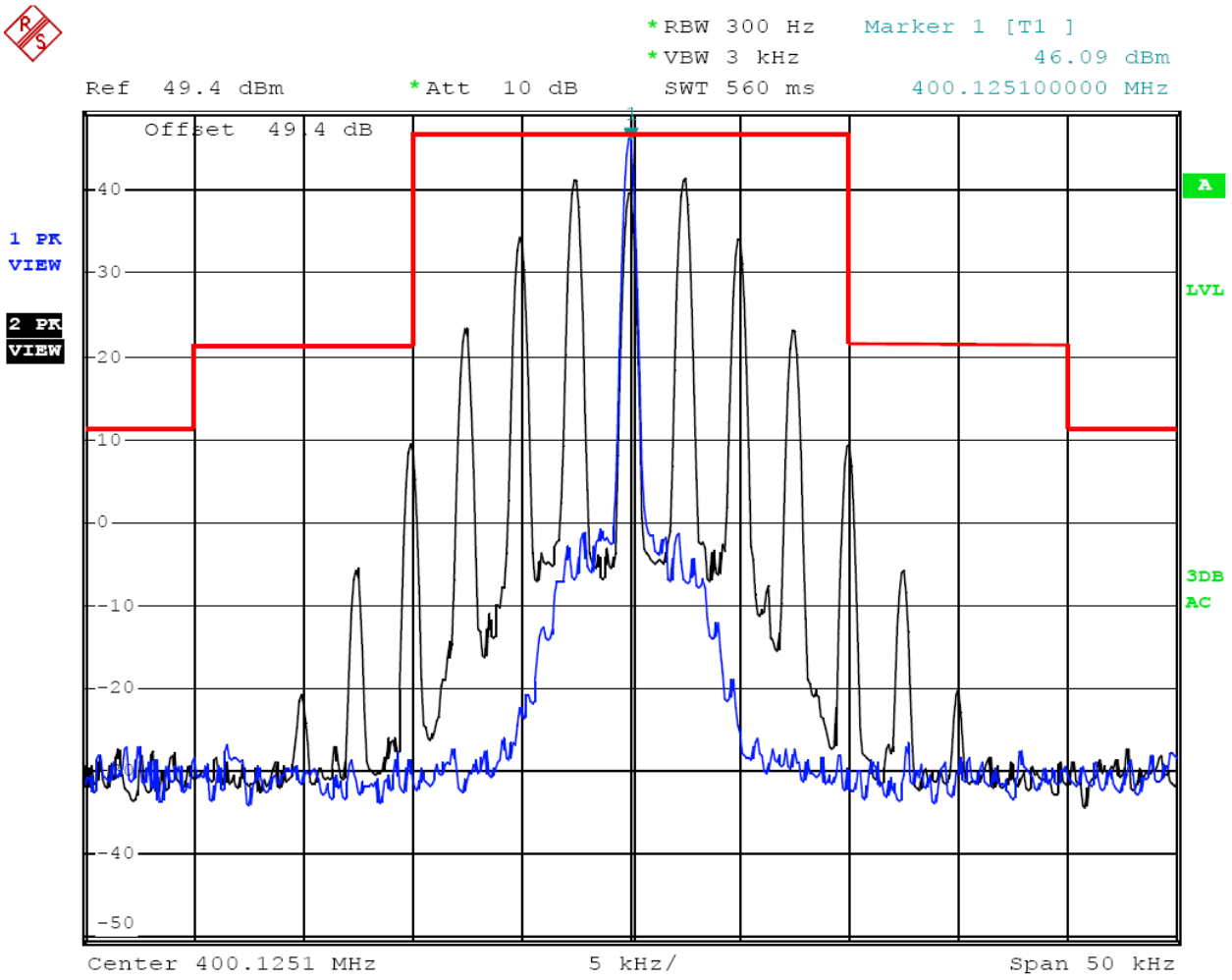
Emission Mask of Middle Channel



Date: 30.MAY.2010 20:09:50

25 kHz Channel Spacing, 435.1250 MHz, 2500 Hz Audio Modulation Only

Emission Mask of Bottom Channel

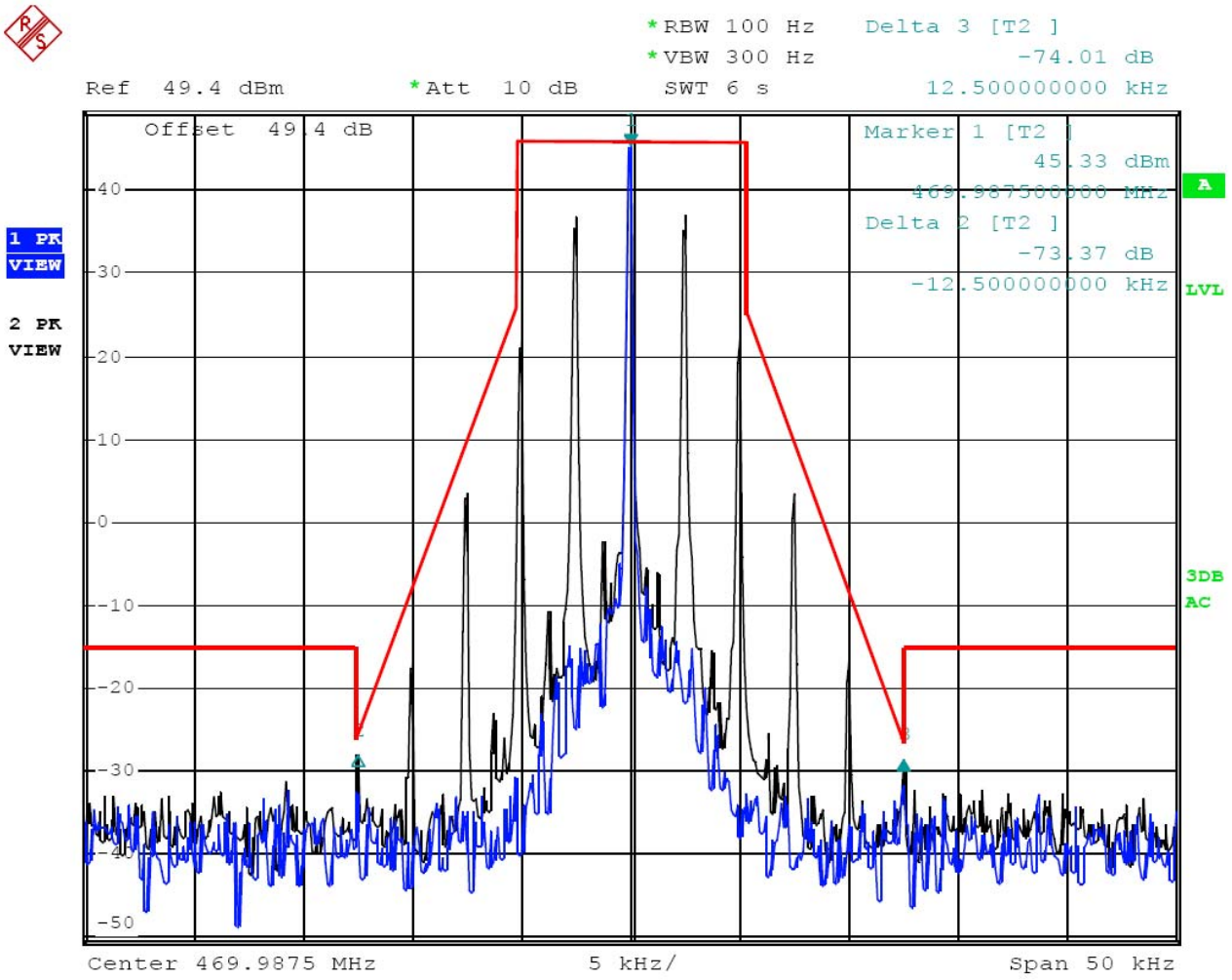


Date: 30.MAY.2010 20:07:47

25 kHz Channel Spacing, 400.1250MHz, 2500 Hz Audio Modulation Only

For 12.5 KHz

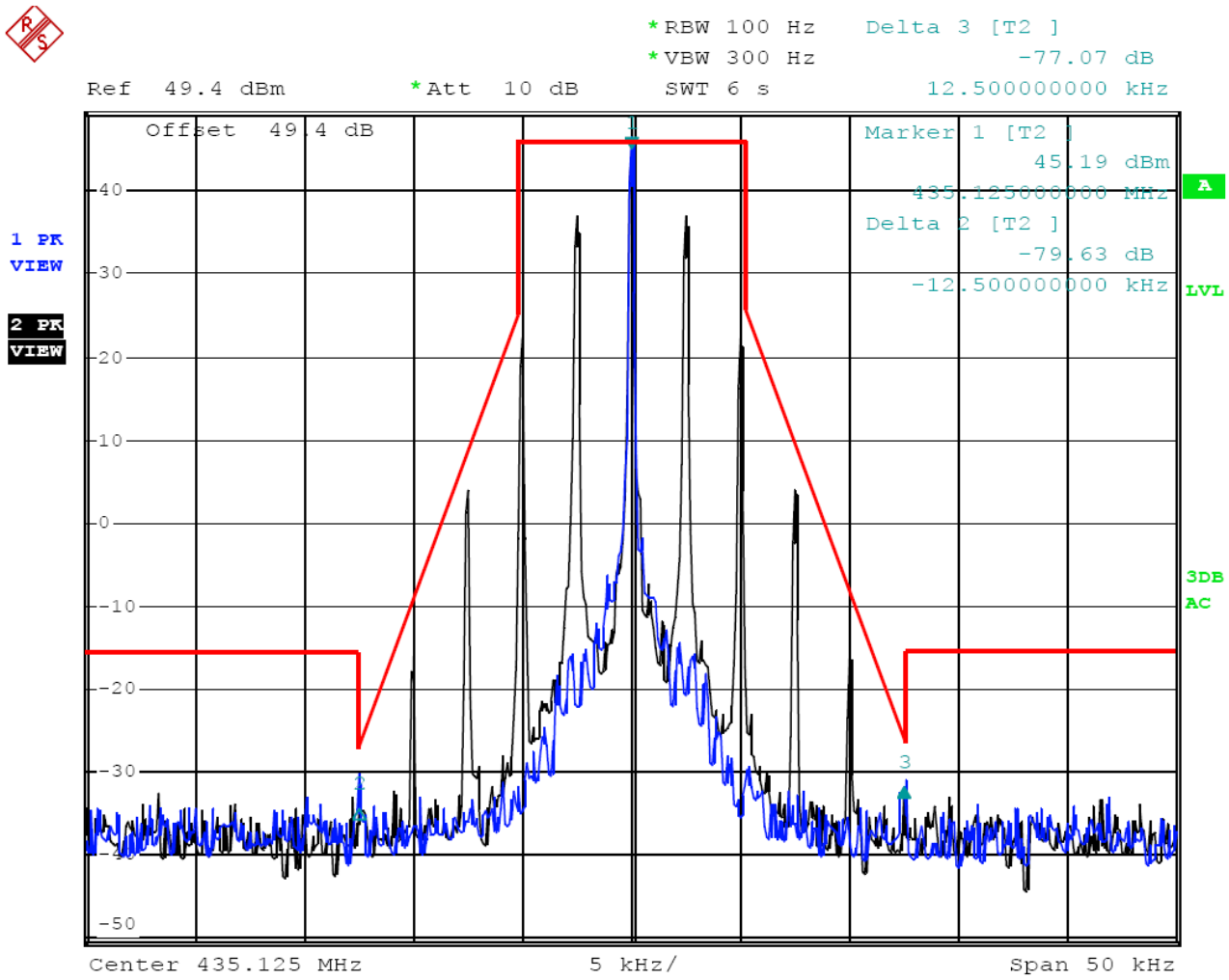
Emission Mask of Top Channel



Date: 30.MAY.2010 20:19:57

12.5 kHz Channel Spacing, 469.9875MHz, 2500 Hz Audio Modulation Only

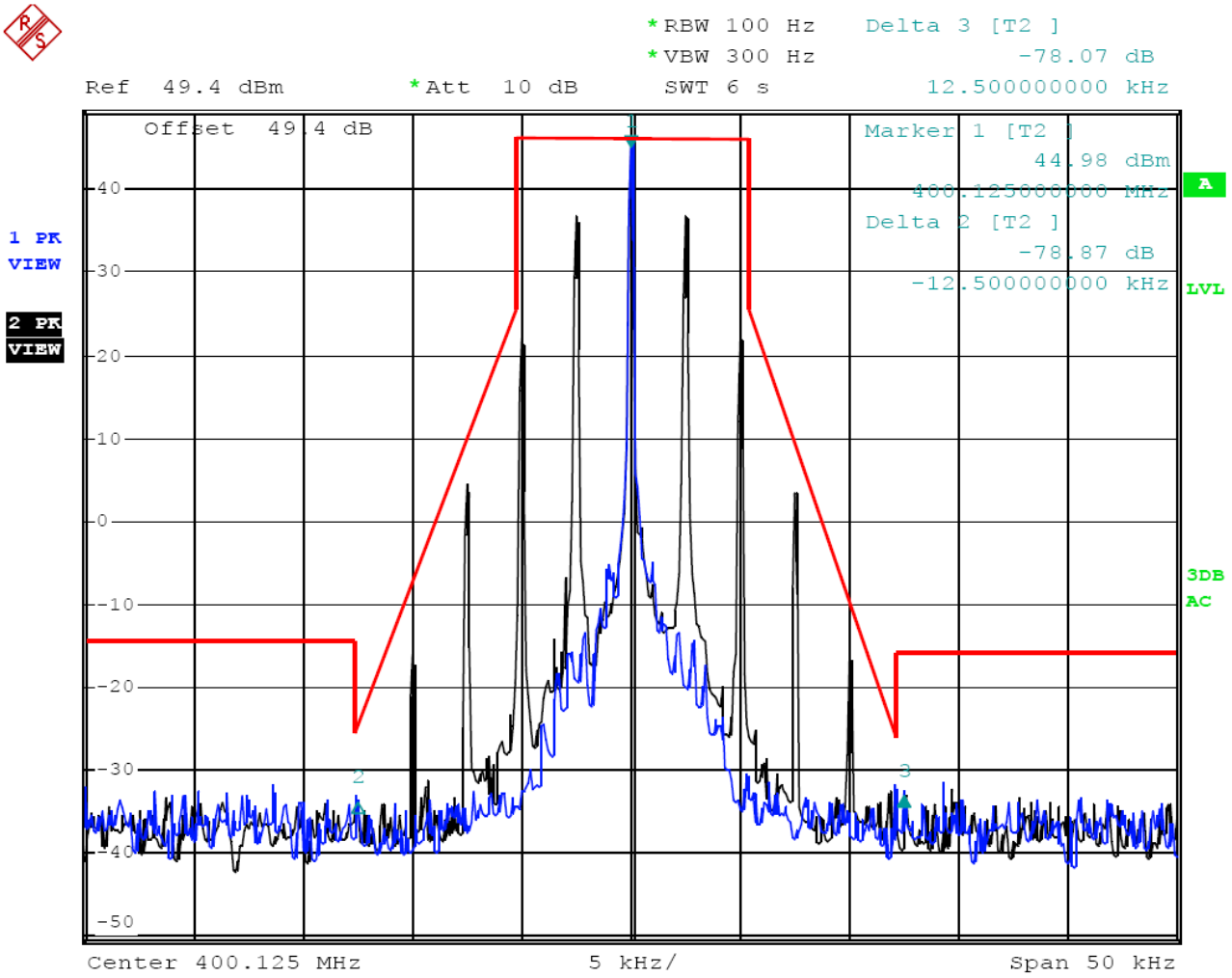
Emission Mask of Middle Channel



Date: 30.MAY.2010 20:16:09

12.5 kHz Channel Spacing, 435.1250 MHz, 2500 Hz Audio Modulation Only

Emission Mask of Bottom Channel



Date: 30.MAY.2010 20:13:00

12.5 kHz Channel Spacing, 400.1250 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:

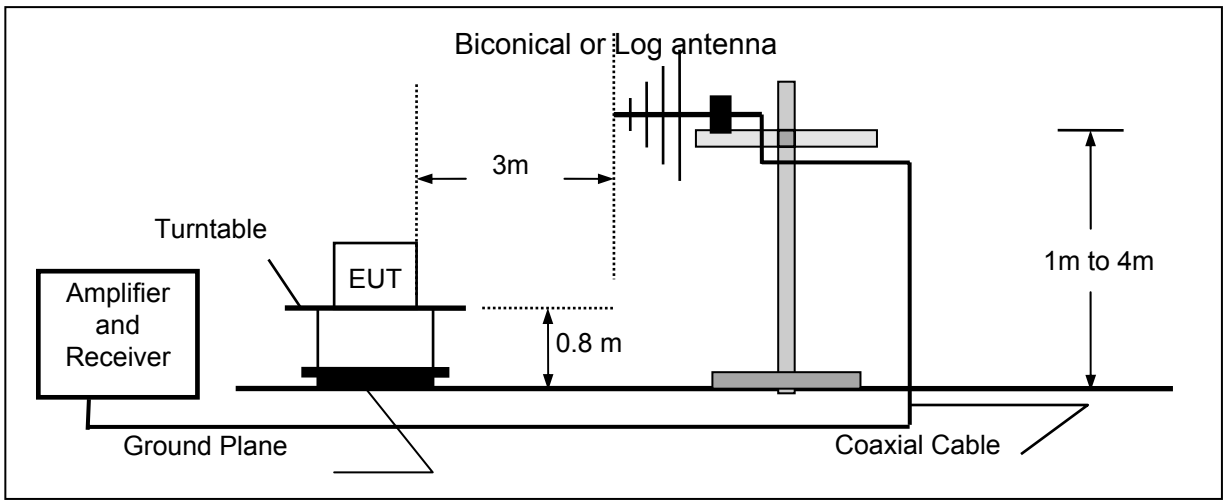
1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
3 On any 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.

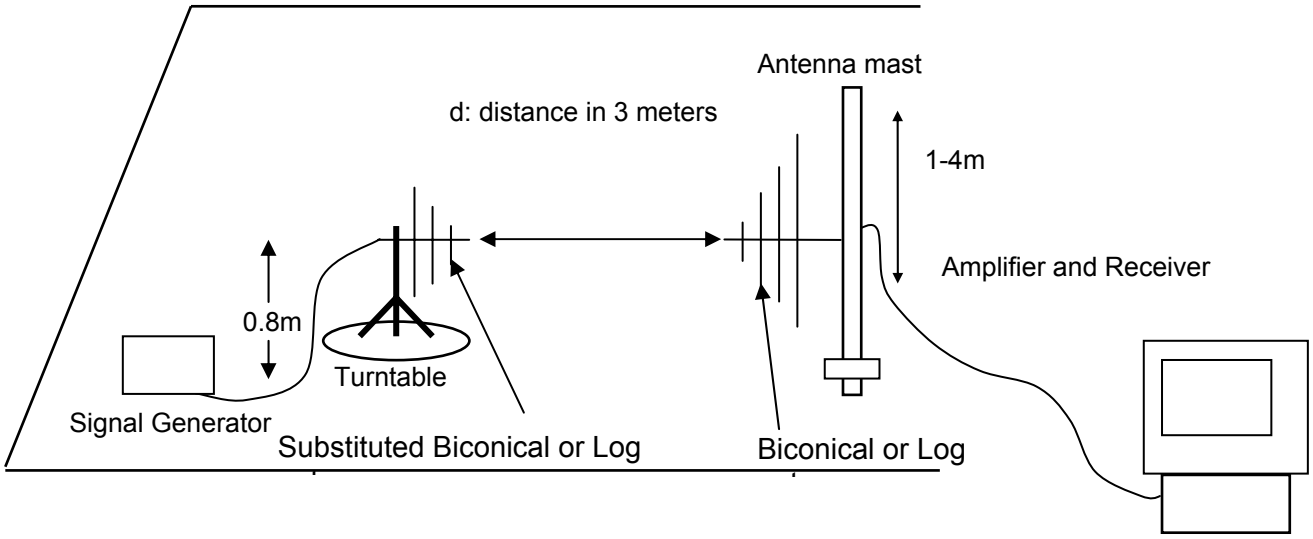
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

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.

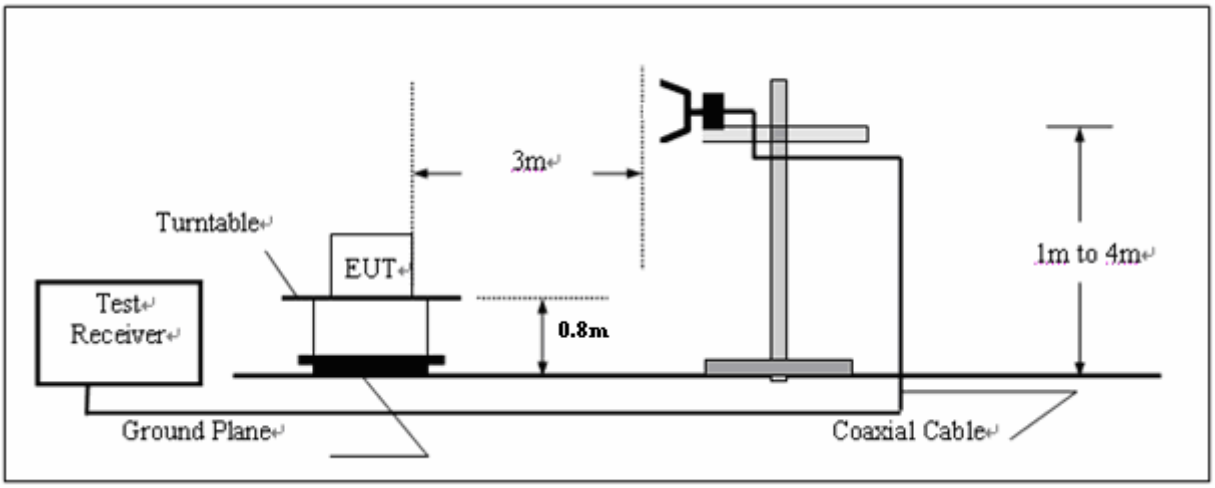
TEST CONFIGURATION

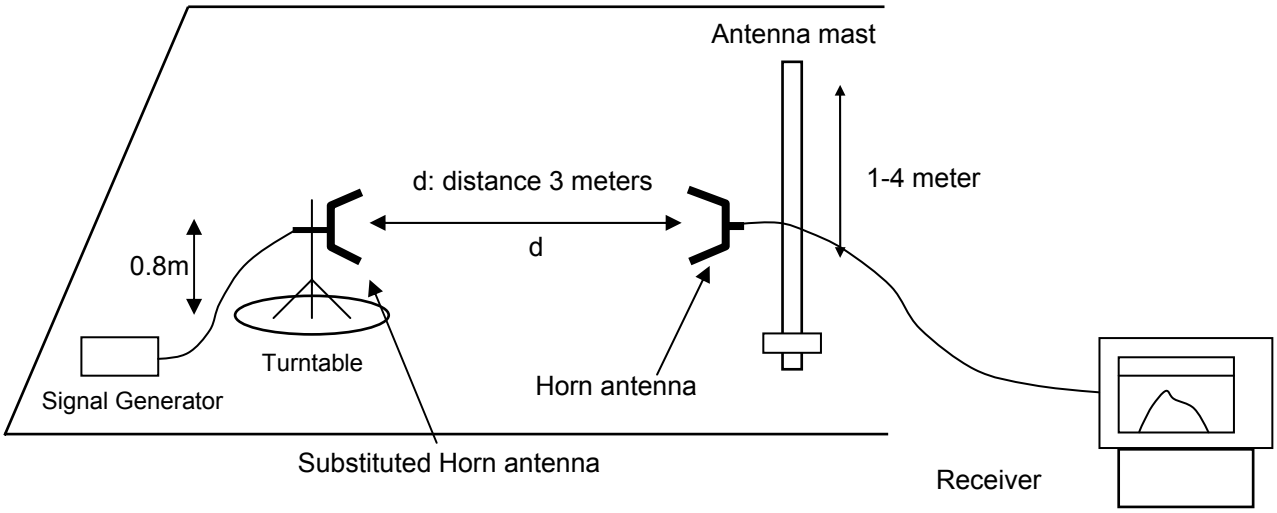
Below 1GHz





Above 1GHz





TEST PROCEDURE

1 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

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only):
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
Low: 43 + 10 log (Pwatts) = 43 + 10 log (43.65) =59.40 dB
High: 43 + 10 log (Pwatts) = 43 + 10 log (47.32) =59.75 dB

FCC Part 90.210 (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 (43.75) =66.41 dB
High: 50 + 10 log (Pwatts) = 50 + 10 log (46.88) =66.71 dB
Note: In general, the worse case attenuation requirement shown above was applied.

For 25 KHz
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 46.53 dBm.
Limit (dBm) =46.53-43-10log10 (47.32) = -13 dBm

The Channel 03

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
939.975	-48.73	H	33.26	-15.47	-13	2.47
1409.963	-27.47	H	3.88	-23.59	-13	10.59
3289.913	-33.62	H	11.46	-22.16	-13	9.16
***	--	H		--	-13	
939.975	-48.41	V	33.26	-15.15	-13	2.15
1409.963	-20.25	V	3.88	-16.37	-13	3.37
2349.938	-29.48	V	7.90	-21.58	-13	8.58
***	--	V		--	-13	

The Channel 02

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
1305.375	-28.51	H	3.10	-25.41	-13	12.41
1740.500	-26.77	H	5.30	-21.47	-13	8.47
2610.750	-31.55	H	8.95	-22.60	-13	9.60
***	--	H		--	-13	
1305.375	-25.48	V	3.10	-22.38	-13	9.38
1740.500	-26.53	V	5.30	-21.23	-13	8.23
2610.750	-31.07	V	8.95	-22.12	-13	9.12
***	--	V		--	-13	

The Channel 01

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
1200.375	-19.44	H	2.70	-16.74	-13	3.74
1600.500	-33.69	H	4.22	-29.47	-13	16.47
2000.625	-35.65	H	6.68	-28.97	-13	15.97
***	--	H		--	-13	
1200.375	-16.99	V	2.70	-14.29	-13	1.29
1600.500	-29.36	V	4.22	-25.14	-13	12.14
2000.625	-28.36	V	6.68	-21.68	-13	8.68
***	--	V		--	-13	

***Note:**

1. ***** means that the emission level is too low to be measured or at least 20 dB down than the limit.**
2. **Margin=Limt-Emission Level**

For 12.5 KHz
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 (46.88) = -20 dBm

The Channel 06

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
939.975	-46.24	H	25.10	-21.14	-20	1.14
1409.963	-24.43	H	2.12	-22.31	-20	2.31
2349.938	-25.88	H	2.88	-23.00	-20	3.00
***	--	H		--	-20	
939.975	-46.18	V	25.10	-21.08	-20	1.08
1409.963	-23.59	V	2.12	-21.47	-20	1.47
2349.938	-24.62	V	2.88	-21.74	-20	1.74
***	--	V		--	-20	

The Channel 05

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
1305.375	-27.07	H	3.10	-23.97	-20	3.97
1740.500	-26.37	H	5.30	-21.07	-20	1.07
2610.750	-30.71	H	8.95	-21.76	-20	1.76
***	--	H		--	-20	
1305.375	-25.54	V	3.10	-22.44	-20	2.44
1740.500	-26.60	V	5.30	-21.30	-20	1.30
2610.750	-30.84	V	8.95	-21.89	-20	1.89
***	--	V		--	-20	

The Channel 04

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
1200.375	-23.73	H	2.70	-21.03	-20	1.03
1600.500	-34.84	H	4.22	-30.62	-20	10.62
2000.625	-33.83	H	6.68	-27.15	-20	7.15
***	--	H		--	-20	
1200.375	-23.72	V	2.70	-21.02	-20	1.02
1600.500	-28.55	V	4.22	-24.33	-20	4.33
2000.625	-28.43	V	6.68	-21.75	-20	1.75
***	--	V		--	-20	

***Note:**

1. ***** means that the emission level is too low to be measured or at least 20 dB down than the limit.**
2. **Margin=Limt-Emission Level**

4.4. Spurious Emssion On Antenna Port

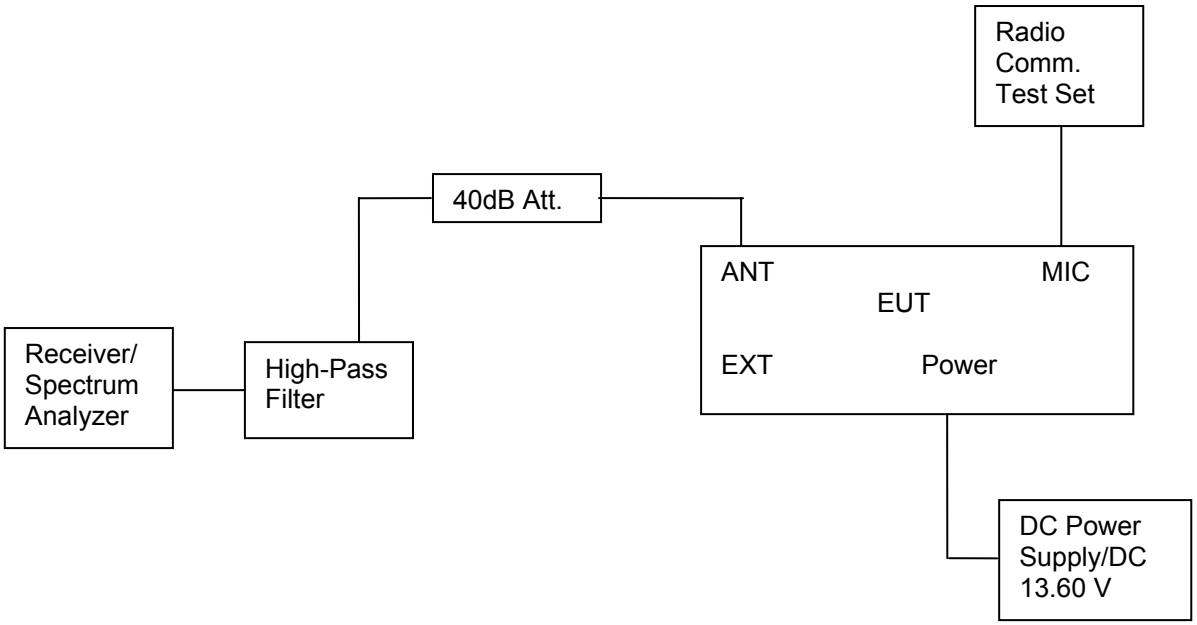
TEST APPLICABLE

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 10th 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

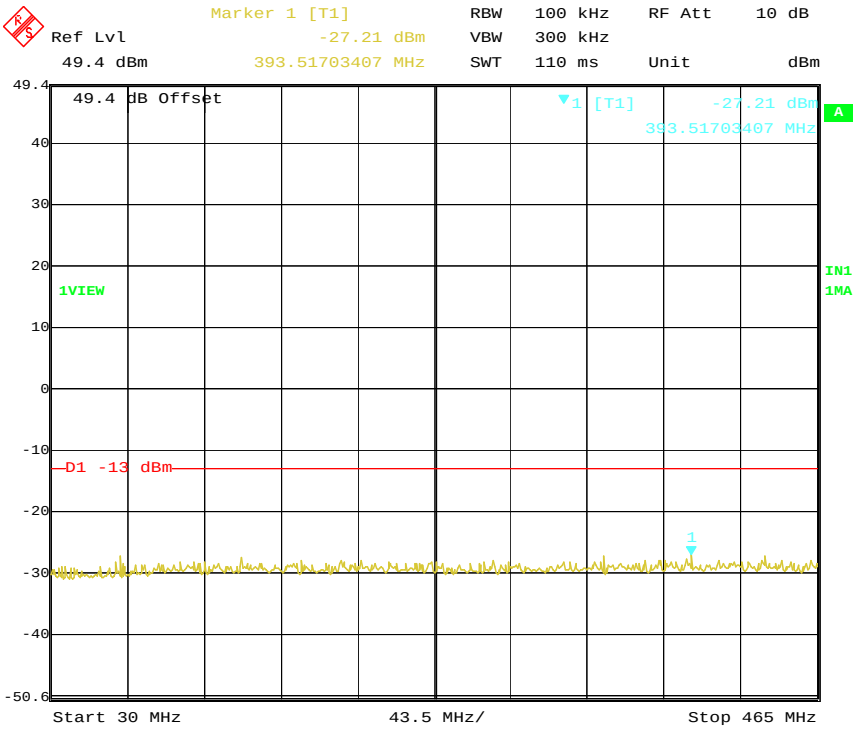
FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 10 (25 kHz bandwidth only):
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
Low: 43 + 10 log (Pwatts) = 43 + 10 log (43.65) =59.40 dB
High: 43 + 10 log (Pwatts) = 43 + 10 log (47.32) =59.75 dB
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 46.53 dBm.
Limit (dBm) =46.53-43-10log10 (47.32) = -13 dBm

FCC Part 90.210 (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 (43.75) =66.41 dB
High: 50 + 10 log (Pwatts) = 50 + 10 log (46.88) =66.71 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 (46.88) = -20 dBm

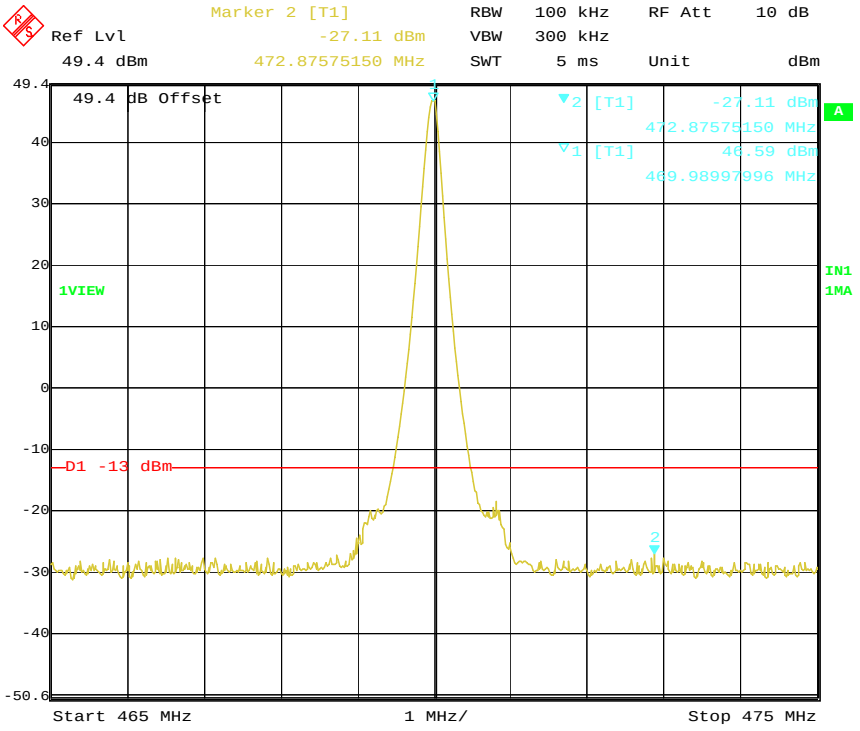
Note: 1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30MHz to 5GHz.

For 25 KHz

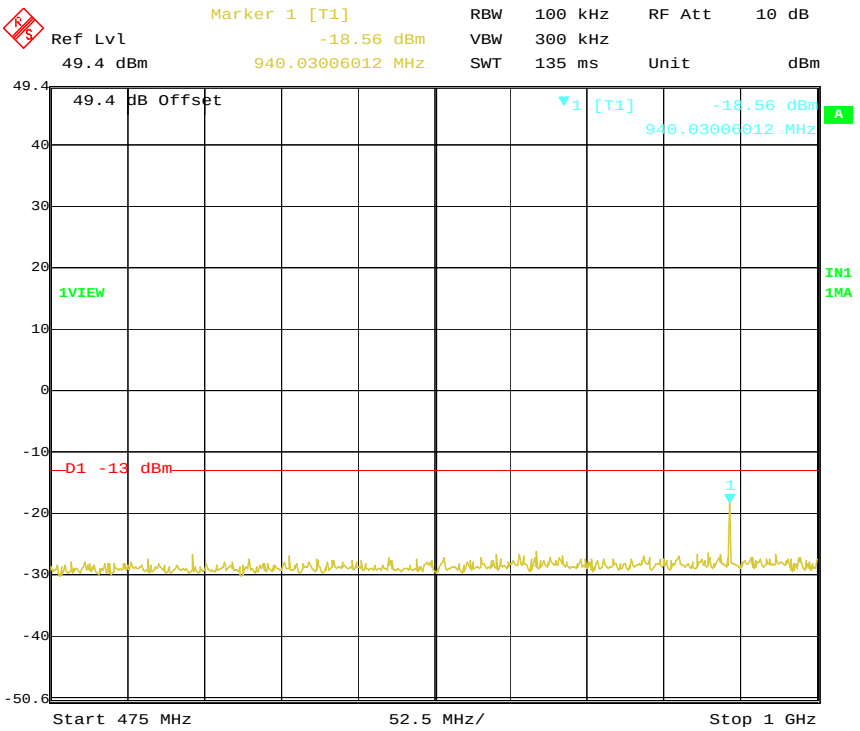
Product	: Mobile Radio	Test Mode	:469.9875MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		



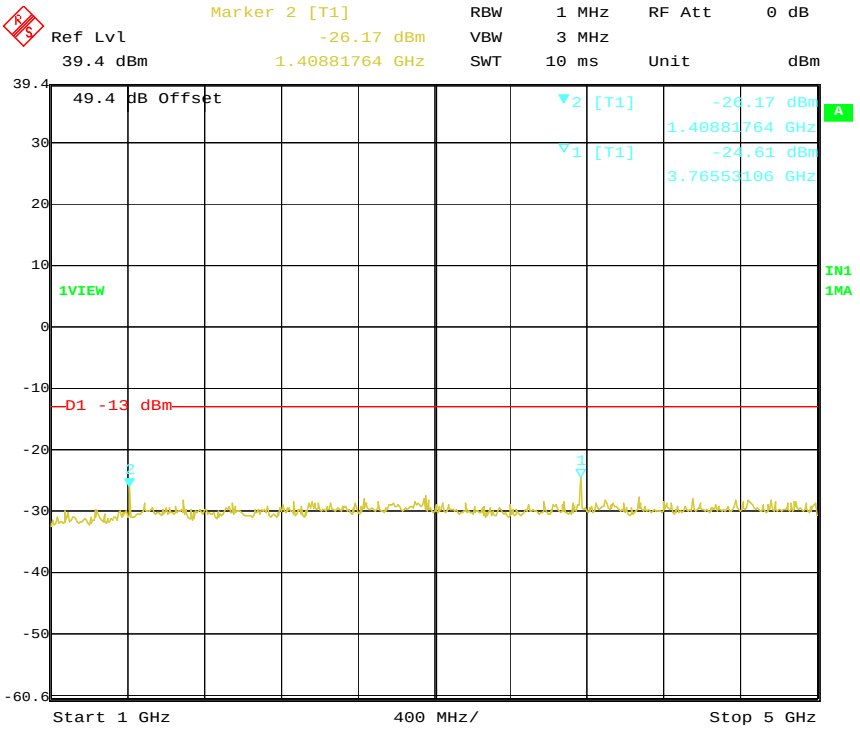
Date: 30.MAY.2010 15:18:44



Date: 30.MAY.2010 15:20:01

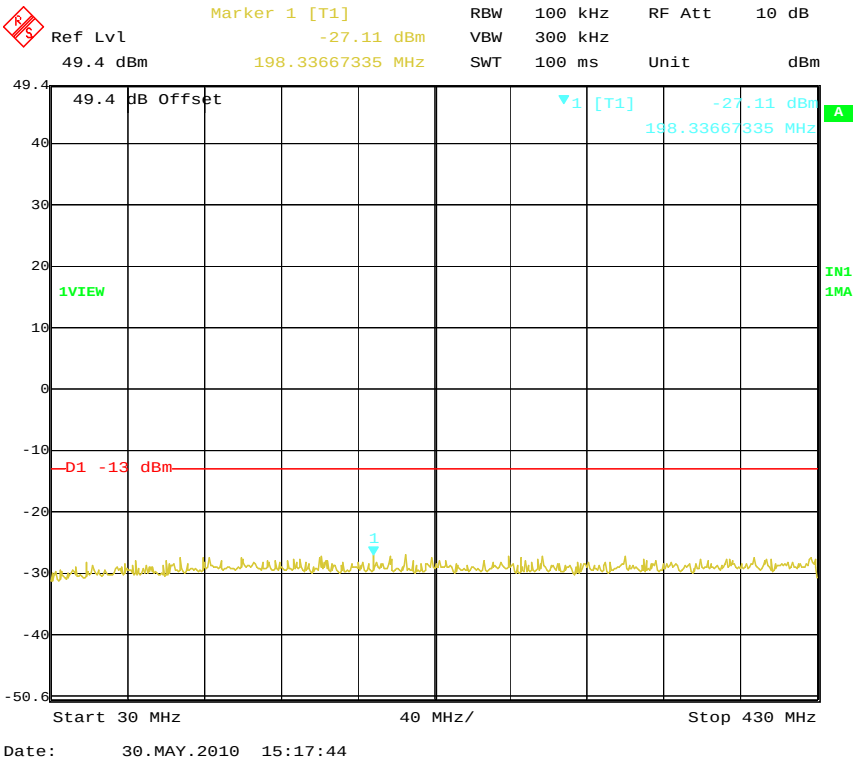


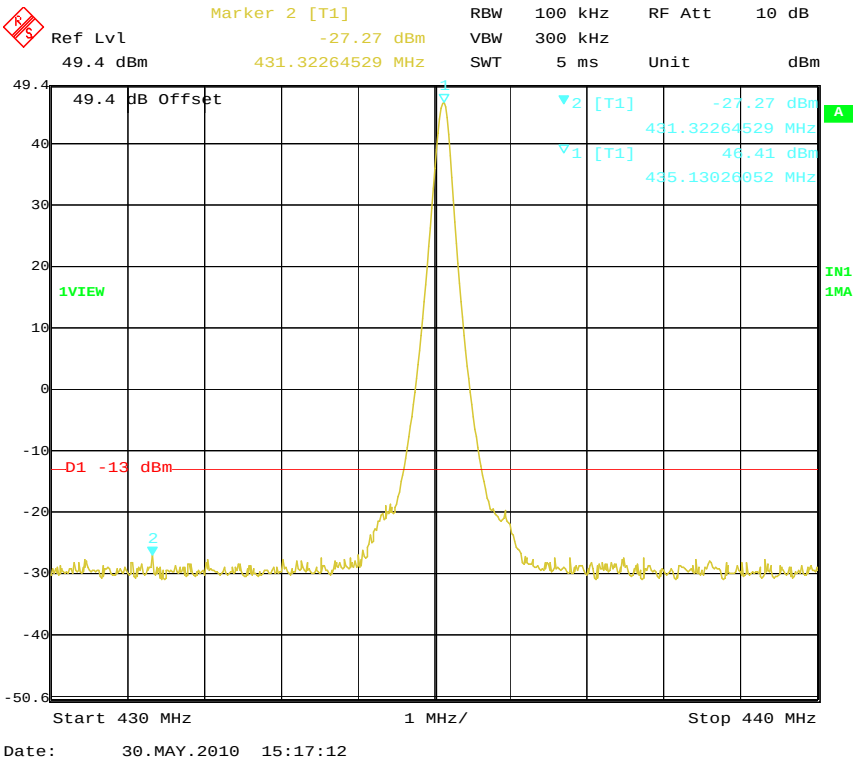
Date: 30.MAY.2010 15:21:08

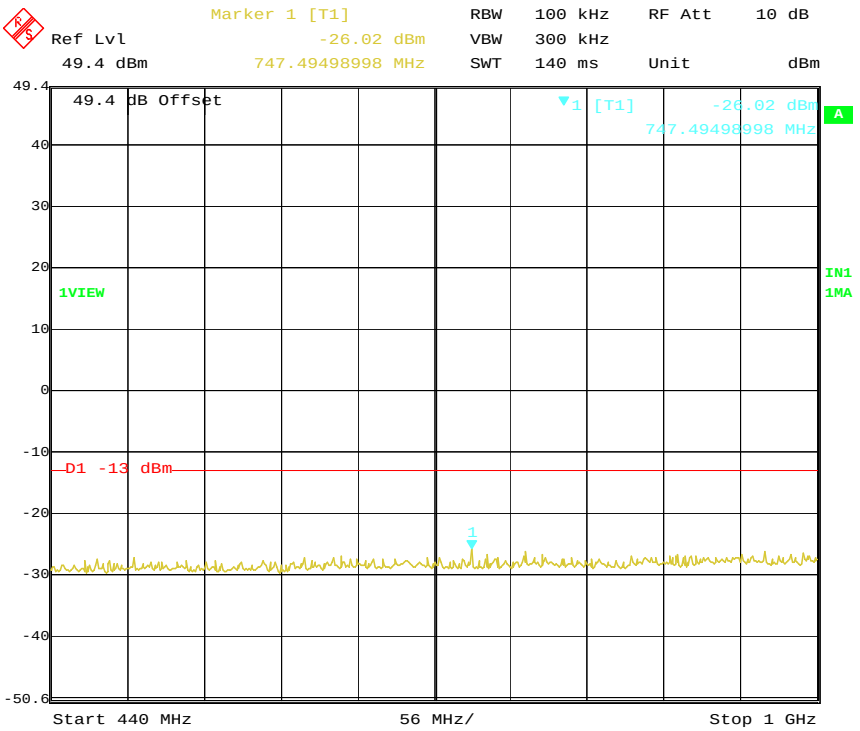


Date: 30.MAY.2010 15:21:56

Product	: Mobile Radio	Test Mode	: 435.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		







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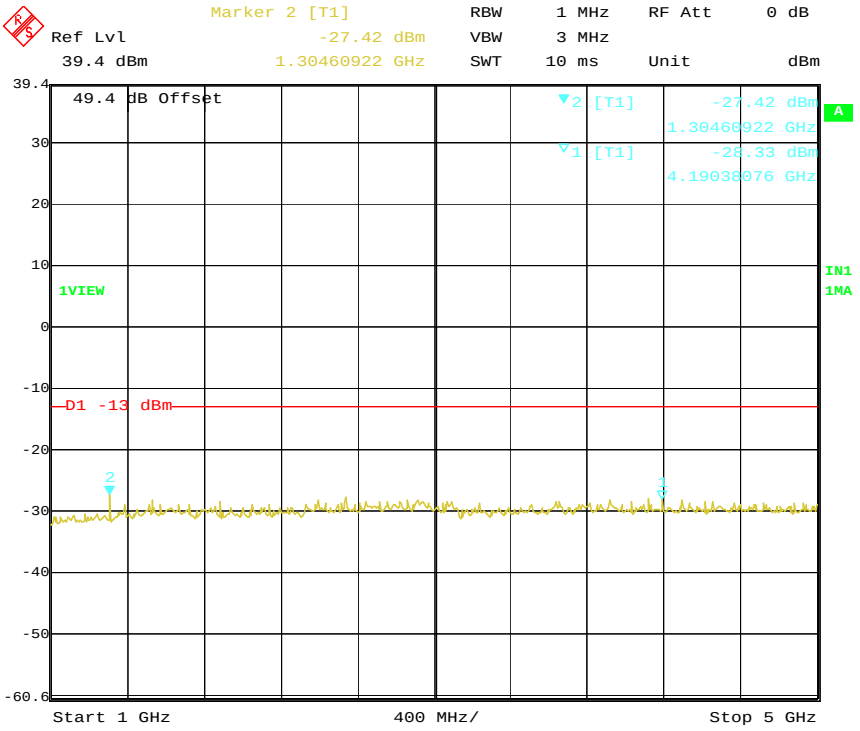
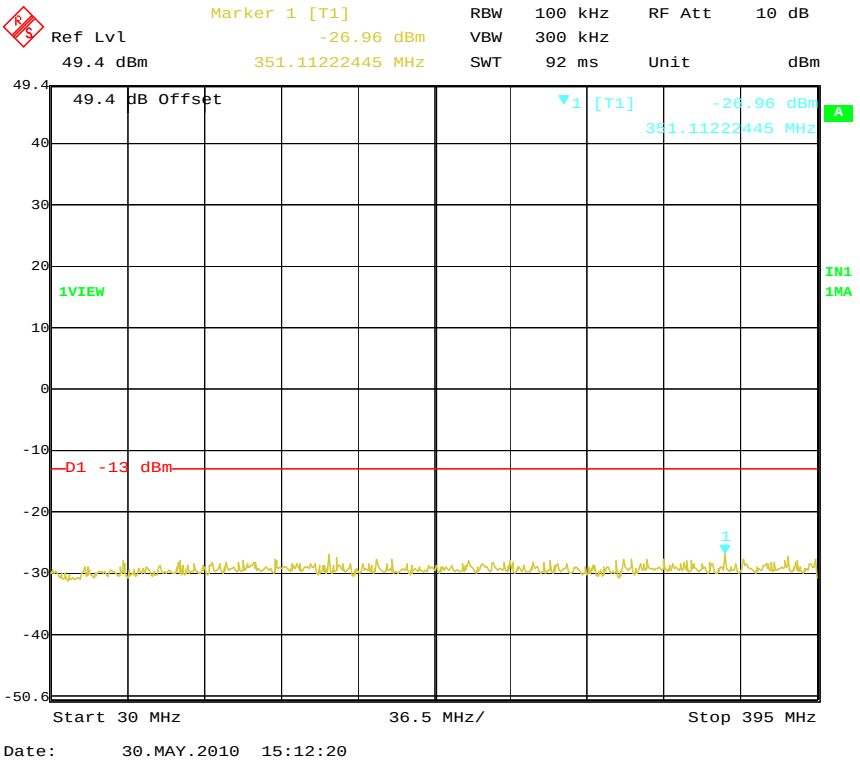
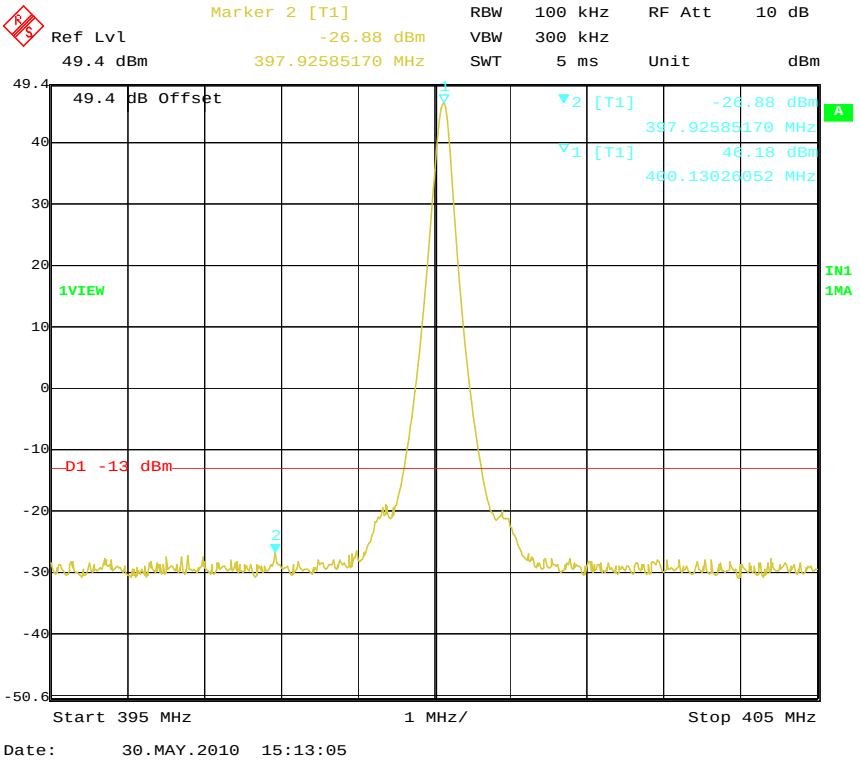
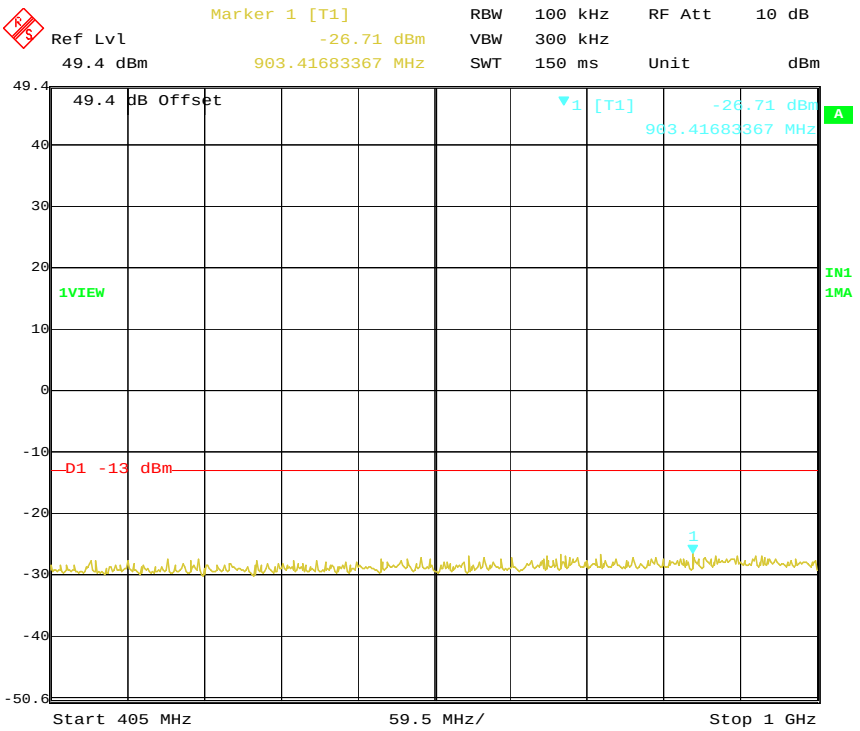


Date: 30.MAY.2010 15:15:23

Product	: Mobile Radio	Test Mode	: 400.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		







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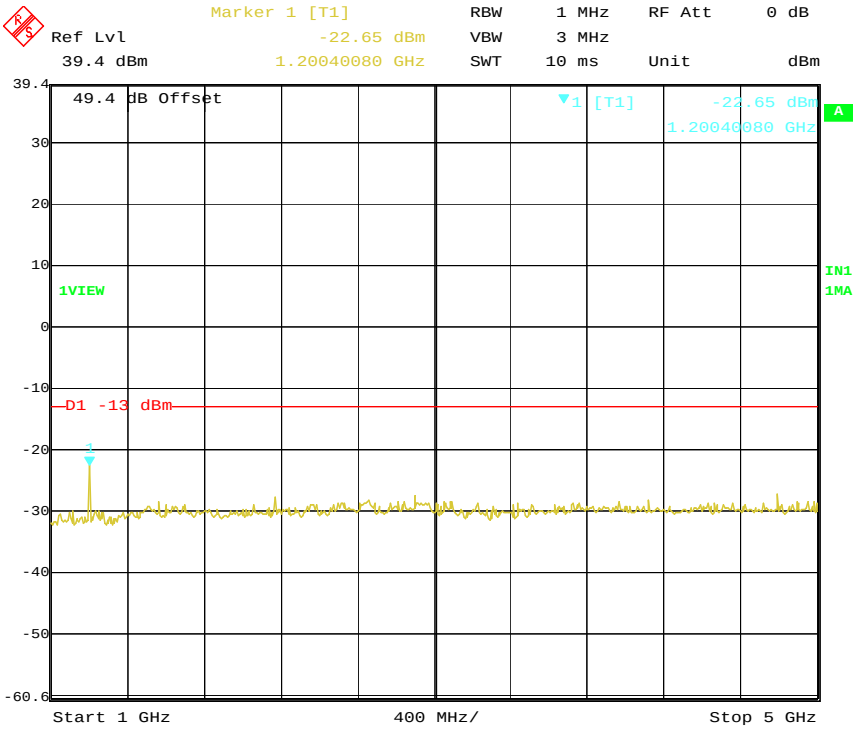
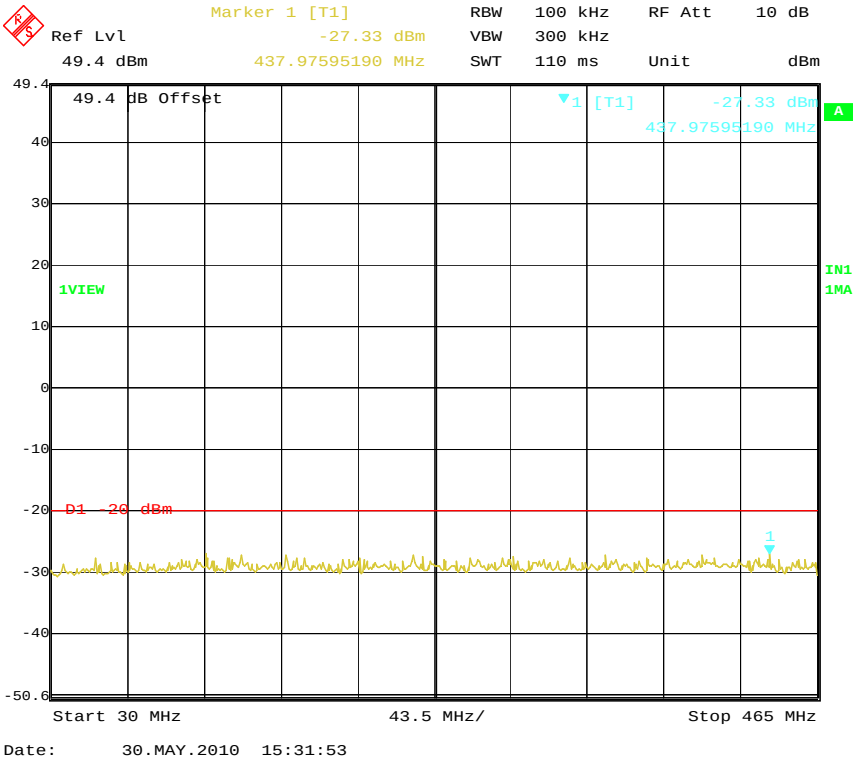
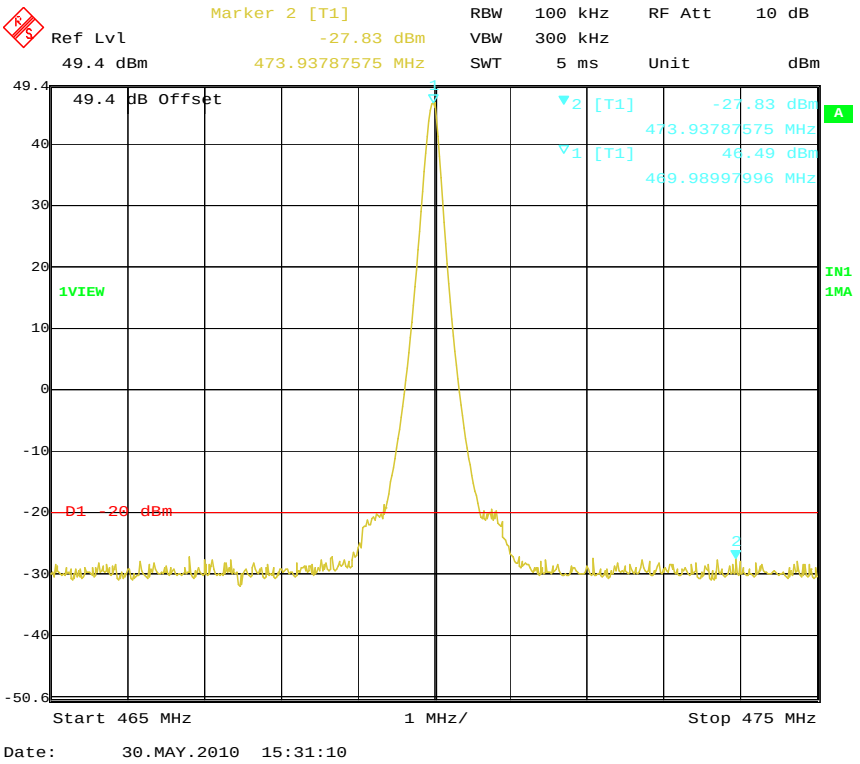


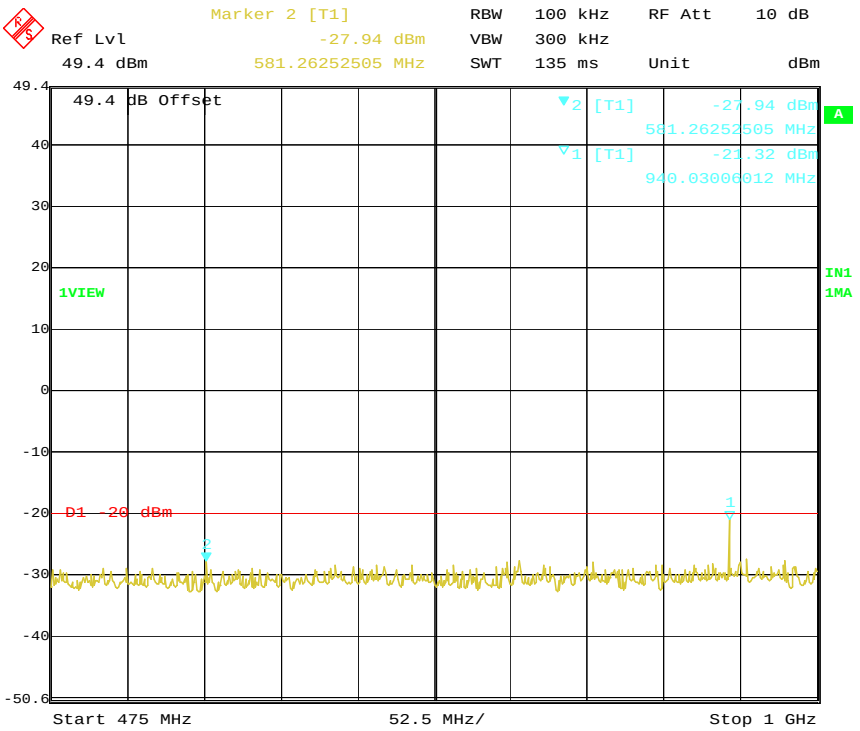
Date: 30.MAY.2010 15:14:46

For 12.5 KHz

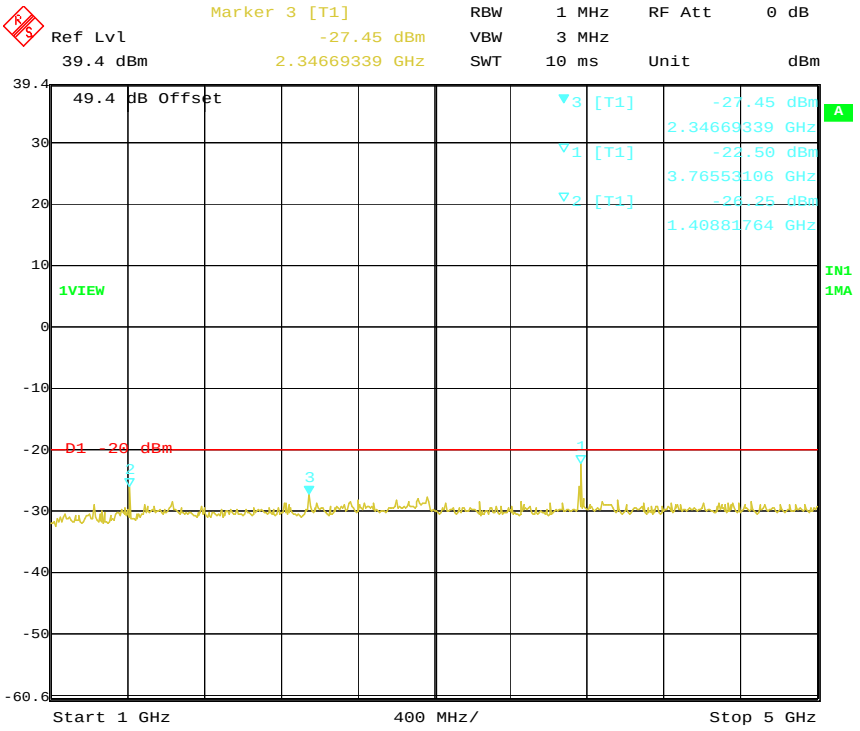
Product	: Mobile Radio	Test Mode	:489.9875MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		





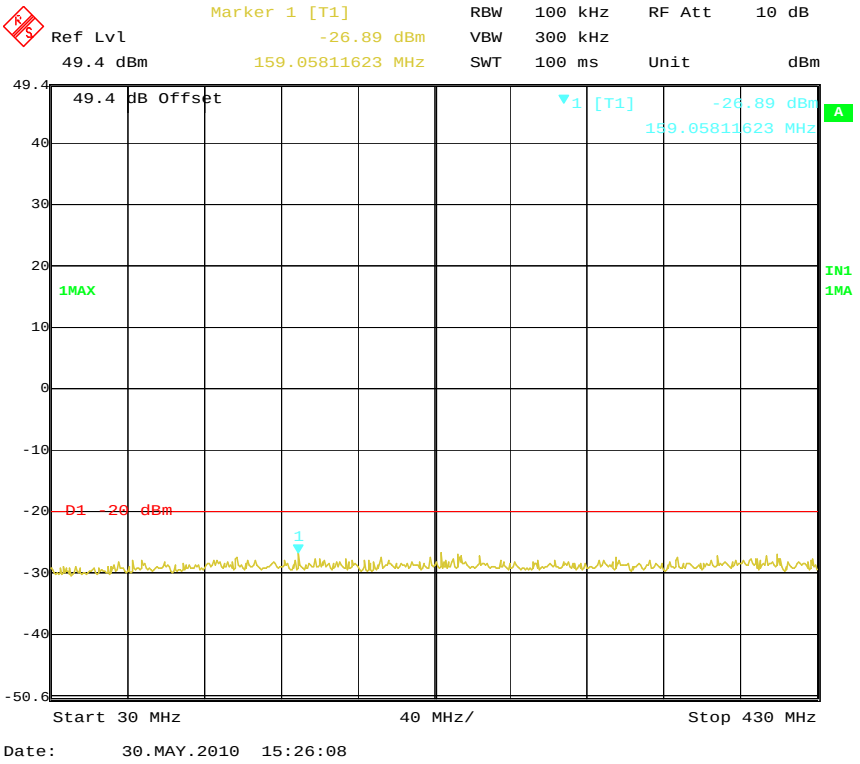


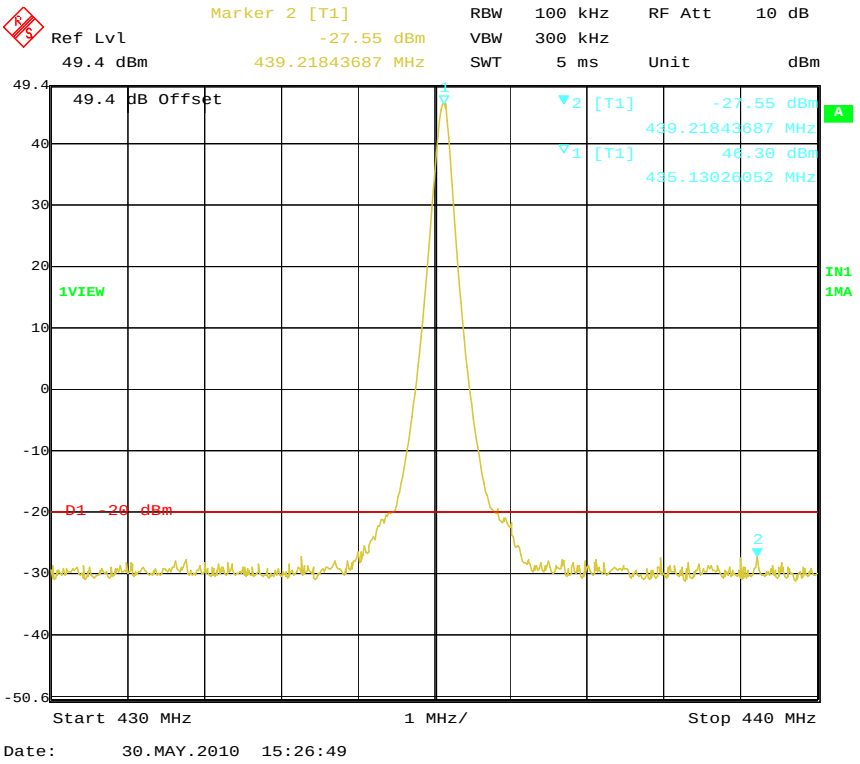
Date: 30.MAY.2010 15:30:04

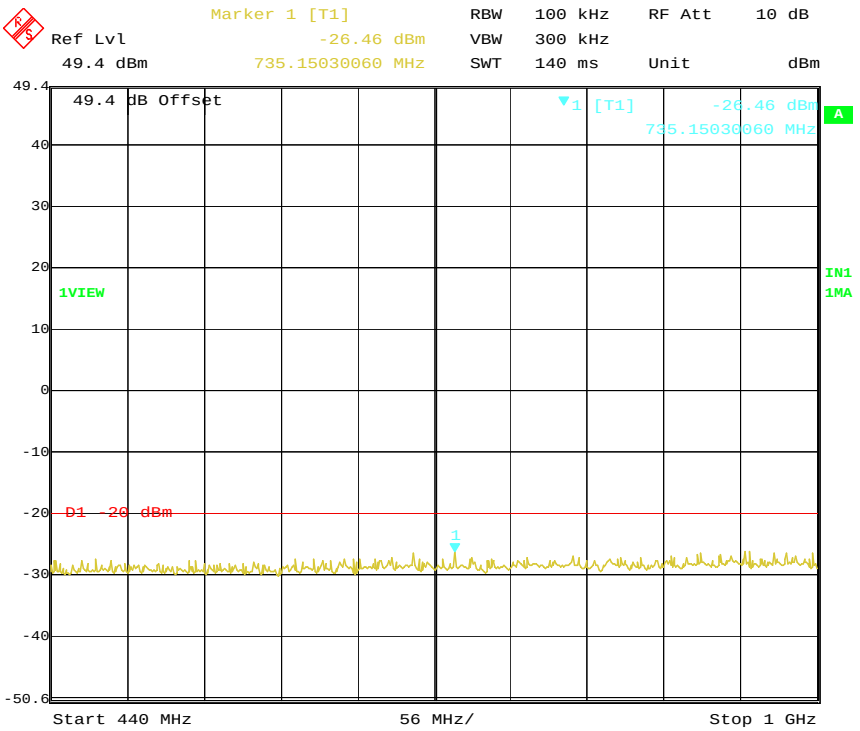


Date: 30.MAY.2010 15:29:12

Product	: Mobile Radio	Test Mode	435.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		







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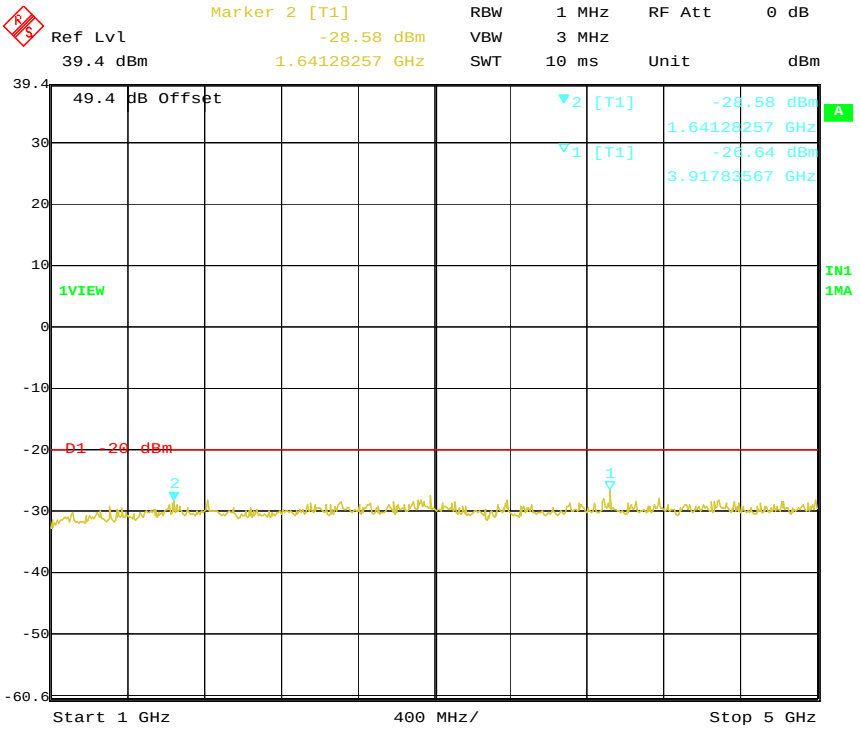
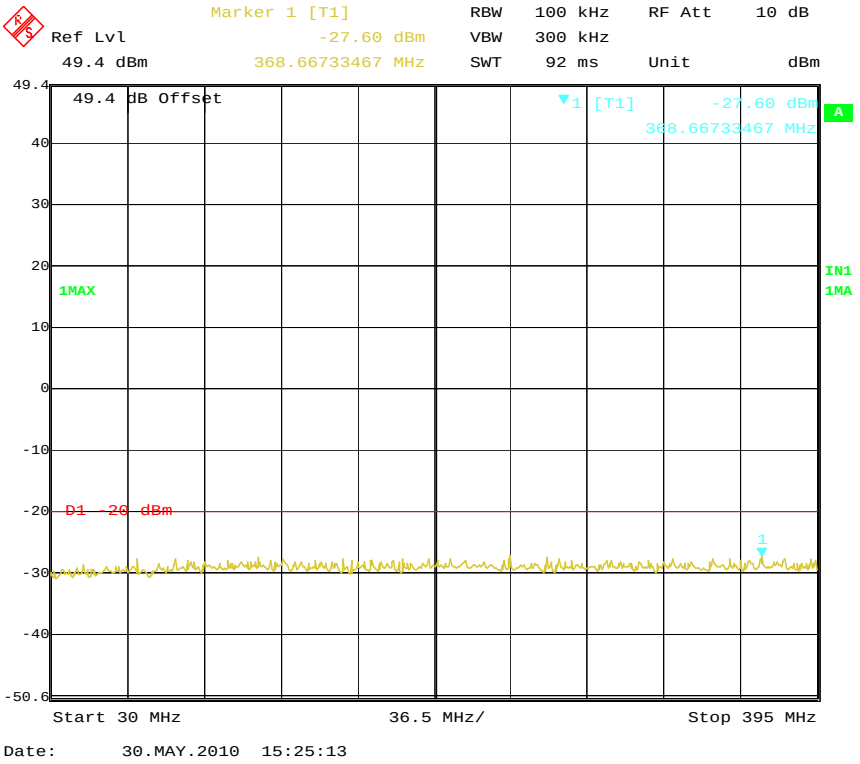
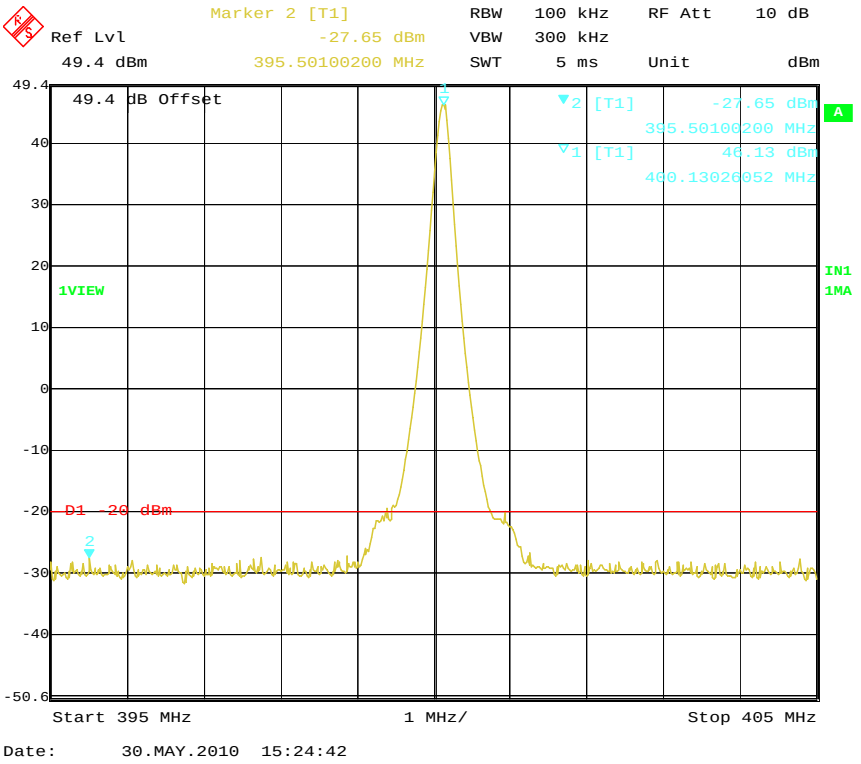
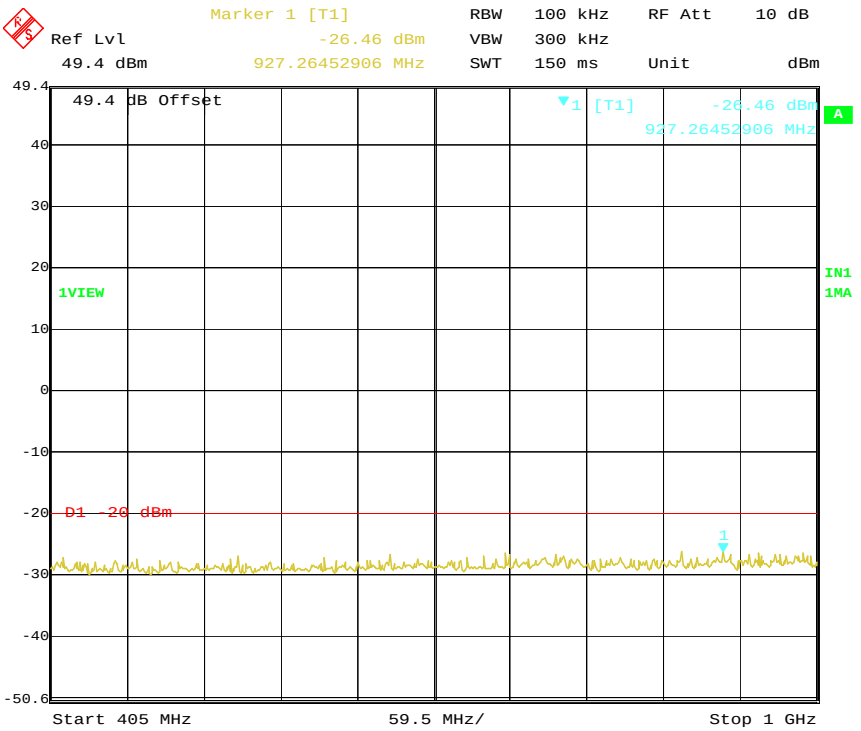


Date: 30.MAY.2010 15:28:37

Product	: Mobile Radio	Test Mode	: 400.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		







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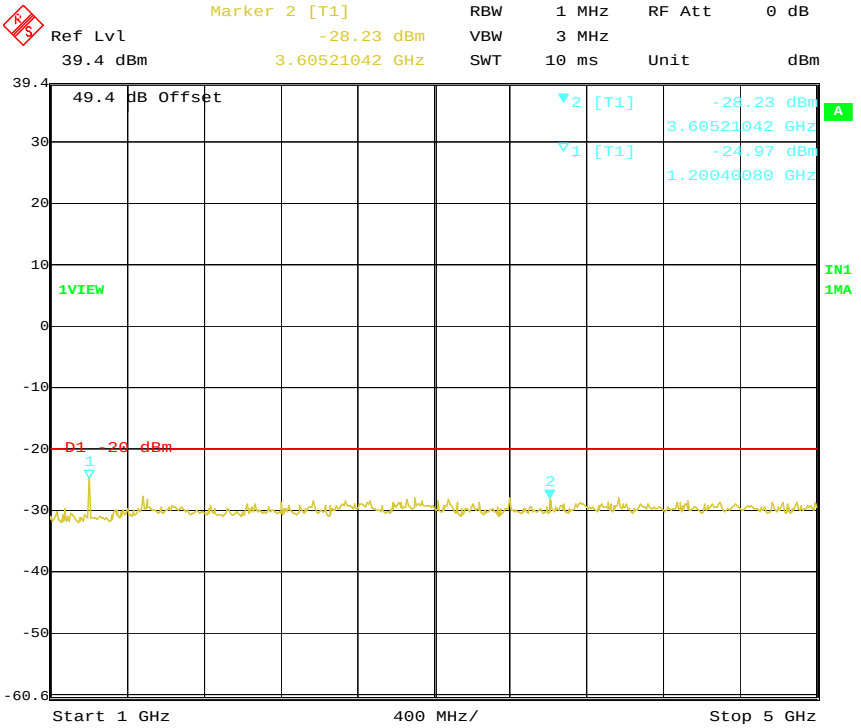

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4.5. Modulation Charcateristics

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

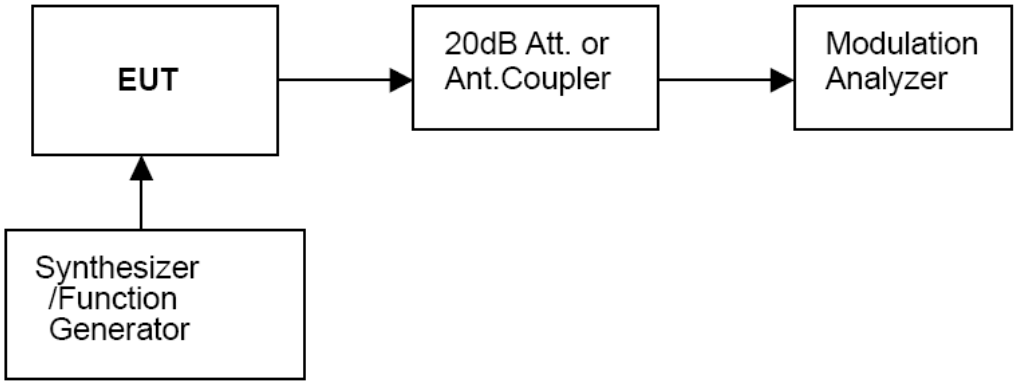
Modulation Limit

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, 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).

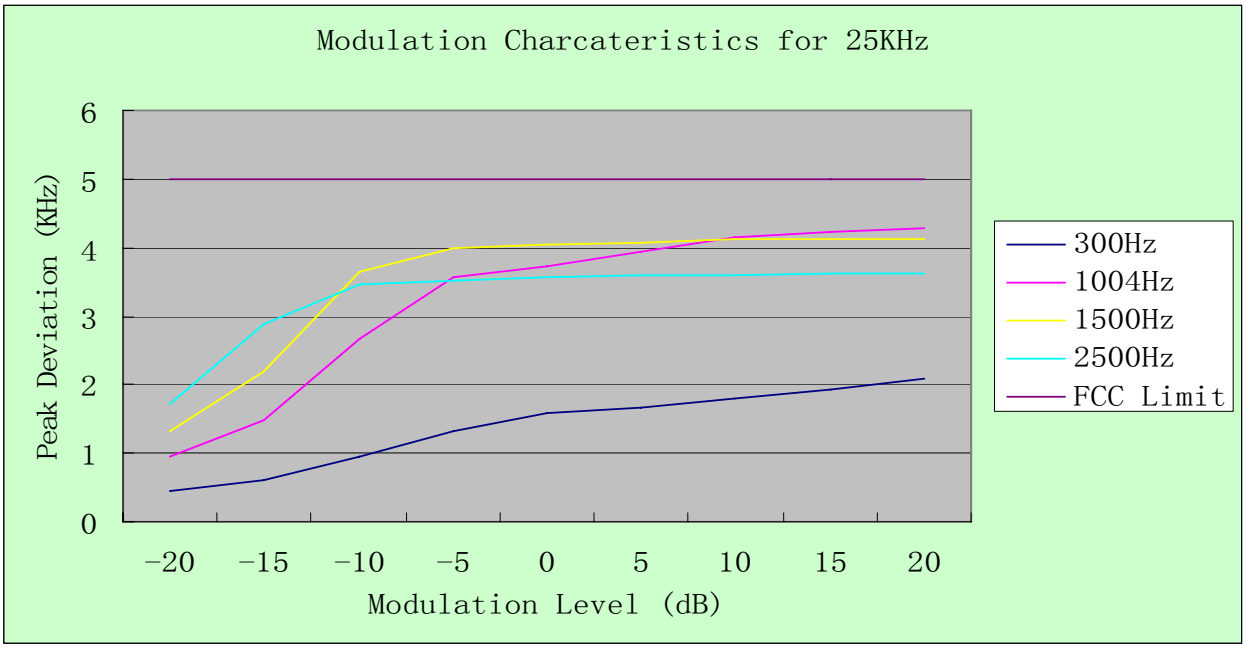
TEST CONFIGURATION



TEST RESULTS

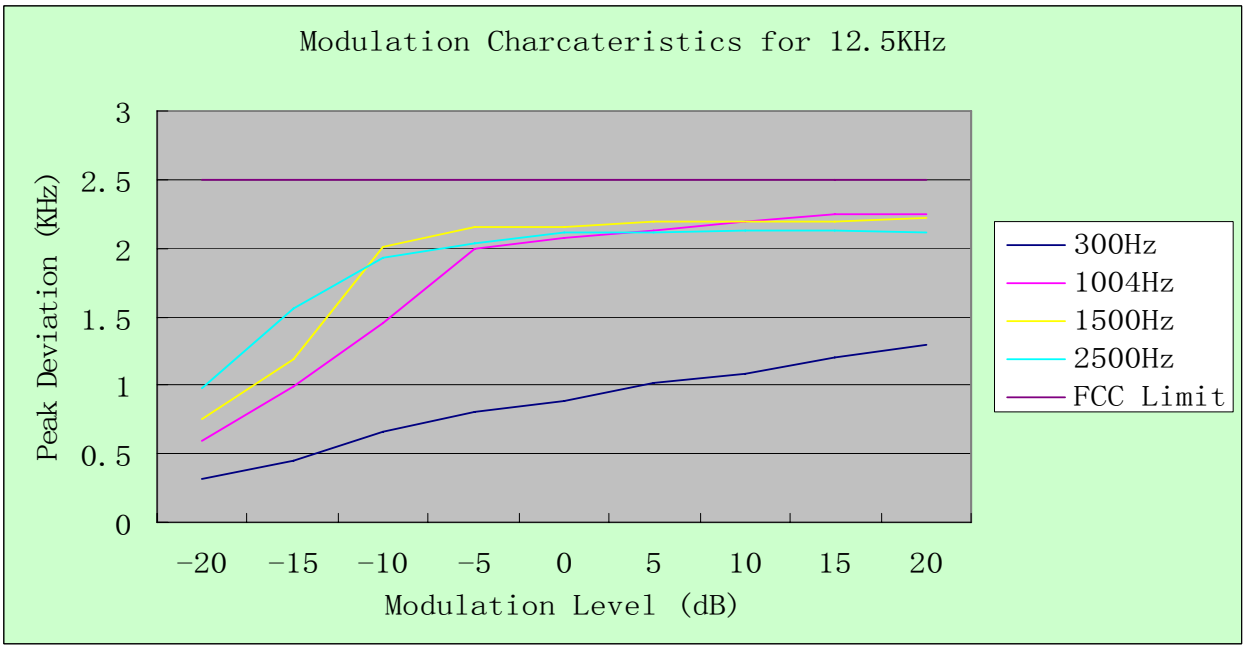
25 KHz Channel Separation

Modulation Level(dB)	Peak Freq. Deviation At 300 Hz(KHz)	Peak Freq. Deviation At 1004 Hz(KHz)	Peak Freq. Deviation At 1500 Hz(KHz)	Peak Freq. Deviation At 2500 Hz(KHz)
-20	0.45	0.96	1.32	1.71
-15	0.61	1.49	2.19	2.89
-10	0.95	2.67	3.65	3.46
-5	1.33	3.58	3.99	3.51
0	1.58	3.73	4.05	3.57
+5	1.66	3.94	4.08	3.60
+10	1.81	4.15	4.12	3.60
+15	1.93	4.22	4.12	3.61
+20	2.10	4.28	4.13	3.61



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	0.32	0.60	0.75	0.98
-15	0.45	0.99	1.19	1.56
-10	0.66	1.46	2.01	1.93
-5	0.80	1.99	2.16	2.04
0	0.89	2.08	2.16	2.12
+5	1.02	2.13	2.19	2.12
+10	1.08	2.19	2.19	2.13
+15	1.20	2.25	2.20	2.13
+20	1.29	2.25	2.22	2.12

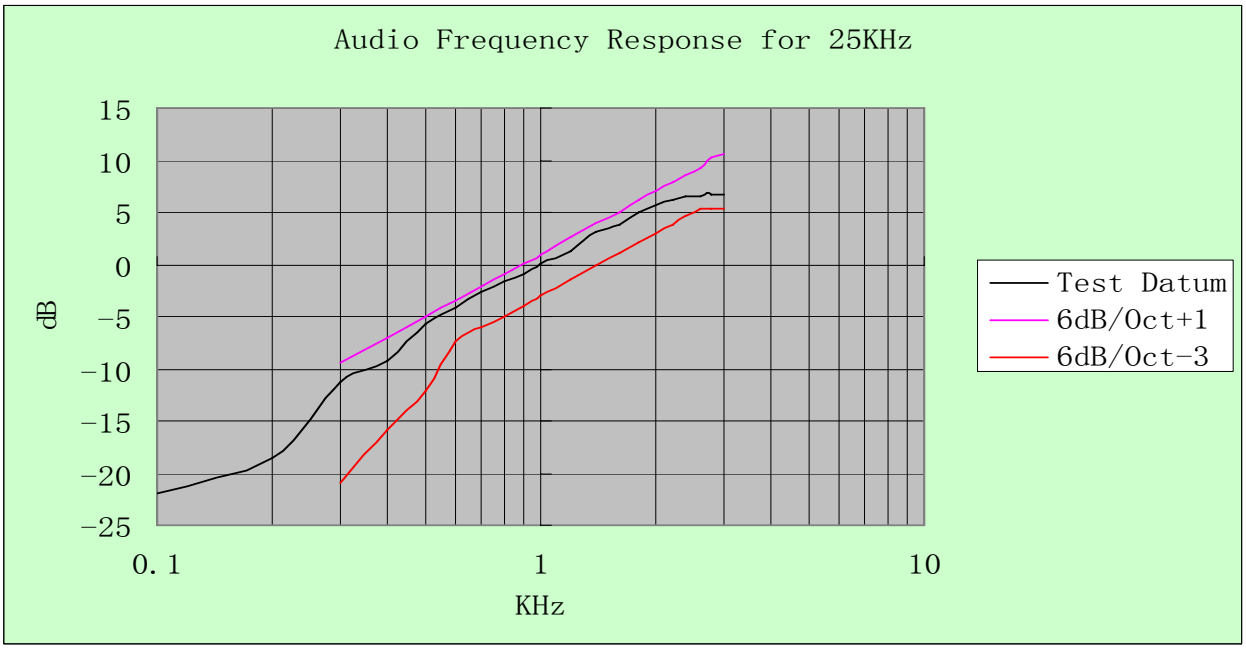


b). Audio Frequency Response:

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.The audio frequency response curve is show below.and
Test Audio Level (1 KHz and 20% maximum deviation) for 25 KHz channel separation is 10mv and 9mv for 12.5 KHz channel separation.
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 and 25 KHz channel separation

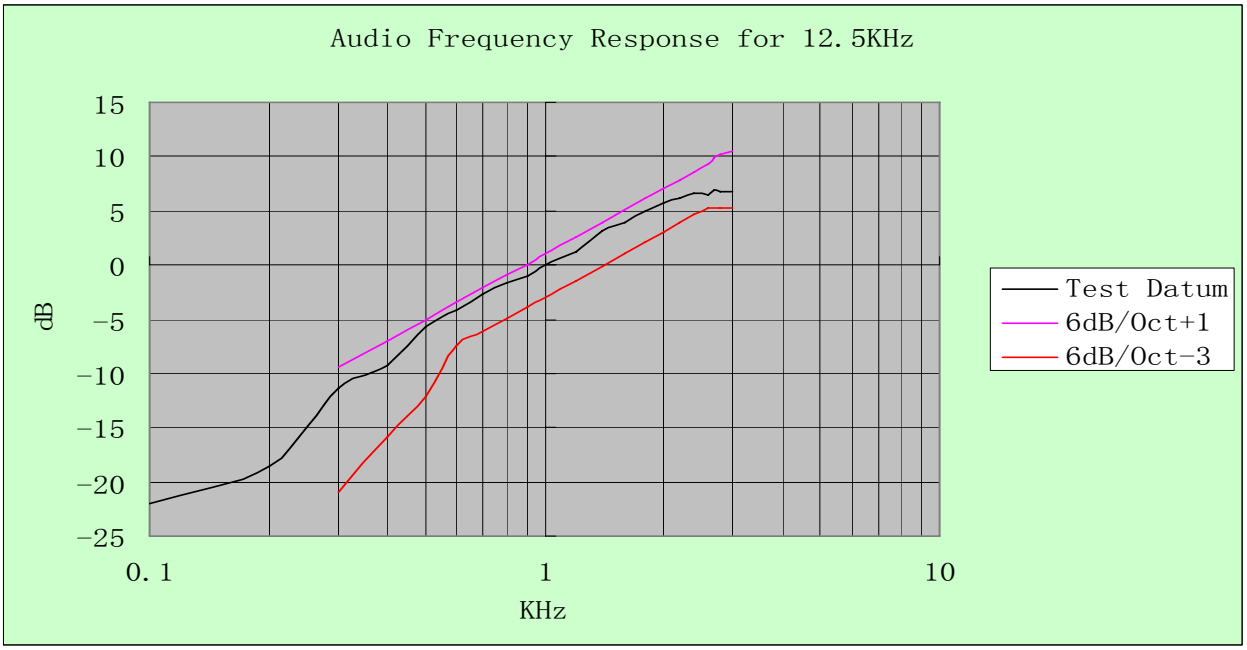
For 25 KHz

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.08	1.01	-22.02
0.2	0.12	1.01	-18.50
0.3	0.27	1.01	-11.31
0.4	0.35	1.01	-9.26
0.5	0.53	1.01	-5.66
0.6	0.62	1.01	-4.2
0.7	0.75	1.01	-2.62
0.8	0.83	1.01	-1.66
0.9	0.90	1.01	-0.98
1.0	1.02	1.01	0.05
1.2	1.16	1.01	1.23
1.4	1.45	1.01	3.12
1.6	1.58	1.01	3.88
1.8	1.79	1.01	4.96
2.0	1.95	1.01	5.71
2.2	2.07	1.01	6.23
2.4	2.15	1.01	6.58
2.6	2.13	1.01	6.48
2.7	2.22	1.01	6.85
2.8	2.20	1.01	6.75
3.0	2.19	1.01	6.73



For 12.5 KHz

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Refenerce Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.06	0.52	-18.76
0.2	0.10	0.52	-14.32
0.3	0.14	0.52	-11.24
0.4	0.17	0.52	-9.47
0.5	0.22	0.52	-7.45
0.6	0.28	0.52	-5.41
0.7	0.32	0.52	-3.47
0.8	0.39	0.52	-2.47
0.9	0.44	0.52	-1.47
1.0	0.45	0.52	-1.26
1.2	0.53	0.52	0.13
1.4	0.67	0.52	2.24
1.6	0.75	0.52	3.16
1.8	0.80	0.52	3.78
2.0	0.89	0.52	4.66
2.2	0.95	0.52	5.24
2.4	0.99	0.52	5.58
2.6	1.02	0.52	5.89
2.7	1.03	0.52	5.90
2.8	1.03	0.52	5.90
3.0	1.04	0.52	5.91



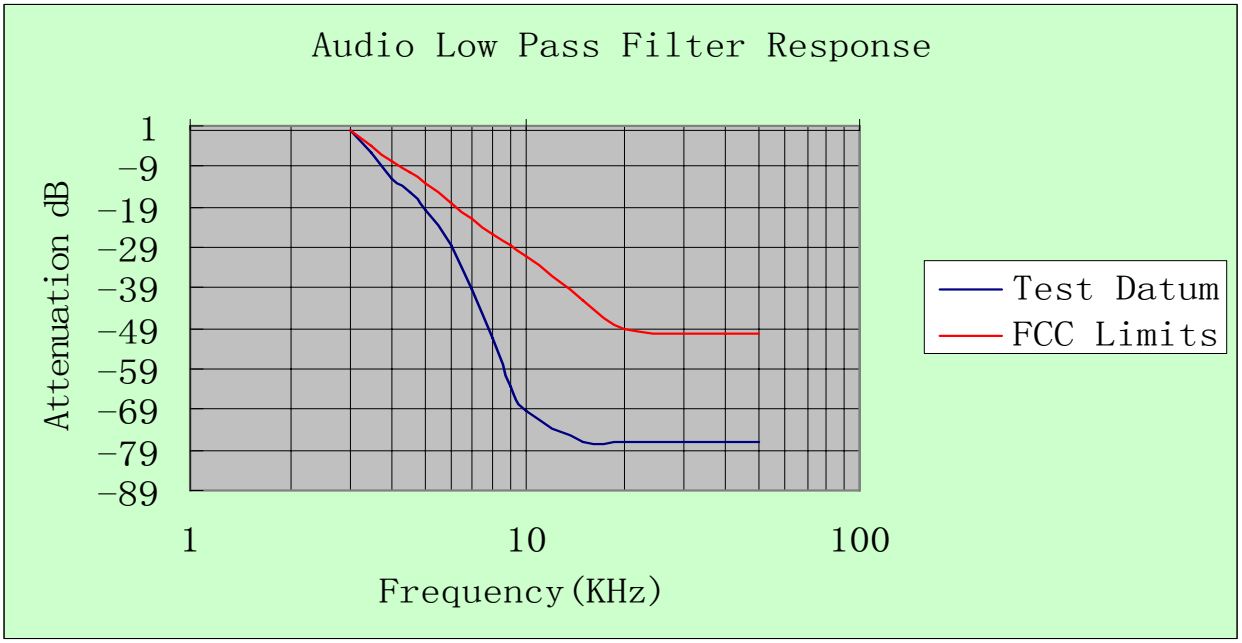
Audio Post Limiter Low Pass Filter Response

For 25 KHz

Audio Frequency (KHz)	Audio Frequency Response (dB)	Audio Frequency (KHz)	Audio Frequency Response (dB)	Limit	Results
3.500	-5.48	9.000	-63.23	See Note	Pass
4.000	-11.88	10.000	-69.26		
4.500	-15.47	15.000	-77.25		
5.000	-19.58	20.000	-77.26		
6.000	-28.63	30.000	-77.26		
7.000	-39.56	40.000	-77.26		
8.000	-51.33	50.000	-77.26		

Note: the limt of Audio Post Limiter Low Pass Filter Response for 25 KHz as following

RF Band	Audio band	Minimum Attenuation Rel. to 1 KHz Attenuation
136-174 MHz	3 –20 KHz	60 log10(f/3) dB where f is in KHz
	20 – 50 KHz	-50dB

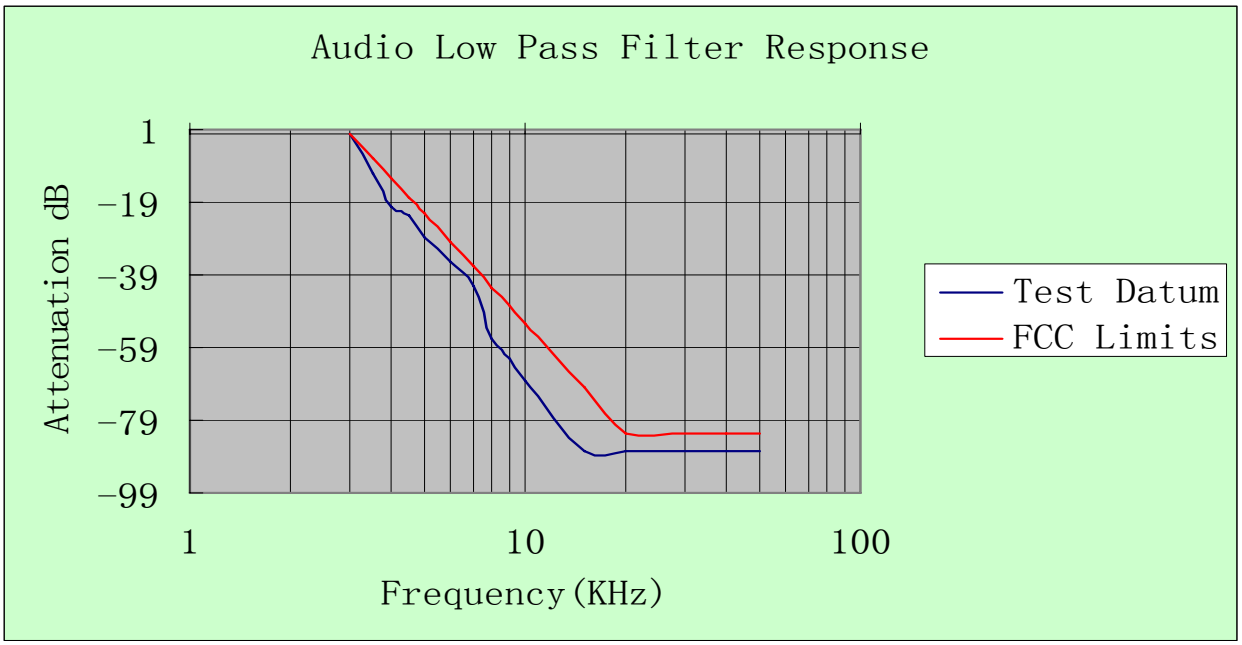


For 12.5 KHz

Audio Frequency (KHz)	Audio Frequency Response (dB)	Audio Frequency (KHz)	Audio Frequency Response (dB)	Limit	Results
3.500	-10.98	9.000	-62.18	See Note	Pass
4.000	-20.06	10.000	-68.26		
4.500	-22.75	15.000	-87.35		
5.000	-28.62	20.000	-87.35		
6.000	-35.62	30.000	-87.35		
7.000	-42.33	40.000	-87.35		
8.000	-56.38	50.000	-87.35		

Note: the limt of Audio Post Limiter Low Pass Filter Response for 25 KHz as following

RF Band	Audio band	Minimum Attenuation Rel. to 1 KHz Attenuation
136-174 MHz	3 –20 KHz	100 log10(f/3) dB where f is in KHz
	20 – 50 KHz	-82.5dB



4.6. Frequency Stability Test

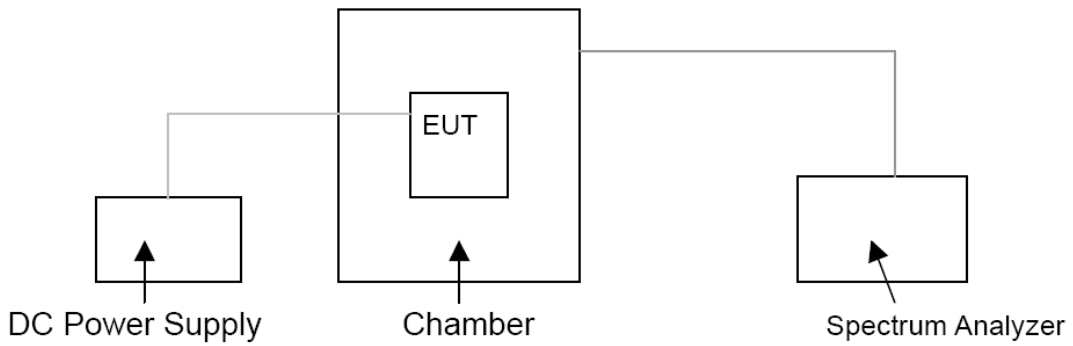
TEST APPLICABLE

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 According to §90.213, the frequency stability limit is 2.5 ppm for 12.5KHz channel separation and 5 ppm for 25KHz 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

a. Frequency stability versus input voltage (battery operation end point voltage is 11.89 V)
For 25 KHz:

Channel	Reference Frequency (MHz)	Frequency Measured at end point	Frequency Deviation (%)	Limit (%)
03	469.9875	469.98765496	0.00003	0.00050
02	435.1250	435.12553687	0.00012	0.00050
01	400.1250	400.12599614	0.00023	0.00050

For 12.5 KHz:

Channel	Reference Frequency (MHz)	Frequency Measured at end point	Frequency Deviation (%)	Limit (%)
06	469.9875	469.98758971	0.00002	0.00025
05	435.1250	435.12559877	0.00014	0.00025
04	400.1250	400.12560214	0.00014	0.00025

b. Frequency stability versus ambient temperature

For 25 KHz:

Channel 03

Reference Frequency: 469.9875MHz			Limit: 0.00050%
Environment Temperature (℃)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	13.60 V	469.98763468	0.00003
40	13.60 V	469.98763796	0.00003
30	13.60 V	469.98733048	-0.00004
20	13.60 V	469.98713928	-0.00008
10	13.60 V	469.98726391	-0.00005
0	13.60 V	469.98739696	-0.00002
-10	13.60 V	469.98733928	-0.00003
-20	13.60 V	469.98757932	0.00002
-30	13.60 V	469.98752669	0.00003

Channel 02

Reference Frequency: 435.1250MHz			Limit: 0.0005%
Environment Temperature (℃)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	13.60 V	435.12556987	0.00013
40	13.60 V	435.12535560	0.00008
30	13.60 V	435.12524922	0.00005
20	13.60 V	435.12465932	-0.00007
10	13.60 V	435.12486332	-0.00003
0	13.60 V	435.12512003	0.00003
-10	13.60 V	435.12465682	-0.00007
-20	13.60 V	435.12513348	0.00003
-30	13.60 V	435.12526213	0.00006

Channel 01

Reference Frequency: 400.12500MHz			Limit: 0.0005%
Environment Temperature (℃)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	13.60 V	400.12559102	0.00015
40	13.60 V	400.12539611	0.00008
30	13.60 V	400.12449960	-0.00011
20	13.60 V	400.12469940	-0.00006
10	13.60 V	400.12465643	-0.00007
0	13.60 V	400.12469384	-0.00007
-10	13.60 V	400.12479050	-0.00005
-20	13.60 V	400.12559781	0.00013
-30	13.60 V	400.12566643	0.00014

For 12.5 KHz:

Channel 06

Reference Frequency:469.9875MHz			Limit: 0.00025%
Environment Temperature (℃)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	13.60 V	469.98762361	0.00003
40	13.60 V	469.98766970	0.00004
30	13.60 V	469.98741156	-0.00002
20	13.60 V	469.98712008	-0.00008
10	13.60 V	469.98726971	-0.00005
0	13.60 V	469.98738996	-0.00002
-10	13.60 V	469.98736028	-0.00003
-20	13.60 V	469.98759852	0.00002
-30	13.60 V	469.98757646	0.00002

Channel 05

Reference Frequency: 435.1250MHz			Limit: 0.00025%
Environment Temperature (℃)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	13.60 V	435.12557987	0.00013
40	13.60 V	435.12536090	0.00008
30	13.60 V	435.12525572	0.00005
20	13.60 V	435.12466982	-0.00007
10	13.60 V	435.12487511	-0.00003
0	13.60 V	435.12513012	0.00003
-10	13.60 V	435.12465892	-0.00007
-20	13.60 V	435.12512068	0.00003
-30	13.60 V	435.12526336	0.00007

Channel 04

Reference Frequency: 400.1250MHz			Limit: 0.00025%
Environment Temperature (℃)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	13.60 V	400.12559871	0.00015
40	13.60 V	400.12540063	0.00009
30	13.60 V	400.12446969	-0.00001
20	13.60 V	400.12468694	-0.00007
10	13.60 V	400.12469242	-0.00007
0	13.60 V	400.12463780	-0.00008
-10	13.60 V	400.12479853	-0.00004
-20	13.60 V	400.12516781	0.00004
-30	13.60 V	400.12565543	0.00014

4.7. Maximum Transmitter Power

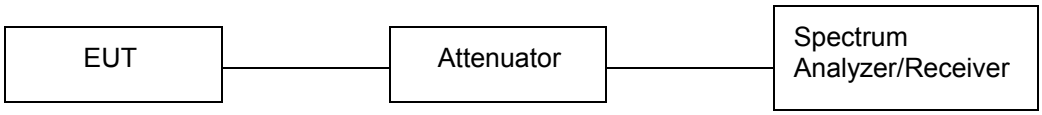
TEST APPLICABLE

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 13.60V stabilized supply voltage.

TEST CONFIGURATION

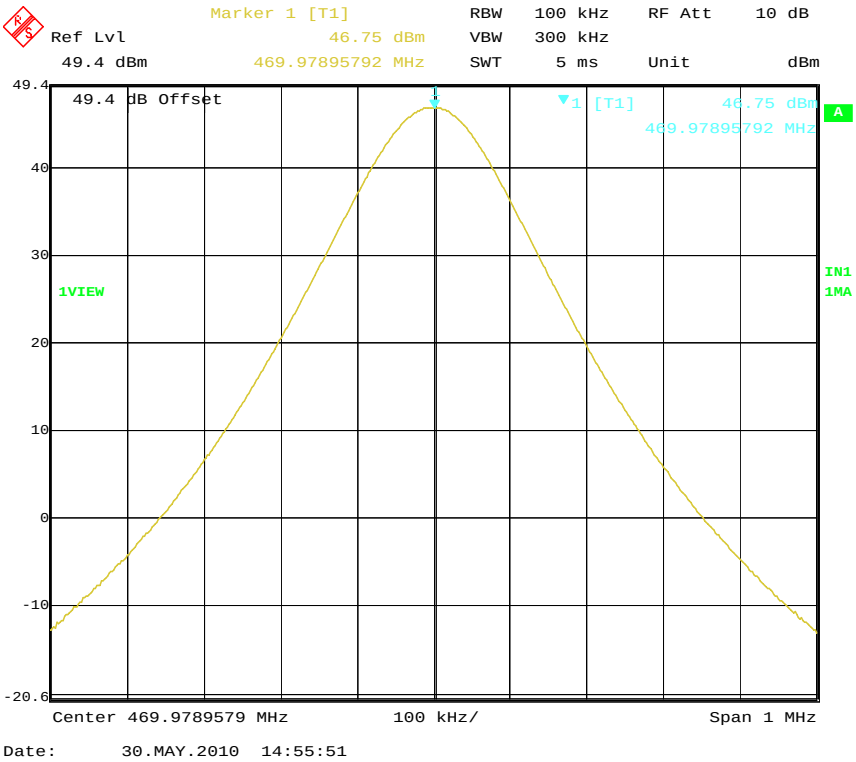


The EUT was directly connected to a RF Communication Test Set by a 40 dB attenuator

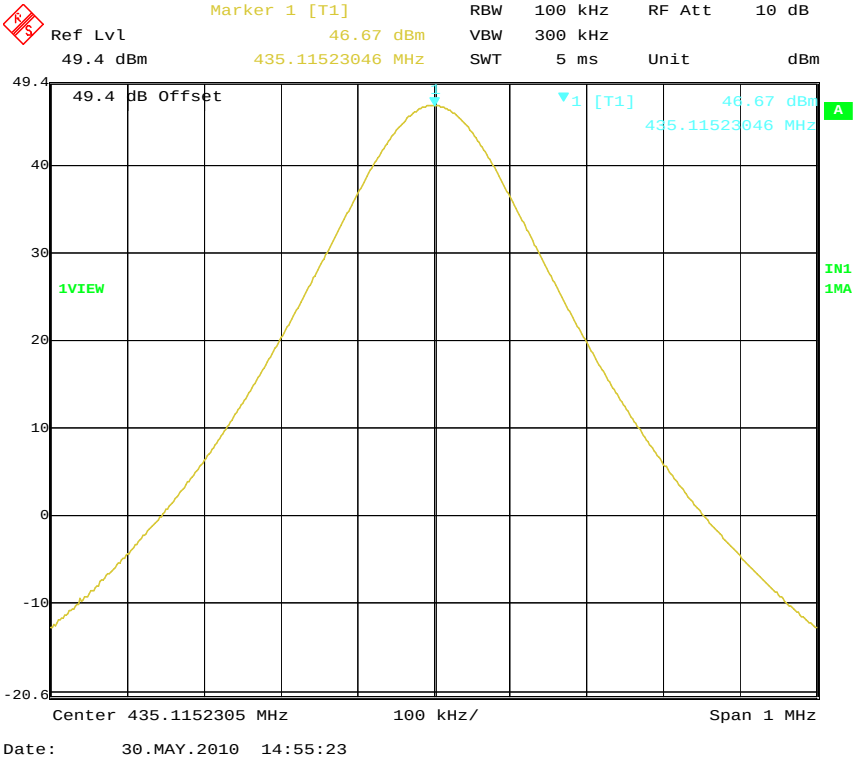
TEST RESULTS

For 25 KHz:

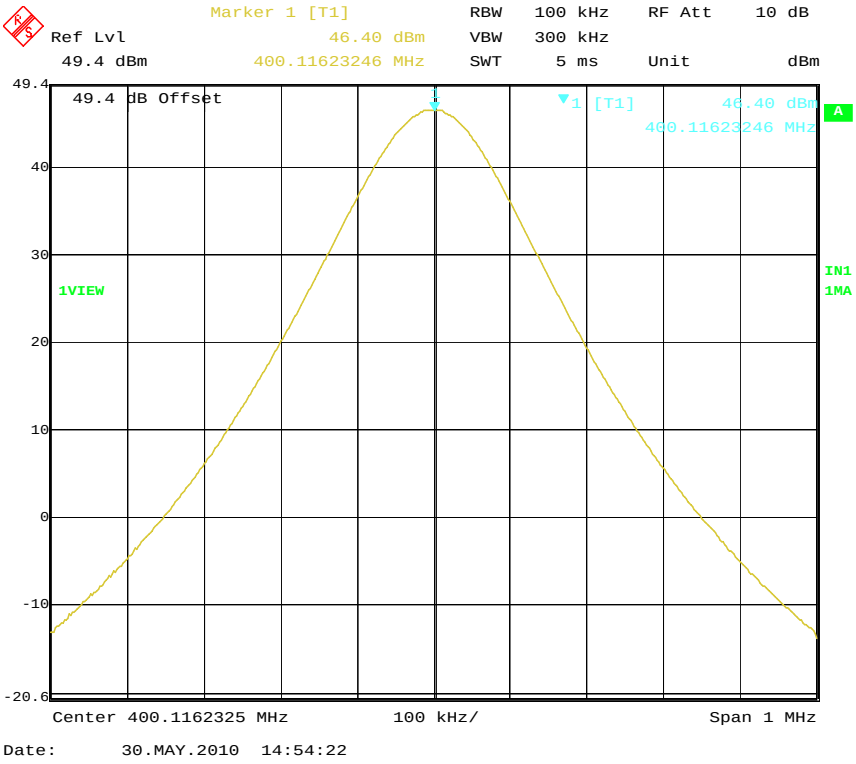
Freq.(MHz)	Measurement (dBm)	FCC Limit
469.9875	46.75	Varies



Freq. (MHz)	Measurement (dBm)	FCC Limit
435.1250	46.67	Varies

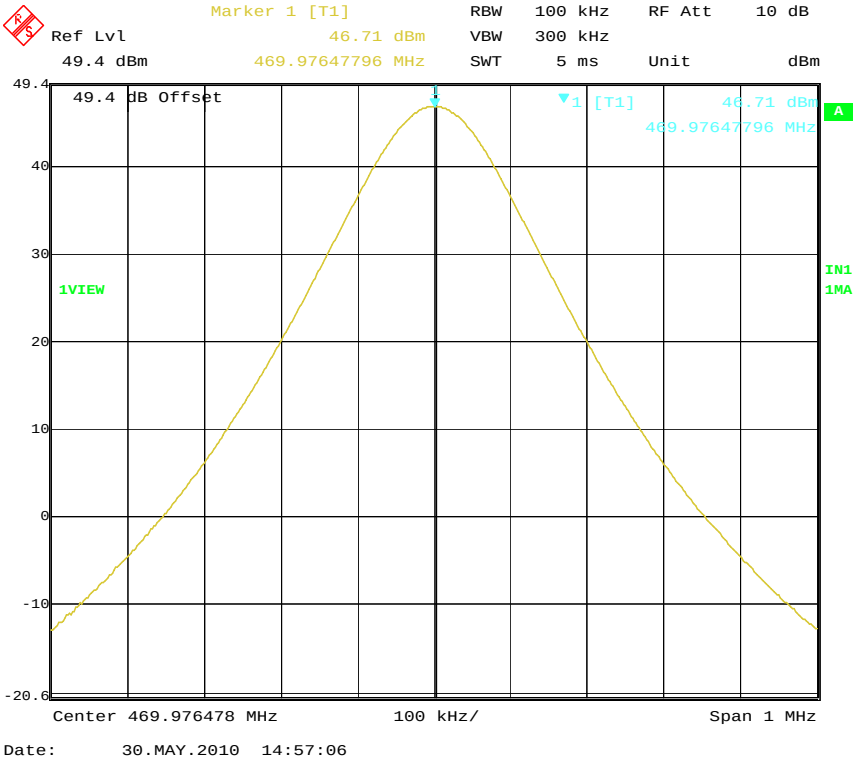


Freq. (MHz)	Measurement (dBm)	FCC Limit
400.1250	46.40	Varies

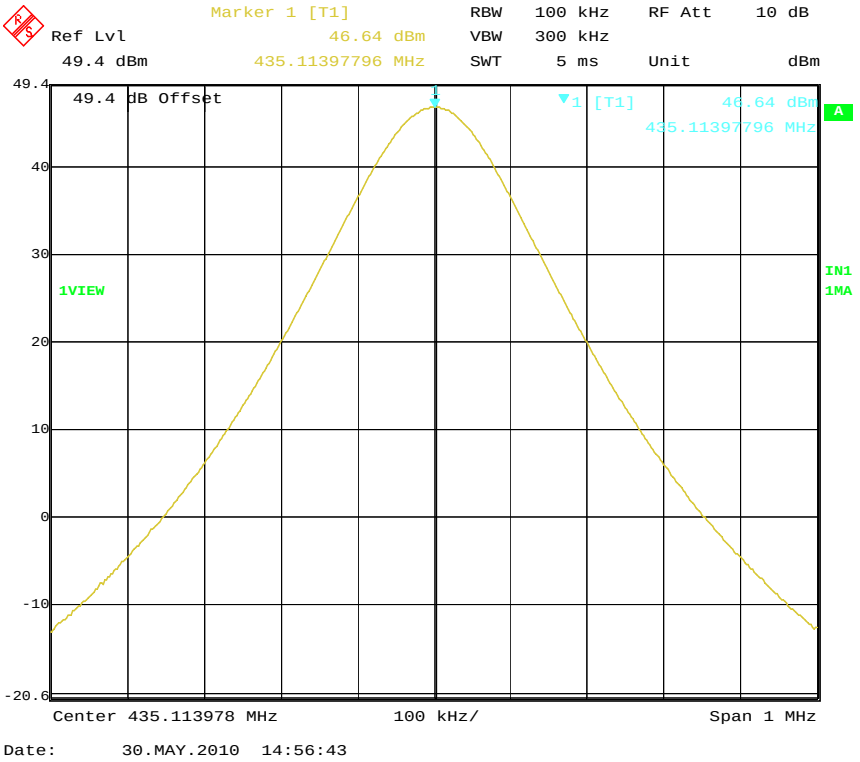


For 12.5 KHz

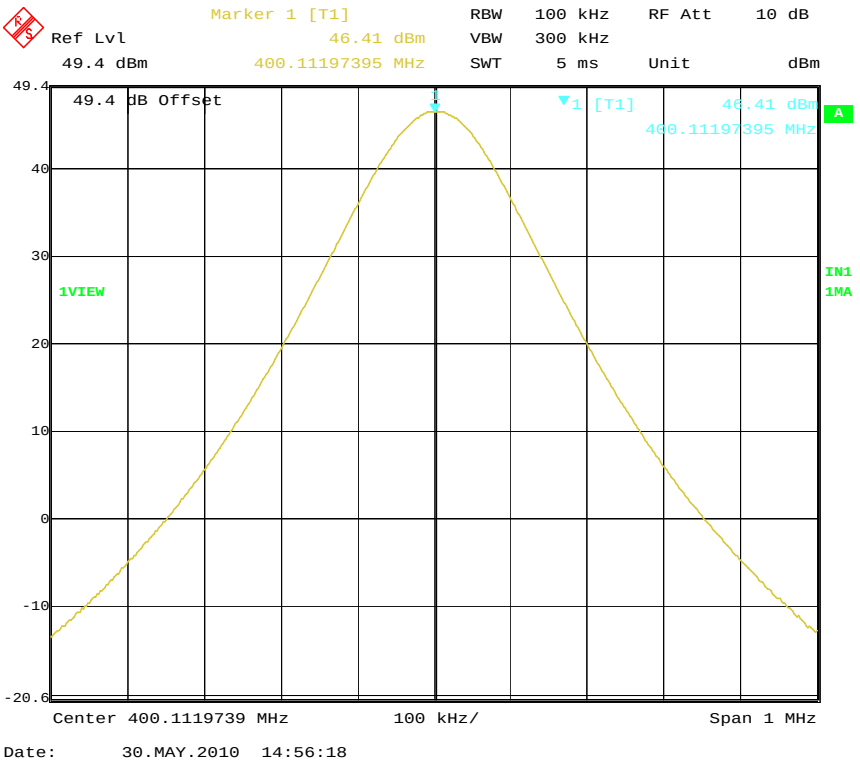
Freq. (MHz)	Measurement (dBm)	FCC Limit
469.9875	46.71	Varies



Freq. (MHz)	Measurement (dBm)	FCC Limit
435.1250	46.64	Varies



Freq. (MHz)	Measurement (dBm)	FCC Limit
400.1250	46.41	Varies



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:

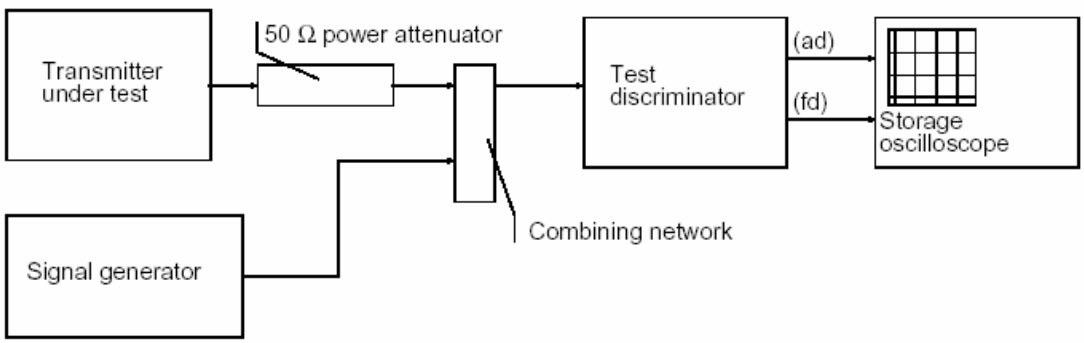
Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t_1 [4]	± 25.0 KHz	5.0 ms	10.0 ms
t_2	± 12.5 KHz	20.0 ms	25.0 ms
t_3 [4]	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency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

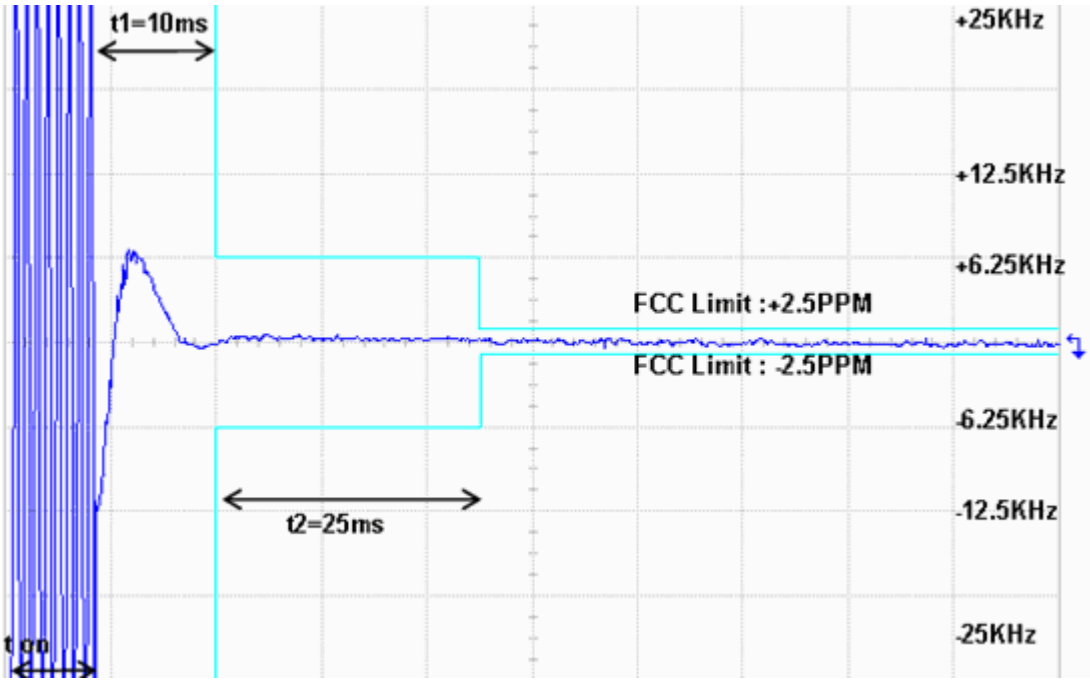
TEST CONFIGURATION



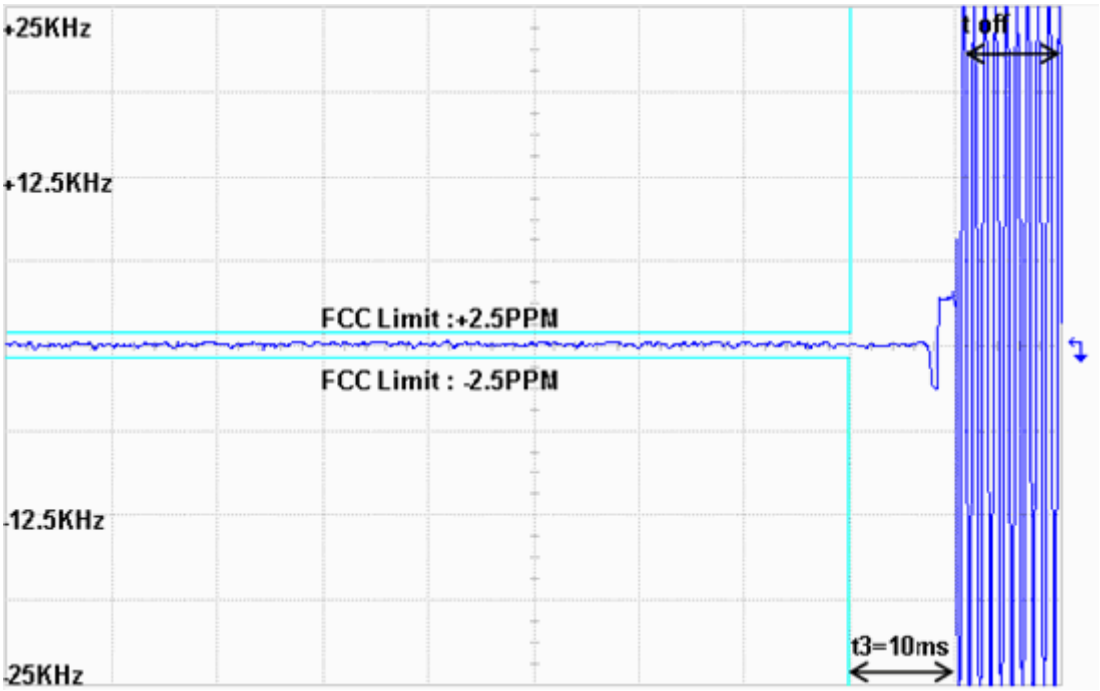
TEST RESULTS

Please refer to the following plots.

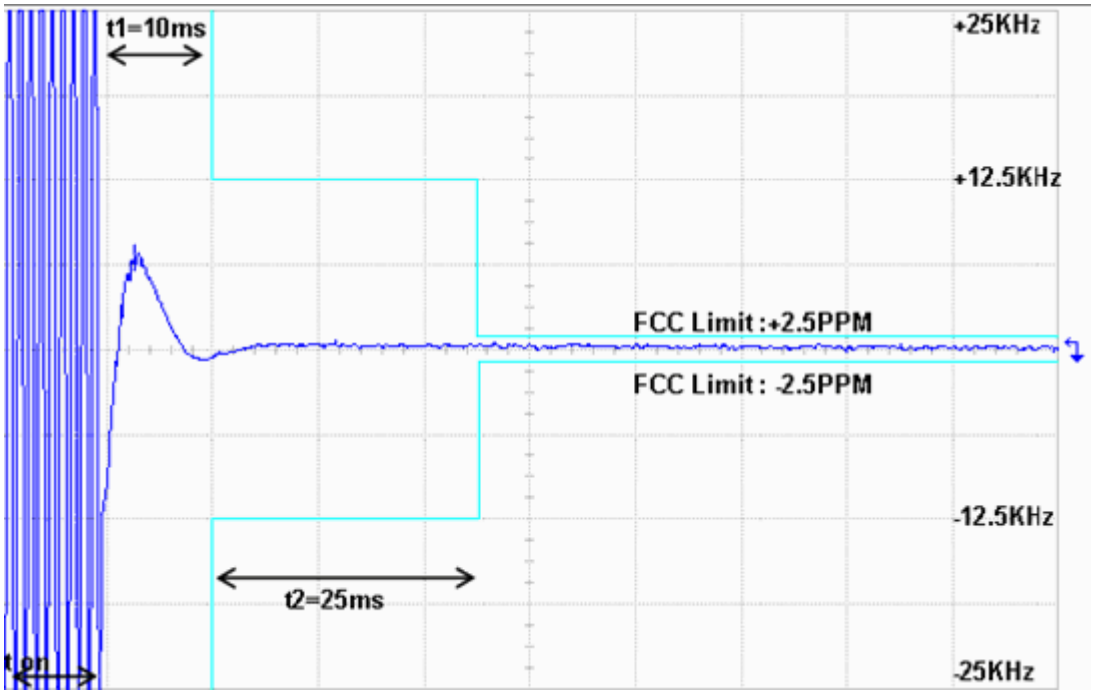
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------Off – On



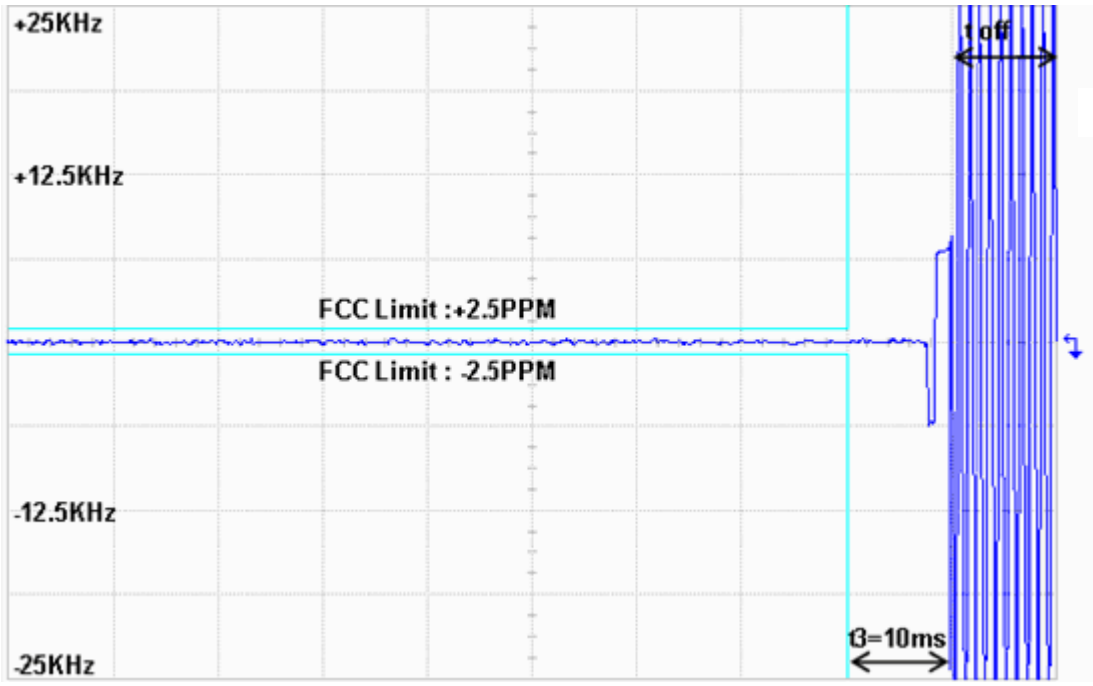
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------On - Off



Transmitter Frequency Behaviour @ 25 KHz Channel Separation------Off – On



Transmitter Frequency Behaviour @ 25 KHz Channel Separation------On - Off



4.9. Receiver Radiated Spurious Emssion

TEST APPLICABLE

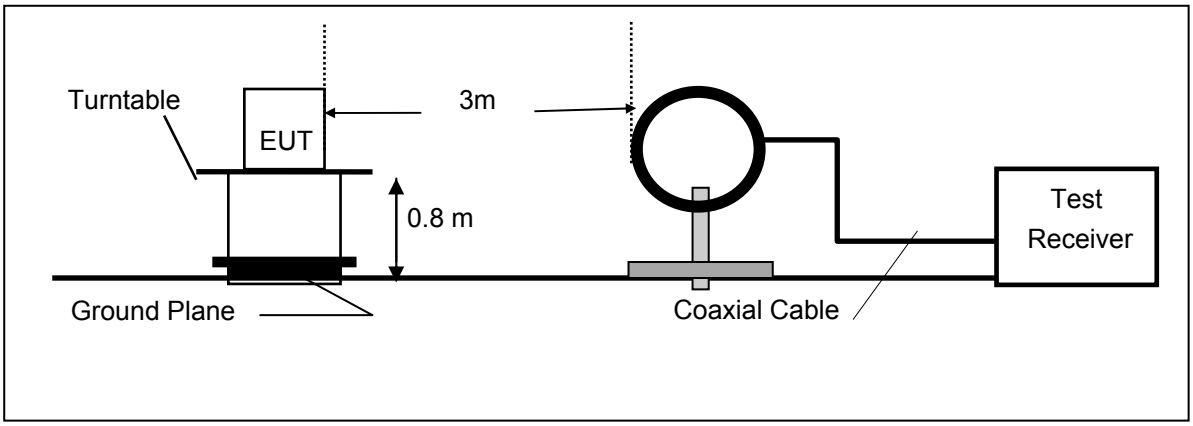
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

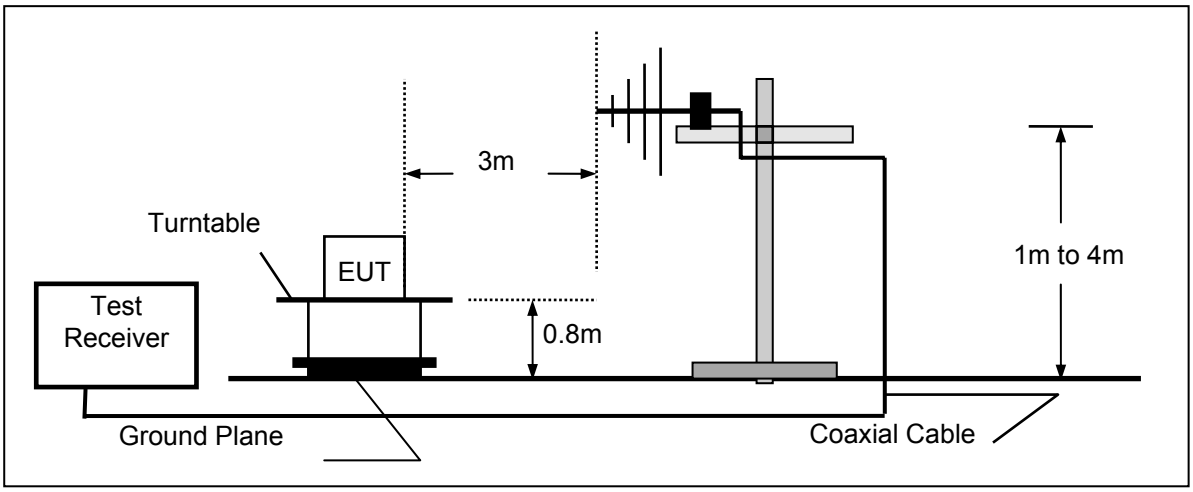
Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

TEST CONFIGURATION

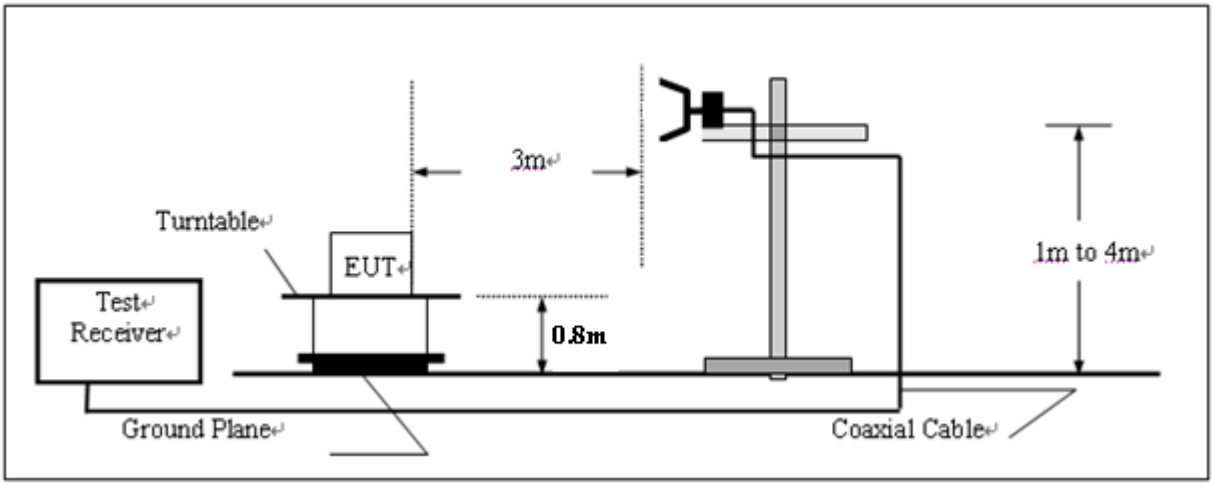
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



(C) 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.

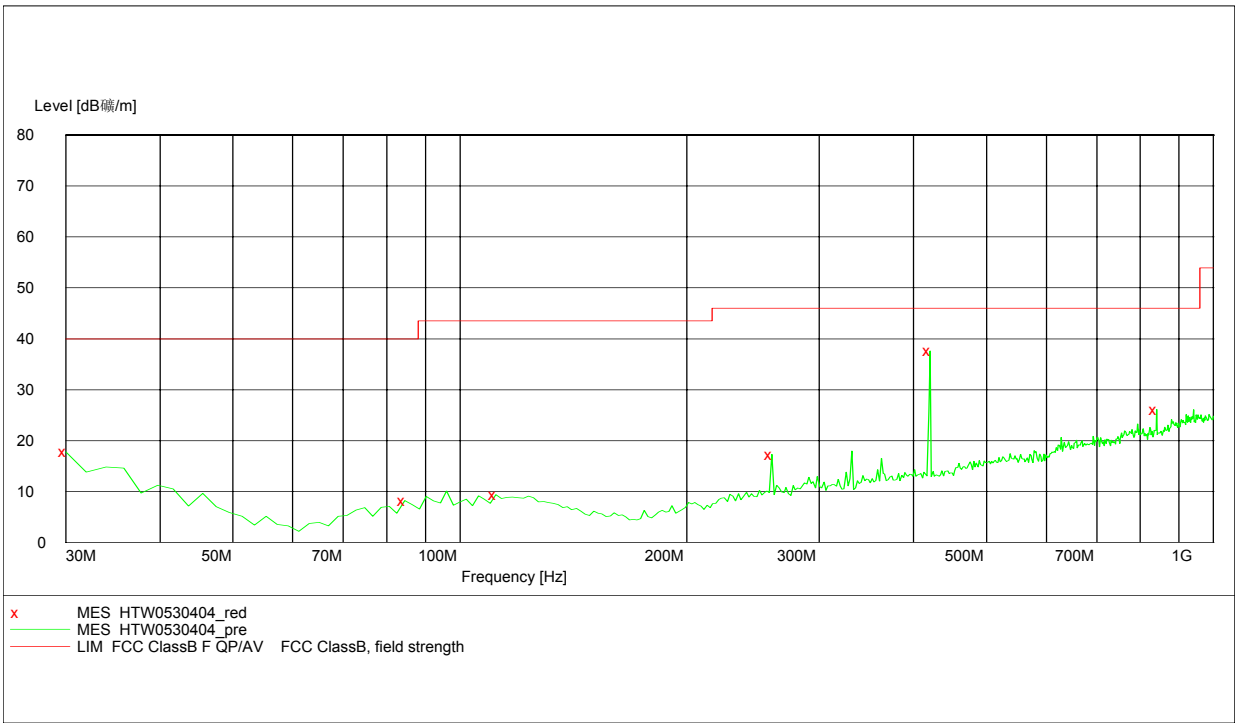
TEST RESULTS

The Radiated Measurement are performed to the three channels (the top channel, the middle channel and the bottom 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.

The Top Channel is the worst case for 25 KHz Channel Separation

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 09



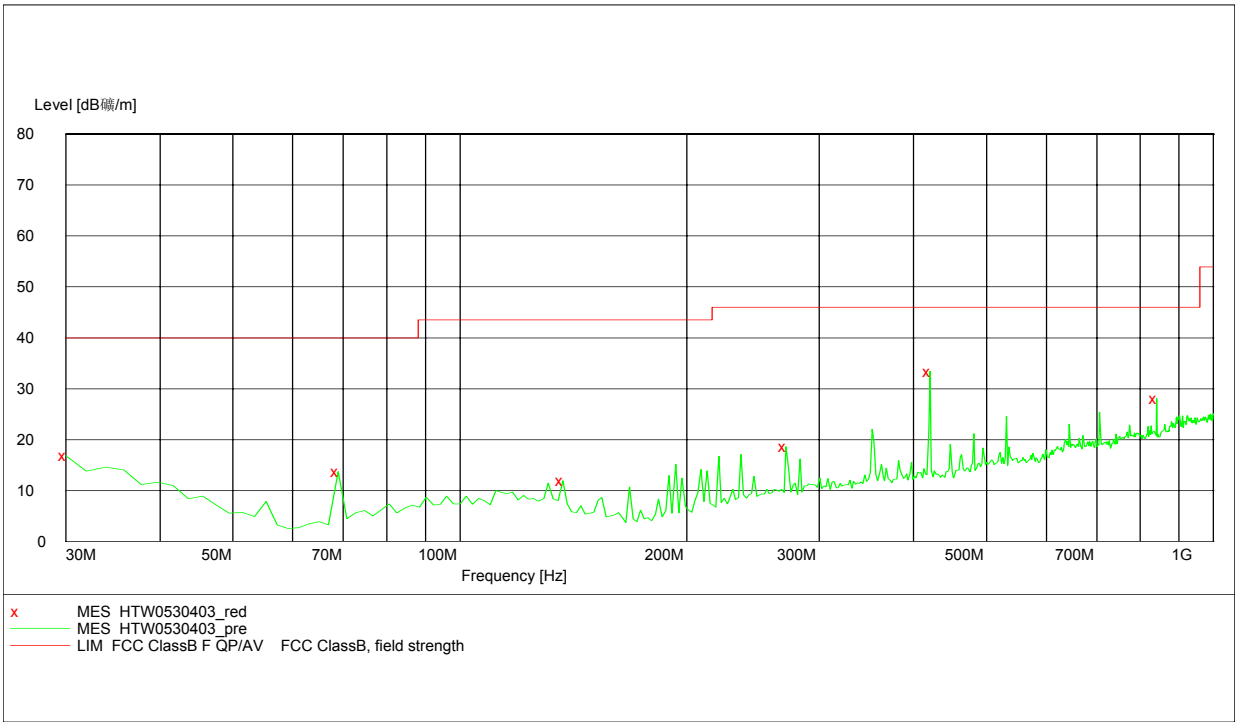
MEASUREMENT RESULT: "HTW0530404_red"

5/30/2010 5:54PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	17.80	-10.7	40.0	22.2	Peak	100.0	187.00	HORIZONTAL
84.428858	8.30	-20.8	40.0	31.7	Peak	100.0	200.00	HORIZONTAL
111.643287	9.40	-19.1	43.5	34.1	Peak	300.0	63.00	HORIZONTAL
259.378758	17.30	-18.3	46.0	28.7	Peak	100.0	139.00	HORIZONTAL
420.721443	37.70	-14.6	46.0	8.3	Peak	100.0	287.00	HORIZONTAL
840.601202	26.10	-6.8	46.0	19.9	Peak	100.0	281.00	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	100 kHz	HL562 09



MEASUREMENT RESULT: "HTW0530403_red"

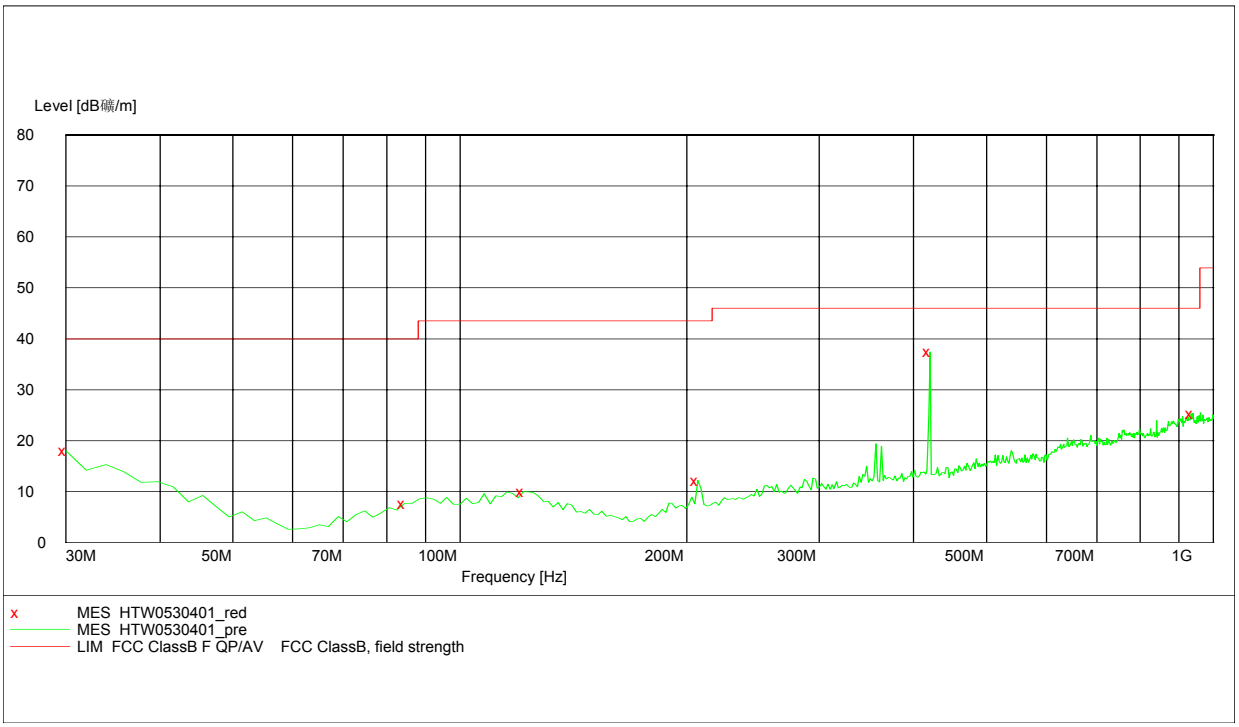
5/30/2010 5:51PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	16.80	-10.7	40.0	23.2	Peak	100.0	224.00	VERTICAL
68.877756	13.70	-23.5	40.0	26.3	Peak	100.0	122.00	VERTICAL
136.913828	12.00	-20.9	43.5	31.5	Peak	100.0	285.00	VERTICAL
271.042084	18.60	-18.0	46.0	27.4	Peak	100.0	177.00	VERTICAL
420.721443	33.40	-14.6	46.0	12.6	Peak	100.0	43.00	VERTICAL
840.601202	28.10	-6.8	46.0	17.9	Peak	100.0	56.00	VERTICAL

The Top Channel is the worst case for 12.5 KHz Channel Separation

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 09



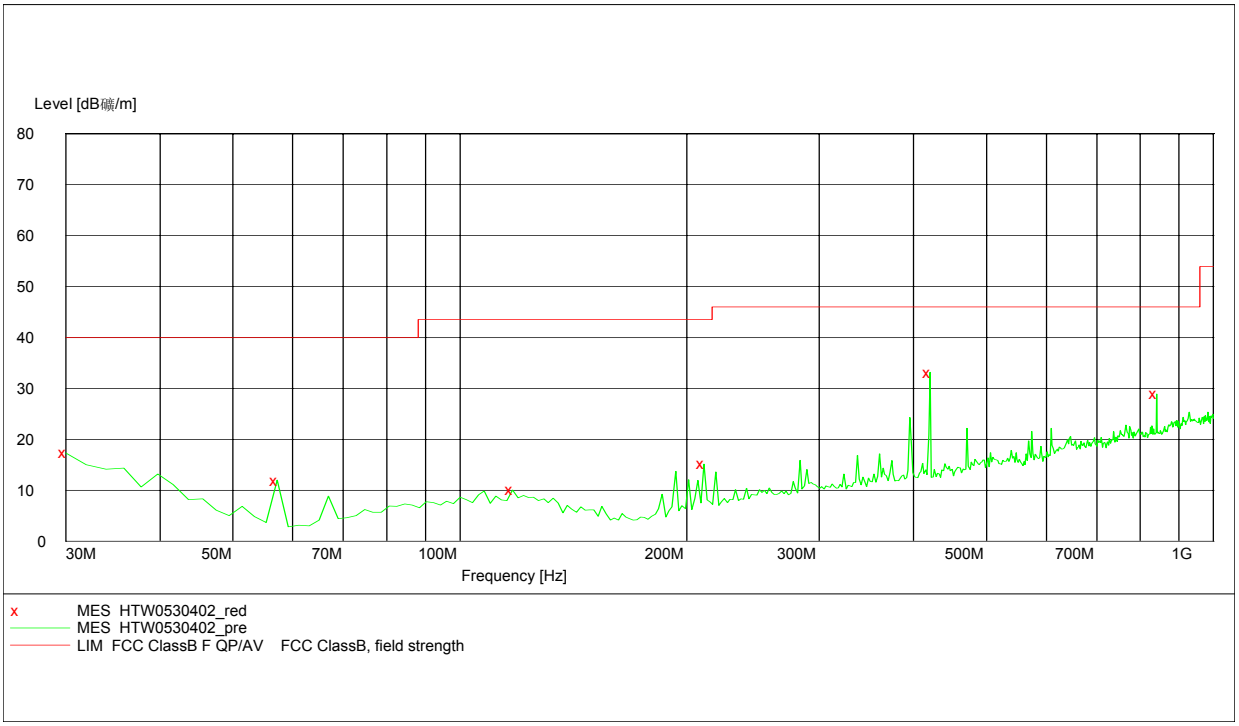
MEASUREMENT RESULT: "HTW0530401_red"

5/30/2010 5:47PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	18.00	-10.7	40.0	22.0	Peak	300.0	200.00	HORIZONTAL
84.428858	7.70	-20.8	40.0	32.3	Peak	100.0	244.00	HORIZONTAL
121.362725	10.00	-18.9	43.5	33.5	Peak	300.0	239.00	HORIZONTAL
206.893788	12.20	-20.8	43.5	31.3	Peak	100.0	285.00	HORIZONTAL
420.721443	37.40	-14.6	46.0	8.6	Peak	100.0	292.00	HORIZONTAL
939.739479	25.40	-3.2	46.0	20.6	Peak	300.0	152.00	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	100 kHz	HL562 09



MEASUREMENT RESULT: "HTW0530402_red"

5/30/2010 5:50PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	17.30	-10.7	40.0	22.7	Peak	100.0	305.00	VERTICAL
57.214429	12.00	-24.4	40.0	28.0	Peak	100.0	177.00	VERTICAL
117.474950	10.10	-18.8	43.5	33.4	Peak	100.0	348.00	VERTICAL
210.781563	15.20	-20.7	43.5	28.3	Peak	100.0	26.00	VERTICAL
420.721443	33.20	-14.6	46.0	12.8	Peak	100.0	65.00	VERTICAL
840.601202	28.90	-6.8	46.0	17.1	Peak	100.0	52.00	VERTICAL

4.10. Receiver Conducted Spurious Emssion

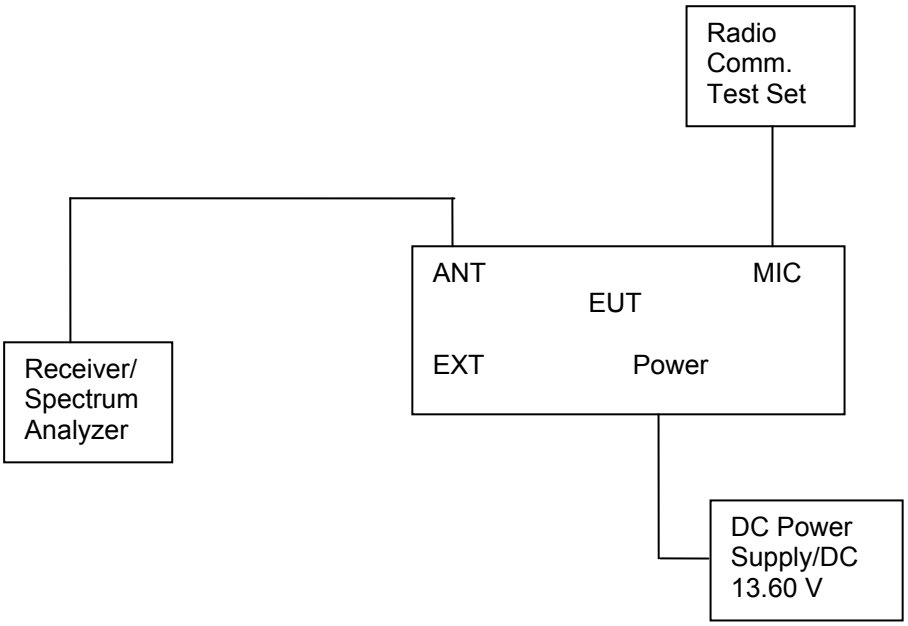
TEST APPLICABLE

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 10th harmonic.

TEST CONFIGURATION



LIMIT

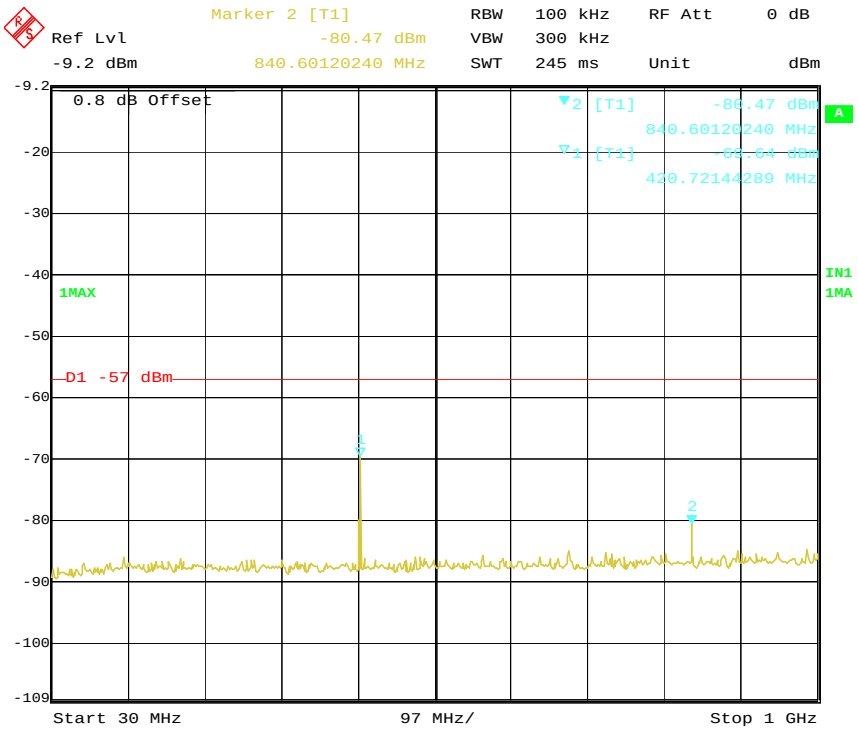
The power at the antenna terminal shall not exceed 2.0 nanowatts (-57dBm).

TEST RESULTS

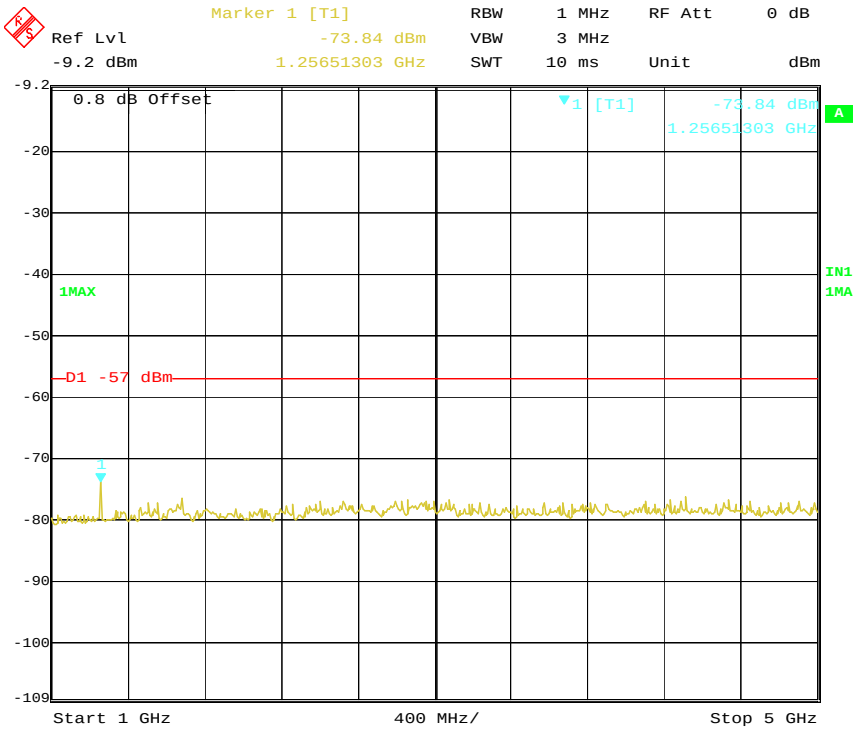
The Receiver Conducted Spurious Emssions Measurement is performed to the three channels (the top channel, the middle channel and the bottom channel), the datums recorded below were for the three channels; and the EUT shall be scanned from 30 MHz to the 5GHz.

For 25 KHz

Product	: Mobile Radio	Test Mode	: 469.9875MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60 V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		

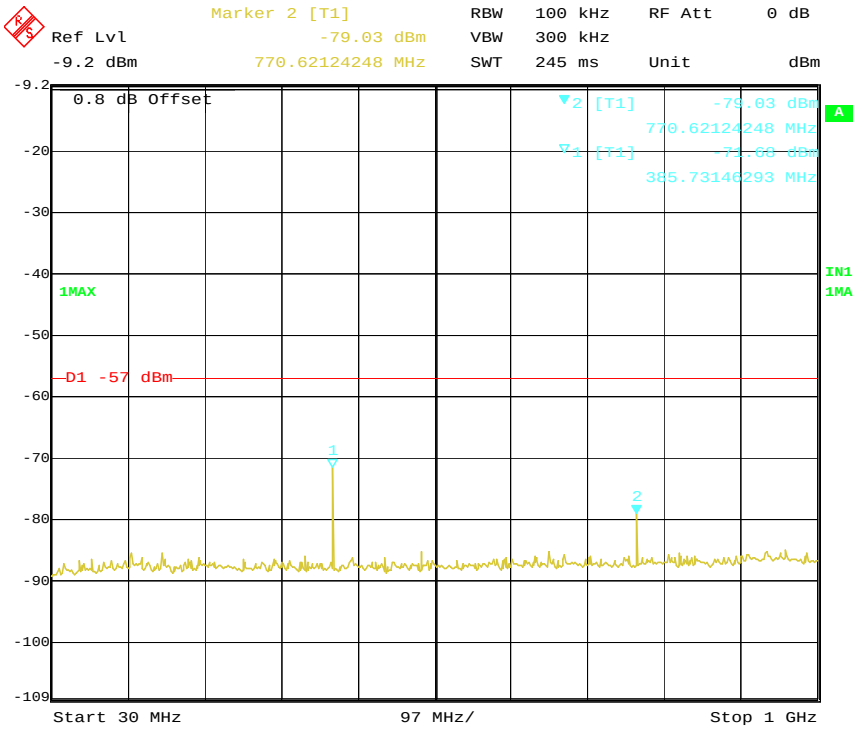


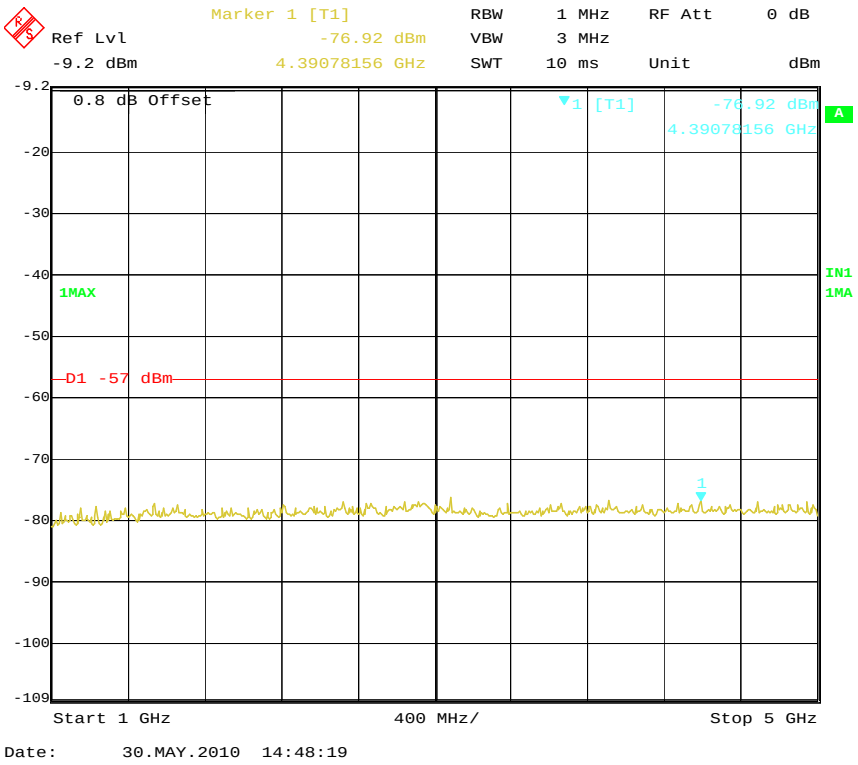
Date: 30.MAY.2010 14:49:14



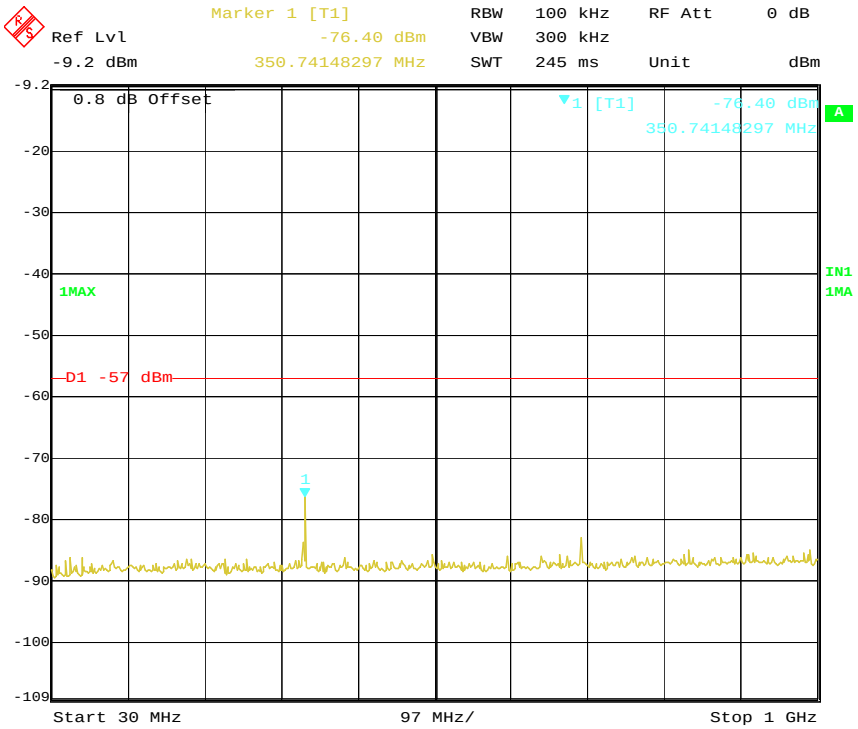
Date: 30.MAY.2010 14:49:41

Product	: Mobile Radio	Test Mode	:435.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC13.60 V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		

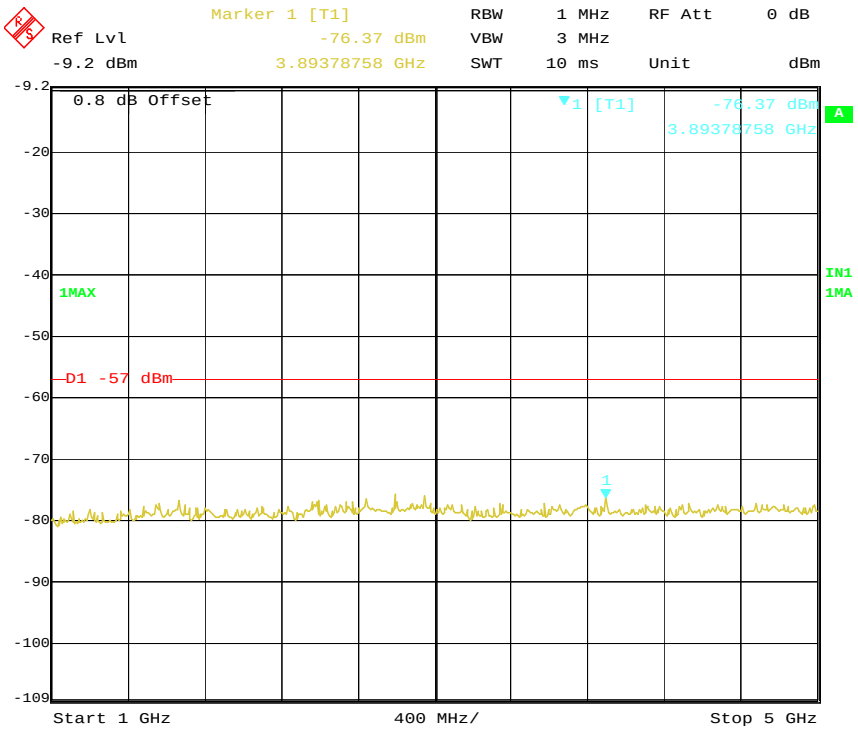




Product	: Mobile Radio	Test Mode	: 400.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60 V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		



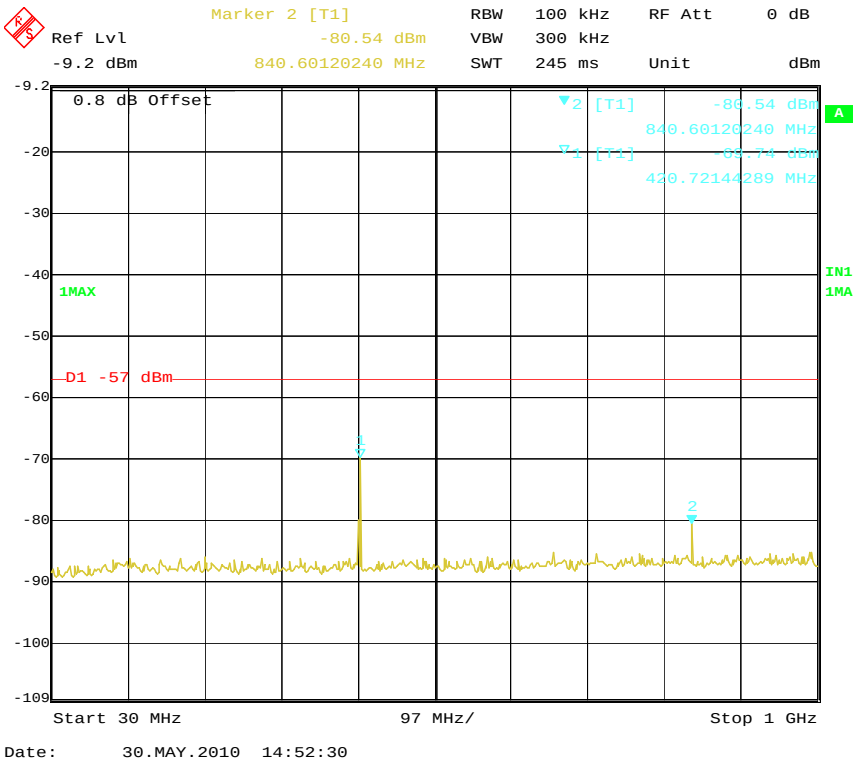
Date: 30.MAY.2010 14:47:14

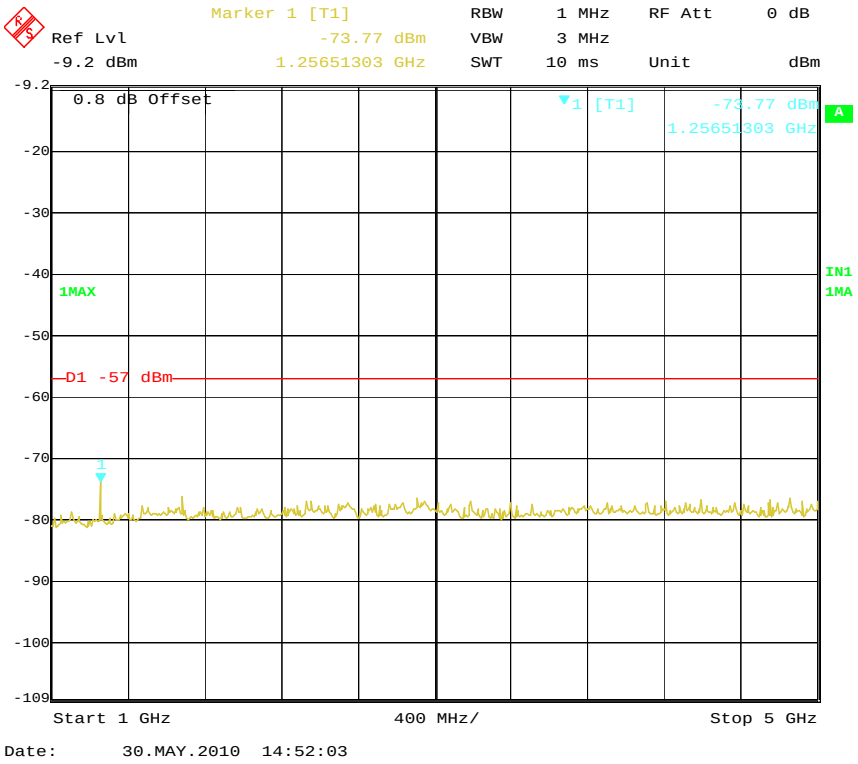


Date: 30.MAY.2010 14:47:47

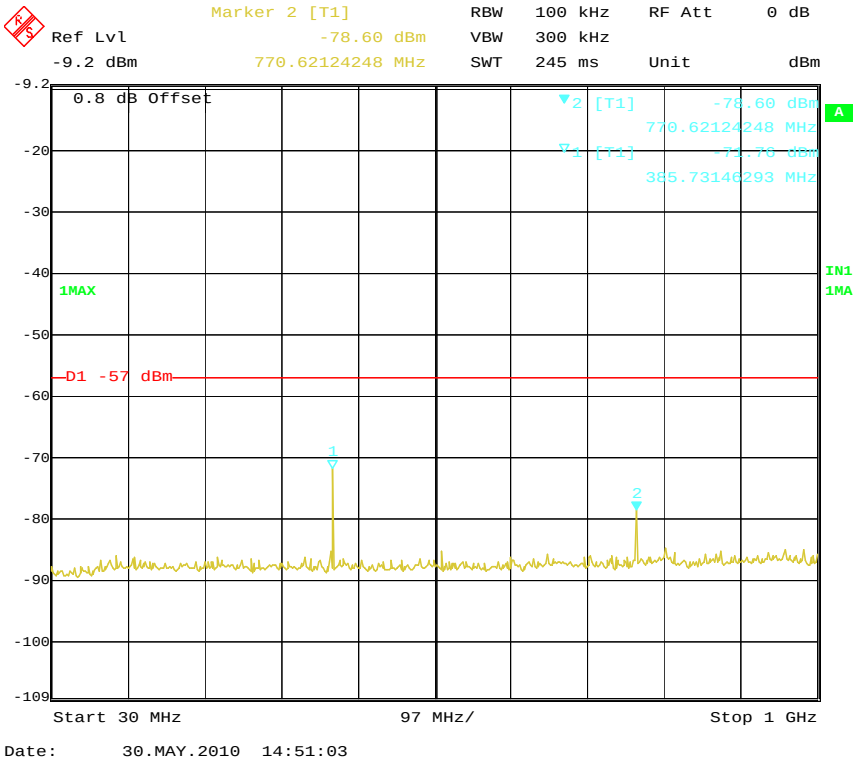
For 12.5 KHz

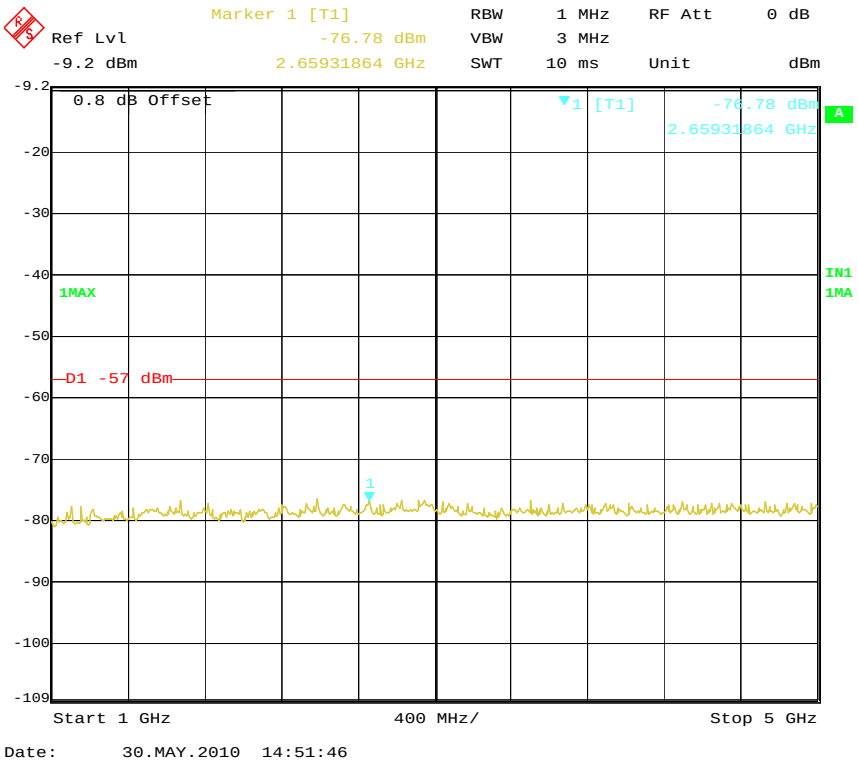
Product	: Mobile Radio	Test Mode	: 469.9875MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60 V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		



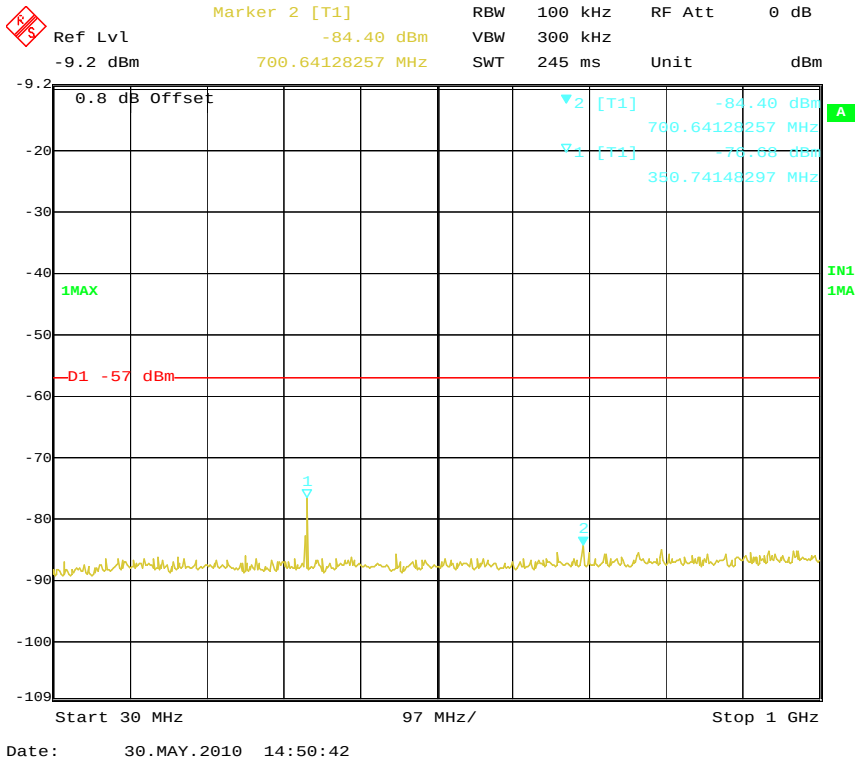


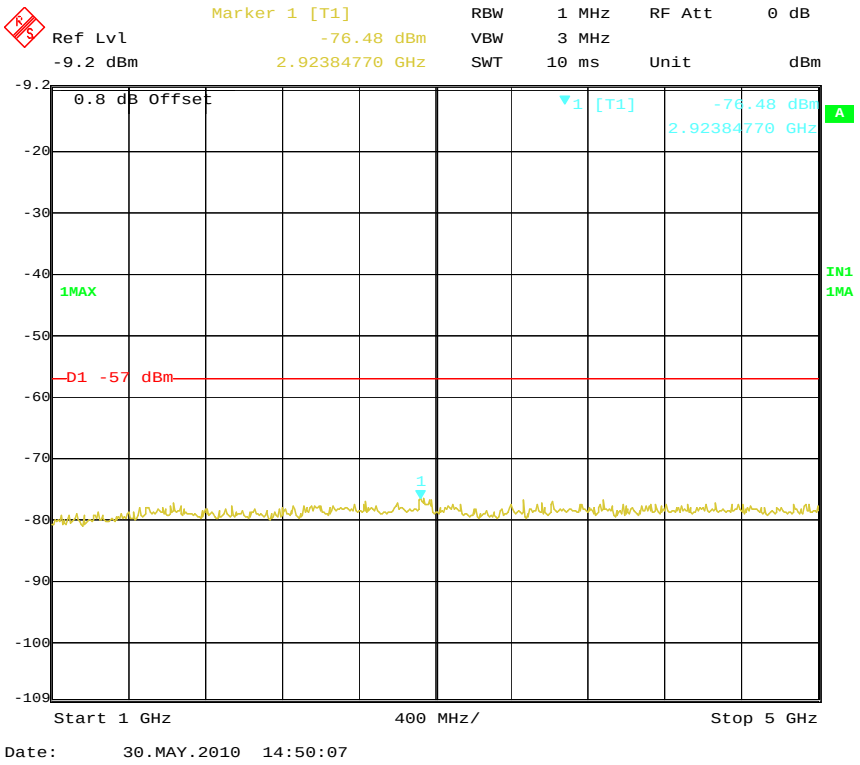
Product	: Mobile Radio	Test Mode	: 435.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60 V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		





Product	: Mobile Radio	Test Mode	: 400.1250MHz
Test Item	: Spurious Emission on Antenna Port	Temperature	: 25 ℃
Test Voltage	: DC 13.60 V (External Power Supply)	Humidity	: 55%RH
Test Result	: **PASS**		





4.11. RF Exposure Evaluation

Applicable Standard

According to §1.1307(b)(1) and RSS-102,systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
According to §1.1310 and §2.1091 and RSS-102 RF exposure is calculated.

LIMIT

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz
*=Plane-wave equivalent power density

MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

As declared by the Applicant, the EUT transmits with the maximum soure-baed Duty Cycle of 50%-see the User manual, and the EUT is a wireless device used in a mobile application, at least 100cm from any body part of the user or nearby persons; from the peak EUT RF output power, the minimum mobile separation distance, R=100cm, as well as the gain of the used antenna is 5.5dBi, the RF power density can be obtained.

TEST RESULTS

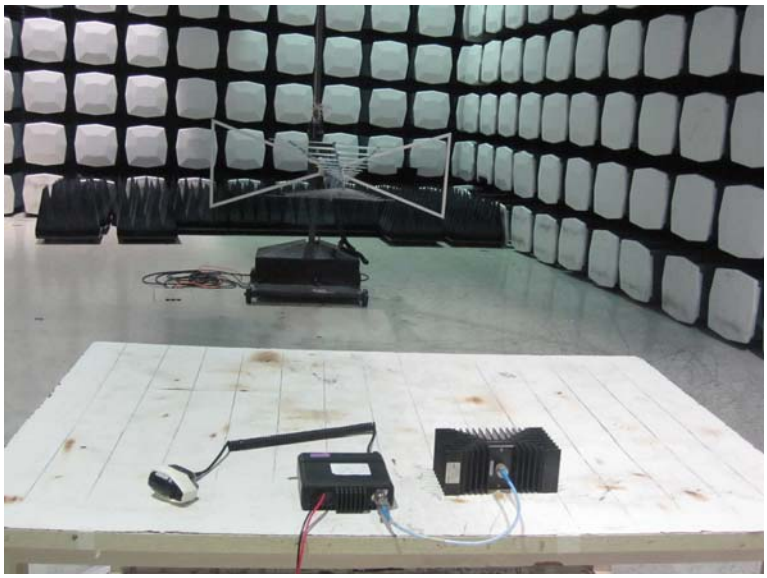
For 25 KHz Channel Spacing

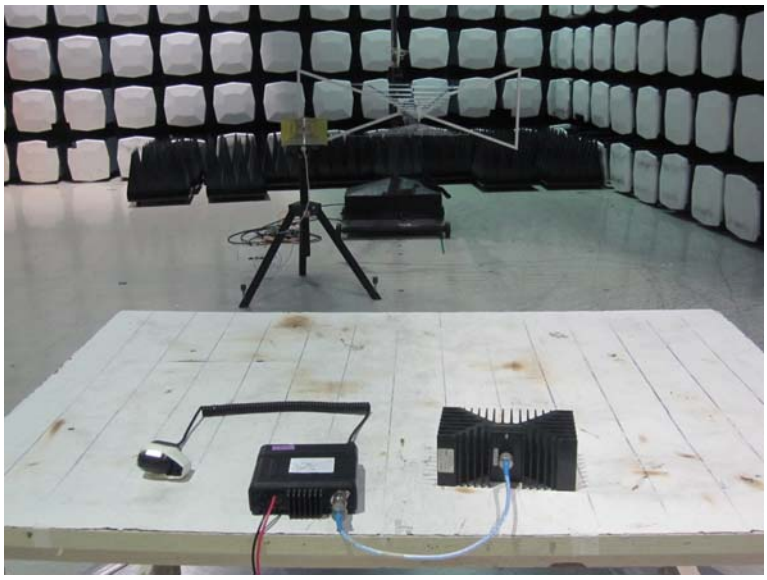
Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Antenna Gain (Nemeric)	Power Density Limit (mW/cm^2)	Power Density At 100 cm (mW/cm^2)	Test Results
400.1250	100.00	46.40	43652.00	3.5481	1.3334	1.2325	Compliance
435.1250	100.00	46.67	46452.00	3.5481	1.4504	1.3116	Compliance
469.9875	100.00	46.75	47315.00	3.5481	1.5666	1.3359	Compliance

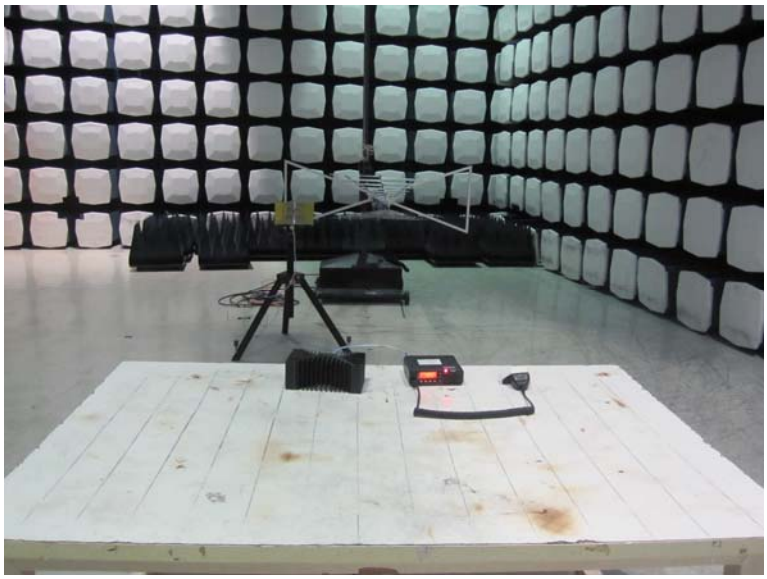
For 12.5 KHz Channel Spacing

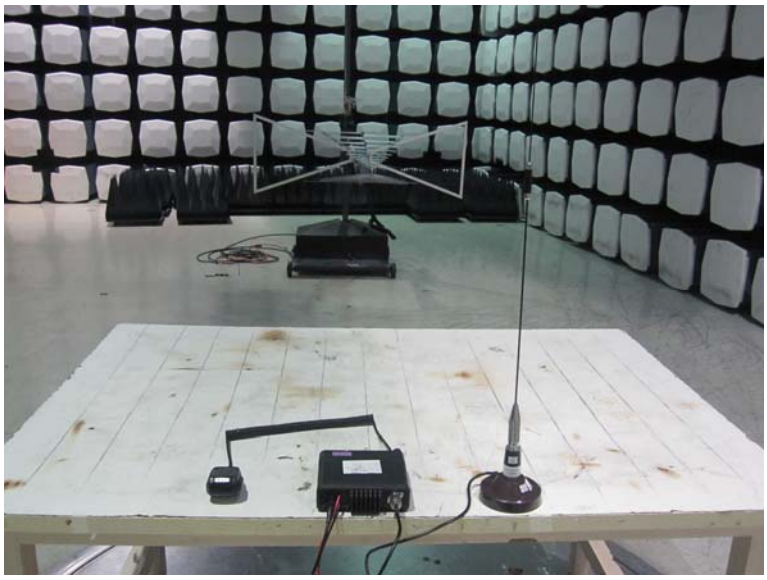
Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Antenna Gain (Nemeric)	Power Density Limit (mW/cm^2)	Power Density At 100 cm (mW/cm^2)	Test Results
400.1250	100.00	46.41	43752.00	3.5481	1.3334	1.2354	Compliance
435.1250	100.00	46.64	46132.00	3.5481	1.4504	1.3025	Compliance
469.9875	100.00	46.71	46881.00	3.5481	1.5666	1.3237	Compliance

5. Test Setup Photos of the EUT





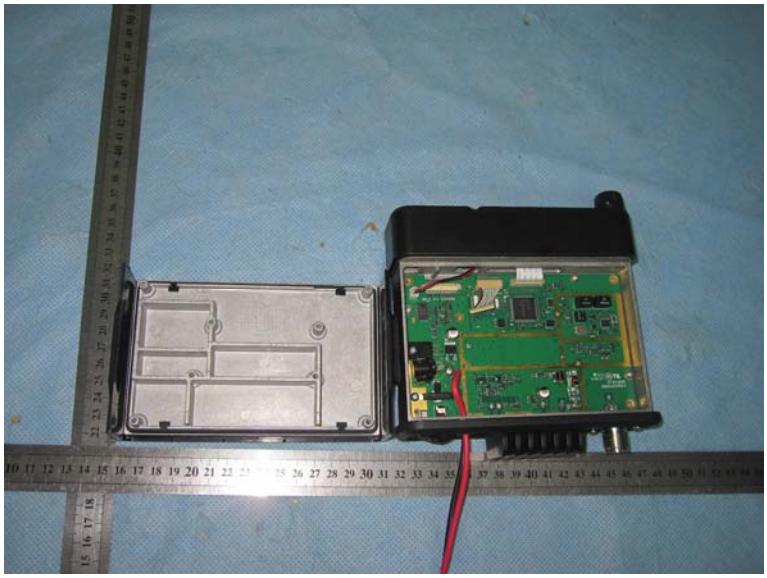


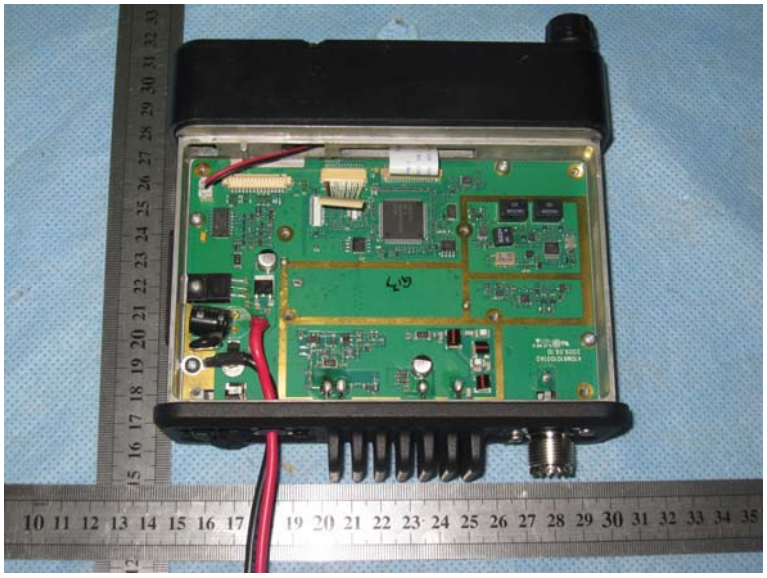


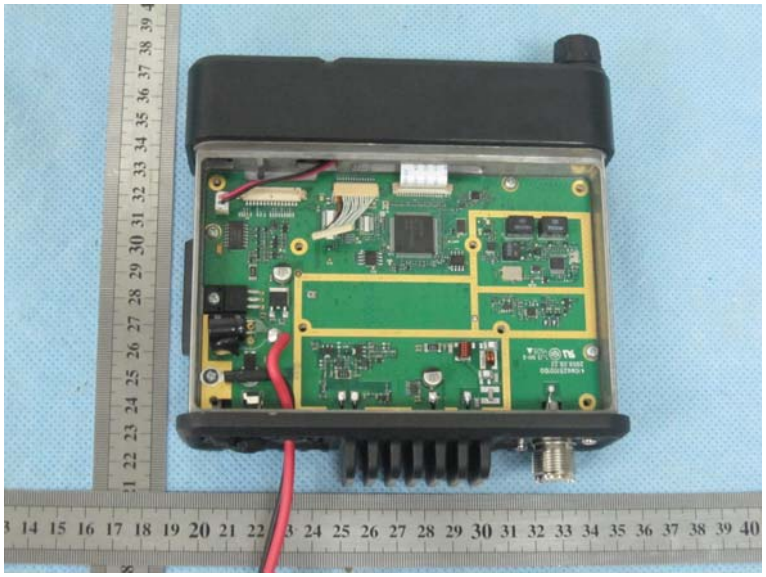
6. External and Internal Photos of the EUT

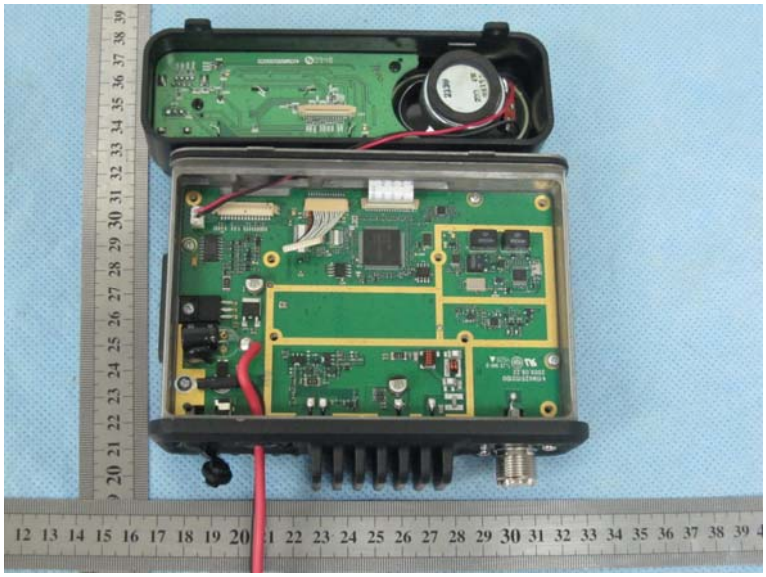
External Photos

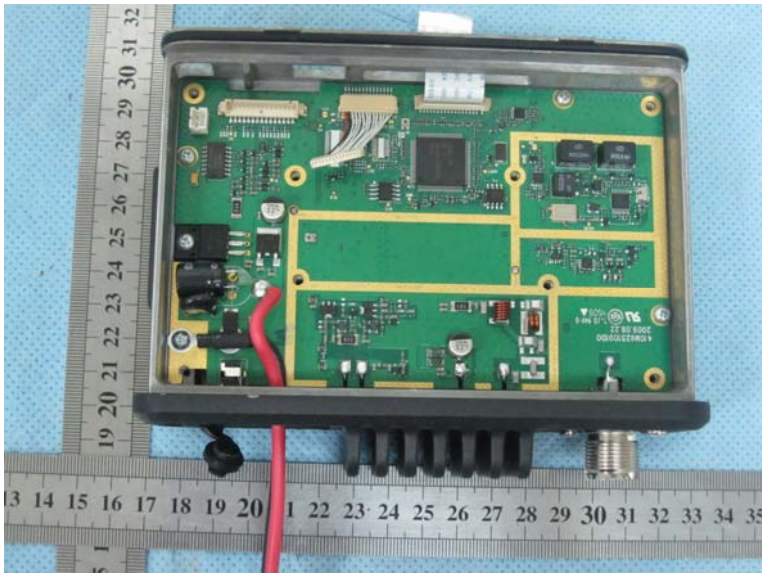
Internal Photos

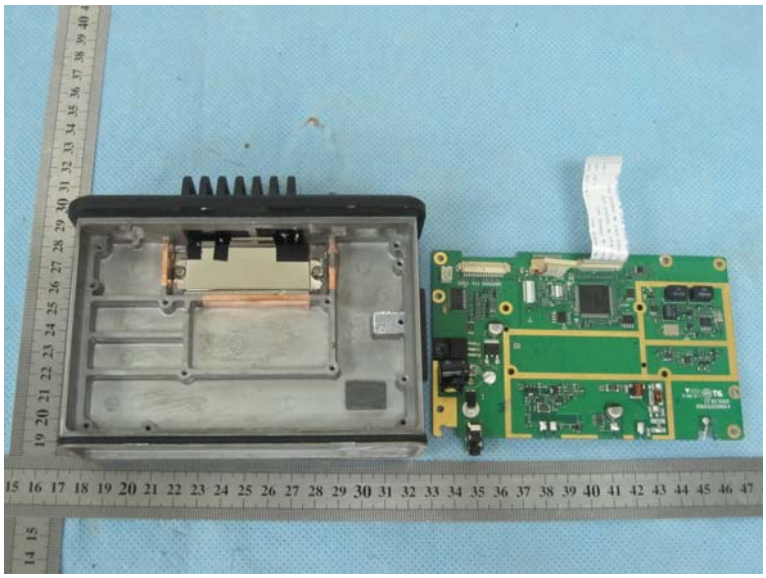


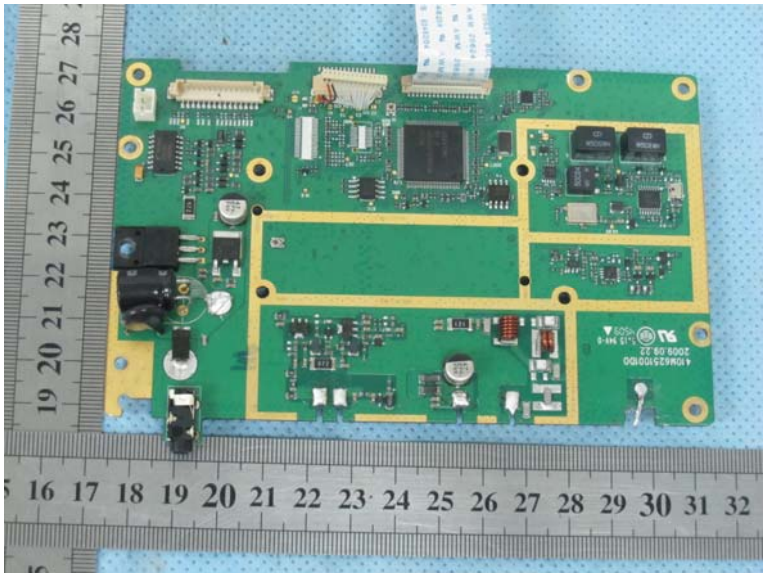


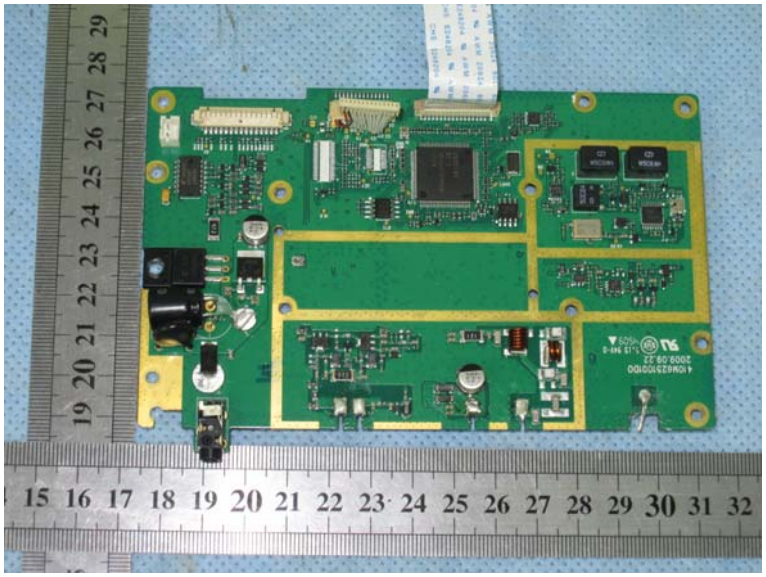


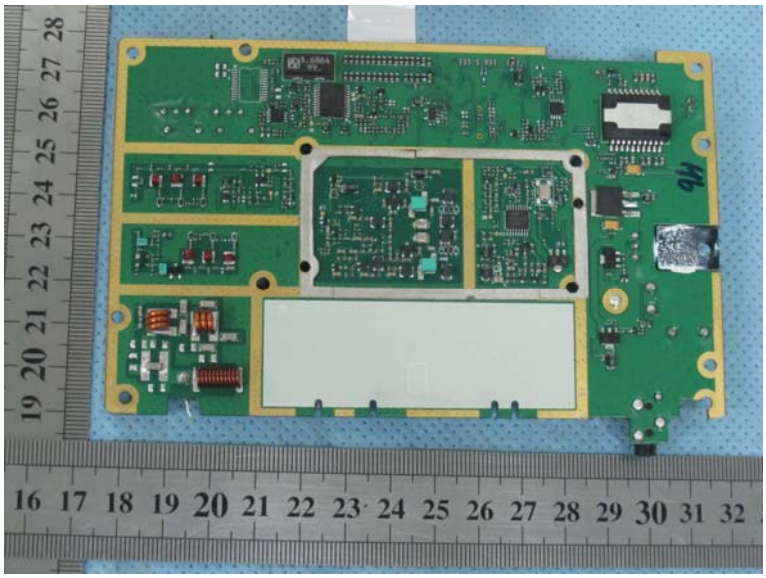


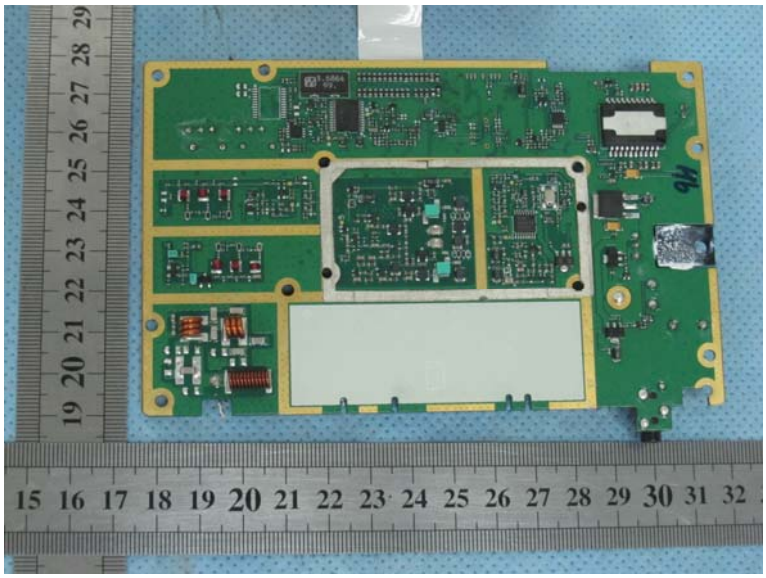












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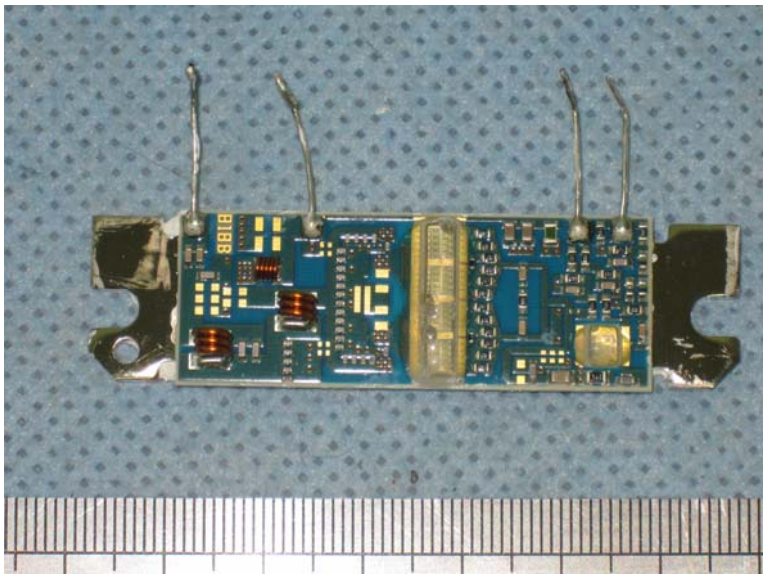

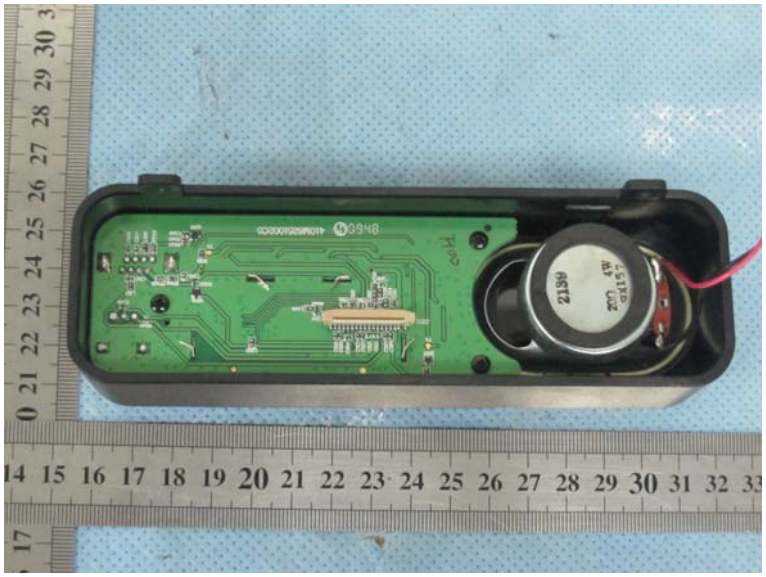

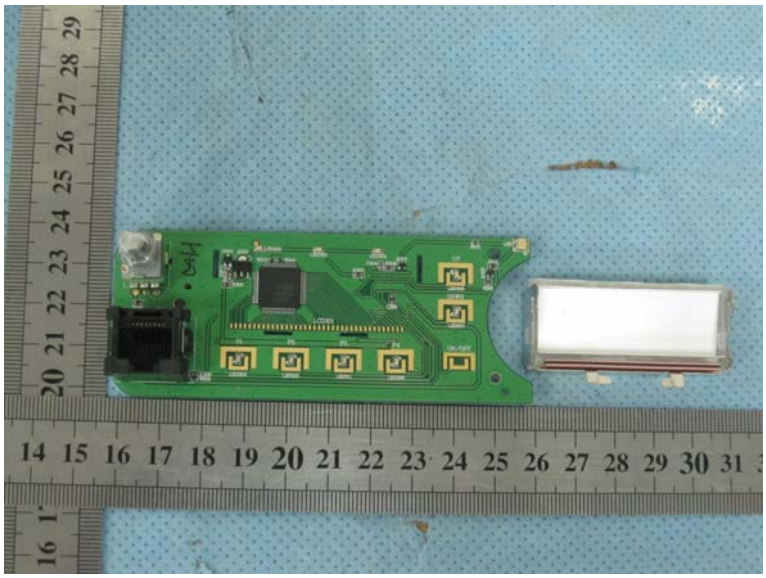

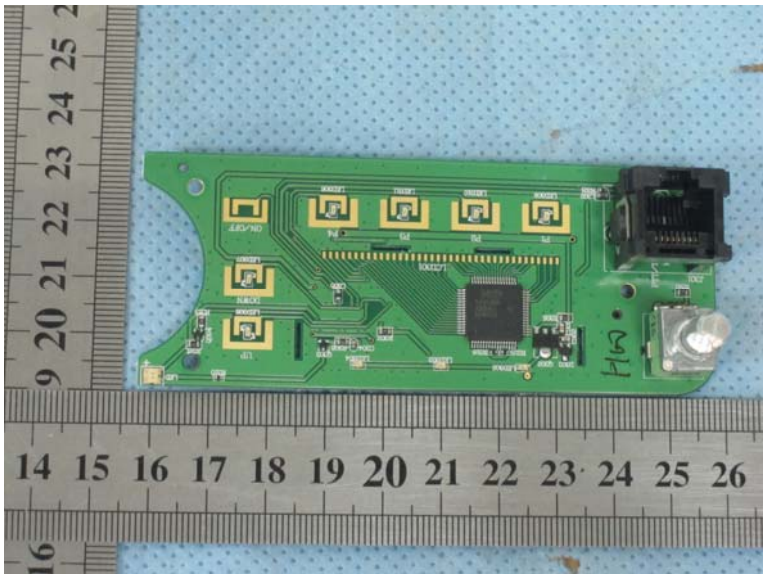

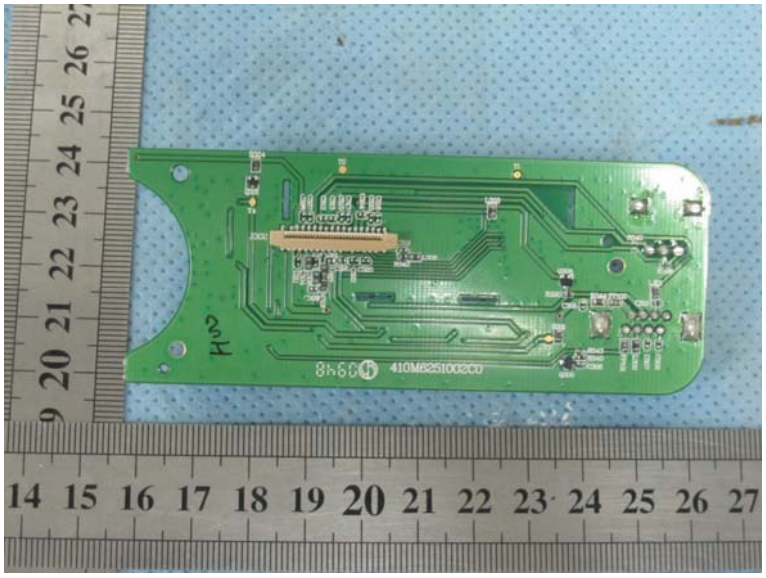

.....End of Report.....