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CNASL1225

FCC PART 90 TEST REPORT

FCC Part 90

Report Reference No.....: TRE1112009301

FCC ID.....: YAMMD78XG-U2

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Manager Wenliang Li

Wenliang Li

Date of issue.....: Dec 27, 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

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Test item description: Digital Mobile Radio



Trade Mark: Hytera

Manufacturer: Hytera Communications Corporation Ltd.

Model/Type reference.....: MD782G U(2)/ MD785G U(2)/ MD786G U(2)/ MD788G U(2)

Listed Models: /

Modulation: FM&4FSK

Channel Separation.....: 12.5KHz

Rated Power: 45 Watts(46.53 dBm)/5 Watts(36.99 dBm)

Operation Frequency.....: From 450 MHz to 520 MHz

Ratings: DC 13.60 V

Result.....: Positive

TEST REPORT

Test Report No. :	TRE1112009301	Dec 27, 2011 Date of issue
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Equipment under Test : Digital Mobile Radio

Model /Type : MD782G U(2)/ MD785G U(2)/ MD786G U(2)/ MD788G U(2)

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 10:	Positive
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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.

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

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

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

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Dec 24, 2011
Testing commenced on	:	Dec 24, 2011
Testing concluded on	:	Dec 27, 2011

2.2. Product Description

The Hytera Communications Corporation Ltd.'s Model: MD782G U(2)/ MD785G U(2)/ MD786G U(2)/ MD788G U(2) 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	Digital Mobile Radio	
Model Number	MD782G U(2)/ MD785G U(2)/ MD786G U(2)/ MD788G U(2)	
FCC ID	YAMMD78XG-U2	
Rated Output Power	45 Watts(46.53 dBm)/5 Watts(36.99 dBm)	
Support data rate	9.6kbps	
Modulation Type	FM for Analog Voice	
	4FSK for Digital Voice/Digital Data	
	4FSK for Digital Data	
	Analog	11K0F3E for 12.5KHz Channel Separation
	Digital	7K60FXD for Digital Data only
		7K60FXW for Digital Data & Digital Voice
Channel Separation	Analog Voice	12.5KHz
	Digital Voice/Data	12.5KHz
	Digital Data	12.5KHz
Antenna Type	External	
Frequency Range	From 450 MHz to 520 MHz	
Maximum Transmitter Power	Analog	47.75 W for 12.5 KHz Channel Separation
	Digital	47.53 W for 12.5 KHz Channel Separation

Note: The product has the same digital working characters when operating in both two digitized voice/data mode (7K60FXD and 7K60FXW). So only one set of test results for digital modulation modes are provided in this test report.

2.3. Equipment under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/>	120V / 60 Hz	<input type="radio"/>	115V / 60Hz
		<input type="radio"/>	12 V DC	<input type="radio"/>	24 V DC
		<input checked="" type="radio"/>	Other (specified in blank below)		

DC 13.60 V

Test frequency list

Modulation Type	Test Channel	Test Frequency
Analog/FM	Low Channel	450.5000 MHz
	Middle Channel	485.0000 MHz
	High Channel	519.5000 MHz
Digital/4FSK	Low Channel	450.5000 MHz
	Middle Channel	485.0000 MHz
	High Channel	519.5000 MHz

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

450-520 MHz U frequency band Digital Mobile Radio with GPS function (MD782G U(2)/ MD785G U(2)/ MD786G U(2)/ MD788G U(2)).

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

Serial number: Prototype

2.5. EUT Configuration

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

2.6. EUT operation mode

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

2.7. EUT configuration

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

- - supplied by the manufacturer
- - supplied by the lab

●	Power Cable	Length (m) :	3
		Shield :	Unshield
		Detachable :	Detachable
○	Multimeter	Manufacturer :	/
		Model No. :	/

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

This submittal(s) (test report) is intended for FCC ID: **YAMMD78GX-U2** 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 a U frequency band (450-520 MHz) Digital Mobile Radio with GPS function,The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 90	TRE1112009301
Health	Oet 65	TRE1112009302

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, 2013.

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 24th, 2011.

ACA

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

NEMKO-Aut. No.: ELA125

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

VCCI

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

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

DNV

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

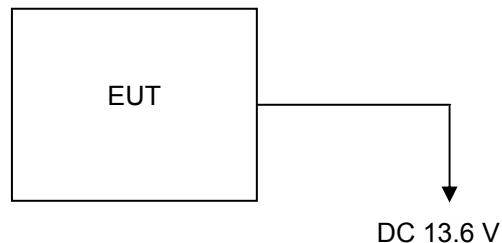
3.3. Environmental conditions

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



3.5. Description of Tested Modes

The EUT (Digital 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 Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)
Emission Mask	-----	(1)
Modulation Characteristic	-----	(1)
Transmitter Frequency Behavior	-----	(1)

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

3.7. Test Description

FCC Rules	Description of Test	Test Result
§ 15.107	Conducted Emission	Complies
§ 15.109	Receiver Radiated Spurious Emssion	Complies
§ 15.109	Receiver Conducted Spurious Emssion	Complies
§ 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	23/10/2012
Artificial Mains	Rohde&Schwarz	ESH2-Z6	100211	23/10/2012
EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	23/10/2012
Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	23/10/2012
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	23/10/2012

Modulation Characteristic				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	Rohde&Schwarz	SMT03	100059	23/10/2012
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	23/10/2012

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

Transmitter Radiated Spurious Emission & Occupied Bandwidth & Emission Mask & Receiver Radiated Spurious Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Ultra-Broadband Antenna	Rohde&Schwarz	HL562	100015	23/10/2012
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	23/10/2012
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
HORN ANTENNA	Rohde&Schwarz	HF906	100039	23/10/2012
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
High-Pass Filter	Anritsu	MP526B	6220875256	23/10/2012
High-Pass Filter	Anritsu	MP526D	6220878392	23/10/2012
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	23/10/2012
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	23/10/2012
Spectrum Analyzer	Agilent	E4407B	MY44210775	23/10/2012

Frequency Stability				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Communication Test Set	HP	HP8920B	US35010135	23/10/2012
Signal Generator	Rohde&Schwarz	SMT03	100059	23/10/2012
Climate Chamber	ESPEC	EL-10KA	05107008	23/10/2012

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

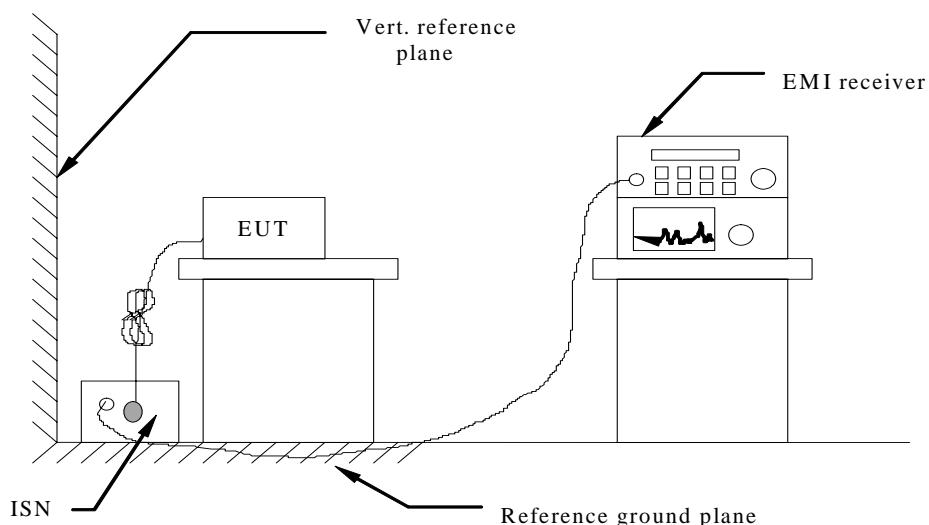
4. TEST CONDITIONS AND RESULTS

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) Line Conducted Emission Limits is as following :

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

* Decreasing linearly with the logarithm of the frequency

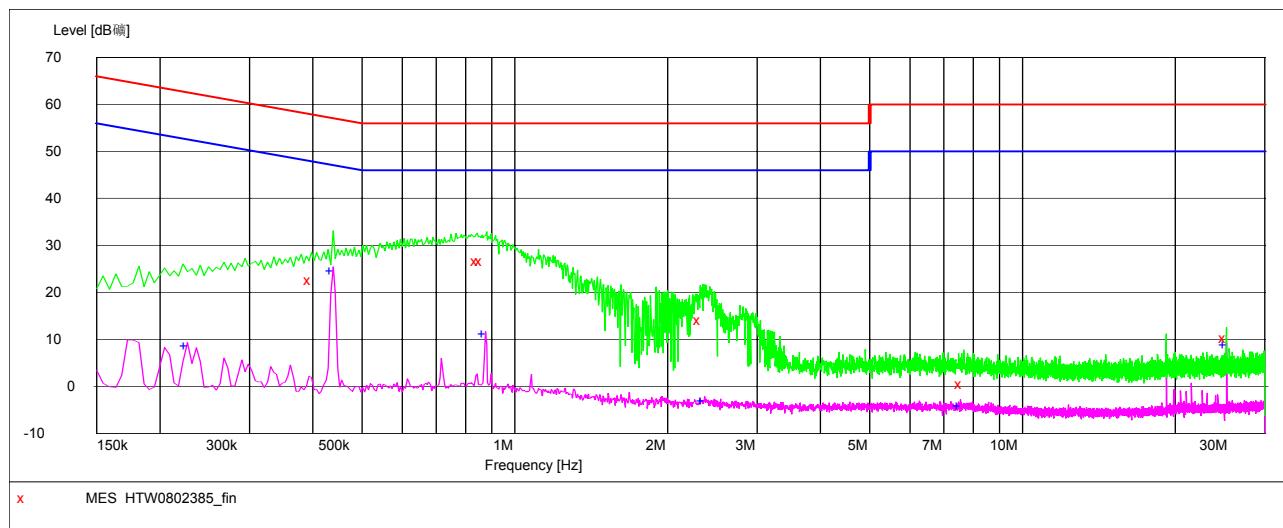
For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

TEST RESULTS

For FM Modulation @ 12.5 KHz TX Mode

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

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW1226385_fin"

12/26/2011 6:33PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.397500	22.50	10.1	58	35.4	QP	+	GND
0.847500	26.60	10.1	56	29.4	QP	+	GND
0.865500	26.60	10.1	56	29.4	QP	+	GND
2.323500	14.00	10.2	56	42.0	QP	+	GND
7.615500	0.50	10.3	60	59.5	QP	+	GND
25.201500	10.20	10.7	60	49.8	QP	+	GND

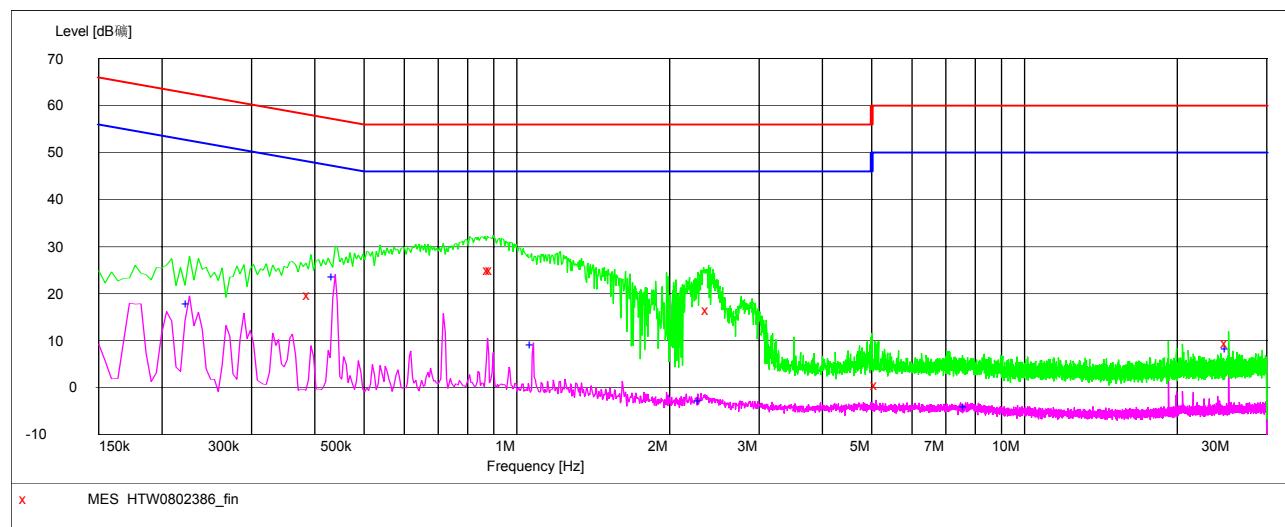
MEASUREMENT RESULT: "HTW1226385_fin2"

12/26/2011 6:33PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.226500	8.60	10.1	53	44.0	AV	+	GND
0.438000	24.60	10.1	47	22.5	AV	+	GND
0.874500	11.10	10.1	46	34.9	AV	+	GND
2.355000	-3.00	10.2	46	49.0	AV	+	GND
7.548000	-4.30	10.3	50	54.3	AV	+	GND
25.201500	8.90	10.7	50	41.1	AV	+	GND

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

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW1226386_fin"**

12/26/2011 6:37PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.393000	19.70	10.1	58	38.3	QP	-	GND
0.888000	25.00	10.1	56	31.0	QP	-	GND
0.897000	25.00	10.1	56	31.0	QP	-	GND
2.391000	16.40	10.2	56	39.6	QP	-	GND
5.140500	0.60	10.2	60	59.4	QP	-	GND
25.201500	9.50	10.7	60	50.5	QP	-	GND

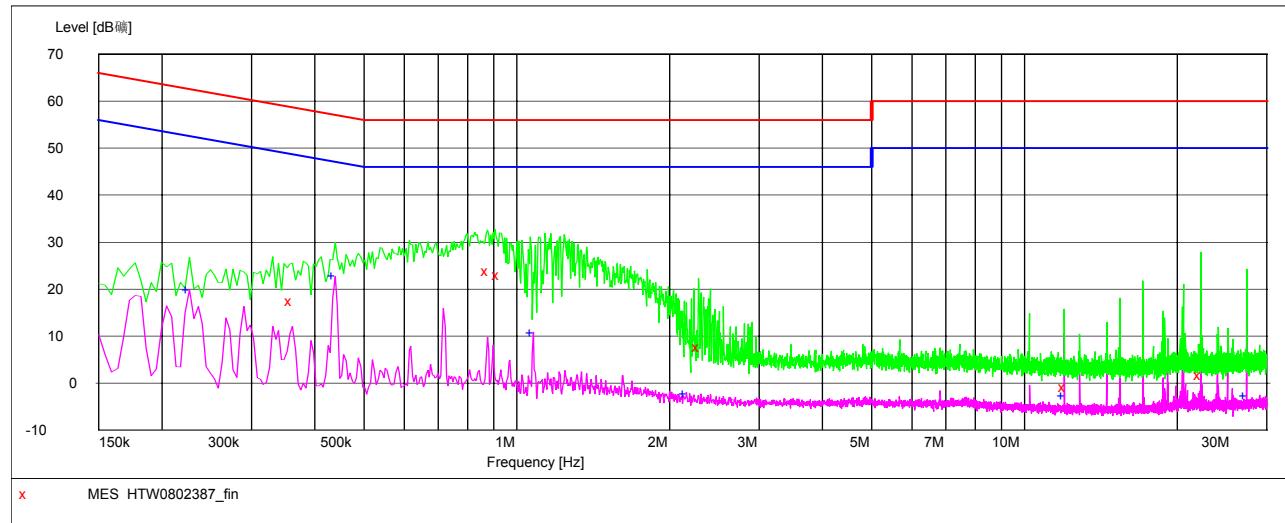
MEASUREMENT RESULT: "HTW1226386_fin2"

12/26/2011 6:37PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.226500	17.80	10.1	53	34.8	AV	-	GND
0.438000	23.60	10.1	47	23.5	AV	-	GND
1.077000	9.10	10.2	46	36.9	AV	-	GND
2.310000	-2.80	10.2	46	48.8	AV	-	GND
7.710000	-4.20	10.3	50	54.2	AV	-	GND
25.201500	8.10	10.7	50	41.9	AV	-	GND

For 4FSK Modulation @ 12.5 KHz TX Mode**SCAN TABLE: "Voltage (9K-30M) fin"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW1226387_fin"**

12/26/2011 6:41PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.361500	17.40	10.1	59	41.3	QP	-	GND
0.879000	23.70	10.1	56	32.3	QP	-	GND
0.924000	22.90	10.1	56	33.1	QP	-	GND
2.292000	7.60	10.2	56	48.4	QP	-	GND
12.057000	-0.80	10.4	60	60.8	QP	-	GND
22.335000	1.60	10.5	60	58.4	QP	-	GND

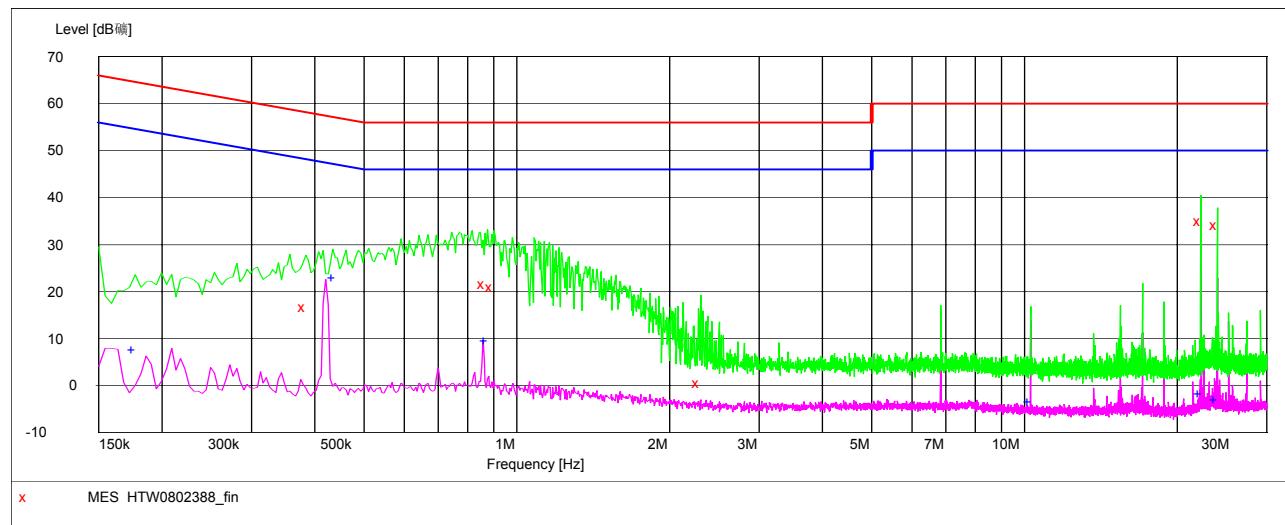
MEASUREMENT RESULT: "HTW1226387_fin2"

12/26/2011 6:41PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.226500	19.70	10.1	53	32.9	AV	-	GND
0.438000	22.80	10.1	47	24.3	AV	-	GND
1.077000	10.60	10.2	46	35.4	AV	-	GND
2.152500	-2.40	10.2	46	48.4	AV	-	GND
11.994000	-2.80	10.4	50	52.8	AV	-	GND
27.420000	-2.70	10.8	50	52.7	AV	-	GND

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

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW1226388_fin"**

12/26/2011 6:45PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.384000	16.60	10.1	58	41.6	QP	+	GND
0.865500	21.60	10.1	56	34.4	QP	+	GND
0.897000	20.90	10.1	56	35.1	QP	+	GND
2.287500	0.60	10.2	56	55.4	QP	+	GND
22.281000	34.90	10.5	60	25.1	QP	+	GND
24.004500	34.10	10.7	60	25.9	QP	+	GND

MEASUREMENT RESULT: "HTW1226388_fin2"

12/26/2011 6:45PM

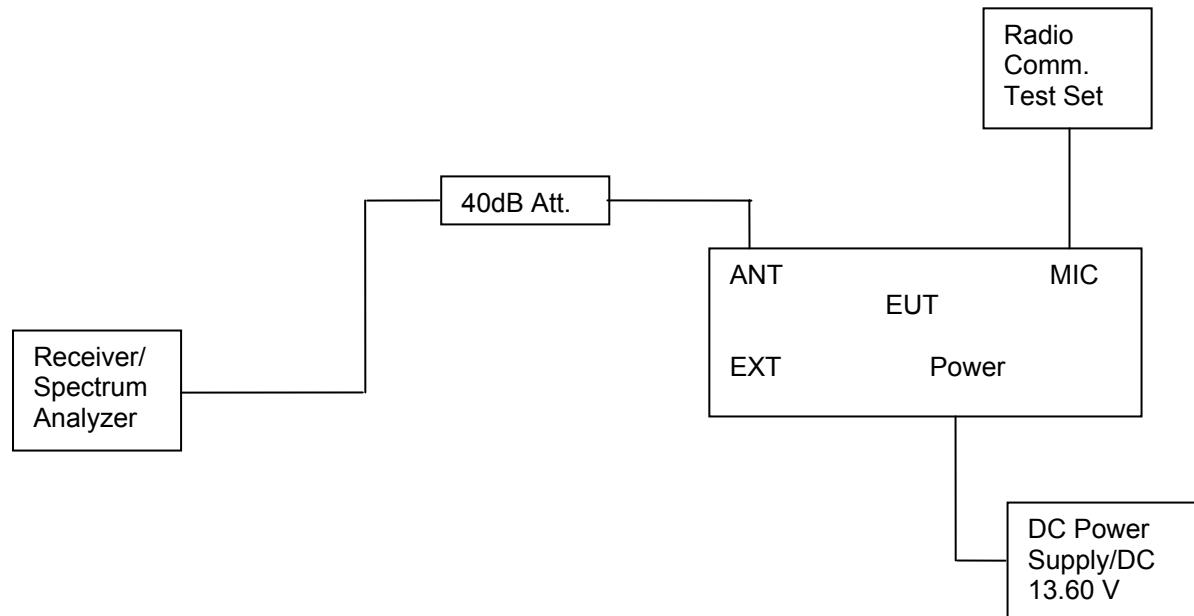
Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.177000	7.60	10.1	55	47.0	AV	+	GND
0.438000	22.80	10.1	47	24.3	AV	+	GND
0.874500	9.40	10.1	46	36.6	AV	+	GND
10.293000	-3.40	10.5	50	53.4	AV	+	GND
22.303500	-1.90	10.5	50	51.9	AV	+	GND
23.955000	-3.00	10.7	50	53.0	AV	+	GND

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 f0: 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 $7.27(fd - 2.88 \text{ kHz})$ 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

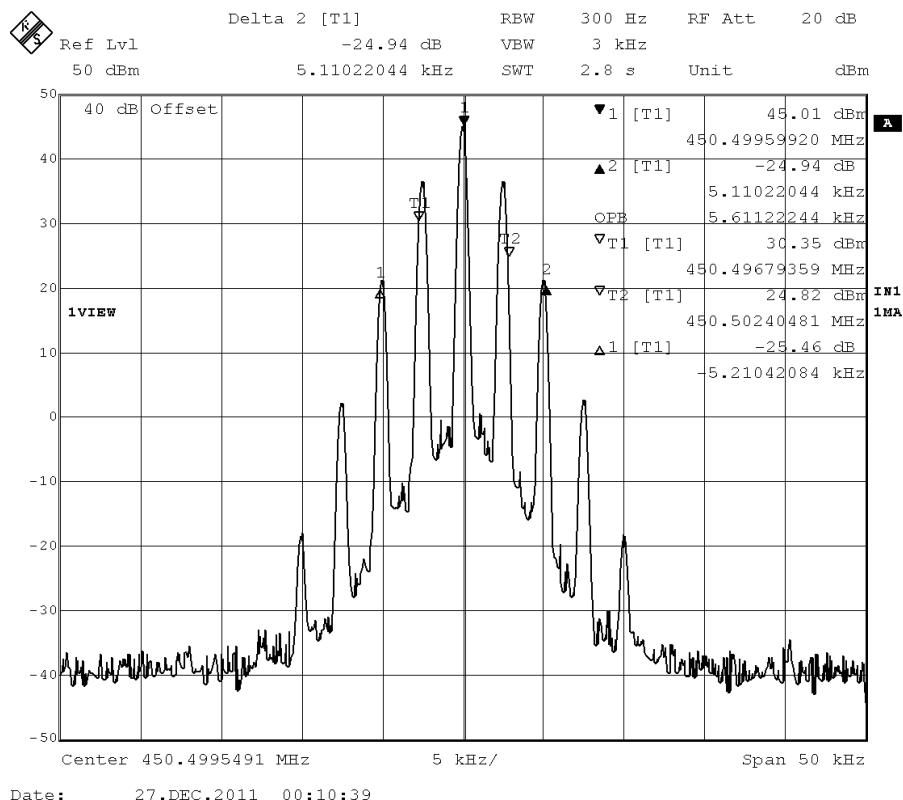
- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel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

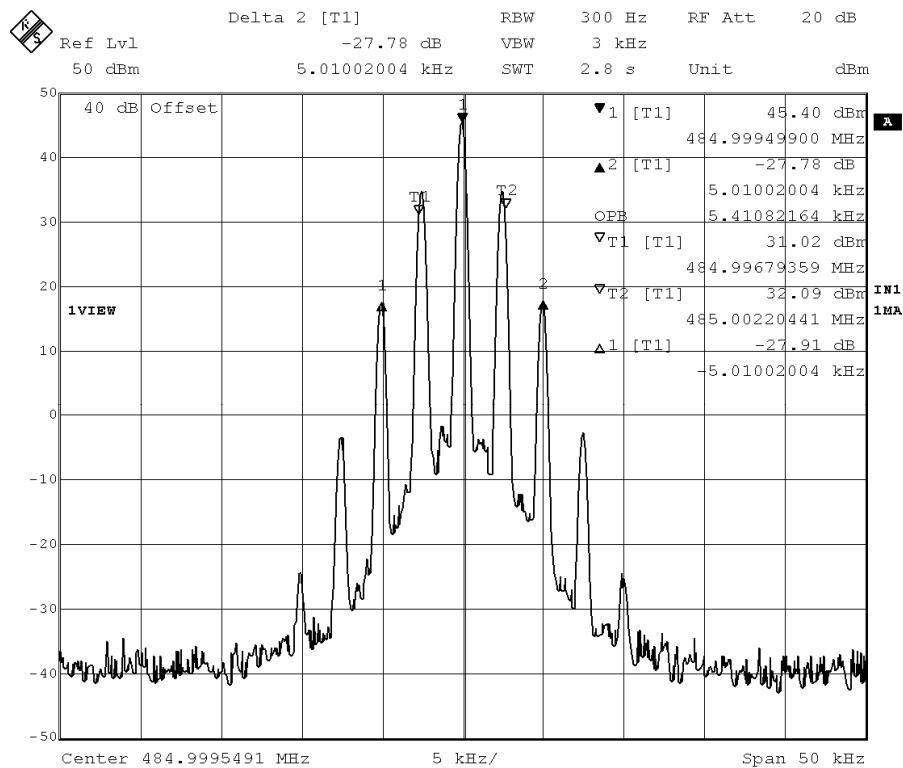
Modulation Type	Channel Sparation	Test Channel	Test Frequency	99% Occupied Bandwidth	26dB Occupied Band width	
FM	12.5KHz	Low	450.5000 MHz	5.61 KHz	10.32 KHz	
		Middle	485.0000 MHz	5.41 KHz	10.02 KHz	
		High	519.5000 MHz	5.51 KHz	10.02 KHz	
4FSK	12.5KHz	Low	450.5000 MHz	7.81 KHz	10.02 KHz	
		Middle	485.0000 MHz	7.52 KHz	9.82 KHz	
		High	519.5000 MHz	7.62 KHz	9.42 KHz	
Limit		11.25KHz for 12.5KHz Channel Separation				
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	450.5000	5.61	10.32	11.25	Compliance

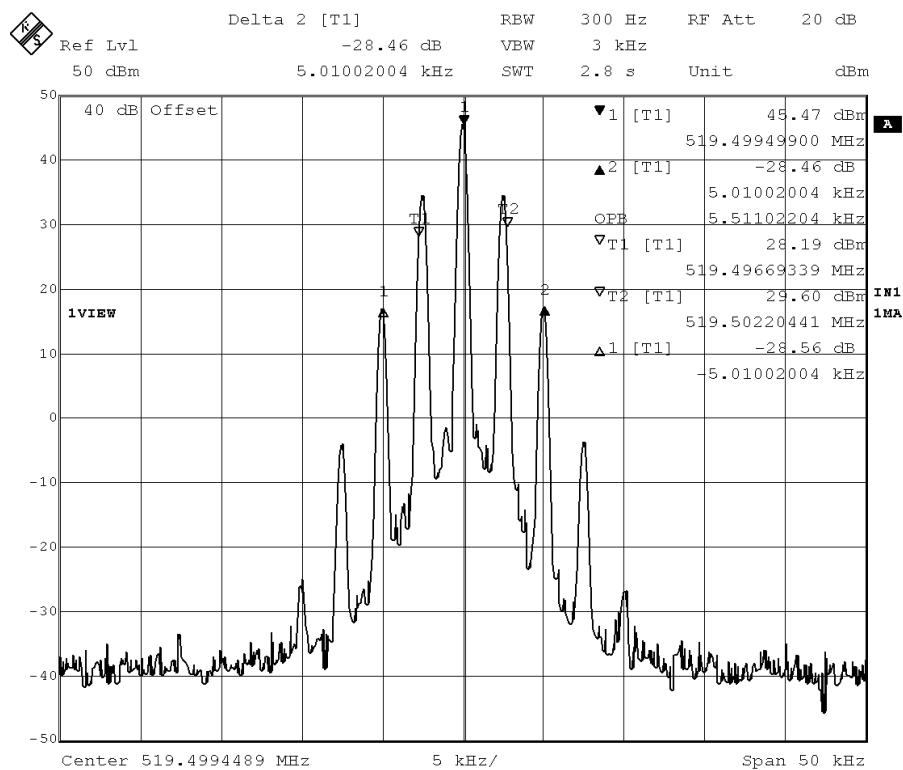


Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	485.0000	5.41	10.02	11.25	Compliance



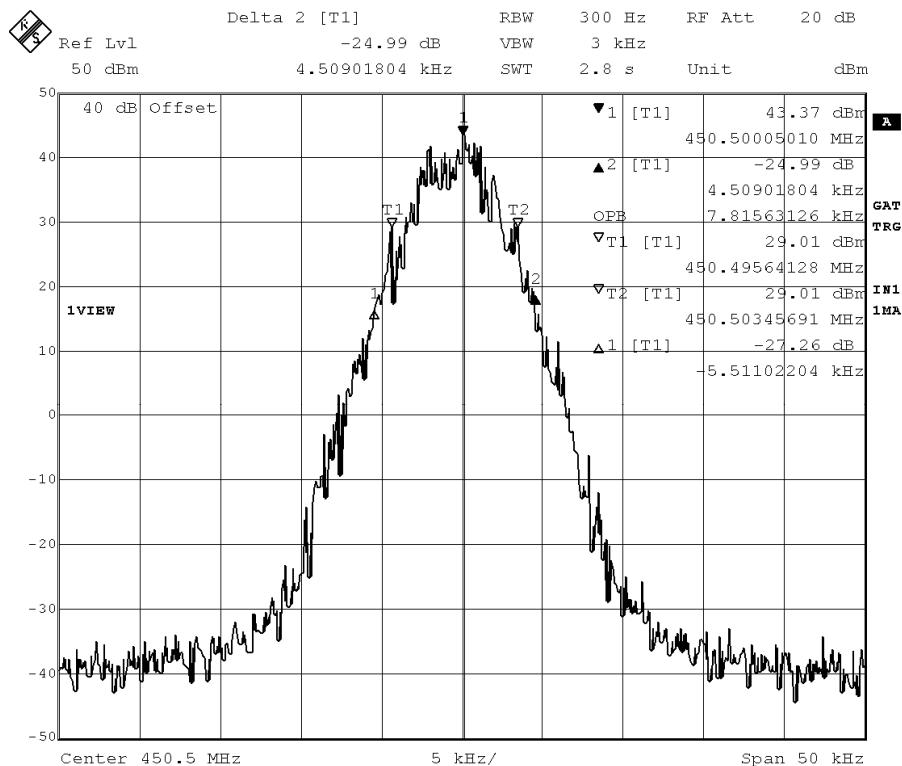
Date: 27.DEC.2011 00:12:07

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	519.5000	5.51	10.02	11.25	Compliance



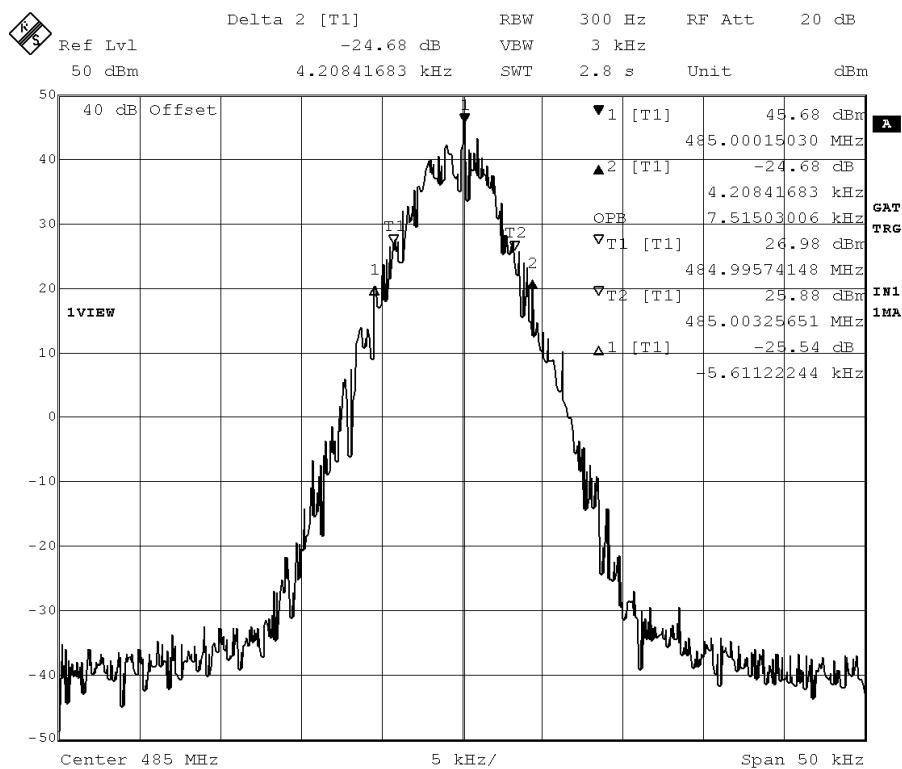
Date: 27.DEC.2011 00:13:25

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
4FSK	12.5 KHz	450.5000	7.81	10.02	11.25	Compliance



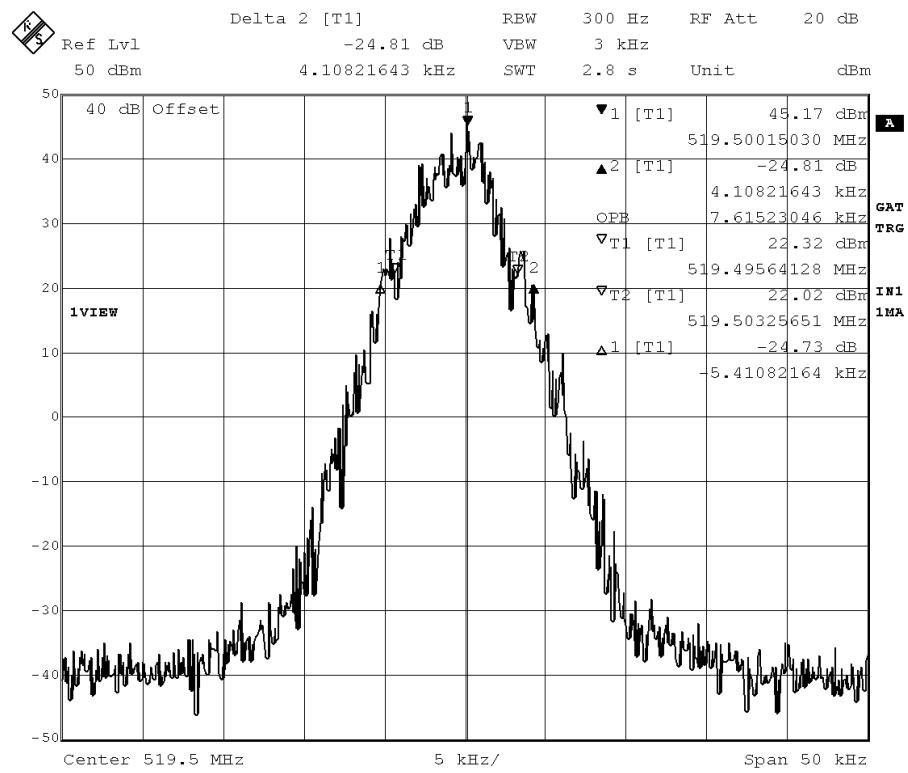
Date: 27.DEC.2011 00:15:23

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
4FSK	12.5 KHz	485.0000	7.52	9.82	11.25	Compliance



Date: 27.DEC.2011 00:17:25

Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
4FSK	12.5 KHz	519.5000	7.62	9.42	11.25	Compliance



4.2.2 Emission Mask

Modulation Type	Channel Spairation	Test Channel	Test Frequency	FCC Applicable Mask	RBW
FM	12.5KHz	Low	450.5000 MHz	D	100 Hz
		Middle	485.0000 MHz	D	100 Hz
		High	519.5000 MHz	D	100 Hz
4FSK	12.5KHz	Low	450.5000 MHz	D	100 Hz
		Middle	485.0000 MHz	D	100 Hz
		High	519.5000 MHz	D	100 Hz
Test Results		Compliance			

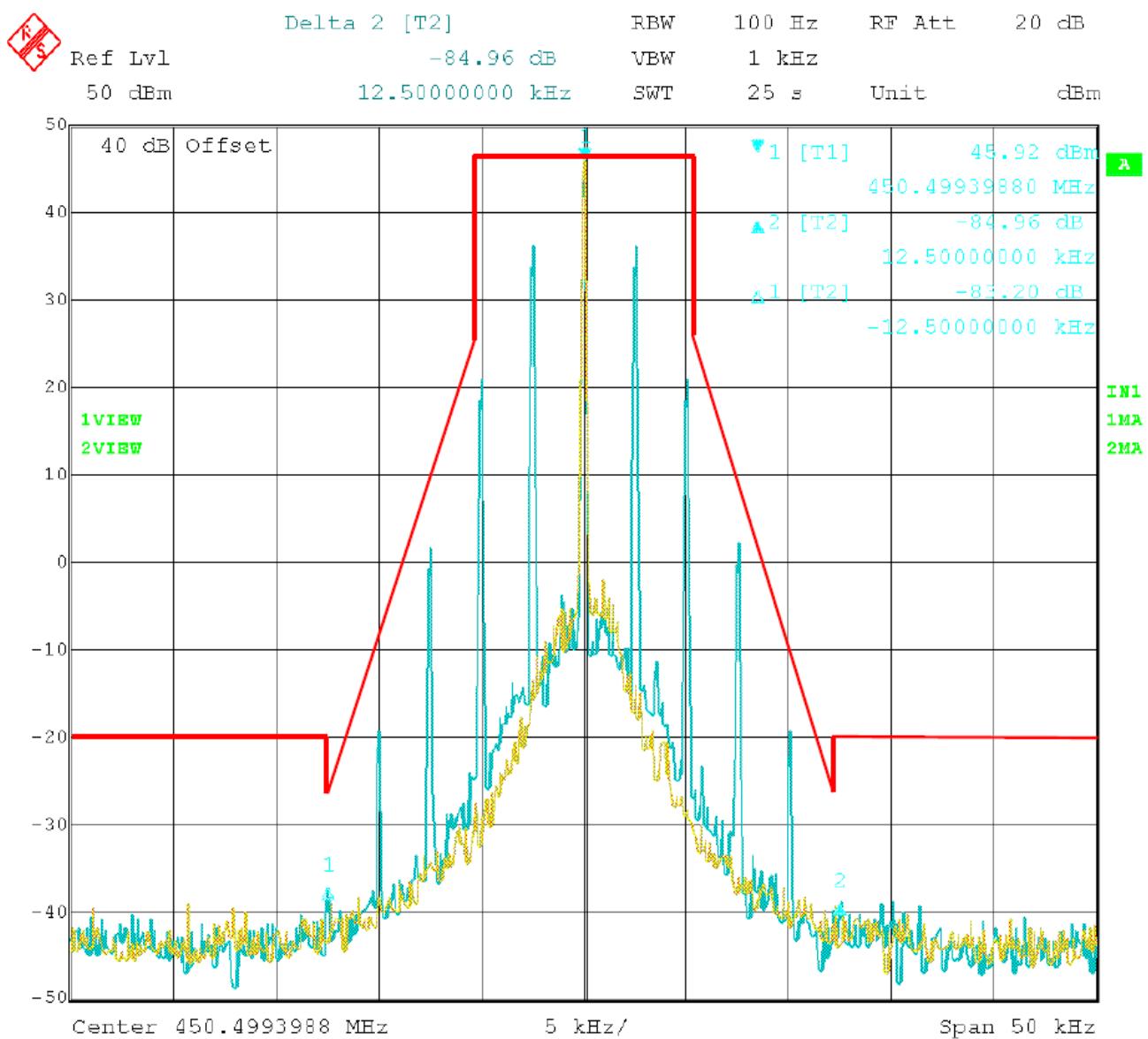
Plots of Emission Mask Measurement

Referred as the attached plot hereinafter

Note: The yellow curve represents unmodulated signal.

The green curve represents modulated signal.

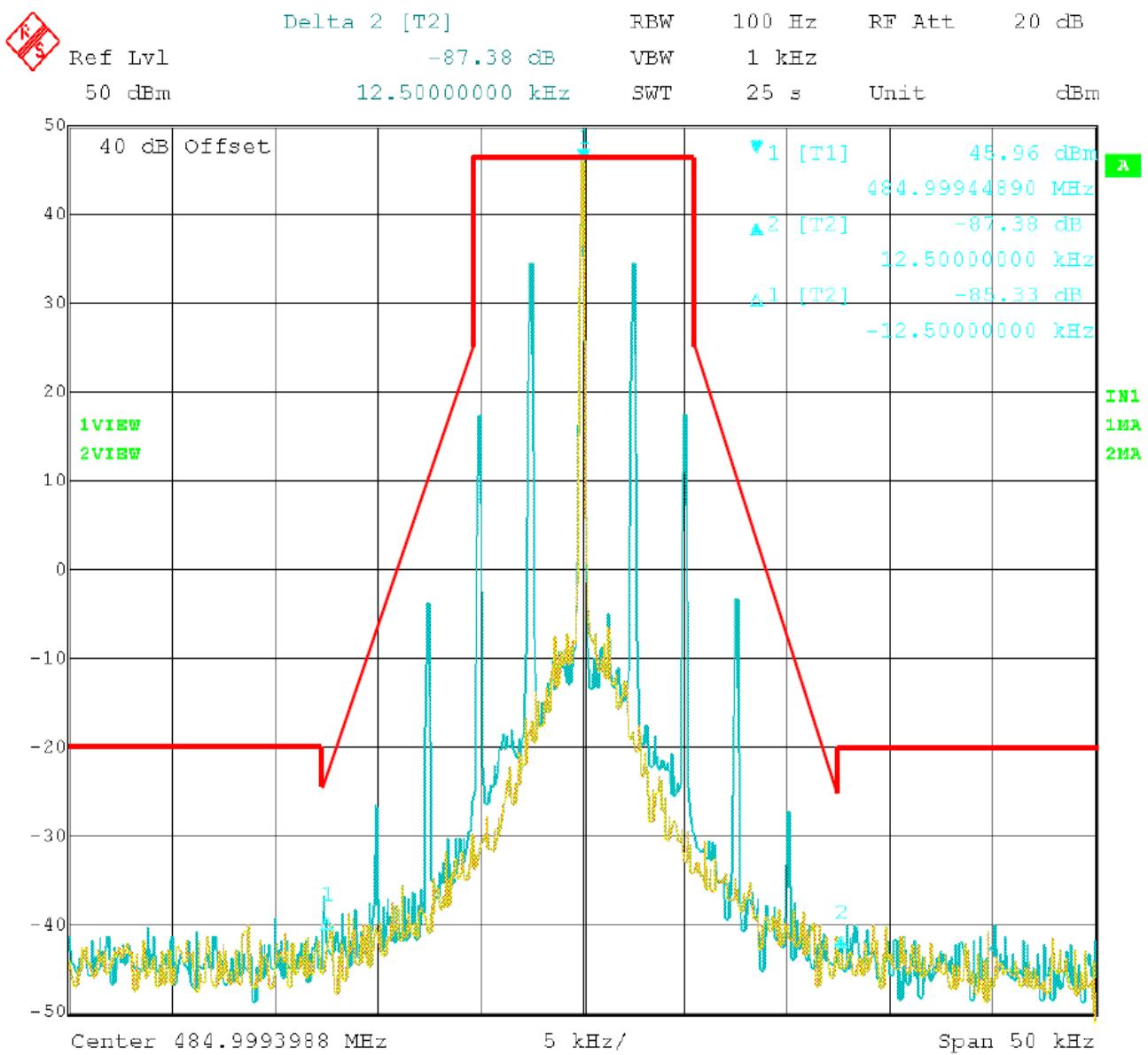
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	450.5000	D	100Hz	2.5	Compliance



Date: 27.DEC.2011 00:32:03

12.5 kHz Channel Spacing, 450.5000 MHz, 2500 Hz Audio Modulation Only

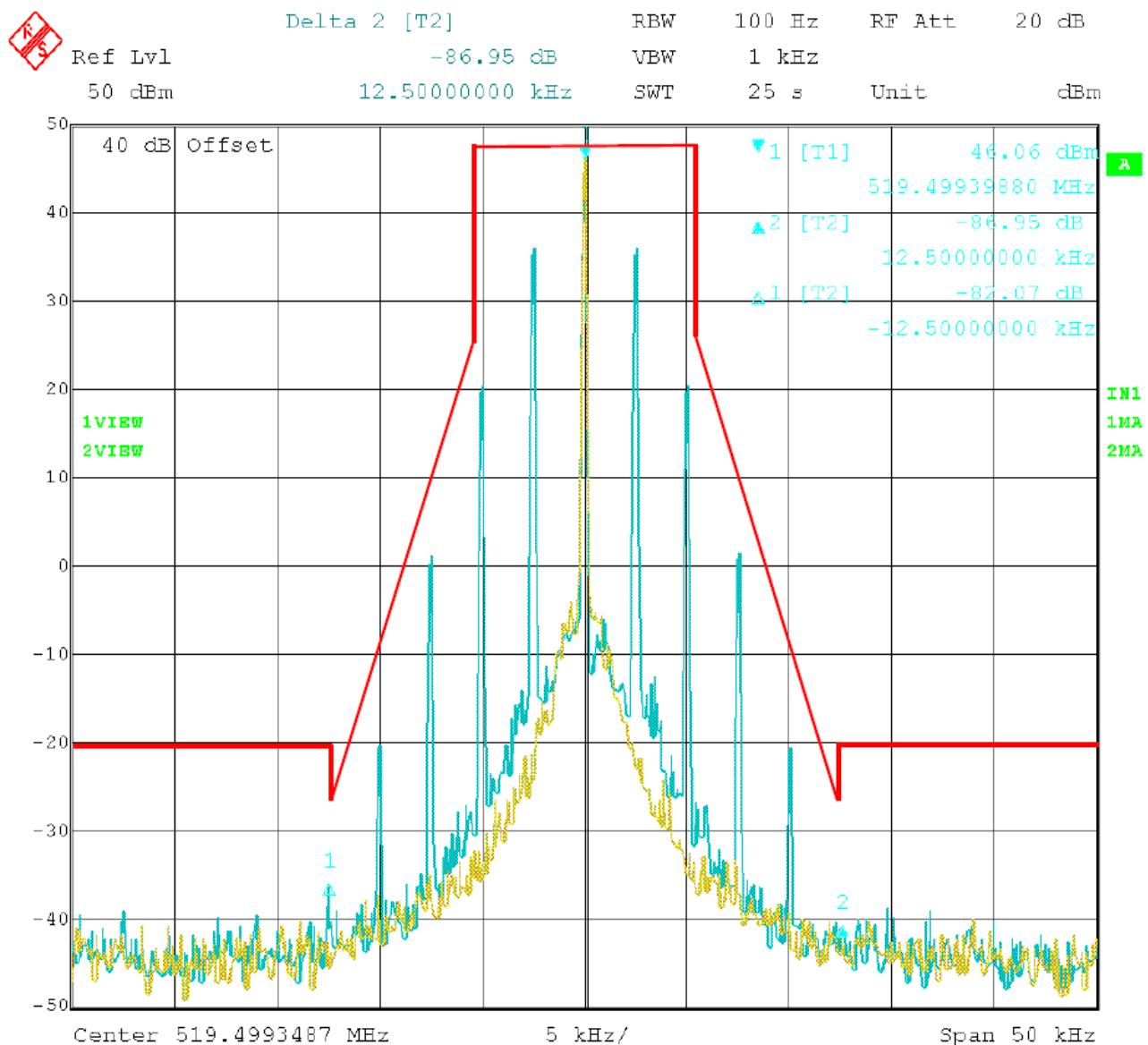
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	485.0000	D	100Hz	2.5	Compliance



Date: 27.DEC.2011 00:27:47

12.5 kHz Channel Spacing, 485.0000 MHz, 2500 Hz Audio Modulation Only

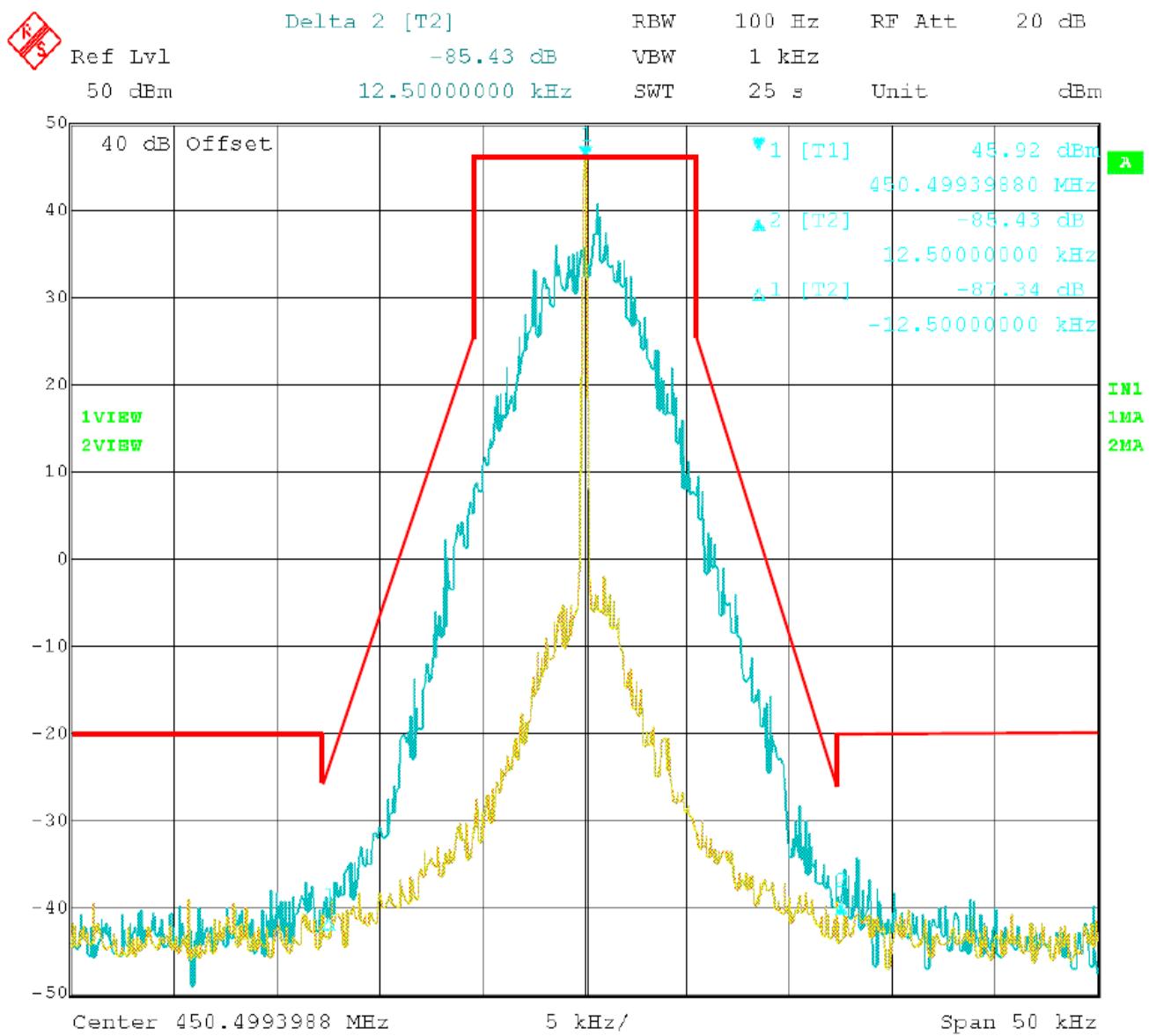
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	519.5000	D	100Hz	2.5	Compliance



Date: 27.DEC.2011 00:22:56

12.5 kHz Channel Spacing, 519.5000 MHz, 2500 Hz Audio Modulation Only

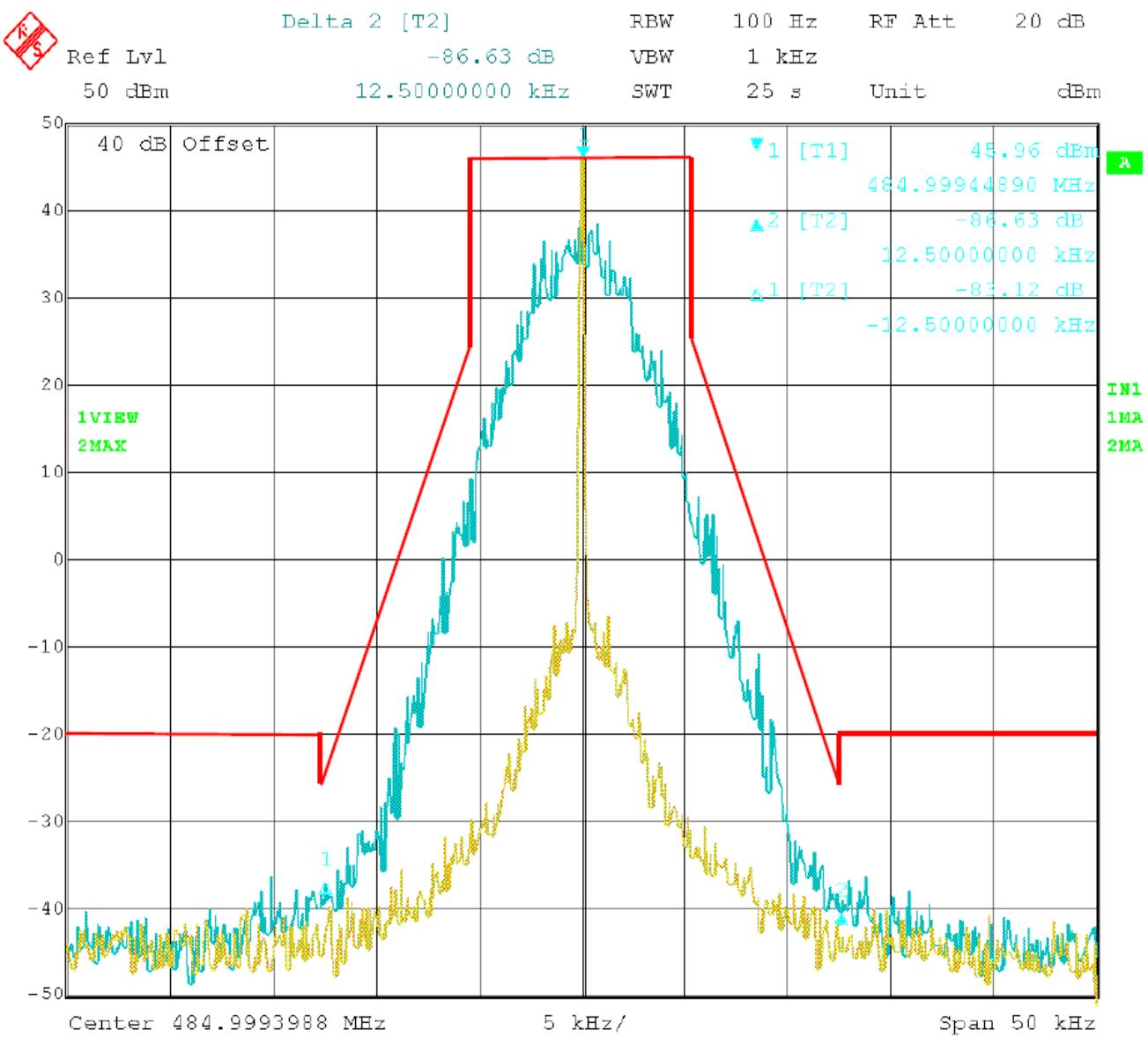
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5 KHz	450.5000	D	100Hz	/	Compliance



Date: 27.DEC.2011 00:33:15

12.5 kHz Channel Spacing, 450.5000 MHz, 4FSK Modulation Only

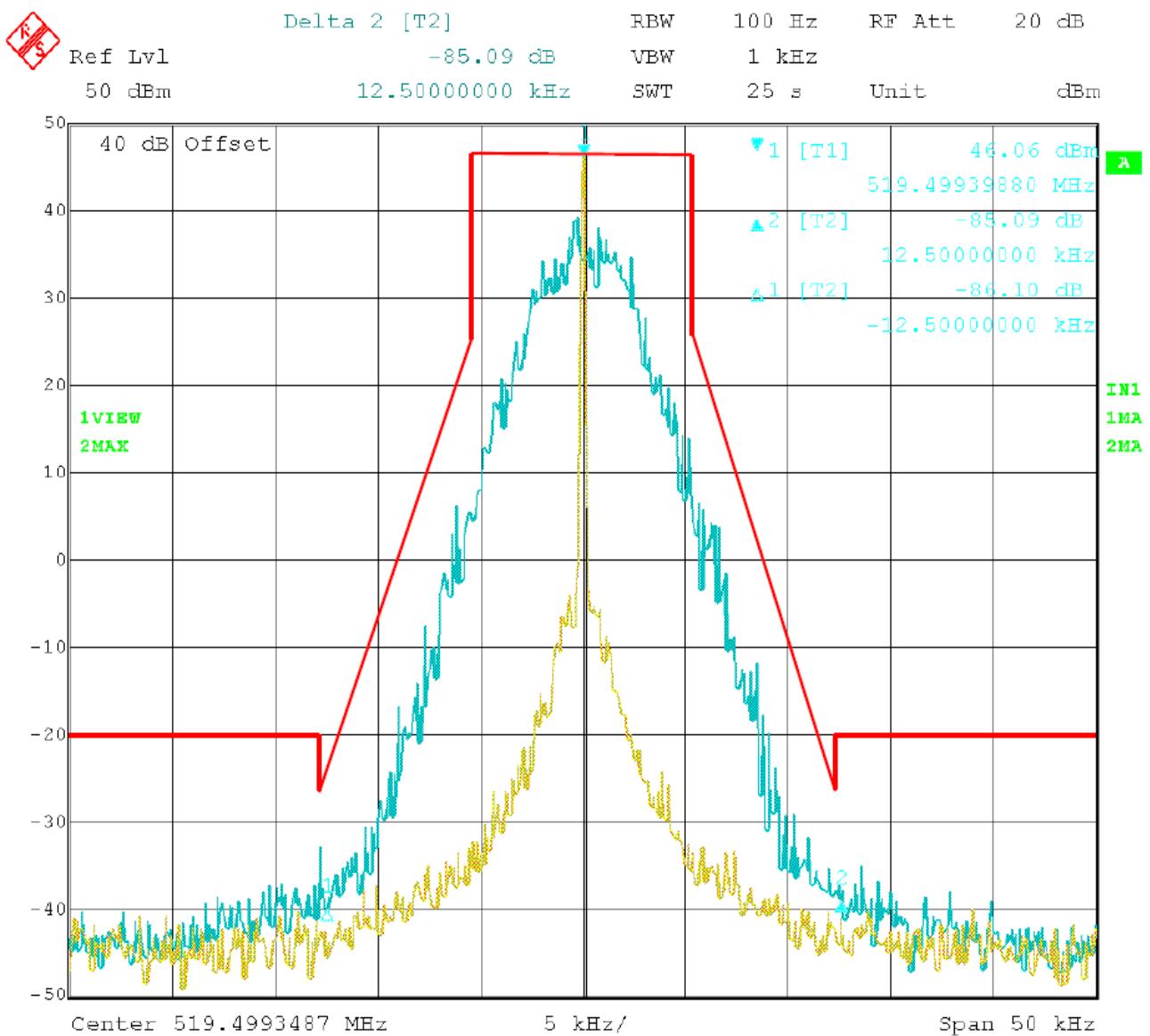
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5 KHz	485.0000	D	100Hz	/	Compliance



Date: 27.DEC.2011 00:28:54

12.5 kHz Channel Spacing, 485.0000 MHz, 4FSK Modulation Only

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
4FSK	12.5 KHz	519.5000	D	100Hz	/	Compliance



Date: 27.DEC.2011 00:24:43

12.5 kHz Channel Spacing, 519.5000 MHz, 4FSK Modulation Only

4.3. Transmitter Radiated Spurious Emission

TEST APPLICABLE

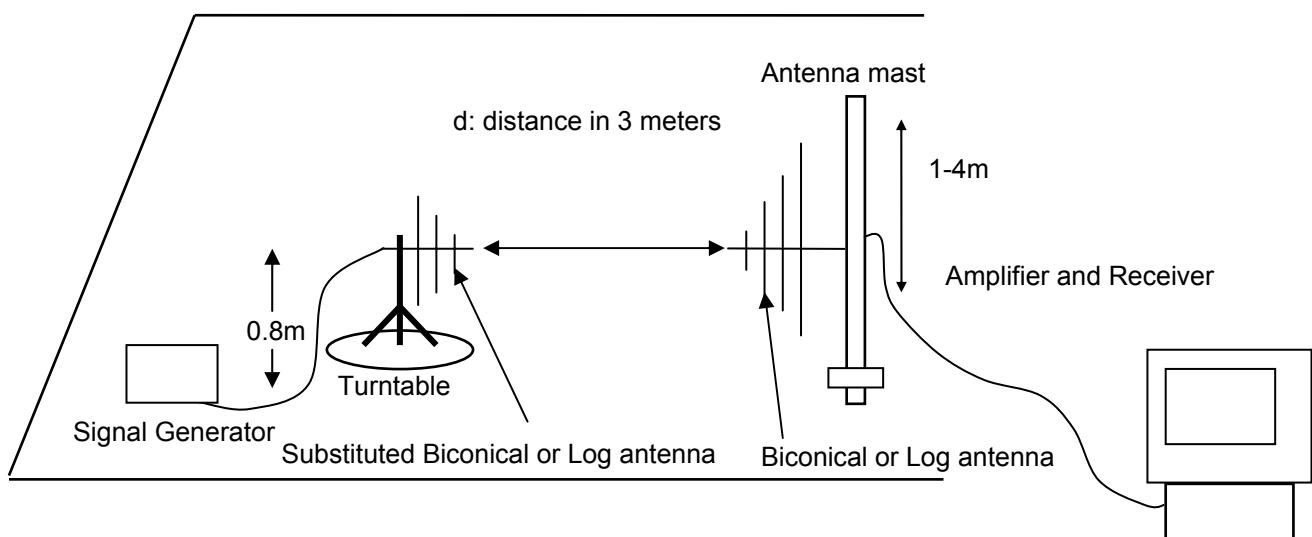
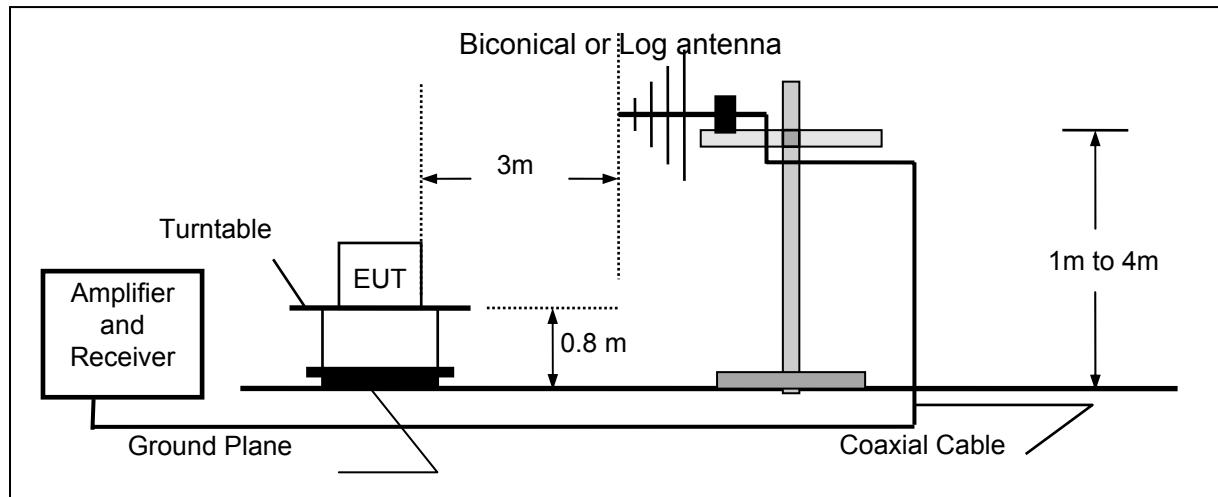
According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

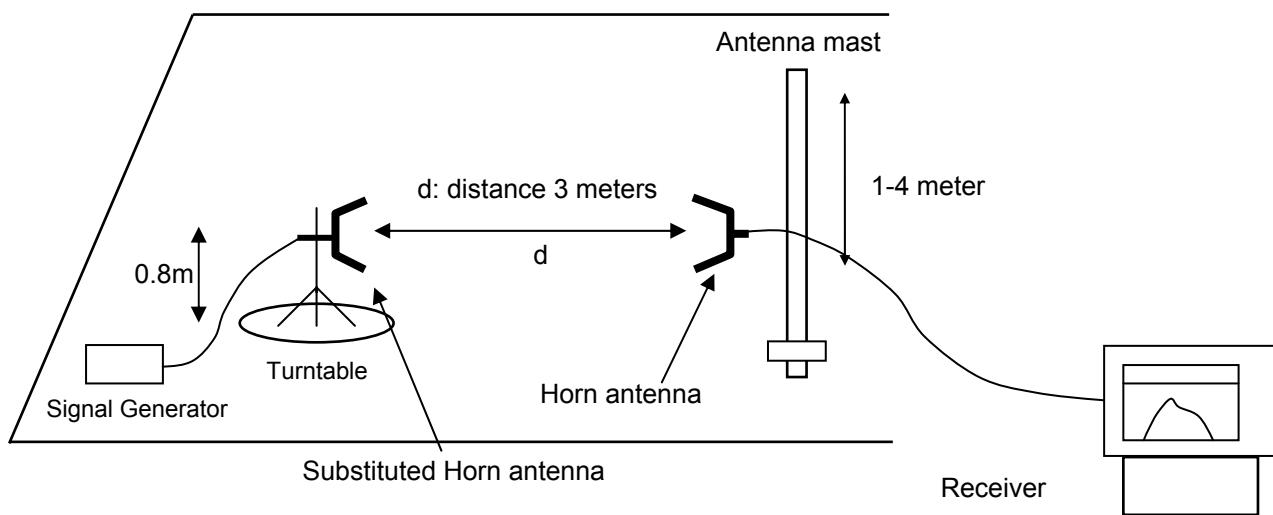
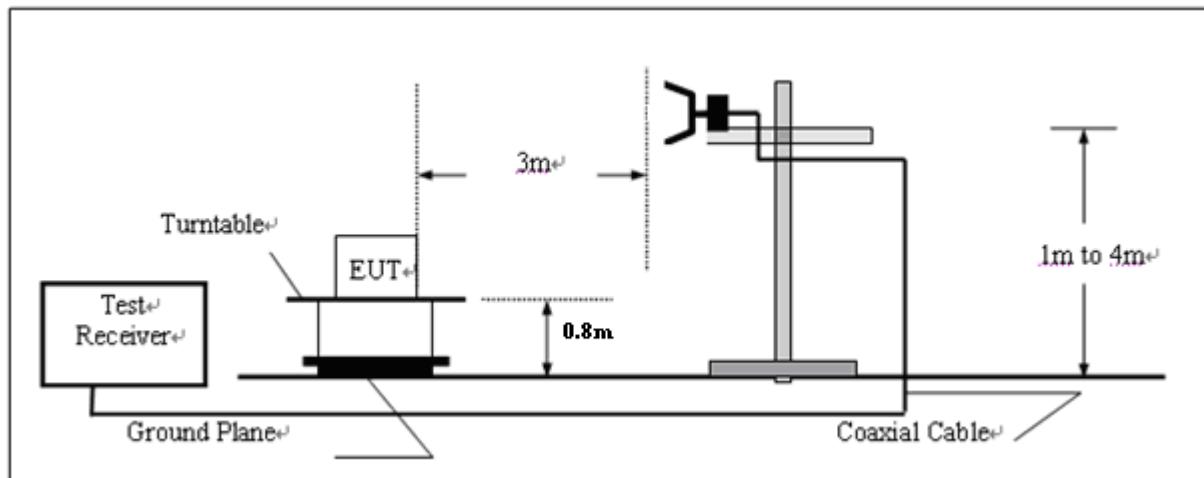
- 1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
 - 2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
 - 3 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, whichever 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 $43 + 10\log(P)$ 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
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB)}$
- 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° 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:

$$P = P_1 - L_1 = (P_2 + L_2) - L_1 = P_3 + A + L_2 - L_1$$

$$\text{EIRP} = P + G_1 = P_3 + L_2 - L_1 + A + G_1$$

$$\text{ERP} = \text{EIRP} - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver} = L_2 - L_1 + G_1$$
- 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 Emission 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 11 (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: $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (46.88) = 66.71 \text{ dB}$
 High: $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (47.75) = 66.79 \text{ dB}$

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 (47.75) = -20 dBm

Modulation Type: 4FSK

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (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: $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (47.10) = 66.73 \text{ dB}$
 High: $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (47.53) = 66.77 \text{ dB}$

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 (47.53) = -20 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.

2. The measurement frequency range from 30 MHz to 6 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		450.5000 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)
901.00	55.56	Peak	H	300	245	-41.21	-20	21.21
1351.50	49.45	Peak	H	221	200	-46.59	-20	26.59
1802.00	49.56	Peak	H	109	56	-47.32	-20	27.32
...	...		H					
901.00	51.77	Peak	V	108	335	-45.23	-20	25.23
1351.50	49.56	Peak	V	100	28	-47.00	-20	27.00
1802.00	48.68	Peak	V	100	110	-47.67	-20	27.67
...	...		V					

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		Middle Channel		Test Frequency		485.0000 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)
970.00	54.55	Peak	H	305	300	-42.34	-20	22.34
1455.00	52.00	Peak	H	267	97	-44.96	-20	24.96
2425.00	49.83	Peak	H	100	111	-46.65	-20	26.65
...	...		H					
970.00	53.21	Peak	V	108	56	-43.55	-20	23.55
1455.00	49.97	Peak	V	100	108	-46.11	-20	26.11
2425.00	49.52	Peak	V	124	179	-47.55	-20	27.55
...	...		V					

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		High Channel		Test Frequency		519.5000 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)
1039.00	54.43	Peak	H	400	255	-42.11	-20	22.11
1558.50	50.31	Peak	H	209	200	-46.55	-20	26.55
2078.00	50.69	Peak	H	155	255	-45.76	-20	25.76
...	...		H					
1039.00	56.02	Peak	V	156	341	-40.53	-20	20.53
1558.50	53.77	Peak	V	100	31	-43.33	-20	23.33
2078.00	49.76	Peak	V	105	134	-46.68	-20	26.68
...	...		V					

Modulation		4FSK		Channel Separation		12.5KHz		
Test Channel		Low Channel		Test Frequency		450.5000 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)
901.00	55.51	Peak	H	200	123	-41.04	-20	21.04
1351.50	52.11	Peak	H	159	320	-44.66	-20	24.66
1802.00	49.32	Peak	H	345	122	-47.45	-20	27.45
...	...		H					
901.00	54.64	Peak	V	100	275	-42.23	-20	22.23
1351.50	51.53	Peak	V	124	345	-45.02	-20	25.02
1802.00	45.05	Peak	V	100	264	-47.00	-20	27.00
...	...		V					

Modulation		4FSK		Channel Separation		12.5KHz		
Test Channel		Middle Channel		Test Frequency		485.0000 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)
970.00	56.32	Peak	H	350	289	-40.33	-20	20.33
1455.00	50.78	Peak	H	145	312	-45.51	-20	25.51
2425.00	49.87	Peak	H	100	100	-46.44	-20	26.44
...	...		H					
970.00	54.56	Peak	V	128	277	-42.04	-20	22.04
1455.00	50.94	Peak	V	104	184	-45.95	-20	25.95
2425.00	49.94	Peak	V	100	0	-47.00	-20	27.00
...	...		V					

Modulation		4FSK		Channel Separation		12.5KHz		
Test Channel		High Channel		Test Frequency		519.5000 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)
1039.00	54.44	Peak	H	231	222	-42.22	-20	22.22
1588.50	51.38	Peak	H	300	101	-45.66	-20	25.66
2078.00	96.11	Peak	H	100	304	-47.44	-20	27.44
...	...		H					
1039.00	50.78	Peak	V	100	155	-45.55	-20	25.55
1588.50	51.63	Peak	V	100	294	-44.71	-20	24.71
2078.00	49.51	Peak	V	100	67	-47.04	-20	27.04
...	...		V					

4.4. Spurious Emission on Antenna Port

TEST APPLICABLE

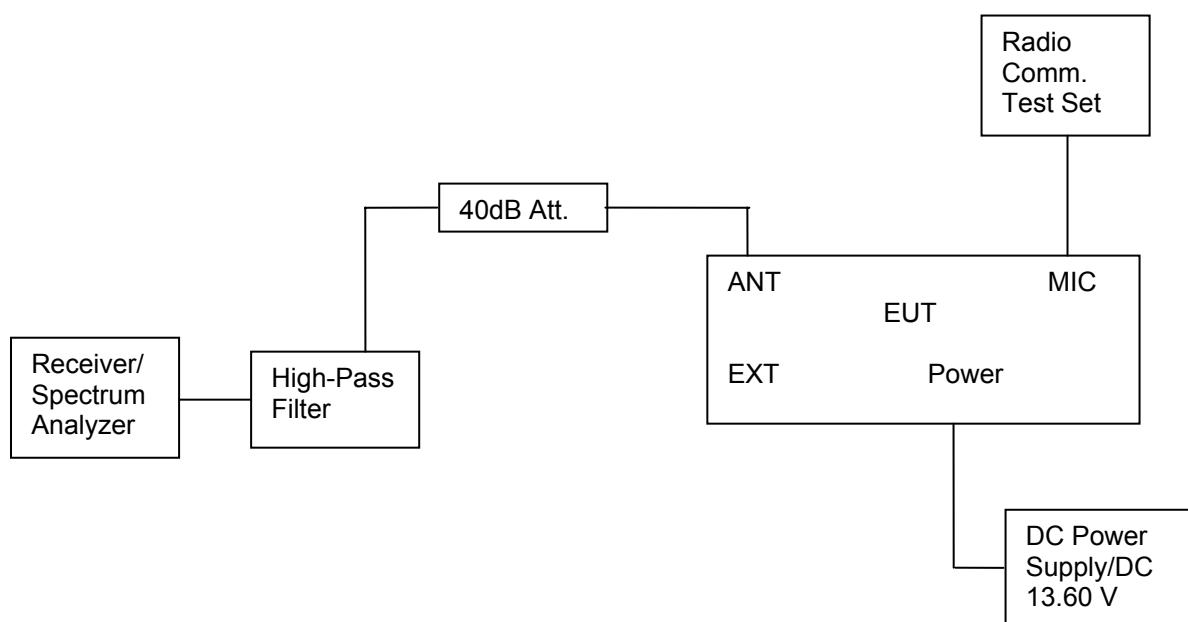
The same as Section 4.3

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

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (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: $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(46.88) = 66.71 \text{ dB}$

High: $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(47.75) = 66.79 \text{ dB}$

Note: In general, the worse case attenuation requirement shown above was applied.

Calculation: Limit (dBm) = $EL - 50 - 10 \log_{10}(TP)$

Notes: EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is 46.53 dBm.

Limit (dBm) = $46.53 - 50 - 10 \log_{10}(47.75) = -20 \text{ dBm}$

Modulation Type: 4FSK

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (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: $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(47.10) = 66.73 \text{ dB}$

High: $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(47.53) = 66.77 \text{ dB}$

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 (47.53) = -20 dBm

Note: 1. In general, the worse case attenuation requirement shown above was applied.

2. The measurement frequency range from 30 MHz to 6 GHz.

For Rated High Power (45Watt)

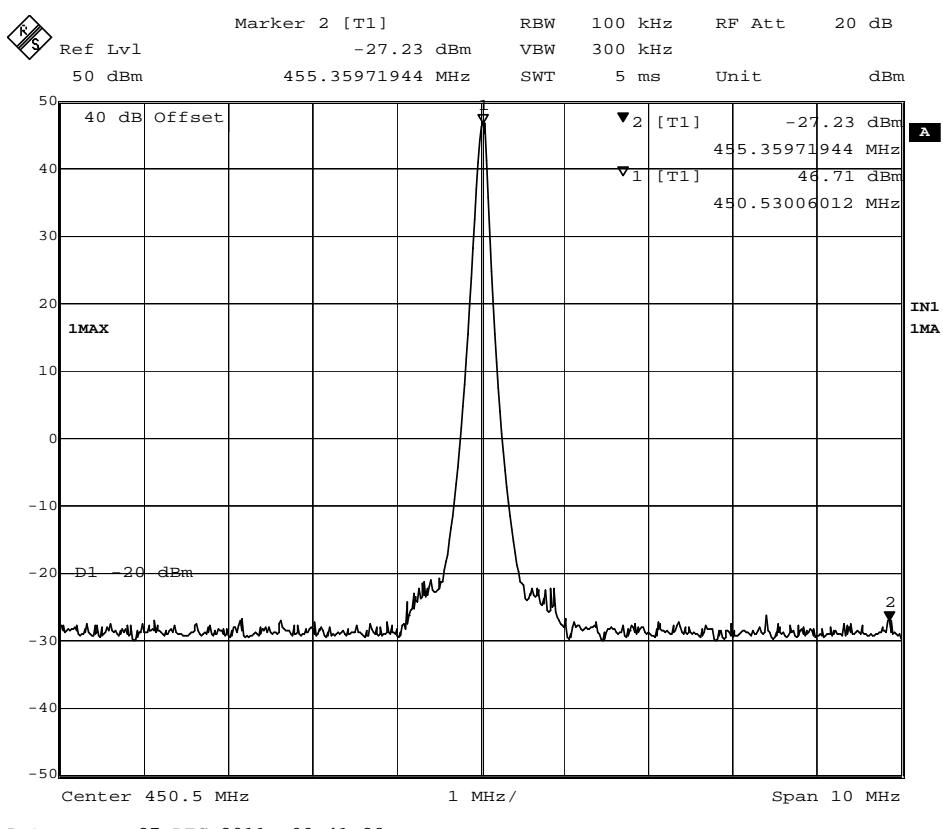
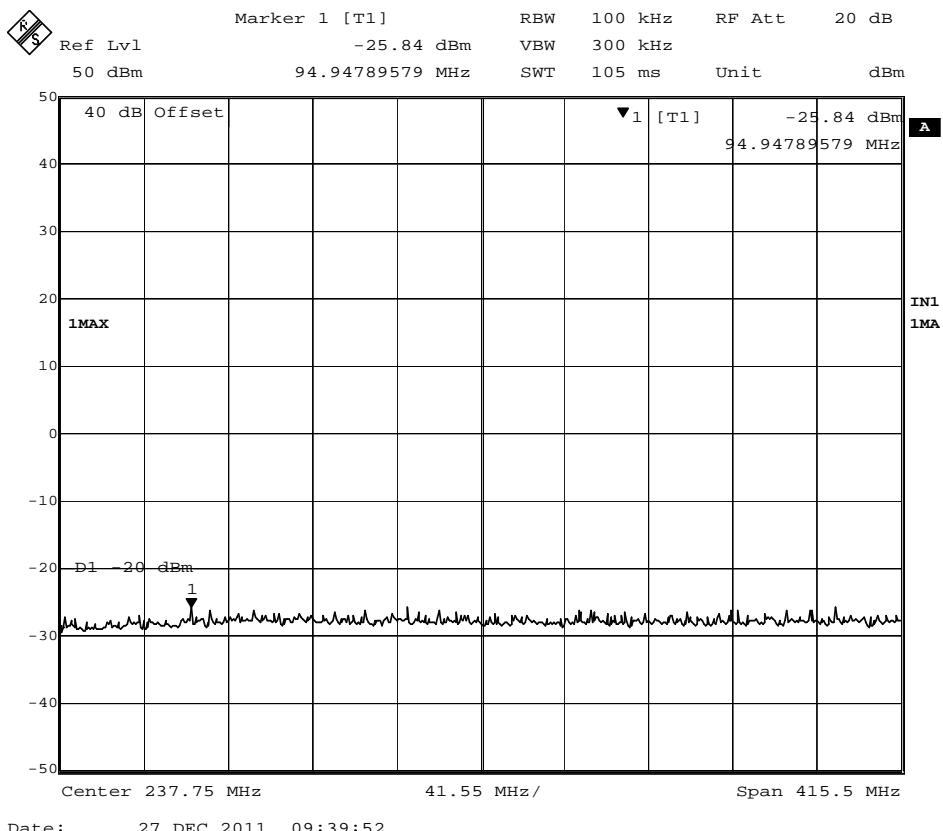
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	450.5000	906.16	-25.27	5859.72	-27.19	
		Middle	485.0000	968.32	-25.24	5729.46	-27.04	
		High	519.5000	853.25	-25.09	5939.88	-26.90	
4FSK	12.5KHz	Low	450.5000	891.73	-23.24	5829.66	-27.83	
		Middle	485.0000	463.77	-25.40	5619.24	-27.08	
		High	519.5000	967.60	-25.24	5979.96	-26.36	
Limit		-20dBm for 12.5KHz Channel Separtion						
Test Results		Compliance						

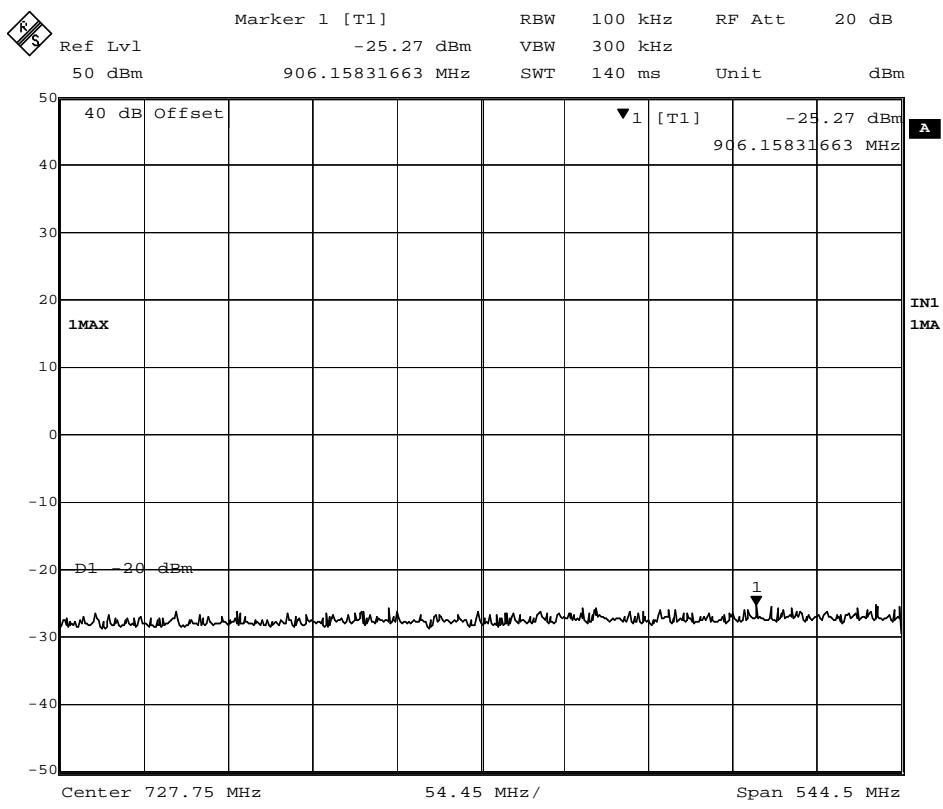
For Rated Low Power (5Watt)

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	450.5000	900.86	-24.67	5799.60	-27.27	
		Middle	485.0000	970.84	-25.10	5709.42	-27.23	
		High	519.5000	955.29	-35.44	1040.08	-24.10	
4FSK	12.5KHz	Low	450.5000	900.86	-30.09	5118.24	-27.36	
		Middle	485.0000	970.84	-24.96	5929.86	-27.43	
		High	519.5000	982.51	-35.73	1040.08	-24.06	
Limit		-20dBm for 12.5KHz Channel Separtion						
Test Results		Compliance						

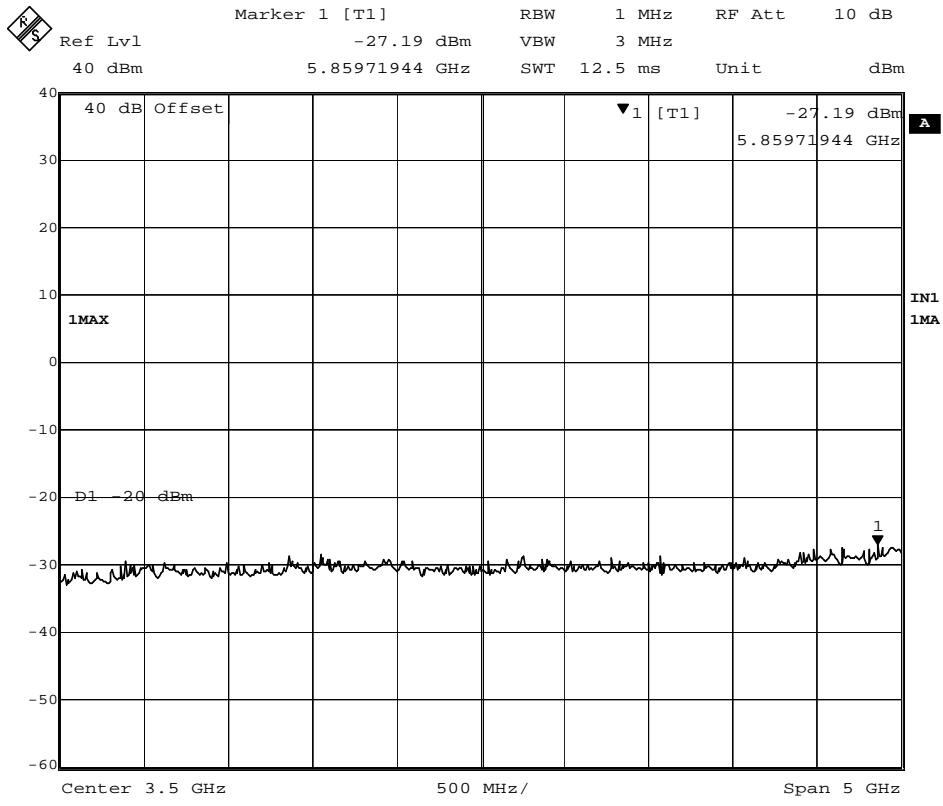
Plots of Spurious Emission on Antenna Port Measurement**For Rated High Power (45Watt)**

Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	450.5000	906.16	-25.27	5859.72	-27.19	-20dBm
Test Results				Compliance				



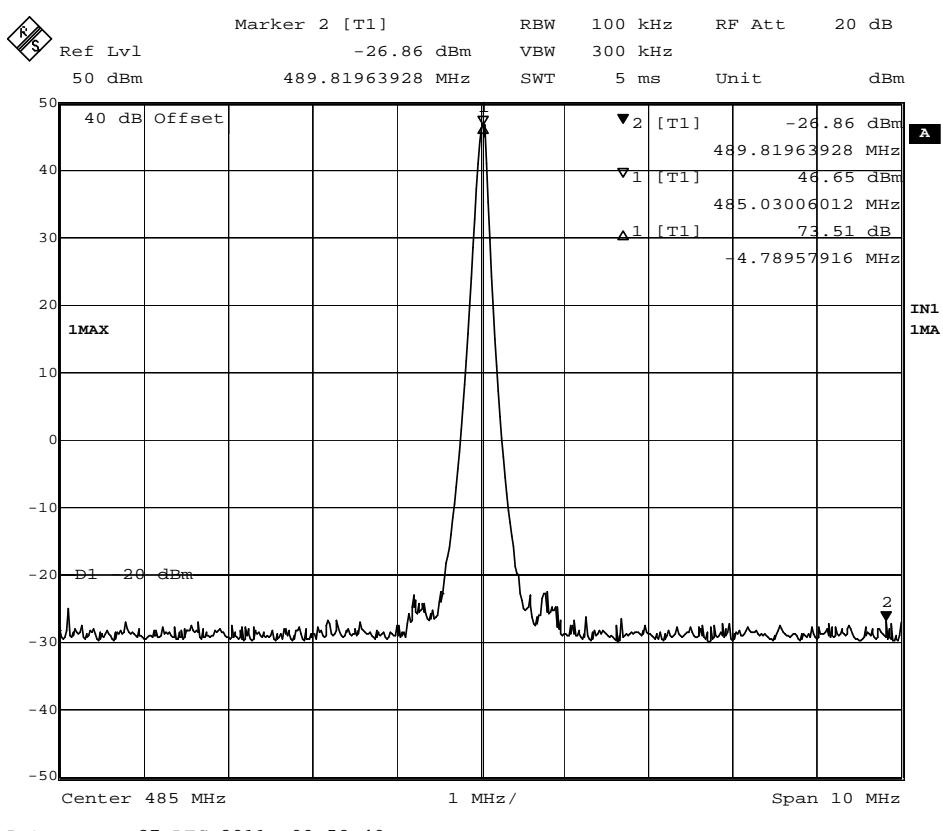
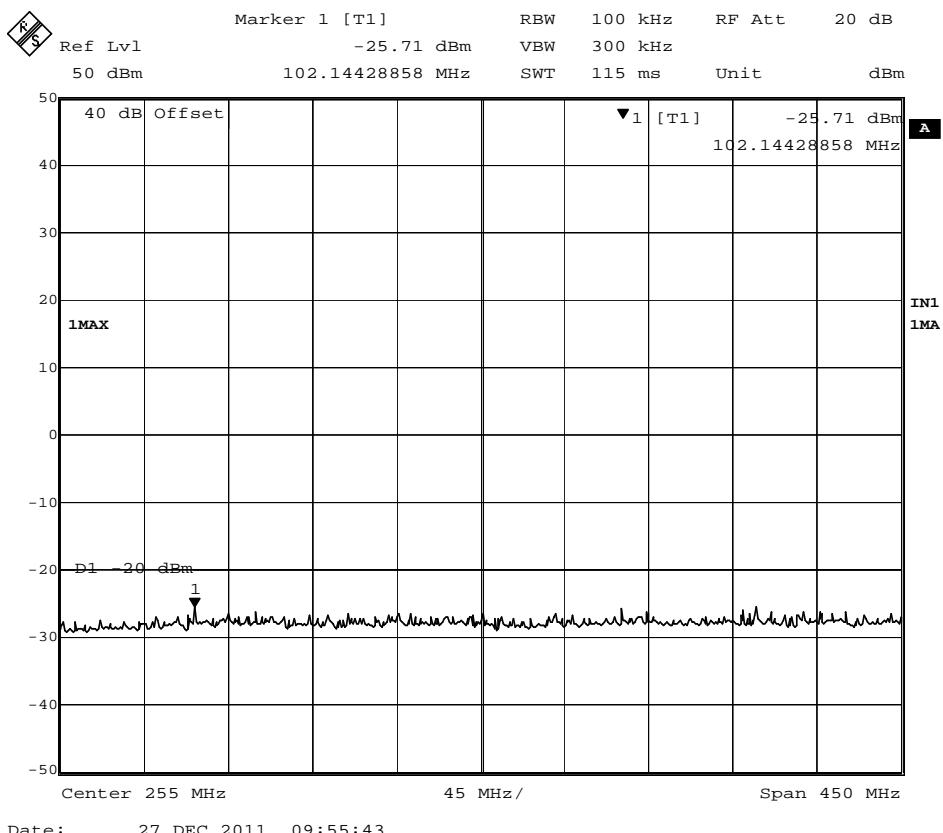


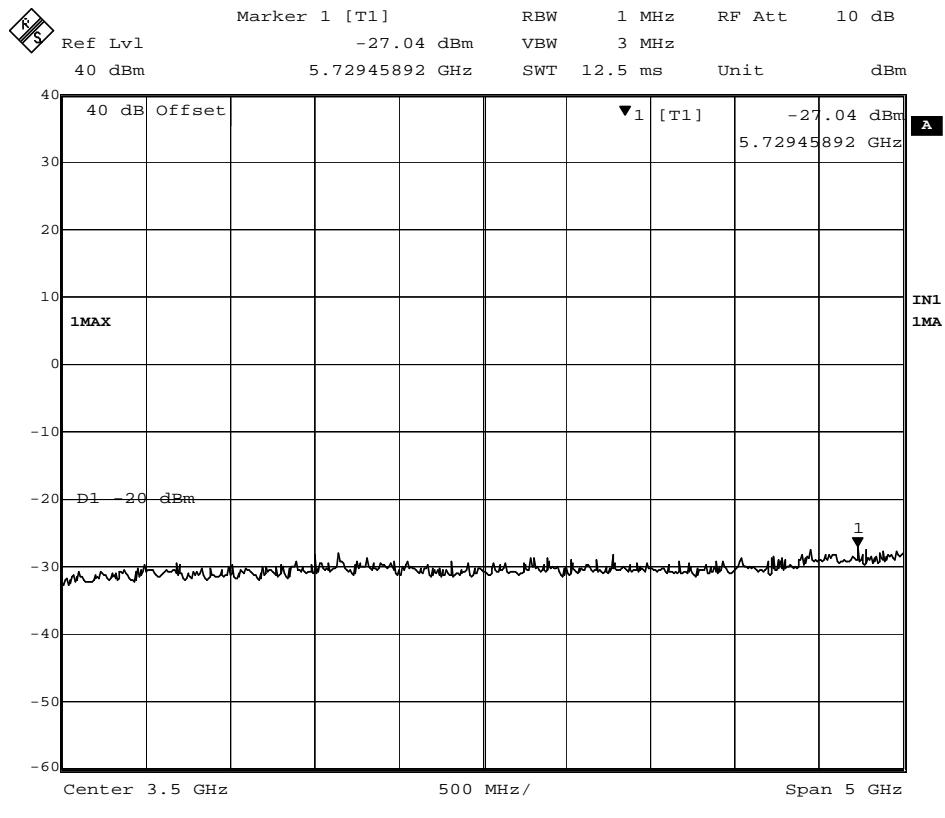
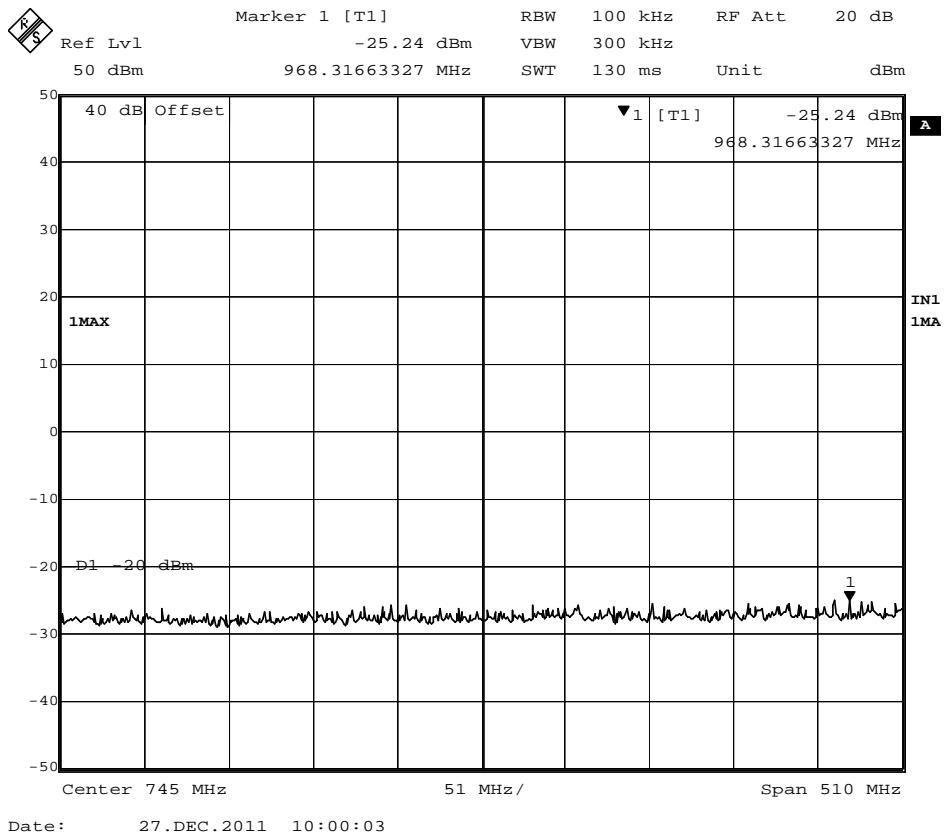
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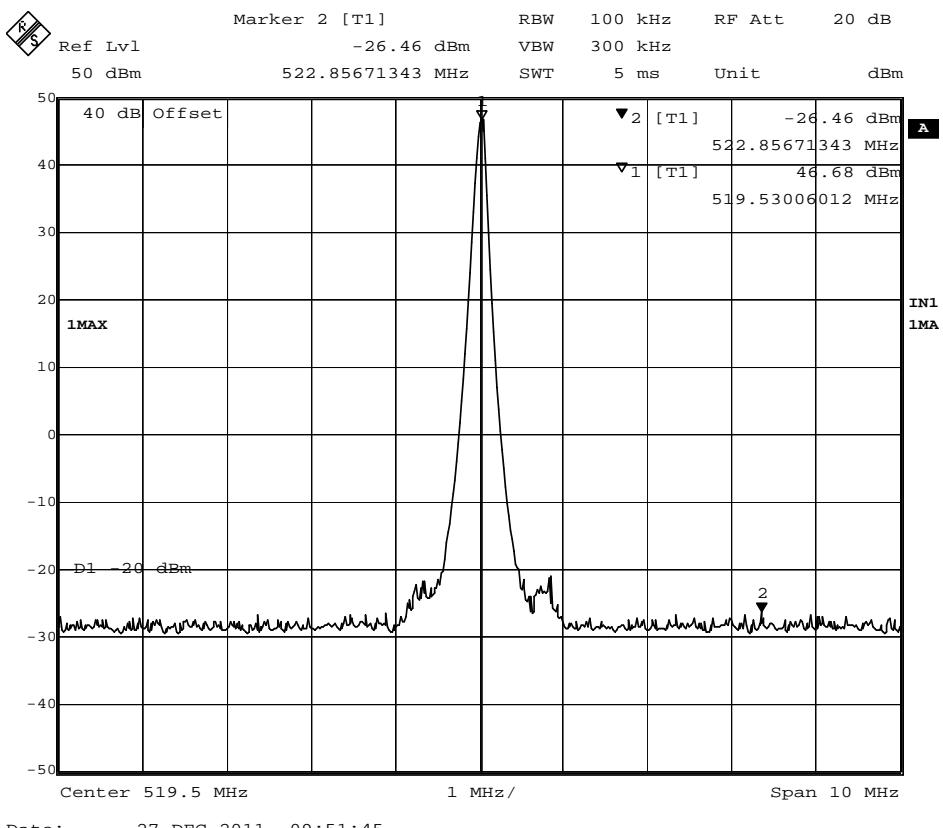
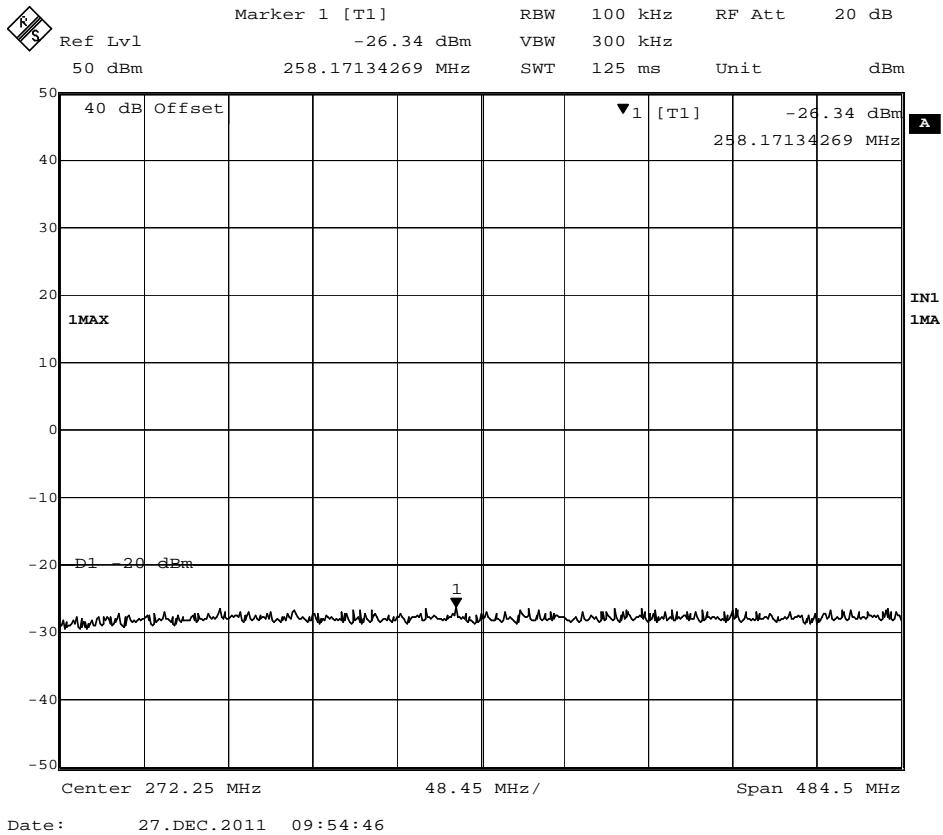
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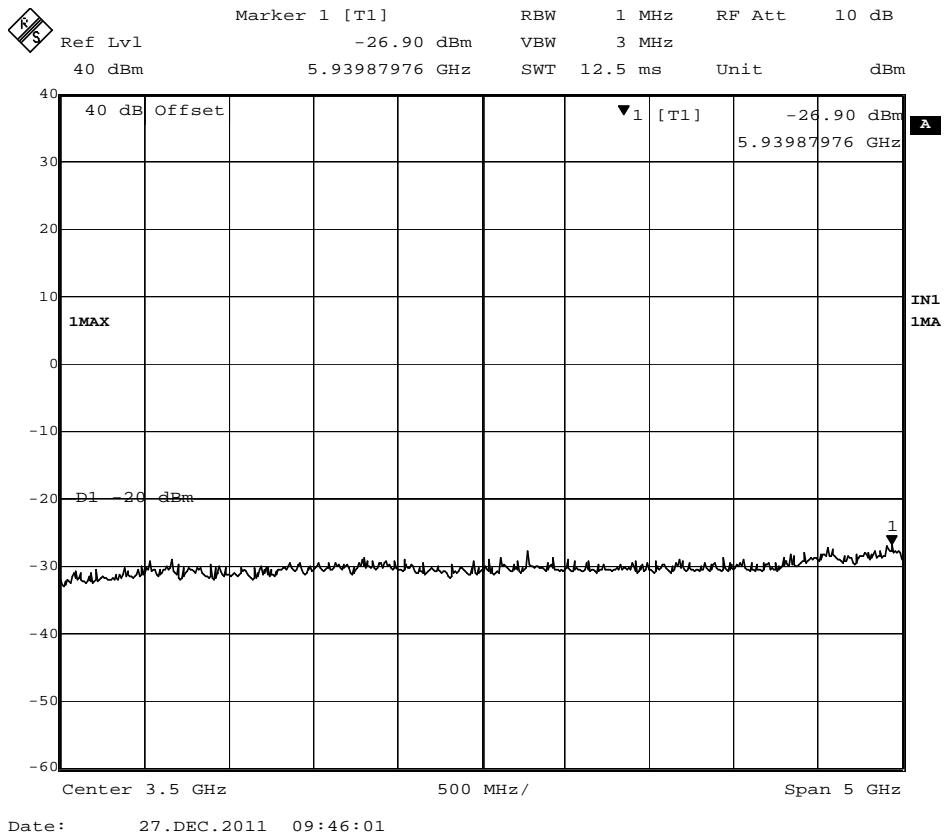
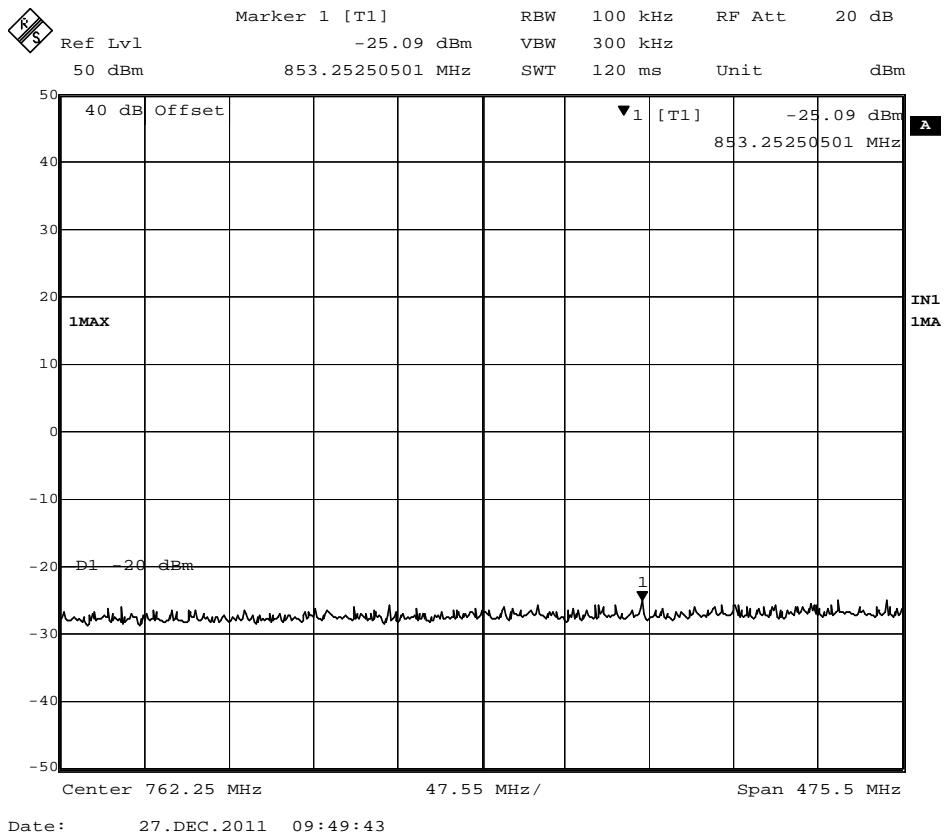
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	485.0000	968.32	-25.24	5729.46	-27.04	-20dBm
Test Results				Compliance				



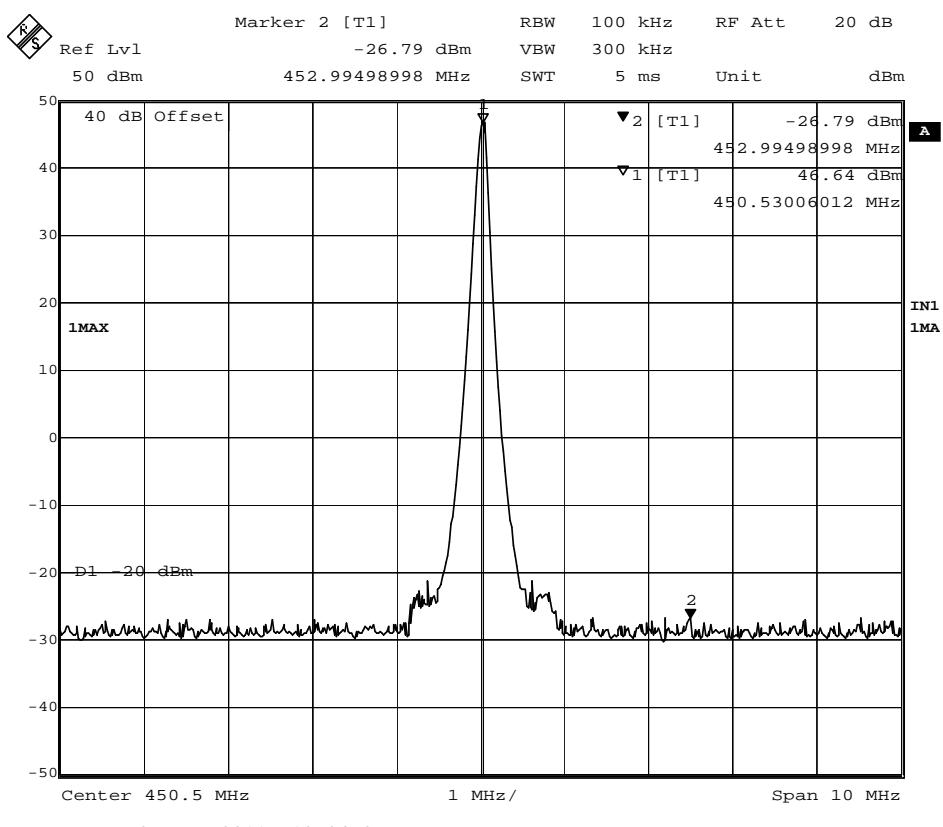
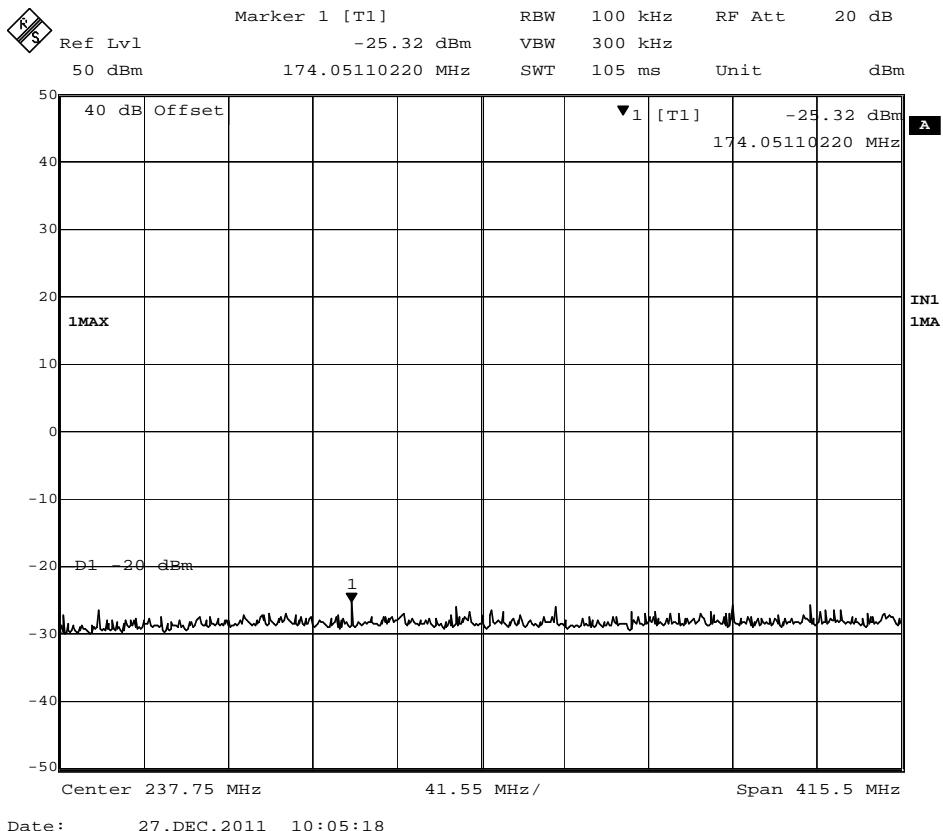


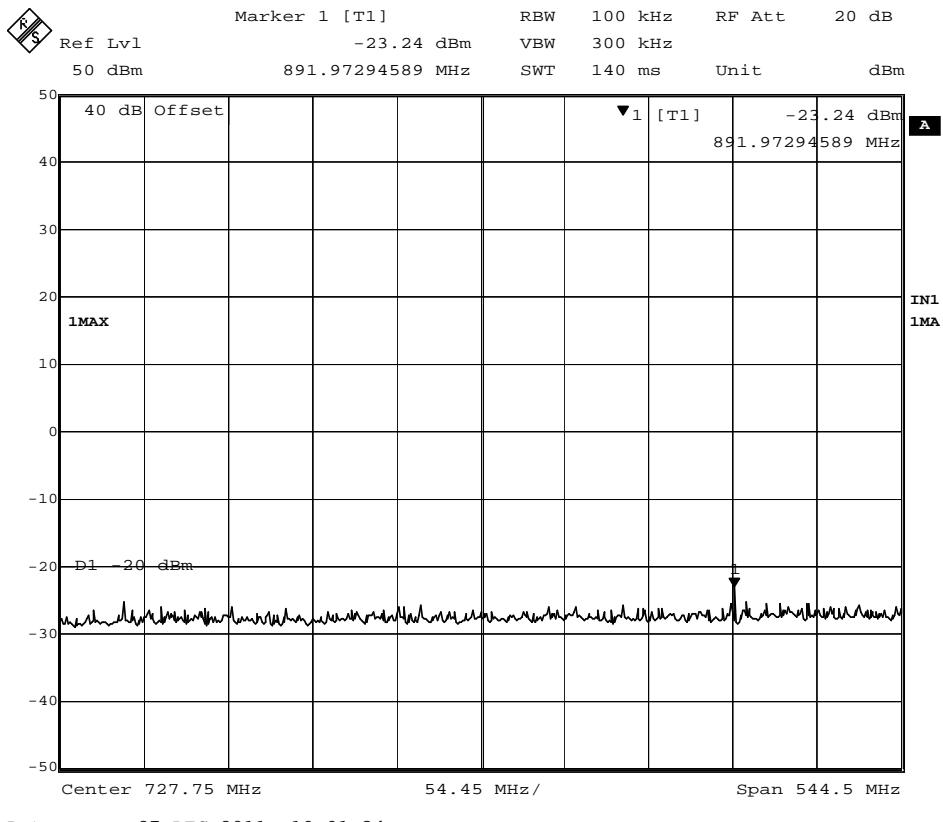
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	High	519.5000	853.25	-25.09	5939.88	-26.90	-20dBm
Test Results				Compliance				



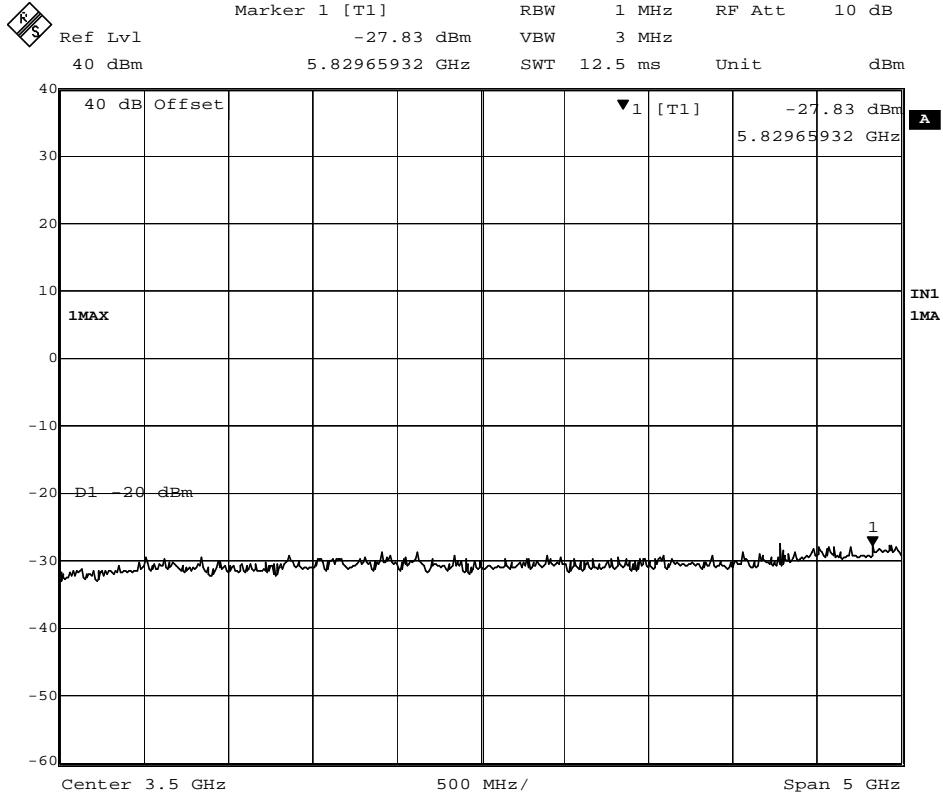


Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
4FSK	12.5KHz	Low	450.50000	891.73	-23.24	5829.66	-27.83	-20dBm
Test Results				Compliance				



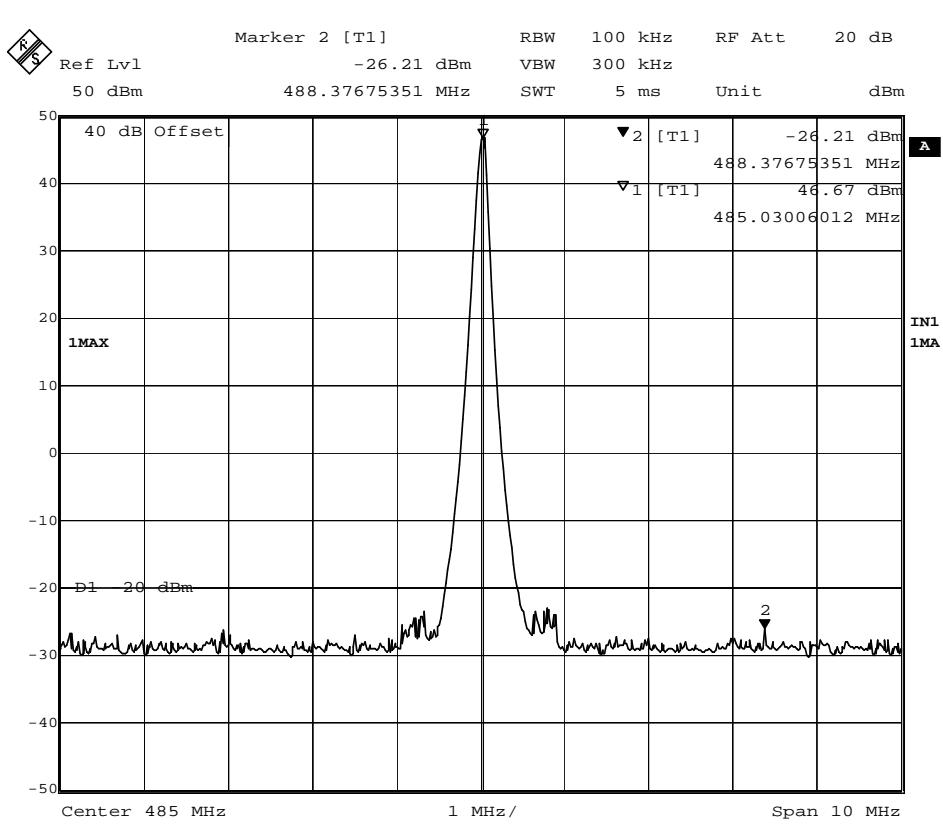
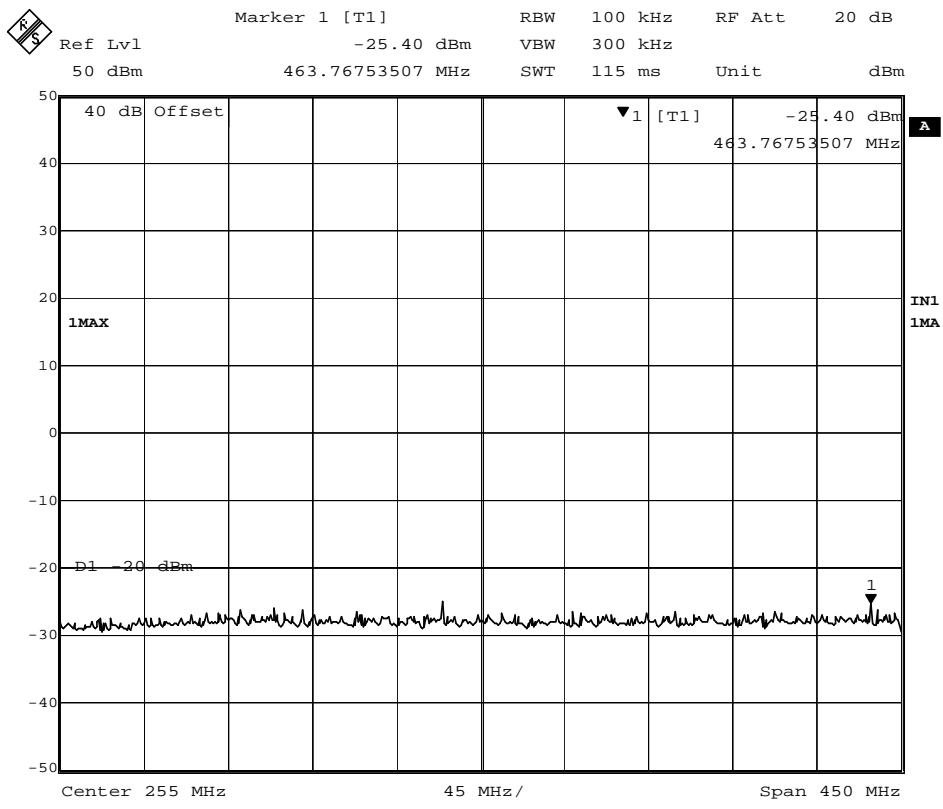


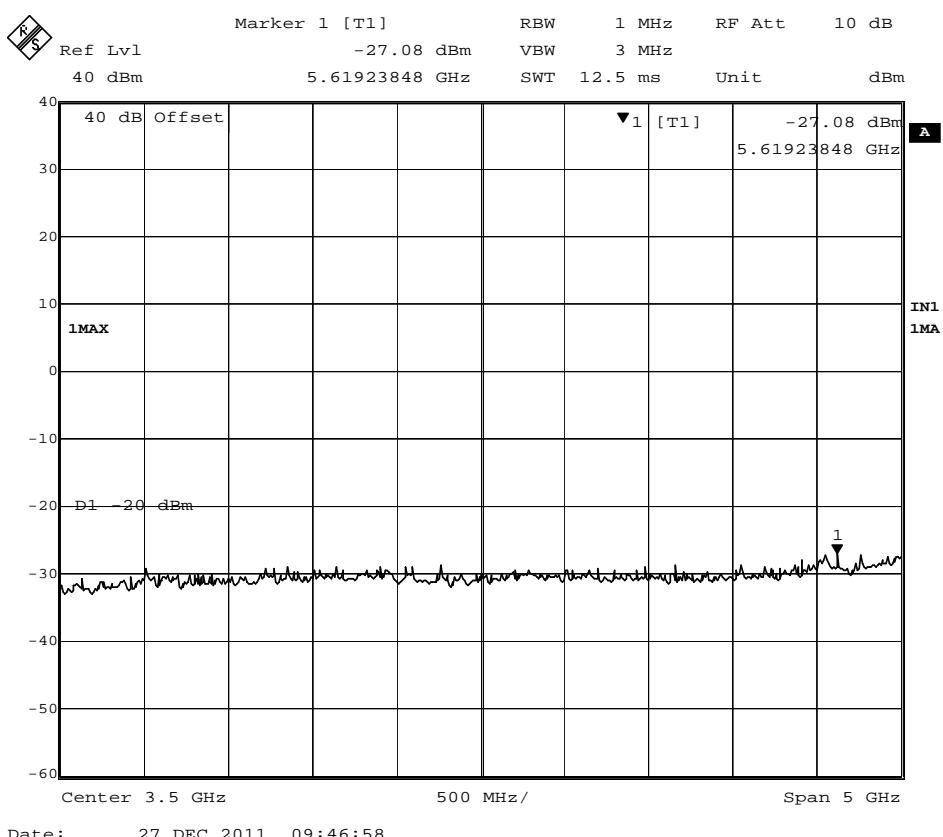
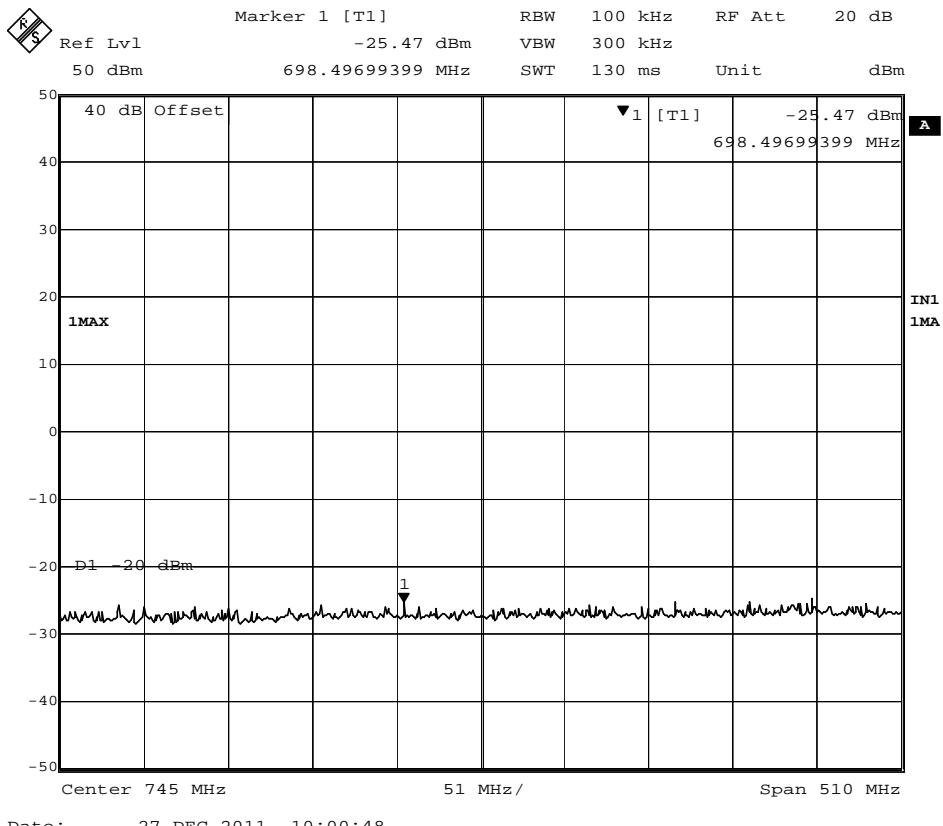
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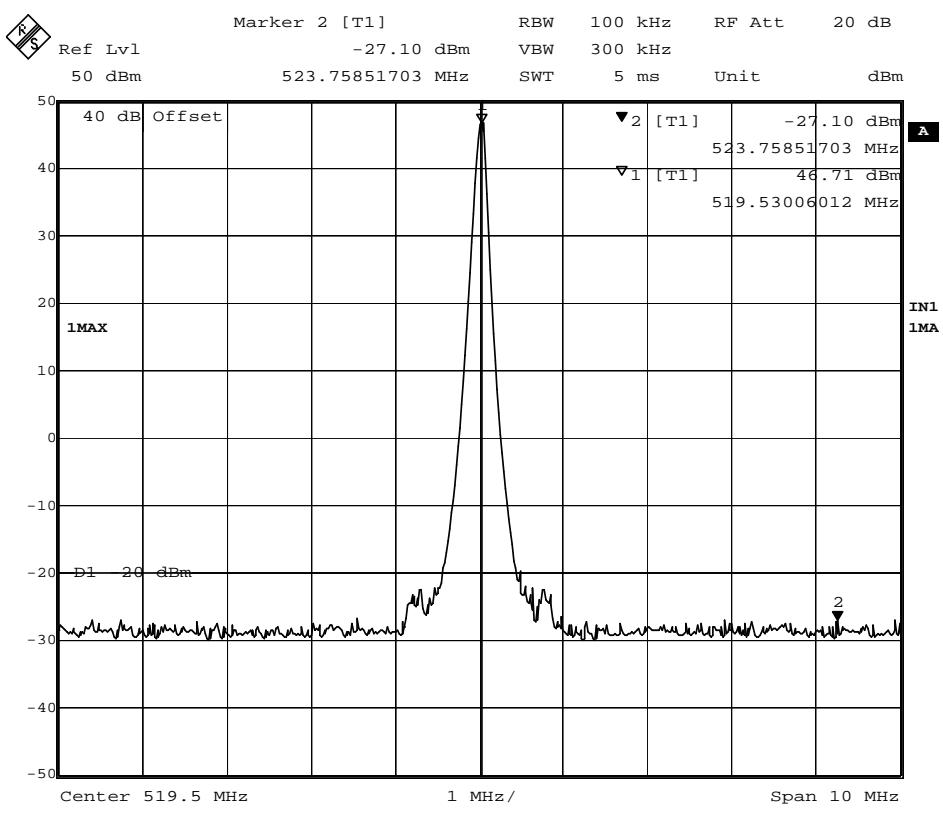
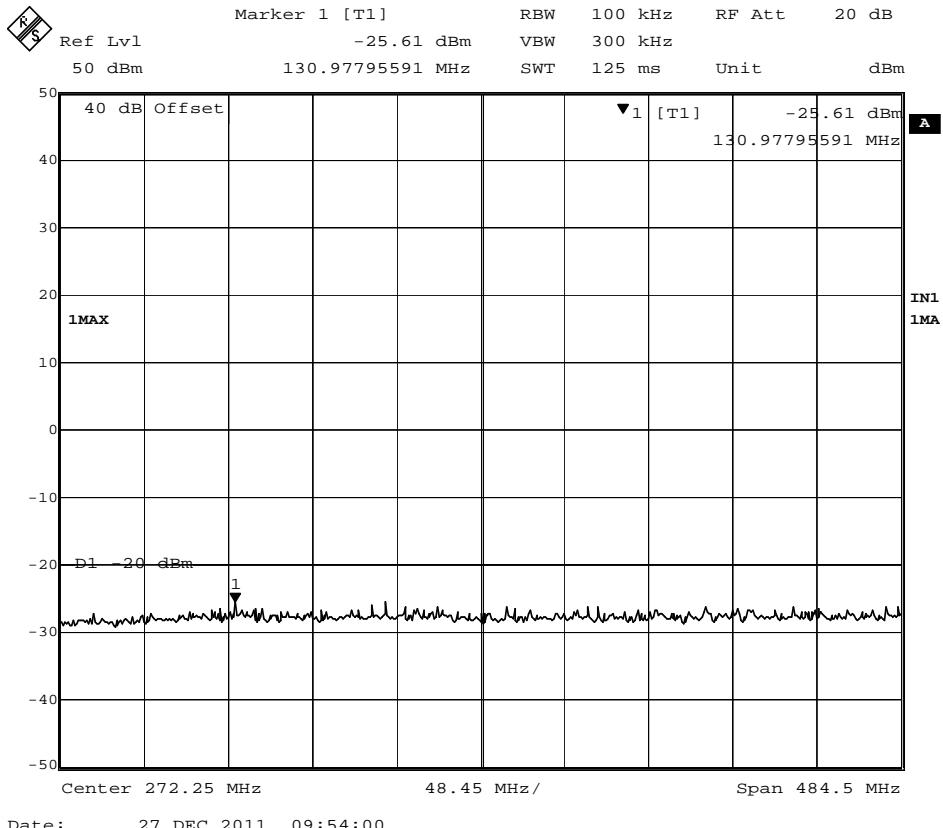
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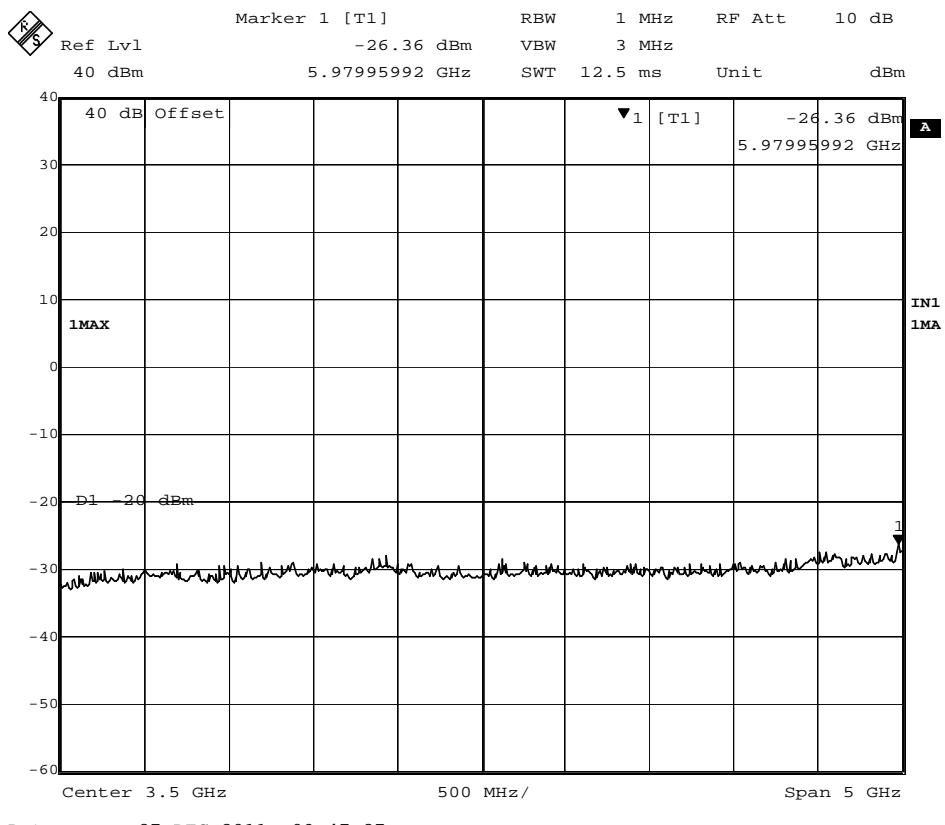
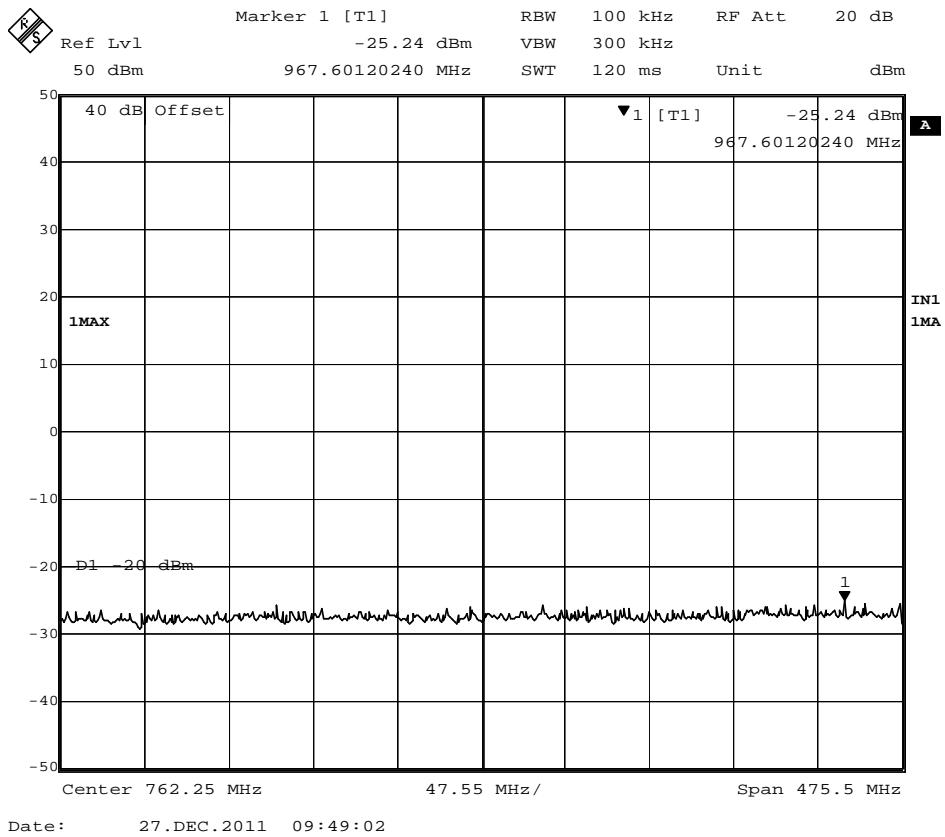
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
4FSK	12.5KHz	Middle	485.0000	463.77	-25.40	5619.24	-27.08	-20dBm
Test Results				Compliance				





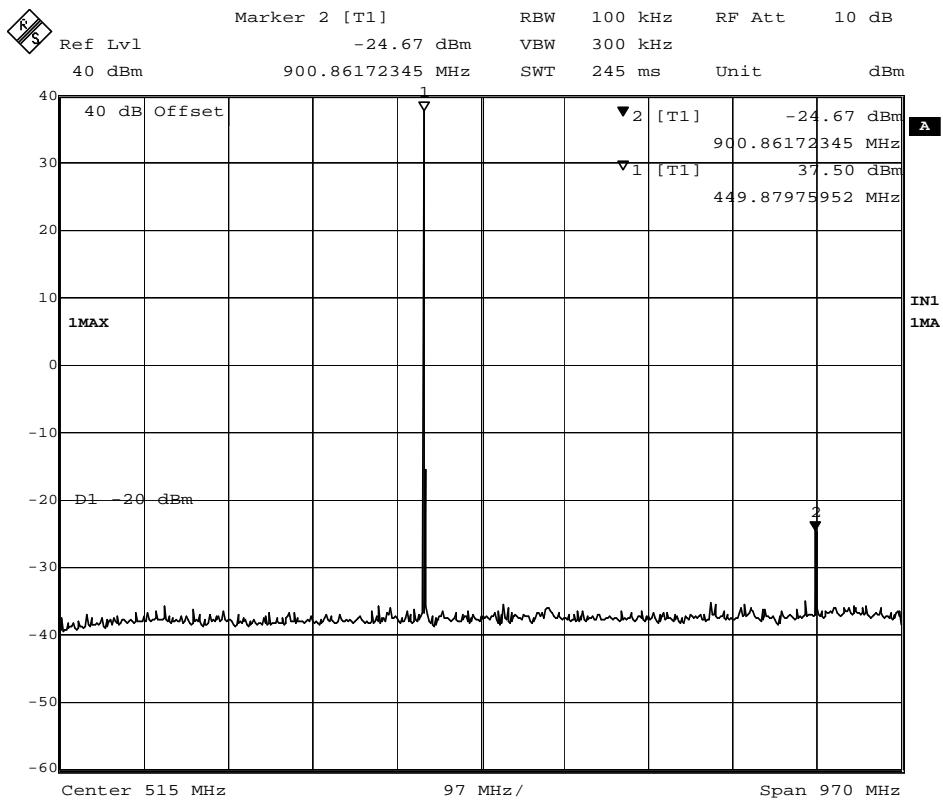
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
4FSK	12.5KHz	High	519.5000	967.60	-25.24	5979.96	-26.36	-20dBm
Test Results				Compliance				



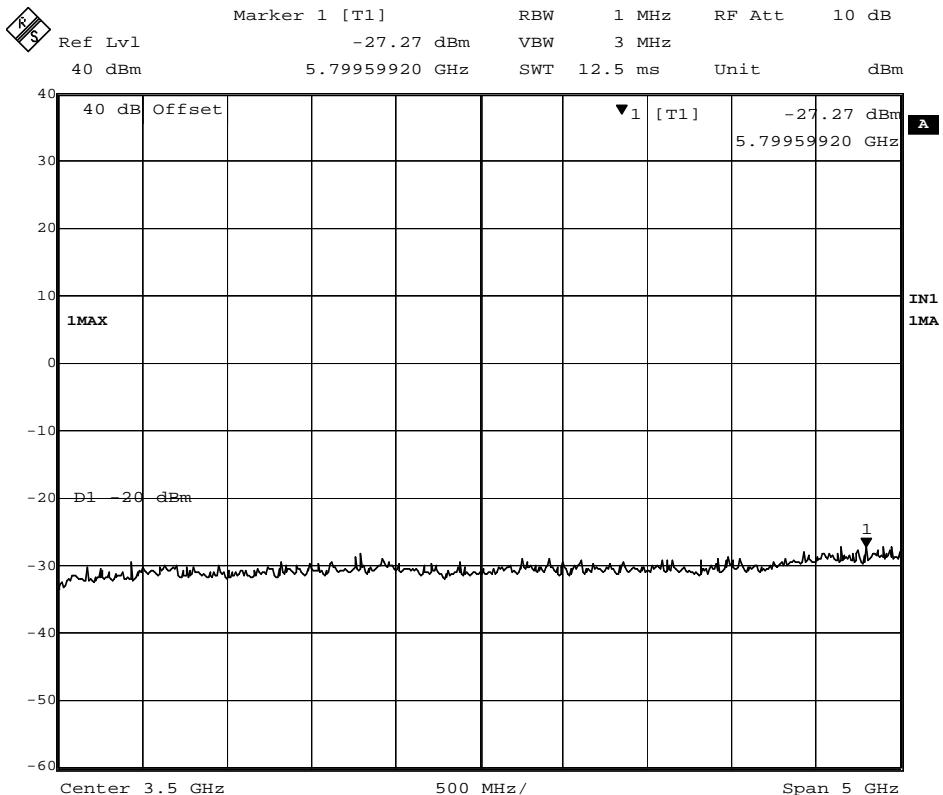


For Rated Low Power (5Watt)

Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	450.5000	900.86	-24.67	5799.60	-27.27	-20dBm
Test Results				Compliance				

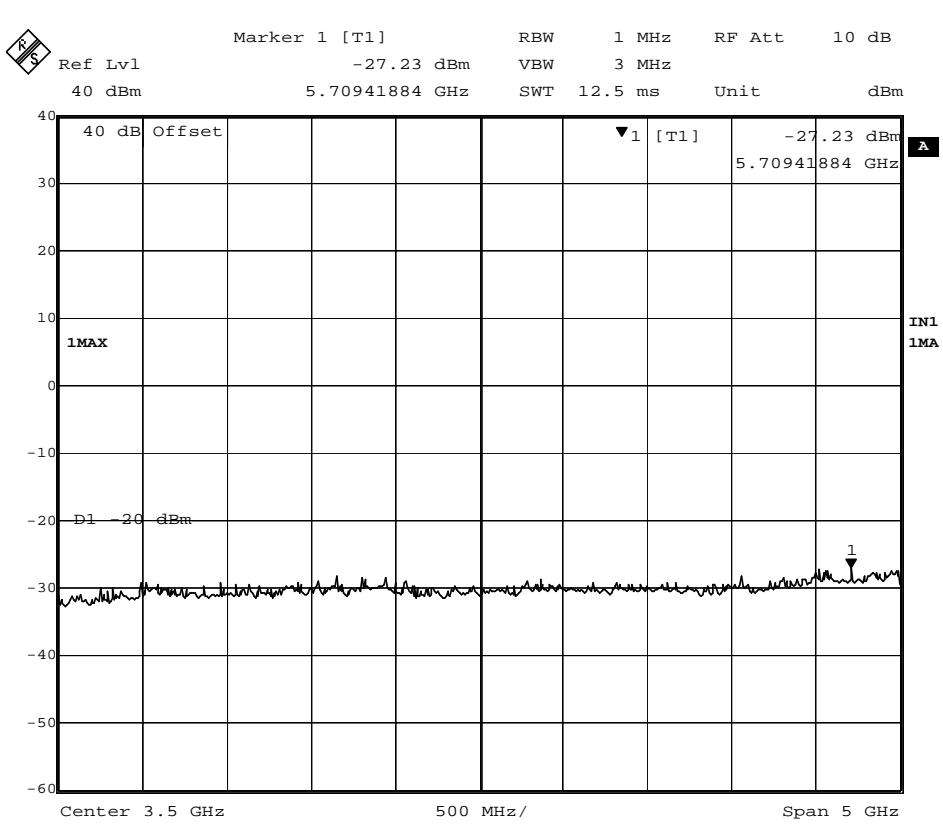
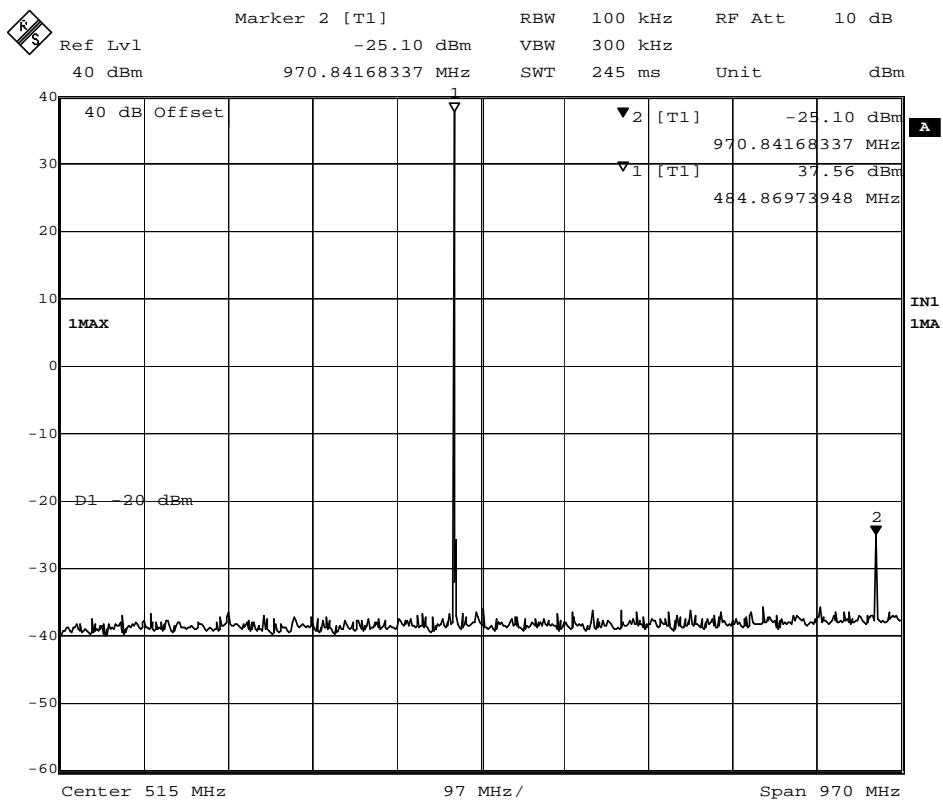


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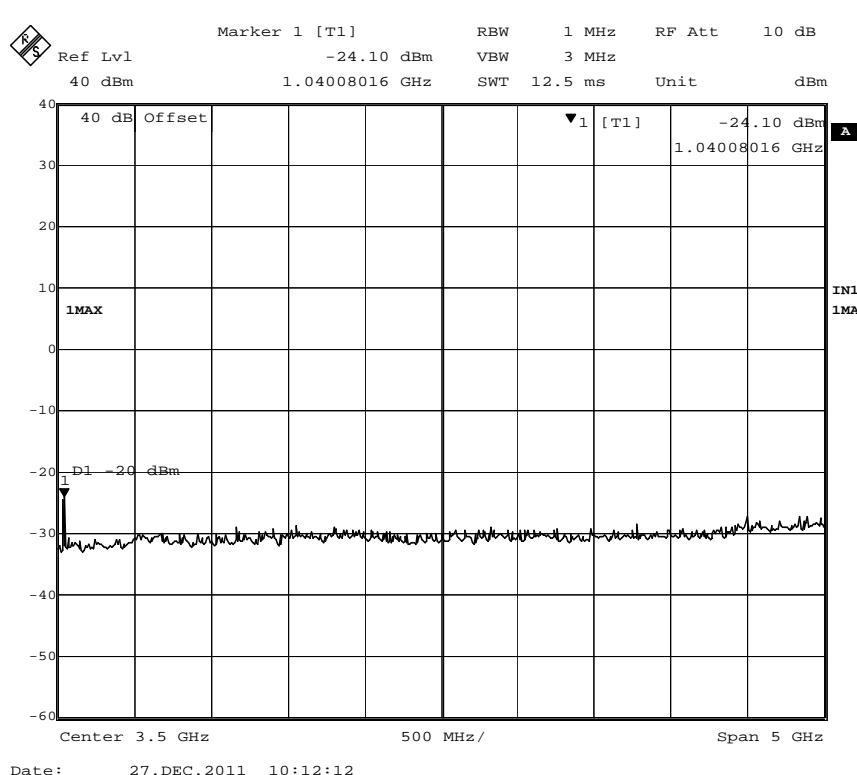
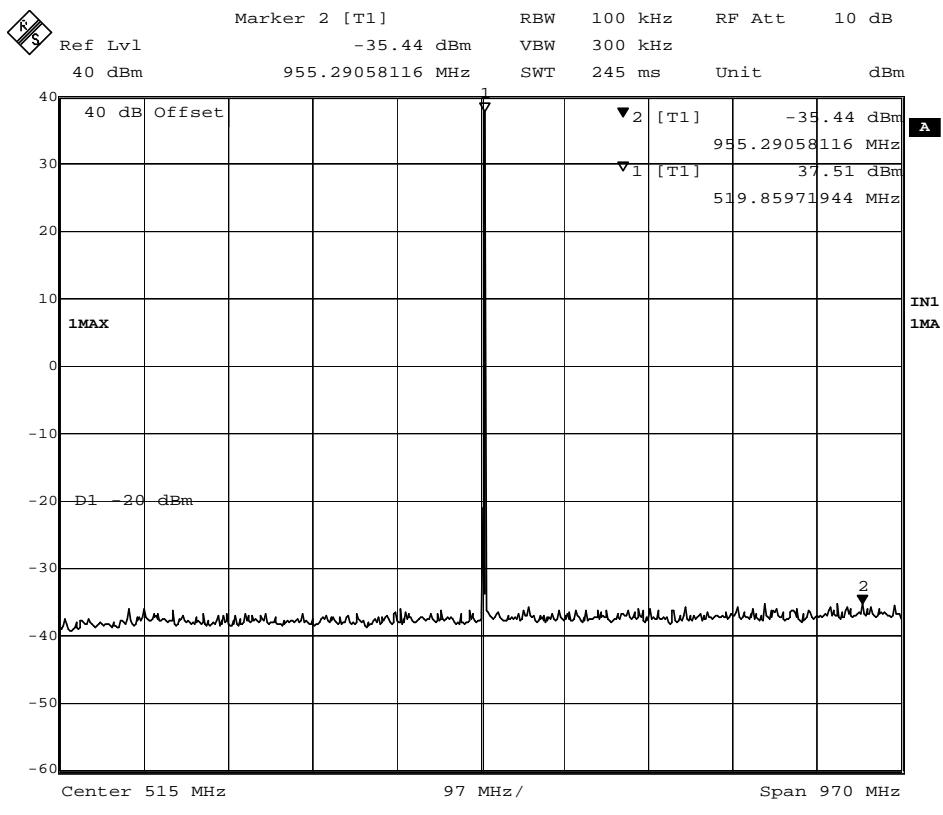


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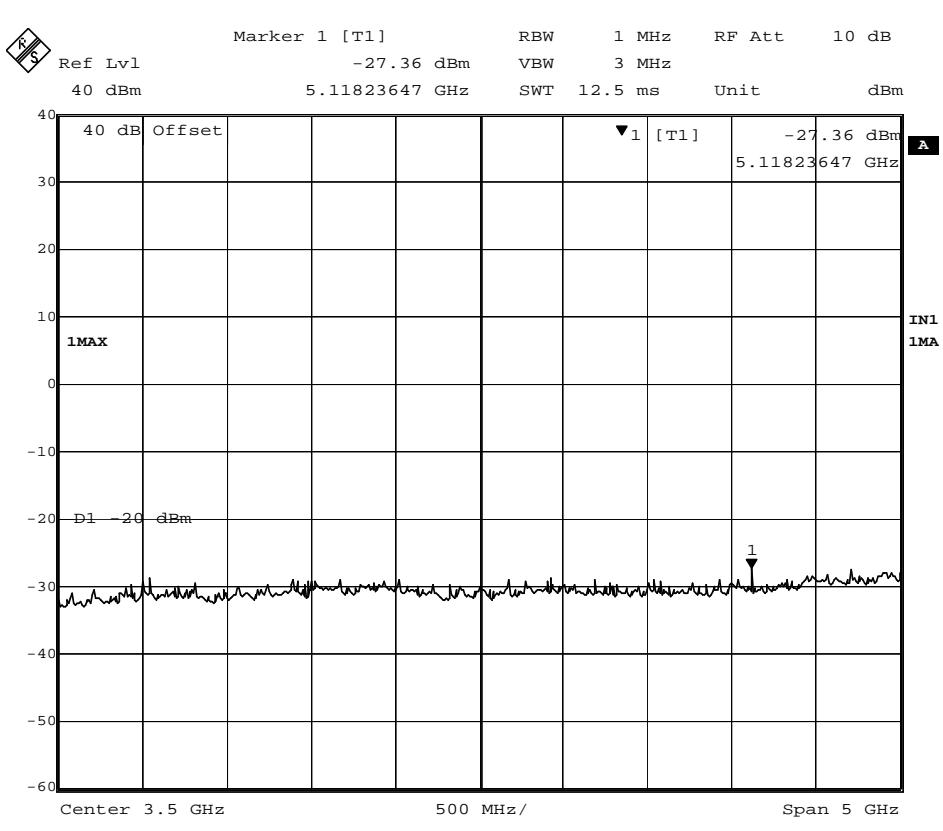
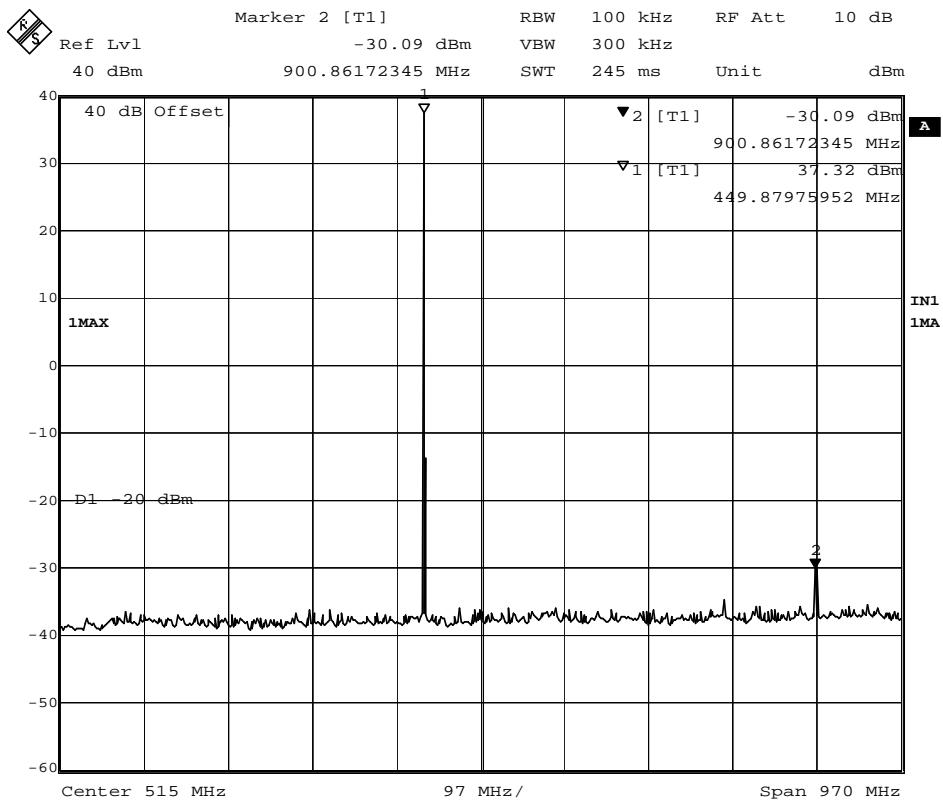
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	485.0000	970.84	-25.10	5709.42	-27.23	-20dBm
Test Results				Compliance				



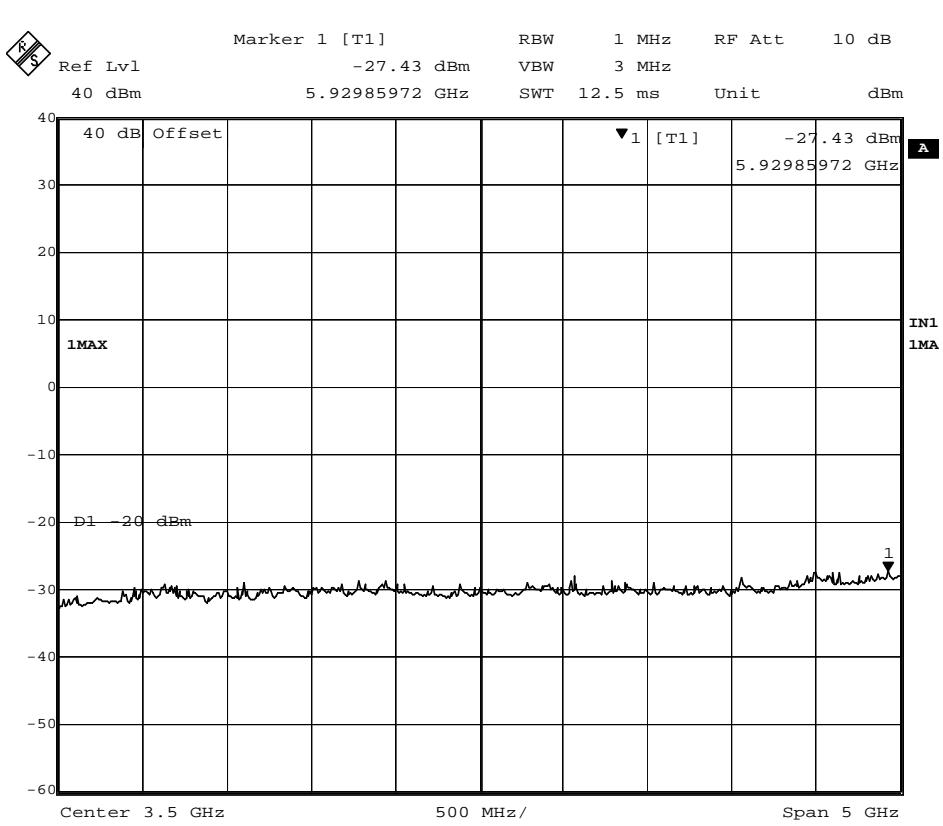
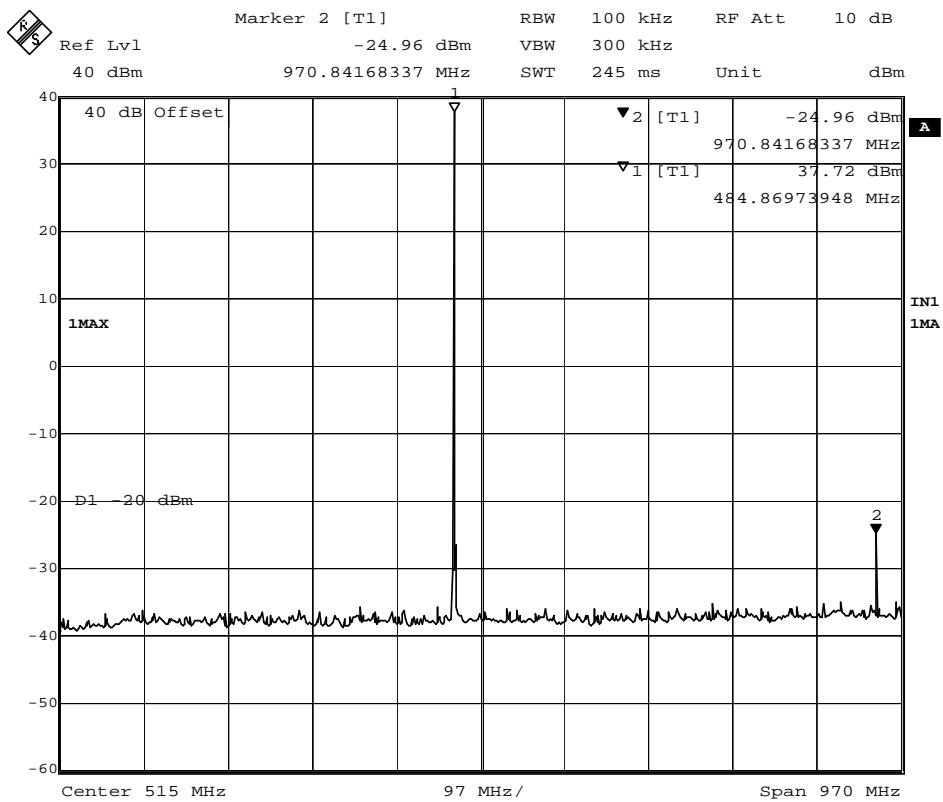
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	High	519.5000	955.29	-35.44	1040.08	-24.10	-20dBm
Test Results				Compliance				



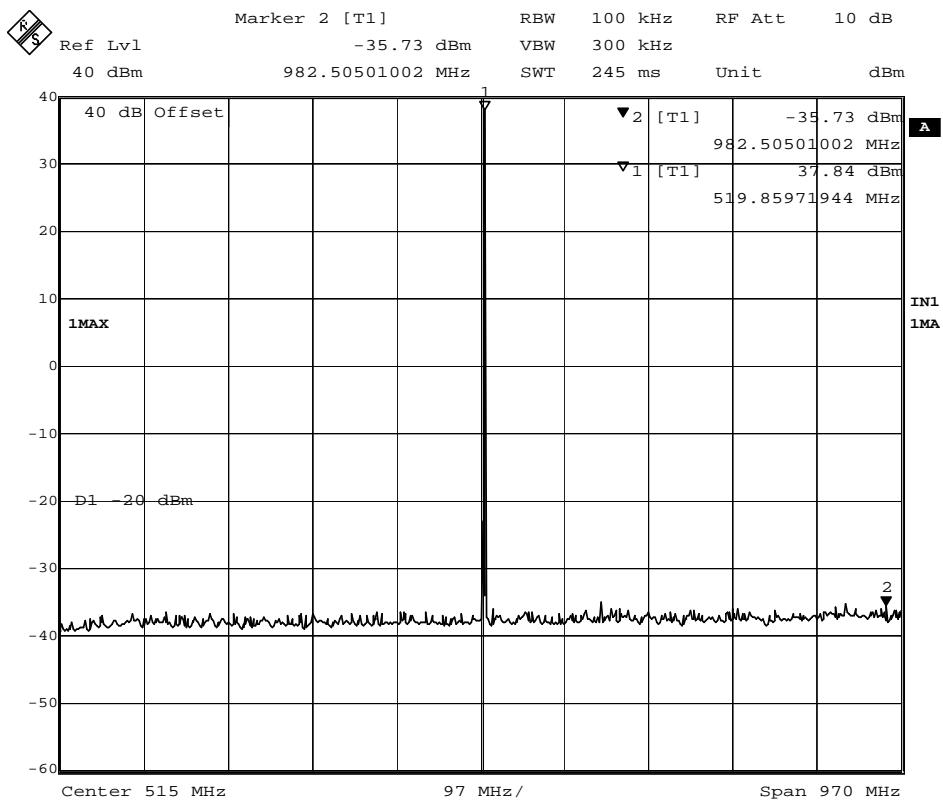
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
4FSK	12.5KHz	Low	450.5000	900.86	-30.09	5118.24	-27.36	-20dBm
Test Results								



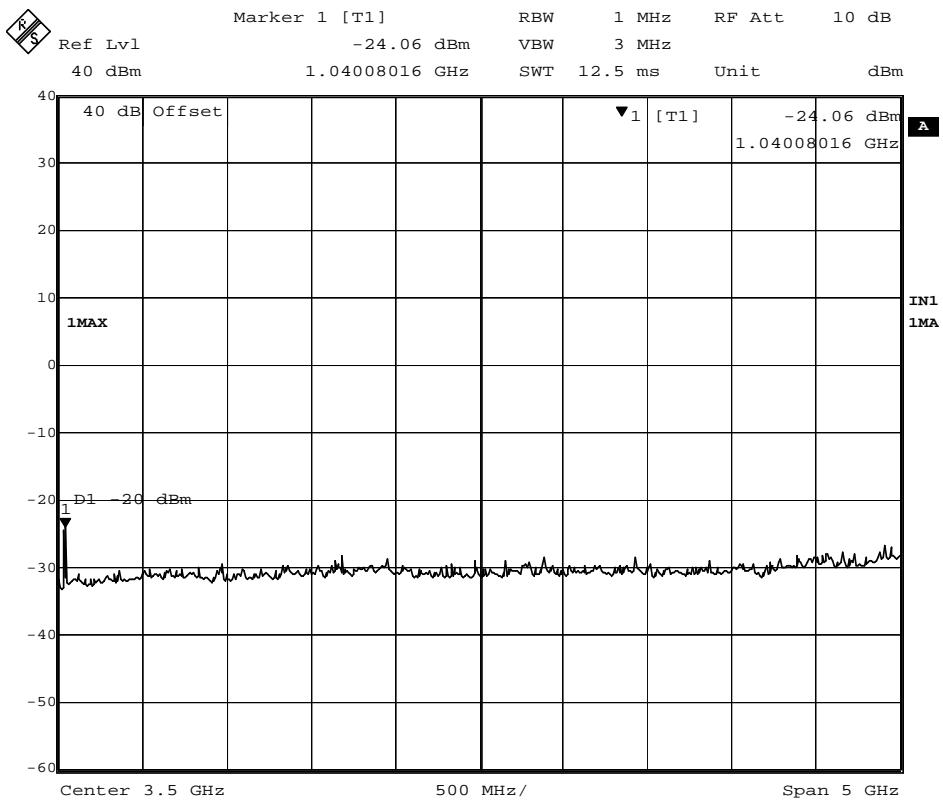
Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
4FSK	12.5KHz	Middle	485.0000	970.84	-24.96	5929.86	-27.43	-20dBm
Test Results				Compliance				



Modulation Type	Channel Sparation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
4FSK	12.5KHz	High	519.5000	982.51	-35.73	1040.08	-24.06	-20dBm
Test Results				Compliance				



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4.5. Modulation Characteristics

TEST APPLICABLE

According to CFR47 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

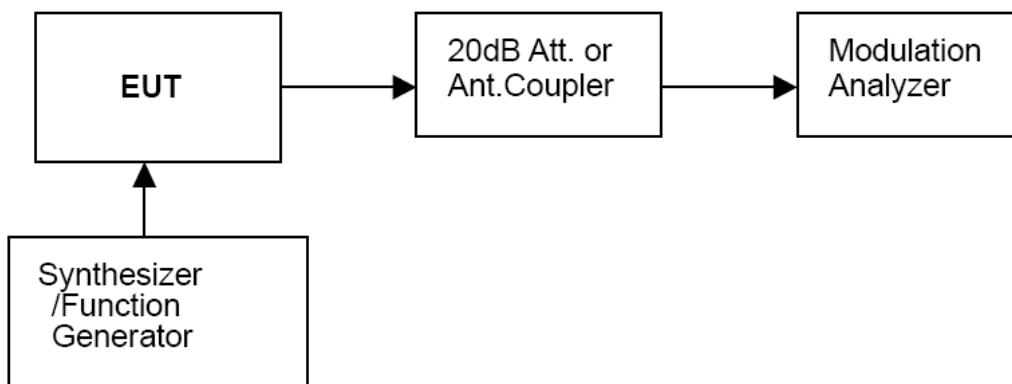
Modulation Limit

- 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 = $20\log_{10}(\text{Deviation of test frequency}/\text{Deviation of 1 KHz reference})$.

TEST CONFIGURATION

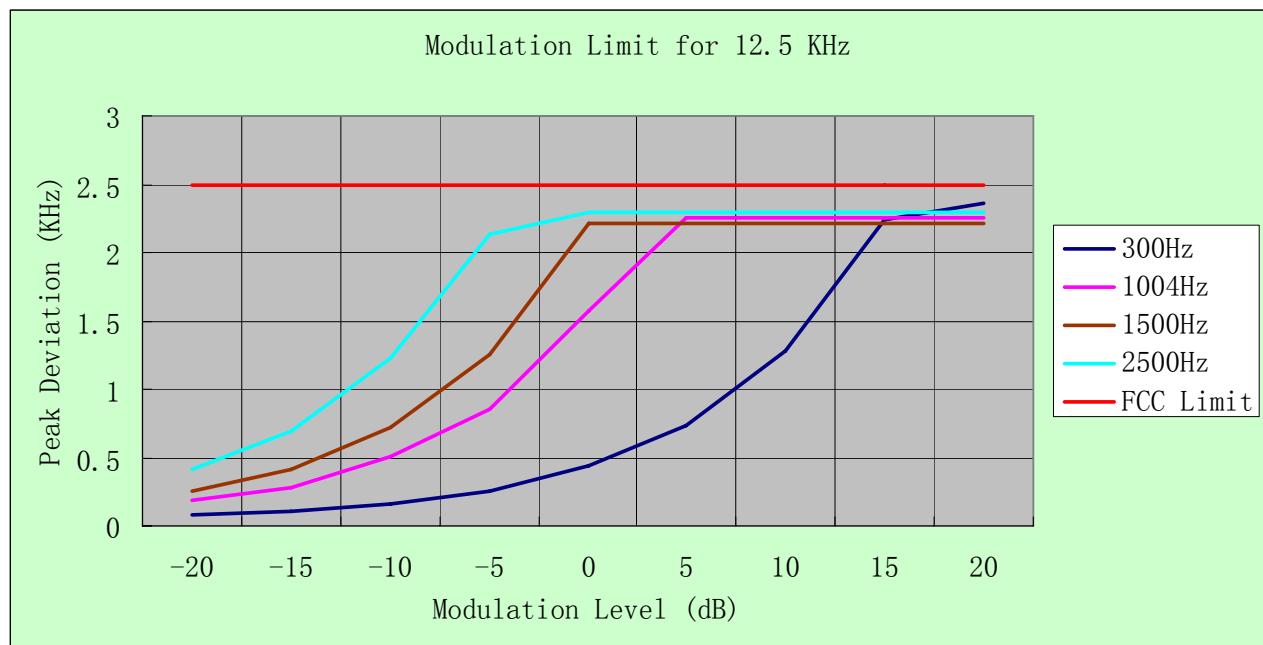


TEST RESULTS

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	0.19	0.25	0.42
-15	0.11	0.28	0.41	0.69
-10	0.16	0.51	0.72	1.23
-5	0.26	0.86	1.25	2.14
0	0.44	1.57	2.21	2.30
+5	0.73	2.26	2.21	2.30
+10	1.28	2.26	2.21	2.30
+15	2.24	2.26	2.21	2.30
+20	2.36	2.26	2.21	2.30



Modulation type: 4FSK

Channel bandwidth: 12.5 kHz

It is not applicable for devices which operate with the digitized voice/data modulation type.

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

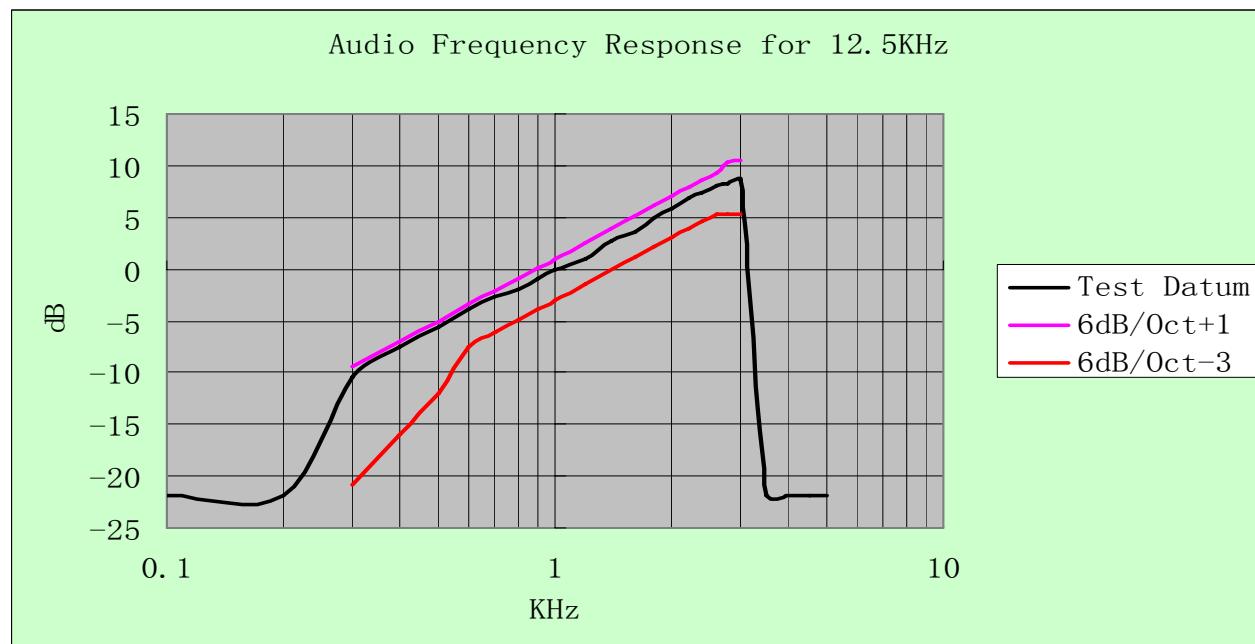
Test Audio Level (1 KHz and 20% maximum deviation) for 12.5 KHz channel separation is 23 mv.

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 Reference Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.04	0.50	-21.94
0.2	0.04	0.50	-21.94
0.3	0.15	0.50	-10.46
0.4	0.21	0.50	-7.54
0.5	0.26	0.50	-5.68
0.6	0.32	0.50	-3.88
0.7	0.37	0.50	-2.62
0.8	0.40	0.50	-1.94
0.9	0.45	0.50	-0.92
1.0	0.50	0.50	0.00
1.2	0.56	0.50	0.98
1.4	0.68	0.50	2.67
1.6	0.75	0.50	3.52
1.8	0.89	0.50	5.00
2.0	0.97	0.50	5.75
2.2	1.11	0.50	6.92
2.4	1.16	0.50	7.30
2.6	1.28	0.50	8.16
2.7	1.30	0.50	8.29
2.8	1.30	0.50	8.29
3.0	1.34	0.50	8.56
3.5	0.04	0.50	-21.94
4.0	0.04	0.50	-21.94
4.5	0.04	0.50	-21.94
5.0	0.04	0.50	-21.94

Modulation type: 4FSK

Channel bandwidth: 12.5 kHz

It is not applicable for devices which operate with the digitized voice/data modulation type.

4.6. Frequency Stability Test

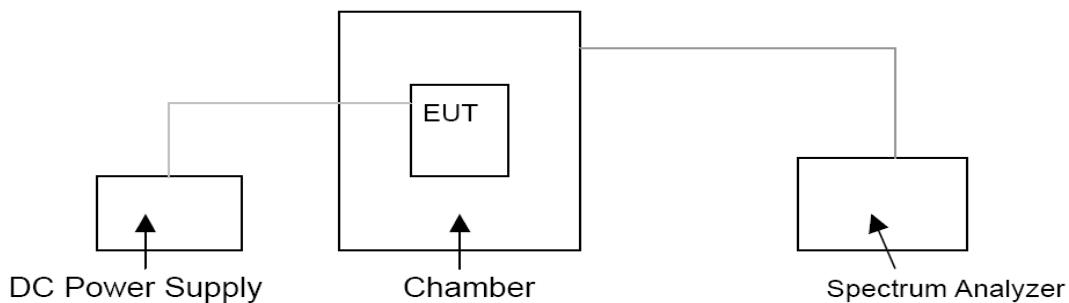
TEST APPLICABLE

- 1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +60°C 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 manufacturer.
- 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(°C)	Low Channel	Middle Channel	High Channel	
Analog/FM	12.5KHz	13.60	-30	1.41	1.38	1.35	
			-20	1.22	1.20	1.02	
			-10	0.99	0.97	0.95	
			0	0.81	0.89	0.88	
			10	0.58	0.75	0.69	
			20	0.58	0.69	0.69	
			30	0.58	0.69	0.69	
			40	0.88	0.79	0.88	
			50	1.02	0.91	1.02	
			11.0 (85% Rated)	20	0.71	0.74	
			15.6 (115% Rated)	20	0.81	0.74	
Limit		2.5 ppm					
Conclusion		Complies					

Modulation Type	Channel Separation	Test conditions		Frequency error (ppm)			
		Voltage(V)	Temp(°C)	Low Channel	Middle Channel	High Channel	
Digital/4FSK	12.5KHz	13.60	-30	1.41	1.37	1.35	
			-20	1.25	1.25	1.10	
			-10	1.00	1.02	0.99	
			0	0.81	0.89	0.90	
			10	0.81	0.80	0.69	
			20	0.61	0.69	0.69	
			30	0.58	0.69	0.69	
			40	0.82	0.82	0.90	
			50	1.05	0.99	1.02	
			11.0 (85% Rated)	20	0.71	0.78	
			15.6 (115% Rated)	20	0.81	0.74	
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

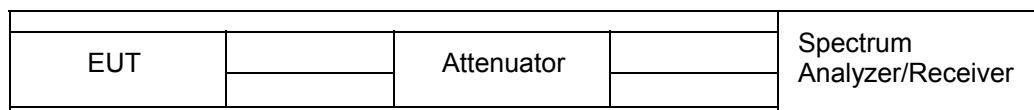
Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below:

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



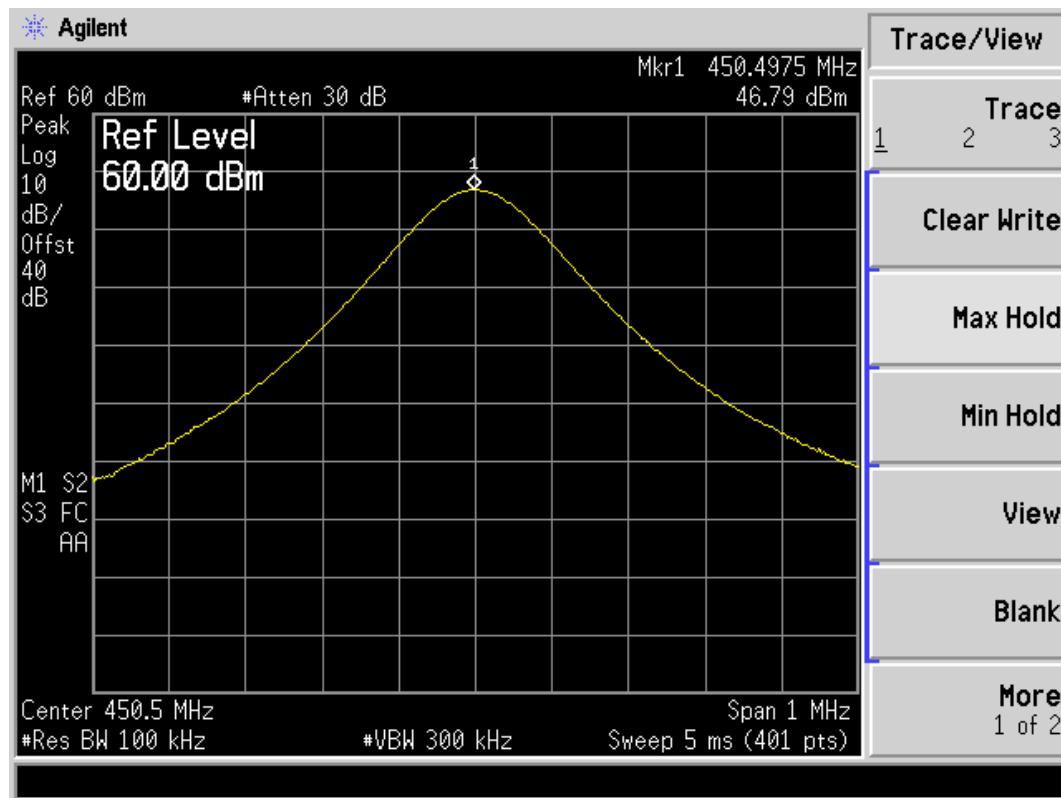
The EUT was directly connected to a RF Communication Test set by a 40 dB attenuator

TEST RESULTS

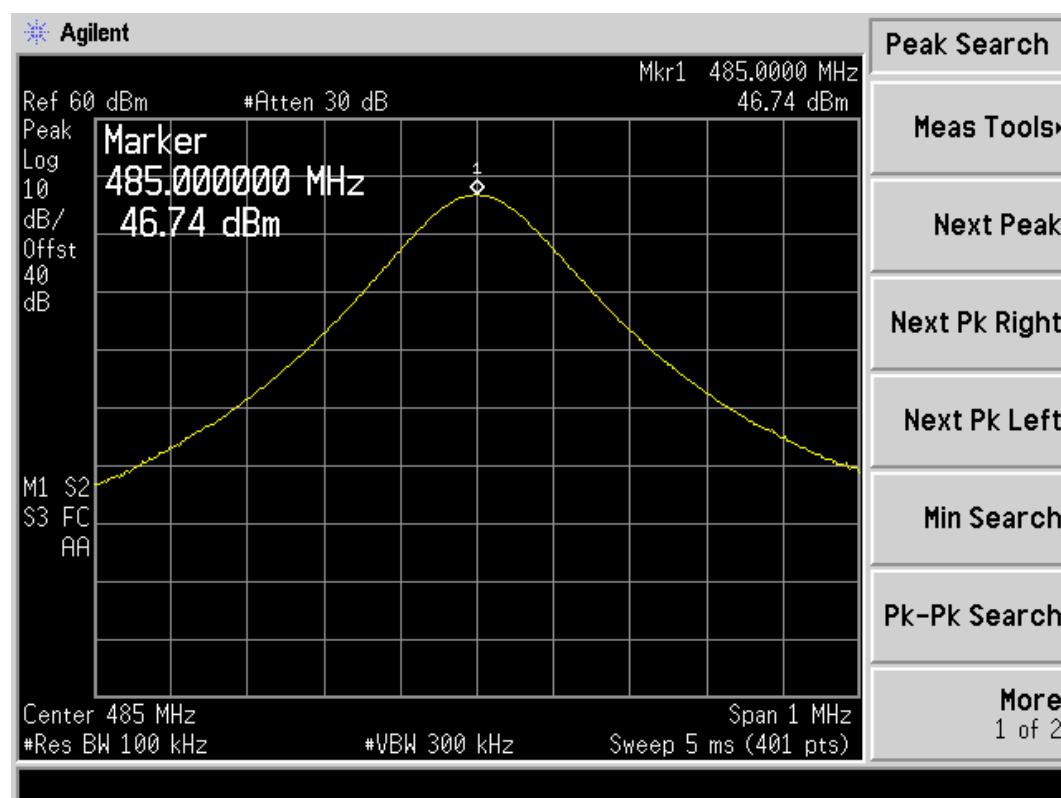
Modulation Type	Channel Separation	Test Channel	Test Frequency	Maximum Transmitter Power at Rated High Power Level(dBm)	Maximum Transmitter Power at Rated Low Power Level(dBm)	
Analog/FM	12.5KHz	Low Channel	450.5000 MHz	46.79	36.76	
		Middle Channel	485.0000 MHz	46.74	37.90	
		High Channel	519.5000 MHz	46.71	37.86	
Digital/4FSK	12.5KHz	Low Channel	450.5000 MHz	46.73	37.62	
		Middle Channel	485.0000 MHz	46.74	37.82	
		High Channel	519.5000 MHz	46.77	37.87	
Limit		The limit is dependent upon the station's antenna HAAT and required service area.				
Test Results		Compliance				

Plots of Maximum Transmitter Power Measurement

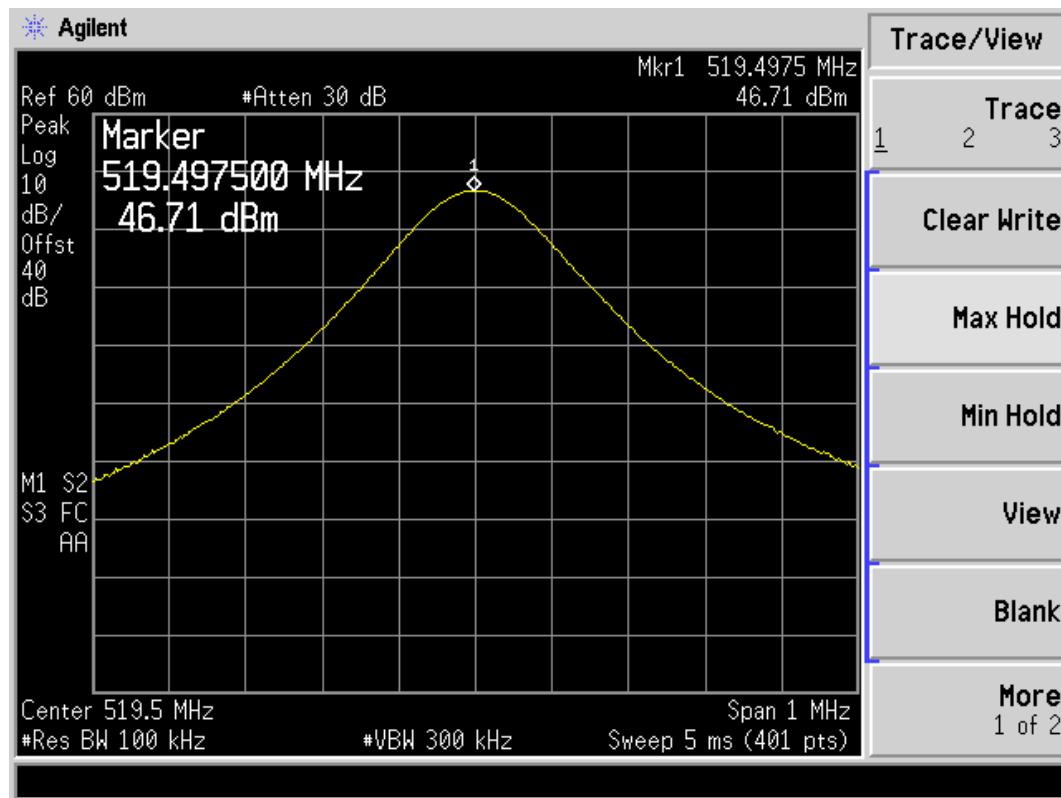
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	450.5000	45	46.79	Varies	Compliance



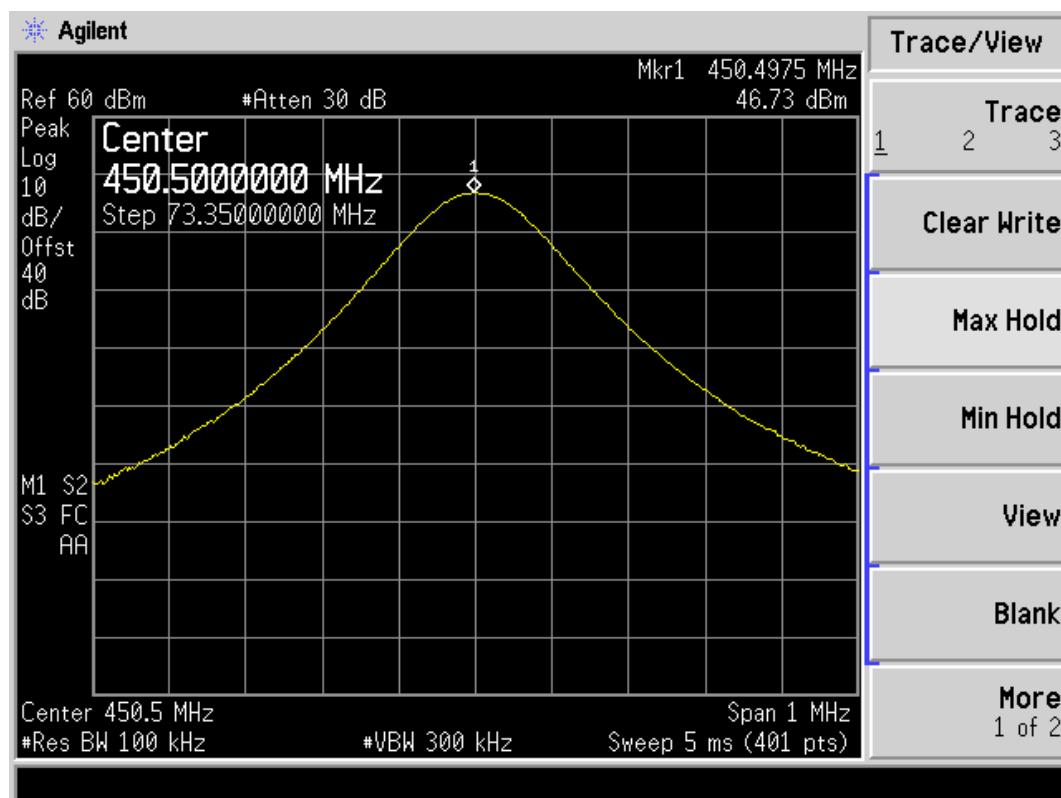
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	485.0000	45	46.74	Varies	Compliance



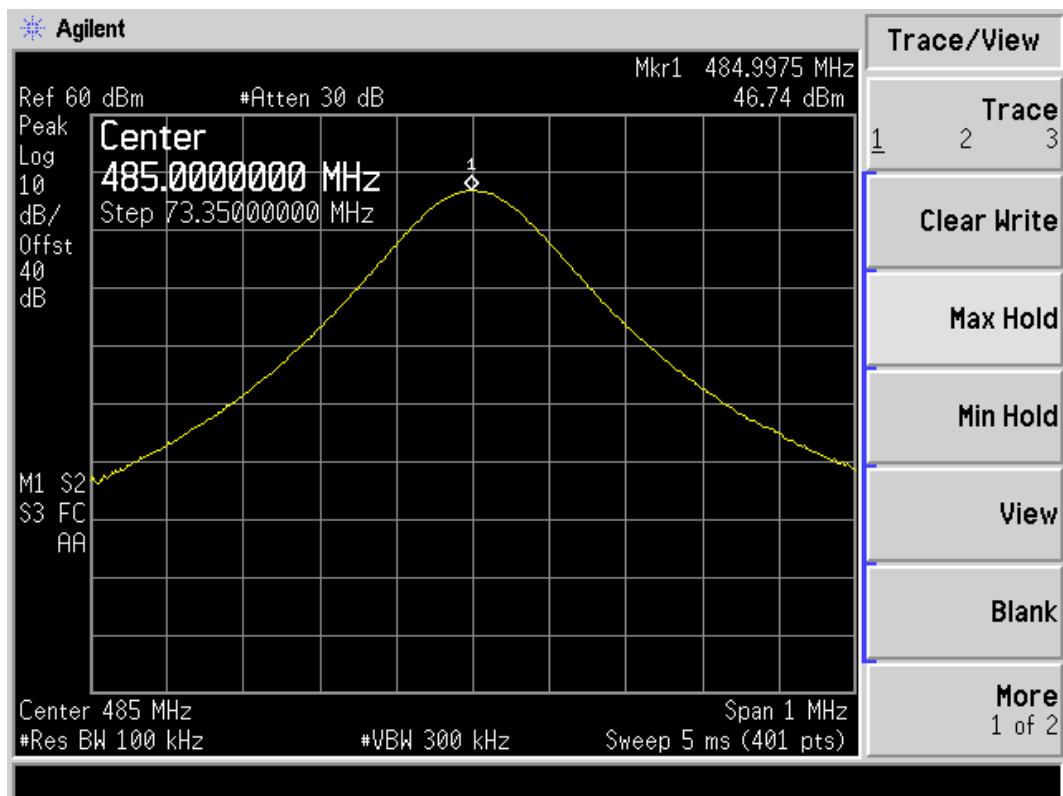
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	519.5000	45	46.71	Varies	Compliance



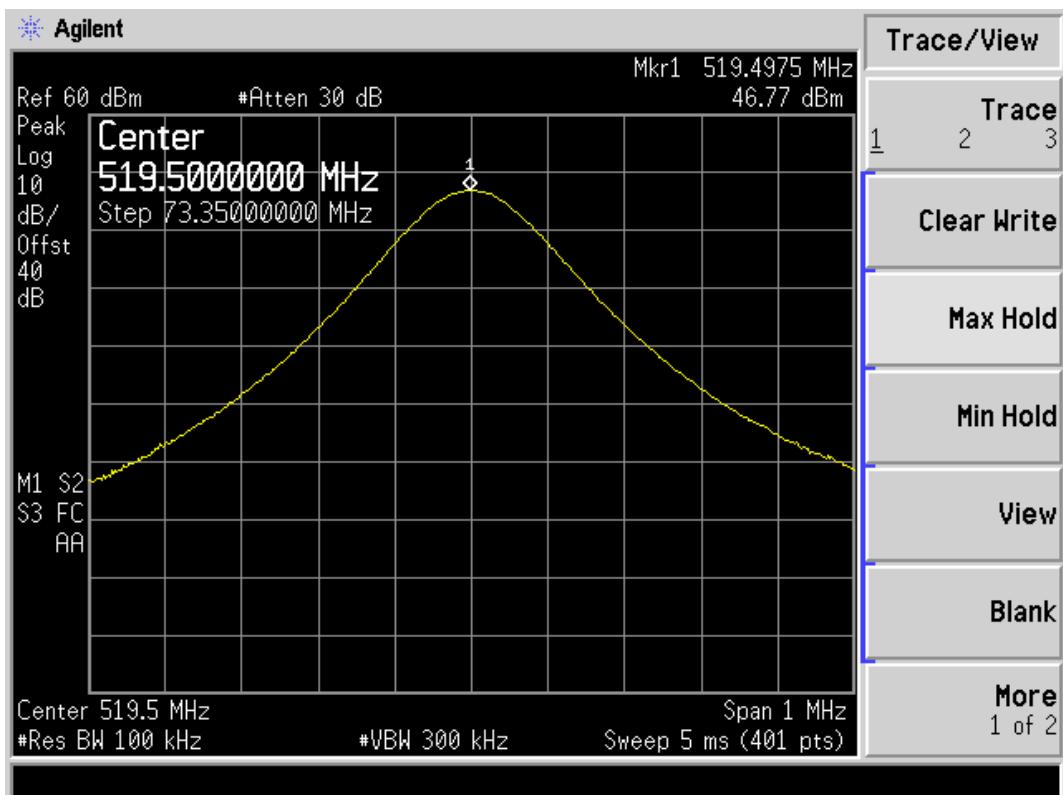
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
4FSK	12.5 KHz	450.5000	45	46.73	Varies	Compliance



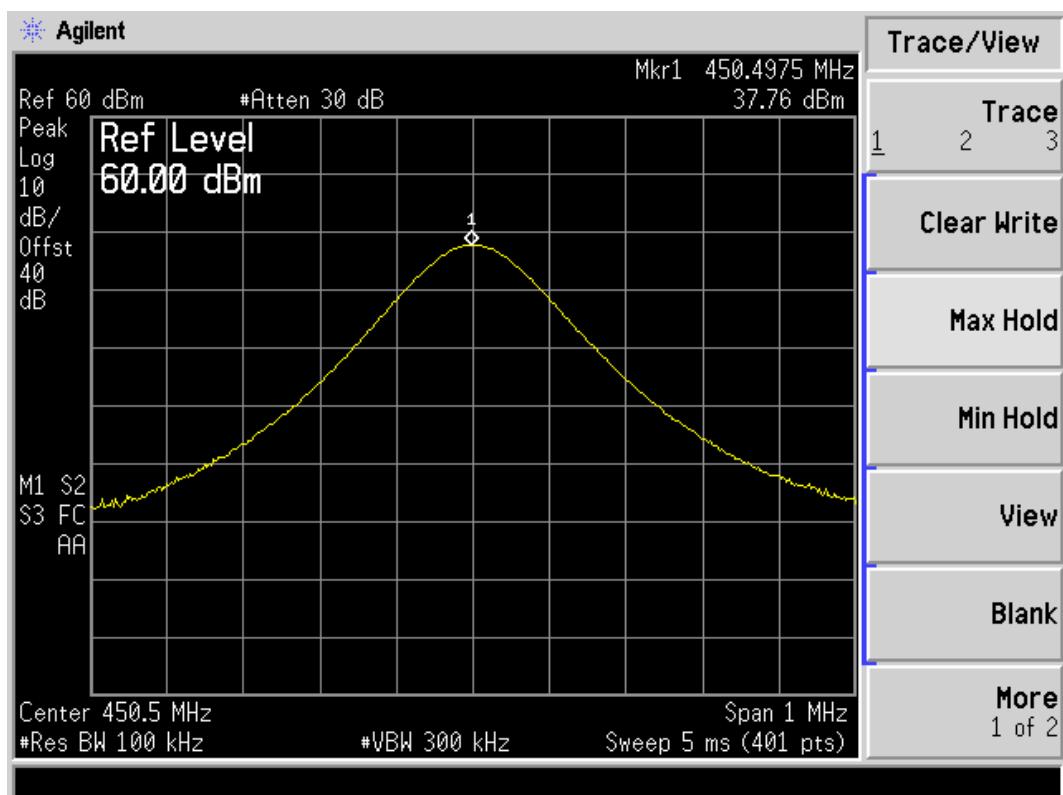
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
4FSK	12.5 KHz	485.0000	45	46.74	Varies	Compliance



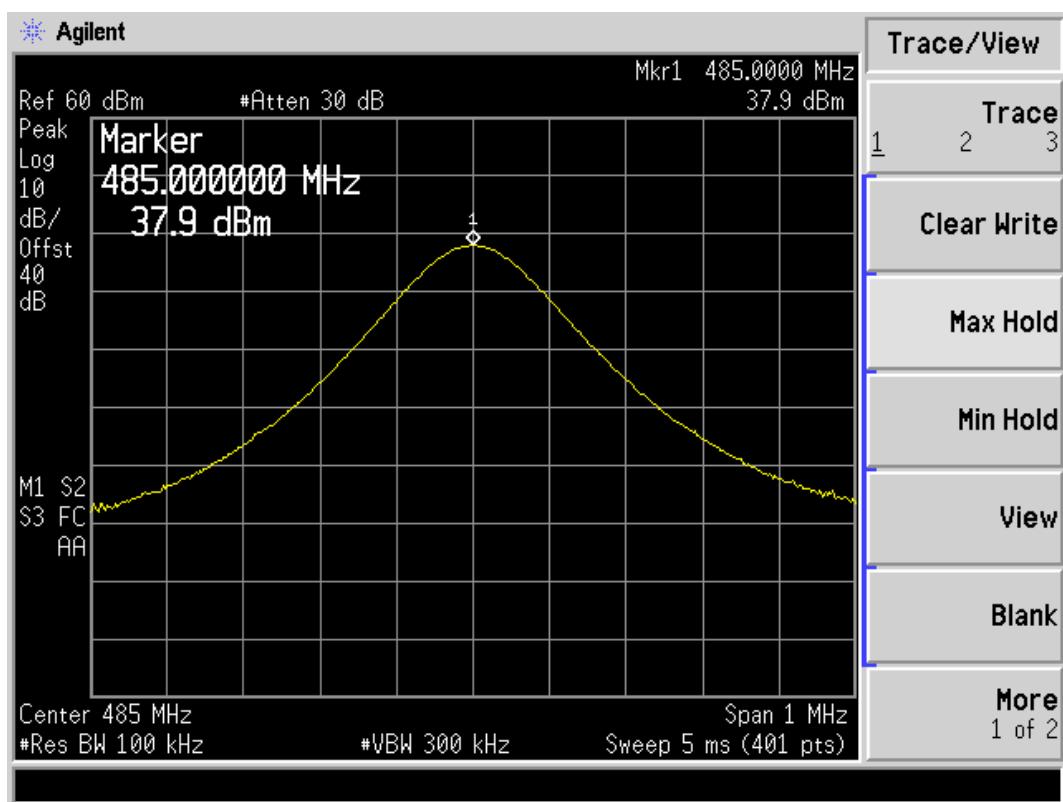
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
4FSK	12.5 KHz	519.5000	45	46.77	Varies	Compliance



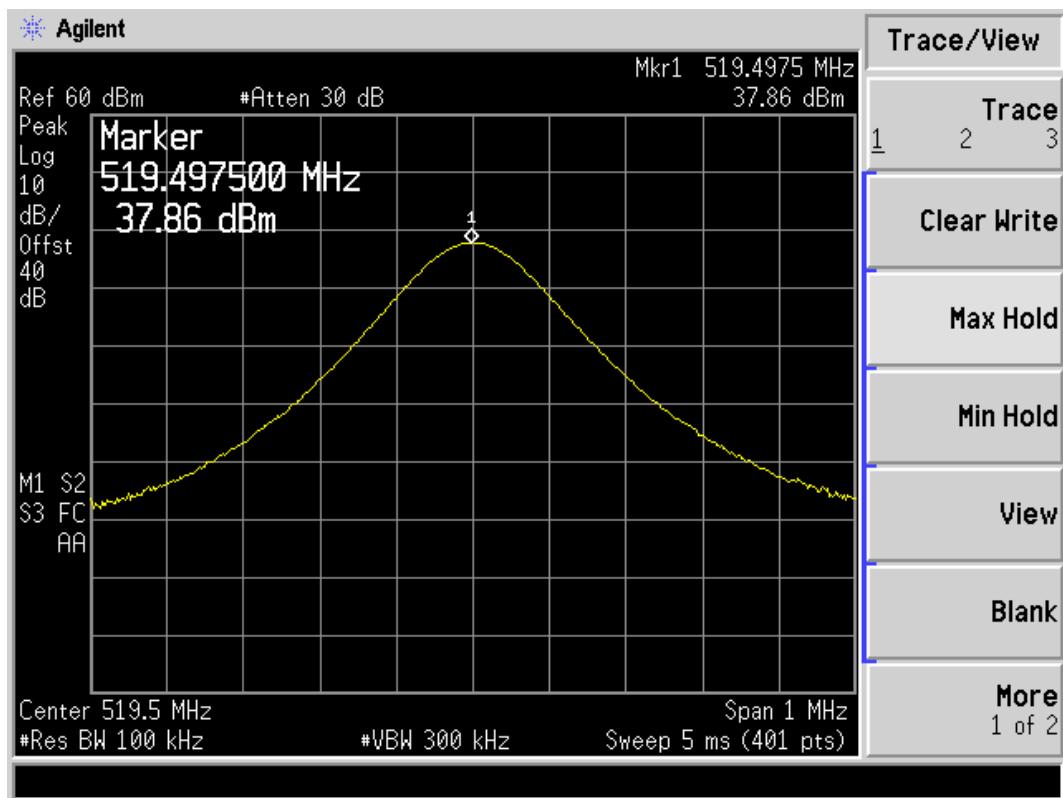
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	450.5000	5	37.76	Varies	Compliance



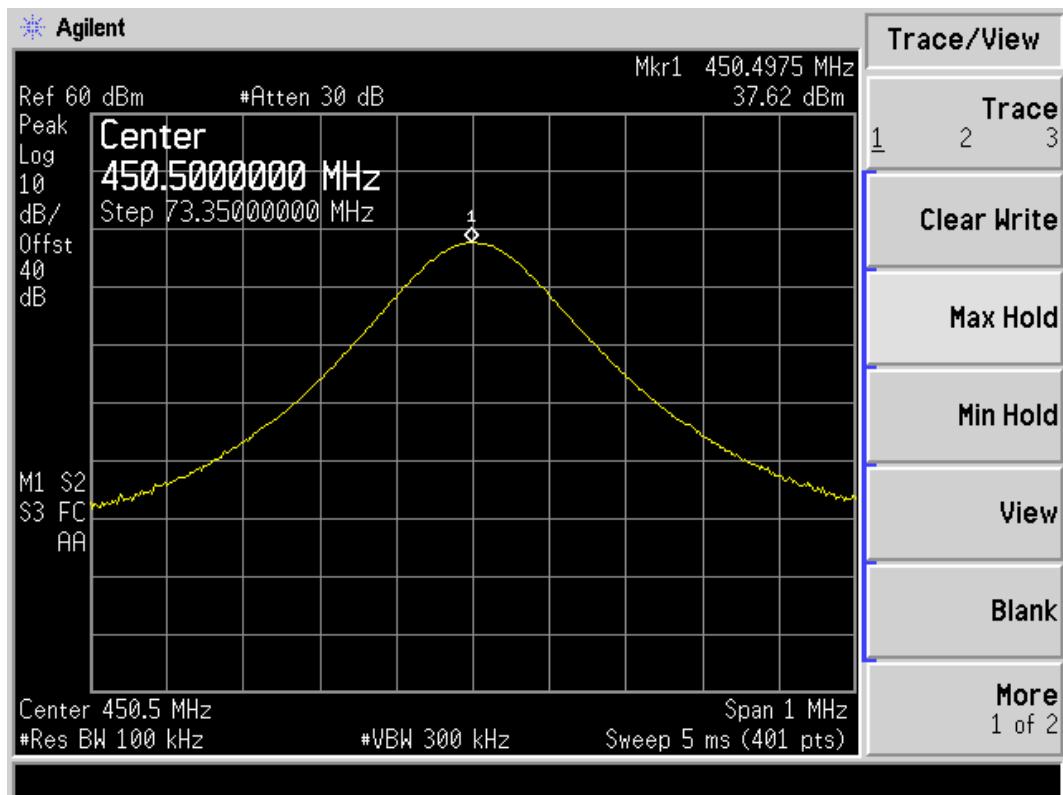
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	485.0000	5	37.90	Varies	Compliance



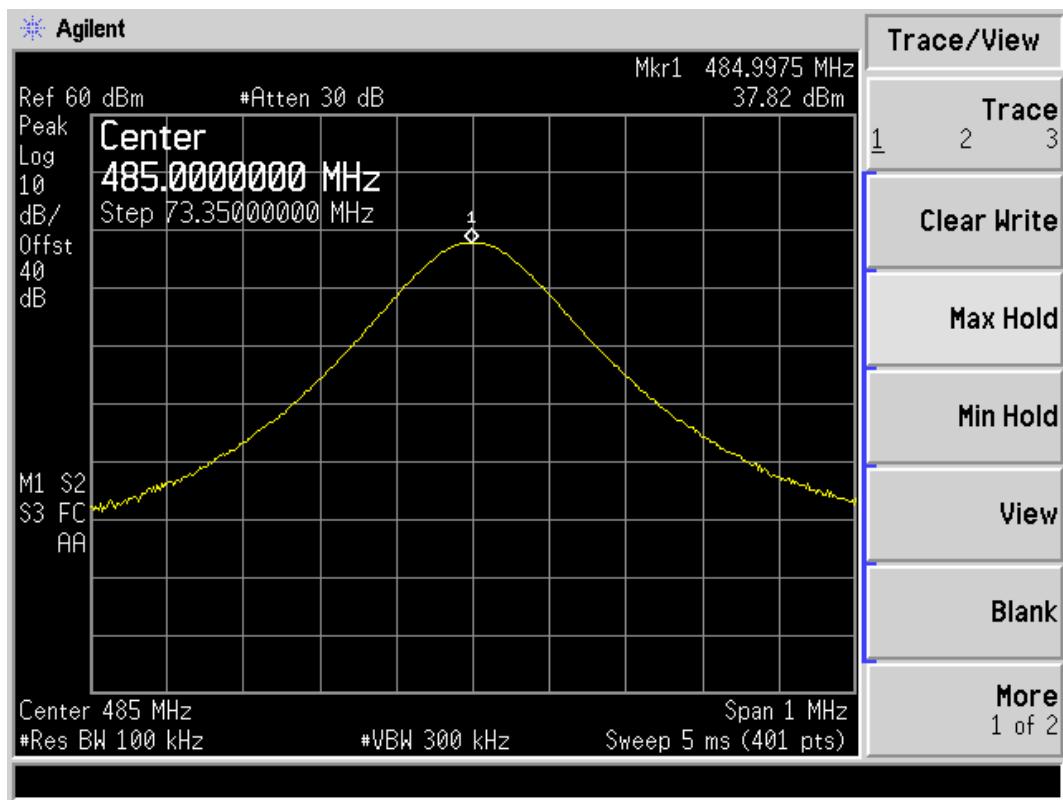
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	519.5000	5	37.86	Varies	Compliance



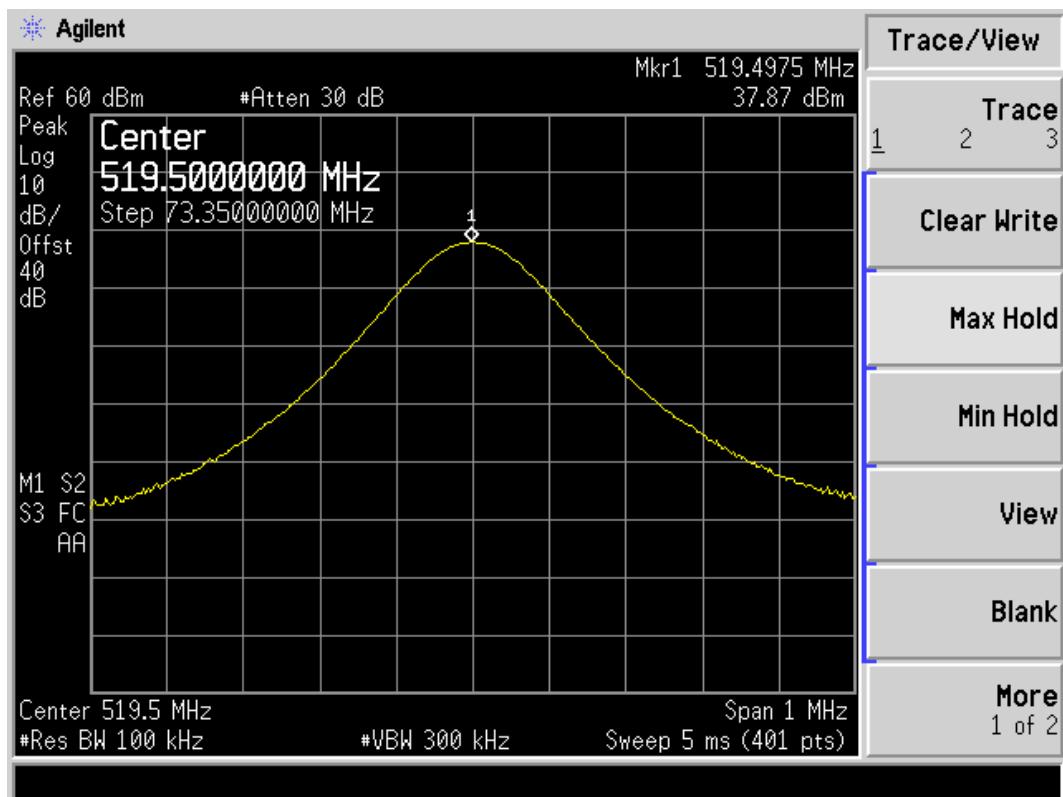
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
4FSK	12.5 KHz	450.5000	5	37.62	Varies	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
4FSK	12.5 KHz	485.0000	5	37.82	Varies	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
4FSK	12.5 KHz	519.5000	5	37.87	Varies	Compliance



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:

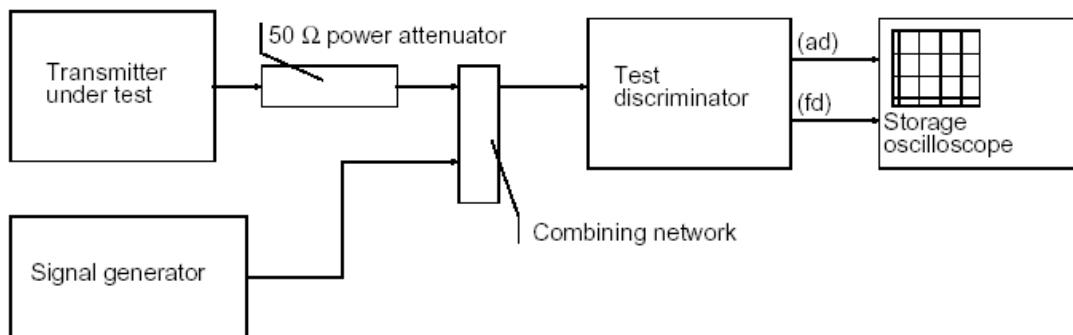
Time intervals ^{1, 2}	Maximum frequency difference ³	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t_1 ⁴	± 25.0 KHz	5.0 ms	10.0 ms
t_2	± 12.5 KHz	20.0 ms	25.0 ms
t_3 ⁴	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior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

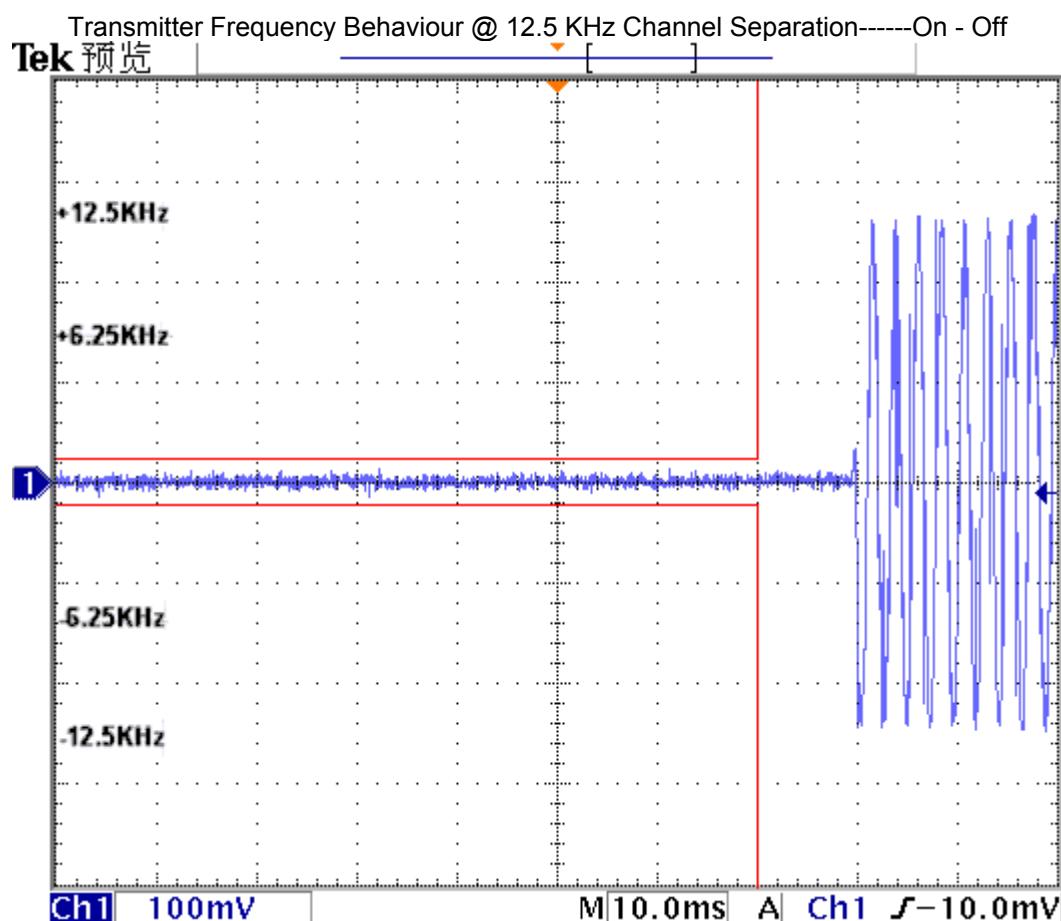
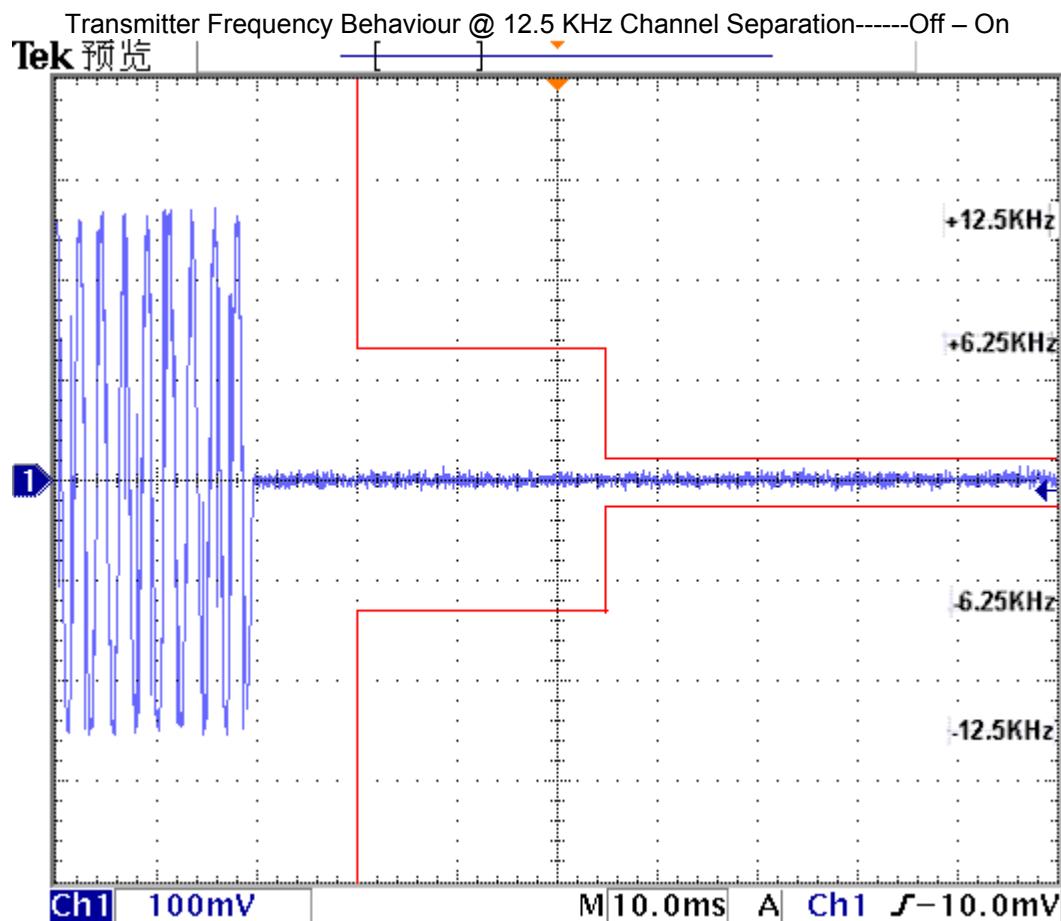
TEST CONFIGURATION



TEST RESULTS

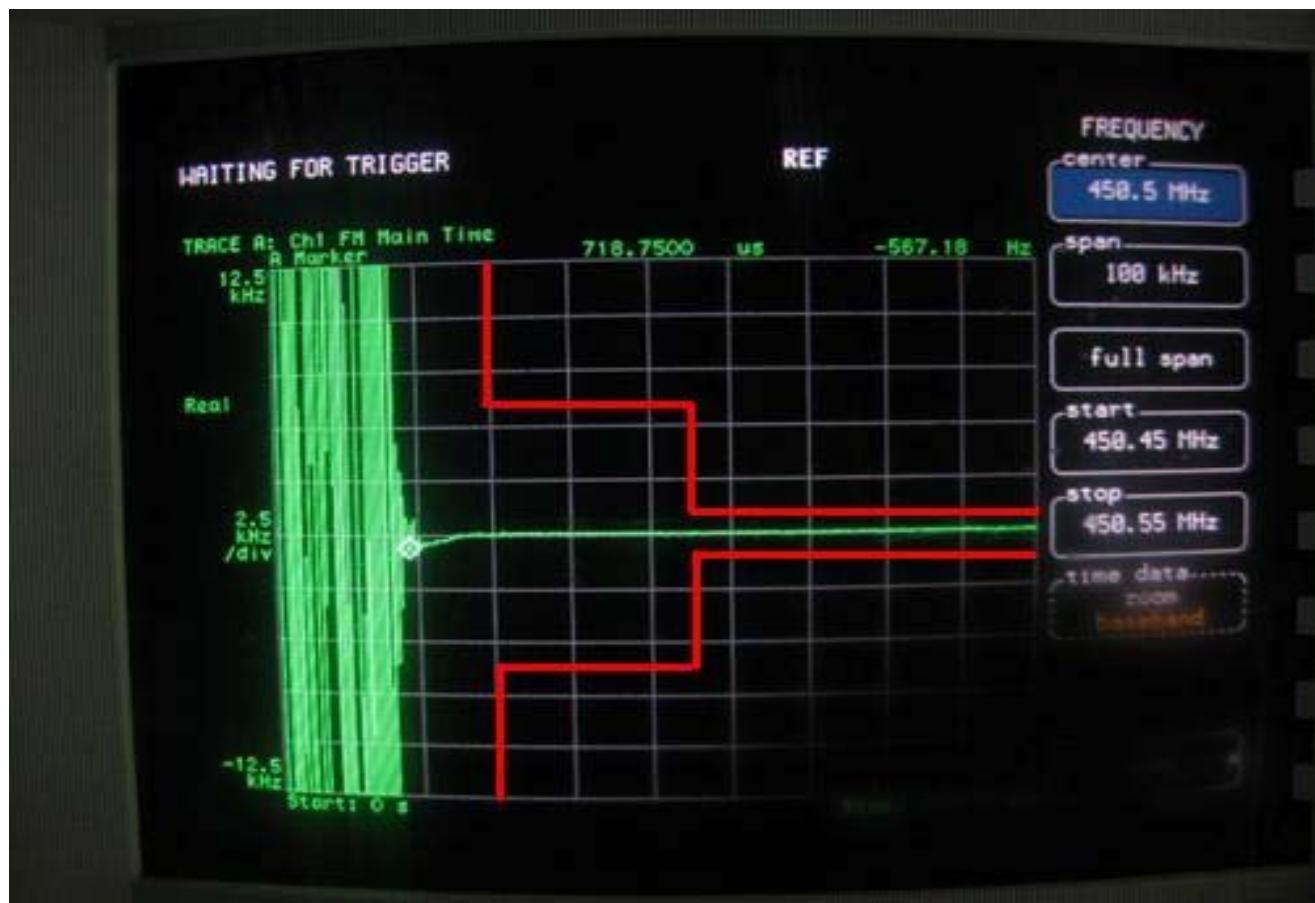
Please refer to the following plots.

Modulation Type: FM

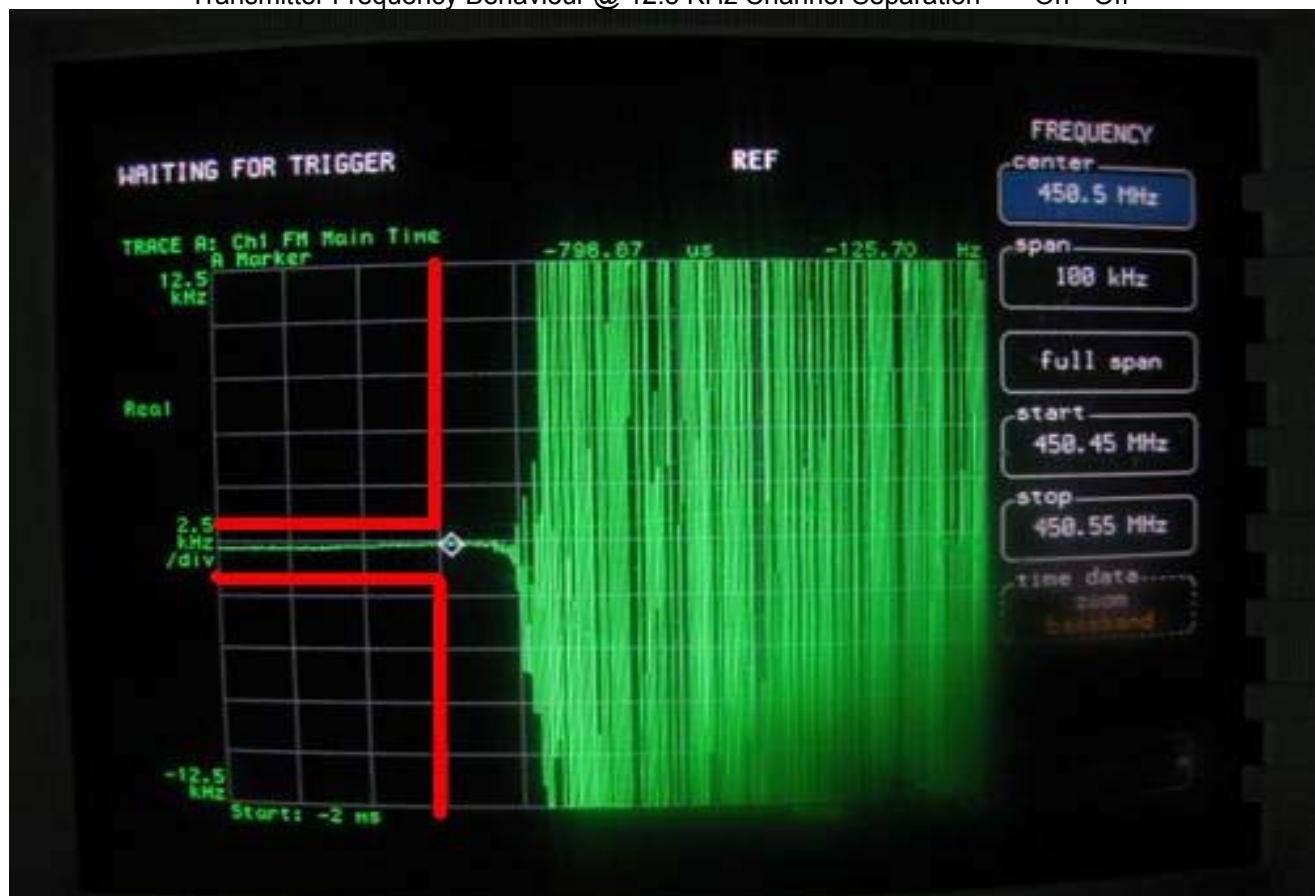


Modulation Type: 4FSK

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 Emission

TEST APPLICABLE

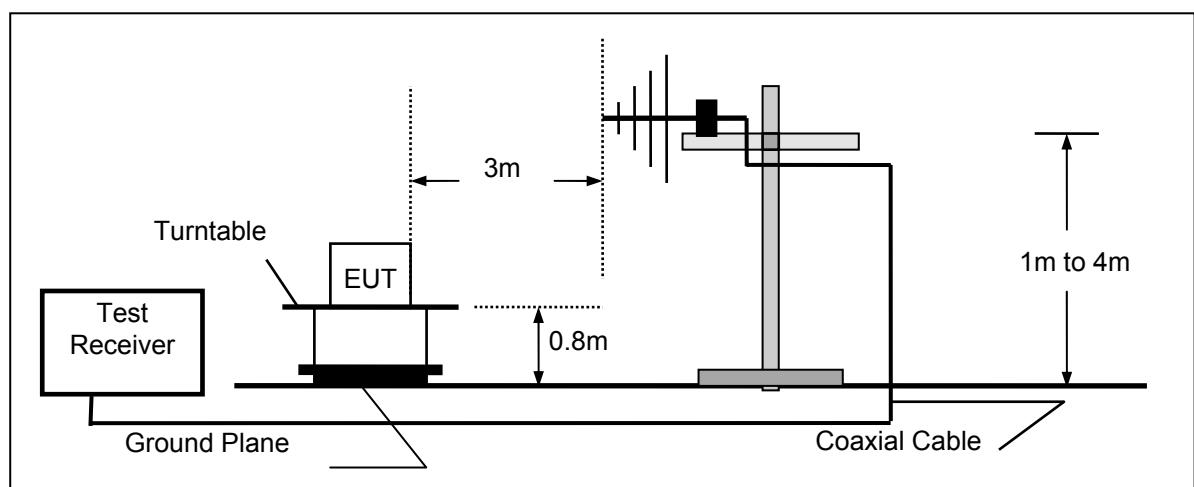
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

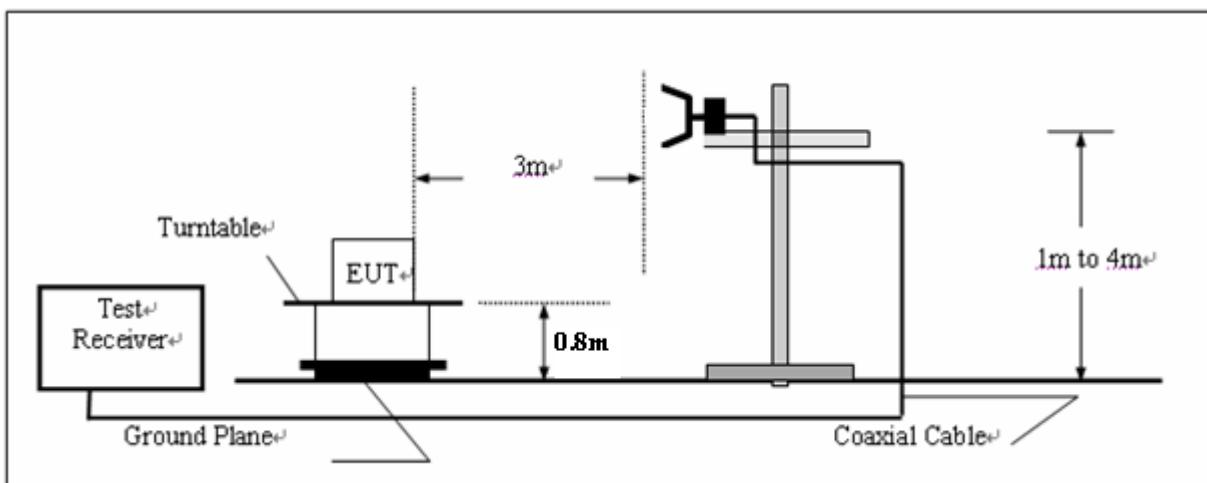
Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

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°C to 360°C 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 (dB μ V/m)	Radiated (μ V/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.

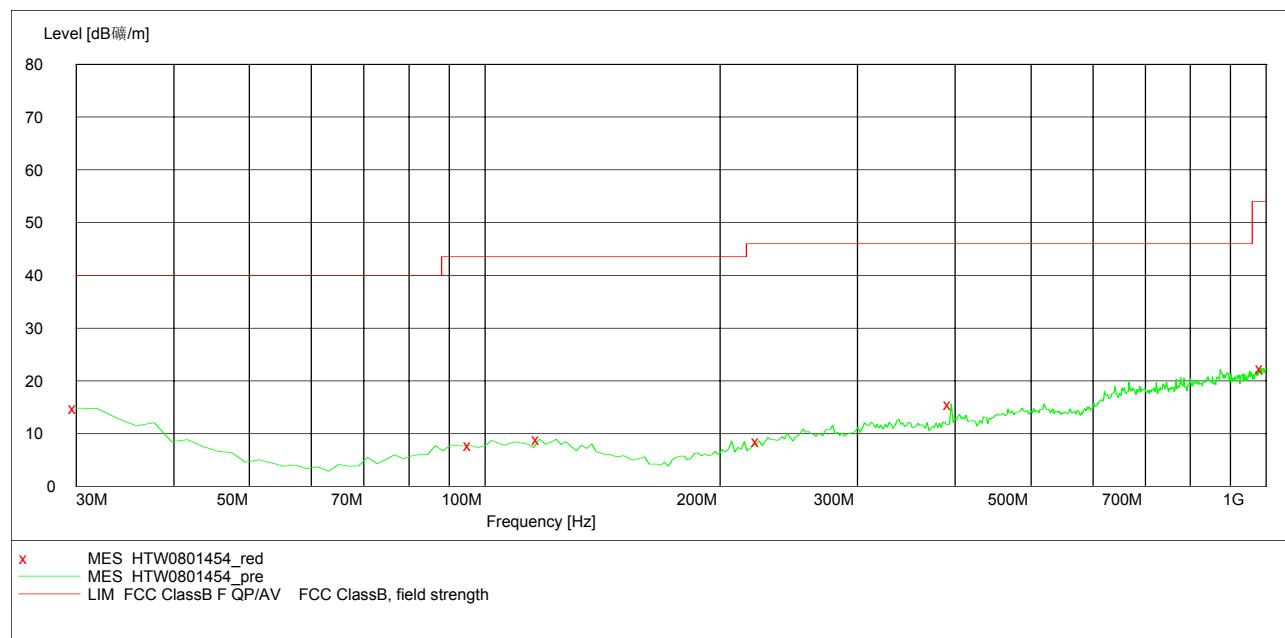
TEST RESULTS

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	990.28	22.40	46.00
			V	984.45	22.70	46.00
Test Results				Compliance		

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

Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz HL562 2011

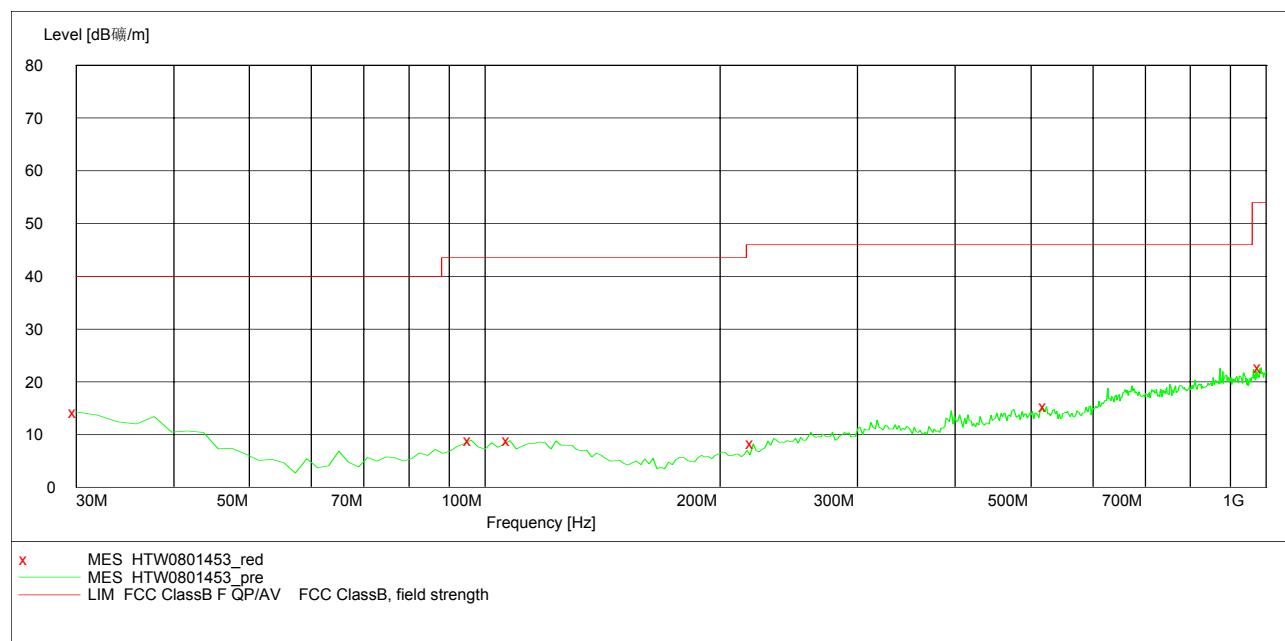
**MEASUREMENT RESULT: "HTW1226454_red"**

12/26/2011 9:25AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	14.80	-22.2	40.0	25.2	Peak	300.0	96.00	HORIZONTAL
96.092184	7.70	-30.9	43.5	35.8	Peak	300.0	146.00	HORIZONTAL
117.474950	9.00	-30.5	43.5	34.5	Peak	100.0	232.00	HORIZONTAL
224.388778	8.60	-31.4	46.0	37.4	Peak	300.0	360.00	HORIZONTAL
395.450902	15.60	-26.3	46.0	30.4	Peak	100.0	114.00	HORIZONTAL
990.280561	22.40	-17.3	54.0	31.6	Peak	300.0	27.00	HORIZONTAL

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

Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz HL562 2011

**MEASUREMENT RESULT: "HTW1226453_red"**

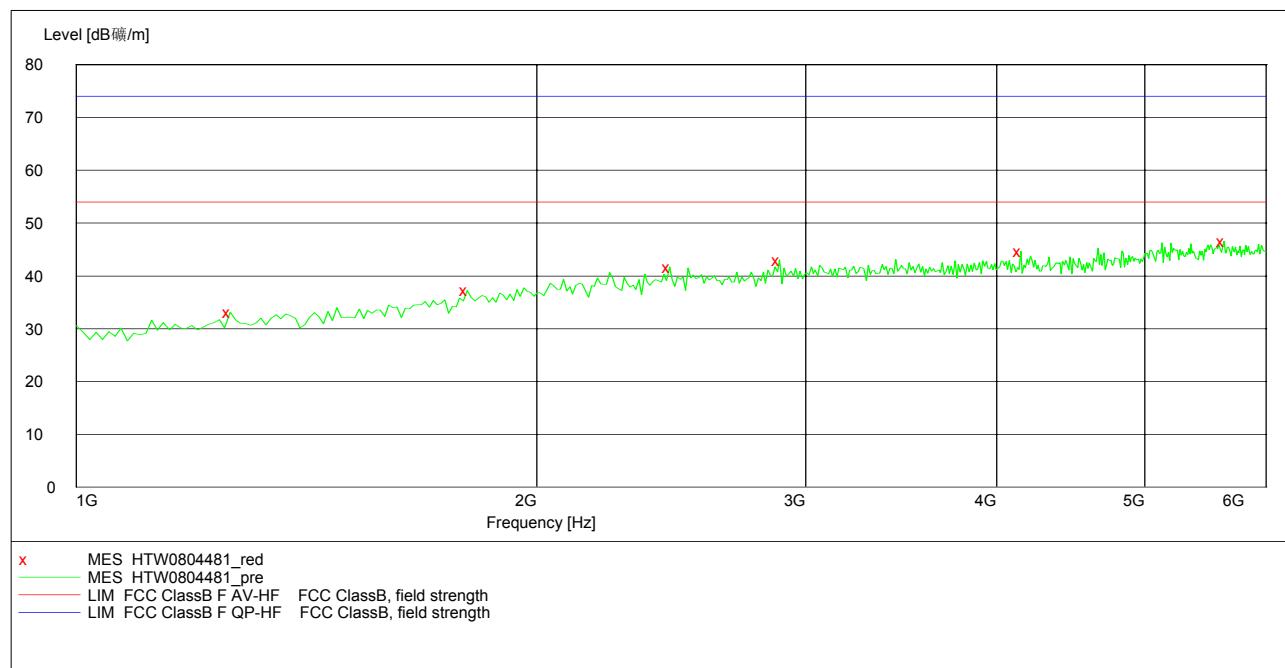
12/26/2011 9:24AM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	14.30	-22.2	40.0	25.7	Peak	100.0	278.00	VERTICAL
96.092184	9.00	-30.9	43.5	34.5	Peak	100.0	328.00	VERTICAL
107.755511	8.90	-30.6	43.5	34.6	Peak	100.0	62.00	VERTICAL
220.501002	8.30	-31.5	46.0	37.7	Peak	100.0	296.00	VERTICAL
523.747495	15.30	-23.9	46.0	30.7	Peak	100.0	29.00	VERTICAL
984.448898	22.70	-17.3	54.0	31.3	Peak	100.0	263.00	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	5629.26	46.60	54.00
			V	5699.40	46.60	54.00
Test Results			Compliance			

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

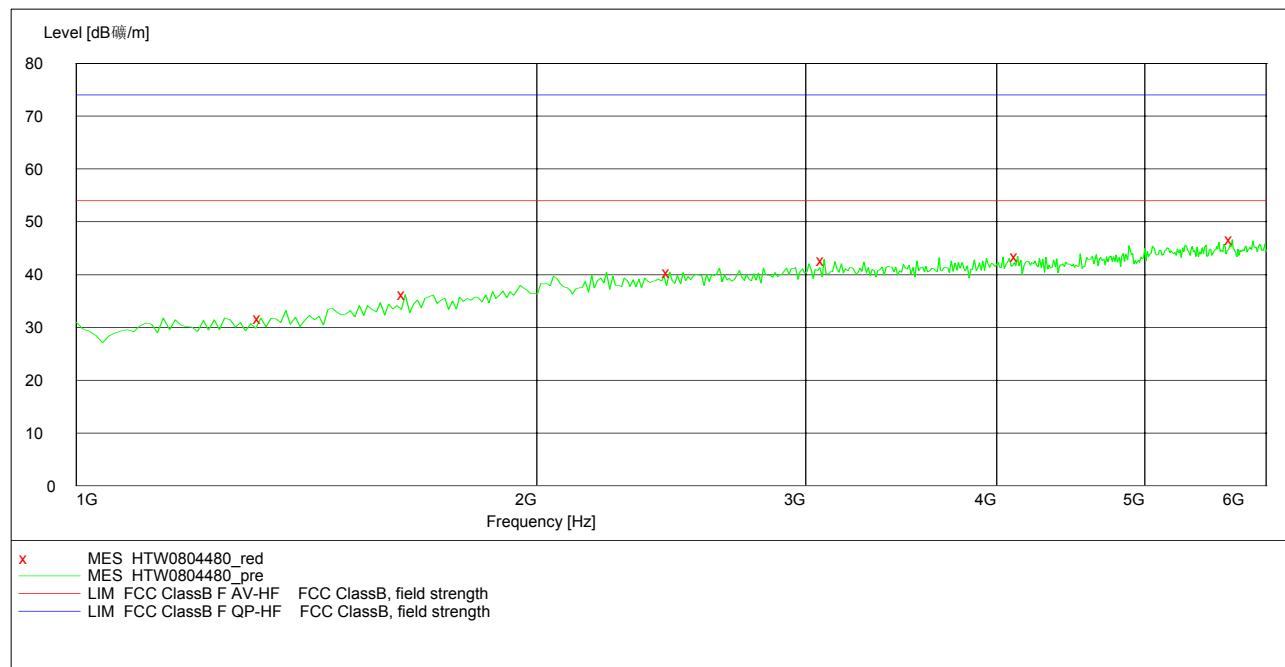
Short Description: EN 55022 Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz HF906 2011

***MEASUREMENT RESULT: "HTW1226481_red"***

12/26/2011 4:26AM	Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization
	MHz	dBuV/m	dB	dBuV/m	dB		cm	deg	
	1260.521042	33.10	-7.6	54.0	20.9	Peak	100.0	299.00	HORIZONTAL
	1801.603206	37.20	-3.0	54.0	16.8	Peak	100.0	311.00	HORIZONTAL
	2442.885772	41.70	0.6	54.0	12.3	Peak	100.0	27.00	HORIZONTAL
	2883.767535	43.00	1.8	54.0	11.0	Peak	100.0	215.00	HORIZONTAL
	4146.292585	44.70	3.5	54.0	9.3	Peak	100.0	114.00	HORIZONTAL
	5629.258517	46.60	6.8	54.0	7.4	Peak	100.0	79.00	HORIZONTAL

SWEET 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: "HTW1226480_red"**

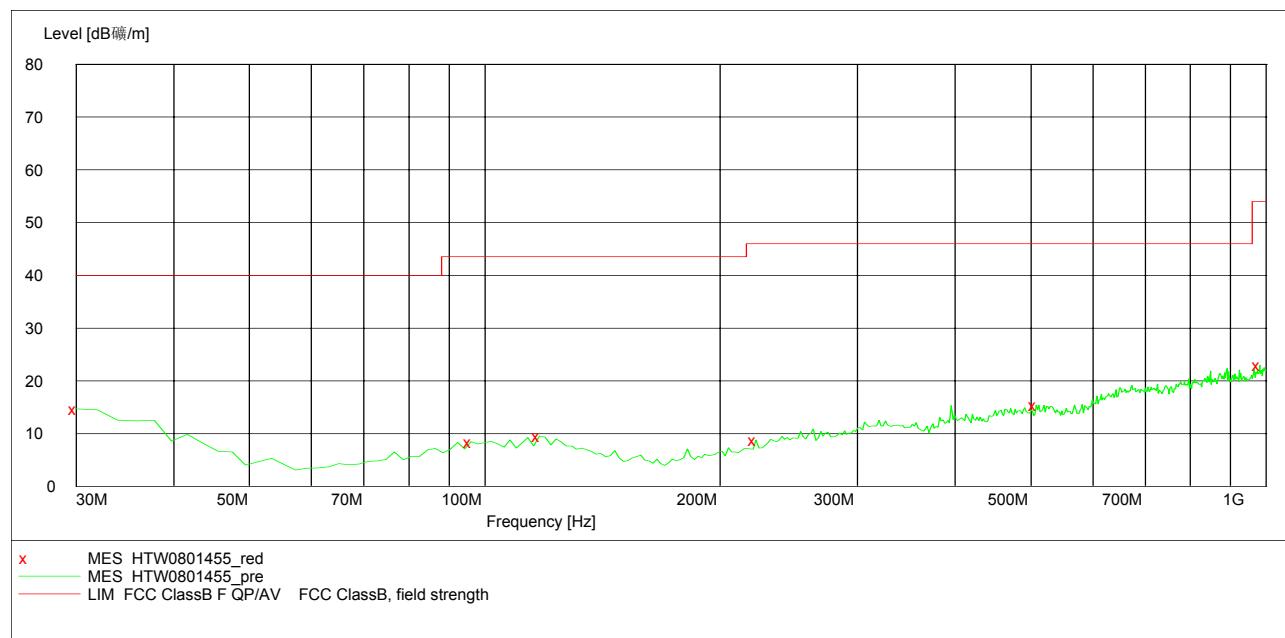
12/26/2011 4:24AM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1320.641283	31.80	-7.2	54.0	22.2	Peak	100.0	3.00	VERTICAL
1641.282565	36.20	-4.5	54.0	17.8	Peak	100.0	18.00	VERTICAL
2442.885772	40.50	0.6	54.0	13.5	Peak	100.0	84.00	VERTICAL
3084.168337	42.80	2.2	54.0	11.2	Peak	100.0	241.00	VERTICAL
4126.252505	43.50	3.6	54.0	10.5	Peak	100.0	12.00	VERTICAL
5699.398798	46.60	6.9	54.0	7.4	Peak	100.0	84.00	VERTICAL

Modulation Type	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
4FSK	12.5 KHz	469.5000	H	980.56	23.00	54.00
			V	994.17	23.00	54.00
Test Results				Compliance		

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

Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz HL562 2011

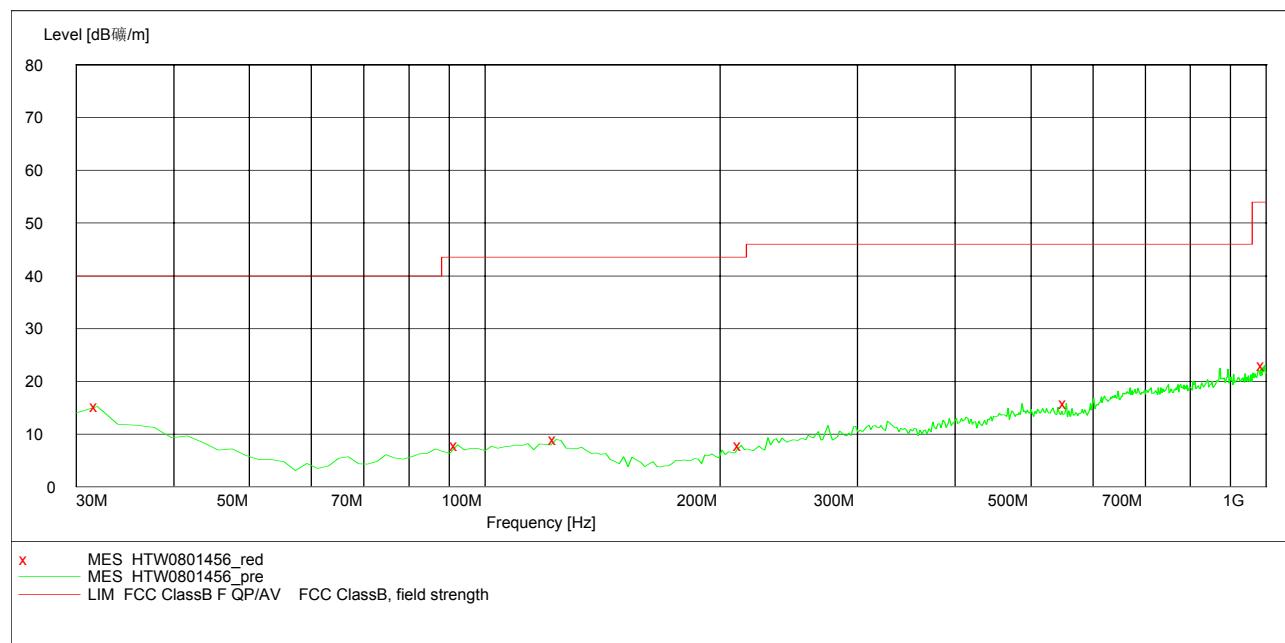
**MEASUREMENT RESULT: "HTW1226455_red"**

12/26/2011 9:26AM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	14.70	-22.2	40.0	25.3	Peak	300.0	298.00	HORIZONTAL
96.092184	8.40	-30.9	43.5	35.1	Peak	300.0	360.00	HORIZONTAL
117.474950	9.50	-30.5	43.5	34.0	Peak	100.0	181.00	HORIZONTAL
222.444890	8.80	-31.4	46.0	37.2	Peak	100.0	332.00	HORIZONTAL
508.196393	15.40	-24.2	46.0	30.6	Peak	300.0	315.00	HORIZONTAL
980.561122	23.00	-17.4	54.0	31.0	Peak	100.0	29.00	HORIZONTAL

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

Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz HL562 2011

***MEASUREMENT RESULT: "HTW1226456_red"***

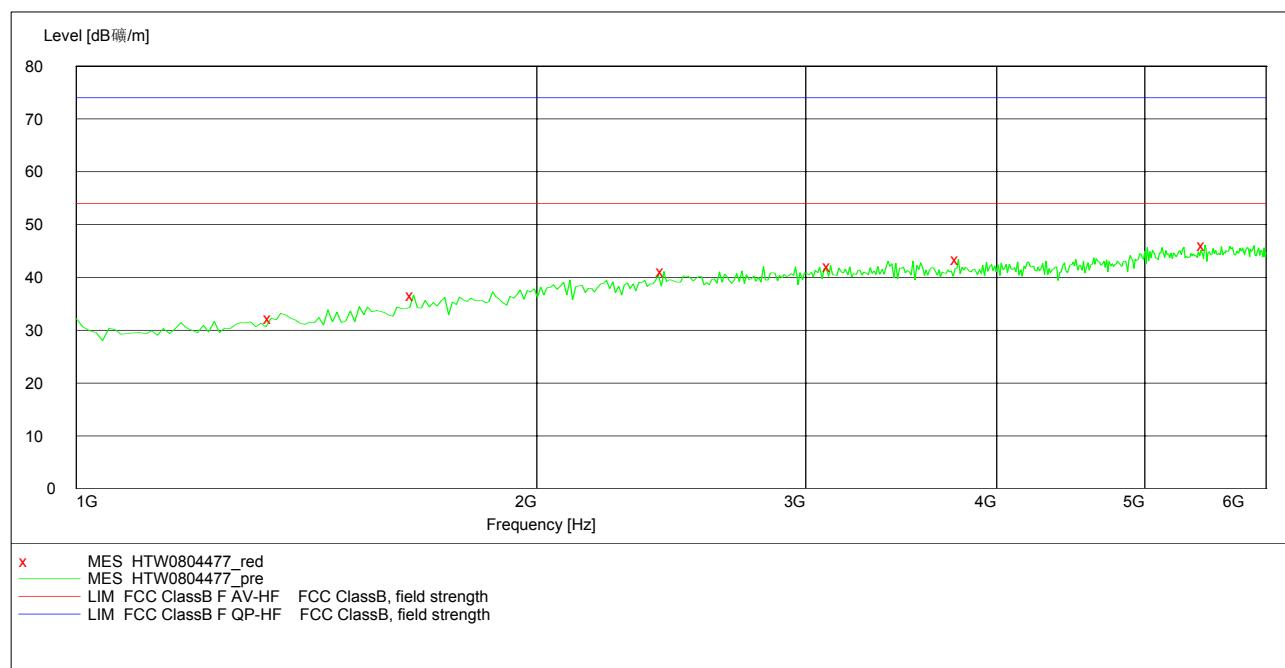
12/26/2011 9:27AM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.943888	15.20	-23.2	40.0	24.8	Peak	100.0	113.00	VERTICAL
92.204409	8.00	-31.1	43.5	35.5	Peak	100.0	300.00	VERTICAL
123.306613	9.00	-30.6	43.5	34.5	Peak	100.0	264.00	VERTICAL
212.725451	7.80	-31.9	43.5	35.5	Peak	100.0	149.00	VERTICAL
554.849699	15.80	-24.6	46.0	30.2	Peak	100.0	282.00	VERTICAL
994.168337	23.00	-17.2	54.0	31.0	Peak	100.0	62.00	VERTICAL

Modulation Type	Channel Separation	Test Frequency (MHz)	Polar.	Maximum Radiated Emissions		FCC Limit (dBuV/m)
				Frequency (MHz)	Datum (dBuV/m)	
4FSK	12.5 KHz	469.5000	H	5468.94	46.10	54.00
			V	5659.32	46.50	54.00
Test Results				Compliance		

SWEET 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

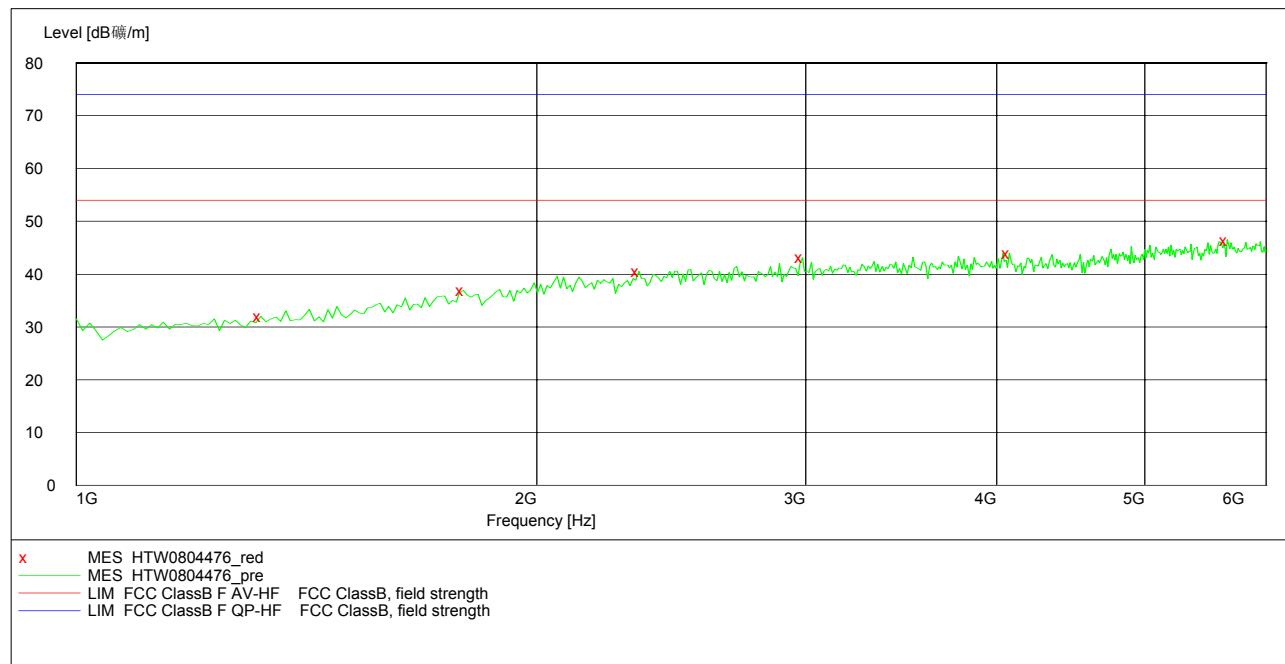
**MEASUREMENT RESULT: "HTW1226477_red"**

12/26/2011 4:18AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1340.681363	32.30	-7.0	54.0	21.7	Peak	100.0	314.00	HORIZONTAL
1661.322645	36.70	-4.3	54.0	17.3	Peak	100.0	297.00	HORIZONTAL
2422.845691	41.10	0.6	54.0	12.9	Peak	100.0	62.00	HORIZONTAL
3114.228457	42.20	2.2	54.0	11.8	Peak	100.0	309.00	HORIZONTAL
3775.551102	43.40	3.2	54.0	10.6	Peak	100.0	33.00	HORIZONTAL
5468.937876	46.10	6.5	54.0	7.9	Peak	100.0	74.00	HORIZONTAL

SWEET 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: "HTW1226476_red"***

12/26/2011 4:16AM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1320.641283	32.00	-7.2	54.0	22.0	Peak	100.0	287.00	VERTICAL
1791.583166	36.90	-3.1	54.0	17.1	Peak	100.0	57.00	VERTICAL
2332.665331	40.50	0.2	54.0	13.5	Peak	100.0	299.00	VERTICAL
2983.967936	43.10	2.1	54.0	10.9	Peak	100.0	228.00	VERTICAL
4076.152305	44.00	3.6	54.0	10.0	Peak	100.0	222.00	VERTICAL
5659.318637	46.50	6.8	54.0	7.5	Peak	100.0	12.00	VERTICAL

4.10. Receiver Conducted Spurious Emssion

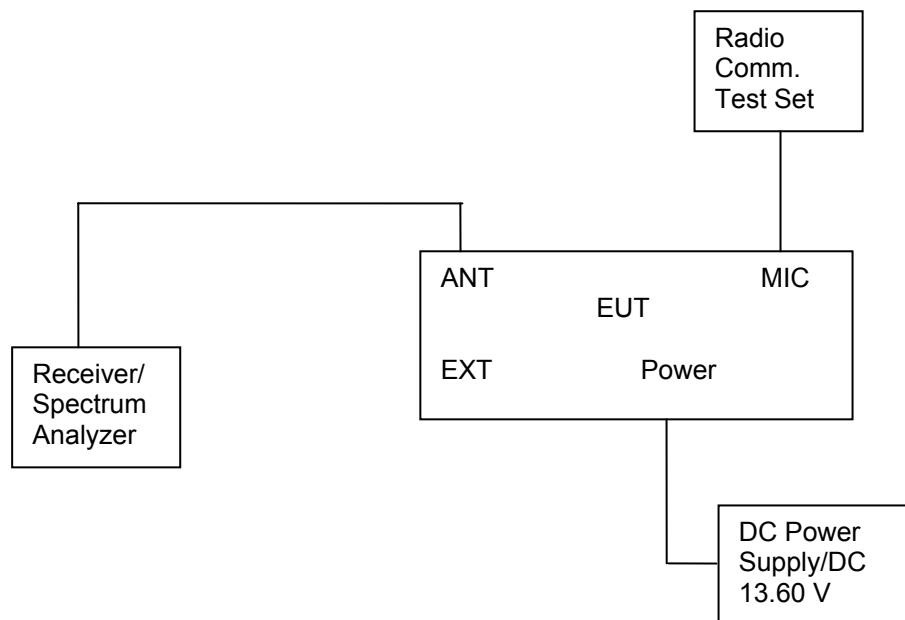
TEST APPLICABLE

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

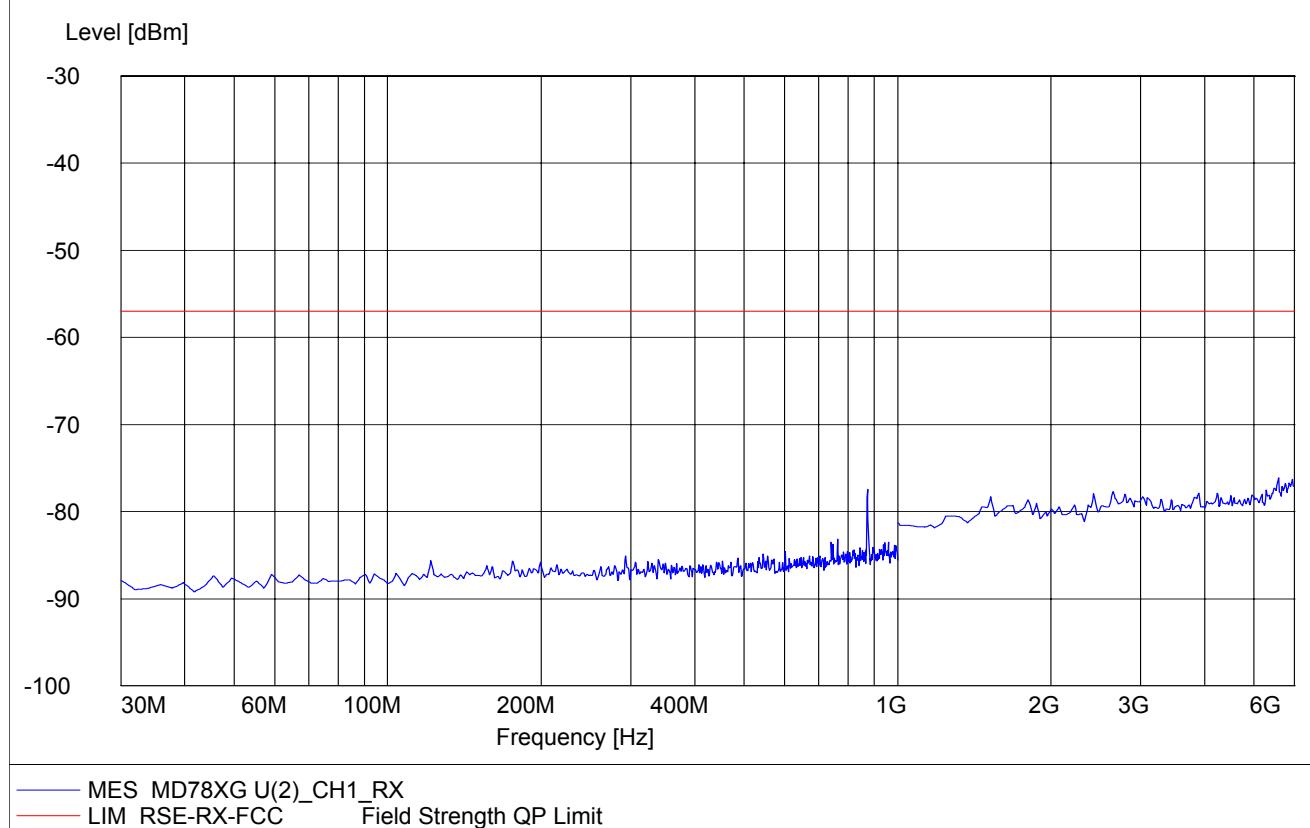
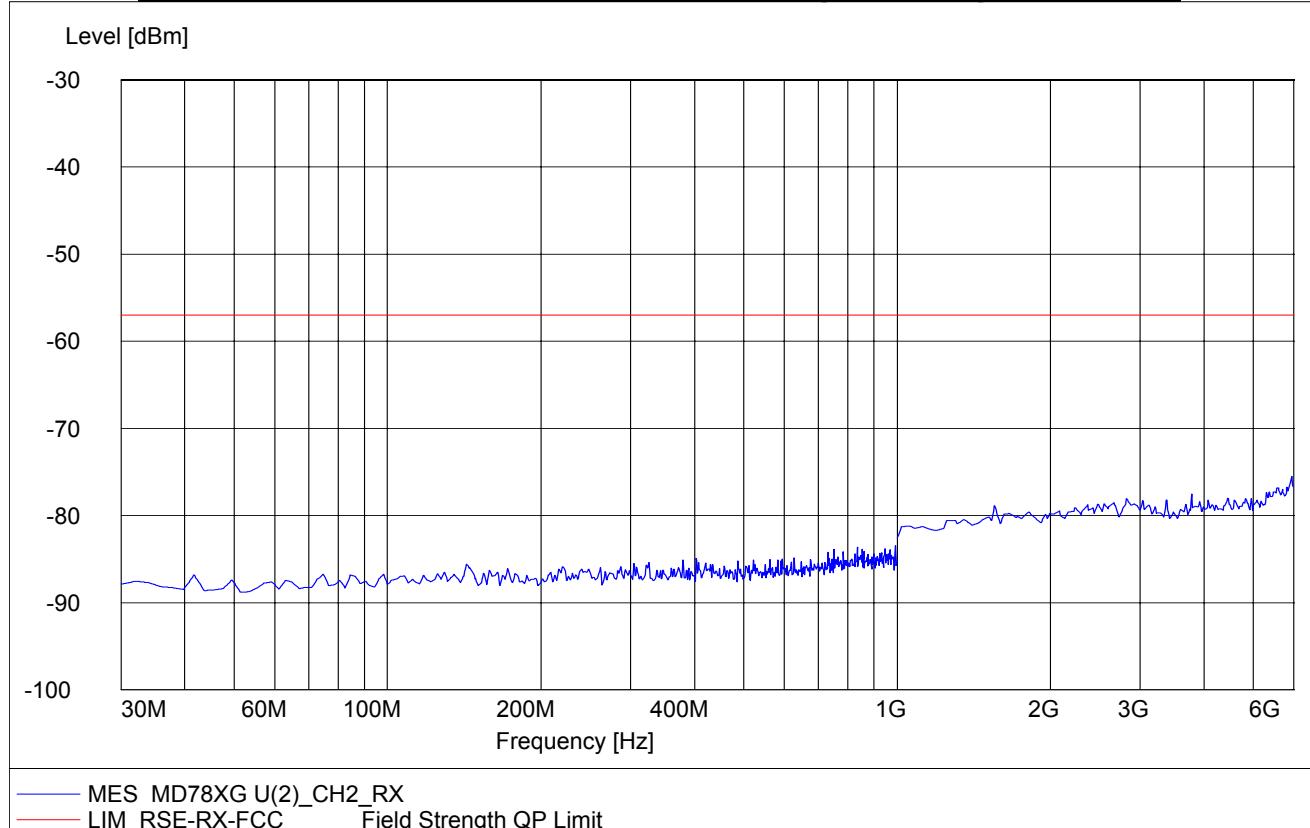


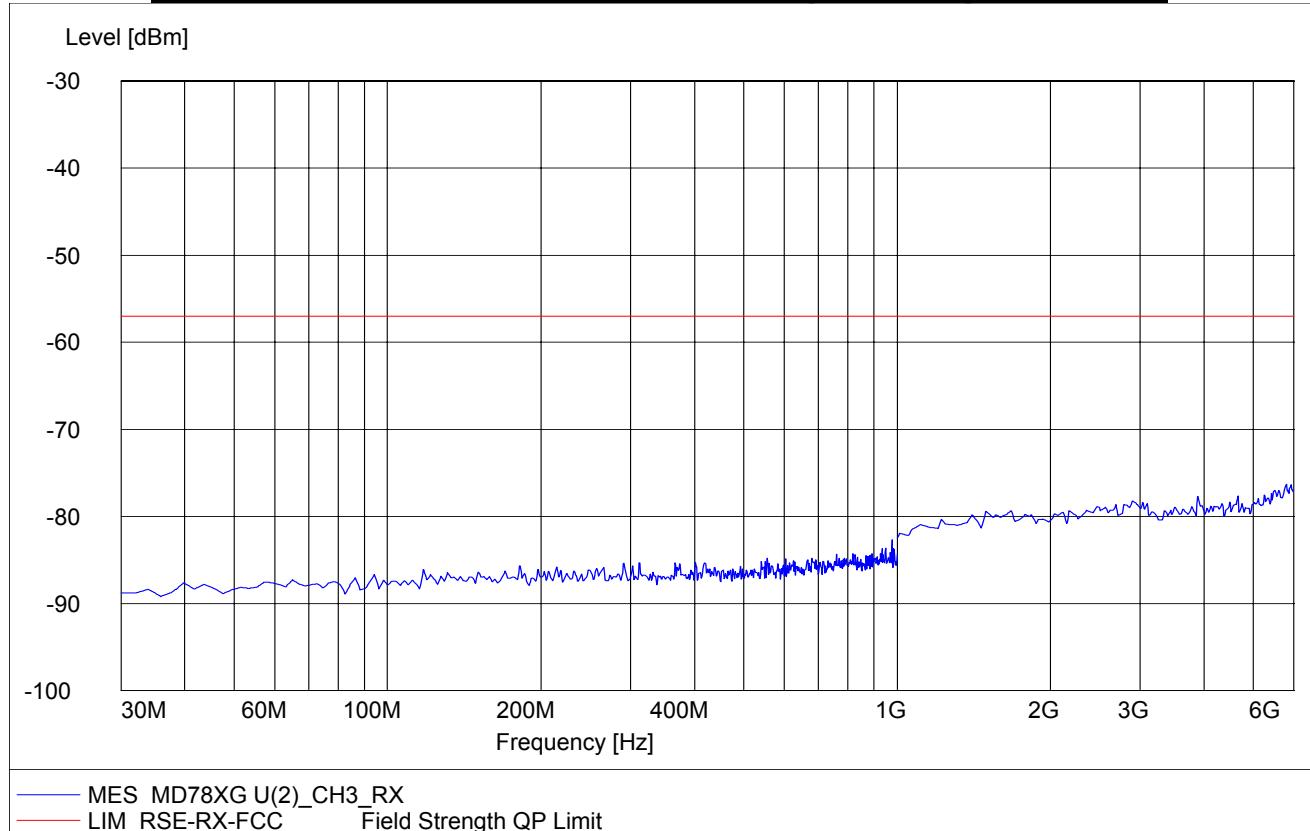
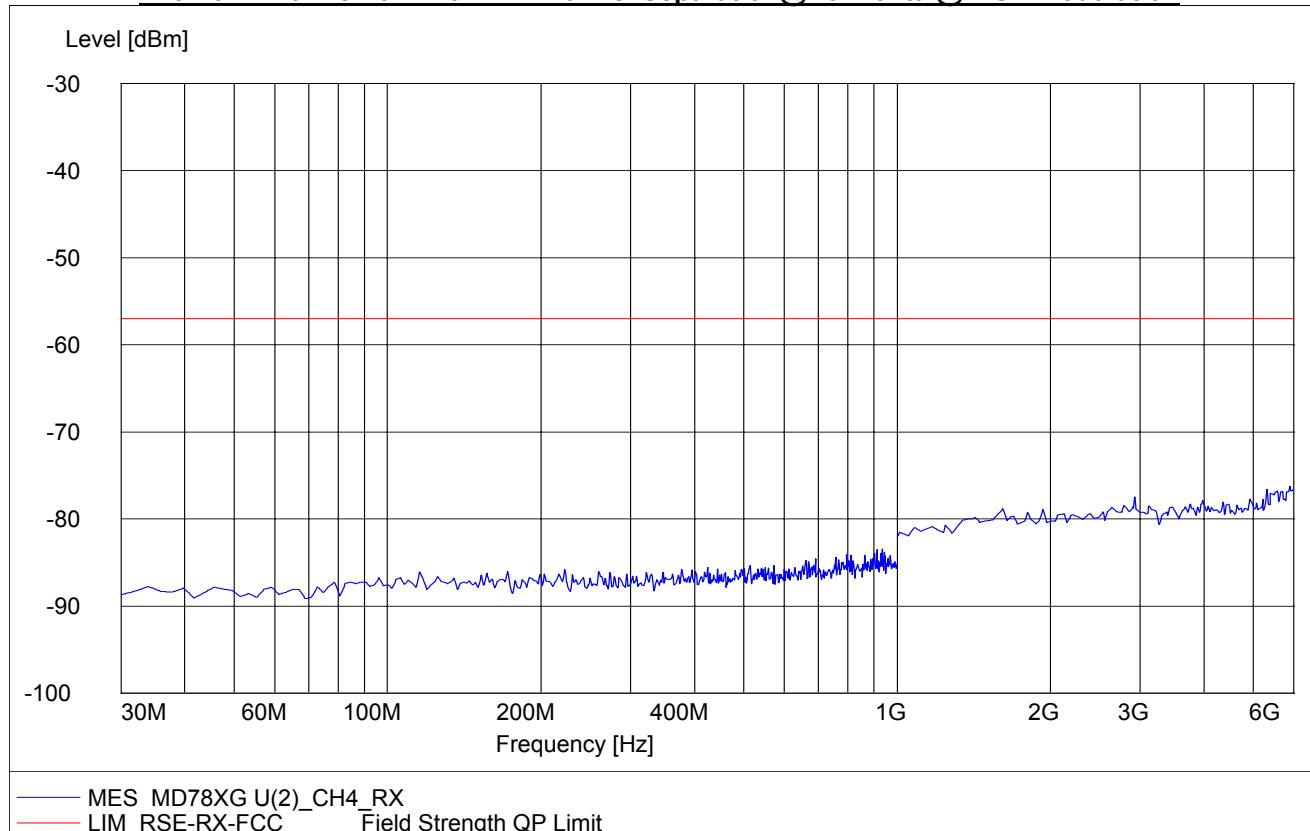
LIMIT

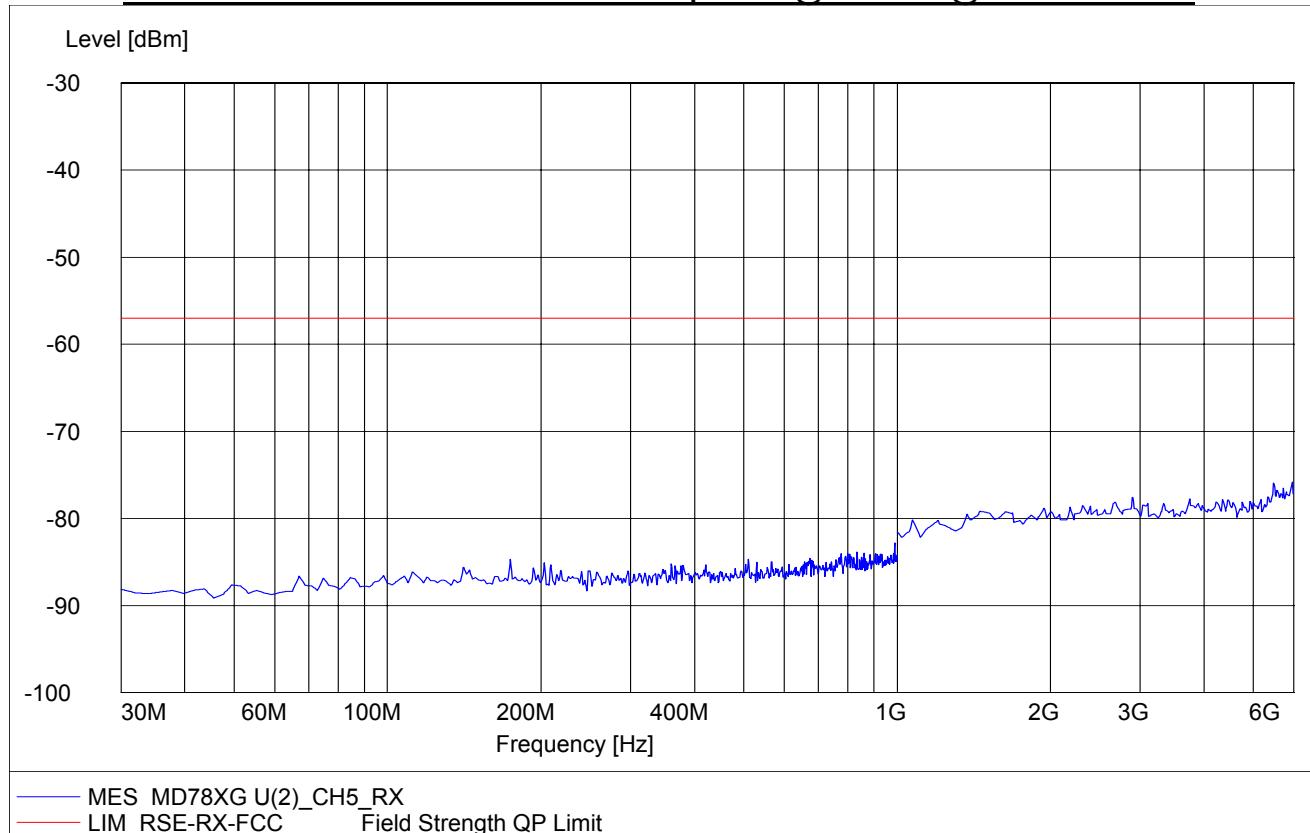
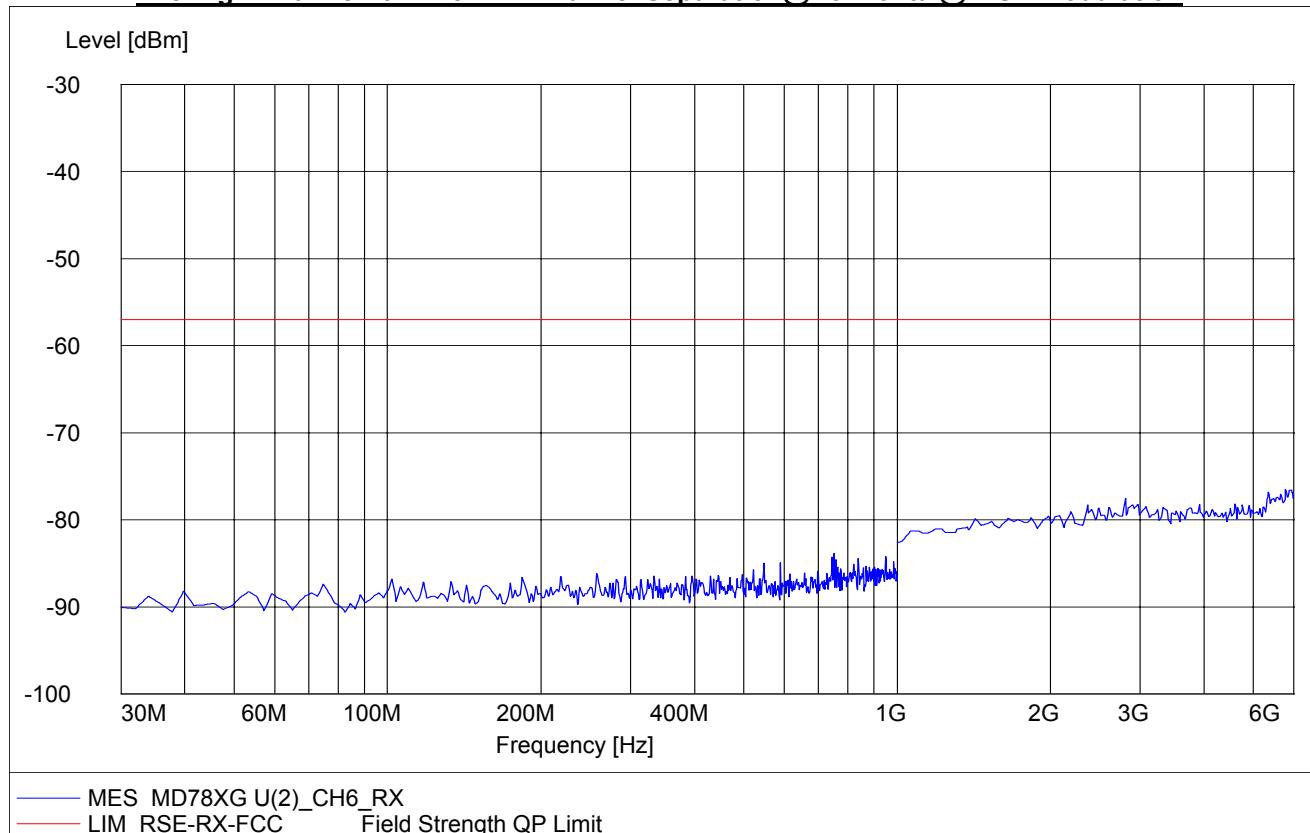
The power at the antenna terminal shall not exceed 2.0 nanowatts (-57dBm).

TEST RESULTS

The Receiver Conducted Spurious Emissions 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 6 GHz.

The Low Channel for 12.5 KHz Channel Separation@Horizontal@FM ModulationThe Middle Channel for 12.5 KHz Channel Separation@Horizontal@FM Modulation

The High Channel for 12.5 KHz Channel Separation@Horizontal@FM ModulationThe Low Channel for 12.5 KHz Channel Separation@Horizontal@4FSK Modulation

The Middle Channel for 12.5 KHz Channel Separation@Horizontal@4FSK ModulationThe High Channel for 12.5 KHz Channel Separation@Horizontal@4FSK Modulation

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/cm ²)	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/cm ²)	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 source-based 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 5.5 dBi, the RF power density can be obtained.

TEST RESULTS

For FM Modulation @ 12.5 KHz Channel Spacing@Maximum Output Power

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
450.5000	100.00	46.79	47752.90	3.5481	1.5017	1.3483	Compliance
485.0000	100.00	46.74	47206.30	3.5481	1.6167	1.3329	Compliance
519.5000	100.00	46.71	46881.30	3.5481	1.7317	1.3237	Compliance

For 4FSK Modulation @ 12.5 KHz Channel Spacing@Maximum Output Power

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
450.5000	100.00	46.73	47097.70	3.5481	1.5017	1.3298	Compliance
485.0000	100.00	46.74	47206.30	3.5481	1.6167	1.3329	Compliance
519.5000	100.00	46.77	47533.50	3.5481	1.7317	1.3421	Compliance

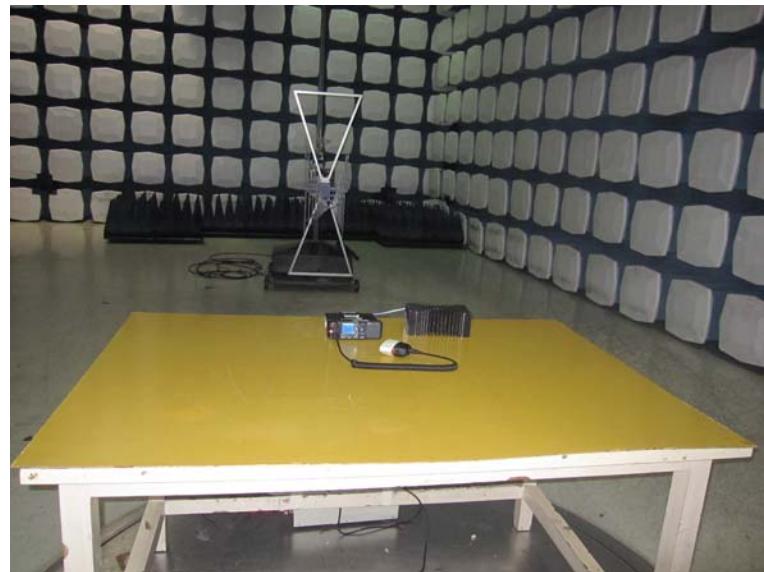
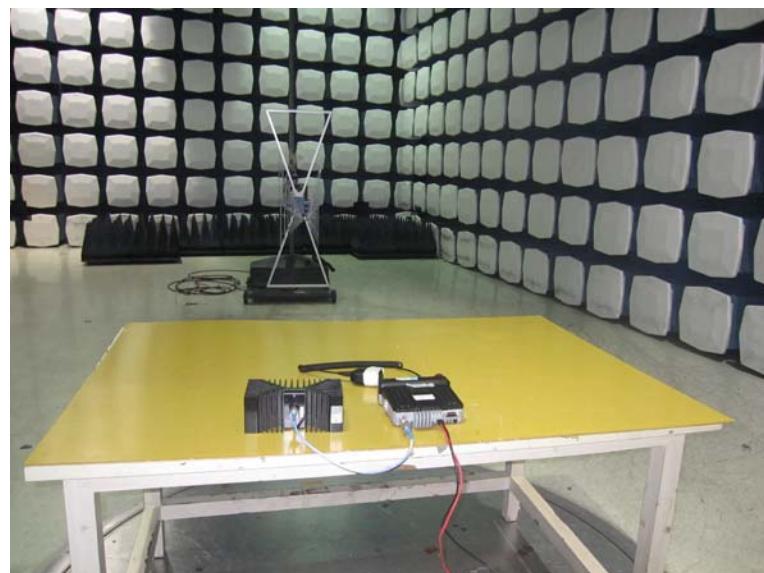
For FM Modulation @ 12.5 KHz Channel Spacing@Minimum Output Power

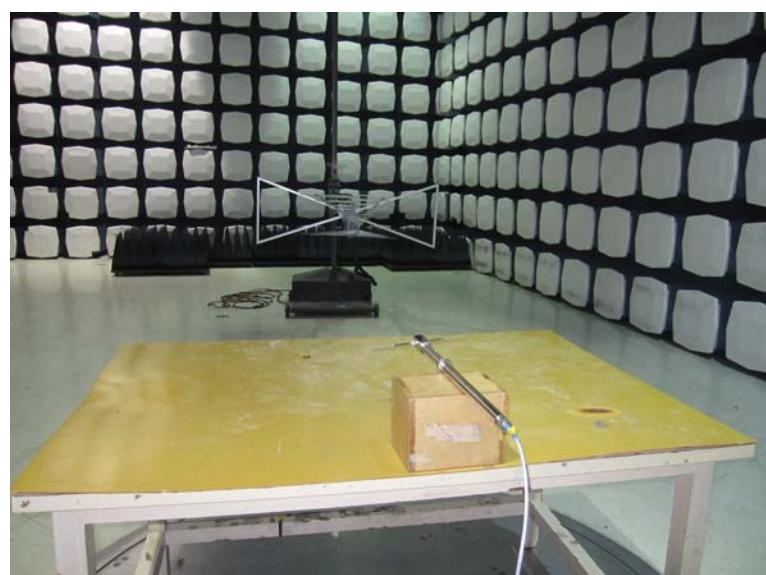
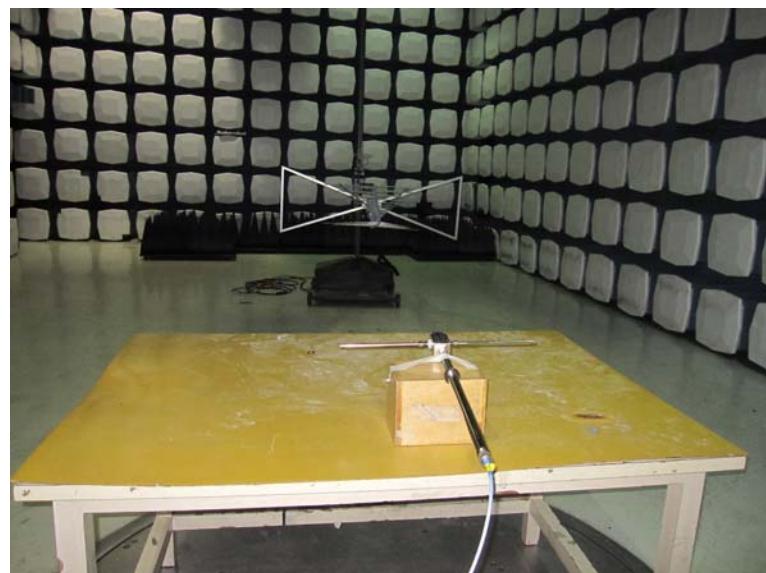
Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Antenna Gain (Nemeric)	Power Density Limit (mW/cm ²)	Power Density At 100 cm (mW/cm ²)	Test Results
450.5000	100.00	36.76	4742.40	3.5481	1.5017	0.1339	Compliance
485.0000	100.00	37.90	6166.00	3.5481	1.6167	0.1741	Compliance
519.5000	100.00	37.86	6109.40	3.5481	1.7317	0.1725	Compliance

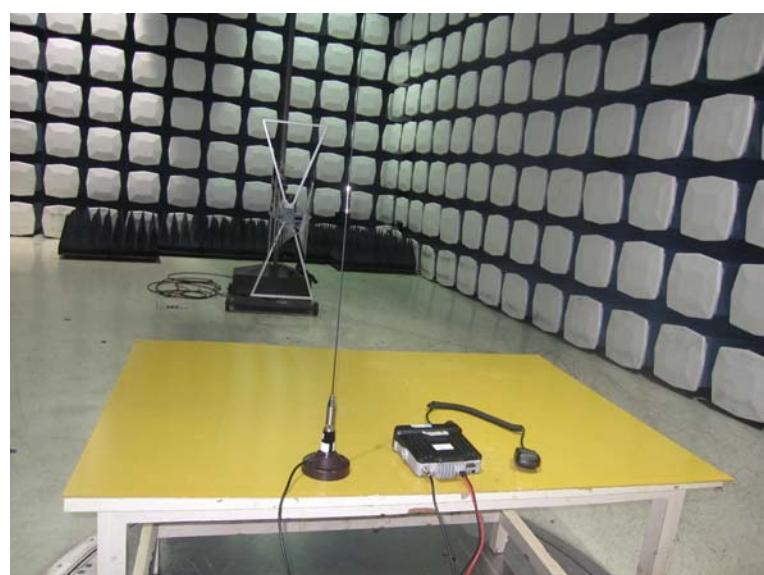
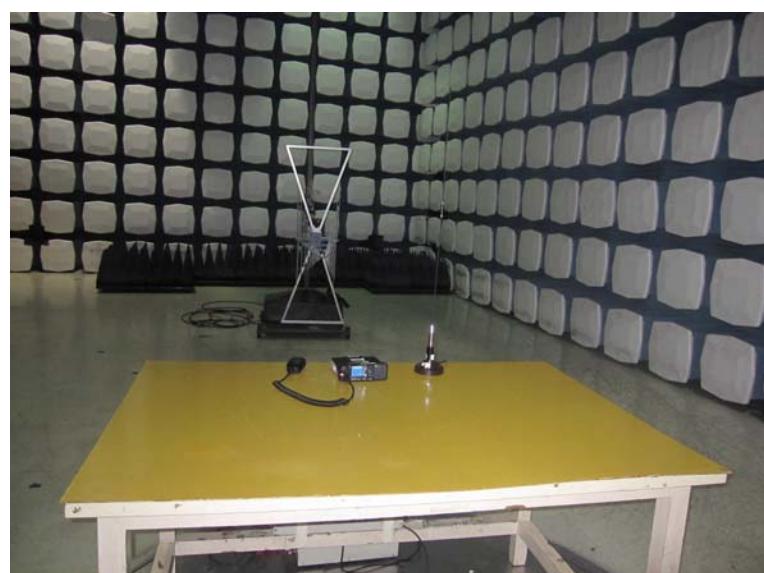
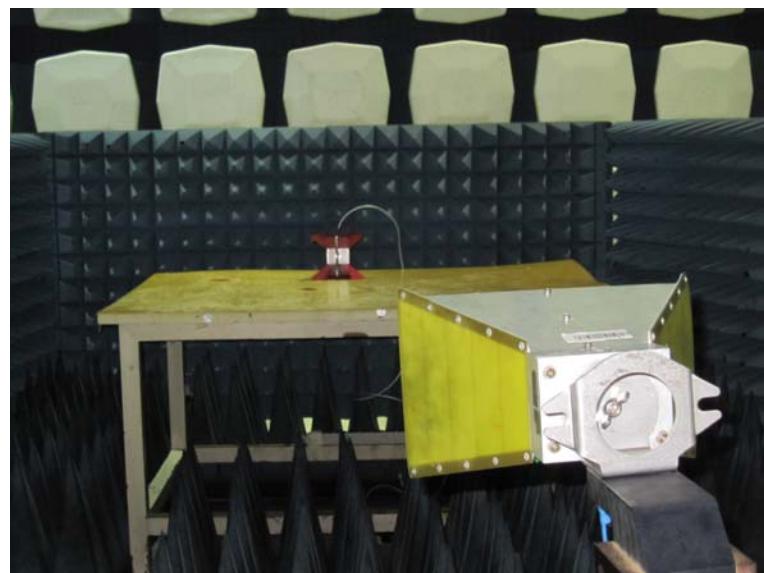
For 4FSK Modulation @ 12.5 KHz Channel Spacing@Minimum Output Power

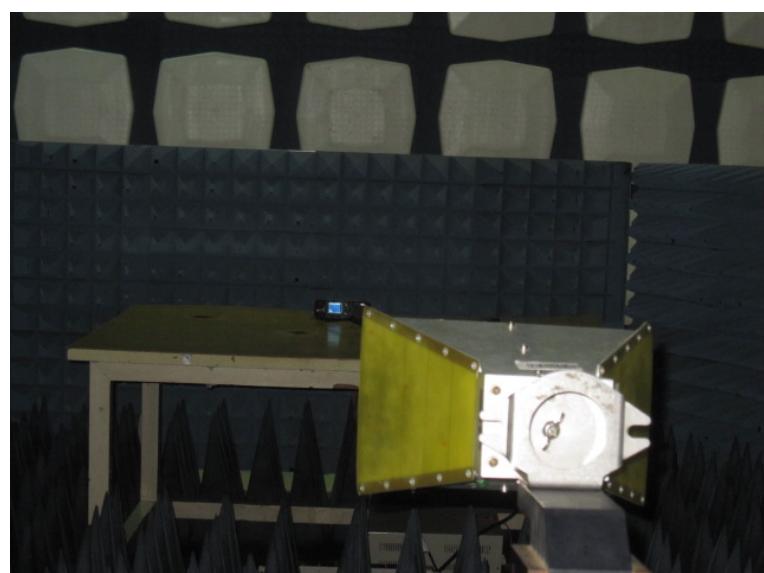
Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Antenna Gain (Nemeric)	Power Density Limit (mW/cm ²)	Power Density At 100 cm (mW/cm ²)	Test Results
450.5000	100.00	37.62	5781.00	3.5481	1.5017	0.1632	Compliance
485.0000	100.00	37.82	6053.40	3.5481	1.6167	0.1709	Compliance
519.5000	100.00	37.87	6123.50	3.5481	1.7317	0.1729	Compliance

5. Test Setup Photos of the EUT









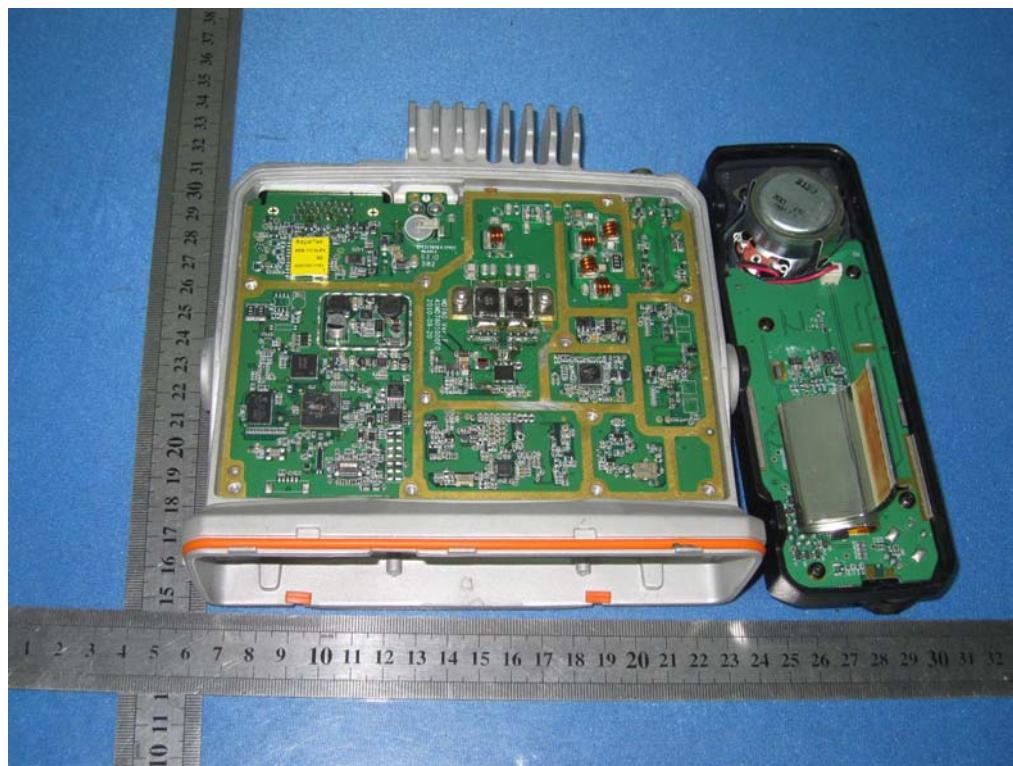
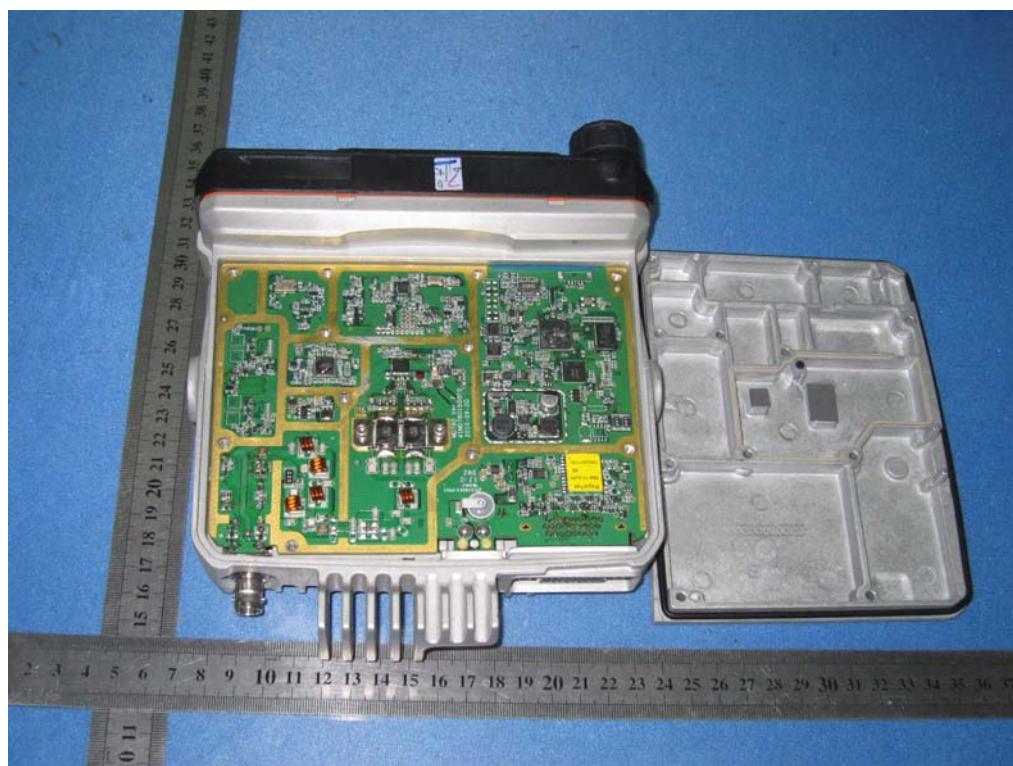
6. External and Internal Photos of the EUT

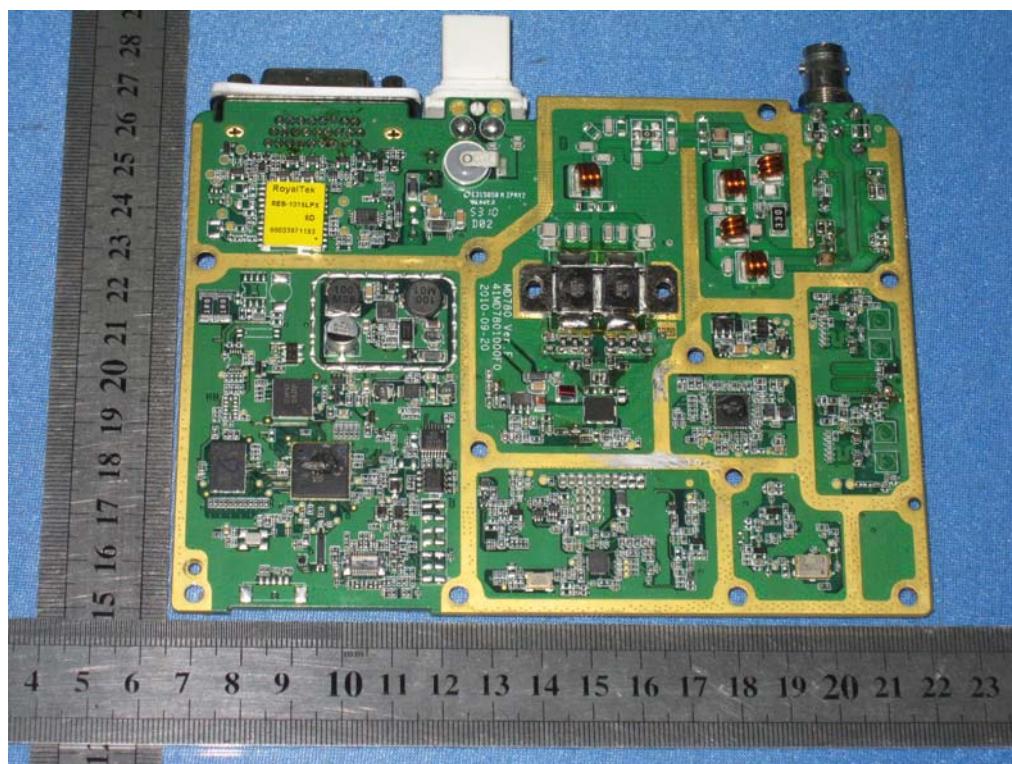
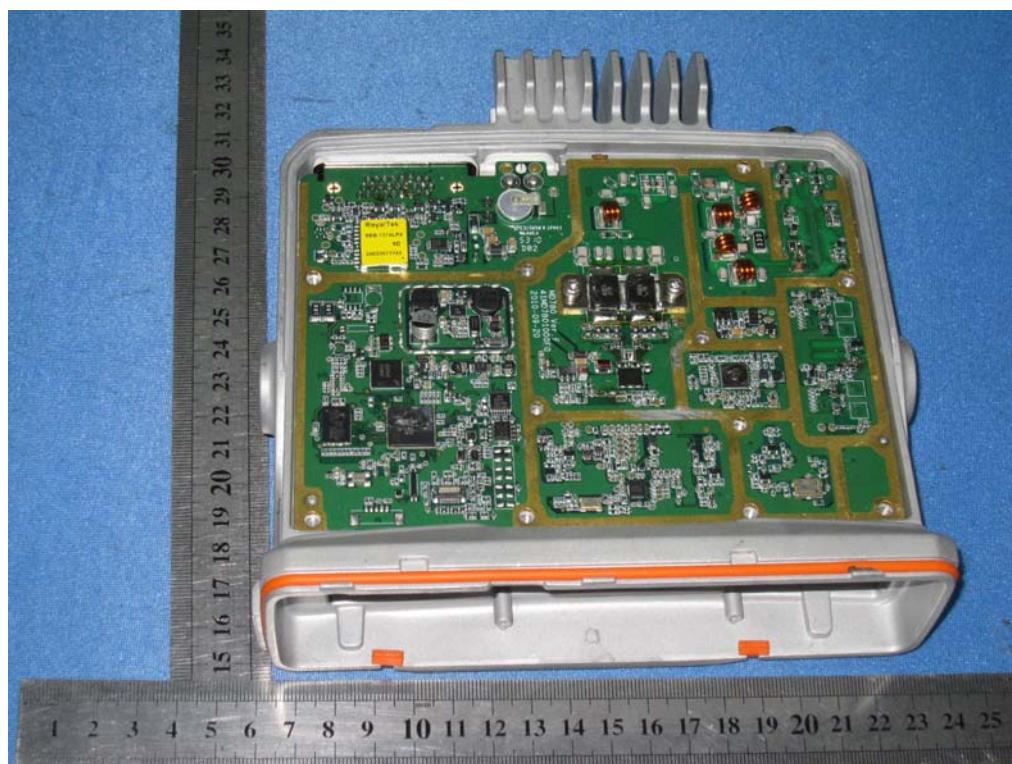
External Photos

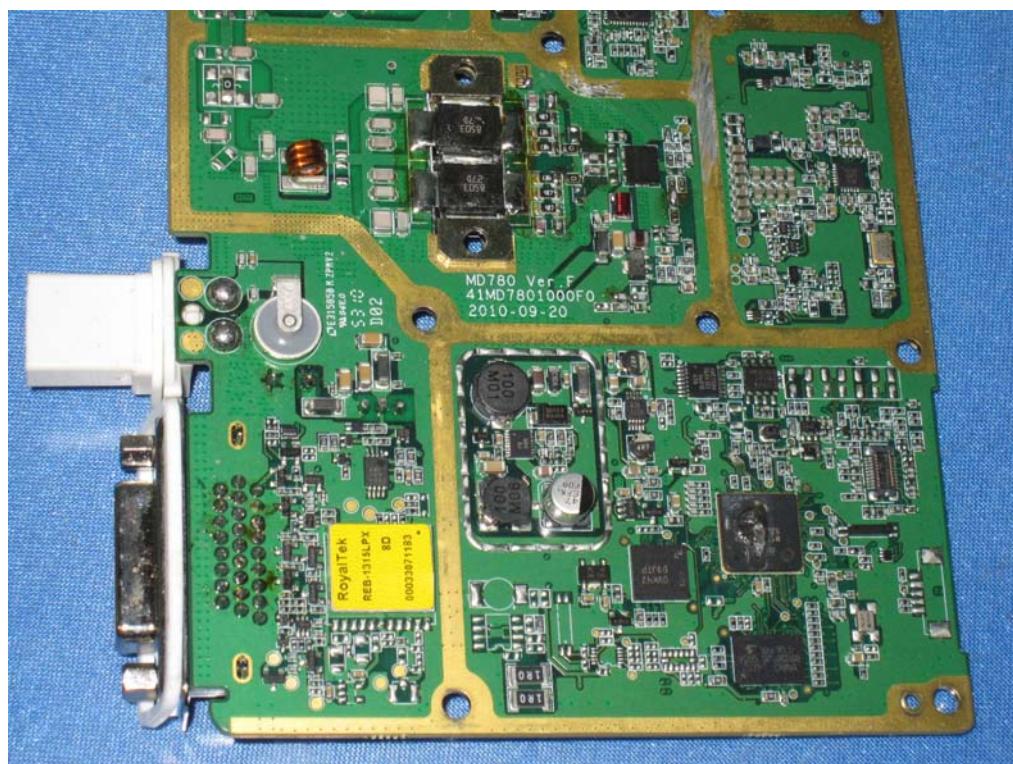
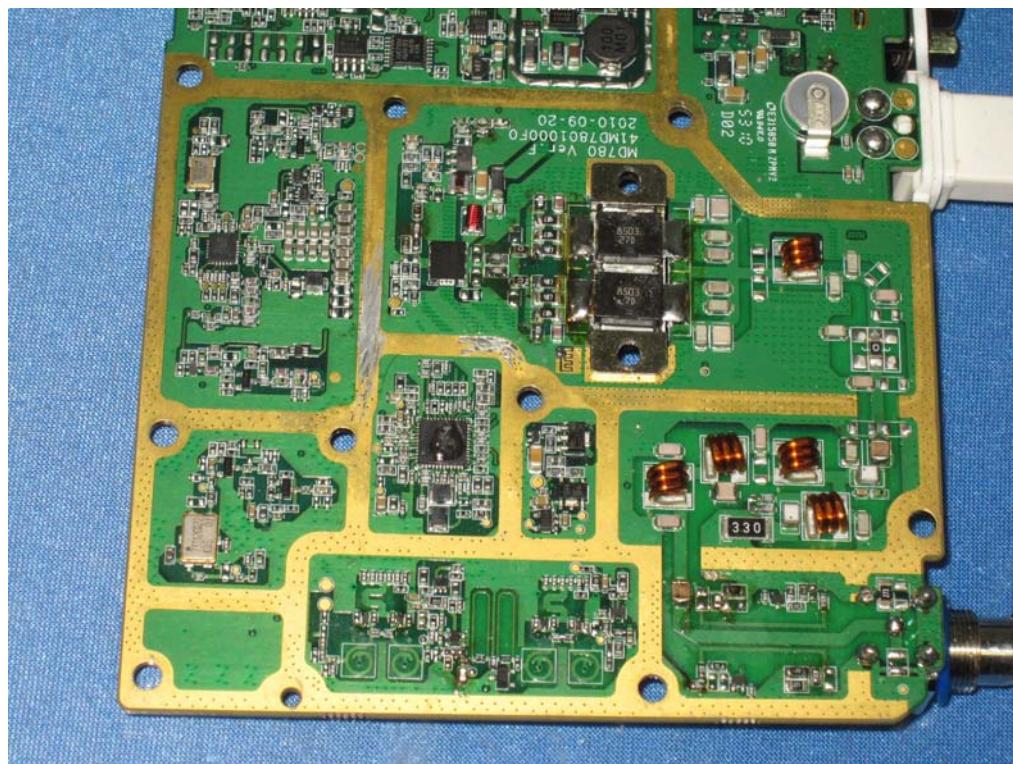


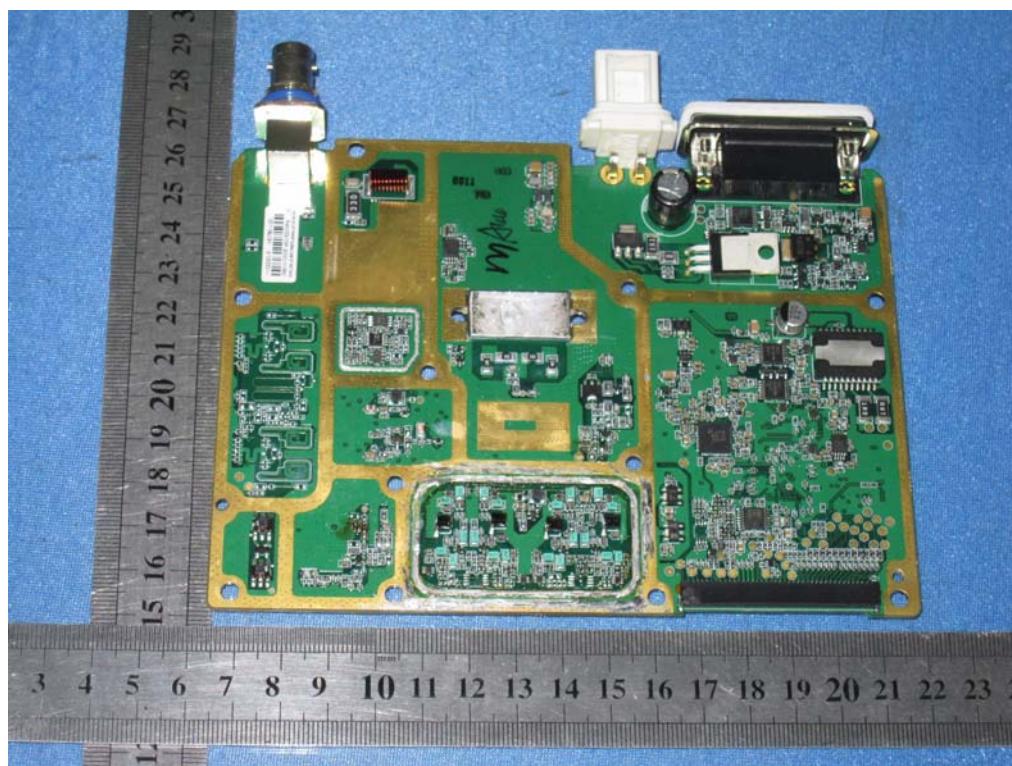
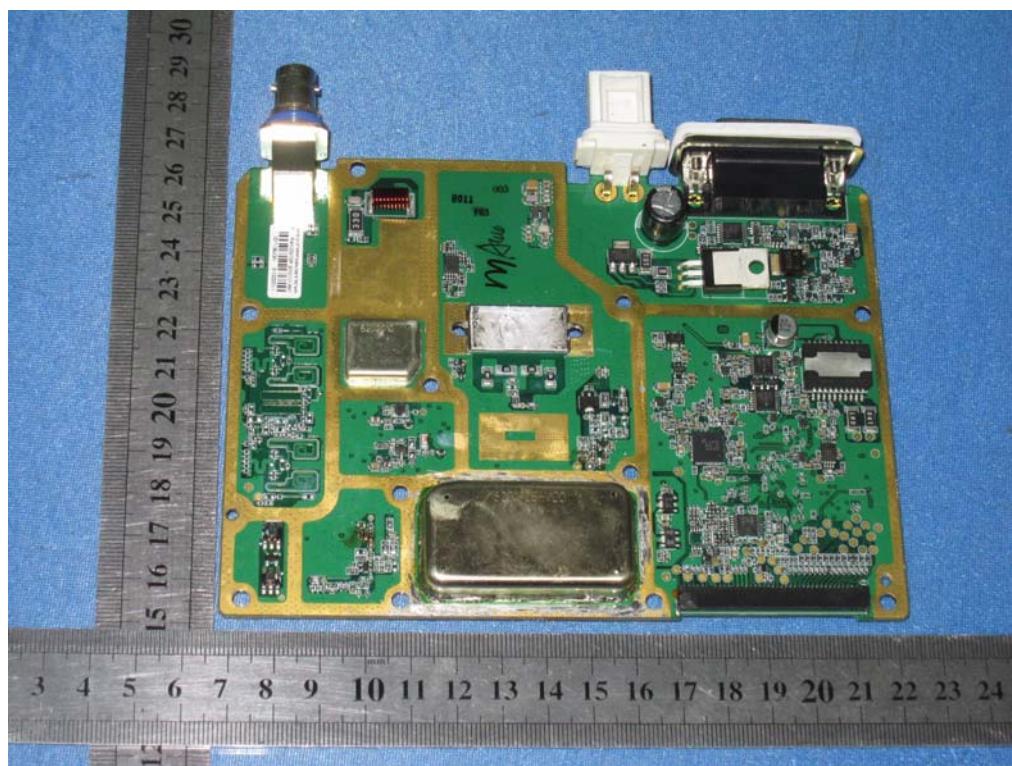


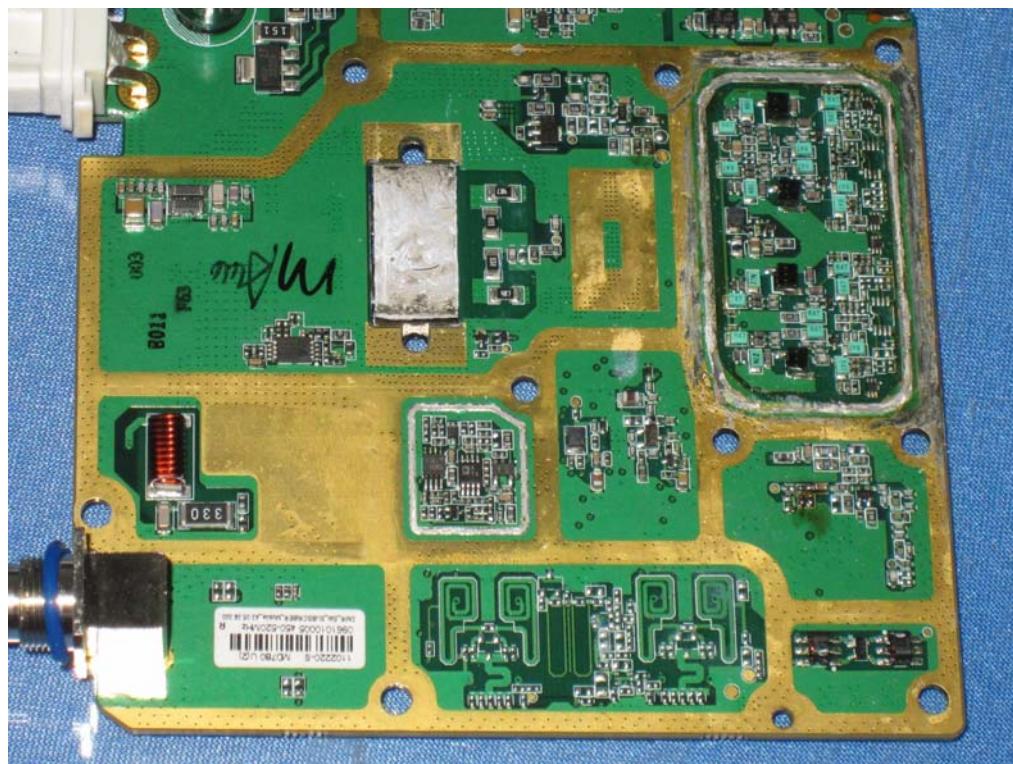
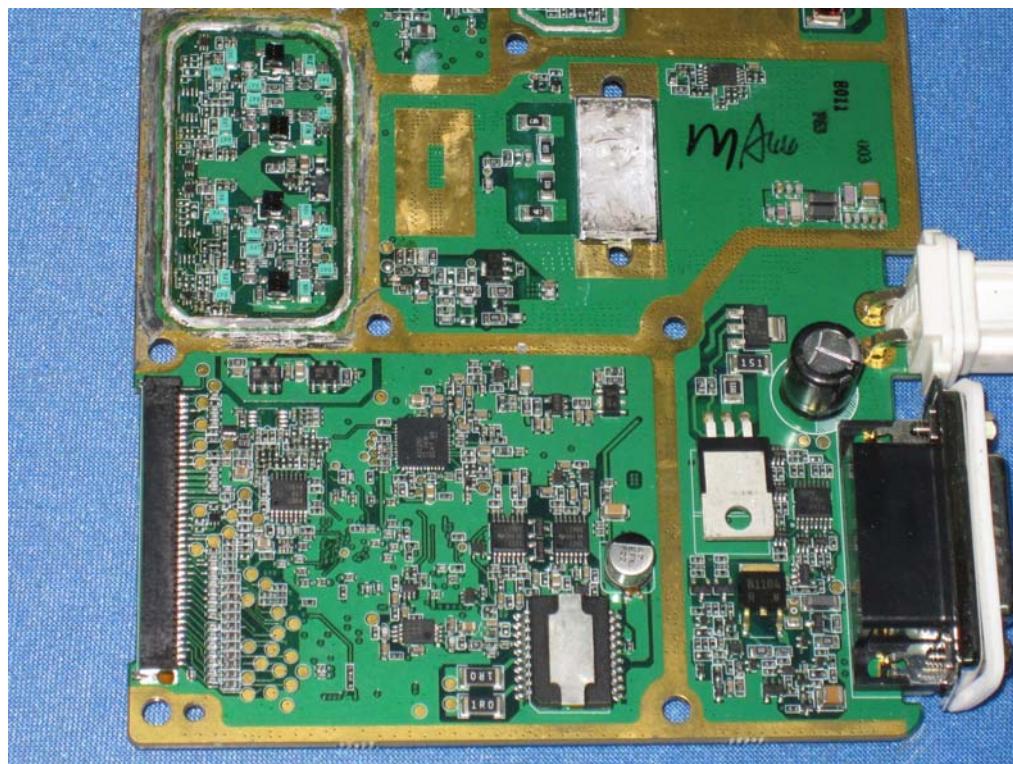


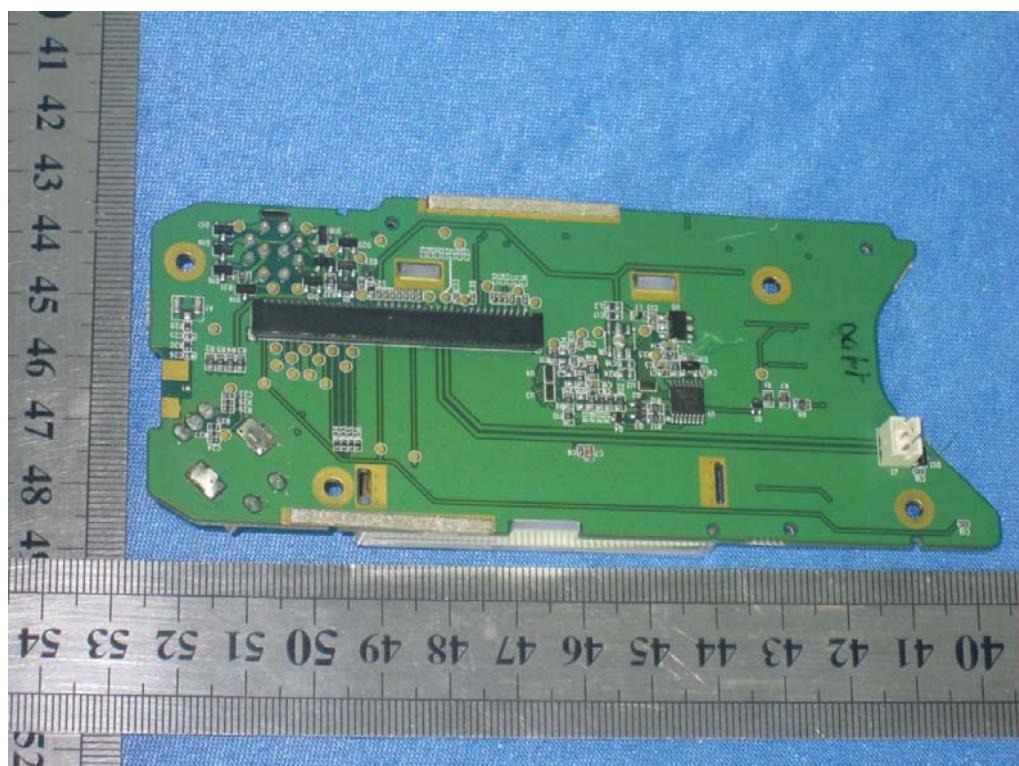
Internal Photos

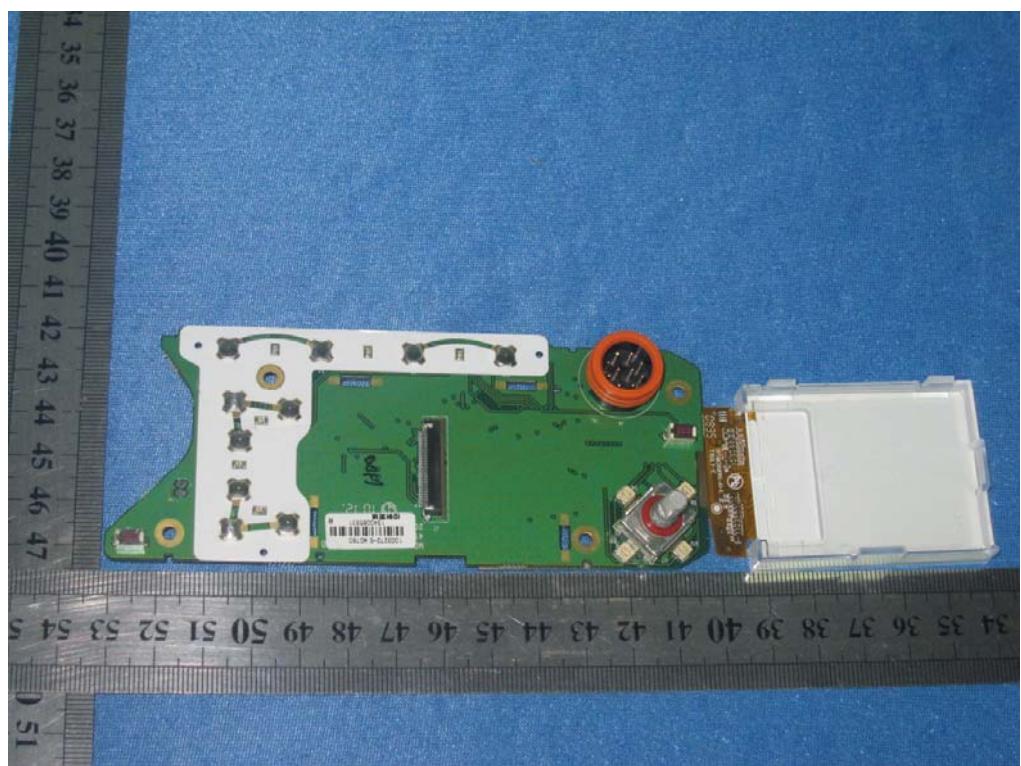
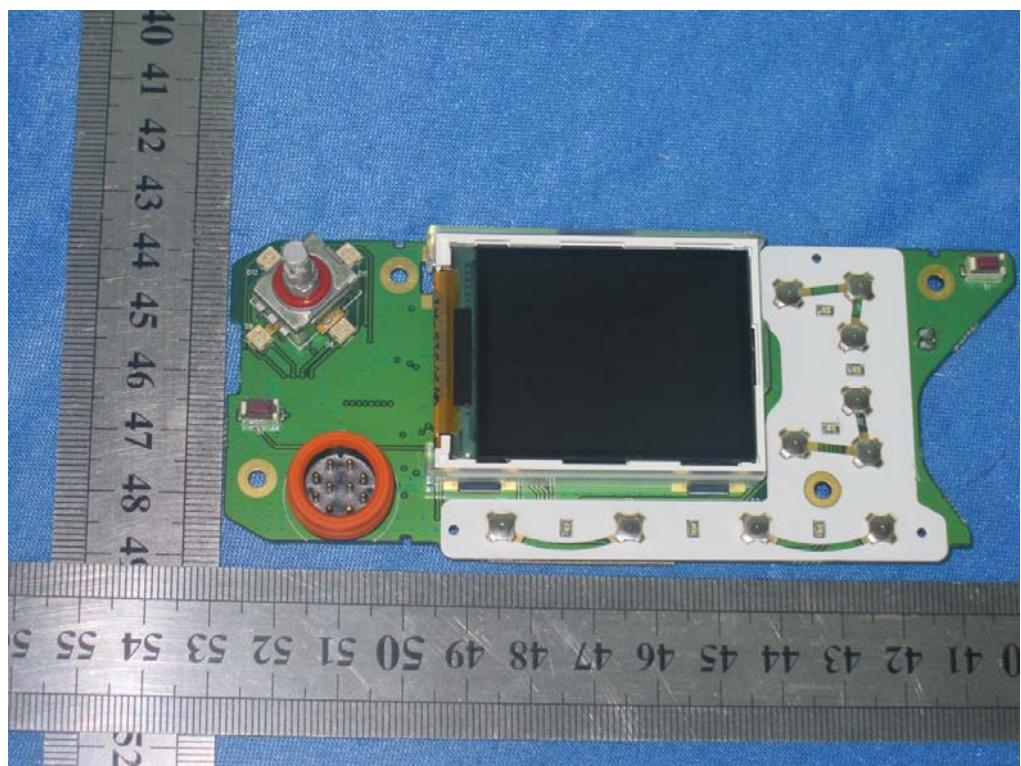


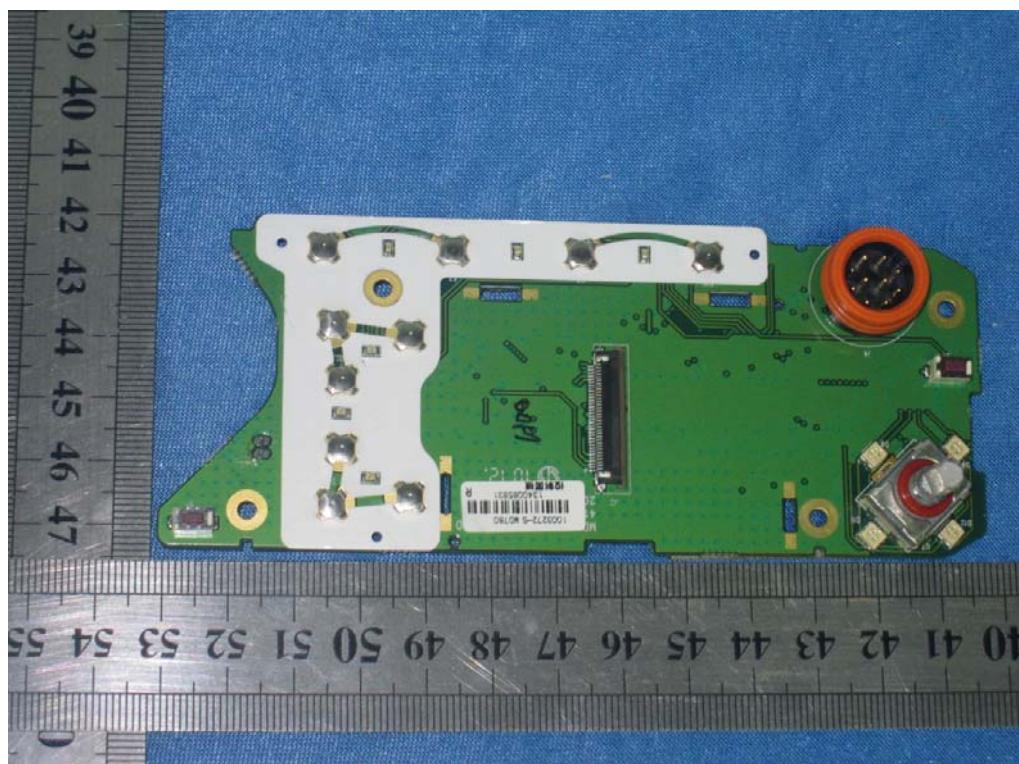












.....End of Report.....