

## FCC PART 90 TEST REPORT

### FCC Part 90

**Report Reference No.....**: TRE11120097

**FCC ID.....**: YAMPD70XG-VHF

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Date of issue.....: Dec 29, 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 Portable Radio



Trade Mark .....

Manufacturer .....

Model/Type reference.....: PD702G VHF/ PD705G VHF/ PD706G VHF/ PD708G VHF/  
HD705G VHF

Listed Models .....

/

Ratings .....

DC 7.40 V

Modulation .....

FM&4FSK

Channel Separation.....

12.5KHz

Rated Power .....

5Watts(36.99dBm)/1Watts(30 dBm)

Operation Frequency Range .....

From 136 MHz to 174 MHz

Result.....: **Positive**

**TEST REPORT**

|                          |                    |                               |
|--------------------------|--------------------|-------------------------------|
| <b>Test Report No. :</b> | <b>TRE11120097</b> | Dec 29, 2011<br>Date of issue |
|--------------------------|--------------------|-------------------------------|

Equipment under Test : Digital Portable Radio

Model /Type : PD702G VHF/ PD705G VHF/ PD706G VHF/ PD708G VHF/HD705G VHF

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

|  |                 |
|--|-----------------|
| <b>Test Result</b> according to the standards on page 4: | <b>Positive</b> |
|--|-----------------|

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.\*\*](#)

[\*\*47 CFR FCC Part 15 Subpart B - Unintentional Radiators\*\*](#)

## 2. SUMMARY

### 2.1. General Remarks

|                                |   |              |
|--------------------------------|---|--------------|
| Date of receipt of test sample | : | Dec 26, 2011 |
|                                |   |              |
|                                |   |              |
| Testing commenced on           | : | Dec 26, 2011 |
|                                |   |              |
|                                |   |              |
| Testing concluded on           | : | Dec 29, 2011 |

### 2.2. Product Description

The Hytera Communications Corporation Ltd.'s Model: PD702G VHF/ PD705G VHF/ PD706G VHF/ PD708G VHF/HD705G VHF 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 Portable Radio                                    |  |
| Model Number         | PD702G VHF/ PD705G VHF/ PD706G VHF/ PD708G VHF/HD705G VHF |  |
| FCC ID               | YAMPD70XG-VHF   |  |
| Rated Output Power   | 5 Watts(36.99 dBm)/1 Watts(30.00 dBm)                     |  |
| 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 136 MHz to 174 MHz                                   |  |
| Maximum Output Power | Analog  | 5.08 W for 12.5 KHz Channel Separation   |
|                      | Digital   | 5.09 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 7.40V from battery

### Test frequency list

| Modulation Type | Test Channel   | Test Frequency |
|-----------------|----------------|----------------|
| Analog/FM       | Low Channel    | 136.5000 MHz   |
|                 | Middle Channel | 155.5000 MHz   |
|                 | High Channel   | 173.5000 MHz   |
| Digital/4FSK    | Low Channel    | 136.5000 MHz   |
|                 | Middle Channel | 155.5000 MHz   |
|                 | High Channel   | 173.5000 MHz   |

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

136-174 MHz V frequency band Digital Portable Radio with GPS function (PD702G VHF/ PD705G VHF/ PD706G VHF/ PD708G VHF/HD705G VHF).

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

|                       |             |                |   |
|-----------------------|-------------|----------------|---|
| <input type="radio"/> | Power Cable | Length (m) :   | / |
|                       |             | Shield :       | / |
|                       |             | Detachable :   | / |
| <input type="radio"/> | Multimeter  | Manufacturer : | / |
|                       |             | Model No. :    | / |

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

This submittal(s) (test report) is intended for FCC ID: **YAMPD70XG-VHF** 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 V frequency band (136-174MHz) Digital Portable Radio with GPS function, The functions of the EUT listed as below:

|       | Test Standards | Reference Report |
|-------|----------------|------------------|
| Radio | FCC Part 90    | TRE11120097      |

### **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 is until Sept 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 Jan 25, 2011. Valid time is until Jan 24, 2014

##### **ACA**

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

##### **NEMKO-Aut. No.: ELA125**

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025:2005 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10; the Authorization is valid through July 07, 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 Aug 24, 2013.

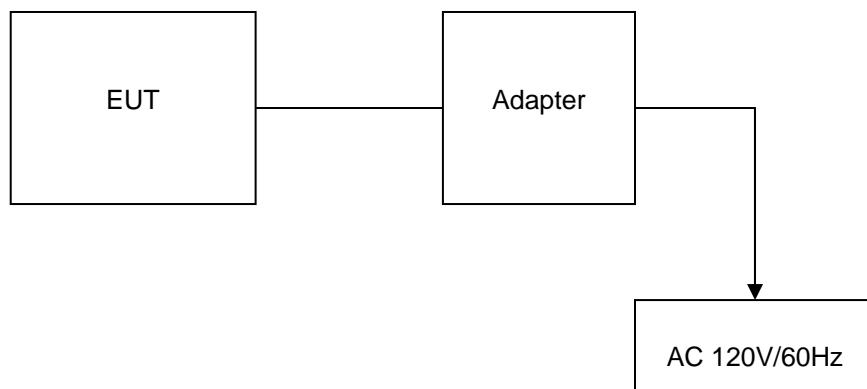
### **3.3. Environmental conditions**

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

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

### **3.4. Configuration of Tested System**

**Fig. 2-1 Configuration of Tested System**



**Table 2-1 Equipment Used in Tested System**

**Adapter:** P/N: PS1014

Model: DSA-15P-12 US 120120

Input:100-240V~50/60Hz 0.5A

Output: +12V DC 1A

Power Cable: 180cm

◇ Shielded      ◆ Unshielded

### **3.5. Description of Tested Modes**

The EUT (Digital Portable 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    |

### 3.8. Equipments Used during the Test

| AC Power Conducted Emission |               |             |               |                 |
|-----------------------------|---------------|-------------|---------------|-----------------|
| Name of Equipment           | Manufacturer  | Model       | Serial Number | Calibration Due |
| Artificial Mains            | Rohde&Schwarz | ESH2-Z5     | 100028        | 10/23/2012      |
| EMI Test Receiver           | Rohde&Schwarz | ESCS 30     | 100038        | 10/23/2012      |
| Pulse Limiter               | Rohde&Schwarz | ESHSZ2      | 100044        | 10/23/2012      |
| EMI Test Software           | Rohde&Schwarz | ES-K1 V1.71 | N/A           | 10/23/2012      |

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

| 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        | 10/23/2012      |
| EMI Test Receiver   | Rohde&Schwarz | ESI 26      | 100009        | 10/23/2012      |
| RF Test Panel   | Rohde&Schwarz | TS / RSP    | 335015/ 0017  | N/A             |
| HORN ANTENNA  | Rohde&Schwarz | HF906       | 100039        | 10/23/2012      |
| Turntable   | ETS           | 2088        | 2149          | N/A             |
| Antenna Mast  | ETS           | 2075        | 2346          | N/A             |
| EMI Test Software   | Rohde&Schwarz | ES-K1 V1.71 | N/A           | 10/23/2012      |
| RF COMMUNICATION TEST SET   | HP            | 8920A       | 3813A10206    | 10/23/2012      |
| 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    | 10/23/2012      |
| Signal Generator       | Rohde&Schwarz | SMT03   | 100059        | 10/23/2012      |
| Climate Chamber        | ESPEC         | EL-10KA | 05107008      | 10/23/2012      |

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

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

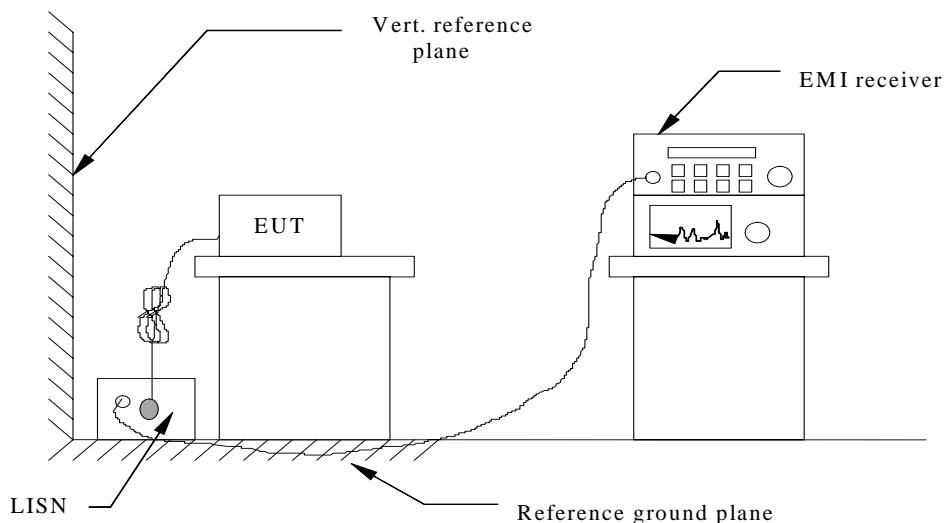
## **4. TEST CONDITIONS AND RESULTS**

### **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<br>(MHz) | Maximum RF Line Voltage (dB $\mu$ 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     |

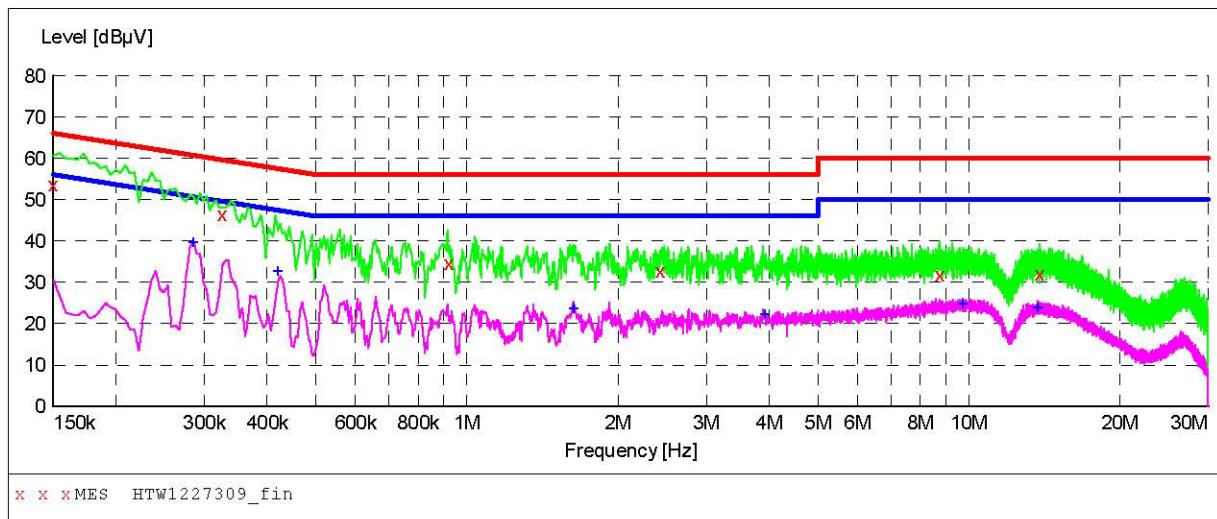
\* Decreasing linearly with the logarithm of the frequency

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

**SCAN TABLE: "Voltage (9K-30M) FIN"**  
 Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW1227309\_fin"**

12/27/2011 9:33AM

| Frequency<br>MHz | Level<br>dB $\mu$ V | Transd<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.150000         | 53.60               | 10.1         | 66                  | 12.4         | QP       | L1   | GND |
| 0.325500         | 46.40               | 10.1         | 60                  | 13.2         | QP       | L1   | GND |
| 0.919500         | 34.60               | 10.1         | 56                  | 21.4         | QP       | L1   | GND |
| 2.431500         | 32.80               | 10.2         | 56                  | 23.2         | QP       | L1   | GND |
| 8.772000         | 31.80               | 10.3         | 60                  | 28.2         | QP       | L1   | GND |
| 13.834500        | 32.10               | 10.3         | 60                  | 27.9         | QP       | L1   | GND |

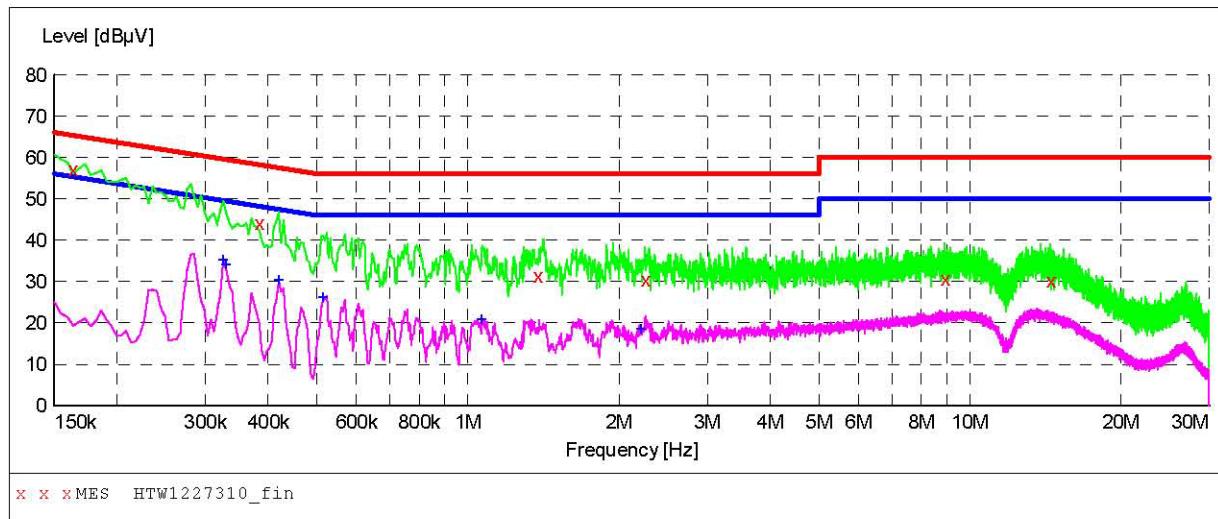
**MEASUREMENT RESULT: "HTW1227309\_fin2"**

12/27/2011 9:33AM

| Frequency<br>MHz | Level<br>dB $\mu$ V | Transd<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.285000         | 39.80               | 10.1         | 51                  | 10.9         | AV       | L1   | GND |
| 0.420000         | 32.80               | 10.1         | 47                  | 14.6         | AV       | L1   | GND |
| 1.630500         | 23.80               | 10.2         | 46                  | 22.2         | AV       | L1   | GND |
| 3.925500         | 22.30               | 10.2         | 46                  | 23.7         | AV       | L1   | GND |
| 9.708000         | 24.90               | 10.3         | 50                  | 25.1         | AV       | L1   | GND |
| 13.731000        | 24.00               | 10.3         | 50                  | 26.0         | AV       | L1   | GND |

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**SCAN TABLE: "Voltage (9K-30M) FIN"**  
 Short Description: 150K-30M Voltage



**MEASUREMENT RESULT: "HTW1227310\_fin"**

12/27/2011 9:36AM

| Frequency<br>MHz | Level<br>dB $\mu$ V | Transd<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.163500         | 57.20               | 10.1         | 65                  | 8.1          | QP       | N    | GND |
| 0.384000         | 44.10               | 10.1         | 58                  | 14.1         | QP       | N    | GND |
| 1.378500         | 31.40               | 10.2         | 56                  | 24.6         | QP       | N    | GND |
| 2.260500         | 30.60               | 10.2         | 56                  | 25.4         | QP       | N    | GND |
| 8.947500         | 30.80               | 10.3         | 60                  | 29.2         | QP       | N    | GND |
| 14.527500        | 30.30               | 10.3         | 60                  | 29.7         | QP       | N    | GND |

**MEASUREMENT RESULT: "HTW1227310\_fin2"**

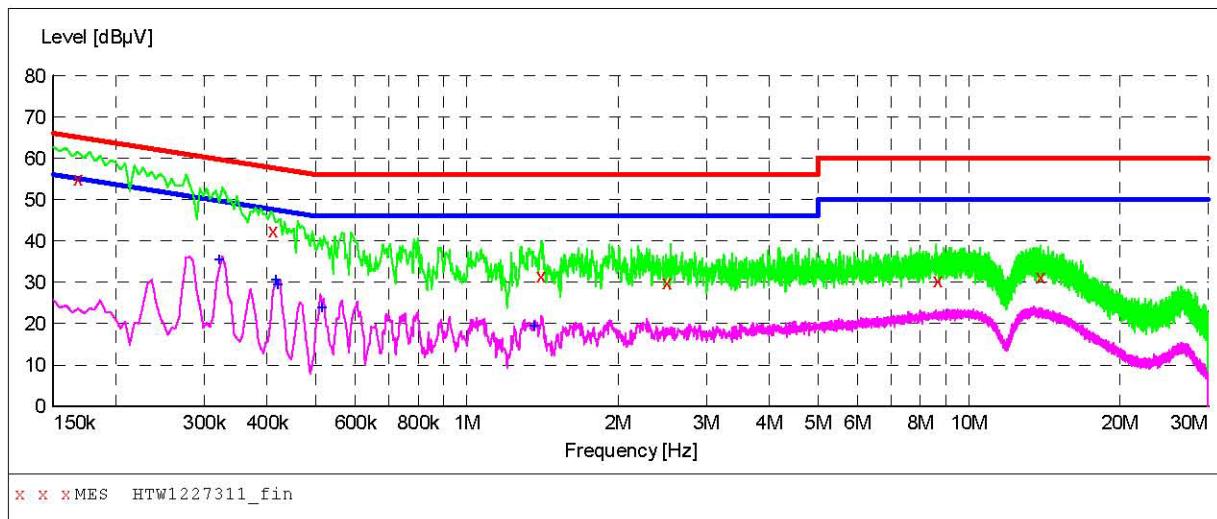
12/27/2011 9:36AM

| Frequency<br>MHz | Level<br>dB $\mu$ V | Transd<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.325500         | 35.30               | 10.1         | 50                  | 14.3         | AV       | N    | GND |
| 0.330000         | 34.10               | 10.1         | 50                  | 15.4         | AV       | N    | GND |
| 0.420000         | 30.60               | 10.1         | 47                  | 16.8         | AV       | N    | GND |
| 0.514500         | 26.30               | 10.1         | 46                  | 19.7         | AV       | N    | GND |
| 1.063500         | 21.00               | 10.2         | 46                  | 25.0         | AV       | N    | GND |
| 2.215500         | 18.70               | 10.2         | 46                  | 27.3         | AV       | N    | GND |

Page 1/1 12/27/2011 9:36AM HTW1227310

For FSK Modulation @ 12.5 KHz

**SCAN TABLE: "Voltage (9K-30M) FIN"**  
 Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "HTW1227311\_fin"**

12/27/2011 9:39AM

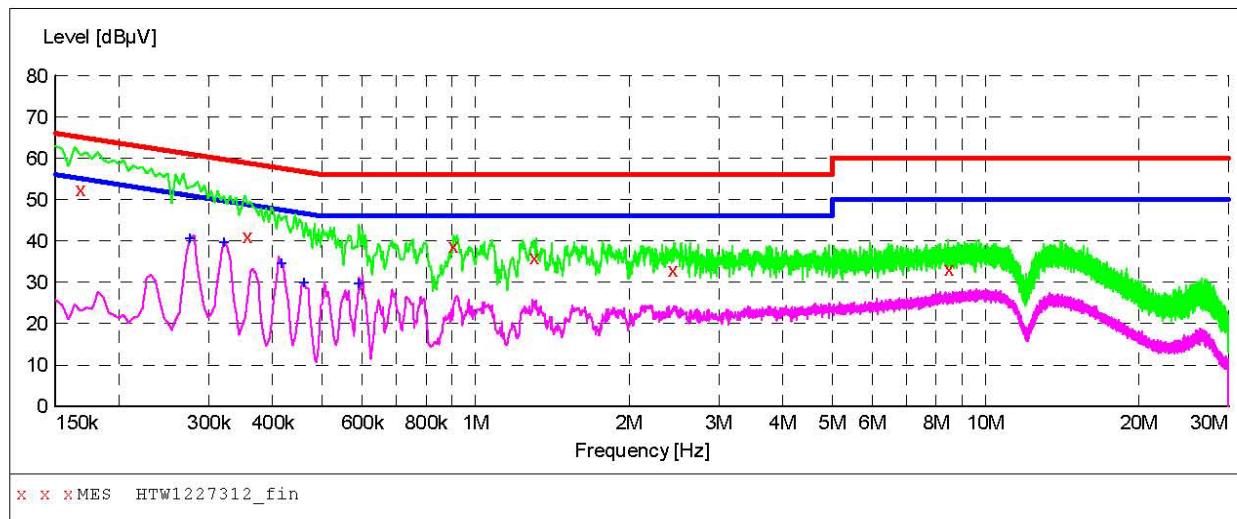
| Frequency<br>MHz | Level<br>dB $\mu$ V | Transd<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.168000         | 55.00               | 10.1         | 65                  | 10.1         | QP       | N    | GND |
| 0.411000         | 42.50               | 10.1         | 58                  | 15.1         | QP       | N    | GND |
| 1.405500         | 31.60               | 10.2         | 56                  | 24.4         | QP       | N    | GND |
| 2.503500         | 30.00               | 10.2         | 56                  | 26.0         | QP       | N    | GND |
| 8.659500         | 30.40               | 10.3         | 60                  | 29.6         | QP       | N    | GND |
| 13.915500        | 31.30               | 10.3         | 60                  | 28.7         | QP       | N    | GND |

**MEASUREMENT RESULT: "HTW1227311\_fin2"**

12/27/2011 9:39AM

| Frequency<br>MHz | Level<br>dB $\mu$ V | Transd<br>dB | Limit<br>dB $\mu$ V | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.321000         | 35.50               | 10.1         | 50                  | 14.2         | AV       | N    | GND |
| 0.415500         | 30.80               | 10.1         | 48                  | 16.7         | AV       | N    | GND |
| 0.420000         | 29.50               | 10.1         | 47                  | 17.9         | AV       | N    | GND |
| 0.514500         | 24.00               | 10.1         | 46                  | 22.0         | AV       | N    | GND |
| 1.360500         | 19.50               | 10.2         | 46                  | 26.5         | AV       | N    | GND |

**SCAN TABLE: "Voltage (9K-30M) FIN"**  
 Short Description: 150K-30M Voltage



**MEASUREMENT RESULT: "HTW1227312\_fin"**

| 12/27/2011 9:42AM | Frequency | Level      | Transd | Limit      | Margin | Detector | Line | PE  |
|-------------------|-----------|------------|--------|------------|--------|----------|------|-----|
|                   | MHz       | dB $\mu$ V | dB     | dB $\mu$ V | dB     |          |      |     |
|                   | 0.168000  | 52.60      | 10.1   | 65         | 12.5   | QP       | L1   | GND |
|                   | 0.357000  | 41.10      | 10.1   | 59         | 17.7   | QP       | L1   | GND |
|                   | 0.906000  | 38.90      | 10.1   | 56         | 17.1   | QP       | L1   | GND |
|                   | 1.306500  | 36.10      | 10.2   | 56         | 19.9   | QP       | L1   | GND |
|                   | 2.436000  | 33.00      | 10.2   | 56         | 23.0   | QP       | L1   | GND |
|                   | 8.493000  | 33.30      | 10.3   | 60         | 26.7   | QP       | L1   | GND |

**MEASUREMENT RESULT: "HTW1227312\_fin2"**

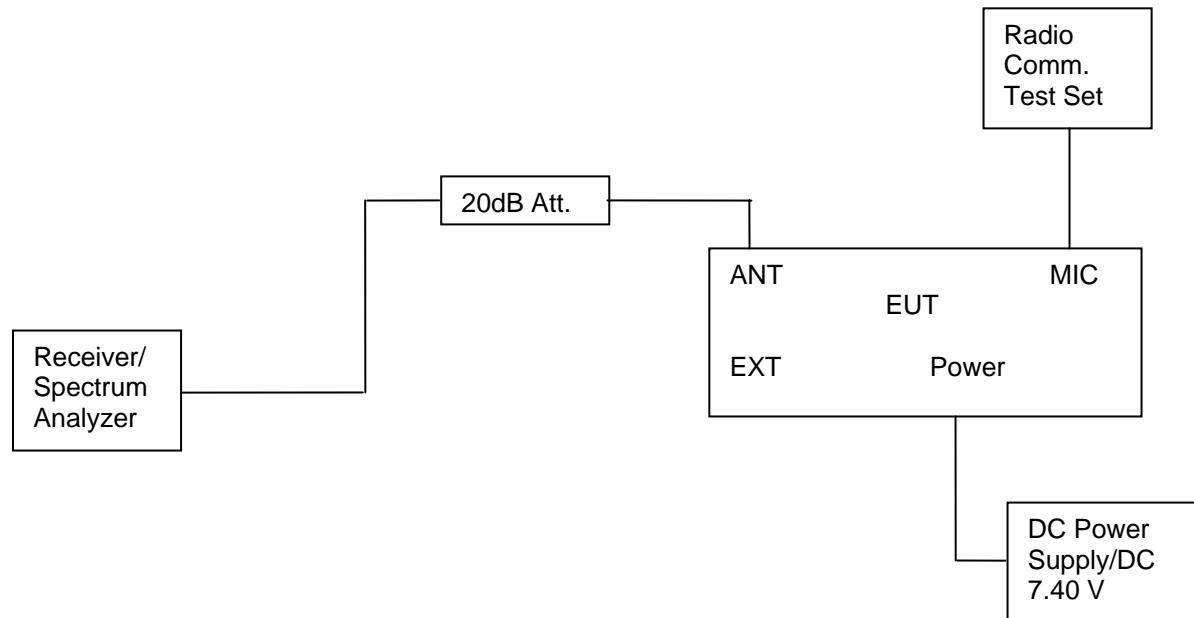
| 12/27/2011 9:42AM | Frequency | Level      | Transd | Limit      | Margin | Detector | Line | PE  |
|-------------------|-----------|------------|--------|------------|--------|----------|------|-----|
|                   | MHz       | dB $\mu$ V | dB     | dB $\mu$ V | dB     |          |      |     |
|                   | 0.276000  | 40.70      | 10.1   | 51         | 10.2   | AV       | L1   | GND |
|                   | 0.321000  | 39.70      | 10.1   | 50         | 10.0   | AV       | L1   | GND |
|                   | 0.415500  | 34.70      | 10.1   | 48         | 12.8   | AV       | L1   | GND |
|                   | 0.460500  | 30.00      | 10.1   | 47         | 16.7   | AV       | L1   | GND |
|                   | 0.591000  | 29.90      | 10.1   | 46         | 16.1   | AV       | L1   | 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

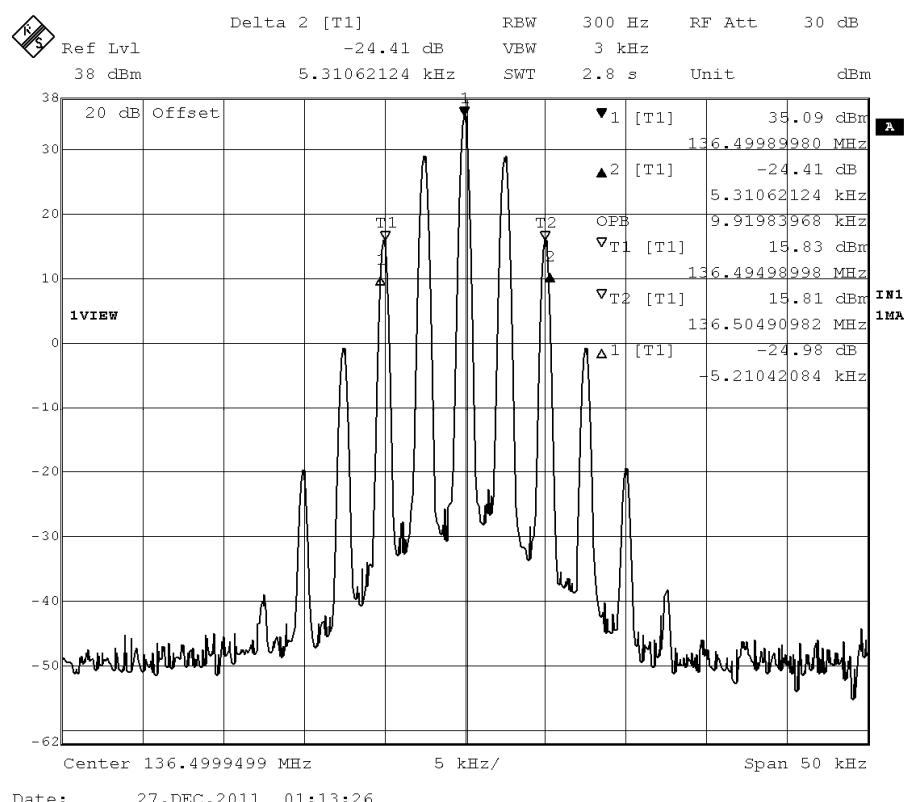
- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel 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=300Hz, span=50 KHz for 12.5 channel spacing.

**TEST RESULTS****4.2.1 Occupied Bandwidth**

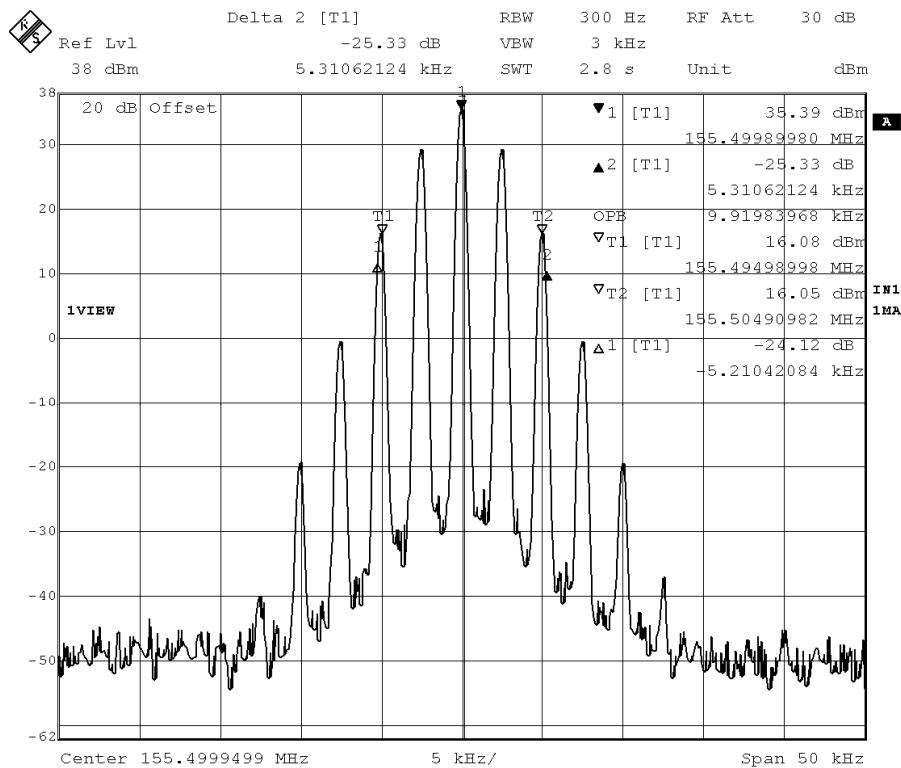
| Modulation Type | Channel Spairation | Test Channel                            | Test Frequency | 99% Occupied Bandwidth | 26dB Occupied Band width |  |
|-----------------|--------------------|---|----------------|------------------------|--------------------------|--|
| FM              | 12.5KHz            | Low                                     | 136.5000 MHz   | 9.92 KHz               | 10.52 KHz                |  |
|                 |                    | Middle                                  | 155.5000 MHz   | 9.92 KHz               | 10.52 KHz                |  |
|                 |                    | High                                    | 173.5000 MHz   | 9.92 KHz               | 10.52 KHz                |  |
| 4FSK            | 12.5KHz            | Low                                     | 136.5000 MHz   | 7.11 KHz               | 9.82 KHz                 |  |
|                 |                    | Middle                                  | 155.5000 MHz   | 6.91 KHz               | 9.92 KHz                 |  |
|                 |                    | High                                    | 173.5000 MHz   | 7.01 KHz               | 8.82 KHz                 |  |
| Limit           |                    | 11.25KHz for 12.5KHz Channel Separation |                |                        |                          |  |
| Test Results    |                    | Compliance                              |                |                        |                          |  |

**Plots of 99% and 26dB Bandwidth Measurement**

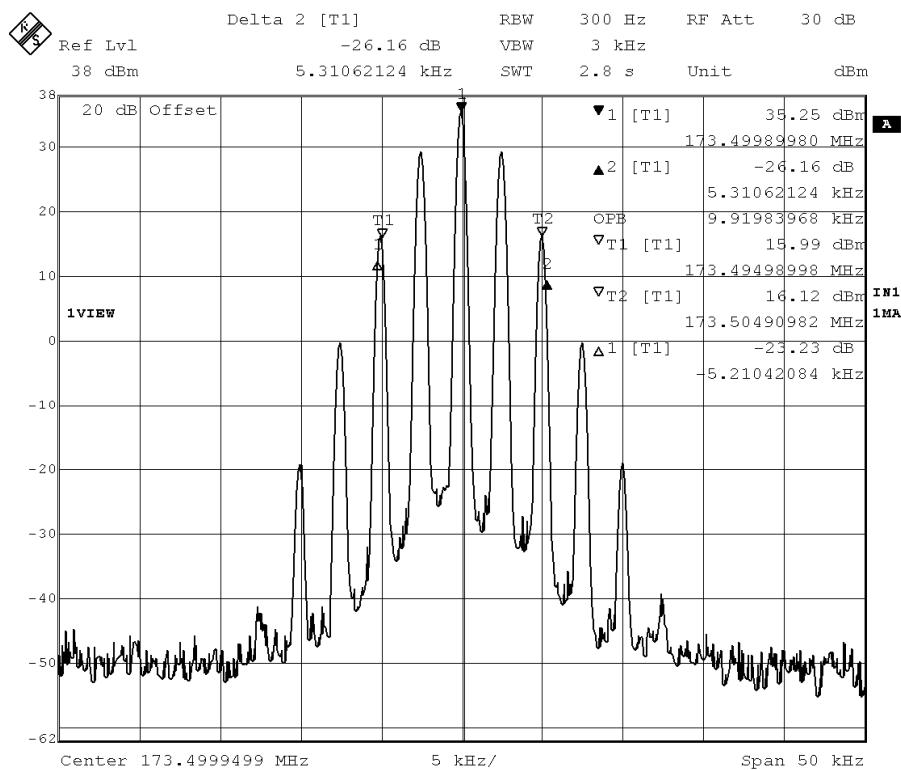
| Modulation Type | Channel Separation | Freq.(MHz) | 99% Bandwidth (KHz) | 26dB Bandwidth (KHz) | FCC Limit (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|----------------------|-----------------|------------|
| FM              | 12.5 KHz           | 136.5000   | 9.92                | 10.52                | 11.25           | Compliance |



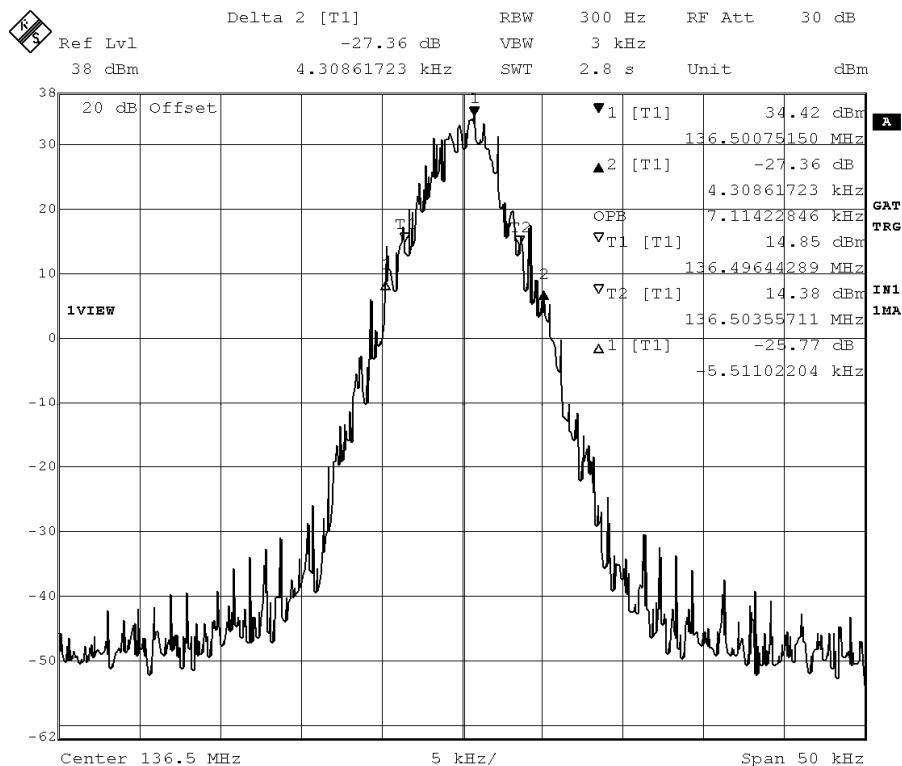
| Modulation Type | Channel Separation | Freq.(MHz) | 99% Bandwidth (KHz) | 26dB Bandwidth (KHz) | FCC Limit (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|----------------------|-----------------|------------|
| FM              | 12.5 KHz           | 155.5000   | 9.92                | 10.52                | 11.25           | Compliance |



| Modulation Type | Channel Separation | Freq.(MHz) | 99% Bandwidth (KHz) | 26dB Bandwidth (KHz) | FCC Limit (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|----------------------|-----------------|------------|
| FM              | 12.5 KHz           | 173.5000   | 9.92                | 10.52                | 11.25           | Compliance |

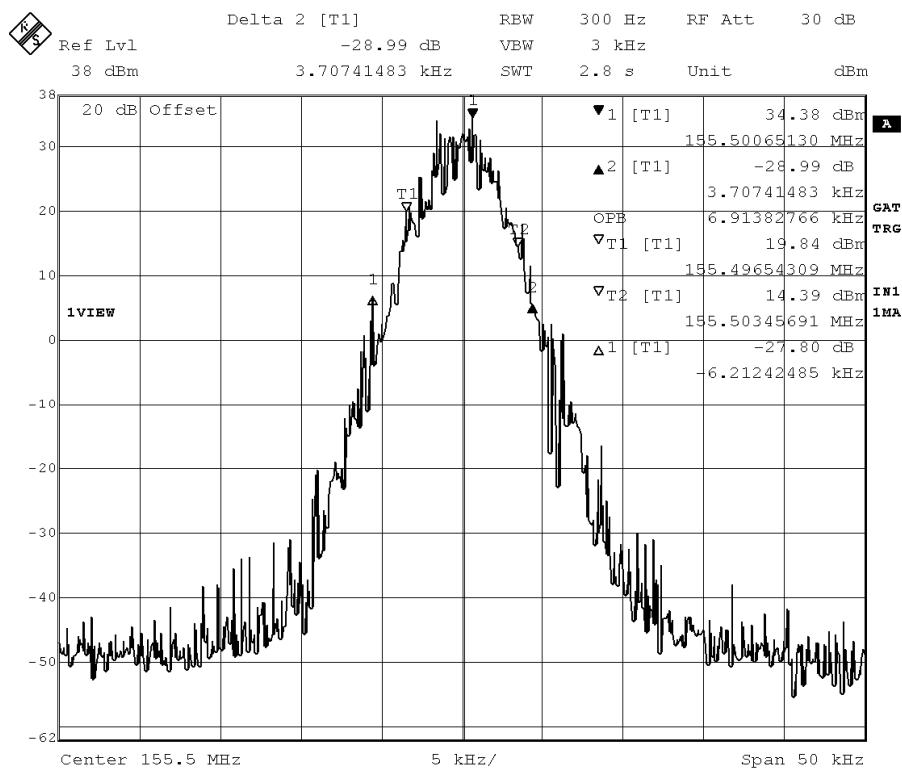


| Modulation Type | Channel Separation | Freq.(MHz) | 99% Bandwidth (KHz) | 26dB Bandwidth (KHz) | FCC Limit (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|----------------------|-----------------|------------|
| 4FSK            | 12.5 KHz           | 136.5000   | 7.11                | 9.82                 | 11.25           | Compliance |



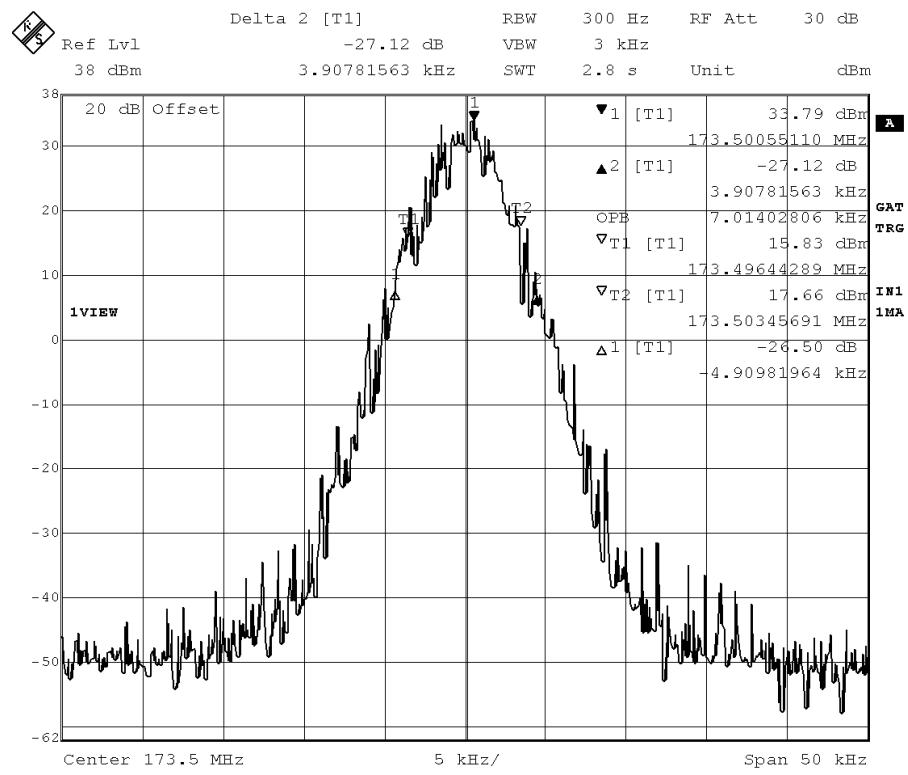
Date: 27.DEC.2011 01:07:29

| Modulation Type | Channel Separation | Freq.(MHz) | 99% Bandwidth (KHz) | 26dB Bandwidth (KHz) | FCC Limit (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|----------------------|-----------------|------------|
| 4FSK            | 12.5 KHz           | 155.5000   | 6.91                | 9.92                 | 11.25           | Compliance |



Date: 27.DEC.2011 01:09:49

| Modulation Type | Channel Separation | Freq.(MHz) | 99% Bandwidth (KHz) | 26dB Bandwidth (KHz) | FCC Limit (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|----------------------|-----------------|------------|
| 4FSK            | 12.5 KHz           | 173.5000   | 7.01                | 8.82                 | 11.25           | Compliance |



#### 4.2.2 Emission Mask

| Modulation Type | Channel Spairation | Test Channel | Test Frequency | FCC Applicable Mask | RBW    |
|-----------------|--------------------|--------------|----------------|---------------------|--------|
| FM              | 12.5KHz            | Low          | 136.5000 MHz   | D                   | 100 Hz |
|                 |                    | Middle       | 155.5000 MHz   | D                   | 100 Hz |
|                 |                    | High         | 173.5000 MHz   | D                   | 100 Hz |
| 4FSK            | 12.5KHz            | Low          | 136.5000 MHz   | D                   | 100 Hz |
|                 |                    | Middle       | 155.5000 MHz   | D                   | 100 Hz |
|                 |                    | High         | 173.5000 MHz   | D                   | 100 Hz |
| Test Results    |                    | Compliance   |                |                     |        |

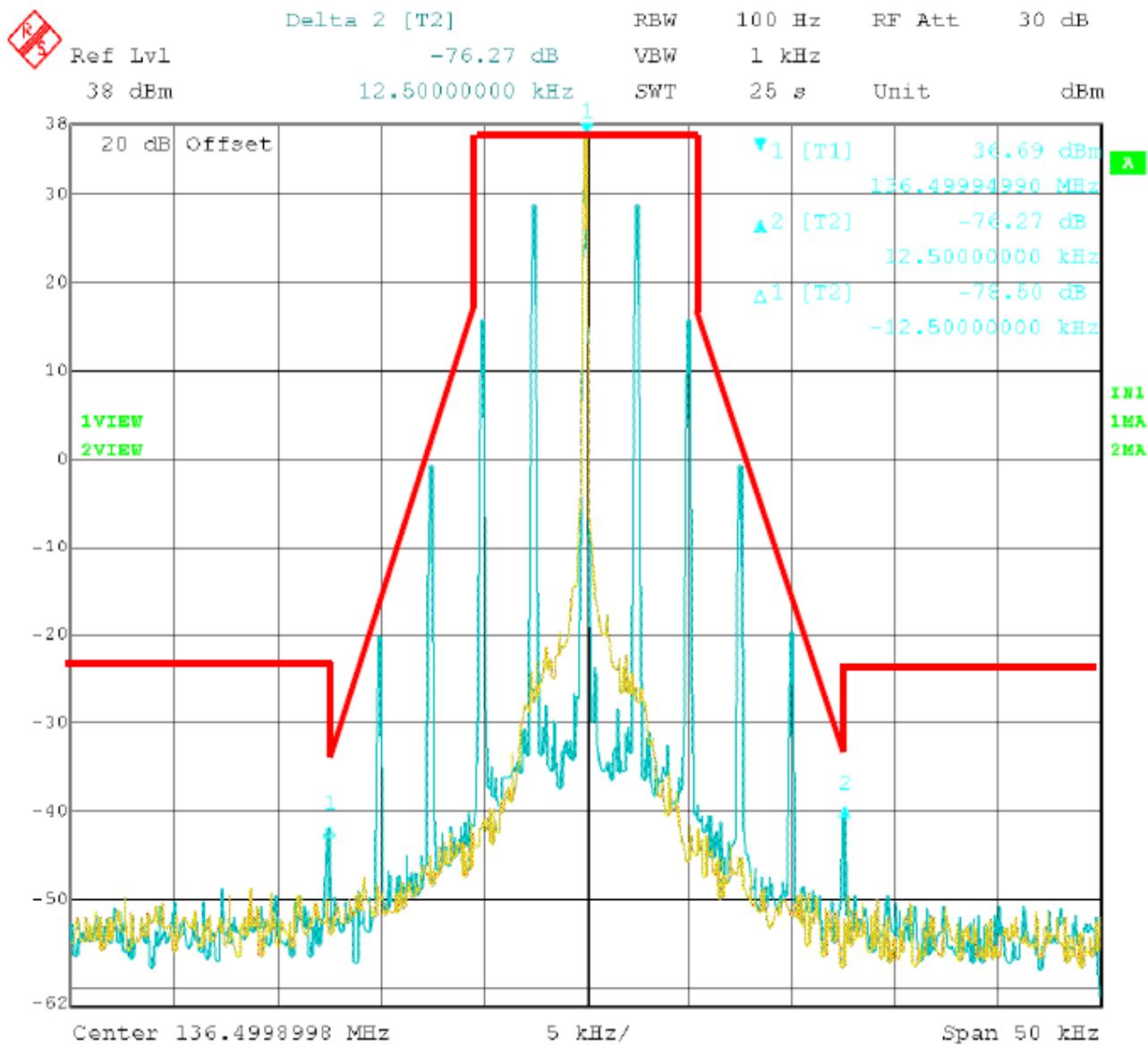
#### Plots of Emission Mask Measurement

Referred as the attached plot hereinafter

Note: The yellow curve represents unmodulated signal.

The green curve represents modulated signal.

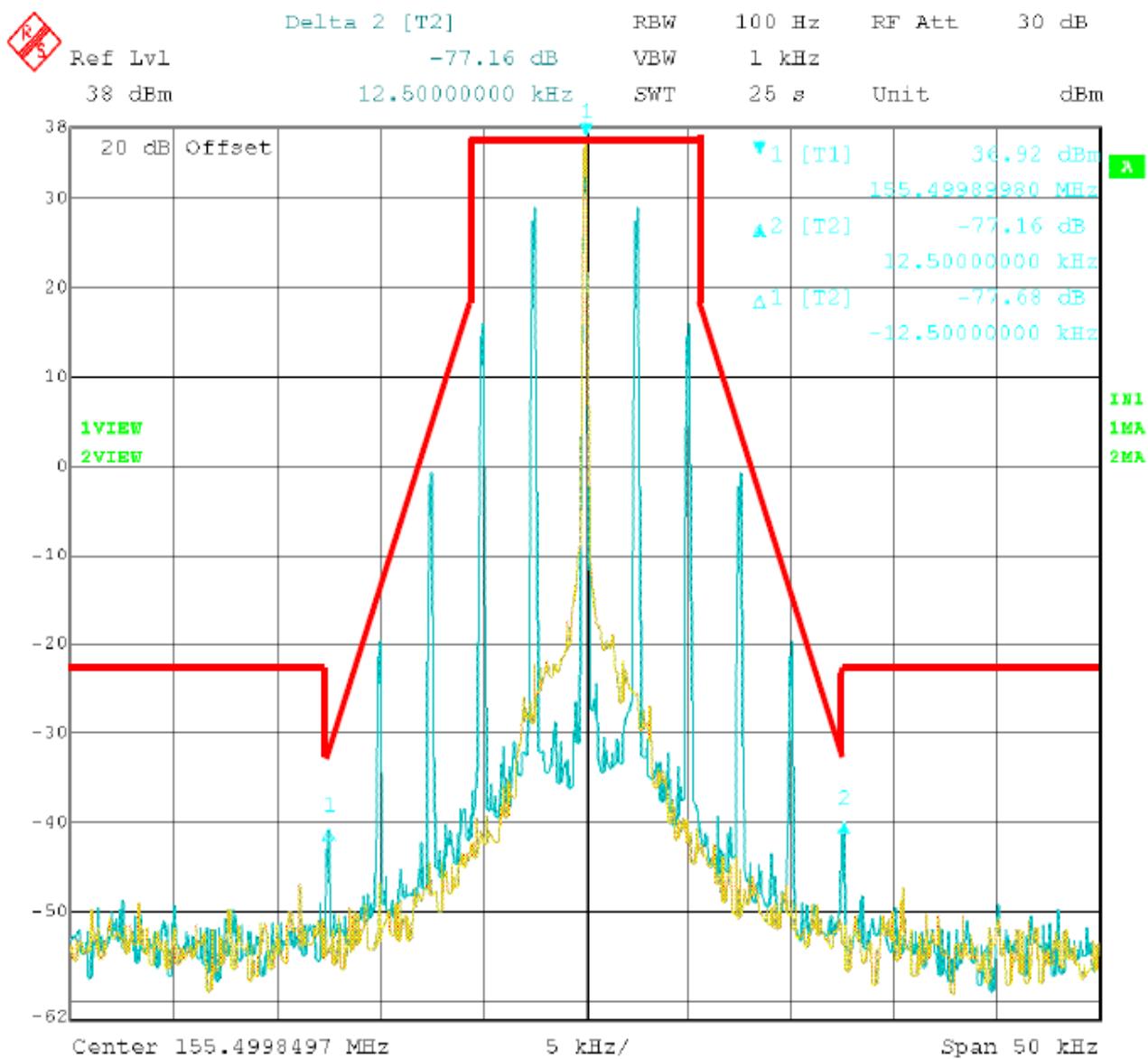
| Modulation Type | Channel Separation | Freq.(MHz) | FCC Applicable Mask | RBW   | Audio Freq. (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|-------|-------------------|------------|
| FM              | 12.5 KHz           | 136.5000   | D                   | 100Hz | 2.5               | Compliance |



Date: 27.DEC.2011 01:17:33

12.5 kHz Channel Spacing, 136.5000 MHz, 2500 Hz Audio Modulation Only

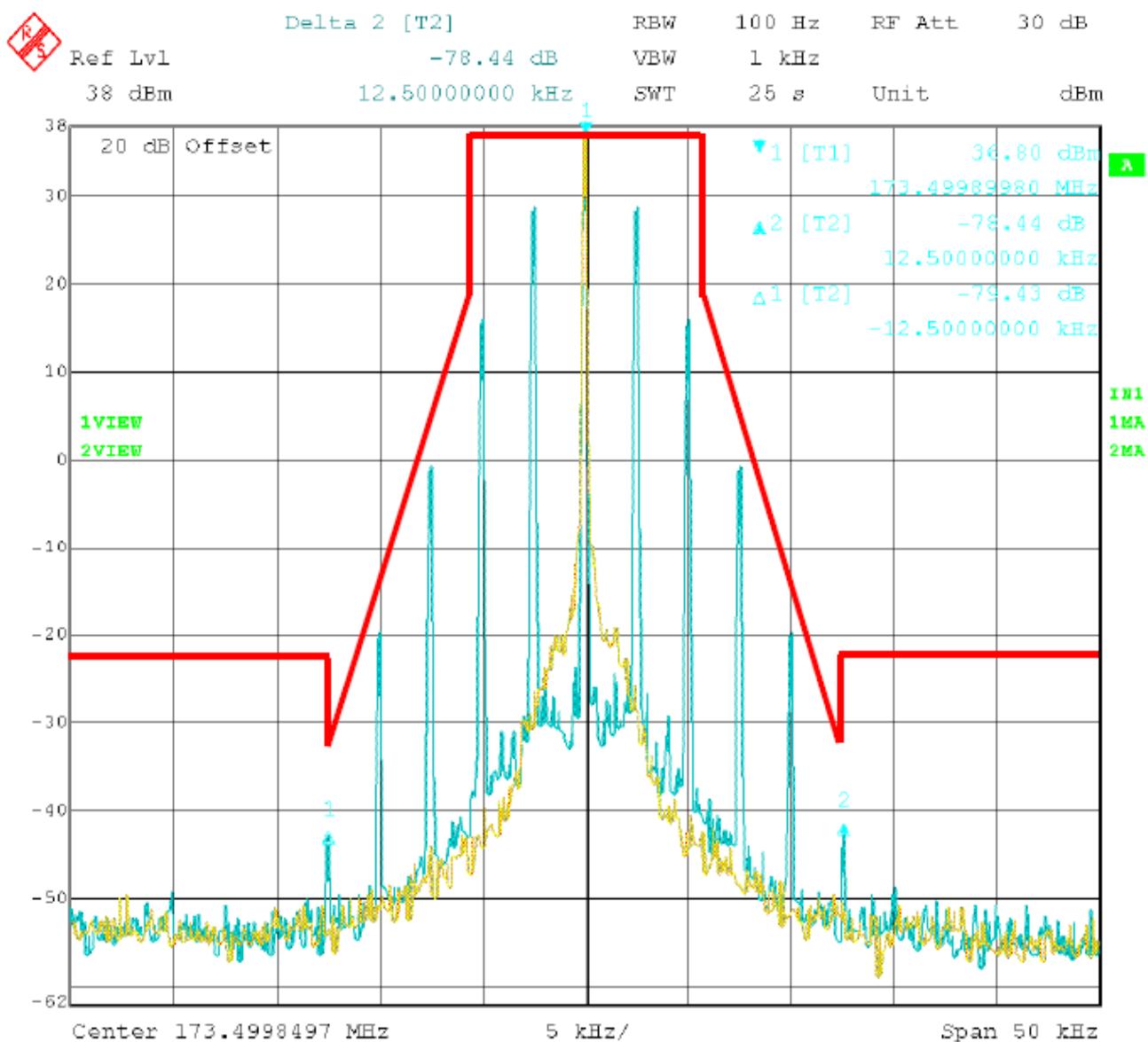
| Modulation Type | Channel Separation | Freq.(MHz) | FCC Applicable Mask | RBW   | Audio Freq. (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|-------|-------------------|------------|
| FM              | 12.5 KHz           | 155.5000   | D                   | 100Hz | 2.5               | Compliance |



Date: 27.DEC.2011 01:22:08

12.5 kHz Channel Spacing, 155.5000 MHz, 2500 Hz Audio Modulation Only

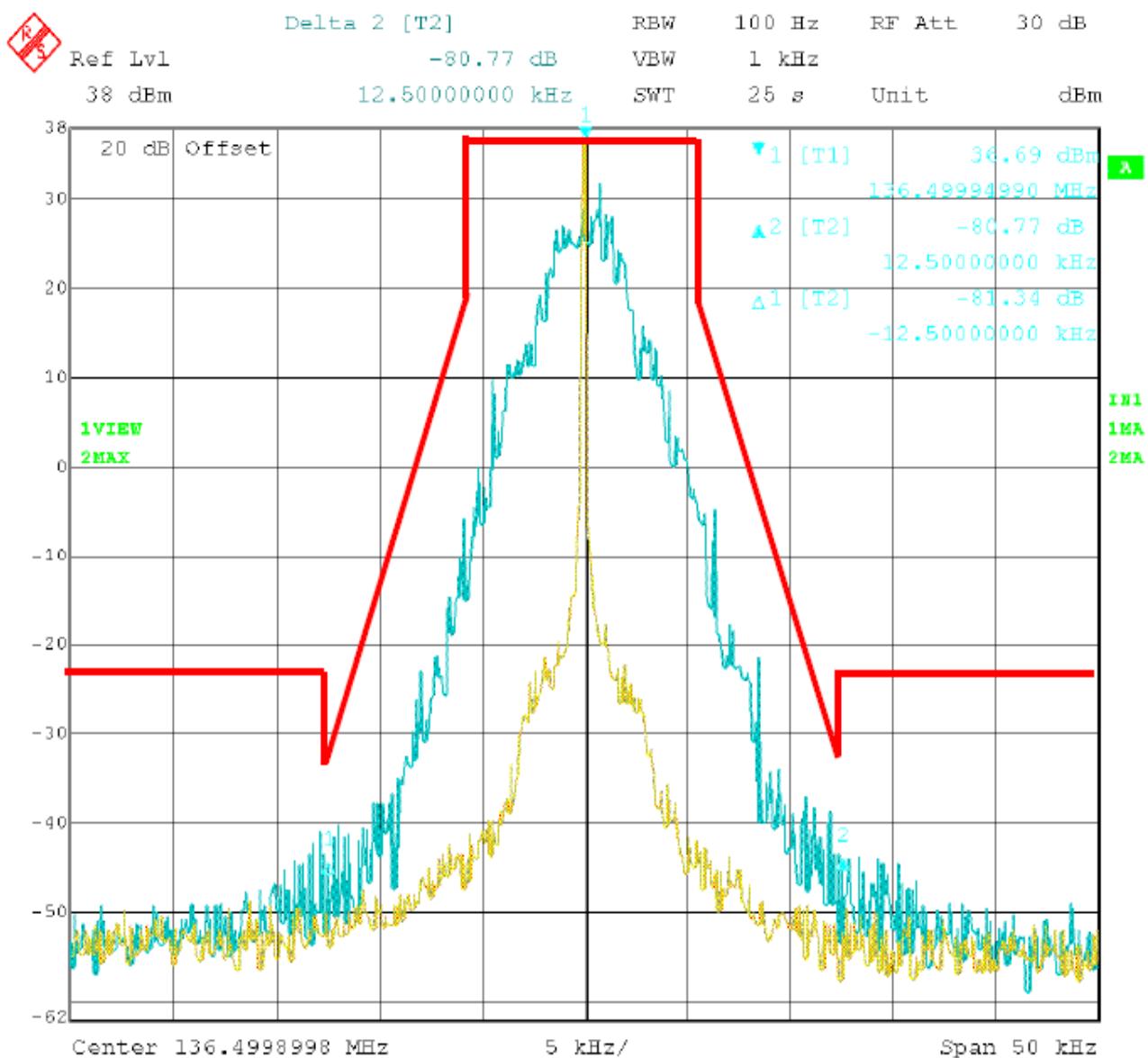
| Modulation Type | Channel Separation | Freq.(MHz) | FCC Applicable Mask | RBW   | Audio Freq. (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|-------|-------------------|------------|
| FM              | 12.5 KHz           | 173.5000   | D                   | 100Hz | 2.5               | Compliance |



Date: 27.DEC.2011 01:27:27

12.5 kHz Channel Spacing, 173.5000 MHz, 2500 Hz Audio Modulation Only

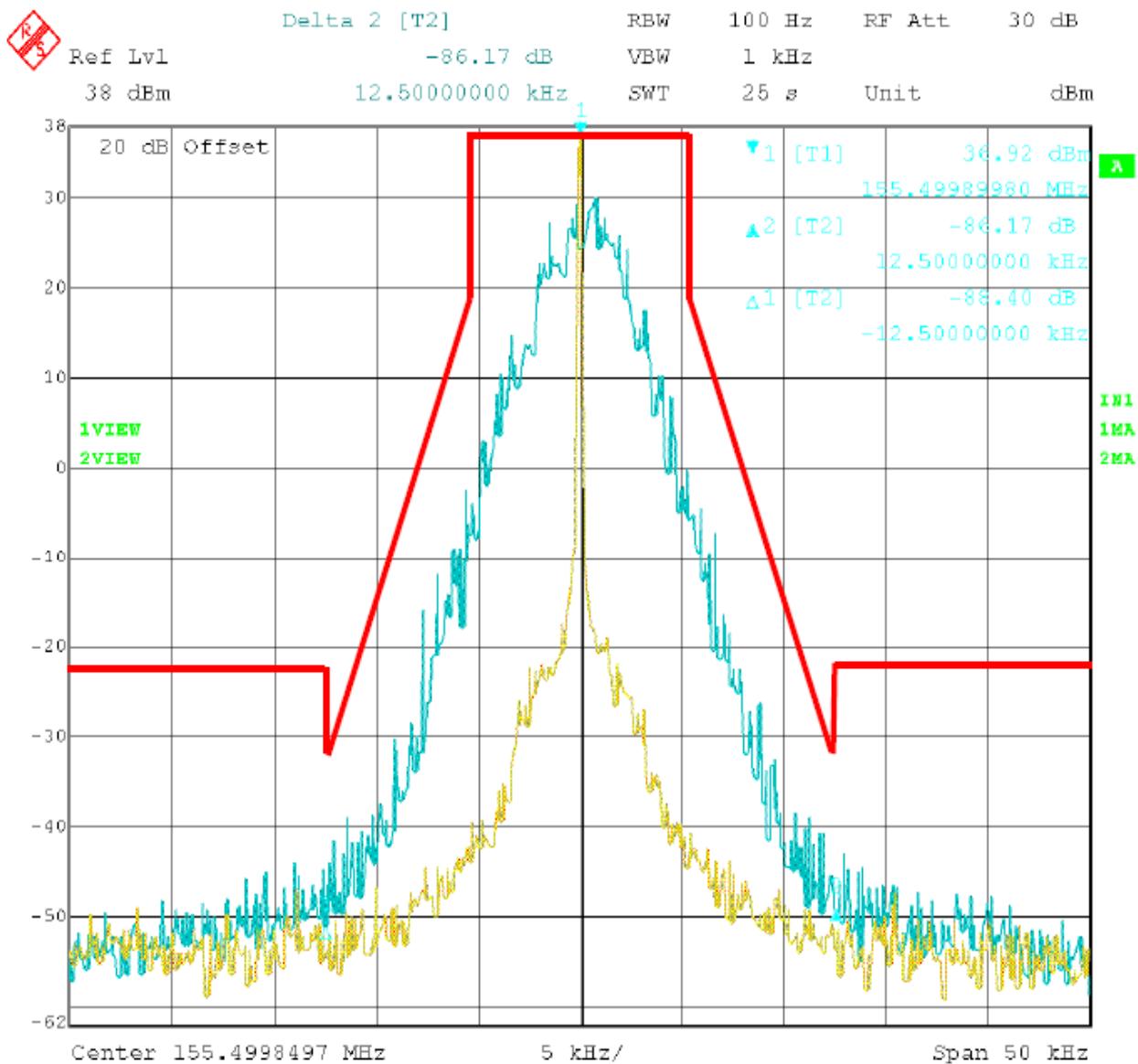
| Modulation Type | Channel Separation | Freq.(MHz) | FCC Applicable Mask | RBW   | Audio Freq. (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|-------|-------------------|------------|
| 4FSK            | 12.5 KHz           | 136.5000   | D                   | 100Hz | /                 | Compliance |



Date: 27.DEC.2011 01:18:58

12.5 kHz Channel Spacing, 136.5000 MHz, 4FSK Modulation Only

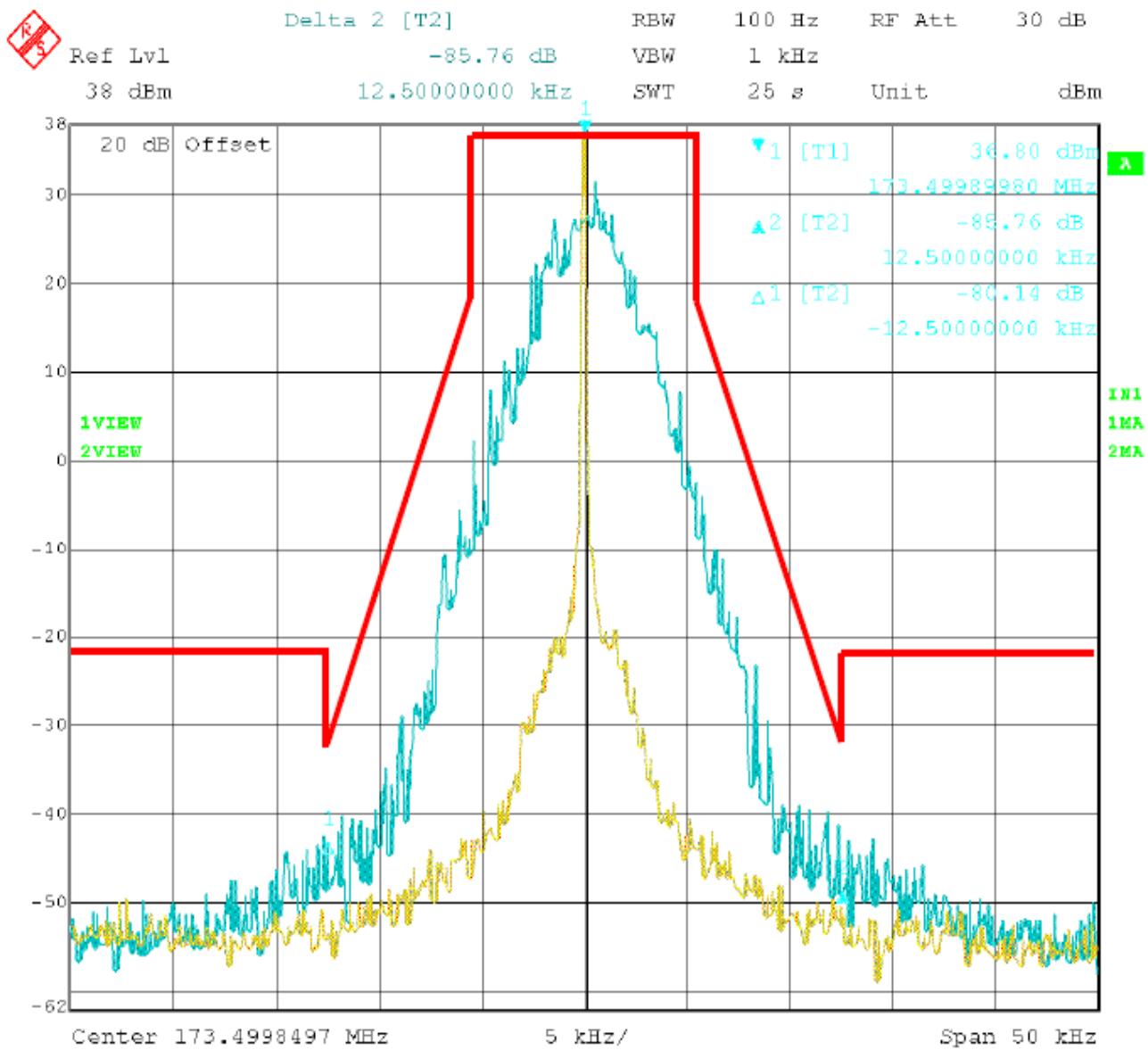
| Modulation Type | Channel Separation | Freq.(MHz) | FCC Applicable Mask | RBW   | Audio Freq. (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|-------|-------------------|------------|
| 4FSK            | 12.5 KHz           | 155.5000   | D                   | 100Hz | /                 | Compliance |



Date: 27.DEC.2011 01:23:24

12.5 kHz Channel Spacing, 155.5000 MHz, 4FSK Modulation Only

| Modulation Type | Channel Separation | Freq.(MHz) | FCC Applicable Mask | RBW   | Audio Freq. (KHz) | Results    |
|-----------------|--------------------|------------|---------------------|-------|-------------------|------------|
| 4FSK            | 12.5 KHz           | 173.5000   | D                   | 100Hz | /                 | Compliance |



Date: 27.DEC.2011 01:28:48

12.5 kHz Channel Spacing, 173.5000 MHz, 4FSK Modulation Only

### 4.3. Transmitter Radiated Spurious Emission

#### TEST APPLICABLE

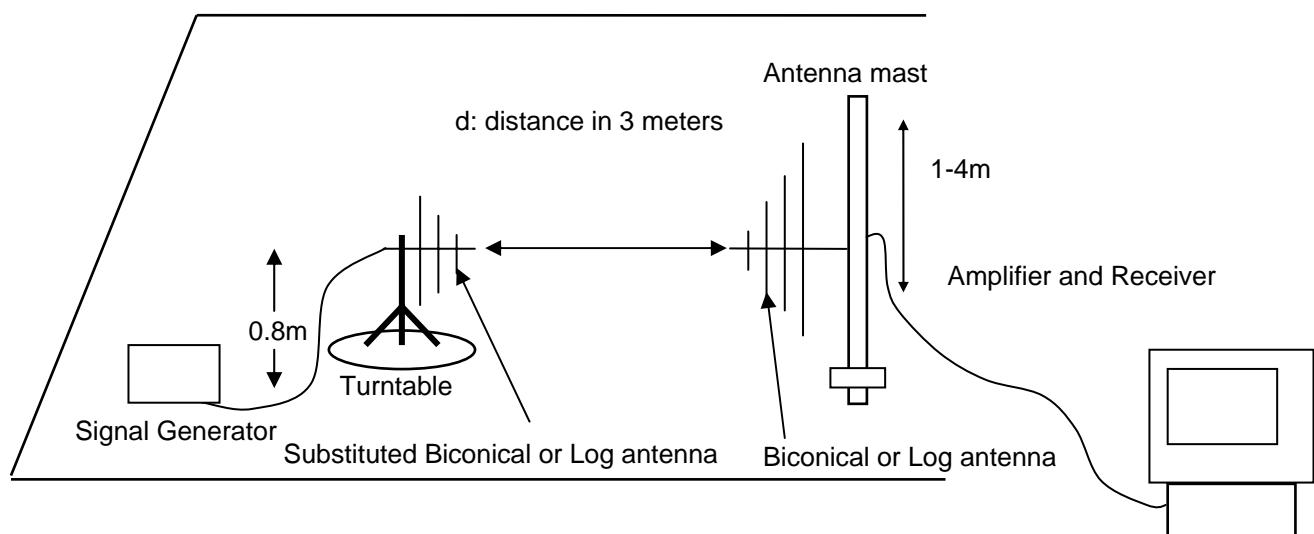
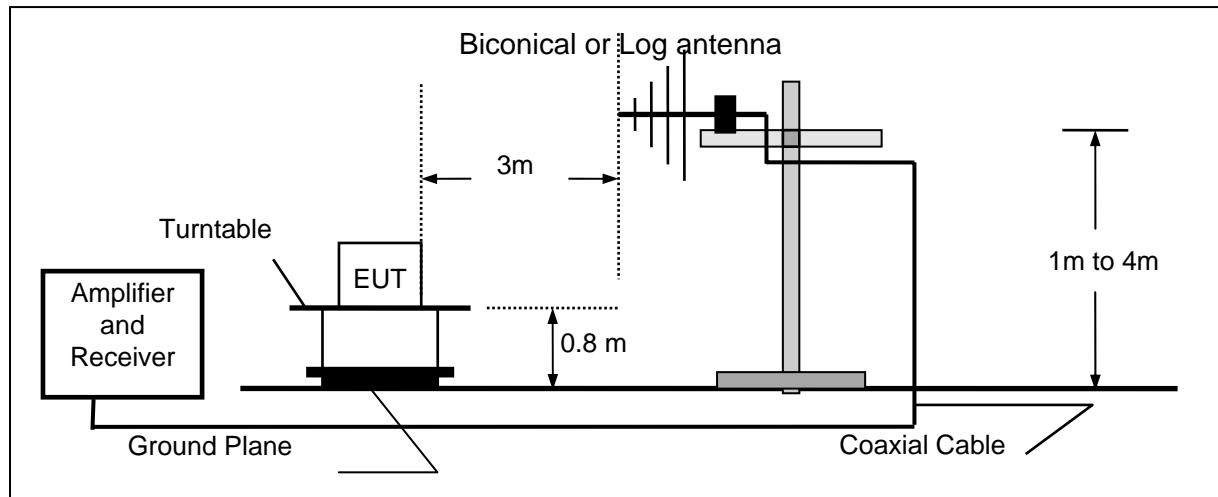
According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

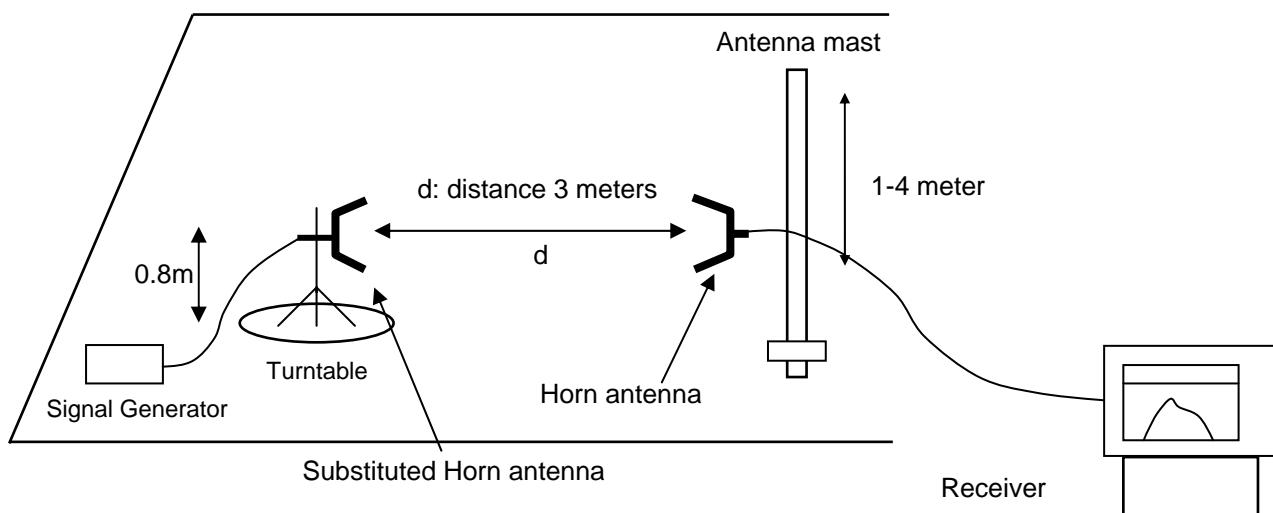
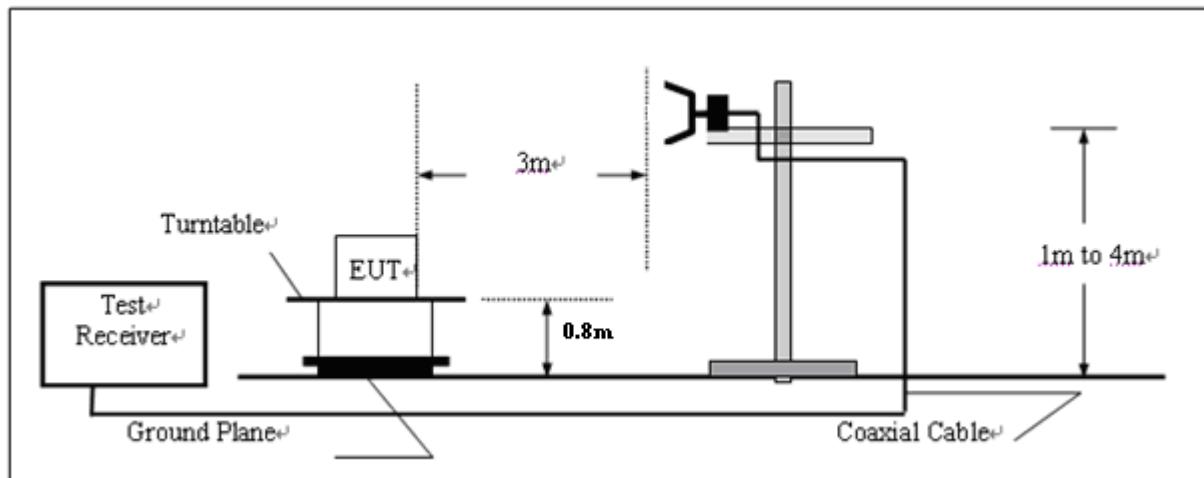
- 1 On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
  - 2 On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
  - 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 On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- 2 The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- 3 The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- 4 The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- 5 The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- 6 The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 7 The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- 8 The maximum signal level detected by the measuring receiver shall be noted.
- 9 The measurement shall be repeated with the test antenna set to horizontal polarization.
- 10 Replace the antenna with a proper Antenna (substitution antenna).
- 11 The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- 12 The substitution antenna shall be connected to a calibrated signal generator.

- 13 If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 14 The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- 15 The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- 16 The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- 17 The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization

## **TEST RESULTS**

The Transmitter Radiated Spurious Emission was performed to the Rated high power (5Watt) and Rated low power (1Watt) 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:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (5.01) = 56.99 \text{ dB}$

High:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (5.08) = 57.06 \text{ dB}$

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

Calculation: Limit (dBm) = EL - 50 - 10 log<sub>10</sub> (TP)

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

In this application, the EL is 36.99 dBm.

Limit (dBm) = 36.99 - 50 - 10 log<sub>10</sub> (5.08) = -20 dBm

### **Modulation Type: 4FSK**

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue11 (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:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (5.03) = 57.02 \text{ dB}$

High:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (5.09) = 57.07 \text{ dB}$

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

Calculation: Limit (dBm) = EL - 50 - 10 log<sub>10</sub> (TP)

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

In this application, the EL is 36.99 dBm.

Limit (dBm) = 36.99 - 50 - 10 log<sub>10</sub> (5.75) = -20 dBm

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

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

3. \*\*\* means that the emission level is too low to be measured or at least 20 dB down than the limit.

| Modulation      |                        | FM                     |                      | Channel Separation  |                      | 12.5KHz                                   |             |             |
|-----------------|------------------------|------------------------|----------------------|---------------------|----------------------|---|-------------|-------------|
| Test Channel    |                        | Low Channel            |                      | Test Frequency      |                      | 136.5000 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) |
| 409.5000        | 54.26                  | Peak                   | H                    | 341                 | 312                  | -42.51                                    | -20         | 24.51       |
| 546.0000        | 55.76                  | Peak                   | H                    | 125                 | 56                   | -40.78                                    | -20         | 20.78       |
| 682.5000        | 56.13                  | Peak                   | H                    | 200                 | 199                  | -39.87                                    | -20         | 19.87       |
| ...             | ...                    |                        | H                    |                     |                      |   |             |             |
| 409.5000        | 54.99                  | Peak                   | V                    | 122                 | 90                   | -41.24                                    | -20         | 21.24       |
| 546.0000        | 55.67                  | Peak                   | V                    | 100                 | 67                   | -40.67                                    | -20         | 20.67       |
| 682.5000        | 50.78                  | Peak                   | V                    | 100                 | 188                  | -45.55                                    | -20         | 25.55       |
| ...             | ...                    |                        | V                    |                     |                      |   |             |             |

| Modulation      |                        | FM                     |                      | Channel Separation  |                      | 12.5KHz                                   |             |             |
|-----------------|------------------------|------------------------|----------------------|---------------------|----------------------|---|-------------|-------------|
| Test Channel    |                        | Middle Channel         |                      | Test Frequency      |                      | 155.5000 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) |
| 466.5000        | 54.49                  | Peak                   | H                    | 309                 | 120                  | -42.23                                    | -20         | 22.23       |
| 622.0000        | 55.34                  | Peak                   | H                    | 300                 | 331                  | -40.99                                    | -20         | 20.99       |
| 777.5000        | 51.54                  | Peak                   | H                    | 233                 | 256                  | -45.22                                    | -20         | 25.22       |
| ...             | ...                    |                        | H                    |                     |                      |   |             |             |
| 466.5000        | 49.57                  | Peak                   | V                    | 100                 | 198                  | -40.55                                    | -20         | 20.55       |
| 622.0000        | 56.12                  | Peak                   | V                    | 100                 | 233                  | -40.06                                    | -20         | 20.06       |
| 777.5000        | 52.01                  | Peak                   | V                    | 108                 | 321                  | -44.44                                    | -20         | 24.44       |
| ...             | ...                    |                        | V                    |                     |                      |   |             |             |

| Modulation      |                        | FM                     |                      | Channel Separation  |                      | 12.5KHz                                   |             |             |
|-----------------|------------------------|------------------------|----------------------|---------------------|----------------------|---|-------------|-------------|
| Test Channel    |                        | High Channel           |                      | Test Frequency      |                      | 173.5000 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) |
| 347.0000        | 52.91                  | Peak                   | H                    | 100                 | 344                  | -43.66                                    | -20         | 23.66       |
| 520.5000        | 55.12                  | Peak                   | H                    | 155                 | 200                  | -41.11                                    | -20         | 21.11       |
| 694.0000        | 57.38                  | Peak                   | H                    | 400                 | 109                  | -39.06                                    | -20         | 19.06       |
| ...             | ...                    |                        | H                    |                     |                      |   |             |             |
| 347.0000        | 50.96                  | Peak                   | V                    | 150                 | 294                  | -45.45                                    | -20         | 25.45       |
| 520.5000        | 56.48                  | Peak                   | V                    | 129                 | 355                  | -40.06                                    | -20         | 20.06       |
| 694.0000        | 55.36                  | Peak                   | V                    | 108                 | 10                   | -41.00                                    | -20         | 21.00       |
| ...             | ...                    |                        | V                    |                     |                      |   |             |             |

| Modulation      |                        | 4FSK                   |                      | Channel Separation  |                      | 12.5KHz                                   |             |             |
|-----------------|------------------------|------------------------|----------------------|---------------------|----------------------|---|-------------|-------------|
| Test Channel    |                        | Low Channel            |                      | Test Frequency      |                      | 136.5000 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) |
| 409.5000        | 55.11                  | Peak                   | H                    | 254                 | 304                  | -41.22                                    | -20         | 21.22       |
| 546.0000        | 57.44                  | Peak                   | H                    | 100                 | 201                  | -39.11                                    | -20         | 19.11       |
| 682.5000        | 55.71                  | Peak                   | H                    | 153                 | 344                  | -40.67                                    | -20         | 20.67       |
| ...             | ...                    |                        | H                    |                     |                      |   |             |             |
| 409.5000        | 53.93                  | Peak                   | V                    | 124                 | 100                  | -42.55                                    | -20         | 22.55       |
| 546.0000        | 51.11                  | Peak                   | V                    | 124                 | 67                   | -45.12                                    | -20         | 25.12       |
| 682.5000        | 56.24                  | Peak                   | V                    | 100                 | 198                  | -40.22                                    | -20         | 20.22       |
| ...             | ...                    |                        | V                    |                     |                      |   |             |             |

| Modulation      |                        | 4FSK                   |                      | Channel Separation  |                      | 12.5KHz                                   |             |             |
|-----------------|------------------------|------------------------|----------------------|---------------------|----------------------|---|-------------|-------------|
| Test Channel    |                        | Middle Channel         |                      | Test Frequency      |                      | 155.5000 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) |
| 466.5000        | 54.23                  | Peak                   | H                    | 200                 | 333                  | -42.11                                    | -20         | 22.11       |
| 622.0000        | 53.05                  | Peak                   | H                    | 312                 | 289                  | -43.00                                    | -20         | 23.00       |
| 777.5000        | 51.12                  | Peak                   | H                    | 350                 | 102                  | -45.78                                    | -20         | 25.78       |
| ...             | ...                    |                        | H                    |                     |                      |   |             |             |
| 466.5000        | 55.40                  | Peak                   | V                    | 100                 | 359                  | -41.34                                    | -20         | 21.34       |
| 622.0000        | 56.53                  | Peak                   | V                    | 106                 | 231                  | -40.08                                    | -20         | 20.08       |
| 777.5000        | 56.88                  | Peak                   | V                    | 108                 | 100                  | -39.56                                    | -20         | 19.56       |
| ...             | ...                    |                        | V                    |                     |                      |   |             |             |

| Modulation      |                        | 4FSK                   |                      | Channel Separation  |                      | 12.5KHz                                   |             |             |
|-----------------|------------------------|------------------------|----------------------|---------------------|----------------------|---|-------------|-------------|
| Test Channel    |                        | High Channel           |                      | Test Frequency      |                      | 173.5000 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) |
| 347.0000        | 56.32                  | Peak                   | H                    | 150                 | 277                  | -40.33                                    | -20         | 20.33       |
| 520.5000        | 55.84                  | Peak                   | H                    | 100                 | 322                  | -40.09                                    | -20         | 20.09       |
| 694.0000        | 57.05                  | Peak                   | H                    | 294                 | 198                  | -39.11                                    | -20         | 19.11       |
| ...             | ...                    |                        | H                    |                     |                      |   |             |             |
| 347.0000        | 54.66                  | Peak                   | V                    | 128                 | 360                  | -41.77                                    | -20         | 21.77       |
| 520.5000        | 54.61                  | Peak                   | V                    | 128                 | 78                   | -41.56                                    | -20         | 21.56       |
| 694.0000        | 56.43                  | Peak                   | V                    | 100                 | 182                  | -39.63                                    | -20         | 19.63       |
| ...             | ...                    |                        | V                    |                     |                      |   |             |             |

## 4.4. Spurious Emission on Antenna Port

### TEST APPLICABLE

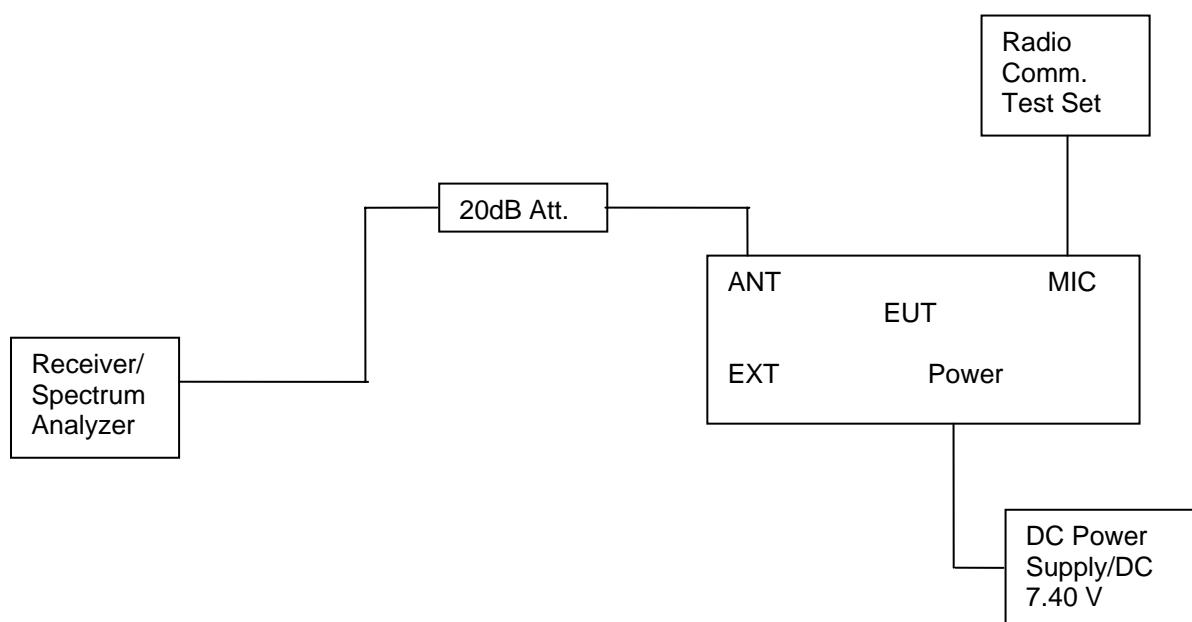
The same as Section 4.3

### 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 10<sup>th</sup> 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:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (5.01) = 56.99 \text{ dB}$

High:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (5.08) = 57.06 \text{ dB}$

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

Calculation: Limit (dBm) = EL - 50 - 10 log10 (TP)

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

In this application, the EL is 36.99 dBm.

Limit (dBm) = 36.99 - 50 - 10 log10 (5.08) = -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:  $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(5.03) = 57.02 \text{ dB}$

High:  $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(5.09) = 57.07 \text{ dB}$

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 36.99 dBm.

Limit (dBm) =  $36.99 - 50 - 10 \log_{10}(5.75) = -20 \text{ dBm}$

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

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

**For Rated High Power (5Watt)**

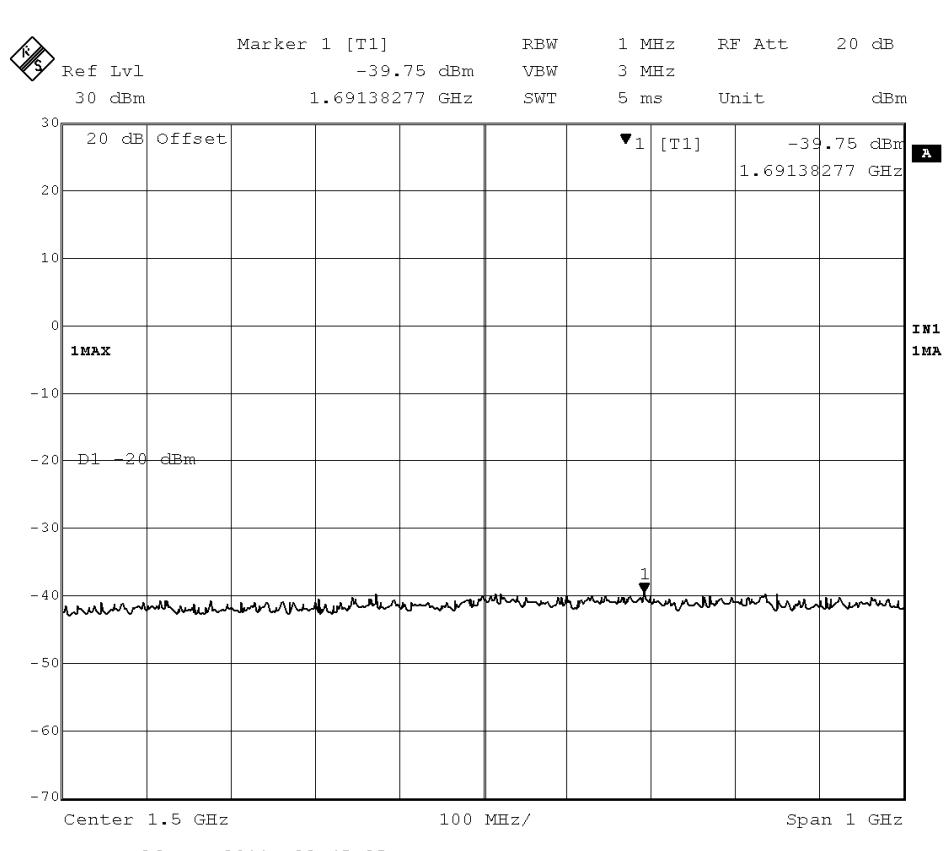
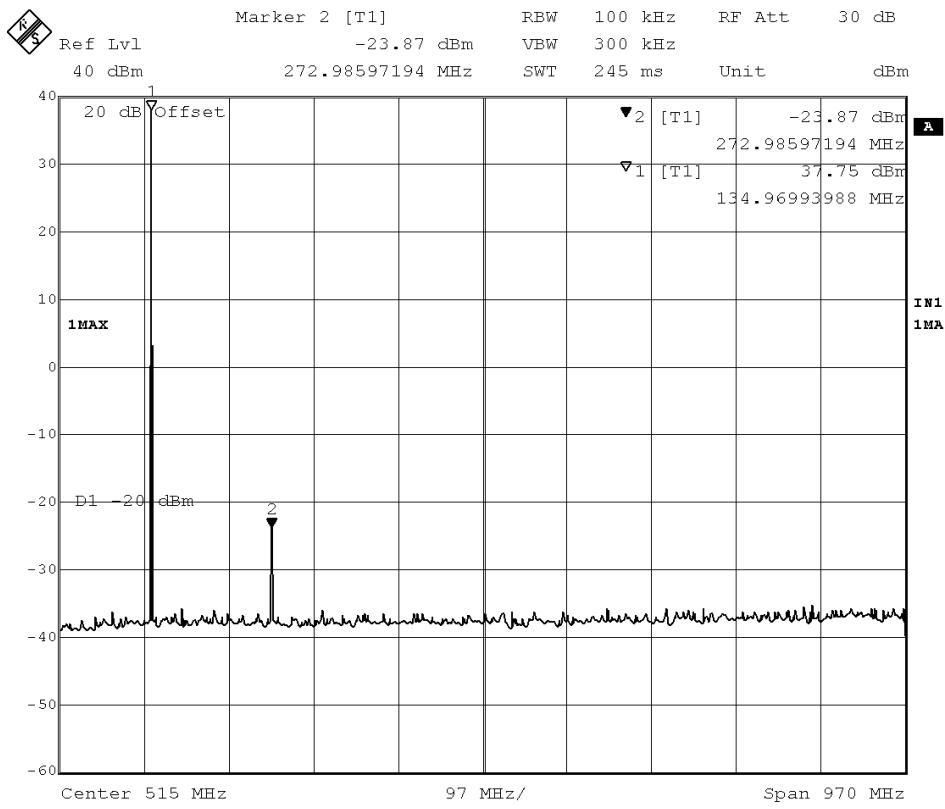
| Modulation Type | Channel Sparation | Test Channel                         | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             |  |
|-----------------|-------------------|--------------------------------------|----------------------|---|-------------|---|-------------|--|
|                 |                   |                                      |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |  |
| FM              | 12.5KHz           | Low                                  | 136.5000             | 272.99  | -23.87      | 1691.38   | -39.75      |  |
|                 |                   | Middle                               | 155.5000             | 309.92  | -22.03      | 1637.27   | -38.90      |  |
|                 |                   | High                                 | 173.5000             | 346.85  | -21.93      | 1667.33   | -38.81      |  |
| 4FSK            | 12.5KHz           | Low                                  | 136.5000             | 272.99  | -23.54      | 1462.93   | -38.39      |  |
|                 |                   | Middle                               | 155.5000             | 309.92  | -22.02      | 1384.77   | -39.70      |  |
|                 |                   | High                                 | 173.5000             | 346.85  | -21.32      | 1609.22   | -38.97      |  |
| Limit           |                   | -20dBm for 12.5KHz Channel Separtion |                      |   |             |   |             |  |
| Test Results    |                   | Compliance                           |                      |   |             |   |             |  |

**For Rated Low Power (1Watt)**

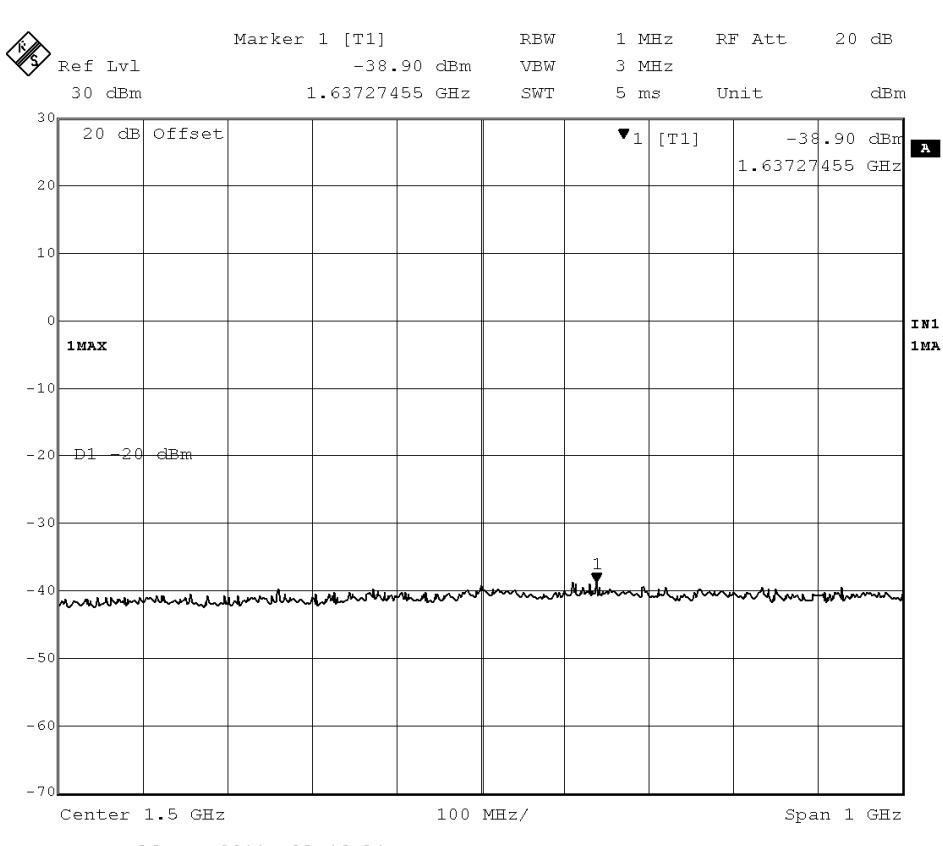
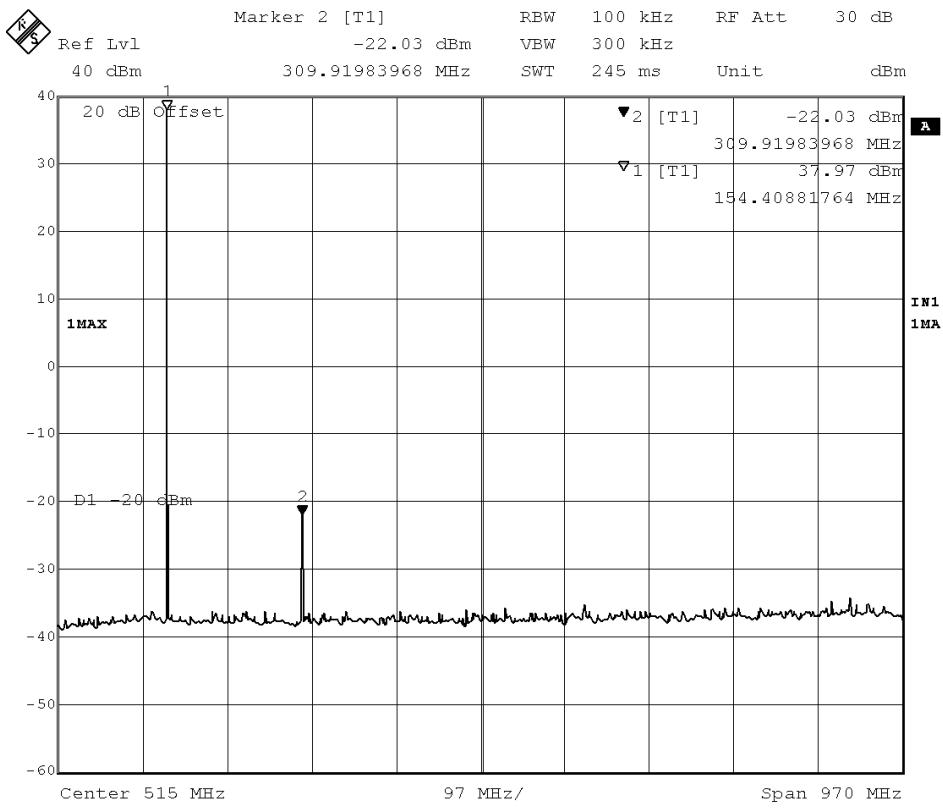
| Modulation Type | Channel Sparation | Test Channel                         | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             |  |
|-----------------|-------------------|--------------------------------------|----------------------|---|-------------|---|-------------|--|
|                 |                   |                                      |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |  |
| FM              | 12.5KHz           | Low                                  | 136.5000             | 272.99  | -33.74      | 1621.64   | -39.68      |  |
|                 |                   | Middle                               | 155.5000             | 309.92  | -34.09      | 1609.22   | -38.98      |  |
|                 |                   | High                                 | 173.5000             | 346.85  | -32.55      | 1683.37   | -38.66      |  |
| 4FSK            | 12.5KHz           | Low                                  | 136.5000             | 272.99  | -33.63      | 1647.29   | -39.63      |  |
|                 |                   | Middle                               | 155.5000             | 309.92  | -32.94      | 1521.04   | -38.83      |  |
|                 |                   | High                                 | 173.5000             | 346.85  | -33.83      | 1951.90   | -39.23      |  |
| Limit           |                   | -20dBm for 12.5KHz Channel Separtion |                      |   |             |   |             |  |
| Test Results    |                   | Compliance                           |                      |   |             |   |             |  |

**Plots of Spurious Emission on Antenna Port Measurement****For Rated High Power (5Watt)**

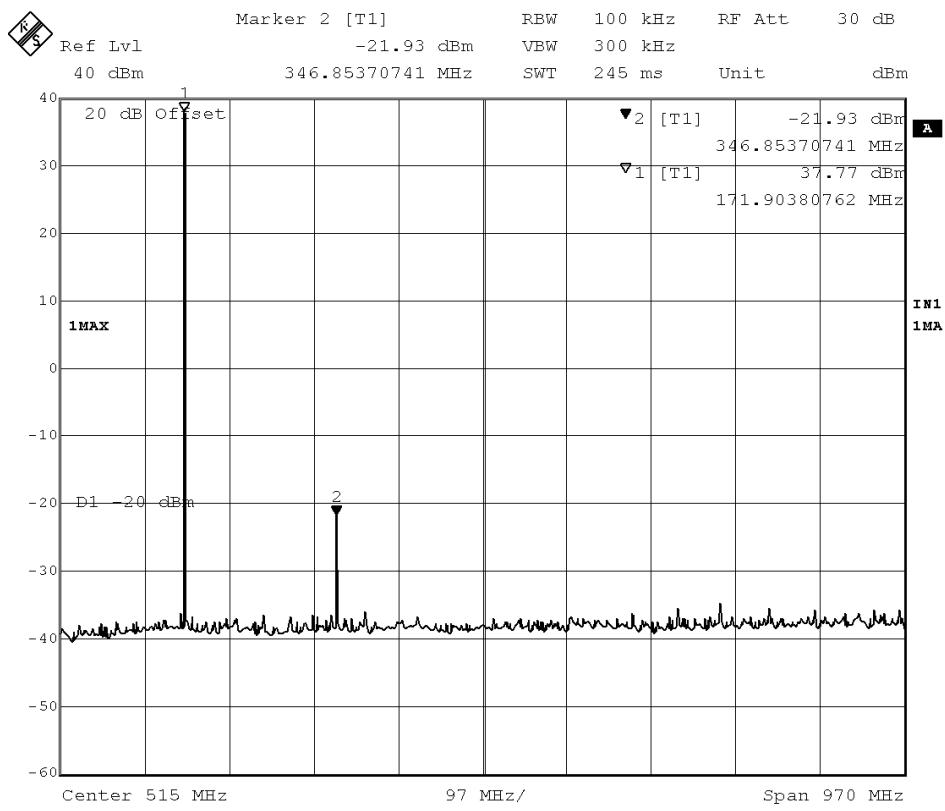
| Modulation Type | Channel Sparation | Test Channel | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             | FCC Limit |
|-----------------|-------------------|--------------|----------------------|---|-------------|---|-------------|-----------|
|                 |                   |              |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |           |
| FM              | 12.5KHz           | Low          | 136.5000             | 272.99  | -23.87      | 1691.38   | -39.75      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |



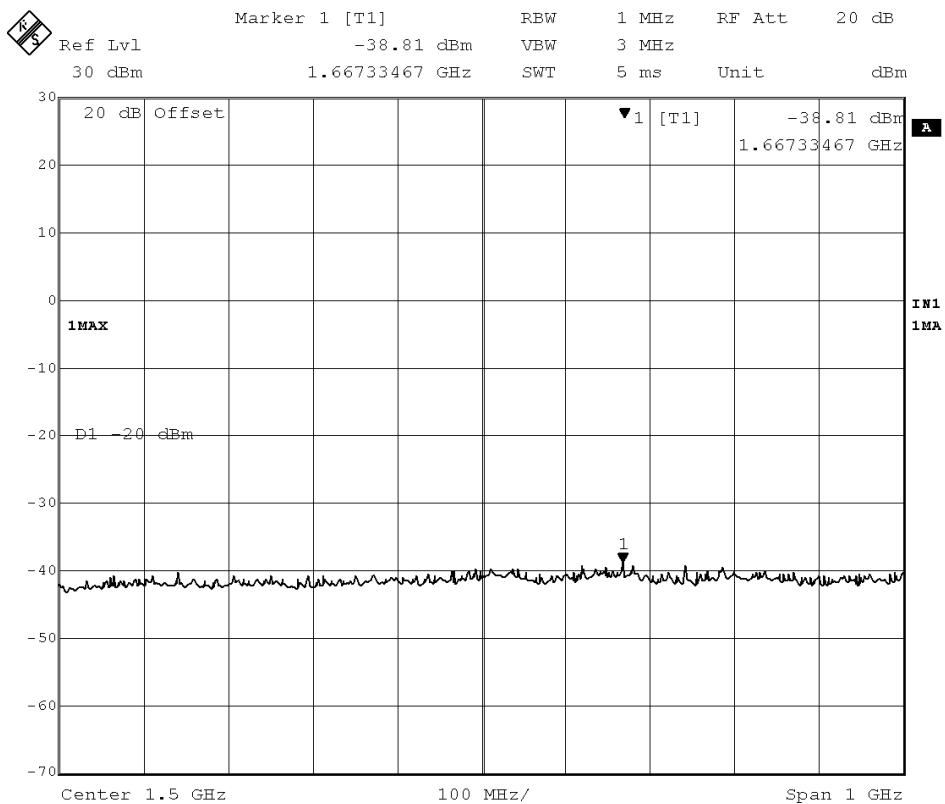
| Modulation Type | Channel Sparation | Test Channel | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             | FCC Limit |
|-----------------|-------------------|--------------|----------------------|---|-------------|---|-------------|-----------|
|                 |                   |              |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |           |
| FM              | 12.5KHz           | Middle       | 155.5000             | 309.92  | -22.03      | 1637.27   | -38.90      | -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) |           |
| FM              | 12.5KHz           | High         | 173.5000             | 346.85  | -21.93      | 1667.33   | -38.81      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |

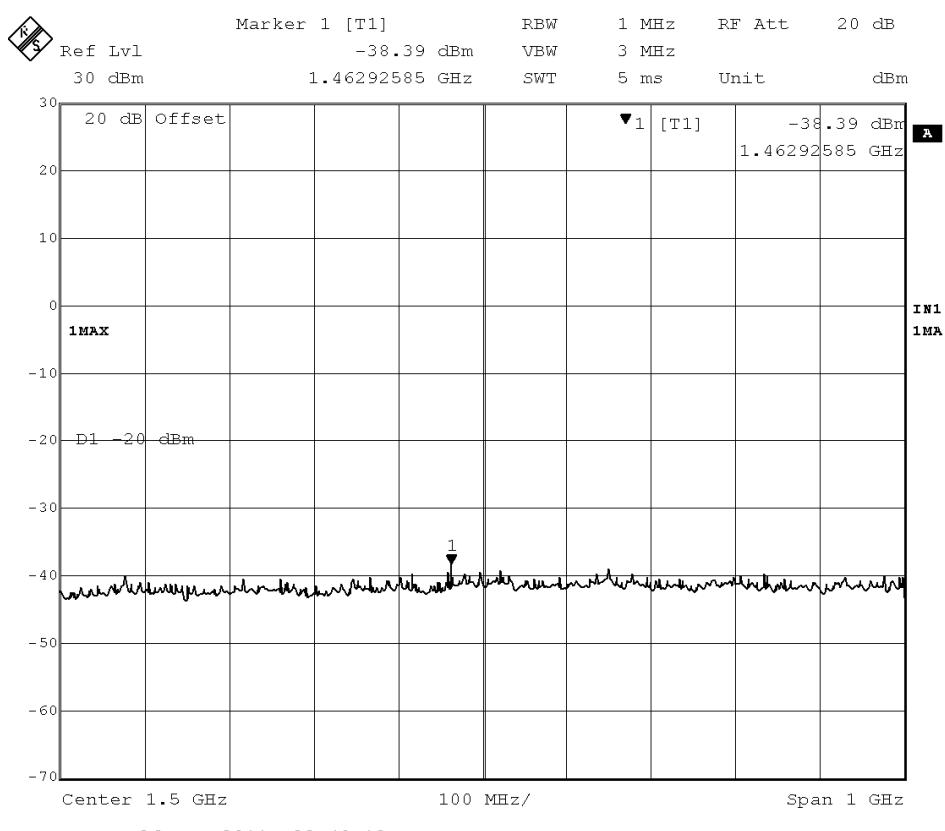
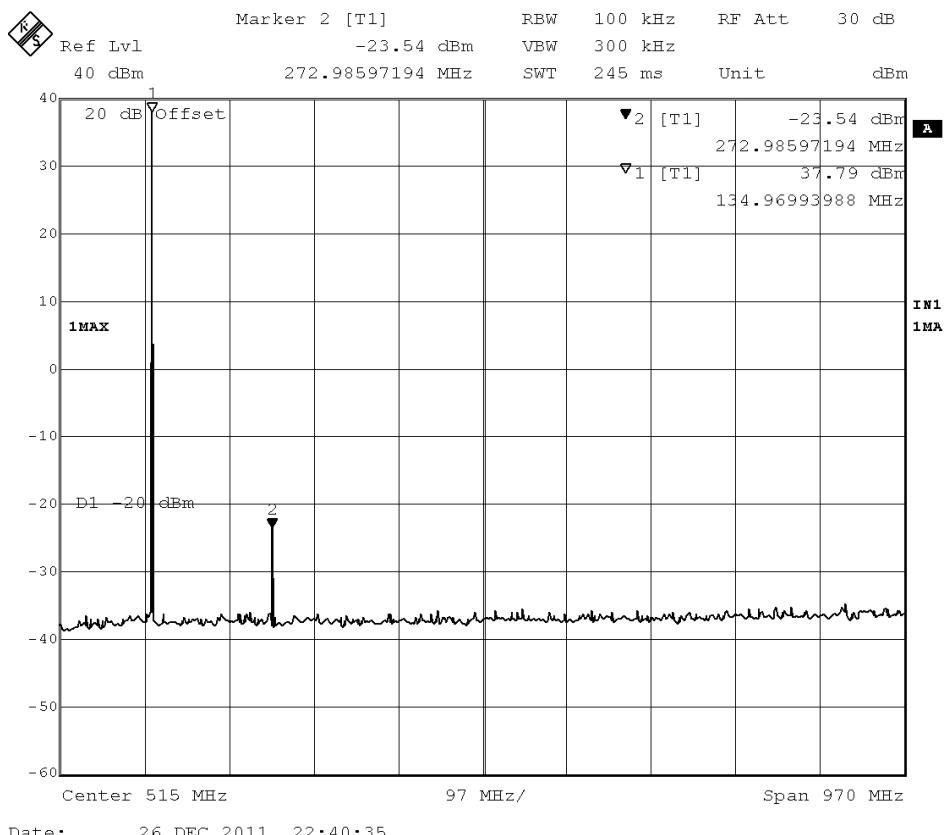


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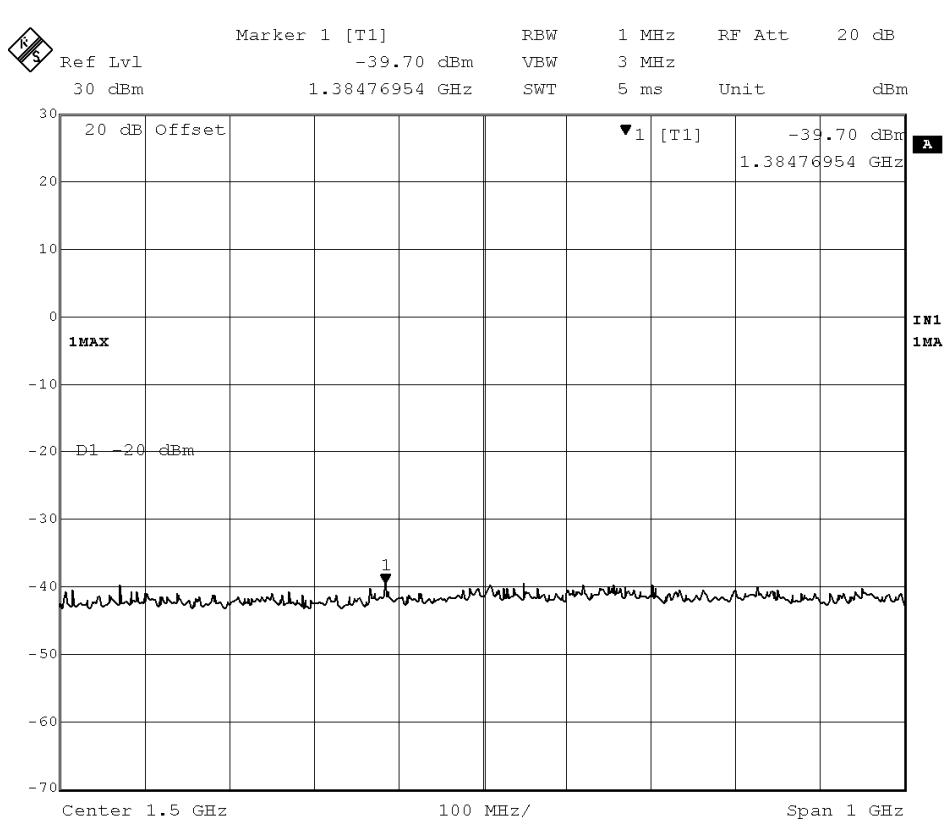
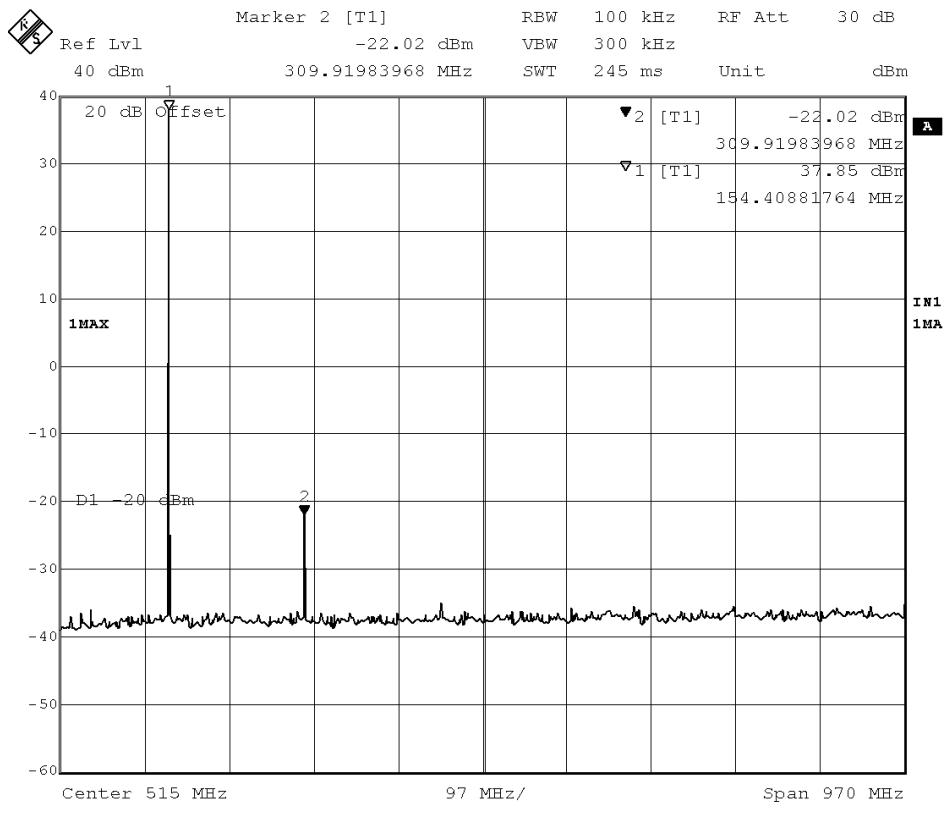


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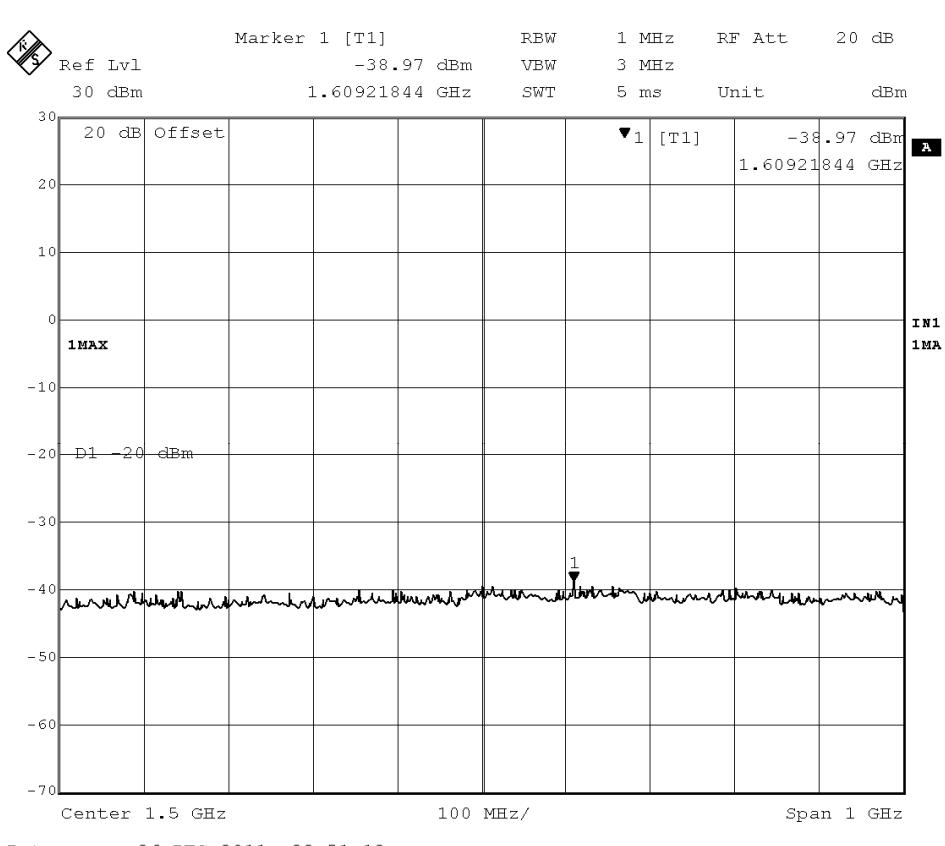
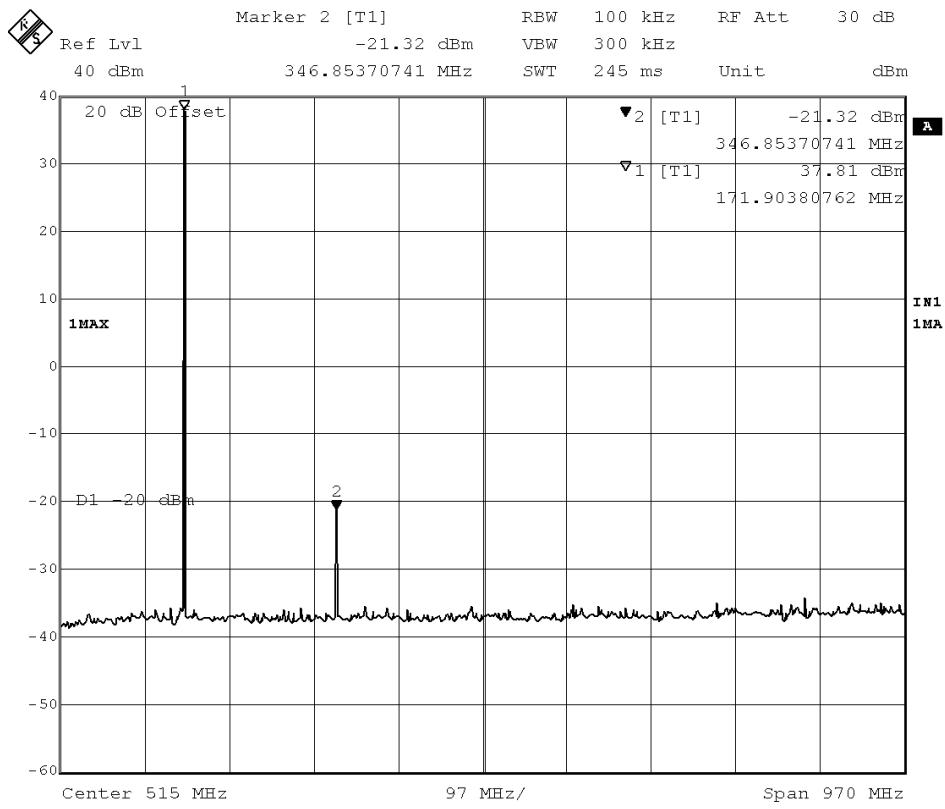
| Modulation Type | Channel Sparation | Test Channel | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             | FCC Limit |
|-----------------|-------------------|--------------|----------------------|---|-------------|---|-------------|-----------|
|                 |                   |              |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |           |
| 4FSK            | 12.5KHz           | Low          | 136.5000             | 272.99  | -23.54      | 1462.93   | -38.39      | -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           | Middle       | 155.5000             | 309.92  | -22.02      | 1384.77   | -39.70      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |

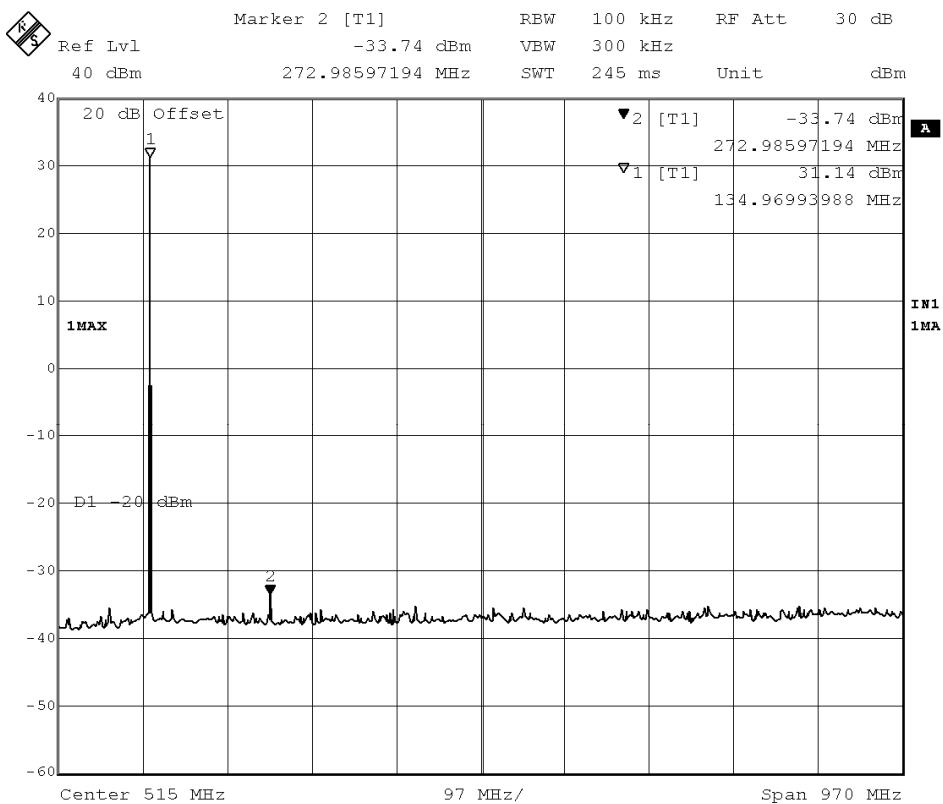


| Modulation Type | Channel Sparation | Test Channel | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             | FCC Limit |
|-----------------|-------------------|--------------|----------------------|---|-------------|---|-------------|-----------|
|                 |                   |              |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |           |
| 4FSK            | 12.5KHz           | High         | 173.5000             | 346.85  | -21.32      | 1609.22   | -38.97      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |

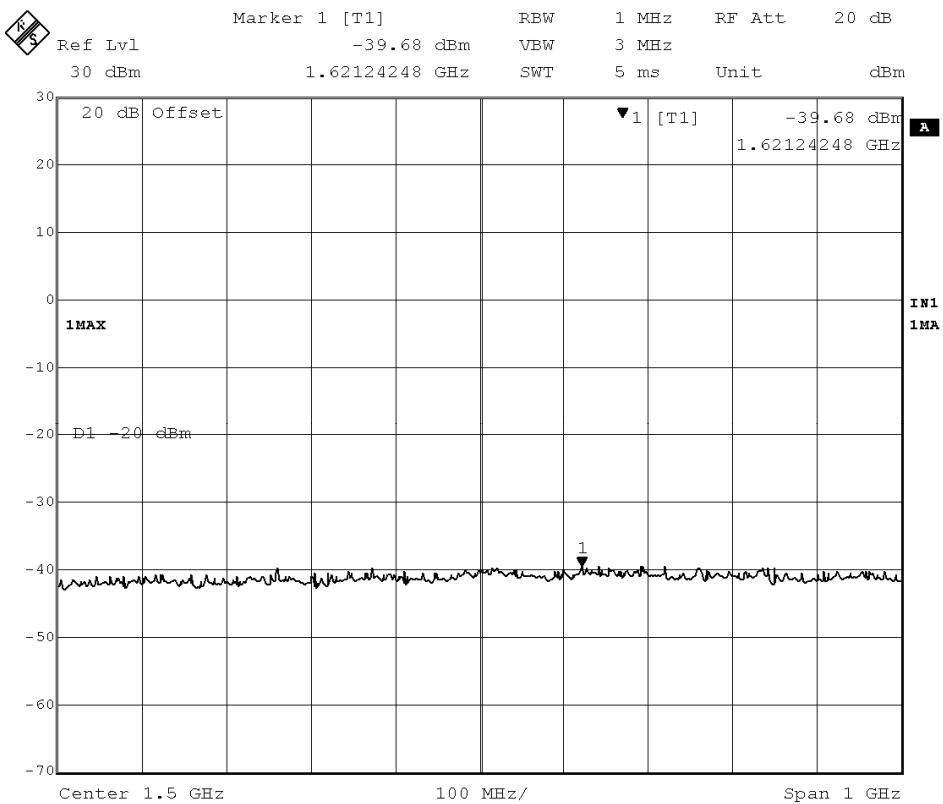


## For Rated Low Power (1Watt)

| 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          | 136.5000             | 272.99  | -33.74      | 1621.64   | -39.68      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |

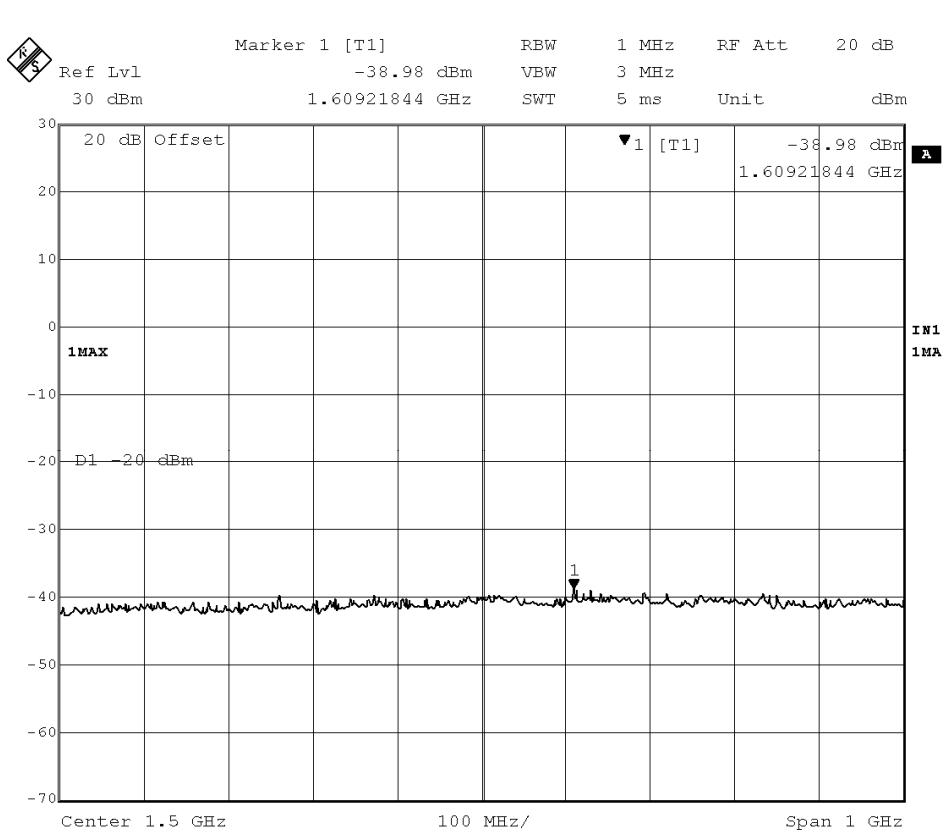
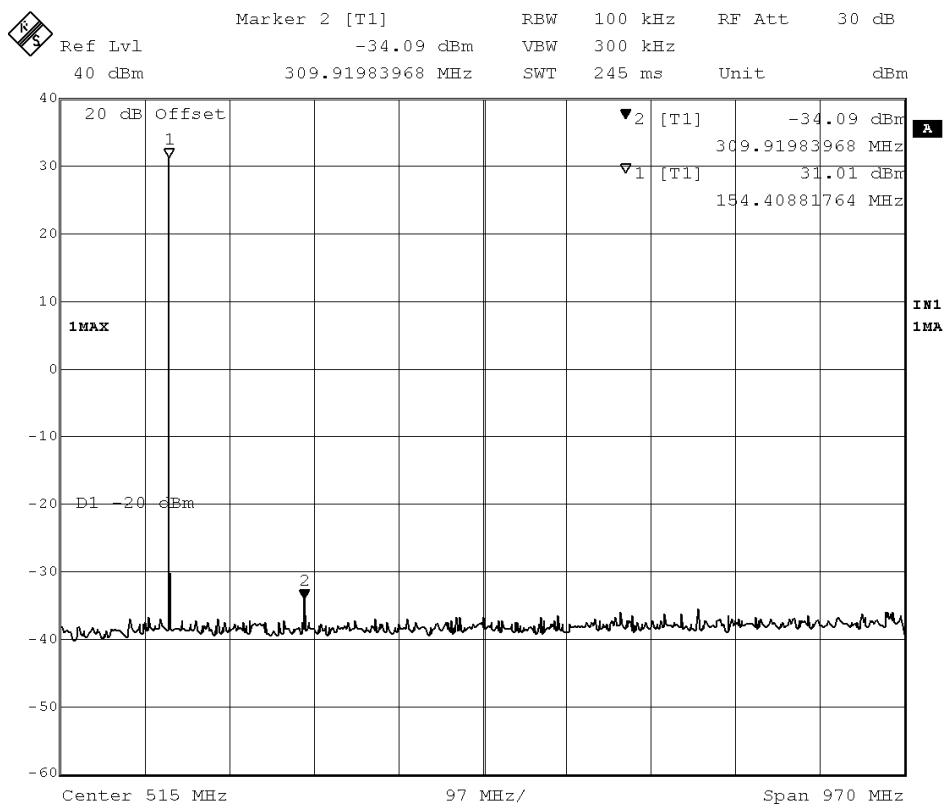


Date: 26.DEC.2011 22:36:22

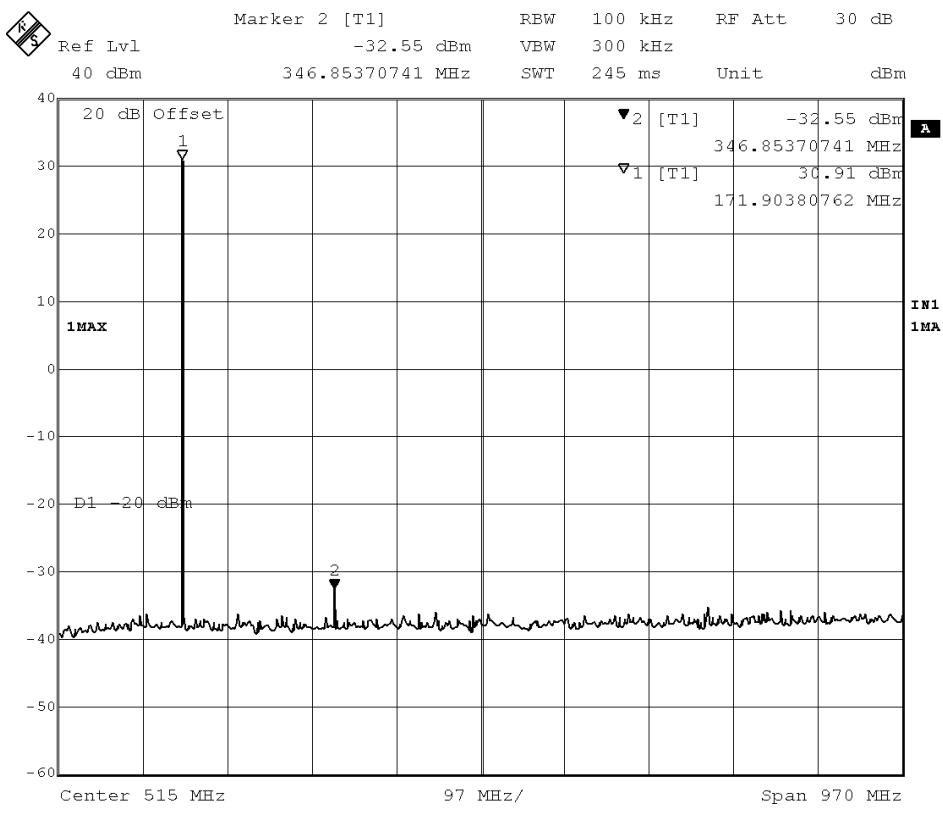


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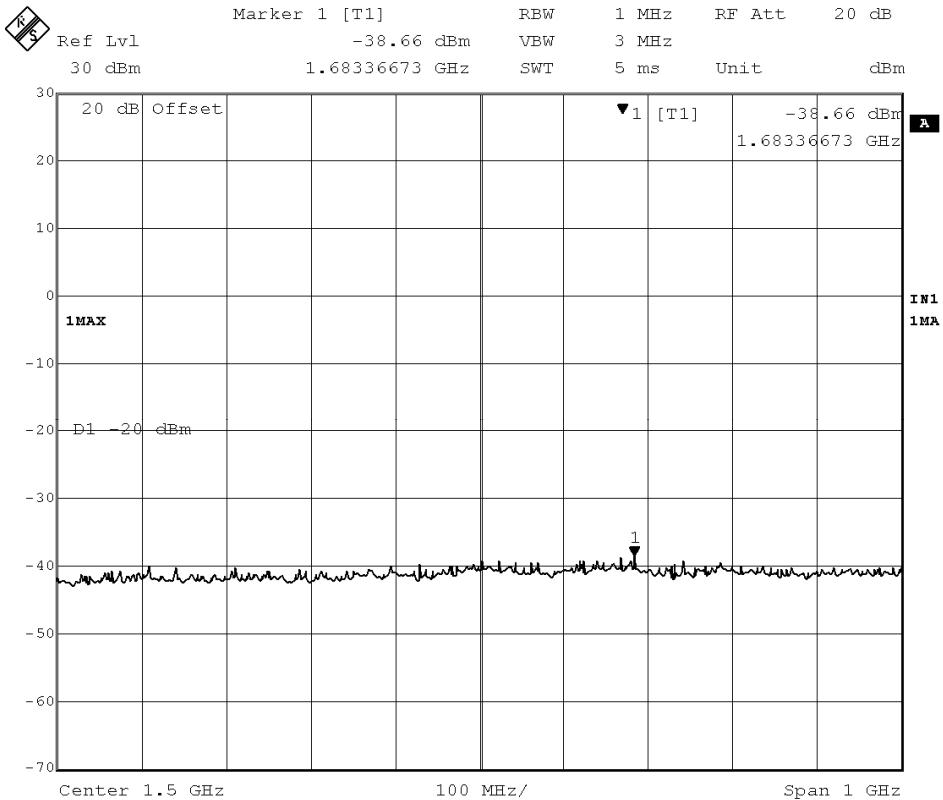
| Modulation Type | Channel Sparation | Test Channel | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             | FCC Limit |
|-----------------|-------------------|--------------|----------------------|---|-------------|---|-------------|-----------|
|                 |                   |              |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |           |
| FM              | 12.5KHz           | Middle       | 155.5000             | 309.92  | -34.09      | 1609.22   | -38.98      | -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         | 173.5000             | 346.85  | -32.55      | 1683.37   | -38.66      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |

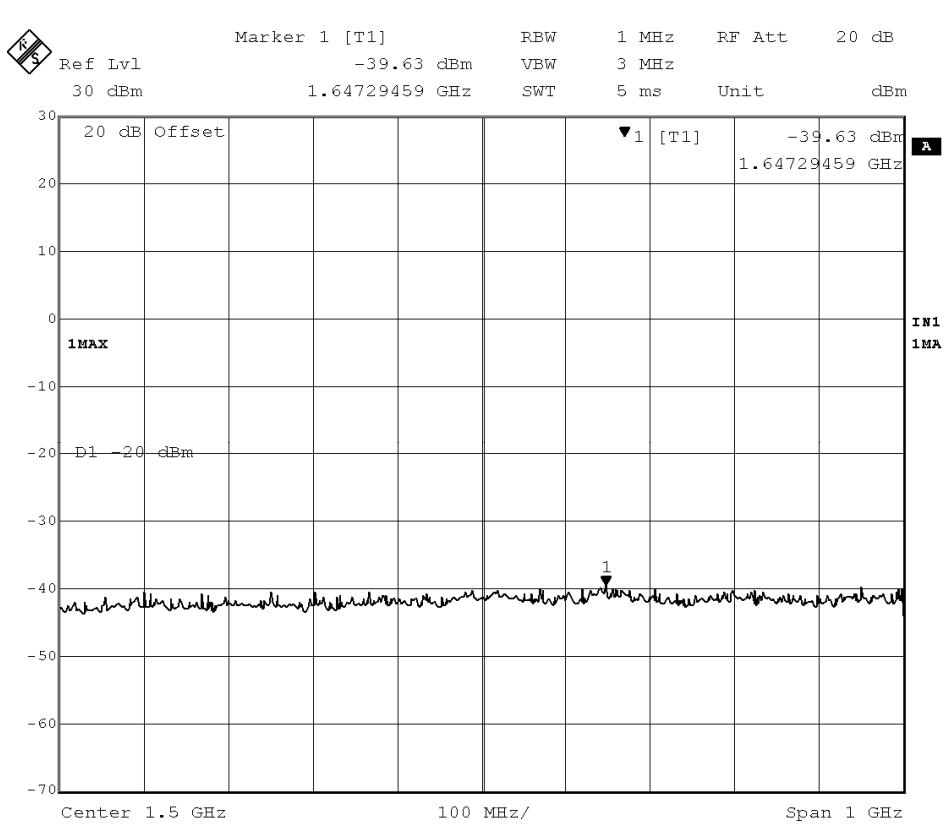
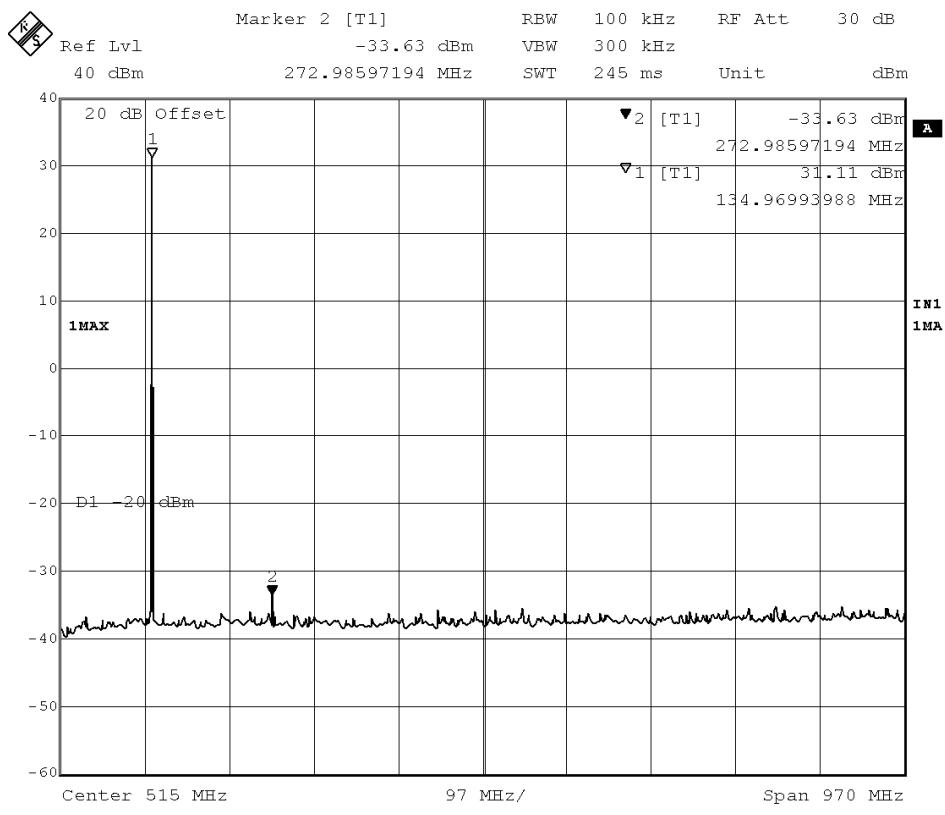


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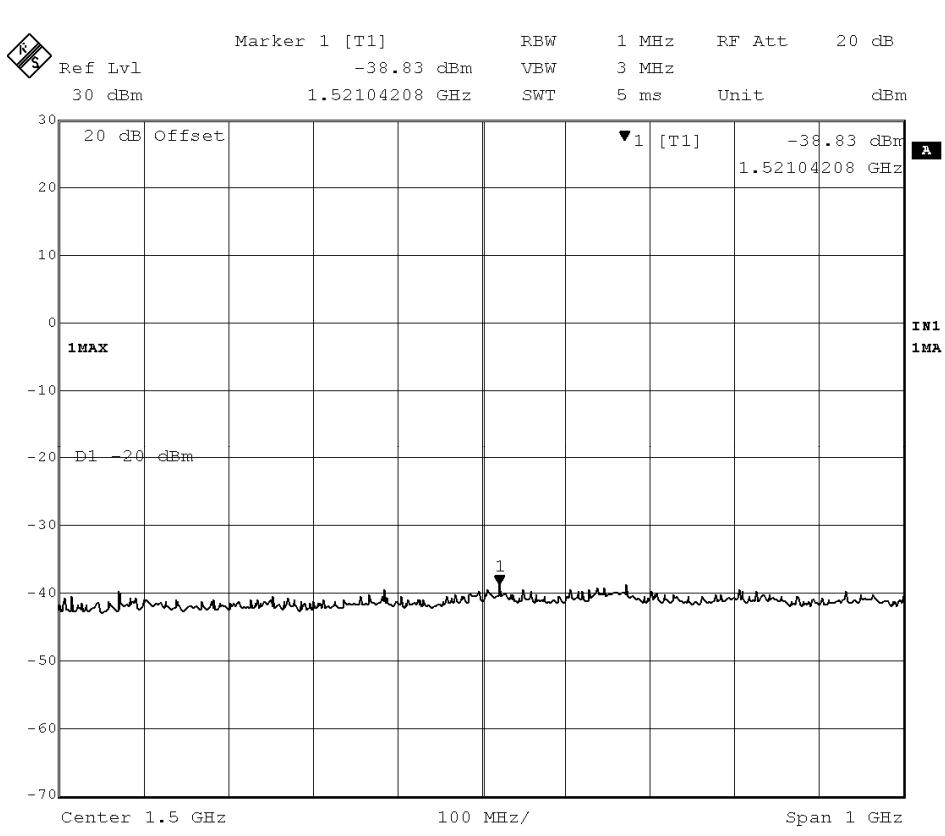
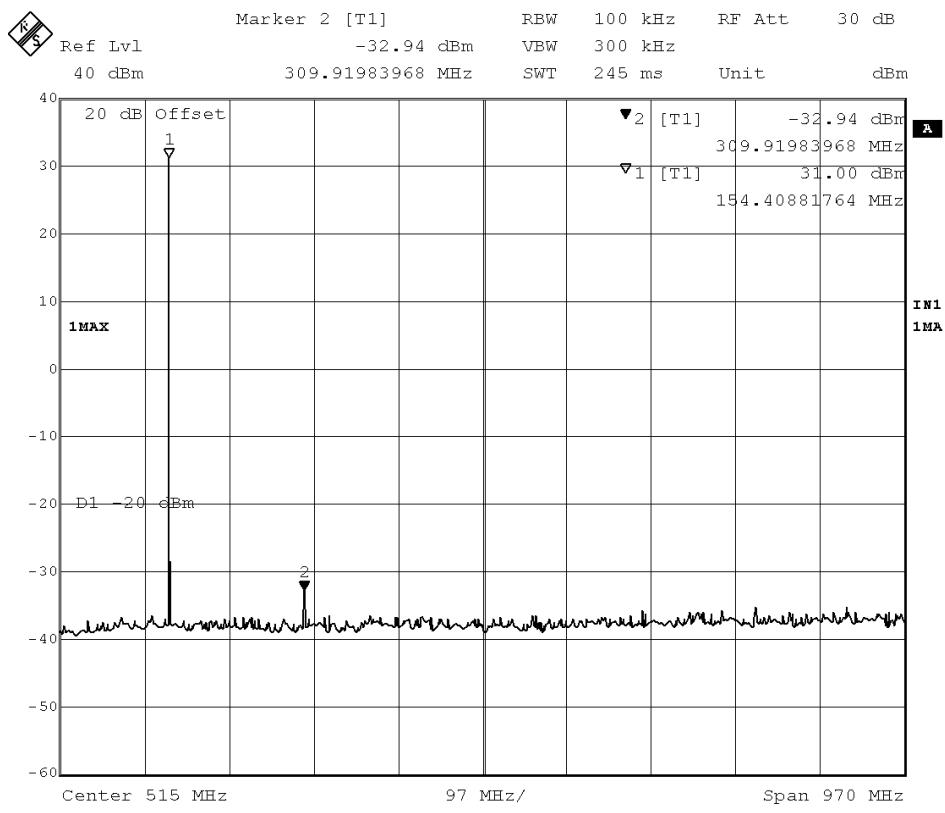


Date: 26.DEC.2011 22:47:36

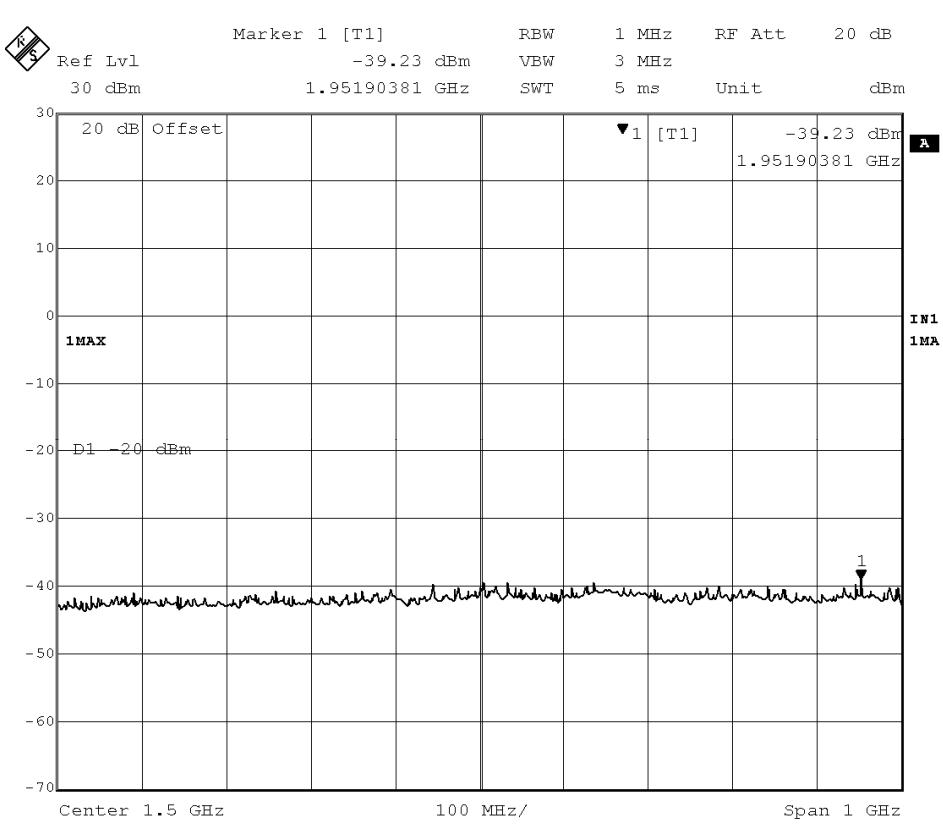
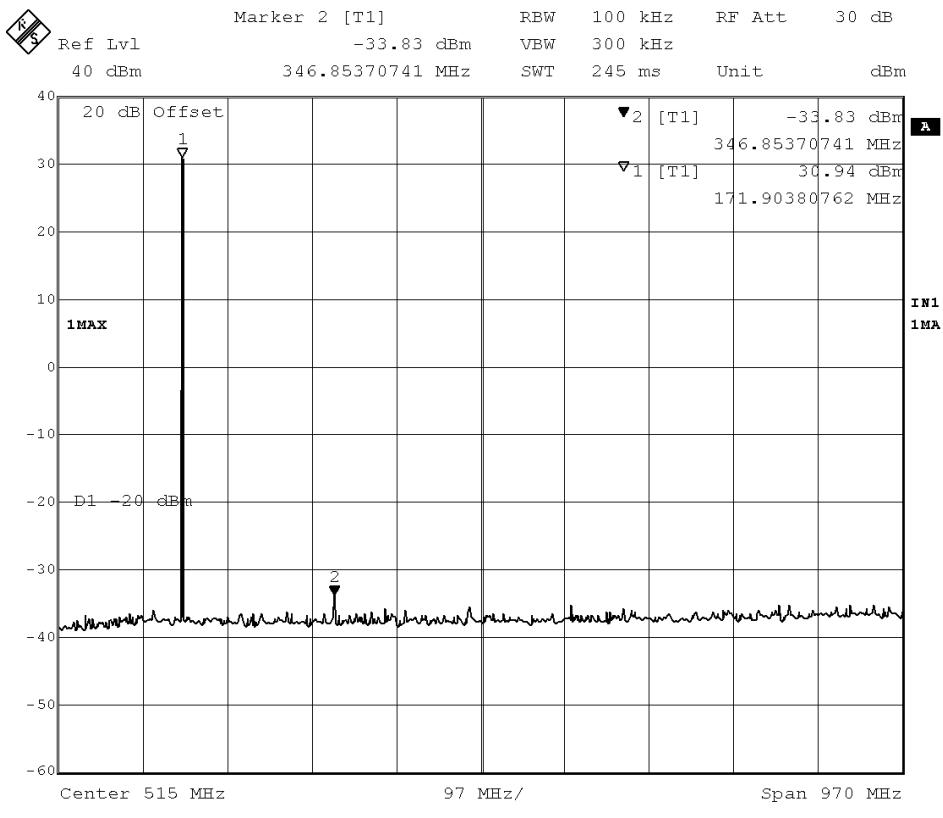
| Modulation Type | Channel Sparation | Test Channel | Test Frequency (MHz) | Maximum Conducted Spurious Emissions Below 1GHz |             | Maximum Conducted Spurious Emissions Above 1GHz |             | FCC Limit |
|-----------------|-------------------|--------------|----------------------|---|-------------|---|-------------|-----------|
|                 |                   |              |                      | Frequency (MHz)                                 | Datum (dBm) | Frequency (MHz)                                 | Datum (dBm) |           |
| 4FSK            | 12.5KHz           | Low          | 136.5000             | 272.99  | -33.63      | 1647.29   | -39.63      | -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           | Middle       | 155.5000             | 309.92  | -32.94      | 1521.04   | -38.83      | -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         | 173.5000             | 346.85  | -33.83      | 1951.90   | -39.23      | -20dBm    |
| Test Results    |                   |              |                      | Compliance                                      |             |   |             |           |



## 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

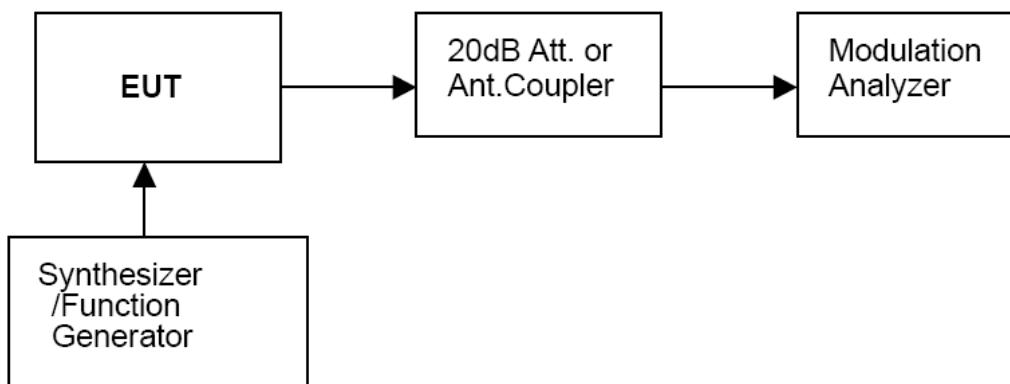
#### Modulation Limit

- 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

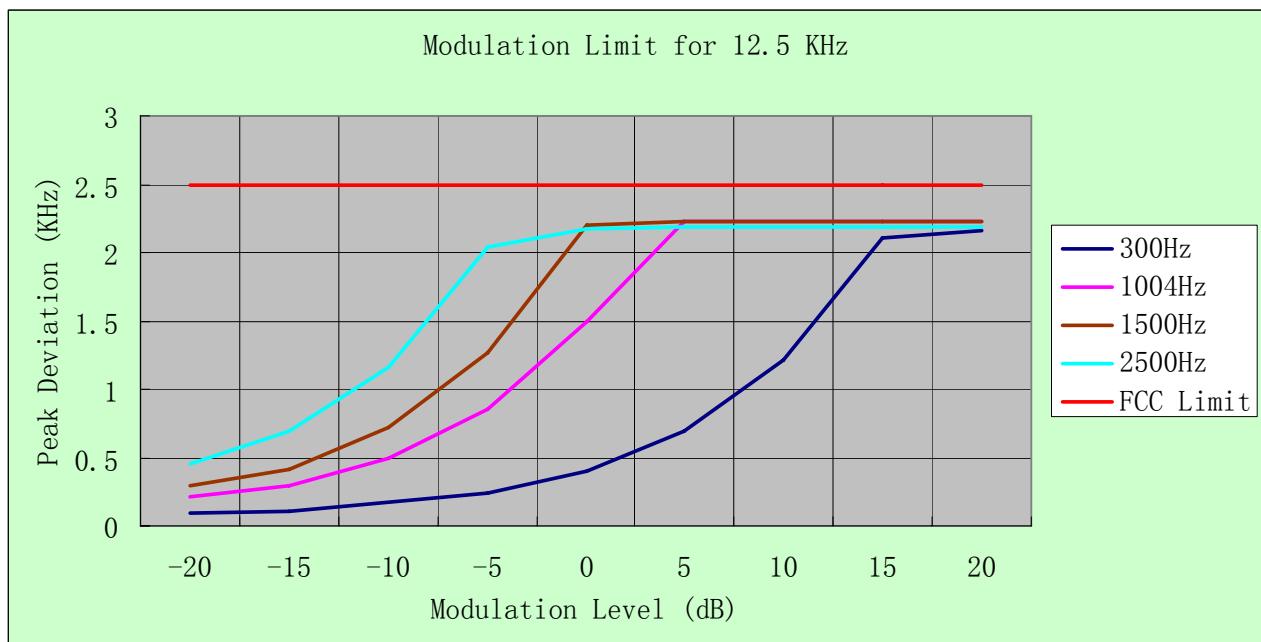


### TEST RESULTS

#### 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                  | 0.09                                | 0.21                                | 0.29                                 | 0.45                                 |
| -15                  | 0.11                                | 0.29                                | 0.41                                 | 0.69                                 |
| -10                  | 0.17                                | 0.50                                | 0.72                                 | 1.16                                 |
| -5                   | 0.24                                | 0.86                                | 1.27                                 | 2.04                                 |
| 0                    | 0.40                                | 1.50                                | 2.20                                 | 2.18                                 |
| +5                   | 0.69                                | 2.23                                | 2.23                                 | 2.19                                 |
| +10                  | 1.21                                | 2.23                                | 2.23                                 | 2.19                                 |
| +15                  | 2.11                                | 2.23                                | 2.23                                 | 2.19                                 |
| +20                  | 2.16                                | 2.23                                | 2.23                                 | 2.19                                 |



#### **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 2.80mv**

#### **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

**For 12.5 KHz**

| Frequency<br>(KHz) | Frequency Deviation<br>(KHz) | 1KHz Reference Deviation<br>(KHz) | Audio Frequency Response<br>(dB) |
|--------------------|------------------------------|-----------------------------------|----------------------------------|
| 0.1                | 0.04                         | 0.50                              | -21.94                           |
| 0.2                | 0.03                         | 0.50                              | -24.44                           |
| 0.3                | 0.15                         | 0.50                              | -10.46                           |
| 0.4                | 0.22                         | 0.50                              | -7.13                            |
| 0.5                | 0.27                         | 0.50                              | -5.35                            |
| 0.6                | 0.31                         | 0.50                              | -4.15                            |
| 0.7                | 0.35                         | 0.50                              | -3.10                            |
| 0.8                | 0.39                         | 0.50                              | -2.16                            |
| 0.9                | 0.45                         | 0.50                              | -0.92                            |
| 1.0                | 0.50                         | 0.50                              | 0.00                             |
| 1.2                | 0.57                         | 0.50                              | 1.14                             |
| 1.4                | 0.69                         | 0.50                              | 2.80                             |
| 1.6                | 0.76                         | 0.50                              | 3.64                             |
| 1.8                | 0.87                         | 0.50                              | 4.82                             |
| 2.0                | 0.93                         | 0.50                              | 5.39                             |
| 2.2                | 1.05                         | 0.50                              | 6.44                             |
| 2.4                | 1.10                         | 0.50                              | 6.85                             |
| 2.6                | 1.23                         | 0.50                              | 7.82                             |
| 2.7                | 1.24                         | 0.50                              | 7.89                             |
| 2.8                | 1.26                         | 0.50                              | 8.03                             |
| 3.0                | 1.29                         | 0.50                              | 8.23                             |
| 3.5                | 0.04                         | 0.50                              | -21.94                           |
| 4.0                | 0.03                         | 0.50                              | -24.44                           |
| 4.5                | 0.03                         | 0.50                              | -24.44                           |
| 5.0                | 0.03                         | 0.50                              | -24.44                           |

Audio Frequency Response for 12.5KHz

**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

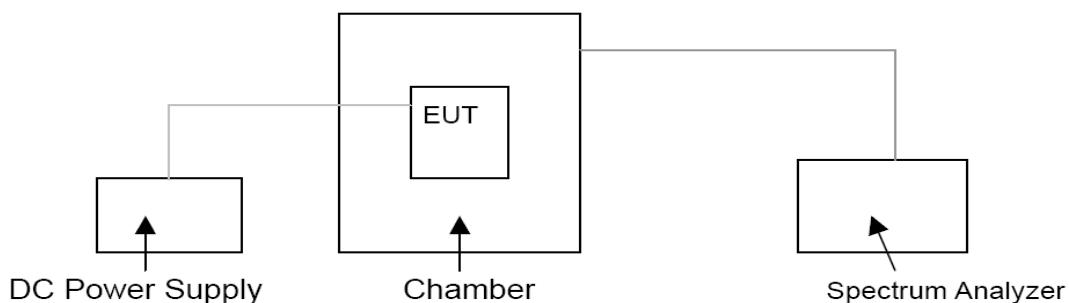
### TEST APPLICABLE

- 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 +50°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 5.0 ppm for 12.5KHz channel separation and 5 ppm for 25KHz channel separation.

### TEST PROCEDURE

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

### TEST CONFIGURATION



### TEST LIMITS

According to 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

| Frequency Range<br>(MHz) | Channel Bandwidth<br>(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            | 7.40            | -30               | -1.45                 | -1.46          | -1.47        |  |
|                 |                    |                 | -20               | -1.40                 | -1.45          | -1.45        |  |
|                 |                    |                 | -10               | -1.39                 | -1.38          | -1.41        |  |
|                 |                    |                 | 0                 | -1.24                 | -1.29          | -1.25        |  |
|                 |                    |                 | 10                | -1.00                 | -1.03          | -0.99        |  |
|                 |                    |                 | 20                | -0.94                 | -0.92          | -0.82        |  |
|                 |                    |                 | 30                | -0.88                 | -0.92          | -0.69        |  |
|                 |                    |                 | 40                | -1.05                 | -0.92          | -0.69        |  |
|                 |                    |                 | 50                | -1.22                 | -1.15          | -0.95        |  |
|                 |                    |                 | 6.67 (End point)  | 20                    | -0.88          | -0.79        |  |
|                 |                    |                 | 6.29 (85% Rated)  | 20                    | -0.88          | -0.76        |  |
|                 |                    |                 | 8.51 (115% Rated) | 20                    | -0.88          | -0.79        |  |
| Limit           |                    | 5.0 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            | 7.40            | -30               | -1.46                 | -1.43          | -1.42        |  |
|                 |                    |                 | -20               | -1.39                 | -1.36          | -1.35        |  |
|                 |                    |                 | -10               | -1.34                 | -1.21          | -1.26        |  |
|                 |                    |                 | 0                 | -1.23                 | -1.13          | -1.20        |  |
|                 |                    |                 | 10                | -1.02                 | -1.03          | -1.01        |  |
|                 |                    |                 | 20                | -0.94                 | -0.90          | -0.82        |  |
|                 |                    |                 | 30                | -0.88                 | -0.79          | -0.81        |  |
|                 |                    |                 | 40                | -1.00                 | -0.92          | -0.96        |  |
|                 |                    |                 | 50                | -1.25                 | -1.15          | -0.96        |  |
|                 |                    |                 | 6.67 (End point)  | 20                    | -0.88          | -0.79        |  |
|                 |                    |                 | 6.29 (85% Rated)  | 20                    | -0.88          | -0.79        |  |
|                 |                    |                 | 8.51 (115% Rated) | 20                    | -0.88          | -0.79        |  |
| Limit           |                    | 5.0 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 20 dB attenuator.

Measurement with Spectrum Analyzer ESI 26 conducted, external power supply with 7.40 V stabilized supply voltage.

### TEST CONFIGURATION

|     |  |            |  |                            |
|-----|--|------------|--|----------------------------|
| EUT |  | Attenuator |  | Spectrum Analyzer/Receiver |
|     |  |            |  |                            |

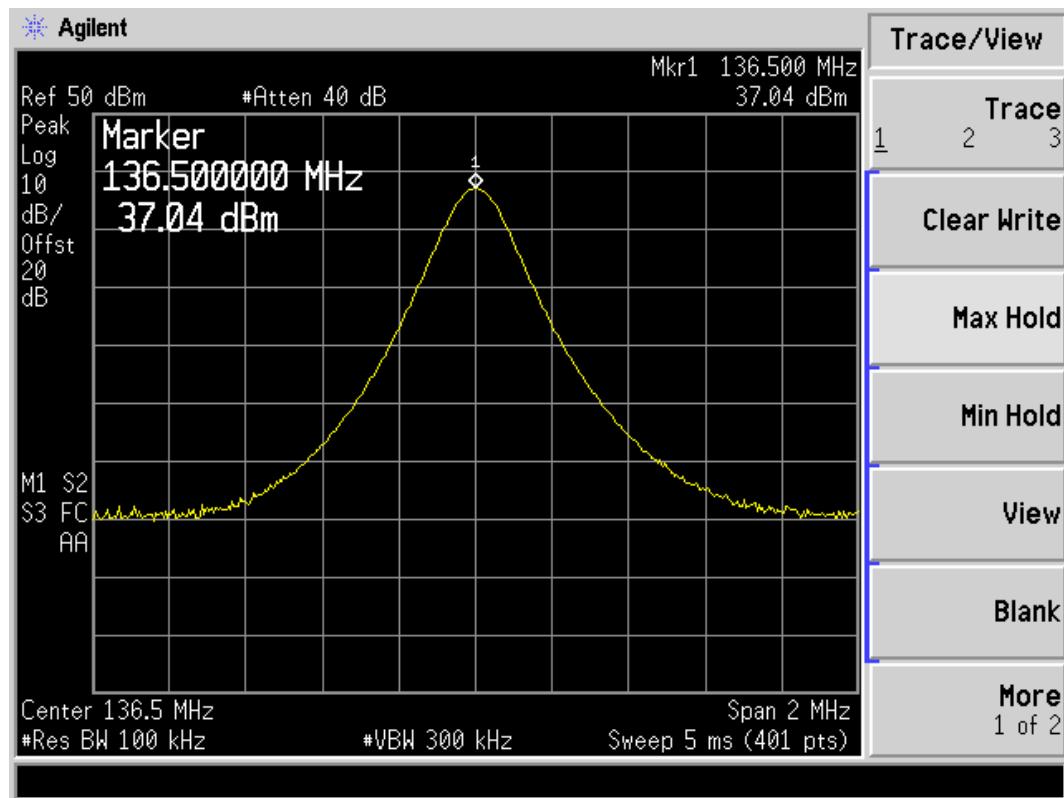
The EUT was directly connected to a RF Communication  
Test set by a 20 dB attenuator

### TEST RESULTS

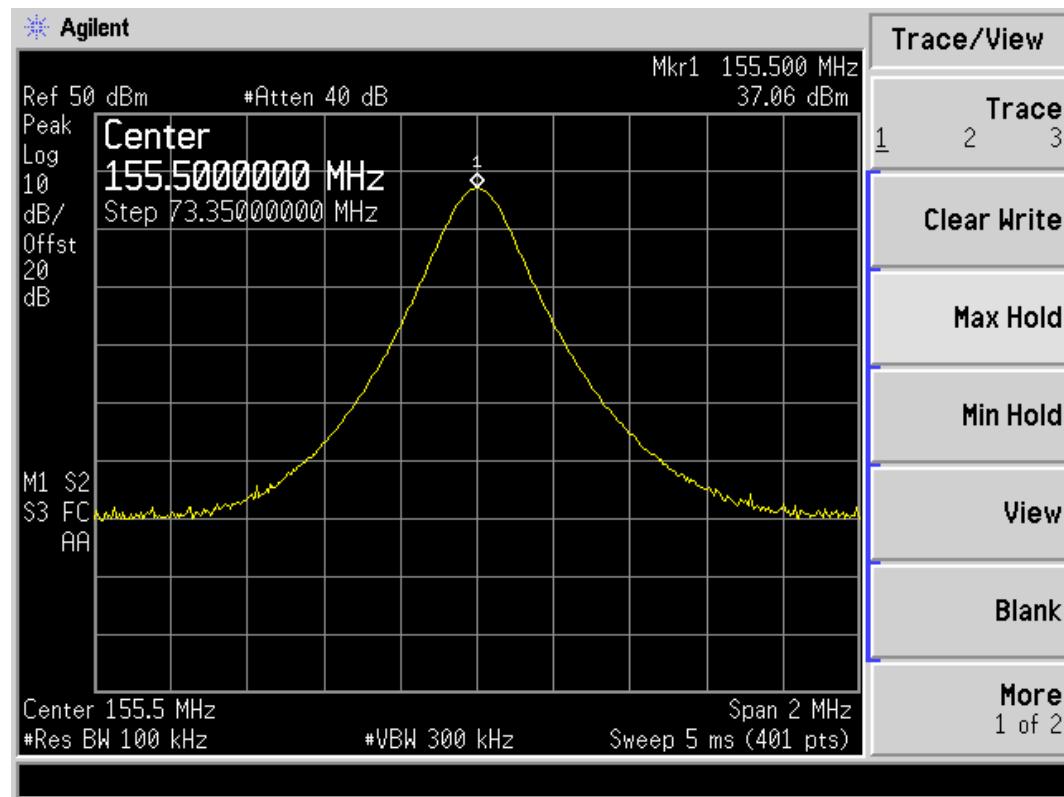
| Modulation Type | Channel Separation | Test Channel  | Test Frequency | Maximum Transmitter Power at Rated High Power Level(dBm) | Maximum Transmitter Power at Rated Low Power Level(dBm) |  |
|-----------------|--------------------|---|----------------|--|---|--|
| Analog/FM       | 12.5KHz            | Low Channel   | 136.5000 MHz   | 37.04  | 30.50   |  |
|                 |                    | Middle Channel  | 155.5000 MHz   | 37.06  | 30.40   |  |
|                 |                    | High Channel  | 173.5000 MHz   | 37.00  | 30.30   |  |
| Digital/4FSK    | 12.5KHz            | Low Channel   | 136.5000 MHz   | 37.04  | 30.41   |  |
|                 |                    | Middle Channel  | 155.5000 MHz   | 37.01  | 30.38   |  |
|                 |                    | High Channel  | 173.5000 MHz   | 37.07  | 30.34   |  |
| Limit           |                    | The limit is dependent upon the station's antenna HAAT and required service area. |                |  |   |  |
| Test Results    |                    | Compliance  |                |  |   |  |

### Plots of Maximum Transmitter Power Measurement

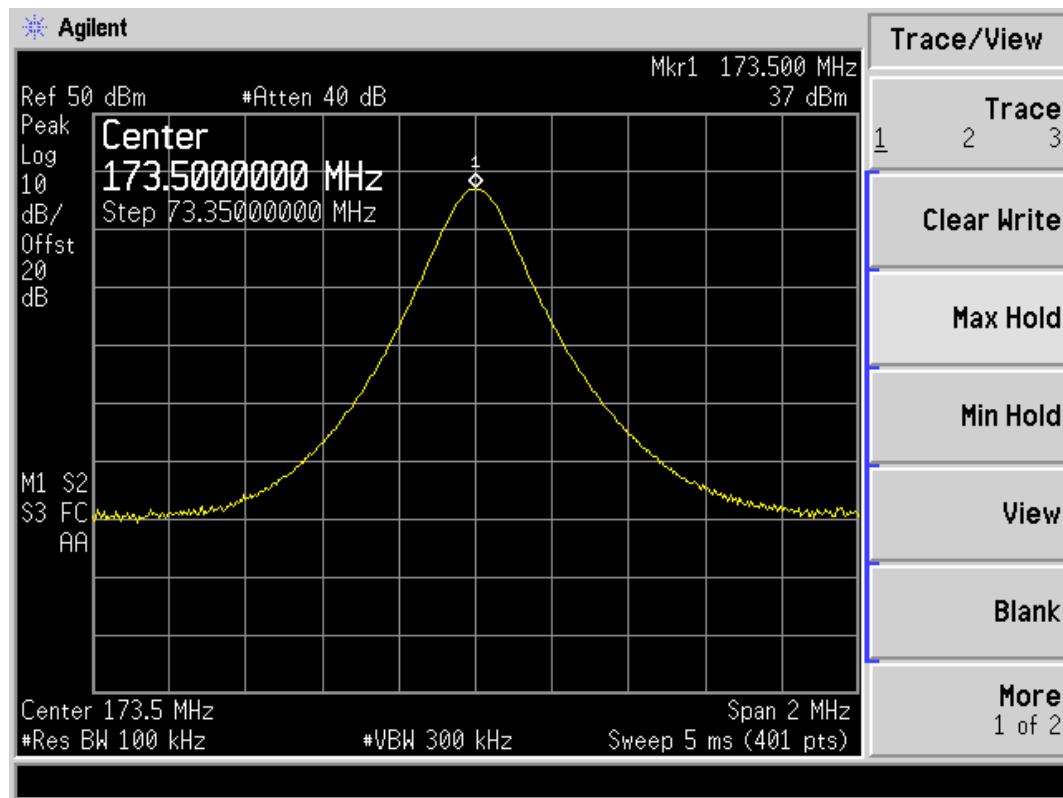
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| FM              | 12.5 KHz           | 136.5000   | 5                  | 37.04             | Varies    | Compliance |



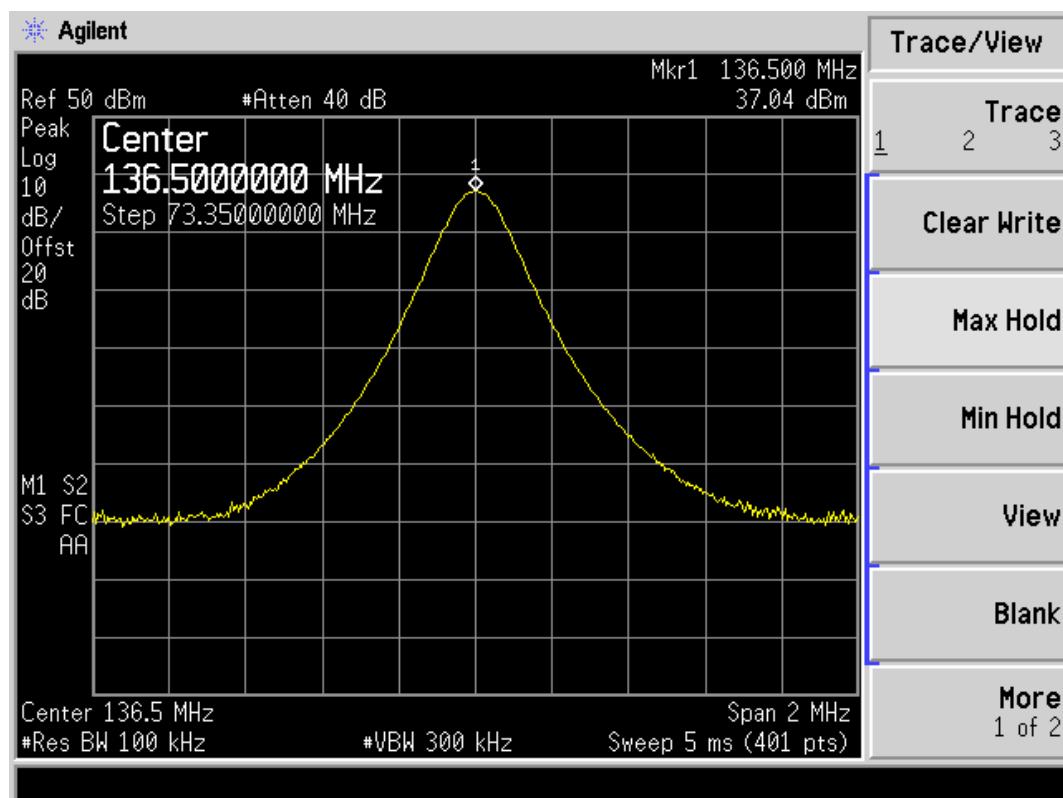
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| FM              | 12.5 KHz           | 155.5000   | 5                  | 37.06             | Varies    | Compliance |



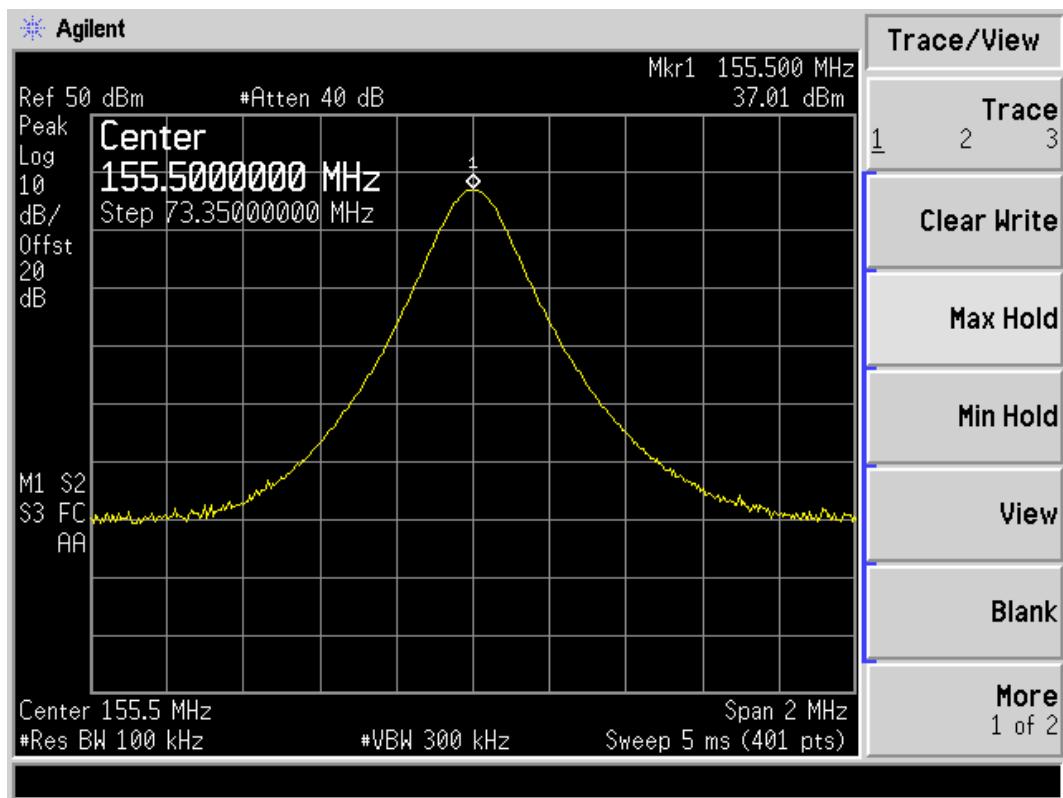
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| FM              | 12.5 KHz           | 173.5000   | 5                  | 37.00             | Varies    | Compliance |



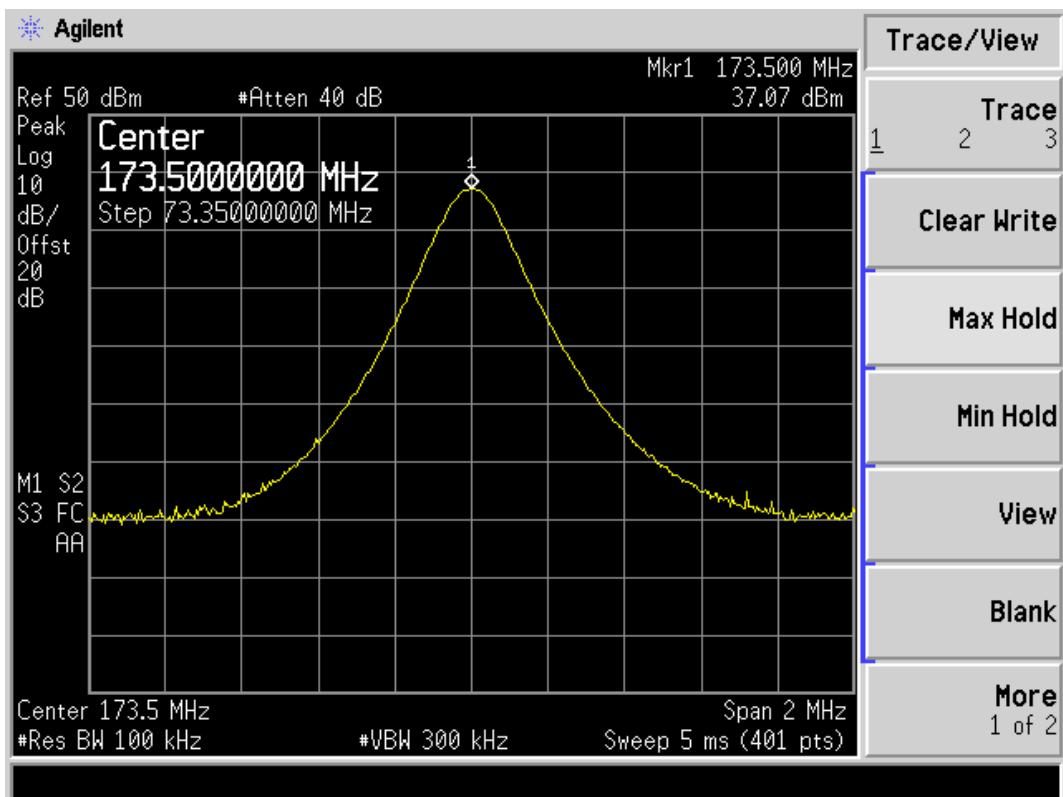
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| 4FSK            | 12.5 KHz           | 136.5000   | 5                  | 37.04             | Varies    | Compliance |



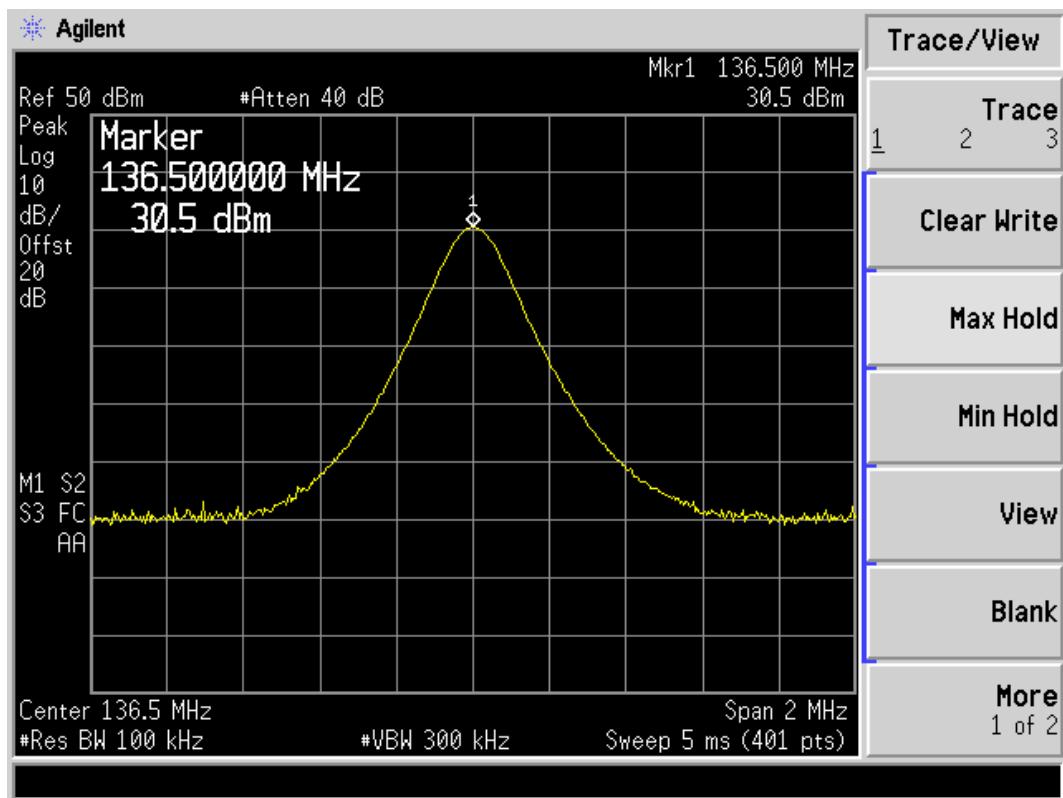
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| 4FSK            | 12.5 KHz           | 155.5000   | 5                  | 37.01             | Varies    | Compliance |



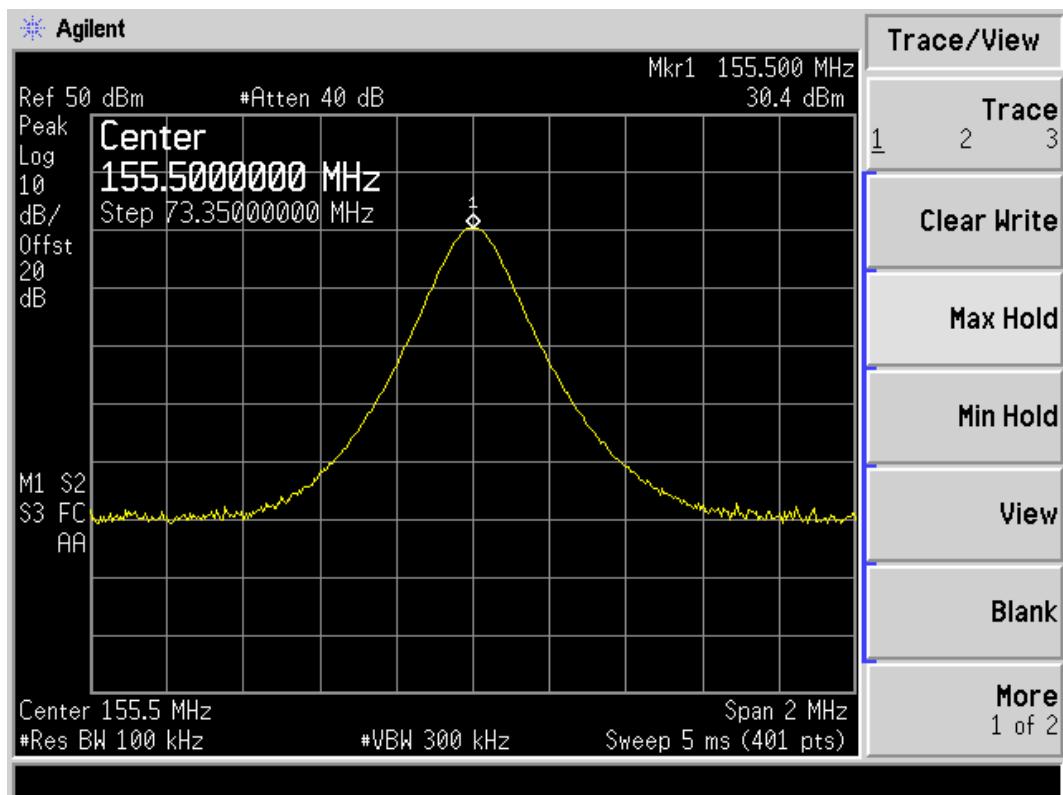
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| 4FSK            | 12.5 KHz           | 173.5000   | 5                  | 37.07             | Varies    | Compliance |



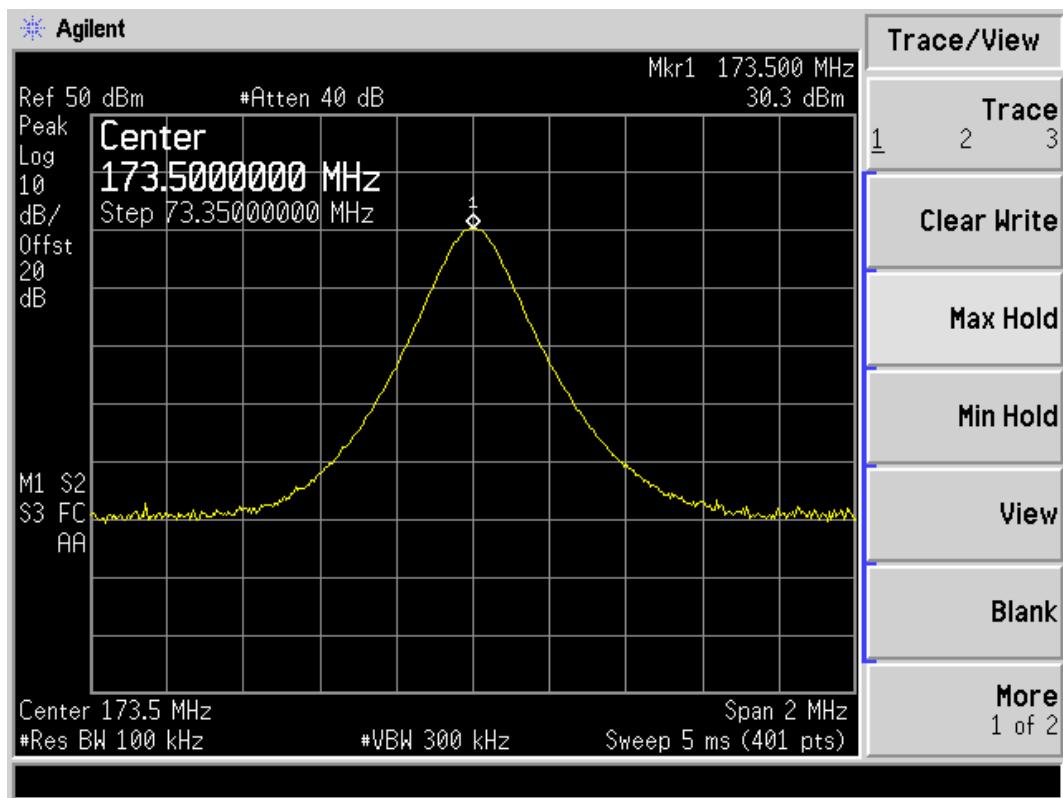
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| FM              | 12.5 KHz           | 136.5000   | 1                  | 30.50             | Varies    | Compliance |



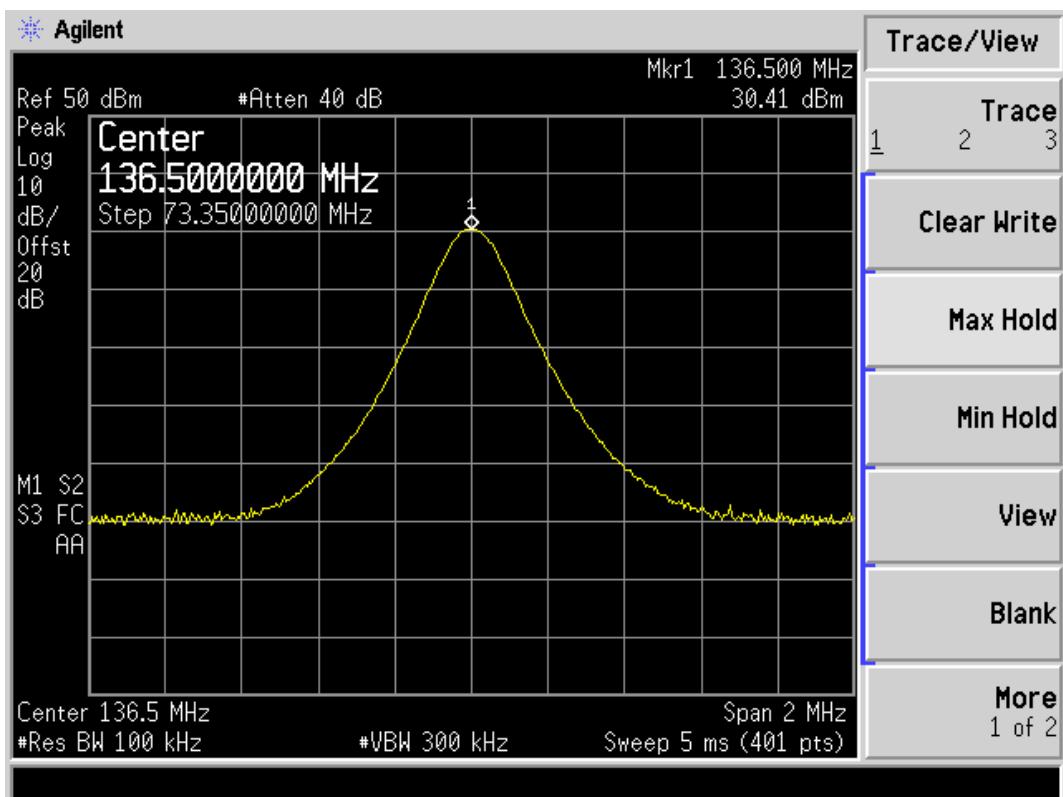
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| FM              | 12.5 KHz           | 155.5000   | 1                  | 30.40             | Varies    | Compliance |



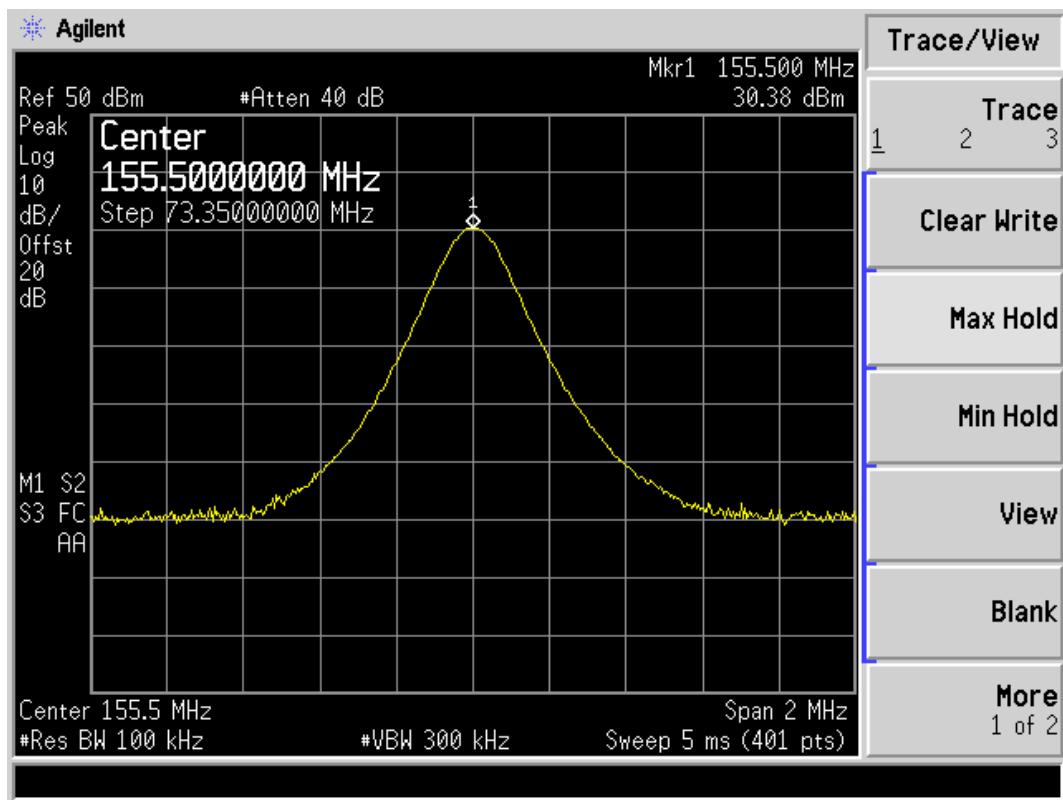
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| FM              | 12.5 KHz           | 173.5000   | 1                  | 30.30             | Varies    | Compliance |



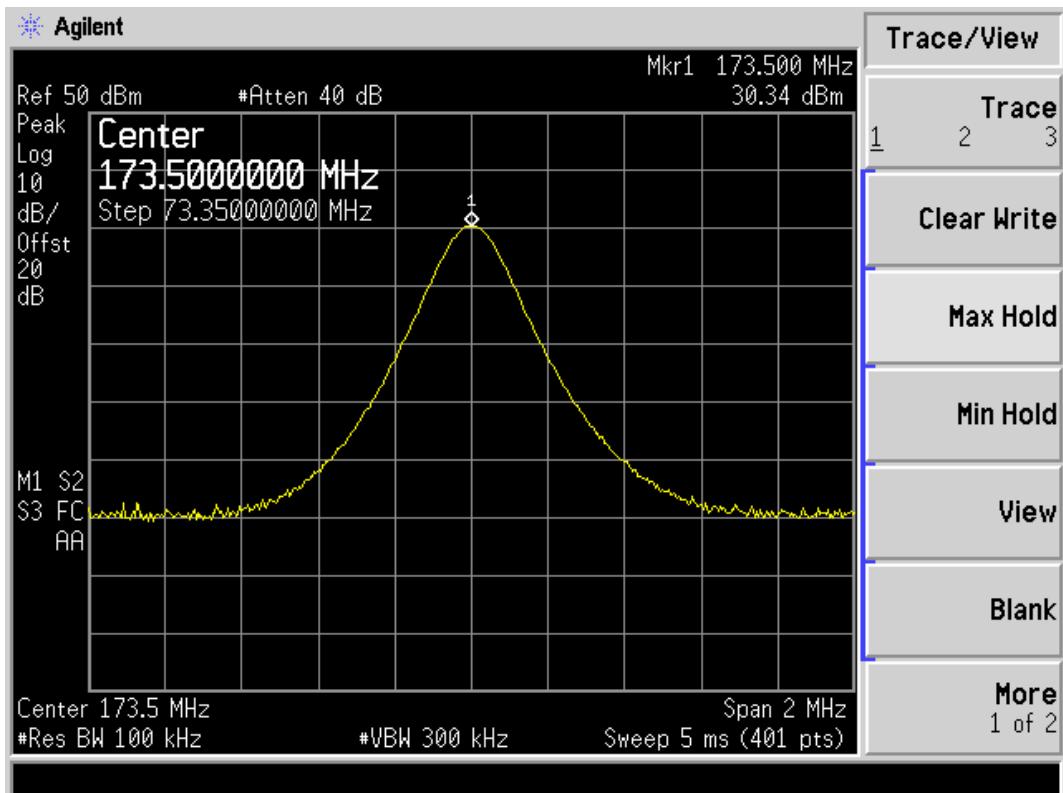
| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| 4FSK            | 12.5 KHz           | 136.5000   | 1                  | 30.41             | Varies    | Compliance |



| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| 4FSK            | 12.5 KHz           | 155.5000   | 1                  | 30.38             | Varies    | Compliance |



| Modulation Type | Channel Separation | Freq.(MHz) | Rated Power (Watt) | Measurement (dBm) | FCC Limit | Results    |
|-----------------|--------------------|------------|--------------------|-------------------|-----------|------------|
| 4FSK            | 12.5 KHz           | 173.5000   | 1                  | 30.34             | 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:

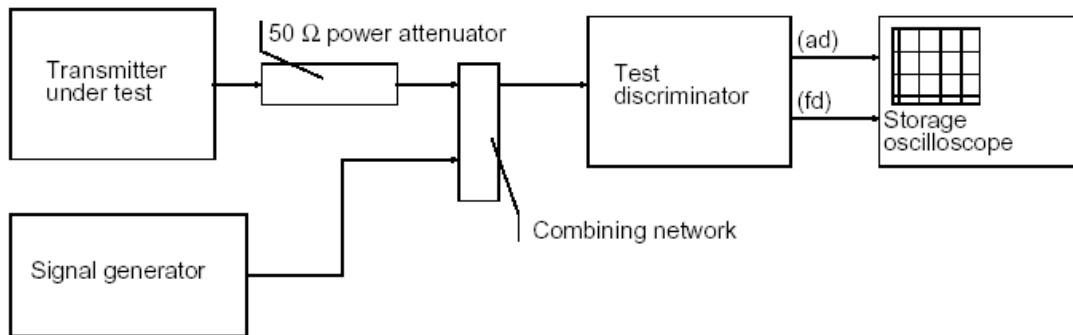
| Time intervals <sup>1, 2</sup>  | Maximum frequency difference <sup>3</sup> | All equipment  |               |
|---|---|----------------|---------------|
|   |   | 150 to 174 MHz | 421 to 512MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels   |   |                |               |
| $t_1$ <sup>4</sup>  | $\pm 25.0$ KHz                            | 5.0 ms         | 10.0 ms       |
| $t_2$ .....   | $\pm 12.5$ KHz                            | 20.0 ms        | 25.0 ms       |
| $t_3$ <sup>4</sup>  | $\pm 25.0$ KHz                            | 5.0 ms         | 10.0 ms       |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels |   |                |               |
| $t_1$ <sup>4</sup>  | $\pm 12.5$ KHz                            | 5.0 ms         | 10.0 ms       |
| $t_2$ .....   | $\pm 6.25$ KHz                            | 20.0 ms        | 25.0 ms       |
| $t_3$ <sup>4</sup>  | $\pm 12.5$ KHz                            | 5.0 ms         | 10.0 ms       |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels |   |                |               |
| $t_1$ <sup>4</sup>  | $\pm 6.25$ KHz                            | 5.0 ms         | 10.0 ms       |
| $t_2$ .....   | $\pm 3.125$ KHz                           | 20.0 ms        | 25.0 ms       |
| $t_3$ <sup>4</sup>  | $\pm 6.25$ 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

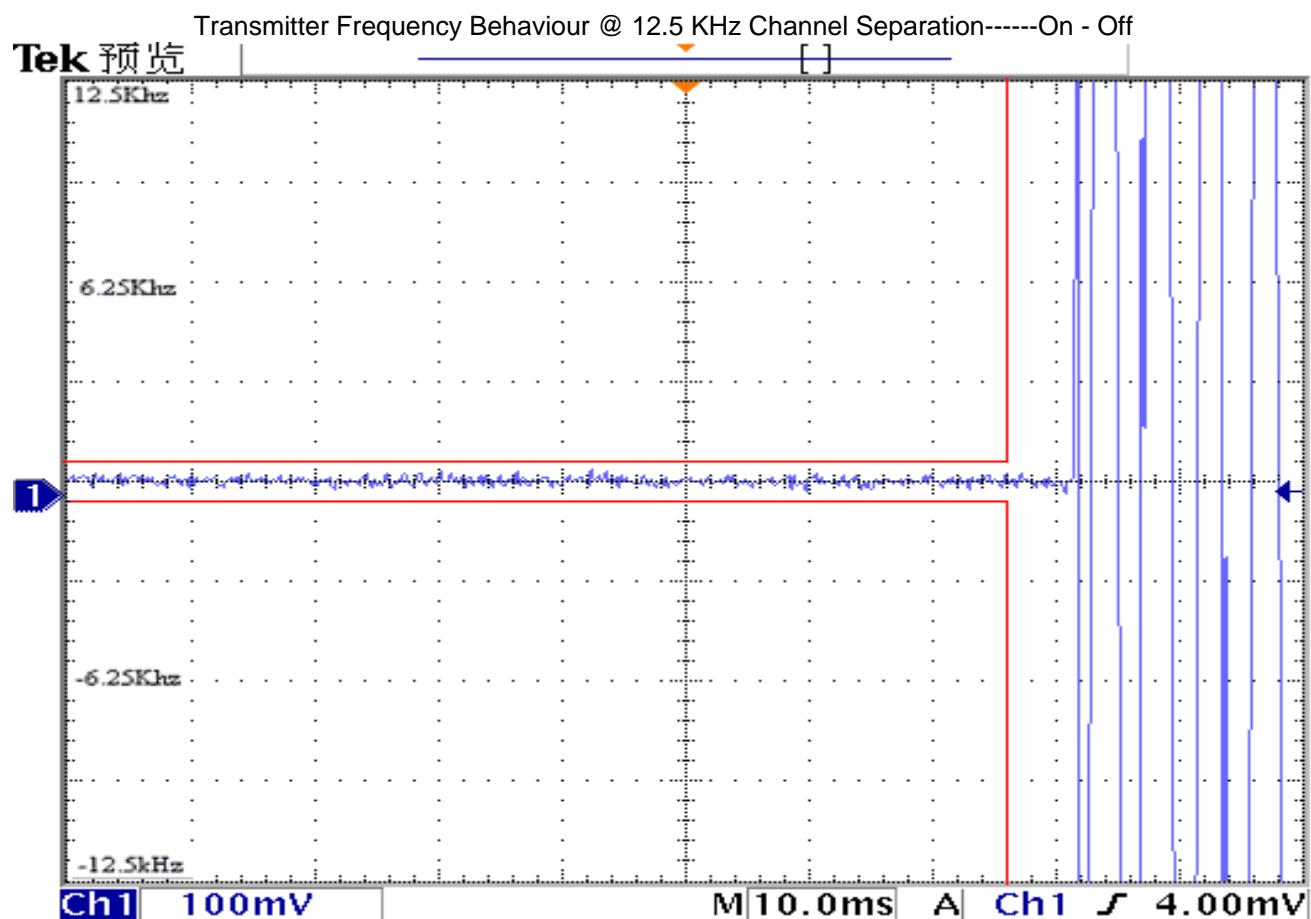
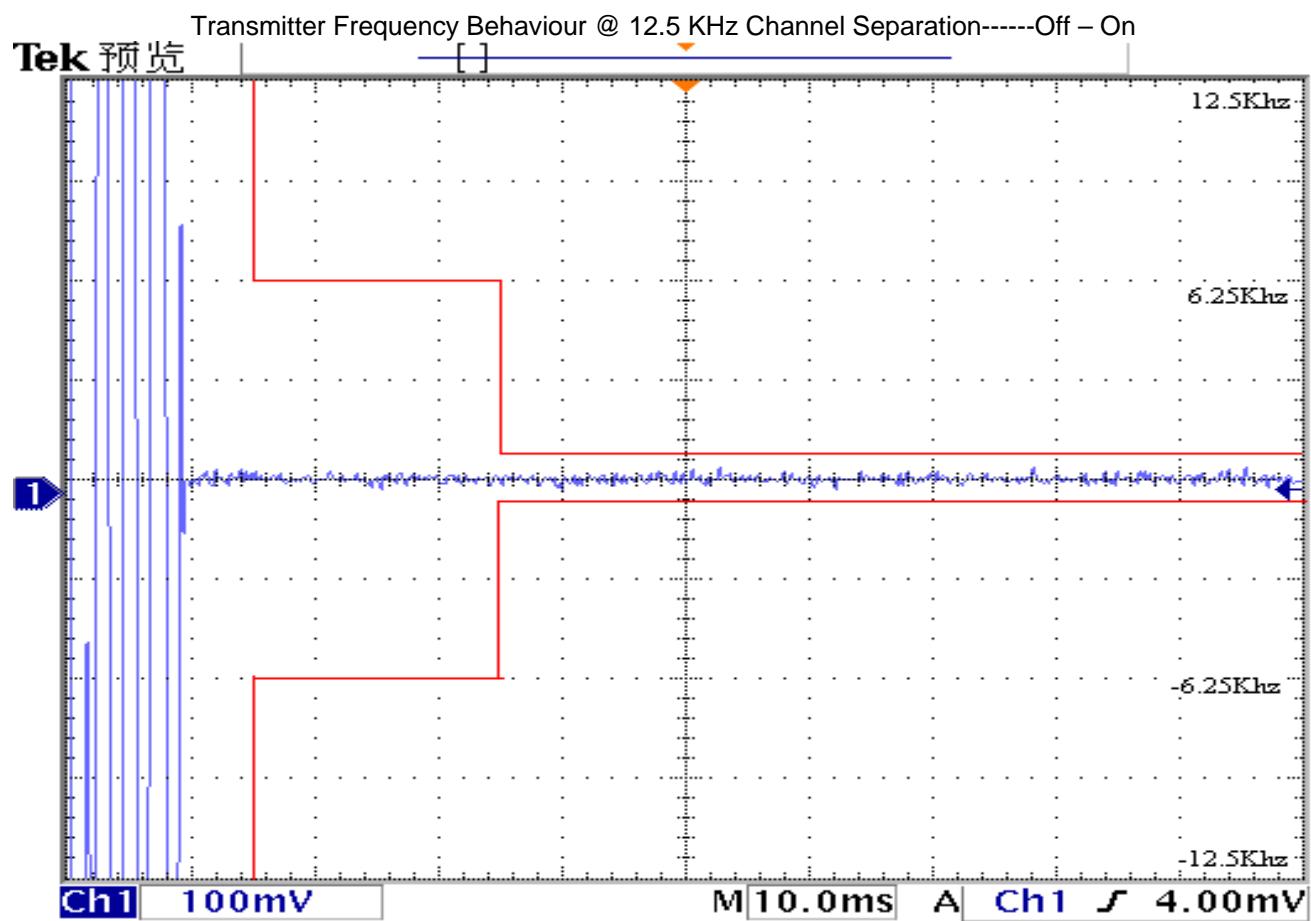
### TEST CONFIGURATION



### TEST RESULTS

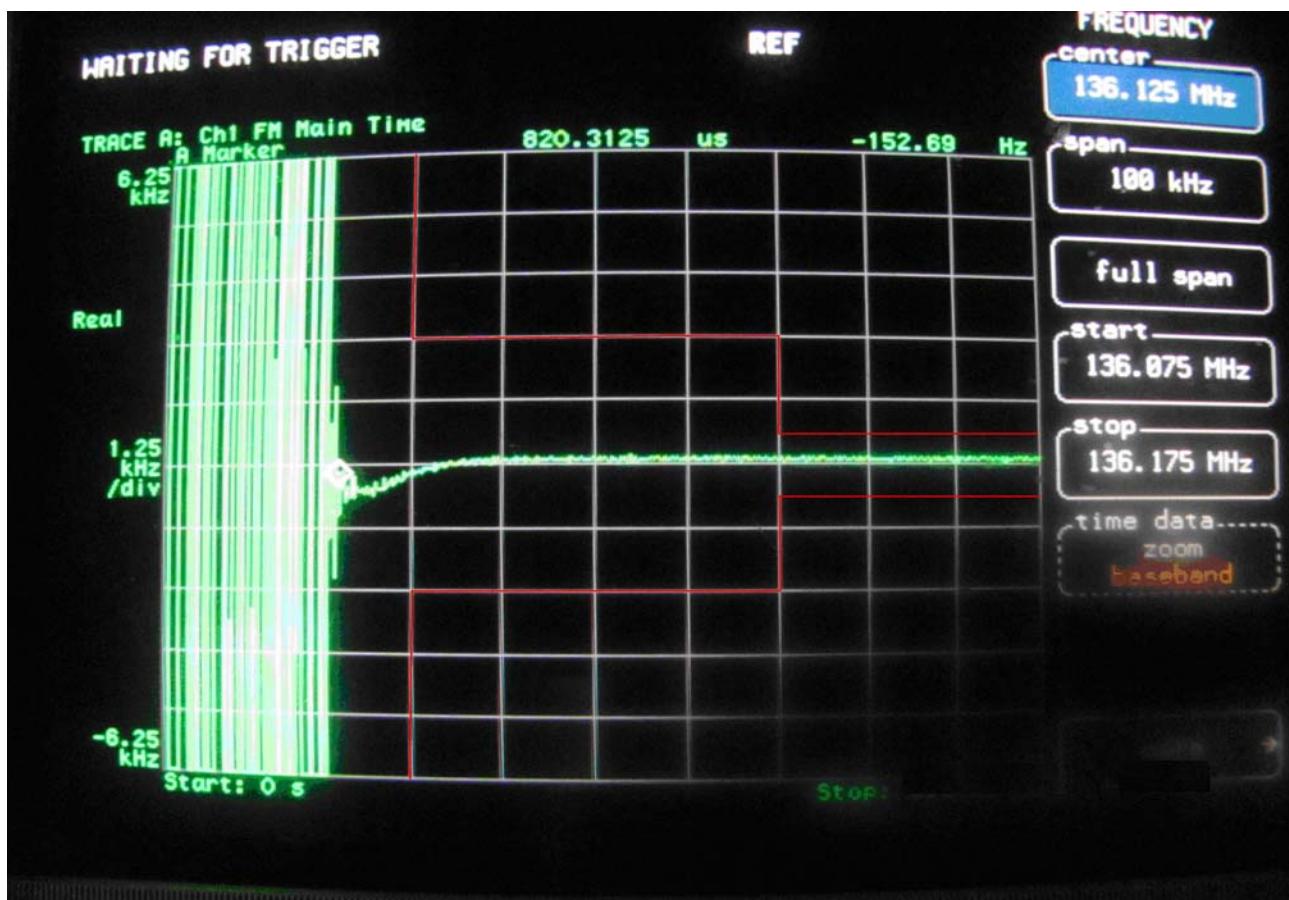
Please refer to the following plots.

Modulation Type: FM

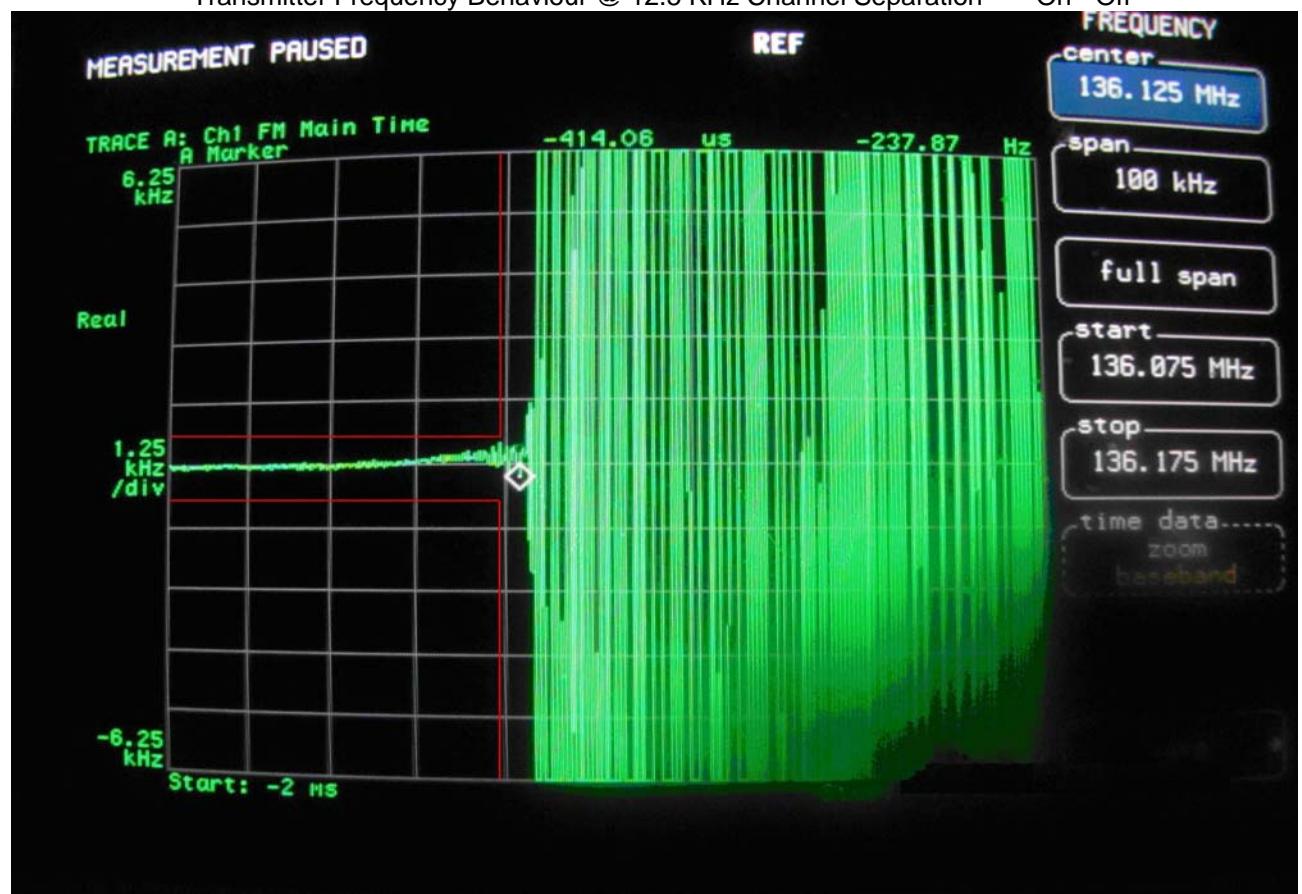


Modulation Type: 4FSK

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

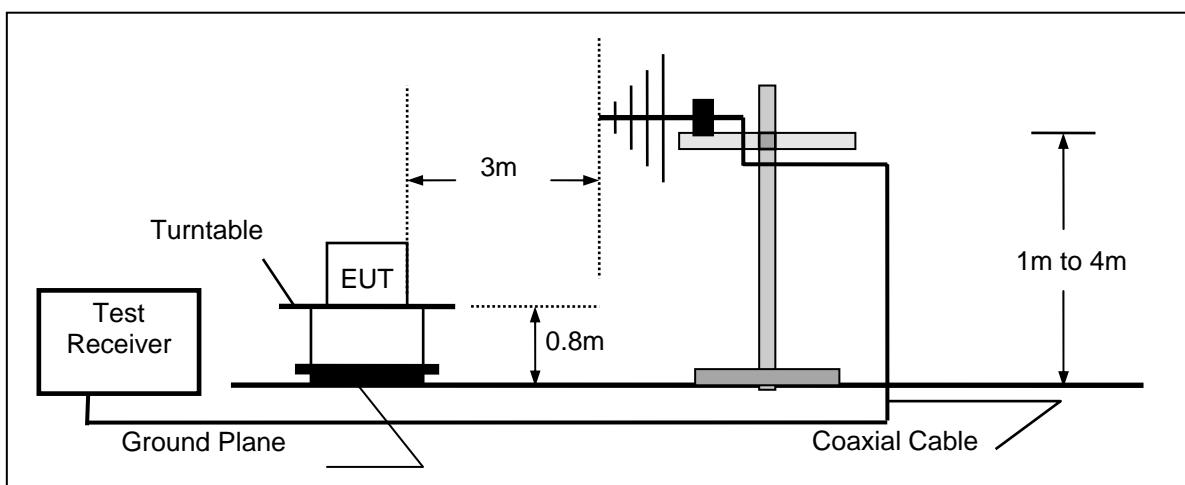
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

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

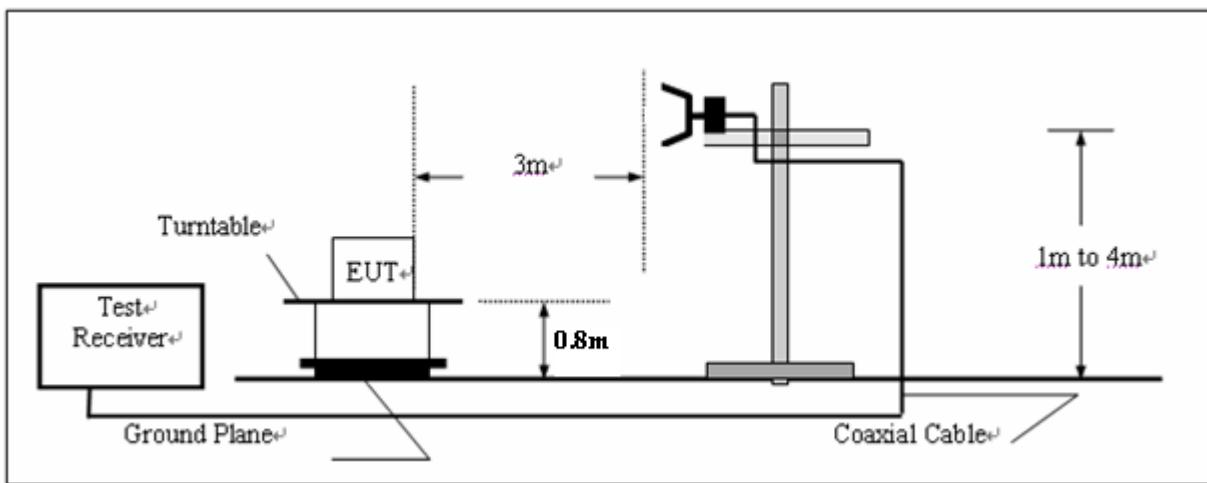
|                           |  |
|---------------------------|--|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude    | AG = Amplifier Gain                        |
| AF = Antenna Factor       |  |

### 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 SPOUSIOUS 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<br>(MHz) | Distance<br>(Meters) | Radiated<br>(dB $\mu$ V/m) | Radiated<br>( $\mu$ 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.

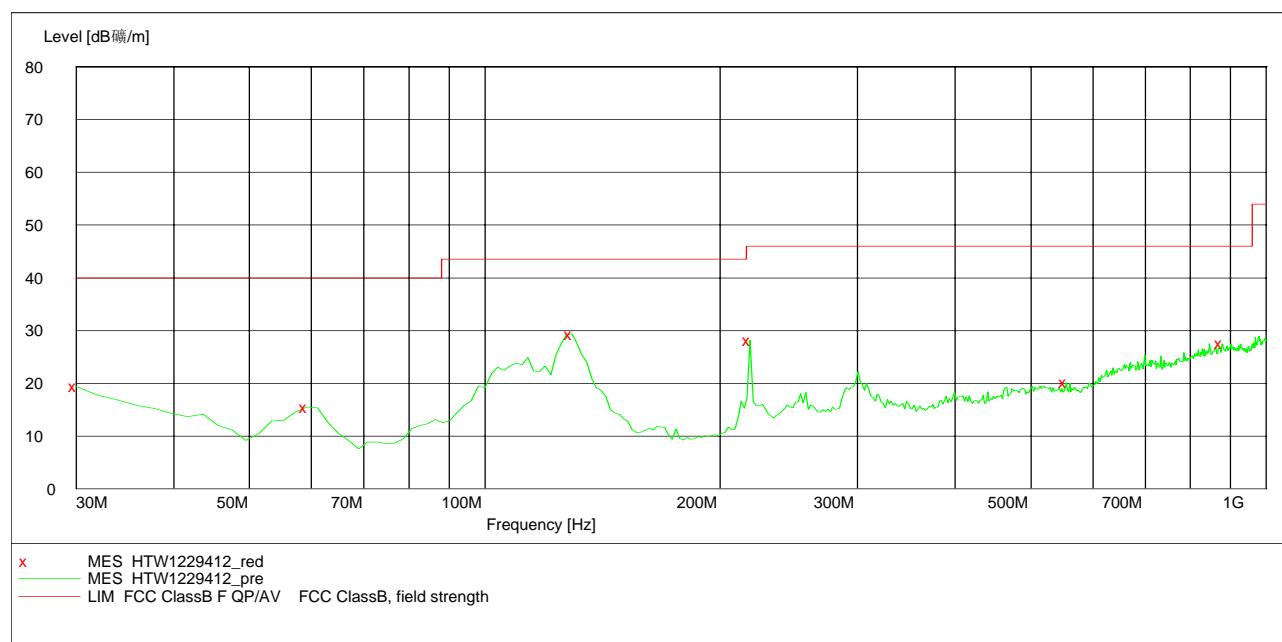
**TEST RESULTS**

The Radiated Measurement are performed to the three channels (the top channel, the middle channel and the bottom channel), the datum recorded below is the worst case for each channel separation;and the EUT shall be scanned from 30 MHz to the 5th harmonic of the highest oscillator frequency in the digital devices or 1 GHz whichever is higher.

| Modulation Type | Channel Separation | Test Frequency (MHz) | Polar.     | Maximum Radiated Emissions |                | FCC Limit (dBuV/m) |
|-----------------|--------------------|----------------------|------------|----------------------------|----------------|--------------------|
|                 |                    |                      |            | Frequency (MHz)            | Datum (dBuV/m) |                    |
| FM              | 12.5 KHz           | 173.5000             | H          | 129.13                     | 29.40          | 43.50              |
|                 |                    |                      | V          | 41.66                      | 30.80          | 40.00              |
| Test Results    |                    |                      | Compliance |                            |                |                    |

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

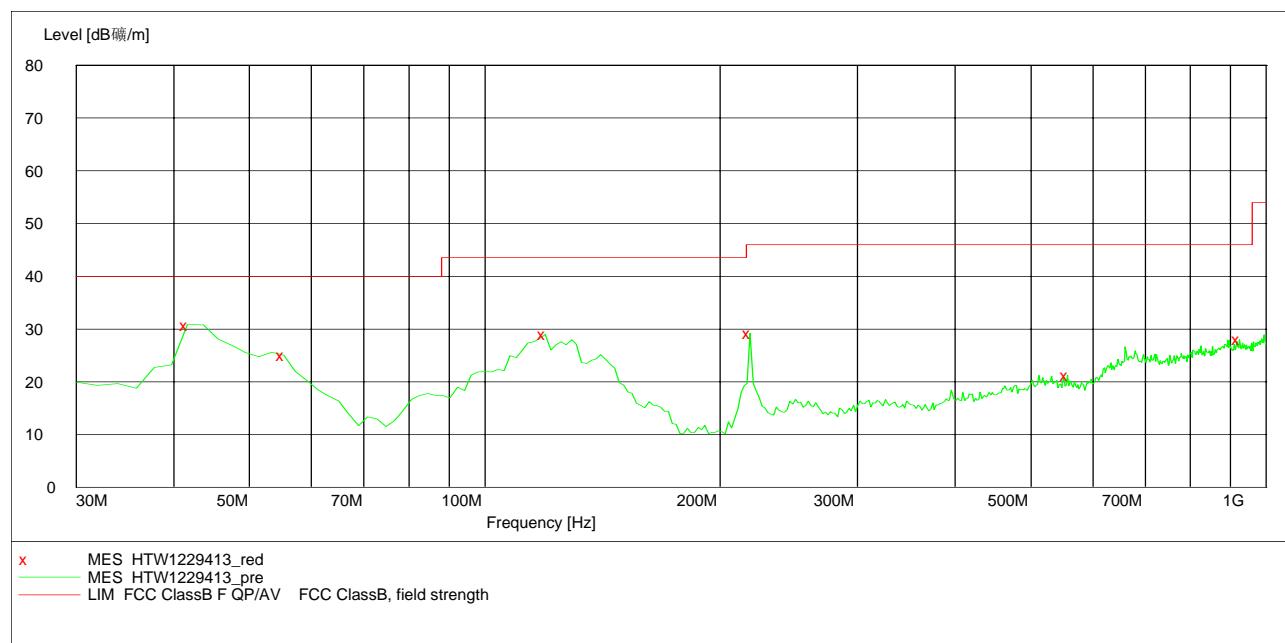
Short Description: Field Strength  
 Start Stop Detector Meas. IF Transducer  
 Frequency Frequency Time Bandw.  
 30.0 MHz 1.0 GHz MaxPeak Coupled 120 kHz HL562 201106

**MEASUREMENT RESULT: "HTW1229412\_red"**

| 12/29/2011 12:26PM |              |        |              |        |      |        |         |              |
|--------------------|--------------|--------|--------------|--------|------|--------|---------|--------------|
| Frequency          | Level        | Transd | Limit        | Margin | Det. | Height | Azimuth | Polarization |
| MHz                | dB $\mu$ V/m | dB     | dB $\mu$ V/m | dB     |      | cm     | deg     |              |
| 30.000000          | 19.40        | -11.3  | 40.0         | 20.6   | Peak | 100.0  | 9.00    | HORIZONTAL   |
| 59.158317          | 15.50        | -25.0  | 40.0         | 24.5   | Peak | 300.0  | 99.00   | HORIZONTAL   |
| 129.138277         | 29.40        | -20.3  | 43.5         | 14.1   | Peak | 300.0  | 191.00  | HORIZONTAL   |
| 218.557114         | 28.20        | -20.5  | 46.0         | 17.8   | Peak | 100.0  | 241.00  | HORIZONTAL   |
| 554.849699         | 20.10        | -13.6  | 46.0         | 25.9   | Peak | 100.0  | 68.00   | HORIZONTAL   |
| 877.535070         | 27.50        | -7.0   | 46.0         | 18.5   | Peak | 300.0  | 328.00  | HORIZONTAL   |

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

|                    |                |          |         |         |              |
|--------------------|----------------|----------|---------|---------|--------------|
| Short Description: | Field Strength |          |         |         |              |
| Start Frequency    | Stop Frequency | Detector | Meas.   | IF Time | Transducer   |
| 30.0 MHz           | 1.0 GHz        | MaxPeak  | Coupled | 120 kHz | HL562 201106 |

**MEASUREMENT RESULT: "HTW1229413\_red"**

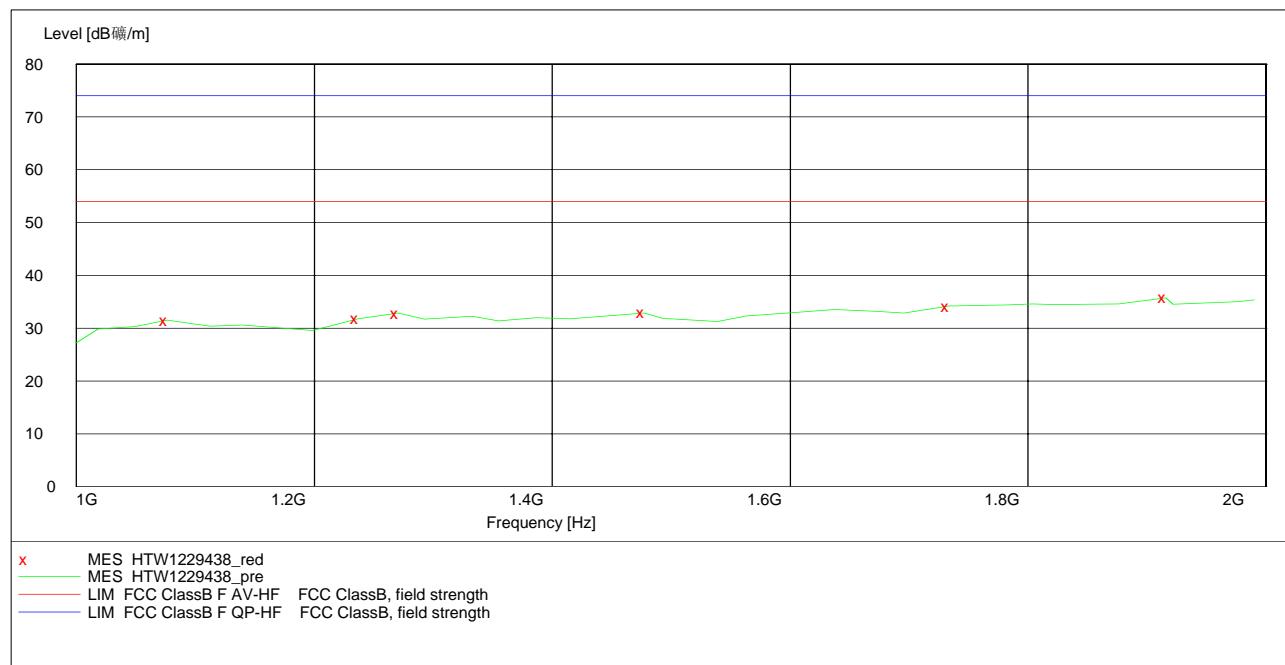
12/29/2011 12:28PM

| Frequency<br>MHz | Level<br>dB $\mu$ V/m | Transd<br>dB | Limit<br>dB $\mu$ V/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------------|--------------|-----------------------|--------------|------|--------------|----------------|--------------|
| 41.663327        | 30.80                 | -17.6        | 40.0                  | 9.2          | Peak | 100.0        | 36.00          | VERTICAL     |
| 55.270541        | 25.00                 | -23.9        | 40.0                  | 15.0         | Peak | 100.0        | 24.00          | VERTICAL     |
| 119.418838       | 29.00                 | -19.3        | 43.5                  | 14.5         | Peak | 100.0        | 260.00         | VERTICAL     |
| 218.557114       | 29.20                 | -20.5        | 46.0                  | 16.8         | Peak | 100.0        | 119.00         | VERTICAL     |
| 556.793587       | 21.30                 | -13.5        | 46.0                  | 24.7         | Peak | 100.0        | 317.00         | VERTICAL     |
| 924.188377       | 28.00                 | -7.1         | 46.0                  | 18.0         | Peak | 100.0        | 57.00          | 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           | 173.5000             | H      | 1915.83                    | 35.80          | 54.00              |
|                 |                    |                      | V      | 1947.90                    | 37.70          | 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

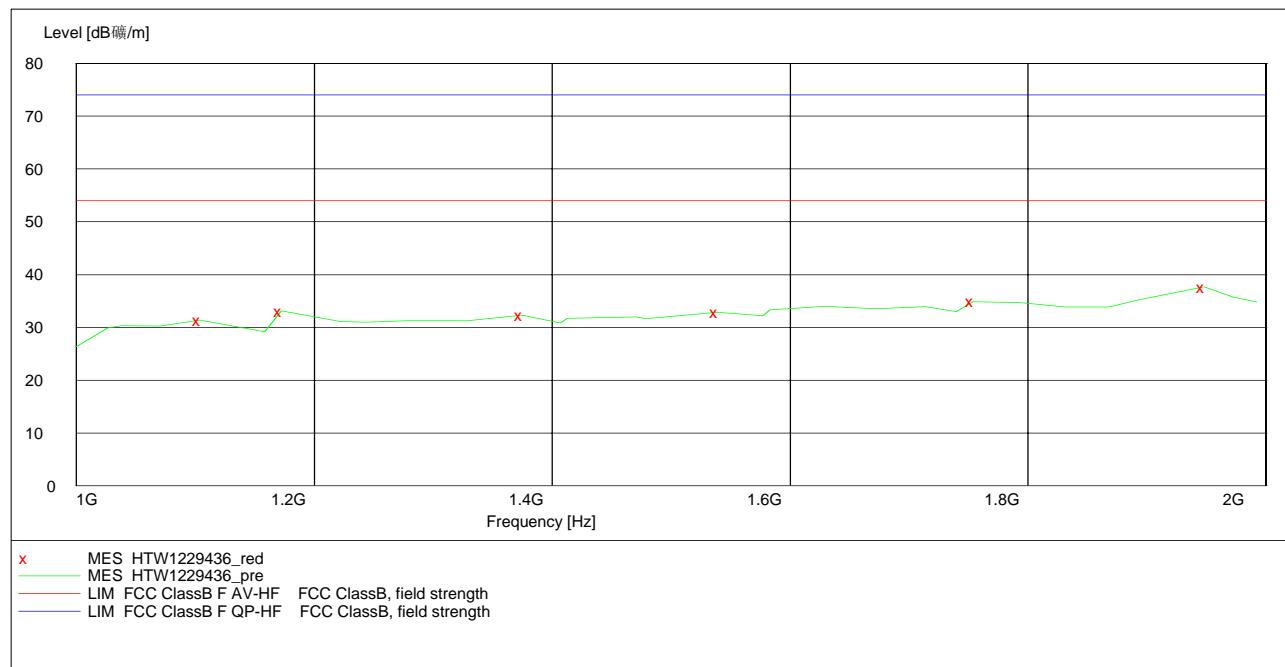
**MEASUREMENT RESULT: "HTW1229438\_red"**

12/29/2011 4:05PM

| Frequency<br>MHz | Level<br>dBuV/m | Transd<br>dB | Limit<br>dBuV/m | Margin<br>dB | Det.<br>Peak | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|--------------|--------------|----------------|--------------|
| 1076.152305      | 31.50           | -26.2        | 54.0            | 22.5         | Peak         | 100.0        | 273.00         | HORIZONTAL   |
| 1236.472946      | 31.80           | -25.2        | 54.0            | 22.2         | Peak         | 100.0        | 36.00          | HORIZONTAL   |
| 1270.541082      | 32.80           | -25.0        | 54.0            | 21.2         | Peak         | 100.0        | 337.00         | HORIZONTAL   |
| 1476.953908      | 32.90           | -23.9        | 54.0            | 21.1         | Peak         | 100.0        | 144.00         | HORIZONTAL   |
| 1733.466934      | 34.20           | -21.7        | 54.0            | 19.8         | Peak         | 100.0        | 296.00         | HORIZONTAL   |
| 1915.831663      | 35.80           | -20.5        | 54.0            | 18.2         | Peak         | 100.0        | 200.00         | 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: "HTW1229436\_red"***

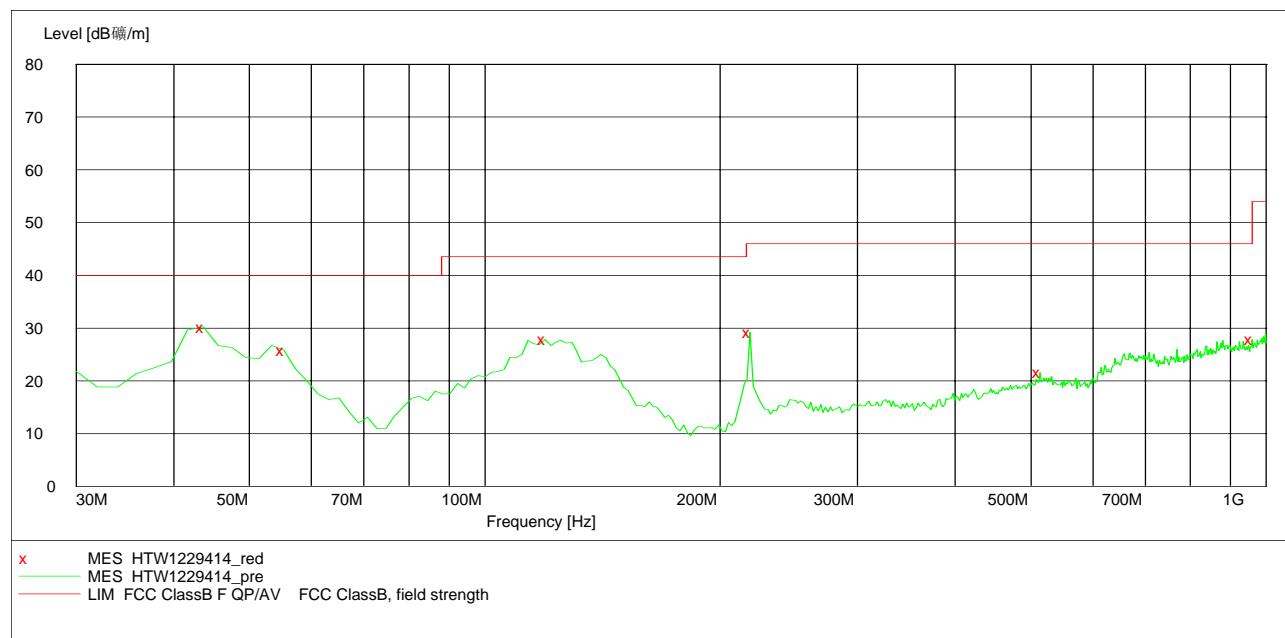
12/29/2011 4:03PM

| Frequency<br>MHz | Level<br>dB $\mu$ V/m | Transd<br>dB | Limit<br>dB $\mu$ V/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------------|--------------|-----------------------|--------------|------|--------------|----------------|--------------|
| 1104.208417      | 31.40                 | -26.0        | 54.0                  | 22.6         | Peak | 100.0        | 125.00         | VERTICAL     |
| 1172.344689      | 33.10                 | -25.6        | 54.0                  | 20.9         | Peak | 100.0        | 345.00         | VERTICAL     |
| 1374.749499      | 32.30                 | -24.4        | 54.0                  | 21.7         | Peak | 100.0        | 56.00          | VERTICAL     |
| 1539.078156      | 32.80                 | -23.4        | 54.0                  | 21.2         | Peak | 100.0        | 178.00         | VERTICAL     |
| 1753.507014      | 34.90                 | -21.6        | 54.0                  | 19.1         | Peak | 100.0        | 227.00         | VERTICAL     |
| 1947.895792      | 37.70                 | -20.2        | 54.0                  | 16.3         | Peak | 100.0        | 347.00         | 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           | 155.5000             | H      | 129.14                     | 29.00          | 43.50              |
|                 |                    |                      | V      | 43.61                      | 30.20          | 40.00              |
| Test Results    |                    |                      |        | Compliance                 |                |                    |

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

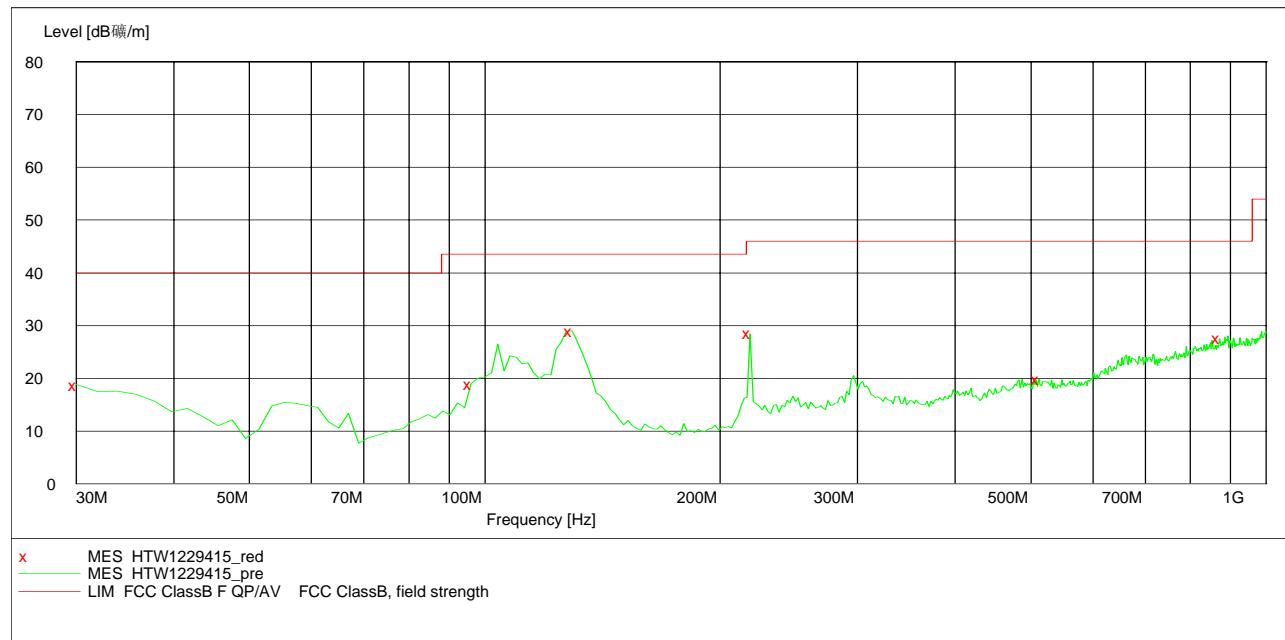
Short Description: Field Strength  
 Start Stop Detector Meas. IF Transducer  
 Frequency Frequency Time Bandw.  
 30.0 MHz 1.0 GHz MaxPeak Coupled 120 kHz HL562 201106

**MEASUREMENT RESULT: "HTW1229414\_red"**

| Frequency<br>MHz | Level<br>dBuV/m | Transd<br>dB | Limit<br>dBuV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 43.607214        | 30.20           | -18.6        | 40.0            | 9.8          | Peak | 100.0        | 27.00          | VERTICAL     |
| 55.270541        | 25.80           | -23.9        | 40.0            | 14.2         | Peak | 100.0        | 80.00          | VERTICAL     |
| 119.418838       | 27.90           | -19.3        | 43.5            | 15.6         | Peak | 100.0        | 6.00           | VERTICAL     |
| 218.557114       | 29.20           | -20.5        | 46.0            | 16.8         | Peak | 100.0        | 69.00          | VERTICAL     |
| 514.028056       | 21.50           | -13.1        | 46.0            | 24.5         | Peak | 100.0        | 134.00         | VERTICAL     |
| 959.178357       | 27.80           | -6.9         | 46.0            | 18.2         | Peak | 100.0        | 161.00         | VERTICAL     |

***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 120 kHz HL562 201106

***MEASUREMENT RESULT: "HTW1229415\_red"***

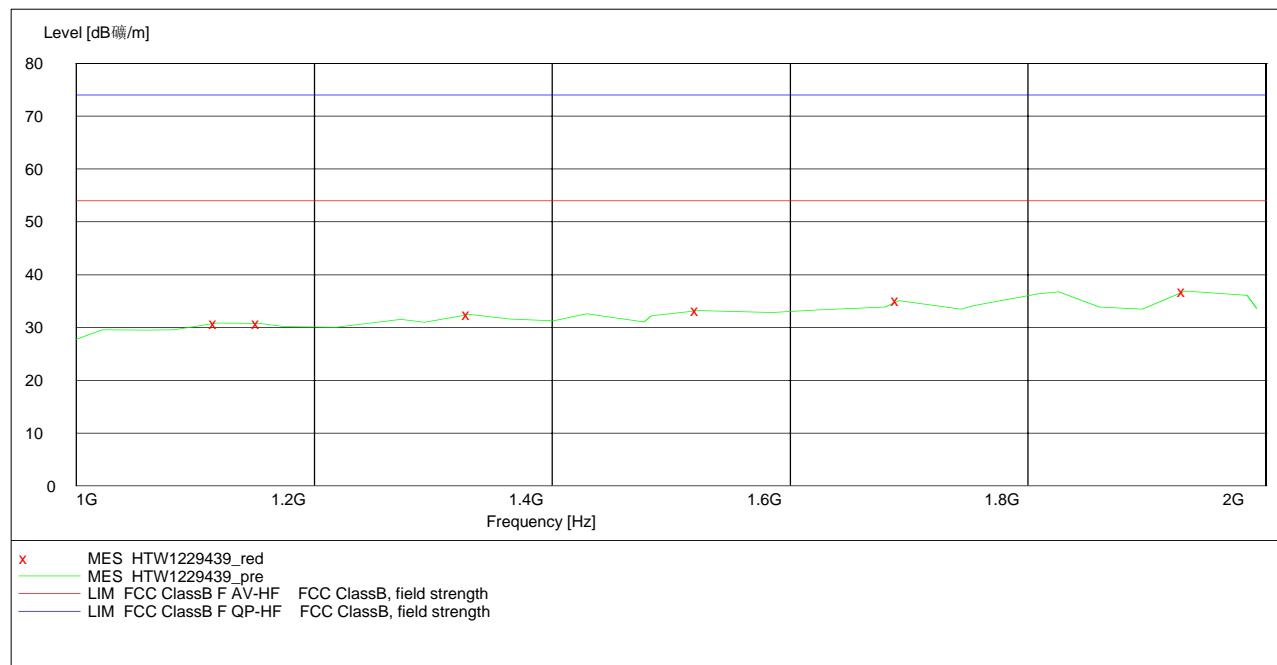
12/29/2011 12:35PM

| Frequency<br>MHz | Level<br>dB $\mu$ V/m | Transd<br>dB | Limit<br>dB $\mu$ V/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------------|--------------|-----------------------|--------------|------|--------------|----------------|--------------|
| 30.000000        | 18.80                 | -11.3        | 40.0                  | 21.2         | Peak | 300.0        | 66.00          | HORIZONTAL   |
| 96.092184        | 18.90                 | -19.9        | 43.5                  | 24.6         | Peak | 300.0        | 170.00         | HORIZONTAL   |
| 129.138277       | 29.00                 | -20.3        | 43.5                  | 14.5         | Peak | 300.0        | 206.00         | HORIZONTAL   |
| 218.557114       | 28.50                 | -20.5        | 46.0                  | 17.5         | Peak | 100.0        | 245.00         | HORIZONTAL   |
| 512.084168       | 19.80                 | -13.1        | 46.0                  | 26.2         | Peak | 100.0        | 360.00         | HORIZONTAL   |
| 871.703407       | 27.50                 | -6.9         | 46.0                  | 18.5         | Peak | 300.0        | 191.00         | HORIZONTAL   |

| Modulation Type | Channel Separation | Test Frequency (MHz) | Polar.     | Maximum Radiated Emissions |                | FCC Limit (dBuV/m) |
|-----------------|--------------------|----------------------|------------|----------------------------|----------------|--------------------|
|                 |                    |                      |            | Frequency (MHz)            | Datum (dBuV/m) |                    |
| 4FSK            | 12.5 KHz           | 155.5000             | H          | 1931.86                    | 36.90          | 54.00              |
|                 |                    |                      | V          | 1989.98                    | 36.00          | 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

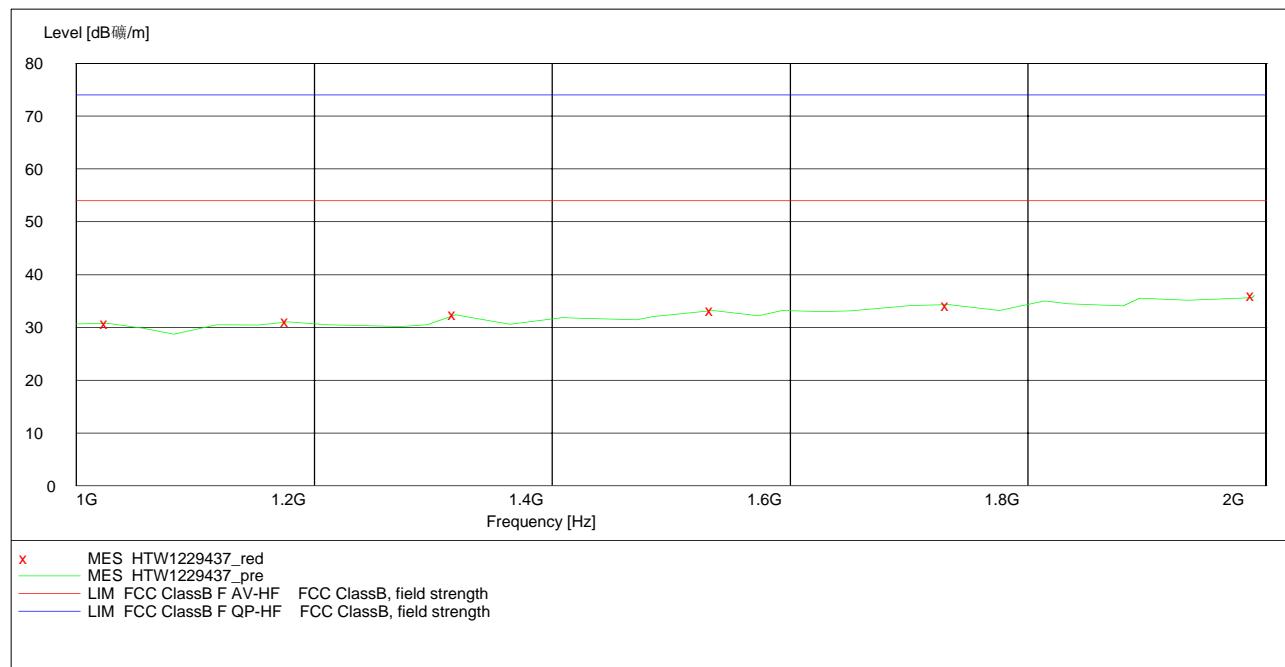
**MEASUREMENT RESULT: "HTW1229439\_red"**

12/29/2011 4:06PM

| Frequency MHz | Level dBuV/m | Transd dB | Limit dBuV/m | Margin dB | Det. | Height cm | Azimuth | Polarization deg |
|---------------|--------------|-----------|--------------|-----------|------|-----------|---------|------------------|
| 1118.236473   | 30.80        | -25.9     | 54.0         | 23.2      | Peak | 100.0     | 360.00  | HORIZONTAL       |
| 1154.308617   | 30.80        | -25.7     | 54.0         | 23.2      | Peak | 100.0     | 125.00  | HORIZONTAL       |
| 1330.661323   | 32.40        | -24.6     | 54.0         | 21.6      | Peak | 100.0     | 36.00   | HORIZONTAL       |
| 1523.046092   | 33.20        | -23.5     | 54.0         | 20.8      | Peak | 100.0     | 111.00  | HORIZONTAL       |
| 1691.382766   | 35.10        | -22.1     | 54.0         | 18.9      | Peak | 100.0     | 78.00   | HORIZONTAL       |
| 1931.863727   | 36.90        | -20.3     | 54.0         | 17.1      | Peak | 100.0     | 307.00  | 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: "HTW1229437\_red"***

12/29/2011 4:04PM

| Frequency<br>MHz | Level<br>dB $\mu$ V/m | Transd<br>dB | Limit<br>dB $\mu$ V/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------------|--------------|-----------------------|--------------|------|--------------|----------------|--------------|
| 1026.052104      | 30.80                 | -26.6        | 54.0                  | 23.2         | Peak | 100.0        | 125.00         | VERTICAL     |
| 1178.356713      | 31.10                 | -25.5        | 54.0                  | 22.9         | Peak | 100.0        | 79.00          | VERTICAL     |
| 1318.637275      | 32.40                 | -24.7        | 54.0                  | 21.6         | Peak | 100.0        | 167.00         | VERTICAL     |
| 1535.070140      | 33.20                 | -23.4        | 54.0                  | 20.8         | Peak | 100.0        | 243.00         | VERTICAL     |
| 1733.466934      | 34.30                 | -21.7        | 54.0                  | 19.7         | Peak | 100.0        | 319.00         | VERTICAL     |
| 1989.979960      | 36.00                 | -19.9        | 54.0                  | 18.0         | Peak | 100.0        | 53.00          | VERTICAL     |

## 4.10. Receiver Conducted Spurious Emssion

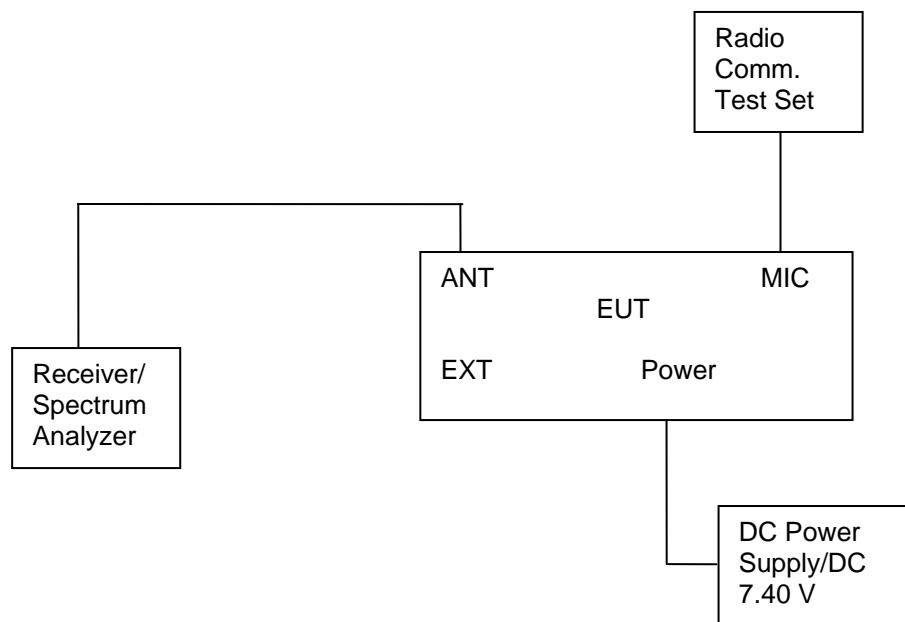
### TEST APPLICABLE

The same as Section 4.3

### TEST PROCEDURE

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

### TEST CONFIGURATION

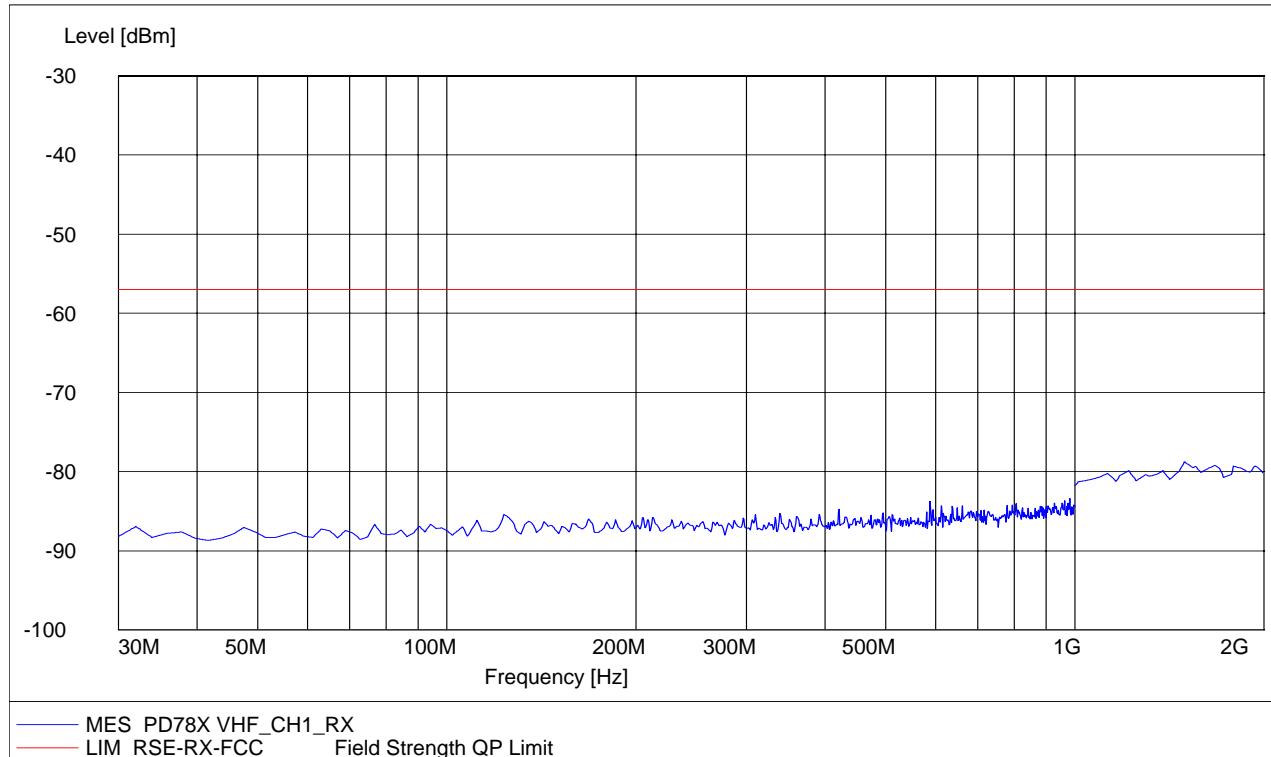
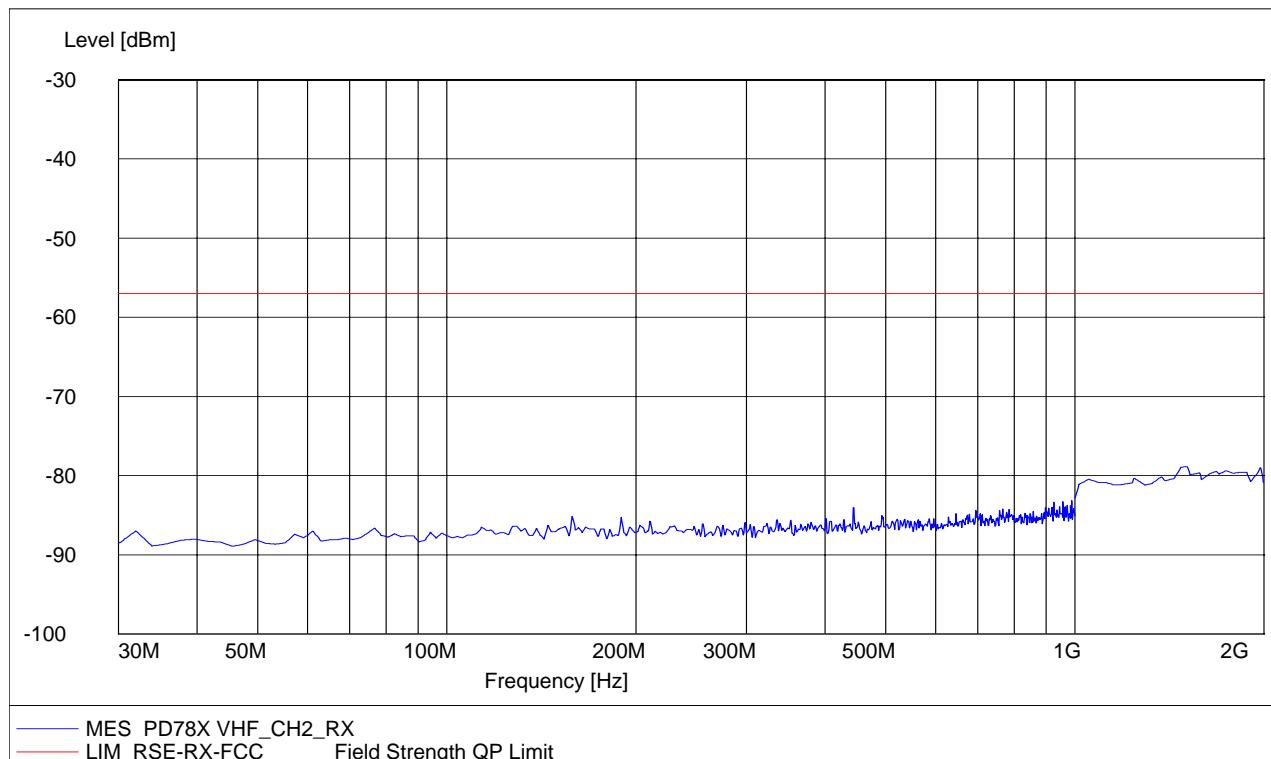


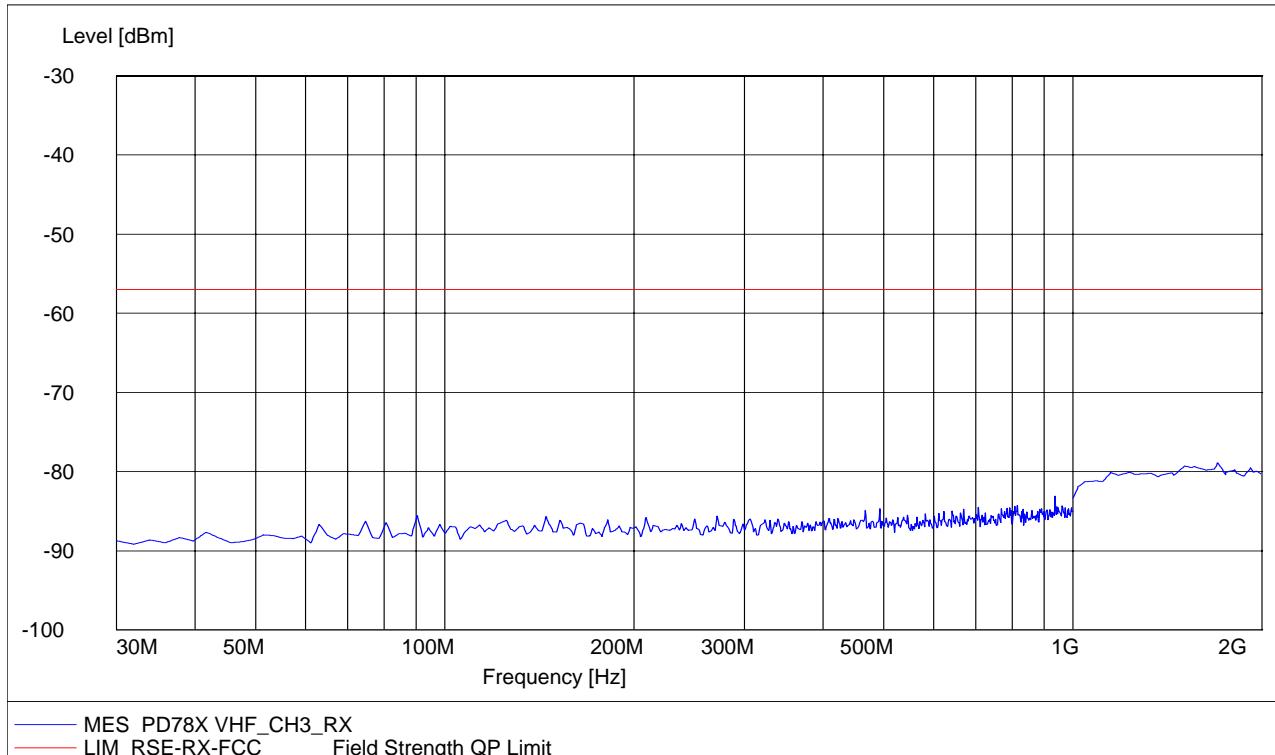
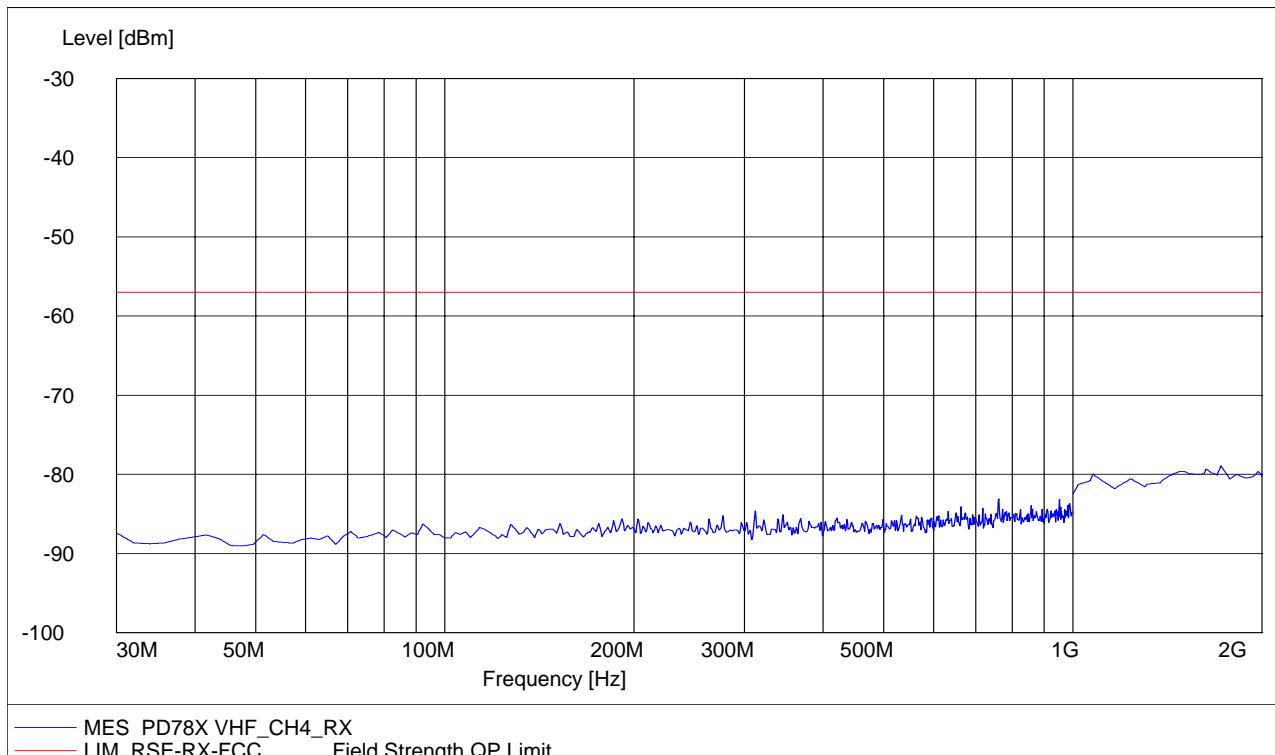
### LIMIT

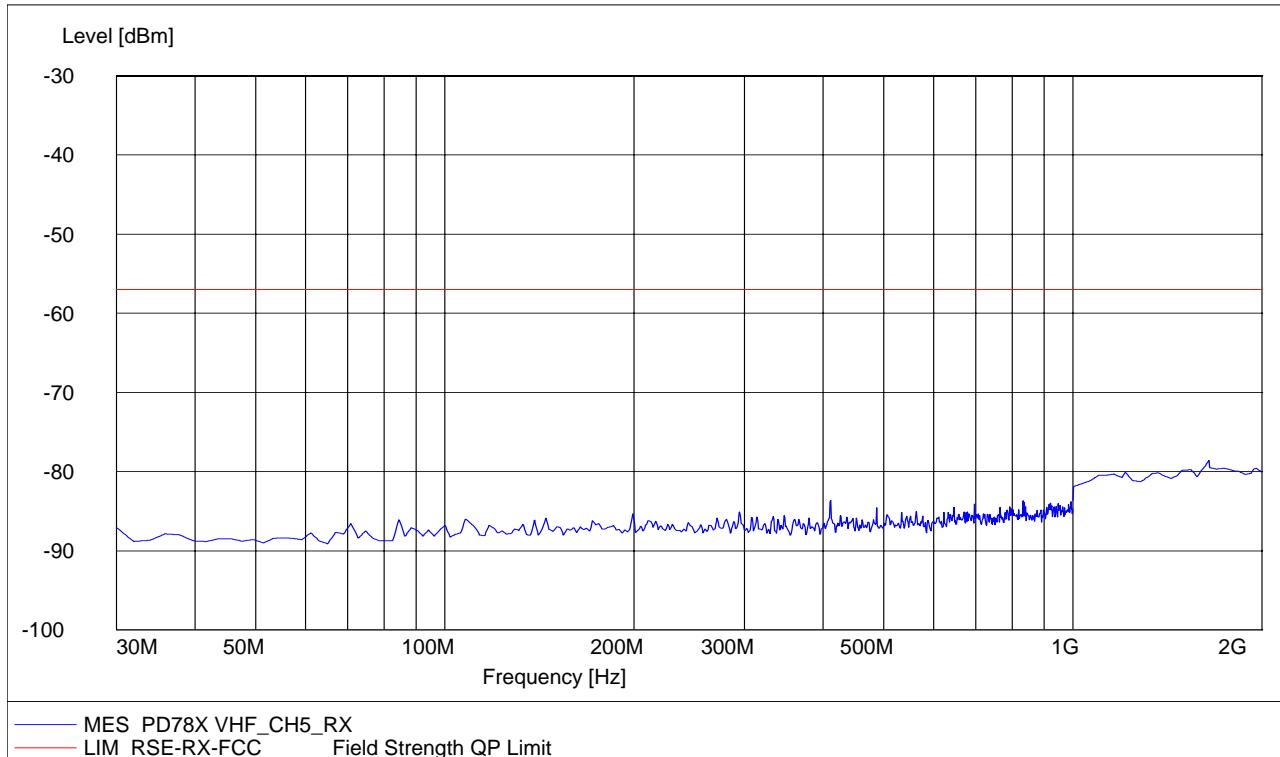
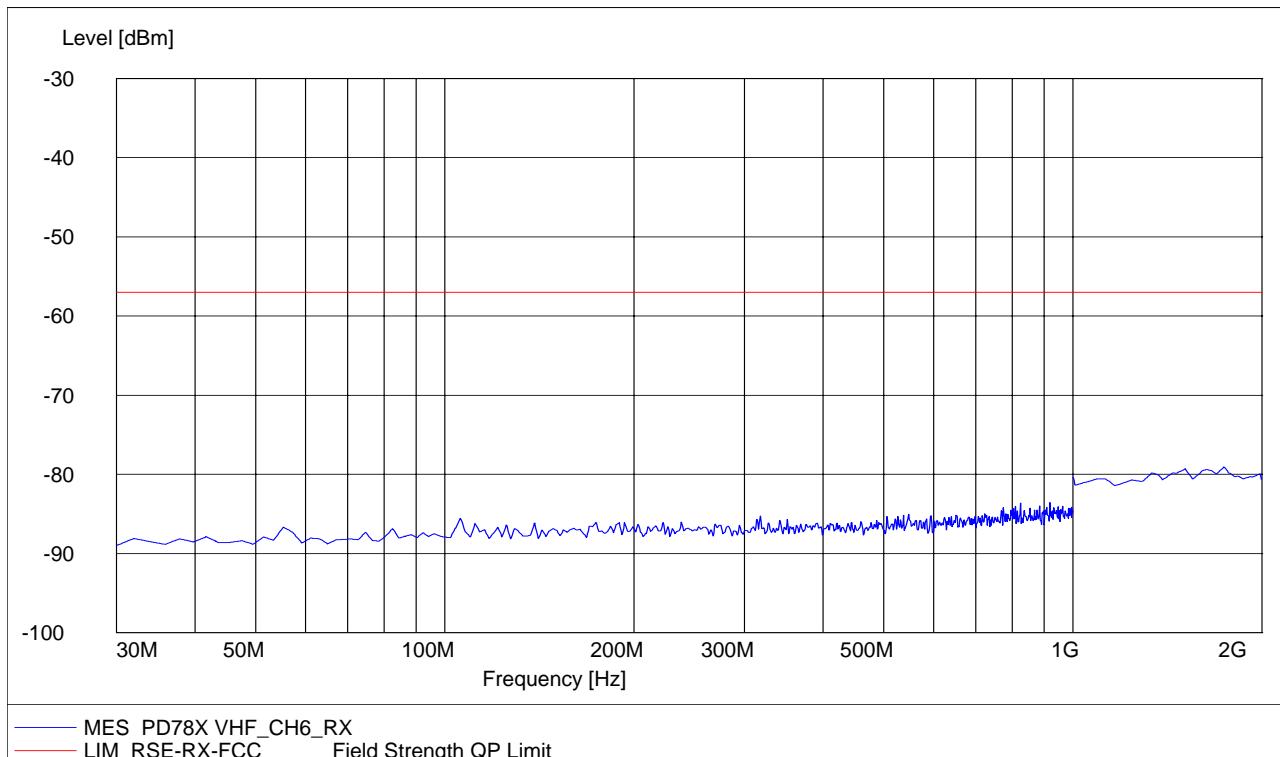
The power at the antenna terminal shall not exceed 2.0 nanowatts (-57dBm).

### TEST RESULTS

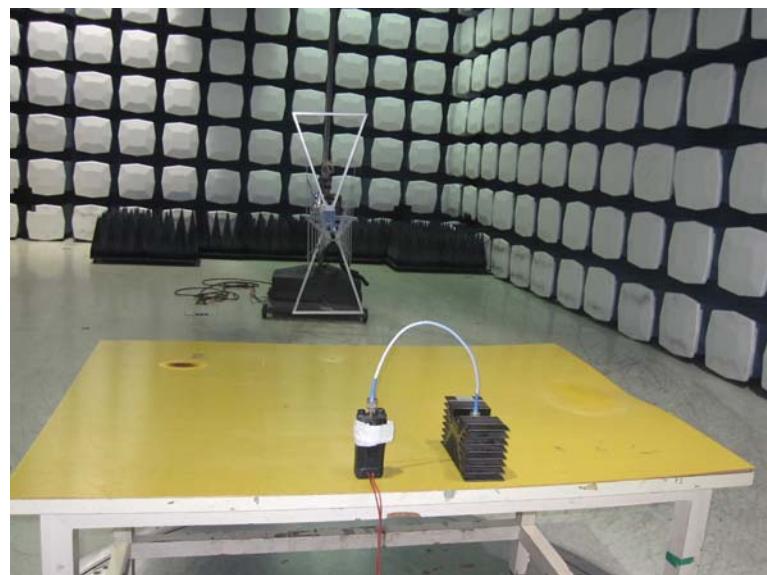
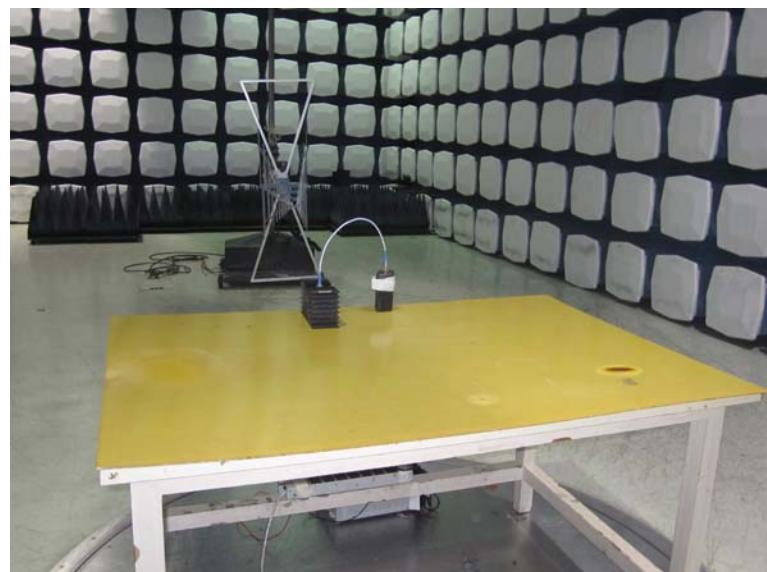
The Receiver Conducted Spurious Emissions Measurement is performed to the three channels (the top channel, the middle channel and the bottom channel), the datums recorded below were for the three channels; and the EUT shall be scanned from 30 MHz to the 2 GHz.

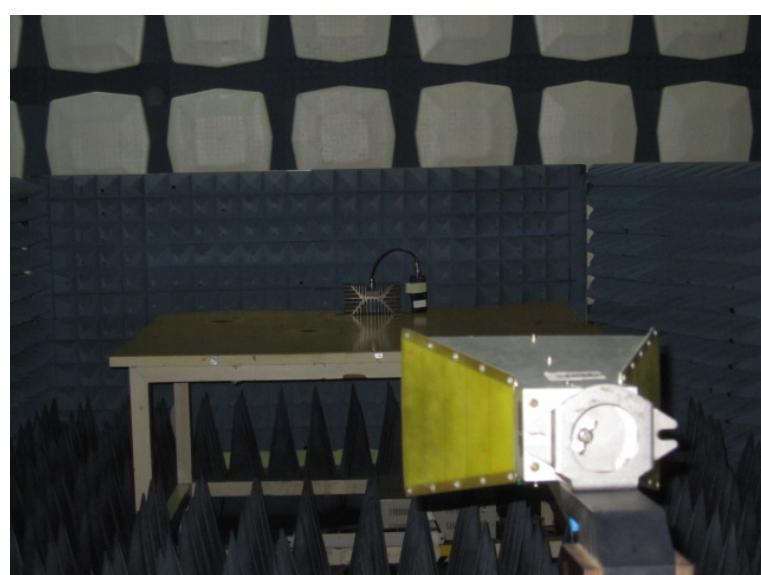
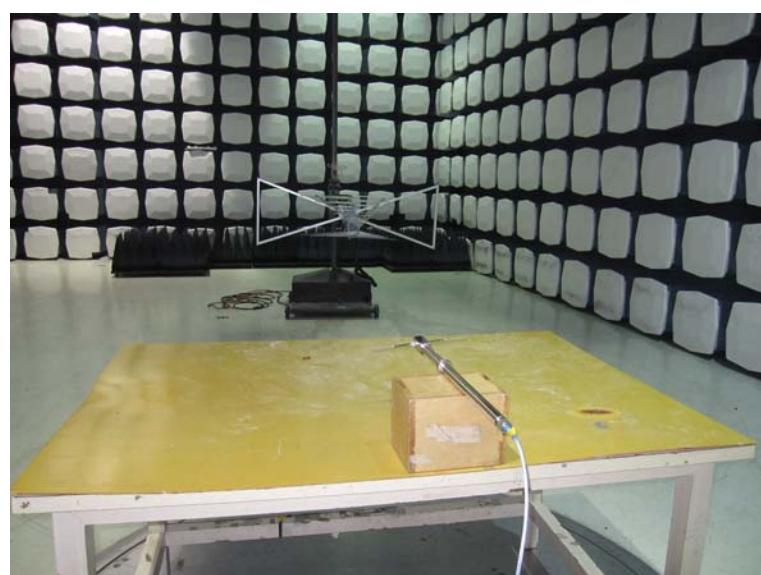
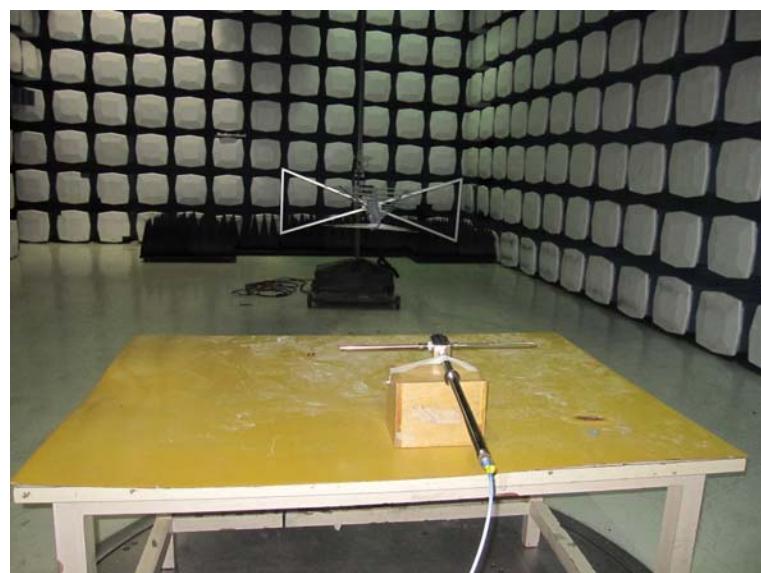
The Low Channel of FM 12.5 KHz Channel SeparationThe Mid Channel of FM 12.5 KHz Channel Separation

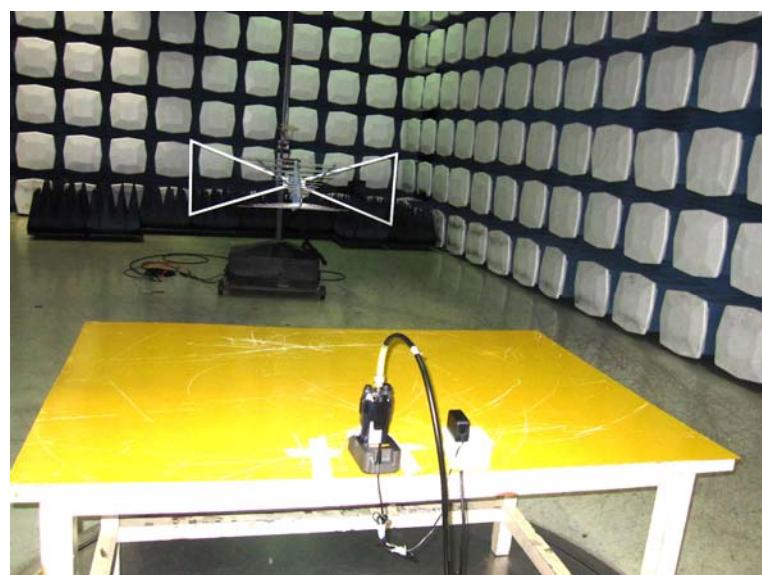
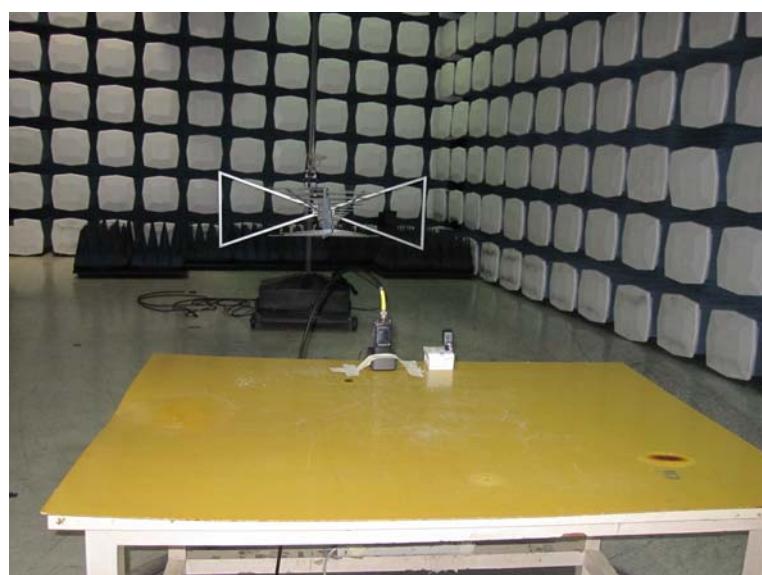
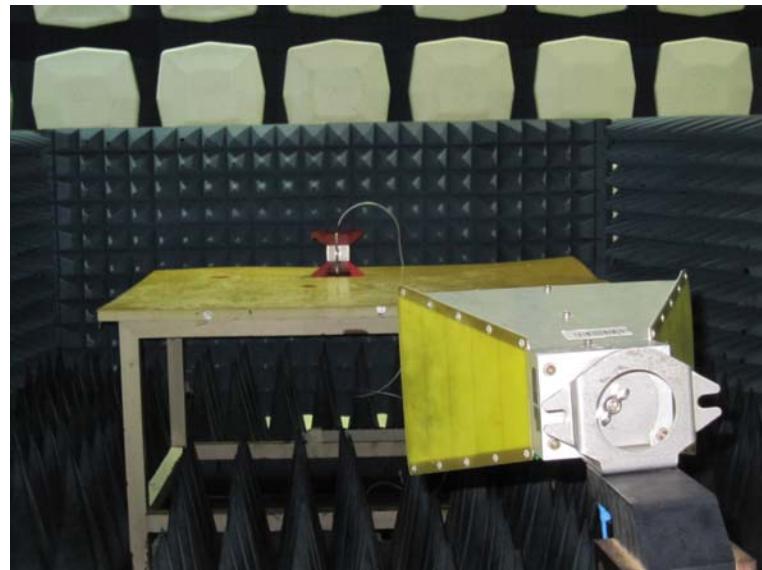
The High Channel of FM 12.5 KHz Channel SeparationThe Low Channel of 4FSK 12.5 KHz Channel Separation

The Mid Channel of 4FSK 12.5 KHz Channel SeparationThe High Channel of 4FSK 12.5 KHz Channel Separation

## 5. Test Setup Photos of the EUT



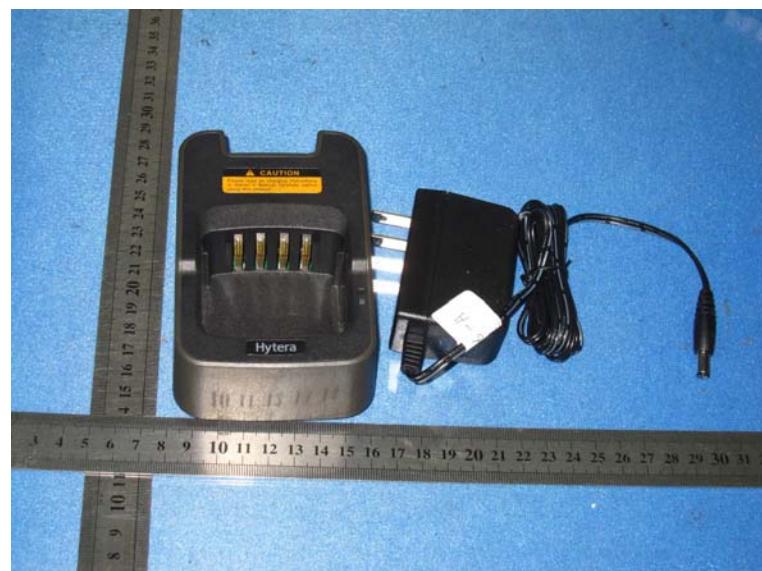






## 6. External and Internal Photos of the EUT

### External Photos

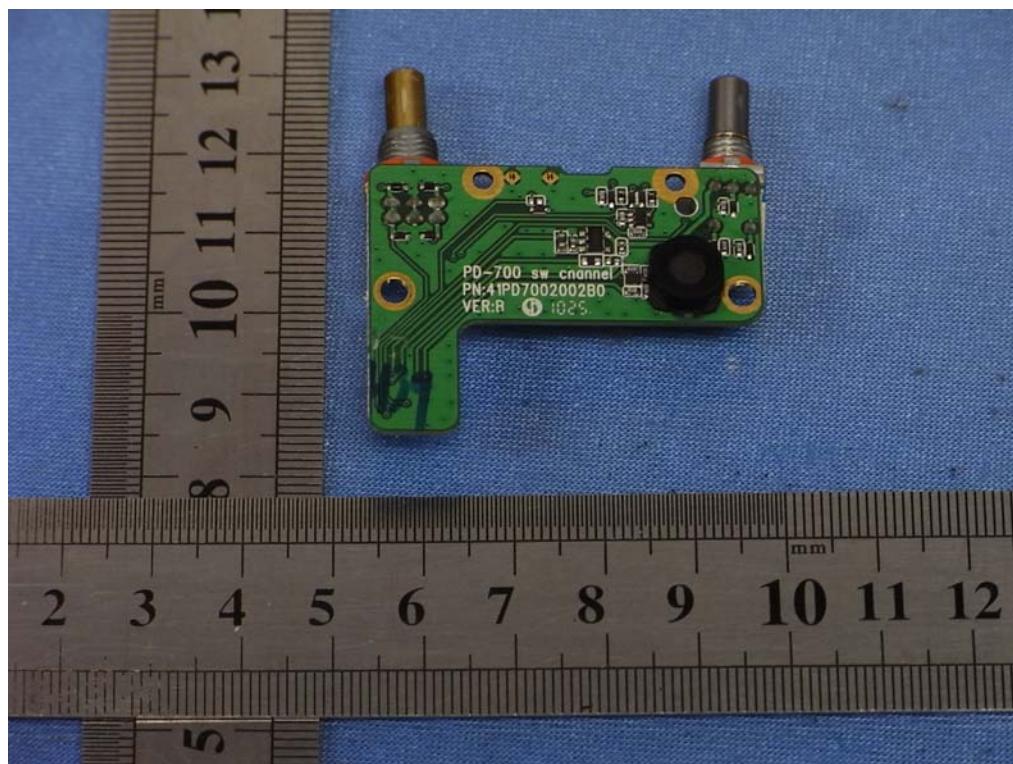


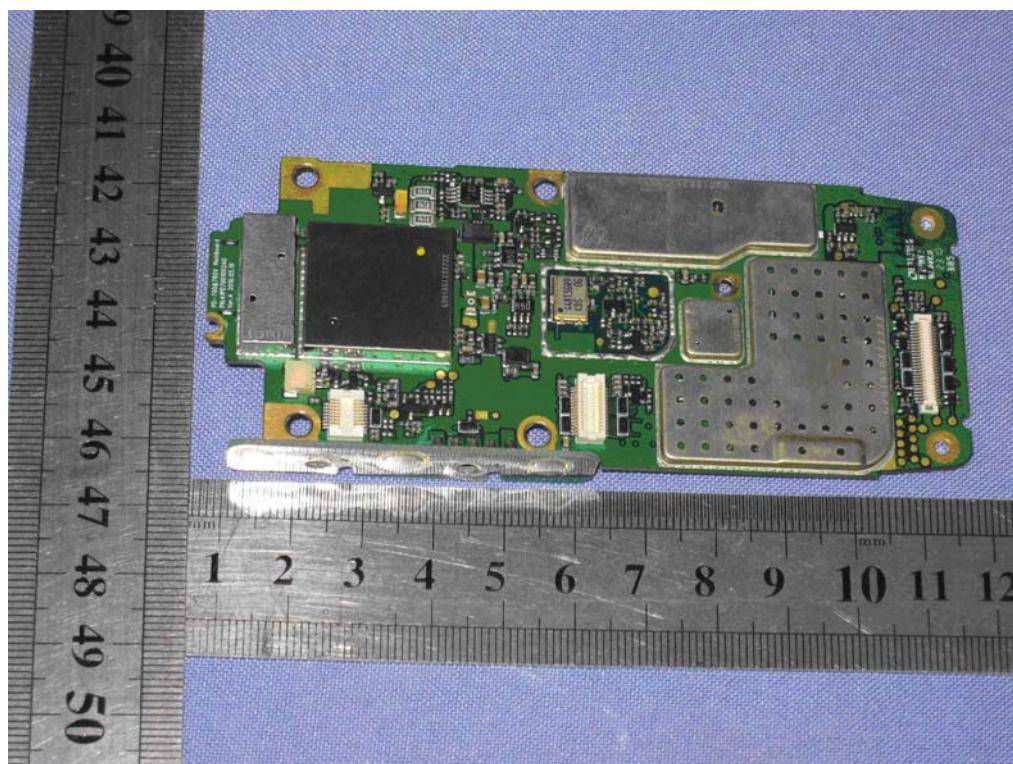
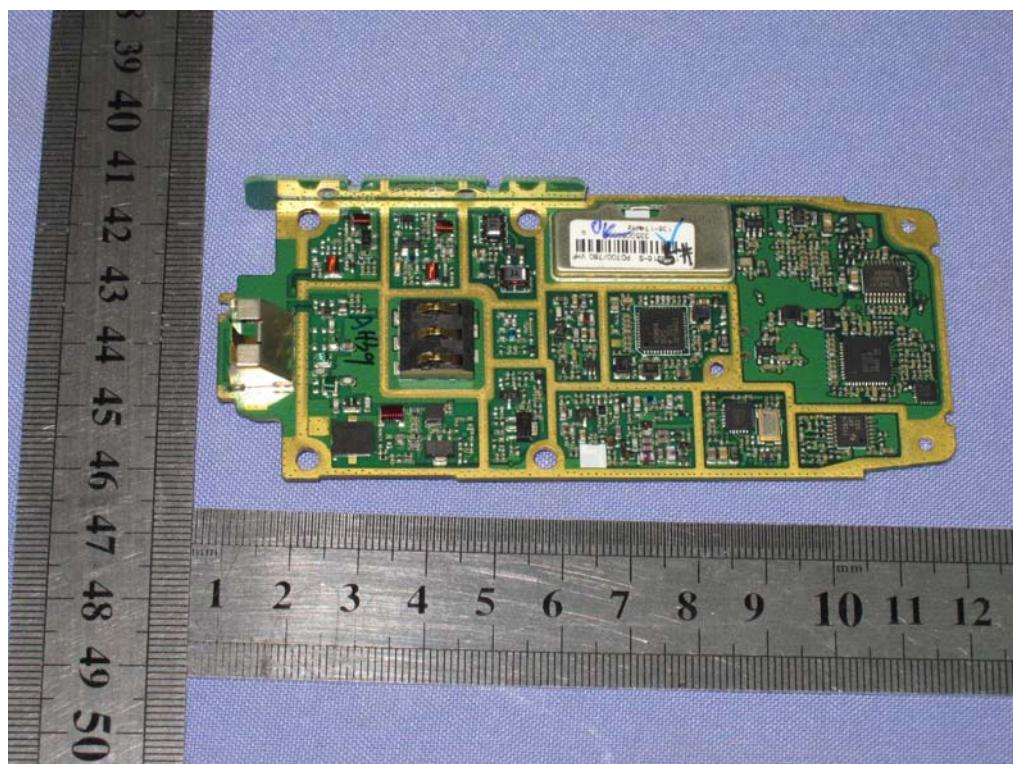


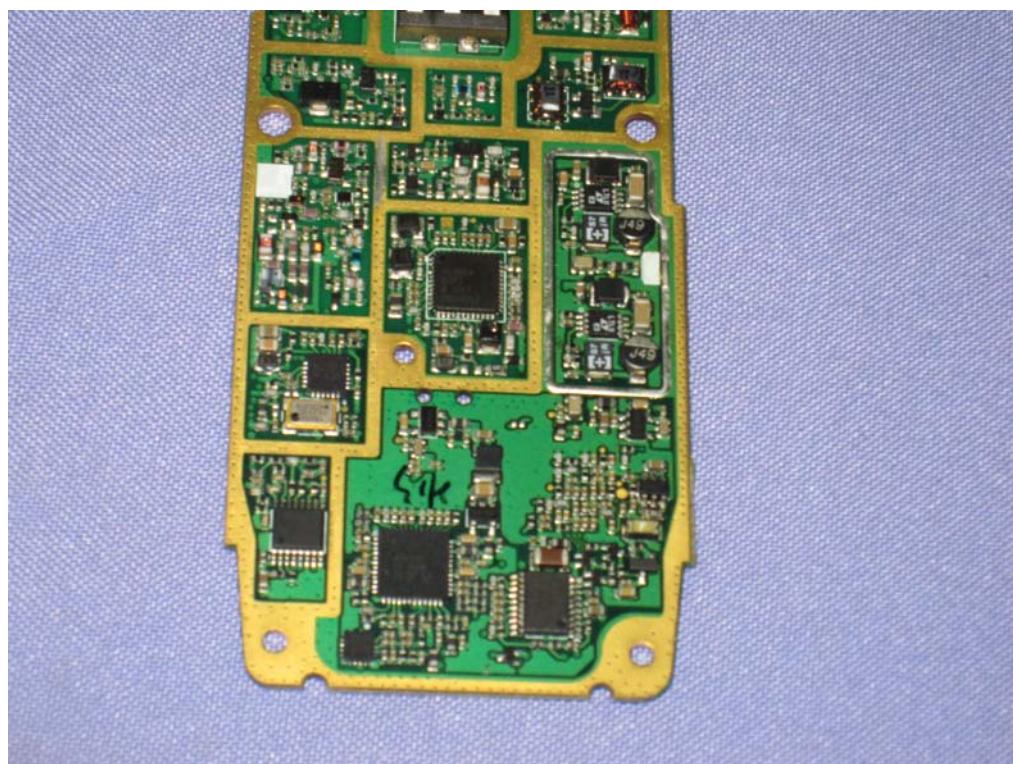
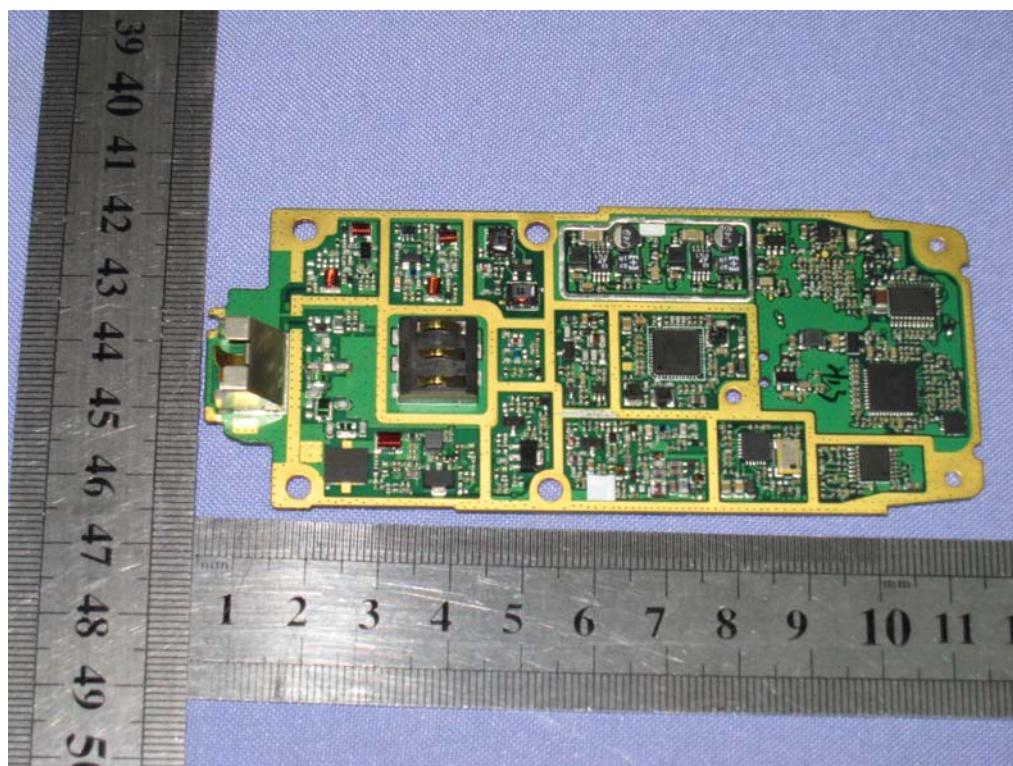


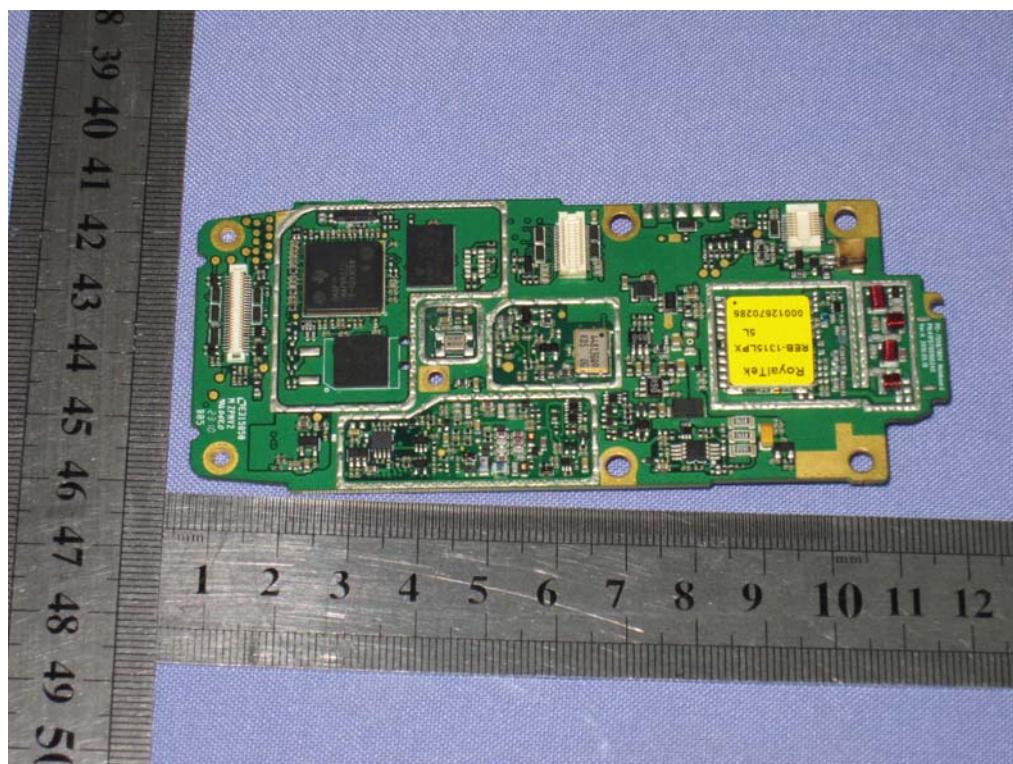
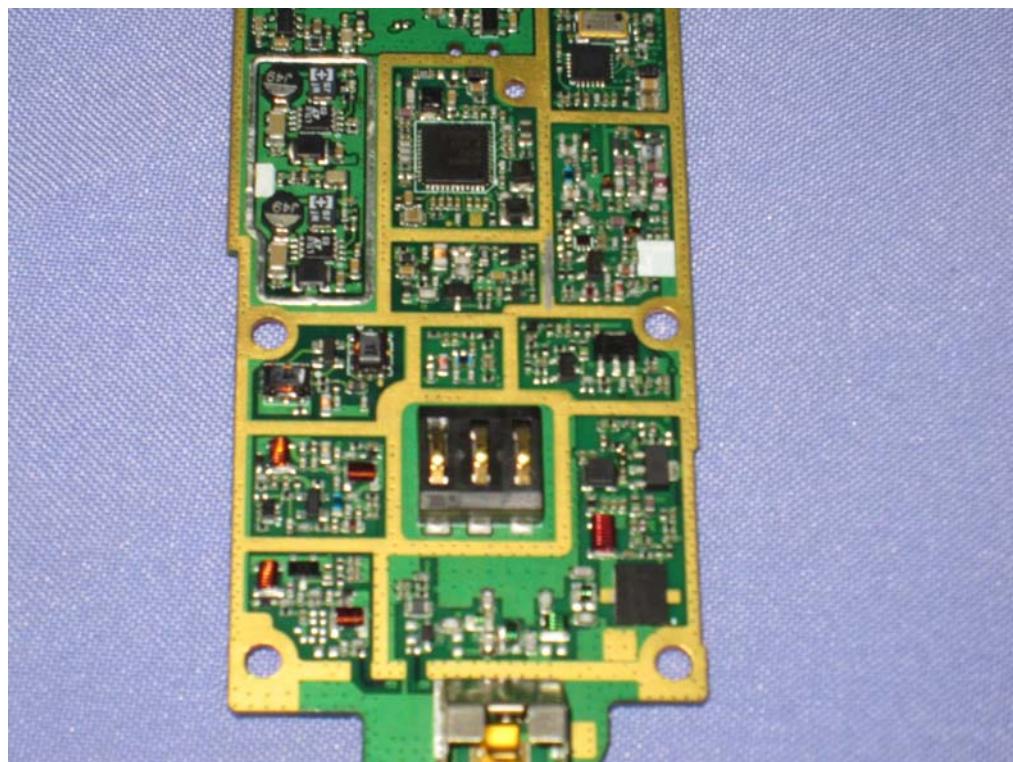


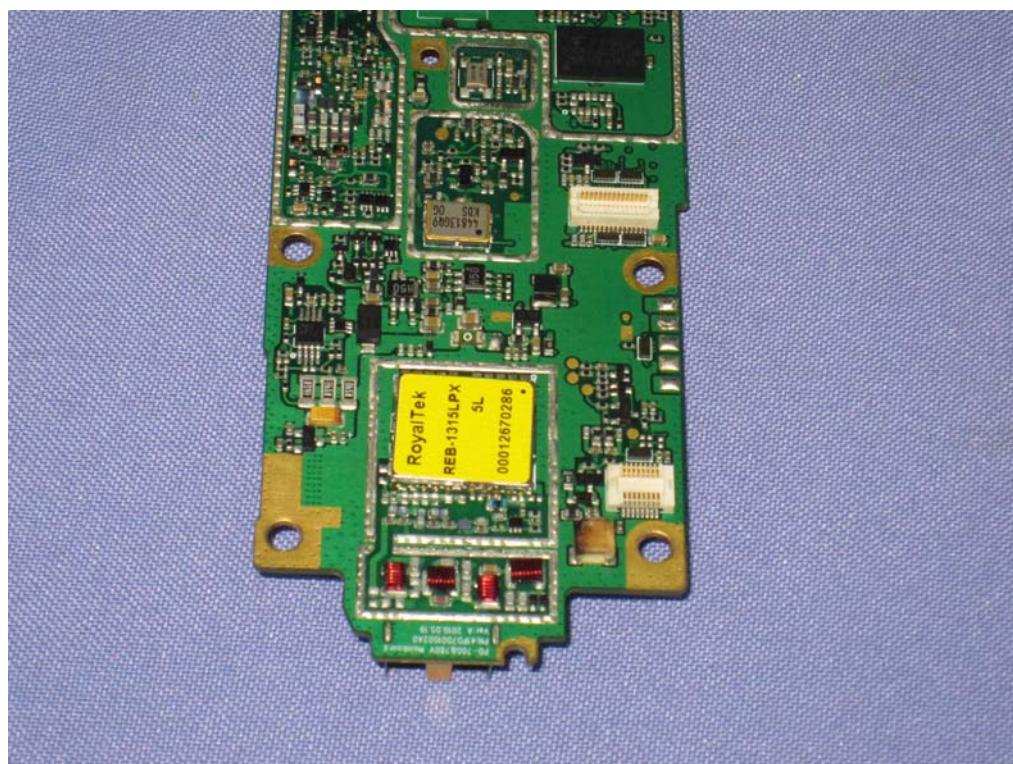
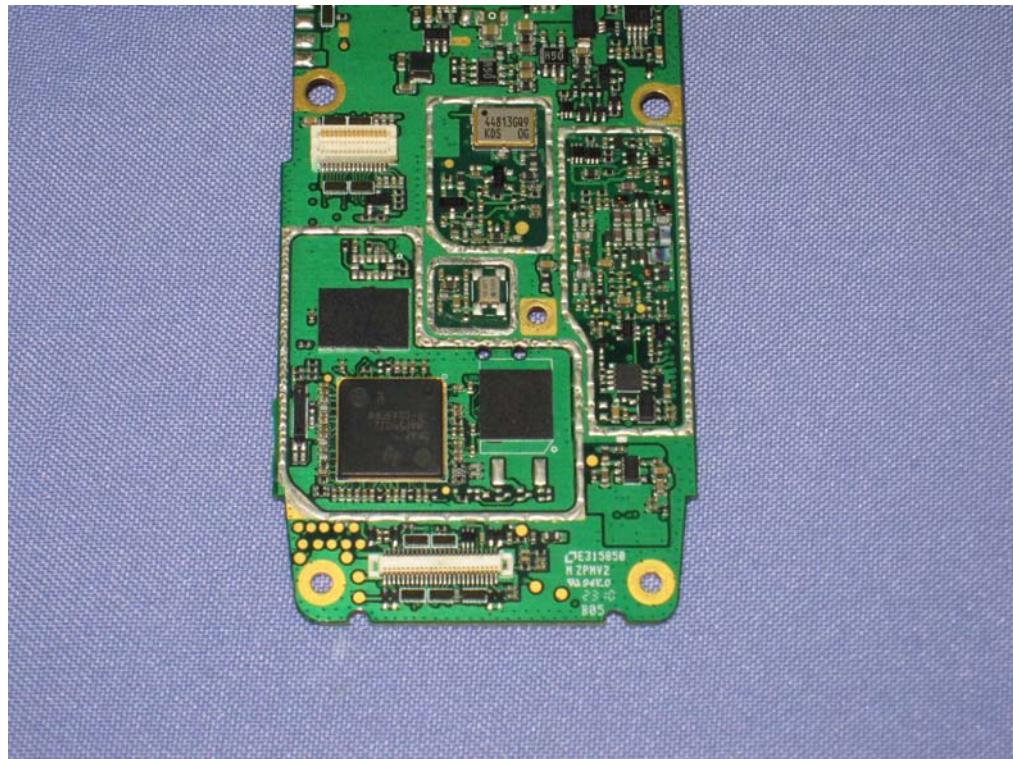
Internal Photos











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