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# FCC Part 90

## Test Report

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Report No.: AGC051110701F1

**FCC ID** : ZS4FD-880

**PRODUCT DESIGNATION** : Handheld two way radio

**BRAND NAME** : FDX

**TEST MODEL** : FD-880

**CLIENT** : Quanzhou Feidaxin Electronics Co.,Ltd

**DATE OF ISSUE** : Mar. 20, 2012

**STANDARD(S)** : FCC Part 90 Rules

### Attestation of Global Compliance Co., Ltd.

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## VERIFICATION OF COMPLIANCE

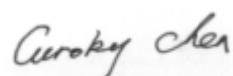
Applicant:	Quanzhou Feidaxin Electronics Co.,Ltd Feidaxin Building,Tangxi Industrial Zone, Luojiang District,Quanzhou, Fujian China 362011
Manufacturer:	Quanzhou Feidaxin Electronics Co.,Ltd Feidaxin Building,Tangxi Industrial Zone, Luojiang District,Quanzhou, Fujian China 362011
Product Description:	Handheld two way radio
Brand Name:	FDX
Model Name:	FD-880
File Number:	AGC051110701F1
Date of Test:	Mar. 15 to Mar. 19, 2012

### We hereby certify that:

The above equipment was tested by Attestation of Global Compliance Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2003 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part 90 requirements.

The test results of this report relate only to the tested sample identified in this report.

Tested By:



Curoky Chen Mar. 20, 2012

Review By:



Forrest Lei Mar. 20, 2012

Approved By:



Solger Zhang Mar. 20, 2012

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## 1. GENERAL INFORMATION

### 1.1 PRODUCT DESCRIPTION

The EUT is a single channel Two-way Radio designed for voice communication. It is designed by way of utilizing the FM modulation achieves the system operating.

A major technical description of EUT is described as following:

Communication Type	Voice / Tone only		
Modulation	FM		
Emission Type	F3E		
Channel separation:	12.5KHz		
Emission Bandwidth	6.806KHz		
Peak Frequency Deviation	1.92 KHz		
Peak output power	36.56dBm for VHF (max) 35.51dBm for UHF (max)		
Audio frequency response	10.32dB		
Antenna Designation	Detachable		
Power Supply	DC 7.4V by battery		
Battery Endpoint	DC 6.4V		
Operation Frequency Range and Channel	Frequency Range:136MHz to 174MHz & 400MHz to 470MHz Channel Separation: 12.5KHz		
	136MHz to 174MHz: Top Channel: 173.975MHz, Centre Channel: 155.05MHz, Bottom Channel: 136.025MHz,	400MHz to 470MHz: Top Channel: 469.975MHz, Centre Channel: 435.05MHz, Bottom Channel: 400.025MHz,	
Frequency Tolerance	1.393ppm for VHF 0.871ppm for UHF		

Note: VHF (136MHz to 174MHz)

UHF (400MHz to 470MHz).

## **1.2 RELATED SUBMITTAL(S) / GRANT (S)**

This submittal(s) (test report) is intended for FCC ID: ZS4FD-880, filing to comply with the FCC Part 90 requirements.

## **1.3 TEST METHODOLOGY**

The radiated emission testing was performed according to the procedures of ANSI C 63.4: 2009; TIA/EIA 603 and FCC CFR 47 Rules of 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057.

## **1.4 TEST FACILITY**

The test site used to collect the radiated data is located on the address of Attestation of Global Compliance Co., Ltd. 2F., No.2 Building, Huafeng No.1 Technical Industrial Park, Sanwei, Xixiang, Baoan District, Shenzhen. The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC register No.: 259865

## **1.5 SPECIAL ACCESSORIES**

Not available for this EUT intended for grant.

## **1.6 EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

## 2. SYSTEM TEST CONFIGURATION

### 2.1 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.

### 2.2 EUT EXERCISE

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

### 2.3 GENERAL TECHNICAL REQUIREMENTS

- (1). Section 15.207: Conducted Limits
- (2). Section 90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area
- (3). Section 90.207: Modulation Characteristic
- (4). Section 90.209: Occupied Bandwidth
- (5). Section 90.210: Emission Mask
- (6). Section 90.213: Frequency Tolerance
- (7). Section 90.214: Transient Frequency Behavior
- (8). Section 15.109: Radiated Emission

### 2.4 CONFIGURATION OF TESTED SYSTEM

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Model No.	Identifier	Note
1	Handheld two way radio	FD-880	FCC ID: ZS4FD-880	EUT
2	Charger	CFD-04	10.5V/300mA	Accessory
3	Battery	FDB-20	7.4V/1600mA	Accessory

### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.107	Conducted Emission	Compliant
§90.205	Maximum Transmitter Power	Compliant
§90.207	Modulation Characteristic	Compliant
§90.209	Occupied Bandwidth	Compliant
§90.210	Emission Mask	Compliant
§90.213	Frequency Tolerance	Compliant
§90.214	Transient Frequency Behavior	Compliant
§15.109	Radiated Emission	Compliant

#### **4. DESCRIPTION OF TEST MODES**

The EUT (Handheld two way radio) has been tested under normal operating condition. (The top channel, the middle channel and the bottom channel) are chosen for testing at each channel separation (12.5 KHz).

## 5. FREQUENCY TOLERANCE

### 5.1 PROVISIONS APPLICABLE

- a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  centigrade.
- b). According to FCC Part 2 Section 2.1055(d)(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.
- c). According to FCC Part 90 Section 90.213, Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150–174MHz band and 2.5 ppm in the 421–512 MHz band.

### 5.2 MEASUREMENT PROCEDURE

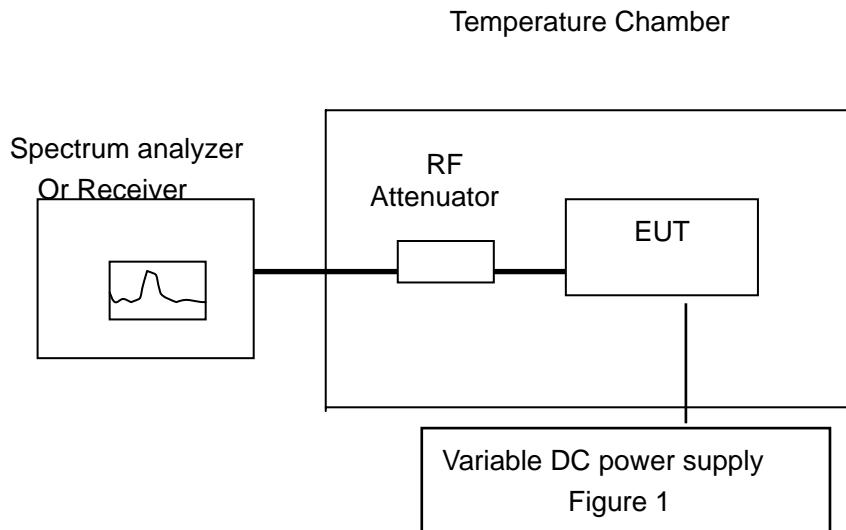
#### 5.2.1 Frequency stability versus environmental temperature

1. Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
2. Turn on EUT and set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1KHz and Video Resolution Bandwidth to 1KHz and Frequency Span to 50KHz. Record this frequency as reference frequency.
3. Set the temperature of chamber to  $50^{\circ}\text{C}$ . Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a  $10^{\circ}\text{C}$  decreased per stage until the lowest temperature  $-30^{\circ}\text{C}$  is measured, record all measured frequencies on each temperature step.

#### 5.2.2 Frequency stability versus input voltage

1. Setup the configuration per figure 1 for frequencies measured at temperature if it is within  $15^{\circ}\text{C}$  to  $25^{\circ}\text{C}$ . Otherwise, an environment chamber set for a temperature of  $20^{\circ}\text{C}$  shall be used. The EUT shall be powered by DC 7.4V
2. Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1 KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.
3. Supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency.

### 5.3 TEST SETUP BLOCK DIAGRAM



### 5.4 TEST EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Receiver	R&S	ESCI	N/A	2011.6.27
Climate Chamber	Albatross	--	--	2011.6.27

### 5.5 TEST RESULT

**Frequency Range: 136MHz to 174MHz**

**Bottom Channel @ 12.5 KHz Channel Separation**

Reference Frequency:	136.025MHz	Limit:	5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(°C)	(V)	(MHz)	ppm
50	7.4	136.0250124	0.091
40	7.4	136.0250113	0.083
30	7.4	136.0250103	0.076
20	6.4	136.0250089	0.065
20	8.5	136.0250017	0.012
20	7.4	136.0250094	0.069
10	7.4	136.0250081	0.060
0	7.4	136.0250084	0.062
-10	7.4	136.0250085	0.062
-20	7.4	136.0250101	0.074
-30	7.4	136.0250112	0.082

**Middle Channel @ 12.5 KHz Channel Separation**

Reference Frequency:	155.05MHz	Limit:	5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(°C)	(V)	(MHz)	ppm
50	7.4	155.050216	1.393
40	7.4	155.050213	1.374
30	7.4	155.050201	1.296
20	6.4	155.050117	0.755
20	8.5	155.050146	0.942
20	7.4	155.050196	1.264
10	7.4	155.050136	0.877
0	7.4	155.050142	0.916
-10	7.4	155.050146	0.942
-20	7.4	155.050169	1.090
-30	7.4	155.050178	1.148

**Top Channel @ 12.5KHz Channel Separation**

Reference Frequency:	173.975 MHz	Limit:	5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(°C)	(V)	(MHz)	ppm
50	7.4	173.9750221	0.127
40	7.4	173.9750216	0.124
30	7.4	173.9750213	0.122
20	6.4	173.9750013	0.007
20	8.5	173.9750113	0.065
20	7.4	173.9750207	0.119
10	7.4	173.9750123	0.071
0	7.4	173.9750126	0.072
-10	7.4	173.9750197	0.113
-20	7.4	173.9750202	0.116
-30	7.4	173.9750206	0.118

**Frequency Range:400MHz to 470MHz**

**Bottom Channel @ 12.5 KHz Channel Separation**

Reference Frequency:	400.025 MHz	Limit:	2.5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(°C)	(V)	(MHz)	ppm
50	7.4	400.0250358	0.089
40	7.4	400.0250296	0.074
30	7.4	400.0250099	0.025
20	6.4	400.0250122	0.030
20	8.5	400.0250114	0.028
20	7.4	400.0250124	0.031
10	7.4	400.0250158	0.039
0	7.4	400.0250165	0.041
-10	7.4	400.0250197	0.049
-20	7.4	400.0250241	0.060
-30	7.4	400.0250257	0.064

**Middle Channel @ 12.5 KHz Channel Separation**

Reference Frequency:	435.05 MHz	Limit:	2.5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(°C)	(V)	(MHz)	ppm
50	7.4	435.050376	0.864
40	7.4	435.050332	0.763
30	7.4	435.050165	0.379
20	6.4	435.050143	0.329
20	8.5	435.050131	0.301
20	7.4	435.050172	0.395
10	7.4	435.050181	0.416
0	7.4	435.050251	0.577
-10	7.4	435.050274	0.630
-20	7.4	435.050285	0.655
-30	7.4	435.050289	0.664

**Top Channel @ 12.5KHz Channel Separation**

Reference Frequency:	469.975 MHz	Limit:	2.5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(°C)	(V)	(MHz)	ppm
50	7.4	469.9750362	0.077
40	7.4	469.9750337	0.072
30	7.4	469.9750095	0.020
20	6.4	469.9750216	0.046
20	8.5	469.9750108	0.023
20	7.4	469.9750146	0.031
10	7.4	469.9750158	0.034
0	7.4	469.9750161	0.034
-10	7.4	469.9750177	0.038
-20	7.4	469.9750226	0.048
-30	7.4	469.9750285	0.061

## 6. EMISSION BANDWIDTH

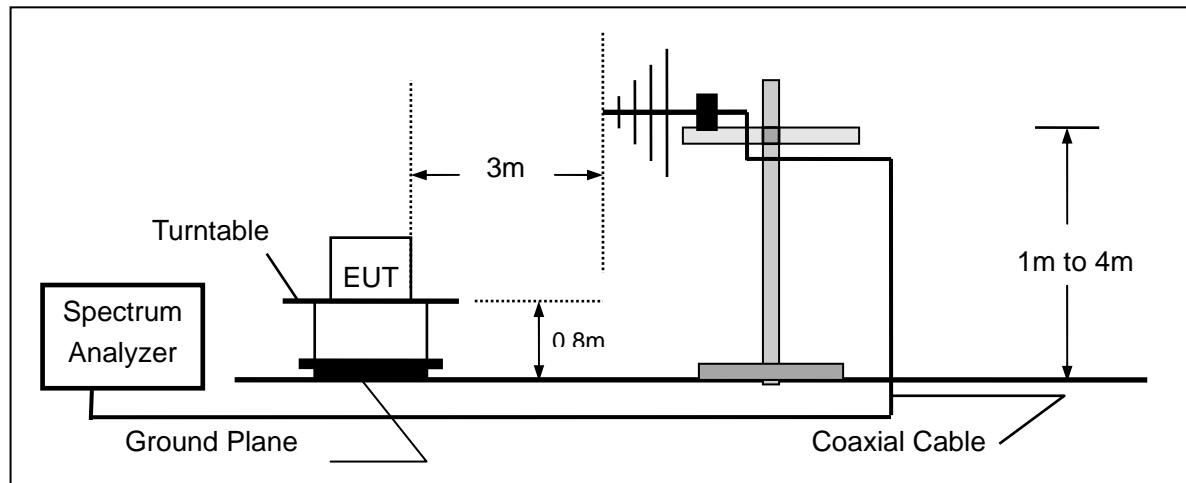
### 6.1 PROVISIONS APPLICABLE

According to FCC Part 90 Section 90.209: The authorized bandwidth shall be 11.25 KHz for 12.5 KHz.

### 6.2 MEASUREMENT PROCEDURE

- 1). The EUT was placed on a turn table which is 0.8m above ground plane.
- 2). The EUT was modulated by 3.0 KHz Sine wave audio signal, The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).
- 3). Set SPA Center Frequency = fundamental frequency, RBW=VBW= 300 Hz, Span =50 KHz.
- 4). Set SPA Max hold. Mark peak, -26 dB.

### 6.3 TEST SETUP BLOCK DIAGRAM



### 6.4 MEASUREMENT EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2011.6.27
MODULATION ANALYZER	HP	8901B	3104A03367	2011.6.27
BROADBAND ANT.	R&S	HL562	A0304224	2011.6.27

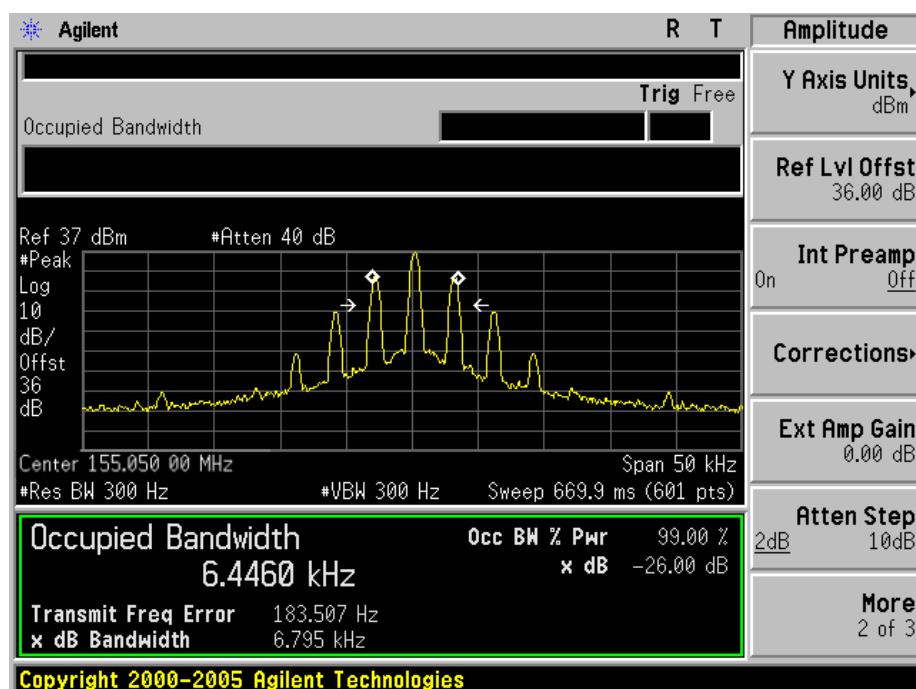
## 6.5 MEASUREMENT RESULT:

Operating Frequency	12.5 KHz Channel Separation		
	Test Data KHz	Limits KHz	Result
136.025MHz	6.791	11.25	Pass
155.05MHz	6.795	11.25	Pass
173.975MHz	6.790	11.25	Pass
400.025MHz	6.806	11.25	Pass
435.02MHz	6.798	11.25	Pass
460.975MHz	6.795	11.25	Pass

Note: only present the worst case of test plot in the following:

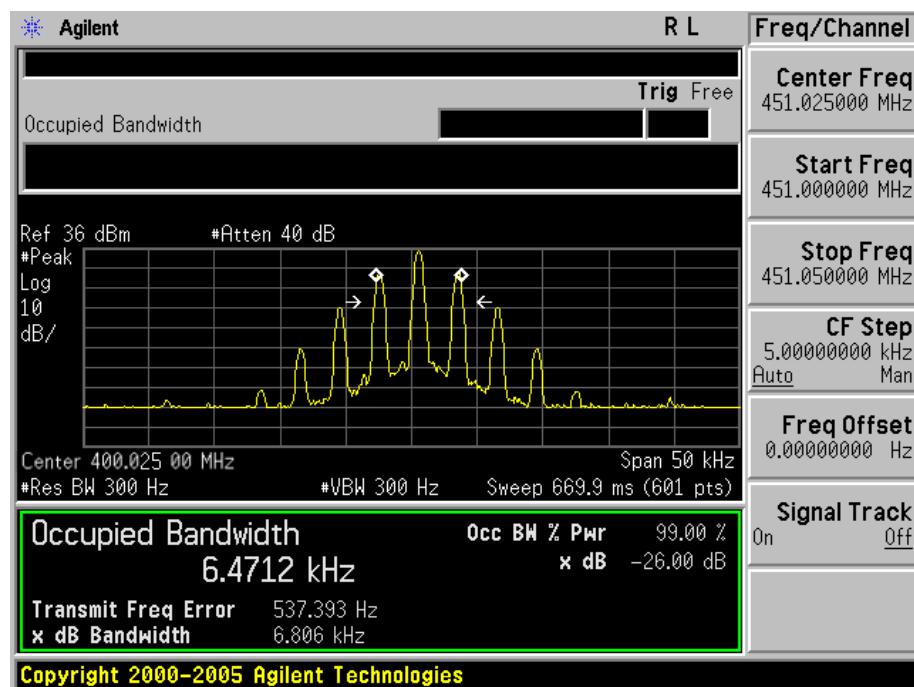
**Frequency range: 136MHz to 174MHz**

**Occupied bandwidth of Middle Channel**



Frequency range: 400MHz to 470MHz

Occupied bandwidth of Bottom Channel



## 7. UNWANTED RADIATION

### 7.1 PROVISIONS APPLICABLE

8.1.1 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  $f_0$  to 5.625 KHz removed from  $f_0$ : Zero dB
- (2).On any frequency removed from the center of the authorized bandwidth by a displacement frequency( $f_d$  in KHz) $f_0$  of more than 5.625 KHz but no more than 12.5 KHz: At least  $7.27(f_d-2.88\text{ KHz})$  dB
- (3).On any frequency removed from the center of the authorized bandwidth by a displacement Frequency ( $f_d$  in KHz) $f_0$  of more than 12.5 KHz: At least  $50+10\log(P)$  dB or 70 dB, Which ever is lesser attenuation.

### 7.2 MEASUREMENT PROCEDURE

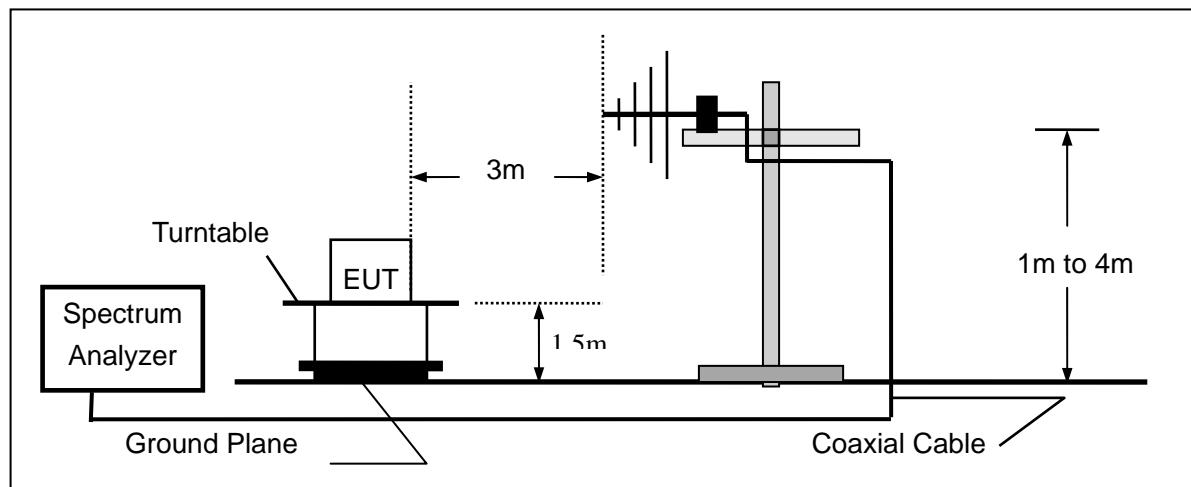
- (1)On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- (2)The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3)The output of the antenna shall 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 than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- (7)The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- (8)The maximum signal level detected by the measuring receiver shall be noted.
- (9)The measurement shall be repeated with the test antenna set to horizontal polarization.
- (10) Replace the antenna with a proper Antenna (substitution antenna).
- (11)The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- (12)The substitution antenna shall be connected to a calibrated signal generator.
- (13)If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- (14)The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

(15) The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

(16) The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

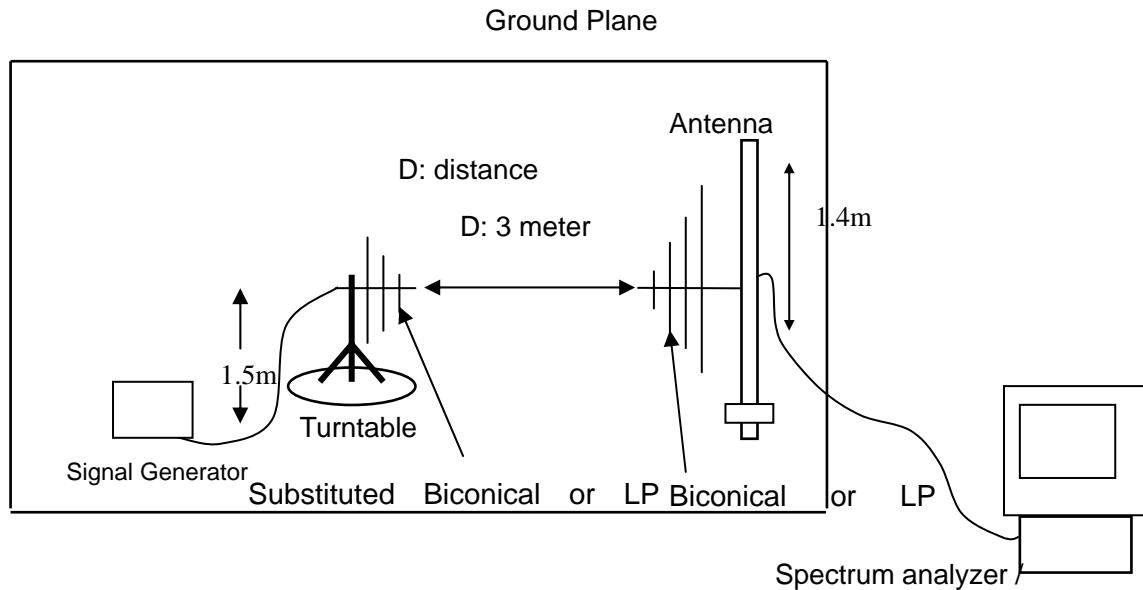
(17) The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

### 7.3 TEST SETUP BLOCK DIAGRAM

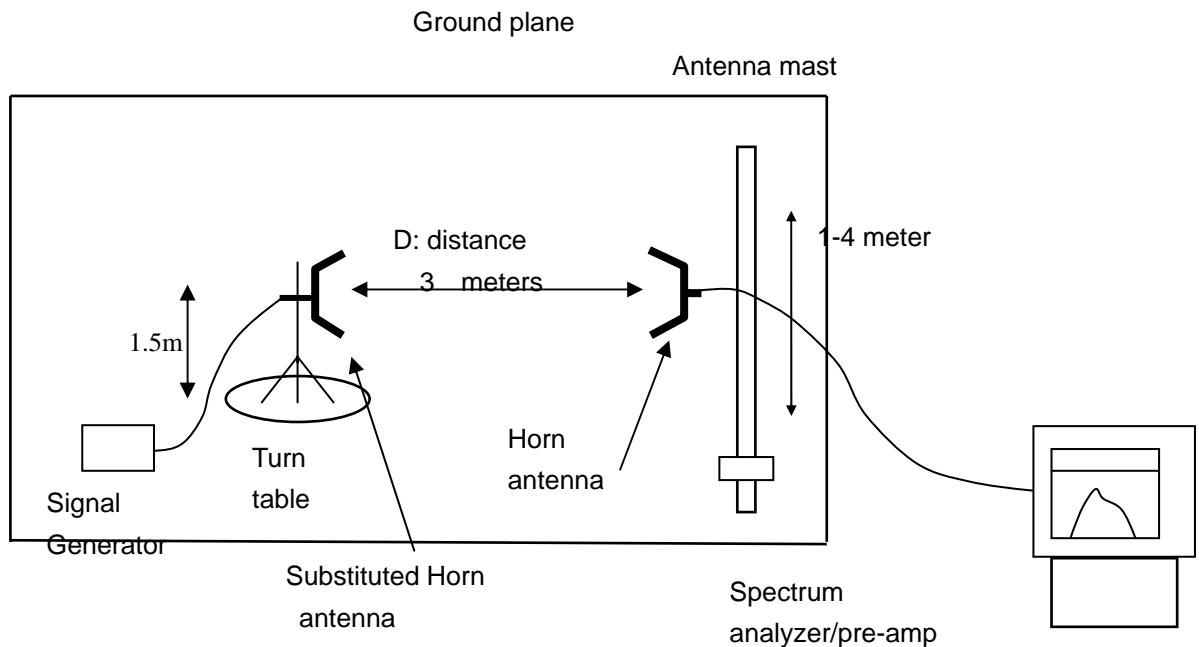


## SUBSTITUTION METHOD: (Radiated Emissions)

### Radiated Below 1GHz



### Radiated Above 1 GHz



#### 7.4 MEASUREMENT EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2011.6.27
TEST RECEIVER	R&S	ESCI	N/A	2011.6.27
LOOP ANTENNA	R&S	HFH2-Z2	A0304220	2011.6.27
HORN ANTENNA	EM	EM-AH-10180	N/A	2011.6.27
BROADBAND ANT.	A.H.	SAS-521-4	N/A	2011.6.27

#### 7.5 MEASUREMENT RESULTS:

##### Measurement Result for 12.5 KHz Channel Separation

On any frequency removed from the center of the authorized bandwidth by a displacement

Frequency (fd in KHz)fo of more than 12.5 KHz: At least  $50+10 \log(P)$  dB or 70 dB, which ever is lesser attenuation.

**Limit:  $50+10 \log (P) = 50+10\log(5) = 57(\text{dBc})$  (136MHz to 174MHz)**

**Limit:  $50+10 \log (P) = 50+10\log(4) = 56(\text{dBc})$  (400MHz to 470MHz)**

**Measurement Result for 12.5 KHz Channel Separation @ 136.025MHz**

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
136.050	v	0		pass
272.100	v	68.44(-31.44dBm)	57	pass
408.15	v	74.32(-37.32dBm)	57	pass
544.200	v	80.45	57	pass
680.250	v	85.47	57	pass
816.300	v	82.55	57	pass
952.350	v	90.21	57	pass
1088.400	v	92.44	57	pass
1224.450	v	91.54	57	pass
1360.500	v	95.69	57	pass

**Measurement Result for 12.5 KHz Channel Separation @ 155.05MHz**

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
155.050	v	0		pass
310.100	v	72.12(-35.12dBm)	57	pass
465.150	v	77.12	57	pass
620.200	v	80.78	57	pass
775.250	v	82.12	57	pass
930.300	v	89.13	57	pass
1085.350	v	91.15	57	pass
1240.400	v	92.71	57	pass
1395.450	v	93.62	57	pass
1550.500	v	95.44	57	pass

**Measurement Result for 12.5 KHz Channel Separation @ 173.975MHz**

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
173.950	v	0		pass
347.900	v	71.21(-34.21dBm)	57	pass
521.850	v	80.13	57	pass
695.800	v	82.12	57	pass
869.750	v	83.34	57	pass
1043.700	v	89.26	57	pass
1217.650	v	91.35	57	pass
1391.600	v	92.55	57	pass
1565.550	v	93.26	57	pass
1739.500	v	95.13	57	pass

**Measurement Result for 12.5 KHz Channel Separation @ 400.025MHz**

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
400.050	v	0		pass
800.100	v	71.44(-35.44dBm)	56	pass
1200.15	v	80.21	56	pass
1600.200	v	81.46	56	pass
2000.250	v	82.54	56	pass
2400.300	v	83.67	56	pass
2800.350	v	90.11	56	pass
3200.400	v	91.23	56	pass
3600.450	v	92.41	56	pass
4000.500	v	95.71	56	pass

**Measurement Result for 12.5 KHz Channel Separation @ 435.02MHz**

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
435.050	v	0		pass
870.100	v	71.17(-35.17dBm)	56	pass
1305.150	v	78.55	56	pass
1740.200	v	80.78	56	pass
2175.250	v	82.45	56	pass
2610.300	v	89.13	56	pass
3045.350	v	91.15	56	pass
3480.400	v	92.72	56	pass
3915.450	v	93.63	56	pass
4350.500	v	95.12	56	pass

**Measurement Result for 12.5 KHz Channel Separation @ 469.975MHz**

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
469.950	v	0		pass
939.900	v	70.01(-34.01dBm)	56	pass
1409.850	v	76.32	56	pass
1879.800	v	81.12	56	pass
2349.750	v	82.34	56	pass
2819.700	v	88.26	56	pass
3289.650	v	90.35	56	pass
3759.600	v	92.55	56	pass
4229.550	v	94.26	56	pass
4699.500	v	96.13	56	pass

**Notes: The emissions were scanned from 30 MHz to 10th harmonics;**

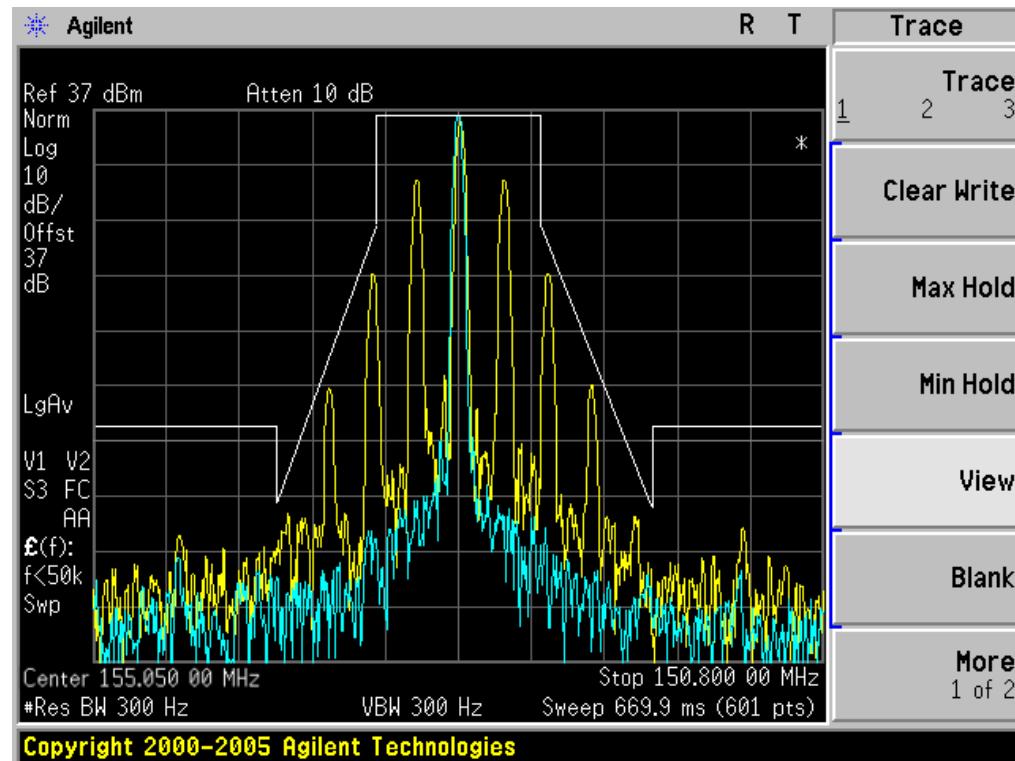
## 7.6 EMISSION MASK PLOT

The detailed procedure employed for Emission Mask measurements are specified as following:

- The transmitter shall be modulated by a 2.5 kHz 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)

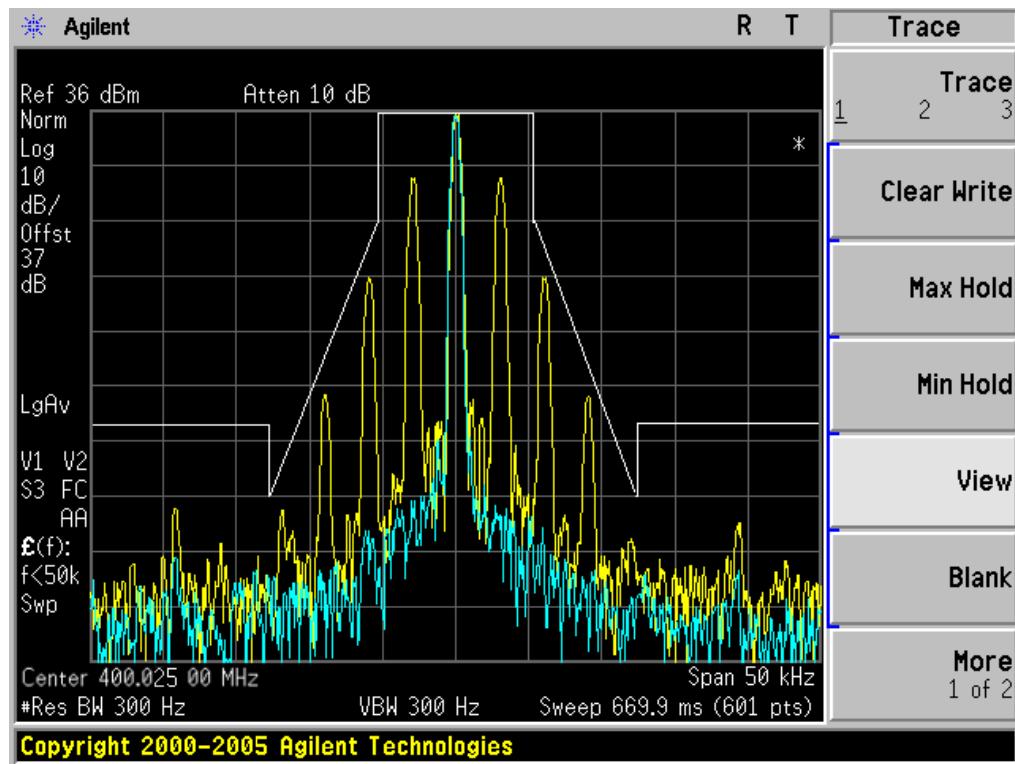
**Frequency range: 136MHz to 174MHz**

**The Worst Emission Mask for 12.5 KHz channel Separation (5W)**



Frequency range: 400MHz to 470MHz

The Worst Emission Mask for 12.5 KHz channel Separation (4W)



## 8. MODULATION CHARACTERISTICS

### 8.1 PROVISIONS APPLICABLE

According to CFR 47 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.

### 8.2 MEASUREMENT METHOD

#### 8.2.1 Modulation Limit

- (1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1KHz 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. Rated system deviation is 2.5 kHz
- (2). Repeat step 1 with input frequency changing to 300, 1000, 1500 and 3000Hz in sequence.

#### 8.2.2 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 (0 dB).
- (3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.
- (4). Audio Frequency Response =  $20\log_{10}(\text{Deviation of test frequency}/\text{Deviation of 1 KHz reference})$ .

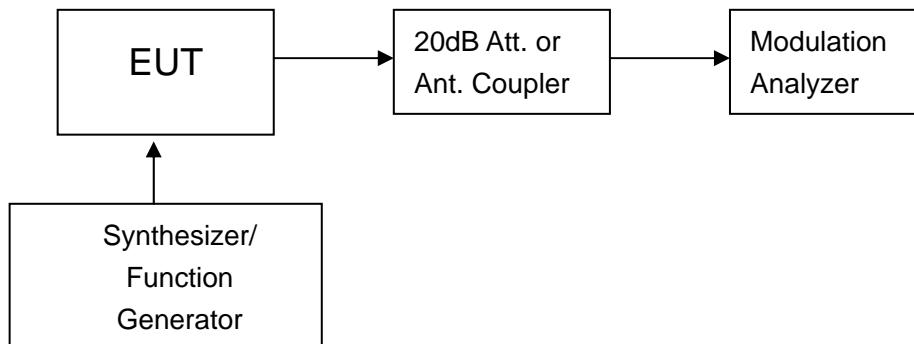


Figure 1: Modulation characteristic measurement configuration

### 8.3 MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Modulation Analyzer	HP	8920B	N/A	2011.6.27

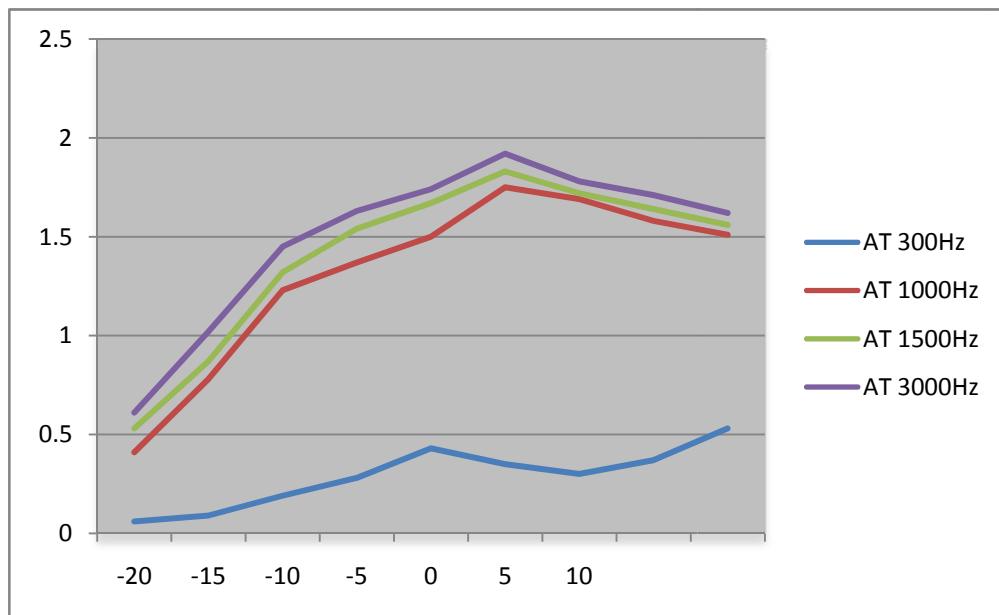
NOTE: 8920B can generate 1KHZ modulation frequency.

## 8.4 MEASUREMENT RESULT

### (a). Modulation Limit:

Middle Channel @ 12.5 KHz Channel Separations

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz	Peak Freq. Deviation At 1000 Hz	Peak Freq. Deviation At 1500 Hz	Peak Freq. Deviation At 3000 Hz
-20	0.06	0.41	0.53	0.61
-15	0.09	0.78	0.87	1.02
-10	0.19	1.23	1.32	1.45
-5	0.28	1.37	1.54	1.63
0	0.43	1.5	1.67	1.74
5	0.35	1.75	1.83	1.92
10	0.3	1.69	1.72	1.78
15	0.37	1.58	1.64	1.71
20	0.53	1.51	1.56	1.62

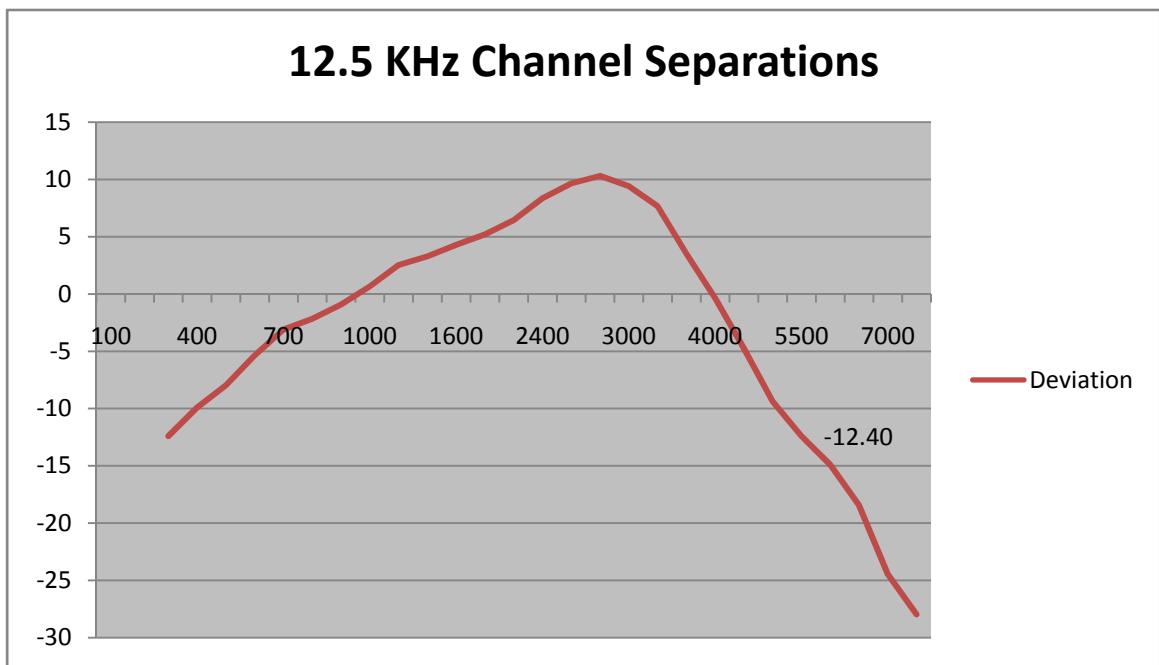


**(b). Audio Frequency Response:**

**12.5 KHz Channel Separations**

Frequency (Hz)	Deviation (KHz)	Audio Frequency Response
100	--	--
200	--	--
300	0.12	-12.40
400	0.16	-9.90
500	0.2	-7.96
600	0.27	-5.35
700	0.35	-3.10
800	0.39	-2.16
900	0.45	-0.92
1000	0.54	0.67
1200	0.67	2.54
1400	0.73	3.29
1600	0.82	4.30
1800	0.91	5.20
2000	1.05	6.44
2400	1.31	8.37
2500	1.52	9.66
2800	1.64	10.32
3000	1.48	9.43
3200	1.21	7.68
3600	0.75	3.52
4000	0.48	-0.35
4500	0.29	-4.73
5000	0.17	-9.37
5500	0.12	-12.40
6000	0.09	-14.89
6500	0.06	-18.42
7000	0.03	-24.44
9000	--	
10000	--	
12000	--	
14000	--	
18000	--	
20000	--	
30000	--	

**Frequency Response of Middle Channel**



## 9. MAXIMUM TRANSMITTER POWER (CONDUCTED OUTPUT POWER) AND CONDUCTED SPURIOUS EMISSION

### 9.1 PROVISIONS APPLICABLE

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

RS-119 and §5.4: The output power shall be within  $\pm 1.0$  dB of the manufacturer's rated power.

### 9.2 TEST PROCEDURE

The RF output of Two-way Radio was conducted to a spectrum analyzer through an appropriate attenuator.

The transmitter shall be modulated by a 2.5 kHz 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)

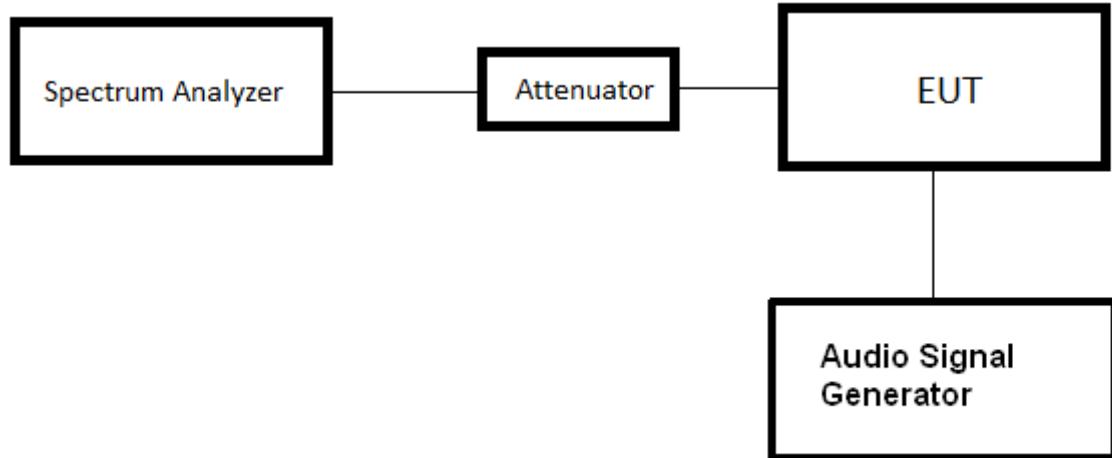
Measure and record the transmitter output power, using a measurement (resolution) bandwidth at least two to three times the occupied bandwidth for transmitters equipped to capture the true peak emission of the equipment under test.

### 9.3 TEST INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	N/A	2011.6.27

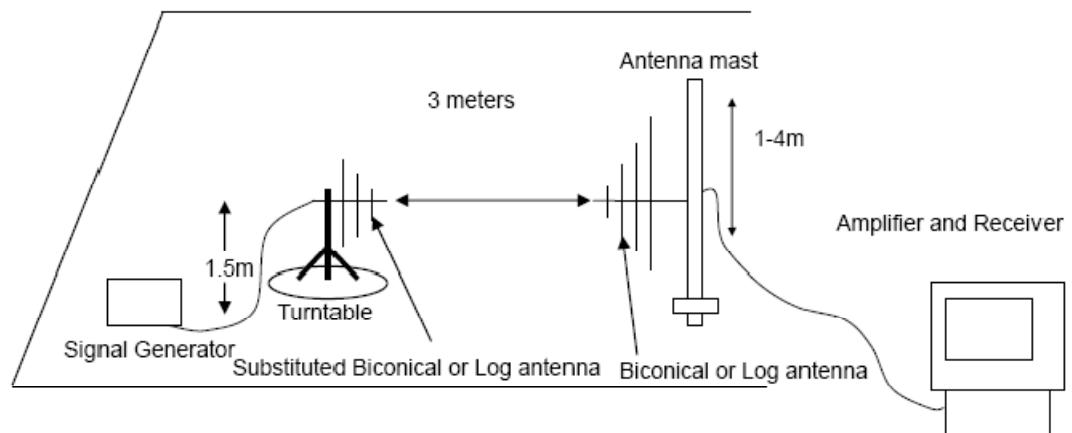
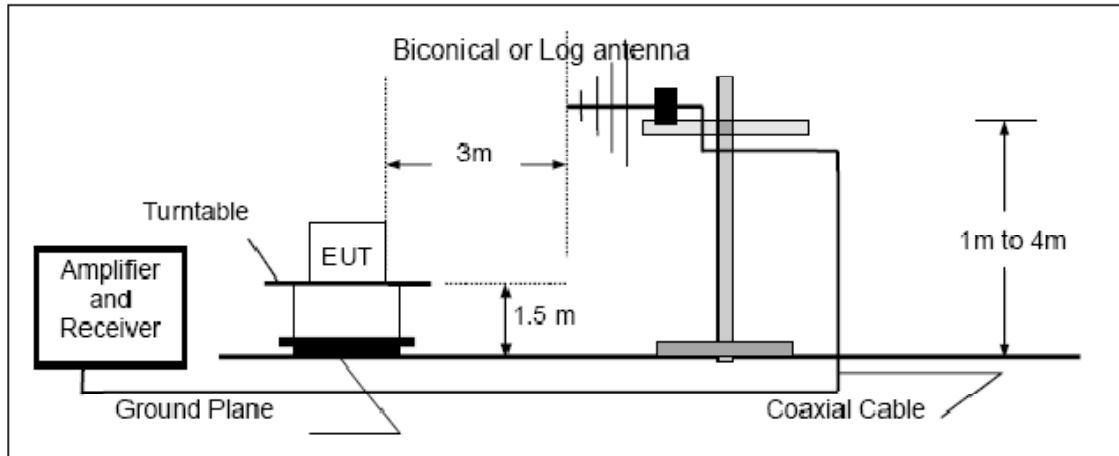
### 9.4 TEST CONFIGURATION

Conducted Output Power:

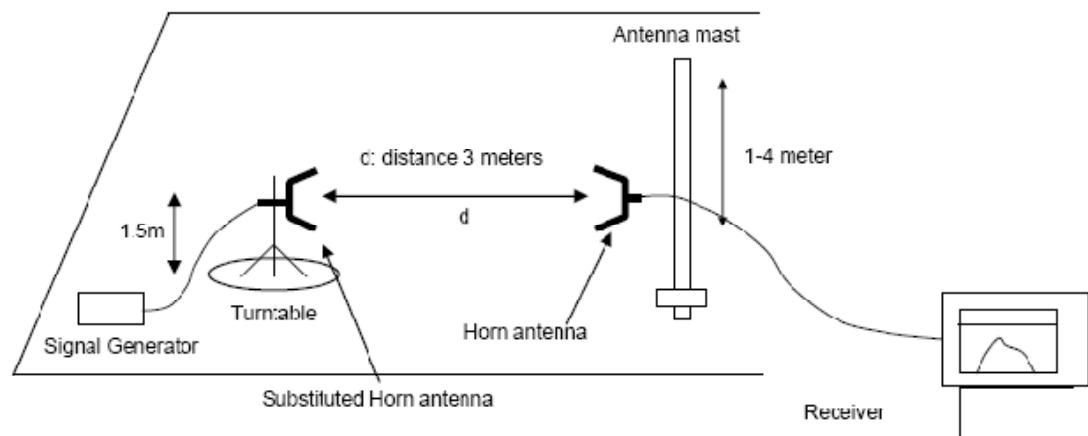
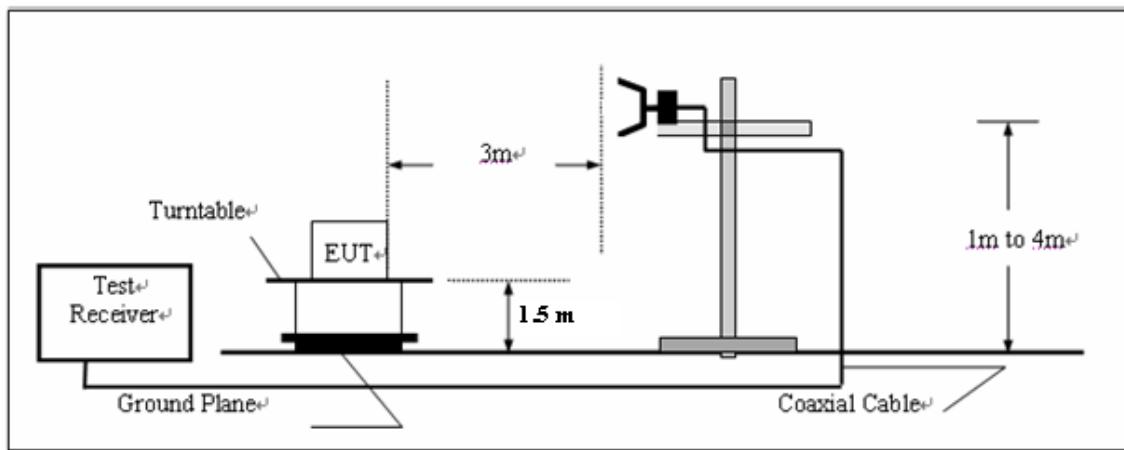


### Effective Radiated Power measurement (30 MHz to 4 GHz)

#### Below 1GHz



**Above 1GHz**



## 9.5 TEST RESULT

The maximum Conducted Power (CP) is

5W for VHF (136MHz to 174MHz)

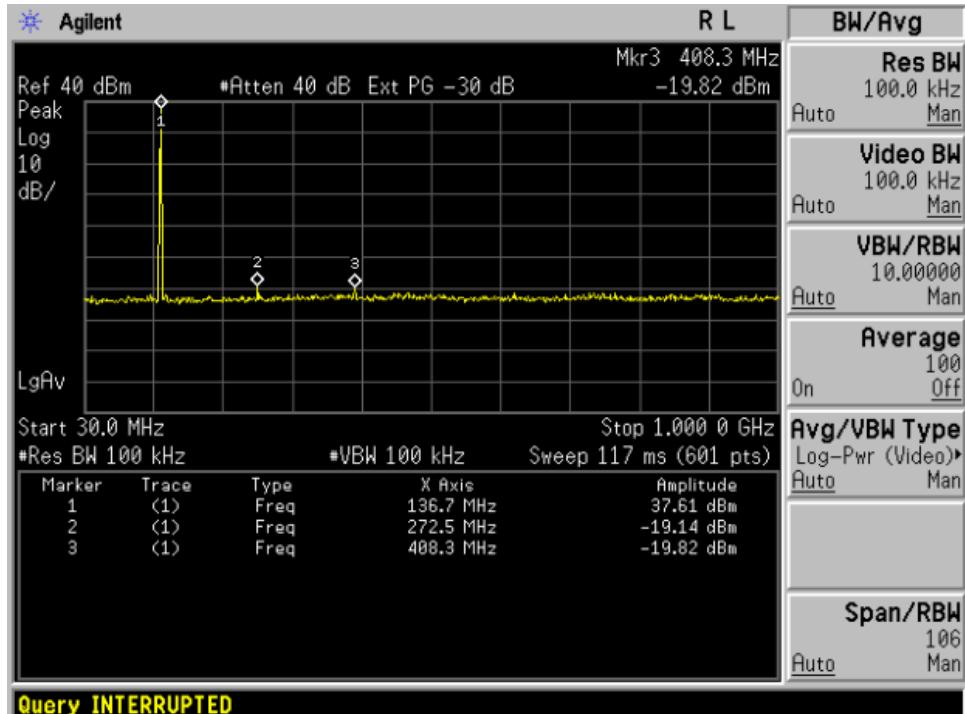
4W for UHF (400MHz to 470MHz)

Conducted Power Measurement Results				
Channel Separation	Frequency Range	Channel	Conducted output Power (dBm)	E.R.P (dBm)
12.5 KHz	136MHz to 174MHz	Bottom(136.025MHz)	<b>36.56</b>	<b>36.42</b>
		Middle(155.05MHz)	36.44	36.35
		Top (173.975MHz)	36.38	36.09
	400MHz to 470MHz	Bottom(400.025MHz)	<b>35.51</b>	<b>35.39</b>
		Middle(435.05MHz)	35.36	35.28
		Top (469.975MHz)	35.46	35.35

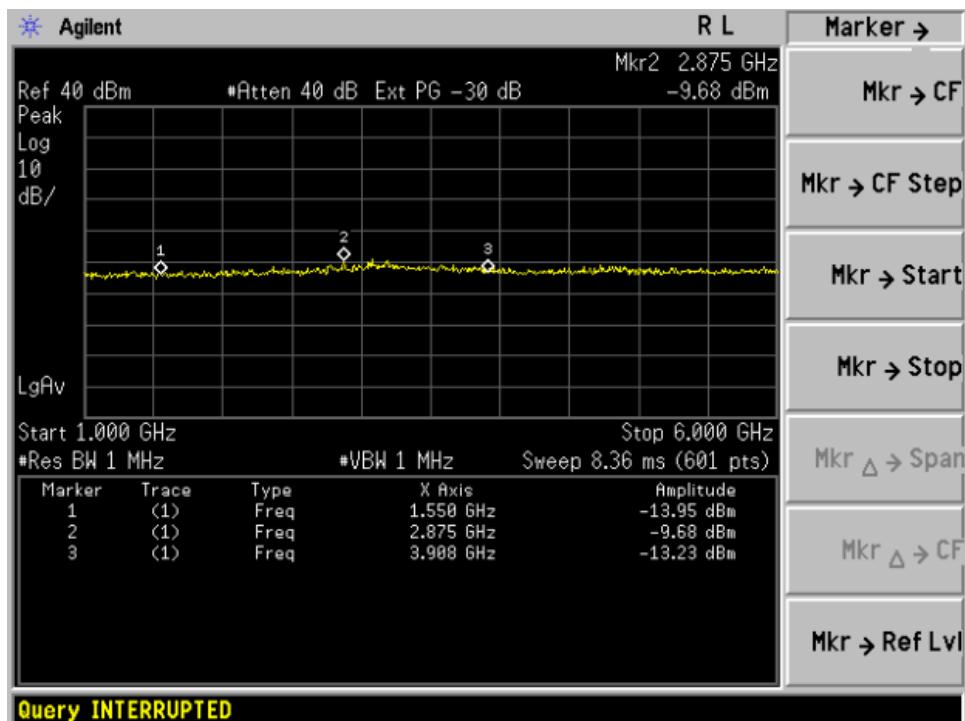
## 9.6 CONDUCT SPURIOUS PLOT

Frequency Range: 136Mhz to 174MHz

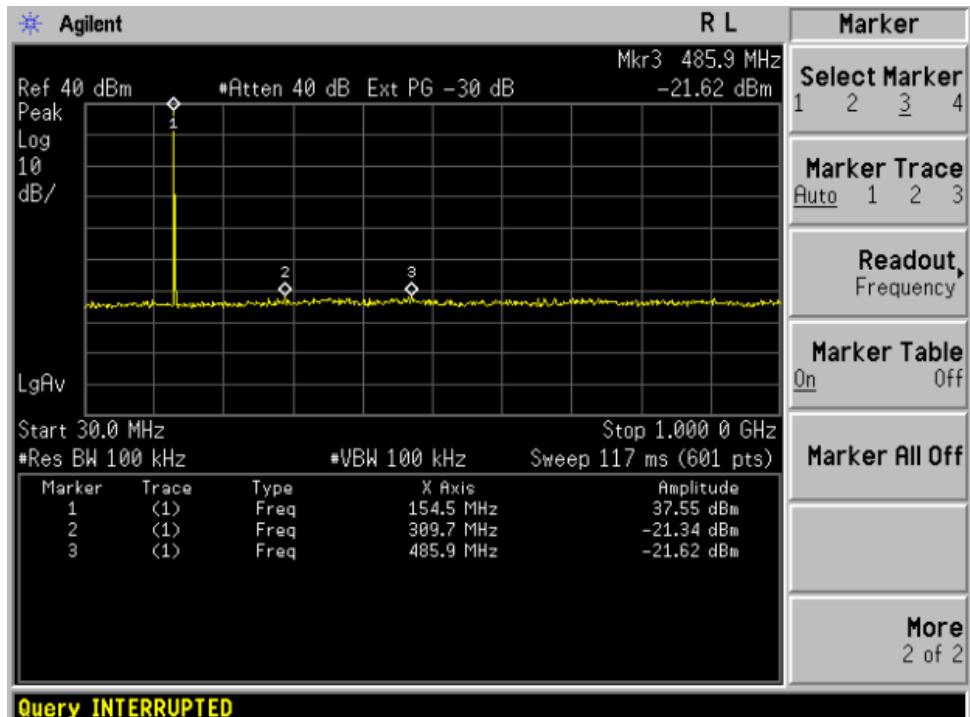
Conducted Spurious Emission @ 136.025MHz (30MHz-1GHz)



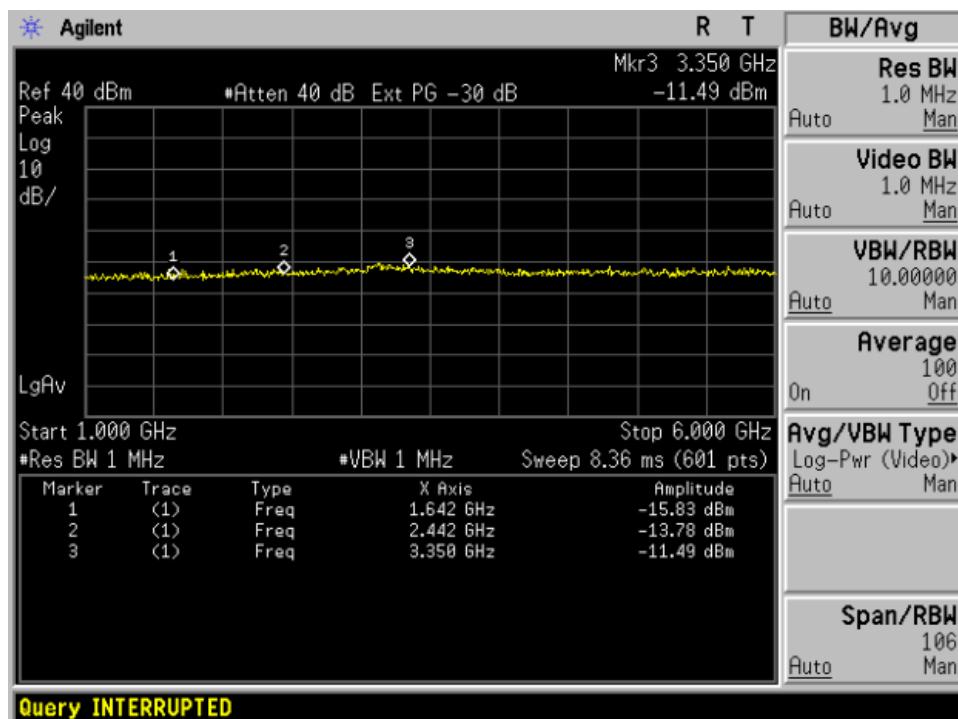
Conducted Spurious Emission @ 136.025MHz (1GHz-6GHz)



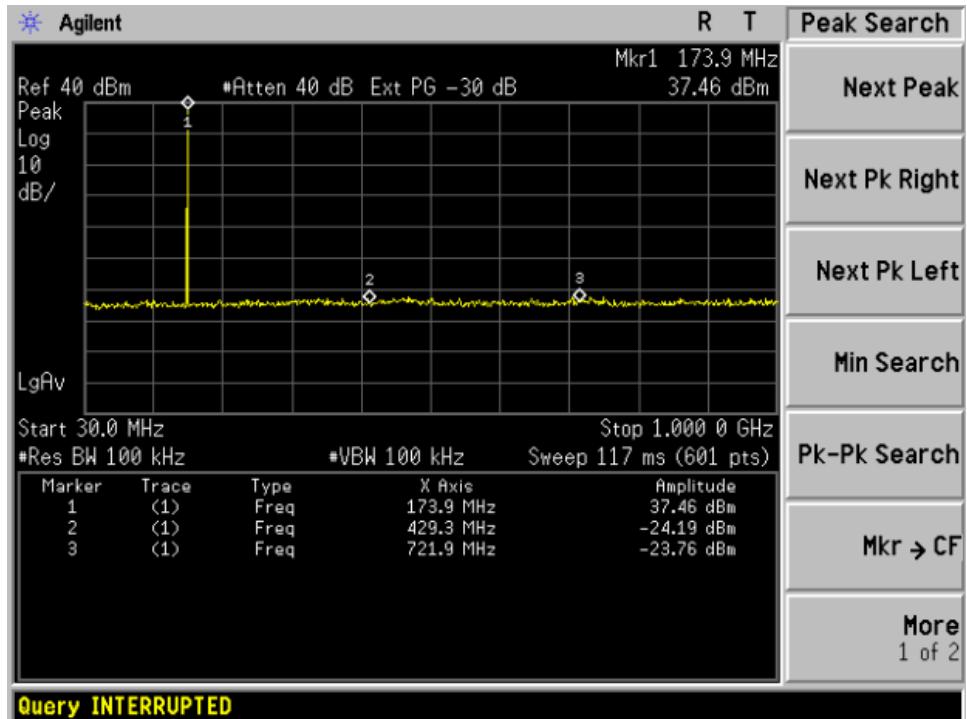
Conducted Spurious Emission @ 155.05MHz (30MHz-1GHz)



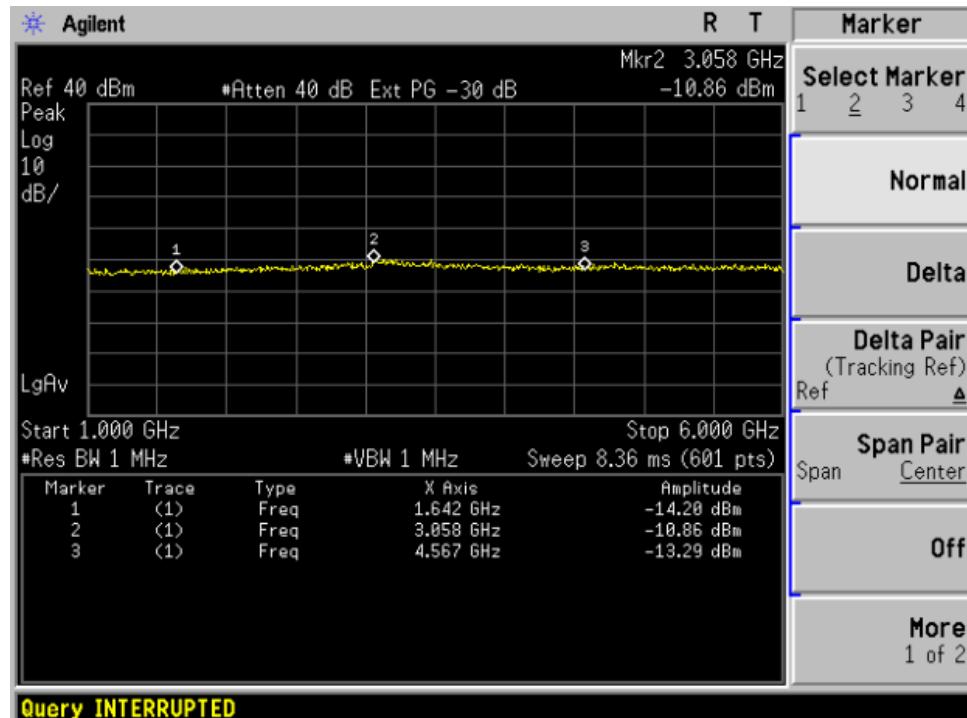
Conducted Spurious Emission @ 155.05MHz (1GHz-6GHz)



**Conducted Spurious Emission @ 173.975MHz (30MHz-1GHz)**

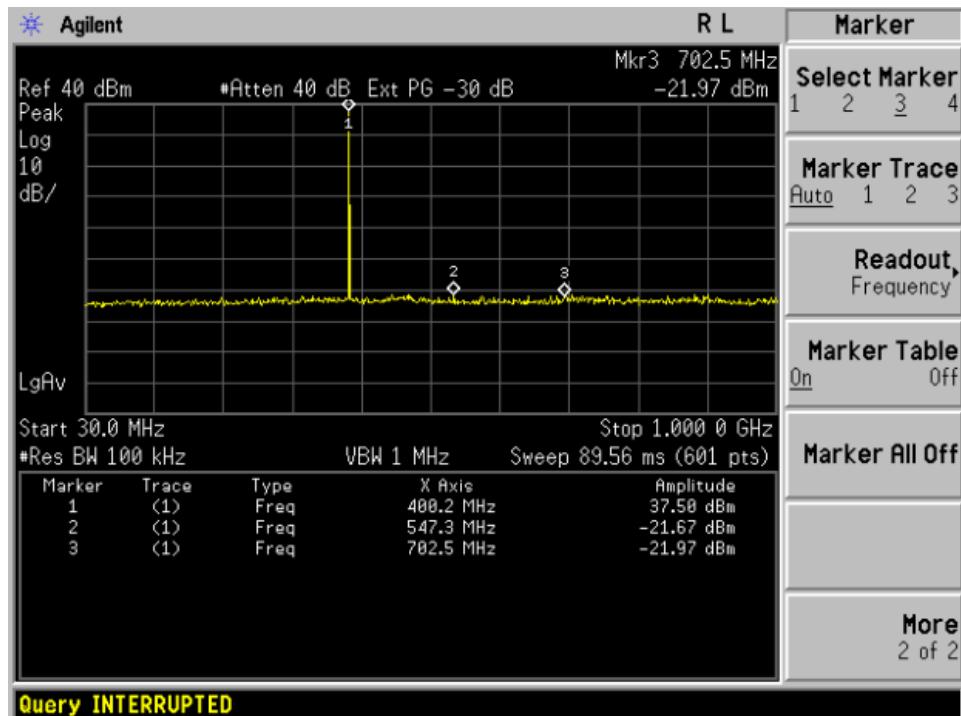


**Conducted Spurious Emission @ 173.975MHz (1GHz-6GHz)**

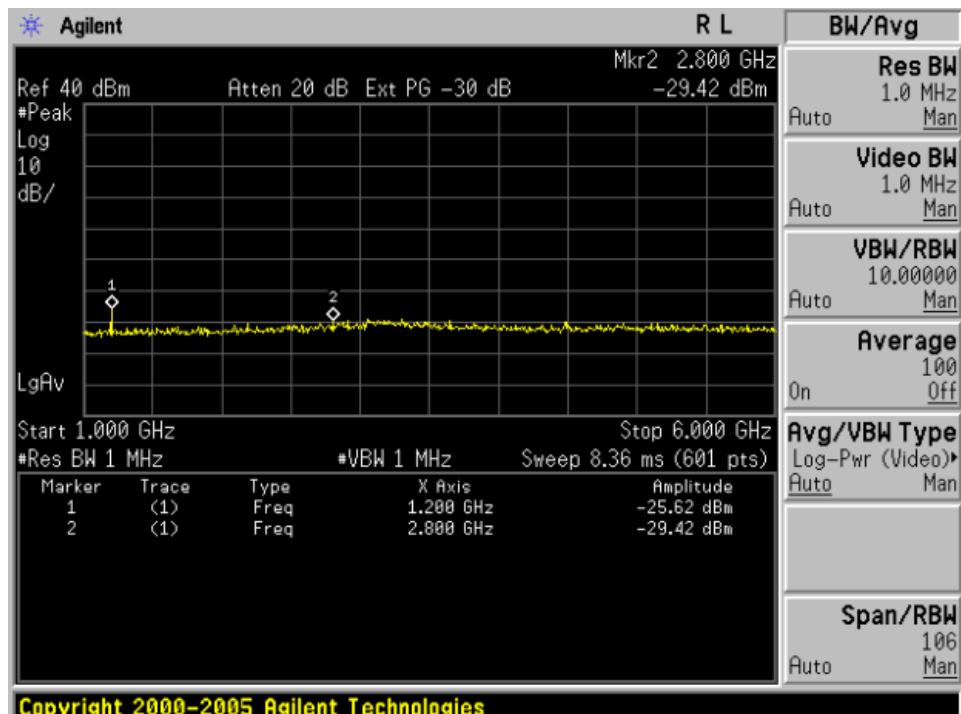


**Frequency Range: 400MHz to 470MHz**

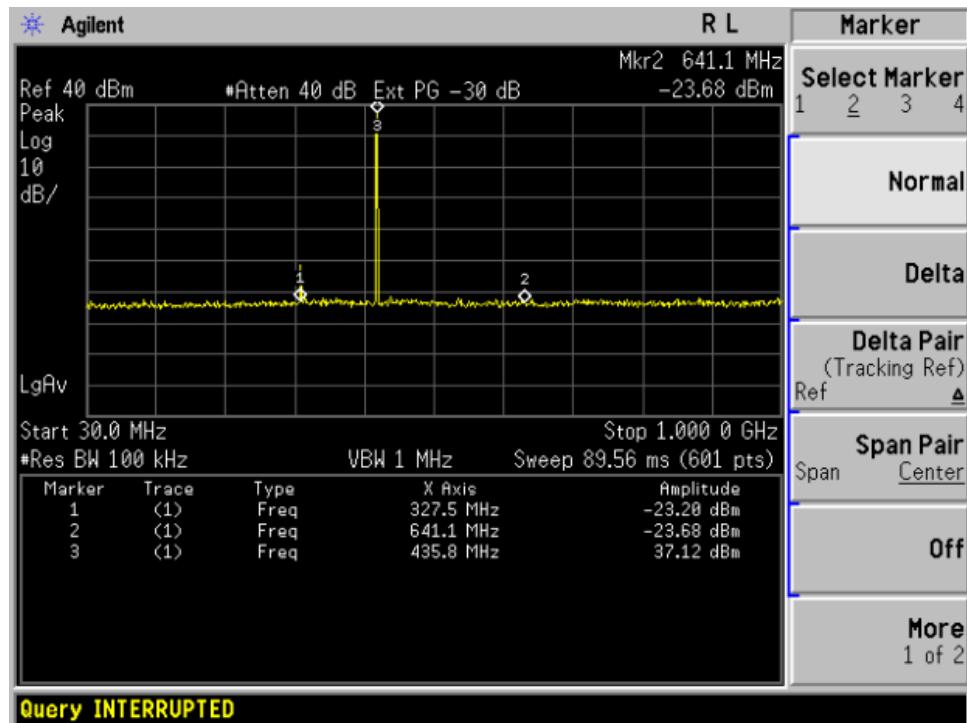
## Conducted Spurious Emission @ 400.025MHz (30MHz-1GHz)



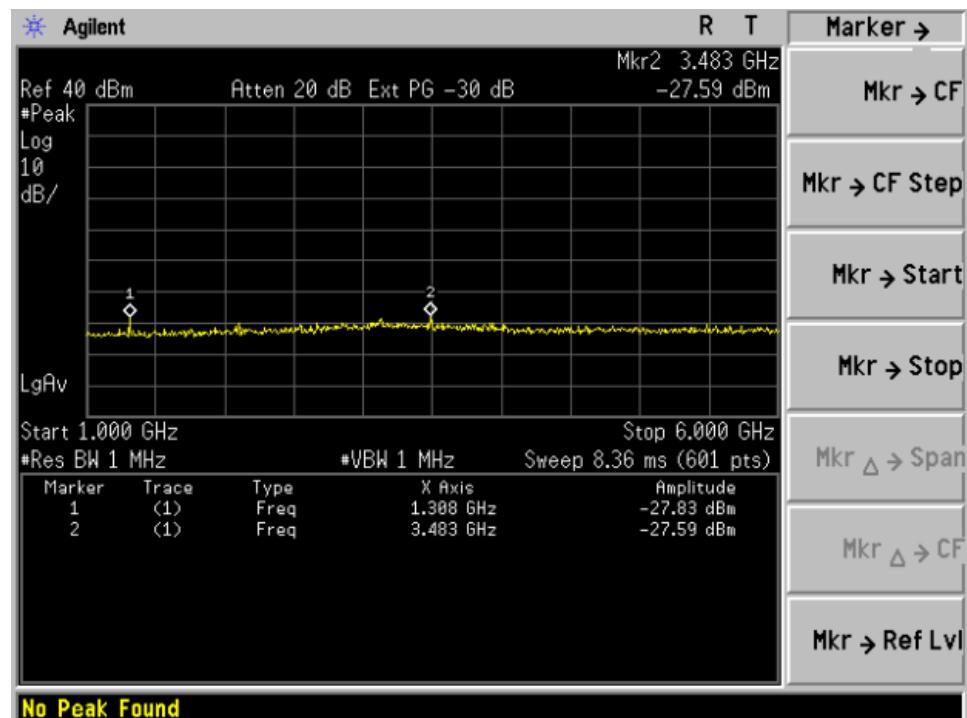
## Conducted Spurious Emission @ 400.025MHz (1GHz-6GHz)



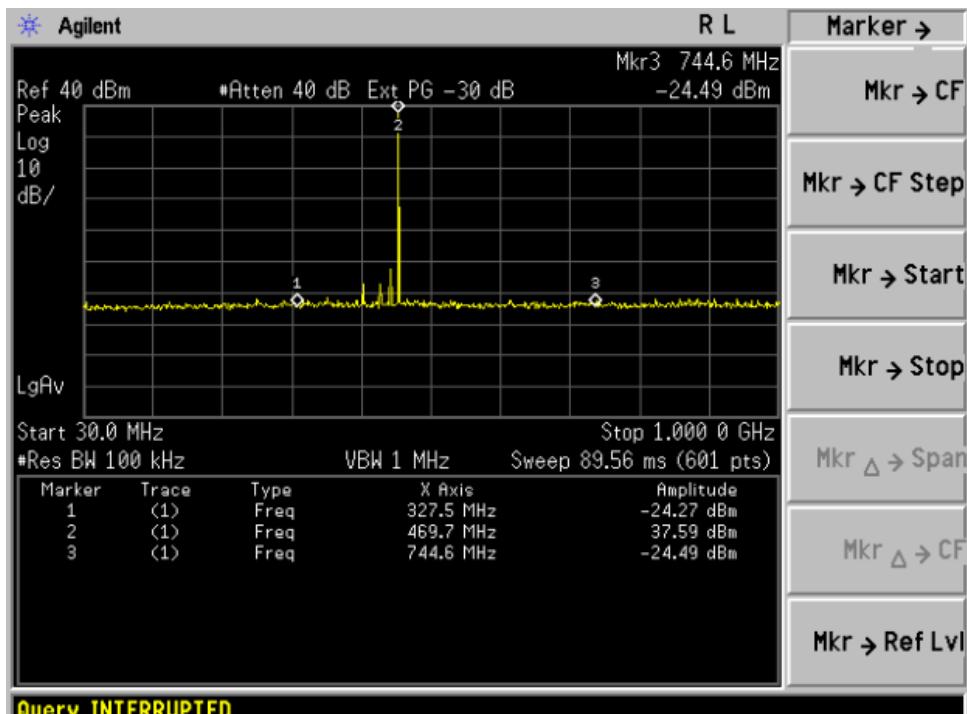
Conducted Spurious Emission @ 435.05MHz (30MHz-1GHz)



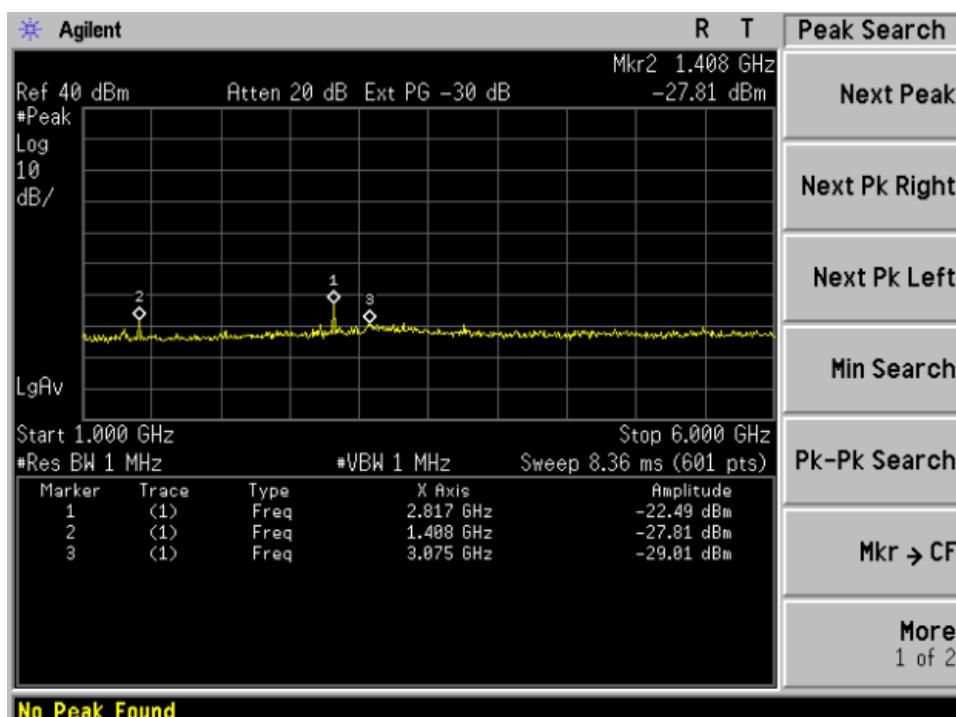
Conducted Spurious Emission @ 435.05MHz (1GHz-6GHz)



**Conducted Spurious Emission @ 469.975MHz (30MHz-1GHz)**



**Conducted Spurious Emission @ 469.975MHz (1GHz-6GHz)**



## 10. TRANSMITTER FREQUENCY BEHAVIOR

### 10.1 PROVISIONS APPLICABLE

Section 90.214

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

<sup>1</sup>  $t_{\text{off}}$  is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

<sup>2</sup>  $t_1$  is the time period immediately following  $t_{\text{off}}$ .

<sup>3</sup>  $t_2$  is the time period immediately following  $t_1$ .

<sup>4</sup>  $t_3$  is the time period from the instant when the transmitter is turned off until  $t_{\text{off}}$ .

<sup>5</sup>  $t_{\text{off}}$  is the instant when the 1 kHz test signal starts to rise.

<sup>2</sup> 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.

<sup>3</sup> Difference between the actual transmitter frequency and the assigned transmitter frequency.

<sup>4</sup> 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.

### 10.2 TEST METHOD

TIA/EIA-603 2.2.19

### 10.3 TEST INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Signal Generator	R&S	SMT02	A0304261	2011.6.27
Storage Oscilloscope	Tektronix	TDS3052	B017447	2011.6.27

#### 10.4 DESCRIBE LIMIT LINE OF TRANSMITTER FREQUENCY BEHAVIOR

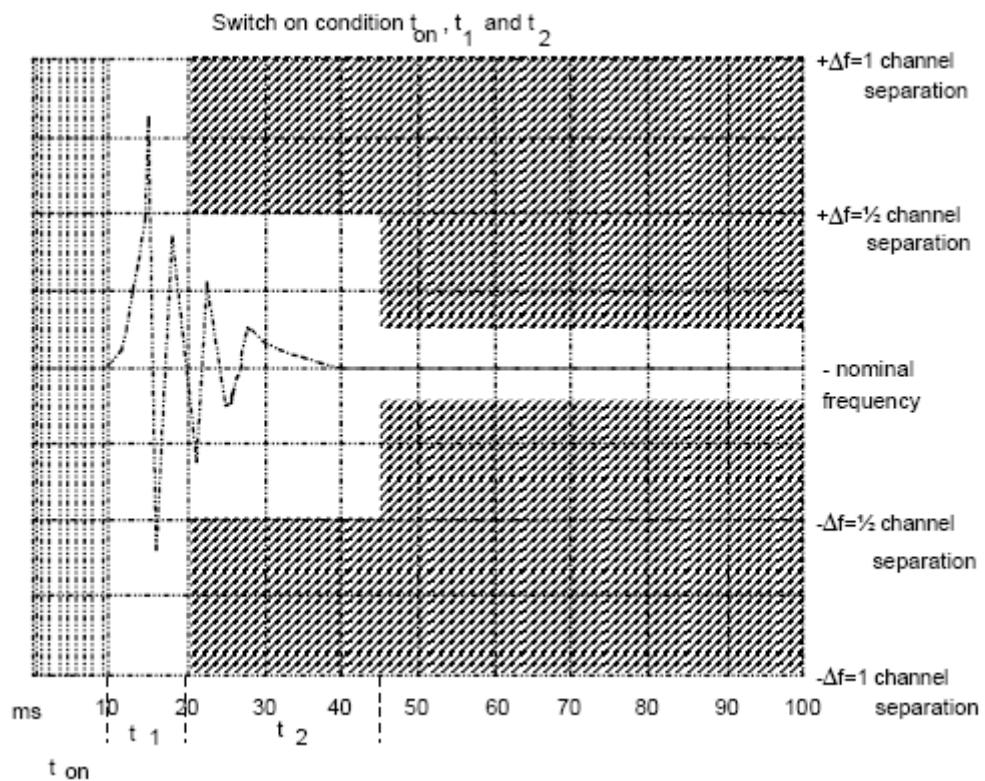
**ton:** The switch-on instant ton of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the full output power (-30 dBc).

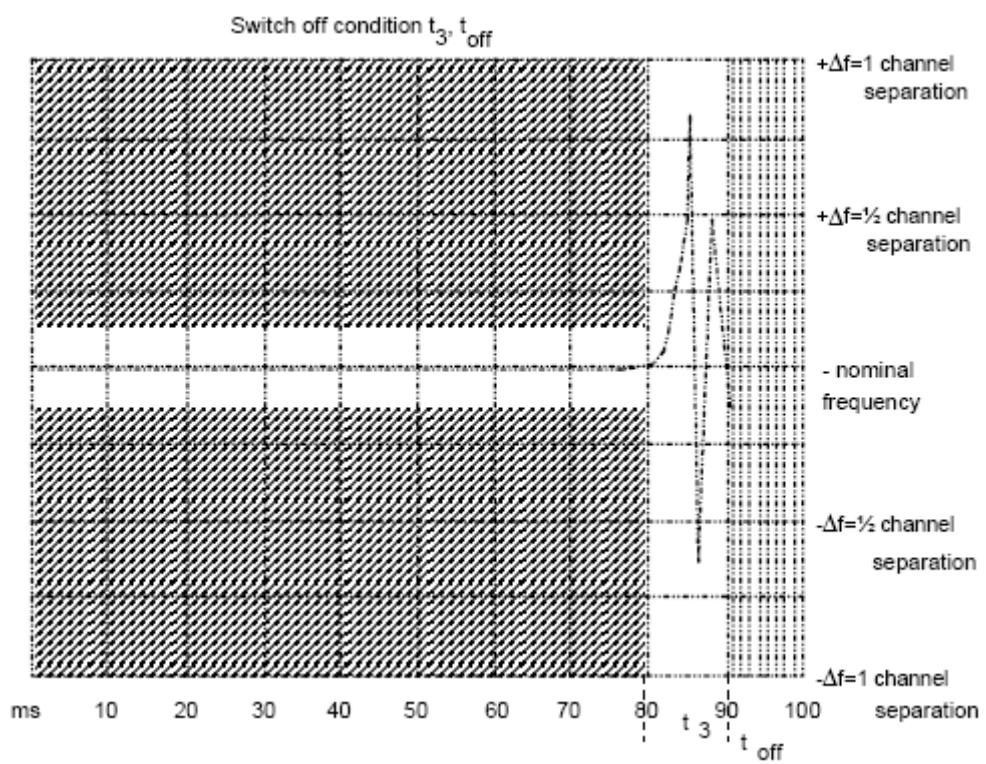
**t1:** period of time starting at ton and finishing according to above 11.1

**t2:** period of time starting at the end of t1 and finishing according to above 11.1

toff: switch-off instant defined by the condition when the output power falls below 0,1 % of the full output power (-30 dBc).

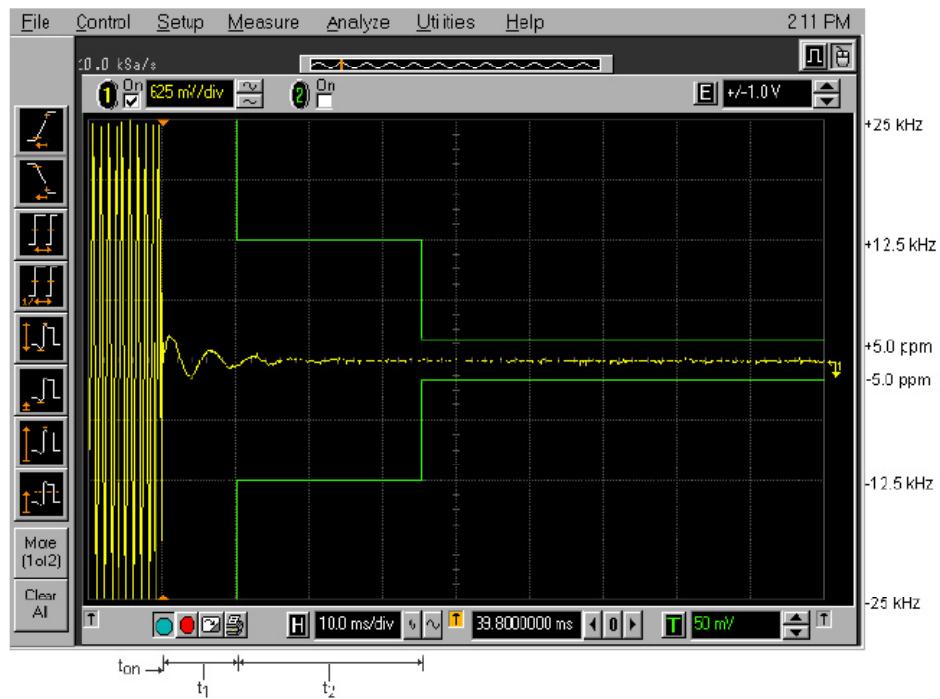
**t3:** period of time that finishing at off and starting according to above 11.1



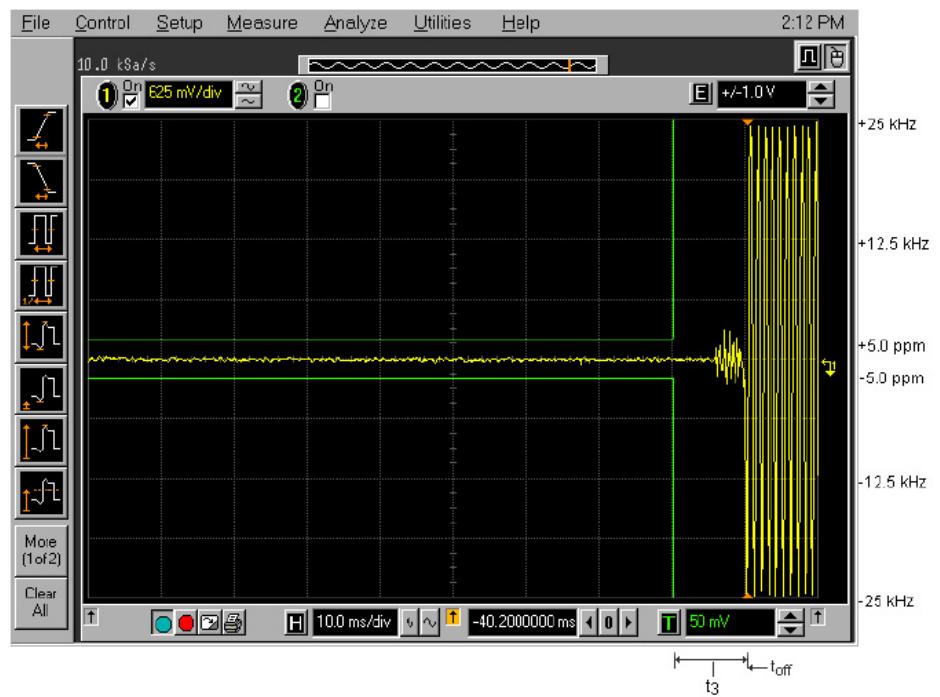


## 10.5 MEASURE RESULT

Transmitter Frequency Behavior @ 12.5 KHz Channel Separation--Off to On



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



## 11. Radiated Emission on Receiving Mode

### 11.1 PROVISIONS APPLICABLE

FCC Part 15 Subpart B Section 15.109

### 11.2 TEST METHOD

ANSI C 63.4: 2003

### 11.3 TEST INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	N/A	2011.6.27
TEST RECEIVER	R&S	ESCI	N/A	2011.6.27
LOOP ANTENNA	R&S	HFH2-Z2	A0304220	2011.6.27
HORN ANT.	EM	EM-AH-10180	N/A	2011.6.27
BROADBAND ANT.	R&S	HL562	A0304224	2011.6.27

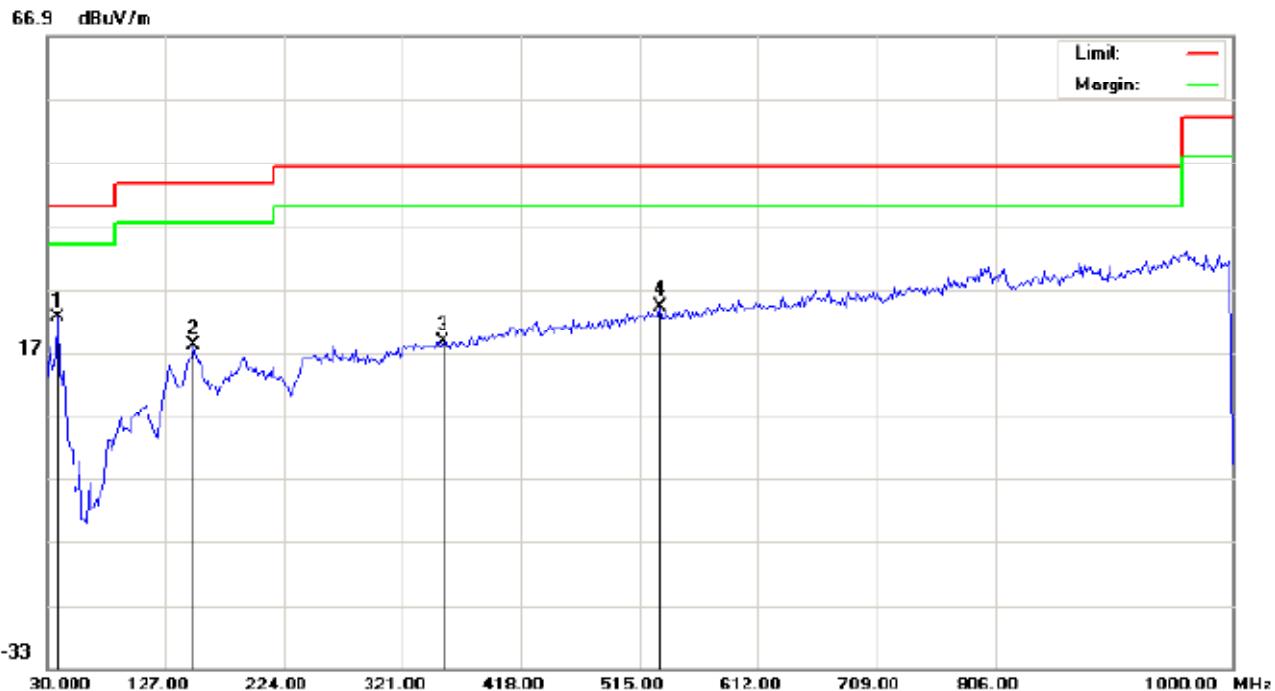
**11.4 MEASURE RESULT (MEASURED AT 3M USING FCC PART15 B LIMITS)**  
RADIATED EMISSION TEST RESULTS – HORIZONTAL



Site: site #1  
 Limit: FCC Class B 3M Radiation  
 EUT: Handheld two way radio  
 M/N: -D-88U  
 Mode: charging  
 Note:

No.	Mk	Freq. MHz	Reading dBuV	Factor	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		180.3500	-1.38	18.05	16.67	43.50	-26.83	peak			
2		264.4167	1.89	16.94	18.83	46.00	-27.17	peak			
3	*	458.4167	0.40	21.52	21.92	46.00	-24.08	peak			

## RADIATED EMISSION TEST RESULTS – VERTICAL



Site: site #1      Polarization: **Vertical**      Temperature: 26  
 Limit: FCC Class B 3M Radiation      Power:      Humidity: 60 %  
 EUT: Handheld two way radio      Distance: 3m  
 M/N: FD-880  
 Mode: charging  
 Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	38.0333	7.66	14.99	22.34	40.00	-17.36	peak			
2		149.6333	-0.99	19.01	18.02	43.50	-25.48	peak			
3		353.3333	-0.43	19.07	18.54	46.00	-27.36	peak			
4		531.1667	0.86	23.37	24.23	46.00	-21.77	peak			

## 12. Audio Low Pass Filter Response

### 12.1 LIMITS

**2.1047(a):** Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

**90.242(b)(8):** Recommended audio filter attenuation characteristics are given below:

Audio band	Minimum Attenuation Rel. to 1 KHz Attenuation
3 –20 KHz	$60 \log_{10}(f/3)$ dB where f is in KHz
20 – 30 KHz	50dB

### 12.2. METHOD OF MEASUREMENTS

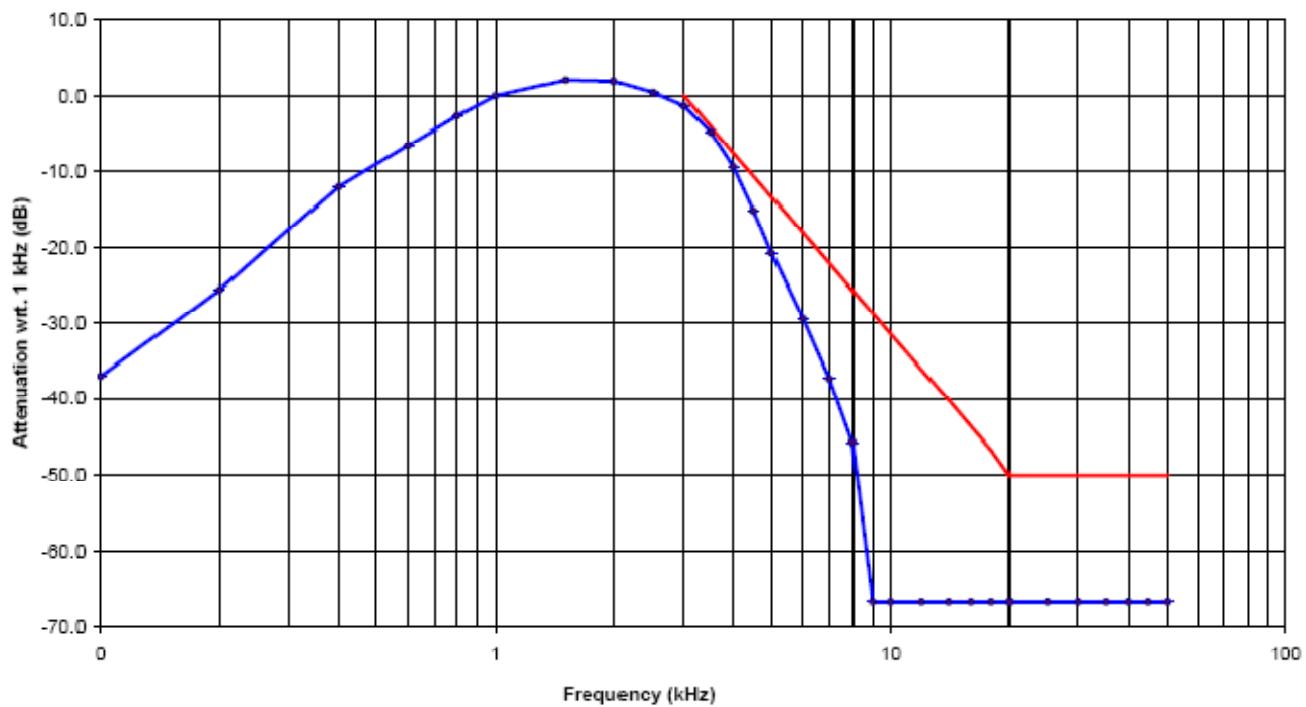
The rated audio input signal was applied to the input of the audio low-pass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT Digital Spectrum Analyzer. Tests were repeated at different audio signal frequencies from 0 to 50 KHz.

### 12.3 TEST DATA

**12.5 KHz Channel Spacing, F3E, Frequency of All Modulation States**

Frequency (KHz)	Audio In (dBV)	Audio Out (dBV)	Attenuation (Out - In) (dB)	Attenuation Rel. to 3 KHz (dB)	Recommended Attenuation (dB)
0.1	-75.79	-30.26	45.5	-36.9	--
0.2	-75.79	-18.84	57.0	-25.5	--
0.4	-75.79	-5.29	70.5	-12.0	--
0.6	-75.79	0.23	76.0	-6.4	--
0.8	-75.79	4.09	79.9	-2.6	--
1.0	-75.79	6.68	82.5	0.0	--
1.5	-75.79	8.75	84.5	2.1	--
2.0	-75.79	8.59	84.4	1.9	--
2.5	-75.79	7.13	82.9	0.5	--
3.0	-75.79	5.35	81.1	-1.3	0
3.5	-75.79	2.00	77.8	-4.7	-4
4.0	-75.79	-2.61	73.2	-9.3	-7
4.5	-75.79	-8.42	67.4	-15.1	-11
5.0	-75.79	-14.06	61.7	-20.7	-13
6.0	-75.79	-22.69	53.1	-29.4	-18
7.0	-75.79	-30.61	45.2	-37.3	-22
8.0	-75.79	-38.96	36.8	-45.6	-26
9.0	-75.79	-60.00	15.8	-66.7	-29
10.0	-75.79	-60.00	15.8	-66.7	-31
12.0	-75.79	-60.00	15.8	-66.7	-36
14.0	-75.79	-60.00	15.8	-66.7	-40
16.0	-75.79	-60.00	15.8	-66.7	-44
18.0	-75.79	-60.00	15.8	-66.7	-47
20.0	-75.79	-60.00	15.8	-66.7	-50
25.0	-75.79	-60.00	15.8	-66.7	-50
30.0	-75.79	-60.00	15.8	-66.7	-50
35.0	-75.79	-60.00	15.8	-66.7	-50
40.0	-75.79	-60.00	15.8	-66.7	-50
45.0	-75.79	-60.00	15.8	-66.7	-50
50.0	-75.79	-60.00	15.8	-66.7	-50

**Note:** Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the Frequency Response of All Modulation States is performed to show the roll-off at 3 KHz in comparison with the recommended audio filter attenuation.



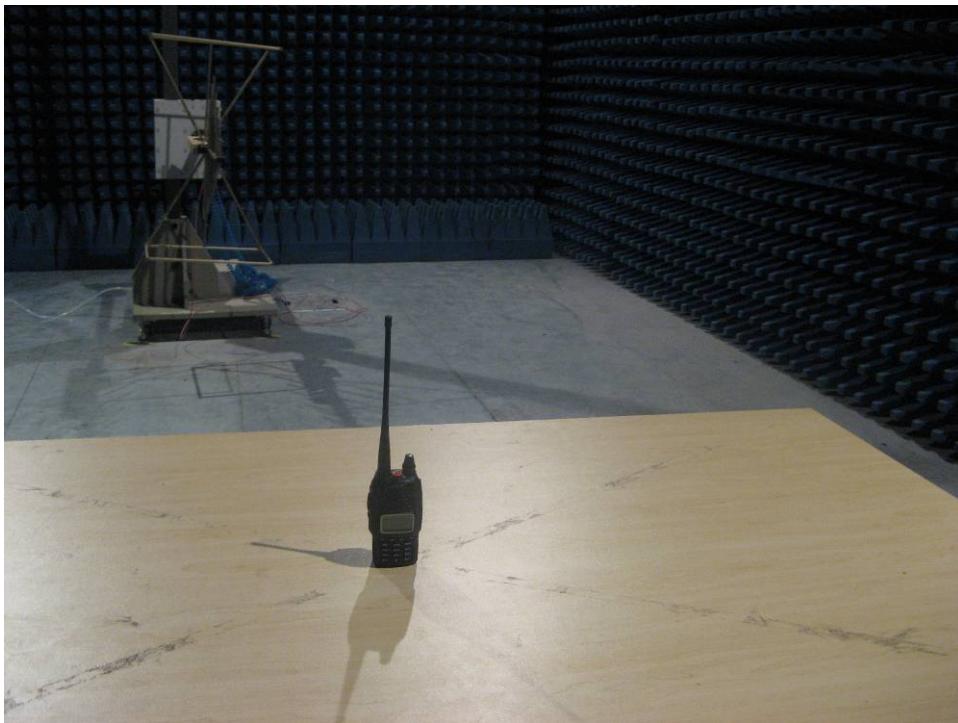
## **APPENDIX I**

## **PHOTOGRAPHS OF SETUP**

CONDUCTED EMISSION TEST SETUP



RADIATED TEST SETUP





## **APPENDIX II**

## **VIEW OF EUT**

TOP VIEW OF EUT



BOTTOM VIEW OF EUT



LEFT VIEW OF EUT



RIGHT VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT



ALL VIEW OF EUT



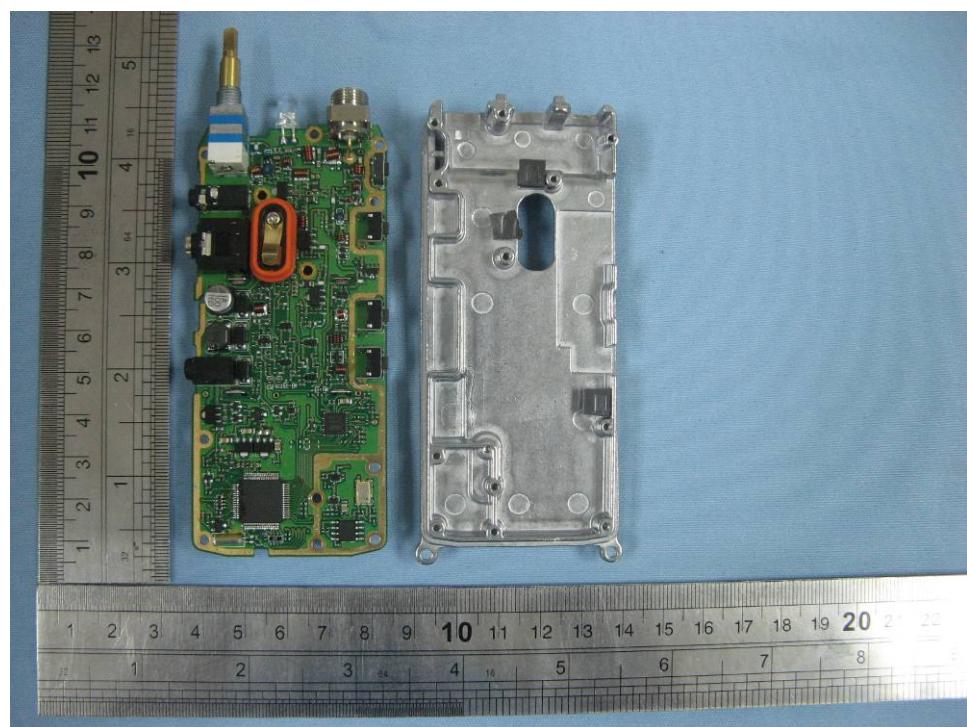
INTERNAL VIEW OF EUT – 1



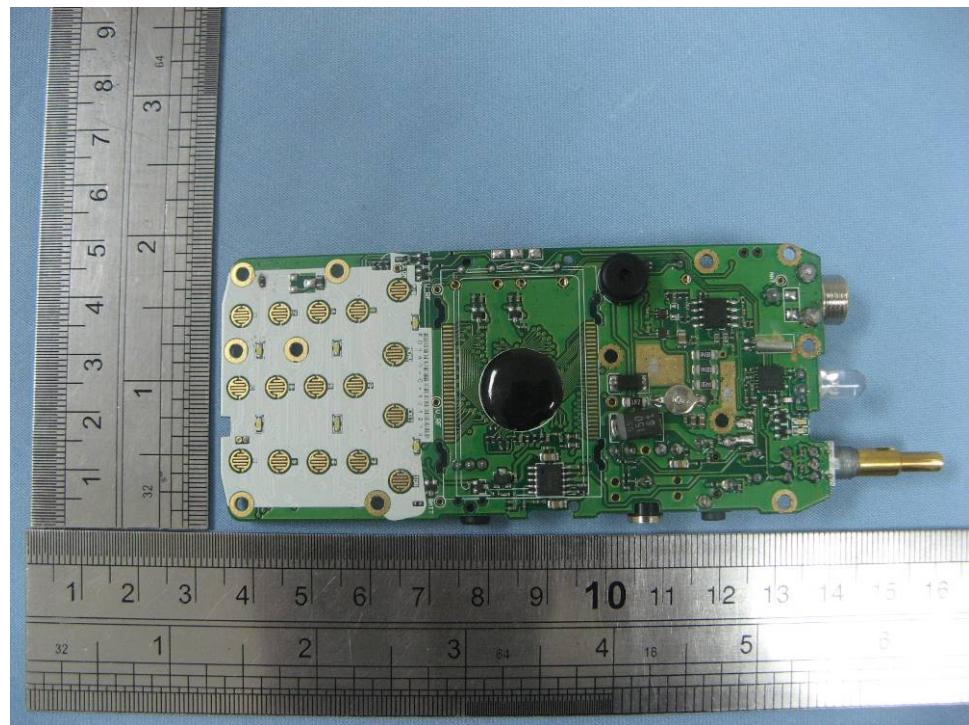
INTERNAL VIEW OF EUT – 2



Internal View of EUT – 3



Internal View of EUT – 4



----END OF REPORT----