

# **FCC Part 90 & RSS-119 Test Report**

*For*

**TWO-WAY RADIO**

**Model Name: HD-1000V2**

**Brand Name: ADVANCED WIRELESS COMMUNICATIONS**

**FCC ID: Q9SHD-1000V2, IC ID: 4651A-HD1000V2**

**Report No.: AGC100810007SZ09-1F2**

**Date of Issue: Aug.03, 2010**

*Prepared For*

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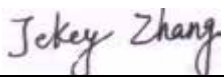
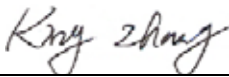
## VERIFICATION OF COMPLIANCE

Applicant:	Northfield Telecommunications, Inc.
	20809 Kensington Blvd, Lakeville, MN. United States, 55044
Manufacturer:	CHINA NEW CENTURY (QUANZHOU) COMMUNICATION ELECTRONICS CO., LTD
	No.1 Fengshou Road, Zhaofeng Industrial Area, Quanzhou City, Fujian Province, China
Product Description:	TWO-WAY RADIO
Brand Name:	ADVANCED WIRELESS COMMUNICATIONS
Model Number:	HD-1000V2
File Number:	AGC10081007SZ09-1F2
Date of Test:	Jul.28 to Aug.03, 2010

### 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 and RSS-119

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

Checked By:	
	Jekey Zhang      Aug.03, 2010
Authorized By	
	King Zhang      Aug.03, 2010

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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	199
Emission Bandwidth	10.26kHz/15.37kHz (Limite:11.25KHz/20KHz)
Peak Frequency Deviation	1.10 KHz for 12.5 KHz Channel Separation (Limit $\leq\pm 2.5$ KHz)
	2.21 KHz for 25 KHz Channel Separation (Limit $\leq\pm 5$ KHz)
Maximum Transmitter Power	0.96W for 12.5 KHz Channel Separation
	0.93W for 25.0KHz Channel Separation
Output power Modification	1W (It was fixed by the manufacturer, any individual can't arbitrarily change it)
Antenna Designation	It isn't detachable
Power Supply	DC 3.6V by battery
Battery Endpoint	DC 3.6V
Operation Frequency Range and Channel	Frequency Range:450MHz to 470MHz Channel Separation: 12.5KHz and 25KHz
	Top Channel: 469.975MHz, Centre Channel:460.000MHz, Bottom Channel:450.025MHz,
Frequency Tolerance	1.041 ppm for 12.5 KHz Channel Separation 1.255 ppm for 25.0 KHz Channel Separation
Transmitter Spurious (Worst case)	-25.12dBm
Receiver Spurious (Worse case)	30.38 dBuV/m at 3m measuring distance

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

This submittal(s) (test report) is intended for **FCC ID: Q9SHD-1000V2, IC ID: 4651A-HD1000V2** filing to comply with the FCC Part 90 and RSS-119 requirements.

## **1.3 TEST METHODOLOGY**

The radiated emission testing was performed according to the procedures of ANSI C 63.4: 2003; 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. 1F., 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 and IC register No.: 9083A

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

### 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	Two-way Radio	HD-1000V2	FCC ID: Q9SHD-1000V2 IC ID: 4651A-HD1000V2	EUT
--	--	--	--	--
--	--	--	--	--

### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§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



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

The EUT (two way radio) has been tested under normal operating condition. UHF (The top channel, the middle channel and the bottom channel) are chosen for testing at each channel separation (12.5 KHz/ 25 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  $+60^{\circ}\text{C}$  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, the frequency tolerance must be maintained within 0.00025% for 12.5KHz channel separation and 0.0005% for 25KHz channel separation.

### **5.2 MEASUREMENT PROCEDURE**

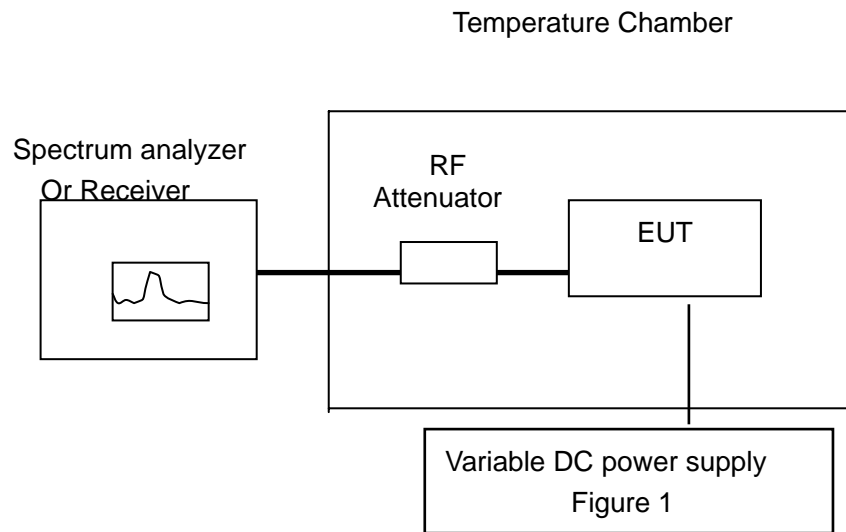
#### **5.2.1 Frequency stability versus environmental temperature**

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  $60^{\circ}\text{C}$ . 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 3.6 V
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.

## 5.2 TEST SETUP BLOCK DIAGRAM



## 5.3 TEST EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Receiver	R&S	ESIB26	A0304218	2010.06
Climate Chamber	Albatross	--	--	2010.12

## 5.4 TEST RESULT

**Bottom Channel @ 12.5 KHz Channel Separation**

Reference Frequency:	450.025 MHz	Limit:	2.5ppm
Environment Temperature	Power Supply	Frequency Deviation	
( )	(V)	(MHz)	ppm
50	3.6	450.024531	-1.042
40	3.6	450.024587	-0.918
30	3.6	450.024633	-0.816
20	3.6	450.024721	-0.620
10	3.6	450.024831	-0.376
0	3.6	450.024859	-0.313
-10	3.6	450.024952	-0.107
-20	3.6	450.024942	-0.129
-30	3.6	450.025061	0.136

**Middle Channel @ 12.5 KHz Channel Separation**

Reference Frequency:	460.000 MHz	Limit:	2.5ppm
Environment Temperature	Power Supply	Frequency Deviation	
( )	(V)	(MHz)	ppm
50	3.6	459.999541	-0.998
40	3.6	459.999599	-0.872
30	3.6	459.999622	-0.822
20	3.6	459.999731	-0.585
10	3.6	459.999817	-0.398
0	3.6	459.999837	-0.354
-10	3.6	459.999908	-0.200
-20	3.6	459.999919	-0.176
-30	3.6	459.999973	-0.059

**Top Channel @ 12.5KHz Channel Separation**

Reference Frequency:	469.975 MHz	Limit:	2.5ppm
Environment Temperature	Power Supply	Frequency Deviation	
( )	(V)	(MHz)	ppm
50	3.6	469.974521	-1.019
40	3.6	469.974509	-1.045
30	3.6	469.974611	-0.828
20	3.6	469.974721	-0.594
10	3.6	469.974845	-0.330
0	3.6	469.974875	-0.266
-10	3.6	469.974921	-0.168
-20	3.6	469.975011	0.023
-30	3.6	469.975117	0.249

**Bottom Channel @ 25.0 KHz Channel Separation**

Reference Frequency:	450.025 MHz	Limit:	5.0ppm
Environment Temperature	Power Supply	Frequency Deviation	
( )	(V)	(MHz)	ppm
50	3.6	450.024435	-1.255
40	3.6	450.024579	-0.936
30	3.6	450.024619	-0.847
20	3.6	450.024732	-0.596
10	3.6	450.024916	-0.187
0	3.6	450.025034	0.076
-10	3.6	450.025022	0.049
-20	3.6	450.025025	0.056
-30	3.6	450.025128	0.284

**Middle Channel @ 25.0 KHz Channel Separation**

Reference Frequency:	460.000 MHz	Limit:	2.5ppm
Environment Temperature	Power Supply	Frequency Deviation	
( )	(V)	(MHz)	ppm
50	3.6	459.999542	-0.996
40	3.6	459.999573	-0.928
30	3.6	459.999643	-0.776
20	3.6	459.999715	-0.620
10	3.6	459.999829	-0.372
0	3.6	459.999838	-0.352
-10	3.6	459.999901	-0.215
-20	3.6	459.999942	-0.126
-30	3.6	459.999982	-0.039

**Top Channel @ 25.0 KHz Channel Separation**

Reference Frequency:	469.975 MHz	Limit:	5.0ppm
Environment Temperature	Power Supply	Frequency Deviation	
( )	(V)	(MHz)	ppm
50	3.6	469.974416	-1.243
40	3.6	469.974535	-0.989
30	3.6	469.974611	-0.828
20	3.6	469.974609	-0.832
10	3.6	469.974815	-0.394
0	3.6	469.974945	-0.117
-10	3.6	469.975009	0.019
-20	3.6	469.975107	0.228
-30	3.6	469.975008	0.017

## 6. EMISSION BANDWIDTH

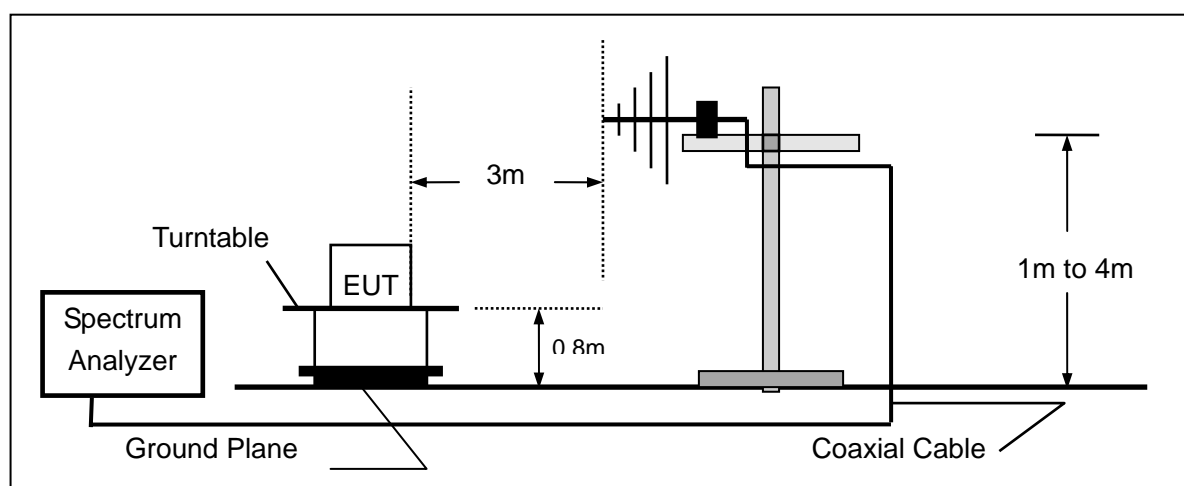
### 6.1 PROVISIONS APPLICABLE

According to FCC Part 90 Section 90.209: The authorized bandwidth shall be 11.25 KHz for 12.5 KHz and 20 KHz for 25 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 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 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



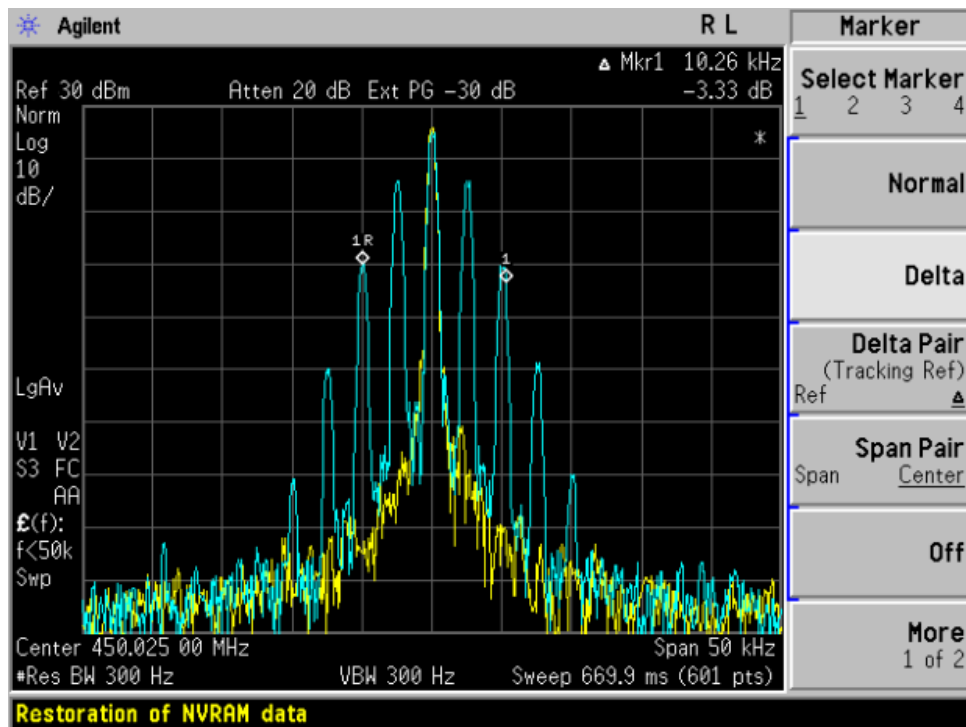
### 6.4 MEASUREMENT EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2010.06
MODULATION ANALYZER	HP	8901B	3104A03367	2010.06
BROADBAND ANT.	R&S	HL562	A0304224	2010.06

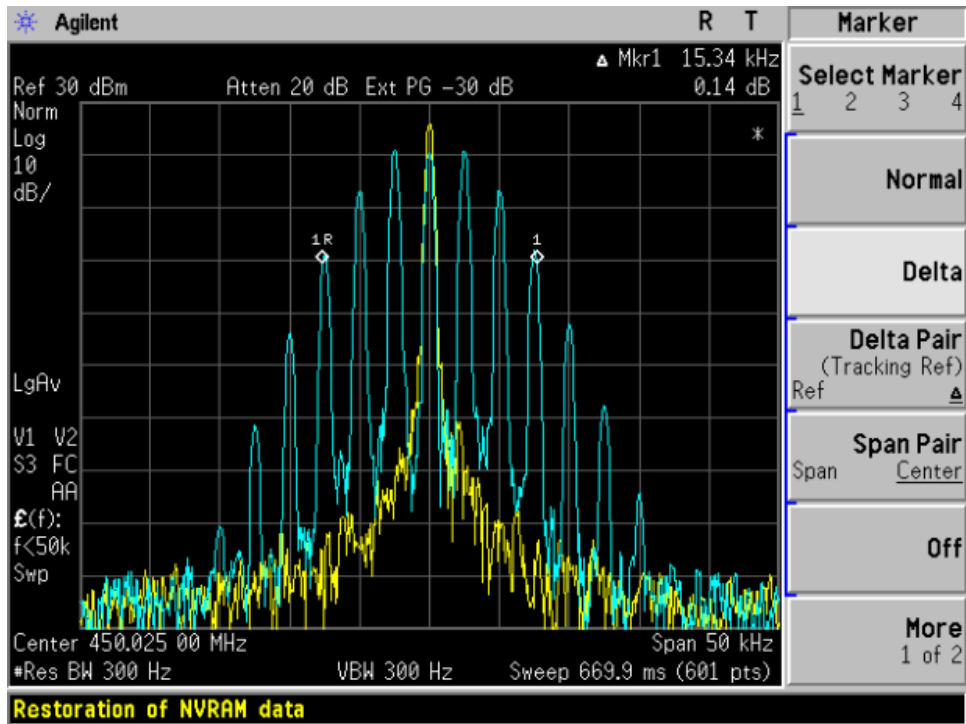
## 6.5 MEASUREMENT RESULT:

26 dB Bandwidth Measurement Result						
Operating Frequency	12.5 KHz Channel Separation			25 KHz Channel Separation		
	Test Data	Limits	Result	Test Data	Limits	Result
450.025MHz	10.26KHz	11.25 KHz	Pass	15.34 KHz	20.00 KHz	Pass
460.000MHz	10.24KHz	11.25 KHz	Pass	15.25KHz	20.00KHz	Pass
469.975MHz	10.14 KHz	11.25 KHz	Pass	15.37 KHz	20.00 KHz	Pass

**Occupied bandwidth of Middle Channel (Maximum) @ 12.5KHz Channel Separation**



**Occupied bandwidth of Middle Channel (Maximum) @ 25KHz Channel Separation**





## 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, whichever is lesser attenuation.

8.1.2 According to Section 90.210, Emission mask B. 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.

### 7.2 MEASUREMENT PROCEDURE

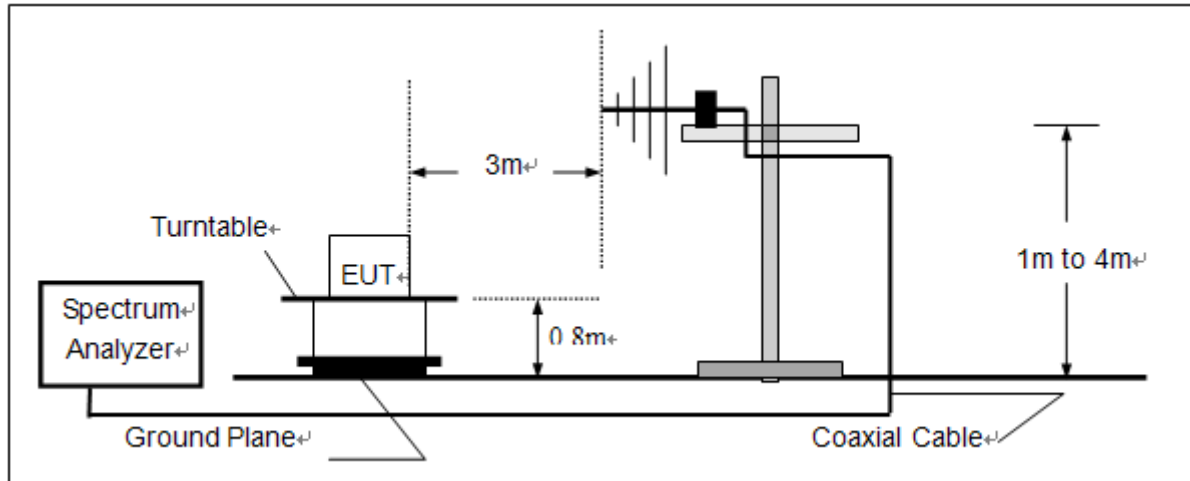
- (1) On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3) The output of the antenna shall 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 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.

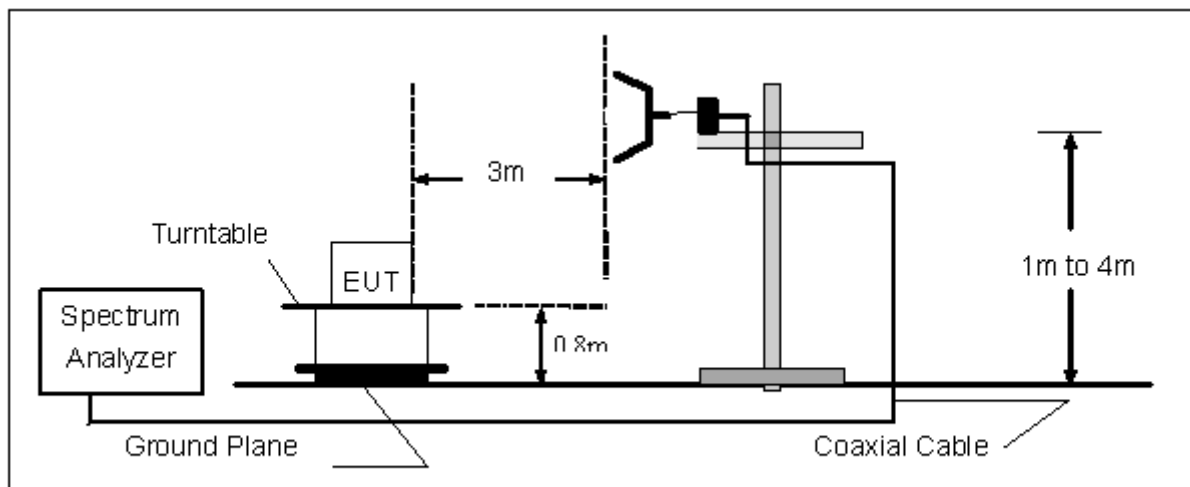
### **7.3 TEST SETUP BLOCK DIAGRAM**

## 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	2010.06
TEST RECEIVER	R&S	ESIB26	A0304218	2010.06
LOOP ANTENNA	R&S	HFH2-Z2	A0304220	2010.06
HORN ANT.	R&S	HF906	100150	2010.06
BROADBAND ANT.	R&S	HL562	A0304224	2010.06

#### 7.5 MEASUREMENT RESULTS:

##### Measurement Result for 12.5 KHz Channel Separation-1W

On any frequency removed from the center of the authorized bandwidth by a displacement Frequency ( $f_d$  in KHz)  $f_o$  of more than 12.5 KHz: At least  $50 + 10 \log(P)$  dB or 70 dB, which ever is lesser attenuation.

**Limit: At least  $50 + 10 \log(P) = 50 + 10 \log(1) = 50$**

##### Measurement Result For 25 KHz Channel Separation-1W

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log(P)$  dB.

**Limit: At least  $43 + 10 \log(P) = 43 + 10 \log(1) = 43$**

# THE WORST RADIATED SPURIOUS EMISSION OF ALL TEST DATA

## Measurement Result for 12.5 KHz Channel Separation-1W

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
460.00	V	0	--	Pass
920.00	V	55.44	50	Pass
1380.00	V	56.57	50	Pass
1840.00	V	61.15	50	Pass
2300.00	V	63.91	50	Pass
2760.00	V	63.54	50	Pass
3220.00	V	67.75	50	Pass
3680.00	V	69.51	50	Pass
4140.00	V	73.23	50	Pass
4600.00	V	72.43	50	Pass

## Measurement Result For 25 KHz Channel Separation-1W

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
460.00	V	0	--	Pass
920.00	V	<b>55.12</b> (-25.12dBm)	43	Pass
1380.00	V	57.75	43	Pass
1840.00	V	58.61	43	Pass
2300.00	V	60.95	43	Pass
2760.00	V	65.17	43	Pass
3220.00	V	67.75	43	Pass
3680.00	V	69.51	43	Pass
4140.00	V	71.01	43	Pass
4600.00	V	72.61	43	Pass

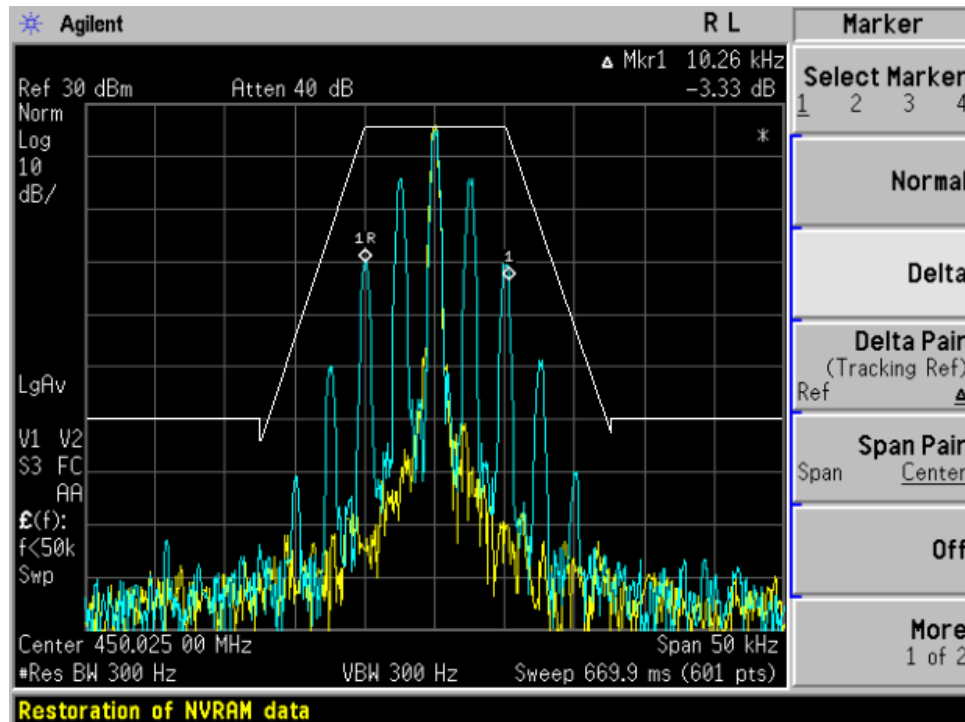
**Note: The worst result is 55.12dBc, so the worst case for Transmitter spurious is 30dBm-55.12dBc=-25.12dBm**

## 8.6 EMISSION MASK PLOT

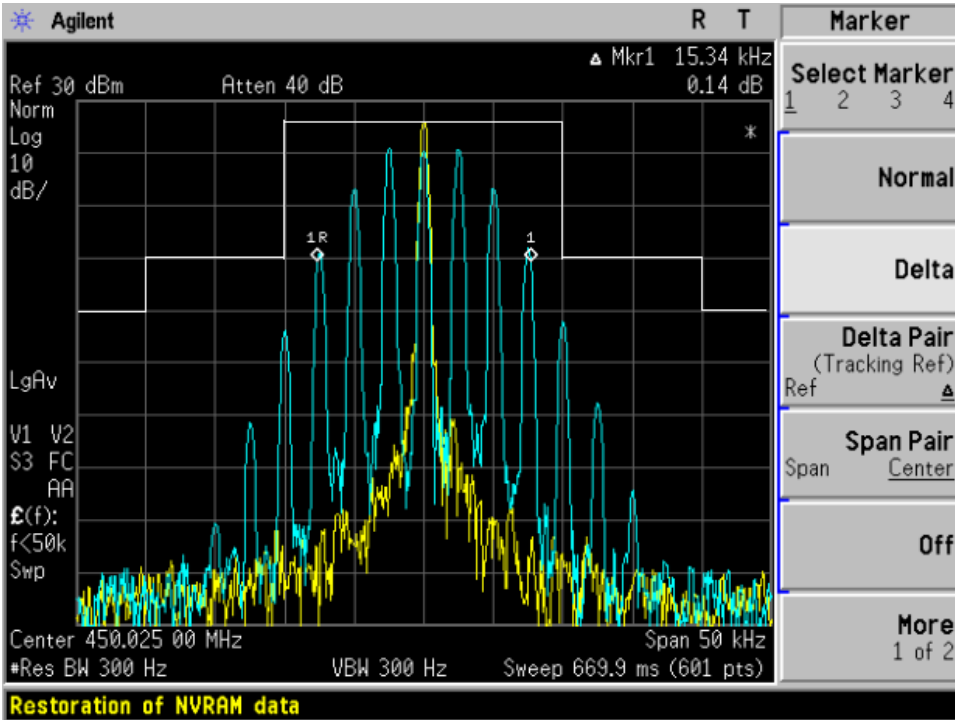
The detailed procedure employed for Emission Mask measurements are specified as following:

- 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) and 5 kHz (25 kHz channel spacing)

### The Worst Emission Mask for 12.5 KHz channel Separation



The Worst Emission Mask for 25 KHz channel Separation



## 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.

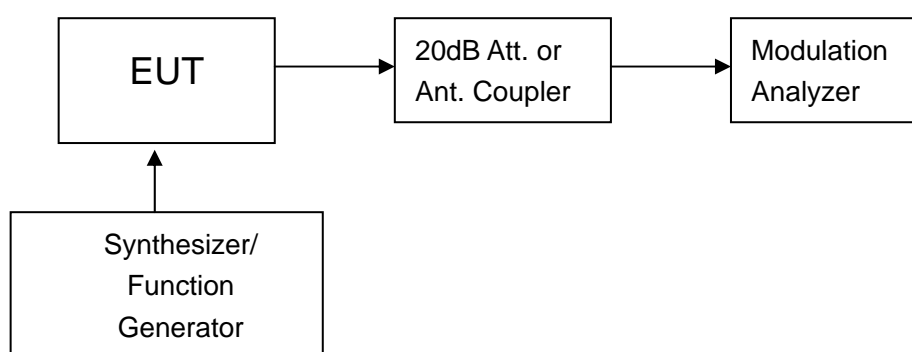
### 8.2 MEASUREMENT METHOD

#### 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.
- (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	8901B	3104A03367	2010.06



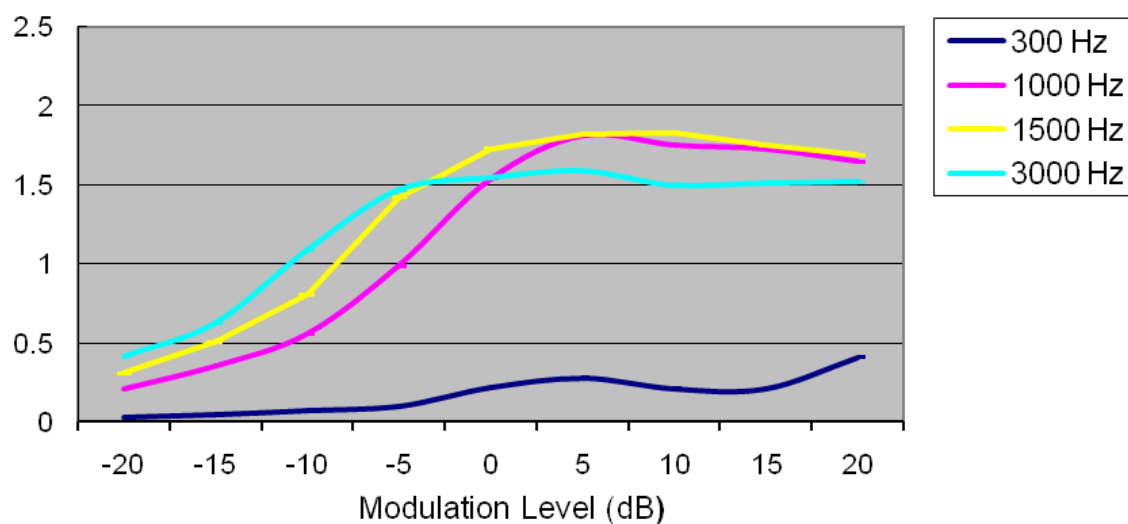
## 8.4 MEASUREMENT RESULT

### (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	0.03	0.21	0.31	0.42
-15	0.05	0.36	0.51	0.63
-10	0.07	0.56	0.81	1.09
-5	0.10	0.99	1.42	1.47
0	0.22	1.54	1.73	1.55
+5	0.28	1.81	1.82	1.59
+10	0.21	1.75	1.83	1.50
+15	0.21	1.73	1.75	1.51
+20	0.41	1.65	1.69	1.52

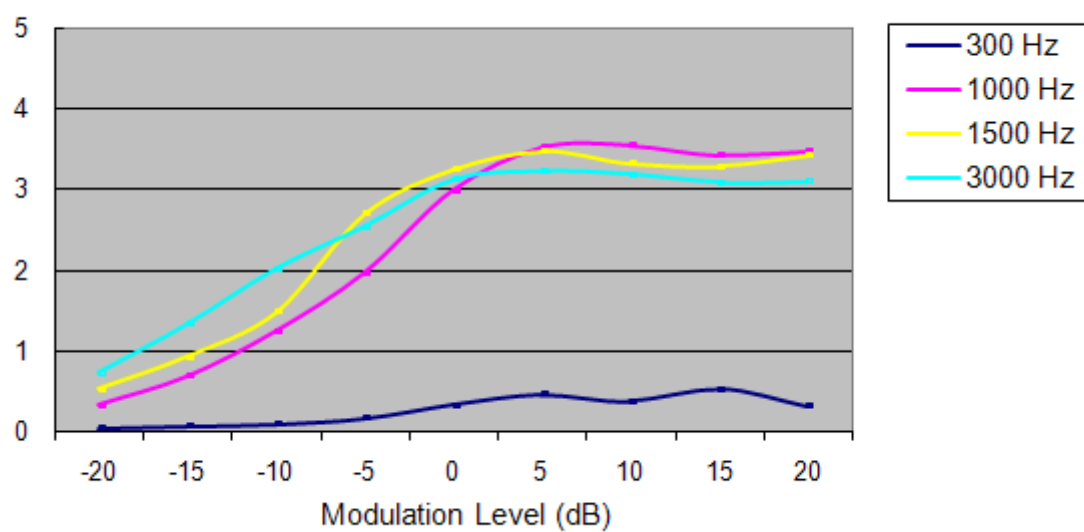
#### Modulation Limit



**Middle Channel @ 25KHz Channel Separation**

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	0.03	0.32	0.51	0.71
-15	0.05	0.68	0.91	1.32
-10	0.08	1.24	1.48	2.01
-5	0.15	1.96	2.69	2.53
0	0.32	2.98	3.24	3.11
+5	0.45	3.51	3.47	3.21
+10	0.37	3.54	3.32	3.18
+15	0.51	3.41	3.28	3.08
+20	0.31	3.47	3.41	3.09

**Modulation Limit**

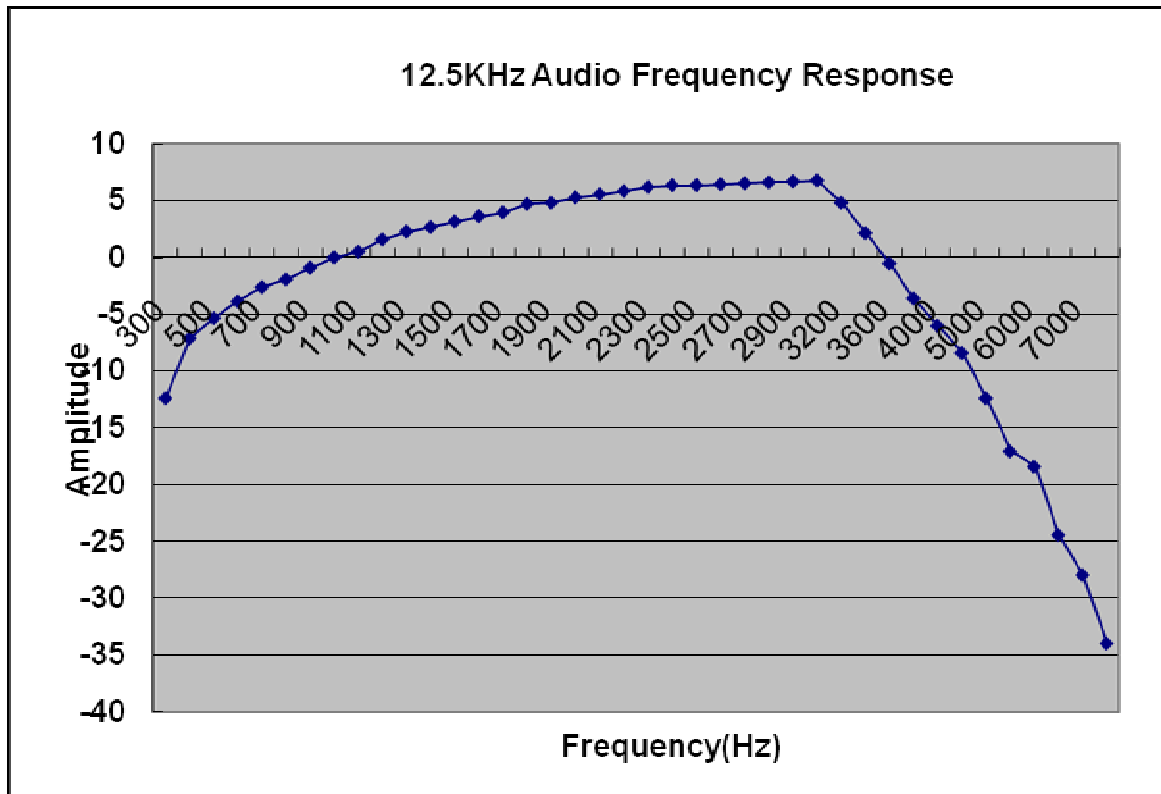


**(b). Audio Frequency Response:**

**12.5 KHz Channel Separation**

<b>Frequency (Hz)</b>	<b>Deviation (KHz)</b>
100	--
200	--
300	0.12
400	0.22
500	0.27
600	0.32
700	0.37
800	0.40
900	0.45
1000	0.50
1100	0.53
1200	0.60
1300	0.65
1400	0.68
1500	0.72
1600	0.76
1700	0.79
1800	0.86
1900	0.87
2000	0.92
2100	0.95
2200	0.98
2300	1.02
2400	1.04
2500	1.04
2600	1.05
2700	1.06
2800	1.07
2900	1.08
3000	1.10
3200	0.87
3400	0.64
3600	0.47
3800	0.33
4000	0.25
4500	0.19
5000	0.12
5500	0.07
6000	0.06
6500	0.03
7000	0.02
7500	0.01
8000	--
8500	--
9000	--
9500	--

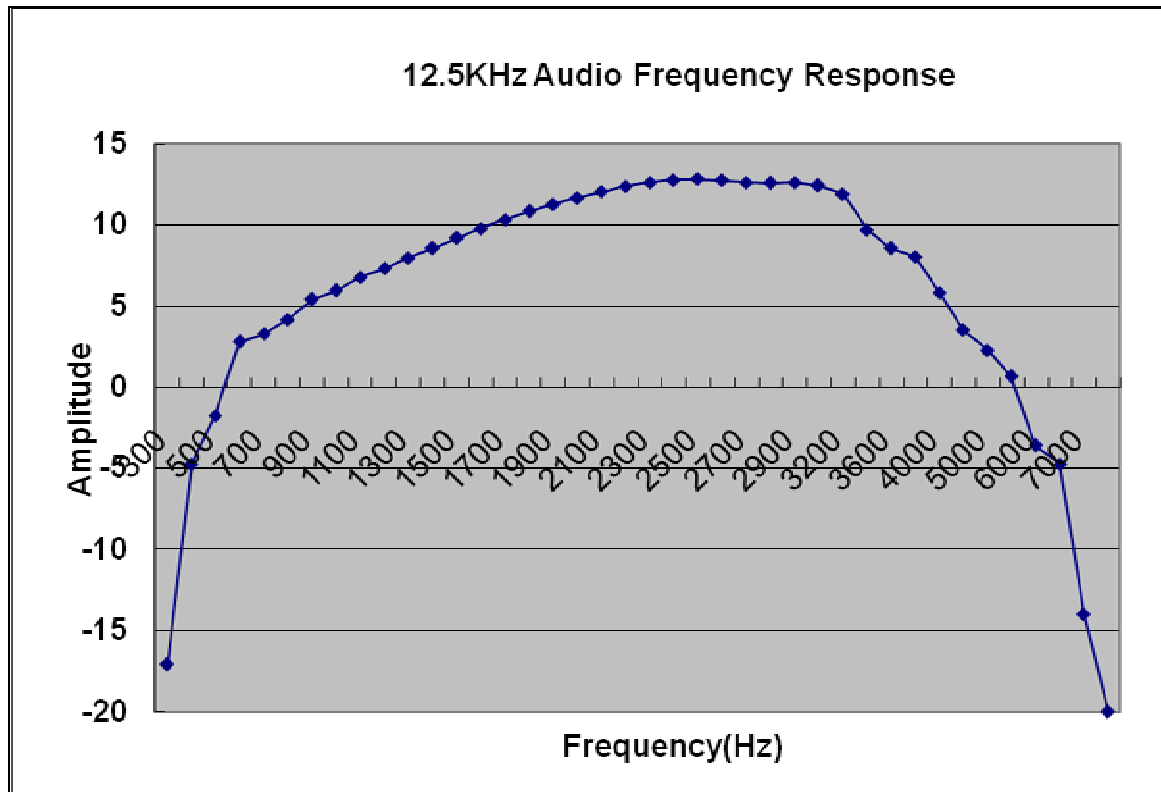
**Frequency Response of Middle Channel**



**25 KHz Channel Separation**

<b>Frequency (Hz)</b>	<b>Deviation (KHz)</b>
100	--
200	--
300	0.07
400	0.29
500	0.41
600	0.69
700	0.73
800	0.81
900	0.93
1000	0.99
1100	1.09
1200	1.16
1300	1.25
1400	1.34
1500	1.44
1600	1.54
1700	1.64
1800	1.74
1900	1.83
2000	1.92
2100	2.00
2200	2.08
2300	2.14
2400	2.18
2500	2.21
2600	2.17
2700	2.14
2800	2.13
2900	2.14
3000	2.09
3200	1.97
3400	1.53
3600	1.34
3800	1.26
4000	0.98
4500	0.75
5000	0.65
5500	0.54
6000	0.33
6500	0.29
7000	0.10
7500	0.05
8000	--
8500	--
9000	--
9500	--
10000	--

**Frequency Response of Middle Channel**



## 9. MAXIMUM TRANSMITTER POWER

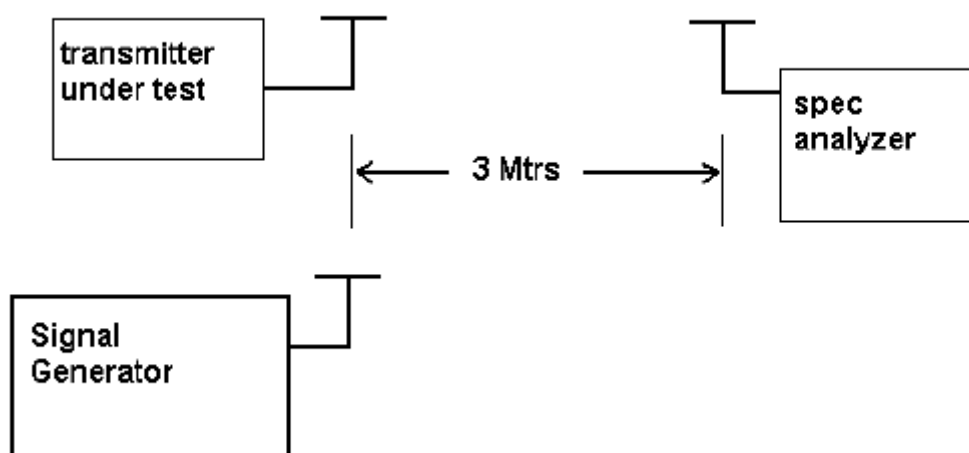
### 9.1 PROVISIONS APPLICABLE

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

### 9.2 TEST PROCEDURE

RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

**Test Setup Diagram:**



### 9.3 TEST RESULT

Conducted Power Measurement Results		
Channel Separation	Channel	Measurement Result
		For 1W
12.5 KHz	Bottom(450.025MHz)	0.89w(29.49dBm)
	Middle(460.000MHz)	0.96w(29.82dBm)
	Top (469.975MHz)	0.92w (29.63dBm)
25kHz	Bottom(450.025MHz)	0.86w(29.34dBm)
	Middle(460.000MHz)	0.93w(29.68dBm)
	Top (469.975MHz)	0.90w(29.54dBm)

## 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 <sub>1</sub> <sup>4</sup> .....	± 25.0 kHz	5.0 ms	10.0 ms
t <sub>2</sub> .....	± 12.5 kHz	20.0 ms	25.0 ms
t <sub>3</sub> <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 <sub>1</sub> <sup>4</sup> .....	± 12.5 kHz	5.0 ms	10.0 ms
t <sub>2</sub> .....	± 6.25 kHz	20.0 ms	25.0 ms
t <sub>3</sub> <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 <sub>1</sub> <sup>4</sup> .....	± 6.25 kHz	5.0 ms	10.0 ms
t <sub>2</sub> .....	± 3.125 kHz	20.0 ms	25.0 ms
t <sub>3</sub> <sup>4</sup> .....	± 6.25 kHz	5.0 ms	10.0 ms

<sup>1</sup>  $t_{on}$  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.

<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	2009.09
Oscilloscope	Tektronix	TDS3052	B017447	2009.10



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

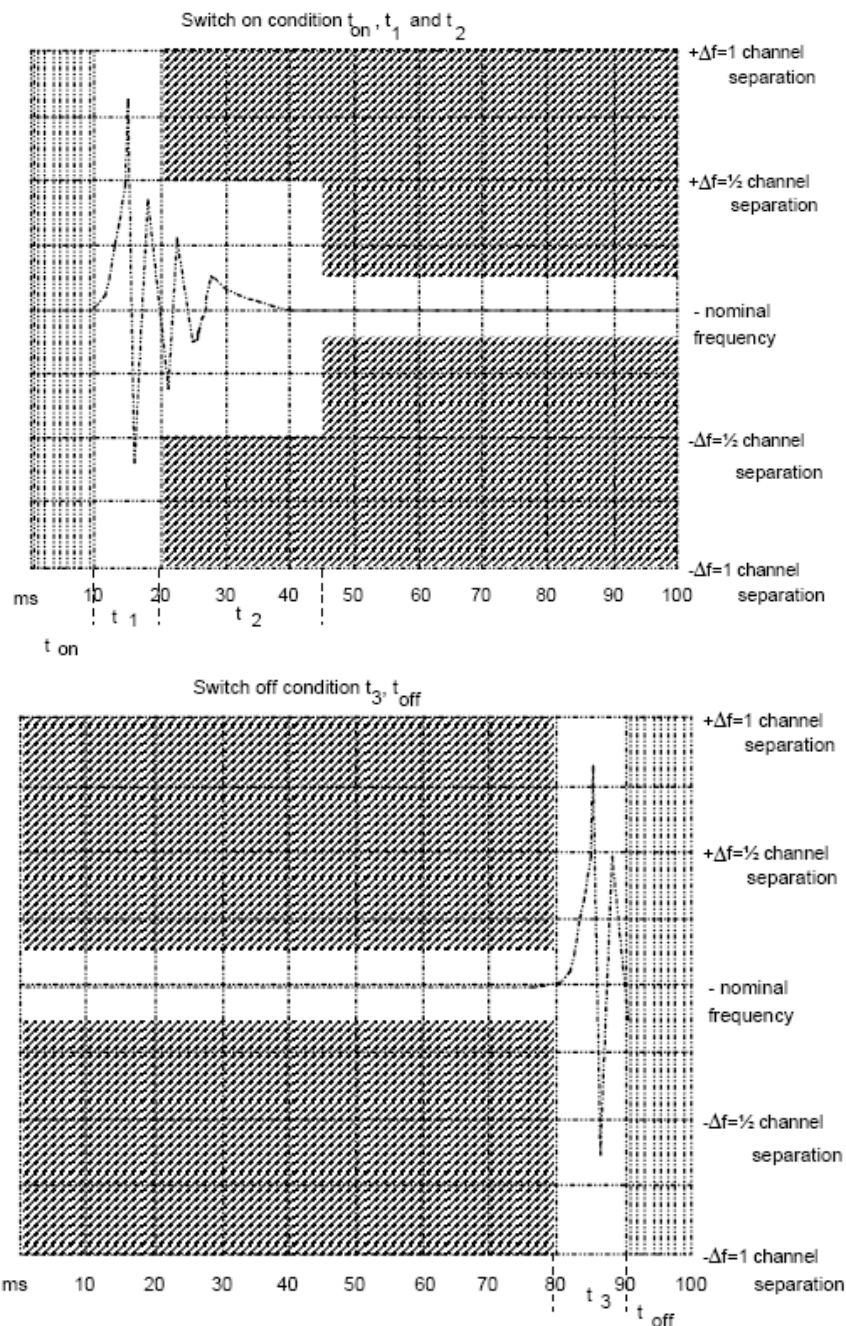
**ton**: The switch-on instant  $t_{on}$  of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the full output power (-30 dBc).

**t1**: period of time starting at  $t_{on}$  and finishing according to above 10.1

**t2**: period of time starting at the end of  $t_1$  and finishing according to above 10.1

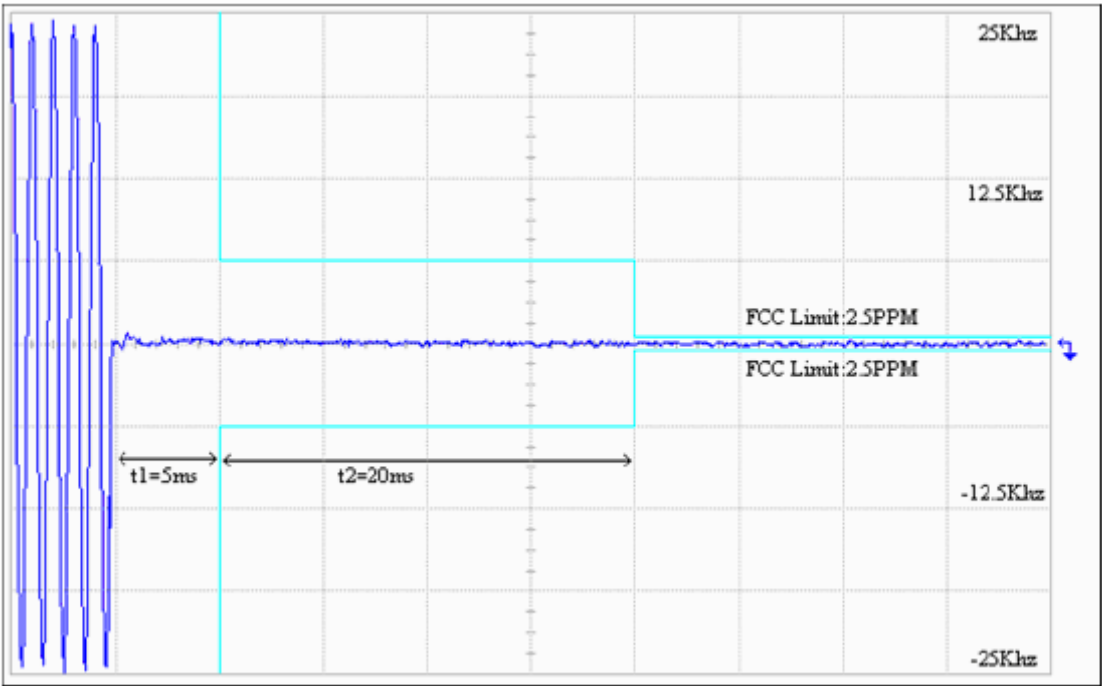
**toff**: switch-off instant defined by the condition when the output power falls below 0,1 % of the full output power (-30 dBc).

**t3**: period of time that finishing at  $t_{off}$  and starting according to above 10.1

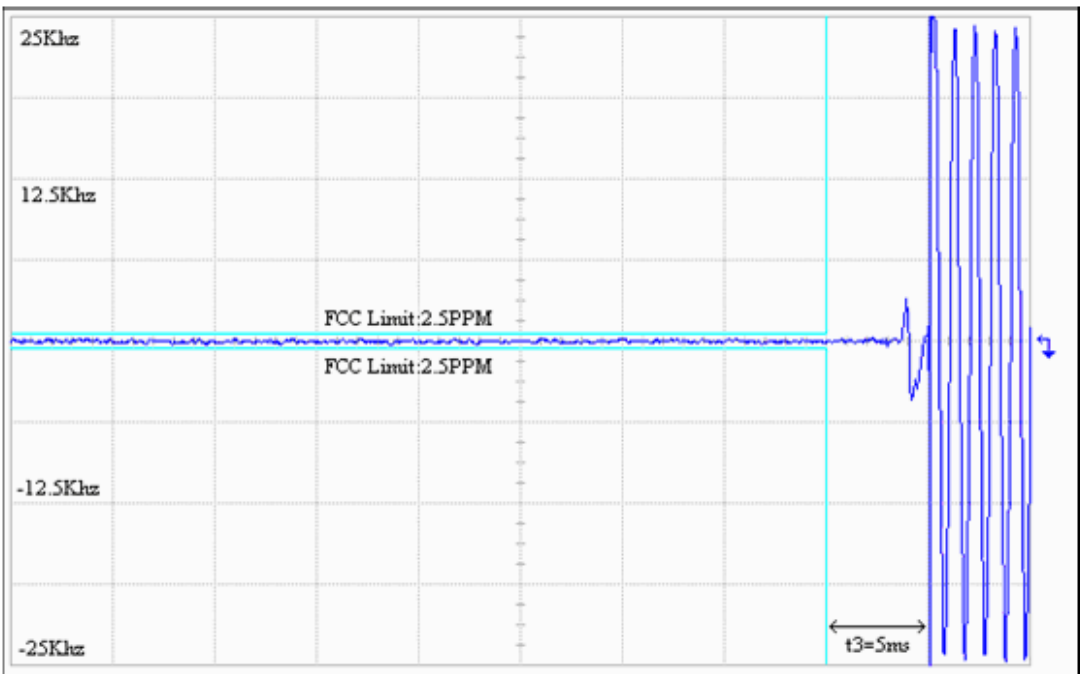


10.5 MEASURE RESULT

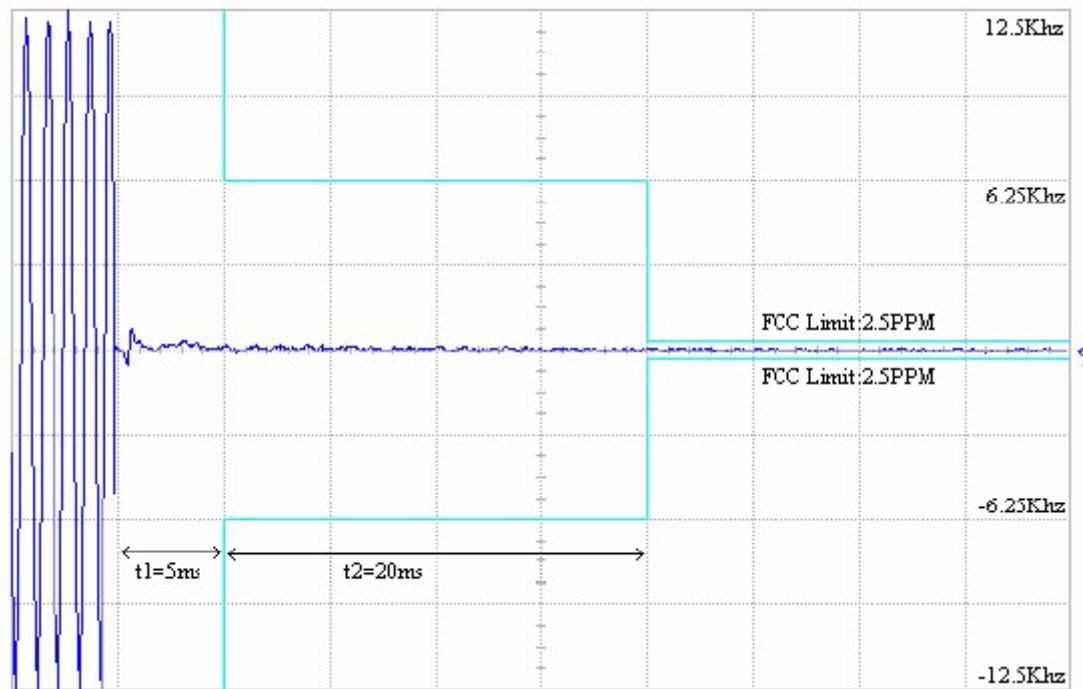
Transmitter Frequency Behavior @ 25 KHz Channel Separation--Off to On



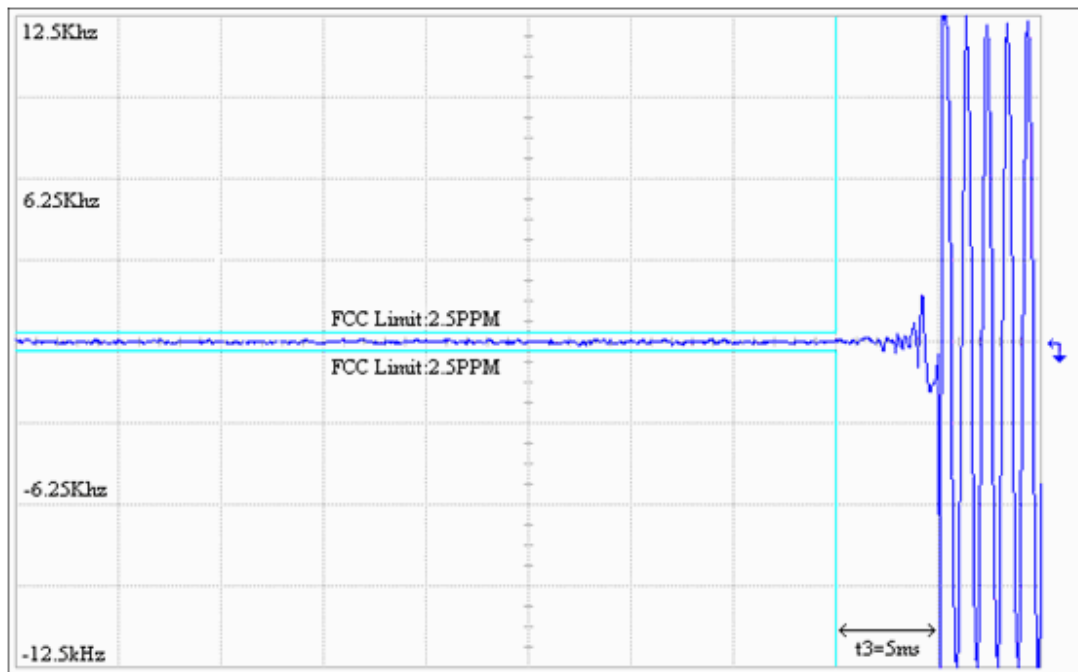
Transmitter Frequency Behaviour @ 25 KHz Channel Separation--On to Off



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



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



## 12. Radiated Emission on Receiving Mode

### 12.1 PROVISIONS APPLICABLE

FCC Part 15 Section 15.209

### 12.2 TEST METHOD

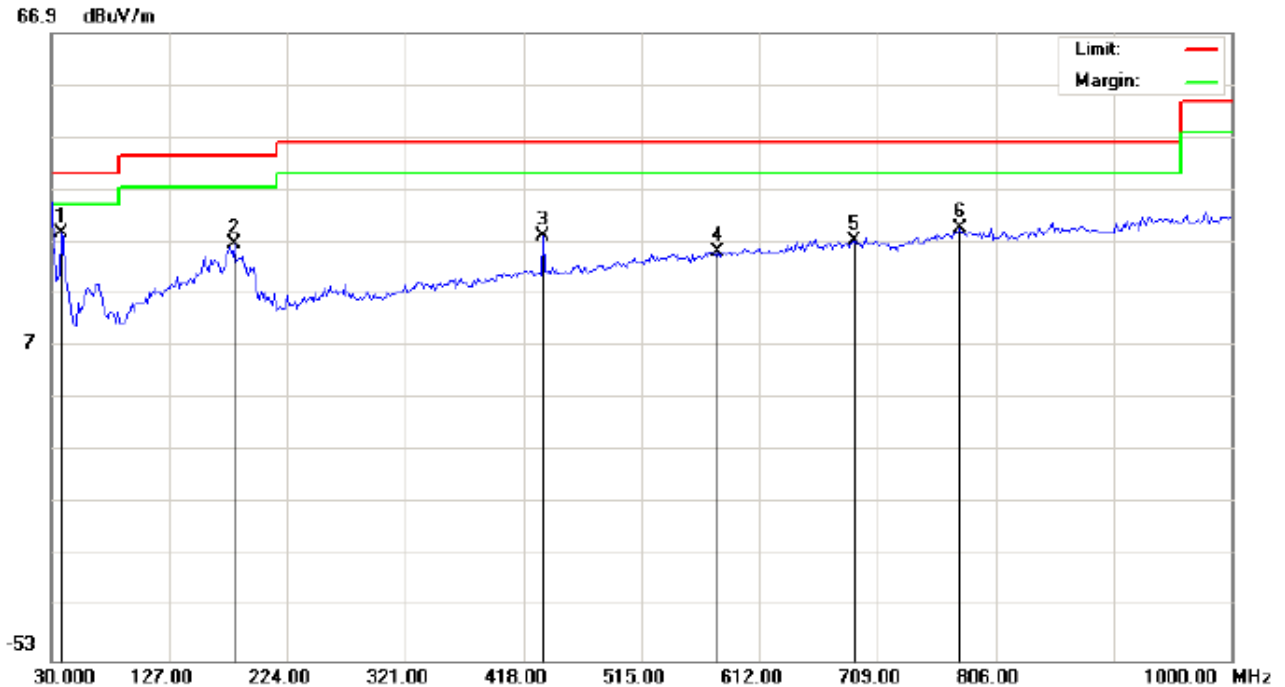
ANSI C 63.4: 2003

### 12.3 TEST INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2010.06
TEST RECEIVER	R&S	ESIB26	A0304218	2010.06
LOOP ANTENNA	R&S	HFH2-Z2	A0304220	2010.06
HORN ANT.	R&S	HF906	100150	2010.06
BROADBAND ANT.	R&S	HL562	A0304224	2010.06

## 12.4 MEASURE RESULT (MEASURED AT 3M USING FCC PART15 B LIMITS)

### RADIATED EMISSION TEST RESULTS – HORIZONTAL (30MHz-1GHz)



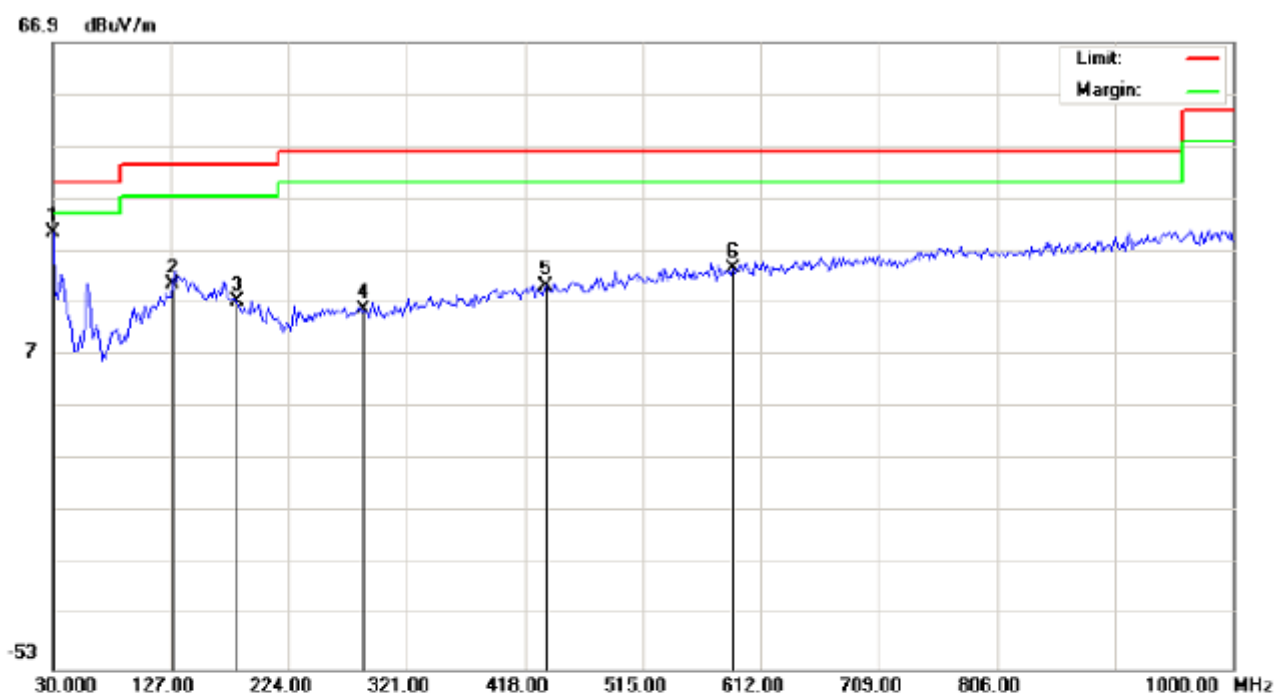
Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: TWO-WAY RADIO  
M/N: HD-1000  
Mode: RX  
Note:

Polarization: **Horizontal**  
Power:  
Distance: 3m

Temperature: 26  
Humidity: 60 %

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	*	38.0833	11.94	16.57	28.51	40.00	-11.49	peak			
2		180.3499	7.66	18.77	26.43	43.50	-17.07	peak			
3		434.1666	6.65	21.47	28.12	46.00	-17.88	peak			
4		578.0499	0.48	24.65	25.13	46.00	-20.87	peak			
5		689.6000	0.89	26.29	27.18	46.00	-18.82	peak			
6		776.8999	1.37	28.12	29.49	46.00	-16.51	peak			

## RADIATED EMISSION TEST RESULTS – VERTICAL (30MHz-1GHz)



Site: site #1

Limit: FCC Class B 3M Radiation

EUT: TWO-WAY RADIO

M/N: HD-1000

Mode:

Note:

Polarization: Vertical

Power:

Distance: 3m

Temperature: 26

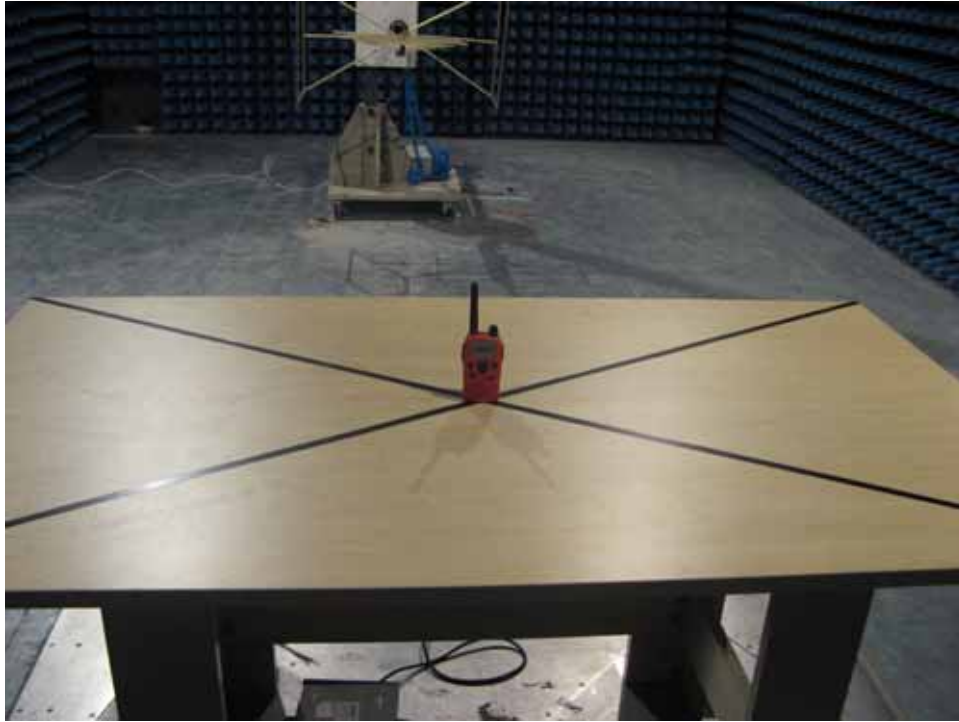
Humidity: 60 %

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	*	30.0000	10.63	19.75	30.38	40.00	-9.62	peak			
2		128.6167	1.50	19.12	20.62	43.50	-22.88	peak			
3		181.9667	-1.14	18.47	17.33	43.50	-26.17	peak			
4		285.4332	-1.44	17.11	15.67	46.00	-30.33	peak			
5		435.7832	-1.34	21.47	20.13	46.00	-25.87	peak			
6		589.3667	-1.37	24.79	23.42	46.00	-22.58	peak			

## **APPENDIX I**

### **PHOTOGRAPHS OF SETUP**

## RADIATED TEST SETUP





## **APPENDIX II**

### **EXTERNAL 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



VIEW OF PCB-1



VIEW OF PCB-2





VIEW OF PCB-3



VIEW OF PCB-4



----END OF REPORT----