FCC PART90 &RSS-119 TEST REPORT
FCC ID : 2ABNA-TRM100
IC : 11648A-TRM100

Product: Wireless Data Transceiver Module

Trade Name: Geoelectron

Model No: TRM100

Report No.: STUEMO016010601729F

Prepared for

Guangzhou Geoelectron Science & Technology Company Limited

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VERIFICATION OF COMPLIANCE

Applicant:	Guangzhou Geoelectron Science & Technology Company Limited
	No.704, 7/F, Building C, No.7, Cai Pin Road, Science City, Luogang District, Guangzhou, China
Manufacturer:	Guangzhou Geoelectron Science & Technology Company Limited
	No.704, 7/F, Building C, No.7, Cai Pin Road, Science City, Luogang District, Guangzhou, China
Product Description:	Two way radio
Brand Name:	Geoelectron
Model Name:	TRM100
Model difference:	N/A
Date of Test:	Feb.10 to Feb.19, 2016

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 63.4:2014 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part 90 and RSS-119 requirements.

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

Testing Engineer : 

(Ken Li)

Technical Manager : 

(Jimmy Yao)

Authorized Signatory : 

(Terry Yang)

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Modulation	GSMK
Emission Bandwidth	10.42kHz/15.43kHz (Limite:11.25KHz/20KHz)
Peak Frequency Deviation	0.369 KHz for 12.5 KHz Channel Separation (Limit<±2.5 KHz)
	0.428 KHz for 25 KHz Channel Separation (Limit<±5 KHz)
Maximum Transmitter Power	29.43dBm for 12.5 KHz Channel Separation
	29.44dBm for 25.0KHz Channel Separation
Bit Rate of Transmitter	9600bps(12.5KHz) 19200bps(25KHz)
Output power Modification	1W (It was fixed by the manufacturer, any individual can't arbitrarily change it)
Antenna Designation	Detachable
Power Supply	DC 3.3V
Operation Frequency Range and Channel	Frequency Range:410MHz to 470MHz Close frequency through software: (454-456MHz,462.375-462.825MHz,467.5375-467.7375MHz) Channel Separation: 12.5KHz and 25KHz
	Top Channel: 469.5MHz, Centre Channel: 440.0MHz, Bottom Channel: 410.5MHz,
Frequency Tolerance	0.908ppm for 12.5 KHz Channel Separation 1.054 ppm for 25.0 KHz Channel Separation
Transmitter Spurious (Worst case)	-34.31dBm

1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: 2ABNA-TRM100 and IC ID: 11648A-TRM100, filing to comply with the FCC Part 90 and RS-119 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

BZT Testing Technology Co., Ltd
Add.: Buliding 17,Xinghua Road Xingwei industrial Park Fuyong,Baoan District, Shenzhen, Guangdong,China
FCC Registration No.: 701733

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	Wireless Data Transceiver Module	TRM100	FCC ID: 2ABNA-TRM100 IC ID: 11648A-TRM100	EUT
2	--	--	--	--
--	--	--	--	--

3. SUMMARY OF TEST RESULTS

FCC Rules	RS-119	Description Of Test	Result
§15.207	RS-Gen	Conducted Emission	Compliant
§90.205	§5.4	Maximum Transmitter Power	Compliant
§90.207	§5.13	Modulation Characteristic	Compliant
§90.209	§5.5	Occupied Bandwidth	Compliant
§90.210	§5.8	Emission Mask	Compliant
§90.213	§5.3	Frequency Tolerance	Compliant
§90.214	§5.9	Transient Frequency Behavior	Compliant
§15.109	RS-Gen	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/ 25 KHz).

5. CONDUCTED LIMITS

5.1 PROVISIONS APPLICABLE

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the, the radio frequency voltage that is conducted back onto the AC power line on any frequencies within the band 150 KHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50uH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

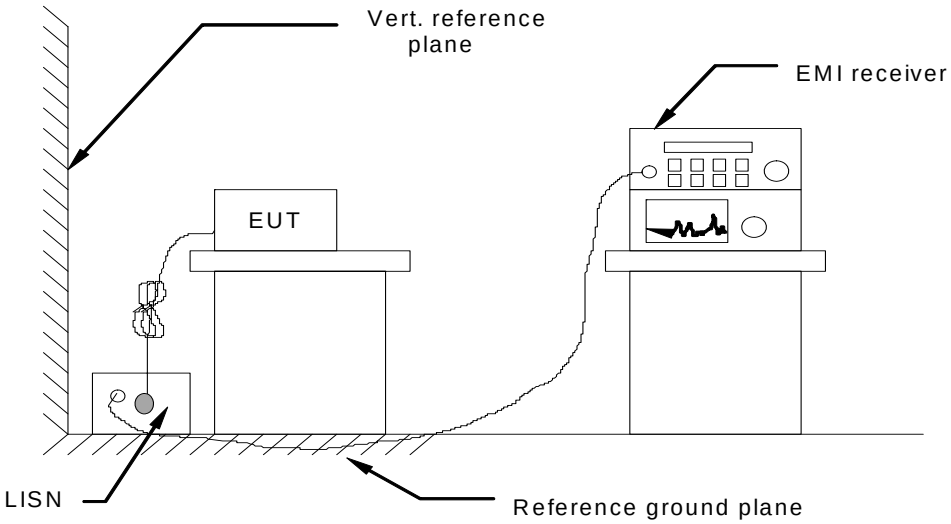
Frequency of Emission (MHz)	Conducted Limit(dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

5.2 MEASUREMENT PROCEDURE

(1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When 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 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
(2) Support equipment, if needed, was placed as per ANSI C63.4.
(3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
(4) The EUT 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 150kHz to 30MHz for emissions in each of the test modes.
During the above scans, the emissions were maximized by cable manipulation.

5.3 TEST SETUP BLOCK DIAGRAM



5.4 TEST EQUIPMENT USED

Conducted Emission Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal. Date**
TEST RECEIVER	R&S	FCKL1528	A0304230	2015.06
LISN	SCHWARZBECK	NSLK8127	A0304233	2015.06

5.5 TEST RESULT

N/A

6. FREQUENCY TOLERANCE

6.1 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℃ to +50℃ 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.

6.2 MEASUREMENT PROCEDURE

6.2.1 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℃. 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℃ decreased per stage until the lowest temperature -30℃ is measured, record all measured frequencies on each temperature step.

6.2.2 Frequency stability versus input voltage

1. Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15℃ to 25℃. Otherwise, an environment chamber set for a temperature of 20℃ shall be used. The EUT shall be powered by DC 3.3V
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.

6.3 TEST SETUP BLOCK DIAGRAM

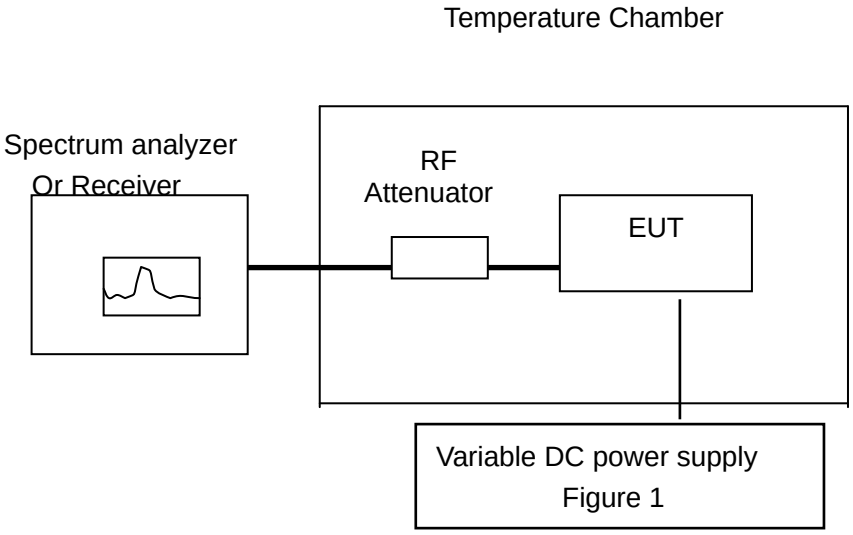


Figure 1

6.4 TEST EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Receiver	R&S	ESIB26	A0304218	2015.06
Climate Chamber	Albatross	--	--	2015.12

6.5 TEST RESULT

(1) Frequency stability versus input voltage (Supply nominal voltage is 3.3V)

Bottom Channel @ 12.5 KHz Channel Separation

Reference Frequency:	410.5 MHz	Limit:	2.5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(℃)	(V)	(MHz)	ppm
50	3.3	410.500358	0.872
40	3.3	410.500296	0.721
30	3.3	410.500257	0.626
20	3.3	410.500241	0.587
10	3.3	410.500197	0.480
0	3.3	410.500165	0.402
-10	3.3	410.500158	0.385
-20	3.3	410.500124	0.302
-30	3.3	410.500099	0.241

Middle Channel @ 12.5 KHz Channel Separation

Reference Frequency:	440.0 MHz	Limit:	2.5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(℃)	(V)	(MHz)	ppm
50	3.3	440.000379	0.861
40	3.3	440.000335	0.761
30	3.3	440.000289	0.657
20	3.3	440.000278	0.632
10	3.3	440.000187	0.425
0	3.3	440.000187	0.425
-10	3.3	440.000161	0.366
-20	3.3	440.000151	0.343
-30	3.3	440.000099	0.225

Top Channel @ 12.5KHz Channel Separation

Reference Frequency:	469.5 MHz	Limit:	2.5ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(℃)	(V)	(MHz)	ppm
50	3.3	469.500361	0.769
40	3.3	469.500335	0.714
30	3.3	469.500281	0.599
20	3.3	469.500225	0.479
10	3.3	469.500226	0.481
0	3.3	469.500163	0.347
-10	3.3	469.500151	0.322
-20	3.3	469.500141	0.300
-30	3.3	469.500088	0.187

Bottom Channel @ 25.0 KHz Channel Separation

Reference Frequency:	410.5 MHz	Limit:	5.0ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(℃)	(V)	(MHz)	ppm
50	3.3	410.500421	1.026
40	3.3	410.500367	0.894
30	3.3	410.500299	0.728
20	3.3	410.500287	0.699
10	3.3	410.500238	0.580
0	3.3	410.500221	0.538
-10	3.3	410.500201	0.490
-20	3.3	410.500187	0.456
-30	3.3	410.500111	0.270

Middle Channel @ 25.0 KHz Channel Separation

Reference Frequency:	440.0 MHz	Limit:	5.0ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(℃)	(V)	(MHz)	ppm
50	3.3	440.000433	0.984
40	3.3	440.000401	0.911
30	3.3	440.000381	0.866
20	3.3	440.000299	0.680
10	3.3	440.000253	0.575
0	3.3	440.000221	0.502
-10	3.3	440.000221	0.502
-20	3.3	440.000164	0.373
-30	3.3	440.000113	0.257

Top Channel @ 25.0 KHz Channel Separation

Reference Frequency:	469.5 MHz	Limit:	5.0ppm
Envionment Temperature	Power Supply	Frequency Deviation	
(℃)	(V)	(MHz)	ppm
50	3.3	469.500461	0.982
40	3.3	469.500431	0.918
30	3.3	469.500381	0.812
20	3.3	469.500321	0.684
10	3.3	469.500307	0.654
0	3.3	469.500263	0.560
-10	3.3	469.500191	0.407
-20	3.3	469.500155	0.330
-30	3.3	469.500097	0.207

7. EMISSION BANDWIDTH

7.1 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

7.2 MEASUREMENT PROCEDURE

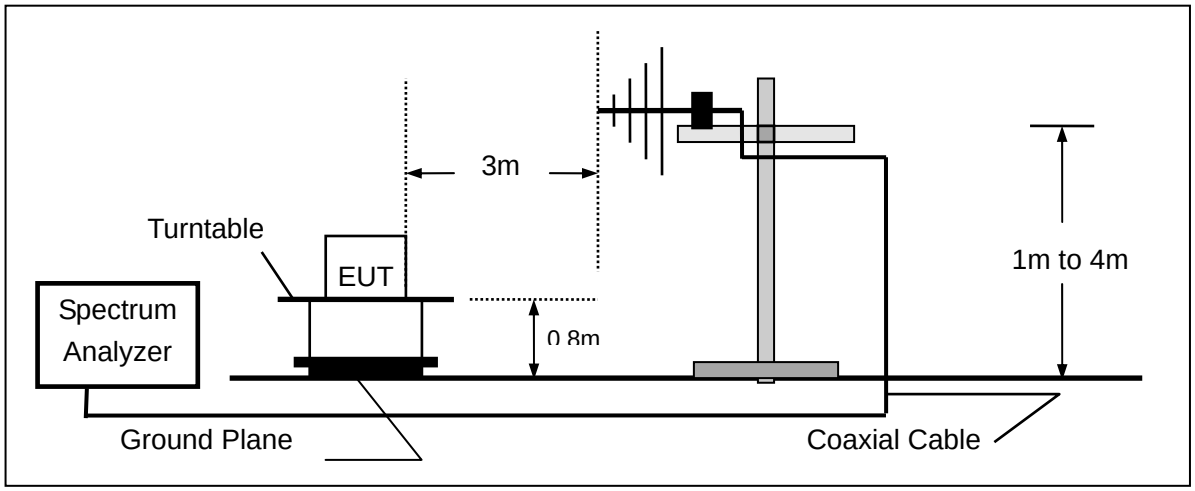
1). The EUT was placed on a turn table which is 0.8m above ground plane.

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.

7.3 TEST SETUP BLOCK DIAGRAM



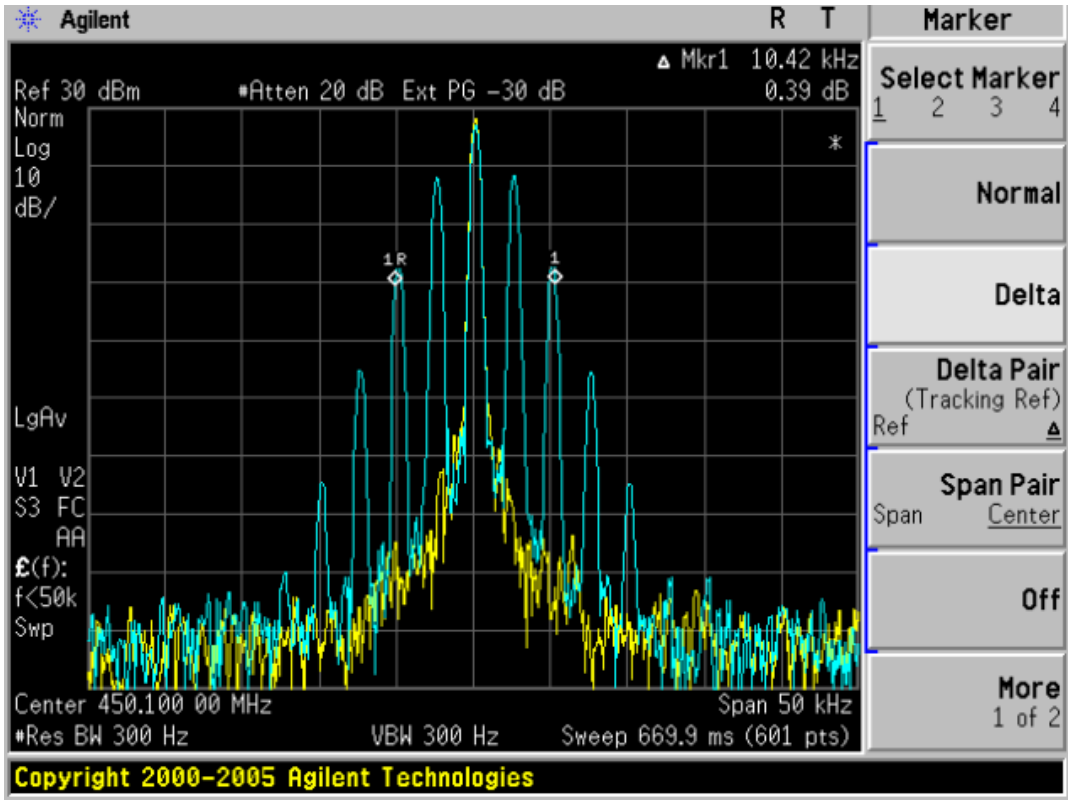
7.4 MEASUREMENT EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2015.06
MODULATION ANALYZER	HP	8901B	3104A03367	2015.06
BROADBAND ANT.	R&S	HL562	A0304224	2015.06

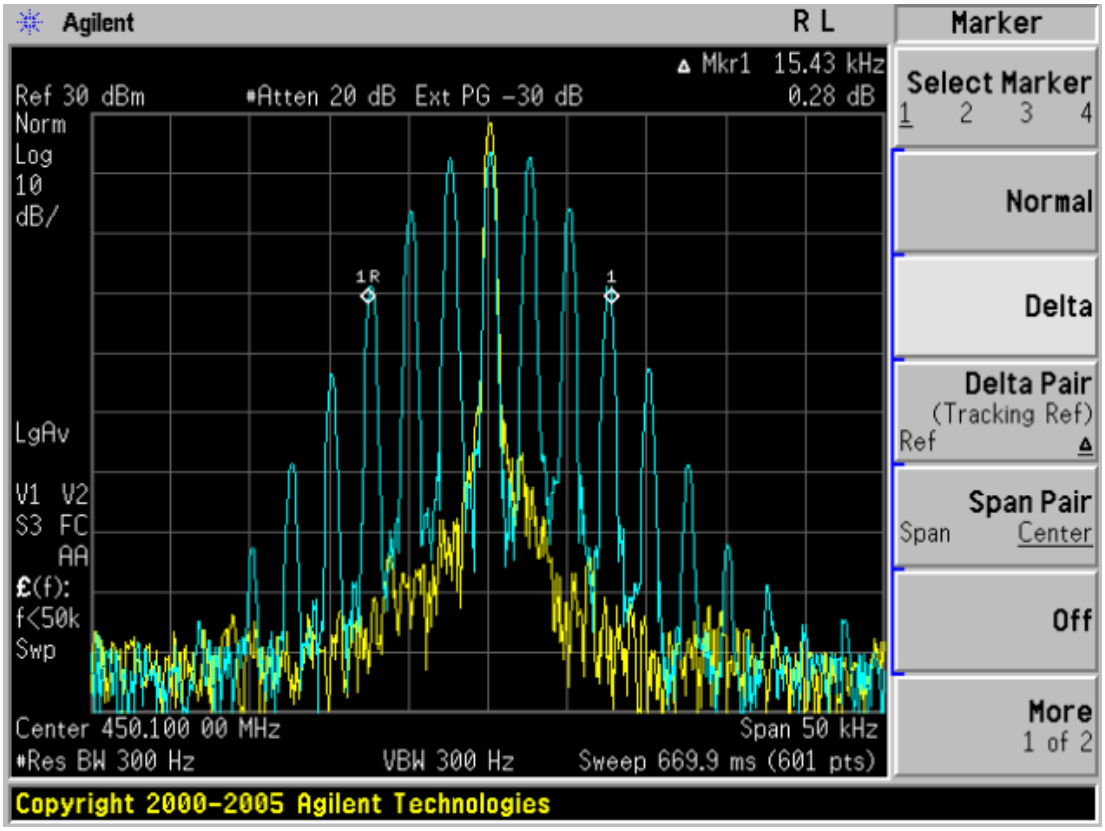
7.5 MEASUREMENT RESULT:

26 dB Bandwidth Measurement Result						
Operating Frequency	12.5 KHz Channel Separation			25 KHz Channel Separation		
	Test Data	Limits	Result	Test Data	Limits	Result
410.5MHz	10.27 KHz	11.25 KHz	Pass	15.31KHz	20.00 KHz	Pass
440.0MHz	10.42KHz	11.25 KHz	Pass	15.43 KHz	20.00 KHz	Pass
469.5MHz	10.25 KHz	11.25 KHz	Pass	15.21 KHz	20.00 KHz	Pass

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



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



8. UNWANTED RADIATION

8.1 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 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 7.27(fd-2.88 KHz) dB

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

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+10Log(P) dB.

8.2 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.

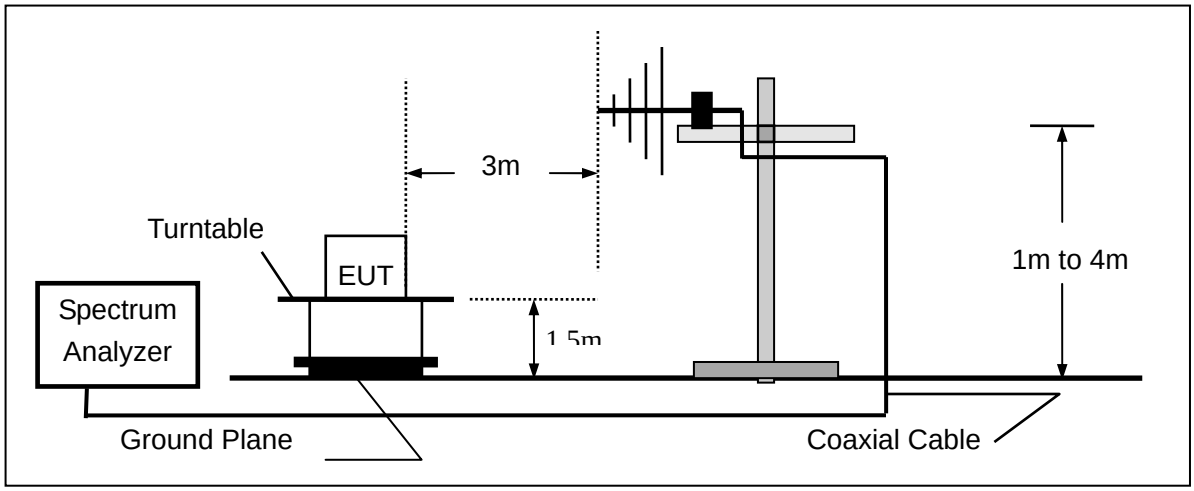
(5)The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

(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.

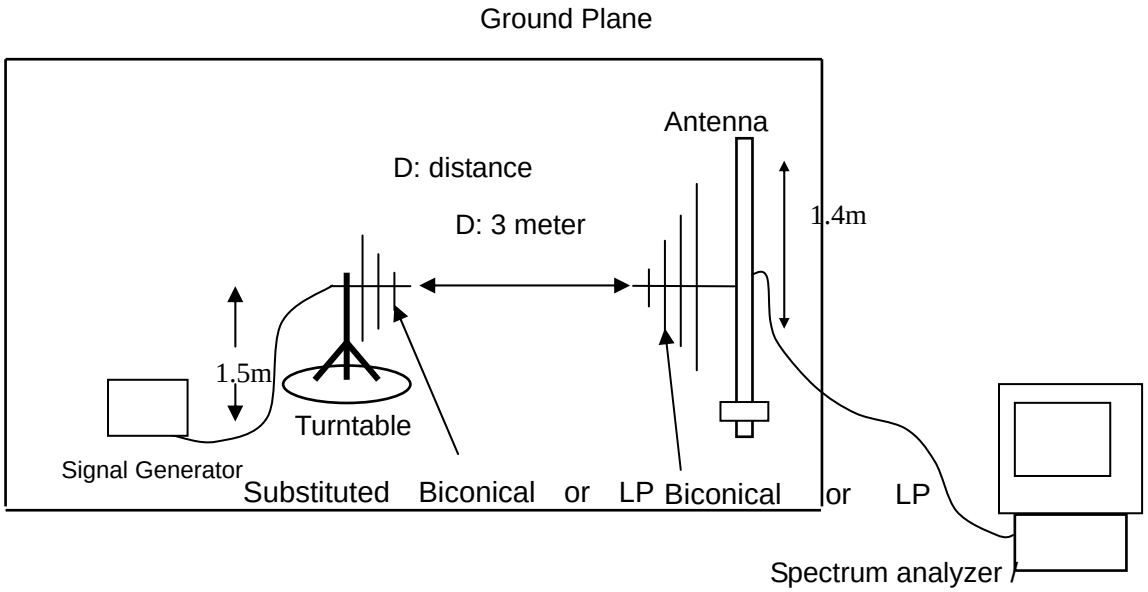
(8)The maximum signal level detected by the measuring receiver shall be noted.
(9)The measurement shall be repeated with the test antenna set to horizontal polarization.
(10) Replace the antenna with a proper Antenna (substitution antenna).
(11)The substitution antenna shall be oriented for vertical 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.

8.3 TEST SETUP BLOCK DIAGRAM

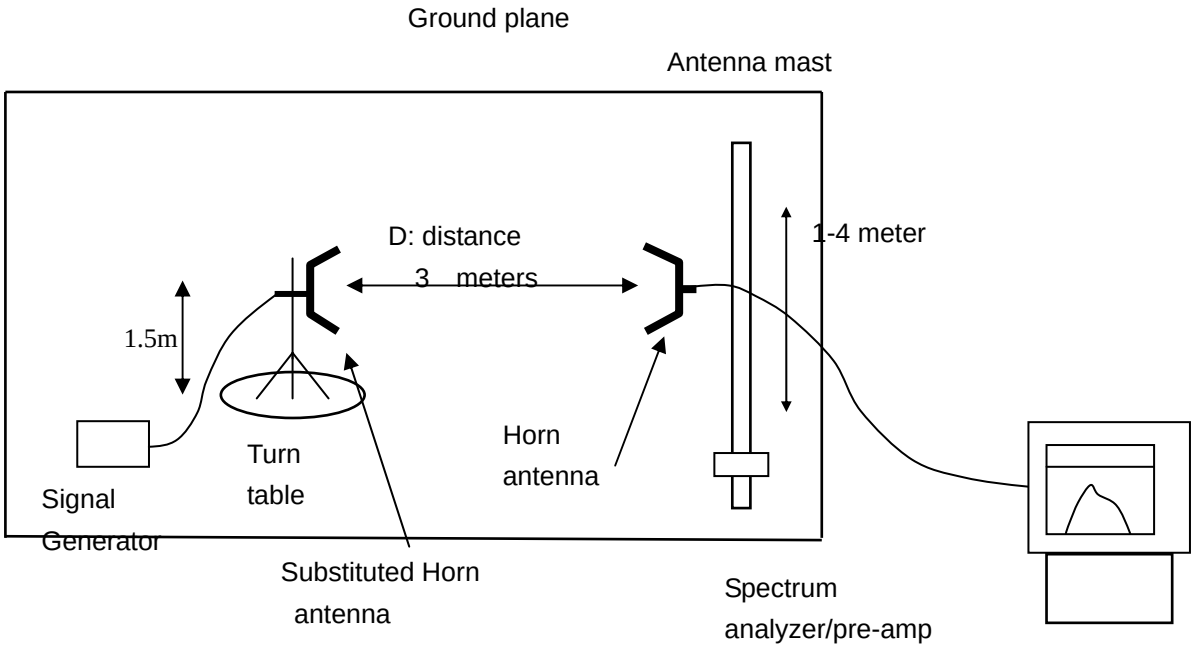


SUBSTITUTION METHOD: (Radiated Emissions)

Radiated Below 1GHz



Radiated Above 1 GHz



8.4 MEASUREMENT EQUIPMENT USED:

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2015.06
TEST RECEIVER	R&S	ESIB26	A0304218	2015.06
LOOP ANTENNA	R&S	HFH2-Z2	A0304220	2015.06
HORN ANT.	R&S	HF906	100150	2015.06
BROADBAND ANT.	R&S	HL562	A0304224	2015.06

8.5 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 (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: At least 50+10 log (P) =50+10log(4)=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+10Log(P) dB.

Limit: At least 43+10 log (P) =43+10log(4)=43

Measurement Result for 25 KHz Channel Separation @ 410.5MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
410.500	v	0		pass
821.000	v	75.33(-39.33dBm)	43	pass
1231.500	v	76.65	43	pass
1642.000	v	76.22	43	pass
2052.500	v	85.76	43	pass
2463.000	v	92.58	43	pass
2873.500	v	94.67	43	pass
3284.000	v	95.53	43	pass
3694.500	v	96.09	43	pass
4105.000	v	96.22	43	pass

Measurement Result for 25 KHz Channel Separation @ 440.0MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
440.000	v	0		pass
880.000	v	75.55(-39.55dBm)	43	pass
1320.000	v	81.11	43	pass
1760.000	v	84.21	43	pass
2200.000	v	87.43	43	pass
2640.000	v	91.76	43	pass
3080.000	v	93.77	43	pass
3520.000	v	94.44	43	pass
3960.000	v	91.56	43	pass
4400.000	v	97.22	43	pass

Measurement Result for 25 KHz Channel Separation @ 469.95MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
469.500	v	0		pass
939.000	v	77.43(-41.43dBm)	43	pass
1408.500	v	78.67	43	pass
1878.000	v	79.77	43	pass
2347.500	v	84.67	43	pass
2817.000	v	91.67	43	pass
3286.500	v	92.32	43	pass
3756.000	v	93.78	43	pass
4225.500	v	94.45	43	pass
4695.000	v	92.76	43	pass

Measurement Result for 12.5 KHz Channel Separation @ 410.5MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
410.500	v	0		pass
821.000	v	70.31(-34.31dBm)	50	pass
1231.50	v	75.41(-39.41dBm)	50	pass
1642.000	v	78.21	50	pass
2052.500	v	85.32	50	pass
2463.000	v	82.56	50	pass
2873.500	v	90.55	50	pass
3284.000	v	92.34	50	pass
3694.500	v	91.25	50	pass
4105.000	v	92.65	50	pass

Measurement Result for 12.5 KHz Channel Separation @ 440.0MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
440.000	v	0		pass
880.000	v	73.44(-36.44dBm)	50	pass
1320.000	v	76.21	50	pass
1760.000	v	80.13	50	pass
2200.000	v	83.42	50	pass
2640.000	v	89.68	50	pass
3080.000	v	91.16	50	pass
3520.000	v	92.56	50	pass
3960.000	v	93.67	50	pass
4400.000	v	95.33	50	pass

Measurement Result for 12.5 KHz Channel Separation @ 469.5MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result Below carrier(dBc)	Limit	Result(P/F)
469.500	v	0		pass
939.000	v	74.21(-38.21dBm)	50	pass
1408.500	v	83.34	50	pass
1878.000	v	85.64	50	pass
2347.500	v	87.52	50	pass
2817.000	v	92.46	50	pass
3286.500	v	93.26	50	pass
3756.000	v	95.76	50	pass
4225.500	v	95.21	50	pass
4695.000	v	93.77	50	pass

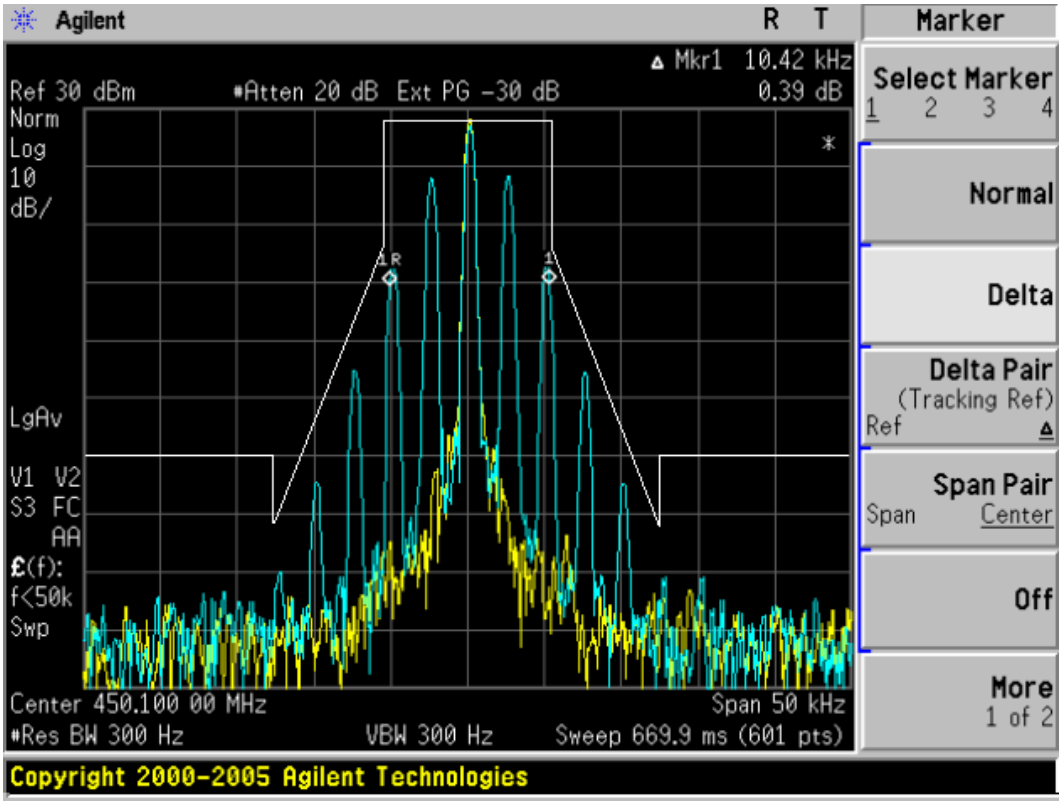
Notes: The emissions were scanned from 30 MHz to 10th harmonics; The worst case for Transmitter spurious is 36dBm-70.31dBc=-34.31dBm

8.6 EMISSION MASK PLOT

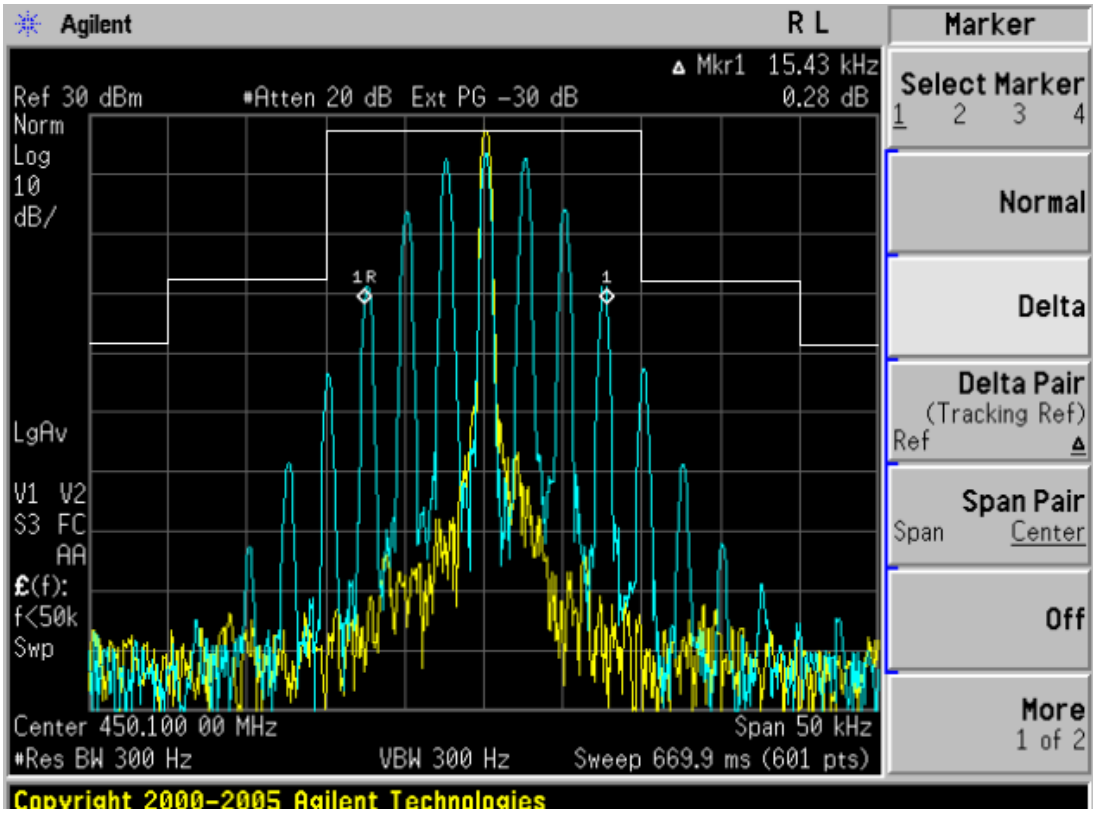
The detailed procedure employed for Emission Mask measurements are specified as following:

- 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 (1W)



The Worst Emission Mask for 25 KHz channel Separation (1W)



9. MODULATION CHARACTERISTICS

9.1 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.

9.2 MEASUREMENT METHOD

9.2.1 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.

9.2.2 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 = 20log10 (Deviation of test frequency/Deviation of 1 KHz reference).

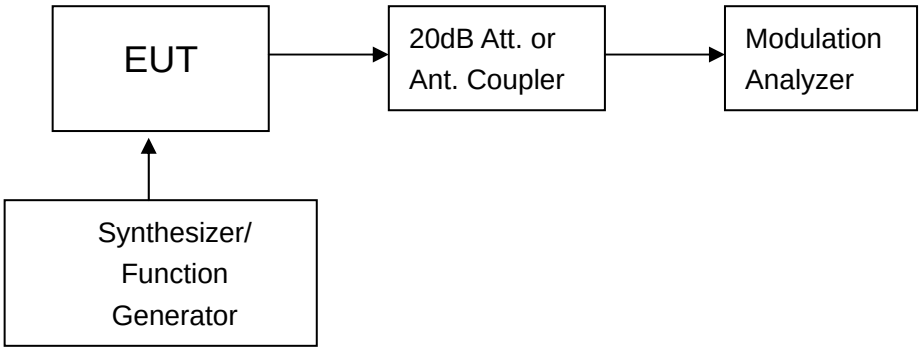


Figure 1: Modulation characteristic measurement configuration

9.3 MEASUREMENT INSTRUMENTS

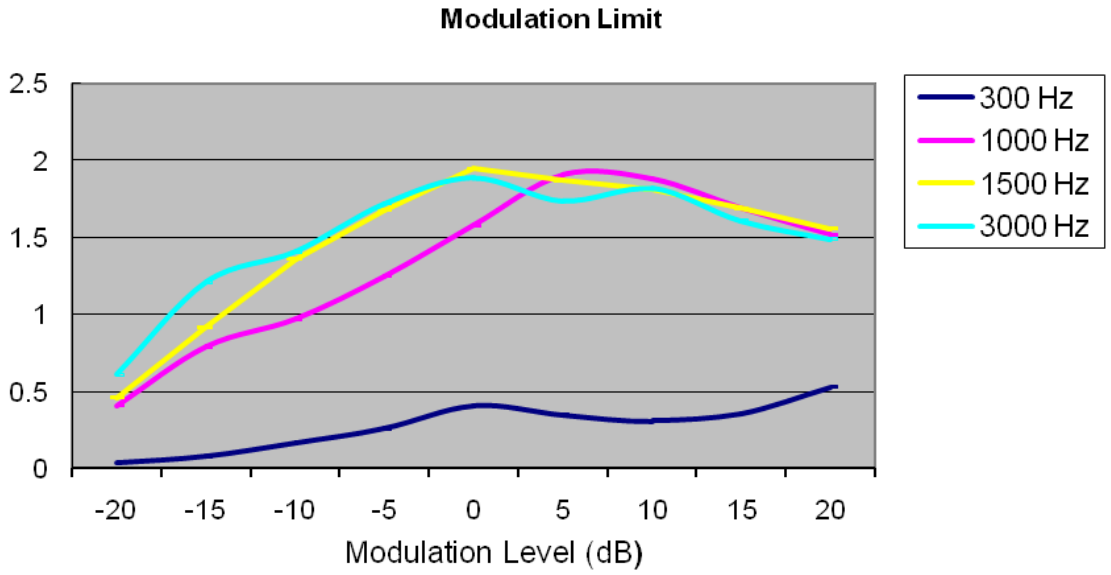
NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Modulation Analyzer	HP	8901B	3104A03367	2015.06

9.4 MEASUREMENT RESULT

(a). Modulation Limit:

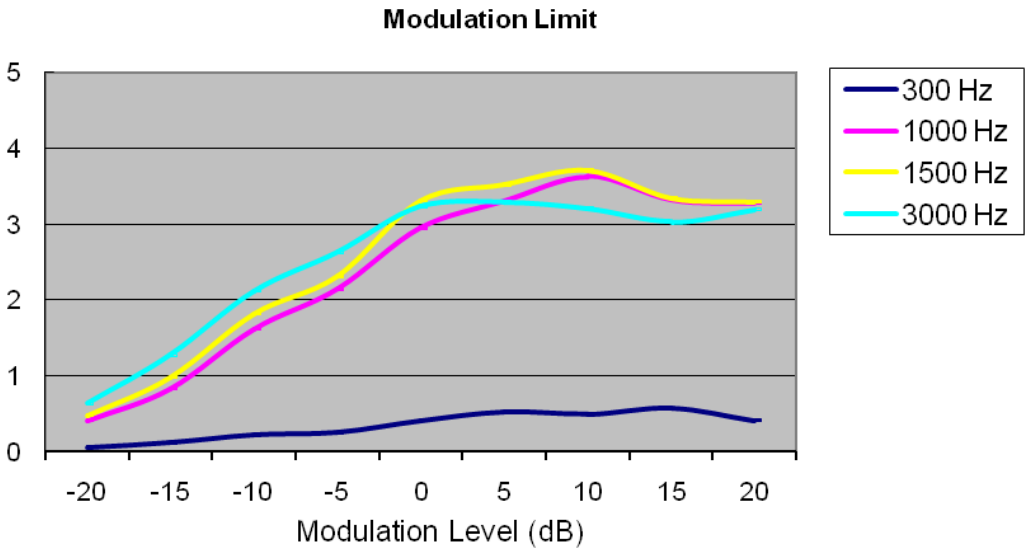
Middle Channel @ 12.5 KHz Channel Separations

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	0.04	0.41	0.46	0.61
-15	0.08	0.79	0.92	1.21
-10	0.17	0.97	1.36	1.41
-5	0.26	1.25	1.68	1.72
0	0.41	1.58	1.95	1.89
+5	0.35	1.91	1.87	1.74
+10	0.31	1.88	1.81	1.82
+15	0.36	1.69	1.69	1.61
+20	0.53	1.52	1.56	1.49



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	0.06	0.41	0.48	0.64
-15	0.12	0.83	0.98	1.27
-10	0.22	1.62	1.82	2.12
-5	0.25	2.14	2.31	2.63
0	0.41	2.95	3.31	3.23
+5	0.52	3.31	3.52	3.29
+10	0.49	3.63	3.71	3.21
+15	0.57	3.32	3.34	3.03
+20	0.41	3.28	3.29	3.19

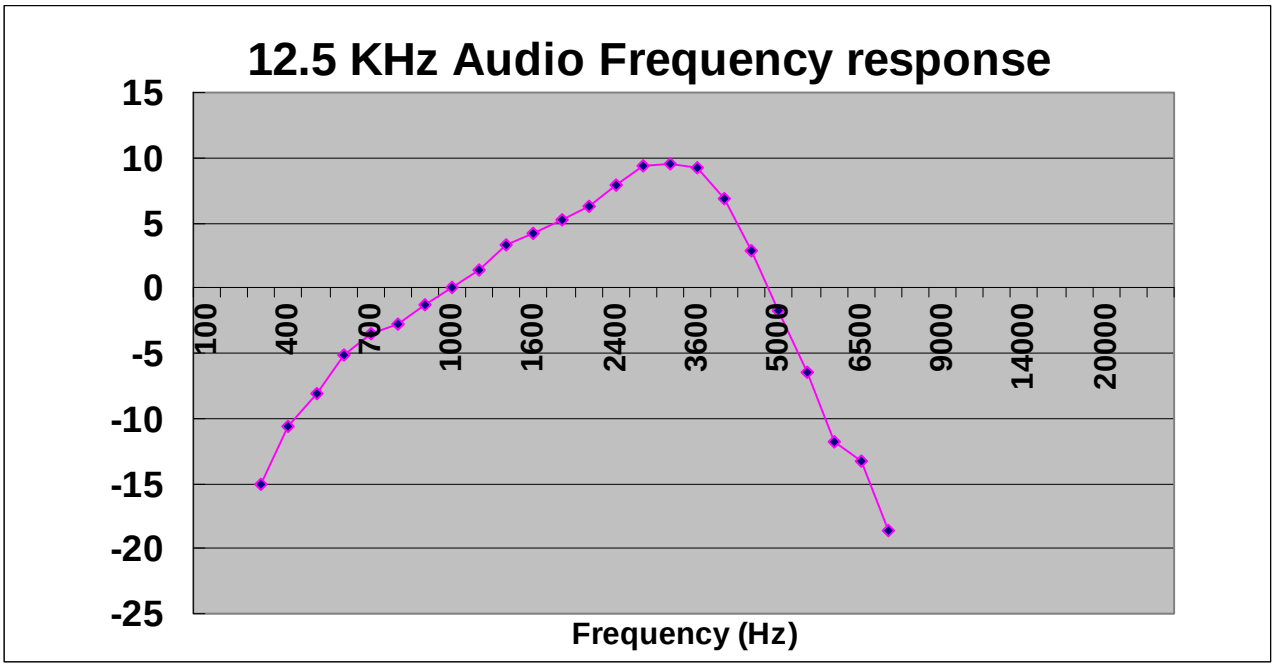


(b). Audio Frequency Response:

12.5 KHz Channel Separations

Frequency (Hz)	Deviation (KHz)
100	--
200	--
300	0.09
400	0.15
500	0.20
600	0.28
700	0.34
800	0.37
900	0.44
1000	0.51
1200	0.60
1400	0.74
1600	0.82
1800	0.93
2000	1.04
2400	1.26
2800	1.49
3000	1.53
3200	1.47
3600	1.12
4000	0.71
4500	0.42
5000	0.24
5500	0.13
6000	0.11
6500	0.06
7000	0.04
7500	0.03
9000	--
10000	--
12000	--
14000	--
18000	--
20000	--
30000	--

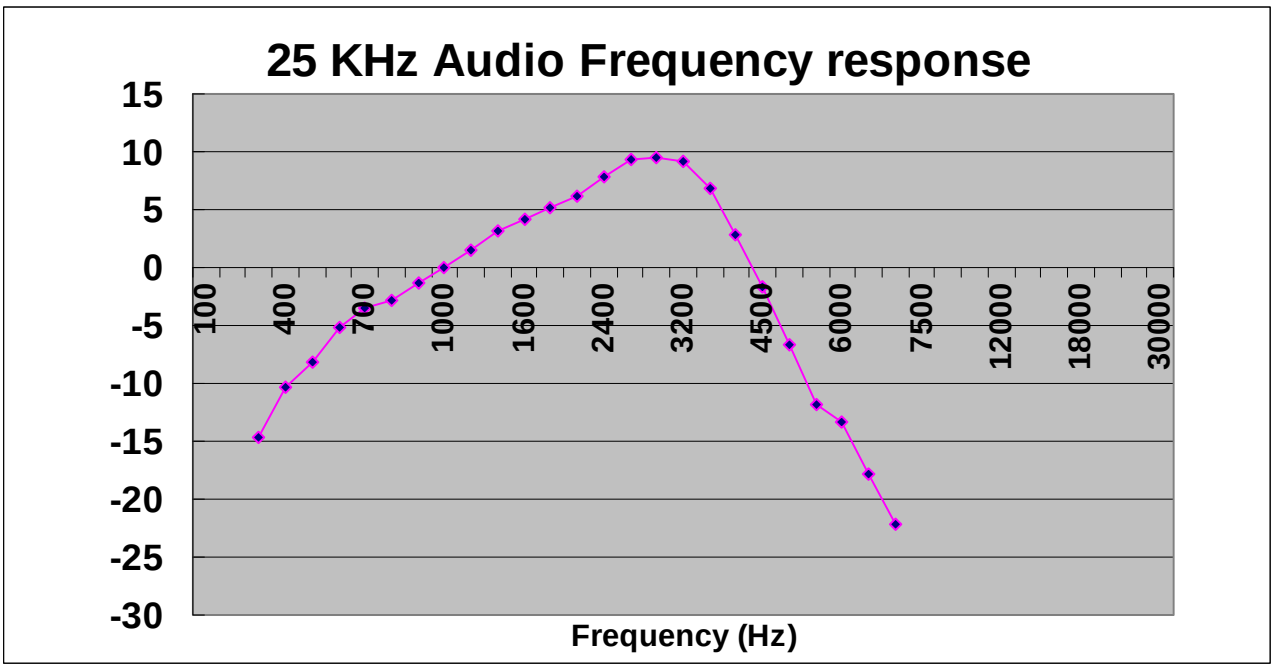
Frequency Response of Middle Channel



25 KHz Channel Separation

Frequency (Hz)	Deviation (KHz)
100	--
200	--
300	0.19
400	0.31
500	0.40
600	0.56
700	0.68
800	0.74
900	0.88
1000	1.02
1200	1.21
1400	1.48
1600	1.64
1800	1.86
2000	2.09
2400	2.53
2800	2.98
3000	3.07
3200	2.94
3600	2.25
4000	1.42
4500	0.84
5000	0.47
5500	0.26
6000	0.22
6500	0.13
7000	0.08
7500	0.06
9000	--
10000	--
12000	--
14000	--
16000	--
18000	--
20000	--
25000	--
30000	--

Frequency Response of Middle Channel



10. MAXIMUMN TRANSMITTER POWER (CONDUCTED OUTPUT POWER)

10.1 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 ±1.0 dB of the manufacturer's rated power.

10.2 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,

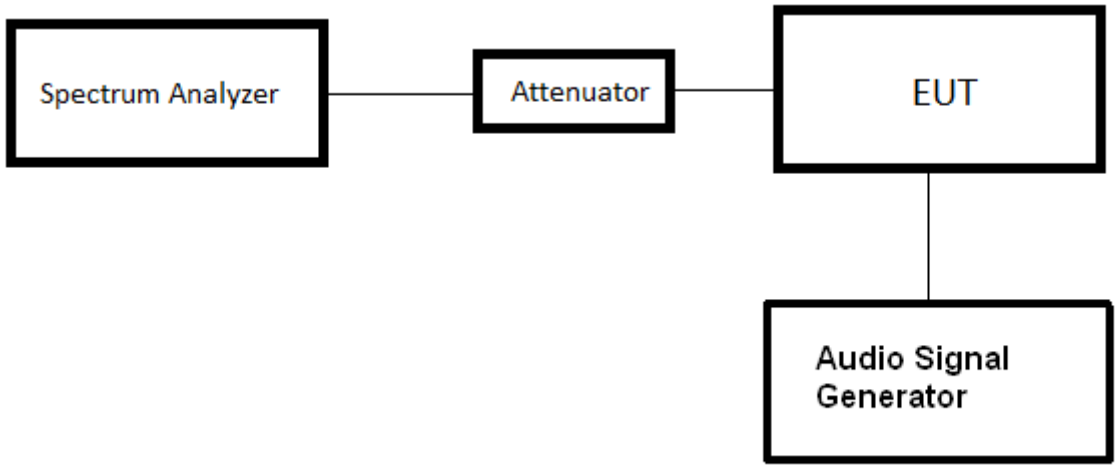
The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing) and 5 kHz (25 kHz channel spacing)

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.

10.3 TEST INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
SPECTRUM ANALYZER	AGILENT	E4440A	US44300399	2010.06

10.4 TEST CONFIGURATION



10.5 TEST RESULT

The maximum Conducted Power (CP) is

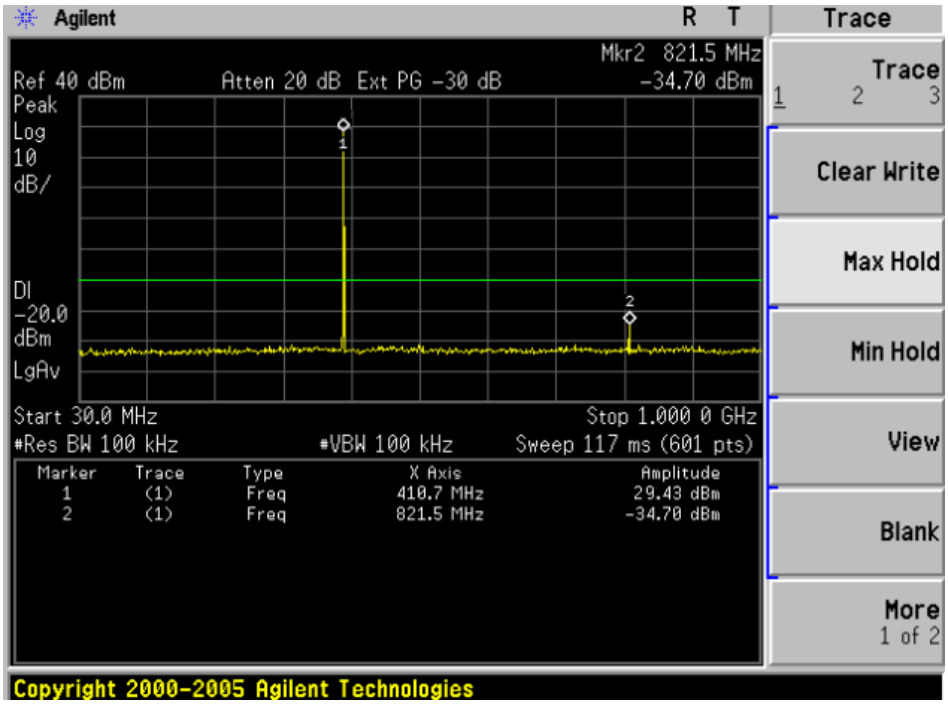
4 W for 12.5 KHz Channel Separation

4W for 25.0 KHz Channel Separation

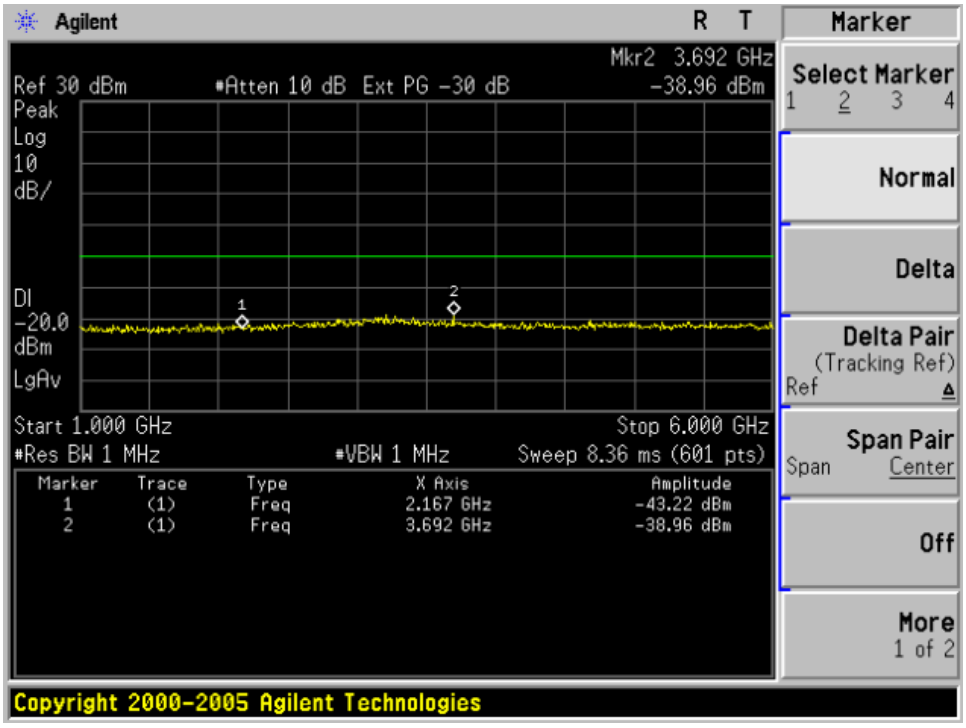
Conducted Power Measurement Results		
Channel Separation	**Channel**	**Measurement Result (dBm)**
		For 30dBm(1W)
12.5 KHz	Bottom(410.5MHz)	29.43
	Middle(440.0MHz)	29.11
	Top (469.5MHz)	29.34
25 KHz	Bottom(410.5MHz)	29.44
	Middle(440.0MHz)	29.24
	Top (469.5MHz)	29.21

10.4 CONDUCT SPURIOUS PLOT

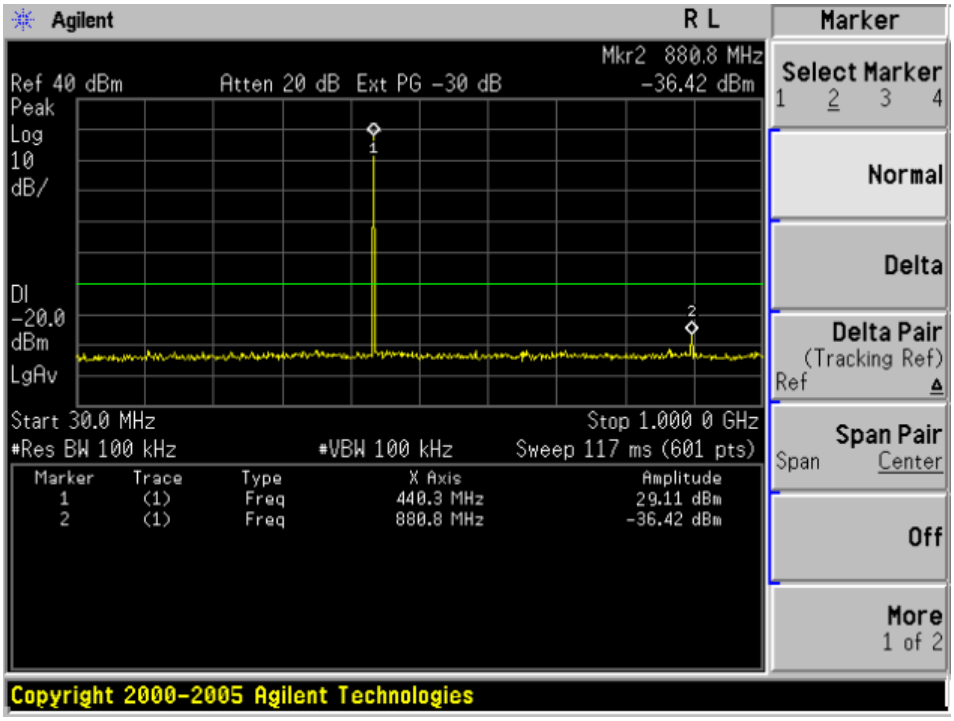
Conduct Spurious Emission @ 410.5MHz (30MHz-1GHz)



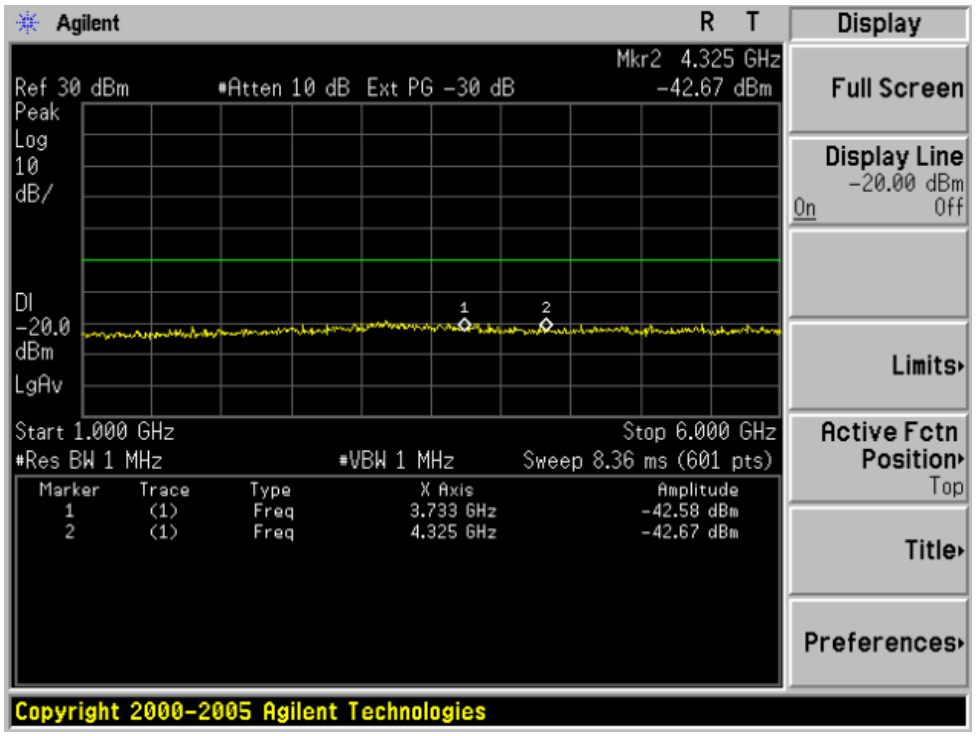
Conduct Spurious Emission @ 410.5MHz (1GHz-6GHz)



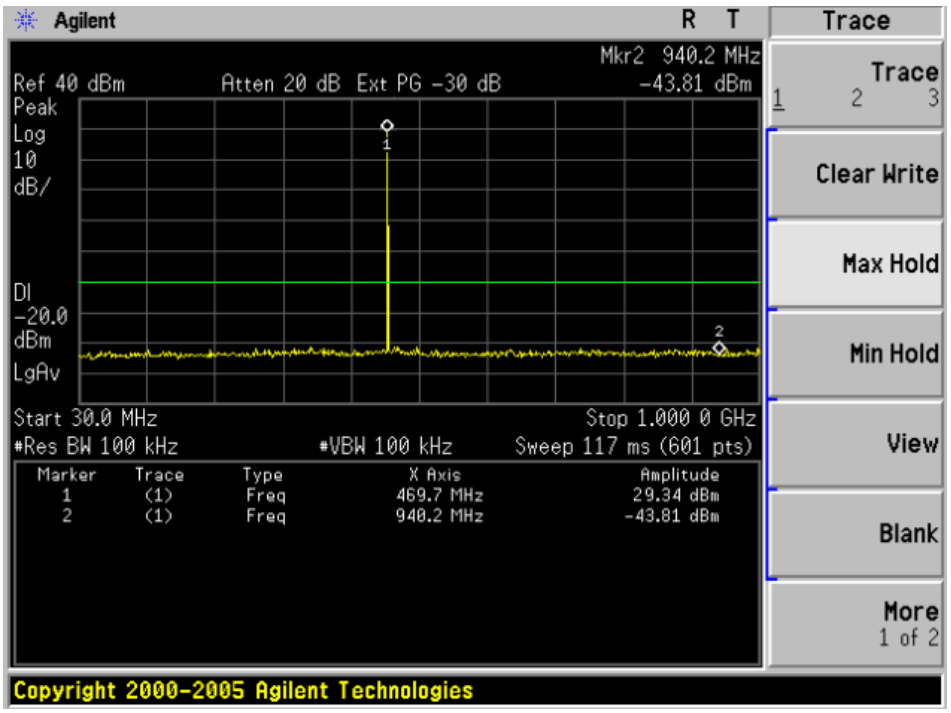
Conduct Spurious Emission @ 440.00MHz (30MHz-1GHz)



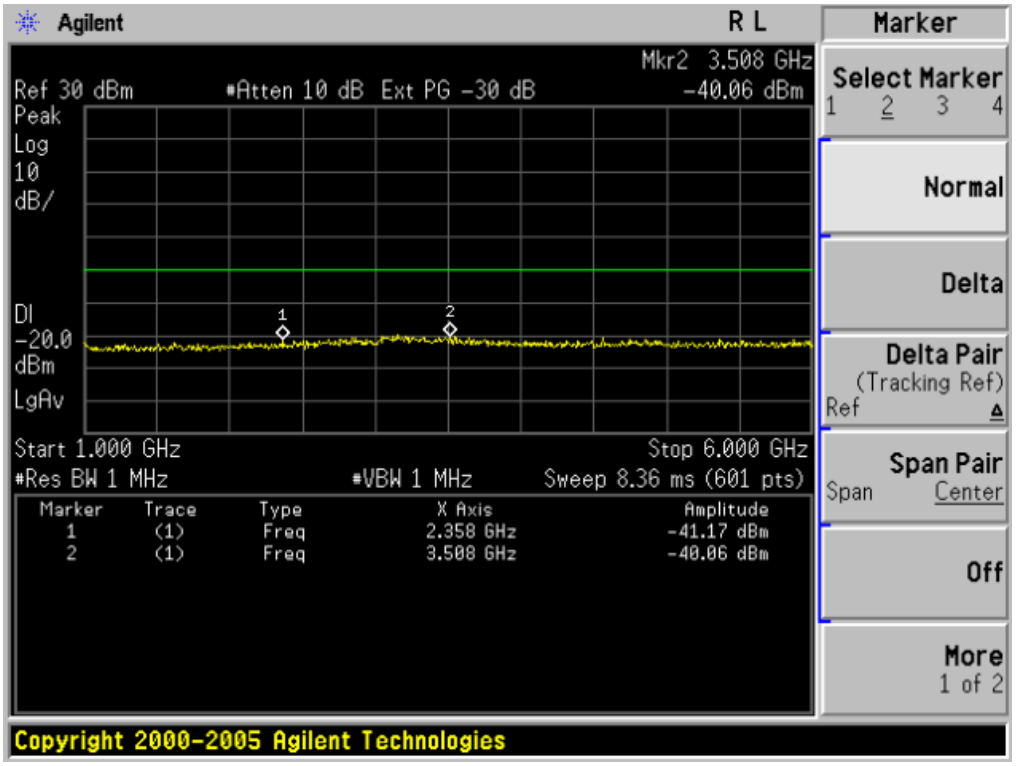
Conduct Spurious Emission @ 440.0MHz (1GHz-6GHz)



Conduct Spurious Emission @ 469.5MHz (30MHz-1GHz)



Conduct Spurious Emission @ 469.5MHz (1GHz-6GHz)



11. RANSMITTER FREQUENCY BEHAVIOR

11.1 PROVISIONS APPLICABLE

Section 90.214

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

[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
t_{off} is the instant when the 1 kHz test signal starts to rise.
[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.
[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

11.2TEST METHOD

TIA/EIA-603 2.2.19

11.3TEST INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL. DATE
Signal Generator	R&S	SMT02	A0304261	2015.09
Storage Oscilloscope	Tektronix	TDS3052	B017447	2015.10

11.4 DESCRIBE LIMIT LINE OF RANSMITTER FREQUENCY BEHAVIOR

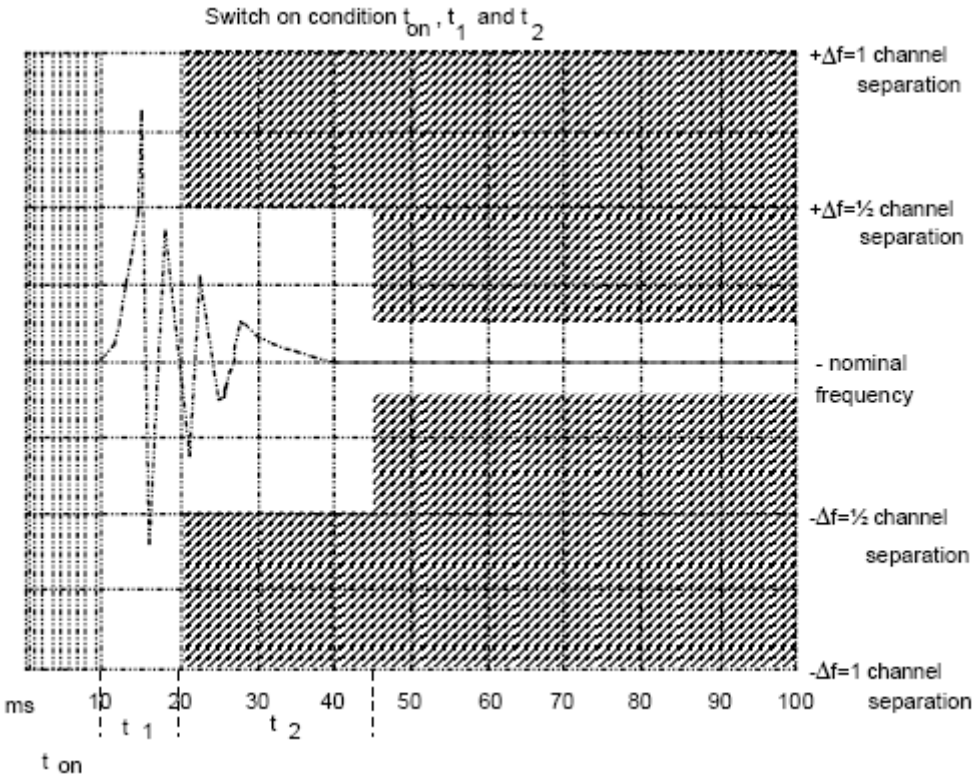
ton: The switch-on instant ton of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the full output power (-30 dBc).

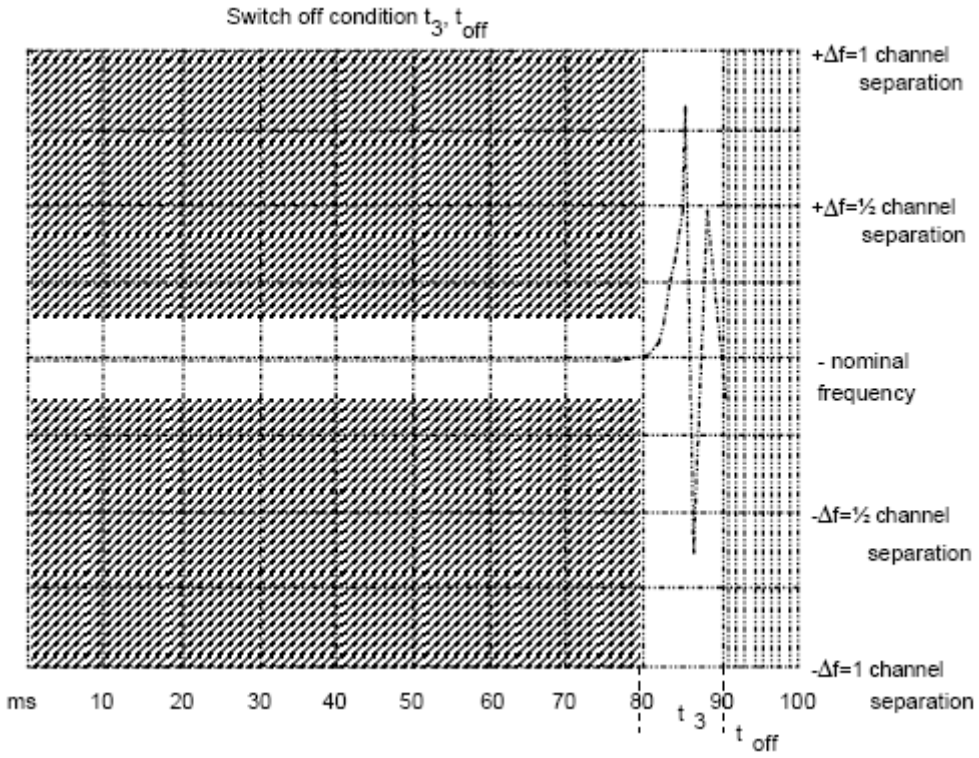
t1: period of time starting at ton and finishing according to above 11.1

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).

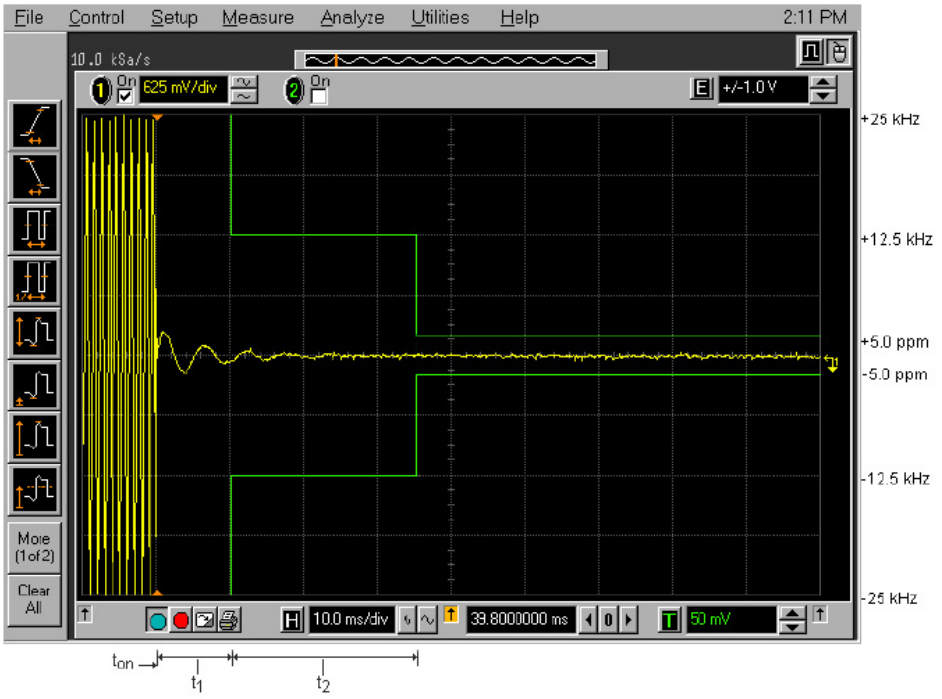
t3: period of time that finishing at toff and starting according to above 11.1



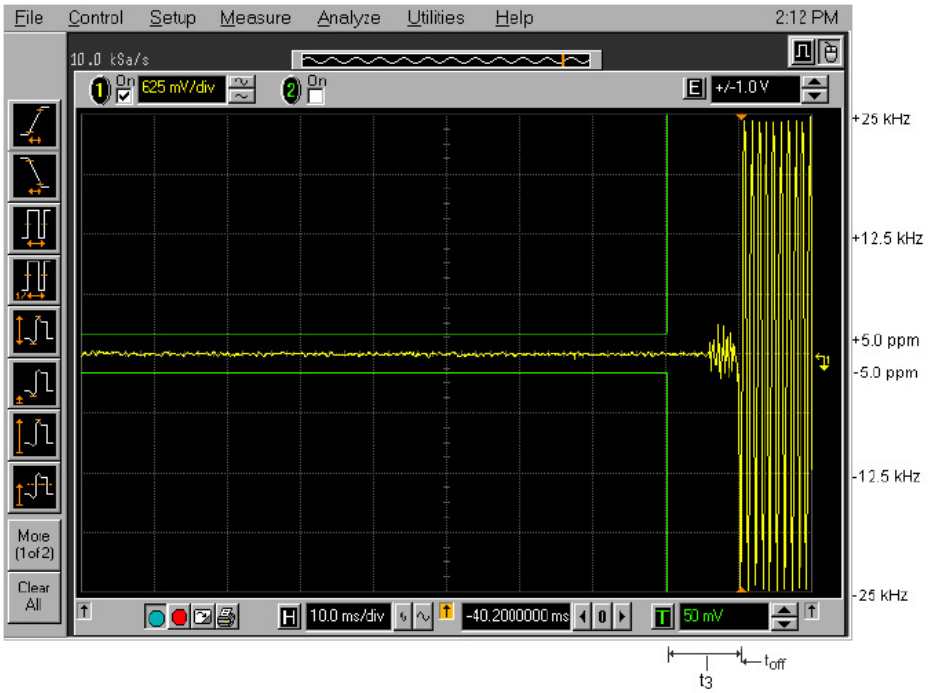

Switch off condition t_3, t_{off}
+Δf=1 channel separation
+Δf=½ channel separation
- nominal frequency
-Δf=½ channel separation
-Δf=1 channel separation
ms
10
20
30
40
50
60
70
80
90
100
t_3
t_{off}

11.5 MEASURE RESULT

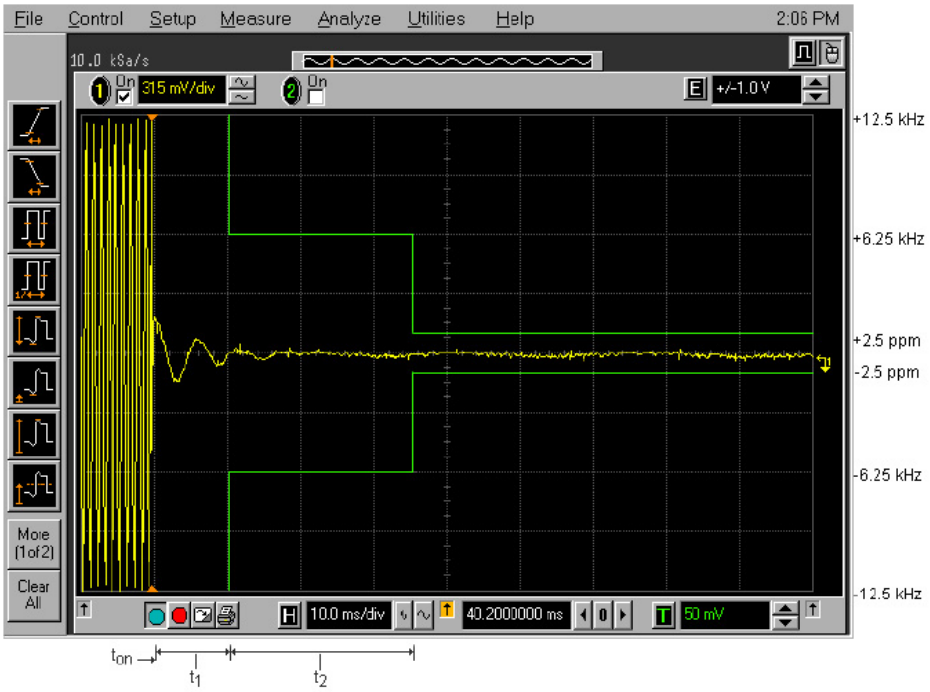
Transmitter Frequency Behavior @ 25 KHz Channel Separation--Off to On



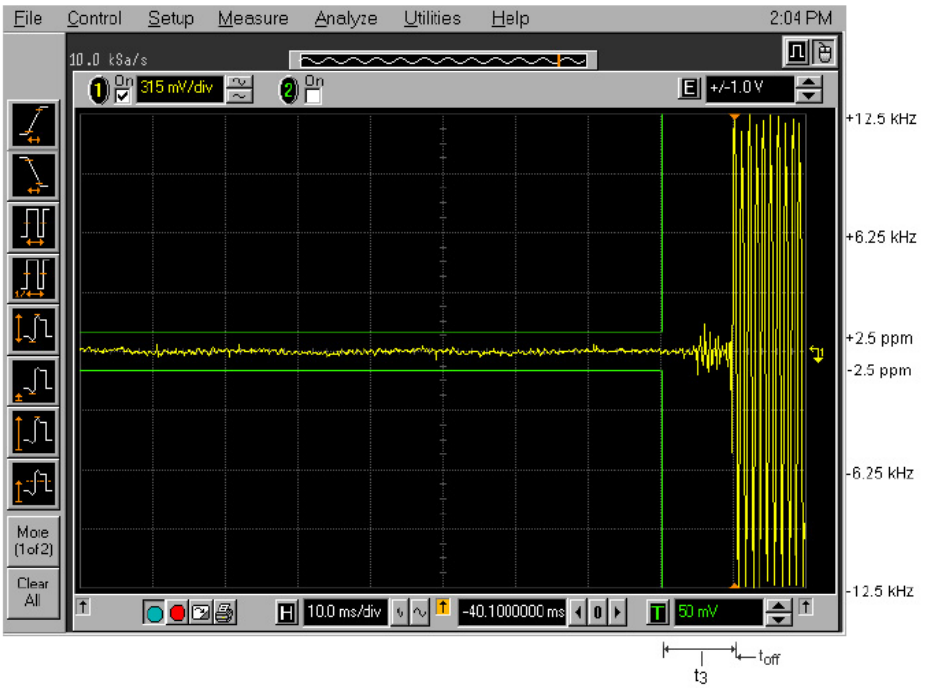
Transmitter Frequency Behaviour @ 25 KHz Channel Separation--On to Off



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 Subpart B Section 15.109

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	2015.06
TEST RECEIVER	R&S	ESIB26	A0304218	2015.06
LOOP ANTENNA	R&S	HFH2-Z2	A0304220	2015.06
HORN ANT.	R&S	HF906	100150	2015.06
BROADBAND ANT.	R&S	HL562	A0304224	2015.06

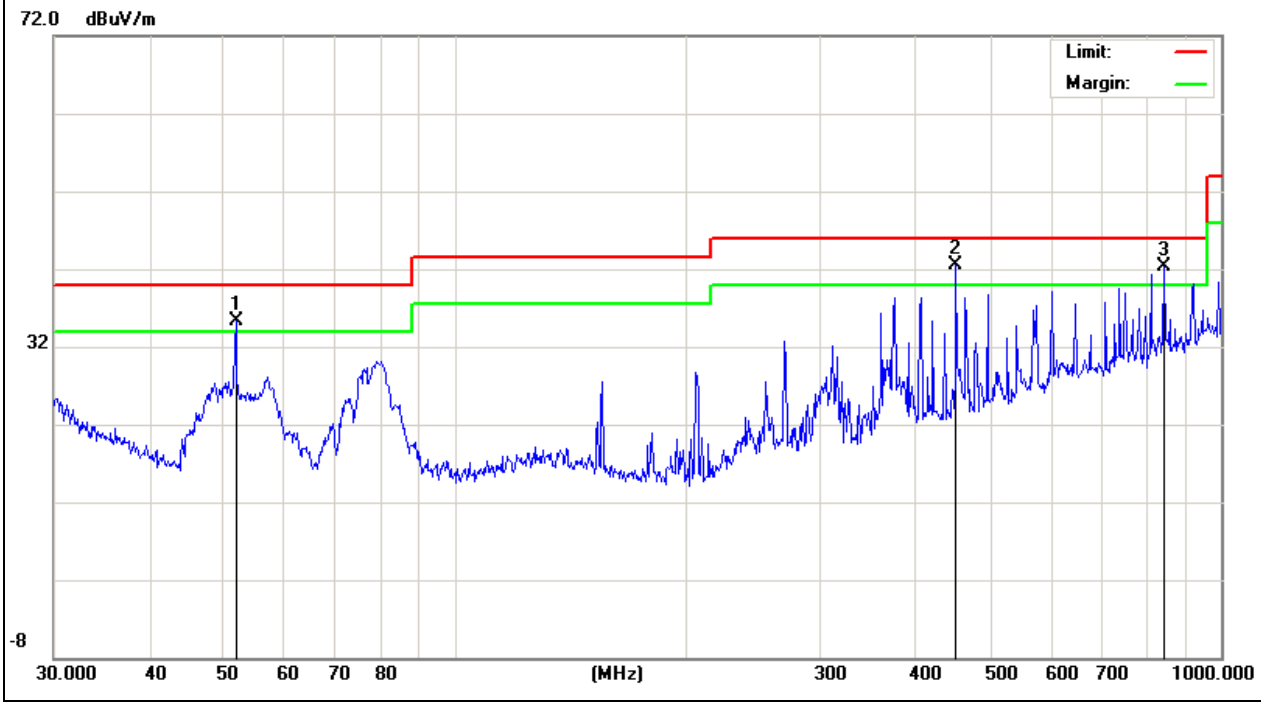
12.4 MEASURE RESULT (MEASURED AT 3M USING FCC PART15 B LIMITS)

EUT：	Wireless Data Transceiver Module	Model Name ：	TRM100
Temperature：	24 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Test Date :	2016-02-14
Test Mode ：	RX	Polarization :	Horizontal
Test Power ：	DC 3.3V		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
51.8430	28.02	7.31	35.33	40.00	-4.67	QP
451.1349	24.27	18.30	42.57	46.00	-3.43	QP
842.1295	17.08	25.32	42.40	46.00	-3.60	QP

Remark:

Factor = Antenna Factor + Cable Loss.

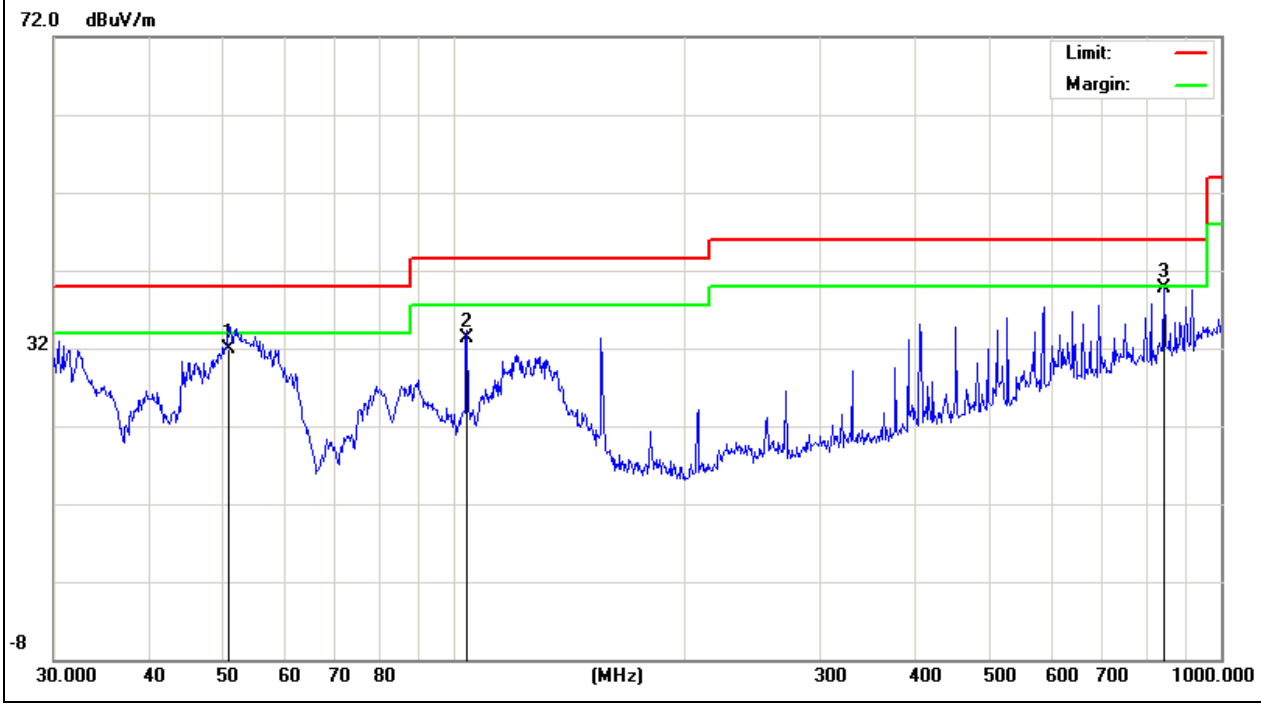


EUT：	Wireless Data Transceiver Module	Model Name ：	TRM100
Temperature：	24 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Test Date :	2016-02-14
Test Mode ：	Rx	Polarization :	Vertical
Test Power ：	DC 3.3V		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
50.7637	24.16	7.82	31.98	40.00	-8.02	QP
103.8054	22.34	10.87	33.21	43.50	-10.29	QP
842.1295	14.36	25.32	39.68	46.00	-6.32	QP

Remark:

Factor = Antenna Factor + Cable Loss.



----END OF REPORT----