



Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 Fax: +86-755-26636041

FCC PART 90 & RSS-119 Test Report

Report Reference No......: **CTL1410172530-WF**

Compiled by

(position+printed name+signature)...: File administrators Jacky Chen

Jacky Chen

Name of the organization performing the tests

Test Engineer Tracy Qi

Tracy Qi

(position+printed name+signature)...:

Approved by

(position+printed name+signature)...: Manager Tracy Qi

Tracy Qi

Date of issue.....: Nov. 24, 2014

Testing Laboratory Name: **Shenzhen CTL Testing Technology Co., Ltd.**

Address.....: Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

Applicant's name.....: **Northfield Telecommunications, Inc. d/b/a Advanced Wireless Communications**

Address.....: 20809 Kensington Blvd, Lakeville, Minnesota, 55044-8385, USA

Test specification:

Standard: **FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES**

RSS-119 Issue 11 June 2011: Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz

TRF Originator.....: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF.....: Dated 2011-01

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Test item description: Two-way Radio

Trade Mark: ADVANCED WIRELESS COMMUNICATIONS

Model/Type reference.....: AWR391V3

Modulation.....: FM

Channel Separation.....: 12.5KHz

Power Supply.....: DC 3.7V

Rated Power.....: 1W

Operating Frequency Range.....: From 450 MHz to 470 MHz

FCC ID.....: **Q9SAWR391V3**

IC.....: **4651A-AWR391V3**

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

TEST REPORT

Test Report No. :	CTL1410172530-WF	Nov. 24, 2014
		Date of issue

Equipment under Test : Two-way Radio

Model /Type : AWR391V3

Applicant : **Northfield Telecommunications, Inc. d/b/a Advanced Wireless Communications**

Address : 20809 Kensington Blvd, Lakeville, Minnesota, 55044-8385, USA

Manufacture : **Shenzhen Surwave Technologies Co.,LTD**

Address : RM602-603, No535. Building East, Bagua RD.2
Bagualing, Futian District, Shenzhen, China

Test Result according to the standards on page 4:	Positive
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES

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

47 CFR FCC Part 15 Subpart B - Unintentional Radiators

FCC Part 2: FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

RSS-119 Issue 11 June 2011: Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz

RSS-Gen Issue 4 November 2014: General Requirements and Information for the Certification of Radio Apparatus



2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Oct. 30, 2014
Testing commenced on	:	Oct. 30, 2014
Testing concluded on	:	Nov. 24, 2014

2.2. Equipment Under Test

Power supply system utilised

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

DC 3.7V from battery

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

The Two-way Radio Mode: AWR391V3 (EUT) as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

EUT* Name	:	Two-way radio
Model Number	:	AWR391V3
Trade Mark	:	ADVANCED WIRELESS COMMUNICATIONS
Power supply	:	DC 3.70V from battery
Operation frequency range	:	450.00MHz to 470.00MHz
Modulation type	:	FM
RF Rated Output power	:	1W
Emission type	:	F3E
Channel Separation	:	12.5KHz for FCC/IC
Antenna Type	:	External Antenna
Sample Type	:	Prototype Unit
Exposure category:	:	Occupational / Controlled environment

Test frequency list

Frequency Range (MHz)	Modulation Type	Channel Separation (KHz)	Test Channel	Test Frequency (MHz)	
				TX	RX
	Analog/FM	12.5	Low	450.5000	450.5000
			Middle	460.5000	460.5000
			High	469.5000	469.5000

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

450-470MHz Two-way Radio (AWR391V3).

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

Serial number: Prototype

2.5. EUT operation mode

The EUT has been tested under typical operating condition.

2.6. EUT configuration

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

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

●	AC adapter	Manufacturer :	Surwave
		Model No. :	SSA021F060080USD
○	Multimeter	Manufacturer :	/
		Model No. :	/

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

This submittal(s) (test report) is intended for FCC ID: Q9SAWR391V3 and IC: 4651A-AWR391V3 filing to comply with the FCC Part 90 Rules and RSS-119 Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

2.9. Note

The EUT is is a U frequency band (450-470MHz) Two-way Radio, The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 90 RSS-119	CTL1410172530-WF

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

The sites are constructed in conformance with the requirements of ANSI C6230, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

3.3. Environmental conditions

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

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

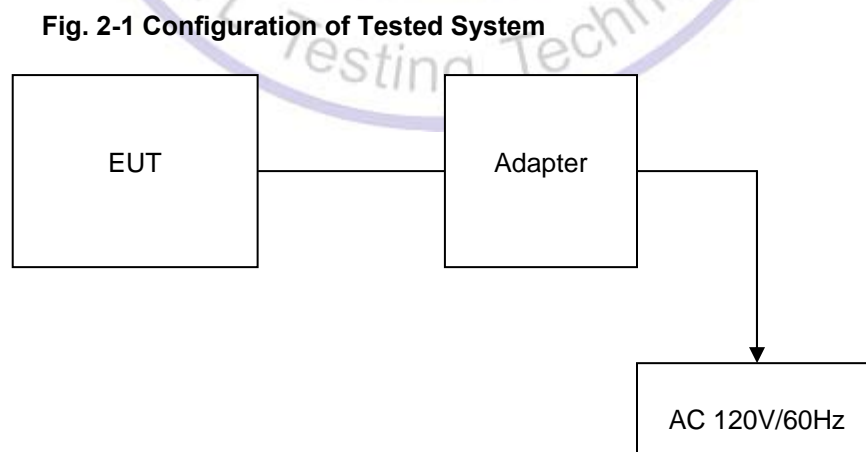


Table 2-1 Equipment Used in Tested System

Adapter: Model: SSA021F060080USD
 Input: 100-240V~50/60Hz 0.2A
 Output: +6V DC 0.8A
 Power Cable: 150cm
 ◇ Shielded ◆ Unshielded

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/12	2015/07/11
EMI Test Receiver	R&S	ESCI	103710	2014/07/10	2015/07/09
Spectrum Analyzer	Agilent	E4407B	MY45108355	2014/07/06	2015/07/05
Controller	EM Electronics	Controller EM 1000	N/A	2014/07/06	2015/07/05
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2014/07/12	2015/07/11
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2014/07/12	2015/07/11
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2014/07/12	2015/07/11
LISN	R&S	ENV216	101316	2014/07/10	2015/07/09
LISN	SCHWARZBECK	NSLK8127	8127687	2014/07/10	2015/07/09
Microwave Preamplifier	HP	8349B	3155A00882	2014/07/10	2015/07/09
Amplifier	HP	8447D	3113A07663	2014/07/10	2015/07/09
Transient Limiter	Com-Power	LIT-153	532226	2014/07/10	2015/07/09
Radio Communication Tester	R&S	CMU200	3655A03522	2014/07/06	2015/07/05
Temperature/Humidity Meter	zhicheng	ZC1-2	22522	2014/07/10	2015/07/09
SIGNAL GENERATOR	HP	8647A	3200A00852	2014/07/10	2015/07/09
Wideband Peak Power Meter	Anritsu	ML2495A	220.23.35	2014/07/06	2015/07/05
Climate Chamber	ESPEC	EL-10KA	A20120523	2014/07/06	2015/07/05
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	/	2014/07/06	2015/07/05
High-Pass Filter	K&L	41H10-1375/U12750-O/O	/	2014/07/06	2015/07/05
RF Cable	HUBER+SUHNER	RG214	/	2014/07/09	2015/07/08
20dB Attenuator	Dong Fang Xu Pu	50W/20dB	/	2014/07/06	2015/07/05

3.7. General Technical Requirements and Summary of Test Results

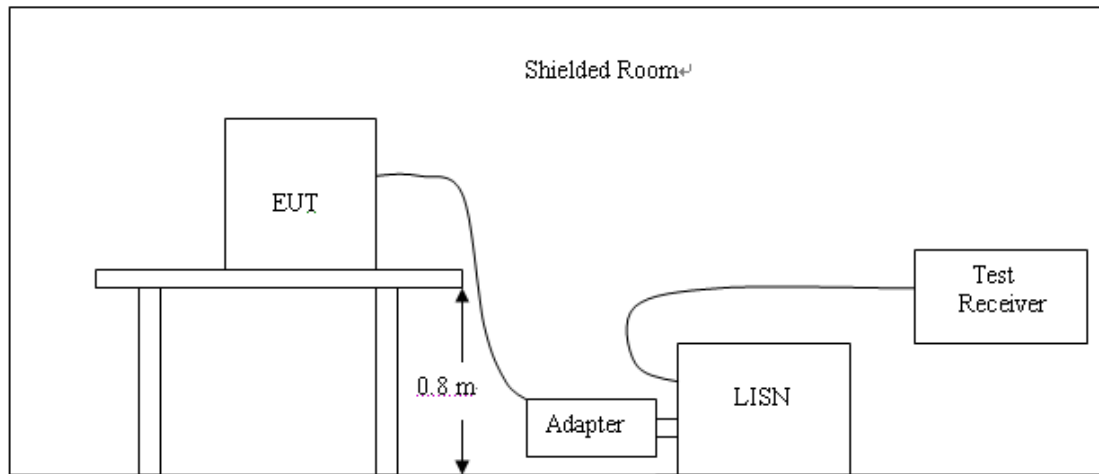
FCC Rules	RSS Rules	Description of Test	Test Result
§ 15.107	RSS-Gen	Conducted Emission	Complies
§ 15.109	RSS-Gen	Receiver Radiated Spurious Emission	Complies
§ 15.109	RSS-Gen	Receiver Conducted Spurious Emission	Complies
§ 90.205	§ 5.4	Maximum Transmitter Power	Complies
§ 90.207	§ 5.13	Modulation Characteristic	Complies
§ 90.209	§ 5.5	Occupied Bandwidth	Complies
§ 90.210	§ 5.8	Emission Mask	Complies
§ 90.213	§ 5.3	Frequency Stability	Complies
§ 90.214	§ 5.9	Transmitter Frequency Behavior	Complies
§ 90.210	§ 5.8	Transmitter Radiated Spurious Emission	Complies
§ 90.210	§ 5.8	Spurious Emission On Antenna Port	Complies



4. TEST CONDITIONS AND RESULTS

4.1. Conducted Emissions Test

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4.
- 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 DC 3.7 V power from the battery.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

Conducted Power Line Emission Limit

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following :

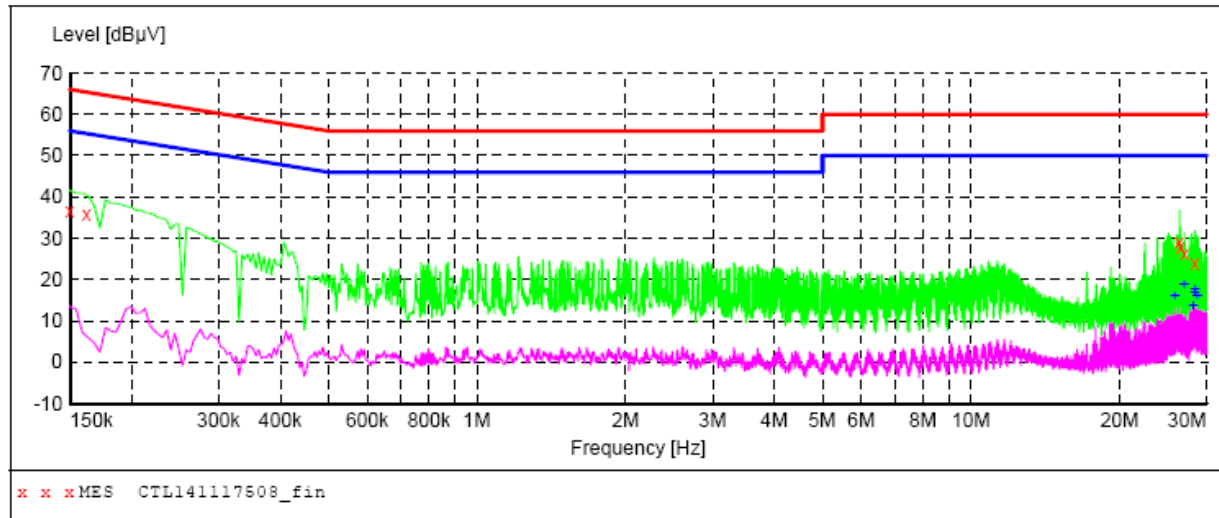
Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

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

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

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL141117508_fin"**

11/17/2014 11:00AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	36.40	10.2	66	29.6	QP	N	GND
0.162000	35.70	10.2	65	29.7	QP	N	GND
26.408000	29.20	11.2	60	30.8	QP	N	GND
26.534000	27.70	11.2	60	32.3	QP	N	GND
27.074000	26.20	11.2	60	33.8	QP	N	GND
28.400000	23.90	11.2	60	36.1	QP	N	GND

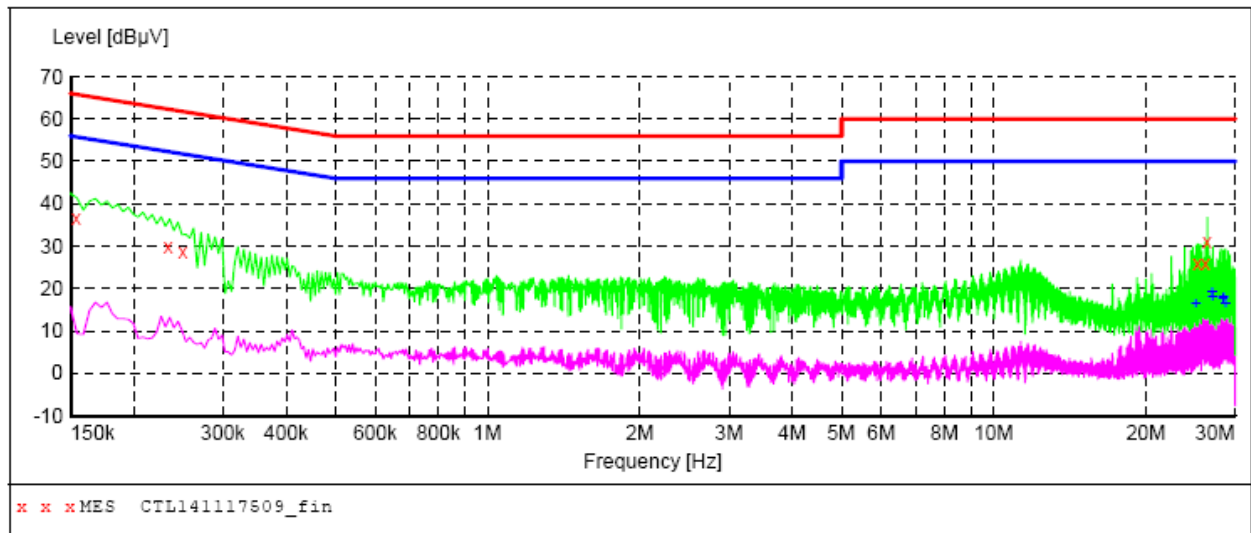
MEASUREMENT RESULT: "CTL141117508_fin2"

11/17/2014 11:00AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
25.868000	16.00	11.1	50	34.0	AV	N	GND
27.014000	18.90	11.2	50	31.1	AV	N	GND
28.160000	13.60	11.2	50	36.4	AV	N	GND
28.400000	16.80	11.2	50	33.2	AV	N	GND
28.460000	17.70	11.2	50	32.3	AV	N	GND
28.700000	16.00	11.2	50	34.0	AV	N	GND

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

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL141117509_fin"**

11/17/2014 11:03AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.154000	36.50	10.2	66	29.3	QP	L1	GND
0.234000	29.90	10.2	62	32.4	QP	L1	GND
0.250000	28.70	10.2	62	33.1	QP	L1	GND
25.268000	25.90	11.1	60	34.1	QP	L1	GND
26.174000	26.00	11.2	60	34.0	QP	L1	GND
26.414000	31.20	11.2	60	28.8	QP	L1	GND

MEASUREMENT RESULT: "CTL141117509_fin2"

11/17/2014 11:03AM

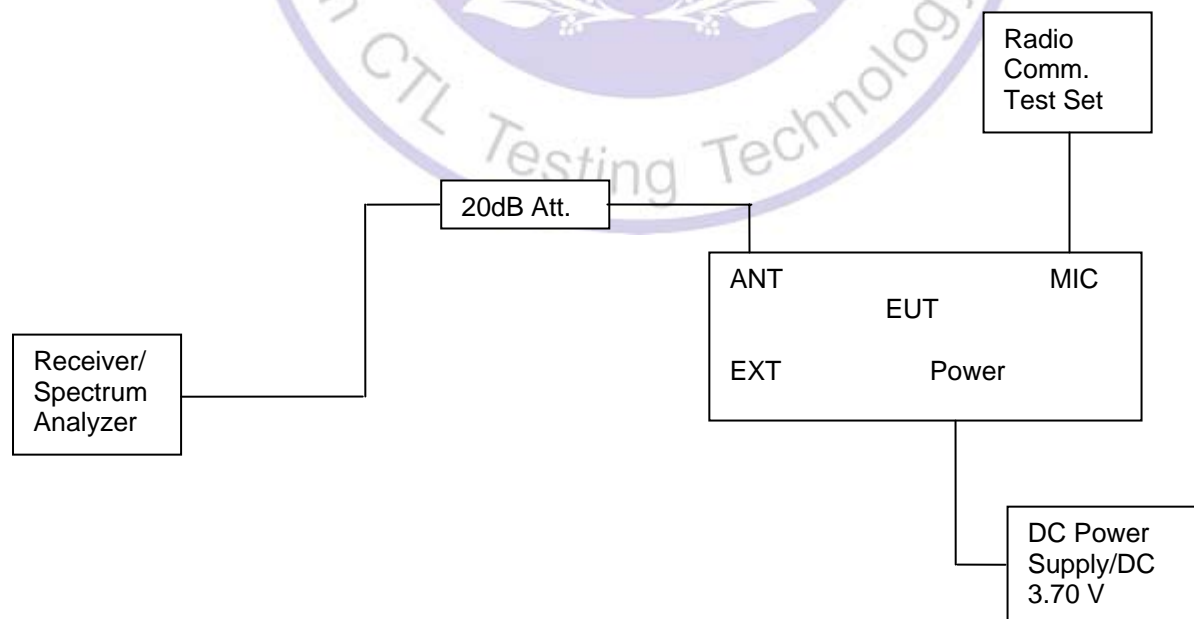
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
25.088000	16.50	11.1	50	33.5	AV	L1	GND
27.014000	19.00	11.2	50	31.0	AV	L1	GND
27.074000	17.80	11.2	50	32.2	AV	L1	GND
28.400000	17.40	11.2	50	32.6	AV	L1	GND
28.460000	18.10	11.2	50	31.9	AV	L1	GND
28.700000	16.40	11.2	50	33.6	AV	L1	GND

4.2. Occupied Bandwidth and Emission Mask

PROVISIONS APPLICABLE

- (a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.
- (b). Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:
- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
 - (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
 - (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.
- (c). Emission Mask D, 12.5 kHz channel bandwidth equipment: For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
- (1) On any frequency from the center of the authorized bandwidth 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) 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) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.
- (d). Emission Mask E—6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
- (1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 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) of more than 3.0 kHz but no more than 4.6 kHz: At least $30 + 16.67(f_d - 3 \text{ kHz})$ or $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.
 - (3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.

TEST CONFIGURATION



TEST PROCEDURE

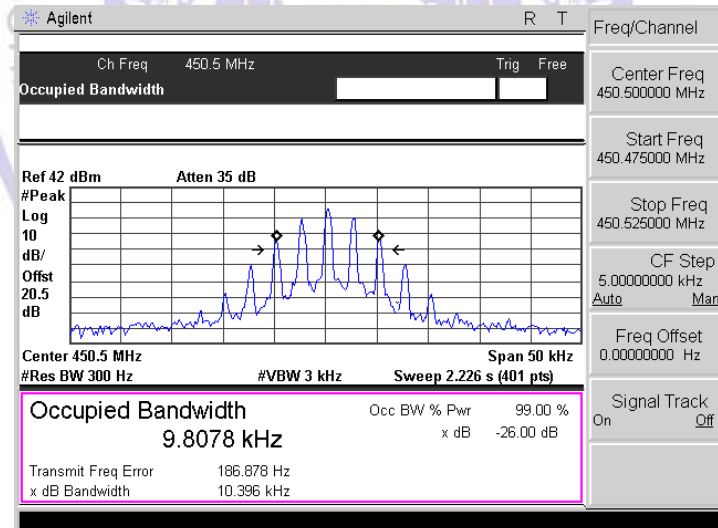
- 1 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing) and 5 kHz (25 kHz channel spacing).
- 2 Set EUT as normal operation.
- 3 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
- 4 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
- 6 Set SPA Center Frequency=fundamental frequency, set =100Hz, VBW=1 KHz, span=50 KHz for 12.5 channel spacing and set =100Hz, VBW=1 KHz, span=50 KHz for 6.25 channel spacing

TEST RESULTS:**4.2.1 Occupied Bandwidth**

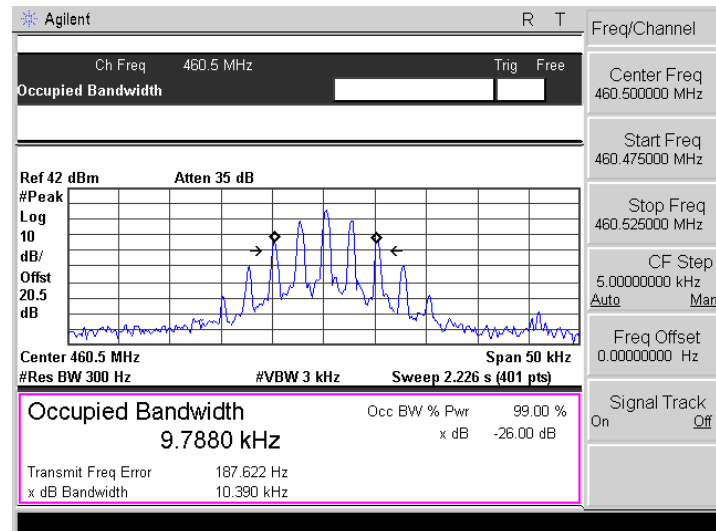
Modulation Type	Channel Separation	Test Channel	Test Frequency	99% Occupied Bandwidth	26dB Occupied Band width
FM	12.5KHz	Low	450.5000 MHz	9.8078 KHz	10.396 KHz
		Middle	460.5000 MHz	9.7880 KHz	10.390 KHz
		High	469.5000 MHz	9.8026 KHz	10.381 KHz
Limit		11.25KHz			
Test Results		Compliance			

Plots of 99% and 26dB Bandwidth Measurement

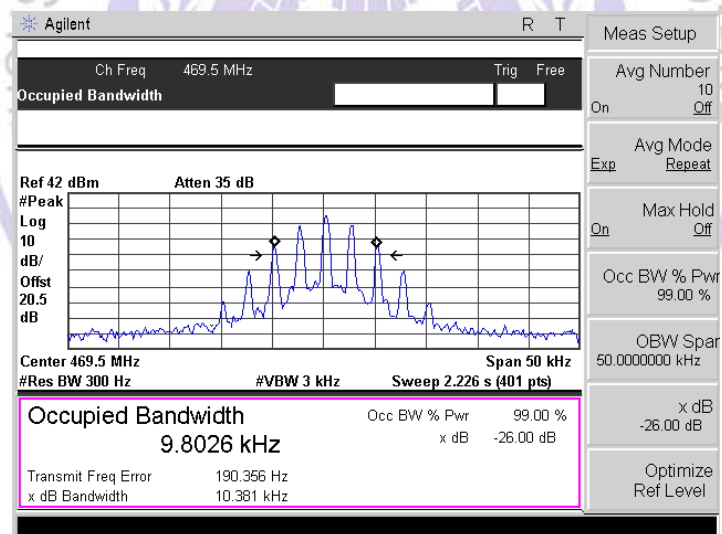
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	450.5000	9.8078	10.396	11.25	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	460.5000	9.7880	10.390	11.25	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	469.5000	9.8026	10.381	11.25	Compliance



4.2.2 Emission Mask

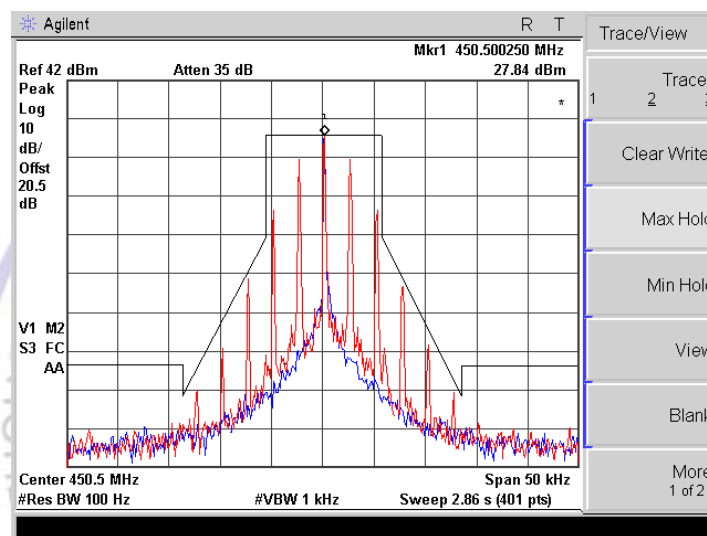
Modulation Type	Channel Separation	Test Channel	Test Frequency	FCC Applicable Mask	RBW
FM	12.5KHz	Low	450.5000 MHz	D	100 Hz
		Middle	460.5000 MHz	D	100 Hz
		High	469.5000 MHz	D	100 Hz
Test Results		Compliance			

Referred as the attached plot hereinafter

Note: The Blue curve represents unmodulated signal.

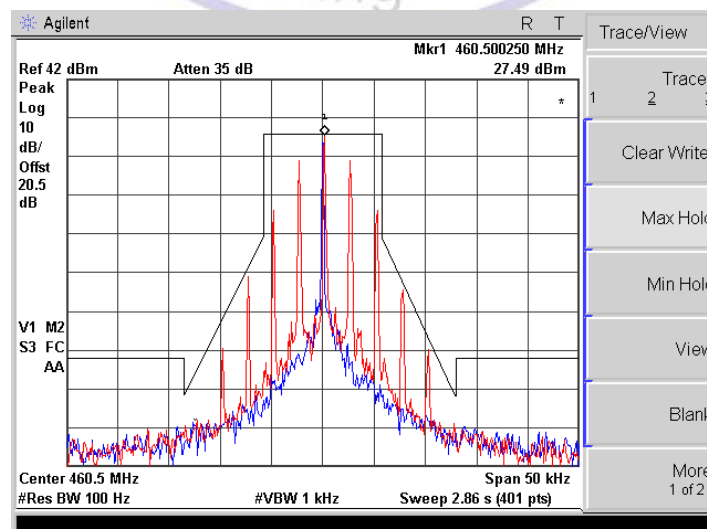
The Red curve represents modulated signal.

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



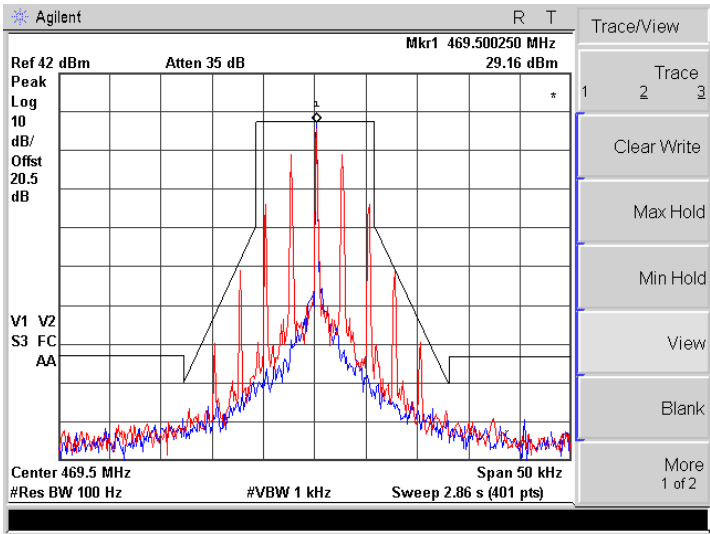
12.5 kHz Channel Spacing, 450.5000 MHz, 2500 Hz Audio Modulation Only

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	460.5000	D	100Hz	2.5	Compliance



12.5 kHz Channel Spacing, 460.5000 MHz, 2500 Hz Audio Modulation Only

Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	469.5000	D	100Hz	2.5	Compliance



12.5 kHz Channel Spacing, 469.5000 MHz, 2500 Hz Audio Modulation Only



4.3. Radiated Spurious Emission Test

TEST APPLICABLE

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

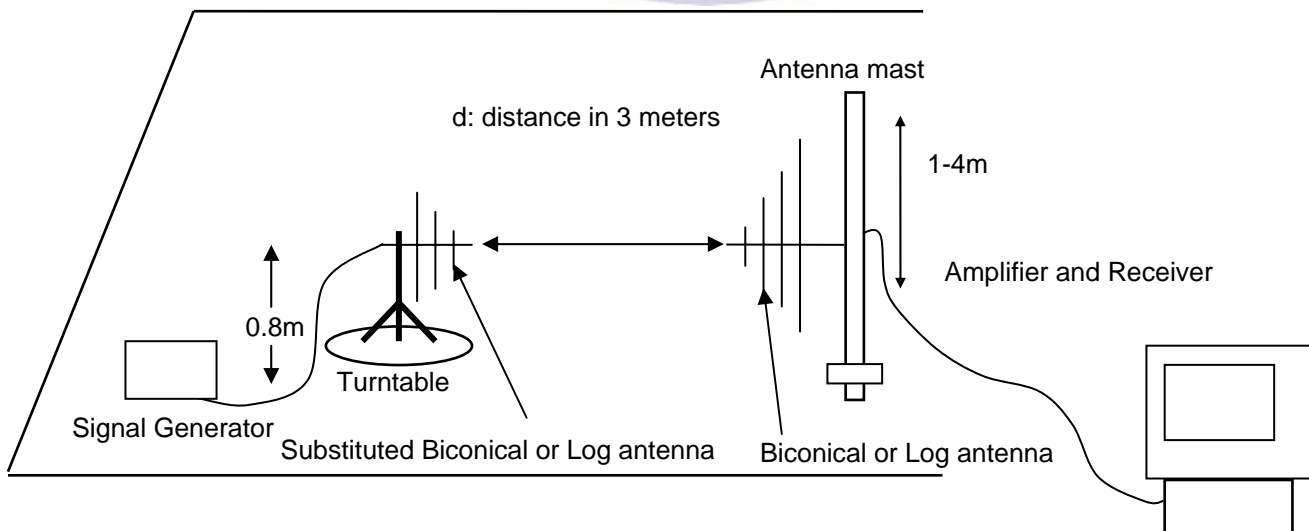
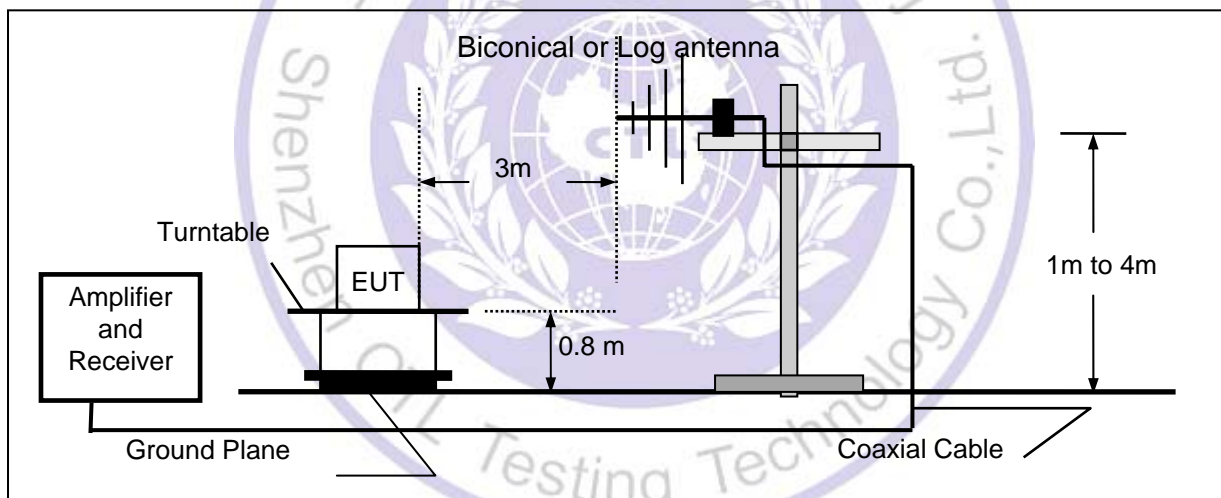
- 1 On any frequency removed from the centre of the authorized bandwidth f_0 to 5.625 KHz removed from f_0 : Zero dB
- 2 On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in KHz) f_0 of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
- 3 On any frequency removed from the centre 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.

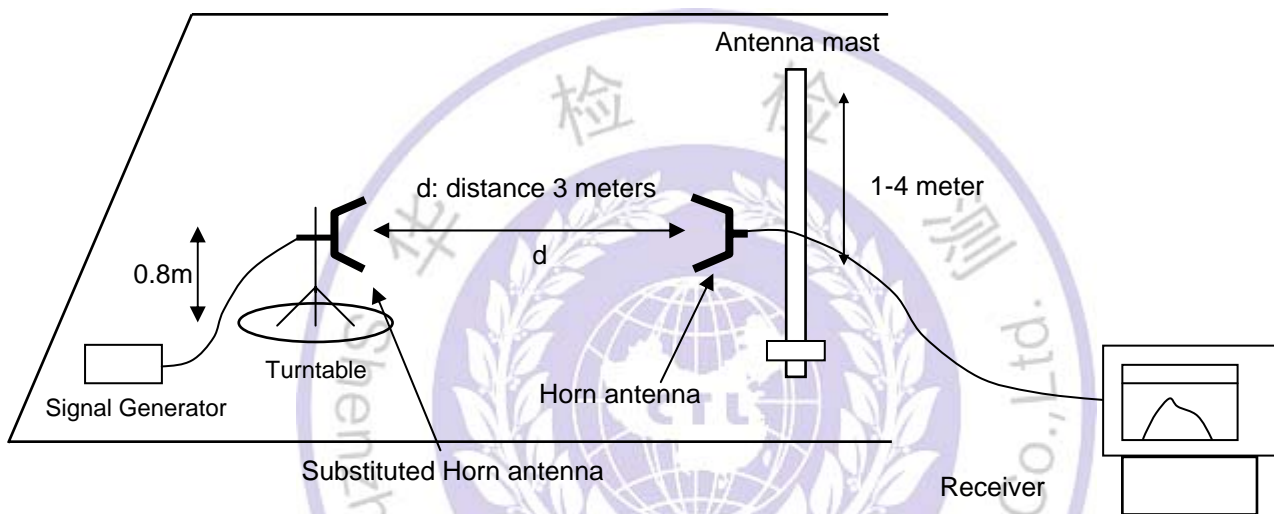
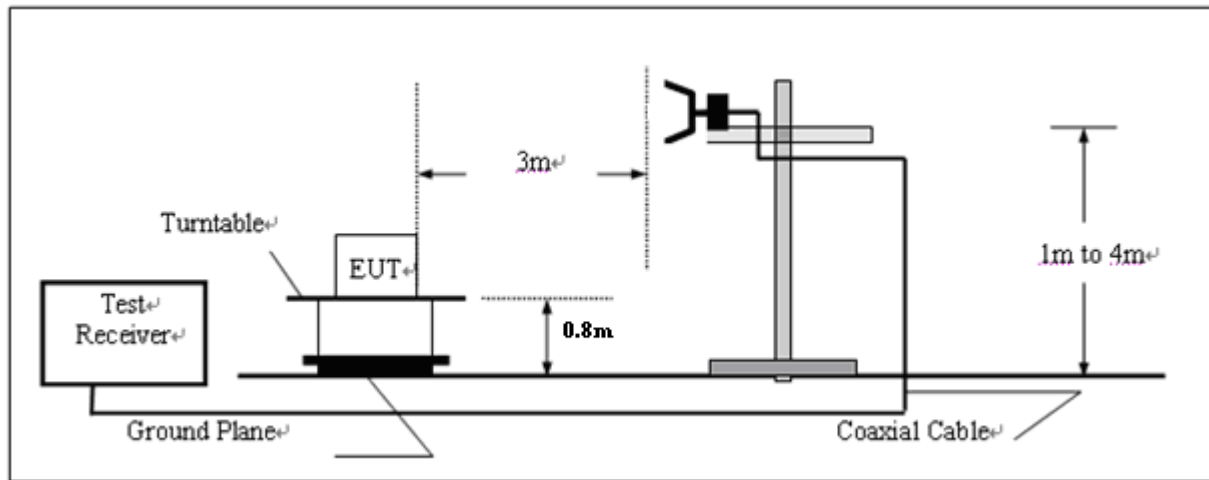
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

- 1 On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.
- 2 On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth: At least 35 dB.
- 3 On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log(P)$ dB.

TEST CONFIGURATION

Below 1GHz



Above 1GHz**TEST PROCEDURE**

- 1 Set the EMI Receiver (for measuring E-Field) and Receiver (for measuring EIRP) as follows:
 Center Frequency: equal to the signal source
 Resolution BW: 100 KHz
 Video BW: VBW > RBW
 Detector Mode: positive
 Average: off
 Span: 3 x the signal bandwidth
- 2 Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
 Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor + Amplifier Gain
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB)}$
- 3 The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- 4 Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
 DIPOLE antenna for frequency from 30-1000 MHz or
 HORN antenna for frequency above 1 GHz}.
- 5 Mount the transmitting antenna at 1.0 meter high from the ground plane.
- 6 Use one of the following antenna as a receiving antenna:
 DIPOLE antenna for frequency from 30-1000 MHz or
 HORN antenna for frequency above 1 GHz}.
- 7 If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
- 8 Adjust both transmitting and receiving antenna in a VERTICAL polarization.
- 9 Tune the EMI Receivers to the test frequency.
- 10 Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- 11 The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- 12 Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

- 13 Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
- 14 Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

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

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

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

$$\text{Total Correction factor in EMI Receiver} = L_2 - L_1 + G_1$$

Where:

 - P: Actual RF Power fed into the substitution antenna port after corrected.
 - P₁: Power output from the signal generator
 - P₂: Power measured at attenuator A input
 - P₃: Power reading on the Average Power Meter
 - EIRP: EIRP after correction
 - ERP: ERP after correction
- 15 Adjust both transmitting and receiving antenna in a Horizontal polarization, then repeat step (11) to (14).
- 16 Repeat step (4) to (16) for different test frequency
- 17 Repeat steps (3) to (12) with the substitution antenna oriented in horizontal polarization.
- 18 Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

TEST RESULTS

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 12.5 kHz at least:

Low: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (0.841) = 49.25 \text{ dB}$

High: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (0.863) = 49.36 \text{ dB}$

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

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

Notes: EL is the emission level of the Output Power expressed in dBm,
 In this application, the EL is 30.0 dBm.
 Limit (dBm) = 30.0 - 50 - 10log10 (0.863) = -20 dBm

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

2. The measurement frequency range from 30 MHz to 5 GHz.

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

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		Low Channel		Test Frequency		450.5000 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
901.000	58.09	Peak	H	100	234	-36.80	-20	16.80
3153.500	64.13	Peak	H	100	178	-31.53	-20	11.53
4054.500	67.66	Peak	H	200	305	-28.36	-20	8.36
...			H					
901.000	56.24	Peak	V	100	148	-38.65	-20	18.65
3153.500	65.81	Peak	V	100	107	-29.85	-20	9.85
4054.500	68.07	Peak	V	300	48	-27.95	-20	7.95
...	...		V					

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		Middle Channel		Test Frequency		460.5000 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
921.000	54.09	Peak	H	100	317	-40.80	-20	20.80
1381.500	57.26	Peak	H	200	52	-38.40	-20	18.40
2302.500	64.49	Peak	H	200	114	-31.53	-20	11.53
...			H					
921.000	56.01	Peak	V	100	96	-38.88	-20	18.88
1381.500	61.20	Peak	V	100	301	-34.46	-20	14.46
2302.500	63.38	Peak	V	200	103	-32.64	-20	12.64
...	...		V					

Modulation		FM		Channel Separation		12.5KHz		
Test Channel		High Channel		Test Frequency		469.5000 MHz		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
939.000	55.02	Peak	H	400	89	-39.87	-20	19.87
4225.500	64.71	Peak	H	100	105	-30.95	-20	10.95
4695.000	69.03	Peak	H	200	277	-26.99	-20	6.99
...			H					
939.000	54.94	Peak	V	100	314	-39.95	-20	19.95
4225.500	65.57	Peak	V	100	113	-30.09	-20	10.09
4695.000	68.01	Peak	V	100	179	-28.01	-20	8.01
...	...		V					

4.4. Spurious Emission On Antenna Port

TEST APPLICABLE

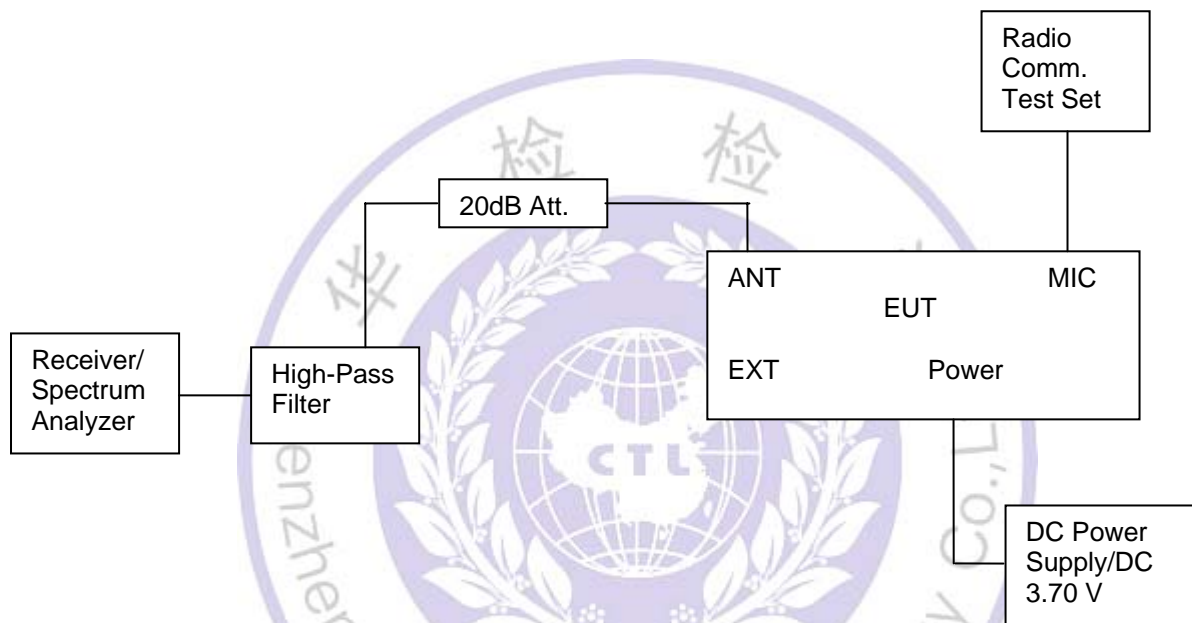
The same as Section 4.3

TEST PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz, while set RBW=1MHz, VBW=3MHz from the 1GHz to 10th Harmonic.

The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST CONFIGURATION



TEST RESULTS:

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 11 (12.5 kHz Bandwidth only):
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

Low: $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(0.841) = 49.25 \text{ dB}$

High: $50 + 10 \log(P_{\text{watts}}) = 50 + 10 \log(0.863) = 49.36 \text{ dB}$

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

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

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 30.0 dBm.

Limit (dBm) = 30.0 - 50 - 10log10 (0.863) = -20 dBm

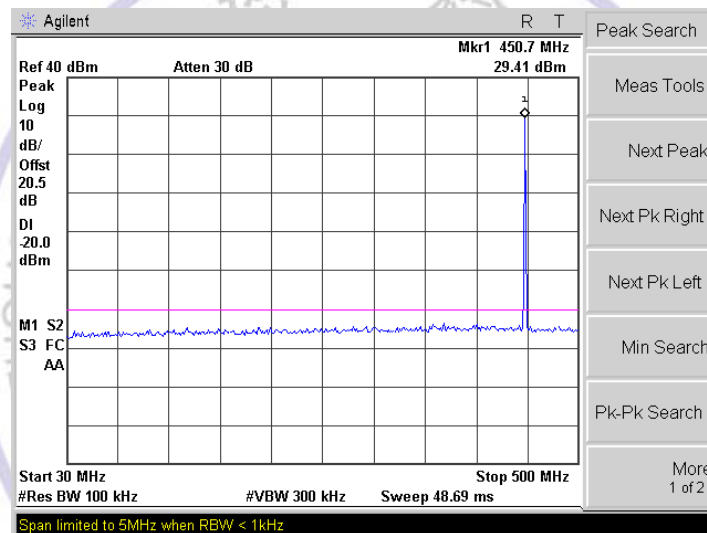
Note: 1. In general, the worse case attenuation requirement shown above was applied.

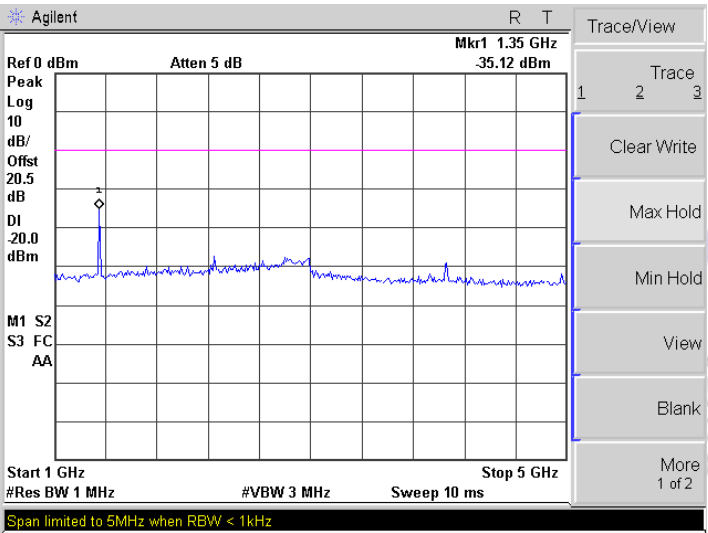
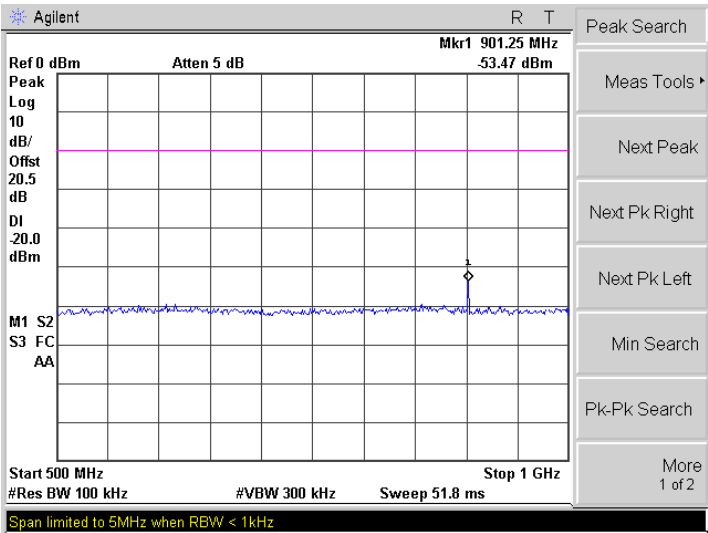
2. The measurement frequency range from 30 MHz to 5 GHz.

Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz	
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)
Analog/FM	12.5KHz	Low	450.5000	901.25	-53.47	1350.00	-35.12
		Middle	460.5000	921.25	-54.95	1380.00	-47.55
		High	469.5000	940.00	-51.59	1410.00	-42.78
Limit		-20dBm for 12.5KHz Channel Separation					
Test Results		Compliance					

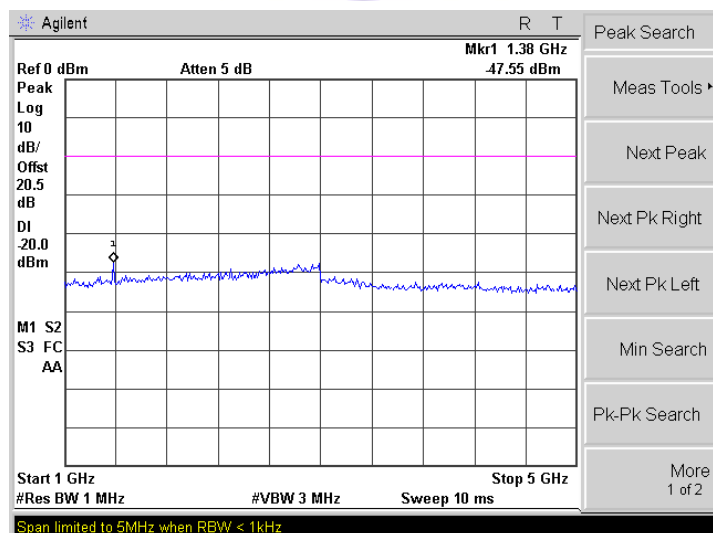
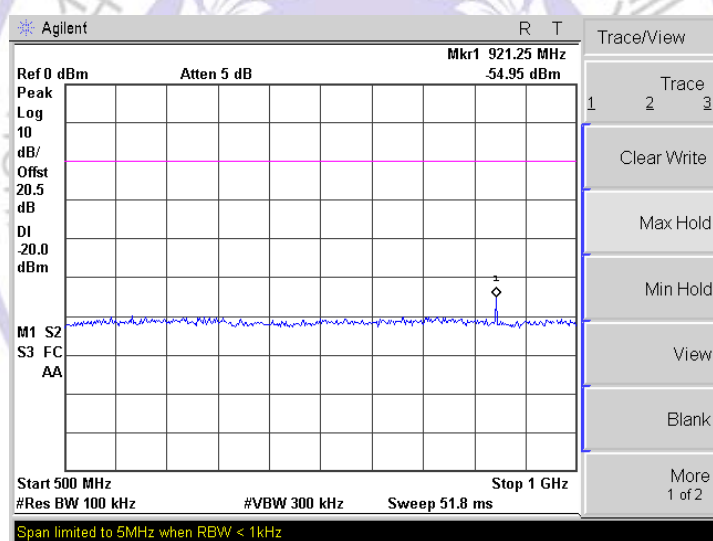
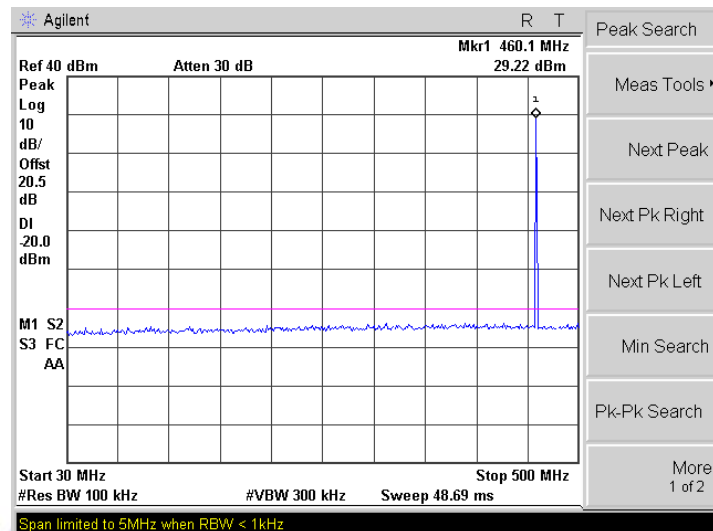
Plots of Spurious Emission on Antenna Port Measurement

Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	450.5000	901.25	-53.47	1350.00	-35.12	-20dBm
Test Results				Compliance				

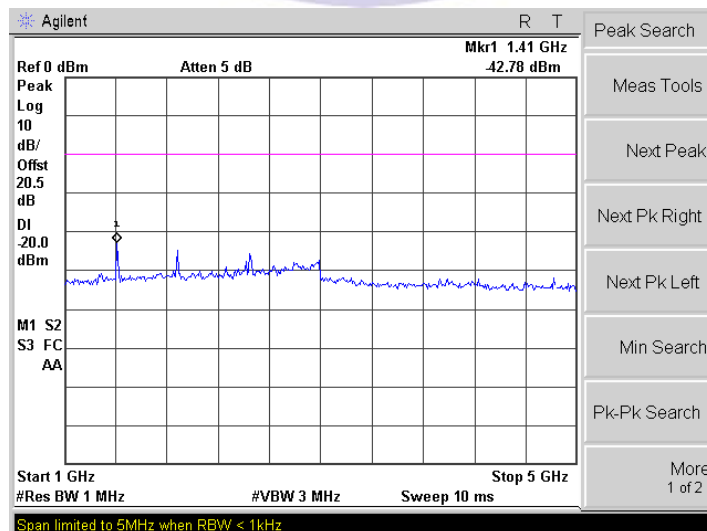
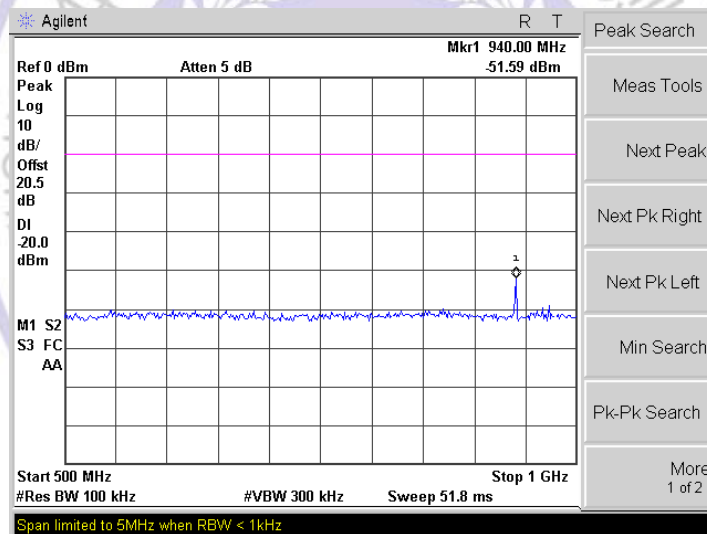
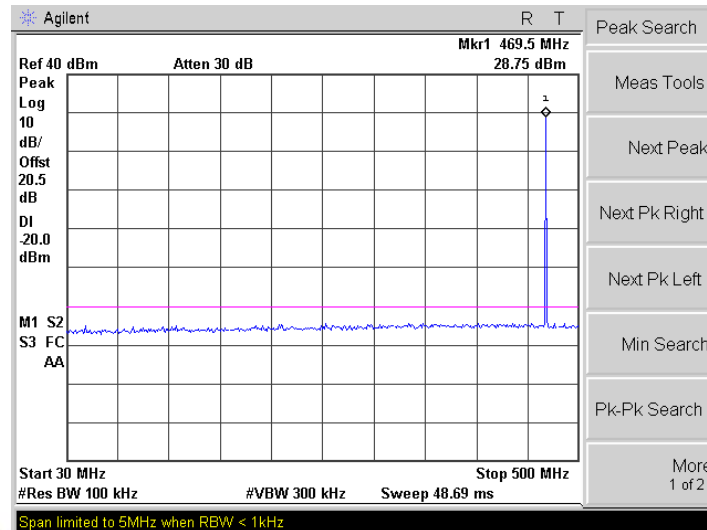




Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	460.5000	921.25	-54.95	1380.00	-47.55	-20dBm
Test Results				Compliance				



Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	High	469.5000	940.00	-51.59	1410.00	-42.78	-20dBm
Test Results				Compliance				



4.5. Modulation Characteristics

TEST APPLICABLE

According to CFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

TEST PROCEDURE

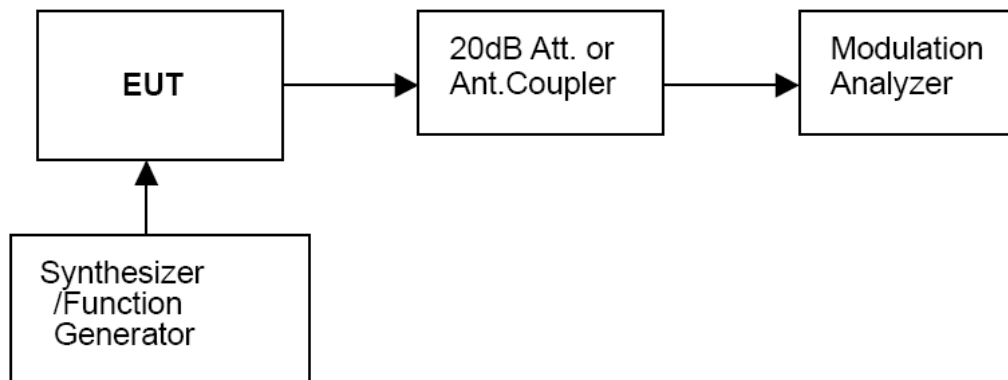
Modulation Limit

- 1 Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0dB) and vary the input level from -20 to +20dB. Record the frequency deviation obtained as a function of the input level.
- 2 Repeat step 1 with input frequency changing to 300, 1004, 1500 and 2500Hz in sequence.

Audio Frequency Response

- 1 Configure the EUT as shown in figure 1.
- 2 Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).
- 3 Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation.
- 4 Audio Frequency Response = $20 \log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1 KHz reference})$.

TEST CONFIGURATION

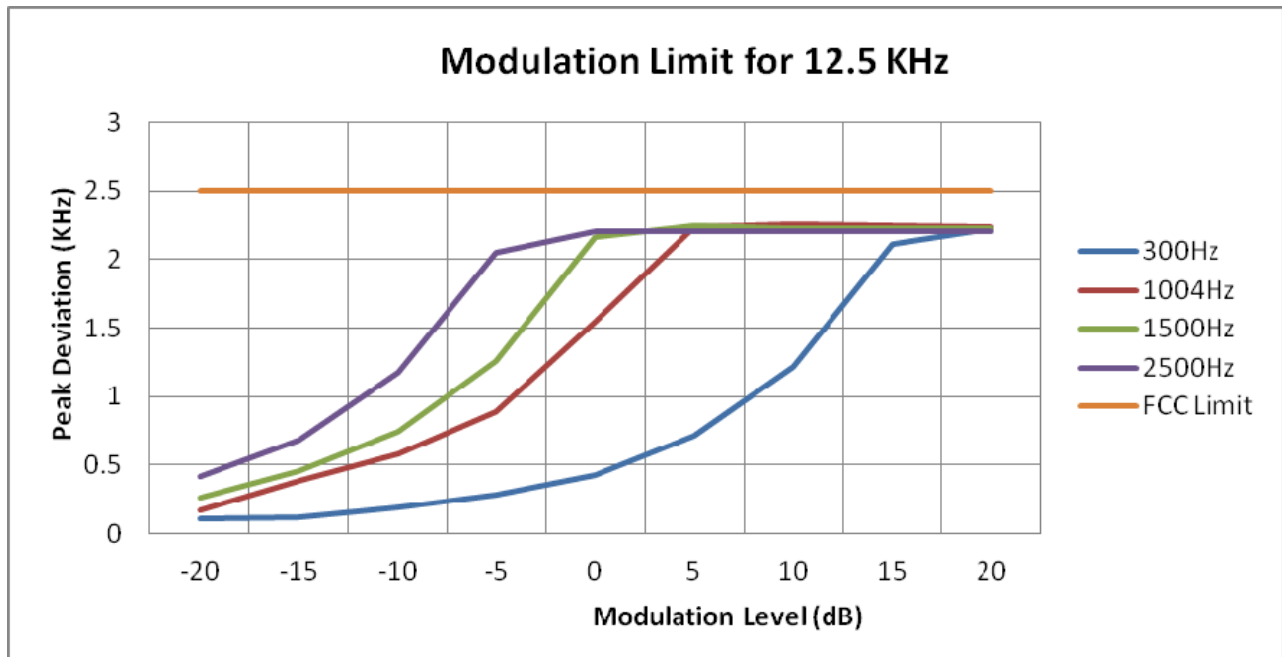


TEST RESULTS

Modulation Type: FM

12.5 KHz Channel Separation

Modulation Level(dB)	Peak Freq. Deviation At 300 Hz(KHz)	Peak Freq. Deviation At 1004 H(KHz)	Peak Freq. Deviation At 1500 Hz(KHz)	Peak Freq. Deviation At 2500 Hz(KHz)
-20	0.10	0.16	0.27	0.43
-15	0.14	0.39	0.48	0.69
-10	0.18	0.57	0.73	1.19
-5	0.27	0.90	1.28	2.04
0	0.42	1.53	2.17	2.20
+5	0.70	2.27	2.26	2.21
+10	1.25	2.22	2.24	2.22
+15	2.13	2.24	2.24	2.22
+20	2.24	2.23	2.24	2.22



b). Audio Frequency Response:

Rule Part No.: Part 2.1407(a) (b)

Method of Measurement:

The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 300-3000Hz shall be submitted and Audio Post Limiter Low Pass Filter Response from 3.0 KHz to 50KHz. However, the audio frequency response should test from 100Hz to 5.0 KHz according to FCC Part 90.

Modulation Type: FM

The audio frequency response curve is show below.and

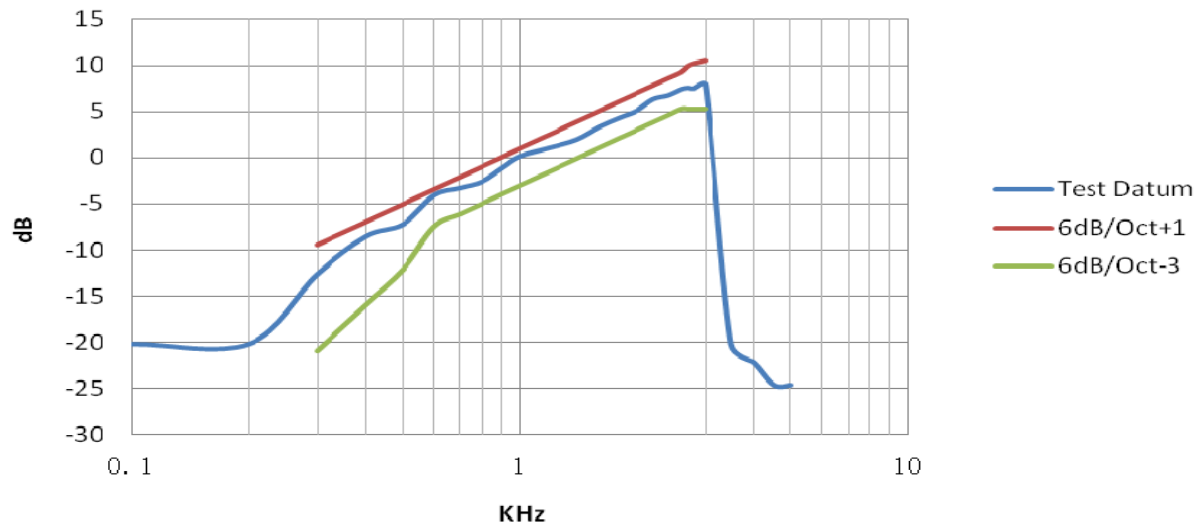
Test Audio Level (1 KHz and 20% maximum deviation) is 2.90mv for 12.5 KHz channel separation.

Note:

- 1 Not applicable to new standard. However, tests are conducted under FCC's recommendation.
- 2 The Audio Frequency Response is identical for 12.5 KHz channel separation

12.5 KHz Channel Separation

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.05	0.51	-20.16
0.2	0.05	0.51	-20.16
0.3	0.15	0.51	-12.61
0.4	0.27	0.51	-8.54
0.5	0.25	0.51	-7.20
0.6	0.32	0.51	-4.06
0.7	0.35	0.51	-3.26
0.8	0.38	0.51	-2.57
0.9	0.45	0.51	-1.10
1.0	0.52	0.51	0.18
1.2	0.58	0.51	1.13
1.4	0.64	0.51	1.96
1.6	0.75	0.51	3.34
1.8	0.84	0.51	4.36
2.0	0.92	0.51	5.13
2.2	1.06	0.51	6.34
2.4	1.11	0.51	6.75
2.6	1.20	0.51	7.44
2.7	1.22	0.51	7.59
2.8	1.21	0.51	7.51
3.0	1.27	0.51	7.90
3.5	0.05	0.51	-20.16
4.0	0.04	0.51	-22.18
4.5	0.03	0.51	-24.64
5.0	0.03	0.51	-24.64

Audio Frequency Response for 12.5KHz

4.6. Frequency Stability Measurement

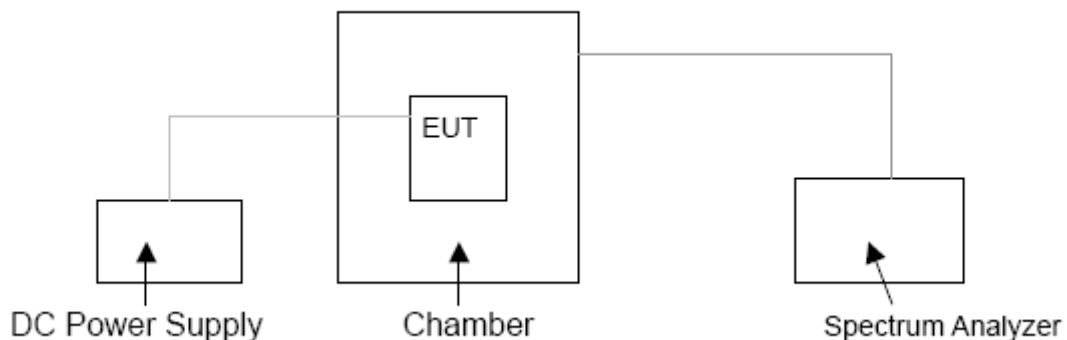
TEST APPLICABLE

- 1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +50°C centigrade.
- 2 According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
- 3 Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and tested end point voltage.
- 4 According to §90.213, the frequency stability limit is 2.5 ppm for 12.5 KHz channel separation and 1.0 ppm for 6.25KHz channel separation.

TEST PROCEDURE

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

TEST SETUP BLOCK DIAGRAM



TEST LIMITS

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

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	1,2,3 100	100	200
25–50	20	20	50
72–76	5	5	50
150–174	5,11 5	5	4,6 50
216–220	1.0	1.0	1.0
220–222 ¹²	0.1	1.5	1.5
421–512	7,11,14 2.5	5	5
806–809	¹⁴ 1.0	1.5	1.5
809–824	¹⁴ 1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	¹⁴ 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 ¹³	2.5	2.5	2.5
929–930	1.5	1.5	1.5
935–940	0.1	1.5	1.5
1427–1435	300	300	300
Above 2450 ¹⁰	300	300	300

Modulation Type	Channel Separation	Test conditions		Frequency error (ppm)		
		Voltage(V)	Temp(℃)	450.5000 (MHz)	460.5000 (MHz)	469.5000 (MHz)
Analog/FM	12.5KHz	3.70	-30	0.46	0.50	0.53
			-20	0.46	0.48	0.52
			-10	0.50	0.48	0.52
			0	0.37	0.43	0.39
			10	0.43	0.42	0.43
			20	0.38	0.37	0.38
			30	0.37	0.37	0.38
			40	0.29	0.22	0.24
			50	0.42	0.42	0.46
		3.20 (End Point)	25	0.77	0.78	0.73
		3.14 (85% Rated)	20	0.47	0.48	0.47
		4.23 (115% Rated)	20	0.47	0.44	0.47
Limit			2.50	2.50	2.50	
Conclusion		Complies				



4.7. Conducted Output Power

TEST APPLICABLE

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

Per RSS-119 Section 5.4 and 5.4.1: The output power shall be within ± 1.0 dB of the manufacturer's rated power. Typical transmitter output powers are 110 watts for base and/or fixed stations (paging transmitters excepted), and 30 watts for mobile stations. Higher powers may be certified, but it should be noted that mobile stations are normally only licensed up to 30 watts. See the SRSP relevant to the operating frequency for equipment power limits.

TEST PROCEDURE

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

If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

The EUT connect to the Receiver through 40 dB attenuator.

Measurement with Spectrum Analyzer FSP40 or Aglient E4407B conducted, external power supply with 12.50 V stabilized supply voltage.

TEST CONFIGURATION

EUT		Attenuator		Spectrum Analyzer/Receiver

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

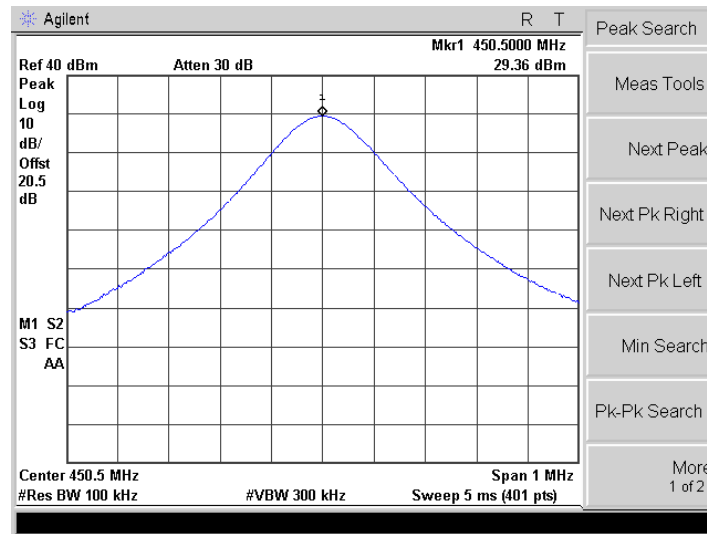
TEST RESULTS

Frequency Range (MHz)	Modulation Type	Channel Separation (KHz)	Test Channel	Maximum Output Power Test Results (dBm)
450-470	Analog/FM	12.5	Low	29.36
			Middle	29.32
			High	29.25
Limit	FCC:The limit is dependent upon the station's antenna HAAT and required service area.			
	IC:The output power shall be within ±1.0 dB of the manufacturer's rated power.			
Test Results	Compliance			

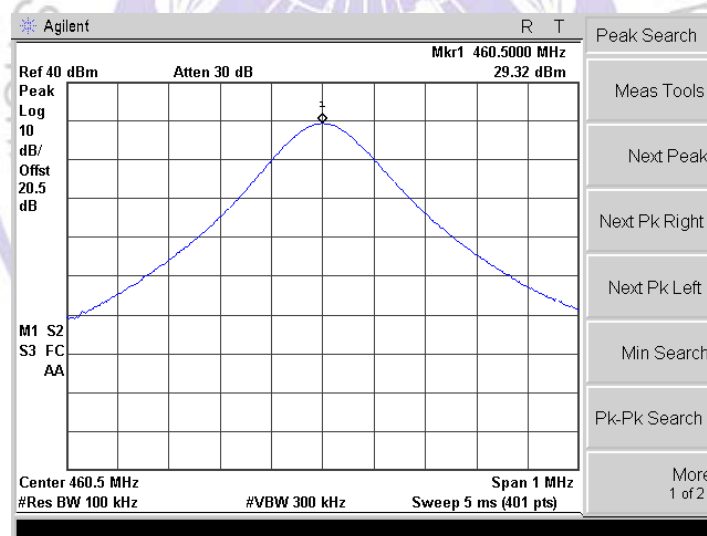
Plots of Maximum Transmitter Power Measurement

Please see the next page:

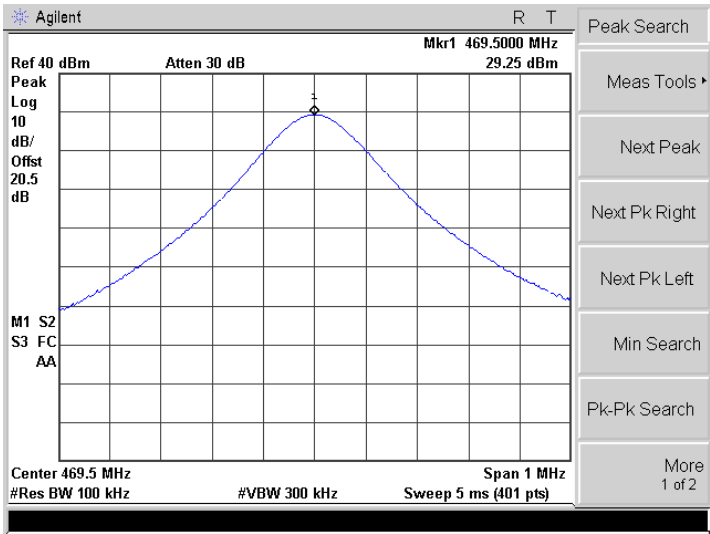
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	IC Limit (dB)	Results
FM	12.5 KHz	450.5000	1	29.36	Varies	30.0±1	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	IC Limit (dB)	Results
FM	12.5 KHz	460.5000	1	29.32	Varies	30.0±1	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	IC Limit (dB)	Results
FM	12.5 KHz	469.5000	1	29.25	Varies	30.0±1	Compliance



4.8. Transmitter Frequency Behavior

TEST APPLICABLE

Section 90.214

Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

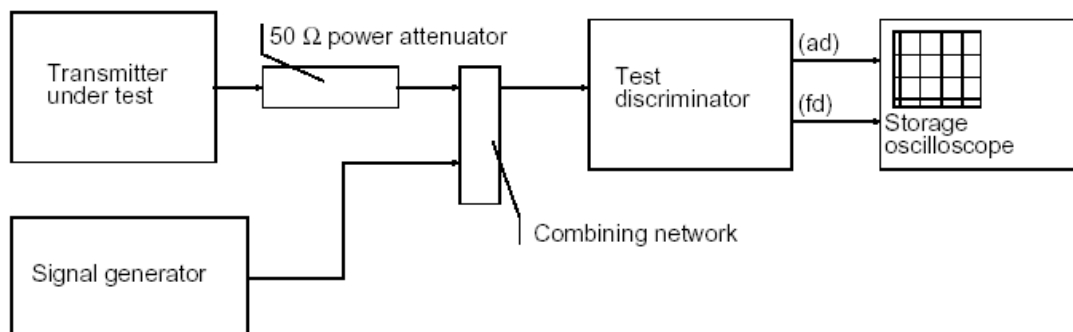
Time intervals ^{1, 2}	Maximum frequency difference ³	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t ₁ ⁴	± 25.0 KHz	5.0 ms	10.0 ms
t ₂	± 12.5 KHz	20.0 ms	25.0 ms
t ₃ ⁴	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels			
t ₁ ⁴	± 12.5 KHz	5.0 ms	10.0 ms
t ₂	± 6.25 KHz	20.0 ms	25.0 ms
t ₃ ⁴	± 12.5 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels			
t ₁ ⁴	±6.25 KHz	5.0 ms	10.0 ms
t ₂	±3.125 KHz	20.0 ms	25.0 ms
t ₃ ⁴	±6.25 KHz	5.0 ms	10.0 ms

- 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.
- 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.
- Difference between the actual transmitter frequency and the assigned transmitter frequency.
- If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

TEST PROCEDURE

TIA/EIA-603 2.2.19

TEST CONFIGURATION

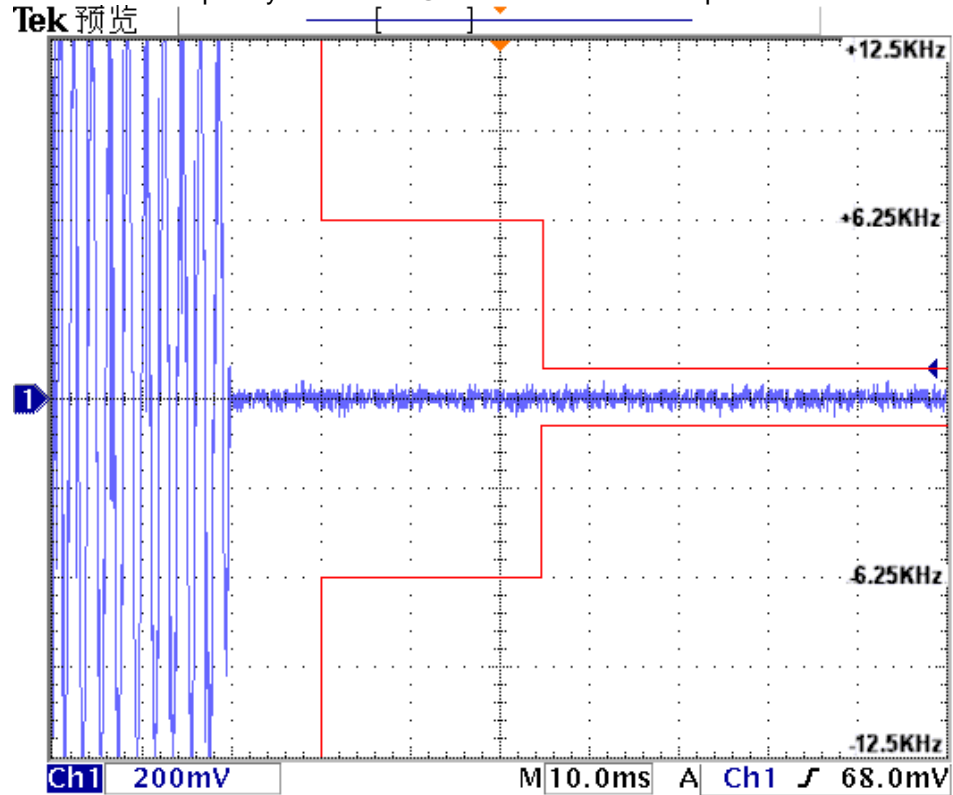


TEST RESULTS

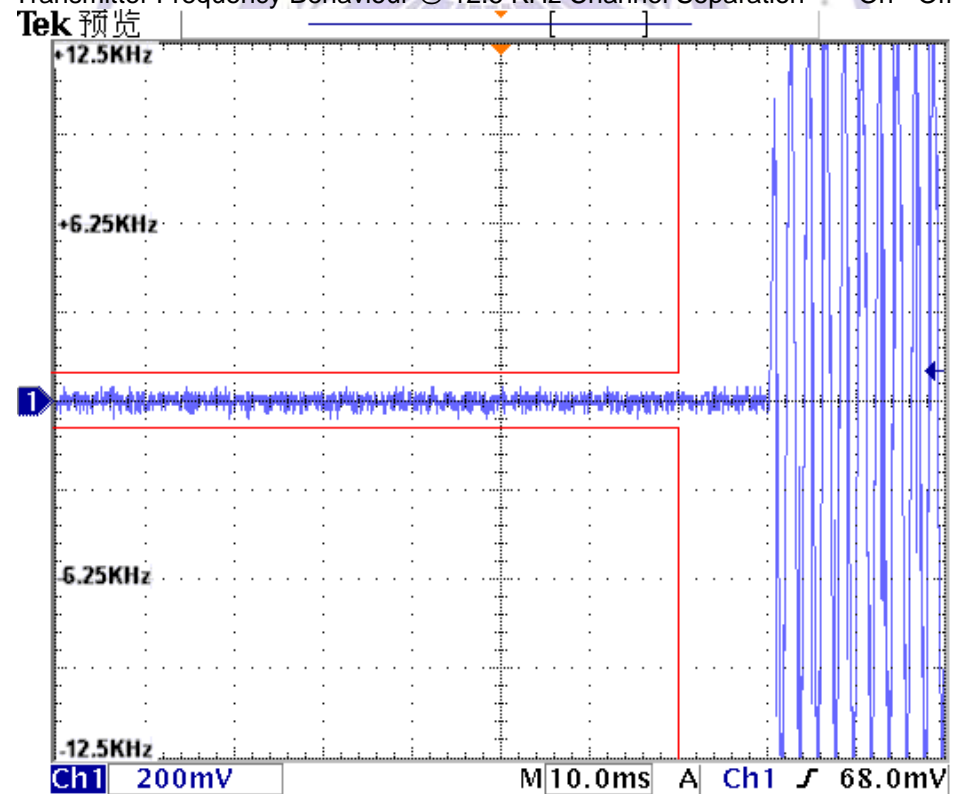
Please refer to the following plots.

Modulation Type: FM

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



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



4.9. Receiver Radiated Spurious Emission

TEST APPLICABLE

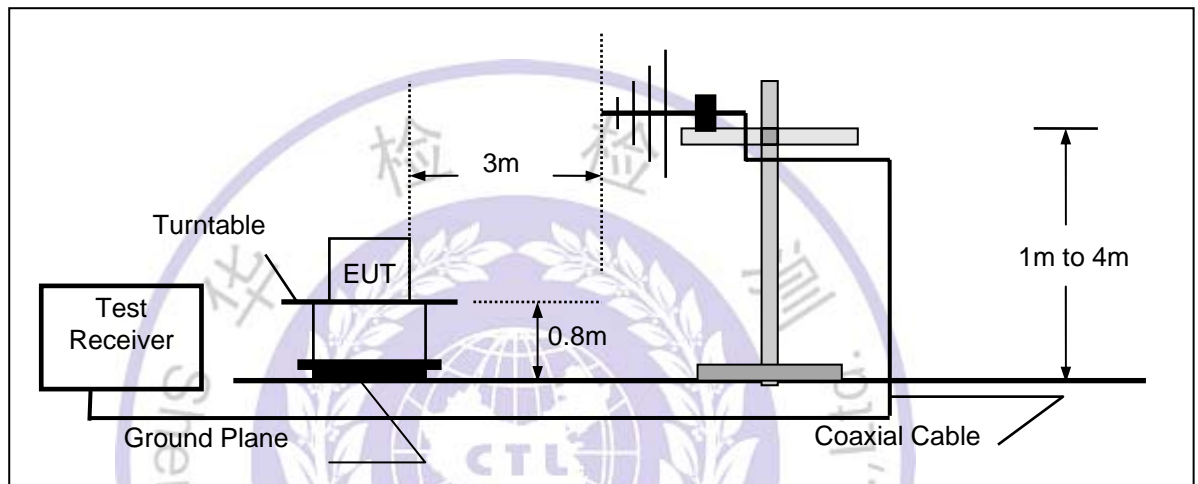
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

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

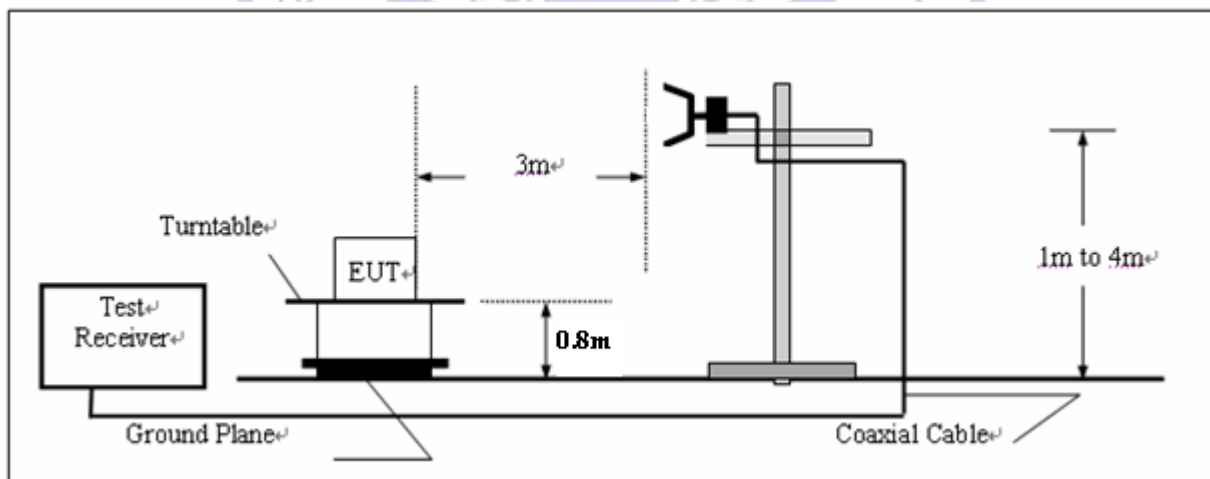
Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
- 3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4 Repeat above procedures until all frequency measurements have been completed.

RECEIVER RADIATED SPOUIOUS LIMIT

For unintentional device, according to § 15.109(a) and RSS-Gen, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

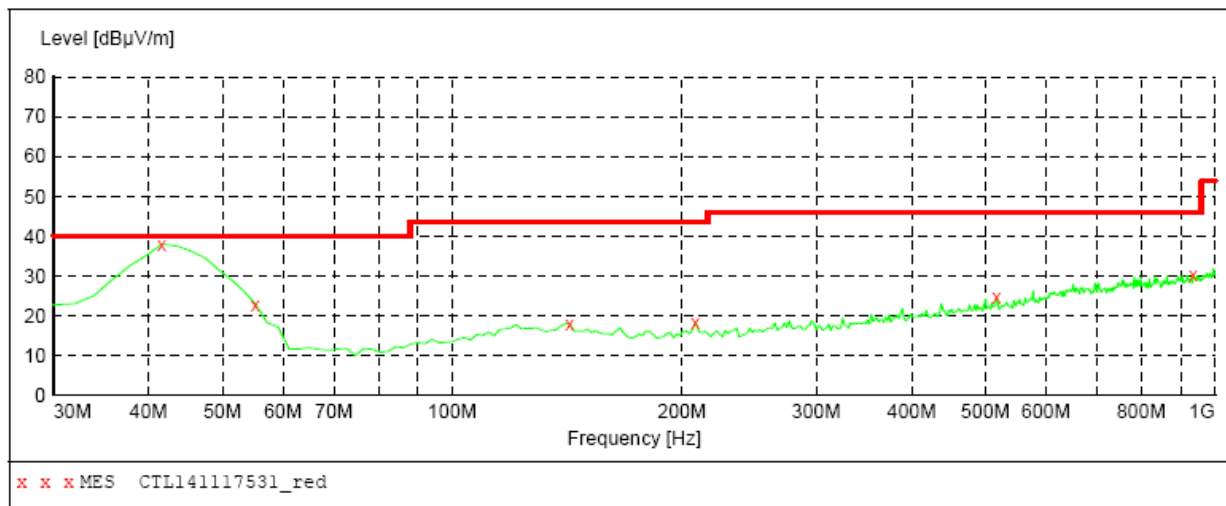
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

TEST RESULTS

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

450.5MHz:***SWEEP TABLE: "test (30M-1G)"***

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

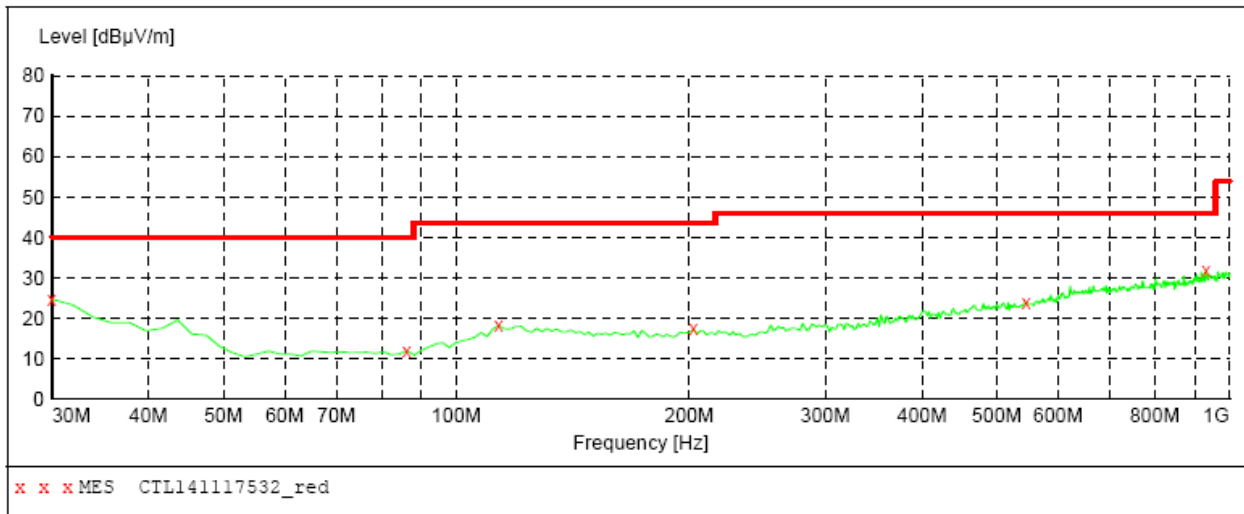
***MEASUREMENT RESULT: "CTL141117531_red"***

11/17/2014 9:23AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	37.90	12.5	40.0	2.1	---	0.0	0.00	VERTICAL
55.220000	22.80	8.3	40.0	17.2	---	0.0	0.00	VERTICAL
142.520000	18.00	14.5	43.5	25.5	---	0.0	0.00	VERTICAL
208.480000	18.30	14.3	43.5	25.2	---	0.0	0.00	VERTICAL
516.940000	24.60	20.5	46.0	21.4	---	0.0	0.00	VERTICAL
935.980000	30.30	26.5	46.0	15.7	---	0.0	0.00	VERTICAL

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

Short Description:		Field Strength			Transducer
Start	Stop	Detector	Meas. Time	IF Bandw.	
Frequency	Frequency				
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

***MEASUREMENT RESULT: "CTL141117532_red"***

11/17/2014 9:25AM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.70	21.1	40.0	15.3	---	0.0	0.00	HORIZONTAL
86.260000	11.90	9.3	40.0	28.1	---	0.0	0.00	HORIZONTAL
113.420000	18.10	14.5	43.5	25.4	---	0.0	0.00	HORIZONTAL
202.660000	17.30	14.4	43.5	26.2	---	0.0	0.00	HORIZONTAL
546.040000	24.00	20.9	46.0	22.0	---	0.0	0.00	HORIZONTAL
932.100000	31.80	26.4	46.0	14.2	---	0.0	0.00	HORIZONTAL

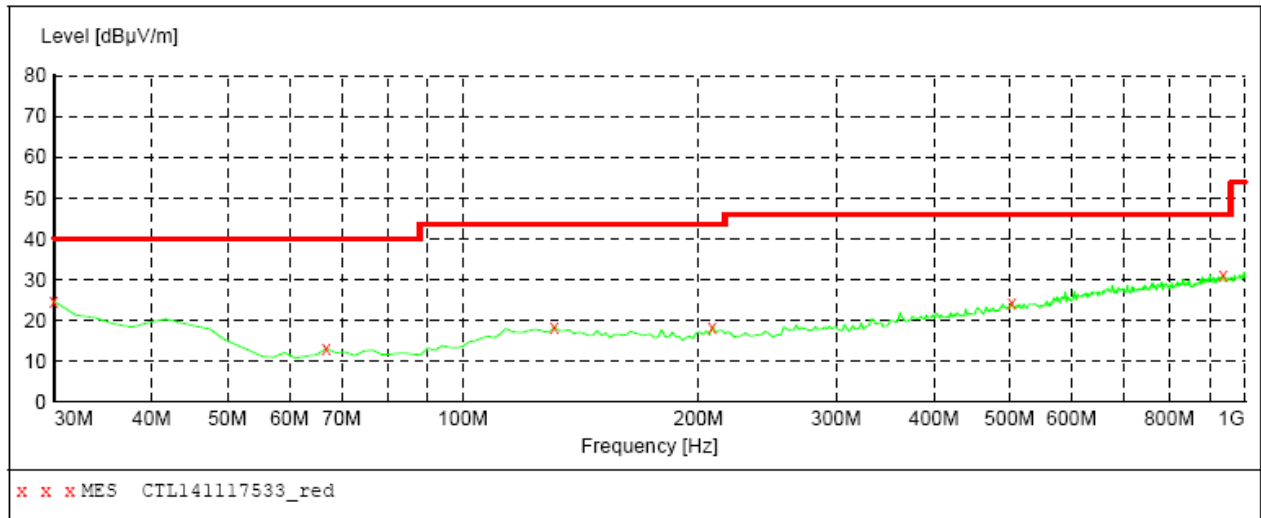
Note: Radiated emission test above 1GHz up to 6GHz was verified, and no any emission was found except system noise floor.



460.5:

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

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

***MEASUREMENT RESULT: "CTL141117533_red"***

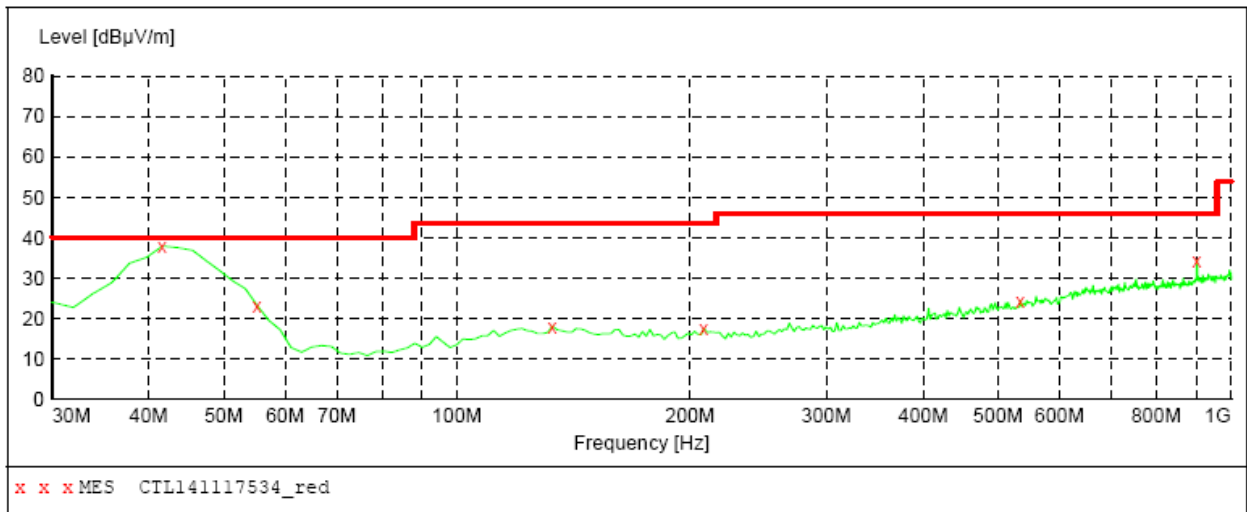
11/17/2014 9:27AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.60	21.1	40.0	15.4	---	0.0	0.00	HORIZONTAL
66.860000	13.00	8.4	40.0	27.0	---	0.0	0.00	HORIZONTAL
130.880000	18.40	14.9	43.5	25.1	---	0.0	0.00	HORIZONTAL
208.480000	18.40	14.3	43.5	25.1	---	0.0	0.00	HORIZONTAL
503.360000	24.30	20.4	46.0	21.7	---	0.0	0.00	HORIZONTAL
937.920000	31.20	26.5	46.0	14.8	---	0.0	0.00	HORIZONTAL



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

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

***MEASUREMENT RESULT: "CTL141117534_red"***

11/17/2014 9:28AM

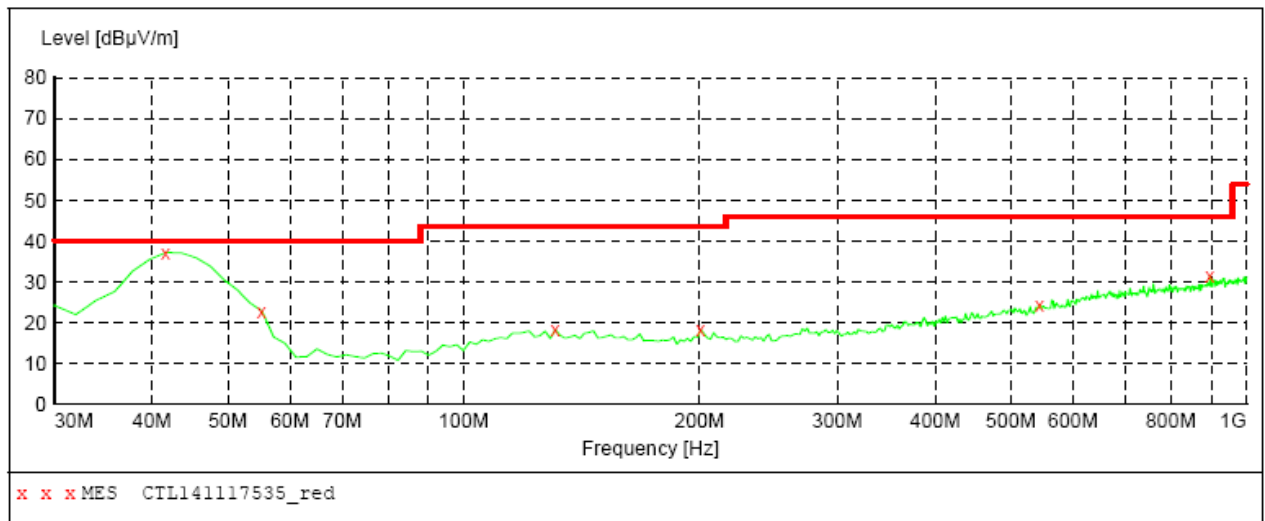
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	37.90	12.5	40.0	2.1	---	0.0	0.00	VERTICAL
55.220000	23.10	8.3	40.0	16.9	---	0.0	0.00	VERTICAL
132.820000	18.00	14.8	43.5	25.5	---	0.0	0.00	VERTICAL
208.480000	17.50	14.3	43.5	26.0	---	0.0	0.00	VERTICAL
534.400000	24.40	20.6	46.0	21.6	---	0.0	0.00	VERTICAL
903.000000	34.30	26.1	46.0	11.7	---	0.0	0.00	VERTICAL

Note: Radiated emission test above 1GHz up to 6GHz was verified, and no any emission was found except system noise floor.

469.5:

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

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

***MEASUREMENT RESULT: "CTL141117535_red"***

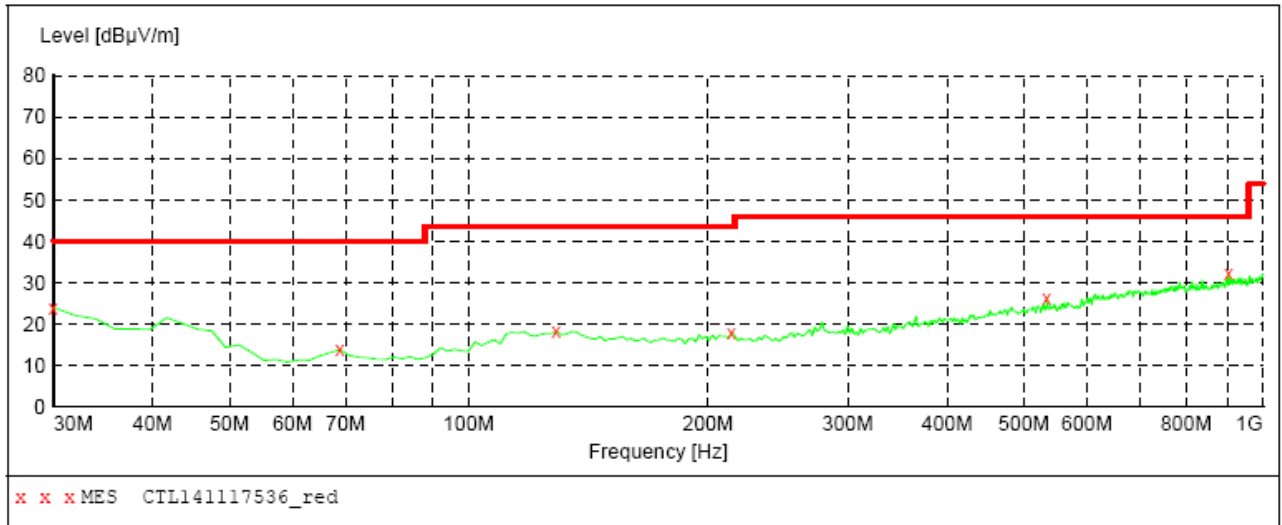
11/17/2014 9:29AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	37.10	12.5	40.0	2.9	---	0.0	0.00	VERTICAL
55.220000	22.80	8.3	40.0	17.2	---	0.0	0.00	VERTICAL
130.880000	18.20	14.9	43.5	25.3	---	0.0	0.00	VERTICAL
200.720000	18.20	14.4	43.5	25.3	---	0.0	0.00	VERTICAL
544.100000	24.30	20.9	46.0	21.7	---	0.0	0.00	VERTICAL
897.180000	31.50	26.0	46.0	14.5	---	0.0	0.00	VERTICAL



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

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

***MEASUREMENT RESULT: "CTL141117536_red"***

11/17/2014 9:31AM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.00	21.1	40.0	16.0	---	0.0	0.00	HORIZONTAL
68.800000	13.70	8.4	40.0	26.3	---	0.0	0.00	HORIZONTAL
128.940000	18.20	14.9	43.5	25.3	---	0.0	0.00	HORIZONTAL
214.300000	18.00	14.3	43.5	25.5	---	0.0	0.00	HORIZONTAL
534.400000	26.20	20.6	46.0	19.8	---	0.0	0.00	HORIZONTAL
904.940000	32.10	26.2	46.0	13.9	---	0.0	0.00	HORIZONTAL

Note: Radiated emission test above 1GHz up to 6GHz was verified, and no any emission was found except system noise floor.

4.10. Receiver Conducted Spurious Emission

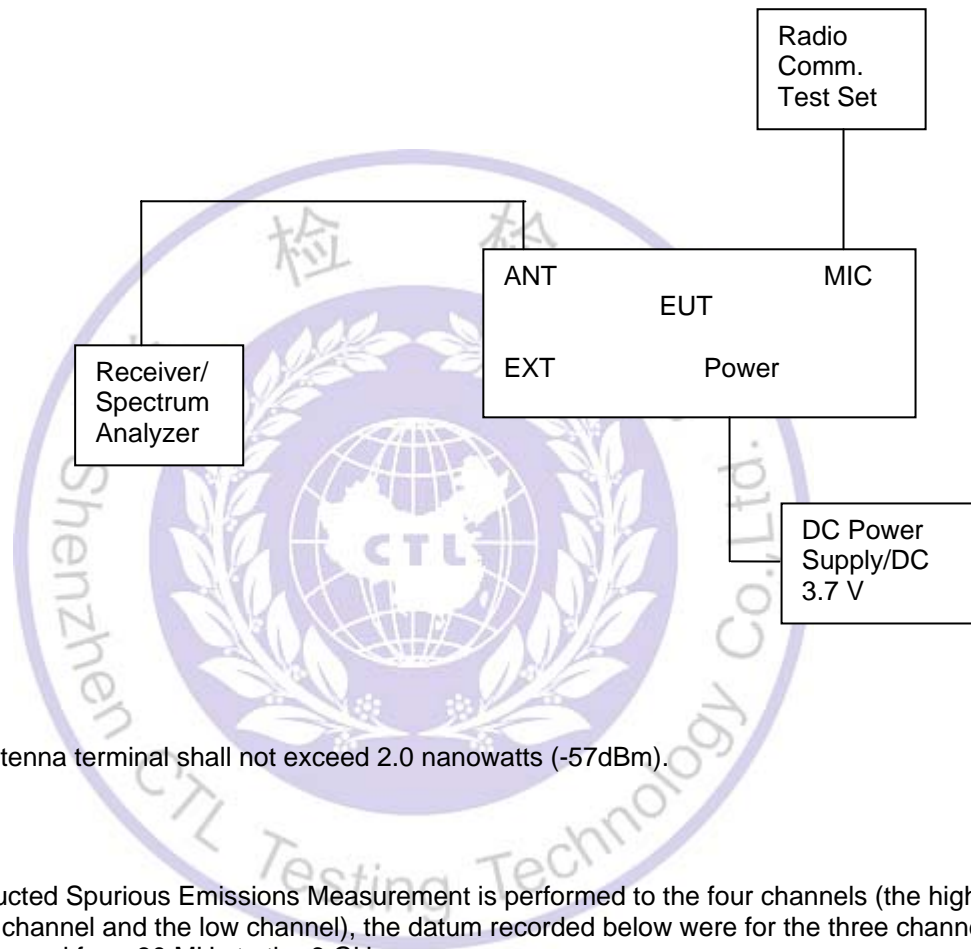
TEST APPLICABLE

The same as Section 4.3

TEST PROCEDURE

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

TEST CONFIGURATION



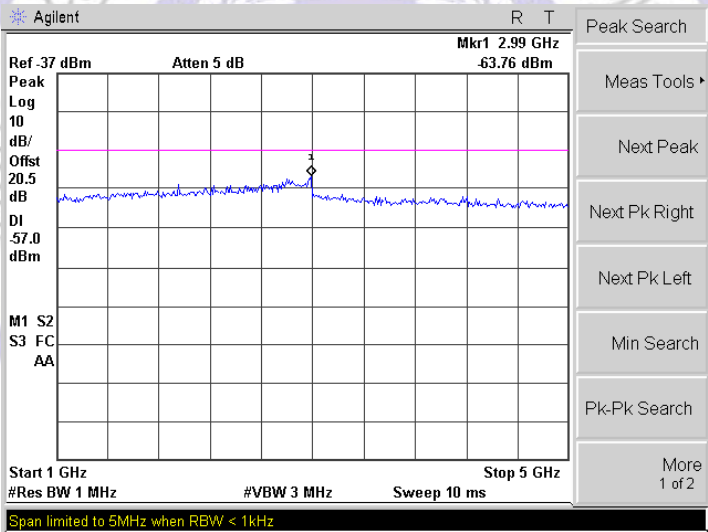
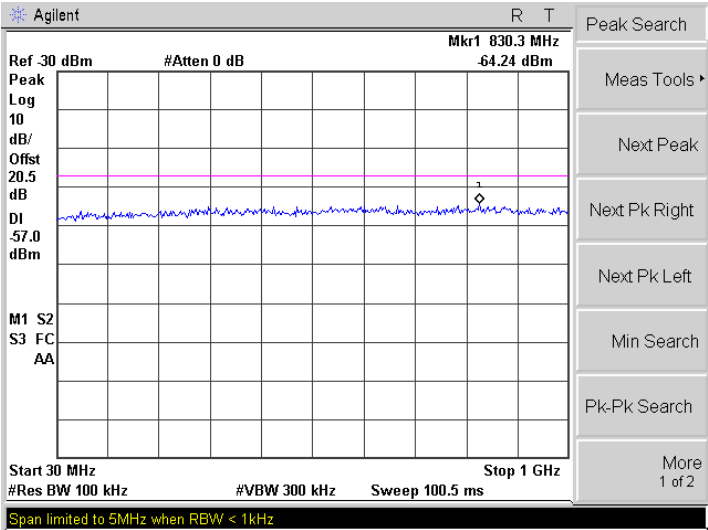
LIMIT

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

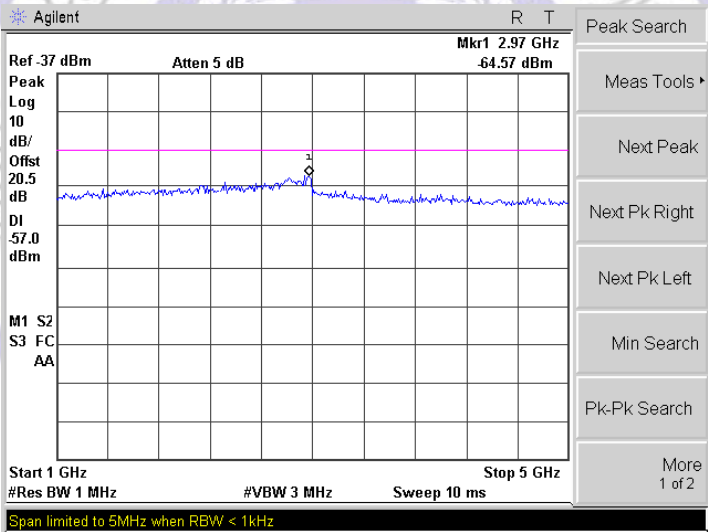
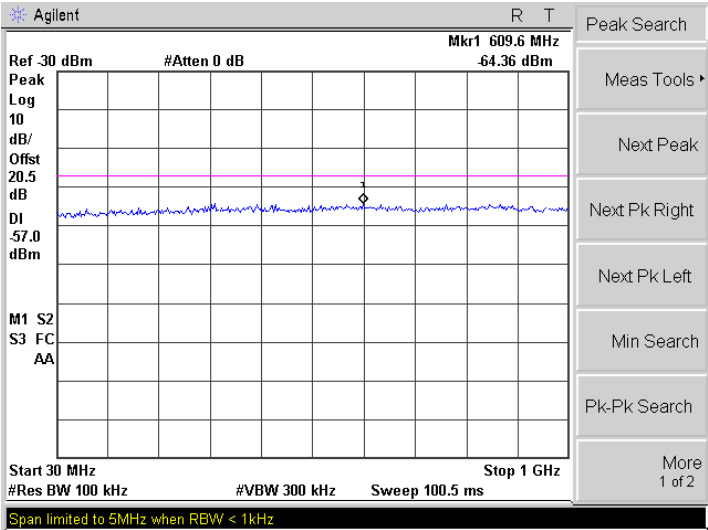
TEST RESULTS

The Receiver Conducted Spurious Emissions Measurement is performed to the four channels (the high channel, the middle channel and the low channel), the datum recorded below were for the three channels; and the EUT shall be scanned from 30 MHz to the 6 GHz.

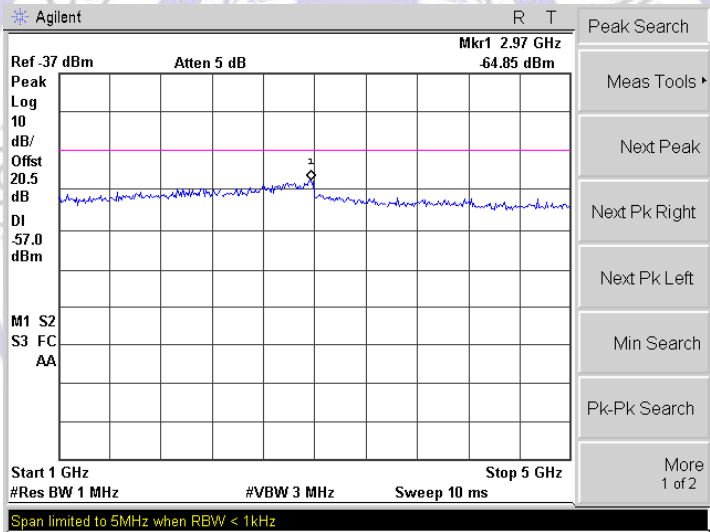
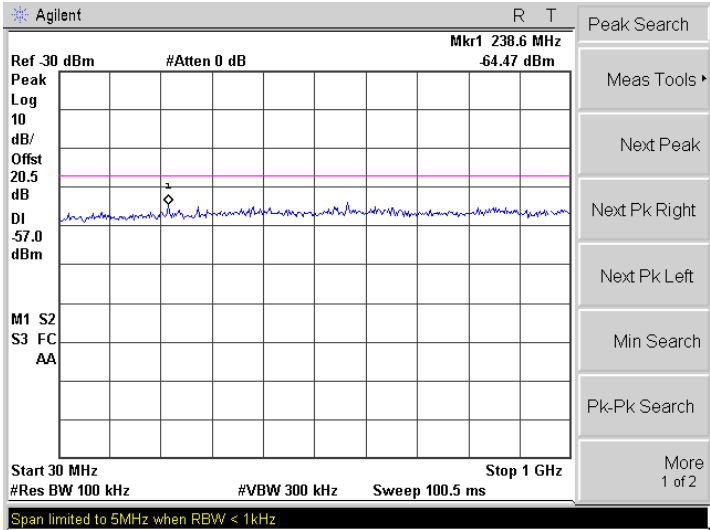
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Low	450.5000	830.3	-64.24	2990.00	-63.76	-57dBm
Test Results				Compliance				



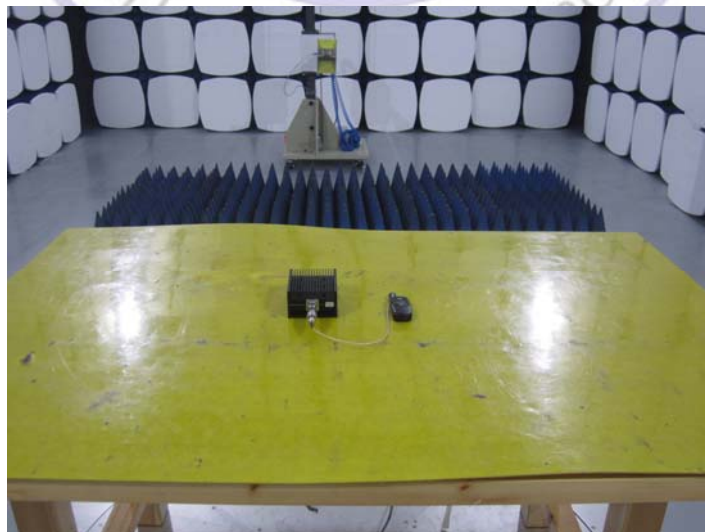
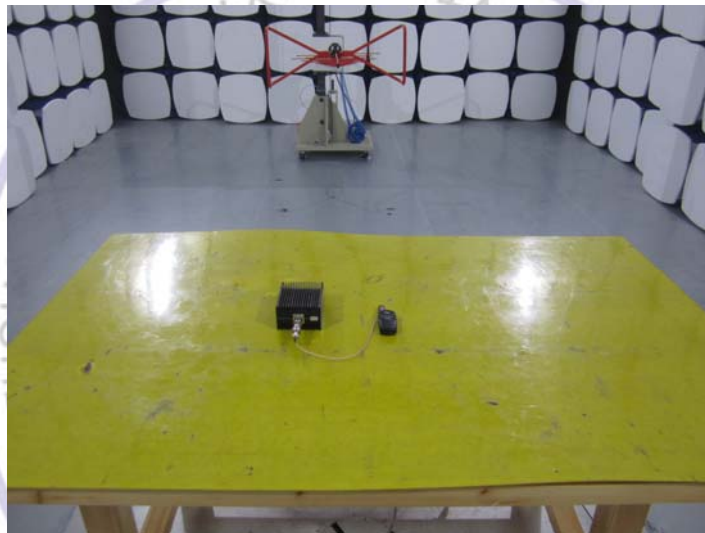
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	Middle	460.5000	609.6	-64.36	2970.00	-64.57	-57dBm
Test Results				Compliance				



Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	High	469.5000	238.60	-64.47	2970.00	-64.85	-57dBm
Test Results				Compliance				



5. Test Setup Photos of the EUT



6. External and Internal Photos of the EUT

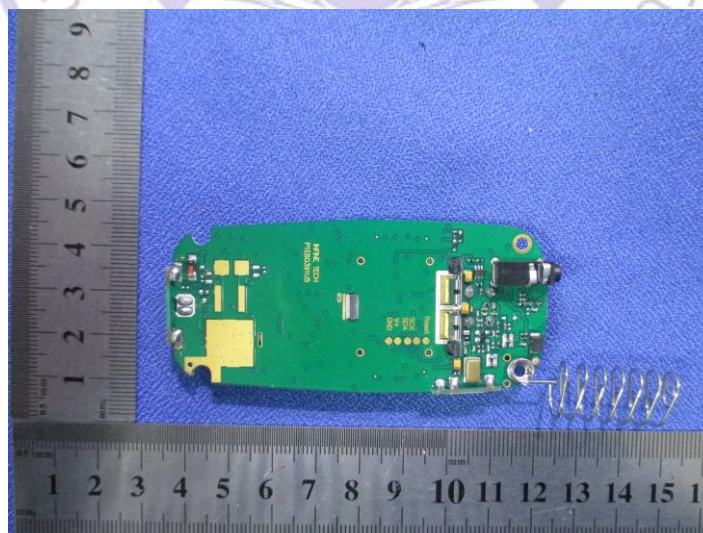
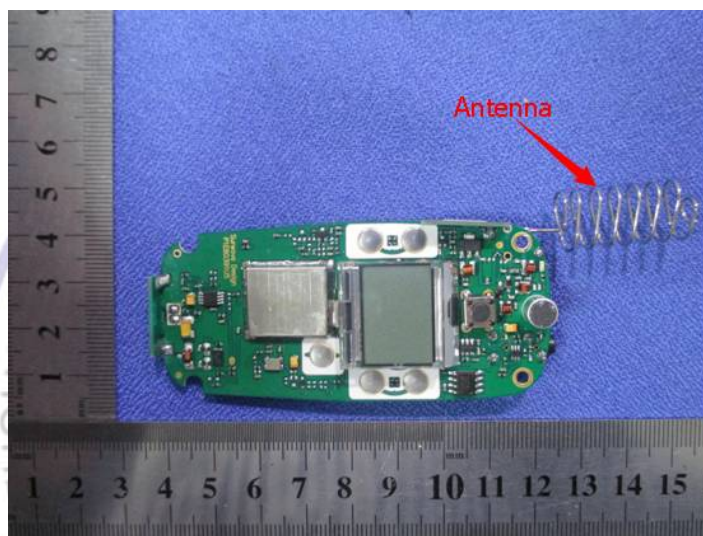
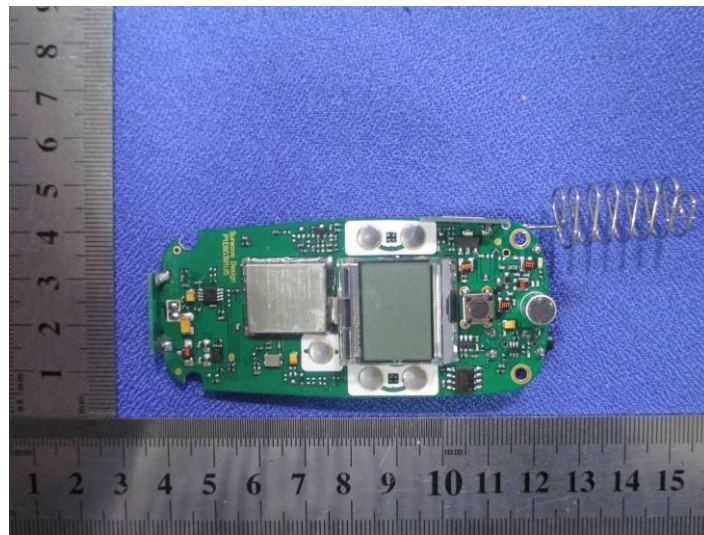
External Photos

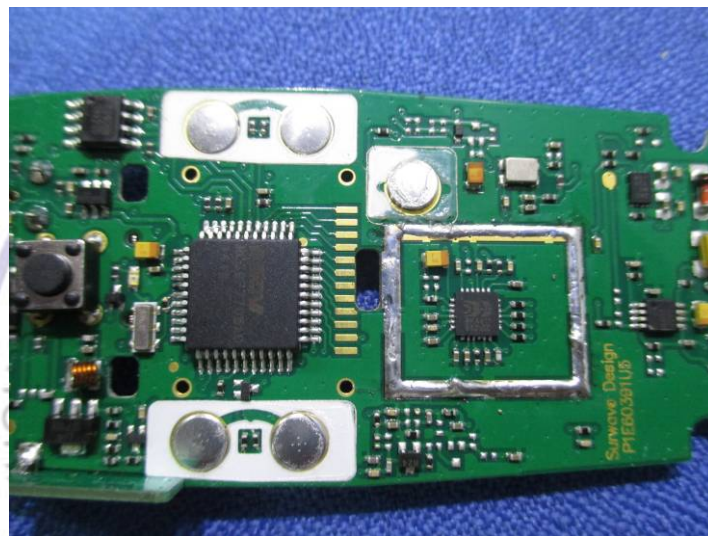
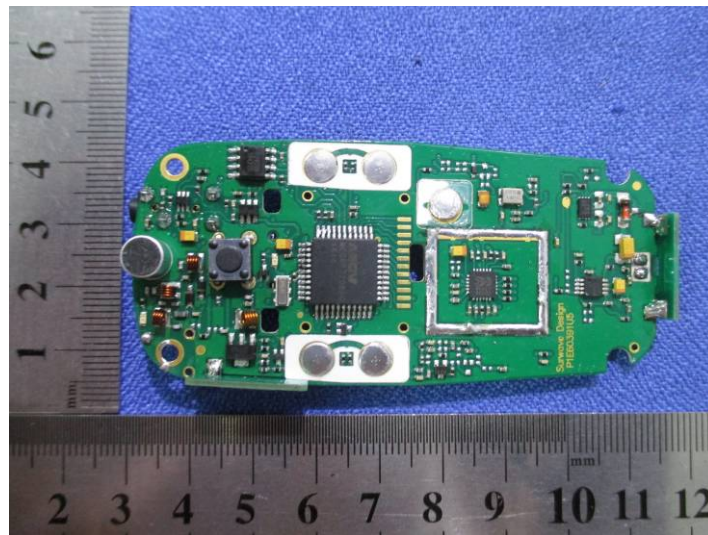






Internal Photos





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

