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FCC PART 90 Test Report

Report Reference No.....:	CTL1407301819-WF
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Approved by (position+printed name+signature)...:	Manager Tracy Qi
Date of issue.....:	Aug. 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.....:	Quanzhou Leixen Electronics Co., Ltd
Address.....:	No.48, Jinqiao Road, Changtai Street, Quanzhou City, Fujian Province, China
Test specification	
Standard	FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES
TRF Originator.....:	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF.....:	Dated 2011-01
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Test item description	Mobile Transceiver
FCC ID.....:	2AC2Z-898UV
Trade Mark	LEIXEN
Model/Type reference.....:	VV-898, UV-898, UV-898S, UV-998, UV-998S, JT270M, LX-809
Modulation.....:	FM
Channel Separation.....:	12.5KHz
Power Supply.....:	13.8V DC
Rated Power.....:	10W
Operating Frequency Range.....:	136-174MHz, 400-470MHz
Result.....:	Positive

TEST REPORT

Test Report No. : CTL1407301819-WF	Aug. 24, 2014 Date of issue
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Equipment under Test : Mobile Transceiver

Model /Type : VV-898

Listed Models : UV-898, UV-898S, UV-998, UV-998S, JT270M, LX-809

Difference Description : Only the color and model's name is different.

Applicant : **Quanzhou Leixen Electronics Co., Ltd**

Address : No.48, Jinqiao Road, Changtai Street, Quanzhou City,
Fujian Province, China

Manufacturer : **Quanzhou Leixen Electronics Co., Ltd**

Address : No.48, Jinqiao Road, Changtai Street, Quanzhou City,
Fujian Province, 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 603D:](#) Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

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

[FCC Part 2:](#) FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS



2. SUMMARY

2.1. General Remarks

Date of receipt of test sample : Aug. 01, 2014

Testing commenced on : Aug. 01, 2014

Testing concluded on : Aug. 23, 2014

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐ 120V / 60 Hz	☐ 115V / 60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 13.8V

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

The Mobile Transceiver, Model: VV-898 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Mobile Transceiver	
Model Number	VV-898	
FCC ID	2AC2Z-898UV	
Rated Output Power	10 Watts(40.00dBm)	
Modulation Type	FM for Analog Voice	
	Analog	F3E for 12.5KHz Channel Separation
Channel Separation	Analog Voice	12.5KHz
Antenna Type	External	
Frequency Range	136-174MHz, 400-470MHz	
Maximum Output Power	Analog	10.47W for 12.5 KHz Channel Separation

Test Frequency list

Frequency Range (MHz)	Modulation Type	Channel Separation (KHz)	Test Channel	Test Frequency (MHz)
				TX
	Analog/FM	12.5	A001	136.5000
			A002	146.0000
			A003	155.5000
			A004	164.0000
			A005	173.5000

Frequency Range (MHz)	Modulation Type	Channel Separation (KHz)	Test Channel	Test Frequency (MHz)
				TX
	Analog/FM	12.5	A006	406.5000
			A007	418.0000
			A008	435.5000
			A009	453.0000
			A010	469.5000

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

136-174MHz, 400-470MHz Mobile Transceiver.

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

●	Power Cable	Length (m) :	1.6m
		Shield :	No
		Detachable :	No
○	Multimeter	Manufacturer :	/
		Model No. :	/

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

This submittal(s) (test report) is intended for **FCC ID: 2AC2Z-898UV** filing to comply with the FCC Part 90 Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

2.9. Note

The EUT is a 136-174MHz, 400-470MHz Mobile Transceiver, The functions of the EUT listed as below:

	Test Standards	Reference Report
VV-898	FCC Part 90	CTL1407301819-WF
	FCC Per 47 CFR 2.1091(b)	CTL1407301819-WM

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, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

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

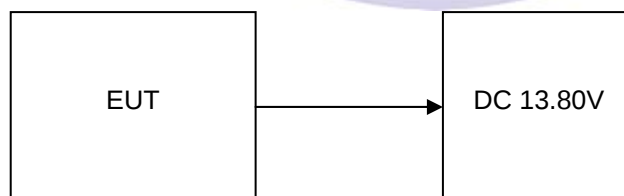
During the measurement the environmental conditions were within the listed ranges:

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

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



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 Electromagnetic 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	1~12.75GHz	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/X127 50-O/O	/	2014/07/06	2015/07/05
High-Pass Filter	K&L	41H10-1375/U127 50-O/O	/	2014/07/06	2015/07/05

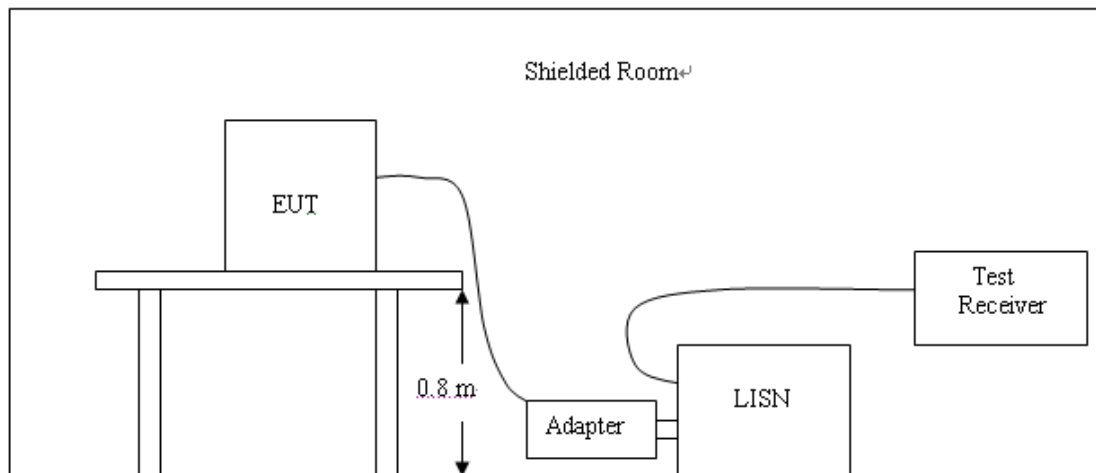
3.7. General Technical Requirements and Summary of Test Results

FCC Rules	Description of Test	Test Result
§ 90.205	Maximum Transmitter Power	Complies
§ 90.207	Modulation Characteristic	Complies
§ 90.209	Occupied Bandwidth	Complies
§ 90.210	Emission Mask	Complies
§ 90.213	Frequency Stability	Complies
§ 90.214	Transmitter Frequency Behavior	Complies
§ 90.210	Transmitter Radiated Spurious Emission	Complies
§ 90.210	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 DC13.6 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

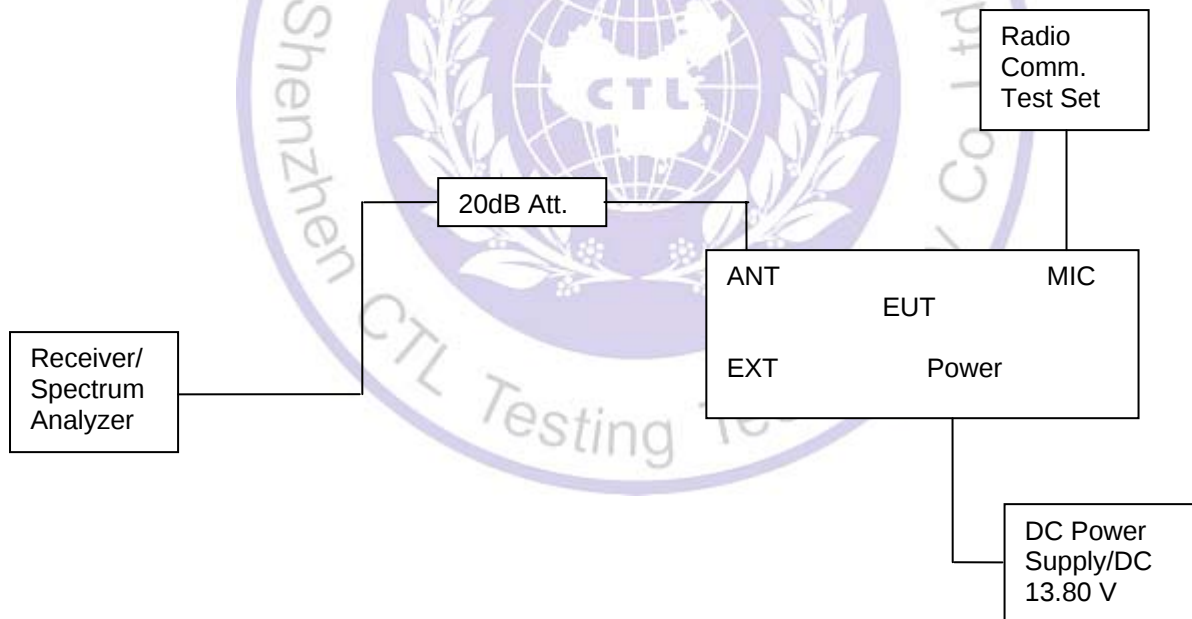
Not applicable to this device.

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 centre 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.

TEST CONFIGURATION



TEST PROCEDURE

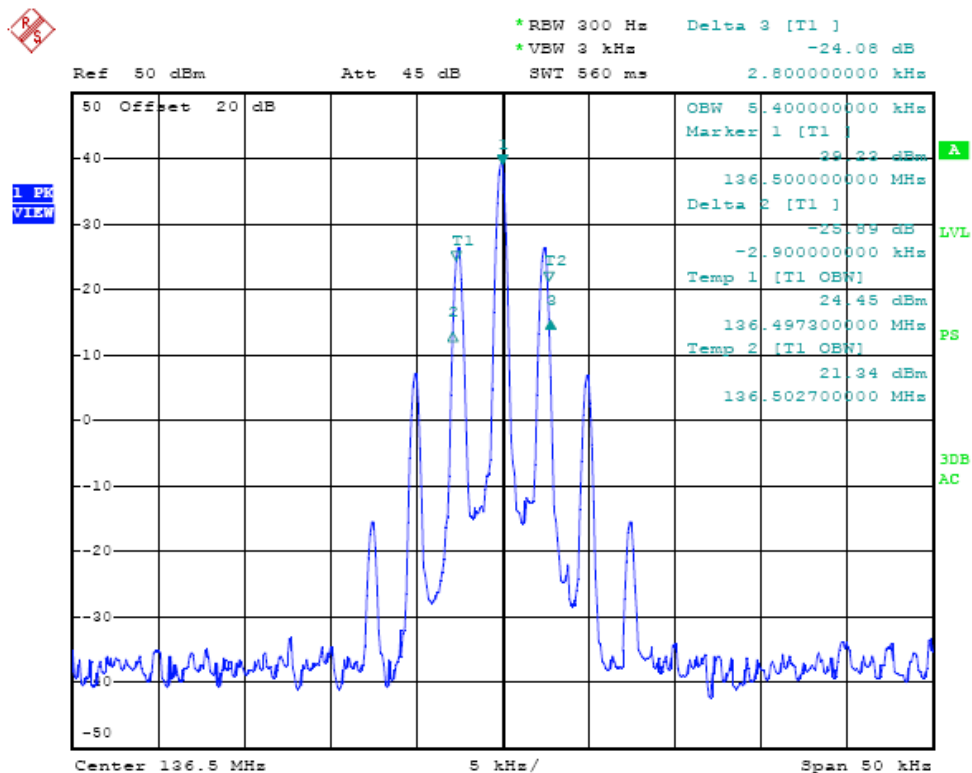
- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing) and 5 kHz (25 kHz channel spacing).
- 3 Set EUT as normal operation.
- 4 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
- 5 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
- 6 Set SPA Center Frequency=fundamental frequency, 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**

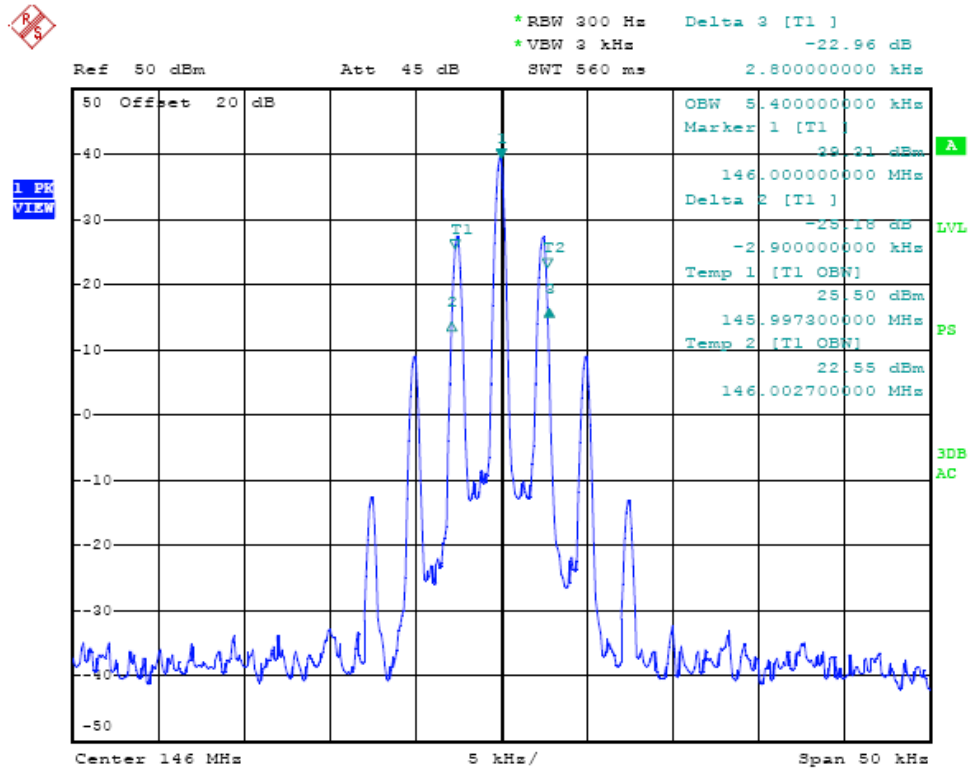
Modulation Type	Channel Separation	Test Channel	Test Frequency	99% Occupied Bandwidth	26dB Occupied Band width
FM	12.5KHz	A001	136.5000	5.40 KHz	5.70 KHz
		A002	146.0000	5.40 KHz	5.70 KHz
		A003	155.5000	5.50 KHz	5.70 KHz
		A004	164.0000	5.40 KHz	5.70 KHz
		A005	173.5000	5.30 KHz	5.70 KHz
		A006	406.5000	5.40 KHz	5.80 KHz
		A007	418.0000	5.40 KHz	5.80 KHz
		A008	435.5000	5.40 KHz	5.80 KHz
		A009	453.0000	5.30 KHz	5.70 KHz
		A010	469.5000	5.30 KHz	5.70 KHz
Limit		11.25KHz for 12.5KHz Channel Separation			
Test Results		Compliance			

Plots of 99% and 26dB Bandwidth Measurement

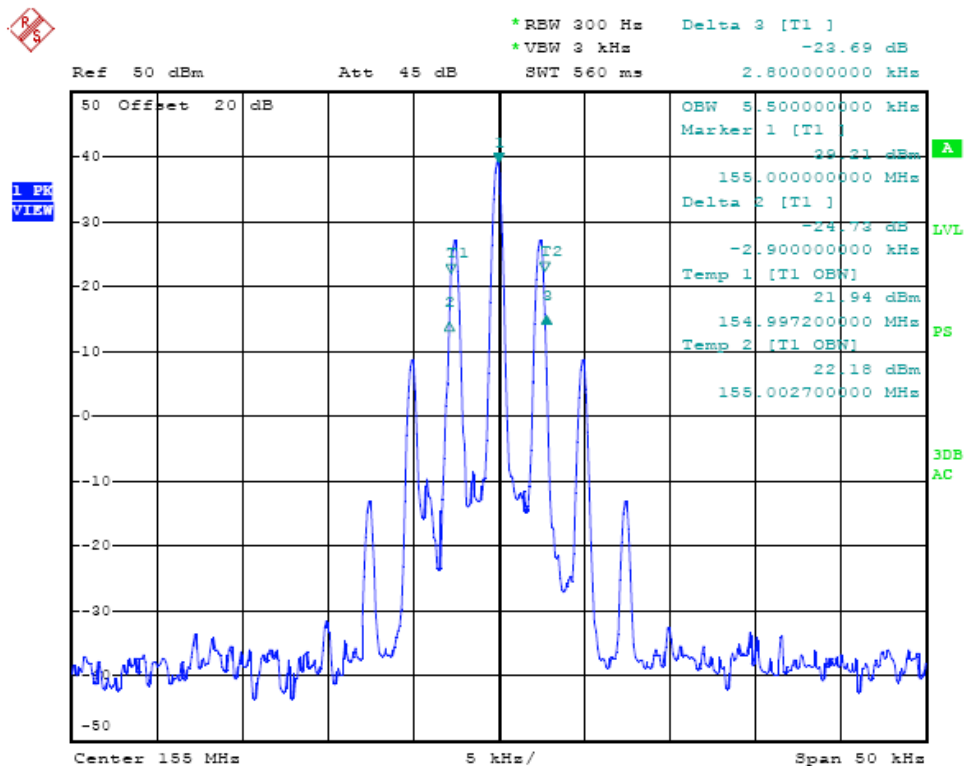
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	136.5000	5.40	5.70	11.25	Compliance



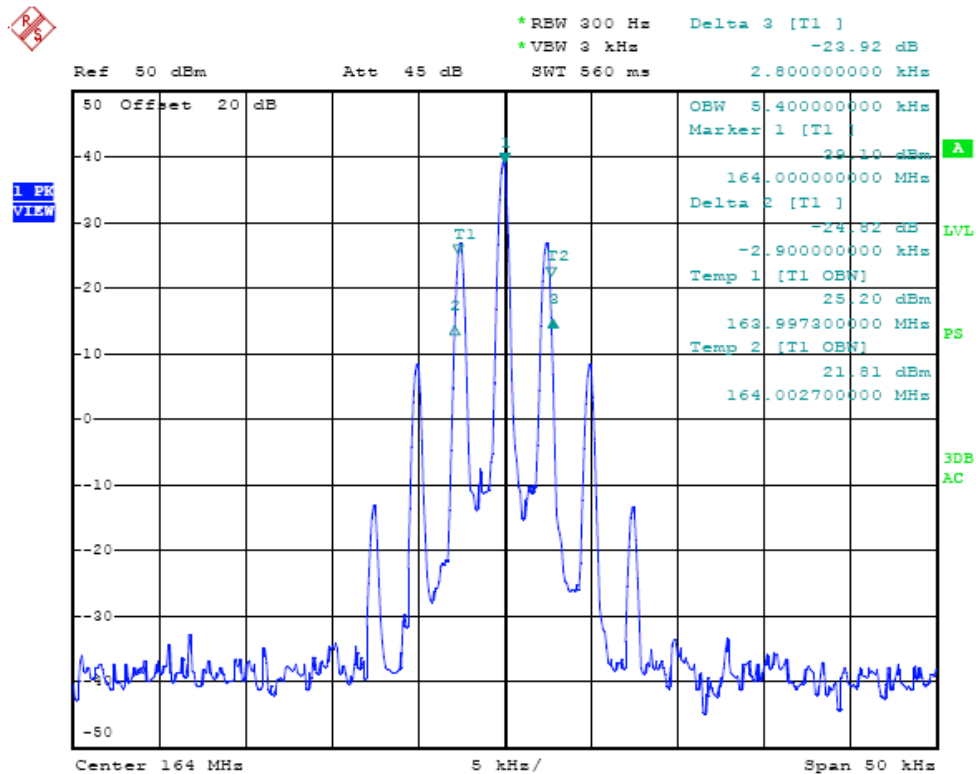
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	146.0000	5.40	5.70	11.25	Compliance



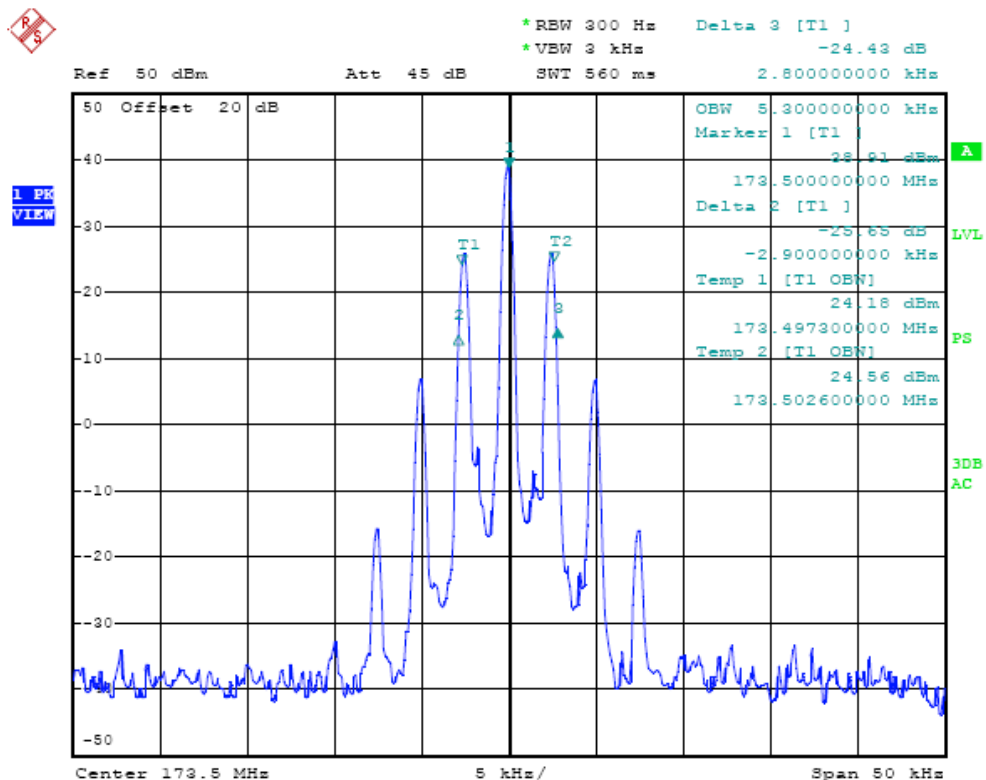
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	155.0000	5.50	5.70	11.25	Compliance



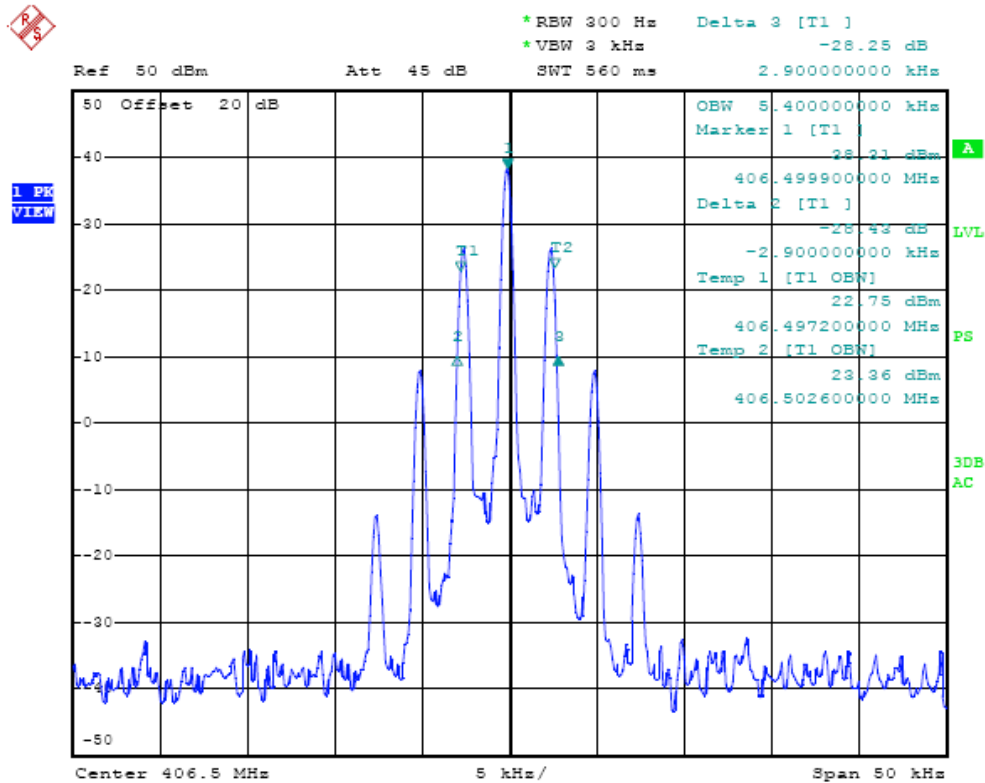
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	164.0000	5.40	5.70	11.25	Compliance



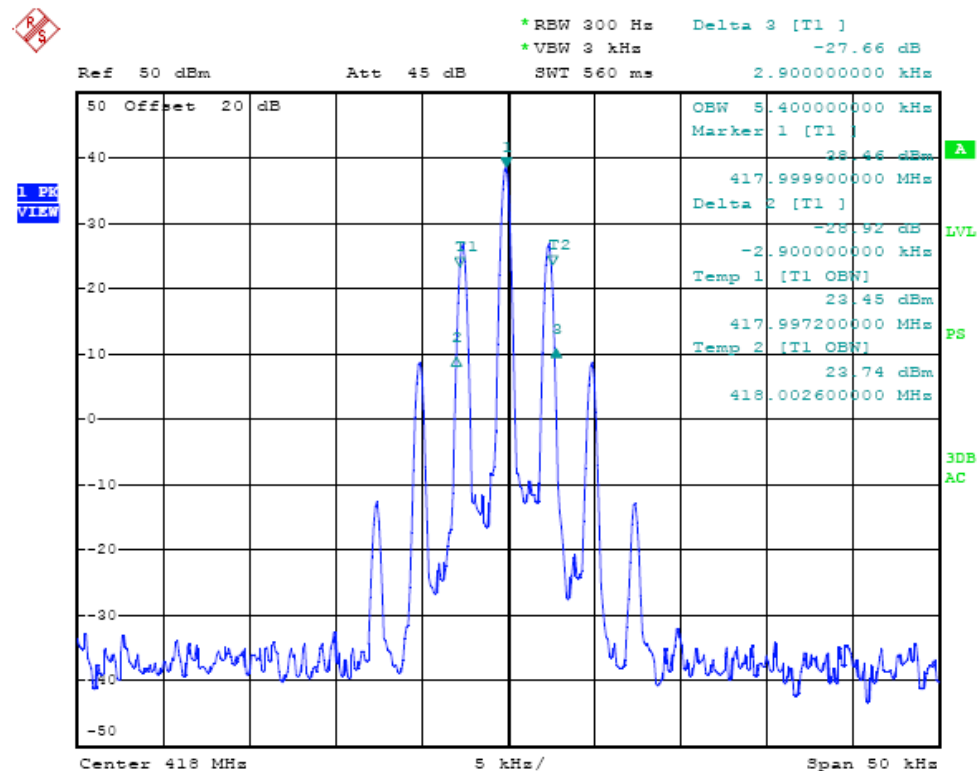
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	173.5000	5.30	5.70	11.25	Compliance



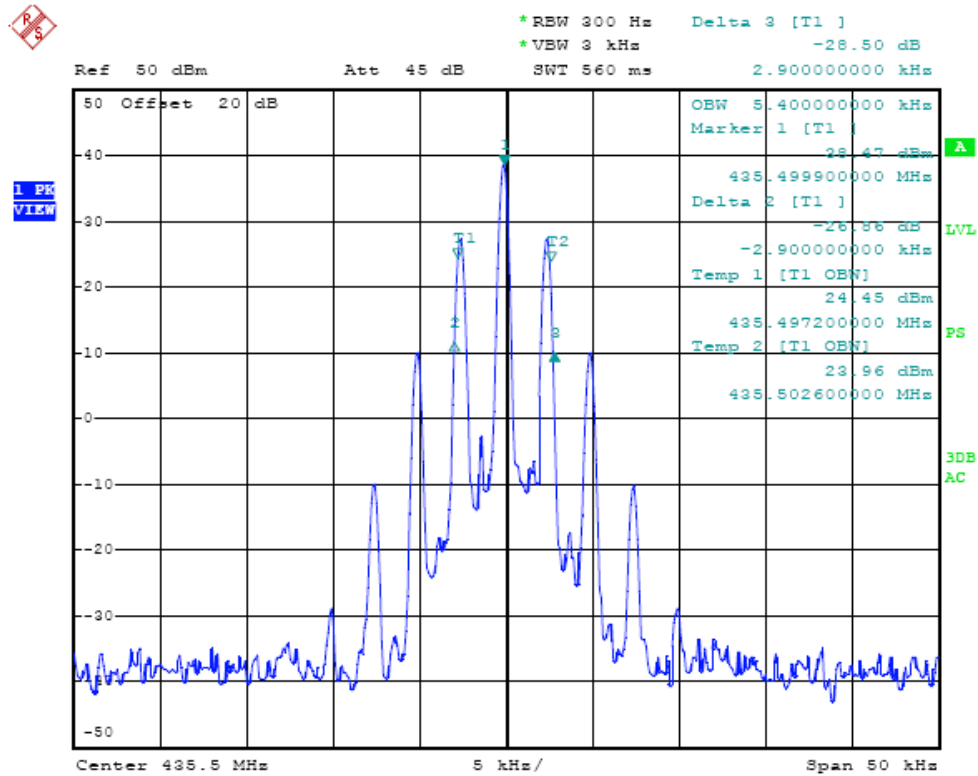
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	406.5000	5.40	5.80	11.25	Compliance



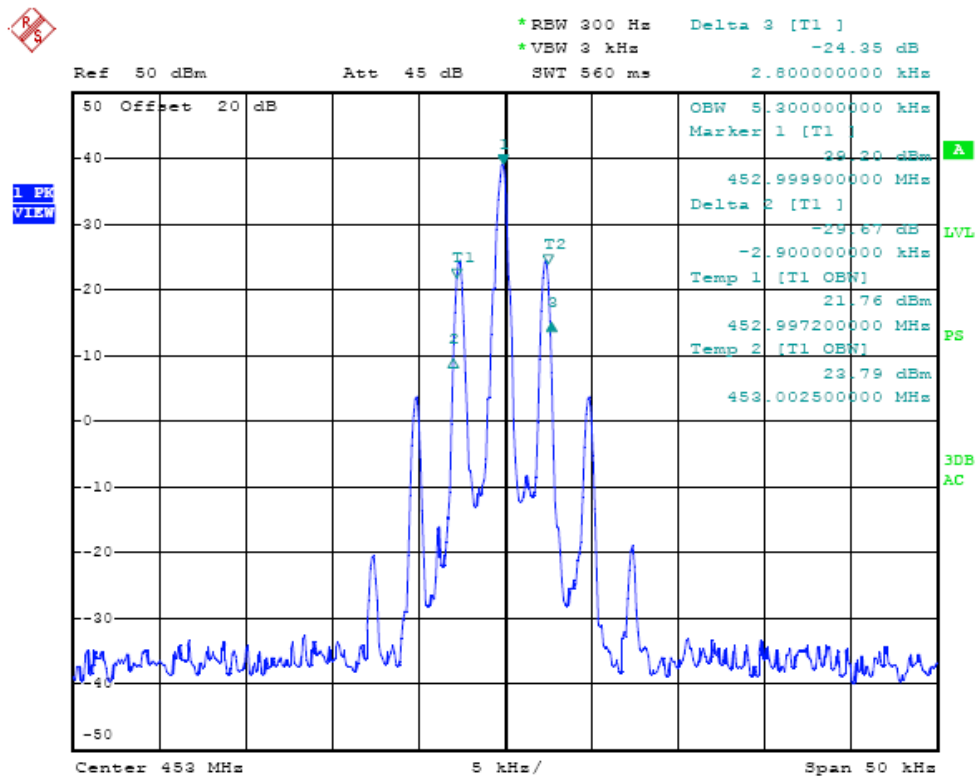
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	418.0000	5.40	5.80	11.25	Compliance



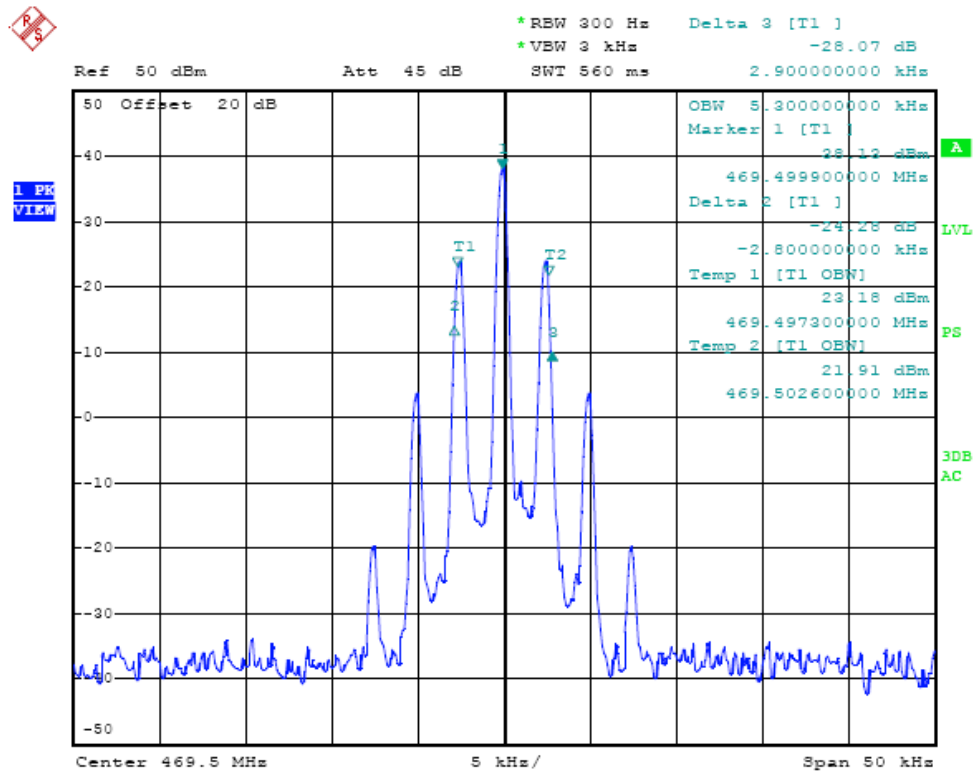
Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	435.5000	5.40	5.80	11.25	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	99% Bandwidth (KHz)	26dB Bandwidth (KHz)	FCC Limit (KHz)	Results
FM	12.5 KHz	453.0000	5.30	5.70	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	5.30	5.70	11.25	Compliance



4.2.2 Emission Mask

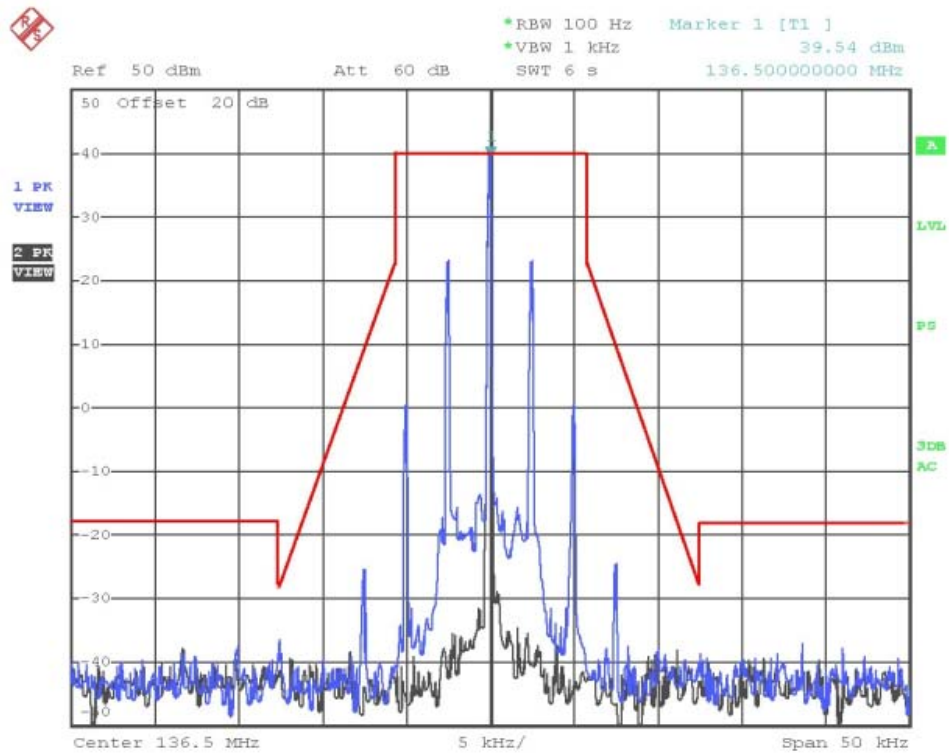
Modulation Type	Channel Separation	Test Channel	Test Frequency	FCC Applicable Mask	RBW
FM	12.5KHz	A001	136.5000	D	100 Hz
		A002	146.0000	D	100 Hz
		A003	155.5000	D	100 Hz
		A004	164.0000	D	100 Hz
		A005	173.5000	D	100 Hz
		A006	406.5000	D	100 Hz
		A007	418.0000	D	100 Hz
		A008	435.5000	D	100 Hz
		A009	453.0000	D	100 Hz
		A010	469.5000	D	100 Hz
Test Results		Compliance			

Referred as the attached plot hereinafter

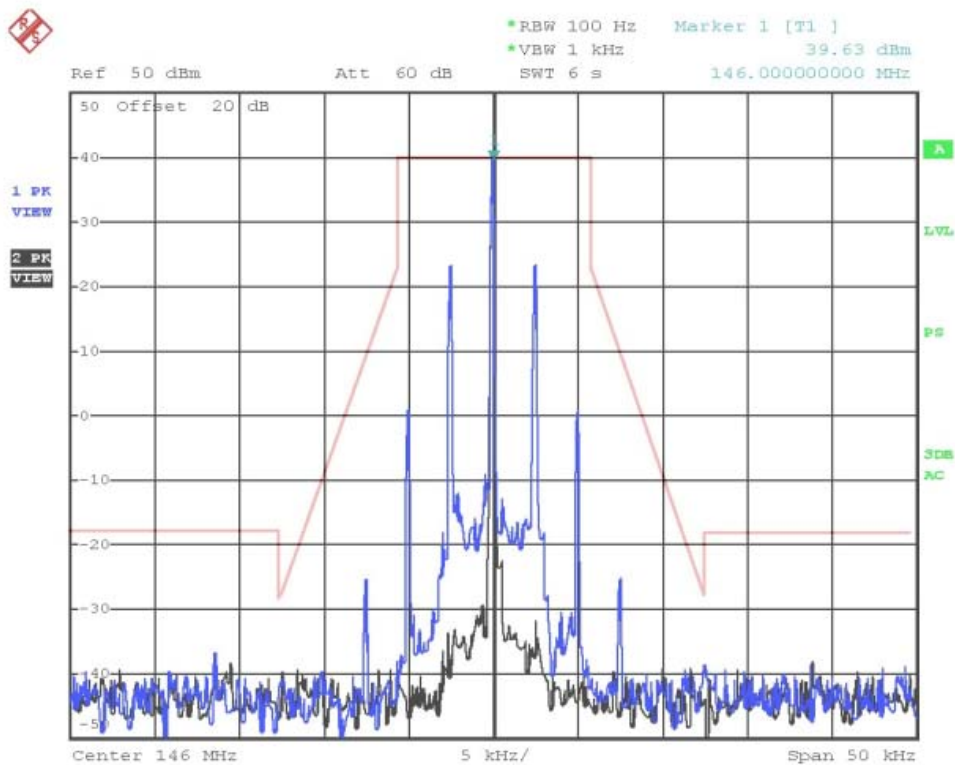
Note: The black curve represents unmodulated signal.

The blue curve represents modulated signal.

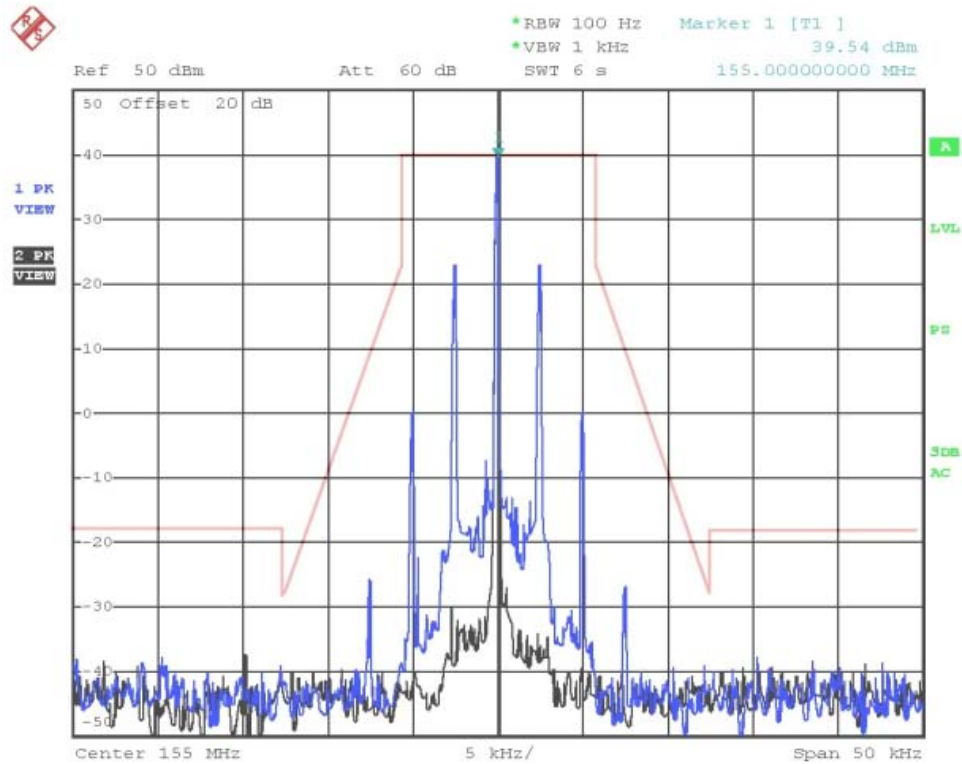
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	136.5000	D	100Hz	2.5	Compliance



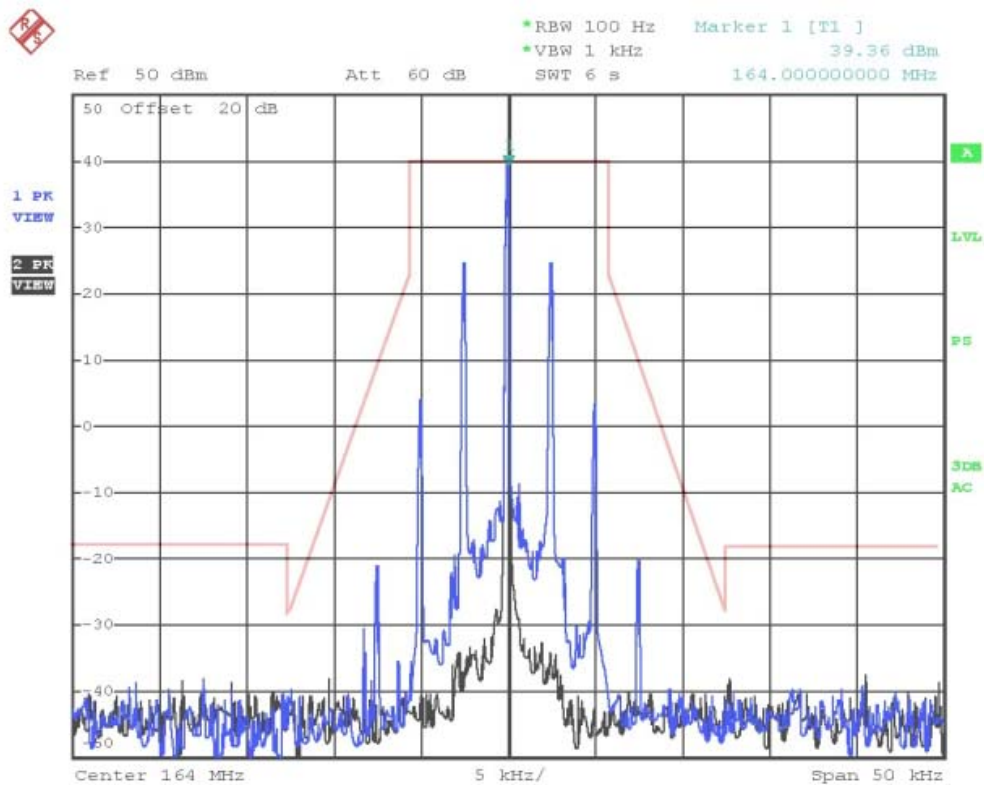
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	146.0000	D	100Hz	2.5	Compliance



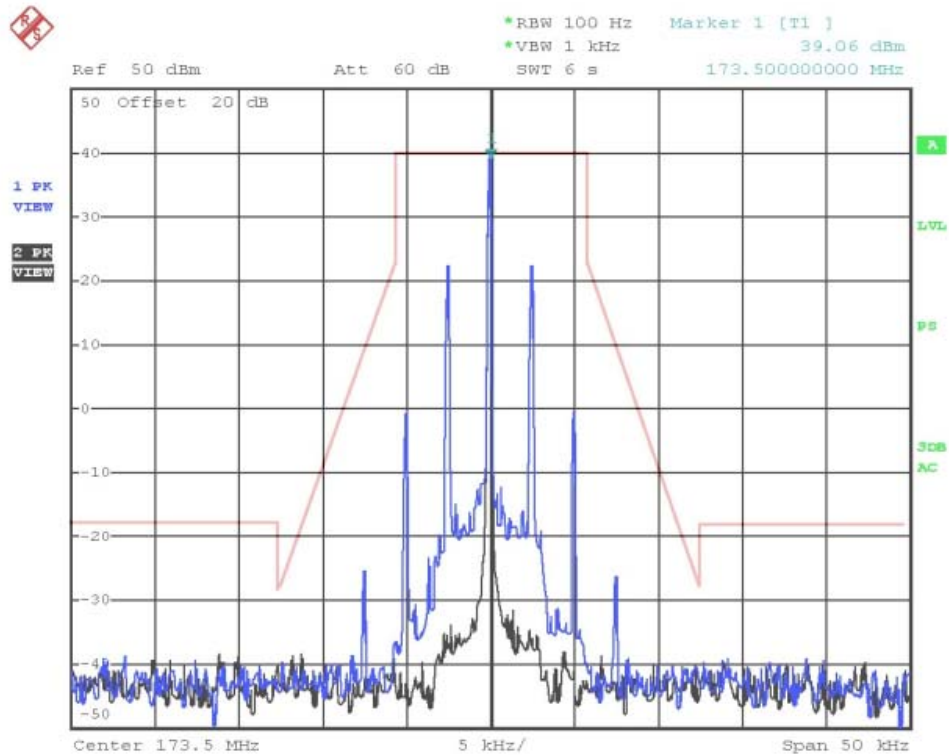
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	155.0000	D	100Hz	2.5	Compliance



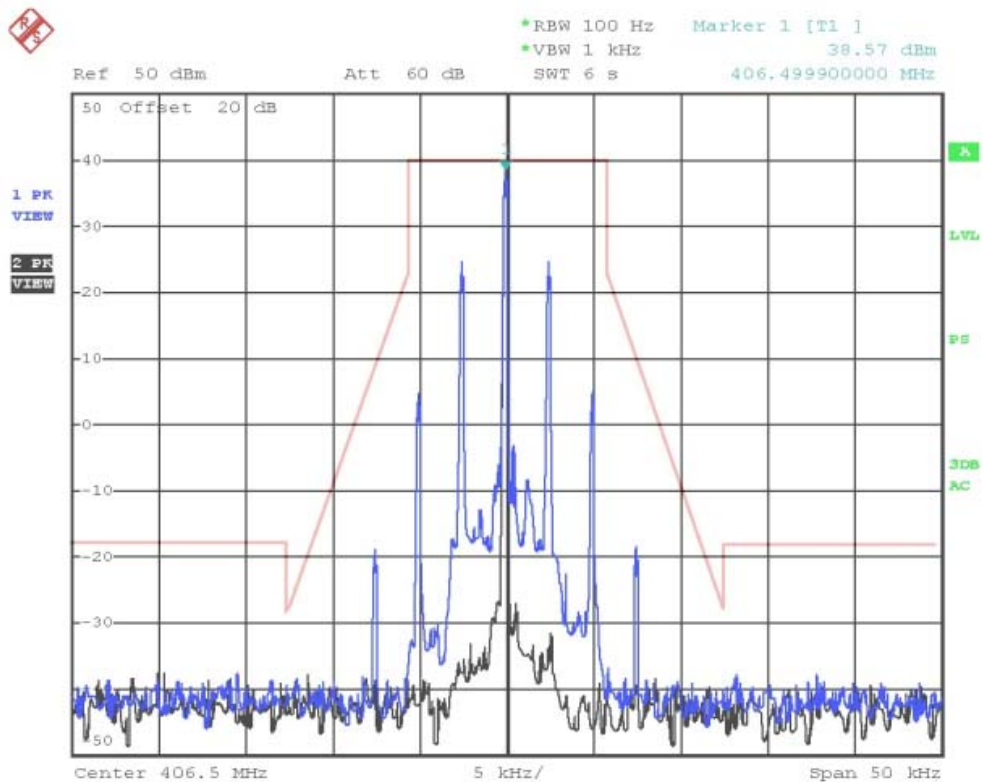
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	164.0000	D	100Hz	2.5	Compliance



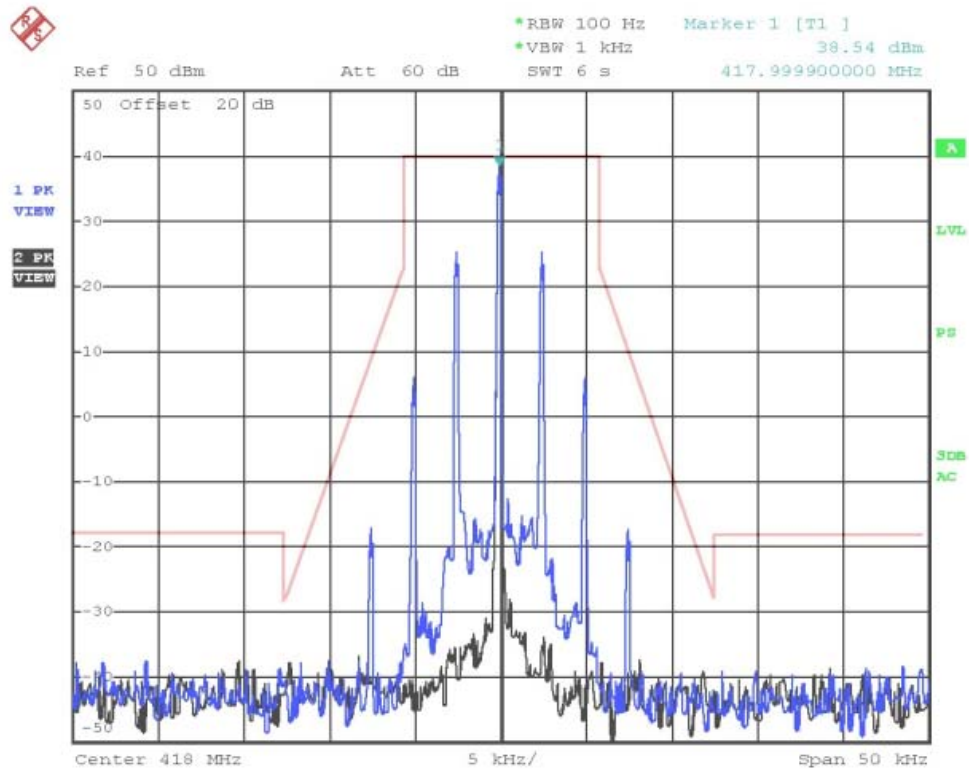
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	173.5000	D	100Hz	2.5	Compliance



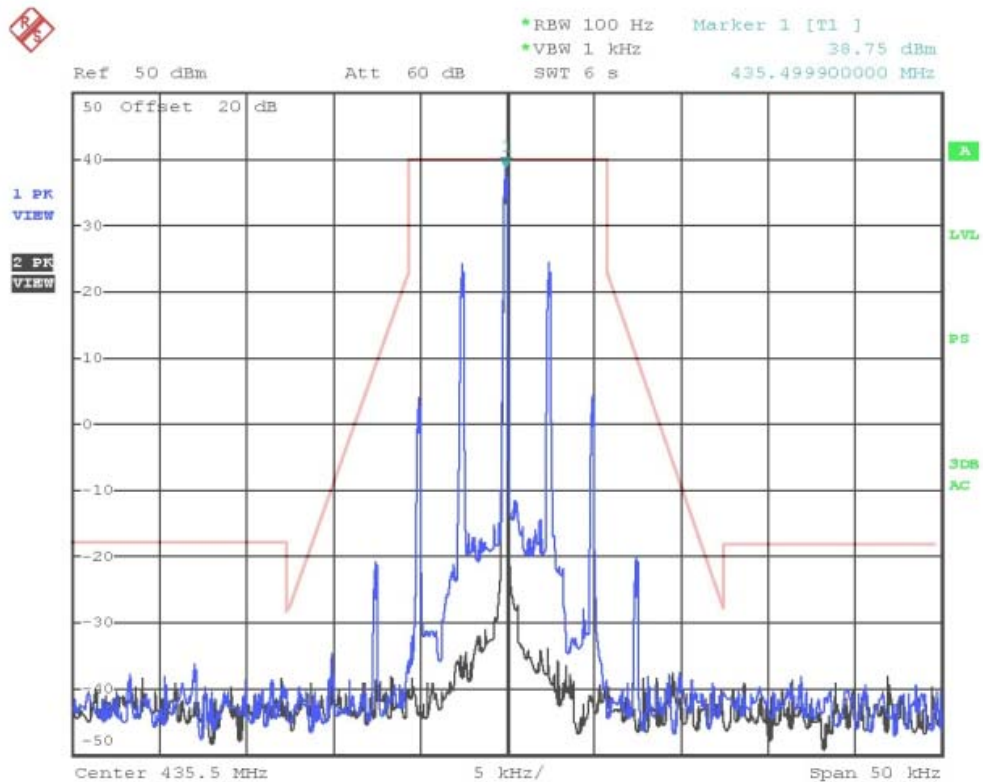
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	406.5000	D	100Hz	2.5	Compliance



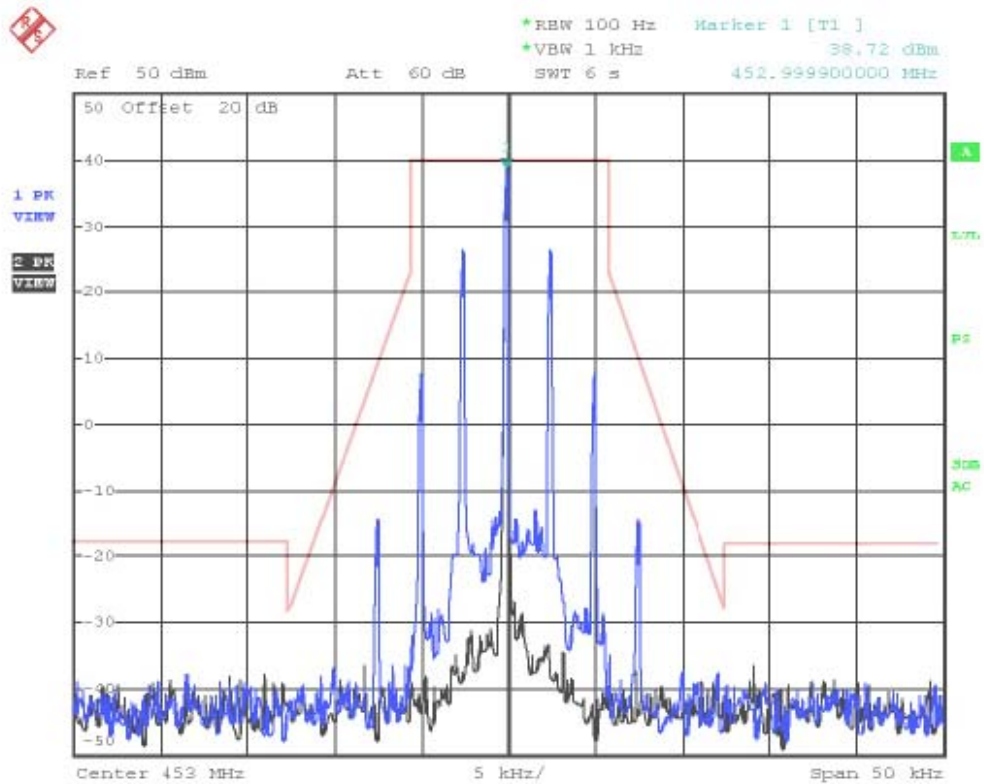
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	418.0000	D	100Hz	2.5	Compliance



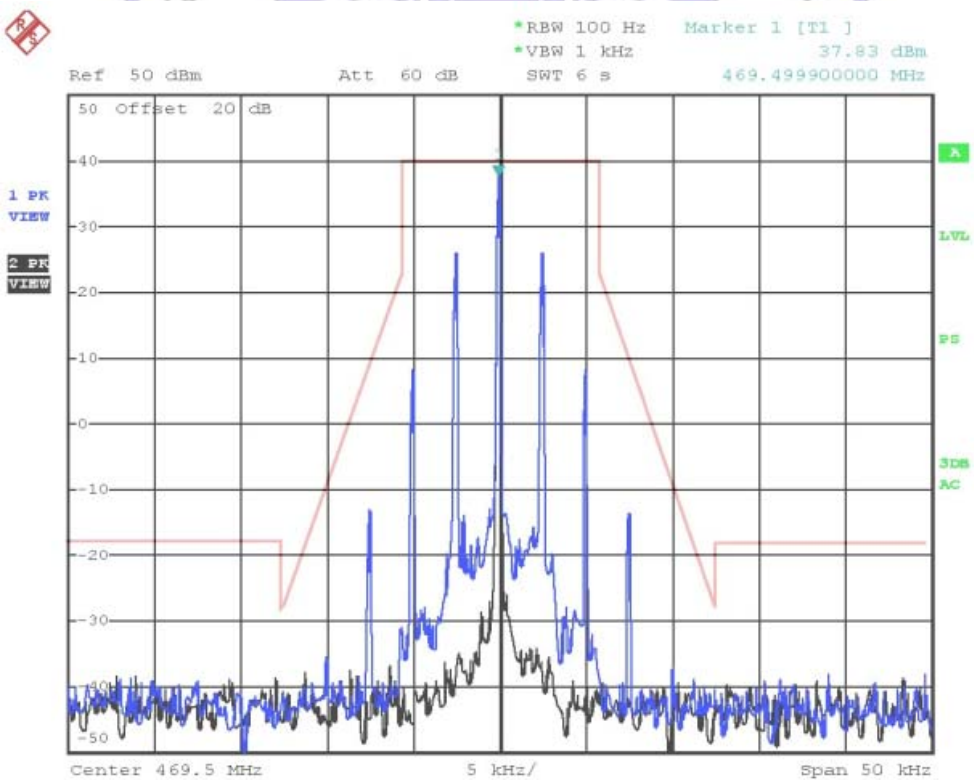
Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	435.5000	D	100Hz	2.5	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	FCC Applicable Mask	RBW	Audio Freq. (KHz)	Results
FM	12.5 KHz	453.0000	D	100Hz	2.5	Compliance



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



4.3. Radiated Spurious Emission Test

TEST APPLICABLE

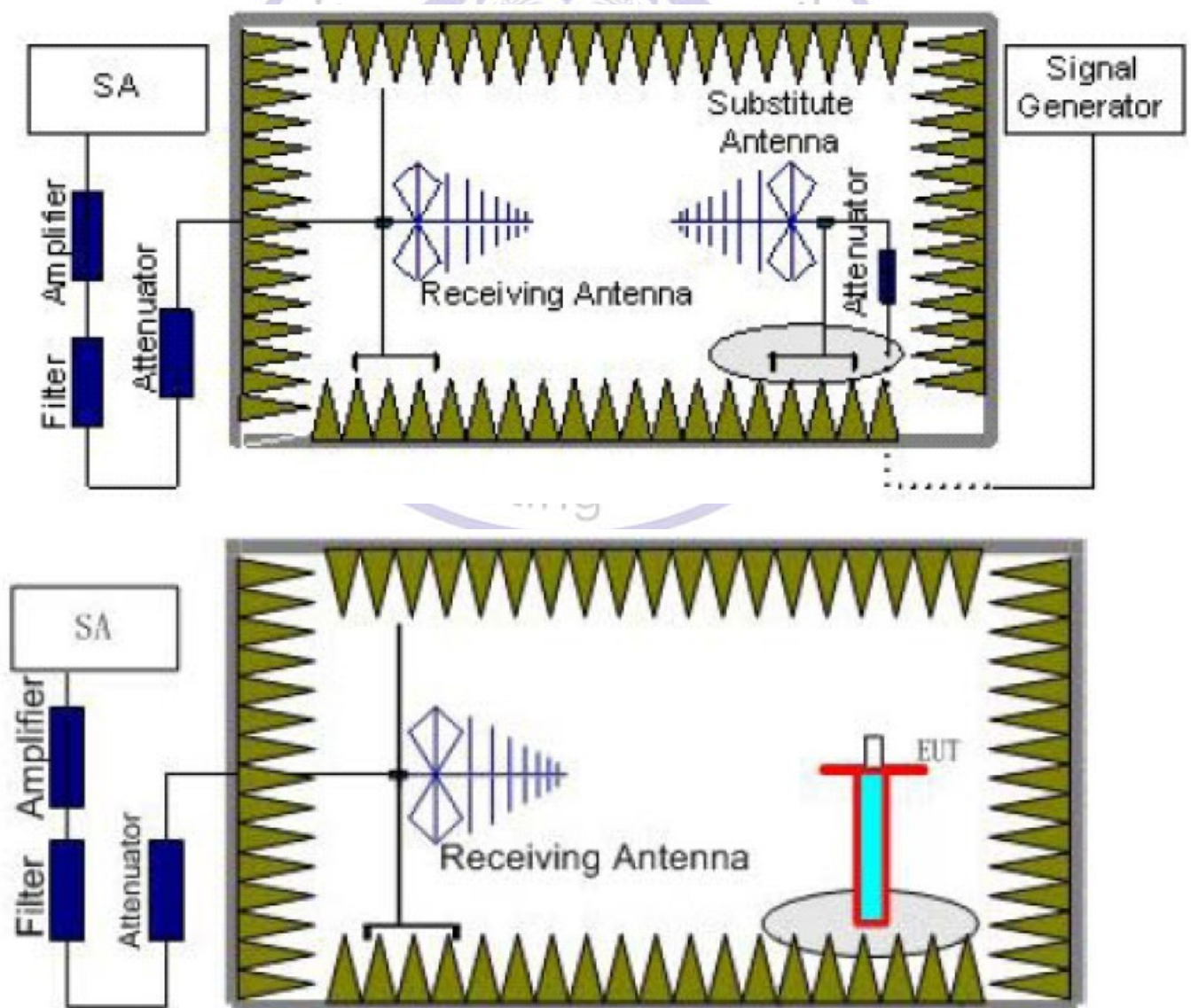
According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

- 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, whichever is lesser attenuation.

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

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

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100KHz, VBW=300KHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
Power(EIRP)= $P_{Mea} - P_{Ag} - P_{cl} - G_a$
We used SMF100A microwave signal generator which signal level can up to 33dBm, so we not used power Amplifier for substitution test; The measurement results are amend as described below:
Power(EIRP)= $P_{Mea} - P_{cl} - G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

TEST RESULTS

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 (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: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (8.13) = 59.10 \text{ dB}$

High: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (10.47) = 60.20 \text{ dB}$

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

Calculation: Limit (dBm) = $EL - 50 - 10 \log_{10} (TP)$

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

In this application, the EL is 40.0 dBm.

Limit (dBm) = $40 - 50 - 10 \log_{10} (10.47) = -20 \text{ dBm}$

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		Separation(KHz)		12.5		
Test Channel		A001		Test Frequency(MHz)		136.5000		
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)
273.0	57.39	Peak	H	300	231	-36.08	-20	16.08
409.5	61.99	Peak	H	100	178	-35.34	-20	15.34
546.0	68.62	Peak	H	100	304	-27.27	-20	7.27
...			H					
273.0	55.54	Peak	V	100	341	-39.32	-20	19.32
409.5	62.77	Peak	V	100	107	-33.00	-20	13
546.0	69.14	Peak	V	200	136	-27.6	-20	7.6

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A002		Test Frequency(MHz)		146.0000		
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)
292.0	59.42	Peak	H	300	212	-34.05	-20	14.05
438.0	64.17	Peak	H	100	78	-33.16	-20	13.16
584.0	66.74	Peak	H	200	342	-29.15	-20	9.15
...			H					
292.0	56.41	Peak	V	100	301	-38.45	-20	18.45
438.0	63.09	Peak	V	100	133	-32.68	-20	12.68
584.0	67.34	Peak	V	100	94	-29.40	-20	9.4
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A003		Test Frequency(MHz)		155.0000		
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)
310.0	60.14	Peak	H	200	47	-33.33	-20	13.33
465.0	65.89	Peak	H	100	124	-31.44	-20	11.44
620.0	68.33	Peak	H	200	350	-27.56	-20	7.56
...			H					
310.0	61.44	Peak	V	100	245	-33.42	-20	13.42
465.0	65.74	Peak	V	200	153	-30.03	-20	10.03
620.0	69.01	Peak	V	100	103	-27.73	-20	7.73
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A004		Test Frequency(MHz)		164.0000		
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)
328.0	60.85	Peak	H	200	133	-32.62	-20	12.62
492.0	66.43	Peak	H	300	158	-30.90	-20	10.9
656.0	69.12	Peak	H	200	46	-26.77	-20	6.77
...			H					
328.0	61.58	Peak	V	300	212	-33.28	-20	13.28
492.0	67.03	Peak	V	200	110	-28.74	-20	8.74
656.0	68.44	Peak	V	100	76	-28.30	-20	8.3
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A005		Test Frequency(MHz)		173.5000		
Frequency (MHz)	E-Field Level (dBuv/m)	EMI Detector (Peak/QP)	Antenna Polarization	Antenna Height (cm)	Table Angle (Degree)	ERP measured by Substitution Method (dBm)	Limit (dBm)	Margin (dB)
347.0	60.85	Peak	H	200	133	-32.62	-20	12.62
520.5	66.43	Peak	H	300	158	-30.90	-20	10.9
694.0	69.12	Peak	H	200	46	-26.77	-20	6.77
...			H					
347.0	61.58	Peak	V	300	212	-33.28	-20	13.28
520.5	67.03	Peak	V	200	110	-28.74	-20	8.74
694.0	68.44	Peak	V	100	76	-28.30	-20	8.3
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A006		Test Frequency(MHz)		406.5000		
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)
813.0	56.41	Peak	H	100	52	-37.06	-20	17.06
1219.5	67.11	Peak	H	300	123	-30.22	-20	10.22
1626.0	69.65	Peak	H	200	269	-26.24	-20	6.24
...			H					
813.0	58.14	Peak	V	200	186	-36.72	-20	16.72
1219.5	69.22	Peak	V	200	223	-26.55	-20	6.55
1626.0	71.23	Peak	V	300	166	-25.51	-20	5.51
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A007		Test Frequency(MHz)		418.0000		
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)
836.0	58.03	Peak	H	200	34	-35.44	-20	15.44
1254.0	65.13	Peak	H	100	103	-32.20	-20	12.2
1672.0	72.45	Peak	H	200	96	-23.44	-20	3.44
...			H					
836.0	57.33	Peak	V	200	105	-37.53	-20	17.53
1254.0	68.52	Peak	V	200	39	-27.25	-20	7.25
1672.0	68.01	Peak	V	100	284	-28.73	-20	8.73
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A008		Test Frequency(MHz)		435.5000		
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)
871.0	56.49	Peak	H	200	244	-36.98	-20	16.98
1306.5	63.36	Peak	H	300	152	-33.97	-20	13.97
1742.0	69.54	Peak	H	300	133	-26.35	-20	6.35
...			H					
871.0	57.71	Peak	V	100	74	-37.15	-20	17.15
1306.5	66.63	Peak	V	200	126	-29.14	-20	9.14
1742.0	72.97	Peak	V	100	109	-23.77	-20	3.77
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A009		Test Frequency(MHz)		453.0000		
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)
906.0	57.56	Peak	H	300	98	-35.91	-20	15.91
1359.0	65.08	Peak	H	100	141	-32.25	-20	12.25
1812.0	68.81	Peak	H	300	100	-27.08	-20	7.08
...			H					
906.0	58.03	Peak	V	300	87	-36.83	-20	16.83
1359.0	66.72	Peak	V	300	294	-29.05	-20	9.05
1812.0	70.46	Peak	V	100	348	-26.28	-20	6.28
...	...		V					

Modulation		FM		Separation(KHz)		12.5		
Test Channel		A010		Test Frequency(MHz)		469.5000		
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)
939.0	54.91	Peak	H	100	113	-38.56	-20	18.56
1408.5	65.68	Peak	H	100	354	-31.65	-20	11.65
1878.0	70.52	Peak	H	300	272	-25.37	-20	5.37
...			H					
939.0	56.11	Peak	V	100	322	-38.75	-20	18.75
1408.5	67.09	Peak	V	300	199	-28.68	-20	8.68
1878.0	71.19	Peak	V	100	83	-25.55	-20	5.55
...	...		V					

4.4. Spurious Emission On Antenna Port

TEST APPLICABLE

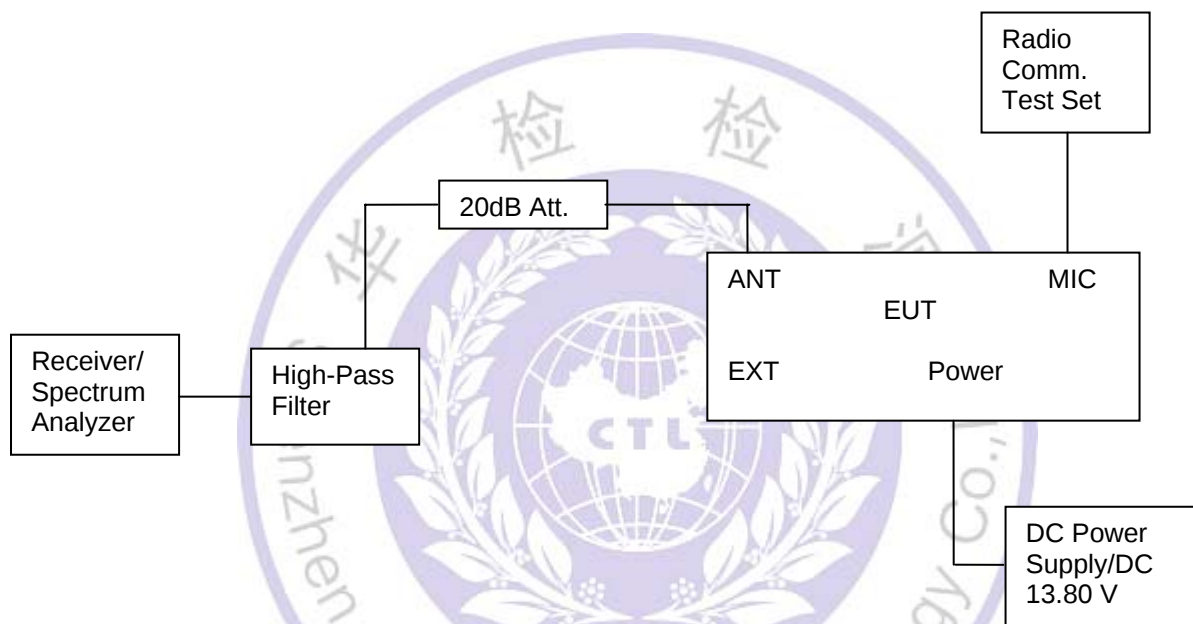
The same as Section 4.3

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: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (8.13) = 59.10 \text{ dB}$

High: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (10.47) = 60.20 \text{ dB}$

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 40.0 dBm.

Limit (dBm) = 40.0 - 50 - 10log10 (10.47) = -20 dBm

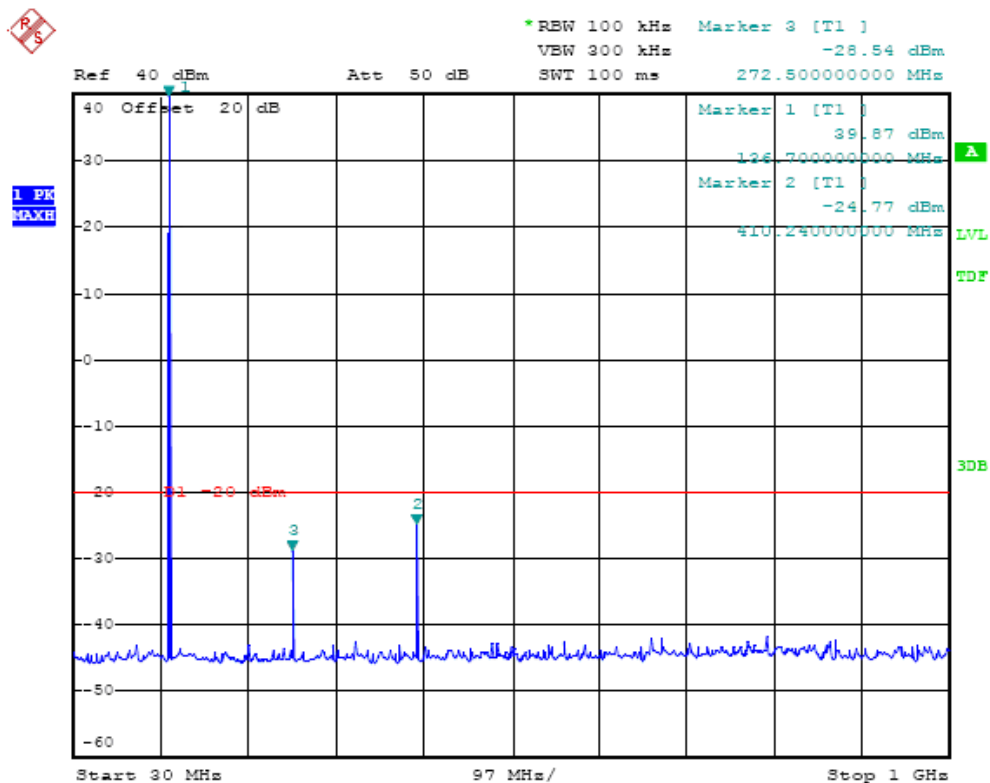
Note: 1. In general, the worse case attenuation requirement shown above was applied.

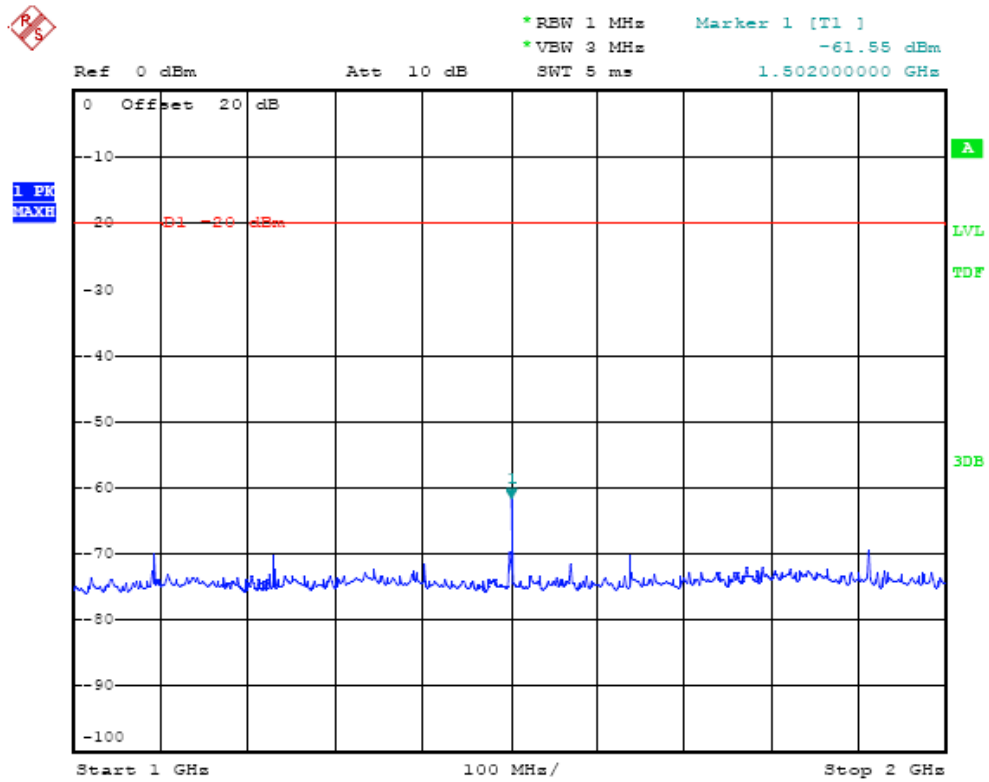
2. The measurement frequency range from 30 MHz to 6 GHz.

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	A001	136.5000	410.24	-24.77	1502.00	-61.55
		A002	146.0000	437.40	-23.91	1168.00	-37.30
		A003	155.5000	309.36	-27.46	1550.00	-43.59
		A004	164.0000	328.76	-28.16	1476.00	-40.31
		A005	173.5000	520.82	-34.73	1214.00	-46.41
		A006	406.5000	----	----	2456.00	-63.40
		A007	418.0000	----	----	2504.00	-50.66
		A008	435.5000	----	----	3488.00	-46.34
		A009	453.0000	----	----	3624.00	-50.55
		A010	469.5000	----	----	1392.00	-52.74
Limit		-20dBm for 12.5KHz Channel Separation					
Test Results		Compliance					

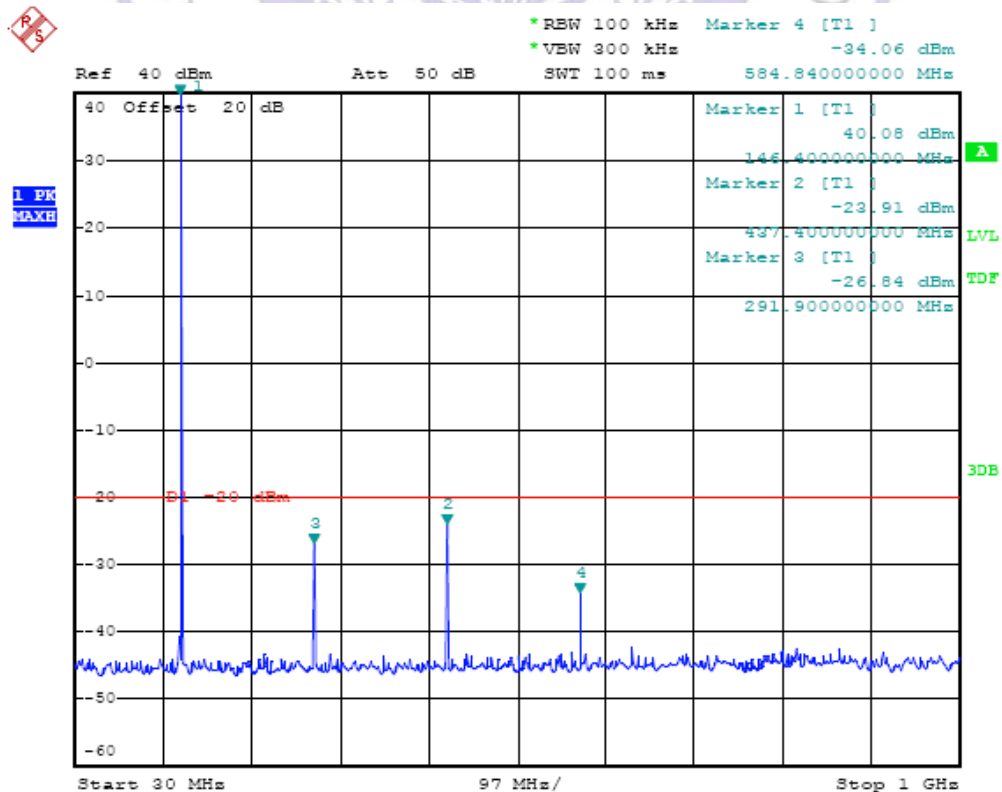
Plots of Spurious Emission on Antenna Port Measurement

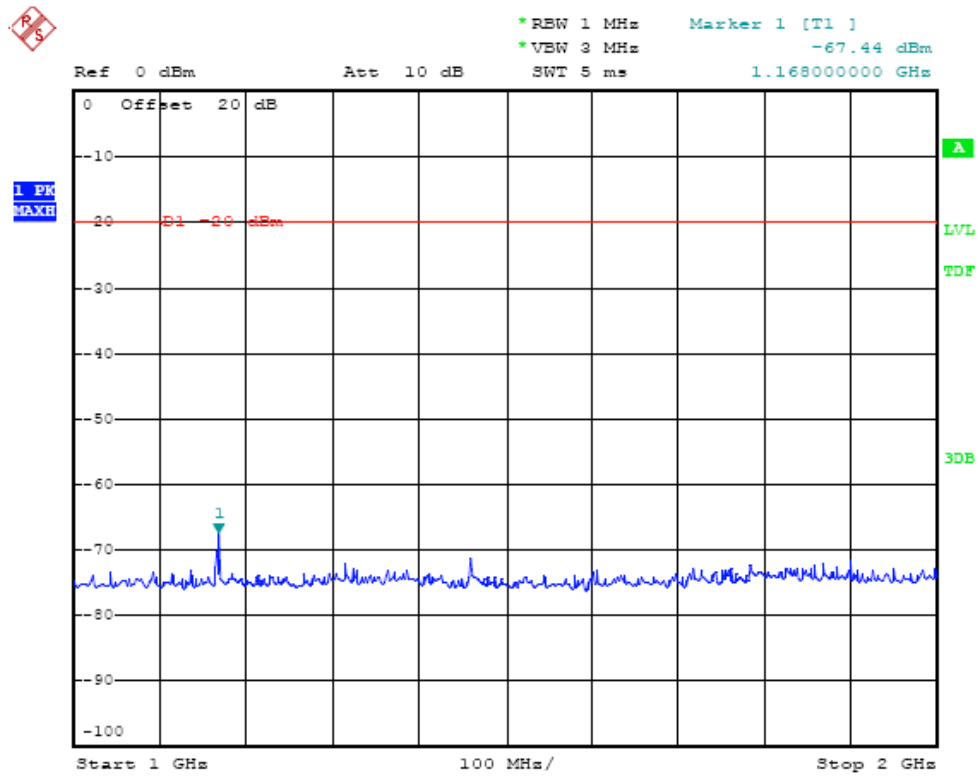
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A001	136.5000	410.24	-24.77	1502.00	-61.55	-20dBm
Test Results				Compliance				



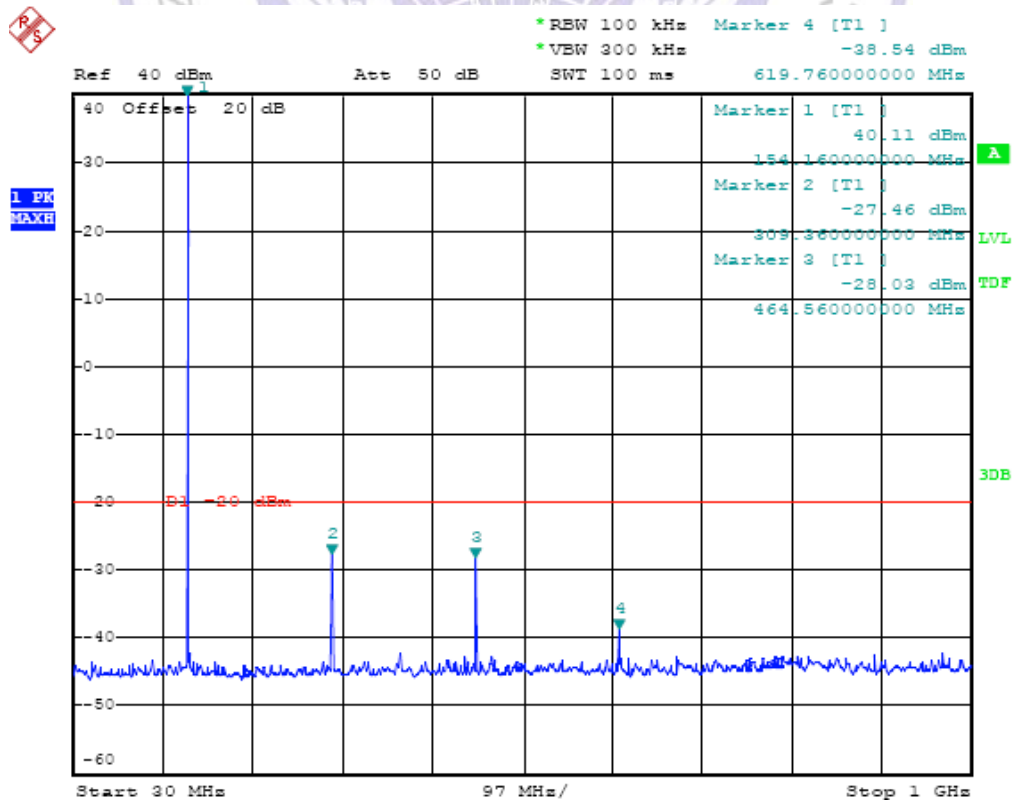


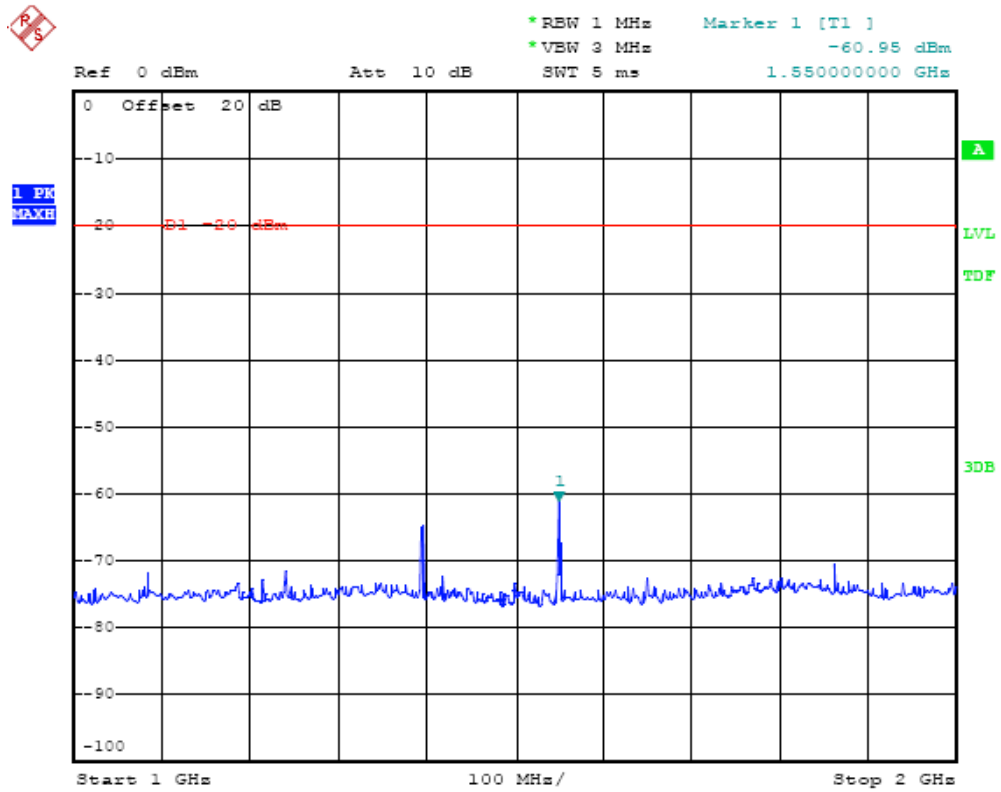
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A002	146.0000	437.40	-23.91	1168.00	-67.44	-20dBm
Test Results				Compliance				



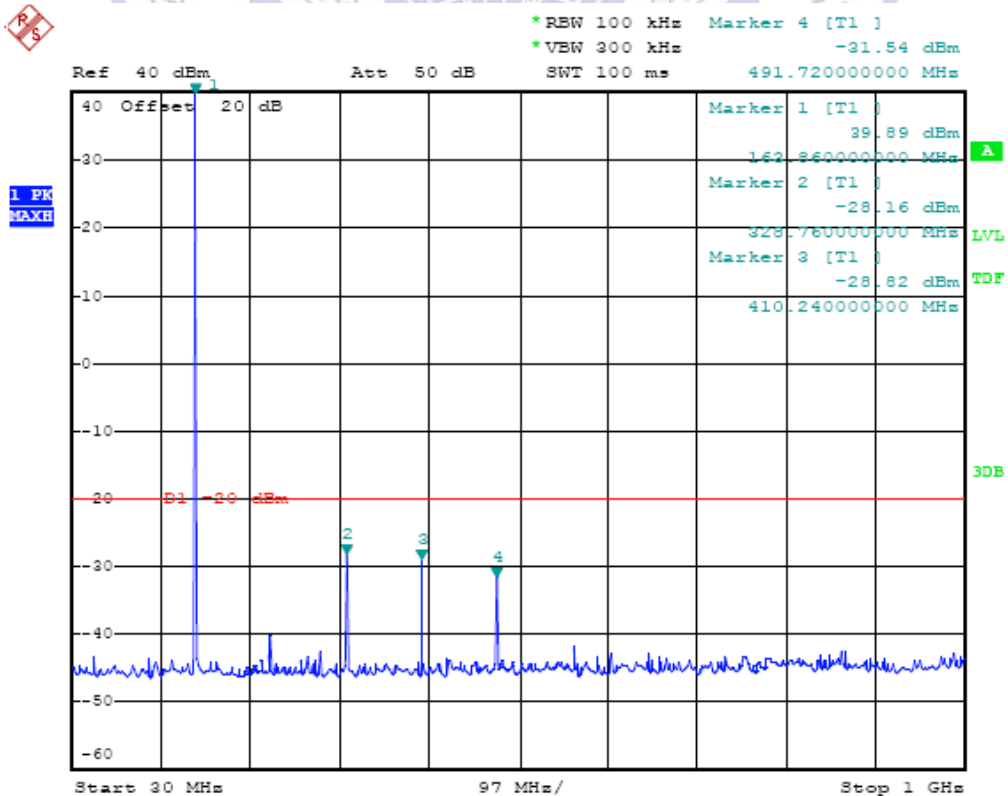


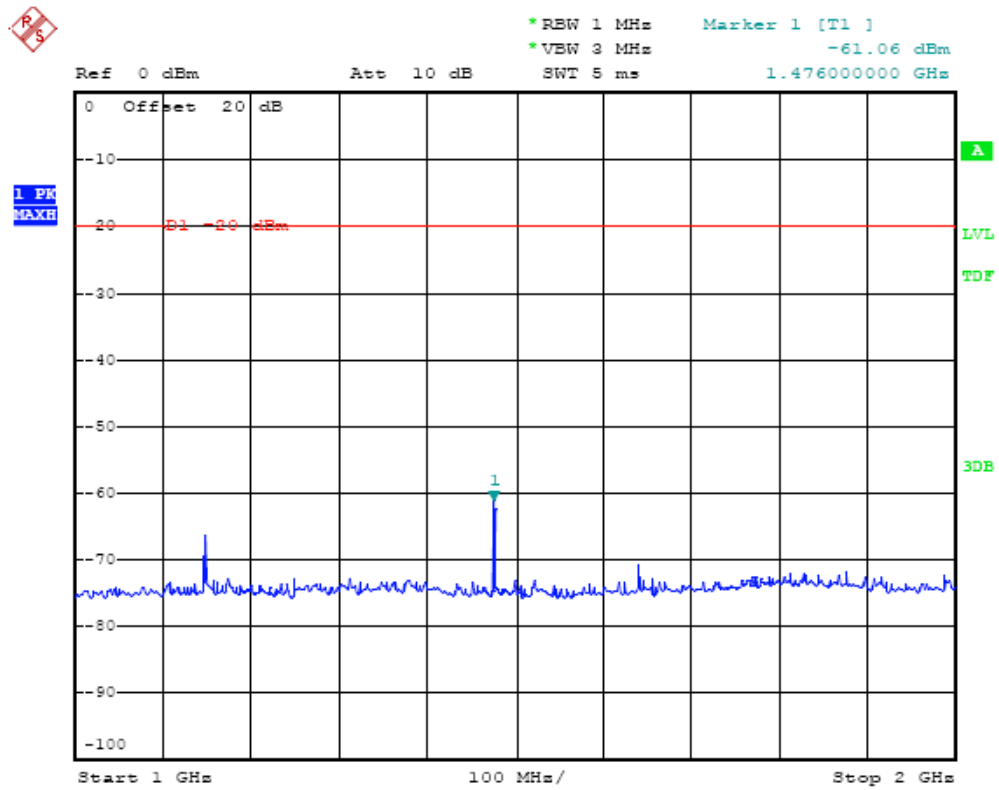
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A003	155.0000	309.36	-27.46	1550.00	-60.95	-20dBm
Test Results				Compliance				



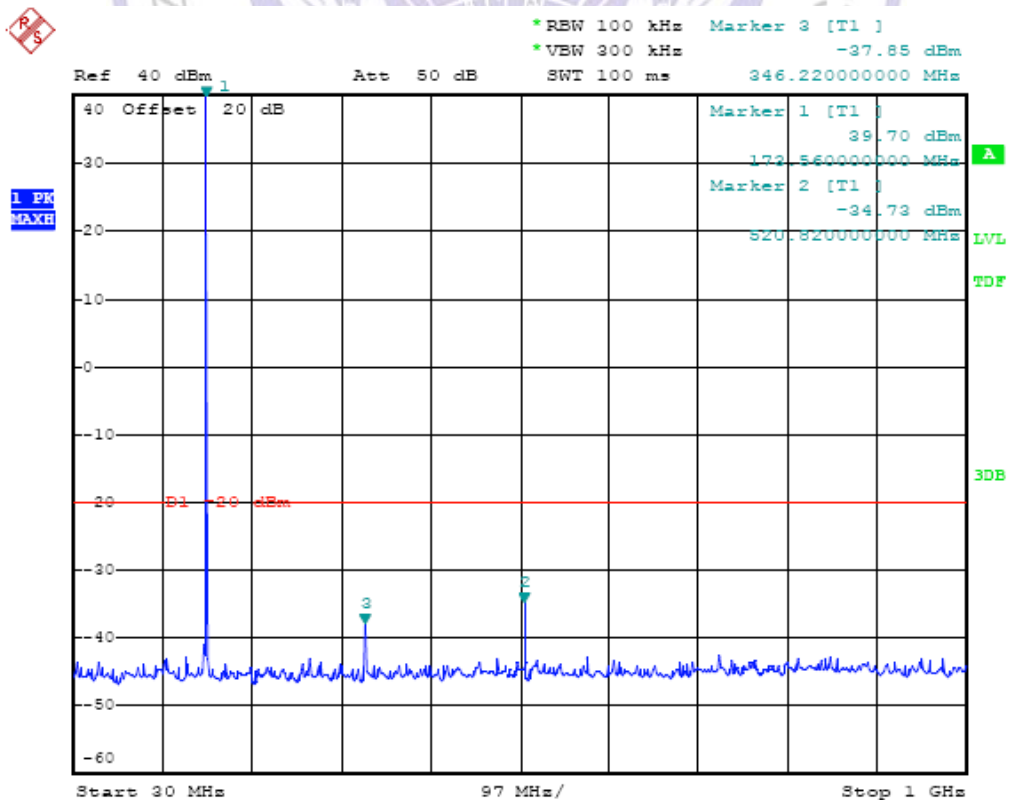


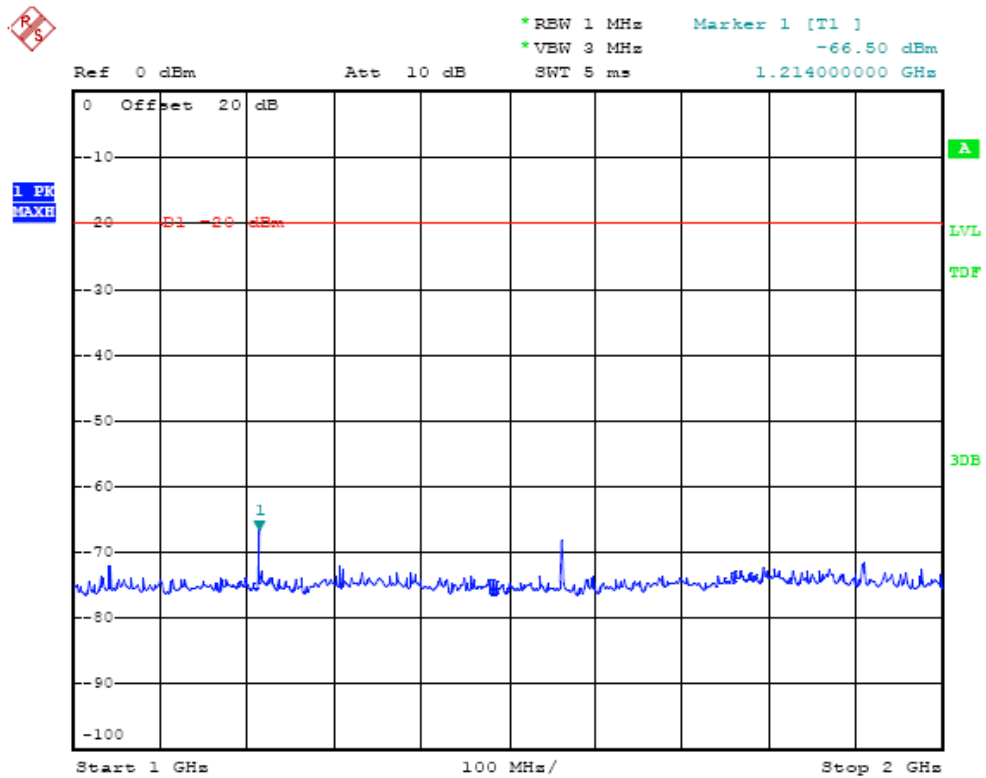
Modulation Type	Channel Sparanation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A004	164.0000	328.76	-28.16	1476.00	-61.06	-20dBm
Test Results				Compliance				



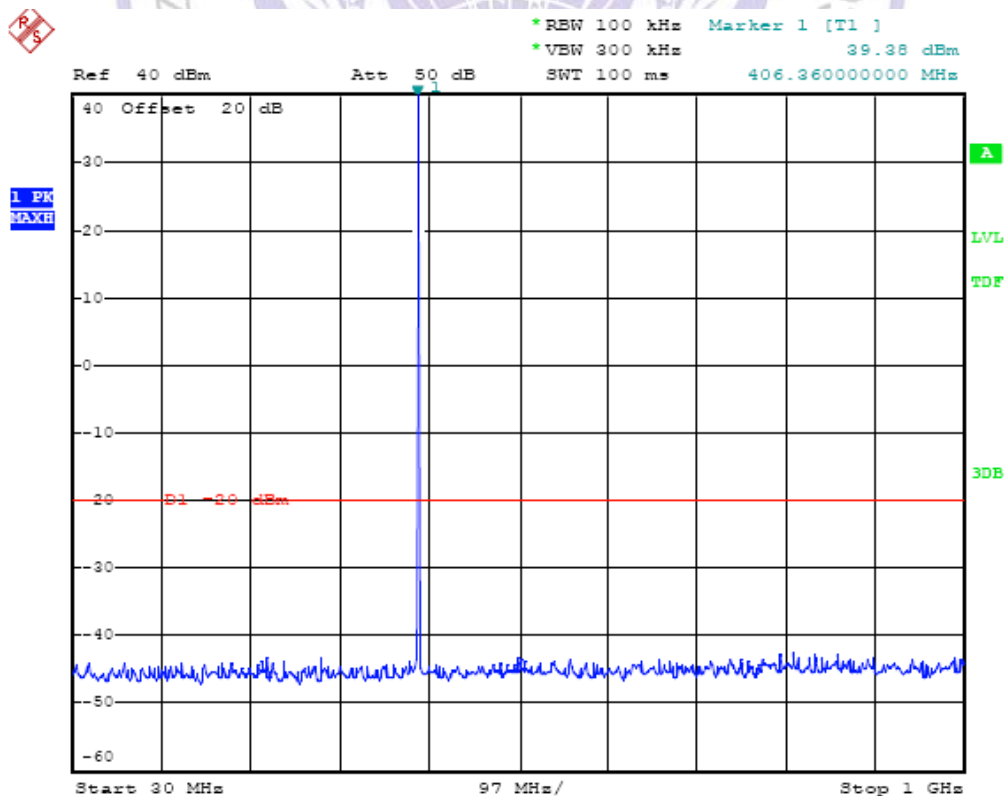


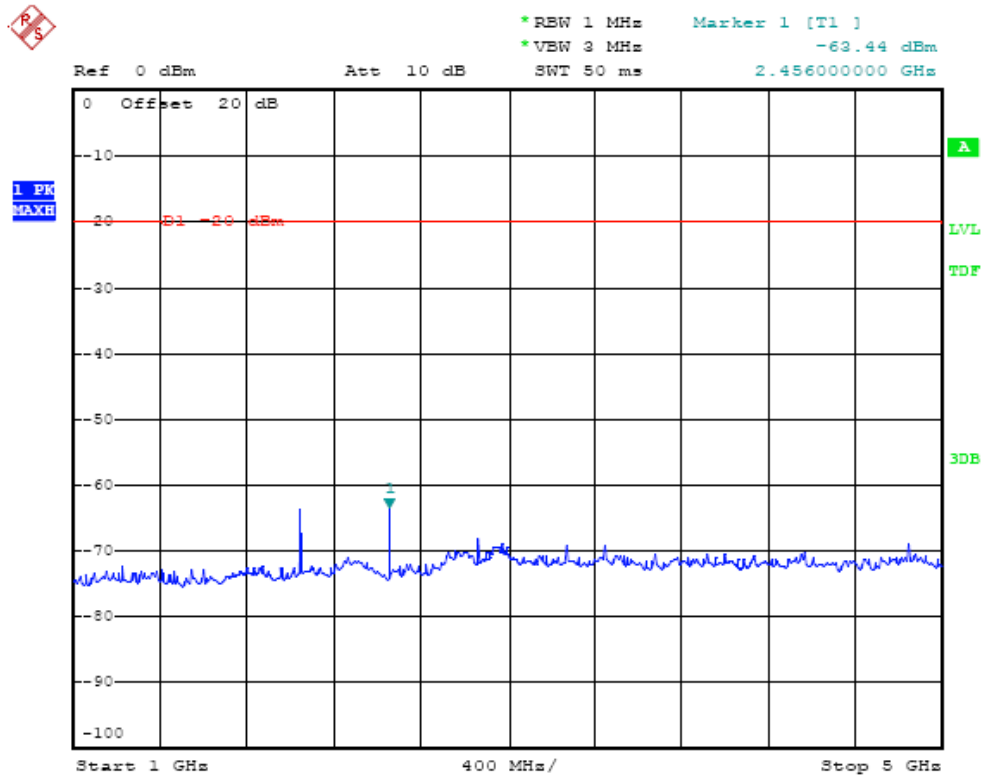
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A005	173.5000	520.82	-34.73	1214.00	-66.50	-20dBm
Test Results				Compliance				



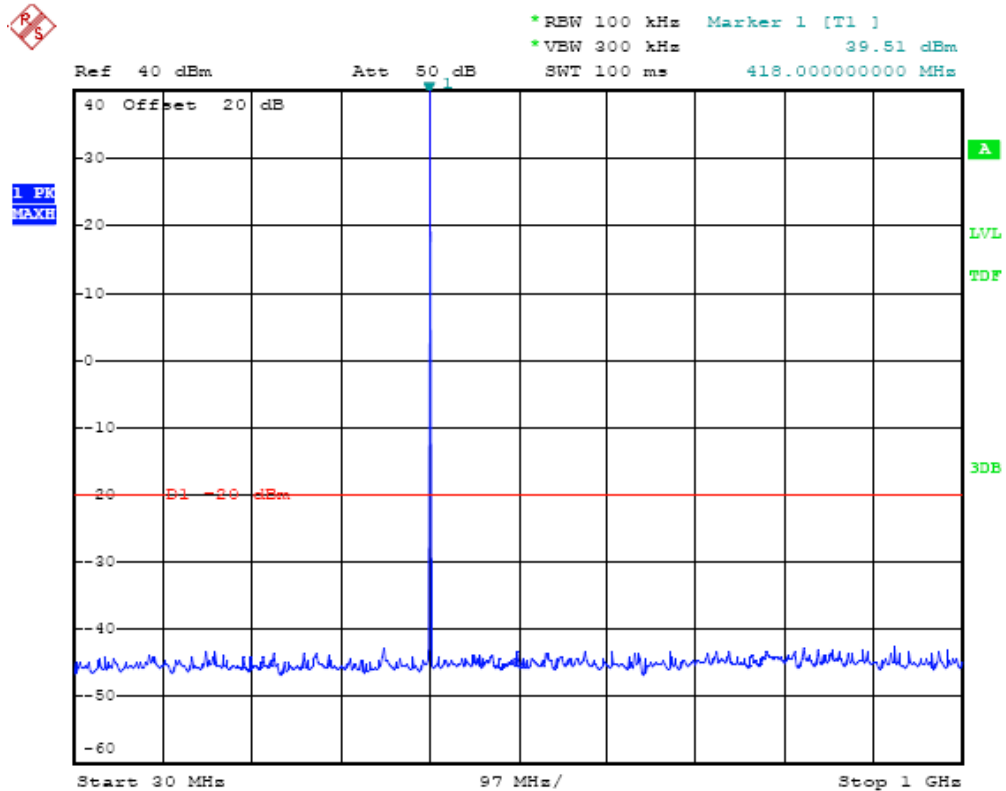


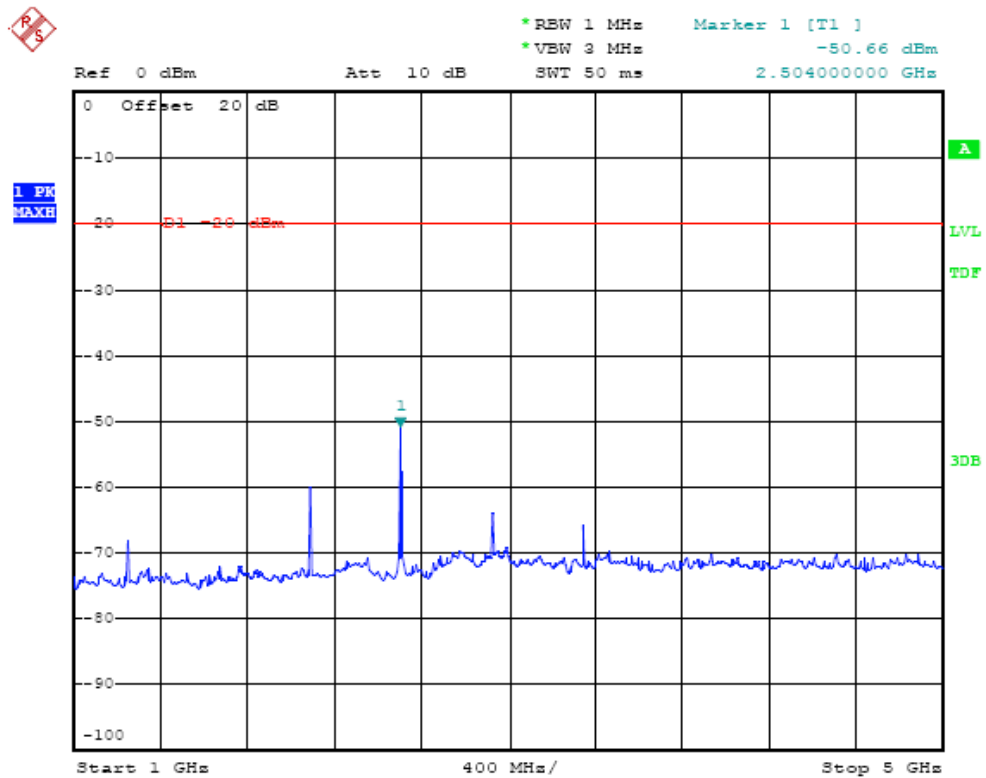
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A006	406.5000	----	----	2456.00	-63.40	-20dBm
Test Results				Compliance				



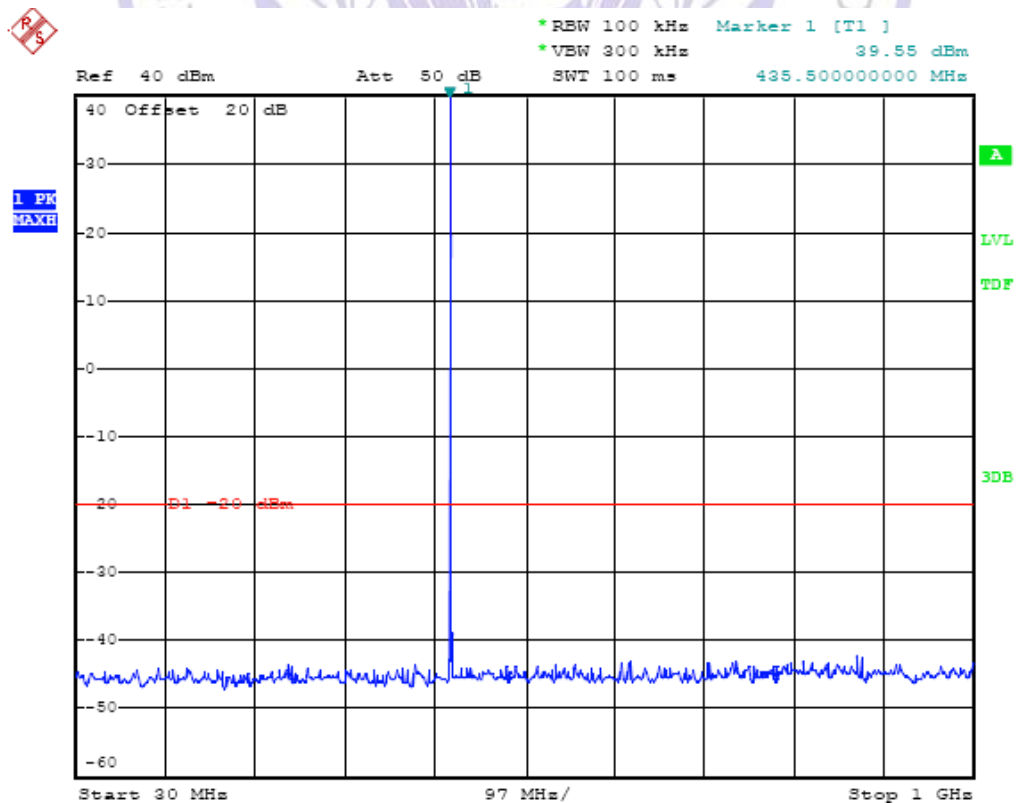


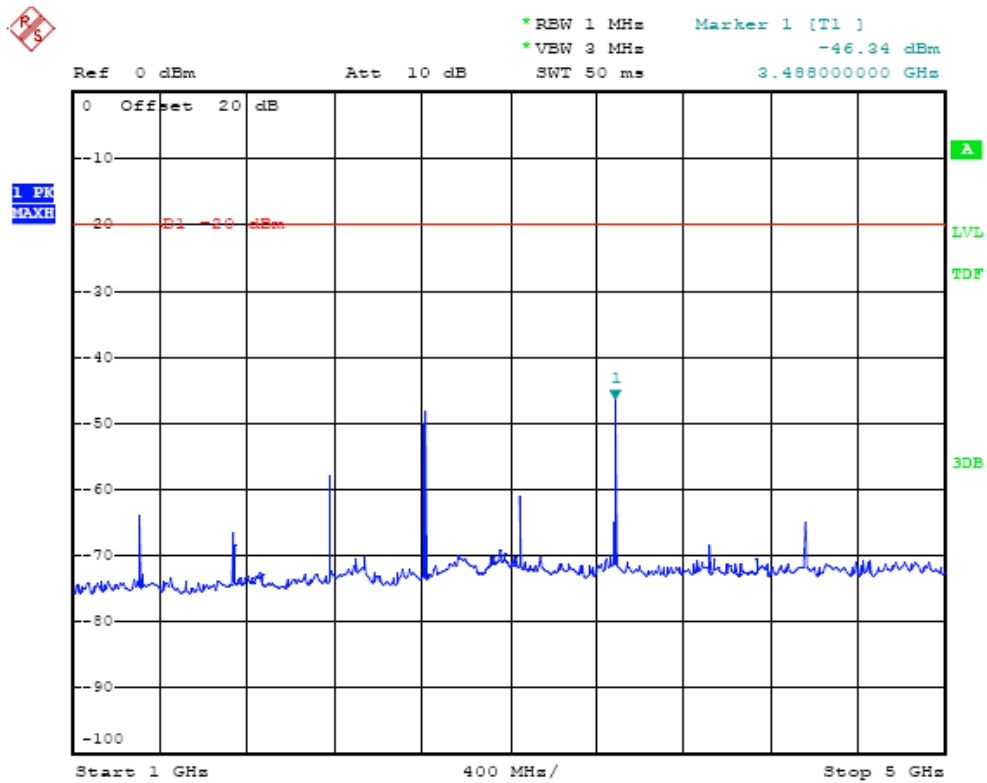
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A007	418.0000	----	----	2504.00	-50.66	-20dBm
Test Results				Compliance				



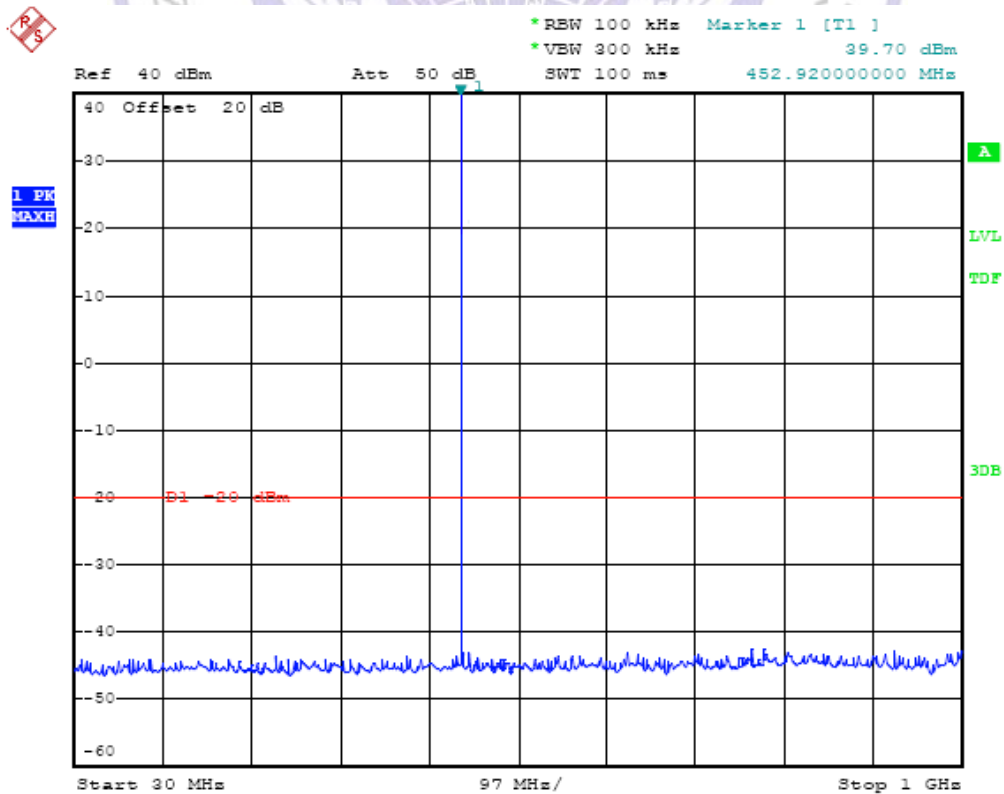


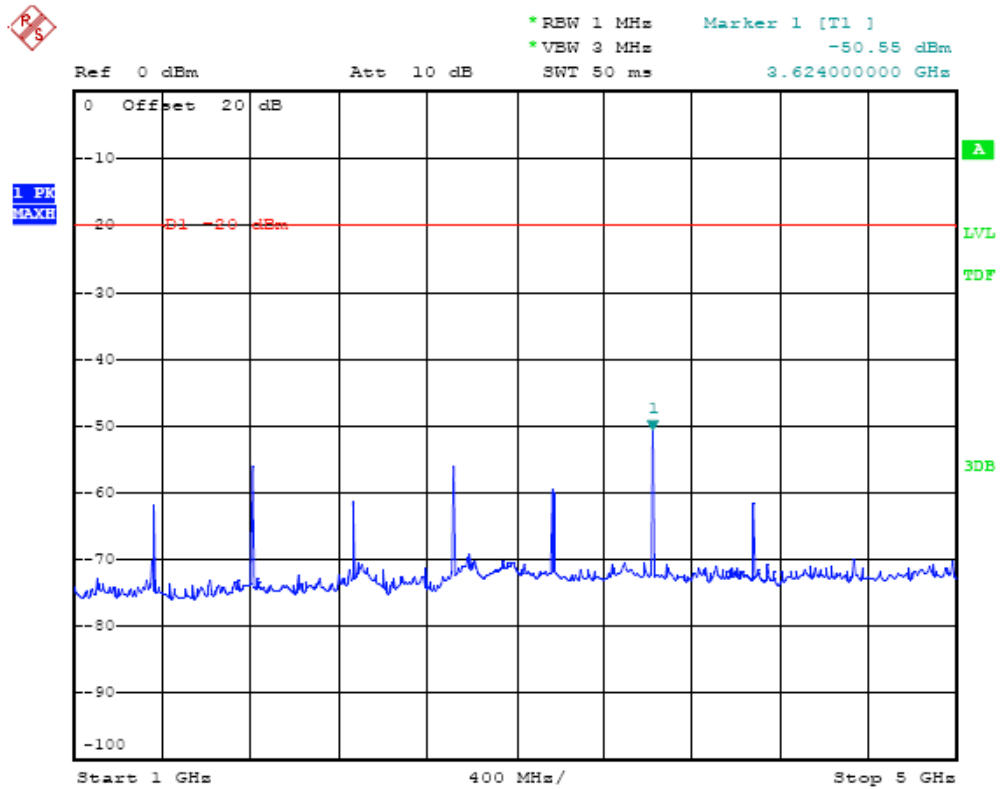
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A008	435.5000	----	----	3488.00	-46.34	-20dBm
Test Results				Compliance				



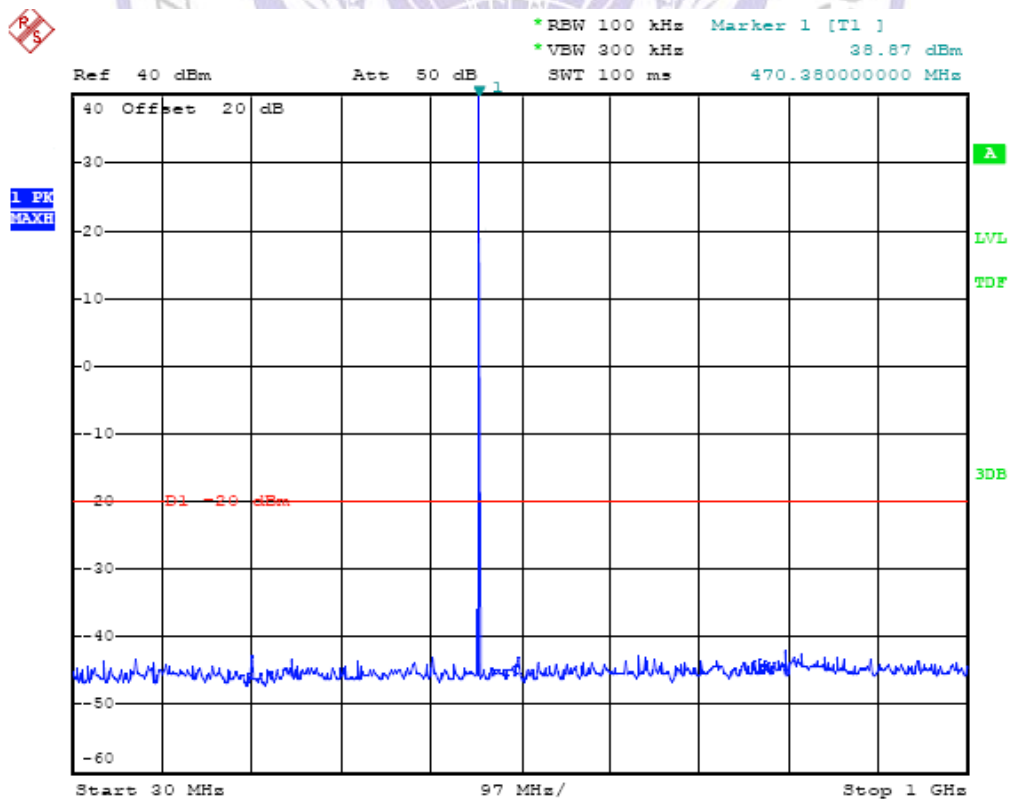


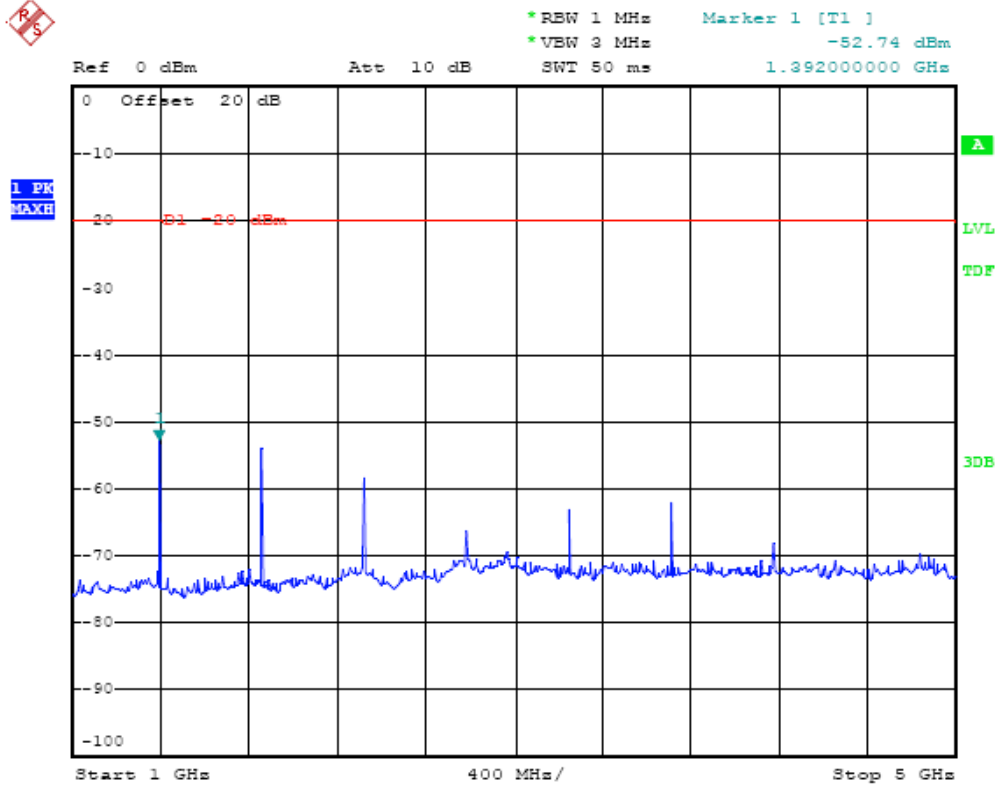
Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)	Maximum Conducted Spurious Emissions Below 1GHz		Maximum Conducted Spurious Emissions Above 1GHz		FCC Limit
				Frequency (MHz)	Datum (dBm)	Frequency (MHz)	Datum (dBm)	
FM	12.5KHz	A009	453.0000	----	----	3624.00	-50.55	-20dBm
Test Results				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	A010	469.5000	----	----	1392.00	-52.74	-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

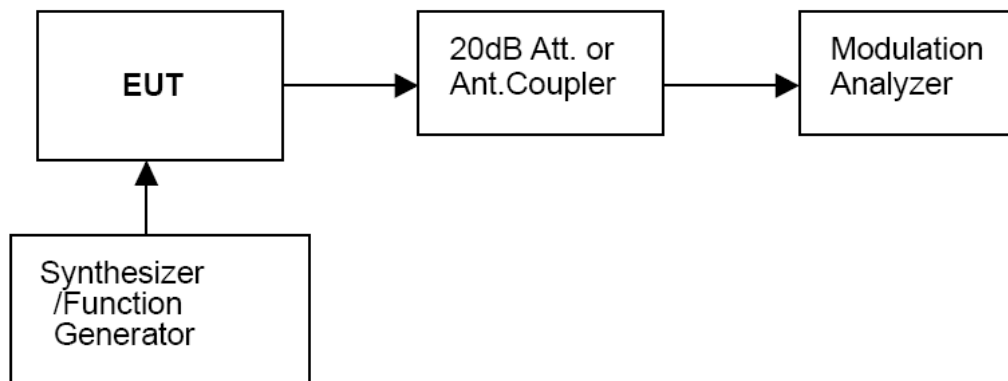
Modulation Limit

- 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

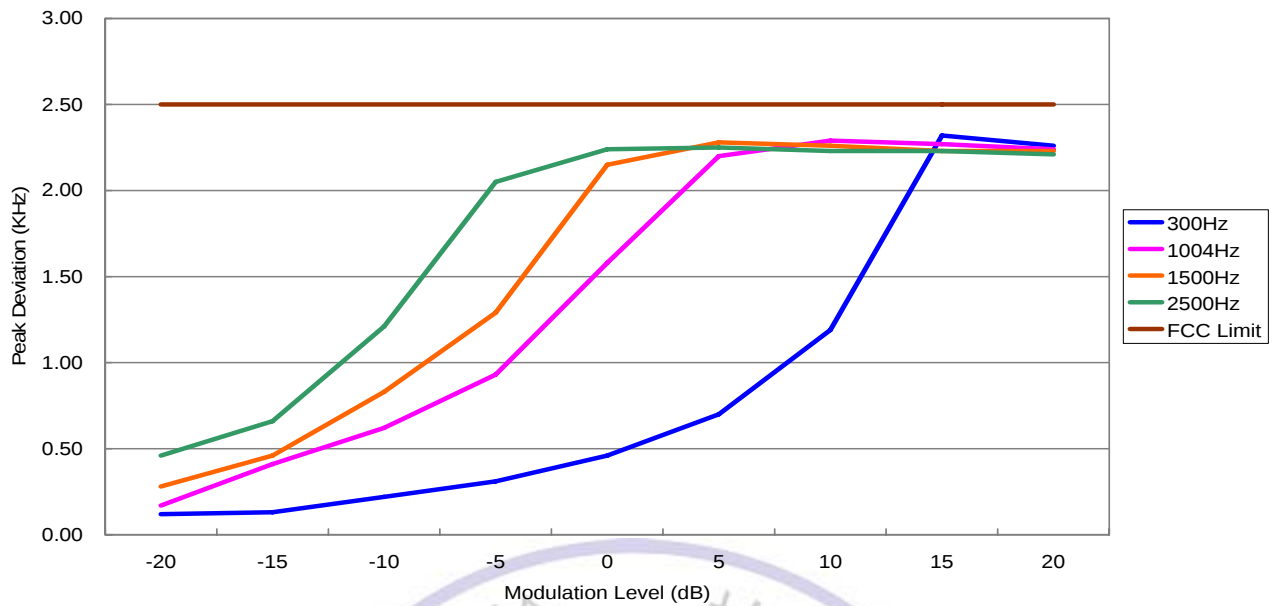
Modulation Type: FM

V Frequency Band:

12.5 KHz Channel Separation

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.12	0.17	0.28	0.46
-15	0.13	0.41	0.46	0.66
-10	0.22	0.62	0.83	1.21
-5	0.31	0.93	1.29	2.05
0	0.46	1.58	2.15	2.24
+5	0.70	2.20	2.28	2.25
+10	1.19	2.29	2.26	2.23
+15	2.32	2.27	2.23	2.23
+20	2.26	2.24	2.23	2.21

Modulation Limit for 12.5KHz

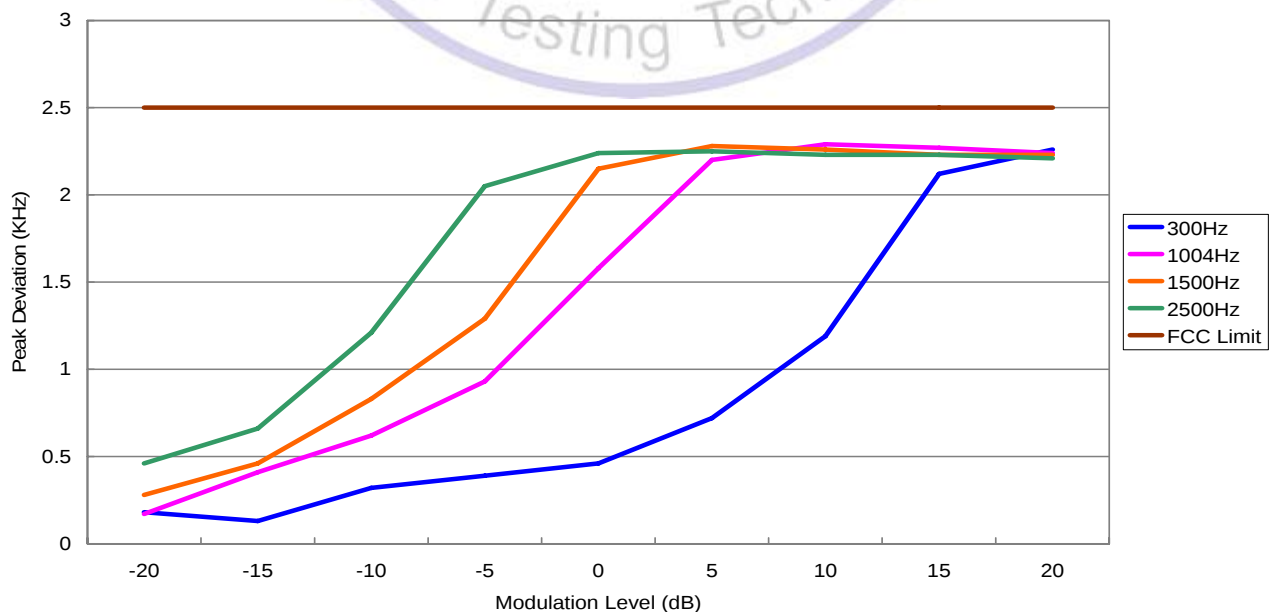


U Frequency Band:

12.5 KHz Channel Separation

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.18	0.22	0.31	0.52
-15	0.13	0.43	0.46	0.69
-10	0.32	0.64	0.87	1.24
-5	0.39	1.02	1.29	2.25
0	0.46	1.64	2.24	2.33
+5	0.72	2.27	2.28	2.27
+10	1.19	2.22	2.33	2.21
+15	2.12	2.37	2.34	2.33
+20	2.26	2.35	2.33	2.31

Modulation Limit for 12.5KHz



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.

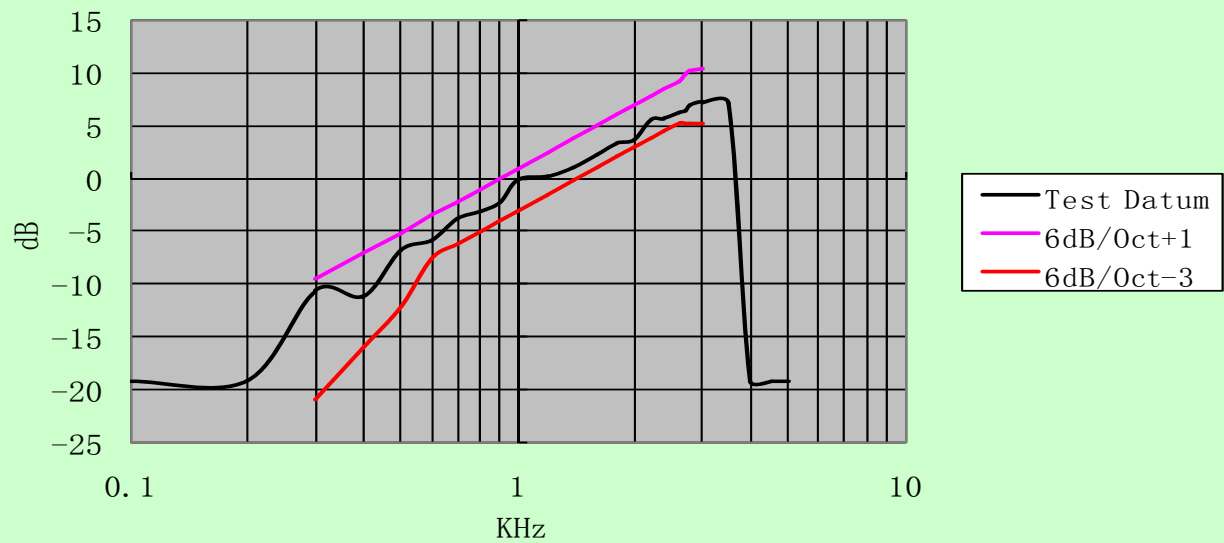
Note:

- 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

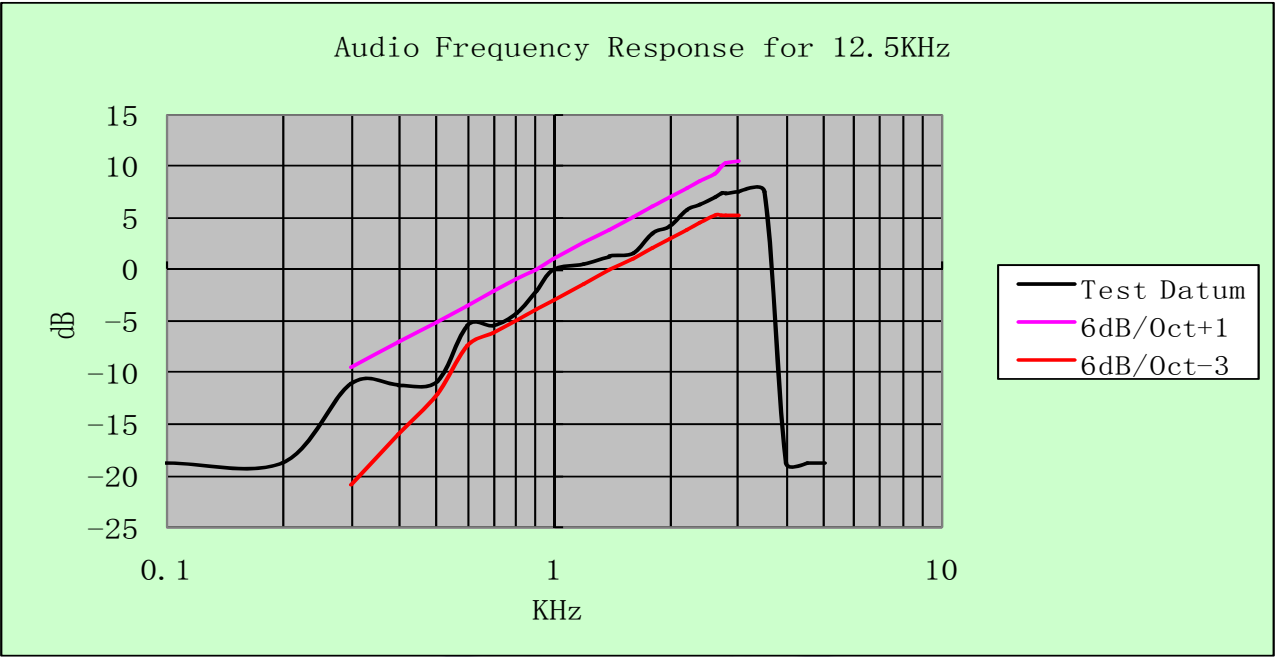
V Frequency Band:**12.5 KHz Channel Separation**

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.06	0.54	-19.24
0.2	0.06	0.54	-19.24
0.3	0.16	0.54	-11.29
0.4	0.15	0.54	-11.29
0.5	0.25	0.54	-7.96
0.6	0.28	0.54	-6.18
0.7	0.35	0.54	-3.21
0.8	0.38	0.54	-2.34
0.9	0.42	0.54	-2.14
1.0	0.54	0.54	0.00
1.2	0.56	0.54	0.46
1.4	0.62	0.54	0.76
1.6	0.71	0.54	2.58
1.8	0.80	0.54	3.36
2.0	0.83	0.54	3.68
2.2	1.04	0.54	5.62
2.4	1.05	0.54	5.78
2.6	1.12	0.54	6.02
2.7	1.15	0.54	6.56
2.8	1.22	0.54	6.78
3.0	1.26	0.54	7.13
3.5	1.25	0.54	7.13
4.0	0.06	0.54	-19.24
4.5	0.06	0.54	-19.24
5.0	0.06	0.54	-19.24

Audio Frequency Response for 12.5KHz

**U Frequency Band:****12.5 KHz Channel Separation**

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.1	0.06	0.52	-18.76
0.2	0.06	0.52	-18.76
0.3	0.14	0.52	-11.11
0.4	0.14	0.52	-11.21
0.5	0.15	0.52	-10.80
0.6	0.28	0.52	-5.36
0.7	0.28	0.52	-5.39
0.8	0.32	0.52	-4.22
0.9	0.41	0.52	-2.06
1.0	0.52	0.52	0.00
1.2	0.55	0.52	0.49
1.4	0.60	0.52	1.24
1.6	0.62	0.52	1.53
1.8	0.79	0.52	3.58
2.0	0.84	0.52	4.18
2.2	1.01	0.52	5.77
2.4	1.07	0.52	6.27
2.6	1.17	0.52	7.04
2.7	1.22	0.52	7.41
2.8	1.22	0.52	7.42
3.0	1.24	0.52	7.58
3.5	1.24	0.52	7.55
4.0	0.06	0.52	-18.76
4.5	0.06	0.52	-18.76
5.0	0.06	0.52	-18.76



4.6. Frequency Stability Measurement

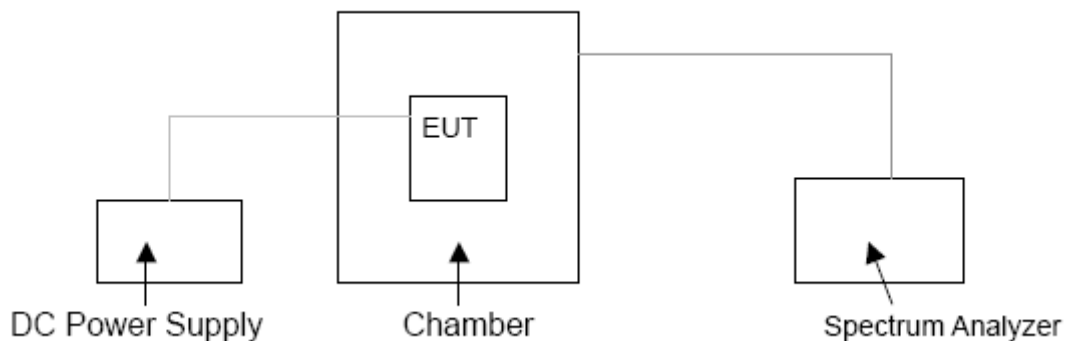
TEST APPLICABLE

- 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		50
150–174	^{5,11} 5	⁶ 5	^{4,6} 50
216–220	1.0		1.0
220–222 ¹²	0.1	1.5	1.5
421–512	^{7,11,14} 2.5	⁸ 5	⁸ 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		
935–940	0.1	1.5	1.5
1427–1435	⁹ 300	300	300
Above 2450 ¹⁰			

V Frequency Band:

Modulation Type	Channel Separation	Test conditions		Frequency error (ppm)				
		Voltage(V)	Temp (°C)	136.5000 (MHz)	146.0000 (MHz)	155.0000 (MHz)	164.0000 (MHz)	173.5000 (MHz)
Analog/FM	12.5KHz	13.8	-30	1.15	1.33	1.14	1.25	1.27
			-20	1.04	1.12	1.07	0.94	1.11
			-10	1.01	1.25	1.25	0.93	0.97
			0	1.04	1.04	1.14	1.02	0.96
			10	1.05	1.10	1.17	0.94	0.89
			20	1.06	1.07	1.18	0.96	0.95
			30	1.12	1.08	1.12	0.94	0.92
			40	1.23	1.04	1.09	1.06	1.12
			50	1.18	1.11	0.99	1.01	0.97
		10.85 (End Point)	25	1.21	1.03	0.97	0.97	1.12
		11.73 (85% Rated)	20	0.98	1.01	0.91	0.95	0.84
		15.87 (115% Rated)	20	1.03	1.01	0.92	0.91	1.12
Limit				2.50	2.50	2.50	2.50	2.50
Conclusion				Complies				

U Frequency Band:

Modulation Type	Channel Separation	Test conditions		Frequency error (ppm)				
		Voltage (V)	Temp (°C)	406.5000 (MHz)	418.0000 (MHz)	435.5000 (MHz)	453.0000 (MHz)	469.5000 (MHz)
Analog/FM	12.5KHz	13.8	-30	0.75	0.70	0.70	0.72	0.72
			-20	0.70	0.65	0.74	0.64	0.74
			-10	0.64	0.61	0.75	0.61	0.62
			0	0.57	0.58	0.54	0.57	0.51
			10	0.44	0.39	0.43	0.43	0.42
			20	0.31	0.37	0.38	0.35	0.31
			30	0.34	0.31	0.31	0.31	0.38
			40	0.49	0.42	0.40	0.40	0.41
			50	0.62	0.40	0.53	0.57	0.50
		10.85 (End Point)	25	0.38	0.38	0.34	0.38	0.38
		11.73 (85% Rated)	20	0.41	0.37	0.31	0.31	0.31
		15.87 (115% Rated)	20	0.49	0.38	0.38	0.34	0.31
Limit			2.50	2.50	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 13.80 V stabilized supply voltage.

TEST CONFIGURATION

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

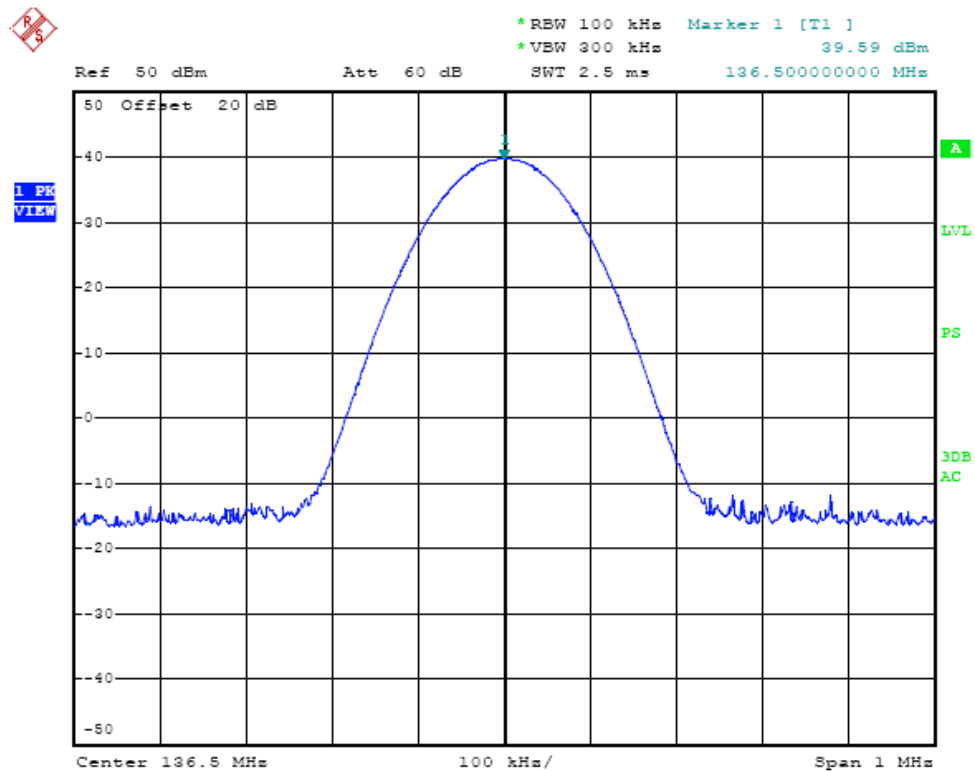
The EUT was directly connected to a RF Communication Test set by a 20 dB attenuator

TEST RESULTS

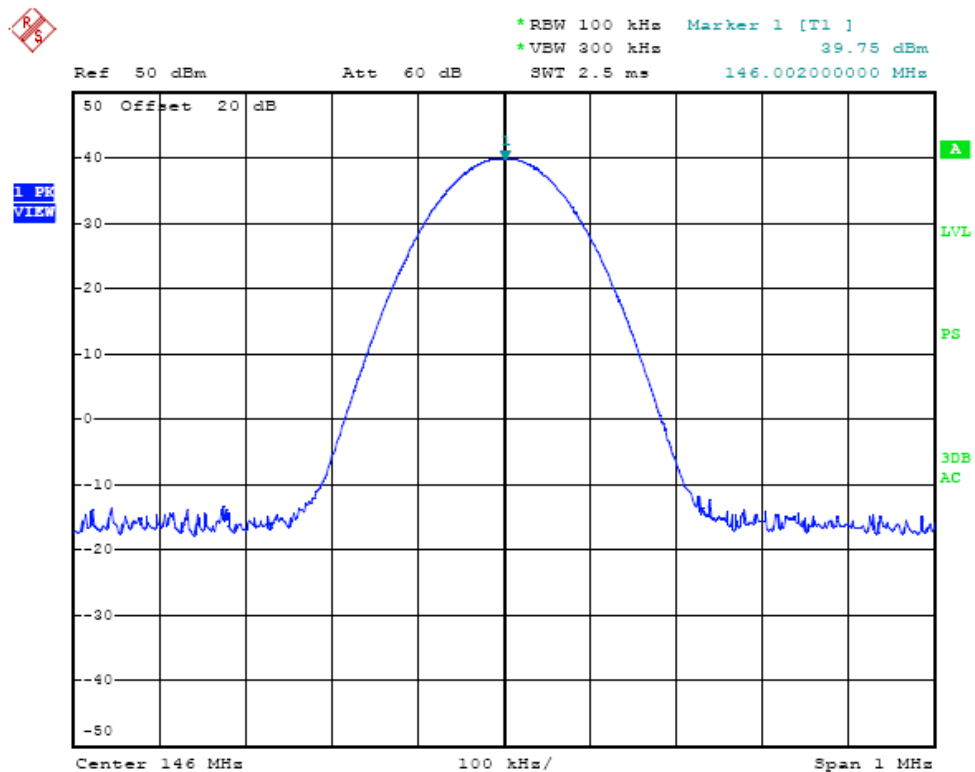
Frequency Range (MHz)	Modulation Type	Channel Separation (KHz)	Test Channel	Maximum Output Power Test Results (dBm)
136-174	Analog/FM	12.5	A001	39.59
			A002	39.75
			A003	39.64
			A004	39.52
			A005	39.10
400-470			A006	39.65
			A007	39.55
			A008	39.98
			A009	40.20
			A010	39.40
Limit	FCC: The limit is dependent upon the station's antenna HAAT and required service area.			
Test Results	Compliance			

Plots of Maximum Transmitter Power Measurement

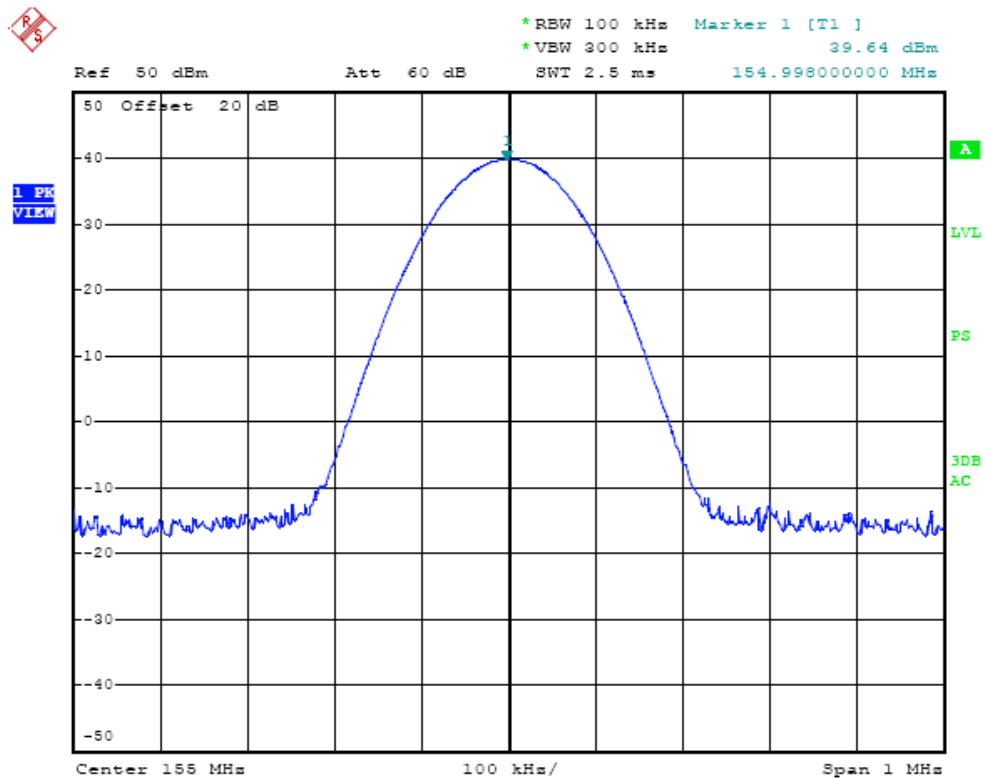
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	136.5000	10	39.59	Varies	Compliance



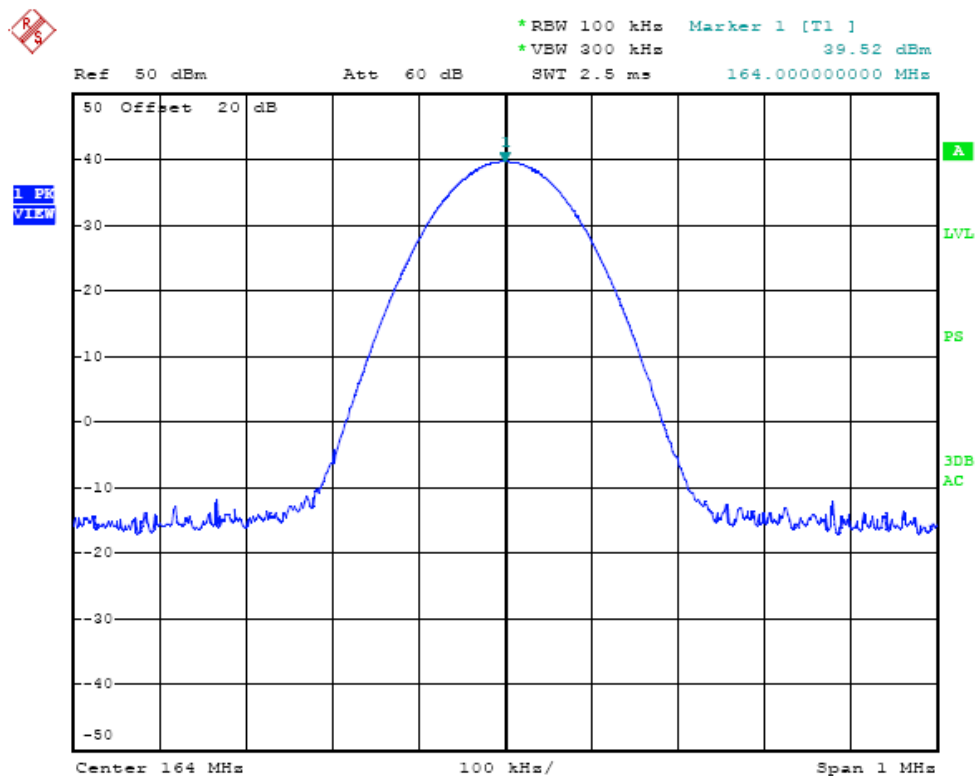
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	146.0000	10	39.75	Varies	Compliance



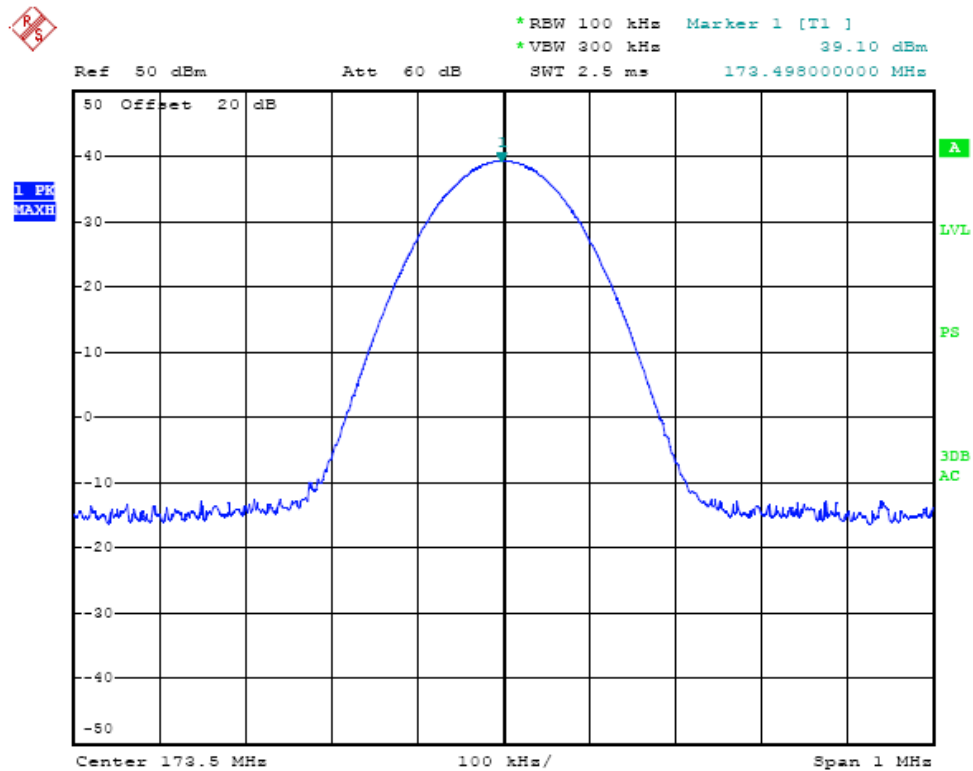
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	155.0000	10	39.64	Varies	Compliance



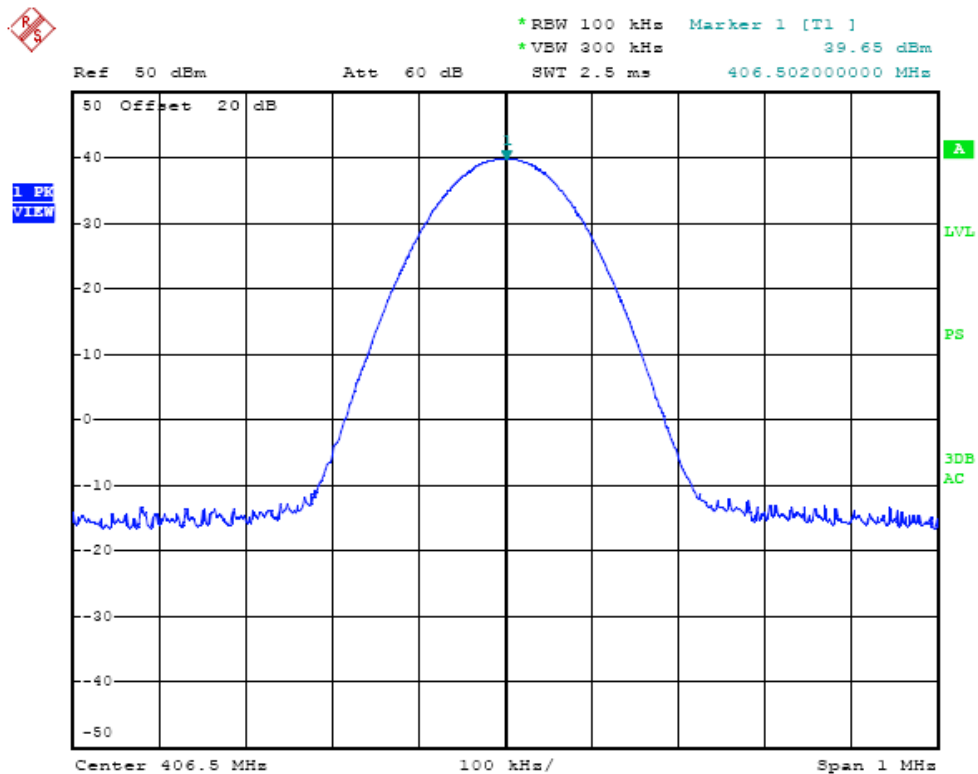
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	164.0000	10	39.52	Varies	Compliance



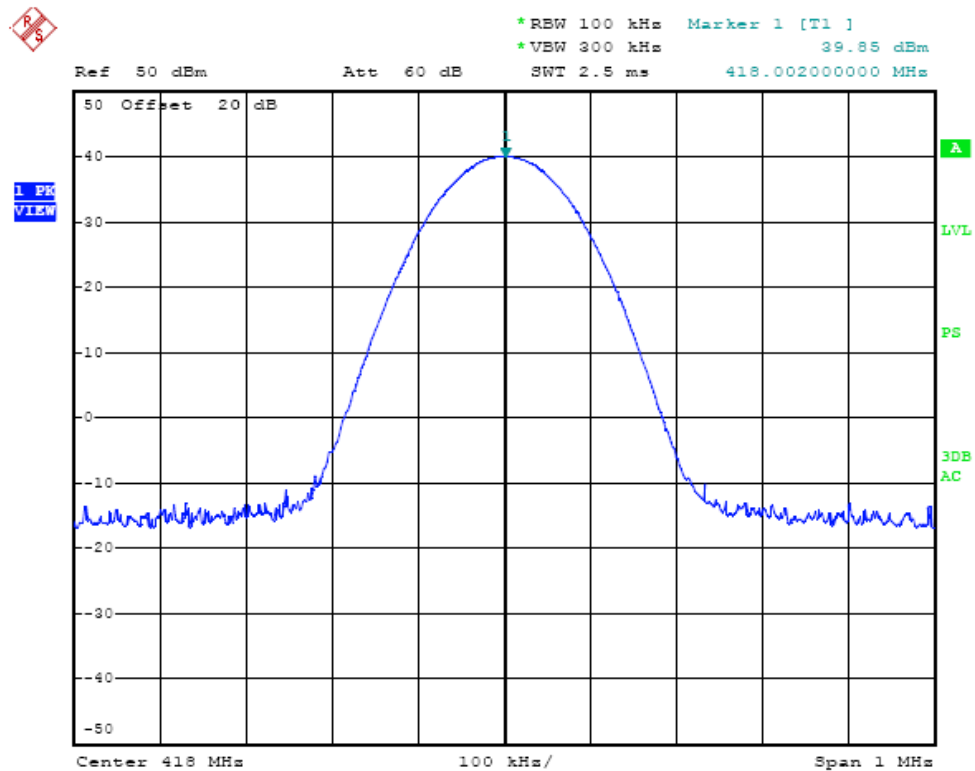
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	173.5000	10	39.10	Varies	Compliance



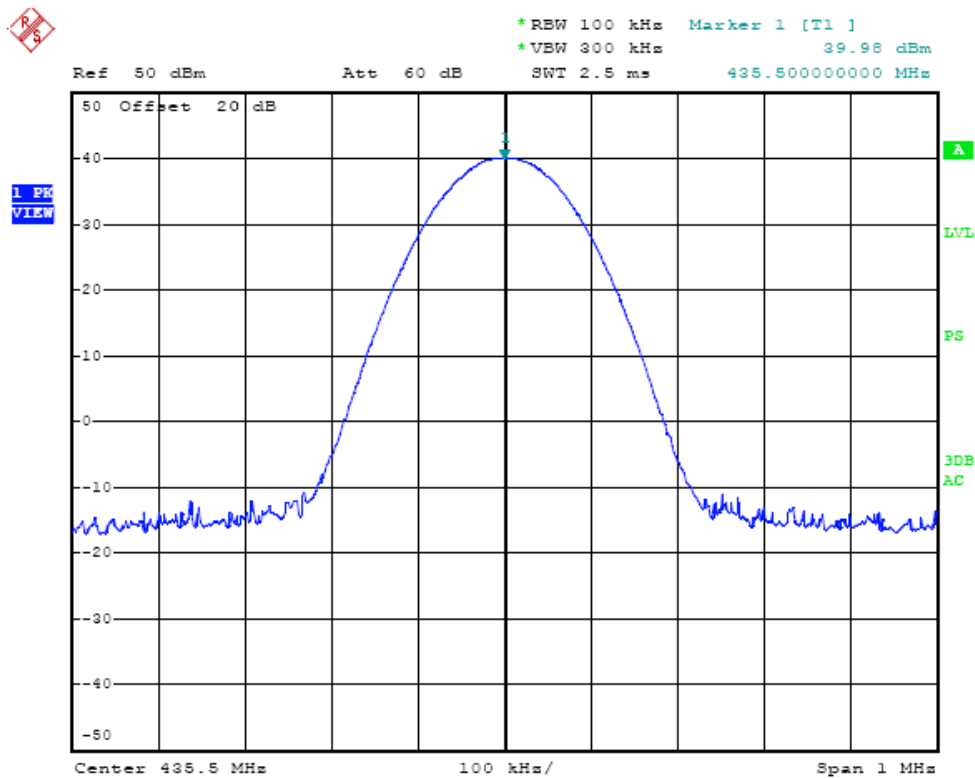
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	406.5000	10	39.65	Varies	Compliance



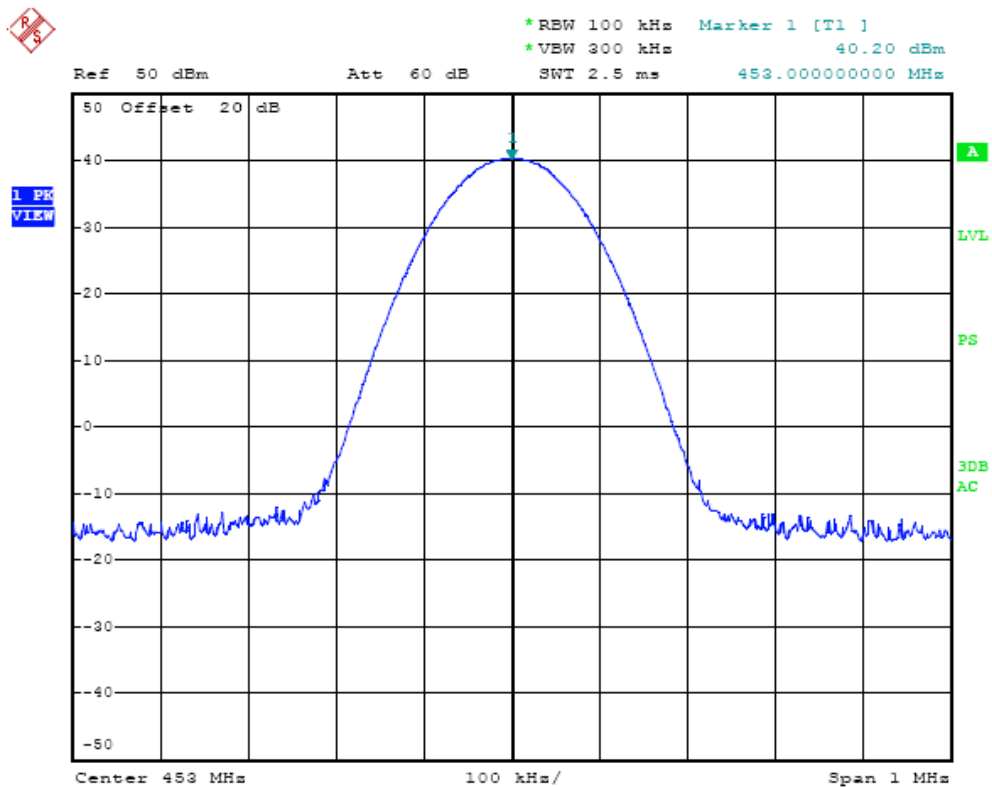
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	418.0000	10	39.55	Varies	Compliance



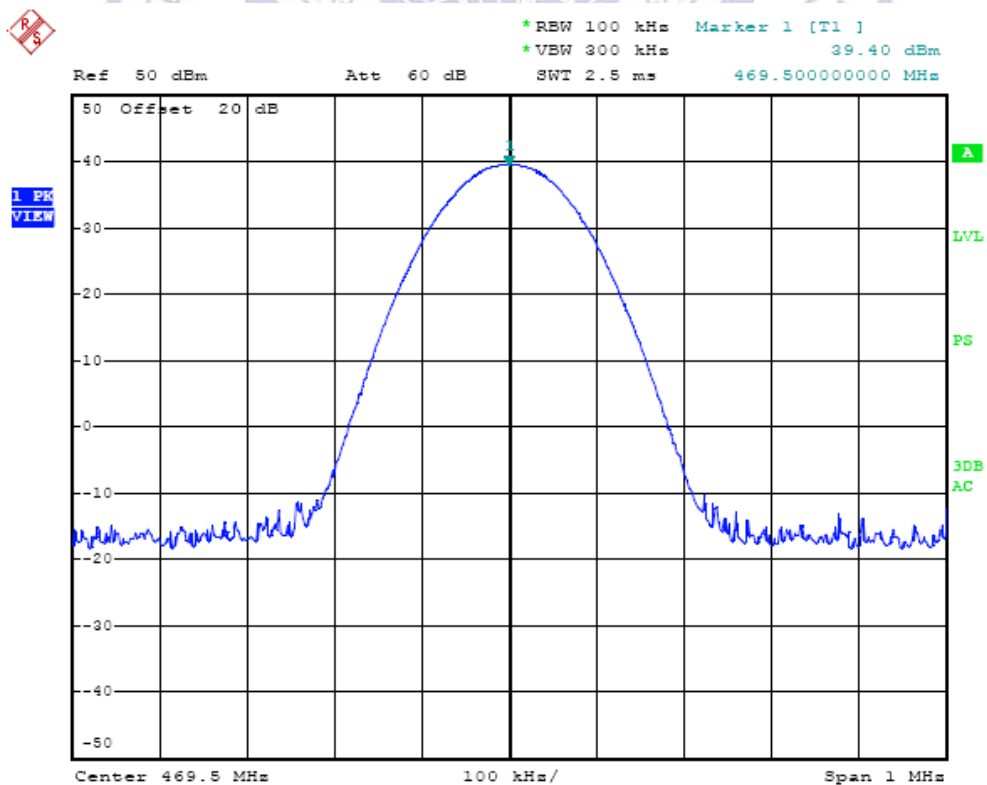
Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	435.5000	10	39.98	Varies	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	453.0000	10	40.20	Varies	Compliance



Modulation Type	Channel Separation	Freq.(MHz)	Rated Power (Watt)	Measurement (dBm)	FCC Limit	Results
FM	12.5 KHz	469.5000	10	39.40	Varies	Compliance



4.8. Transmitter Frequency Behaviour

TEST APPLICABLE

Section 90.214

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

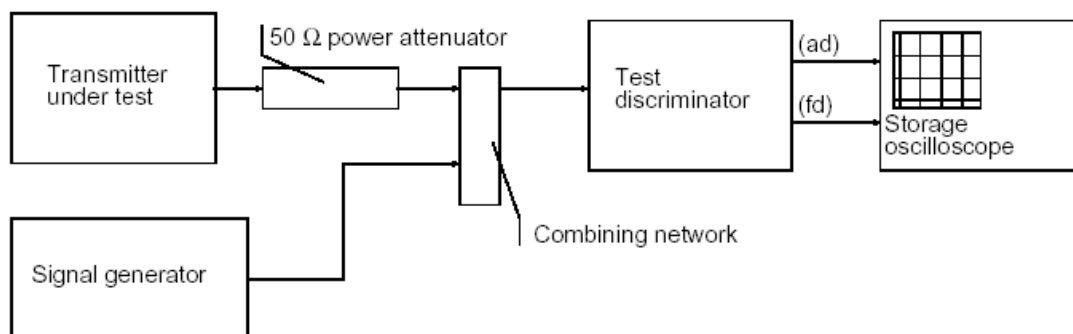
Time intervals ^{1, 2}	Maximum frequency difference ³	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t ₁ ⁴	± 25.0 KHz	5.0 ms	10.0 ms
t ₂	± 12.5 KHz	20.0 ms	25.0 ms
t ₃ ⁴	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior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



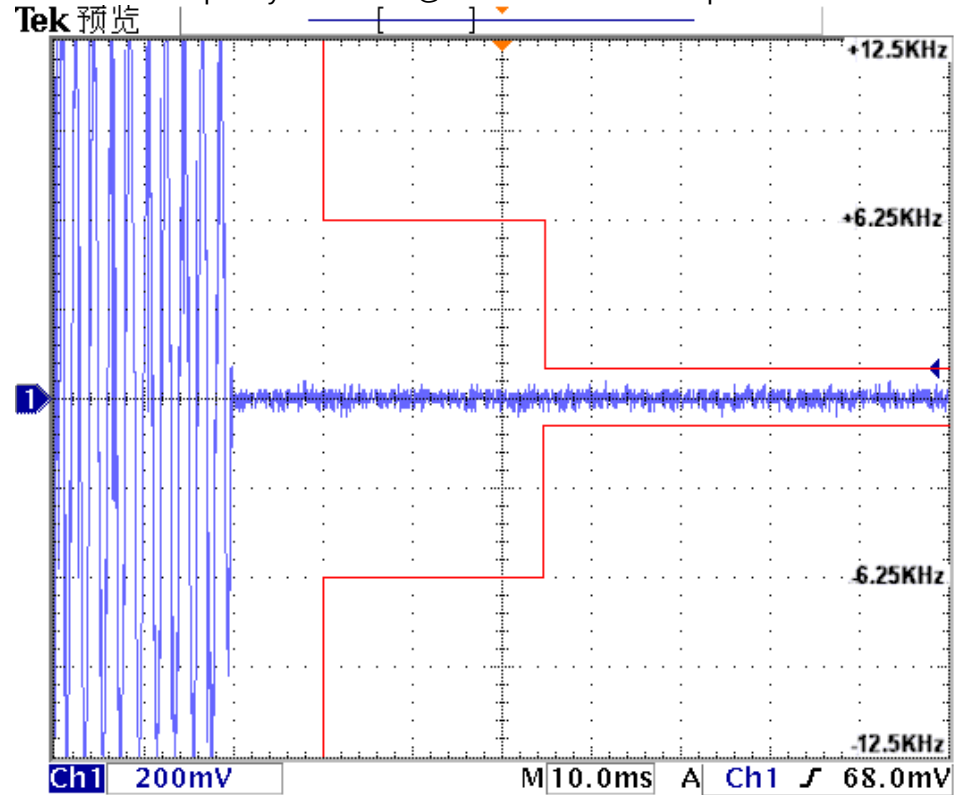
TEST RESULTS

Please refer to the following plots.

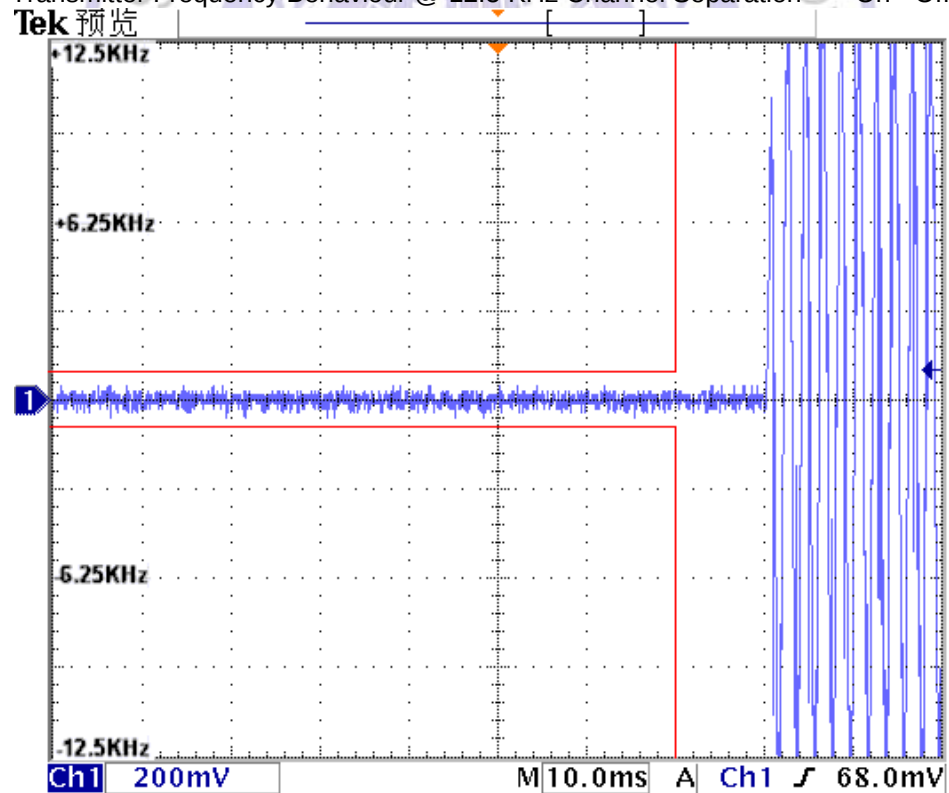
Modulation Type: FM

V Frequency Band:

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

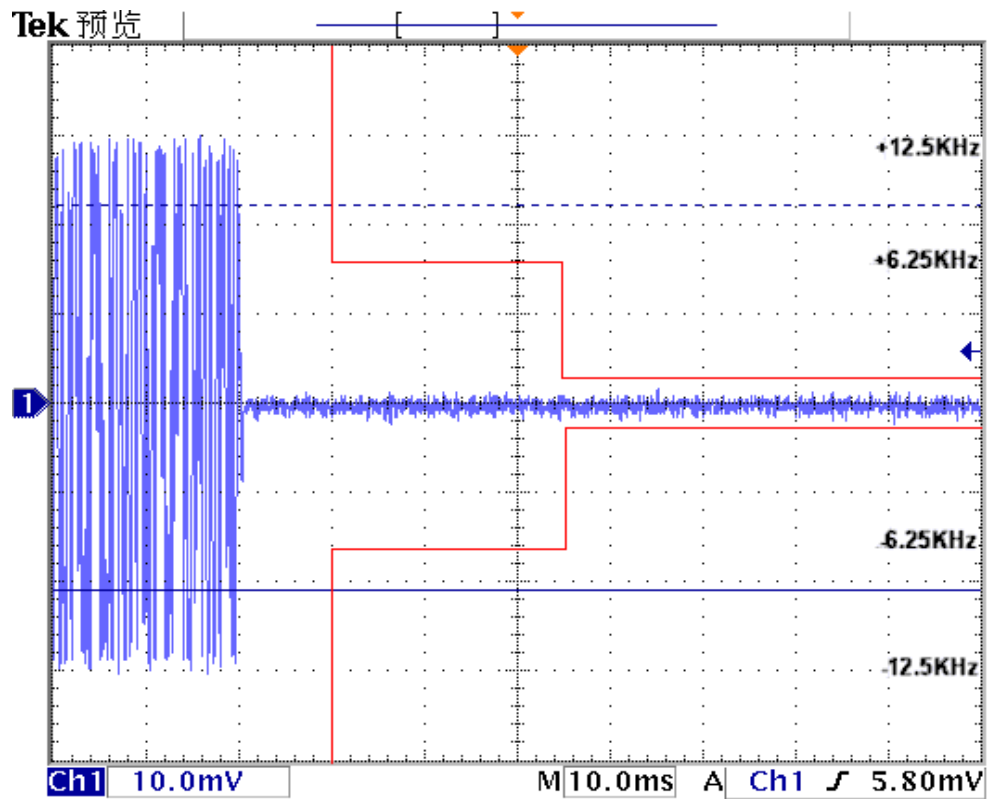


Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation-----On - Off

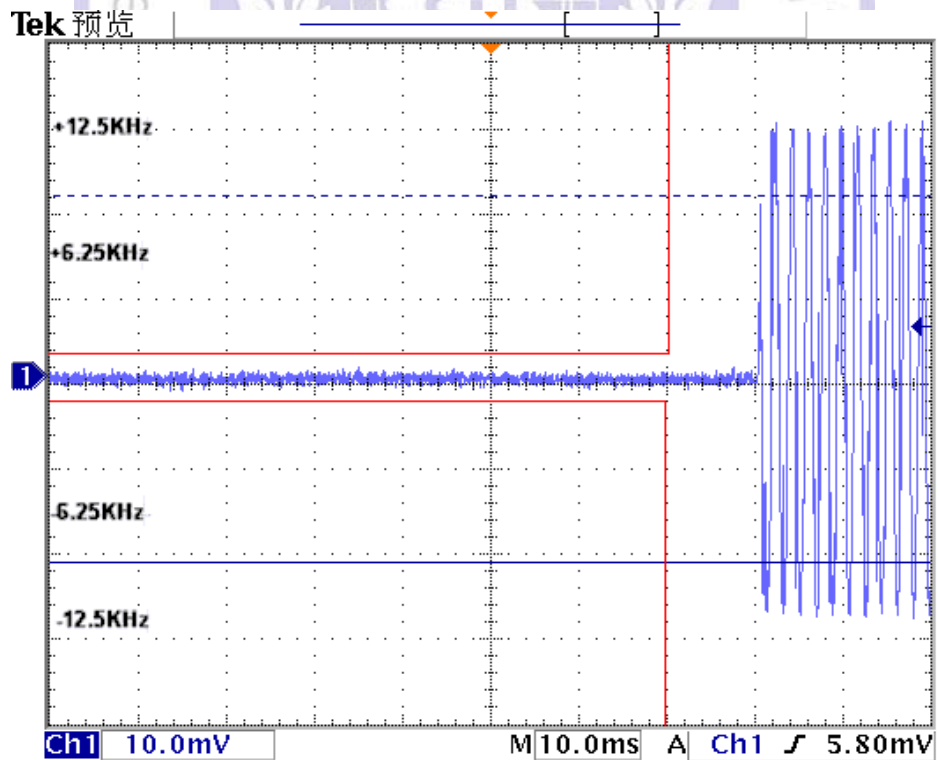


U Frequency Band:

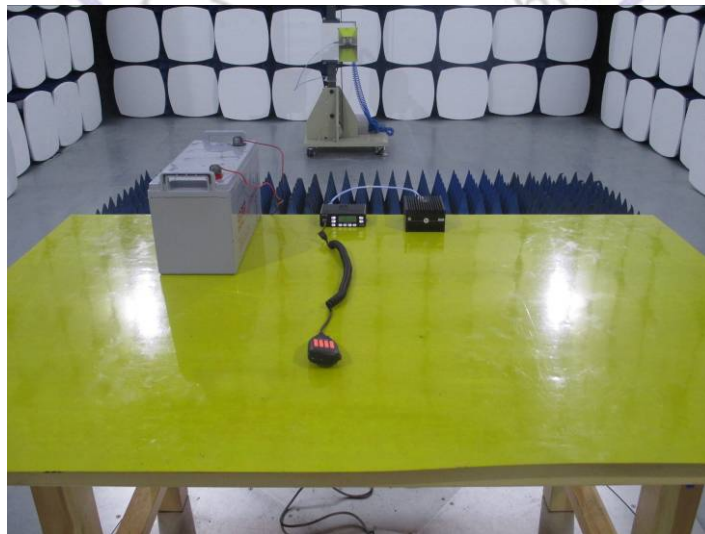
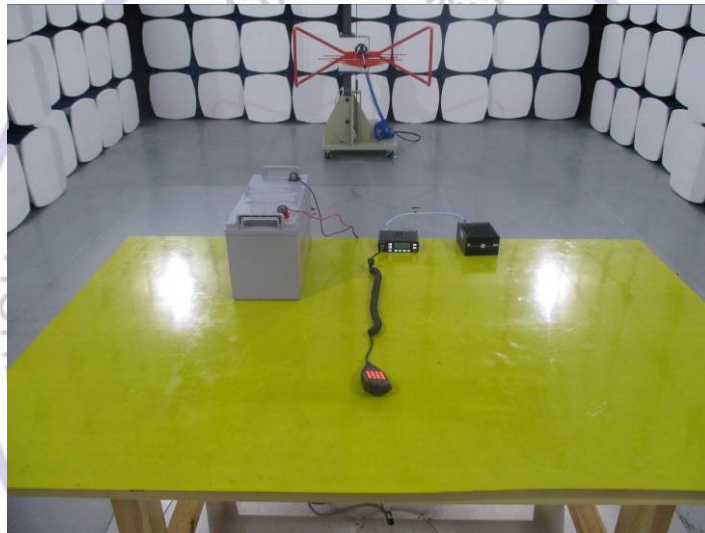
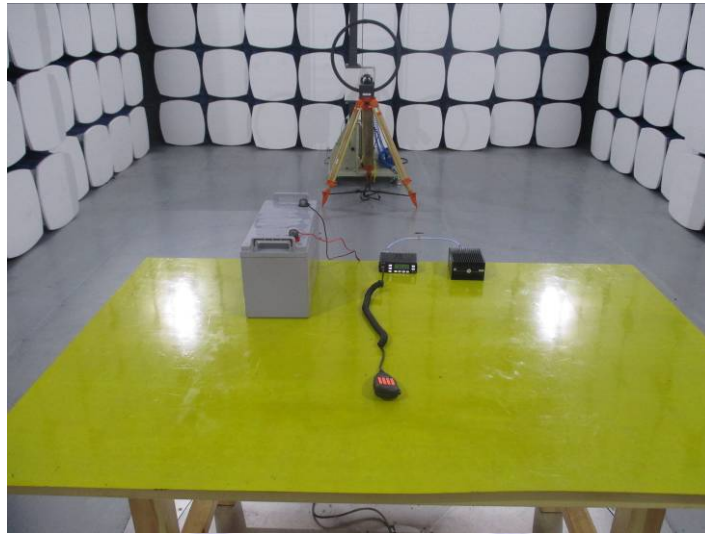
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation-----Off – On



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

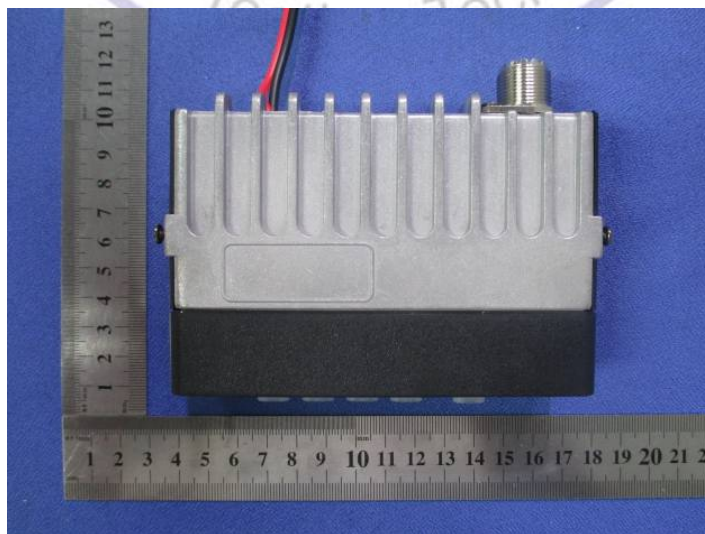
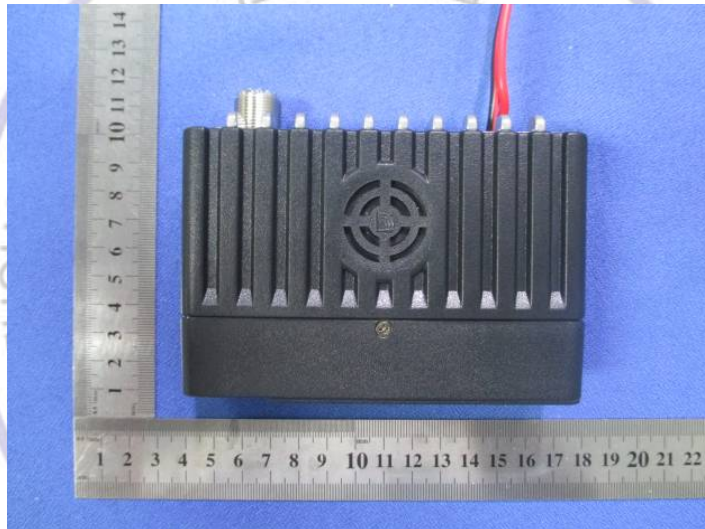


5. Test Setup Photos of the EUT



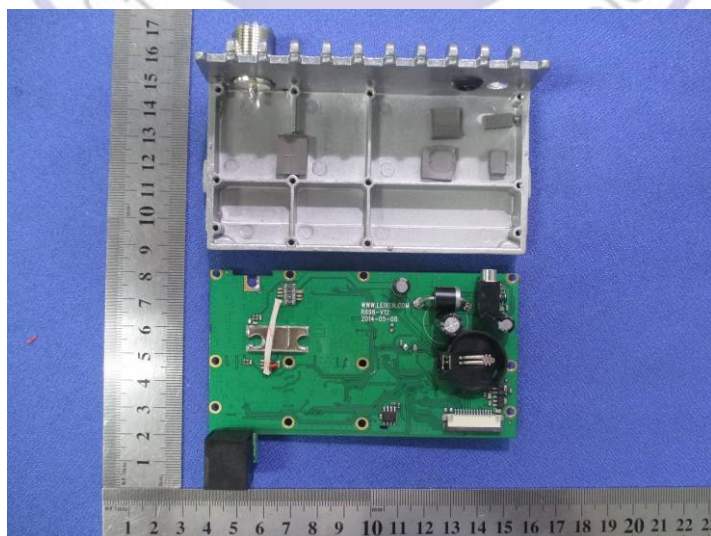
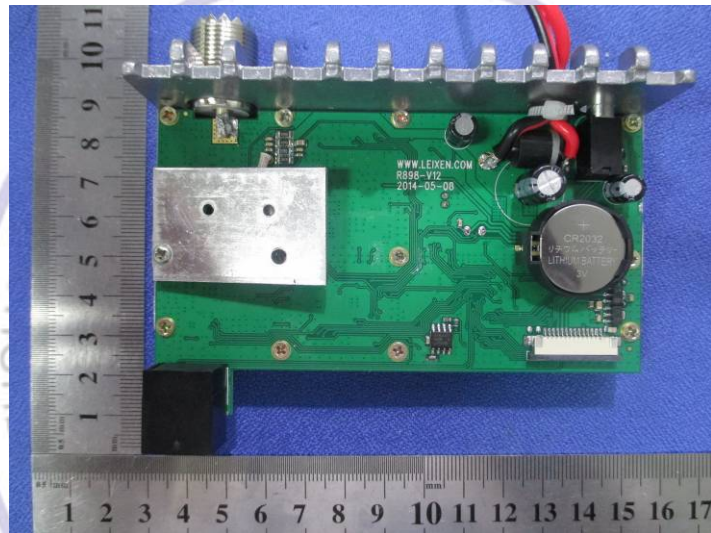
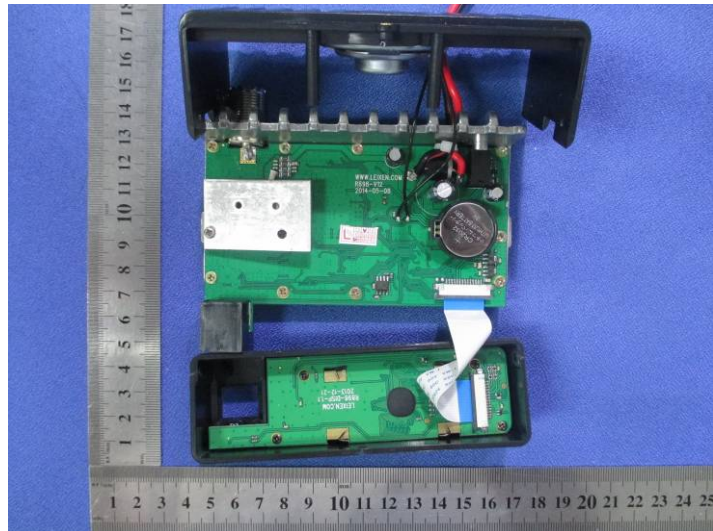
6. External and Internal Photos of the EUT

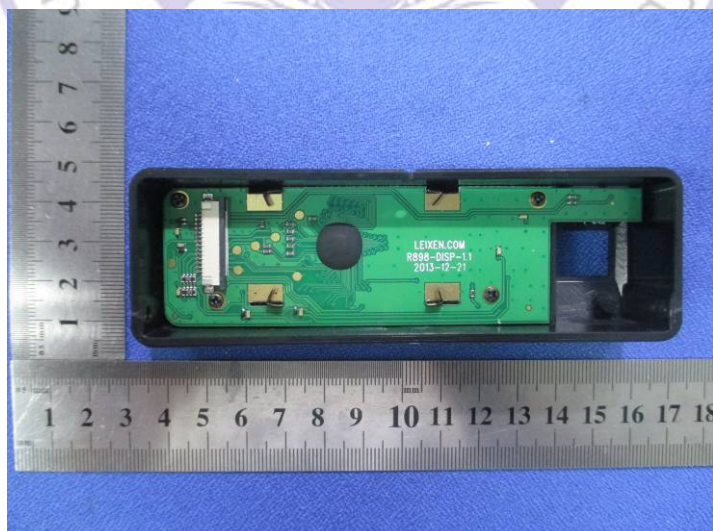
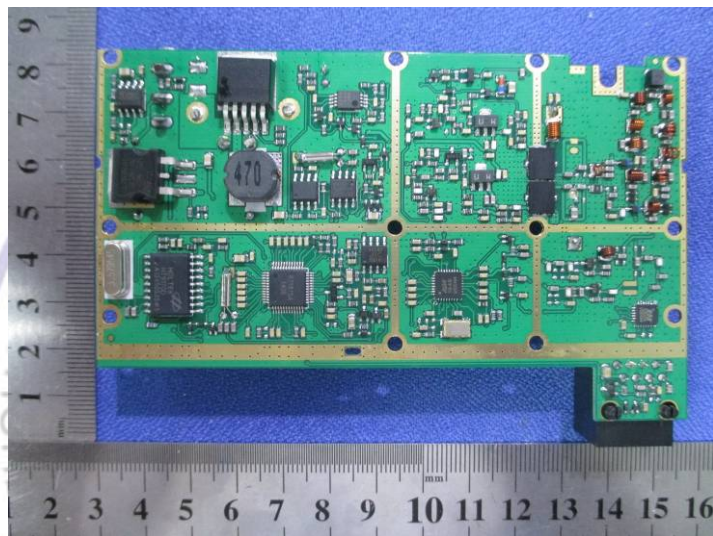
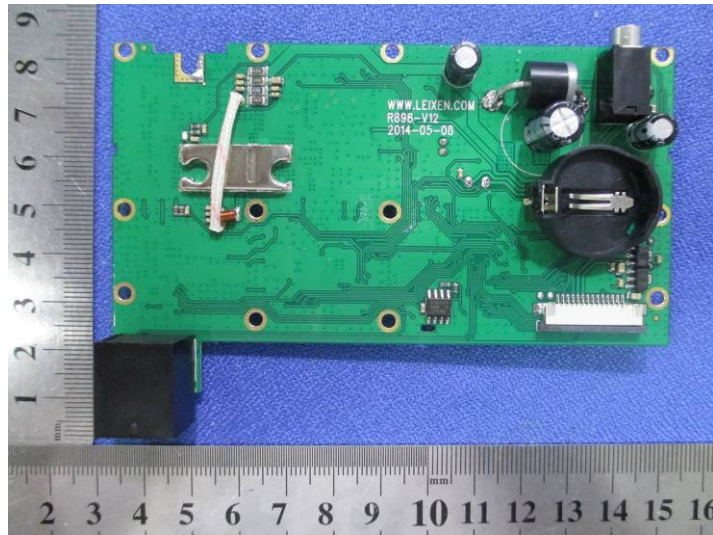
External Photos

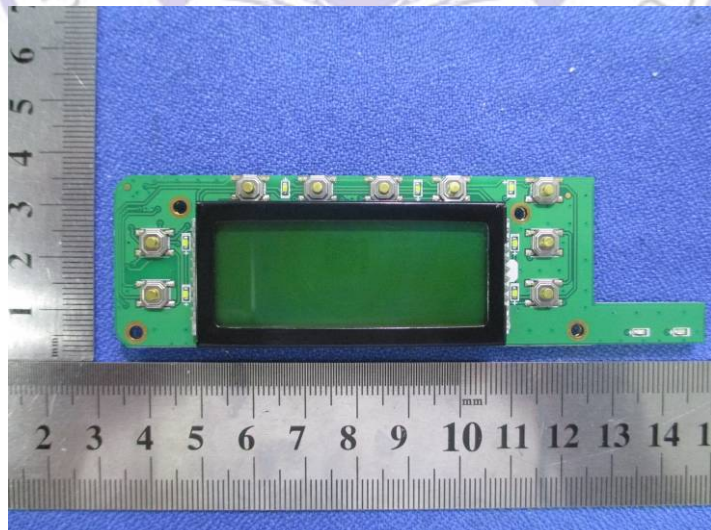
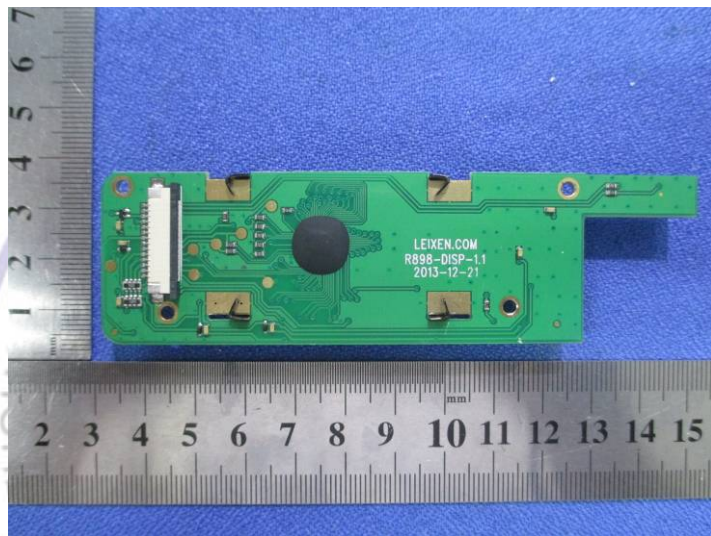
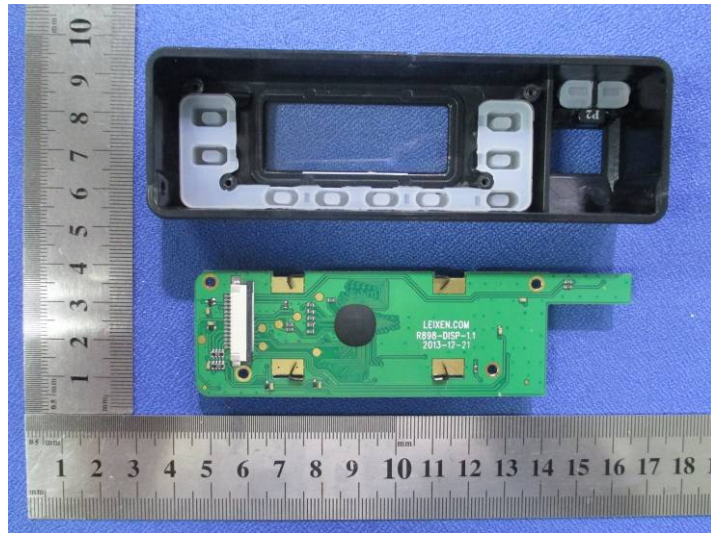


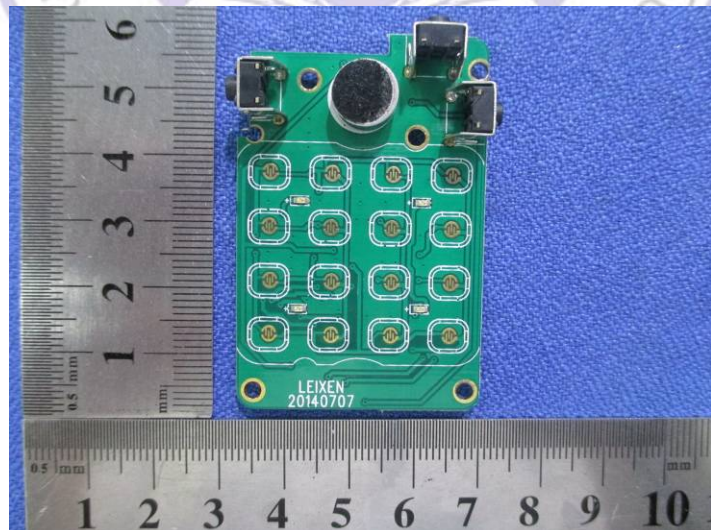
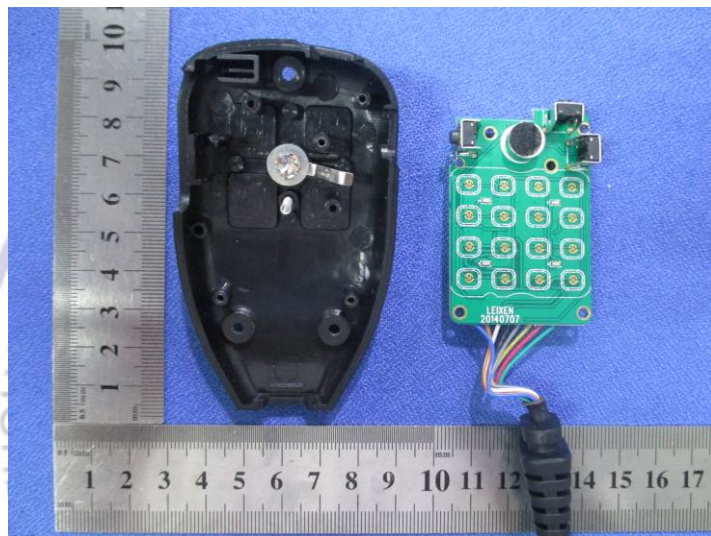


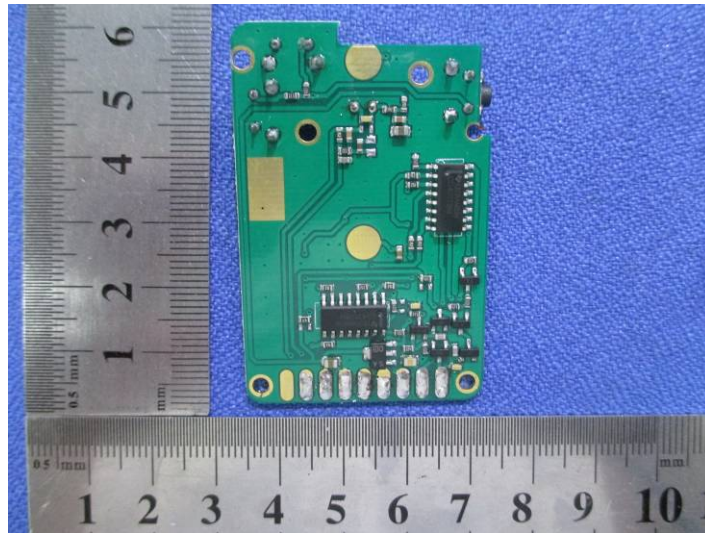


Internal Photos









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

