



Shenzhen Huatongwei International Inspection Co., Ltd.

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# TEST REPORT

**Report Reference No.** ..... : **TRE17080049** **R/C.....:** 14621

**FCC ID** ..... : **2AMXI-WT-1002**

**Applicant's name** ..... : **Ningbo Zhonghai Electrical Appliances Co.,Ltd**

**Address** ..... : **JISHAN INDUSTRIAL DISTRICT, NINGBO, ZHEJIANG, CHINA**

**Manufacturer** ..... : **Ningbo Zhonghai Electrical Co.,Ltd**

**Address** ..... : **Jishan Industrial District, Xidian Town, Ninghai City, Ningbo, Zhejiang, China**

**Test item description** ..... : **Walkie Talkies**

**Trade Mark** ..... : -

**Model/Type reference** ..... : **WT-1002**

**Listed Model(s)** ..... : -

**Standard** ..... : **FCC Part 95**

**Date of receipt of test sample** ..... : **Nov. 23, 2017**

**Date of testing** ..... : **Nov. 24, 2017 – Dec. 01, 2017**

**Date of issue** ..... : **Dec. 01, 2017**

**Result** ..... : **PASS**

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**Testing Laboratory Name** ..... : **Shenzhen Huatongwei International Inspection Co., Ltd.**

**Address** ..... : **1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China**

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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 AND REPORT VERSION**

### 1.1. **Test Standards**

The tests were performed according to following standards:

[FCC Rules Part 95](#) PERSONAL RADIO SERVICES

[TIA/EIA-603-E-2016](#) Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[ANSI C63.26](#) American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

[FCC Part 2](#) Frequency allocations and radio treaty matters, general rules and regulations.

### 1.2. **Report version**

Version No.	Date of issue	Description
00	Aug. 22, 2017	Original
01	Dec. 01, 2017	Only change the capacitance of the oscillation circuit into a diode, issued based on TRE17080049. Added the test data of "Transmitter Radiated Spurious Emission". Other data were the same as original. Delete the GMRS description.

## 2. Test Description

Transmitter Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Maximum Transmitter Power	FCC Part 95.567	<input checked="" type="checkbox"/>	
Modulation Limit	FCC Part 95.575	<input checked="" type="checkbox"/>	
Emission Bandwidth	FCC Part 95.573	<input checked="" type="checkbox"/>	
Emission Mask	FCC Part 95.579	<input checked="" type="checkbox"/>	
Transmitter Radiated Spurious Emission	FCC Part 95.579	<input checked="" type="checkbox"/>	
Spurious Emission On Antenna Port	FCC Part 95.579		<input checked="" type="checkbox"/>
Frequency Stability	FCC Part 95.565	<input checked="" type="checkbox"/>	

**Note:**

The test measurements were made in accordance with the above-mentioned departmental standard(s), and the equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

### 3. **SUMMARY**

#### 3.1. Client Information

Applicant:	Ningbo Zhonghai Electrical Appliances Co.,Ltd
Address:	JISHAN INDUSTRIAL DISTRICT, NINGBO, ZHEJIANG, CHINA
Manufacturer:	Ningbo Zhonghai Electrical Co.,Ltd
Address:	Jishan Industrial District, Xidian Town, Ninghai City, Ningbo, Zhejiang, China

#### 3.2. Product Description

Name of EUT:	Walkie Talkies	
Trade mark:	-	
Model/Type reference:	WT-1002	
Listed model(s):	-	
Power supply:	DC 6V	
Battery information:	-	
Charger information:	-	
Adapter information:	-	
Operation Frequency Range:	FRS:	462.5500MHz~462.7250MHz 467.5625MHz~467.7125MHz
Rated Output Power:	FRS:	0.5W(27dBm)
Modulation Type:	FRS:	FM
Channel Separation:	FRS:	12.5kHz
Emission Designator:	FRS:	5K20F3E
Maximum Transmitter Power (ERP):	FRS:	24.98dBm
Antenna Type:	Integral	

Note:

1. The device only supports voice communication.
2. The device has no gain and vertically polarized antenna.

### 3.3. Test frequency list

Operation Mode	Modulation	Channel Separation (kHz)	Operation Frequency Range (MHz)	Test Channel	Test Frequency (MHz)
FRS	FM	12.5	462.5500~462.7250 467.5625~467.7125	CH <sub>L1</sub>	462.5625(CH1)
				CH <sub>M1</sub>	462.6375(CH4)
				CH <sub>H1</sub>	462.7125(CH7)
				CH <sub>L2</sub>	467.5625(CH8)
				CH <sub>M2</sub>	467.6375(CH11)
				CH <sub>H2</sub>	467.7125(CH14)
				CH <sub>L3</sub>	462.5500(CH15)
				CH <sub>M3</sub>	462.6500(CH19)
				CH <sub>H3</sub>	462.7250(CH22)

The Product channel frequency table:

Channel	Frequency	Description	Channel	Frequency	Description
1	462.5625	FRS	12	467.6625	FRS
2	462.5875	FRS	13	467.6875	FRS
3	462.6125	FRS	14	467.7125	FRS
4	462.6375	FRS	15	462.5500	FRS
5	462.6625	FRS	16	462.5750	FRS
6	462.6875	FRS	17	462.6000	FRS
7	462.7125	FRS	18	462.6250	FRS
8	467.5625	FRS	19	462.6500	FRS
9	467.5875	FRS	20	462.6750	FRS
10	467.6125	FRS	21	462.7000	FRS
11	467.6375	FRS	22	462.7250	FRS

### 3.4. EUT operation mode

Test mode	Transmitting	FRS
TX1	✓	✓

✓: is operation mode.

### 3.5. EUT configuration

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

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

<input type="radio"/>	Power Cable	Length (m) :	-
		Shield :	Unshielded
		Detachable :	Undetachable
<input type="radio"/>	Multimeter	Manufacturer :	-
		Model No. :	-

## **4. TEST ENVIRONMENT**

### **4.1. Address of the test laboratory**

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Phone: 86-755-26748019 Fax: 86-755-26748089

### **4.2. Test Facility**

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

#### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **A2LA-Lab Cert. No. 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### **FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection 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 762235.

#### **IC-Registration No.: 5377B-1**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1.

#### **ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

### 4.3. Environmental conditions

Normal Condition	
Relative humidity:	20 % to 75 %.
Air Pressure:	950~1050mba
Voltage:	DC 6.0V

### 4.4. 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 Huatongwei International Inspection 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 Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power Radiated	2.20 dB	(1)
Radiated Emission 30~1000MHz	4.65 dB	(1)
Occupied Bandwidth	35 Hz	(1)
FM deviation	25 Hz	(1)
Audio level	0.62 dB	(1)
Low Pass Filter Response	0.76 dB	(1)
Modulation Limiting	0.42 %	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .

#### 4.5. Equipments Used during the Test

Modulation Characteristic				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/11/2017

Frequency Stability				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/11/2017
Signal Generator	Rohde&Schwarz	SMT03	100059	11/11/2017
Climate Chamber	ESPEC	EL-10KA	05107008	11/10/2017

Maximum Transmitter Power & Transmitter Radiated Spurious Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
Horn Antenna	SCHWARZBECK	9120D	1011	3/27/2017
Spectrum Analyzer	R&S	FSP40	100597	11/11/2017
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-248	10/18/2017
Turntable	Maturo Germany	TT2.0-1T	N/A	N/A
Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A
Test Software	R&S	E3	N/A	N/A
Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	538	4/5/2017
Pre-amplifier	SCHWARZBECK	BBV 9743	9743-0022	10/18/2017
RF Connection Cable	HUBER+SUHNER	3m 18GHz S Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	3m 3GHz S Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	3m 3GHz RG Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	6m 18GHz S Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	6m 18GHz S Serisa	N/A	N/A
RF Connection Cable	HUBER+SUHNER	3m 18GHz S Serisa	N/A	N/A
High-Pass Filter	Anritsu	MP526D	6220878392	11/11/2017
High-Pass Filter	OCEN	OSP-HPF26300P20-LC	---	N/A
High-Pass Filter	OCEN	OSP-HPF60300P20-LC	---	N/A
RF Connection Cable	HUBER+SUHNER	MULTIFLEX 141	N/A	11/21/2017

Emission Bandwidth & Emission Mask				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
Receiver	Rohde&Schwarz	ESI 26	100009	11/11/2017
Attenuator	R&S	ESH3-22	100449	11/11/2017
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/11/2017
Spectrum Analyzer	Rohde&Schwarz	FSP40	1164.4391.40	11/11/2017

The calibration interval was one year.

## 5. **TEST CONDITIONS AND RESULTS**

### 5.1. Maximum Transmitter Power (Effective Radiated Power)

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation.

#### **LIMIT**

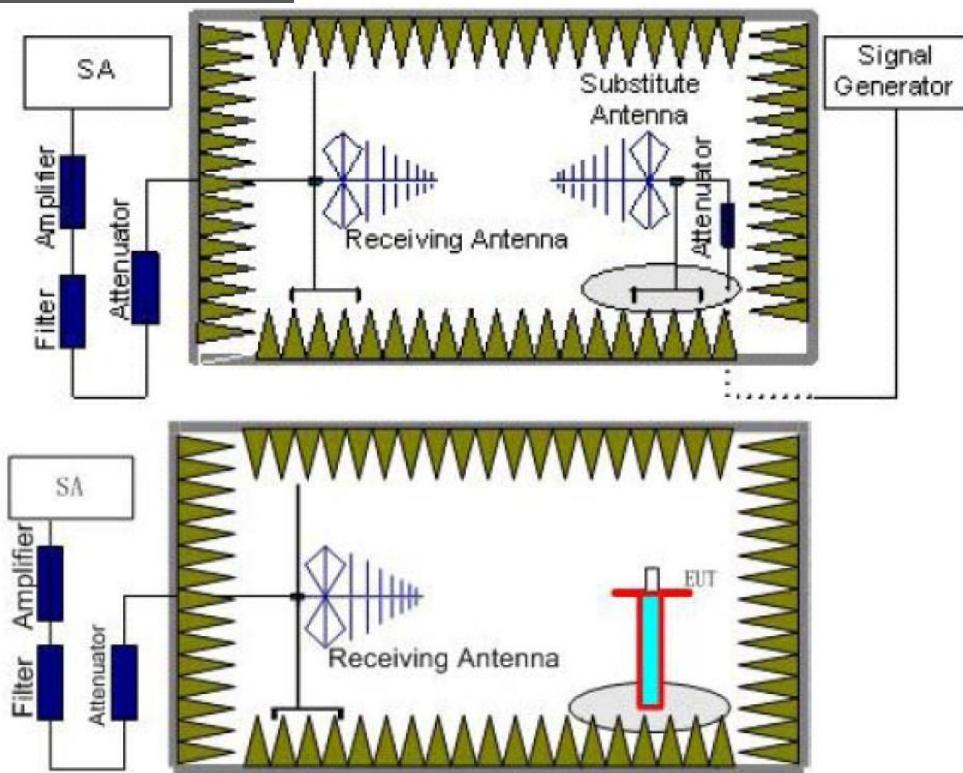
FCC Part 95.567:

Each FRS transmitter type must be designed such that the effective radiated power (ERP) on channels 8 through 14 does not exceed 0.5 Watts and the ERP on channels 1 through 7 and 15 through 22 does not exceed 2.0 Watts.

#### **TEST PROCEDURE**

1. EUT was placed on a 0.8 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 1.0 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=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
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 (PMea) 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 (Pr). The power of signal source (PMea) 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 (Pcl), the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.  
The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} - \text{Ga}$$

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:  
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} - \text{Ga}$$
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,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

**TEST CONFIGURATION****TEST MODE:**

Please reference to the section 3.4

**TEST RESULTS**

Passed       Not Applicable

Operation Mode	Test Channel	Measured ERP (dBm)	Limit (dBm)	Result
TX1	CH <sub>L1</sub>	24.54	33.01	Pass
	CH <sub>M1</sub>	24.80	33.01	
	CH <sub>H1</sub>	23.68	33.01	
	CH <sub>L2</sub>	24.65	27.00	Pass
	CH <sub>M2</sub>	24.98	27.00	
	CH <sub>H2</sub>	24.83	27.00	
	CH <sub>L3</sub>	24.37	33.01	Pass
	CH <sub>M3</sub>	24.75	33.01	
	CH <sub>H3</sub>	23.78	33.01	

## 5.2. Emission Bandwidth

The Emission bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits.

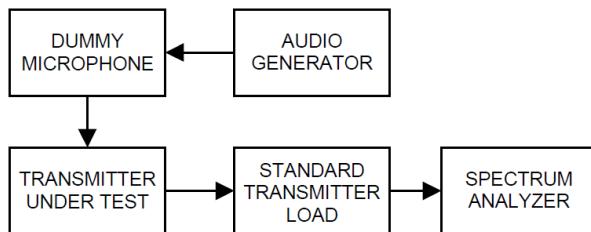
### LIMIT

FCC Part 95.573:

FRS:

The authorized bandwidth for an FRS unit is 12.5 kHz.

### TEST CONFIGURATION



### TEST PROCEDURE

- 1 The EUT was modulated by 2.5kHz sine wave audio signal; the level of the audio signal employed is 16dB greater than that necessary to produce 50% of rated system deviation.  
Rated system deviation is 2.5kHz and 5kHz).
- 2 Spectrum set as follow:  
Centre frequency = fundamental frequency, span=50kHz,  
RBW=100Hz, VBW=300Hz, Sweep = auto,  
Detector function = peak, Trace = max hold
- 3 Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth
- 4 Measure and record the results in the test report.

### TEST MODE:

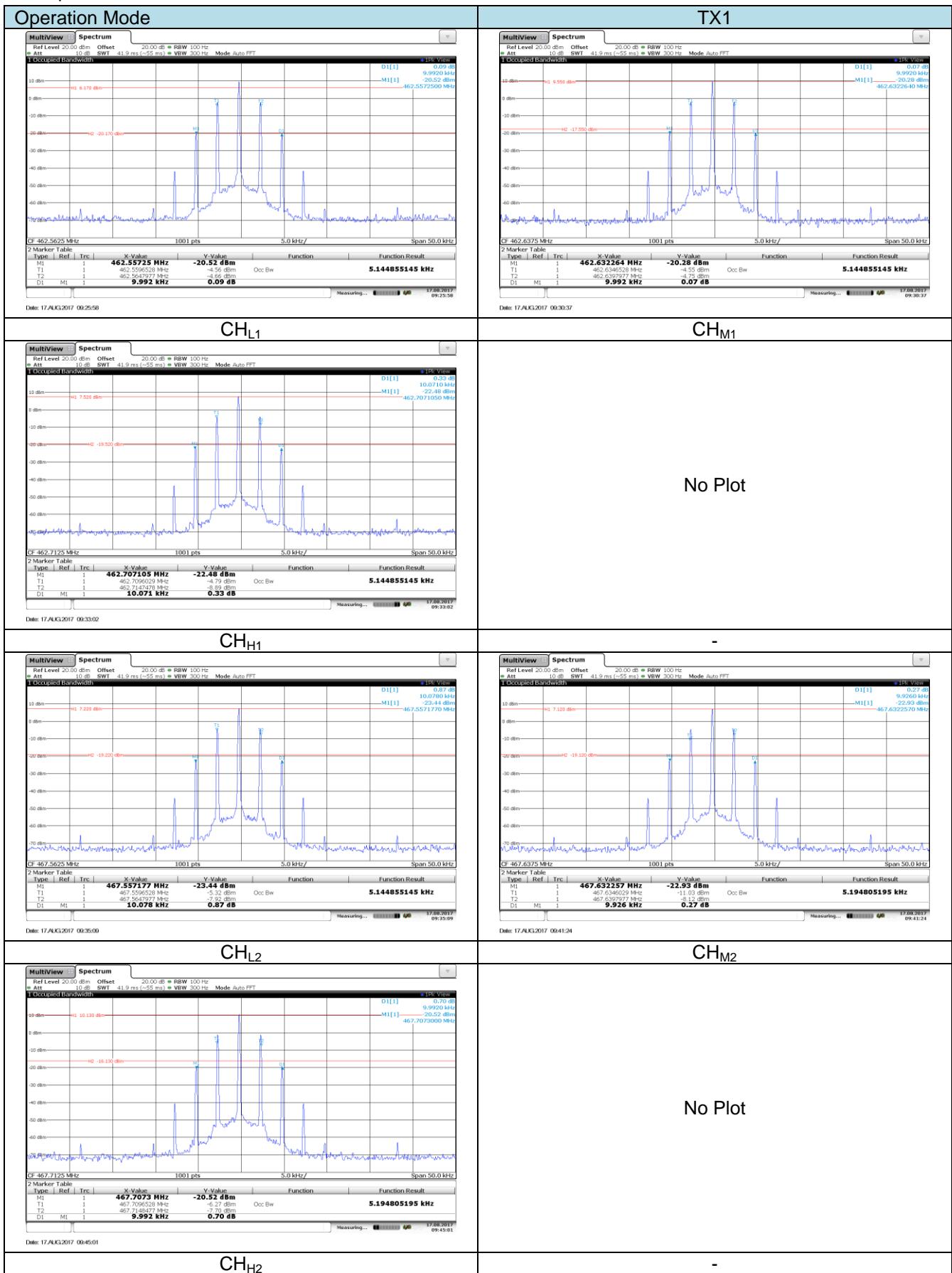
Please reference to the section 3.4

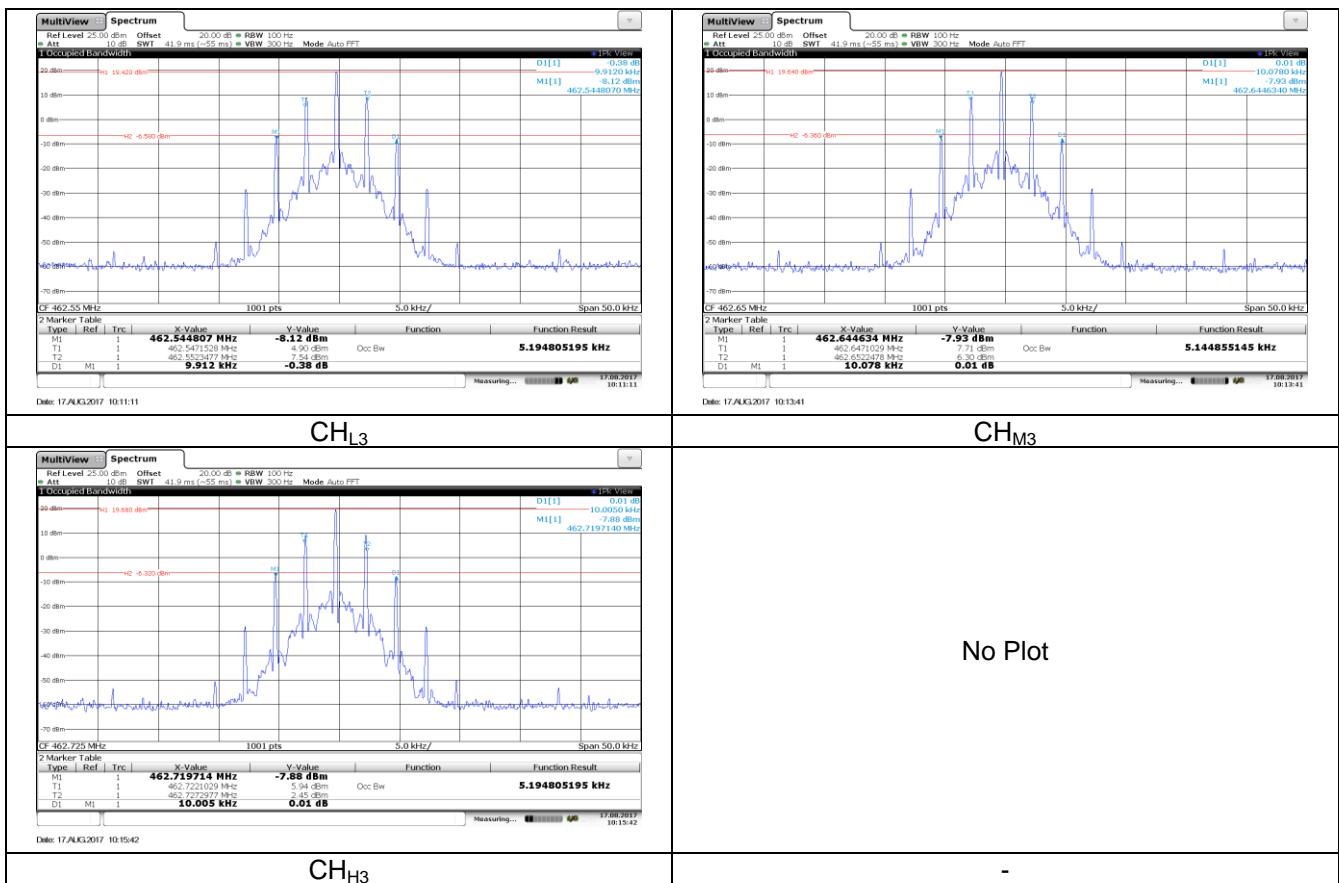
### TEST RESULTS

Passed       Not Applicable

Operation Mode	Test Channel	Occupied Bandwidth		Limit(kHz)	Result
		99%	26dB		
TX1	CH <sub>L1</sub>	5.14	9.99	≤12.5	Pass
	CH <sub>M1</sub>	5.15	9.99	≤12.5	
	CH <sub>H1</sub>	5.14	10.07	≤12.5	
	CH <sub>L2</sub>	5.15	10.08	≤12.5	Pass
	CH <sub>M2</sub>	5.19	9.93	≤12.5	
	CH <sub>H2</sub>	5.19	9.99	≤12.5	
	CH <sub>L3</sub>	5.20	9.91	≤12.5	Pass
	CH <sub>M3</sub>	5.14	10.08	≤12.5	
	CH <sub>H3</sub>	5.19	10.01	≤12.5	

Test plot as follows:





### 5.3. Emission Mask

Transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section.

#### LIMIT

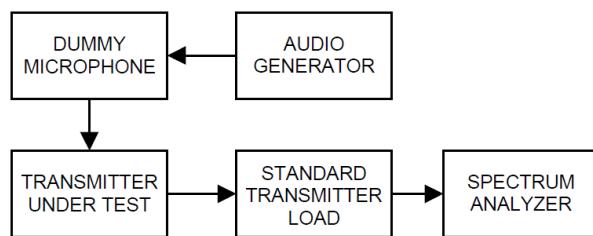
FCC Part 95.579:

Each FRS transmitter type must be designed to satisfy the applicable unwanted emissions limits in this paragraph.

(a) Attenuation requirements. The power of unwanted emissions must be attenuated below the carrier power output in Watts (P) by at least:

- (1) 25 dB (decibels) in the frequency band 6.25 kHz to 12.5 kHz removed from the channel center frequency.
- (2) 35 dB in the frequency band 12.5 kHz to 31.25 kHz removed from the channel center frequency.
- (3)  $43 + 10 \log (P)$  dB in any frequency band removed from the channel center frequency by more than 31.25 kHz.

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 Connect the equipment as illustrated.
- 2 Spectrum set as follow:  
Centre frequency = fundamental frequency, span=125kHz for 12.5kHz channel spacing, RBW=300Hz, VBW=1000Hz, Sweep = auto, Detector function = peak, Trace = max hold
- 3 Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.
- 4 Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation(Rated system deviation is 2.5 kHz for 12.5kHz channel spacing). The input level shall be established at the frequency of maximum response of the audio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer
- 5 Measure and record the results in the test report.

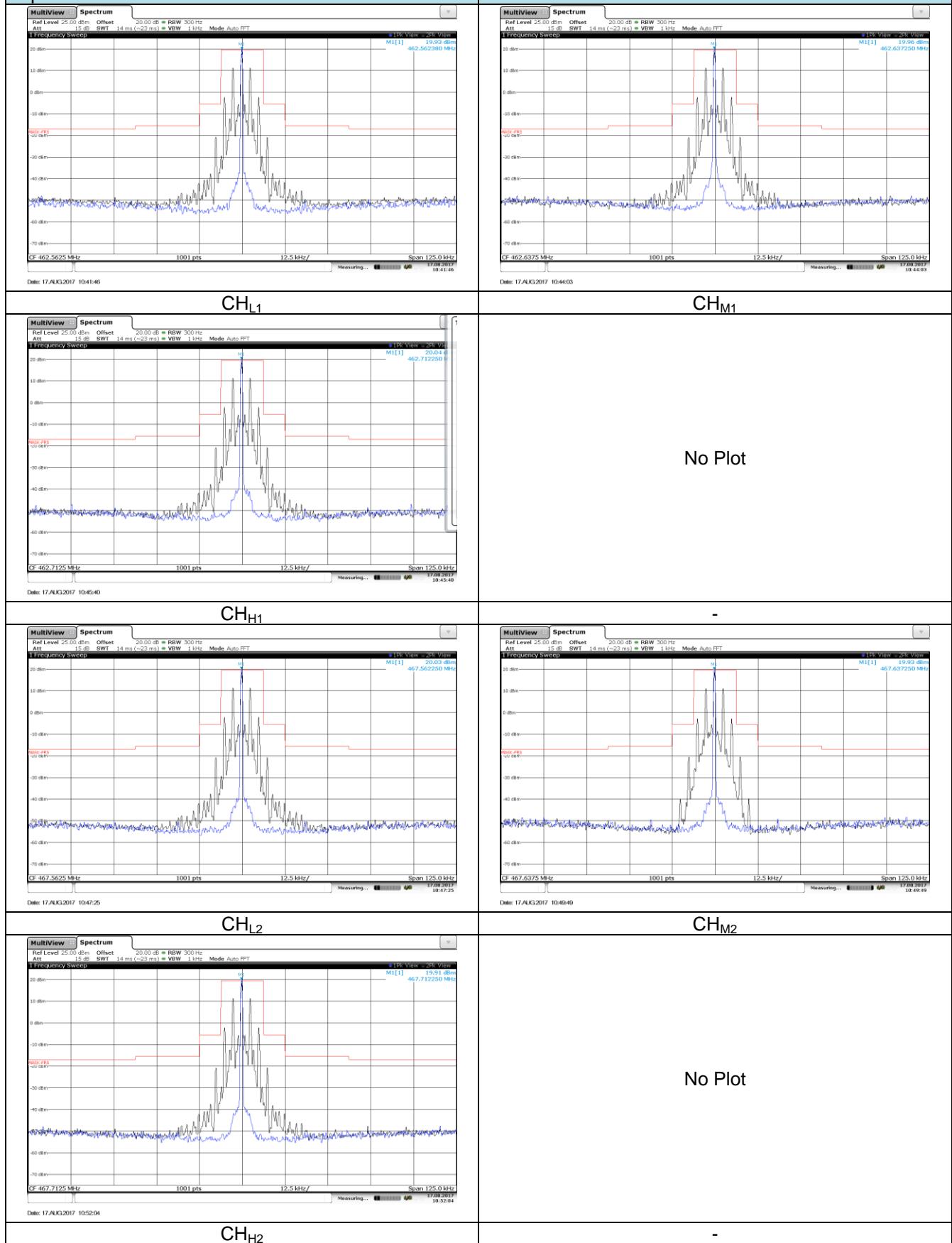
#### TEST MODE:

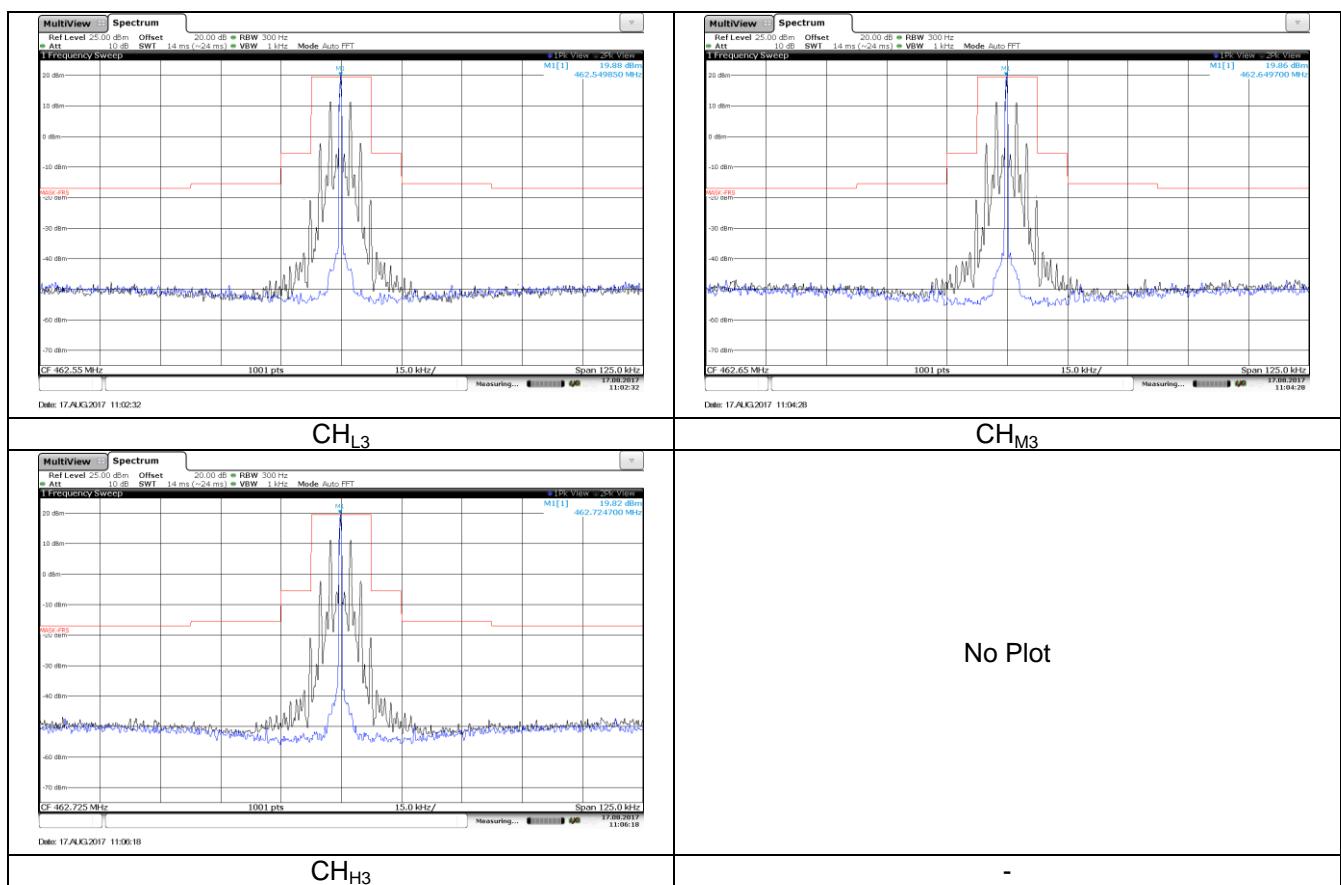
Please reference to the section 3.4

#### TEST RESULTS

Passed       Not Applicable

## Operation Mode





## 5.4. Transmitter Radiated Spurious Emission

Radiated spurious emissions are emissions from the equipment when transmitting into a nonradiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

### LIMIT

FCC Part 95.579:

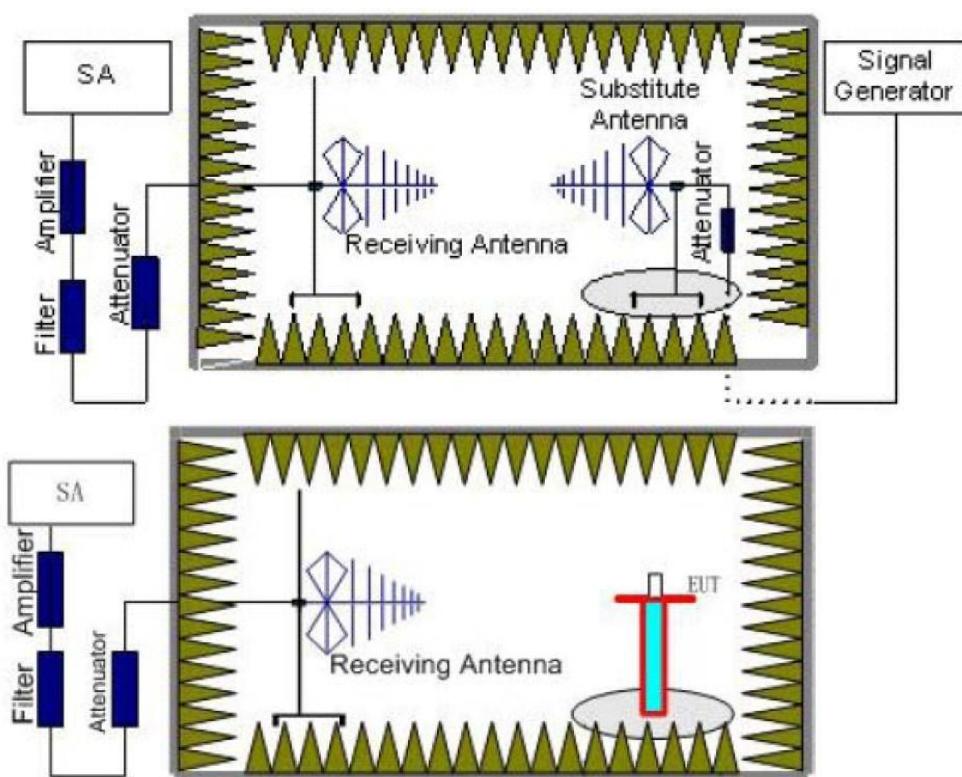
$$43 + 10 \log (P\text{watts})$$

Calculation: Limit (dBm) =  $EL - 43 - 10 \log_{10} (TP)$

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

$$\text{Limit (dBm)} = P(\text{dBm}) - 43 - 10 \log (P\text{watts}) = -13 \text{ dBm}$$

### TEST CONFIGURATION



### TEST PROCEDURE

1. EUT was placed on a 1.5 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 1.0 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:

$$\text{Power(EIRP)} = P_{Mea} - P_{Ag} - P_{cl} - G_a$$

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:

$$\text{Power(EIRP)} = P_{Mea} - P_{cl} - G_a$$

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 MODE:**

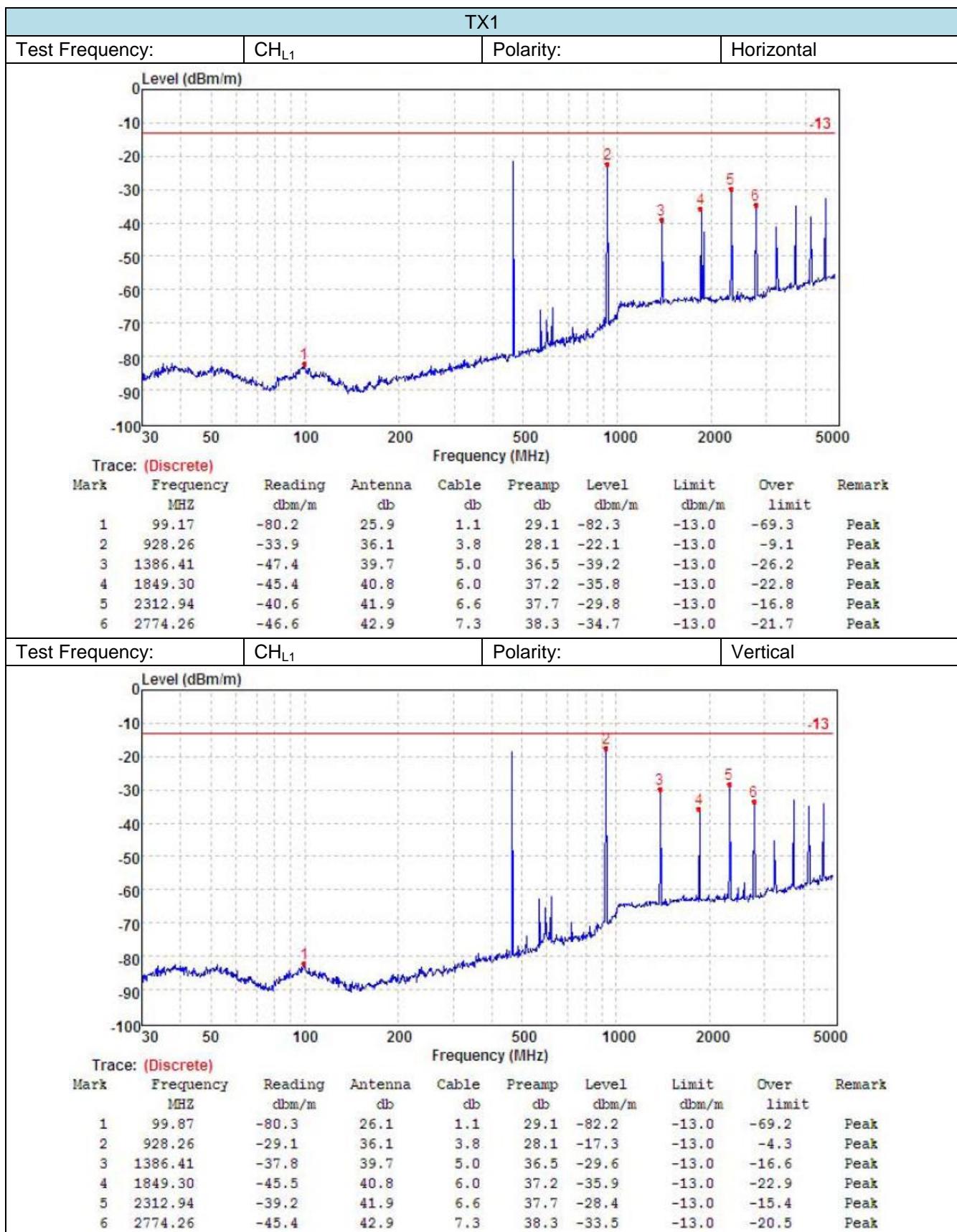
Please reference to the section 3.4

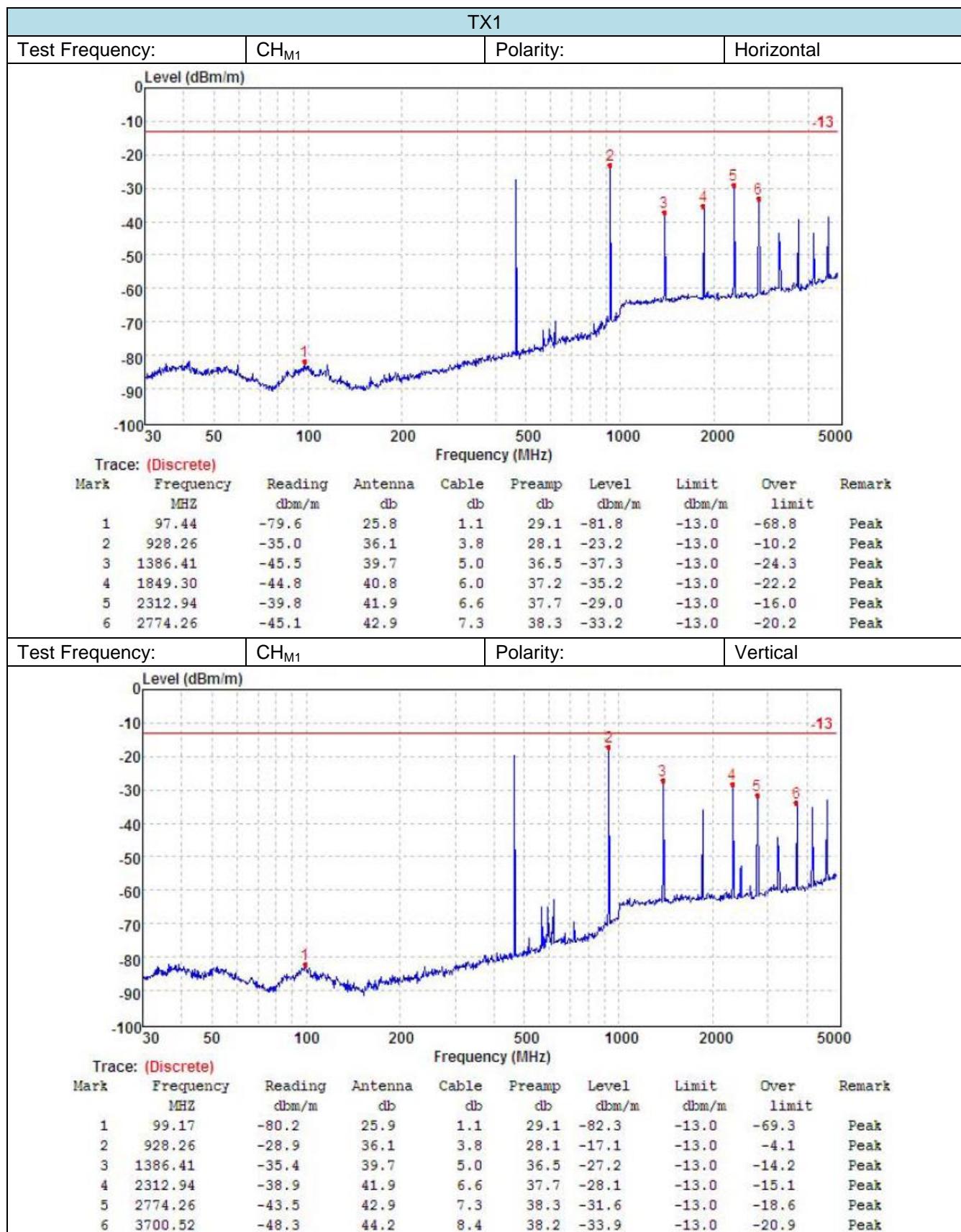
#### **TEST RESULTS**

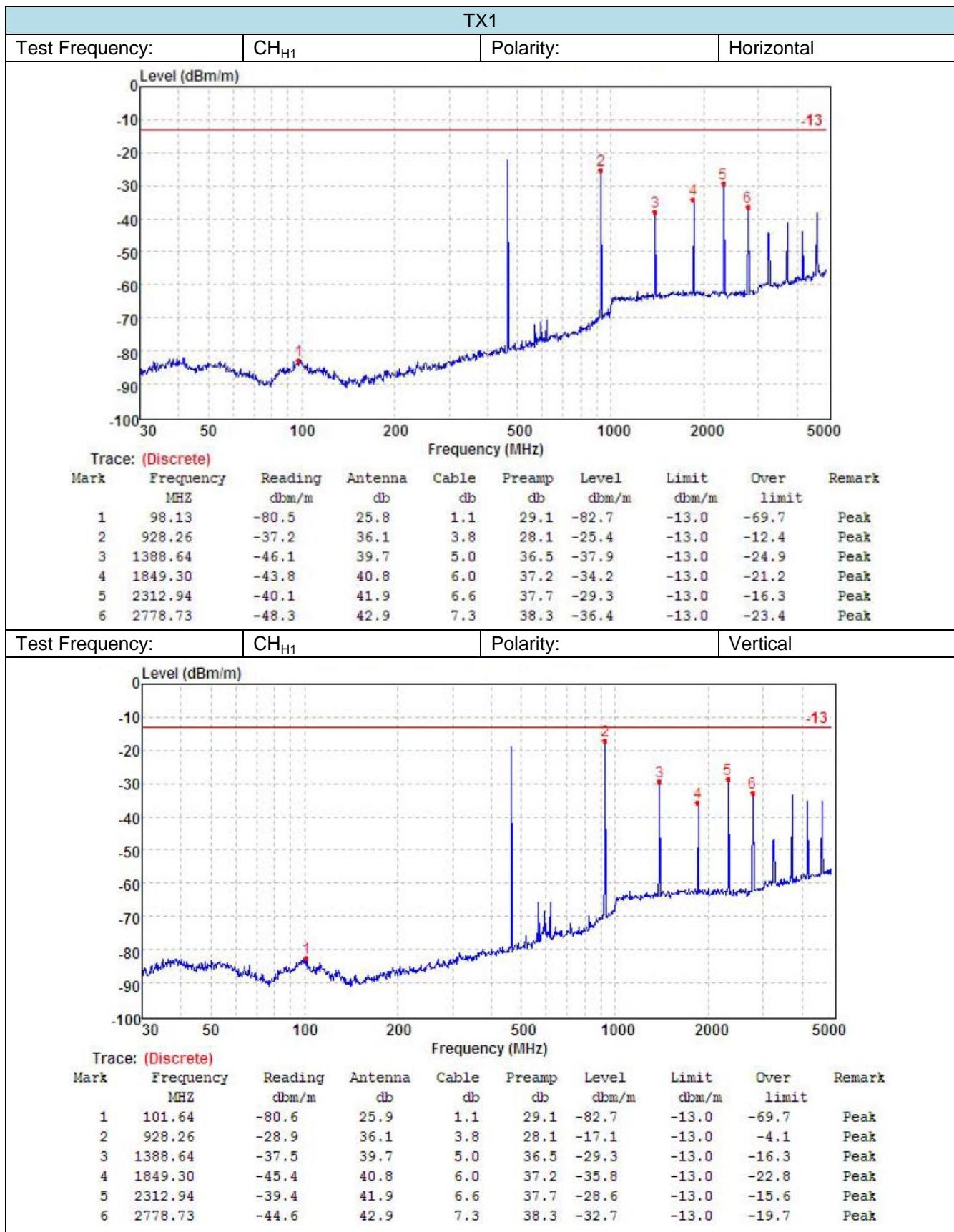
**Passed**       **Not Applicable**

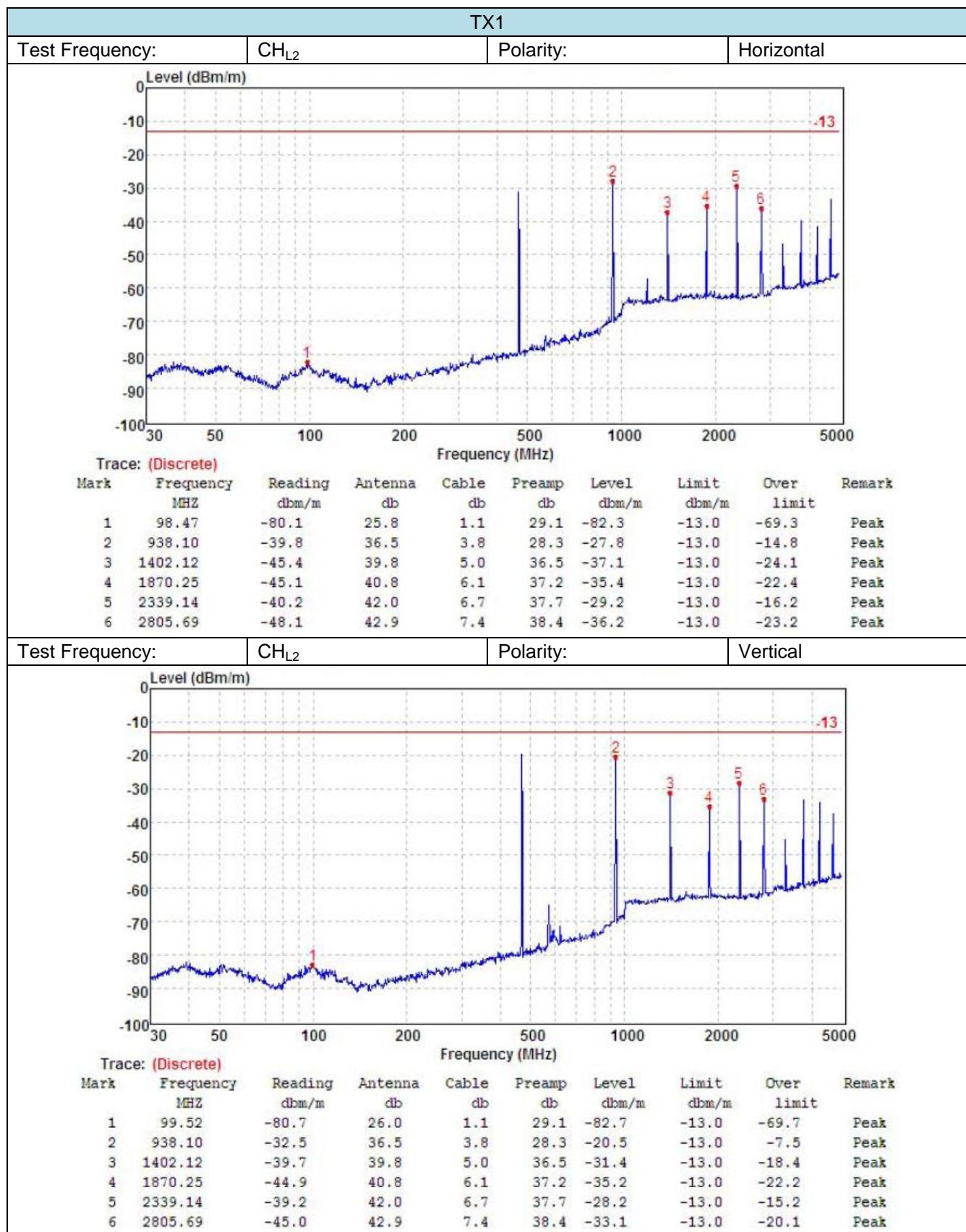
##### **Note:**

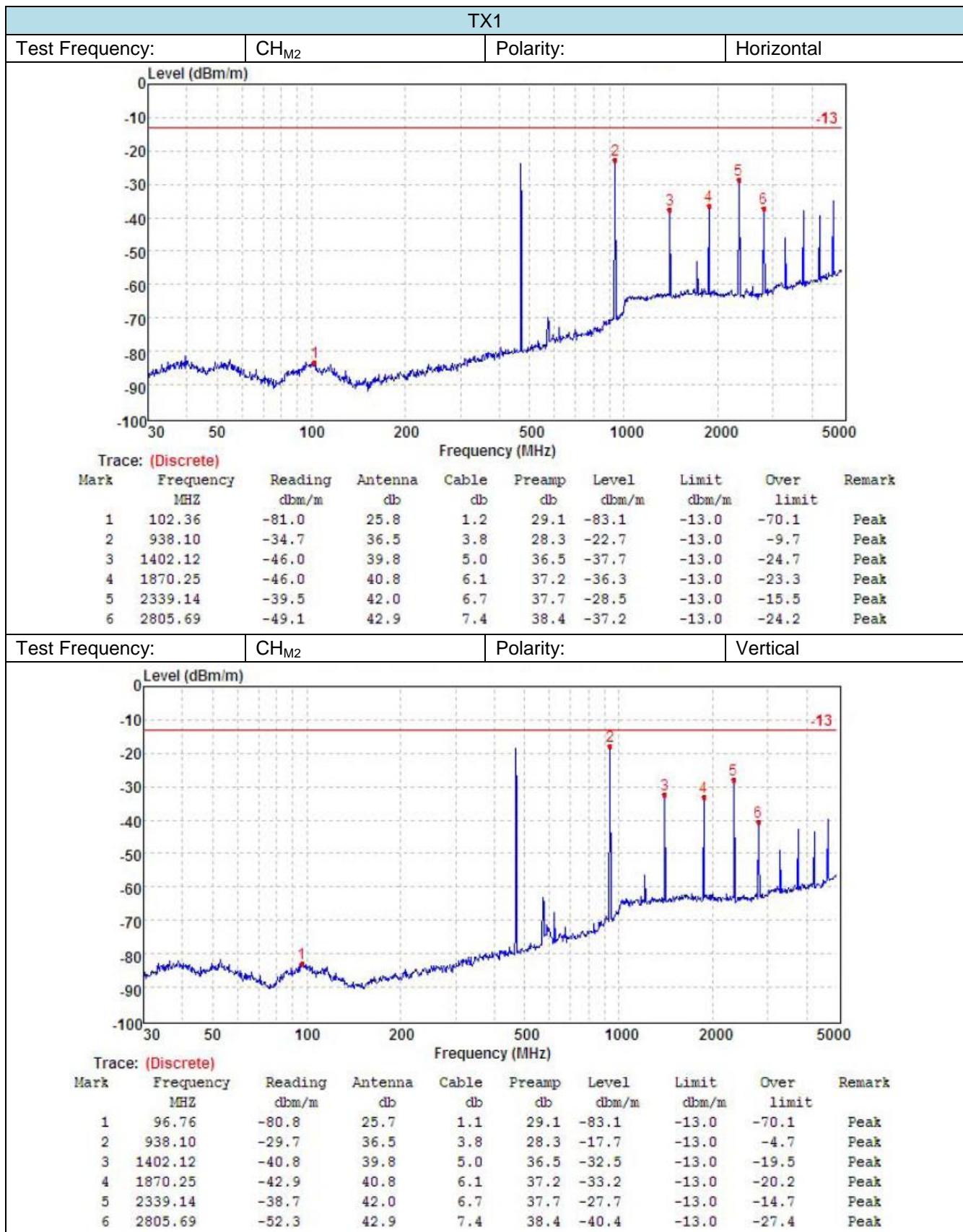
1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 5 GHz.
3. Absolute Level=SG Level-Cable loss+Antenna Gain, Margin=Limit-Absolute Level

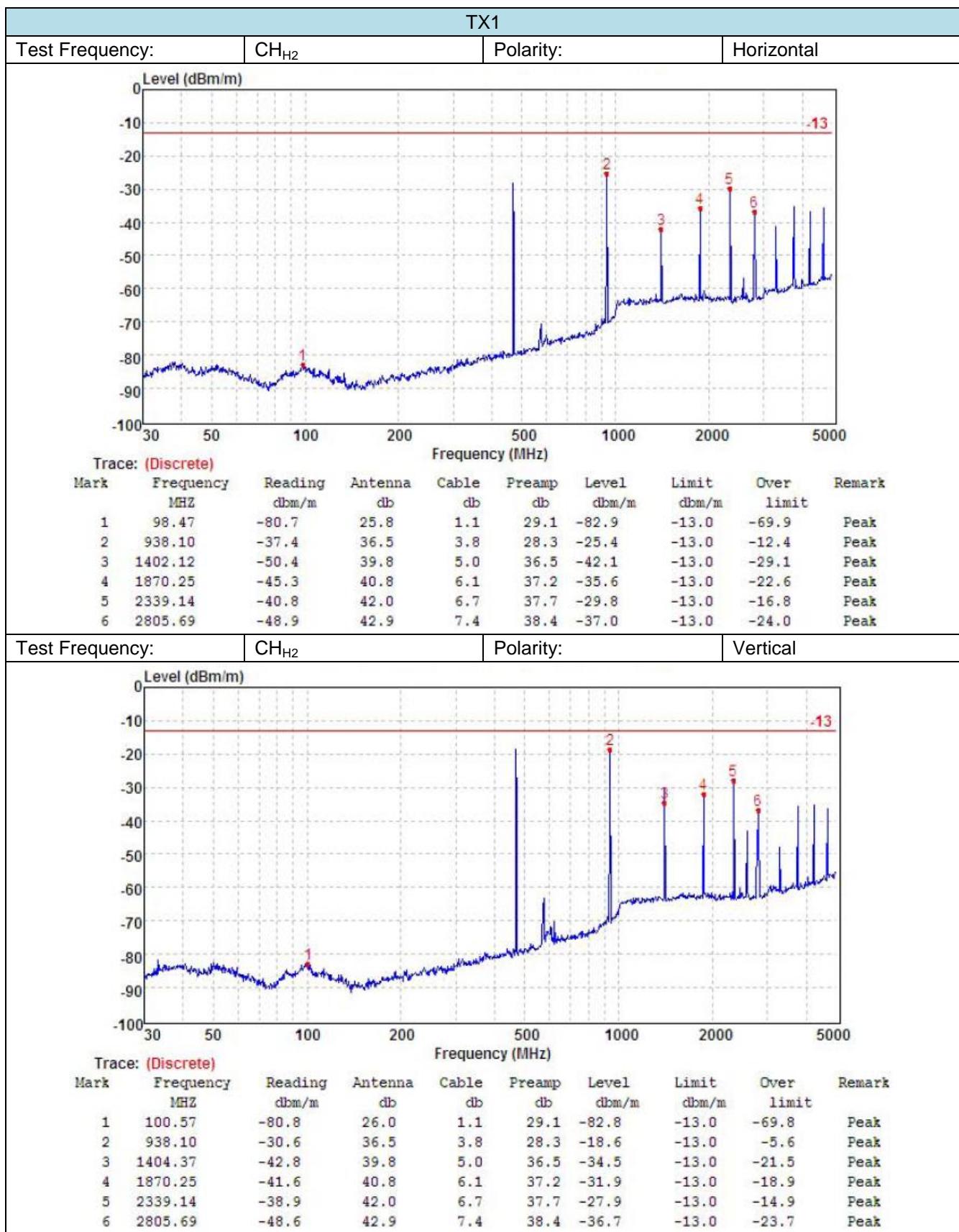


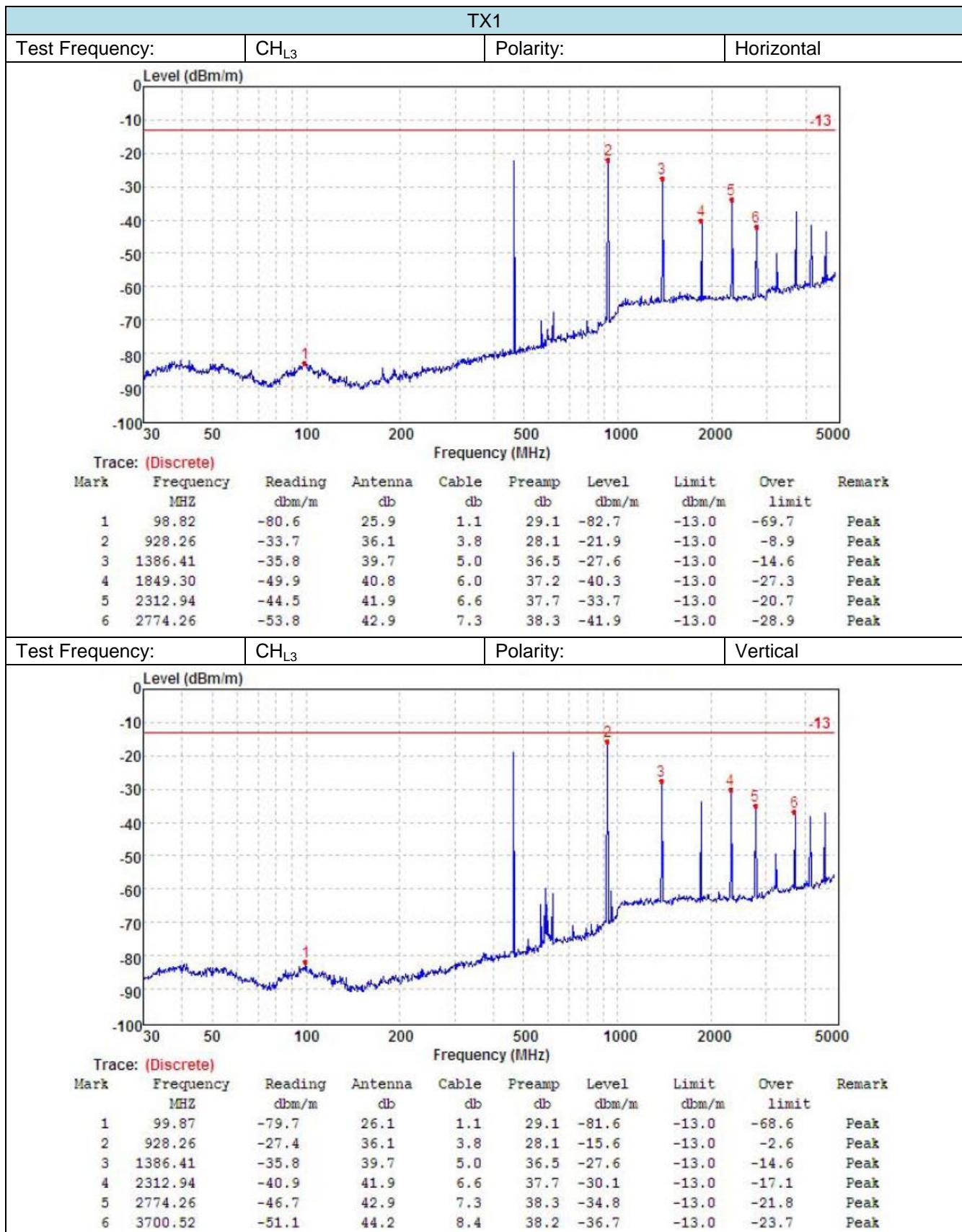


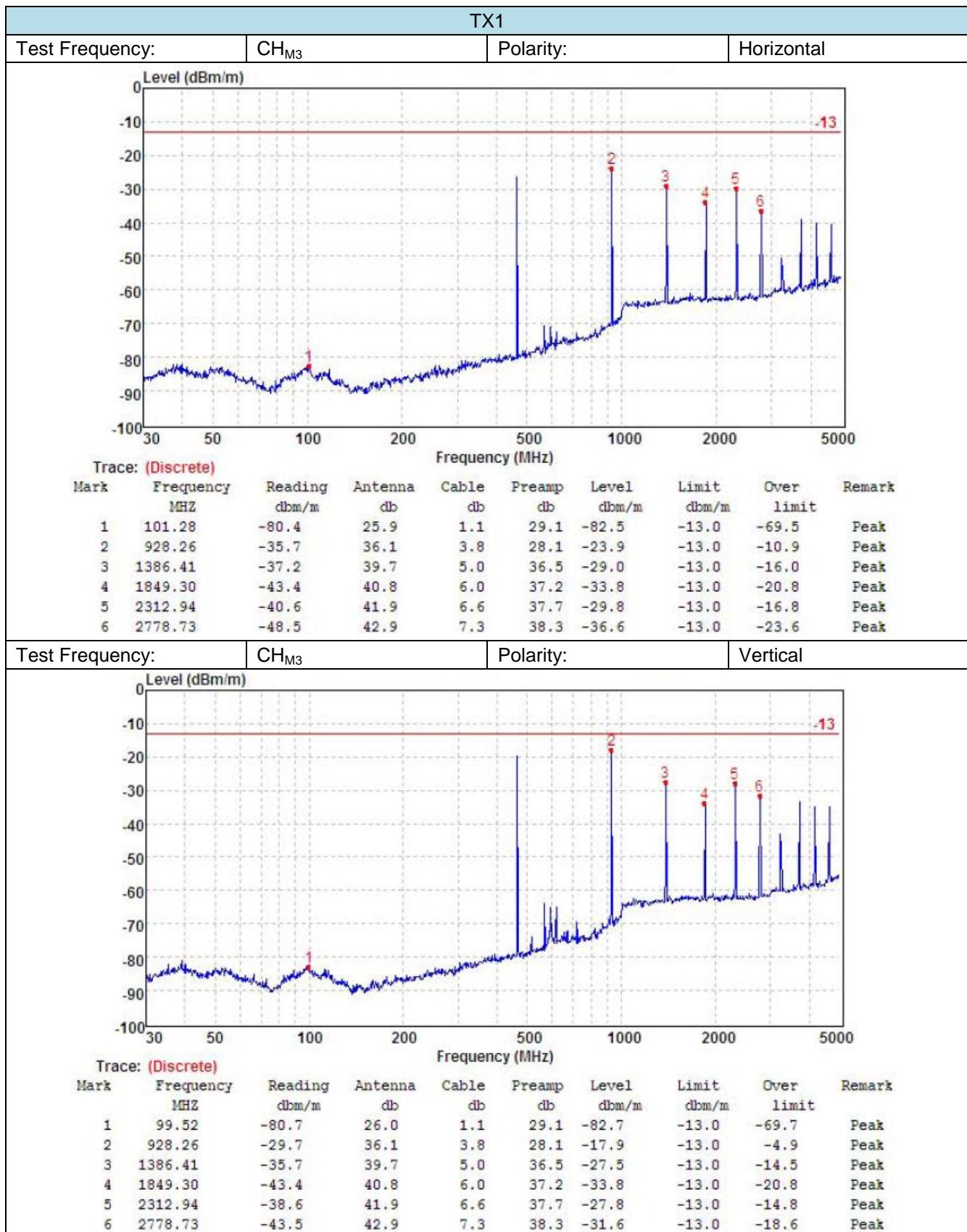


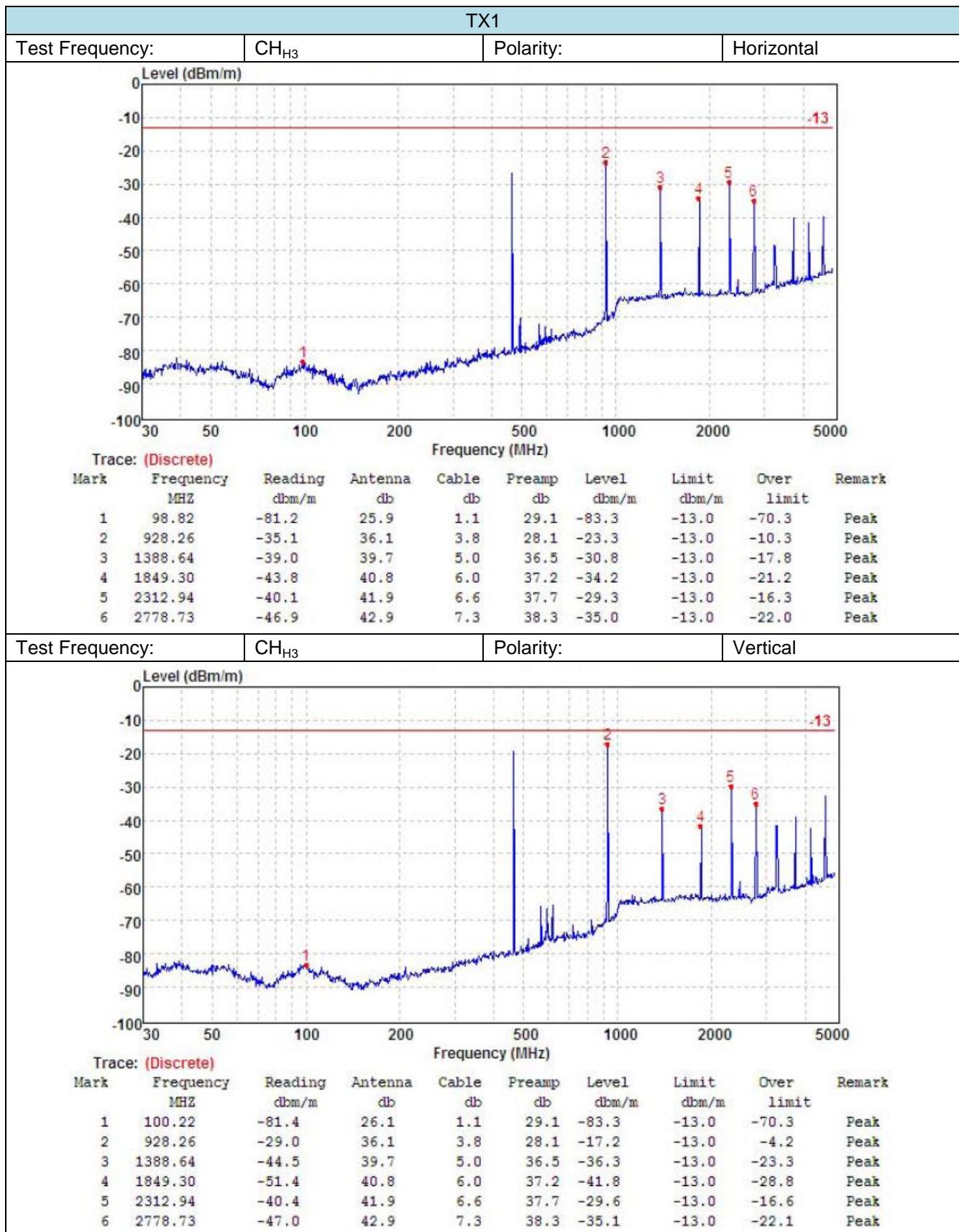












## 5.5. Spurious Emission on Antenna Port

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired

### LIMIT

FCC Part 95.579 :

$43 + 10 \log (P\text{watts})$

Calculation: Limit (dBm) =  $EL - 43 - 10 \log_{10} (TP)$

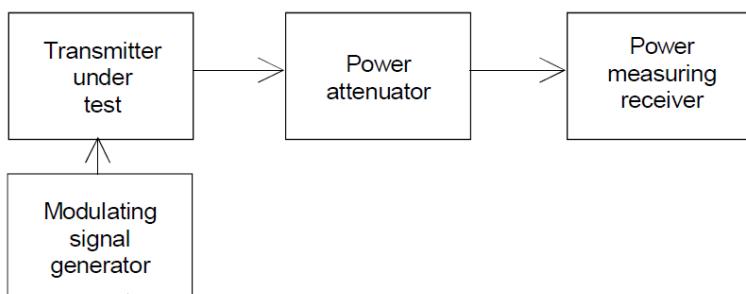
Notes: EL is the emission level of the Output Power expressed in dBm,  
In this application, the EL is P (dBm).

Limit (dBm) =  $P(\text{dBm}) - 43 - 10 \log (P\text{watts}) = -13 \text{ dBm}$

### TEST PROCEDURE

1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
2. 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 10<sup>th</sup> 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 10<sup>th</sup> Harmonic.
3. 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 MODE:

Please reference to the section 3.4

### TEST RESULTS

Passed       Not Applicable

This equipment is integral antenna.

## 5.6. Modulation Limit

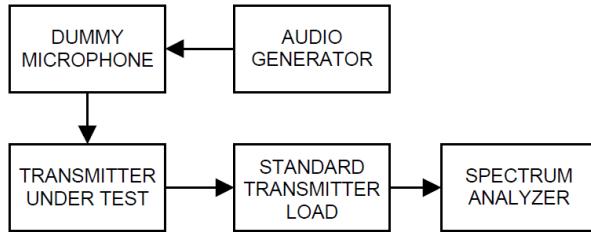
Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

### LIMIT

FCC Part 95.575, FCC Part 2.1047(b)

Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

### TEST CONFIGURATION



### TEST PROCEDURE

#### Modulation Limit test procedure:

- 1) Connect the equipment as illustrated.
- 2) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- 3) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for  $\leq 0.25$  Hz to  $\geq 15,000$  Hz. Turn the de-emphasis function off.
- 4) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation, this level is as a reference (0dB) and vary the input level from -20 to +20dB.
- 5) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level
- 6) Repeat step 4-5 with input frequency changing to 300Hz, 1004Hz, 1500Hz and 2500Hz in sequence.

#### Audio Frequency Response:

- 1) Connect the equipment as illustrated.
- 2) Adjust the audio input for 20% of rated system deviation at 1kHz using this level as a reference.
- 3) Vary the Audio frequency from 100Hz to 5 kHz and record the frequency deviation.
- 4) Audio Frequency Response =  $20\log_{10} (V_{FREQ}/V_{REF})$ .

### TEST MODE:

Please reference to the section 3.4

### TEST RESULTS

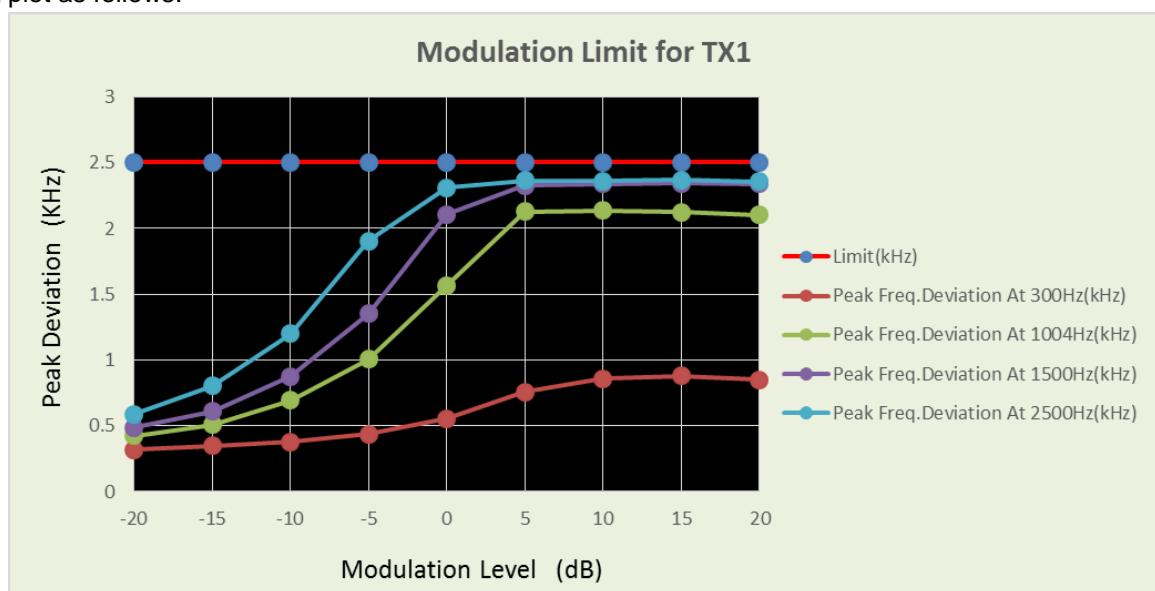
Passed       Not Applicable

Note: have pre-tested all test frequency, record the worst case mode  $CH_{M1}, CH_{M2}$  and  $CH_{M3}$  on the report.

**Modulation Limit:**

TX1: CH <sub>M1</sub>					Limit (kHz)	Result		
Modulation Level (dB)	Peak frequency deviation (kHz)							
	300Hz	1004Hz	1500Hz	2500 Hz				
-20	0.317	0.425	0.486	0.586	2.5	Pass		
-15	0.347	0.508	0.609	0.802				
-10	0.375	0.694	0.873	1.197				
-5	0.437	1.005	1.351	1.901				
0	0.553	1.567	2.105	2.306				
5	0.755	2.125	2.323	2.361				
10	0.857	2.134	2.338	2.358				
15	0.877	2.12	2.341	2.367				
20	0.851	2.099	2.335	2.356				

Test plot as follows:



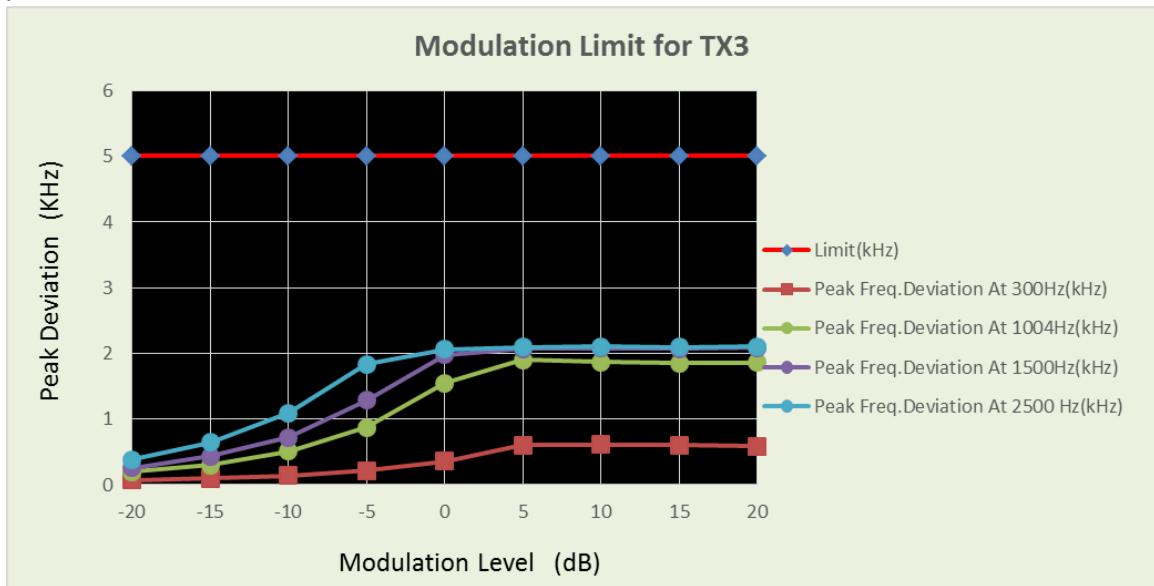
TX1: CH <sub>M2</sub>						
Modulation Level (dB)	Peak frequency deviation (kHz)				Limit (kHz)	Result
	300Hz	1004Hz	1500Hz	2500 Hz		
-20	0.332	0.423	0.49	0.583	2.5	Pass
-15	0.338	0.515	0.618	0.781		
-10	0.378	0.694	0.879	1.192		
-5	0.445	0.996	1.34	1.885		
0	0.554	1.547	2.106	2.313		
5	0.757	2.115	2.312	2.326		
10	0.882	2.121	2.329	2.362		
15	0.868	2.121	2.318	2.362		
20	0.876	2.096	2.338	2.365		

Test plot as follows:



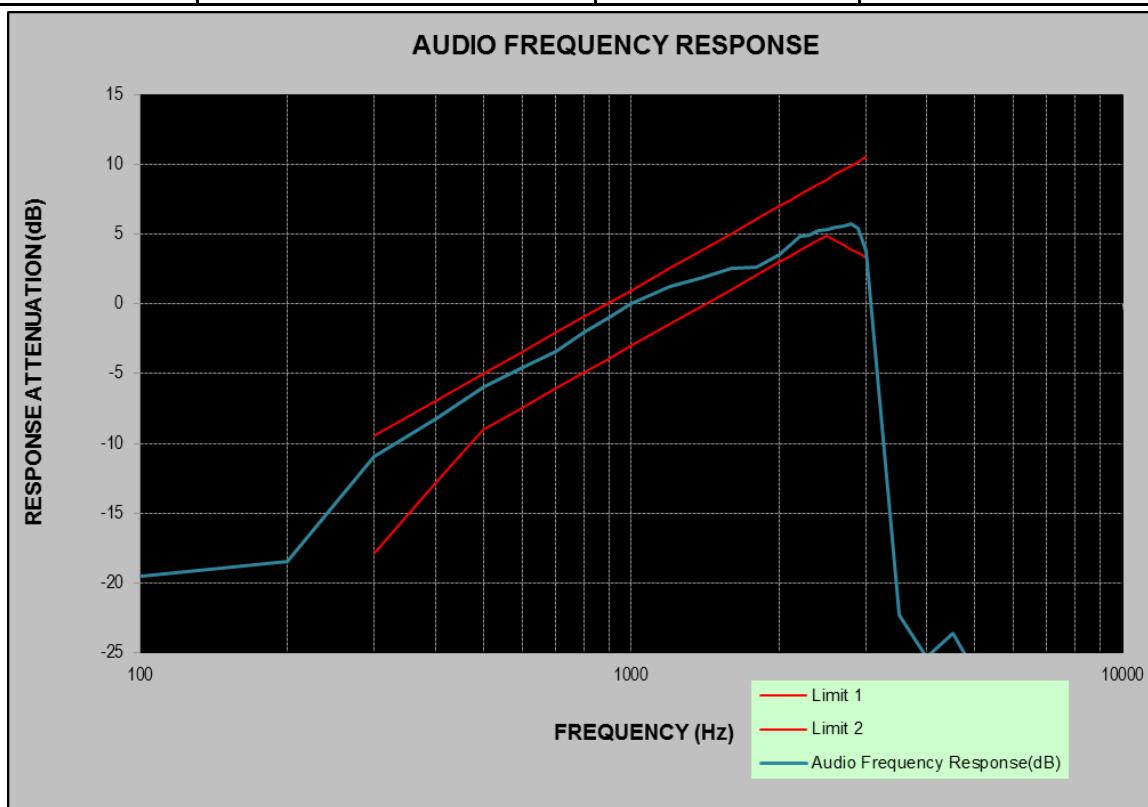
TX1: CH <sub>M3</sub>						
Modulation Level (dB)	Peak frequency deviation (kHz)				Limit (kHz)	Result
	300Hz	1004Hz	1500Hz	2500 Hz		
-20	0.067	0.199	0.255	0.379	2.5	Pass
-15	0.098	0.302	0.436	0.645		
-10	0.139	0.506	0.717	1.095		
-5	0.213	0.873	1.281	1.832		
0	0.358	1.547	1.973	2.059		
5	0.605	1.898	2.071	2.096		
10	0.613	1.867	2.074	2.103		
15	0.604	1.849	2.073	2.096		
20	0.586	1.855	2.088	2.103		

Test plot as follows:



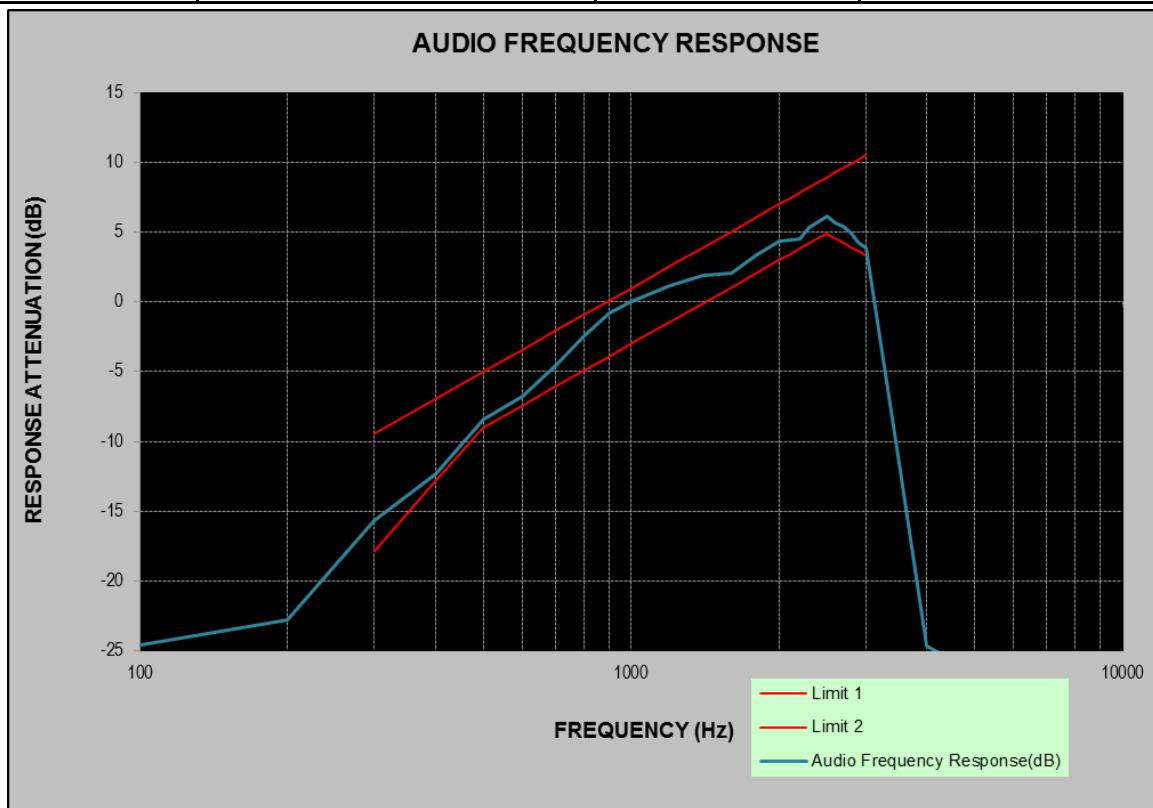
**Audio Frequency Response:**

TX1: CH <sub>M1</sub>			
Audio Frequency (Hz)	Audio Frequency Response (dB)	Audio Frequency (Hz)	Audio Frequency Response (dB)
100	-19.49	2100	4.18
200	-18.43	2200	4.82
300	-10.91	2300	4.96
400	-8.20	2400	5.29
500	-5.94	2500	5.37
600	-4.56	2600	5.48
700	-3.38	2700	5.61
800	-2.01	2800	5.79
900	-0.96	2900	5.45
1000	0.00	3000	3.76
1200	1.27	3500	-22.31
1400	1.93	4000	-25.30
1600	2.55	4500	-23.60
1800	2.67	5000	-26.32
2000	3.54	-	-



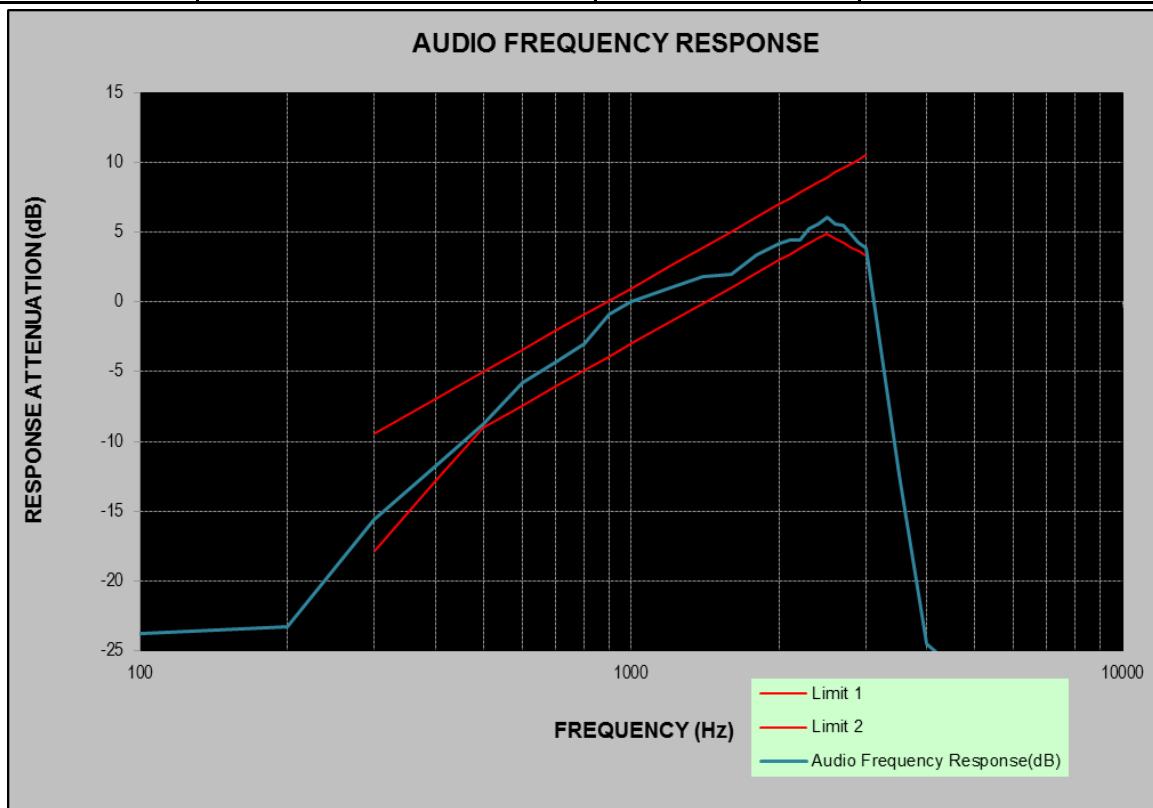
Note: The highest audio frequency response at 3kHz<3.125kHz, so meet the requirement.

TX2: CH <sub>M2</sub>			
Audio Frequency (Hz)	Audio Frequency Response (dB)	Audio Frequency (Hz)	Audio Frequency Response (dB)
100	-24.61	2100	4.41
200	-22.79	2200	4.51
300	-15.67	2300	5.36
400	-12.35	2400	5.73
500	-8.44	2500	6.12
600	-6.73	2600	5.66
700	-4.55	2700	5.46
800	-2.46	2800	4.90
900	-0.82	2900	4.29
1000	0.00	3000	3.88
1200	1.16	3500	-11.61
1400	1.89	4000	-24.68
1600	2.08	4500	-25.67
1800	3.36	5000	-27.93
2000	4.34	-	-



Note: The highest audio frequency response at 3kHz<3.125kHz, so meet the requirement.

TX3: CH <sub>M3</sub>			
Audio Frequency (Hz)	Audio Frequency Response (dB)	Audio Frequency (Hz)	Audio Frequency Response (dB)
100	-23.82	2100	4.41
200	-23.30	2200	4.42
300	-15.60	2300	5.27
400	-11.77	2400	5.59
500	-8.75	2500	6.04
600	-5.79	2600	5.56
700	-4.30	2700	5.49
800	-3.01	2800	4.82
900	-0.87	2900	4.31
1000	0.00	3000	3.84
1200	0.99	3500	-12.39
1400	1.83	4000	-24.55
1600	1.98	4500	-26.19
1800	3.36	5000	-29.32
2000	4.22	-	-



Note: The highest audio frequency response at 3kHz<3.125kHz, so meet the requirement.

## 5.7. Frequency Stability

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

### LIMIT

FCC Part 95.565:

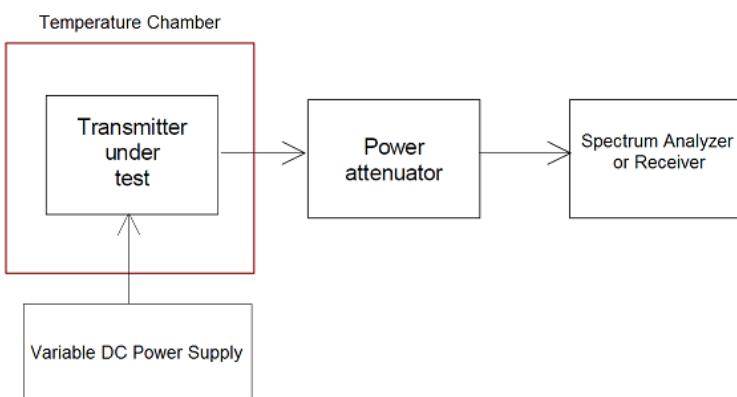
FRS:

The carrier frequency tolerance shall be better than  $\pm 2.5$  ppm.

### TEST PROCEDURE

1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  centigrade.
2. According to FCC Part 2 Section 2.1055 (d) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacturer.
3. Vary primary supply voltage from 5.1V to 6.9V.
4. 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. 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 CONFIGURATION



### TEST MODE:

Please reference to the section 3.4

### TEST RESULTS

Passed       Not Applicable

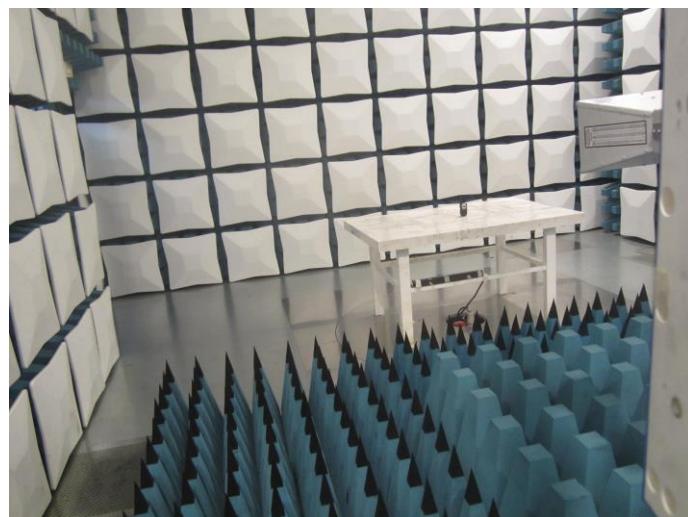
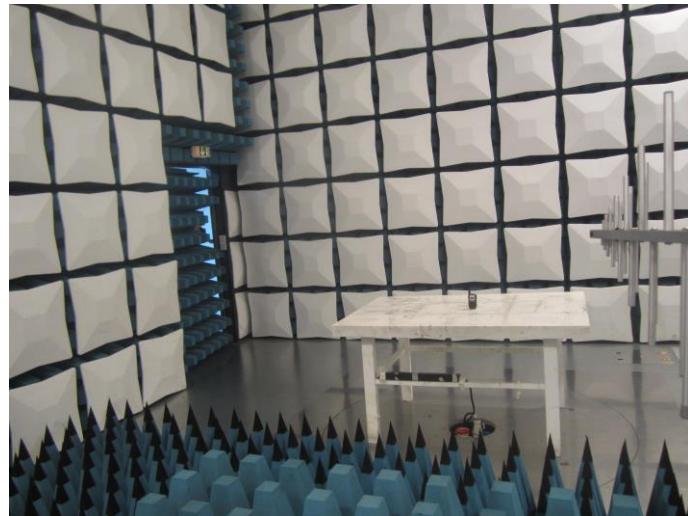
TX1						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage(V)	Temp(°C)	CH <sub>L1</sub>	CH <sub>M1</sub>	CH <sub>H1</sub>		
6.0	-30	-0.25	-0.13	-0.17	±2.5	Pass
	-20	-0.25	-0.13	-0.16		
	-10	-0.25	-0.13	-0.16		
	0	-0.25	-0.14	-0.16		
	10	-0.25	-0.14	-0.16		
	20	-0.24	-0.14	-0.15		
	30	-0.24	-0.14	-0.15		
	40	-0.24	-0.15	-0.15		
	50	-0.24	-0.16	-0.15		
	5.1	-0.24	-0.15	-0.15		
6.9	20	-0.24	-0.15	-0.16		

TX1						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage(V)	Temp(°C)	CH <sub>L2</sub>	CH <sub>M2</sub>	CH <sub>H2</sub>		
6.0	-30	-0.19	-0.14	-0.16	±2.5	Pass
	-20	-0.19	-0.15	-0.14		
	-10	-0.20	-0.16	-0.14		
	0	-0.19	-0.15	-0.14		
	10	-0.18	-0.16	-0.14		
	20	-0.19	-0.15	-0.15		
	30	-0.19	-0.14	-0.14		
	40	-0.18	-0.15	-0.14		
	50	-0.19	-0.15	-0.14		
	5.1	-0.19	-0.15	-0.14		
6.9	20	-0.19	-0.15	-0.15		

TX1						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage(V)	Temp(°C)	CH <sub>L3</sub>	CH <sub>M3</sub>	CH <sub>H3</sub>		
6.0	-30	-0.16	-0.16	-0.14	±2.5	Pass
	-20	-0.17	-0.16	-0.14		
	-10	-0.17	-0.15	-0.15		
	0	-0.17	-0.16	-0.14		
	10	-0.17	-0.16	-0.13		
	20	-0.17	-0.16	-0.14		
	30	-0.17	-0.15	-0.14		
	40	-0.18	-0.16	-0.13		
	50	-0.17	-0.16	-0.14		
5.1	20	-0.18	-0.15	-0.14		
6.9	20	-0.17	-0.15	-0.14		

## **6. Test Setup Photos of the EUT**

Transmitter Radiated Spurious Emission:

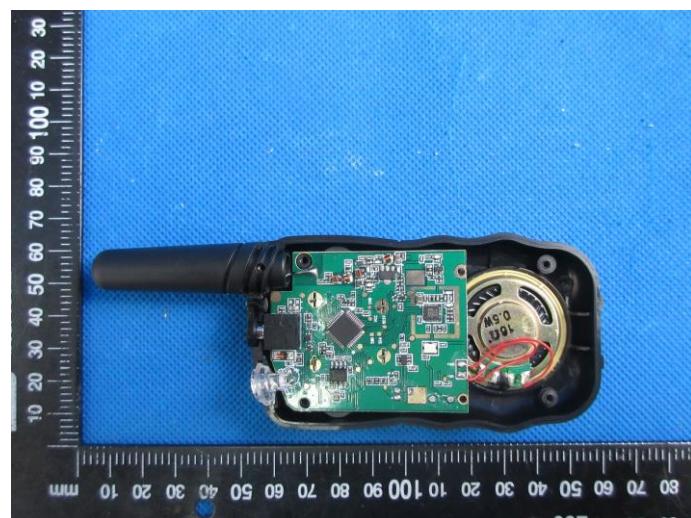


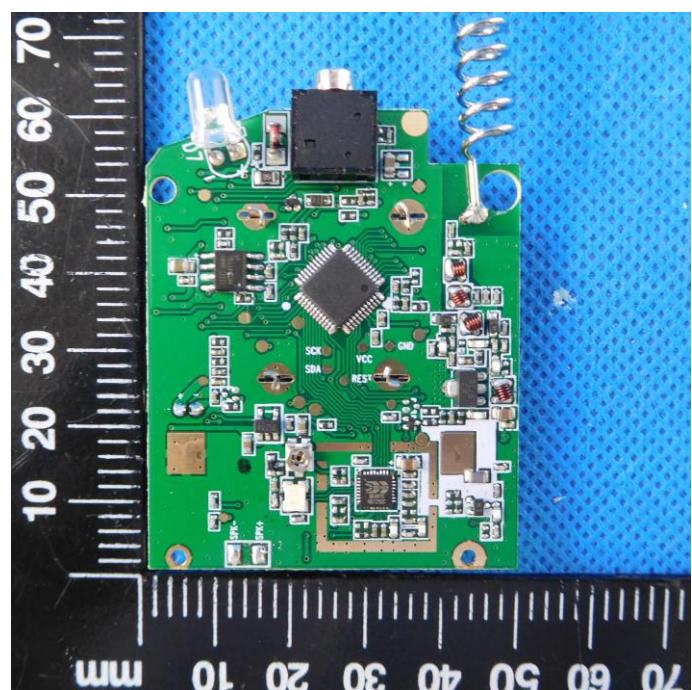
## 7. External and Internal Photos of the EUT

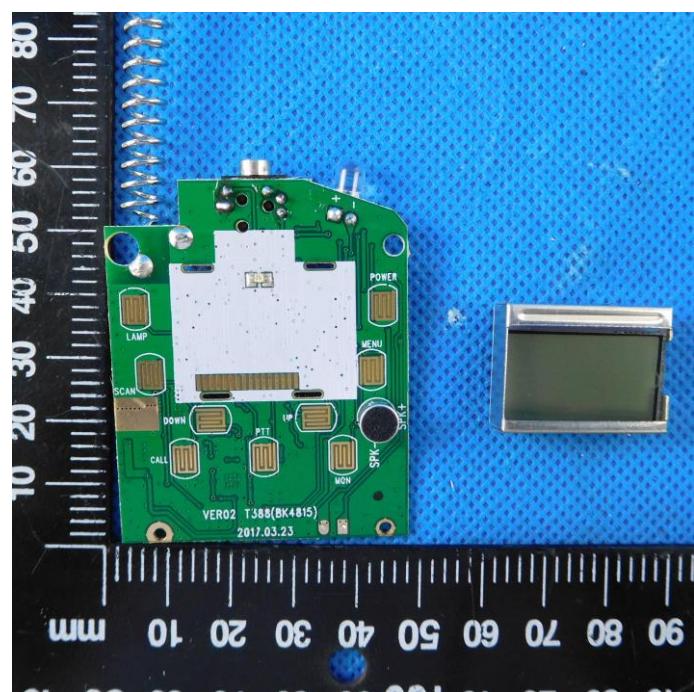
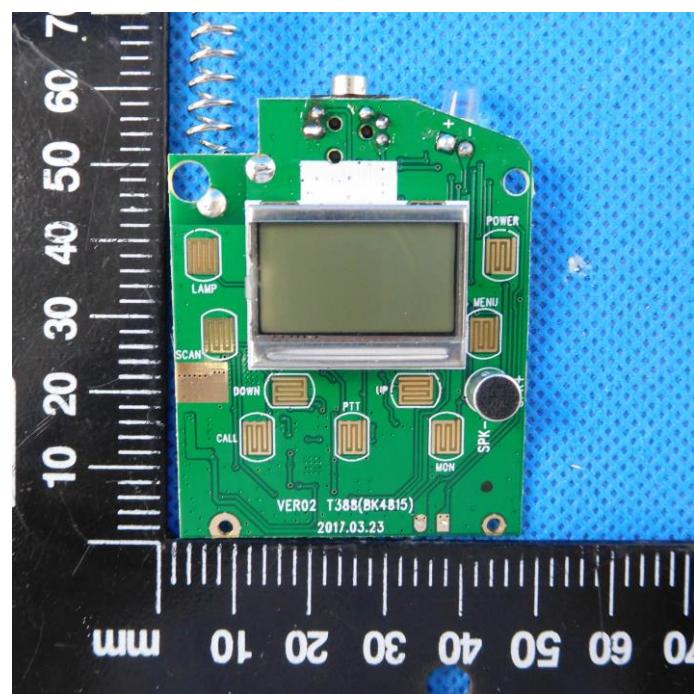
### External photos of the EUT

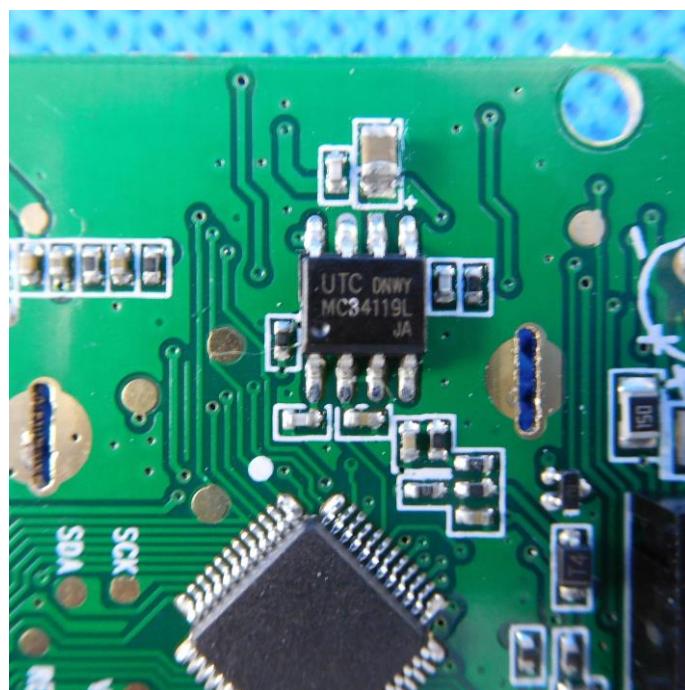
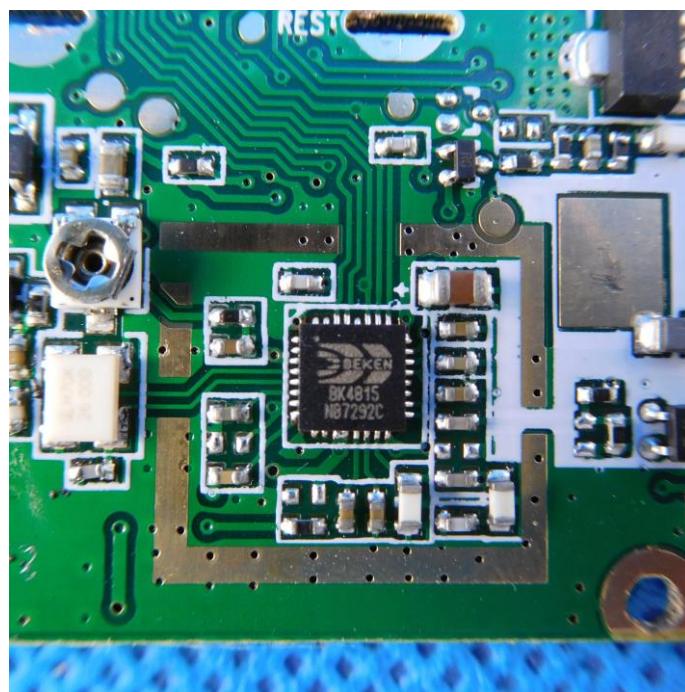




**Internal photos of the EUT**







-----End of Report-----