



TEST REPORT

Report Reference No.: **TRE18090135** R/C.....: 85330

FCC ID: **K6630643X3D**

Applicant's name: **YAESU MUSEN CO., LTD.**

Address: Tennozu Parkside Building 2-5-8 Higashi-Shinagawa,
Shinagawa-ku, Tokyo 140-0002 Japan

Manufacturer.....: QUANZHOU QIXIANG ELECTRON SCIENCE &
TECHNOLOGY CO., LTD.

Address.....: Wan'An Tangxi Industrial Zone, Luojiang District, Quanzhou,
Fujian, China

Test item description: **25 Watt VHF/FM Marine Transceiver**

Trade Mark.....: STANDARD HORIZON

Model/Type reference: GX1850GPS

Listed Model(s).....: GX1850, GX1800GPS, GX1800

Standard.....: **FCC CFR Title 47 Part 2**
FCC CFR Title 47 Part 80

Date of receipt of test sample.....: Sep. 25, 2018

Date of testing.....: Sep. 25, 2018- Oct. 11, 2018

Date of issue.....: Oct. 30, 2018

Result: **PASS**

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

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The test report merely correspond to the test sample.

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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 2](#): Frequency allocations and radio treaty matters; General rules and regulations

[FCC Rules Part 80](#): Stations In The Maritime Services.

[ANSI C63.26-2015](#): American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

[ANSI/TIA-603-E\(2016\)](#): Land Mobile FM or PM Communications Equipment and Performance Standards

[FCC Part 15 Subpart B](#): Unintentional Radiators.

[ANSI C63.4-2014](#): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2018-10-12	Original
R1	2018-10-30	Update model name GX1860 to GX1850GPS

2. Test Description

Transmitter Requirement			
Test item	Standards requirement	Result	Test Engineer
Conducted Carrier Output Power	FCC Part 80.215,FCC Part 2.1046	Pass	Gaosheng Pan
99% Occupied Bandwidth&26dB bandwidth	FCC Part 80.205,FCC Part 2.1049	Pass	Gaosheng Pan
Modulation Limit	FCC Part 80.213,FCC Part 2.1047(b)	Pass	Gaosheng Pan
Audio Frequency Response	FCC Part 2.1047(a)	Pass	Gaosheng Pan
Audio Low Pass Filter Response	FCC Part 80.213,Part 2.1047(a)	Pass	Gaosheng Pan
Emission Mask	FCC Part 80.211(f),FCC Part 2.1049	Pass	Gaosheng Pan
Frequency Stability V.S. Temperature	FCC Part 80.209,Part 2.1055	Pass	Gaosheng Pan
Frequency Stability V.S. Voltage	FCC Part 80.209,Part 2.1055	Pass	Gaosheng Pan
Transmit Conducted Spurious Emission	FCC Part 80. 211(f)(3),FCC Part 2.1051	Pass	Gaosheng Pan
Transmitter Radiated Spurious Emission	FCC Part 80. 211(f)(3),FCC Part 2.1053	Pass	Shower Dai
Receiver Requirement			
Test item	Standards requirement	Result	Test Engineer
AC Power Line Conducted Emission	FCC Part 15.207	N/A	N/A
Radiated Emission	FCC Part 15.209	Pass	Shower Dai

3. SUMMARY

3.1. Client Information

Applicant:	YAESU MUSEN CO., LTD.
Address:	Tennozu Parkside Building 2-5-8 Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-0002 Japan
Manufacturer:	QUANZHOU QIXIANG ELECTRON SCIENCE & TECHNOLOGY CO., LTD.
Address:	Wan'An Tangxi Industrial Zone, Luojiang District, Quanzhou, Fujian, China

3.2. Product Description

Name of EUT:	25 Watt VHF/FM Marine Transceiver
Trade mark:	STANDARD HORIZON
Model/Type reference:	GX1850GPS
Listed mode(s):	GX1850,GX1800GPS,GX1800
Power supply:	DC 13.8V
Hardware Version:	SPP01
Software Version:	V0.00.09
Analog Voice	
Operation Frequency Range:	TX:156.025MHz to 161.6MHz
	RX:156.05MHz to 162MHz
Rated Output Power:	☒ High Power: 25W (43.98dBm) ☒ Low Power 1W (30.00dBm)
Modulation Type:	FM
Channel Separation:	25kHz
Emission Designator ^{*1} :	16K0G3E
Antenna Type:	External

Note:

(1) ^{*1} According to FCC Part 2.202 requirements, the Necessary Bandwidth is calculated as follows:

- For PM Voice Modulation

Channel Spacing = 25 KHz, D = 5 KHz max, K = 1, M = 3 KHz

$B_n = 2M + 2DK = 2 \times 3 + 2 \times 5 \times 1 = 16 \text{ KHz}$

Emission designation: 16K0G3E

3.3. Test frequency list

According to ANSI C63.26 section 5.1.2.1:

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in Table 2.

Frequency range over which EUT operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

Frequency Bands (MHz)	Test Channel	Test Frequency (MHz)	
		TX	RX
156.025~162.000	CH _L (CH60)	156.025	160.625
	CH _{M2} (CH16)	156.800	156.800
	CH _H (CH88)	157.425	157.425

3.4. EUT operation mode

Test mode	Transmitting	Receiving	Power level		Analog Voice/PM	GPS+US Weather Channel*
			High	Low	25kHz	
TX-AWH	√		√		√	
TX-AWL	√			√	√	
RX-AW		√			√	
RX-GPS		√				√

√: is operation mode.

Note:

- US weaheer Channel:

Channel	Frequency(MHz)	Restrictions
WX1	162.550	RX ONLY
WX2	162.400	RX ONLY
WX3	162.475	RX ONLY
WX4	162.425	RX ONLY
WX5	162.450	RX ONLY
WX6	162.500	RX ONLY
WX7	162.525	RX ONLY

Modulation Type	Description
UM	Un-modulation
AM2	Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
AM6	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, then increase the level from the audio generator by 20 dB
AM5	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.
DM	A 511 bit binary pseudo-random bit sequence based on ITU-T Rec. O.153

Pre-scan above all test mode, found below test mode which it was worse case mode, so only show the test data for worse case mode on the test report.

Test item	Modulation Type	Test mode (Worse case mode)
Conducted Output Power	UM	TX-AWH, TX-AWL
99% Occupied Bandwidth & 26dB bandwidth	AM6	TX-AWH, TX-AWL
Emission Mask	AM5	TX-AWH, TX-AWL
Modulation Limit	AM6	TX-AWH
Audio Frequency Response	AM2	TX-AWH
Audio Frequency Response	AM2	TX-AWH
Frequency Stability VS Temperature	UM	TX-AWH, TX-AWL
Frequency Stability VS Voltage	UM	TX-AWH, TX-AWL
Transmit Conducted Spurious Emission	AM5	TX-AWH
Transmit Radiated Spurious Emission	AM5	TX-AWH
AC Power Line Conducted Emission	-	RX- GPS
Radiated Emission	-	RX- GPS

3.5. 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) :	/
		Shield :	Unshielded
		Detachable :	Undetachable
○	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

Atmospheric Contions	
Temperature:	21°C to 25°C
Relative Humidity:	20 % to 75 %.
Atmospheric Pressure:	860 mbar to 1060 mbar
Norminal Test Voltage:	$V_N = \text{DC } 13.8\text{V}$
Extrem Test Voltage:	$V_H = \text{DC } 15.87\text{V}$
Extrem Test Voltage:	$V_L = \text{DC } 11.73\text{V}$

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 conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.65 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 18-40GHz	5.54 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

AC power line conducted emission						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	Shielded Room	Albatross projects	N/A	N/A	05/02/2017	05/01/2020
2	Artificial Mains	SCHWARZBECK	NNLK 8121	573	11/11/2017	11/10/2018
3	EMI Test Receiver	R&S	ESCI	101247	11/11/2017	11/10/2018
4	Pulse Limiter	R&S	ESH3-Z2	101488	11/11/2017	11/10/2018
5	RF Connection Cable	HUBER+SUHNER	EF400	N/A	11/21/2017	11/20/2018
6	Test Software	R&S	ES-K1	N/A	N/A	N/A

RF Conducted Test						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	Analog communication tester	HP	8920A	3813A10206	11/11/2017	11/10/2018
2	Digital communication tester	Aeroflex	3920B	1001682041	11/11/2017	11/10/2018
3	Spectrum Analyzer	R&S	FSW26	103440	11/11/2017	11/10/2018
4	Signal Generator	R&S	SML02	100507	11/11/2017	11/10/2018
5	Signal Generator	IFR	2032	203002\100	11/11/2017	11/10/2018
6	RF Cable	Chengdu E-Microwave	----	----	11/11/2017	11/10/2018
7	Attenuator	Chengdu E-Microwave	EMCAXX-10RNZ-3	----	11/11/2017	11/10/2018
8	High-Pass Filter	OCEN	OSP-HPF26300P20-LC	----	11/11/2017	11/10/2018
9	High-Pass Filter	OCEN	OSP-HPF60300P20-LC	----	11/11/2017	11/10/2018
10	RF Control Unit	Tonscend	JS0806-2	N/A	11/11/2017	11/10/2018
11	Climate Chamber	ESPEC	GPL-2	----	11/10/2017	11/09/2018
12	Variable Power Supply	GW INSTRON	GPS-3030D	012578	11/11/2017	11/10/2018

Radiated Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	EMI Test Receiver	R&S	ESCI	101247	11/11/2017	11/10/2018
2	Loop Antenna	R&S	HFH2-Z2	100020	11/20/2017	11/19/2018
3	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	538	04/05/2017	04/04/2020
4	Preamplifier	SCHWARZBECK	BBV 9743	9743-0022	11/20/2017	11/19/2018
5	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	11/21/2017	11/20/2018
6	EMI Test Software	R&S	ESK1	N/A	N/A	N/A
7	Spectrum Analyzer	R&S	FSP40	100597	11/11/2017	11/10/2018
8	Horn Antenna	SCHWARZBECK	9120D	1011	03/27/2018	03/26/2020
9	Horn Antenna	SCHWARZBECK	BBHA9170	25841	03/27/2018	03/26/2020
10	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-248	11/20/2017	11/19/2018
11	RF Connection Cable	HUBER+SUHNER	RE-7-FH	N/A	11/21/2017	11/20/2018
12	Signal Generator	Rohde&Schwarz	SMB100A	114360	11/21/2017	11/20/2018
13	High-Pass Filter	OCEN	OSP-HPF26300P20-LC	----	11/11/2017	11/10/2018
14	High-Pass Filter	OCEN	OSP-HPF60300P20-LC	----	11/11/2017	11/10/2018
15	EMI Test Software	Audix	E3	N/A	N/A	N/A
16	Turntable	MATURO	TT2.0	/	N/A	N/A
17	Antenna Mast	MATURO	TAM-4.0-P	/	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Conducted Carrier Output Power

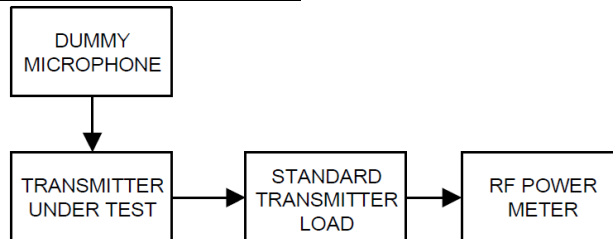
LIMIT

FCC Part 80.215(e)

(e) Ship stations frequencies above 27500 kHz. The maximum power must not exceed the values listed below.

(1) Ship stations 156-162 MHz—25W

TEST CONFIGURATION



TEST PROCEDURE

- (1) Connect the equipment as illustrated
- (2) Correct for all losses in the RF path
- (3) Measure the transmitter output power
- (4) If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

Please refer to appendix A on the section 8 appendix report

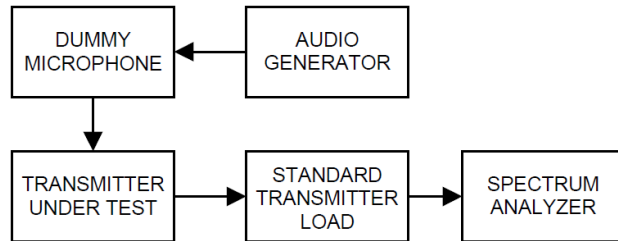
5.2. 99% Occupied Bandwidth & 26dB Bandwidth

LIMIT

FCC Part 80.205

(a) An emission designator shows the necessary bandwidth for each class of emission of a station except that in ship earth stations it shows the occupied or necessary bandwidth, whichever is greater. The following table gives the class of emission and corresponding emission designator and authorized bandwidth:

Class of emission	Emission designator	Authorized bandwidth (kHz)
A1A	160HA1A	0.4
A1B ¹	160HA1B	0.4
A1D ¹²	16K0A1D	20.0
A2A	2K66A2A	2.8
A2B ¹	2K66A2B	2.8
A2D ¹²	16K0A2D	20.0
A3E	6K00A3E	8.0
A3N ²	2K66A3N	2.8
A3X ³	3K20A3X	25.0
F1B ⁴	280HF1B	0.3
F1B ⁵	300HF1B	0.5
F1B ⁶	16K0F1B	20.0
F1C	2K80F1C	3.0
F1D ¹²	16K0F1D	20.0
F2B ⁶	16K0F2B	20.0
F2C ⁷	16K0F2C	20.0
F2D ¹²	16K0F2D	20.0
F3C	2K80F3C	3.0
F3C ⁷	16K0F3C	20.0
F3E ⁸	16K0F3E	20.0
F3N ⁹	20M0F3N	20,000.0
G1D ¹²	16K0G1D	20.0
G2D ¹²	16K0G2D	20.0
G3D ¹⁰	16K0G3D	20.0
G3E ⁸	16K0G3E	20.0
G3N ^{3 13}	16K0G3N	20.0
H2A	1K40H2A	2.8
H2B ¹	1K40H2B	2.8
H3E ¹¹	2K80H3E	3.0
H3N	2K66H3N	2.8
J2A	160HJ2A	0.4
J2B ⁴	280HJ2B	0.3
J2B ⁵	300HJ2B	0.5
J2B	2K80J2B	3.0
J2C	2K80J2C	3.0
J2D ¹⁴	2K80J2D	3.0
J3C	2K80J3C	3.0
J3E ¹¹	2K80J3E	3.0
J3N	160HJ3N	0.4
NON	NON	0.4
PON	(¹²)	(¹²)
R3E ¹¹	2K80R3E	3.0

TEST CONFIGURATION**TEST PROCEDURE**

- (1) Connect the equipment as illustrated
- (2) Spectrum set as follow:
Centre frequency = the nominal EUT channel center frequency,
The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient)
RBW = 1% to 5% of the anticipated OBW, VBW $\geq 3 \times \text{RBW}$, Sweep = auto,
Detector function = peak, Trace = max hold
- (3) Set 99% Occupied Bandwidth and 26dB 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

Please refer to appendix B on the section 8 appendix report

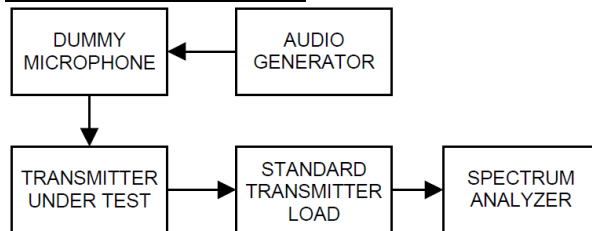
5.3. Emission Mask

LIMIT

FCC Part 80.211

- (f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:
- (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
 - (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
 - (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

TEST CONFIGURATION



TEST PROCEDURE

- 1) Connect the equipment as illustrated.
- 2) Spectrum set as follow:
Centre frequency= fundamental frequency, span=120kHz, 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) Apply Input Modulation Signal to EUT according to Section 3.4
- 5) Measure and record the results in the test report.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

Please refer to appendix C on the section 8 appendix report

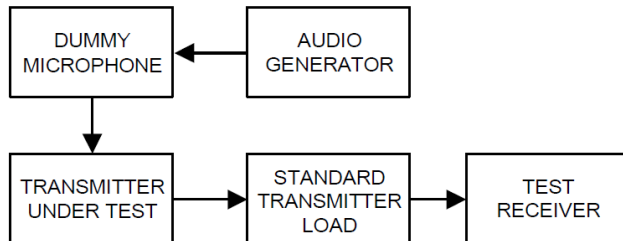
5.4. Modulation Limit

LIMIT

FCC Part 2.1047(b), FCC Part 80.213(d)

Ship and coast station transmitters operating in the 156-162 MHz and 216-220 bands must be capable of proper operation with a frequency deviation that does not exceed ± 5 kHz when using any emission authorized by §80.207.

TEST CONFIGURATION



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 ≤ 0.25 Hz to $\geq 15,000$ Hz. Turn the de-emphasis function off.
- 4) Apply Input Modulation Signal to EUT according to Section 3.4 and vary the input level from -20 to $+20$ dB.
- 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.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

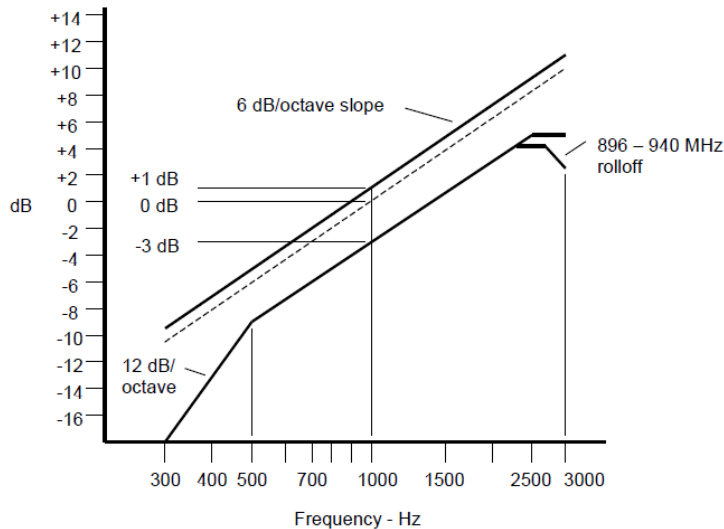
Please refer to appendix D on the section 8 appendix report

5.5. Audio Frequency Response

LIMIT

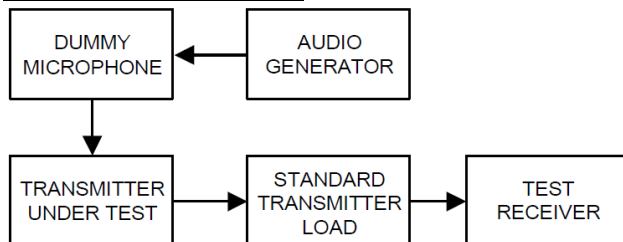
FCC Part 2.1047(a):

Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.



An additional 6 dB per octave attenuation is allowed from 2500 Hz to 3000 Hz in equipment operating in the 25 MHz to 869 MHz range.

TEST CONFIGURATION



TEST PROCEDURE

- 1) Connect the equipment as illustrated.
- 2) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for 50 Hz to 15,000 Hz. Turn the de-emphasis function off.
- 3) Set the DMM to measure rms voltage.
- 4) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- 5) Apply Input Modulation Signal to EUT according to Section 3.4
- 6) Set the test receiver to measure rms deviation and record the deviation reading.
- 7) Record the DMM reading as V_{REF} .
- 8) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
- 9) Vary the audio frequency generator output level until the deviation reading that was recorded in step 6) is obtained.
- 10) Record the DMM reading as V_{FREQ}
- 11) Calculate the audio frequency response at the present frequency as:

$$\text{audio frequency response} = 20 \log_{10} (V_{FREQ} / V_{REF})$$
- 12) Repeat steps 8) through 11) for all the desired test frequencies

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

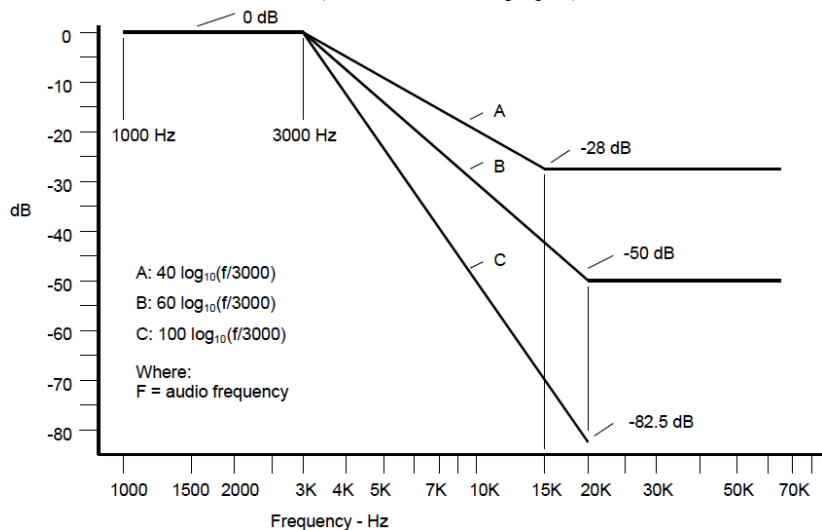
Please refer to appendix E on the section 8 appendix report

5.6. Audio Low Pass Filter Response

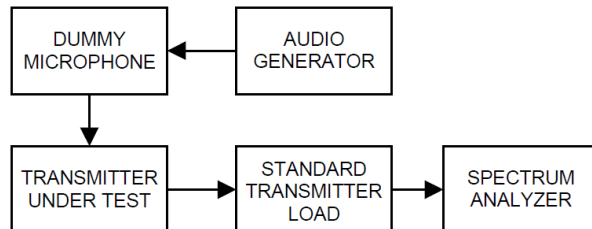
LIMIT

FCC Part 2.1047(b), FCC Part 80.213(e)

Coast station transmitters operated in the 156-162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz it must have an attenuation greater than at 1 kHz by at least $60\log_{10}(f/3)$ dB where "f" is the audio frequency in kilohertz. At frequencies above 20 kHz the attenuation must be at least 50 dB greater than at 1 kHz.



TEST CONFIGURATION



TEST PROCEDURE

- 1) Configure the EUT as shown in figure .
- 2) Apply a 1000 Hz tone from the audio signal generator and adjust the level per manufacturer's specifications. Record the dB level of the 1000 Hz tone as LEV_{REF} .
- 3) Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low pass filter limit. Record the dB level at the test frequency as LEV_{FREQ} .
- 4) Calculate the audio frequency response at the test frequency as:
 low pass filter response = $LEV_{FREQ} - LEV_{REF}$

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

Please refer to appendix F on the section 8 appendix report

5.7. Frequency stability VS Temperature

LIMIT

FCC Part 80.209(a):

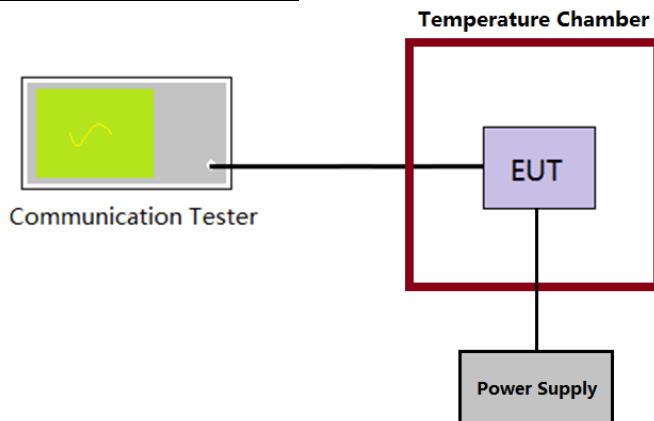
The frequency tolerance requirements applicable to transmitters in the maritime services are shown in the following table. Tolerances are given as parts in 10^6 unless shown in Hz.

Frequency bands and categories of stations	Tolerances ¹
(5) Band 156-162 MHz:	
(i) Coast stations:	
For carriers licensed to operate with a carrier power:	
Below 3 watts	10.
3 to 100 watts	5. ⁷
(ii) Ship stations	10. ⁴
(iii) Survival craft stations operating on 121.500 MHz	50.
(iv) EPIRBs:	
Operating on 121.500 and 243.000 MHz	50.
Operating on 156.750 and 156.800 MHz. ⁶	10.
(6) Band 216-220 MHz:	
(i) Coast stations:	
For all emissions	5.
(ii) Ship stations:	
For all emissions	5.
(7) Band 400-466 MHz:	
(i) EPIRBs operating on 406-406.1 MHz	5.
(ii) On-board stations	5.
(iii) Radiolocation and telecommand stations.	5.
(8) Band 1626.5-1646.5 MHz:	
(i) Ship earth stations	5.

⁴For transmitters in the radiolocation and associated telecommand service operating on 154.584 MHz, 159.480 MHz, 160.725 MHz and 160.785 MHz the frequency tolerance is 15 parts in 10^6 .

⁷For transmitters operated at private coast stations with antenna heights less than 6 meters (20 feet) above ground and output power of 25 watts or less the frequency tolerance is 10 parts in 10^6 .

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT output port was connected to communication tester.
2. The EUT was placed inside the temperature chamber.
3. Turn EUT off and set the chamber temperature to -30°C . After the temperature stabilized for approximately 30 minutes recorded the frequency as MCF_{MHz} .
4. Calculate the ppm frequency error by the following:

$$\text{ppm error} = (\text{MCF}_{\text{MHz}} / \text{ACF}_{\text{MHz}} - 1) * 10^6$$
 where
 MCF_{MHz} is the Measured Carrier Frequency in MHz
 ACF_{MHz} is the Assigned Carrier Frequency in MHz
5. Repeat step 3 measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix G on the section 8 appendix report

5.8. Frequency stability VS Voltage

LIMIT

FCC Part 80.209(a):

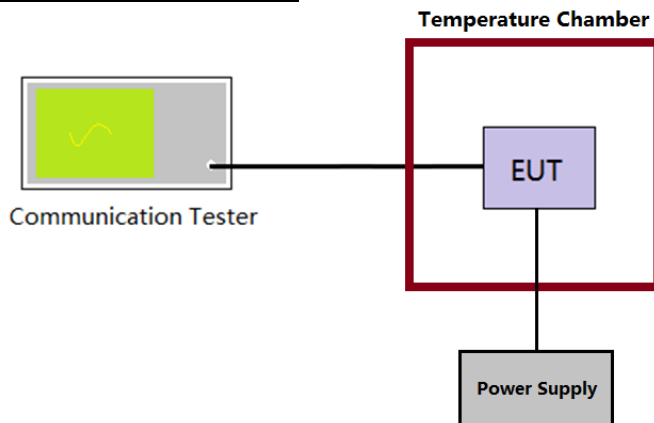
The frequency tolerance requirements applicable to transmitters in the maritime services are shown in the following table. Tolerances are given as parts in 10^6 unless shown in Hz.

Frequency bands and categories of stations	Tolerances ¹
(5) Band 156-162 MHz:	
(i) Coast stations:	
For carriers licensed to operate with a carrier power:	
Below 3 watts	10.
3 to 100 watts	5. ⁷
(ii) Ship stations	10. ⁴
(iii) Survival craft stations operating on 121.500 MHz	50.
(iv) EPIRBs:	
Operating on 121.500 and 243.000 MHz	50.
Operating on 156.750 and 156.800 MHz. ⁶	10.
(6) Band 216-220 MHz:	
(i) Coast stations:	
For all emissions	5.
(ii) Ship stations:	
For all emissions	5.
(7) Band 400-466 MHz:	
(i) EPIRBs operating on 406-406.1 MHz	5.
(ii) On-board stations	5.
(iii) Radiolocation and telecommand stations.	5.
(8) Band 1626.5-1646.5 MHz:	
(i) Ship earth stations	5.

⁴For transmitters in the radiolocation and associated telecommand service operating on 154.584 MHz, 159.480 MHz, 160.725 MHz and 160.785 MHz the frequency tolerance is 15 parts in 10^6 .

⁷For transmitters operated at private coast stations with antenna heights less than 6 meters (20 feet) above ground and output power of 25 watts or less the frequency tolerance is 10 parts in 10^6 .

TEST CONFIGURATION



TEST PROCEDURE

- 1) The EUT output port was connected to communication tester.
- 2) The EUT was placed inside the temperature chamber at 25°C
- 3) Record the carrier frequency of the transmitter as MCF_{MHz}
- 4) Calculate the ppm frequency error by the following:

$$\text{ppm error} = (MCF_{MHz}/ACF_{MHz} - 1) \times 10^6$$
 where
 MCF_{MHz} is the Measured Carrier Frequency in MHz
 ACF_{MHz} is the Assigned Carrier Frequency in MHz
- 5) Repeat step 3 measure with varied $\pm 15\%$ of the nominal value measured at the input to the EUT

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix H on the section 8 appendix report

5.9. Transmit Conducted Spurious Emission

LIMIT

FCC Part 80.211(f)(3)

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

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

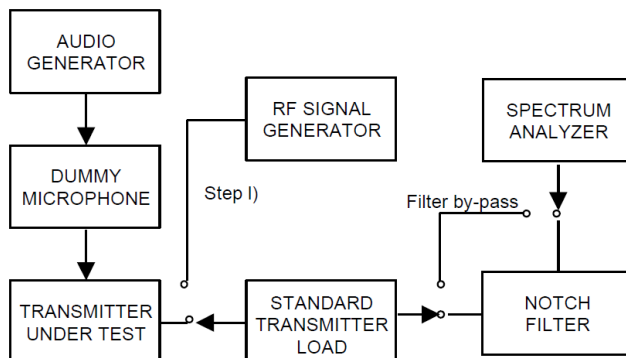
Calculation: Limit (dBm) = EL-43-10log10 (TP)

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

In this application, the EL is P(dBm)

Limit (dBm) = P(dBm)-43-10 log (Pwatts) = -13dBm

TEST CONFIGURATION



TEST PROCEDURE

- 1) Connect the equipment as illustrated, with the notch filter by-passed.
- 2) Apply Input Modulation Signal to EUT according to Section 3.4
- 3) Adjust the spectrum analyzer for the following settings:
Below 1GHz: RBW=100kHz, VBW=300kHz, Above 1GHz: RBW=1MHz, VBW=3MHz
Detector=Peak, Sweep time=Auto, Trace=Max hold
- 4) Scan frequency range up to 10th harmonic.
- 5) Record the frequencies and levels of spurious emissions.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

5.10. Transmitter Radiated Spurious Emission

LIMIT

FCC Part 80.211(f)(3)

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB.

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

Calculation: Limit (dBm) = EL-43-10log10 (TP)

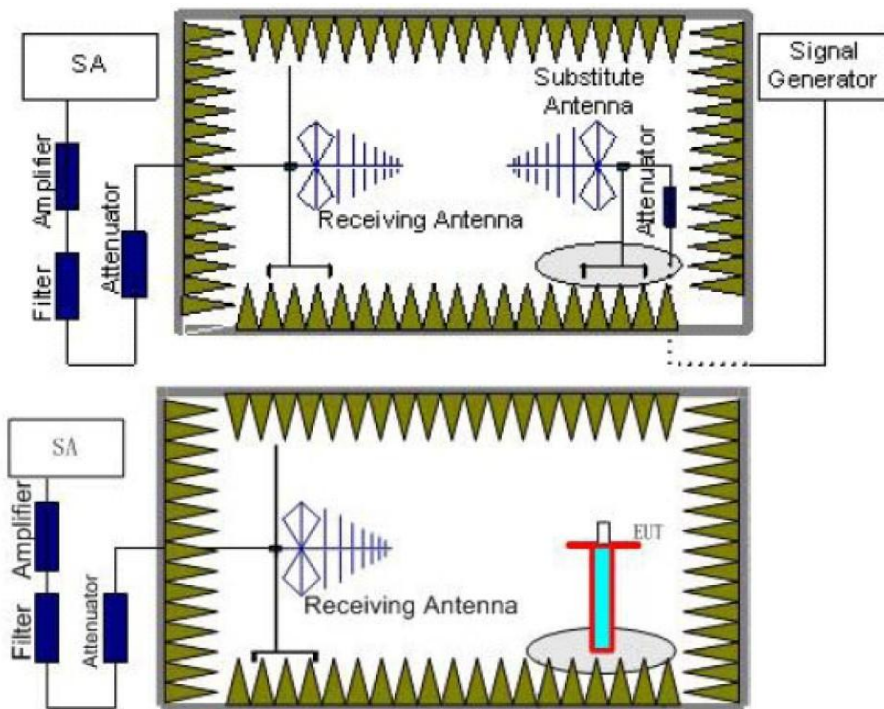
EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is P(dBm)

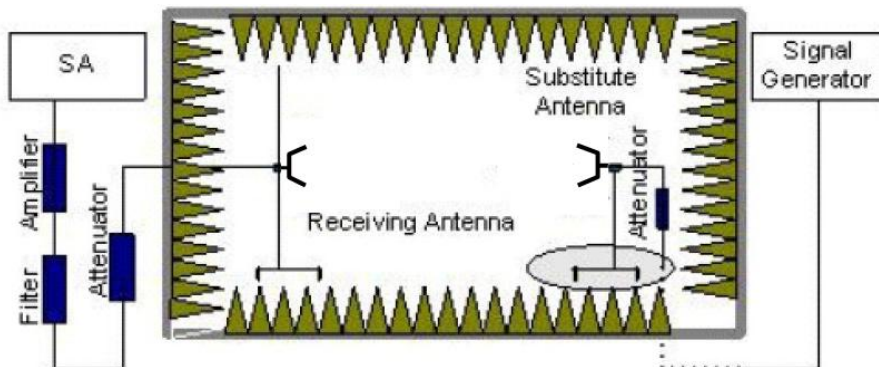
Limit (dBm) = P(dBm)-43-10 log (Pwatts) = -13dBm

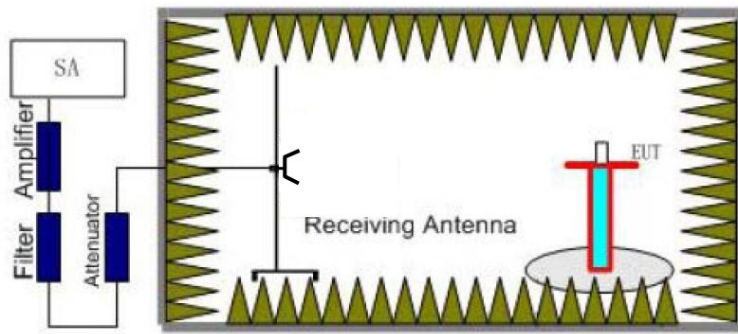
TEST CONFIGURATION

Below 1GHz:



Above 1GHz:





TEST PROCEDURE

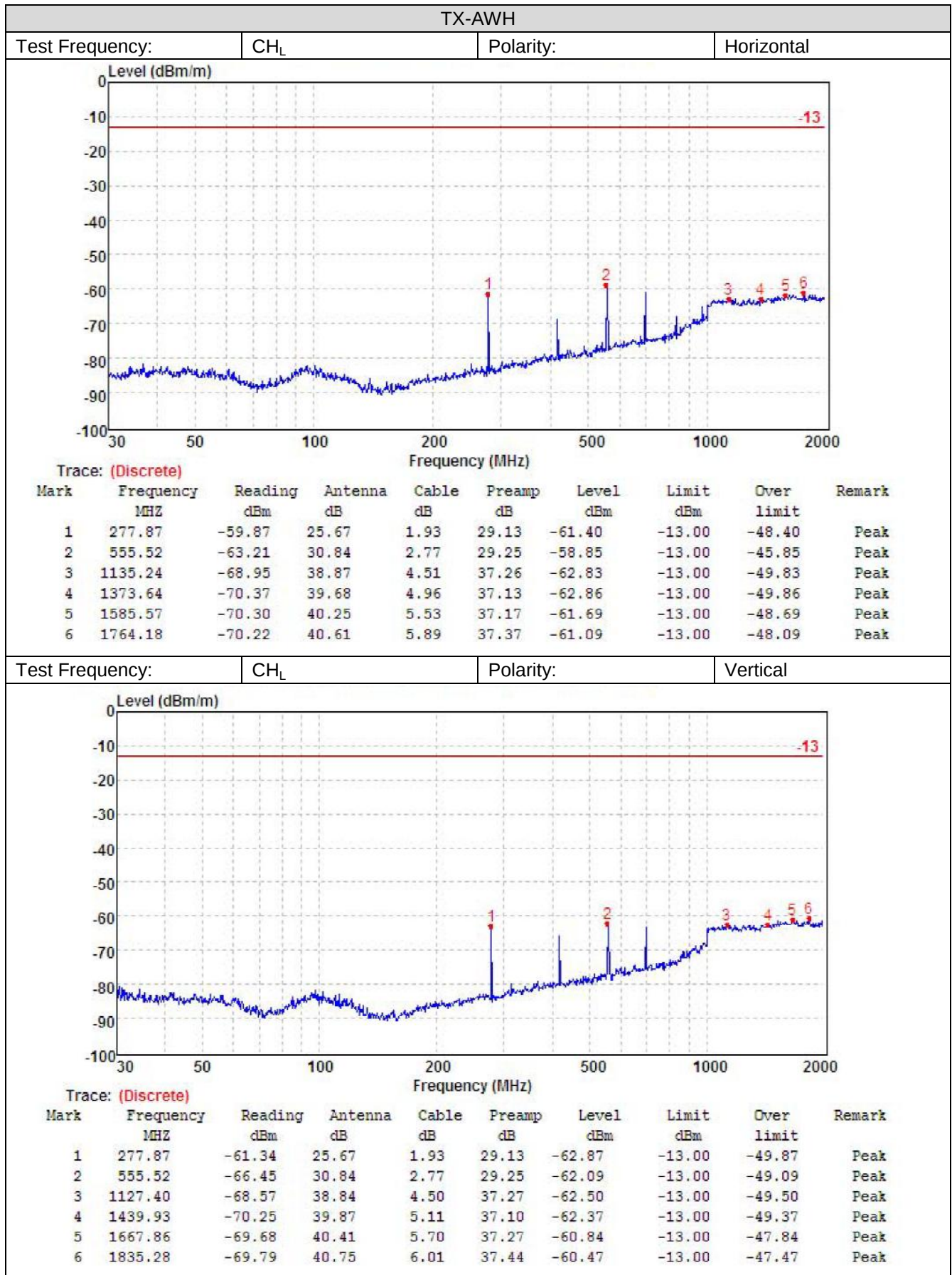
1. Standard Transmitter Load with a $50\ \Omega$ input impedance and an output impedance matched to the test equipment.
2. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the 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.
3. 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.
4. 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 (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, a 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.
6. 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:
Power(EIRP)=PMea- PAg - Pcl - 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:
Power(EIRP)=PMea- Pcl - Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

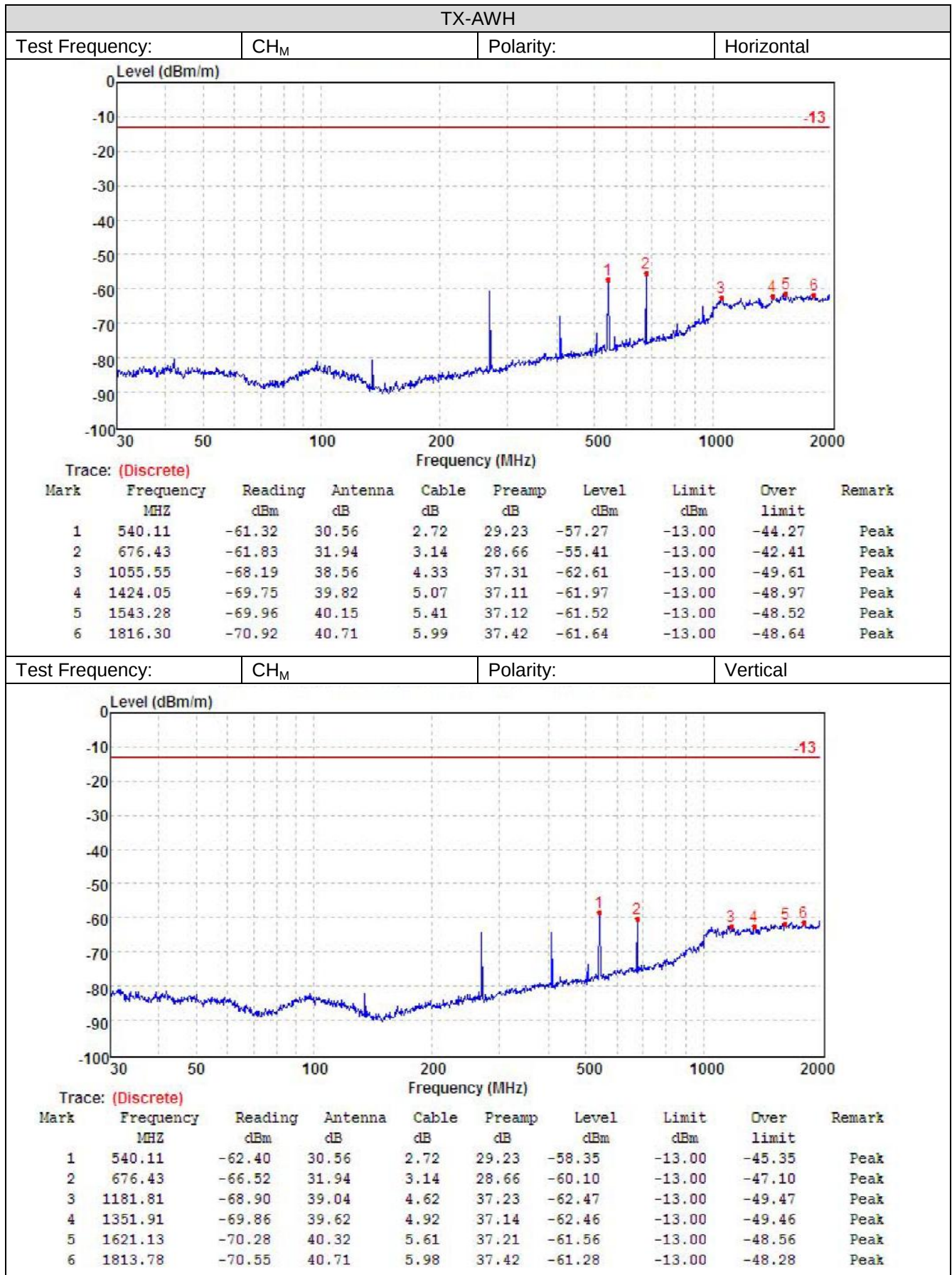
TEST MODE:

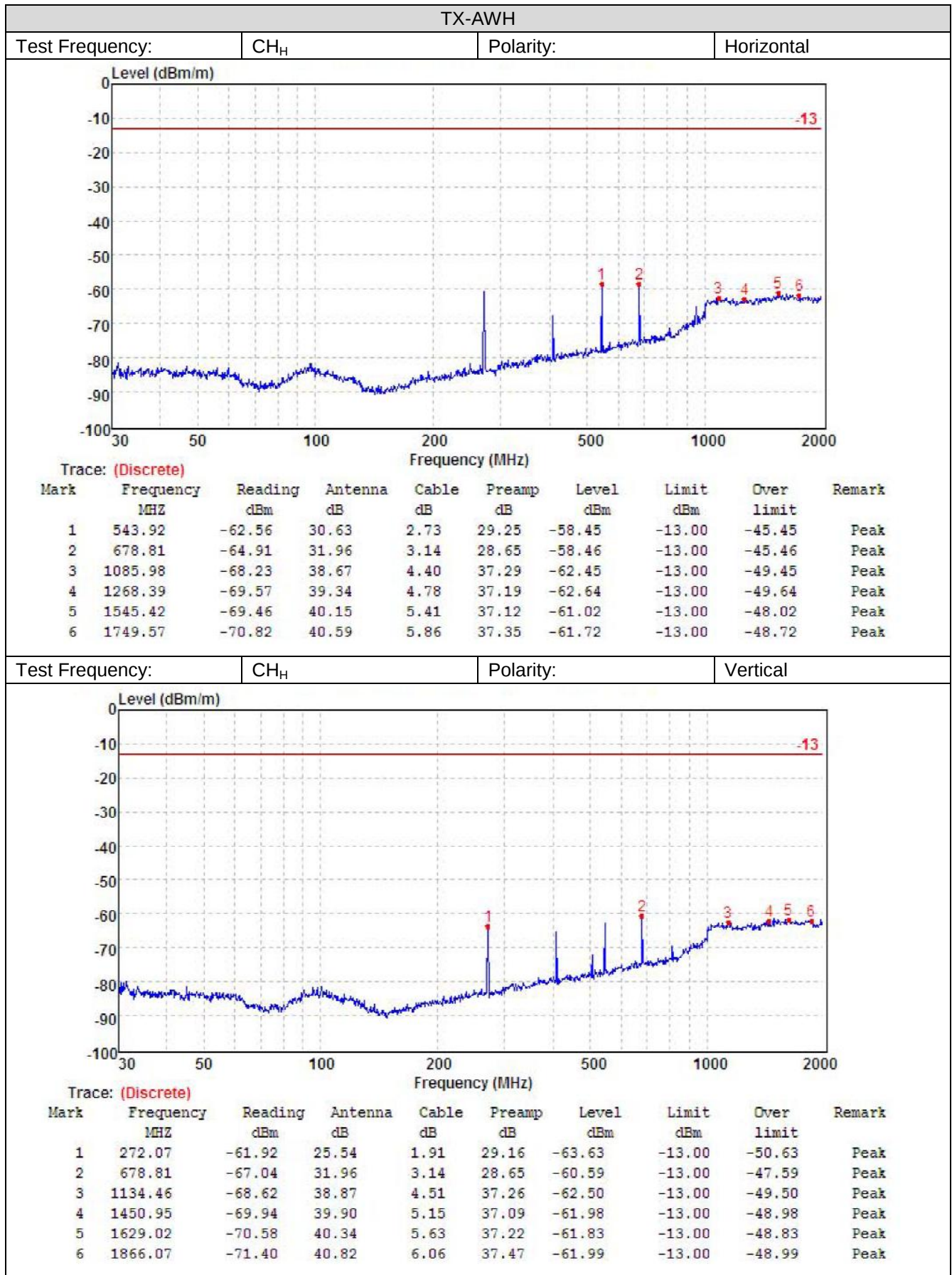
Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable







1.1 AC Power Line Conducted Spurious Emission

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 u Henry as specified by section 5.1 of ANSI C63.4. Cables and peripherals were moved to find the maximum emission levels for each frequency.

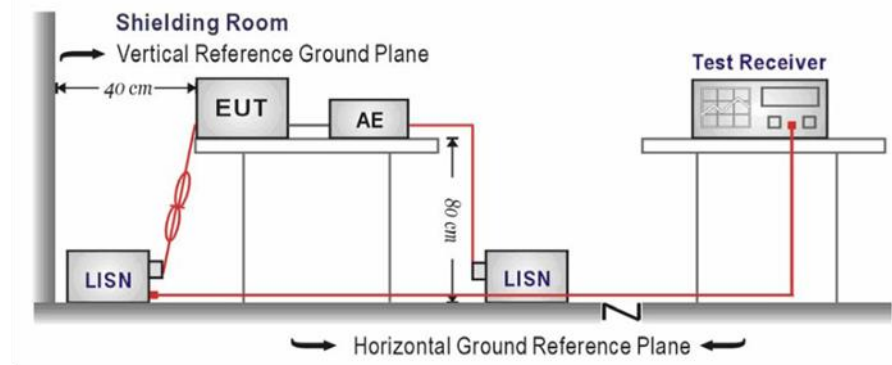
Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☐ Passed ☒ Not Applicable

1.2 Radiated Emission

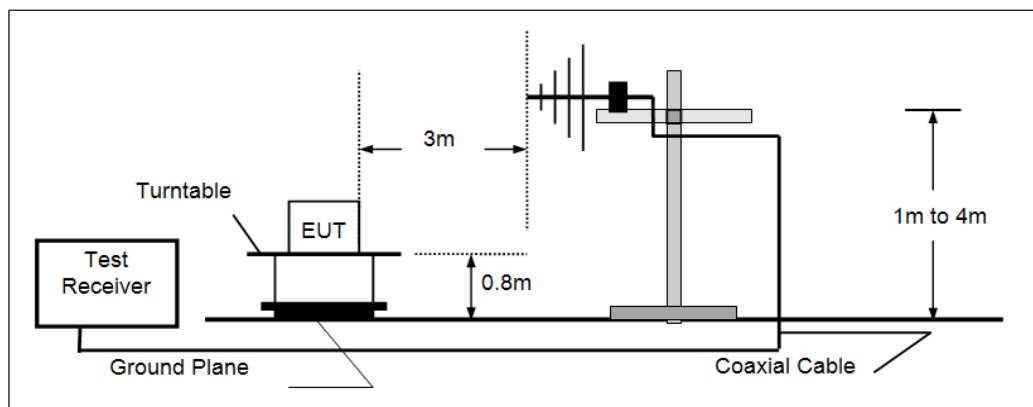
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

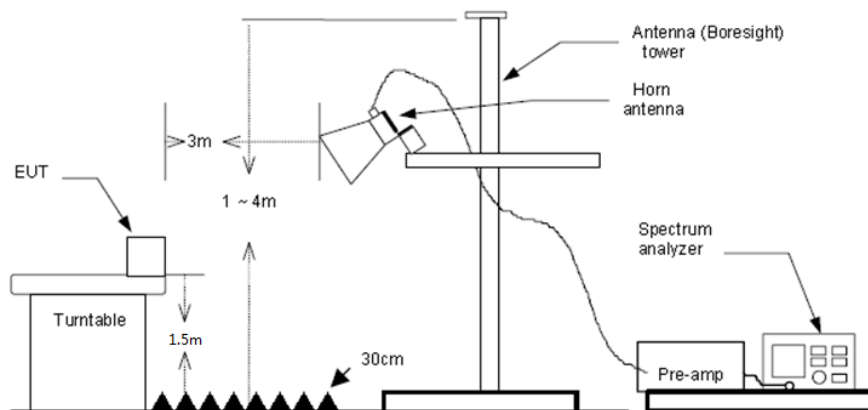
Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

➤ 30MHz ~ 1GHz



➤ Above 1GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE

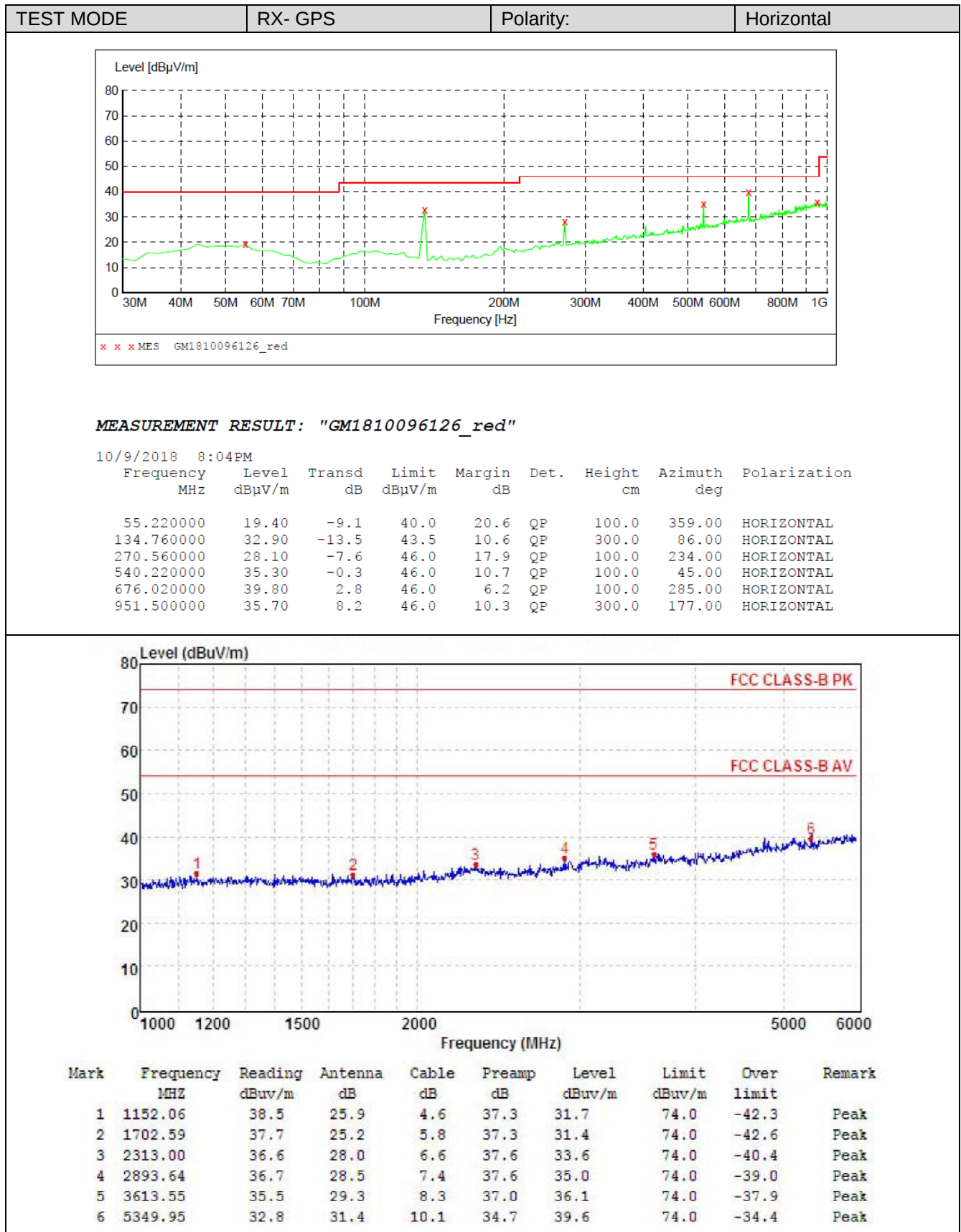
Please reference to the section 3.4

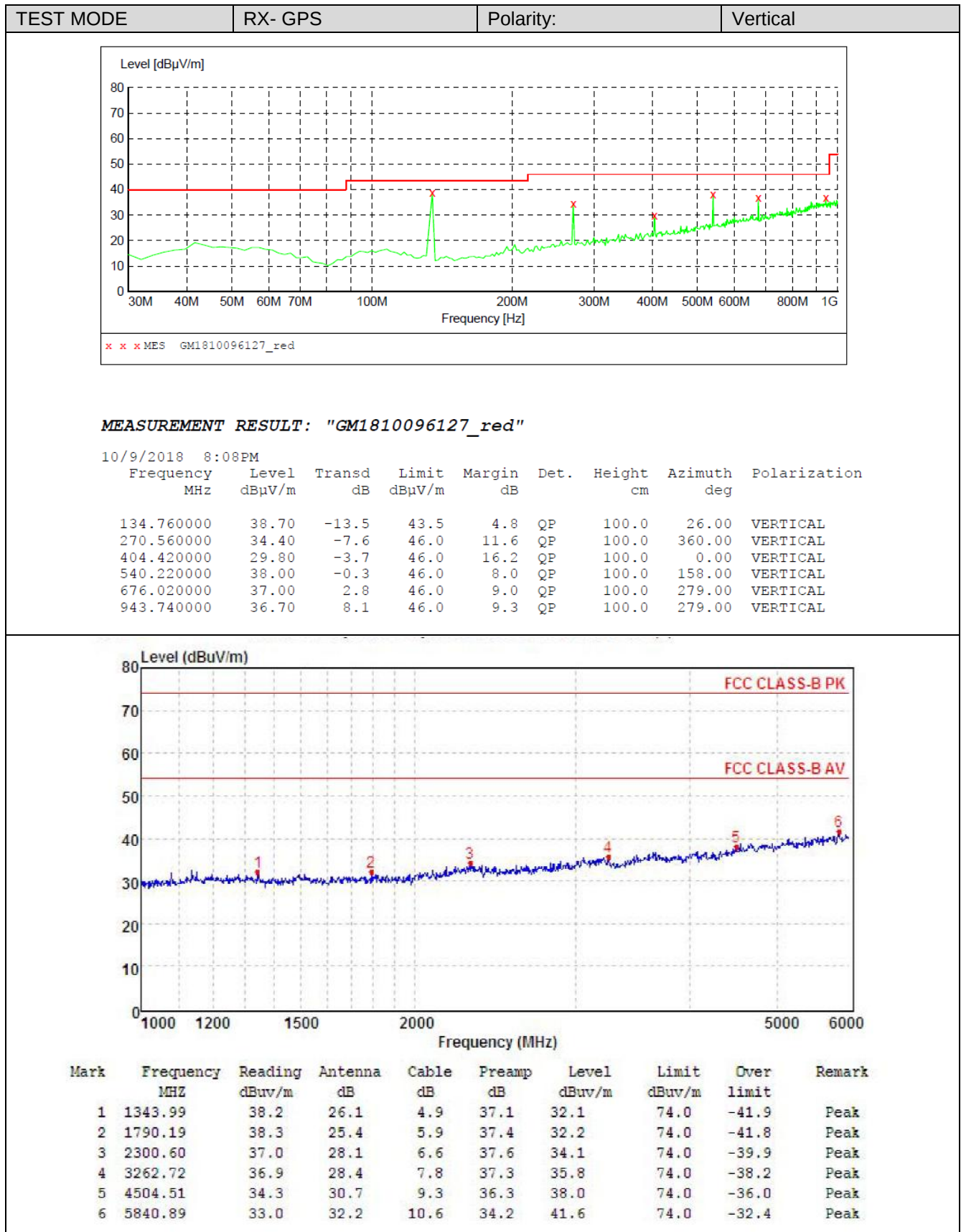
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:

The EUT shall be scanned from 30 MHz to the 5th harmonic of the highest oscillator frequency in the digital devices or 1 GHz whichever is higher.





6. APPENDIX Report

**Appendix A:Maximum Transmitter Power**

Operation Mode	Modulation Type	Test Channel	Measured Power(dBm)	Measured Power(W)	Rated Power(W)	Percentage (%)	Limit (%)	Result
TX-AWH	FM	CH _L	43.69	23.39	25.00	-6.4	±20	PASS
TX-AWH	FM	CH _{M2}	43.69	23.39	25.00	-6.4	±20	PASS
TX-AWH	FM	CH _H	43.68	23.33	25.00	-6.7	±20	PASS
TX-AWL	FM	CH _L	29.27	0.85	1.00	-15.5	±20	PASS
TX-AWL	FM	CH _{M2}	29.27	0.85	1.00	-15.5	±20	PASS
TX-AWL	FM	CH _H	29.26	0.84	1.00	-15.7	±20	PASS

**Appendix B:Occupied Bandwidth**

Operation Mode	Modulation Type	Test Channel	Occupied Bandwidth		99% Limit(kHz)	Result
			99%(kHz)	26dB(kHz)		
TX-AWH	FM	CH _L	15.035	15.558	≤20	PASS
TX-AWH	FM	CH _{M2}	15.085	15.644	≤20	PASS
TX-AWH	FM	CH _H	15.084	15.608	≤20	PASS
TX-AWL	FM	CH _L	15.034	15.615	≤20	PASS
TX-AWL	FM	CH _{M2}	15.085	15.608	≤20	PASS
TX-AWL	FM	CH _H	15.084	15.558	≤20	PASS



Appendix B:Occupied Bandwidth

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT																																			
TX-AWH	FM	CH _L	MultiViewSpectrum Ref Level 44.00 dBm Offset 30.50 dB RBW 300 Hz Att 23 dB SWT 14 ms (<23 ms) VBW 1 kHz Mode Auto FFT 1 Occupied Bandwidth 40 dBm 30 dBm 20 dBm 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm h1 39.430 dBm h2 13.430 dBm T1 T2 D1 M1[1] 15.09 dBm D1[1] 156.042280 MHz -0.98 dB 15.5580 kHz CF 156.05 MHz 1001 pts 5.0 kHz/ Span 50.0 kHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>156.042228 MHz</td><td>15.09 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>156.0424575 MHz</td><td>24.30 dBm</td><td>Occ Bw</td><td>15.034965035 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>156.0574925 MHz</td><td>24.10 dBm</td><td></td><td></td></tr><tr><td>D1</td><td>M1</td><td>1</td><td>15.558 kHz</td><td>-0.98 dB</td><td></td><td></td></tr></table> Measuring... 29.09.2018 16:26:07 Date: 29.SEP.2018 16:26:07	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		156.042228 MHz	15.09 dBm			T1	1		156.0424575 MHz	24.30 dBm	Occ Bw	15.034965035 kHz	T2	1		156.0574925 MHz	24.10 dBm			D1	M1	1	15.558 kHz	-0.98 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																
M1	1		156.042228 MHz	15.09 dBm																																		
T1	1		156.0424575 MHz	24.30 dBm	Occ Bw	15.034965035 kHz																																
T2	1		156.0574925 MHz	24.10 dBm																																		
D1	M1	1	15.558 kHz	-0.98 dB																																		
TX-AWH	FM	CH _{M2}	MultiViewSpectrum Ref Level 44.00 dBm Offset 30.50 dB RBW 300 Hz Att 23 dB SWT 14 ms (<23 ms) VBW 1 kHz Mode Auto FFT 1 Occupied Bandwidth 40 dBm 30 dBm 20 dBm 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm h1 39.390 dBm h2 13.390 dBm T1 T2 D1 M1[1] 11.36 dBm D1[1] 156.7921350 MHz 2.35 dB 15.6440 kHz CF 156.8 MHz 1001 pts 5.0 kHz/ Span 50.0 kHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>156.792135 MHz</td><td>11.36 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>156.7924575 MHz</td><td>24.52 dBm</td><td>Occ Bw</td><td>15.084915085 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>156.8075425 MHz</td><td>24.22 dBm</td><td></td><td></td></tr><tr><td>D1</td><td>M1</td><td>1</td><td>15.644 kHz</td><td>2.35 dB</td><td></td><td></td></tr></table> Measuring... 29.09.2018 16:10:52 Date: 29.SEP.2018 16:10:52	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		156.792135 MHz	11.36 dBm			T1	1		156.7924575 MHz	24.52 dBm	Occ Bw	15.084915085 kHz	T2	1		156.8075425 MHz	24.22 dBm			D1	M1	1	15.644 kHz	2.35 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																
M1	1		156.792135 MHz	11.36 dBm																																		
T1	1		156.7924575 MHz	24.52 dBm	Occ Bw	15.084915085 kHz																																
T2	1		156.8075425 MHz	24.22 dBm																																		
D1	M1	1	15.644 kHz	2.35 dB																																		
TX-AWH	FM	CH _H	MultiViewSpectrum Ref Level 44.00 dBm Offset 30.50 dB RBW 300 Hz Att 23 dB SWT 14 ms (<23 ms) VBW 1 kHz Mode Auto FFT 1 Occupied Bandwidth 40 dBm 30 dBm 20 dBm 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm h1 39.420 dBm h2 13.420 dBm T1 T2 D1 M1[1] 11.63 dBm D1[1] 157.4171710 MHz 3.00 dB 15.6080 kHz CF 157.425 MHz 1001 pts 5.0 kHz/ Span 50.0 kHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>157.417171 MHz</td><td>11.63 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>157.4174575 MHz</td><td>24.75 dBm</td><td>Occ Bw</td><td>15.084915085 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>157.4325425 MHz</td><td>24.48 dBm</td><td></td><td></td></tr><tr><td>D1</td><td>M1</td><td>1</td><td>15.608 kHz</td><td>3.00 dB</td><td></td><td></td></tr></table> Measuring... 29.09.2018 16:23:09 Date: 29.SEP.2018 16:23:09	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		157.417171 MHz	11.63 dBm			T1	1		157.4174575 MHz	24.75 dBm	Occ Bw	15.084915085 kHz	T2	1		157.4325425 MHz	24.48 dBm			D1	M1	1	15.608 kHz	3.00 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																
M1	1		157.417171 MHz	11.63 dBm																																		
T1	1		157.4174575 MHz	24.75 dBm	Occ Bw	15.084915085 kHz																																
T2	1		157.4325425 MHz	24.48 dBm																																		
D1	M1	1	15.608 kHz	3.00 dB																																		



Appendix B:Occupied Bandwidth

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT																																			
TX-AWL	FM	CH _L	MultiViewSpectrum Ref Level 30.00 dBm Offset 30.50 dB RBW 300 Hz Att 9 dB SWF 14 ms (~23 ms) VBW 1 kHz Mode Auto FFT 1 Occupied Bandwidth 156.05 MHz 1001 pts 5.0 kHz/ Span 50.0 kHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>156.042171 MHz</td><td>-3.72 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>156.0424575 MHz</td><td>9.19 dBm</td><td>Occ Bw</td><td>15.034965035 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>156.0574925 MHz</td><td>8.96 dBm</td><td></td><td></td></tr><tr><td>D1</td><td>M1</td><td>1</td><td>15.615 kHz</td><td>2.00 dB</td><td></td><td></td></tr></table> Measuring... 29.09.2018 16:27:28 Date: 29.SEP.2018 16:27:27	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		156.042171 MHz	-3.72 dBm			T1	1		156.0424575 MHz	9.19 dBm	Occ Bw	15.034965035 kHz	T2	1		156.0574925 MHz	8.96 dBm			D1	M1	1	15.615 kHz	2.00 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																
M1	1		156.042171 MHz	-3.72 dBm																																		
T1	1		156.0424575 MHz	9.19 dBm	Occ Bw	15.034965035 kHz																																
T2	1		156.0574925 MHz	8.96 dBm																																		
D1	M1	1	15.615 kHz	2.00 dB																																		
TX-AWL	FM	CH _{M2}	MultiViewSpectrum Ref Level 30.00 dBm Offset 30.50 dB RBW 300 Hz Att 9 dB SWF 14 ms (~23 ms) VBW 1 kHz Mode Auto FFT 1 Occupied Bandwidth 156.8 MHz 1001 pts 5.0 kHz/ Span 50.0 kHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>156.792171 MHz</td><td>-4.02 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>156.7924575 MHz</td><td>9.51 dBm</td><td>Occ Bw</td><td>15.084915085 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>156.8075425 MHz</td><td>9.26 dBm</td><td></td><td></td></tr><tr><td>D1</td><td>M1</td><td>1</td><td>15.608 kHz</td><td>2.86 dB</td><td></td><td></td></tr></table> Measuring... 29.09.2018 16:12:29 Date: 29.SEP.2018 16:12:29	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		156.792171 MHz	-4.02 dBm			T1	1		156.7924575 MHz	9.51 dBm	Occ Bw	15.084915085 kHz	T2	1		156.8075425 MHz	9.26 dBm			D1	M1	1	15.608 kHz	2.86 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																
M1	1		156.792171 MHz	-4.02 dBm																																		
T1	1		156.7924575 MHz	9.51 dBm	Occ Bw	15.084915085 kHz																																
T2	1		156.8075425 MHz	9.26 dBm																																		
D1	M1	1	15.608 kHz	2.86 dB																																		
TX-AWL	FM	CH _H	MultiViewSpectrum Ref Level 30.00 dBm Offset 30.50 dB RBW 300 Hz Att 9 dB SWF 14 ms (~23 ms) VBW 1 kHz Mode Auto FFT 1 Occupied Bandwidth 157.425 MHz 1001 pts 5.0 kHz/ Span 50.0 kHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>157.417221 MHz</td><td>-0.05 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>157.4174575 MHz</td><td>9.70 dBm</td><td>Occ Bw</td><td>15.084915085 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>157.4325425 MHz</td><td>9.44 dBm</td><td></td><td></td></tr><tr><td>D1</td><td>M1</td><td>1</td><td>15.558 kHz</td><td>-0.53 dB</td><td></td><td></td></tr></table> Measuring... 29.09.2018 16:20:59 Date: 29.SEP.2018 16:20:59	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		157.417221 MHz	-0.05 dBm			T1	1		157.4174575 MHz	9.70 dBm	Occ Bw	15.084915085 kHz	T2	1		157.4325425 MHz	9.44 dBm			D1	M1	1	15.558 kHz	-0.53 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																
M1	1		157.417221 MHz	-0.05 dBm																																		
T1	1		157.4174575 MHz	9.70 dBm	Occ Bw	15.084915085 kHz																																
T2	1		157.4325425 MHz	9.44 dBm																																		
D1	M1	1	15.558 kHz	-0.53 dB																																		



Appendix C:Emission Mask

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-AWH	FM	CH _L	
TX-AWH	FM	CH _{M2}	
TX-AWH	FM	CH _H	



Appendix C:Emission Mask

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-AWL	FM	CH _L	
TX-AWL	FM	CH _{M2}	
TX-AWL	FM	CH _H	

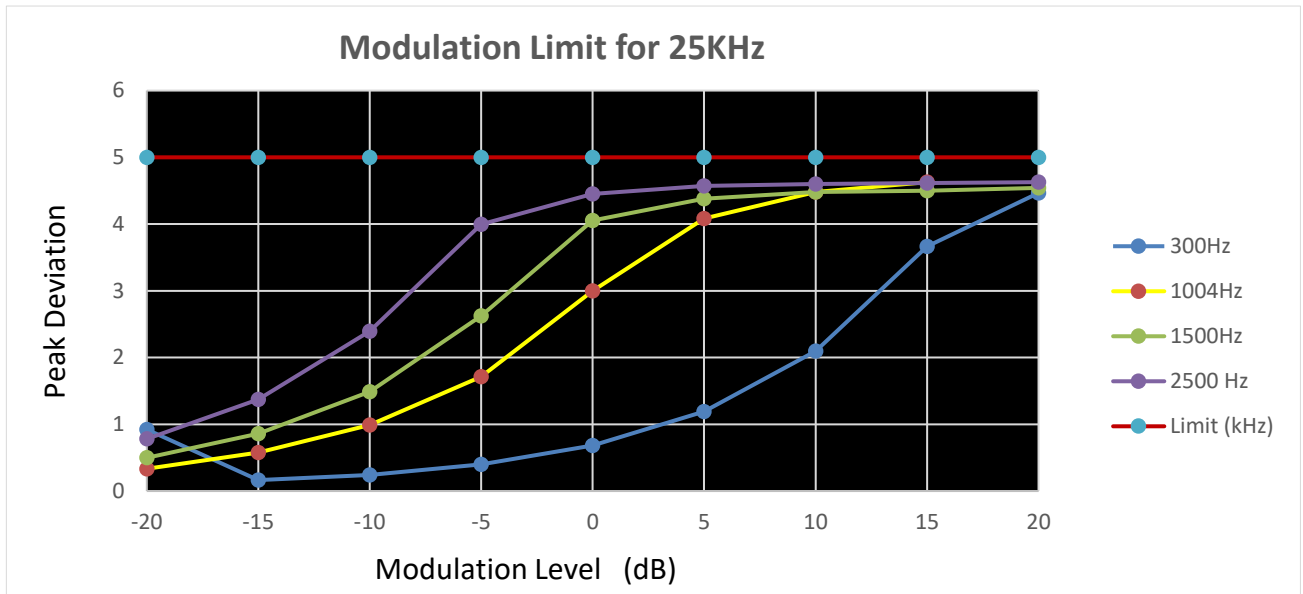
**Appendix D:Modulation Limit**

Operation Mode	Modulation Type	Test Channel	Modulation Level (dB)	Peak frequency deviation (kHz)				Limit (kHz)	Result
				300Hz	1004Hz	1500Hz	2500 Hz		
TX-AWH	FM	CH _{M2}	-20	0.923	0.334	0.498	0.781	5	PASS
TX-AWH	FM	CH _{M2}	-15	0.164	0.575	0.859	1.373	5	PASS
TX-AWH	FM	CH _{M2}	-10	0.241	0.991	1.49	2.396	5	PASS
TX-AWH	FM	CH _{M2}	-5	0.398	1.713	2.624	3.997	5	PASS
TX-AWH	FM	CH _{M2}	0	0.682	2.998	4.052	4.451	5	PASS
TX-AWH	FM	CH _{M2}	5	1.192	4.083	4.381	4.57	5	PASS
TX-AWH	FM	CH _{M2}	10	2.096	4.48	4.48	4.602	5	PASS
TX-AWH	FM	CH _{M2}	15	3.665	4.628	4.501	4.614	5	PASS
TX-AWH	FM	CH _{M2}	20	4.466	4.708	4.542	4.628	5	PASS



Appendix D:Modulation Limit

TEST PLOT RESULT



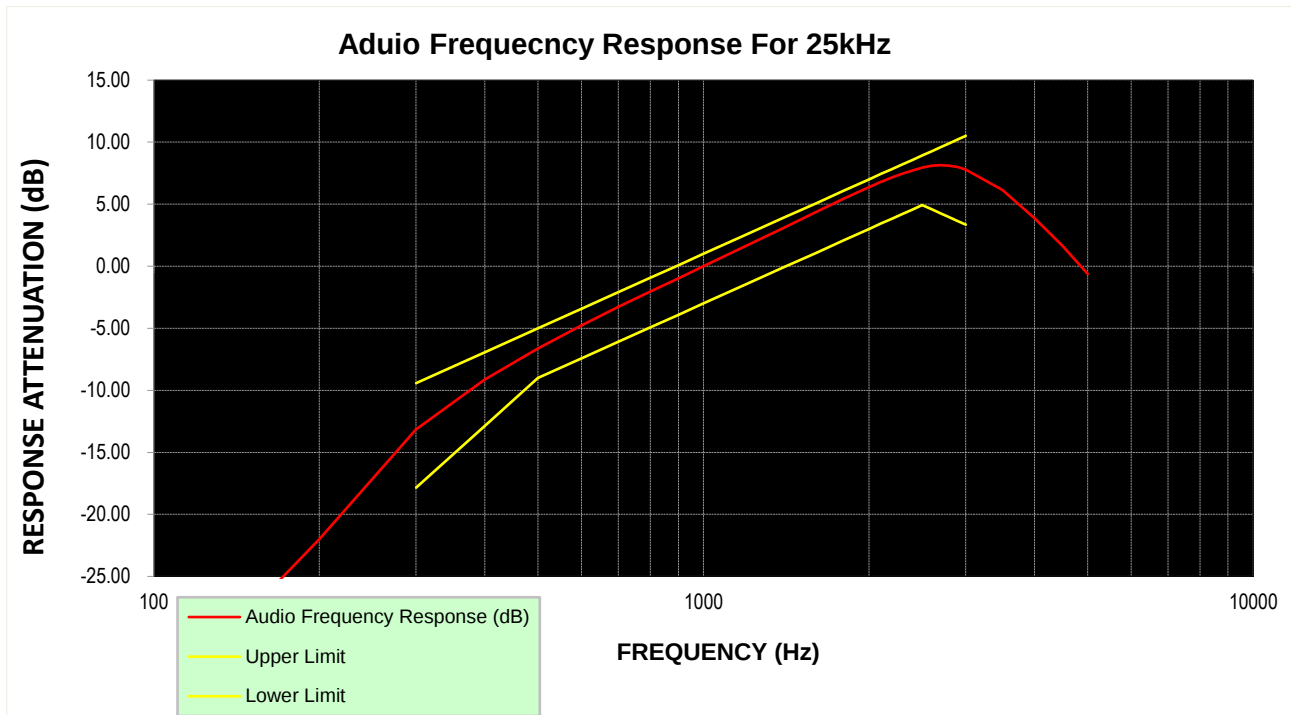
**Appendix E:Aduio Frequency Response**

Operation Mode	Modulation Type	Test Channel	Frequency (Hz)	Audio Frequency Response (dB)	Lower Limit	Upper Limit	Result
TX-AWH	FM	CH _{M2}	100	-35.79			PASS
TX-AWH	FM	CH _{M2}	200	-22.00			PASS
TX-AWH	FM	CH _{M2}	300	-13.15	-17.84	-9.42	PASS
TX-AWH	FM	CH _{M2}	400	-9.14	-12.86	-6.93	PASS
TX-AWH	FM	CH _{M2}	500	-6.62	-9.00	-5.00	PASS
TX-AWH	FM	CH _{M2}	600	-4.76	-7.42	-3.42	PASS
TX-AWH	FM	CH _{M2}	700	-3.28	-6.09	-2.09	PASS
TX-AWH	FM	CH _{M2}	800	-2.03	-4.93	-0.93	PASS
TX-AWH	FM	CH _{M2}	900	-0.98	-3.91	0.09	PASS
TX-AWH	FM	CH _{M2}	1000	-0.01	-3.00	1.00	PASS
TX-AWH	FM	CH _{M2}	1200	1.67	-1.42	2.58	PASS
TX-AWH	FM	CH _{M2}	1400	3.10	-0.09	3.91	PASS
TX-AWH	FM	CH _{M2}	1600	4.35	1.07	5.07	PASS
TX-AWH	FM	CH _{M2}	1800	5.44	2.09	6.09	PASS
TX-AWH	FM	CH _{M2}	2000	6.38	3.00	7.00	PASS
TX-AWH	FM	CH _{M2}	2100	6.79	3.42	7.42	PASS
TX-AWH	FM	CH _{M2}	2200	7.15	3.83	7.83	PASS
TX-AWH	FM	CH _{M2}	2300	7.46	4.21	8.21	PASS
TX-AWH	FM	CH _{M2}	2400	7.72	4.58	8.58	PASS
TX-AWH	FM	CH _{M2}	2500	7.94	4.93	8.93	PASS
TX-AWH	FM	CH _{M2}	2600	8.09	4.59	9.27	PASS
TX-AWH	FM	CH _{M2}	2700	8.15	4.27	9.60	PASS
TX-AWH	FM	CH _{M2}	2800	8.11	3.95	9.91	PASS
TX-AWH	FM	CH _{M2}	2900	7.99	3.65	10.22	PASS
TX-AWH	FM	CH _{M2}	3000	7.80	3.35	10.51	PASS
TX-AWH	FM	CH _{M2}	3500	6.14			PASS
TX-AWH	FM	CH _{M2}	4000	3.87			PASS
TX-AWH	FM	CH _{M2}	4500	1.62			PASS
TX-AWH	FM	CH _{M2}	5000	-0.60			PASS



Appendix E:Aduio Frequency Response

TEST PLOT RESULT



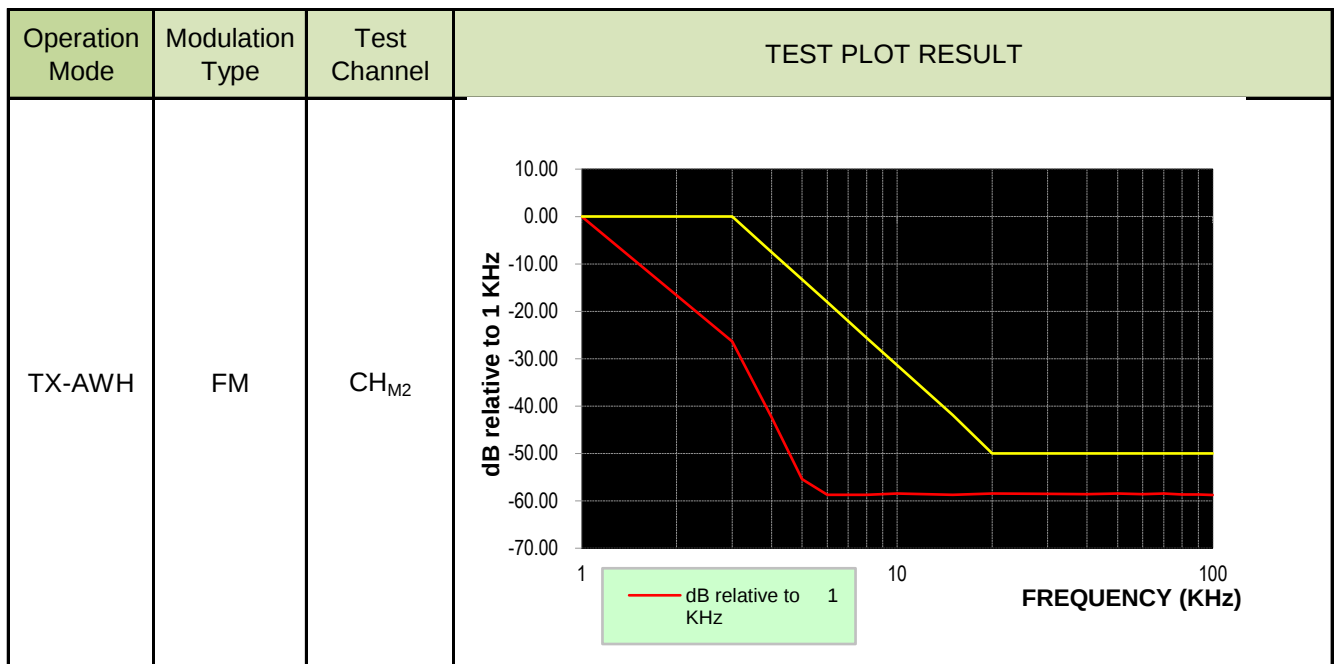
Note: The highest audio frequency response at 3kHz<3.125kHz, so meet the requirement.

**Appendix F:Audio Low Pass Filter Response**

Operation Mode	Modulation Type	Test Channel	Frequency (KHz)	dB relative to 1 KHz	Limit	Result
TX-AWH	FM	CH _{M2}	1	0.00	0.00	PASS
TX-AWH	FM	CH _{M2}	3	-26.39	0.00	PASS
TX-AWH	FM	CH _{M2}	4	-42.41	-7.50	PASS
TX-AWH	FM	CH _{M2}	5	-55.45	-13.30	PASS
TX-AWH	FM	CH _{M2}	6	-58.73	-18.10	PASS
TX-AWH	FM	CH _{M2}	8	-58.75	-25.60	PASS
TX-AWH	FM	CH _{M2}	10	-58.45	-31.40	PASS
TX-AWH	FM	CH _{M2}	15	-58.71	-41.90	PASS
TX-AWH	FM	CH _{M2}	20	-58.43	-50.00	PASS
TX-AWH	FM	CH _{M2}	30	-58.52	-50.00	PASS
TX-AWH	FM	CH _{M2}	40	-58.59	-50.00	PASS
TX-AWH	FM	CH _{M2}	50	-58.46	-50.00	PASS
TX-AWH	FM	CH _{M2}	60	-58.57	-50.00	PASS
TX-AWH	FM	CH _{M2}	70	-58.44	-50.00	PASS
TX-AWH	FM	CH _{M2}	80	-58.69	-50.00	PASS
TX-AWH	FM	CH _{M2}	90	-58.69	-50.00	PASS
TX-AWH	FM	CH _{M2}	100	-58.77	-50.00	PASS



Appendix F:Audio Low Pass Filter Response



**Appendix G:Frequency Stability Test & Temperature**

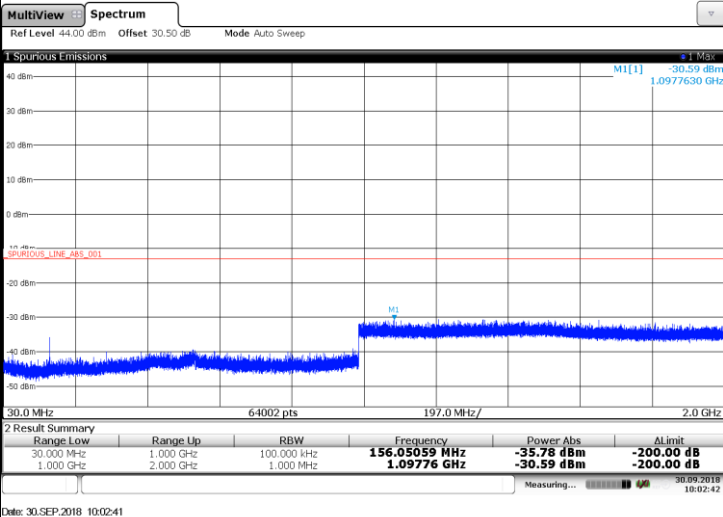
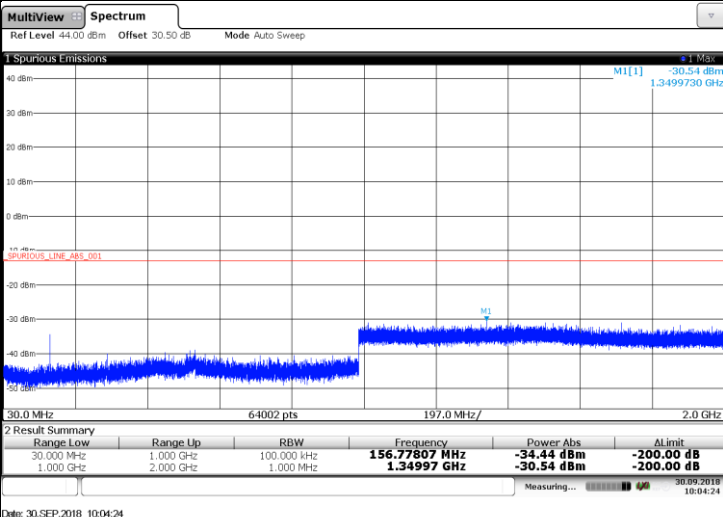
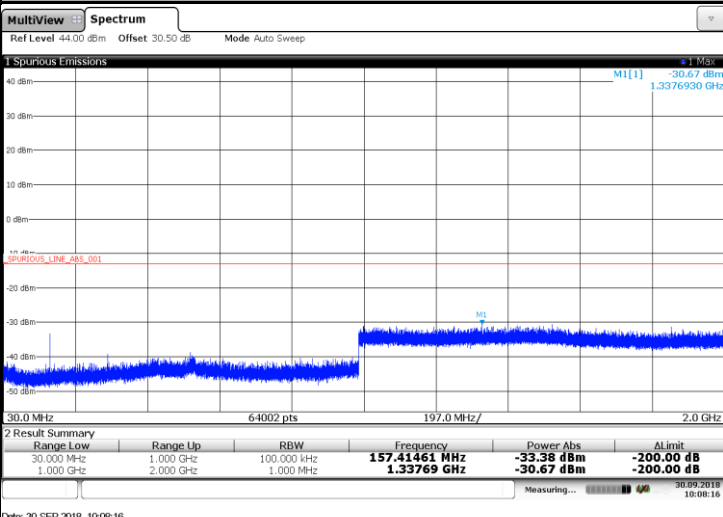
Operation Mode	Modulation Type	Test Conditions		Frequency error (ppm)			Limit (ppm)	Result
		Voltage	Temperature	CH _L	CH _{M2}	CH _H		
TX-AWH	FM	V _N	-30	0.09	0.09	0.10	±10	PASS
TX-AWH	FM	V _N	-20	0.08	0.09	0.10	±10	PASS
TX-AWH	FM	V _N	-10	0.09	0.09	0.10	±10	PASS
TX-AWH	FM	V _N	0	0.09	0.09	0.10	±10	PASS
TX-AWH	FM	V _N	10	0.08	0.09	0.10	±10	PASS
TX-AWH	FM	V _N	20	0.08	0.09	0.10	±10	PASS
TX-AWH	FM	V _N	30	0.09	0.10	<u>0.10</u>	±10	PASS
TX-AWH	FM	V _N	40	0.09	0.10	0.10	±10	PASS
TX-AWH	FM	V _N	55	0.08	0.09	0.10	±10	PASS
TX-AWL	FM	V _N	-30	0.08	0.08	0.09	±10	PASS
TX-AWL	FM	V _N	-20	0.08	0.08	0.09	±10	PASS
TX-AWL	FM	V _N	-10	0.08	0.09	0.09	±10	PASS
TX-AWL	FM	V _N	0	0.08	0.08	0.09	±10	PASS
TX-AWL	FM	V _N	10	0.08	0.08	0.10	±10	PASS
TX-AWL	FM	V _N	20	0.08	0.08	0.09	±10	PASS
TX-AWL	FM	V _N	30	0.08	0.08	0.10	±10	PASS
TX-AWL	FM	V _N	40	0.08	0.08	0.09	±10	PASS
TX-AWL	FM	V _N	55	0.08	0.08	0.09	±10	PASS

**Appendix H:Frequency Stability Test & Voltage**

Operation Mode	Modulation Type	Test Conditions		Frequency error (ppm)			Limit (ppm)	Result
		Voltage	Temperature	CH _L	CH _{M2}	CH _H		
TX-AWH	FM	V _N	T _N	0.081	0.091	0.095	±10	PASS
TX-AWH	FM	V _L	T _N	0.083	0.093	0.095	±10	PASS
TX-AWH	FM	V _H	T _N	0.084	0.096	<u>0.097</u>	±10	PASS
TX-AWL	FM	V _N	T _N	0.076	0.078	0.088	±10	PASS
TX-AWL	FM	V _L	T _N	0.076	0.079	0.089	±10	PASS
TX-AWL	FM	V _H	T _N	0.077	0.078	0.090	±10	PASS



Appendix I:Spurious Emission On Antenna Port

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-AWH	FM	CH _L	
TX-AWH	FM	CH _{M2}	
TX-AWH	FM	CH _H	

----End of Report----