Shenzhen Huatongwei International Inspection Co.,Ltd.
Huatongwei Building, keji'nan 12th Road, High-Tech Industrial Park, Nanshan District,
Shenzhen, Guangdong, China.
Phone:86-755-26715499 E-mail: cs@szhtw.com.cn Website:http://www.szhtw.com.cn

TEST REPORT

Report No. ..... :	**CHTEW22060048** Report verification **:**
Project No. ..... :	**SHT2204047901EW**
FCC ID .....:	**2A3OORM20**
Applicant's name .....:	**Shenzhen Ysair Technology Co., LTD**
Address .....:	6/F, building 6, Yunli intelligent park, No. 3, Changfa Middle Road, Yangmei community, Bantian street, Longgang District, Shenzhen,Guangdong, China
Test item description .....:	**VHF Marine Radio**
Trade Mark.....:	RETEVIS
Model/Type reference .....:	RM20
Listed Model(s).....:	-
Standard.....:	**FCC CFR Title 47 Part 2** **FCC CFR Title 47 Part 80**
Date of receipt of test sample.....:	Apr.27, 2022
Date of testing.....:	Apr.28, 2022-Jun.06, 2022
Date of issue.....:	Jun.07, 2022
Result ....:	**PASS**

Compiled by (position+printed name+signature) . :	File administrators Fanghui Zhu
Supervised by (position+printed name+signature) . :	Project Engineer Cheng Xiao
Approved by (position+printed name+signature) . :	RF Manager Hans Hu

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

Contents

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

1.2. Report revised information

Revised No.	Date of issued	Description
N/A	2022-06-07	Original

2 TEST DESCRIPTION

Test Item	Section in CFR 47	Result	Test Engineer
Conducted Carrier Output Power	Part 80.215 Part 2.1046(a)	Pass	Caspar Chen
99% Occupied Bandwidth & 26dB bandwidth	Part 80.205 Part 2.1049	Pass	Caspar Chen
Emission Mask	Part 80.211(f) Part 2.1049	Pass	Caspar Chen
Modulation Limit	Part 2.1047(b) Part 80.213	Pass	Caspar Chen
Audio Frequency Response	Part 2.1047(a) Part 80.213(e)	Pass	Caspar Chen
Frequency Stability V.S. Temperature	Part 80.209 Part 2.1055	Pass	Caspar Chen
Frequency Stability V.S. Voltage	Part 80.209 Part 2.1055	Pass	Caspar Chen
Transmit Conducted Spurious Emission	Part 80.211(f)(3) Part 2.1051	Pass	Caspar Chen
Transmit Radiated Spurious Emission	Part 80.211(f)(3) Part 2.1053	Pass	Quanhai Deng

3 SUMMARY

3.1 Client Information

Applicant:	Shenzhen Ysair Technology Co., LTD
Address:	6/F, building 6, Yunli intelligent park, No. 3, Changfa Middle Road, Yangmei community, Bantian street, Longgang District, Shenzhen,Guangdong,China
Manufacturer:	Shenzhen Ysair Technology Co., LTD
Address:	6/F, building 6, Yunli intelligent park, No. 3, Changfa Middle Road, Yangmei community, Bantian street, Longgang District, Shenzhen,Guangdong,China

3.2 Product Description

Main unit	
Name of EUT:	VHF Marine Radio
Trade Mark:	RETEVIS
Model/Type reference:	RM20
Listed Model(s)	-
Power supply:	DC13.8V
Hardware version:	M-200BM-J150618
Software version:	V6PD7-2008-BME

RF Specification		
Support Frequency Range:	156.025~162.025MHz	
Permitted frequency range:	TX:156.025MHz to 157.425MHz RX:156.050MHz to 162.025MHz	
Rated Output Power:	☒ High Power: 25W ☒ Low Power: 1W	
Modulation Type:	Analog:	FM
	Digital Data(DSC):	AFSK
Channel Separation:	Analog:	☒ 25kHz
	Digital Data(DSC):	☒ 25kHz
Emission Designator: *[1]	Analog:	16K0F3E
	Digital Data(DSC):	16K0G2B
Antenna Type:	detachable	

Note:

(1) *[1] According to FCC Part 2.202 requirements, the Necessary Bandwidth is calculated as follows:

- For FM Voice Modulation

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

  Bn = 2M + 2DK = 2*3 + 2*5*1 = **16 KHz**

  Emission designation: 16K0F3E

- Digital Data(DSC)

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

  Bn = 2M + 2DK = 2*3 + 2*5*1 = **16 KHz**

  Emission designation: 16K0G2B

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
156.025~162.025	CH_L (CH60)	156.025	160.625
	CH_M(CH16)	156.800	156.800
	CH_H(CH88)	157.425	162.025

■ VHF MARINE CHANNEL LIST USA - USA Channel Group , INT - International Channel Group , CAN - Canadian Channel Group

Channel Number			Frequency (MHz)		Channel Number			Frequency (MHz)		Channel Number			Frequency (MHz)		Channel Number			Frequency (MHz)	
USA	INT	CAN	Transmit	Receive	USA	INT	CAN	Transmit	Receive	USA	INT	CAN	Transmit	Receive	USA	INT	CAN	Transmit	Receive
	01	01	156.050	160.060		21	21	157.050	161.650	68	68	68	156.425	156.425	86A			157.325	157.325
01A			156.050	156.050	21A		21A	157.050	157.050	69	69	69	156.475	156.475	87	87	87	157.375	161.975
	02	02	156.100	160.700			21b	RX Only	161.650	70	70	70	RX Only	156.525	87A			157.375	157.375
	03	03	156.150	160.750		22		157.100	161.700	71	71	71	156.575	156.575	88	88	88	157.425	162.025
03A			156.150	156.150	22A		22A	157.100	157.100	72	72	72	156.625	156.625	88A			157.425	157.425
	04		156.200	160.800		23	23	157.150	161.750	73	73	73	156.675	156.675		A1*2		161.975	161.975
		04A	156.200	156.200	23A			157.150	157.150	74	74	74	156.725	156.725		A2*2		162.025	162.025
	05		156.250	160.850	24	24	24	157.200	161.800	75*1	75*1	75*1	156.775	156.775					
05A		05A	156.250	156.250	25	25	25	157.250	161.850	76*1	76*1	76*1	156.825	156.825					
06	06	06	156.300	156.300			25b	RX Only	161.850	77*1	77	77*1	156.875	156.875					
	07		156.350	160.950	26	26	26	157.300	161.900		78		156.925	161.525					
07A		07A	156.350	156.350	27	27	27	157.350	161.950	78A		78A	156.925	156.925					
08	08	08	156.400	156.400	28	28	28	157.400	162.000		79		156.975	161.575					
09	09	09	156.450	156.450			28b	RX Only	162.000	79A		79A	156.975	156.975					
10	10	10	156.500	156.500		60	60	156.025	160.625		80		157.025	161.625					
11	11	11	156.550	156.550		61		156.075	160.675	80A		80A	157.025	157.025					
12	12	12	156.600	156.600	61A		61A	156.075	156.075		81		157.075	161.675	Weather Channel	Frequency (MHz)			
13*1	13	13*1	156.650	156.650		62		156.125	160.725	81A		81A	157.075	157.075		Transmit	Receive		
14	14	14	156.700	156.700			62A	156.125	156.125		82		157.125	161.725	1	RX Only	162.550		
15*1	15*1	15*1	156.750	156.750		63		156.175	160.775	82A		82A	157.125	157.125	2	RX Only	162.400		
16	16	16	156.800	156.800	63A			156.175	156.175		83	83	157.175	161.775	3	RX Only	162.475		
17*1	17	17*1	156.850	156.850		64	64	156.225	160.825	83A		83A	157.175	157.175	4	RX Only	162.425		
	18		156.900	161.500	64A		64A	156.225	156.225			83b	RX Only	161.775	5	RX Only	162.450		
18A		18A	156.900	156.900		65		156.275	160.875	84	84	84	157.225	161.825	6	RX Only	162.500		
	19		156.950	161.550	65A	65A	65A	156.275	156.275	84A			157.225	157.225	7	RX Only	162.525		
19A		19A	156.950	156.950		66		156.325	160.925	85	85	85	157.275	161.875	8	RX Only	161.650		
20	20	20*1	157.000	161.600	66A	66A	66A*1	156.325	156.325	85A			157.275	157.275	9	RX Only	161.775		
20A			157.000	157.000	67*1	67	67	156.375	156.375	86	86	86	157.325	161.925	10	RX Only	163.275		

*1 Low power only. *2 Australian version only.

3.4 Operation mode

Test mode	Transmitting	Receiving	Power level		Analog Voice/PM
			High	Low	25kHz
TX-AWH	√		√		√
TX-AWL	√			√	√

Note:
√: is operation mode.

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.

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
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

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

4.2 Test Facility

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	FCC	762235

4.3 Environmental conditions

Atmospheric Contions	
Temperature:	21℃ to 25℃
Relative Humidity:	20 % to 75 %.
Atmospheric Pressure:	860 mbar to 1060 mbar
Norminal Test Voltage:	V_N = DC 13.8V
Extrem Test Voltage @115%V_N:	V_H = DC 15.18V
Extrem Test Voltage @85%V_N:	V_L = DC 11.22V

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 & Occupied Bandwidth	15Hz for <1GHz 70Hz for >1GHz	(1)
Conducted Output Power	0.51dB	(1)
ERP / EIRP / RSE	2.66dB for <1GHz 3.44dB for >1GHz	(1)
Conducted Emission 9KHz-30MHz	3.02dB	(1)
Radiated Emission 30~1000MHz	4.90dB	(1)
Radiated Emission 1~18GHz	4.96dB	(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)
Transient Frequency Behavior	6.8 %	(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

● TS8613 Test system							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Spectrum Analyzer	Agilent	HTWE0286	N9020A	MY50510187	2021/09/13	2022/09/12
●	Signal & Spectrum Analyzer	R&S	HTWE0262	FSW26	103440	2021/09/13	2022/09/12
●	RF Communication Test Set	HP	HTWE0038	8920A	3813A10206	2021/09/13	2022/09/12
○	Digital intercom communication tester	Aeroflex	HTWE0255	3920B	1001682041	2021/09/13	2022/09/12
●	Signal Generator	R&S	HTWE0191	SML02	100507	2021/09/13	2022/09/12
●	Signal Generator	R&S	HTWE0337	SMC100A	107268	2021/09/13	2022/09/12
●	RF Control Unit	Tonscend	HTWE0294	JS0806-2	N/A	N/A	N/A
●	Filter-VHF	Microwave	HTWE0309	N26460M1	498702	N/A	N/A
○	Filter-UHF	Microwave	HTWE0311	N25155M2	498704	N/A	N/A
●	Power Divider	Microwave	HTWE0043	OPD1040-N-4	N/A	2022/05/16	2023/05/15
●	Attenuator	JFW	HTWE0292	50FH-030-100	N/A	2022/05/16	2023/05/15
●	Attenuator	JFW	HTWE0293	50-A-MFN-20	0322	2022/05/16	2023/05/15
●	Test software	HTW	N/A	Radio ATE	N/A	N/A	N/A

● Auxiliary Equipment							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Climate chamber	ESPEC	HTWE0254	GPL-2	N/A	2021/09/14	2022/09/13
●	DC Power Supply	Gwinstek	HTWE0274	SPS-2415	GER835793	N/A	N/A

● Radiated Spurious Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	C11121	2018/09/27	2022/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2021/09/13	2022/09/12
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2021/11/05	2022/11/04
●	Broadband Preamplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0119-05	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	EMI Test Software	Audix	N/A	E3	N/A	N/A	N/A

5 TEST CONDITIONS AND RESULTS

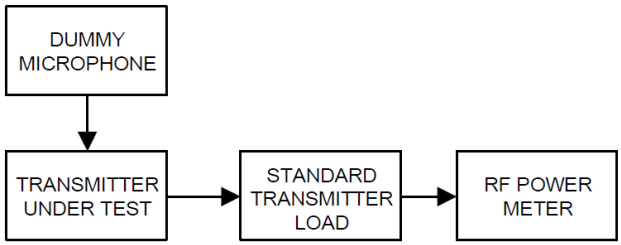
5.1 Conducted Carrier Output Power

LIMIT

FCC Part 80.215， FCC Part 2.1046

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

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

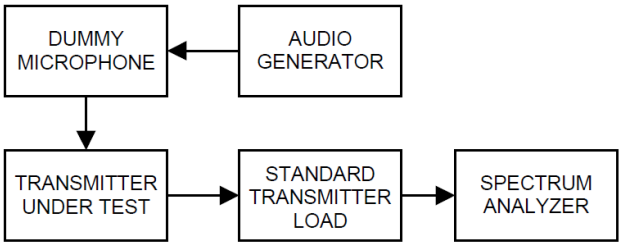
FCC Part 80.205, FCC Part 2.1049

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]	16KOF1B	20.0
F1C	2K80F1C	3.0
F1D[12]	16K0F1D	20.0
F2B[6]	16KOF2B	20.0
F2C[7]	16KOF2C	20.0
F2D[12]	16K0F2D	20.0
F3C	2K80F3C	3.0
F3C[7]	16KOF3C	20.0
F3E[8]	16KOF3E	20.0

[8]Applicable only when maximum frequency deviation is 5 kHz. See also paragraph (b) of this section.

TEST CONFIGURATION

Test setup for Analog:



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 × OBW is sufficient)

RBW = 1% to 5% of the anticipated OBW, VBW ≥ 3 × 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),FCC Part 2.1049

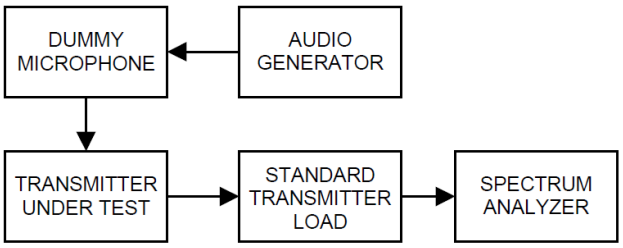
(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;

(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 10log10 (mean power in watts) dB.

TEST CONFIGURATION

Test setup for Analog:



TEST PROCEDURE

1) Connect the equipment as illustrated.
2) Spectrum set as follow:
   Centre frequency = fundamental frequency, span=120kHz for 12.5kHz channel spacing,
   RBW=100Hz, 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**

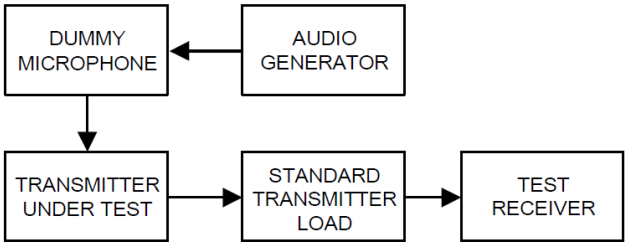
Please refer to appendix C on the section 8 appendix report

5.4 Modulation Limit

LIMIT

FCC Part 80.213,FCC Part 2.1047(b)
5kHz for 25 KHz Channel Spacing System

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 ≥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 +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.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

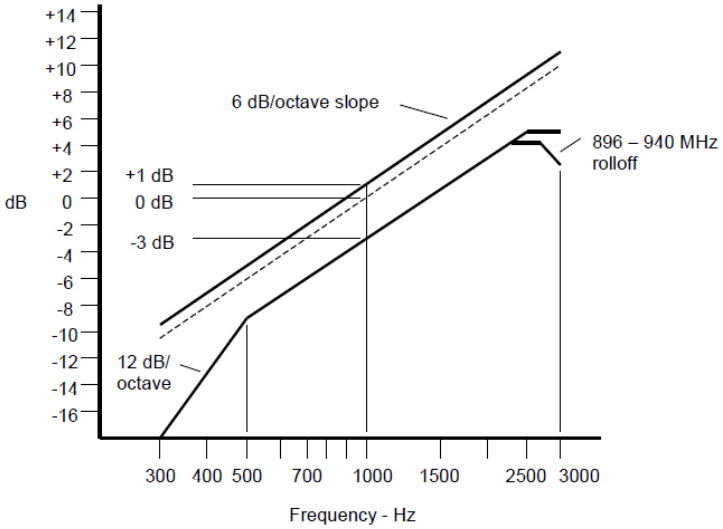
☒ **Passed** ☐ **Not Applicable**

Please refer to appendix D on the section 8 appendix report

5.5 Audio Frequency Response

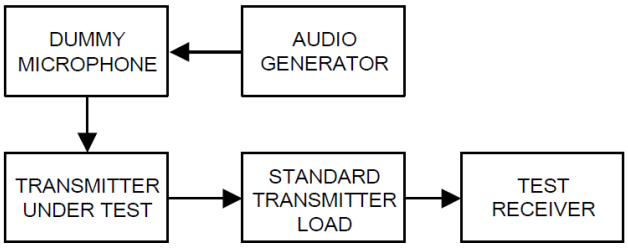
LIMIT

FCC Part 80.213(e) ,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:
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**

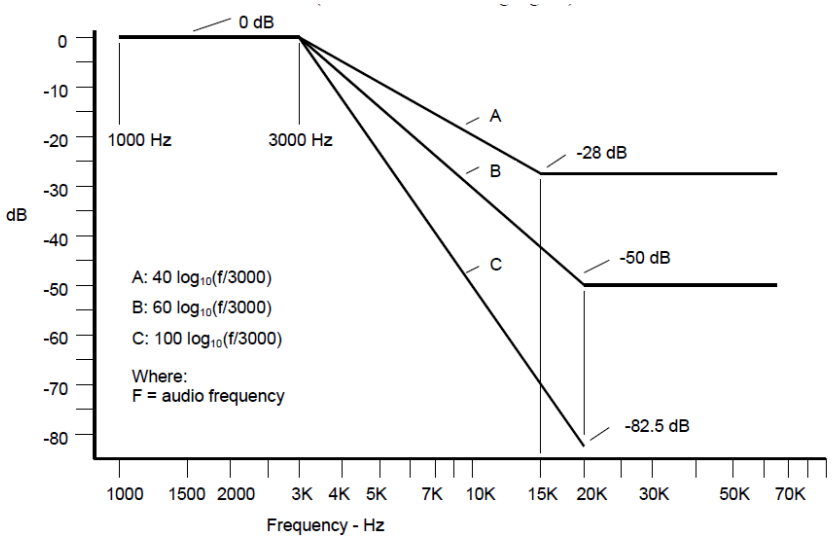
Please refer to appendix E on the section 8 appendix report

5.6 Audio Low Pass Filter Response

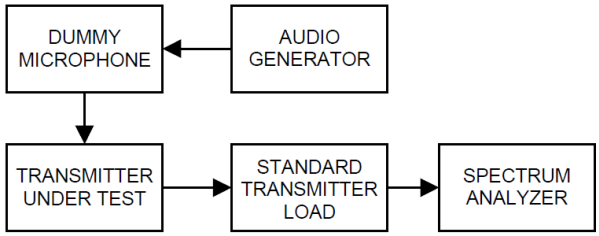
LIMIT

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 60log10(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**

TEST DATA

Please refer to appendix F on the appendix report

5.7 Frequency stability VS Temperature

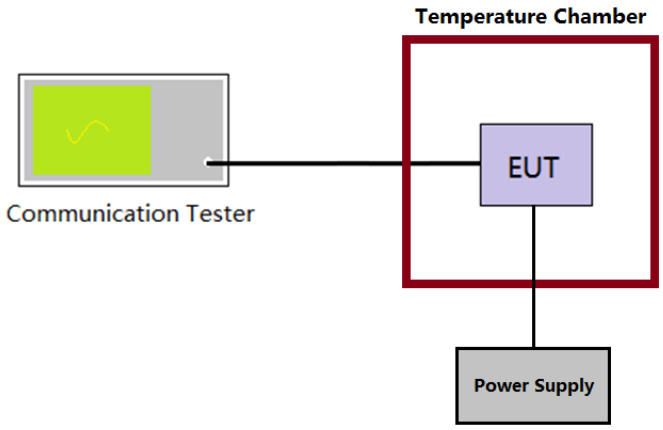
LIMIT

FCC Part 80.209， FCC Part 2.1055

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.

[7]For 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:
ppm error=$(MCF_{MHz}/ACF_{MHz}-1)*10^6$
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°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

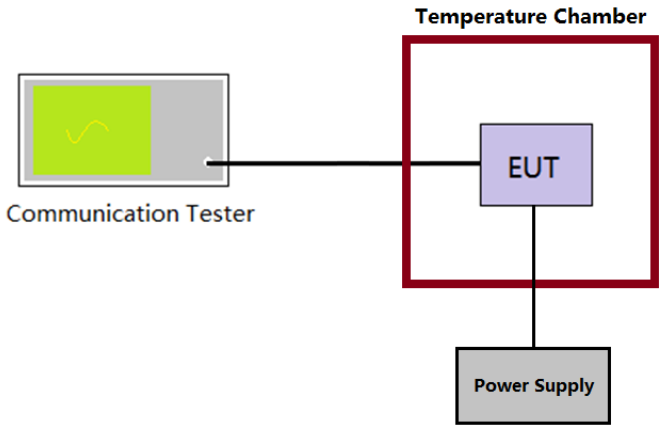
LIMIT

FCC Part 80.209， FCC Part 2.1055

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.

[7]For 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:
   $ppm\ error=(MCF_{MHZ}/ACF_{MHZ}-1)*10^6$
   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 varied ±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 G on the section 8 appendix report

5.9 Transmit Conducted Spurious Emission

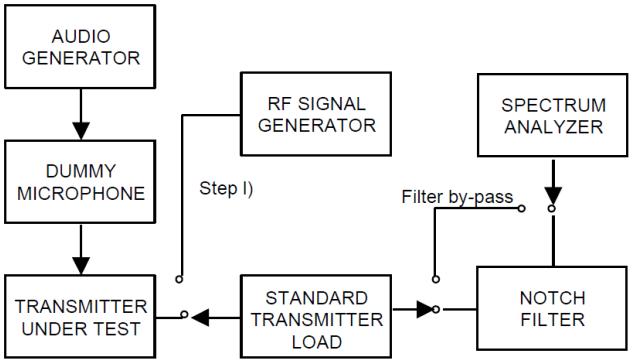
LIMIT

FCC Part 80.211(f)(3), FCC Part 2.1051

FCC Rules	Attenuation Limit (dBc)
§ 80.211(f)(3)	At least 43 +10log10 (mean power in watts) dB

43 + 10 log (Pwatts)
Calculation: Limit (dBm) =EL-43-10log10 (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(dBm)-43-10 log (Pwatts) = -13 dBm

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**

Please refer to appendix I on the section 8 appendix report

5.10 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

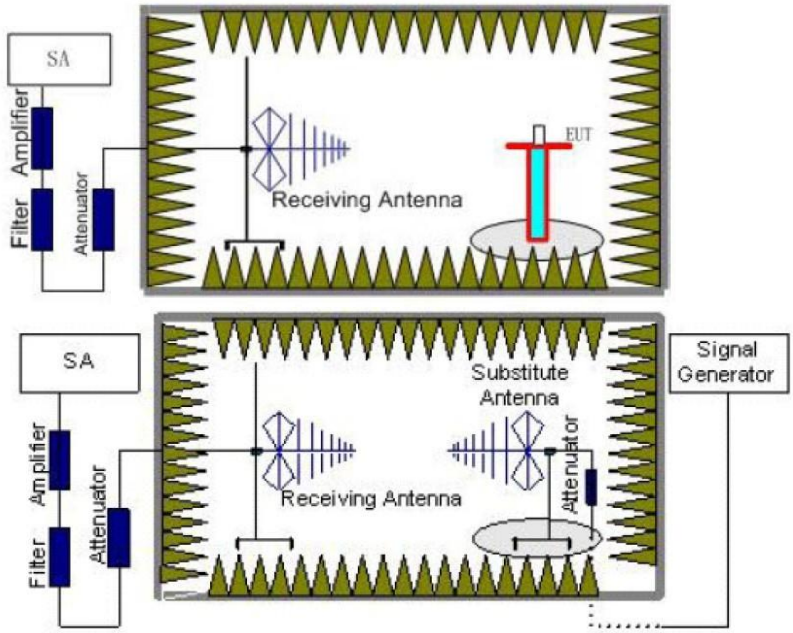
FCC Part 80.211(f)(3), FCC Part 2.1051

FCC Rules	Attenuation Limit (dBc)
§ 80.211(f)(3)	At least 43 +10log10 (mean power in watts) dB

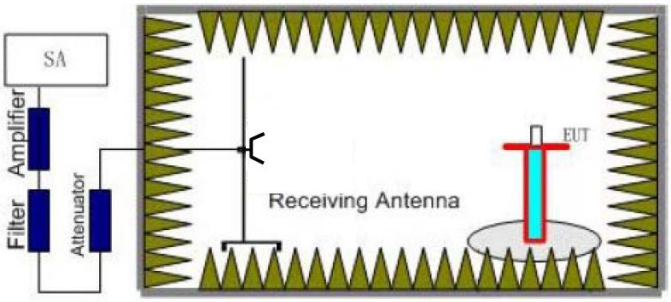
43 + 10 log (Pwatts)
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is P(dBm).
Limit (dBm) = P(dBm)-43-10 log (Pwatts) = -13 dBm

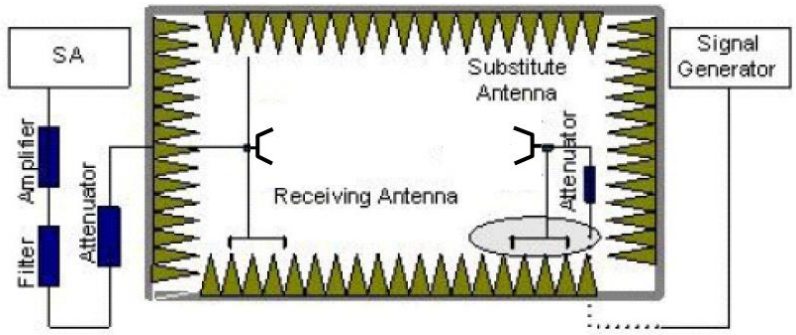
TEST CONFIGURATION

Below 1GHz:



Above 1GHz:





TEST PROCEDURE

1. Place the EUT in the center of the turntable.
   a) For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
   b) For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
2. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
3. The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
4. Receiver or Spectrum set as follow:
   Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto
   Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto
5. Each emission under consideration shall be evaluated:
   a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
   b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
   c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
   d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
   e) Record the measured emission amplitude level and frequency
6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
7. Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
10. For each emission that was detected and measured in the initial test
    a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
    b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
    c) Record the output power level of the signal generator when equivalence is achieved in step b).
11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.
12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:
    Pe = Ps(dBm) − cable loss (dB) + antenna gain (dBd)
    where
    Pe = equivalent emission power in dBm
    Ps = source (signal generator) power in dBm
    NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.
13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:
    gain (dBd) = gain (dBi) − 2.15 dB.
    If necessary, the antenna gain can be calculated from calibrated antenna factor information

14. Provide the complete measurement results as a part of the test report.

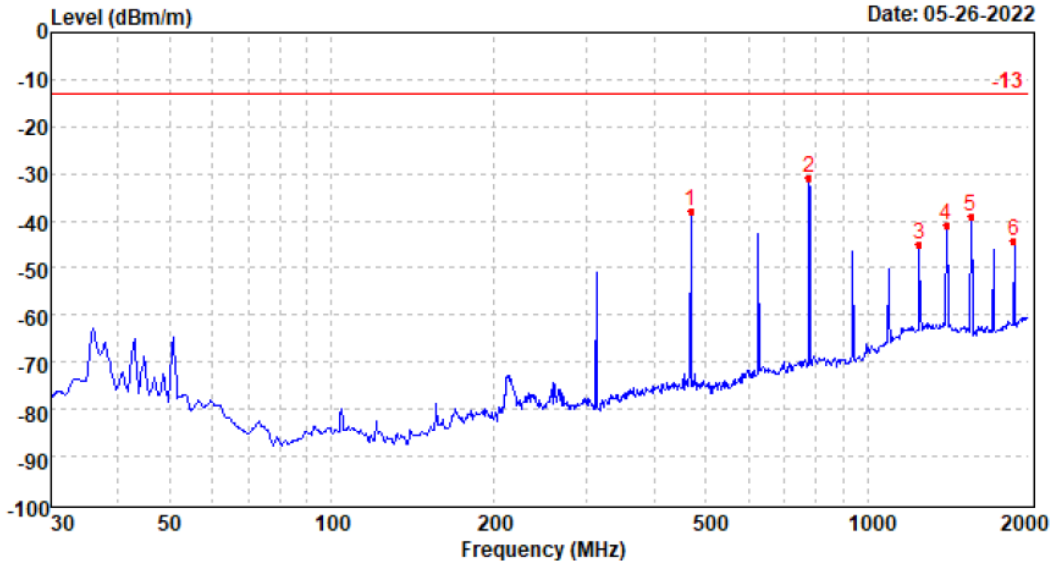
TEST MODE

Please reference to the section 3.4

TEST RESULTS

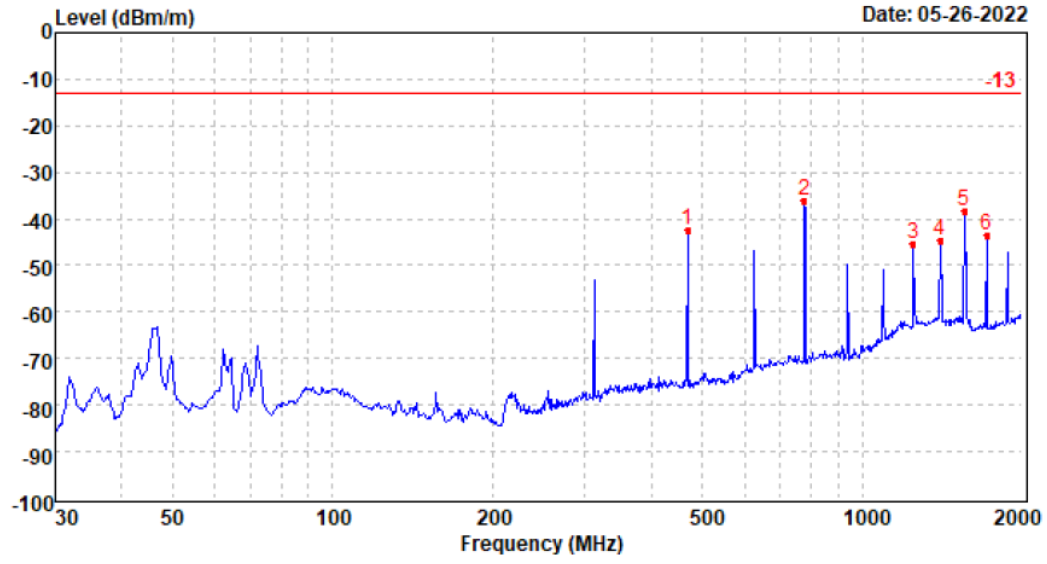
☒ **Passed** ☐ **Not Applicable**

TEST MODE	TX-AWH	Test Channel:	CH_L	Polarity:	Horizontal



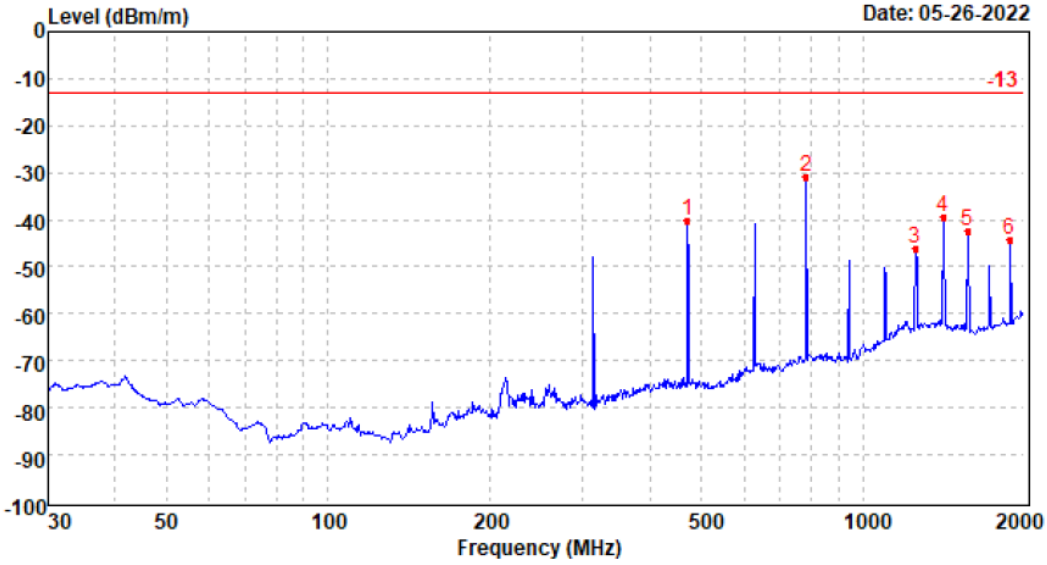
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	467.59	-42.63	25.59	9.45	30.45	-38.04	-13.00	-25.04	Peak
2	778.59	-40.94	29.74	10.51	30.05	-30.74	-13.00	-17.74	Peak
3	1248.33	-49.24	36.84	3.95	36.65	-45.10	-13.00	-32.10	Peak
4	1404.45	-45.68	37.13	4.18	36.60	-40.97	-13.00	-27.97	Peak
5	1560.49	-42.72	36.18	4.41	36.95	-39.08	-13.00	-26.08	Peak
6	1872.55	-49.33	37.62	4.85	37.24	-44.10	-13.00	-31.10	Peak

TEST MODE	TX-AWH	Test Channel:	CH_L	Polarity:	Vertical



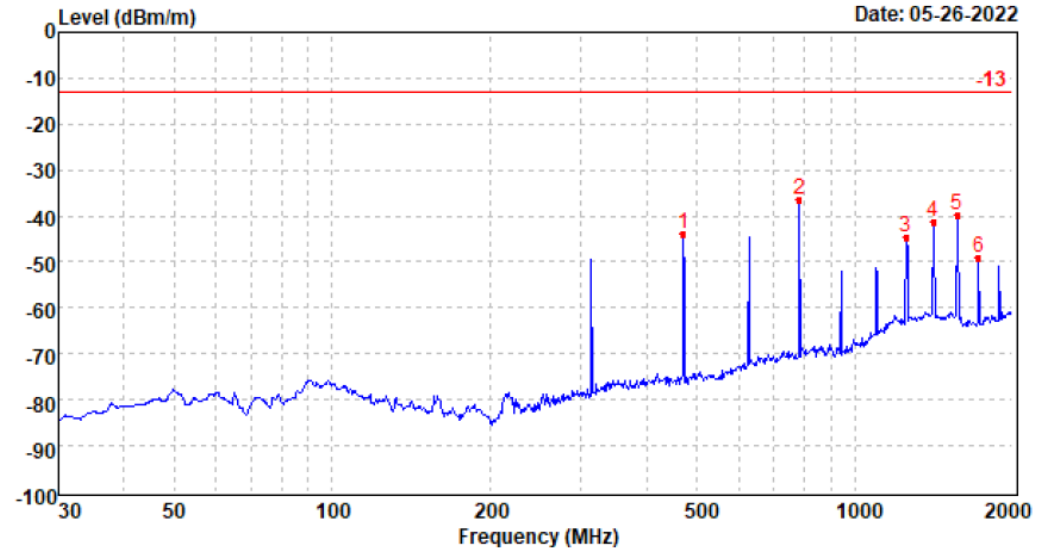
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	467.59	-46.77	25.25	9.45	30.45	-42.52	-13.00	-29.52	Peak
2	778.59	-45.61	29.27	10.51	30.05	-35.88	-13.00	-22.88	Peak
3	1248.33	-49.55	37.08	3.95	36.65	-45.17	-13.00	-32.17	Peak
4	1404.45	-49.85	37.76	4.18	36.60	-44.51	-13.00	-31.51	Peak
5	1560.49	-43.42	37.76	4.41	36.95	-38.20	-13.00	-25.20	Peak
6	1717.13	-47.02	36.28	4.64	37.30	-43.40	-13.00	-30.40	Peak

TEST MODE	TX-AWH	Test Channel:	CH_M	Polarity:	Horizontal



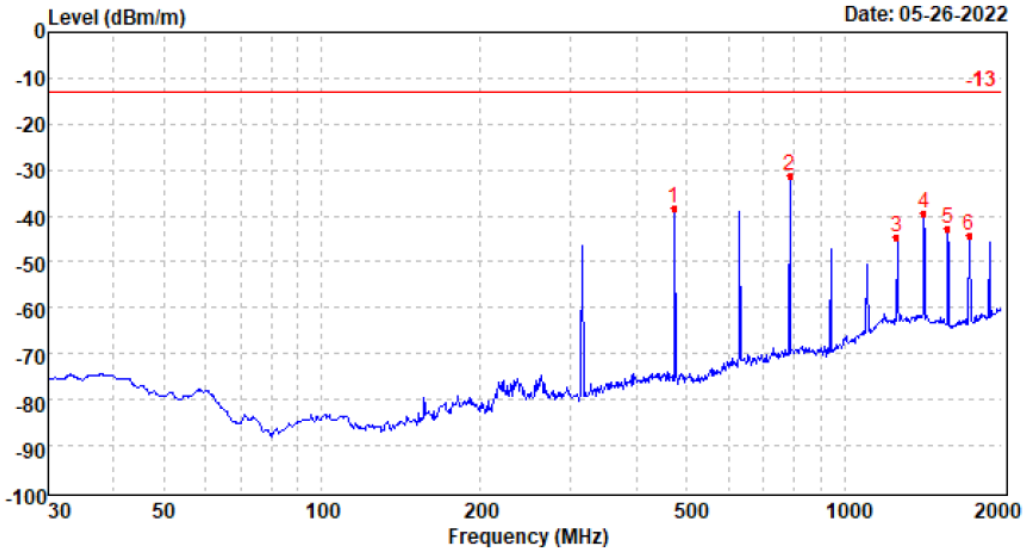
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	469.24	-44.63	25.53	9.45	30.45	-40.10	-13.00	-27.10	Peak
2	784.08	-41.23	29.80	10.52	30.02	-30.93	-13.00	-17.93	Peak
3	1254.40	-50.44	36.85	3.96	36.62	-46.25	-13.00	-33.25	Peak
4	1411.28	-44.02	37.09	4.19	36.64	-39.38	-13.00	-26.38	Peak
5	1568.08	-45.80	36.14	4.42	36.98	-42.22	-13.00	-29.22	Peak
6	1881.65	-49.68	37.73	4.87	37.21	-44.29	-13.00	-31.29	Peak

TEST MODE	TX-AWH	Test Channel:	CH_M	Polarity:	Vertical



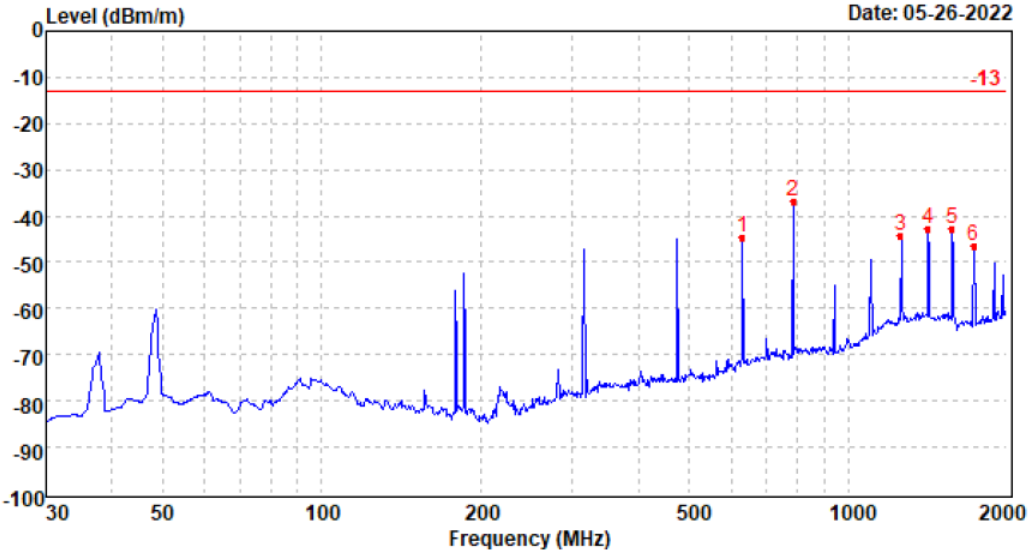
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	469.24	-48.34	25.32	9.45	30.45	-44.02	-13.00	-31.02	Peak
2	784.08	-46.17	29.31	10.52	30.02	-36.36	-13.00	-23.36	Peak
3	1254.40	-48.87	37.10	3.96	36.62	-44.43	-13.00	-31.43	Peak
4	1411.28	-46.51	37.76	4.19	36.64	-41.20	-13.00	-28.20	Peak
5	1568.08	-45.08	37.76	4.42	36.98	-39.88	-13.00	-26.88	Peak
6	1725.48	-52.60	36.30	4.65	37.32	-48.97	-13.00	-35.97	Peak

TEST MODE	TX-AWH	Test Channel:	CH_H	Polarity:	Horizontal



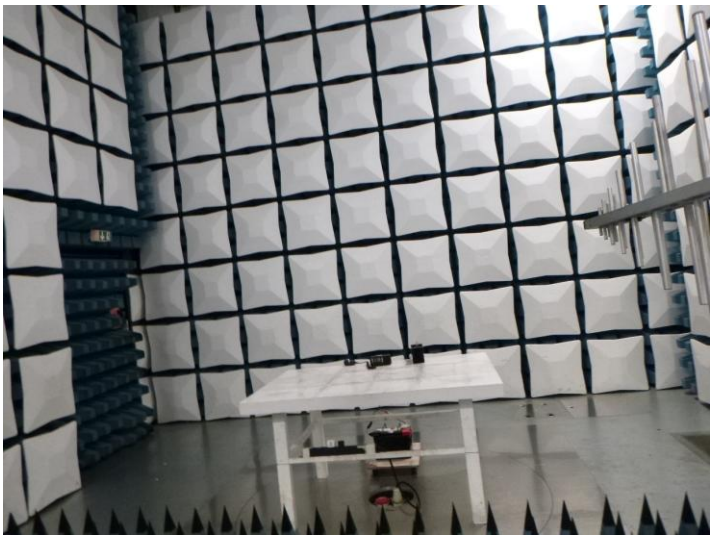
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	472.55	-42.83	25.42	9.47	30.45	-38.39	-13.00	-25.39	Peak
2	786.85	-41.40	29.81	10.52	30.01	-31.08	-13.00	-18.08	Peak
3	1259.63	-48.91	36.87	3.97	36.59	-44.66	-13.00	-31.66	Peak
4	1417.16	-44.17	37.05	4.20	36.64	-39.56	-13.00	-26.56	Peak
5	1574.62	-46.38	36.10	4.43	37.02	-42.87	-13.00	-29.87	Peak
6	1731.47	-48.14	36.47	4.66	37.33	-44.34	-13.00	-31.34	Peak

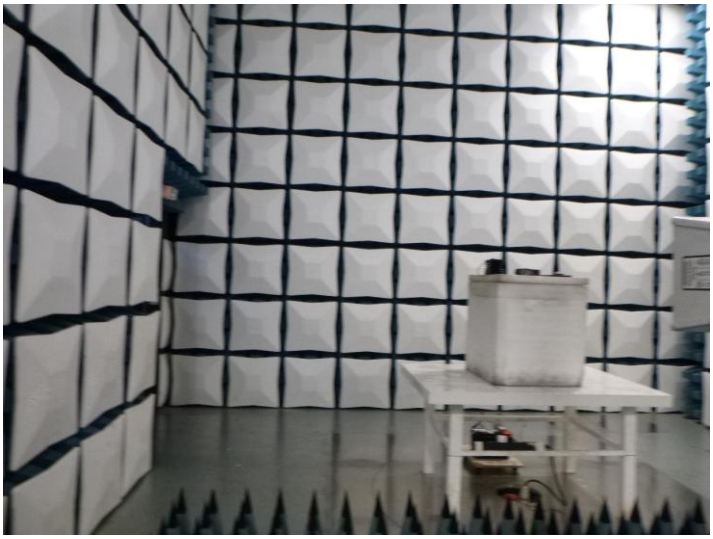
TEST MODE	TX-AWH	Test Channel:	CH_H	Polarity:	Vertical

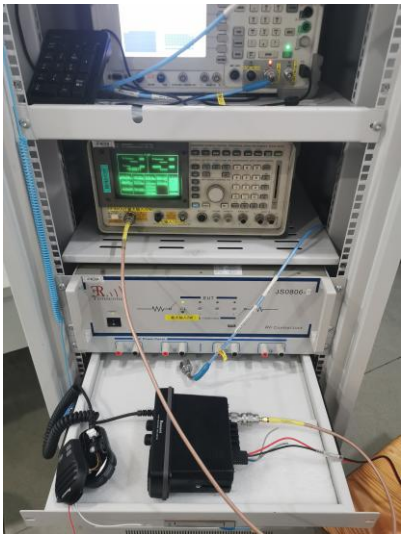


Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	630.49	-52.64	28.14	10.01	30.23	-44.72	-13.00	-31.72	Peak
2	786.85	-46.58	29.32	10.52	30.01	-36.75	-13.00	-23.75	Peak
3	1259.63	-48.57	37.13	3.97	36.59	-44.06	-13.00	-31.06	Peak
4	1417.16	-47.96	37.76	4.20	36.64	-42.64	-13.00	-29.64	Peak
5	1574.62	-47.76	37.76	4.43	37.02	-42.59	-13.00	-29.59	Peak
6	1731.47	-49.96	36.31	4.66	37.33	-46.32	-13.00	-33.32	Peak

6 TEST SETUP PHOTOS OF THE EUT

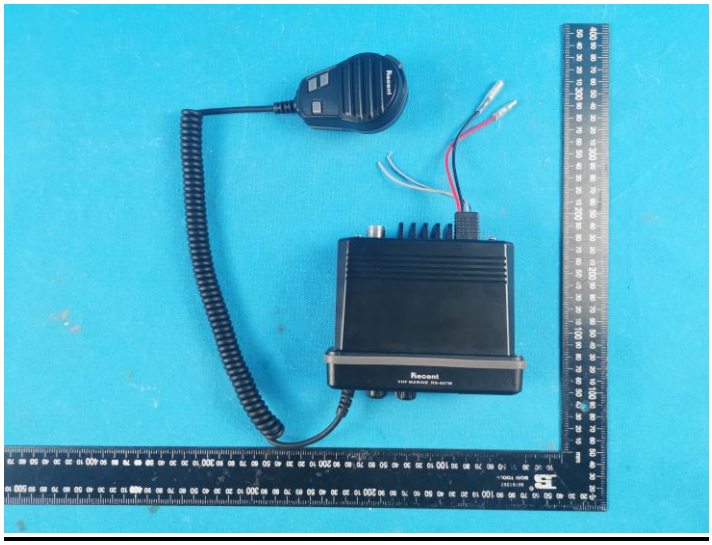


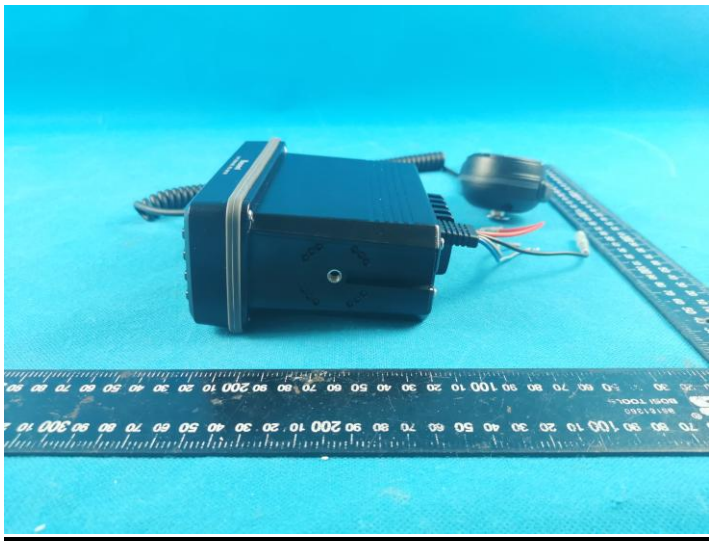




7 EXTERNAL AND INTERNAL PHOTOS OF THE EUT

External Photos



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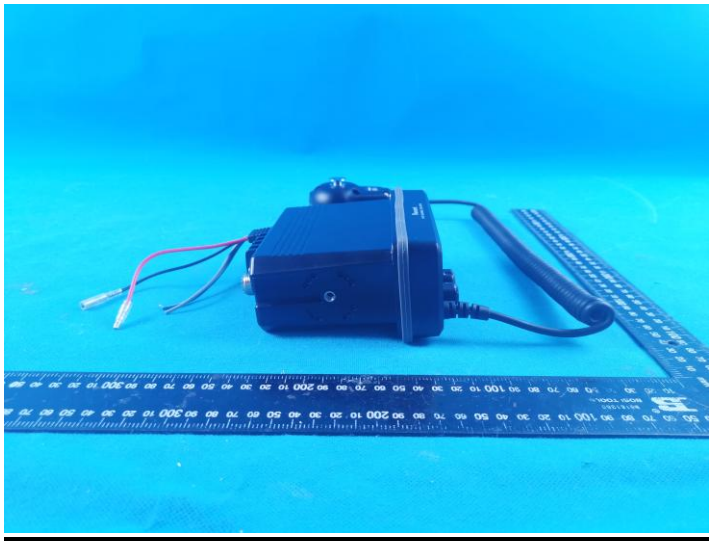
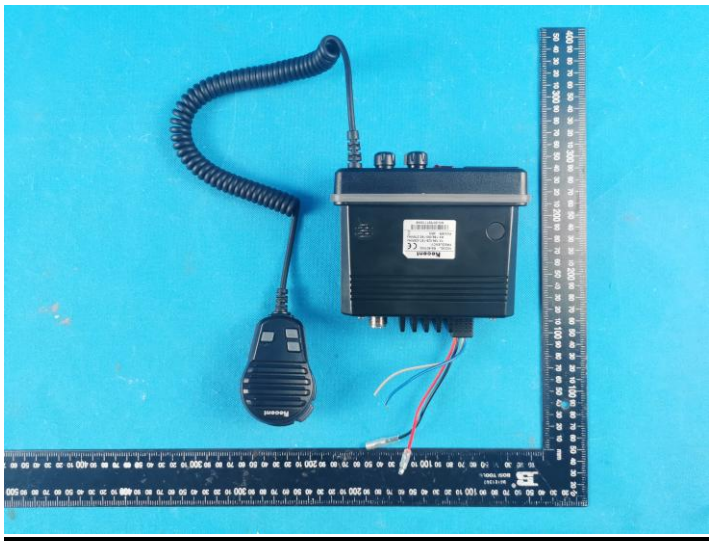
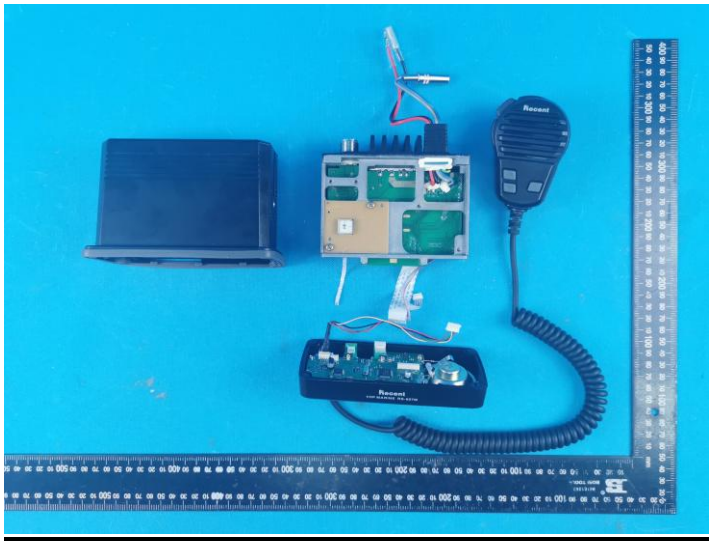
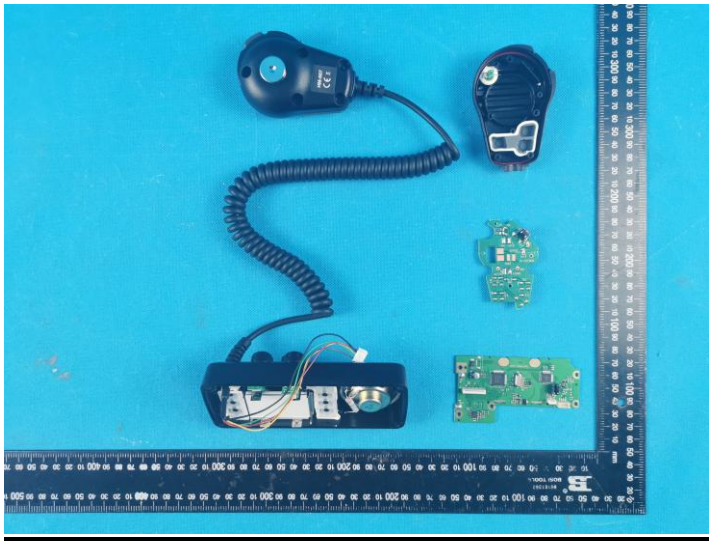
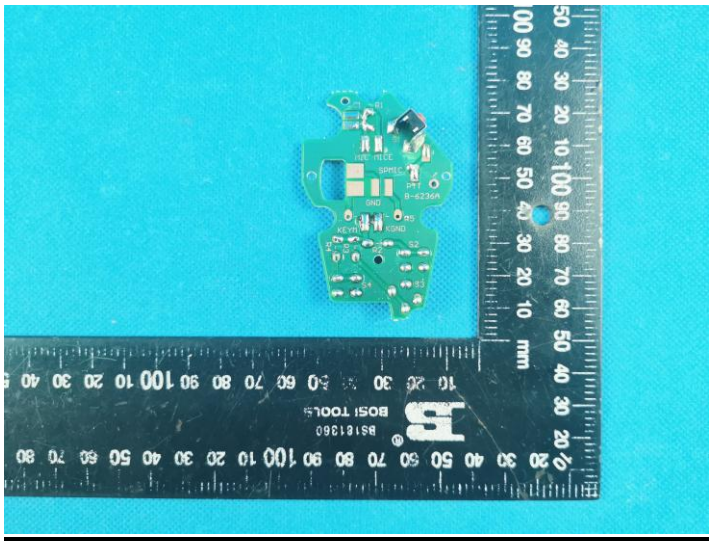


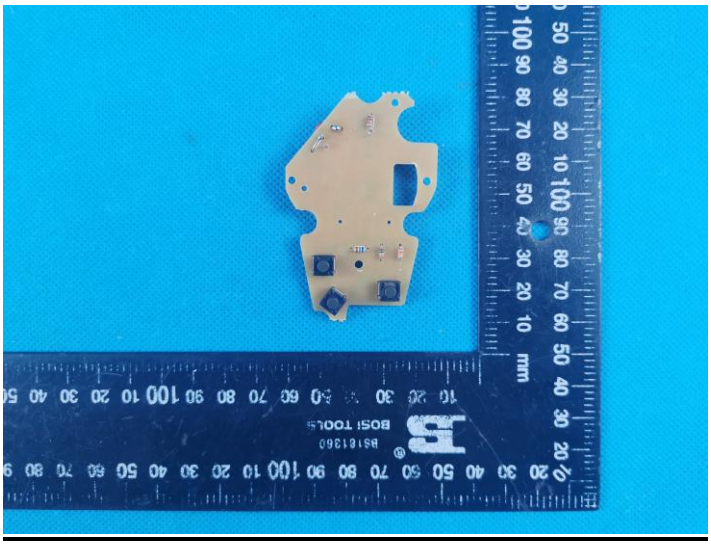


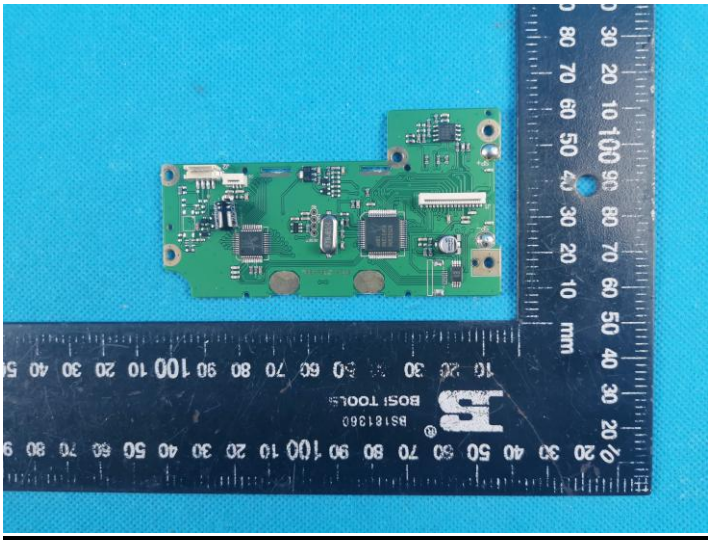
Internal Photos

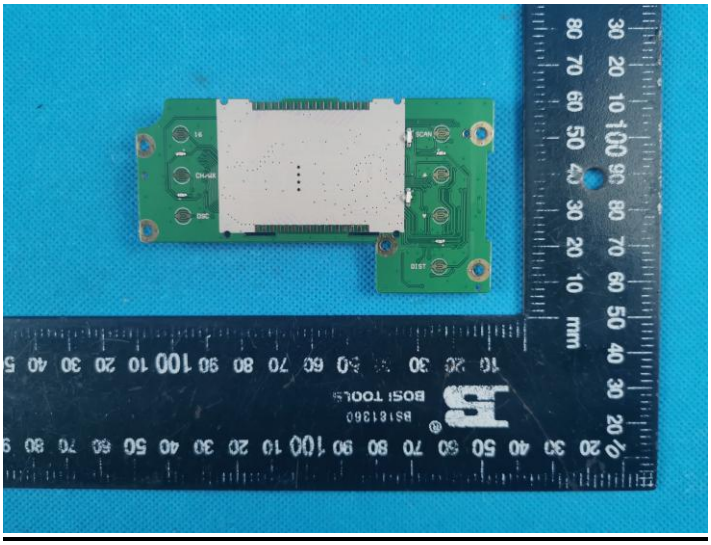


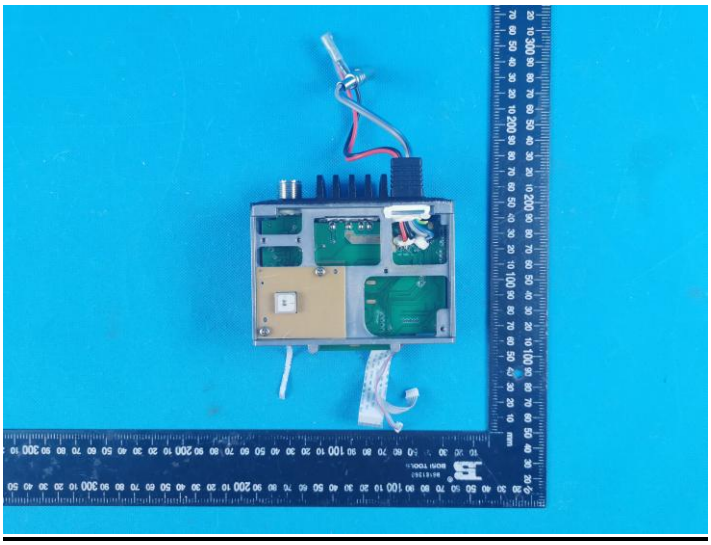


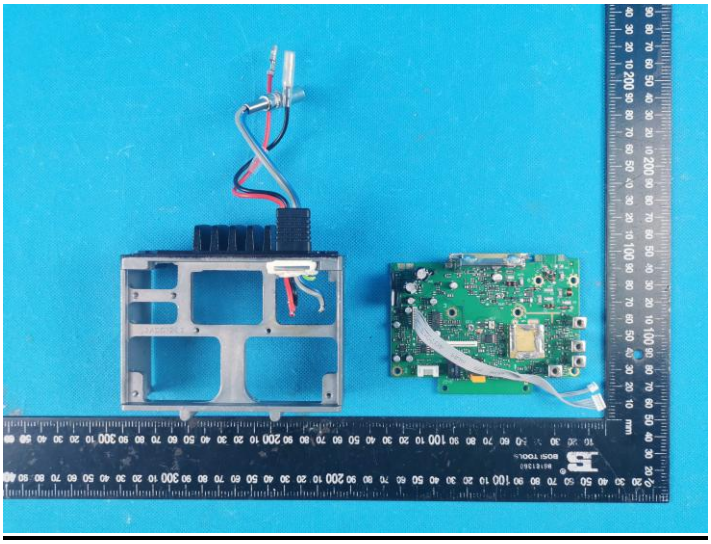


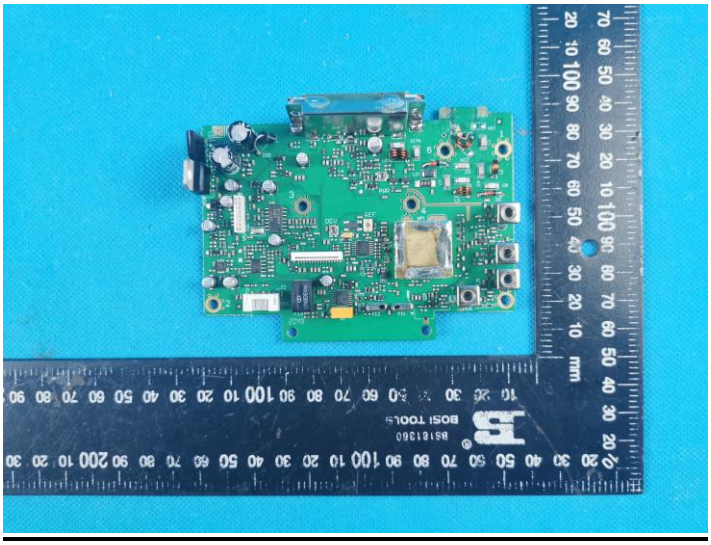


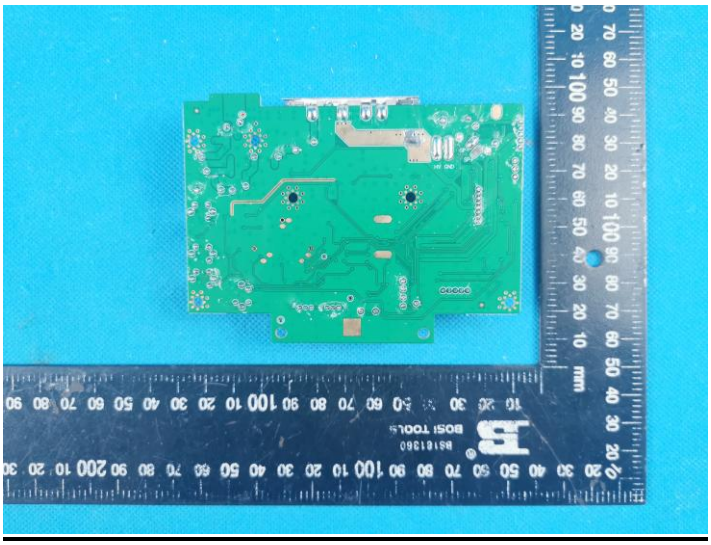


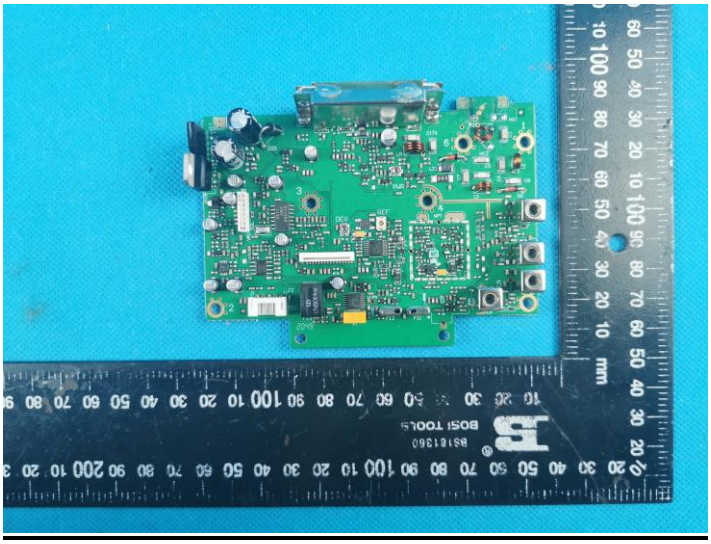


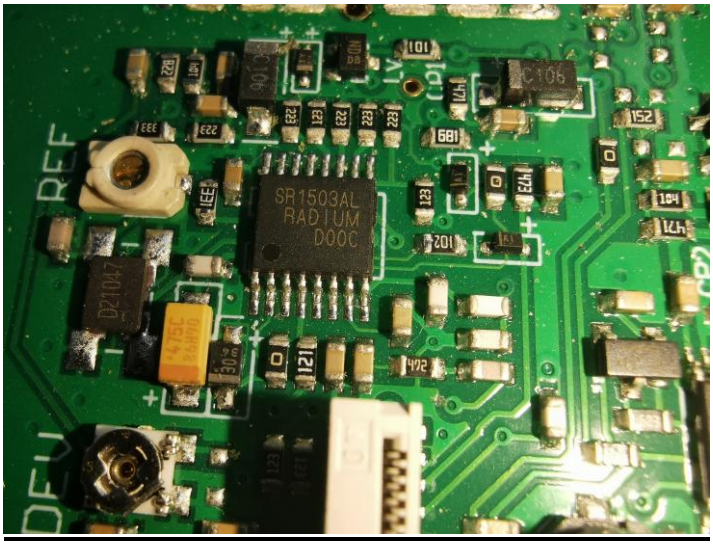












8 APPENDIX REPORT