



TEST REPORT

Report Reference No.: **TRE1712015901** R/C.....: 75040

FCC ID: **P6NDR-9200V**

Applicant's name: **Shenzhen HQT Science&Technology Co., Ltd.**

Address: 5/F, East of Building M-8, Central Zone, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China

Manufacturer.....: Shenzhen HQT Science&Technology Co., Ltd.

Address.....: 5/F, East of Building M-8, Central Zone, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China

Test item description: **Digital Repeater Radio**

Trade Mark: HQT

Model/Type reference: DR-9200

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

Standard.....: **FCC Part 90/FCC Part 2**

Date of receipt of test sample.....: Dec. 18, 2017

Date of testing.....: Dec. 19, 2017 – Jan. 09, 2018

Date of issue.....: Jan. 09, 2018

Result: **PASS**

Compiled by
(position+printed name+signature) .: File administrators Shayne Zhu

Shayne Zhu

Supervised by
(position+printed name+signature) .: Project Engineer Jerry Wang

Jerry Wang

Approved by
(position+printed name+signature) .: RF Manager Hans Hu

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

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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 90](#): Private land mobile radio services.

[TIA/EIA 603 D: June 2010](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

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

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

[KDB579009 D03 v01](#): Applications Part 90 Refarming Bands.

[KDB971168 D01 v02r02](#): MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS.

1.2. Report version

Version No.	Date of issue	Description
00	Jan. 09, 2018	Original

2. Test Description

Transmitter Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Maximum Transmitter Power	FCC Part 90.205, FCC Part 2.1046	☒	
Modulation Characteristic	FCC Part 90.207, FCC Part 2.1047	☒	
Occupied Bandwidth	FCC Part 90.209, FCC Part 90.210, FCC Part 2.1049	☒	
Emission Mask	FCC Part 90.209, FCC Part 90.210, FCC Part 2.1049	☒	
Frequency Stability	FCC Part 90.213, FCC Part 2.1055	☒	
Transmitter Frequency Behavior	FCC Part 90.214	☒	
Transmitter Radiated Spurious Emission	FCC Part 90.210, FCC Part 2.1053	☒	
Spurious Emission On Antenna Port	FCC Part 90.210, FCC Part 2.1051	☒	
Receiver Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Conducted Emission	FCC Part 15.107	☒	
Radiated Emission	FCC Part 15.109	☒	

3. SUMMARY

3.1. Client Information

Applicant:	Shenzhen HQT Science&Technology Co., Ltd.
Address:	5/F, East of Building M-8, Central Zone, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen HQT Science&Technology Co., Ltd.
Address:	5/F, East of Building M-8, Central Zone, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China

3.2. Product Description

Name of EUT:	Digital Repeater Radio	
Trade mark:	HQT	
Model/Type reference:	DR-9200	
Listed model(s):	-	
Power supply:	DC13.6V/ AC110V	
Battery information:	-	
Charger information:	-	
Adapter information:	-	
Operation Frequency Range:	From 136MHz to 174MHz	
Rated Output Power:	High Power: 50W (46.99dBm)/Low Power: 25W (43.98dBm)	
Modulation Type:	Analog Voice:	FM
	Digital Voice /Digital Data:	4FSK
Digital Type:	DMR	
Channel Separation:	Analog Voice:	☒ 12.5kHz
	Digital Voice /Digital Data:	☒ 12.5kHz ☐ 6.25kHz
Emission Designator:	Analog Voice:	☒ 12.5kHz Channel Separation: 5K28F3E ☐ 25kHz Channel Separation: ---
	Digital Voice& Data:	☒ 12.5kHz Channel Separation: 7K63FXW ☐ 6.25kHz Channel Separation: ---
	Digital Data:	☒ 12.5kHz Channel Separation: 7K63FXD ☐ 6.25kHz Channel Separation: ---
Support data rate:	9.6kbps	
Antenna Type:	External	
Maximum Transmitter Power:	Digital	48.98W for 12.5kHz Channel Separation
	Analog	45.60W for 12.5kHz Channel Separation

Note:

- 1)The product has the same digital working characters when operating in both two digitized voice/data mode. So only one set of test results for digital modulation modes are provided in this test report.

2) This equipment is capable of supporting a minimum data rate of 4800 bits per second per 6.25 kHz of channel bandwidth. DMR interphone's bandwidth is 12.5 kHz, and it has a double time slot, one is the speech time slot, one is the data time slot, just language sequence is satisfied with 4800 bps/6.25 kHz BW.

3.3. Test frequency list

Mode	Modulation	Operation Frequency Range (MHz)	Test Frequency (MHz)
Analog	FM	136-174	CH _L 136.0125
			CH _M 155.0125
			CH _H 173.9875
Digital	4FSK	136-174	CH _L 136.0125
			CH _M 155.0125
			CH _H 173.9875

Note:

In section KDB 634817 D01 Sections II)f)1) and 2):

- (1) Test only on the allowed frequencies.
- (2) Test at least one frequency in each band for each rule part applied under and ensure the device is capable of operating on the frequency under each rule part. This requirement may result in testing on multiple frequencies. Testing on one frequency may be acceptable if multiple listed bands for a rule part with a continuous frequency range are split to remove a conflict with other rules and the technical requirements in the split bands are the same. Additional requirements for RF exposure may apply.

3.4. EUT operation mode

Test mode	Transmitting	Receiving	Power level		Digital	Analog
			High	Low	12.5kHz	12.5kHz
TX1	√		√		√	
TX2	√			√	√	
TX3	√		√			√
TX4	√			√		√
RX1		√			√	
RX2		√				√

√: is operation mode.

3.5. EUT configuration

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

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

●	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/IEC 17025: 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 with Registration No. 762235.

IC-Registration No.: 5377B-1

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

ACA

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

4.3. Environmental conditions

Normal Condition	
Relative humidity:	20 % to 75 %.
Air Pressure:	950~1050mba
Voltage:	DC13.6V/ AC110V

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)
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

Conducted Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
Artificial Mains	SCHWARZBECK	NNLK 8121	573	11/11/2017
EMI Test Receiver	R&S	ESCI	101247	11/11/2017
Pulse Limiter	R&S	ESH3-Z2	101488	11/11/2017
Test Software	R&S	ES-K1	N/A	N/A
RF COMMUNICATION TEST SET	HP	8920A	3813A10 206	11/11/2017
Digital intercom COMM.TESRER	Aeroflex	3920B	1001682 041	11/11/2017
RF Connection Cable	HUBER+SUHNER	EF400	N/A	11/21/2017

Modulation Characteristic				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
RF COMMUNICATION TEST SET	HP	8920A	3813A10 206	11/11/2017
RF Cable	Chengdu E-Microwave	----	----	11/11/2017

Frequency Stability				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
RF COMMUNICATION TEST SET	HP	8920A	3813A10 206	11/11/2017
Digital intercom COMM.TESRER	Aeroflex	3920B	1001682 041	11/11/2017
Signal Generator	R&S	SML02	100507	11/11/2017
Climate Chamber	ESPEC	GPL-2	----	11/10/2017
RF Cable	Chengdu E-Microwave	----	----	11/11/2017

Transient Frequency Behavior				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
RF Communication Test Set	HP	8920A	3813A10 206	11/11/2017
Digital intercom COMM.TESRER	Aeroflex	3920B	1001682 041	11/11/2017
RF Communication Test Set	HP	8920A	3813A10 206	11/11/2017
Spectrum Analyzer	R&S	FSW26	103440	11/11/2017

Transmitter Radiated Spurious Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	538	04/05/2017
Emi Test Receiver	R&S	ESCI	101247	11/11/2017
Pre-amplifier	SCHWARZBECK	BBV 9742	N/A	11/22/2017
Turntable	Maturo Germany	TT2.0-1T	N/A	N/A
Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A
Test Software	R&S	ES-K1	N/A	N/A
Active Rod Antenna	BEIJING Radio	ZN30800	N/A	N/A
Loop Antenna	R&S	HFH2-Z2	100020	11/20/2017
RF Connection Cable	HUBER+SUHNER	N/A	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	11/21/2017
Horn Antenna	SCHWARZBECK	9120D	1011	03/27/2017
Spectrum Analyzer	R&S	FSP40	100597	11/11/2017
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-248	10/18/2017
RF Connection Cable	HUBER+SUHNER	MULTIFLEX 141	N/A	11/21/2017
Turntable	Maturo Germany	TT2.0-1T	N/A	N/A
Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A
Test Software	R&S	E3	N/A	N/A
Pre-amplifier	SCHWARZBECK	BBV 9743	9743-0022	10/18/2017
RF Connection Cable	HUBER+SUHNER	3m 18GHz S Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	3m 3GHz S Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	3m 3GHz RG Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	6m 18GHz S Serisa	N/A	11/21/2017
RF Connection Cable	HUBER+SUHNER	6m 18GHz S Serisa	N/A	N/A
RF Connection Cable	HUBER+SUHNER	3m 18GHz S Serisa	N/A	N/A

Maximum Transmitter Power & Spurious Emission On Antenna Port & Occupied Bandwidth & Emission Mask				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal. (mm/dd/yy)
Spectrum Analyzer	R&S	FSW26	103440	11/11/2017
Attenuator	Chengdu E-Microwave	EMCAXX-10RNZ-3	----	11/11/2017
RF COMMUNICATION TEST SET	HP	8920A	3813A10 206	11/11/2017
Digital intercom COMM.TESRER	Aeroflex	3920B	1001682 041	11/11/2017
High-Pass Filter	OCEN	OSP-HPF26300P20-LC	----	11/11/2017
High-Pass Filter	OCEN	OSP-HPF60300P20-LC	----	11/11/2017
RF Control Unit	Tonscend	JS0806-2	N/A	11/11/2017

The calibration interval was one year.

5. TEST CONDITIONS AND RESULTS

5.1. Maximum Transmitter Power

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

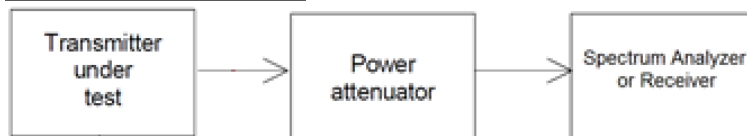
LIMIT

FCC Part 90.205, FCC Part 2.1046

Maximum ERP is dependent upon the station's antenna HAAT and required service area.

The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

TEST CONFIGURATION



TEST PROCEDURE

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

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

Connect the equipment as illustrated.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Power supply @DC13.6V:

Operation Mode	Test Channel	Measured power (dBm)	Measured power (W)	Limit (W)
TX1	CH _L	46.3	42.66	40~60
	CH _M	46.8	47.86	
	CH _H	46.9	48.98	
TX2	CH _L	44.0	25.18	20~30
	CH _M	43.8	23.99	
	CH _H	43.7	23.55	
TX3	CH _L	46.3	42.46	40~60
	CH _M	46.3	42.95	
	CH _H	46.4	43.75	
TX4	CH _L	44.0	24.89	20~30
	CH _M	43.8	24.21	
	CH _H	43.9	24.27	

Power supply @AC 110V:

Operation Mode	Test Channel	Measured power (dBm)	Measured power (W)	Limit (W)
TX1	CH _L	46.5	44.67	40~60
	CH _M	46.9	48.98	
	CH _H	46.6	45.71	
TX2	CH _L	43.9	24.66	20~30
	CH _M	44.0	25.00	
	CH _H	43.9	24.38	
TX3	CH _L	46.3	42.36	40~60
	CH _M	46.6	45.60	
	CH _H	46.4	43.15	
TX4	CH _L	43.8	24.21	20~30
	CH _M	44.0	24.89	
	CH _H	43.9	24.43	

5.2. Occupied Bandwidth

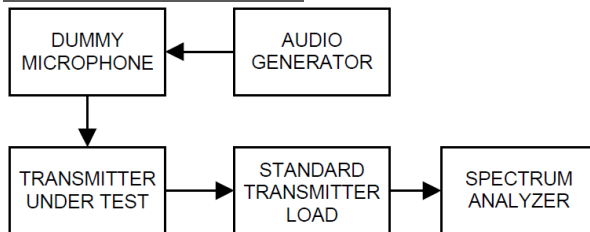
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits.

LIMIT

FCC Part 90.209, FCC Part 90.210, FCC Part 2.1049

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Below 252		
25-50	20	20
72-76	20	20
150-174	17.5	1 320/11.25/6
216-2205	6.25	20/11.25/6
220-222	5	4
406-5122	16.25	1 320/11.25/6
806-809/851-854	12.5	20
809-824/854-869	25	20
896-901/935-940	12.5	13.6
902-9284		
929-930	25	20
1427-14325	12.5	12.5
32450-2483.52		
Above 25002		

TEST CONFIGURATION



TEST PROCEDURE

- 1 The EUT was modulated by 2.5kHz sine wave audio signal; the level of the audio signal employed is 16dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz for 12.5kHz channel spacing).
- 2 Spectrum set as follow:
Centre frequency = fundamental frequency, span=50kHz for 12.5kHz channel spacing,
RBW=100Hz, VBW=300Hz, Sweep = auto,
Detector function = peak, Trace = max hold
- 3 Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth
- 4 Measure and record the results in the test report.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

Note: Have pre-tested TX1 to TX4 mode, record the worst case mode TX1 and TX3 on the report.

Power supply @DC13.6V:

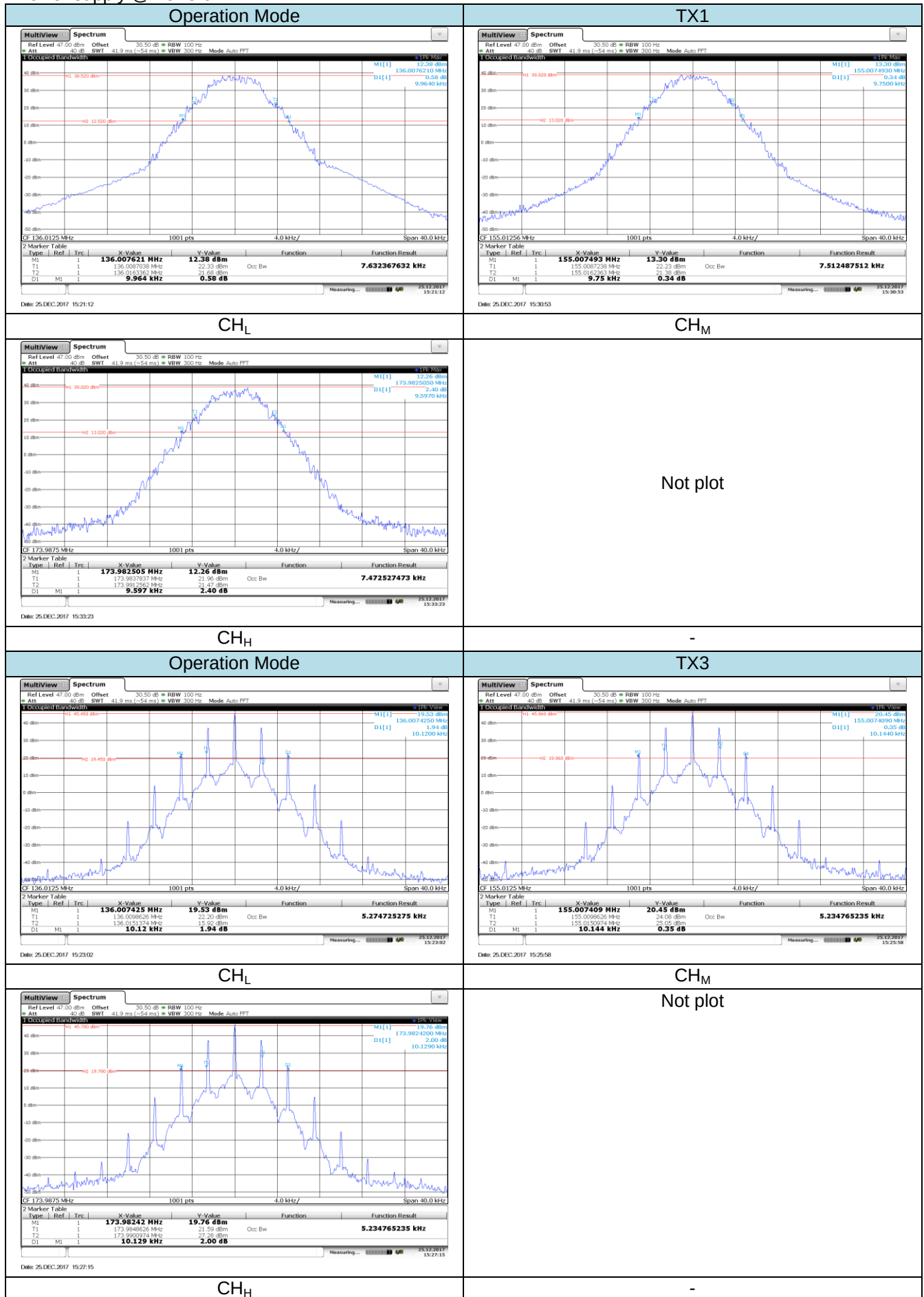
Operation Mode	Test Channel	Occupied Bandwidth (kHz)		Limit(kHz)	Result
		99%	26dB		
TX1	CH _L	7.632	9.964	≤11.25	Pass
	CH _M	7.512	9.750		
	CH _H	7.472	9.597		
TX3	CH _L	5.275	10.120	≤11.25	Pass
	CH _M	5.235	10.144		
	CH _H	5.235	10.129		

Power supply @AC 110V:

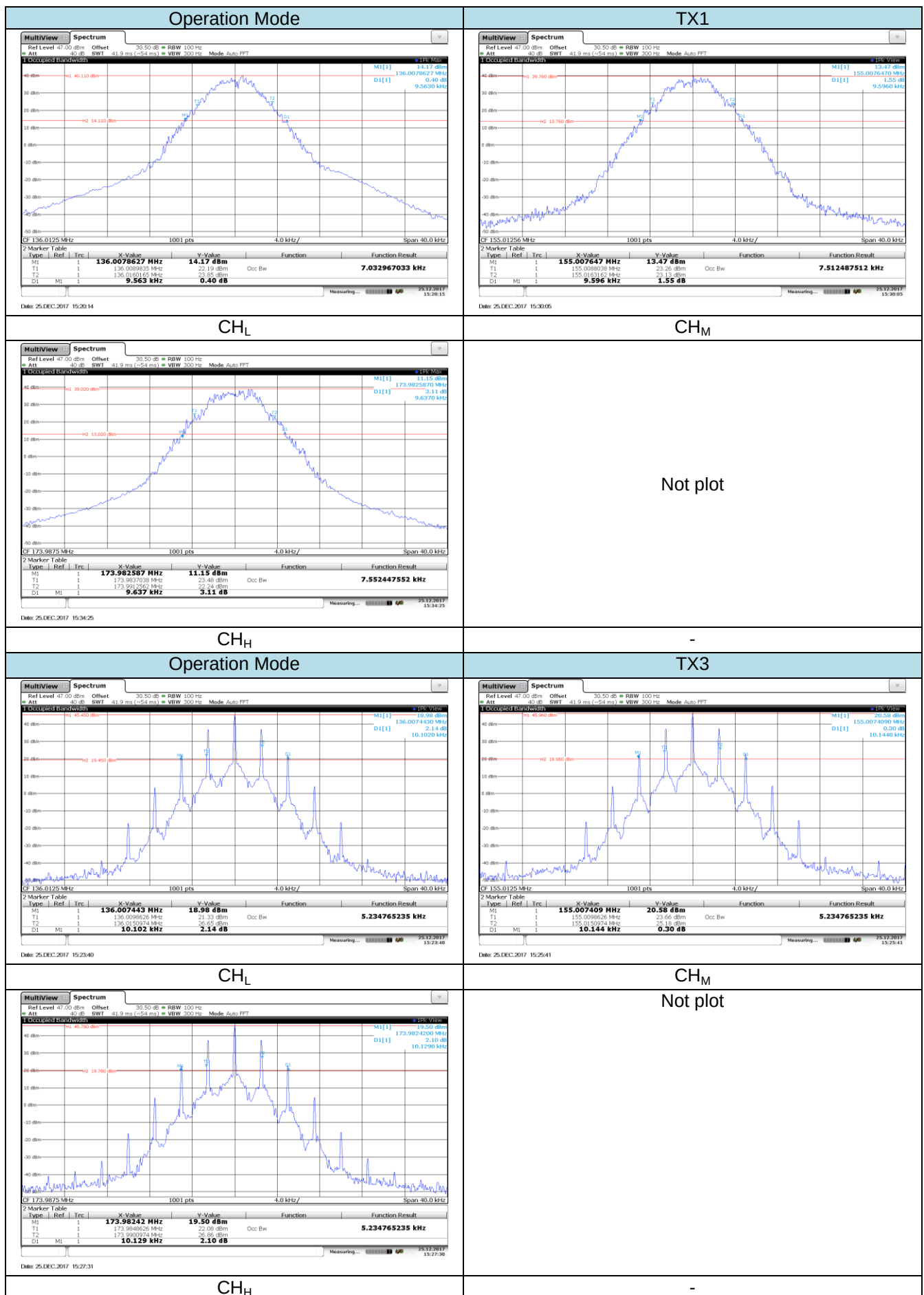
Operation Mode	Test Channel	Occupied Bandwidth (kHz)		Limit(kHz)	Result
		99%	26dB		
TX1	CH _L	7.632	9.964	≤11.25	Pass
	CH _M	7.512	9.750		
	CH _H	7.472	9.597		
TX3	CH _L	5.275	10.120	≤11.25	Pass
	CH _M	5.235	10.144		
	CH _H	5.235	10.129		

Test plot as follows:

Power supply @DC13.6V:



Power supply @AC 110V:



5.3. Emission Mask

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

LIMIT

FCC Part 90.209, FCC Part 90.210, FCC Part 2.1049

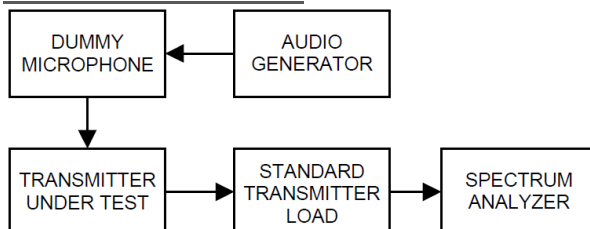
Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
Below 251	A or B	A or C
25-50	B	C
72-76	B	C
150-1742	B, D, or E	C, D or E
150 paging only	B	C
220-222	F	F
421-5122.5	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854	B	H
809-824/854-8693.5	B	G
896-901/935-940	I	J
902-928	K	K
929-930	B	G
4940-4990 MHz	L or M	L or M
5850-59254		
All other bands	B	C

(d) Emission Mask D—12.5 kHz channel bandwidth equipment.

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- 1) On any frequency from the centre of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : 0dB
- 2) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.
- 3) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

TEST CONFIGURATION



TEST PROCEDURE

- 1 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 Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation(Rated system deviation is 2.5 kHz for 12.5kHz channel spacing). The input level shall be established at the frequency of maximum response of the audio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer
- 5 Measure and record the results in the test report.

TEST MODE:

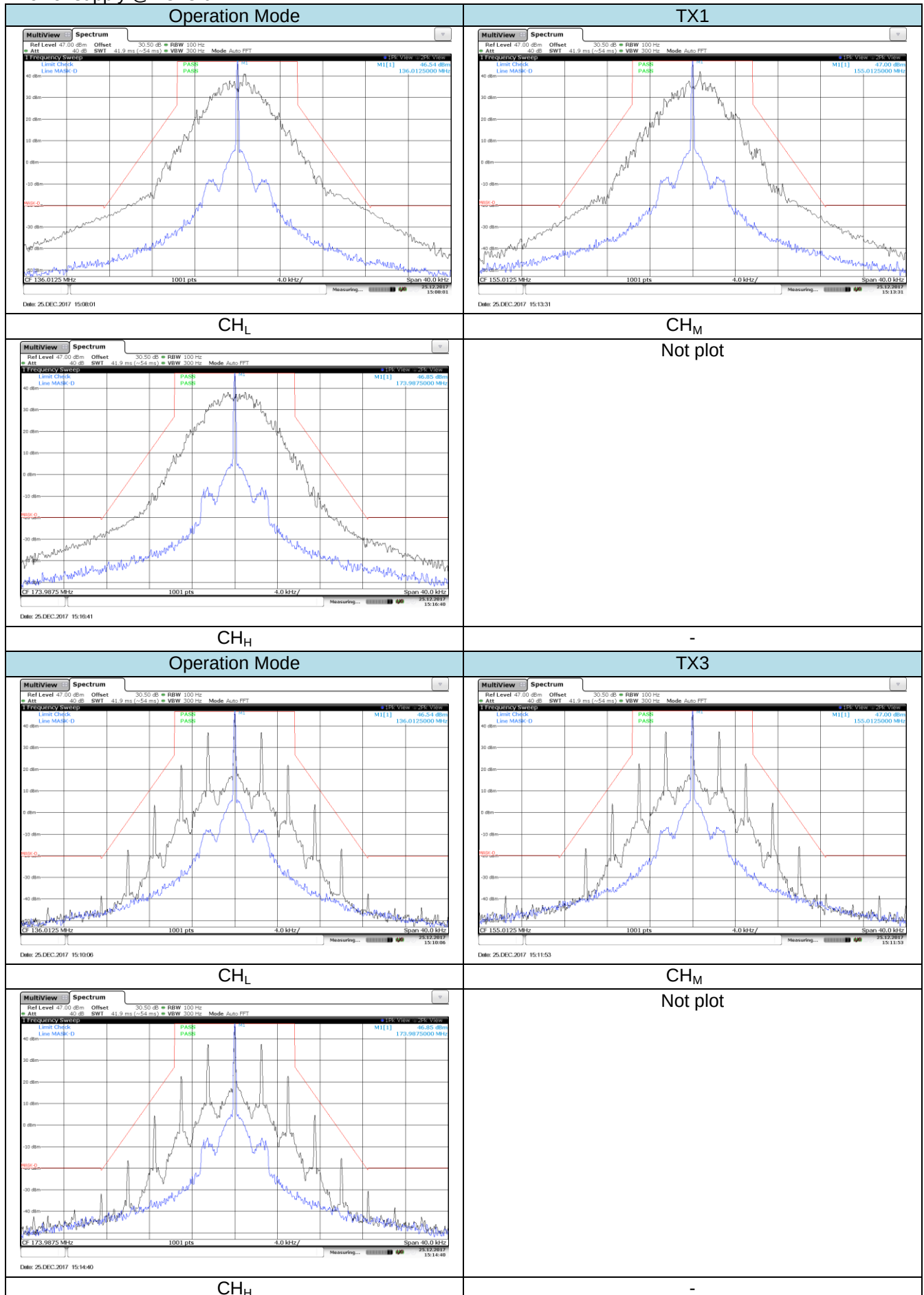
Please reference to the section 3.4

TEST RESULTS

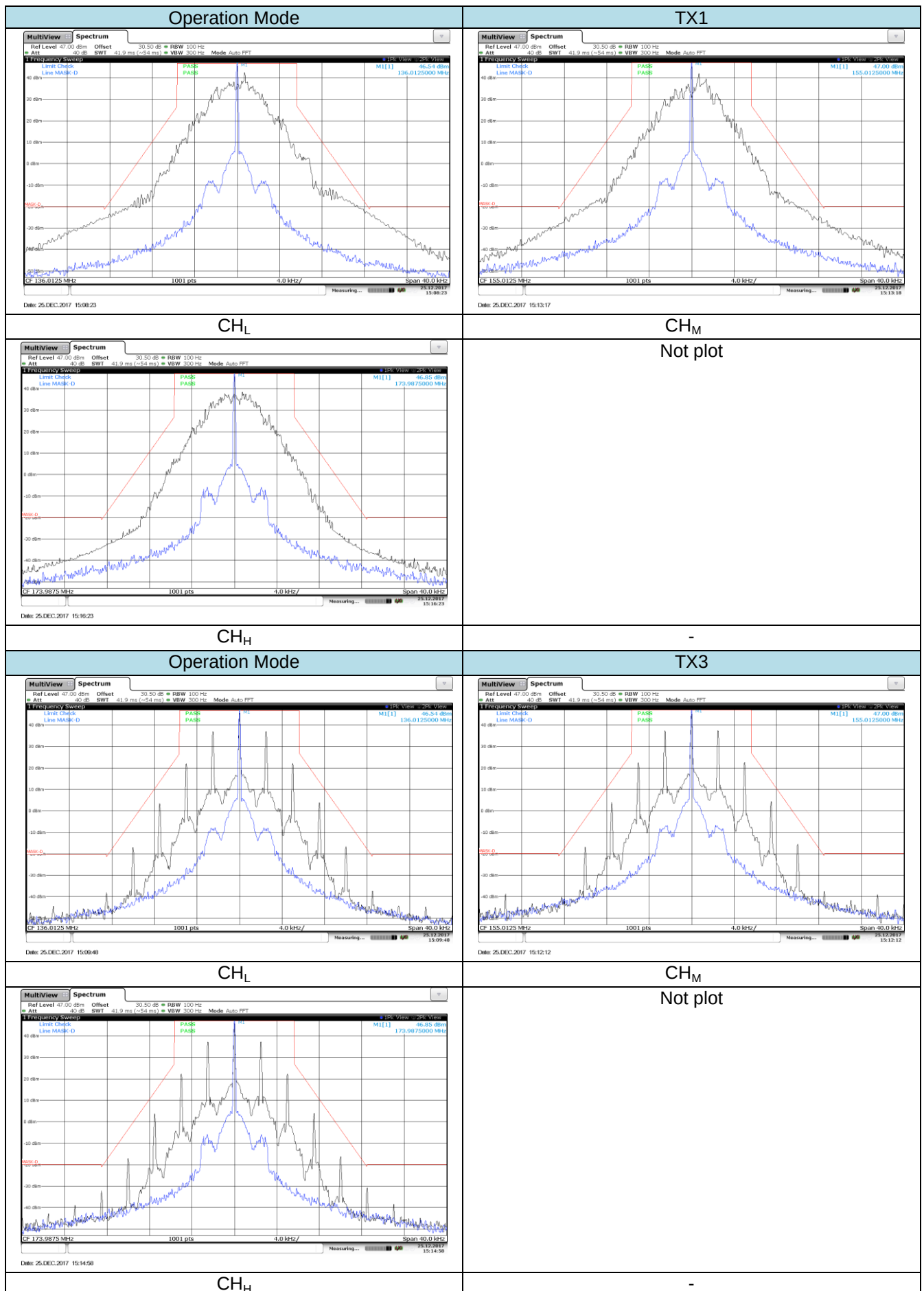
☒ Passed ☐ Not Applicable

Note: Have pre-tested TX1 to TX4 mode, record the worst case mode TX1 and TX3 on the report.

Power supply @DC13.6V:



Power supply @AC 110V:



5.4. Modulation Limit

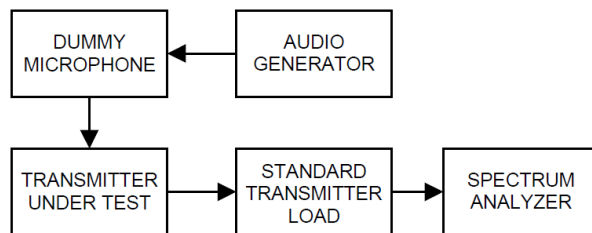
Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

LIMIT

FCC Part 2.1047(b)

2.5kHz for 12.5 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 $\geq 15,000$ Hz. Turn the de-emphasis function off.
- 4) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation, this level is as a reference (0dB) and vary the input level from -20 to +20dB.
- 5) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level
- 6) Repeat step 4-5 with input frequency changing to 300Hz, 1004Hz, 1500Hz and 2500Hz in sequence.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

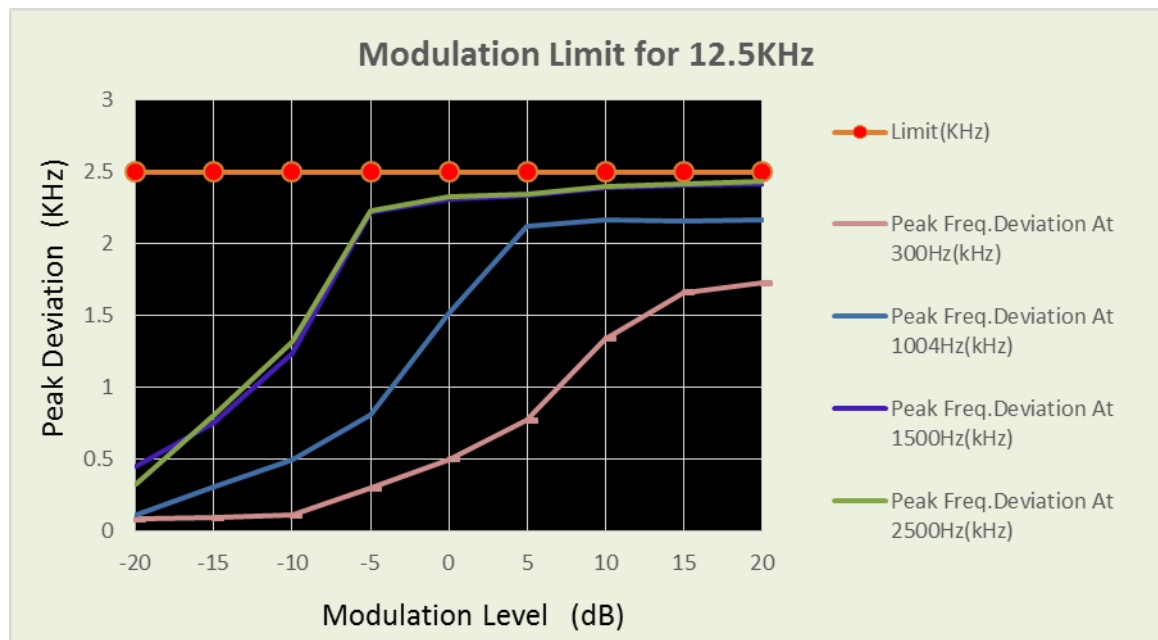
☒ **Passed** ☐ **Not Applicable**

Note: Have pre-tested TX3 to TX4 mode, record the worst case mode TX3 on the report.

Power supply @DC13.6V:

TX3: CH _H						
Modulation Level (dB)	Peak frequency deviation (kHz)				Limit (kHz)	Result
	300Hz	1004Hz	1500Hz	2500 Hz		
-20	0.083	0.115	0.457	0.324	2.5	Pass
-15	0.095	0.309	0.759	0.812		
-10	0.113	0.502	1.238	1.322		
-5	0.301	0.812	2.225	2.231		
0	0.502	1.512	2.312	2.325		
5	0.773	2.121	2.334	2.346		
10	1.342	2.168	2.388	2.401		
15	1.661	2.156	2.412	2.418		
20	1.727	2.167	2.421	2.433		

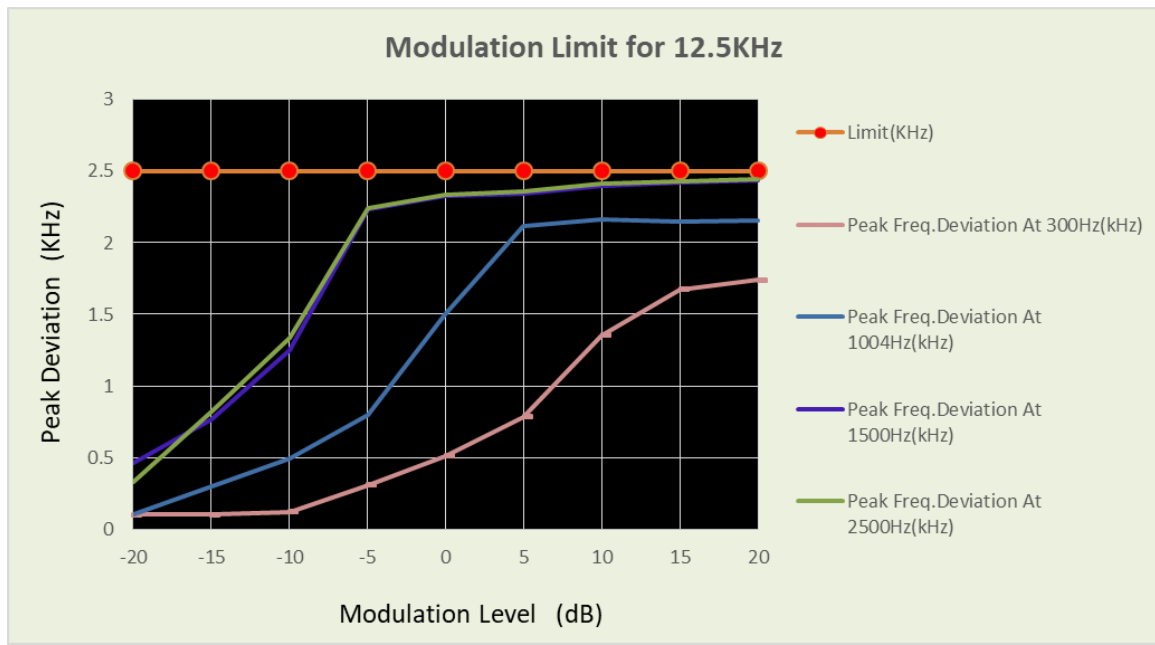
Test plot as follows:



Power supply @AC 110V:

TX3: CH _H						
Modulation Level (dB)	Peak frequency deviation (kHz)				Limit (kHz)	Result
	300Hz	1004Hz	1500Hz	2500 Hz		
-20	0.103	0.105	0.467	0.334	2.5	Pass
-15	0.105	0.299	0.769	0.822		
-10	0.123	0.492	1.248	1.332		
-5	0.311	0.802	2.235	2.241		
0	0.512	1.502	2.322	2.335		
5	0.783	2.111	2.344	2.356		
10	1.352	2.158	2.398	2.411		
15	1.671	2.146	2.422	2.428		
20	1.737	2.157	2.431	2.443		

Test plot as follows:

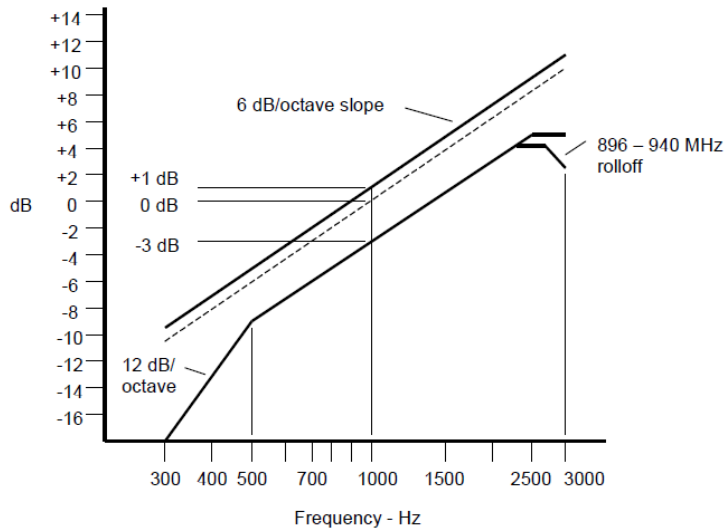


5.5. Audio Frequency Response

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

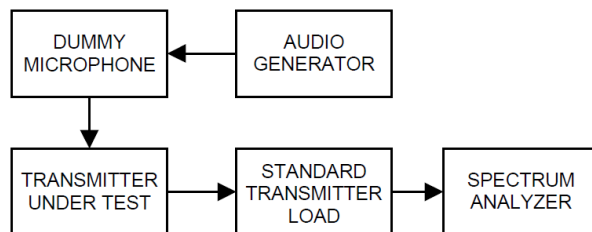
LIMIT

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) Configure the EUT as shown in figure .
- 2) Adjust the audio input for 20% of rated system deviation at 1kHz using this level as a reference.
- 3) Vary the Audio frequency from 300Hz to 3 kHz and record the frequency deviation.
- 4) Audio Frequency Response = $20\log_{10} (V_{\text{FREQ}}/V_{\text{REF}})$.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

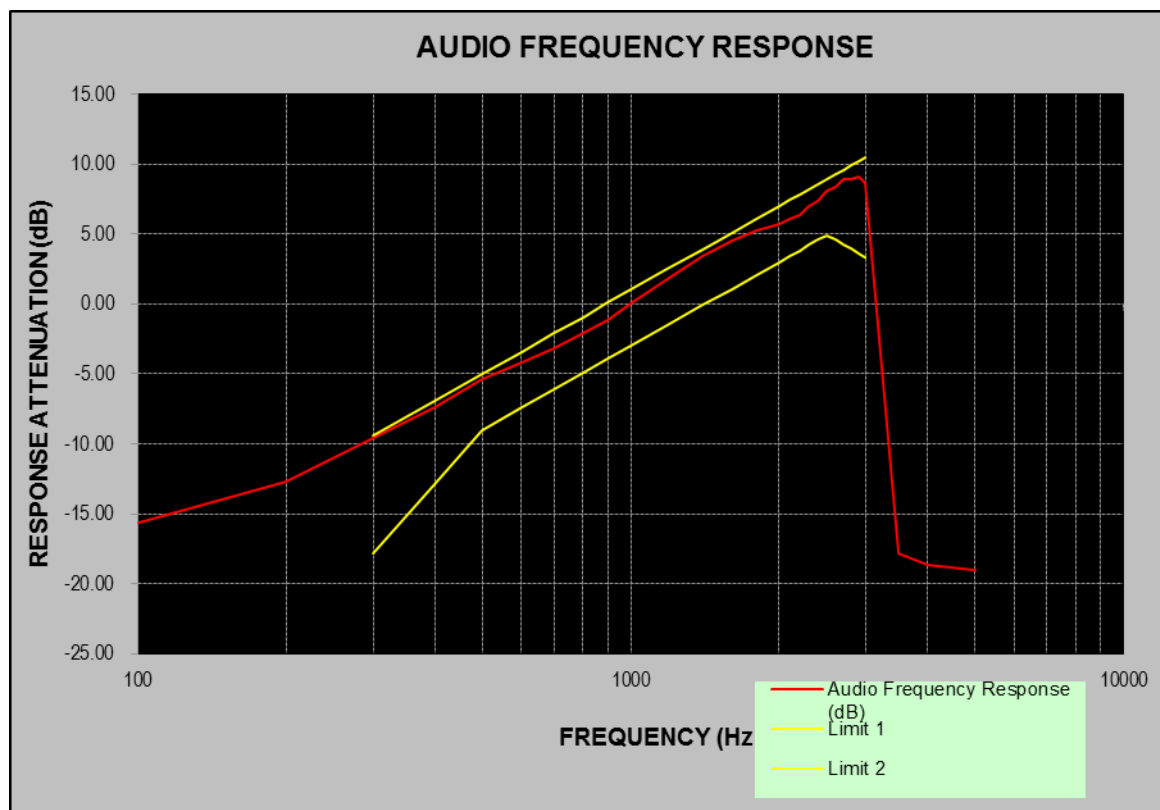
☒ Passed ☐ Not Applicable

Note: Have pre-tested TX3 to TX4 mode, record the worst case mode TX3 on the report.

Power supply @DC13.6V:

TX3: CH _H			
Frequency (Hz)	Audio Frequency Response (dB)	Frequency (Hz)	Audio Frequency Response (dB)
100	-15.62	2100	6.13
200	-12.66	2200	6.39
300	-9.56	2300	7.04
400	-7.35	2400	7.41
500	-5.38	2500	8.10
600	-4.22	2600	8.37
700	-3.19	2700	8.90
800	-2.06	2800	8.90
900	-1.18	2900	9.10
1000	0.00	3000	8.63
1200	1.91	3500	-17.86
1400	3.39	4000	-18.63
1600	4.55	4500	-18.88
1800	5.23	5000	-18.98
2000	5.68	-	-

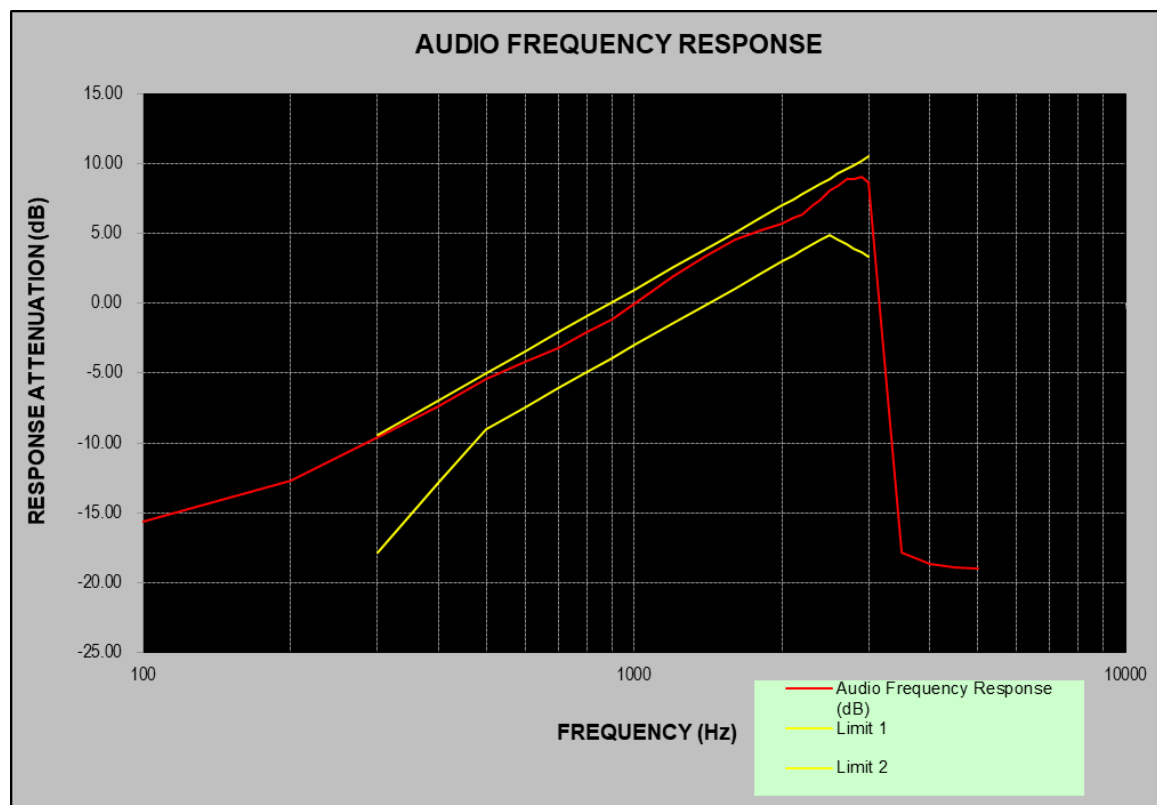
Test plot as follows:



Power supply @AC 110V:

TX3: CH _H			
Frequency (Hz)	Audio Frequency Response (dB)	Frequency (Hz)	Audio Frequency Response (dB)
100	-15.64	2100	6.13
200	-12.66	2200	6.39
300	-9.56	2300	7.04
400	-7.35	2400	7.41
500	-5.38	2500	8.10
600	-4.22	2600	8.37
700	-3.19	2700	8.90
800	-2.06	2800	8.90
900	-1.18	2900	9.10
1000	0.00	3000	8.63
1200	1.91	3500	-17.86
1400	3.39	4000	-18.63
1600	4.55	4500	-18.88
1800	5.23	5000	-18.98
2000	5.68	-	-

Test plot as follows:



5.6. Frequency Stability Test

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

LIMIT

FCC Part 90.213, FCC Part 2.1055

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	12.3100	100	200
25-50	20	20	50
72-76	5		50
150-174	5.115	65	4.650
216-220	1.0		1.0
220-222.12	0.1	1.5	1.5
421-512	7.11.142.5	85	85
806-809	141.0	1.5	1.5
809-824	141.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	140.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928.13	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	9300	300	300
Above 245010			

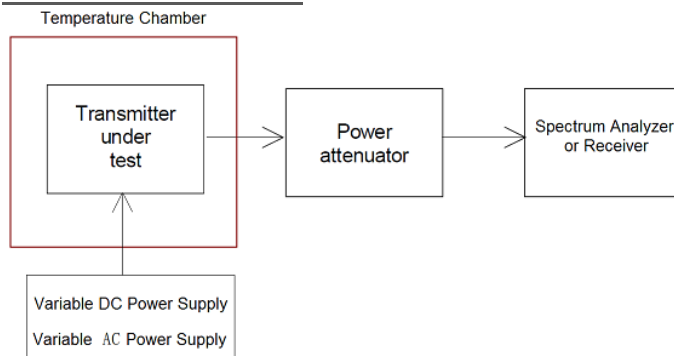
⁵In the 150-174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

⁷In the 421-512 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 0.5 ppm.

¹¹Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

¹⁴Control stations may operate with the frequency tolerance specified for associated mobile frequencies.

TEST CONFIGURATION



TEST PROCEDURE

1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +50°C.
2. According to FCC Part 2 Section 2.1055 (d) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 11.56V to 15.64V.
4. The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer, The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: Have pre-tested TX1 to TX4 mode, record the worst case mode TX1 and TX3 on the report.

Power supply @DC13.6V:

TX1						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp(°C)	CH _L	CH _M	CH _H		
13.6	-30	0.175	0.197	0.181	±5.0	Pass
	-20	0.191	0.171	0.197		
	-10	0.187	0.179	0.180		
	0	0.184	0.173	0.196		
	10	0.192	0.185	0.177		
	20	0.180	0.185	0.200		
	30	0.171	0.178	0.180		
	40	0.193	0.192	0.183		
	50	0.182	0.191	0.179		
11.56	20	0.186	0.185	0.189	±5.0	Pass
15.64	20	0.190	0.175	0.195		

TX3						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp(°C)	CH _L	CH _M	CH _H		
13.6	-30	0.368	0.483	0.376	±5.0	Pass
	-20	0.385	0.306	0.439		
	-10	0.342	0.380	0.447		
	0	0.336	0.471	0.313		
	10	0.466	0.445	0.351		
	20	0.358	0.383	0.471		
	30	0.334	0.316	0.401		
	40	0.331	0.300	0.473		
	50	0.315	0.467	0.416		
11.56	20	0.413	0.364	0.426	±5.0	Pass
15.64	20	0.325	0.460	0.350		

Power supply @AC 110V:

TX1						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp(°C)	CH _L	CH _M	CH _H		
13.6	-30	0.176	0.199	0.175	±5.0	Pass
	-20	0.195	0.174	0.179		
	-10	0.170	0.179	0.188		
	0	0.184	0.183	0.200		
	10	0.172	0.178	0.174		
	20	0.180	0.195	0.180		
	30	0.181	0.191	0.190		
	40	0.197	0.171	0.179		
	50	0.175	0.188	0.191		
11.56	20	0.184	0.196	0.191	±5.0	Pass
15.64	20	0.188	0.193	0.182		

TX3						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp(°C)	CH _L	CH _M	CH _H		
13.6	-30	0.483	0.430	0.338	±5.0	Pass
	-20	0.386	0.381	0.484		
	-10	0.452	0.428	0.465		
	0	0.342	0.347	0.445		
	10	0.301	0.423	0.453		
	20	0.353	0.313	0.374		
	30	0.352	0.333	0.444		
	40	0.337	0.466	0.399		
	50	0.458	0.464	0.454		
11.56	20	0.459	0.410	0.423	±5.0	Pass
15.64	20	0.424	0.433	0.322		