Shenzhen Huatongwei International Inspection Co., Ltd.
1/F,Bldg 3,Hongfa Hi-tech Industrial Park,Genyu Road,Tianliao,Gongming,Shenzhen,China
Phone:86-755-26748019 Fax:86-755-26748089 http://www.szhtw.com.cn

TEST REPORT

Report Reference No. ..... :	**TRE1705015001** R/C…….: **75990**
FCC ID ..... :	**YAMPTC760FXB1**
Applicant's name ..... :	**Hytera Communications Corporation Limited**
Address.....:	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Manufacturer.....:	Hytera Communications Corporation Limited
Address.....:	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Test item description ..... :	**Multi-mode Advanced Radio**
Trade Mark .....:	Hytera
Model/Type reference.....:	PTC760 FxB1
Listed Model(s) .....:	-
Standard ..... :	**FCC Part 22/ FCC Part 90/FCC Part 2** **FCC Part 15B**
Date of receipt of test sample……..:	May 17, 2017
Date of testing……:	May 18, 2017 - Aug. 30, 2017
Date of issue……...:	Aug. 30, 2017
Result……..:	**PASS**

Compiled by (position+printed name+signature)..:	File administrators Becky Liang	Becky Liang
Supervised by (position+printed name+signature)..:	Project Engineer Cary Luo	Cary Luo
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

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. Test Standards and Report version

1.1. Test Standards

The tests were performed according to following standards:
FCC Rules Part 22 PUBLIC MOBILE SERVICES
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 D01 v03r01: Questions and Answers on Re-farming Part 90 frequencies
KDB579009 D02 v01r02: Transition Summary Table
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	Aug. 30, 2017	Original

2. Test Description

Transmitter Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Maximum Transmitter Power	FCC Part 22.565 FCC Part 90.205	☒	
Occupied Bandwidth	FCC Part 90.209	☒	
Emission Mask	FCC Part 90.210	☒	
Frequency Stability	FCC Part 22.355 FCC Part 90.213	☒	
Transmitter Frequency Behavior	FCC Part 90.214	☒	
Adjacent Channel Power Limits	FCC Part 90.221	☒	
Transmitter Radiated Spurious Emission	FCC Part 22.359 FCC Part 90.210	☒	
Spurious Emission On Antenna Port	FCC Part 22.359 FCC Part 90.210	☒	
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:	Hytera Communications Corporation Limited
Address:	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Manufacturer:	Hytera Communications Corporation Limited
Address:	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China

3.2. Product Description

Name of EUT:	Multi-mode Advanced Radio
Trade Mark:	Hytera
Model/Type reference:	PTC760 FxB1
Listed Model(s):	-
Power supply:	DC 7.6V
Adapter information:	Model: S024WM1200200 Input: 100-240Va.c., 50/60Hz, 600mA Output: 12.0Vd.c., 2000mA
Battery information:	Model: BP2901 Output: 7.6Vd.c., 2900mAh
Charger information:	Model: CH20L08 Input: 12Vd.c., 2000mA Output: 12Vd.c., 2000mA
RF Specification	
Operation Frequency Range:	450MHz ~ 470MHz
Rated Output Power:	1.8 Watts (32.55dBm)
Modulation Type:	π/4 DQPSK
Channel Separation:	25kHz
Antenna Type	External
Maximum Transmitter Power :	2.09W for TMO 1.95W for DMO

3.3. Test frequency list

Mode	Operation frequency (MHz)	Channel Separation (kHz	Test Channel	Test Frequency (MHz)	Applicable
TMO&DMO	454~455	25	CH_{L1}	454.025	Part 22(LMR)
TMO&DMO	456~460	25	CH_{H1}	459.975	
TMO&DMO	450~470	25	CH_{L2}	450.025	Part 90(TETAR)
			CH_{M2}	460.000	
			CH_{H2}	469.975	

3.4. EUT operation mode

Test mode	Transmitting	Receiving	TMO	DMO	GPS	AC Adapter
TX1	√		√			
TX2	√			√		
RX1		√	√			√
RX2		√		√		√
RX3		√			√	√

√: 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/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.: 317478

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.

IC-Registration No.: 5377B

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.

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 Conditon	
Relative humidity:	20 % to 75 %.
Air Pressure:	950~1050mba
Voltage:	DC 7.6V

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 9KHz-30MHz	2.20 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.
Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2016/11/13
EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	2016/11/13
Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2016/11/13
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
Artificial Mains	Rohde&Schwarz	ESH3-Z6	100210	2016/11/13
Artificial Mains	Rohde&Schwarz	ESH3-Z6	100211	2016/11/13
Test cable	ENVIROFLEX	3651	1101902	2016/11/13

Adjacent Channel Power				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
TETRA Signal Analyzer	IFR	2310	231001/168	2016/11/13
RF Cable	Chengdu E-Microwave	----	----	2016/11/13

Frequency Stability				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
Signal Generator	Rohde&Schwarz	SMT03	100059	2016/11/13
Climate Chamber	ESPEC	EL-10KA	05107008	2016/11/13
RF Cable	Chengdu E-Microwave	----	----	2016/11/13

Transmitter Radiated Spurious Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
Ultra-Broadband Antenna	Rohde&Schwarz	HL562	100015	2016/11/13
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
HORN ANTENNA	Rohde&Schwarz	HF906	100039	2016/11/13
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2016/11/13
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2016/11/13
HORN ANTENNA	ShwarzBeck	9120D	1012	2016/11/13
HORN ANTENNA	ShwarzBeck	9120D	1011	2016/11/13
TURNTABLE	MATURO	TT2.0	----	N/A
ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
Test cable	Siva Cables Italy	RG 58A/U	W14.02	2016/11/13

Maximum Transmitter Power & Spurious Emission On Antenna Port & Occupied Bandwidth & Emission Mask				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
Attenuator	R&S	ESH3-22	100449	2016/11/13
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
High-Pass Filter	Anritsu	MP526B	6220875256	2016/11/13
High-Pass Filter	Anritsu	MP526D	6220878392	2016/11/13
Spectrum Analzyer	Aglient	E4407B	MY44210775	2016/11/13
Spectrum Analzyer	Rohde&Schwarz	FSP40	1164.4391.40	2016/11/13
SPECTRUM ANALYZER	Agilent	E4407B	MY44210775	2016/11/13
Digital Radio Tester	IFR	3920	299001967	2016/11/13
TETRA Signal Analyzer	IFR	2310	231001/168	2016/11/13
Attenuator	Chengdu E-Microwave	EMCAXX-10RNZ-3	----	2016/11/13
RF Cable	Chengdu E-Microwave	----	----	2016/11/13
Combiner	Chengdu E-Microwave	EMPD-T-2-180-10-600	----	2016/11/13

Transient Frequency Behavior				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
Signal Generator	Rohde&Schwarz	SMT03	100059	2016/11/13
Storage Oscilloscope	Tektronix	TDS3054B	B033027	2016/11/13
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
RF Cable	Chengdu E-Microwave	----	----	2016/11/13

The calibration interval was one year.

5. Test conditions and results

5.1. RF output Power

The conducted carrier power output rating for a transmitter is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

LIMIT

FCC Part 2.1046 and Part 90.205

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.

Part 22.565

The transmitting power of base, mobile and fixed transmitters operating on the channels listed in §22.561 must not exceed the limits in this section.

(a) Maximum ERP. The effective radiated power (ERP) of base and fixed transmitters must not exceed the applicable limits in this paragraph under any circumstances.

Frequency range (MHz)	Maximum ERP (watts)
152-153	1400
157-159	150
454-455	3500
459-460	150

(b) Basic power limit. Except as provided in paragraph (d) of this section, the ERP of base transmitters must not exceed 500 Watts.

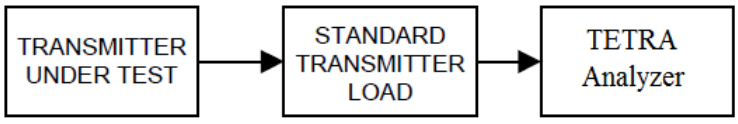
(c) Height-power limits. Except as provided in paragraph (d) of this section, the ERP of base transmitters must not exceed the amount that would result in an average distance to the service contour of 41.6 kilometers (26 miles) for VHF channels or 30.7 kilometers (19 miles) for UHF channels. The average distance to the service contour is calculated by taking the arithmetic mean of the distances determined using the procedures specified in §22.567 for the eight cardinal radial directions, excluding cardinal radial directions for which 90% or more of the distance so calculated is over water.

(d) Encompassed interfering contour areas. Base transmitters are exempt from the basic power and height-power limits of this section if the area within their interfering contours is totally encompassed by the interfering contours of operating co-channel based transmitters controlled by the same licensee. For the purpose of this paragraph, operating transmitters are authorized transmitters that are providing service to subscribers.

(e) Adjacent channel protection. The ERP of base and fixed transmitters must not exceed 500 Watts if they transmit on channel 454.025 MHz and are located less than 7 kilometers (4.3 miles) from any Private Radio Services station receiving on adjacent channel 454.0000 MHz.

(f) Mobile transmitters. The transmitter output power of mobile transmitters must not exceed 60 watts.

TEST CONFIGURATION



TEST PROCEDURE

TIA/EIA 603 D, Section 2.2.1.2

1) Connect the equipment as illustrated
2) Correct for all losses in the RF path
3) Measure the transmitter output power

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Channel	Measured ERP (dBm)	Measured ERP (W)	Limit (W)	Result
TX1	CH_{L1}	32.4	1.74	＜7W	Pass
	CH_{H1}	32.5	1.78		
TX2	CH_{L1}	32.9	1.95	＜7W	Pass
	CH_{H1}	32.3	1.70		

Note:
Measured ERP(dBm) = Conducted Measured power(dBm)+ Antenna Gain(dBd)
dBd= dBi-2.15, Antenna Gain=0.5dBi

Operation Mode	Test Channel	Measured Conducted Power (dBm)	Measured Conducted Power (W)	Limit (W)	Result
TX1	CH_{L2}	32.30	1.70	1.44 ~ 2.16	Pass
	CH_{M2}	32.50	1.78		
	CH_{H2}	33.20	2.09		
TX2	CH_{L2}	32.80	1.91	1.44 ~ 2.16	Pass
	CH_{M2}	32.30	1.70		
	CH_{H2}	32.90	1.95		

5.2. Occupied Bandwidth

LIMIT

FCC part 90.209

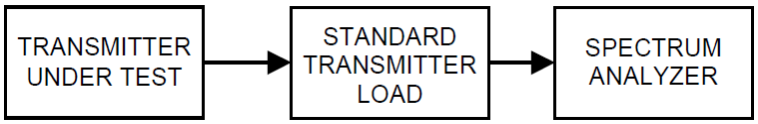
Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Below 252		
25-50	20	20
72-76	20	20
150-174	17.5	1 320/11.25/6
216-2205	6.25	20/11.25/6
220-222	5	4
406-5122	16.25	1 320/11.25/6
806-809/851-854	12.5	20
809-824/854-869	25	20
896-901/935-940	12.5	13.6
902-9284		
929-930	25	20
1427-14325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

Note:
Operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the Adjacent Channel Power limits of § 90.221.

FCC part 22

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

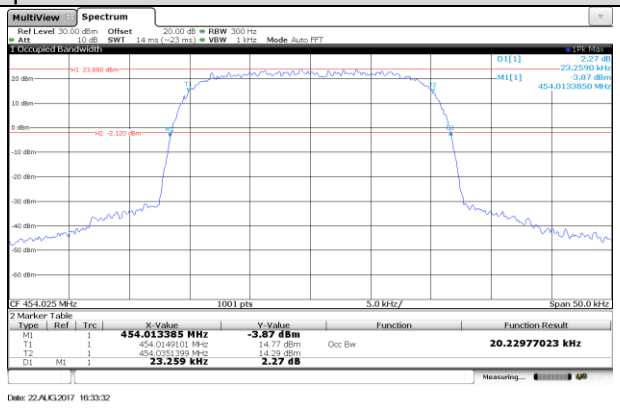
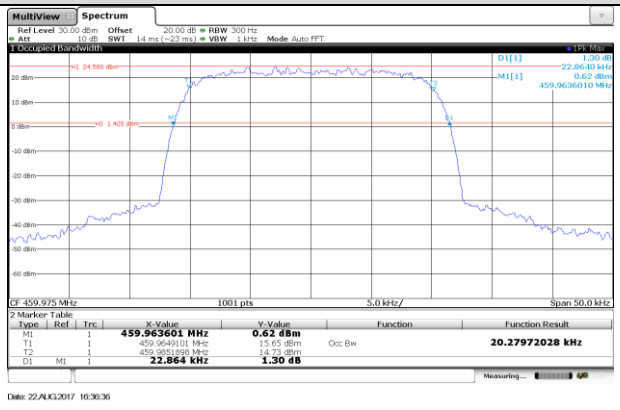
☒ **Passed** ☐ **Not Applicable**

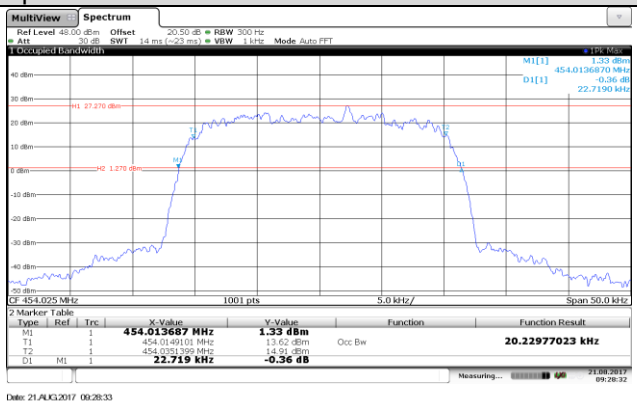
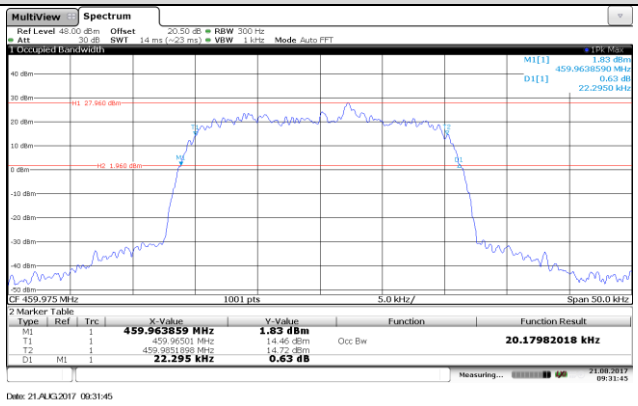
Please refer to the below test data:

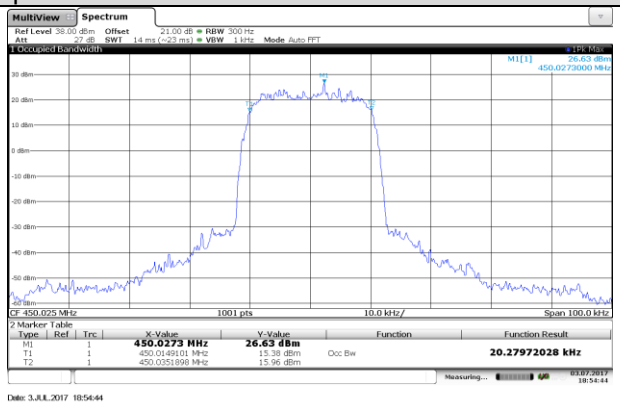
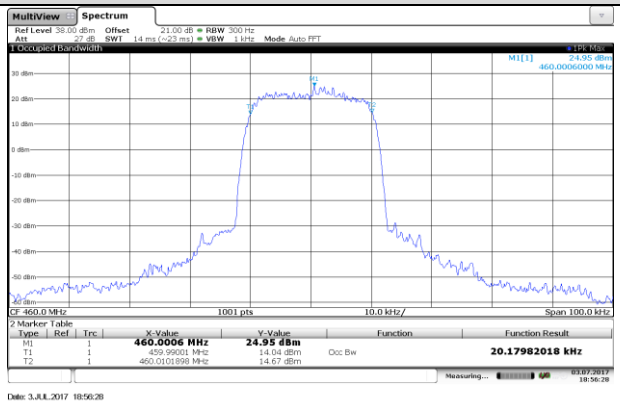
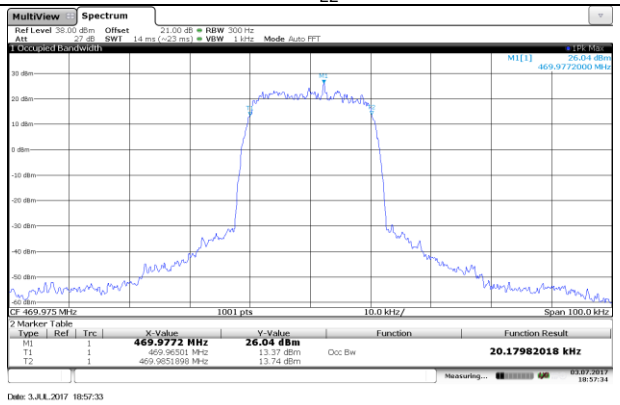
Operation Mode	Test Channel	99% Occupied Bandwidth (kHz)	26dB Occupied Bandwidth (kHz)	Result
TX1	CH_{L1}	20.23	23.26	Pass
	CH_{H1}	20.28	22.86	
TX2	CH_{L1}	20.23	22.72	Pass
	CH_{H1}	20.18	22.30	

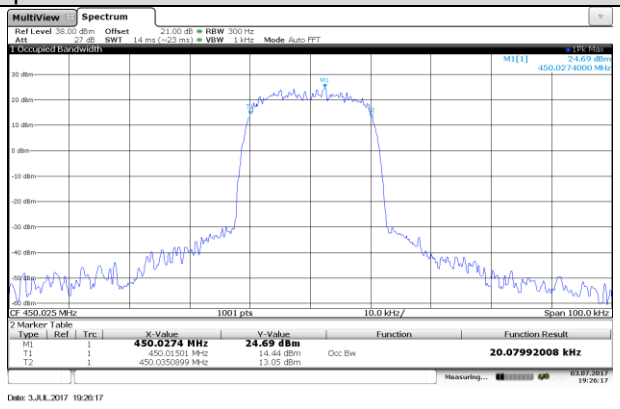
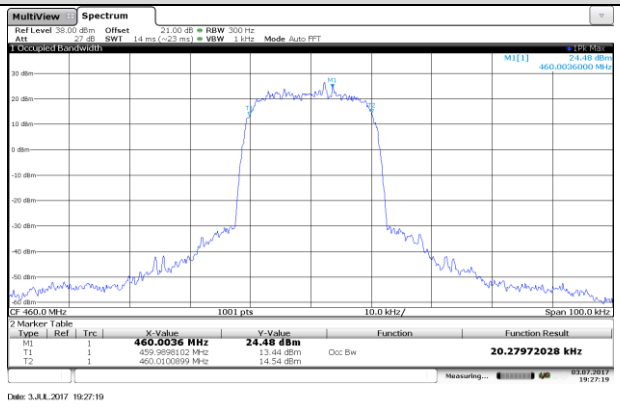
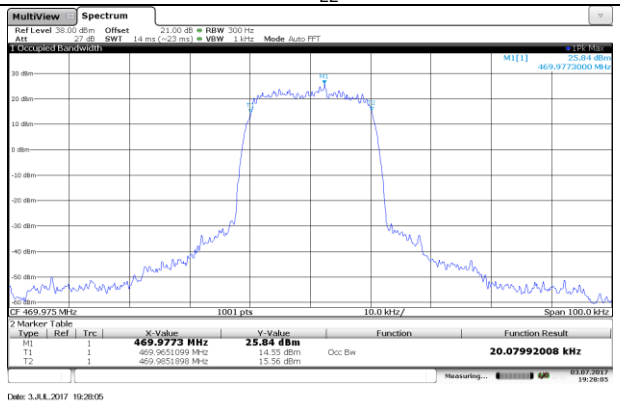
Operation Mode	Test Channel	99% Occupied Bandwidth (kHz)	Limit (kHz)	Result
TX1	CH_{L2}	20.28	≤22	Pass
	CH_{M2}	20.18		
	CH_{H2}	20.18		
TX2	CH_{L2}	20.08	≤22	Pass
	CH_{M2}	20.28		
	CH_{H2}	20.08		

Test plot as follows:

Operation Mode	TX1
	
CH_{L1}	CH_{H1}

Operation Mode	TX2
	
CH_{L1}	CH_{H1}

Operation Mode	TX1
	
CH_{L2}	CH_{M2}
	No plot
CH_{H2}	-

Operation Mode	TX2
	
CH_{L2}	CH_{M2}
	No plot
CH_{H2}	-

5.3. Emission Mask

The transmitter sideband spectrum denotes the sideband power produced at a discrete frequency separation from the carrier up to the test bandwidth due to all sources of unwanted noise within the transmitter in a modulated condition.

LIMIT

FCC part 90.210

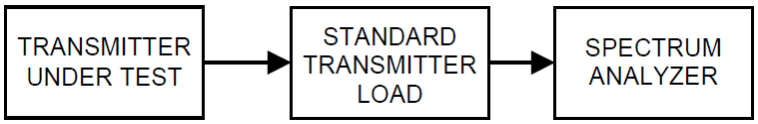
Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
Below 251	A or B	A or C
25-50	B	C
72-76	B	C
150-1742	B, D, or E	C, D or E
150 paging only	B	C
220-222	F	F
421-5122 5	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854	B	H
809-824/854-8693 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

1) Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
2) Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.
3) Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of §90.691 of this chapter.
4) DSRCS Roadside Units equipment in the 5850-5925 MHz band is governed under subpart M of this part.
5) Equipment may alternatively meet the Adjacent Channel Power limits of §90.221.

FCC part 22

N/A

TEST CONFIGURATION



TEST PROCEDURE

TIA/EIA-603-D, Section 2.2.11.2

1) Connect the equipment as illustrated
2) Adjust the spectrum analyzer for the following settings
   a) Resolution Bandwidth per the above table.
   b) Video Bandwidth at least 10 times the resolution bandwidth.
   c) Sweep Speed slow enough to maintain measurement calibration.
   d) Detector Mode = Positive Peak.
   e) Span that will allow proper viewing of the test bandwidth
3) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0 dB reference for the measurement
4) The device with digital modulation: modulated to its maximum extent using a pseudo-random data sequence.
5) Record the resulting spectrum analyzer presentation of the emission level with an on-line recording device or in a photograph. It is recommended that the emission limit be drawn on the plotted graph or photograph. The spectrum analyzer presentation is the sideband spectrum.

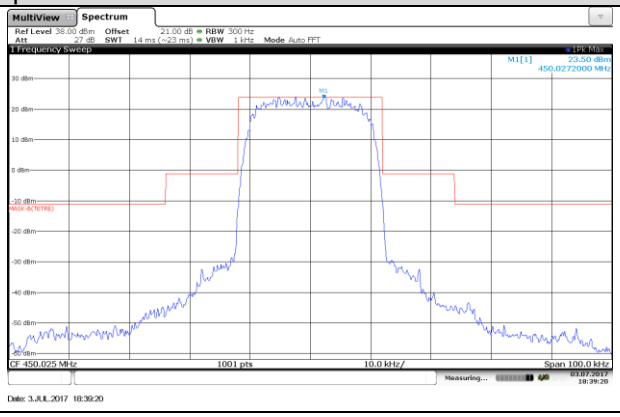
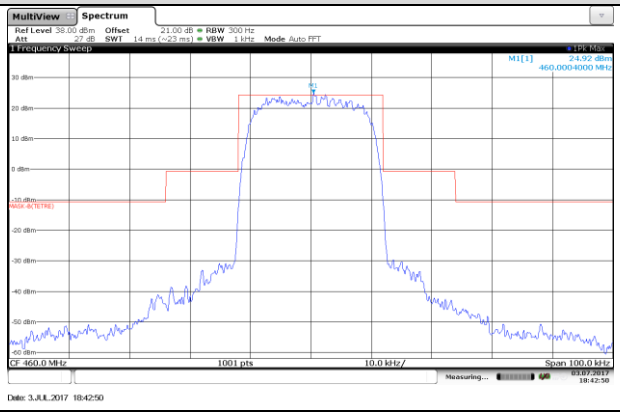
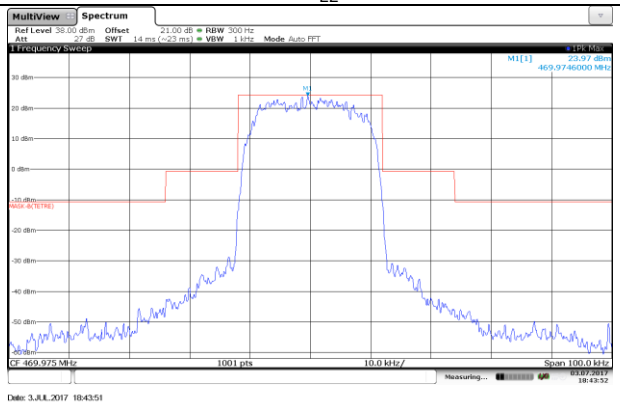
TEST MODE:

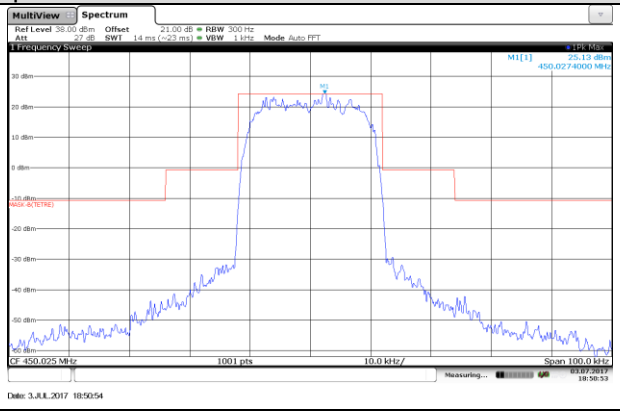
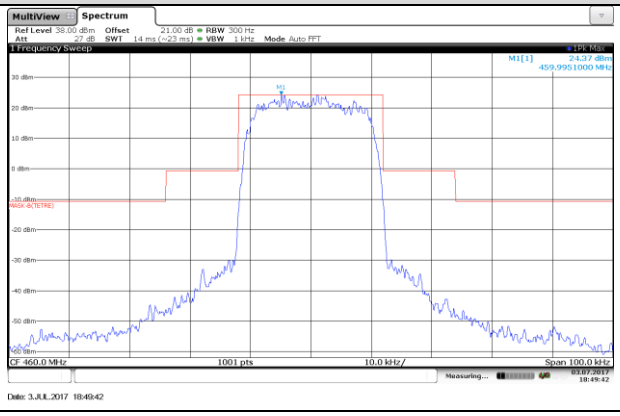
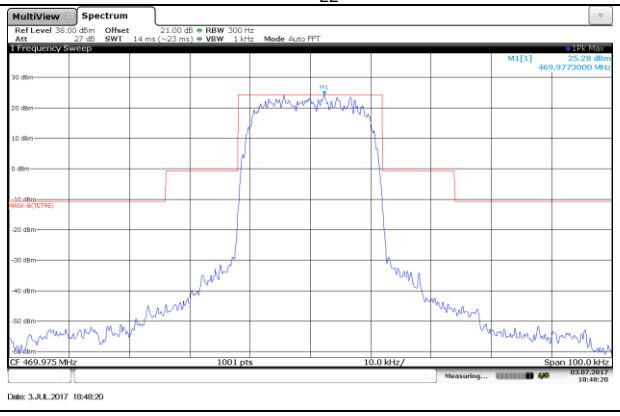
Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	TX1
	
CH_{L2}	CH_{M2}
	No plot
CH_{H2}	-

Operation Mode	TX2
	
CH_{L2}	CH_{M2}
	No plot
CH_{H2}	-

5.4. Frequency Stability Test

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

LIMIT

FCC part 90.213

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	1 2 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
220-22212	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
902-92813	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			

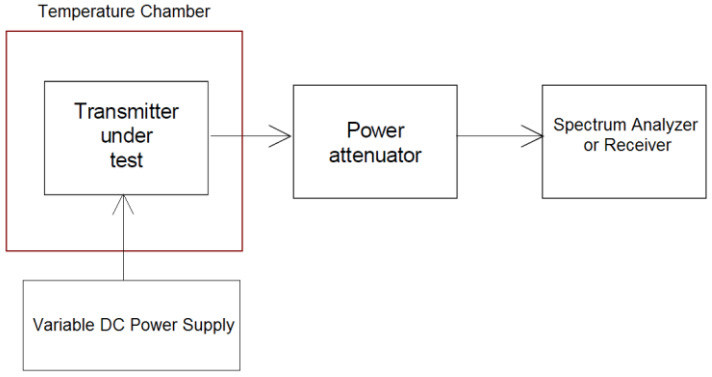
FCC part 22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

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℃ to +50℃ centigrade.
2. According to FCC Part 2 Section 2.1055 (d) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 85 to 115 percent of the nominal value.
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**

Please refer to the below test data:

Frequency Stability VS Temperature

Operation mode	Voltage (V)	Temperature (°C)	Frequency error (ppm)		Limit (ppm)	Result
			CH_{L1}	CH_{H1}		
TX1	7.6	-30	0.13	0.12	±5.00	Pass
		-20	0.12	0.11		
		-10	0.12	0.12		
		0	0.10	0.12		
		10	0.11	0.11		
		20	0.12	0.13		
		30	0.13	0.12		
		40	0.11	0.13		
		50	0.11	0.12		
TX2	7.6	-30	0.12	0.13	±5.00	Pass
		-20	0.12	0.12		
		-10	0.13	0.12		
		0	0.12	0.14		
		10	0.11	0.10		
		20	0.12	0.12		
		30	0.12	0.13		
		40	0.10	0.10		
		50	0.11	0.11		

Frequency Stability VS Voltage

Operation mode	Temperature (°C)	Voltage (V)	Frequency error (ppm)		Limit (ppm)	Result
			CH_{L1}	CH_{H1}		
TX1	20	6.46	0.053	0.053	±5.00	Pass
		7.60	0.058	0.054		
		8.74	0.059	0.046		
TX2	20	6.46	0.054	0.051	±5.00	Pass
		7.60	0.063	0.052		
		8.74	0.058	0.044		

Frequency Stability VS Temperature

Operation mode	Voltage (V)	Temperature (°C)	Frequency error (ppm)			Limit (ppm)	Result
			CH_{L2}	CH_{M2}	CH_{H2}		
TX1	7.6	-30	0.11	0.11	0.09	±5.00	Pass
		-20	0.11	0.10	0.09		
		-10	0.10	0.11	0.09		
		0	0.11	0.11	0.09		
		10	0.11	0.11	0.09		
		20	0.11	0.11	0.10		
		30	0.11	0.11	0.08		
		40	0.12	0.12	0.09		
		50	0.12	0.11	0.09		
TX2	7.6	-30	0.10	0.11	0.09	±5.00	Pass
		-20	0.11	0.10	0.09		
		-10	0.10	0.11	0.09		
		0	0.11	0.11	0.09		
		10	0.11	0.11	0.09		
		20	0.11	0.11	0.10		
		30	0.11	0.11	0.08		
		40	0.12	0.12	0.09		
		50	0.12	0.11	0.09		

Frequency Stability VS Voltage

Operation mode	Temperature (°C)	Voltage (V)	Frequency error (ppm)			Limit (ppm)	Result
			CH_{L2}	CH_{M2}	CH_{H2}		
TX1	20	6.46	0.058	0.054	0.049	±5.00	Pass
		7.60	0.061	0.055	0.053		
		8.74	0.054	0.047	0.051		
TX2	20	6.46	0.056	0.055	0.044	±5.00	Pass
		7.60	0.062	0.058	0.047		
		8.74	0.052	0.049	0.054		

5.5. Transmitter Frequency Behaviour

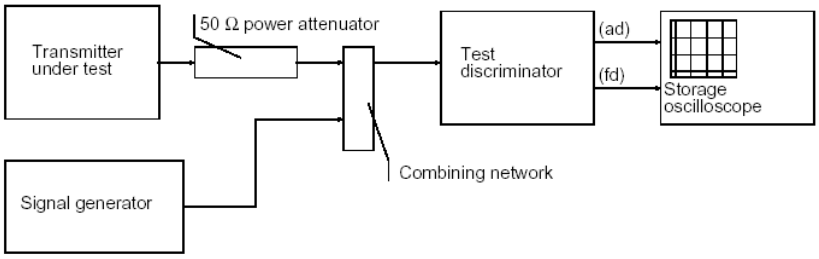
LIMIT
FCC part 90.214

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals[1 2]	Maximum frequency difference[3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1[4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3[4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1[4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3[4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1[4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3[4]	±6.25 kHz	5.0 ms	10.0 ms

Note:
1. On is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
   1) t_1 is the time period immediately following ton.
   2) t_2 is the time period immediately following t_1.
   3) t_3 is the time period from the instant when the transmitter is turned off until toff.
   4) t_{off} is the instant when the 1 kHz test signal starts to rise.
2. During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

TEST CONFIGURATION



TEST PROCEDURE

According to TIA/EIA-603 2.2.19 requirement, as for the product different from PTT, we use test steps as follows:

1. Connect DUT into Test discriminator and Storage Oscilloscope and keep DUT stats ON;
2. Input 1kHz signal into DUT;
3. Set the modulation domain analyzer to trigger on the rising edge of the waveform in order to capture a single-shot turn-on of the transmitter signals;
4. Keep DUT in OFF state and Key the PTT;
5. Observe the stored oscilloscope of modulation domain analyzer. The signal trace shall be maintained within the allowable limits during the periods t_1 and t_2,and shall also remain within limits following t_2;
6. Adjust the modulation domain analyzer to trigger on the falling edge of the transmitter waveform in order to capture a single-shot turn-off transmitter of the transmitter signal.
7. Keep the digital portable radio in ON state and unkey the PTT;
8. Observe the stored oscilloscope of modulation domain analyzer, The signal trace shall be maintained within the allowable limits during the period t_3.
9. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ±12.5 kHz deviation and set its output level to -100dBm.
10. Turn on the transmitter.
11. Supply sufficient attenuation via the RF attenuator to provide an input level to the stored oscilloscope
12. that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the stored oscilloscope as P_0.
13. Turn off the transmitter.
14. Adjust the RF level of the signal generator to provide RF power equal to P_0. This signal generator RF level shall be maintained throughout the rest of the measurement.
15. Remove the attenuation, so the input power to the stored oscilloscope is increased by 30 dB when the transmitter is turned on.
16. Adjust the vertical amplitude control of the stored oscilloscope to display the 1000 Hz at ±4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to “Video”, and tune the “trigger level” on suitable level. Then set the “tiger offset” to -10ms for turn on and -15ms for turn off.
17. Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be ton. The trace should be maintained within the allowed divisions during the period t_1 and t_2.
18. Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum
19. Analyzer. The trace should be maintained within the allowed divisions during the period t_3.

TEST MODE:

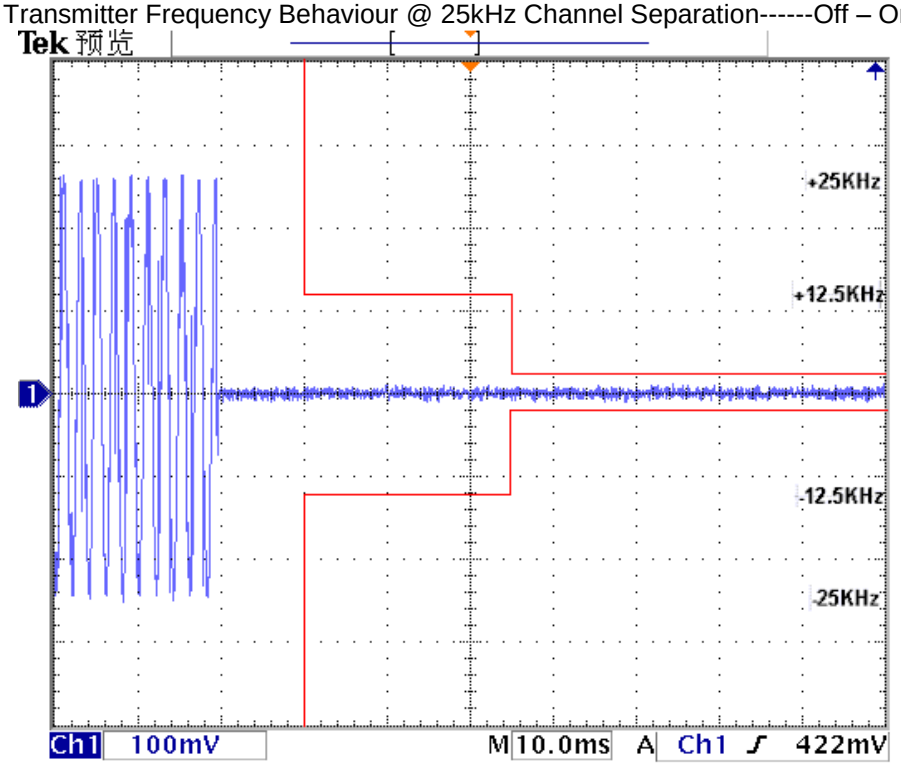
Please reference to the section 3.4

TEST RESULTS

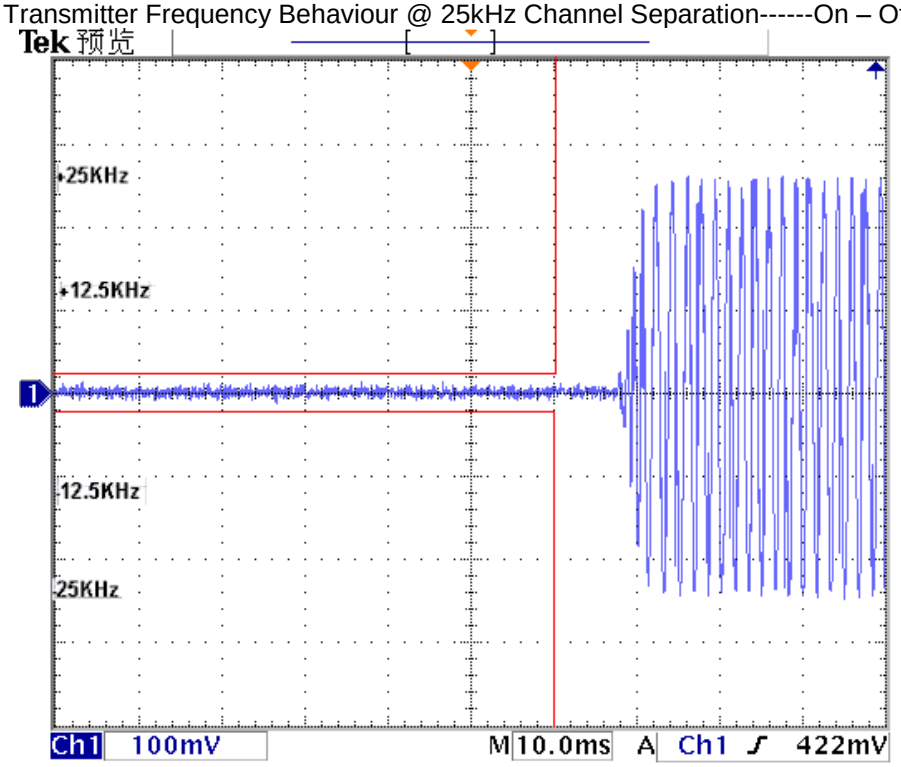
☒ **Passed** ☐ **Not Applicable**

Note:
have pre-tested CH_{L2} to CH_{H2} for TX1 to TX2 mode, record the worst case CH_{L2} for mode TX1 on the report.

Transmitter Frequency Behaviour @ 25kHz Channel Separation------Off – On



Transmitter Frequency Behaviour @ 25kHz Channel Separation------On – Off



5.6. Adjacent Channel Power

The adjacent channel power ratio is the ratio of the total output power of a transmitter under defined conditions and modulation, to that part of the output power that falls within a specified passband centered on the nominal frequency of either of the adjacent channels or channels further offset above or below the assigned carrier frequency.

LIMIT

FCC part 90.221

(a) For the frequency bands indicated below, operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below.
The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 18 kHz.
(b)(1) Maximum adjacent power levels for frequencies in the 450-470 MHz band:

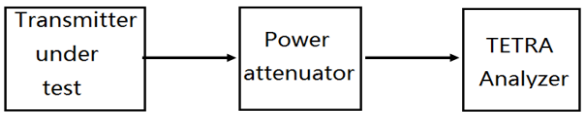
Frequency offset	Maximum ACP (dBc) for devices 1 watt and less	Maximum ACP (dBc) for devices above 1 watt
25 kHz	−55 dBc	−60 dBc
50 kHz	−70 dBc	−70 dBc
75 kHz	−70 dBc	−70 dBc

(2) In any case, no requirement in excess of −36 dBm shall apply.
(c)(1) Maximum adjacent power levels for frequencies in the 809-824/854-869 MHz band:

Frequency offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	−55 dBc	−55 dBc
50 kHz	−65 dBc	−65 dBc
75 kHz	−65 dBc	−70 dBc

(2) In any case, no requirement in excess of −36 dBm shall apply.
(d) On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least 43 + 10 log (P_{watts}) dB.

TEST CONFIGURATION



TEST PROCEDURE

The RF output of the transmitter was connected to the input of the TETRA analyzer through sufficient attenuation.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Channel	Frequency Offset (kHz)	Measurement Power (dBc)	Limit (dB)	Result
TX1	CH_{L2}	-75	-74.56	≤-70	Pass
		-50	-75.78		
		-25	-68.34	≤-60	
		25	-67.57		
		50	-74.71	≤-70	
		75	-75.82		
	CH_{M2}	-75	-74.88	≤-70	
		-50	-75.95		
		-25	-67.13	≤-60	
		25	-66.48		
		50	-74.55	≤-70	
		75	-75.16		
	CH_{H2}	-75	-74.43	≤-70	
		-50	-75.29		
		-25	-66.14	≤-60	
		25	-66.83		
		50	-75.28	≤-70	
		75	-76.33		
TX2	CH_{L2}	-75	-74.56	≤-70	Pass
		-50	-75.45		
		-25	-68.27	≤-60	
		25	-67.53		
		50	-74.82	≤-70	
		75	-75.16		
	CH_{M2}	-75	-74.86	≤-70	
		-50	-75.72		
		-25	-67.53	≤-60	
		25	-66.75		
		50	-74.41	≤-70	
		75	-75.68		
	CH_{H2}	-75	-74.37	≤-70	
		-50	-75.63		
		-25	-66.36	≤-60	
		25	-66.62		
		50	-75.54	≤-70	
		75	-76.37		

5.7. Spurious Emission on Antenna Port

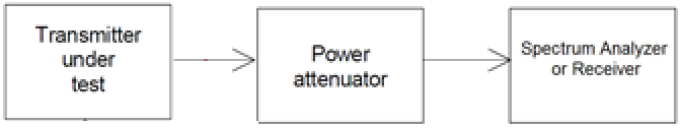
Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired.

LIMIT

FCC Part 22.359

FCC Part 90.210
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43 + 10 log (Pwatts)
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
Limit (dBm) = EL-43-10$\log_{10}$ (TP) = -13 dBm

TEST CONFIGURATION



TEST PROCEDURE

1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.

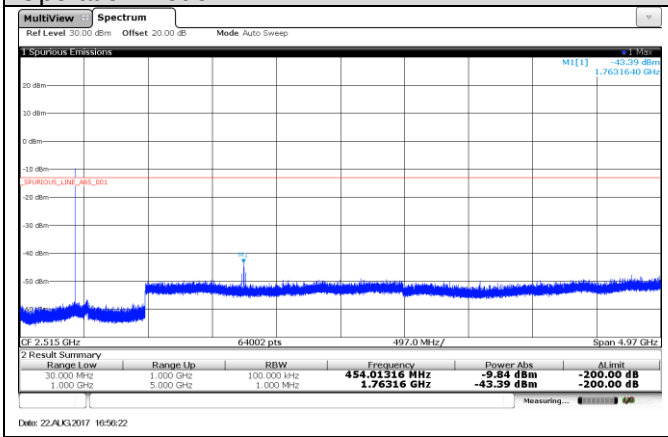
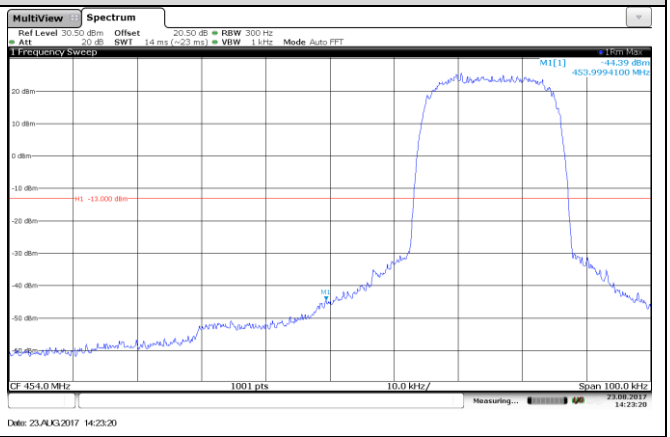
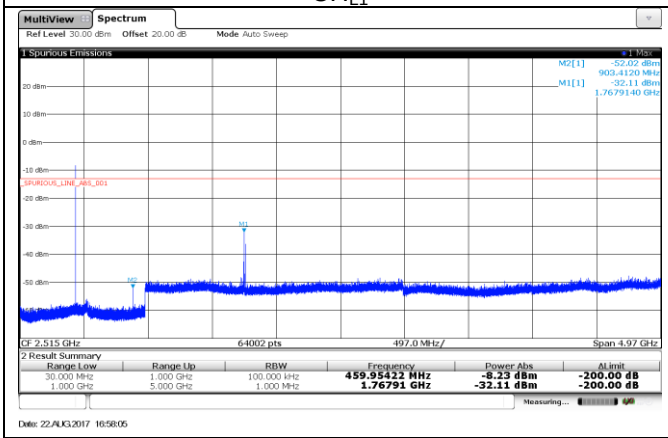
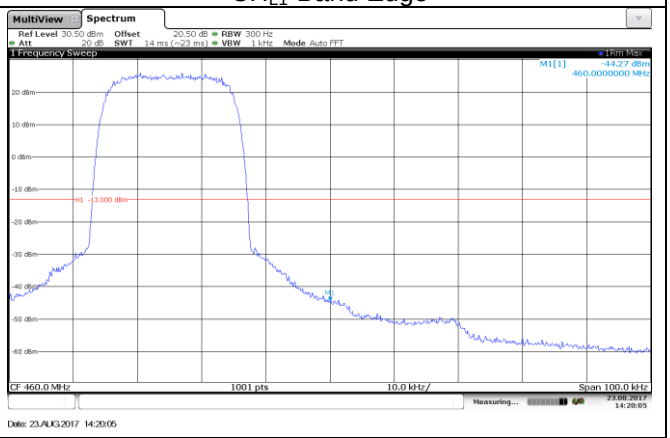
TEST MODE:

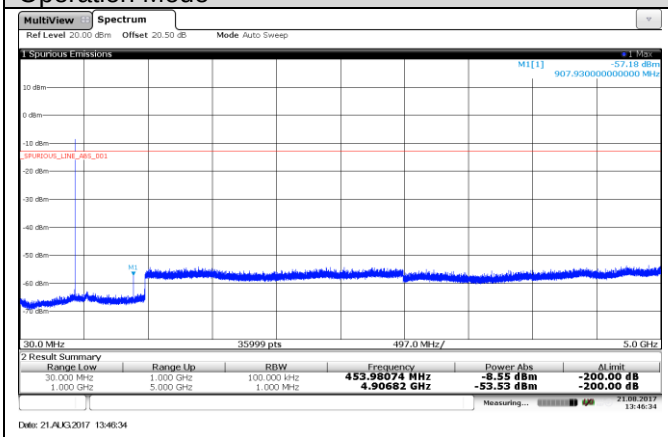
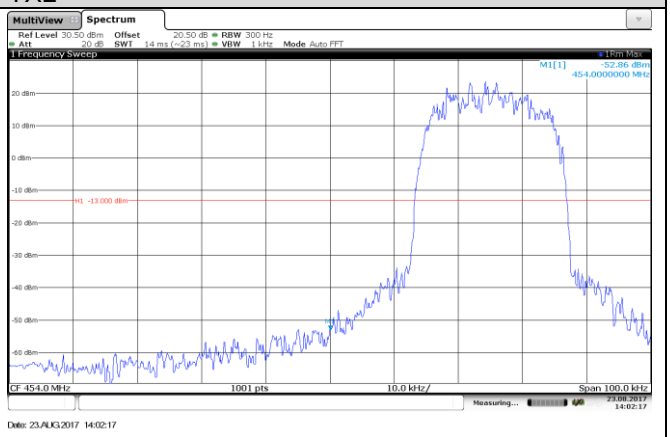
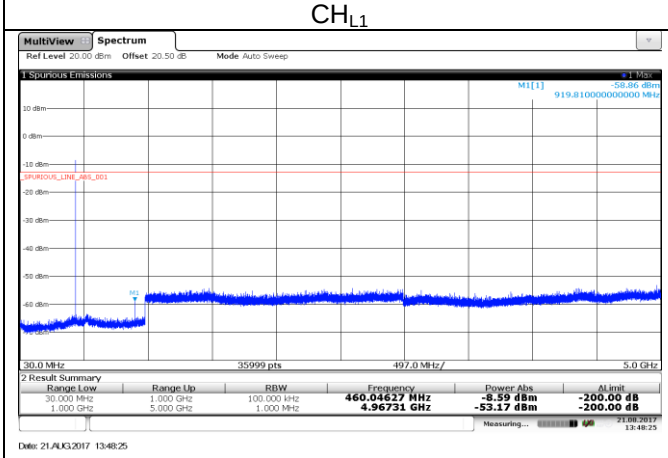
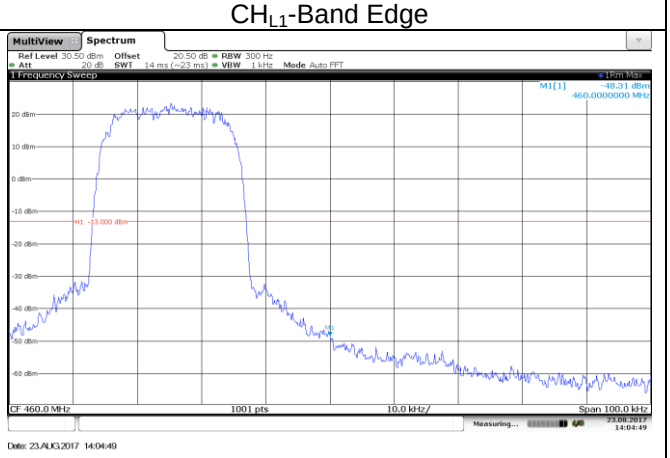
Please reference to the section 3.4

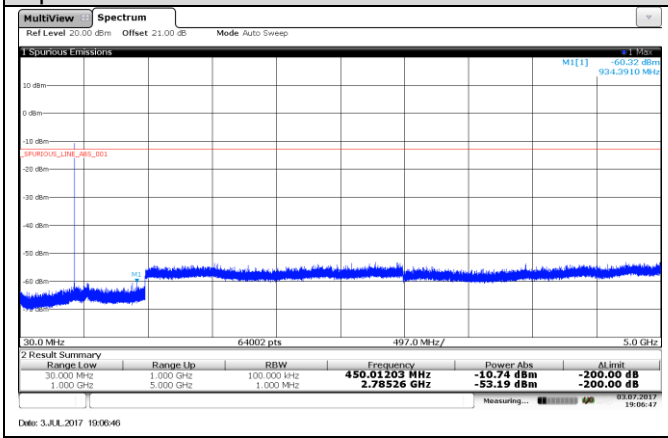
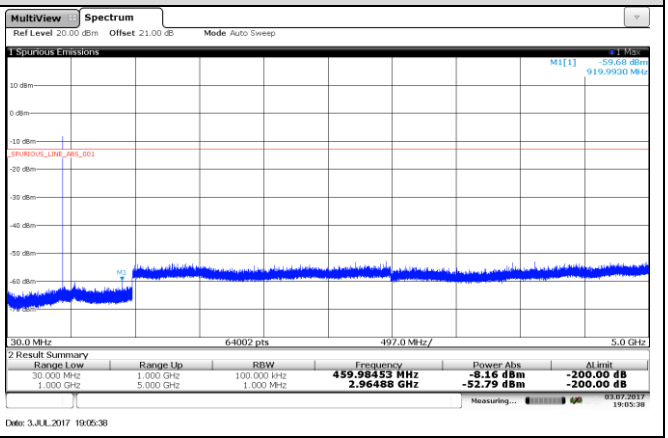
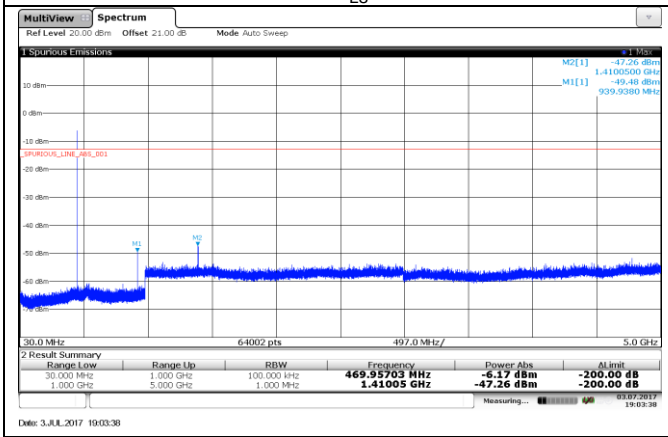
TEST RESULTS

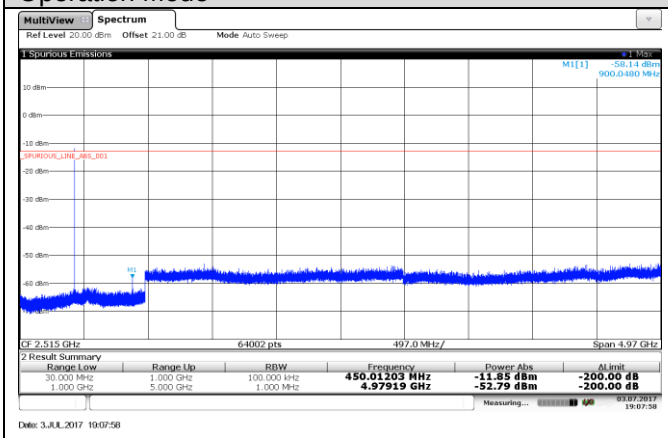
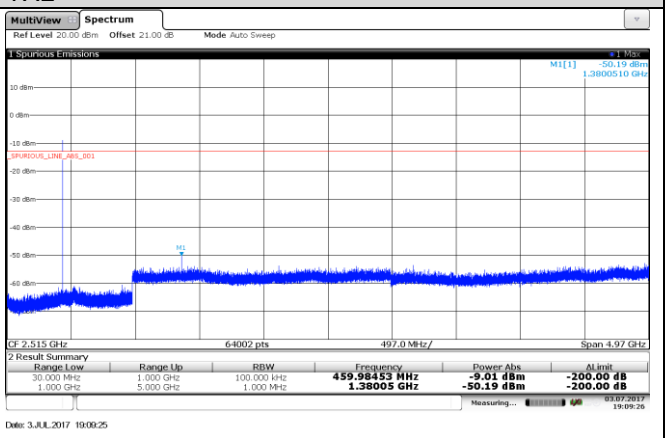
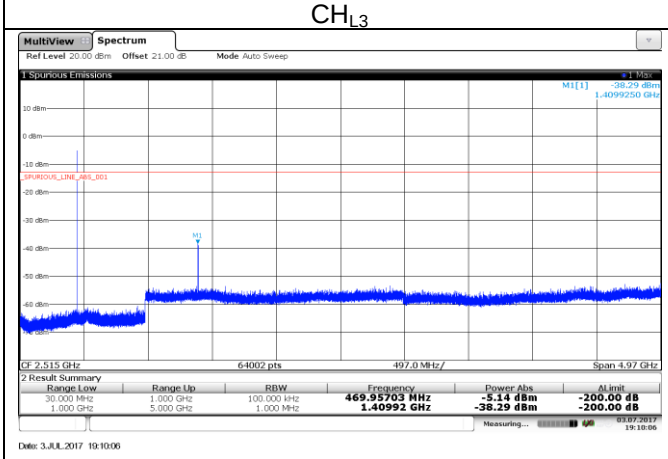
☒ **Passed** ☐ **Not Applicable**

Test plot as follows:

Operation Mode	TX1
	
CH_{L1}	CH_{L1}-Band Edge
	
CH_{H1}	CH_{H1}-Band Edge

Operation Mode	TX2
	
CH_{L1}	CH_{L1}-Band Edge
	
CH_{H1}	CH_{H1}-Band Edge

Operation Mode	TX1
	
CH_{L3}	CH_{M3}
	No plot
CH_{H3}	-

Operation Mode	TX2
	
CH_{L3}	CH_{M3}
	No plot
CH_{H3}	-

5.8. 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.

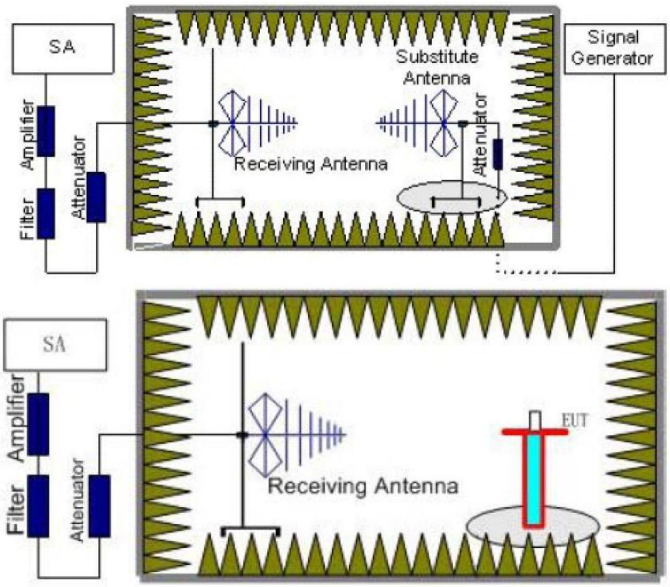
LIMIT

FCC Part 22.359

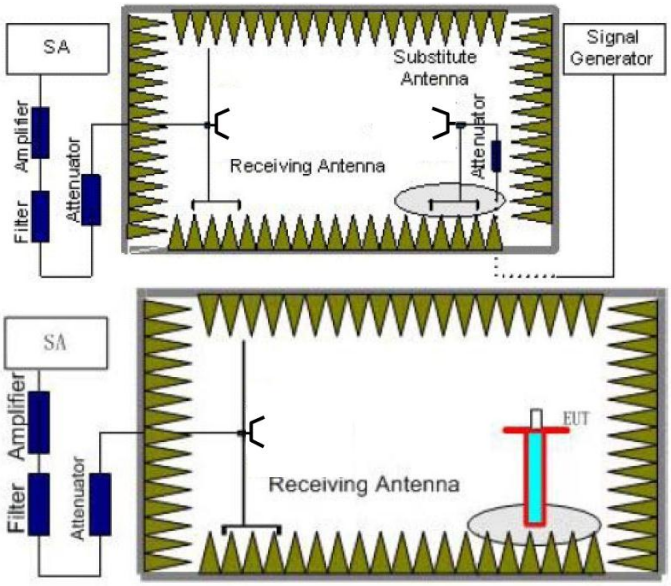
FCC Part 90.210
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43 + 10 log (Pwatts)
Calculation: Limit (dBm) =EL-43-10log10 (TP)
Notes: EL is the emission level of the Output Power expressed in dBm,
Limit (dBm) = EL-43-10$\log_{10}$ (TP) = -13 dBm

TEST CONFIGURATION

Below 1GHz:



Above 1GHz:



TEST PROCEDURE

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1. 0 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} - G_a
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=P_{Mea}- P_{cl} - G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST MODE:

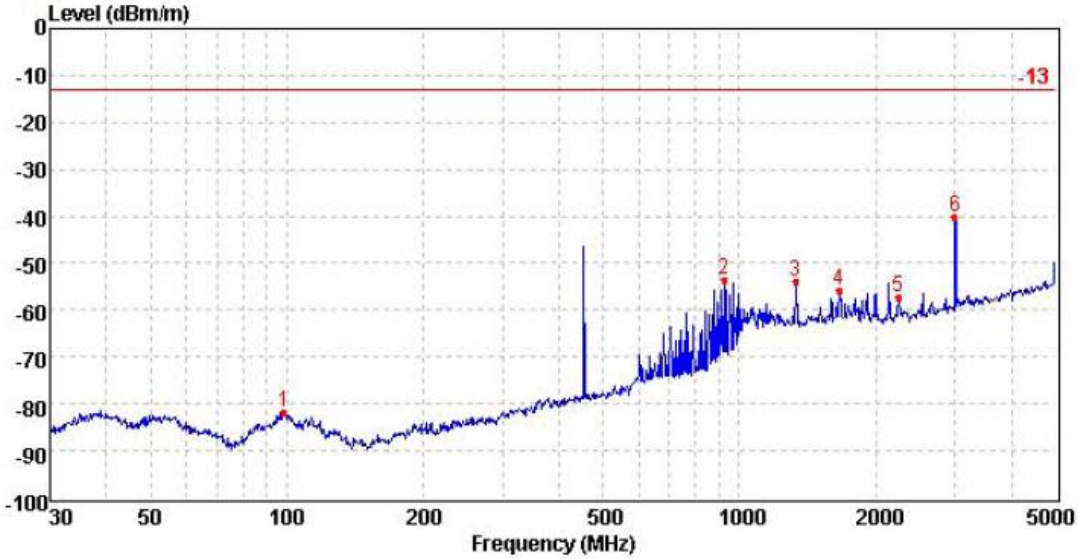
Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

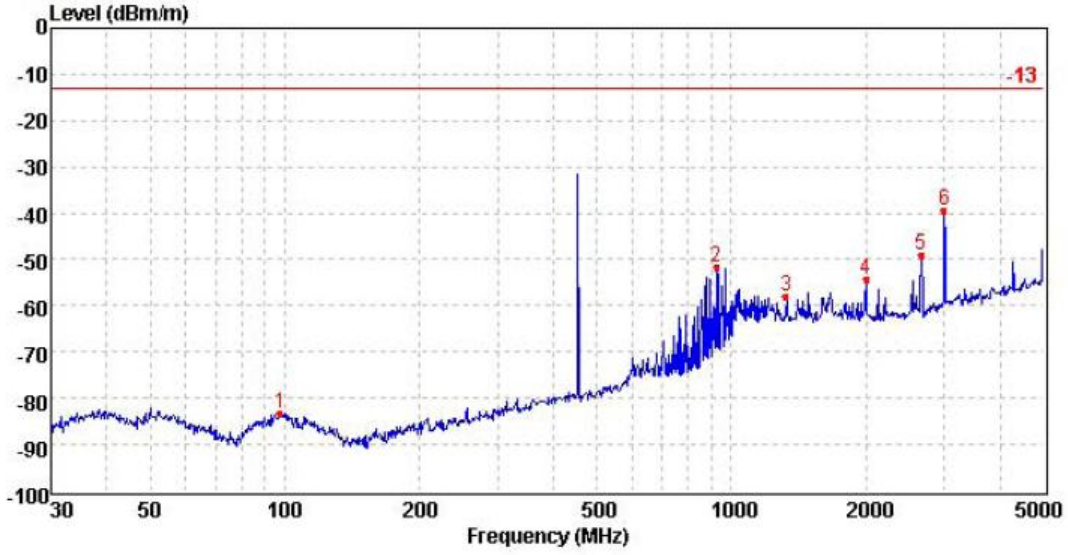
Test plot as follows:

TX1			
Test Frequency:	CH_{L1}	Polarity:	Horizontal



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	98.82	-79.92	25.92	1.14	29.09	-81.95	-13.00	-68.95	Peak
2	925.00	-65.19	36.08	3.77	28.05	-53.39	-13.00	-40.39	Peak
3	1331.73	-61.96	39.54	4.88	36.50	-54.04	-13.00	-41.04	Peak
4	1662.93	-65.19	40.41	5.69	36.85	-55.94	-13.00	-42.94	Peak
5	2243.28	-68.01	41.71	6.51	37.46	-57.25	-13.00	-44.25	Peak
6	3001.90	-52.63	43.29	7.48	38.23	-40.09	-13.00	-27.09	Peak

Test Frequency:	CH_{L1}	Polarity:	Vertical



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	97.78	-80.96	25.76	1.14	29.09	-83.15	-13.00	-70.15	Peak
2	925.00	-63.54	36.08	3.77	28.05	-51.74	-13.00	-38.74	Peak
3	1327.45	-66.08	39.54	4.88	36.50	-58.16	-13.00	-45.16	Peak
4	2001.04	-64.21	41.05	6.27	37.30	-54.19	-13.00	-41.19	Peak
5	2660.56	-60.97	42.67	7.05	38.00	-49.25	-13.00	-36.25	Peak
6	2992.26	-51.89	43.26	7.48	38.24	-39.39	-13.00	-26.39	Peak