



TEST REPORT

Report Reference No. : TRE1703009201 R/C.....: 20218

FCC ID : YAMPT560HF4

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 : TETRA TERMINAL

Trade Mark : Hytera

Model/Type reference..... : PT560H F4

Listed Model(s) : -

Standard : FCC Part 90
FCC Part 2

Date of receipt of test sample..... : Mar. 13, 2017

Date of testing..... : Mar. 13, 2017 - Apr. 08, 2017

Date of issue..... : Apr. 08, 2017

Result..... : PASS

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

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

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The test report merely corresponds to the test sample.

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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 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	Apr. 08, 2017	Original

2. Test Description

Transmitter Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Maximum Transmitter Power	FCC Part 90.205	<input checked="" type="checkbox"/>	
Occupied Bandwidth	FCC Part 90.209	<input checked="" type="checkbox"/>	
Emission Mask	FCC Part 90.210	<input checked="" type="checkbox"/>	
Frequency Stability	FCC Part 90.213	<input checked="" type="checkbox"/>	
Adjacent Channel Power Limits	FCC Part 90.221	<input checked="" type="checkbox"/>	
Transmitter Radiated Spurious Emission	FCC Part 90.210	<input checked="" type="checkbox"/>	
Spurious Emission On Antenna Port	FCC Part 90.210	<input checked="" type="checkbox"/>	
Receiver Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Conducted Emission	FCC Part 15.107	<input checked="" type="checkbox"/>	
Radiated Emission	FCC Part 15.109	<input checked="" type="checkbox"/>	

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:	TETRA TERMINAL
Trade Mark:	Hytera
Model/Type reference:	PT560H F4
Listed Model(s):	-
Power supply:	DC 7.4V
Charger information:	Model: CH20L06 Input: 12Vd.c., 2000mA Output: 2000mA
Adapter information:	Model: HKA02412020-1W Input: 100-240Va.c., 0.7A, 50/60Hz Output: 12.0Vd.c., 2.0A
RF Specification	
Operation Frequency Range:	450MHz ~ 470MHz
Rated Output Power:	3 Watts (34.77dBm)
Modulation Type:	$\pi/4$ DQPSK
Channel Separation:	25kHz
Antenna Type	External
Maximum Transmitter Power :	2.45W for TMO 2.45W for DMO

3.3. Test frequency list

Mode	Modulation	Operation Frequency Range	Test Frequency (MHz)	
TMO	$\pi/4$ DQPSK	450MHz~470MHz	CH _L	450.025
			CH _M	460.000
			CH _H	469.975
DMO	$\pi/4$ DQPSK	450MHz~470MHz	CH _L	450.025
			CH _M	460.000
			CH _H	469.975

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above listed frequency for testing.

3.4. EUT operation mode

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

√: 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, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

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. Valid time is until April 30, 2017.

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. Registration 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

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 on Dec. 03, 2014, valid time is until Dec. 03, 2017.

ACA

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

4.3. Environmental conditions

Normal Condition	
Relative humidity:	20 % to 75 %.
Air Pressure:	950~1050mba
Voltage:	DC 7.4V

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 Analyzer	Aglient	E4407B	MY44210775	2016/11/13
Spectrum Analyzer	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

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.

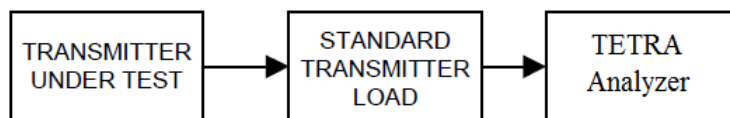
LIMIT

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.

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 2.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Frequency (MHz)	Measured power (dBm)	Measured power (W)	Limit (W)	Result
TX1	CH _L	33.90	2.45	2.4 ~ 3.6	Pass
	CH _M	33.90	2.45		
	CH _H	33.90	2.45		
TX2	CH _L	33.90	2.45	2.4 ~ 3.6	Pass
	CH _M	33.90	2.45		
	CH _H	33.90	2.45		

5.2. Occupied Bandwidth

LIMIT

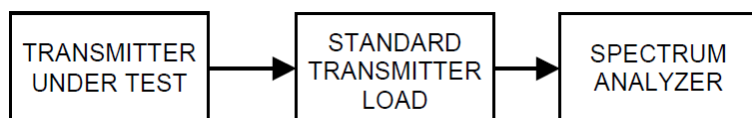
FCC part 90.209

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.

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 2.4

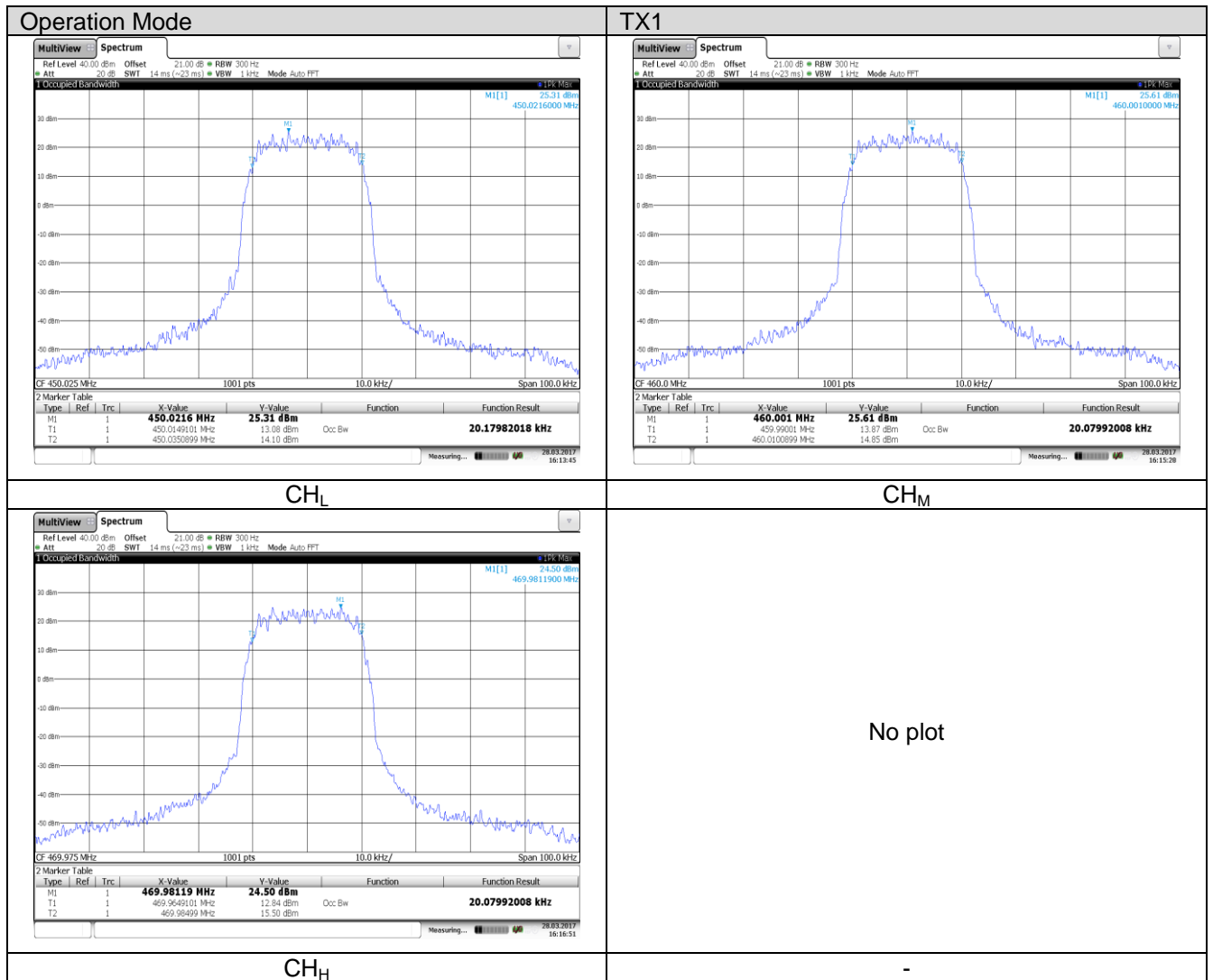
TEST RESULTS

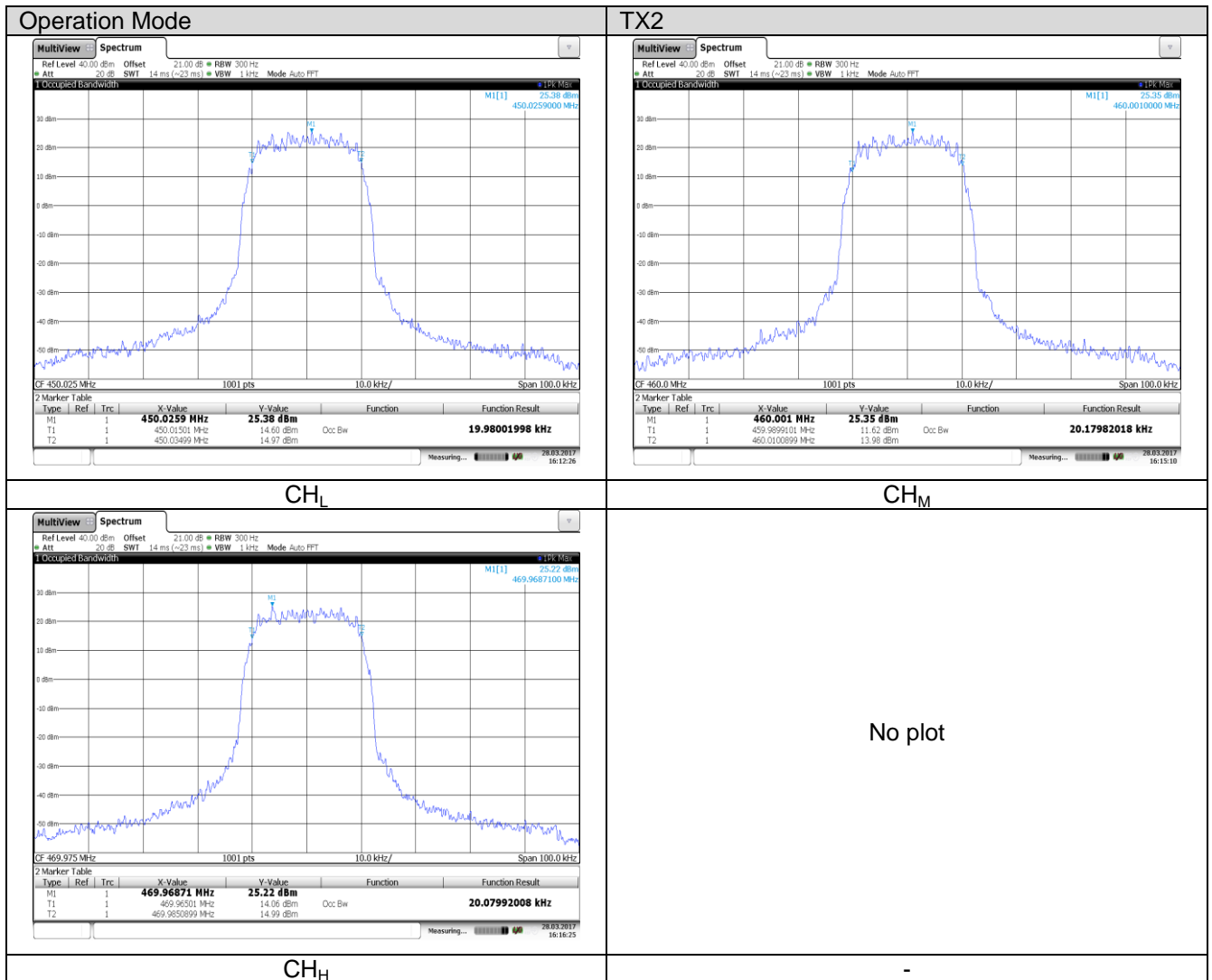
☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Channel	99% Occupied Bandwidth (kHz)	Limit (kHz)	Result
TX1	CH _L	20.18	≤22	Pass
	CH _M	20.08		
	CH _H	20.08		
TX2	CH _L	19.98	≤22	Pass
	CH _M	20.18		
	CH _H	20.08		

Test plot as follows:





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.

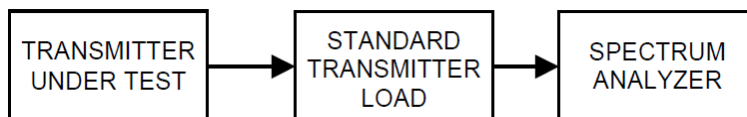
LIMIT

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.

TEST CONFIGURATION



TEST PROCEDURE

TIA/EIA-603-D, Section 2.2.11.2

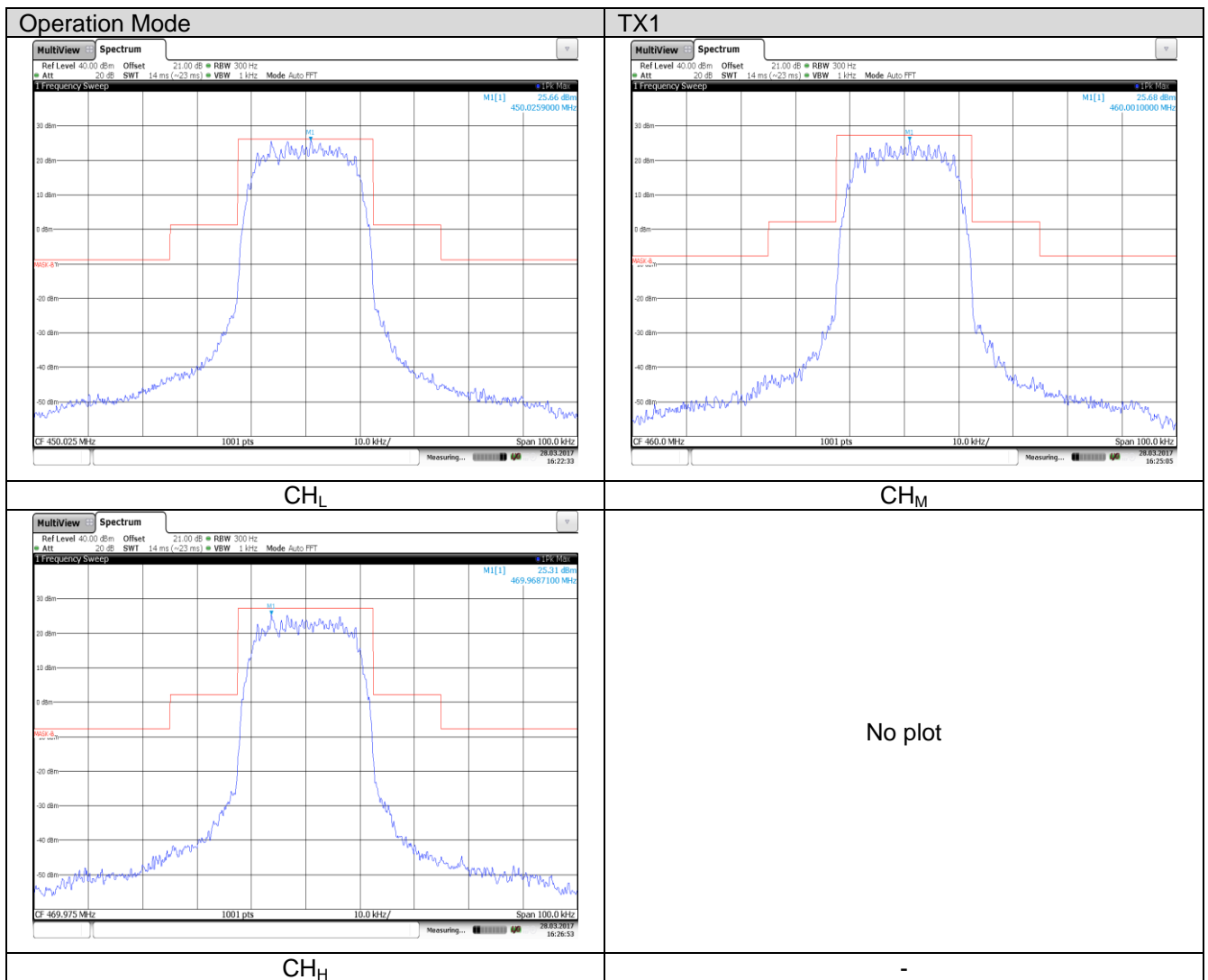
- 1) Connect the equipment as illustrated
- 2) Adjust the spectrum analyzer for the following settings
 - a) Resolution Bandwidth per the above table.
 - b) Video Bandwidth at least 10 times the resolution bandwidth.
 - c) Sweep Speed slow enough to maintain measurement calibration.
 - d) Detector Mode = 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.

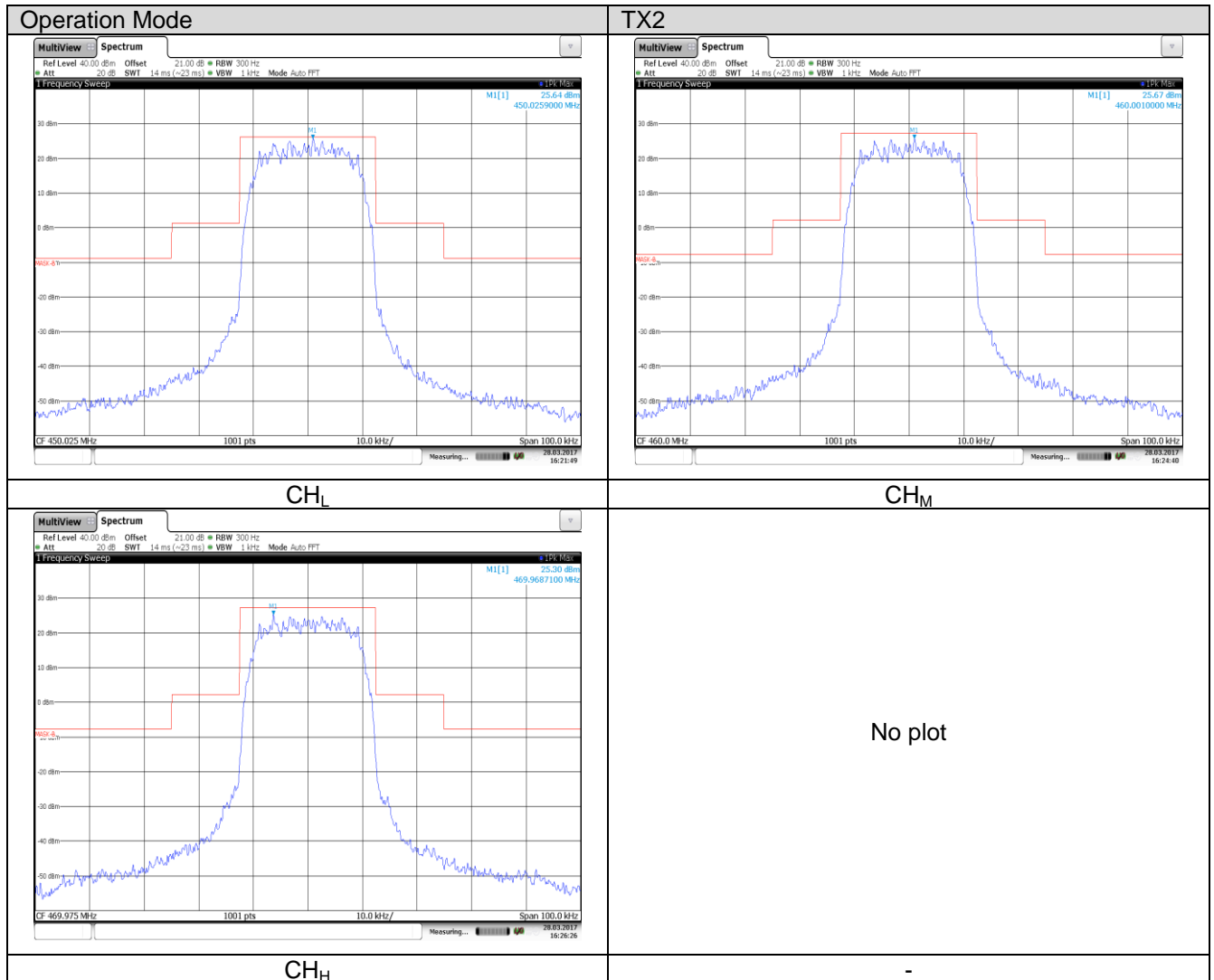
TEST MODE:

Please reference to the section 2.4

TEST RESULTS☒ Passed ☐ Not Applicable

Please refer to the below test data:





5.4. Frequency Stability Test

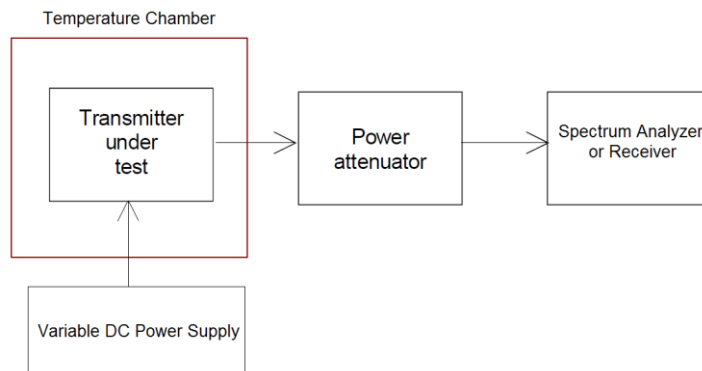
The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

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 3 100	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 2450	10		

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 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 2.4

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 _L	CH _M	CH _H		
TX1	7.4	-30	0.14	0.10	0.12	±5.00	Pass
		-20	0.14	0.09	0.11		
		-10	0.14	0.10	0.11		
		0	0.13	0.09	0.12		
		10	0.14	0.09	0.12		
		20	0.14	0.10	0.12		
		30	0.14	0.10	0.13		
		40	0.15	0.11	0.14		
		50	0.16	0.12	0.15		
TX2	7.4	-30	0.13	0.11	0.11	±5.00	Pass
		-20	0.13	0.11	0.11		
		-10	0.12	0.11	0.11		
		0	0.13	0.11	0.11		
		10	0.13	0.11	0.12		
		20	0.13	0.12	0.12		
		30	0.14	0.13	0.12		
		40	0.14	0.14	0.13		
		50	0.14	0.15	0.14		

Frequency Stability VS Voltage

Operation mode	Temperature (°C)	Voltage (V)	Frequency error (ppm)			Limit (ppm)	Result
			CH _L	CH _M	CH _H		
TX1	20	6.29	0.14	0.09	0.11	±5.00	Pass
		7.40	0.14	0.10	0.12		
		8.51	0.15	0.10	0.13		
TX2	20	6.29	0.13	0.10	0.11	±5.00	Pass
		7.40	0.13	0.12	0.12		
		8.51	0.14	0.12	0.13		

5.5. 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.

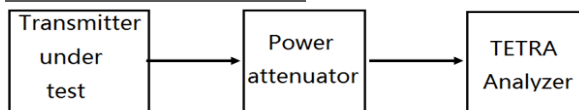
(c)(1) Maximum adjacent power levels for frequencies in the 809-824/854-869 MHz band:

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 $43 + 10 \log (P_{\text{watts}})$ 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 2.4

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 _L	-75	-78.32	≤-70	Pass
		-50	-76.18		
		-25	-63.35	≤-60	
		25	-63.74		
		50	-76.00	≤-70	
		75	-76.78		
	CH _M	-75	-78.52	≤-70	
		-50	-76.45		
		-25	-64.54	≤-60	
		25	-64.37		
		50	-75.99	≤-70	
		75	-76.76		
	CH _H	-75	-78.52	≤-70	
		-50	-76.40		
		-25	-64.26	≤-60	
		25	-63.96		
		50	-75.54	≤-70	
		75	-76.80		
TX2	CH _L	-75	-78.24	≤-70	Pass
		-50	-75.57		
		-25	-63.72	≤-60	
		25	-63.10		
		50	-75.21	≤-70	
		75	-76.88		
	CH _M	-75	-78.29	≤-70	
		-50	-75.36		
		-25	-64.33	≤-60	
		25	-63.18		
		50	-75.22	≤-70	
		75	-76.87		
	CH _H	-75	-78.36	≤-70	
		-50	-75.38		
		-25	-64.04	≤-60	
		25	-63.60		
		50	-75.14	≤-70	
		75	-76.48		

5.6. 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 90.210 (25 kHz bandwidth only):

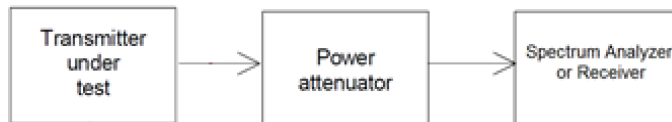
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
 $43 + 10 \log (P_{\text{watts}})$

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

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

Limit (dBm) = EL-43-10log₁₀ (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.

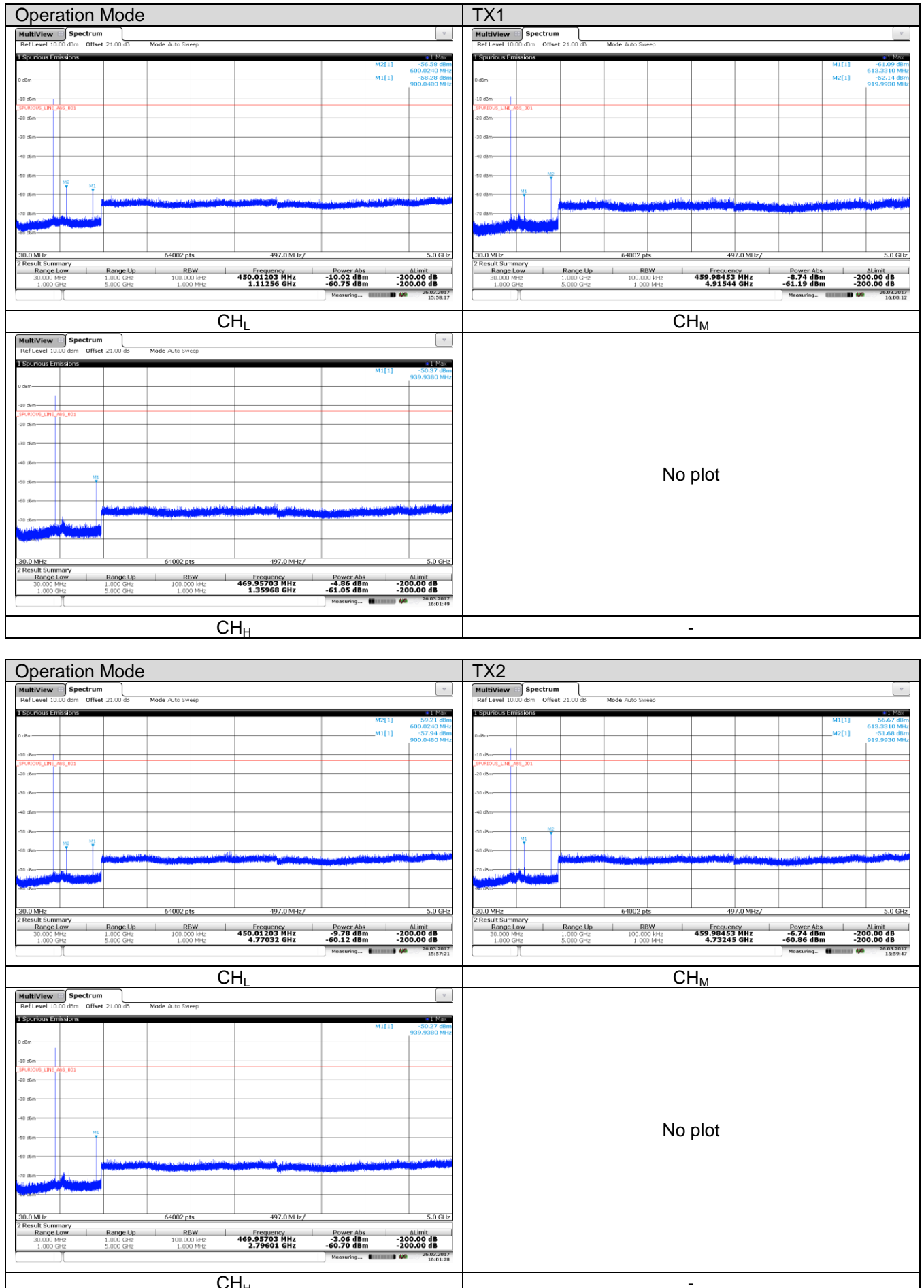
TEST MODE:

Please reference to the section 2.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Test plot as follows:



5.7. 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 90.210 (25 kHz bandwidth only):

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

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

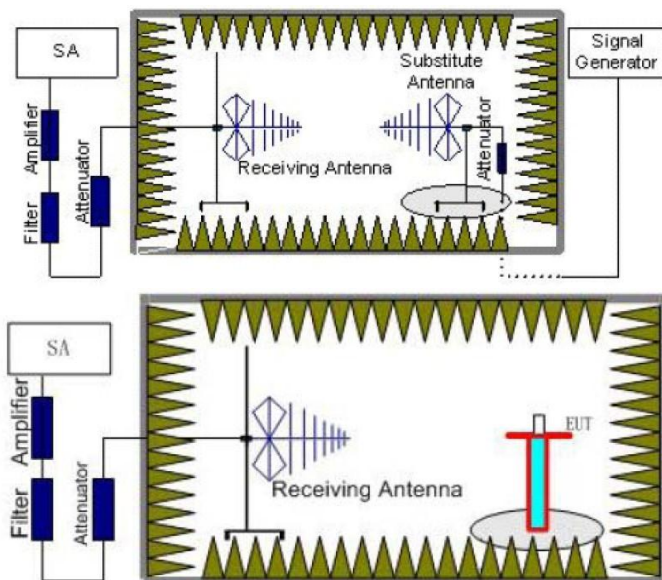
Calculation: Limit (dBm) = EL - 43 - 10 log₁₀ (TP)

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

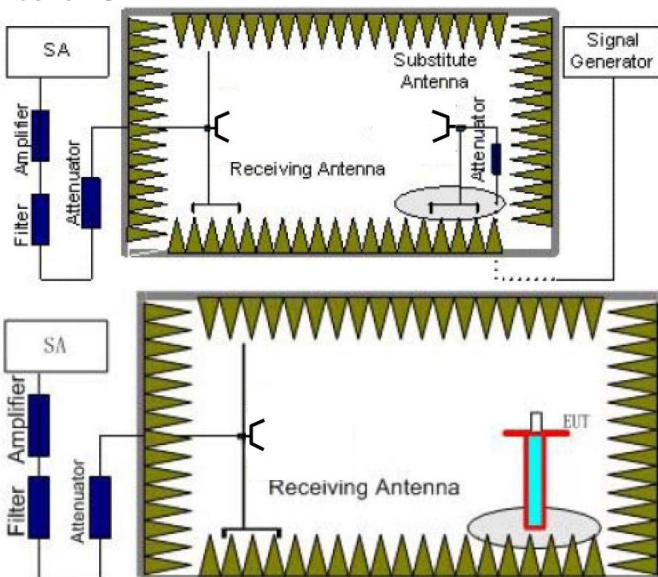
Limit (dBm) = EL - 43 - 10 log₁₀ (TP) = -13 dBm

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, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
$$\text{Power(EIRP)} = P_{Mea} - P_{Ag} - P_{cl} - G_a$$

We used SMF100A microwave signal generator which signal level can up to 33dBm, so we not used power Amplifier for substitution test; The measurement results are amend as described below:
$$\text{Power(EIRP)} = P_{Mea} - P_{cl} - G_a$$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

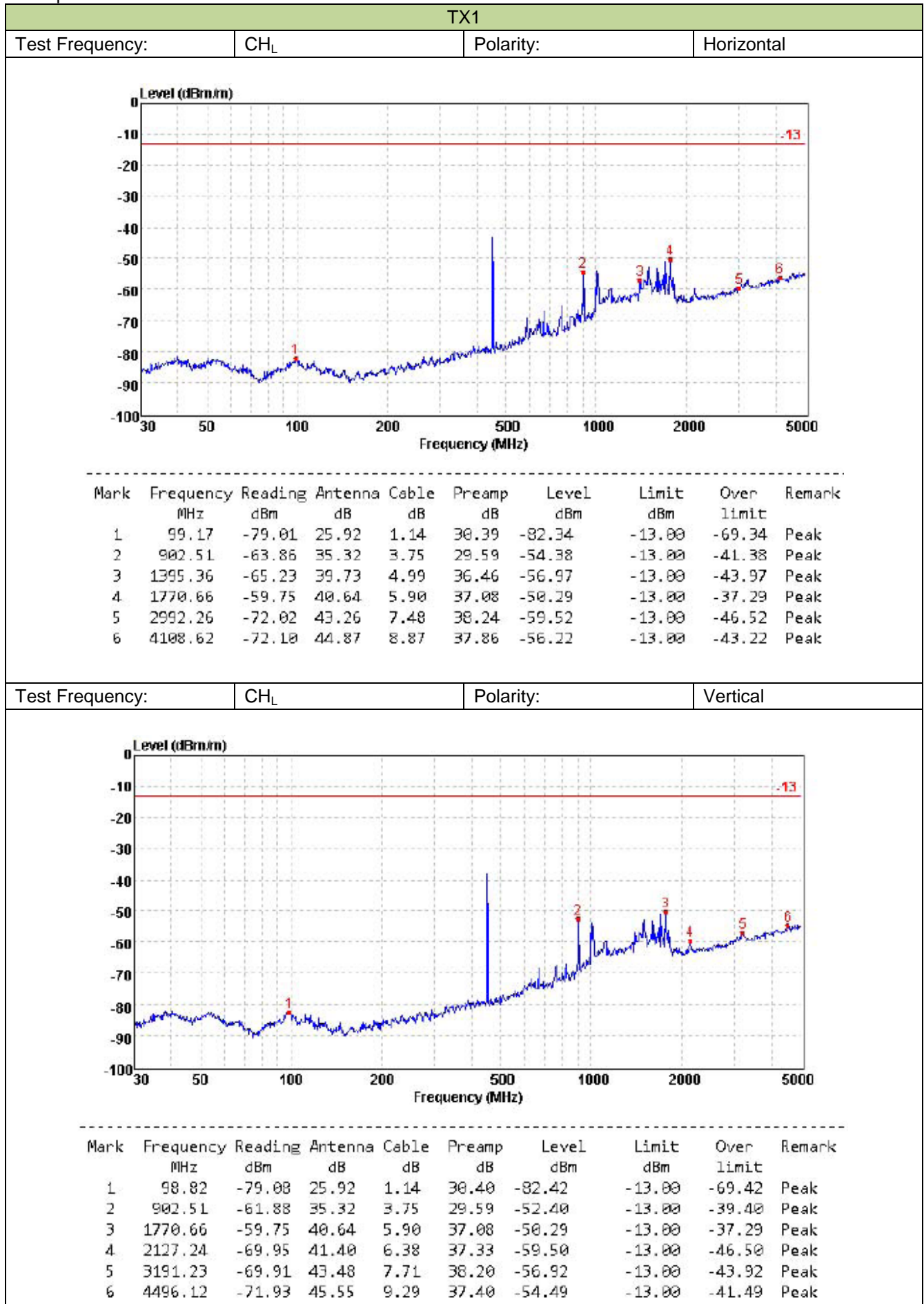
TEST MODE:

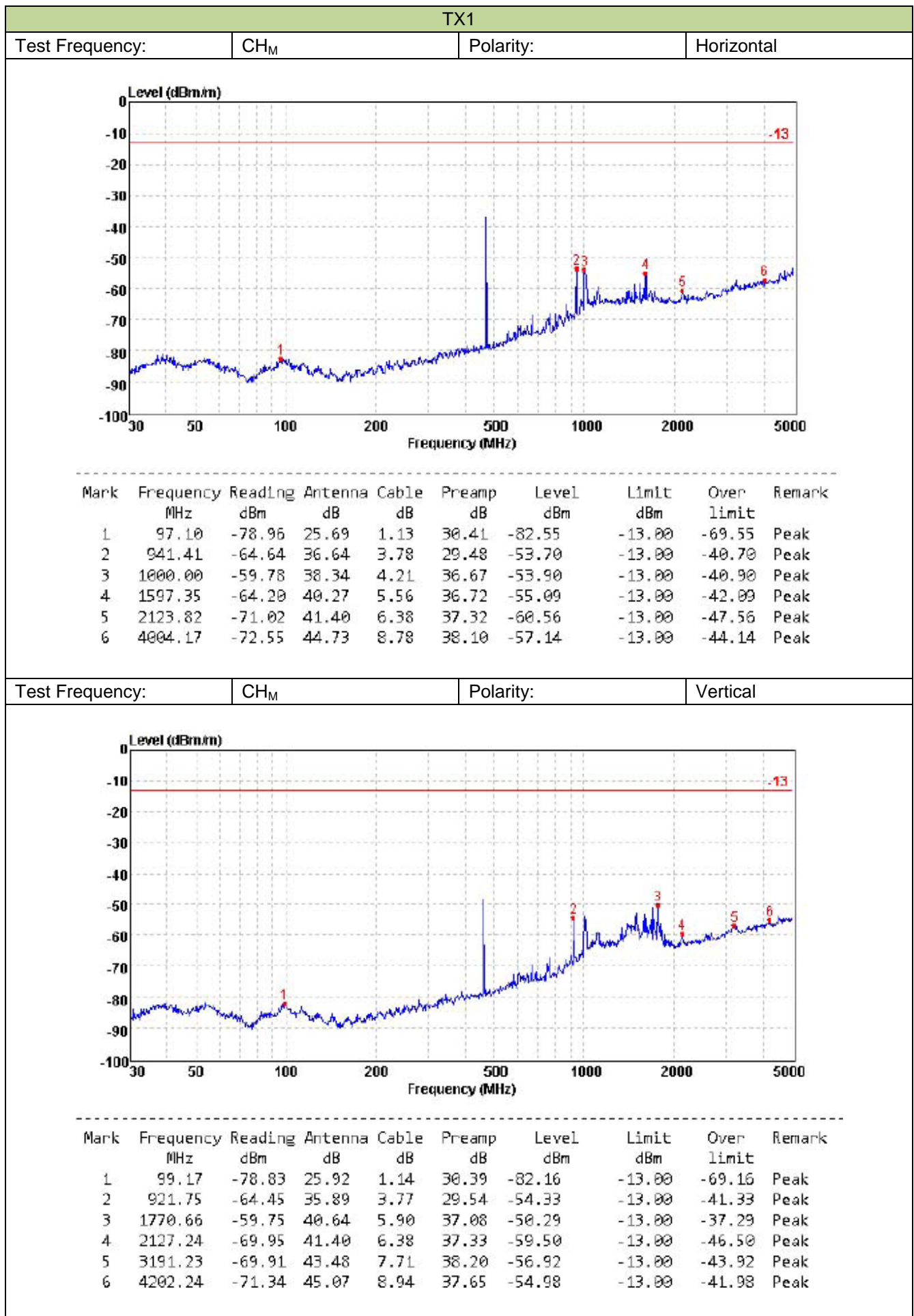
Please reference to the section 2.4

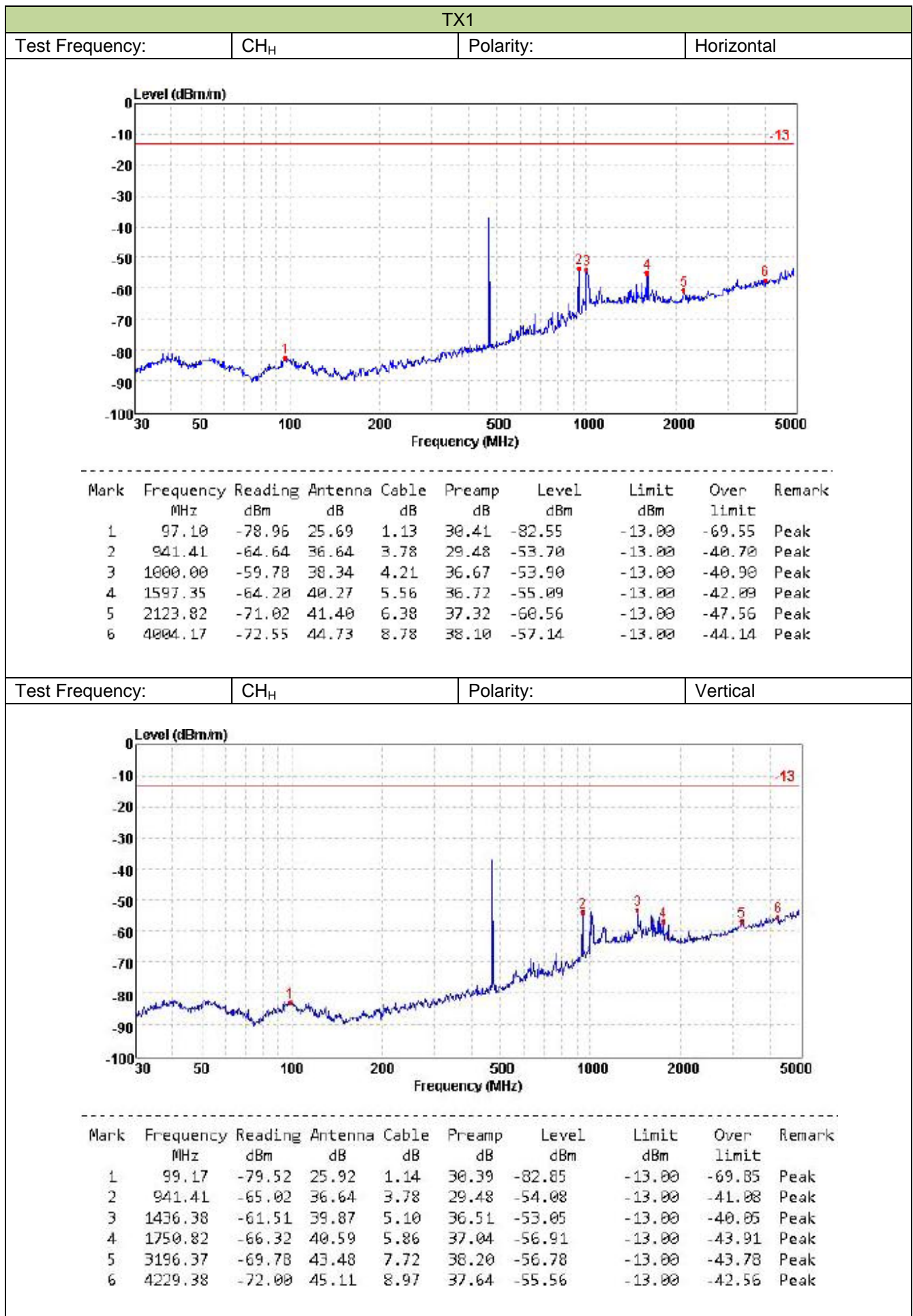
TEST RESULTS

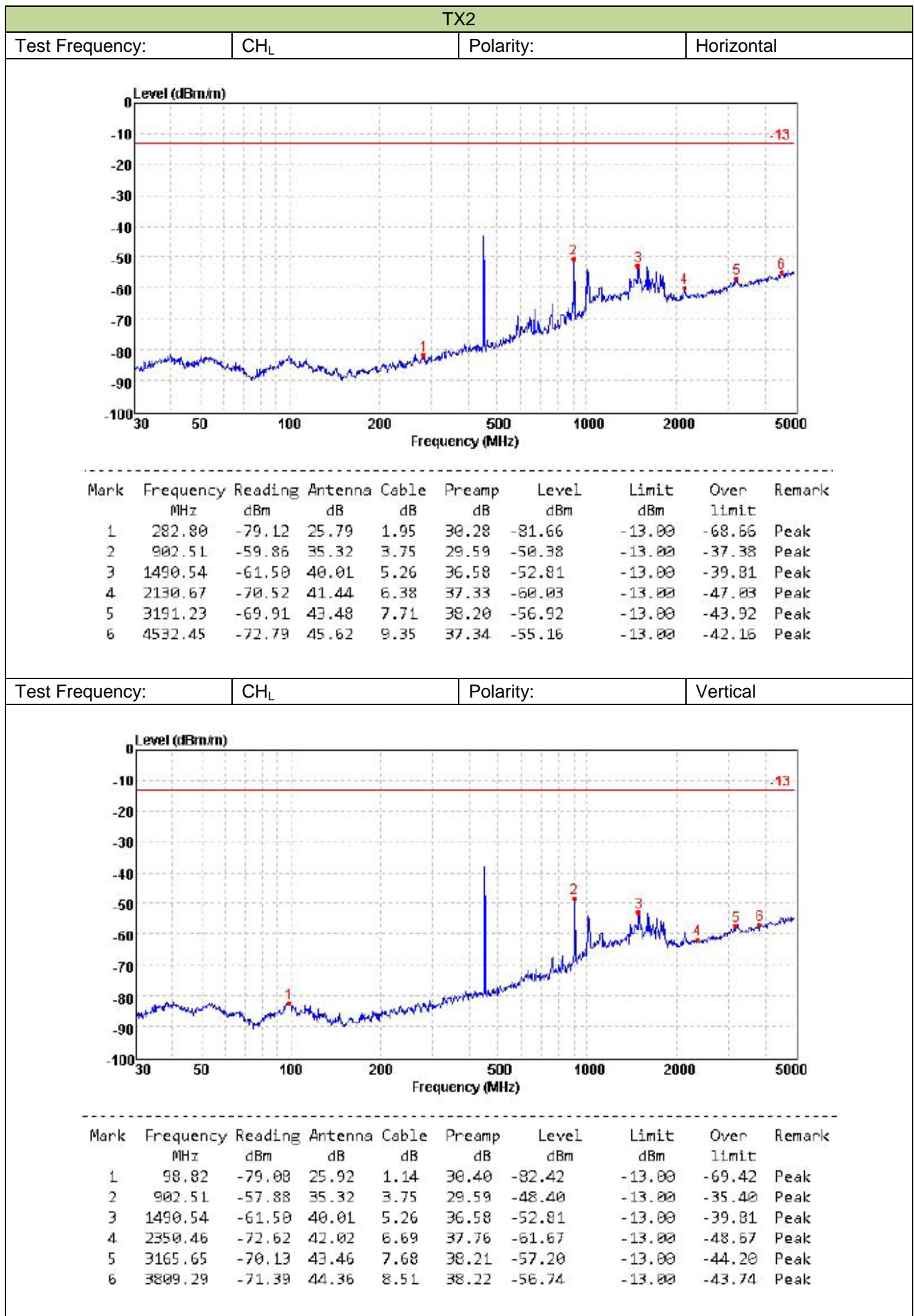
☒ Passed ☐ Not Applicable

Test plot as follows:



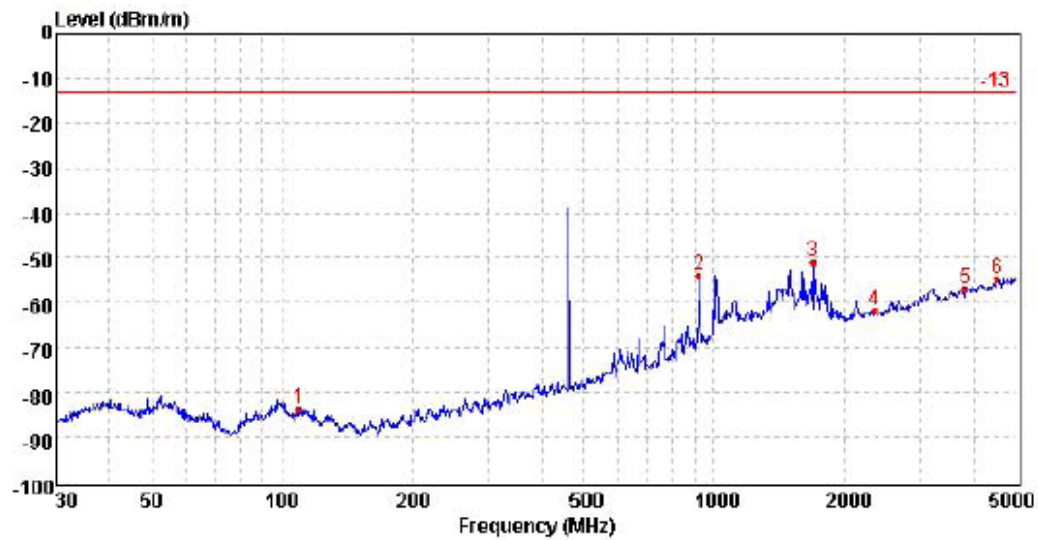






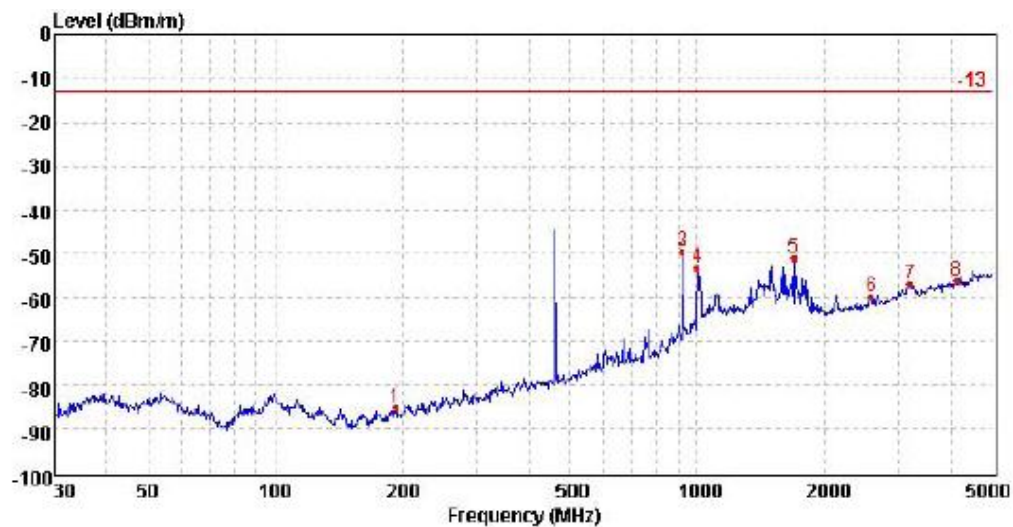
TX2

Test Frequency:	CH _M	Polarity:	Horizontal
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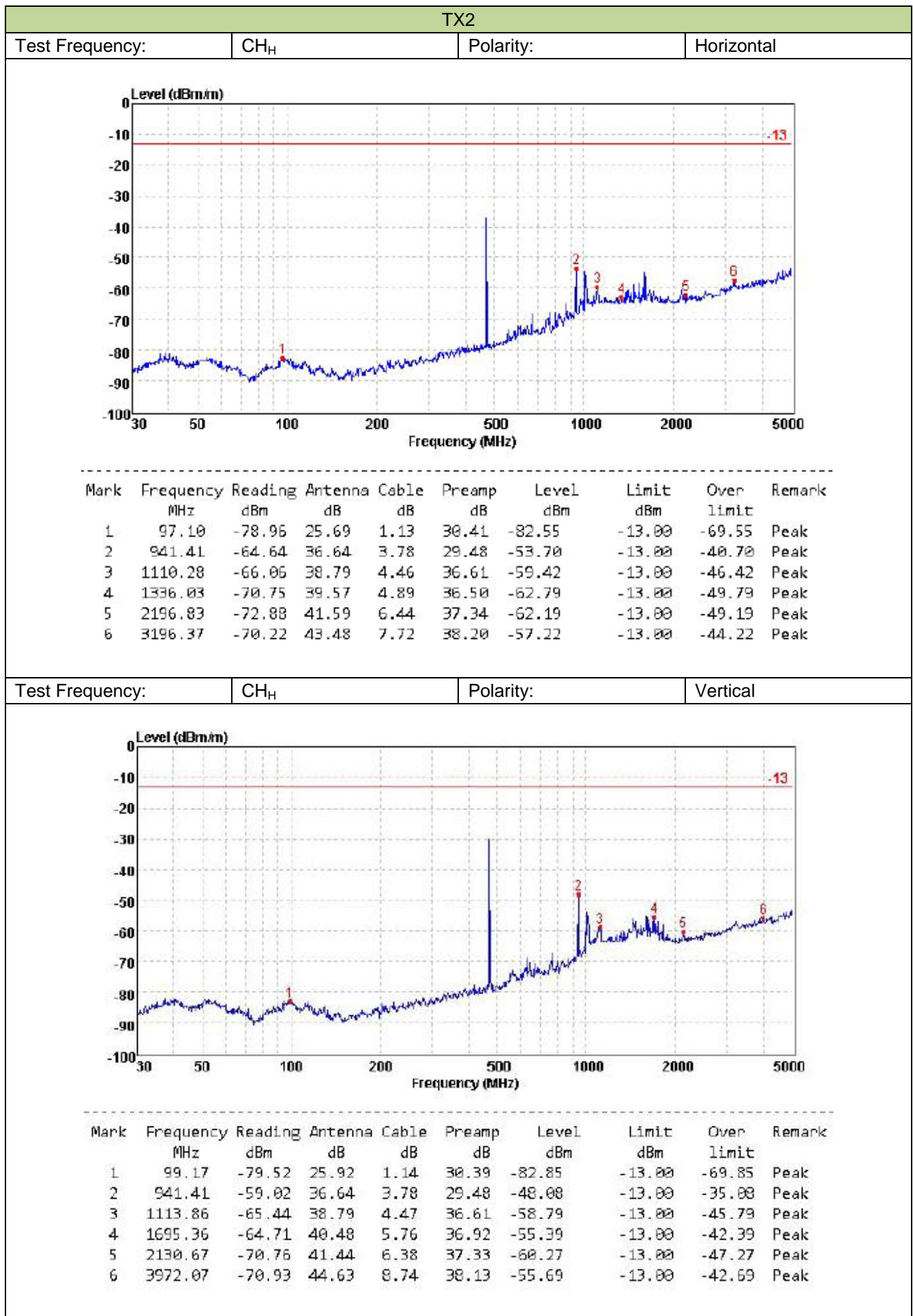


Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	109.81	-79.28	24.97	1.19	30.37	-83.49	-13.00	-70.49	Peak
2	921.75	-63.89	35.89	3.77	29.54	-53.77	-13.00	-40.77	Peak
3	1689.91	-60.28	40.45	5.75	36.91	-50.99	-13.00	-37.99	Peak
4	2350.46	-72.62	42.02	6.69	37.76	-61.67	-13.00	-48.67	Peak
5	3809.29	-71.39	44.36	8.51	38.22	-56.74	-13.00	-43.74	Peak
6	4496.12	-71.93	45.55	9.29	37.40	-54.49	-13.00	-41.49	Peak

Test Frequency:	CH _M	Polarity:	Vertical
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Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	192.76	-79.79	23.28	1.59	30.33	-85.25	-13.00	-72.25	Peak
3	921.75	-59.45	35.89	3.77	29.54	-49.33	-13.00	-36.33	Peak
4	1000.00	-59.12	38.34	4.21	36.67	-53.24	-13.00	-40.24	Peak
5	1689.91	-60.28	40.45	5.75	36.91	-50.99	-13.00	-37.99	Peak
6	2572.15	-71.43	42.50	6.89	37.85	-59.89	-13.00	-46.89	Peak
7	3191.23	-69.91	43.48	7.71	38.20	-56.92	-13.00	-43.92	Peak
8	4108.62	-72.10	44.87	8.87	37.86	-56.22	-13.00	-43.22	Peak



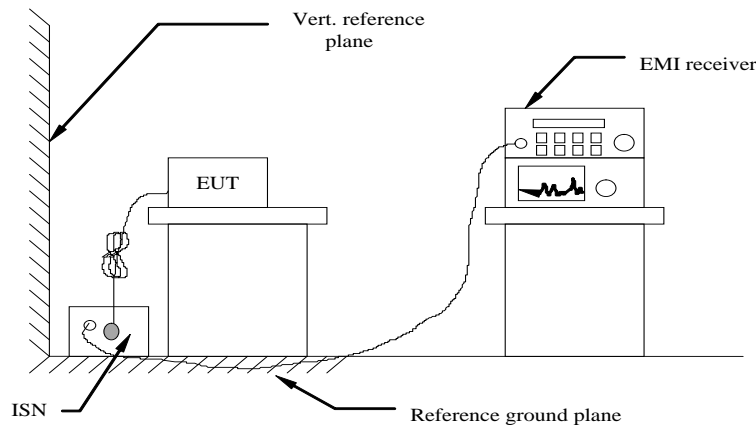
5.8. Conducted Emissions

Limit

FCC part 15.107(a)

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

TEST CONFIGURATION



TEST PROCEDURE

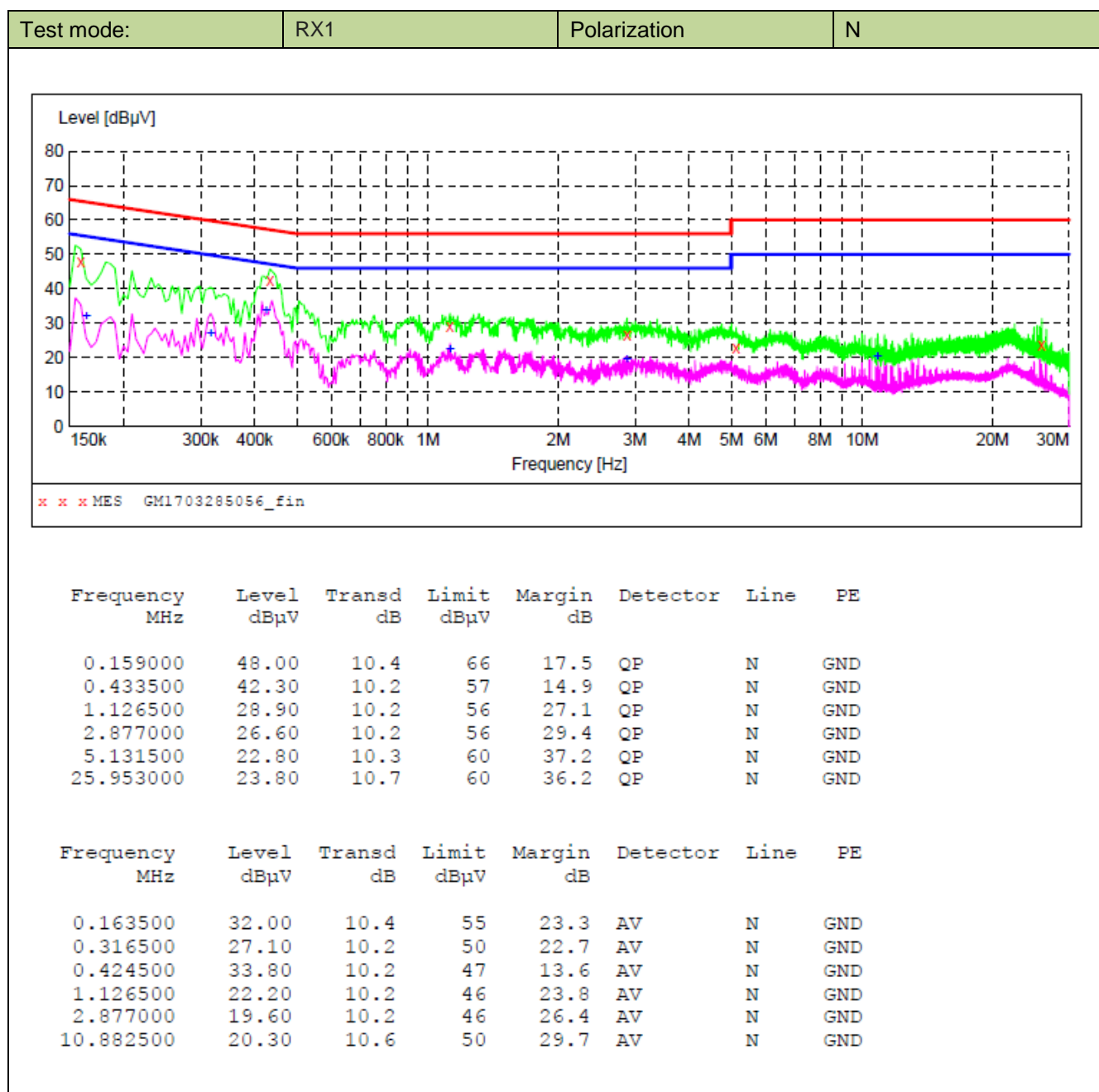
- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2014.
- 2 Support equipment, if needed, was placed as per ANSI C63.4-2014.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2014.
- 4 If a EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

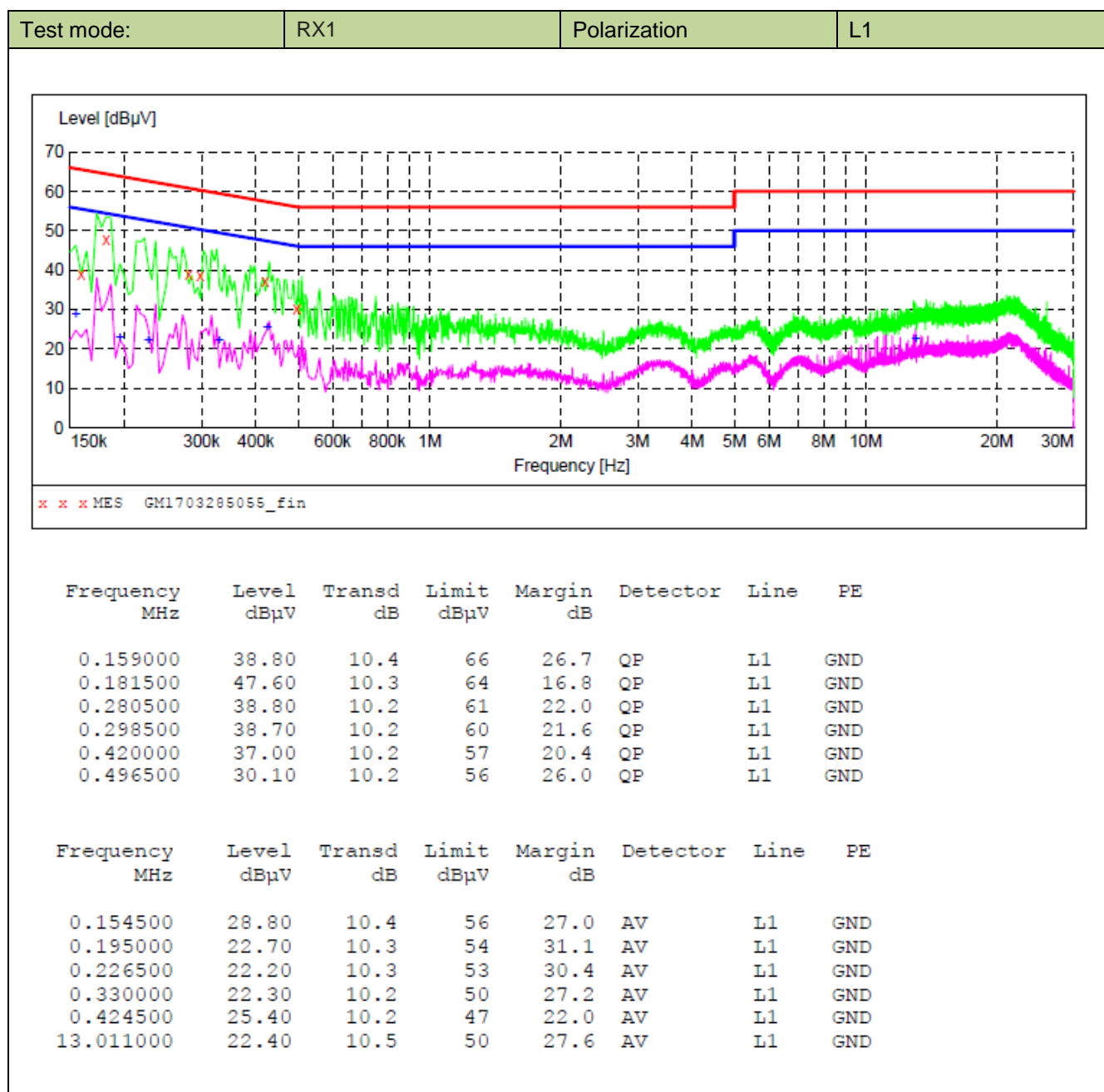
TEST MODE:

Please reference to the section 2.4

TEST RESULTS

☒ Passed ☐ Not Applicable





5.9. Radiated Emission

LIMIT

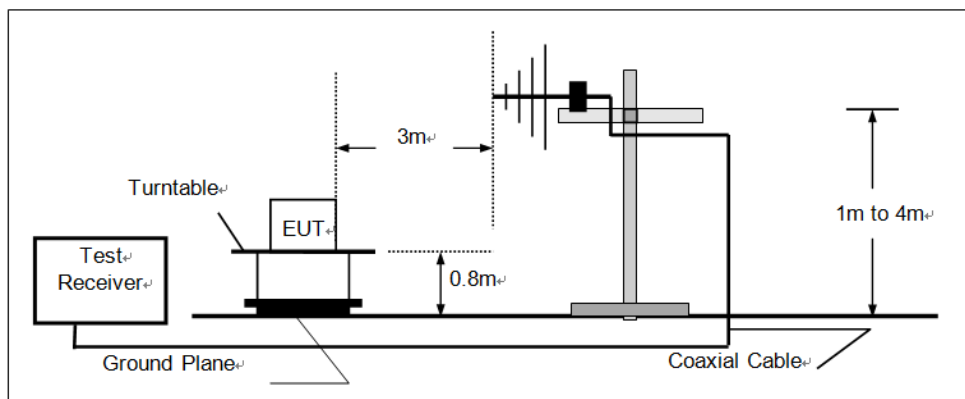
For unintentional device, according to § 15.109(a) except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

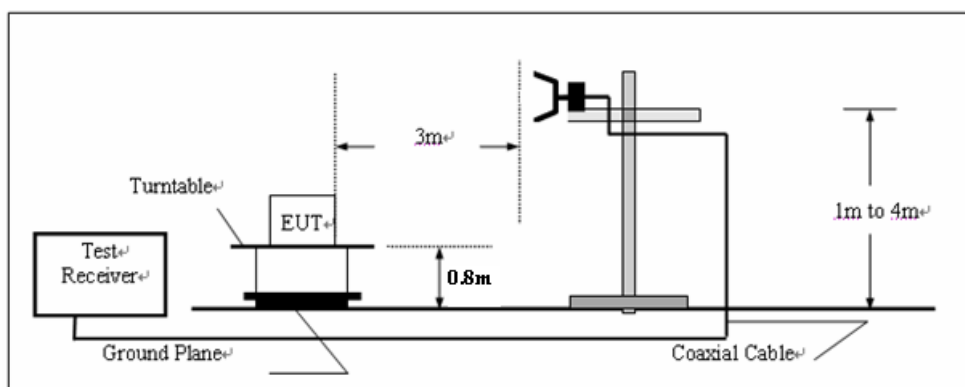
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
- 3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4 Repeat above procedures until all frequency measurements have been completed.

TEST MODE:

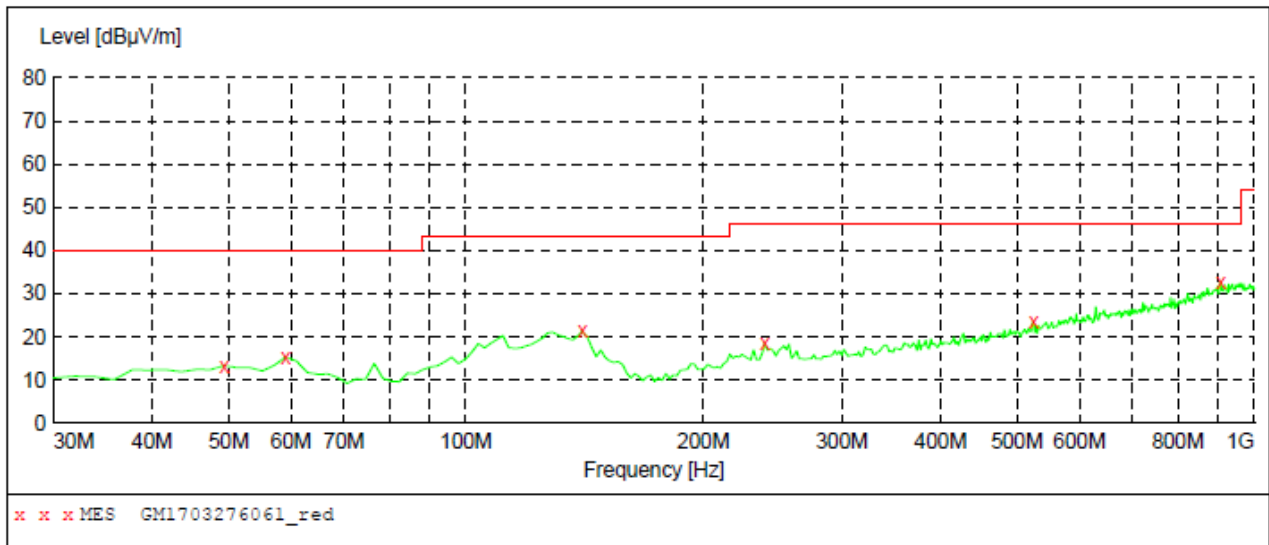
Please reference to the section 2.4

TEST RESULTS

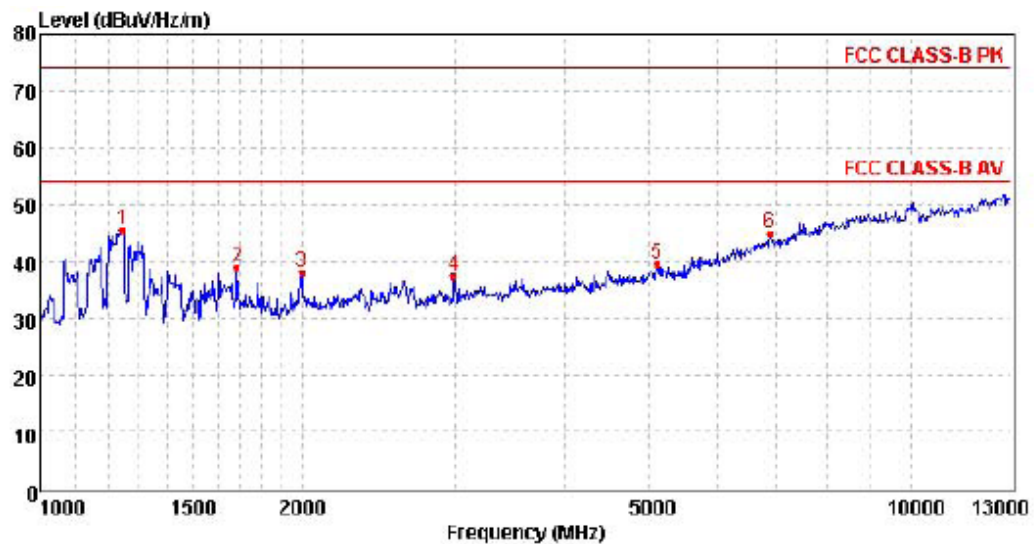
☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Test mode:	RX1	Polarity:	Horizontal
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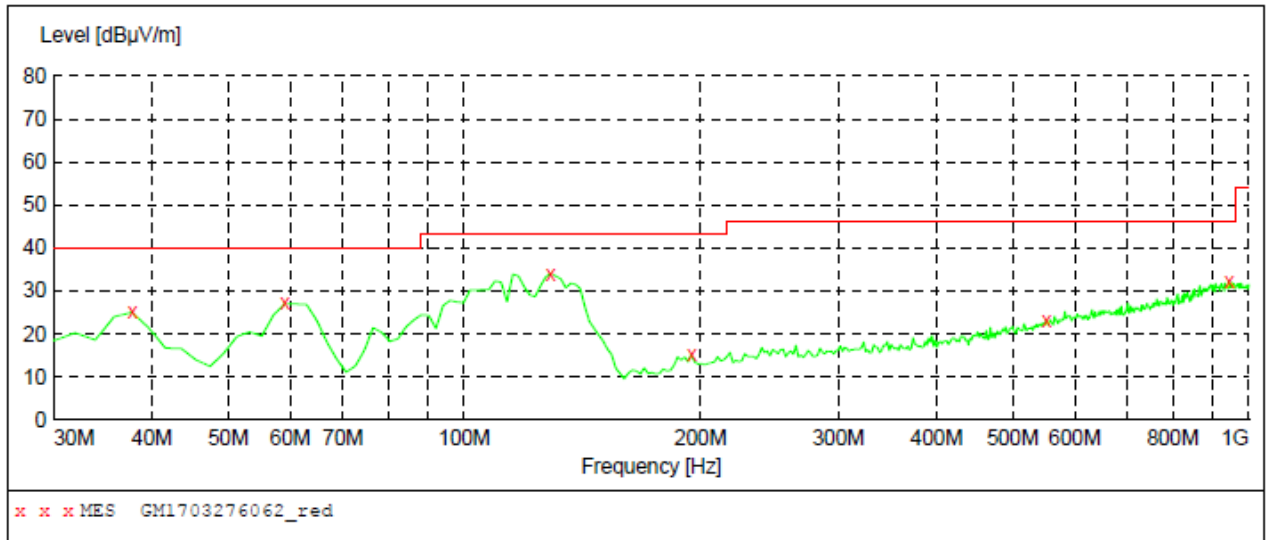


Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.400000	13.40	-16.2	40.0	26.6	QP	300.0	360.00	HORIZONTAL
59.100000	15.40	-17.1	40.0	24.6	QP	300.0	219.00	HORIZONTAL
140.580000	21.30	-20.4	43.5	22.2	QP	300.0	59.00	HORIZONTAL
239.520000	18.40	-14.6	46.0	27.6	QP	100.0	143.00	HORIZONTAL
524.700000	23.50	-7.0	46.0	22.5	QP	100.0	119.00	HORIZONTAL
906.880000	32.70	1.2	46.0	13.3	QP	300.0	359.00	HORIZONTAL

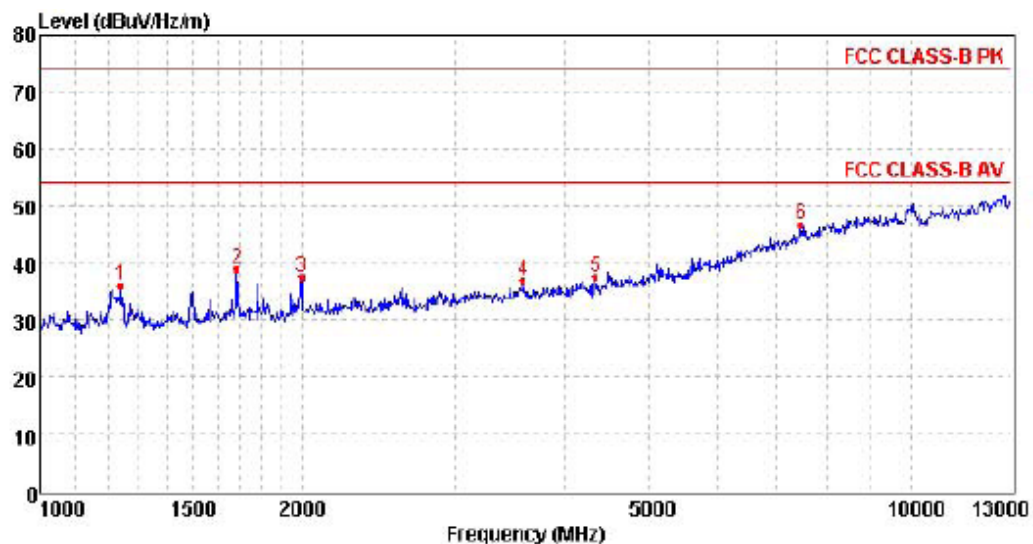


Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1243.61	52.92	24.47	4.73	36.55	45.57	74.00	-28.43	Peak
2	1683.18	44.73	25.26	5.73	36.89	38.83	74.00	-35.17	Peak
3	1998.78	43.10	26.10	6.27	37.30	38.17	74.00	-35.83	Peak
4	2989.88	39.67	28.49	7.47	38.24	37.39	74.00	-36.61	Peak
5	5110.55	34.55	31.45	9.76	36.29	39.47	74.00	-34.53	Peak
6	6881.54	32.37	35.63	11.70	34.91	44.79	74.00	-29.21	Peak

Test mode:	RX1	Polarity:	Vertical
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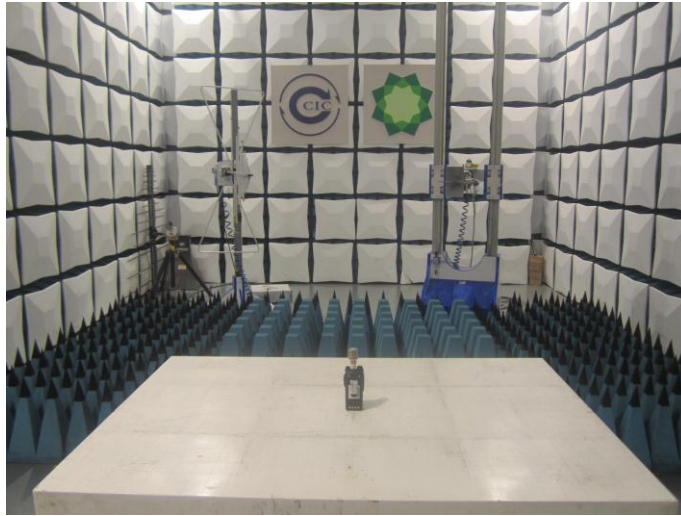
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
37.760000	25.10	-17.3	40.0	14.9	QP	100.0	348.00	VERTICAL
59.100000	27.10	-17.1	40.0	12.9	QP	100.0	0.00	VERTICAL
128.940000	34.10	-19.3	43.5	9.4	QP	100.0	151.00	VERTICAL
194.900000	15.20	-16.6	43.5	28.3	QP	100.0	190.00	VERTICAL
551.860000	23.10	-6.2	46.0	22.9	QP	100.0	114.00	VERTICAL
943.740000	32.30	1.5	46.0	13.7	QP	100.0	127.00	VERTICAL



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1240.43	43.48	24.47	4.73	36.55	36.13	74.00	-37.87	Peak
2	1683.18	44.73	25.26	5.73	36.89	38.83	74.00	-35.17	Peak
3	1998.78	42.34	26.10	6.27	37.30	37.41	74.00	-36.59	Peak
4	3587.10	37.95	28.85	8.25	38.29	36.76	74.00	-37.24	Peak
5	4336.86	35.61	30.48	9.07	37.59	37.57	74.00	-36.43	Peak
6	7470.19	32.99	36.18	12.30	34.88	46.59	74.00	-27.41	Peak

6. Test Setup Photos of the EUT

Transmitter Radiated Spurious Emission:



Radiated Emission:



Conducted Emission:



Frequency Stability:



7. External and Internal Photos of the EUT

External photos of the EUT

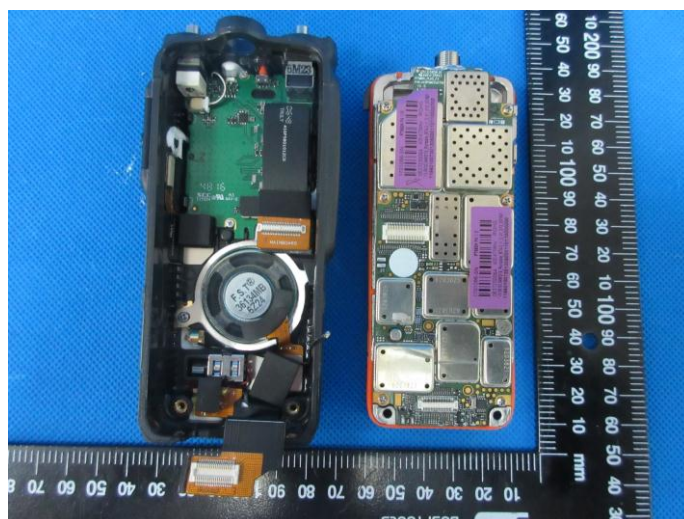
TETRA&GPS ANT

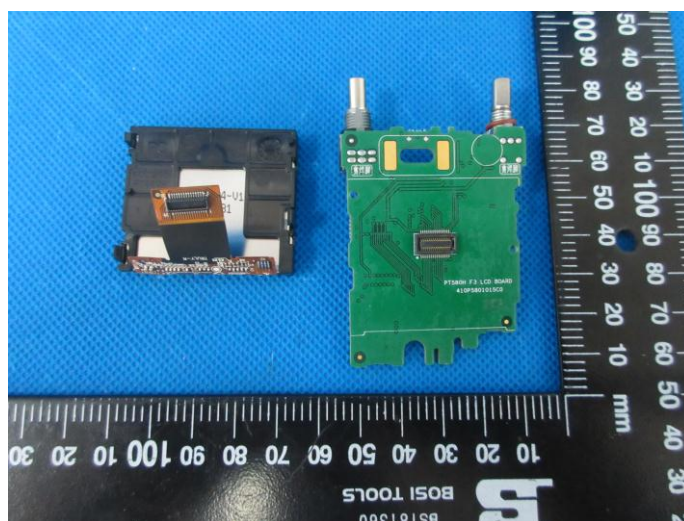
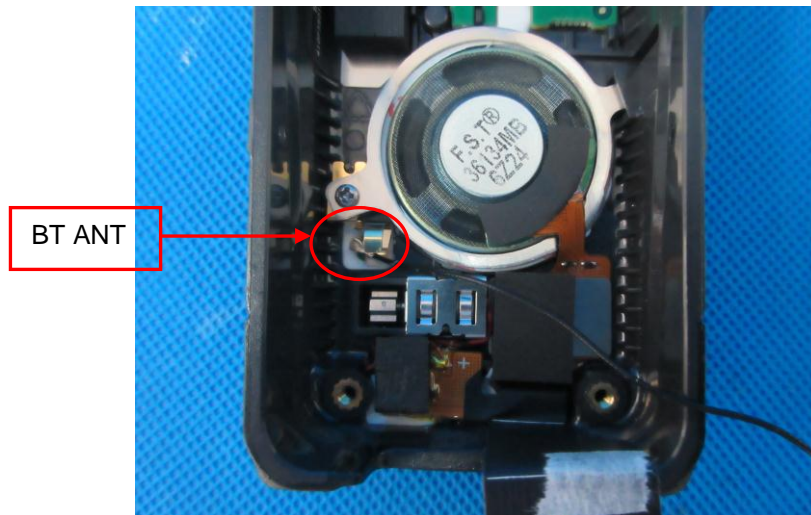


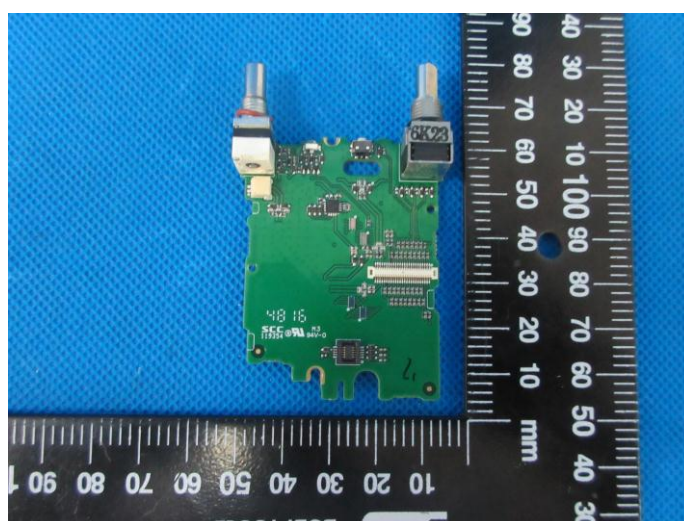
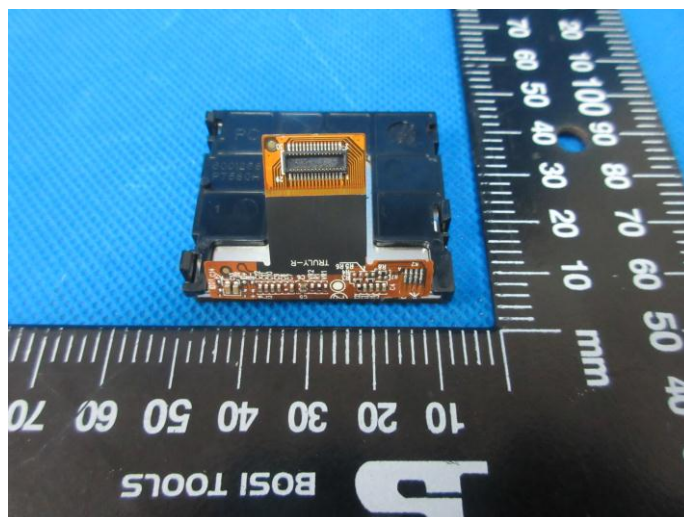
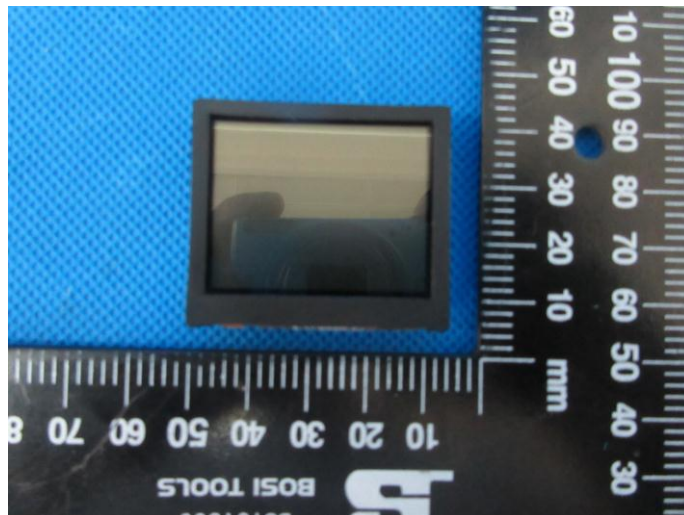


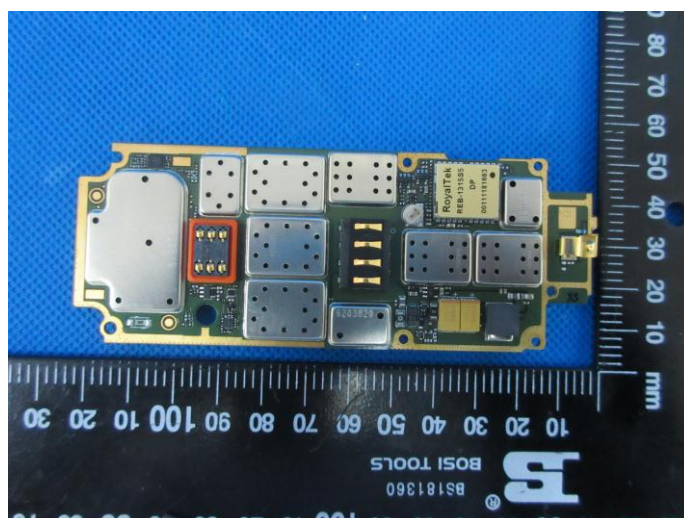
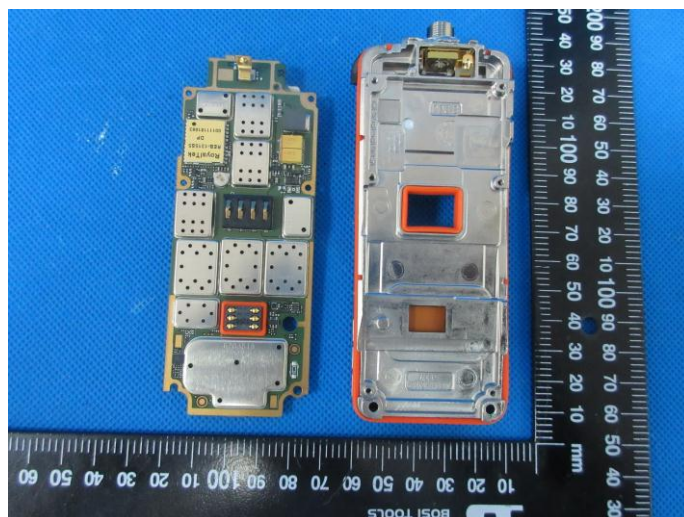
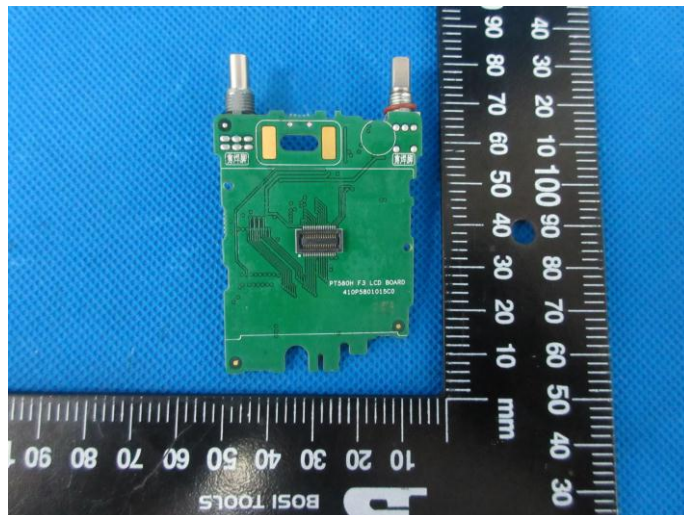


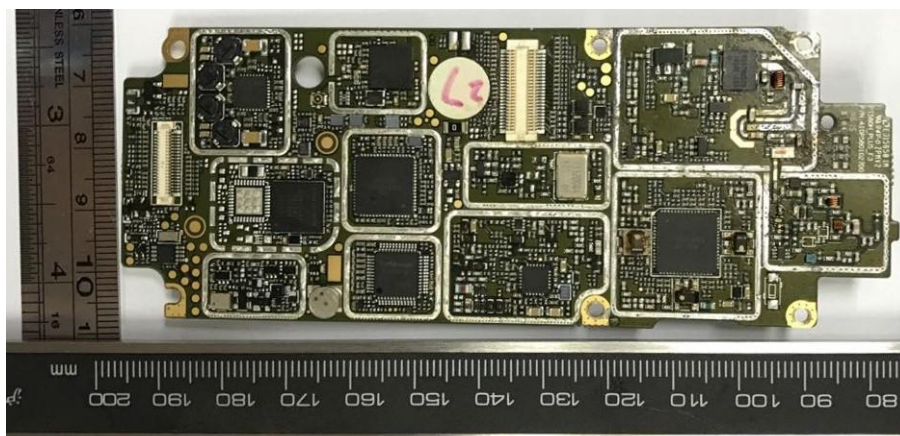
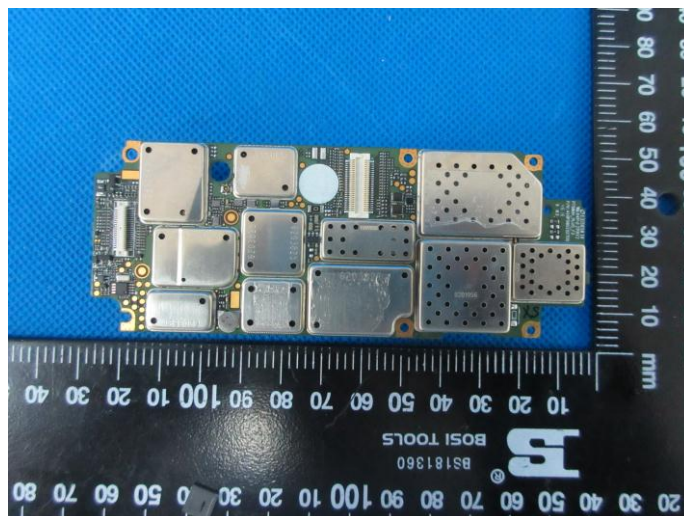
Internal photos of the EUT











.....End of Report.....