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. .....:	**CHTEW2007020601**	Report verification:
Project No. ..... :	**SHT2005099304EW**	
FCC ID .....:	**2ANY6-TE580PD**	
Applicant's name .....:	**Telo Systems Ltd.**	
Address .....:	6/F, No. 42 Liuxian 1st Road, Bao'an District, Shenzhen, China	
Test item description .....:	**Smart Phone**	
Trade Mark.....:	Telo Systems	
Model/Type reference .....:	TE580PD	
Listed Model(s).....:	-	
Standard.....:	**FCC CFR Title 47 Part 22** **FCC CFR Title 47 Part 74** **FCC CFR Title 47 Part 90**	
Date of receipt of test sample……...:	Jun.29, 2020	
Date of testing……..……:	Jun.30, 2020- Jul.20, 2020	
Date of issue……...:	Jul.21, 2020	
Result ..... ……...:	**PASS**	

Compiled by (position+printed name+signature) . :	File administrators Silvia Li	Silvia Li
Supervised by (position+printed name+signature) . :	Project Engineer Gaosheng Pan	Gaosheng. Pan
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

Contents

1 TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:
FCC Rules Part 2: Frequency allocations and radio treaty matters; General rules and regulations
FCC Rules Part 22: Public mobile services.
FCC Rules Part 74: Experimental radio,auxiliary,special broadcast and other program distributional services
FCC Rules Part 90: Private land mobile radio services.
ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
ANSI/TIA-603-E(2016): Land Mobile FM or PM Communications Equipment and Performance Standards
FCC Part 15 Subpart B: Unintentional Radiators.
ANSI C63.4-2014: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.2. Report revised information

Revised No.	Date of issued	Description
N/A	2020-07-21	Original

2 TEST DESCRIPTION

Report clause	Test Item	Standard Requirement	Result
5.1	Conducted Carrier Output Power	Part 22.565 Part 74.461 Part 74.534 Part 90.205 Part 2.1046(a)	Pass
5.2	99% Occupied Bandwidth & 26dB bandwidth	Part 2.1049 Part 22.359 Part 74.462 Part.74.535 Part 90.209 & 210	Pass
5.3	Emission Mask	Part 2.1049 Part 22.359 Part 74.462 Part.74.535 Part 90.209 & 210	Pass
5.4	Modulation Limit	Part 2.1047(b) Part 74.463	N/A
5.5	Audio Frequency Response	Part 2.1047(b) Part 74.463	N/A
5.6	Frequency Stability VS Temperature	Part 2.1055 Part 22.355 Part 74.464 Part 90.213	Pass
5.7	Frequency Stability VS Voltage	Part 2.1055 Part 22.355 Part 74.464 Part 90.213	Pass
5.8	Transient Frequency Behavior	Part 90.214	Pass
5.9	Transmit Conducted Spurious Emission	Part 2.1051 Part 22.359 Part 74.462 Part 90.210	Pass
5.10	Transmit Radiated Spurious Emission	Part 2.1051 Part 22.359 Part 74.462 Part 90.210	Pass

3 SUMMARY

3.1 Client Information

Applicant:	Telo Systems Ltd.
Address:	6/F, No. 42 Liuxian 1st Road, Bao'an District, Shenzhen, China
Manufacturer:	Telo Systems Ltd.
Address:	6/F, No. 42 Liuxian 1st Road, Bao'an District, Shenzhen, China

3.2 Product Description

Main unit	
Name of EUT:	Smart Phone
Trade mark:	Telo Systems
Model/Type reference:	TE580PD
Listed model(s):	-
Power supply:	DC 3.8V
Hardware version:	D931_MB_V2.0_20190519
Software version:	TE580PD_US_V4P_20200617
Ancillary unit	
Battery information:	Model No.: TSRB-3600 DC 3.8V 3600mAh 13.68Wh
Adapter information:	Model No.: MR-0502000US Input: 100-240V AC, 50/60Hz, 0.3A Ouput: 5.5V DC, 2A

3.3 Radio Specification Description

Support Frequency Range:	400MHz~470MHz
Permitted frequency range: *1	400MHz~406MHz, 406.1MHz~470MHz
Rated Output Power:	☒ High Power:2W ☒ Low Power: 0.5W
Modulation Type:	4FSK
Supported Digital Protocol: *2	DMR
Channel Separation:	12.5kHz
Emission Designator: *3	7K60FXW, 7K60FXD
Support data rate:	9.6kbps
Antenna Type:	External

Note:

(1) *[1] Listed frequency range 400MHz~406MHz for Federal use Only.

(2) *[2] The DMR standard specifies two-slot Time Division Multiplexing Technology to split the 12.5 kHz channel into two virtual 6.25kHz communication paths. This equates to an efficiency of one voice channel per 6.25 kHz of bandwidth even though it operates in channels of 12.5 kHz

(3) *[3] According to FCC Part 2.202 requirements, the Necessary Bandwidth is calculated as follows:

- For FM Data Modulation

  Channel Spacing = 12.5 KHz, R = 9600 bps, D = 1944Hz, S = 4, K = 0.72

  $Bn = (R/\log_2 S) + 2DK \cong$ **7.6 KHz**

  Emission designation: 7K60FXW, 7K60FXD

3.4 Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Qualifications	Type	Accreditation Number
	CNAS	L1225
	A2LA	3902.01
	FCC	762235
	Canada	5377A

4 TEST CONFIGURATION

4.1 Test frequency list

According to ANSI C63.26 section 5.1.2.1:

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

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

Frequency Bands (MHz)	Test Frequency (MHz)		Remark
400MHz ~ 406MHz	CH_L	400.0125	For Federal
	CH_{M1}	450.03125	For Part 74
406.1MHz ~470MHz	CH_{M2}	459.025	For Part 22
	CH_H	469.9875	For Part 90

4.2 Operation mode

Test mode	Transmitting	Receiving	Digital	Power level	
			12.5kHz	High	Low
TX-DNH	√		√	√	
TX-DNL	√		√		√
RX-DN		√	√		

Note:

√: is operation mode.

Charging mode: The radio must be turned off during charging mode.

Modulation Type	Description
UM	Un-modulation
AM2	Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
AM6	Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation, then increase the level from the audio generator by 20 dB
AM5	Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation.
DM	A 511 bit binary pseudo-random bit sequence based on ITU-T Rec. O.153

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

Test item	Modulation Type	Test mode (Worse case mode)
Conducted Output Power	UM	TX-DNH, TX-DNL,
99% Occupied Bandwidth & 26dB bandwidth	DM	TX-DNH, TX-DNL,
Emission Mask	UM,DM	TX-DNH, TX-DNL,
Modulation Limit	AM6	N/A
Audio Frequency Response	AM2	N/A
Frequency Stability VS Temperature	UM	TX-DNH, TX-DNL,
Frequency Stability VS Voltage	UM	TX-DNH, TX-DNL,
Transient Frequency Behavior	DM	TX-DNH,
Transmit Conducted Spurious Emission	DM	TX-DNH,
Transmit Radiated Spurious Emission	DM	TX-DNH,

4.3 Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measuremen

Whether support unit is used?					
✓ No					
Item	Equipment	Trade Name	Model No.	FCC ID	Power cord
1					
2					

4.4 Testing environmental condition

Atmospheric Contions	
Temperature:	21℃ to 25℃
Relative Humidity:	20 % to 75 %.
Atmospheric Pressure:	860 mbar to 1060 mbar
Norminal Test Voltage:	V_N = DC 3.80V
Extrem Test Voltage @115%V_N:	V_H = DC 4.35V
Extrem Test Voltage @85%V_N:	V_L = DC 3.60V

4.5 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.

4.6 Equipments Used during the Test

● TS8613 Test system							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Spectrum Analyzer	Agilent	HTWE0286	N9020A	MY50510187	2019/10/26	2020/10/25
●	Signal & Spectrum Analyzer	R&S	HTWE0262	FSW26	103440	2019/10/26	2020/10/25
●	RF Communication Test Set	HP	HTWE0038	8920A	3813A10206	2019/10/26	2020/10/25
●	Digital intercom communication tester	Aeroflex	HTWE0255	3920B	1001682041	2019/10/26	2020/10/25
●	Signal Generator	R&S	HTWE0191	SML02	100507	2019/10/26	2020/10/25
●	RF Control Unit	Tonscend	HTWE0294	JS0806-2	N/A	N/A	N/A
○	Filter-VHF	Microwave	HTWE0309	N26460M1	498702	N/A	N/A
●	Filter-UHF	Microwave	HTWE0311	N25155M2	498704	N/A	N/A
○	Power Divider	Microwave	HTWE0043	OPD1040-N-4	N/A	2020/05/24	2021/05/23
○	Attenuator	JFW	HTWE0292	50FH-030-100	N/A	2020/05/18	2021/05/17
○	Attenuator	JFW	HTWE0293	50-A-MFN-20	0322	2020/05/18	2021/05/17
●	Test software	HTW	N/A	Radio ATE	N/A	N/A	N/A

● Auxiliary Equipment							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Climate chamber	ESPEC	HTWE0254	GPL-2	N/A	2019/10/23	2020/10/22
●	DC Power Supply	Gwinstek	HTWE0274	SPS-2415	GER835793	N/A	N/A

● Radiated Spurious Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	N/A	2018/09/27	2021/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2019/10/26	2020/10/25
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2018/04/02	2021/04/01
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2018/10/11	2021/10/10
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2018/04/04	2021/04/03
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2019/11/14	2020/11/13
●	Broadband Preamplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2020/05/23	2021/05/22
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-03	6m 3GHz RG Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0121-01	6m 18GHz S Serisa	N/A	2020/05/10	2021/05/09
●	EMI Test Software	Audix	N/A	E3	N/A	N/A	N/A

● Auxiliary Equipment							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Radio communication tester	R&S	HTWE0287	CMW500	137688-Lv	2019/10/26	2020/10/25
●	Universal Radio Communication	R&S	HTWE0036	CMU200	112012	2019/10/26	2020/10/25
●	High pass filter	Wainwright	HTWE0297	WHKX3.0/18G-10SS	38	2020/05/24	2021/05/23
○	Band Stop filter		HTW0039	N/A	N/A	2020/05/24	2021/05/23

5 TEST CONDITIONS AND RESULTS

5.1 Conducted Carrier Output Power

LIMIT

FCC Part 90.205， FCC Part 2.1046

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

The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with §90.203(a)(1)] 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

FCC Part 22.565

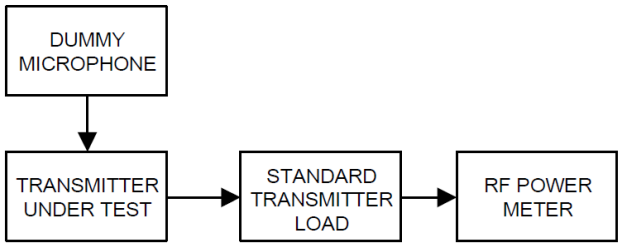
Mobile transmitters. The transmitter output power of mobile transmitters must not exceed 60 watts

FCC Part 74.461

(a) Transmitter power is the power at the transmitter output terminals and delivered to the antenna, antenna transmission line, or any other impedance-matched, radio frequency load. For the purpose of this Subpart, the transmitter power is the carrier power.

(b) The authorized transmitter power for a remote pickup broadcast station shall be limited to that necessary for satisfactory service and, in any event, shall not be greater than 100 watts, except that a station to be operated aboard an aircraft shall normally be limited to a maximum authorized power of 15 watts. Specific authorization to operate stations on board aircraft with an output power exceeding 15 watts will be issued only upon an adequate engineering showing of need, and of the procedures that will be taken to avoid harmful interference to other licensees.

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix A on the section 8 appendix report

5.2 99% Occupied Bandwidth & 26dB Bandwidth

LIMIT

FCC Part 90.209, FCC Part 2.1049

STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Below 25[2]		
25-50	20	20
72-76	20	20
150-174	[1]7.5	[1 3]20/11.25/6
216-220[5]	6.25	20/11.25/6
220-222	5	4
406-512[2]	[1]6.25	[1 3 6]20/11.25/6
806-809/851-854	12.5	20
809-817/854-862	12.5	[6]20/11.25
817-824/862-869	25	[6]20
896-901/935-940	12.5	13.6
902-928[4]		
929-930	25	20
1427-1432[5]	12.5	12.5
[3]2450-2483.5[2]		
Above 2500[2]		

FCC Part 22.359

The rules in this section govern the spectral characteristics of emissions in the Public Mobile Services, except for the Air-Ground Radiotelephone Service (see §22.861, instead) and the Cellular Radiotelephone Service (see §22.917, instead).

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) Alternative out of band emission limit. Licensees in the Public Mobile Services may establish an alternative out of band emission limit to be used at specified frequencies (band edges) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

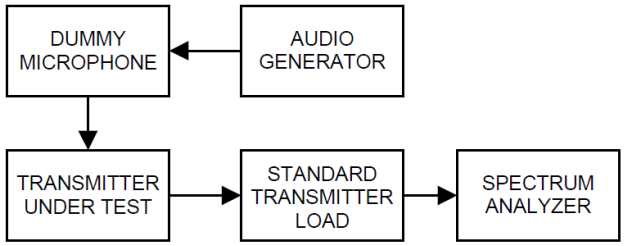
(d) Interference caused by out of band emissions. If any emission from a transmitter operating in any of the Public Mobile Services results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

FCC Part 74.462

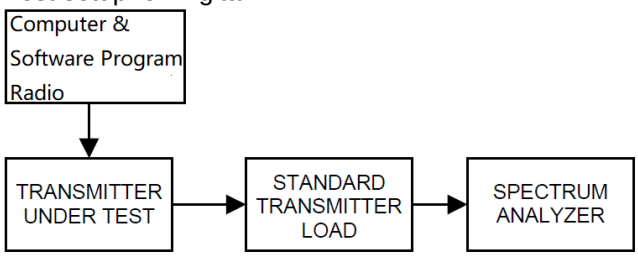
Frequencies	Authorized bandwidth (kHz)	Maximum frequency deviation[1] (kHz)	Type of emission[2]
MHz:			
25.87 to 26.03 26.07 to 26.47 152.8625 to 153.3575[3]	40 20 30/60	10 5 5/10	Frequencies 25.87 to 153.3575 MHz: A3E, F1E, F3E, F9E.
160.860 to 161.400	60	10	
161.625 to 161.775	30	5	
166.25 and 170.15[4]	12.5/25	5	
450.00625 to 450.025 450.98125 to 450.99375 455.00625 to 455.025 455.98125 to 455.99375 Up to 12.5 1.5	Frequencies 160.860 to 455.950 MHz: A1A, A1B, A1D, A1E, A2A, A2B, A2D, A2E, A3E, F1A, F1B, F1D, F1E, F2A, F2B, F2D, F2E, F3E, F9E		
450.03125 to 450.61875			
455.03125 to 455.61875	Up to 25	5	
450.6375 to 450.8625			
455.6375 to 455.8625	25-50	10	
450.900, 450.950			
455.900, 455.950	50-100	35	

TEST CONFIGURATION

Test setup for Analog:



Test setup for Digital:



TEST PROCEDURE

(1) Connect the equipment as illustrated
(2) Spectrum set as follow:
Centre frequency = the nominal EUT channel center frequency,
The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient)
RBW = 1% to 5% of the anticipated OBW, VBW ≥ 3 × RBW, Sweep = auto,
Detector function = peak, Trace = max hold
(3) Set 99% Occupied Bandwidth and 26dB Bandwidth
(4) Measure and record the results in the test report.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix B on the section 8 appendix report

5.3 Emission Mask

LIMIT

FCC Part 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 25[1]	A or B	A or C
25-50	B	C
72-76	B	C
150-174[2]	B, D, or E	C, D or E
150 paging only	B	C
220-222	F	F
421-512[2 5]	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854[6]	B	H
809-824/854-869[35]	B, D	D, G.
896-901/935-940	I	J
902-928	K	K
929-930	B	G
4940-4990 MHz	L or M	L or M
5850-5925[4]		
All other bands	B	C

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 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.

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

FCC Part 22.359

The rules in this section govern the spectral characteristics of emissions in the Public Mobile Services, except for the Air-Ground Radiotelephone Service (see §22.861, instead) and the Cellular Radiotelephone Service (see §22.917, instead).

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) Alternative out of band emission limit. Licensees in the Public Mobile Services may establish an alternative out of band emission limit to be used at specified frequencies (band edges) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

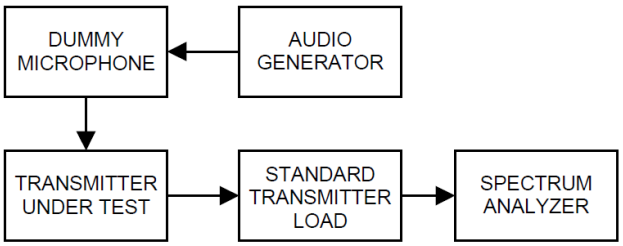
(d) Interference caused by out of band emissions. If any emission from a transmitter operating in any of the Public Mobile Services results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

FCC Part 74.462

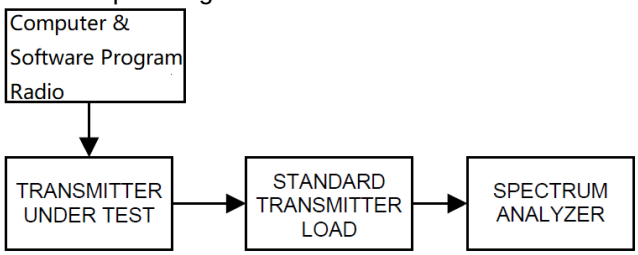
For emissions on frequencies above 25 MHz with authorized bandwidths up to 30 kHz, the emissions shall comply with the emission mask and transient frequency behavior requirements of § §90.210 and 90.214 of this chapter. For all other emissions, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule
(1) On any frequency removed from the assignment frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB:
(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
(3) On any frequency removed from the assigned frequency by more than 250 percent on the authorized bandwidth; at least 43 plus 10 log10 (mean output power, in watts) dB

TEST CONFIGURATION

Test setup for Analog:



Test setup for Digital:



TEST PROCEDURE

1) Connect the equipment as illustrated.
2) Spectrum set as follow:
   Centre frequency = fundamental frequency, span=120kHz for 12.5kHz channel spacing,
   RBW=100Hz, VBW=1000Hz, Sweep = auto,
   Detector function = peak, Trace = max hold
3) Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.
4) Apply Input Modulation Signal to EUT according to Section 3.4
5) Measure and record the results in the test report.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix C on the section 8 appendix report

5.4 Modulation Limit

LIMIT

FCC Part 2.1047(b)

2.5kHz for 12.5 KHz Channel Spacing System

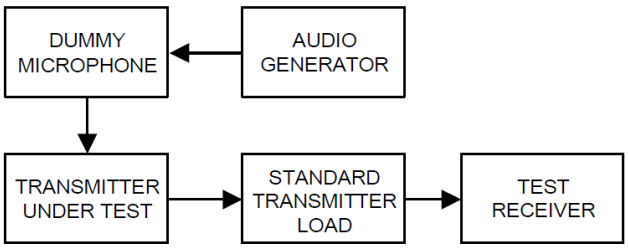
FCC Part 74.463

(a) Each new remote pickup broadcast station authorized to operate with a power output in excess of 3 watts shall be equipped with a device which will automatically prevent modulation in excess of the limits set forth in this subpart.

(b) If amplitude modulation is employed, modulation shall not exceed 100 percent on negative peaks.

(c) If frequency modulation is employed, emission shall conform to the requirements specified in §74.462.

TEST CONFIGURATION



TEST PROCEDURE

1) Connect the equipment as illustrated.
2) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
3) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off.
4) Apply Input Modulation Signal to EUT according to Section 3.4 and vary the input level from –20 to +20dB.
5) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level
6) Repeat step 4-5 with input frequency changing to 300Hz, 1004Hz, 1500Hz and 2500Hz in sequence.

TEST MODE

Please reference to the section 3.4

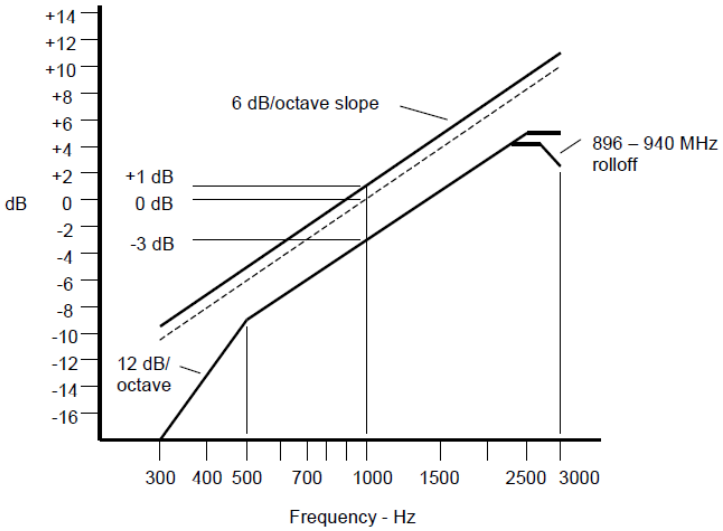
TEST RESULTS

☐ **Passed** ☒ **Not Applicable**

5.5 Audio Frequency Response

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.

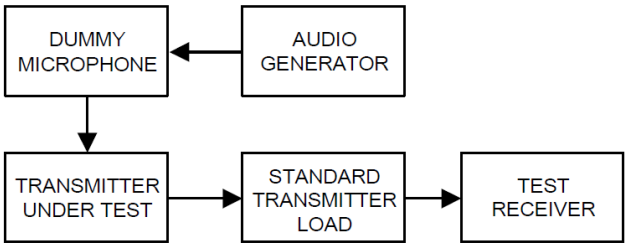
FCC Part 74.463

(a) Each new remote pickup broadcast station authorized to operate with a power output in excess of 3 watts shall be equipped with a device which will automatically prevent modulation in excess of the limits set forth in this subpart.

(b) If amplitude modulation is employed, modulation shall not exceed 100 percent on negative peaks.

(c) If frequency modulation is employed, emission shall conform to the requirements specified in §74.462.

TEST CONFIGURATION



TEST PROCEDURE

1) Connect the equipment as illustrated.
2) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for 50 Hz to 15,000 Hz. Turn the de-emphasis function off.
3) Set the DMM to measure rms voltage.
4) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
5) Apply Input Modulation Signal to EUT according to Section 3.4
6) Set the test receiver to measure rms deviation and record the deviation reading.
7) Record the DMM reading as V_{REF} .
8) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
9) Vary the audio frequency generator output level until the deviation reading that was recorded in step 6) is obtained.
10) Record the DMM reading as V_{FREQ}
11) Calculate the audio frequency response at the present frequency as: audio frequency response=$20\log_{10}$ (V_{FREQ}/V_{REF}).
12) Repeat steps 8) through 11) for all the desired test frequencies

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☐ **Passed** ☒ **Not Applicable**

5.6 Frequency stability VS Temperature

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	[1 2 3]100	100	200
25-50	20	20	50
72-76	5		50
150-174	[5 11]5	[6]5	[4 6]50
216-220	1.0		1.0
220-222[12]	0.1	1.5	1.5
421-512	[7 11 14]2.5	[8]5	[8]5
806-809	[14]1.0	1.5	1.5
809-824	[14]1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	[14]0.1	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	[9]300	300	300
Above 2450[10]			

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.

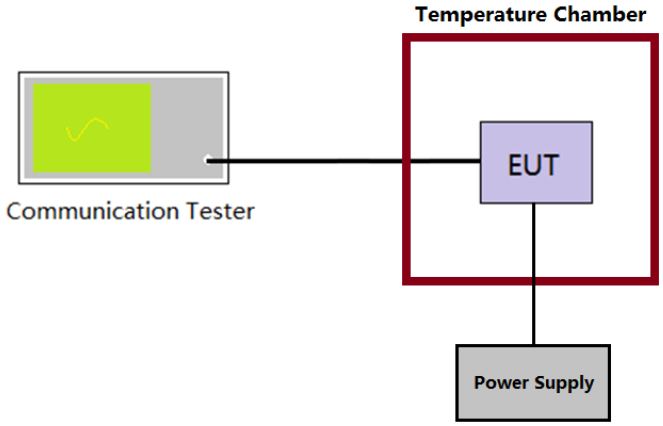
Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC Part 74.464

For operations on frequencies above 25 MHz using authorized bandwidths up to 30 kHz, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in compliance with the frequency tolerance requirements of §90.213 of this chapter. For all other operations, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in accordance with the following:

Frequency range	Tolerance (percent)	
	Base station	Mobile station
25 to 30 MHz:		
3 W or less	.002	.005
Over 3 W	.002	.002
30 to 300 MHz:		
3 W or less	.0005	.005
Over 3 W	.0005	.0005
300 to 500 MHz, all powers	.00025	.0005

TEST CONFIGURATION



TEST PROCEDURE

1) The EUT output port was connected to communication tester.

2) The EUT was placed inside the temperature chamber.

3) Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency as MCF_{MHz}.

4) Calculate the ppm frequency error by the following:
ppm error=$(MCF_{MHZ}/ACF_{MHZ}-1)*10^6$
where
MCF_{MHz} *is the Measured Carrier Frequency in MHz*
ACF_{MHz} *is the Assigned Carrier Frequency in MHz*

5) Repeat step 3 measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix D on the section 8 appendix report

5.7 Frequency stability VS Voltage

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	[1 2 3]100	100	200
25-50	20	20	50
72-76	5		50
150-174	[5 11]5	[6]5	[4 6]50
216-220	1.0		1.0
220-222[12]	0.1	1.5	1.5
421-512	[7 11 14]2.5	[8]5	[8]5
806-809	[14]1.0	1.5	1.5
809-824	[14]1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	[14]0.1	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	[9]300	300	300
Above 2450[10]			

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.

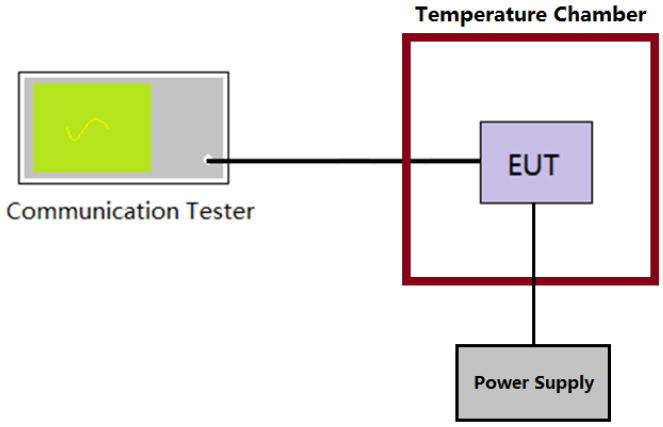
Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC Part 74.464

For operations on frequencies above 25 MHz using authorized bandwidths up to 30 kHz, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in compliance with the frequency tolerance requirements of §90.213 of this chapter. For all other operations, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in accordance with the following:

Frequency range	Tolerance (percent)	
	Base station	Mobile station
25 to 30 MHz:		
3 W or less	.002	.005
Over 3 W	.002	.002
30 to 300 MHz:		
3 W or less	.0005	.005
Over 3 W	.0005	.0005
300 to 500 MHz, all powers	.00025	.0005

TEST CONFIGURATION



TEST PROCEDURE

1) The EUT output port was connected to communication tester.

2) The EUT was placed inside the temperature chamber at 25°C

3) Record the carrier frequency of the transmitter as MCF_{MHZ}

4) Calculate the ppm frequency error by the following:
ppm error=$(MCF_{MHZ}/ACF_{MHZ}-1)*10^6$
where
MCF_{MHz} *is the Measured Carrier Frequency in MHz*
ACF_{MHz} *is the Assigned Carrier Frequency in MHz*

5) Repeat step 3 measure with varied ±15% of the nominal value measured at the input to the EUT

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix E on the section 8 appendix report

5.8 Transmitter Frequency Behavior

LIMIT

FCC part 90.214

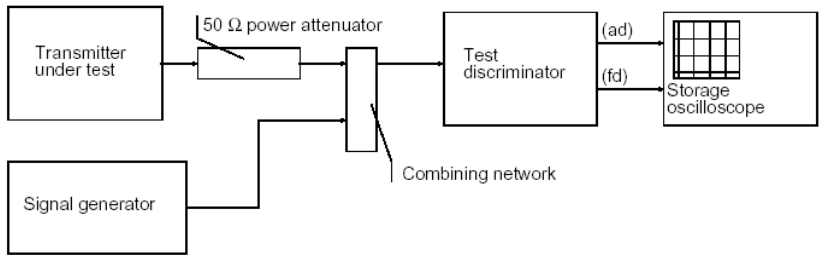
Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

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

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**

Please refer to appendix F on the section 8 appendix report

5.9 Transmit Conducted Spurious Emission

LIMIT

FCC Part 90.210, FCC Part 2.1051

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

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:

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: *At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.*

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

For 12.5kHz:

Calculation: Limit (dBm) =EL-50-10log (P)

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

Limit (dBm) = P(dBm)-50-10 log (Pwatts) = -20dBm

For 25kHz:

Calculation: Limit (dBm) =EL-43-10log (P)

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

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

FCC Part 22.359

The rules in this section govern the spectral characteristics of emissions in the Public Mobile Services, except for the Air-Ground Radiotelephone Service (see §22.861, instead) and the Cellular Radiotelephone Service (see §22.917, instead).

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) Alternative out of band emission limit. Licensees in the Public Mobile Services may establish an alternative out of band emission limit to be used at specified frequencies (band edges) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in any of the Public Mobile Services results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

FCC Part 74.462

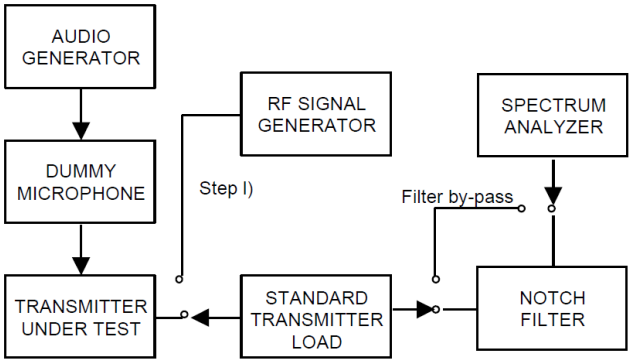
For emissions on frequencies above 25 MHz with authorized bandwidths up to 30 kHz, the emissions shall comply with the emission mask and transient frequency behavior requirements of § §90.210 and 90.214 of this chapter. For all other emissions, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule

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

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

(3) On any frequency removed from the assigned frequency by more than 250 percent on the authorized bandwidth; at least 43 plus 10 log10 (mean output power, in watts) dB

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to appendix G on the section 8 appendix report

5.10 Transmitter Radiated Spurious Emission

Radiated spurious emissions are emissions from the equipment when transmitting into a nonradiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

LIMIT

FCC Part 90.210, FCC Part 2.1051

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

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:

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: *At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.*

Emission Mask E—6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

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

For 12.5kHz:

Calculation: Limit (dBm) =EL-50-10log (P)

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

Limit (dBm) = P(dBm)-50-10 log (Pwatts) = -20dBm

For 25kHz:

Calculation: Limit (dBm) =EL-43-10log (P)

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

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

FCC Part 22.359

The rules in this section govern the spectral characteristics of emissions in the Public Mobile Services, except for the Air-Ground Radiotelephone Service (see §22.861, instead) and the Cellular Radiotelephone Service (see §22.917, instead).

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) Alternative out of band emission limit. Licensees in the Public Mobile Services may establish an alternative out of band emission limit to be used at specified frequencies (band edges) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in any of the Public Mobile Services results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

FCC Part 74.462

For emissions on frequencies above 25 MHz with authorized bandwidths up to 30 kHz, the emissions shall comply with the emission mask and transient frequency behavior requirements of § §90.210 and 90.214 of this chapter. For all other emissions, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule

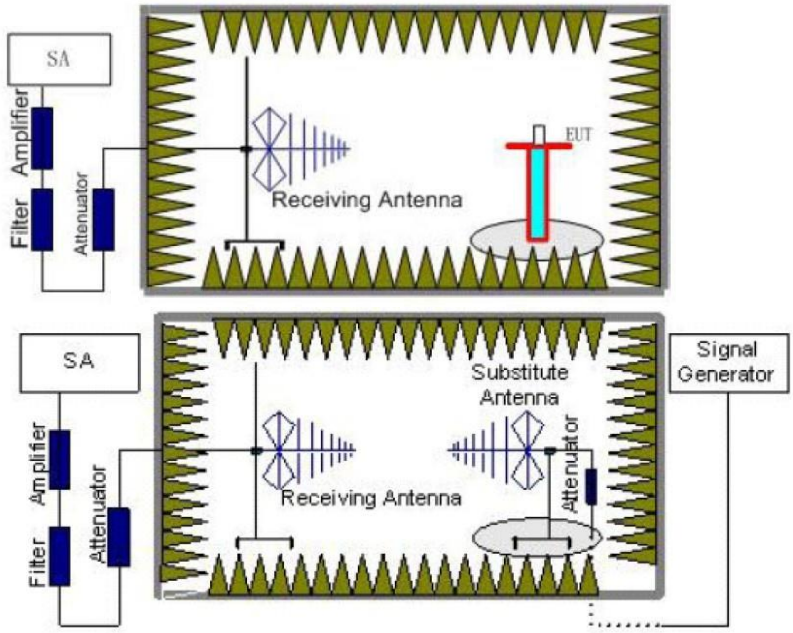
(1) On any frequency removed from the assignment frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB:

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

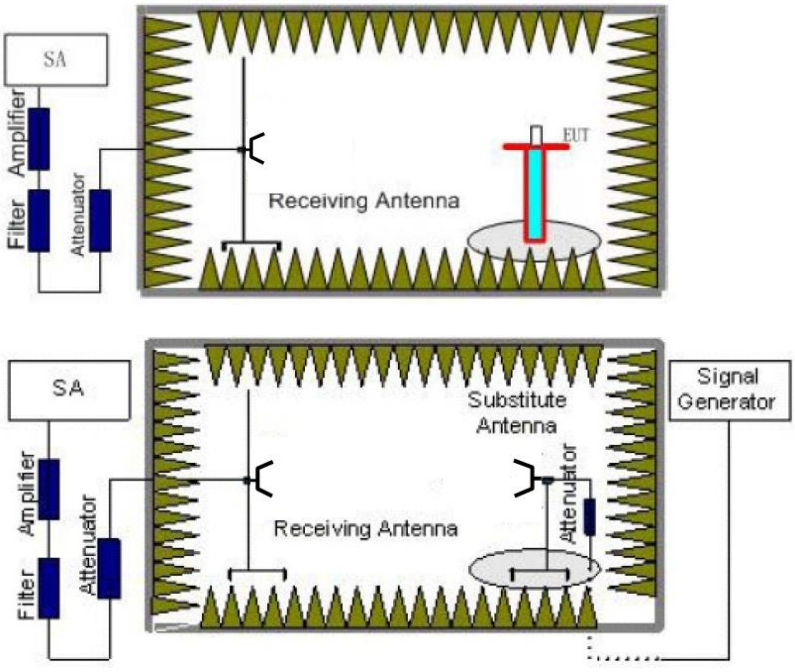
(3) On any frequency removed from the assigned frequency by more than 250 percent on the authorized bandwidth; at least 43 plus 10 log10 (mean output power, in watts) dB

TEST CONFIGURATION

Below 1GHz:



Above 1GHz:



TEST PROCEDURE

1. Standard Transmitter Load with a 50Ω input impedance and an output impedance matched to the test equipment.
2. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1. 0 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
3. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, 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 (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=PMea- PAg - Pcl - Ga
   We used SMF100A 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)=PMea- Pcl - Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

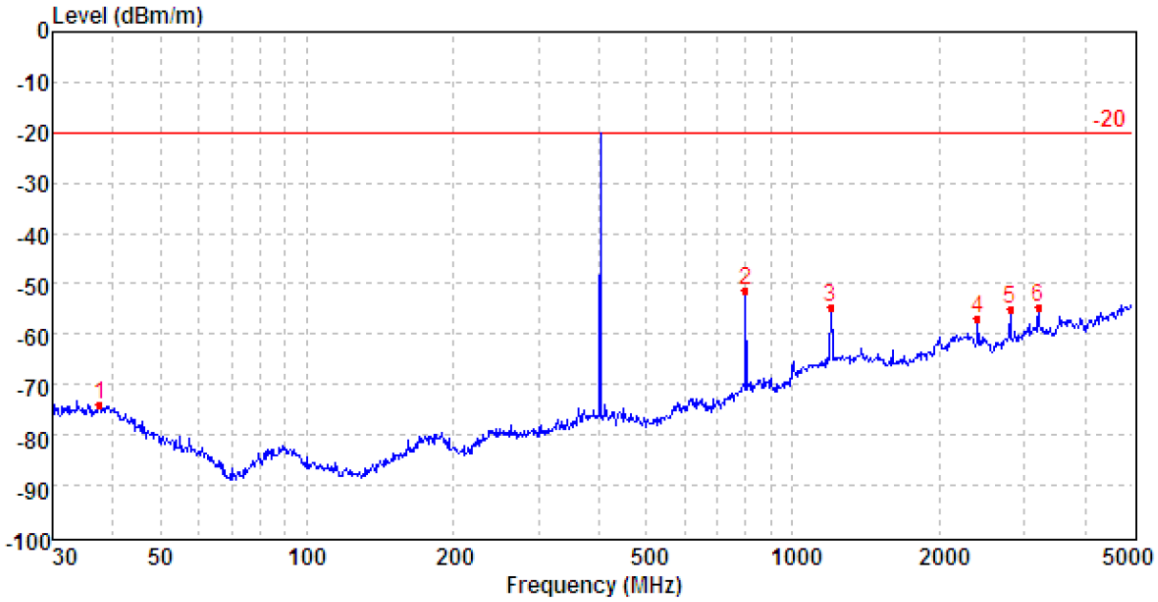
TEST MODE

Please reference to the section 3.4

TEST RESULTS

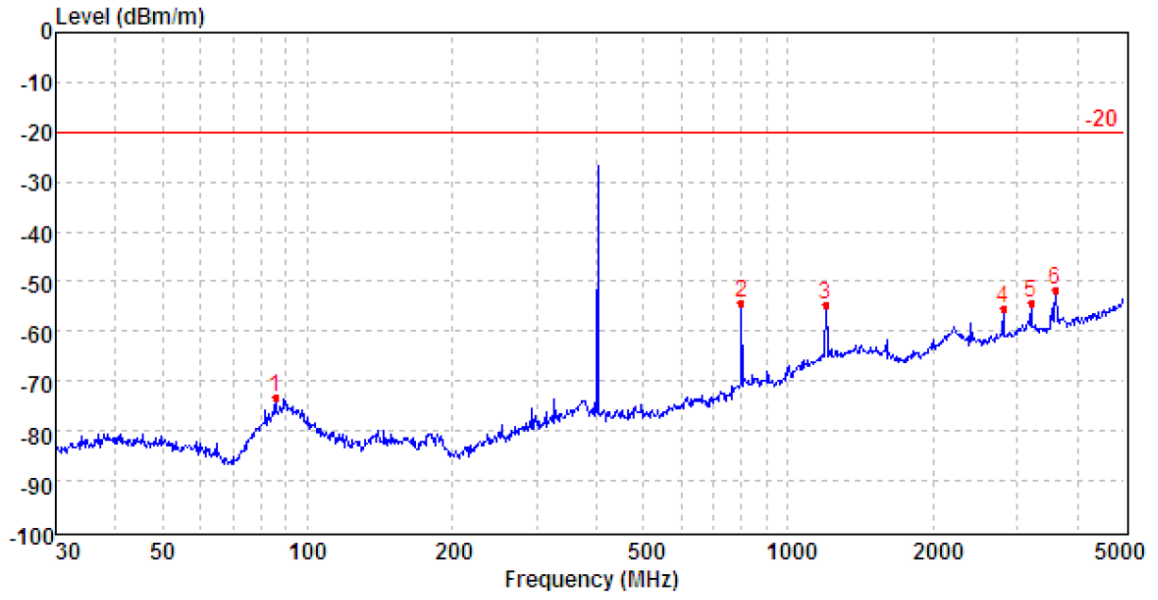
☒ **Passed** ☐ **Not Applicable**

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



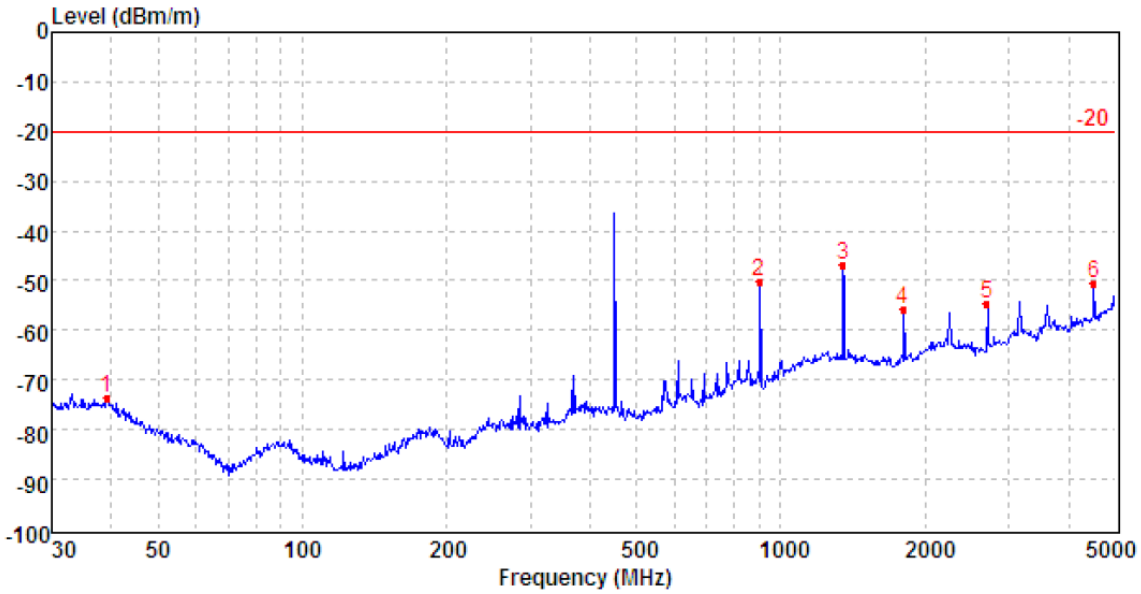
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	37.57	-78.45	28.63	6.53	30.79	-74.08	-20.00	-54.08	Peak
2	800.80	-61.17	29.96	9.56	29.57	-51.22	-20.00	-31.22	Peak
3	1199.45	-59.69	36.72	5.09	36.65	-54.53	-20.00	-34.53	Peak
4	2400.16	-67.13	39.82	7.77	37.41	-56.95	-20.00	-36.95	Peak
5	2801.18	-66.51	40.73	8.17	37.26	-54.87	-20.00	-34.87	Peak
6	3201.51	-67.93	41.36	8.73	36.97	-54.81	-20.00	-34.81	Peak

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



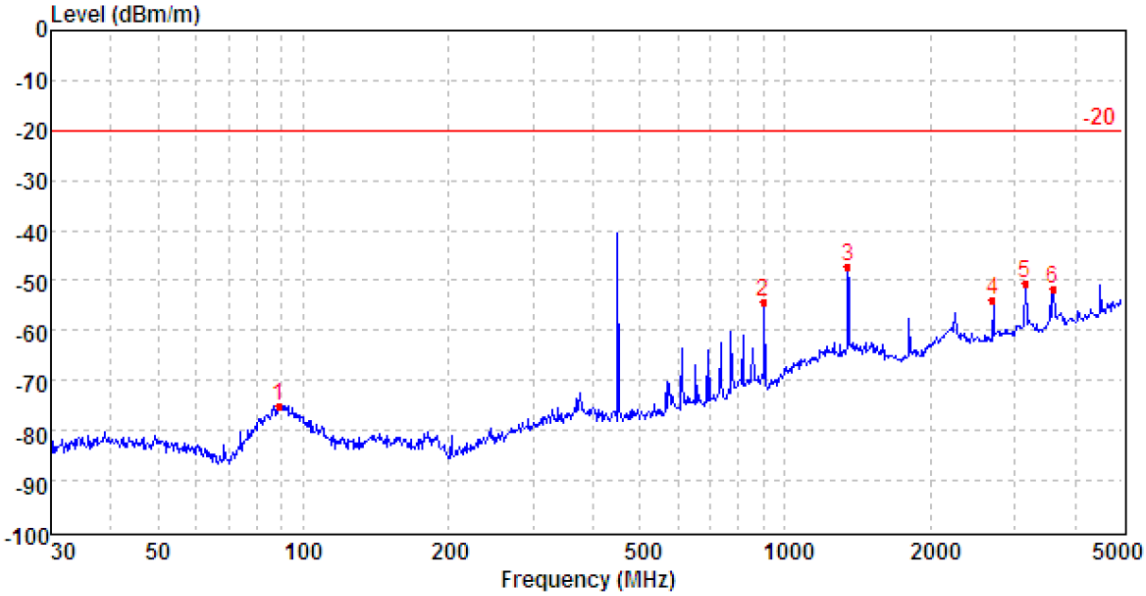
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	85.85	-76.22	26.65	6.89	30.69	-73.37	-20.00	-53.37	Peak
2	800.80	-63.82	29.49	9.56	29.57	-54.34	-20.00	-34.34	Peak
3	1199.45	-59.87	36.83	5.09	36.65	-54.60	-20.00	-34.60	Peak
4	2801.18	-67.11	40.68	8.17	37.26	-55.52	-20.00	-35.52	Peak
5	3201.51	-67.35	41.47	8.73	36.97	-54.12	-20.00	-34.12	Peak
6	3600.64	-67.59	42.62	10.10	36.94	-51.81	-20.00	-31.81	Peak

TEST MODE	TX-DNH	Test Channel:	CH_{M1}	Polarity:	Horizontal



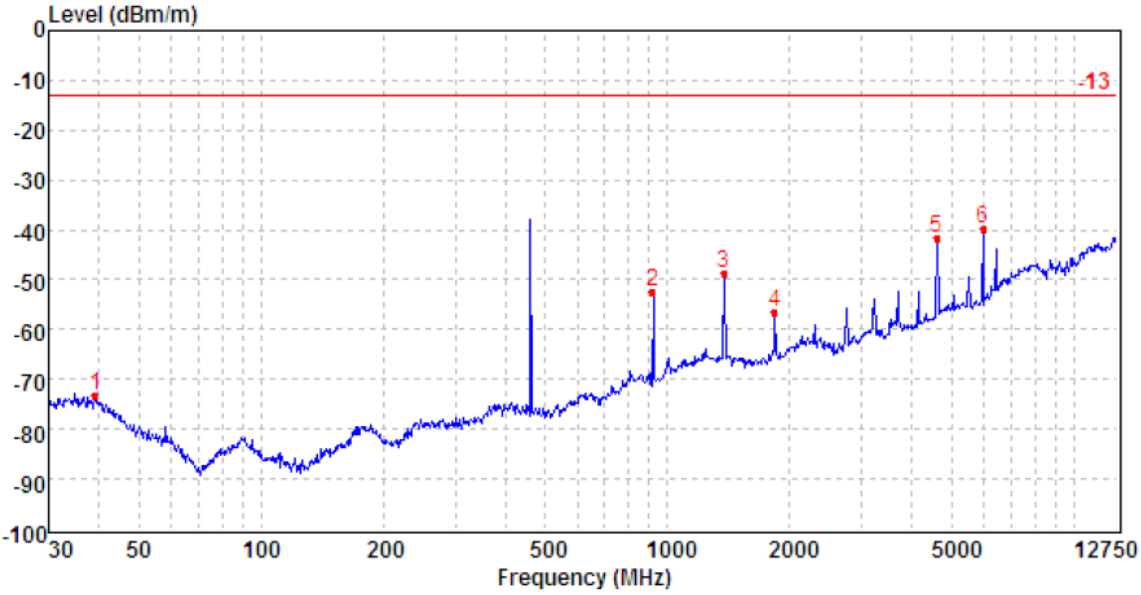
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	39.05	-78.04	28.60	6.55	30.83	-73.72	-20.00	-53.72	Peak
2	902.51	-60.14	29.56	9.83	29.47	-50.22	-20.00	-30.22	Peak
3	1348.99	-53.13	37.06	5.48	36.42	-47.01	-20.00	-27.01	Peak
4	1799.39	-62.01	36.72	6.61	37.07	-55.75	-20.00	-35.75	Peak
5	2699.38	-65.41	39.75	8.06	37.14	-54.74	-20.00	-34.74	Peak
6	4503.36	-67.98	43.21	10.67	36.31	-50.41	-20.00	-30.41	Peak

TEST MODE	TX-DNH	Test Channel:	CH_{M1}	Polarity:	Vertical



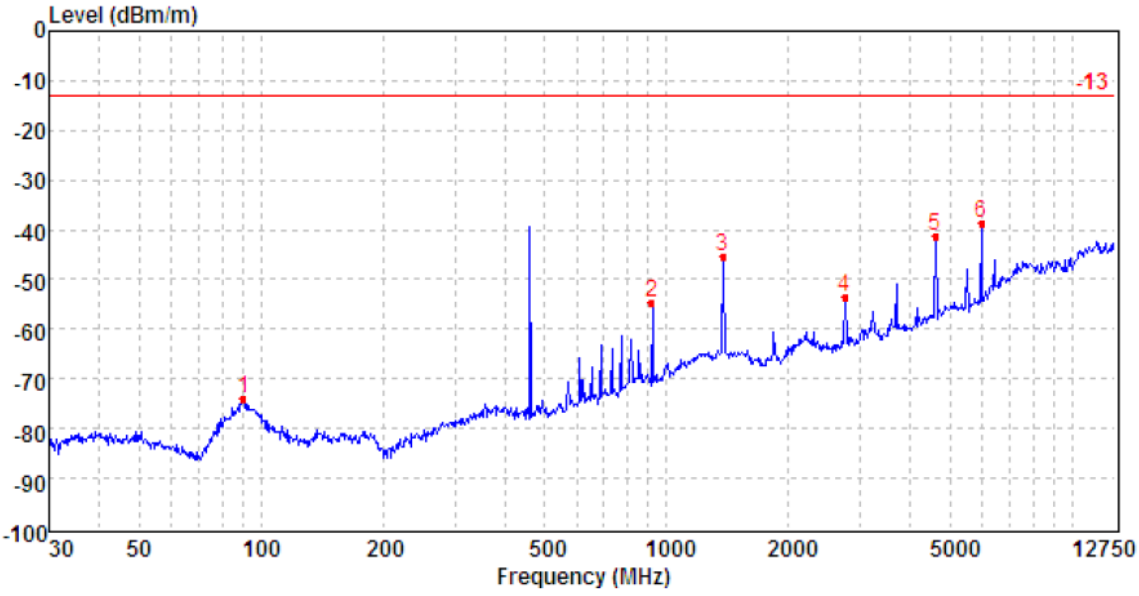
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	89.24	-79.29	27.99	6.92	30.67	-75.05	-20.00	-55.05	Peak
2	902.51	-64.85	30.03	9.83	29.47	-54.46	-20.00	-34.46	Peak
3	1348.99	-53.88	37.54	5.48	36.42	-47.28	-20.00	-27.28	Peak
4	2699.38	-64.60	39.92	8.06	37.14	-53.76	-20.00	-33.76	Peak
5	3150.40	-63.27	41.37	8.68	37.19	-50.41	-20.00	-30.41	Peak
6	3600.64	-67.50	42.62	10.10	36.94	-51.72	-20.00	-31.72	Peak

TEST MODE	TX-DNH	Test Channel:	CH_{M2}	Polarity:	Horizontal



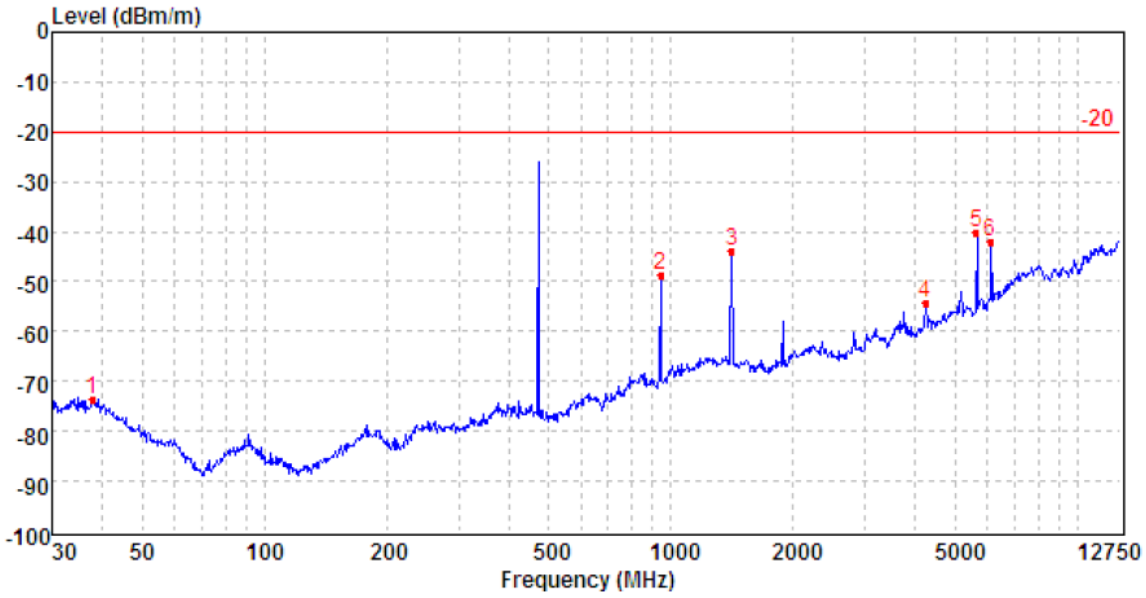
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	39.19	-77.71	28.60	6.55	30.84	-73.40	-13.00	-60.40	Peak
2	918.52	-61.84	29.06	9.91	29.40	-52.27	-13.00	-39.27	Peak
3	1374.64	-54.83	37.11	5.51	36.48	-48.69	-13.00	-35.69	Peak
4	1832.79	-63.27	37.13	6.58	37.05	-56.61	-13.00	-43.61	Peak
5	4594.10	-59.75	43.44	10.84	36.11	-41.58	-13.00	-28.58	Peak
6	5971.29	-61.86	44.47	12.58	35.04	-39.85	-13.00	-26.85	Peak

TEST MODE	TX-DNH	Test Channel:	CH_{M2}	Polarity:	Vertical



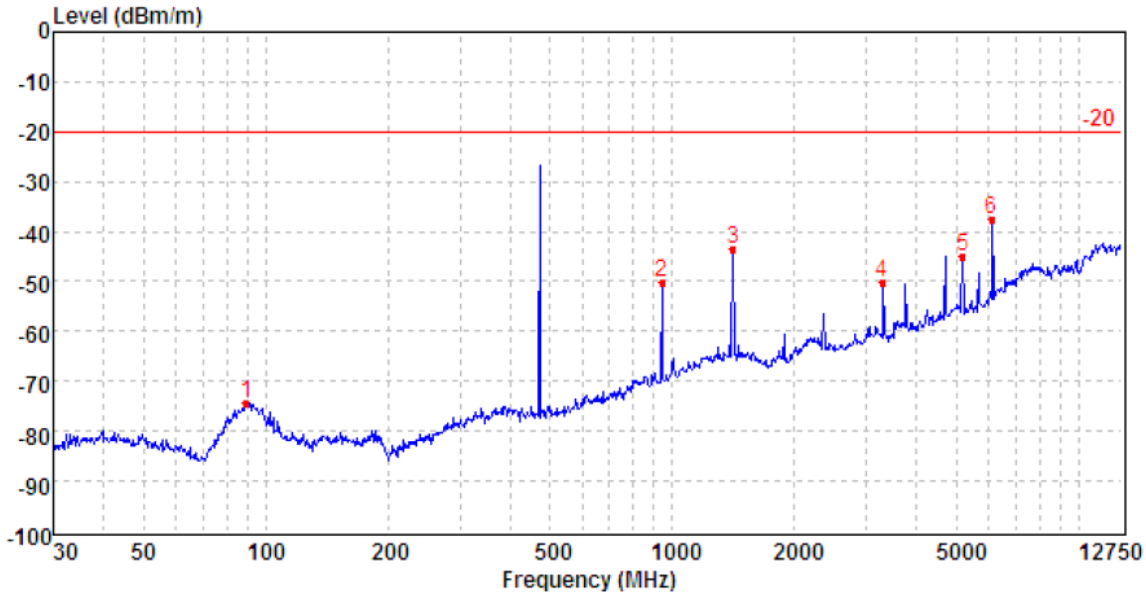
Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	90.50	-78.20	28.13	6.92	30.67	-73.82	-13.00	-60.82	Peak
2	918.52	-64.67	29.54	9.91	29.40	-54.62	-13.00	-41.62	Peak
3	1374.64	-51.97	37.65	5.51	36.48	-45.29	-13.00	-32.29	Peak
4	2754.19	-64.61	40.34	8.12	37.24	-53.39	-13.00	-40.39	Peak
5	4594.10	-59.62	43.49	10.84	36.11	-41.40	-13.00	-28.40	Peak
6	5971.29	-60.94	44.66	12.58	35.04	-38.74	-13.00	-25.74	Peak

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



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	37.70	-77.83	28.63	6.53	30.80	-73.47	-20.00	-53.47	Peak
2	941.41	-58.82	29.29	9.98	29.30	-48.85	-20.00	-28.85	Peak
3	1410.08	-50.04	37.10	5.56	36.63	-44.01	-20.00	-24.01	Peak
4	4234.72	-71.07	42.40	10.41	36.08	-54.34	-20.00	-34.34	Peak
5	5646.08	-61.43	43.79	12.46	35.00	-40.18	-20.00	-20.18	Peak
6	6109.67	-64.92	44.99	12.94	34.84	-41.83	-20.00	-21.83	Peak

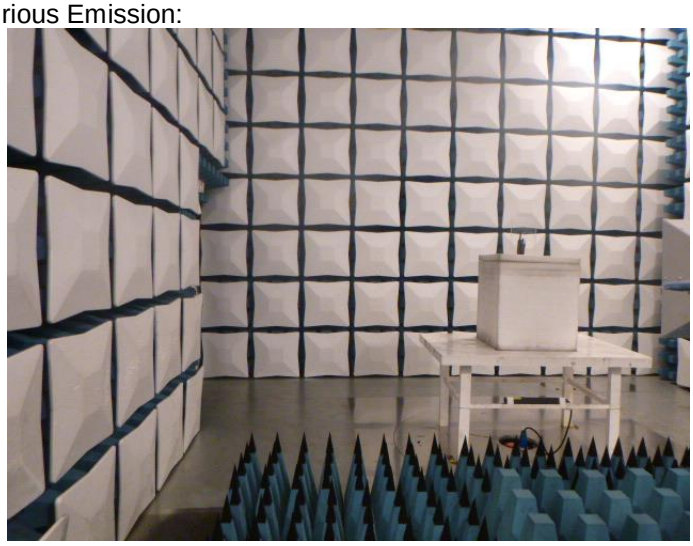
TEST MODE	TX-DNH	Test Channel:	CH_H	Polarity:	Vertical



Mark	Frequency MHz	Reading dBm	Antenna dB	Cable dB	Preamp dB	Level dBm	Limit dBm	Over limit	Remark
1	89.55	-78.62	28.12	6.92	30.67	-74.25	-20.00	-54.25	Peak
2	941.41	-60.04	29.00	9.98	29.30	-50.36	-20.00	-30.36	Peak
3	1410.08	-50.20	37.76	5.56	36.63	-43.51	-20.00	-23.51	Peak
4	3291.39	-62.83	40.59	9.00	36.83	-50.07	-20.00	-30.07	Peak
5	5177.97	-64.96	43.98	11.49	35.43	-44.92	-20.00	-24.92	Peak
6	6109.67	-60.85	45.18	12.94	34.84	-37.57	-20.00	-17.57	Peak

6 TEST SETUP PHOTOS OF THE EUT

Transmitter Radiated Spurious Emission:

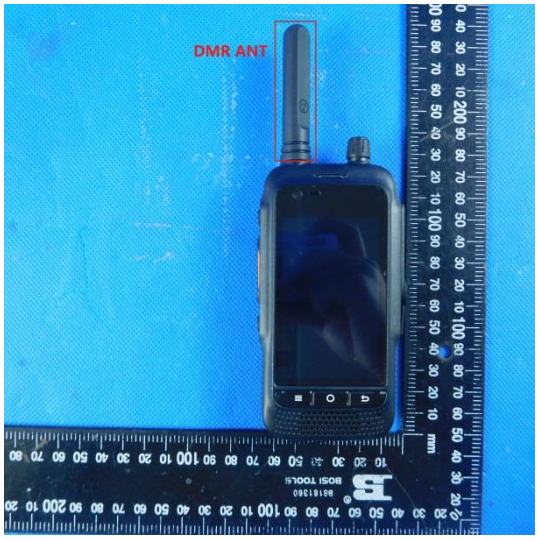


Frequency Stability:

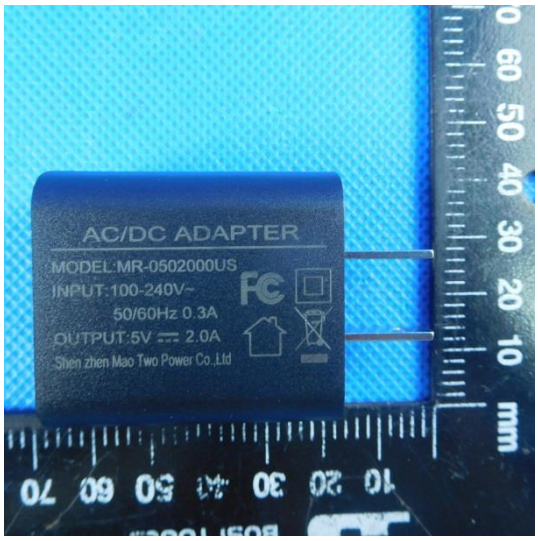
Other RF test item:
:

7 EXTERNAL AND INTERNAL PHOTOS OF THE EUT

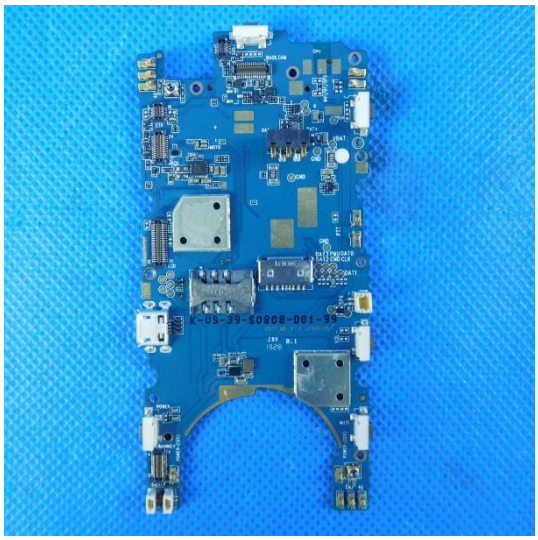
External Photos of the EUT

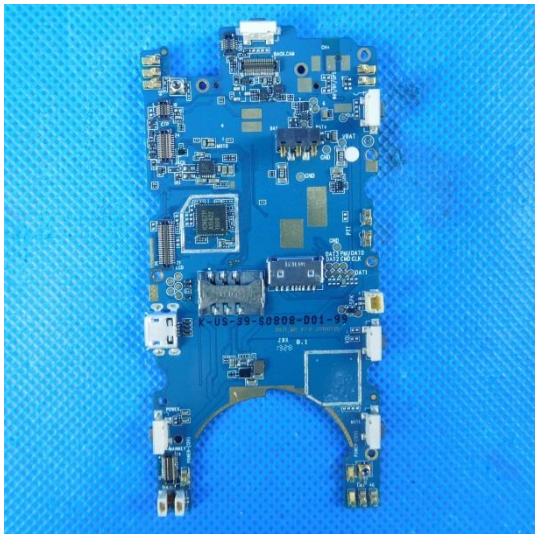


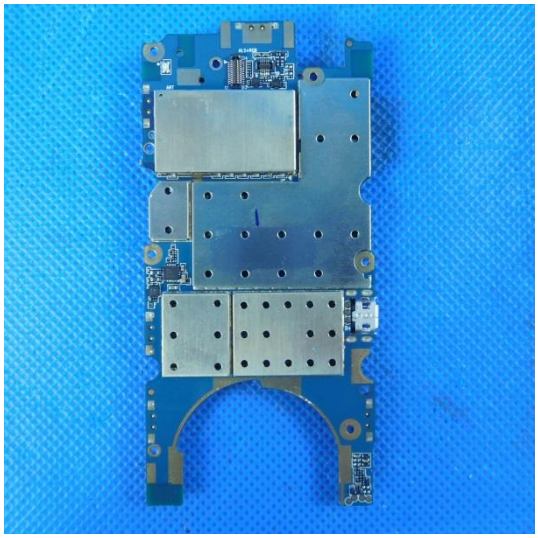

SOS

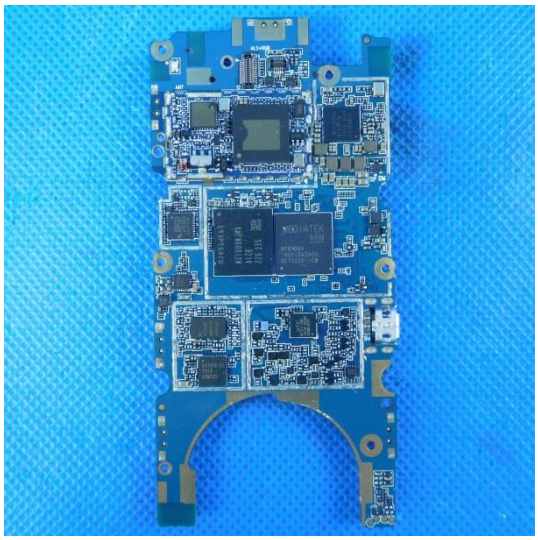

AC/DC ADAPTER
MODEL:MR-0502000US
INPUT:100-240V~
50/60Hz 0.3A
OUTPUT:5V 2.0A
Shen zhen Mao Two Power Co.,Ltd
FC
mm

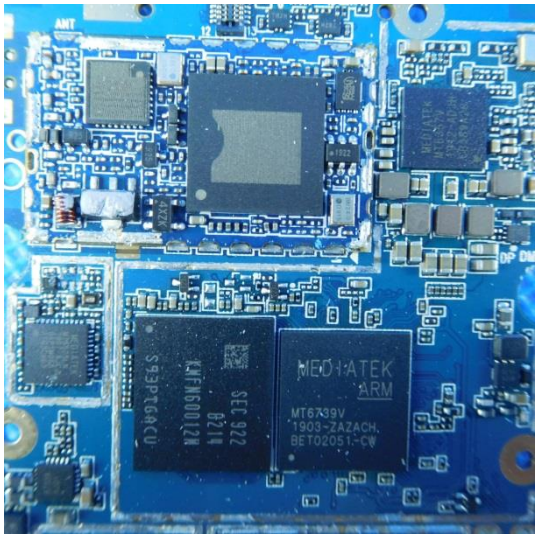
Internal Photos of the EUT










MEDIATEK
ARM
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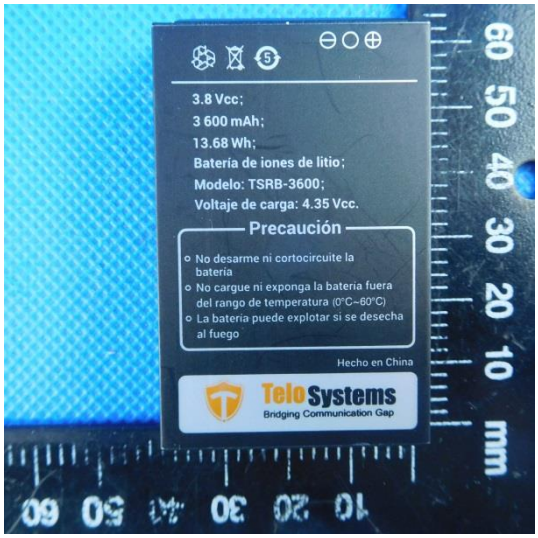
1903-ZAZACH.
BET02051-CW
KMFN60012M
SEC 022
0214



8 APPENDIX REPORT

Project No.	SHT2005099304EW	Test sample No.	TE580PD
Start test date	2020/7/13	Finish date	2020/7/17
Temperature	22℃	Humidity	55%
Test Engineer	patrick. Qin.	Auditor	Xiaodong Zhao

Appendix clause	Test Item	Test date (M/D)	Test Result (PASS/FAIL)
A	Maximum Transmitter Power	7/13	PASS
B	Occupied Bandwidth	7/15	PASS
C	Emission Mask	7/17	PASS
D	Frequency Stability Test & Temperature	7/13	PASS
E	Frequency Stability Test & Voltage	7/13	PASS
F	Transmitter Frequency Behavior	7/14	PASS
G	Spurious Emission On Antenna Port	7/15	PASS

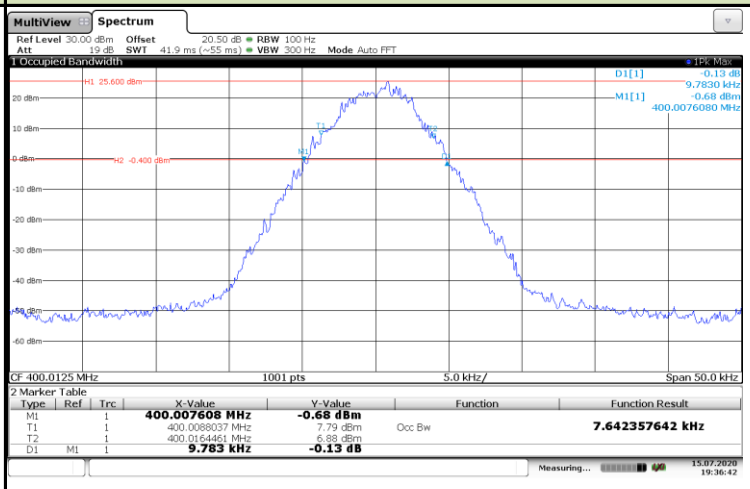
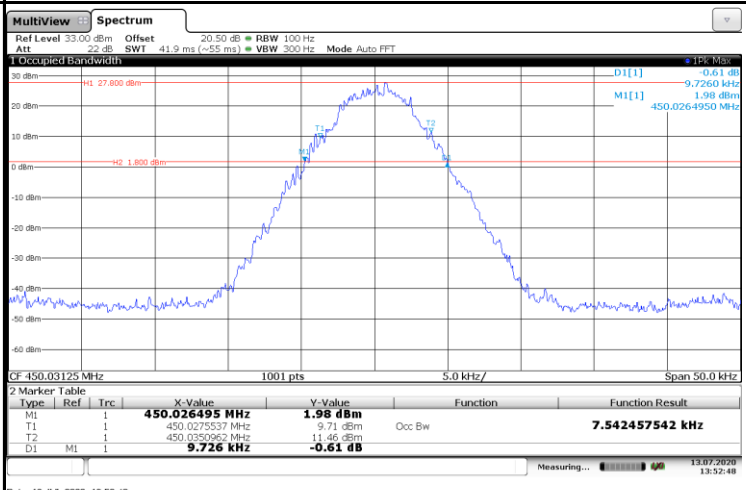
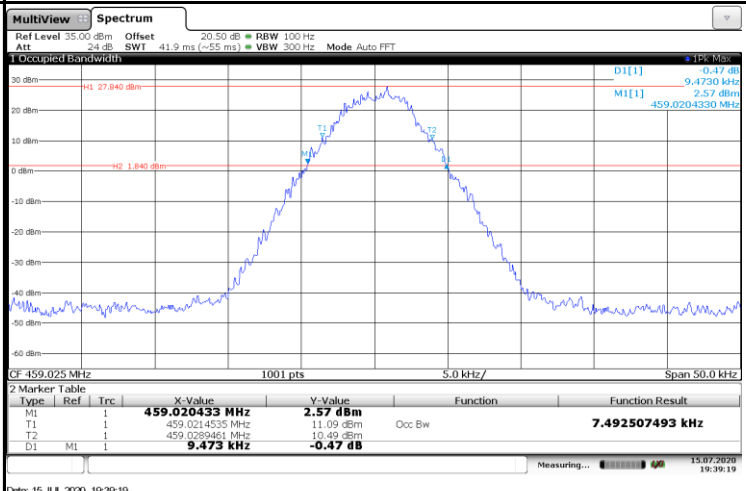
Appendix A:Maximum Transmitter Power

Operation Mode	Modulation Type	Test Channel	Measured Power(dBm)	Measured Power(W)	Rated Power(W)	Percentage (%)	Limit	Result
TX-DNH	4FSK	CH_L	32.3	1.70	2.00	-15.1	±20%	PASS
TX-DNH	4FSK	CH_{M1}	32.7	1.86	2.00	-6.9	≤50dBm	PASS
TX-DNH	4FSK	CH_{M2}	32.6	1.82	2.00	-9.0	≤47.78dBm	PASS
TX-DNH	4FSK	CH_H	32.2	1.66	2.00	-17.0	±20%	PASS
TX-DNL	4FSK	CH_L	26.8	0.48	0.50	-4.1	±20%	PASS
TX-DNL	4FSK	CH_{M1}	27.2	0.53	0.50	5.2	≤50dBm	PASS
TX-DNL	4FSK	CH_{M2}	26.8	0.48	0.50	-3.4	≤47.78dBm	PASS
TX-DNL	4FSK	CH_H	26.6	0.46	0.50	-7.9	±20%	PASS

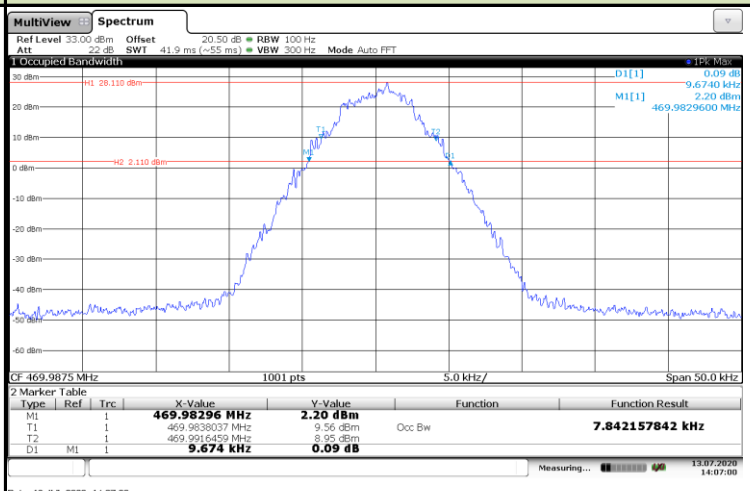
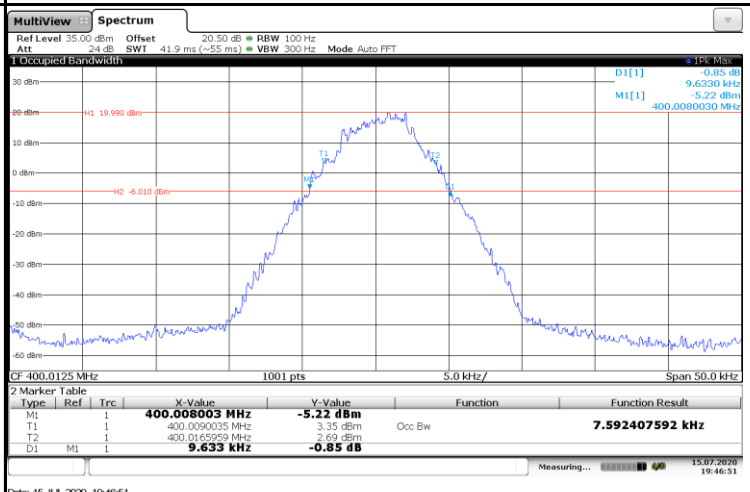
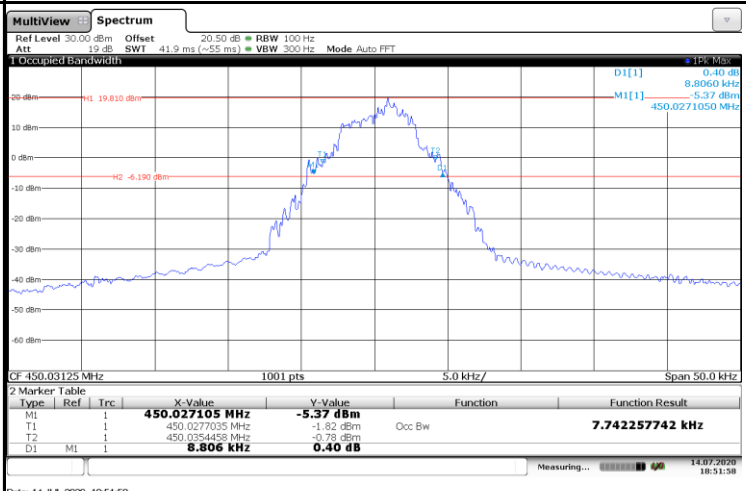
Appendix B:Occupied Bandwidth

Operation Mode	Modulation Type	Test Channel	Occupied Bandwidth		99% Limit(kHz)	Result
			99%(kHz)	26dB(kHz)		
TX-DNH	4FSK	CH_L	7.64	9.78	≤11.25	PASS
TX-DNH	4FSK	CH_{M1}	7.54	9.73	≤11.25	PASS
TX-DNH	4FSK	CH_{M2}	7.49	9.47	≤11.25	PASS
TX-DNH	4FSK	CH_H	7.84	9.67	≤11.25	PASS
TX-DNL	4FSK	CH_L	7.59	9.63	≤11.25	PASS
TX-DNL	4FSK	CH_{M1}	7.74	9.70	≤11.25	PASS
TX-DNL	4FSK	CH_{M2}	7.54	9.54	≤11.25	PASS
TX-DNL	4FSK	CH_H	7.34	9.64	≤11.25	PASS

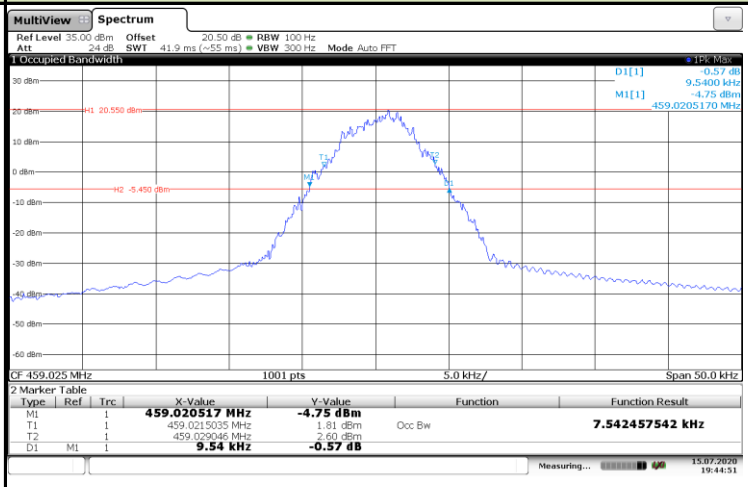
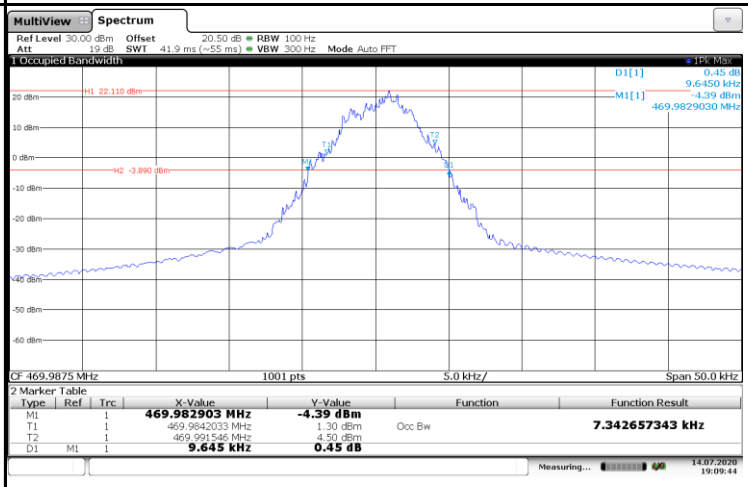
Appendix B:Occupied Bandwidth

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_L	
TX-DNH	4FSK	CH_{M1}	
TX-DNH	4FSK	CH_{M2}	

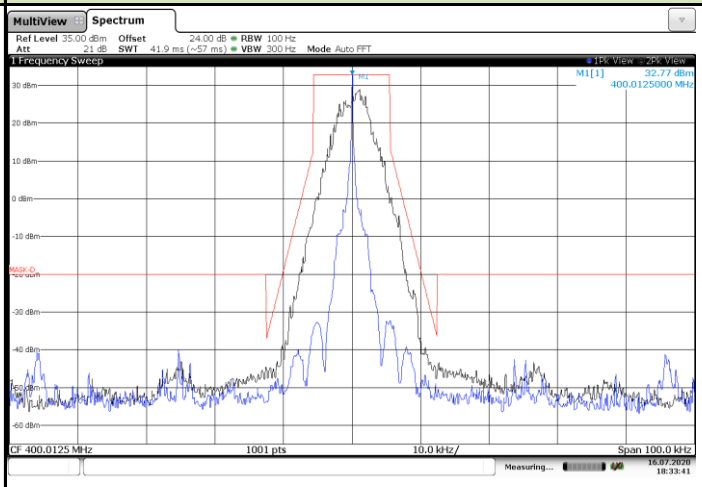
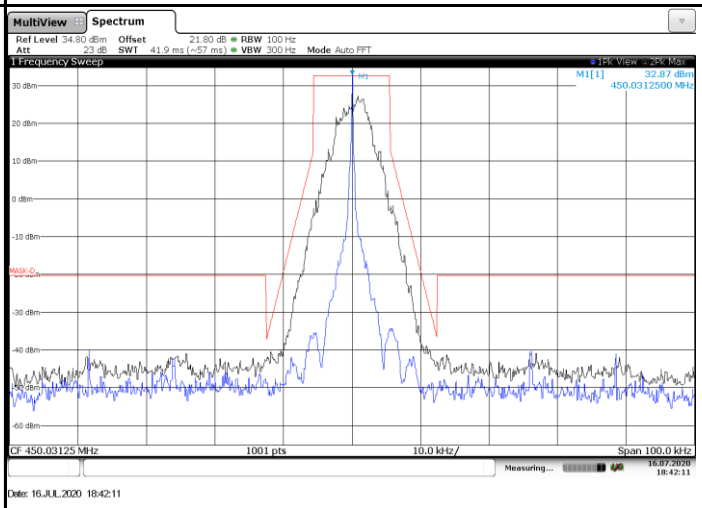
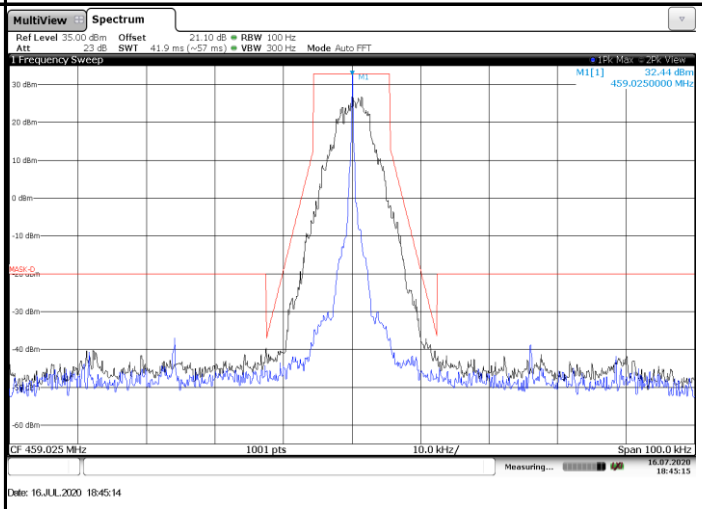
Appendix B:Occupied Bandwidth

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_H	
TX-DNL	4FSK	CH_L	
TX-DNL	4FSK	CH_{M1}	

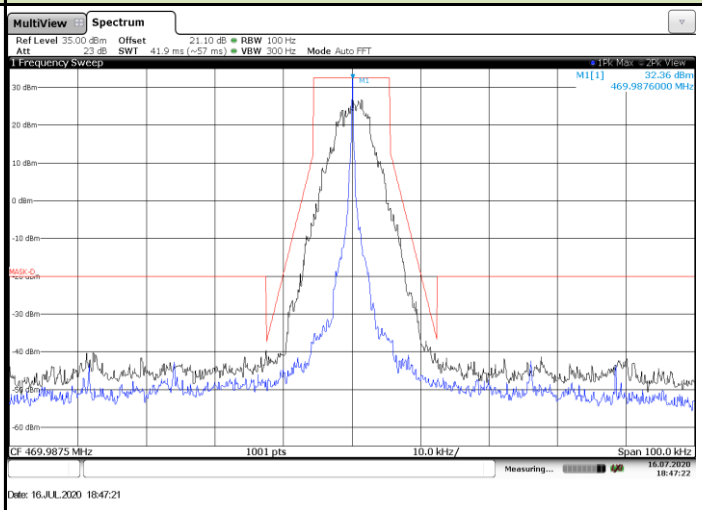
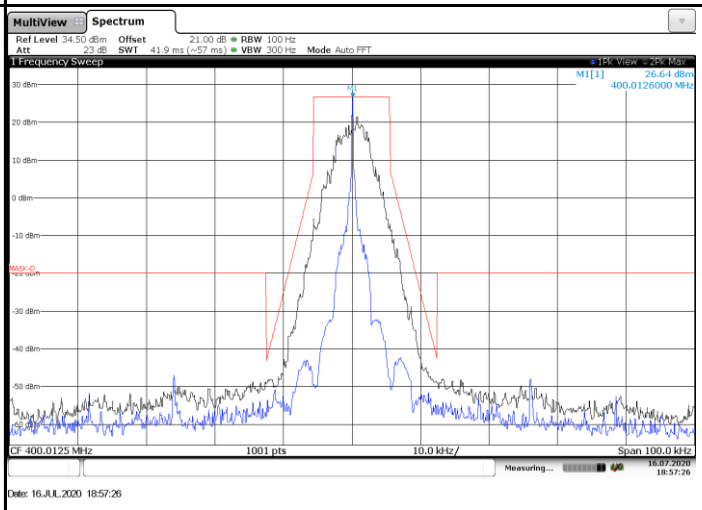
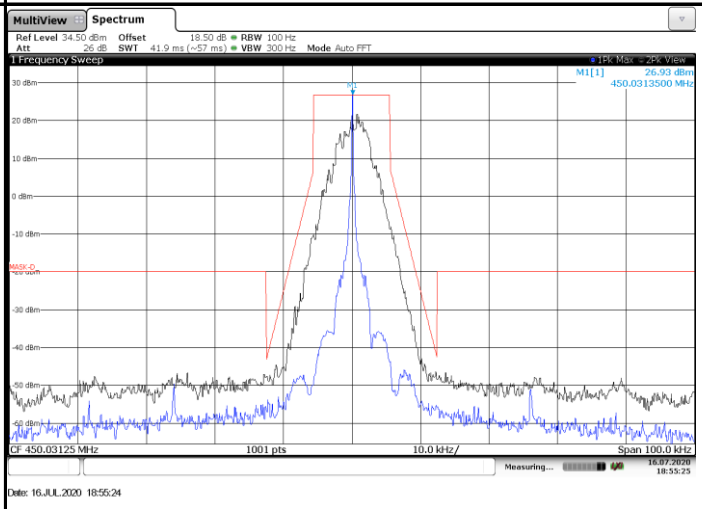
Appendix B:Occupied Bandwidth

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNL	4FSK	CH_{M2}	
TX-DNL	4FSK	CH_{H}	

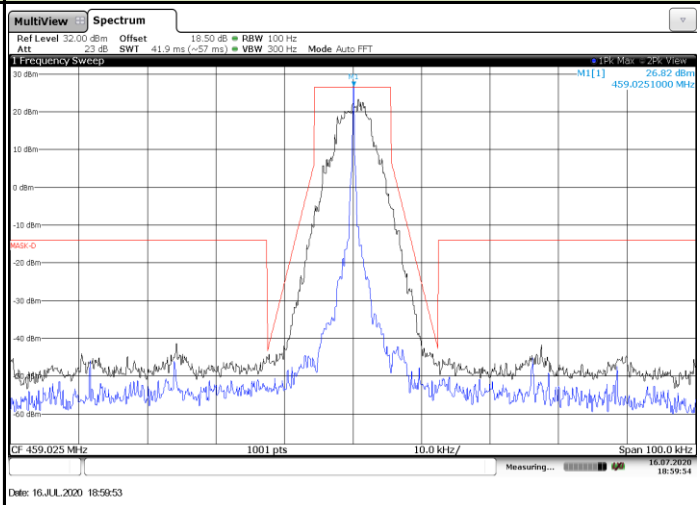
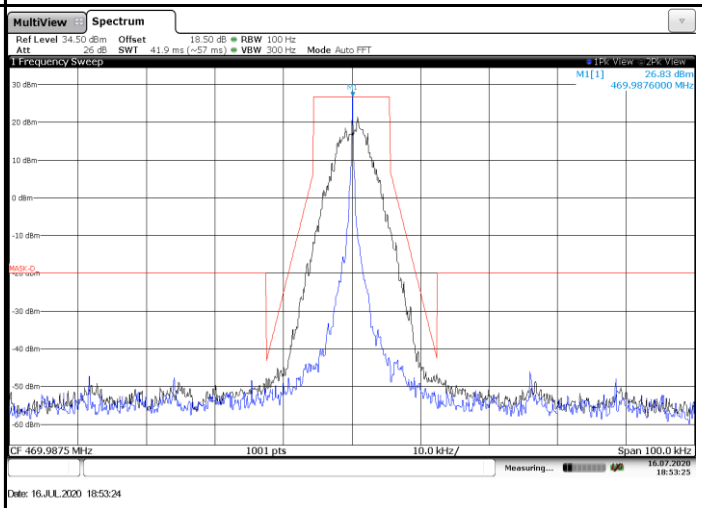
Appendix C:Emission Mask

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_L	
TX-DNH	4FSK	CH_{M1}	
TX-DNH	4FSK	CH_{M2}	

Appendix C:Emission Mask

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_H	
TX-DNL	4FSK	CH_L	
TX-DNL	4FSK	CH_{M1}	

Appendix C:Emission Mask

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNL	4FSK	CH_{M2}	
TX-DNL	4FSK	CH_{H}	

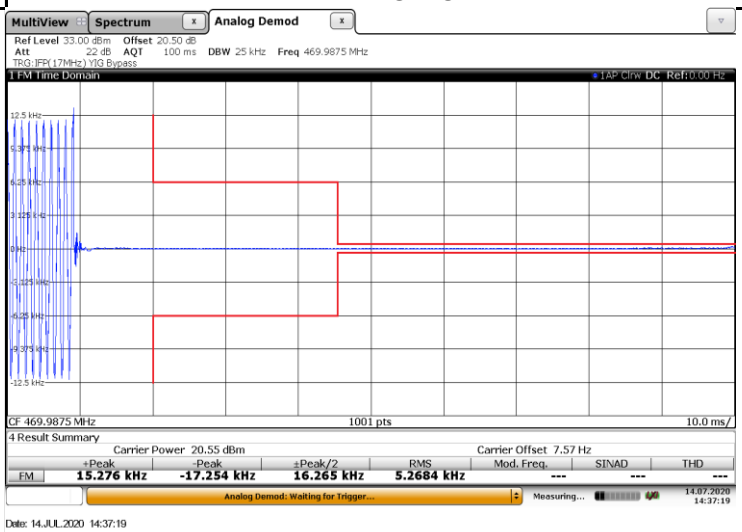
Appendix D:Frequency Stability Test & Temperature

Operation Mode	Modulation Type	Test Conditions		Frequency error (ppm)				Limit (ppm)	Result
		Voltage	Temperature	CH_L	CH_{M1}	CH_{M2}	CH_H		
TX-DNH	4FSK	V_N	-30	0.174	0.160	0.192	0.118	±5.0	PASS
TX-DNH	4FSK	V_N	-20	0.184	0.165	0.187	0.118	±5.0	PASS
TX-DNH	4FSK	V_N	-10	0.189	0.154	0.192	0.128	±5.0	PASS
TX-DNH	4FSK	V_N	0	0.187	0.165	0.185	0.122	±5.0	PASS
TX-DNH	4FSK	V_N	10	0.178	0.163	0.197	0.120	±5.0	PASS
TX-DNH	4FSK	V_N	20	0.172	0.154	0.184	0.116	±5.0	PASS
TX-DNH	4FSK	V_N	30	0.188	0.168	0.184	0.121	±5.0	PASS
TX-DNH	4FSK	V_N	40	0.186	0.161	0.199	0.127	±5.0	PASS
TX-DNH	4FSK	V_N	55	0.184	0.163	0.198	0.121	±5.0	PASS
TX-DNL	4FSK	V_N	-30	0.174	0.136	0.165	0.146	±5.0	PASS
TX-DNL	4FSK	V_N	-20	0.169	0.135	0.159	0.140	±5.0	PASS
TX-DNL	4FSK	V_N	-10	0.175	0.132	0.162	0.146	±5.0	PASS
TX-DNL	4FSK	V_N	0	0.181	0.129	0.161	0.139	±5.0	PASS
TX-DNL	4FSK	V_N	10	0.185	0.128	0.171	0.145	±5.0	PASS
TX-DNL	4FSK	V_N	20	0.169	0.124	0.157	0.136	±5.0	PASS
TX-DNL	4FSK	V_N	30	0.174	0.127	0.167	0.141	±5.0	PASS
TX-DNL	4FSK	V_N	40	0.181	0.130	0.172	0.143	±5.0	PASS
TX-DNL	4FSK	V_N	55	0.182	0.130	0.171	0.136	±5.0	PASS

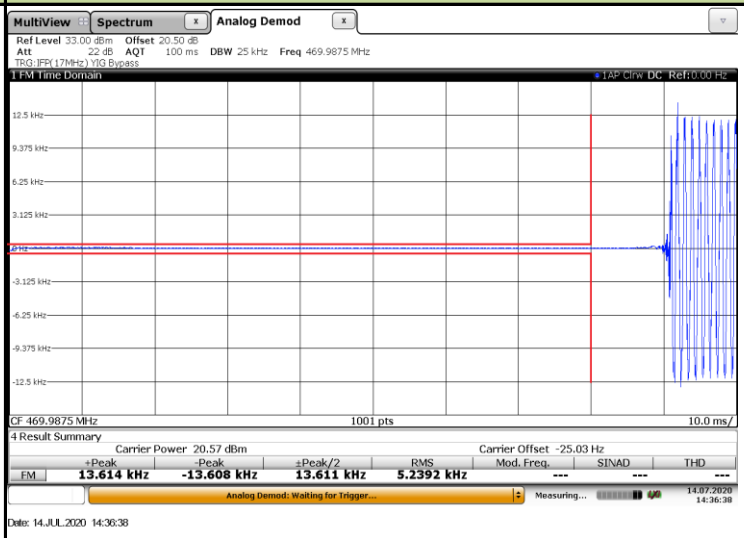
Appendix E:Frequency Stability Test & Voltage

Operation Mode	Modulation Type	Test Conditions		Frequency error (ppm)				Limit (ppm)	Result
		Voltage	Temperature	CH_L	CH_{M1}	CH_{M2}	CH_H		
TX-DNH	4FSK	V_N	T_N	0.172	0.154	0.184	0.116	±5.0	PASS
TX-DNH	4FSK	V_L	T_N	0.174	0.157	0.184	0.116	±5.0	PASS
TX-DNH	4FSK	V_H	T_N	0.185	0.156	0.189	0.121	±5.0	PASS
TX-DNL	4FSK	V_N	T_N	0.169	0.124	0.157	0.136	±5.0	PASS
TX-DNL	4FSK	V_L	T_N	0.170	0.124	0.160	0.137	±5.0	PASS
TX-DNL	4FSK	V_H	T_N	0.174	0.130	0.160	0.143	±5.0	PASS

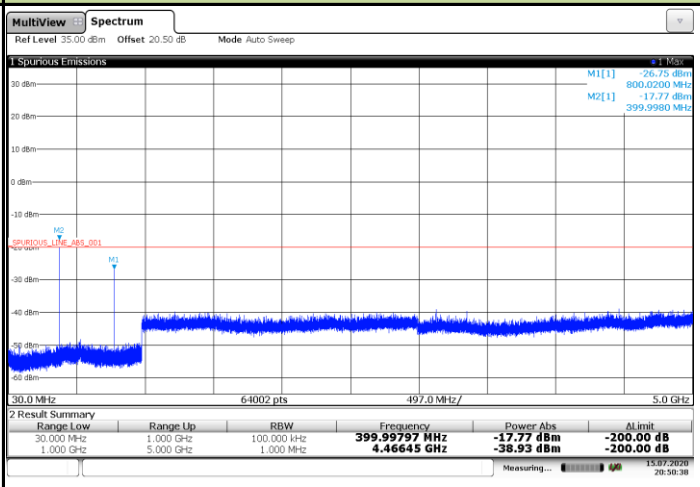
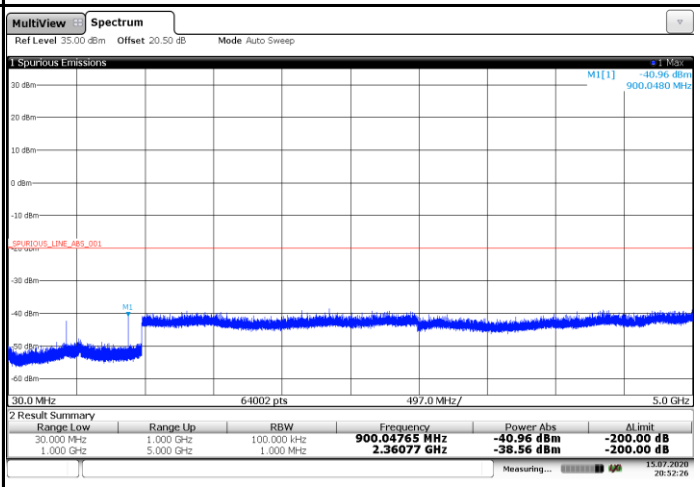
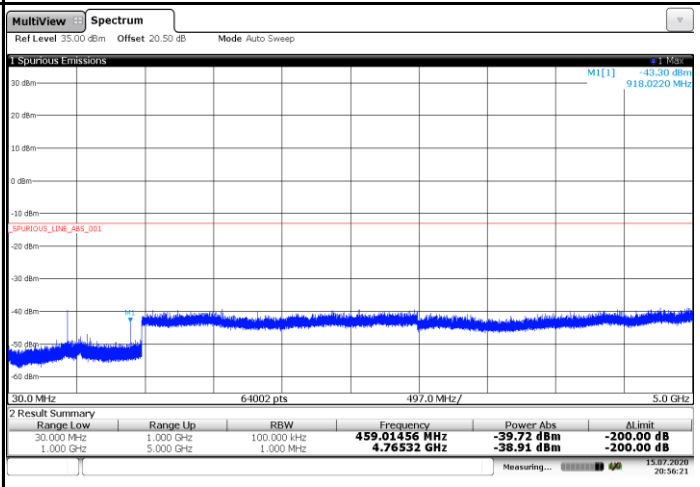
Appendix F:Transmitter Frequency Behavior

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_L	 OFF~ON
TX-DNH	4FSK	CH_L	 ON-OFF
TX-ANH	FM	CH_H	 OFF~ON

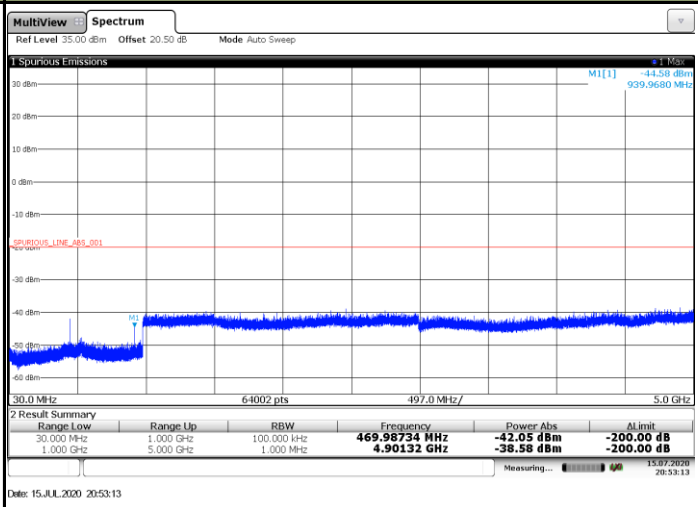
Appendix F:Transmitter Frequency Behavior

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-ANH	FM	CH_H	 ON-OFF

Appendix G:Spurious Emission On Antenna Port

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_L	
TX-DNH	4FSK	CH_{M1}	
TX-DNH	4FSK	CH_{M2}	

Appendix G:Spurious Emission On Antenna Port

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-DNH	4FSK	CH_H	

----End of Report----