



TEST REPORT

Report Reference No. : CHTEW20040203 Report verification: 

Project No. : SHT2004008001EW

FCC ID : 2AUSV-ETERAE980

Applicant's name : SINOTECH R&D GROUP LIMITED

Address : Room 2203, 22/F, WAH HING COMMERCIAL BUILDING, 283 LOCKHART ROAD, WAN CHAI, HONG KONG.

Manufacturer : SINOTECH R&D GROUP LIMITED

Address : Room 2203, 22/F, WAH HING COMMERCIAL BUILDING, 283 LOCKHART ROAD, WAN CHAI, HONG KONG.

Test item description : Smart Phone

Trade Mark : eTera

Model/Type reference : E980

Listed Model(s) : -

Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of receipt of test sample : Sep. 25, 2019

Date of testing : Sep. 26, 2019- Apr. 26, 2020

Date of issue : Apr. 27, 2020

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 correspond 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 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB 558074 D01 15.247 Meas Guidance v05r02](#): Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of The FCC Rules

1.2. Report version

Revision No.	Date of issue	Description
N/A	2020-04-27	Original

2. TEST DESCRIPTION

Test Item	Section in CFR 47	Result	Test Engineer
Antenna Requirement	15.203/15.247 (c)	PASS	Kang Yang
AC Power Line Conducted Emissions	15.207	PASS	Kang Yang
Conducted Peak Output Power	15.247 (b)(1)	PASS	Ximing Huang
20 dB Bandwidth	15.247 (a)(1)	PASS	Ximing Huang
Carrier Frequencies Separation	15.247 (a)(1)	PASS	Ximing Huang
Hopping Channel Number	15.247 (a)(1)	PASS	Ximing Huang
Dwell Time	15.247 (a)(1)	PASS	Ximing Huang
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	PASS	Ximing Huang
Restricted band	15.247(d)/15.205	PASS	Xu Yang
Radiated Emissions	15.247(d)/15.209	PASS	Xu Yang

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	SINOTECH R&D GROUP LIMITED
Address:	Room 2203, 22/F, WAH HING COMMERCIAL BUILDING, 283 LOCKHART ROAD, WAN CHAI, HONG KONG.
Manufacturer:	SINOTECH R&D GROUP LIMITED
Address:	Room 2203, 22/F, WAH HING COMMERCIAL BUILDING, 283 LOCKHART ROAD, WAN CHAI, HONG KONG.

3.2. Product Description

Name of EUT:	Smart Phone
Trade Mark:	eTera
Model No.:	E980
Listed Model(s):	-
IMEI:	Conducted: 352164110004109 Radiated: 359612090258426
Power supply:	DC 3.8V
Adapter information:	Moel:MR-0502000US Input:100-240Va.c., 50/60Hz, 0.3A Output:5.0Vd.c., 2.0A
Hardware version:	K920_MB_P3_V03
Software version:	E980_US_GMS_V005_20180925
Bluetooth	
Version:	Supported BT4.0+EDR
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	FPC Antenna
Antenna gain:	-2.34 dBi

3.3. Operation state

➤ Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

Channel	Frequency (MHz)
00	2402
01	2403
:	:
39	2441
:	:
77	2479
78	2480

➤ TEST MODE

For RF test items:
The engineering test program was provided and enabled to make EUT continuous transmit
For AC power line conducted emissions:
The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.
For Radiated suprious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data recorded in the report.

3.4. EUT configuration

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

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

/	Manufacturer:	/
	Model No.:	/
/	Manufacturer:	/
	Model No.:	/

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

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

4.2. Test Facility

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

IC-Registration No.:5377A

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.: 5377A.

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

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

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 in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to 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.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.51 dB	(1)
Conducted spurious emissions 9kHz~40GHz	0.51 dB	(1)
Conducted Disturbance 150kHz~30MHz	3.02 dB	(1)
Radiated Emissions below 1GHz	4.90 dB	(1)
Radiated Emissions above 1GHz	4.96 dB	(1)
Occupied Bandwidth	70 Hz	(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							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	HTWE0114	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	HTWE0111	ESCI	101247	2019/10/26	2020/10/25
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2019/10/23	2020/10/22
●	Pulse Limiter	R&S	HTWE0033	ESH3-Z2	100499	2019/10/23	2020/10/22
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLEX 142	EF-NM-BNCM-2M	2019/10/23	2020/10/22
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-6th test site							
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	HTWE0127	SAC-3m-02	C11121	2018/09/30	2021/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2019/10/26	2020/10/25
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2018/04/02	2021/04/01
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0119	VULB9163	538	2018/04/04	2021/04/03
●	Pre-Amplifier	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2019/11/14	2020/11/13
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2019/08/21	2020/08/20
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX 104	501184/4	2019/05/27	2020/05/26
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
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
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	25841	2018/10/11	2021/10/10
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2018/10/11	2021/10/11
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2019/11/14	2020/11/13
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2019/05/23	2020/05/22
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2019/05/10	2020/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2019/05/10	2020/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-03	6m 3GHz RG Serisa	N/A	2019/05/10	2020/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2019/05/10	2020/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0121-01	6m 18GHz S Serisa	N/A	2019/05/10	2020/05/09
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

● RF Conducted Method						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2019/10/26	2020/10/25
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2019/10/26	2020/10/25
○	Radio communication tester	R&S	CMW500	137688-Lv	2019/10/26	2020/10/25

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

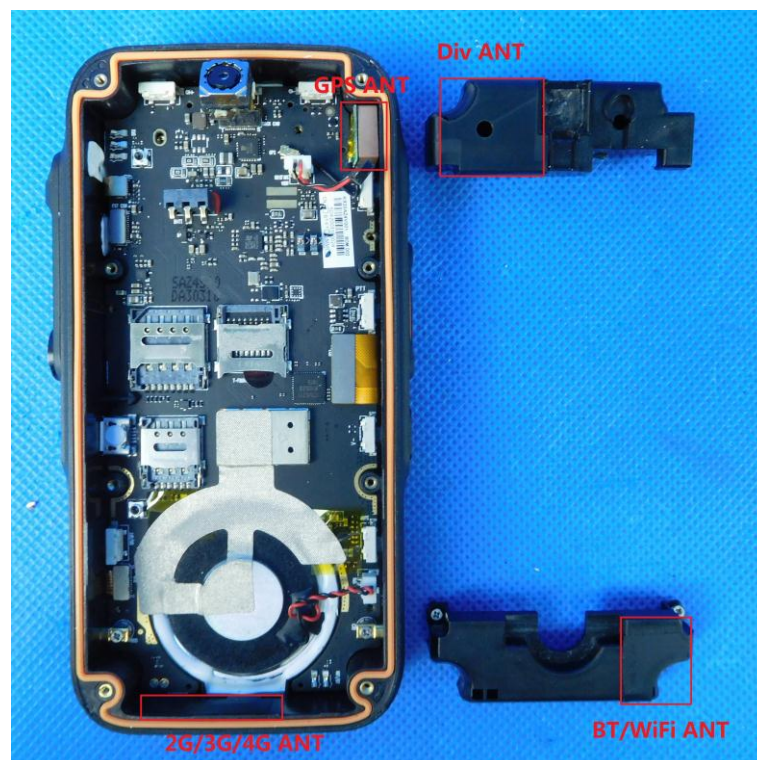
FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Test Result:

☒ **Passed** ☐ **Not Applicable**

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



5.2. Conducted Emissions (AC Main)

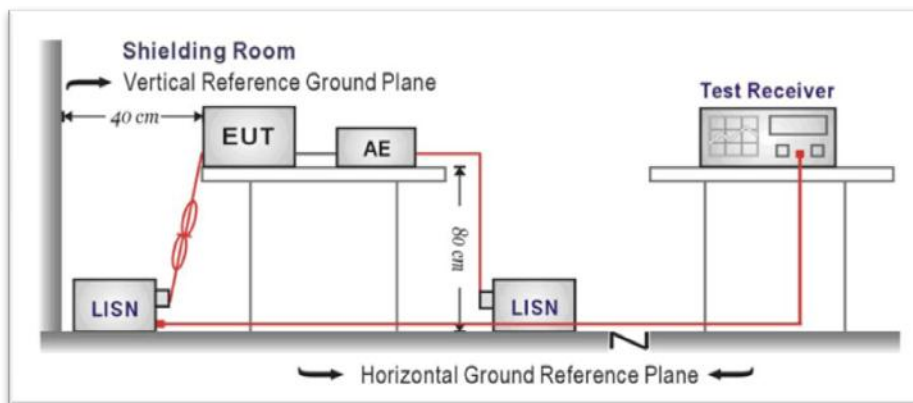
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

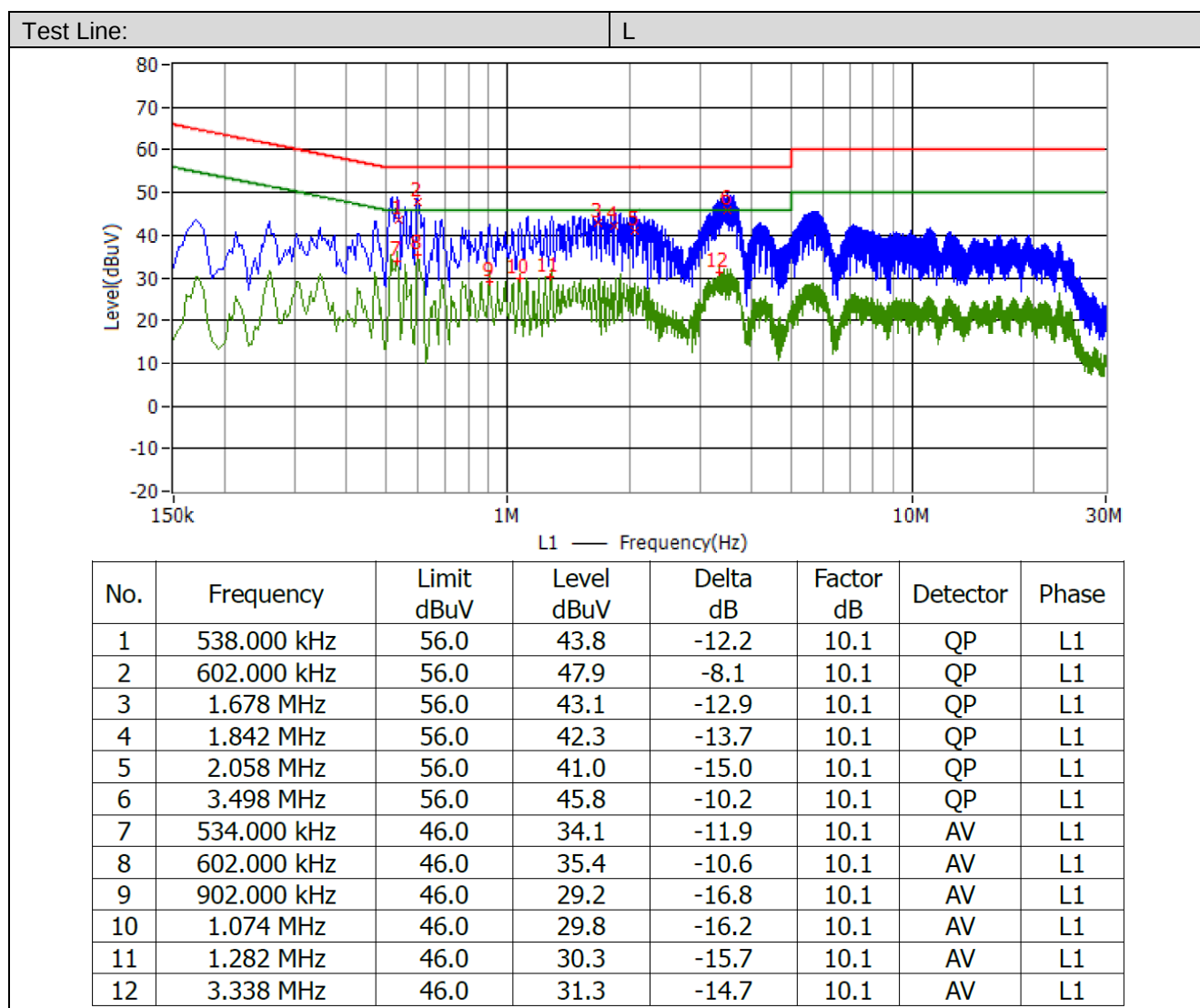
1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

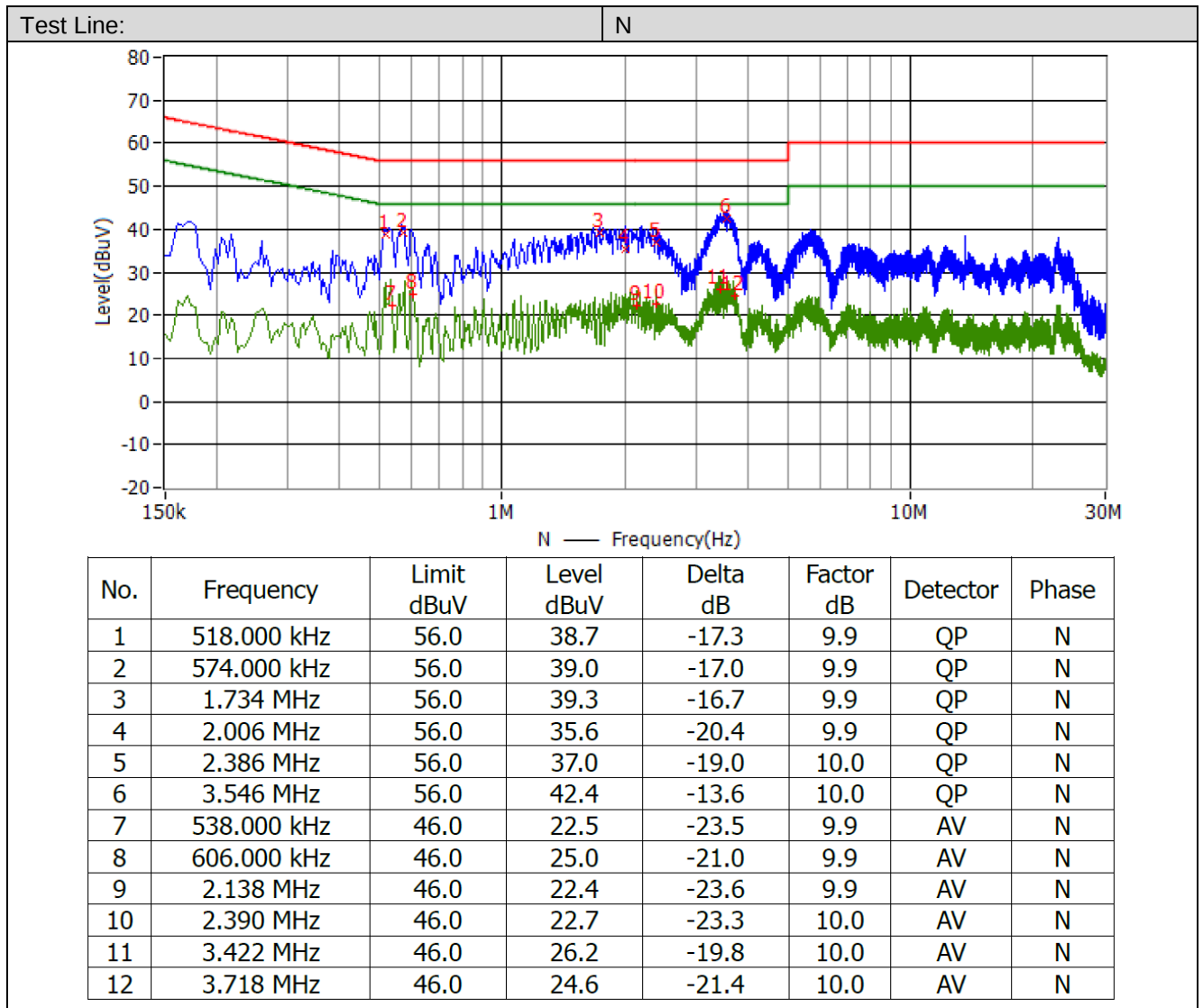
TEST RESULTS

☒ Passed ☐ Not Applicable

Note:

- 1) Transd= Cable lose + Pulse Limiter Factor + Artificial Mains Factor
- 2) Margin= Limit - Level





5.3. Conducted Peak Output Power

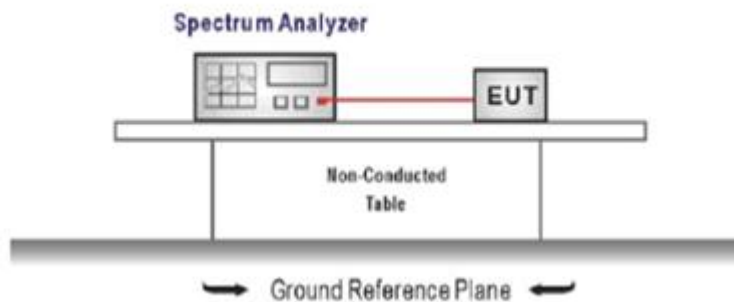
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1):

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
 Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
 RBW $\geq$ the 20 dB bandwidth of the emission being measured, VBW $\geq$ RBW
 Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

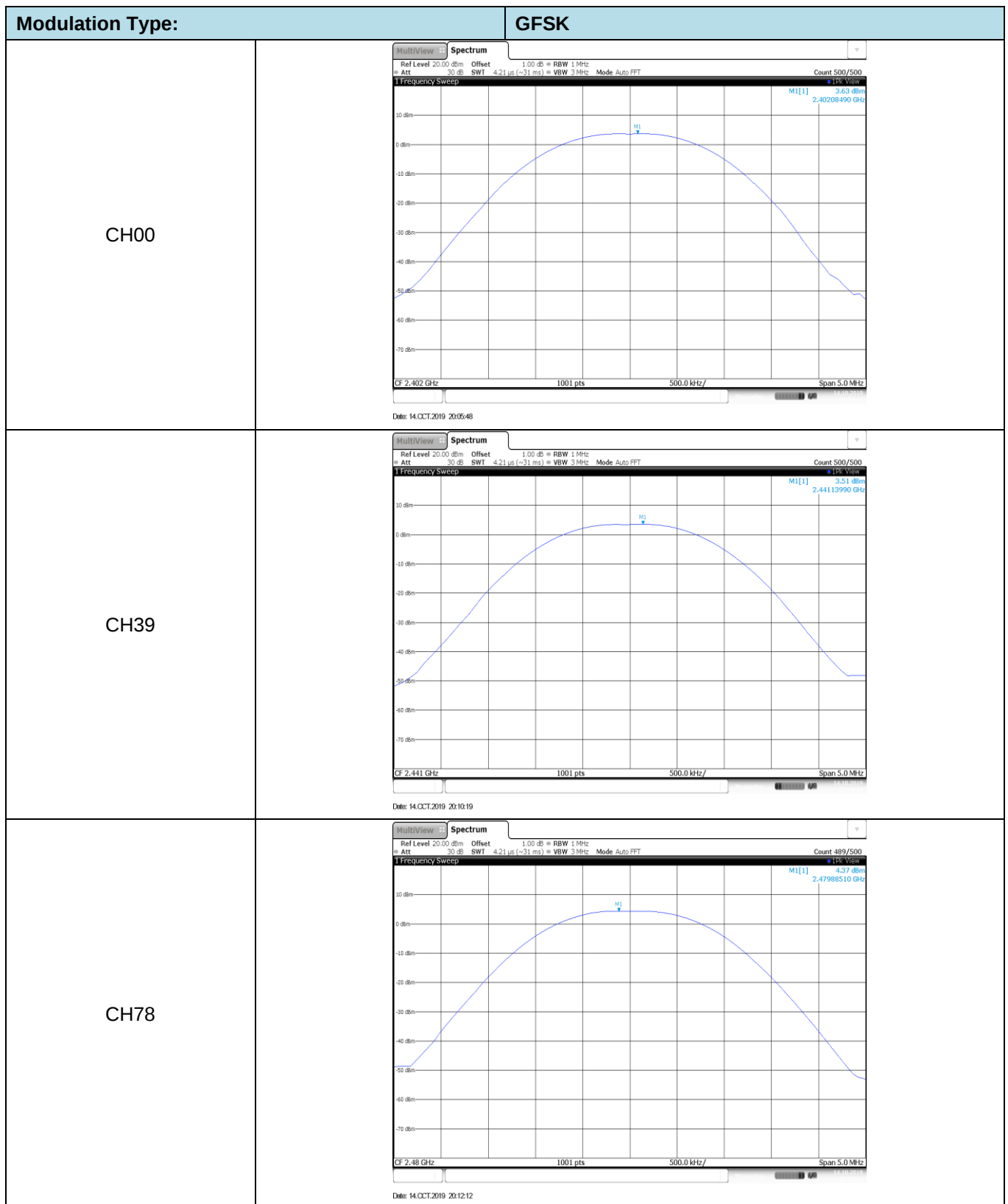
TEST MODE:

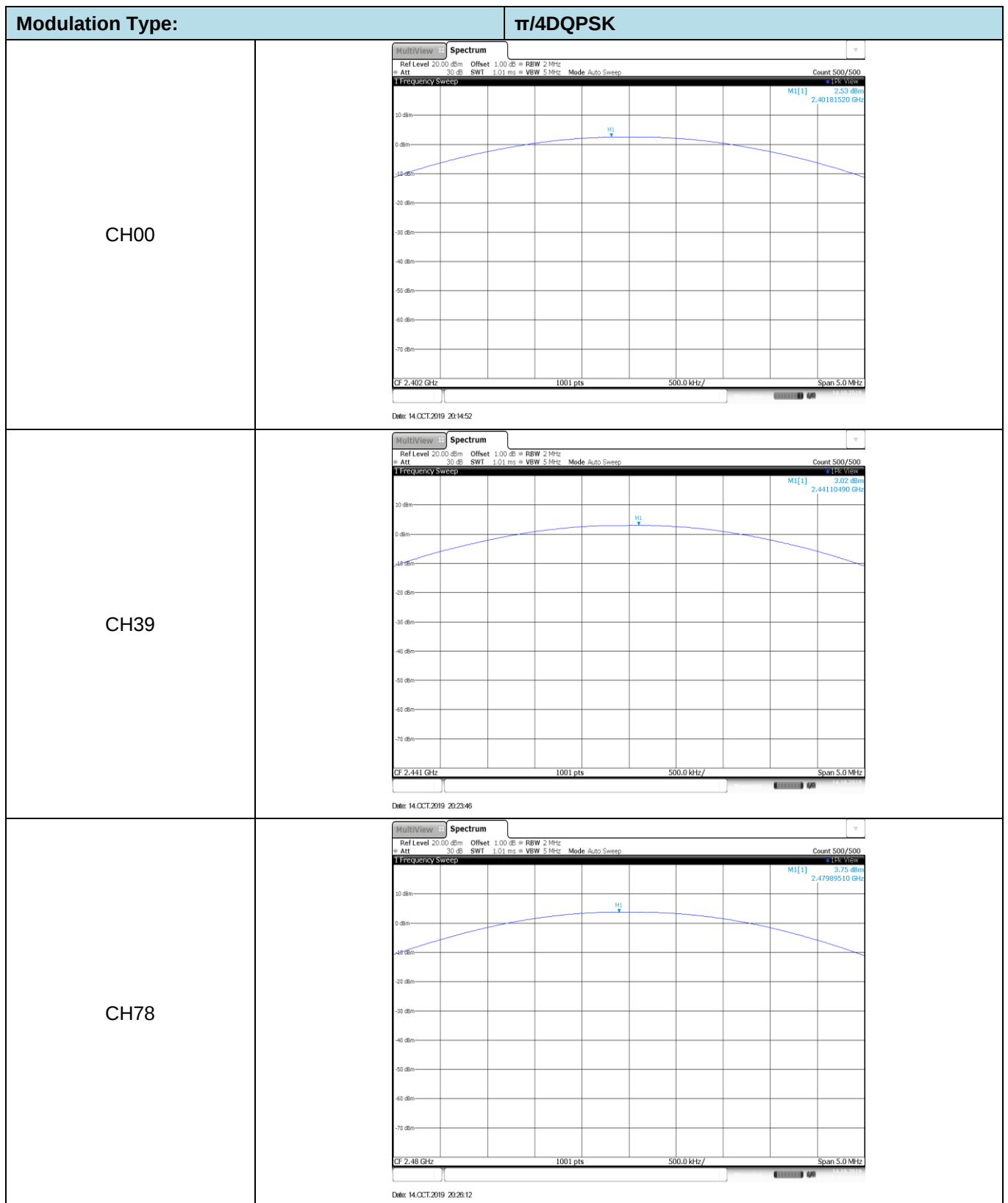
Please refer to the clause 3.3

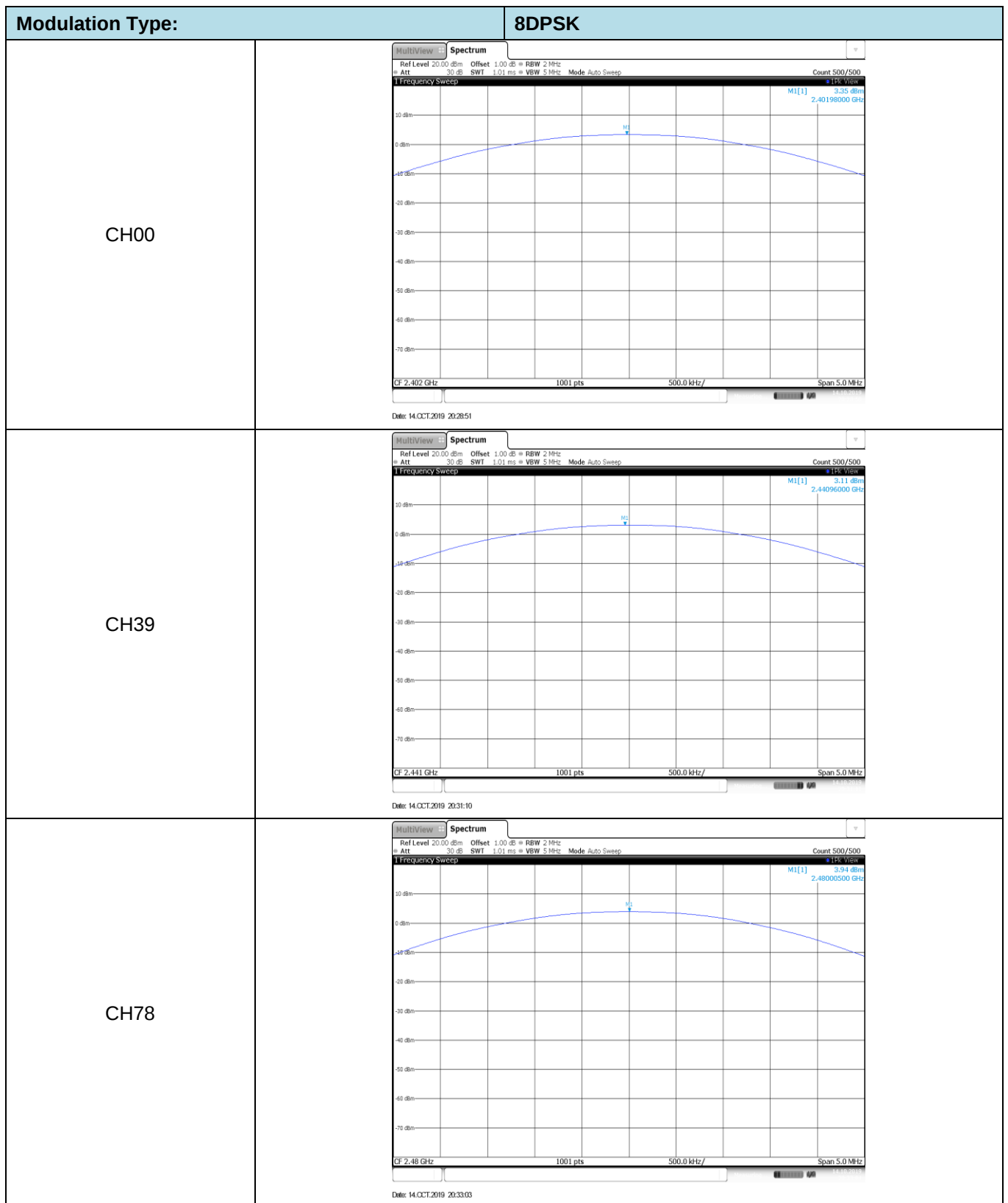
TEST RESULTS

☒ Passed ☐ Not Applicable

Modulation type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	00	3.63	3.61	≤ 30.00	Pass
	39	3.51	3.46		
	78	4.37	4.35		
$\pi/4$ DQPSK	00	2.53	1.96	≤ 21.00	Pass
	39	3.02	2.62		
	78	3.75	3.27		
8DPSK	00	3.35	2.91	≤ 21.00	Pass
	39	3.11	2.67		
	78	3.94	3.44		





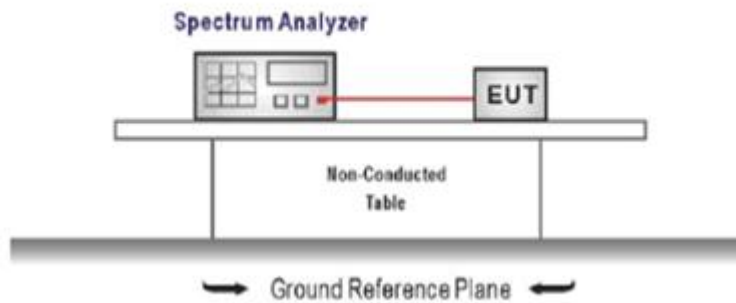


5.4. 20 dB Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW $\geq$ 1% of the 20 dB bandwidth, VBW $\geq$ RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

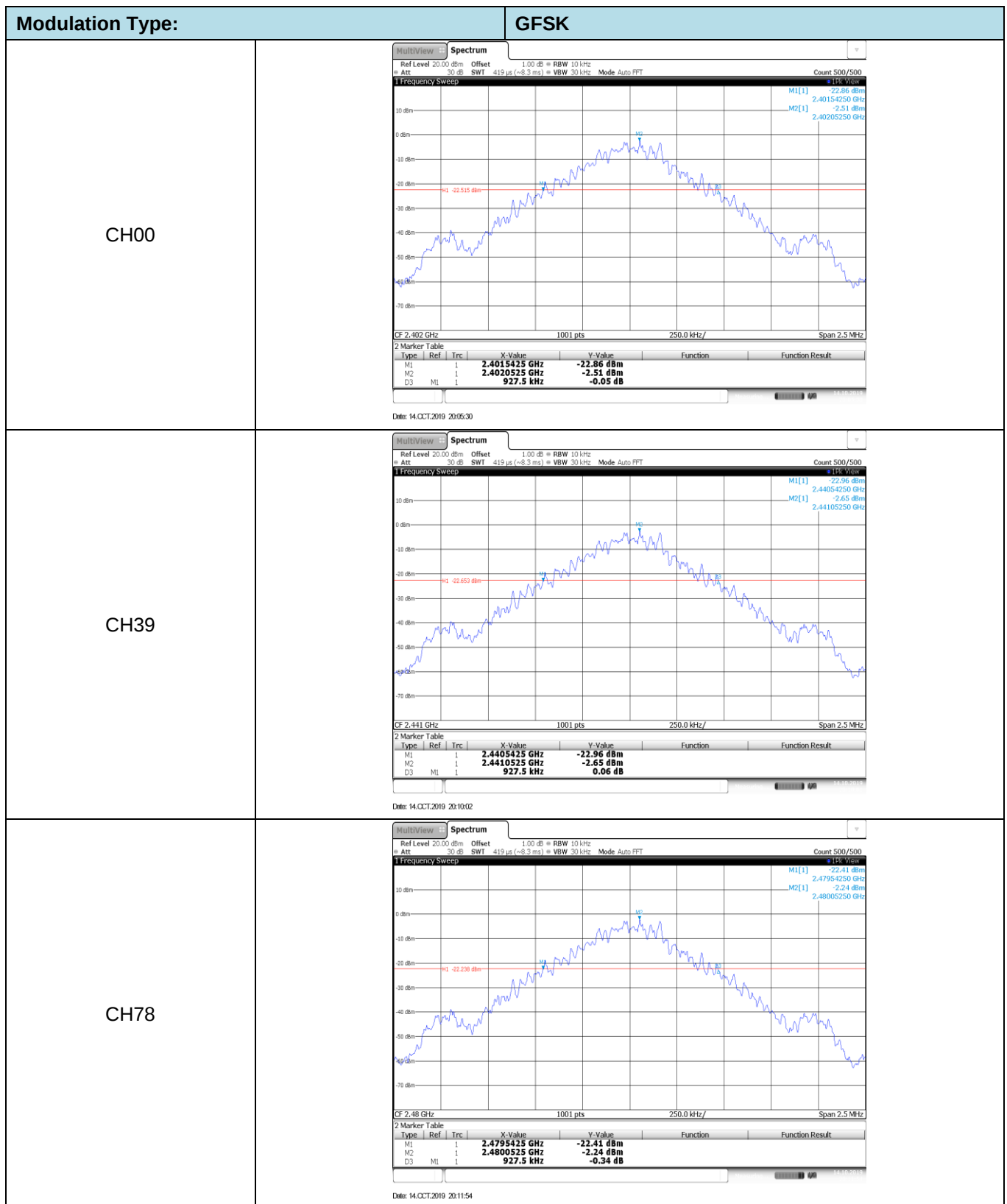
TEST MODE:

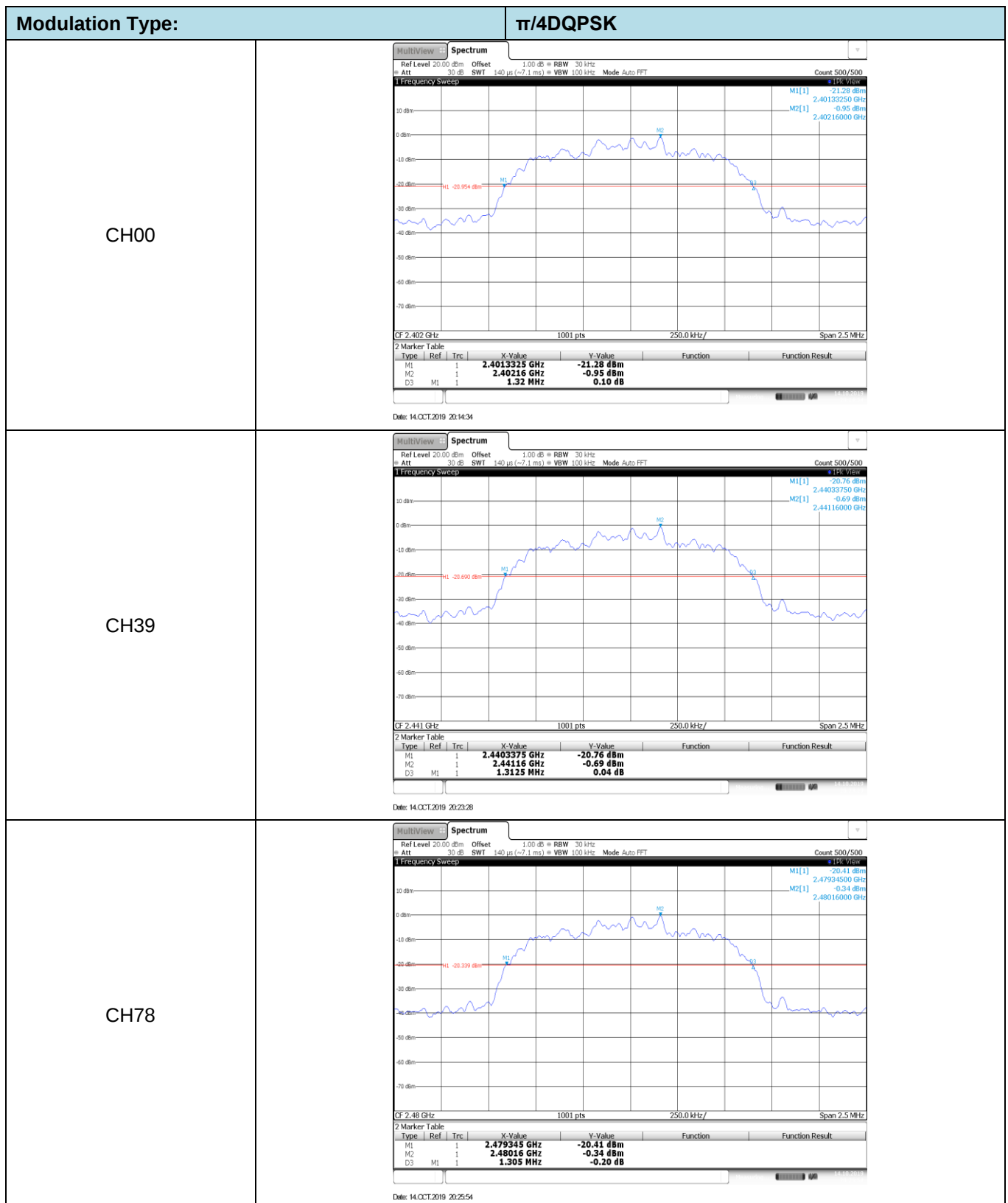
Please refer to the clause 3.3

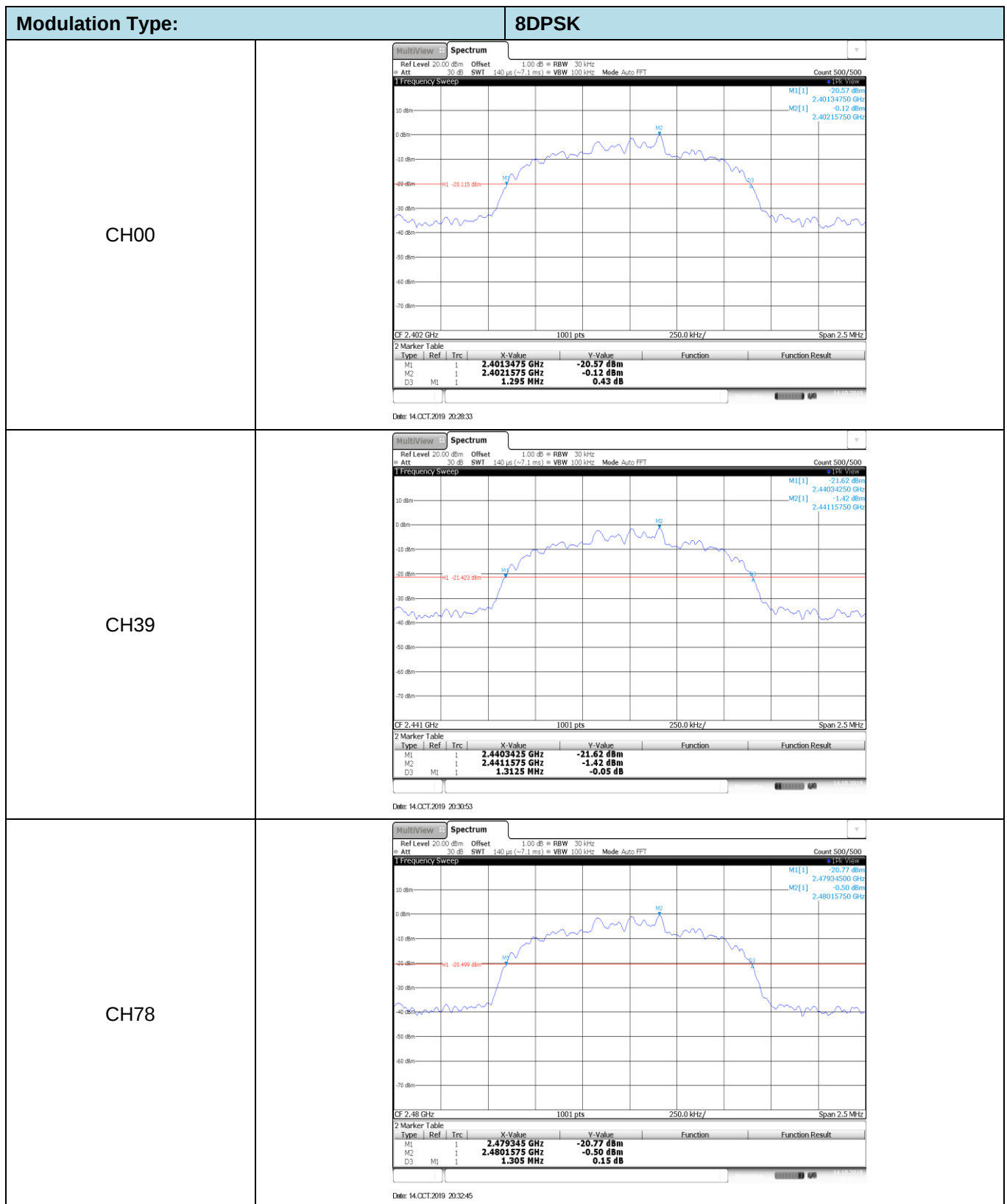
TEST RESULTS

☒ Passed ☐ Not Applicable

Modulation type	Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Result
GFSK	00	927.00	-	Pass
	39	927.00		
	78	927.00		
$\pi/4$ DQPSK	00	1320.00	-	Pass
	39	1313.00		
	78	1305.00		
8DPSK	00	1295.00	-	Pass
	39	1313.00		
	78	1305.00		







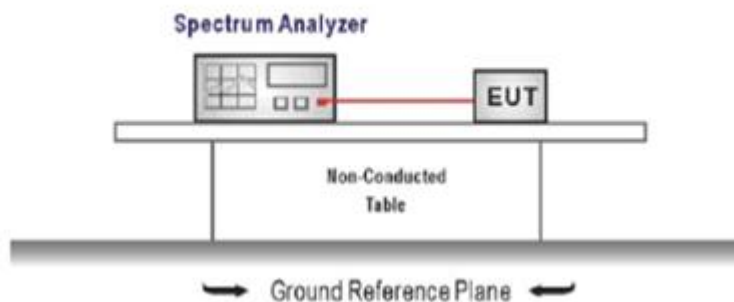
5.5. Carrier Frequencies Separation

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
RBW $\geq$ 1% of the span, VBW $\geq$ RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ Passed ☐ Not Applicable

Modulation type	Channel	Carrier Frequencies Separation (kHz)	Limit (kHz) *	Result
GFSK	39	927.00	≥ 927.50	Pass
$\pi/4$ DQPSK	39	1002.00	≥ 875.33	Pass
8DPSK	39	900.00	≥ 875.33	Pass

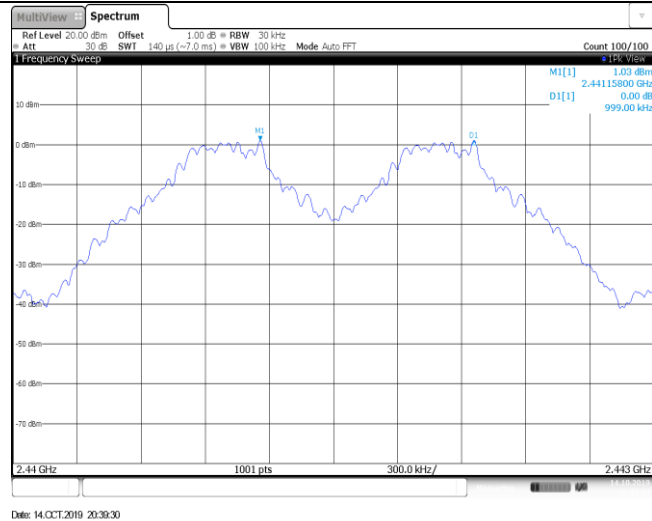
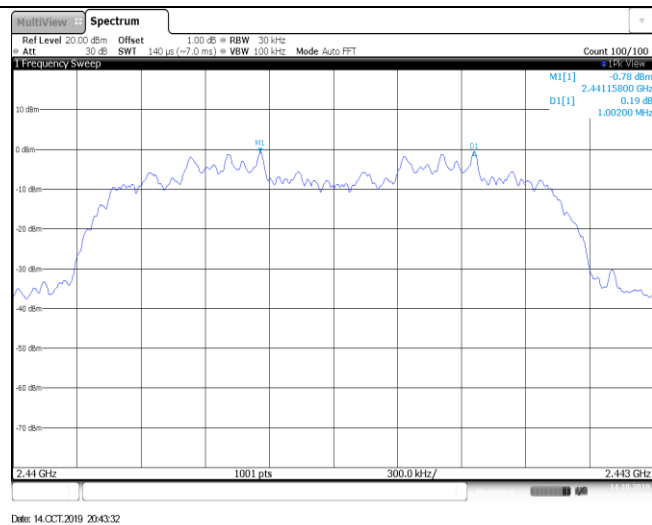
Note:

*: GFSK limit = The maximum 20 dB Bandwidth for GFSK modulation on the section 5.4.

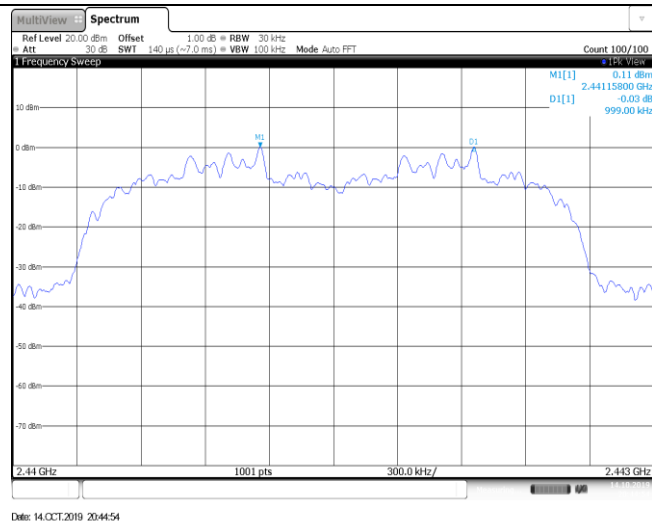
$\pi/4$ DQPSK limit = $2/3$ * The maximum 20 dB Bandwidth for $\pi/4$ DQPSK modulation on the section 5.4.

8DPSK limit = $2/3$ * The maximum 20 dB Bandwidth for 8DPSK modulation on the section 5.4

GFSK

 $\pi/4$ DQPSK

8DPSK

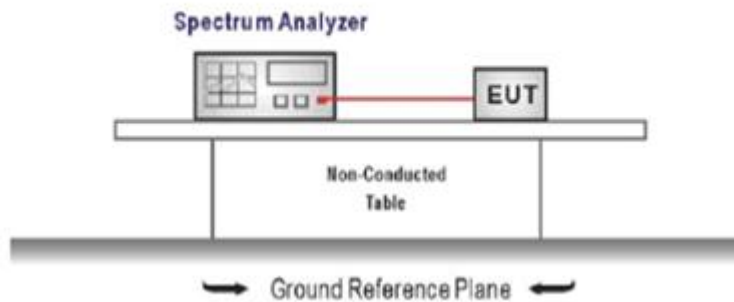


5.6. Hopping Channel Number

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1): Frequency hopping systems in the 2400–2483.5 MHz band shall use at least **15** channels.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW $\geq$ 1% of the span, VBW $\geq$ RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

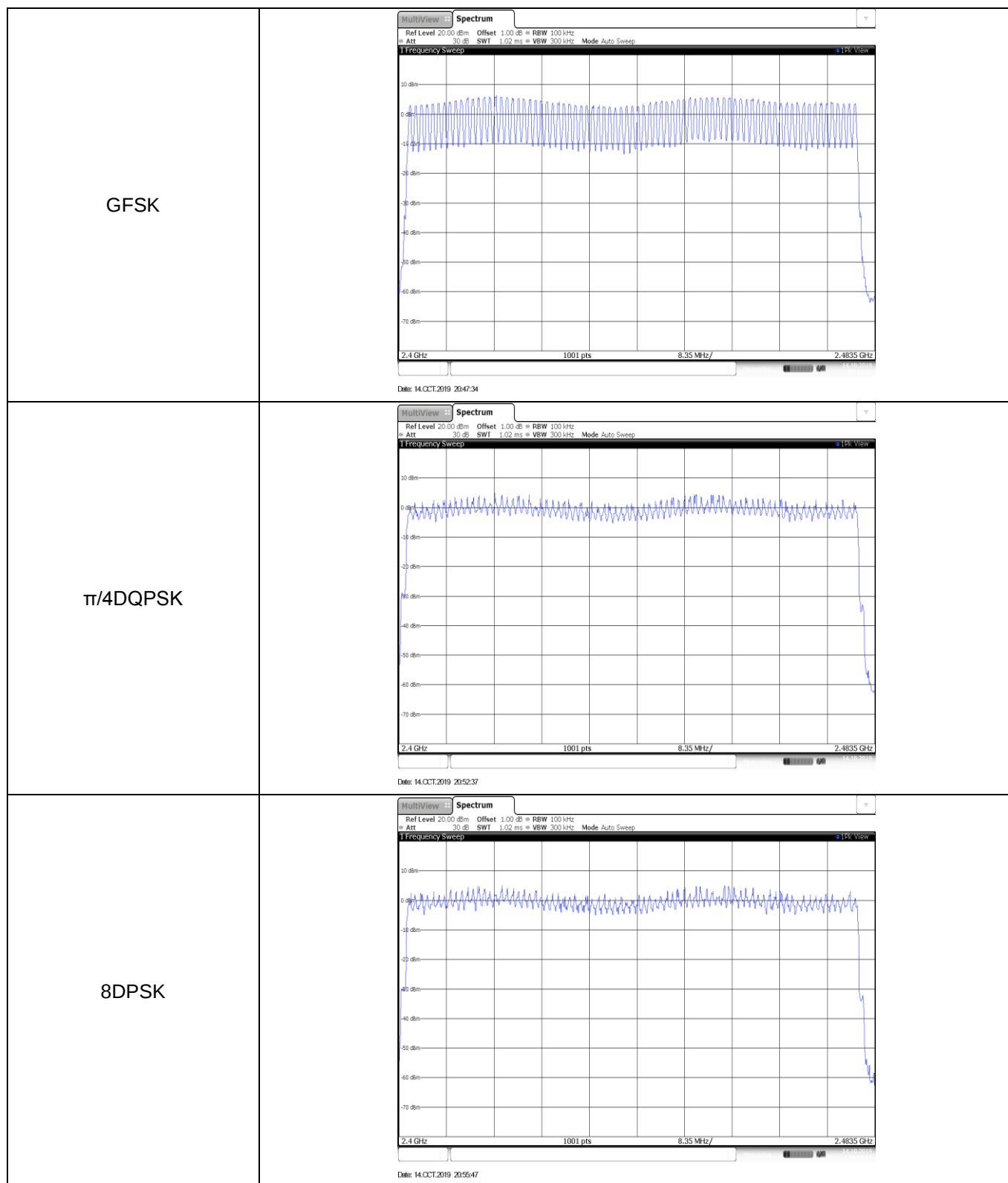
TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ Passed ☐ Not Applicable

Modulation type	Channel number	Limit	Result
GFSK	79	≥ 15.00	Pass
$\pi/4$ DQPSK	79		
8DPSK	79		

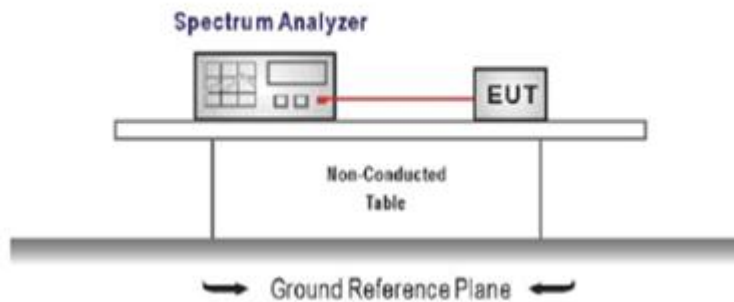


5.7. Dwell Time

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1): The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel, RBW= 1 MHz, VBW $\geq$ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel,
Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

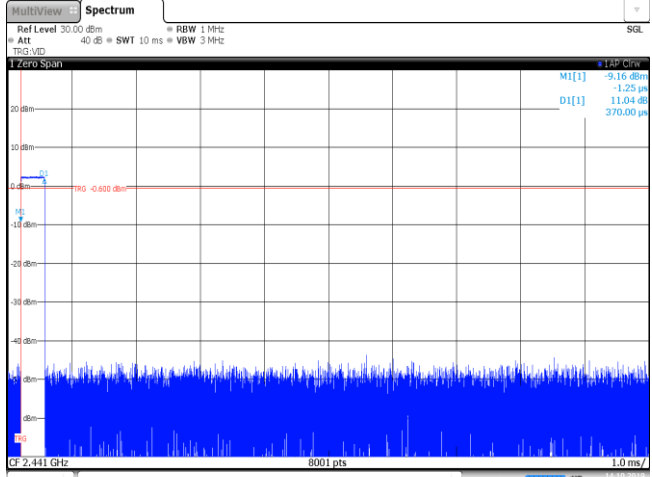
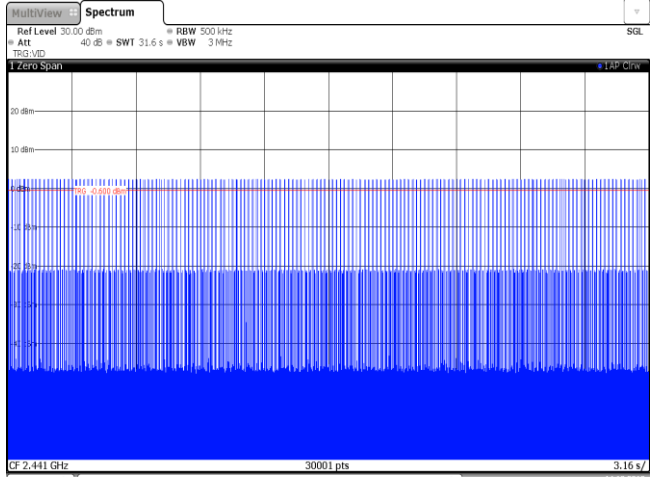
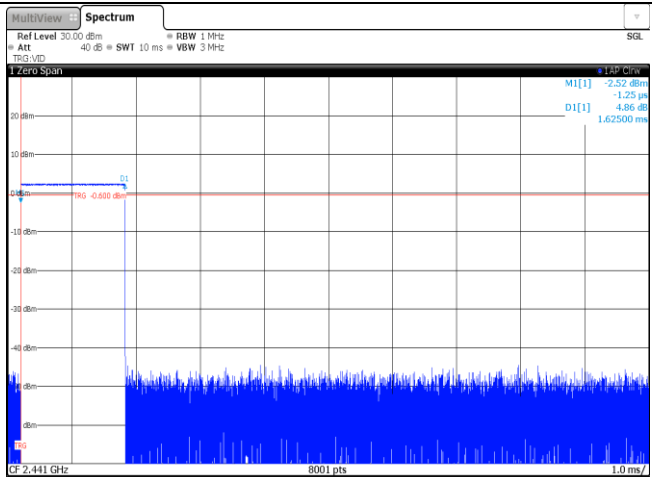
TEST MODE:

Please refer to the clause 3.3

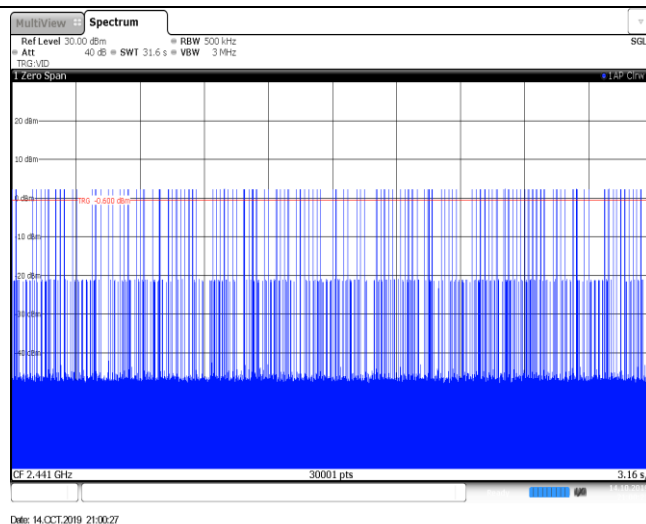
TEST RESULTS

☒ Passed ☐ Not Applicable

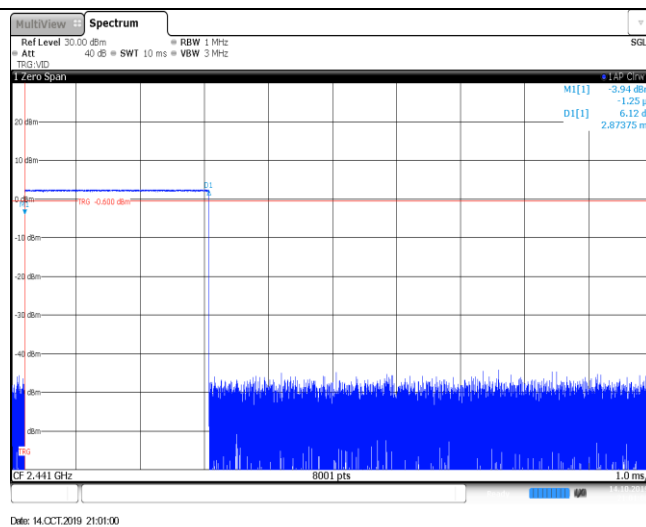
Modulation type	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.37	314.00	0.12	≤ 0.40	Pass
	DH3	1.63	157.00	0.26		
	DH5	2.87	103.00	0.30		
$\pi/4$ DQPSK	2DH1	0.38	317.00	0.12	≤ 0.40	Pass
	2DH3	1.63	158.00	0.26		
	2DH5	2.88	103.00	0.30		
8DPSK	3DH1	0.38	314.00	0.12	≤ 0.40	Pass
	3DH3	1.63	158.00	0.26		
	3DH5	2.88	103.00	0.30		

Modulation Type:	GFSK
DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -50 to 20. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the signal level at -0.600 dBm. The plot shows a narrowband signal with a peak at approximately 2.441 GHz. Ref Level 30.00 dBm Att 40 dB RBW 1 MHz SWT 10 ms VBW 3 MHz SGL 1 Zero Span M1[1] -5.16 dBm D1[1] 11.04 dB 270.00 ps CF 2.441 GHz 8001 pts 1.0 ms Date: 14.OCT.2019 20:58:15
DH1 Burst number	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 30001 pts. The y-axis represents power in dBm, ranging from -50 to 20. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the signal level at -0.600 dBm. The plot shows a narrowband signal with a peak at approximately 2.441 GHz. Ref Level 30.00 dBm Att 40 dB RBW 500 kHz SWT 31.6 s VBW 3 MHz SGL 1 Zero Span M1[1] -5.16 dBm D1[1] 11.04 dB 270.00 ps CF 2.441 GHz 30001 pts 3.16 s Date: 14.OCT.2019 20:58:49
DH3 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -50 to 20. The x-axis represents frequency in MHz, ranging from 2.440 to 2.442. A red line indicates the signal level at -0.600 dBm. The plot shows a narrowband signal with a peak at approximately 2.441 GHz. Ref Level 30.00 dBm Att 40 dB RBW 1 MHz SWT 10 ms VBW 3 MHz SGL 1 Zero Span M1[1] -2.52 dBm D1[1] 4.86 dB 1.62500 ms CF 2.441 GHz 8001 pts 1.0 ms Date: 14.OCT.2019 20:59:53

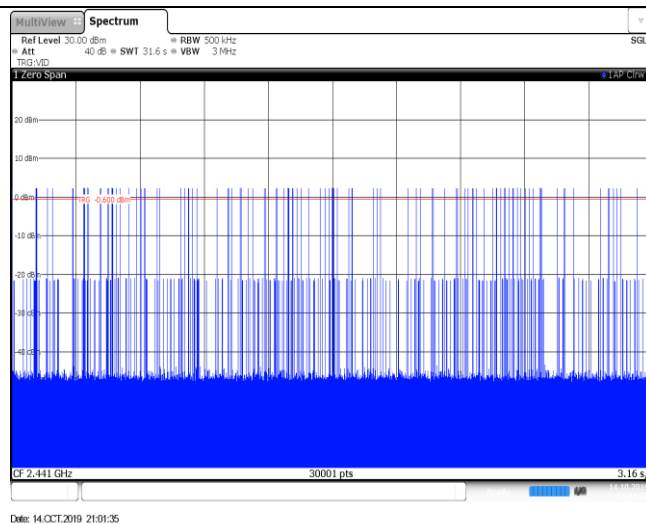
DH3
Burst number

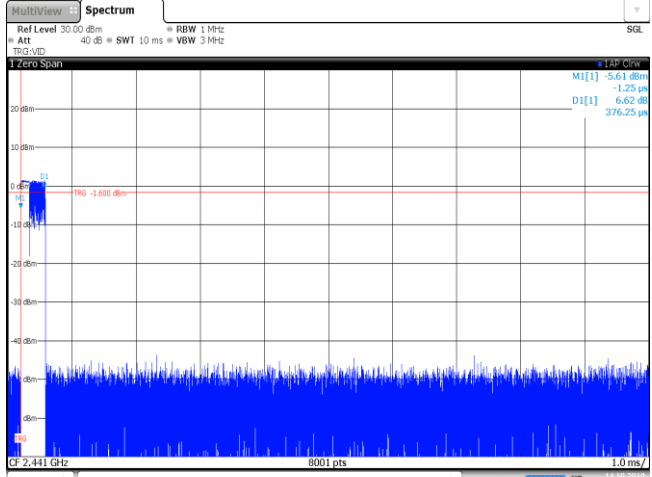
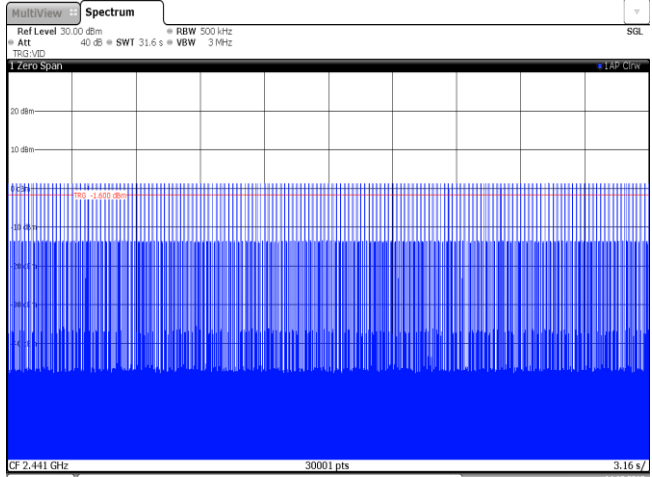
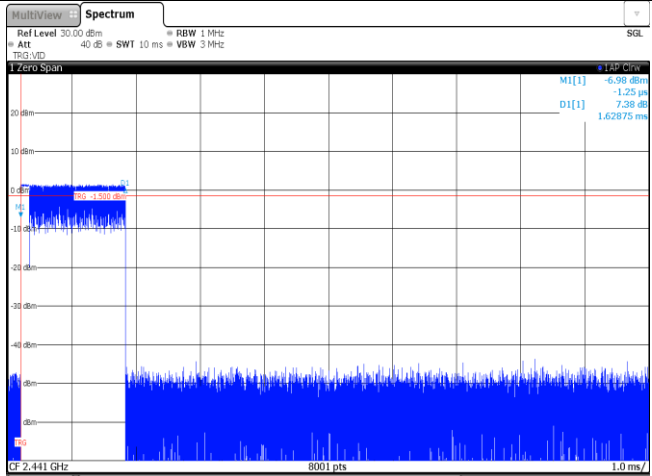


DH5
Burst width

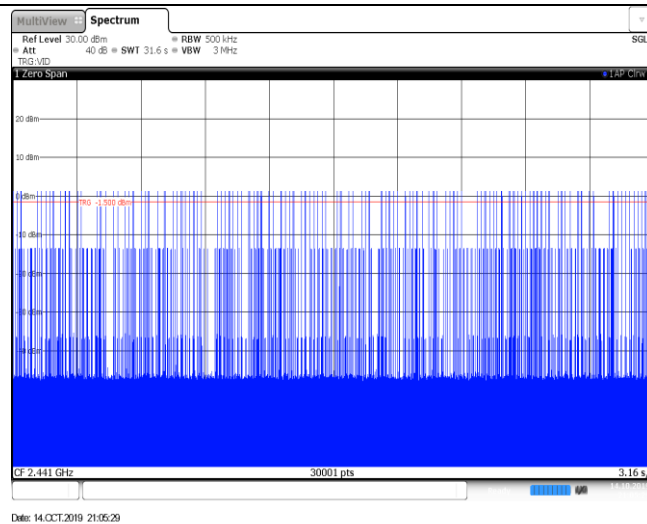


DH5
Burst number



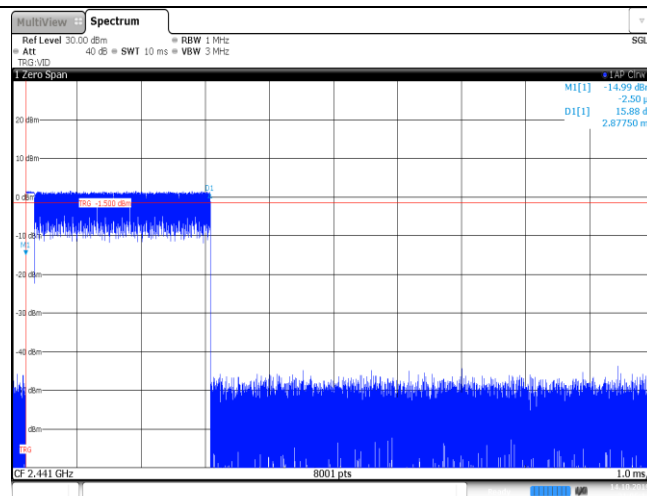
Modulation Type:	$\pi/4$ DQPSK
2DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -50 to 20. A red line indicates a reference level at -1.600 dBm. The signal is centered around 2.441 GHz. The plot is titled 'Spectrum' and includes parameters: Ref Level 30.00 dBm, Att 40 dB, SWT 10 ms, VBW 3 MHz, RBW 1 MHz. The date is 14.OCT.2019 21:03:32.
2DH1 Burst number	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 30001 pts. The y-axis represents power in dBm, ranging from -50 to 20. A red line indicates a reference level at -1.600 dBm. The signal is centered around 2.441 GHz. The plot is titled 'Spectrum' and includes parameters: Ref Level 30.00 dBm, Att 40 dB, SWT 31.6 s, VBW 3 MHz, RBW 500 kHz. The date is 14.OCT.2019 21:04:06.
2DH3 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -50 to 20. A red line indicates a reference level at -1.500 dBm. The signal is centered around 2.441 GHz. The plot is titled 'Spectrum' and includes parameters: Ref Level 30.00 dBm, Att 40 dB, SWT 10 ms, VBW 3 MHz, RBW 1 MHz. The date is 14.OCT.2019 21:04:55.

2DH3
Burst number



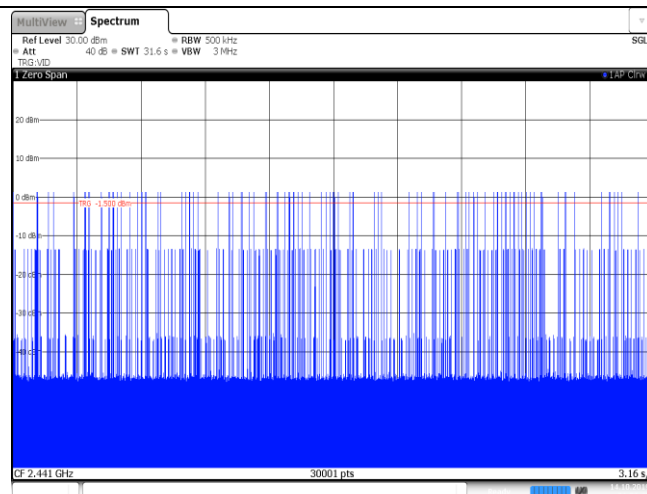
Date: 14.OCT.2019 21:05:29

2DH5
Burst width

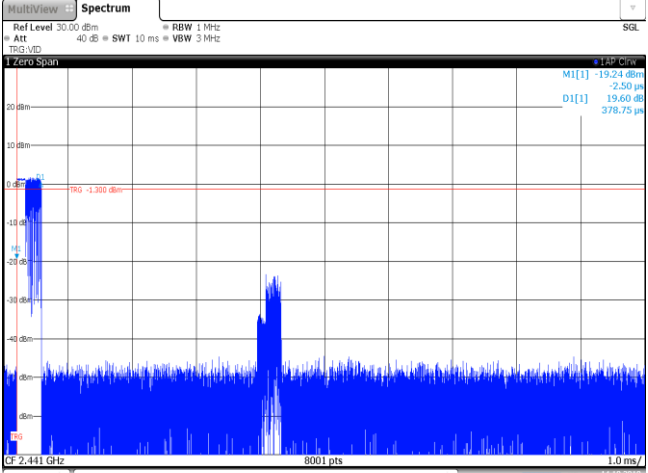
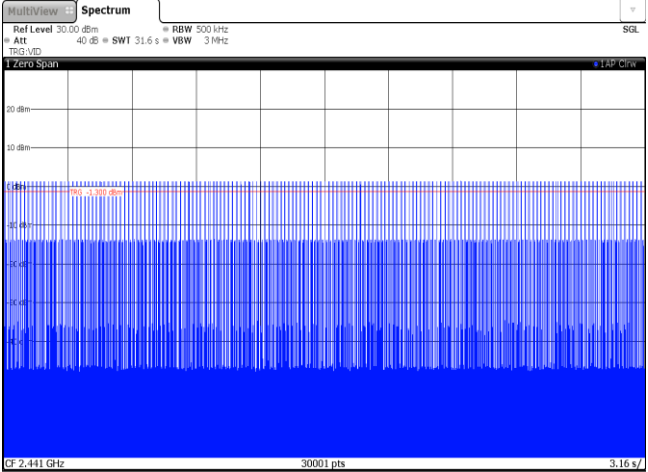
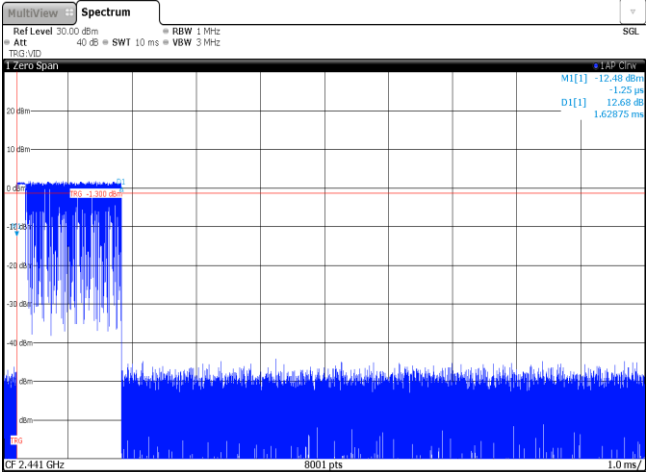


Date: 14.OCT.2019 21:06:14

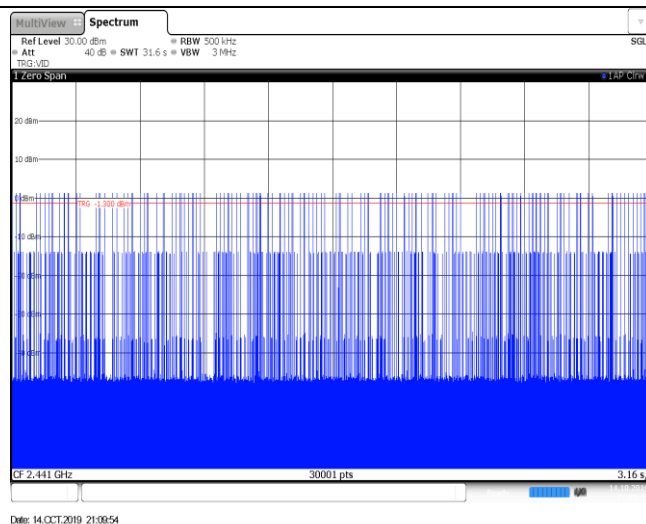
2DH5
Burst number



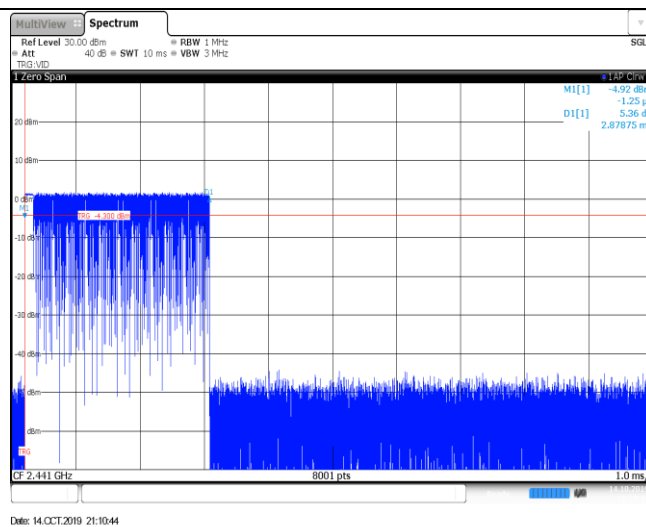
Date: 14.OCT.2019 21:06:48

Modulation Type:	$\pi/4$ DQPSK
3DH1 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -50 to 20. A red line indicates a reference level at -10.00 dBm. The signal is characterized by a sharp peak at the carrier frequency, with a noise floor around -40 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 30.00 dBm, Att 40 dB, BW 1 MHz, SWT 10 ms, VBW 3 MHz. The date is 14.OCT.2019 21:07:35.
3DH1 Burst number	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 30001 pts. The y-axis represents power in dBm, ranging from -50 to 20. A red line indicates a reference level at -10.00 dBm. The signal is characterized by a sharp peak at the carrier frequency, with a noise floor around -40 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 30.00 dBm, Att 40 dB, BW 500 kHz, SWT 31.6 s, VBW 3 MHz. The date is 14.OCT.2019 21:08:09.
3DH3 Burst width	 The spectrum plot shows a signal at 2.441 GHz with a bandwidth of 8001 pts. The y-axis represents power in dBm, ranging from -50 to 20. A red line indicates a reference level at -10.00 dBm. The signal is characterized by a sharp peak at the carrier frequency, with a noise floor around -40 dBm. The plot is titled 'Spectrum' and includes parameters: Ref Level 30.00 dBm, Att 40 dB, BW 1 MHz, SWT 10 ms, VBW 3 MHz. The date is 14.OCT.2019 21:09:20.

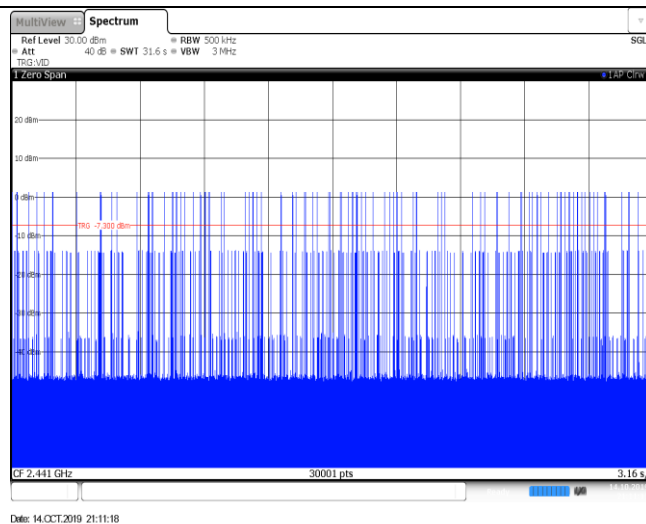
3DH3
Burst number



3DH5
Burst width



3DH5
Burst number



5.8. Pseudorandom Frequency Hopping Sequence

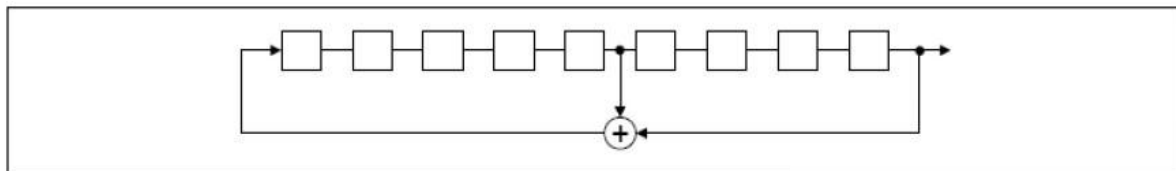
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo-randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST RESULTS

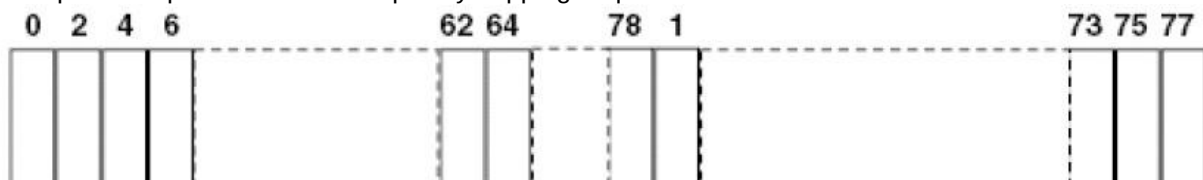
The pseudorandom frequency hopping sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally on the average by each transmitter.

The system receiver has input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

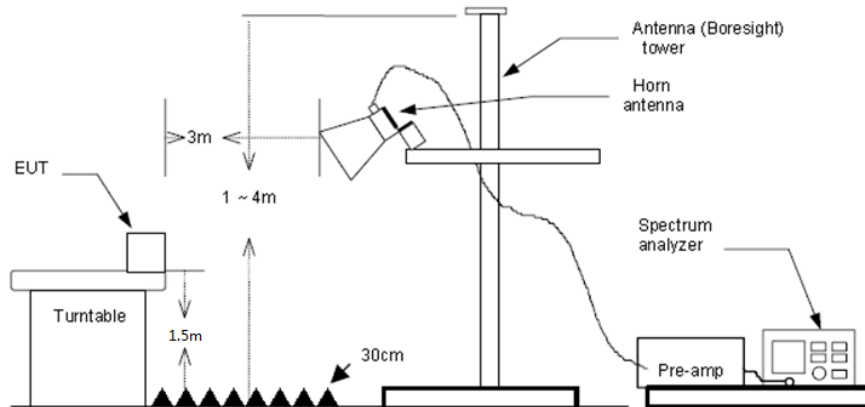
5.9. Restricted band (radiated)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
RBW=1 MHz, VBW=3 MHz Peak detector for Peak value
RBW=1 MHz, VBW=10 Hz Peak detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ Passed ☐ Not Applicable

Note:

- 1) Final level= Read level + Factor
- 2) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.
- 3) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

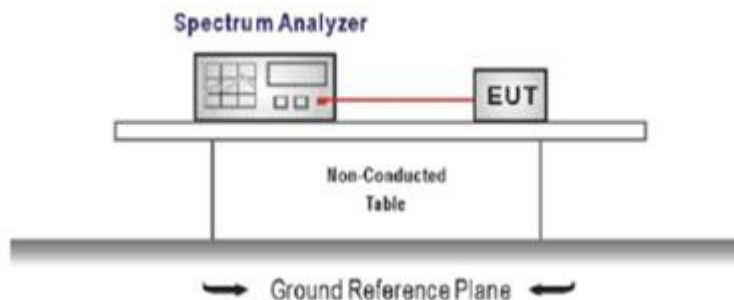
Test channel:				CH00			
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
2310.000	44.07	-2.34	41.73	74.00	32.27	Horizontal	PK
2390.010	44.49	-2.41	42.08	74.00	31.92	Horizontal	PK
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
2310.000	44.90	-2.34	42.56	74.00	31.44	Vertical	PK
2390.010	44.21	-2.41	41.80	74.00	32.20	Vertical	PK
Test channel:				CH78			
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
2483.501	44.85	-2.15	42.70	74.00	31.30	Horizontal	PK
2500.000	44.20	-2.10	42.10	74.00	31.90	Horizontal	PK
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
2483.501	45.98	-2.15	43.83	74.00	30.17	Vertical	PK
2500.000	44.95	-2.10	42.85	74.00	31.15	Vertical	PK

5.10. Band edge and Spurious Emissions (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
RBW = 100 kHz, VBW $\geq$ RBW, scan up through 10th harmonic.
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

TEST MODE:

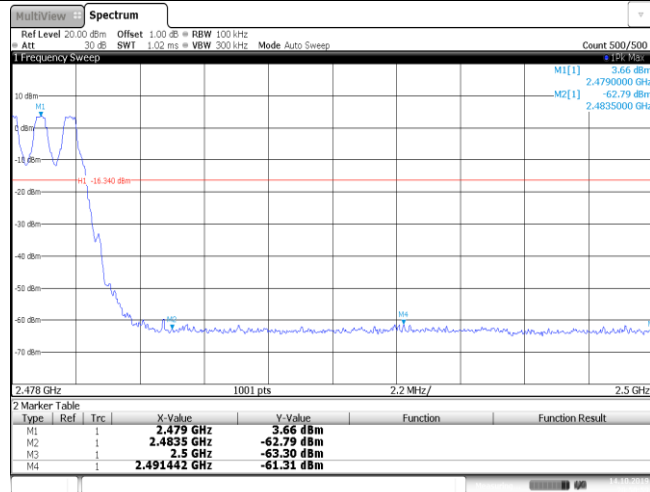
Please refer to the clause 3.3

TEST RESULTS

☒ Passed ☐ Not Applicable

Test Item:	Band edge	Modulation type:	GFSK
CH00 No hopping mode			

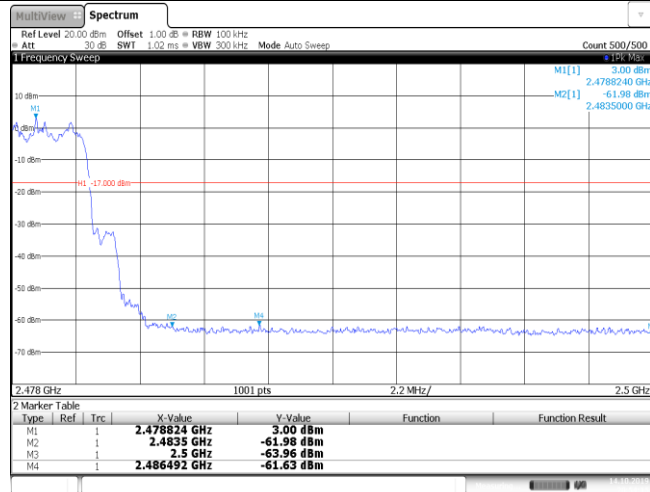
CH78
Hopping mode



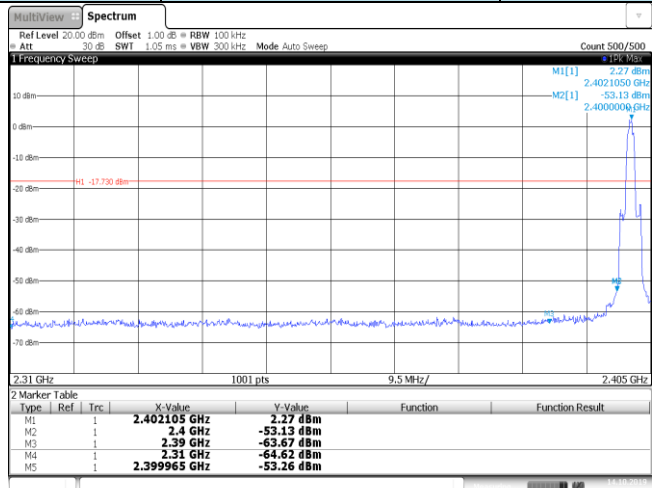
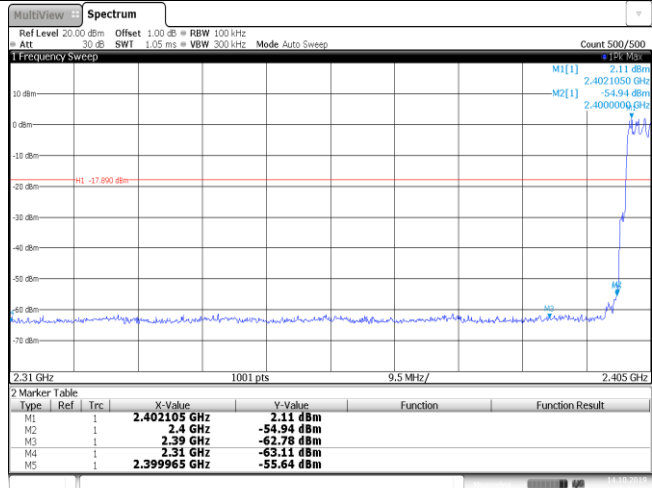
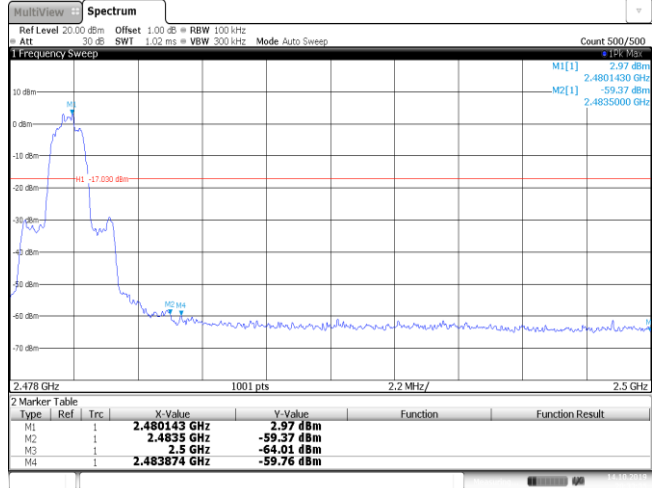
Date: 14.OCT.2019 20:50:59

Test Item:	Band edge	Modulation type:	$\pi/4$ DQPSK																																										
CH00 No hopping mode	MultiViewSpectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1 Frequency Sweep 2.31 GHz 2.405 GHz 1001 pts 9.5 MHz/ M1 [1] 2.15 dBm M2 [1] 2.402105 GHz M3 [1] 52.02 dBm M4 [1] 2.400000 GHz 2.31 GHz 2.405 GHz 1001 pts 9.5 MHz/ <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.402105 GHz</td><td>2.15 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-52.02 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-63.14 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.85 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-51.23 dBm</td><td></td><td></td></tr></table> Date: 14.OCT.2019 20:15:31			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	2.15 dBm			M2	1		2.4 GHz	-52.02 dBm			M3	1		2.39 GHz	-63.14 dBm			M4	1		2.31 GHz	-64.85 dBm			M5	1		2.399965 GHz	-51.23 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	2.15 dBm																																									
M2	1		2.4 GHz	-52.02 dBm																																									
M3	1		2.39 GHz	-63.14 dBm																																									
M4	1		2.31 GHz	-64.85 dBm																																									
M5	1		2.399965 GHz	-51.23 dBm																																									
CH00 Hopping mode	MultiViewSpectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1 Frequency Sweep 2.31 GHz 2.405 GHz 1001 pts 9.5 MHz/ M1 [1] 1.57 dBm M2 [1] 2.404003 GHz M3 [1] 53.28 dBm M4 [1] 2.400000 GHz 2.31 GHz 2.405 GHz 1001 pts 9.5 MHz/ <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.404003 GHz</td><td>1.57 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-53.28 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-62.29 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-63.04 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-52.49 dBm</td><td></td><td></td></tr></table> Date: 14.OCT.2019 20:53:35			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.404003 GHz	1.57 dBm			M2	1		2.4 GHz	-53.28 dBm			M3	1		2.39 GHz	-62.29 dBm			M4	1		2.31 GHz	-63.04 dBm			M5	1		2.399965 GHz	-52.49 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.404003 GHz	1.57 dBm																																									
M2	1		2.4 GHz	-53.28 dBm																																									
M3	1		2.39 GHz	-62.29 dBm																																									
M4	1		2.31 GHz	-63.04 dBm																																									
M5	1		2.399965 GHz	-52.49 dBm																																									
CH78 No hopping mode	MultiViewSpectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SW 1.02 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1 Frequency Sweep 2.478 GHz 2.5 GHz 1001 pts 2.2 MHz/ M1 [1] 2.99 dBm M2 [1] 2.479835 GHz M3 [1] 61.24 dBm M4 [1] 2.485500 GHz 2.478 GHz 2.5 GHz 1001 pts 2.2 MHz/ <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.479835 GHz</td><td>2.99 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-61.24 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-64.36 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.483566 GHz</td><td>-60.18 dBm</td><td></td><td></td></tr></table> Date: 14.OCT.2019 20:26:44			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479835 GHz	2.99 dBm			M2	1		2.4835 GHz	-61.24 dBm			M3	1		2.5 GHz	-64.36 dBm			M4	1		2.483566 GHz	-60.18 dBm									
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.479835 GHz	2.99 dBm																																									
M2	1		2.4835 GHz	-61.24 dBm																																									
M3	1		2.5 GHz	-64.36 dBm																																									
M4	1		2.483566 GHz	-60.18 dBm																																									

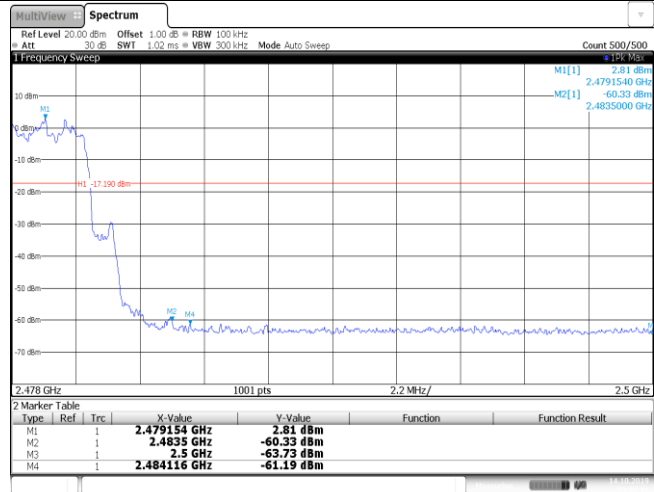
CH78
Hopping mode



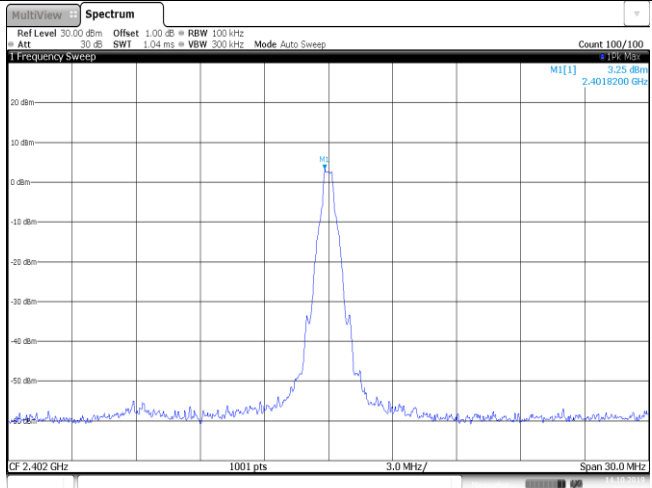
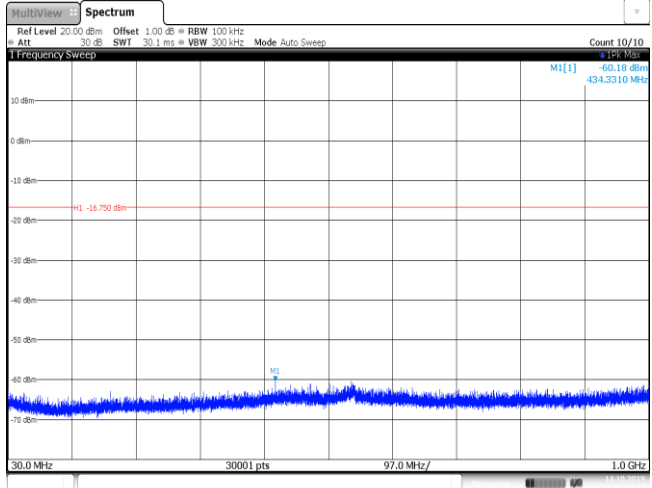
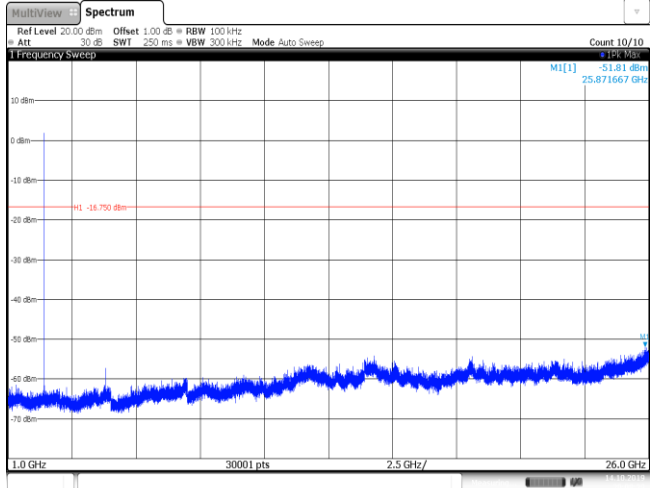
Date: 14.OCT.2019 20:54:14

Test Item:	Band edge	Modulation type:	8DPSK																																										
CH00 No hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SWF 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1 Frequency Sweep  2.31 GHz1001 pts9.5 MHz/2.405 GHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.402105 GHz</td><td>2.27 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-53.13 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-63.67 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-64.62 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-53.26 dBm</td><td></td><td></td></tr></table> Date: 14.OCT.2019 22:30:04			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	2.27 dBm			M2	1		2.4 GHz	-53.13 dBm			M3	1		2.39 GHz	-63.67 dBm			M4	1		2.31 GHz	-64.62 dBm			M5	1		2.399965 GHz	-53.26 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	2.27 dBm																																									
M2	1		2.4 GHz	-53.13 dBm																																									
M3	1		2.39 GHz	-63.67 dBm																																									
M4	1		2.31 GHz	-64.62 dBm																																									
M5	1		2.399965 GHz	-53.26 dBm																																									
CH00 Hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SWF 1.05 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1 Frequency Sweep  2.31 GHz1001 pts9.5 MHz/2.405 GHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.402105 GHz</td><td>2.11 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4 GHz</td><td>-54.94 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.39 GHz</td><td>-62.78 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.31 GHz</td><td>-63.11 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>2.399965 GHz</td><td>-55.64 dBm</td><td></td><td></td></tr></table> Date: 14.OCT.2019 20:56:27			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.402105 GHz	2.11 dBm			M2	1		2.4 GHz	-54.94 dBm			M3	1		2.39 GHz	-62.78 dBm			M4	1		2.31 GHz	-63.11 dBm			M5	1		2.399965 GHz	-55.64 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.402105 GHz	2.11 dBm																																									
M2	1		2.4 GHz	-54.94 dBm																																									
M3	1		2.39 GHz	-62.78 dBm																																									
M4	1		2.31 GHz	-63.11 dBm																																									
M5	1		2.399965 GHz	-55.64 dBm																																									
CH78 No hopping mode	MultiView Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 100 kHz Att 30 dB SWF 1.02 ms VBW 300 kHz Mode Auto Sweep Count 500/500 1 Frequency Sweep  2.478 GHz1001 pts2.2 MHz/2.5 GHz 2 Marker Table <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-Value</th><th>Y-Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.480143 GHz</td><td>2.97 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>2.4835 GHz</td><td>-59.37 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>2.5 GHz</td><td>-64.01 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>2.483674 GHz</td><td>-59.76 dBm</td><td></td><td></td></tr></table> Date: 14.OCT.2019 20:33:35			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.480143 GHz	2.97 dBm			M2	1		2.4835 GHz	-59.37 dBm			M3	1		2.5 GHz	-64.01 dBm			M4	1		2.483674 GHz	-59.76 dBm									
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																																							
M1	1		2.480143 GHz	2.97 dBm																																									
M2	1		2.4835 GHz	-59.37 dBm																																									
M3	1		2.5 GHz	-64.01 dBm																																									
M4	1		2.483674 GHz	-59.76 dBm																																									

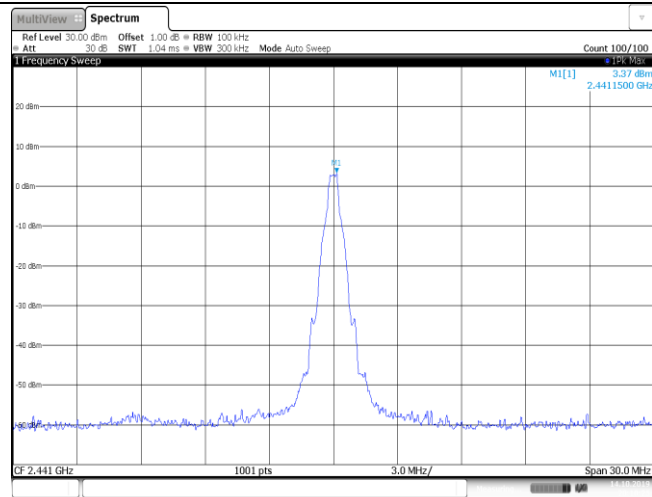
CH78
Hoppig mode



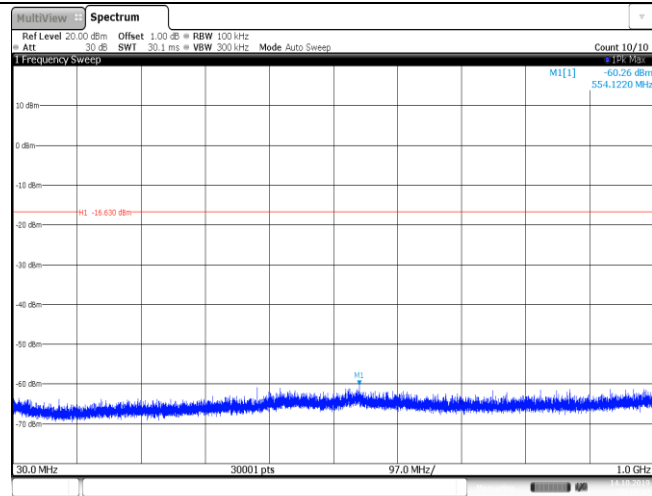
Date: 14.OCT.2019 20:57:11

Test Item:	SE	Modulation type:	GFSK
CH00 Reference level	 Ref Level 30.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 1.04 ms VBW 300 kHz Mode Auto Sweep Count 100/100 MI[1] 3.25 dBm 2.4018200 GHz CF 2.402 GHz 1001 pts 3.0 MHz/ Span 30.0 MHz Date: 14.OCT.2019 20:07:56		
CH00 30MHz~1000MHz	 Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -60.18 dBm 434.3310 MHz 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 14.OCT.2019 20:08:12		
CH00 1GHz~26GHz	 Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -51.81 dBm 25.871667 GHz 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 14.OCT.2019 20:08:28		

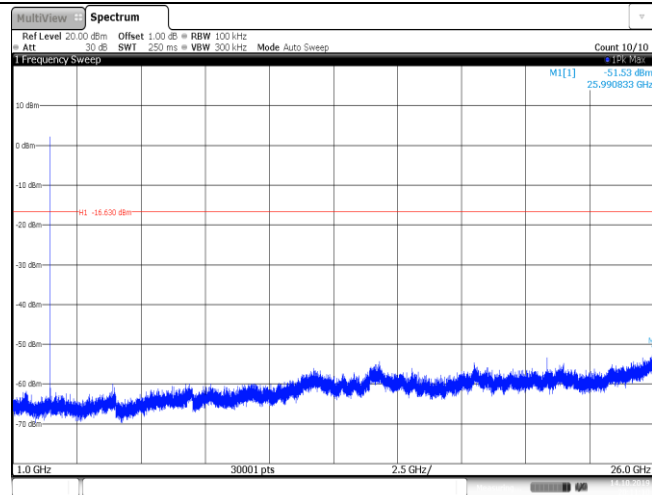
CH39
Reference level



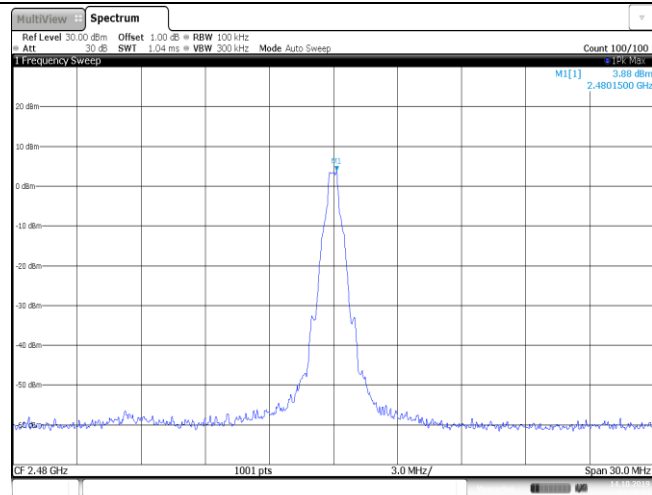
CH39
30MHz~1000MHz



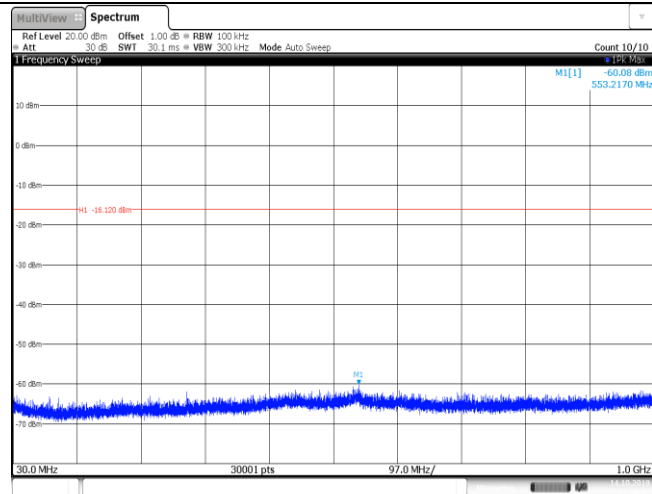
CH39
1GHz~26GHz



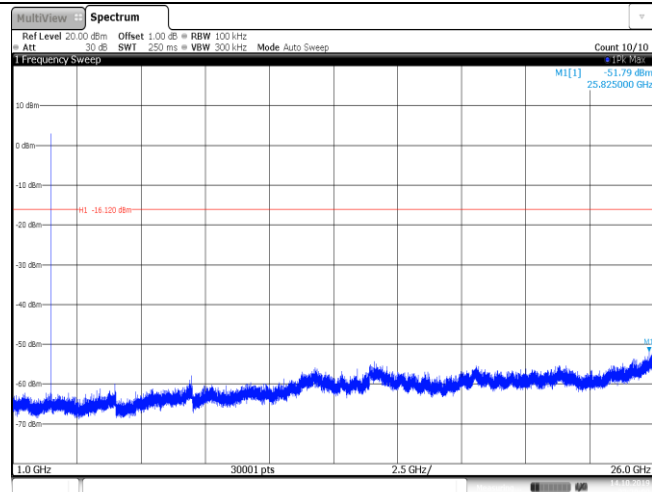
CH78
Reference level

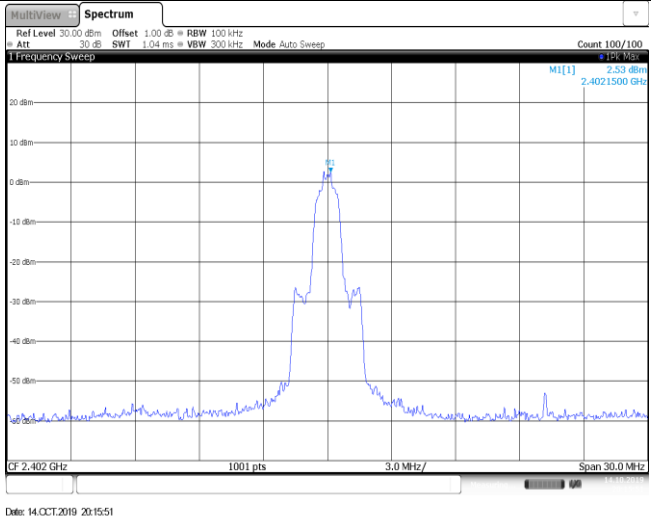
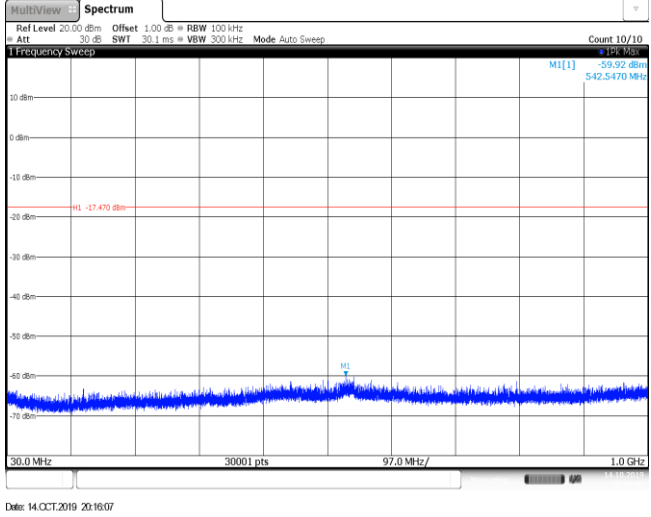
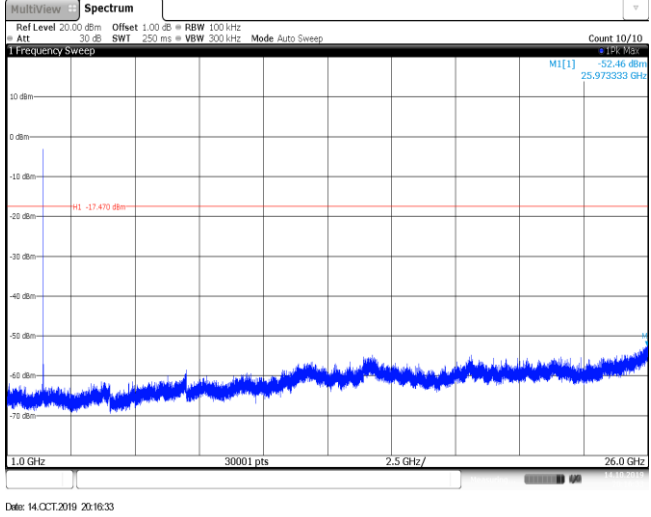


CH78
30MHz~1000MHz

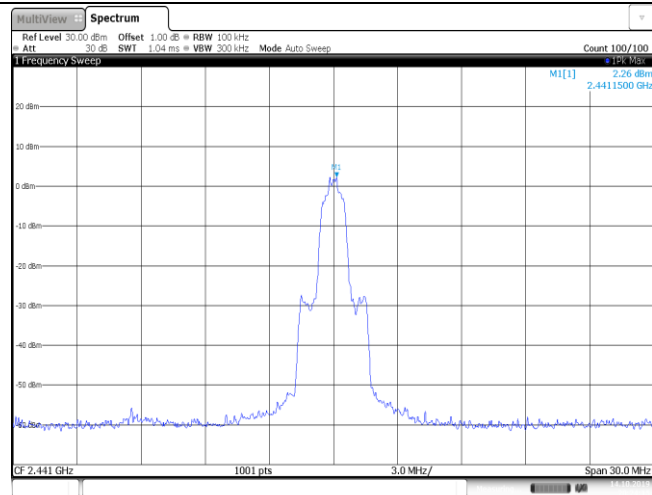


CH78
1GHz~26GHz

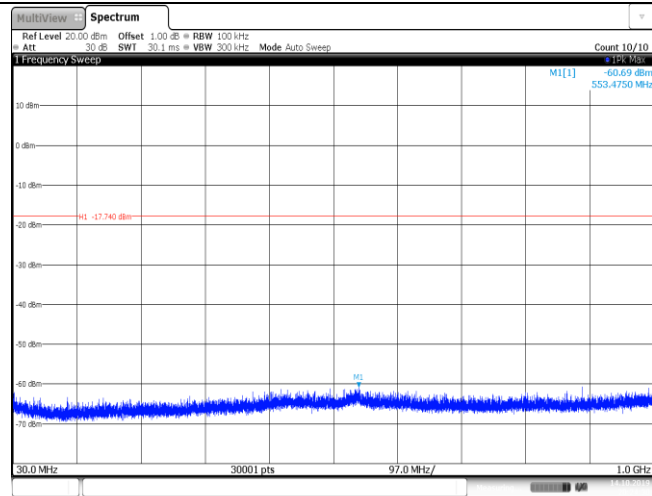


Test Item:	SE	Modulation type:	$\pi/4$ DQPSK
CH00 Reference level			
CH00 30MHz~1000MHz			
CH00 1GHz~26GHz			

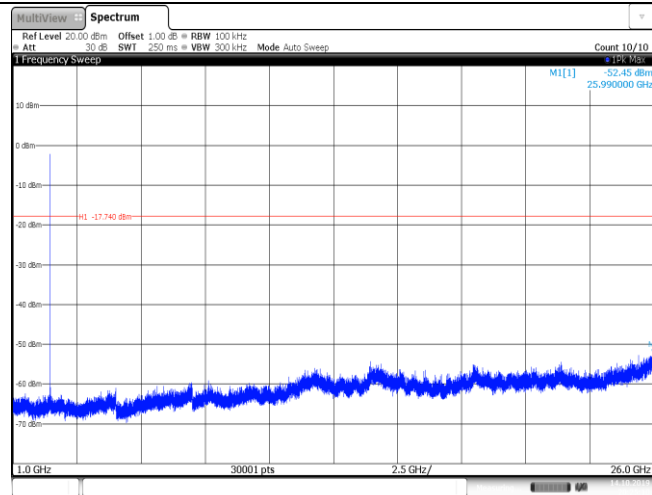
CH39
Reference level



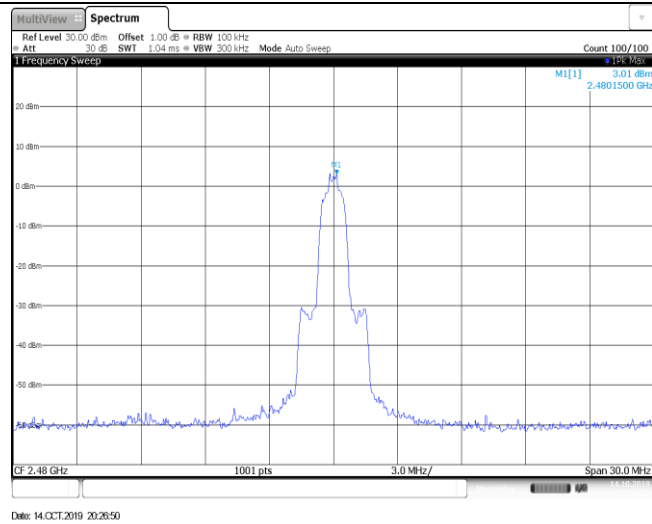
CH39
30MHz~1000MHz



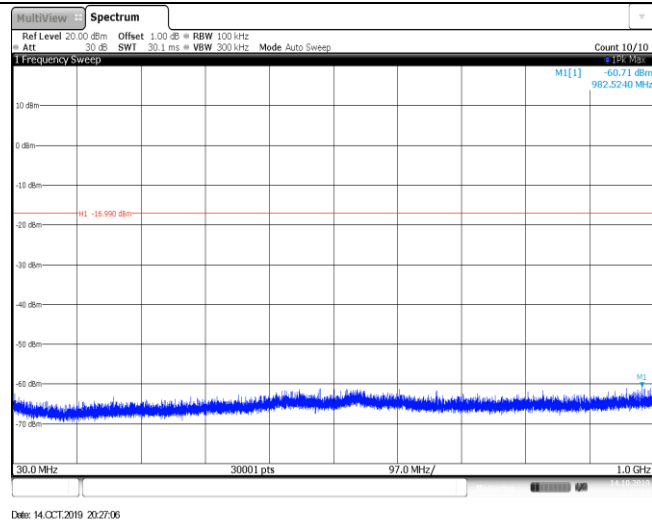
CH39
1GHz~26GHz



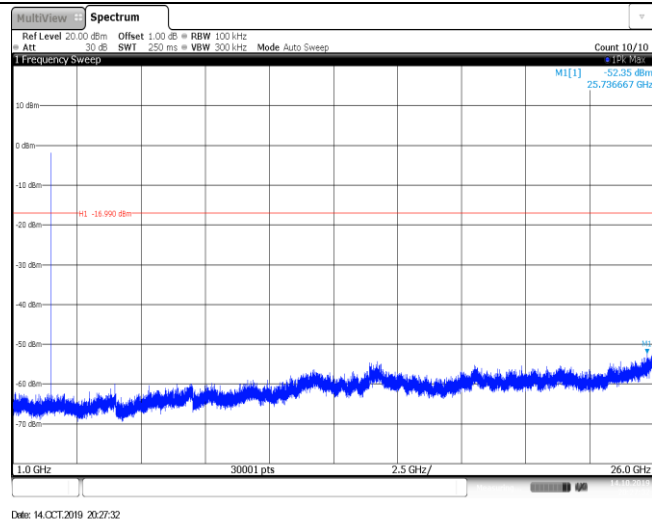
CH78
Reference level

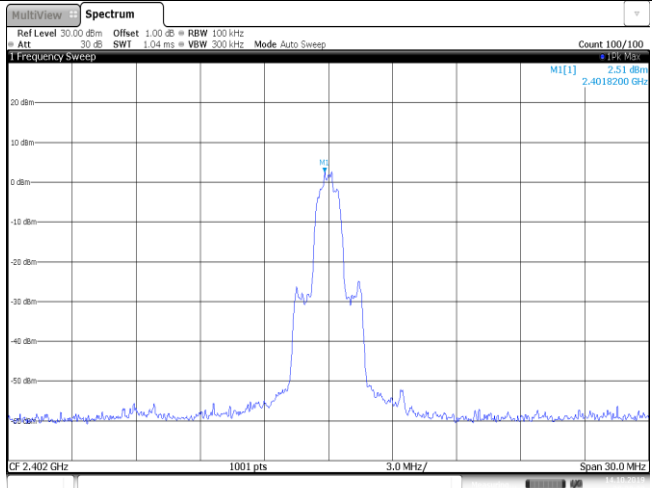
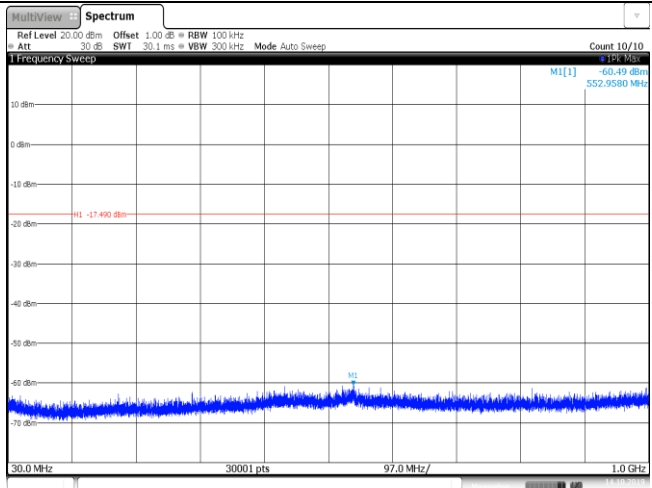
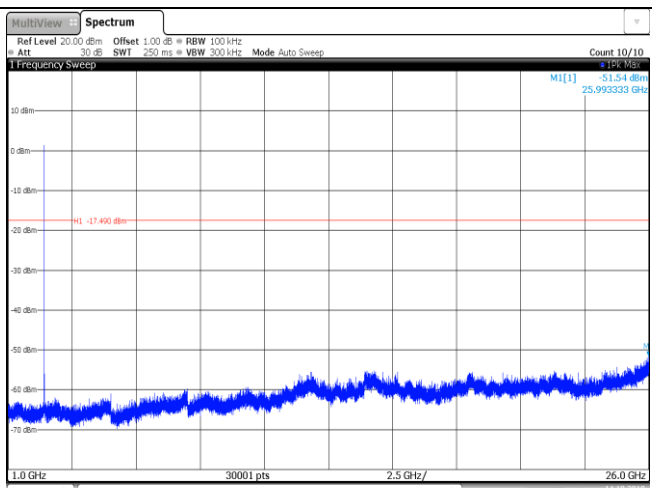


CH78
30MHz~1000MHz

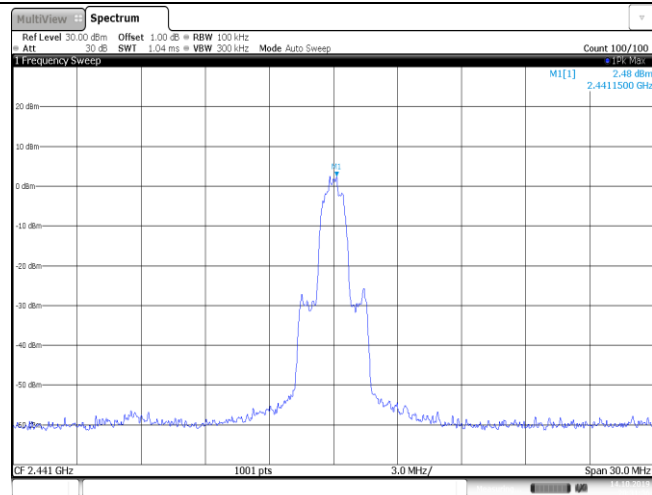


CH78
1GHz~26GHz

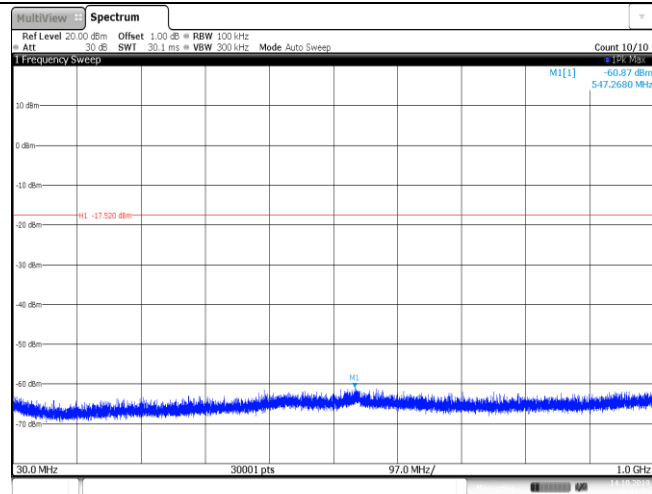


Test Item:	SE	Modulation type:	8DPSK
CH00 Reference level	 14.OCT.2019 20:29:29		
CH00 30MHz~1000MHz	 14.OCT.2019 20:20:45		
CH00 1GHz~26GHz	 14.OCT.2019 20:30:07		

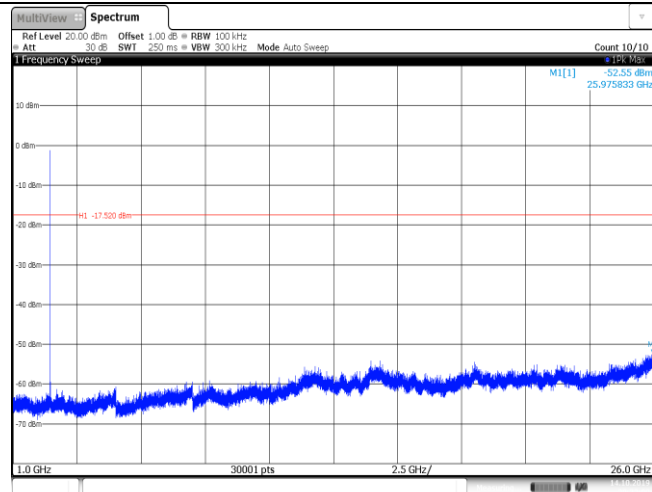
CH39
Reference level



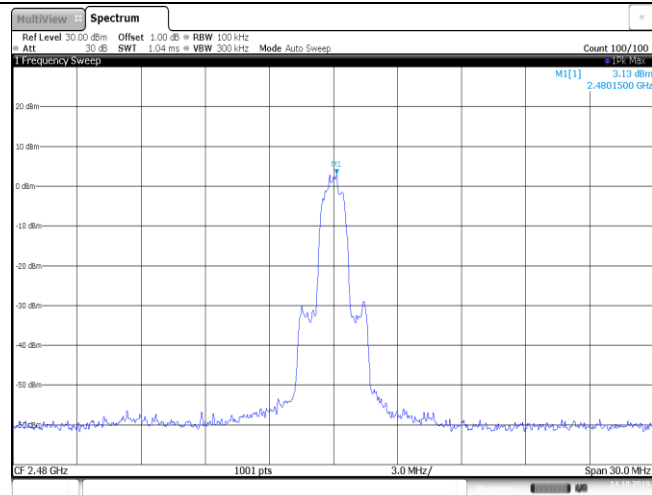
CH39
30MHz~1000MHz



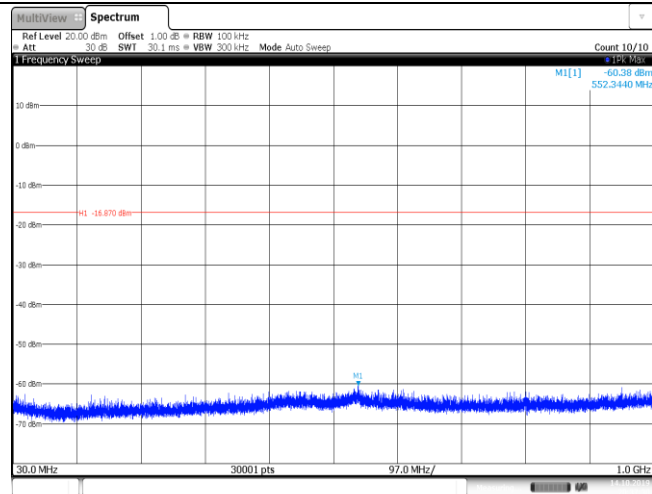
CH39
1GHz~26GHz



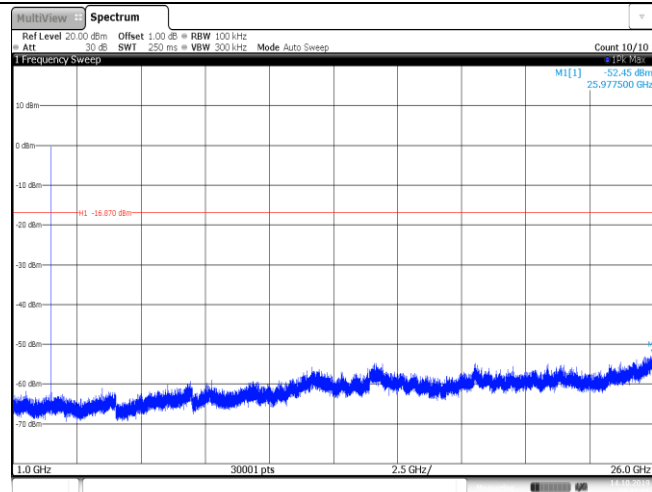
CH78
Reference level



CH78
30MHz~1000MHz



CH78
1GHz~26GHz



5.11. Spurious Emissions (radiated)

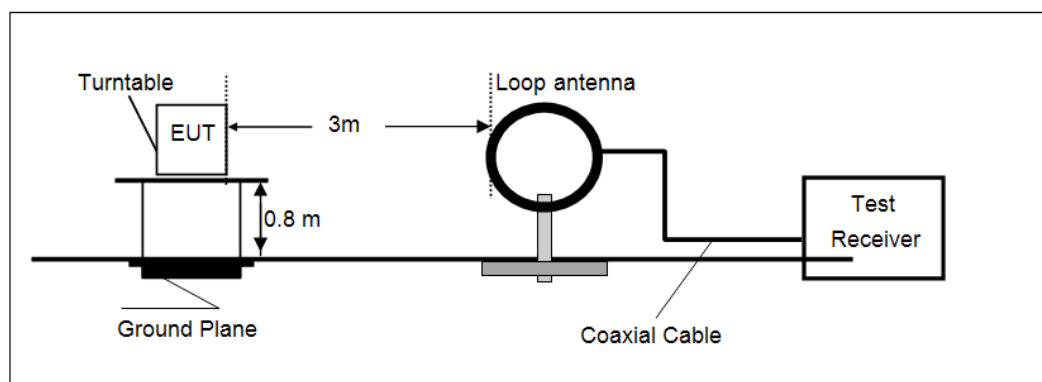
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

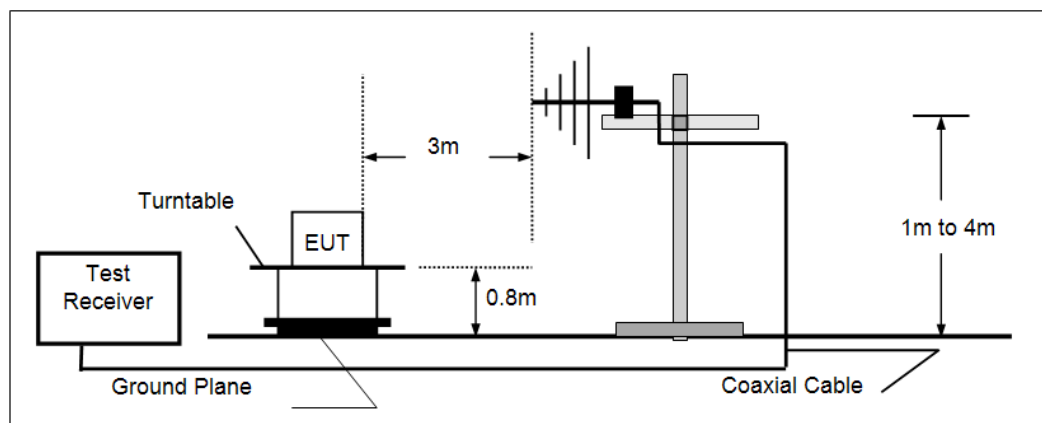
Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

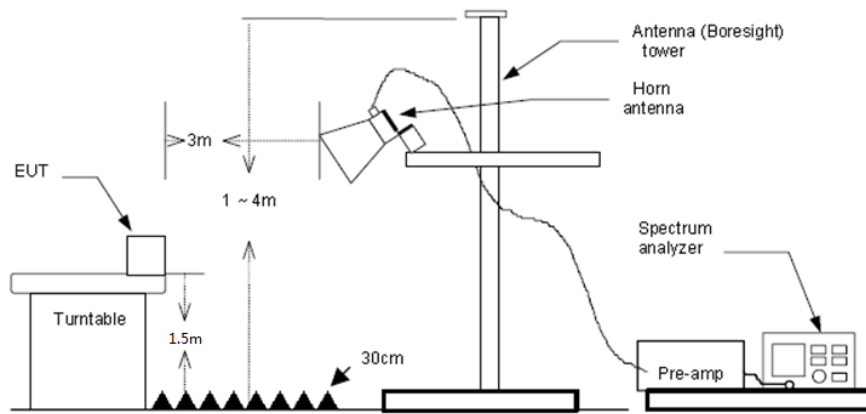
➤ Below 30 MHz



➤ 30 MHz ~1000 MHz



➤ Above 1 GHz



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10:2013.
2. The EUT is placed on a turn table with 0.8 meter above ground for below 1GHz, 1.5 meter above ground for above 1GHz.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
 - RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
 - If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic:
 - RBW=1 MHz, VBW=3 MHz Peak detector for Peak value
 - RBW=1 MHz, VBW=10 Hz Peak detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ Passed ☐ Not Applicable

Note:

- 1) Final Level = Receiver Read level + Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3) Below 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation High channel which it was worst case, so only the worst case's data on the test report.
- 4) Above 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report
- 5) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

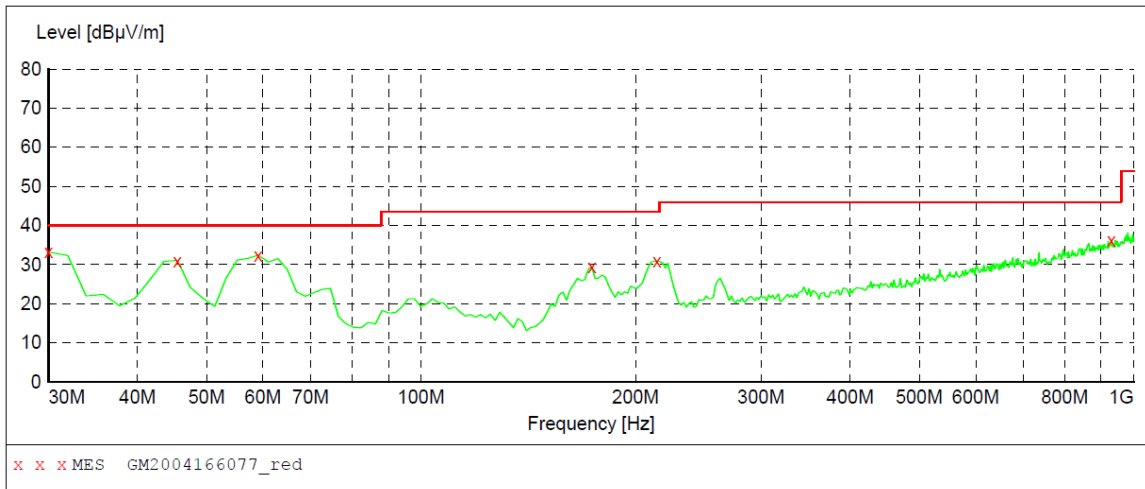
➤ 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

➤ 30 MHz ~ 1 GHz

Polarization:

Vertical

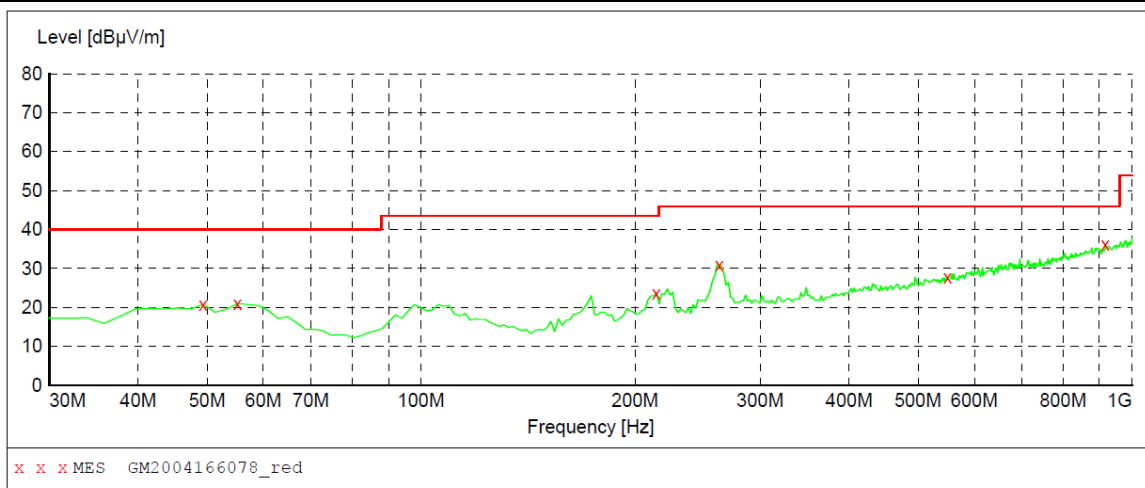
**MEASUREMENT RESULT: "GM2004166077_red"**

4/16/2020 7:48PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	33.20	-10.7	40.0	6.8	QP	100.0	285.00	VERTICAL
45.520000	31.00	-7.6	40.0	9.0	QP	100.0	262.00	VERTICAL
59.100000	32.40	-8.0	40.0	7.6	QP	100.0	206.00	VERTICAL
173.560000	29.50	-11.9	43.5	14.0	QP	100.0	285.00	VERTICAL
214.300000	31.00	-8.9	43.5	12.5	QP	100.0	285.00	VERTICAL
930.160000	36.30	8.7	46.0	9.7	QP	100.0	359.00	VERTICAL

Polarization:

Horizontal

**MEASUREMENT RESULT: "GM2004166078_red"**

4/16/2020 7:52PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.400000	20.80	-7.7	40.0	19.2	QP	100.0	186.00	HORIZONTAL
55.220000	21.00	-7.1	40.0	19.0	QP	300.0	326.00	HORIZONTAL
214.300000	23.60	-8.9	43.5	19.9	QP	100.0	158.00	HORIZONTAL
262.800000	31.00	-7.1	46.0	15.0	QP	100.0	106.00	HORIZONTAL
549.920000	27.80	1.2	46.0	18.2	QP	300.0	154.00	HORIZONTAL
916.580000	36.30	8.5	46.0	9.7	QP	100.0	66.00	HORIZONTAL

➤ 1 GHz ~ 25 GHz

CH00							
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1207.093	33.56	-5.81	27.75	74.00	46.25	Horizontal	PK
3188.437	32.08	0.78	32.86	74.00	41.14	Horizontal	PK
5021.437	30.53	8.05	38.58	74.00	35.42	Horizontal	PK
6645.875	31.27	13.30	44.57	74.00	29.43	Horizontal	PK
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1217.375	34.80	-5.78	29.02	74.00	44.98	Vertical	PK
3220.750	31.98	0.59	32.57	74.00	41.43	Vertical	PK
4804.062	30.99	7.06	38.05	74.00	35.95	Vertical	PK
6648.812	29.90	13.31	43.21	74.00	30.79	Vertical	PK
CH39							
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1227.656	33.14	-5.76	27.38	74.00	46.62	Horizontal	PK
3144.375	31.93	0.55	32.48	74.00	41.52	Horizontal	PK
4856.937	30.15	7.12	37.27	74.00	36.73	Horizontal	PK
6701.687	30.12	13.47	43.59	74.00	30.41	Horizontal	PK
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1264.375	33.63	-5.66	27.97	74.00	46.03	Vertical	PK
3210.468	31.87	0.72	32.59	74.00	41.41	Vertical	PK
4881.906	32.37	7.16	39.53	74.00	34.47	Vertical	PK
6713.437	29.65	13.43	43.08	74.00	30.92	Vertical	PK
CH78							
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1193.875	34.02	-5.89	28.13	74.00	45.87	Horizontal	PK
3194.312	31.42	0.81	32.23	74.00	41.77	Horizontal	PK
4760.000	29.84	6.78	36.62	74.00	37.38	Horizontal	PK
6723.718	31.10	13.41	44.51	74.00	29.49	Horizontal	PK
Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity	Detector
1195.343	34.23	-5.88	28.35	74.00	45.65	Vertical	PK
3184.031	32.19	0.76	32.95	74.00	41.05	Vertical	PK
4804.062	30.34	7.06	37.40	74.00	36.60	Vertical	PK
6744.281	29.68	13.35	43.03	74.00	30.97	Vertical	PK

Remark:

1. Final Level = Receiver Read level + Factor
2. The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

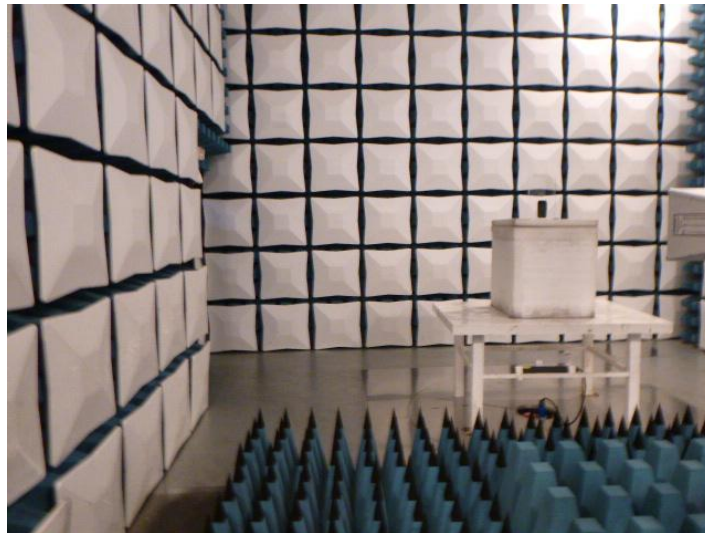
6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)



Radiated Emissions





7. EXTERANAL AND INTERNAL PHOTOS

Reference to the test report No. CHTEW20040200

-----End of Report-----