



# **TEST REPORT**

Report Reference No:	CHTEW19070003	Report verification	
Project No:	SHT1905093901EW		
FCC ID	ZSW-30-090		Report No: ChittW13070003
Applicant's name:	b mobile HK Limited		
Address:	Flat 18; 14/F Block 1; Golden Street; Kwai Chung; New Terr		
Manufacturer	b mobile HK Limited		
Address	Flat 18; 14/F Block 1; Golden Street; Kwai Chung; New Terr		
Test item description:	Mobile Phone		
Trade Mark	Bmobile		
Model/Type reference:	AX751		
Listed Model(s):	AX751+		
Standard:	FCC CFR Title 47 Part 15 Su	bpart C Section 1	5.247
Date of receipt of test sample:	May 31,2019		
Date of testing	Jun 01,2019- Jun 28,2019		
Date of issue	Jul 01,2019		
Result:	PASS		
Compiled by (Position+Printed name+Signature):	File administrators Silvia Li	Sil	via Li
Supervised by (Position+Printed name+Signature):	Project Engineer Aaron Fang	Aaro	via Li on.Fang
Approved by (Position+Printed name+Signature):	RF Manager Hans Hu	Ho	msHy
Testing Laboratory Name:	Shenzhen Huatongwei Intern	national Inspectio	n Co., Ltd.
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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:

<u>FCC Rules Part 15.247:</u> 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 Devicese

# 1.2. Report version

Revision No.	Date of issue	Description
N/A	2019-07-01	Original

# 2. TEST DESCRIPTION

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

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

# 3. <u>SUMMARY</u>

# 3.1. Client Information

Applicant:	b mobile HK Limited
Address:Flat 18; 14/F Block 1; Golden Industrial Building;16-26 Kwai Tak Kwai Chung; New Territories; Hong Kong.	
Manufacturer:	b mobile HK Limited
Address:	Flat 18; 14/F Block 1; Golden Industrial Building;16-26 Kwai Tak Street; Kwai Chung; New Territories; Hong Kong.

# 3.2. Product Description

Name of EUT:	Mobile Phone	
Trade Mark:	Bmobile	
Model No.:	AX751	
Listed Model(s):	AX751+	
IMEI:	Conducted: 359982070012097 Radiated: 359982070012311	
Power supply:	DC 3.8V	
Adapter information: Input:100-240Va.c., 50/60Hz, 0.2A Output:5.0Vd.c., 700mA		
Hardware version:	7130DW_MMI_V10	
Software version:	Bmobile_AX751_OM_LTM_V009	
Bluetooth		
Version:	Supported BT4.0+EDR	
Modulation:	GFSK, π/4DQPSK, 8DPSK	
Operation frequency:	2402MHz~2480MHz	
Channel number:	79	
Channel separation:	1MHz	
Antenna type:	PIFA Antenna	
Antenna gain:	-1.0dBi	

# 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

	1	Manufacturer:	/
	·	Model No.:	/
,	1	Manufacturer:	/
	7	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-1

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

#### ACA

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

# 4.3. Environmental conditions

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	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
•	Shielded Room	Albatross projects	N/A	N/A	2018/09/28	2023/09/27
•	EMI Test Receiver	R&S	ESCI	101247	2018/10/27	2019/10/26
•	Artificial Mains	SCHWARZBECK	NNLK 8121	573	2018/10/27	2019/10/26
•	Pulse Limiter	R&S	ESH3-Z2	100499	2018/10/27	2019/10/26
•	RF Connection Cable	HUBER+SUHNER	EF400	N/A	2018/11/15	2019/11/14
•	Test Software	R&S	ES-K1	N/A	N/A	N/A
0	Single Balanced Telecom Pair ISN	FCC	FCC-TLISN-T2-02	20371	2018/10/28	2019/10/27
0	Two Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T4-02	20373	2018/10/28	2019/10/27
0	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T8-02	20375	2018/10/28	2019/10/27
0	V-Network	R&S	ESH3-Z6	100211	2018/10/27	2019/10/26
0	V-Network	R&S	ESH3-Z6	100210	2018/10/27	2019/10/26
0	2-Line V-Network	R&S	ESH3-Z5	100049	2018/10/27	2019/10/26

•	Radiated Emission-6th test site					
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
•	Semi-Anechoic Chamber	Albatross projects	SAC-3m-02	N/A	2018/09/30	2021/09/29
•	EMI Test Receiver	R&S	ESCI	100900	2018/10/28	2019/10/27
•	Loop Antenna	R&S	HFH2-Z2	100020	2017/11/20	2020/11/19
•	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	546	2017/04/05	2020/04/04
•	Pre-Amplifer	SCHWARZBECK	BBV 9742	N/A	2018/11/15	2019/11/14
•	RF Connection Cable	HUBER+SUHNER	N/A	N/A	2018/09/28	2019/09/27
•	RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	2018/09/28	2019/09/27
•	Test Software	R&S	ES-K1	N/A	N/A	N/A
•	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
•	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

•	Radiated emissi	on-7th test site				
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
•	Semi-Anechoic Chamber	Albatross projects	SAC-3m-01	N/A	2018/09/30	2021/09/29
•	Spectrum Analyzer	R&S	FSP40	100597	2018/10/27	2019/10/26
•	Horn Antenna	SCHWARZBECK	9120D	1011	2017/03/27	2020/03/26
•	Pre-amplifier	BONN	BLWA0160-2M	1811887	2018/11/14	2019/11/13
•	Pre-amplifier	CD	PAP-0102	12004	2018/11/14	2019/11/13
•	Broadband Pre- amplifier	SCHWARZBECK	BBV 9718	9718-248	2019/04/26	2020/04/25
•	RF Connection Cable	HUBER+SUHNER	RE-7-FH	N/A	2018/11/15	2019/11/14
•	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	2018/11/15	2019/11/14
•	Test Software	Audix	E3	N/A	N/A	N/A

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•	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
•	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

•	RF Conducted N	lethod				
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	2018/10/28	2019/10/27
•	Spectrum Analyzer	Agilent	N9020A	MY50510187	2018/09/29	2019/09/28
0	Radio communication tester	R&S	CMW500	137688-Lv	2018/09/29	2019/09/28
0	Test software	Tonscend	JS1120-1(LTE)	N/A	N/A	N/A
0	Test software	Tonscend	JS1120-2(WIFI)	N/A	N/A	N/A
0	Test software	Tonscend	JS1120-3(WCDMA)	N/A	N/A	N/A
0	Test software	Tonscend	JS1120-4(GSM)	N/A	N/A	N/A

# 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 anantenna 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)

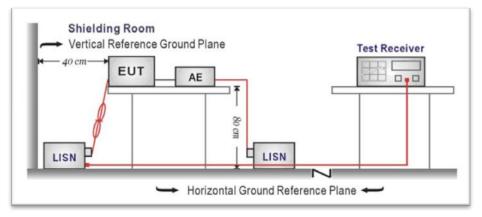
# <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207

	Limit (d	lBuV)
Frequency range (MHz)	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

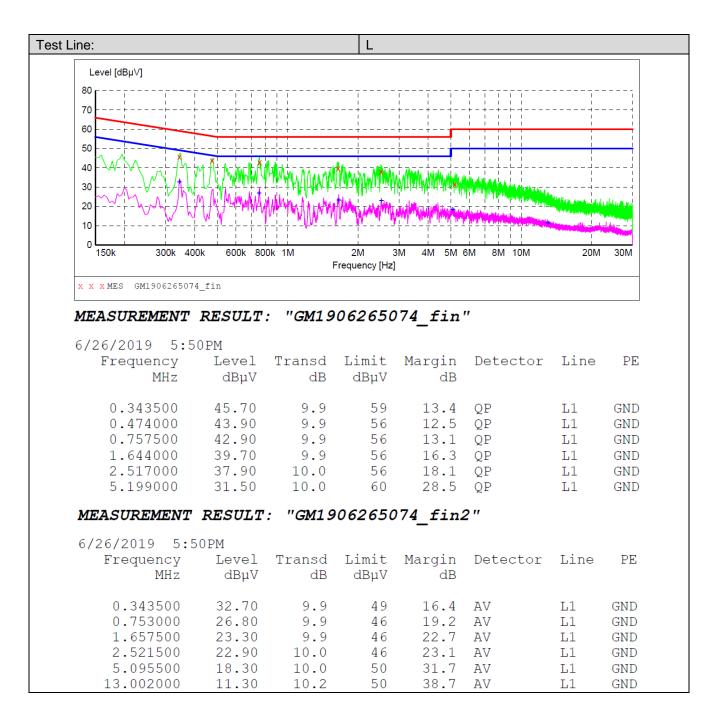
- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm 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.

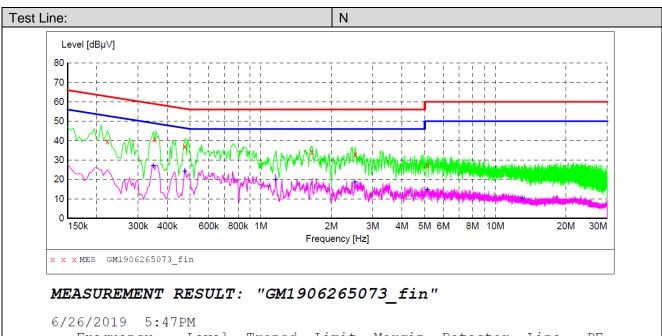
#### TEST RESULTS

#### ☑ Passed □ Not Applicable

Note:

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





Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE	
0.222000 0.352500 0.474000 1.653000 2.526000 5.140500	39.60 40.60 37.10 34.10 32.90 27.40	9.9 9.9 9.9 9.9 10.0 10.0	63 59 56 56 56 60	19.3 21.9	QP QP QP QP QP QP	N N N N N	GND GND GND GND GND GND	
MEASUREMENT	RESULT	: "GM19	062650	)73_fin2	2 ''			
6/26/2019 5:4 Frequency MHz		Transd dB	Limit dBµV	Margin dB	Detector	Line	PE	
0.348000	27.10 24.30	9.9 9.9	49 46	21.9 22.1	AV AV	N N	GND GND	

46

46

50

50

26.1 AV

AV

AV

AV

27.3

35.2

39.9

9.9

10.0

10.0

10.2

1.158000

2.517000

5.136000

12.997500

19.90

18.70

14.80

10.10

Ν

Ν

Ν

Ν

GND

GND

GND

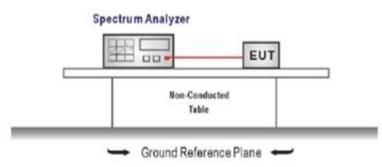
GND

# 5.3. Conducted Peak Output Power

#### <u>LIMIT</u>

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 nonoverlapping 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
- Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW≥ the 20 dB bandwidth of the emission being measured, VBW≥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	Output power (dBm)	Limit (dBm)	Result
	00	3.55		
GFSK	39	3.41	≤ 30.00	Pass
	78	3.19		
	00	3.41		
π/4DQPSK	39	3.32	≤ 21.00	Pass
	78	3.10		
	00	3.51		
8DPSK	39	3.39	≤ 21.00	Pass
	78	3.19		

Modulation Type:	GFSK
	Spectrum         Image: Constraint of the sector of t
	Count 500/500
	0 dBm
01100	-10 dBm
CH00	-30 dBm
	-50 dBm
	-70 dBm
	Date:14.JUN.2019 10:47:18
	Spectrum         Image: Constraint of the sector of th
	10 dBm     10 dBm     10 dBm
	0 dBm
CH39	-20 dBm
	-50 dBm
	-60 dBm
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Date:14.500.2019 10:46:45
	Ref Level 20.00 dbm Offset 1.00 dB RBW 1 MHz Att 30 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep Count 500/500 IPk View
	10 dBm M1[1] 3.19 dBm 2.48003620 GHz
	-10 dBm
CH78	-20 dBm
	-50 dBm
	-60 dBm
	CF 2.48 GHz 691 pts Span 5.0 MHz

Adulation Turney	
Nodulation Type:	π/4DQPSK
	Spectrum (♥) Ref Level 20.00 dbm Offset 1.00 db ● RBW 2 MHz
	Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count 500/500
	1Pk View     M1[1] 3.41 dBm
	10 dBm
	MI
	D dBm
	-10 05m
	-20 dBm
CH00	-30 d8m-
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm-
	CF 2.402 GHz 691 pts Span 5.0 MHz
	Ne soring
	Data:14.JUN 2019 10:50:57
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 1.00 dB ● RBW 2 MHz ● Att 30 dB SWT 1 ms ● VBW 5 MHz Mode Auto Sweep
	Count 500/500
	M1[1] 3.32 dBm 2.44110850 GHz
	10 dBm M1
	0 dBm
	_10 dBm
	-20 dBm
CH39	
01100	-30 d8m
	-40 dBm
	-50 dBm
	-60 dBm-
	-70 dBm
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Date:14.JUN 2019 10:52:23
	Spectrum         (mm)           Ref Level 20.00 dbm         Offset 1.00 db ● RBW 2 MHz
	● Att 30 dB SWT 1 ms ● VBW 5 MHz Mode Auto Sweep Count 500/500
	P1Pk View     M1[1] 3.10 dBm
	10 dBm
	-10 dBm
	-20 dBm
CH78	-30 dBm
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm
	CF 2.48 GHz         691 pts         Span 5.0 MHz

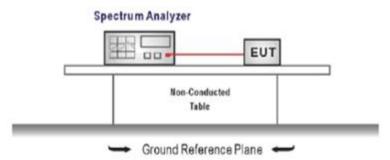
Modulation Type:	8DPSK
	Spectrum         (100 m)           Ref Level 20.00 dBm         Offset 1.00 dB ● RBW 2 MHz
	Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count 500/500
	●1Pk View M1[1] 3.51 dBm
	10 dBm
	ML
	0 dBm
	_10 dBm
	-20 dBm
CH00	-30 dBm
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm
	CF 2.402 GHz 691 pts Span 5.0 MHz
	Date:14.JUN 2019 10:54:10
	Spectrum         (100 dB ● RBW 2 MHz           Ref Level 20.00 dBm         Offset 1.00 dB ● RBW 2 MHz
	Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count 500/500
	IPk View
	M1[1] 3.39 dBm 2.44094930 GHz
	10 dBm
	0 dBm
	-10 d8m
	-20 dBm
CH39	
01100	-30 d8m
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm
	*/U UBIII
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Measuring
	Date:14.JUN 2019 10:54:53
	Spectrum (♥)
	RefLevel 20.00 dBm Offset 1.00 dB RBW 2 MHz Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep
	Count S00/S00  Plk View
	M1[1] 3.19 dBm 2.47997830 GHz
	10 dBm ML
	D dBm
	-10-d8m
	-20 dBm
CH78	
0170	-30 dBm
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm
	CF 2.48 GHz 691 pts Span 5.0 MHz
	Measuring

# 5.4. 20 dB Bandwidth

#### <u>LIMIT</u>

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  $\ge$  1% of the 20 dB bandwidth, VBW  $\ge$  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 (MHz)	Limit (MHz)	Result
	00	0.93		
GFSK	39	0.93	-	Pass
	78	0.93		
	00	1.29		
π/4DQPSK	39	1.29	-	Pass
	78	1.29		
	00	1.28		
8DPSK	39	1.28	-	Pass
	78	1.28		

Modulation Type:	GFSK
	Spectrum Ref Level 20.00 dBm Offset 1.00 dB ● RBW 10 kHz
	Att 30 dB SWT 189.6 µs ♥ VBW 30 kHz Mode Auto FFT Count 500/500 ●1Pk View 10 dBm M1[1] -22.80 dBm 10 dBm M2[1] -2.36 dBm
	-10 dBm
CH00	-40 dBm
	Type         Ref         Y-value         Y-value         Function         Function Result           Marker         1         2:4012545 GHz         -22.80 dBm         Function         Function Result           M1         1         2:401255 GHz         -23.60 dBm         Function Result         Function Result
	D3         M1         1         927.5 kHz         -0.67 d8           D3         M1         1         927.5 kHz         -0.67 d8           D400:13.2019         1638:47         Monormal         Monormal           Spectrum         Total         Total         Total
	Ref Level 20.00 dBm         Offset         1.00 dB         ● RBW         10 HHz           Att         30 dB         SWT         189.6 µs         ♥ WBW 30 kHz         Mode Auto FFT           Count 500/500           ♥ DBW 30 kHz         Mode Auto FFT           ● 1Pk View           ● 1Pk View         ● 1Pk
	10 dBm 22.44105500 GHz -2.64 dBm M2[1] -2.64 dBm 0 dBm10 dBm
СН39	-30 dBm
	GEC dBm         Control         Control <t< td=""></t<>
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2:440545 GHz         -2:2:6 dBm         -2:64 dBm         -0.57 dB         -0.57 dB
	Spectrum Ref Level 20.00 dBm Offset 1.00 dB ■ RBW 10 kHz Att 30 dB SWT 189.6 µs ■ VBW 30 kHz Mode Auto FFT Count 500/\$500 ● JFk View
	M1[1]         -23.56 dBm           10 dBm         2.47954250 GHz           0 dBm         M2[1]         -2.92 dBm           10 dBm         M2         2.48005500 GHz           10 dBm         Δ0/√√√√√√         40005500 GHz
CH78	-20 dBm D1 -22.922 dBm WWW WWW
	-50 dBm
	CF 2.48 GHz         1001 pts         Span 2.5 MHz           Marker         Type   Ref         Trc         X-value         Y-value         Function           M1         1         2.4795425 GHz         -23.56 GBm         Mitor         Mitor           M2         1         2.440055 GHz         -29.20 GBm         Mitor         Mitor           D3         M1         1         927.5 kHz         -0.21 dB         Mitor         Mitor
	Data: 14 JUN 2019 10:03:39

Modulation Type: π/4DQPSK ₿ Spectrum RefLevel 20.00 dBm Att 30 dB Offset 1.00 dB ● RBW 30 kHz SWT 63.1 µs ● VBW 100 kHz Mode Auto FFT Att Count 500/500 -21.19 d 2.40136250 d -0.60 d M1[1] 10 dBm M2[1] 2.40216000 G 0 dBm- $\searrow$ -10 dBm 20 dBm 1 -20.5 -30 dBm CH00 -40 dBm  $\sim$ -50 dBm 60 dBm 70 dBm CF 2.402 GHz 1001 pts Span 2.5 MHz Y-value 01 19 dBm Type Ref Trc X-value Function Function Result -value .4013625 GHz 2.40216 GHz 1.2875 MHz -21.19 dBm -0.60 dBm 0.23 dB M2 M1 Date: 14 JUN 2019 10:05:2 ₽ Spectrum Ref Level 20.00 dBm Att 30 dB Mode Auto FFT Count 500/500 -21.70 d 2.44036250 M1[1] 10 dBm M2[1] -1.06 d M2 2.44116000 GH 0 dBm  $\sim$ -10 dBm му́ 20 dBm 01 -21 DE 30 dBm CH39 40 dBm 50 dBm -60 dBm -70 dBm CF 2.441 GH 1001 pt Span 2.5 MHz larke Type Ref Trc M1 1 X-value 2.4403625 GHz 2.44116 GHz 1.2875 MHz Y-value -21.70 dBm -1.06 dBm 0.26 dB Function Function Result M2 D3 М1 440 Date:14.JUN.2019 10:07:51 Spectrum ₿ 
 Ref Level
 20.00 dBm
 Offset
 1.00 dB
 ■ RBW
 30 kHz

 Att
 30 dB
 SWT
 63.1 µs
 ■ VBW
 100 kHz
 Mode Auto FFT Count 500/500 M1[1] -21.30 dB 10 dBm M2[1] -0.88 dB 2.48016000 GF Ma 0 dBm  $\sim$ -10 dBm мv 20 dB 1 -20.86 30 dBr **CH78** -40 dBm 50 dBm 60 dBm 70 dBm CF 2.48 2 5 M larke X-value 2.4793625 GHz 2.48016 GHz 1.2875 MHz 
 Y-value
 Function

 -21.30 dBm
 -0.88 dBm

 -0.05 dB
 -0.05 dB
 Function Result Type Ref Trc M1 Data:14.JUN.2019 10:11:44

odulation Type:	8DPSK
	Spectrum         Image: Constraint of the sector of th
	Count 500/500
CH00	0 dBm 2.40215750 GHz -10 dBm20 dBm - 01 -19,952 dBm
	-30 dBm
	-60 dBm
	CF 2.402 GHz         1001 pts         Span 2.5 MHz           Marker
	Messurging.
	Spectrum         Image: Spectrum           Ref Level 20.00 dBm         Offset 1.00 dB ● RBW         30 kHz           Att         30 dB         SWT         63.1 µs         VBW 100 kHz         Mode Auto FFT           Count 500/500         Count 500/500         Count 500/500         Count 500/500         Count 500/500
	• 1Pk View               M1[1]             -20.28 dBm            10 dBm               M1[1]             -20.326 dBm            0 dBm               M2[1]            0 dBm               M2[1]
	-10 dBm
CH39	-40 dBm
	-70 dBm CF 2.441 GHz 1001 pts Span 2.5 MHz
	Marker         Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.4403525 GHz         -20.28 dBm         Function         Function Result           M2         1         2.441357 GHz         -0.03 dBm         Function         Function Result           D3         M1         1         1.2775 MHz         0.06 dB         Function Result
	Daw:14.JUN 2019 10:15:23
	Ref Level         20.00 dBm         Offset         1.00 dB         BW         30 kHz           ● Att         30 dB         SWT         63.1 µs         • VBW         Mode         Auto FFT           Count         500/500         • VBW         100 kHz         Mode         Auto FFT           ● 1Pk View         • VBW         • M1[1]         -20.36 dBm
	10 dBm 2.47933250 GHz -0.21 dBm 2.47933250 GHz -0.21 dBm 2.48015750 GHz -10 dBm 2.48015750 GHz
	-20-d8m D1 -20.213 d8m
CH78	-50 dBm
	-70 dBm
	Hype         He         L         A value         Production         Production           M1         1         2.4793525 GHz         -20.36 dBm         Production

# 5.5. Carrier Frequencies Separation

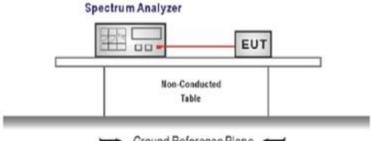
#### <u>LIMIT</u>

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**



- Ground Reference Plane

#### 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
- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels RBW ≥ 1% of the span, VBW ≥ 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

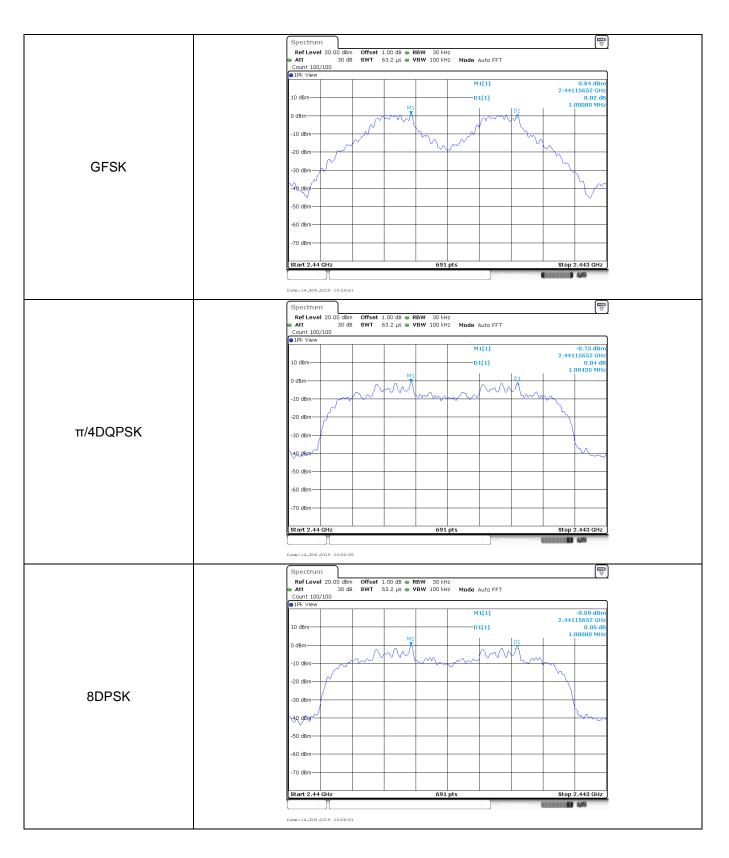
#### TEST RESULTS

#### ☑ Passed □ Not Applicable

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz) *	Result	
GFSK	39	1.00	≥0.93	Pass	
π/4DQPSK	39	1.00	≥0.86	Pass	
8DPSK	39	1.00	≥0.85	Pass	

Note:

\*: GFSK limit = The maximum 20 dB Bandwidth for GFSK modulation on the section 5.4.  $\pi$ /4DQPSK limit = 2/3 \* The maximum 20 dB Bandwidth for  $\pi$ /4DQPSK modulation on the section 5.4. 8DPSK limit = 2/3 \* The maximum 20 dB Bandwidth for 8DPSK modulation on the section 5.4

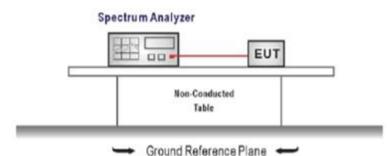


# 5.6. Hopping Channel Number

#### 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
- Use the following spectrum analyzer settings: Span = the frequency band of operation RBW ≥ 1% of the span, VBW ≥ RBW Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

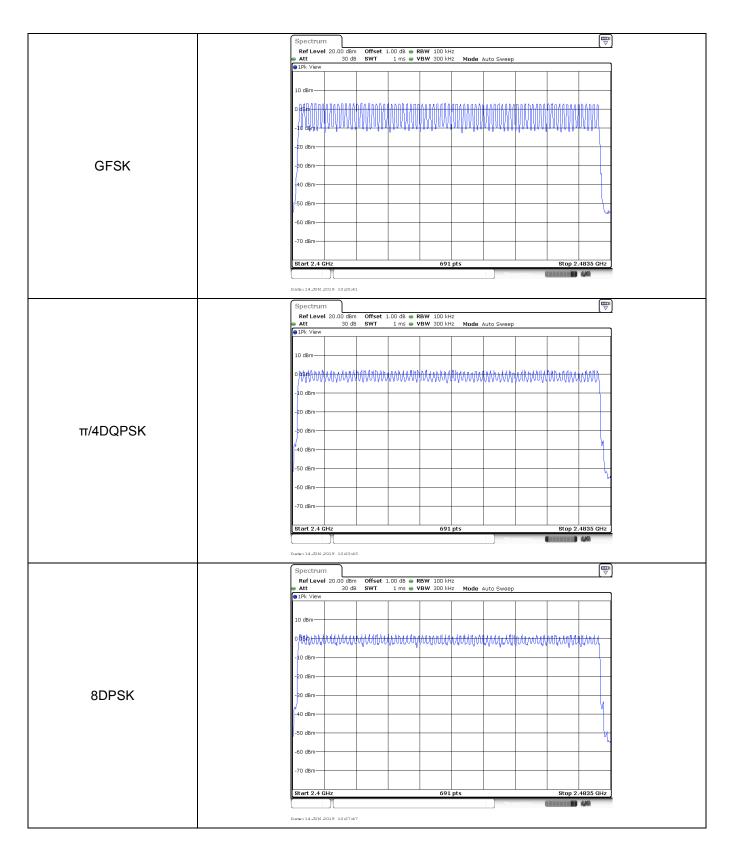
#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

☑ Passed □ Not Applicable

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

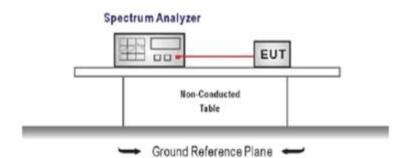


### 5.7. Dwell Time

#### <u>LIMIT</u>

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
- Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel, RBW= 1 MHz, VBW ≥ 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.

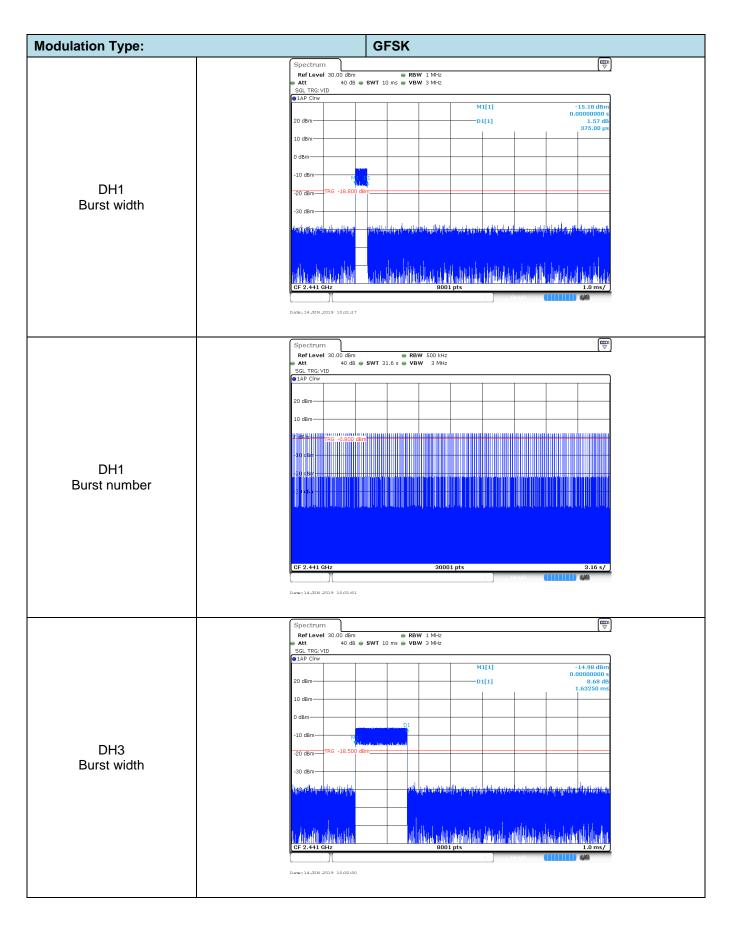
#### TEST MODE:

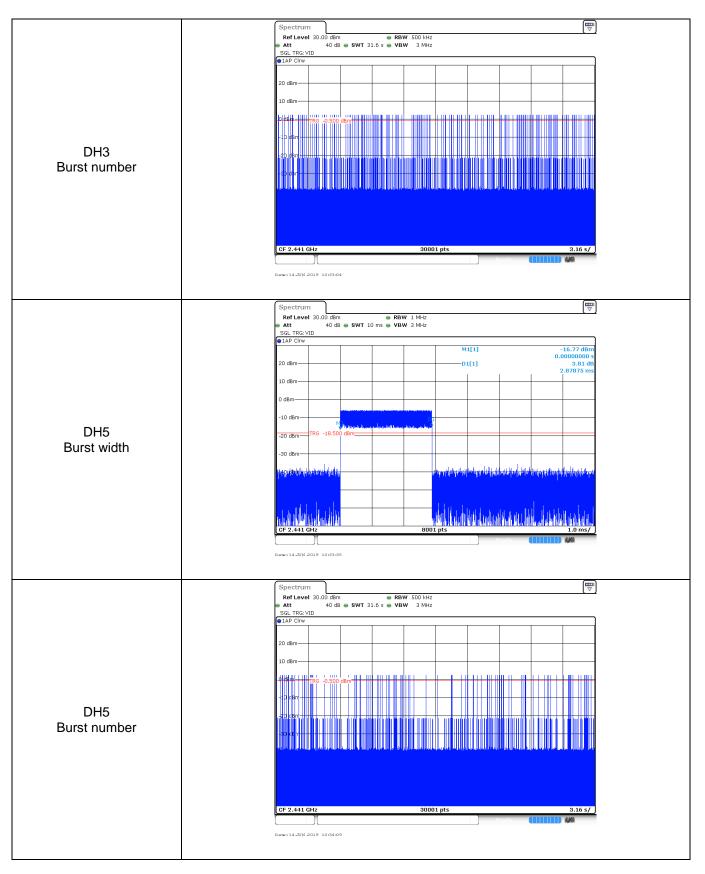
Please refer to the clause 3.3

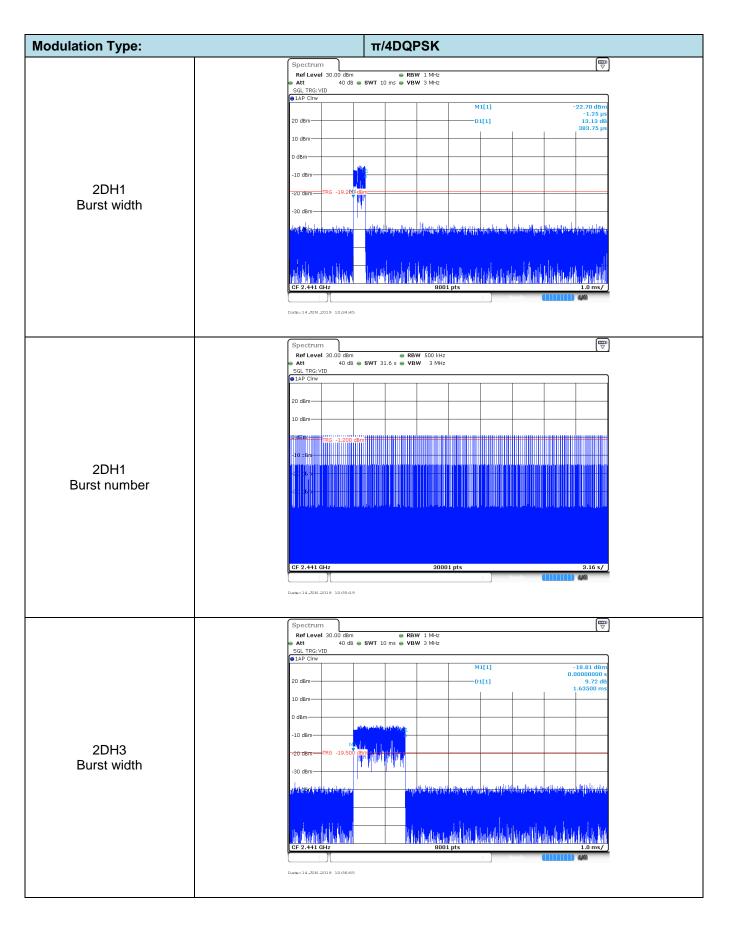
#### TEST RESULTS

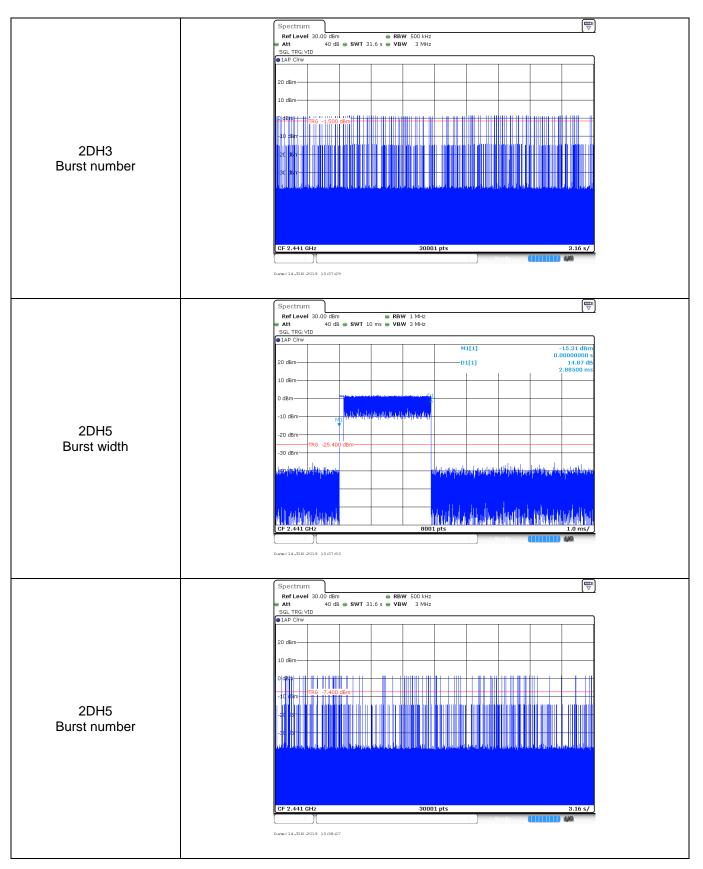
#### ☑ Passed □ Not Applicable

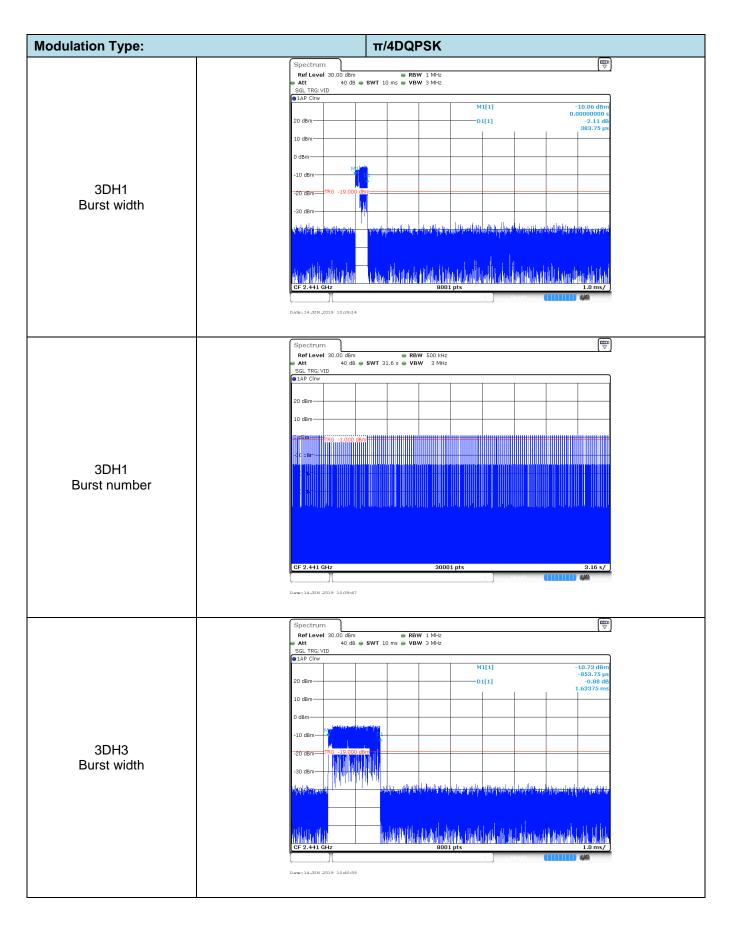
Modulation type	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
	DH1	0.38	315.00	0.12		
GFSK	DH3	1.63	166.00	166.00 0.27		Pass
	DH5	2.88	104.00	0.30		
	2DH1	0.38	315.00	0.12		
π/4DQPSK	2DH3	1.63	157.00	0.26	≤ 0.40	Pass
	2DH5	2.89	103.00	0.30		
	3DH1	0.38	315.00	0.12		
8DPSK	3DH3	1.63	160.00	0.26	≤ 0.40	Pass
	3DH5	2.89	103.00	0.30		

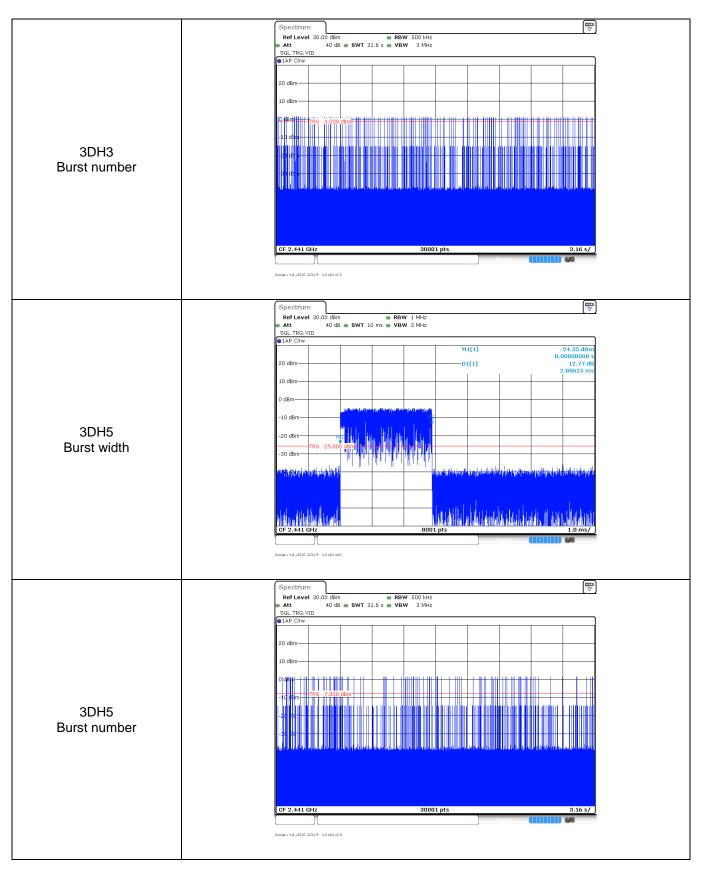












# 5.8. Pseudorandom Frequency Hopping Sequence

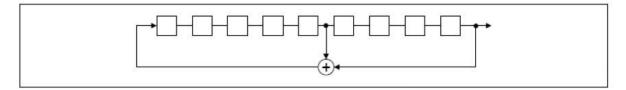
### <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies 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 chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

#### TEST RESULTS

The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5<sup>th</sup> and 9<sup>th</sup> stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the friststage. The sequence begins with the frist 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:29-1=511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:

0	2	4	6	62	64	-	78	1	73	75 7
٦				 ·····			1			П
							i i			
				1			1			
				 			<u>i</u>		 _Ĺ_	

Each frequency used equally one the average by each transmitter.

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

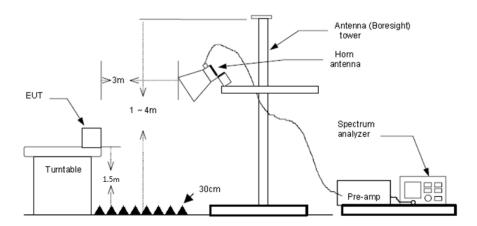
# 5.9. Restricted band (radiated)

#### <u>LIMIT</u>

#### 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 waspositioned 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.
- 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 + Antenna Factor+ Cable Loss- Preamp Factor
- 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 chann	el:				СН00					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value	
2310.00	34.41	28.05	7.73	38.17	32.02	74.00	-41.98	Horizontal	Peak	
2390.00	42.21	27.65	7.84	37.97	39.73	74.00	-34.27	Horizontal	Peak	
2310.00	35.36	28.05	7.73	38.17	32.97	74.00	-41.03	Vertical	Peak	
2390.00	40.85	27.65	7.84	37.97	38.37	74.00	-35.63	Vertical	Peak	
2310.00	22.36	28.05	7.73	38.17	19.97	54.00	-34.03	Horizontal	Average	
2390.00	22.06	27.65	7.84	37.97	19.58	54.00	-34.42	Horizontal	Average	
2310.00	23.06	28.05	7.73	38.17	20.67	54.00	-33.33	Vertical	Average	
2390.00	22.73	27.65	7.84	37.97	20.25	54.00	-33.75	Vertical	Average	

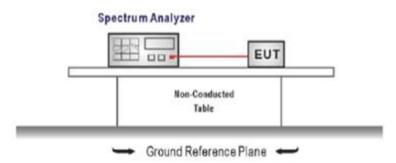
Test chann	el:				CH78					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value	
2483.50	59.44	27.26	8.04	37.59	57.15	74.00	-16.85	Horizontal	Peak	
2500.00	41.63	27.20	8.08	37.38	39.53	74.00	-34.47	Horizontal	Peak	
2483.50	59.49	27.26	8.04	37.59	57.20	74.00	-16.80	Vertical	Peak	
2500.00	42.01	27.20	8.08	37.38	39.91	74.00	-34.09	Vertical	Peak	
2483.50	24.87	27.26	8.04	37.59	22.58	54.00	-31.42	Horizontal	Average	
2500.00	21.74	27.20	8.08	37.38	19.64	54.00	-34.36	Horizontal	Average	
2483.50	25.32	27.26	8.04	37.59	23.03	54.00	-30.97	Vertical	Average	
2500.00	21.90	27.20	8.08	37.38	19.80	54.00	-34.20	Vertical	Average	

# 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
- Use the following spectrum analyzer settings: RBW = 100 kHz, VBW ≥ RBW, scan up through 10<sup>th</sup> 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

est Item:	Band edge		Modula	ation ty	pe:	GF	SK
		Spectrum Ref Level 20.00 dBm Att 30 dB Count 500/500	Offset 1.00 dB ● SWT 1.1 ms ●	RBW 100 kHz		2 <b></b>	
		10 dBm			M1[1] M2[1]		2.92 dBm 2.402040 GHz -52.21 dBm 2.400000 GHz
CH00		-10 dBm D1 -17.080 d -20 dBm 17.080 d -30 dBm	Bm				
No hopping mode		-50 dBm	ananananan anananananananananananananan	natraanataa kal	presentation and the second	m www.www.uwd	and Ma
		Start 2.31 GHz           Marker           M1         1           M2         1           M3         1           M4         1	X-value 2.40204 GHz 2.4 GHz 2.39 GHz 2.31 GHz	691 pt Y-value 2.92 dBm -52.21 dBm -56.00 dBm -55.35 dBm	s Function	Function	Stop 2.405 GHz
		M5 1 M5 1	2.399906 GHz	-52.07 dBm	Ne Ne	osuring 📲	4,4
		Spectrum Ref Level 20.00 dBm Att 30 dB Count 500/500 PIPk Max	Offset 1.00 dB ● SWT 1.1 ms ●	RBW 100 kHz VBW 300 kHz	Mode Auto Swee	0	₩
CH00		10 dBm			M1[1] M2[1]		2.85 dBm 2.403140 GHz -56.15 dBm 2.400000 GHz
		-20 dBm D1 -17.150 d -30 dBm	Bm				
Hopping mode		-50 dBm	anderson and and an and		lanar haynad yw hyne hagar	M manunununununun	
		Start 2.31 GHz           Marker         Trc           M1         1           M2         1           M3         1	X-value 2.40314 GHz 2.4 GHz 2.39 GHz	691 pt Y-value 2.85 dBm -56.15 dBm -55.74 dBm	Function	Function	Stop 2.405 GHz
		M4 1 M5 1	2.31 GHz 2.32363 GHz	-55.57 dBm -53.24 dBm	Me	asuring	<b>1</b> 10 440
		Att 30 dB Count 500/500	Offset 1.00 dB ● SWT 56.9 µs ●		Mode Auto FFT		
		1Pk Max     10 dBm M1     0 dBm			M1[1] M2[1]		2.58 dBm 2.4798310 GHz -60.17 dBm 2.4835000 GHz
CH78 No hopping mode		-10 dBm D1 -17.420 d -30 dBm	Bm				
		-50 dBm	M2 M4		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		-,
		Start 2.478 GHz           Marker           Type         Ref         Trc           M1         1           M2         1	X-value 2.479831 GHz 2.4835 GHz	691 pt 2.58 dBm -60.17 dBm	s Function	Function	Stop 2.5 GHz
		M3 1 M4 1 Date: 14 JUN 2019 10:04:03	2.5 GHz 2.4846 GHz	-60.11 dBm -57.09 dBm	Me	asuring 📲	4,44

# Report No.: CHTEW19070003

	Spectrum         mms           Ref Level 20.00 dBm         Offset 1.00 dB         RBW         100 kHz           Att         30 dB         SWT         56.9 µs         VBW         300 kHz           Count S0/500         SWT         56.9 µs         VBW         300 kHz
	Count Solution
	M1[1] 2.33 dBm 10 dbm 2.4780480 GHz
	10 dBm 0 dBm
	-tō qaim-
	-20 dBm D1 -17.670 dBm
CH78	-30 dBm
CH78 Hopping mode	-50 dBm
	-70 dBm
	Start 2.478 GHz 691 pts Stop 2.5 GHz
	Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.478048 GHz         2.33 dBm         Function         Function         Function
	M1 1 2.4935 GHz -50.15 dBm
	M3         1         2.5 GHz         -60.30 dBm           M4         1         2.4958551 GHz         -57.74 dBm
	Measuring.

est Item:	Band edge		Modula	ation f	ype:	π/	4DQPSK
		Spectrum Ref Level 20.00 dBm Att 30 dB	Offset 1.00 dB 👄	<b>RBW</b> 100 kH		n	
		Count 500/500	5WT 1.1115	100 SOC KI	2 Mode Adto Swee	þ	
		10 dBm			M1[1]		1.51 dBm 2.402180 GHz
		0 dBm			M2[1]		-52.47 ពីមីm 2.400000 ត្រីHz
		-10 dBm					
		-20 dBm D1 -18.490 d	IBm				
		-30 dBm					
CH00		-40 dBm					Nate
No hopping mode		4-50 dBm 	munum	markon	warman warman	newsulation	Taking and h
		-70 dBm					
		Start 2.31 GHz		691	pts		Stop 2.405 GHz
		Marker _Type   Ref   Trc	X-value	Y-value	Function	Functio	
		M1 1 M2 1	2.40218 GHz 2.4 GHz	1.51 dB -52.47 dB	m	T dilocio	
		M3 1 M4 1 M5 1	2.39 GHz 2.31 GHz 2.39963 GHz	-56.26 dB -55.84 dB -51.95 dB	m		
		Date: 14 JUN 2019 10:06:47			Me	asuring 📲	4/9
		Spectrum Ref Level 20.00 dBm	Offset 1.00 dB 👄	PPW 100 ku	7		
		<ul> <li>Att 30 dB</li> <li>Count 500/500</li> </ul>			z Mode Auto Swee	р	
		●1Pk Max			M1[1]		1.02 dBm
		10 dBm			M1[1] M2[1]		2.403010 GHz -52.57 d⊠th
		0 dBm				1 1	2.400000 GHz
		-10 dBm	10				
		-20 dBm D1 -18.980 d	18m				
CH00		-40 dBm					
		450 dBm					MD BAR
Hopping mode		-60 dBm		vershindunder	mutania	mahanna	Invderon
		-70 dBm					
		Start 2.31 GHz		691	pts		Stop 2.405 GHz
		Marker Type Ref Trc M1 1	X-value 2.40301 GHz	Y-value 1.02 dB	Function	Functio	n Result
		M2 1 M3 1	2.4 GHz 2.39 GHz	-52.57 dB -54.98 dB	m		
		M4 1 M5 1	2.31 GHz 2.399768 GHz	-54.71 dB -52.51 dB	m		
		Date: 14.JUN 2019 10:24:21			Me	asuring 机	4/6
		Spectrum					
		Ref Level 20.00 dBm					( )
		Count 500/500	SWT 56.9 µs 🖷	¥BW 300 kH	<ul> <li>Mode Auto FFT</li> </ul>		
		●1Pk Max			M1[1]		1.94 dBm 2.4801490 GHz
		10 dBm Mi			M2[1]		2.4801490 GHz -59.71 dBm 2.4835000 GHz
		0 dBm					2.7033000 GHZ
		-10 dBm	IBm				
		-30 d6m					
CH78		-40 dBm				+	
No hopping mode		50 dBm	M4			+	
		-60 dBm	ma Angere and			marine and a second	
		-70 dBm				+	
		Start 2.478 GHz		691	pts		Stop 2.5 GHz
		Marker Type Ref Trc	X-value	Y-value	Function	Functio	n Result
		M1 1 M2 1	2.480149 GHz 2.4835 GHz	1.94 dB -59.71 dB	m		
		M3 1 M4 1	2.5 GHz 2.4839304 GHz	-60.00 dB -56.42 dB	m m		
		M3 1 M4 1	2.5 GHz 2.4839304 GHz	-60.00 dB -56.42 dB	m m	asuring	49

# Report No.: CHTEW19070003

	Spectrum         Image: Constraint of the second seco
	IPK Max
	M1[1] 1.30 dBm 10 dBm 2.4790670 GH2 M1 M2[1]59.51 dBm
	-10 dBm
	-20 dBm 01 -18.700 dBm
CH78 opping mode	-50 dBm / M2 M4
	-70 dBm-
	Start 2.478 GHz 691 pts Stop 2.5 GHz
	Marker Type   Ref   Trc   X-value   Y-value   Function   Function Result
	M1 1 2.479067 GHz 1.30 dBm M2 1 2.4835 GHz -59,51 dBm
	M3         1         2.5 GHz         -60.08 dBm           M4         1         2.4860029 GHz         -57.49 dBm
	Date:14.201 2019 102525

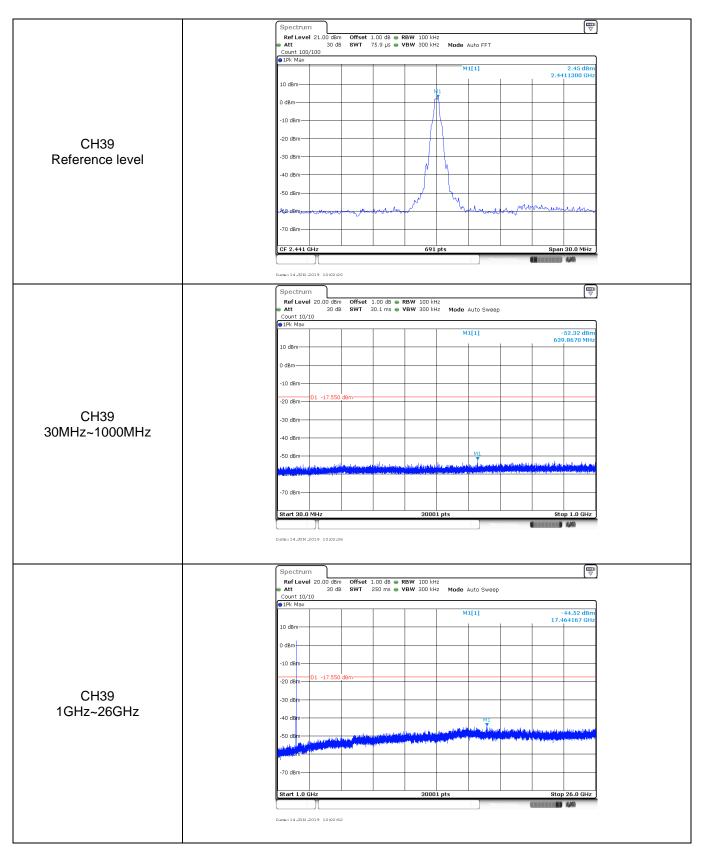
est Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode	Spec Ref Att Coun 10 dB -10 dB -20 dB -20 dB -30 dB -30 dB -40 dB -50 dB -70 dB	Image: state in the s	
CH00 Hopping mode	Ref         Att           Count         1Pk1           10 dB         0 dB           -10 dB         -20 dB           -20 dB         -30 dB           -60 dB         -50 dB           -70 dB         Start           Marke         Type           MM         MM	m     M1[1]       m     M2[1]       2.31 GHz     691 pts       r     F       1     2.40216 GHz       1     2.40216 GHz       1     2.39 GHz       -51.15 dBm       1     2.399768 GHz       -51.75 dBm	weep 1.43 dBm 2.402100 GHz 2.400000 WK 2.400000 WK 2.400000 WK Stop 2.405 GHz Stop 2.405 GHz
CH78 No hopping mode	Spec Ref • Att Coun • 1Pk 1 10 db • 20 db • -20 db • -30 db • -50 db • -50 db • -50 db • -70 db • -70 db	t 500/500 Max Max Max M1[1] M1 M2[1] M4 M4 M4 M4 M4 M4 M4 M4 M4 M4	2.01 dBm 2.4801490 GHz -56.66 dBm 2.4835000 GHz 

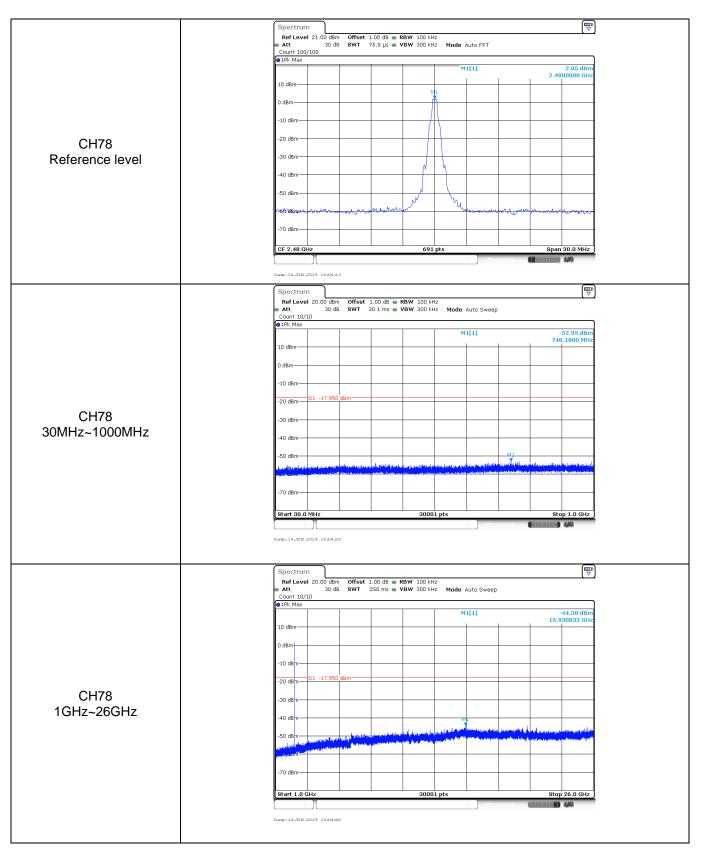
# Report No.: CHTEW19070003

Page: 43 of 58

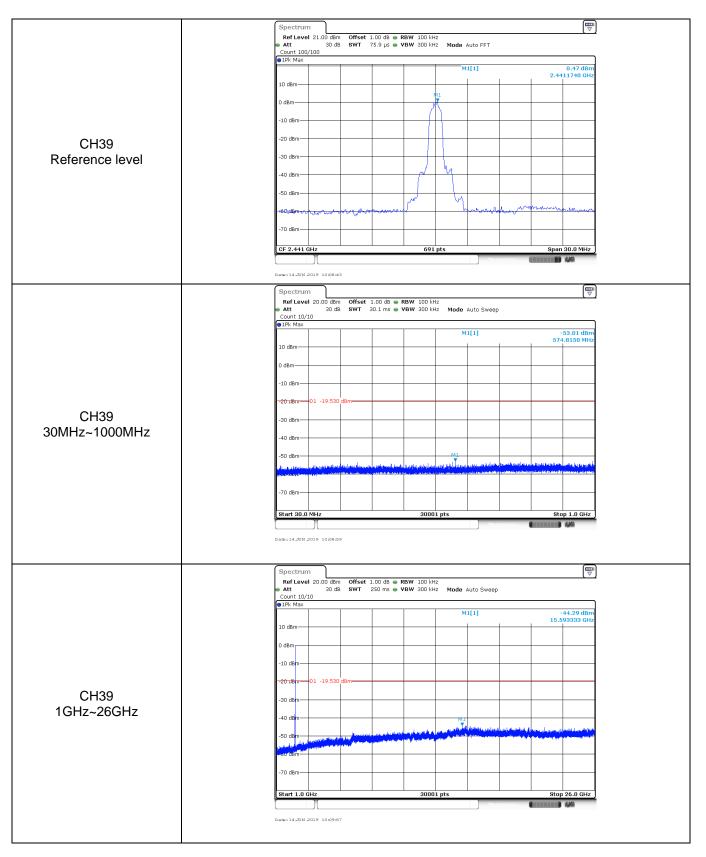
	Spectrum         Image: Constraint of the constrain
CH78 Hoppig mode	-40 dBm
	Start 2.478 GHz         691 pts         Stop 2.5 GHz
	Marker         Yuppe         Ref         X-value         Y-value         Function         Function Result           M1         1         2.478016 GHz         1.07 dbm         Function         Function Result           M2         1         2.4835 GHz         -59.63 dbm         Function         Function           M3         1         2.493007 GHz         -59.63 dbm         Function         Function           M4         1         2.4990007 GHz         -57.47 dbm         Function         Function

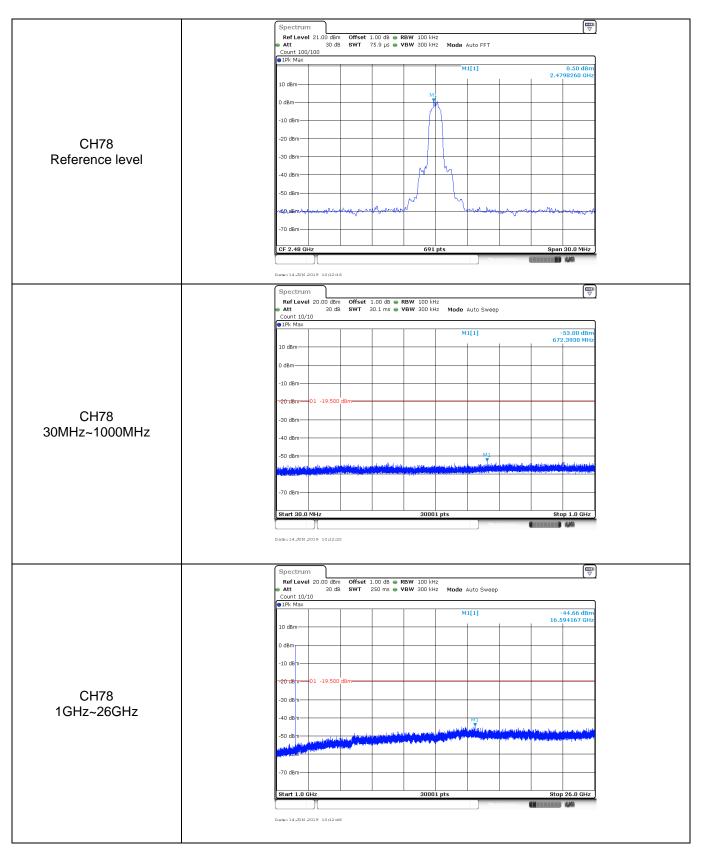
fest Item:	SE		Modula	GFSK			
		Spectrum					
		Att 30 dB	Offset 1.00 dB ● SWT 75.9 µs ●	RBW 100 kHz VBW 300 kHz	Mode Auto FFT		
		Count 100/100 1Pk Max	,				
					M1[1]	2.	2.46 dBm 4019570 GHz
		10 dBm		м			
		0 dBm					
		-10 dBm		<u>+</u> /∖∖			
		-20 d8m		+ $+$			
CH00		-30 dBm					
Reference level				1 1	1		
		-40 dBm					
		-50 dBm		N	4		
		-60-dBmj++++++++++++++++++++++++++++++++++++	malan una m		Marshard and and and and and and and and and an	face of the second second	www.howbhood
		-70 dBm					
		CF 2.402 GHz		691 pts		Sp	an 30.0 MHz
					Measur	ing	
		Date:13.JUN 2019 16:39:26					
		Spectrum					
		Ref Level 20.00 dBm Att 30 dB	Offset 1.00 dB = SWT 30.1 ms =		Mada Auto Curra		(•)
		Count 10/10	3W1 30.1 ms	VBW 300 KH2	Mode Auto Sweep		
		TEN MOA			M1[1]		-53.45 dBm 85.9520 MHz
		10 dBm					03.5320 1112
		0 dBm					
		-10 dBm					
		-20 dBm D1 -17.540 d	Bm				
CH00							
30MHz~1000MHz		-30 dBm					
		-40 dBm					
		-50 dBm	e de ser se se se la fille de la se la s		han and anti-anti-territie		M1.
			need open period and period and period and the second second second second second second second second second s			na ha ba ana da a ta ana da ba	forest thread block the provider of the path
		-70 dBm					
		Start 30.0 MHz		30001 pt	S Measur	ina (111111	itop 1.0 GHz
		Data:13.JUN.2019 16:39:42					
		Spectrum					
		Att 30 dB	Offset 1.00 dB = SWT 250 ms =	RBW 100 kHz VBW 300 kHz	Mode Auto Sweep		
		Count 10/10 Pk Max					]
					M1[1]	15	-44.39 dBm i.897500 GHz
		10 dBm					
		0 dBm					
		-10 dBm					
		-20 dBm D1 -17.540 d	Bm				
CH00		-30 dBm					
1GHz~26GHz							
		-40 dBm			رور المراجع الم	a dia manjara di matana di sa	فالا بتعافر خلاء لير أبتم فأردته
		-50 de m			a sector de la companya de la compa	and the second	a the sector and the sector
		A REAL PROPERTY AND A REAL					
		-70 dBm					
		Stat 1.0 GUT					an 06 0 011-
	1	Start 1.0 GHz		30001 pt	.s	St	op 26.0 GHz
					Measur	ing	



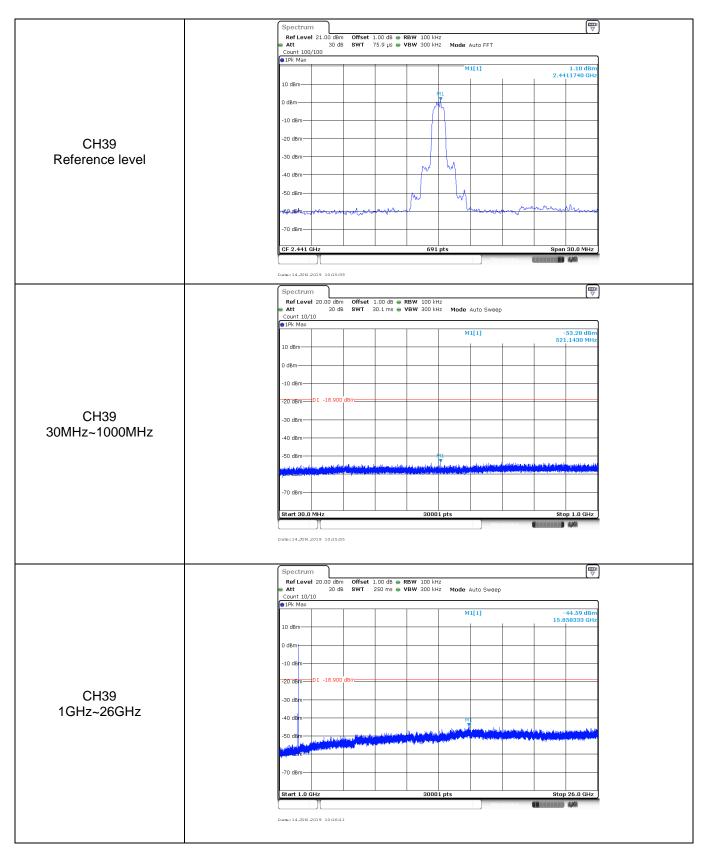


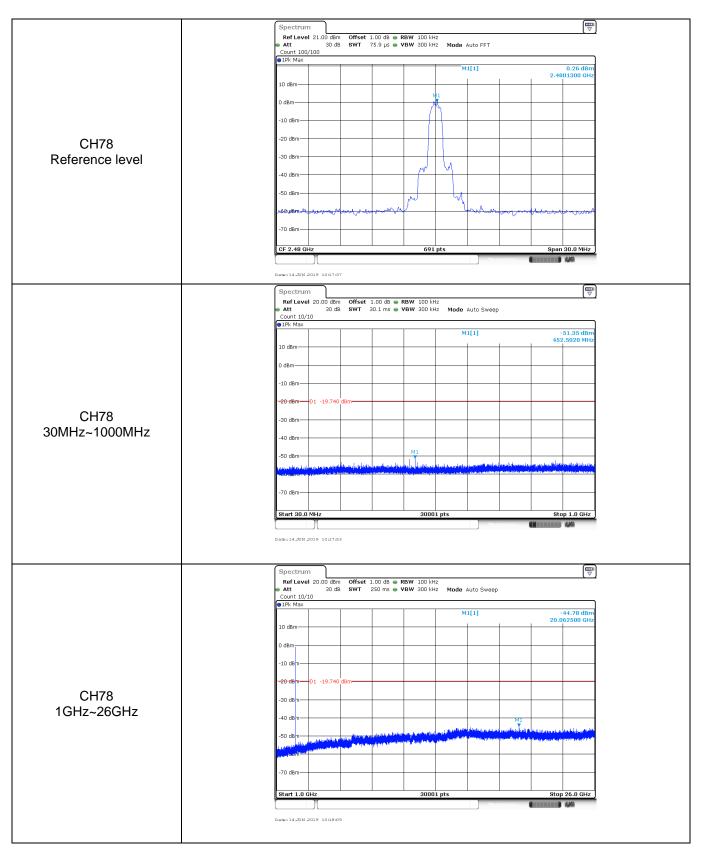
est Item:	SE		Modu	ation t	ype:	-	π/4DQPS
		Spectrum					
		Ref Level 21.00 dBm Att 30 dB Count 100/100	Offset 1.00 dB SWT 75.9 μs			т	
		IPk Max			M1[1]		0.71 0
		10 dBm					2.4021740
		0 dBm		•	11		
		-10 dBm		(			
		-20 dBm					
CH00		-30 dBm					
Reference level		-40 dBm		and	L.		
		-50 dBm		[m	Ч.,		
		AD dBm way to the	and syndremetrys	land of		morre	www.thurst.thur
		-70 dBm					
		CF 2.402 GHz		691	pts	Measuring	Span 30.0 M
		Date: 14.JUN 2019 10:06:55					
		Spectrum	0.4		_		
		Ref Level 20.00 dBm Att 30 dB Count 10/10	Offset 1.00 dB SWT 30.1 ms (	• KBW 100 kH • VBW 300 kH	z z Mode Auto S	weep	
		●1Pk Max			M1[1]		-53.32 0
		10 dBm					780.4150
		0 dBm		_			
		-10 dBm					
		-20 dBm-D1 -19.290 (	iBm	_			
CH00		-30 dBm					
30MHz~1000MHz		-40 dBm					
		-50 dBm				847	
		all a solution of the states in a state	na rise lighter description (see		والمستعلمية والمراجع	In the same of the long of the	Antholis International Antholis
		-70 dBm					
		Start 30.0 MHz		3000	1 pts	Measuring	Stop 1.0 G
		Date: 14.JUN .2019 10:07:11					
		Spectrum					
		Ref Level 20.00 dBm Att 30 dB Count 10/10				veep	
		● 1Pk Max			M1[1]		-45.18 (
		10 dBm					19.380000
		0 dBm					
		-10 dgm					
		-20 dgm-D1 -19.290 (	IBm				
CH00		-30 dgm					
1GHz~26GHz							
		-40 d8m	and the states	turna turnala	and a state of the	M1	and the second second second second
		-50 dBm			an a karanta da karaya	in a subsection of the	a da takang panakan dapat panén Dhawa s
		A STATE OF CONTRACTOR OF CONTRACT					
		-70 dBm					
		Start 1.0 GHz		3000	1 pts		Stop 26.0 G
						Measuring	<b>1</b>
		Date: 14.JUN 2019 10:07:27					





est Item:	SE		Modul	ation type:	8	DPSK				
		Spectrum								
		Ref Level 21.00 dBn Att 30 db	n Offset 1.00 dB 👄 B SWT 75.9 µs 👄	RBW 100 kHz VBW 300 kHz Mode Auto	FFT					
		Count 100/100								
				M1[1]	1 1	1.40 dBm 2.4018260 GHz				
		10 dBm		M						
		0 dBm		1 14						
		-10 dBm								
		-20 dBm								
CH00		-30 dBm								
Reference level		-40 dBm		W M						
		-50 dBm								
				where where						
		h601d8pp+1-95-pp-1-	and a second second	-10	a strand all a against	ale and the strength of the st				
		-70 dBm								
		CF 2.402 GHz		691 pts		Span 30.0 MHz				
					Measuring	490				
		Date:14.JUN.2019 10:14:0	4							
		Cu a structure								
		Ref Level 20.00 dBn	n Offset 1.00 dB 🖷	RBW 100 kHz		$\nabla$				
		Count 10/10	3 SWT 30.1 ms 🖷	VBW 300 kHz Mode Auto	Sweep					
		●1Pk Max		M1[1]		-52.70 dBm				
		10 dBm				923.7440 MHz				
		0 dBm								
		-10 dBm								
		-20 dBm D1 -18.600	dBm							
CH00										
BOMHz~1000MHz		-30 dBm								
		-40 dBm								
		-50 dBm	The last of the		و ما بين بالغرابية. من المربية	M1				
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		-70 dBm								
		Start 30.0 MHz		30001 pts	Measuring	Stop 1.0 GHz				
		Data:14.JUN.2019 10:14:1	9							
		Spectrum								
		RefLevel 20.00 dBn Att 30 db		RBW 100 kHz VBW 300 kHz Mode Auto	Sweep					
		Count 10/10 • 1Pk Max								
				M1[1]		-44.84 dBm 25.625833 GHz				
		10 dBm								
		0 dBm								
		-10 dBm								
		-20 dBm-D1 -18.600	dBm							
CH00		-30 dBm								
1GHz~26GHz		-40 dEm				5.41				
		-50 dgm	un and and a set	سالعه حفوسا الاروب وبالمالية والخالية	يريلار أويعم معتقد معتقر ورو	Mandalus, inclusion				
		-SU dem	and the first state of the second state of the		n a h-chaig dh' an tarth lla chain, dh ba	i fan di gwango ny katalani dipartipi di				
		A MARKEN (S) STO								
		-70 dBm								
		Start 1.0 GHz		30001 pts		Stop 26.0 GHz				
		ature 1.0 driz		00001 pts		300p 20.0 GHz j				
					Measuring 📗					





# 5.11. Spurious Emissions (radiated)

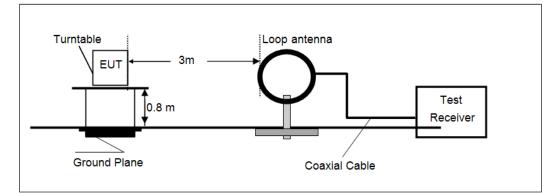
# <u>LIMIT</u>

# FCC CFR Title 47 Part 15 Subpart C Section 15.209

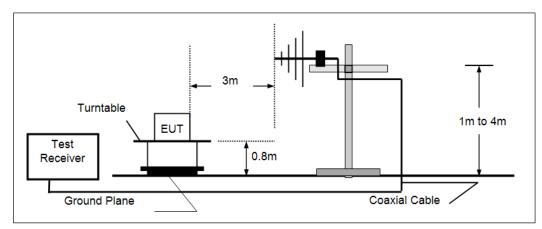
Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

# **TEST CONFIGURATION**

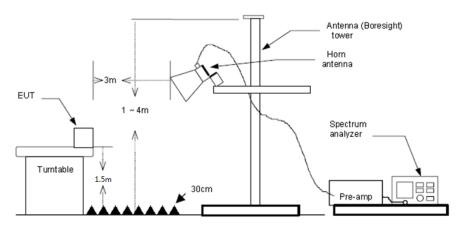
Below 30 MHz



# > 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 detectoris 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 10<sup>th</sup> 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

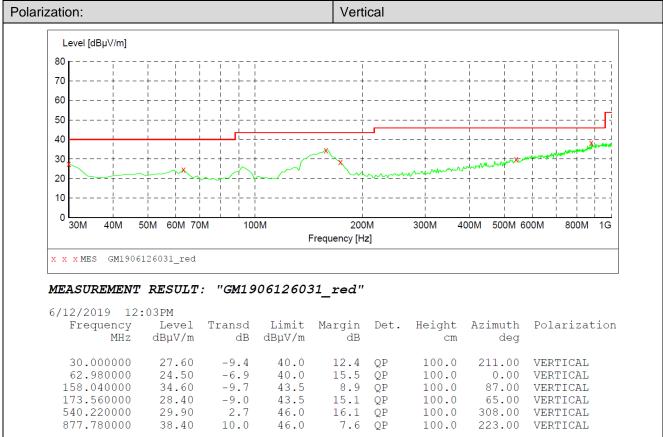
#### Note:

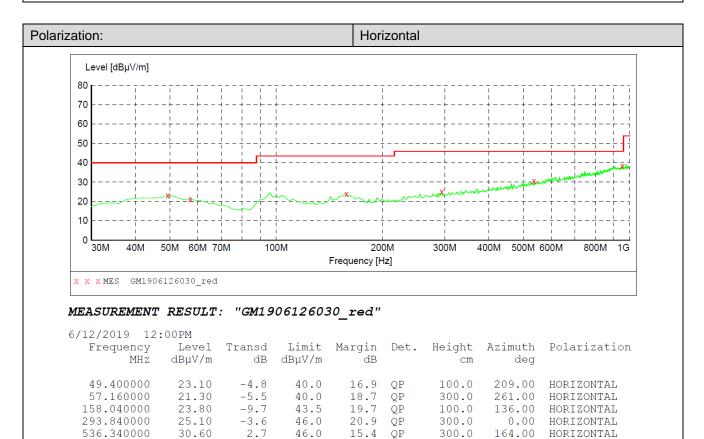
- 1) Final Level = Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3) Below 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation High channel which it was worst 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





38.30

10.9

46.0

7.7

QP

953.440000

38.00 HORIZONTAL

100.0

$\triangleright$	1	GHz	~	25	GHz
-				20	

	CH00											
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value			
2810.85	34.20	28.14	8.92	35.23	36.03	74.00	-37.97	Vertical	Peak			
3653.46	35.17	29.30	9.99	37.93	36.53	74.00	-37.47	Vertical	Peak			
4809.50	36.76	31.58	11.74	36.27	43.81	74.00	-30.19	Vertical	Peak			
8022.46	31.52	37.08	15.60	34.40	49.80	74.00	-24.20	Vertical	Peak			
3168.08	35.54	28.80	9.35	37.61	36.08	74.00	-37.92	Horizontal	Peak			
4570.77	33.25	30.84	11.32	36.51	38.90	74.00	-35.10	Horizontal	Peak			
7045.74	31.42	35.44	14.50	34.65	46.71	74.00	-27.29	Horizontal	Peak			
8615.13	32.01	37.39	15.93	34.48	50.85	74.00	-23.15	Horizontal	Peak			

CH39									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2810.85	33.73	28.14	8.92	35.23	35.56	74.00	-38.44	Vertical	Peak
4883.52	35.21	31.43	11.68	35.97	42.35	74.00	-31.65	Vertical	Peak
7357.33	31.76	36.30	14.66	34.72	48.00	74.00	-26.00	Vertical	Peak
8022.46	32.08	37.08	15.60	34.40	50.36	74.00	-23.64	Vertical	Peak
2854.11	33.67	28.32	8.90	36.20	34.69	74.00	-39.31	Horizontal	Peak
4321.84	33.95	30.27	10.93	37.11	38.04	74.00	-35.96	Horizontal	Peak
4883.52	33.67	31.43	11.68	35.97	40.81	74.00	-33.19	Horizontal	Peak
8042.90	31.67	37.06	15.67	34.37	50.03	74.00	-23.97	Horizontal	Peak

CH78										
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value	
2124.37	35.87	26.90	7.47	38.08	32.16	74.00	-41.84	Vertical	Peak	
3003.17	35.73	28.61	8.96	37.70	35.60	74.00	-38.40	Vertical	Peak	
4958.68	35.29	31.46	11.81	35.69	42.87	74.00	-31.13	Vertical	Peak	
7117.84	31.37	35.71	14.51	34.69	46.90	74.00	-27.10	Vertical	Peak	
3216.84	35.21	28.70	9.48	37.38	36.01	74.00	-37.99	Horizontal	Peak	
5138.58	32.57	31.74	12.04	34.94	41.41	74.00	-32.59	Horizontal	Peak	
6172.20	32.15	32.79	13.39	35.34	42.99	74.00	-31.01	Horizontal	Peak	
8063.40	31.36	37.04	15.69	34.35	49.74	74.00	-24.26	Horizontal	Peak	

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss - Preamplifier 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.

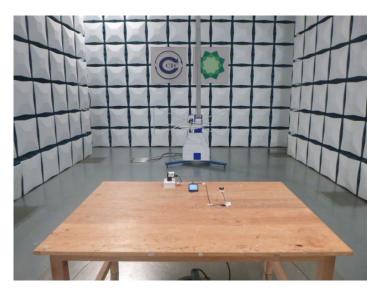
# 6. TEST SETUP PHOTOS

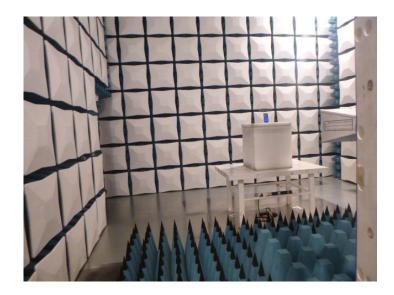
# Conducted Emissions (AC Mains)



#### **Radiated Emissions**







# 7. EXTERANAL AND INTERNAL PHOTOS

Reference to the test report No. CHTEW19070001.

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