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Report Reference No:	TRE1709016404 R/C: 21830			
FCC ID	ZSW-30-050			
Applicant's name:	b mobile HK Limited			
Address:	Flat 18; 14/F Block 1; Golden Industrial Building;16-26 Kwai Street; Kwai Chung; New Territories; Hong Kong.	Tak		
Manufacturer	b mobile HK Limited			
Address:	Flat 18; 14/F Block 1; Golden Industrial Building;16-26 Kwai Street; Kwai Chung; New Territories; Hong Kong.	Tak		
Test item description:	Mobile Phone			
Trade Mark	Bmobile			
Model/Type reference:	AX1071			
Listed Model(s)	AX1072			
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.247			
Date of receipt of test sample:	Sep.20, 2017			
Date of testing	Sep.21, 2017 - Oct.09, 2017			
Date of issue	Oct.10, 2017			
Result	PASS			
Compiled by ( Position+Printed name+Signature):	File administrators Candy Liu	,		
Supervised by (Position+Printed name+Signature):	Project Engineer : Edward Pan Bolward. Pan Hemster			
Approved by (Position+Printed name+Signature):	RF Manager Hans Hu			
Testing Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.			
Address:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China			

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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

Version No.	Date of issue	Description
00	Oct.10, 2017	Original

# 2. TEST DESCRIPTION

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

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 S 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.:	AX1071
Listed Model(s):	AX1072
IMEI 1:	355408080203579
IMEI 2:	355408080203868
Power supply:	DC 3.8V From exchange battery
Adapter information:	Input: 100-240Va.c., 50/60Hz, 0.2A Output: 5Vd.c.,1A
Hardware version:	V00
Software version:	MX2135FA_B25_E5017_SA11_N_V01_170906 Web Sep 6 17:20:53 CST 2017
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:	0.5 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 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:	/	
	7	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.:5377B-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.: 5377B-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	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.39 dB	(1)
Radiated Emissions 30~1000MHz	4.24 dB	(1)
Radiated Emissions 1~18GHz	5.16 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth		(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

Cond	Conducted Emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2016/11/13	
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	100038	2016/11/13	
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2016/11/13	
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	-	-	

Radiated Emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI test receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
2	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2016/11/13
3	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2016/11/13
4	Horn antenna	ShwarzBeck	9120D	1011	2016/11/13
5	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2016/11/13
6	Amplifier	Sonoma	310N	E009-13	2016/11/13
7	JS Amplifier	Rohde&Schwarz	JS4-00101800- 28-5A	F201504	2016/11/13
8	Amplifier	Compliance Direction systems	PAP1-4060	120	2016/11/13
9	High pass filter	Compliance Direction systems	BSU-6	34202	2016/11/13
10	EMI test Software	Rohde&Schwarz	ESK1	-	-
11	EMI test Software	Audix	E3	-	-
12	TURNTABLE	MATURO	TT2.0	-	-
13	ANTENNA MAST	MATURO	TAM-4.0-P	-	-

RF Co	onducted methods				
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2016/11/13
2	MXA Signal Analyzer	Agilent Technologies	N9020A	MY5050187	2016/11/13

The Cal.Interval was one year.

# 5. TEST CONDITIONS AND RESULTS

## 5.1. Antenna requirement

## <u>Requirement</u>

#### 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)

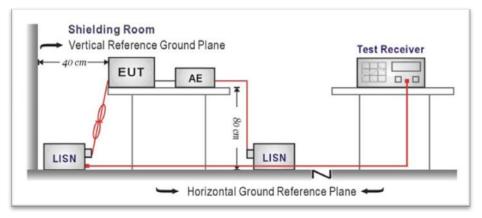
## <u>LIMIT</u>

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

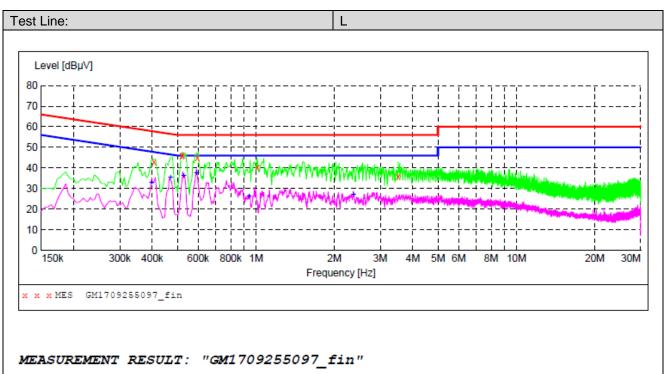
- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm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

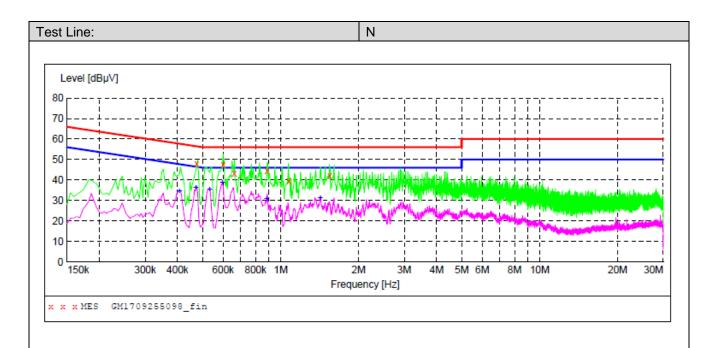


9/25/2017 10:30PM

Frequency MHz	Level dBµV		Limit dBµV	Margin dB	Detector	Line	PE
0.406500 0.519000 0.523500 0.595500 1.014000 3.520500	42.90 45.90 46.30 44.80 40.20 35.70	10.2 10.2 10.2 10.2 10.2 10.2	58 56 56 56 56 56	14.8 10.1 9.7 11.2 15.8 20.3	QP QP QP QP	L1 L1 L1 L1 L1 L1	GND GND GND GND GND GND

MEASUREMENT RESULT: "GM1709255097\_fin2"

9/25/2017 1 Frequency MHz	Level	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.397500	32.90	10.2	48	15.0	AV	L1	GND
0.469500	35.50	10.2	47	11.0	AV	L1	GND
0.528000	36.30	10.2	46	9.7	AV	L1	GND
0.591000	37.40	10.2	46	8.6	AV	L1	GND
0.942000	26.20	10.2	46	19.8	AV	L1	GND
2.368500	26.90	10.2	46	19.1	AV	L1	GND



#### MEASUREMENT RESULT: "GM1709255098\_fin"

9/25/2017 10:33PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.474000	47.70	10.2	56	8.7	QP	N	GND
0.600000	47.40	10.2	56	8.6	QP	N	GND
0.663000	43.20	10.2	56	12.8	QP	N	GND
0.888000	44.60	10.1	56	11.4	QP	N	GND
1.077000	39.50	10.2	56	16.5	QP	N	GND
1.549500	42.00	10.2	56	14.0	QP	N	GND

## MEASUREMENT RESULT: "GM1709255098\_fin2"

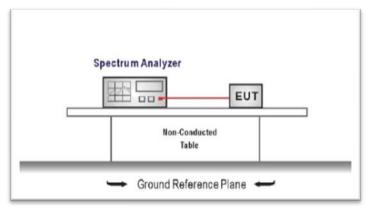
9/25/2017 10: Frequency MHz		Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.406500	34.60	10.2	48	13.1	AV	N	GND
0.469500	36.20	10.2	47	10.3	AV	N	GND
0.532500	35.20	10.2	46	10.8	AV	Ν	GND
0.595500	38.60	10.2	46	7.4	AV	Ν	GND
0.883500	30.60	10.1	46	15.4	AV	N	GND
1.423500	31.30	10.2	46	14.7	AV	Ν	GND

## 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
- 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.

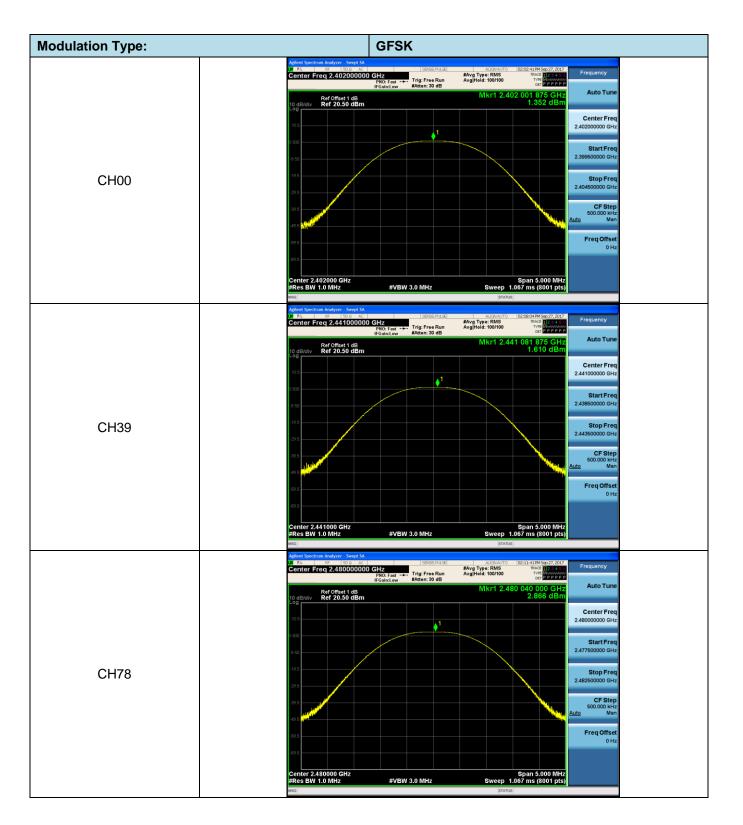
#### TEST MODE:

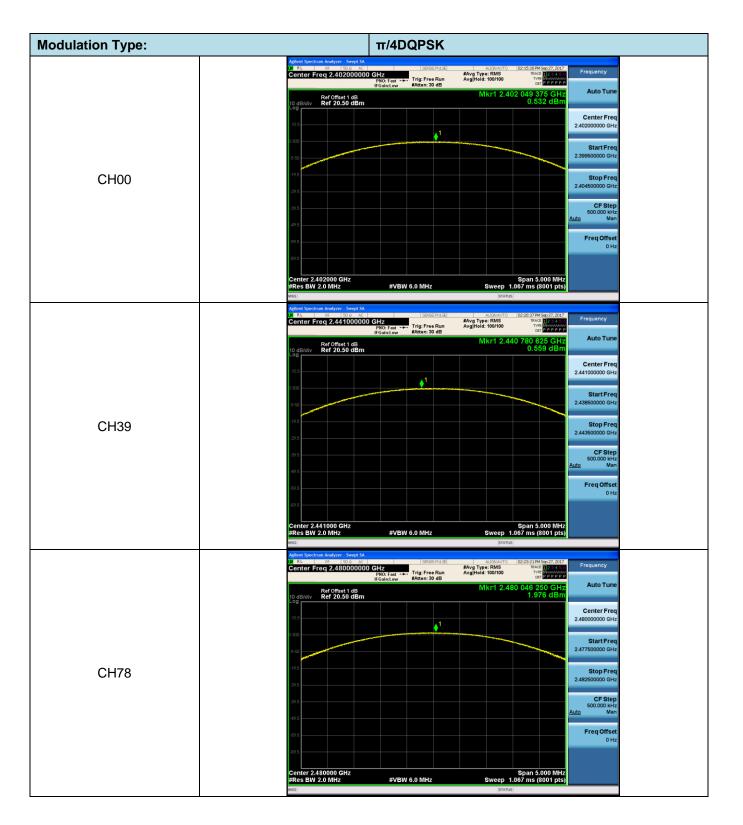
Please refer to the clause 3.3

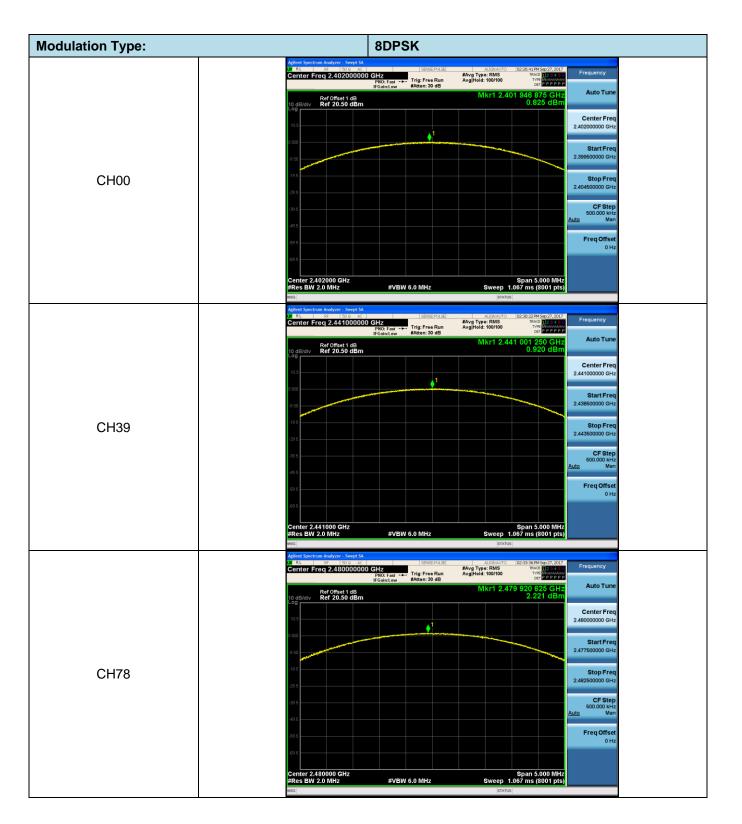
#### TEST RESULTS

#### ☑ Passed □ Not Applicable

Modulation type	Channel	Output power (dBm)	Limit (dBm)	Result
	00	1.352		
GFSK	39	1.610	≤ 30.00	Pass
	78	2.866		
	00	0.532		
π/4DQPSK	39	0.559	≤ 21.00	Pass
	78	1.976		
	00	0.825		
8DPSK	39	0.920	≤ 21.00	Pass
	78	2.221		





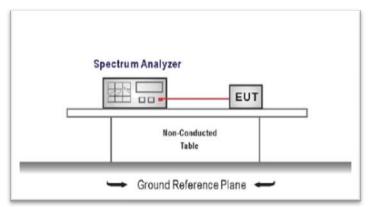


## 5.4. 20 dB Bandwidth

## 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  $\ge$  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:

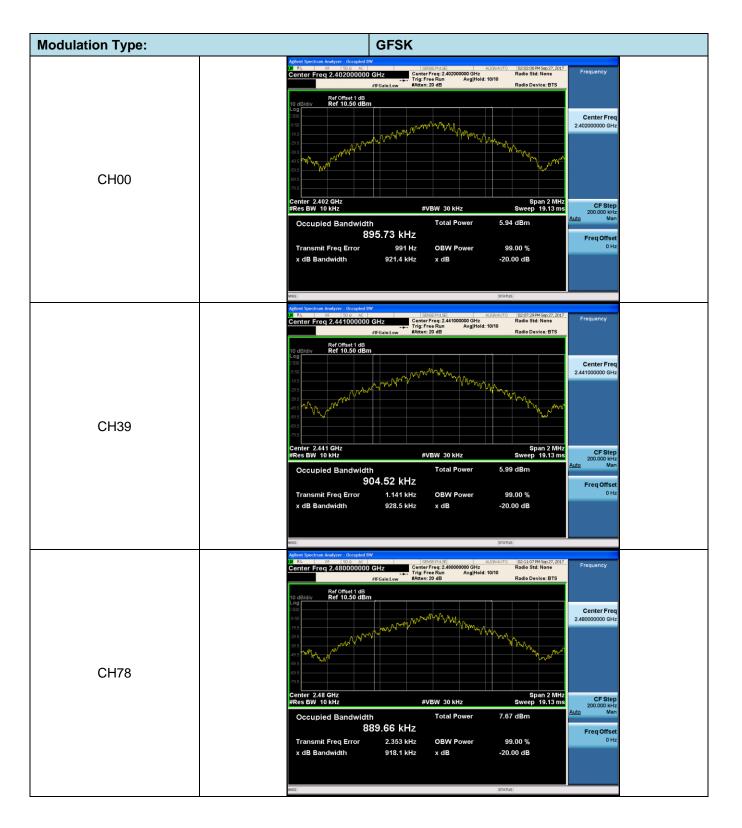
Please refer to the clause 3.3

## TEST RESULTS

**Passed** 

#### Not Applicable

Modulation type	Channel	20 dB Bandwidth (MHz)	Limit (MHz)	Result
	00	0.9214		
GFSK	39	0.9285	-	Pass
	78	0.9181		
	00	1.248		
π/4DQPSK	39	1.341	-	Pass
	78	1.318		
	00	1.330		
8DPSK	39	1.292	-	Pass
	78	1.325		





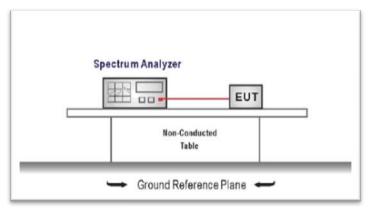


## 5.5. Carrier Frequencies Separation

## 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 minimum of 25 kHz or the 2/3\*20 dB bandwidth of the hopping channel, whichever is greater.

### 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 = 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	1.086	≥0.929	Pass
π/4DQPSK	39	1.033	≥0.894	Pass
8DPSK	39	1.098	≥0.887	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

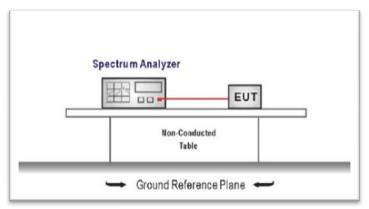
	Agilent Spectrum Analyzer - Swept SA
	Off         RF         S0 & AC         SBNSE:PULSE         ALIGN AUTO         02:45:20 PM Sip 27, 2017           Marker 1 1.086250000 MHz         #Avg Type: RMS         TRACE         Peak Search
	IFGainLow Atten: 26 dB Detricted Ref Offset 1 dB △Mkr1 1.086 25 MHz
	10 dBldiv Ref 16.50 dBm U.141 dB
	125
GFSK	415 And
	Start 2.440500 GHz         Stop 2.442500 GHz           #Res BW 30 kHz         #VBW 100 kHz         Sweep 2.133 ms (8001 pts)
	MSR MODE TRC SL         X         Y         FUNCTION         PUNCTION         PUNCTION WIDTH         PUNCTION VALUE           1         0.2         1         f         (Δ)         1.086/25 MHz         (Δ)         0.141 dB         2           2         F         1         f         2.440 907 50 GHz         -1.466 dBm         3         3         4
	Solution     Solut
	10 11 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
	Aglinit Spectrum, Analyzer, Swept SA         Spectrum (A)         Spectrum (A)
	Trig-FreeRun AvgiHeid>100/100 trve freePerer IFGaint.ow AvgiHeid>100/100 trve freePerer Atten: 26 dB ΔMkr1 1.032 75 MHz 10 dB/div Ref 16.50 dBm -4.158 dB
	6.00 6.00 3.00 X₀ ↓1Δ2 Next Pk Right
π/4DQPSK	AUS 63.5 63.5 7.5
	Start 2.440500 GHz #Kes BW 30 kHz #VBW 100 kHz Sweep 2.133 ms (8001 pts) Mkr⊸CF
	MRR MODE         TRC:         X         Y         FUNCTION
	9 10 11 < ₩60 5 10 10 10 10 10 10 10 10 10 10 10 10 10
	Adjent Spectrum Analyzer         Sampt SA           III         R4         FP         S0 G         ALGN AUTO         0255:22 PM Sip 27, 2017         Dank Canroh
	Marker 1         1.098/250000         HZ         Marker 1
	6.50 162 Next Pk Right
	135 335 455
8DPSK	As Marker Delta
	Start 2.440500 GHz         Stop 2.442500 GHz           #Res BW 30 kHz         #VBW 100 kHz         Sweep 2.133 ms (8001 pts)           MRR MODE TRC SL         X         Y         Runction worth         Runction worth         Runction worth
	More Toole : Tool : Call         X         Y         Y         F </td
	0 0 10 11 11 11 11 11 11 11 10 10
	Ka Status

## 5.6. Hopping Channel Number

## <u>LIMIT</u>

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		

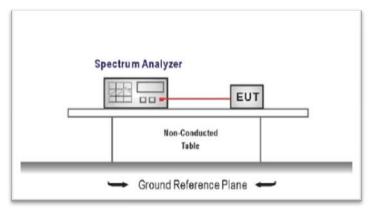
	Argineri Spectrum Analyzer - Swept SA         SBR6E.PL/SE         ALIOLAUTO         102:43:57 M Sep 27, 2017           D         R.L         6F         50:0         A.C         SBR6E.PL/SE         ALIOLAUTO         102:43:57 M Sep 27, 2017
	02 RL 17 177-959336477 MHz Marker 1 77-959336477 MHz Pt0: Fat → Trig: Free Run Avg Type: RMS 1944 1945 1944 1945 1944 1945 1944 1945 1944 1945 1944 1945 1945
	Ref Offset 1 dB         ΔMkr1 77.959 MHz         NextPeak           10 dB/div         Ref 16.50 dBm         1.392 dB
	6 99 6 90 9 90 13 5 X2 Next Pk Right
	-225 
GFSK	ASS ASS ASS ASS ASS ASS ASS ASS
	Start 2.40000 GHz #Res BW 1.0 MHz         Stop 2.48350 GHz #VBW 3.0 MHz         Stop 2.48350 GHz Sweep 1.113 ms (8350 pts)           MKr—CF           MKR MODE TRC SCL         X         Y         Function worth         Function value         Function value
	1         Δ2         1         Γ         (Δ)         77.959 MHz         (Δ)         1.392 dB            2         F         1         7         2.401 960 GHz         1.212 dBm
	0     0
	1450] Adjent Spectrum Analyzer - Swept SA. Of R. 147 [50:0:42] ASSISTER ALSE ALSOLATIO [02:47-4719459222,2037
	Marker 178,019343634 MHz #Avg Type: RMS that a the sector of the sector
	Ref offield 1 dB 1,649 dB 2.00 2.
	135 235 335
π/4DQPSK	40.5 43.5 43.5 43.5 43.5 Marker Delta
	735 Start 2.40000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.113 ms (8350 pts) Mkr→CF
	McR. Mode: The Set.         X         Y         Function         Function worth         Function water           1         Δ2         1         f         (Δ)         1.649 dB         2         F         1         f         2.401 960 GHz         -0.349 dB
	6 More Market Control
	10 1 of 2 < 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
	Addred Spectrum Analyzer, Smith Street State Sta
	PR0: Fast →→ Trig: Free Run Avg Held: 100/100 1197 PPPPPP IFGaint.ew #Atten: 26 dB ΔMKr1 78,189 MHz 10 dBIdty Ref 16.50 dBm 1.815 dB
	6.00 (30) (135)
	225
8DPSK	435 0
	Start 2.40000 GHz #Res BW 1.0 MHz         Stop 2.48350 GHz #VBW 3.0 MHz         Stop 2.48350 GHz Sweep 1.113 ms (8350 pts)           MKr—CF           MKR, MORE, TRC, SQ.         x         Y         Function worth         Function value         C
	1         Ω2         1         f         (Δ)         78 189 MHz         (Δ)         1.816 dB         4         4         4         5         5         5         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         7         78 189 MHz         0.343 dBm         6         7 <th7< th=""> <th7< th=""> <th7< th=""> <th7< th=""></th7<></th7<></th7<></th7<>
	7 9 9 10 11
	K B

## 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	Dwell time (Second)	Limit (Second)	Result
	DH1	0.118		
GFSK	DH3	0.261	≤ 0.40	Pass
	DH5	0.306		
	2DH1	0.122		
π/4DQPSK	2DH3	0.261	≤ 0.40	Pass
	2DH5	0.307		
	3DH1	0.122		
8DPSK	3DH3	0.261	≤ 0.40	Pass
	3DH5	0.307		

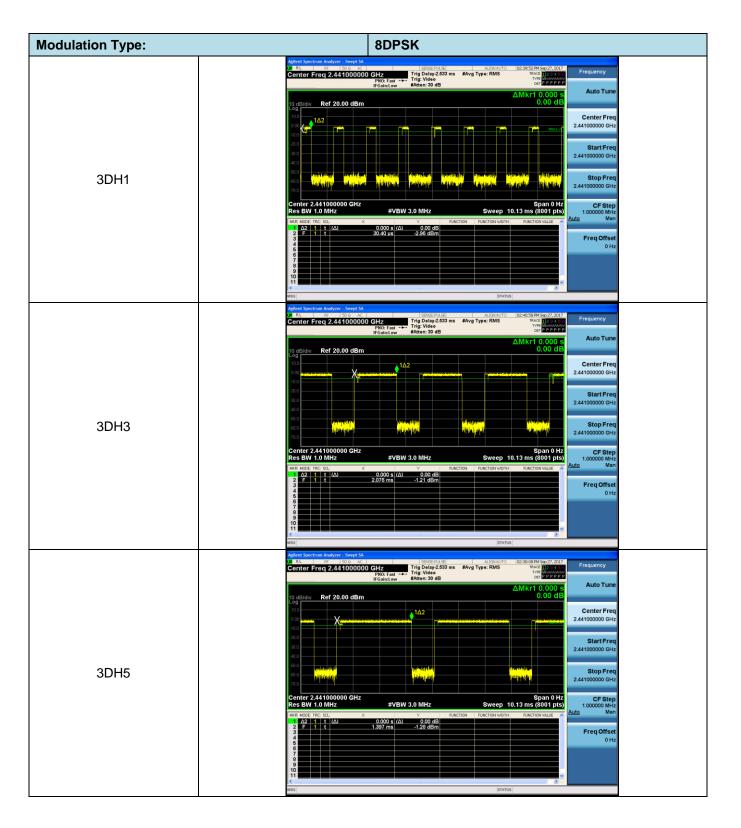
Note:

1. We have tested all mode at high, middle and low channel, and recoreded worst case at middle channel.

2. Dwell time=Pulse time (ms) x (1600  $\div$  2  $\div$  79) x31.6 Second for DH1, 2DH1, 3DH1 Dwell time=Pulse time (ms) x (1600  $\div$  4  $\div$  79) x31.6 Second for DH3, 2DH3, 3DH3 Dwell time=Pulse time (ms) x (1600  $\div$  6  $\div$  79) x31.6 Second for DH5, 2DH5, 3DH5

Iodulation Type:	GFSK
DH1	Allerit System         Solution
DH3	Older         Spect PLASE         ALXALITIO         D0227-ABM Spec27, 2007         Frequency           Center Freq 2.44100000 GHz         Trig biley2.53 ms         #Avg Type: RMS         Invo: Frequency         Auto Tune           10 dBrain         0.00 dB         0.00 dB         0.00 dB         0.00 dB         Center Freq 2.44100000 GHz         Auto Tune           10 dBrain         0.00 dB         0.00 dB         0.00 dB         0.00 dB         0.00 dB         Center Freq 2.44100000 GHz         Center Freq 2.44100000 GHz         Center Freq 2.441000000 GHz         Start Freq 0.15 ms         Start Freq 0.15 ms
DH5	Applied     Source     Source<





# 5.8. Pseudorandom Frequency Hopping Sequence

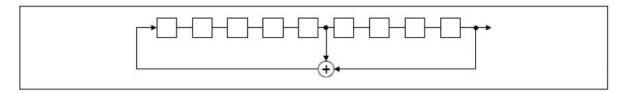
## <u>LIMIT</u>

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	77
٦				 1			1		 Γ	Г	Г
				1			i i				L
				1			1		1		L
				 1			<u>i</u>		 L		L

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.

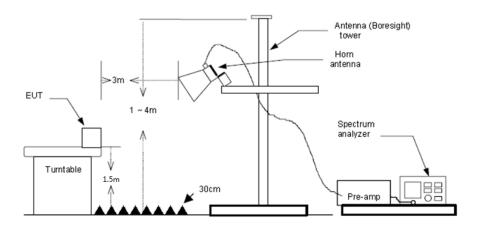
## 5.9. Restricted band (radiated)

### <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

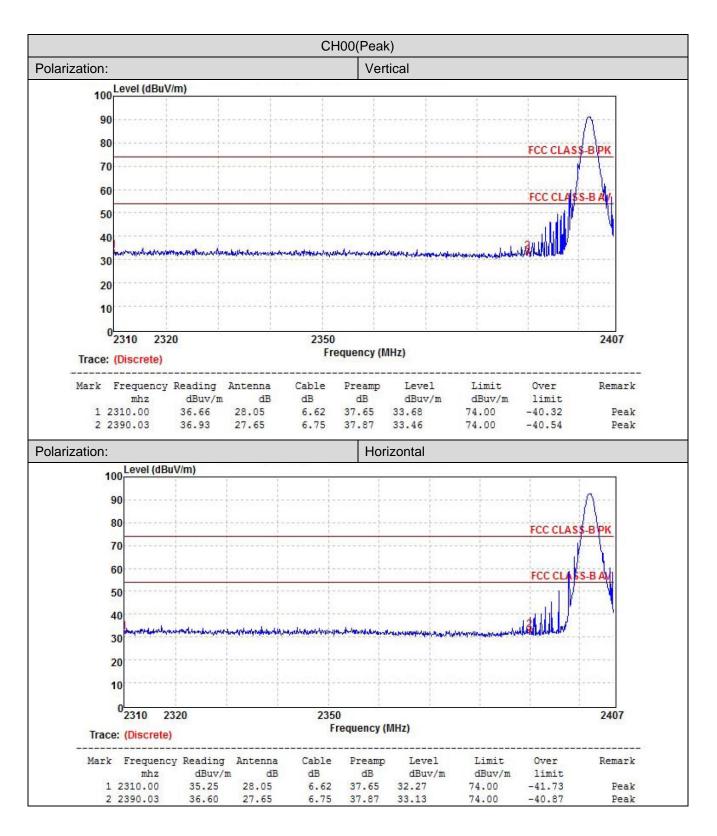
☑ Passed □ Not Applicable

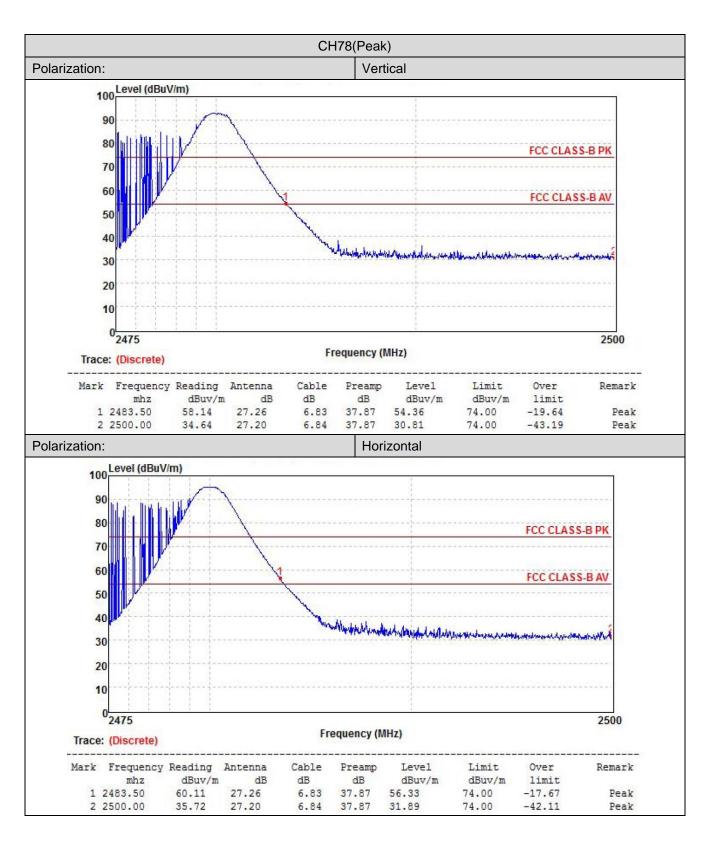
Note:

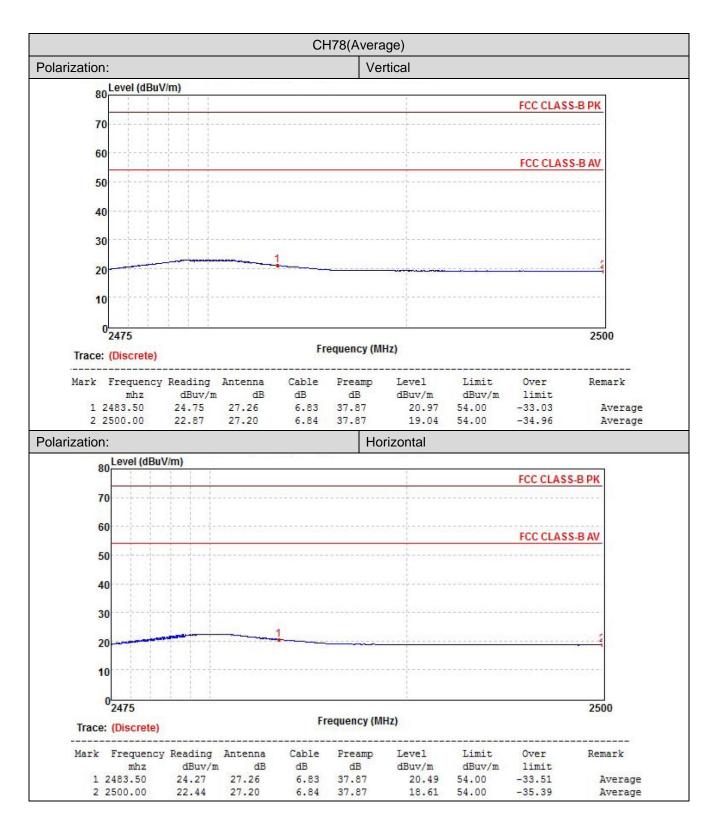
- 1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
- 2) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.
- 3) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument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

					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
2310.00	36.66	28.05	6.62	37.65	33.68	74.00	-40.32	Vertical	Peak
2390.03	36.93	27.65	6.75	37.87	33.46	74.00	-40.54	Vertical	Peak
2310.00	35.25	28.05	6.62	37.65	32.27	74.00	-41.73	Horizontal	Peak
2390.03	36.60	27.65	6.75	37.87	33.13	74.00	-40.87	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
2483.50	58.14	27.26	6.83	37.87	54.36	74.00	-19.64	Vertical	Peak
2500.00	34.64	27.20	6.84	37.87	30.81	74.00	-43.19	Vertical	Peak
2483.50	60.11	27.26	6.83	37.87	56.33	74.00	-17.67	Horizontal	Peak
2500.00	35.72	27.20	6.84	37.87	31.89	74.00	-42.11	Horizontal	Peak
2483.50	24.75	27.26	6.83	37.87	20.97	54.00	-33.03	Vertical	Average
2500.00	22.87	27.20	6.84	37.87	19.04	54.00	-34.96	Vertical	Average
2483.50	24.27	27.26	6.83	37.87	20.49	54.00	-33.51	Horizontal	Average
2500.00	22.44	27.20	6.84	37.87	18.61	54.00	-35.39	Horizontal	Average





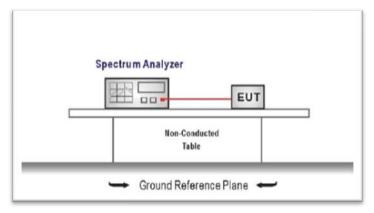


# 5.10. Band edge and Spurious Emissions (conducted)

## <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 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
   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

fest Item:	Band edge	Modulat	ion type:	GFSK
CH00 No hopping mode		Ref Offset 1 dB         Trig: Fr           10         B30	se Run 30 dB 20 dB	2220450022000 The property 24333 GHz 24333 GHz 24353 GHz 24550000 GHz 240500000 GHz 2405000000 GHz 2405000000 GHz 240500000000 GHz 2405000000 GHz 2405000000 GHz 24050000000 GHz 24050000000 GHz 24050000000 GHz 240500000000 GHz 240500000000 GHz 240500000000 GHz 24050000000000 GHz 24050000000 GHz 240500000000 GHz 240500000000 GHz 240500000000 GHz 2405000000000 GHz 24050000000 GHz 240500000000 GHz 240500000000 GHz 240500000000 GHz 2405000000000 GHz 2405000000000 GHz 240500000000 GHz 240500000000 GHz 24050000000000 GHz 240500000000000 GHz 240500000000000000 GHz 240500000000000 GHz 240500000000000000000000000000000000000
CH00 Hopping mode		Ref         Offset 1 dB         IE         Trig. F           100         B00 addition         FR00 addition         Trig. F           Marker 1 2.40405000000 GHz         FR00 fault         Trig. F           10 dB/ddy         Ref Offset 1 dB         Trig. F           10 dB/ddy         Ref Offset 1 dB         Trig. F           10 dB/ddy         Ref 1 6.50 dBm         Trig. F           10 dB/ddy         Trig. F         Trig. F           11 d	e Run Avgilteide>100/100 26 dB Mktr4 2.3 -6 -6 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7	Marker Deita
CH78 No hopping mode		Applied Texture         Server 5 Million         Server 5 Million </td <td>Mkr4 2.483</td> <td>Center Freq     2.49900000 GHz     Start Freq     2.47800000 GHz     Start Freq     2.47800000 GHz     Stop Freq     2.500000000 GHz</td>	Mkr4 2.483	Center Freq     2.49900000 GHz     Start Freq     2.47800000 GHz     Start Freq     2.47800000 GHz     Stop Freq     2.500000000 GHz

	Actient Spectrum Analyzer - Swegt SA         SERVER - LER         ALIMATIO         D02-46-34 MS 90-27, 2012           20         R.L         SF         90.0         AC         SERVER - LER         ALIMATIO         D02-46-34 MS 90-27, 2012           Marker 1 2.4790340000000 GHz         Files Free Run         #Avg Type: RMS         Trace Base of the period
	PRO: Fast Colspan="2">Trig: Free Run Avg Heid>100/100         Trig: Free Run Avg Heid>100/100
	Log 6 50 ↓ 1 3 50 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
CH78	22.5
Hopping mode	ASS ASS ASS ASS ASS ASS ASS ASS
	Start 2.47800 GHz         Stop 2.50000 GHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 2.133 ms (1001 pts)           MR Hode: Thic SQL         X         Y         Participe Mode the second sec
	2 N 1 f 2483 500 GHz 42.988 dBm 3 N 1 f 2500 000 GHz 42.2979 dBm N 1 f 2484 050 GHz 402.984 dBm 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	7 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9

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Test Item:	Band edge	Modulation type:	π/4DQPSK
CH00 No hopping mode		Log Blow Ref 20.50 dBm	Mkr4 2:349 413 GHz         Auto Tune           -57.929 dBm         Center Freq           -57.929 dBm         Start Freq           -57.920 dBm         Start Freq           -59.900000 dHz         Start Freq           9.500000 dHz         9.500000 dHz
CH00 Hopping mode		Leg 65 3.0 1.15	MARTO 102-882-894 Sep27, 2017 Marco 102-882-894 Sep27, 2017 Mkr4 2.376 595 GHz -61.128 dBm -61.128 dBm Next Pk Right -33 de Next Pk Left Marker Delta Stop 2.40500 GHz eep 9.133 ms (1001 pts) Mkr-CF
CH78 No hopping mode		e dBdiv Ref 20.50 dBm 102 102 103 104 105 105 105 105 105 105 105 105	Control         Control         Frequency           Max         The control         Frequency           Max         The control         Auto Tune           -57.797 dBm         Center Freq           -32.500         Start Freq           -32.500         Start Freq           -32.500         Start Freq           -32.500         Start Freq           -32.5000         CF Start Freq           -32.50000         CF Start Start Freq           -32.50000         CF Start Start Start Start Freq           -32.50000         CF Start

	Aginal Spectrum Analyzer         Swigt SA         SPSEPLUSE         RUSHAUTO         02-55           08         RL         6F         50.9         AC         SPSEPLUSE         RUSHAUTO         02-55           Marker 1 2.480002000000 GHz         PHOLEst         Trig: Free Run         Avg Heid>100/100           Health Sector         PHOLEst         Trig: Free Run         Avg Heid>100/100	0:07 PM Sep 27, 2017 TRACE 2 2 4 5 4 TYPE Minute Control of the PP PP PP
	Net Offset 1 dB         Mkr4 2.45           10 dB/div         Ref 16.50 dBm         -5	4 500 GHz NextPeak 9.412 dBm
		Next Pk Right
CH78		Next Pk Left
		3 Marker Delta
Hopping mode	#Res BW 100 kHz #VBW 300 kHz Sweep 2.133 r	
	MRR         MORE         TF         2.450         020         TF         0.70         EastCrim         Partcrim         Pa	Mkr→RefLvi
		More 1 of 2
	e MSG STATUS	