



TE	EST REPORT			
Report Reference No:	TRE1806021802	/C: <b>33662</b>		
FCC ID:	QRP-AZUMIAL2			
Applicant's name:	Azumi S.A			
Address	Avenida Aquilino de la Guardia o Piso 16 of. 16-01, Marbella, Ciud Panama			
Manufacturer	AZUMI HK LTD			
Address	FLAT/RM 18 BLK 1 14/F GOLDE 26 KWAI TAK STREET KWAI CI			
Test item description:	Mobile Phone			
Trade Mark	AZUMI	AZUMI		
Model/Type reference:	AL2			
Listed Model(s):				
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.247			
Date of receipt of test sample:	Jun.29,2018			
Date of testing	Jul.02,2018- Jul.09,2018			
Date of issue	Jul.10,2018			
Result:	PASS			
Compiled by ( Position+Printed name+Signature):	File administrators Silvia Li	Silvia Li		
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Approved by (Position+Printed name+Signature):	RF Manager Hans Hu	Homsty		
Testing Laboratory Name:	Shenzhen Huatongwei Internat	tional Inspection 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

Version No.	Date of issue	Description
N/A	2018-07-10	Original

# 2. TEST DESCRIPTION

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

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

# 3. <u>SUMMARY</u>

# 3.1. Client Information

Applicant:	Azumi S.A	
Address:	Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panama City, Rep. Panama	
Manufacturer:	AZUMI HK LTD	
Address:	FLAT/RM 18 BLK 1 14/F GOLDEN INDUSTRIAL BUILDING 16-26 KWAI TAK STREET KWAI CHUNG,HK	

# 3.2. Product Description

Name of EUT:	Mobile Phone	
Trade Mark:	AZUMI	
Model No.:	AL2	
Listed Model(s):	-	
IMEI:	Conducted: 357836080005040 Radiated: 357836080005057	
Power supply:	3.7V	
Adapter information:	Input: 100-240Va.c., 50/60Hz, 0.2A Output: 5.0Vd.c.,500mA	
Hardware version:	W18E_V3.0F	
Software version:	AZUMI_AL2_CA_V01	
Bluetooth		
Version:	Supported BT2.1+EDR	
Modulation:	GFSK, π/4DQPSK, 8DPSK	
Operation frequency:	2402MHz~2480MHz	
Channel number:	79	
Channel separation:	1MHz	
Antenna type:	Integral Antenna	
Antenna gain:	-2.0dBi	

# 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:	/
1	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.

#### **Conducted Emissions** Last Cal. Next Cal. Test Item Model No. Serial No. Manufacturer Equipment (mm-dd-yy) (mm-dd-yy) **EMI** Test R&S ESCI 101247 11/11/2017 11/10/2018 1 Receiver 2 Artificial Mains SCHWARZBECK **NNLK 8121** 11/11/2017 11/10/2018 573 2-Line V-3 R&S 11/11/2017 ESH3-Z5 100049 11/10/2018 Network **Pulse Limiter** ESH3-Z2 11/11/2017 4 R&S 101488 11/10/2018 RF 5 Connection HUBER+SUHNER EF400 N/A 11/21/2017 11/20/2018 Cable 6 **Test Software** R&S ES-K1 N/A N/A N/A Radiated Emissions Last Cal. Next Cal. Test Item Manufacturer Model No. Serial No. Equipment (mm-dd-yy) (mm-dd-yy) Semi-Anechoic C11121 1 Albatross projects SAC-3m-01 10/16/2016 10/15/2019 Chamber **EMI** Test 2 R&S ESCI 100900 11/11/2017 11/10/2018 Receiver 11/19/2020 3 HFH2-Z2 100020 11/20/2017 Loop Antenna R&S Ultra-4 Broadband SCHWARZBECK **VULB9163** 538 4/5/2017 4/4/2020 Antenna Horn Antenna 5 SCHWARZBECK 9120D 1011 3/27/2017 3/26/2020 Broadband **BBHA9170** 6 SCHWARZBECK **BBHA9170** 3/27/2017 3/26/2020 Horn Antenna 472 7 BBV 9743 Pre-amplifier SCHWARZBECK 9743-0022 10/17/2018 10/18/2017 Broadband 8 SCHWARZBECK BBV 9718 9718-248 10/18/2017 10/17/2018 Pre-amplifier Spectrum 9 R&S FSP40 100597 11/11/2017 11/10/2018 Analyzer **RF** Connection HUBER+SUHNE 10 RE-7-FL N/A 11/21/2017 11/20/2018 Cable R **RF** Connection HUBER+SUHNE 11/20/2018 RE-7-FH N/A 11/21/2017 11 Cable R 12 **Test Software** Audix E3 N/A N/A N/A 13 **Test Software** R&S N/A ES-K1 N/A N/A 14 N/A N/A N/A Turntable Maturo Germany TT2.0-1T 15 Antenna Mast CAM-4.0-P-12 N/A N/A N/A Maturo Germany

# 4.5. Equipments Used during the Test

RF Con	RF Conducted Test					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	Spectrum Analyzer	R&S	FSV40	100048	11/11/2017	11/10/2018
2	EXA Signal Analyzer	Agilent	N9020A	184247	9/22/2017	9/21/2018
3	OSP	R&S	OSP120	101317	N/A	N/A

# 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.

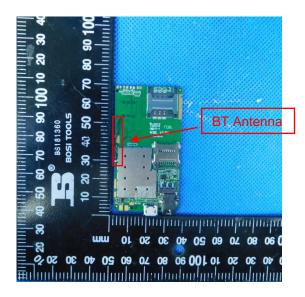
#### FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(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)

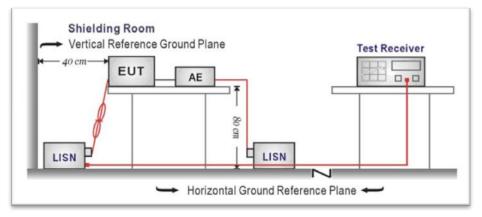
# <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207

	Limit (dBuV)		
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

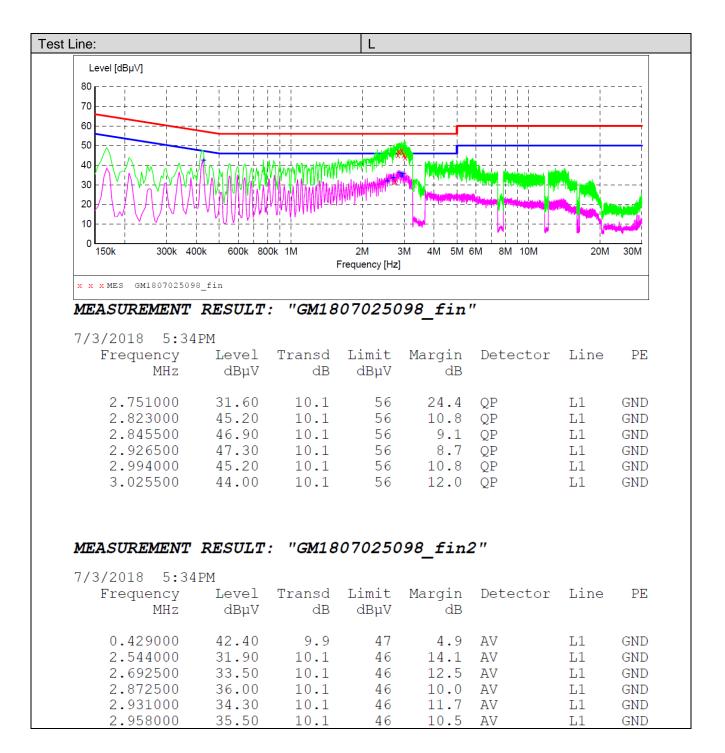
- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm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

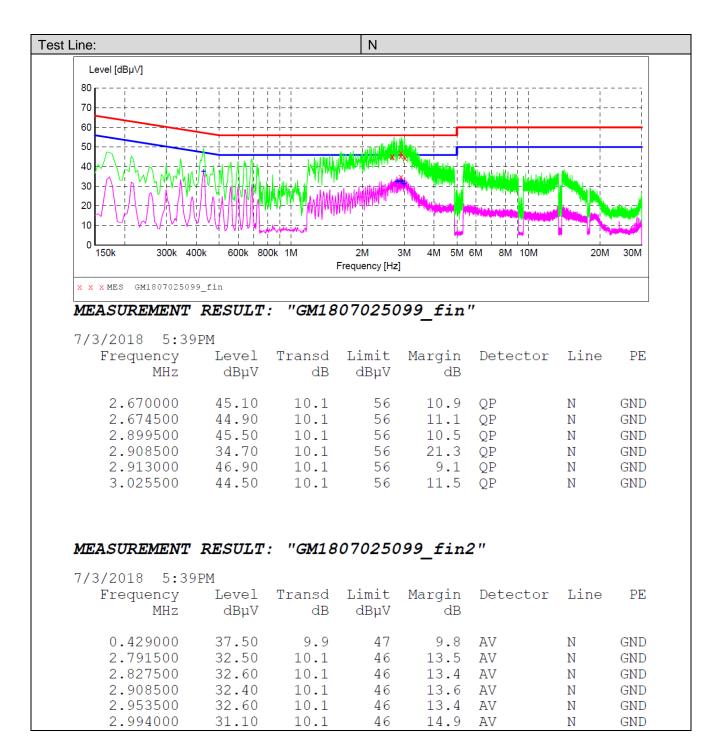
# TEST RESULTS

#### ☑ Passed □ Not Applicable

Note:

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



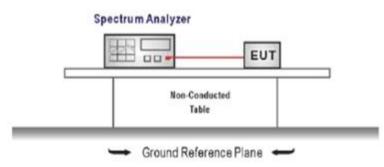


# 5.3. Conducted Peak Output Power

#### <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	6.38			
GFSK	39	7.11	≤ 30.00	Pass	
	78	7.51			
	00	7.57			
π/4DQPSK	K 39	8.33	≤ 21.00	Pass	
	78	8.17			
	00	7.81			
8DPSK	39	8.57	≤ 21.00	Pass	
	78	8.46			

odulation Type:	GFSK
	Spectrum (
	Ref Level         20.00 dBm         Offset         8.00 dB         RBW         1 MHz           ■ Att         30 dB         SWT         1 ms         ■ VBW         3 MHz
	Count 500/500
	M1[1] 6.38 dBm
	10 dBm 2.40211580 GHz
	0 dBm
	-10 dBm
CL 100	-20 dBm
CH00	-50 d8m
	-40 dBm
	-50 d8m
	-60 d8m
	-70 dBm
	CF 2.402 GHz         691 pts         Span 5.0 MHz
	CEF 2:402 GHz         D91 pts         Splat 3:0 mHz
	Spectrum (₩) Ref Level 20.00 dBm Offset 8.00 dB ● RBW 1 MHz
	■ Att 30 dB SWT 1 ms ● VBW 3 MHz Mode Auto Sweep Count 500/500
	P1Pk View     M1[1] 7.11 dBm
	10 dBm M3
	0 dBm
	-10 dBm
	-20 dBm
CH39	-30 dam
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Spectrum (₩) Ref Level 20.00 dBm Offset 8.00 dB ● RBW 1 MHz
	RefLevel 20.00 dam Offset 8.00 da RBW 1 MHz Att 30 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep Count 500/500
	1Pk View
	M1[1] 7.51 dBm 2.47991190 GHz
	10 dBm
	0 dBm
	-10 dBm
	-20 dBm-
CH78	
	1450 dBm
	-40 dBm
	-50 dBm
	-60 dBm-
	-70 dBm
	CF 2.48 GHz 691 pts Span 5.0 MHz
	Measuring

Iodulation Type:	π/4DQPSK
······································	Spectrum (
	Ref Level 20.00 dBm Offset 8.00 dB      RBW 2 MHz
	Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count 500/500
	(19k View     [1]     7.57 dBm
	10 dBm V _
	0 dBm
	-10 dBm
	-20 dBm
CH00	-30 dBm
	-40 dBm-
	-50 dBm
	-60 d8m
	-70 dBm
	CF 2.402 GHz 691 pts Span 5.0 MHz
	Messuring
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 8.00 dB RBW 2 MHz Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep
	Count 500/500
	M1[1] 8.33 dBm
	10 dBm V
	0 dBm
	-10 dBm
CH39	-20 dBm
CH39	-30 dBm
	-40 d8m
	-50 dBm-
	-60 dBm
	-70 dBm
	CF 2.441 GHz 691 pts Span 5.0 MHz
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Spectrum         Image: Comparison of the state of
	att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count 500/500
	10 dBm
	0 dBm
	-10 dBm
	-20 d8m
CH78	
	-30 dBm-
	-40 dBm-
	-50 dBm
	-60 dBm
	-70 dBm
	CF 2.48 GHz 691 pts Span 5.0 MHz

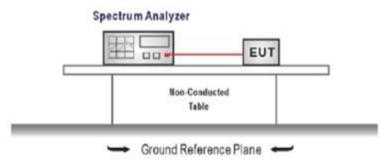
Iodulation Type:	8DPSK
	Spectrum         Image: Constraint of the sector of t
	Count 500/500 ●1Pk View M1[1] 7.81 dBm 2.40192040 GHz
	10 dBm M1
	-10 dBm
CH00	-20 dBm
	-40 dBm
	-60 d8m
	-70 dBm CF 2.402 GHz 691 pts Span 5.0 MHz
	Spectrum
	RefLevel 20.00 dBm Offset 8.00 dB RBW 2 MHz Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count 500/500 Ink View
	10 dBm
	0 dBm
CH39	-20 dBm
	-30 dBm
	-50 dBm
	-70 dBm
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Spectrum         Imp           Ref Level 20.00 dBm         Offset 8.00 dB ● RBW 2 MHz           ● Att         30 dB         SWT         1 ms ● VBW 5 MHz           Count 500/500         Count 500/500         SWT         1 ms ● VBW 5 MHz
	PIPk View     M1[1]     8.46 dBm     M1     2.48000000 GHz
	0 dBm
CH78	-20 d8m
	-30 dBm
	-50 dBm
	-70 dBm
	CF 2.48 GHz         691 pts         Span 5.0 MHz

# 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			

Iodulation Type:	GFSK
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 8.00 dB
	Count 500/500
	M1[1] -19.86 dBm 2.40152500 GHz
	10 dBm M2[1] 0.44 dBm 0 dBm 2.40204000 GHz
	-10 dBm
	-30 dBm
CH00	
	-60 dBm
	-70 dBm
	CF 2.402 GHz 1001 pts Span 2.5 MHz
	Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2:401525 GHz         -19.86 dBm         -
	M2         1         2.40204 GHz         0.44 dBm           D3         M1         1         932.5 kHz         -0.26 dB
	te storing 🖬 interest 🊧
	Spectrum (♥)
	Ref Level 20:00 dBm         Offset         8:00 dB         RBW 10 kHz           Att         30 dB         SWT         189:6 µs         VBW 30 kHz
	Count 500/500
	19k View     M1[1] -19.02 dBm
	10 dBm 2.44052500 GHz
	0 dBm 2.4410400 GHz
	-10 dBm
	-20 dam 01 -18.785 dBm VV
CH39	-30 dBm
01139	-40 dBm Add work
	-550 dBm
	-60 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         2.440525 GHz         -19.02 dBm
	M2         1         2.44104 GHz         1.21 dBm           D3         M1         1         932.5 kHz         -0.33 dB
	Messuring (111111 )
	Spectrum         (1)           Ref Level 20.00 dBm         Offset 8.00 dB ● RBW 10 kHz
	Att 30 dB SWT 189.6 μs VBW 30 kHz Mode Auto FFT Count 500/500
	● 1Pk View M1[1] -18.50 dBm
	10 dBm 2.47952500 GHz
	0 dBm /\u03c6/2 dBm 2.48004000 GHz
	-10 dBm
	-20 dem 01 -18.375 dem 40
	-30 dBm
CH78	-40 dam. A.
	450 dBm
	-60 dBm
	-70 dBm
	CF 2.48 GHz 1001 pts Span 2.5 MHz
	Marker           Type         Ref         Trc         X-value         Y-value         Function         Function Result
	M1         1         2.479525 GHz         -18.50 dBm           M2         1         2.48004 GHz         1.62 dBm
	D3 M1 1 932.5 kHz -0.50 dB Nextmine M1 H M2

Iodulation Type:	π/4DQPSK
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 8.00 dB 🖷 RBW 30 kHz
	● Att 30 dB SWT 63.1 µs ● VBW 100 kHz Mode Auto FFT Count 500/500
	●1Pk View M1[1] -16.40 dBm
	10 dBm 2.40135000 GHz 10 dBm M2 N2[1] 3.99 dBm
	0 dBm
	-10 dBm
	-10 dBm // // 03 // 03 // 03 // 03 // 03 // 03 // 04 /
	-30 dBm
CH00	-40,d8m
	-50 dBm
	-60 dBm
	-70 dBm-
	CF 2.402 GHz 1001 pts Span 2.5 MHz Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.40135 GHz         -16.40 dBm
	M2         1         2.4021475 GHz         3.99 dBm           D3         M1         1         1.285 MHz         0.23 dB
	Mexsuring
	Spectrum         (TTT)           Ref Level 20.00 dBm         Offset 8.00 dB ● RBW 30 kHz
	Att 30 dB SWT 63.1 µs VBW 100 kHz Mode Auto FFT Count 500/500
	●1Pk View
	10 dBm M1[1] -15.57 dBm 2.44035000 GHz
	4.82 asm 2.44114750 GHz
	-20 dBm
	-30 dBm
CH39	
01100	
	-50 d8m
	-60 d8m
	-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         2.44035 GHz         -15.57 dBm           M2         1         2.4411475 GHz         4.82 dBm           D3         M1         1.285 MHz         0.21 dB
	03 M1 1 1.285 MHz 0.21 dB
	Spectrum 🕎
	RefLevel         20.00         dBm         Offset         8.00         dB         RBW         30         kHz           Att         30         dB         SWT         63.1         µs         VBW         100         kHz
	Count 500/500   Pt View
	10 dBm 10
	10 ubin 0 d0m 0 d0m
	-10 dBm
	·20 UBIN
CH78	-30 dBm
	ver and the second seco
	-50 d8m
	-60 dBm-
	-70 dBm-
	CF 2.48 GHz         1001 pts         Span 2.5 MHz
	Marker Type Ref Trc X-value Y-value Function Function Result
	M1         1         2.47935 GHz         -15.81 dBm           M2         1         2.4801475 GHz         4.42 dBm
	D3 M1 1 1.285 MHz -0.03 dB
	Measuring 🚺 11111 🕽 🎎

Modulation Type:	8DPSK
	Spectrum 🕎
	Spectrum Ref Level 20.00 dBm Offset 8.00 dB ● RBW 30 kHz
	Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500
	●1Pk View M1[1] -15.55 dBm
	10 dBm 2.40134000 GHz
	0 dBm 2.40214750 GHz
	10 d9m
	-20 dBm
	-30 dBm
CH00	-10 dB as
	-50 dBm
	-60 d8m
	-70 dBm
	CF 2.402 GHz         1001 pts         Span 2.5 MHz           Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.40134 GHz         -15.55 dBm         -15.55 dBm <td< td=""></td<>
	M2         1         2.4021475 GHz         4.66 dBm           D3         M1         1         1.28 MHz         0.01 dB
	Nexurine
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 8.00 dB  RBW 30 kHz
	Att 30 dB SWT 63.1 μs VBW 100 kHz Mode Auto FFT Count 500/500
	PIK View     M1[1] -14.66 dBm
	10 dBm 2.44034000 GHz 10 dBm M12 13 5.48 dBm
	0 dBm
	-20 dBm
	-30 dBm
CH39	-40 d8m
	-50 d8m
	-60 d8m
	-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         2.44034 GHz         -14.66 dBm
	M2         1         2.4411475 GHz         5.48 dBm           D3         M1         1         1.28 MHz         -0.09 dB
	Measuring (1999)
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 8.00 dB
	● Att 30 dB SWT 63.1 µs ● VBW 100 kHz Mode Auto FFT Count 500/500
	●1Pk View M1[1] -15.13 dBm
	10 dBm 2.47934000 GHz M2[1] 5.10 dBm
	0 dBm 2.48014750 GHz
	-10 dBm 01 -14.900 dBm
	-20 dBm
	-30 dBm
CH78	-40.d8m
	-50 dBm-
	-60 dBm-
	-70 dBm-
	CF 2.48 GHz         1001 pts         Span 2.5 MHz
	Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.47934 GHz         -15.13 dBm         -
	M2         1         2.4801475 GHz         5.10 dBm           D3         M1         1         1.2775 MHz         0.14 dB
	Measuring.

# 5.5. Carrier Frequencies Separation

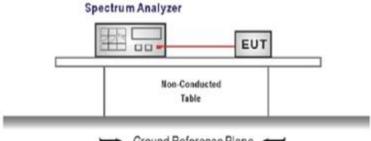
#### LIMIT

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

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively,

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

#### **TEST CONFIGURATION**



- 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

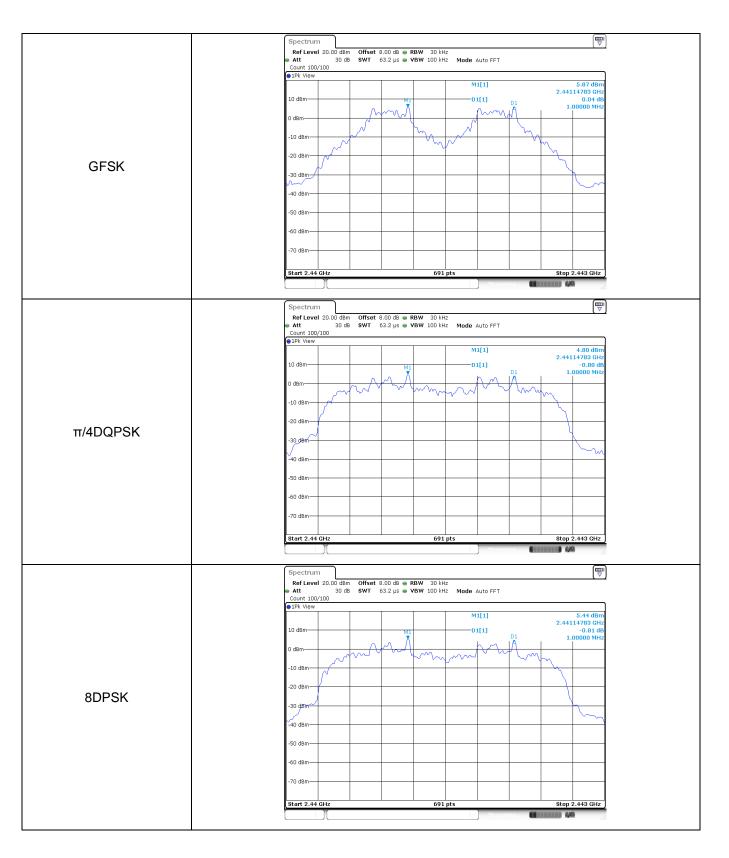
#### TEST RESULTS

#### ☑ 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

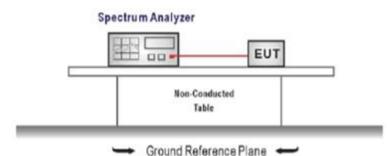


# 5.6. Hopping Channel Number

#### 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		

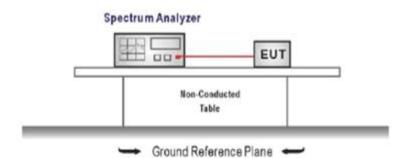
		Spectru			0.00 10		-				(	
		Att	el 20.00 dB 30 c		8.00 dB 👄 🖡 1 ms 👄 V	<b>RBW</b> 100 kH VBW 300 kH		Auto Sweep	)			_
	•	1Pk Viev	·									
		10 dBm—										_
		ontinht	TRATIANT	Annanann	IN ADDIAADD	NANKANA N	ADDAATIGA	AAAAAAA	1800nnada	hanaanna.	INDA	
		0 ( <b>d6</b> m)	WWWW	WWW	ANWAN I		n Mar	WWW	TIWIW		MAN	
		-10 dBm—		1		11.41.			10.11			
		-20 dBm-										
GFSK		-										
		-30 dBm										
	Ň	40 dBm—										
		) -50 dBm—	-									
		-60 dBm-										
		-70 dBm—										
		Start 2.4	GHz			691	pts			Stop 2	.4835 G	Hz
								Measur				
		0									(	
			el 20.00 dB		8.00 dB 👄 F	RBW 100 kH	łz					
		Att 1Pk Viev	30 c		1 ms 🕳 🕅	<b>/BW</b> 300 kH	z Mode	Auto Sweep	)			_
	:	10 dBm—				A. B			<u> </u>			
		<u>, www</u>	MAAMA	WWWW	www	hum	nuun	MMM	MMM	www	WW	
		la dan										
		-10 dBm—										
	•	-20 dBm—										
π/4DQPSK		30 dBm-										
	6	-40 dBm-										
		-50 dBm—										k <sub>j2</sub>
		-60 dBm—										_
		-70 dBm—										
	ļ	Start 2.4	GHz			691	pts				.4835 G	Hz
	L							Measur	ang	44		
		Spectru	im								(	
	_	Ref Lev Att	el 20.00 dB 30 c		8.00 dB 👄 🖡 1 ms 👄	RBW 100 kH VBW 300 kH	iz Iz Mode	Auto Sweep	)			
		1Pk Viev										$\neg$
		10 dBm—										
		MANA!	unuruu.	mmm	unnun	mm	nuun	MANIAN	mm	NHANKA	umu	
	1	0 dBm					- 10 000 00	- 1 U	9			
		-10 dBm—										
		-20 dBm										
8DPSK												
		30 dBm—										4
		-40 dBm—										+
		-50 dBm—										4.
		-60 dBm—										
		-70 dBm—		-	-	-						_
		o										
	L	Start 2.4	GHz			691	pts	Moasue		Stop 2	.4835 GI	Hz

#### 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.

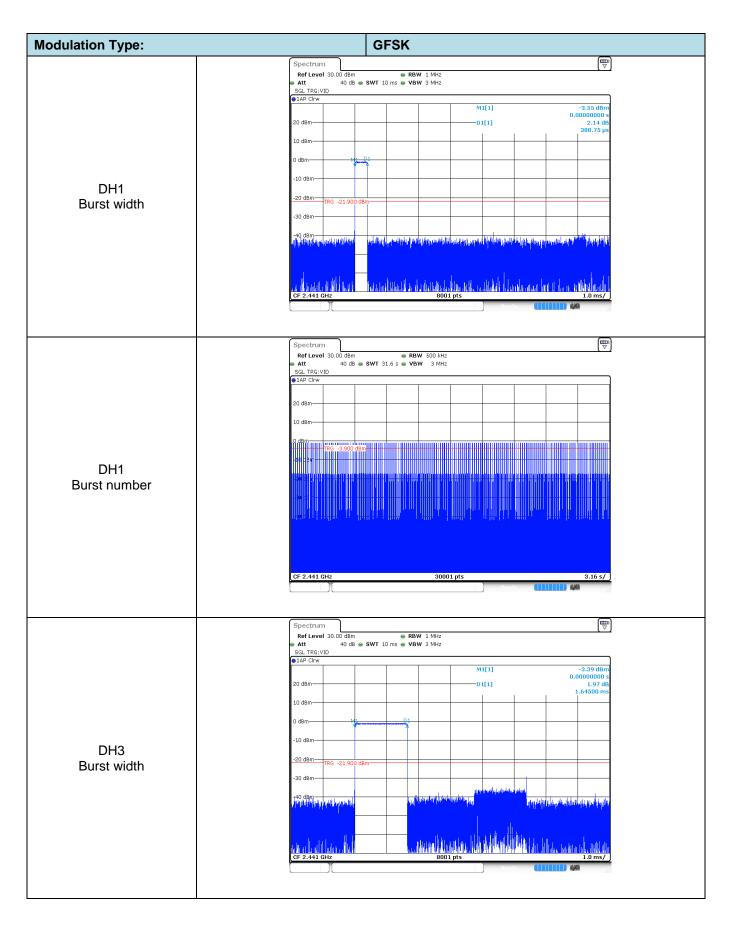
#### TEST MODE:

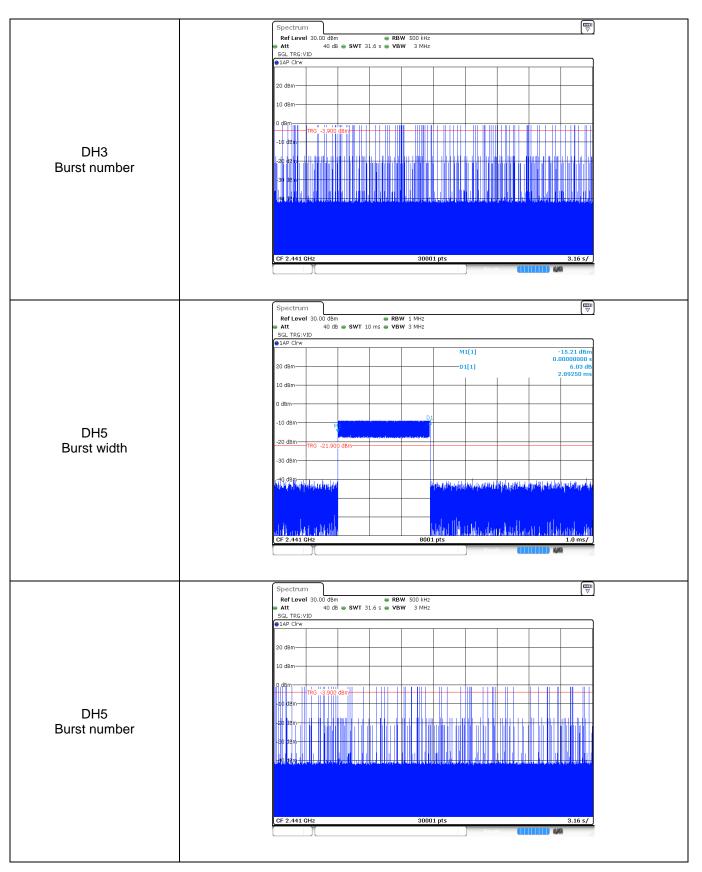
Please refer to the clause 3.3

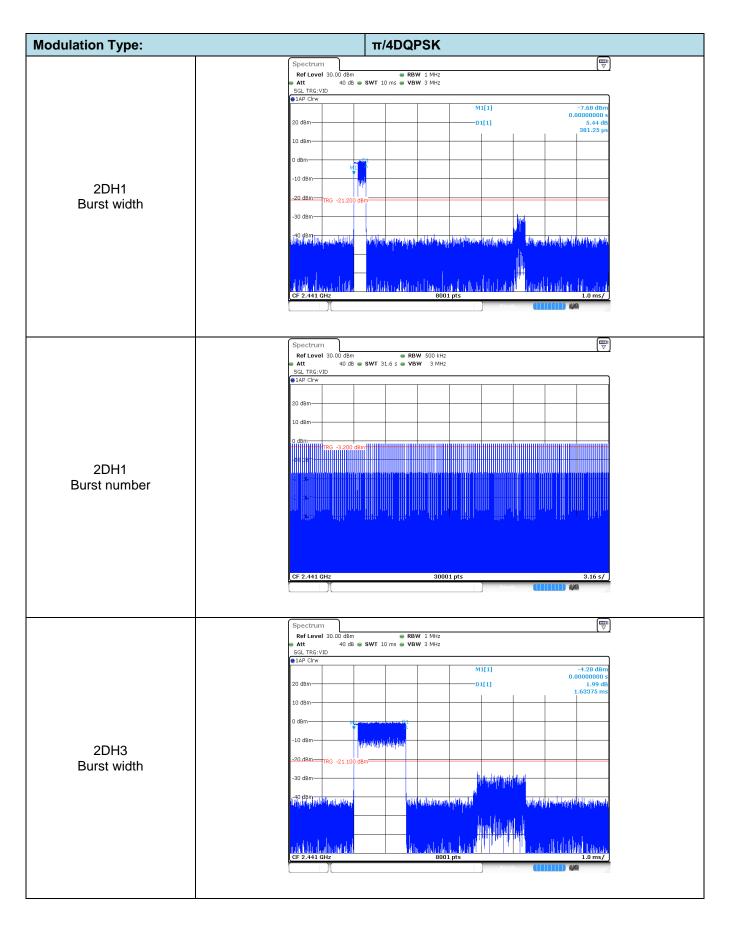
#### TEST RESULTS

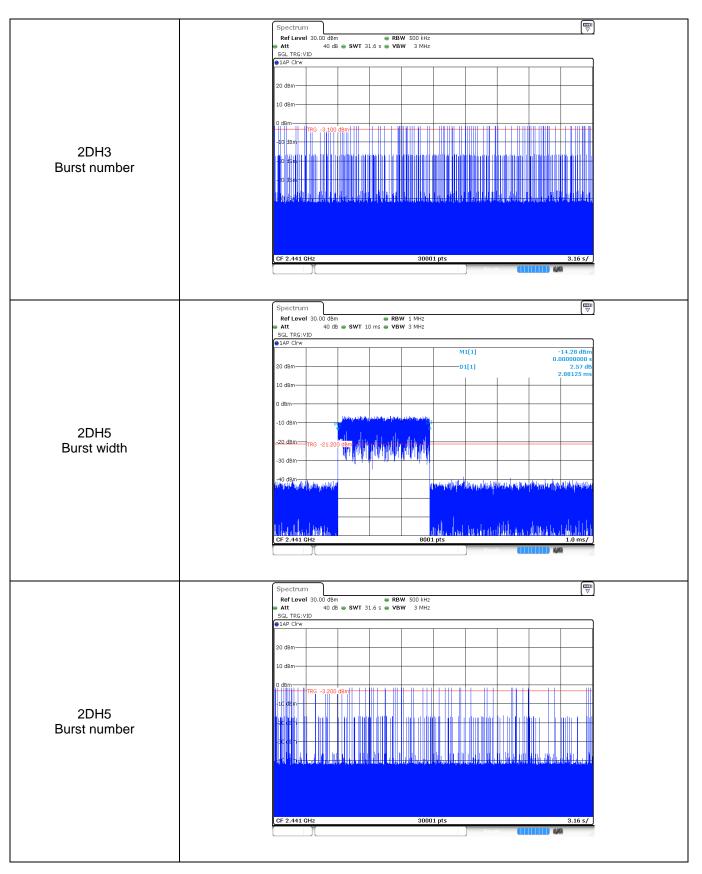
#### ☑ Passed □ Not Applicable

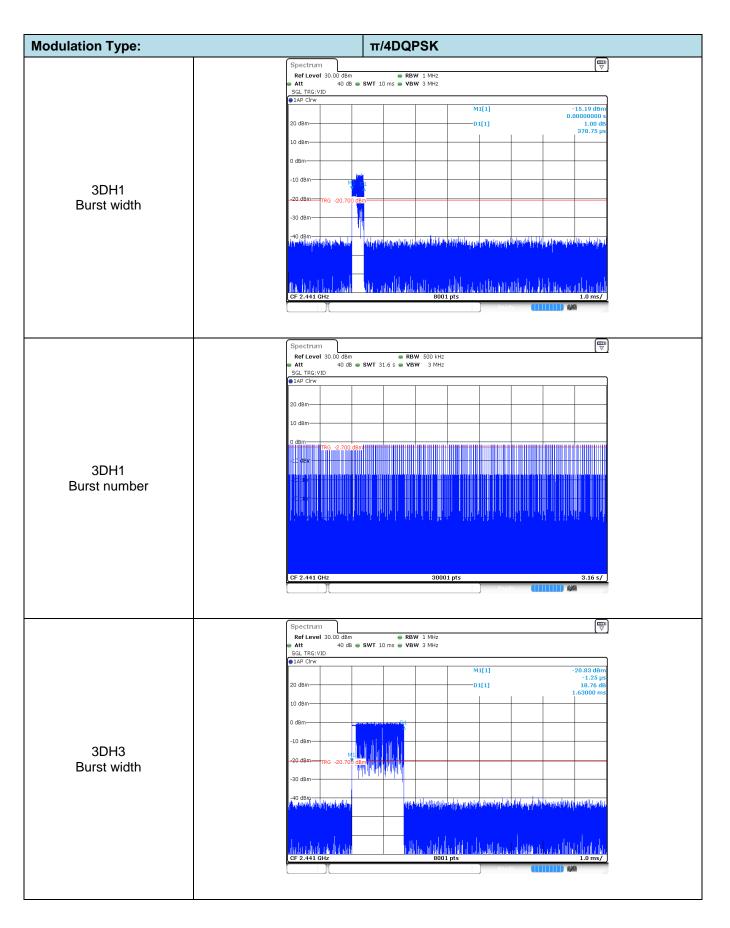
Modulation type	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell time (Second)	Limit (Second)	Result
	DH1	0.39	319.00	0.12		
GFSK	DH3	1.65	102.00	0.17	≤ 0.40	Pass
	DH5	2.89	64.00	0.19		
	2DH1	0.38	317.00	0.12		
π/4DQPSK	2DH3	1.63	108.00	0.18	≤ 0.40	Pass
	2DH5	2.88	63.00	0.18		
	3DH1	0.38	318.00	0.12		
8DPSK	3DH3	1.63	110.00	0.18	≤ 0.40	Pass
	3DH5	2.88	65.00	0.19		

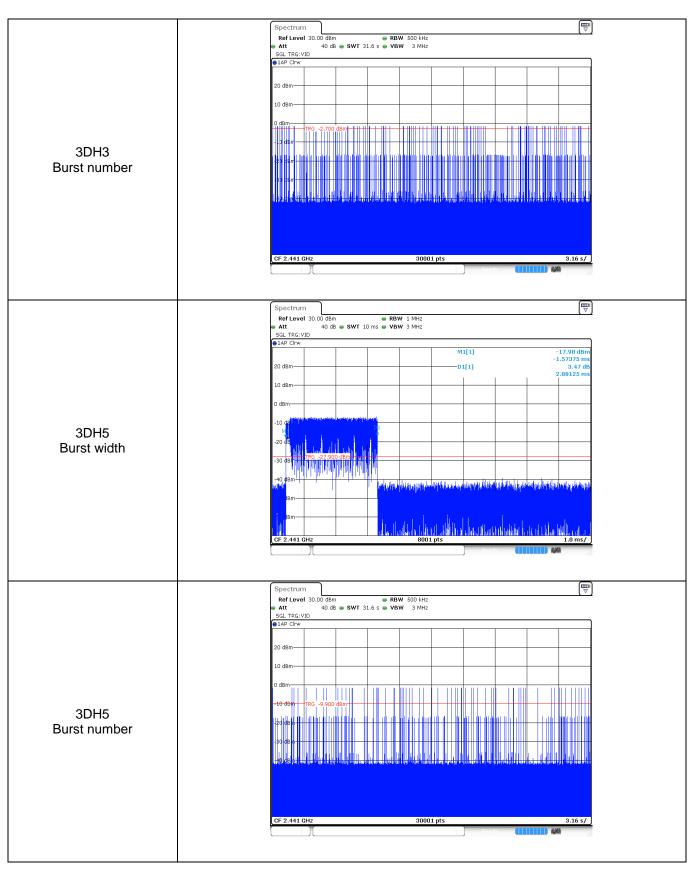












# 5.8. Pseudorandom Frequency Hopping Sequence

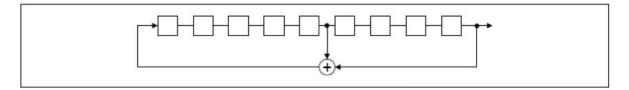
#### <u>LIMIT</u>

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:

5 7	73 7		1	78	64	62	1	ł	4	2	0
Т		 		1			 Τ	Т	Г		Т
				1		1		Т			
				1							

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.

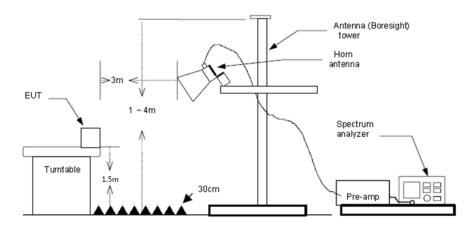
# 5.9. Restricted band (radiated)

#### <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.

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	33.20	28.05	6.62	37.59	30.28	74.00	-43.72	Horizontal	Peak	
2350.06	43.29	27.85	6.69	37.59	40.24	74.00	-33.76	Horizontal	Peak	
2390.03	35.21	27.65	6.75	37.59	32.02	74.00	-41.98	Horizontal	Peak	
2310.00	33.80	28.05	6.62	37.59	30.88	74.00	-43.12	Vertical	Peak	
2350.35	40.46	27.85	6.69	37.59	37.41	74.00	-36.59	Vertical	Peak	
2390.03	32.91	27.65	6.75	37.59	29.72	74.00	-44.28	Vertical	Peak	
2310.00	20.40	28.05	6.62	37.59	17.48	54.00	-36.52	Horizontal	Average	
2331.00	27.97	27.94	6.66	37.59	24.98	54.00	-29.02	Horizontal	Average	
2390.03	20.25	27.65	6.75	37.59	17.06	54.00	-36.94	Horizontal	Average	
2310.00	20.20	28.05	6.62	37.59	17.28	54.00	-36.72	Vertical	Average	
2331.00	29.69	27.94	6.66	37.59	26.70	54.00	-27.30	Vertical	Average	
2390.03	20.33	27.65	6.75	37.59	17.14	54.00	-36.86	Vertical	Average	

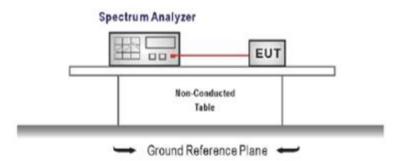
Test channe	el:				CH78					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value	
2483.50	59.72	27.26	6.83	37.59	56.22	74.00	-17.78	Horizontal	Peak	
2500.00	37.94	27.20	6.84	37.59	34.39	74.00	-39.61	Horizontal	Peak	
2483.50	59.39	27.26	6.83	37.59	55.89	74.00	-18.11	Vertical	Peak	
2500.00	37.50	27.20	6.84	37.59	33.95	74.00	-40.05	Vertical	Peak	
2483.50	30.69	27.26	6.83	37.59	27.19	54.00	-26.81	Horizontal	Average	
2500.00	30.75	27.20	6.84	37.59	27.20	54.00	-26.80	Horizontal	Average	
2483.50	30.98	27.26	6.83	37.59	27.48	54.00	-26.52	Vertical	Average	
2500.00	32.00	27.20	6.84	37.59	28.45	54.00	-25.55	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

Ref Level 20.00 dlm         Offset 8.00 dls         Ref W 100 kHz           Att         30 dls         SWT         1.1 ms         VBW 300 kHz         Mode Auto Sweep           Count 500/500         12Fk Max         5.87 dlsm         5.87 dlsm         -50.03 dlsm         -60.03 dlsm           0 dlsm         0 dlsm         M2[1]         2.40170.04H         -50.03 dlsm         -60.03 dlsm           -10 dlsm         0 dlsm         M2[1]         2.40170.04H         -60.03 dlsm         -60.04 dlsm           -20 dlsm         -10 dlsm         -11.130 dlsm         -10.04 m/s         -10.04 m/s         -10.04 m/s           -30 dlsm         -20 dlsm         -10.04 m/s         -10.04 m/s         -10.04 m/s         -10.04 m/s           -20 dlsm	est Item:	Band edge	Modulation type:	GFSK
CH00 No hopping mode       IIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		Spectrum           Ref Level         20.00 dBm           Att         30 dB           Count         500/500	Offset 8.00 dB 👄 RBW 100 kHz	
CH00 No hopping mode       Image: 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1		10 dBm		5.87 dBm 2.401770,g4z - 50.03 dBm 2.400000 dHz
CH00 No hopping mode		-20 dBm	dBm	
CH00 Hopping mode       Spectrum The level 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He SW 100 He related 200 dim of the SW 100 He related 200 dim of t		-40 dBm	MS	
CH00 Hopping mode       Spectrum State       State       Subject to the state <td></td> <td>-70 dBm</td> <td>691 pts</td> <td>Stop 2.405 GHz</td>		-70 dBm	691 pts	Stop 2.405 GHz
CH00 Hopping mode       Spectrum for tave 2000 dbm       Offset 8.00 dbm       Mode Auto Swep         0 dbm       1.1 ms       VWV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VWV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VWV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VWV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVVV       20.000 dbm       0.000 dbm         10 dbm       1.1 ms       VVVVVVV       0.000 dbm       0.000 dbm         10 dbm       1.1 ms       1.0 ms       VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV		M1 1 M2 1 M3 1 M4 1	2.40177 GHz 5.87 dBm 2.4 GHz -50.03 dBm 2.39 GHz -51.45 dBm 2.31 GHz -51.51 dBm	
CH00 Hopping mode         Image: CH00 Ho		Ref Level 20.00 dBm Att 30 dB		( <sup>1</sup> )
CH00 Hopping mode       10 dBm       114230 dBm       10 dBm <t< td=""><td rowspan="2"></td><td>●1Pk Max 10 dBm</td><td></td><td>2.404790 GHø -51.98 dBm</td></t<>		●1Pk Max 10 dBm		2.404790 GHø -51.98 dBm
CH00 Hopping mode       Ho dam       Mode		-10 dBmD1 -14.250 -20 dBm	dBm	
Stort 2.31 GHz         691 pts         Stop 2.405 GHz           Narker         Ypei         Ref         Ti         2.40479 GHz         5.75 dBm         Function         Function Result           Marker         1         2.34 GHz         5.15 dBm         Function         Function Result           Mix         1         2.34 GHz         5.15 dBm         Function         Function Result           Mix         1         2.34 GHz         5.13 dBm         Function         Function           Mix         1         2.34 GHz         GHz         S.75 dBm         Function         Function           Mix         1         2.34 GHz         GHz         Store         Store         GHz         Store           No         0 dBm         Offset 8.00 dB         RB RBW 100 HHZ         Store		-40 d8m		
Type         Ref         Tro         X-value         Function         Function Result           M2         1         2:40479 GHz         5:75 dbm         Function         Function Result           M2         1         2:30 GHz         5:75 dbm         Function         Function Result           M3         1         2:39 GHz         -5:28 dbm         Function         Function Result           M4         1         2:31 GHz         -5:1.86 dbm         Function         Function         Function           M4         1         2:31 GHz         -5:1.86 dbm         Function         Function         Function           M4         1         2:31 GHz         -5:1.86 dbm         Function         Function         Function           M4         1         2:31 GHz         -46:37 dbm         Function         Function         Function           M5         1         2:341942 GHz         -46:37 dbm         Function         Function         Function           Ref Level 20:00 dbm         Offset 8:00 db         RBW 100 kHz         Att         30 db         SWT         So:9 µs         VBW 300 kHz         Mode Auto FFT           Out         Soldsm         M1[1]         2:4801490 GHz         -51:54 dbm		-70 dBm	691 pts	Stop 2.405 GHz
Spectrum         To even mode           Ref Level 20.00 dBm         Offset 8.00 dB         RBW 100 kHz           Att         30 dB         SWT         56.9 µs         VBW 300 kHz         Mode Auto FFT           Cunt S00500         IPK Max         M1[1]         2.480190 GHz         -51.54 dBr           0 dBm         M2[1]         2.4803900 GHz         -51.54 dBr           -10 dBm         0 dBm         -20 dBm         -00 dBm         -00 dBm           -30/dBm         -00 dBm         -00 dBm         -00 dBm         -00 dBm           -50 dBm         -00 dBm         -00 dBm         -00 dBm         -00 dBm		Type         Ref         Trc           M1         1           M2         1           M3         1	2.40479 GHz 5.75 dBm 2.4 GHz -51.98 dBm 2.39 GHz -52.26 dBm 2.31 GHz -51.18 dBm	Function Result
Ref Level 20.00 dlm         Offset 8.00 dl le RBW 100 kHz           30 dls         SWT         56.9 µs         VBW 300 kHz         Mode Auto FFT           Count 500/500         IPK Max         M1[1]         7.28 dlm           10 dlm         M1[2]         2.4801490 dHz           0 dlm         M2[1]         2.4835000 GHz           -10 dlm         M2[1]         2.4835000 GHz           -20 dlm         -         -           -30 dlm         -         -           -50 dlm         -         -			2.341942 GH2 -46.37 dBm	
CH78 No hopping mode		Ref Level 20.00 dBm ● Att 30 dB 	SWT 56.9 µs 👄 VBW 300 kHz Mode Auto FFT	
CH78 No hopping mode		0 dBm		2.4801490 GHz -51.54 dBm
No hopping mode		-20 dbm	d8m	
		-50 dBm		~ Mt N
-70 dBm		Start 2.478 GHz Marker	X-value Y-value Function	
M1         1         2.400149 GHz         7.28 dBm           M2         1         2.49035 GHz         5.154 dBm           M3         1         2.5 GHz         -51.95 dBm           M4         1         2.4993304 GHz         -50.07 dBm		M1 1 M2 1 M3 1	2.480149 GHz 7.28 dBm 2.4835 GHz -51.54 dBm 2.5 GHz -51.95 dBm	

### Report No.: TRE1806021802

	Count 500/500	• RBW 100 kHz • VBW 300 kHz Mode Auto FF	T
CH78 Hopping mode	1Pk Max     10 dBm M     0 dBm     10 dBm     20 dBm     -20 dBm     -30 dBm     -50 dBm     -50 dBm     -60 dBm     -70 dBm	M1[1] M2[1] M2[1] M4 M4	7.28 dBm 2.4801490 dHz -52.96 dBm 2.4835000 GHz
	Start 2.478 GHz Marker	691 pts	Stop 2.5 GHz
	Type         Ref         Trc         X-value           M1         1         2.480149 GHz           M2         1         2.48035 GHz           M3         1         2.5 GHz           M4         1         2.4879478 GHz	Y-value         Function           7.28 dBm         -           -52.96 dBm         -           -51.71 dBm         -           -50.23 dBm         -	Function Result

Test Item:	Band edge		Modula	ation ty	vpe:	π/4DQP	SK
		Spectrum Ref Level 20.00 dBm Att 30 dB Count 500/500			Mode Auto Sweep		
		10 dBm			M1[1]	2.4017	7 dBm 70,GHz 0 đệm
		0 dBm	n			2.4000	
CH00		-30 dBm				M3	
No hopping mode		-60 dBm	with a growing with		ana an	e-uniter and the second s	
			X-value 2.40177 GHz	691 pt: Y-value 5.47 dBm	s Function	Stop 2.40 Function Result	5 GHz
		M1         1           M2         1           M3         1           M4         1           M5         1	2.40177 GH2 2.4 GHz 2.39 GHz 2.31 GHz 2.39963 GHz	-45.50 dBm -50.82 dBm -50.80 dBm -46.95 dBm			
		Spectrum			Measuring	(1111) 44	
		Ref Level         20.00 dBm           Att         30 dB           Count         500/500           1Pk Max			Mode Auto Sweep		
		10 dBm			M1[1] M2[1]	5.4 2.40314 -48.2 2.40000	7 dBm 40 Ghtz 8 dBm 10 GHz
		-10 dBm D1 -14.530 dBr -20 dBm	n				
CH00 Hopping mode		-40 dBm	~	m	man	M3 I	12
		-70 dBm		691 pt:	s	Stop 2.40	5 GHz
		Marker           Type         Ref         Trc           M1         1           M2         1           M3         1           M4         1	X-value 2.40314 GHz 2.4 GHz 2.39 GHz 2.31 GHz	Y-value 5.47 dBm -48.28 dBm -51.56 dBm -50.49 dBm	Function	Function Result	
		M5 1	2.323906 GHz	-47.95 dBm	Measuring	(11111) 4/4	
		Count 500/500	Offset 8.00 dB ● SWT 56.9 µs ●		Mode Auto FFT		
		0 dBm			M1[1] M2[1]	6.1 2.480149 -51.5 2.483500	4 dBm
CH78 No hopping mode		-10 dBm D1 -13.900 dBr -20 dBm	n				_
		-30 dBm 40 dBm -50 dBm	M2	M4	manna	-	M
		-60 dBm					
		M1 1 M2 1	X-value 2.480149 GHz 2.4835 GHz	691 pt: Y-value 6.10 dBm -51.54 dBm	s Function	Stop 2.	5 GHz
		M3 1	2.5 GHz 2.4882029 GHz	-51.24 dBm -49.78 dBm	Measuring		

### Report No.: TRE1806021802

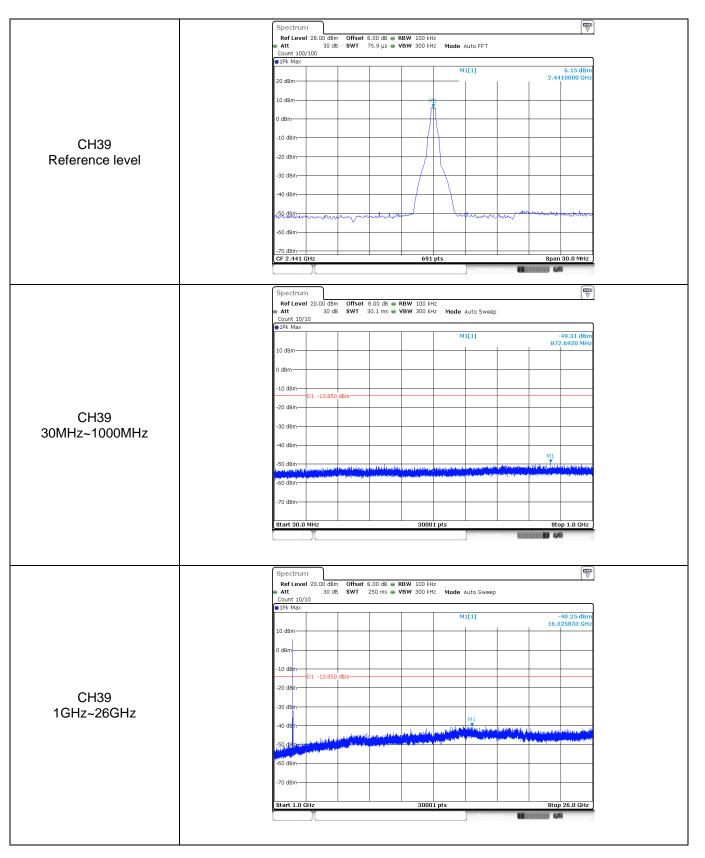
	Count 500/500	■ RBW 100 kHz ■ VBW 300 kHz Mode Auto FF	T
CH78 Hopping mode			6.07 dBm 2.4781430 GHz -51.65 dBm 2.4835000 GHz
	Start 2.478 GHz Marker	691 pts	Stop 2.5 GHz
	Type         Ref         Trc         X-value           M1         1         2.478143 GHz           M2         1         2.4385 GHz           M3         1         2.5 GHz           M4         1         2.4860029 GHz	Y-value         Function           6.07 dBm         -           -51.65 dBm         -           -51.25 dBm         -           -49.47 dBm         -	Function Result

Test Item:	Band edge		Modula	ation ty	oe:	8DPSK	
		Spectrum Ref Level 20.00 dBm Att 30 dB 2000 Count 500/500	Offset 8.00 dB 🖷	RBW 100 kHz	Mode Auto Sweep		
		10 dBm			M1[1] M2[1]	5.45 2.401770 -48.08	M <u>G</u> Hz da¶βm
		-10 dBm	ì			2.400000	βHz
CH00 No hopping mode		-30 dBm	- Anno and a star and a		men wat we send for	M3	
		-60 dBm					
	, ,	M1 1 M2 1	X-value 2.40177 GHz 2.4 GHz	691 pts Y-value 5.45 dBm -48.08 dBm	Function	Stop 2.405	GHZ
		M3 1 M4 1 M5 1	2.39 GHz 2.31 GHz 2.399768 GHz	-51.82 dBm -51.42 dBm -45.88 dBm	Measuring	(mmm) 4/4	
					Mode Auto Sweep		
	9	Count 500/500 1Pk Max 10 dBm			M1[1] M2[1]	5.39 2.402870 -49.35 2.400000	GHZ
		-10 dBm	]			2.40000	
CH00 Hopping mode	6	-30 dBm -40 dBm	and and a construction of the		and a manufacture of the second se	M3	2
		-60 dBm		691 pts		Stop 2.405	GHz
	, ,	Marker           Type         Ref         Trc           M1         1           M2         1           M3         1	X-value 2.40287 GHz 2.4 GHz 2.39 GHz	Y-value 5.39 dBm -49.35 dBm -51.54 dBm	Function	Function Result	
		M4 1 M5 1	2.31 GHz 2.399493 GHz	-50.97 dBm -46.57 dBm	Measuring	(	
	-	Count 500/500	Dffset 8.00 dB ● SWT 56.9 µs ●		Mode Auto FFT		
		10 dBm			M1[1] M2[1]	6.10 2.4801490 -52.00 2.4835000	dBm
CH78 No hopping mode		-10 dBm D1 -13.900 dBr -20 dBm	1				
			M2			M4	M
		-60 dBm -70 dBm Start 2.478 GHz		691 pts		Stop 2.5	GHz
		Marker           Type         Ref         Trc           M1         1           M2         1           M3         1	X-value 2.480149 GHz 2.4835 GHz 2.5 GHz	Y-value 6.10 dBm -52.00 dBm -51.95 dBm	Function	Function Result	
		M4 1	2.4963971 GHz	-50.09 dBm	Measuring	·····	

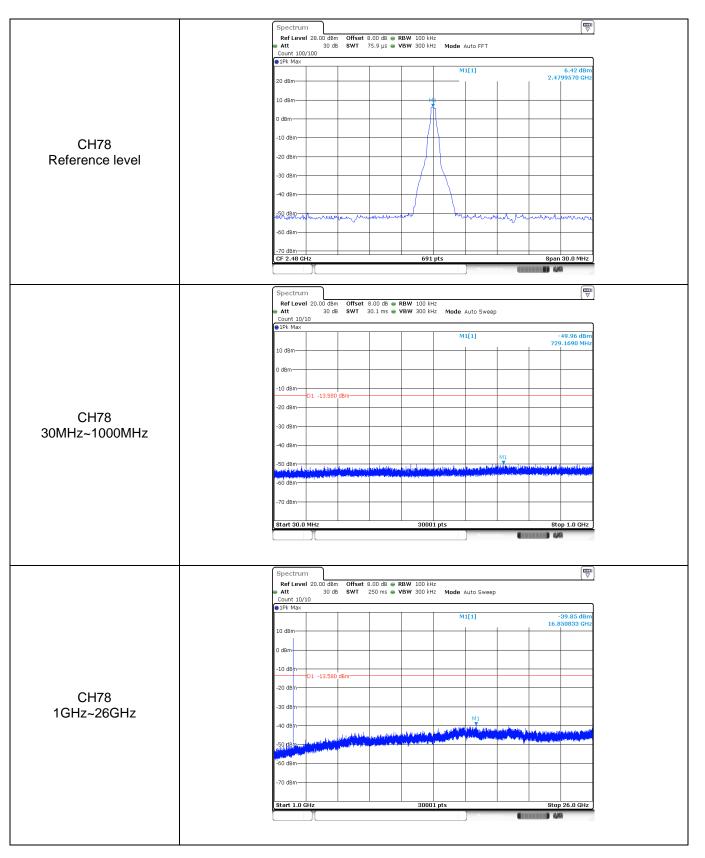
### Report No.: TRE1806021802

-60 dBm -70 dBm Start 2.478 GHz Marker Type [ Ref   Trc   X-value   Y-value   Function   Function Result		Att     Count 500/	20.00 dBm 30 dB	Offset 8.00 SWT 56.9			Mode Auto	FFT		
Marker Type   Ref   Trc   X-value   Y-value   Function   Function Result	CH78 Hoppig mode	10 dBm <del>m.1</del> 10 dBm - -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -70 dBm	M	M2			M2[1]		4	2.4798310 GHz -51.15 dBm 2.4835000 GHz
M1 1 2.479831 GHz 3.87 dBm		Marker Type   Ref	f   Trc			r-value			Function R	
M2         1         2.4835 GHz         -51.15 dBm           M3         1         2.56 GHz         -52.69 dBm           M4         1         2.4944841 GHz         -50.24 dBm		M2 M3	1	2.4835 G 2.5 G	Hz Hz	-51.15 dBm -52.69 dBm				

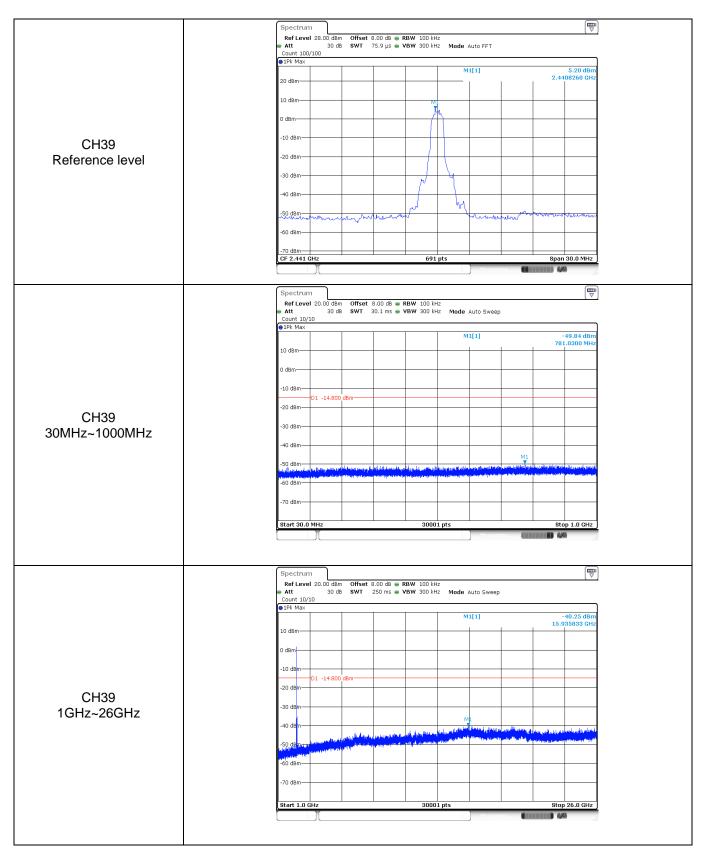
fest Item:	SE		Modu	ation type:		GFSK	Ι
		Spectrum	m Offset 8.00 dB (				
				VBW 300 kHz Mode Aut	o FFT		
		IPk Max		M1[1	.]		5.12 dBm
		20 dBm				2.40	18260 GHz
		10 dBm		M			
		0 dBm					
		-10 dBm		+ /\\ +			
CH00		-20 dBm		+ / \ +			
Reference level		-30 dBm					
		-40 dBm		+/+			
		50 days					
		-50 dBm -60 dBm	munham	man man	murren	montanan	······
		-70 dBm CF 2.402 GHz	1	691 pts			30.0 MHz
					Measuring	44	
		Spectrum Ref Level 20.00 dBr	n Offset 8.00 dB 🖲	• RBW 100 kHz			
		Att 30 d Count 10/10		• VBW 300 kHz Mode Aut	o Sweep		
		● 1Pk Max		M1[1	.]	-	49.75 dBm
		10 dBm		+ + +		679	.8300 MHz
		0 dBm		+ + +			
		-10 dBm					
		-20 dBm	D dBm				
CH00		-30 dBm					
30MHz~1000MHz		-40 dBm					
					M1		
		-50 dBm					len (di Makea) II National International National International
		-70 dBm					
		Start 30.0 MHz	1	30001 pts	Moncuries		p 1.0 GHz
						44	
		Spectrum Ref Level 20.00 dBr	m Offset 8.00 dB e	RBW 100 kHz			
		Att 30 d     Count 10/10	B SWT 250 ms 🖷	VBW 300 kHz Mode Aut	o Sweep		
		1Pk Max		M1[1	.]	- 15.2	40.53 dBm 51667 GHz
		10 dBm		+ + +		13.2	01007 GHZ
		0 dBm		+ + +			
		-10 dem		+ + +			
		-20 dBm	) dBm				
		-30 dem					
1GHz~26GHz		-40 de m		MI			
		-50 de marchinel des lati	and the second second second		n <sup>f</sup> egati n fede <mark>au statu</mark> Mengan fere fegata i Me		lana da Nadal Magana da Nadala
		and the second second second second second					
		-60 dBm					
		-70 dBm					
	1		1				
		Start 1.0 GHz	1	30001 pts	_	Stop	26.0 GHz

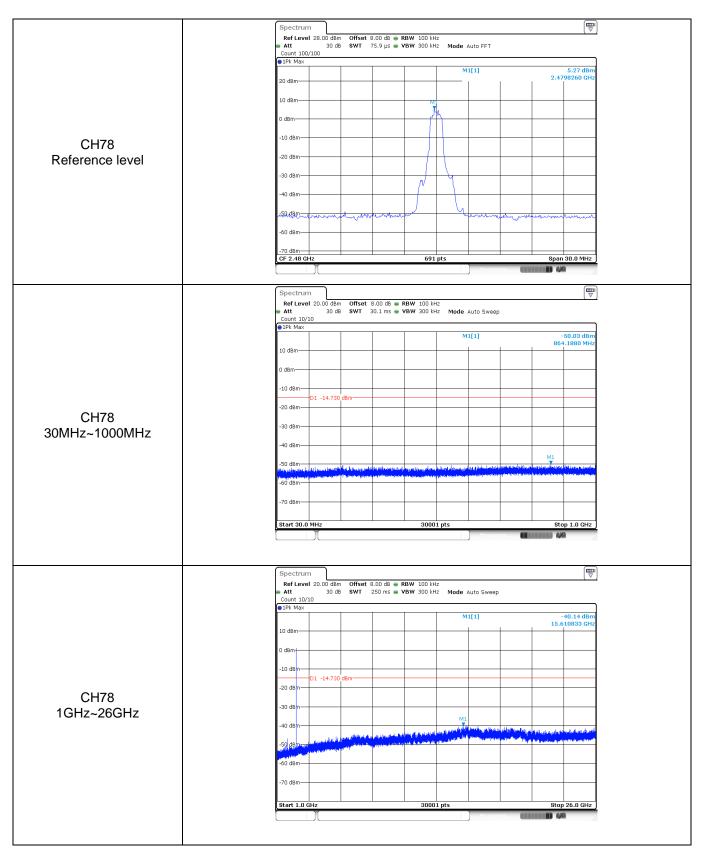


Shenzhen Huatongwei International Inspection Co., Ltd.

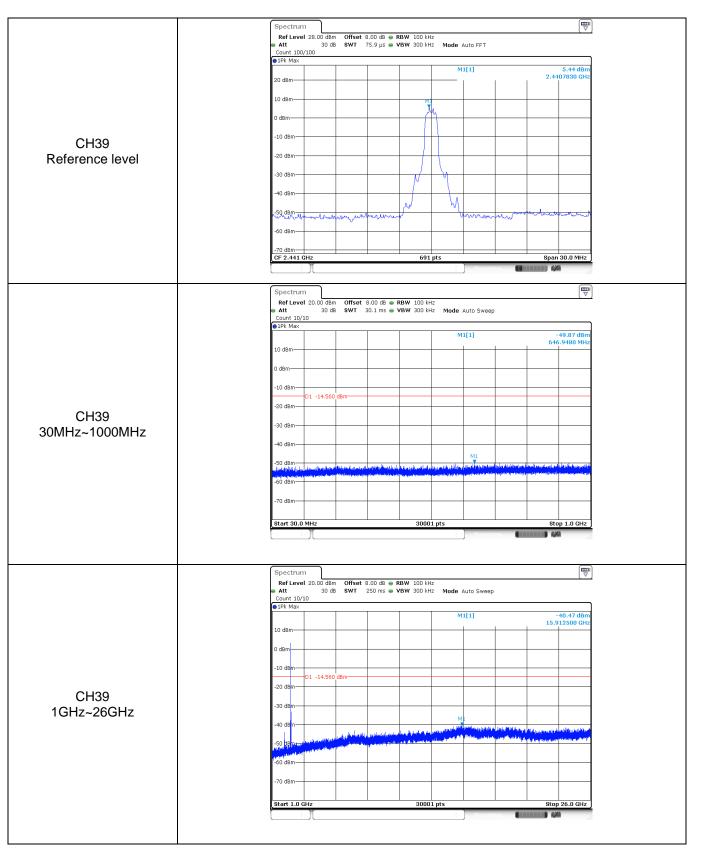


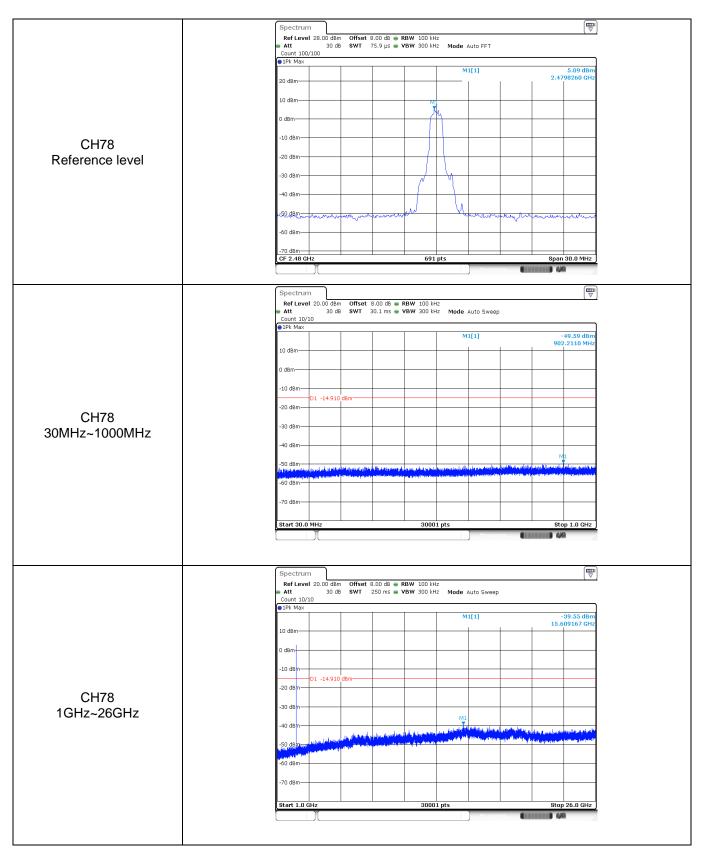
Test Item:	SE	Modulation type: π/4DQPSK
		Spectrum         Image: Constraint of the sector of t
		© IPk Max         M1[1]         4.58 dBm           20 dBm         2.4018260 GHz
		10 dBm
CH00 Reference level		-10 dBm
		-30 dBm
		-59.98m
		-70 dBm         GP 2.402 GHz         691 pts         Span 30.0 MHz           CF 2.402 GHz         691 pts         Manual Market
		Spectrum         Image: Constraint of the section of the sectio
		Att 30 dB SWT 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 PIPK Max 10 dBm 10 dBm 1
		0 d8m
CH00		01 -15.420 dBm
30MHz~1000MHz		-40 dBm
		-50 dim
		Start 30.0 MHz 30001 pts Stop 1.0 GHz
		Spectrum
		Ref Level         20.00 dBm         Offset         8.00 dB         8 BW         100 kHz           Att         30 dB         SWT         250 ms         VBW         300 kHz         Mode         Auto Sweep           Count 10/10         SWT         250 ms         VBW         300 kHz         Mode         Auto Sweep           Output         Militian         Militian         -39.98 dBm
		10 dBm 15.235833 GHz
CH00 1GHz~26GHz		-10 dEm
		-50 d m
		-70 dBm





Test Item:	SE	Modulation type: 8DPSK
		Spectrum         Image: Constraint of the sector of th
		Count 100/100 PJPK Max 20 dBm M1[1] 4.69 dBm 2.4018260 GHz
		10 dBm //// //
CH00 Reference level		-10 dBm
Reletence level		-30 dBm
		-50 dBm
		-70 dBm CF 2.402 GHz 691 pts Span 30.0 MHz
		Spectrum Ref Level 20.00 dbm Offset 8.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 db @ RBW 100 kHz Ref Level 20.00 dbm Offset 9.00 dbm Offset 9.00 kHz Ref Level 20.00 kHz Ref Level 20.00 dbm Offset 9.00 kHz Ref Level 20.00 kHz Ref Level 20.0
		Att 30 dB SWT 30.1 ms ♥ VBW 300 kHz Mode Auto Sweep Count 10/10      IPk Max
		10 dBm
CH00		-20 dBm
30MHz~1000MHz		-40 dBm-
		-50 dam,
		Start 30.0 MHz 30001 pts Stop 1.0 GHz
		Spectrum 🕎
		Ref Level 2:0.00 dBm         Offset 8:0.00 dB         RBW 100 kHz           Att         30 dB         SWT         250 ms         VBW 300 kHz           Count 10/10
		10 dBm - 16.235833 GHz
CH00 1GHz~26GHz		-10 dBm - 01 -15.310 dBm - 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
		-30 dem
		-70 dBm
		Metsuring 🦉 BUBBUBB 🦓





## 5.11. Spurious Emissions (radiated)

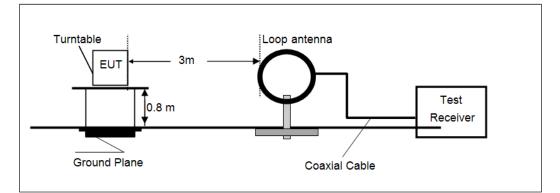
### <u>LIMIT</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.209

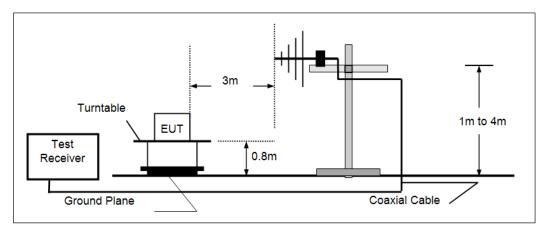
Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

### **TEST CONFIGURATION**

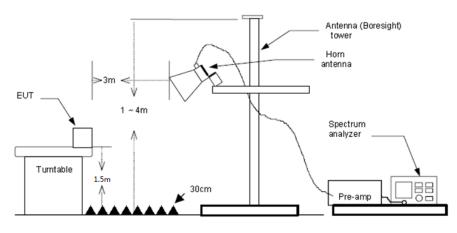
Below 30 MHz



### > 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

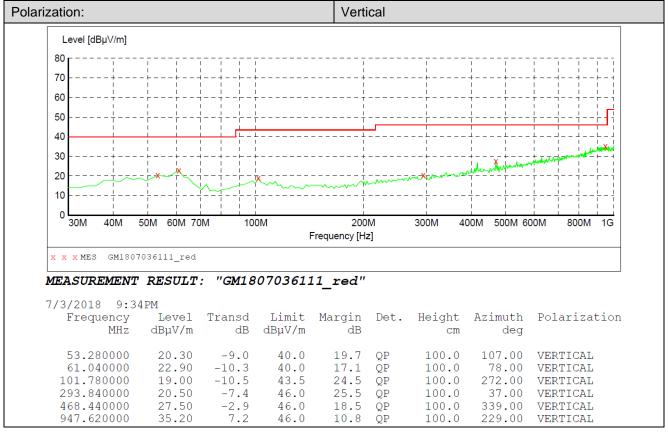
### Note:

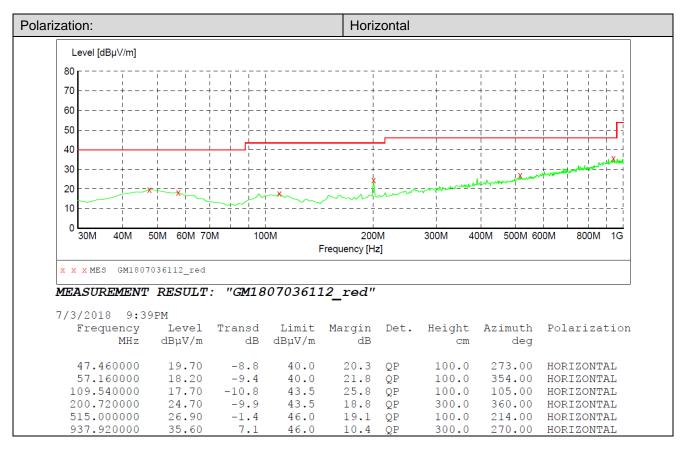
- 1) Final Level = Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3) Below 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation High channel which it was worst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





### ➢ 1 GHz ~ 25 GHz

	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			
3135.99	33.82	28.80	7.64	37.45	32.81	74.00	-41.19	Vertical	Peak			
4004.08	36.33	29.71	8.78	36.76	38.06	74.00	-35.94	Vertical	Peak			
4809.50	36.35	31.58	9.55	35.72	41.76	74.00	-32.24	Vertical	Peak			
7209.02	33.41	36.21	11.87	33.51	47.98	74.00	-26.02	Vertical	Peak			
1204.21	35.97	26.30	4.67	37.22	29.72	74.00	-44.28	Horizontal	Peak			
3241.50	34.67	28.55	7.77	37.36	33.63	74.00	-40.37	Horizontal	Peak			
4288.96	33.83	30.18	9.02	36.48	36.55	74.00	-37.45	Horizontal	Peak			
5379.50	32.74	31.46	10.10	34.64	39.66	74.00	-34.34	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		
3135.99	33.82	28.80	7.64	37.45	32.81	74.00	-41.19	Vertical	Peak		
4004.08	36.33	29.71	8.78	36.76	38.06	74.00	-35.94	Vertical	Peak		
4809.50	36.35	31.58	9.55	35.72	41.76	74.00	-32.24	Vertical	Peak		
7209.02	33.41	36.21	11.87	33.51	47.98	74.00	-26.02	Vertical	Peak		
4065.71	35.25	29.83	8.83	36.69	37.22	74.00	-36.78	Horizontal	Peak		
4883.52	33.20	31.43	9.59	35.58	38.64	74.00	-35.36	Horizontal	Peak		
5776.92	32.94	31.99	10.55	34.27	41.21	74.00	-32.79	Horizontal	Peak		
7172.41	31.81	36.04	11.86	33.58	46.13	74.00	-27.87	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
3200.50	35.55	28.80	7.72	37.40	34.67	74.00	-39.33	Vertical	Peak
4181.16	33.79	29.98	8.92	36.58	36.11	74.00	-37.89	Vertical	Peak
5047.83	32.70	31.69	9.71	35.28	38.82	74.00	-35.18	Vertical	Peak
7470.56	32.37	36.16	12.30	33.07	47.76	74.00	-26.24	Vertical	Peak
3376.24	34.83	28.20	7.93	37.24	33.72	74.00	-40.28	Horizontal	Peak
4996.69	32.99	31.50	9.67	35.39	38.77	74.00	-35.23	Horizontal	Peak
5747.59	32.71	31.84	10.51	34.28	40.78	74.00	-33.22	Horizontal	Peak
6799.06	32.78	34.00	11.60	33.78	44.60	74.00	-29.40	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.: TRE1806021801.

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