



TEST REPORT

Report Reference No.....	TRE1710005701	R/C.....: 12942
FCC ID	YMTARM200	
Applicant's name.....	Victory Concept Electronics Ltd.	
Address.....	Unit 1304, 13/F, Lu Plaza, 2 Wing Yip Street Kwun Tong, Kowloon, Hong Kong	
Manufacturer.....	Victory Concept Electronics Ltd.	
Address.....	Unit 1304, 13/F, Lu Plaza, 2 Wing Yip Street, Kwun Tong, Kowloon, Hong Kong	
Test item description	High Fidelity Hi-Res Music Player and Bluetooth Streamer	
Trade Mark	Acoustic Research	
Model/Type reference.....	AR-M200	
Listed Model(s)	-	
Standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247	
Date of receipt of test sample.....	Oct.13,2017	
Date of testing.....	Oct.14,2017- Oct.25,2017	
Date of issue.....	Oct.26,2017	
Result.....	PASS	

Compiled by

(Position+Printed name+Signature): File administrators Candy Liu

Supervised by

(Position+Printed name+Signature): Project Engineer John Qiao

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:

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

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

1.2. Report version

Version No.	Date of issue	Description
00	Oct.26,2017	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. **SUMMARY**

3.1. Client Information

Applicant:	Victory Concept Electronics Ltd.
Address:	Unit 1304, 13/F, Lu Plaza, 2 Wing Yip Street Kwun Tong, Kowloon, Hong Kong
Manufacturer:	Victory Concept Electronics Ltd.
Address:	Unit 1304, 13/F, Lu Plaza, 2 Wing Yip Street, Kwun Tong, Kowloon, Hong Kong

3.2. Product Description

Name of EUT:	High Fidelity Hi-Res Music Player and Bluetooth Streamer
Trade Mark:	Acoustic Research
Model No.:	AR-M200
Listed Model(s):	-
Power supply:	DC5V 1A
Adapter information:	-
Hardware version:	V6
Software version:	1.0.xxx
Bluetooth	
Version:	Supported BT4.2+EDR
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	Integral Antenna
Antenna gain:	4.093 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:	/
		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

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 Conducted 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

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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

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

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

Test Result:

Passed Not Applicable

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



5.2. Conducted Emissions (AC Main)

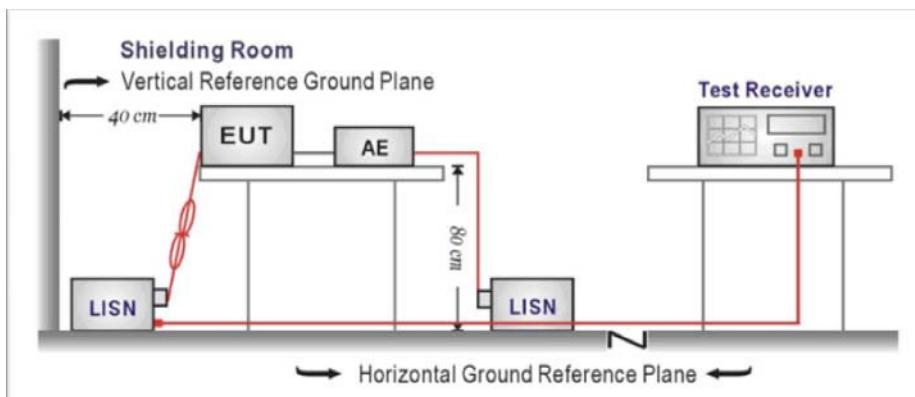
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

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

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

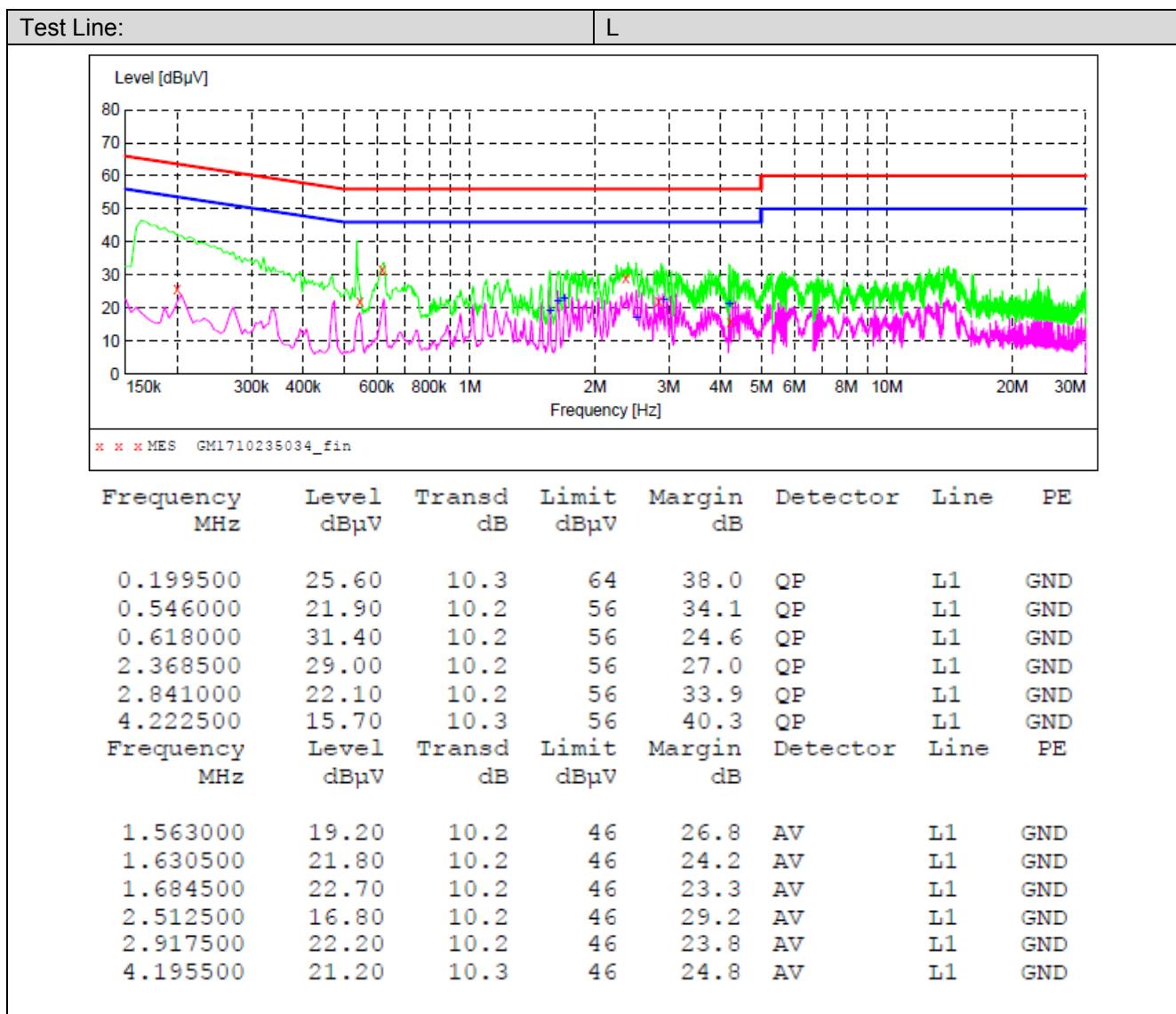
1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from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

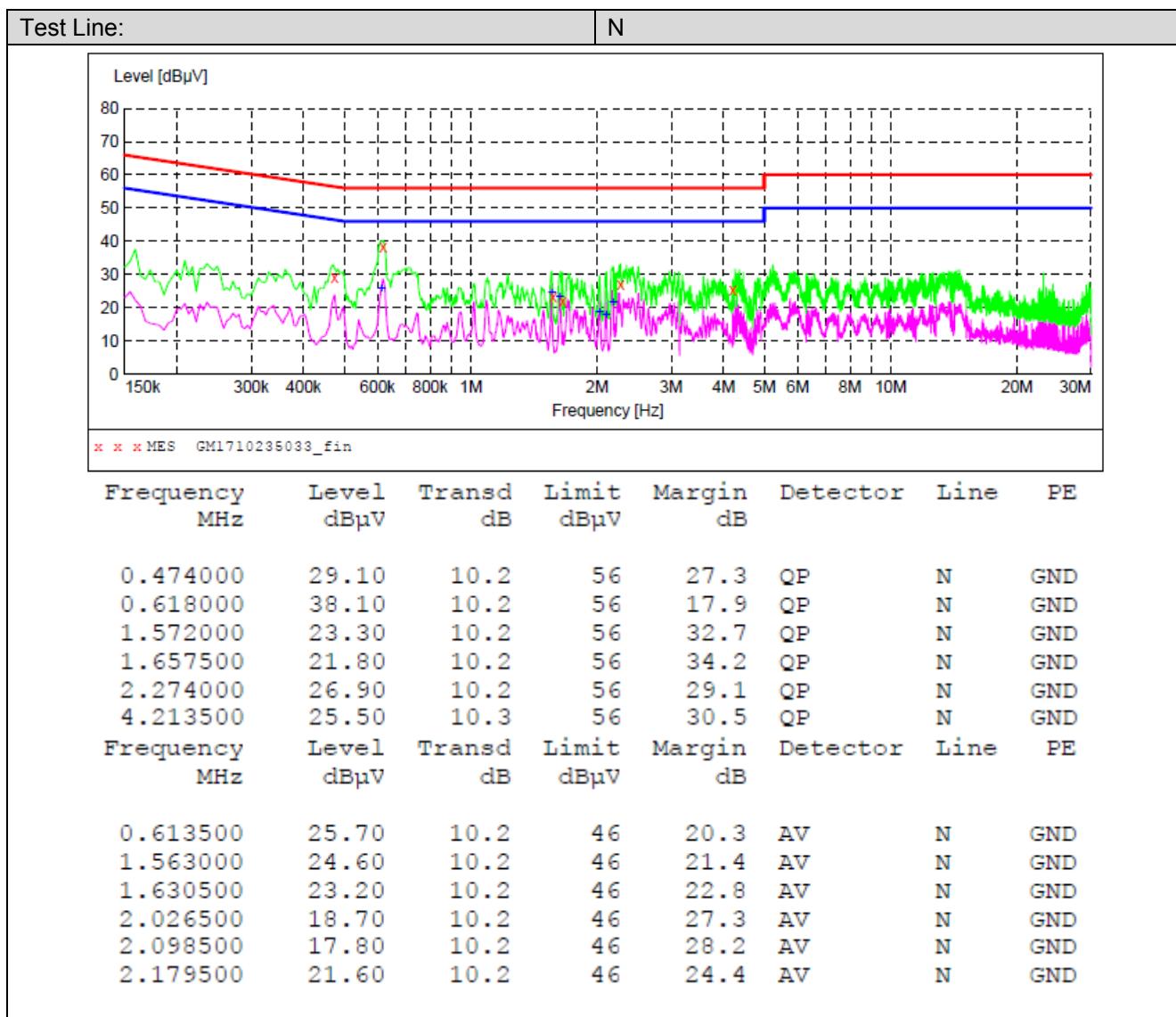
TEST RESULTS

Passed Not Applicable

Note:

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



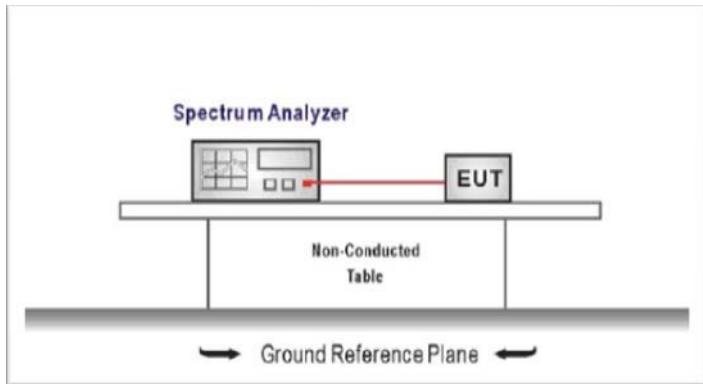


5.3. Conducted Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

Modulation type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	00	0.364	≤ 30.00	Pass
	39	-0.444		
	78	0.023		
$\pi/4$ DQPSK	00	-3.485	≤ 21.00	Pass
	39	-4.070		
	78	-3.781		
8DPSK	00	-2.871	≤ 21.00	Pass
	39	-3.471		
	78	-3.191		

Modulation Type:		GFSK
CH00		Frequency Auto Tune Center Freq 2.402000000 GHz Start Freq 2.399500000 GHz Stop Freq 2.404500000 GHz CF Step 500.000 kHz Auto Man Freq Offset 0 Hz
CH39		Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 500.000 kHz Auto Man Freq Offset 0 Hz
CH78		Frequency Auto Tune Center Freq 2.480000000 GHz Start Freq 2.477500000 GHz Stop Freq 2.482500000 GHz CF Step 500.000 kHz Auto Man Freq Offset 0 Hz

Modulation Type:		$\pi/4$ DQPSK										
CH00			Frequency	Auto Tune	Center Freq	2.40200000 GHz	Start Freq	2.39950000 GHz	Stop Freq	2.40450000 GHz	CF Step	500.000 kHz
CH39			Frequency	Auto Tune	Center Freq	2.44100000 GHz	Start Freq	2.43850000 GHz	Stop Freq	2.44350000 GHz	CF Step	500.000 kHz
CH78			Frequency	Auto Tune	Center Freq	2.48000000 GHz	Start Freq	2.47750000 GHz	Stop Freq	2.48250000 GHz	CF Step	500.000 kHz

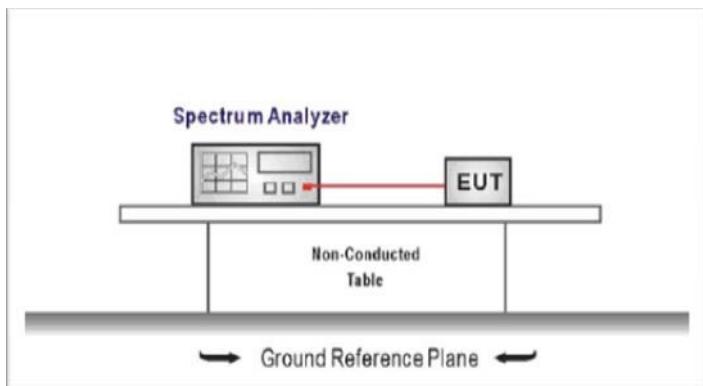
Modulation Type:	8DPSK
CH00	 <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.402000000 GHz</p> <p>Ref Offset 1 dB</p> <p>Ref 20.50 dBm</p> <p>10 dB/div Log</p> <p>Center 2.402000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 5.000 MHz Span 5.000 MHz</p> <p>Mkr1 2.401 956 875 GHz -2.871 dBm</p> <p>MSG STATUS</p> <p>Auto Tune</p> <p>Frequency</p> <p>Center Freq 2.402000000 GHz</p> <p>Start Freq 2.399500000 GHz</p> <p>Stop Freq 2.404500000 GHz</p> <p>CF Step 500.000 kHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p>
CH39	 <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Ref Offset 1 dB</p> <p>Ref 20.50 dBm</p> <p>10 dB/div Log</p> <p>Center 2.441000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 5.000 MHz Span 5.000 MHz</p> <p>Mkr1 2.441 016 250 GHz -3.471 dBm</p> <p>MSG STATUS</p> <p>Auto Tune</p> <p>Frequency</p> <p>Center Freq 2.441000000 GHz</p> <p>Start Freq 2.438500000 GHz</p> <p>Stop Freq 2.443500000 GHz</p> <p>CF Step 500.000 kHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p>
CH78	 <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.480000000 GHz</p> <p>Ref Offset 1 dB</p> <p>Ref 20.50 dBm</p> <p>10 dB/div Log</p> <p>Center 2.480000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 1.067 ms (8001 pts) Span 5.000 MHz</p> <p>Mkr1 2.479 955 000 GHz -3.191 dBm</p> <p>MSG STATUS</p> <p>Auto Tune</p> <p>Frequency</p> <p>Center Freq 2.480000000 GHz</p> <p>Start Freq 2.477500000 GHz</p> <p>Stop Freq 2.482500000 GHz</p> <p>CF Step 500.000 kHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p>

5.4. 20 dB Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE:

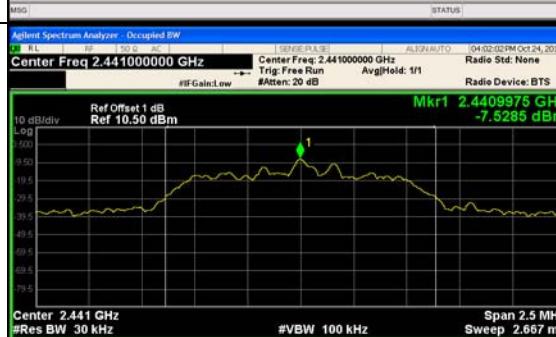
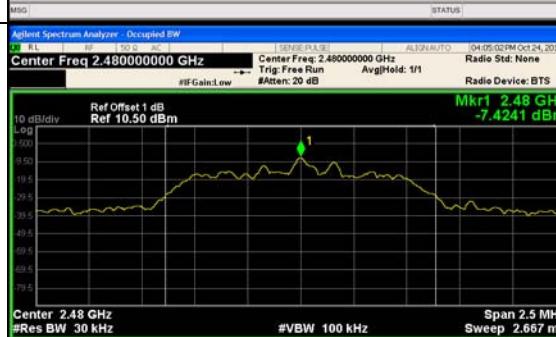
Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

Modulation type	Channel	20 dB Bandwidth (MHz)	Limit (MHz)	Result
GFSK	00	0.9229	-	Pass
	39	0.9272		
	78	0.9274		
$\pi/4$ DQPSK	00	1.259	-	Pass
	39	1.253		
	78	1.257		
8DPSK	00	1.232	-	Pass
	39	1.233		
	78	1.237		

Modulation Type:		GFSK
CH00		Frequency Center Freq 2.402000000 GHz CF Step 200.000 kHz Auto Freq Offset 0 Hz
CH39		Peak Search
CH78		Frequency Center Freq 2.480000000 GHz CF Step 200.000 kHz Auto Freq Offset 0 Hz

Modulation Type:		π/4DQPSK
CH00		<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.402000000 GHz</p> <p>Ref Offset 1 dB</p> <p>Ref 10.50 dBm</p> <p>10 dB/div</p> <p>Log</p>  <p>Mkr1 2.402 GHz -7.1503 dBm</p> <p>Span 2.5 MHz</p> <p>Sweep 2.667 ms</p> <p>Occupied Bandwidth 1.2881 MHz</p> <p>Total Power 1.01 dBm</p> <p>Transmit Freq Error -863 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.259 MHz</p> <p>x dB -20.00 dB</p>
CH39		<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.441000000 GHz</p> <p>Ref Offset 1 dB</p> <p>Ref 10.50 dBm</p> <p>10 dB/div</p> <p>Log</p>  <p>Mkr1 2.4409975 GHz -7.5285 dBm</p> <p>Span 2.5 MHz</p> <p>Sweep 2.667 ms</p> <p>Occupied Bandwidth 1.2665 MHz</p> <p>Total Power 0.59 dBm</p> <p>Transmit Freq Error 1.117 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.253 MHz</p> <p>x dB -20.00 dB</p>
CH78		<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.480000000 GHz</p> <p>Ref Offset 1 dB</p> <p>Ref 10.50 dBm</p> <p>10 dB/div</p> <p>Log</p>  <p>Mkr1 2.48 GHz -7.4241 dBm</p> <p>Span 2.5 MHz</p> <p>Sweep 2.667 ms</p> <p>Occupied Bandwidth 1.2722 MHz</p> <p>Total Power 0.67 dBm</p> <p>Transmit Freq Error 308 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.257 MHz</p> <p>x dB -20.00 dB</p>

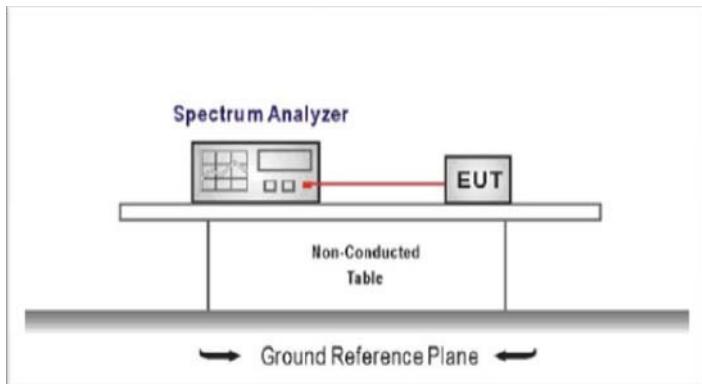
Modulation Type:	8DPSK
CH00	 <p>Center Freq 2.402000000 GHz Ref Offset 1 dB Ref 10.50 dBm Mkr1 2.4019975 GHz -7.3948 dBm Span 2.5 MHz Sweep 2.667 ms Occupied Bandwidth 1.2257 MHz Transmit Freq Error -11.725 kHz x dB Bandwidth 1.232 MHz OBW Power 99.00 % x dB 1.232 MHz Total Power 1.31 dBm x dB -20.00 dB</p>
CH39	 <p>Center Freq 2.441000000 GHz Ref Offset 1 dB Ref 10.50 dBm Mkr1 2.4409975 GHz -7.6248 dBm Span 2.5 MHz Sweep 2.667 ms Occupied Bandwidth 1.2123 MHz Transmit Freq Error -10.435 kHz x dB Bandwidth 1.233 MHz OBW Power 99.00 % x dB 1.233 MHz Total Power 1.10 dBm x dB -20.00 dB</p>
CH78	 <p>Center Freq 2.480000000 GHz Ref Offset 1 dB Ref 10.50 dBm Mkr1 2.4799925 GHz -7.7435 dBm Span 2.5 MHz Sweep 2.667 ms Occupied Bandwidth 1.2224 MHz Transmit Freq Error -10.586 kHz x dB Bandwidth 1.237 MHz OBW Power 99.00 % x dB 1.237 MHz Total Power 0.97 dBm x dB -20.00 dB</p>

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
3. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
RBW \geq 1% of the span, VBW \geq RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

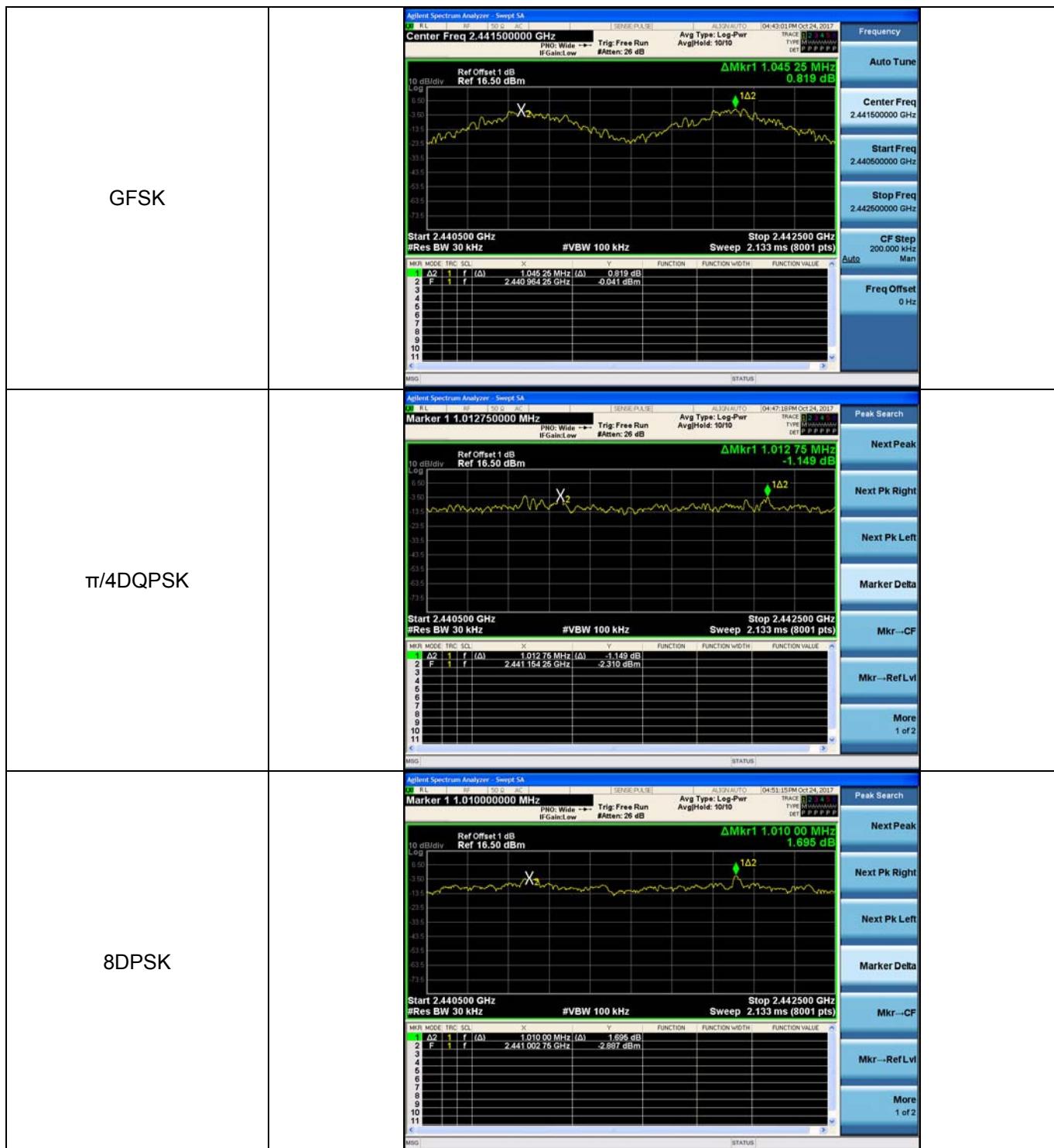
Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz) *	Result
GFSK	39	1.045	\geq 0.927	Pass
$\pi/4$ DQPSK	39	1.013	\geq 0.839	Pass
8DPSK	39	1.010	\geq 0.825	Pass

Note:

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

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

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

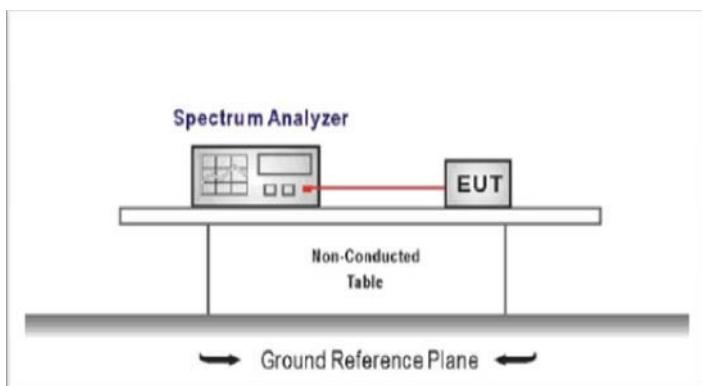


5.6. Hopping Channel Number

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

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

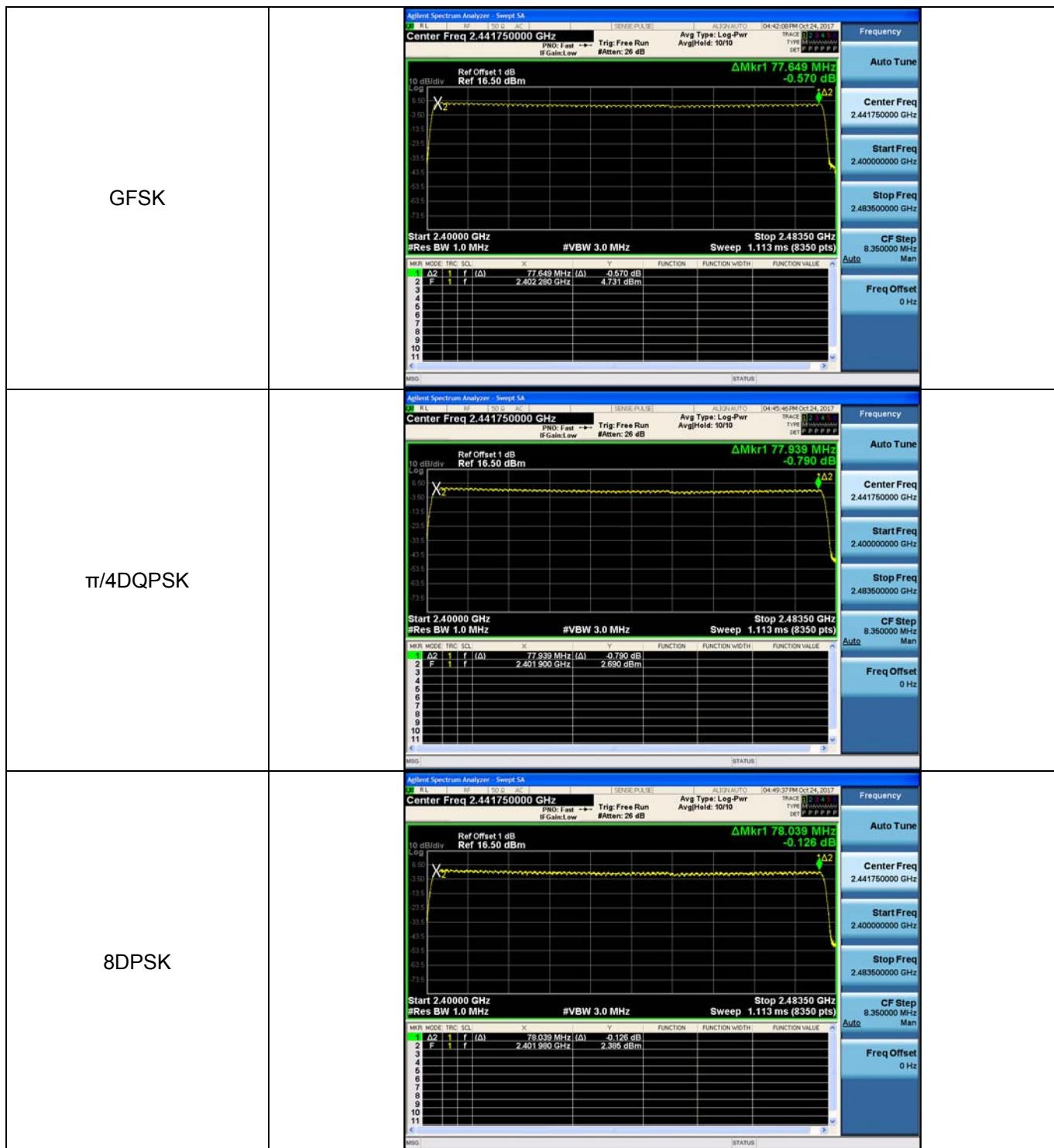
TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

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

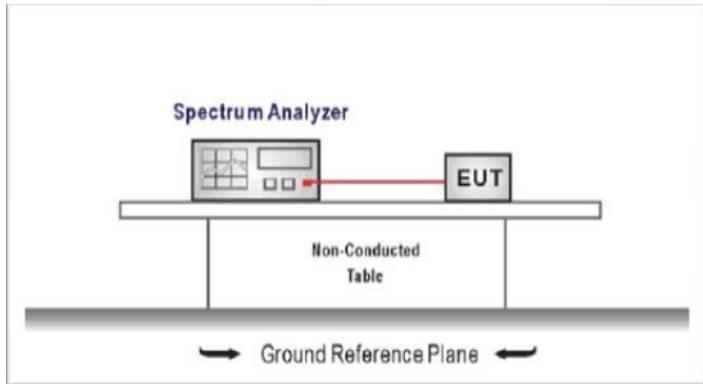


5.7. Dwell Time

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE:

Please refer to the clause 3.3

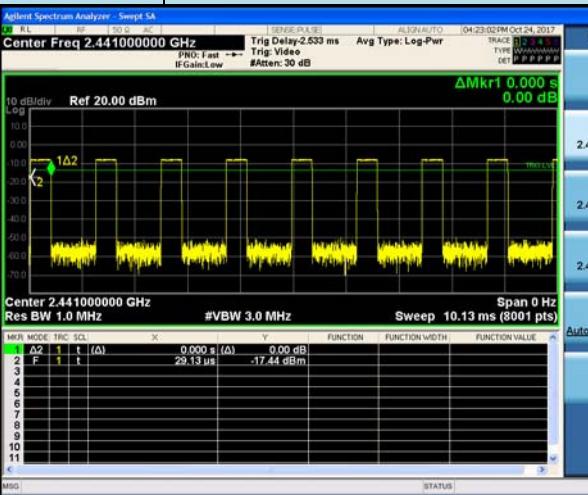
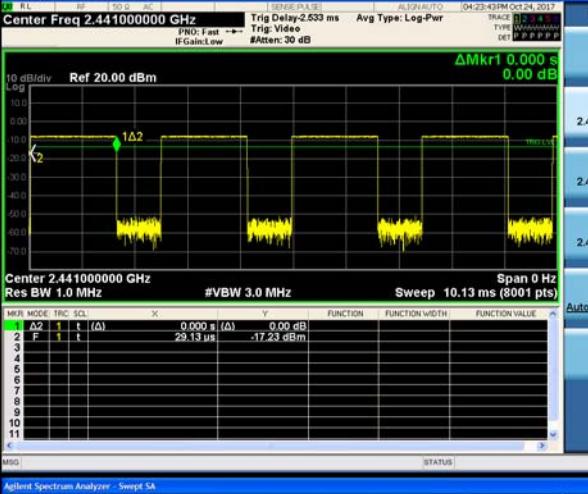
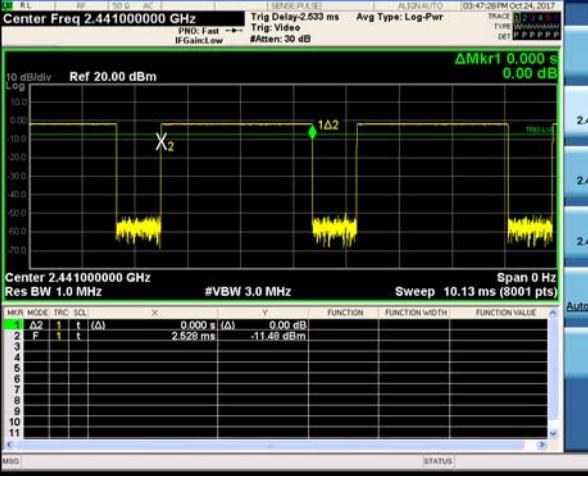
TEST RESULTS

Passed Not Applicable

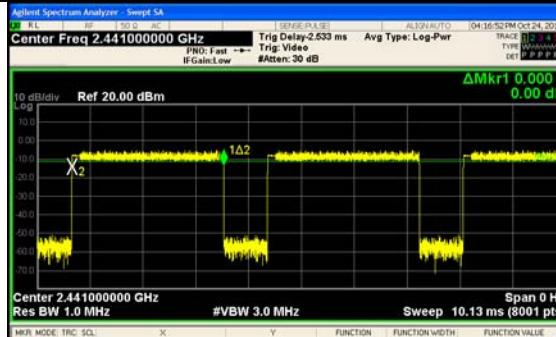
Modulation type	Channel	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.125	≤ 0.40	Pass
	DH3	0.264		
	DH5	0.309		
$\pi/4$ DQPSK	2DH1	0.131	≤ 0.40	Pass
	2DH3	0.266		
	2DH5	0.31		
8DPSK	3DH1	0.131	≤ 0.40	Pass
	3DH3	0.266		
	3DH5	0.31		

Note:

1. We have tested all mode at high,middle and low channel, and recorded worst case at middle channel.
2. Dwell time=Pulse time (ms) \times $(1600 \div 2 \div 79) \times 31.6$ Second for DH1, 2DH1, 3DH1
Dwell time=Pulse time (ms) \times $(1600 \div 4 \div 79) \times 31.6$ Second for DH3, 2DH3, 3DH3
Dwell time=Pulse time (ms) \times $(1600 \div 6 \div 79) \times 31.6$ Second for DH5, 2DH5, 3DH5

Modulation Type:		GFSK																																																																			
	DH1	 <table border="1" data-bbox="674 685 1262 707"> <tr><td>1</td><td>Δ2</td><td>1</td><td>t (Δ)</td><td>0.000 s (Δ)</td><td>0.00 dB</td></tr> <tr><td>2</td><td>F</td><td>1</td><td>t</td><td>29.13 μs</td><td>-17.44 dBm</td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	Δ2	1	t (Δ)	0.000 s (Δ)	0.00 dB	2	F	1	t	29.13 μs	-17.44 dBm	3						4						5						6						7						8						9						10						11						<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.44100000 GHz</p> <p>Start Freq 2.44100000 GHz</p> <p>Stop Freq 2.44100000 GHz</p> <p>CF Step 1.000000 MHz Auto</p> <p>Freq Offset 0 Hz</p>
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	DH5	 <table border="1" data-bbox="674 1695 1262 1718"> <tr><td>1</td><td>Δ2</td><td>1</td><td>t (Δ)</td><td>0.000 s (Δ)</td><td>0.00 dB</td></tr> <tr><td>2</td><td>F</td><td>1</td><td>t</td><td>2.528 ms</td><td>-11.48 dBm</td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	Δ2	1	t (Δ)	0.000 s (Δ)	0.00 dB	2	F	1	t	2.528 ms	-11.48 dBm	3						4						5						6						7						8						9						10						11						<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.44100000 GHz</p> <p>Start Freq 2.44100000 GHz</p> <p>Stop Freq 2.44100000 GHz</p> <p>CF Step 1.000000 MHz Auto</p> <p>Freq Offset 0 Hz</p>
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2	F	1	t	2.528 ms	-11.48 dBm																																																																
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Modulation Type:		$\pi/4$ DQPSK										
2DH1			Frequency	Auto Tune	Center Freq	2.44100000 GHz	Start Freq	2.44100000 GHz	Stop Freq	2.44100000 GHz	CF Step	1.000000 MHz
2DH3			Frequency	Auto Tune	Center Freq	2.44100000 GHz	Start Freq	2.44100000 GHz	Stop Freq	2.44100000 GHz	CF Step	1.000000 MHz
2DH5			Frequency	Auto Tune	Center Freq	2.44100000 GHz	Start Freq	2.44100000 GHz	Stop Freq	2.44100000 GHz	CF Step	1.000000 MHz

Modulation Type:		8DPSK
3DH1		<p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Ref 20.00 dBm</p> <p>Span 0 Hz</p> <p>Res BW 1.0 MHz</p> <p>#VBW 3.0 MHz</p> <p>Sweep 10.13 ms (8001 pts)</p> <p>CF Step 1.000000 MHz</p> <p>Auto</p> <p>Frequency 2.441000000 GHz</p> <p>Auto Tune</p> <p>Center Freq 2.441000000 GHz</p> <p>Start Freq 2.441000000 GHz</p> <p>Stop Freq 2.441000000 GHz</p> <p>CF Step 1.000000 MHz</p> <p>Man</p> <p>Freq Offset 0 Hz</p>  <p>MSG STATUS</p>
3DH3		<p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Ref 20.00 dBm</p> <p>Span 0 Hz</p> <p>Res BW 1.0 MHz</p> <p>#VBW 3.0 MHz</p> <p>Sweep 10.13 ms (8001 pts)</p> <p>CF Step 1.000000 MHz</p> <p>Auto</p> <p>Frequency 2.441000000 GHz</p> <p>Auto Tune</p> <p>Center Freq 2.441000000 GHz</p> <p>Start Freq 2.441000000 GHz</p> <p>Stop Freq 2.441000000 GHz</p> <p>CF Step 1.000000 MHz</p> <p>Man</p> <p>Freq Offset 0 Hz</p>  <p>MSG STATUS</p>
3DH5		<p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Ref 20.00 dBm</p> <p>Span 0 Hz</p> <p>Res BW 1.0 MHz</p> <p>#VBW 3.0 MHz</p> <p>Sweep 10.13 ms (8001 pts)</p> <p>CF Step 1.000000 MHz</p> <p>Auto</p> <p>Frequency 2.441000000 GHz</p> <p>Auto Tune</p> <p>Center Freq 2.441000000 GHz</p> <p>Start Freq 2.441000000 GHz</p> <p>Stop Freq 2.441000000 GHz</p> <p>CF Step 1.000000 MHz</p> <p>Man</p> <p>Freq Offset 0 Hz</p>  <p>MSG STATUS</p>

5.8. Pseudorandom Frequency Hopping Sequence

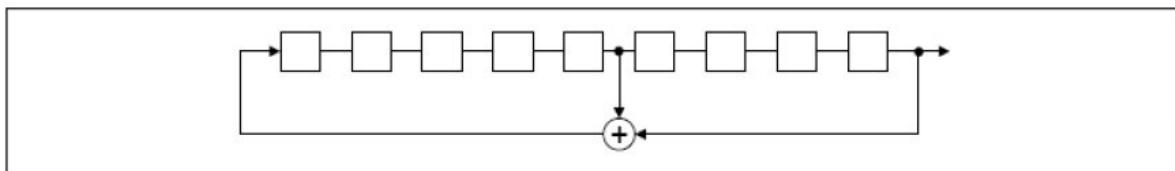
LIMIT

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

TEST RESULTS

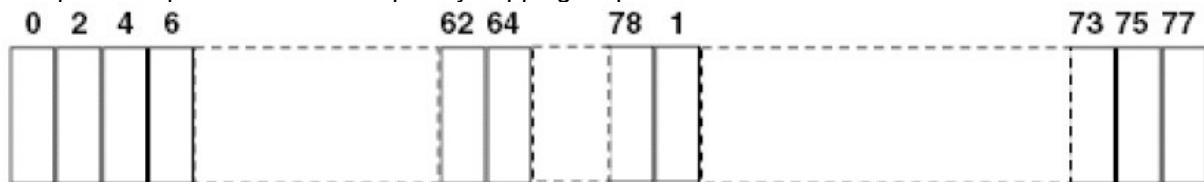
The pseudorandom frequency hopping sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: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

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



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency is used equally on the average by each transmitter.

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

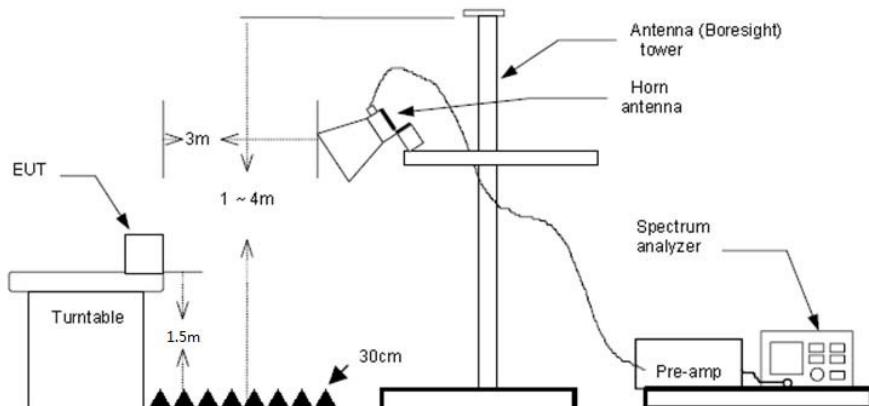
5.9. Restricted band (radiated)

LIMIT

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

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

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

Note:

- 1) Final level= Read level + 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	39.00	28.05	6.62	37.65	36.02	74.00	-37.98	Vertical	Peak
2390.03	46.80	27.65	6.75	37.87	43.33	74.00	-30.67	Vertical	Peak
2310.00	34.14	28.05	6.62	37.65	31.16	74.00	-42.84	Horizontal	Peak
2390.03	38.86	27.65	6.75	37.87	35.39	74.00	-38.61	Horizontal	Peak
2310.00	22.76	28.05	6.62	37.65	19.78	54.00	-34.22	Vertical	Average
2390.03	22.76	27.65	6.75	37.87	19.29	54.00	-34.71	Vertical	Average
2310.00	22.16	28.05	6.62	37.65	19.18	54.00	-34.82	Horizontal	Average
2390.03	22.81	27.65	6.75	37.87	19.34	54.00	-34.66	Horizontal	Average

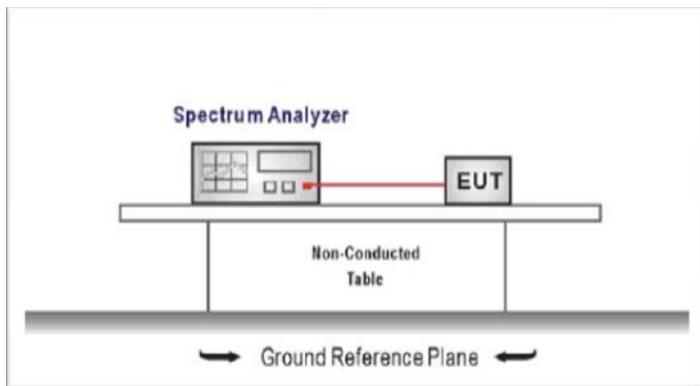
CH78									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.50	52.80	27.26	6.83	37.87	49.02	74.00	-24.98	Vertical	Peak
2500.00	35.82	27.20	6.84	37.87	31.99	74.00	-42.01	Vertical	Peak
2483.50	54.12	27.26	6.83	37.87	50.34	74.00	-23.66	Horizontal	Peak
2500.00	34.81	27.20	6.84	37.87	30.98	74.00	-43.02	Horizontal	Peak
2483.50	27.99	27.26	6.83	37.87	24.21	54.00	-29.79	Vertical	Average
2500.00	22.35	27.20	6.84	37.87	18.52	54.00	-35.48	Vertical	Average
2483.50	27.92	27.26	6.83	37.87	24.14	54.00	-29.86	Horizontal	Average
2500.00	22.78	27.20	6.84	37.87	18.95	54.00	-35.05	Horizontal	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

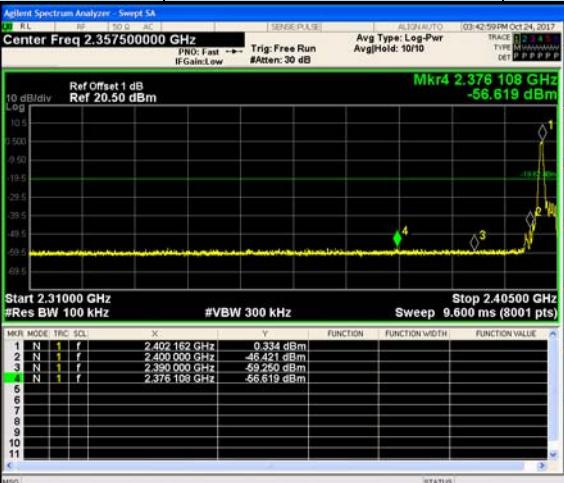
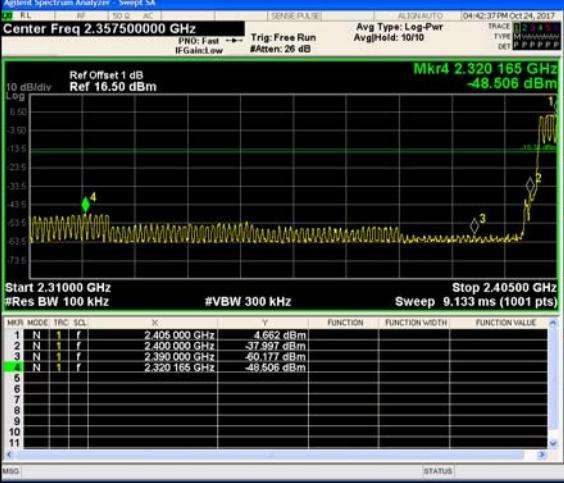
1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
RBW = 100 kHz, VBW \geq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

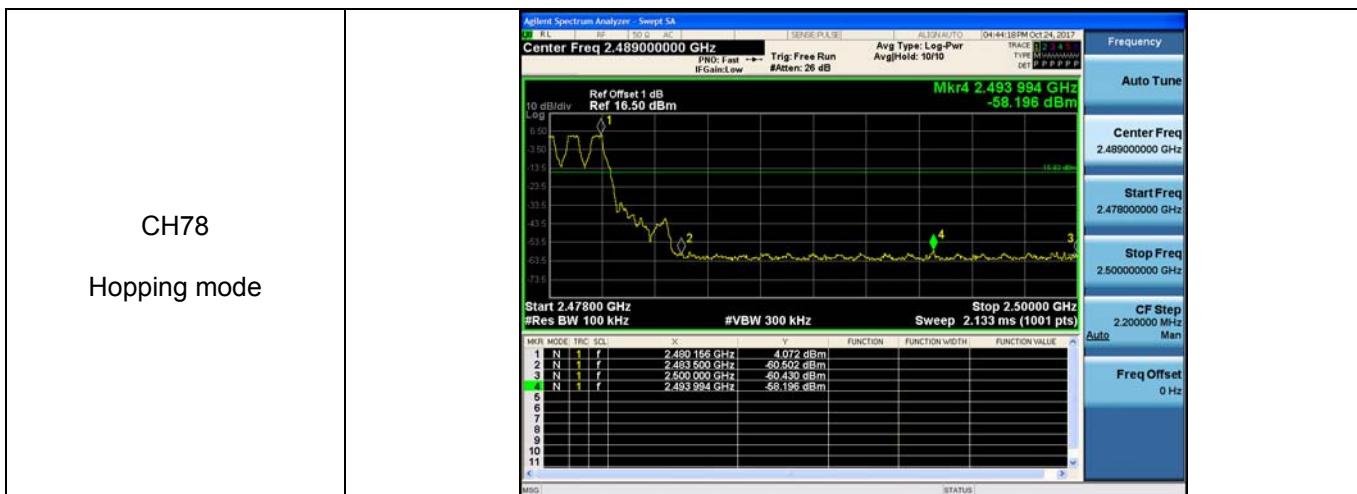
TEST MODE:

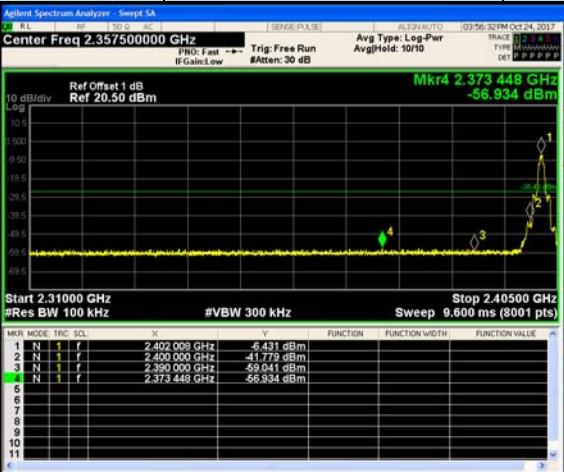
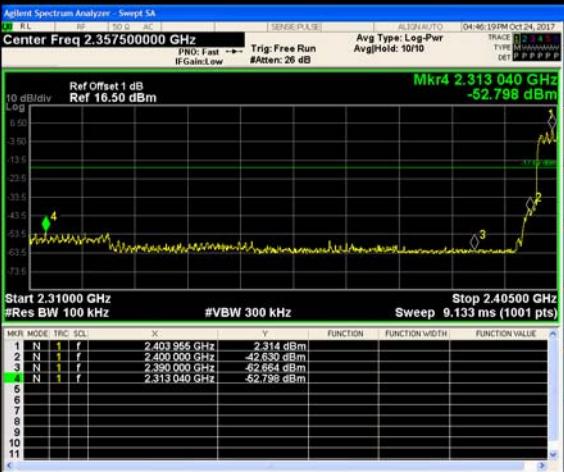
Please refer to the clause 3.3

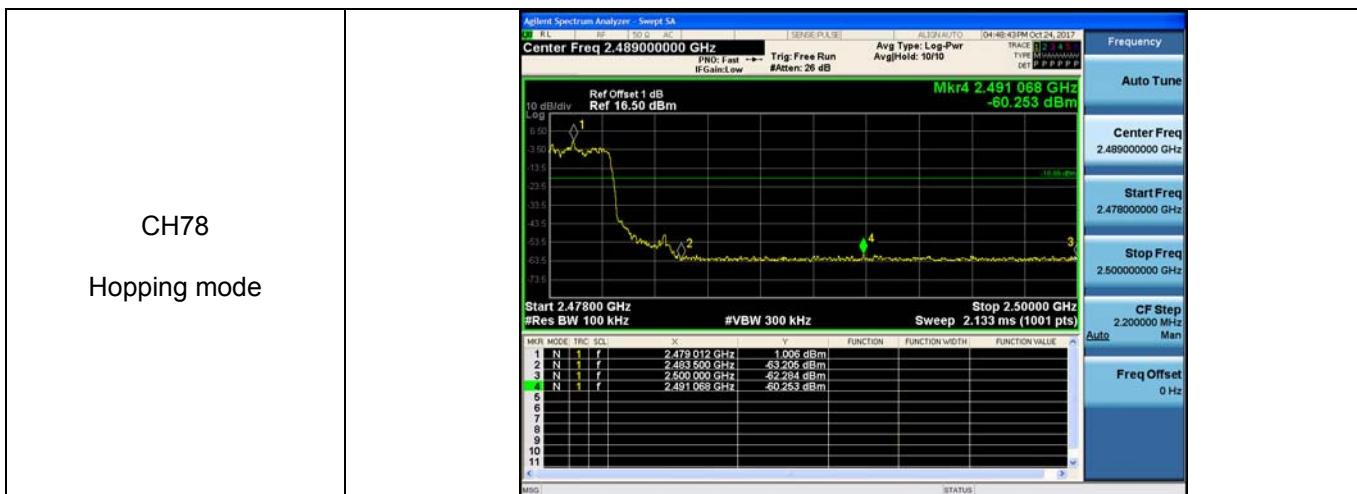
TEST RESULTS

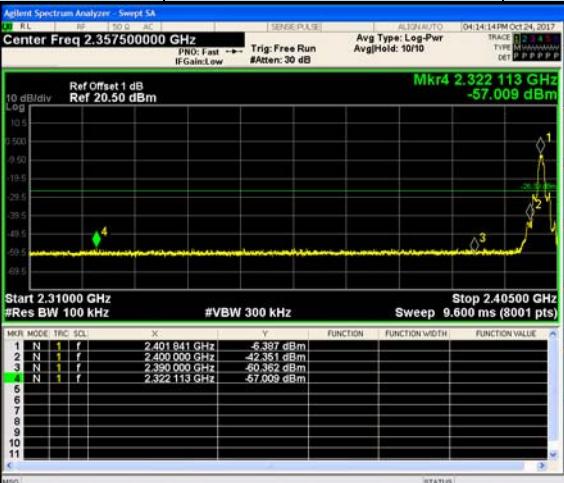
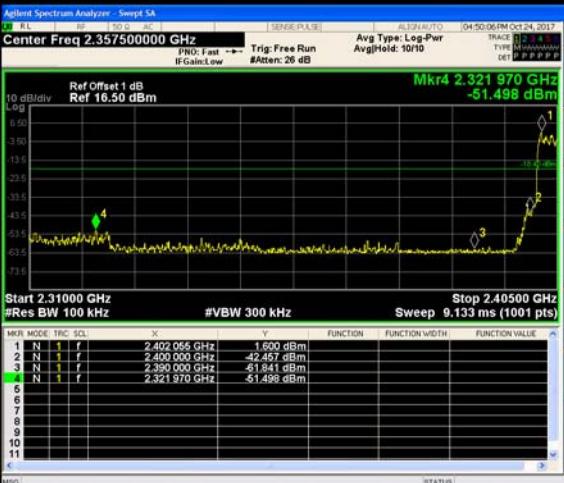
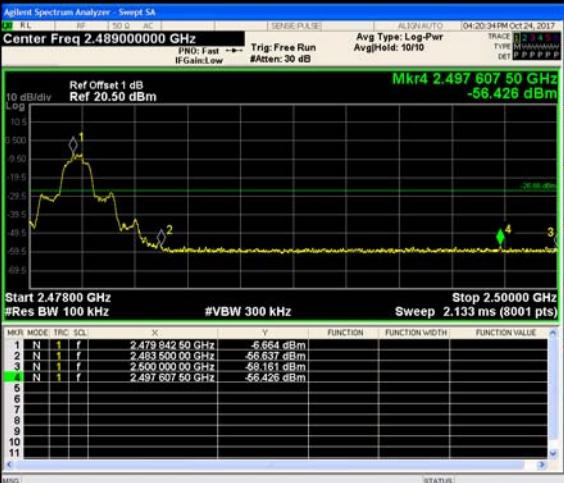
Passed Not Applicable

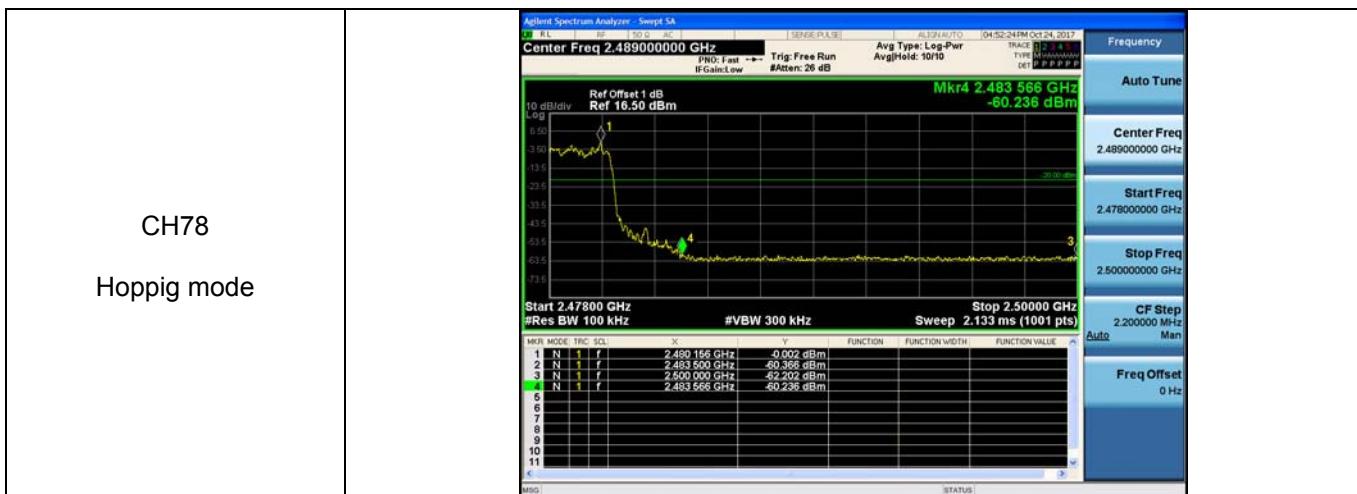
Test Item:	Band edge	Modulation type:	GFSK																								
CH00	No hopping mode	 <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.357500000 GHz</p> <p>Start Freq 2.310000000 GHz</p> <p>Stop Freq 2.405000000 GHz</p> <p>CF Step 9.500000 MHz</p> <p>Freq Offset 0 Hz</p> <table border="1"> <tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.402 162 GHz</td><td>0.334 dBm</td></tr> <tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.400 000 GHz</td><td>-46.421 dBm</td></tr> <tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.399 000 GHz</td><td>-59.250 dBm</td></tr> <tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.376 108 GHz</td><td>-56.619 dBm</td></tr> </table>	1	N	1	f	2.402 162 GHz	0.334 dBm	2	N	1	f	2.400 000 GHz	-46.421 dBm	3	N	1	f	2.399 000 GHz	-59.250 dBm	4	N	1	f	2.376 108 GHz	-56.619 dBm	<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.357500000 GHz</p> <p>Start Freq 2.310000000 GHz</p> <p>Stop Freq 2.405000000 GHz</p> <p>CF Step 9.500000 MHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p>
1	N	1	f	2.402 162 GHz	0.334 dBm																						
2	N	1	f	2.400 000 GHz	-46.421 dBm																						
3	N	1	f	2.399 000 GHz	-59.250 dBm																						
4	N	1	f	2.376 108 GHz	-56.619 dBm																						
CH00	Hopping mode	 <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.357500000 GHz</p> <p>Start Freq 2.310000000 GHz</p> <p>Stop Freq 2.405000000 GHz</p> <p>CF Step 9.500000 MHz</p> <p>Freq Offset 0 Hz</p> <table border="1"> <tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.405 000 GHz</td><td>4.662 dBm</td></tr> <tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.400 000 GHz</td><td>-37.997 dBm</td></tr> <tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.399 000 GHz</td><td>-60.177 dBm</td></tr> <tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.320 165 GHz</td><td>-48.506 dBm</td></tr> </table>	1	N	1	f	2.405 000 GHz	4.662 dBm	2	N	1	f	2.400 000 GHz	-37.997 dBm	3	N	1	f	2.399 000 GHz	-60.177 dBm	4	N	1	f	2.320 165 GHz	-48.506 dBm	<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.357500000 GHz</p> <p>Start Freq 2.310000000 GHz</p> <p>Stop Freq 2.405000000 GHz</p> <p>CF Step 9.500000 MHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p>
1	N	1	f	2.405 000 GHz	4.662 dBm																						
2	N	1	f	2.400 000 GHz	-37.997 dBm																						
3	N	1	f	2.399 000 GHz	-60.177 dBm																						
4	N	1	f	2.320 165 GHz	-48.506 dBm																						
CH78	No hopping mode	 <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.489000000 GHz</p> <p>Start Freq 2.478000000 GHz</p> <p>Stop Freq 2.500000000 GHz</p> <p>CF Step 2.200000 MHz</p> <p>Freq Offset 0 Hz</p> <table border="1"> <tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.479 945 26 GHz</td><td>-0.121 dBm</td></tr> <tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.483 500 00 GHz</td><td>-57.926 dBm</td></tr> <tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.500 000 00 GHz</td><td>-58.149 dBm</td></tr> <tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.489 451 00 GHz</td><td>-55.993 dBm</td></tr> </table>	1	N	1	f	2.479 945 26 GHz	-0.121 dBm	2	N	1	f	2.483 500 00 GHz	-57.926 dBm	3	N	1	f	2.500 000 00 GHz	-58.149 dBm	4	N	1	f	2.489 451 00 GHz	-55.993 dBm	<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.489000000 GHz</p> <p>Start Freq 2.478000000 GHz</p> <p>Stop Freq 2.500000000 GHz</p> <p>CF Step 2.200000 MHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p>
1	N	1	f	2.479 945 26 GHz	-0.121 dBm																						
2	N	1	f	2.483 500 00 GHz	-57.926 dBm																						
3	N	1	f	2.500 000 00 GHz	-58.149 dBm																						
4	N	1	f	2.489 451 00 GHz	-55.993 dBm																						



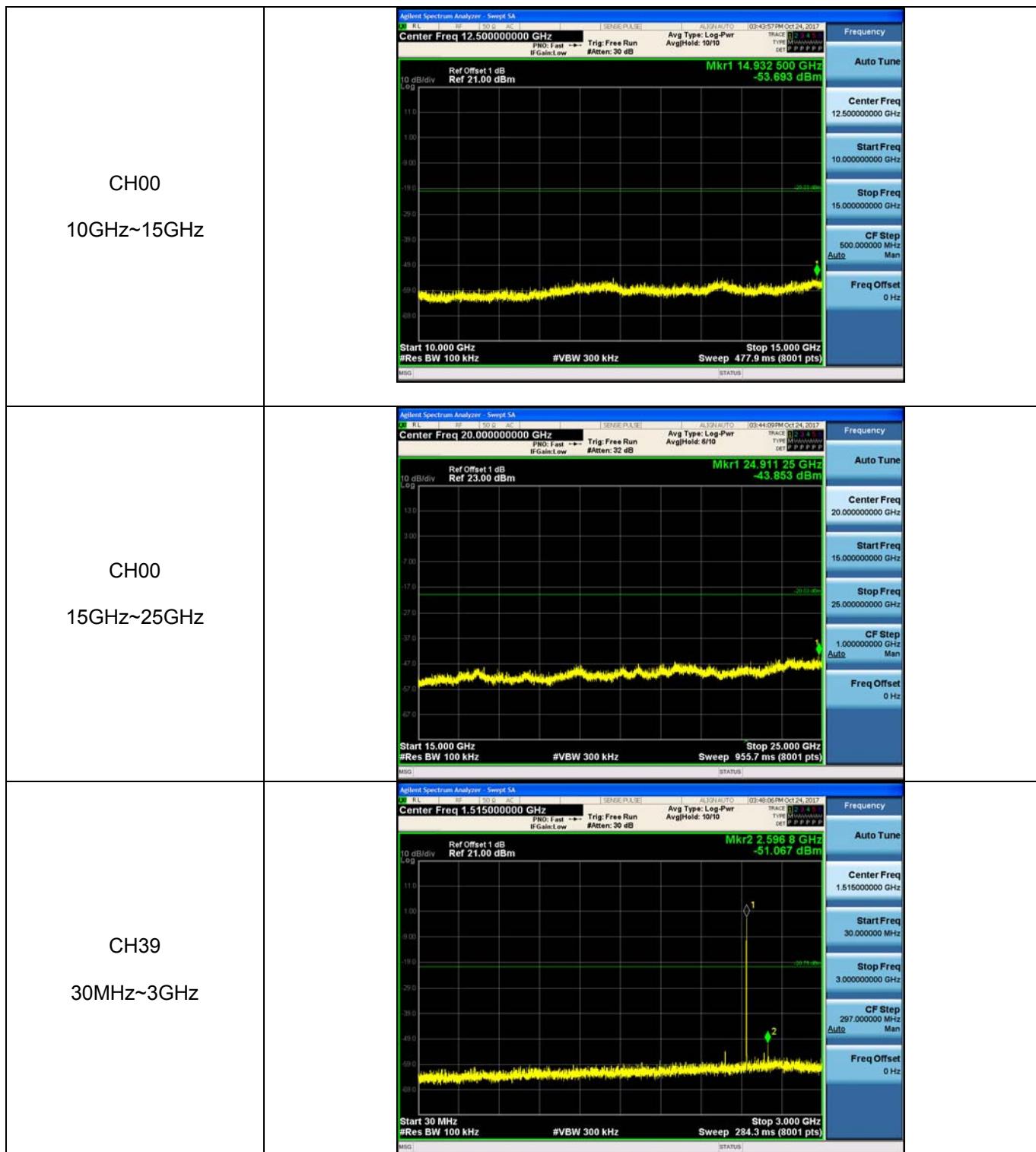
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CH00	No hopping mode		Frequency Auto Tune Center Freq 2.35750000 GHz Start Freq 2.31000000 GHz Stop Freq 2.40500000 GHz CF Step 9.500000 MHz Auto Freq Offset 0 Hz
CH00	Hopping mode		Frequency Auto Tune Center Freq 2.35750000 GHz Start Freq 2.31000000 GHz Stop Freq 2.40500000 GHz CF Step 9.500000 MHz Auto Freq Offset 0 Hz
CH78	No hopping mode		Frequency Auto Tune Center Freq 2.48900000 GHz Start Freq 2.47800000 GHz Stop Freq 2.50000000 GHz CF Step 2.200000 MHz Auto Freq Offset 0 Hz

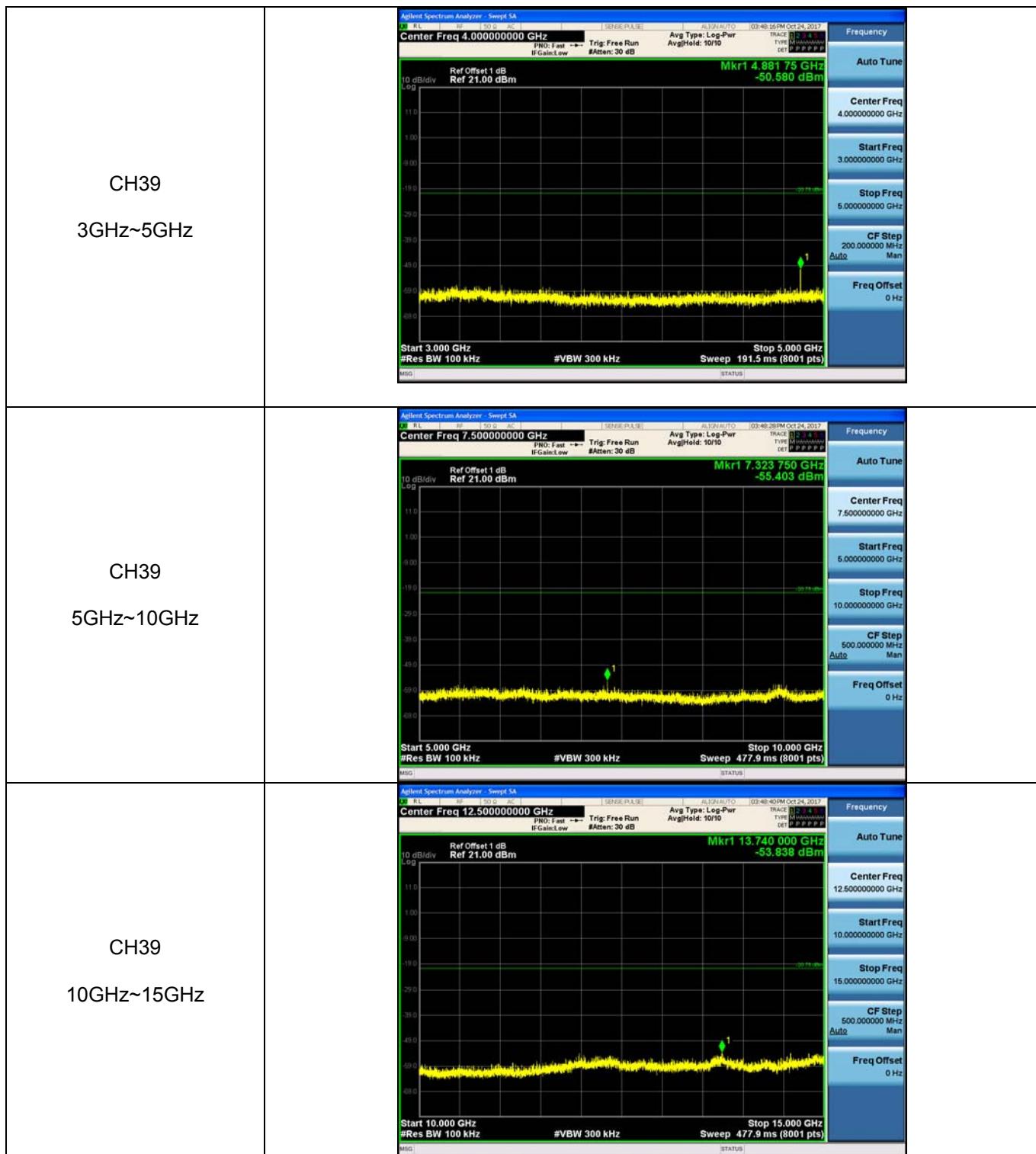


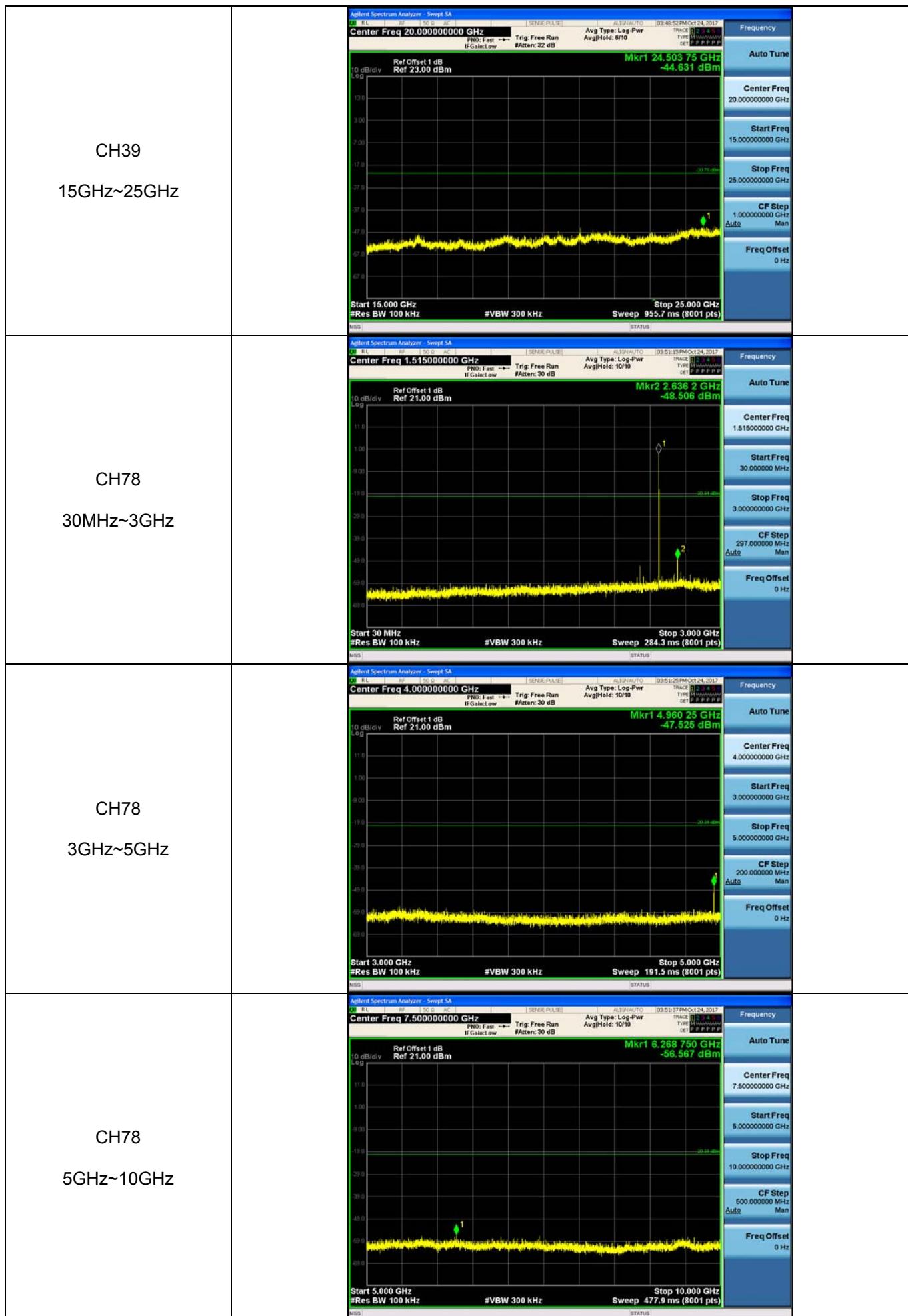
Test Item:	Band edge	Modulation type:	8DPSK
	CH00 No hopping mode		Frequency Auto Tune Center Freq 2.35750000 GHz Start Freq 2.31000000 GHz Stop Freq 2.40500000 GHz CF Step 9.500000 MHz Auto Freq Offset 0 Hz
	CH00 Hopping mode		Frequency Auto Tune Center Freq 2.35750000 GHz Start Freq 2.31000000 GHz Stop Freq 2.40500000 GHz CF Step 9.500000 MHz Auto Freq Offset 0 Hz
	CH78 No hopping mode		Frequency Auto Tune Center Freq 2.48900000 GHz Start Freq 2.47800000 GHz Stop Freq 2.50000000 GHz CF Step 2.200000 MHz Auto Freq Offset 0 Hz

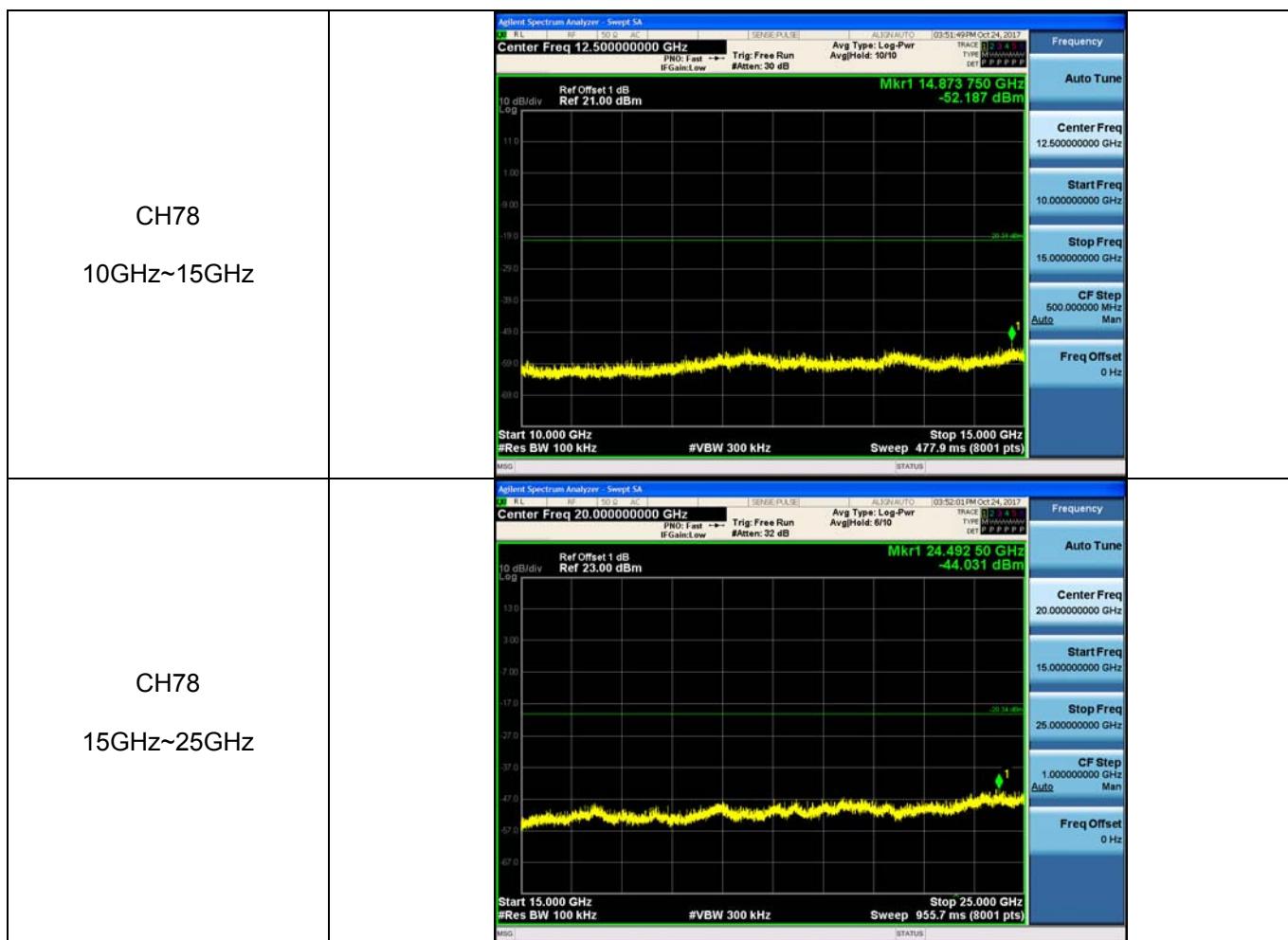


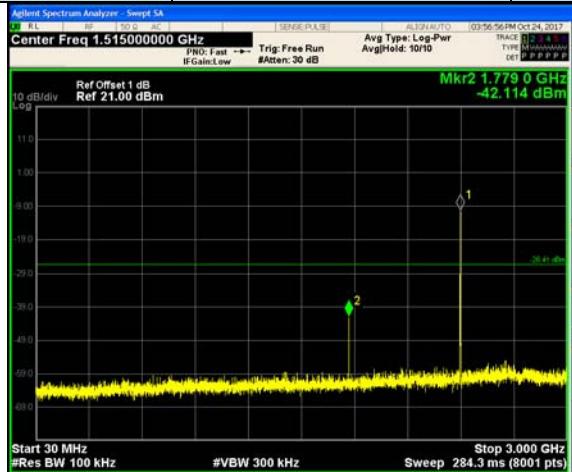
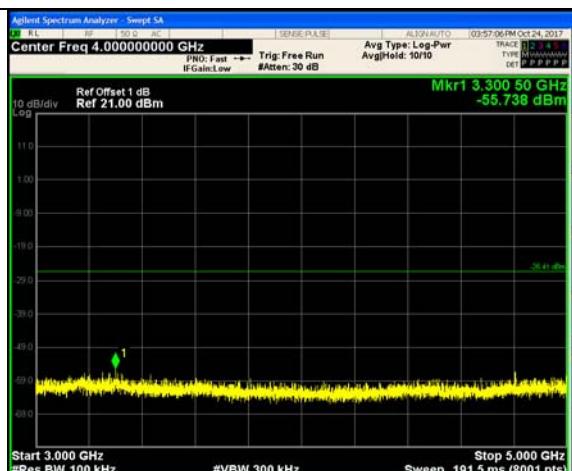
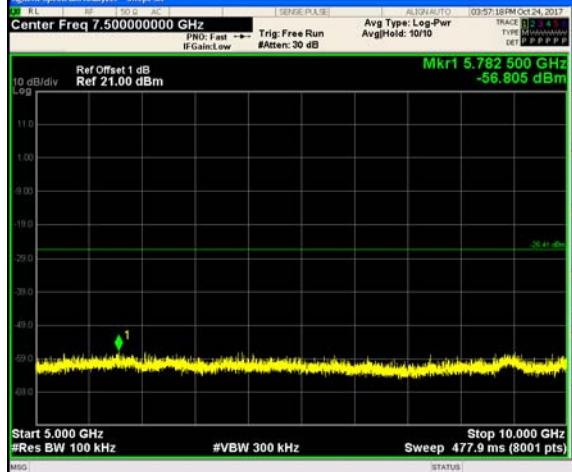
Test Item:	SE	Modulation type:	GFSK
CH00 30MHz~3GHz			Frequency Auto Tune Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GHz CF Step 297.000000 MHz Auto Man Freq Offset 0 Hz
CH00 3GHz~5GHz			Frequency Auto Tune Center Freq 4.000000000 GHz Start Freq 3.000000000 GHz Stop Freq 6.000000000 GHz CF Step 200.000000 MHz Auto Man Freq Offset 0 Hz
CH00 5GHz~10GHz			Frequency Auto Tune Center Freq 7.500000000 GHz Start Freq 5.000000000 GHz Stop Freq 10.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz

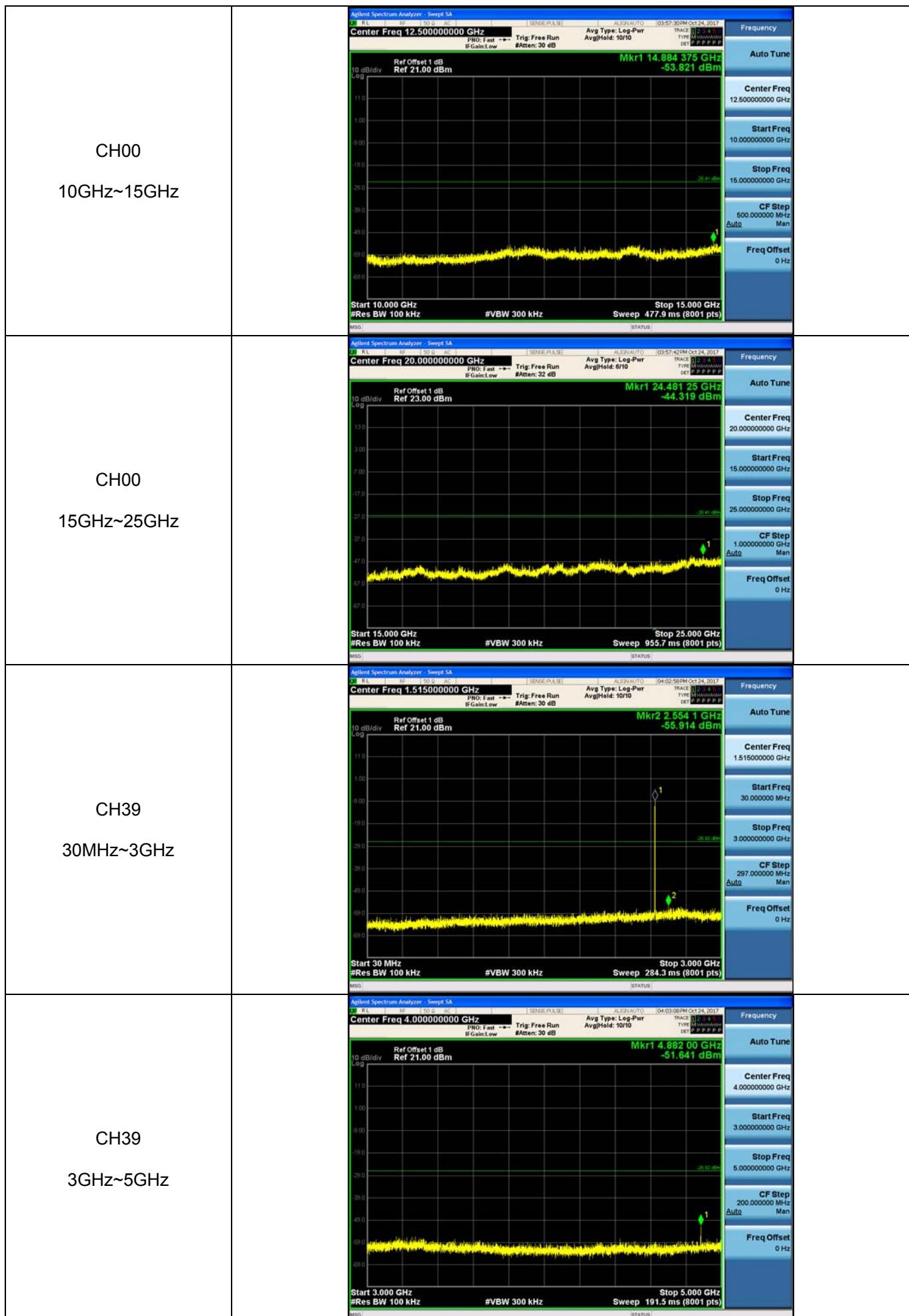


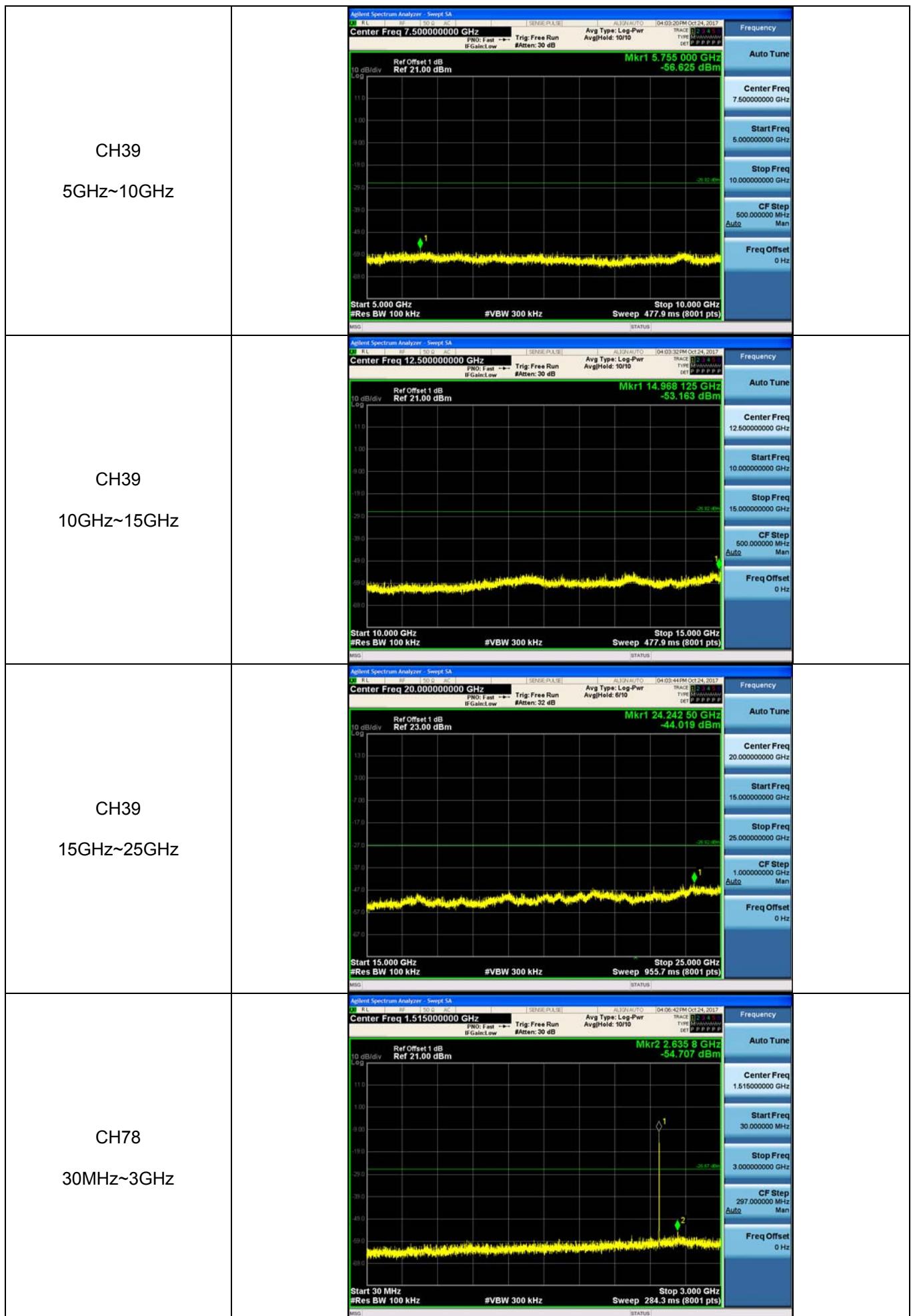


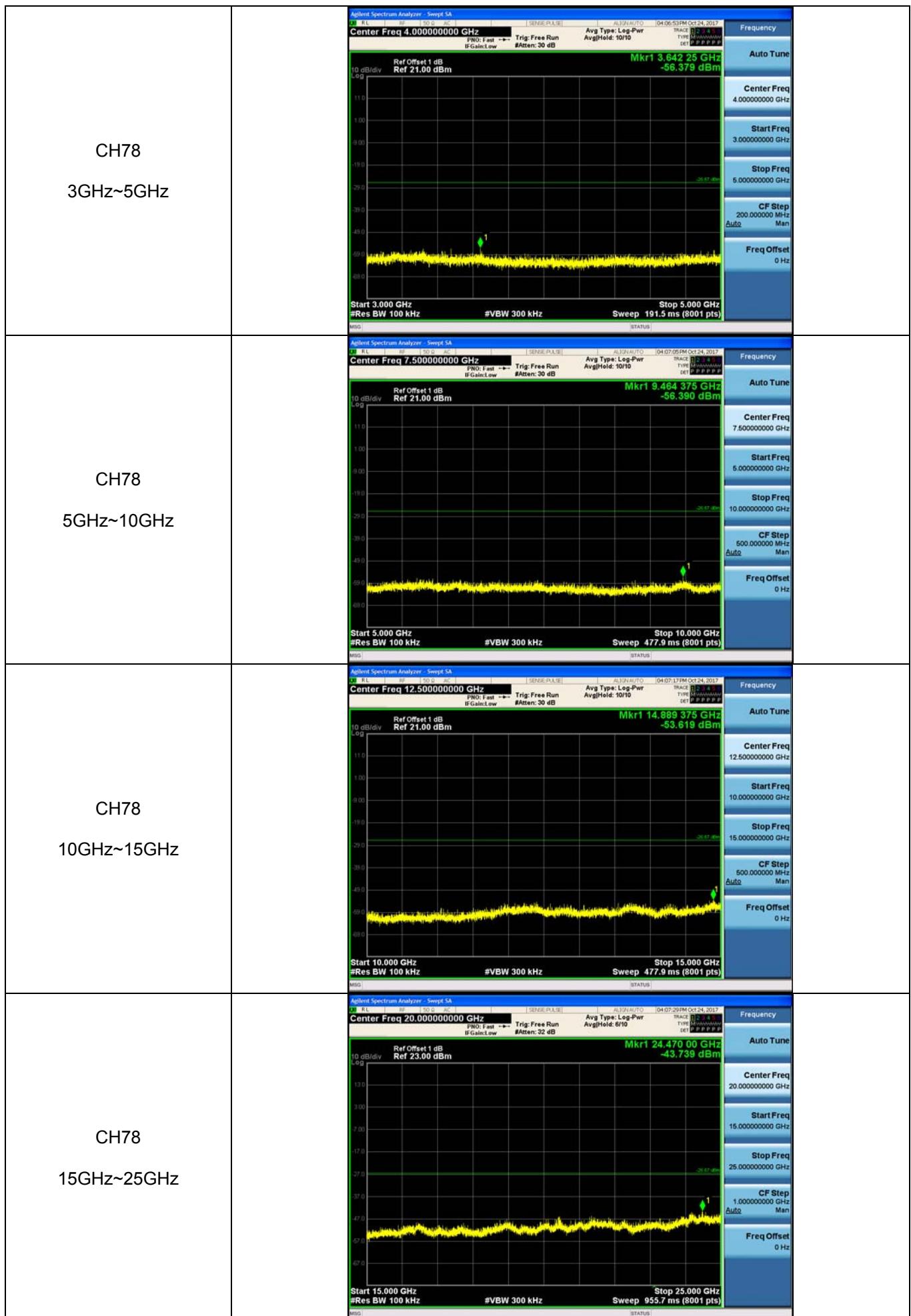


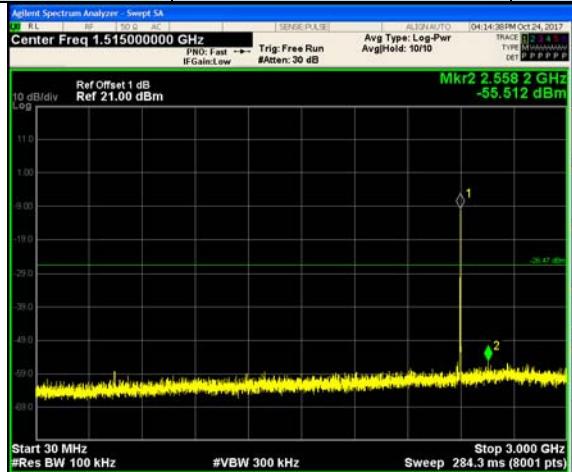
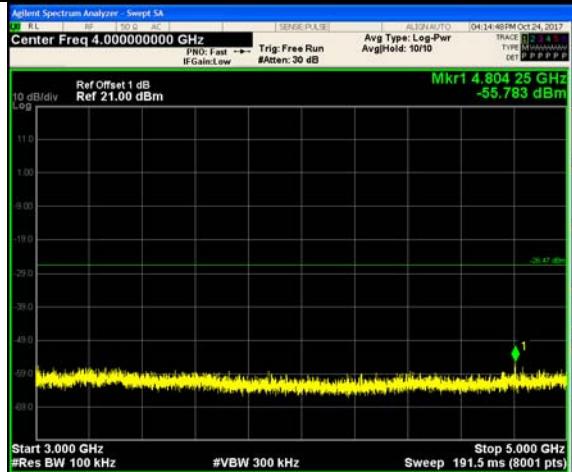


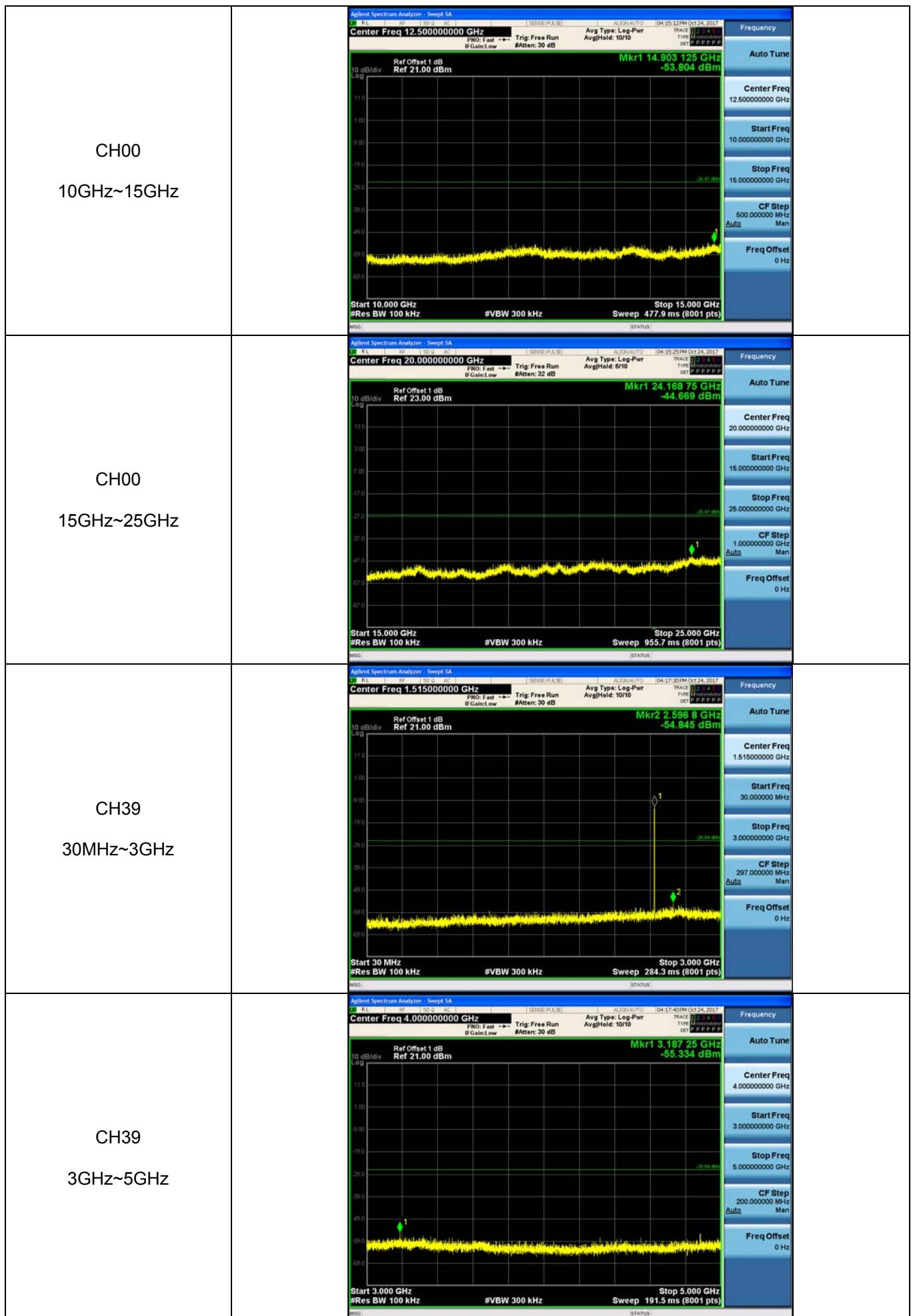
Test Item:	SE	Modulation type:	$\pi/4$ DQPSK
CH00 30MHz~3GHz			<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 1.515000000 GHz</p> <p>Start Freq 30.000000 MHz</p> <p>Stop Freq 3.000000000 GHz</p> <p>CF Step 297.000000 MHz</p> <p>Freq Offset 0 Hz</p>
CH00 3GHz~5GHz			<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 4.000000000 GHz</p> <p>Start Freq 3.000000000 GHz</p> <p>Stop Freq 5.000000000 GHz</p> <p>CF Step 200.000000 MHz</p> <p>Freq Offset 0 Hz</p>
CH00 5GHz~10GHz			<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 7.500000000 GHz</p> <p>Start Freq 5.000000000 GHz</p> <p>Stop Freq 10.000000000 GHz</p> <p>CF Step 500.000000 MHz</p> <p>Freq Offset 0 Hz</p>

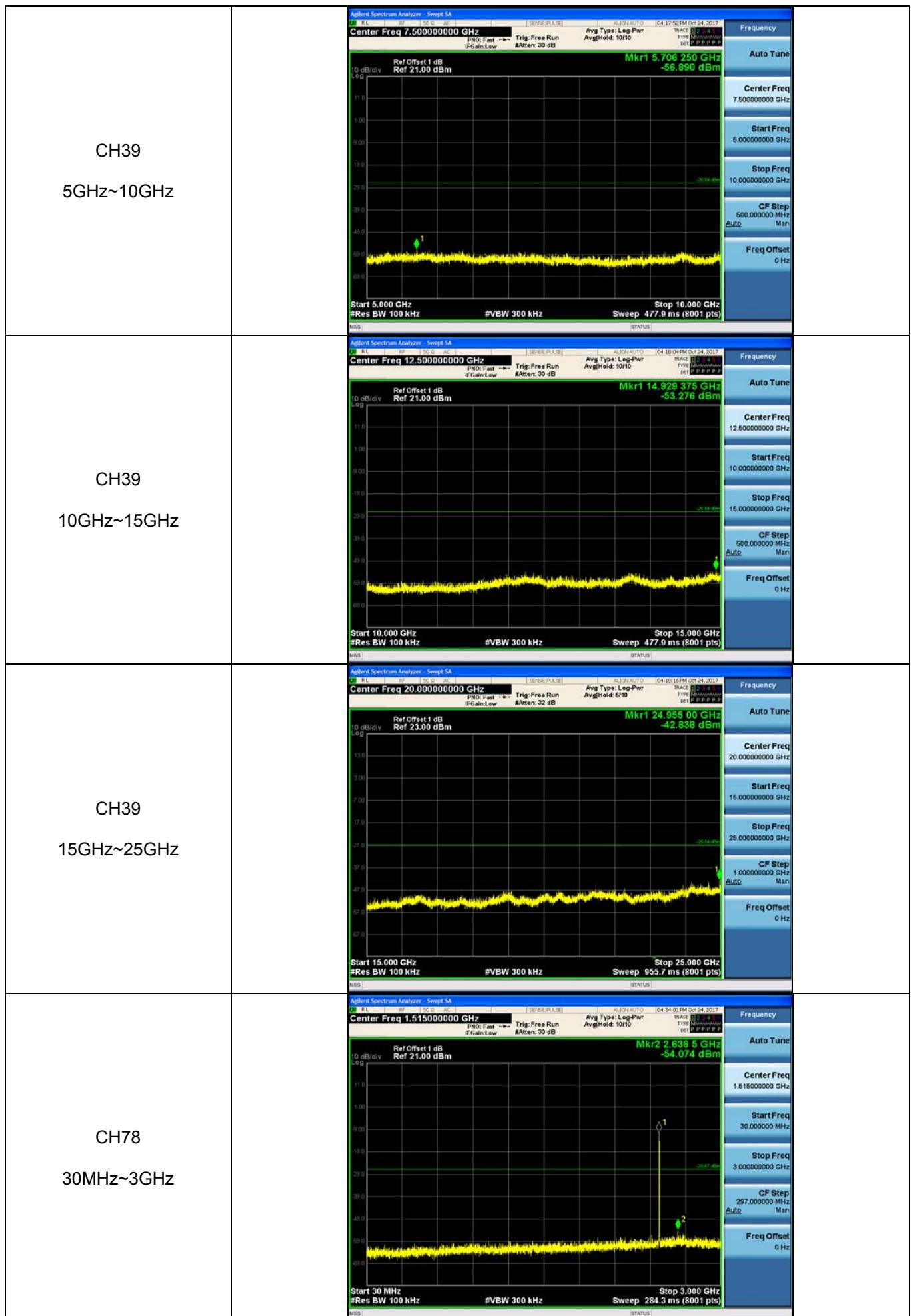


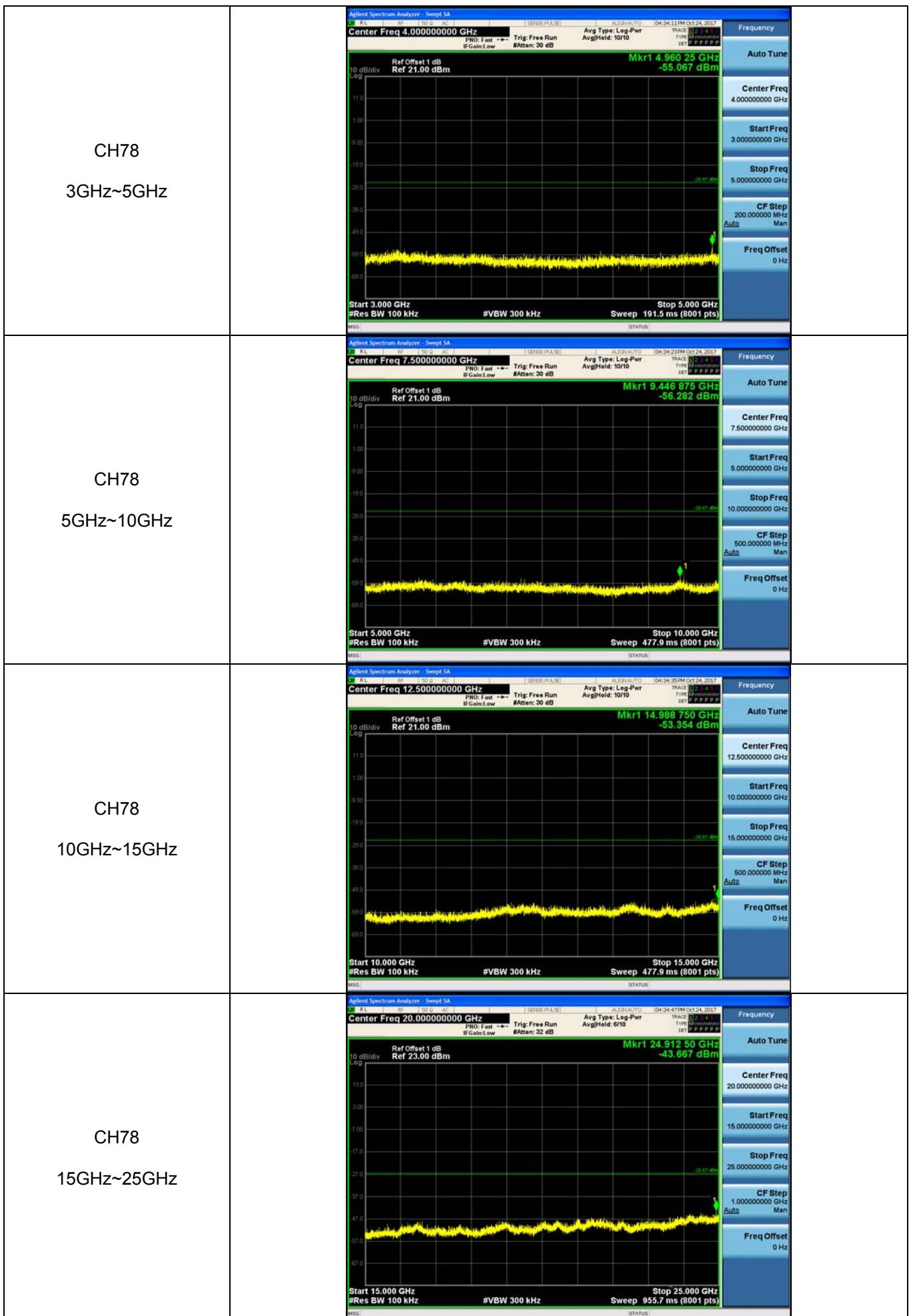




Test Item:	SE	Modulation type:	8DPSK
CH00 30MHz~3GHz		 <p>Agilent Spectrum Analyzer - Sweep SA Center Freq 1.515000000 GHz PND: Fast --> Trig: Free Run IFGain:Low #Atten: 30 dB Avg Type: Log-Pwr AvgHold: 10/10 Mkr2 2.558 2 GHz -55.512 dBm Ref Offset 1 dB Ref 21.00 dBm 10 dB/div Log Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 284.3 ms (8001 pts) Stop 3.000 GHz</p>	Frequency Auto Tune Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GHz CF Step 297.000000 MHz Auto Man Freq Offset 0 Hz
CH00 3GHz~5GHz		 <p>Agilent Spectrum Analyzer - Sweep SA Center Freq 4.000000000 GHz PND: Fast --> Trig: Free Run IFGain:Low #Atten: 30 dB Avg Type: Log-Pwr AvgHold: 10/10 Mkr1 4.804 25 GHz -55.783 dBm Ref Offset 1 dB Ref 21.00 dBm 10 dB/div Log Start 3.000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 191.5 ms (8001 pts) Stop 5.000 GHz</p>	Frequency Auto Tune Center Freq 4.000000000 GHz Start Freq 3.000000000 GHz Stop Freq 6.000000000 GHz CF Step 200.000000 MHz Auto Man Freq Offset 0 Hz
CH00 5GHz~10GHz		 <p>Agilent Spectrum Analyzer - Sweep SA Center Freq 7.500000000 GHz PND: Fast --> Trig: Free Run IFGain:Low #Atten: 30 dB Avg Type: Log-Pwr AvgHold: 10/10 Mkr1 5.530 000000 GHz -56.714 dBm Ref Offset 1 dB Ref 21.00 dBm 10 dB/div Log Start 5.000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 477.9 ms (8001 pts) Stop 10.000 GHz</p>	Frequency Auto Tune Center Freq 7.500000000 GHz Start Freq 5.000000000 GHz Stop Freq 10.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz







5.11. Spurious Emissions (radiated)

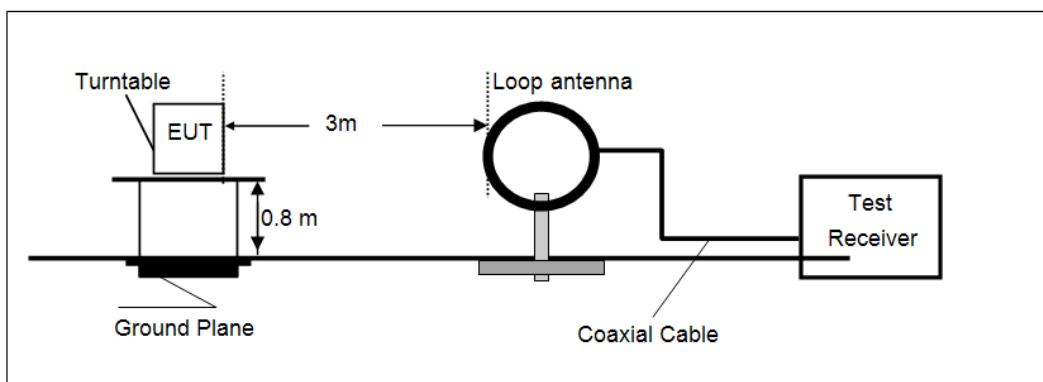
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

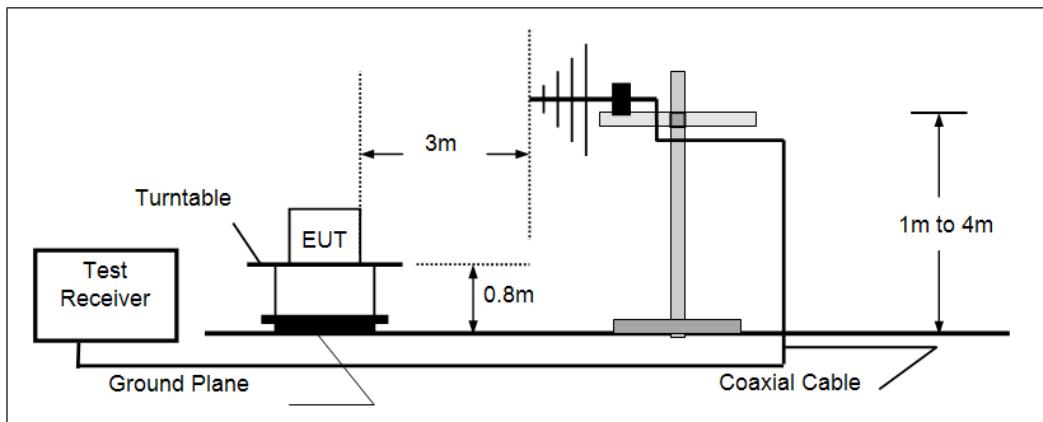
Frequency	Limit (dB _{UV} /m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

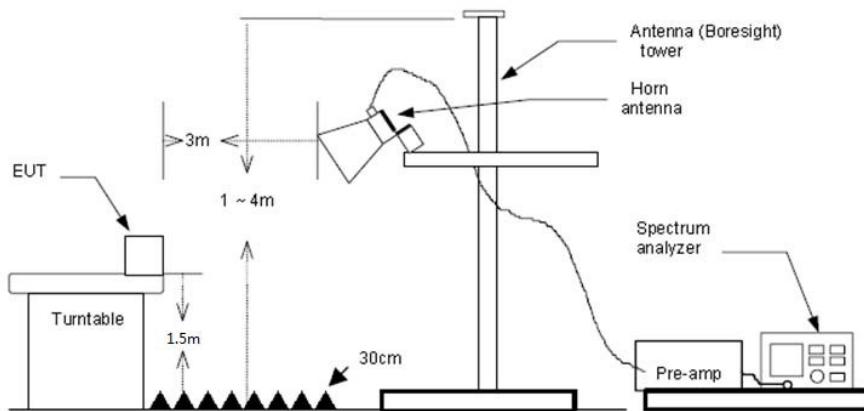
- Below 30 MHz



- 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 which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna.
5. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz, RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold; If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) Above 1 GHz, 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

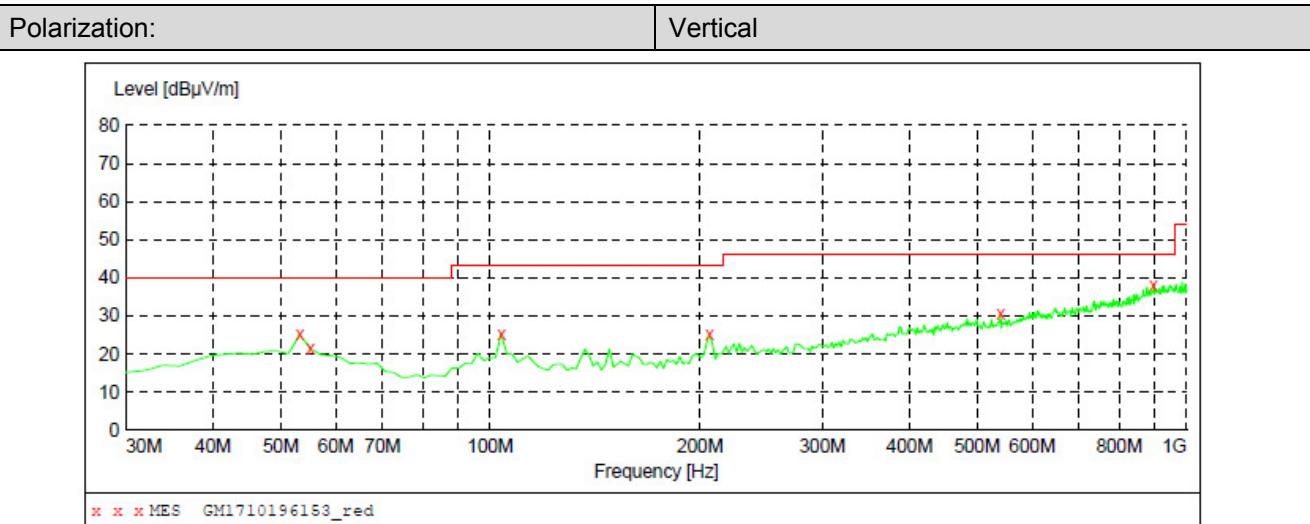
Note:

- 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.

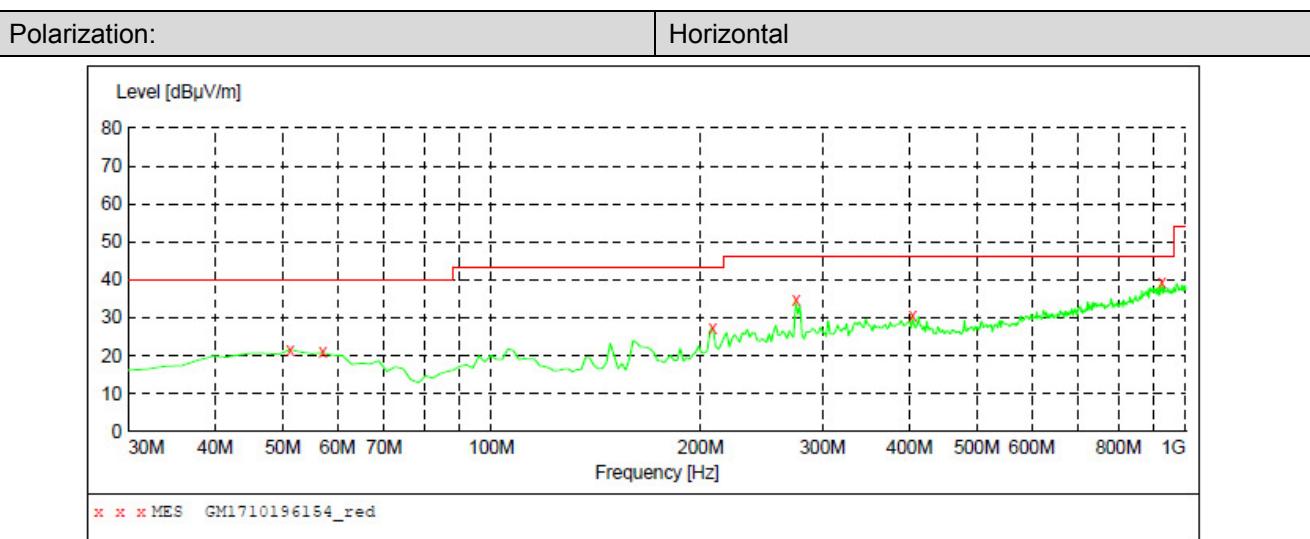
➤ 9 kHz ~ 30 MHz

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

**MEASUREMENT RESULT: "GM1710196153_red"**

10/19/2017 11:30PM	Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization
	MHz	dB μ V/m	dB	dB μ V/m	dB		cm	deg	
	53.280000	25.10	-9.0	40.0	14.9	QP	100.0	90.00	VERTICAL
	55.220000	21.60	-9.2	40.0	18.4	QP	100.0	90.00	VERTICAL
	103.720000	25.30	-10.5	43.5	18.2	QP	100.0	324.00	VERTICAL
	206.540000	25.10	-10.5	43.5	18.4	QP	100.0	6.00	VERTICAL
	540.220000	30.40	-1.0	46.0	15.6	QP	100.0	210.00	VERTICAL
	895.240000	38.10	6.6	46.0	7.9	QP	100.0	101.00	VERTICAL

**MEASUREMENT RESULT: "GM1710196154_red"**

10/19/2017 11:34PM	Frequency	Level	Transd	Limit	Margin	Det.	Height	Azimuth	Polarization
	MHz	dB μ V/m	dB	dB μ V/m	dB		cm	deg	
	51.340000	21.70	-8.8	40.0	18.3	QP	300.0	159.00	HORIZONTAL
	57.160000	20.90	-9.4	40.0	19.1	QP	100.0	151.00	HORIZONTAL
	208.480000	27.40	-10.5	43.5	16.1	QP	100.0	98.00	HORIZONTAL
	274.440000	34.60	-7.9	46.0	11.4	QP	100.0	265.00	HORIZONTAL
	404.420000	30.50	-4.1	46.0	15.5	QP	100.0	65.00	HORIZONTAL
	924.340000	39.30	7.0	46.0	6.7	QP	300.0	111.00	HORIZONTAL

➤ Above 1 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
1746.25	57.40	25.29	5.86	37.03	51.52	74.00	-22.48	Vertical	Peak
3283.02	40.95	28.30	7.82	38.35	38.72	74.00	-35.28	Vertical	Peak
4809.50	40.98	31.58	9.55	36.93	45.18	74.00	-28.82	Vertical	Peak
7209.02	36.77	36.21	11.87	35.07	49.78	74.00	-24.22	Vertical	Peak
1782.18	44.78	25.37	5.93	37.10	38.98	74.00	-35.02	Horizontal	Peak
3283.02	42.65	28.30	7.82	38.35	40.42	74.00	-33.58	Horizontal	Peak
4809.50	42.03	31.58	9.55	36.93	46.23	74.00	-27.77	Horizontal	Peak
7209.02	35.18	36.21	11.87	35.07	48.19	74.00	-25.81	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
1483.73	44.96	25.82	5.24	36.57	39.45	74.00	-34.55	Vertical	Peak
2081.55	43.89	26.63	6.34	37.32	39.54	74.00	-34.46	Vertical	Peak
3299.78	40.10	28.20	7.84	38.37	37.77	74.00	-36.23	Vertical	Peak
5806.41	33.42	32.11	10.59	35.32	40.80	74.00	-33.20	Vertical	Peak
1782.18	42.26	25.37	5.93	37.10	36.46	74.00	-37.54	Horizontal	Peak
3815.03	35.59	29.62	8.52	38.22	35.51	74.00	-38.49	Horizontal	Peak
5060.69	33.73	31.74	9.72	36.34	38.85	74.00	-35.15	Horizontal	Peak
6379.86	33.48	33.26	10.99	35.31	42.42	74.00	-31.58	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
1746.25	46.94	25.29	5.86	37.03	41.06	74.00	-32.94	Vertical	Peak
3266.35	42.70	28.40	7.80	38.32	40.58	74.00	-33.42	Vertical	Peak
4958.68	38.52	31.46	9.64	36.52	43.10	74.00	-30.90	Vertical	Peak
7527.83	33.46	36.13	12.49	34.92	47.16	74.00	-26.84	Vertical	Peak
1746.25	44.69	25.29	5.86	37.03	38.81	74.00	-35.19	Horizontal	Peak
3516.59	36.91	29.05	8.14	38.39	35.71	74.00	-38.29	Horizontal	Peak
4958.68	40.49	31.46	9.64	36.52	45.07	74.00	-28.93	Horizontal	Peak
7451.57	36.33	36.20	12.24	34.86	49.91	74.00	-24.09	Horizontal	Peak

Remark:

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

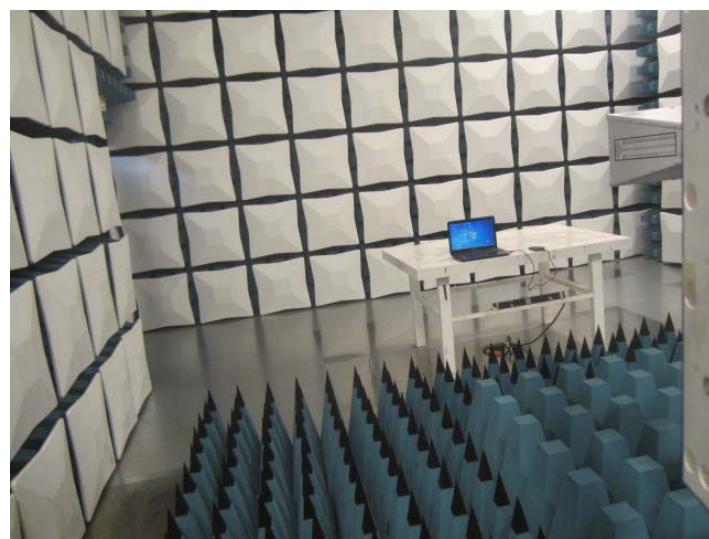
6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)



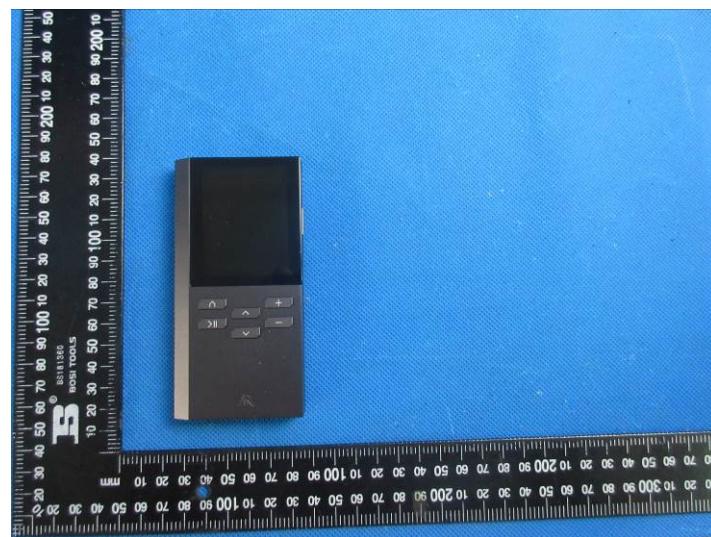
Radiated Emissions

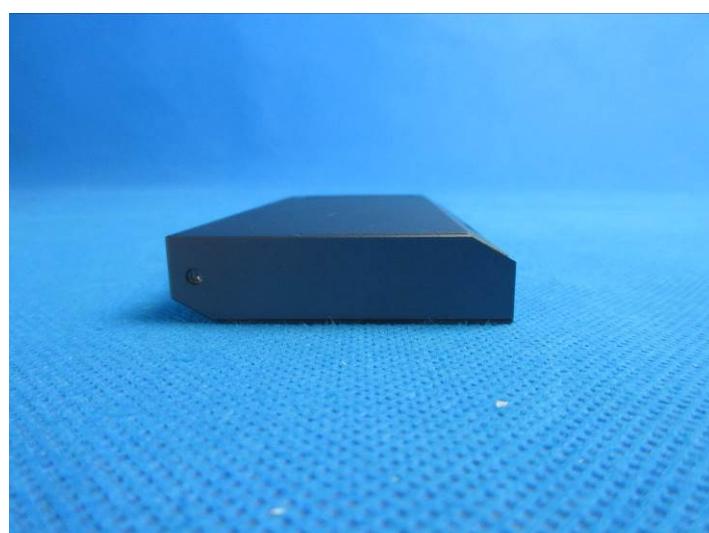




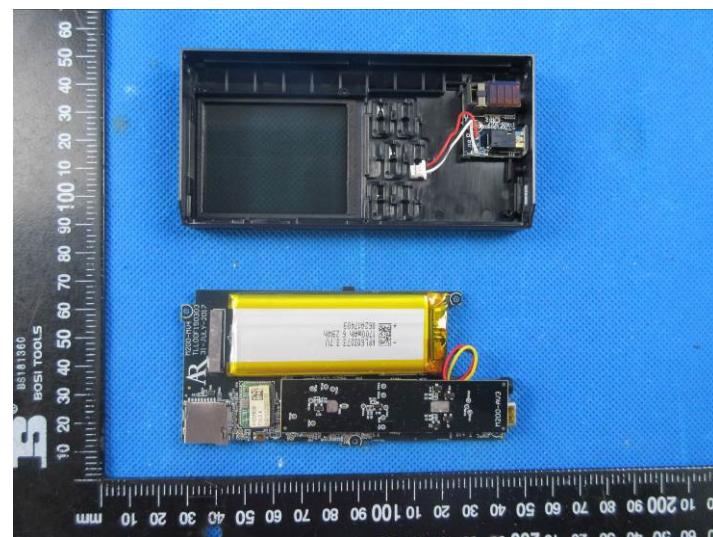
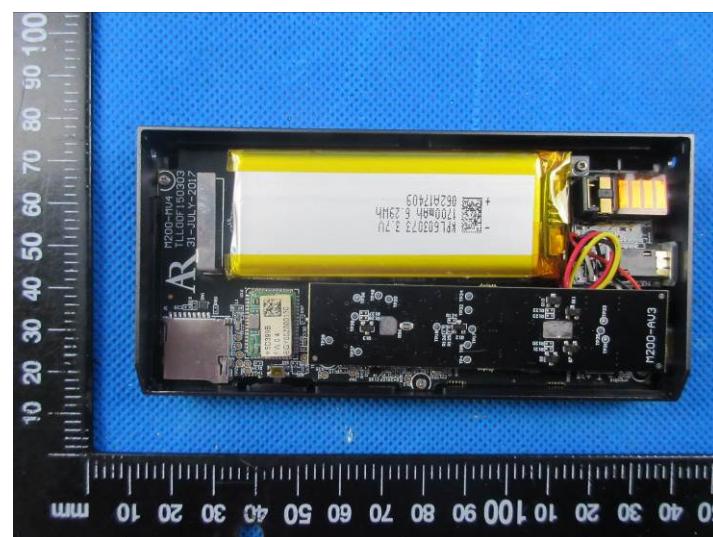
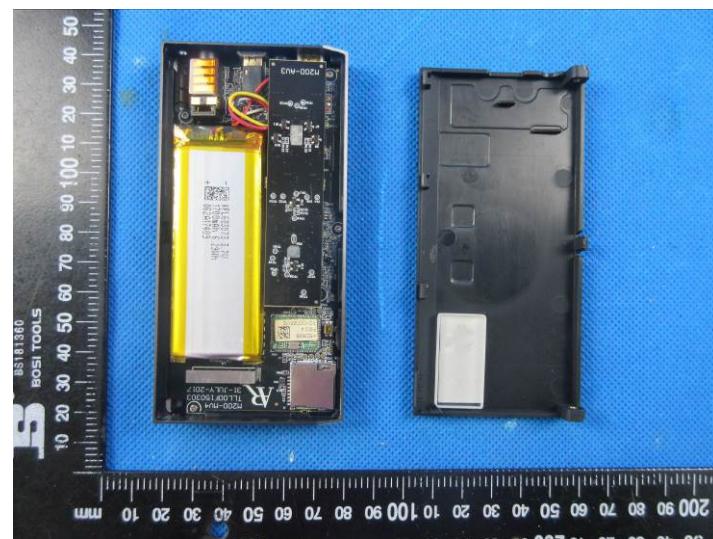
7. EXTERANAL AND INTERNAL PHOTOS

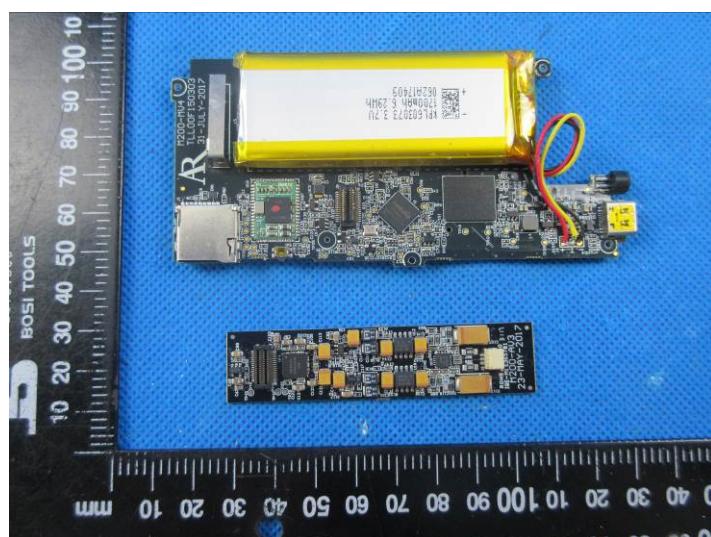
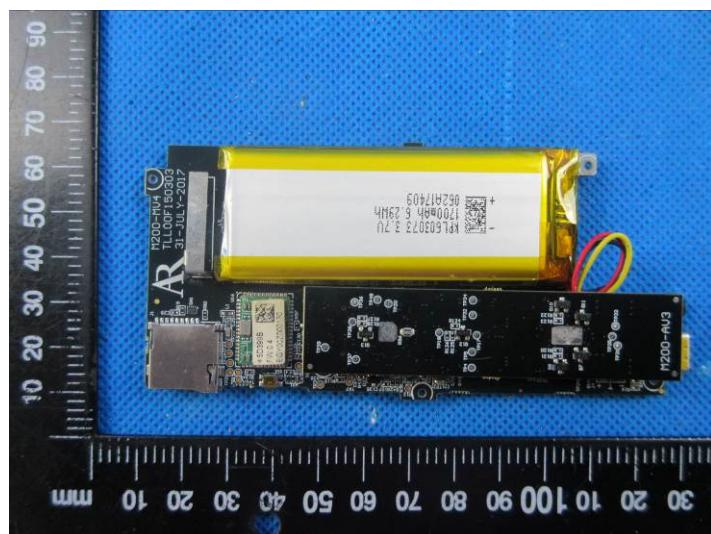
External photos of the EUT

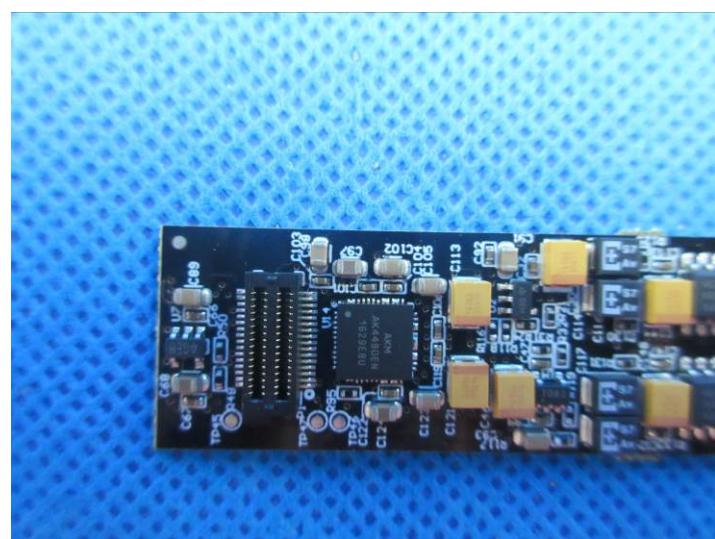
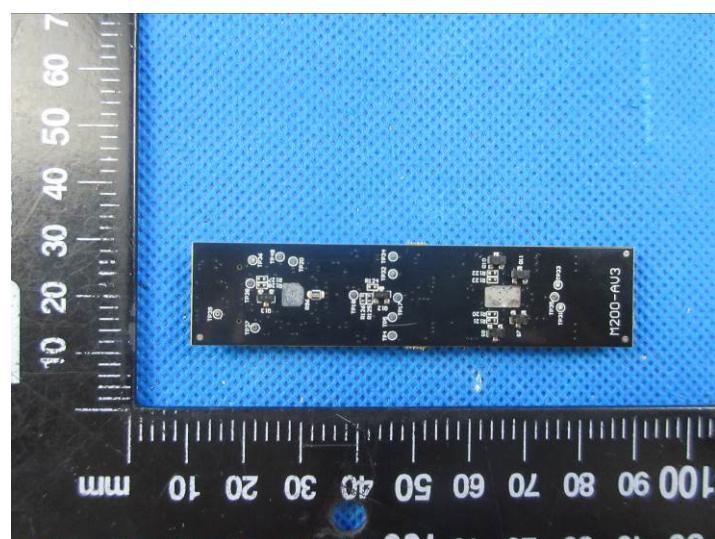
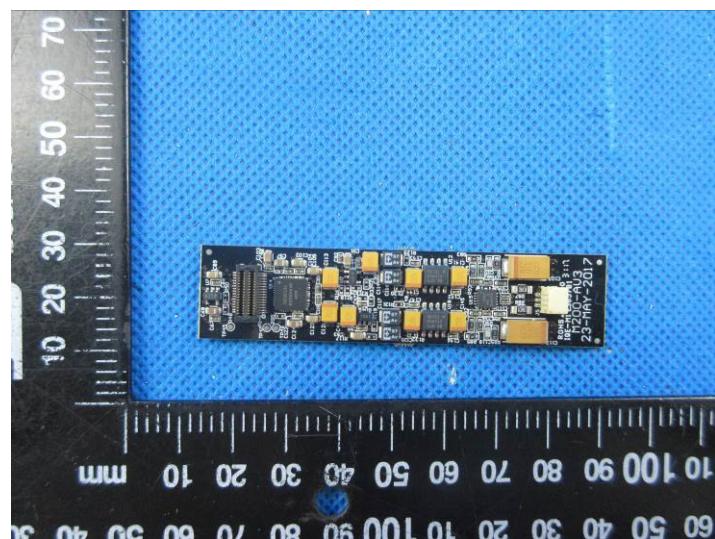


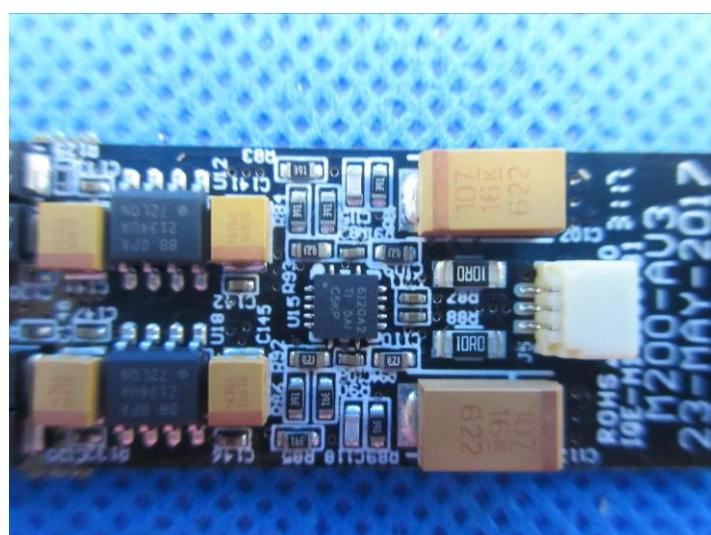
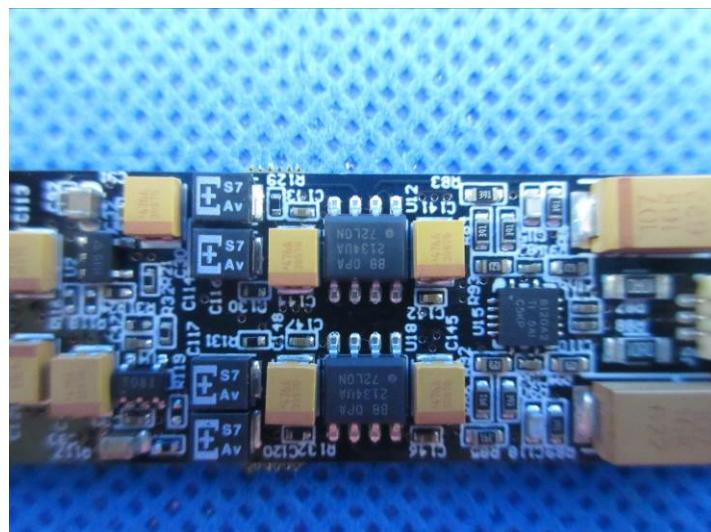


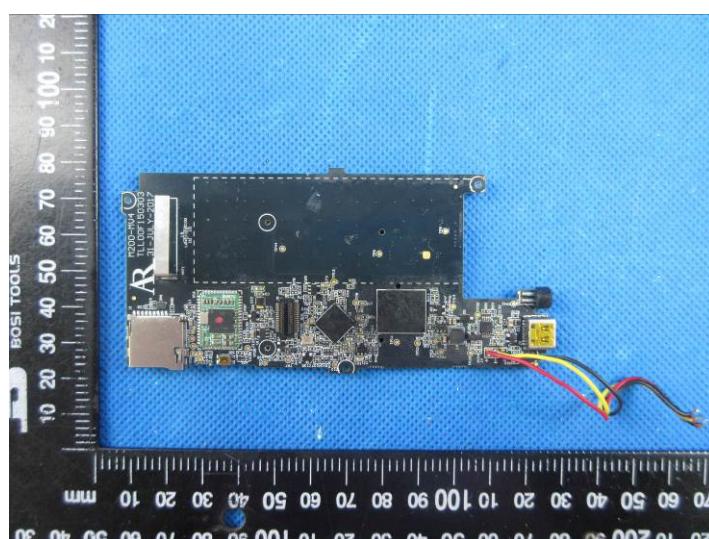
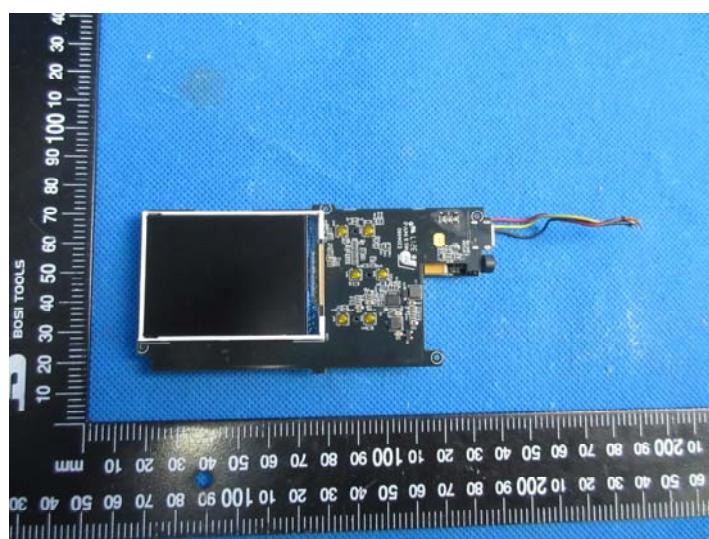
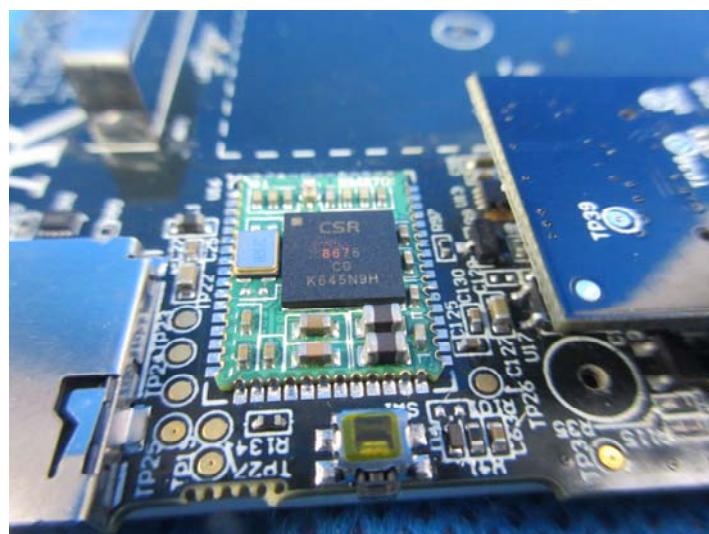


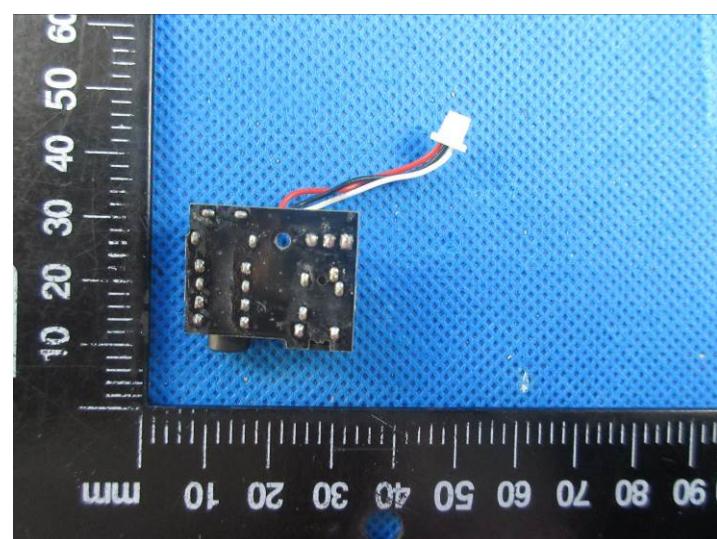
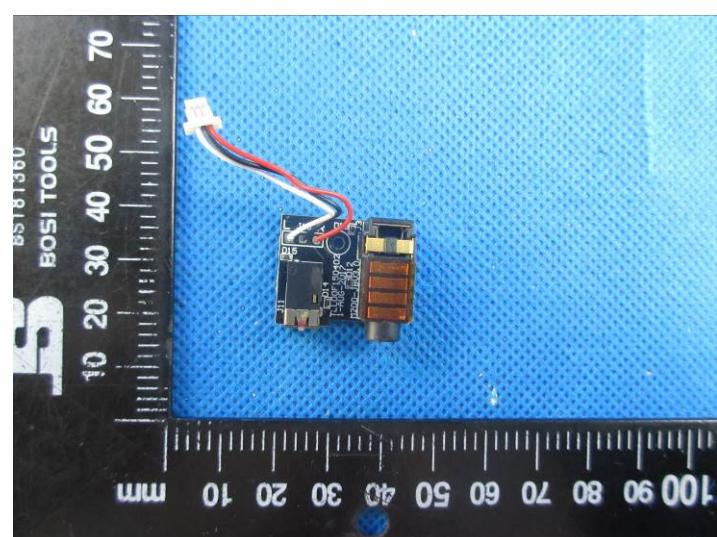
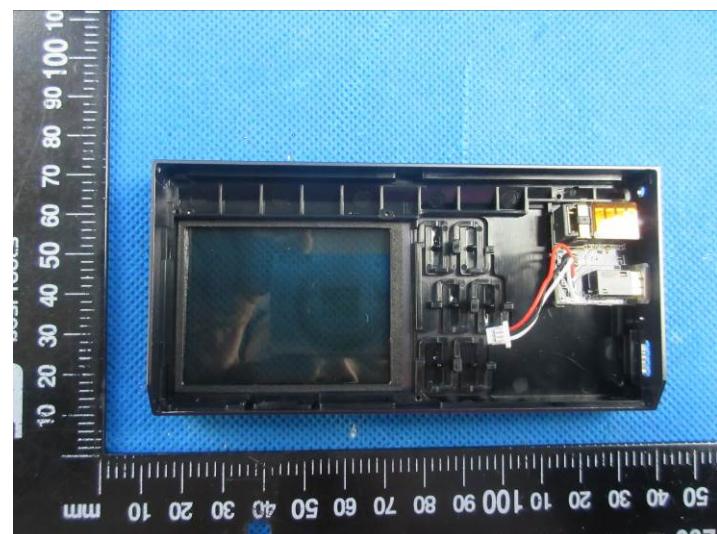
Internal photos of the EUT











.....End of Report.....