

## FCC RADIO TEST REPORT

### No. 171001524SHA-003

Applicant : Qingdao Intelligent&Precise Electronics Co., Ltd  
No.218, Qianwangang Road, Qingdao Economic&Technological  
Development Zone, Shandong, China.

Manufacturing site : Qingdao Intelligent&Precise Electronics Co., Ltd  
No.218, Qianwangang Road, Qingdao Economic&Technological  
Development Zone, Shandong, China.

Product Name : Wireless Module

Type/Model : ZDGFMT7668AU

**TEST RESULT : PASS**

### SUMMARY

The equipment complies with the requirements according to the following standard(s) or specification:

**47CFR Part 15 (2016):** Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

**RSS-247 Issue 2 (February 2017):** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

**RSS-Gen Issue 4 (December 2014):** General Requirements for Compliance of Radio Apparatus

Date of issue: December 19, 2017

Prepared by:



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Reviewed by:



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### Revision History

Issue No.	Version	Description	Date Issued
171001524SHA-003	Rev. 01	Initial issue of report	December 19, 2017

## 1 GENERAL INFORMATION

### 1.1 Description of Equipment Under Test (EUT)

Product name : Wireless Module  
Type/Model : ZDGFMT7668AU  
Description of EUT : EUT is a Wireless Module with WiFi and Bluetooth function, and has only one model.  
Rating : DC 5V  
Sample received date : October 30, 2017  
Date of test : October 30, 2017 ~ December 18, 2017

### 1.2 RF Technical Information

Assigned Frequency : 2400MHz to 2483.5MHz  
Band  
Protocol : Bluetooth Base Rate + EDR  
Operating Frequency : 2402MHz to 2480MHz  
Type of Modulation : GFSK,  $\pi/4$ -DQPSK, 8DPSK  
Number of Channels : 79  
Channel Separation : 1MHz  
Antenna Type : PIFA antenna  
Antenna Gain : 0.29dBi  
FCC ID : 2AJVQ-ZDGF7668AU  
IC : 22470-ZDGF7668AU

### 1.3 Description of Test Facility

Name : Intertek Testing Services Shanghai  
Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China  
Telephone : 86 21 61278200  
Telefax : 86 21 54262353

The test facility is recognized, certified, or accredited by these organizations :

- CNAS Accreditation Lab  
Registration No. CNAS L0139
- FCC Accredited Lab  
Designation Number: CN1175
- IC Registration Lab  
Registration code No.: 2042B-1
- VCCI Registration Lab  
Registration No.: R-4243, G-845, C-4723, T-2252
- NVLAP Accreditation Lab  
NVLAP LAB CODE: 200849-0
- A2LA Accreditation Lab  
Certificate Number: 3309.02

## 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15 (2016)  
ANSI C63.10 (2013)  
DA 00-705  
RSS-247 Issue 2 (February 2017)  
RSS-Gen Issue 4 (December 2014)

### 2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

Software name	Manufacturer	Version	Supplied by
Combo Tool	MTK	-	Client

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	GFSK	2402	2441	2480
	$\pi/4$ -DQPSK	2402	2441	2480
	8DPSK	2402	2441	2480

The pre-test was conducted and the worst-case configuration was chosen to do the final test as listed below:

Frequency Band (MHz)	Mode	Data Rate	Packet Type	Worst case
2400-2483.5	GFSK	BR-1Mbps	DH1, DH3, DH5	BR-1Mbps DH5
	$\pi/4$ -DQPSK	EDR-2Mbps	2DH1, 2DH3, 2DH5	EDR-2Mbps 2DH5
	8DPSK	EDR-3Mbps	3DH1, 3DH3, 3DH5	EDR-3Mbps 3DH5

**2.3 Test environment condition:**

Temperature:	20-26°C
Humidity:	52-60% RH
Atmospheric Pressure:	101-102kPa

**2.4 Test peripherals used**

Item No	Description	Manufacturer	Model No.	Serial Number
1	Laptop computer	HP	4230s	-

**2.5 Test software list:**

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71



## 2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2018-09-12
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2018-12-01
<input type="checkbox"/>	A.M.N.	R&S	ENV 216	EC 3393	2018-07-30
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2018-09-12
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2018-05-30
<input type="checkbox"/>	Horn antenna	R&S	HF 906	EC 3049	2018-09-23
<input checked="" type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2018-08-24
<input checked="" type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
<input checked="" type="checkbox"/>	Pre-amplifier	R&S	Pre-amp 18	EC5881	2018-06-19
<input checked="" type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2018-01-25
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
<input type="checkbox"/>	Power sensor/ Power meter	Agilent	N1911A/ N1921A	EC4318	2018-05-12
<input type="checkbox"/>	Test Receiver	R&S	ESCI 7	EC 4501	2018-09-12
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2018-01-08
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-03-09
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2018-06-14
<input type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2018-04-09
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2018-03-23
<input checked="" type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2018-06-28

## 2.7 Measurement Uncertainty

Test Items	Expanded Uncertainty (k=2) ( $\pm$ )
Maximum conducted output power	0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	5.02dB
Emission outside the frequency band	2.89dB
Power line conducted emission	3.19dB

## 2.8 Test Summary

**This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Services Shanghai.**

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
20 dB Bandwidth	15.247(a)(1)	RSS-247 Issue 2 Clause 5	Pass
Peak output power	15.247(b)(1)	RSS-247 Issue 2 Clause 5	Pass
Conducted Spurious Emissions & Band Edge	15.247(d)	RSS-247 Issue 2 Clause 5	Pass
Number of Hopping Frequencies	15.247(a)(1)(iii)	RSS-247 Issue 2 Clause 5	Pass
Carrier Frequency Separation	15.247(a)(1)	RSS-247 Issue 2 Clause 5	Pass
Dwell time	15.247(a)(1)(iii)	RSS-247 Issue 2 Clause 5	Pass
Radiated Spurious Emissions	15.205 & 15.209	RSS-247 Issue 2 Clause 5	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	NA
Antenna requirement	15.203	-	Pass
Occupied bandwidth	-	RSS-Gen Issue 4 Clause 6.6	Tested

Notes: 1: NA =Not Applicable

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### 3 20dB Bandwidth

Test result: Pass

#### 3.1 Limit

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

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

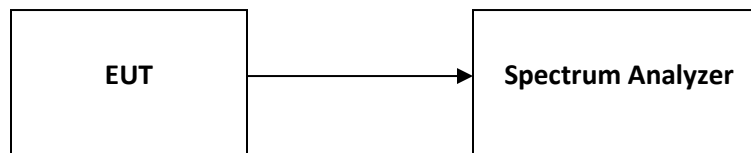
#### 3.2 Measurement Procedure

The 20 bandwidth is measured using the Spectrum Analyzer with Span = 2 to 3 times the 20dB bandwidth, RBW  $\geq$  1% of the 20dB bandwidth, VBW  $\geq$  RBW, Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

#### 3.3 Test Configuration



#### 3.4 Test Results of 20dB Bandwidth

Please refer to Appendix A

## 4 Peak Output Power

Test result: Pass

### 4.1 Limit

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

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

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

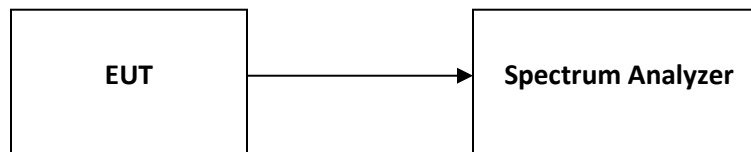
### 4.2 Measurement Procedure

The Peak Power output is measured using the Spectrum Analyzer with Span = 5 times the 20dB bandwidth, RBW  $\geq$  the 20dB bandwidth, VBW  $\geq$  RBW, Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

### 4.3 Test Configuration



### 4.4 Test Results of Peak Output Power

Please refer to Appendix A

## 5 Conducted Spurious Emissions & Band Edge

Test result: Pass

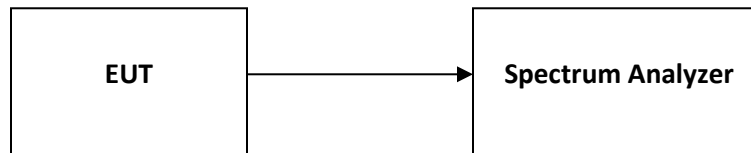
### 5.1 Limit

In any 100kHz 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 100kHz bandwidth within the band that contains the highest level of the desired power.

### 5.2 Measurement Procedure

The Conducted Spurious Emissions per FCC §15.247(d) is measured using the Spectrum Analyzer with Span wide enough capturing all spurious from the lowest emission frequency of the EUT up to 10th harmonics, RBW = 100kHz, VBW  $\geq$  RBW, Sweep = auto, Detector = peak, Trace = max hold. The test was performed at 3 channels (lowest, middle and highest channel). The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

### 5.3 Test Configuration



### 5.4 The results of Conducted Spurious Emissions & Band Edge

Please refer to Appendix A

## 6 Number of Hopping Frequencies

Test result: Pass

### 6.1 Limit

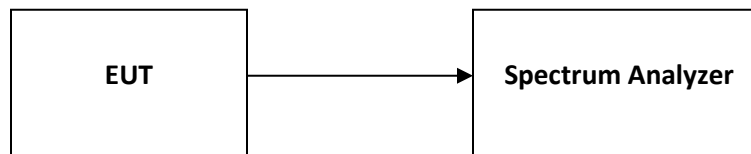
Number of Hopping Frequencies in the 2400-2483.5MHz band shall use at least 15 channels.

### 6.2 Measurement Procedure

The Number of Hopping Frequencies is measured using the Spectrum Analyzer with RBW = 100kHz, VBW  $\geq$  RBW, Sweep = auto, Detector = peak, Trace = max hold.

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

### 6.3 Test Configuration



### 6.4 Test Results of Number of Hopping Frequencies

Please refer to Appendix A

## 7 Carrier Frequency Separation

**Test result:** Pass

### 7.1 Limit

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

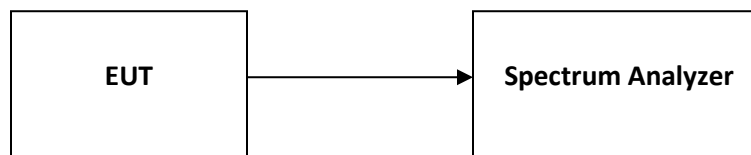
Frequency hopping systems operating in the 2400–2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

### 7.2 Measurement Procedure

The Carrier Frequency Separation is measured using the Spectrum Analyzer with Span can capture two adjacent channels, RBW  $\geq$  1% of the span, VBW  $\geq$  RBW, Sweep = auto, Detector = peak, Trace = max hold. The test was performed at 3 channels (lowest, middle and highest channel).

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

### 7.3 Test Configuration



### 7.4 Test Results of Carrier Frequency Separation

Please refer to Appendix A



## 8 Dwell Time

**Test result:** Pass

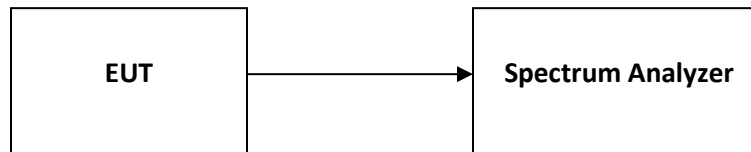
### 8.1 Limit

The dwell time 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 8.2 Measurement Procedure

Dwell time is measured using the Spectrum Analyzer with Span = 0, RBW = 1MHz, VBW  $\geq$  RBW, Sweep can capture the entire dwell time, Detector = peak, Trace = max hold.  
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems).

### 8.3 Test Configuration



### 8.4 Test Results of Dwell Time

Please refer to Appendix A

## 9 Radiated Spurious Emissions

**Test result: Pass**

### 9.1 Limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

### 9.2 Measurement Procedure

#### For Radiated emission below 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) Both X and Y axes of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

**For Radiated emission above 30MHz:**

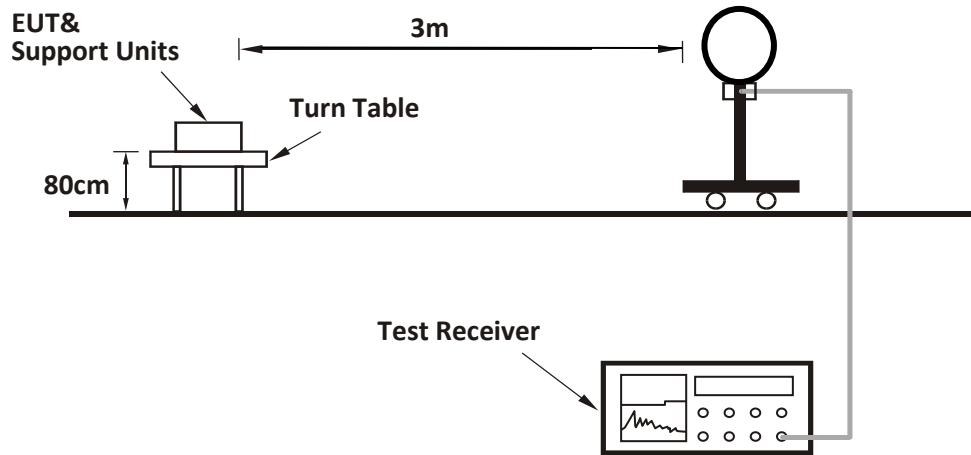
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

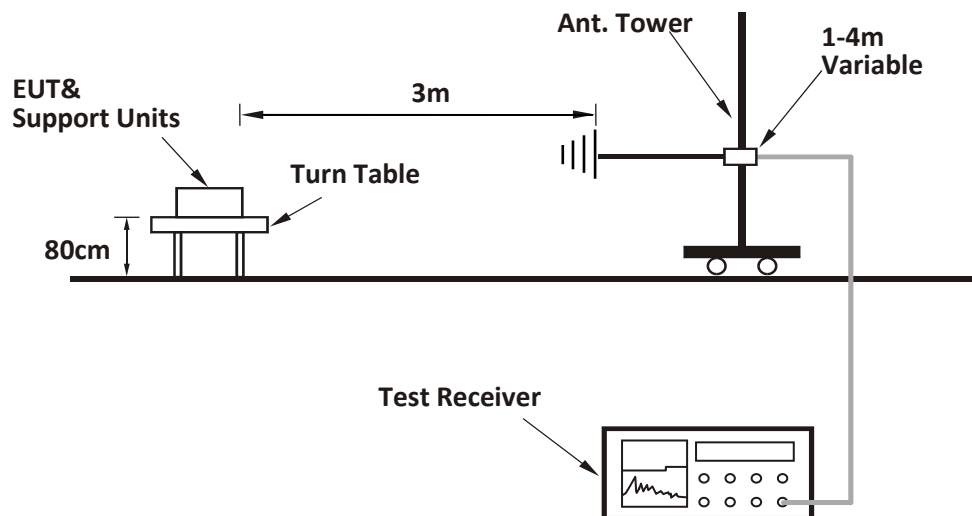
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 3 x RBW (Duty cycle  $\geq$  98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

### 9.3 Test Configuration

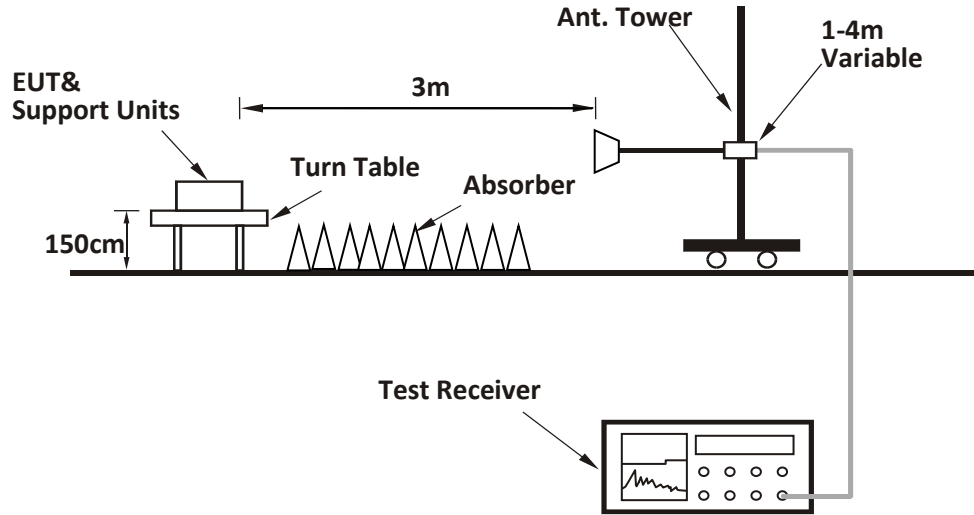
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



**For Radiated emission above 1GHz:**



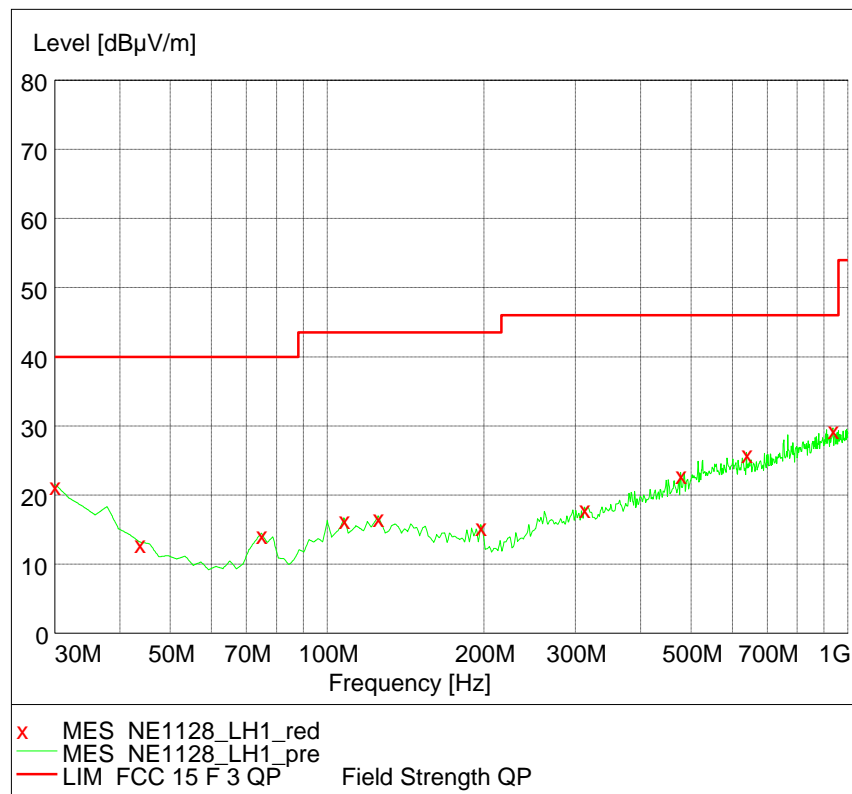
### 9.4 Test Results of Radiated Emissions

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

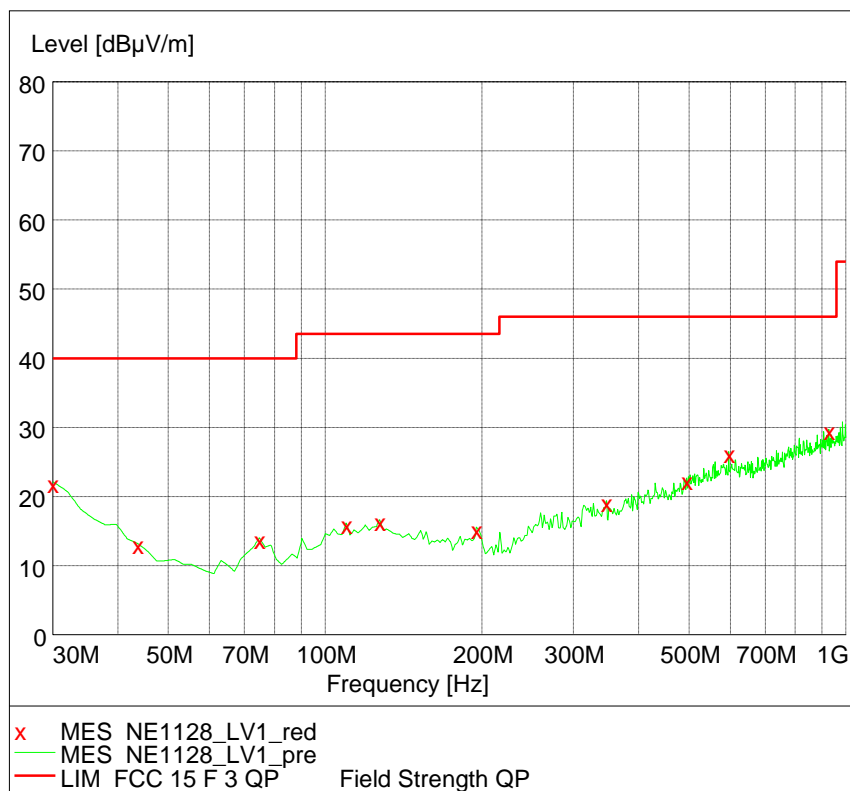
EUT was tested with WiFi on and off, and the worst data was listed in the report.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	21.60	19.20	40.00	18.40	PK
H	43.80	13.40	11.60	40.00	26.60	PK
H	74.78	14.50	7.50	40.00	25.50	PK
H	125.25	16.80	13.10	43.50	26.70	PK
H	638.48	26.20	20.70	46.00	19.80	PK
H	935.85	29.60	23.30	46.00	16.40	PK
V	30.00	22.20	19.20	40.00	17.80	PK
V	43.64	13.20	11.60	40.00	26.80	PK
V	74.78	14.10	7.50	40.00	25.90	PK

V	494.55	22.60	19.20	46.00	23.40	PK
V	595.64	26.60	20.50	46.00	19.40	PK
V	928.12	29.70	23.30	46.00	16.30	PK

**Test result above 1GHz:**

The emission was conducted from 1GHz to 25GHz

GFSK

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402	102.00	34.10	Fundamental	/	PK
	H	2390.00	47.40	34.20	74.00	26.60	PK
	V	2390.00	47.40	34.20	74.00	26.60	PK
	H	3330.66	53.10	-3.60	74.00	20.90	PK
M	H	2441	101.50	34.20	Fundamental	/	PK
	H	3330.66	53.00	-3.60	74.00	21.00	PK
H	H	2480	100.60	34.40	Fundamental	/	PK
	H	2483.50	48.20	34.80	74.00	25.80	PK
	V	2483.50	48.10	34.80	74.00	25.90	PK
	H	3330.66	53.30	-3.60	74.00	20.70	PK

$\pi/4$ -DQPSK

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402	104.20	34.10	Fundamental	/	PK
	H	2390.00	47.80	34.20	74.00	26.20	PK
	V	2390.00	47.60	34.20	74.00	26.40	PK
	H	3330.66	53.20	-3.60	74.00	20.80	PK
M	H	2441	103.70	34.20	Fundamental	/	PK
	H	3330.66	53.10	-3.60	74.00	20.90	PK



H	H	2480	102.80	34.40	Fundamental	/	PK
	H	2483.50	48.30	34.80	74.00	25.70	PK
	V	2483.50	48.10	34.80	74.00	25.90	PK
	H	3330.66	53.30	-3.60	74.00	20.70	PK

8DPSK

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402	104.00	34.10	Fundamental	/	PK
	H	2390.00	47.70	34.20	74.00	26.30	PK
	V	2390.00	47.50	34.20	74.00	26.50	PK
	H	3330.66	53.30	-3.60	74.00	20.70	PK
M	H	2441	103.20	34.20	Fundamental	/	PK
	H	3330.66	53.10	-3.60	74.00	20.90	PK
H	H	2480	102.70	34.40	Fundamental	/	PK
	H	2483.50	48.40	34.80	74.00	25.60	PK
	V	2483.50	48.30	34.80	74.00	25.70	PK
	H	3330.66	53.20	-3.60	74.00	20.80	PK

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.  
 2. Corrected Reading = Original Receiver Reading + Correct Factor  
 3. Margin = Limit - Corrected Reading  
 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,  
 Limit = 40.00dBuV/m.  
 Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;  
 Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;  
 Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

## 10 Power line conducted emission

Test result: NA

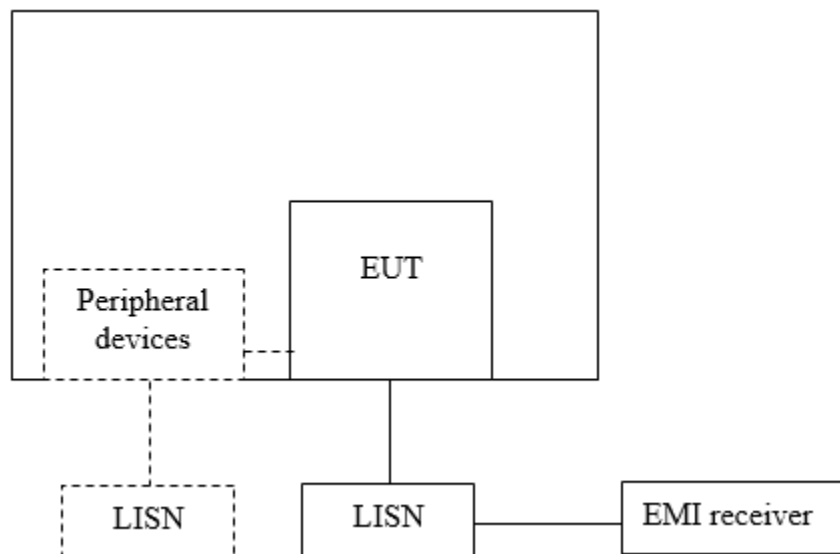
### 10.1 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50  $\Omega$  LISN port (to which the EUT is connected), where permitted, terminated into a 50  $\Omega$  measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50  $\Omega$  measuring port is terminated by a measuring instrument having 50  $\Omega$  input impedance. All other ports are terminated in 50  $\Omega$  loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

### 10.2 Test Configuration



**10.3 Test Results of Power line conducted emission**

**Test Curve:**

**Test Data:**

Frequency (MHz)	Quasi-peak			Average			Line
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	

Note: \* means the emission level 20dB below the relevant limit.

- Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.  
 2. Corrected Reading = Original Receiver Reading + Correct Factor  
 3. Margin = Limit - Corrected Reading  
 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,  
 Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.  
 Then Correct Factor = 10.00 + 2.00 = 12.00dB;  
 Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;  
 Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

## 11 Antenna requirement

**Requirement:**

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 shall be considered sufficient to comply with the provisions of this section.

**Result:**

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

## 12 Occupied Bandwidth

**Test result:** Pass

### 12.1 Limit

None

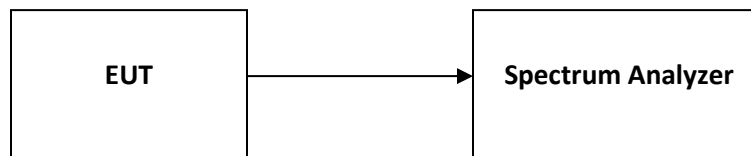
### 12.2 Measurement Procedure

The occupied bandwidth per RSS-Gen Issue 4 Clause 6.6 was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

### 12.3 Test Configuration



### 12.4 The results of Occupied Bandwidth

Please refer to Appendix A

## Appendix A: Test results

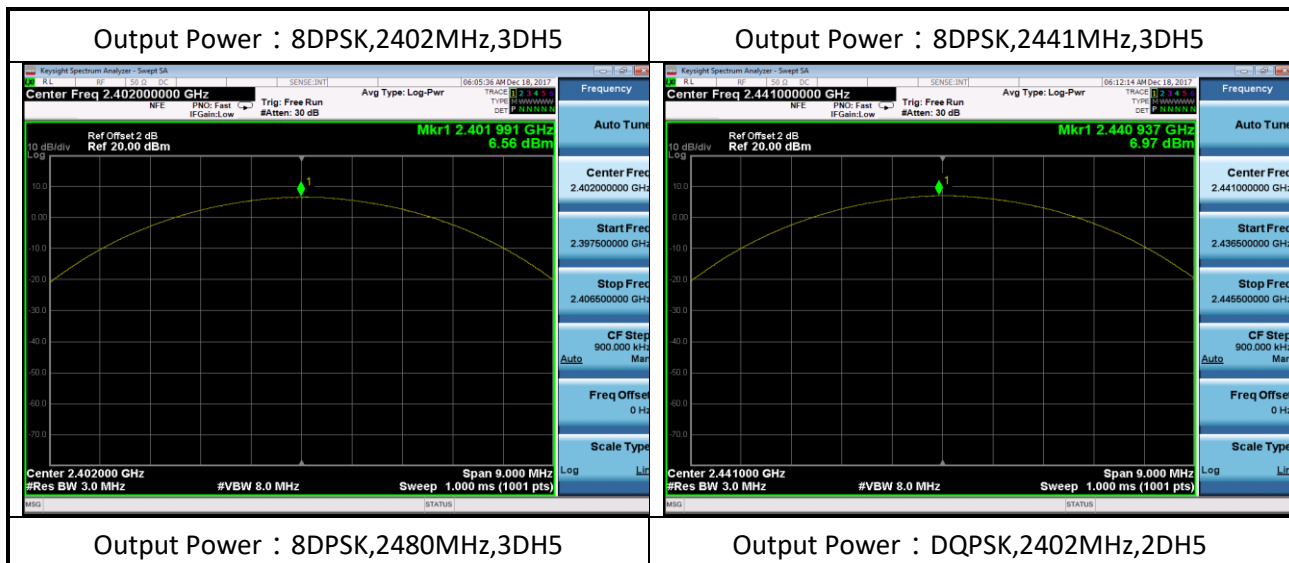
### 1. Peak Output Power

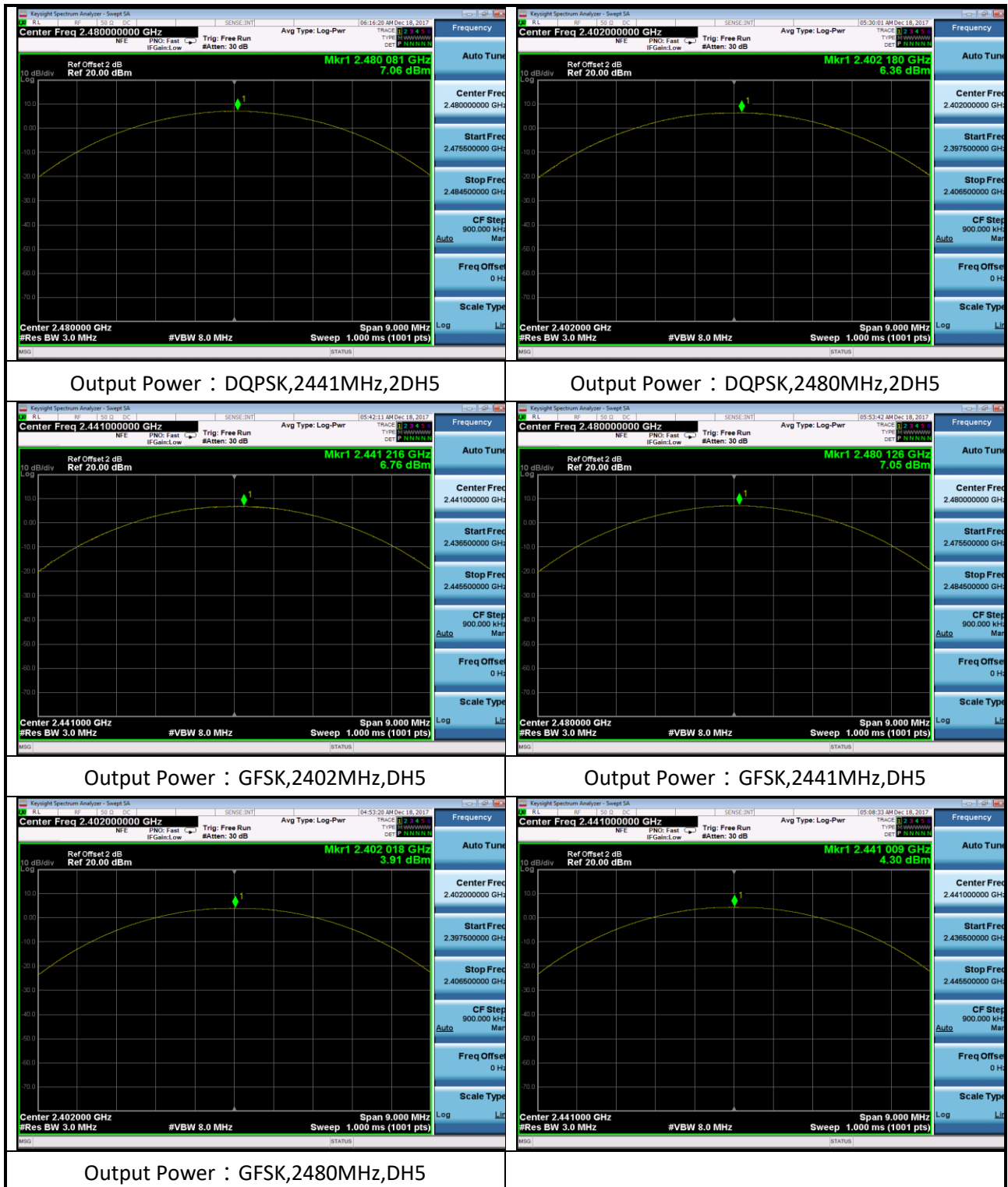
#### 1.1 Test Data

BT Maximum Output Power				
Mode	Test Frequency	Packet Type	Power(dBm)	Result
GFSK	2402	DH5	3.909	Pass
GFSK	2441	DH5	4.302	Pass
GFSK	2480	DH5	4.702	Pass
DQPSK	2402	2DH5	6.365	Pass
DQPSK	2441	2DH5	6.761	Pass
DQPSK	2480	2DH5	7.055	Pass
8DPSK	2402	3DH5	6.558	Pass
8DPSK	2441	3DH5	6.971	Pass
8DPSK	2480	3DH5	7.063	Pass

BLE EIRP		
Max power (dBm)	Max EIRP (W)	Result
7.063	0.005	Pass

#### 1.2 Test Plots







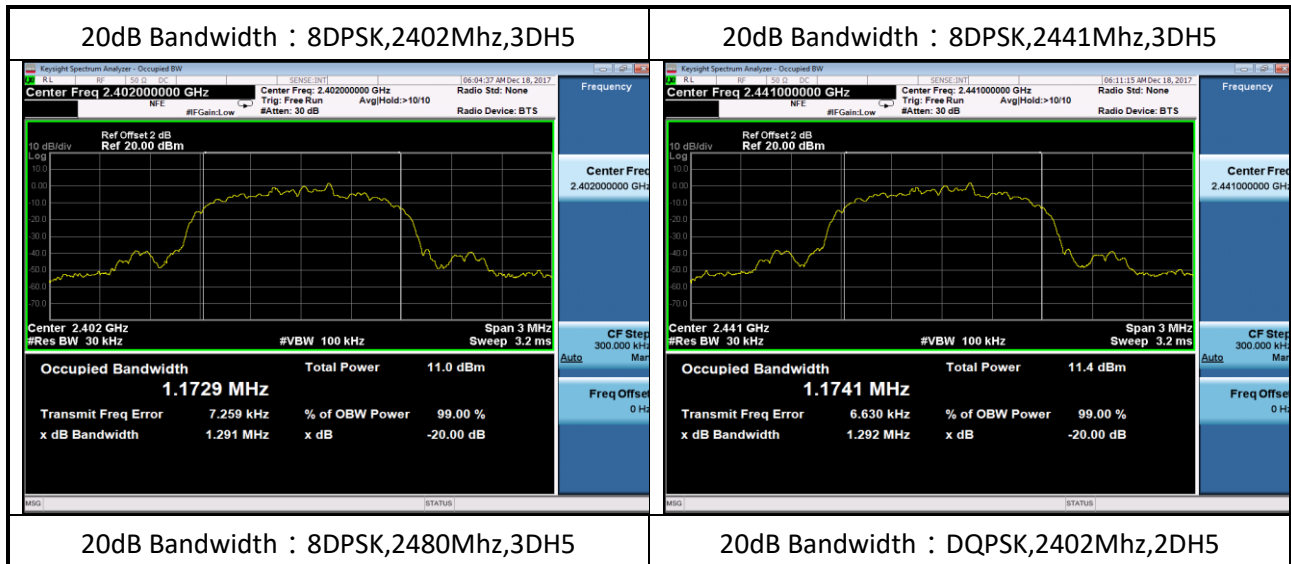


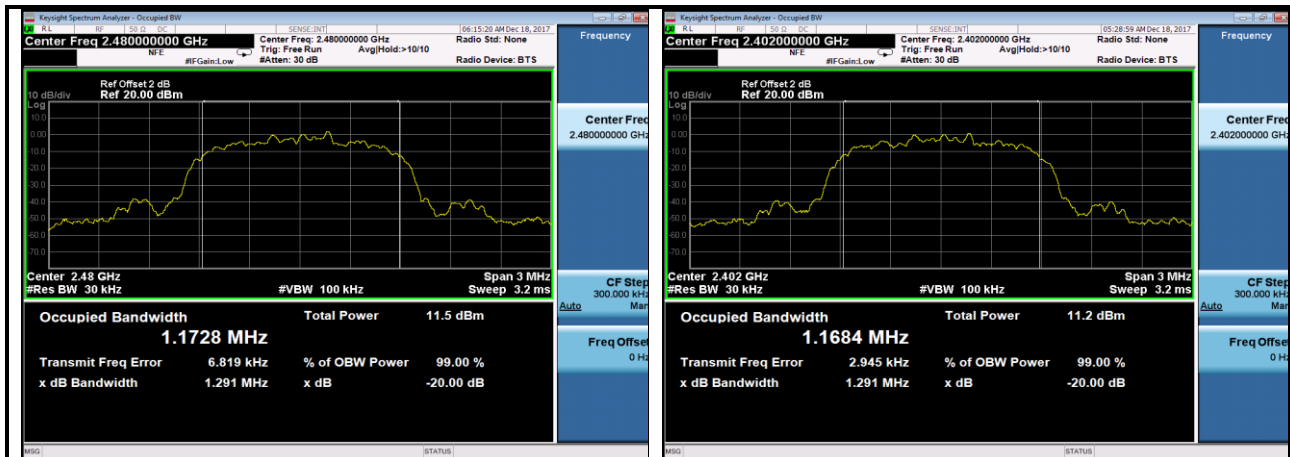
2. 20dB Bandwidth

2.1 Test Data

BT Occupied 20dB Bandwidth				
Mode	Test Frequency	Packet Type	20dB Occupied Bandwidth(kHz)	Result
GFSK	2402	DH5	953.666	Pass
GFSK	2441	DH5	956.896	Pass
GFSK	2480	DH5	953.843	Pass
DQPSK	2402	2DH5	1291.341	Pass
DQPSK	2441	2DH5	1291.139	Pass
DQPSK	2480	2DH5	1291.818	Pass
8DPSK	2402	3DH5	1290.653	Pass
8DPSK	2441	3DH5	1292.187	Pass
8DPSK	2480	3DH5	1291.151	Pass

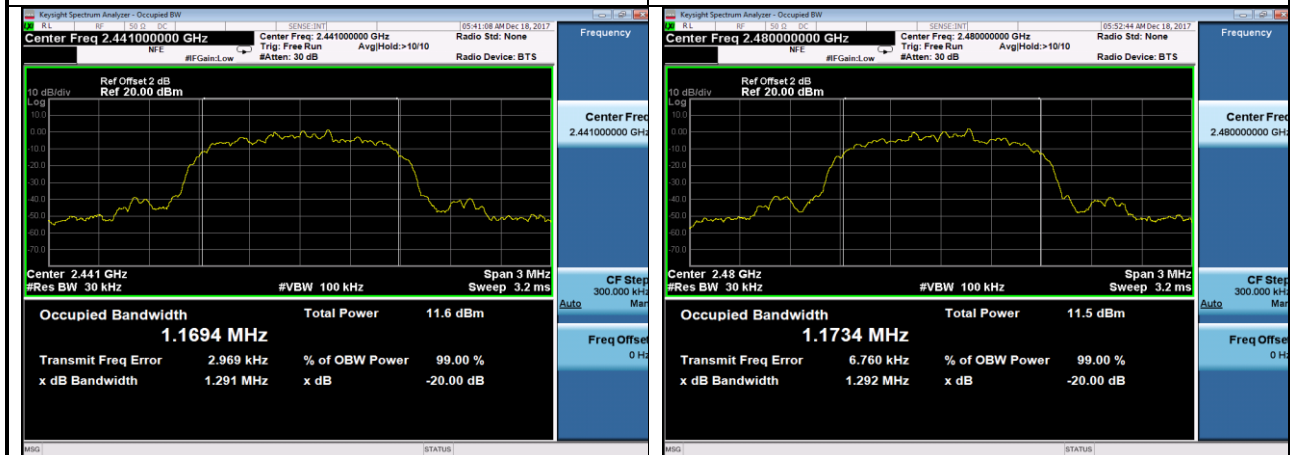
2.2 Test Plots





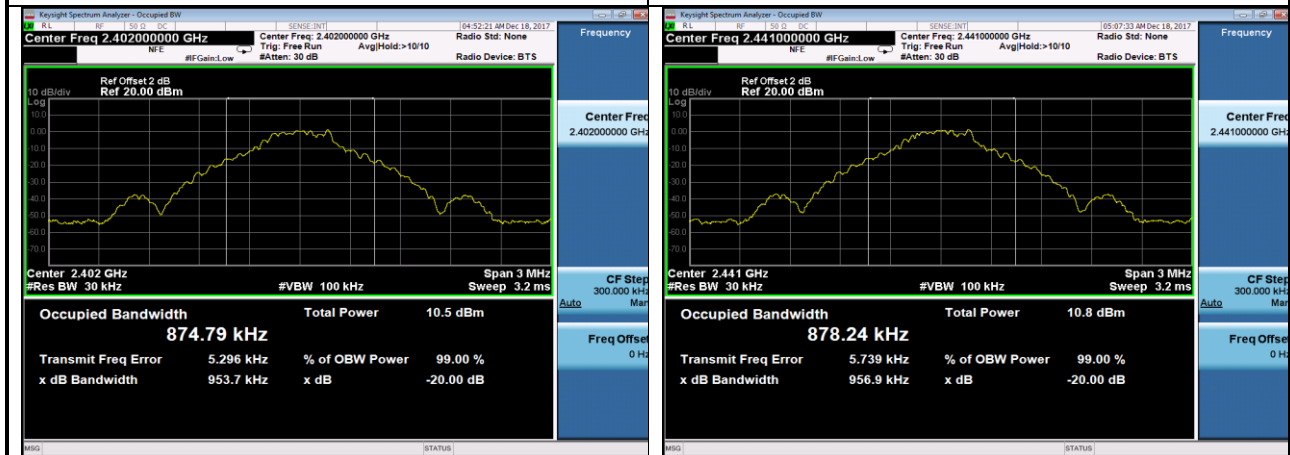
20dB Bandwidth : DQPSK,2441Mhz,2DH5

20dB Bandwidth : DQPSK,2480Mhz,2DH5

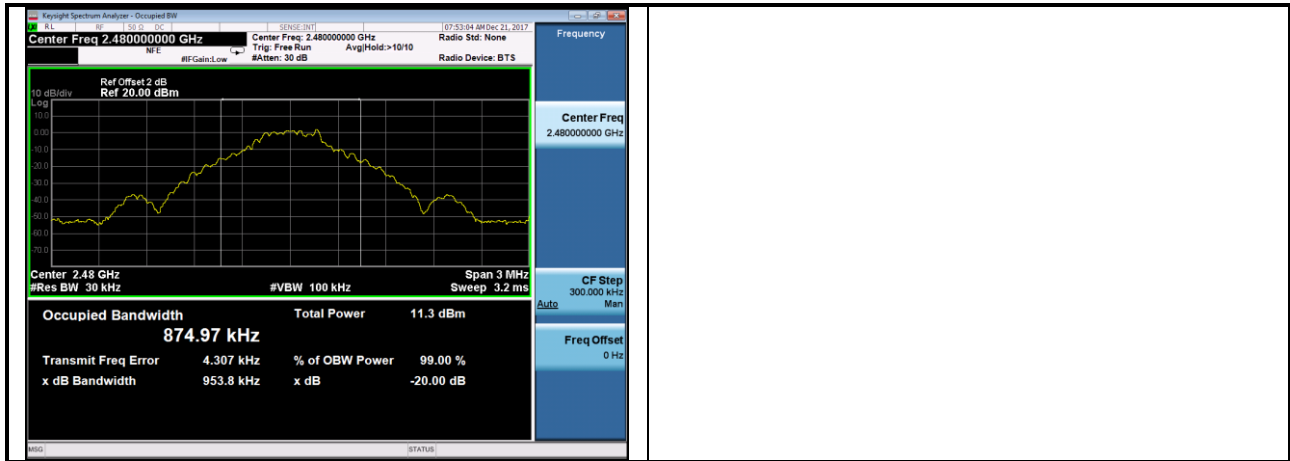


20dB Bandwidth : GFSK,2402Mhz,DH5

20dB Bandwidth : GFSK,2441Mhz,DH5



20dB Bandwidth : GFSK,2480Mhz,DH5

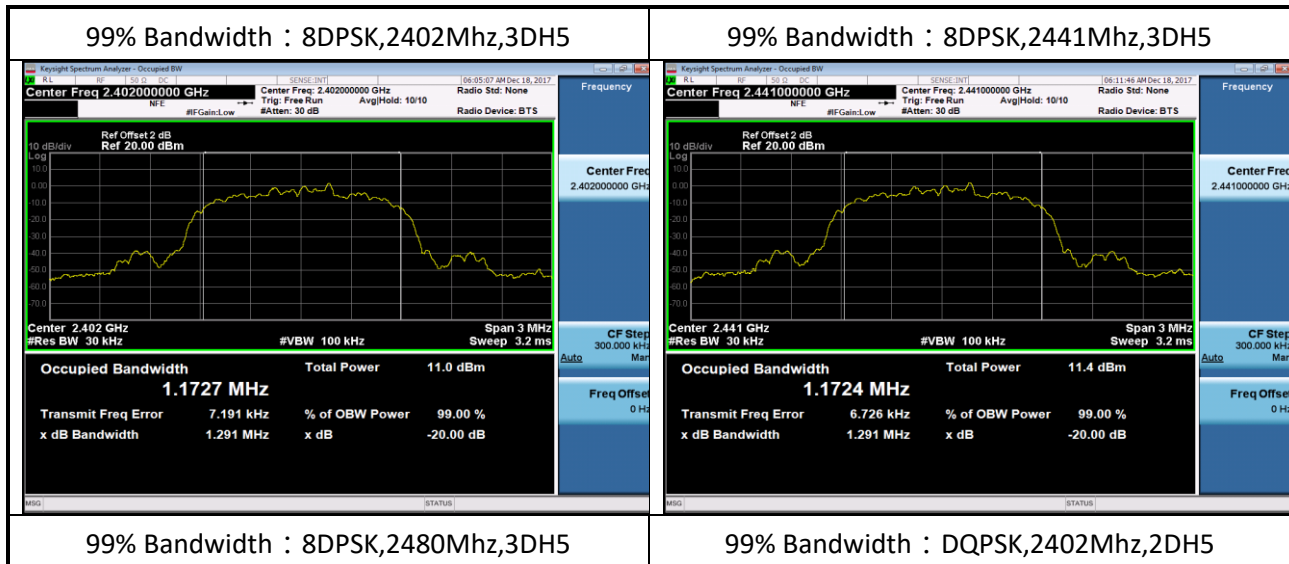


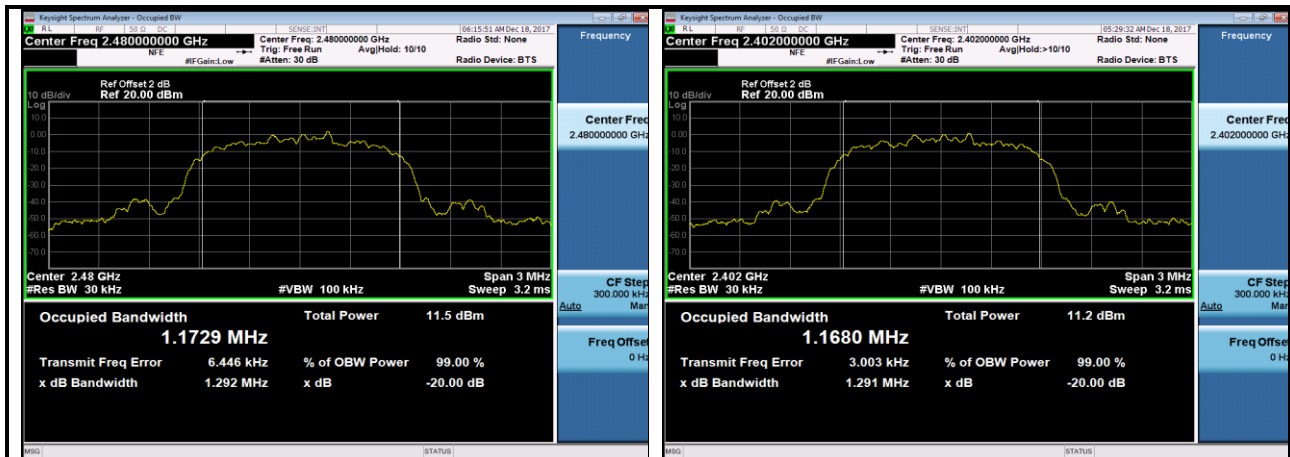
### 3. Occupied Bandwidth

#### 3.1 Test Data

BT 99% Occupied Bandwidth				
Mode	Test Frequency	Packet Type	99% Occupied Bandwidth(kHz)	Result
GFSK	2402	DH5	875.567	Pass
GFSK	2441	DH5	875.174	Pass
GFSK	2480	DH5	875.839	Pass
DQPSK	2402	2DH5	1168.014	Pass
DQPSK	2441	2DH5	1168.172	Pass
DQPSK	2480	2DH5	1173.087	Pass
8DPSK	2402	3DH5	1172.683	Pass
8DPSK	2441	3DH5	1172.434	Pass
8DPSK	2480	3DH5	1172.903	Pass

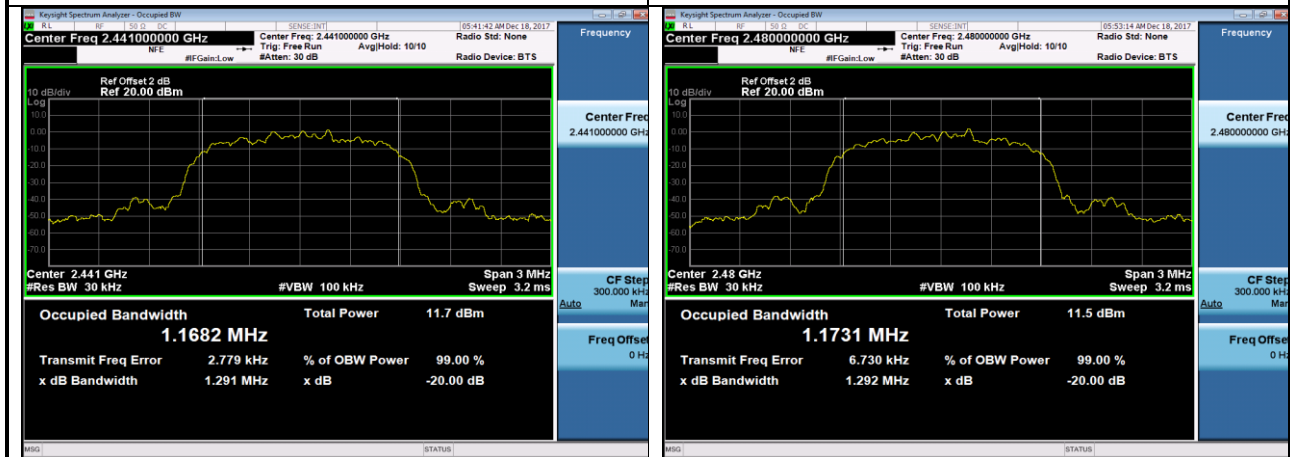
#### 3.2 Test Plots





99% Bandwidth : DQPSK,2441Mhz,2DH5

99% Bandwidth : DQPSK,2480Mhz,2DH5

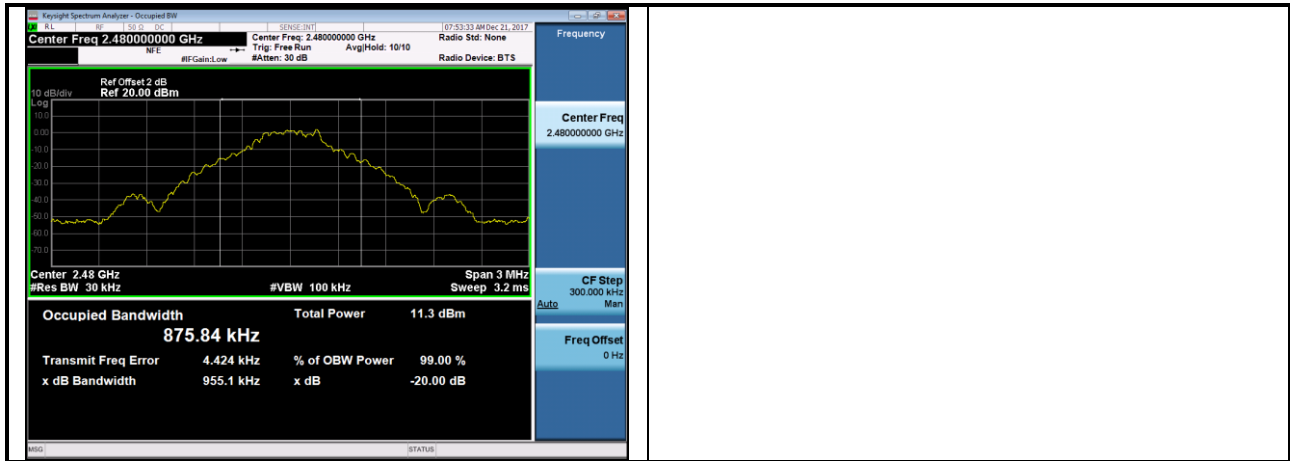


99% Bandwidth : GFSK,2402Mhz,DH5

99% Bandwidth : GFSK,2441Mhz,DH5



99% Bandwidth : GFSK,2480Mhz,DH5



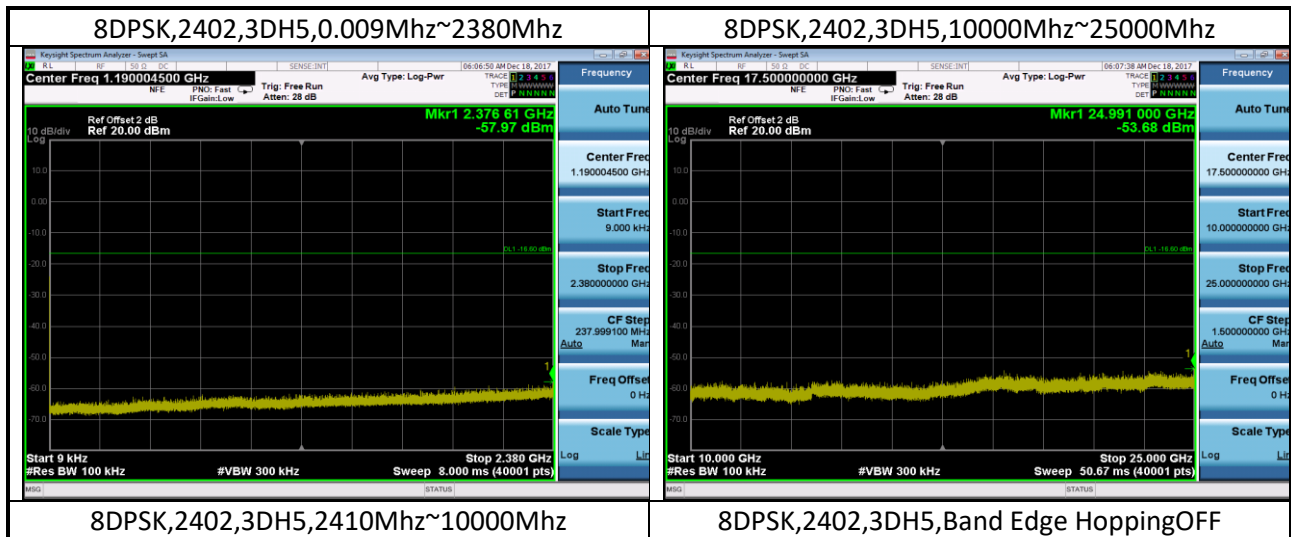
4. Conducted Spurious Emissions & Band Edge

4.1 Test Data

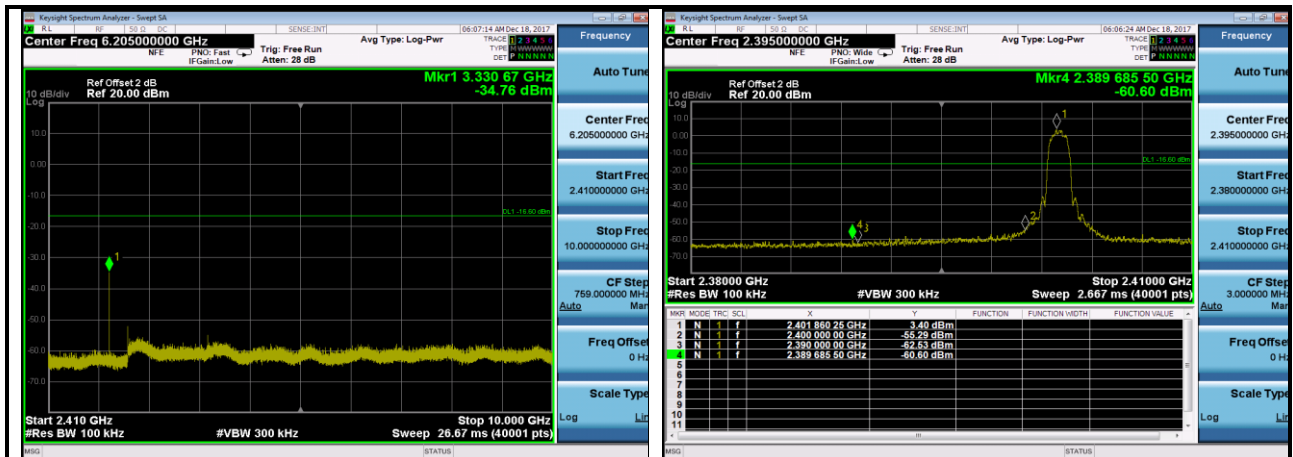
BT Transmitter Spurious Emission					
Mode	Test Frequency	Packet Type	Frequency Range	Power(dBm)	Result
GFSK	2402	DH5	Band Edge HoppingOFF	-51.02	Pass
GFSK	2402	DH5	0.009Mhz~2380Mhz	-58.14	Pass
GFSK	2402	DH5	2410Mhz~10000Mhz	-34.66	Pass
GFSK	2402	DH5	10000Mhz~25000Mhz	-53.50	Pass
GFSK	2441	DH5	Band Edge HoppingOFF	-60.74	Pass
GFSK	2441	DH5	0.009Mhz~2300Mhz	-59.16	Pass
GFSK	2441	DH5	2500Mhz~10000Mhz	-34.82	Pass
GFSK	2441	DH5	10000Mhz~25000Mhz	-54.30	Pass
GFSK	2480	DH5	Band Edge HoppingOFF	-57.26	Pass
GFSK	2480	DH5	0.009Mhz~2475Mhz	-56.74	Pass
GFSK	2480	DH5	2505Mhz~10000Mhz	-34.90	Pass
GFSK	2480	DH5	10000Mhz~25000Mhz	-54.22	Pass
DQPSK	2402	2DH5	Band Edge HoppingOFF	-53.53	Pass
DQPSK	2402	2DH5	0.009Mhz~2380Mhz	-58.68	Pass
DQPSK	2402	2DH5	2410Mhz~10000Mhz	-34.74	Pass
DQPSK	2402	2DH5	10000Mhz~25000Mhz	-54.08	Pass
DQPSK	2441	2DH5	Band Edge HoppingOFF	-60.32	Pass
DQPSK	2441	2DH5	0.009Mhz~2300Mhz	-59.09	Pass
DQPSK	2441	2DH5	2500Mhz~10000Mhz	-34.88	Pass
DQPSK	2441	2DH5	10000Mhz~25000Mhz	-52.80	Pass
DQPSK	2480	2DH5	Band Edge HoppingOFF	-57.98	Pass
DQPSK	2480	2DH5	0.009Mhz~2475Mhz	-55.61	Pass
DQPSK	2480	2DH5	2505Mhz~10000Mhz	-34.80	Pass

DQPSK	2480	2DH5	10000Mhz~25000Mhz	-53.86	Pass
8DPSK	2402	3DH5	Band Edge HoppingOFF	-55.29	Pass
8DPSK	2402	3DH5	0.009Mhz~2380Mhz	-57.97	Pass
8DPSK	2402	3DH5	2410Mhz~10000Mhz	-34.76	Pass
8DPSK	2402	3DH5	10000Mhz~25000Mhz	-53.68	Pass
8DPSK	2441	3DH5	Band Edge HoppingOFF	-60.76	Pass
8DPSK	2441	3DH5	0.009Mhz~2300Mhz	-58.96	Pass
8DPSK	2441	3DH5	2500Mhz~10000Mhz	-34.72	Pass
8DPSK	2441	3DH5	10000Mhz~25000Mhz	-54.01	Pass
8DPSK	2480	3DH5	Band Edge HoppingOFF	-56.28	Pass
8DPSK	2480	3DH5	0.009Mhz~2475Mhz	-57.06	Pass
8DPSK	2480	3DH5	2505Mhz~10000Mhz	-34.83	Pass
8DPSK	2480	3DH5	10000Mhz~25000Mhz	-54.10	Pass

## 4.2 Test Plots

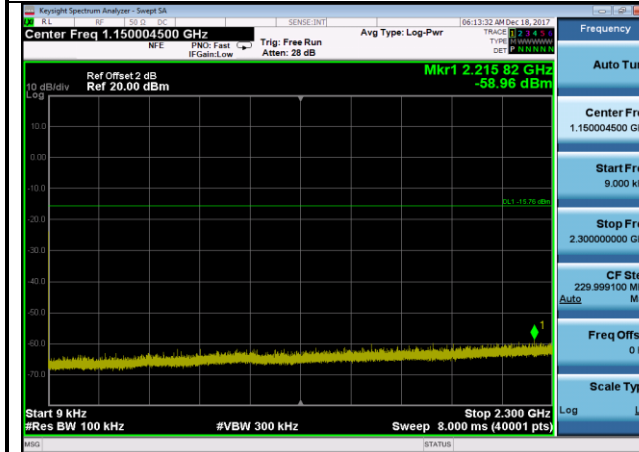




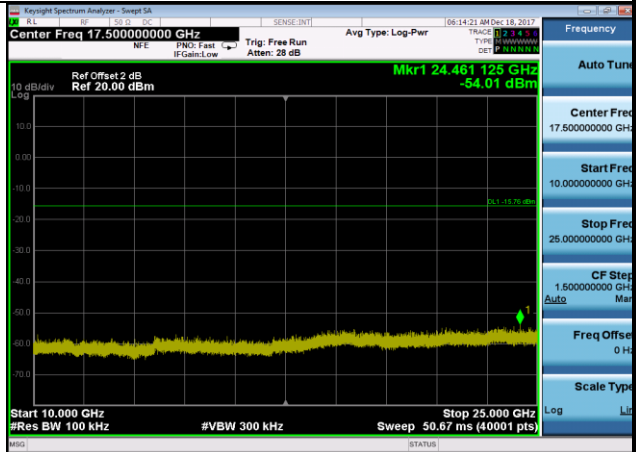


8DPSK,2441,3DH5,0.009Mhz~2300Mhz

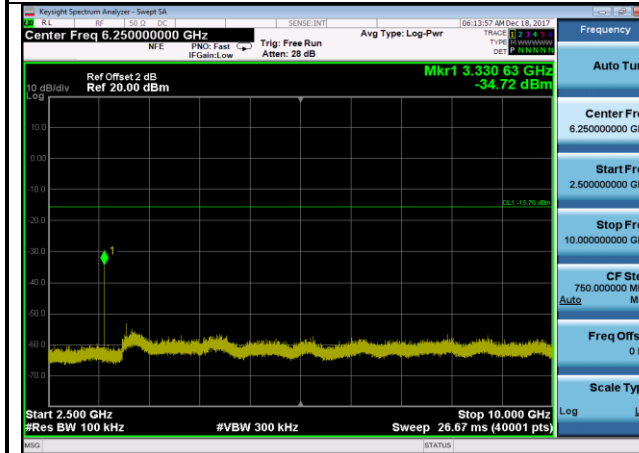
8DPSK,2441,3DH5,1000Mhz~25000Mhz



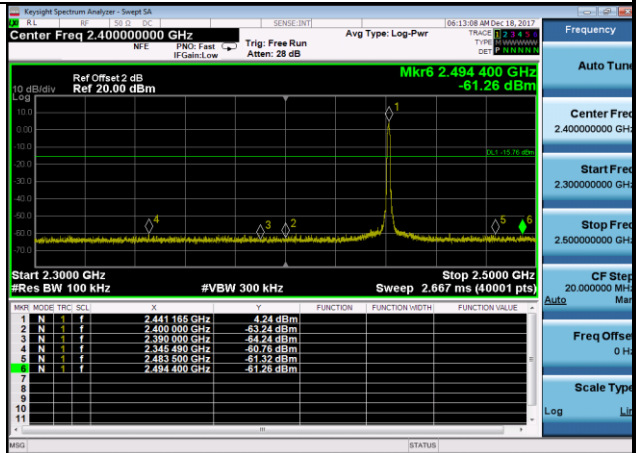
8DPSK,2441,3DH5,2500Mhz~10000Mhz



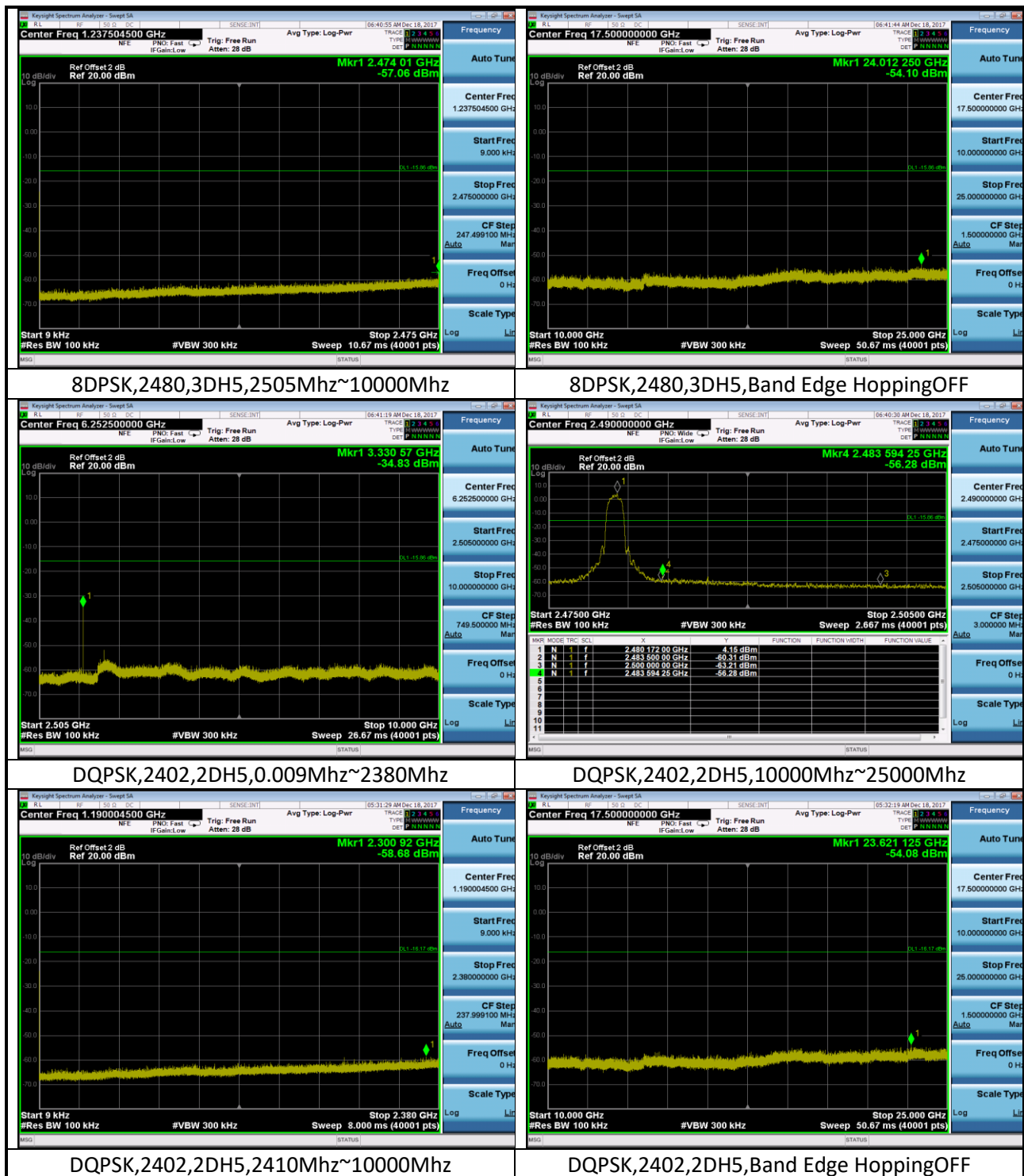
8DPSK,2441,3DH5,Band Edge HoppingOFF

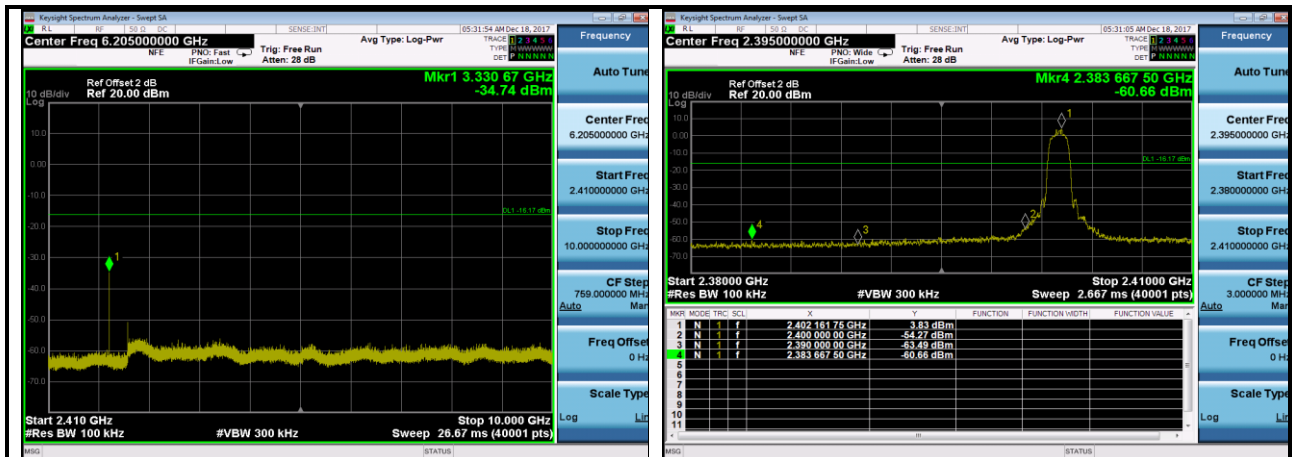


8DPSK,2480,3DH5,0.009Mhz~2475Mhz



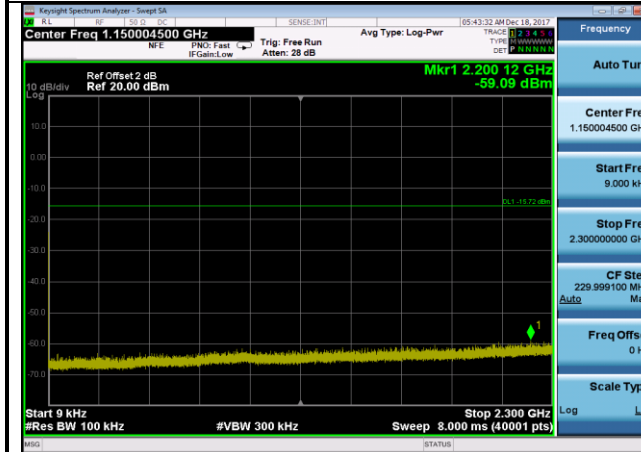
8DPSK,2480,3DH5,10000Mhz~25000Mhz



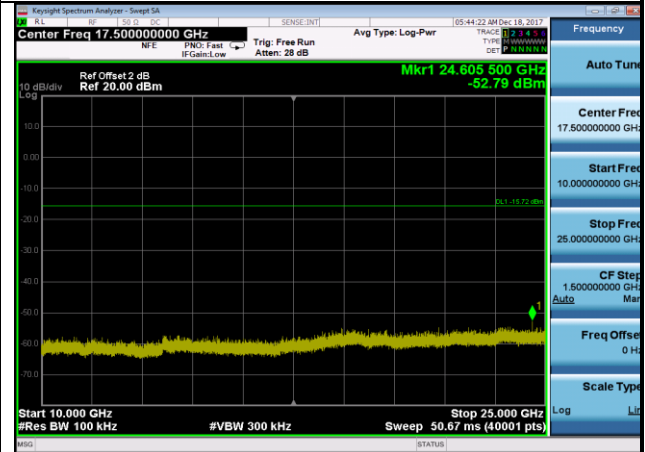


DQPSK,2441,2DH5,0.009Mhz~2300Mhz

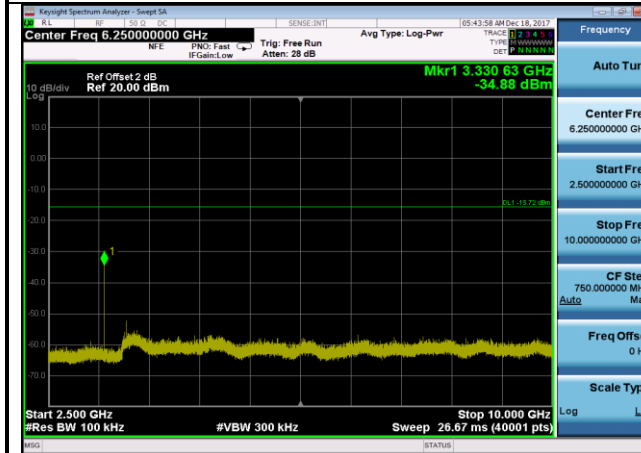
DQPSK,2441,2DH5,1000Mhz~25000Mhz



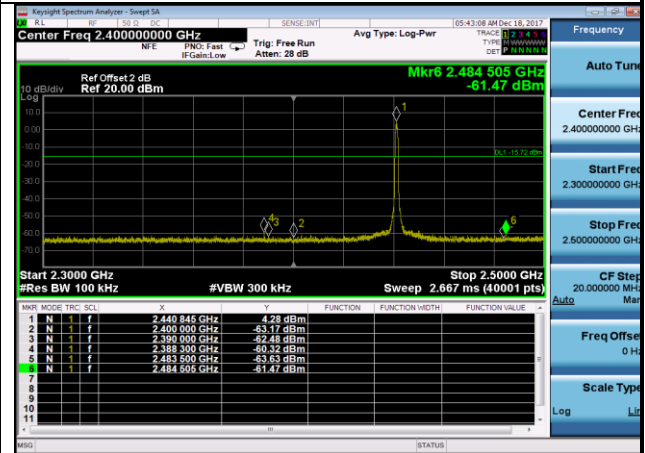
DQPSK,2441,2DH5,2500Mhz~10000Mhz



DQPSK,2441,2DH5,Band Edge HoppingOFF



DQPSK,2480,2DH5,0.009Mhz~2475Mhz



DQPSK,2480,2DH5,1000Mhz~25000Mhz