



FCC TEST REPORT

FCC ID: SY4-A01023

On Behalf of

Shanghai Huace Navigation Technology LTD.

GNSS Receiver (i70+)

Model No.: 1180271031142

Prepared for : Shanghai Huace Navigation Technology LTD.
Address : Building D, 599 Gaojing Road, Qingpu District, Shanghai, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China


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TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology LTD.
Address : Building D, 599 Gaojing Road, Qingpu District, Shanghai, China
Manufacturer : Shanghai Huace Navigation Technology LTD.
Address : Building D, 599 Gaojing Road, Qingpu District, Shanghai, China
EUT Description : GNSS Receiver (i70+)
(A) Model No. : 1180271031142
(B) Trademark : 

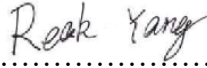
Measurement Standard Used:

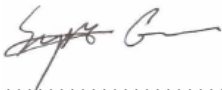
**FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2017,
ANSI C63.10:2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang 
Project Engineer

Approved by (name + signature).....: Simple Guan 
Project Manager

Date of issue..... : October 24, 2018

Revision History

Revision	Issue Date	Revisions	Revised By
00	October 24, 2018	Initial released Issue	Simple Guan

1. SUMMARY OF STANDARDS AND RESULTS


1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10 :2013	P
Bandwidth	FCC Part 15: 15.215 ANSI C63.10 :2013	P
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10 :2013	P
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	P
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	P
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10 :2013	P
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.10 :2013	P
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10 :2013	P
Antenna requirement	FCC Part 15: 15.203	P
Note:	1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.	

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description	:	GNSS Receiver (i70+)
Model Number	:	1180271031142
Note	:	1. The model name “1180271031142” information not listed on marking plate at testing & certification stage, but will be listed in white rectangular frame of marking plate at MP stage. 2. The model name “1180271031142” corresponding client's internal model is “GNSS Receiver (i70+) i70F-WSA9C”.
Trademark	:	
Test Voltage	:	DC 7.2V from battery or 12-36VDC, DC 12V From adapter
Radio Technology	:	Bluetooth 4.2 EDR
Operation frequency	:	2402-2480MHz
Channel No.	:	79 Channels
Modulation type	:	GFSK, $\pi/4$ DQPSK, 8- DPSK
Antenna Type	:	Internal antenna, Maximum Gain is 1dBi for BT
Software version	:	V1.5.99
Hardware version	:	V2.1

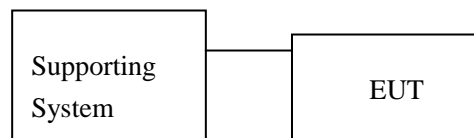
2.2. Accessories of Device (EUT)

Accessories1 : Power supply
 Manufacturer : GUANGDONG ABT INDUSTRIAL CO LTD
 Model : ABT030120
 Ratings : Input:100-240V~, 50/60Hz, 1A;
 Output: 12VDC, 3A

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1.	Notebook	ACER	ZQT	N/A	DOC

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
GFSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
π /4 DQPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
8- DPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	27°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd
 Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
 Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
 Registration Number: 293961

July 25, 2017 Certificated by IC
 Registration Number: 12135A

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2018.09.21	1 Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2018.09.21	1 Year
Receiver	R&S	ESCI	1166.5950K03-1011	2018.09.21	1 Year
Receiver	R&S	ESCI	101202	2018.09.21	1 Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2018.04.13	2 Year
Horn Antenna	EMCO	3115	640201028-06	2018.04.13	2 Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2018.04.13	2 Year
Cable	Resenberger	N/A	No.1	2018.09.21	1 Year
Cable	SCHWARZBECK	N/A	No.2	2018.09.21	1 Year
Cable	SCHWARZBECK	N/A	No.3	2018.09.21	1 Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2018.09.21	1 Year
Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2018.09.21	1 Year
Temperature controller	Terchy	MHQ	120	2018.09.21	1 Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2018.09.21	1 Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2018.09.21	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2018.09.21	1 Year
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170294	2018.04.13	2 Year
Power Meter	Agilent	E9300A	MY41496625	2018.09.21	1 Year

3. MAXIMUM PEAK OUTPUT POWER

3.1.Limit

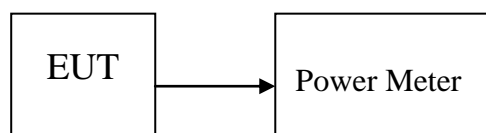
Please refer section 15.247.

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, the e.i.r.p shall not exceed 4W

3.2.Test Procedure

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.

3.3.Test Setup



3.4.Test Result

Mode	Freq (MHz)	PK Output Power (dBm)	PK Output Power (mW)	Limit (dBm)	Result
GFSK	2402	5.107	3.241	30	Pass
	2441	6.910	4.909	30	Pass
	2480	6.748	4.729	30	Pass
π /4 DQPSK	2402	5.221	3.327	21	Pass
	2441	5.308	3.395	21	Pass
	2480	3.002	1.996	21	Pass
8- DPSK	2402	3.173	2.076	21	Pass
	2441	5.391	3.460	21	Pass
	2480	5.228	3.333	21	Pass
Conclusion: PASS					

4. BANDWIDTH

4.1.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3.Test Result

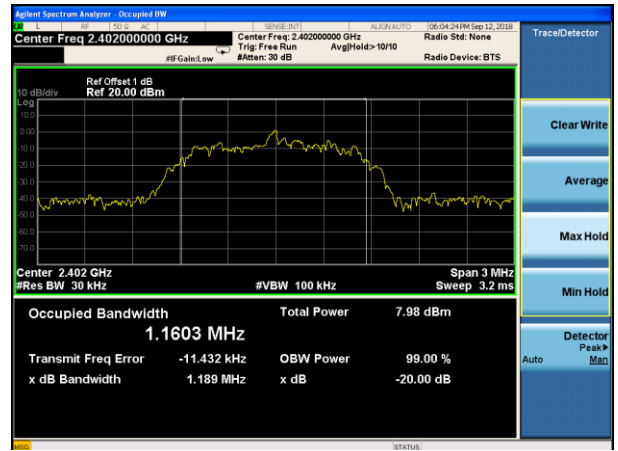
Mode	Freq (MHz)	20dB Bandwidth (KHz)	Conclusion
GFSK	2402	870.7	PASS
	2441	809.9	PASS
	2480	840.6	PASS
π /4 DQPSK	2402	1189.0	PASS
	2441	1212.0	PASS
	2480	1196.0	PASS
8- DPSK	2402	1203.0	PASS
	2441	1204.0	PASS
	2480	1201.0	PASS

Original Test data For 20dB bandwidth

GFSK mode	$\pi/4$ DQPSK
------------------	---------------------------------



Lowest channel



Lowest channel



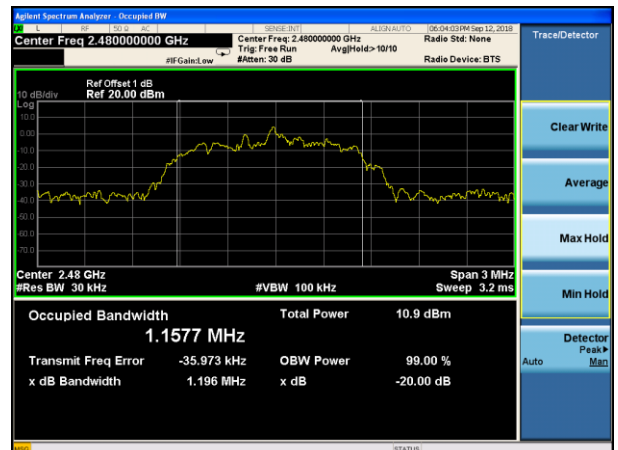
Middle channel



Middle channel

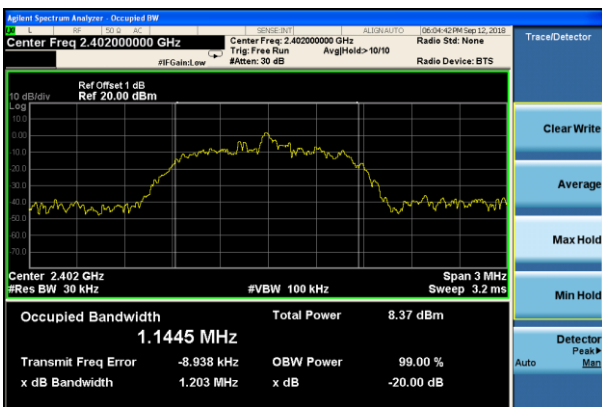


Highest channel

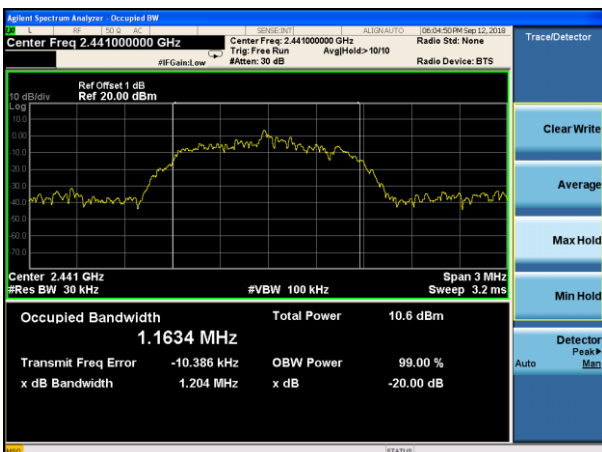


Highest channel

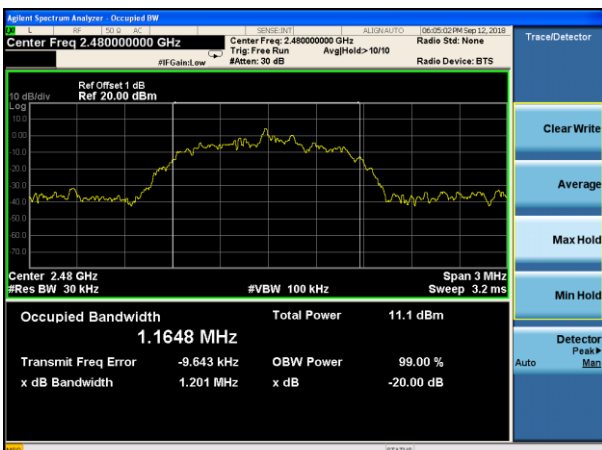
8- DPSK



Lowest channel



Middle channel



Highest channel

:

5. CARRIER FREQUENCY SEPARATION

5.1.Limit

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

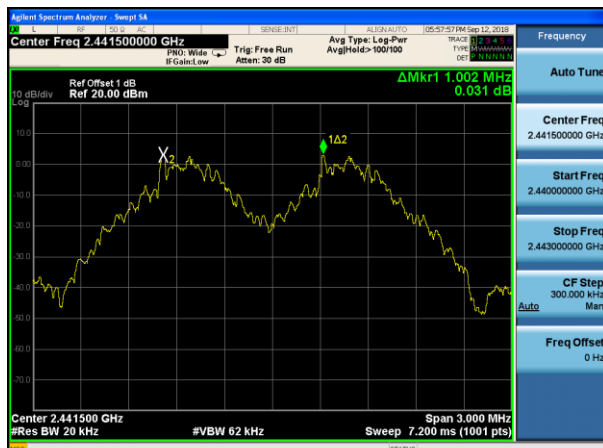
5.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The carrier frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW.

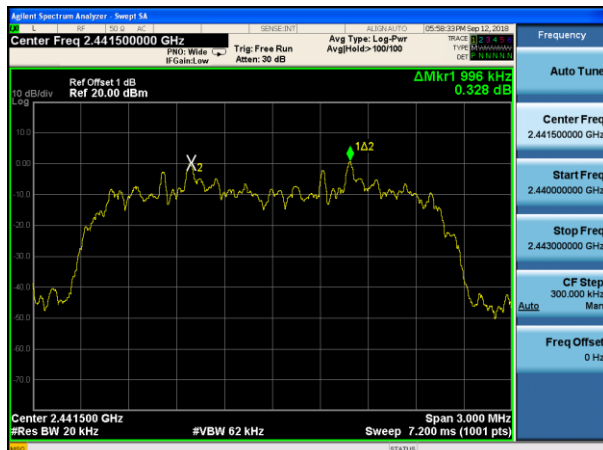
5.3.Test Result

Mode/Channel	Channel separation (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Conclusion
GFSK	1.002	870.7	870.7	PASS
π /4 DQPSK	0.996	1212.0	808.00	PASS
8- DPSK	1.008	1204.0	802.67	PASS

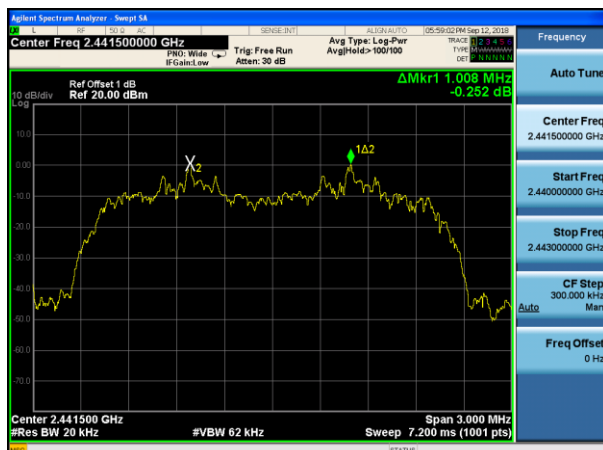
Original test data for channel separation



GFSK



$\pi/4$ DQPSK



8- DPSK

6. NUMBER OF HOPPING CHANNEL

6.1.Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

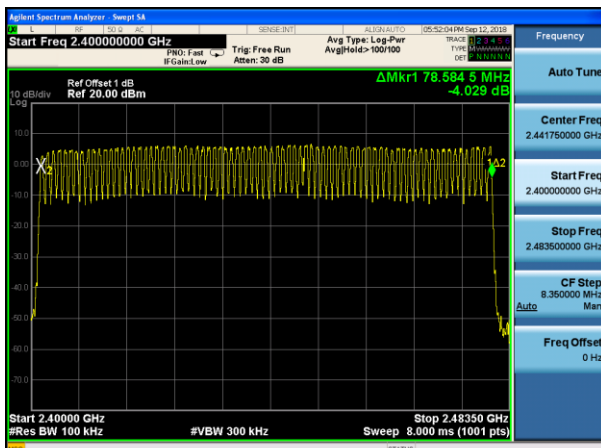
6.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.

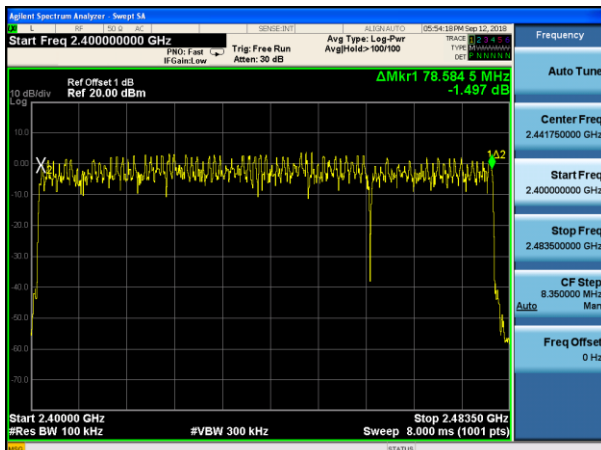
6.3.Test Result

Mode	Number of hopping channel	Limit	Conclusion
GFSK	79	>15	PASS
π /4 DQPSK	79	>15	PASS
8- DPSK	79	>15	PASS

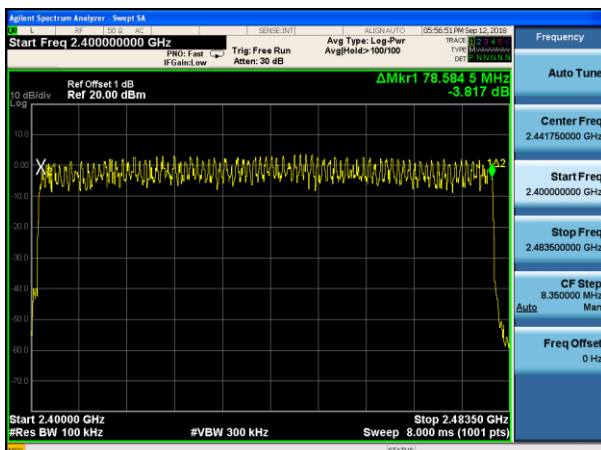
Original test data for hopping channel number



GFSK



$\pi/4$ DQPSK



8- DPSK

7. DWELL TIME

7.1. Test limit

Please refer section 15.247

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channels employed.

7.2. Test Procedure

- 7.2.1. Place the EUT on the table and set it in transmitting mode.
- 7.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 7.2.3. Set center frequency of spectrum analyzer = operating frequency.
- 7.2.4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
- 7.2.5. Repeat above procedures until all frequency measured were complete.

7.3. Test Result

PASS.

Detailed information please see the following page.

Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (ms)	Limit (ms)	Conclusion
GFSK	DH1	2441	0.389	124.480	400	PASS
	DH3	2441	1.651	264.160		PASS
	DH5	2441	2.880	307.200		PASS
π /4 DQPSK	DH1	2441	0.408	130.560	400	PASS
	DH3	2441	1.670	267.200		PASS
	DH5	2441	2.904	309.760		PASS
8- DPSK	DH1	2441	0.413	132.160	400	PASS
	DH3	2441	1.661	265.760		PASS
	DH5	2441	2.918	311.253		PASS

Note: 1 A period time = $0.4 \text{ (s)} * 79 = 31.6 \text{ (s)}$

2 DH1 time slot = $\text{Pulse Duration} * (1600 / (2 * 79)) * \text{A period time} / 1000$

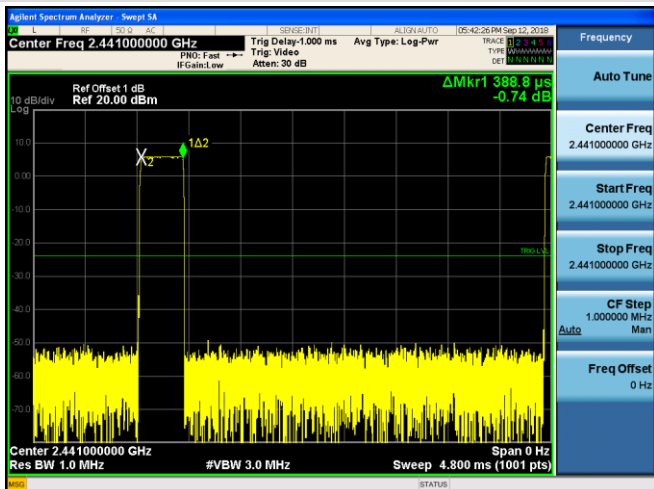
DH3 time slot = $\text{Pulse Duration} * (1600 / (4 * 79)) * \text{A period time} / 1000$

DH5 time slot = $\text{Pulse Duration} * (1600 / (6 * 79)) * \text{A period time} / 1000$

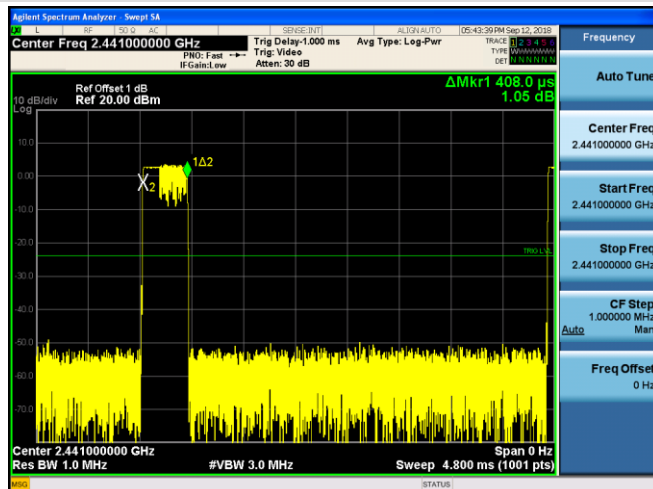
Dwell time

GFSK

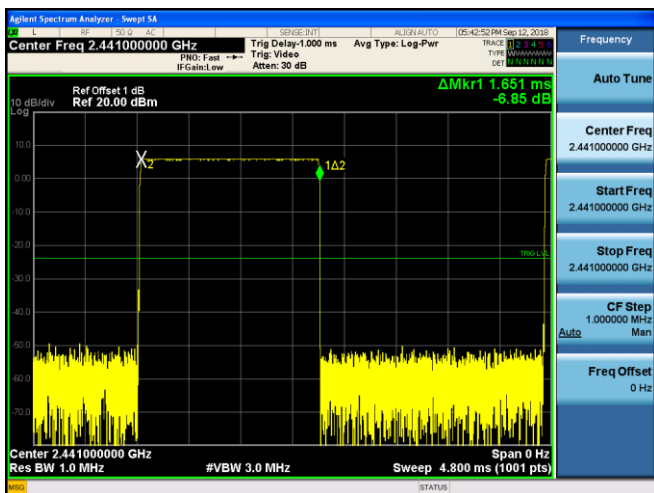
$\pi/4$ -DQPSK



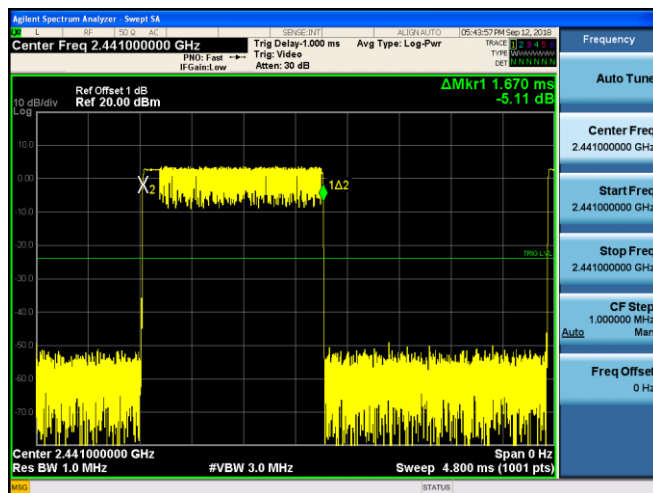
Channel 39 / 2441 MHz - DH1



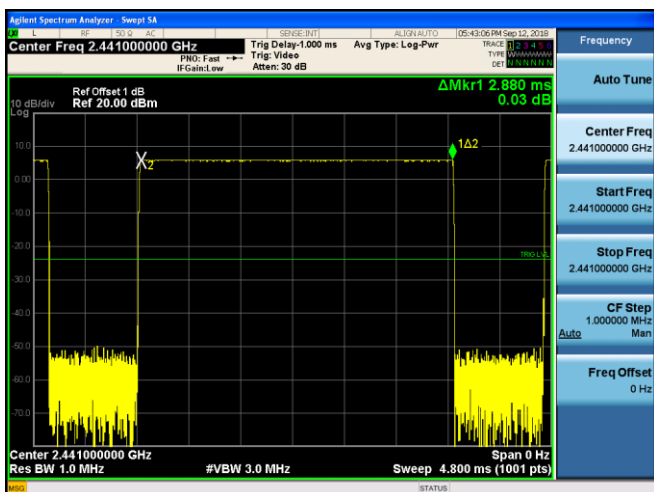
Channel 39 / 2441 MHz - 2DH1



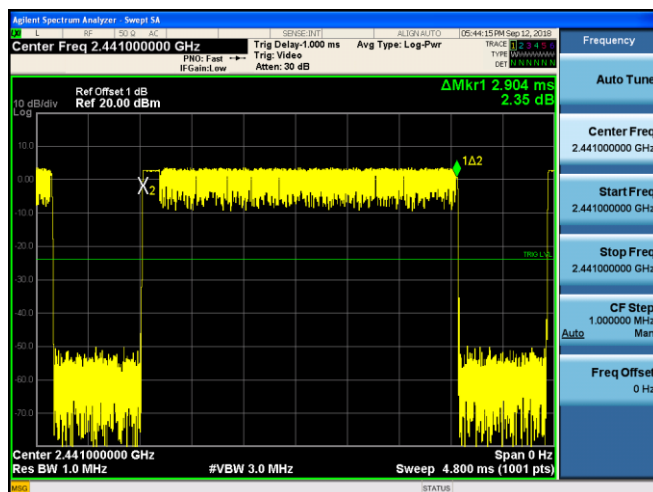
Channel 39 / 2441 MHz - DH3



Channel 39 / 2441 MHz - 2DH3



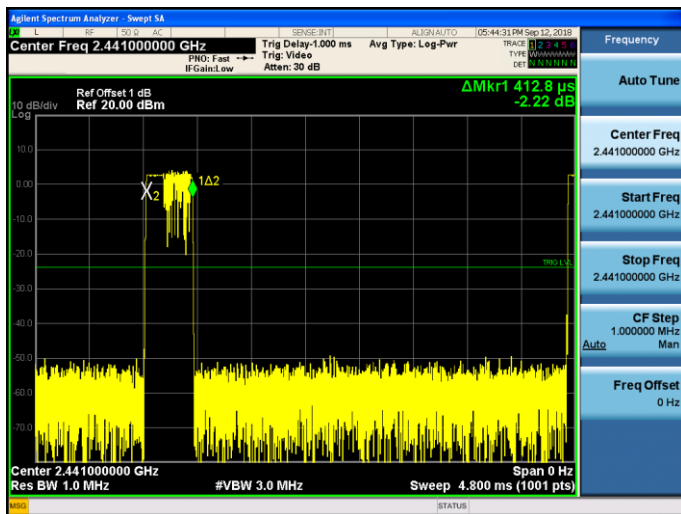
Channel 39 / 2441 MHz - DH5



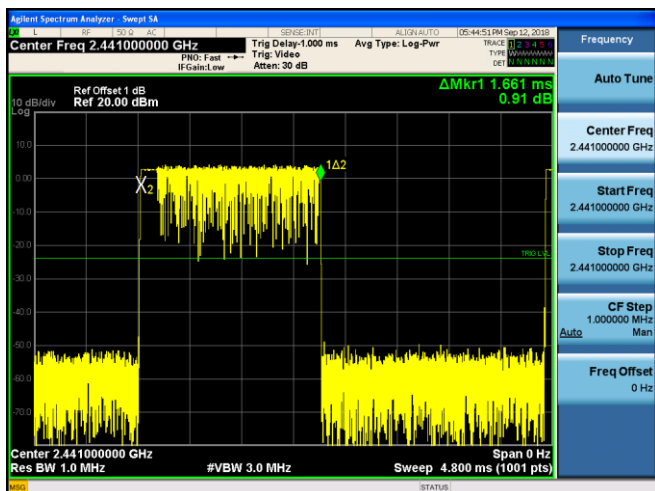
Channel 39 / 2441 MHz - 2DH5

Dwell time

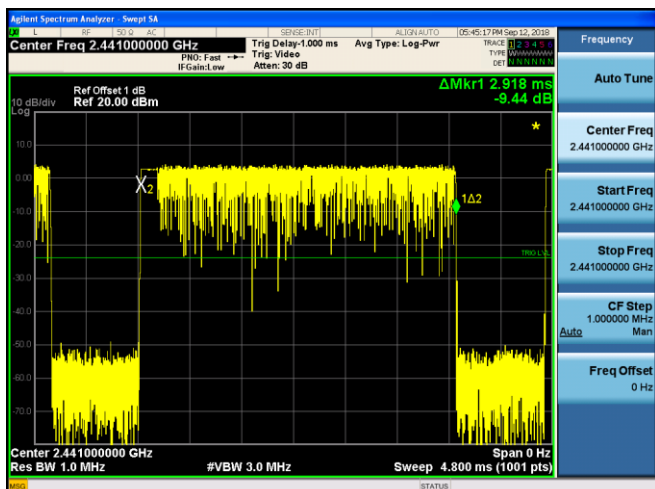
8DPSK



Channel 39 / 2441 MHz - 3DH1



2 Channel 39 / 2441 MHz - 3DH3



Channel 39 / 2441 MHz - 3DH5

8. RADIATED EMISSIONS

8.1.Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

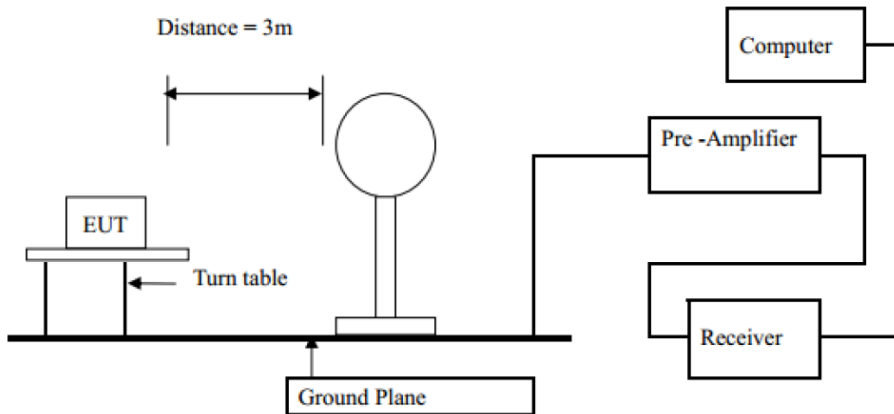
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

15.209 Limit

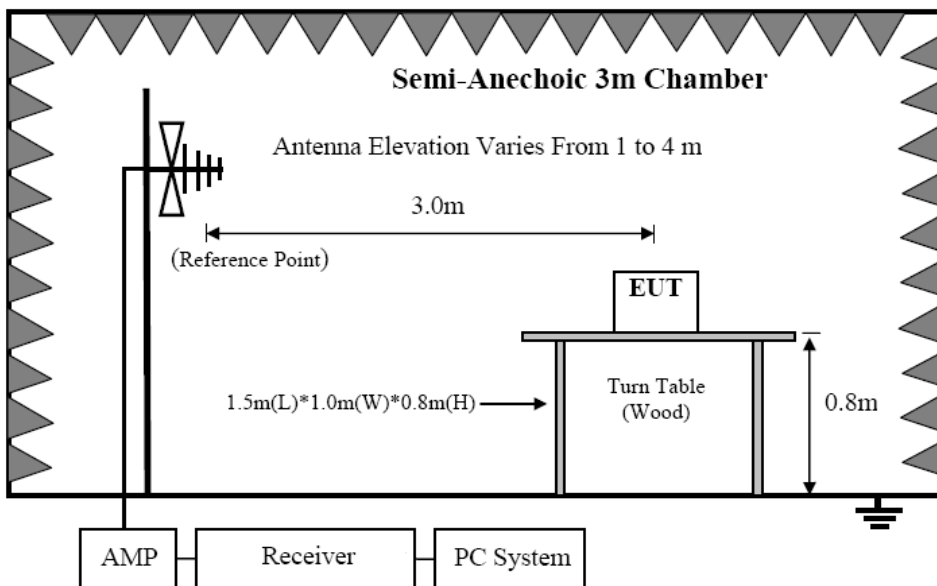
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

8.2. Block Diagram of Test setup

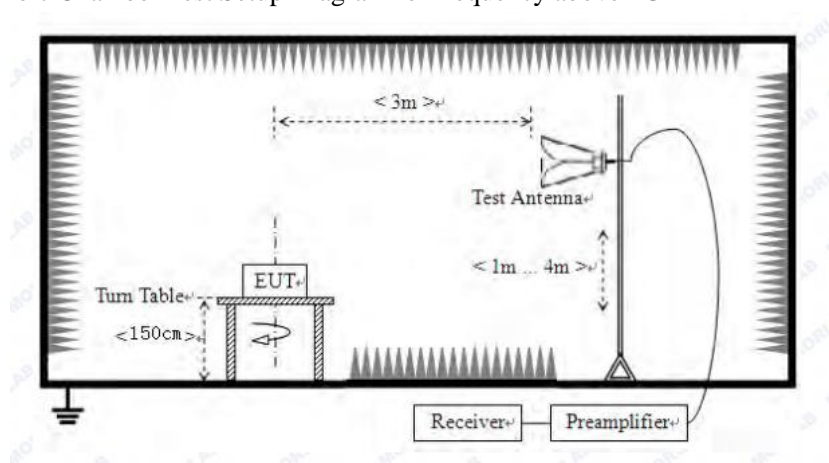
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



8.2.2 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and simulator as shown in section 1.4 and 6.1
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on Radiated Emission test.
- (6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

8.4. Test Result

We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency..
Detailed information please see the following page.

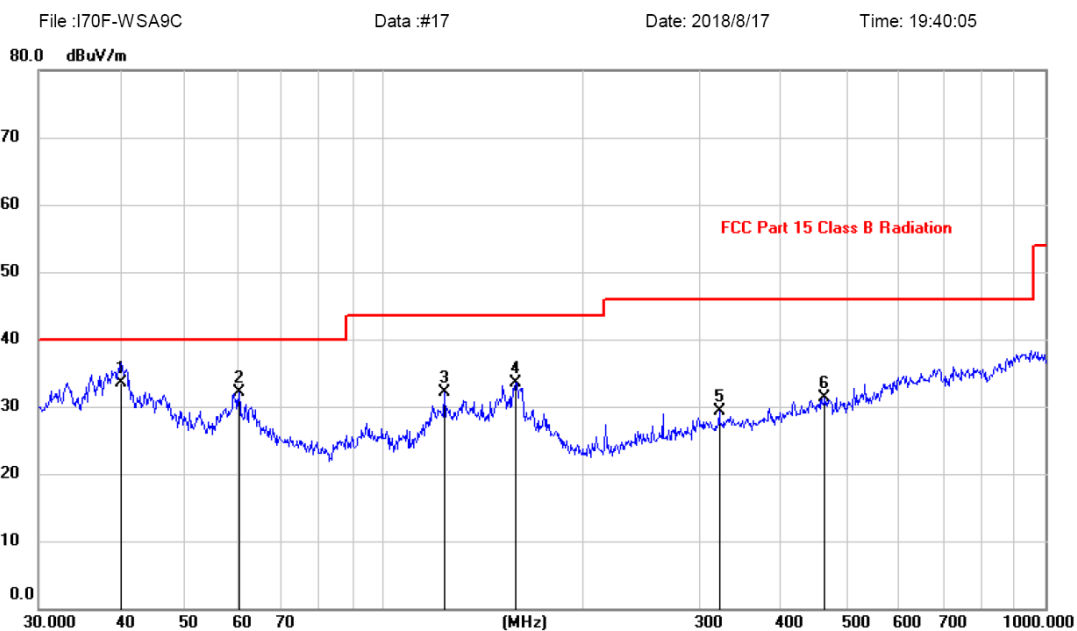
From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

From 30MHz to 1000MHz: Conclusion: PASS

Vertical:

Radiated Emission Measurement



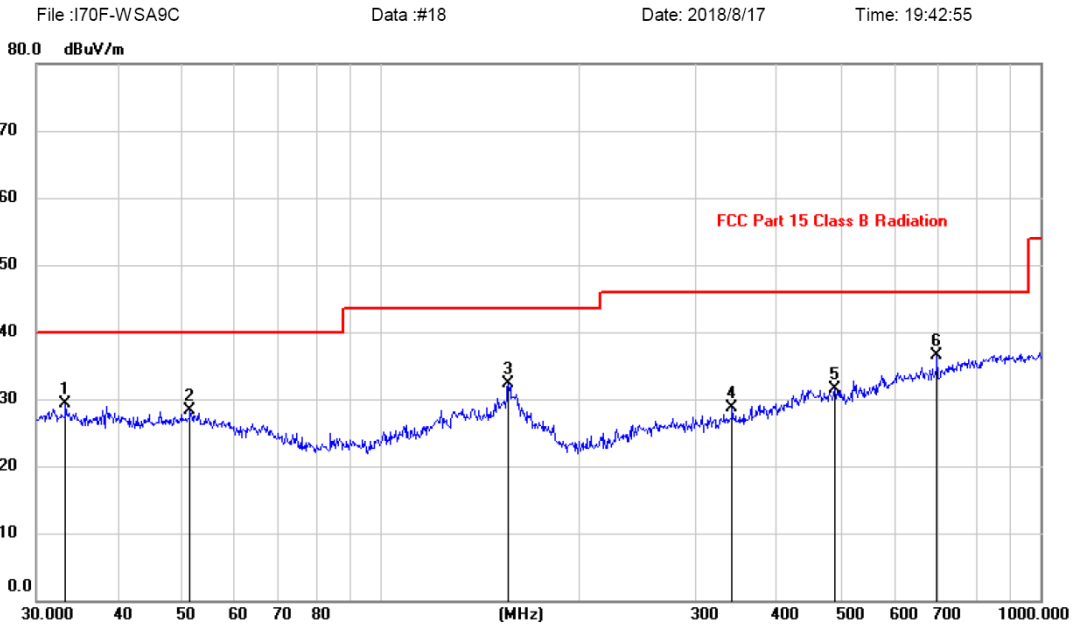
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	39.9941	19.35	14.24	33.59	40.00	-6.41			QP
2		60.4917	19.40	12.77	32.17	40.00	-7.83			peak
3		123.6984	19.28	12.83	32.11	43.50	-11.39			peak
4		158.1123	18.98	14.57	33.55	43.50	-9.95			peak
5		321.0605	15.43	13.91	29.34	46.00	-16.66			peak
6		463.9696	14.32	17.08	31.40	46.00	-14.60			peak

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Horizontal:

Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		33.2111	15.92	13.44	29.36	40.00	-10.64	peak		
2		51.3004	14.64	13.63	28.27	40.00	-11.73	peak		
3		155.9100	17.66	14.57	32.23	43.50	-11.27	peak		
4		340.7817	14.33	14.43	28.76	46.00	-17.24	peak		
5		489.0267	14.05	17.37	31.42	46.00	-14.58	peak		
6	*	696.8567	16.00	20.51	36.51	46.00	-9.49	peak		

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Remark: All modes have been tested, and only worst data of GFSK mode, Channel 2402MHz (AC 120V/60Hz) was listed in this report.

From 1G-25GHz

Test Mode: GFSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	43.45	V	33.95	10.18	34.26	53.32	74	20.68	PK
4804	33.31	V	33.95	10.18	34.26	43.18	54	10.82	AV
7206	/		/						
9608	/		/						
4824	44.28	H	33.95	10.18	34.26	54.15	74	19.85	PK
4824	32.61	H	33.95	10.18	34.26	42.48	54	11.52	AV
7206									
9608									
Test Mode: GFSK TX Mid									
4882	42.05	V	33.93	10.2	34.29	51.89	74	22.11	PK
4882	33.39	V	33.93	10.2	34.29	43.23	54	10.77	AV
7323	/								
9764	/								
4882	42.07	H	33.93	10.2	34.29	51.91	74	22.09	PK
4882	34.23	H	33.93	10.2	34.29	44.07	54	9.93	AV
7323									
9764									
Test Mode: GFSK TX High									
4960	42.17	V	33.98	10.22	34.25	52.12	74	21.88	PK
4960	33.01	V	33.98	10.22	34.25	42.96	54	11.04	AV
7440	/								
9920	/								
4960	43.69	H	33.98	10.22	34.25	53.64	74	20.36	PK
4960	32.45	H	33.98	10.22	34.25	42.40	54	11.60	AV
7440	/								
9920	/								
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

From 1G-25GHz

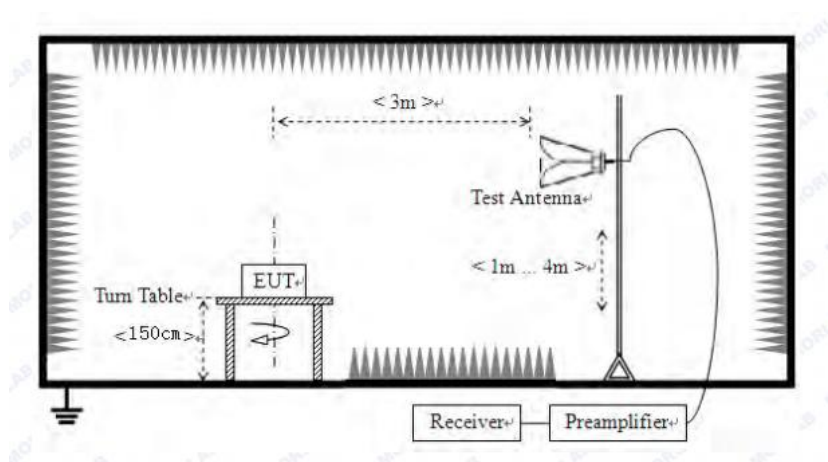
Test Mode: $\pi/4$ DQPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	43.67	V	33.95	10.18	34.26	53.54	74	20.46	PK
4804	32.69	V	33.95	10.18	34.26	42.56	54	11.44	AV
7206	/		/						
9608	/		/						
4824	43.44	H	33.95	10.18	34.26	53.31	74	20.69	PK
4824	33.18	H	33.95	10.18	34.26	43.05	54	10.95	AV
7206									
9608									
Test Mode: $\pi/4$ DQPSK TX Mid									
4882	44.62	V	33.93	10.2	34.29	54.46	74	19.54	PK
4882	32.38	V	33.93	10.2	34.29	42.22	54	11.78	AV
7323	/								
9764	/								
4882	45.41	H	33.93	10.2	34.29	55.25	74	18.75	PK
4882	34.22	H	33.93	10.2	34.29	44.06	54	9.94	AV
7323									
9764									
Test Mode: $\pi/4$ DQPSK TX High									
4960	43.45	V	33.98	10.22	34.25	53.40	74	20.60	PK
4960	32.64	V	33.98	10.22	34.25	42.59	54	11.41	AV
7440	/								
9920	/								
4960	43.82	H	33.98	10.22	34.25	53.77	74	20.23	PK
4960	32.19	H	33.98	10.22	34.25	42.14	54	11.86	AV
7440	/								
9920	/								
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

From 1G-25GHz

Test Mode: 8- DQPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	42.62	V	33.95	10.18	34.26	52.49	74	21.51	PK
4804	32.72	V	33.95	10.18	34.26	42.59	54	11.41	AV
7206	/		/						
9608	/		/						
4824	41.45	H	33.95	10.18	34.26	51.32	74	22.68	PK
4824	32.89	H	33.95	10.18	34.26	42.76	54	11.24	AV
7206									
9608									
Test Mode: 8- DQPSK TX Mid									
4882	41.36	V	33.93	10.2	34.29	51.20	74	22.80	PK
4882	32.55	V	33.93	10.2	34.29	42.39	54	11.61	AV
7323	/								
9764	/								
4882	43.53	H	33.93	10.2	34.29	53.37	74	20.63	PK
4882	33.44	H	33.93	10.2	34.29	43.28	54	10.72	AV
7323									
9764									
Test Mode: 8- DQPSK TX High									
4960	43.61	V	33.98	10.22	34.25	53.56	74	20.44	PK
4960	32.80	V	33.98	10.22	34.25	42.75	54	11.25	AV
7440	/								
9920	/								
4960	43.50	H	33.98	10.22	34.25	53.45	74	20.55	PK
4960	32.93	H	33.98	10.22	34.25	42.88	54	11.12	AV
7440	/								
9920	/								
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

9. BAND EDGE COMPLIANCE

9.1. Block Diagram of Test Setup



9.2. Limit

All the lower and upper band-edges emissions appearing within restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

9.3. Test Procedure

All restriction band and non- restriction band have been tested , only worse case is reported.

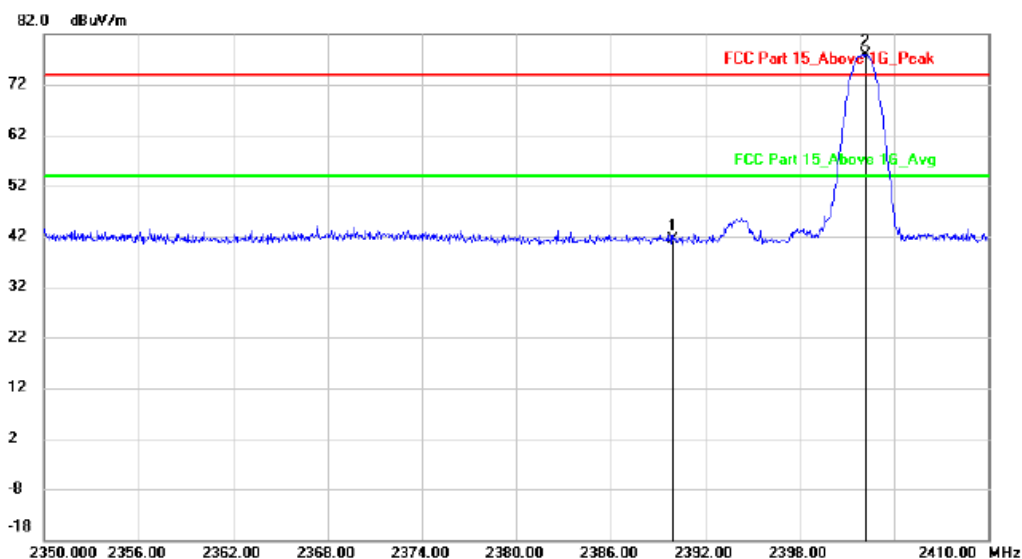
9.4. Test Result

PASS. (See below detailed test data)

Radiated Method:

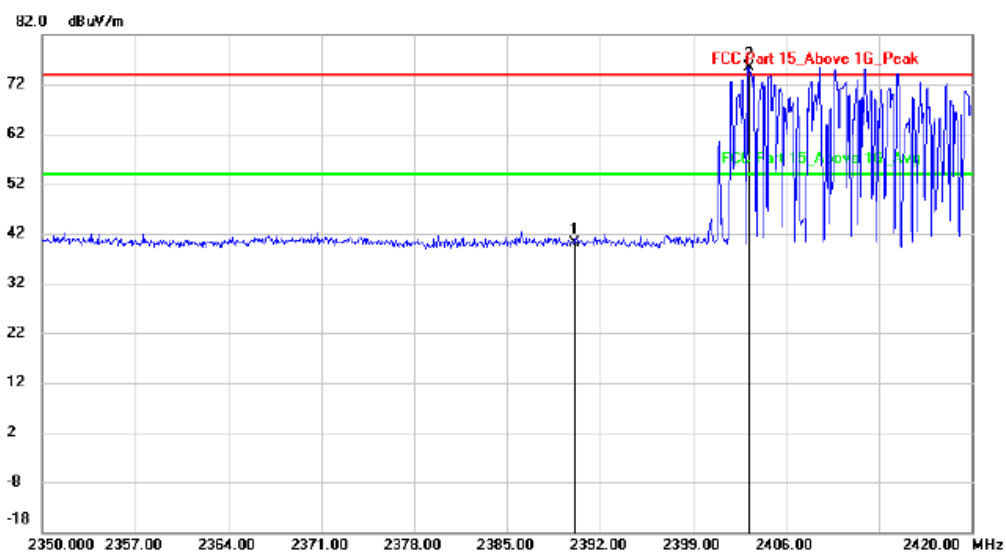
Polarization: Vertical

Test Mode: GFSK-Low



No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1	2390.000	44.83	-3.40	41.43	74.00	-32.57		

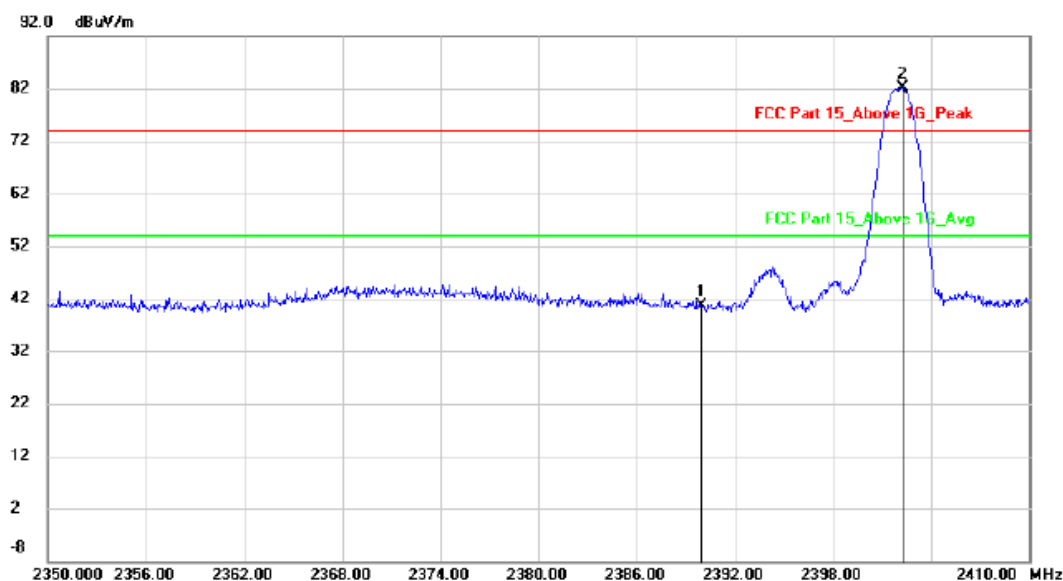
hopping-off



No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1	2390.000	43.59	-3.40	40.19	74.00	-33.81		
2 *	2403.200	78.87	-3.41	75.46	74.00	1.46		

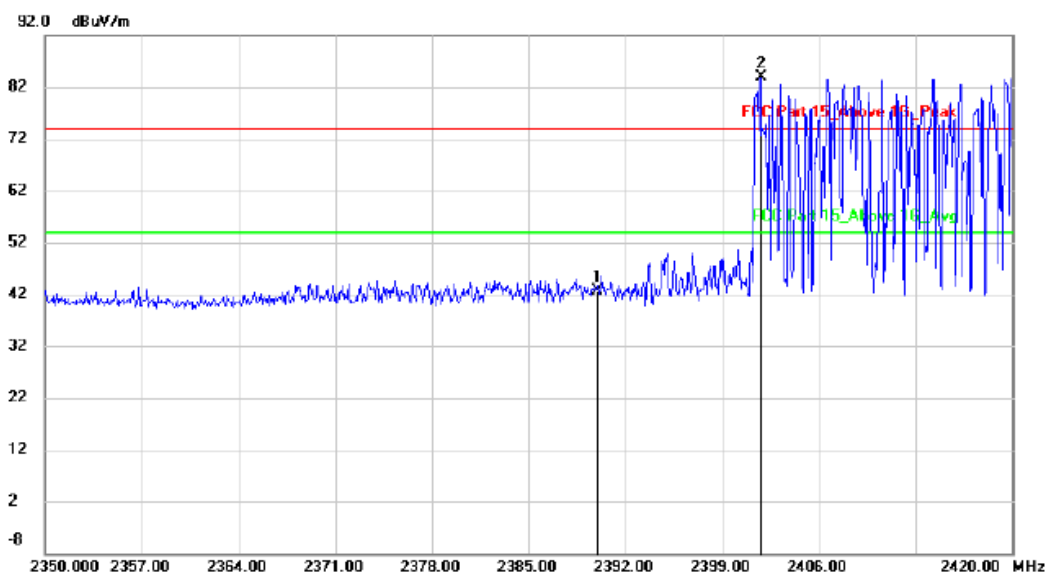
hopping-on

Polarization: Horizontal Test Mode: GFSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1		2390.000	44.07	-3.40	40.67	74.00	-33.33	peak	
2	*	2402.260	85.47	-3.41	82.06	74.00	8.06	peak	

hopping-off

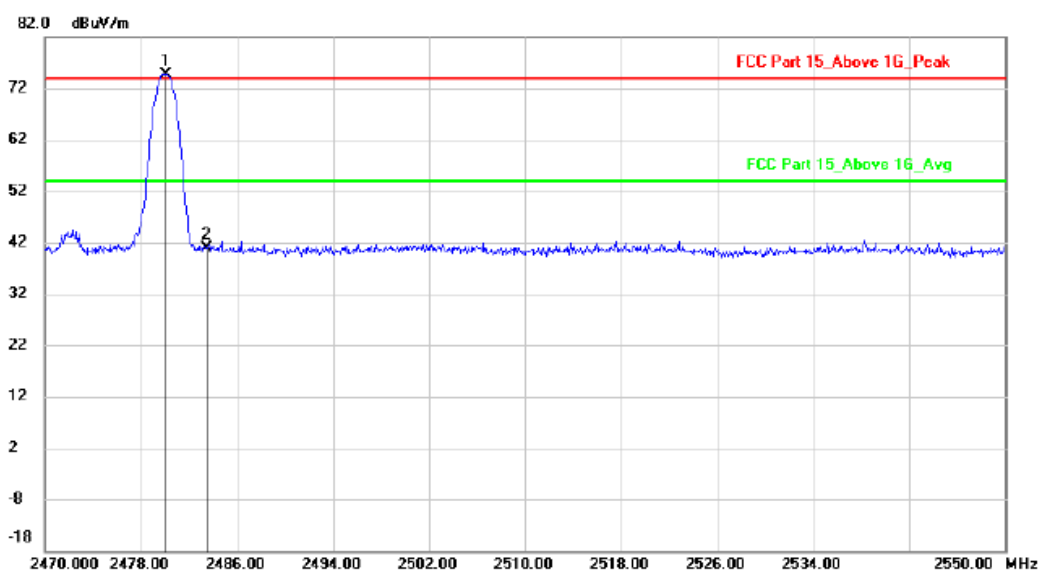


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1		2390.000	45.92	-3.40	42.52	74.00	-31.48	peak	
2	*	2401.800	87.41	-3.41	84.00	74.00	10.00	peak	

hopping-on

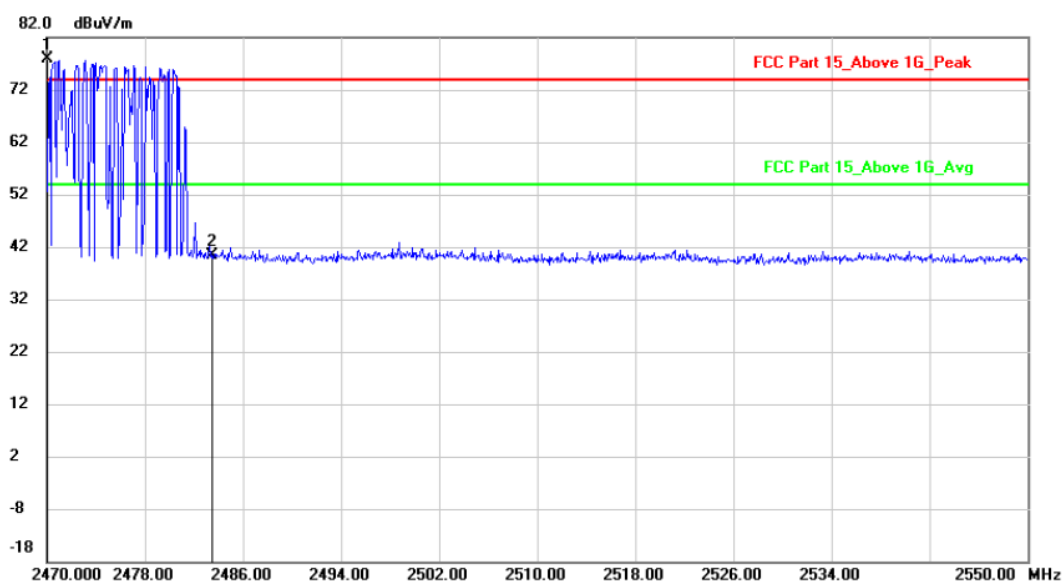
Polarization: Vertical

Test Mode: GFSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	2480.080	77.95	-3.38	74.57	74.00	0.57			peak
2		2483.500	44.24	-3.38	40.86	74.00	-33.14			peak

hopping-off

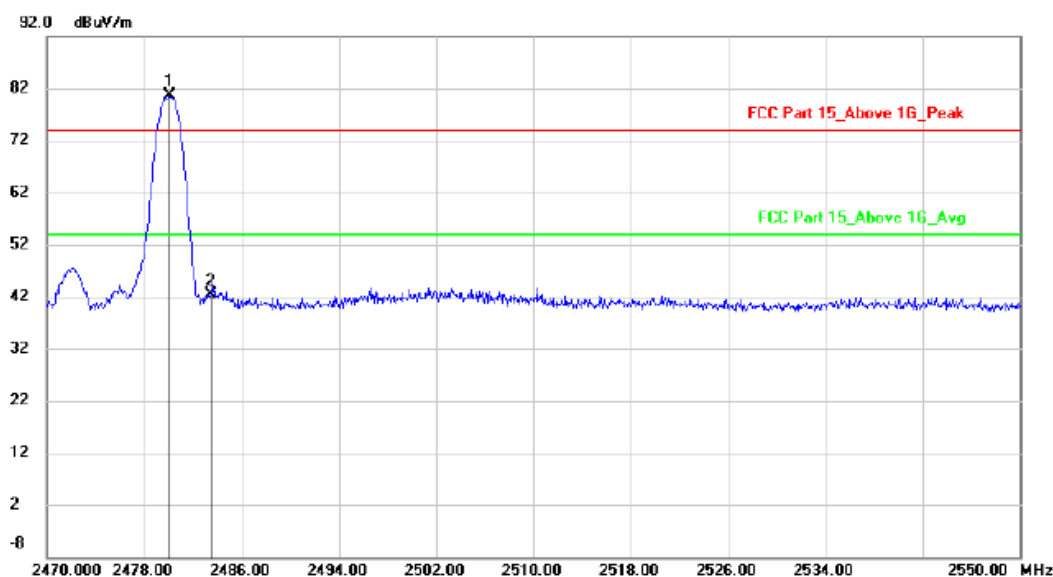


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	2470.000	81.33	-3.39	77.94	74.00	3.94			peak
2		2483.500	43.78	-3.38	40.40	74.00	-33.60			peak

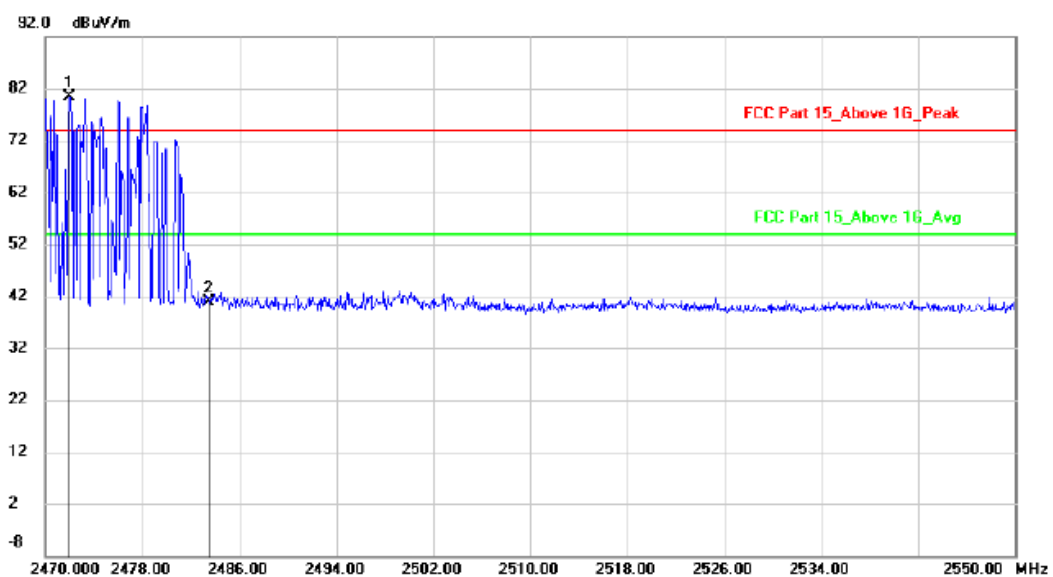
hopping-on

Polarization: Horizontal

Test Mode: GFSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2480.080	83.91	-3.38	80.53	74.00	6.53	peak		
2		2483.500	45.80	-3.38	42.42	74.00	-31.58	peak		hopping-off

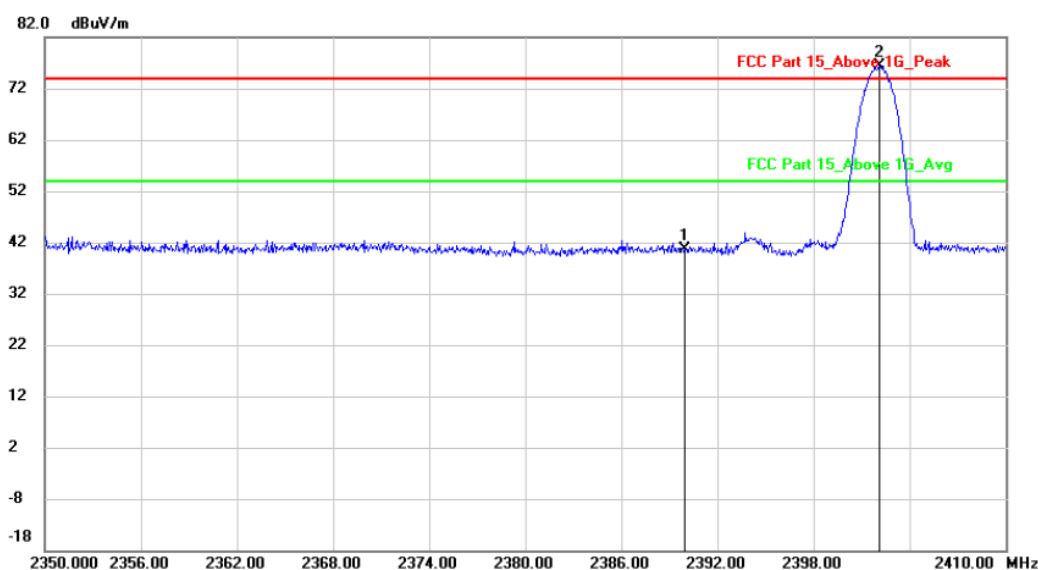


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2471.920	83.75	-3.39	80.36	74.00	6.36	peak		
2		2483.500	44.34	-3.38	40.96	74.00	-33.04	peak		hopping-on

Polarization: Vertical

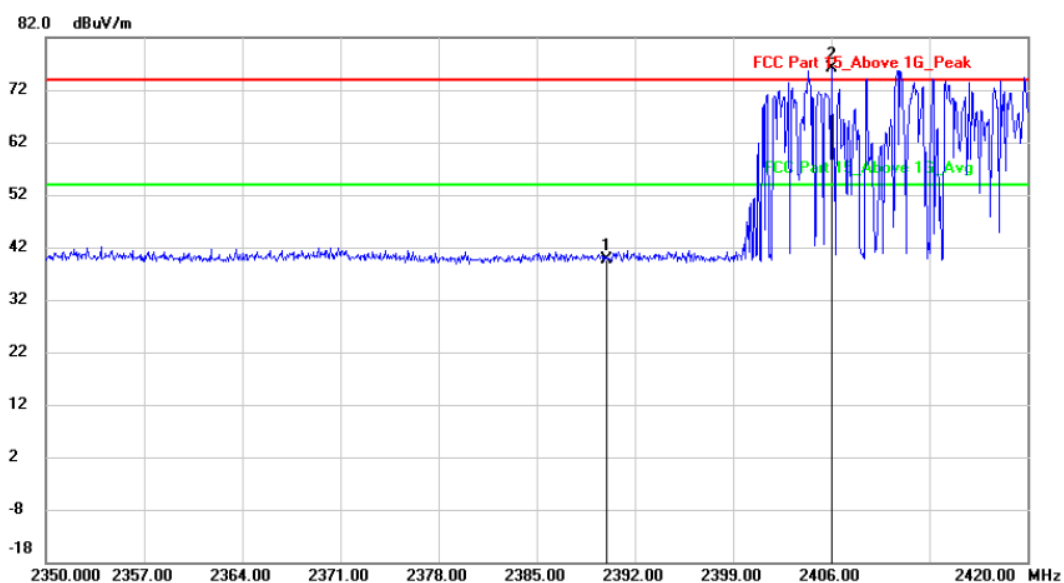
Test Mode:

π /4 DQPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	43.98	-3.40	40.58	74.00	-33.42			peak
2	*	2402.080	79.80	-3.41	76.39	74.00	2.39			peak

hopping-off



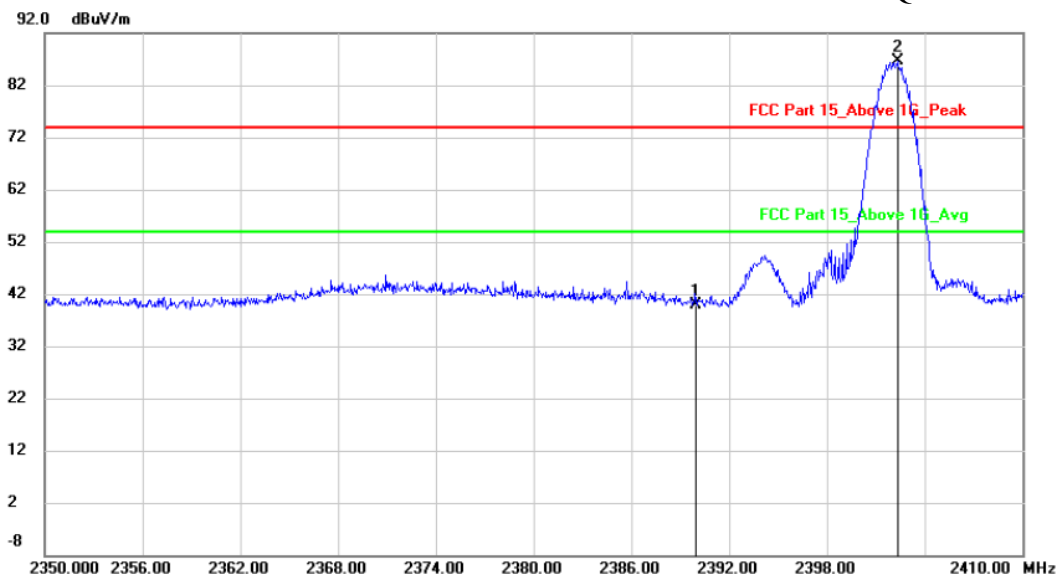
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	43.12	-3.40	39.72	74.00	-34.28			peak
2	*	2406.070	79.64	-3.41	76.23	74.00	2.23			peak

hopping-on

Polarization: Horizontal

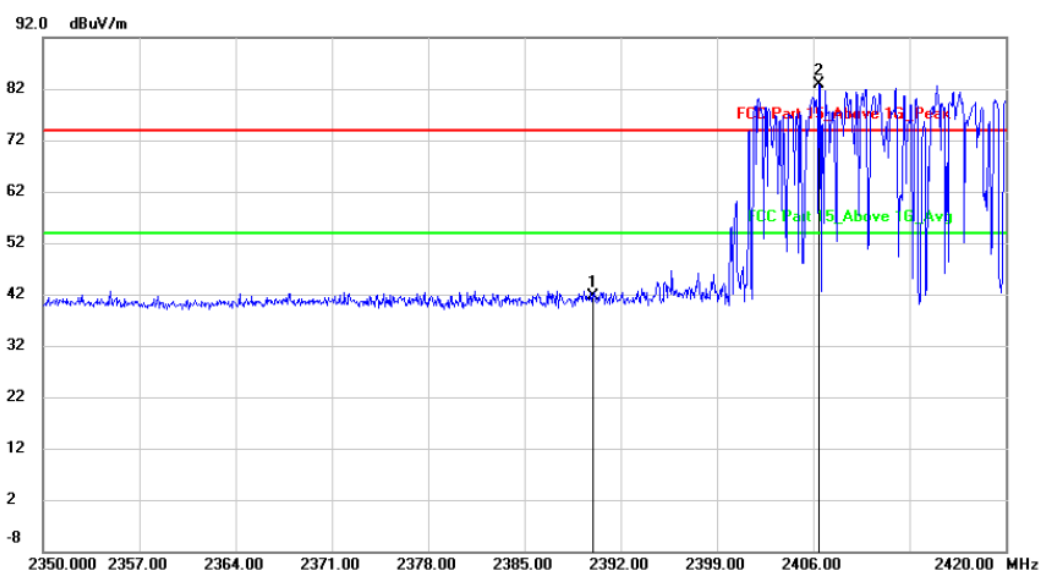
Test Mode:

$\pi/4$ DQPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	43.23	-3.40	39.83	74.00	-34.17			peak
2	*	2402.320	89.94	-3.41	86.53	74.00	12.53			peak

hopping-off

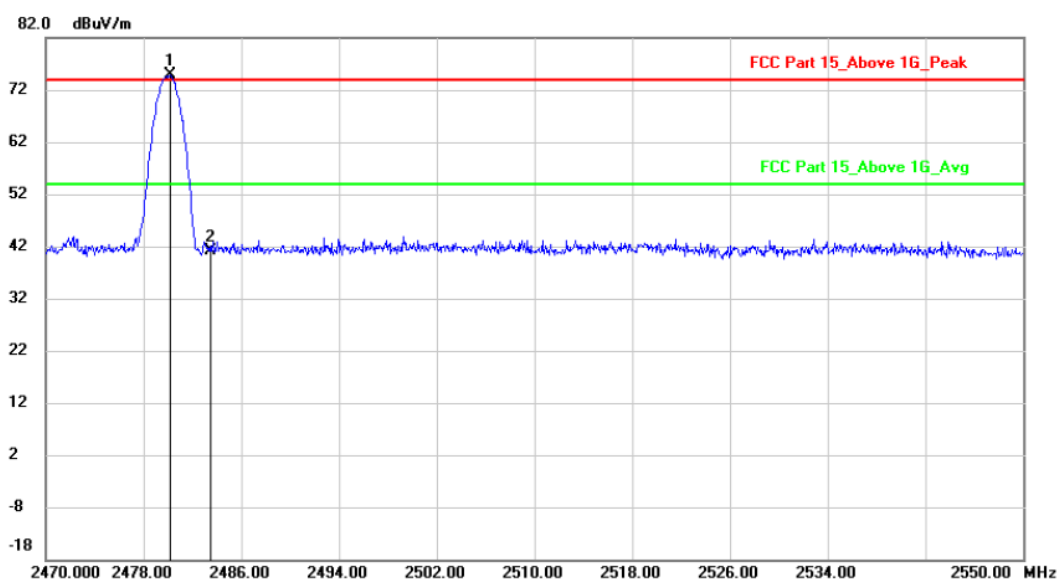


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	45.11	-3.40	41.71	74.00	-32.29			peak
2	*	2406.420	86.18	-3.41	82.77	74.00	8.77			peak

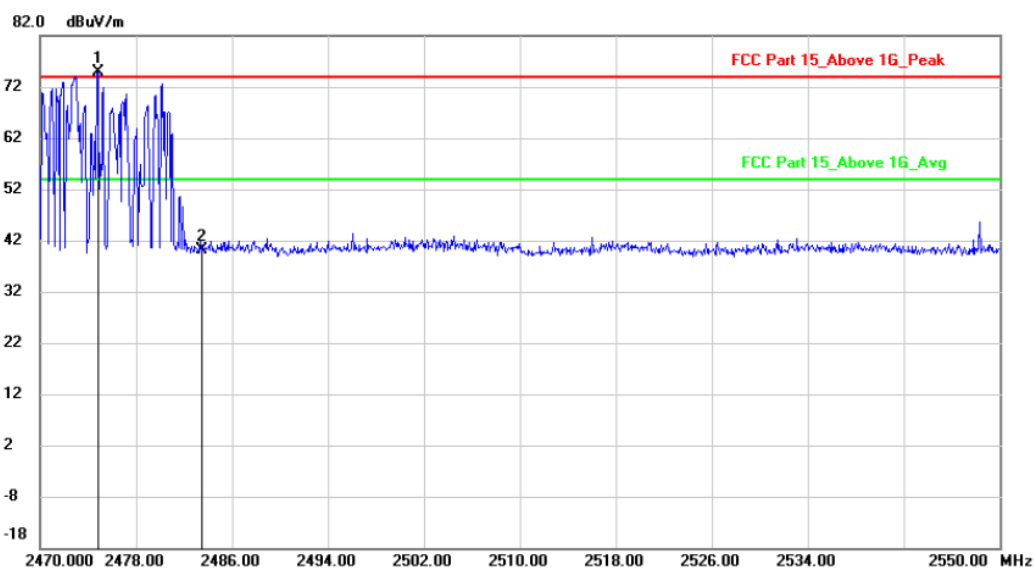
hopping-on

Polarization: Vertical

Test Mode: $\pi/4$ DQPSK-High



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	2480.160	78.15	-3.38	74.77	74.00	0.77	peak			
2		2483.500	44.59	-3.38	41.21	74.00	-32.79	peak			hopping-off



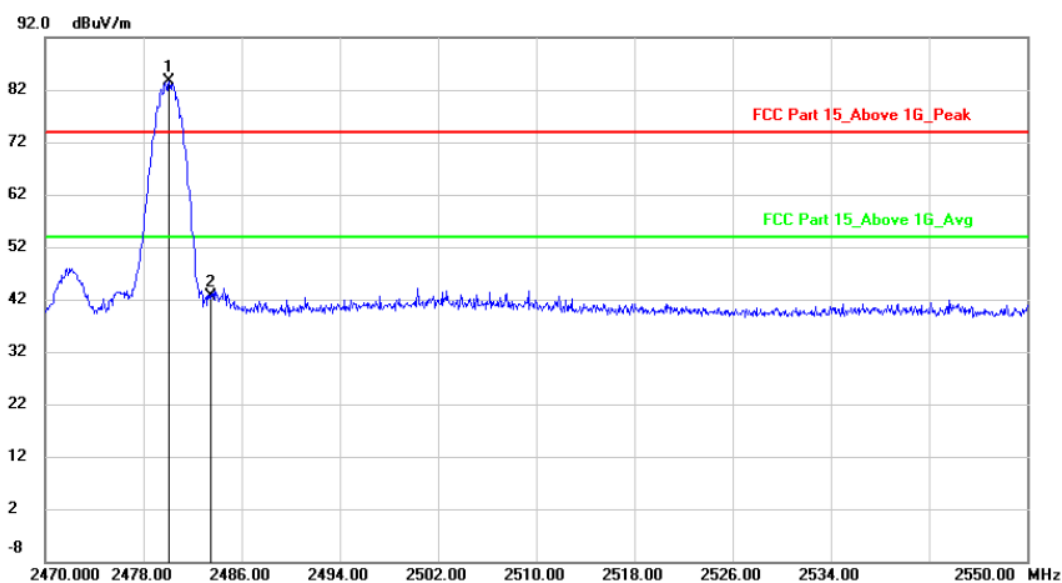
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	2474.800	78.37	-3.39	74.98	74.00	0.98	peak			
2		2483.500	43.53	-3.38	40.15	74.00	-33.85	peak			hopping-on

hopping-on

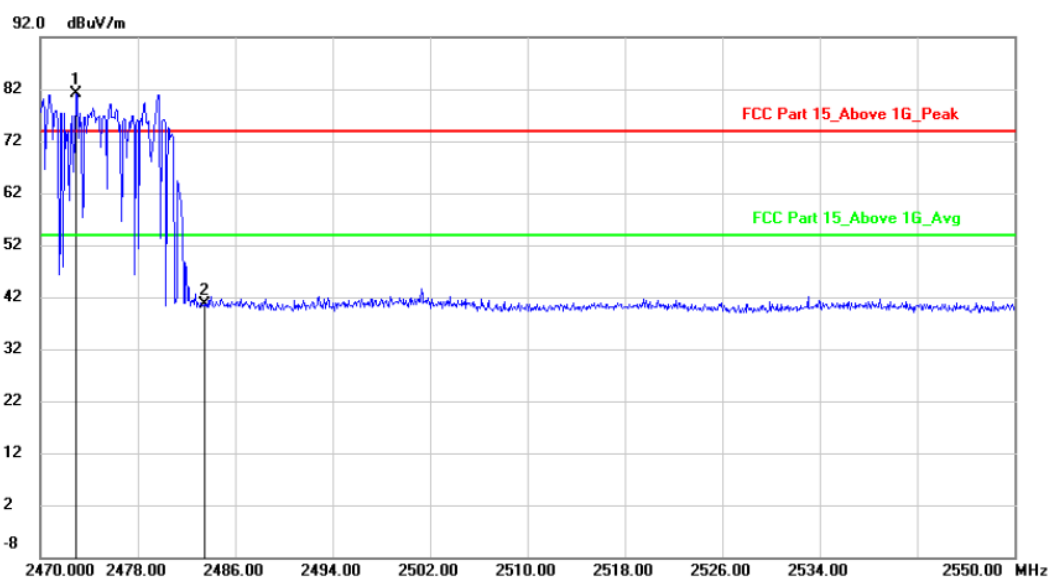
Polarization: Horizontal

Test Mode:

$\pi/4$ DQPSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2480.080	87.13	-3.38	83.75	74.00	9.75	peak		
2		2483.500	46.13	-3.38	42.75	74.00	-31.25	peak		hopping-off

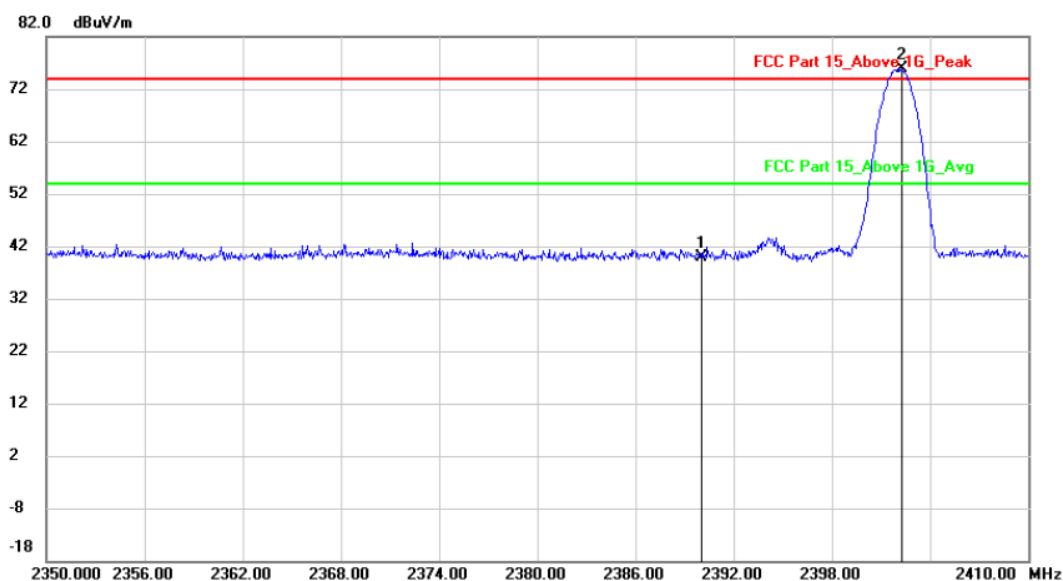


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1	*	2472.960	84.61	-3.39	81.22	74.00	7.22	peak		
2		2483.500	44.07	-3.38	40.69	74.00	-33.31	peak		hopping-on

Polarization: Vertical

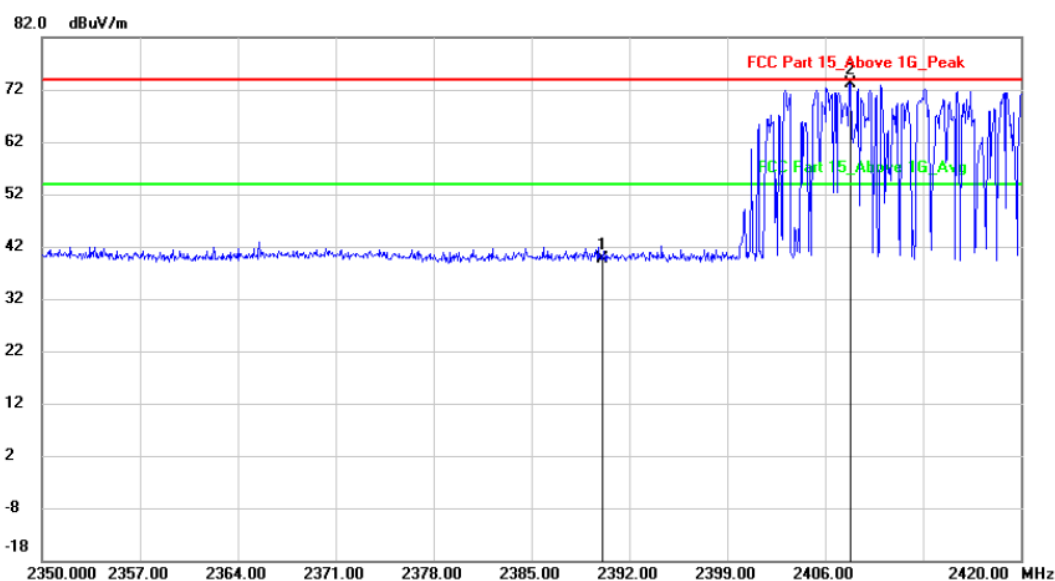
Test Mode:

8DPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	43.33	-3.40	39.93	74.00	-34.07			peak
2	*	2402.260	79.39	-3.41	75.98	74.00	1.98			peak

hopping-off

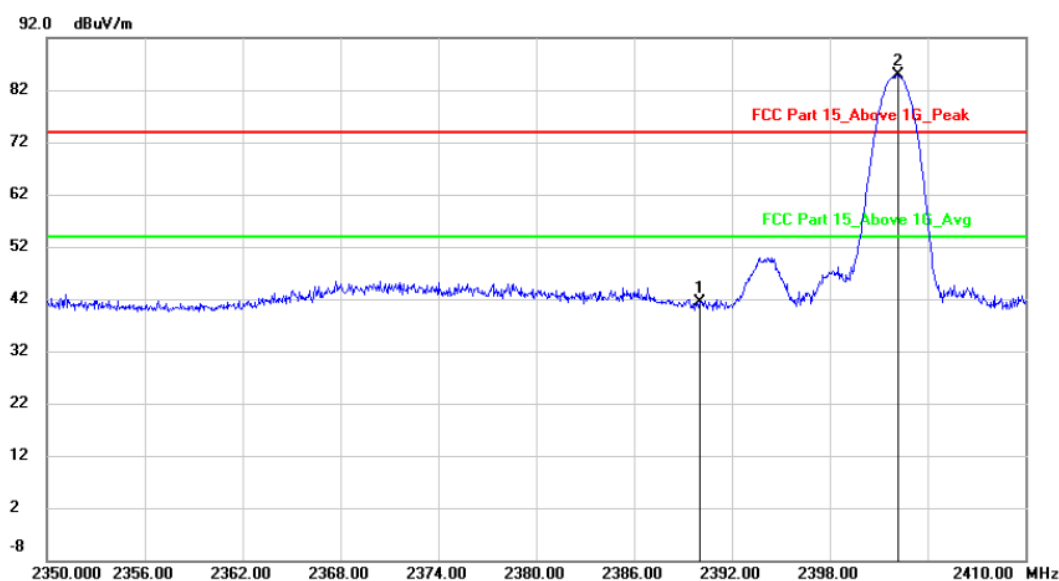


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	43.08	-3.40	39.68	74.00	-34.32			peak
2	*	2407.820	76.50	-3.40	73.10	74.00	-0.90			peak

hopping-on

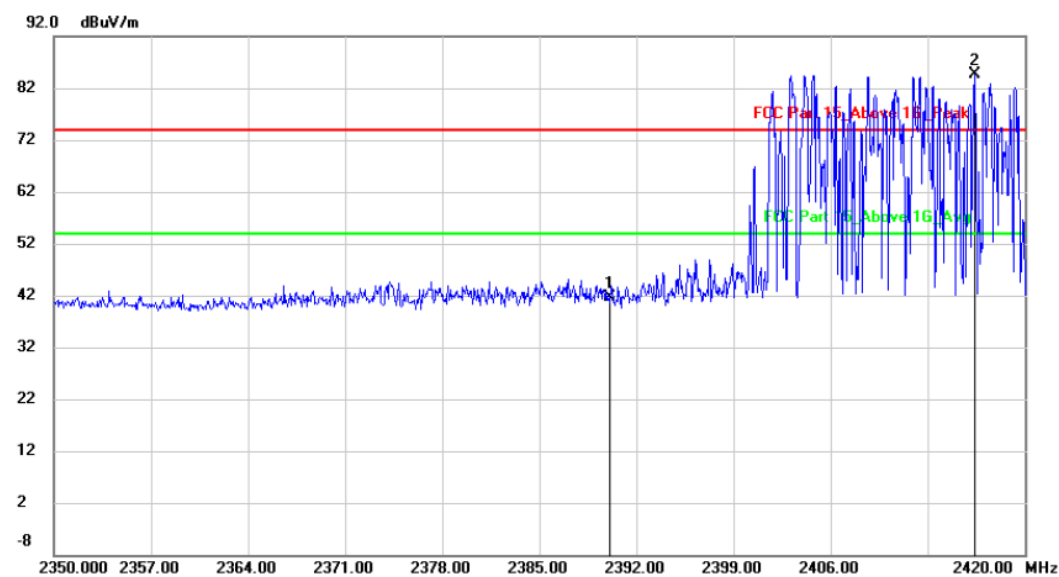
Polarization: Horizontal

Test Mode: 8DPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	44.74	-3.40	41.34	74.00	-32.66			peak
2	*	2402.200	88.26	-3.41	84.85	74.00	10.85			peak

hopping-off

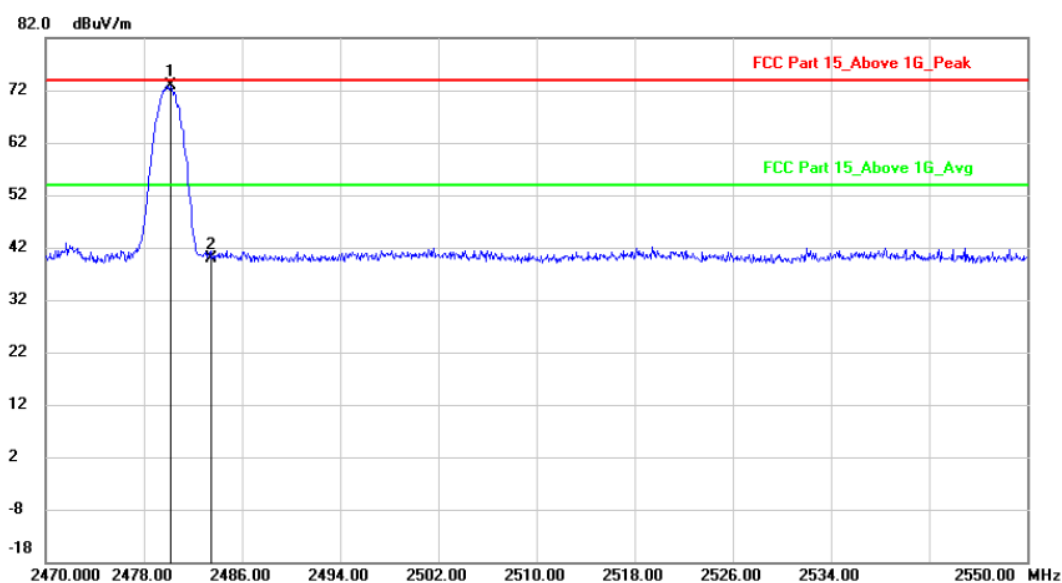


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		2390.000	44.95	-3.40	41.55	74.00	-32.45			peak
2	*	2416.360	88.03	-3.41	84.62	74.00	10.62			peak

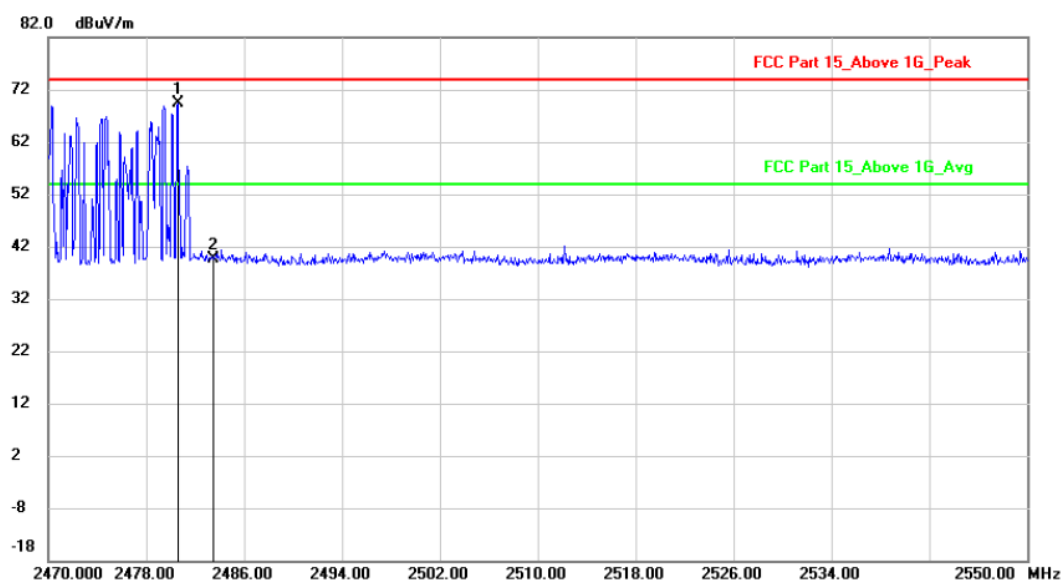
hopping-on

Polarization: Vertical

Test Mode: 8DPSK-High



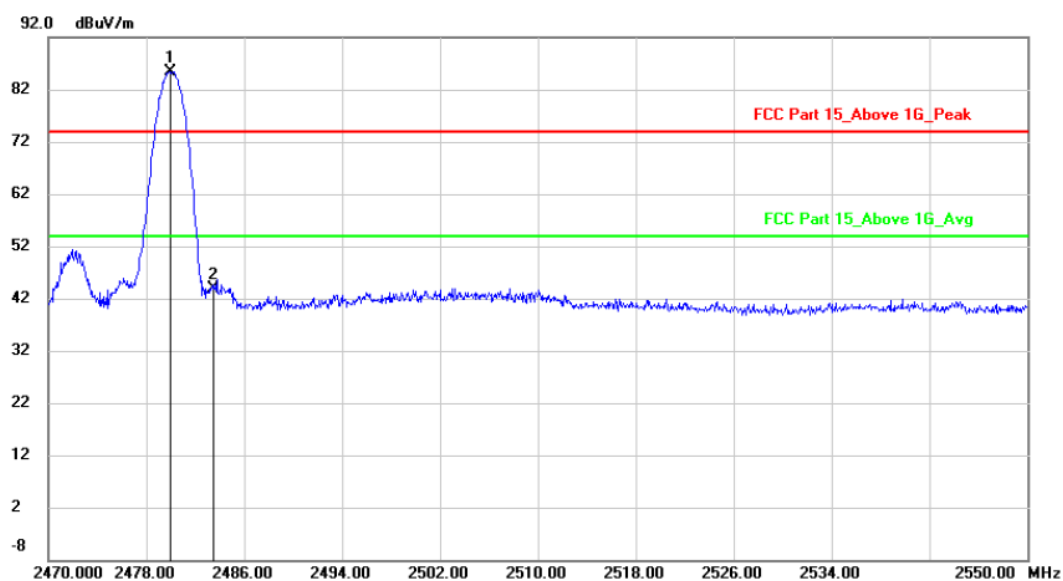
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	2480.160	76.36	-3.38	72.98	74.00	-1.02			peak
2		2483.500	43.22	-3.38	39.84	74.00	-34.16			peak hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	2480.560	72.71	-3.38	69.33	74.00	-4.67			peak
2		2483.500	43.01	-3.38	39.63	74.00	-34.37			peak hopping-on

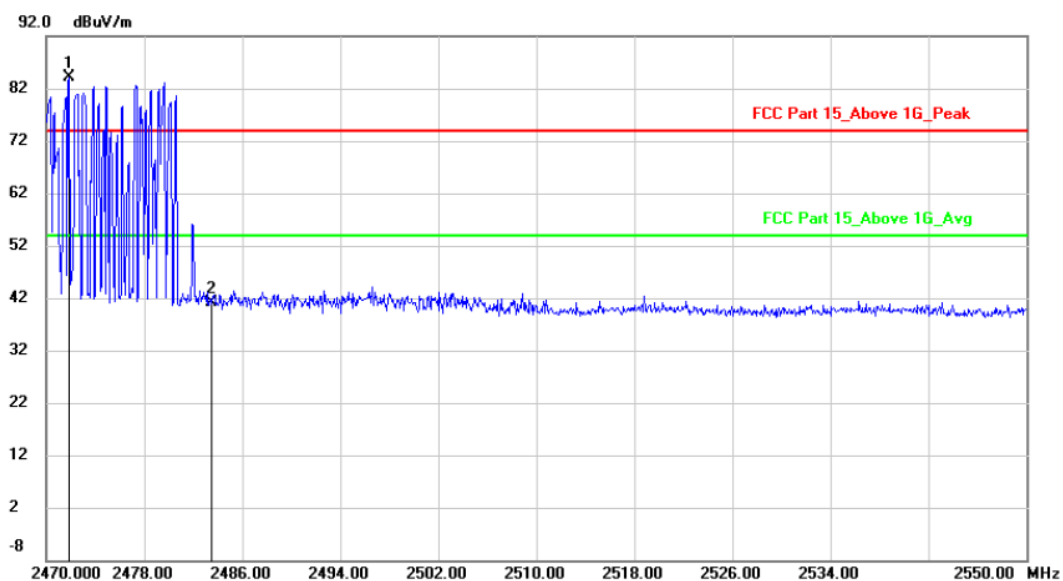
Polarization: Horizontal

Test Mode: 8DPSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	2480.000	88.84	-3.38	85.46	74.00	11.46			peak
2		2483.500	47.25	-3.38	43.87	74.00	-30.13			peak

hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	2471.840	87.50	-3.39	84.11	74.00	10.11			peak
2		2483.500	44.58	-3.38	41.20	74.00	-32.80			peak

hopping-on

Note: 1. *:Maximum data; x:Over limit; !:over margin.

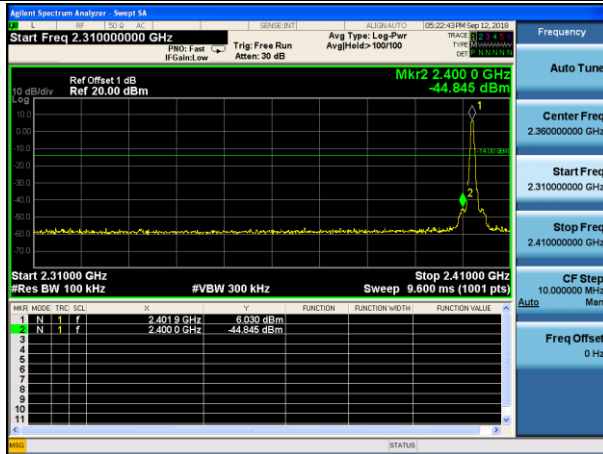
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Conducted Method

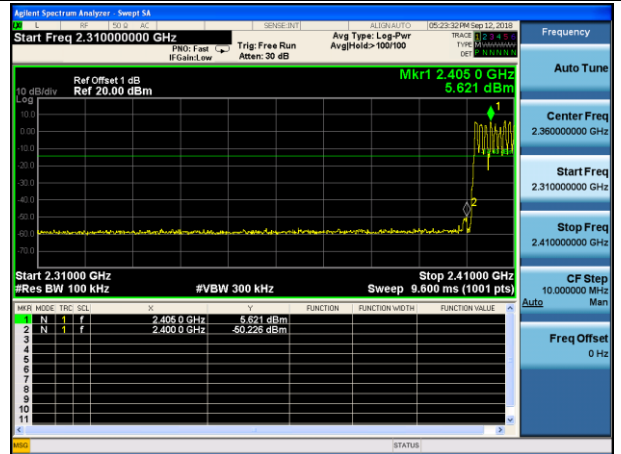
GFSK Mode:

Test channel:

Lowest channel



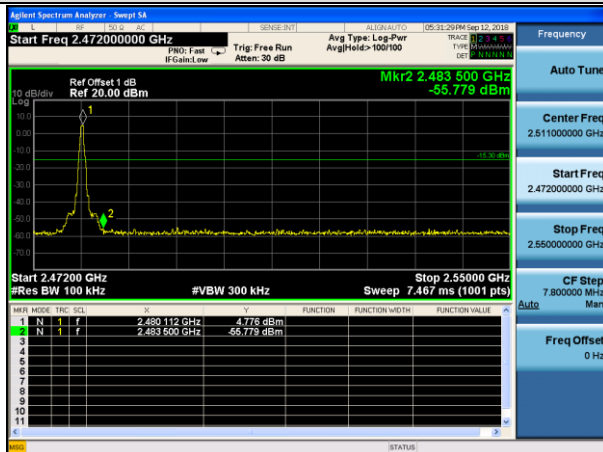
No-hopping mode



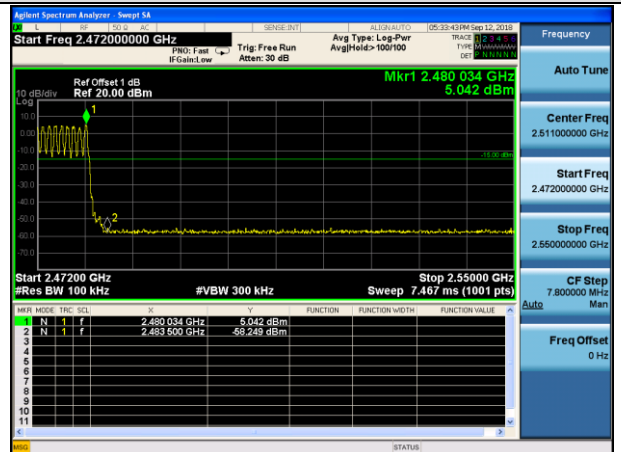
Hopping mode

Test channel:

Highest channel



No-hopping mode

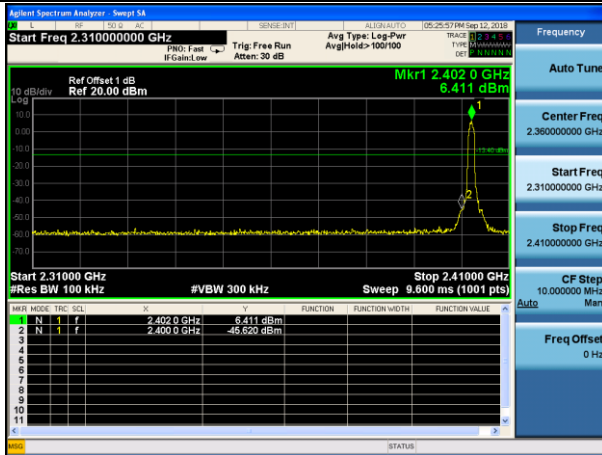


Hopping mode

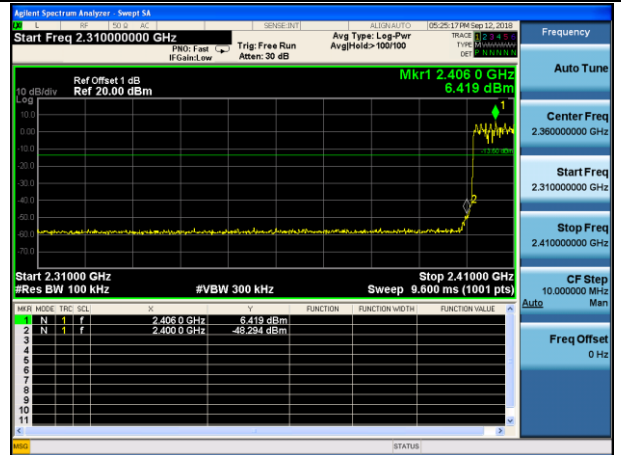
Pi/4QPSK Mode:

Test channel:

Lowest channel



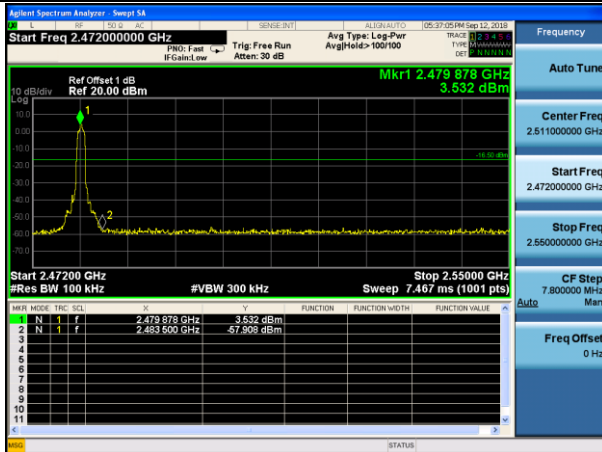
No-hopping mode



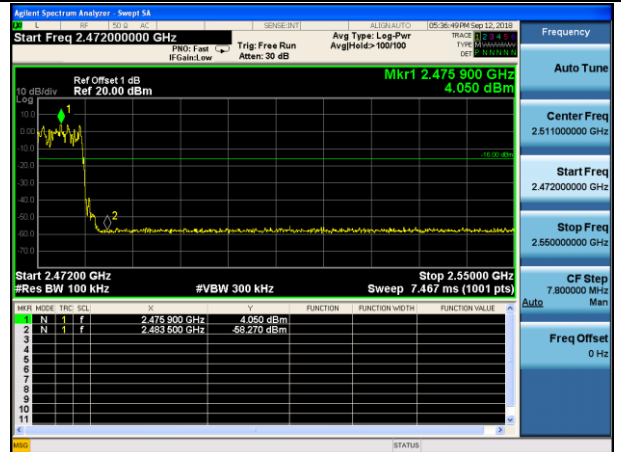
Hopping mode

Test channel:

Highest channel



No-hopping mode

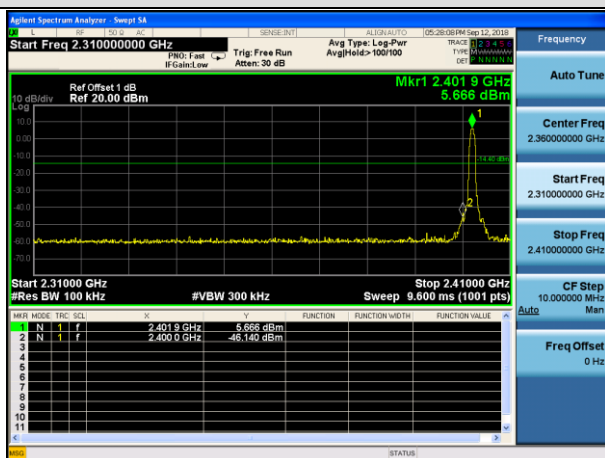


Hopping mode

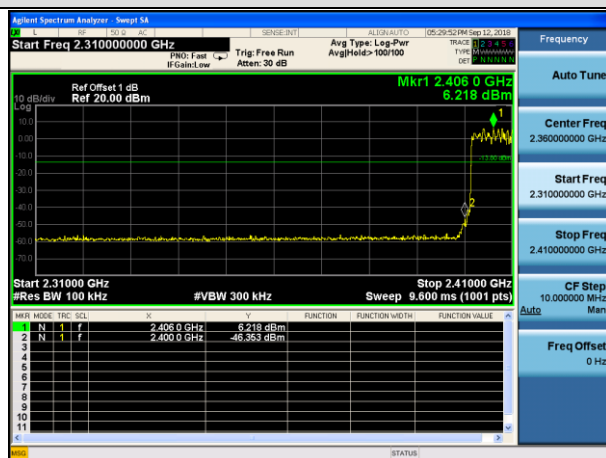
8DPSK Mode:

Test channel:

Lowest channel



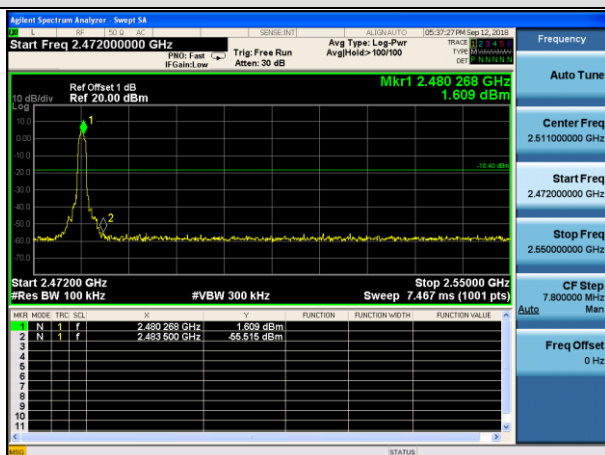
No-hopping mode



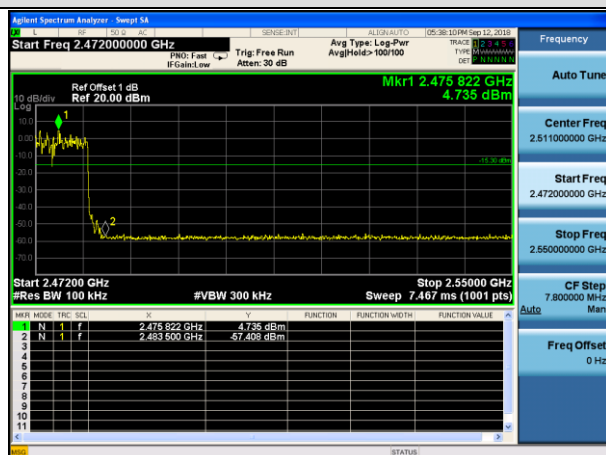
Hopping mode

Test channel:

Highest channel



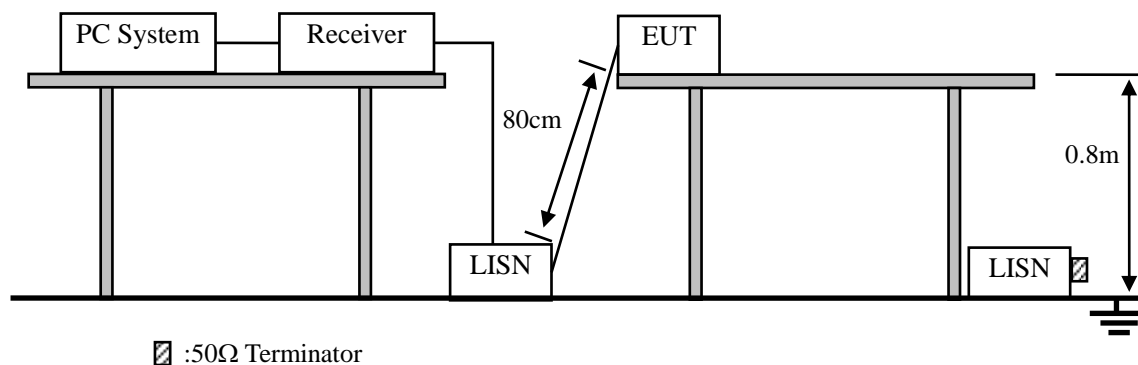
No-hopping mode



Hopping mode

10. POWER LINE CONDUCTED EMISSIONS

10.1. Block Diagram of Test Setup



10.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

10.3. Test Procedure

- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on conducted Emission test.
- (4) The bandwidth of test receiver is set at 10KHz.
- (5) The frequency range from 150 KHz to 30MHz is checked.

10.4. Test Result

PASS. (See below detailed test data)

Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:

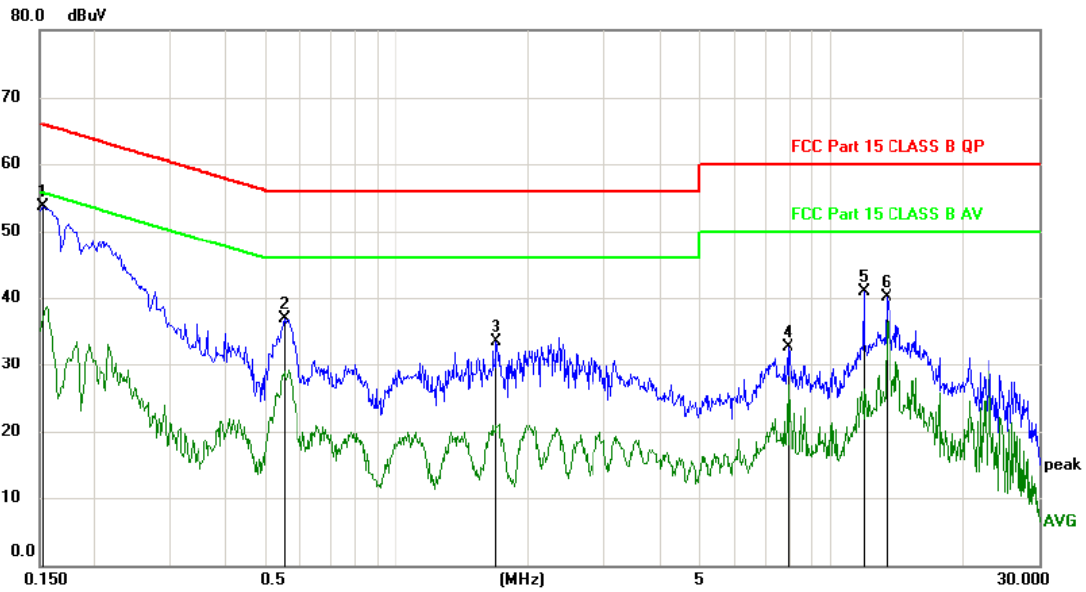
Conducted Emission Measurement

File :I70F-WSA9C

Data :#7

Date: 2018-8-16

Time: 21:04:23



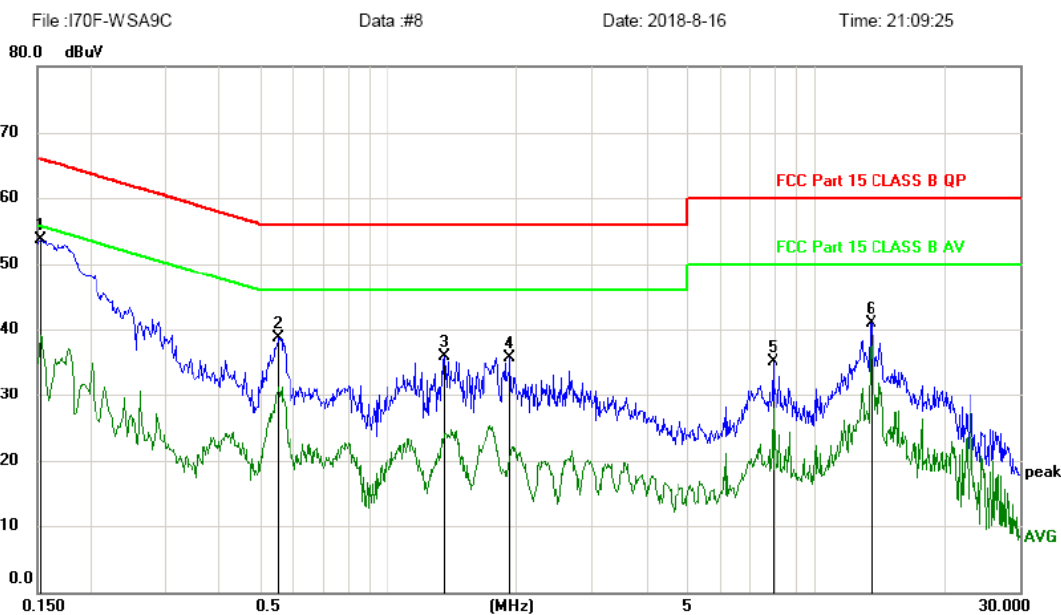
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1529	53.45	0.20	53.65	65.84	-12.19	peak	
2		0.5490	36.77	0.20	36.97	56.00	-19.03	peak	
3		1.6916	33.22	0.20	33.42	56.00	-22.58	peak	
4		7.9230	32.31	0.34	32.65	60.00	-27.35	peak	
5		11.8320	40.39	0.44	40.83	60.00	-19.17	peak	
6		13.3589	39.60	0.46	40.06	60.00	-19.94	peak	

*:Maximum data x:Over limit l:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:

Conducted Emission Measurement



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1529	53.42	0.20	53.62	65.84	-12.22	peak	
2		0.5520	38.55	0.20	38.75	56.00	-17.25	peak	
3		1.3500	35.63	0.20	35.83	56.00	-20.17	peak	
4		1.9229	35.43	0.20	35.63	56.00	-20.37	peak	
5		7.9230	34.82	0.34	35.16	60.00	-24.84	peak	
6		13.4190	40.50	0.46	40.96	60.00	-19.04	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Remark: All modes have been tested, and only worst data of GFSK mode, Channel 2402MHz (AC 120V/60Hz) was listed in this report.

11. ANTENNA REQUIREMENTS

11.1. Limit

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2. Result

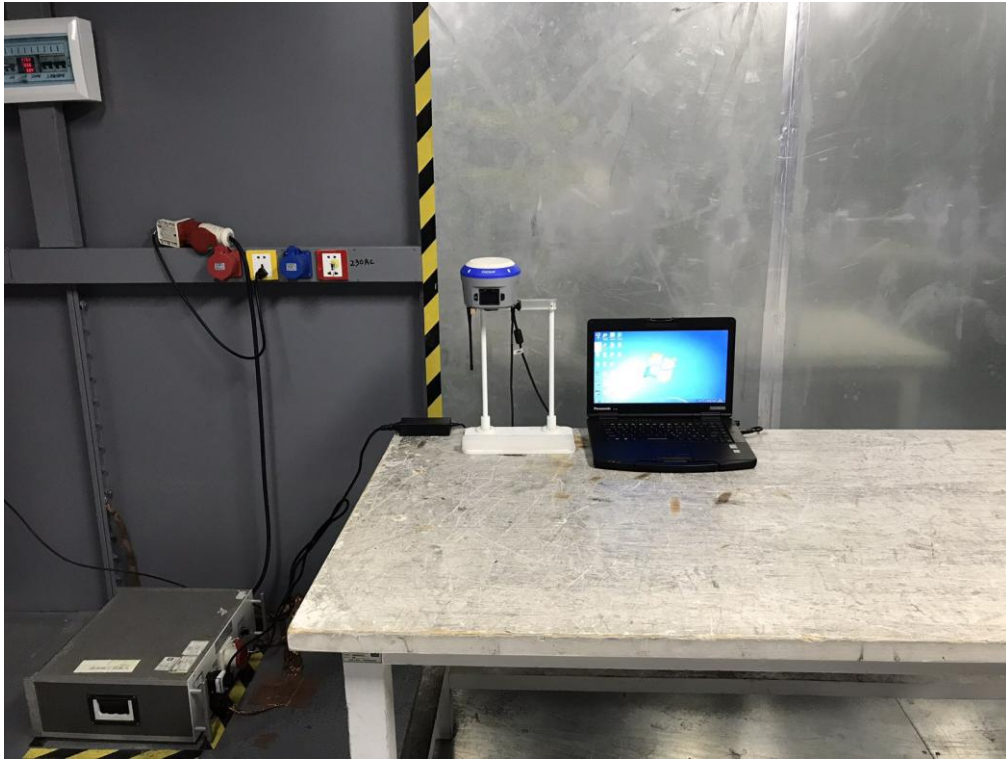
The EUT antenna is internal antenna. It complies with the standard requirement.

12. TEST SETUP PHOTO

12.1. Photos of Radiated emission



12.2.Photos of Conducted Emission test



13.PHOTOS OF EUT

Please refer to the report T1881286 01.

-----THE END OF REPORT-----