FCC TEST REPORT

FCC ID: SY4-A01014

On Behalf of

Shanghai Huace Navigation Technology LTD.

Geodetic GNSS Receiver (i50U)

Model No.: 1150322131145

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

Report Number	:	T1881531 02
Date of Receipt	:	September 25, 2018
Date of Test	:	September 25, 2018-November 21, 2018
Date of Report	:	November 21, 2018
Version Number	:	REV0

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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	:	Geodetic GNSS Receiver (i50U)
	(A) Model No.	: 1150322131145
	(B) Trademark	: CHCNAV

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	Reak Yang
Approved by (name + signature)…....:	Simple Guan Project Manager	
Date of issue…… ……..:	November 21, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	November 21, 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	:	Geodetic GNSS Receiver (i50U)
Model Number	:	1150322131145
Note	:	The model name “1150322131145” corresponding client’s internal model is “Geodetic GNSS Receiver (i50U).
Trademark	:	CHCNAV
Test Voltage	:	12-36V⎓, 2A (for DC port) or 7.4V⎓, 3400mAh (for replaceable lithium battery)
Radio Technology	:	Bluetooth V4.1
Operation frequency	:	2402-2480MHz
Channel No.	:	79 Channels
Modulation type	:	GFSK, π /4 DQPSK, 8- DPSK
Antenna Type	:	Internal Antenna, 0dBi(Max.)
Software version	:	V1.0.2ST
Hardware version	:	V2.2

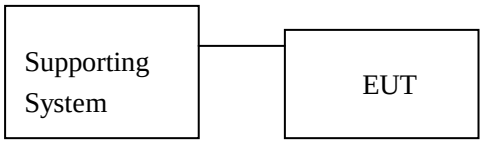
2.2.Accessories of Device (EUT)

Accessories1	:	AC/DC ADAPTER
Manufacturer	:	Shanghai Huace Navigation Technology LTD.
Model	:	GM601-120400
Ratings	:	Input: 100-240V, 50/60Hz, 2.0A Output: 12VDC, 4.0A

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℃	27℃
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℃
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	1Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2018.09.21	1Year
Receiver	R&S	ESCI	1166.5950K03-1011	2018.09.21	1Year
Receiver	R&S	ESCI	101202	2018.09.21	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2018.04.13	2Year
Horn Antenna	EMCO	3115	640201028-06	2018.04.13	2Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2018.04.13	2Year
Cable	Resenberger	N/A	No.1	2018.09.21	1Year
Cable	SCHWARZBECK	N/A	No.2	2018.09.21	1Year
Cable	SCHWARZBECK	N/A	No.3	2018.09.21	1Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2018.09.21	1Year
Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2018.09.21	1Year
Temperature controller	Terchy	MHQ	120	2018.09.21	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2018.09.21	1Year
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	Anritsu	ML2487A	6K00001491	2018.09.21	1 Year

3. MAXIMUM PEAK OUTPUT POWER

3.1.Limit

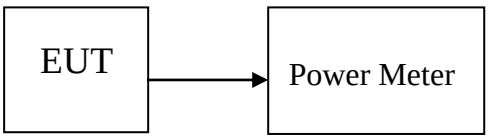
Please refer section15.247.

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	**6.707**	4.685	30	Pass
	2441	6.459	4.425	30	Pass
	2480	6.218	4.186	30	Pass
π /4 DQPSK	2402	5.839	3.836	21	Pass
	2441	5.601	3.632	21	Pass
	2480	5.863	3.857	21	Pass
8- DPSK	2402	5.204	3.314	21	Pass
	2441	5.933	3.920	21	Pass
	2480	5.273	3.367	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

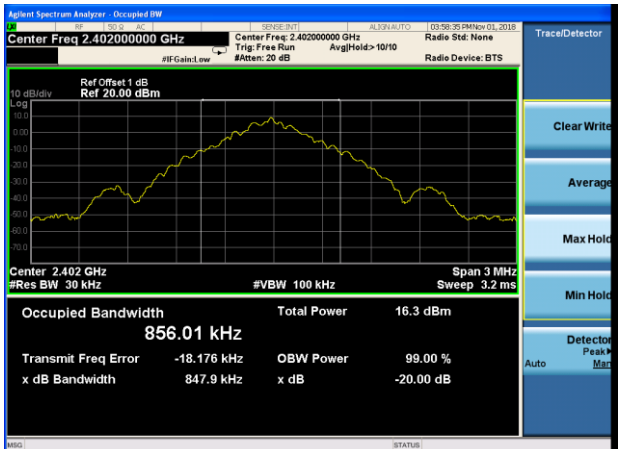
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3.Test Result

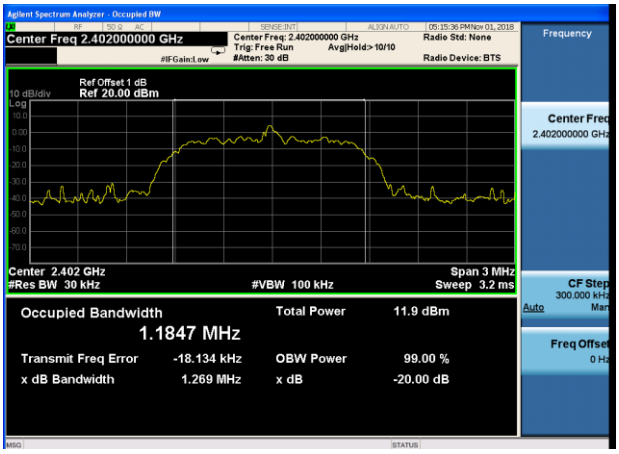
Mode	Freq (MHz)	20dB Bandwidth (KHz)	Conclusion
GFSK	2402	847.9	PASS
	2441	813.2	PASS
	2480	843.9	PASS
π /4 DQPSK	2402	1269.0	PASS
	2441	1269.0	PASS
	2480	1270.0	PASS
8- DPSK	2402	1284.0	PASS
	2441	1292.0	PASS
	2480	1290.0	PASS

Orginal Test data For 20dB bandwidth

GFSK mode	π /4 DQPSK

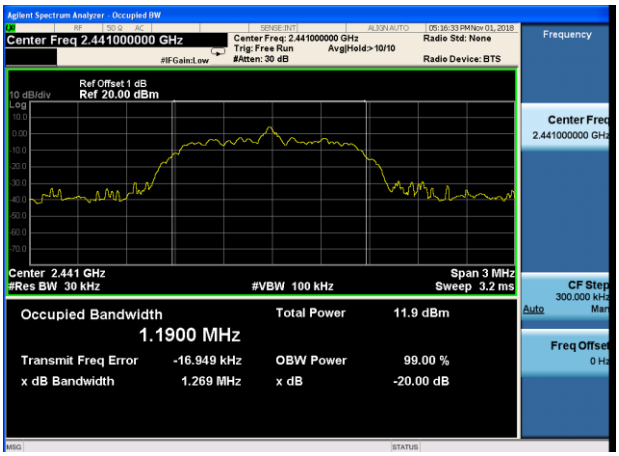


Lowest channel

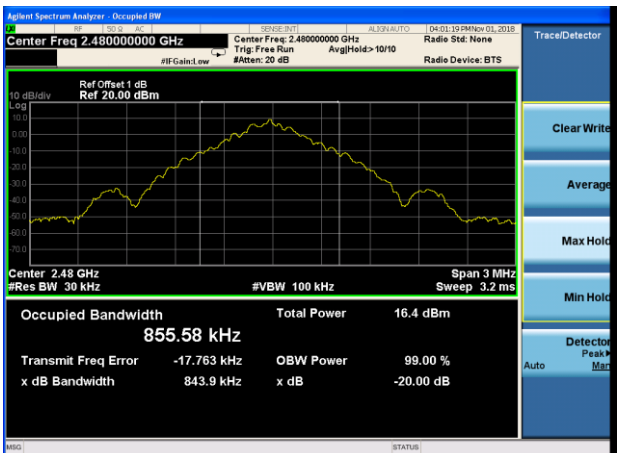


Lowest channel

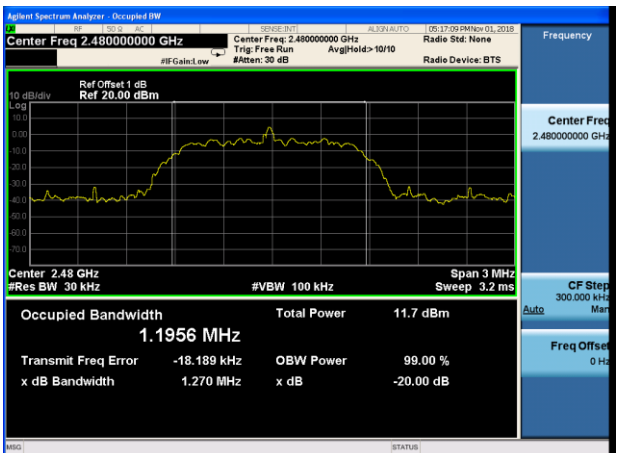
Middle channel



Middle channel

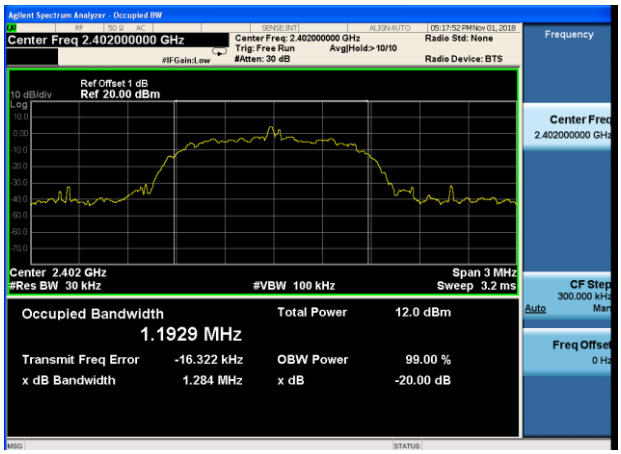


Highest channel

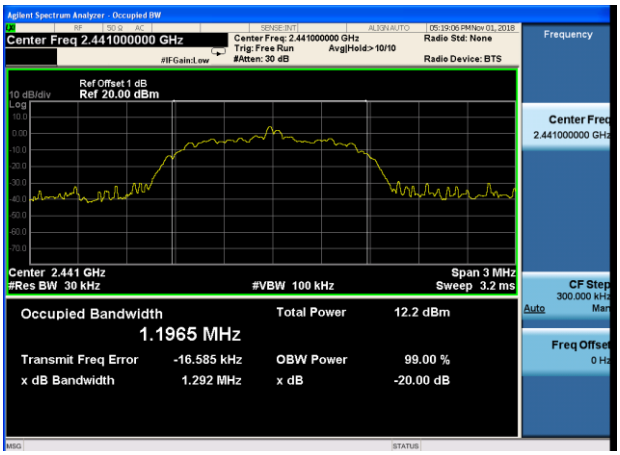


Highest channel

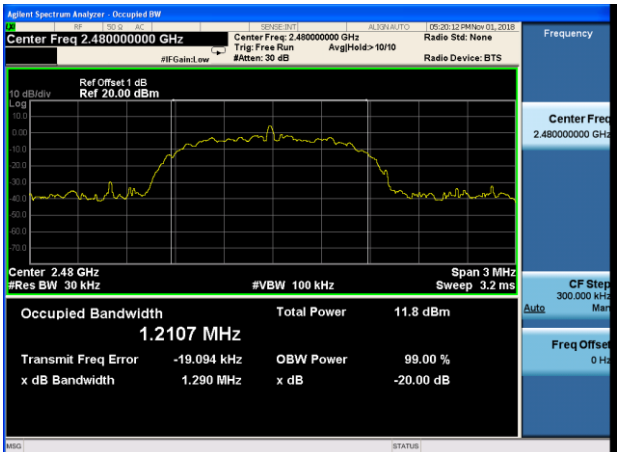
8- DPSK	



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

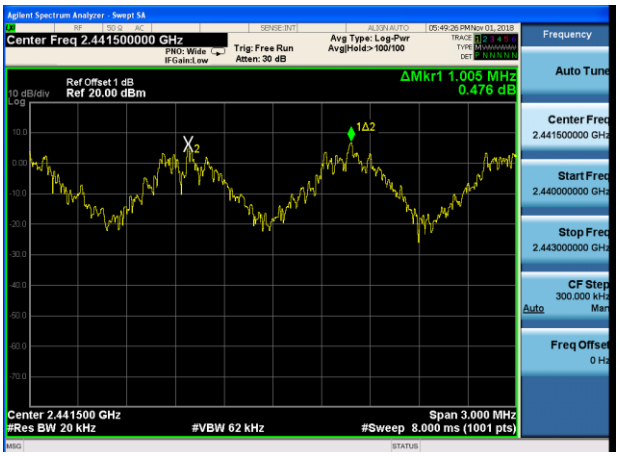
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The carrier frequency was measured by spectrum analyzer with 20kHz RBW and 62kHz VBW.

5.3. Test Result

Mode/Channel	Channel separation (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Conclusion
GFSK	0.999	847.9	847.9	PASS
π /4 DQPSK	1.005	1270.0	846.67	PASS
8- DPSK	1.002	1292.0	861.33	PASS

Orginal test data for channel separation

GFSK



π /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

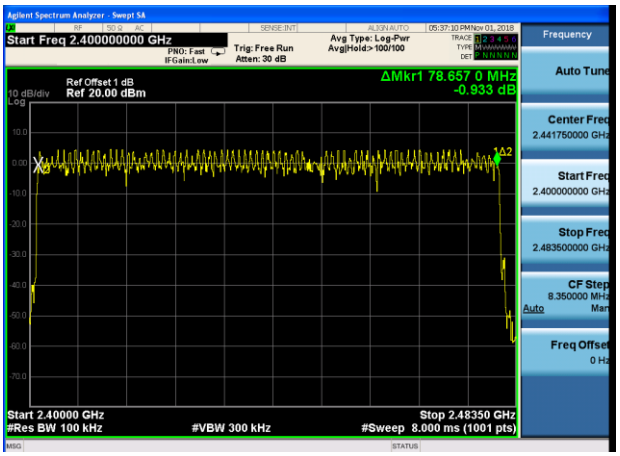
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.

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



π /4 DQPSK

8- DPSK

7. DWELL TIME

7.1. Test limit

Please refer section15.247

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 greater than 0.4 s within period of 0.4 sec- onds multiplied by the number of hopping channel 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=1MHz, VBW=1MHz, Span = 0Hz, Sweep = auto.

7.2.5. Repeat above procedures until all frequency measured were complete.

7.3. Test Result

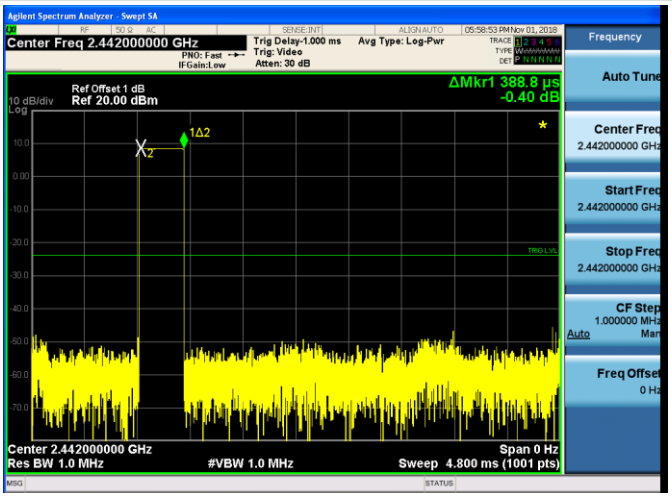
PASS.

Detailed information please see the following page.

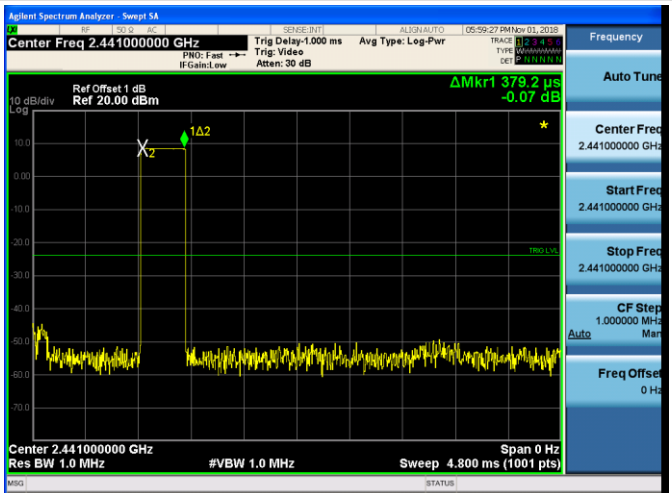
Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (ms)	Limit (ms)	Conclusion
GFSK	DH1	2441	0.389	124.480	400	PASS
	DH3	2441	1.642	262.720		PASS
	DH5	2441	2.894	308.693		PASS
π /4 DQPSK	DH1	2441	0.379	121.280	400	PASS
	DH3	2441	1.646	263.360		PASS
	DH5	2441	2.870	306.133		PASS
8- DPSK	DH1	2441	0.389	124.480	400	PASS
	DH3	2441	1.646	263.360		PASS
	DH5	2441	2.885	307.733		PASS
Note: 1 A period time = 0.4 (s) * 79 = 31.6(s) 2 DH1 time slot = Pulse Duration * (1600/(2*79)) * A period time/1000 DH3 time slot = Pulse Duration * (1600/(4*79)) * A period time/1000 DH5 time slot = Pulse Duration * (1600/(6*79)) * A period time/1000						

Dwell time

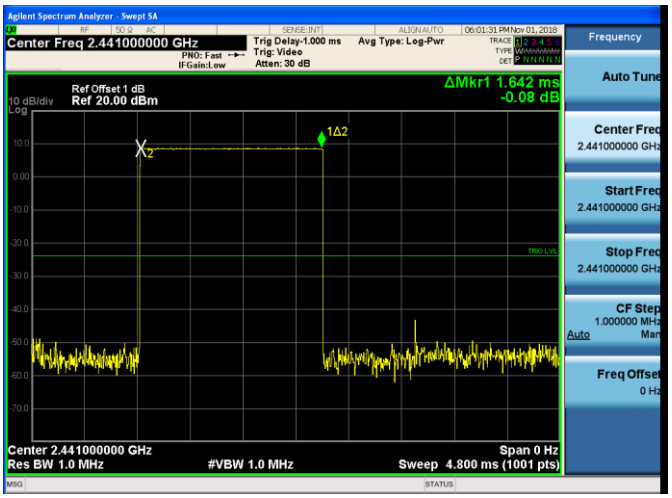
GFSK	π/4-DQPSK



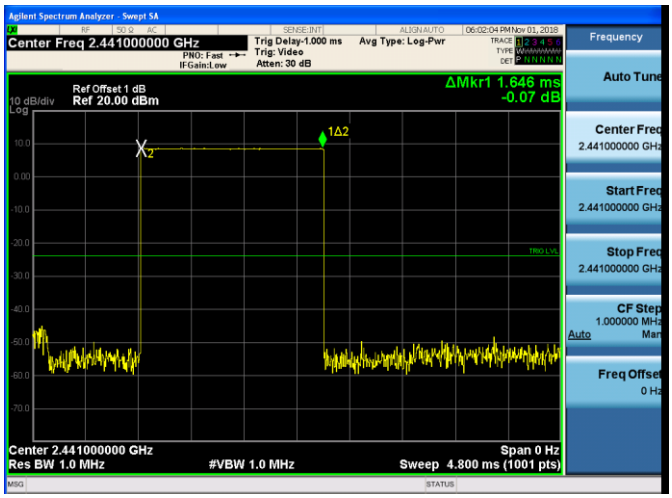
Channel 39 / 2441 MHz - DH1



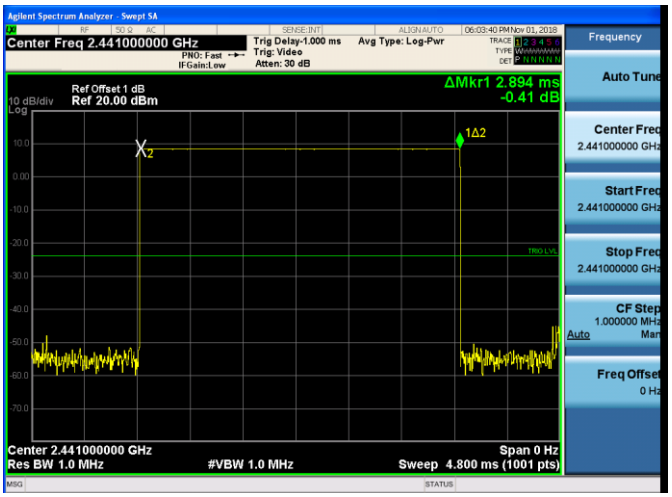
Channel 39 / 2441 MHz - 2DH1



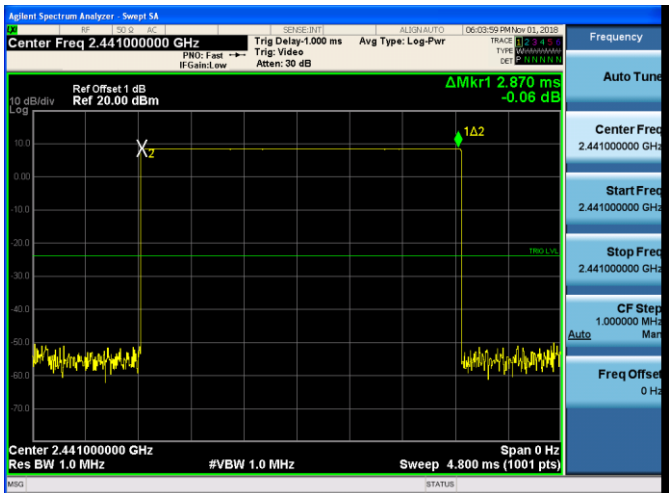
Channel 39 / 2441 MHz – DH3



Channel 39 / 2441 MHz - 2DH3



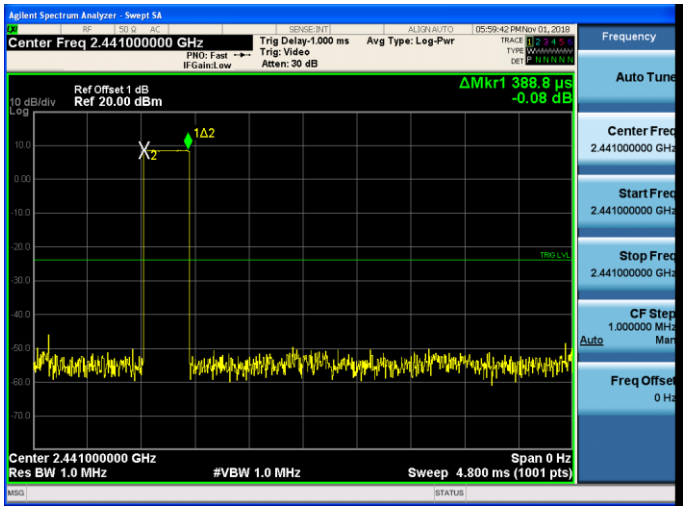
Channel 39 / 2441 MHz – DH5



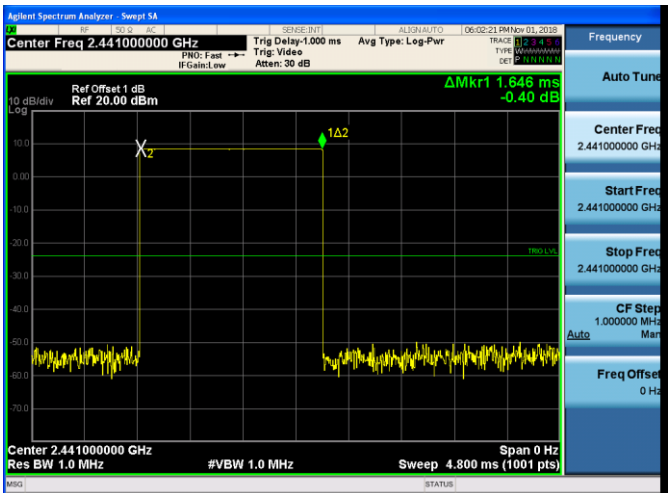
Channel 39 / 2441 MHz - 2DH5

Dwell time

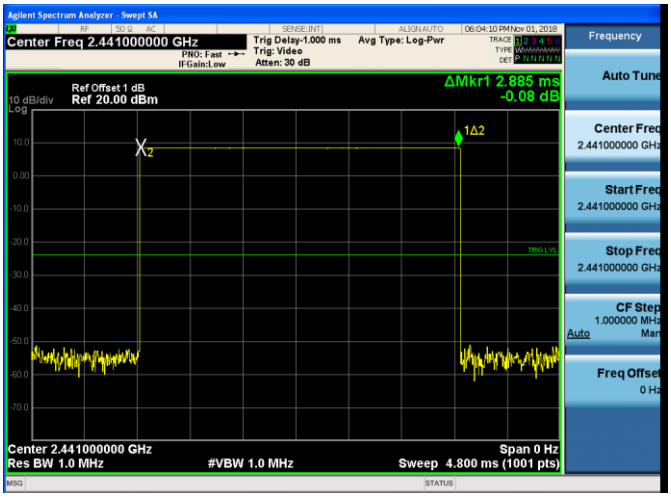
8DPSK



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

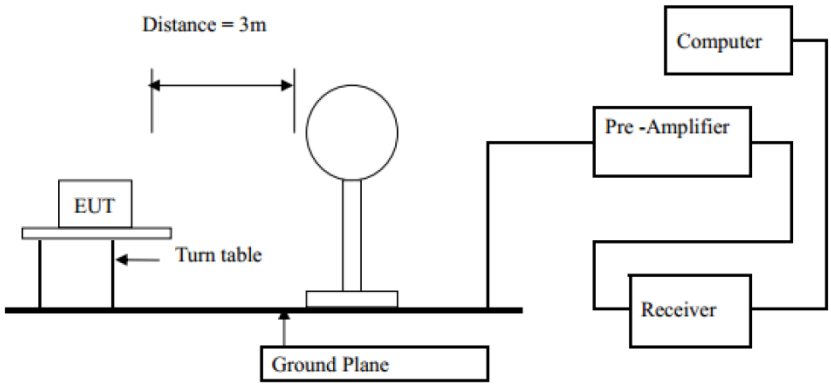
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 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

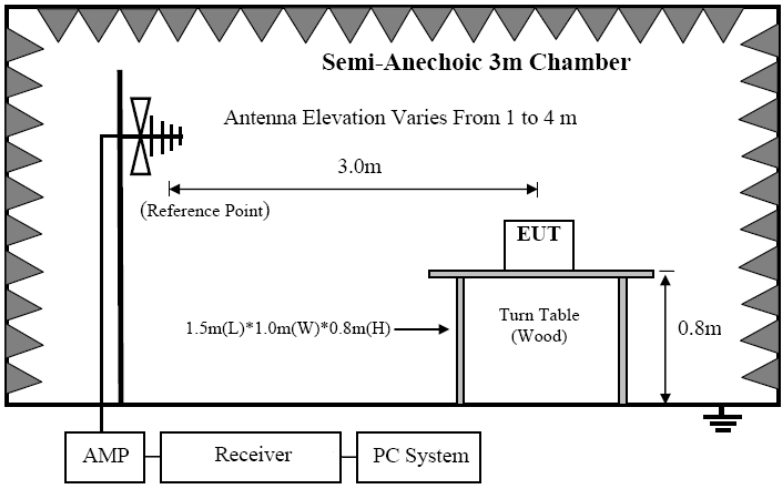
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

8.2.Block Diagram of Test setup

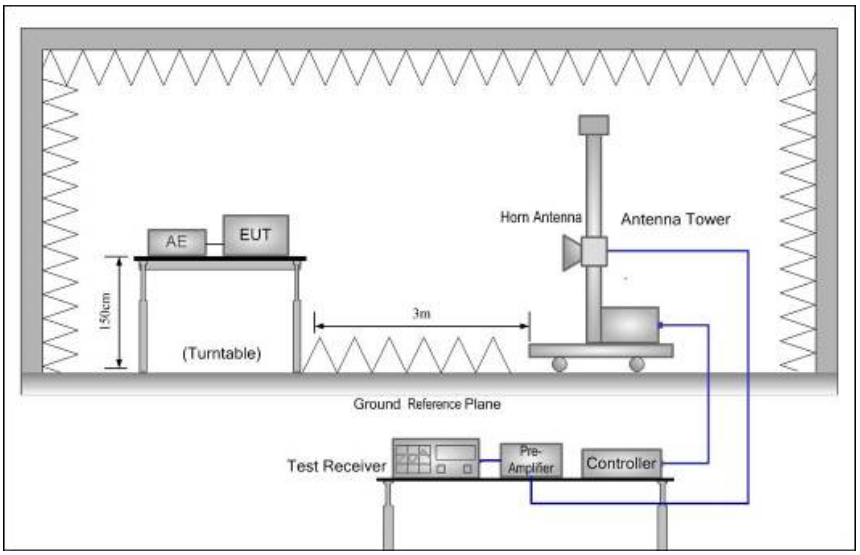
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



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

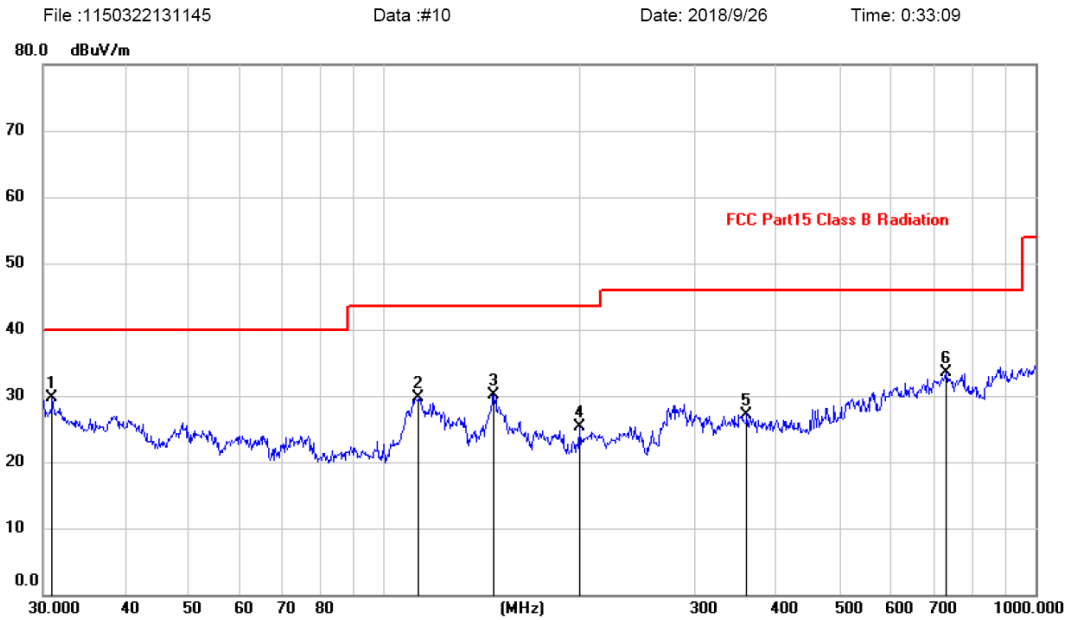
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency..
Detailed information please see the following page.

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

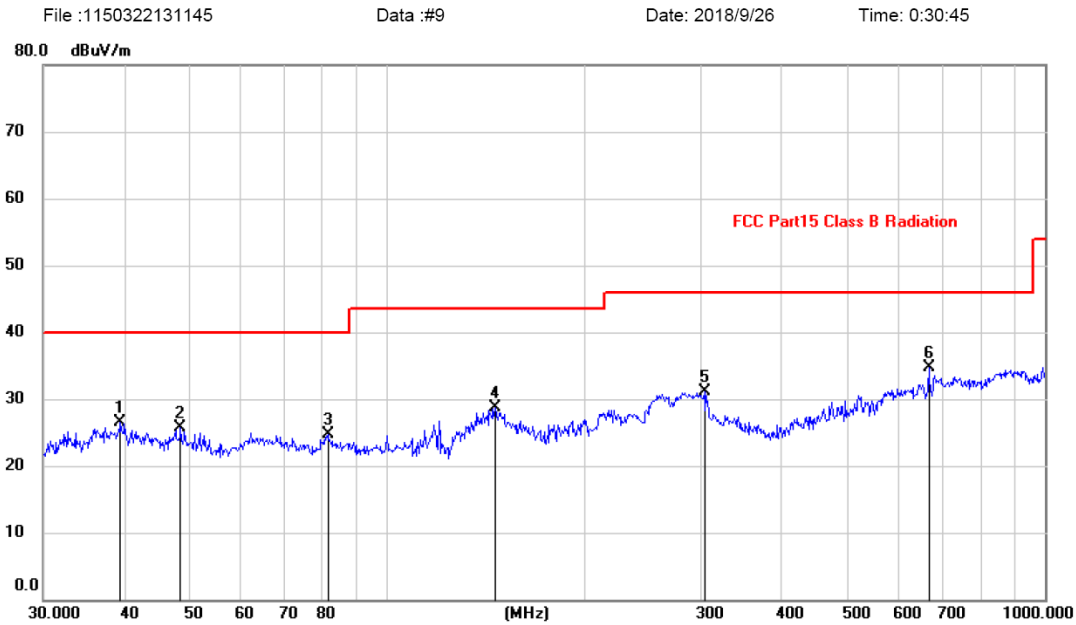
Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	30.9618	16.26	13.35	29.61	40.00	-10.39	peak			
2		113.3161	17.80	11.87	29.67	43.50	-13.83	peak			
3		147.4036	15.77	14.36	30.13	43.50	-13.37	peak			
4		199.2855	14.92	10.37	25.29	43.50	-18.21	peak			
5		360.4476	12.67	14.53	27.20	46.00	-18.80	peak			
6		731.9202	12.22	21.37	33.59	46.00	-12.41	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		39.2991	12.21	14.21	26.42	40.00	-13.58	peak			
2		48.5016	12.02	13.66	25.68	40.00	-14.32	peak			
3		81.2116	15.12	9.50	24.62	40.00	-15.38	peak			
4		145.8608	14.46	14.25	28.71	43.50	-14.79	peak			
5		304.6099	17.58	13.56	31.14	46.00	-14.86	peak			
6	*	668.1422	14.25	20.42	34.67	46.00	-11.33	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	44.73	V	33.95	10.18	34.26	54.60	74	19.40	PK
4804	34.75	V	33.95	10.18	34.26	44.62	54	9.38	AV
7206	/								
9608	/								
4824	45.96	H	33.95	10.18	34.26	55.83	74	18.17	PK
4824	34.04	H	33.95	10.18	34.26	43.91	54	10.09	AV
7206									
9608									
Test Mode: GFSK TX Mid									
4882	43.38	V	33.93	10.2	34.29	53.22	74	20.78	PK
4882	34.78	V	33.93	10.2	34.29	44.62	54	9.38	AV
7323	/								
9764	/								
4882	43.06	H	33.93	10.2	34.29	52.90	74	21.10	PK
4882	34.84	H	33.93	10.2	34.29	44.68	54	9.32	AV
7323									
9764									
Test Mode: GFSK TX High									
4960	43.00	V	33.98	10.22	34.25	52.95	74	21.05	PK
4960	33.17	V	33.98	10.22	34.25	43.12	54	10.88	AV
7440	/								
9920	/								
4960	44.74	H	33.98	10.22	34.25	54.69	74	19.31	PK
4960	34.23	H	33.98	10.22	34.25	44.18	54	9.82	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: π /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	44.22	V	33.95	10.18	34.26	54.09	74	19.91	PK
4804	34.13	V	33.95	10.18	34.26	44.00	54	10.00	AV
7206	/		/						
9608	/		/						
4824	44.24	H	33.95	10.18	34.26	54.11	74	19.89	PK
4824	34.82	H	33.95	10.18	34.26	44.69	54	9.31	AV
7206									
9608									
Test Mode: π /4 DQPSK TX Mid									
4882	45.38	V	33.93	10.2	34.29	55.22	74	18.78	PK
4882	32.90	V	33.93	10.2	34.29	42.74	54	11.26	AV
7323	/								
9764	/								
4882	45.43	H	33.93	10.2	34.29	55.27	74	18.73	PK
4882	35.50	H	33.93	10.2	34.29	45.34	54	8.66	AV
7323									
9764									
Test Mode: π /4 DQPSK TX High									
4960	43.49	V	33.98	10.22	34.25	53.44	74	20.56	PK
4960	33.13	V	33.98	10.22	34.25	43.08	54	10.92	AV
7440	/								
9920	/								
4960	45.06	H	33.98	10.22	34.25	55.01	74	18.99	PK
4960	33.28	H	33.98	10.22	34.25	43.23	54	10.77	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.

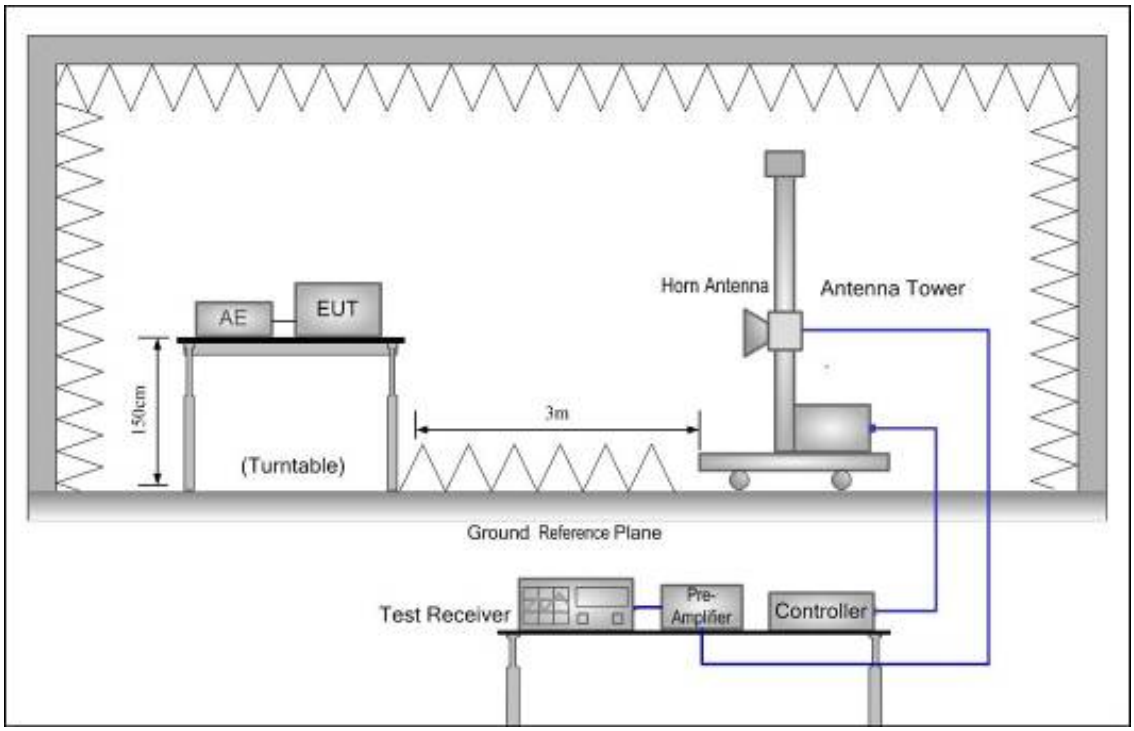
From 1G-25GHz

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	43.93	V	33.95	10.18	34.26	53.80	74	20.20	PK
4804	33.87	V	33.95	10.18	34.26	43.74	54	10.26	AV
7206	/		/						
9608	/		/						
4824	42.60	H	33.95	10.18	34.26	52.47	74	21.53	PK
4824	34.32	H	33.95	10.18	34.26	44.19	54	9.81	AV
7206									
9608									
Test Mode: 8- DQPSK TX Mid									
4882	42.04	V	33.93	10.2	34.29	51.88	74	22.12	PK
4882	33.94	V	33.93	10.2	34.29	43.78	54	10.22	AV
7323	/								
9764	/								
4882	44.18	H	33.93	10.2	34.29	54.02	74	19.98	PK
4882	34.42	H	33.93	10.2	34.29	44.26	54	9.74	AV
7323									
9764									
Test Mode: 8- DQPSK TX High									
4960	44.81	V	33.98	10.22	34.25	54.76	74	19.24	PK
4960	33.65	V	33.98	10.22	34.25	43.60	54	10.40	AV
7440	/								
9920	/								
4960	45.18	H	33.98	10.22	34.25	55.13	74	18.87	PK
4960	34.16	H	33.98	10.22	34.25	44.11	54	9.89	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

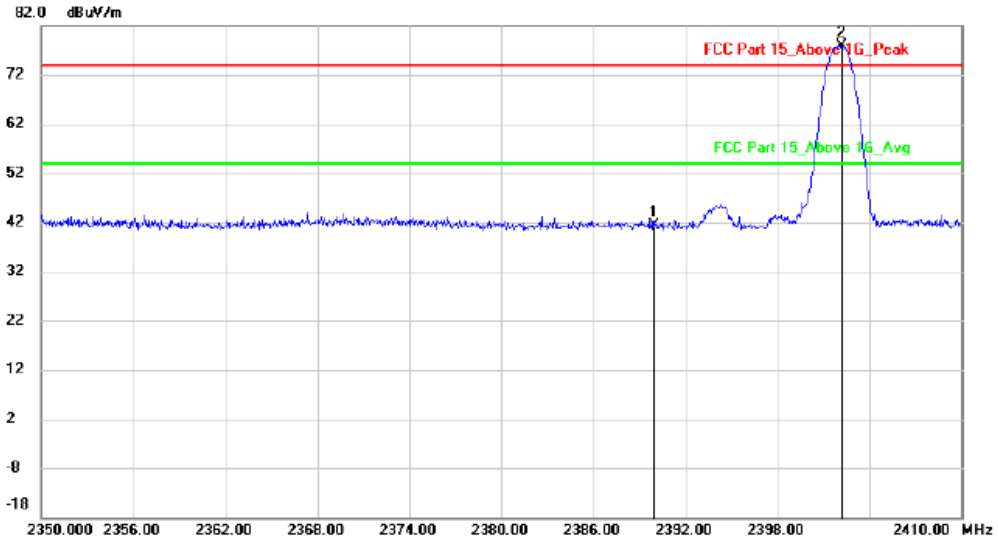
All restriction band and non- restriction band have been tested ， only worse case is reported.

9.4.Test Result

PASS. (See below detailed test data)

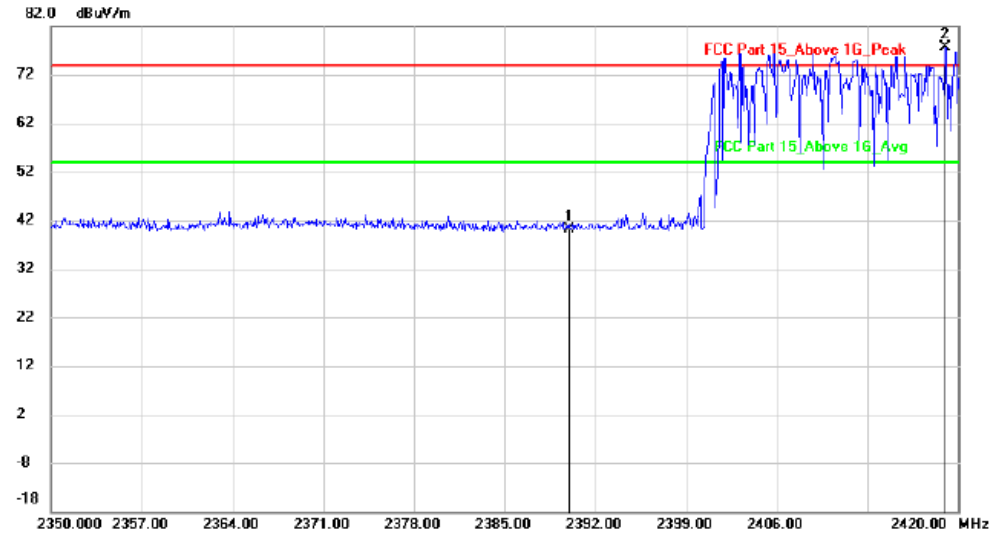
Radiated Method:

Polarization: Vertical Test Mode: GFSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector cm	degree	Comment
1		2390.000	44.83	-3.40	41.43	74.00	-32.57	peak		
2	*	2402.200	81.39	-3.41	77.98	74.00	3.98	peak		

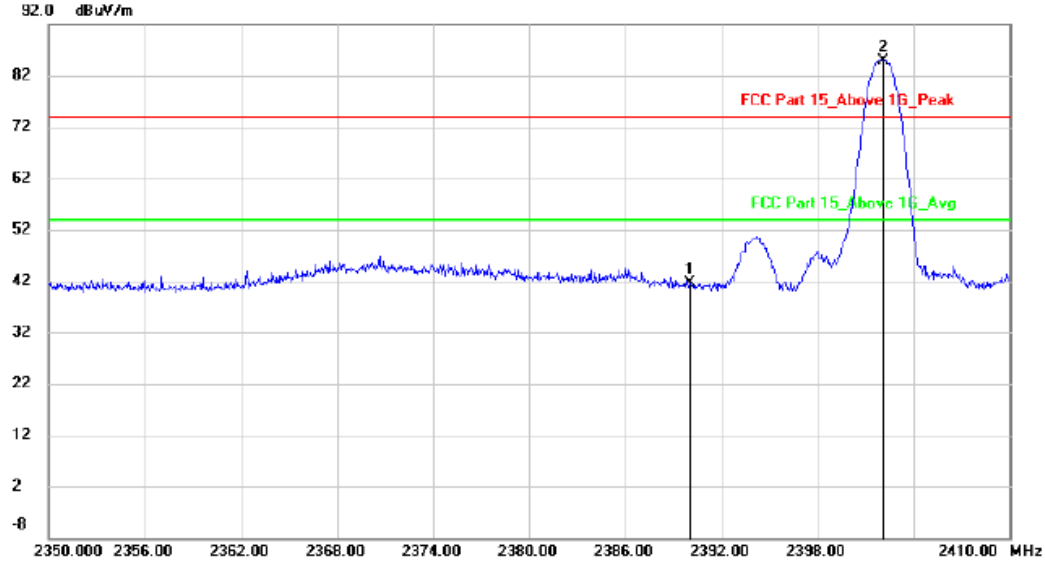
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector cm	degree	Comment
1		2390.000	43.42	-3.40	40.02	74.00	-33.98	peak		
2	*	2419.020	81.13	-3.41	77.72	74.00	3.72	peak		

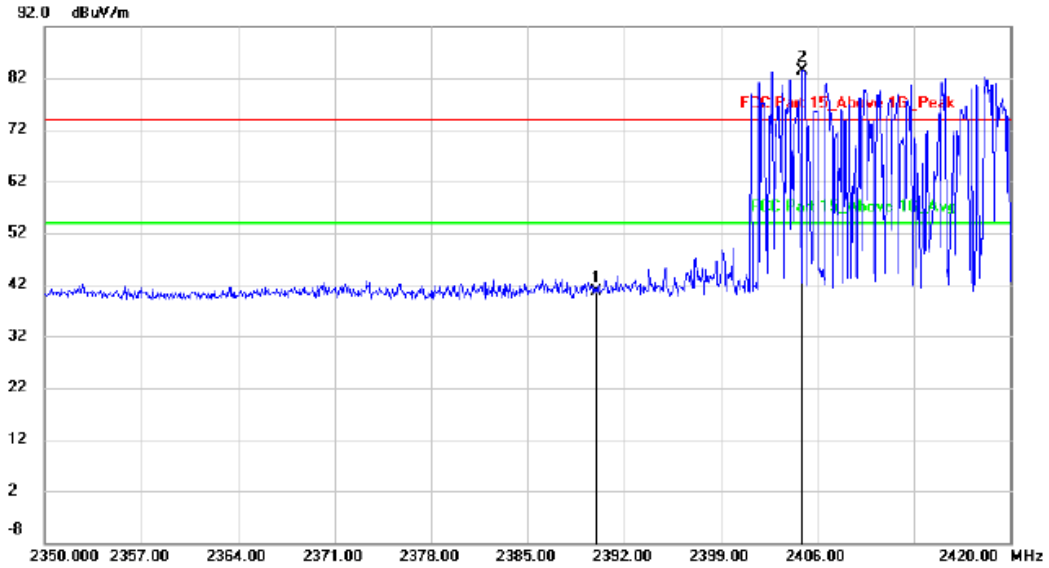
hopping-on

Polarization: Horizontal: Test Mode: GFSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	45.11	-3.40	41.71	74.00	-32.29	peak			
2	*	2402.080	88.41	-3.41	85.00	74.00	11.00	peak			

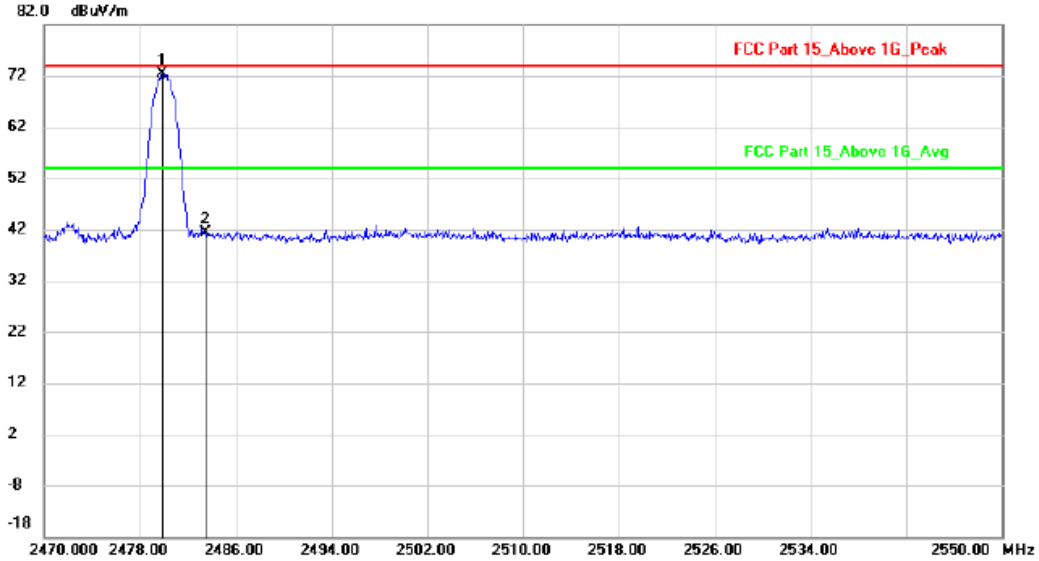
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	43.95	-3.40	40.55	74.00	-33.45	peak			
2	*	2404.950	86.81	-3.41	83.40	74.00	9.40	peak			

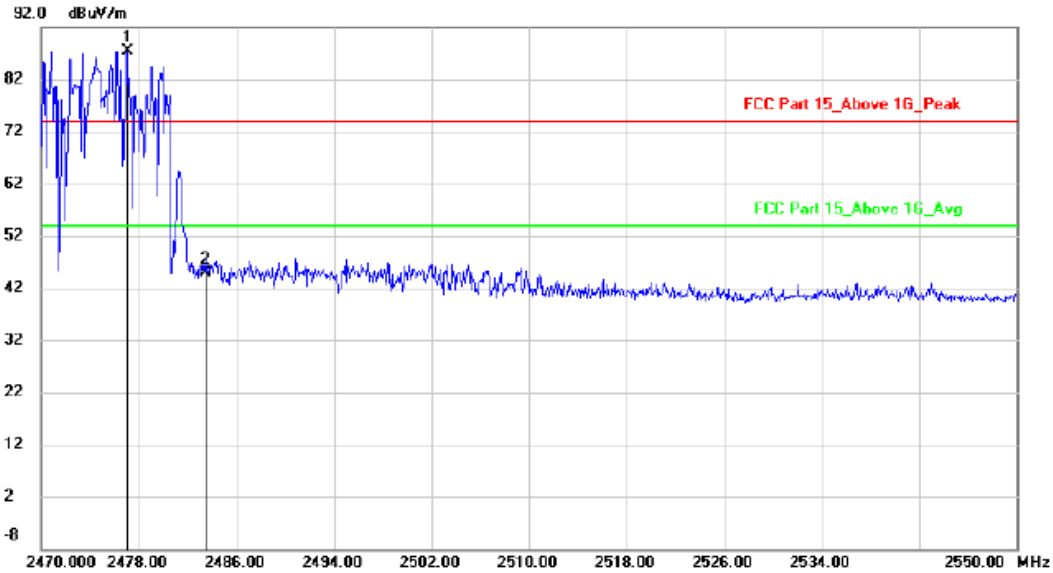
hopping-on

Polarization: Vertical Test Mode: GFSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2479.840	75.64	-3.38	72.26	74.00	-1.74	peak			
2		2483.500	44.81	-3.38	41.43	74.00	-32.57	peak			

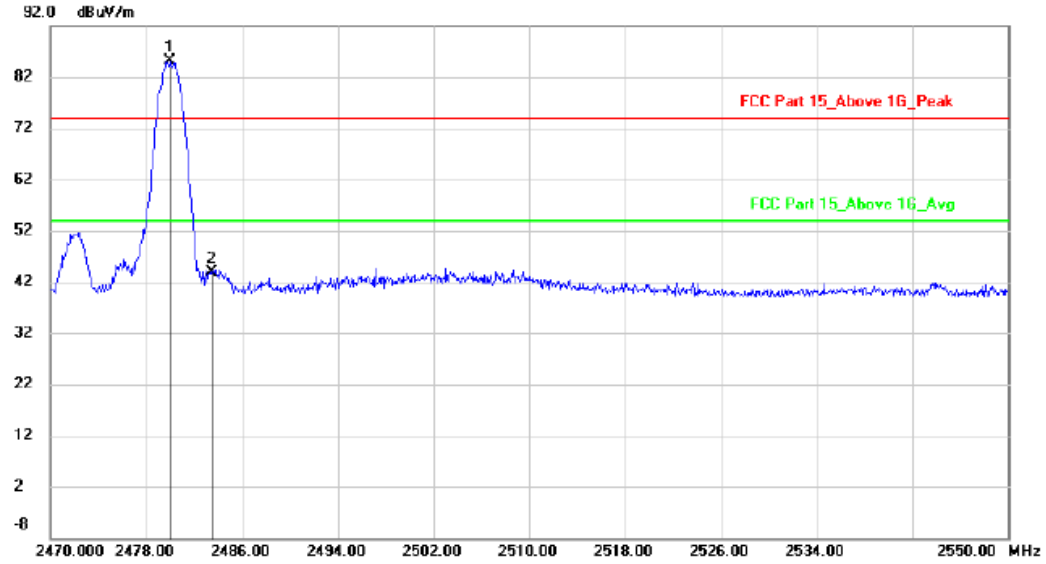
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2477.040	90.81	-3.39	87.42	74.00	13.42	peak			
2		2483.500	48.29	-3.38	44.91	74.00	-29.09	peak			

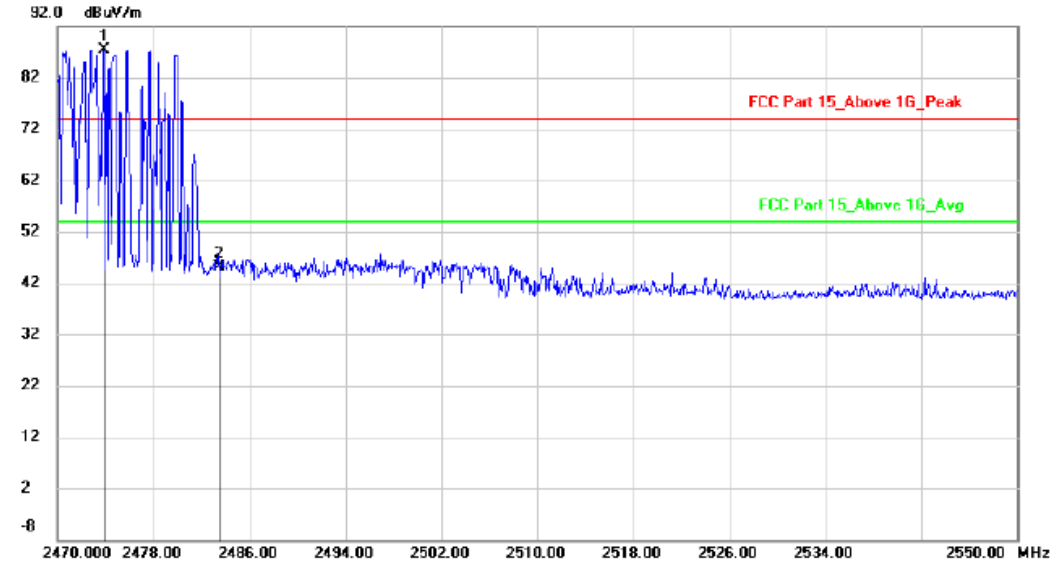
hopping-on

Polarization: Horizontal Test Mode: GFSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	88.39	-3.38	85.01	74.00	11.01	peak			
2		2483.500	47.16	-3.38	43.78	74.00	-30.22	peak			

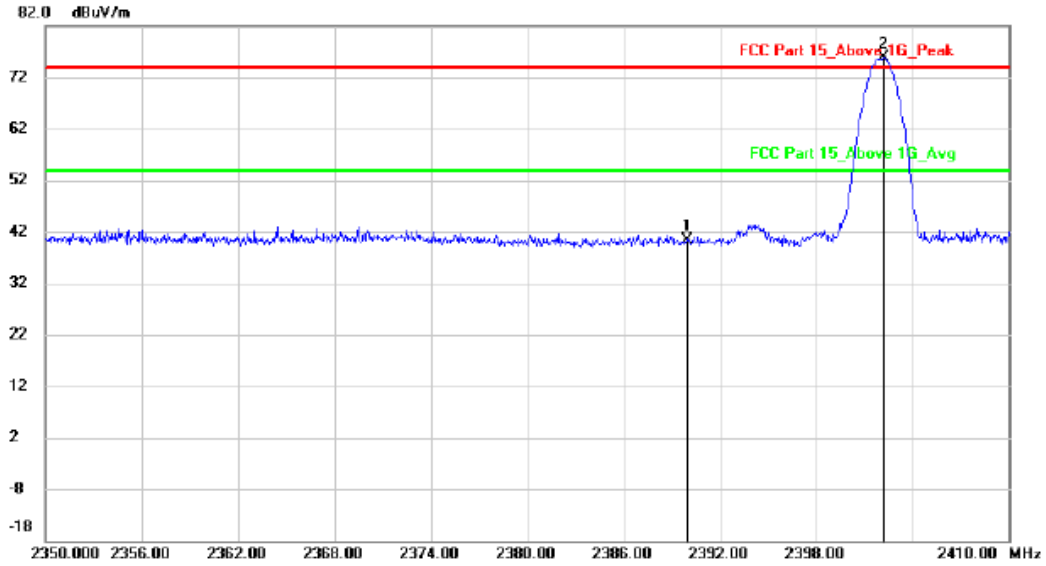
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2473.840	90.74	-3.39	87.35	74.00	13.35	peak			
2		2483.500	48.43	-3.38	45.05	74.00	-28.95	peak			

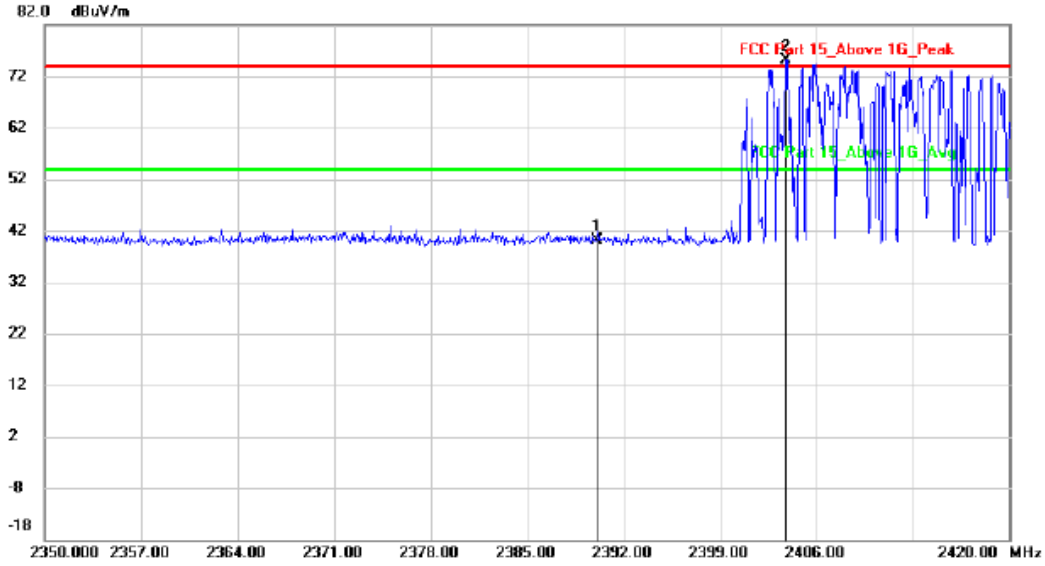
hopping-on

Polarization: Vertical Test Mode: π /4 DQPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	43.87	-3.40	40.47	74.00	-33.53	peak			
2	*	2402.200	79.29	-3.41	75.88	74.00	1.88	peak			

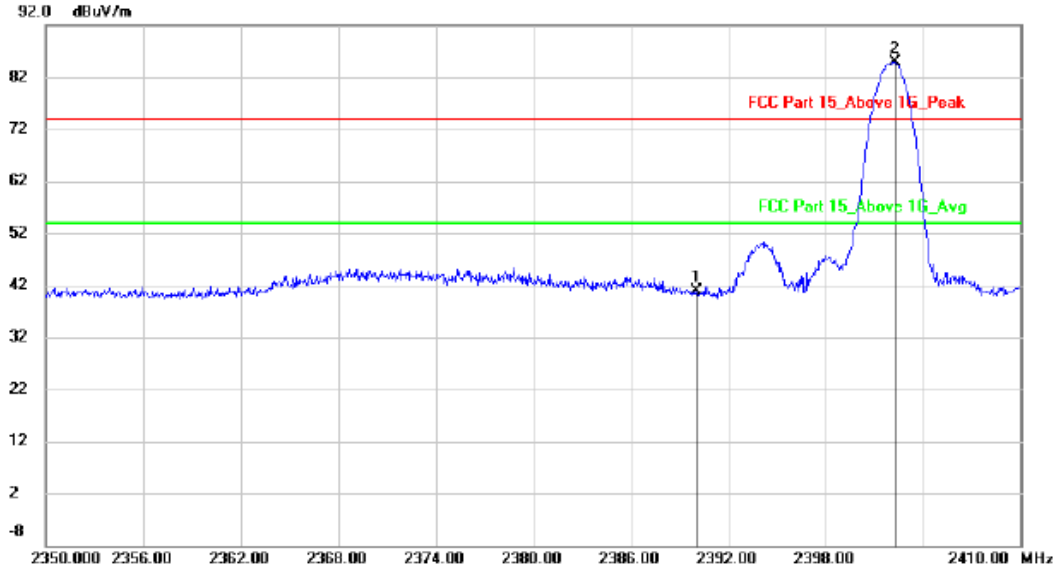
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	43.48	-3.40	40.08	74.00	-33.92	peak			
2	*	2403.830	78.60	-3.41	75.19	74.00	1.19	peak			

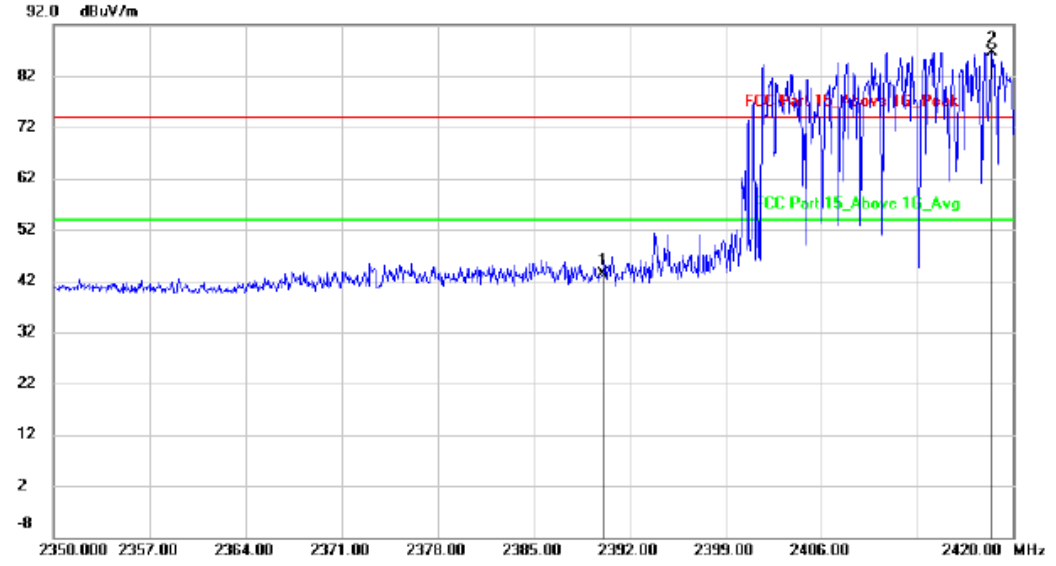
hopping-on

Polarization: Horizontal Test Mode: π /4 DQPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector cm	degree	Comment
1		2390.000	44.24	-3.40	40.84	74.00	-33.16	peak		
2	*	2402.260	88.26	-3.41	84.85	74.00	10.85	peak		

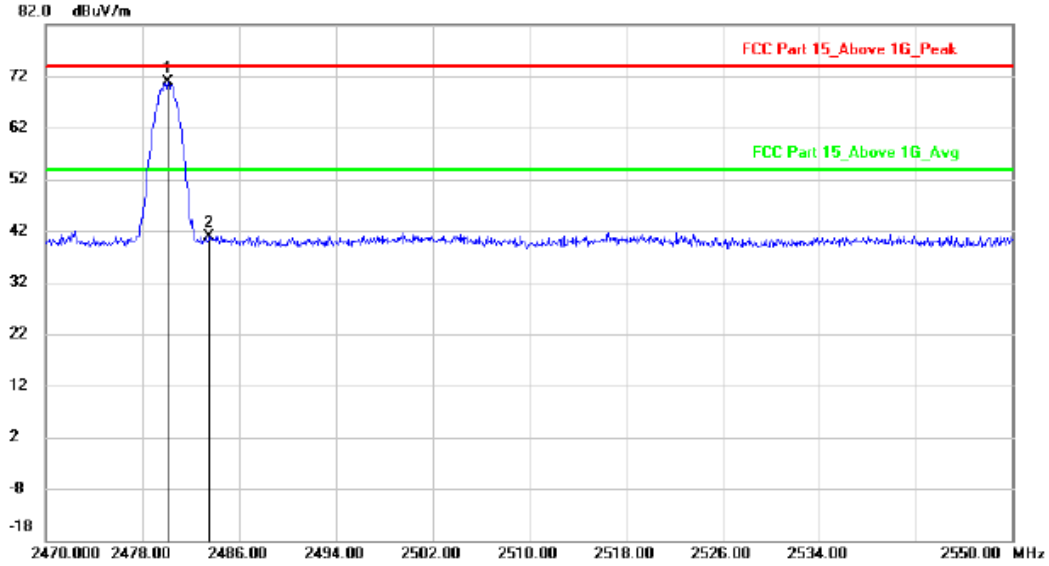
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector cm	degree	Comment
1		2390.000	46.67	-3.40	43.27	74.00	-30.73	peak		
2	*	2418.460	90.13	-3.41	86.72	74.00	12.72	peak		

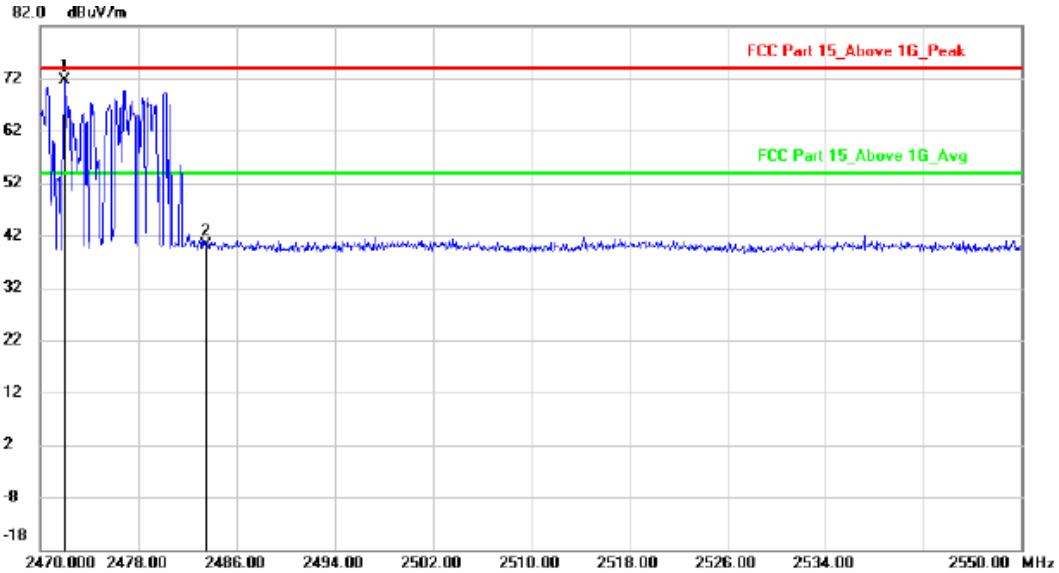
hopping-on

Polarization: Vertical Test Mode: π /4 DQPSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.080	74.28	-3.38	70.90	74.00	-3.10	peak			
2		2483.500	44.28	-3.38	40.90	74.00	-33.10	peak			

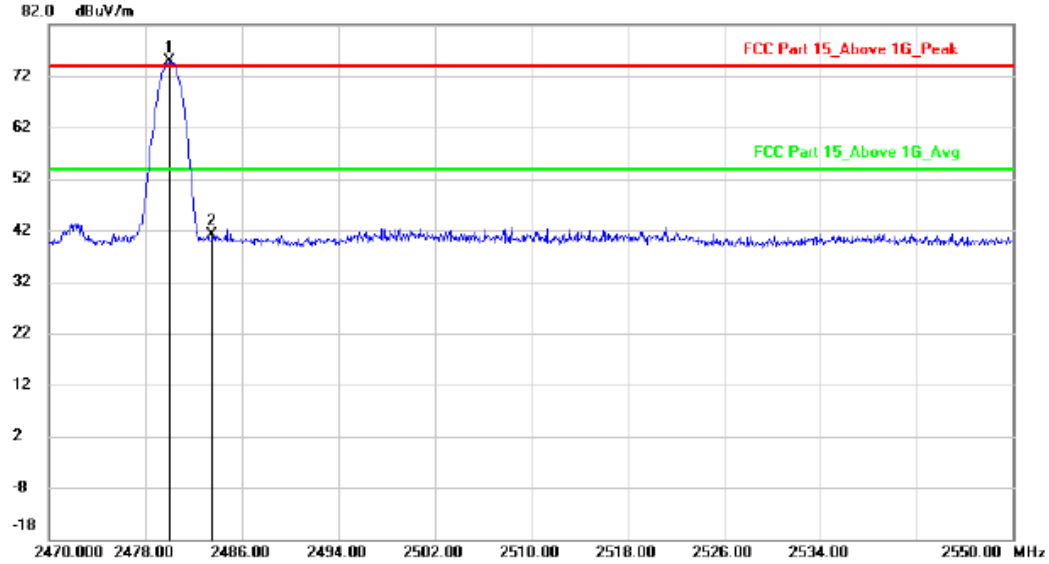
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2471.920	75.03	-3.39	71.64	74.00	-2.36	peak			
2		2483.500	43.62	-3.38	40.24	74.00	-33.76	peak			

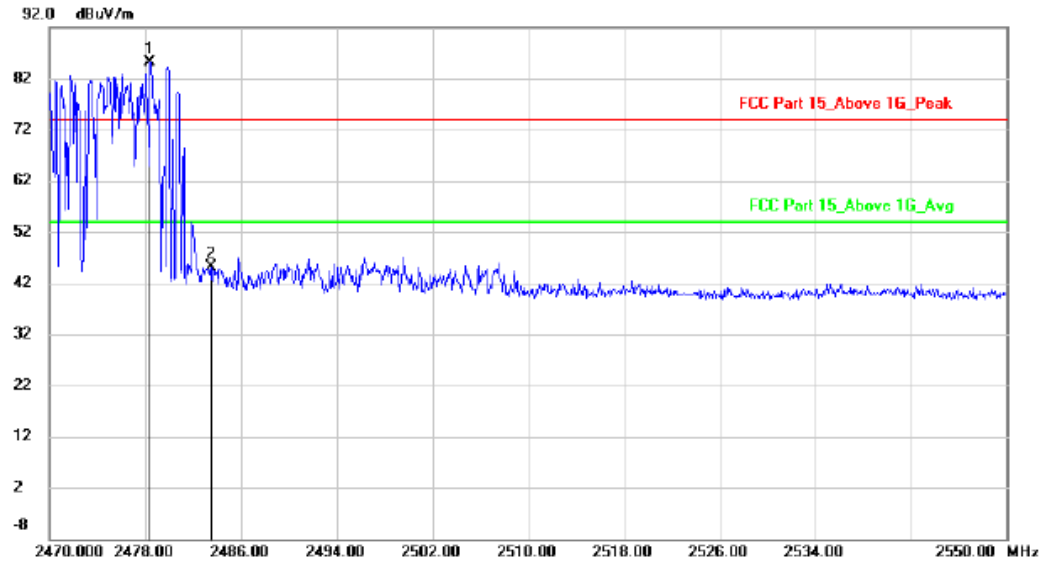
hopping-on

Polarization: Horizontal Test Mode: π /4 DQPSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	78.16	-3.38	74.78	74.00	0.78	peak			
2		2483.500	44.47	-3.38	41.09	74.00	-32.91	peak			

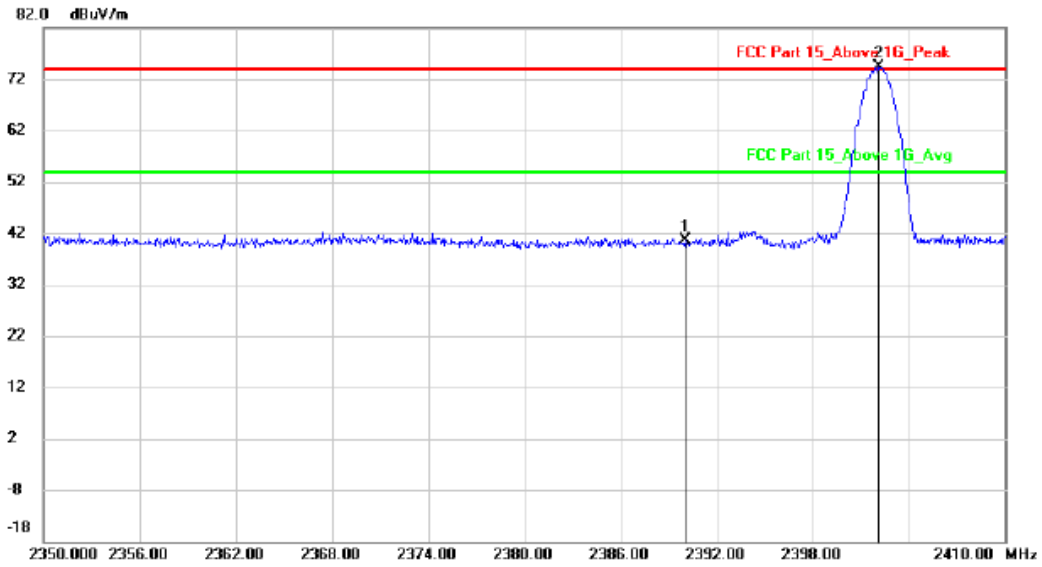
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2478.400	88.42	-3.39	85.03	74.00	11.03	peak			
2		2483.500	48.49	-3.38	45.11	74.00	-28.89	peak			

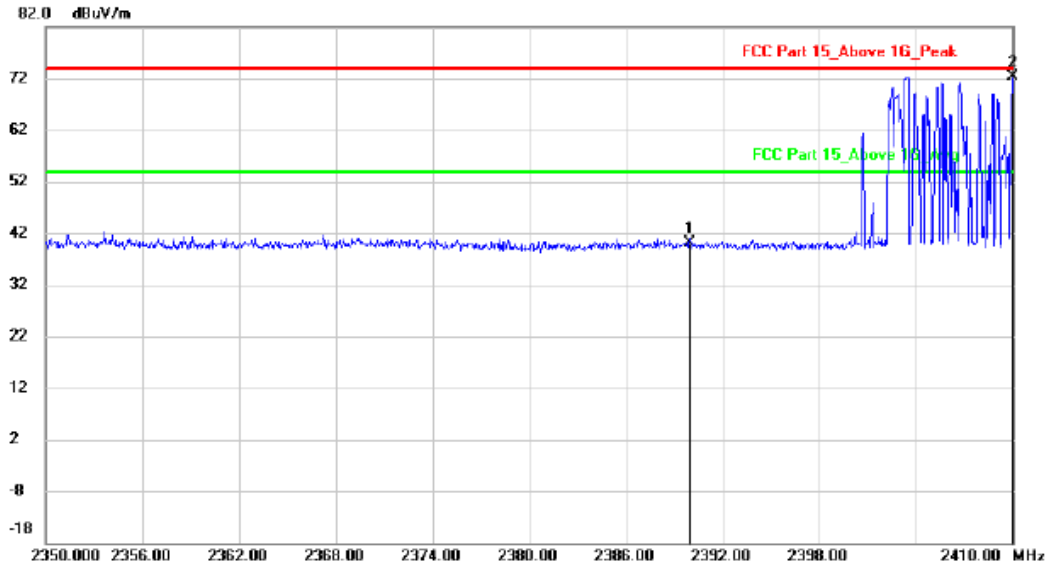
hopping-on

Polarization: Vertical Test Mode: 8DPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	44.14	-3.40	40.74	74.00	-33.26	peak			
2	*	2402.140	77.90	-3.41	74.49	74.00	0.49	peak			

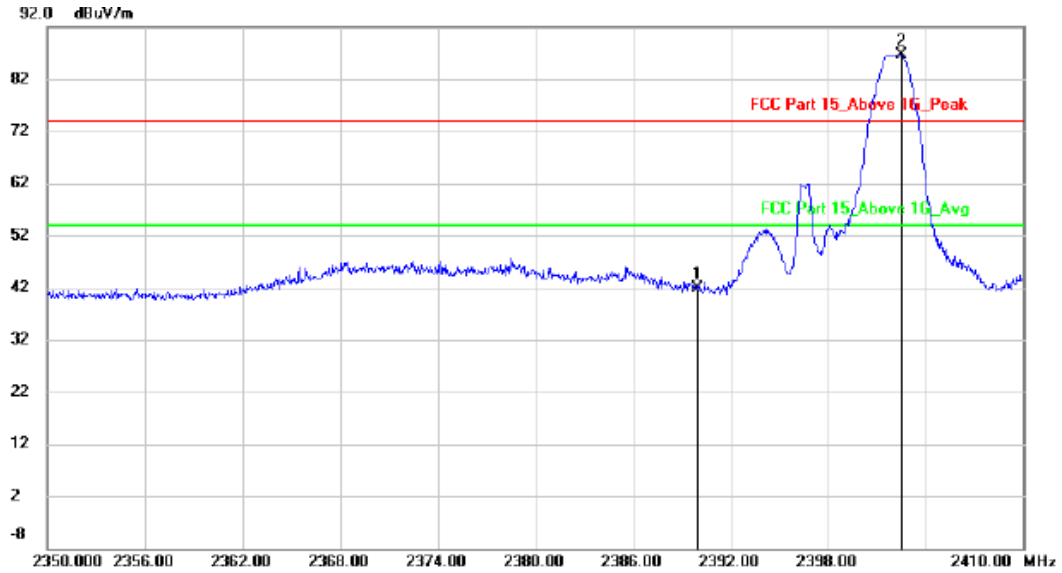
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	43.41	-3.40	40.01	74.00	-33.99	peak			
2	*	2410.000	75.86	-3.40	72.46	74.00	-1.54	peak			

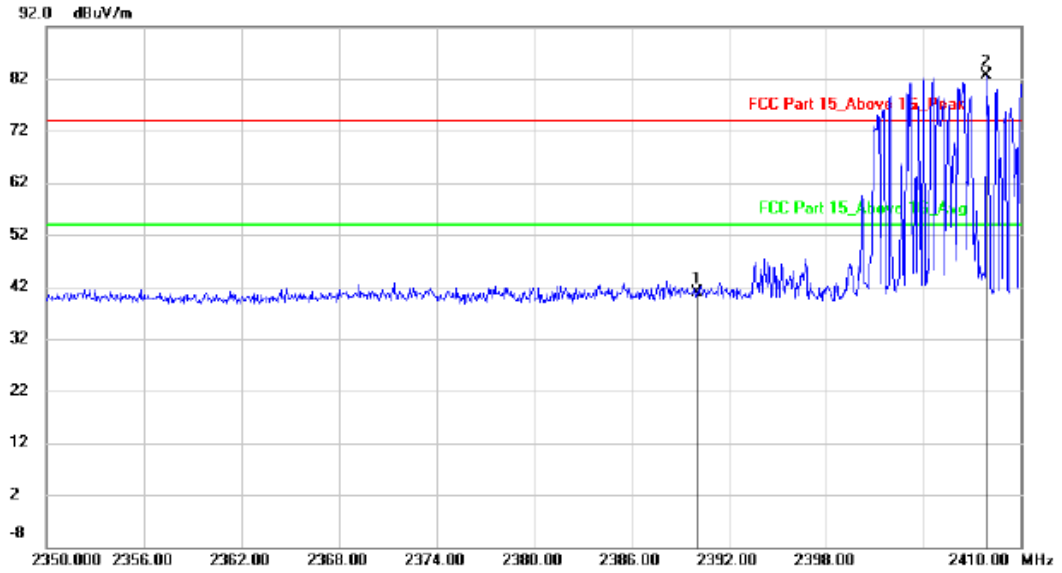
hopping-on

Polarization: Horizontal Test Mode: 8DPSK-Low



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	45.31	-3.40	41.91	74.00	-32.09	peak			
2	*	2402.500	89.99	-3.41	86.58	74.00	12.58	peak			

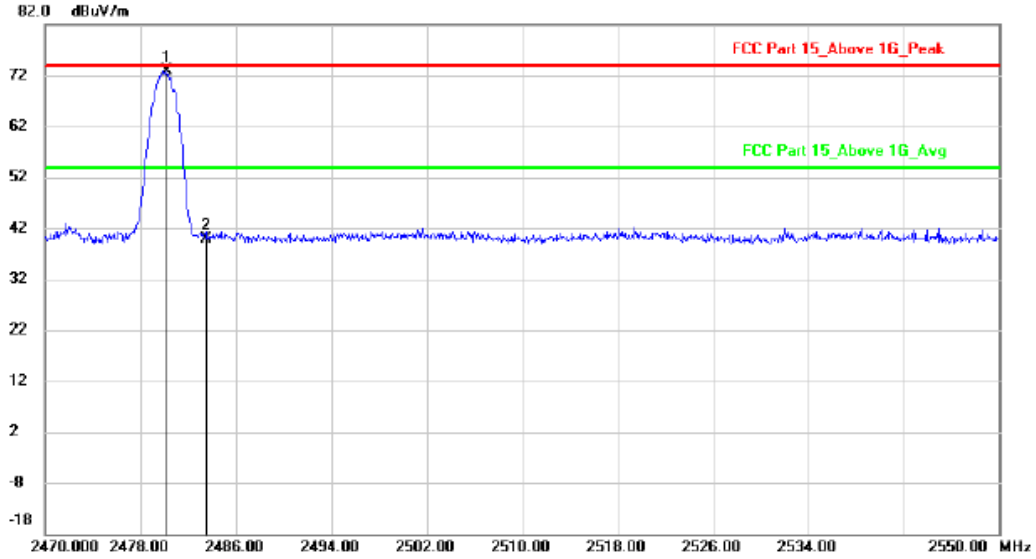
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	44.25	-3.40	40.85	74.00	-33.15	peak			
2	*	2407.840	86.09	-3.40	82.69	74.00	8.69	peak			

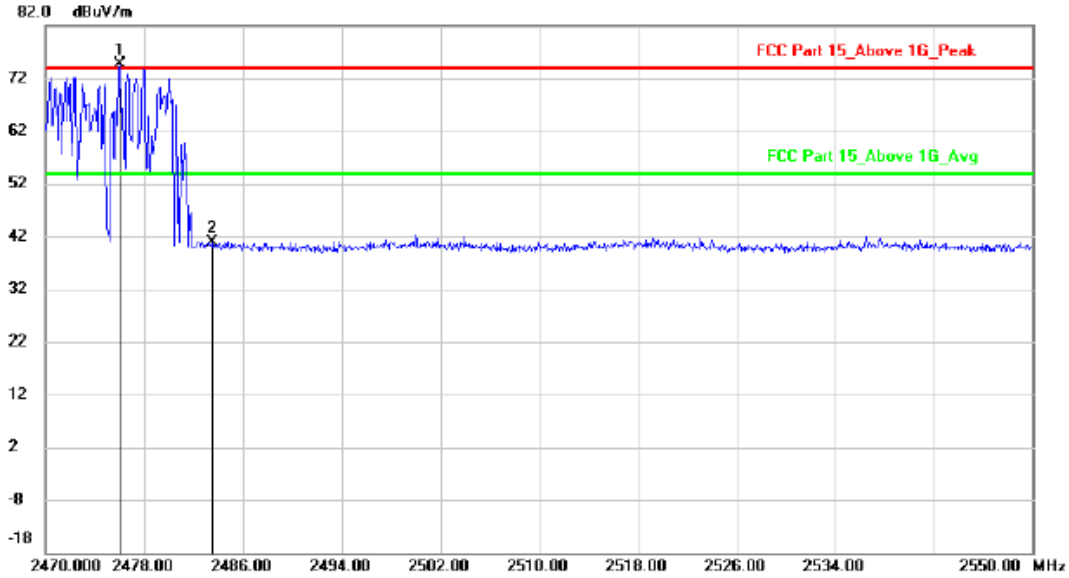
hopping-on

Polarization: Vertical Test Mode: 8DPSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	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			

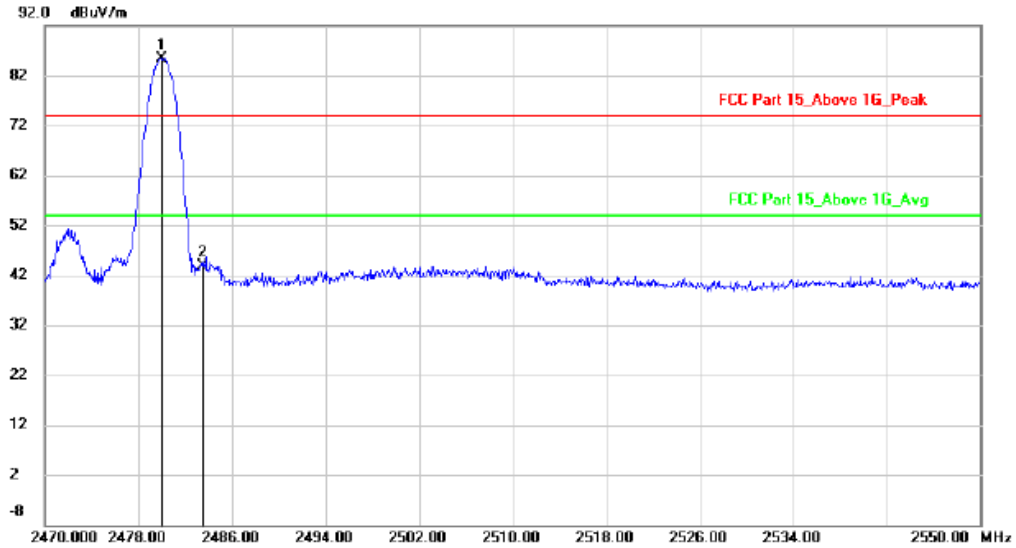
hopping-off



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2476.000	77.97	-3.39	74.58	74.00	0.58	peak			
2		2483.500	44.35	-3.38	40.97	74.00	-33.03	peak			

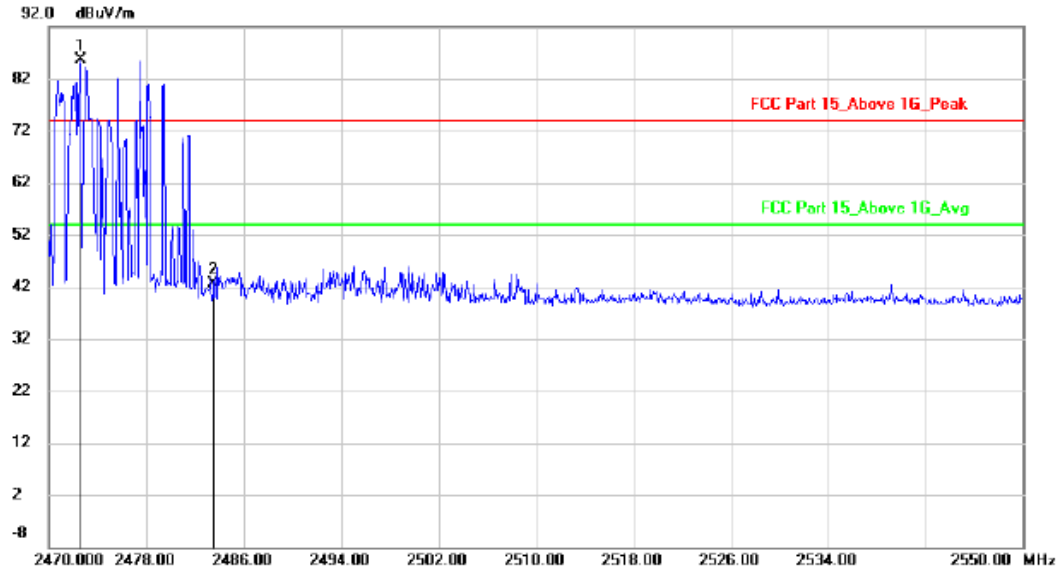
hopping-on

Polarization: Horizontal Test Mode: 8DPSK-High



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	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	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2472.560	88.92	-3.39	85.53	74.00	11.53	peak			
2		2483.500	46.02	-3.38	42.64	74.00	-31.36	peak			

hopping-on

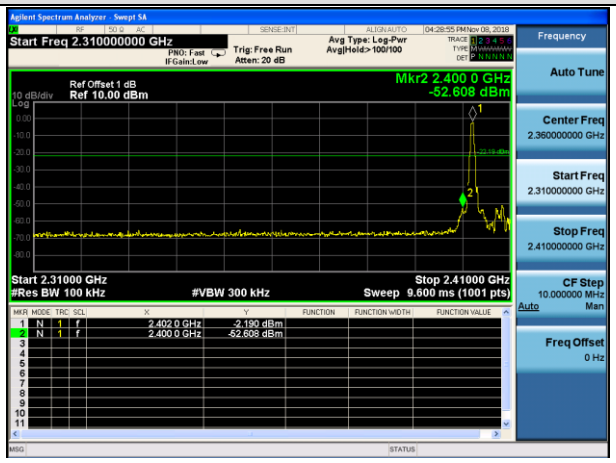
Note: 1. *:Maximum data; x:Over limit; !:over margin.

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

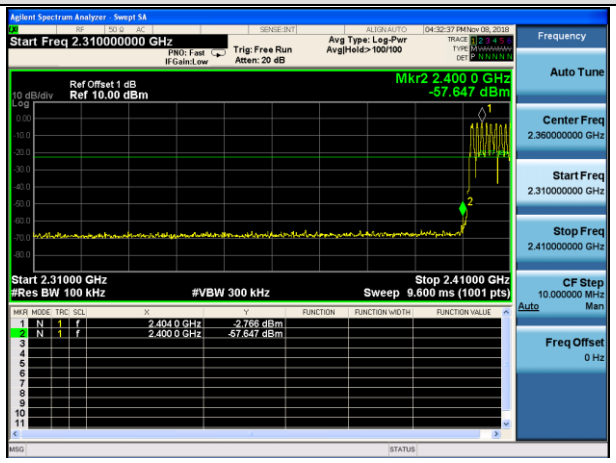
Conducted Method

GFSK Mode:

Test channel:	Lowest channel

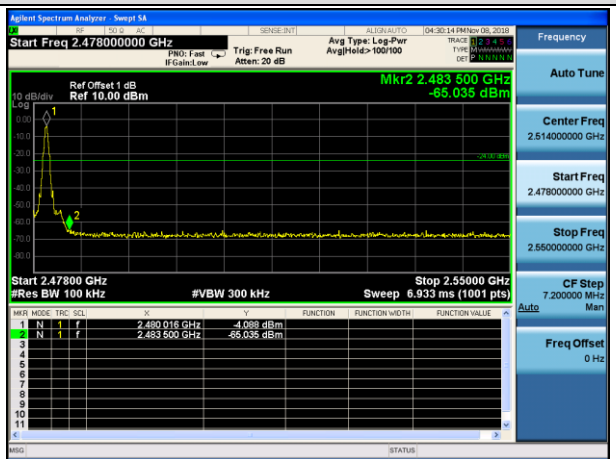


No-hopping mode

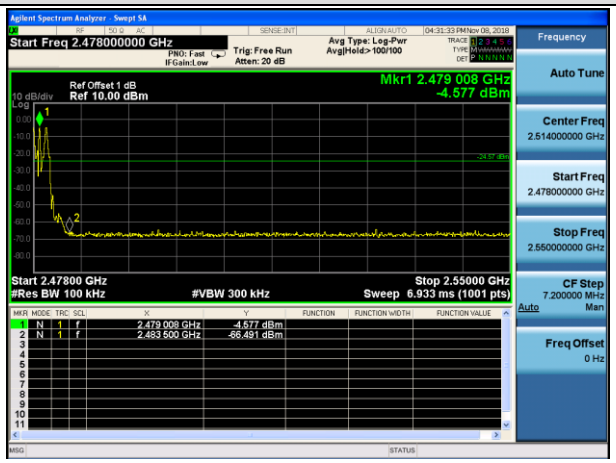


Hopping mode

Test channel:	Highest channel



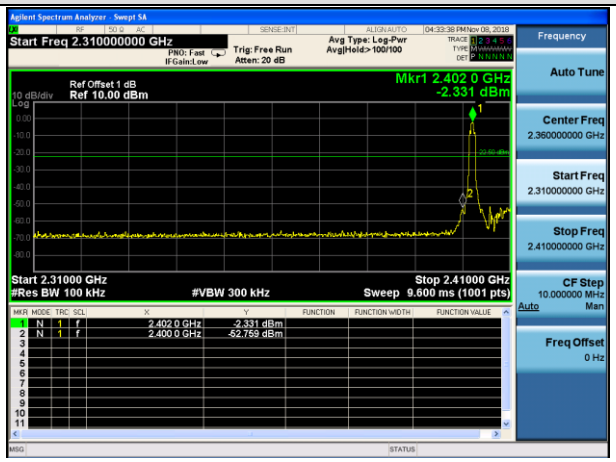
No-hopping mode



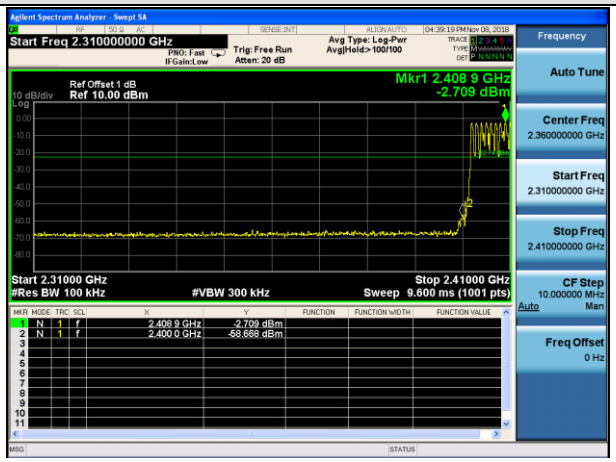
Hopping mode

Pi/4QPSK Mode:

Test channel:	Lowest channel

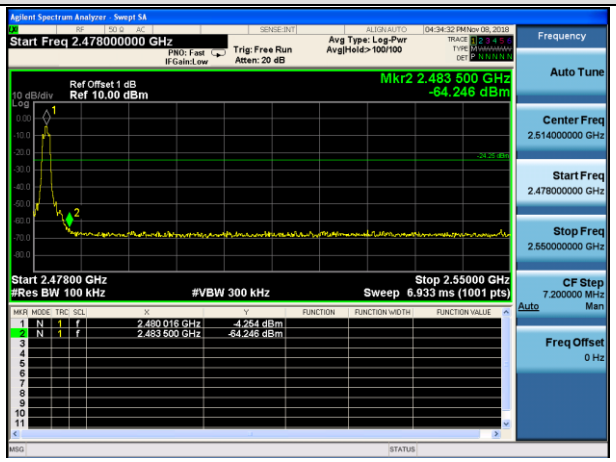


No-hopping mode

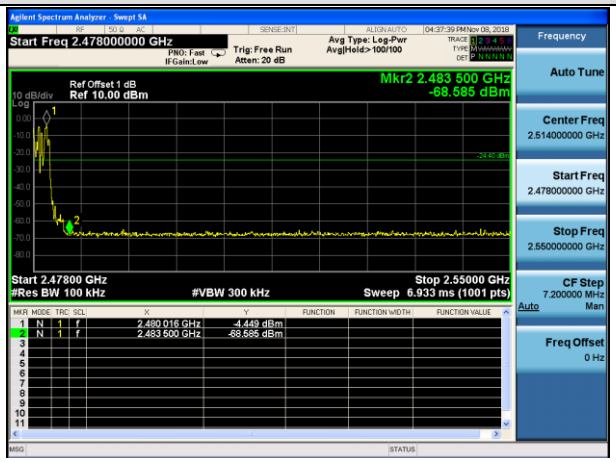


Hopping mode

Test channel:	Highest channel



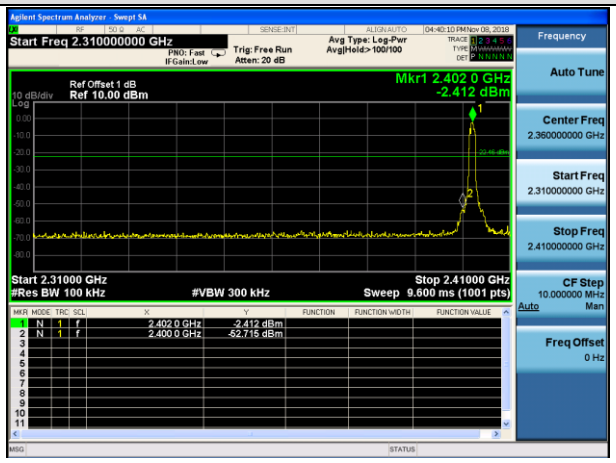
No-hopping mode



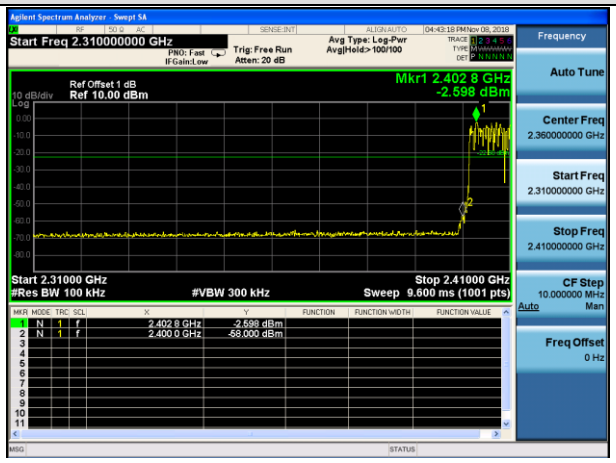
Hopping mode

8DPSK Mode:

Test channel:	Lowest channel

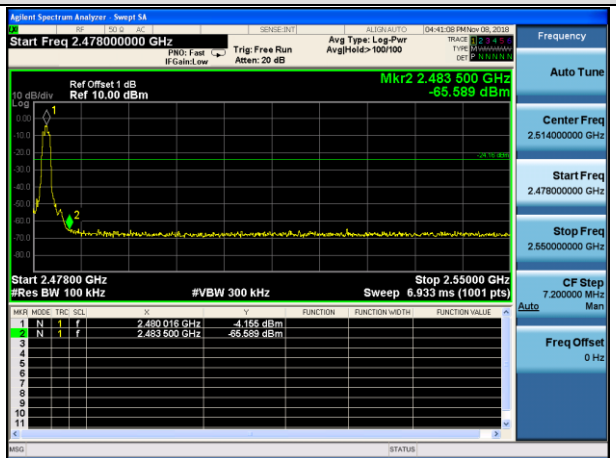


No-hopping mode

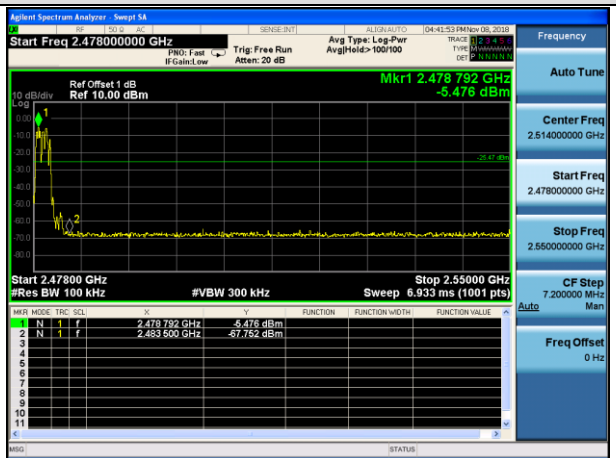


Hopping mode

Test channel:	Highest channel



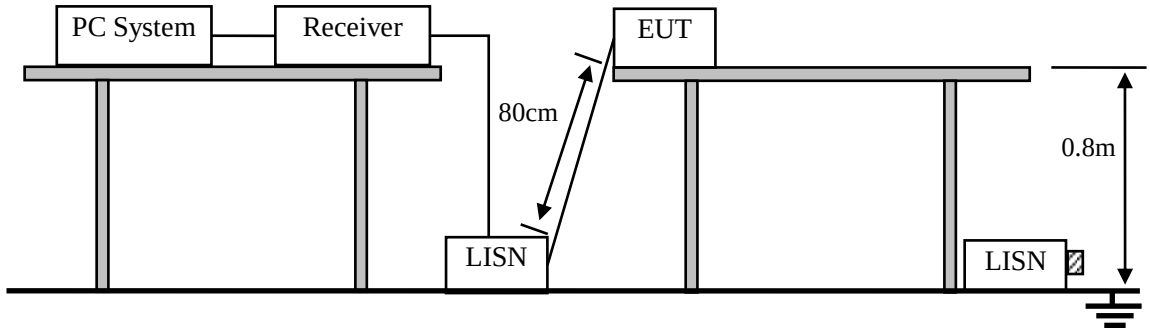
No-hopping mode



Hopping mode

10. POWER LINE CONDUCTED EMISSIONS

10.1. Block Diagram of Test Setup



:50Ω Terminator

10.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
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

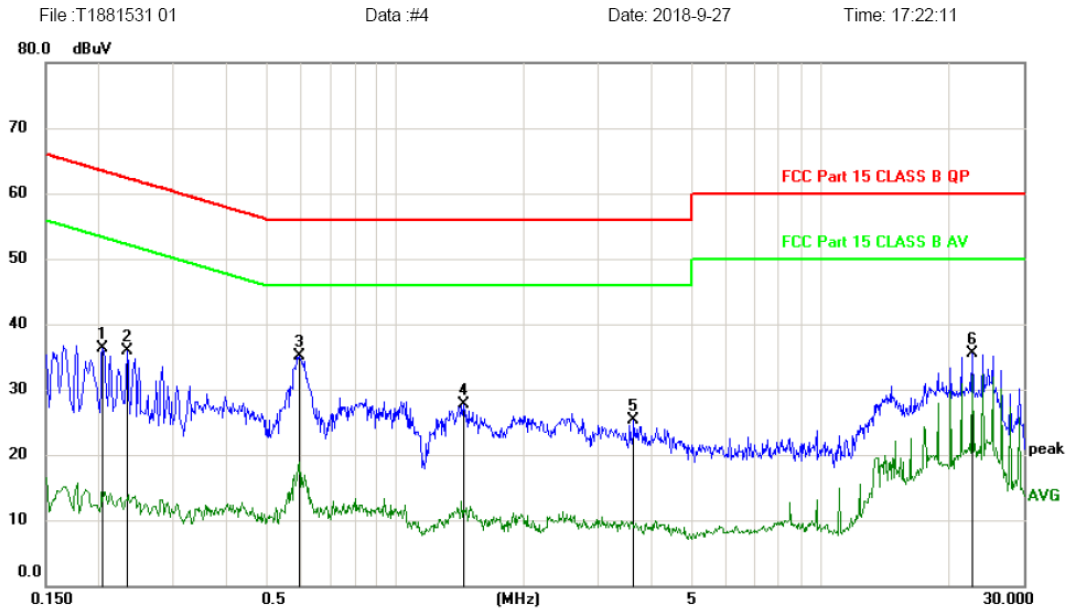
(1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
(2) Setup the EUT and simulator as shown in 10.1
(3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected 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:

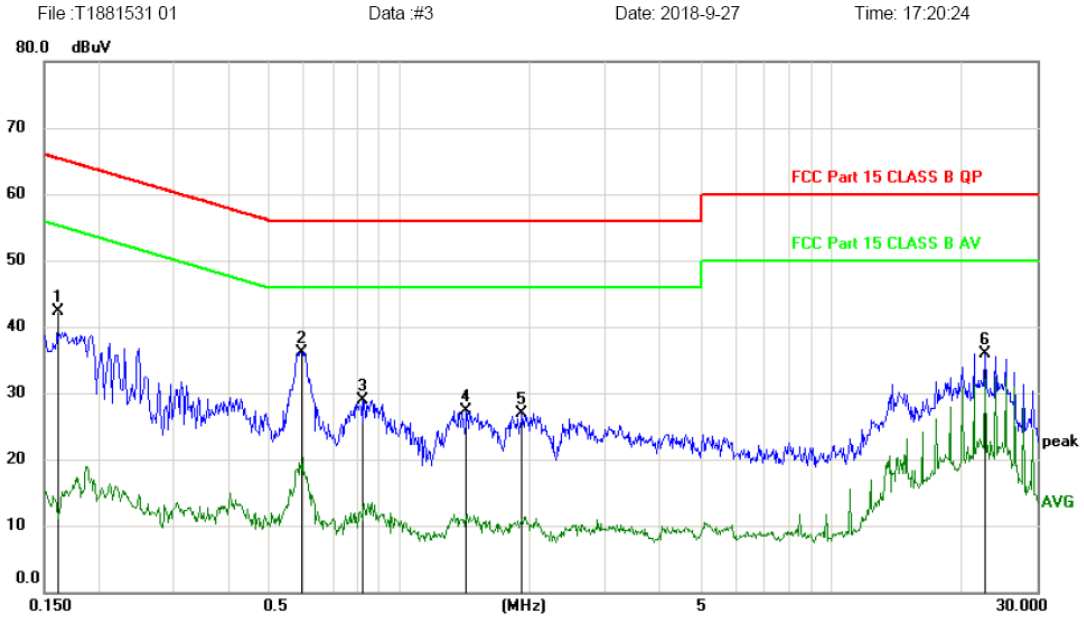


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2038	36.12	0.13	36.25	63.45	-27.20	peak	
2		0.2340	35.75	0.13	35.88	62.31	-26.43	peak	
3	*	0.5936	35.02	0.13	35.15	56.00	-20.85	peak	
4		1.4429	27.56	0.15	27.71	56.00	-28.29	peak	
5		3.6240	25.04	0.20	25.24	56.00	-30.76	peak	
6		22.7700	34.72	0.82	35.54	60.00	-24.46	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

Neutral:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1620	42.09	0.13	42.22	65.36	-23.14	peak	
2	*	0.5936	36.05	0.13	36.18	56.00	-19.82	peak	
3		0.8216	28.84	0.13	28.97	56.00	-27.03	peak	
4		1.4275	27.14	0.15	27.29	56.00	-28.71	peak	
5		1.9255	26.80	0.16	26.96	56.00	-29.04	peak	
6		22.7606	35.11	0.82	35.93	60.00	-24.07	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

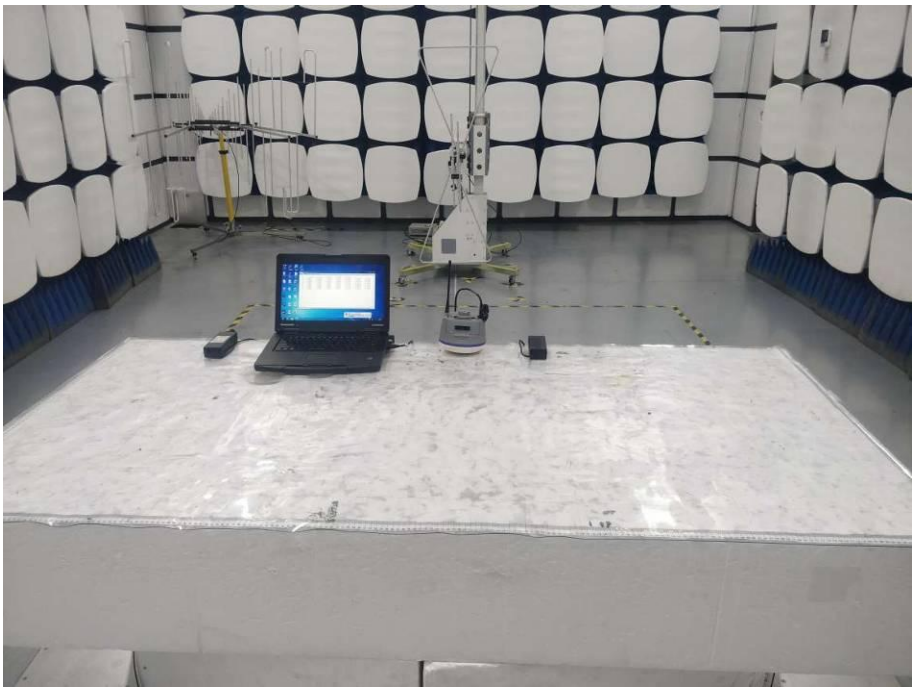
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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 T1881531 01.

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