

# TEST REPORT

**Applicant:** Shenzhen Uniwisdom Technologies Co., Ltd.

**Address of Applicant:** Bldg 91 101 ( Bldg.91-94) 2nd Industrial Zone, Lisonglang, Gongming Street, GuangMing District, Shenzhen, P. R. China

**Manufacturer/Factory :** Shenzhen Uniwisdom Technologies Co., Ltd.,

**Address of Manufacturer/Factory :** Bldg 91 101 ( Bldg.91-94) 2nd Industrial Zone, Lisonglang, Gongming Street, GuangMing District, Shenzhen, P. R. China

**Equipment Under Test (EUT)**

Product Name: Mixing console

Model No.: LV7

Trade Mark: HARBINGER

FCC ID: ZTJ-LV7

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: May 06, 2021

Date of Test: May 06, 2021~May 27, 2021

Date of report issued: May 28, 2021

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

  
A handwritten signature of Robinson Luo is written over a circular blue stamp. The stamp contains the text "GTS" in the center, surrounded by "GLOBAL UNITED TECHNOLOGY SERVICES CO., LTD." and "TEST REPORT" at the bottom, with the date "May 2021" at the bottom.

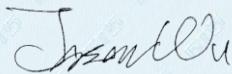
**Robinson Luo**  
**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

Version No.	Date	Description
00	May 28, 2021	Original

Prepared By:

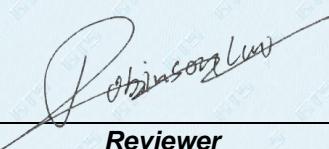


Date:

May 28, 2021

**Project Engineer**

Check By:



Date:

May 28, 2021

**Reviewer**

### 3 Contents

	Page
1 COVER PAGE .....	1
2 VERSION .....	2
3 CONTENTS .....	3
4 TEST SUMMARY .....	4
5 GENERAL INFORMATION .....	5
5.1 GENERAL DESCRIPTION OF EUT .....	5
5.2 TEST MODE .....	7
5.3 DESCRIPTION OF SUPPORT UNITS .....	7
5.4 DEVIATION FROM STANDARDS .....	7
5.5 ABNORMALITIES FROM STANDARD CONDITIONS .....	7
5.6 TEST FACILITY .....	7
5.7 TEST LOCATION .....	7
6 TEST INSTRUMENTS LIST .....	8
7 TEST RESULTS AND MEASUREMENT DATA .....	10
7.1 ANTENNA REQUIREMENT .....	10
7.2 CONDUCTED EMISSIONS .....	11
7.3 CONDUCTED PEAK OUTPUT POWER .....	14
7.4 20DB EMISSION BANDWIDTH .....	21
7.5 CARRIER FREQUENCIES SEPARATION .....	26
7.6 HOPPING CHANNEL NUMBER .....	31
7.7 DWELL TIME .....	33
7.8 BAND EDGE .....	39
7.8.1 Conducted Emission Method .....	39
7.8.2 Radiated Emission Method .....	44
7.9 SPURIOUS EMISSION .....	46
7.9.1 Conducted Emission Method .....	46
7.9.2 Radiated Emission Method .....	49
8 TEST SETUP PHOTO .....	57
9 EUT CONSTRUCTIONAL DETAILS .....	57

## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)(iii)	Pass
Dwell Time	15.247 (a)(1)(iii)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

Remarks:

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *Test according to ANSI C63.10:2013*

### Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 5 General Information

### 5.1 General Description of EUT

Product Name:	Mixing console
Model No.:	LV7
Serial No.:	N/A
Hardware Version:	N/A
Software Version:	N/A
Test sample(s) ID:	GTSL202105000269-1(Engineer sample)
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Antenna Type:	PCB antenna
Antenna gain:	0dBi
Power supply:	DC $\pm 15V$ from adapter (MODEL: QXA15-1515 V1.0; INPUT: AC 100-240V, 50/60Hz 0.5A; OUTPUT: DC $\pm 15V$ , 500mA)

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2441MHz
The Highest channel	2480MHz

## 5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Test software	BK32xx RFTest_V1.8.2.exe
Power level setting	3

*Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.*

## 5.3 Description of Support Units

None.

## 5.4 Deviation from Standards

None.

## 5.5 Abnormalities from Standard Conditions

None.

## 5.6 Test Facility

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

- **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383. Designation Number: CN5029.

- **IC —Registration No.: 9079A**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

## 5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

## 6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

# GTS

Report No.: GTS202105000269F01

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021
4	ENV216 2-L-V- NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 25 2020	June. 24 2021
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 25 2020	June. 24 2021
8	Absorbing clamp	Elektronik- Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	June. 25 2020	June. 24 2021
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	July. 10 2020	July. 09 2021

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021
9	Spectrum Analyzer	R&S	FSV40	GTS559	June. 25 2020	June. 24 2021

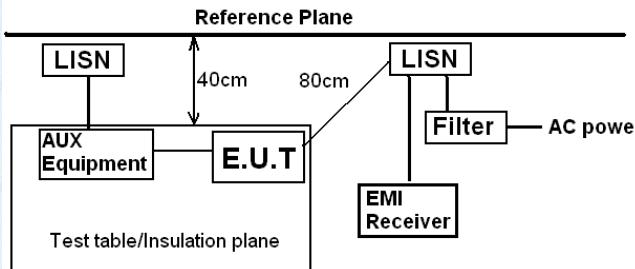
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

## 7 Test results and Measurement Data

### 7.1 Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
<b>15.203 requirement:</b> An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
<b>15.247(c) (1)(i) requirement:</b> (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
<b>E.U.T Antenna:</b> <i>The antenna is PCB antenna, the best case gain of the is 0dBi, reference to the appendix II for details</i>	

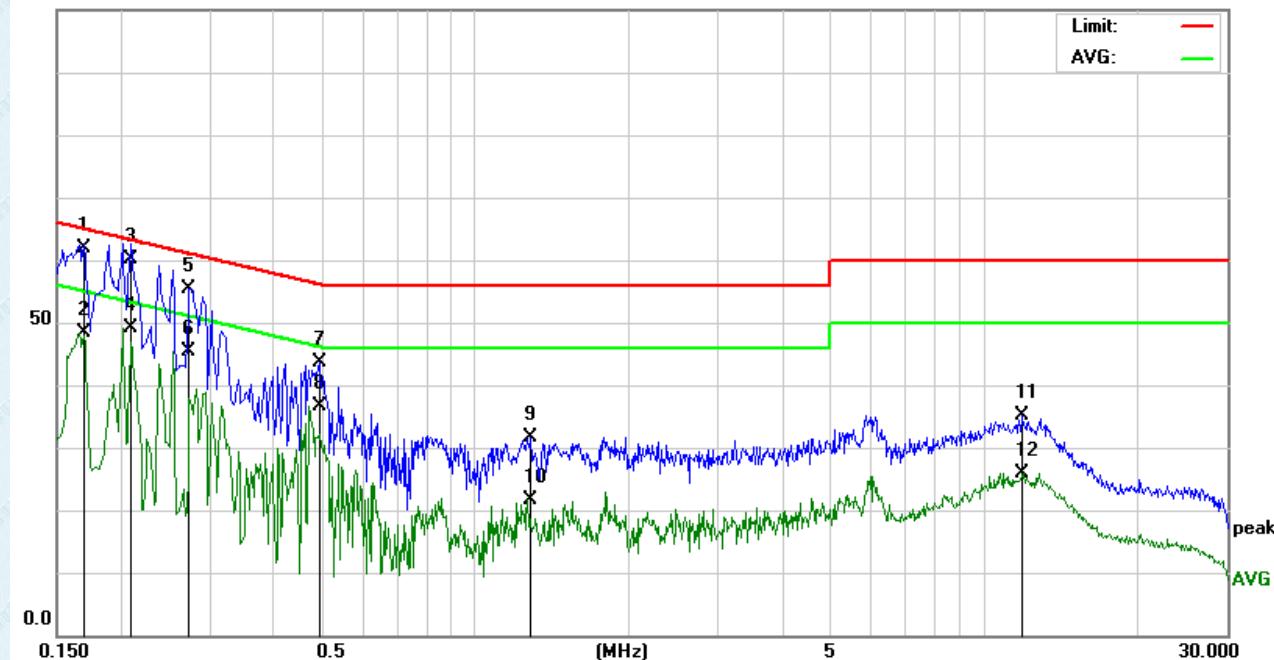
## 7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																
Test Method:	ANSI C63.10:2013																
Test Frequency Range:	150KHz to 30MHz																
Class / Severity:	Class B																
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>			Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																
	Quasi-peak	Average															
0.15-0.5	66 to 56*	56 to 46*															
0.5-5	56	46															
5-30	60	50															
	* Decreases with the logarithm of the frequency.																
Test setup:	 <p>Remark  <i>E.U.T: Equipment Under Test      LISN: Line Impedance Stabilization Network      Test table height=0.8m</i></p>																
Test procedure:	<ol style="list-style-type: none"> <li>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</li> </ol>																
Test Instruments:	Refer to section 6.0 for details																
Test mode:	Refer to section 5.2 for details																
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar											
Test voltage:	AC 120V, 60Hz																
Test results:	Pass																

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

**Measurement data:**
**Line:**

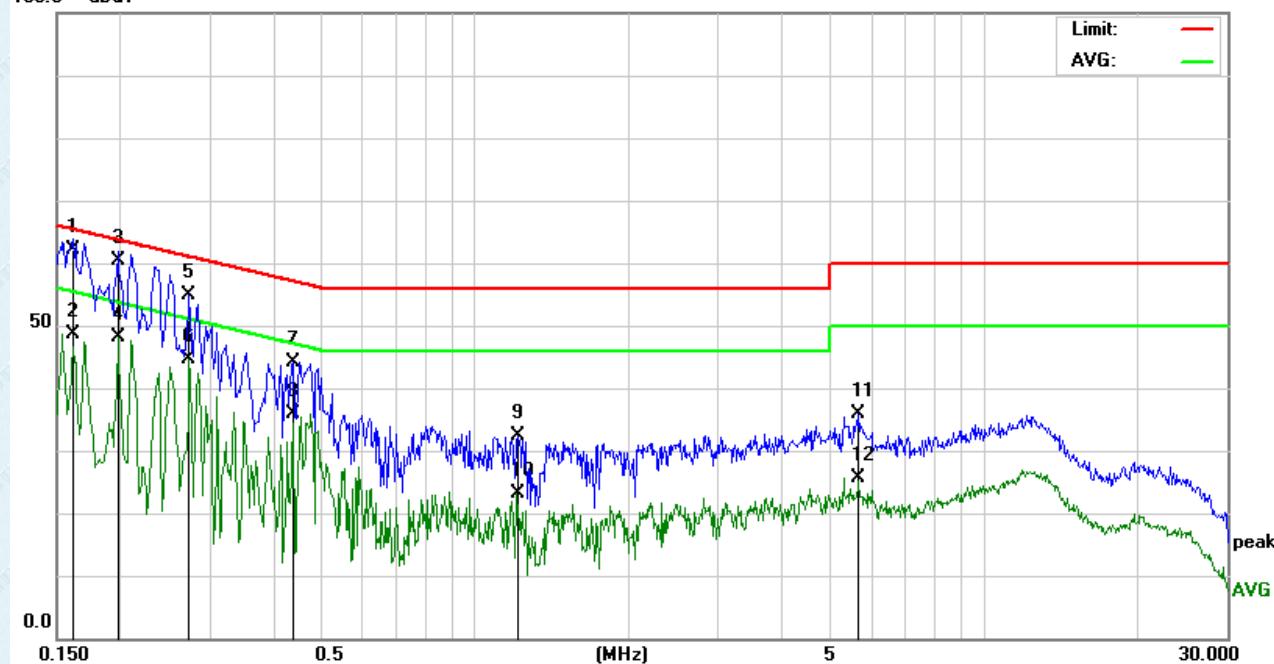
100.0 dBuV



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV	dB	Detector
1	*	0.1700	59.30	2.51	61.81	64.96	-3.15
2		0.1700	45.79	2.51	48.30	54.96	-6.66
3		0.2099	58.00	2.03	60.03	63.21	-3.18
4		0.2099	47.03	2.03	49.06	53.21	-4.15
5		0.2740	53.65	1.79	55.44	60.99	-5.55
6		0.2740	43.52	1.79	45.31	50.99	-5.68
7		0.4939	42.68	0.93	43.61	56.10	-12.49
8		0.4939	35.80	0.93	36.73	46.10	-9.37
9		1.2860	30.85	0.85	31.70	56.00	-24.30
10		1.2860	20.70	0.85	21.55	46.00	-24.45
11		11.9018	24.70	10.34	35.04	60.00	-24.96
12		11.9018	15.56	10.34	25.90	50.00	-24.10

**Neutral:**

100.0 dBuV

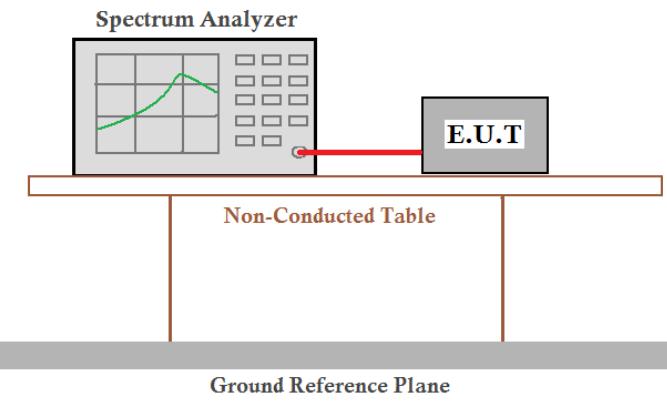


No.	Mk.	Freq.	Reading	Correct Factor	Measure-ment	Limit	Over
			Level				
		MHz	dBuV	dB	dBuV	dB	Detector
1	*	0.1620	50.50	11.68	62.18	65.36	-3.18
2		0.1620	36.86	11.68	48.54	55.36	-6.82
3		0.1980	49.20	11.16	60.36	63.69	-3.33
4		0.1980	36.89	11.16	48.05	53.69	-5.64
5		0.2740	44.14	10.81	54.95	60.99	-6.04
6		0.2740	33.78	10.81	44.59	50.99	-6.40
7		0.4380	34.16	10.08	44.24	57.10	-12.86
8		0.4380	25.90	10.08	35.98	47.10	-11.12
9		1.2139	22.32	9.95	32.27	56.00	-23.73
10		1.2139	13.24	9.95	23.19	46.00	-22.81
11		5.6619	25.67	10.11	35.78	60.00	-24.22
12		5.6619	15.50	10.11	25.61	50.00	-24.39

**Notes:**

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss

## 7.3 Conducted Peak Output Power

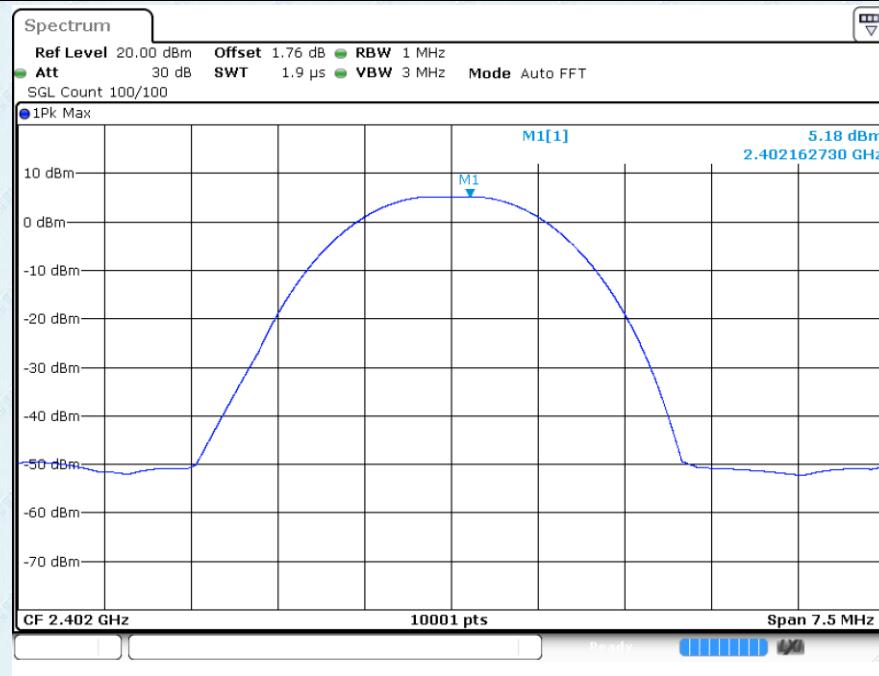
Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013
Limit:	30dBm(for GFSK),20.97dBm(for EDR)
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

### Measurement Data

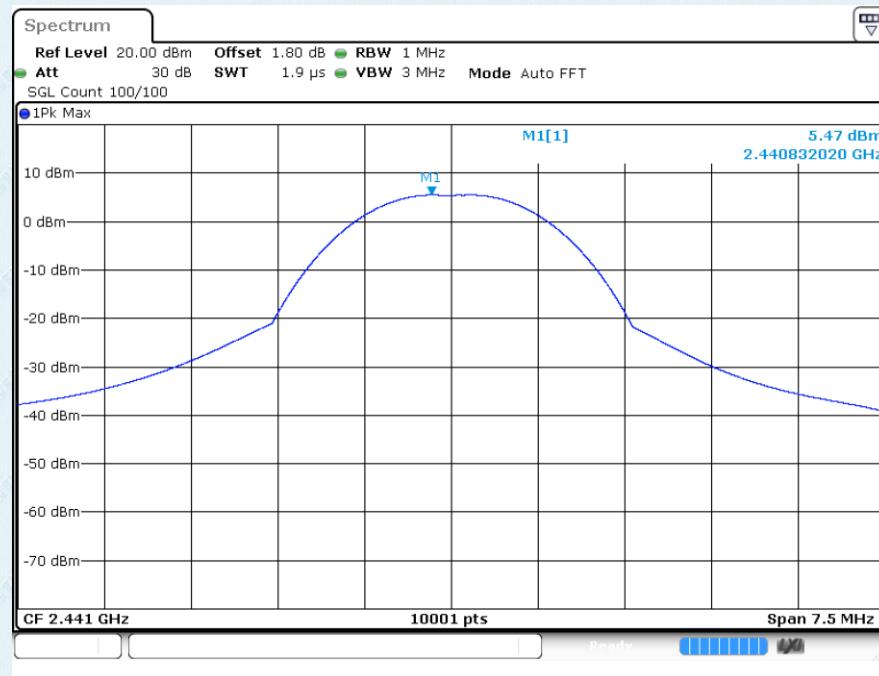
Mode	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
GFSK	Lowest	5.18	21.00	Pass
	Middle	5.47		
	Highest	5.77		
$\pi/4$ -DQPSK	Lowest	2.86	21.00	Pass
	Middle	2.92		Pass
	Highest	3.12		Pass
8-DPSK	Lowest	2.92	21.00	Pass
	Middle	2.23		
	Highest	3.40		

**Test plot as follows:**

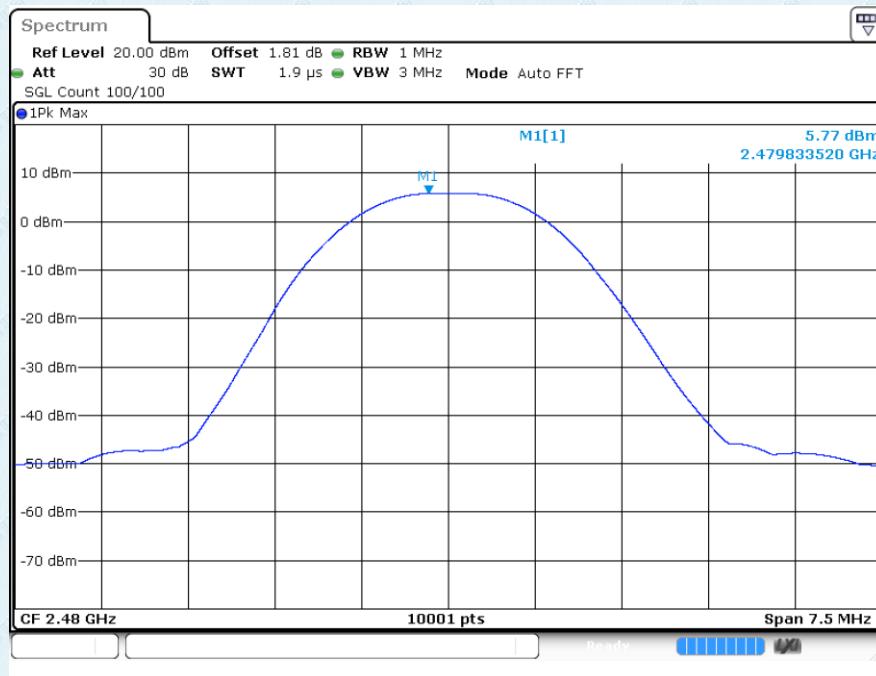
Test mode:	GFSK mode
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Lowest channel



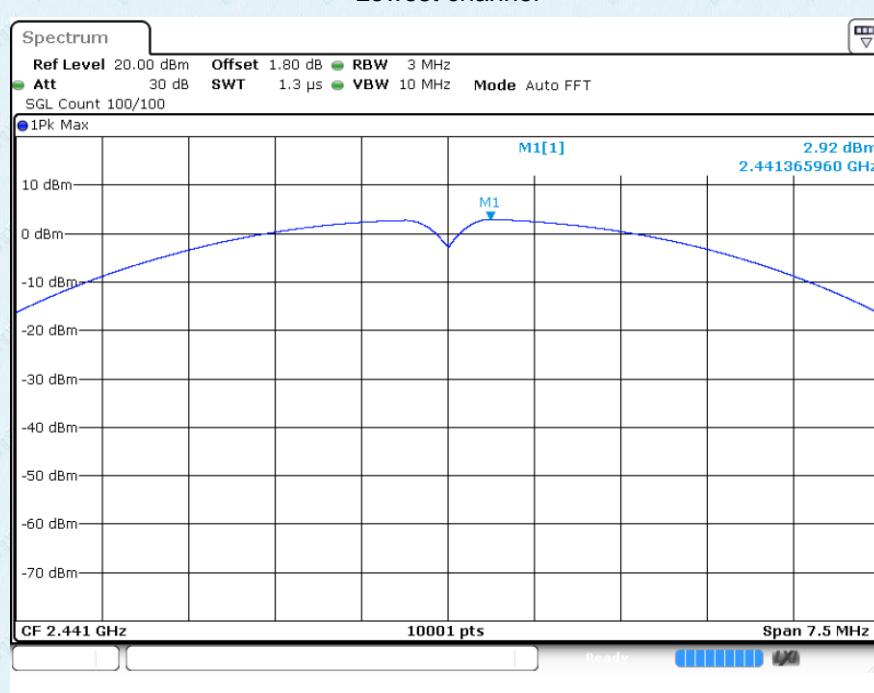
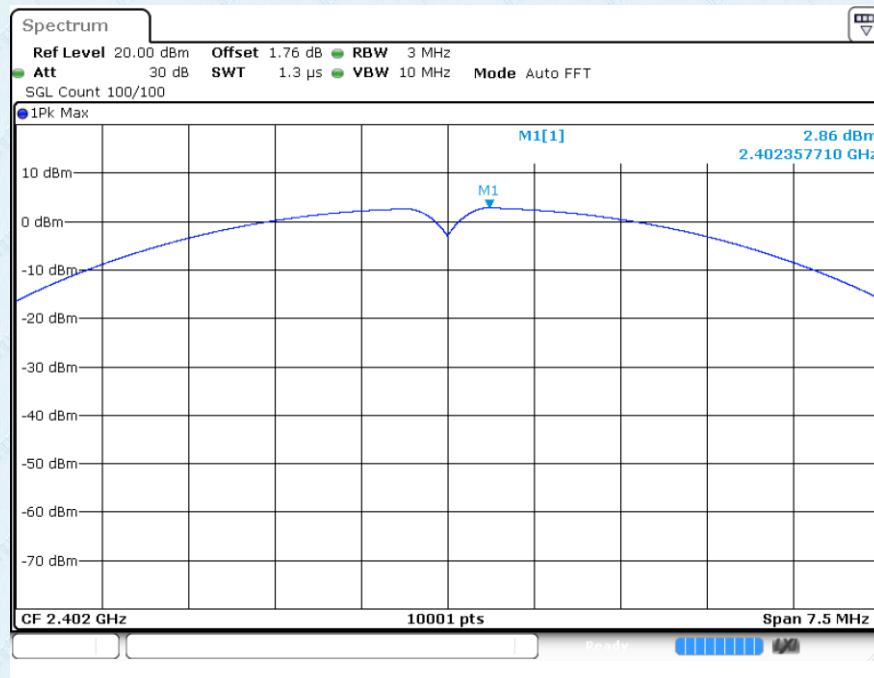
Middle channel

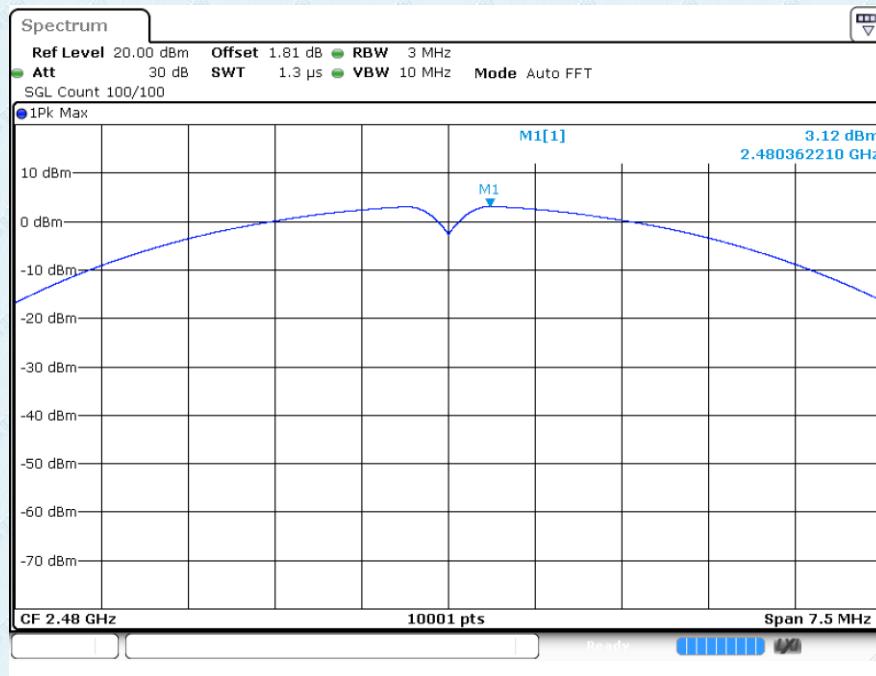


Highest channel

Test mode:

$\pi/4$ -DQPSK mode

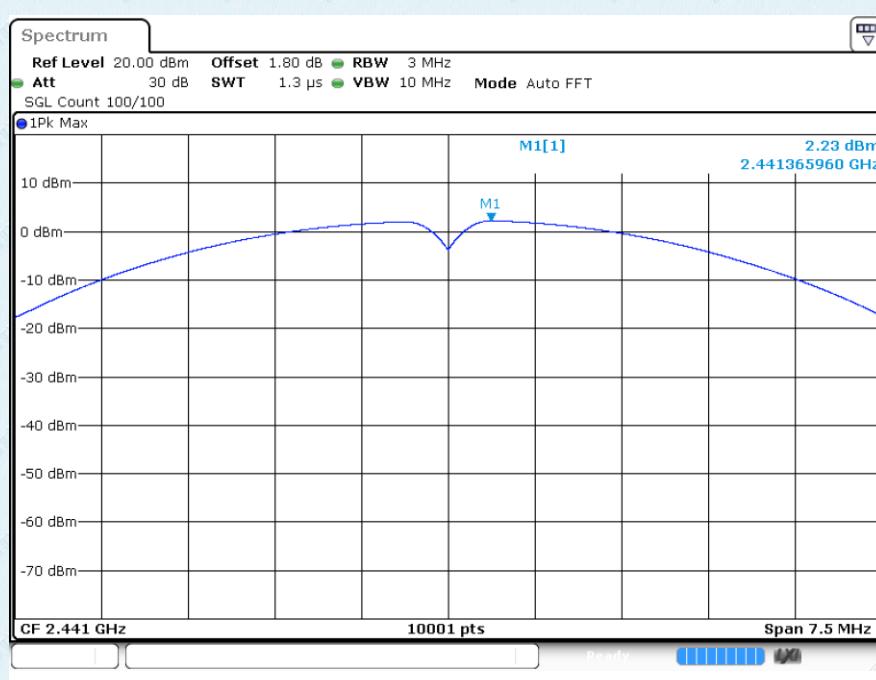
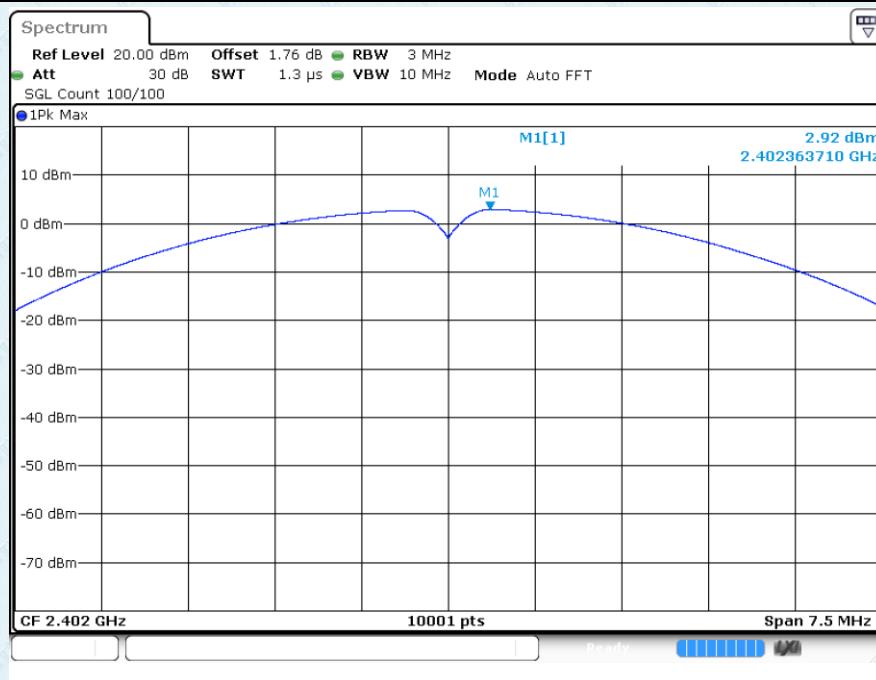


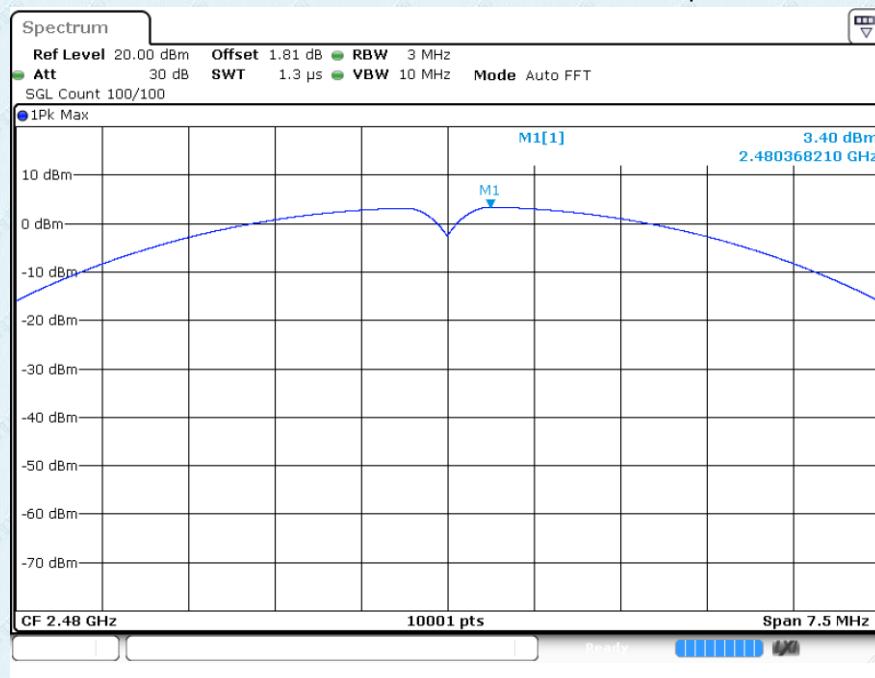


Highest channel

Test mode:

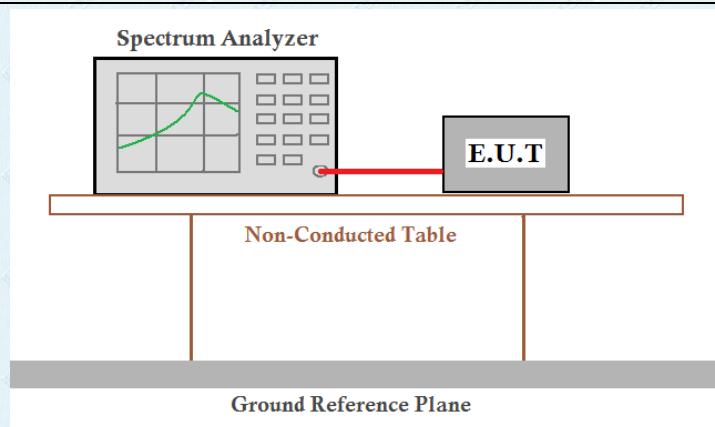
8-DPSK mode





Highest channel

## 7.4 20dB Emission Bandwidth

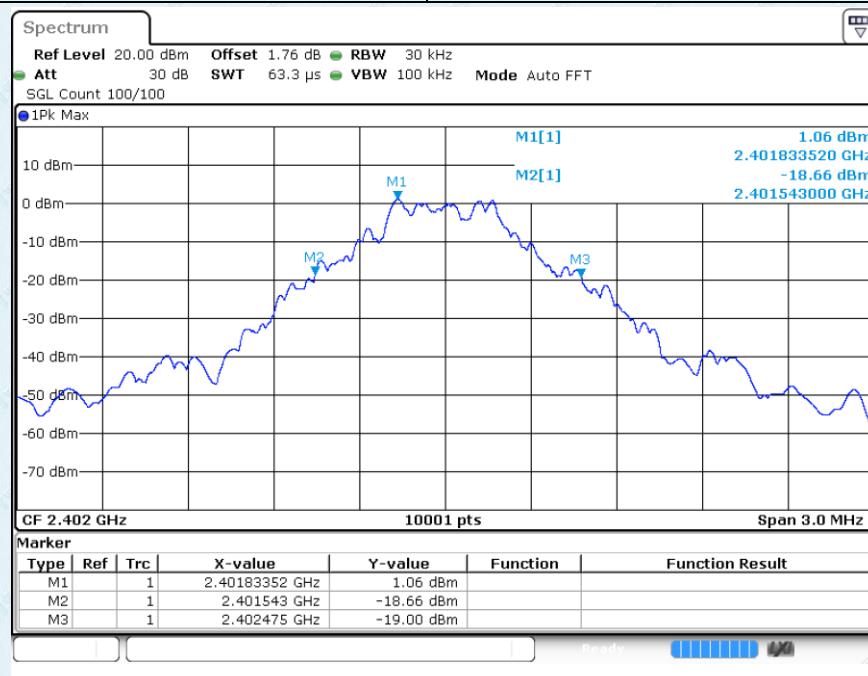
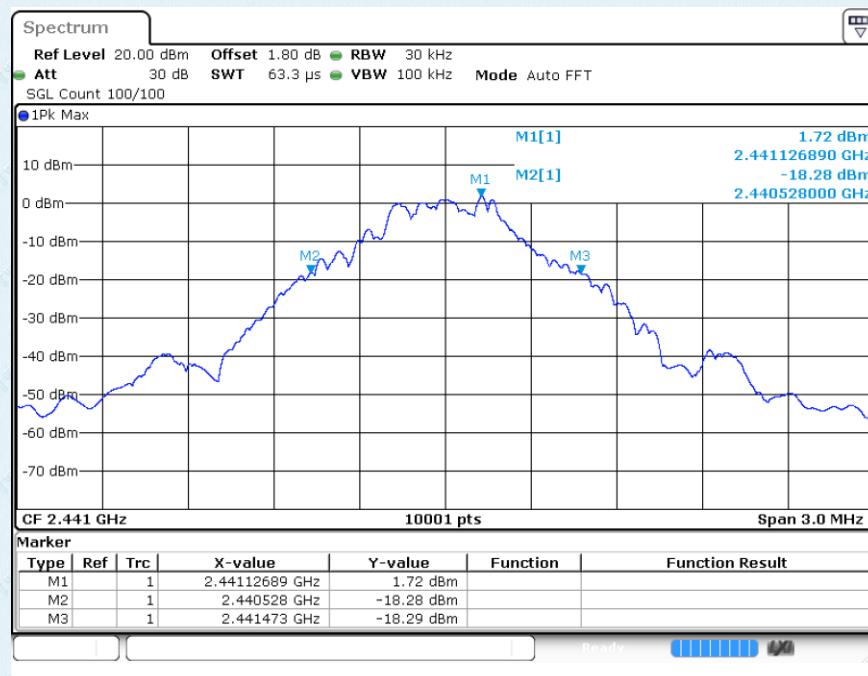
Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	<p>Pass</p> <p>All modulation types had been verified and record the worst case.</p>

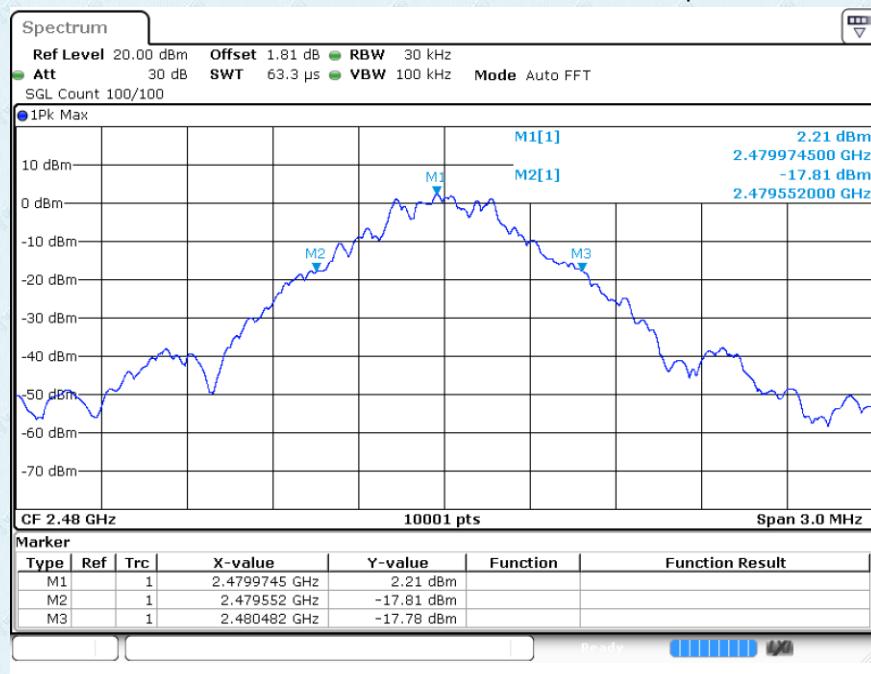
### Measurement Data

Mode	Test channel	20dB Emission Bandwidth (MHz)	Result
GFSK	Lowest	0.932	Pass
	Middle	0.945	
	Highest	0.930	
8-DPSK	Lowest	1.289	Pass
	Middle	1.281	
	Highest	1.296	

**Test plot as follows:**

Test mode:	GFSK mode
------------	-----------

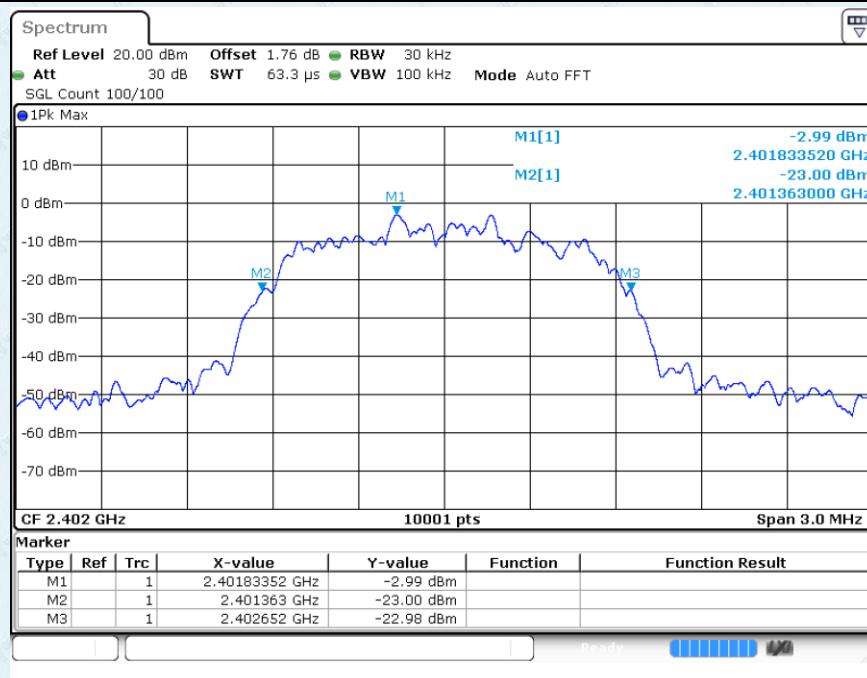

**Lowest channel**

**Middle channel**



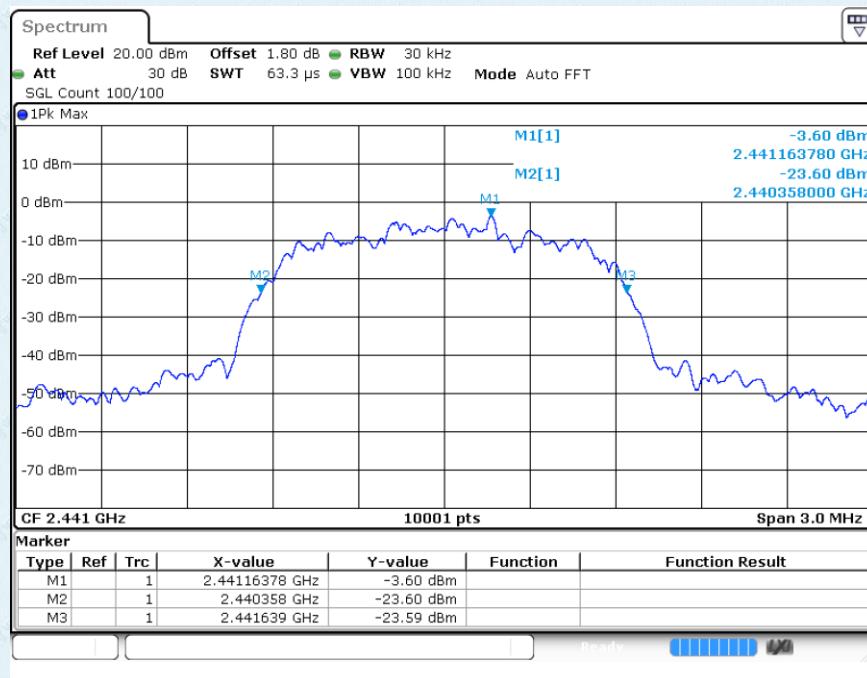
Highest channel

Test mode:

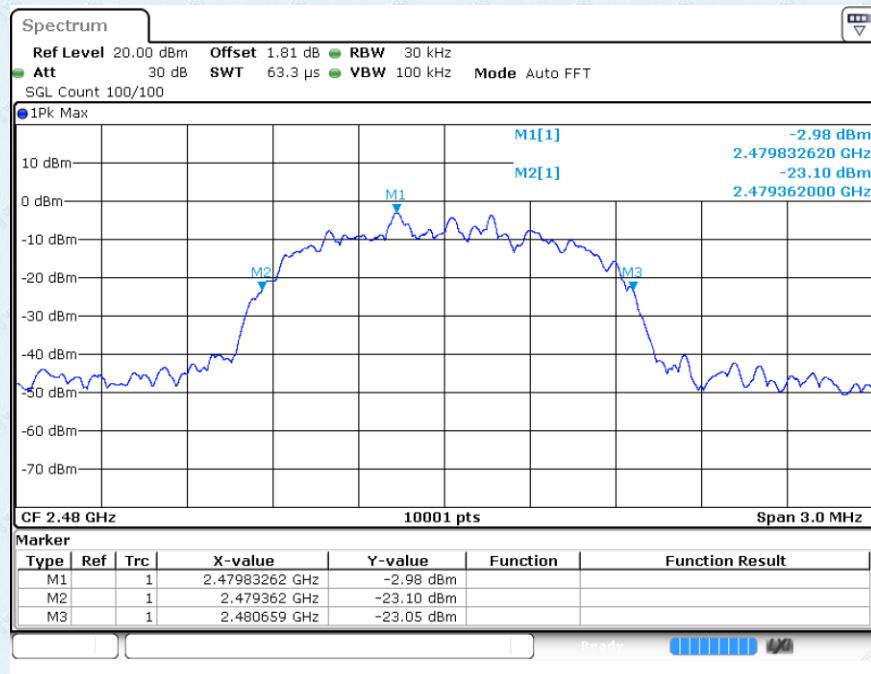
8-DPSK mode



Lowest channel

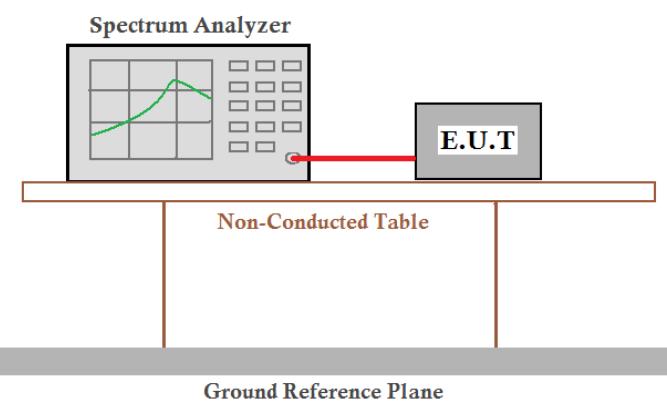


Middle channel



Highest channel

## 7.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	GFSK: 20dB bandwidth $\pi/4$ -DQPSK & 8DSK: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass All modulation types had been verified and record the worst case.

### Measurement Data

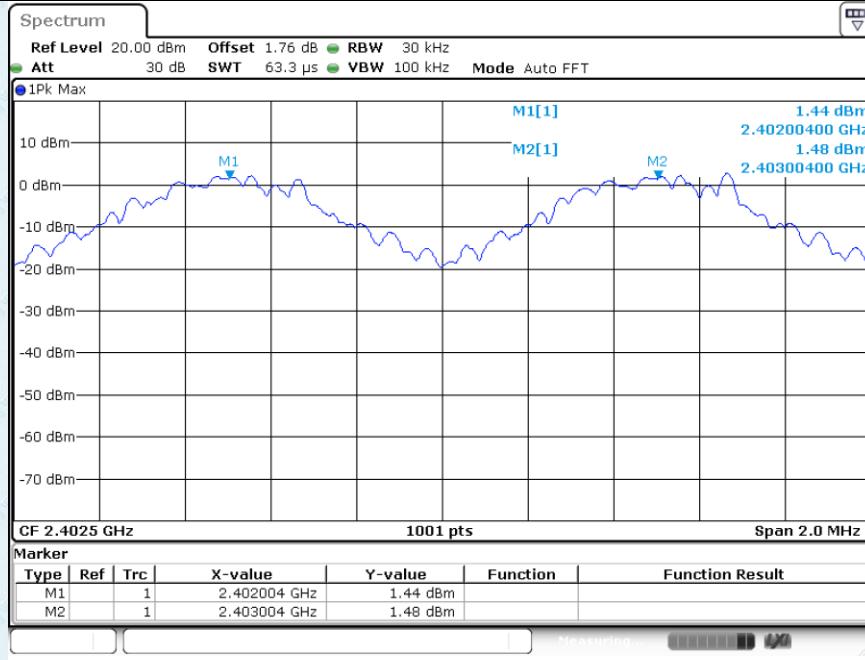
Mode	Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
GFSK	Lowest	1000	630.0	Pass
	Middle	992	630.0	Pass
	Highest	1000	630.0	Pass
8-DPSK	Lowest	849	864.0	Pass
	Middle	1002	864.0	Pass
	Highest	1002	864.0	Pass

Note: According to section 7.4

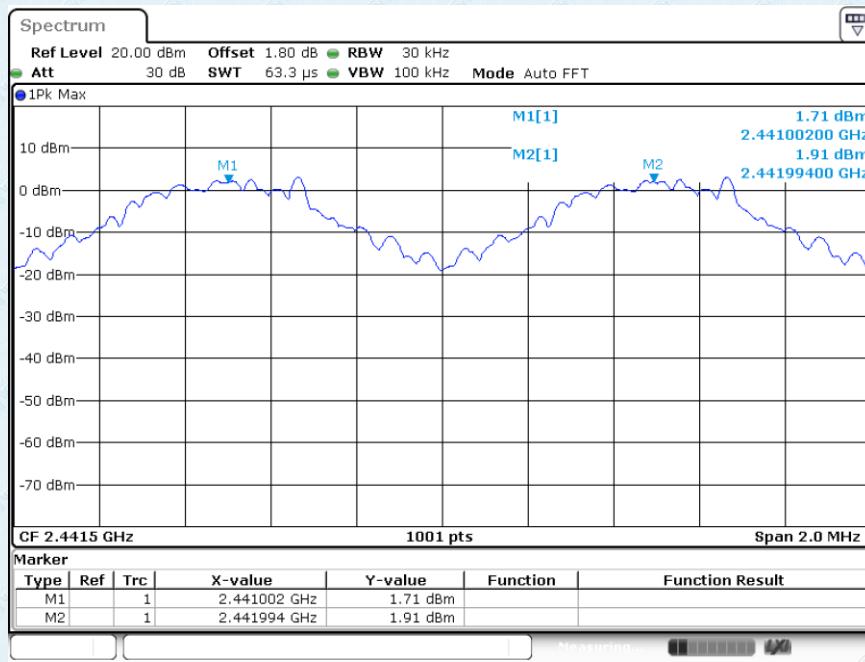
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	945	630.0
8-DPSK	1296	864.0

**Test plot as follows:**

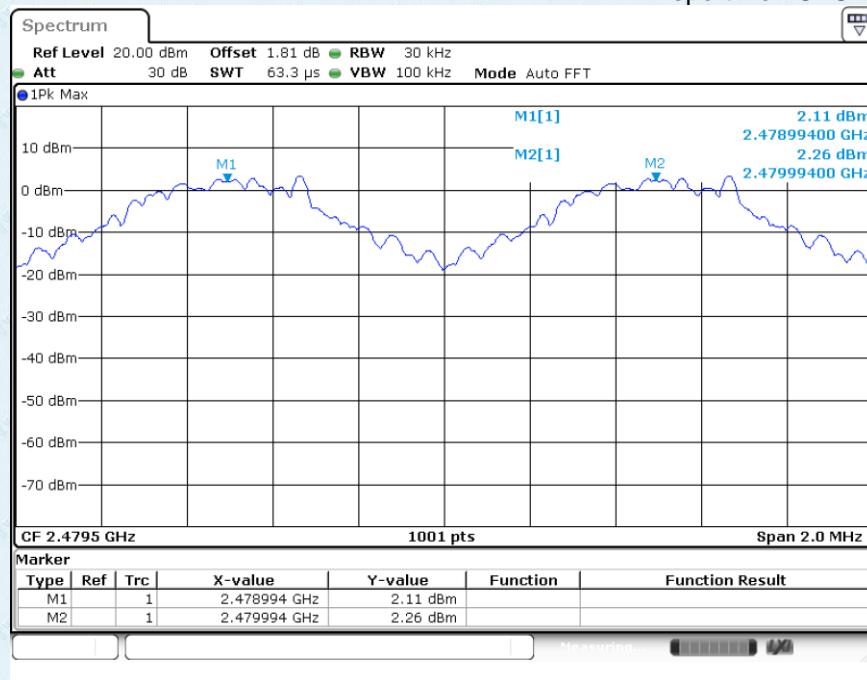
Modulation mode:	GFSK
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Lowest channel



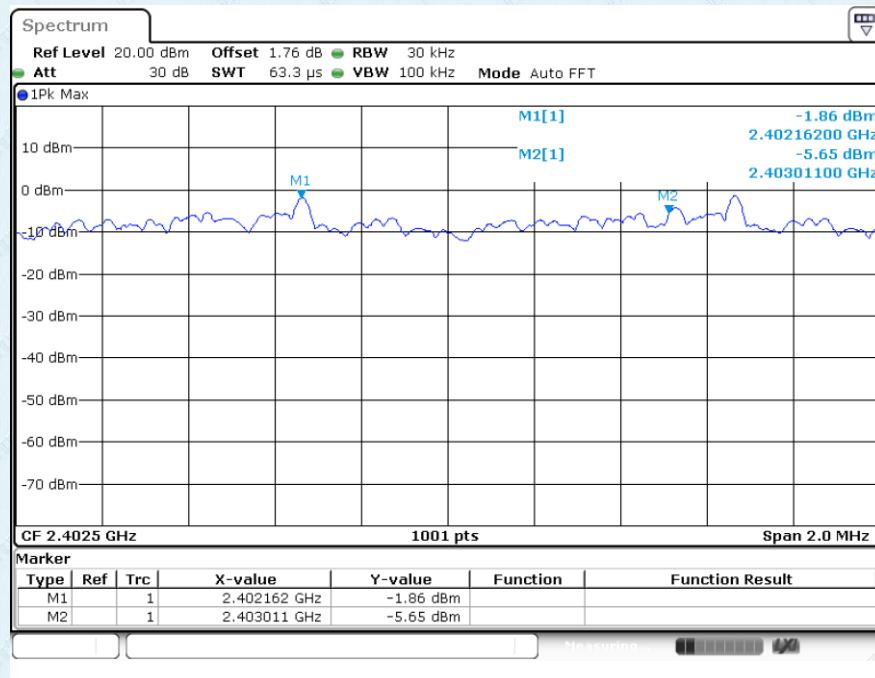
Middle channel



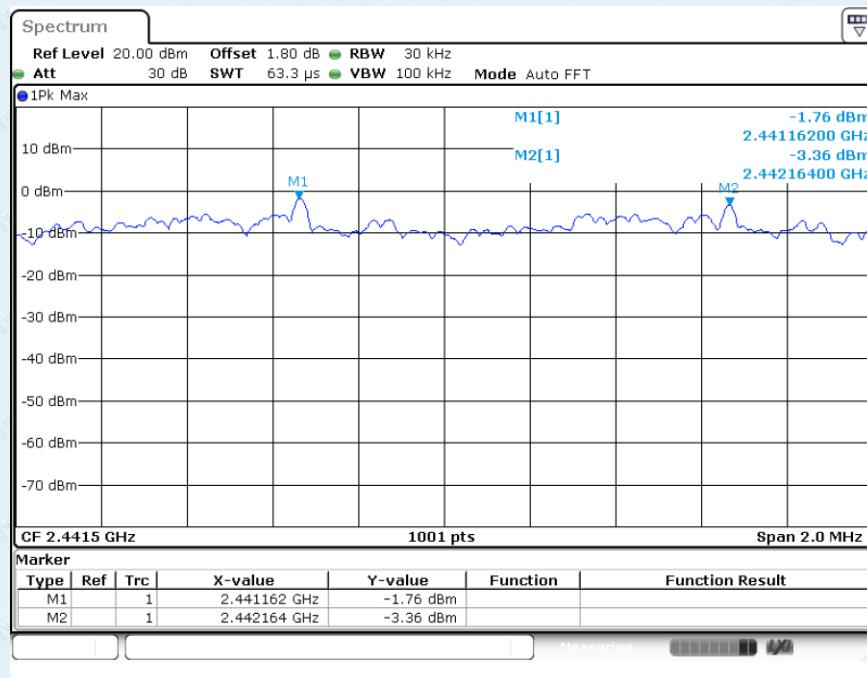
Highest channel

Test mode:

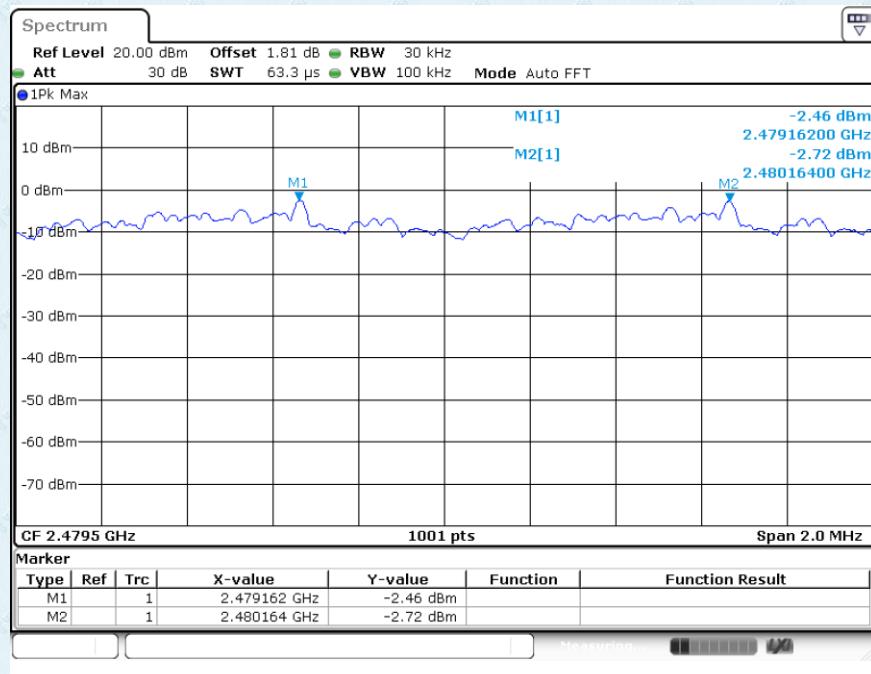
8-DPSK



Lowest channel

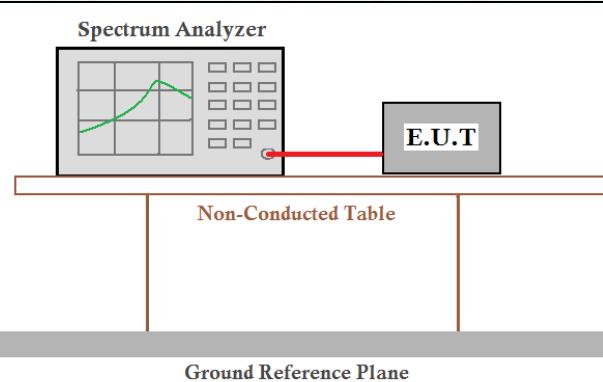


Middle channel



Highest channel

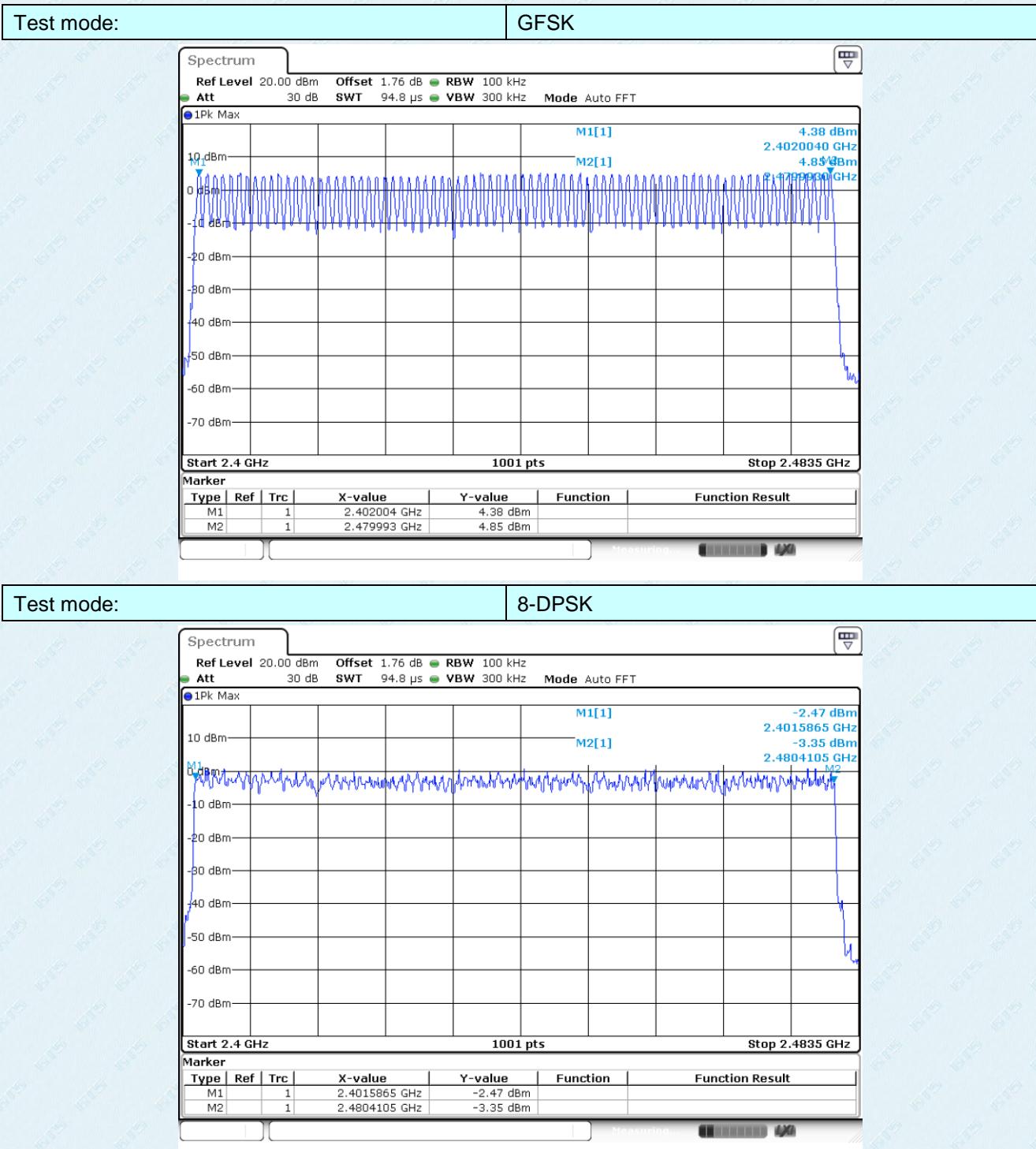
## 7.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass All modulation types had been verified and record the worst case.

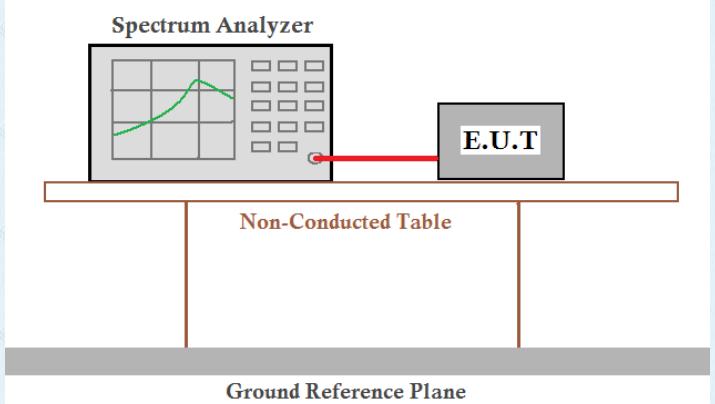
### Measurement Data:

Mode	Hopping channel numbers	Limit	Result
GFSK	79	$\geq 15\text{CH}$	Pass
8-DPSK	79	$\geq 15\text{CH}$	Pass

Test plot as follows:



## 7.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass All modulation types had been verified and record the worst case.

# GTS

Report No.: GTS202105000269F01

## Measurement Data

### GFSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2402MHz	DH1	122.560	400	Pass
2402MHz	DH3	262.240	400	Pass
2402MHz	DH5	307.947	400	Pass

Remarks:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

Test channel: 2402MHz as blow

DH1 time slot=0.383(ms)\*(1600/ (2\*79))\*31.6

DH3 time slot=1.639(ms)\*(1600/ (4\*79))\*31.6

DH5 time slot=2.887(ms)\*(1600/ (6\*79))\*31.6

### 8-DPSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2402MHz	3DH1	123.200	400	Pass
2402MHz	3DH3	261.760	400	Pass
2402MHz	3DH5	123.200	400	Pass

Remarks:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

Test channel: 2402MHz as blow

DH1 time slot=0.385(ms)\*(1600/ (2\*79))\*31.6

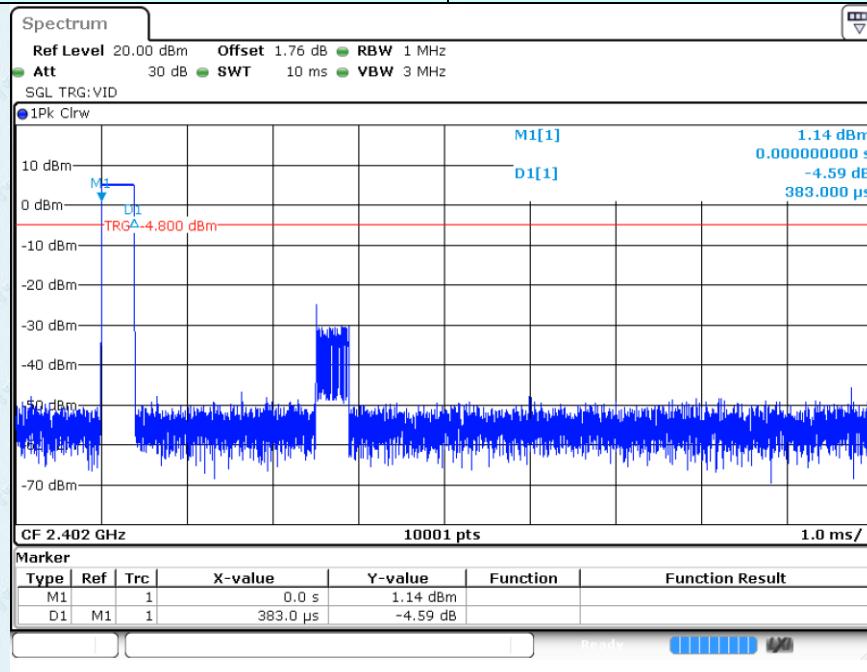
DH3 time slot=1.636(ms)\*(1600/ (4\*79))\*31.6

DH5 time slot=2.887(ms)\*(1600/ (6\*79))\*31.6

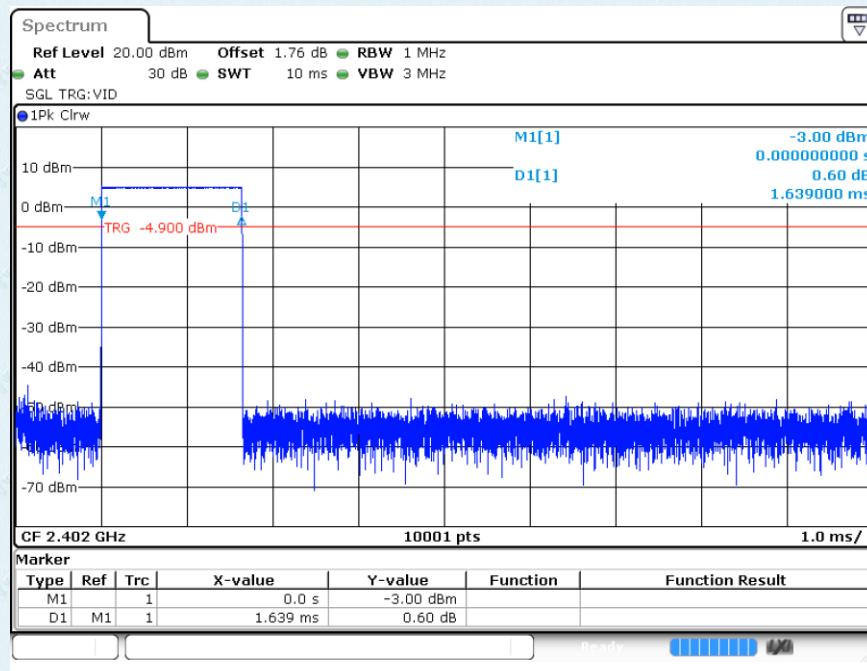
**Test plot as follows:**

**GFSK mode:**

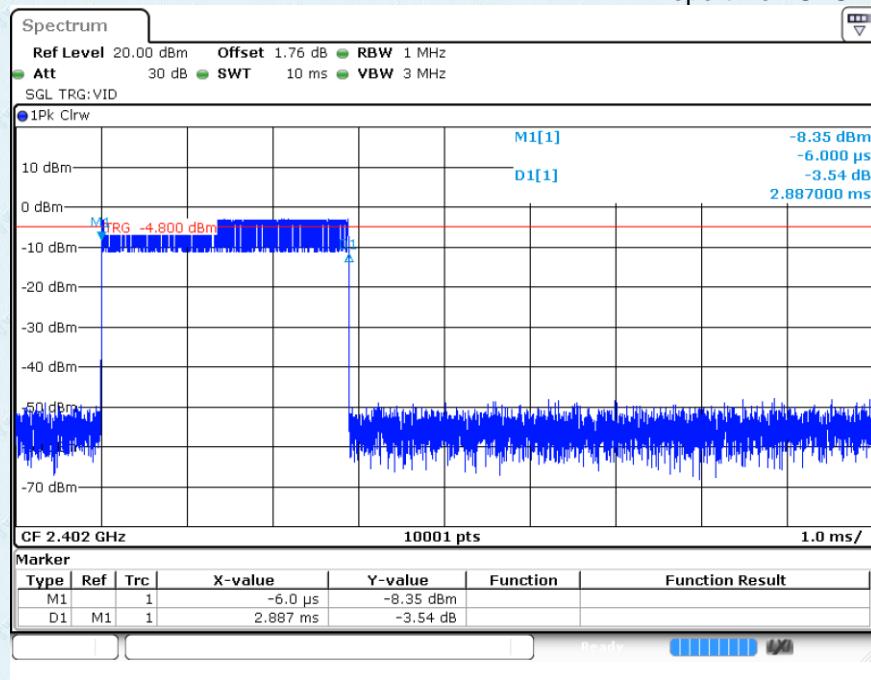
Test channel:	2402MHz
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DH1



DH3

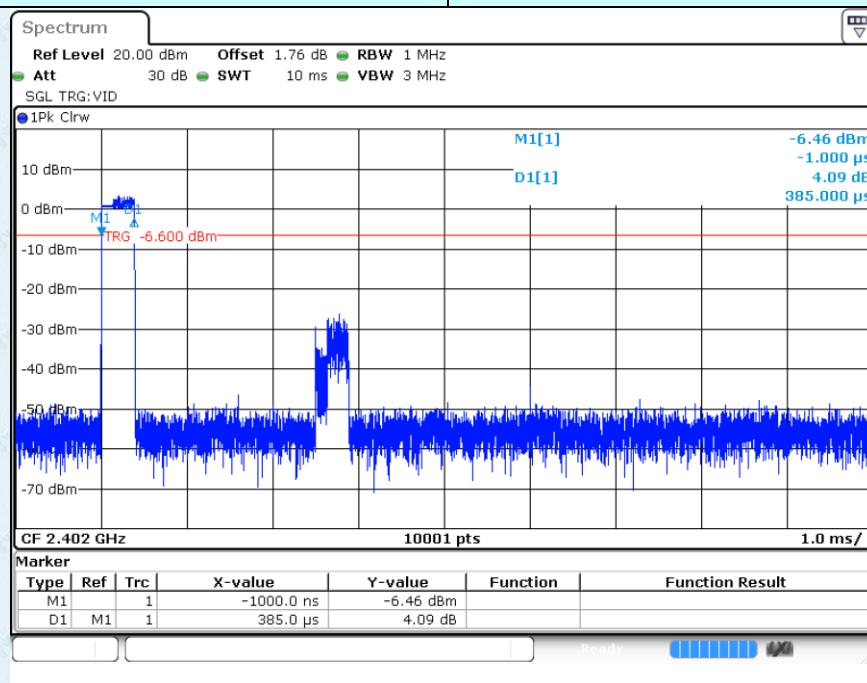


DH5

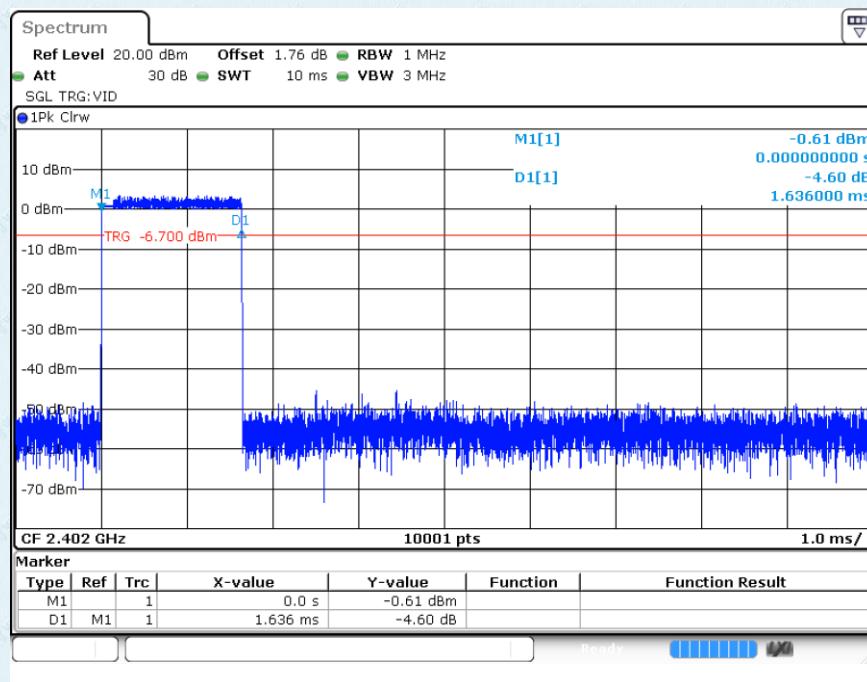
**8-DPSK mode:**

Test channel:

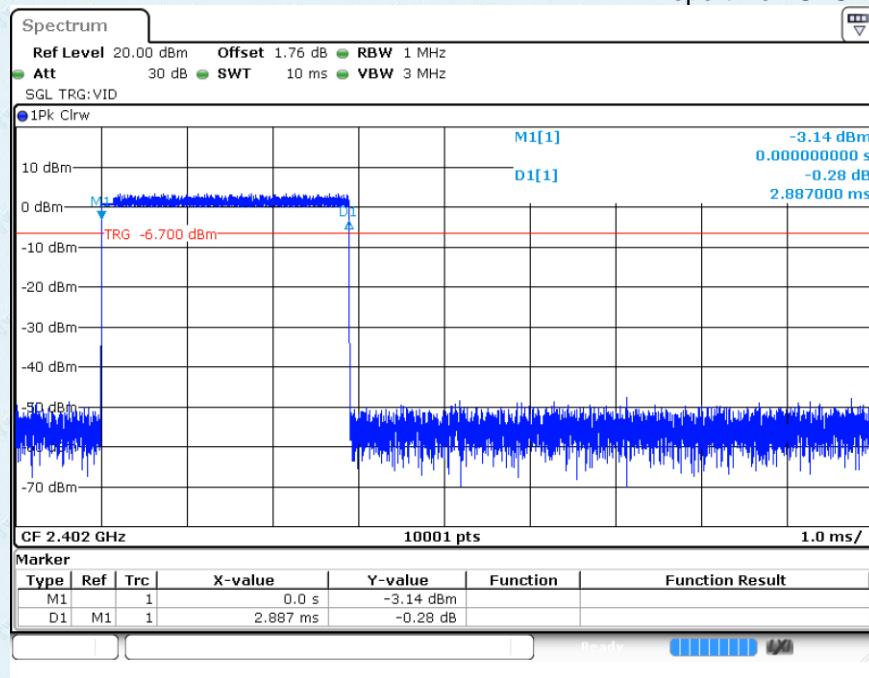
2402MHz



DH1



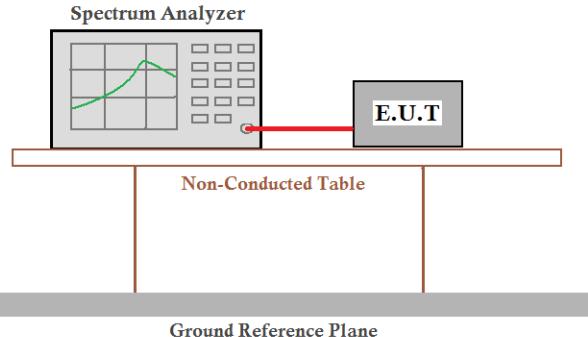
DH3



DH5

## 7.8 Band Edge

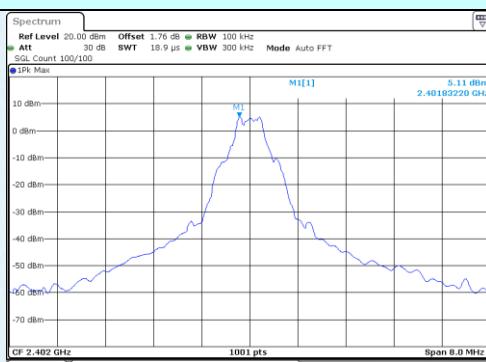
### 7.8.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass All modulation types had been verified and record the worst case.

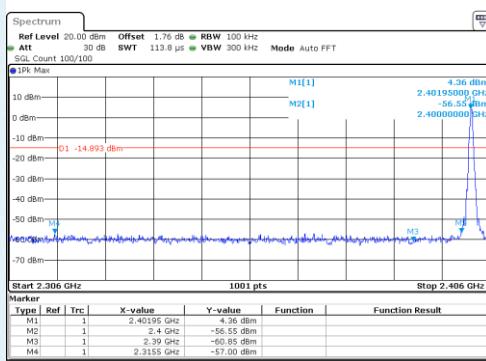
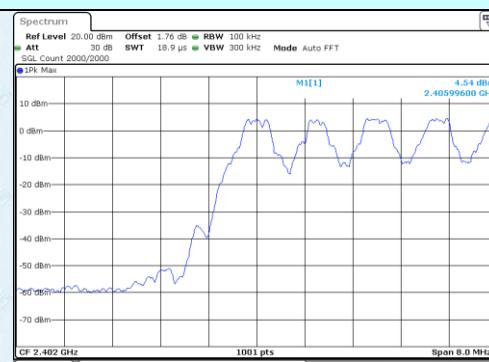
**Test plot as follows:**

**GFSK Mode:**

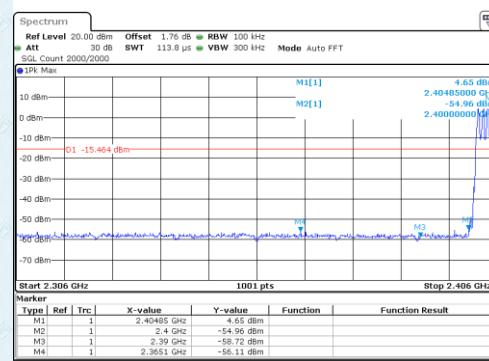
Test channel:



Lowest channel

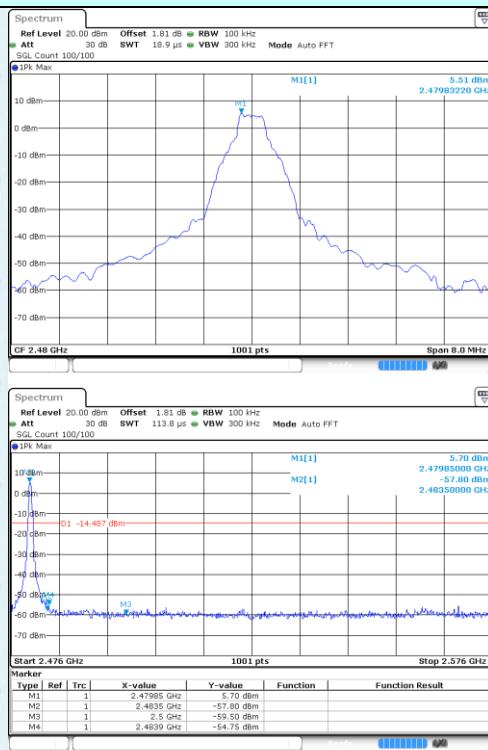


No-hopping mode



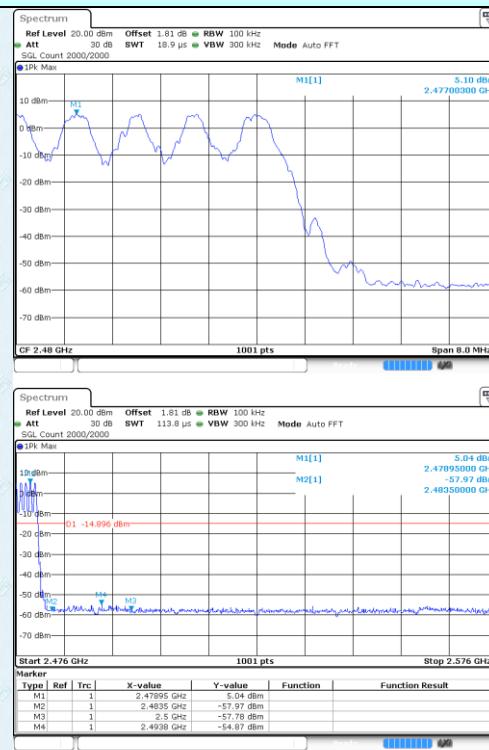
Hopping mode

## Test channel:



No-hopping mode

## Highest channel

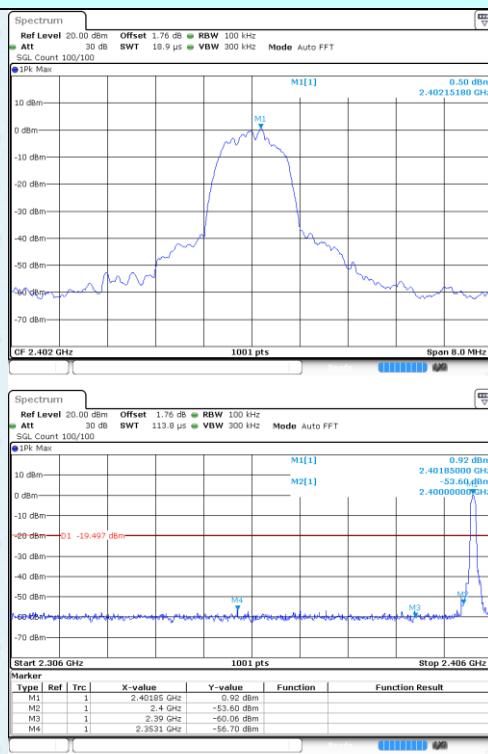


Hopping mode

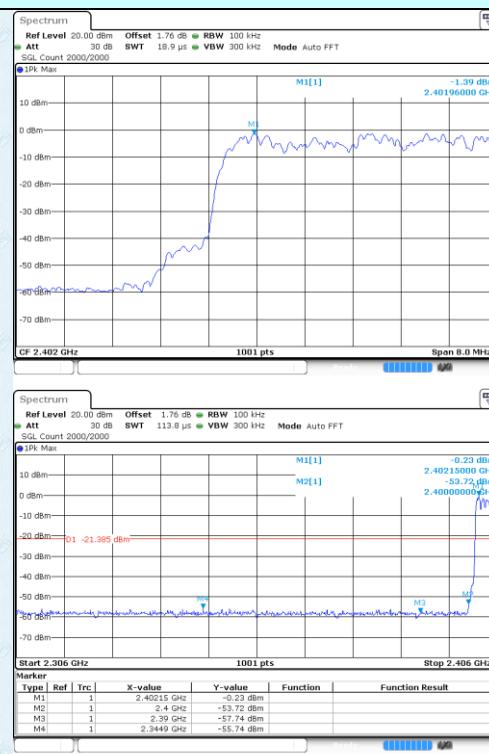
## 8-DPSK Mode:

Test channel:

Lowest channel

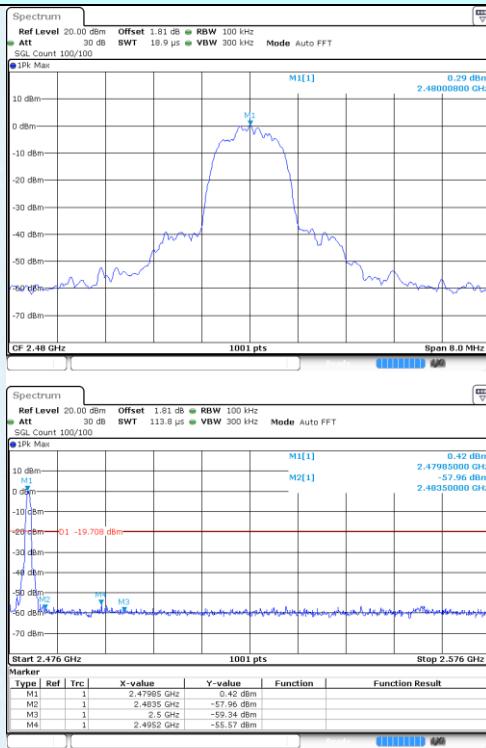


No-hopping mode



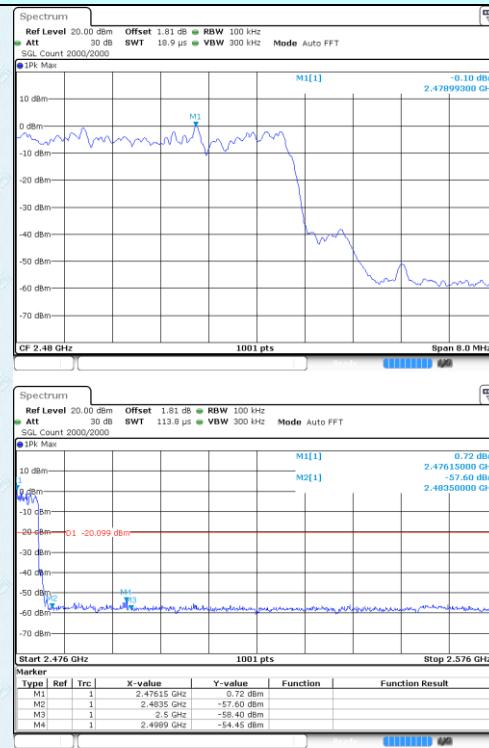
Hopping mode

## Test channel:



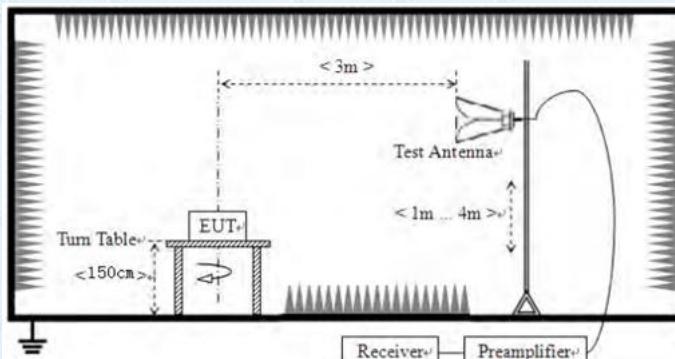
No-hopping mode

## Highest channel



Hopping mode

## 7.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205								
Test Method:	ANSI C63.10:2013								
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.								
Test site:	Measurement Distance: 3m								
Receiver setup:	Frequency	Detector	RBW	VBW	Remark				
	Above 1GHz	Peak	1MHz	3MHz	Peak Value				
		Peak	1MHz	1/T	Average Value				
Limit:	Frequency	Limit (dBuV/m @3m)		Remark					
	Above 1GHz	54.00		Average Value					
		74.00		Peak Value					
Test setup:									
Test Procedure:	<ol style="list-style-type: none"> <li>The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> </ol>								
Test Instruments:	Refer to section 6.0 for details								
Test mode:	Refer to section 5.2 for details								
Test results:	Pass								

## Measurement Data

Test channel:	Lowest channel
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**Vertical:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2400.000	58.08	-5.70	52.38	74.00	-21.62	
2400.000	43.64	-5.70	37.94	54.00	-16.06	AVG

**Horizontal:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2400.000	61.03	-5.70	55.33	74.00	-18.67	
2400.000	45.44	-5.70	39.74	54.00	-14.26	AVG

Test channel:	Highest channel
---------------	-----------------

**Vertical:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2483.500	49.96	-4.98	44.98	74.00	-29.02	
2483.500	40.00	-4.98	35.02	54.00	-18.98	AVG

**Horizontal:**

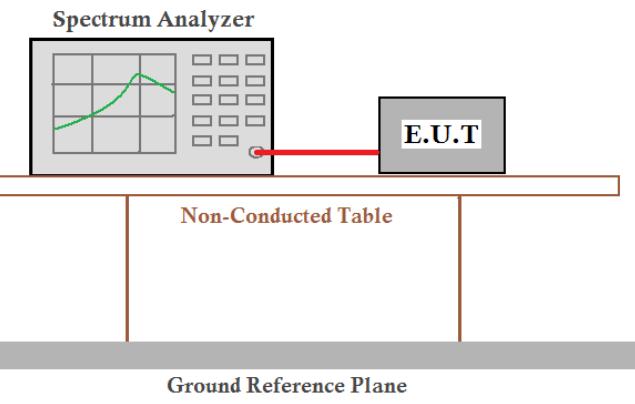
Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2483.500	51.25	-4.98	46.27	74.00	-27.73	
2483.500	42.23	-4.98	37.25	54.00	-16.75	AVG

**Remarks:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.
4. During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.

## 7.9 Spurious Emission

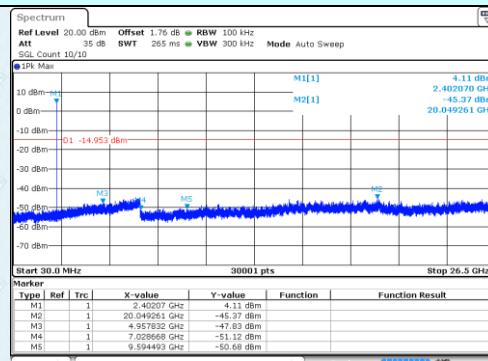
### 7.9.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup for conducted emission. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a cable. The E.U.T is placed on a Non-Conducted Table. The entire setup is positioned above a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	<p>Pass</p> <p>All modulation types had been verified and record the worst case.</p>

GFSK mode:

Test channel:

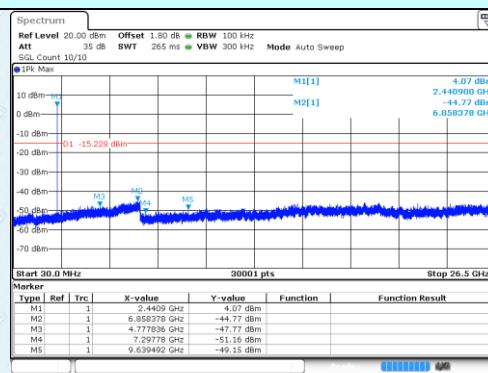
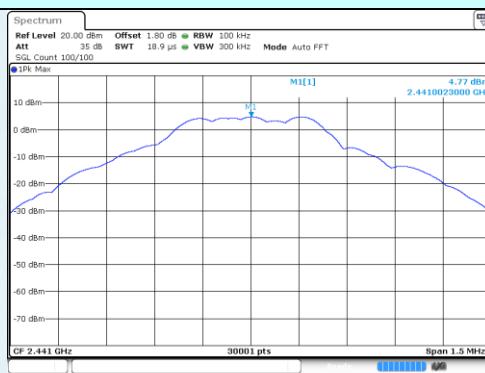
Lowest channel



30MHz~25GHz

Test channel:

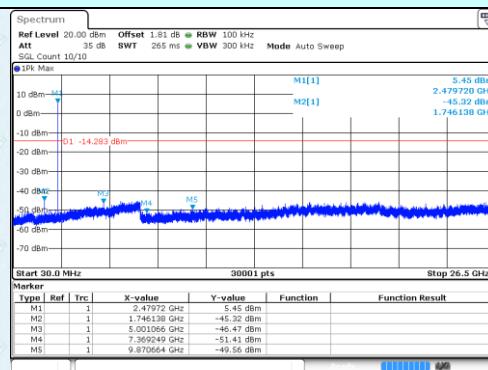
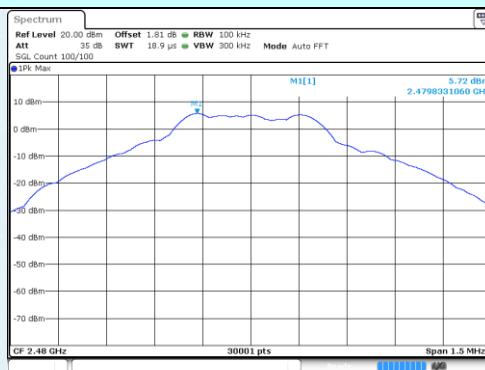
Middle channel



30MHz~25GHz

Test channel:

Highest channel

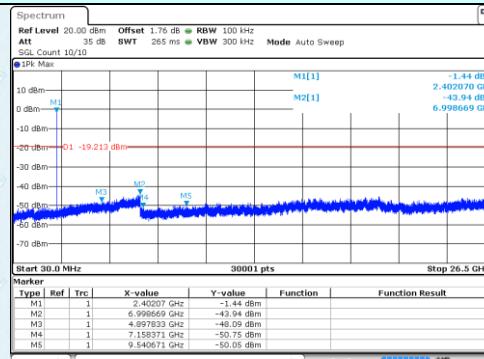
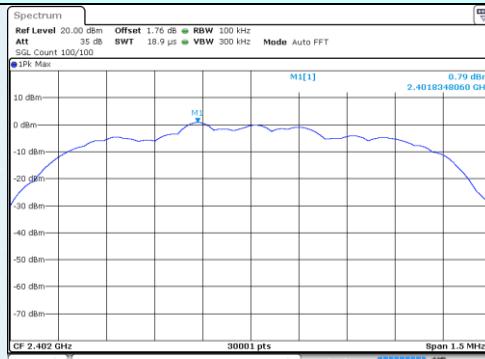


30MHz~25GHz

8-DPSK mode:

Test channel:

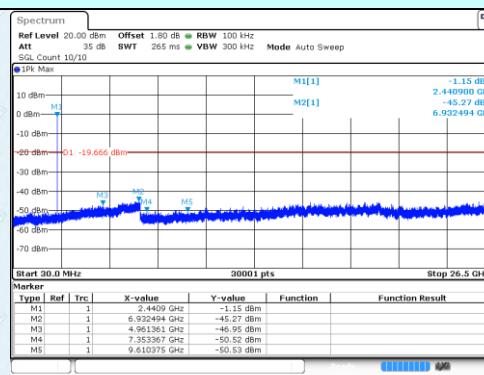
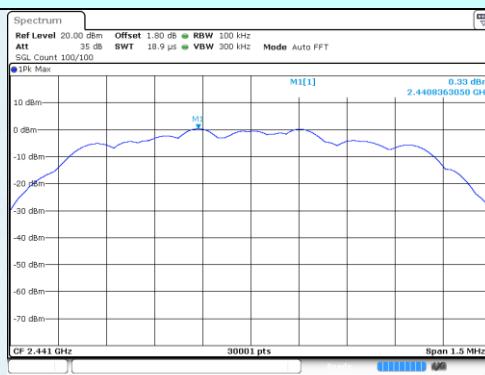
Lowest channel



30MHz~25GHz

Test channel:

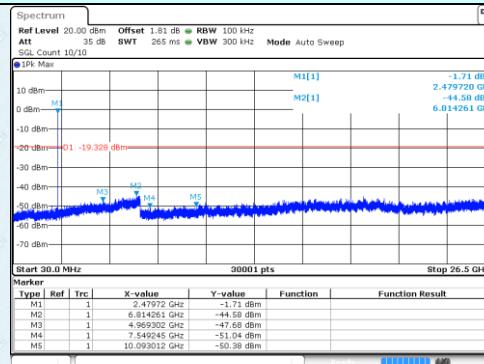
Middle channel



30MHz~25GHz

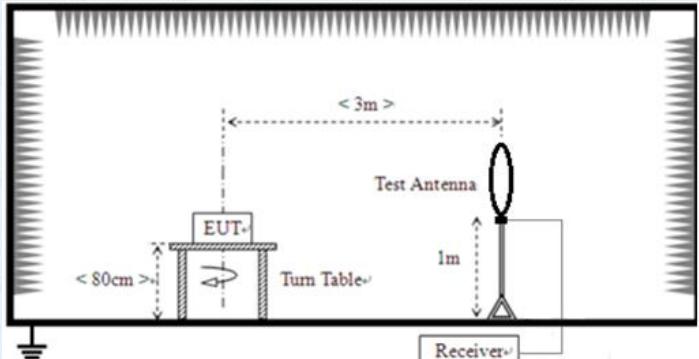
Test channel:

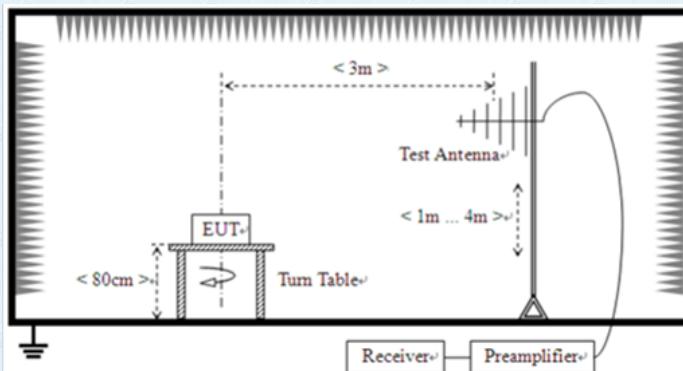
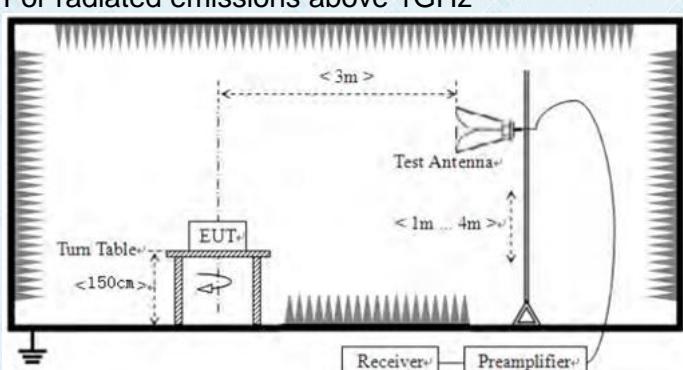
Highest channel



30MHz~25GHz

## 7.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209						
Test Method:	ANSI C63.10:2013						
Test Frequency Range:	9kHz to 25GHz						
Test site:	Measurement Distance: 3m						
Receiver setup:	Frequency	Detector	RBW	VBW	Value		
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak		
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak		
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak		
	Above 1GHz	Peak	1MHz	3MHz	Peak		
		Peak	1MHz	1/T	Average		
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance			
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m			
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m			
	1.705MHz-30MHz	30	QP	30m			
	30MHz-88MHz	100	QP	3m			
	88MHz-216MHz	150	QP				
	216MHz-960MHz	200	QP				
	960MHz-1GHz	500	QP				
	Above 1GHz	500	Average				
		5000	Peak				
Test setup:	For radiated emissions from 9kHz to 30MHz						
							

<p>For radiated emissions from 30MHz to1GHz</p> 	
<p>For radiated emissions above 1GHz</p> 	
Test Procedure:	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> </ol>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details

# GTS

Report No.: GTS202105000269F01

Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

## Measurement data:

### Remarks:

1. During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.
2. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

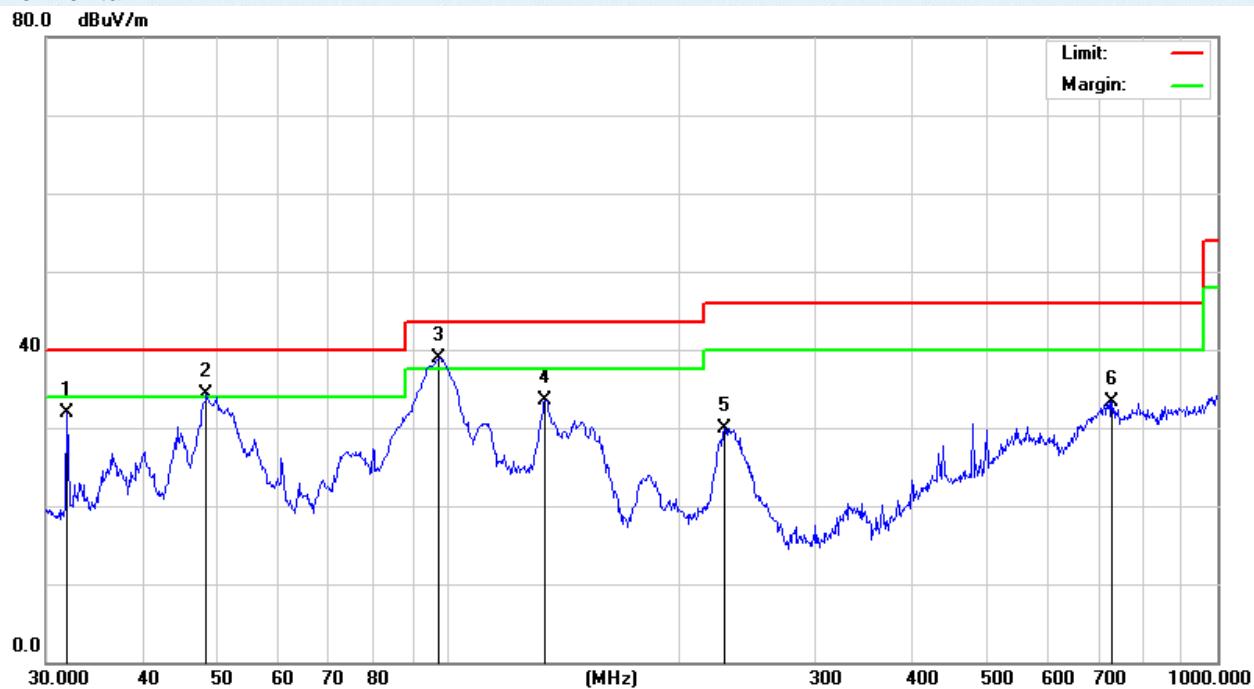
### ■ 9kHz~30MHz

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

## ■ Below 1GHz

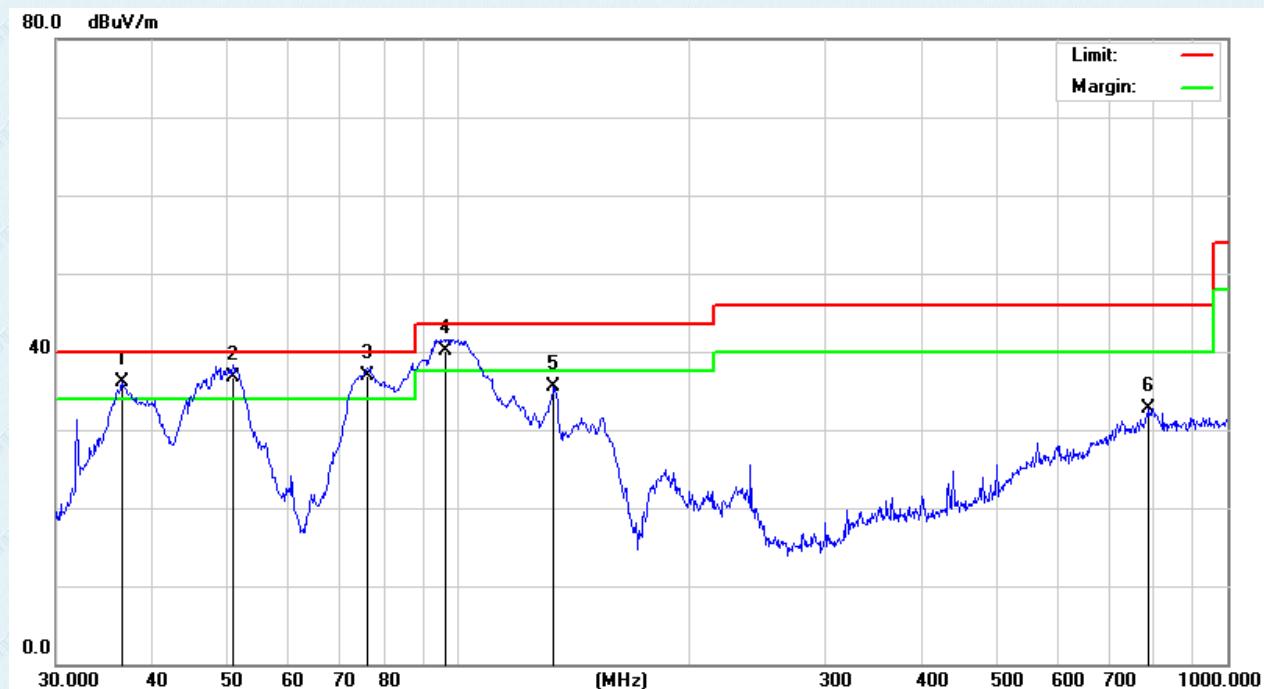
Pre-scan all test modes, found worst case at GFSK 2480MHz, and so only show the test result of GFSK 2480MHz

### Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		31.9546	35.95	-4.01	31.94	40.00	-8.06	peak
2	!	48.5016	37.35	-3.05	34.30	40.00	-5.70	peak
3	*	97.1148	47.17	-8.17	39.00	43.50	-4.50	peak
4		133.6188	41.33	-7.75	33.58	43.50	-9.92	peak
5		228.4904	36.30	-6.46	29.84	46.00	-16.16	peak
6		729.3583	26.22	7.16	33.38	46.00	-12.62	peak

Vertical:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	!	36.5092	40.72	-4.62	36.10	40.00	-3.90	QP
2	!	50.9420	42.90	-6.14	36.76	40.00	-3.24	QP
3	*	76.2442	47.40	-10.53	36.87	40.00	-3.13	QP
4	!	96.0986	49.60	-9.48	40.12	43.50	-3.38	QP
5		133.1511	44.51	-9.09	35.42	43.50	-8.08	QP
6		790.6188	24.96	7.69	32.65	46.00	-13.35	QP

■ Above 1GHz

Test channel:	Lowest channel
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H

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4804.000	48.98	5.06	54.04	74.00	-19.96	PEAK
4804.000	38.91	5.06	43.97	54.00	-10.03	AVG
7206.000	42.04	7.03	49.07	74.00	-24.93	PEAK
7206.000	32.67	7.03	39.70	54.00	-14.30	AVG

V

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4804.000	47.27	5.06	52.33	74.00	-21.67	PEAK
4804.000	39.59	5.06	44.65	54.00	-9.35	AVG
7206.000	43.17	7.03	50.20	74.00	-23.80	PEAK
7206.000	33.42	7.03	40.45	54.00	-13.55	AVG

# GTS

Report No.: GTS202105000269F01

Test channel:	Middle channel
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H

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4882.000	49.03	5.14	54.17	74.00	-19.83	PEAK
4882.000	37.84	5.14	42.98	54.00	-11.02	AVG
7323.000	41.96	7.52	49.48	74.00	-24.52	PEAK
7323.000	32.48	7.52	40.00	54.00	-14.00	AVG

V

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4882.000	47.37	5.14	52.51	74.00	-21.49	PEAK
4882.000	38.13	5.14	43.27	54.00	-10.73	AVG
7323.000	42.57	7.52	50.09	74.00	-23.91	PEAK
7323.000	32.56	7.52	40.08	54.00	-13.92	AVG

Test channel:	Highest channel
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H

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4960.000	48.68	5.22	53.90	74.00	-20.10	PEAK
4960.000	38.16	5.22	43.38	54.00	-10.62	AVG
7440.000	42.35	8.06	50.41	74.00	-23.59	PEAK
7440.000	32.35	8.06	40.41	54.00	-13.59	AVG

V

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4960.000	47.26	5.22	52.48	74.00	-21.52	PEAK
4960.000	38.13	5.22	43.35	54.00	-10.65	AVG
7440.000	41.56	8.06	49.62	74.00	-24.38	PEAK
7440.000	31.99	8.06	40.05	54.00	-13.95	AVG

#### Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. \*\*, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. The test data shows only the worst case GFSK mode.

## 8 Test Setup Photo

Reference to the **appendix I** for details.

## 9 EUT Constructional Details

Reference to the **appendix II** for details.

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