SGS-CSTC Standards Technical Services Ltd.

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
Email: ee.shenzhen@sgs.com

FCC REPORT

Application No:	SZEM1204002106RF
Applicant:	Edifier International Limited
Manufacturer:	Beijing Edifier technology Co., Ltd.
Factory:	Dongguan Edifier technology Co., Ltd.
Product Name:	Multimedia Speaker
Model No.(EUT):	iF600BT
Add Model No.:	Breathe Bluetooth
FCC ID:	Z9G-EDF06
Standards:	FCC CFR Title 47 Part 15 (2010)
Date of Receipt:	2012-04-27
Date of Test:	2012-05-07 to 2012-05-16
Date of Issue:	2012-05-21
Test Result:	**PASS ***

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

Authorized Signature:

Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	FCC CFR Title 47 Part 15C Section 15.203/15.247 (c)	ANSI C63.10 (2009)	PASS
AC Power Line Conducted Emission	FCC CFR Title 47 Part 15C Section 15.207	ANSI C63.10 (2009)	PASS
Conducted Peak Output Power	FCC CFR Title 47 Part 15C Section 15.247 (b)(1)	ANSI C63.10 (2009)	PASS
20dB Occupied Bandwidth	FCC CFR Title 47 Part 15C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Carrier Frequencies Separation	FCC CFR Title 47 Part 15C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Hopping Channel Number	FCC CFR Title 47 Part 15C Section 15.247 (b)	ANSI C63.10 (2009)	PASS
Dwell Time	FCC CFR Title 47 Part 15C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Pseudorandom Frequency Hopping Sequence	FCC CFR Title 47 Part 15C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10 (2009)	PASS
Band-edge for RF Conducted Emissions	FCC CFR Title 47 Part 15C Section 15.247(d)	ANSI C63.10 (2009)	PASS
RF Conducted Spurious Emissions	FCC CFR Title 47 Part 15C Section 15.247(d)	ANSI C63.10 (2009)	PASS
Radiated Spurious emissions	FCC CFR Title 47 Part 15C Section 15.205/15.209	ANSI C63.10 (2009)	PASS
Band Edge (Radiated Emission)	FCC CFR Title 47 Part 15C Section 15.205/15.209	ANSI C63.10 (2009)	PASS

Remark:
Model No.: iF600BT, Breathe Bluetooth
Only the Model No. iF600BT was tested, since the electrical circuit design, layout, components used and Internal wiring were identical for all above models. Only different on model number and color.

3 Contents

4 General Information

4.1 Client Information

Applicant:	Edifier International Limited
Address of Applicant:	Room 2207-9,Tower Two, Lippo Centre 89 Queensway, HongKong
Manufacturer:	Beijing Edifier technology Co., Ltd.
Address of Manufacturer:	8th floor, ZuoAn Building, NO.68 BeiSiHuanXiLu, Haidian District, Beijing 100080, CHINA
Factory:	Dongguan Edifier technology Co., Ltd.
Address of Factory:	No.2 Gongyedong Road, Songshan Lake Sci & Tech Industry Park, Dongguan, Guangdong 523808, PR. China

4.2 General Description of EUT

Name:	Multimedia Speaker
Model No.:	iF600BT, Breathe Bluetooth
Trade Mark:	EDIFIER
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	2.1+EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	fixed production
Test Power Grade:	255 (manufacturer declare)
Test Software of EUT:	CSR blue suite (manufacturer declare)
Antenna Type and Gain:	Type: Integral Gain: 2.5dBi
AC Adapter:	MODEL NO:ADT-60200 INPUT: 100-240V~ 50/60Hz 1.5A OUTPUT:20V ⎓ 2.75A
Test Voltage:	AC 230V
AUX in Line:	<3m
RCA Line:	<3m
DC Line:	<3m

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

4.3 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1006 mbar

4.4 Description of Support Units

The EUT has been tested independent unit.

4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch E&E Lab,
No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.
Tel: +86 755 2601 2053 Fax: +86 755 2671 0594
No tests were sub-contracted.

4.6 Test Facility

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

- **CNAS (No. CNAS L2929)**
  CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.
- **VCCI**
  The 3m Semi-anechoic chamber, Full-anechoic Chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2197, G-416, T-1153 and C-2383 respectively.
- **FCC – Registration No.: 556682**
  SGS-CSTC Standards Technical 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 our files. Registration No.: 556682.
- **Industry Canada (IC)**
  The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1.

4.7 Deviation from Standards

None.

4.8 Abnormalities from Standard Conditions

None.

4.9 Other Information Requested by the Customer

None.

4.10 Test Instruments List

RE in Chamber					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2012-06-10
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	2012-05-26
3	EMI Test software	AUDIX	E3	SEL0050	N/A
4	Coaxial cable	SGS	N/A	SEL0028	2012-05-29
5	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2012-10-29
6	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2012-10-29
7	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2012-10-29
8	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2012-05-26
9	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2012-10-26
11	Band filter	Amindeon	82346	SEL0094	2012-05-26

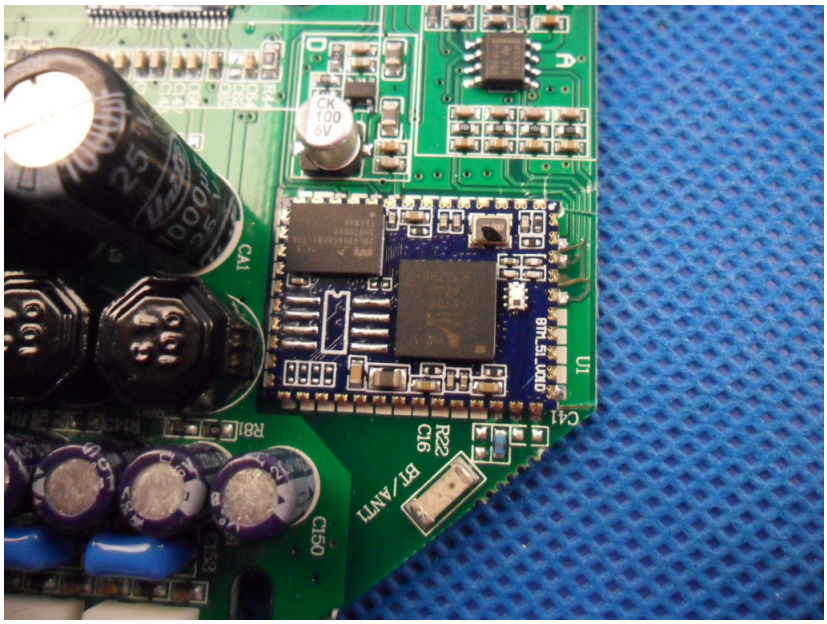
Conducted Emission					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2012-06-10
2	Two-Line V-Network	ETS-LINDGREN	3816/2	SEL0021	2012-05-26
3	LISN	Rohde & Schwarz	ENV216	SEL0152	2012-10-23
4	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2012-05-26
5	Coaxial Cable	SGS	N/A	SEL0024	2012-05-29

RF conducted					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	Spectrum Analyzer	Rohde & Schwarz	FSP 30	SEL0154	2012-10-23
2	Coaxial cable	SGS	N/A	SEL0028	2012-05-29

General used equipment					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0102 to SEL0103	2012-10-27
2	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0101	2012-10-27
3	Barometer	ChangChun	DYM3	SEL0088	2013-05-17

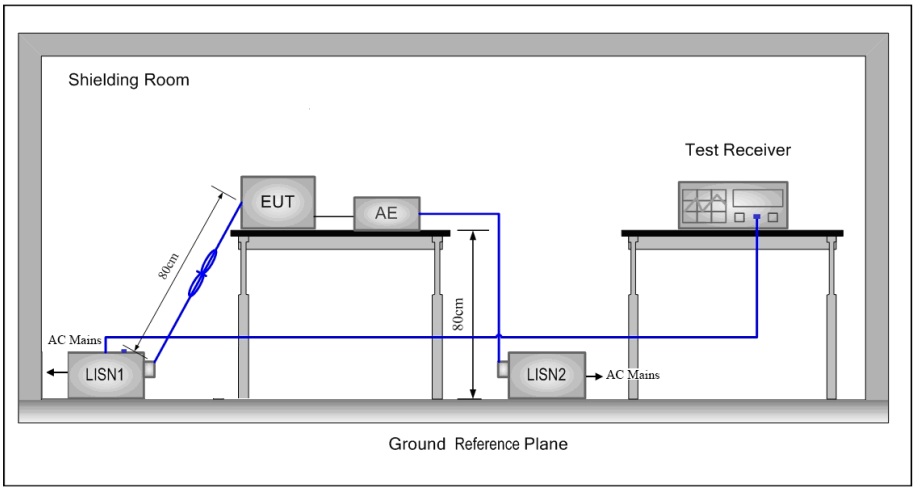
5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.5dBi.	

5.2 Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2009</td></tr>
<tr><td>Test Frequency Range:</td><td>150kHz to 30MHz</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<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>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test Procedure:</td><td>1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) 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: 2009 on conducted measurement.</td></tr>
</table>

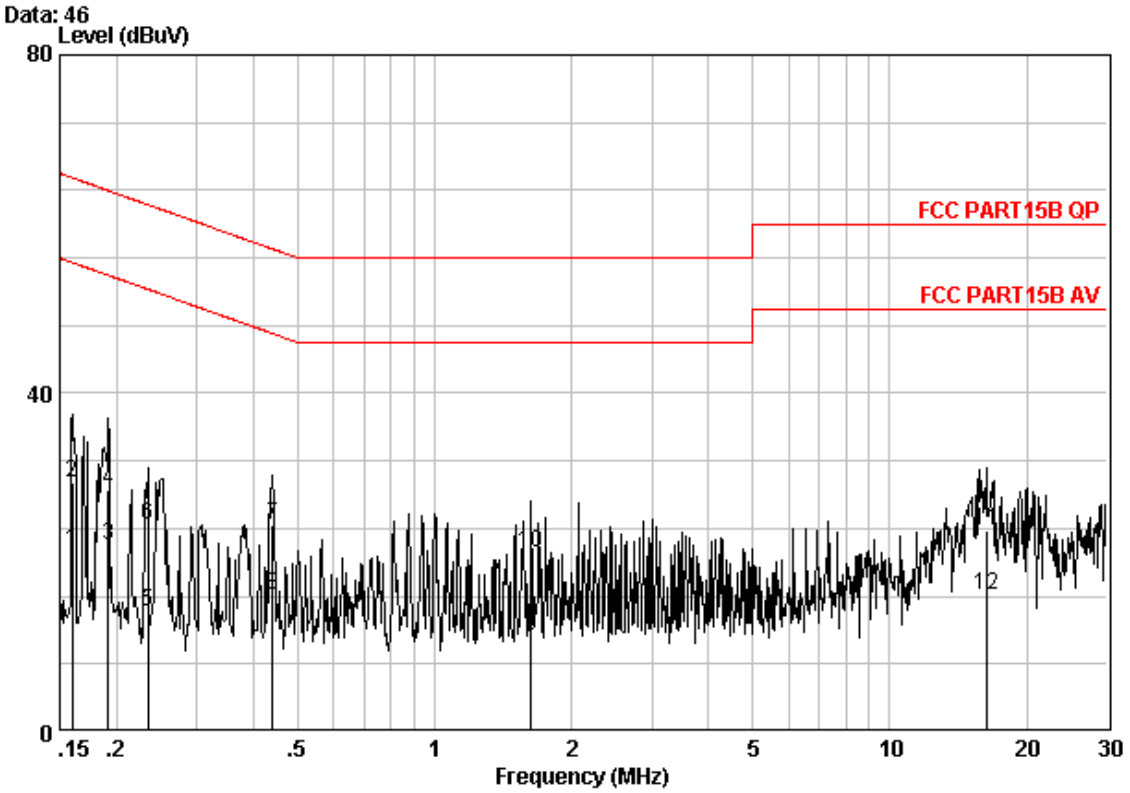
Test Setup:	
Test Mode:	Transmitting mode
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

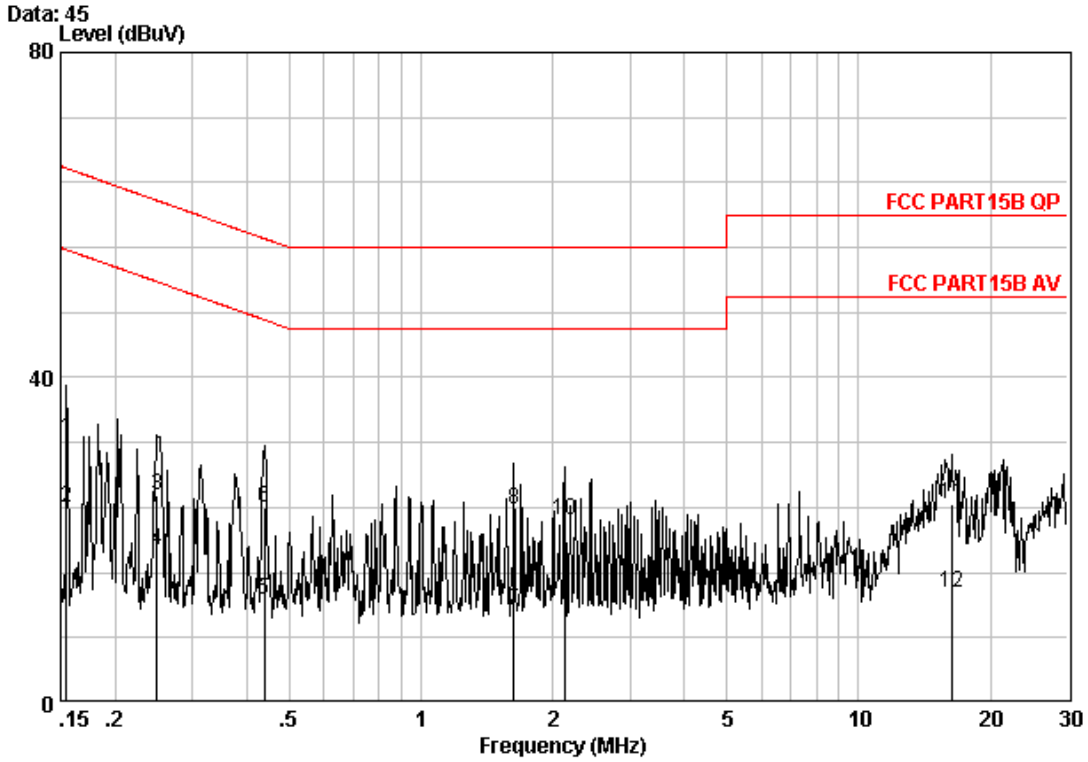
Live line:



Site : Shielding Room
Condition : FCC PART15B QP CE-20101216 LINE
Job No. : 2106RF
Mode : TX

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.15985	0.04	9.60	11.77	21.41	55.47	-34.07	Average
2		0.15985	0.04	9.60	19.75	29.39	65.47	-36.08	QP
3		0.19140	0.04	9.60	12.32	21.96	53.98	-32.01	Average
4		0.19140	0.04	9.60	19.02	28.66	63.98	-35.32	QP
5		0.23409	0.04	9.60	4.50	14.15	52.30	-38.16	Average
6		0.23409	0.04	9.60	14.69	24.33	62.30	-37.97	QP
7		0.43974	0.06	9.60	14.84	24.50	57.07	-32.57	QP
8	@	0.43974	0.06	9.60	6.56	16.22	47.07	-30.85	Average
9		1.628	0.11	9.70	1.47	11.28	46.00	-34.72	Average
10		1.628	0.11	9.70	11.27	21.08	56.00	-34.92	QP
11		16.312	0.26	10.03	13.47	23.75	60.00	-36.25	QP
12		16.312	0.26	10.03	5.82	16.10	50.00	-33.90	Average

Neutral line:



Site : Shielding Room
Condition : FCC PART15B QP CE-20101216 NEUTRAL
Job No. : 2106RF
Mode : TX

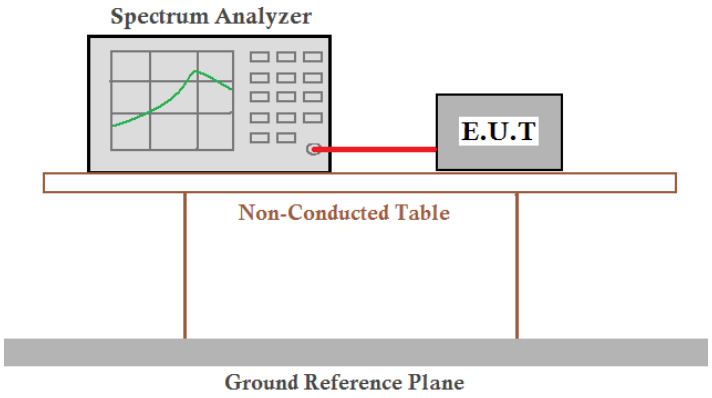
	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15485	0.04	9.60	22.87	32.51	65.74	-33.23	QP
2	0.15485	0.04	9.60	14.42	24.06	55.74	-31.68	Average
3	0.24945	0.05	9.60	15.77	25.42	61.78	-36.36	QP
4	0.24945	0.05	9.60	9.18	18.82	51.78	-32.95	Average
5	0.43742	0.06	9.60	2.89	12.55	47.11	-34.56	Average
6	0.43742	0.06	9.60	14.36	24.02	57.11	-33.09	QP
7	1.628	0.11	9.70	1.60	11.40	46.00	-34.60	Average
8	1.628	0.11	9.70	14.03	23.84	56.00	-32.16	QP
9	2.133	0.12	9.71	2.14	11.97	46.00	-34.03	Average
10	2.133	0.12	9.71	12.68	22.51	56.00	-33.49	QP
11	16.312	0.26	10.03	14.14	24.42	60.00	-35.58	QP
12	16.312	0.26	10.03	3.31	13.59	50.00	-36.41	Average

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

5.3 Conducted Peak Output Power

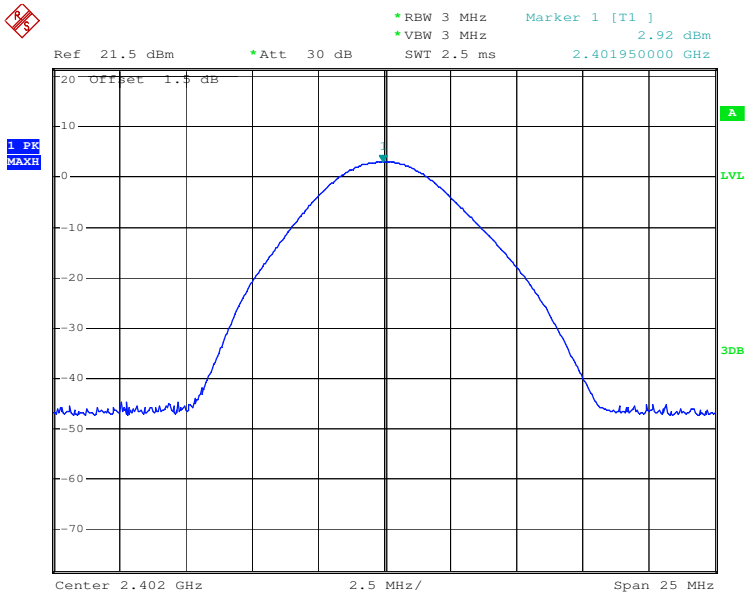
Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Limit:	30dBm
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of date type is the worse case of GFSK modulation type, 2-DH1 of date type is worse case of π/4DQPSK modulation type, 3-DH1 of date type is worse case of 8DPSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

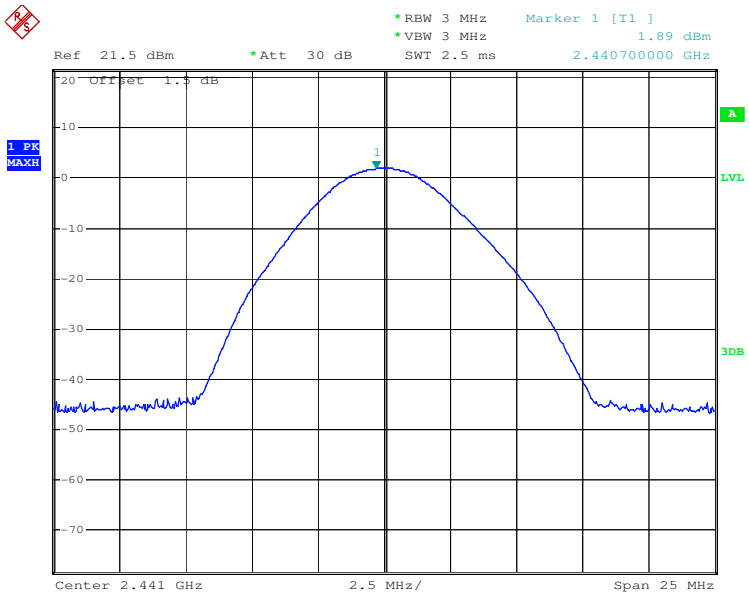
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	2.92	30.00	Pass
Middle	1.89	30.00	Pass
Highest	0.01	30.00	Pass
π/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.74	30.00	Pass
Middle	0.40	30.00	Pass
Highest	-1.90	30.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.04	30.00	Pass
Middle	0.58	30.00	Pass
Highest	-1.66	30.00	Pass

Test plot as follows:

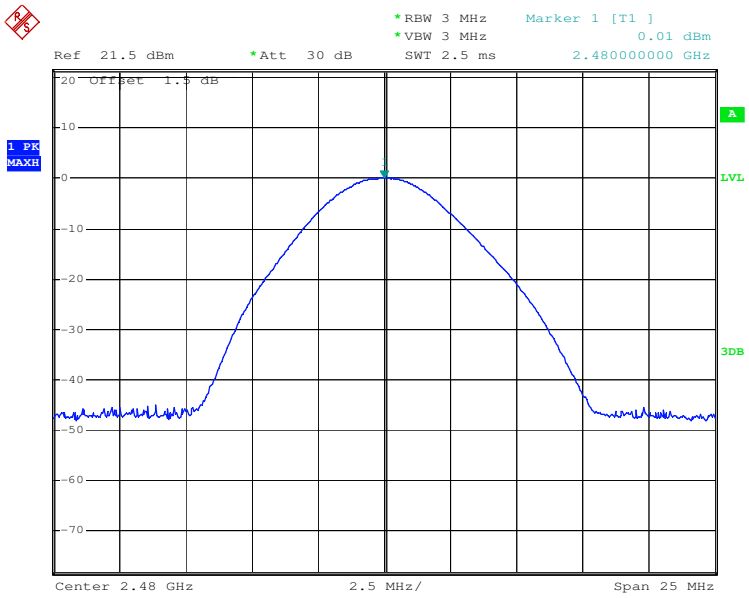
Test mode:	GFSK	Test channel:	Lowest



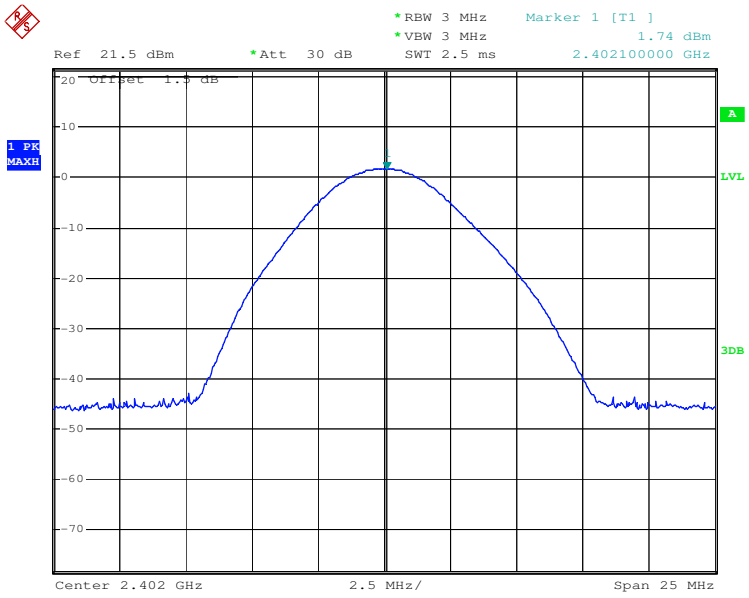
Test mode:	GFSK	Test channel:	Middle



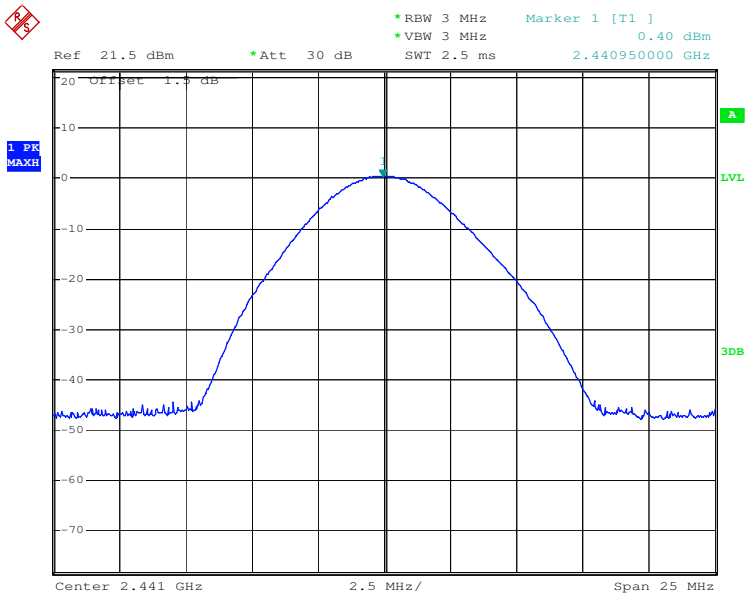
Test mode:	GFSK	Test channel:	Highest



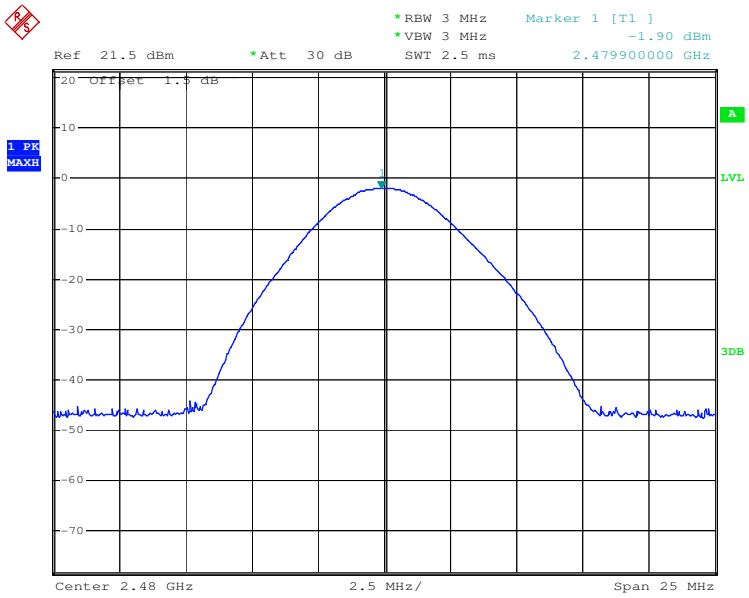
Test mode:	π/4DQPSK	Test channel:	Lowest



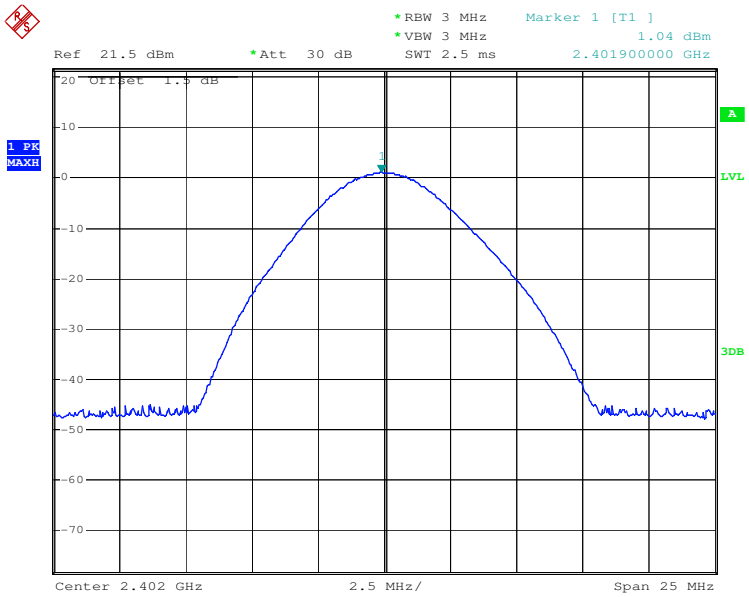
Test mode:	π/4DQPSK	Test channel:	Middle



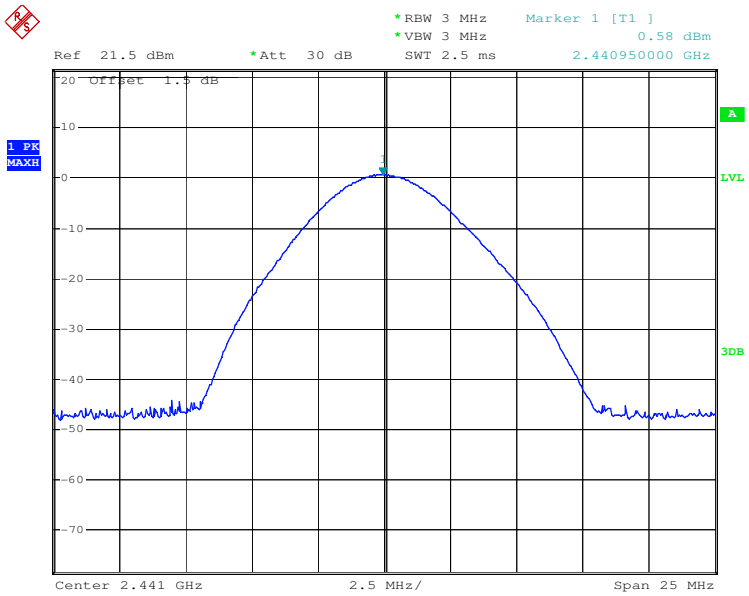
Test mode:	π/4DQPSK	Test channel:	Highest



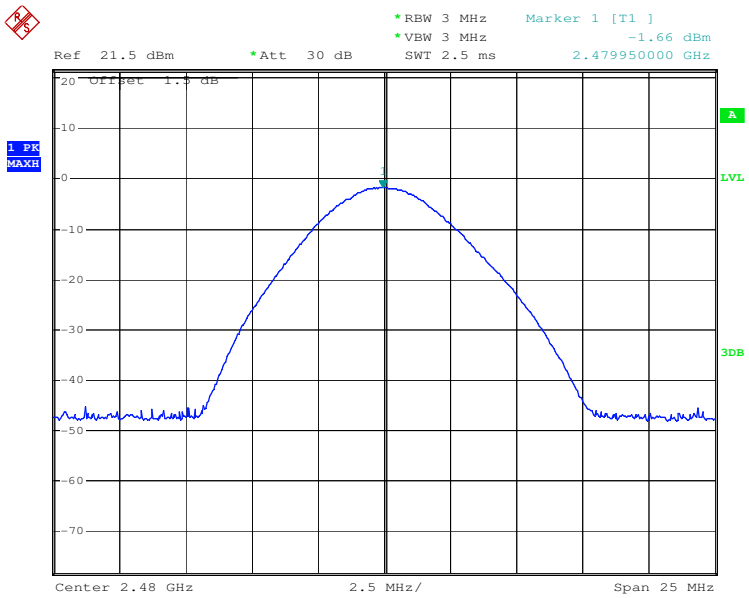
Test mode:	8DPSK	Test channel:	Lowest



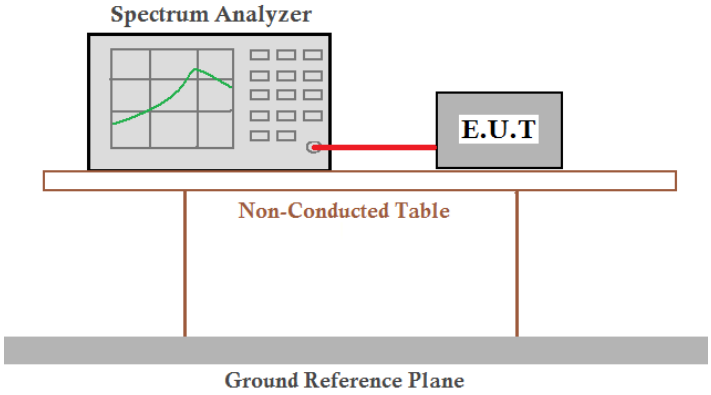
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.4 20dB Occupy Bandwidth

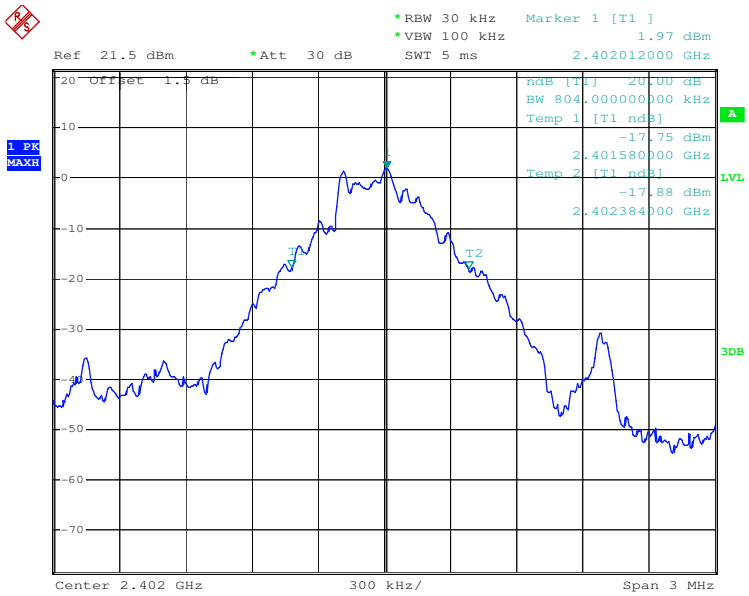
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of date type is the worse case of GFSK modulation type, 2-DH1 of date type is worse case of π/4DQPSK modulation type, 3-DH1 of date type is worse case of 8DPSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

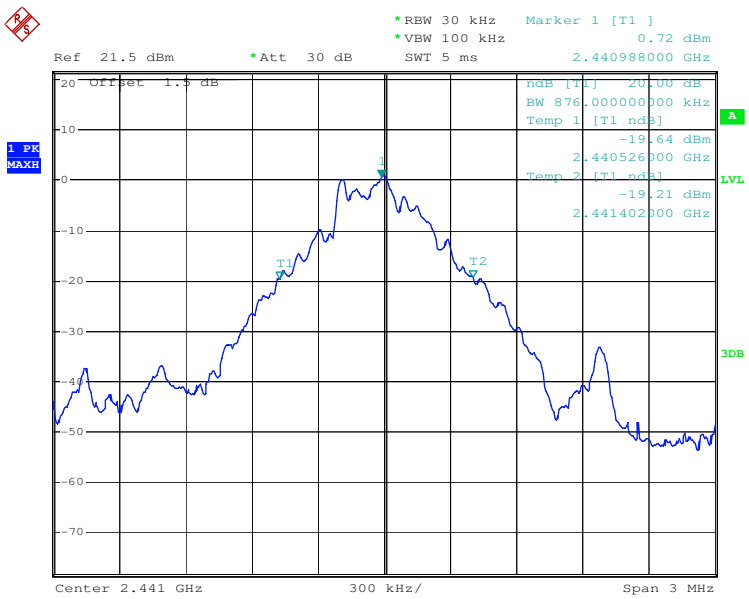
Test channel	20dB Occupy Bandwidth (kHz)		
	GFSK	π/4DQPSK	8DPSK
Lowest	804	1224	1212
Middle	876	1218	1218
Highest	804	1230	1212

Test plot as follows:

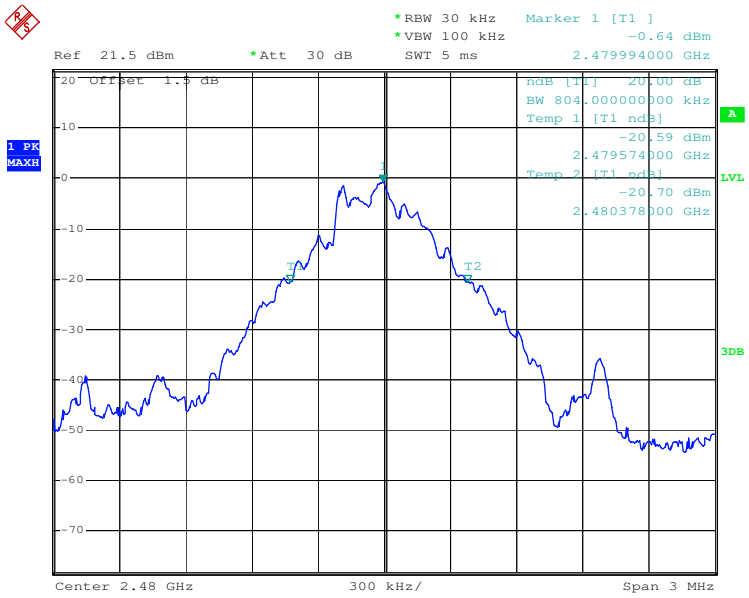
Test mode:	GFSK	Test channel:	Lowest



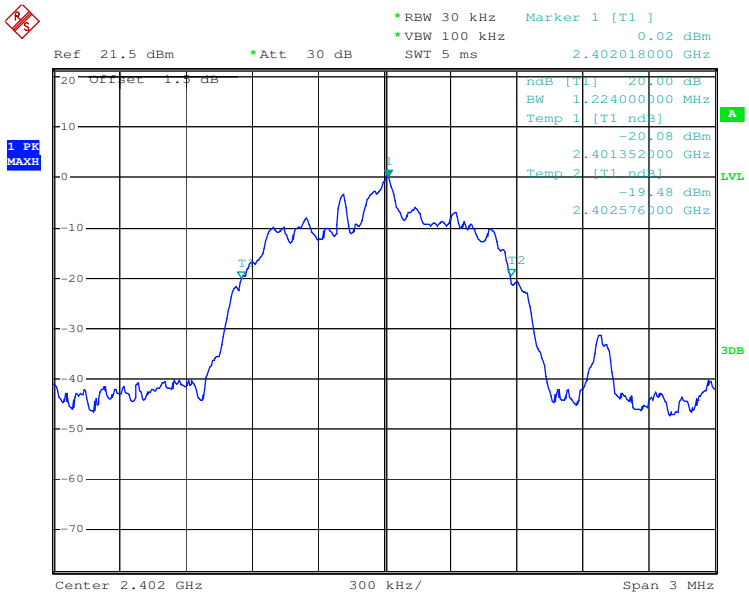
Test mode:	GFSK	Test channel:	Middle



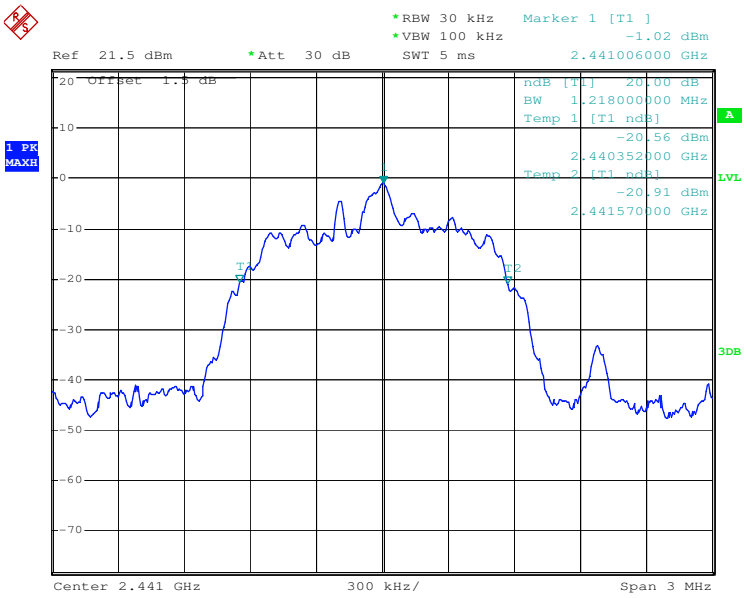
Test mode:	GFSK	Test channel:	Highest



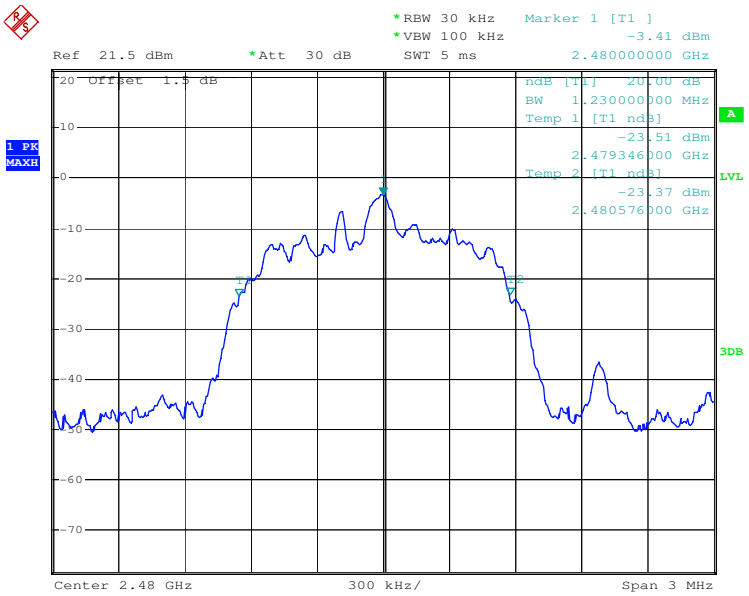
Test mode:	π/4DQPSK	Test channel:	Lowest



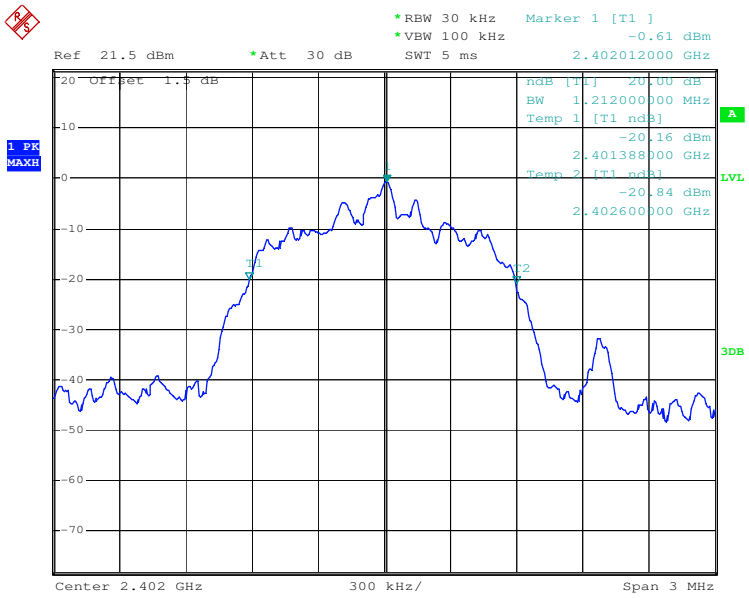
Test mode:	π/4DQPSK	Test channel:	Middle



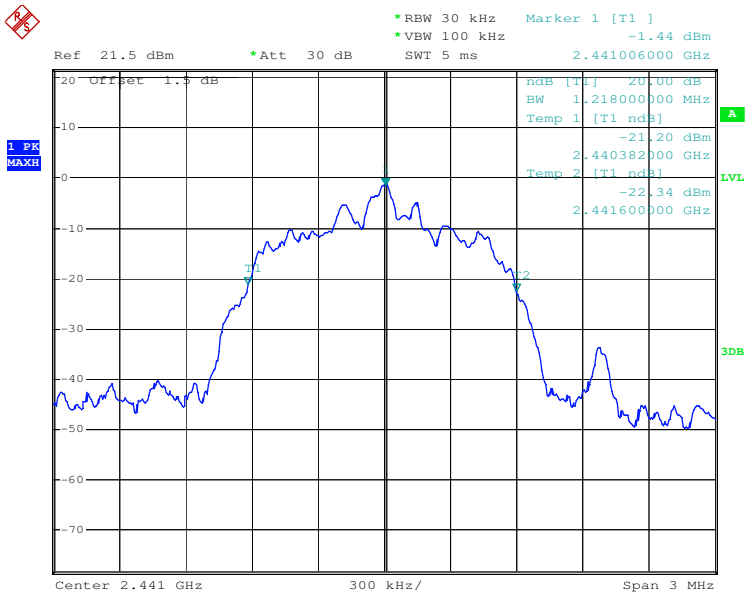
Test mode:	π/4DQPSK	Test channel:	Highest



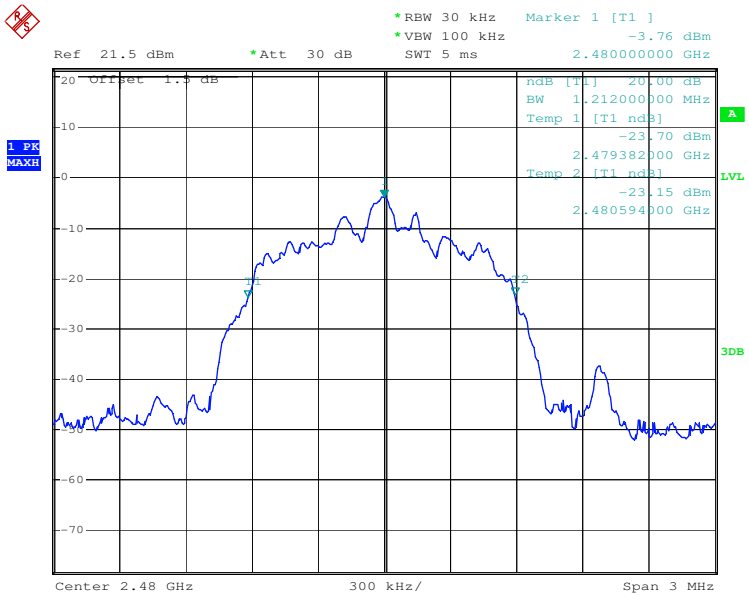
Test mode:	8DPSK	Test channel:	Lowest



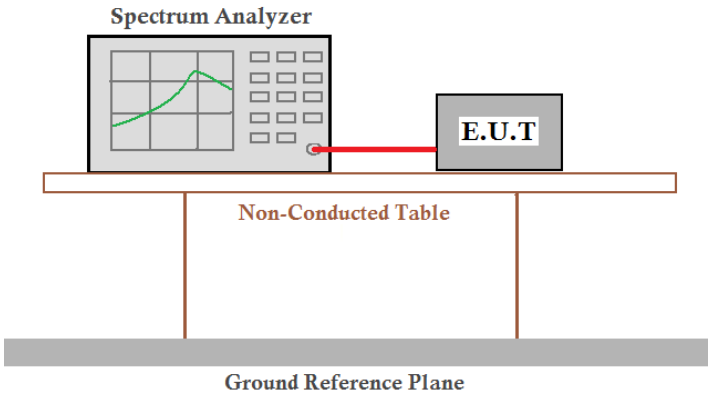
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of date type is the worse case of GFSK modulation type, 2-DH1 of date type is worse case of π/4DQPSK modulation type, 3-DH1 of date type is worse case of 8DPSK modulation type.
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

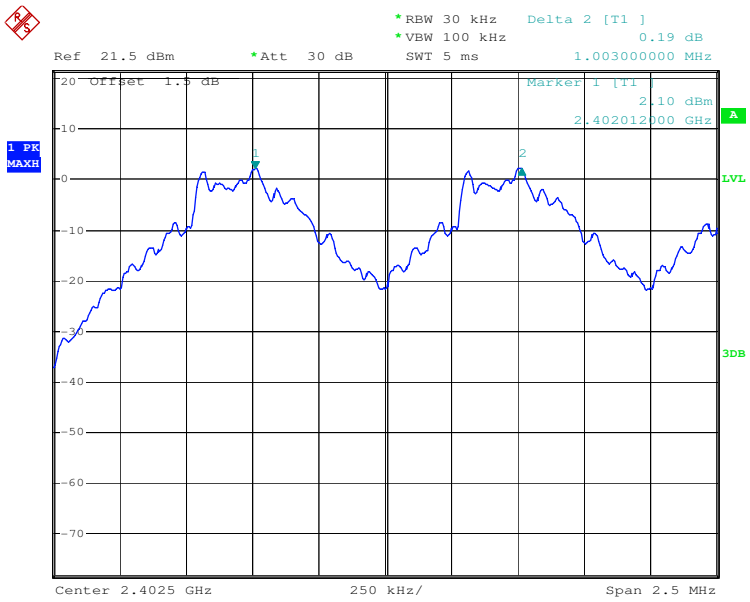
GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1003	≥820	Pass
Middle	1003	≥820	Pass
Highest	1004	≥820	Pass
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	≥820	Pass
Middle	1000	≥820	Pass
Highest	1000	≥820	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	≥820	Pass
Middle	1000	≥820	Pass
Highest	1000	≥820	Pass

Note: According to section 5.4,

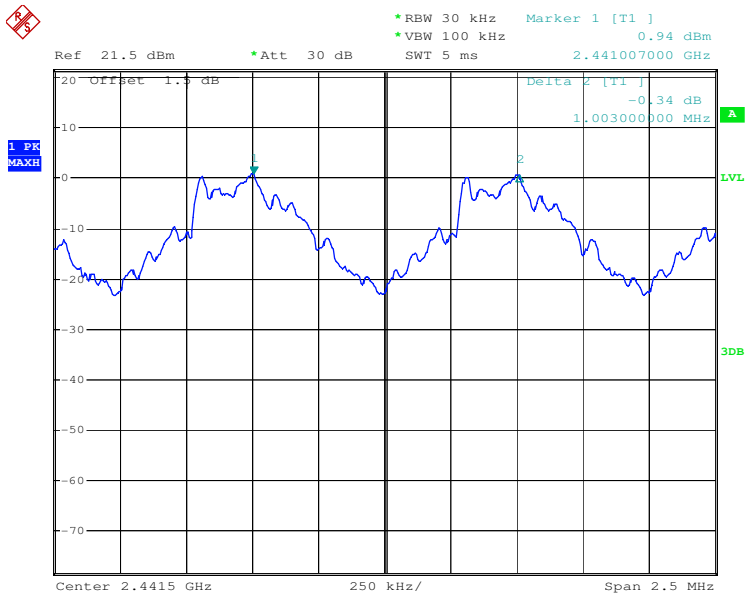
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	876	584
π/4DQPSK	1230	820
8DPSK	1218	812

Test plot as follows:

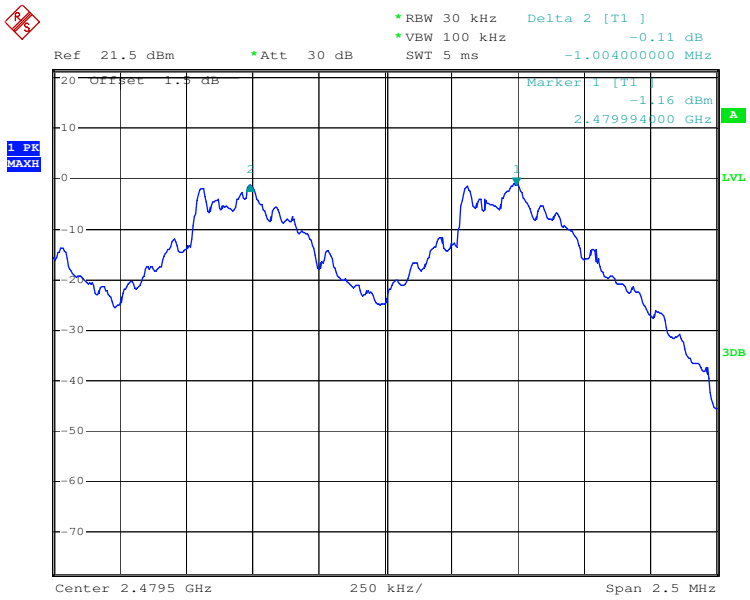
Test mode:	GFSK	Test channel:	Lowest



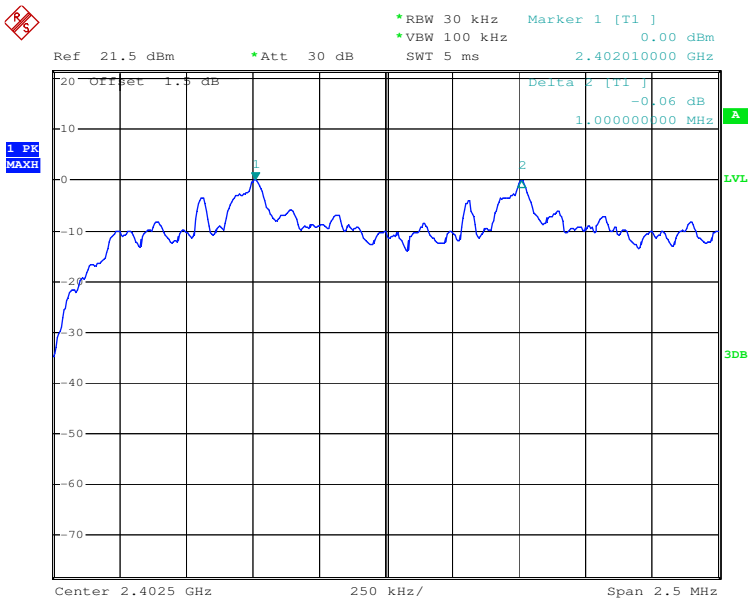
Test mode:	GFSK	Test channel:	Middle



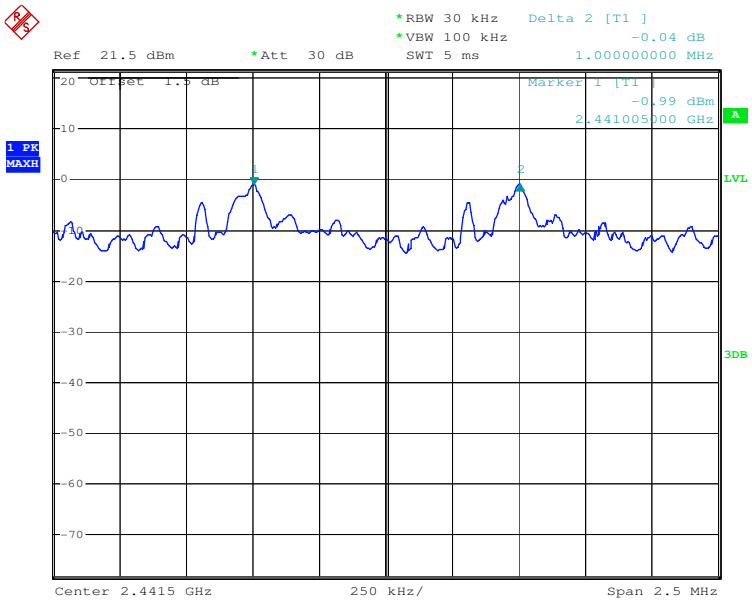
Test mode:	GFSK	Test channel:	Highest



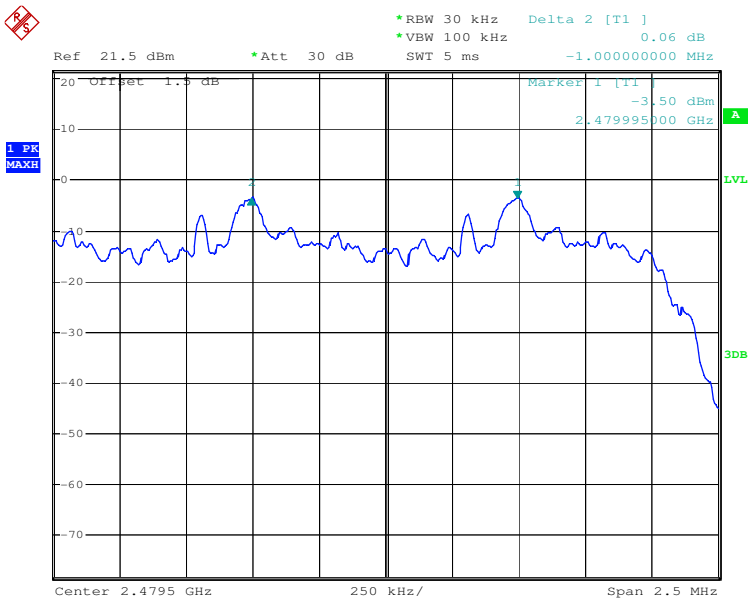
Test mode:	π/4DQPSK	Test channel:	Lowest



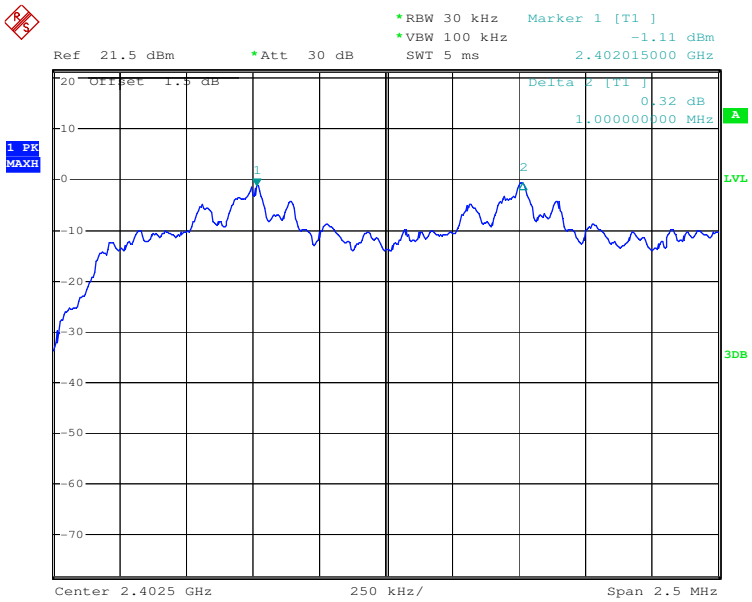
Test mode:	π/4DQPSK	Test channel:	Middle



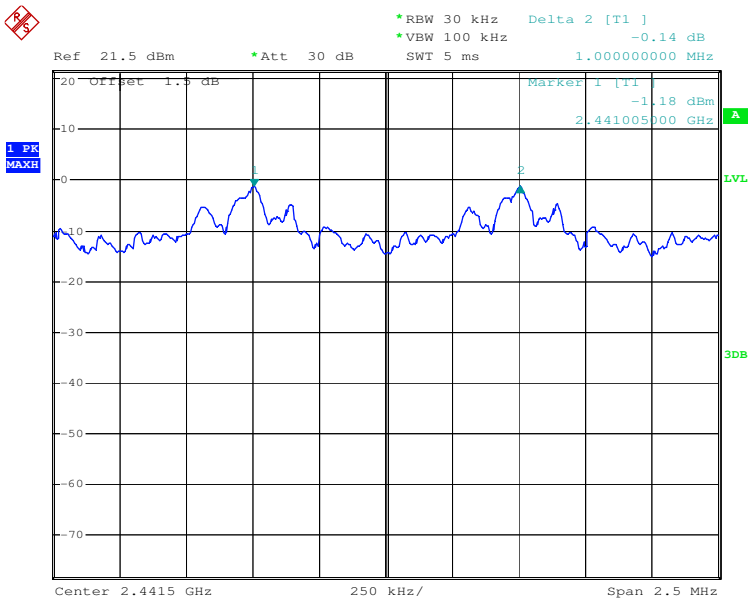
Test mode:	π/4DQPSK	Test channel:	Highest



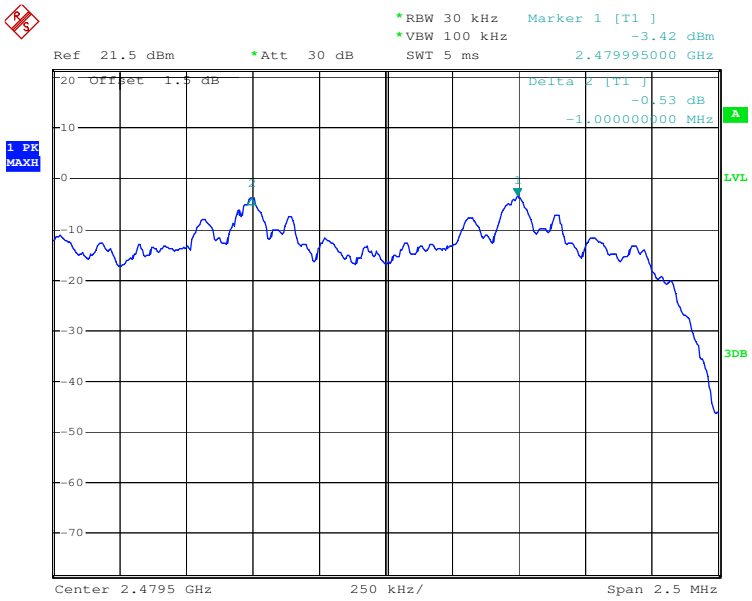
Test mode:	8DPSK	Test channel:	Lowest



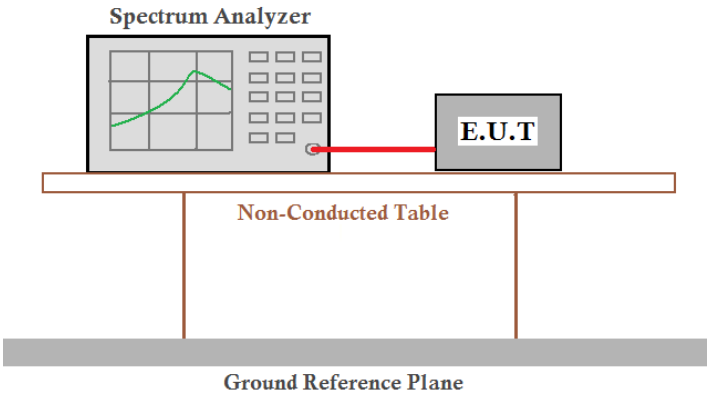
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.6 Hopping Channel Number

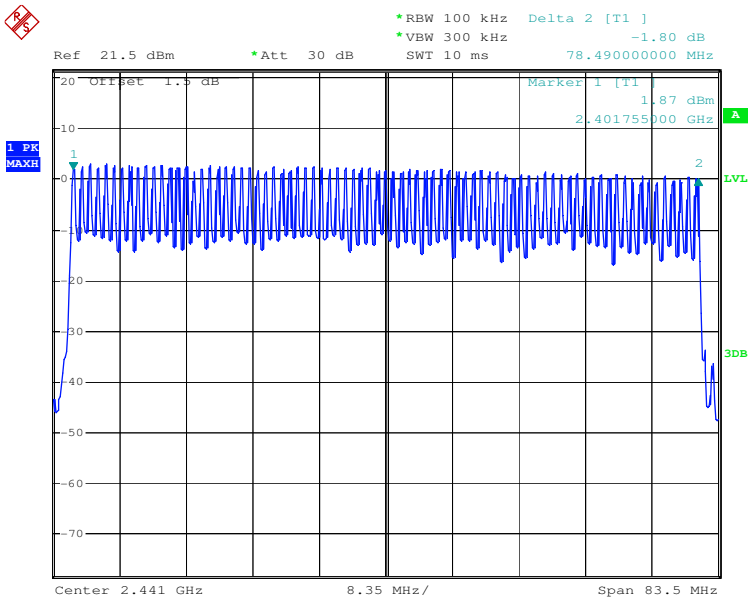
Test Requirement:	FCC Part15 C Section 15.247 (b)
Test Method:	ANSI C63.10:2009
Test Setup:	
Test Mode:	Hopping transmitting with all kind of modulation
Limit:	At least 75channels
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

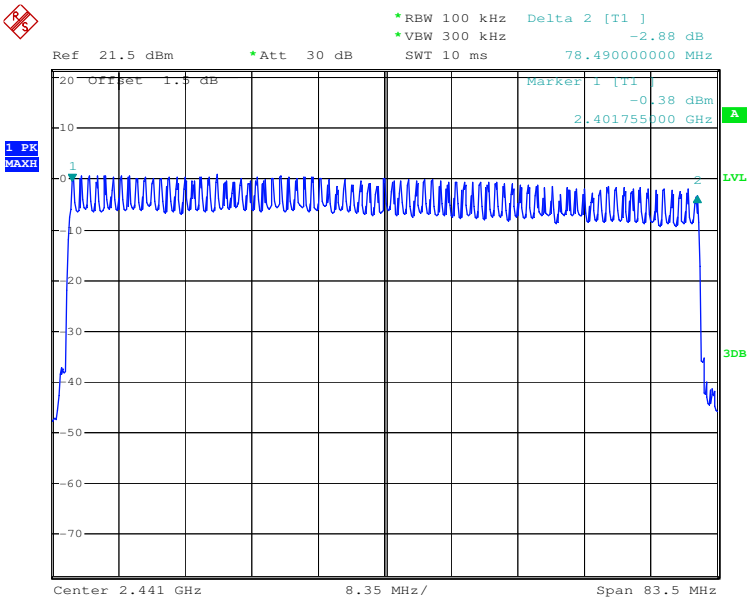
Mode	Hopping channel numbers	Limit
GFSK	79	≥75
π/4DQPSK	79	≥75
8DPSK	79	≥75

Test plot as follows

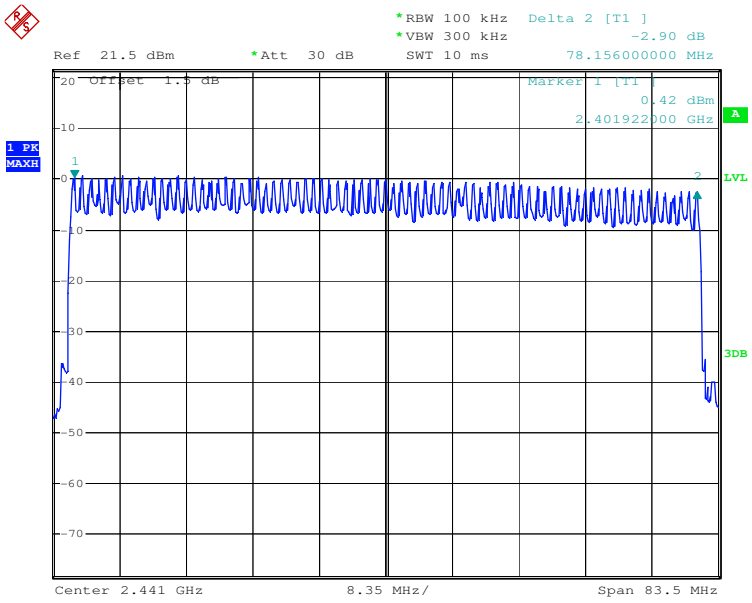
Test mode:	GFSK



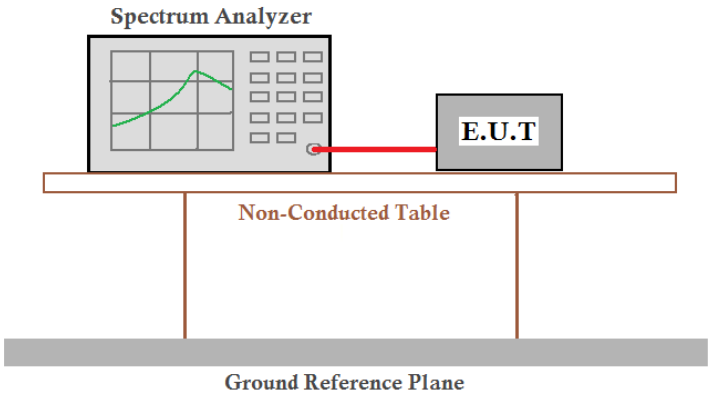
Test mode:	π/4DQPSK



Test mode:	8DPSK



5.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	
Instruments Used:	Refer to section 4.10 for details
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Limit:	0.4 Second
Test Results:	Pass

Measurement Data

Mode	Packet	Dwell time (second)	Limit (second)
GFSK	DH1	0.1664	0.4
	DH3	0.2848	0.4
	DH5	0.3243	0.4
π/4DQPSK	2-DH1	0.1696	0.4
	2-DH3	0.2864	0.4
	2-DH5	0.1952	0.4
8DPSK	3-DH1	0.1712	0.4
	3-DH3	0.2872	0.4
	3-DH5	0.3237	0.4

Remark:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

On (ms)*total number=dwell time (ms)

The lowest channel (2402MHz), as below:

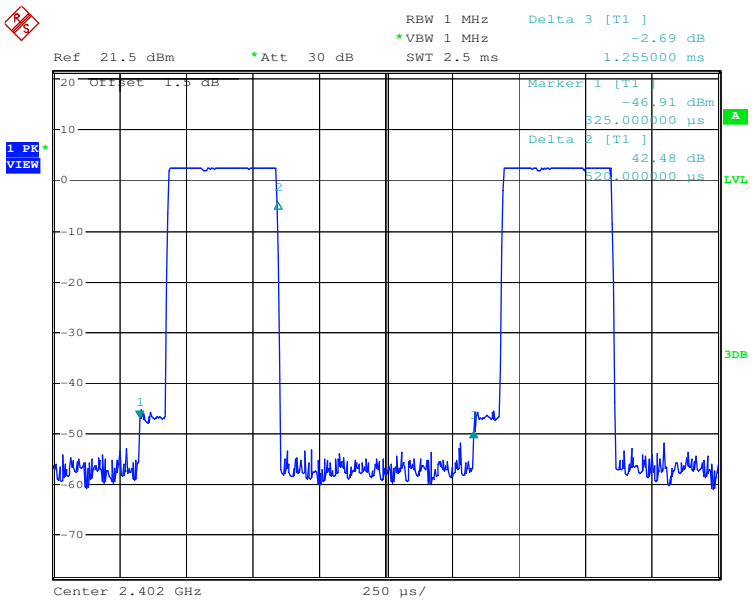
DH1 time slot=0.520(ms)* (1600/ (2*79))*31.6=166.4(ms)

DH3 time slot=1.780(ms)* (1600/ (4*79))*31.6= 284.8(ms)

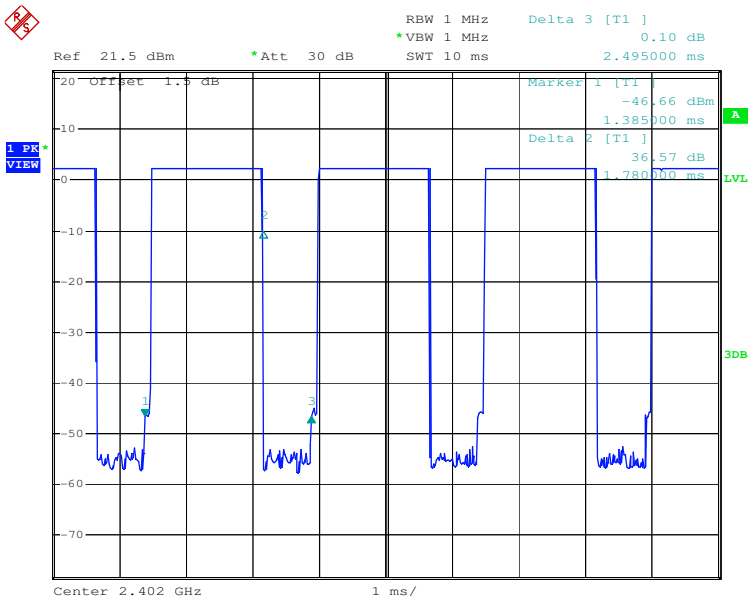
DH5 time slot=3.040(ms)* (1600/ (6*79))*31.6= 324.3(ms)

Test plot as follows

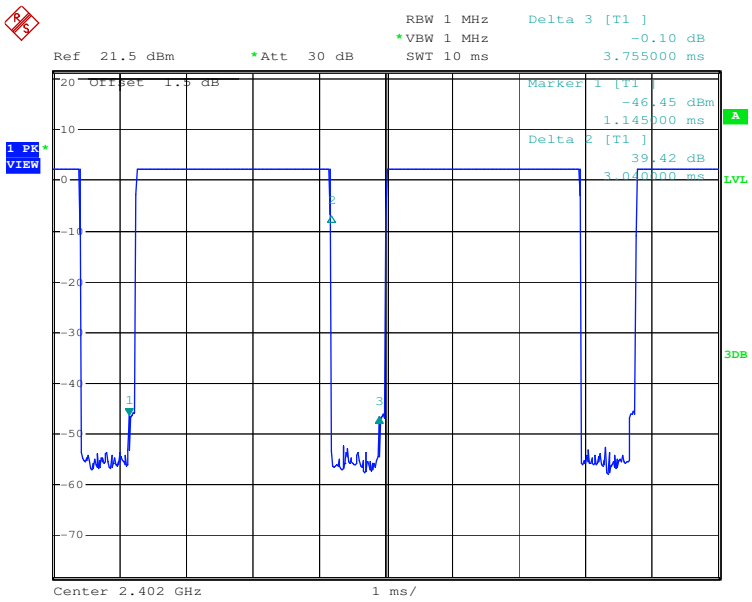
GFSK	DH1



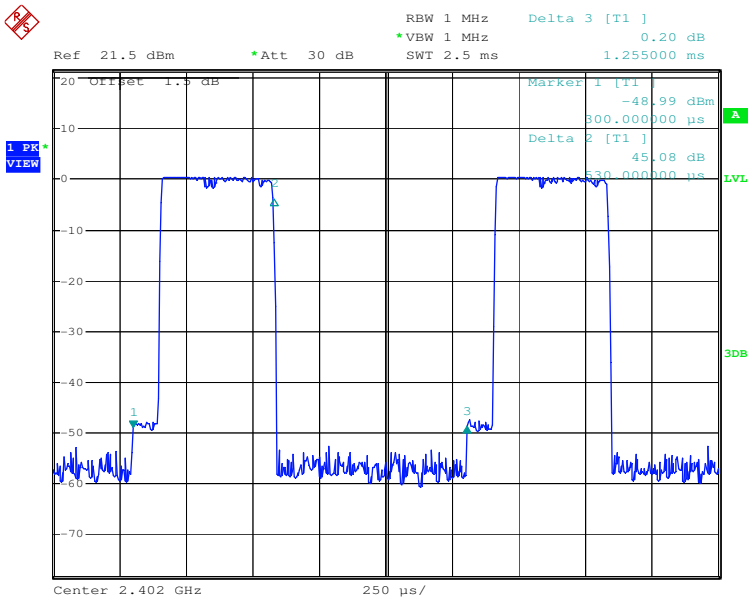
GFSK	DH3



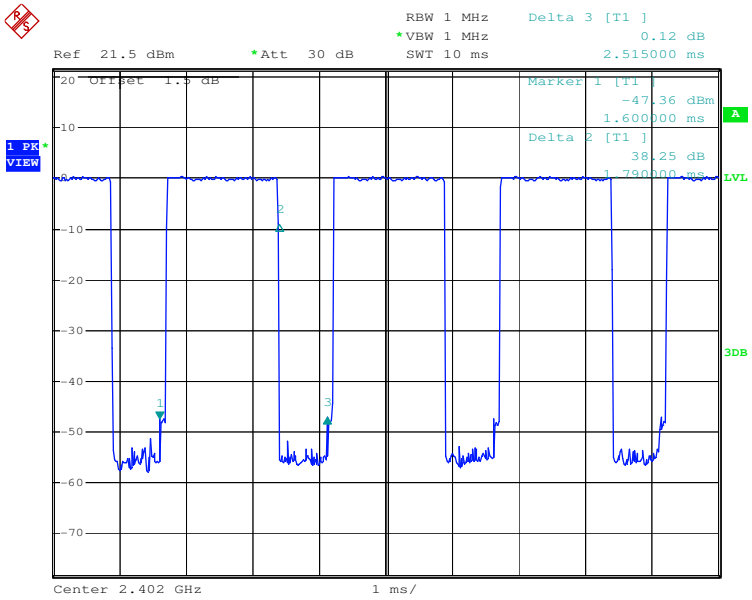
GFSK	DH5



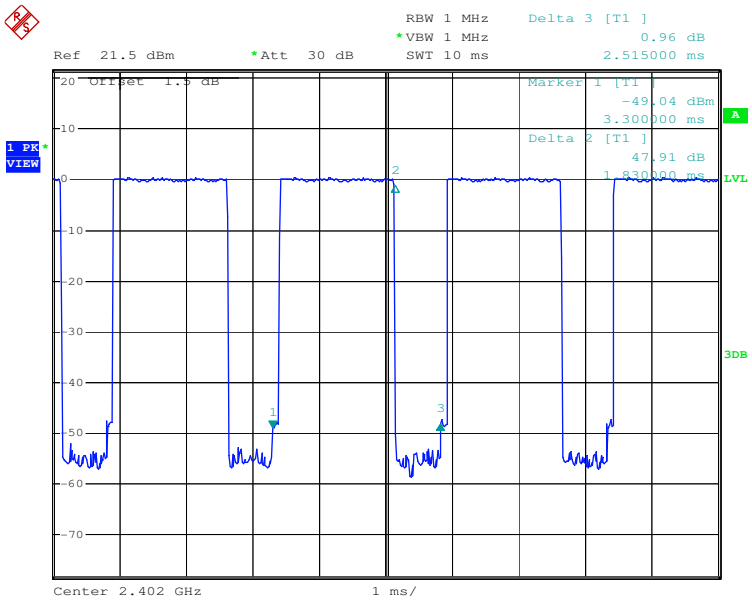
π/4DQPSK	2-DH1



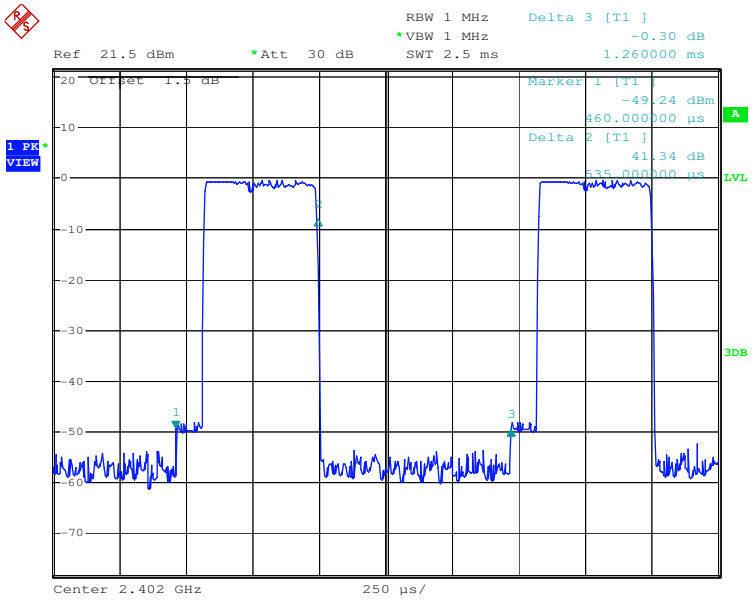
π/4DQPSK	2-DH3



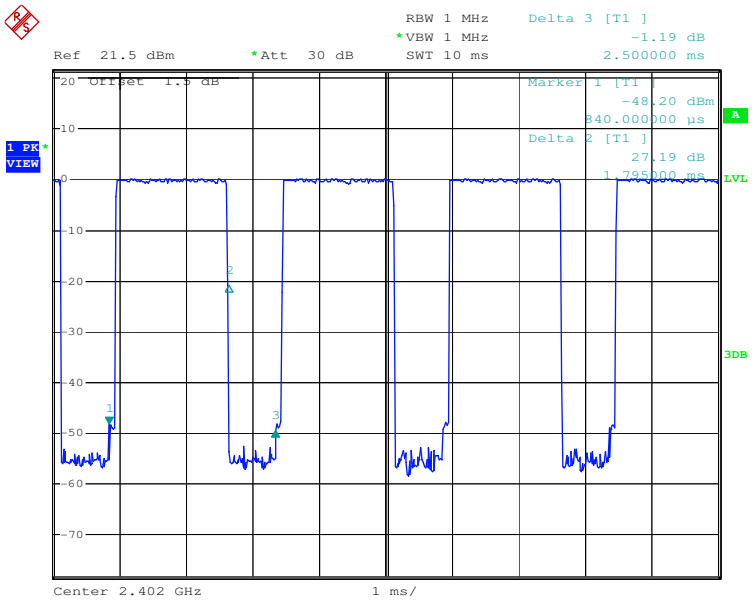
π/4DQPSK	2-DH5



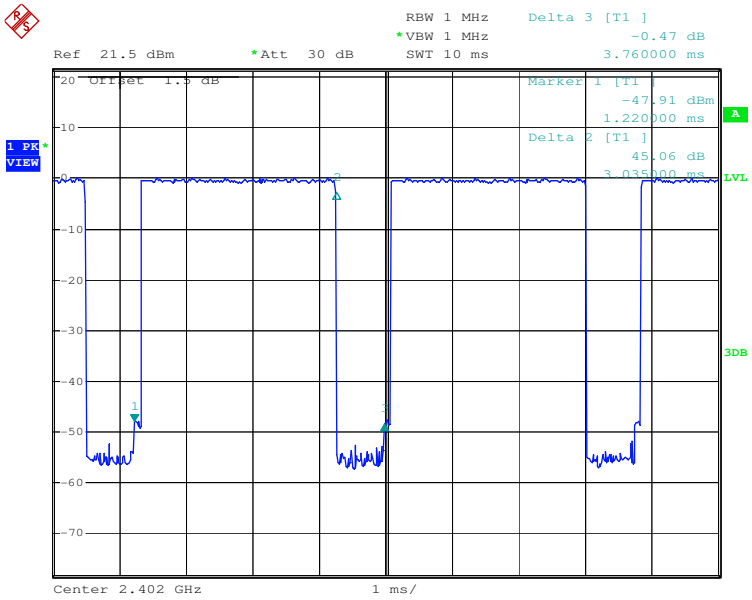
8DPSK	3-DH1



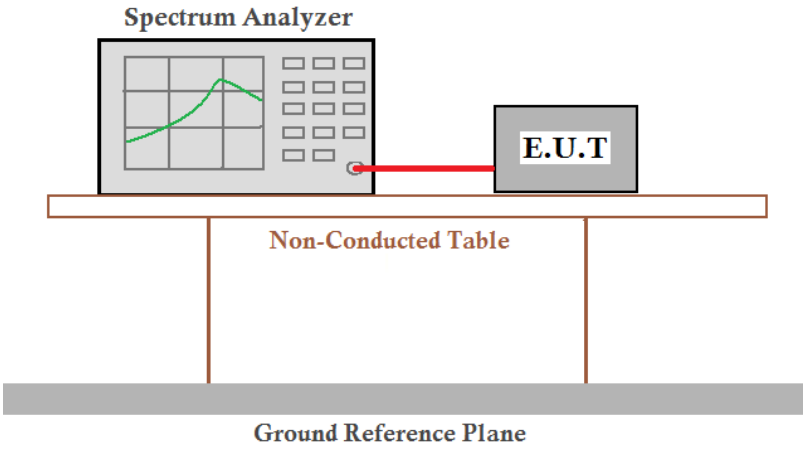
8DPSK	3-DH3



8DPSK	3-DH5



5.8 Duty Cycle

Test Requirement:	FCC Part15 C Section 15.35
Test Method:	ANSI C63.10:2009
Test Setup:	
Instruments Used:	Refer to section 4.10 for details
Limit:	N/A
Final Test Mode:	Through Pre-scan, find the worse case is GFSK modulation type

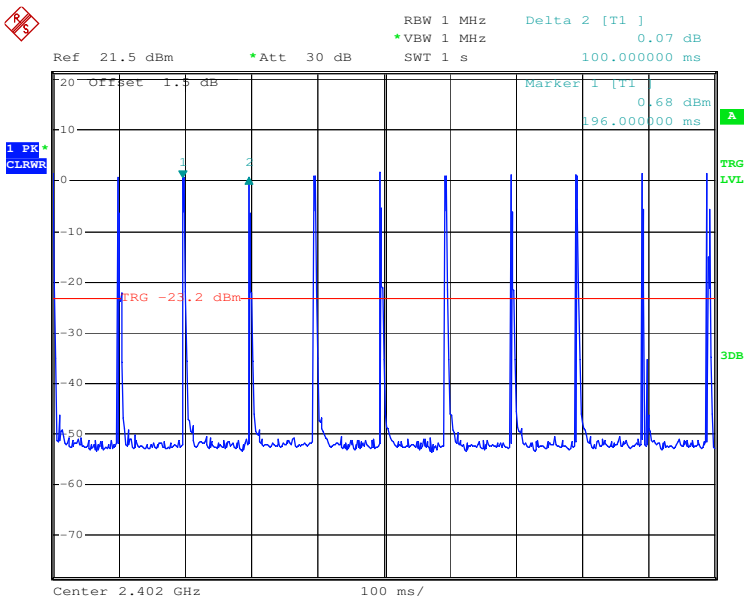
Measurement Data

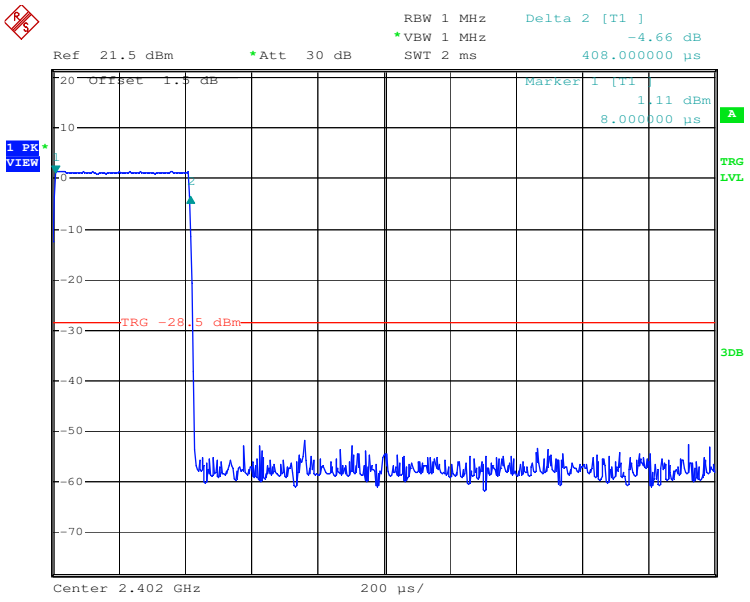
DH1
TX on: 408uS=0.408ms
Duty Cycle=T_{on}/T_{period}=0.408ms/100ms=0.00408ms
PDCF=20*Log(Duty Cycle)=-47.79dB
DH3
TX on:1.67ms
Duty Cycle=T_{on}/T_{period}=1.67ms/100ms=0.0167ms
PDCF=20*Log(Duty Cycle)=-35.55dB
DH5
TX on:2.93ms
Duty Cycle=T_{on}/T_{period}=2.93ms/100ms=0.0293ms
PDCF=20*Log(Duty Cycle)=-30.66dB

Remark:
Duty Cycle=On time/Period time or 100 milliseonds
(Whichever is less)

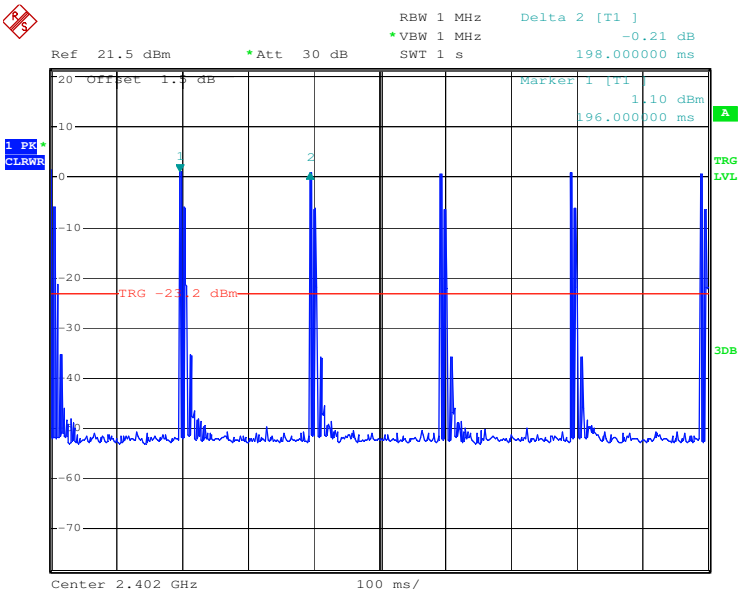
Test plot as follows

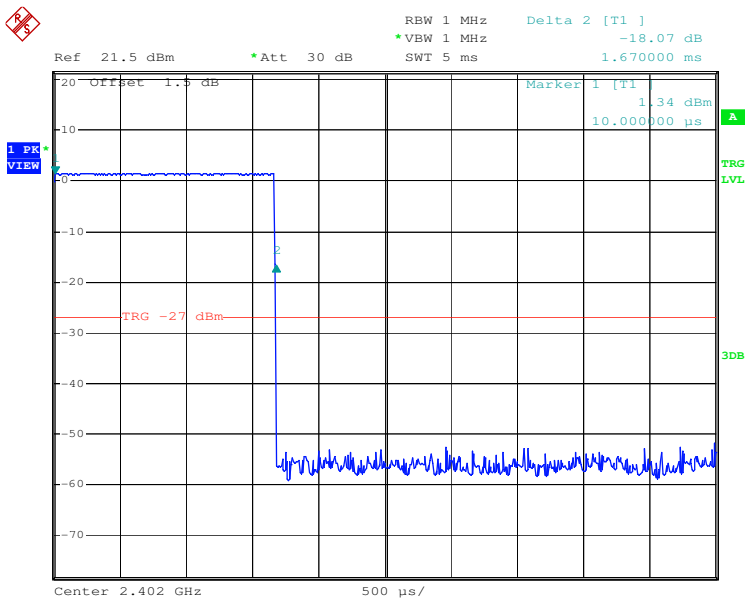
DH1



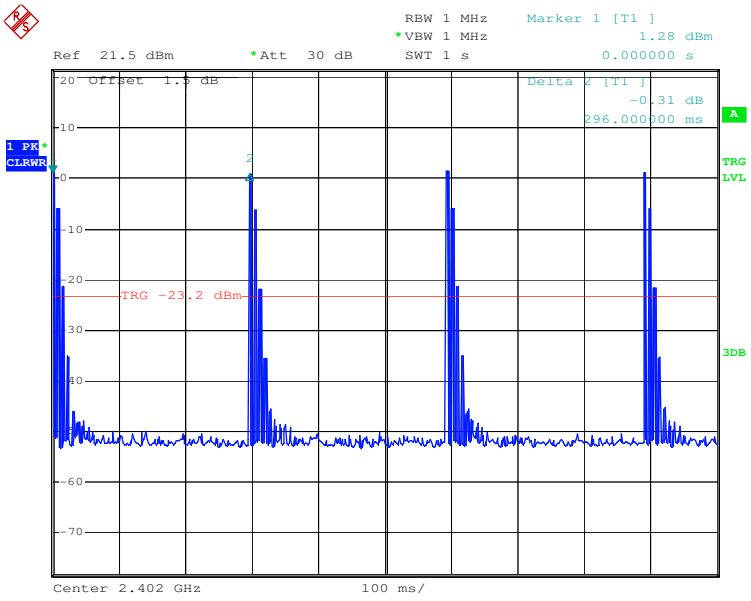


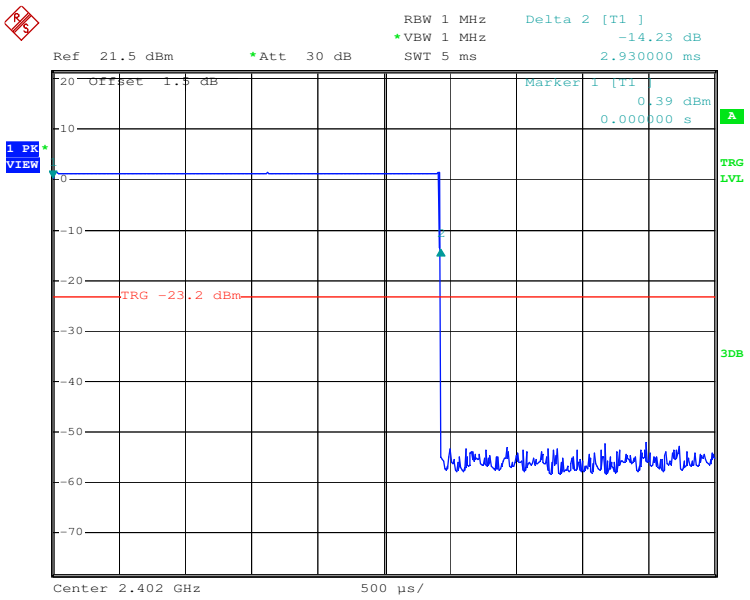
DH3



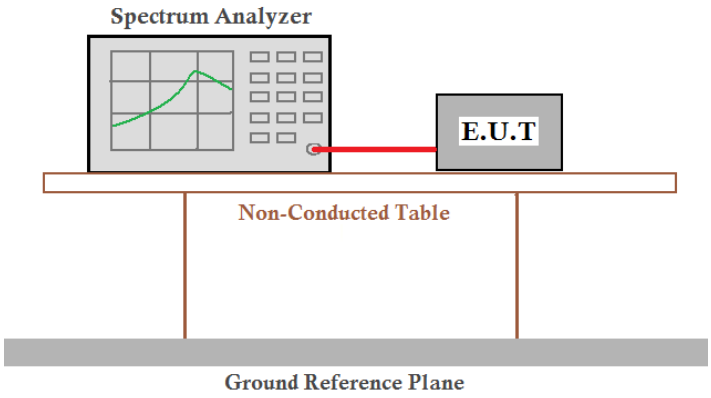


DH5



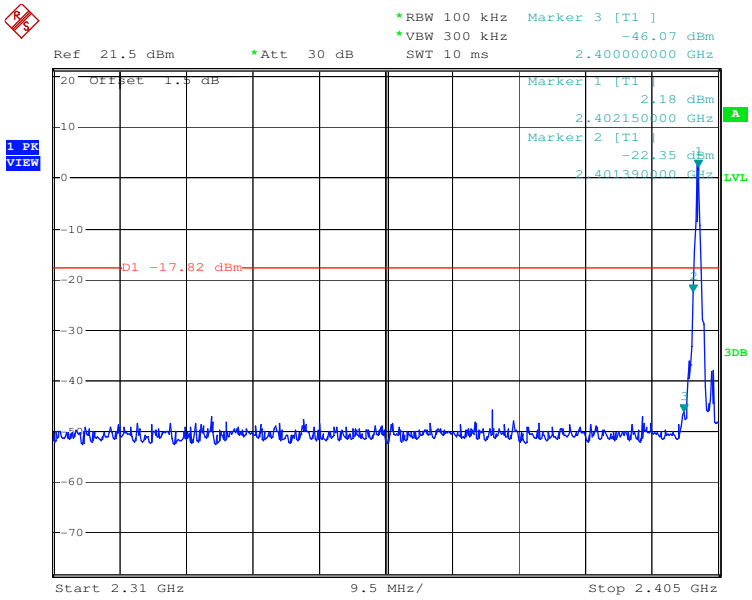


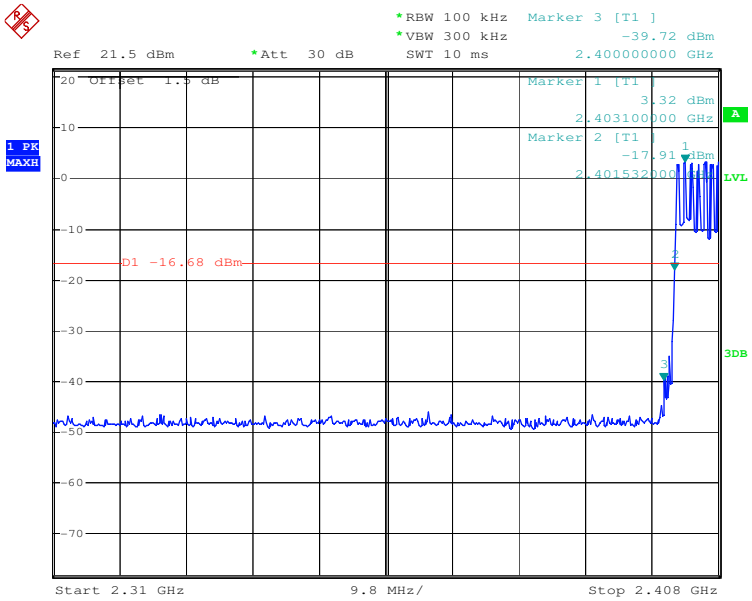
5.9 Band-edge for RF Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of date type is the worse case of GFSK modulation type, 2-DH1 of date type is worse case of π/4DQPSK modulation type, 3-DH1 of date type is worse case of 8DPSK modulation type.
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.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

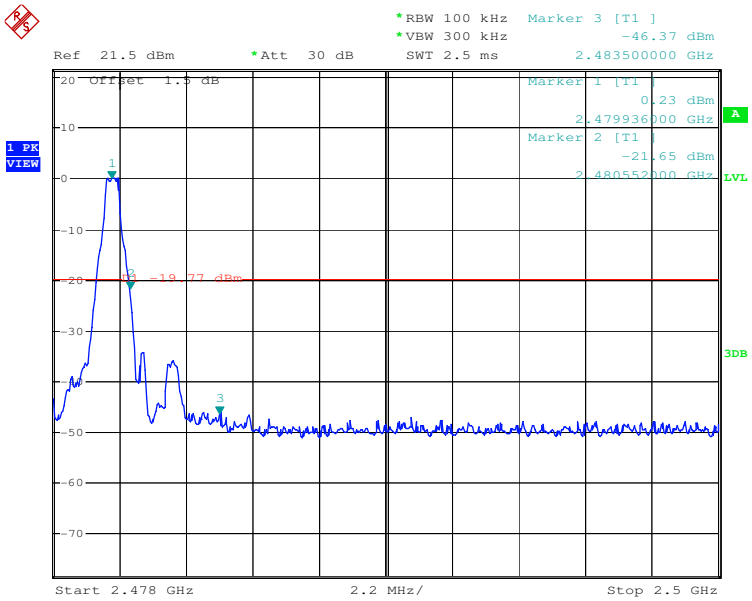
Test plot as follows:

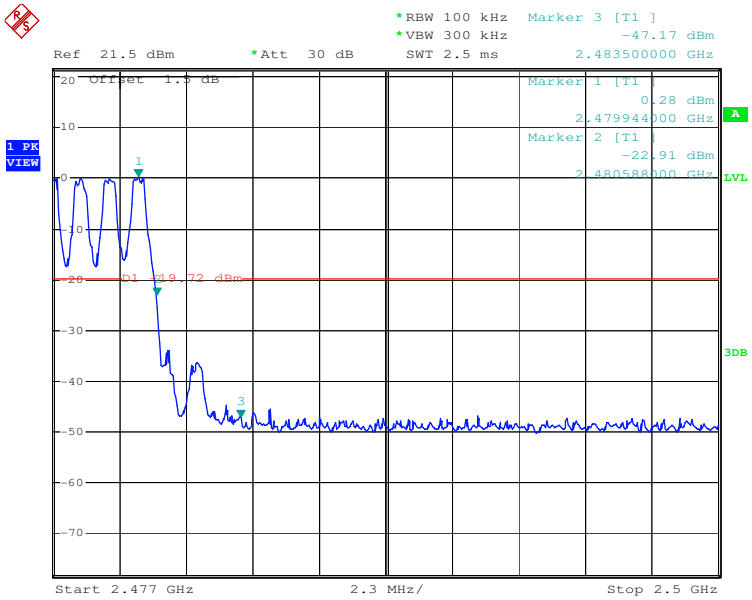
Test mode:	GFSK	Test channel:	Lowest



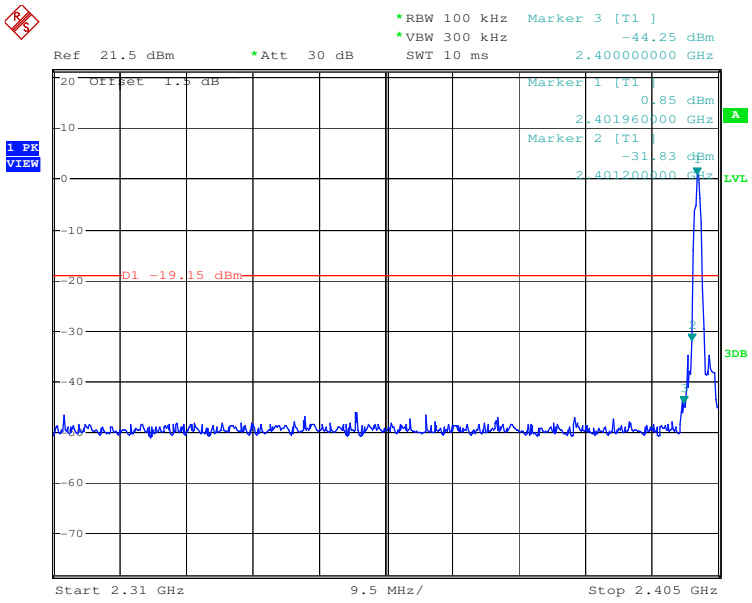


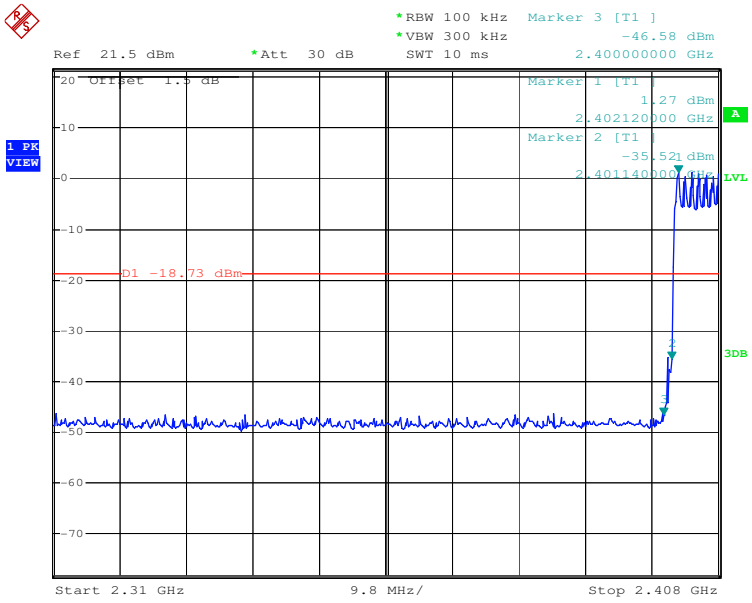
Test mode:	GFSK	Test channel:	Highest



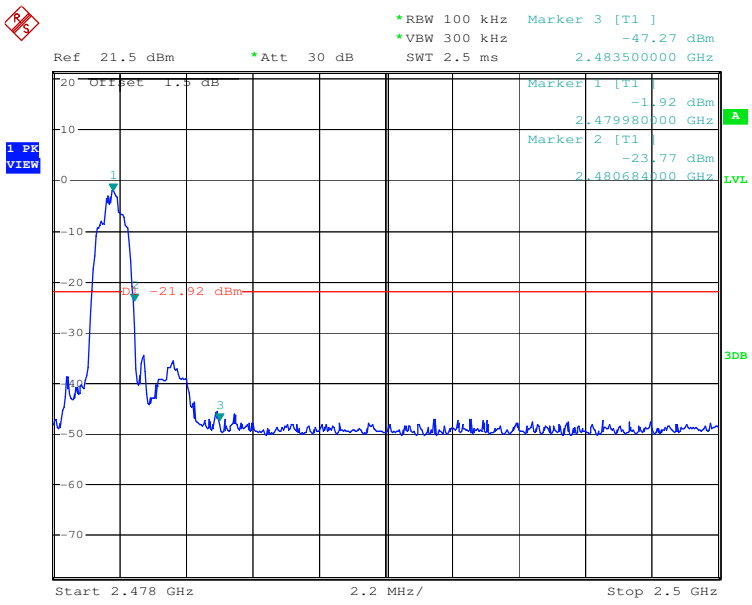


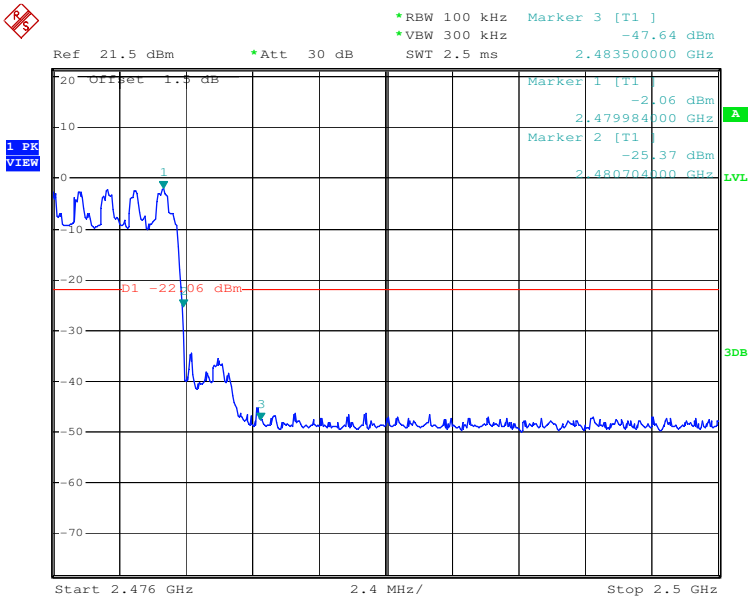
Test mode:	π/4DQPSK	Test channel:	Lowest



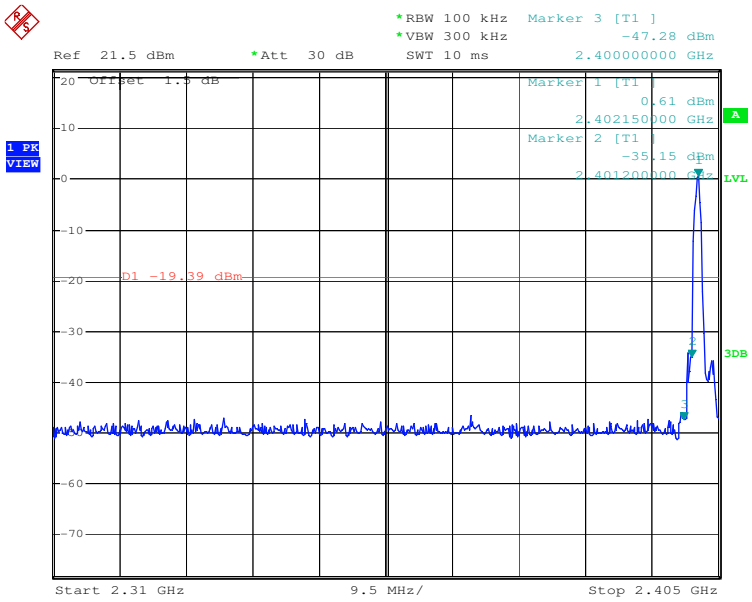


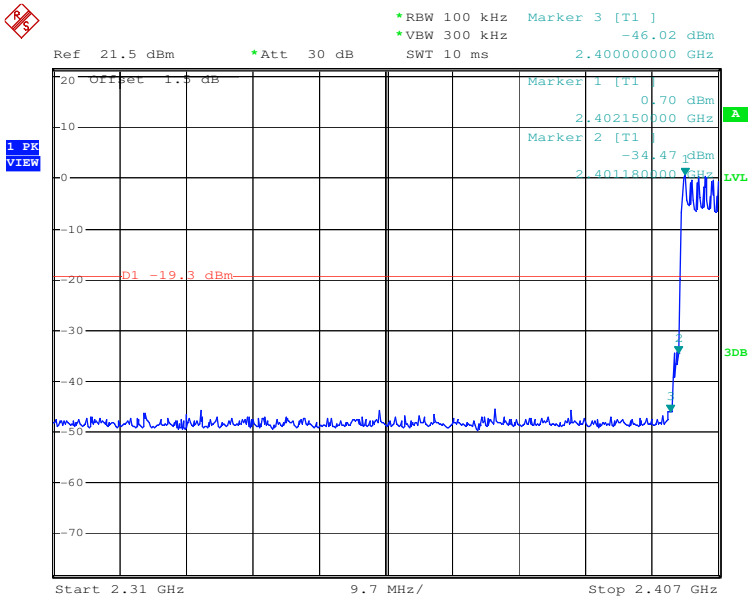
Test mode:	π/4DQPSK	Test channel:	Highest



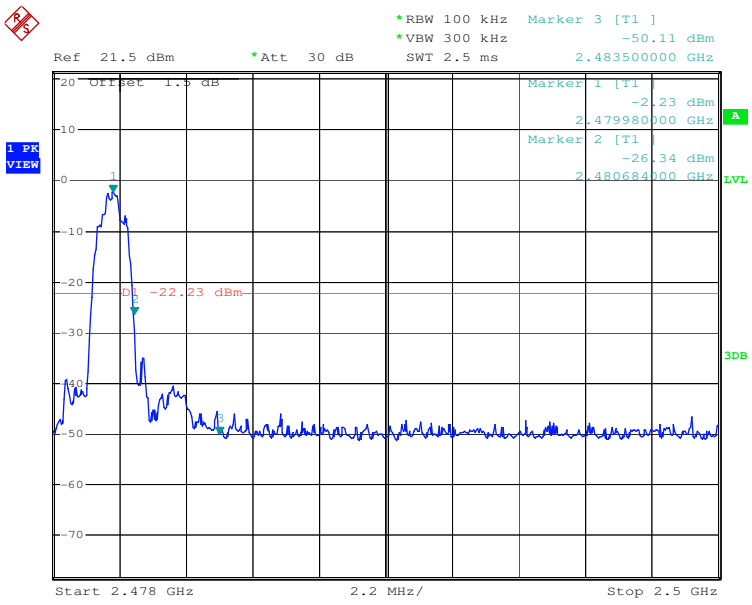


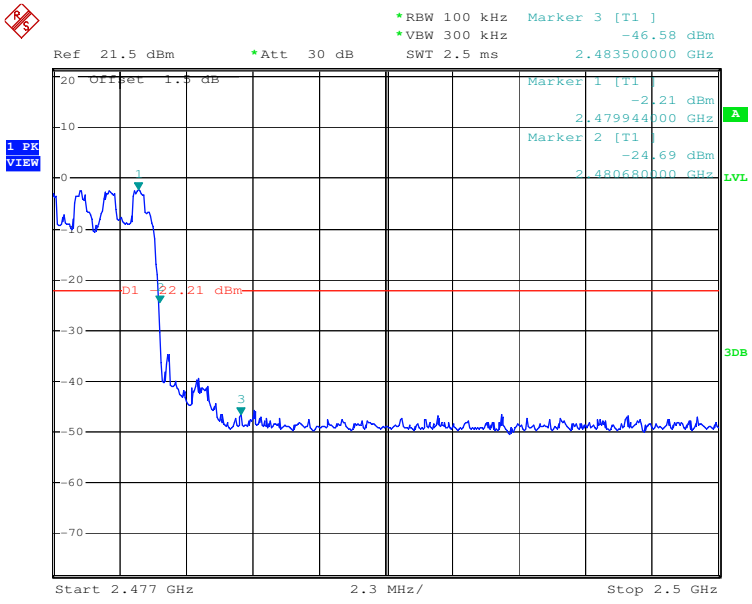
Test mode:	8DPSK	Test channel:	Lowest



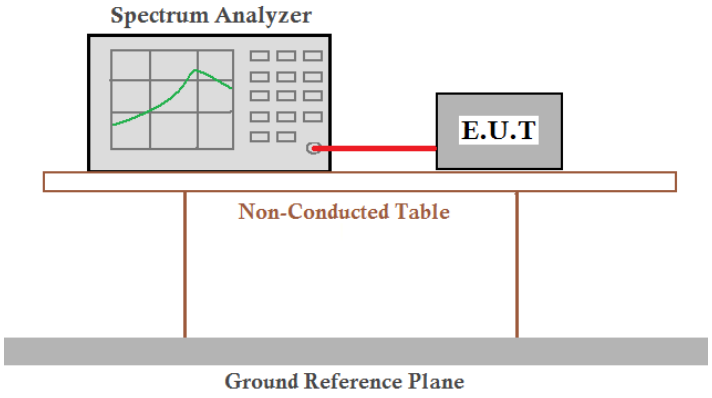


Test mode:	8DPSK	Test channel:	Highest

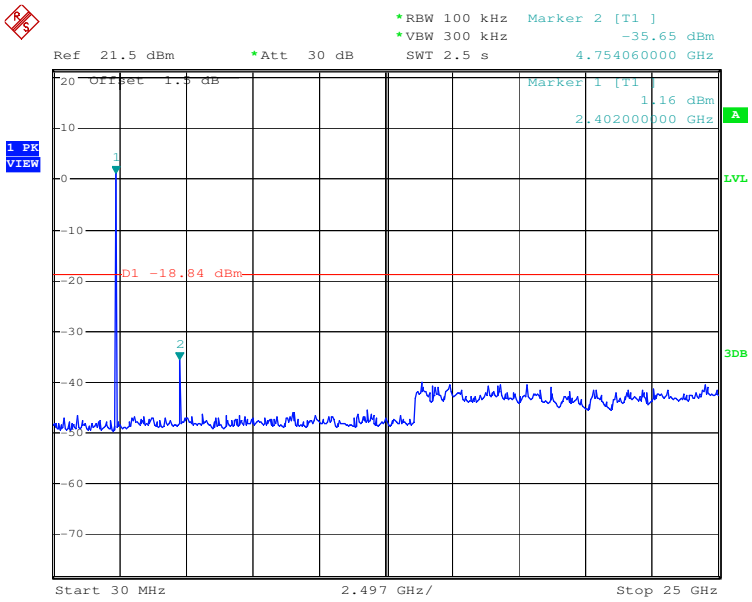




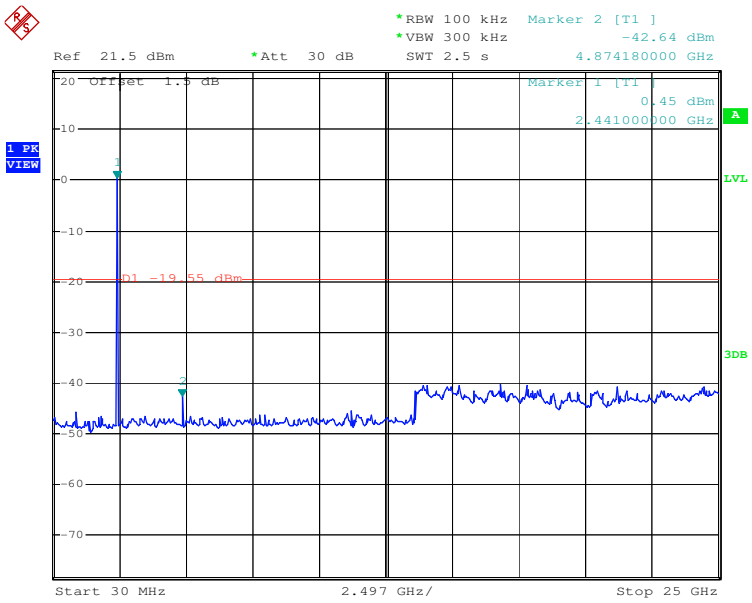
5.10 Spurious RF Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of date type is the worse case of GFSK modulation type, 2-DH1 of date type is worse case of π/4DQPSK modulation type, 3-DH1 of date type is worse case of 8DPSK modulation type.
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.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

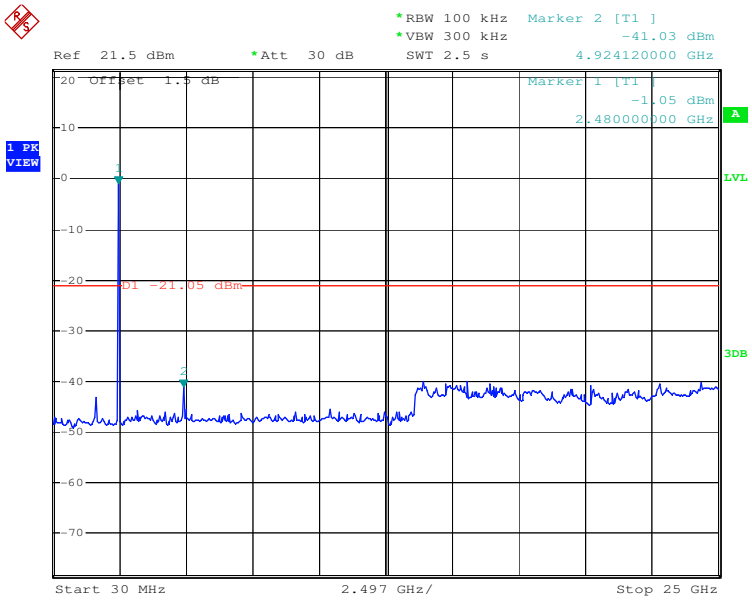
Test mode:	GFSK	Test channel:	Lowest



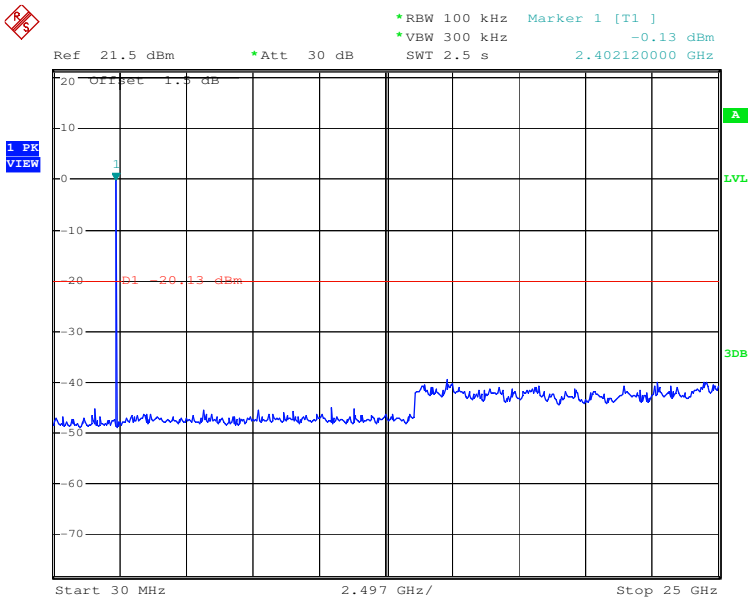
Test mode:	GFSK	Test channel:	Middle



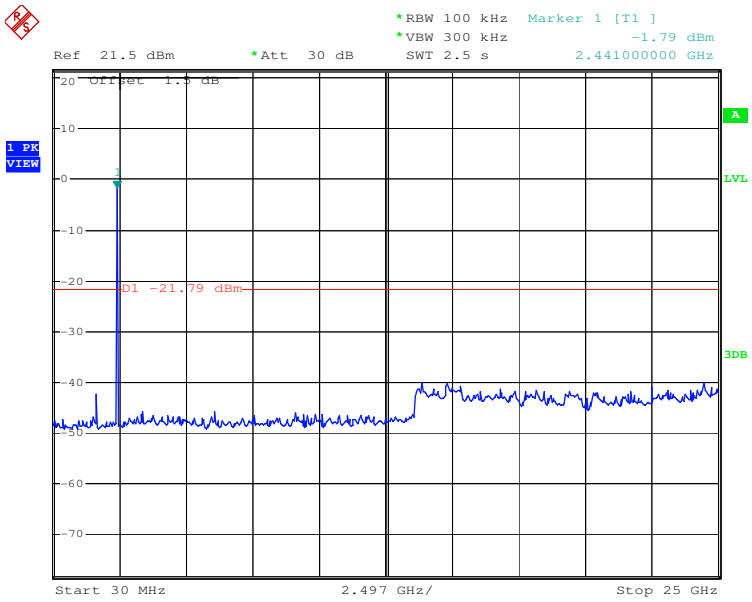
Test mode:	GFSK	Test channel:	Highest



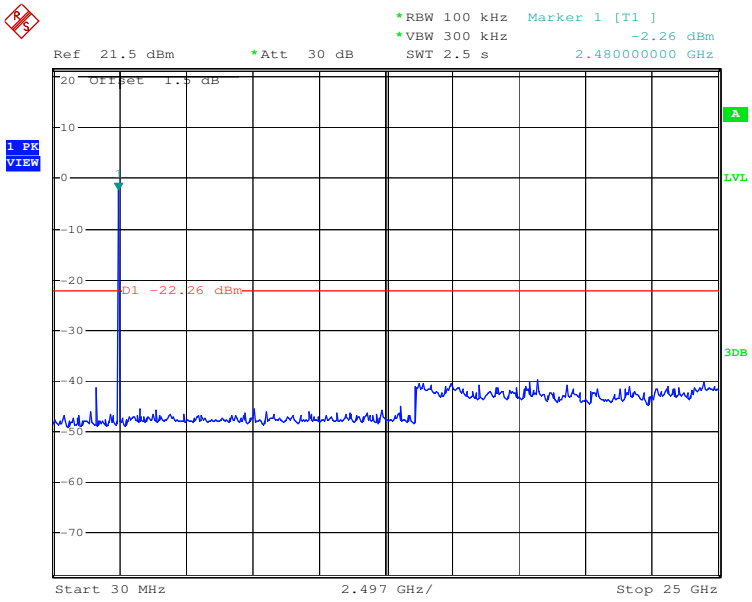
Test mode:	π/4DQPSK	Test channel:	Lowest



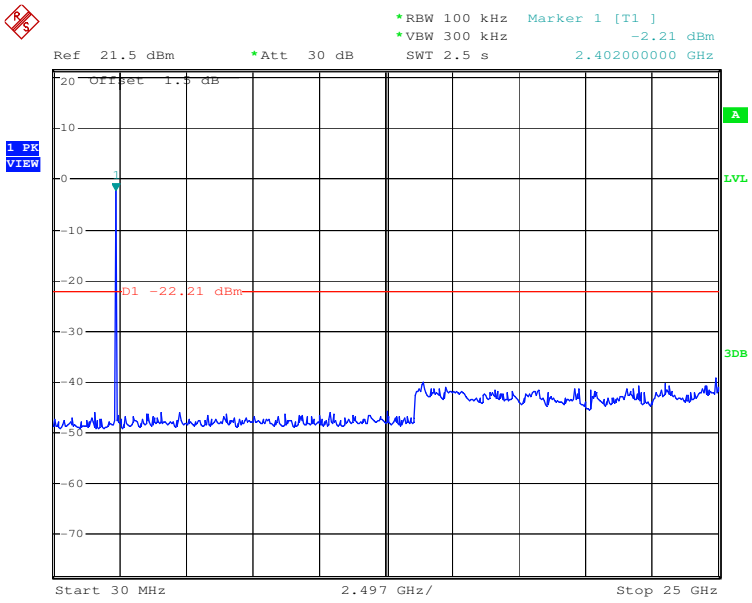
Test mode:	π/4DQPSK	Test channel:	Middle



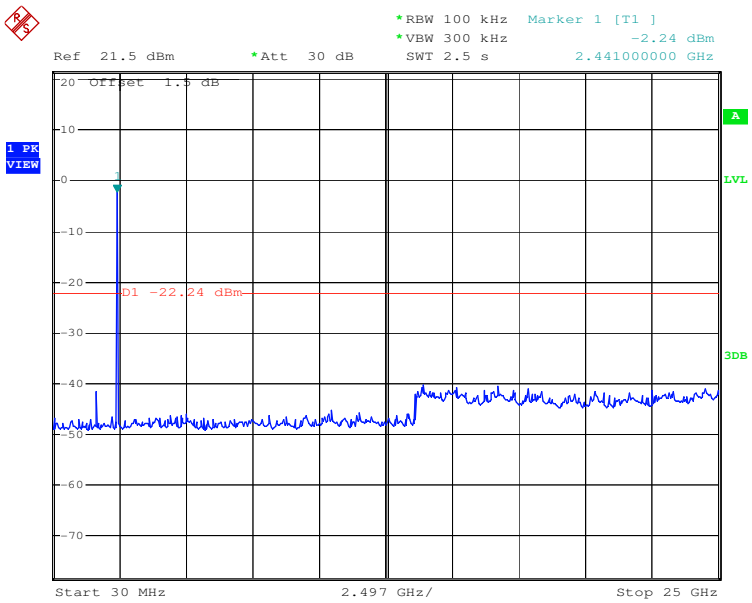
Test mode:	π/4DQPSK	Test channel:	Highest



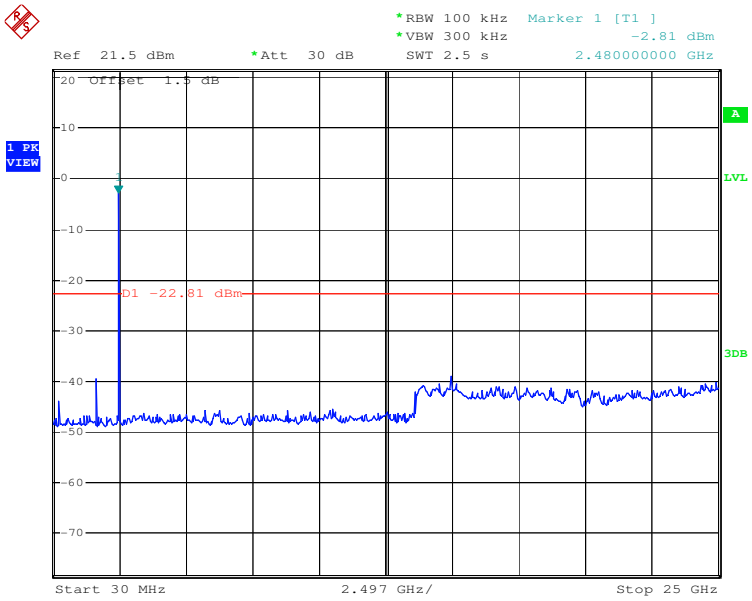
Test mode:	8DPSK	Test channel:	Lowest



Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.11 Pseudorandom Frequency Hopping Sequence

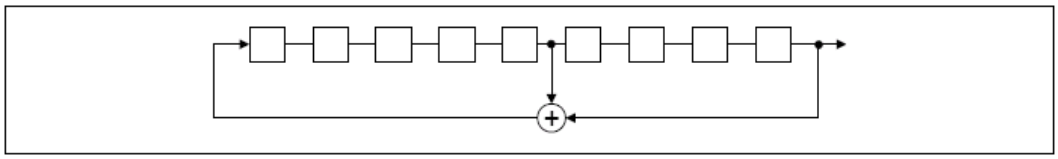
Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:

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

EUT Pseudorandom Frequency Hopping Sequence

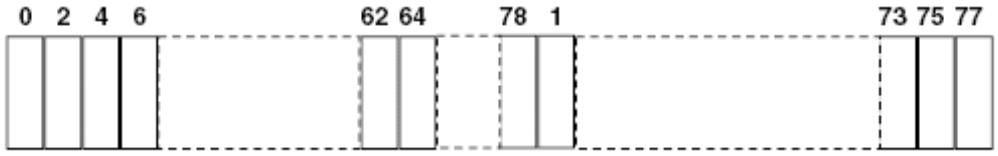
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

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



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.
The system receivers have input bandwidths that match the hopping channel bandwidths of their Corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

5.12 Radiated Spurious Emission

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2009
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Receiver Setup:	

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	100kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

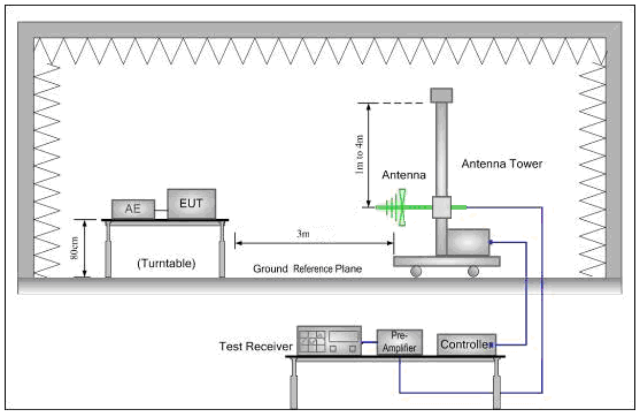


Figure 1. 30MHz to 1GHz

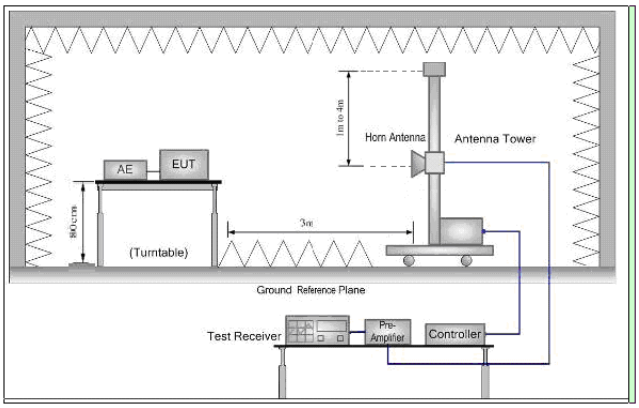
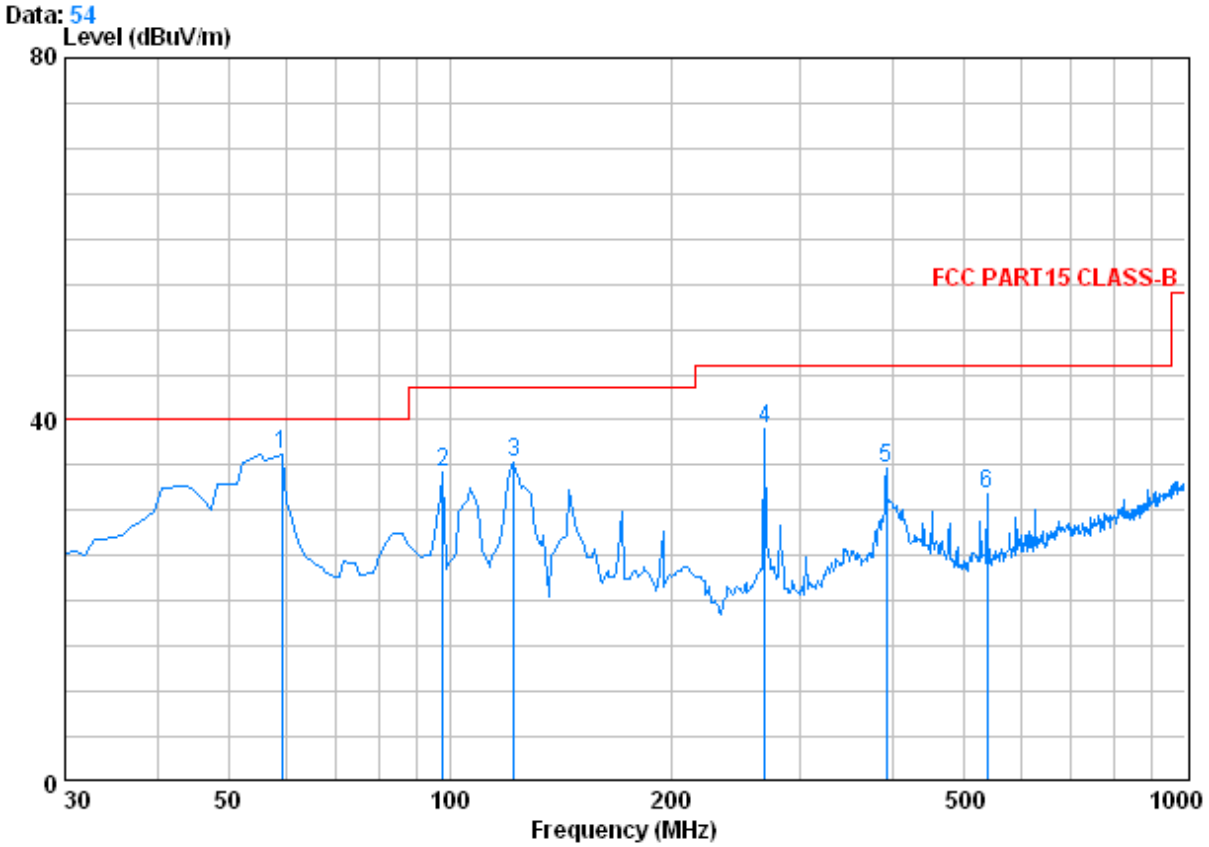


Figure 2. Above 1 GHz

Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The 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. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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. g. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz) h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of date type is the worse case of GFSK modulation type
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

5.12.1 Radiated Emission below 1GHz

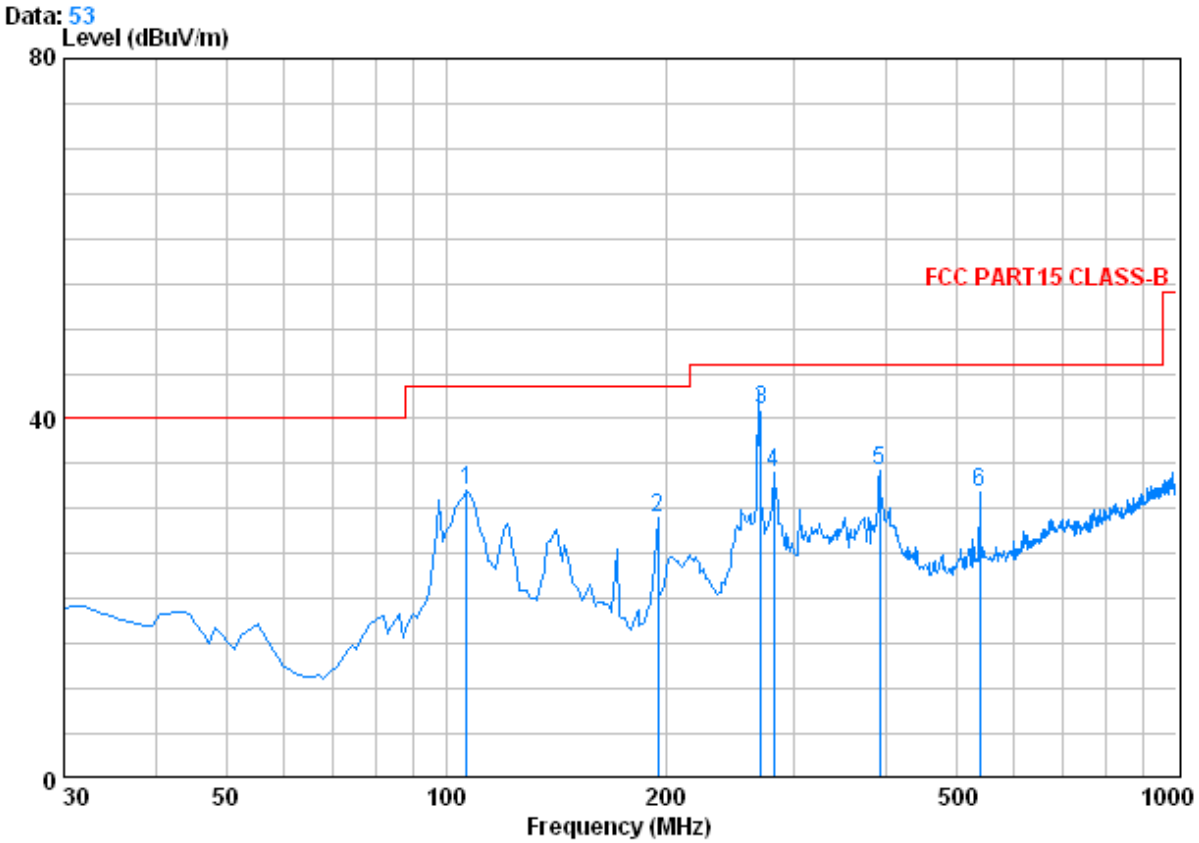
30MHz~1GHz (QP)		
Test mode:	Transmitting	Vertical



Condition : FCC PART15 CLASS-B 3m 0042673 VERTICAL
EUT : 2106RF
MODE : TX

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 @	59.100	0.80	7.27	27.27	55.41	36.20	40.00	-3.80
2	97.900	1.18	9.02	27.20	51.16	34.15	43.50	-9.35
3	122.150	1.26	7.85	27.06	53.31	35.37	43.50	-8.13
4	268.620	1.76	12.68	26.49	51.06	39.02	46.00	-6.98
5	392.780	2.18	16.22	27.09	43.31	34.62	46.00	-11.38
6	537.310	2.64	18.72	27.63	38.05	31.77	46.00	-14.23

Test mode:	Transmitting	Horizontal



Condition : FCC PART15 CLASS-B 3m 0042673 HORIZONTAL
EUT : 2106RF
MODE : TX

		Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1		106.630	1.22	8.77	27.15	49.13	31.97	43.50	-11.53
2		194.900	1.39	10.15	26.71	44.18	29.00	43.50	-14.50
3	@	270.000	1.77	12.70	26.48	53.00	40.99	46.00	-5.01
4		281.230	1.82	13.08	26.45	45.62	34.07	46.00	-11.93
5		392.780	2.18	16.22	27.09	43.00	34.31	46.00	-11.69
6		537.310	2.64	18.72	27.63	38.14	31.86	46.00	-14.14

5.12.2 Transmitter Emission above 1GHz

Worse case mode:	GFSK(DH5)	Test channel:	Lowest	Remark:	Peak

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1593.340	2.58	28.84	39.39	57.69	49.72	74.00	-24.28	Vertical
3208.660	3.49	33.32	40.45	52.26	48.62	74.00	-25.38	Vertical
4014.288	4.17	33.85	41.05	51.68	48.65	74.00	-25.35	Vertical
4804.000	4.69	34.70	41.63	68.92	66.68	74.00	-7.32	Vertical
6203.700	5.18	35.94	40.74	47.66	48.04	74.00	-25.96	Vertical
8166.687	6.20	36.07	39.05	46.46	49.68	74.00	-24.32	Vertical
1593.340	2.58	28.84	39.39	54.25	46.28	74.00	-27.72	Horizontal
3208.660	3.49	33.32	40.45	49.60	45.96	74.00	-28.04	Horizontal
3672.110	3.88	33.41	40.80	48.96	45.45	74.00	-28.55	Horizontal
4202.500	4.29	34.36	41.19	47.78	45.24	74.00	-28.76	Horizontal
4804.000	4.69	34.70	41.63	60.58	58.34	74.00	-15.66	Horizontal
6063.190	5.14	35.78	40.87	48.11	48.16	74.00	-25.84	Horizontal

Worse case mode:	GFSK(DH5)	Test channel:	Middle	Remark:	Peak

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1621.985	2.59	29.09	39.41	57.55	49.82	74.00	-24.18	Vertical
3249.760	3.53	33.30	40.48	56.76	53.11	74.00	-20.89	Vertical
4065.707	4.21	33.99	41.08	53.49	50.61	74.00	-23.39	Vertical
4884.000	4.72	34.59	41.68	64.97	62.60	74.00	-11.40	Vertical
6412.427	5.23	36.18	40.56	47.38	48.23	74.00	-25.77	Vertical
8250.266	6.19	36.10	38.96	46.23	49.56	74.00	-24.44	Vertical
1621.985	2.59	29.09	39.41	56.52	48.79	74.00	-25.21	Horizontal
3249.760	3.53	33.30	40.48	52.77	49.12	74.00	-24.88	Horizontal
4065.707	4.21	33.99	41.08	49.02	46.14	74.00	-27.86	Horizontal
4882.000	4.72	34.59	41.68	61.98	59.61	74.00	-14.39	Horizontal
5806.408	5.06	35.40	41.09	49.47	48.84	74.00	-25.16	Horizontal
7470.558	6.08	35.99	39.64	48.62	51.05	74.00	-22.95	Horizontal

Worse case mode:	GFSK(DH5)	Test channel:	Highest	Remark:	Peak

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1654.000	2.62	29.21	39.42	61.26	53.67	74.00	-20.33	Vertical
3308.000	3.58	33.28	40.52	56.39	52.73	74.00	-21.27	Vertical
4138.802	4.25	34.22	41.14	54.69	52.02	74.00	-21.98	Vertical
4960.000	4.76	34.46	41.74	56.54	54.02	74.00	-19.98	Vertical
5791.646	5.06	35.37	41.10	48.32	47.65	74.00	-26.35	Vertical
7920.996	6.21	36.00	39.26	47.12	50.07	74.00	-23.93	Vertical
1655.354	2.62	29.33	39.42	56.05	48.58	74.00	-25.42	Horizontal
3308.185	3.58	33.28	40.52	53.84	50.18	74.00	-23.82	Horizontal
4960.000	4.76	34.46	41.74	53.32	50.80	74.00	-23.20	Horizontal
5865.832	5.08	35.48	41.04	48.51	48.03	74.00	-25.97	Horizontal
6921.301	5.47	35.89	40.12	48.12	49.36	74.00	-24.64	Horizontal
7840.752	6.22	36.00	39.33	46.10	48.99	74.00	-25.01	Horizontal

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) The disturbance above 13GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

3) Refer to section 5.9 for details, Average Value=Peak Value+PDCF; The worst PDCF is -30.66dB. So, only the peak measurements were shown in the report.

5.13 Band edge (Radiated Emission)

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2009
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

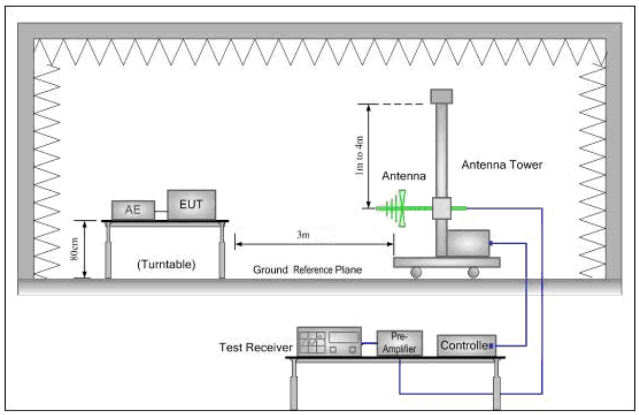


Figure 1. 30MHz to 1GHz

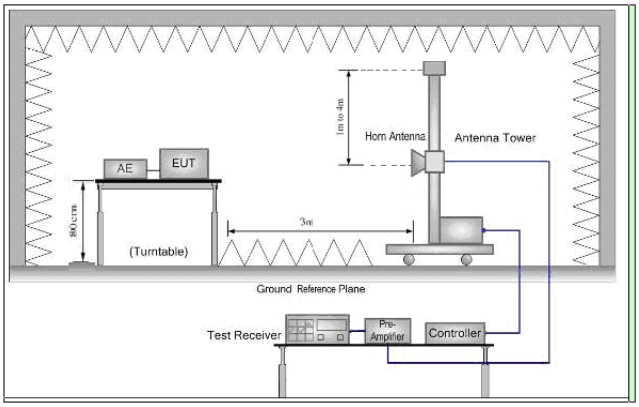
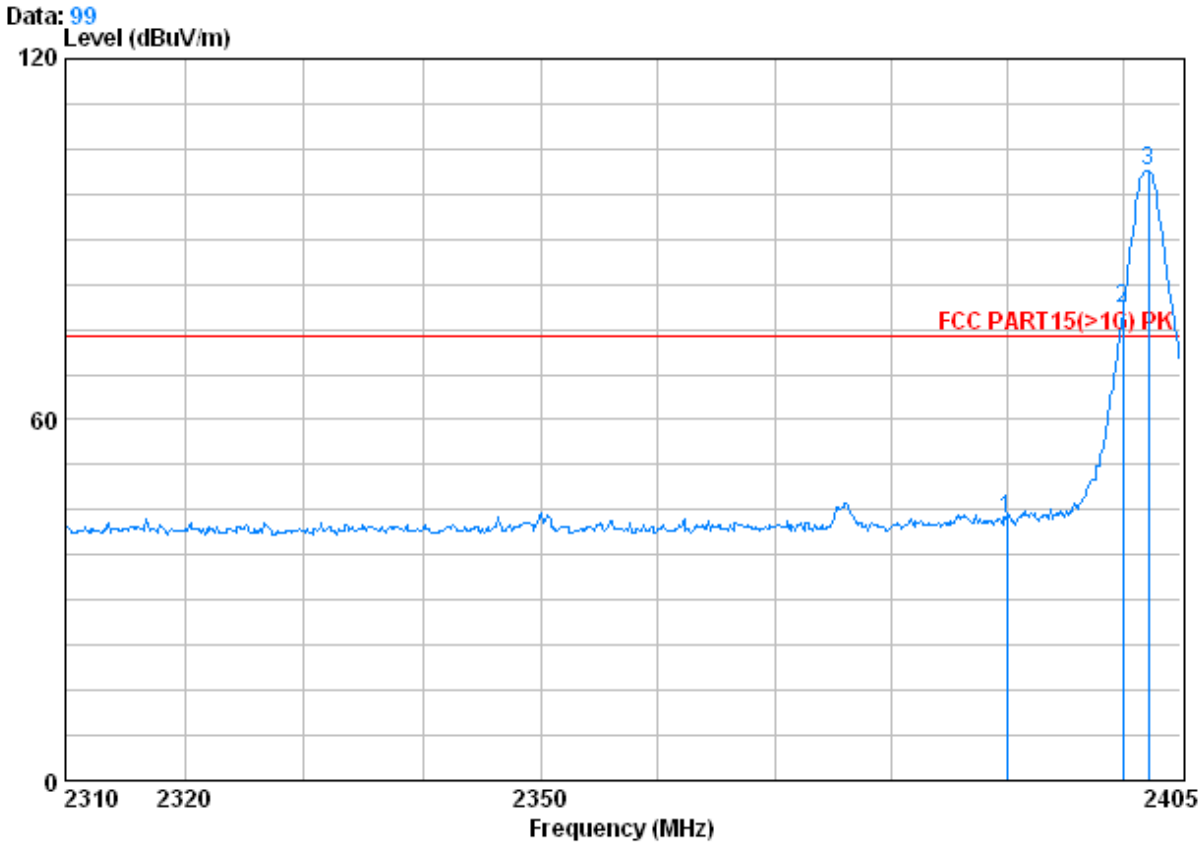


Figure 2. Above 1 GHz

Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The 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. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel g. Test the EUT in the lowest channel , the Highest channel h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of date type is the worse case of GFSK modulation type
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Test plot as follows:

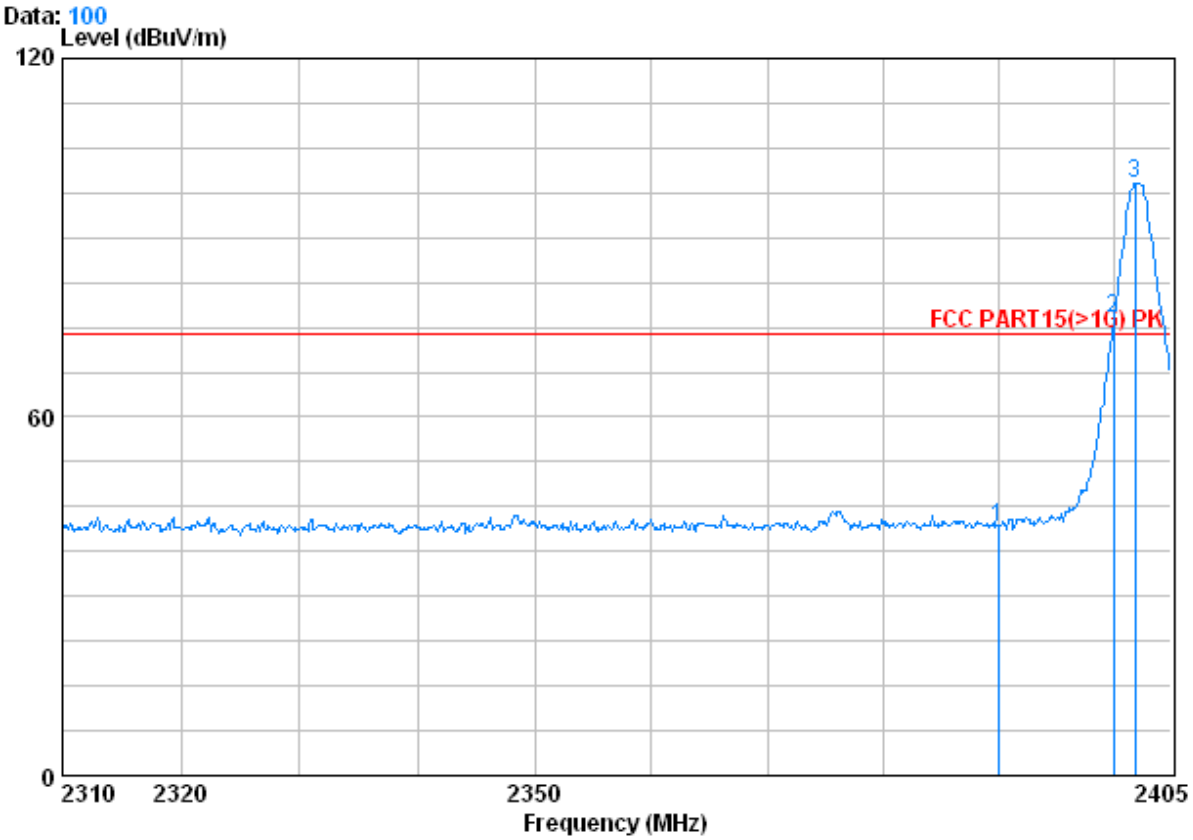
Band edge test data						
Worse case mode:	GFSK(DH5)	Test channel:	Lowest	Remark:	Peak	Vertical



Condition : FCC PART15(>1G) PK 3m VERTICAL
EUT : Multimedia Speaker
Job No. : 2106RF
test mode : 2402 bandedge

		Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1		2390.000	2.98	32.51	39.85	47.85	43.50	74.00	-30.50
2	X	2400.000	2.98	32.51	39.86	82.87	78.50	74.00	4.50
3	@	2402.245	2.98	32.51	39.86	105.64	101.27	74.00	27.27

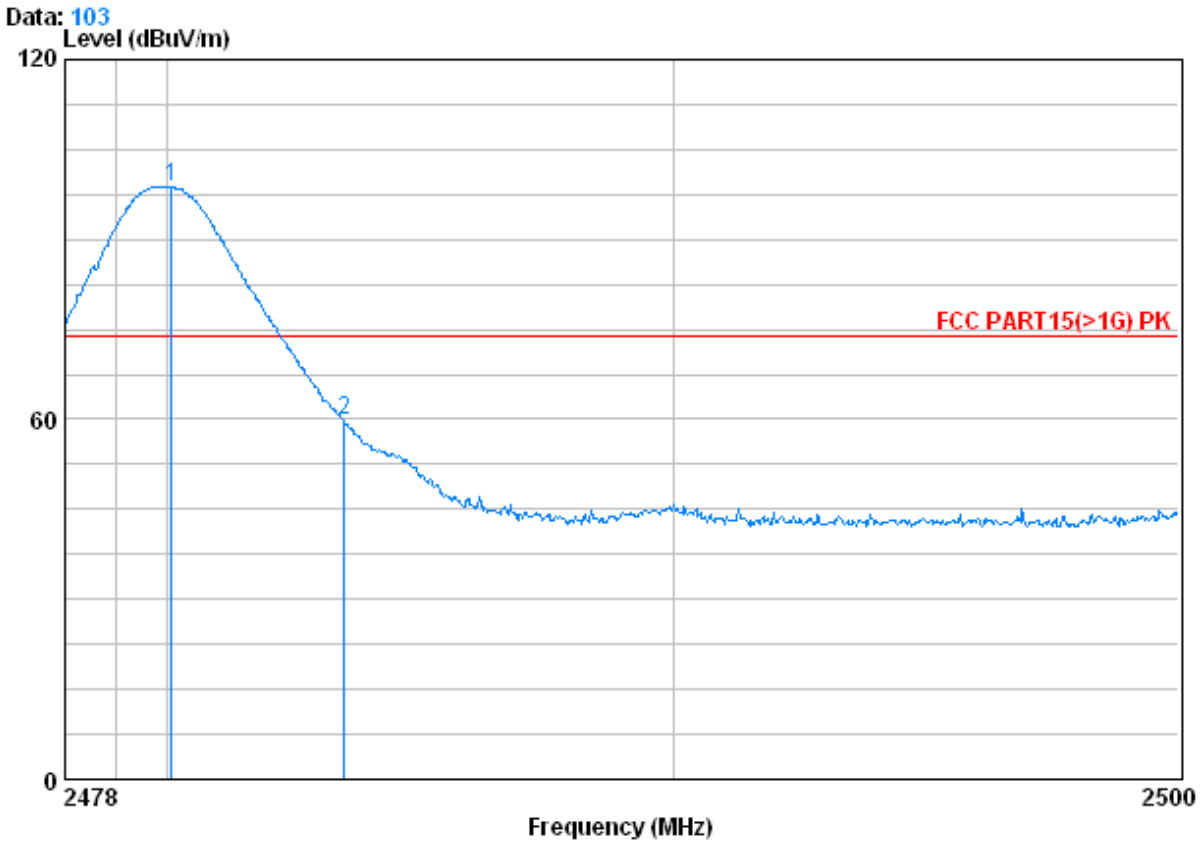
Worse case mode:	GFSK(DH5)	Test channel:	Lowest	Remark:	Peak	Horizontal



Condition : FCC PART15(>1G) PK 3m HORIZONTAL
EUT : Multimedia Speaker
Job No. : 2106RF
test mode : 2402 bandedge

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	2.98	32.51	39.85	45.97	41.62	74.00	-32.38
2 X	2400.000	2.98	32.51	39.86	80.76	76.39	74.00	2.39
3 @	2401.865	2.98	32.51	39.86	103.47	99.10	74.00	25.10

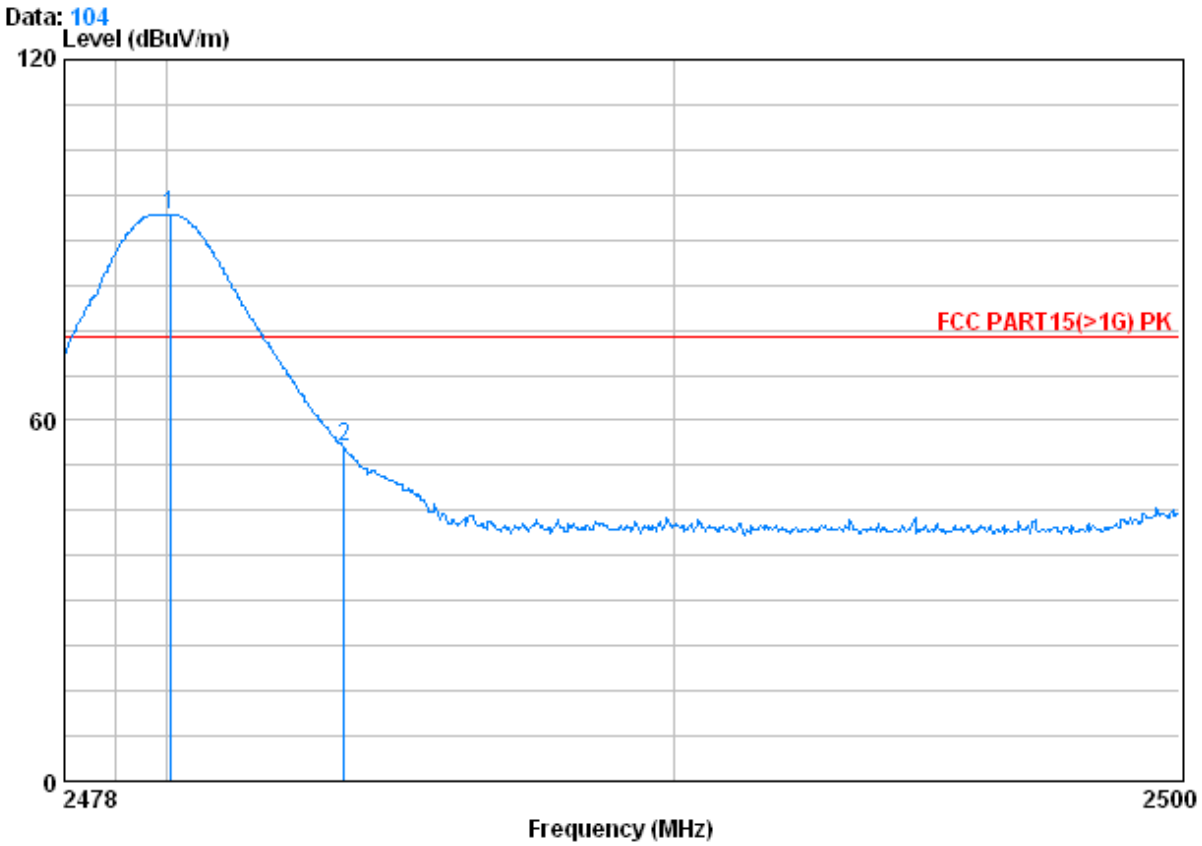
Worse case mode:	GFSK(DH5)	Test channel:	Highest	Remark:	Peak	Vertical



Condition : FCC PART15(>1G) PK 3m VERTICAL
EUT : Multimedia Speaker
Job No. : 2106RF
test mode : 2480 bandedge

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 @	2480.090	3.03	32.67	39.92	103.03	98.81	74.00	24.81
2	2483.500	3.03	32.67	39.92	63.90	59.68	74.00	-14.32

Worse case mode:	GFSK(DH5)	Test channel:	Highest	Remark:	Peak	Horizontal



Condition : FCC PART15(>1G) PK 3m HORIZONTAL
EUT : Multimedia Speaker
Job No. : 2106RF
test mode : 2480 bandedge

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 X	2480.068	3.03	32.67	39.92	98.46	94.24	74.00	20.24
2	2483.500	3.03	32.67	39.92	59.75	55.53	74.00	-18.47

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Refer to section 5.9 for details, Average Value=Peak Value+PDCF; The worst PDCF is -30.66dB. So, only the peak measurements were shown in the report.