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FCC REPORT

Application No:	SZEM1107002570RF
Applicant:	Shenzhen SKY DRAGON Audio-video Technology Co. LTD
Product Name:	Music Speaker
Operation Frequency:	2.402GHz to 2.480GHz
FCC ID:	ZJPBC06ISB311B
Standards:	FCC CFR Title 47 Part 15 Subpart C
Date of Receipt:	2011-07-29
Date of Test:	2011-08-01 to 2011-08-10
Date of Issue:	2011-08-26
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 Contents

3 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 (b)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List (7 July 2002)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

Remark: Pass: The EUT complies with the essential requirements in the standard.
Fail: The EUT does not comply with the essential requirements in the standard.

4 General Information

4.1 Client Information

Applicant:	Shenzhen SKY DRAGON Audio-video Technology Co. LTD
Address of Applicant:	B16, Laneway 3, Liuxian 2RD, District 71, Baoan, shenzhen
Manufacturer:	Shenzhen SKY DRAGON Audio-video Technology Co. LTD
Address of Manufacturer:	B16, Laneway 3, Liuxian 2RD, District 71, Baoan, shenzhen
Factory:	Shenzhen SKY DRAGON Audio-video Technology Co. LTD
Address of Factory:	B16, Laneway 3, Liuxian 2RD, District 71, Baoan, shenzhen

4.2 General Description of E.U.T.

Product Name:	Music Speaker
Model No.:	BC06, ISB311B Only the model BC06 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being the model No. and color.
Trade mark:	SAMESAY
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK, π/4DQPSK, 8DPSK
Antenna Type:	PCB Antenna
Antenna gain:	2.12dBi
Power supply:	DYS SWITCHING MODE POWER SUPPLY P/N: DYS182-050300-11407D MODEL: DYS182-050300W-1 INPUT: 100-240V~50/60Hz 0.45A MAX OUTPUT: 50V ⎓ 3.0A

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 E.U.T Operation mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1004mbar
Test mode:	
Music + Charge mode:	Keep the EUT playing wireless music and charging to two mobile phone.
Transmitting mode:	Keep the EUT in continuously transmitting mode.

4.4 Description of Support Units

The EUT was tested with associated equipment as below.

Description	Manufacturer	Model No.
iPod	Apple	MC027CH/A
Mobile	Nokia	E71
Mobile	SAMSUNG	S5660

4.5 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 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 and C-2383 respectively.
  Date of Registration: September 29, 2008. Valid until September 28, 2011.
- **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 556682, March 16, 2011
- **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.

4.6 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
Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594
No tests were sub-contracted.

4.7 Other Information Requested by the Customer

None.

4.8 Test Instruments list

RE in Chamber						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2011-06-10	2012-06-10
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	2011-05-26	2012-05-26
3	EMI Test software	AUDIX	E3	SEL0050	N/A	N/A
4	Coaxial cable	SGS	N/A	SEL0028	2011-05-29	2012-05-29
5	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2010-11-09	2011-11-09
6	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2010-11-09	2011-11-09
7	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2010-11-09	2011-11-09
8	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2011-05-26	2012-05-26
9	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2010-10-27	2011-10-27
11	Band filter	Amindeon	82346	SEL0094	2011-05-26	2012-05-26

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2011-06-10	2012-06-10
2	LISN	Rohde & Schwarz	ENV216	SEL0152	2010-10-27	2011-10-26
3	Two-Line V-Network	Rohde & Schwarz	ENV216	SEL0152	2010-10-27	2011-10-27
4	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2011-05-26	2012-05-26
5	Coaxial Cable	SGS	N/A	SEL0024	2011-05-29	2012-05-29

RF conducted						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	Spectrum Analyzer	Rohde & Schwarz	FSP 30	SEL0154	2010-10-27	2011-10-27
2	Coaxial cable	SGS	N/A	SEL0028	2011-05-29	2012-05-29

General used equipment						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0102 to SEL0103	2010-11-04	2011-11-04
2	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0101	2011-03-10	2012-03-10
3	Barometer	ChangChun	DYM3	SEL0088	2011-05-18	2012-05-18
4	Oscillogragh	Tektronix	TDS2022B	SZE007-4	2010-12-04	2011-12-04

5 Test results and Measurement Data

5.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

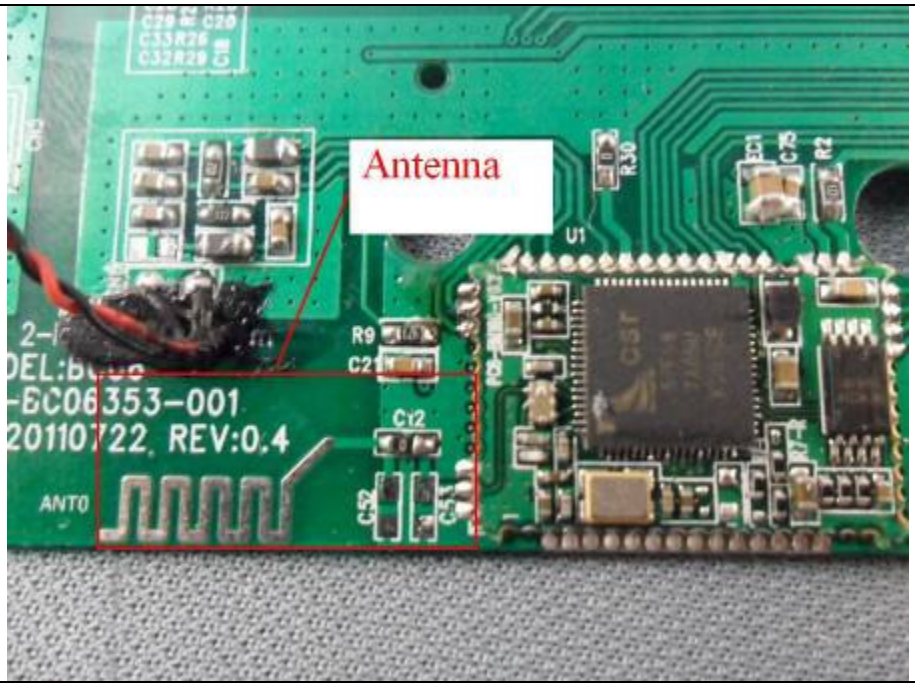
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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:

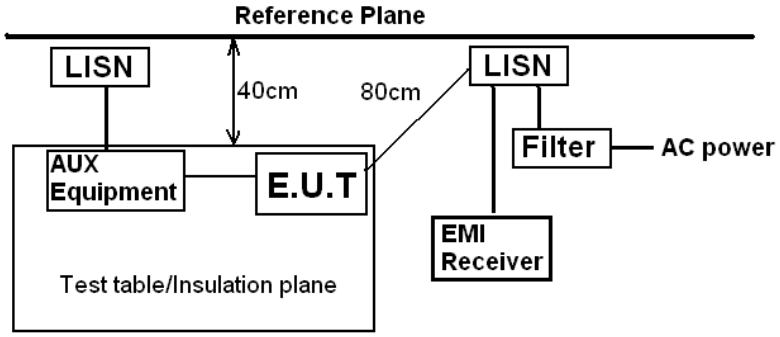
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output 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.

E.U.T Antenna:	

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.12dBi.



5.2 Conducted Emissions

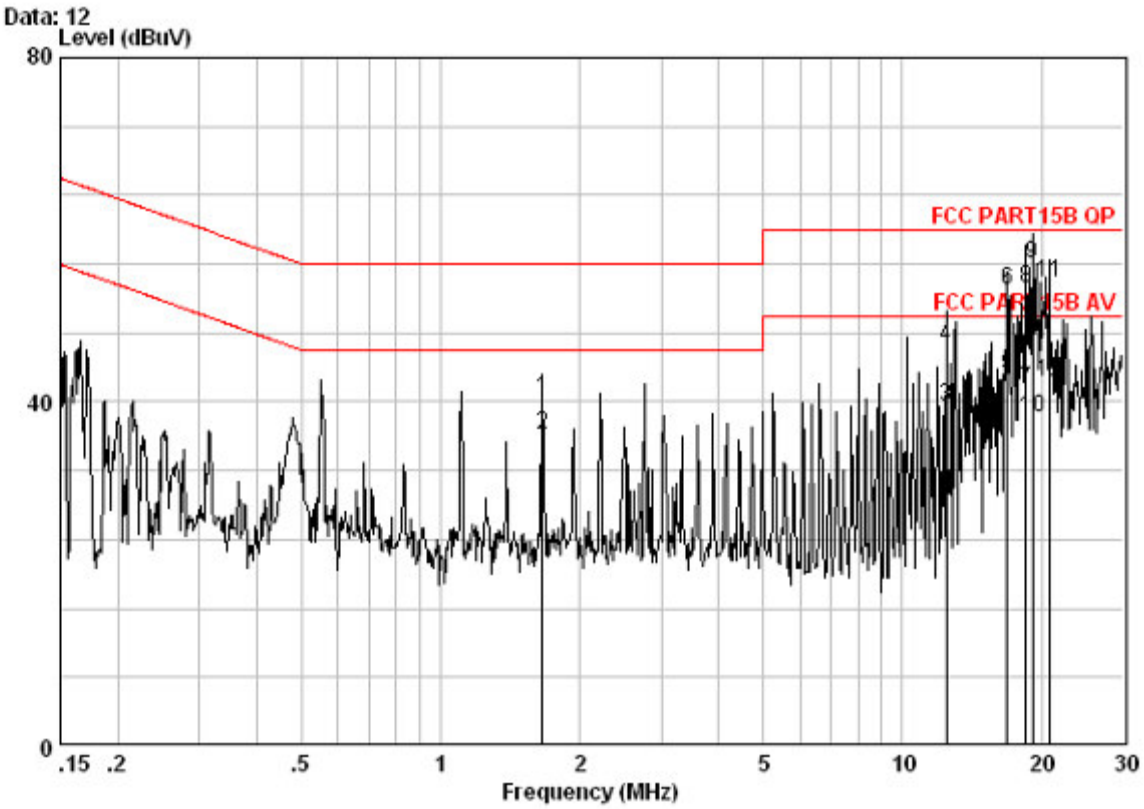
Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10: 2009
Test Frequency Range:	150kHz to 30MHz
Class / Severity:	Class B
Limit:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 * Decreases with the logarithm of the frequency.
Test procedure	The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.).The provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). 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: 2009 on conducted measurement.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test Instruments:	Refer to section 4.8 for details.
Test mode:	Music + Charge mode
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:



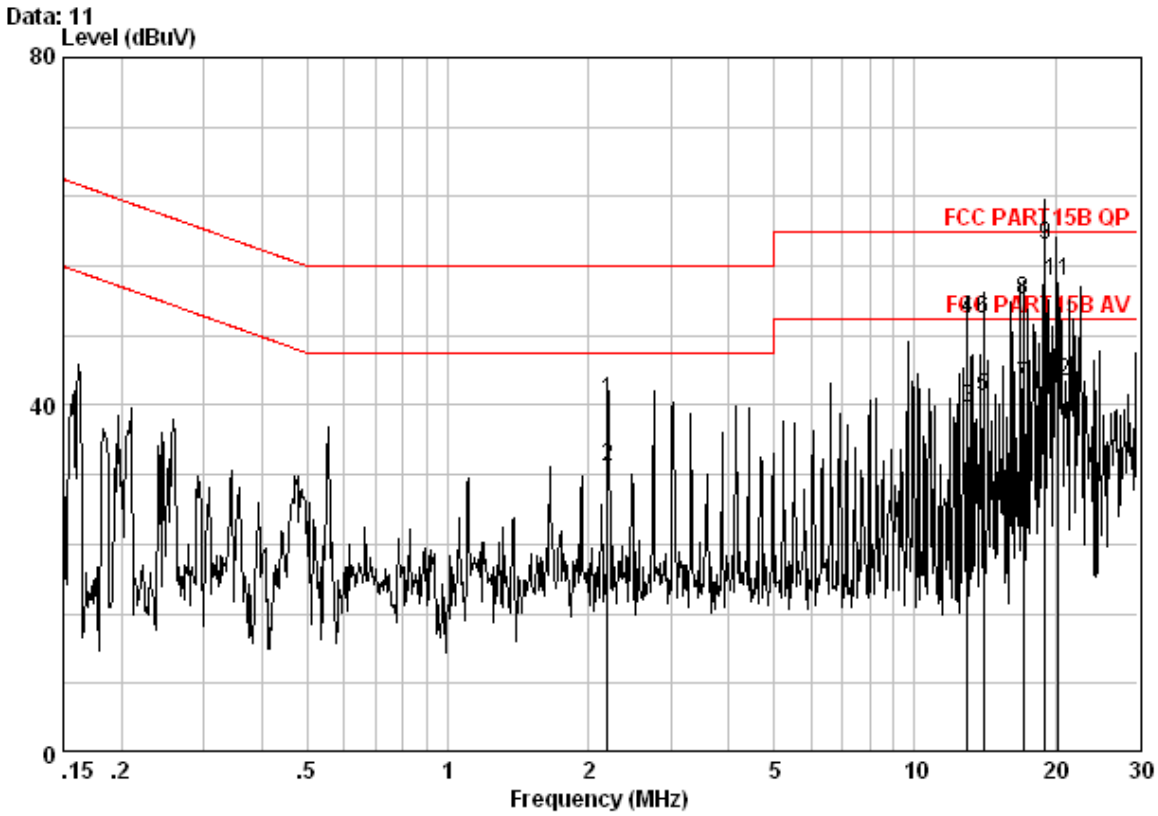
	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	1.662	0.11	9.70	30.61	40.42	56.00	-15.58	QP
2	1.662	0.11	9.70	26.46	36.26	46.00	-9.74	Average
3	12.449	0.24	9.91	29.42	39.56	50.00	-10.44	Average
4	12.449	0.24	9.91	36.32	46.47	60.00	-13.53	QP
5	16.839	0.26	10.04	32.88	43.18	50.00	-6.82	Average
6	16.839	0.26	10.04	42.62	52.92	60.00	-7.08	QP
7	18.524	0.27	10.07	31.10	41.44	50.00	-8.56	Average
8	18.524	0.27	10.07	42.90	53.24	60.00	-6.76	QP
9 @	19.090	0.27	10.08	45.60	55.95	60.00	-4.05	QP
10	19.090	0.27	10.08	27.90	38.25	50.00	-11.75	Average
11	20.814	0.27	10.10	43.51	53.88	60.00	-6.12	QP
12	20.814	0.27	10.10	32.02	42.39	50.00	-7.61	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.

Neutral line:



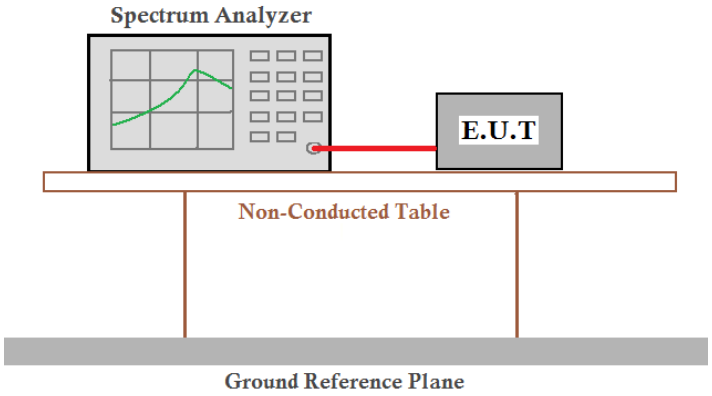
		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		2.201	0.12	9.71	30.65	40.49	56.00	-15.51	QP
2		2.201	0.12	9.71	23.15	32.98	46.00	-13.02	Average
3		12.988	0.24	9.93	29.47	39.63	50.00	-10.37	Average
4		12.988	0.24	9.93	39.75	49.92	60.00	-10.08	QP
5		14.063	0.24	9.97	30.78	40.99	50.00	-9.01	Average
6		14.063	0.24	9.97	39.66	49.87	60.00	-10.13	QP
7		17.109	0.26	10.05	32.06	42.36	50.00	-7.64	Average
8		17.109	0.26	10.05	41.71	52.02	60.00	-7.98	QP
9	@	19.040	0.27	10.08	48.10	58.45	60.00	-1.55	QP
10		19.040	0.27	10.08	30.90	41.25	50.00	-8.75	Average
11		20.240	0.27	10.10	43.90	54.27	60.00	-5.73	QP
12		20.240	0.27	10.10	32.27	42.64	50.00	-7.36	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

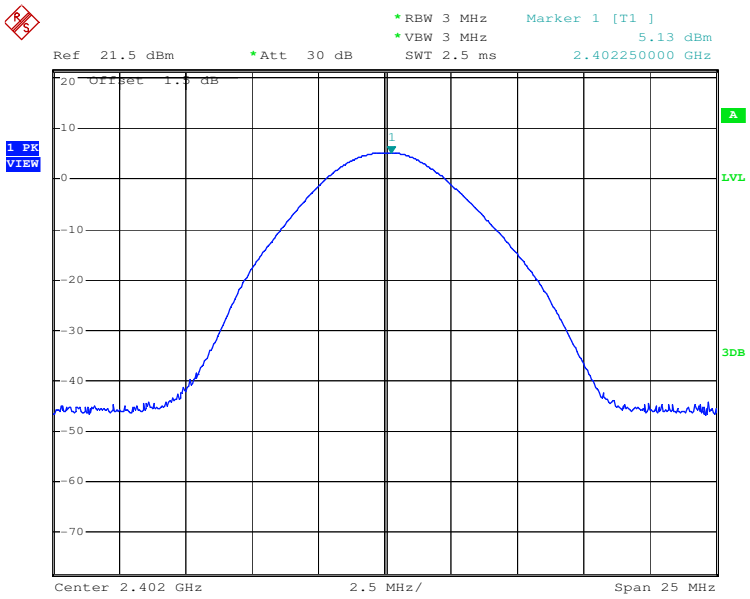
Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2009
Limit:	30dBm
Test setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Test Instruments:	Refer to section 4.8 for details.
Test state:	Non-hopping transmitting with all kinds of modulation.
Test results:	Pass

Measurement Data

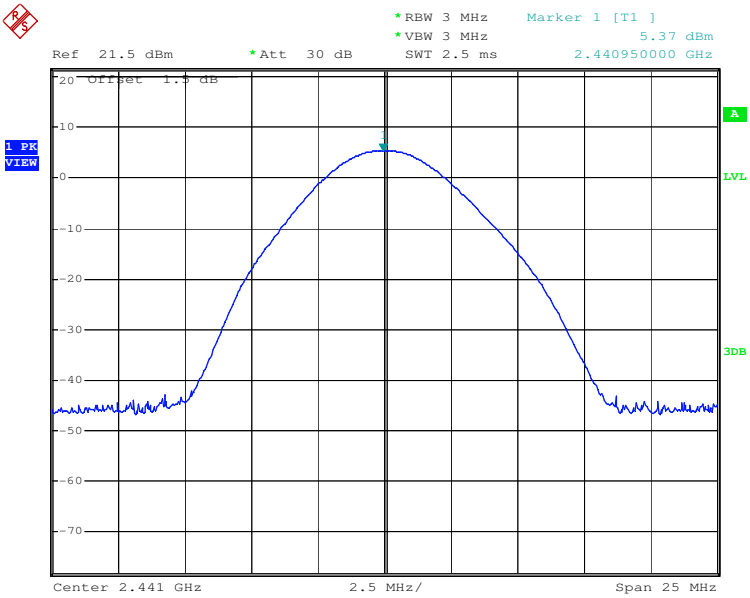
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	5.13	30.00	Pass
Middle	5.37	30.00	Pass
Highest	6.40	30.00	Pass
π/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.59	30.00	Pass
Middle	4.80	30.00	Pass
Highest	5.56	30.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.71	30.00	Pass
Middle	4.91	30.00	Pass
Highest	5.69	30.00	Pass

Test plot as follows:

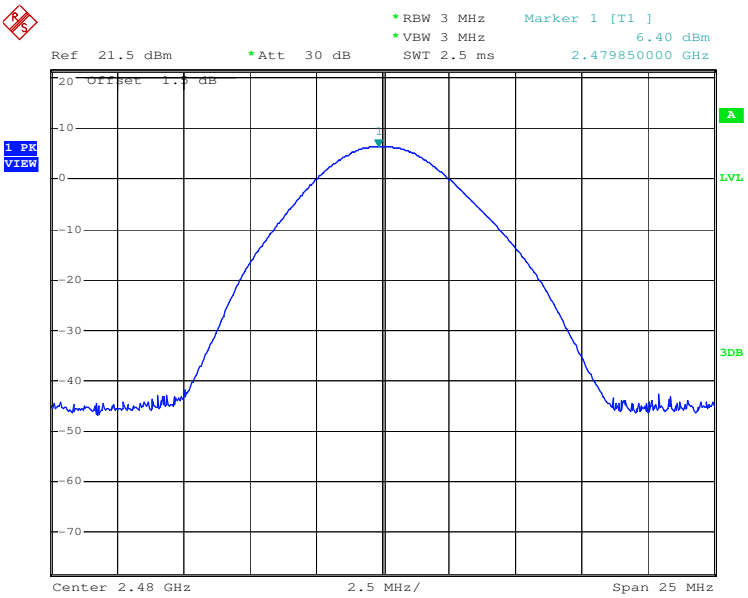
Test mode:	GFSK	Test channel:	Lowest



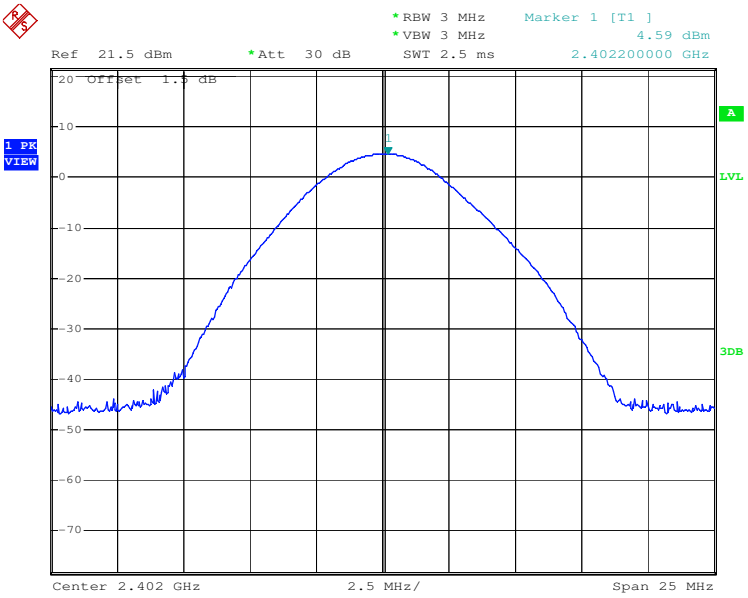
Test mode:	GFSK	Test channel:	Middle



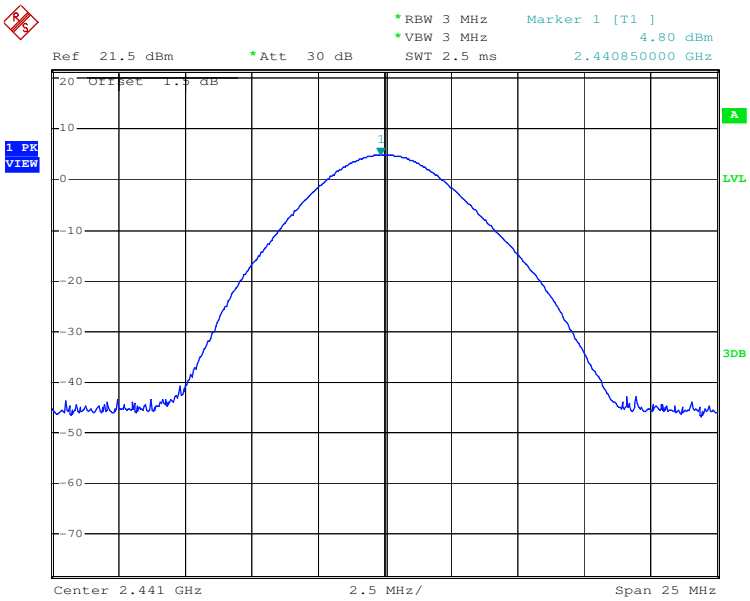
Test mode:	GFSK	Test channel:	Highest



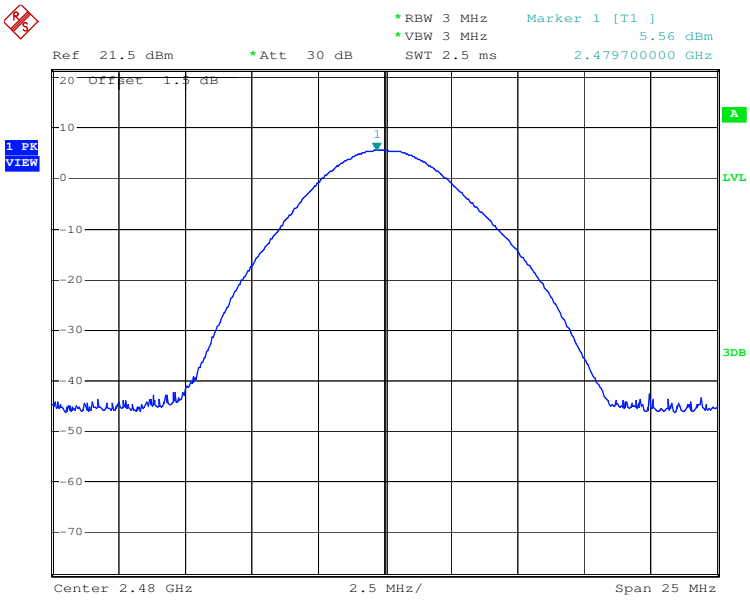
Test mode:	π/4DQPSK	Test channel:	Lowest



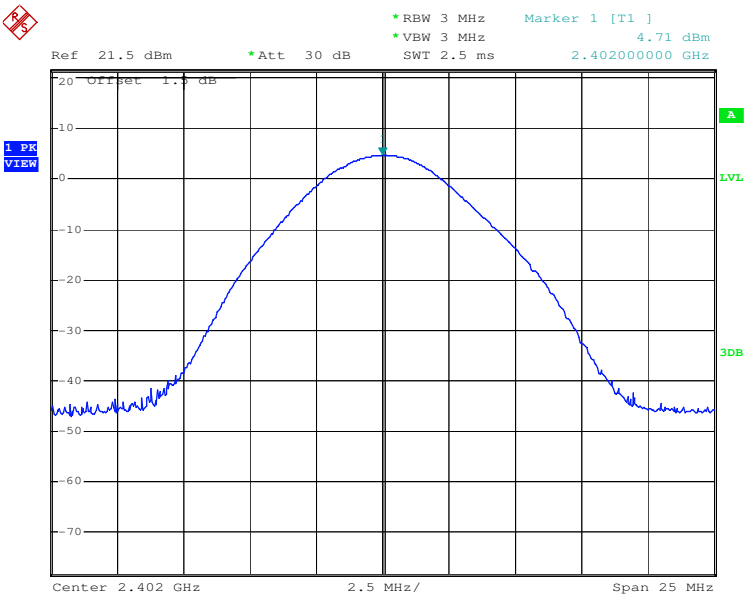
Test mode:	π/4DQPSK	Test channel:	Middle



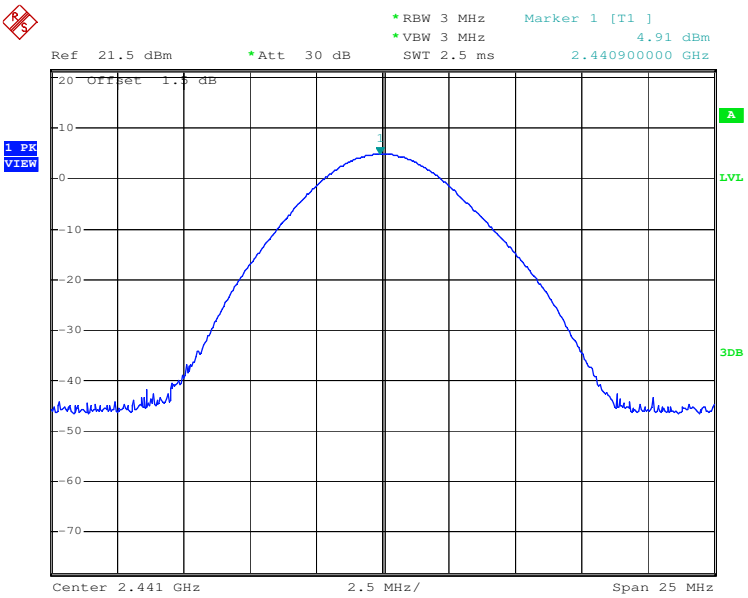
Test mode:	π/4DQPSK	Test channel:	Highest



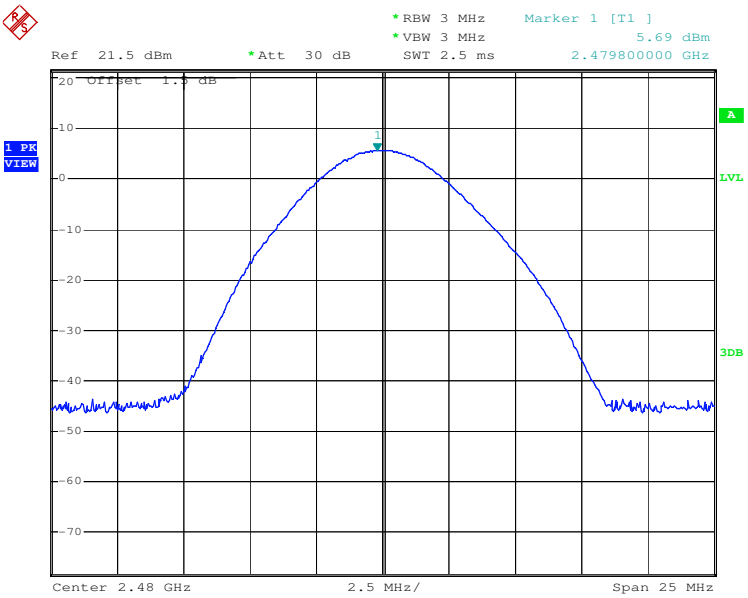
Test mode:	8DPSK	Test channel:	Lowest



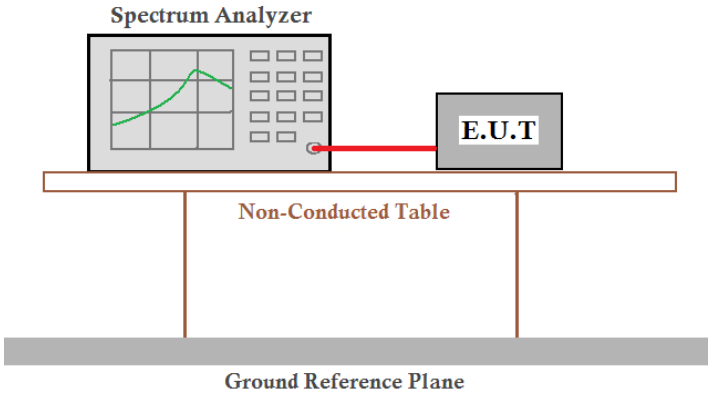
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.4 20dB Occupy Bandwidth

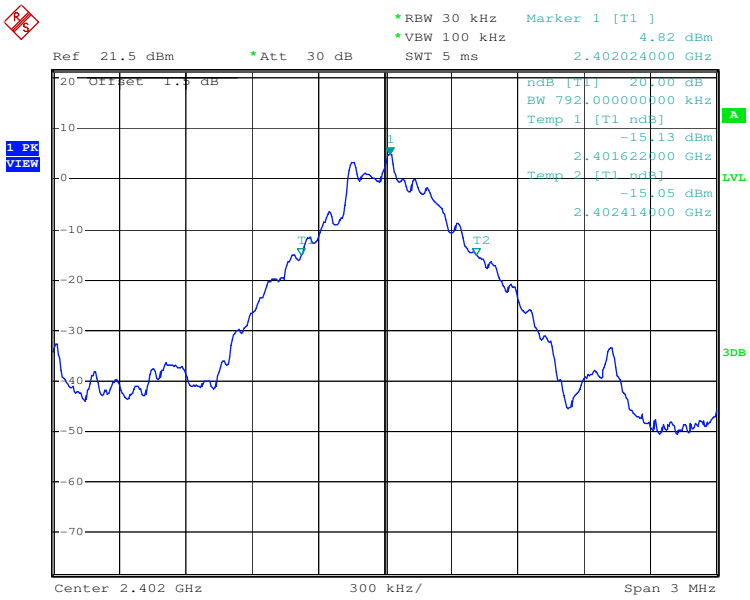
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009
Limit:	NA
Test setup:	
Test Instruments:	Refer to section 4.8 for details
Test state:	Non-hopping transmitting with all kind of modulation.
Test results:	Pass

Measurement Data

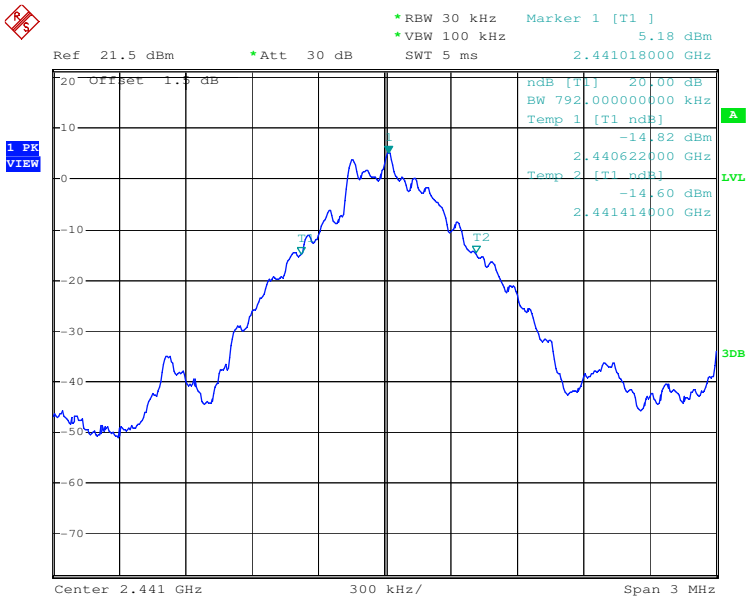
Test channel	20dB Occupy Bandwidth (kHz)		
	GFSK	π/4DQPSK	8DPSK
Lowest	792	1212	1212
Middle	792	1224	1212
Highest	798	1218	1212

Test plot as follows:

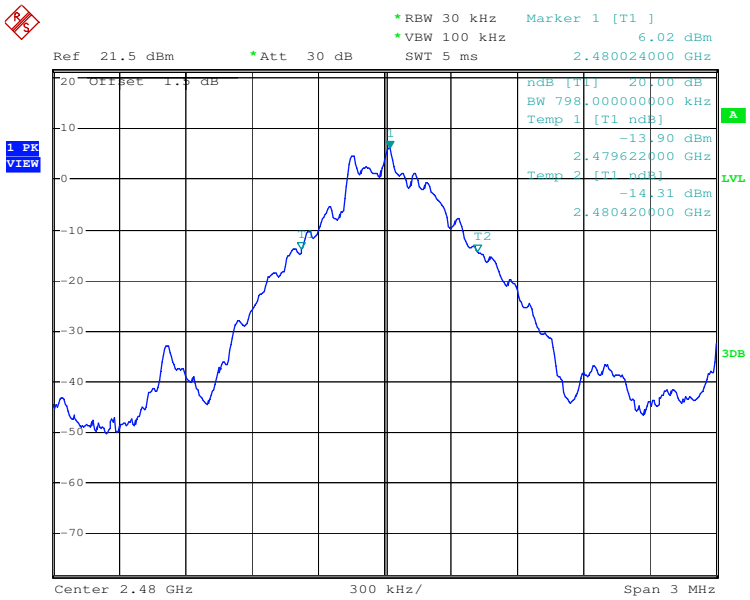
Test mode:	GFSK	Test channel:	Lowest



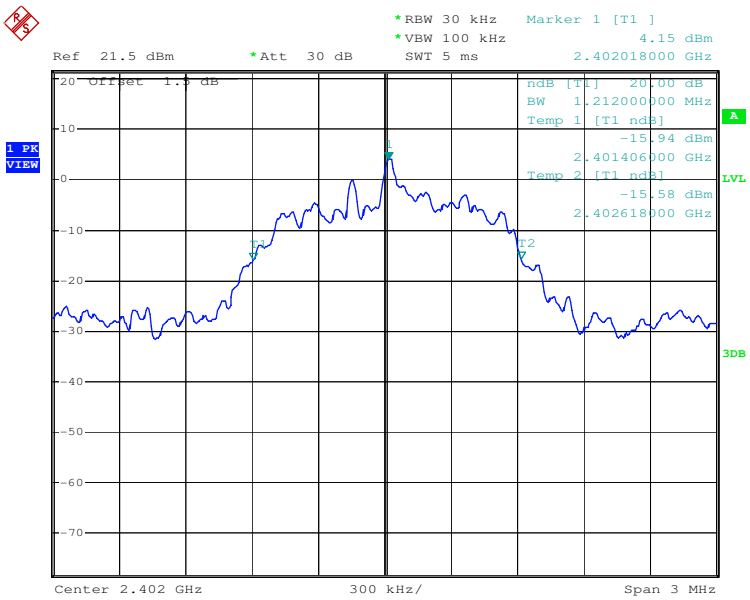
Test mode:	GFSK	Test channel:	Middle



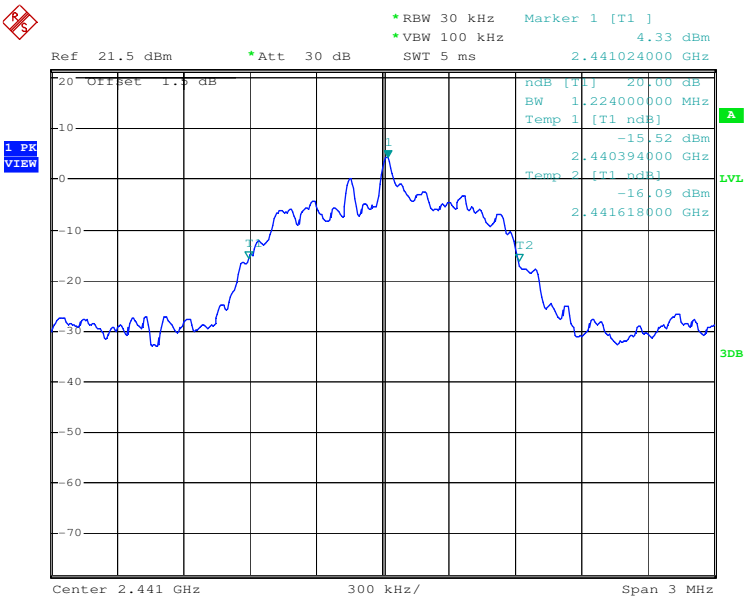
Test mode:	GFSK	Test channel:	Highest



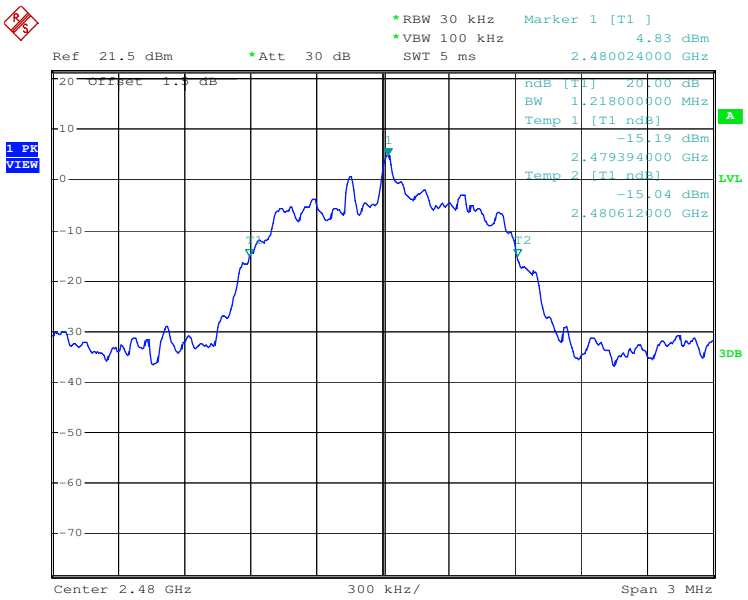
Test mode:	π/4DQPSK	Test channel:	Lowest



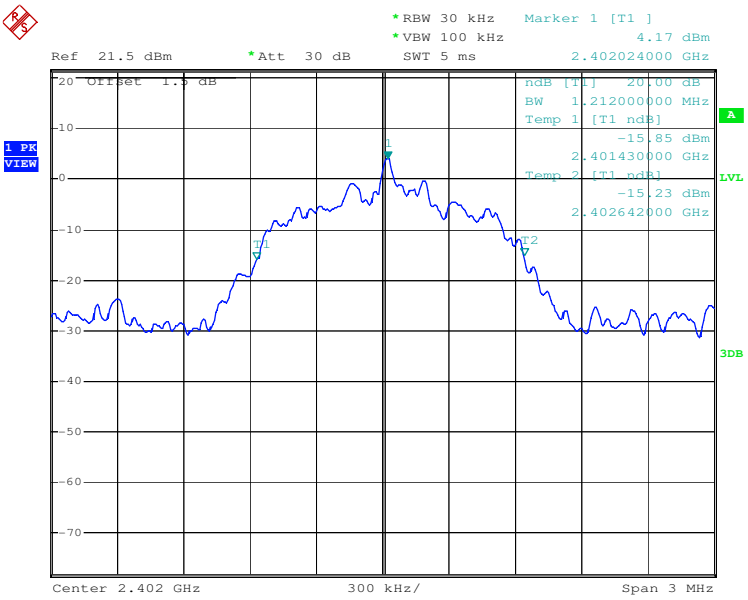
Test mode:	π/4DQPSK	Test channel:	Middle



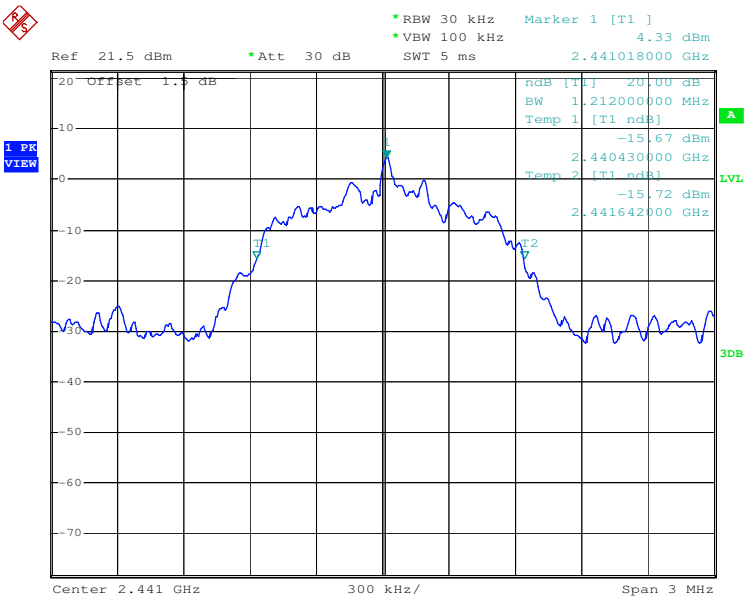
Test mode:	π/4DQPSK	Test channel:	Highest



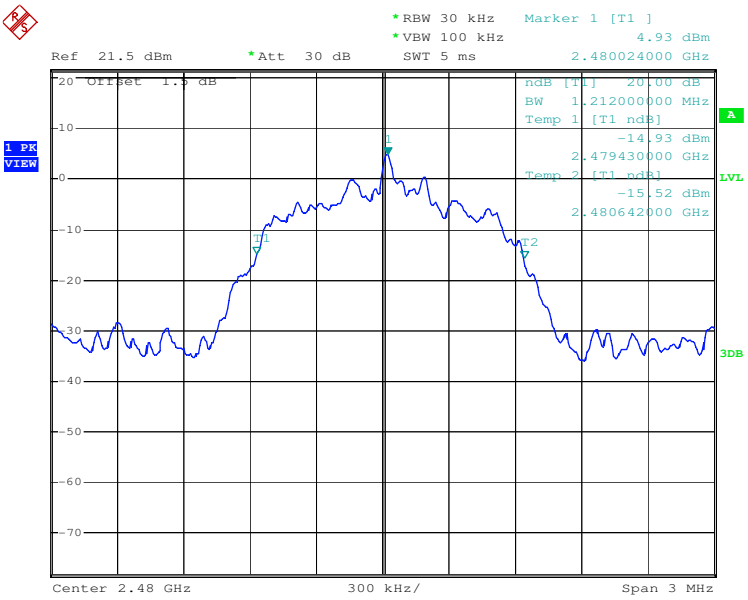
Test mode:	8DPSK	Test channel:	Lowest



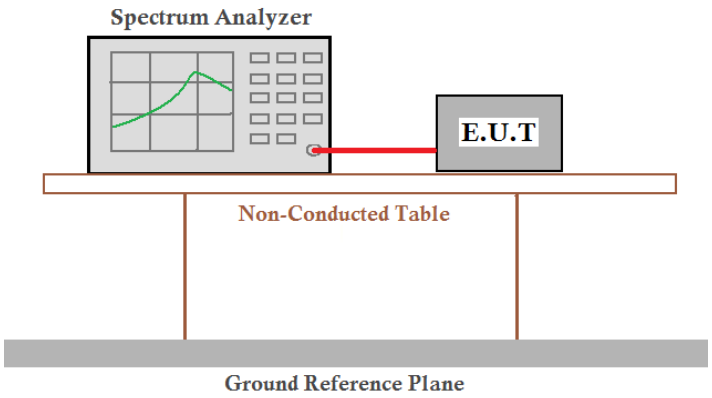
Test mode:	8DPSK	Test channel:	Middle



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 state:	Hopping transmitting with all kind of modulation.
Test setup:	
Test Instruments:	Refer to section 4.8 for details
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test results:	Pass

Measurement Data

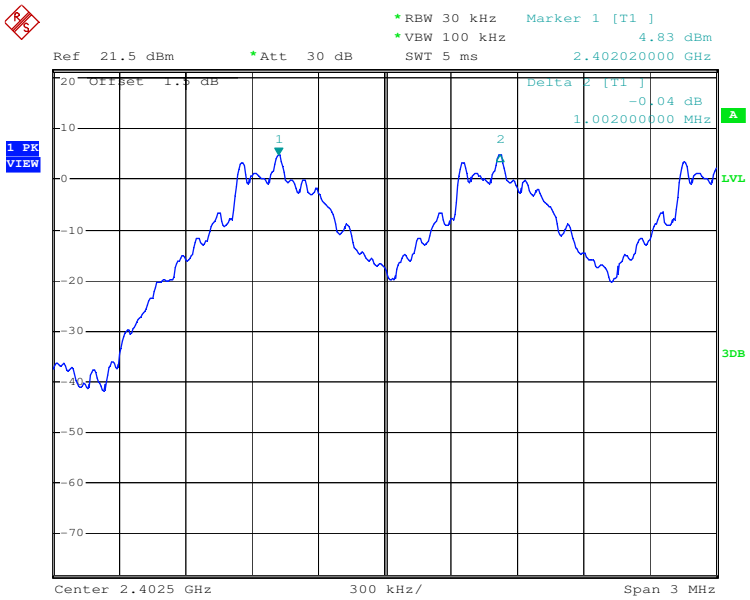
GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	≥816	Pass
Middle	1002	≥816	Pass
Highest	1002	≥816	Pass
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	≥816	Pass
Middle	1002	≥816	Pass
Highest	1002	≥816	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1008	≥816	Pass
Middle	1002	≥816	Pass
Highest	1002	≥816	Pass

Note: According to section 5.4,

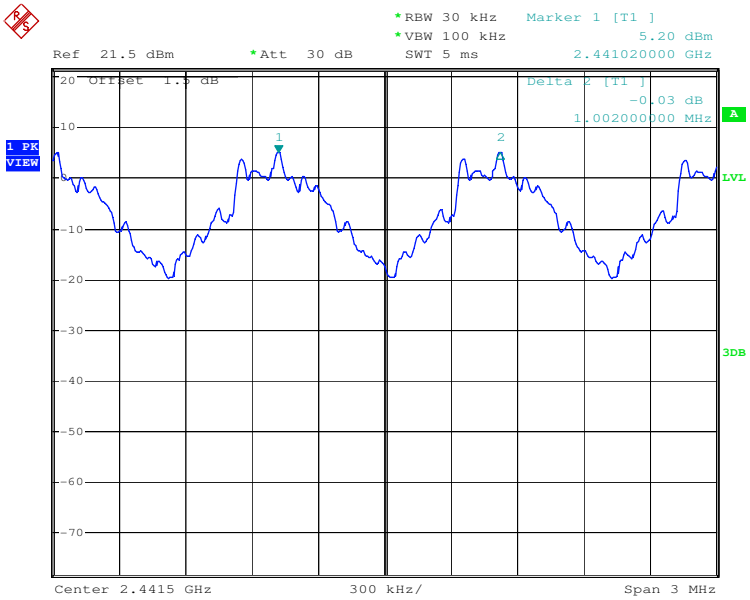
Mode	*20dB bandwidth (kHz) (worse case)*	*Limit (kHz) (Carrier Frequencies Separation)*
GFSK	*798*	*532*
π/4DQPSK	*1224*	*816*
8DPSK	*1212*	*808*

Test plot as follows:

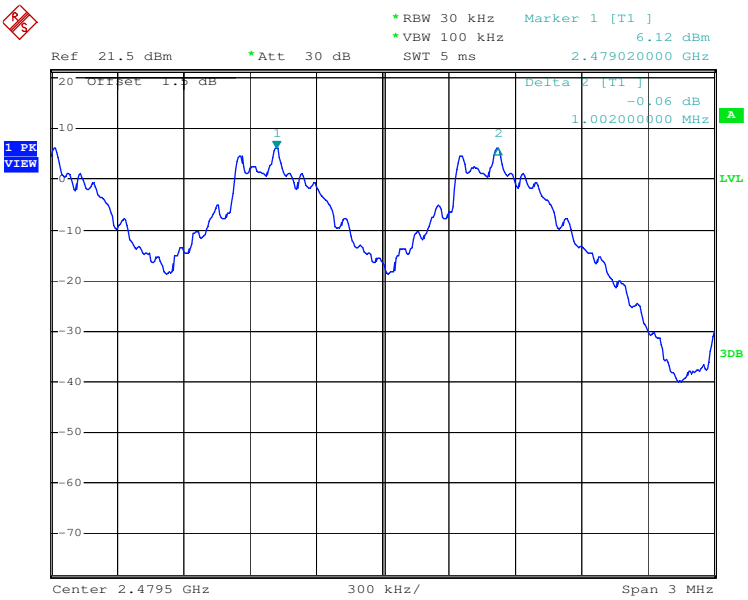
Test mode:	GFSK	Test channel:	Lowest



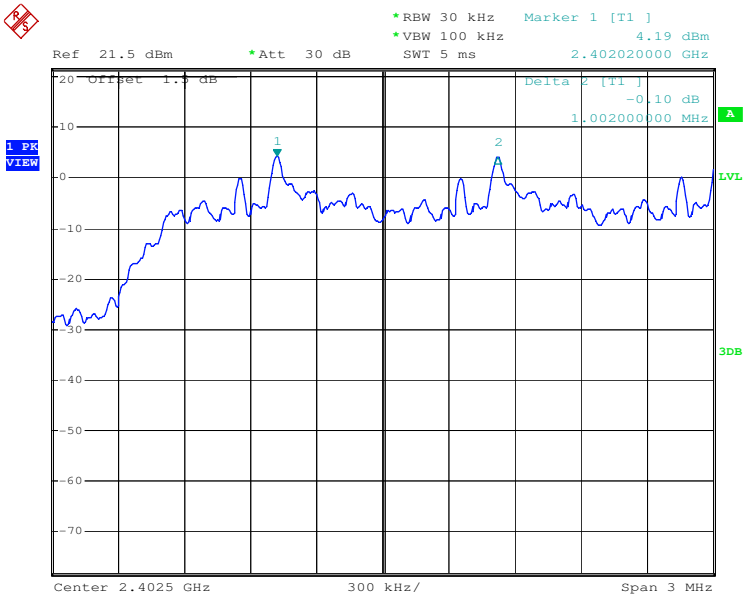
Test mode:	GFSK	Test channel:	Middle



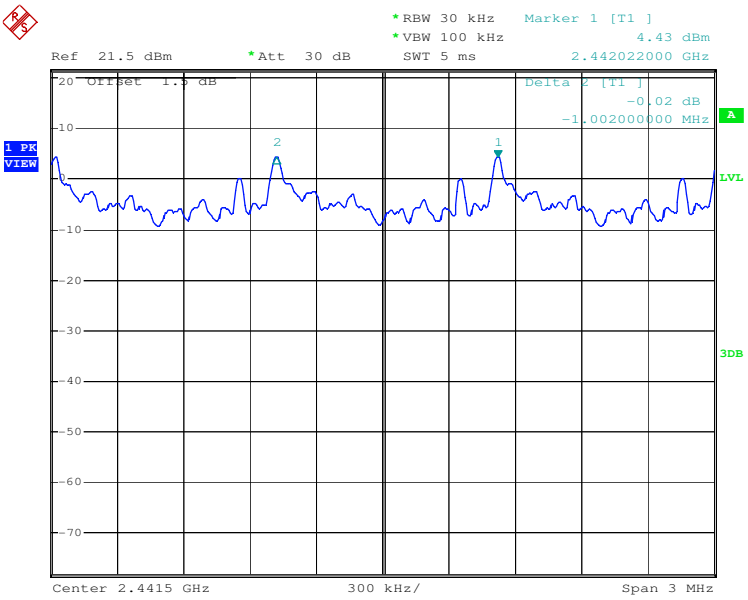
Test mode:	GFSK	Test channel:	Highest



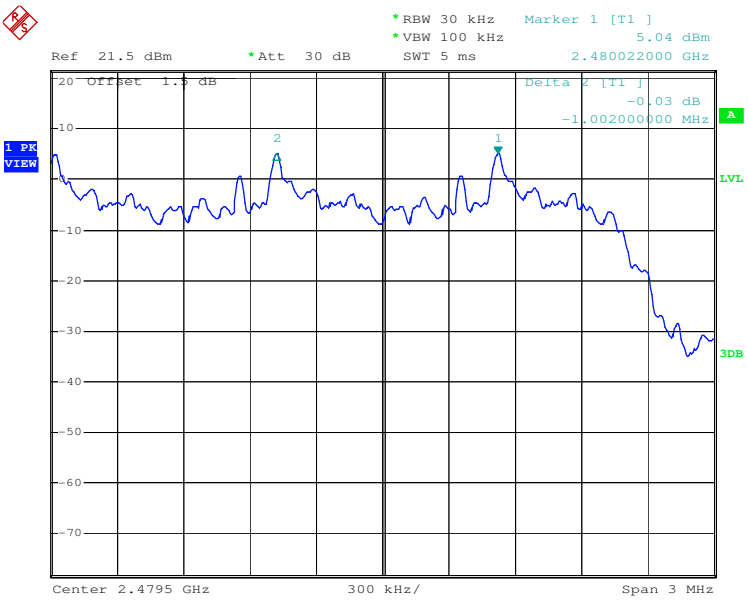
Test mode:	π/4DQPSK	Test channel:	Lowest



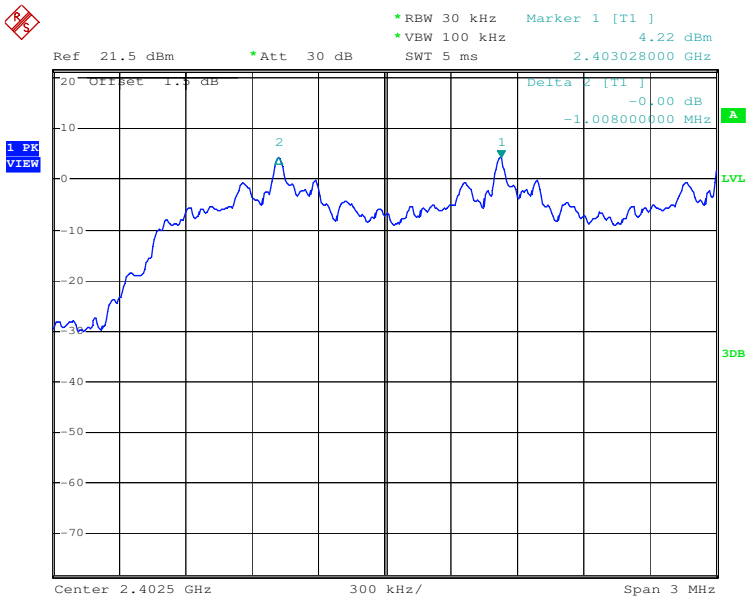
Test mode:	π/4DQPSK	Test channel:	Middle



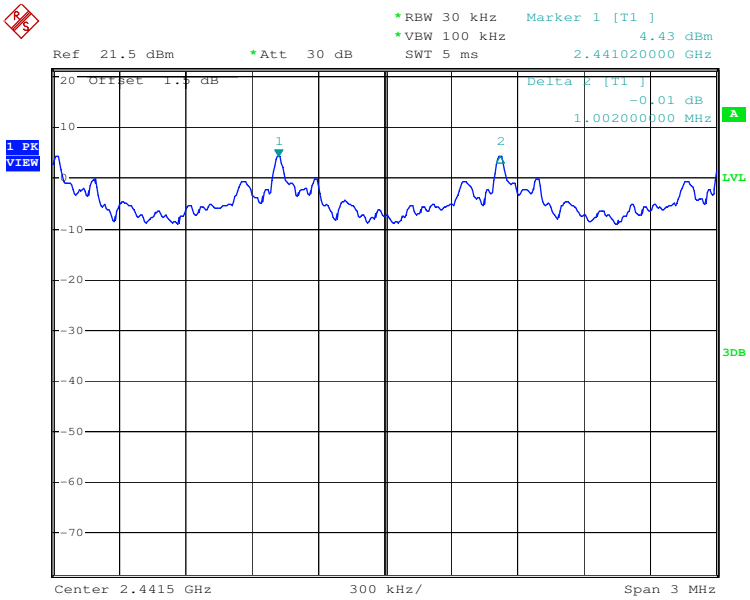
Test mode:	π/4DQPSK	Test channel:	Highest



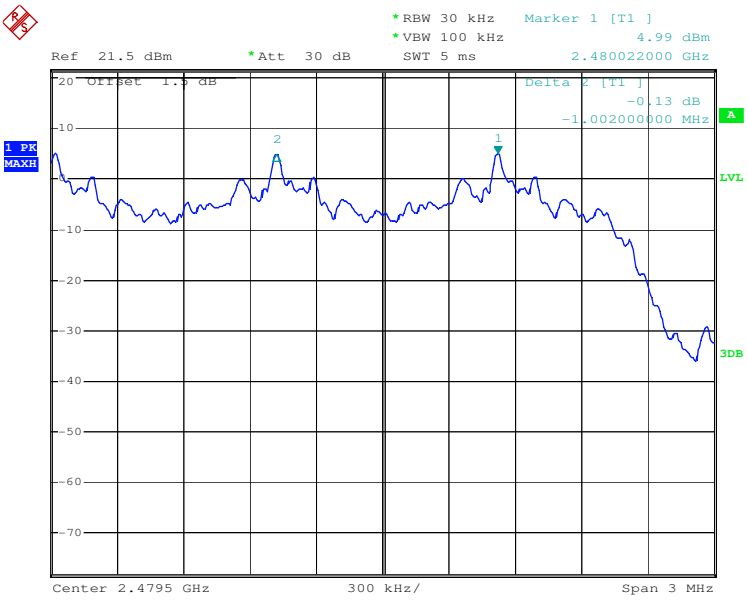
Test mode:	8DPSK	Test channel:	Lowest



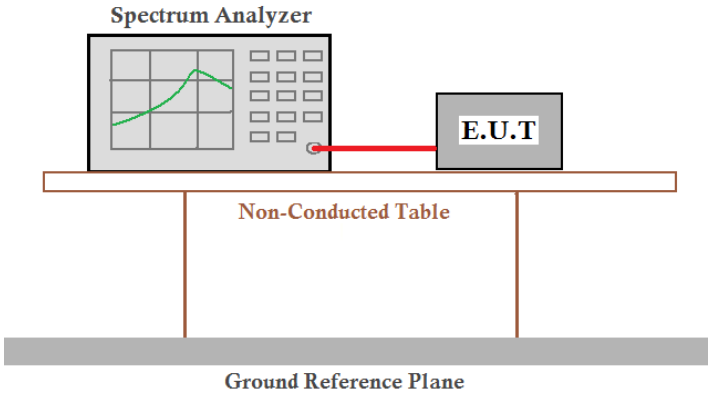
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.6 Hopping Channel Number

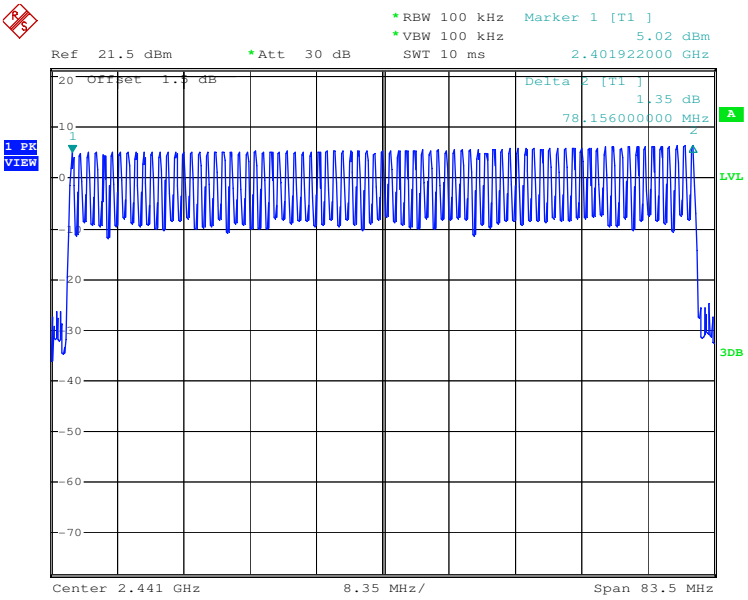
Test Requirement:	FCC Part15 C Section 15.247 (b)
Test Method:	ANSI C63.10:2009
Limit:	75channels
Test setup:	
Test Instruments:	Refer to section 4.8 for details
Test state:	Hopping transmitting with all kind of modulation.
Test results:	Pass

Measurement Data

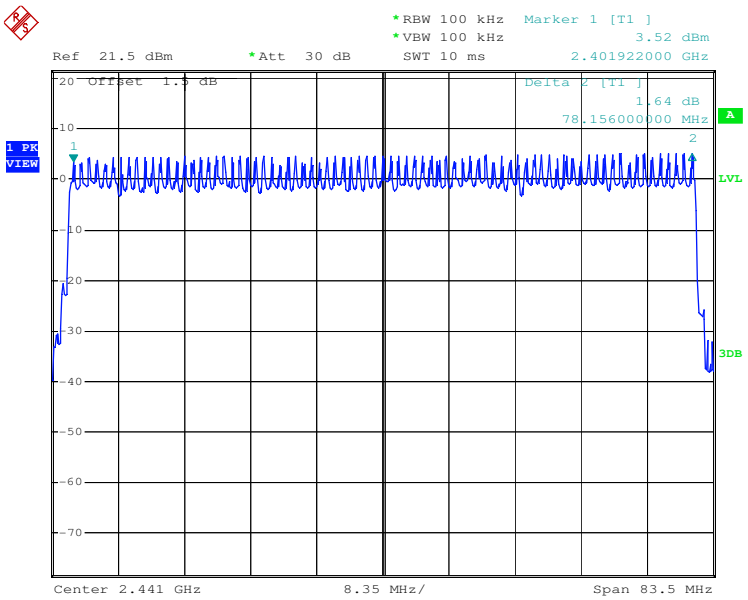
Mode	Hopping channel numbers	Limit
GFSK	79	⩾75
π/4DQPSK	79	⩾75
8DPSK	79	⩾75

Test plot as follows

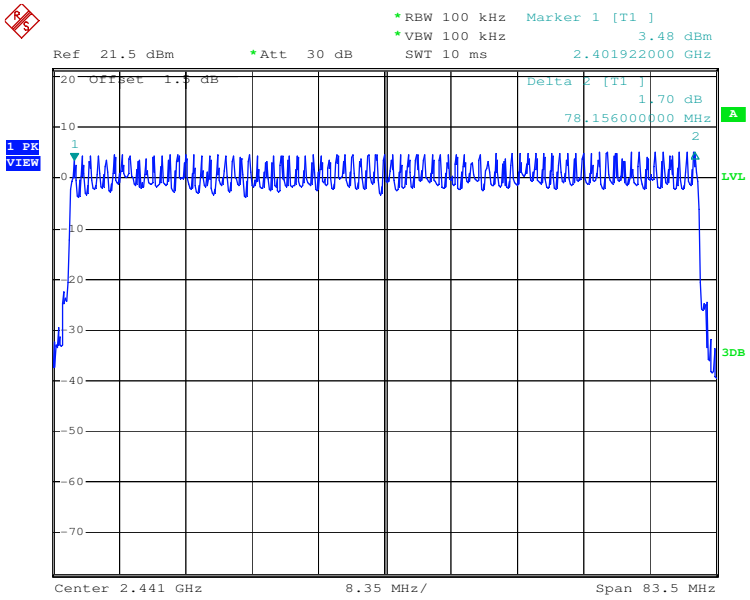
Test mode:	GFSK	



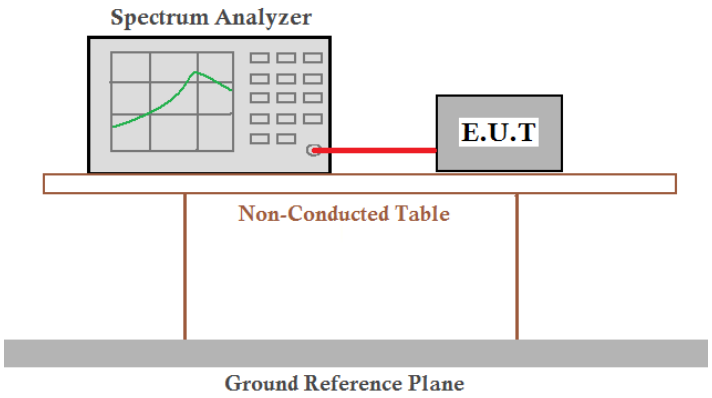
Test mode:	π/4DQPSK	



Test mode:	8DPSK	



5.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 4.8 for details.
Test state:	Hopping transmitting with all kind of modulation.
Test results:	Pass

Measurement Data

Mode	Packet	Dwell time (second)	Limit (second)
GFSK	DH1	0.1696	0.4
	DH3	0.2848	0.4
	DH5	0.3243	0.4
π/4DQPSK	2-DH1	0.1728	0.4
	2-DH3	0.2880	0.4
	2-DH5	0.1968	0.4
8DPSK	3-DH1	0.1728	0.4
	3-DH3	0.2896	0.4
	3-DH5	0.3211	0.4

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

The lowest channel (2402MHz), middle channel (2441MHz), highest channel (2480MHz) as blow

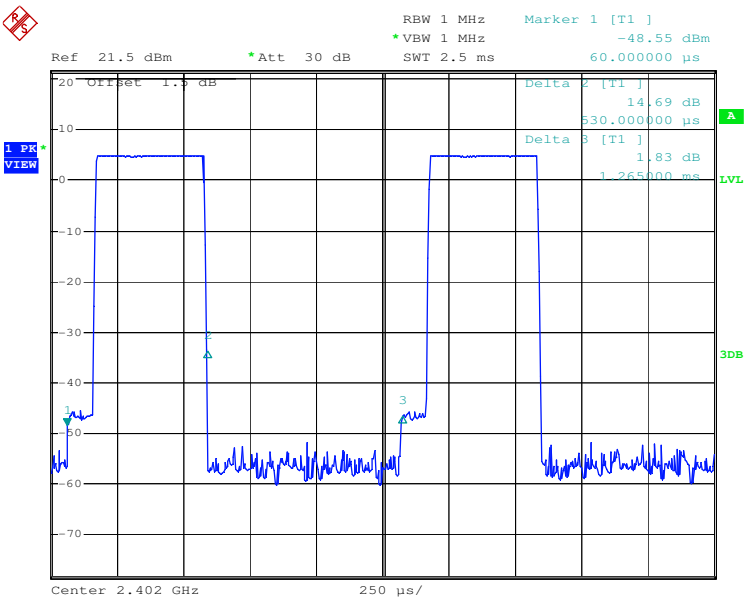
DH1 time slot=0.530(ms)*(1600/ (2*79))*31.6=0.1696ms

DH3 time slot=1.780(ms)*(1600/ (4*79))*31.6=0.2848 ms

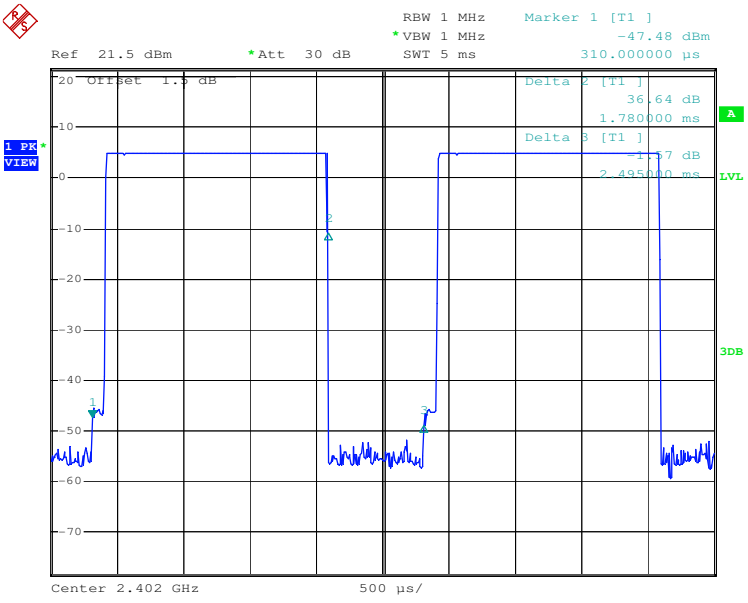
DH5 time slot=3.040(ms)*(1600/ (6*79))*31.6=0.3243ms

Test plot as follows

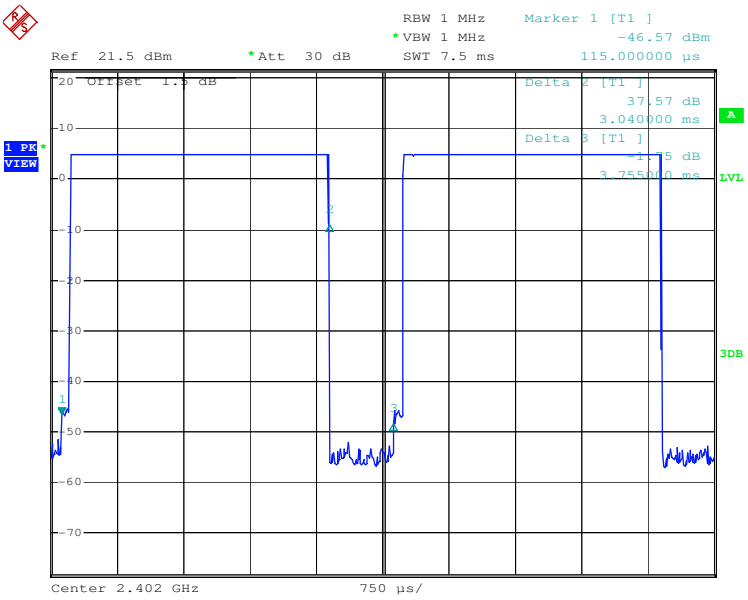
Test mode:	GFSK	Test Packet:	DH1



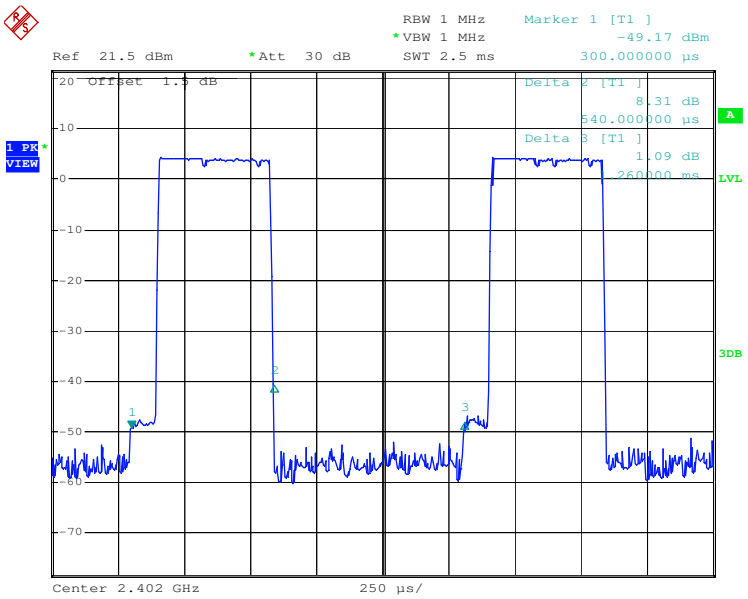
Test mode:	GFSK	Test Packet:	DH3



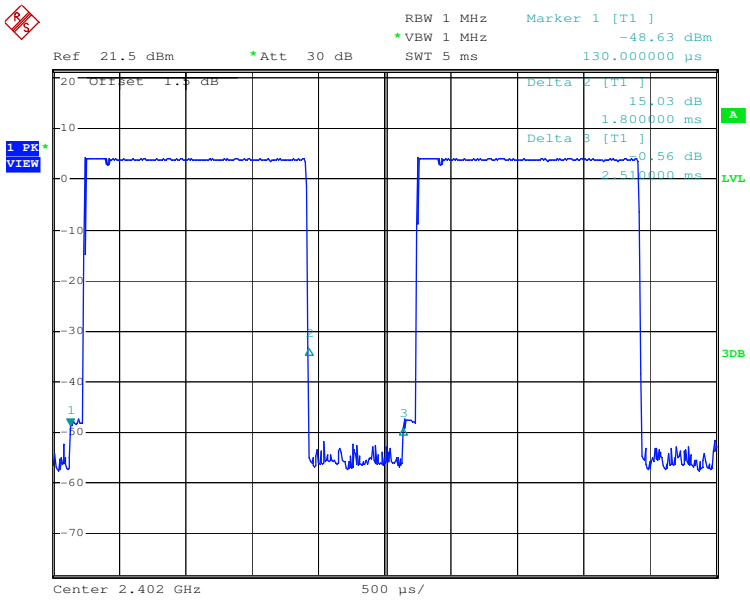
Test mode:	GFSK	Test Packet:	DH5



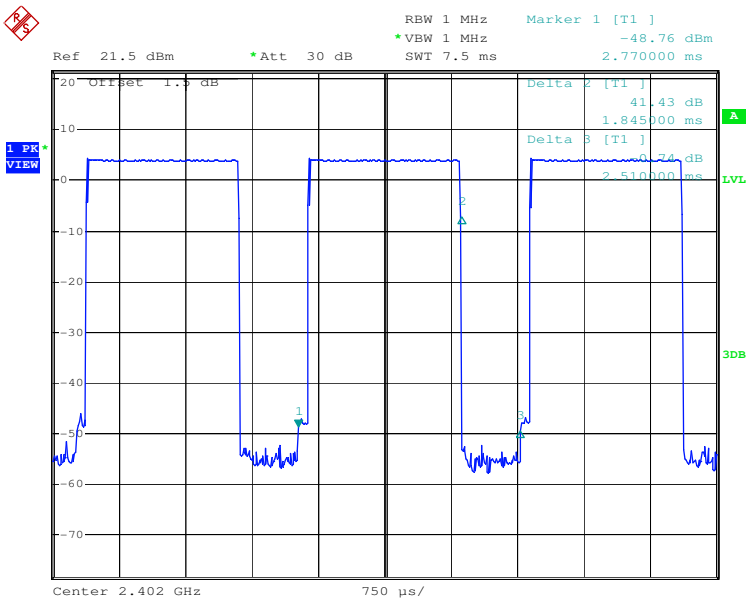
Test mode:	π/4DQPSK	Test Packet:	2-DH1



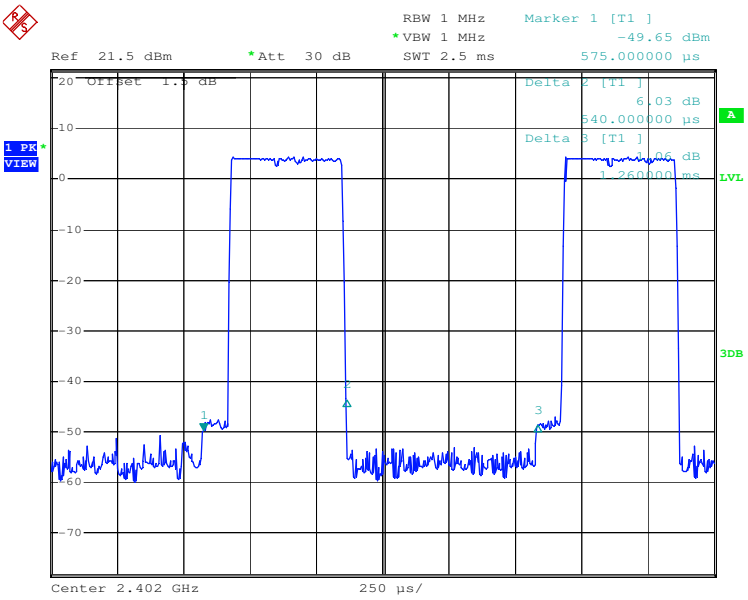
Test mode:	π/4DQPSK	Test Packet:	2-DH3



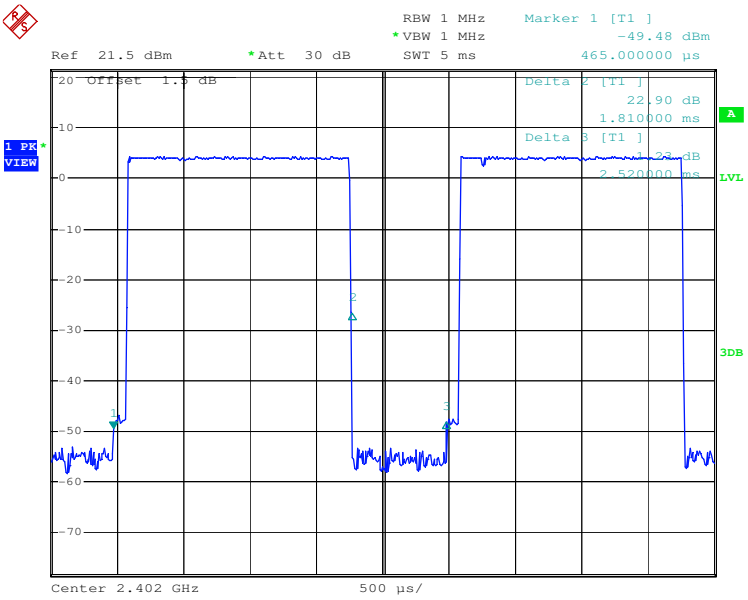
Test mode:	π/4DQPSK	Test Packet:	2-DH5



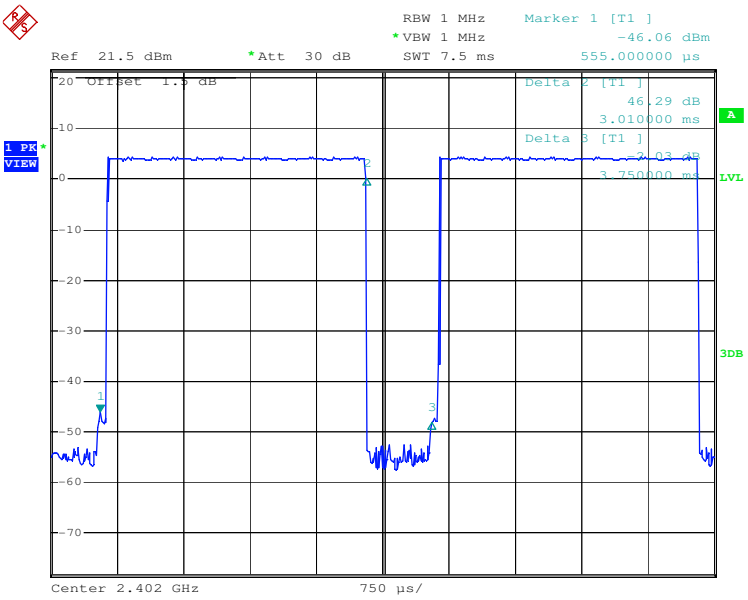
Test mode:	8DPSK	Test Packet:	3-DH1



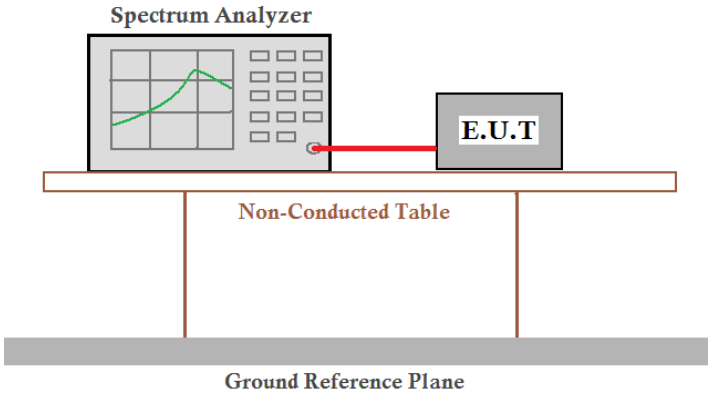
Test mode:	8DPSK	Test Packet:	3-DH3



Test mode:	8DPSK	Test Packet:	3-DH5

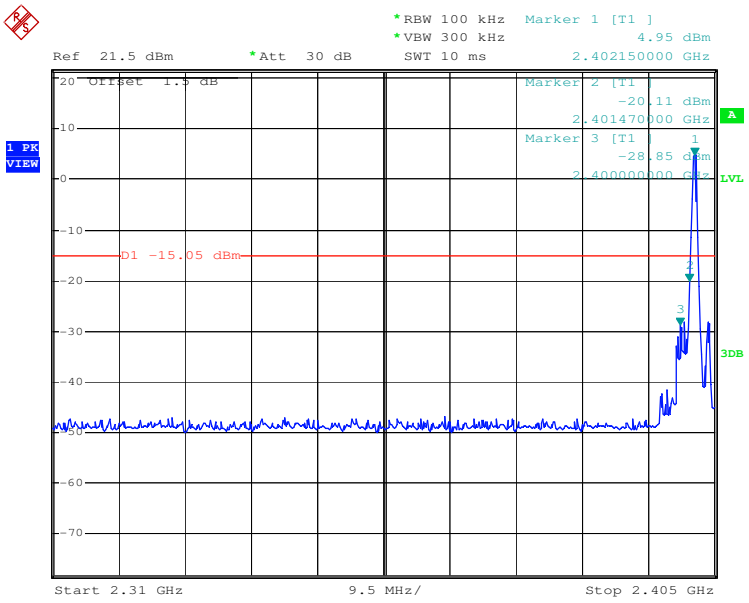


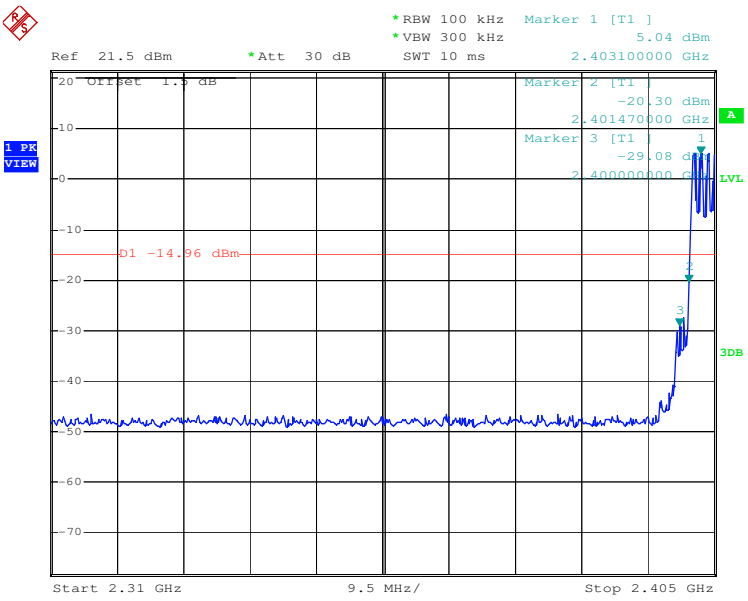
5.8 Band Edge

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009
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:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Test Instruments:	Refer to section 4.8 for details.
Test state:	Non hopping transmitting and Hopping transmitting with all kinds of modulation.
Test results:	Pass

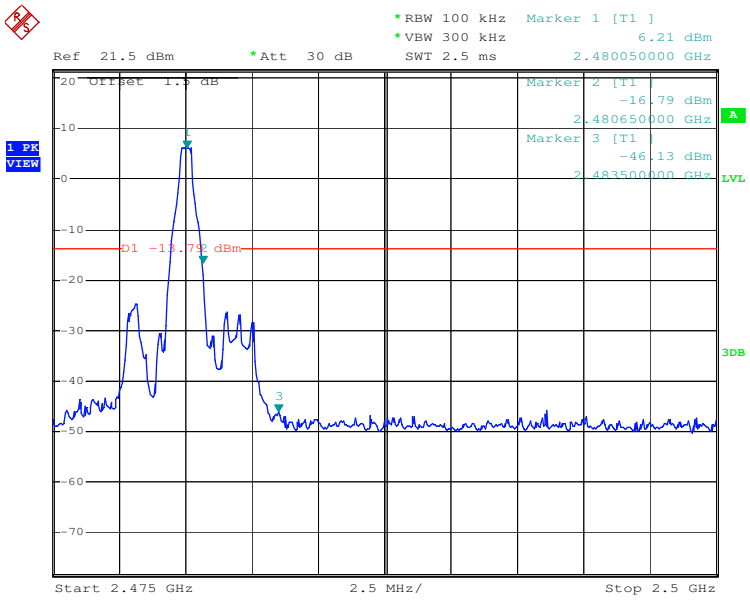
Test plot as follows:

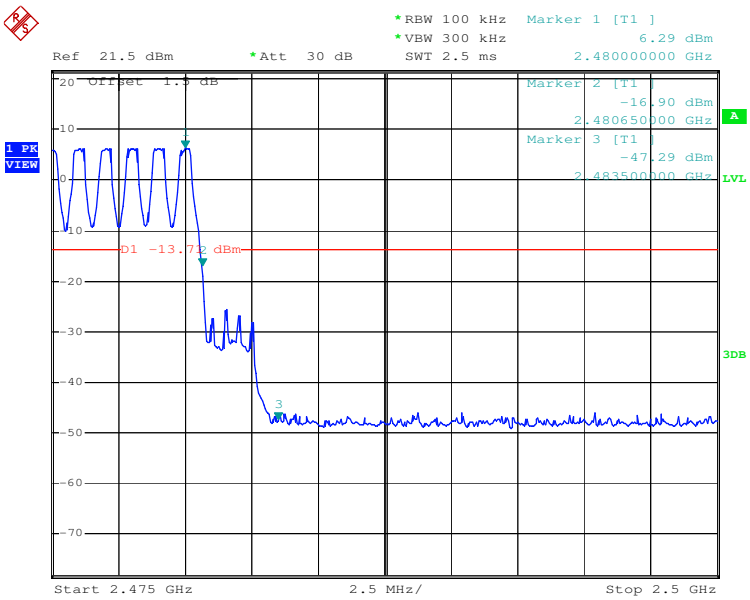
Test mode:	GFSK	Test channel:	Lowest



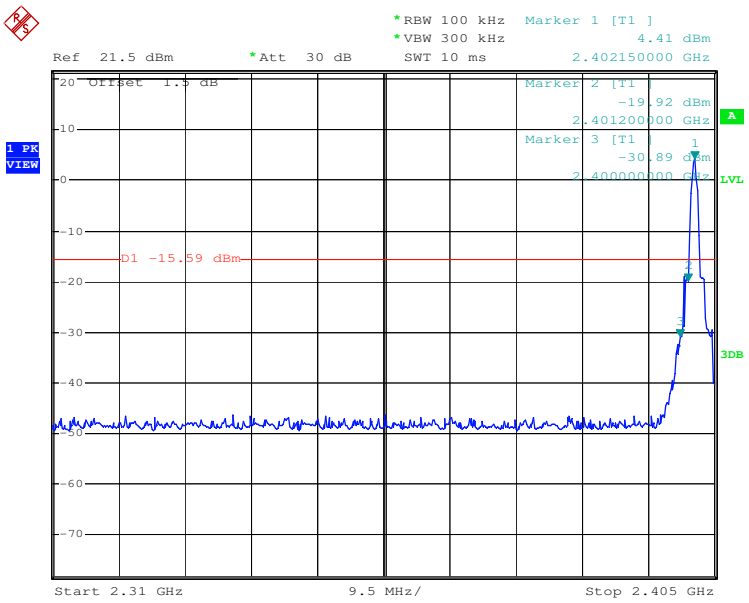


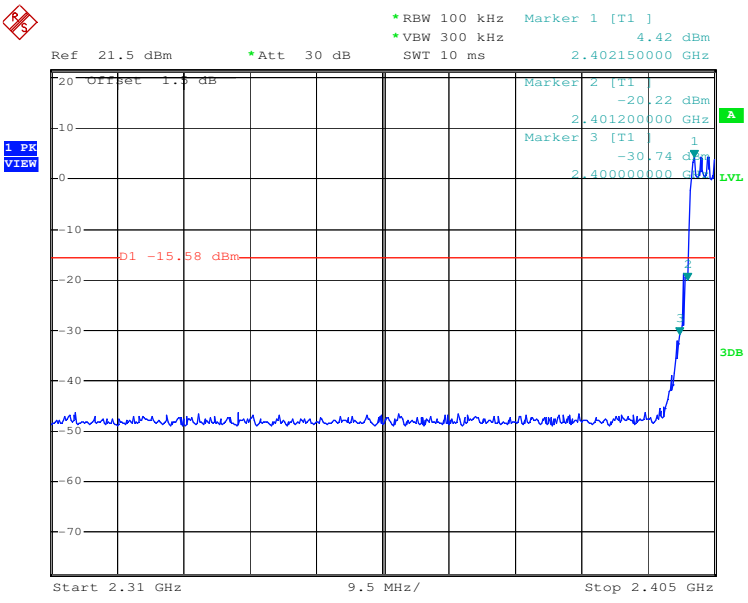
Test mode:	GFSK	Test channel:	Highest



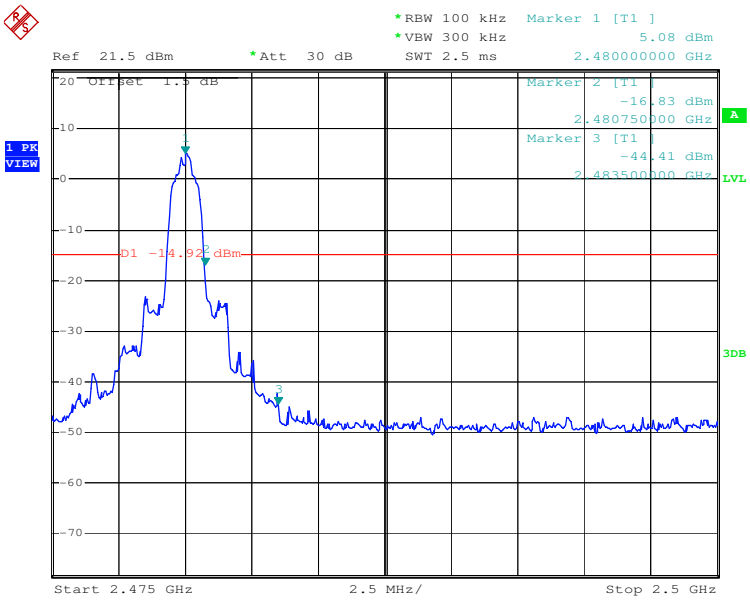


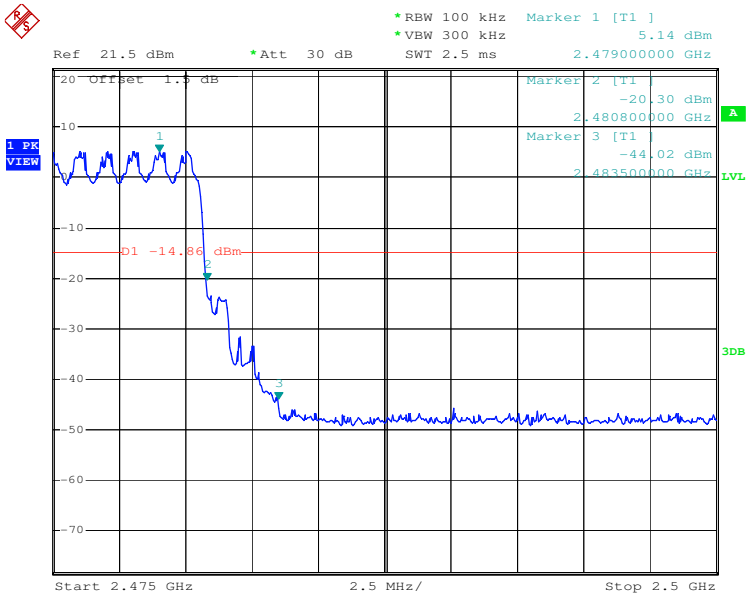
Test mode:	π/4DQPSK	Test channel:	Lowest



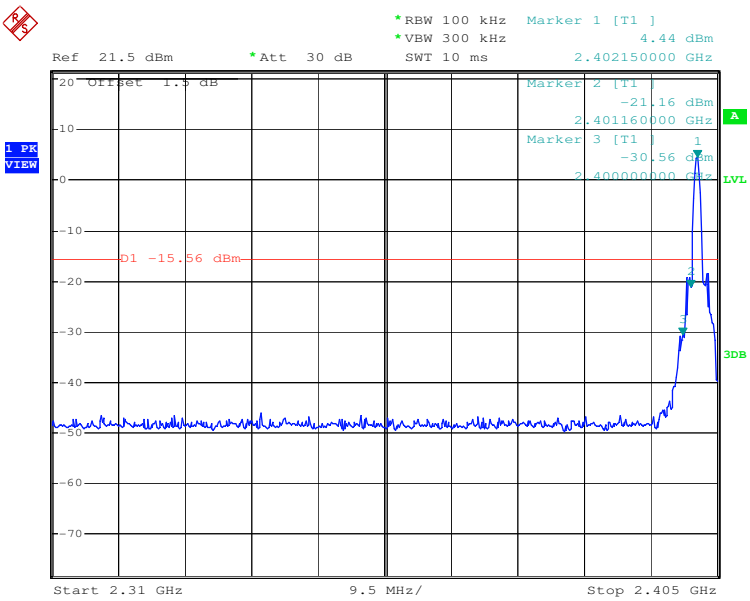


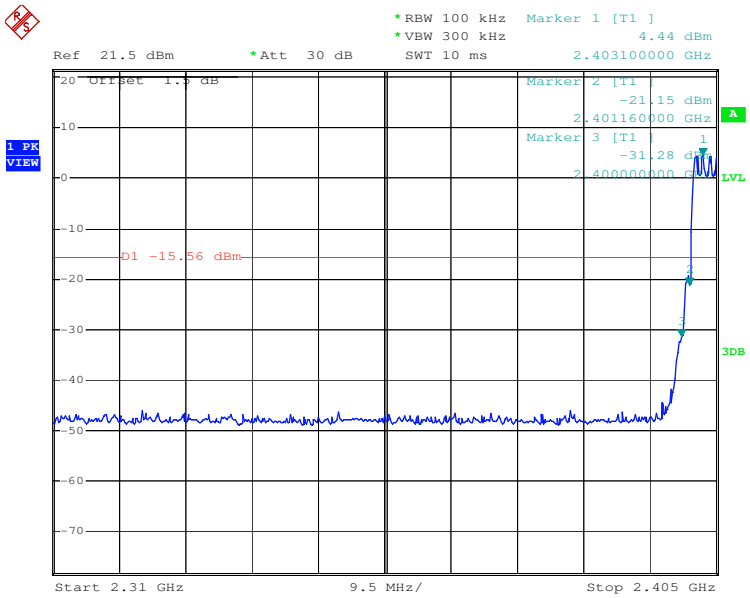
Test mode:	π/4DQPSK	Test channel:	Highest



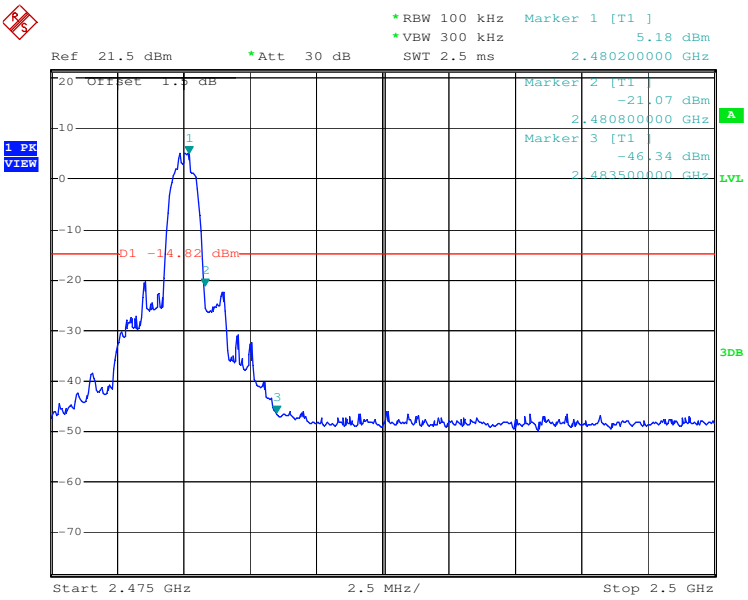


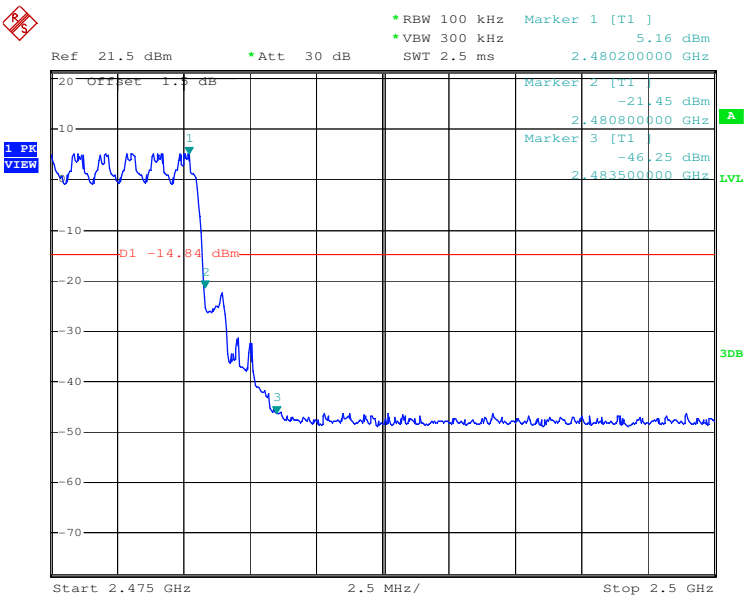
Test mode:	8DPSK	Test channel:	Lowest



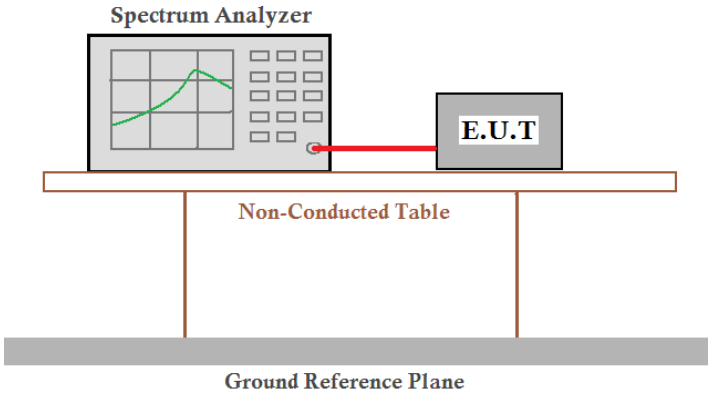


Test mode:	8DPSK	Test channel:	Highest

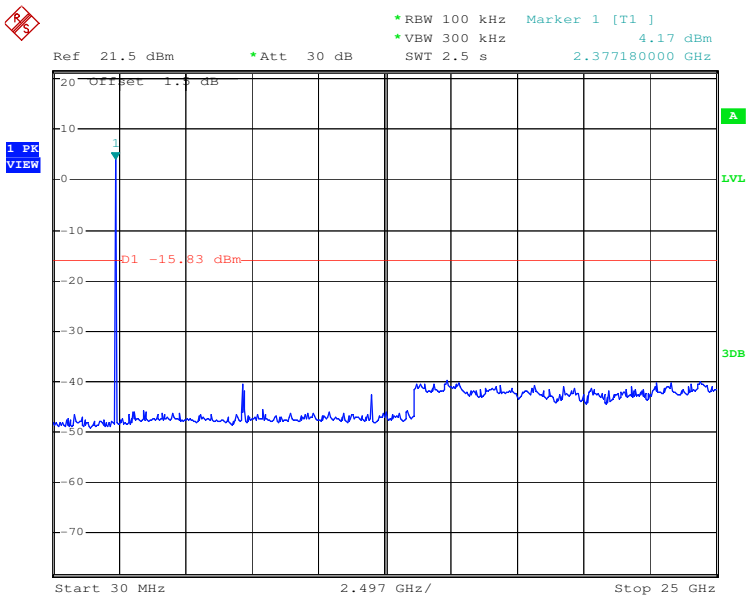




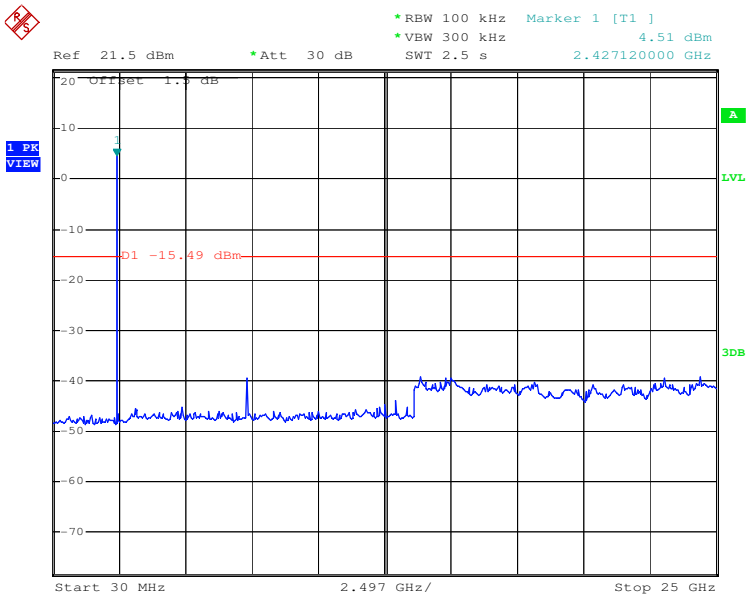
5.9 RF Antenna Conducted spurious emissions

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009
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:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Test Instruments:	Refer to section 4.8 for details.
Test results:	Pass

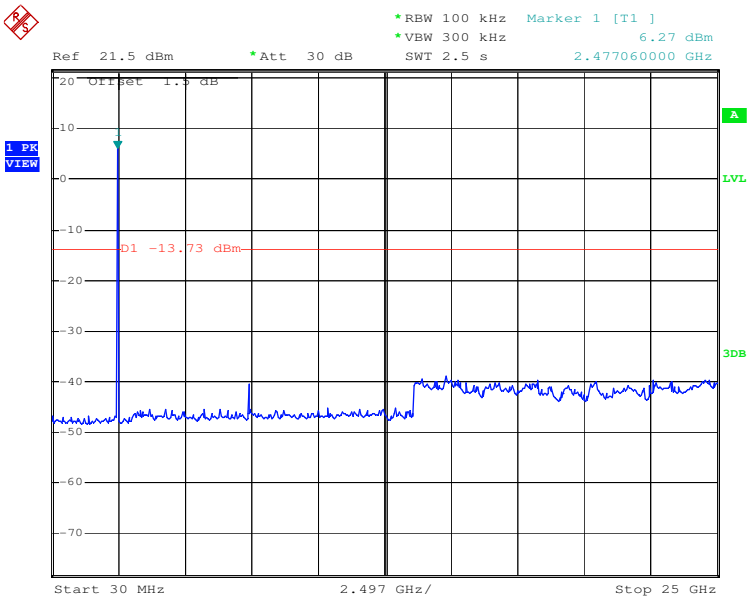
Test mode:	GFSK	Test channel:	Lowest



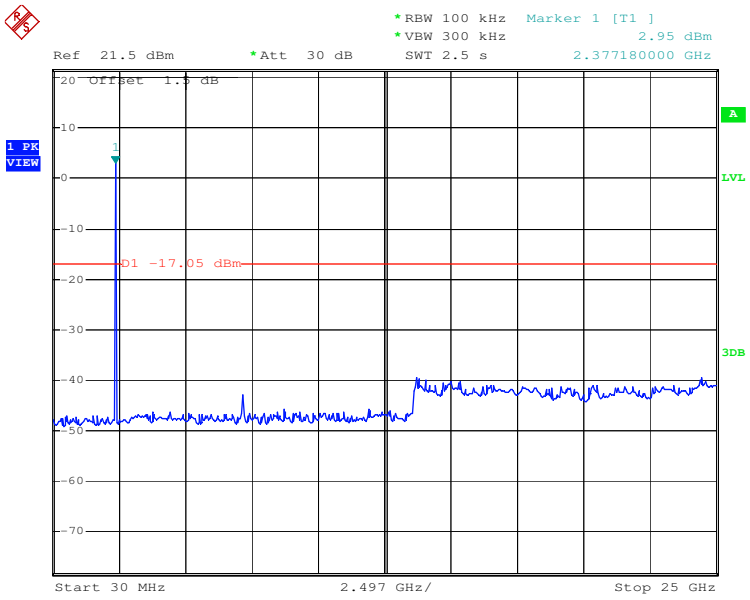
Test mode:	GFSK	Test channel:	Middle



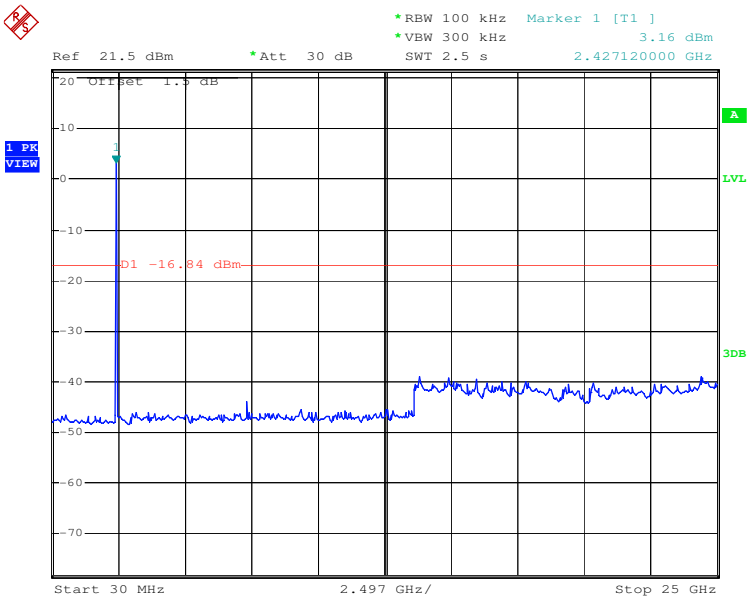
Test mode:	GFSK	Test channel:	Highest



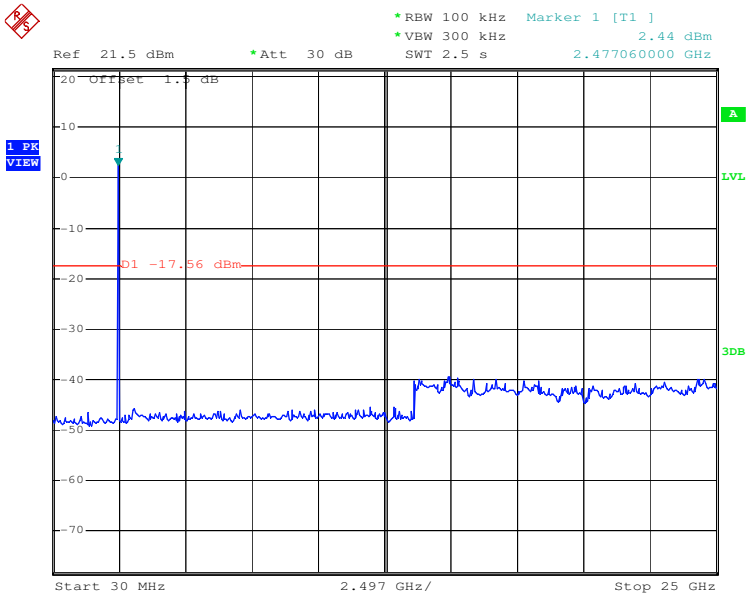
Test mode:	π/4DQPSK	Test channel:	Lowest



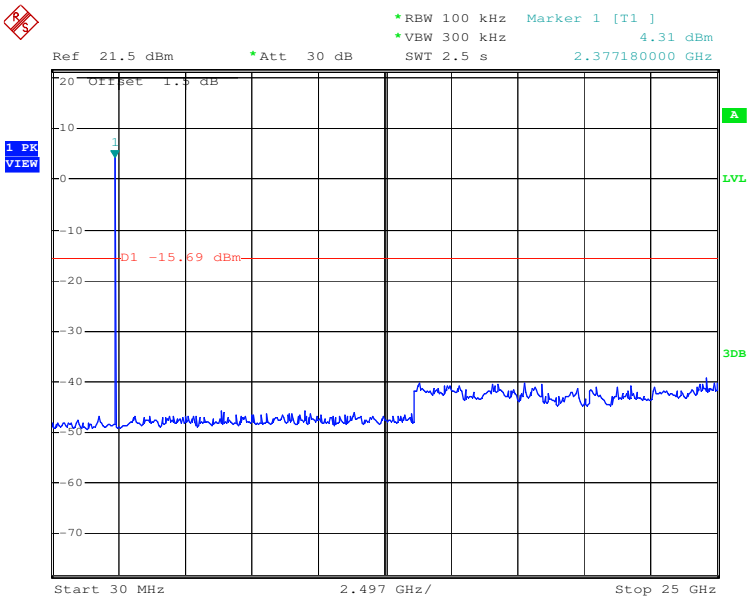
Test mode:	π/4DQPSK	Test channel:	Middle



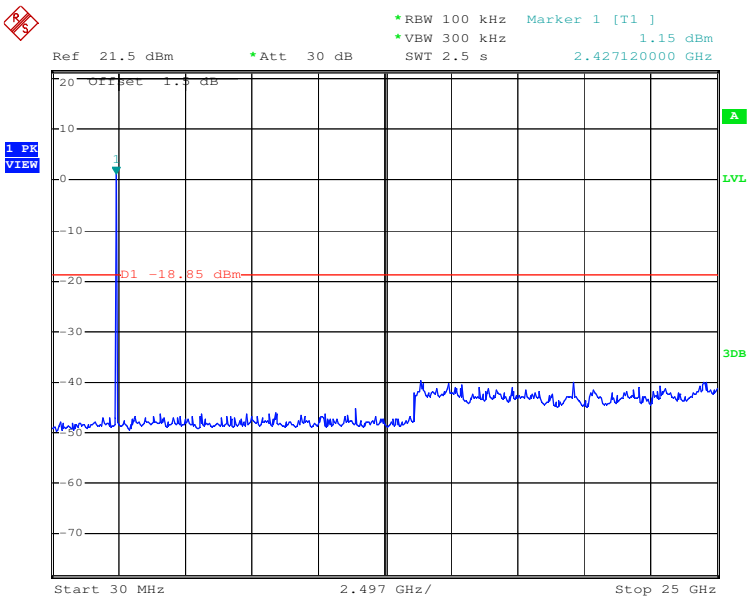
Test mode:	π/4DQPSK	Test channel:	Highest



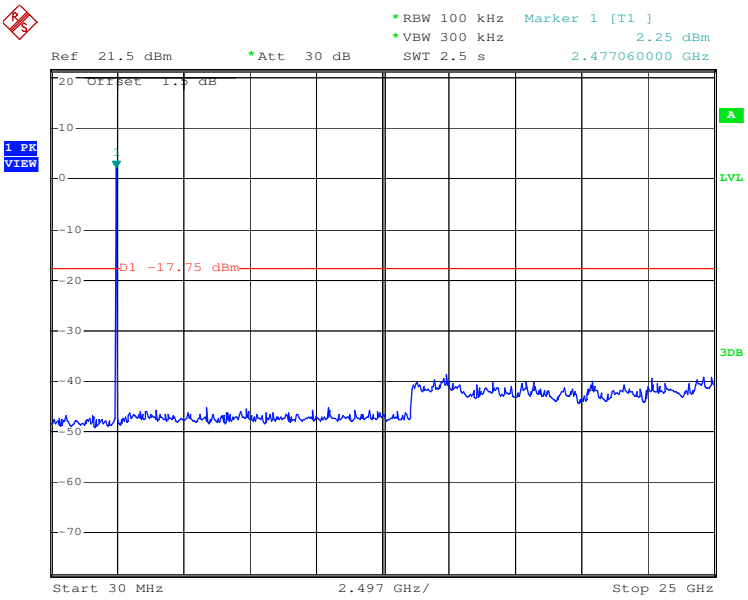
Test mode:	8DPSK	Test channel:	Lowest



Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.10 Pseudorandom Frequency Hopping Sequence

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

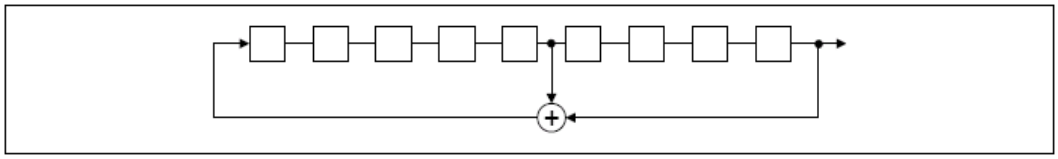
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

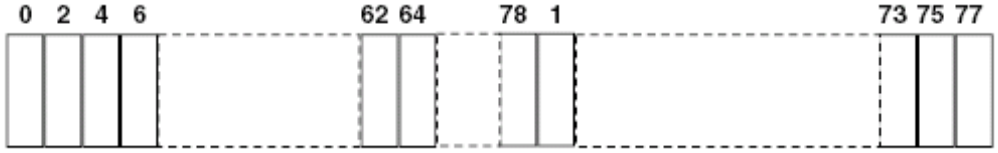
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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

5.11 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2009
Test Frequency Range:	30MHz to 25GHz
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

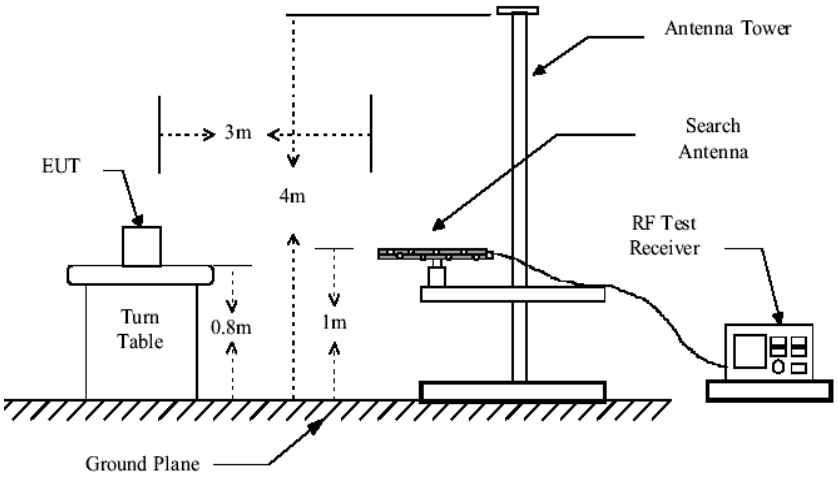
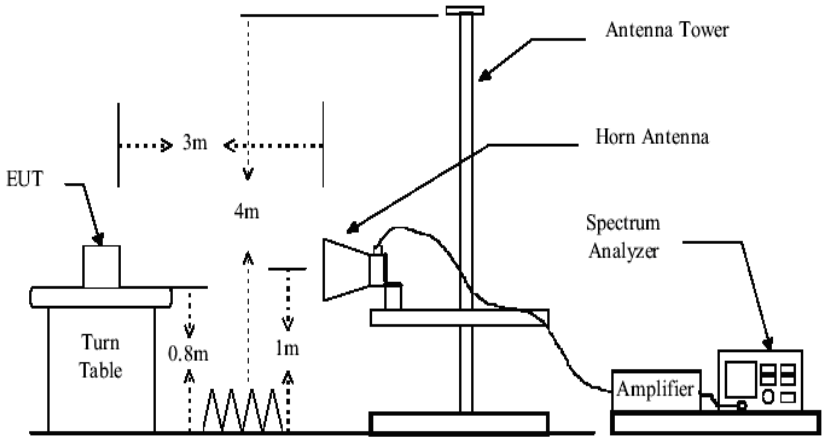
Limit:

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 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.

Test Instruments:	Refer to section 4.8 for details.

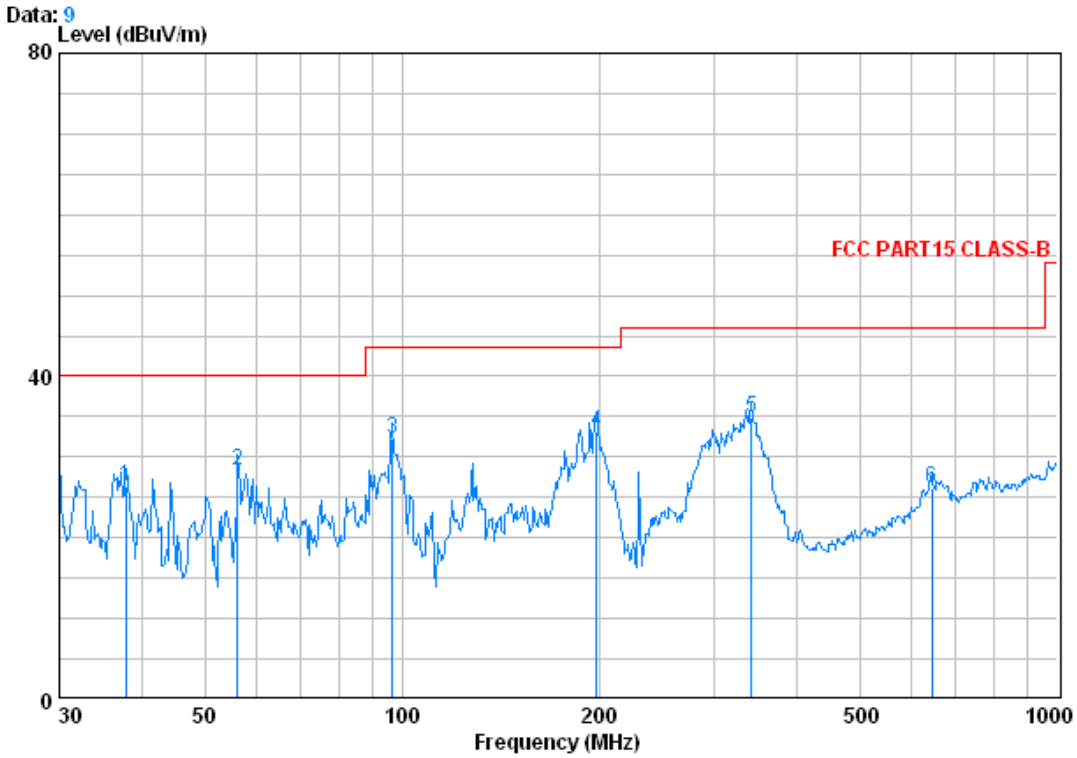
Test mode:	Non-hopping transmitting with modulation. 1. Pre-scan the EUT in GFSK, π/4DQPSK and 8DPSK modes and find out the worst case is GFSK mode. 2. Music + Charge mode.
Test results:	Pass
Test setup:	Below 1GHz  Above 1GHz 

Note:
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

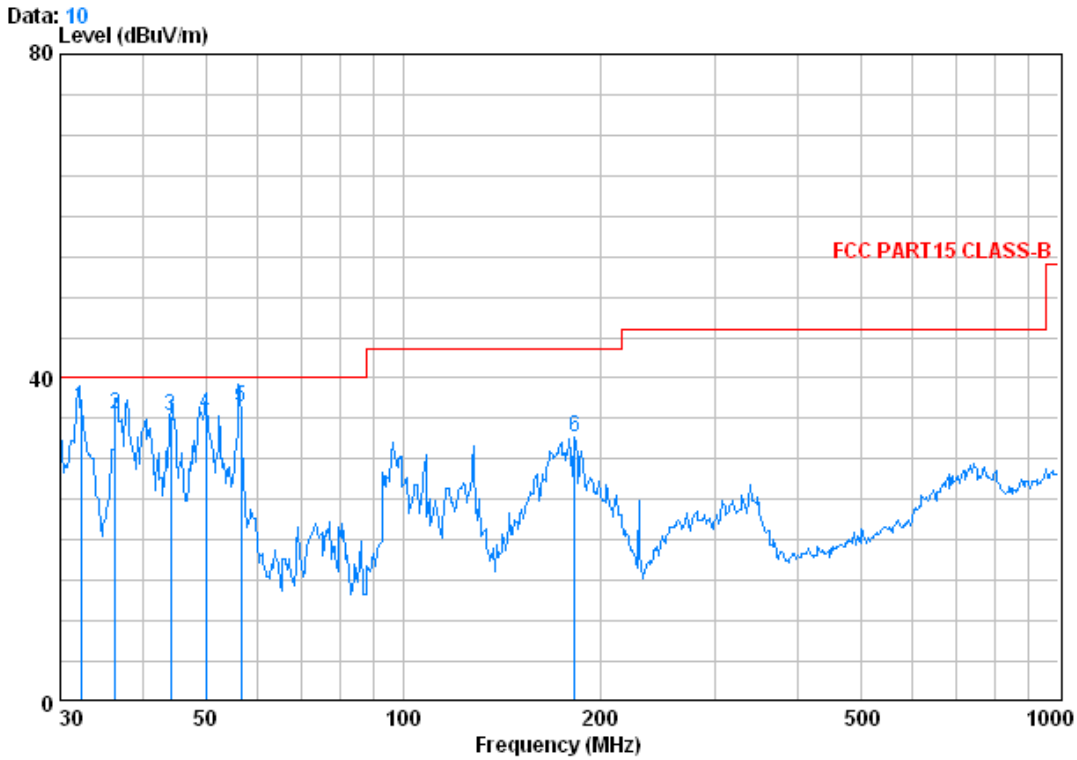
5.11.1 Radiated emission below 1GHz

Horizontal:



	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	37.945	0.60	12.27	27.33	40.91	26.45	40.00	-13.55
2	56.197	0.80	7.65	27.27	47.21	28.38	40.00	-11.62
3	96.775	1.17	8.98	27.20	49.37	32.31	43.50	-11.19
4 @	197.893	1.40	10.18	26.70	48.18	33.05	43.50	-10.45
5	341.979	2.04	15.22	26.73	44.30	34.83	46.00	-11.17
6	642.861	2.79	20.57	27.49	30.35	26.23	46.00	-19.77

Vertical:



	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 @	32.280	0.60	14.26	27.35	49.00	36.51	40.00	-3.49
2 @	36.381	0.60	12.45	27.33	49.80	35.52	40.00	-4.48
3 @	44.275	0.69	9.71	27.31	52.27	35.37	40.00	-4.63
4 @	50.057	0.80	8.00	27.29	54.12	35.63	40.00	-4.37
5 @	56.602	0.80	7.44	27.27	55.50	36.47	40.00	-3.53
6	182.559	1.37	9.95	26.77	48.15	32.71	43.50	-10.79

5.11.2 Transmitter emission above 1GHz

Worse case mode:	GFSK	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
2915.250	5.00	33.28	40.24	48.43	46.47	74.00	-27.53	Vertical
4137.250	6.63	34.22	41.14	50.64	50.35	74.00	-23.65	Vertical
4783.500	7.42	34.73	41.61	57.89	58.43	74.00	-15.57	Vertical
5829.250	7.90	35.42	41.07	51.84	54.09	74.00	-19.91	Vertical
7368.500	8.92	35.95	39.74	49.49	54.62	74.00	-19.38	Vertical
9389.500	9.66	37.08	37.98	46.96	55.72	74.00	-18.28	Vertical
2527.500	4.68	32.75	39.95	49.73	47.21	74.00	-26.79	Horizontal
3761.250	6.13	33.51	40.86	50.80	49.58	74.00	-24.42	Horizontal
4804.330	7.44	34.70	41.63	59.31	59.82	74.00	-14.18	Horizontal
6522.500	8.15	36.28	40.46	51.87	55.84	74.00	-18.16	Horizontal
7556.500	9.17	36.00	39.57	50.56	56.16	74.00	-17.84	Horizontal
9765.500	9.75	37.48	37.66	46.46	56.03	74.00	-17.97	Horizontal

Worse case mode:	GFSK	Test channel:	Lowest	Remark:	Average

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit	polarization
2915.250	5.00	33.28	40.24	39.91	37.95	54.00	-16.05	Vertical
4137.250	6.63	34.22	41.14	41.28	40.99	54.00	-13.01	Vertical
4804.330	7.44	34.70	41.63	52.40	52.91	54.00	-1.09	Vertical
5829.250	7.90	35.42	41.07	42.39	44.64	54.00	-9.36	Vertical
7368.500	8.92	35.95	39.74	38.73	43.86	54.00	-10.14	Vertical
9389.500	9.66	37.08	37.98	37.84	46.60	54.00	-7.40	Vertical
2527.500	4.68	32.75	39.95	39.22	36.70	54.00	-17.30	Horizontal
3761.250	6.13	33.51	40.86	40.56	39.34	54.00	-14.66	Horizontal
4804.330	7.44	34.70	41.63	51.01	51.52	54.00	-2.48	Horizontal
6522.500	8.15	36.28	40.46	41.12	45.09	54.00	-8.91	Horizontal
7556.500	9.17	36.00	39.57	40.97	46.57	54.00	-7.43	Horizontal
9765.500	9.75	37.48	37.66	37.67	47.24	54.00	-6.76	Horizontal

Worse case mode:	GFSK	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
3056.250	5.14	33.38	40.34	49.31	47.49	74.00	-26.51	Vertical
3843.500	6.26	33.61	40.93	49.41	48.35	74.00	-25.65	Vertical
4881.680	7.48	34.59	41.68	61.30	61.69	74.00	-12.31	Vertical
6099.500	8.01	35.82	40.84	50.47	53.46	74.00	-20.54	Vertical
7368.500	8.92	35.95	39.74	50.34	55.47	74.00	-18.53	Vertical
9072.250	9.63	36.68	38.26	47.93	55.98	74.00	-18.02	Vertical
2962.250	5.04	33.33	40.27	50.11	48.21	74.00	-25.79	Horizontal
4184.250	6.68	34.31	41.18	49.94	49.75	74.00	-24.25	Horizontal
4877.500	7.48	34.59	41.68	56.33	56.72	74.00	-17.28	Horizontal
6957.250	8.43	35.85	40.08	51.14	55.34	74.00	-18.66	Horizontal
7603.500	9.21	36.00	39.52	50.92	56.61	74.00	-17.39	Horizontal
9683.250	9.71	37.39	37.73	46.82	56.19	74.00	-17.81	Horizontal

Worse case mode:	GFSK	Test channel:	Middle	Remark:	Average

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Limit (dBµV/m)	Over limit	polarization
3056.250	5.14	33.38	40.34	39.57	37.75	54.00	-16.25	Vertical
3843.500	6.26	33.61	40.93	39.15	38.09	54.00	-15.91	Vertical
4881.680	7.48	34.59	41.68	52.50	52.89	54.00	-1.11	Vertical
6099.500	8.01	35.82	40.84	40.18	43.17	54.00	-10.83	Vertical
7368.500	8.92	35.95	39.74	40.58	45.71	54.00	-8.29	Vertical
9072.250	9.63	36.68	38.26	38.77	46.82	54.00	-7.18	Vertical
2962.250	5.04	33.33	40.27	38.65	36.75	54.00	-17.25	Horizontal
4184.250	6.68	34.31	41.18	38.99	38.80	54.00	-15.20	Horizontal
4877.500	7.48	34.59	41.68	48.55	48.94	54.00	-5.06	Horizontal
6957.250	8.43	35.85	40.08	42.95	47.15	54.00	-6.85	Horizontal
7603.500	9.21	36.00	39.52	41.98	47.67	54.00	-6.33	Horizontal
9683.250	9.71	37.39	37.73	38.65	48.02	54.00	-5.98	Horizontal

Worse case mode:	GFSK	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
3056.250	5.14	33.38	40.34	49.99	48.17	74.00	-25.83	Vertical
3984.500	6.43	33.80	41.02	49.66	48.87	74.00	-25.13	Vertical
4936.250	7.51	34.48	41.72	51.84	52.11	74.00	-21.89	Vertical
5911.500	7.93	35.56	41.01	51.37	53.85	74.00	-20.15	Vertical
7556.500	9.17	36.00	39.57	49.78	55.38	74.00	-18.62	Vertical
8684.500	9.53	36.35	38.60	49.46	56.74	74.00	-17.26	Vertical
3056.250	5.14	33.38	40.34	50.11	48.29	74.00	-25.71	Horizontal
4454.500	7.01	35.06	41.37	51.01	51.71	74.00	-22.29	Horizontal
4936.250	7.51	34.48	41.72	52.62	52.89	74.00	-21.11	Horizontal
6299.250	8.08	36.06	40.66	51.02	54.50	74.00	-19.50	Horizontal
7791.500	9.27	36.00	39.38	49.94	55.83	74.00	-18.17	Horizontal
8684.500	9.53	36.35	38.60	49.09	56.37	74.00	-17.63	Horizontal

Worse case mode:	GFSK	Test channel:	Highest	Remark:	Average

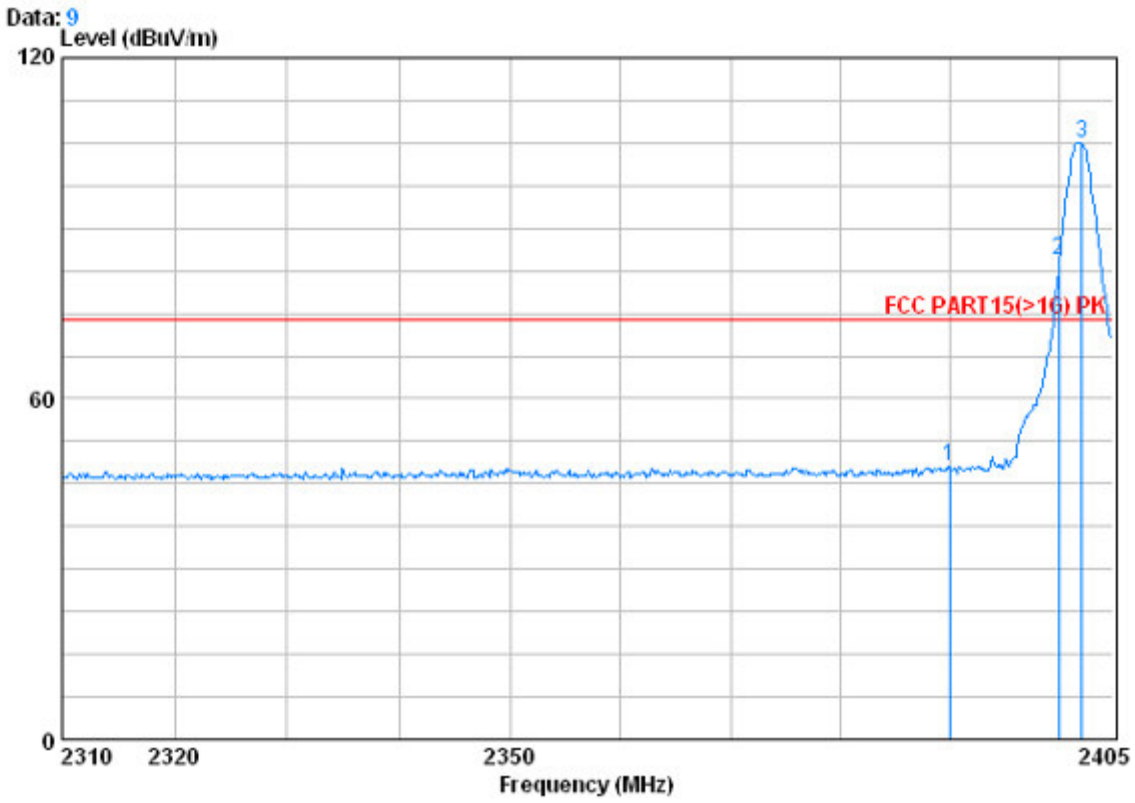
Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit	polarization
3056.250	5.14	33.38	40.34	40.19	38.37	54.00	-15.63	Vertical
3984.500	6.43	33.80	41.02	40.45	39.66	54.00	-14.34	Vertical
4936.250	7.51	34.48	41.72	42.59	42.86	54.00	-11.14	Vertical
5911.500	7.93	35.56	41.01	42.57	45.05	54.00	-8.95	Vertical
7556.500	9.17	36.00	39.57	39.99	45.59	54.00	-8.41	Vertical
8684.500	9.53	36.35	38.60	39.19	46.47	54.00	-7.53	Vertical
3056.250	5.14	33.38	40.34	41.36	39.54	54.00	-14.46	Horizontal
4454.500	7.01	35.06	41.37	41.98	42.68	54.00	-11.32	Horizontal
4936.250	7.51	34.48	41.72	42.66	42.93	54.00	-11.07	Horizontal
6299.250	8.08	36.06	40.66	42.66	46.14	54.00	-7.86	Horizontal
7791.500	9.27	36.00	39.38	40.65	46.54	54.00	-7.46	Horizontal
8684.500	9.53	36.35	38.60	39.88	47.16	54.00	-6.84	Horizontal

Remark: The disturbance above 10GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

5.11.3 Band edge (Radiated Emission)

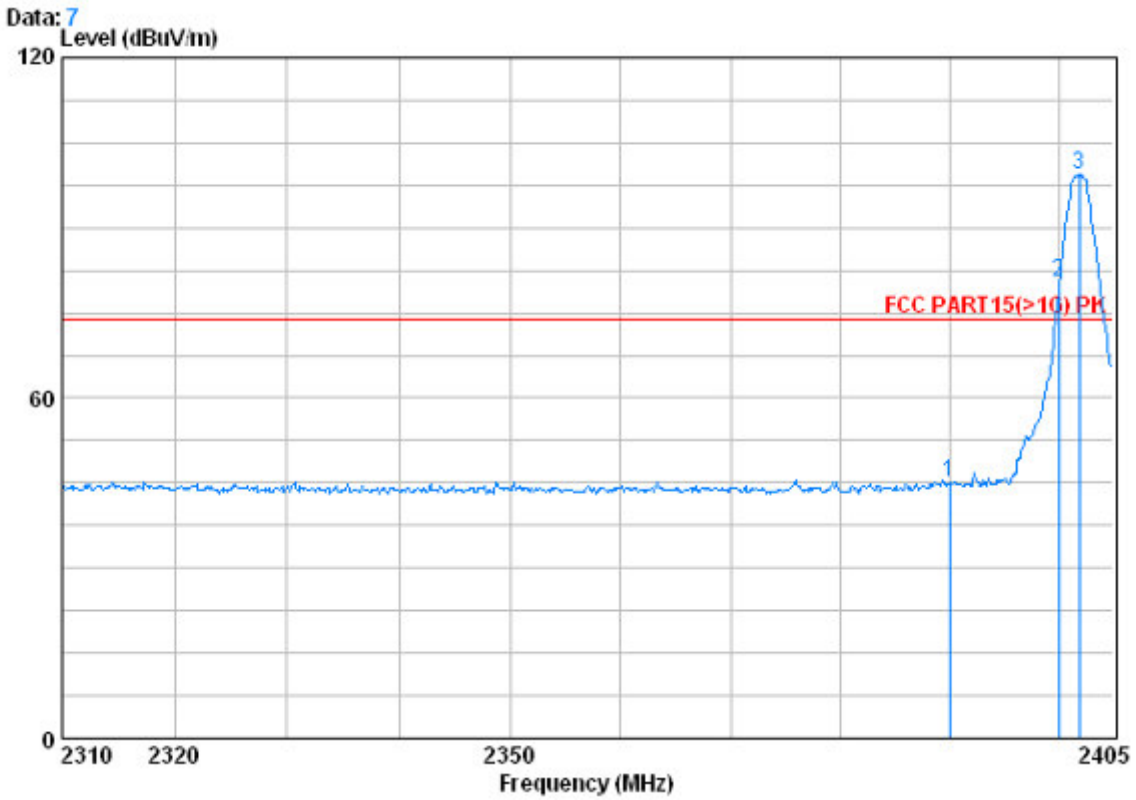
Test mode:	Transmitting	Test channel:	Lowest	Remark:	Peak

Vertical:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2390.000	2.98	32.51	39.85	52.51	48.15	74.00	-25.85	Peak
2 X	2400.000	2.98	32.51	39.86	88.82	84.45	74.00	10.45	Peak
3 X	2402.150	2.98	32.51	39.86	109.36	104.99	74.00	30.99	Peak

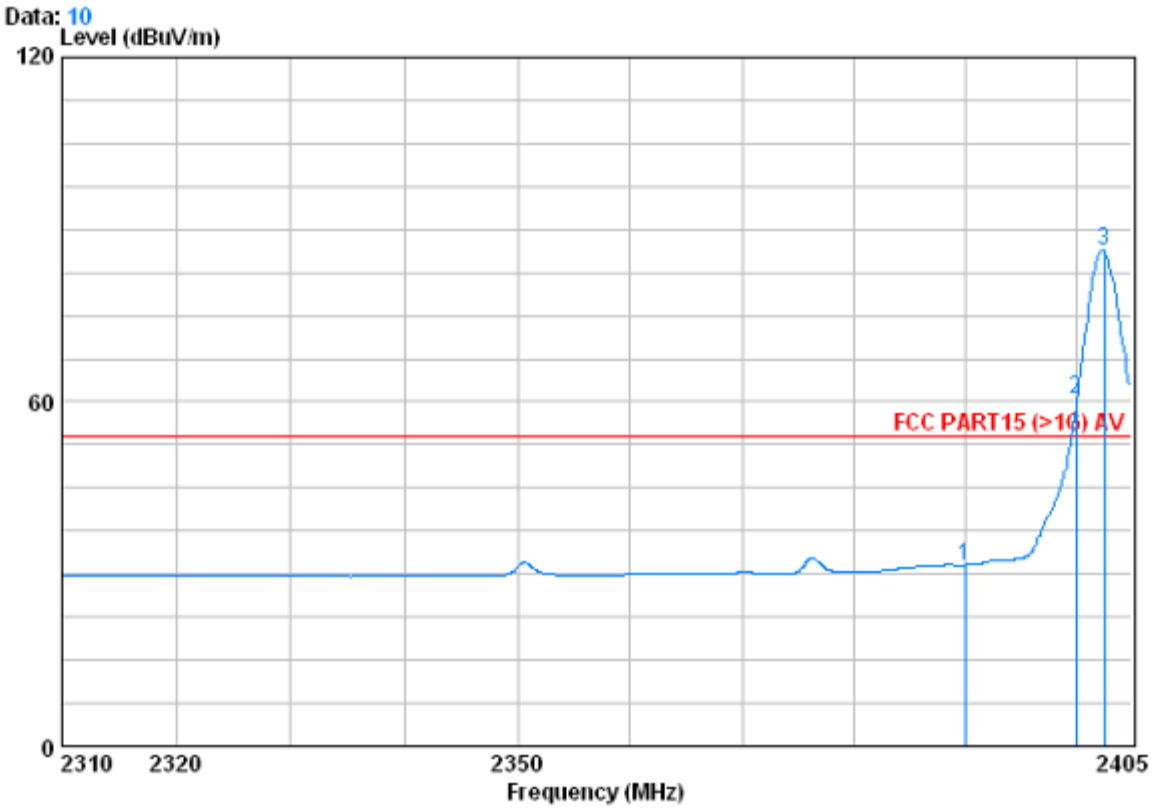
Horizontal:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2390.000	2.98	32.51	39.85	49.43	45.07	74.00	-28.93	Peak
2 X	2400.000	2.98	32.51	39.86	84.65	80.28	74.00	6.28	Peak
3 X	2401.865	2.98	32.51	39.86	103.70	99.33	74.00	25.33	Peak

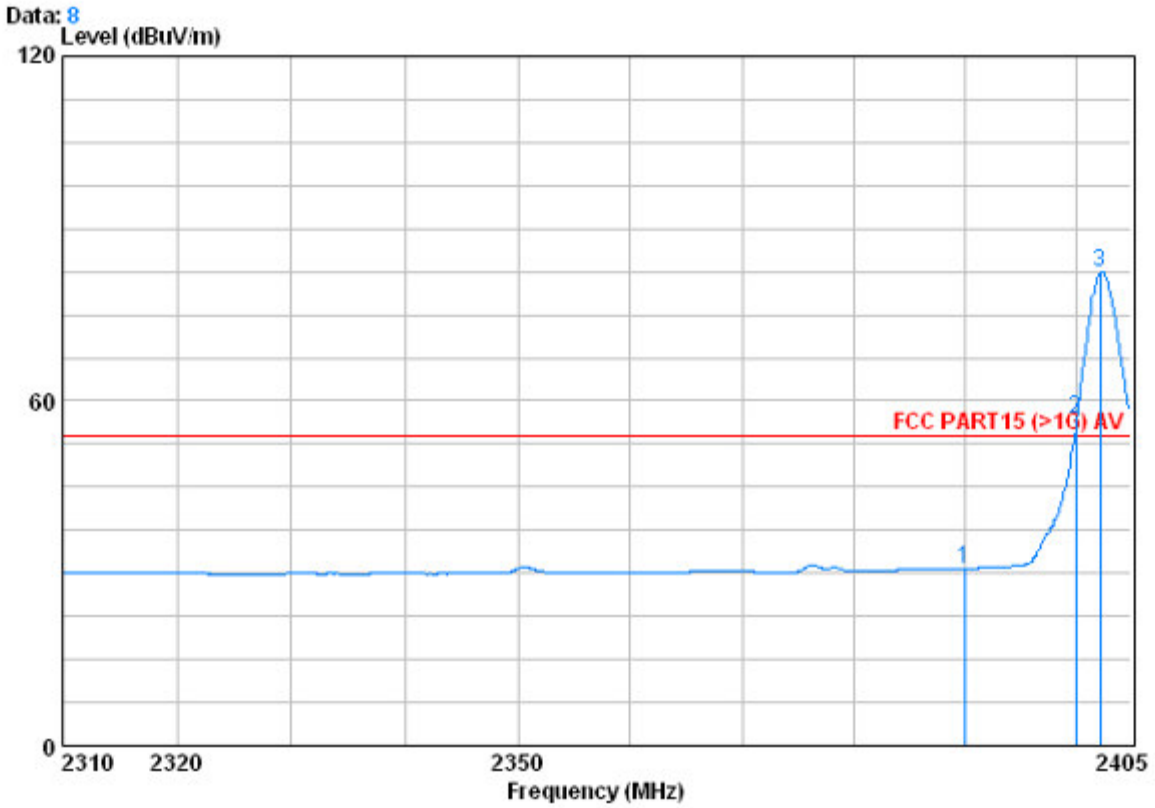
Test mode:	Transmitting	Test channel:	Lowest	Remark:	Average

Vertical:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2390.000	2.98	32.51	39.85	35.90	31.55	54.00	-22.45	Average
2 X	2400.000	2.98	32.51	39.86	64.79	60.42	54.00	6.42	Average
3 X	2402.530	2.98	32.54	39.86	90.77	86.44	54.00	32.44	Average

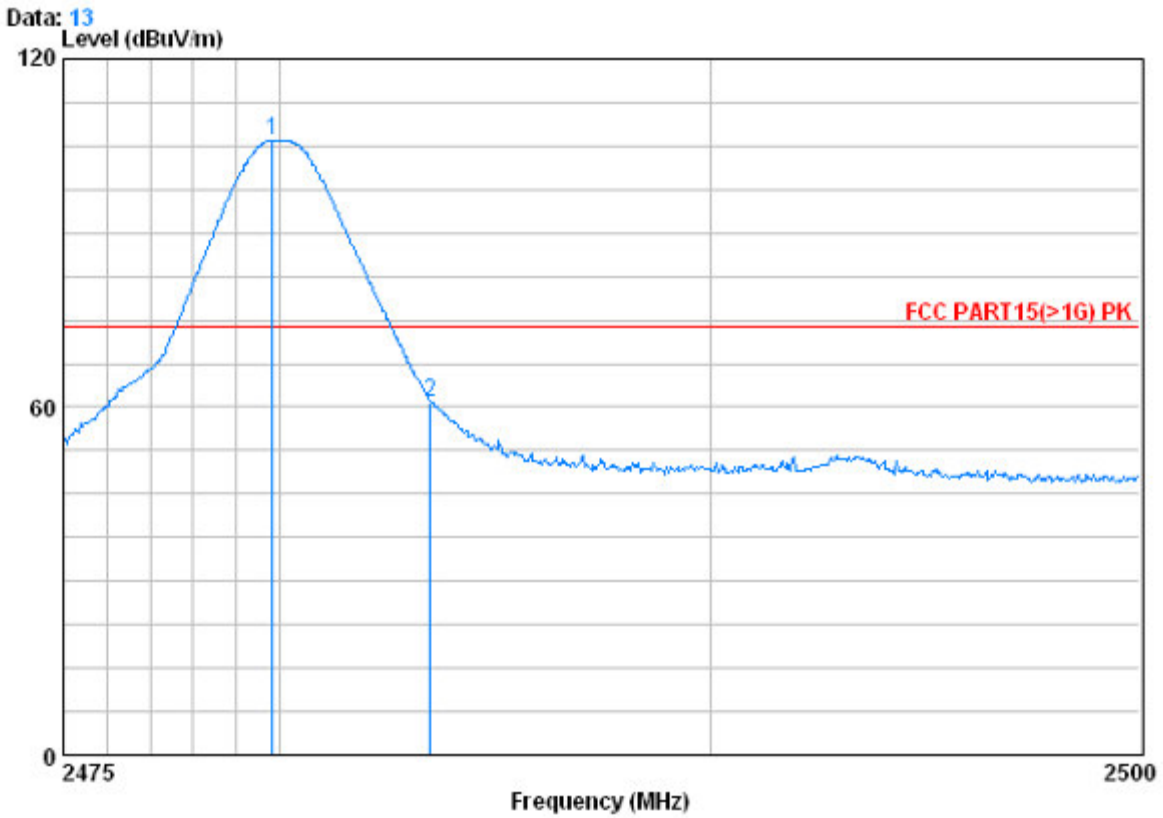
Horizontal:



		Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1		2390.000	2.98	32.51	39.85	35.17	30.81	54.00	-23.19	Average
2	X	2400.000	2.98	32.51	39.86	61.16	56.79	54.00	2.79	Average
3	X	2402.245	2.98	32.51	39.86	86.69	82.32	54.00	28.32	Average

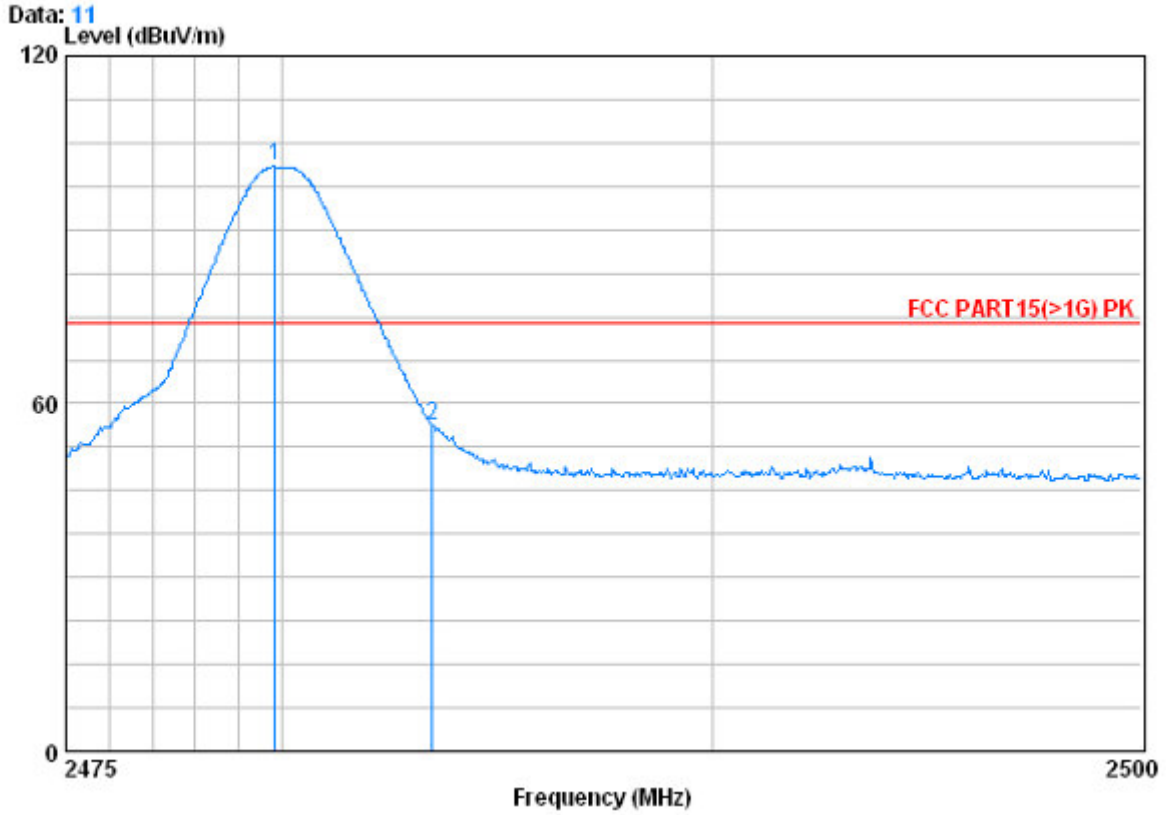
Test mode:	Transmitting	Test channel:	Highest	Remark:	Peak

Vertical:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 X	2479.850	3.03	32.67	39.92	110.16	105.94	74.00	31.94	Peak
2	2483.500	3.03	32.67	39.92	65.11	60.89	74.00	-13.11	Peak

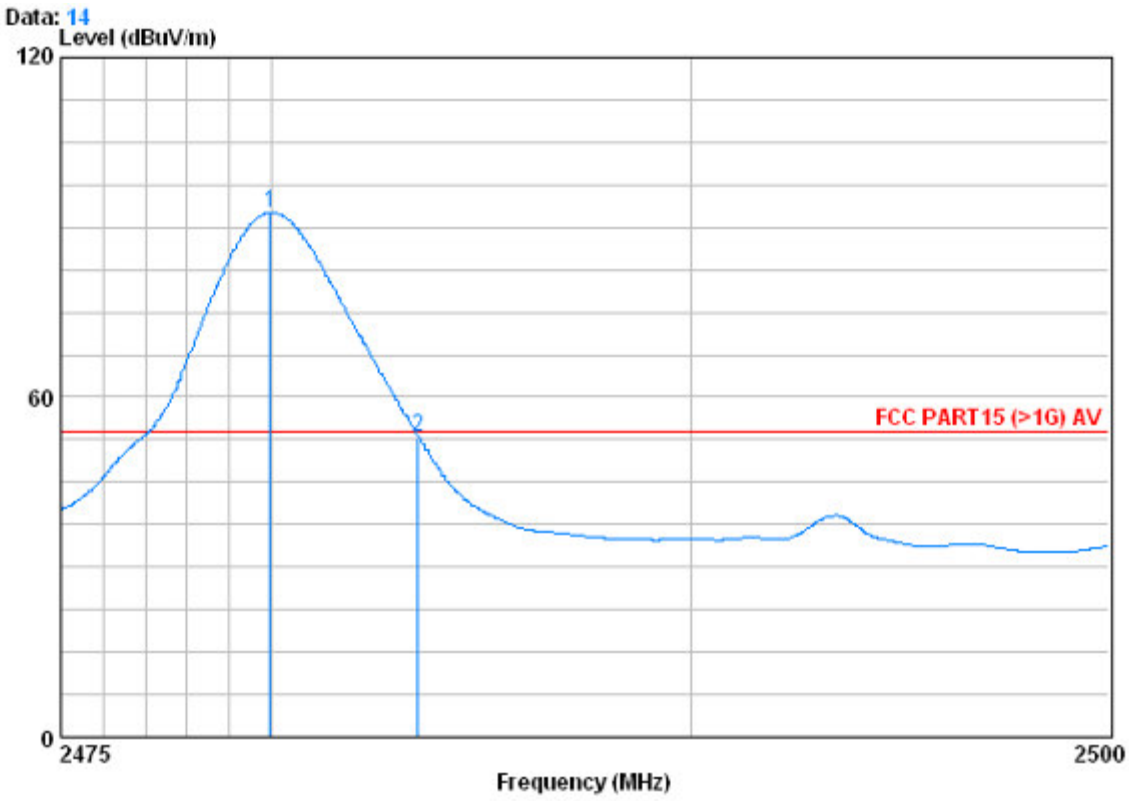
Horizontal:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 X	2479.850	3.03	32.67	39.92	105.10	100.88	74.00	26.88	Peak
2	2483.500	3.03	32.67	39.92	60.31	56.09	74.00	-17.91	Peak

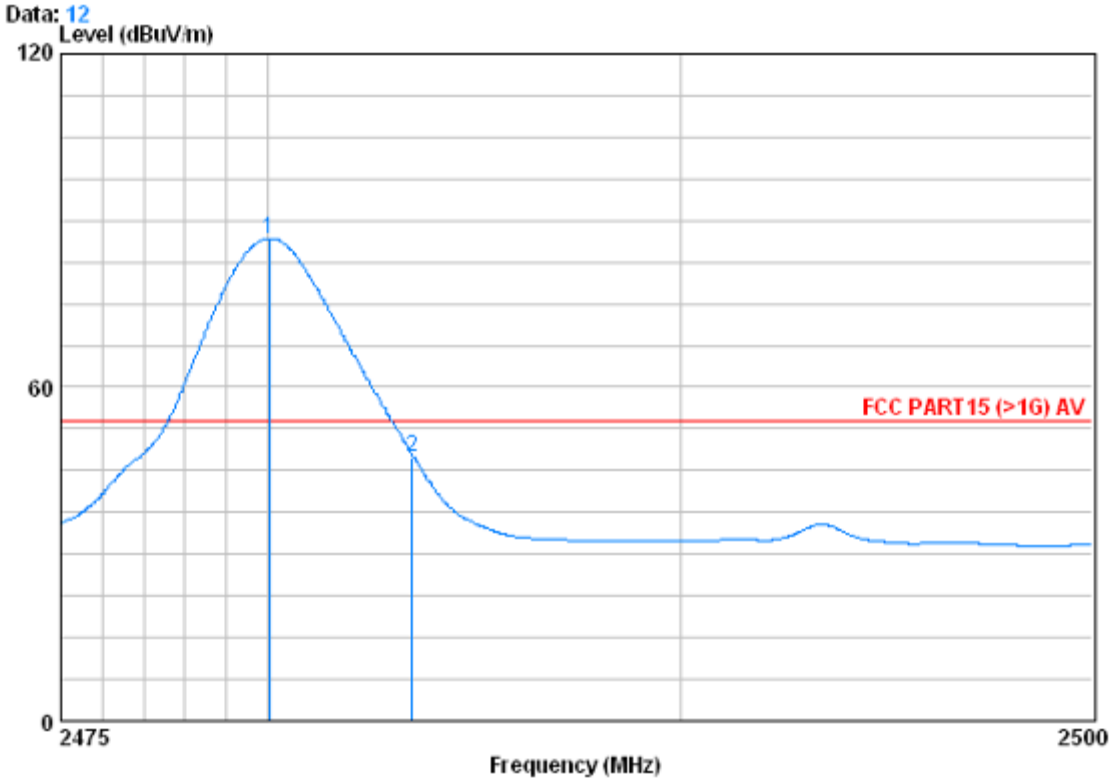
Test mode:	Transmitting	Test channel:	Highest	Remark:	Average

Vertical:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 @	2479.975	3.03	32.67	39.92	96.86	92.64	54.00	38.64	Average
2	2483.500	3.03	32.67	39.92	57.16	52.94	54.00	-1.06	Average

Horizontal:



	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 X	2480.050	3.03	32.67	39.92	90.97	86.75	54.00	32.75	Average
2	2483.500	3.03	32.67	39.92	51.78	47.57	54.00	-6.43	Average