SGS-CSTC Standards Technical Services Ltd.

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FCC REPORT

Application No:	SZEM1403000776RF
Applicant:	Harman International Industries, Inc.
Manufacturer:	Harman International Industries, Inc.
Factory:	Dongguan Tai Sing Audio Technology Limited
Product Name:	Bluetooth Headset
Model No.(EUT):	E50BT
Trade Mark:	JBL
FCC ID:	APIE50BT
Standards:	47 CFR Part 15, Subpart C (2013)
Date of Receipt:	2014-03-04
Date of Test:	2014-03-11 to 2014-03-13
Date of Issue:	2014-03-17
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	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 (2009)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2009)	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10 (2009)	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Carrier Frequencies Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (b)	ANSI C63.10 (2009)	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10 (2009)	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2009)	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2009)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2009)	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2009)	PASS

3 Contents

4 General Information

4.1 Client Information

Applicant:	Harman International Industries, Inc.
Address of Applicant:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES
Manufacturer:	Harman International Industries, Inc.
Address of Manufacturer:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES
Factory:	Dongguan Tai Sing Audio Technology Limited
Address of Factory:	Tai Sing Industrial Road, Bai Zhou Bian Village, DongCheng, Dongguan City, Guangdong Province 523113, P.R.China

4.2 General Description of EUT

Product Name:	Bluetooth Headset
Model No.:	E50BT
Trade Mark:	JBL
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V3.0(with 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:	Portable production
Test Power Grade:	255 , 46 (manufacturer declare)
Test Software of EUT:	CSR BlueSuite (manufacturer declare)
Antenna Type:	Integral
Antenna Gain:	0dBi
Battery:	3.7V 730mAh 2.7Wh Li-ion rechargeable battery
EUT power supply:	USB charge
Test Voltage:	AC 120V 60Hz DC 3.7V battery fully charged
USB Charging Cable:	100cm(Unshielded)
AUX Cable:	120cm(Unshielded)

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

Operating Environment:	
Temperature:	21.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	1015mbar

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.
Adapter	Supply by SGS	N/A

4.5 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663
Tel: +86 2082155555 Fax: +86 20 82075059

4.6 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**
  SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.
- **ACMA**
  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.
- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**
  Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.
- **CNAS (Lab Code: L0167)**
  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.
- **FCC (Registration No.: 282399)**
  SGS-CSTC Standards Technical Services Co., Ltd., 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 282399, May 31, 2002.
- **Industry Canada (Registration No.: 4620B-1)**
  The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.
- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**
  The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584，G-449 and T-1179 respectively.
- **CBTL (Lab Code: TL129)**
  SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01:2006-10 and Rules of procedure IECEE 02:2006-10, and the relevant IECEE CB-Scheme Operational documents.

4.7 Deviation from Standards

None.

4.8 Abnormalities from Standard Conditions

None.

4.9 Other Information Requested by the Customer

None.

4.10 Equipment List

Conducted Emission						
No.	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Due date (YYYY-MM-DD)**	**Calibration Interval**
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m^3	N/A	N/A	N/A
EMC0118	Two-line v-netwok	R&S	ENV216	100359	2015-03-03	1Y
EMC0102	LISN	SCHAFFNER CHASE	MN2050D/1	1421	2014-08-31	1Y
EMC2046	Artificial Mains Network (LISN)	AFJ Instruments	LT32C	S.N.32031120150	2015-03-03	1Y
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2015-03-03	1Y
EMC0107	Coaxial Cable	SGS	2m	N/A	2014-07-25	2Y
EMC0106	Voltage Probe	SGS	N/A	N/A	N/A	1Y
EMC0120	8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	20550	2014-08-31	1Y
EMC0121	4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	20549	2014-08-31	1Y
EMC0122	2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	20548	2014-08-31	1Y
EMC2047	CDN	Elektronik-Feinmechanik	L-801:AF2	2793	2014-11-11	3Y
EMC2048	CDN	Elektronik-Feinmechanik	L-801:M2/M3	2738	2014-11-11	3Y
EMC2062	6dB Attenuator	HP	8491A	24487	2015-01-04	1Y
EMC167	Conical metal housing	SGS-EMC	N/A	N/A	2016-02-16	2Y

RE in Chamber						
No.	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Due date (YYYY-MM-DD)**	**Calibration Interval**
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2014-08-30	2Y
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2014-05-06	1Y
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	100236	2015-03-03	1Y
EMC0528	RI High frequency Cable	SGS	20 m	N/A	2014-05-09	1Y
EMC2025	Trilog Broadband Antenna 30-3000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9163	9163-450	2016-08-31	3Y
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2016-08-31	3Y
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2014-06-02	2Y
EMC2026	Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-841	2016-08-31	3Y
EMC0518	Horn Antenna	Rohde & Schwarz	HF906	100096	2014-07-01	2Y
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2015-03-03	1Y
EMC2065	Amplifier	HP	8447F	N/A	2014-08-31	1Y
EMC2063	1-26GHz Pre Amplifier	Compliance Direction System Inc.	PAP-1G26-48	6279.628	2014-07-29	1Y
EMC0075	310N Amplifier	Sonama	310N	272683	2015-03-03	1Y
EMC0523	Active Loop Antenna	EMCO	6502	42963	2014-04-07	2Y
EMC2041	Broad-Band Horn Antenna (14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONI	BBHA 9170	9170-375	2014-06-01	3Y
EMC2069	2.4GHz filter	Micro-Tronics	BRM 50702	149	2014-06-05	1Y
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2014-04-27	2Y
EMC2041	Broad-Band Horn Antenna(14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9170	9170-375	2014-06-11	3Y

RF connected test						
No.	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Due date (YYYY-MM-DD)**	**Calibration Interval**
EMC0039	Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	118	2014-08-31	1Y
EMC2022	DC Power Supply	KIKUSUI ELECTRONICS CORP.	PAN60-20A	HH000269	2014-05-06	1Y
EMC0007	DMM	Fluke	73	70671122	2014-09-13	1Y
EMC0006	DMM	Fluke	73	70681569	2014-09-13	1Y
EMC0525	Compact Semi- Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	N/A	N/A
EMC0530	10m Semi- Anechoic Chamber	ETS	N/A	N/A	2014-04-27	2Y
EMC0502	Biconical Antenna (Rx)	Rohde & Schwarz	HK116	100032	2014-08-30	2Y
EMC0503	Biconical Antenna (Tx)	Rohde & Schwarz	HK116	100033	2014-07-01	2Y
EMC0504	Log-Perd. Dipole Antenna (Rx)	Rohde & Schwarz	HL223	100039	2014-08-30	2Y
EMC0518	Horn Antenna (Rx)	Rohde & Schwarz	HF906	100096	2014-07-01	2Y
EMC0519	Bilog Type Antenna	Schaffner Chase	CBL6143	5070	2014-06-02	2Y
EMC0521	1-26.5GHz Pre Amplifier	Agilent	8449B	3008A01649	2015-03-03	1Y
EMC2063	1-26GHz Pre Amplifier	Compliance Direction System Inc.	PAP-1G26-48	6279.628	2014-07-29	1Y
EMC0075	9KHz-1GHz Pre Amplifier	SONOMA INSTRUMENT Co.	310N	272683	2015-03-03	1Y
EMC0507	Antenna Mask (Tx)	HD-GmbH	AS620M	620/408	N/A	N/A
EMC0508	Antenna Mask (Rx)	HD-GmbH	MA240	240/619	N/A	N/A
EMC0509	Turntable	HD-GmbH	DT430	N/A	N/A	N/A
EMC0510	Turntable & Antenna Mask Controller	HD-GmbH	HD100	N/A	N/A	N/A
EMC0512	EMI Test Software	Rohde & Schwarz	ES-K1	N/A	N/A	N/A
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2014-05-06	1Y
EMC0516	Signal Generator	Rohde & Schwarz	SMR20	100416	2014-05-06	1Y
EMC0032	Radio Communication Monitor	Rohde & Schwarz	CMS54	100137	2014-08-31	1Y

EMC0904	Power Meter	Rohde & Schwarz	NRVS	825770/074	2015-03-03	1Y
EMC0071	URV5-Z2 Insert. Unit	Rohde & Schwarz	URV5-Z2	100309	2015-03-03	1Y
EMC0906	Dual Directional Coupler	Werlatone Inc.	C1795	6634	2014-08-31	1Y
EMC2012	Power-Electronics Measurement System	Tektronix	TDS 744A	N/A	2015-03-03	1Y
EMC0523	Active Loop Antenna	EMCO	6502	42963	2014-04-07	2Y
EMC0069	Signal Analyzer (20Hz ~ 26.5Ghz	R&S	FSIQ26	100312	2015-03-03	1Y
EMC2041	Broad-Band Horn Antenna(14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONI	BBHA 9170	9170-375	2014-06-01	3Y
EMC0078	Temperature, & Humidity	Shanghai Meteorological Instrument factory Co., Ltd.	ZJ1-2B	709131	2014-09-13	1Y

Note: The calibration interval is one year, all the instruments are valid.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)

15.203 requirement:

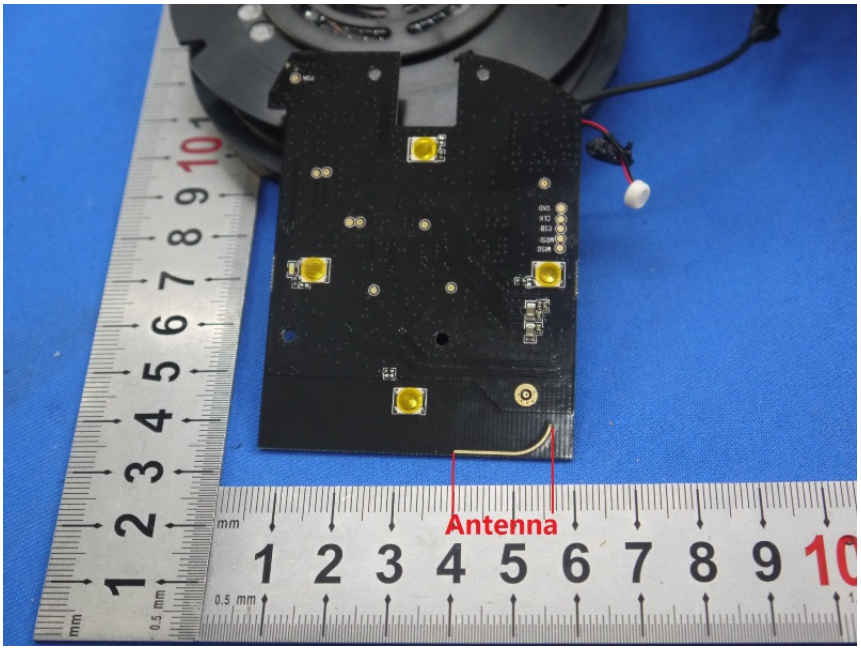
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit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

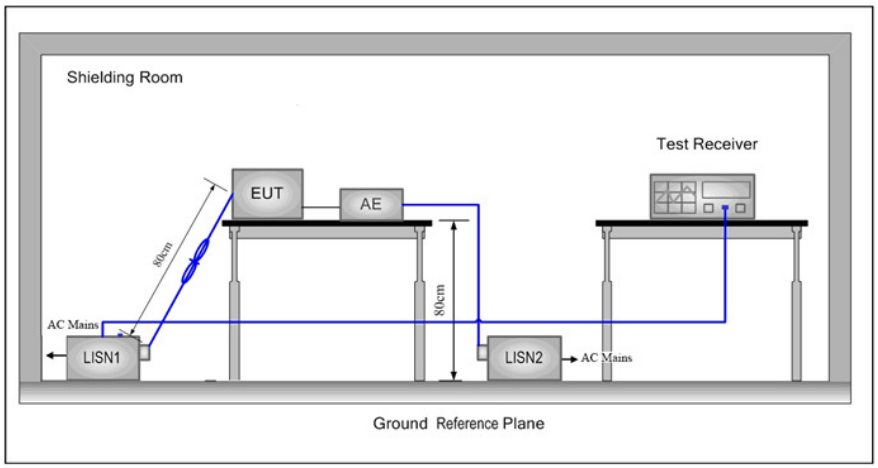
EUT Antenna:	

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.



5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2009
Test Frequency Range:	150kHz to 30MHz
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:	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.

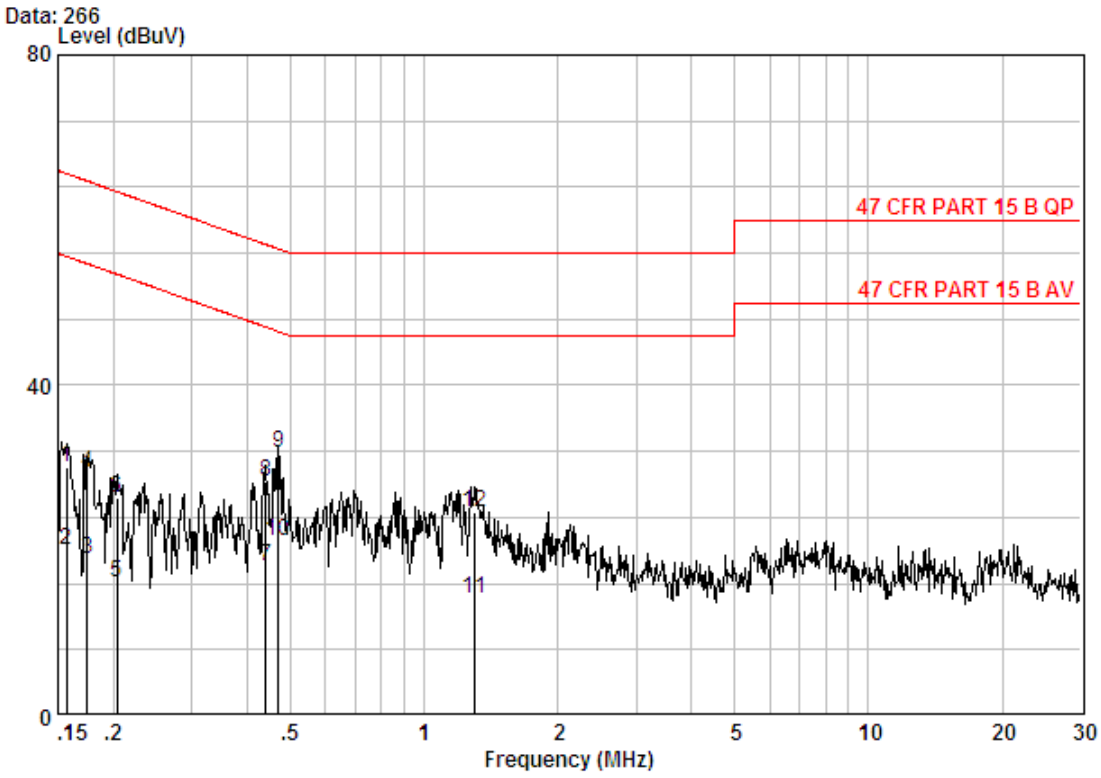
Test Setup:	
Test Mode:	Charge mode
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

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.

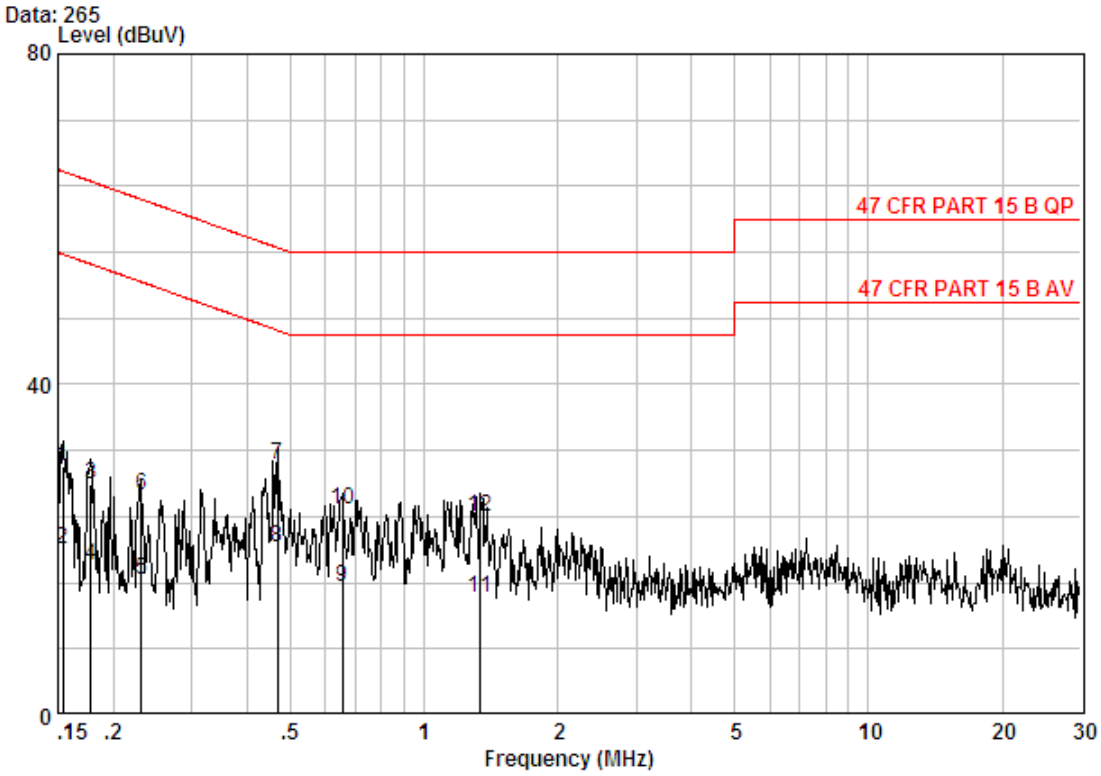
Live line:



Site : Shielding Room
Condition : 47 CFR PART 15 B QP CE LINE
Job.No : 0776RF
MODE : Charge

		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.15649	0.02	9.70	20.25	29.97	65.65	-35.67	QP
2		0.15649	0.02	9.70	10.34	20.06	55.65	-35.59	Average
3		0.17491	0.02	9.70	9.30	19.02	54.72	-35.70	Average
4		0.17491	0.02	9.70	19.68	29.40	64.72	-35.32	QP
5		0.20396	0.02	9.70	6.46	16.18	53.45	-37.27	Average
6		0.20396	0.02	9.70	16.57	26.29	63.45	-37.16	QP
7		0.43974	0.01	9.80	8.28	18.09	47.07	-28.98	Average
8		0.43974	0.01	9.80	18.55	28.36	57.07	-28.71	QP
9	@	0.47110	0.01	9.80	22.00	31.81	56.49	-24.69	QP
10	@	0.47110	0.01	9.80	11.37	21.18	46.49	-25.31	Average
11		1.303	0.02	9.80	4.28	14.10	46.00	-31.90	Average
12		1.303	0.02	9.80	14.84	24.66	56.00	-31.34	QP

Neutral line:



Site : Shielding Room
Condition : 47 CFR PART 15 B QP CE NEUTRAL
Job.No : 0776RF
MODE : Charge

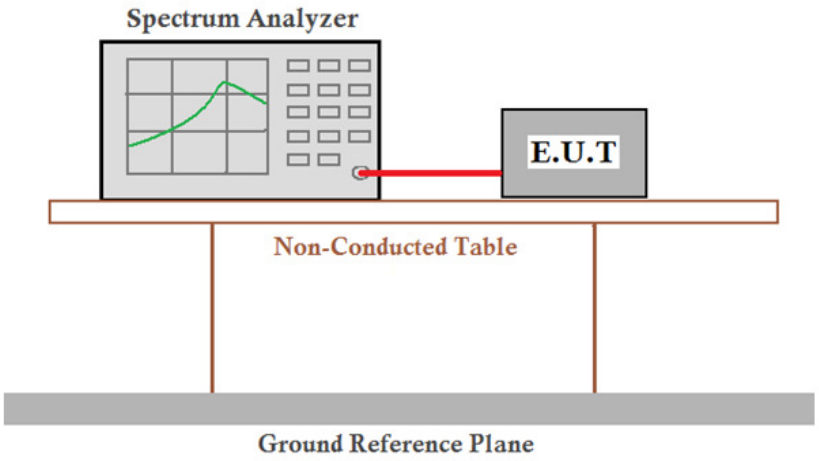
	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15403	0.02	9.70	20.40	30.12	65.78	-35.66	QP
2	0.15403	0.02	9.70	10.37	20.09	55.78	-35.69	Average
3	0.17772	0.02	9.70	18.15	27.87	64.59	-36.73	QP
4	0.17772	0.02	9.70	8.39	18.11	54.59	-36.48	Average
5	0.23162	0.02	9.70	6.65	16.37	52.39	-36.02	Average
6	0.23162	0.02	9.70	16.88	26.60	62.39	-35.79	QP
7 @	0.46861	0.01	9.80	20.41	30.22	56.54	-26.32	QP
8	0.46861	0.01	9.80	10.37	20.18	46.54	-26.36	Average
9	0.65430	0.02	9.80	5.67	15.49	46.00	-30.51	Average
10	0.65430	0.02	9.80	15.03	24.85	56.00	-31.15	QP
11	1.338	0.02	9.80	4.34	14.16	46.00	-31.84	Average
12	1.338	0.02	9.80	14.06	23.88	56.00	-32.12	QP

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

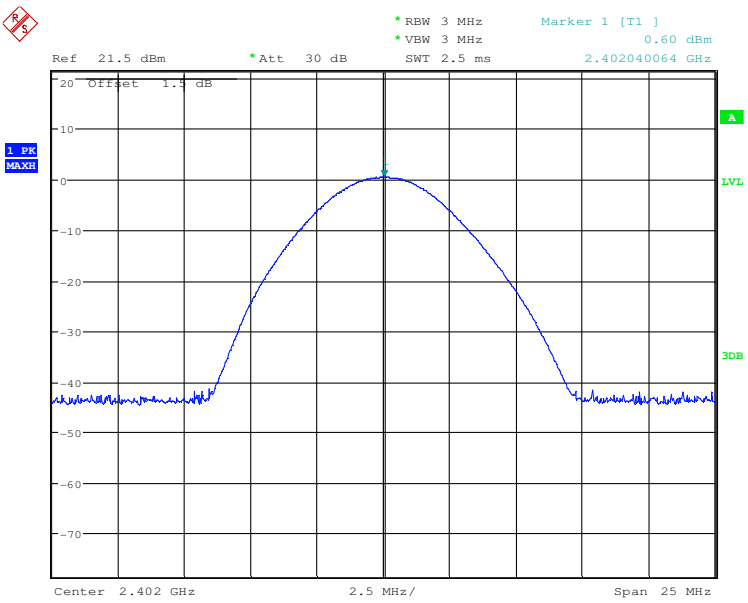
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Limit:	30dBm
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worse case of GFSK modulation type, 2-DH1 of data type is worse case of π/4DQPSK modulation type, 3-DH1 of data type is worse case of 8DPSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

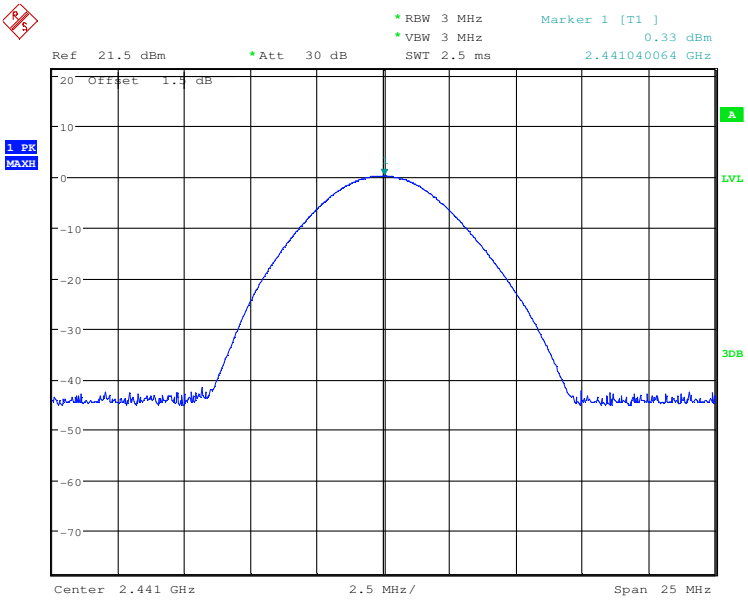
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.60	30.00	Pass
Middle	0.33	30.00	Pass
Highest	0.01	30.00	Pass
π/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-0.54	30.00	Pass
Middle	-0.44	30.00	Pass
Highest	-0.71	30.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-0.18	30.00	Pass
Middle	-0.24	30.00	Pass
Highest	-0.70	30.00	Pass

Test plot as follows:

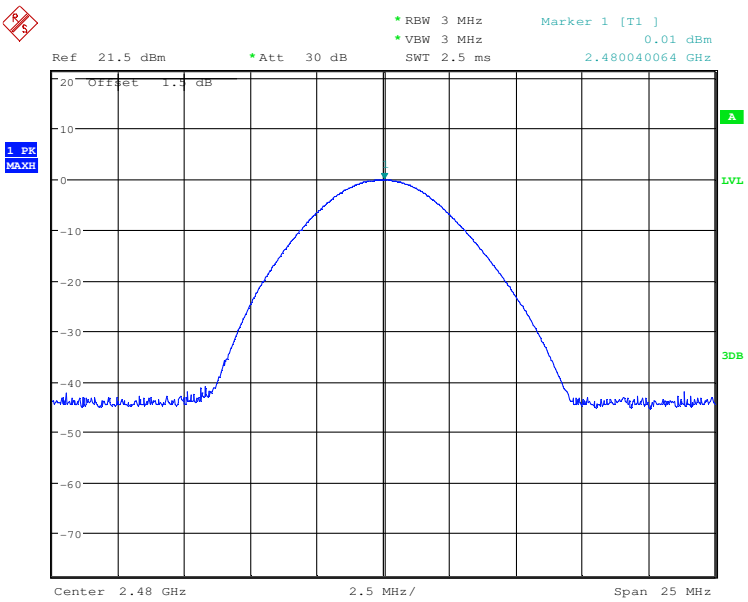
Test mode:	GFSK	Test channel:	Lowest



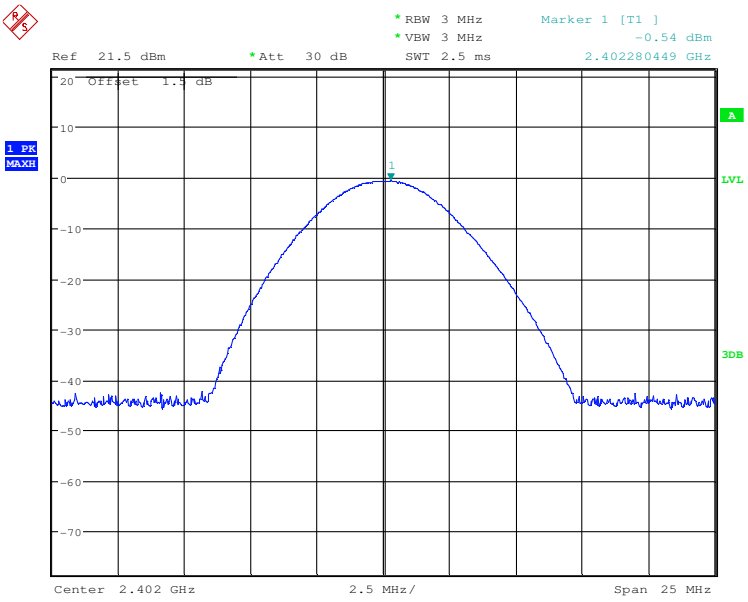
Test mode:	GFSK	Test channel:	Middle



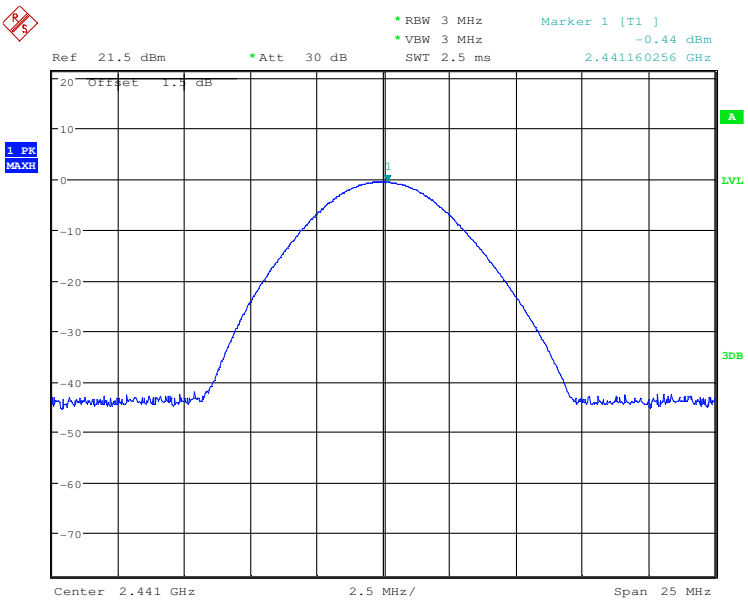
Test mode:	GFSK	Test channel:	Highest



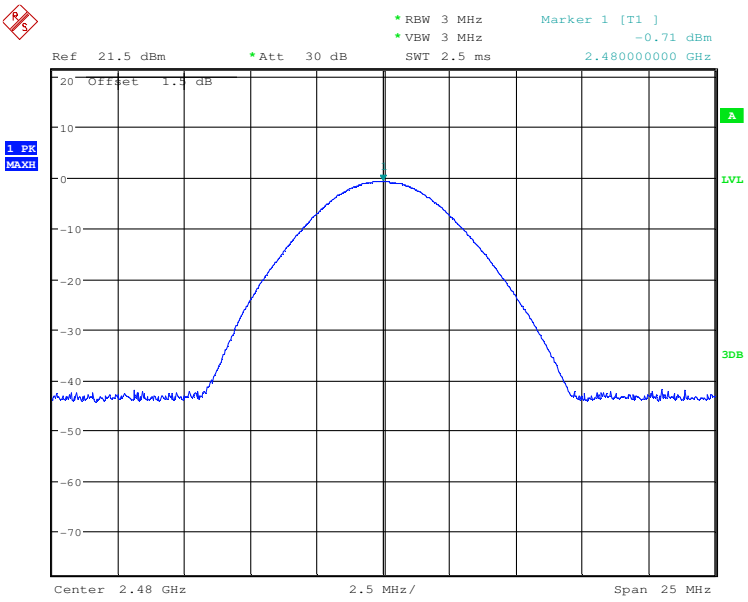
Test mode:	π/4DQPSK	Test channel:	Lowest



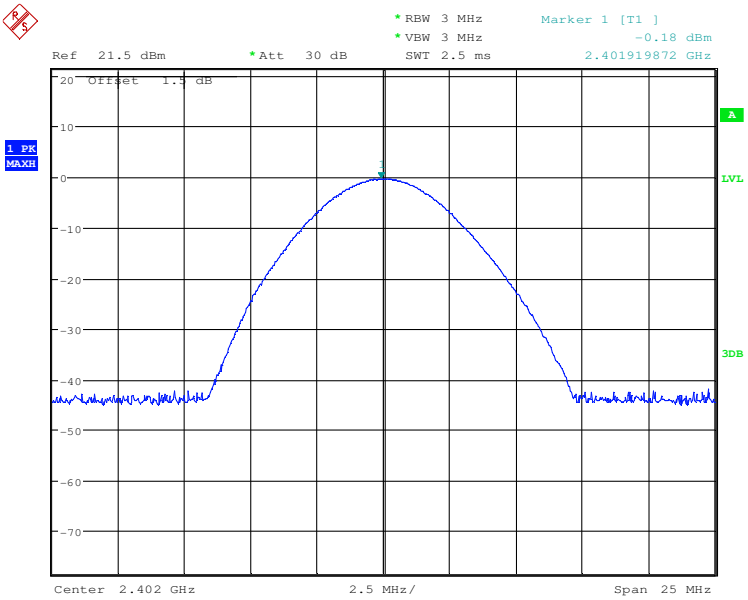
Test mode:	π/4DQPSK	Test channel:	Middle



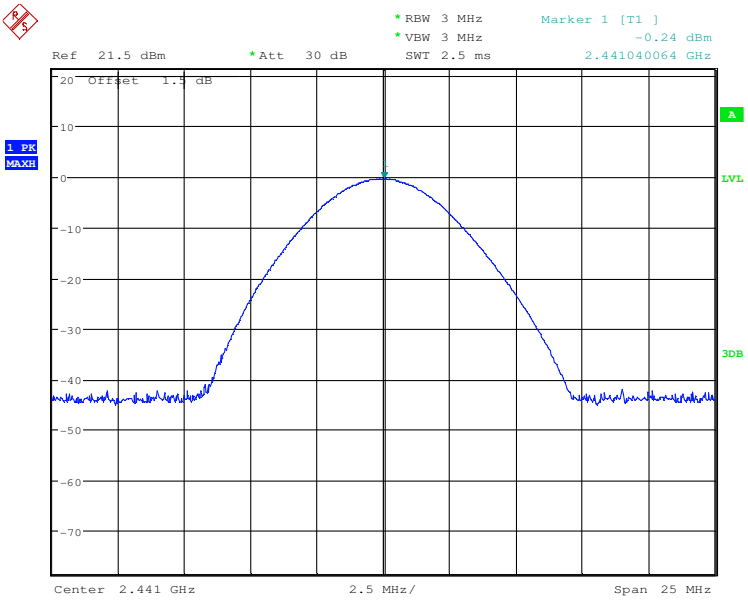
Test mode:	π/4DQPSK	Test channel:	Highest



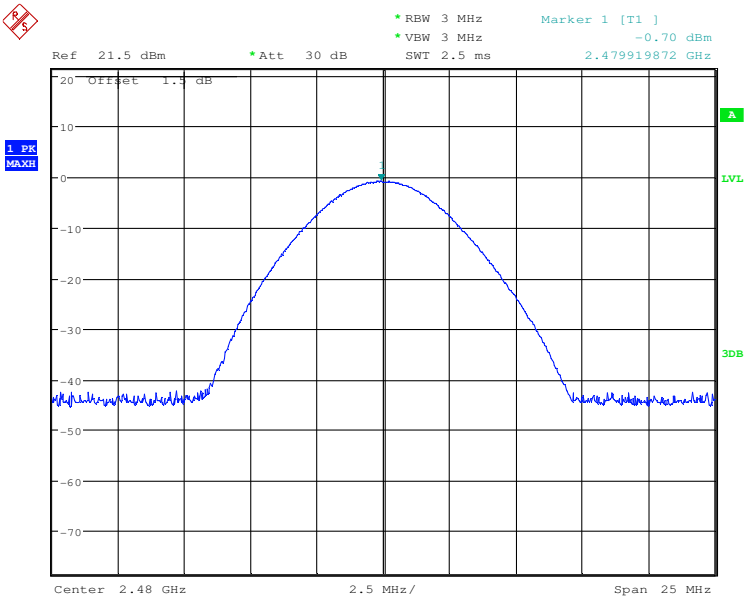
Test mode:	8DPSK	Test channel:	Lowest



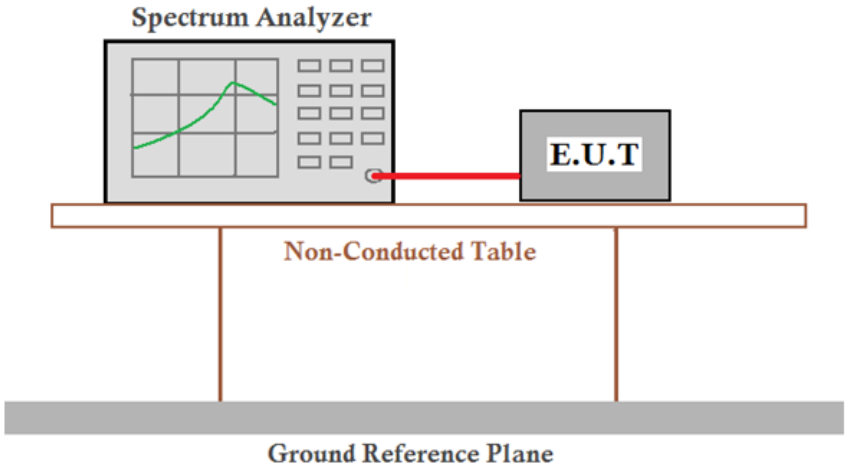
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.4 20dB Occupy Bandwidth

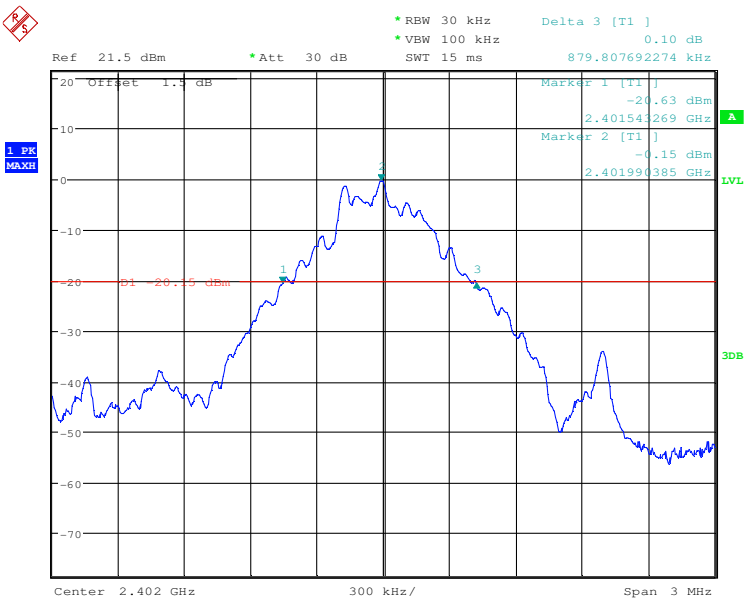
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worse case of GFSK modulation type, 2-DH1 of data type is worse case of π/4DQPSK modulation type, 3-DH1 of data type is worse case of 8DPSK modulation type..
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

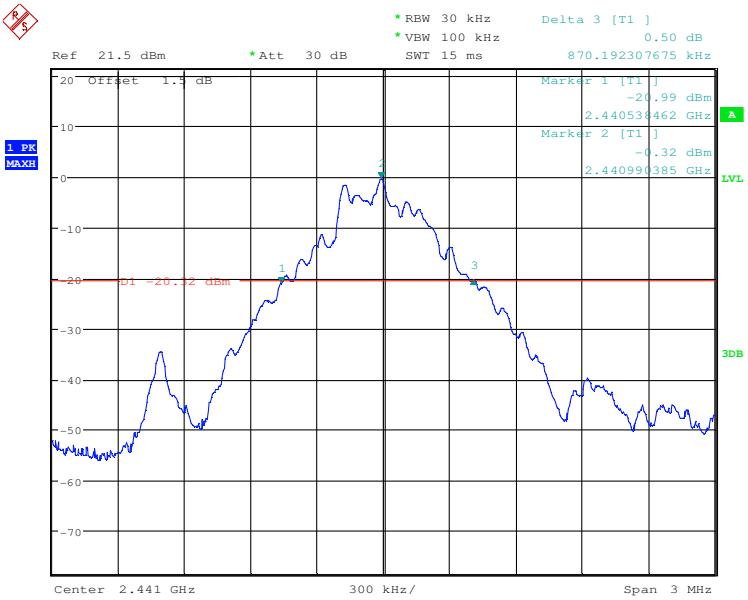
Test channel	20dB Occupy Bandwidth (kHz)		
	GFSK	π/4DQPSK	8DPSK
Lowest	879.807692274	1250.000000	1216.346154
Middle	870.192307675	1225.961538	1216.346154
Highest	874.999999955	1225.961538	1221.153846

Test plot as follows:

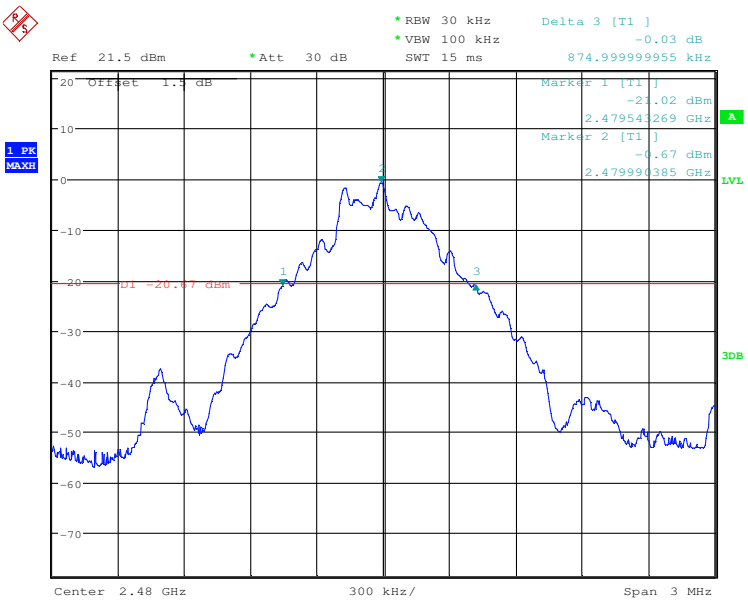
Test mode:	GFSK	Test channel:	Lowest



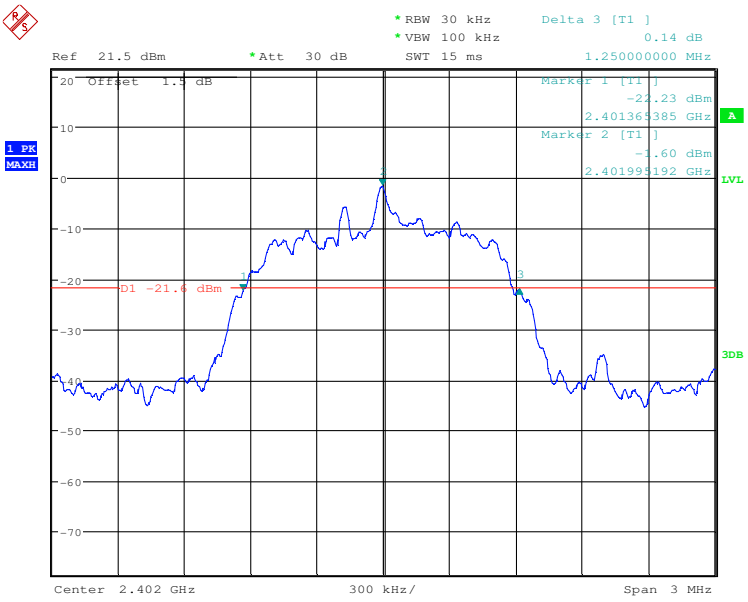
Test mode:	GFSK	Test channel:	Middle



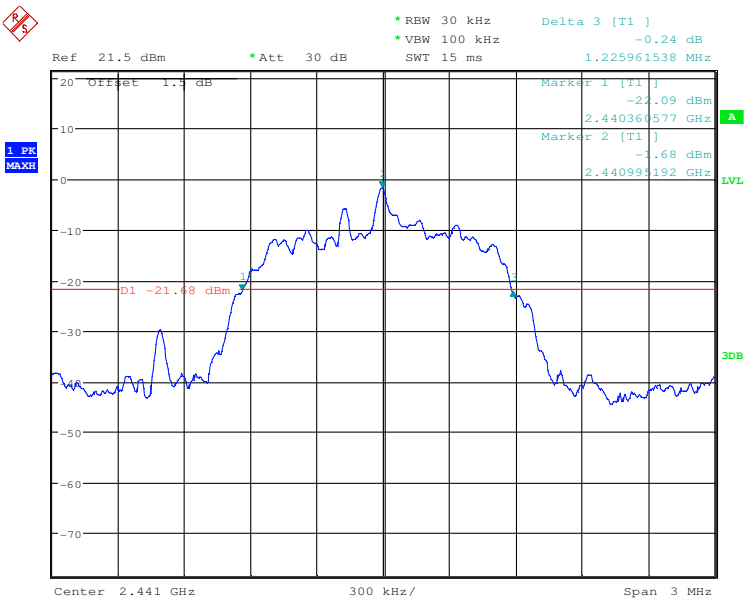
Test mode:	GFSK	Test channel:	Highest



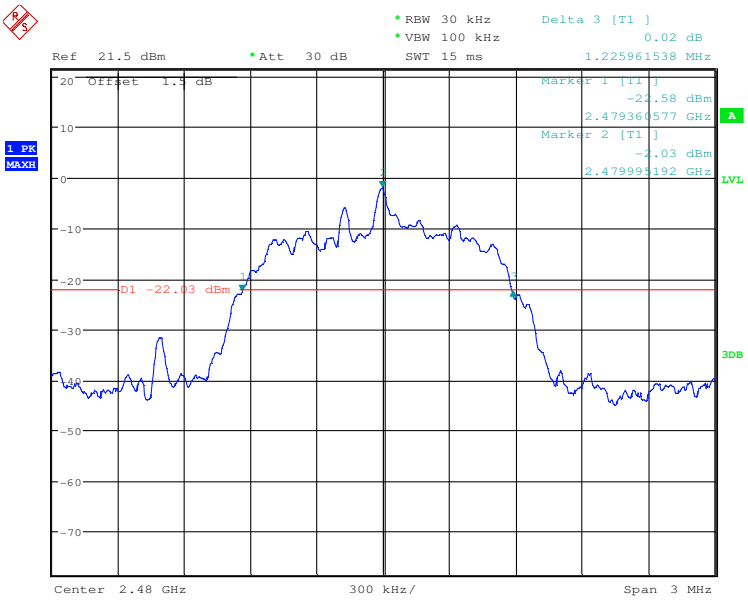
Test mode:	π/4DQPSK	Test channel:	Lowest



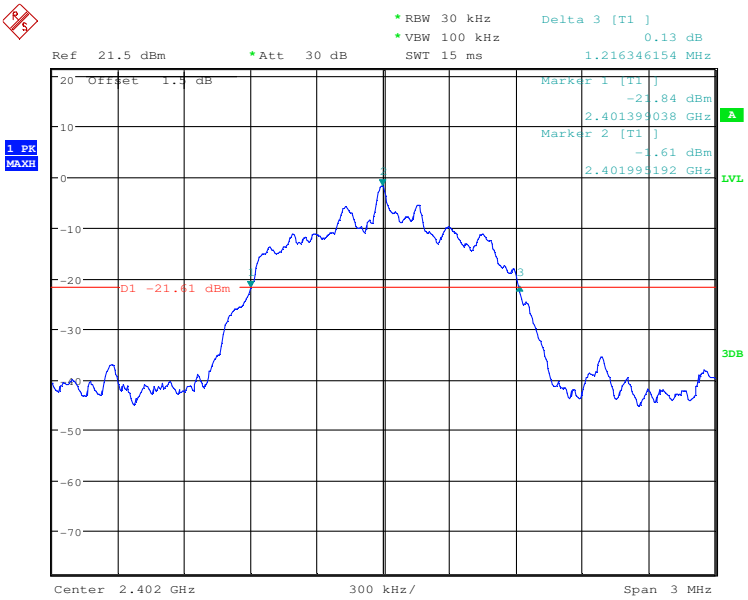
Test mode:	π/4DQPSK	Test channel:	Middle



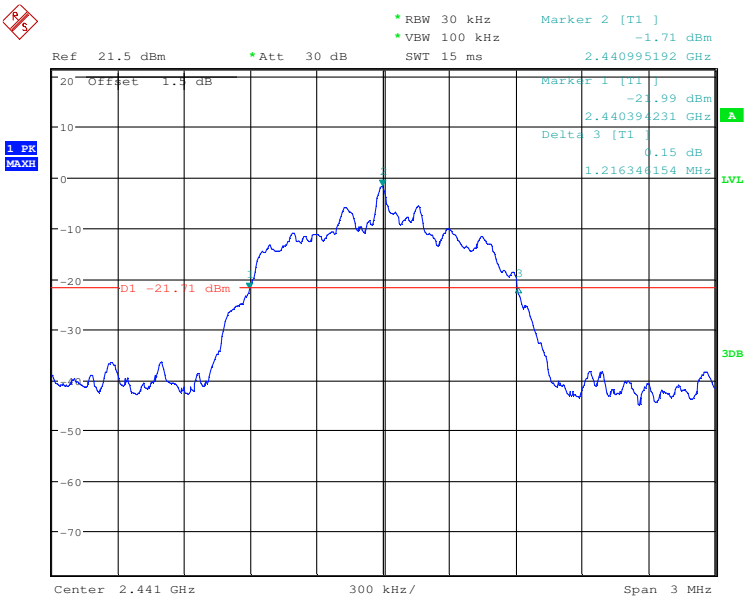
Test mode:	π/4DQPSK	Test channel:	Highest



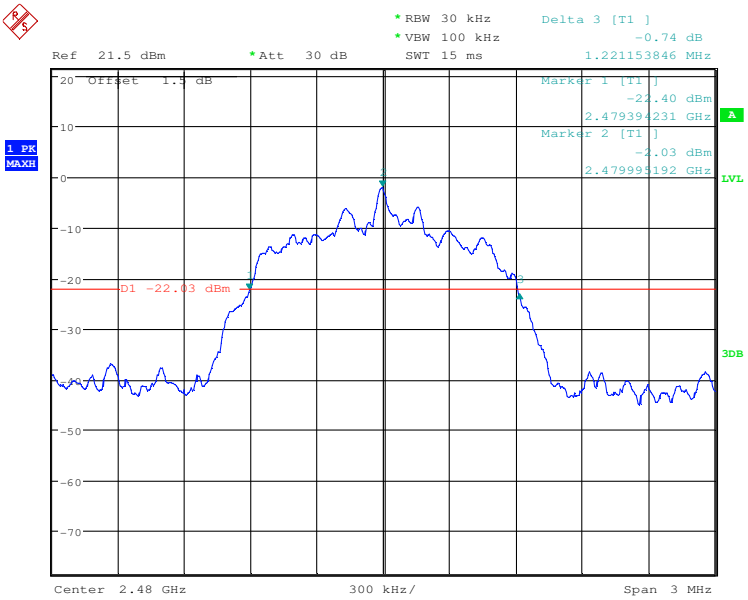
Test mode:	8DPSK	Test channel:	Lowest



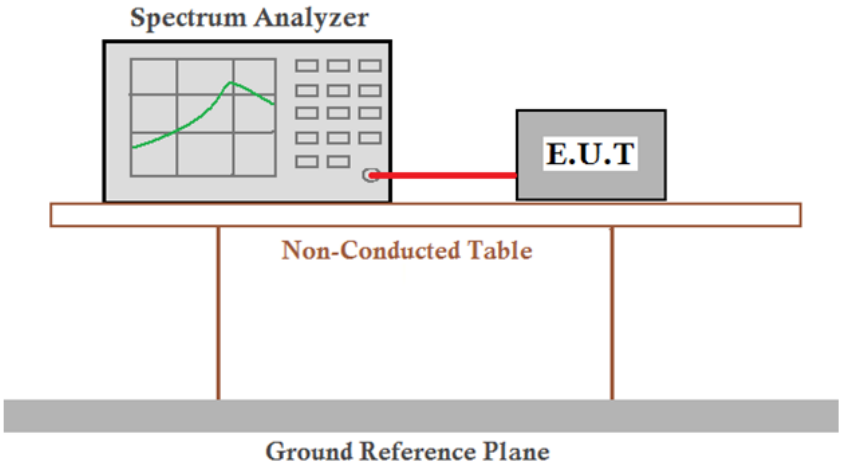
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.5 Carrier Frequencies Separation

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009
Test Setup:	
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
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 data type is the worse case of GFSK modulation type, 2-DH1 of data type is worse case of π/4DQPSK modulation type, 3-DH1 of data type is worse case of 8DPSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

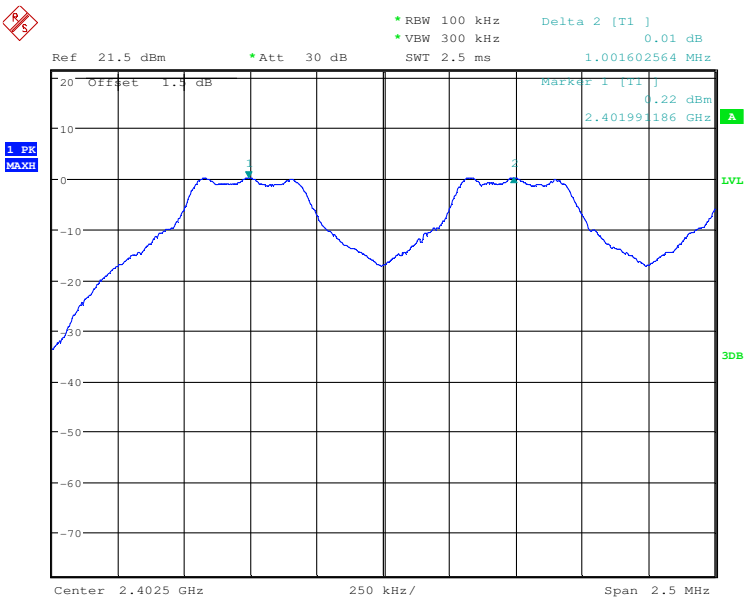
GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	≥833	Pass
Middle	1002	≥833	Pass
Highest	1002	≥833	Pass
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	≥833	Pass
Middle	1002	≥833	Pass
Highest	1006	≥833	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	≥833	Pass
Middle	1002	≥833	Pass
Highest	1002	≥833	Pass

Note: According to section 5.4,

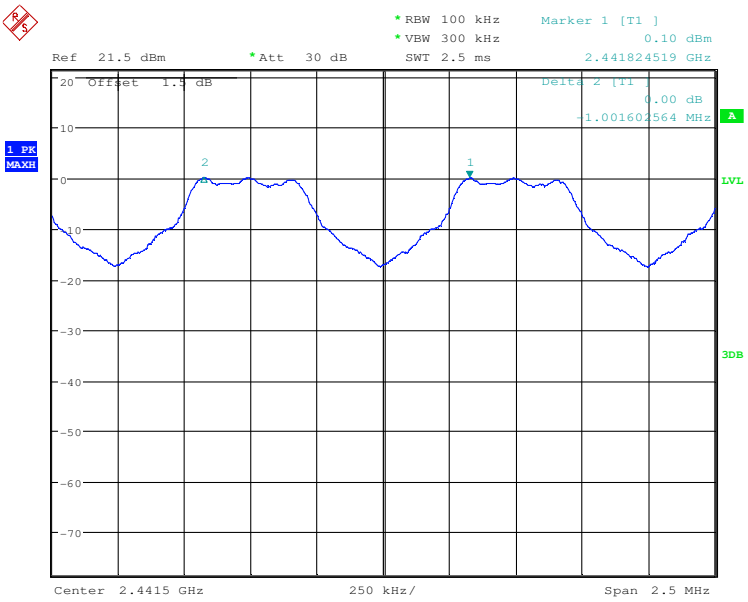
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	879.807692274	587
π/4DQPSK	1250.000000	833
8DPSK	1221.153846	814

Test plot as follows:

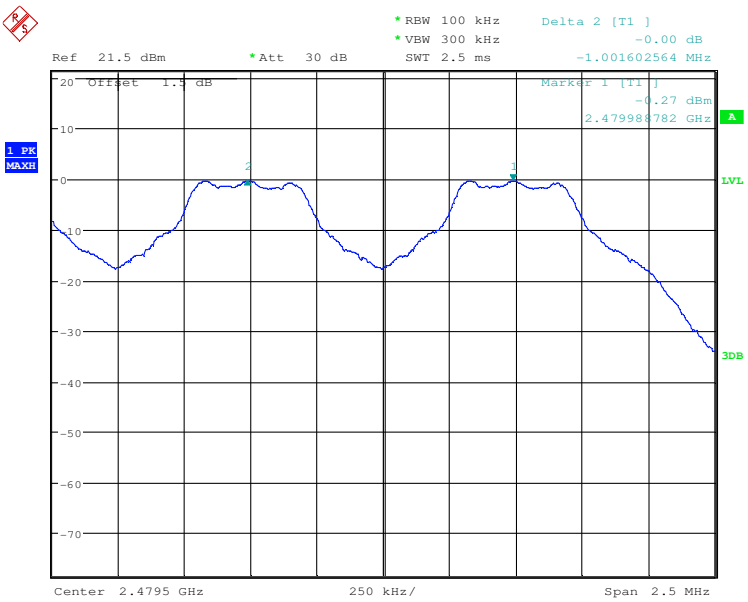
Test mode:	GFSK	Test channel:	Lowest



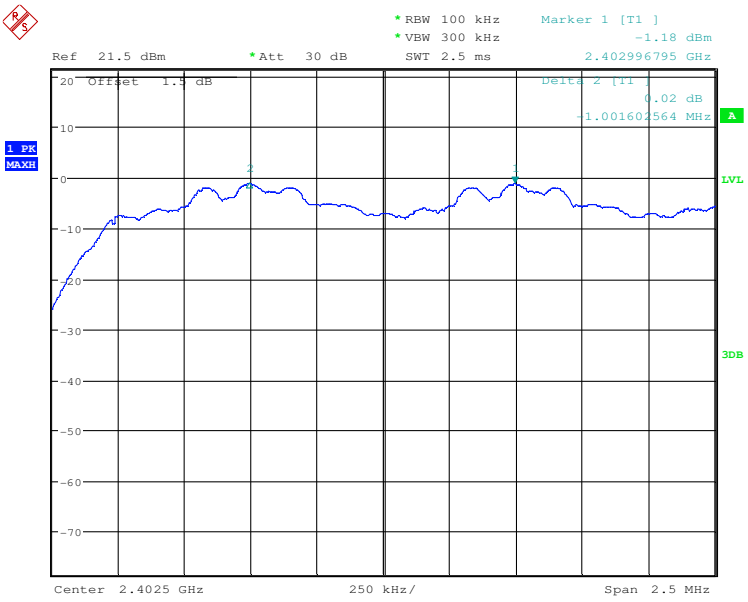
Test mode:	GFSK	Test channel:	Middle



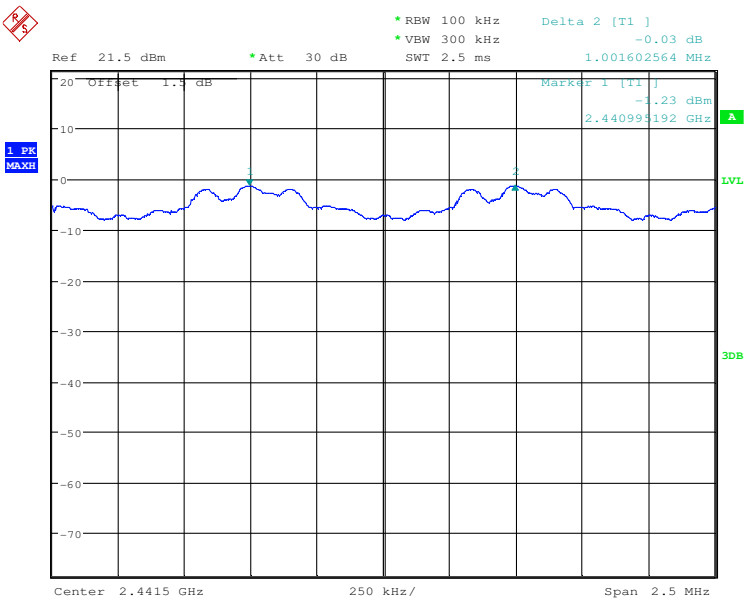
Test mode:	GFSK	Test channel:	Highest



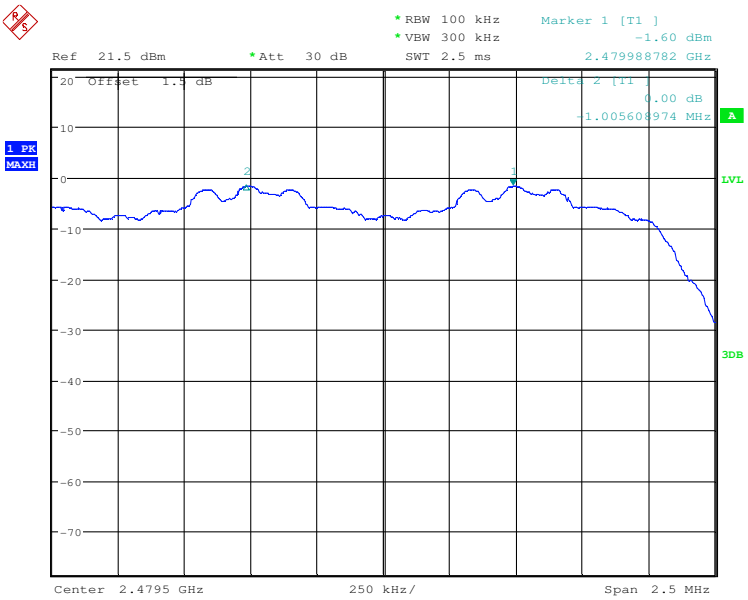
Test mode:	π/4DQPSK	Test channel:	Lowest



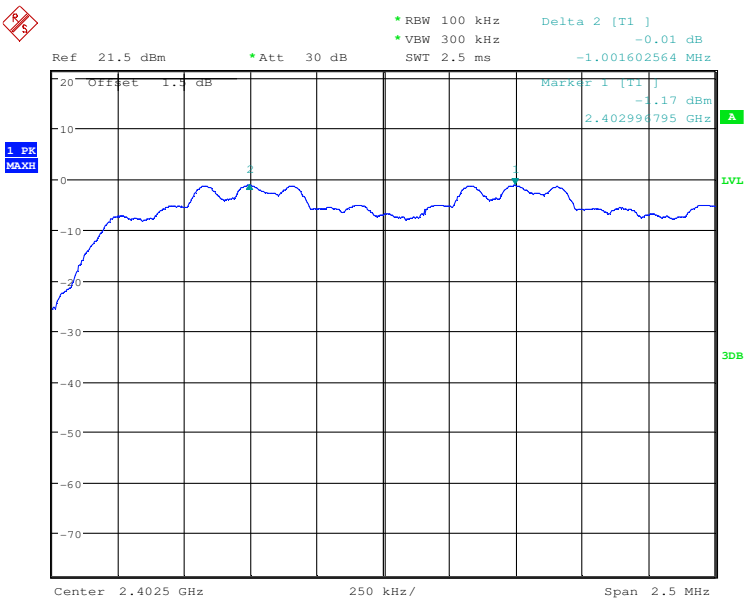
Test mode:	π/4DQPSK	Test channel:	Middle



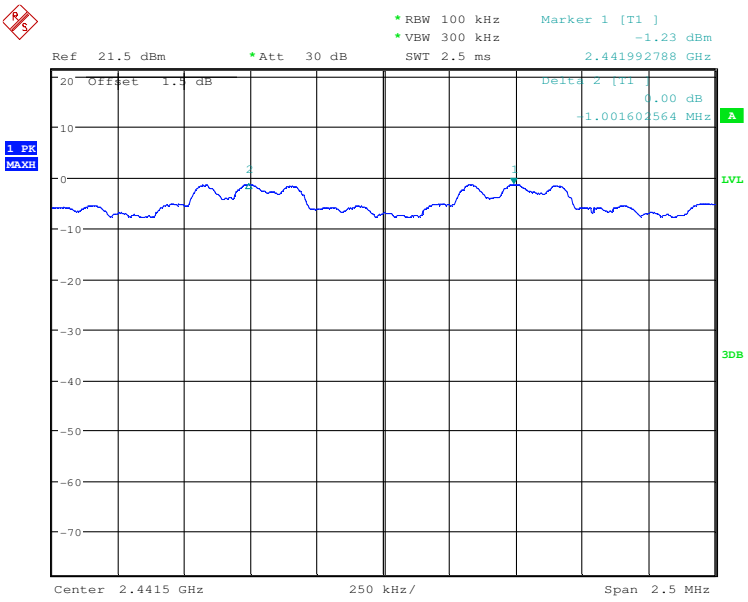
Test mode:	π/4DQPSK	Test channel:	Highest



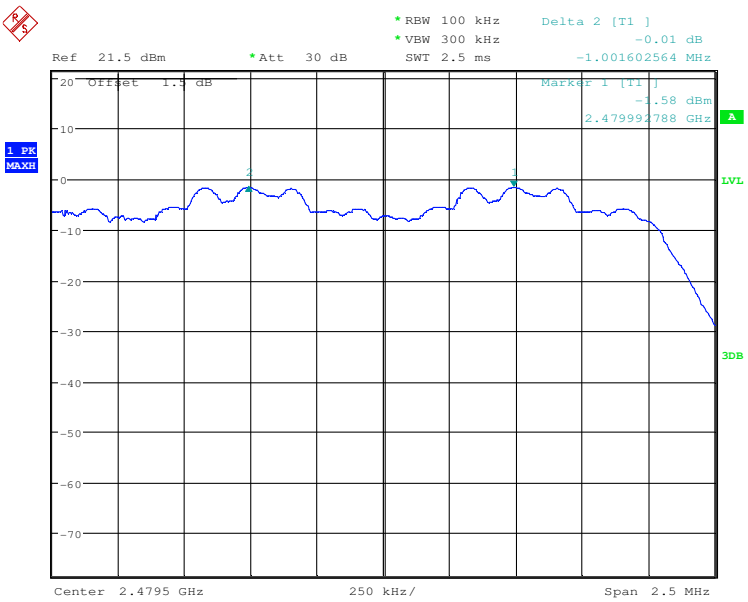
Test mode:	8DPSK	Test channel:	Lowest



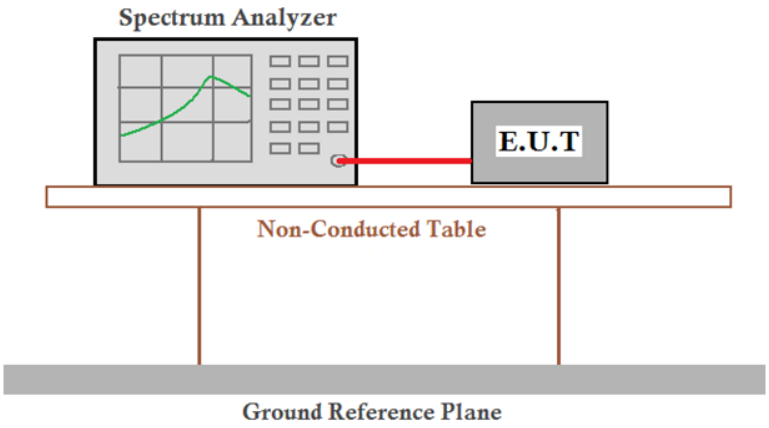
Test mode:	8DPSK	Test channel:	Middle



Test mode:	8DPSK	Test channel:	Highest



5.6 Hopping Channel Number

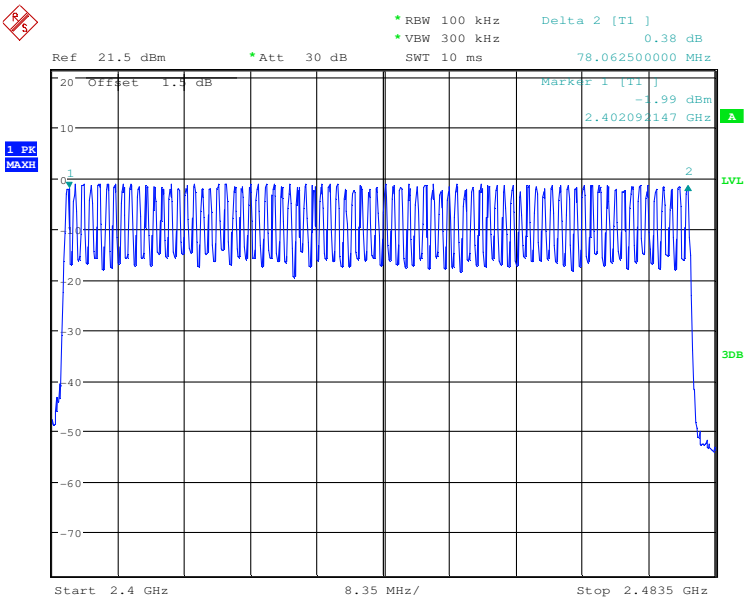
Test Requirement:	47 CFR Part 15C Section 15.247 (b)
Test Method:	ANSI C63.10:2009
Test Setup:	
Limit:	At least 15 channels
Test Mode:	Hopping transmitting with all kind of modulation
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Measurement Data

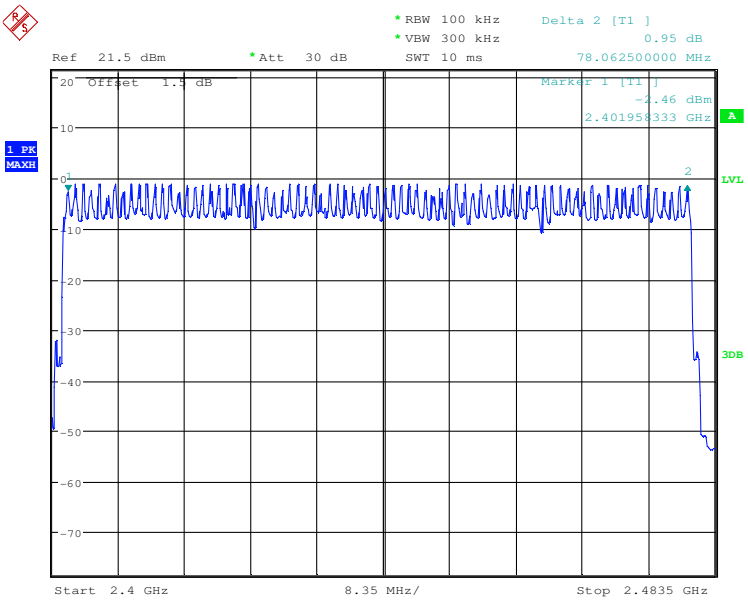
Mode	Hopping channel numbers	Limit
GFSK	79	≥15
π/4DQPSK	79	≥15
8DPSK	79	≥15

Test plot as follows

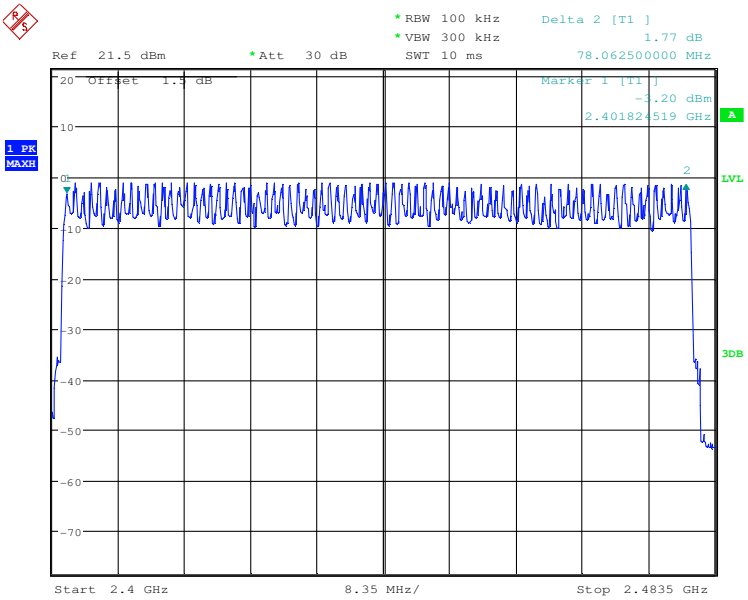
Test mode:	GFSK



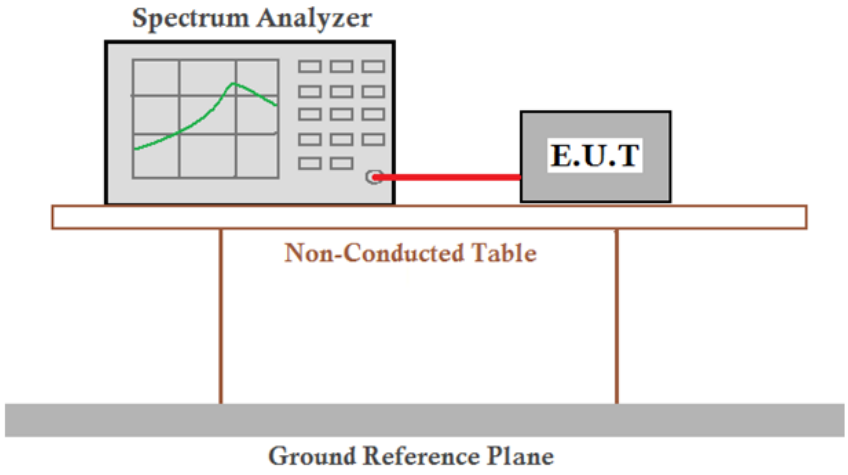
Test mode:	π/4DQPSK



Test mode:	8DPSK



5.7 Dwell Time

Test Requirement:	47 CFR Part 15C 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	0.16320	0.4
	DH3	0.28288	0.4
	DH5	0.32192	0.4
π/4DQPSK	2-DH1	0.16576	0.4
	2-DH3	0.28288	0.4
	2-DH5	0.19552	0.4
8DPSK	3-DH1	0.16704	0.4
	3-DH3	0.28352	0.4
	3-DH5	0.32235	0.4

Test Result:

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 below

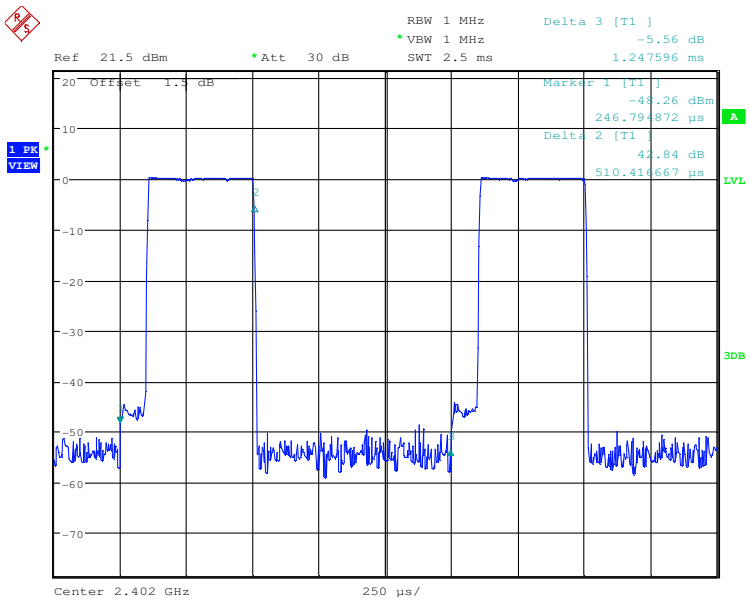
DH1 time slot=0.510(ms)*(1600/ (2*79))*31.6=163.20ms

DH3 time slot=1.768(ms)*(1600/ (4*79))*31.6=282.88ms

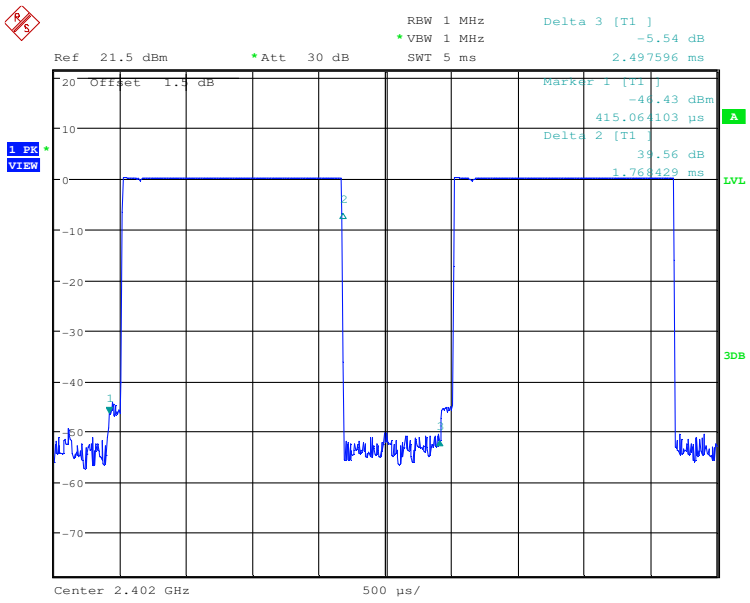
DH5 time slot=3.018(ms)*(1600/ (6*79))*31.6=321.92ms

Test plot as follows:

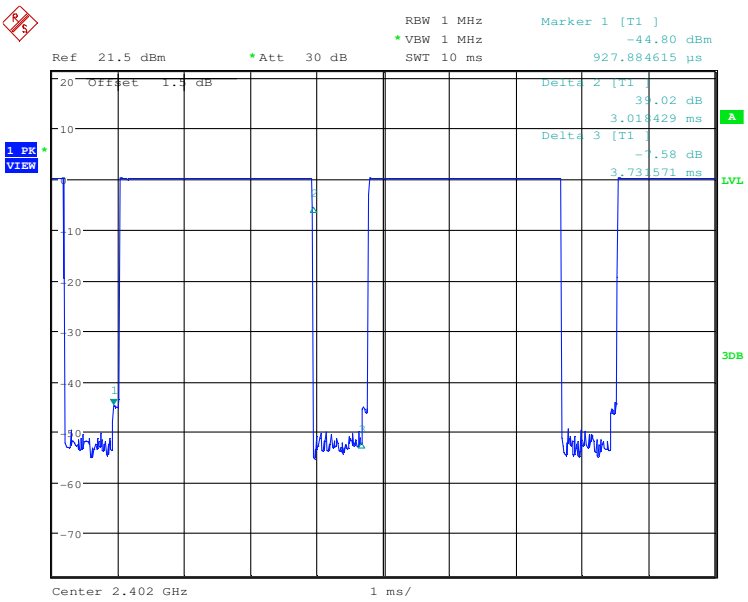
Test Packet:	DH1



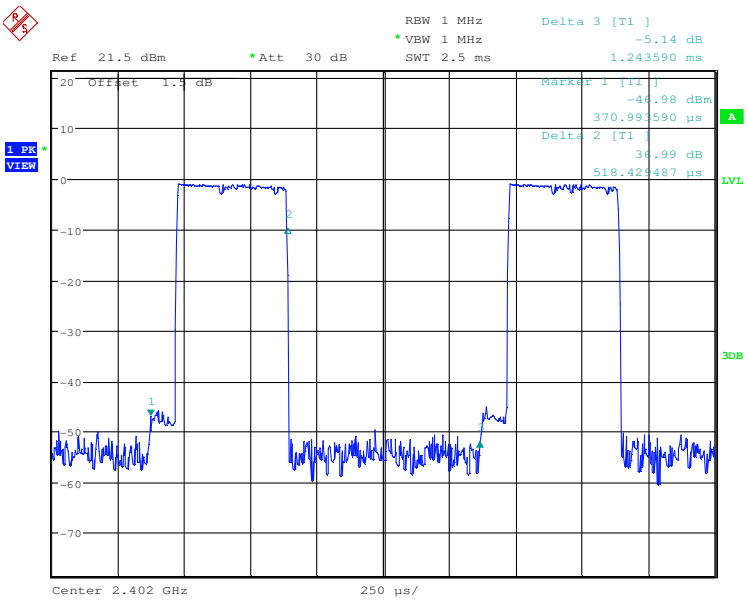
Test Packet:	DH3



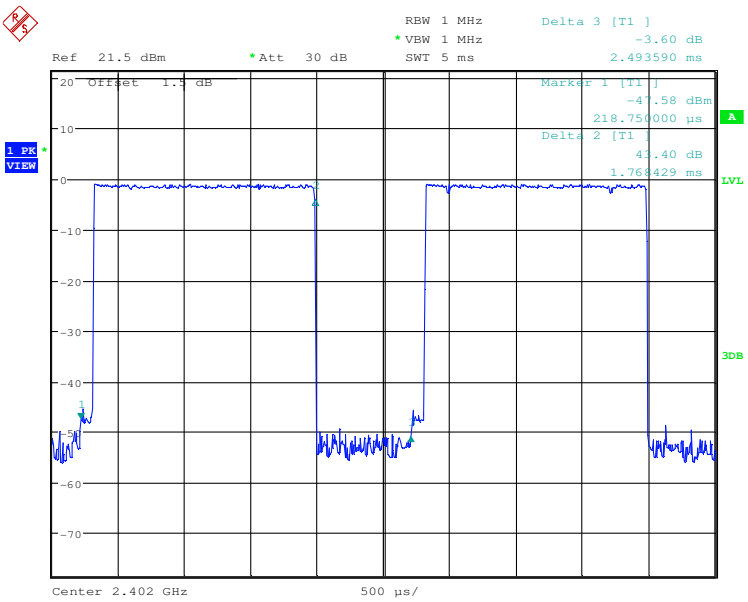
Test Packet:	DH5



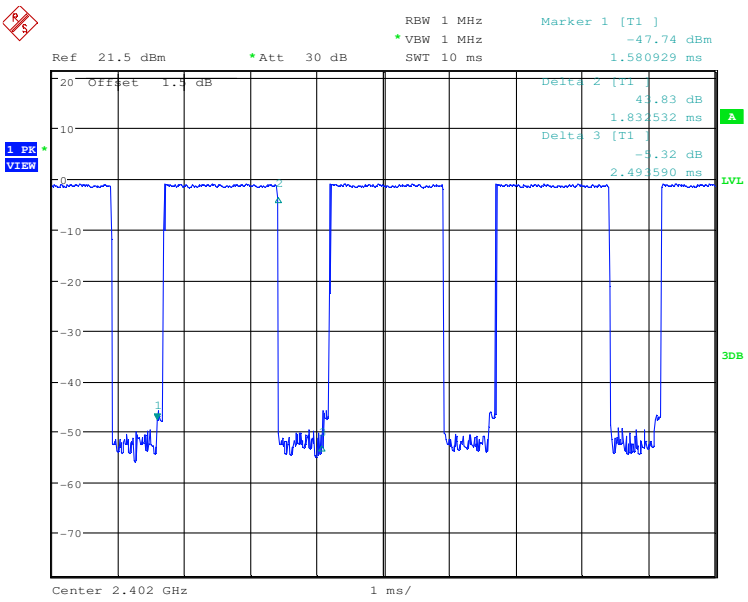
Test Packet:	2-DH1



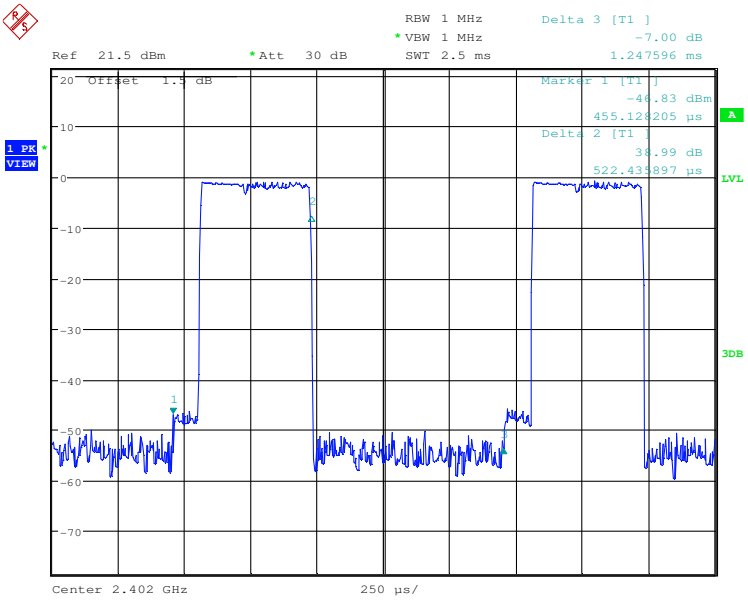
Test Packet:	2-DH3



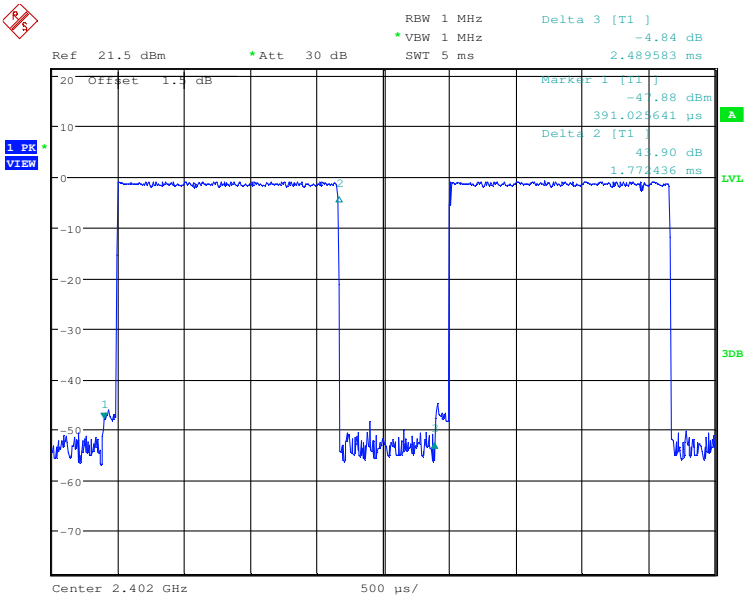
Test Packet:	2-DH5



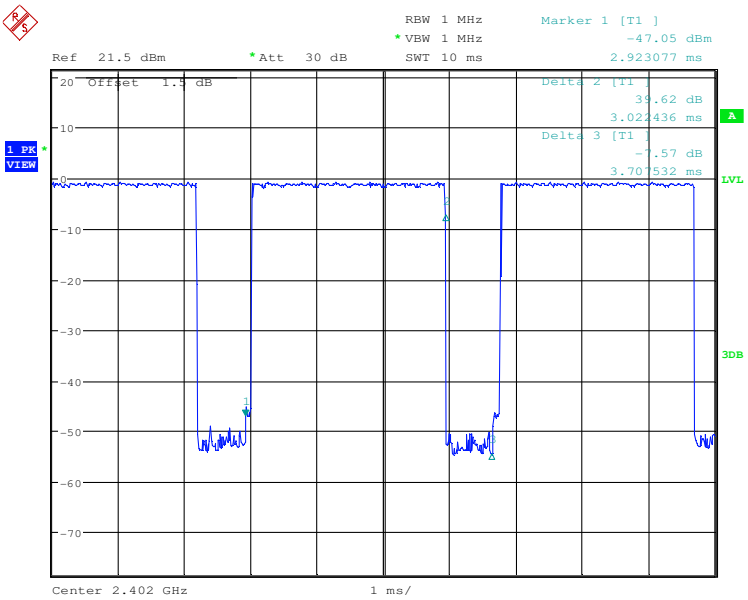
Test Packet:	3-DH1



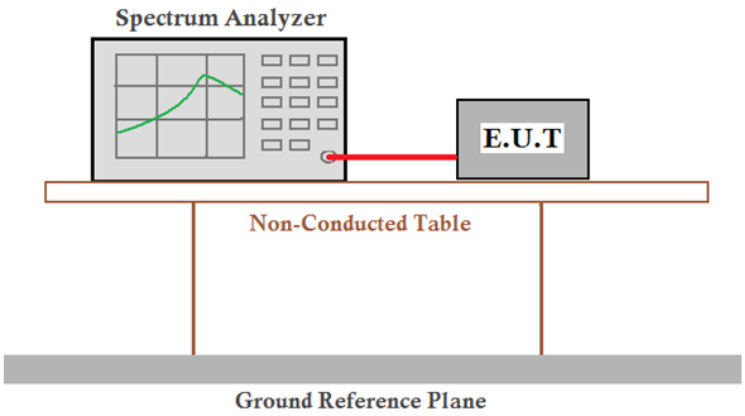
Test Packet:	3-DH3



Test Packet:	3-DH5

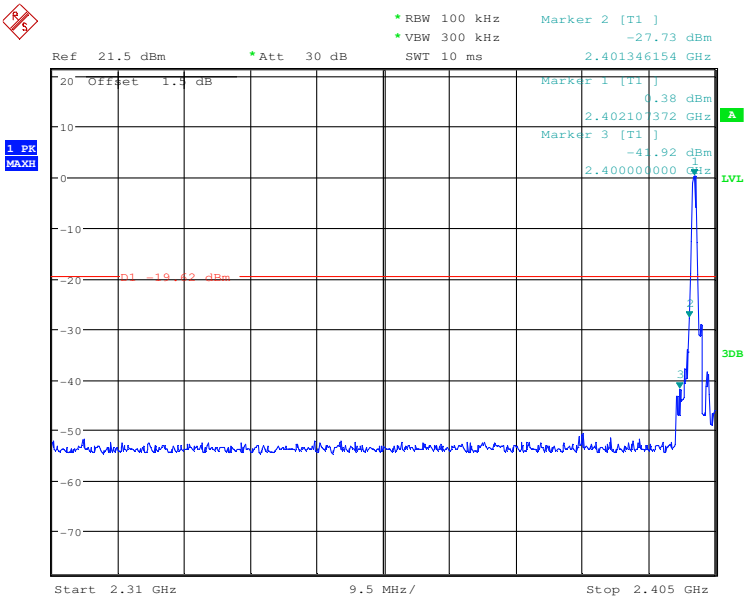


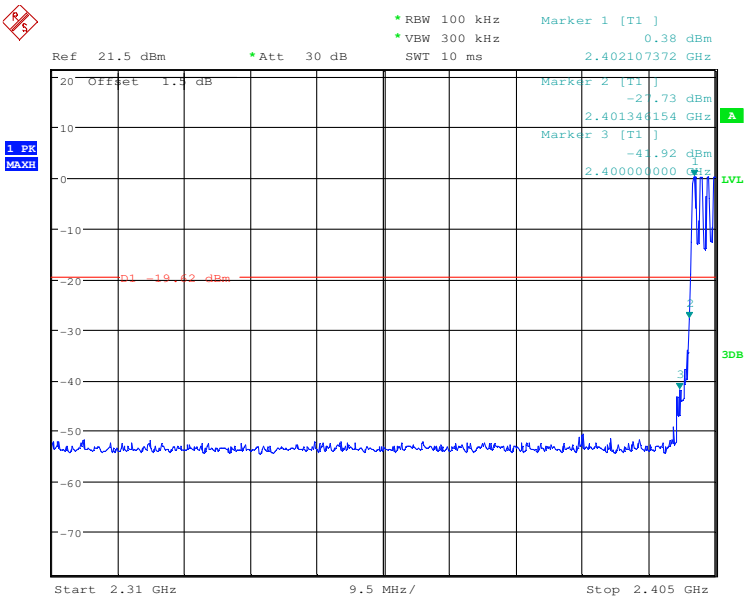
5.8 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C 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.
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.
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 data type is the worse case of GFSK modulation type, 2-DH1 of data type is worse case of π/4DQPSK modulation type, 3-DH1 of data type is worse case of 8DPSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

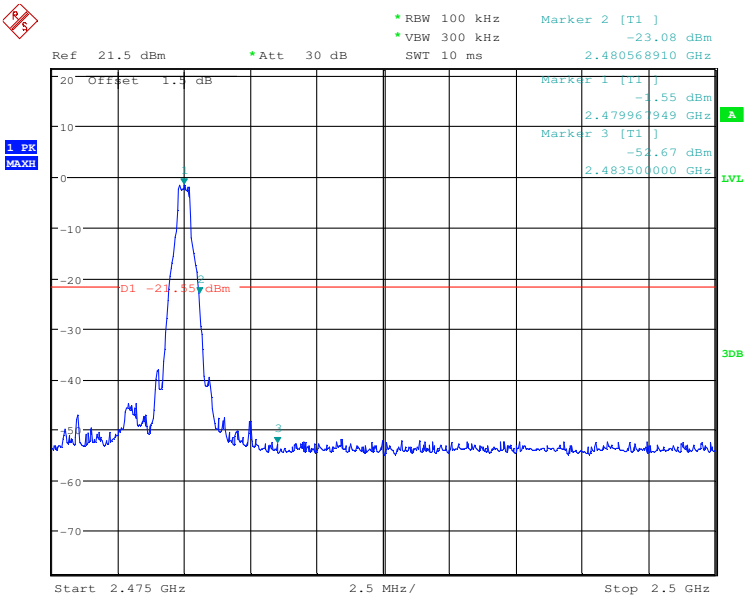
Test plot as follows:

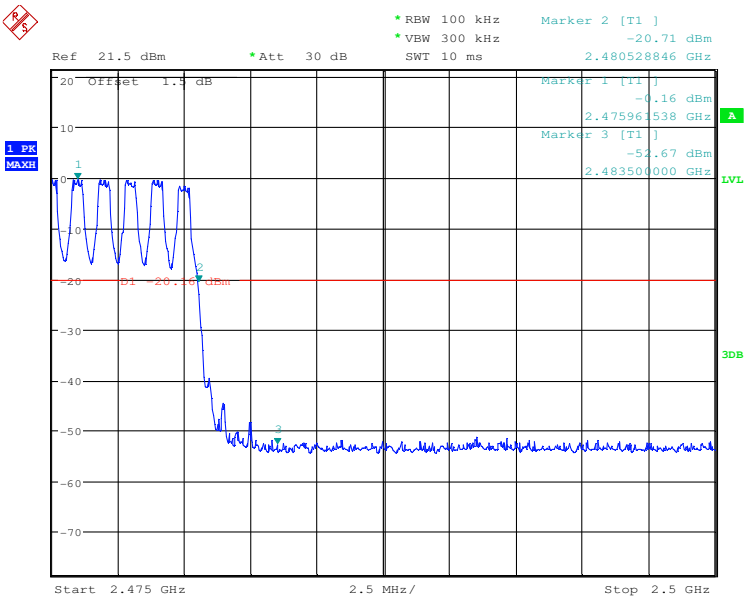
Test mode:	GFSK	Test channel:	Lowest



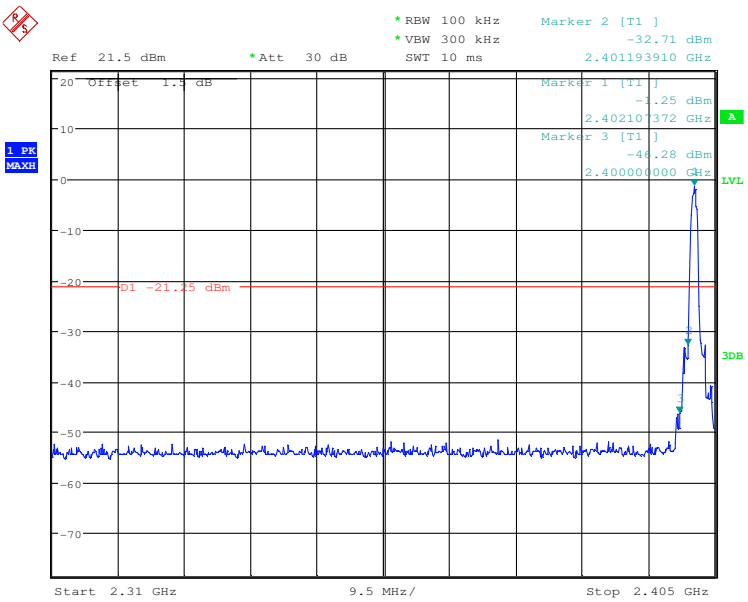


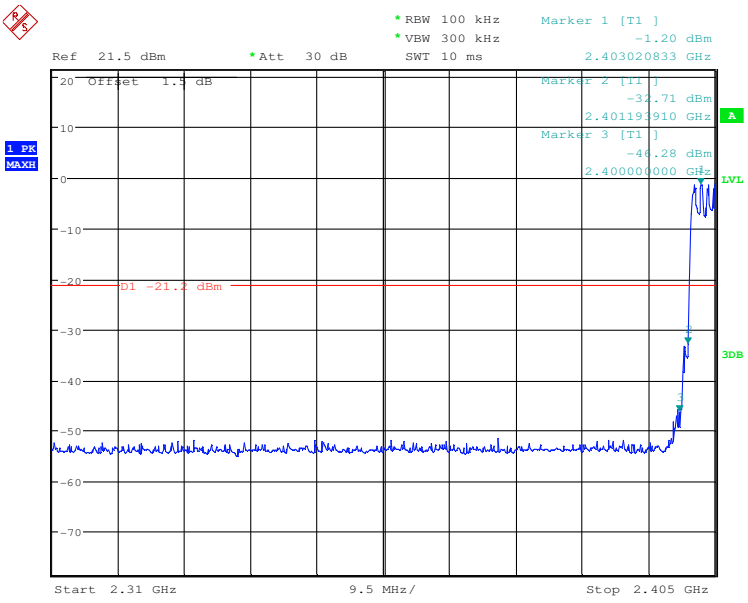
Test mode:	GFSK	Test channel:	Highest



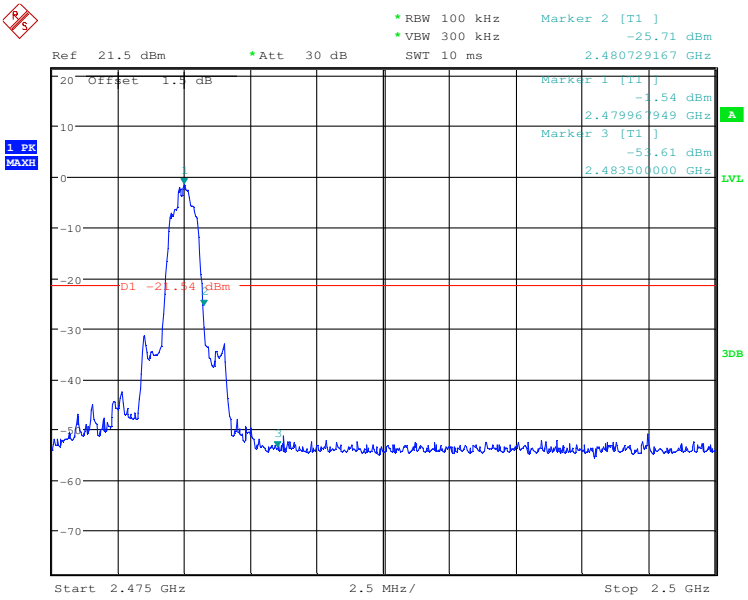


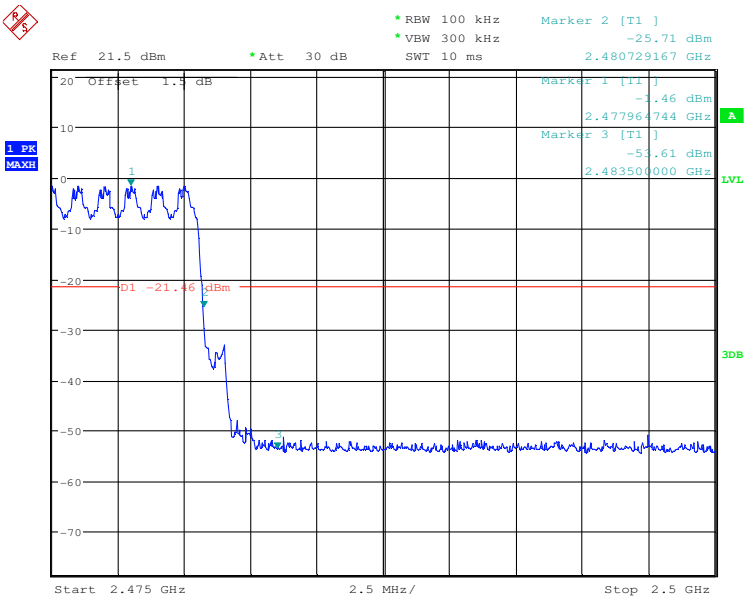
Test mode:	π/4DQPSK	Test channel:	Lowest



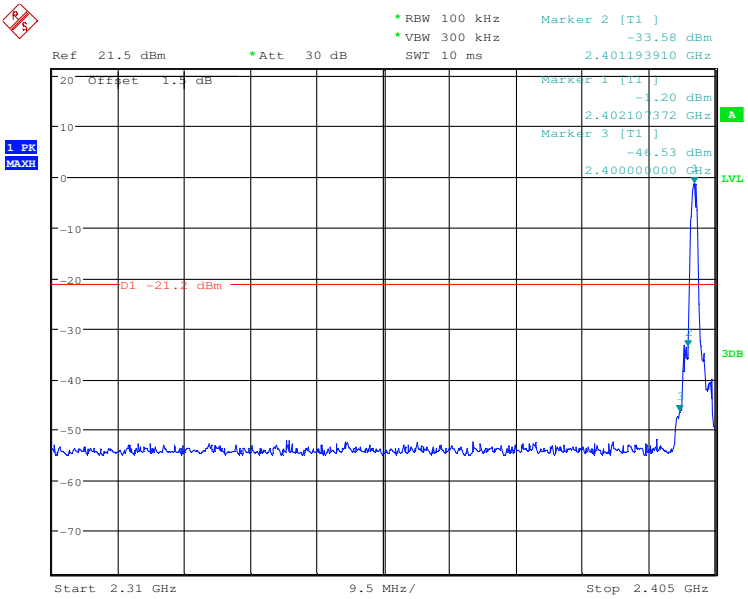


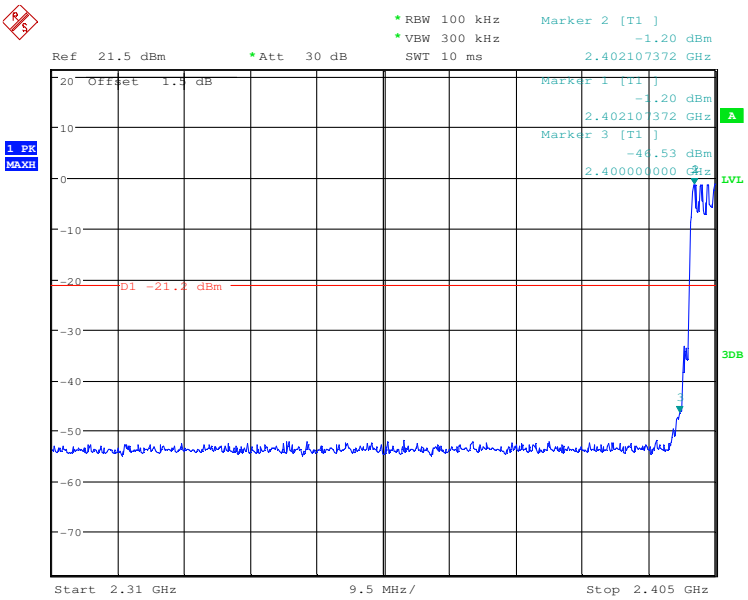
Test mode:	π/4DQPSK	Test channel:	Highest



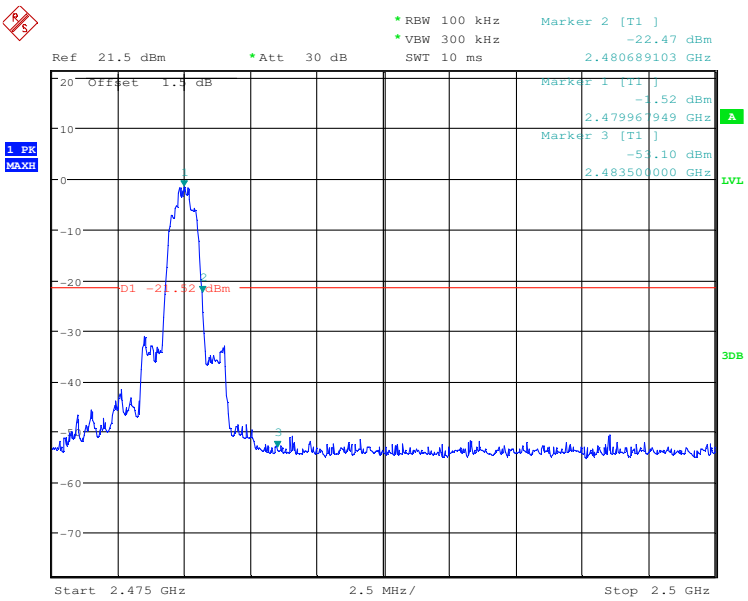


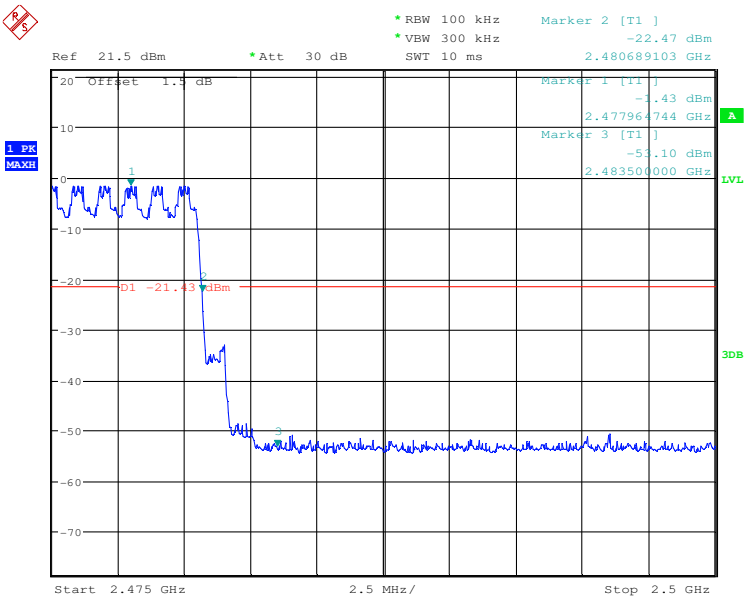
Test mode:	8DPSK	Test channel:	Lowest



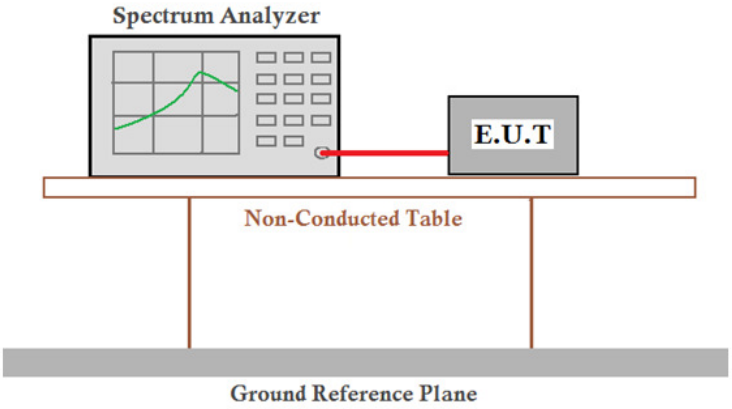


Test mode:	8DPSK	Test channel:	Highest



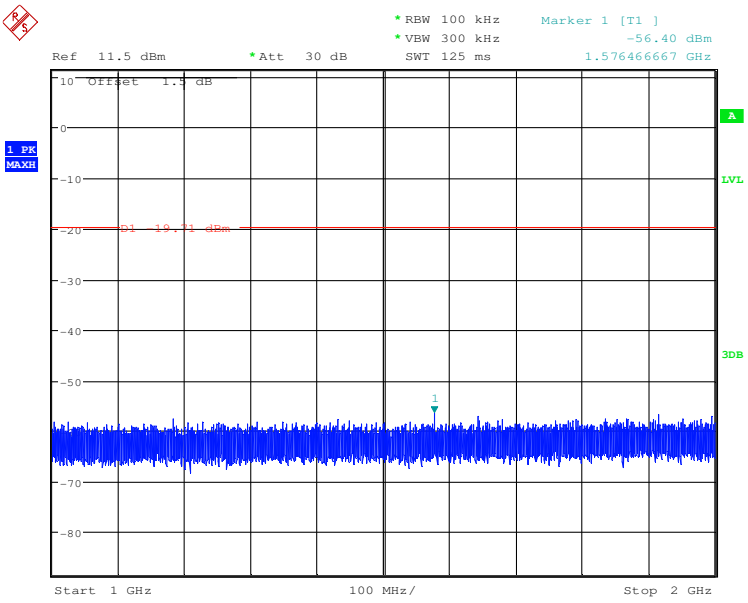


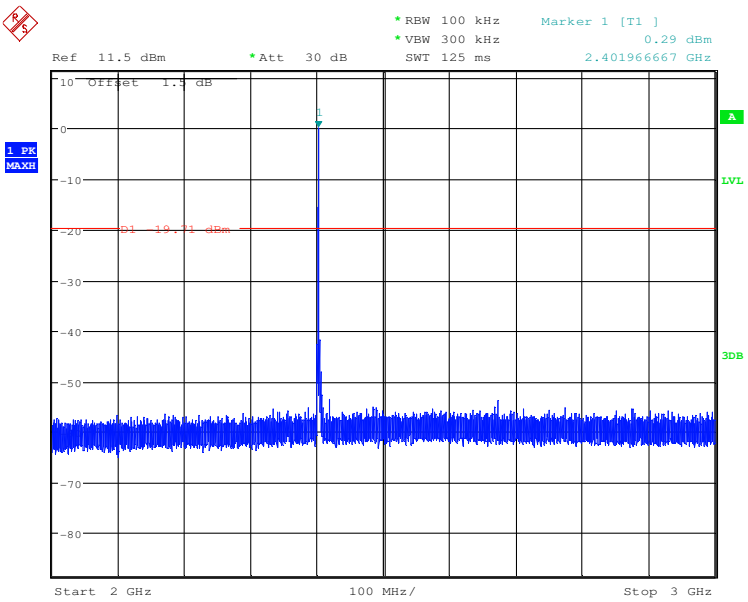
5.9 Spurious RF Conducted Emissions

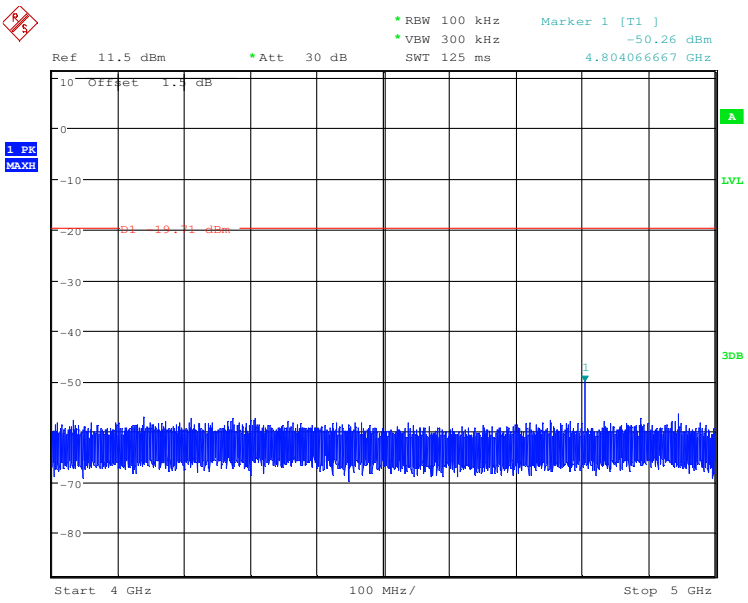
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2009
Test Setup:	 Remark: Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio 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.
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 data type is the worse case of GFSK modulation type, 2-DH1 of data type is worse case of π/4DQPSK modulation type, 3-DH1 of data type is worse case of 8DPSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

Test plot as follows:

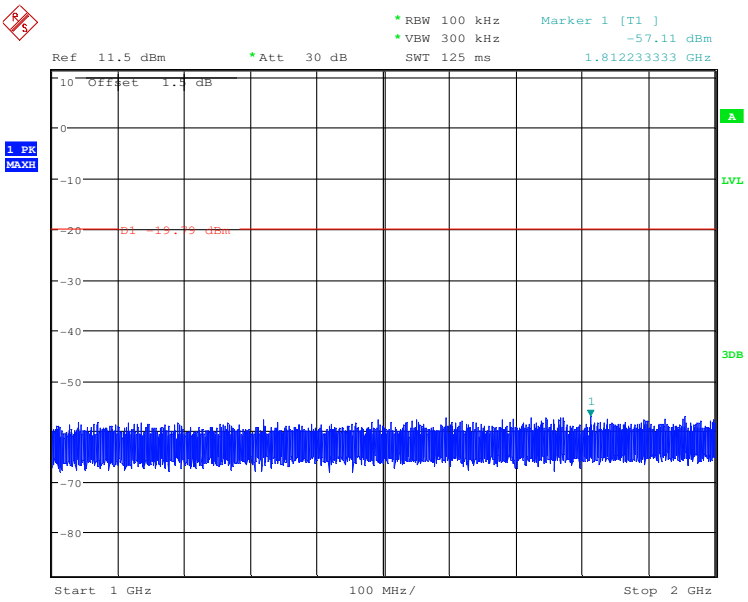
Test mode:	GFSK	Test channel:	Lowest

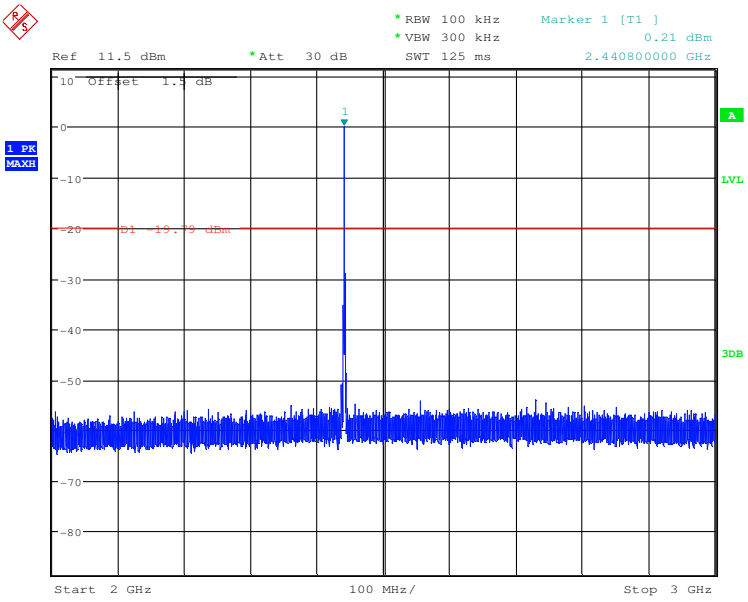


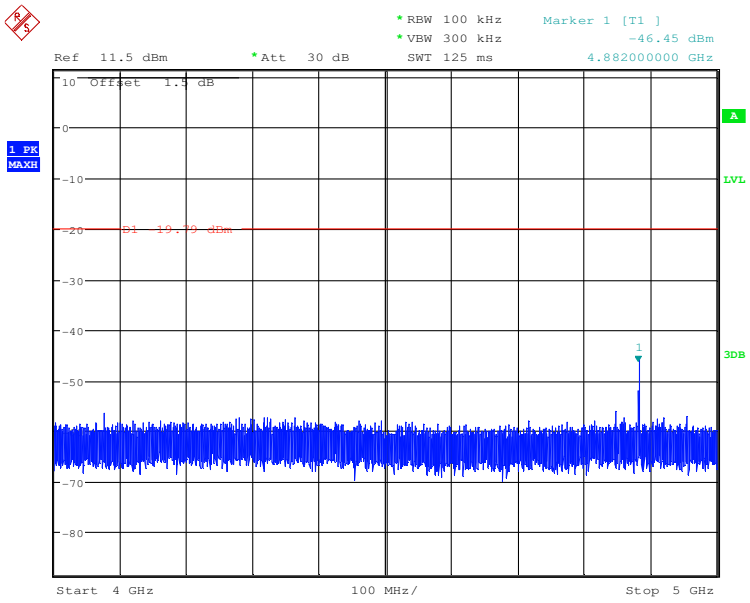




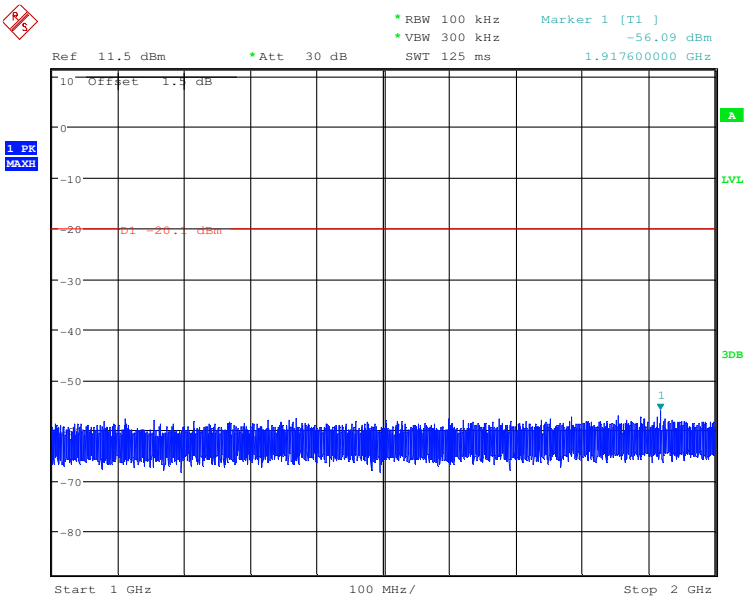
Test mode:	GFSK	Test channel:	Middle

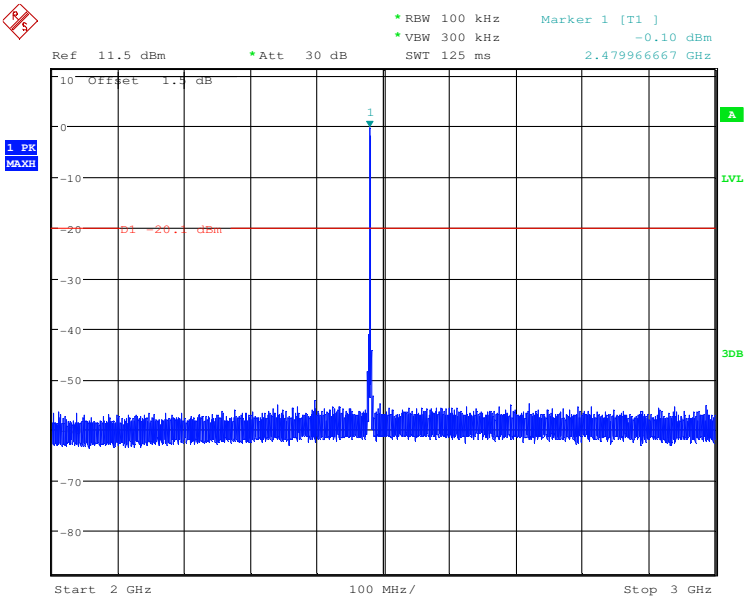


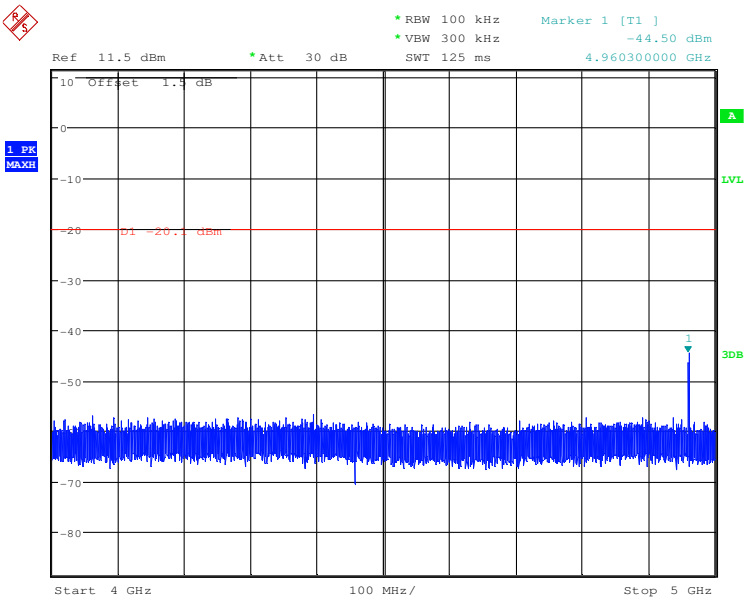




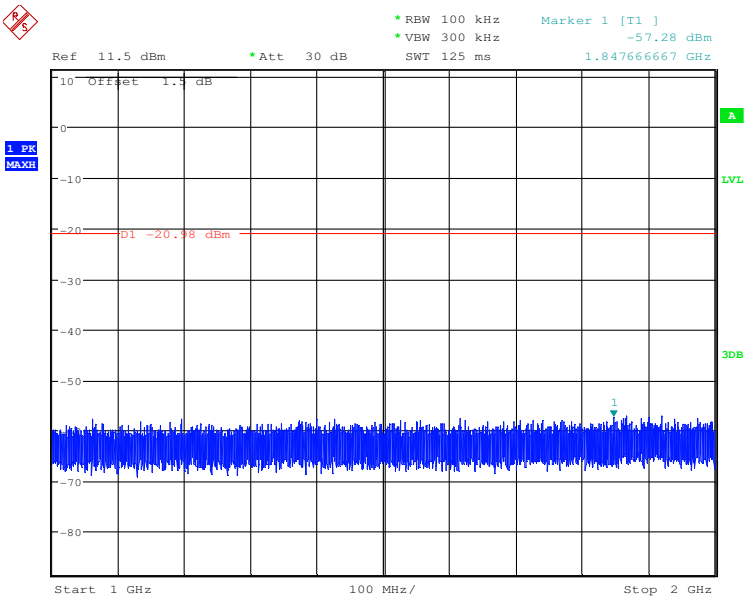
Test mode:	GFSK	Test channel:	Highest

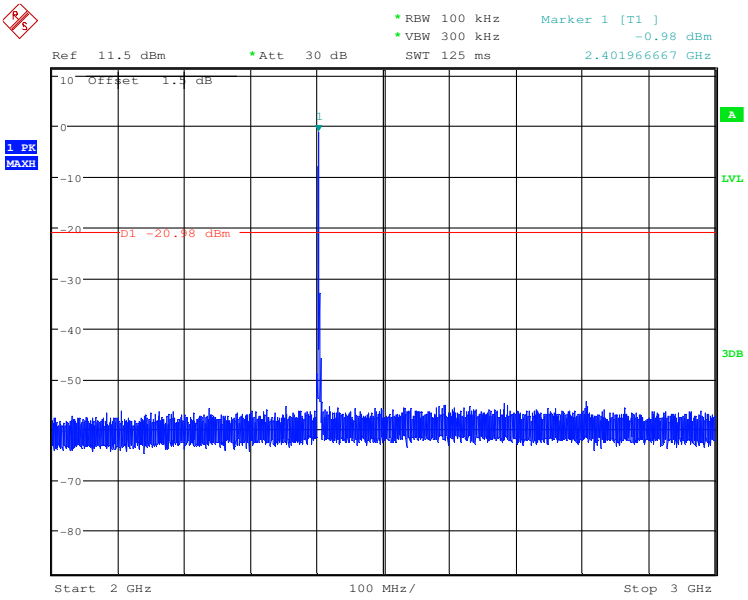


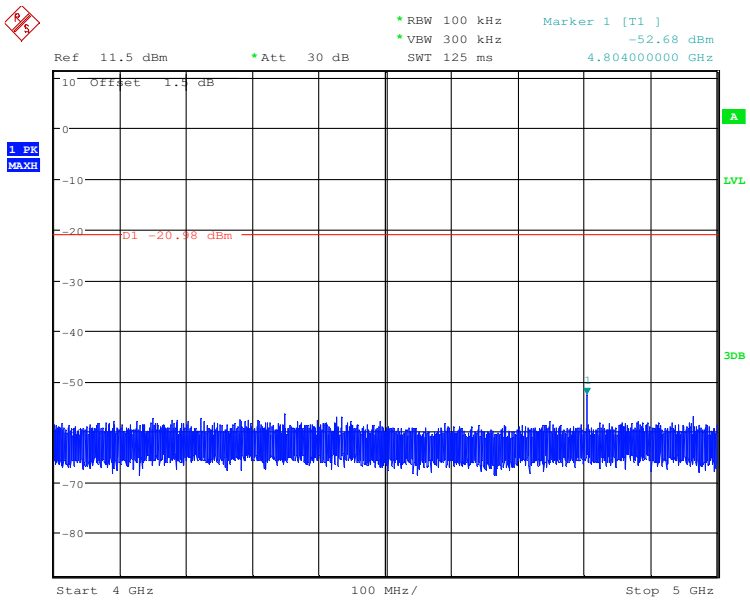




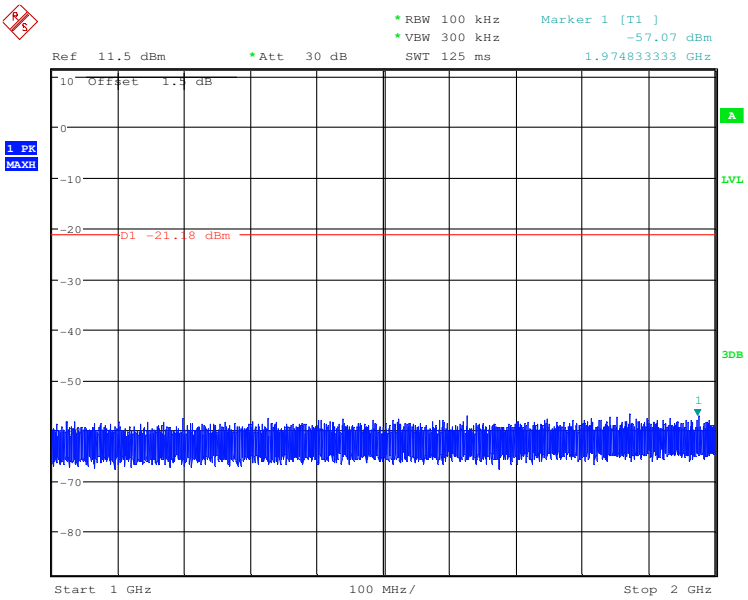
Test mode:	π/4DQPSK	Test channel:	Lowest

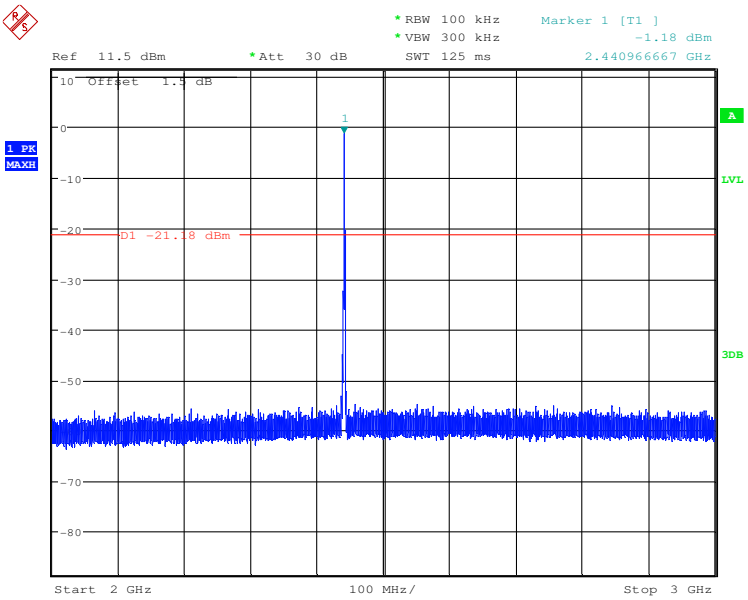


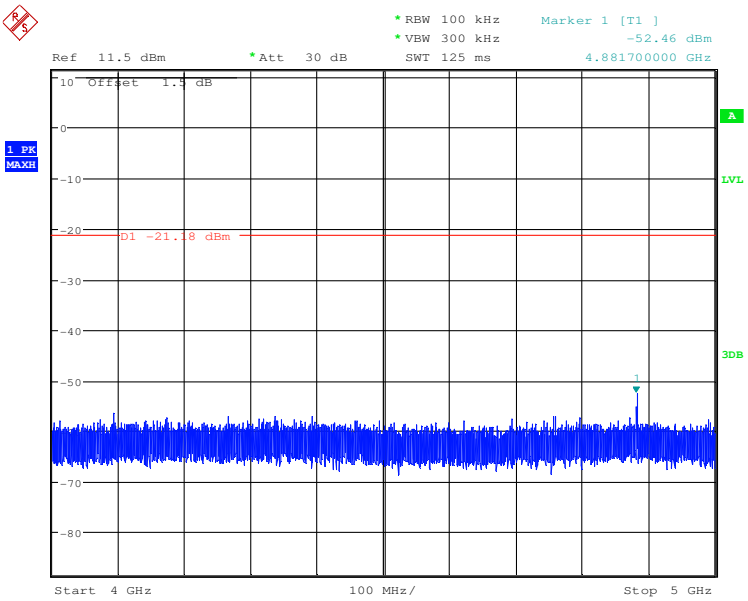




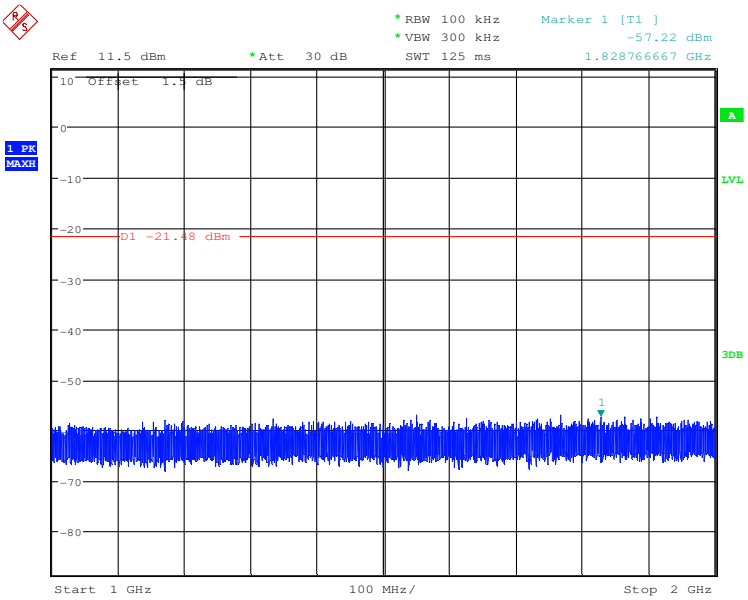
Test mode:	π/4DQPSK	Test channel:	Middle

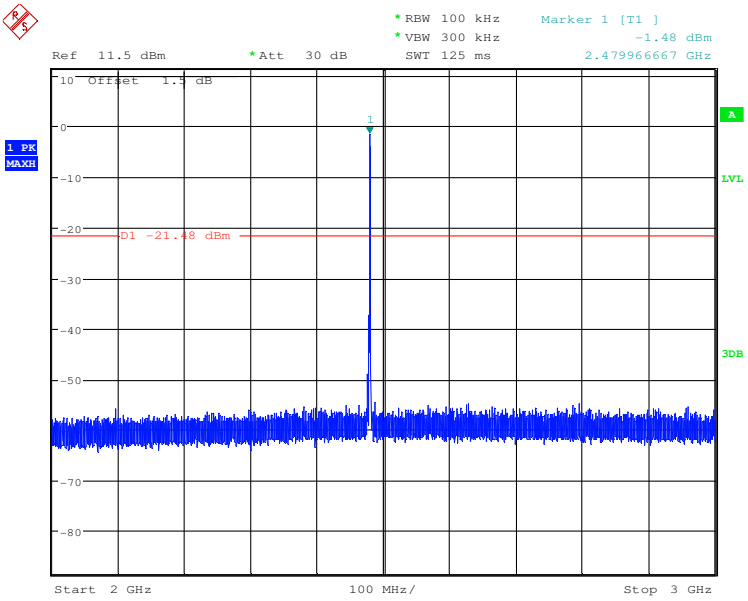


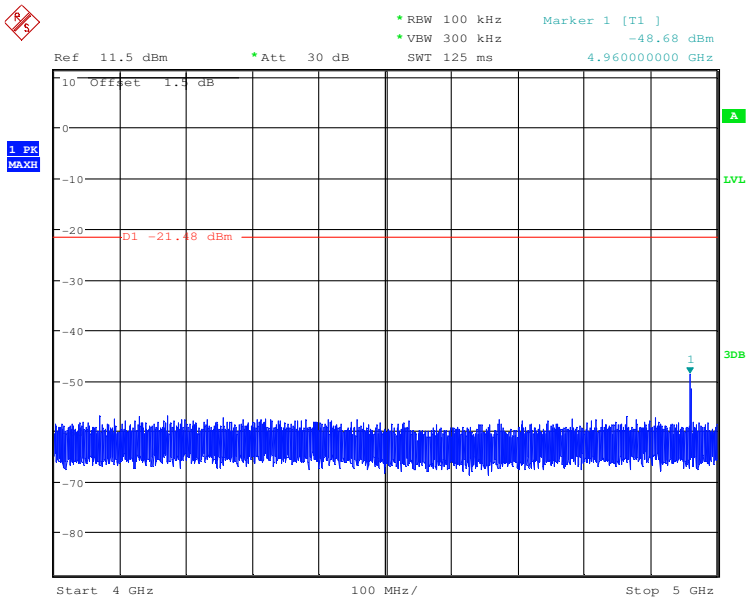




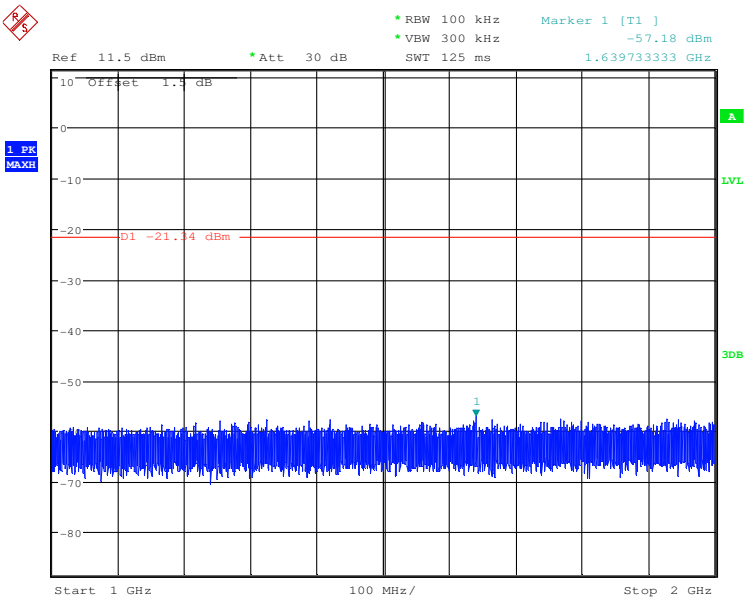
Test mode:	π/4DQPSK	Test channel:	Highest

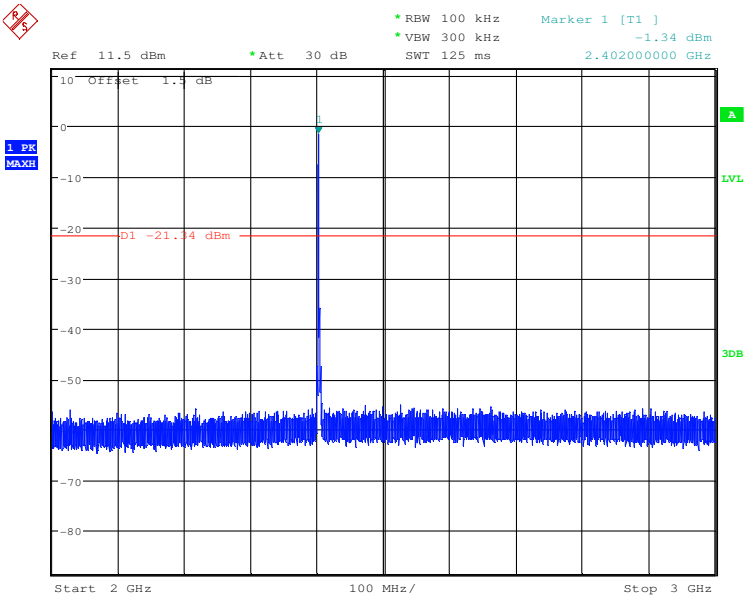


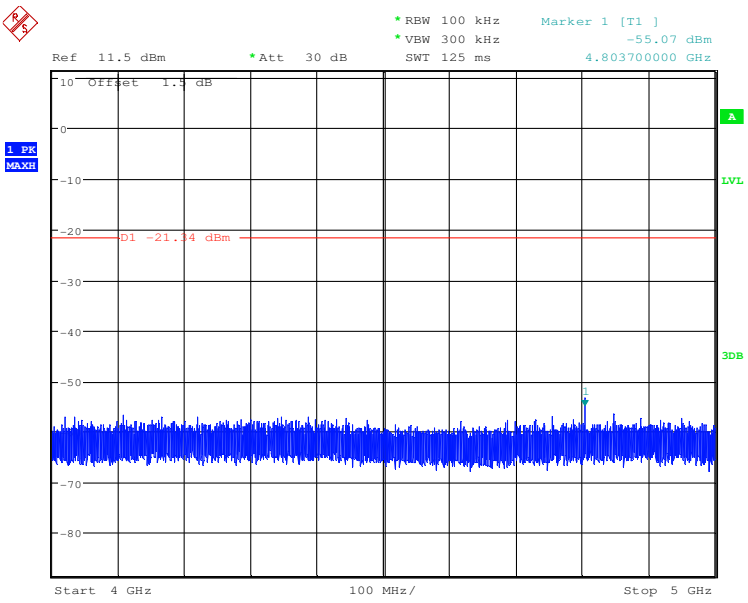




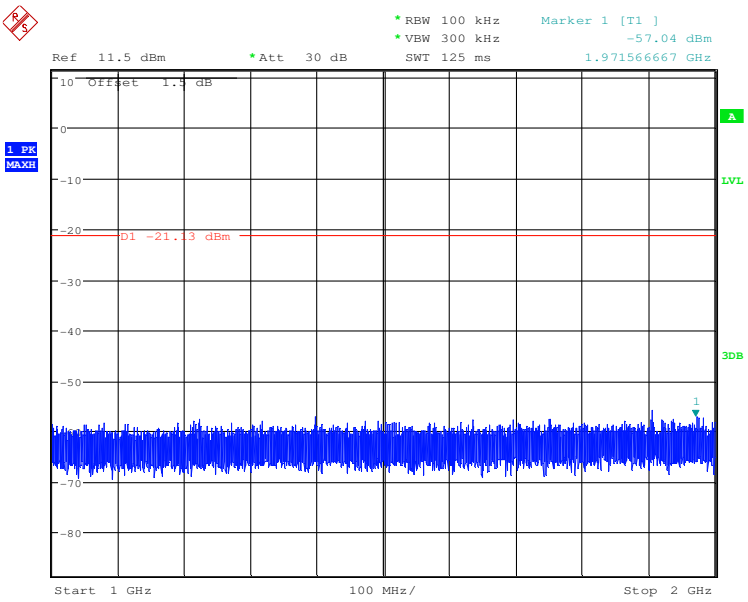
Test mode:	8DPSK	Test channel:	Lowest

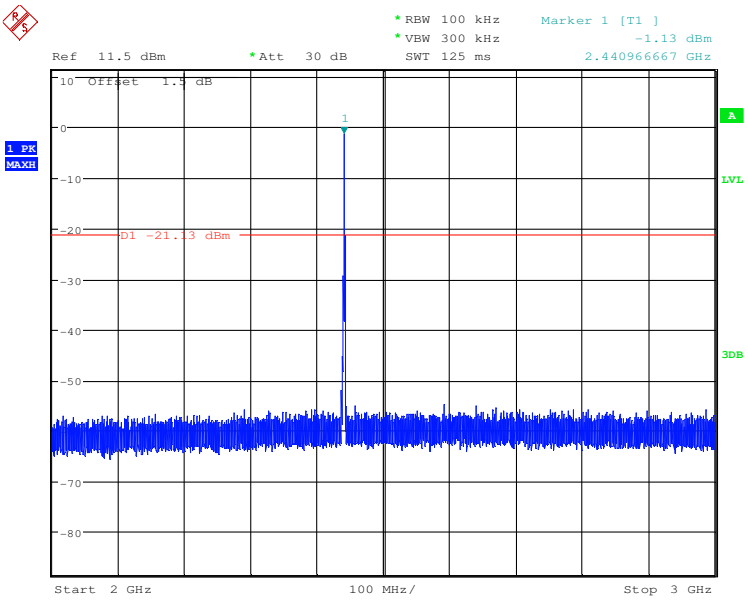


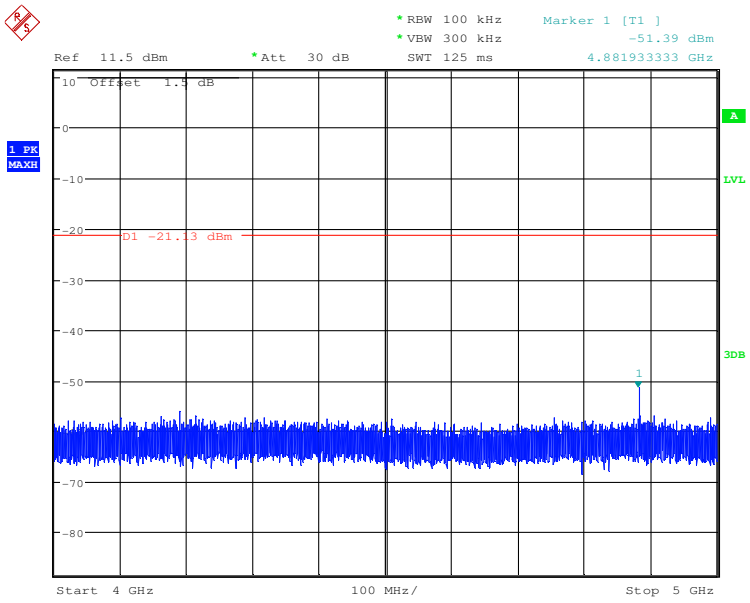




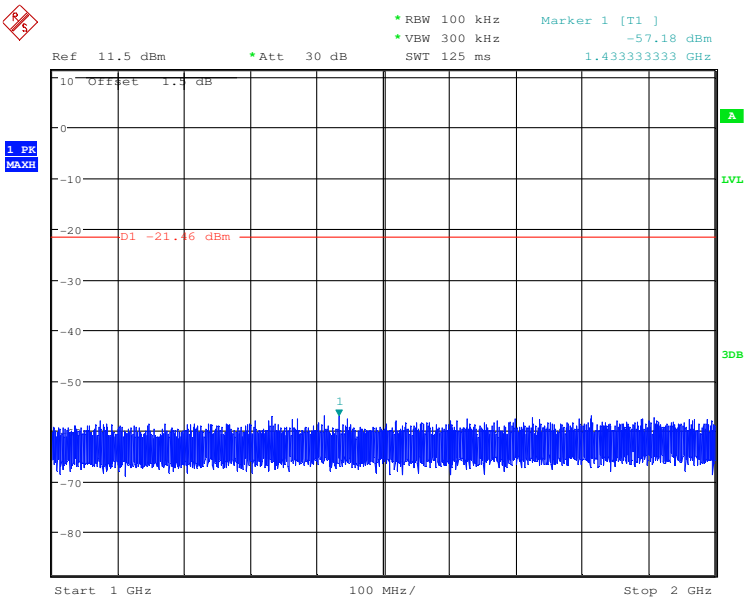
Test mode:	8DPSK	Test channel:	Middle

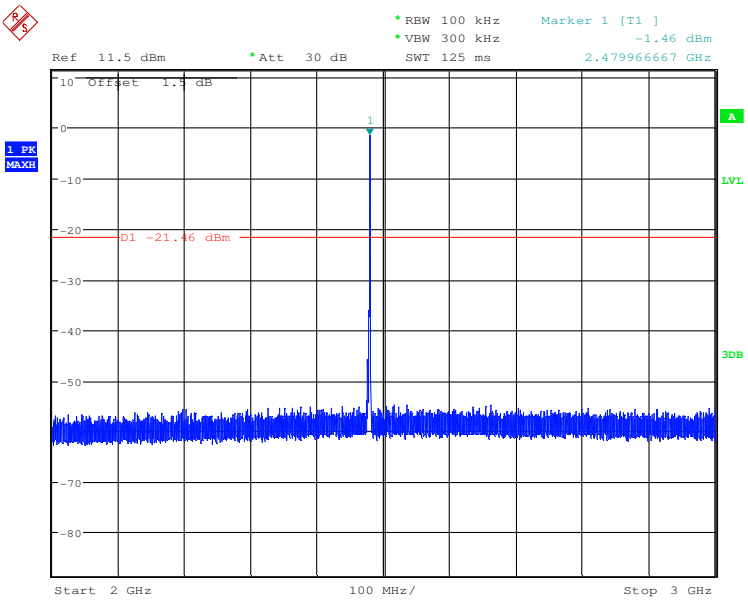


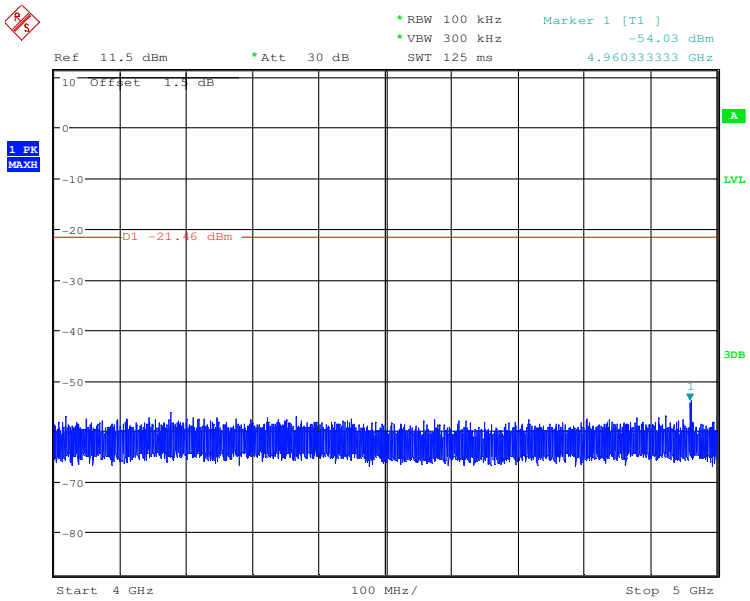




Test mode:	8DPSK	Test channel:	Highest







Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report.

5.10 Pseudorandom Frequency Hopping Sequence

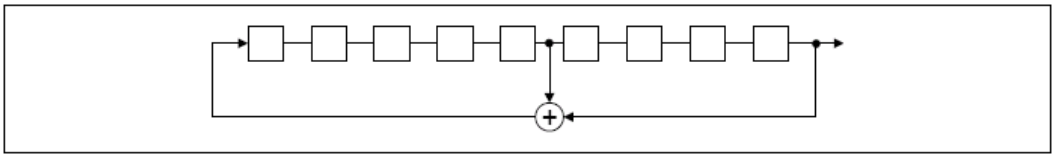
Test Requirement:	47 CFR Part 15**C Section 15.247 (a)(1) requirement:**

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

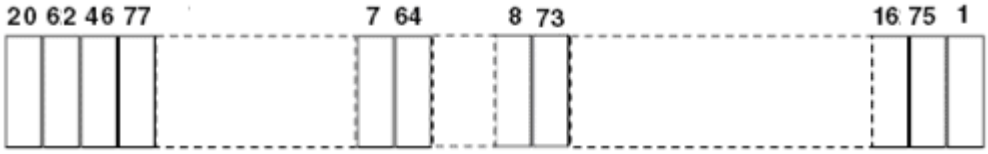
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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

- Number of shift register stages: 9
- Length of pseudo-random sequence: 29 -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 Spurious Emission

Test Requirement:	47 CFR Part 15C 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
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:	

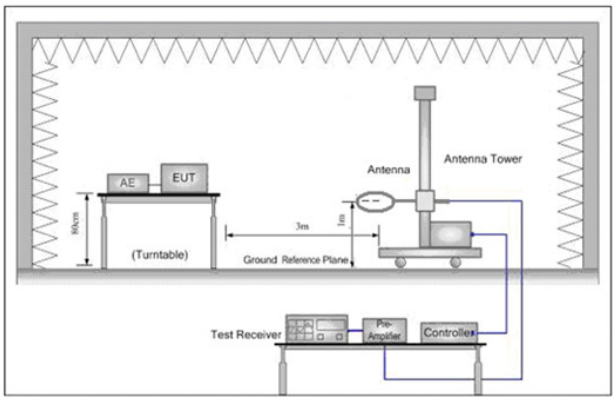


Figure 1. Below 30MHz

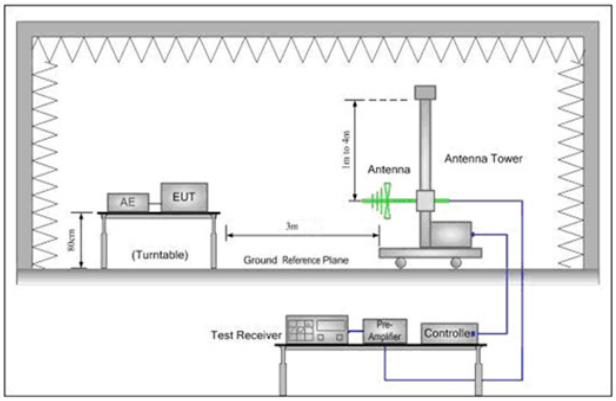


Figure 2. 30MHz to 1GHz

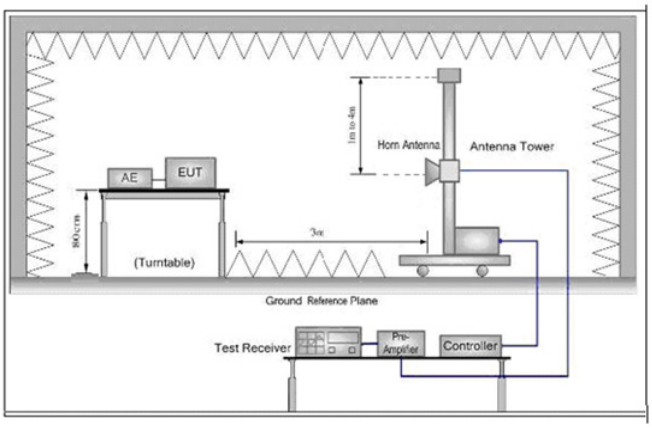


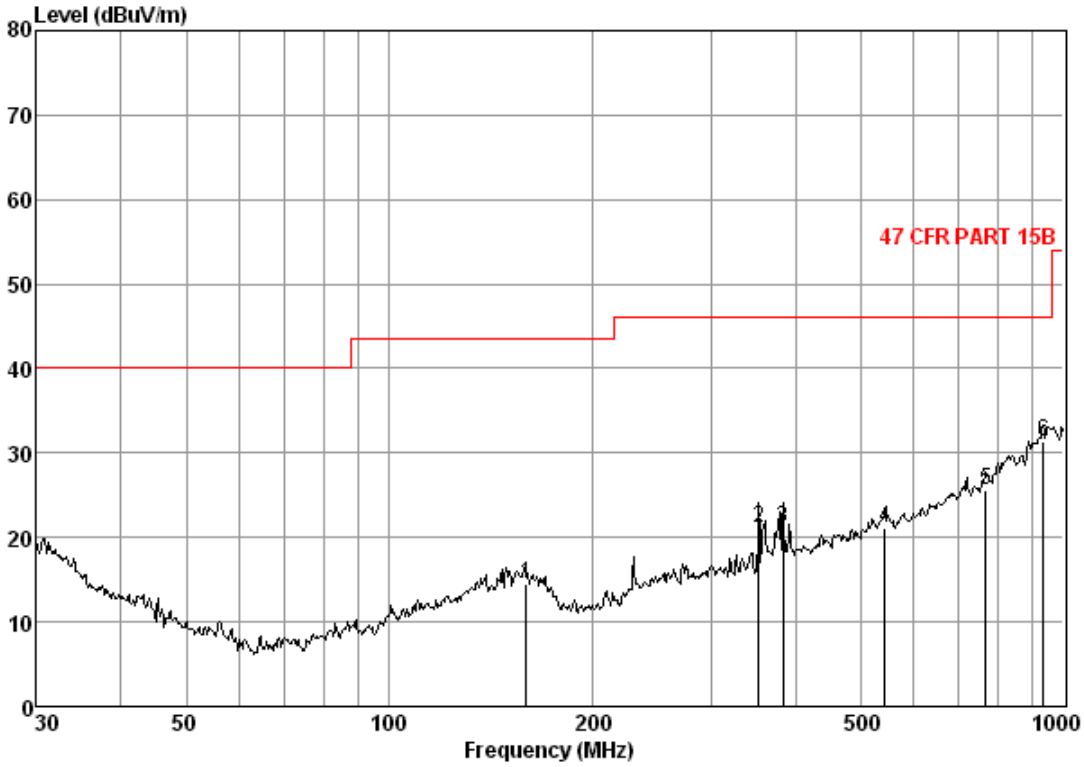
Figure 3. Above 1 GHz

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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) 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. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. i. 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 DH1 of data type is the worse case of GFSK modulation type.
Instruments Used:	Refer to section 4.10 for details
Test Results:	Pass

5.11.1 Radiated Emission below 1GHz

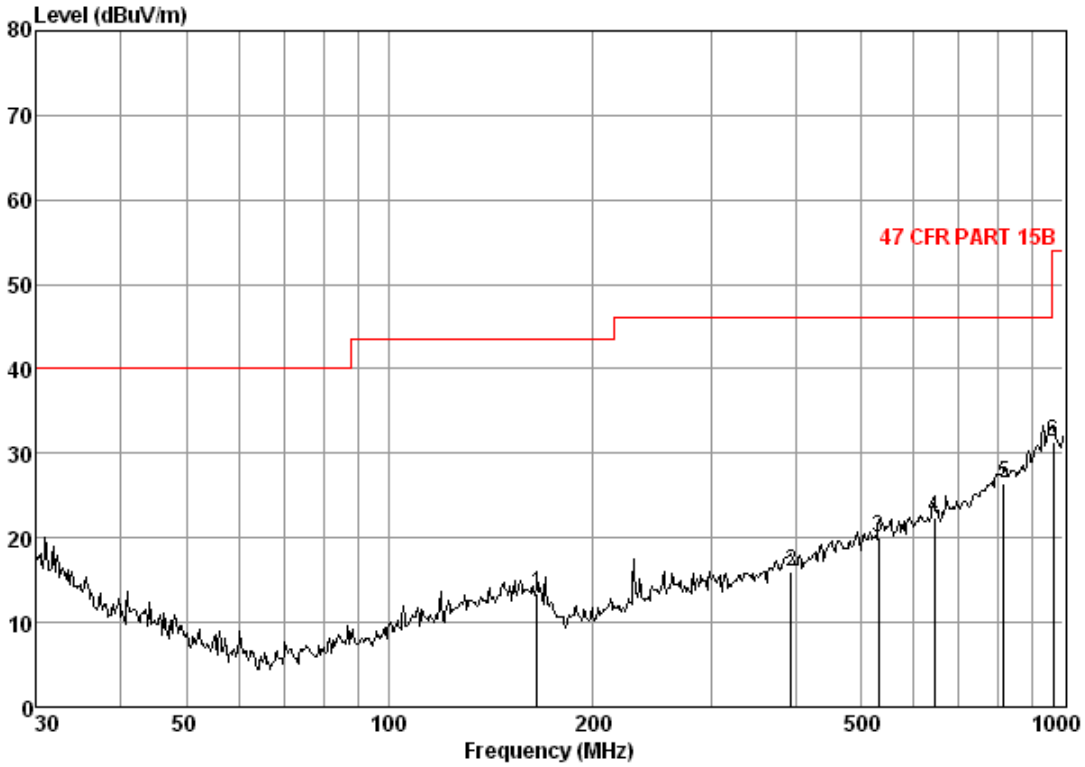
30MHz~1GHz (QP)		
Test mode:	Transmitting	Vertical



Condition: 47 CFR PART 15B 3m 3142C VERTICAL
Job No. : 0776RF
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	159.78	1.34	9.50	26.86	30.48	14.46	43.50	-29.04
2	352.94	2.07	10.59	26.81	35.32	21.17	46.00	-24.83
3	383.93	2.16	11.66	27.03	34.37	21.16	46.00	-24.84
4	543.27	2.65	14.74	27.63	31.26	21.02	46.00	-24.98
5	766.06	3.11	18.23	27.33	31.66	25.67	46.00	-20.33
6	932.27	3.63	20.67	26.61	33.62	31.31	46.00	-14.69

Test mode:	Transmitting	Horizontal



Condition: 47 CFR PART 15B 3m 3142C HORIZONTAL
Job No. : 0776RF
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	165.49	1.35	9.50	26.83	29.38	13.40	43.50	-30.10
2	394.85	2.19	11.59	27.09	29.36	16.05	46.00	-29.95
3	531.96	2.63	14.30	27.65	30.85	20.13	46.00	-25.87
4	642.86	2.79	15.77	27.49	31.43	22.50	46.00	-23.50
5	815.97	3.27	19.07	27.20	31.33	26.47	46.00	-19.53
6	965.54	3.67	21.13	26.47	33.05	31.38	54.00	-22.62

5.11.2 Transmitter Emission above 1GHz

Worse case mode:	GFSK(DH1)	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
2818.011	4.92	33.14	40.17	44.70	42.59	74	-31.41	Vertical
3903.444	6.33	33.70	40.97	45.70	44.76	74	-29.24	Vertical
4804.000	7.44	34.70	41.63	50.89	51.40	74	-22.60	Vertical
7206.000	8.72	35.88	39.87	43.37	48.10	74	-25.90	Vertical
9608.000	9.68	37.30	37.80	41.25	50.43	74	-23.57	Vertical
12397.940	11.45	39.30	38.44	40.47	52.78	74	-21.22	Vertical
3049.394	5.12	33.38	40.34	43.92	42.08	74	-31.92	Horizontal
3893.520	6.31	33.68	40.95	44.10	43.14	74	-30.86	Horizontal
4804.000	7.44	34.70	41.63	44.60	45.11	74	-28.89	Horizontal
7206.000	8.72	35.88	39.87	45.07	49.80	74	-24.20	Horizontal
9608.000	9.68	37.30	37.80	41.29	50.47	74	-23.53	Horizontal
11574.460	10.98	38.47	38.10	40.83	52.18	74	-21.82	Horizontal

Worse case mode:	GFSK(DH1)	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
3088.453	5.19	33.37	40.37	44.64	42.83	74	-31.17	Vertical
4096.875	6.59	34.08	41.11	43.66	43.22	74	-30.78	Vertical
4882.000	7.48	34.59	41.68	49.88	50.27	74	-23.73	Vertical
7323.000	8.87	35.93	39.77	43.72	48.75	74	-25.25	Vertical
9764.000	9.74	37.48	37.66	40.90	50.46	74	-23.54	Vertical
12334.980	11.42	39.24	38.42	40.59	52.83	74	-21.17	Vertical
3026.195	5.09	33.39	40.33	45.64	43.79	74	-30.21	Horizontal
4107.316	6.59	34.13	41.12	45.21	44.81	74	-29.19	Horizontal
4882.000	7.48	34.59	41.68	53.46	53.85	74	-20.15	Horizontal
7323.000	8.87	35.93	39.77	43.47	48.50	74	-25.50	Horizontal
9764.000	9.74	37.48	37.66	41.21	50.77	74	-23.23	Horizontal
12303.620	11.41	39.21	38.40	39.92	52.14	74	-21.86	Horizontal

Worse case mode:	GFSK(DH1)	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
2995.538	5.05	33.38	40.30	44.21	42.34	74	-31.66	Vertical
3973.622	6.43	33.78	41.02	44.70	43.89	74	-30.11	Vertical
4960.000	7.53	34.46	41.74	46.52	46.77	74	-27.23	Vertical
7440.000	9.01	35.98	39.67	42.98	48.30	74	-25.70	Vertical
9920.000	9.81	37.63	37.53	40.32	50.23	74	-23.77	Vertical
12210.020	11.37	39.11	38.36	40.71	52.83	74	-21.17	Vertical
3080.601	5.17	33.37	40.37	43.88	42.05	74	-31.95	Horizontal
3893.520	6.31	33.68	40.95	44.87	43.91	74	-30.09	Horizontal
4960.000	7.53	34.46	41.74	47.30	47.55	74	-26.45	Horizontal
7440.000	9.01	35.98	39.67	44.20	49.52	74	-24.48	Horizontal
9920.000	9.81	37.63	37.53	40.66	50.57	74	-23.43	Horizontal
12303.620	11.41	39.21	38.40	40.49	52.71	74	-21.29	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) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

5.12 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C 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:

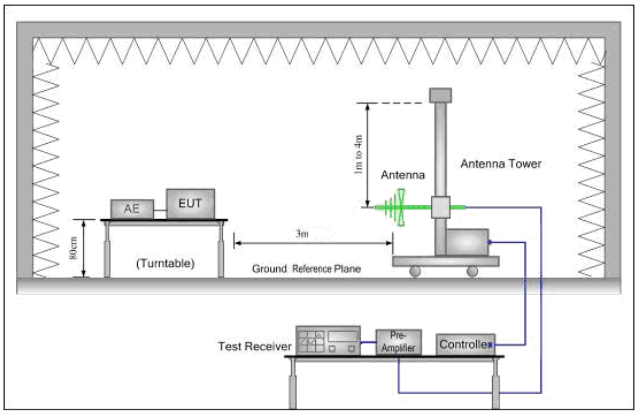


Figure 1. 30MHz to 1GHz

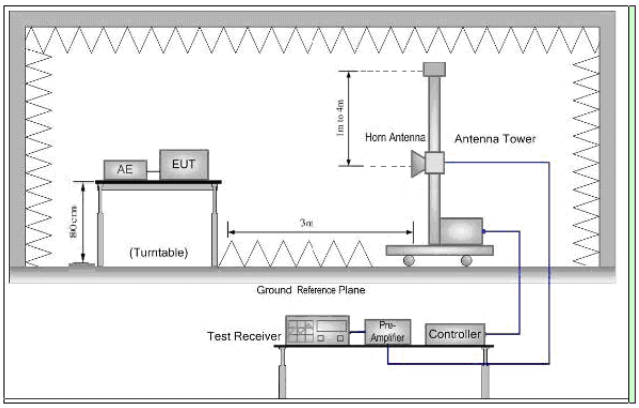
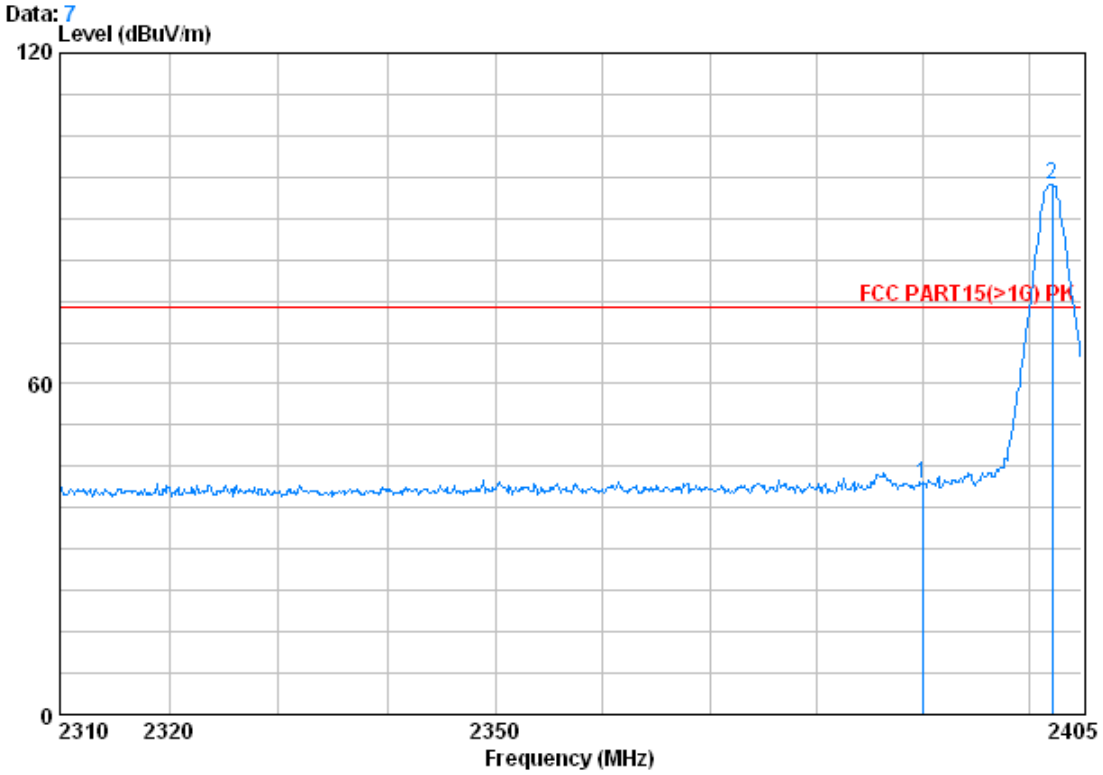


Figure 2. Above 1 GHz

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. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. i. 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 data 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:

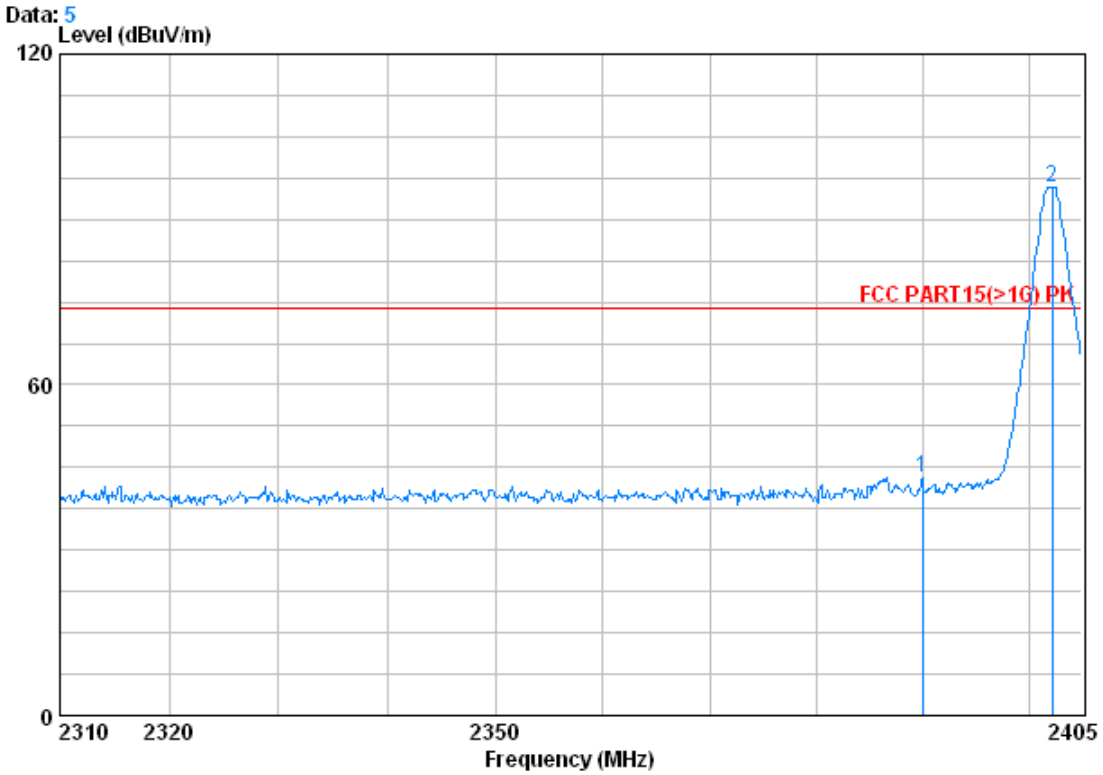
Worse case mode:	GFSK (DH5)	Test channel:	Lowest	Remark:	Peak	Vertical



Condition : FCC PART15(>1G) PK 3m VERTICAL
Job No. : 0776RF
Mode : 2402

	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	46.16	41.81	74.00	-32.19
2 X	2402.245	2.98	32.51	39.86	100.44	96.07	74.00	22.07

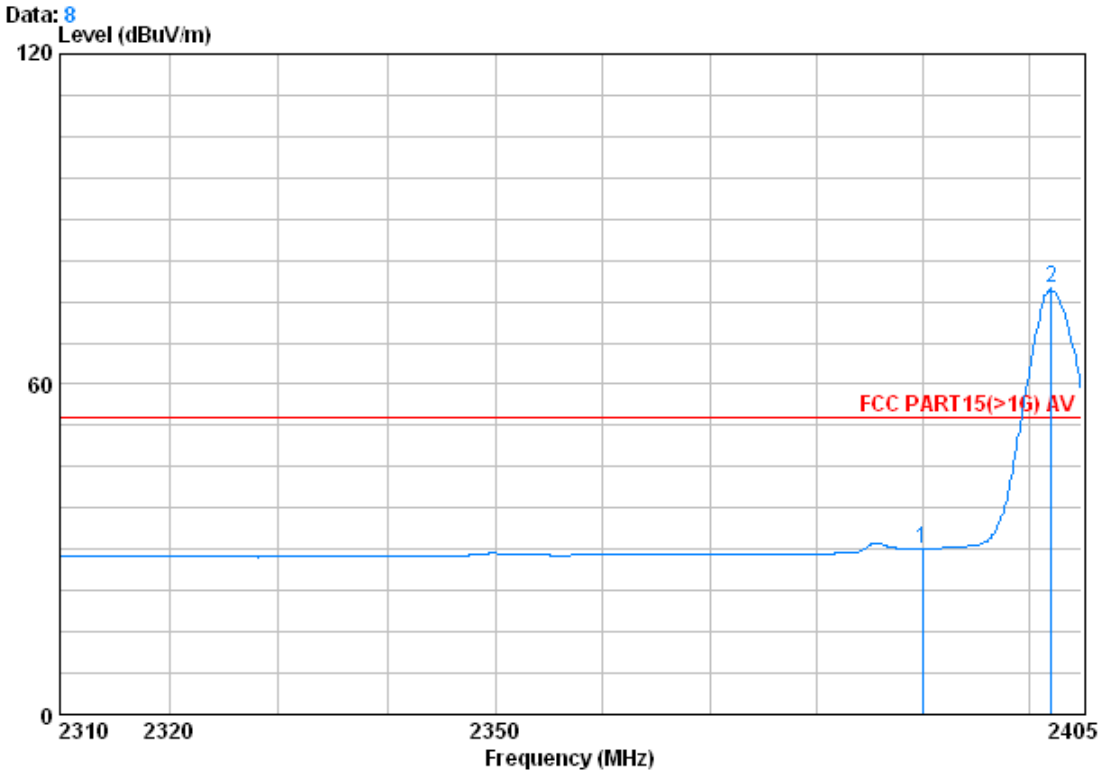
Worse case mode:	GFSK (DH5)	Test channel:	Lowest	Remark:	Peak	Horizontal



Condition : FCC PART15(>1G) PK 3m HORIZONTAL
Job No. : 0776RF
Mode : 2402

	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	47.40	43.05	74.00	-30.95
2 X	2402.245	2.98	32.51	39.86	100.27	95.90	74.00	21.90

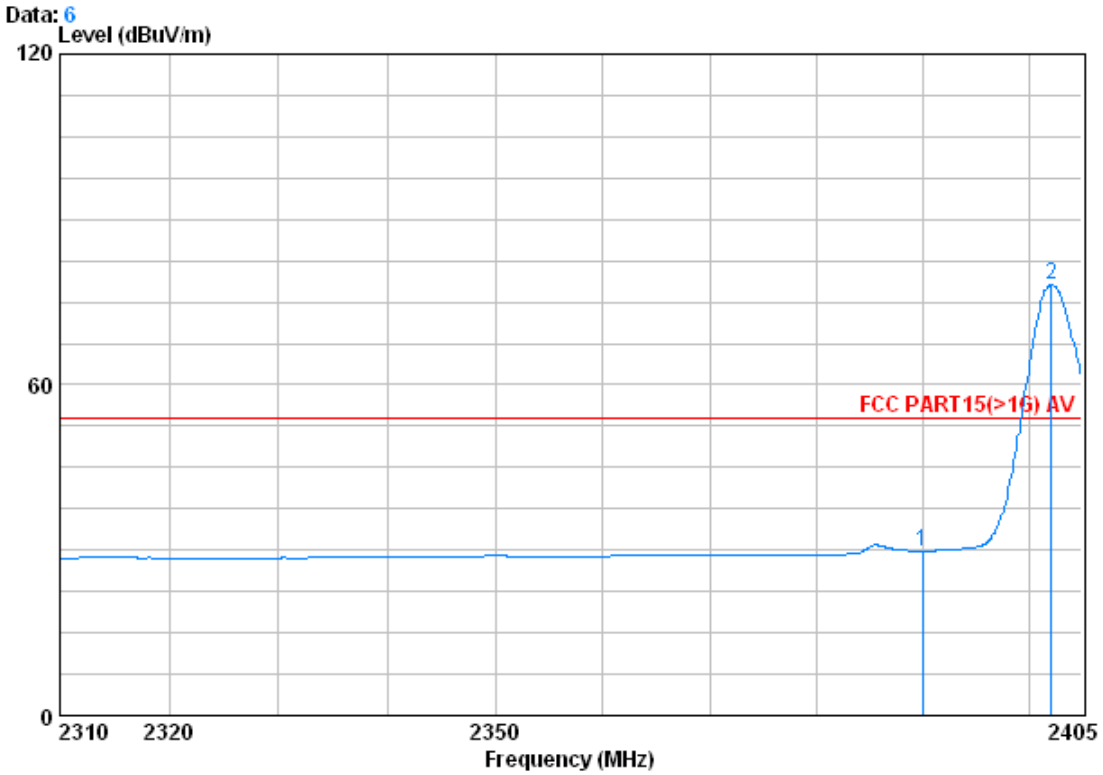
Worse case mode:	GFSK (DH5)	Test channel:	Lowest	Remark:	Average	Vertical



Condition : FCC PART15(>1G) AV 3m VERTICAL
Job No. : 0776RF
Mode : 2402

	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	34.40	30.04	54.00	-23.96
2 @	2402.150	2.98	32.51	39.86	81.76	77.39	54.00	23.39

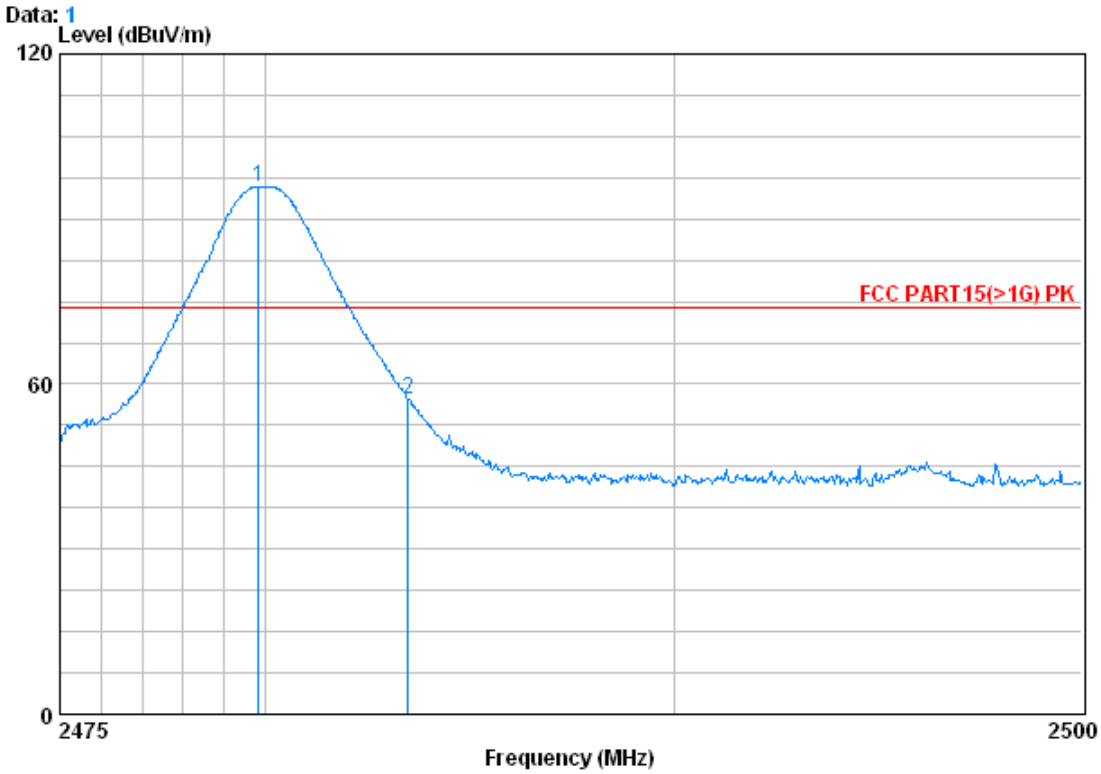
Worse case mode:	GFSK (DH5)	Test channel:	Lowest	Remark:	Average	Horizontal



Condition : FCC PART15(>1G) AV 3m HORIZONTAL
Job No. : 0776RF
Mode : 2402

	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	34.21	29.86	54.00	-24.14
2 @	2402.150	2.98	32.51	39.86	82.60	78.23	54.00	24.23

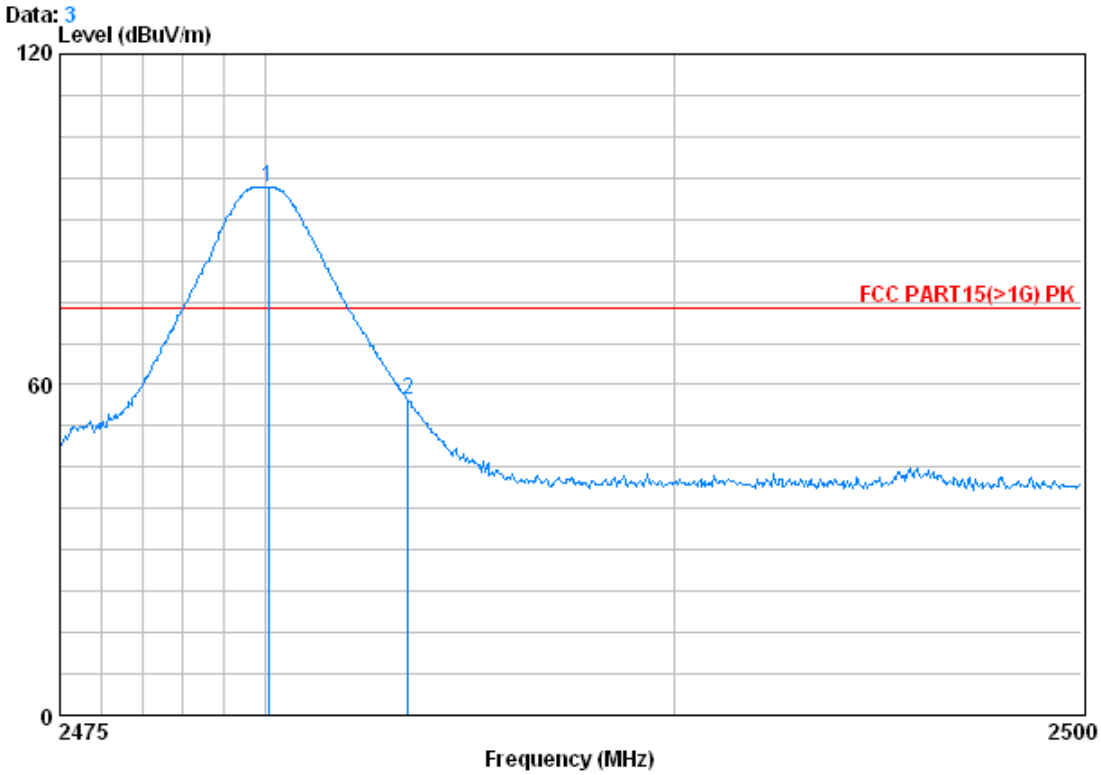
Worse case mode:	GFSK (DH5)	Test channel:	Highest	Remark:	Peak	Vertical



Condition : FCC PART15(>1G) PK 3m VERTICAL
Job No. : 0776RF
Mode : 2480

	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	2479.850	3.03	32.67	39.92	100.11	95.89	74.00	21.89
2	2483.500	3.03	32.67	39.92	61.44	57.22	74.00	-16.78

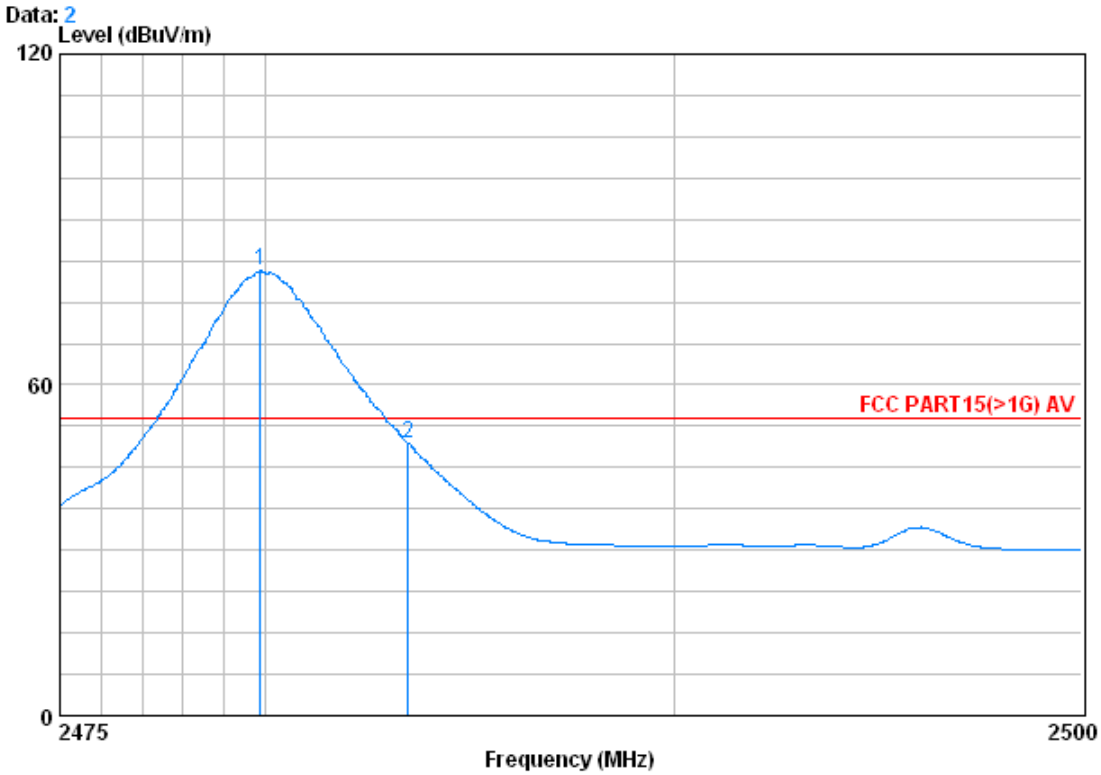
Worse case mode:	GFSK (DH5)	Test channel:	Highest	Remark:	Peak	Horizontal



Condition : FCC PART15(>1G) PK 3m HORIZONTAL
Job No. : 0776RF
Mode : 2480

	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	2480.075	3.03	32.67	39.92	100.15	95.93	74.00	21.93
2	2483.500	3.03	32.67	39.92	61.30	57.08	74.00	-16.92

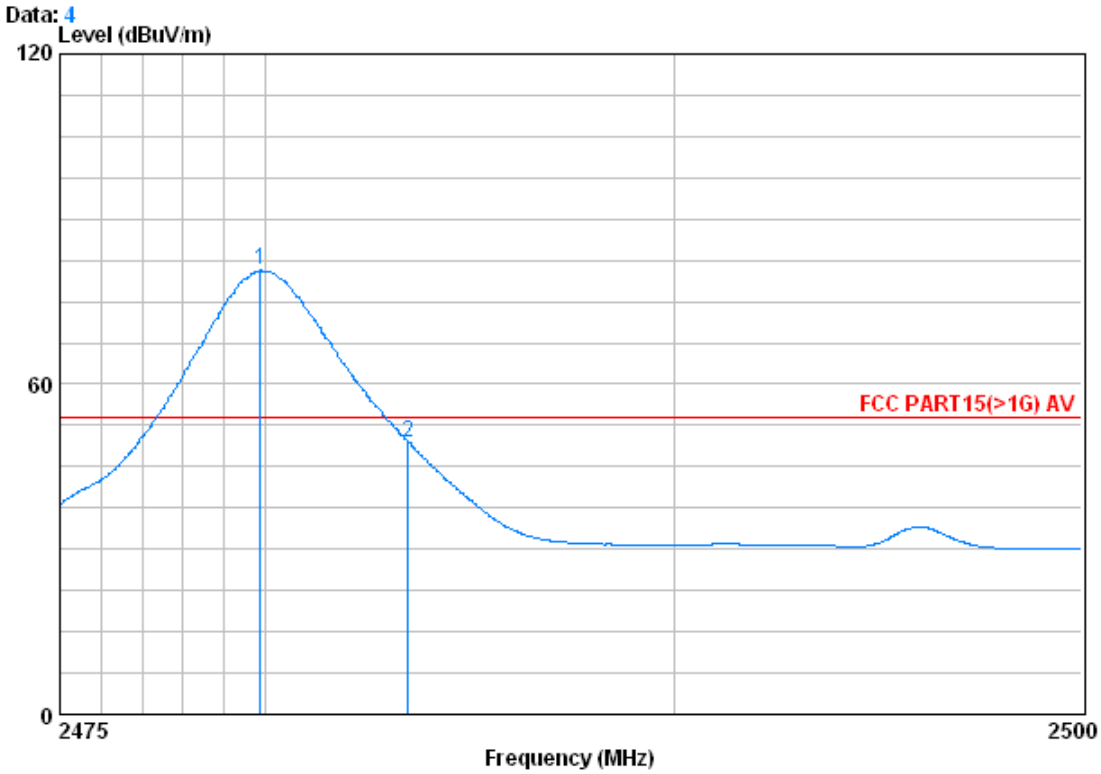
Worse case mode:	GFSK (DH5)	Test channel:	Highest	Remark:	Average	Vertical



Condition : FCC PART15(>1G) AV 3m VERTICAL
Job No. : 0776RF
Mode : 2480

	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 @	2479.875	3.03	32.67	39.92	84.89	80.67	54.00	26.67
2	2483.500	3.03	32.67	39.92	53.60	49.38	54.00	-4.62

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



Condition : FCC PART15(>1G) AV 3m HORIZONTAL
Job No. : 0776RF
Mode : 2480

	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 @	2479.875	3.03	32.67	39.92	84.93	80.71	54.00	26.71
2	2483.500	3.03	32.67	39.92	53.70	49.48	54.00	-4.52

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