Shenzhen Huaxia Testing Technology Co., Ltd

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Report Template Version: V03
Report Template Revision Date: Mar.1st, 2017

Test Report

Report No.:	CQASZ20190300201E-02
Applicant:	Innovation Sound Technology Co.,Ltd.
Address of Applicant:	Building 2nd/3rd/4th, Industrial Area of Huaide Cuihai Fengtang Road, Fuyong Town, Shenzhen, China
Manufacturer:	Innovation Sound Technology Co.,Ltd.
Address of Manufacturer:	Building 2nd/3rd/4th, Industrial Area of Huaide Cuihai Fengtang Road, Fuyong Town, Shenzhen, China
Equipment Under Test (EUT):	
Product:	AmazonBasics Over-Ear Bluetooth Wireless Headset
Model No.:	B07LBYLM7B, B07LBX3K5F
Brand Name:	N/A
FCC ID:	2AKSL-PBH89366
IC:	7540A-PBH89366
Standards:	47 CFR Part 15, Subpart C
	RSS-247 Issue 2 February 2017
	RSS-Gen Issue 5 April 2018
Date of Test:	2019-03-24 to 2019-04-19
Date of Issue:	2019-04-19
Test Result :	**PASS***

Tested By: _____
(Daisy Qin)

Reviewed By: _____
(Aaron Ma)

Approved By: _____
(Jack Ai)

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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

2 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20190300201E-02	Rev.01	Initial report	2019-04-19

3 Test Summary

Test Item	FCC Test Requirement	IC Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	RSS-Gen Issue 5	ANSI C63.10: 2013	PASS
Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	RSS-Gen Issue 5	ANSI C63.10: 2013	PASS
Maximum Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	RSS 247 5.4(2)	RSS-Gen Issue 5 & ANSI C63.10: 2013	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	RSS 247 5.1(1)	RSS-Gen Issue 5	PASS
99% Occupied Bandwidth	/	RSS-Gen Issue 5	RSS-Gen Issue 5	PASS
Carrier Frequencies Separated	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	RSS 247 5.1(2)	ANSI C63.10: 2013	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	RSS 247 5.1(4)	ANSI C63.10: 2013	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	RSS 247 5.1(4)	ANSI C63.10: 2013	PASS
Band-edge for RF Transmit Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	RSS 247 5.5	ANSI C63.10: 2013	PASS
Spurious RF Transmit Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	RSS 247 5.5	ANSI C63.10: 2013	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(d)	RSS 247 5.1(2)	ANSI C63.10: 2013	PASS
Radiated Transmit Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	RSS-Gen Issue 5	RSS-Gen Issue 5 & ANSI C63.10: 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	RSS-Gen Issue 5	RSS-Gen Issue 5 & ANSI C63.10: 2013	PASS

4 Contents

5 General Information

5.1 Client Information

Applicant:	Innovation Sound Technology Co.,Ltd.
Address of Applicant:	Building 2nd/3rd/4th, Industrial Area of Huaide Cuihai Fengtang Road, Fuyong Town, Shenzhen, China
Manufacturer:	Innovation Sound Technology Co.,Ltd.
Address of Manufacturer:	Building 2nd/3rd/4th, Industrial Area of Huaide Cuihai Fengtang Road, Fuyong Town, Shenzhen, China

5.2 General Description of EUT

Product Name:	AmazonBasics Over-Ear Bluetooth Wireless Headset
Model No.:	B07LBYLM7B, B07LBX3K5F
Trade Mark:	N/A
Hardware Version:	SPEC-BTH-1192-01A
Software Version:	SPEC-BTH-1192-01A
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	5.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Transfer Rate:	1Mbps/2Mbps/3Mbps
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Product Type:	☐ Mobile ☒ Portable ☐ Fix Location
Test Software of EUT:	Bluetooth test 3(manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	3.3dBi
Power Supply:	lithium battery:DC3.7V

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

Channel	Frequency
The Lowest channel	2402MHz
The Middle channel	2441MHz
The Highest channel	2480MHz

5.3 Additional Instructions

EUT Test Software Settings:	
Mode:	☒Special software is used. ☐Through engineering command into the engineering mode. engineering command: *#*#3646633#*#*
EUT Power level:	Class1 (Power level is built-in set parameters and cannot be changed and selected)

Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

Mode	Channel	Frequency(MHz)
GFSK_DH1/DH3/DH5	CH0	2402
	CH39	2441
	CH78	2480
π/4DQPSK_2DH1/2DH3/2DH5	CH0	2402
	CH39	2441
	CH78	2480
8DPSK_3DH1/3DH3/3DH5	CH0	2402
	CH39	2441
	CH78	2480

5.4 Test Environment

Operating Environment:	
Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1008 mbar

5.5 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
PC	Lenovo	ThinkPad E450c	Provide by lab	ID
AC/DC Adapter	Lenovo	ADLX65NLC3A	Provide by lab	DOC

5.6 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	±5.12dB	(1)
2	Radiated Emission (Above 1GHz)	±4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	±3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5.7 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

5.8 Test Facility

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

ISED#: 22984

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

5.9 Deviation from Standards

None.

5.10 Abnormalities from Standard Conditions

None.

5.11 Other Information Requested by the Customer

None.

5.12 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2018/9/26	2019/9/25
Spectrum analyzer	R&S	FSU26	CQA-038	2018/10/28	2018/10/27
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/9/26	2019/9/25
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2018/11/2	2019/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2018/10/28	2020/10/27
Bilog Antenna	R&S	HL562	CQA-011	2018/9/26	2020/9/25
Horn Antenna	R&S	HF906	CQA-012	2018/9/26	2020/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2018/9/26	2020/9/25
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2018/9/26	2019/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2018/9/26	2019/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2018/9/26	2019/9/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2018/9/26	2019/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2018/9/26	2019/9/25
EMI Test Receiver	R&S	ESPI3	CQA-013	2018/9/26	2019/9/25
LISN	R&S	ENV216	CQA-003	2018/11/5	2019/11/4
Coaxial cable	CQA	N/A	CQA-C009	2018/9/26	2019/9/25

Note:

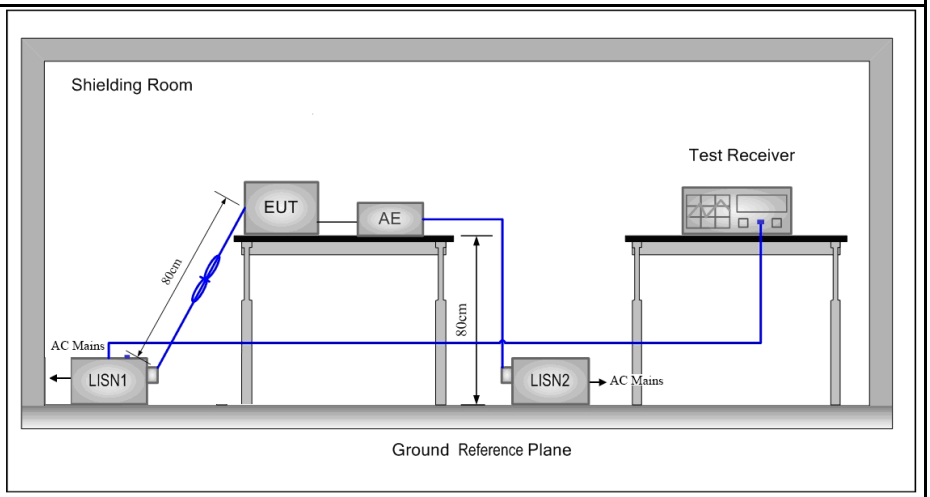
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

6 Test Results and Measurement Data

6.1 Antenna Requirement

Standard Requirement:	47 CFR Part 15C Section 15.203 /247(c), RSS-Gen Issue 5
EUT Antenna:	PCB Antenna
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.3dBi.	

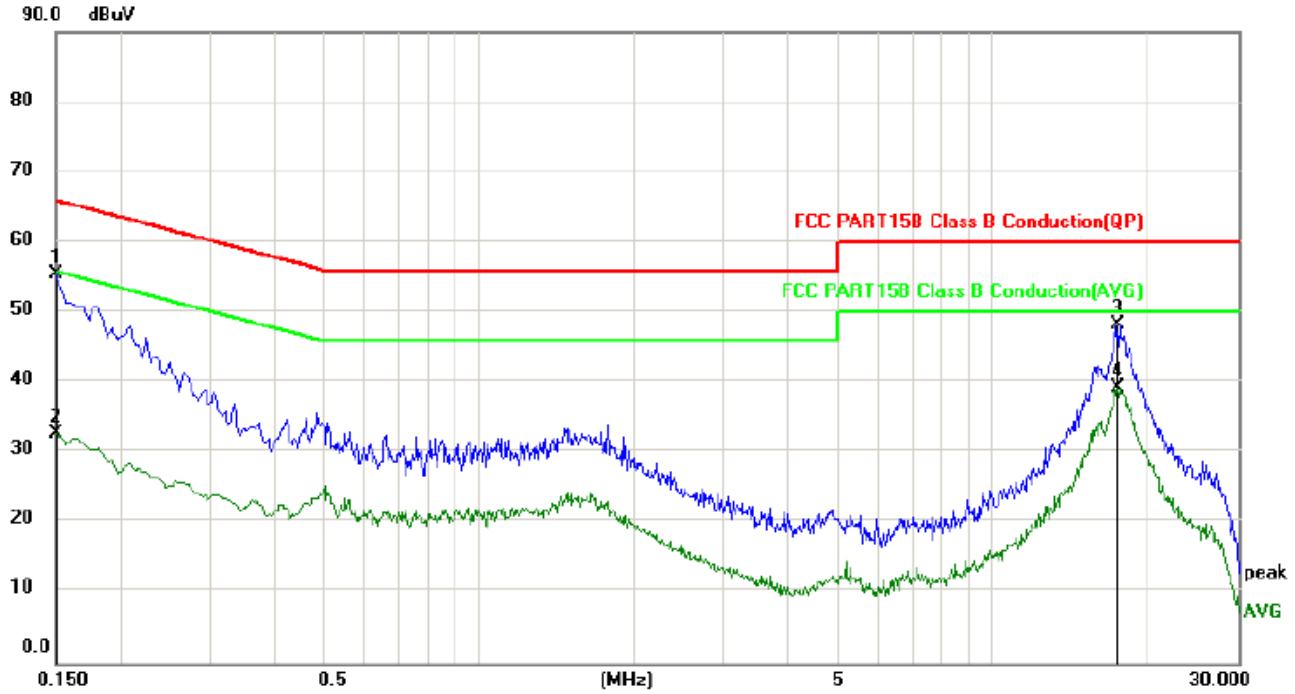
6.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207, RSS-Gen Issue 5
Test Method:	ANSI C63.10: 2013
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: 2013 on conducted measurement.
Test Setup:	

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 and GFSK modulation at highest channel is the worst case. Only the worst case is recorded in the report.
Test Results:	Pass

Measurement Data

Live line:

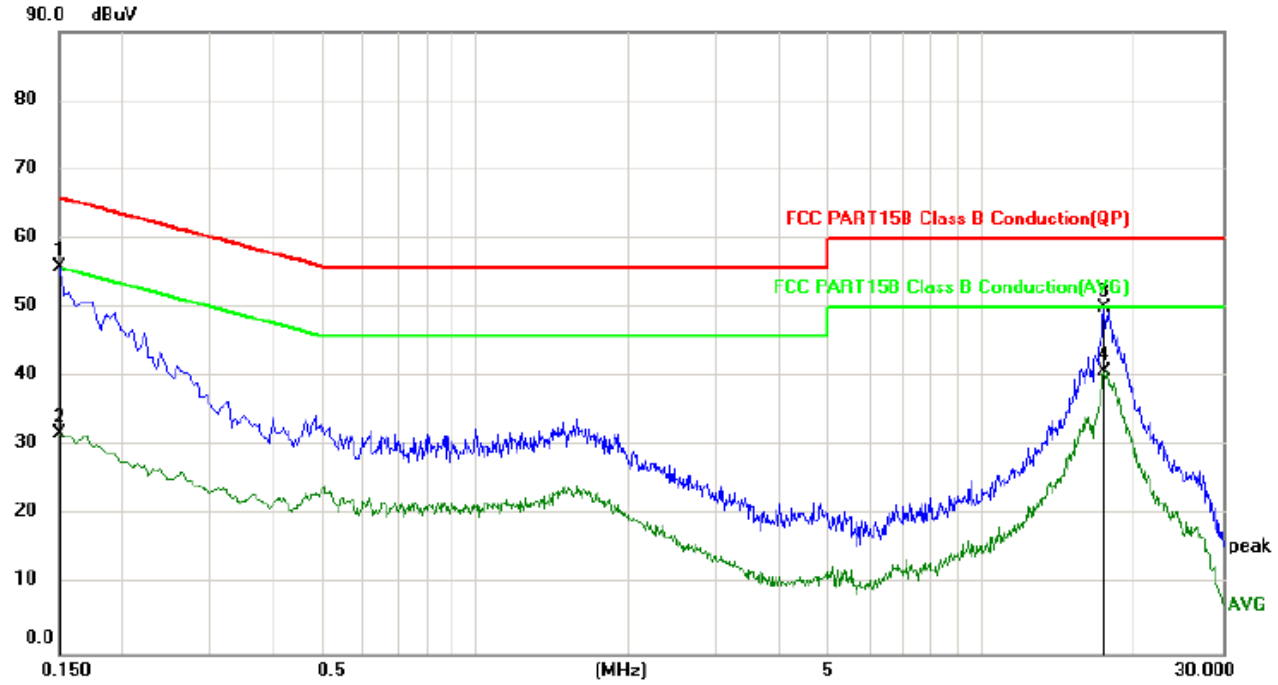


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1500	45.71	9.73	55.44	66.00	-10.56	QP
2		0.1500	23.09	9.73	32.82	56.00	-23.18	AVG
3		17.5500	38.42	9.86	48.28	60.00	-11.72	QP
4		17.5500	29.47	9.86	39.33	50.00	-10.67	AVG

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:

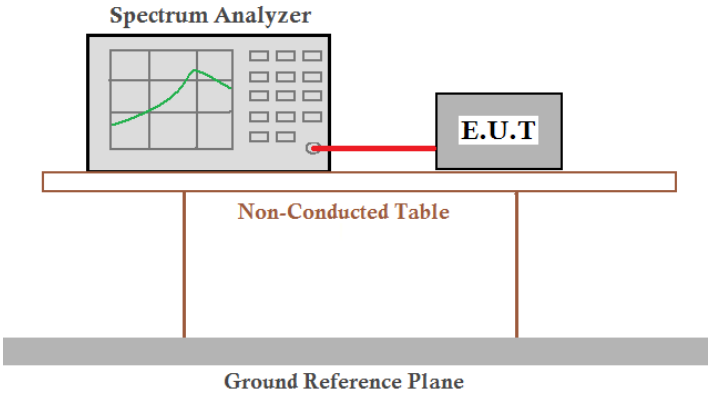


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	46.16	9.79	55.95	66.00	-10.05	QP
2		0.1500	21.96	9.79	31.75	56.00	-24.25	AVG
3		17.4939	40.07	9.88	49.95	60.00	-10.05	QP
4	*	17.4939	30.92	9.88	40.80	50.00	-9.20	AVG

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

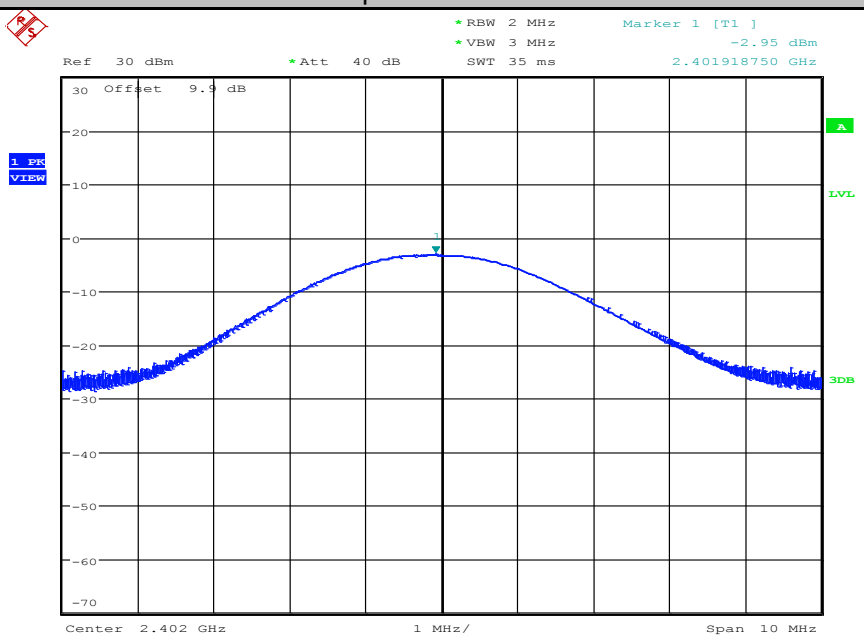
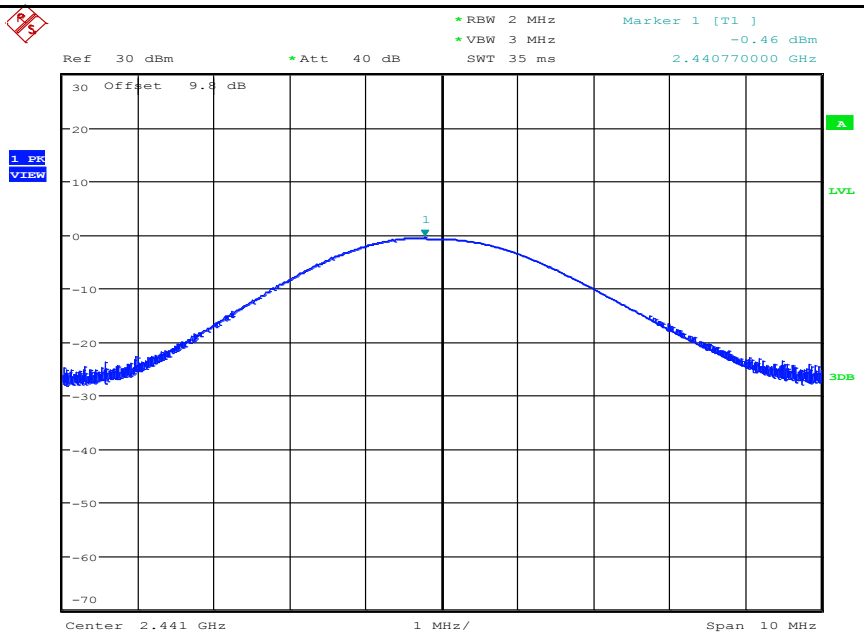
6.3 Conducted Peak Output Power

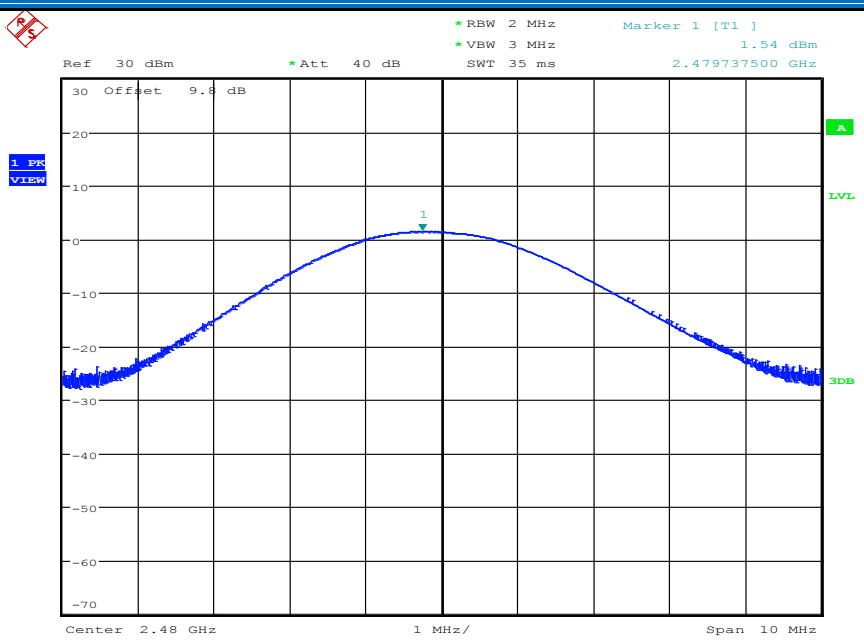
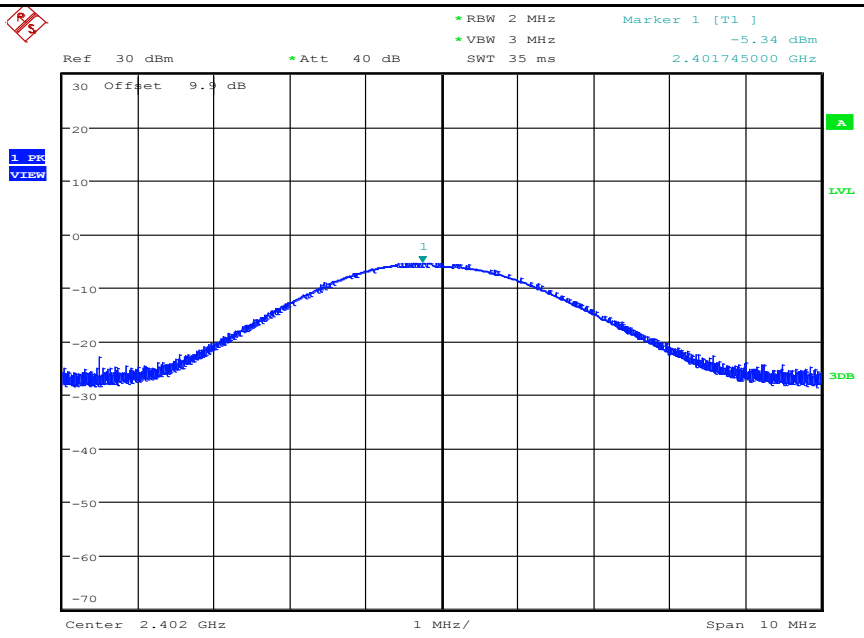
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1), RSS 247 5.4(2)
Test Method:	RSS-Gen Issue 5 & ANSI C63.10: 2013
Limit:	30dBm
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

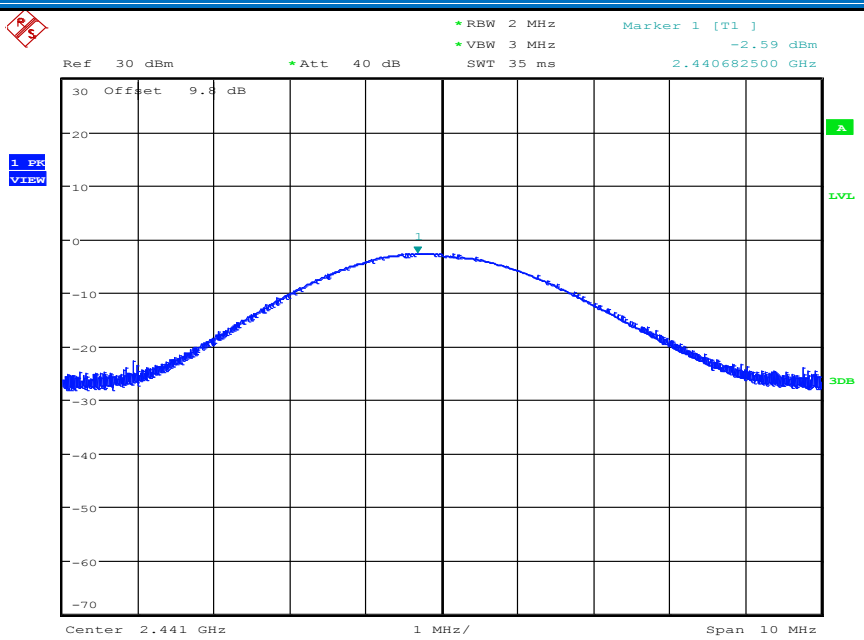
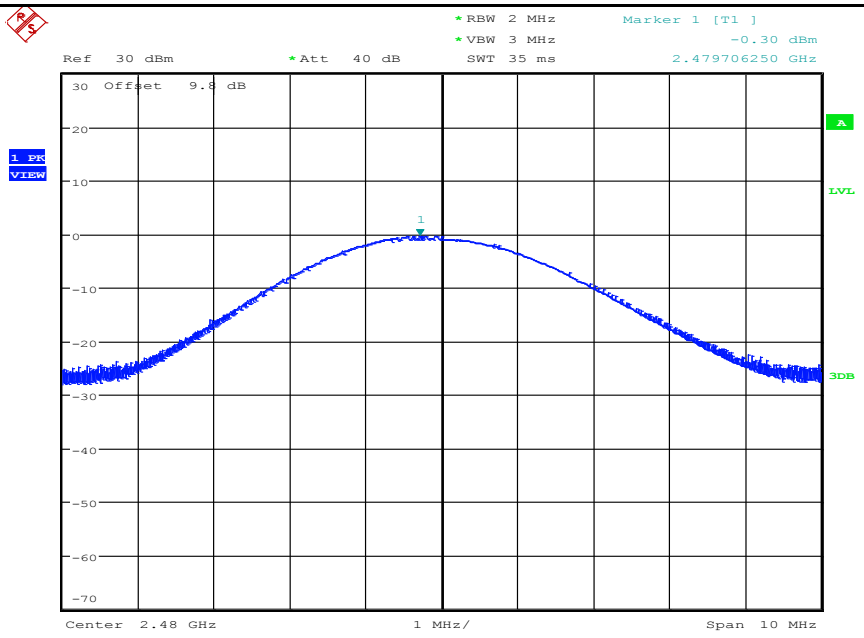
Measurement Data

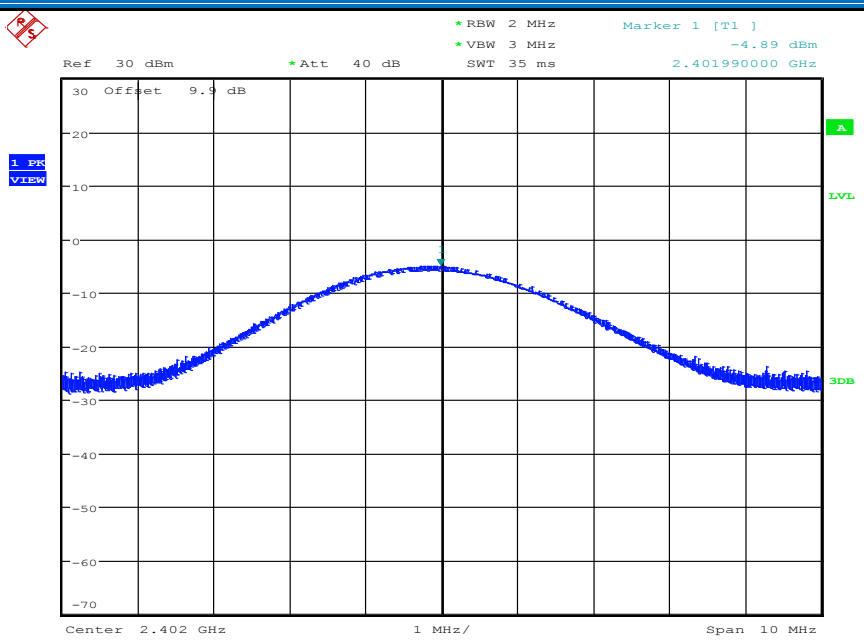
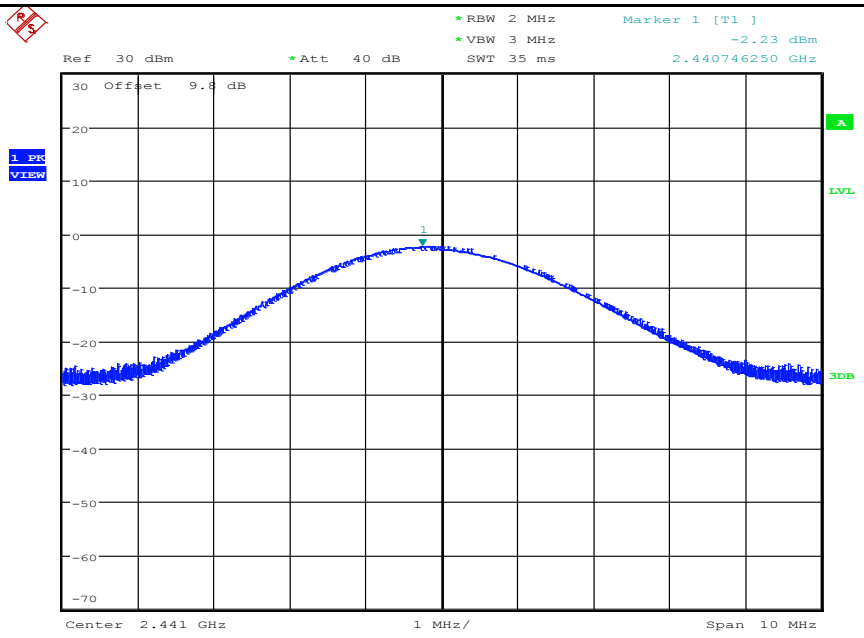
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-2.950	20.9	Pass
Middle	-0.460	20.9	Pass
Highest	1.540	20.9	Pass
π/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-5.340	20.9	Pass
Middle	-2.590	20.9	Pass
Highest	-0.300	20.9	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-4.890	20.9	Pass
Middle	-2.230	20.9	Pass
Highest	0.060	20.9	Pass

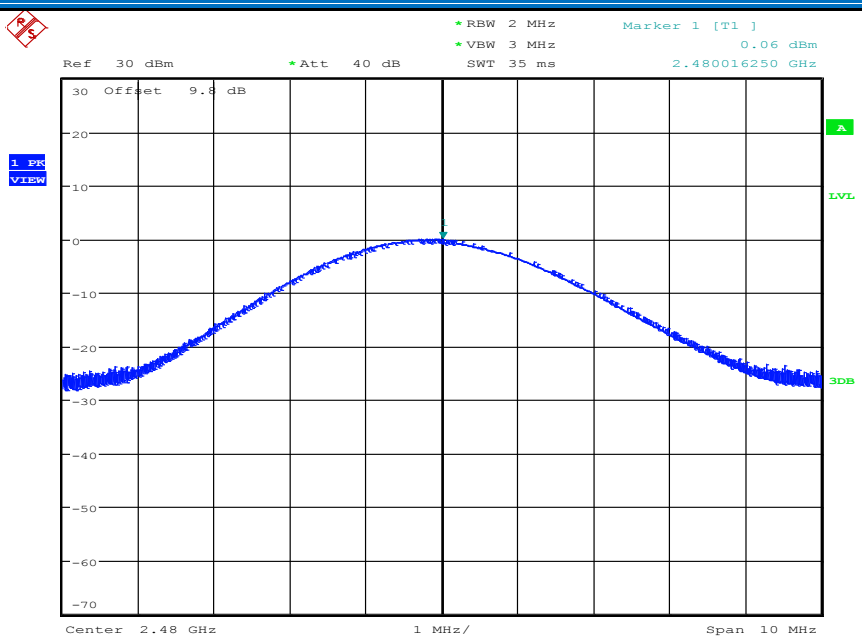
Test plot as follows:

Graphs	
GFSK/LCH	 Date: 18.APR.2019 14:50:33
GFSK/MCH	 Date: 18.APR.2019 14:55:29

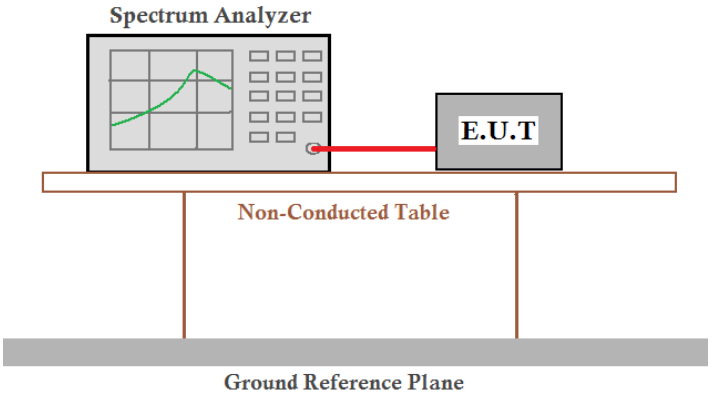
GFSK/HCH	 Date: 18.APR.2019 15:00:22
π/4DQPSK/LCH	 Date: 18.APR.2019 15:05:18

π/4DQPSK/MCH	 Date: 18.APR.2019 15:09:55
π/4DQPSK/HCH	 Date: 18.APR.2019 15:14:05

8DPSK/LCH	 Date: 18.APR.2019 15:19:06
8DPSK/MCH	 Date: 18.APR.2019 15:24:07

8DPSK/HCH	 RBW 2 MHz VBW 3 MHz SWT 35 ms Marker 1 [T1] 0.06 dBm 2.480016250 GHz Ref 30 dBm Att 40 dB Offset 9.8 dB 1 PK VIEW A LVL 3DB Center 2.48 GHz 1 MHz/ Span 10 MHz Date: 18.APR.2019 15:28:11

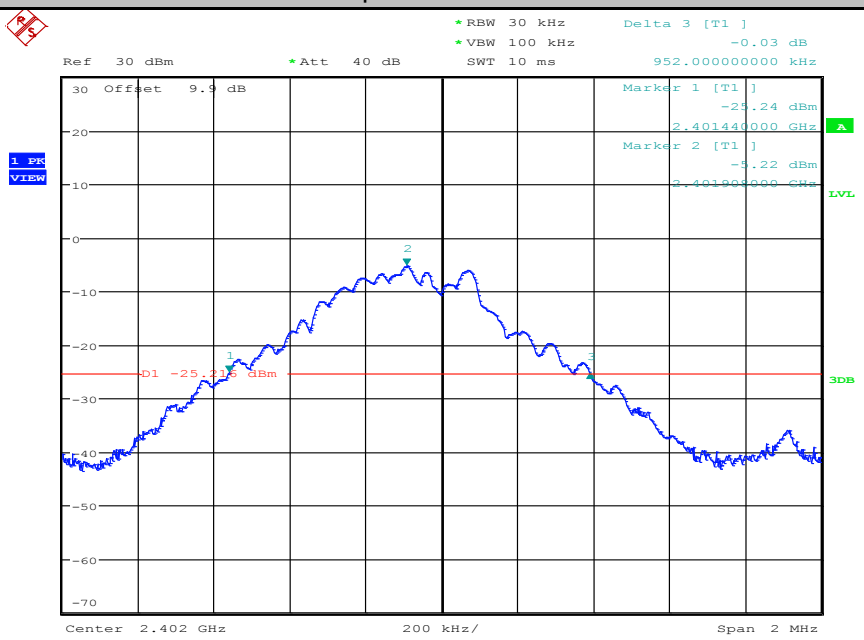
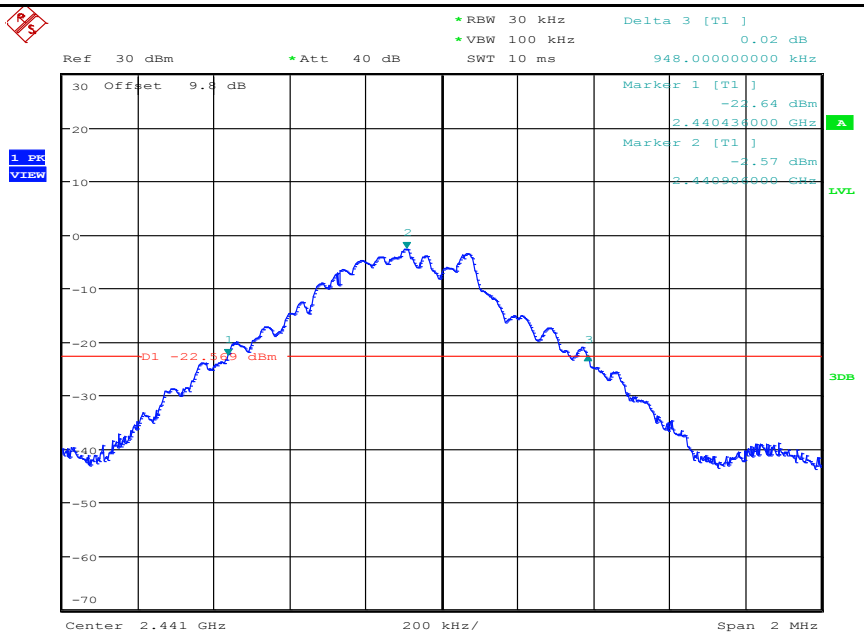
6.4 20dB Occupy Bandwidth

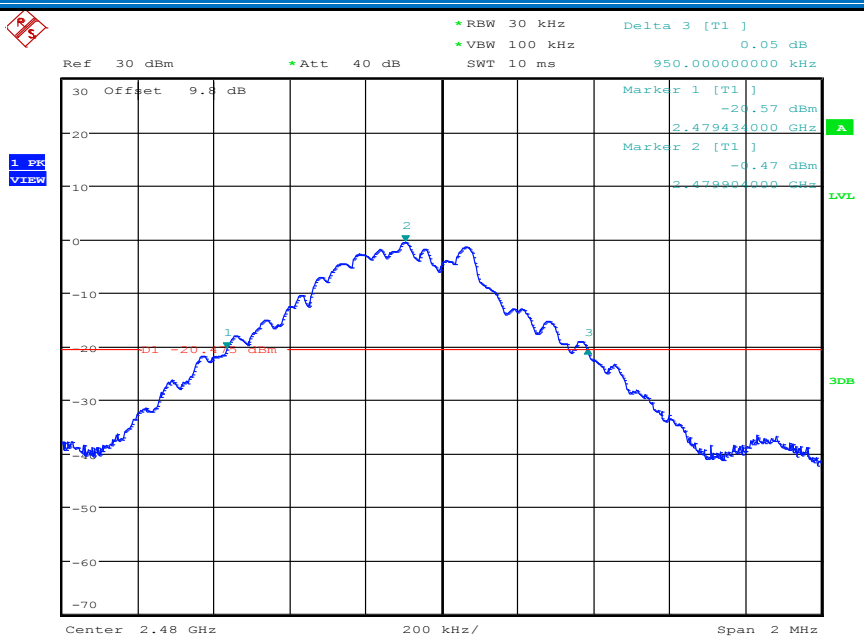
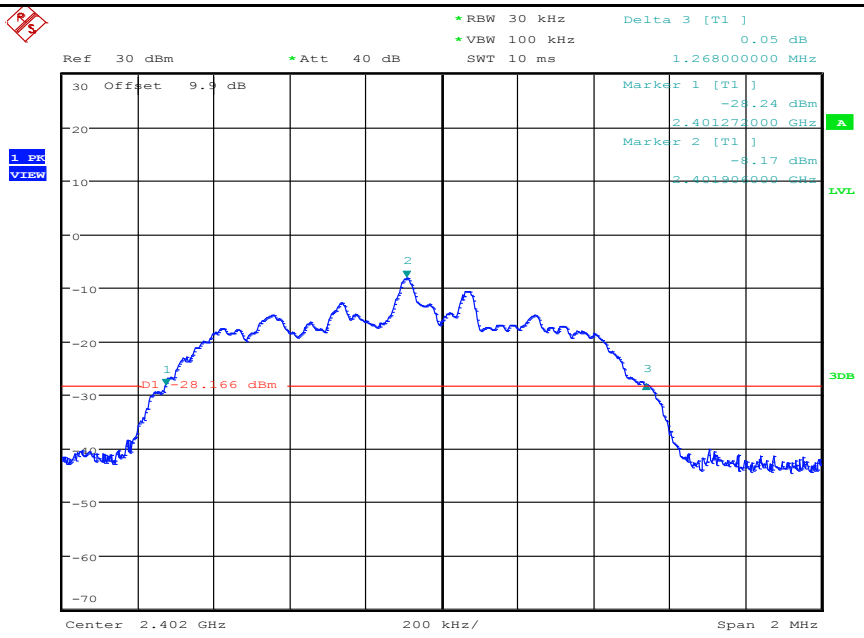
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1), RSS 247 5.1(1)
Test Method:	RSS-Gen Issue 5
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

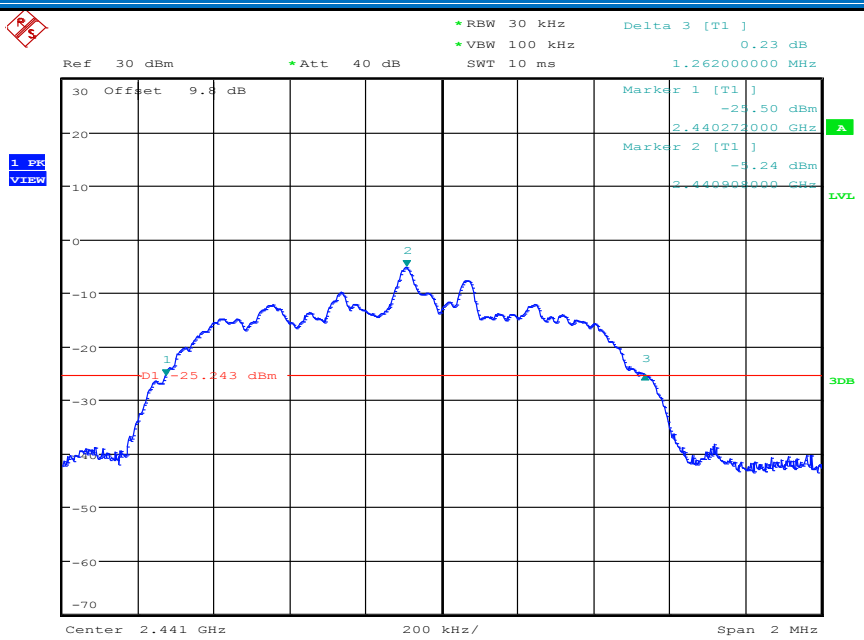
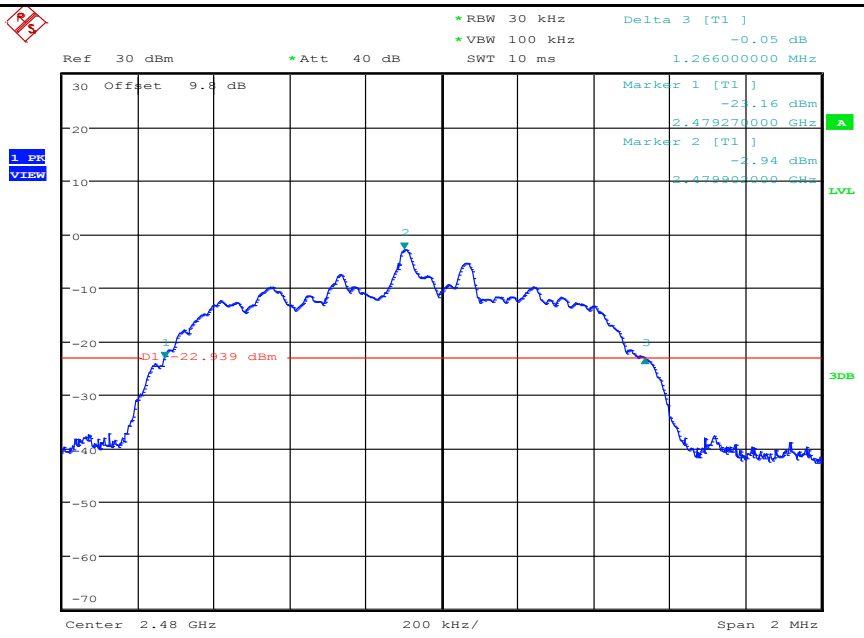
Measurement Data

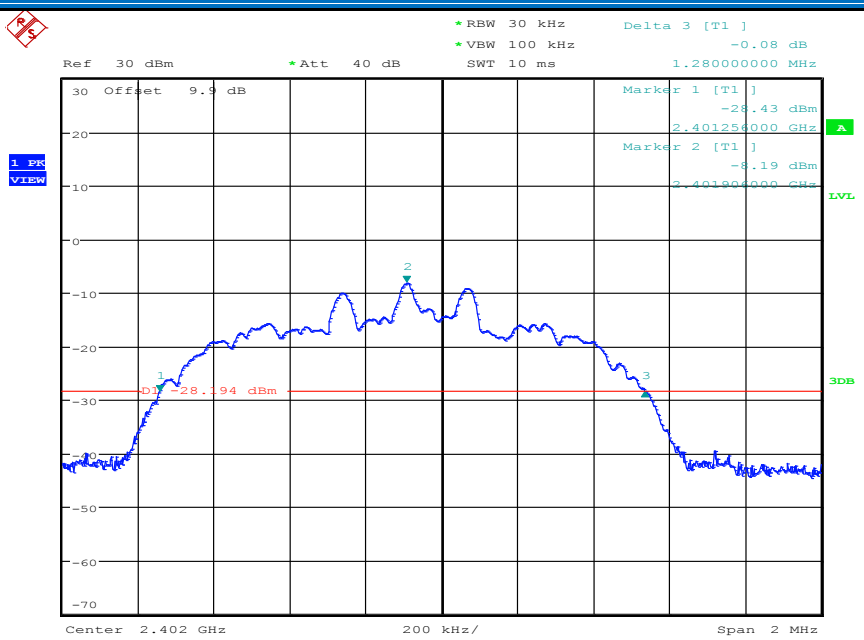
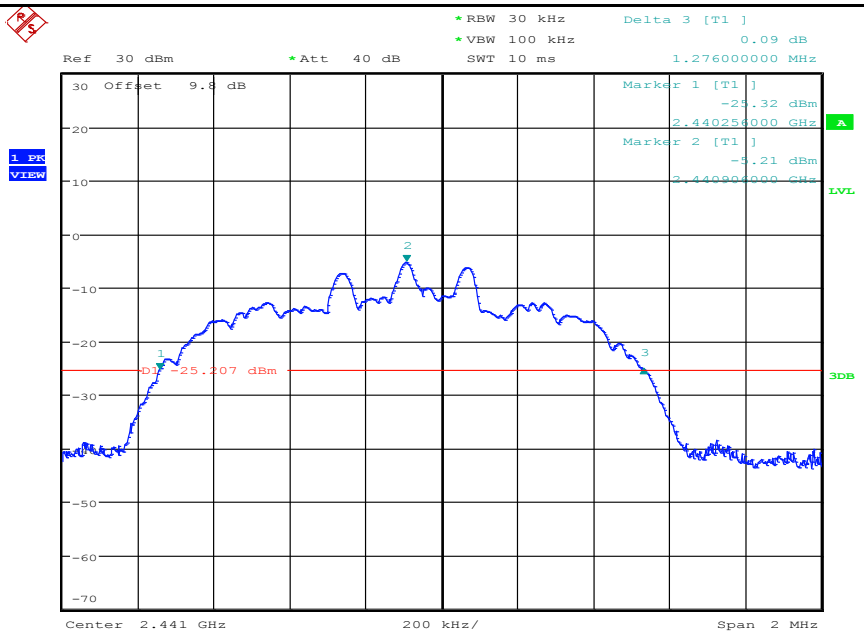
Test channel	20dB Occupy Bandwidth (MHz)		
	GFSK	π/4DQPSK	8DPSK
Lowest	0.952	1.268	1.280
Middle	0.948	1.262	1.276
Highest	0.950	1.266	1.272

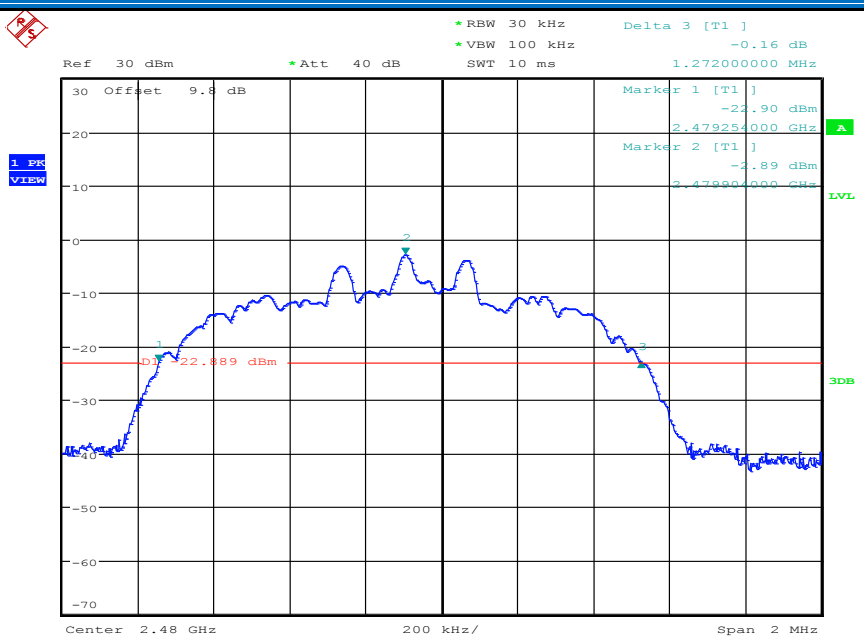
Test plot as follows:

Graphs	
GFSK/LCH	 Date: 18.APR.2019 14:49:42
GFSK/MCH	 Date: 18.APR.2019 14:53:42

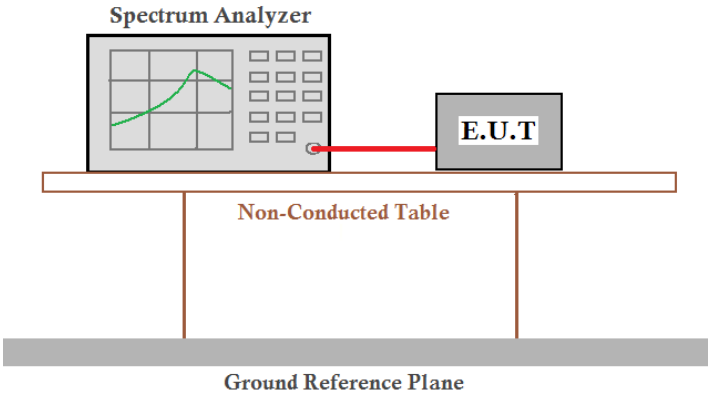
GFSK/HCH	 Date: 18.APR.2019 14:58:54
π/4DQPSK/LCH	 Date: 18.APR.2019 15:04:07

π/4DQPSK/MCH	 Date: 18.APR.2019 15:09:04
π/4DQPSK/HCH	 Date: 18.APR.2019 15:12:55

8DPSK/LCH	 Date: 18.APR.2019 15:17:40
8DPSK/MCH	 Date: 18.APR.2019 15:22:54

8DPSK/HCH	 RBW 30 kHz VBW 100 kHz SWT 10 ms Delta 3 [T1] -0.16 dB 1.272000000 MHz Ref 30 dBm Att 40 dB Offset 9.8 dB Marker 1 [T1] -22.90 dBm 2.479254000 GHz Marker 2 [T1] -2.89 dBm 2.479904000 GHz 1 PK VIEW A LVL 3DB D1 -22.889 dBm Center 2.48 GHz 200 kHz/ Span 2 MHz Date: 18.APR.2019 15:26:55

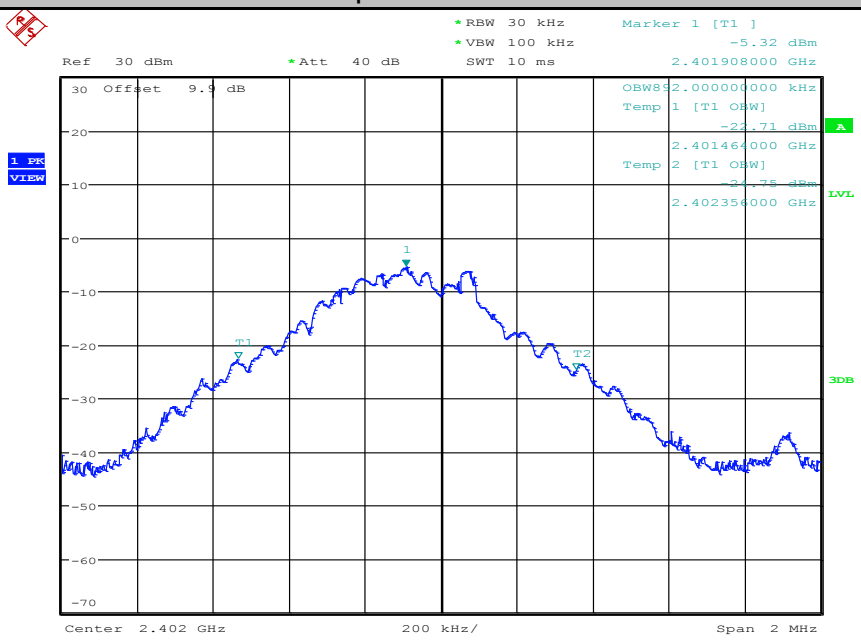
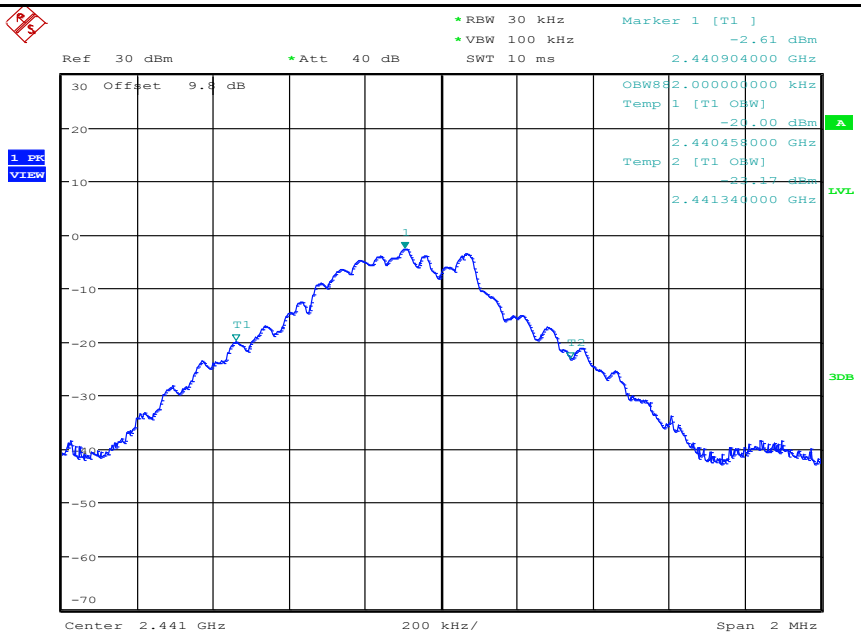
6.5 99% Occupy Bandwidth

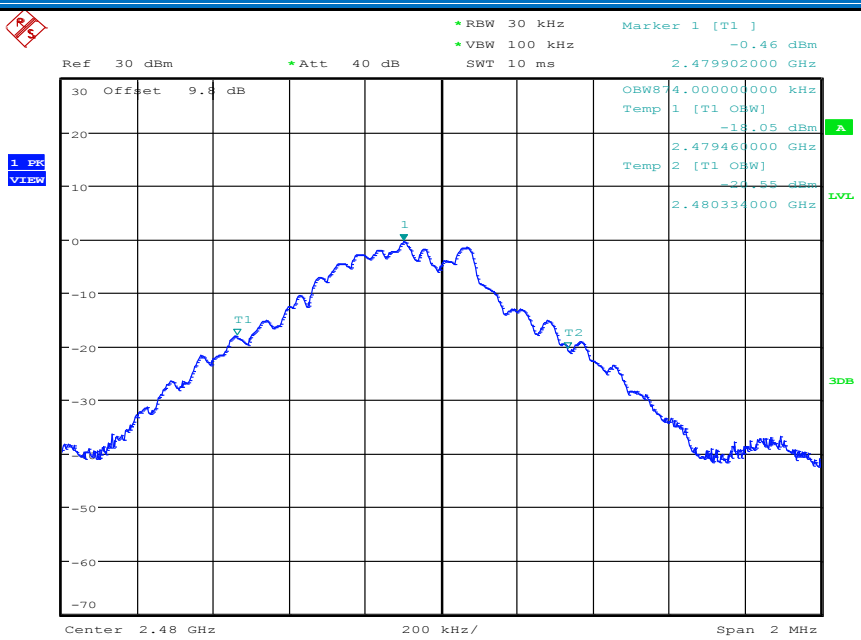
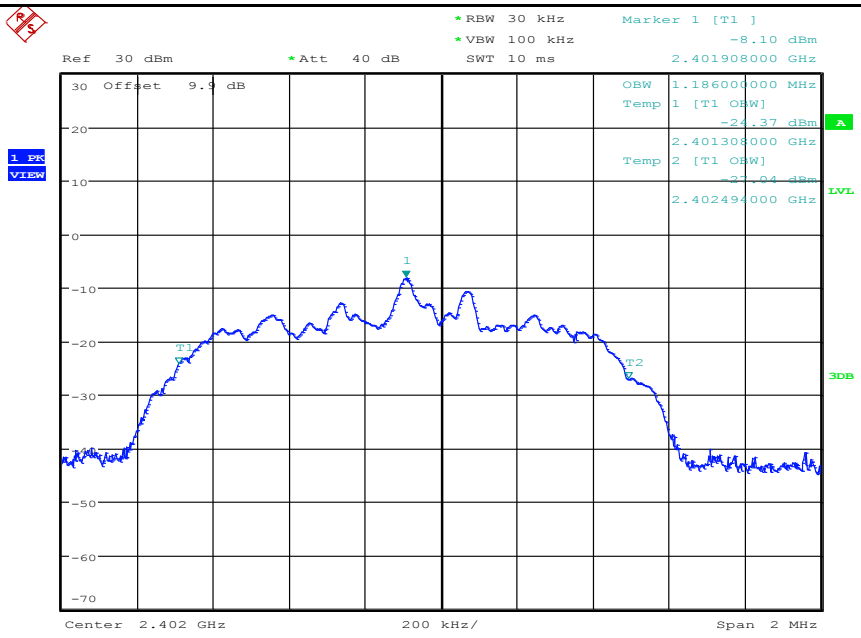
Test Requirement:	RSS-Gen Issue 5
Test Method:	RSS-Gen Issue 5
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

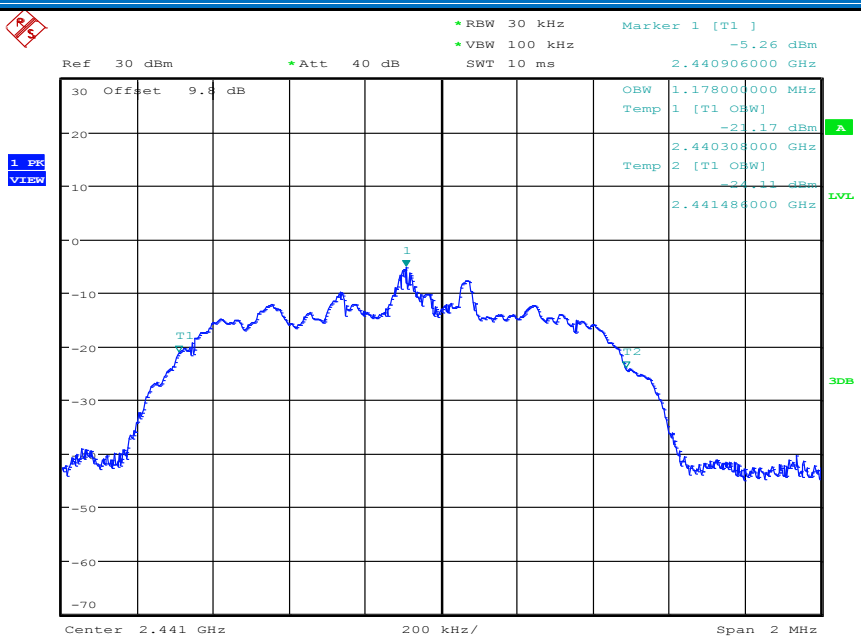
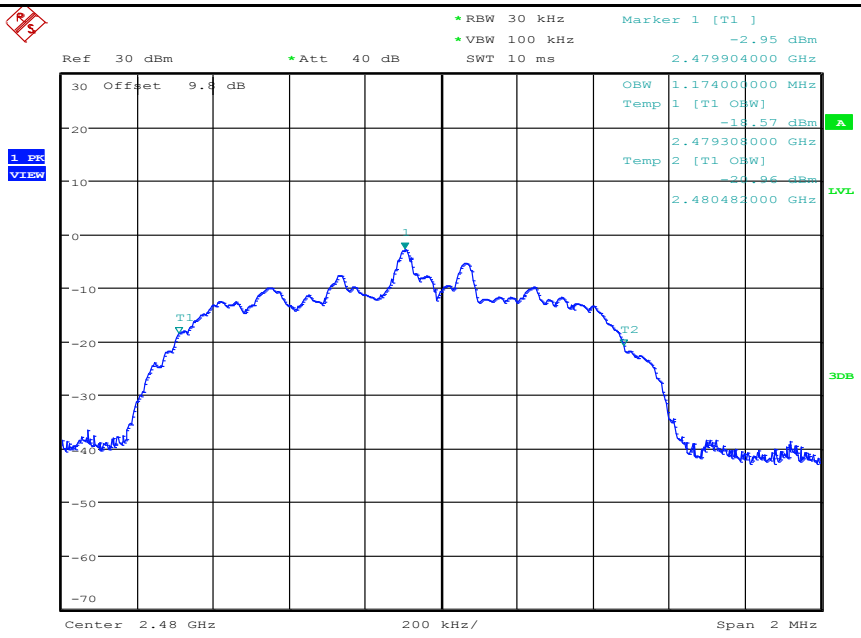
Measurement Data

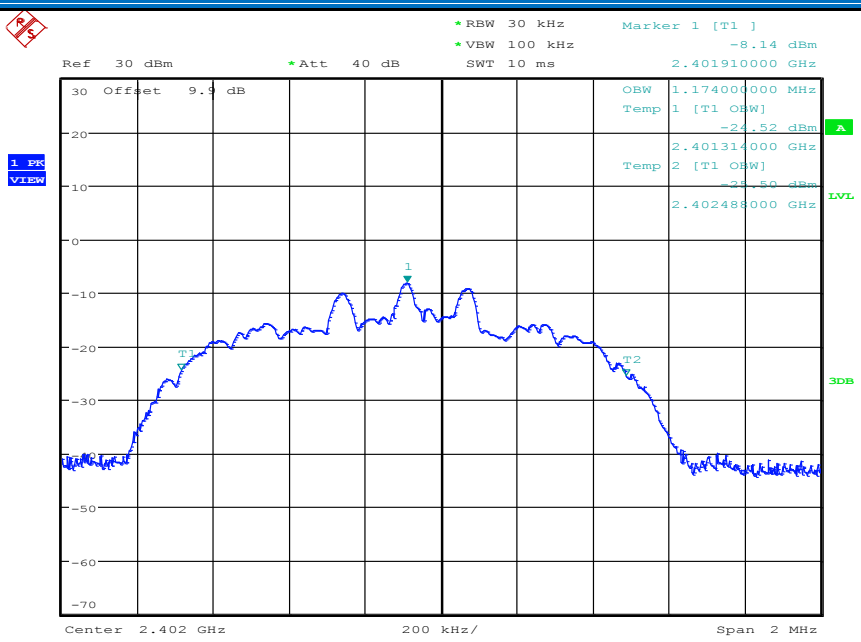
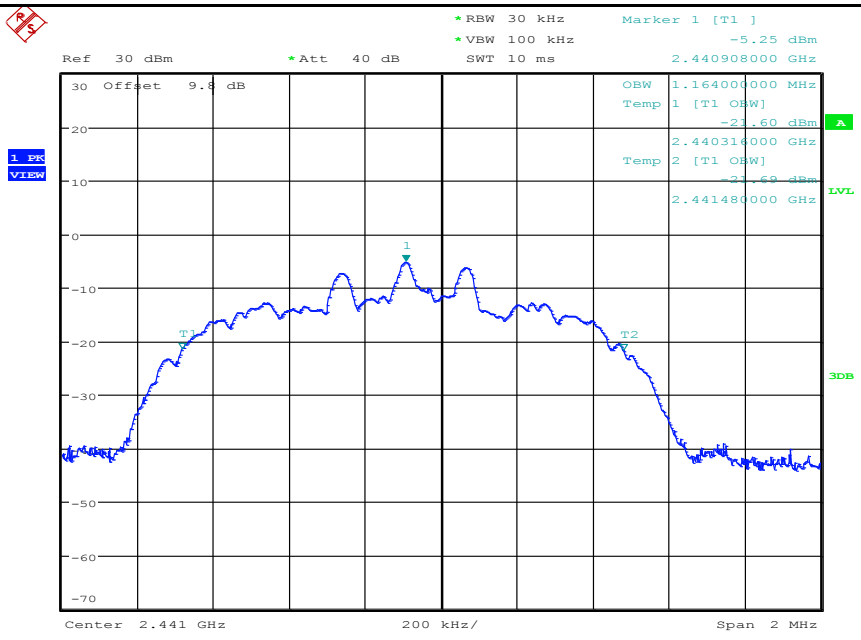
Test channel	99% Occupy Bandwidth (MHz)		
	GFSK	π/4DQPSK	8DPSK
Lowest	0.892	1.186	1.174
Middle	0.882	1.178	1.164
Highest	0.874	1.174	1.162

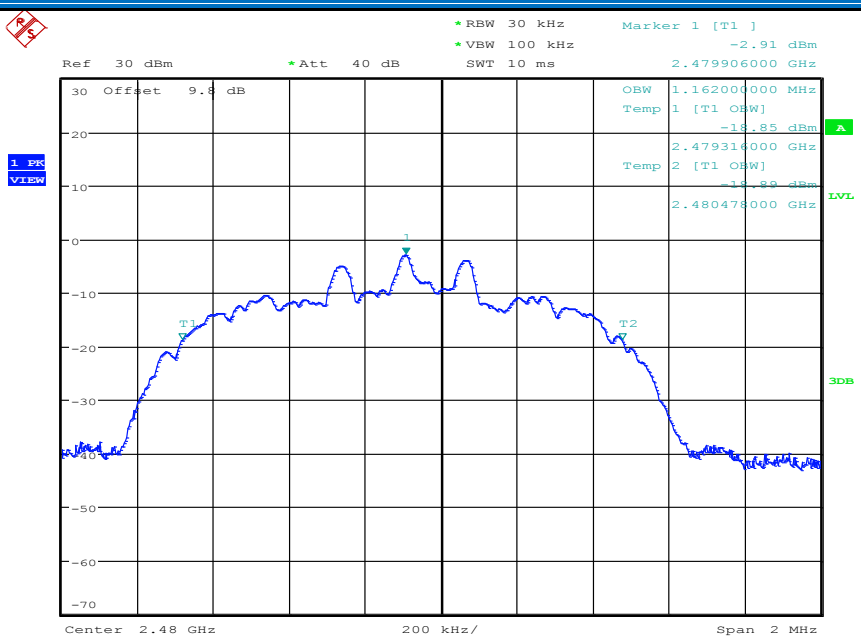
Test plot as follows:

Graphs	
GFSK/LCH	
GFSK/MCH	

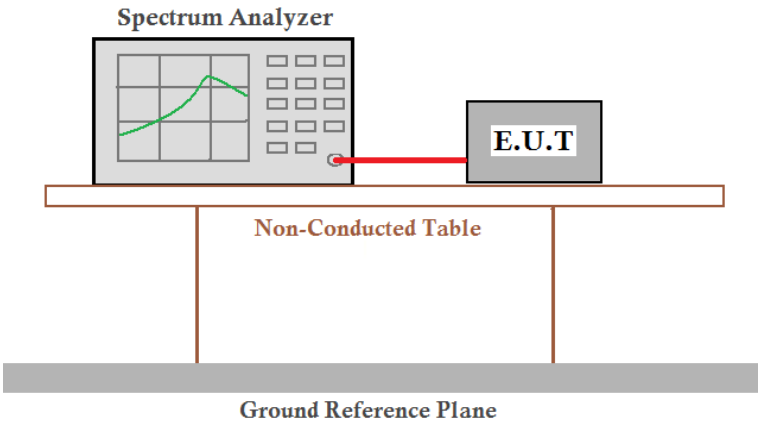
GFSK/HCH	
π/4DQPSK/LCH	

π/4DQPSK/MCH	
π/4DQPSK/HCH	

8DPSK/LCH	
8DPSK/MCH	

8DPSK/HCH	 RBW 30 kHz VBW 100 kHz SWT 10 ms Marker 1 [T1] -2.91 dBm 2.479906000 GHz Ref 30 dBm Att 40 dB 30 Offset 9.8 dB OBW 1.162000000 MHz Temp 1 [T1 OBW] -18.85 dBm 2.479316000 GHz Temp 2 [T1 OBW] -18.89 dBm 2.480478000 GHz 1 PK VIEW A LVL 3DB T1 T2 Center 2.48 GHz 200 kHz/ Span 2 MHz Date: 18.APR.2019 15:27:47

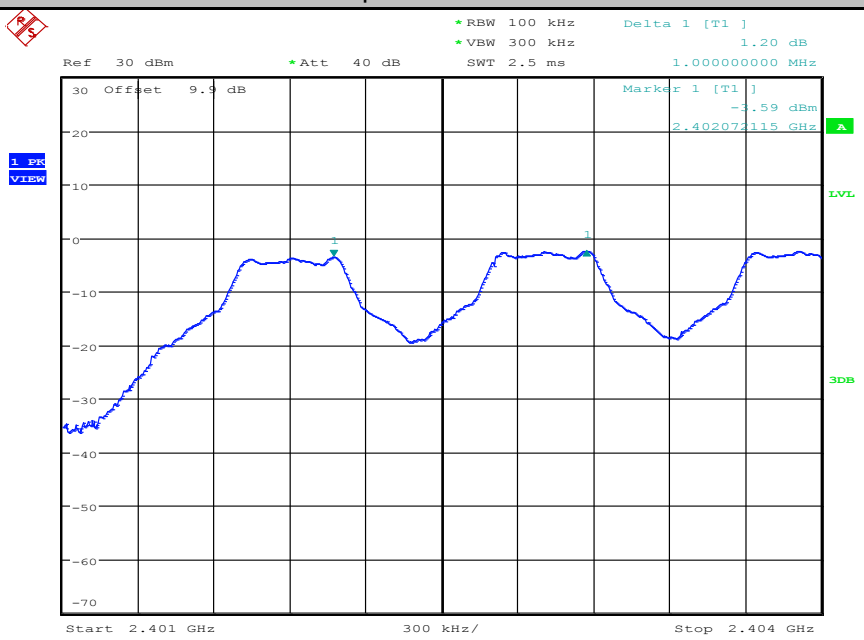
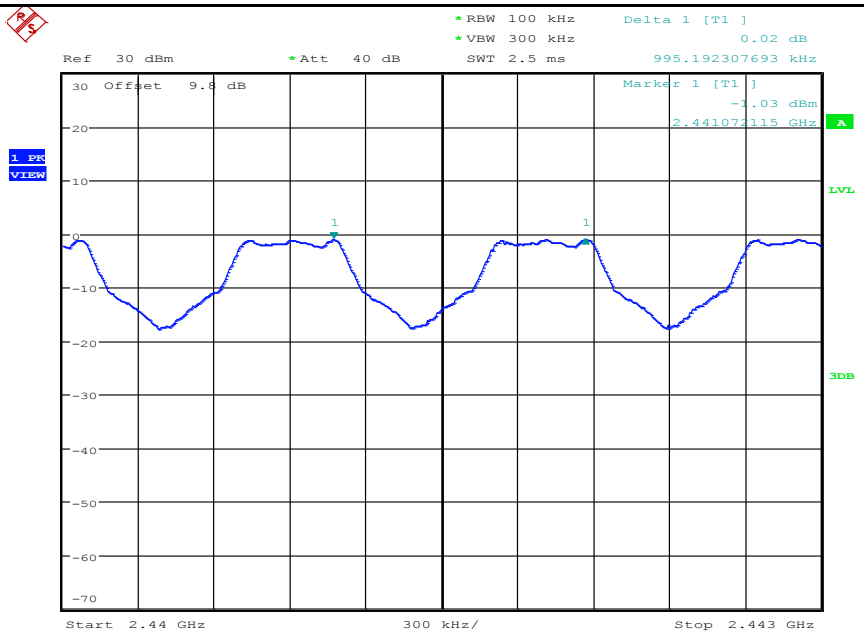
6.6 Carrier Frequencies Separation

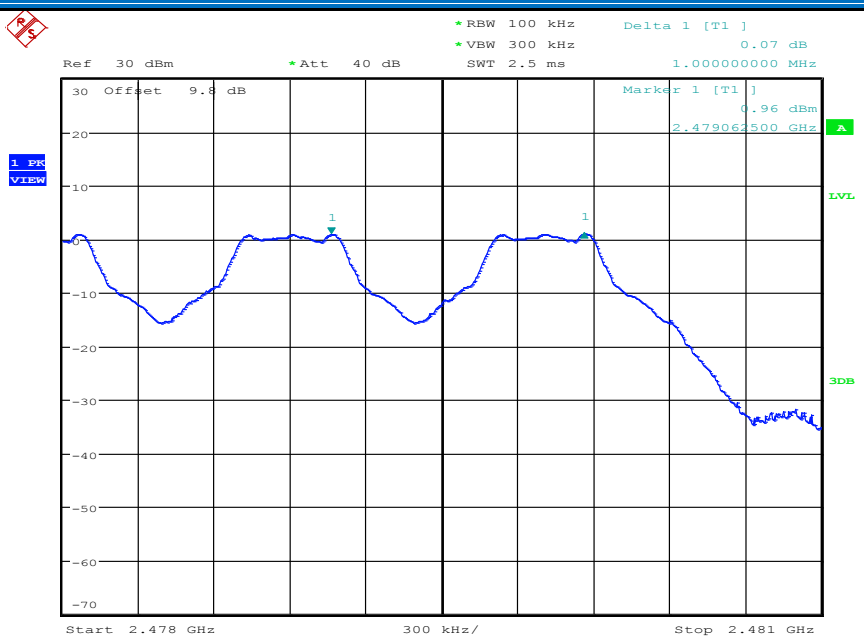
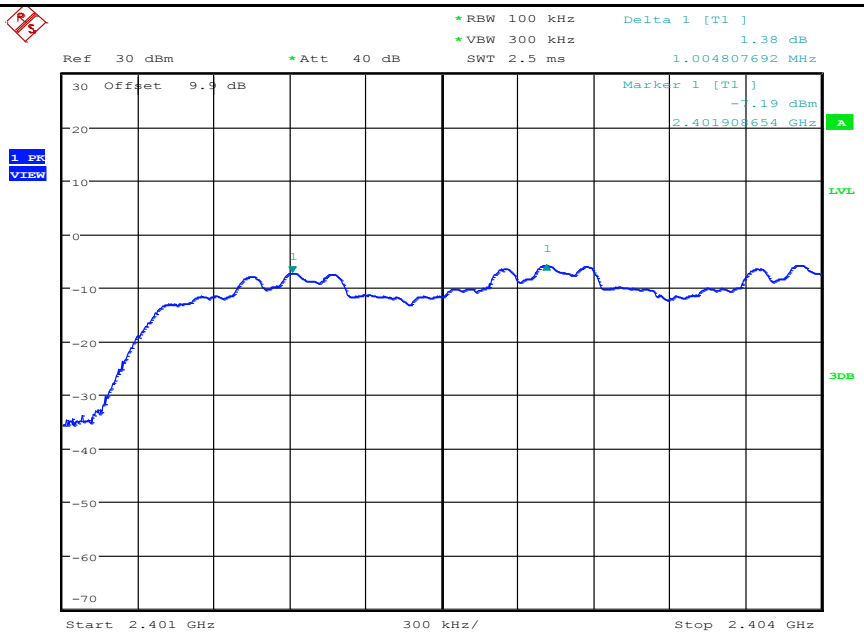
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1), RSS 247 5.1(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test Results:	Pass

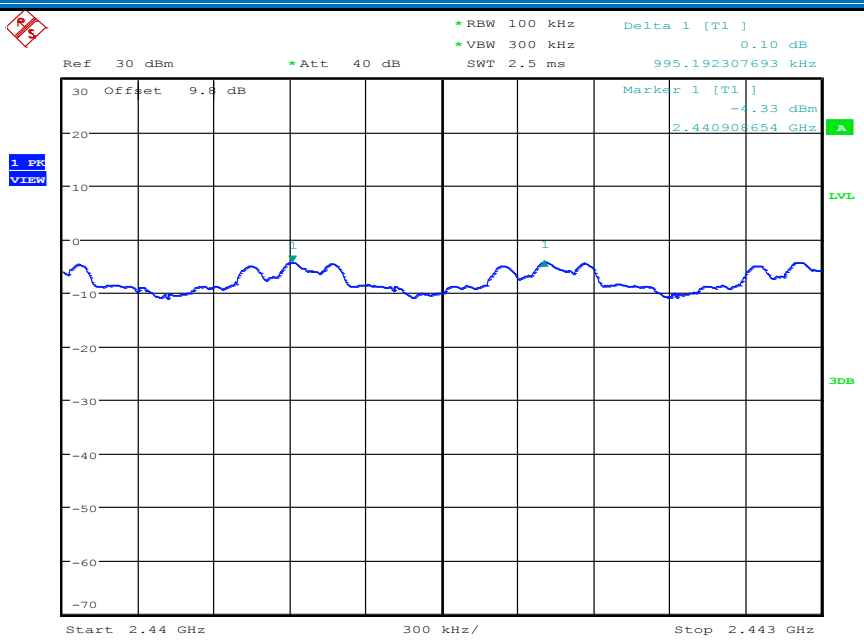
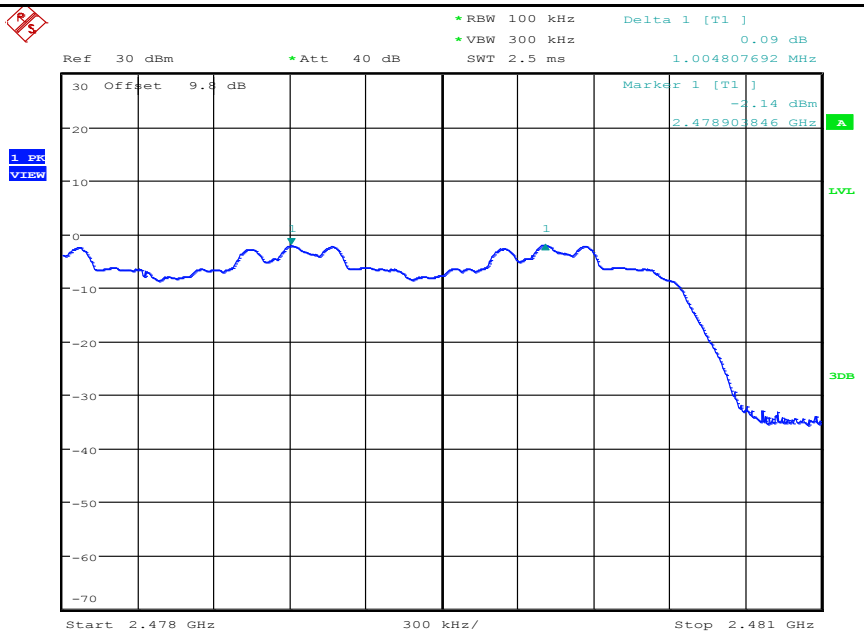
GFSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	1.000	≥0.595	Pass
Middle	0.995	≥0.595	Pass
Highest	1.000	≥0.595	Pass
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation(MHz)	Limit (MHz)	Result
Lowest	1.005	≥0.791	Pass
Middle	0.995	≥0.791	Pass
Highest	1.005	≥0.791	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	1.010	≥0.783	Pass
Middle	1.010	≥0.783	Pass
Highest	1.000	≥0.783	Pass

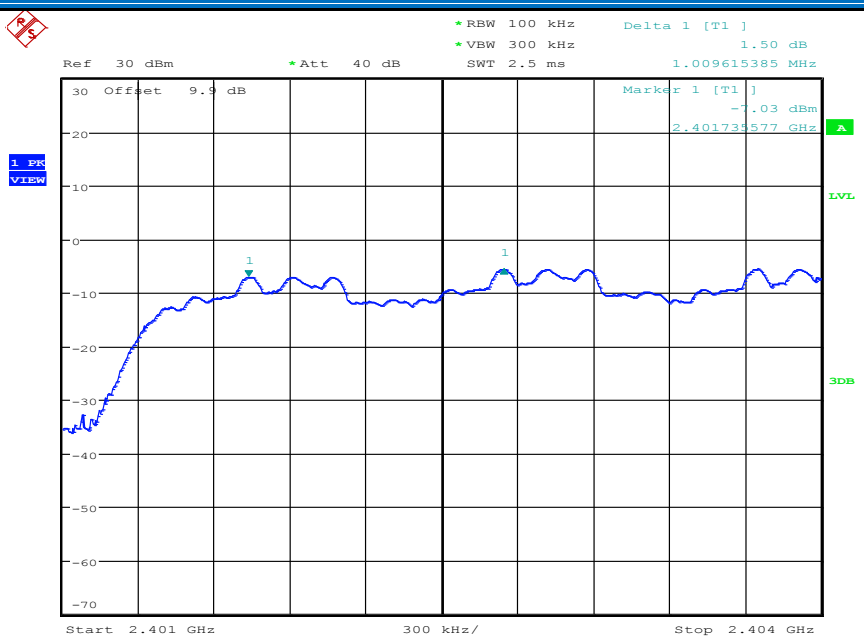
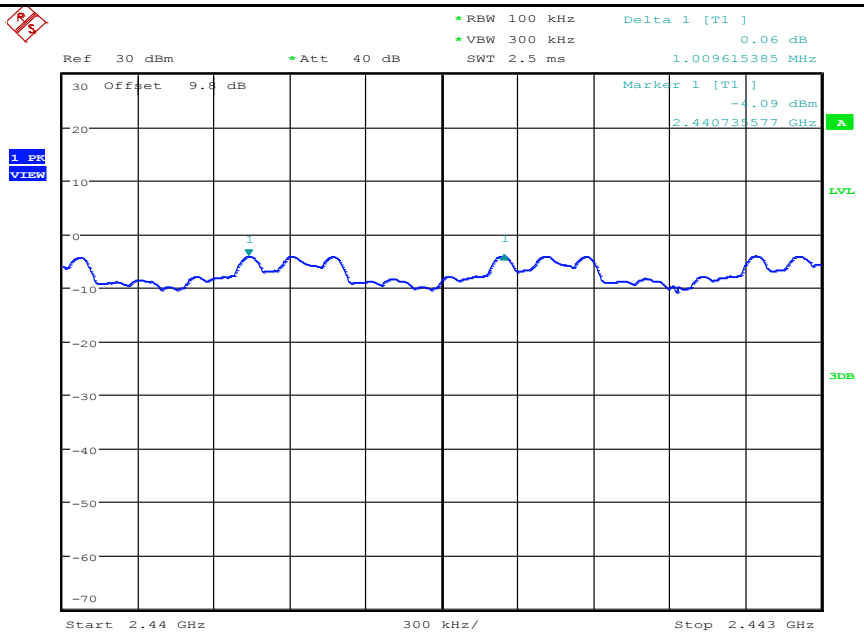
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	0.892	0.595
π/4DQPSK	1.186	0.791
8DPSK	1.174	0.783

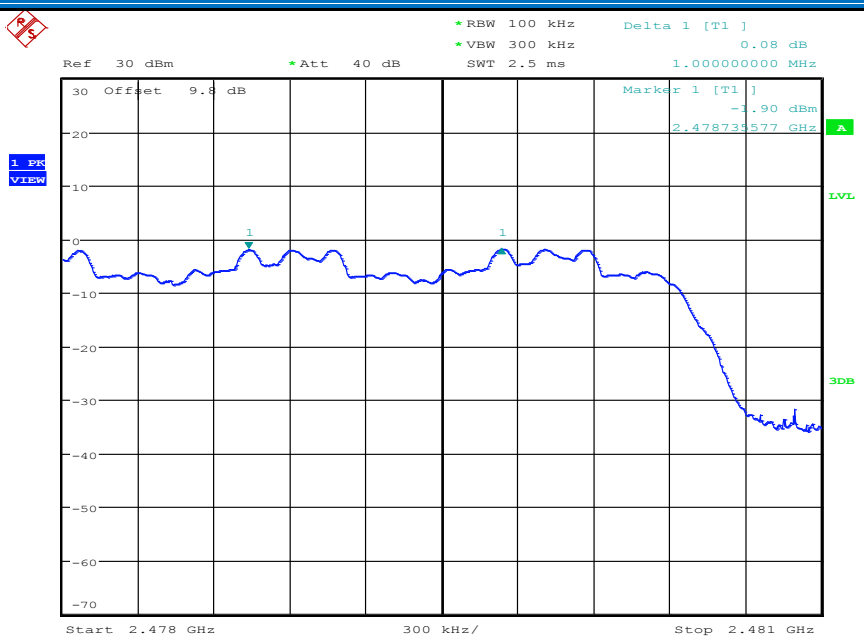
Test plot as follows:

Graphs	
GFSK/LCH	
GFSK/MCH	

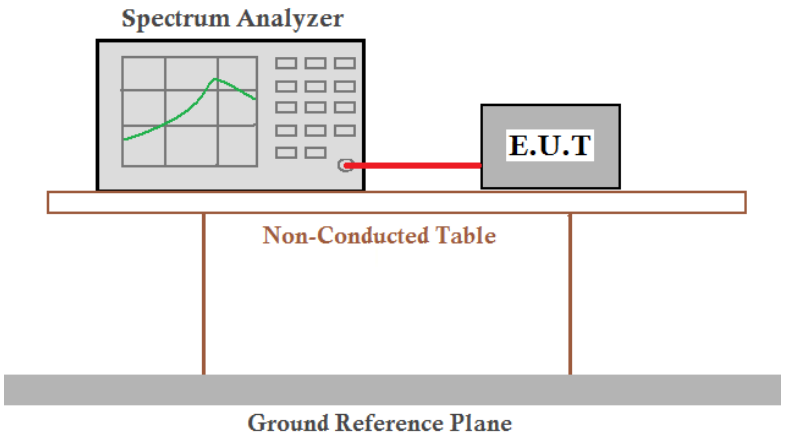
GFSK/HCH	 Date: 18.APR.2019 15:44:42
π/4DQPSK/LCH	 Date: 18.APR.2019 16:02:03

π/4DQPSK/MCH	 Date: 18.APR.2019 16:04:43
π/4DQPSK/HCH	 Date: 18.APR.2019 16:10:12

8DPSK/LCH	 Date: 18.APR.2019 17:30:45
8DPSK/MCH	 Date: 18.APR.2019 17:35:55

8DPSK/HCH	 RBW 100 kHz VBW 300 kHz SWT 2.5 ms Delta 1 [T1] 0.08 dB 1.000000000 MHz Ref 30 dBm Att 40 dB 30 Offset 9.8 dB Marker 1 [T1] -1.90 dBm 2.478735577 GHz 1 PK VIEW A LVL 3DB Start 2.478 GHz 300 kHz/ Stop 2.481 GHz Date: 18.APR.2019 17:41:32

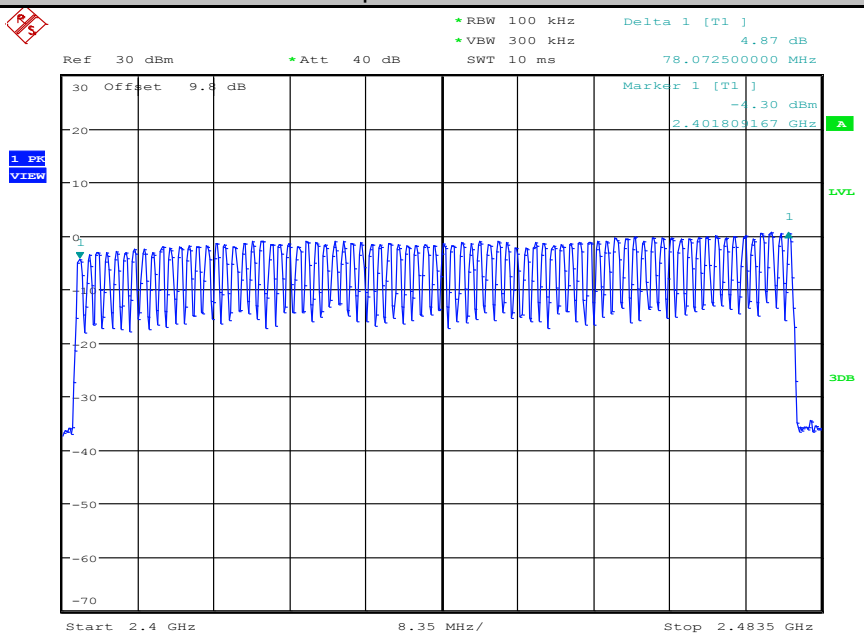
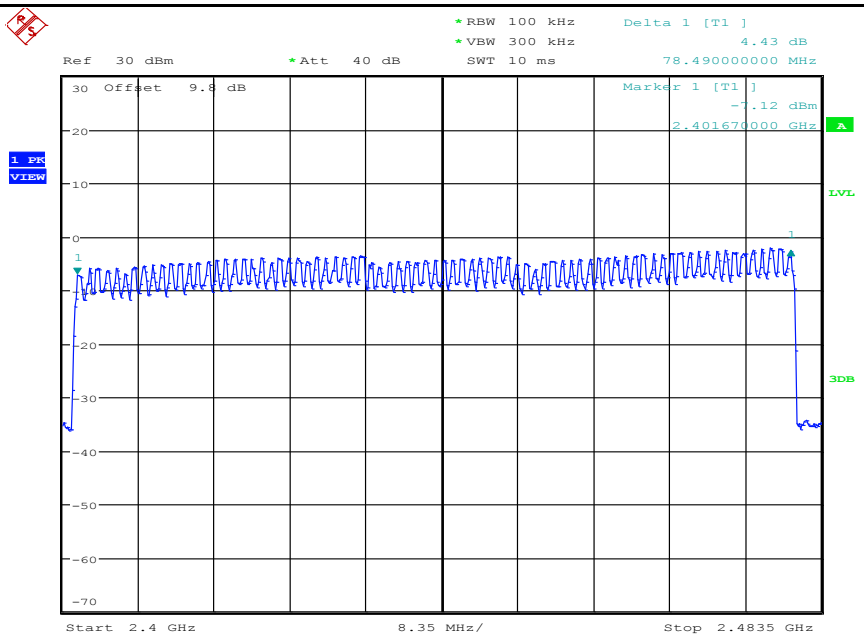
6.7 Hopping Channel Number

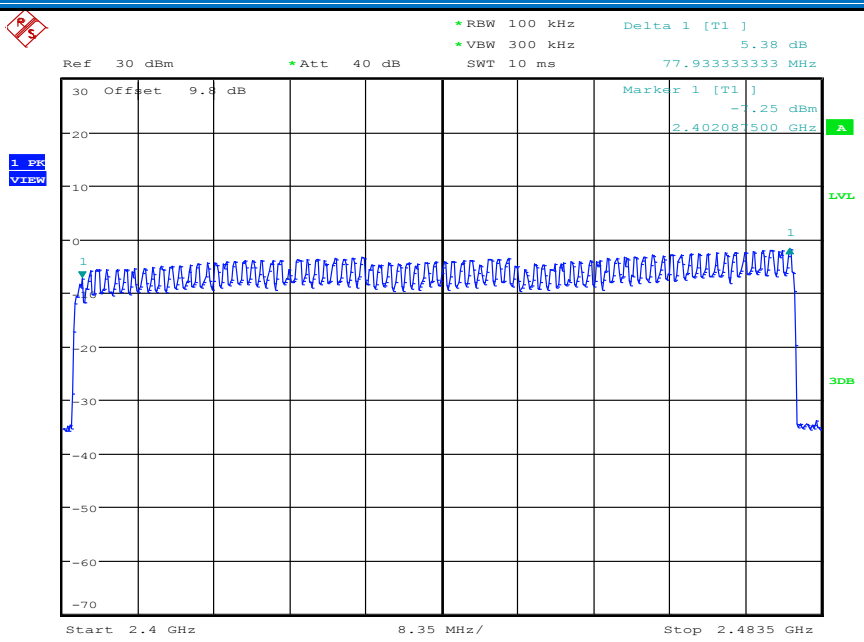
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1), RSS 247 5.1(4)
Test Method:	ANSI C63.10: 2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	At least 15 channels
Exploratory Test Mode:	hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Only the worst case is recorded in the report.
Test Results:	Pass

Measurement Data

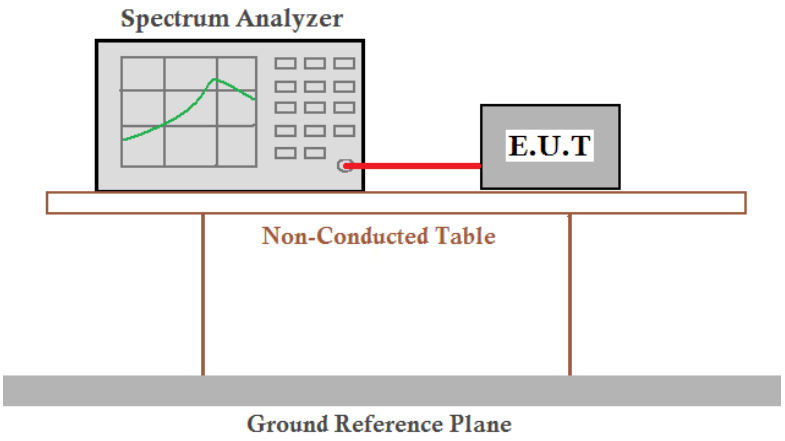
Test mode	Hopping channel numbers	Limit	Results
GFSK	79	15	Pass
π/4DQPSK	79	15	Pass
8DPSK	79	15	Pass

Test plot as follows:

Graphs	
GFSK/Hop	 Date: 18.APR.2019 15:46:14
π/4DQPSK/Hop	 Date: 18.APR.2019 16:26:49

8DPSK/Hop	 RBW 100 kHz VBW 300 kHz SWT 10 ms Delta 1 [T1] 5.38 dB 77.933333333 MHz Ref 30 dBm Att 40 dB 30 Offset 9.8 dB Marker 1 [T1] -7.25 dBm 2.402087500 GHz 1 PK VIEW A LVL 3DB Start 2.4 GHz 8.35 MHz/ Stop 2.4835 GHz Date: 18.APR.2019 17:55:18

6.8 Dwell Time

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1), RSS 247 5.1(4)
Test Method:	ANSI C63.10: 2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	≤0.4 Second
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Test Results:	Pass

Measurement Data

Mode	Packet	Channel	Burst Width [ms/hop/ch]	Dwell Time[s]	Limit (second)
GFSK	DH1	LCH	0.41	0.131	≤0.4
GFSK	DH1	MCH	0.41	0.131	≤0.4
GFSK	DH1	HCH	0.41	0.131	≤0.4
π/4DQPSK	2DH1	LCH	0.42	0.134	≤0.4
π/4DQPSK	2DH1	MCH	0.42	0.134	≤0.4
π/4DQPSK	2DH1	HCH	0.42	0.134	≤0.4
8DPSK	3DH1	LCH	0.42	0.134	≤0.4
8DPSK	3DH1	MCH	0.42	0.134	≤0.4
8DPSK	3DH1	HCH	0.42	0.134	≤0.4
GFSK	DH3	LCH	1.66	0.266	≤0.4
GFSK	DH3	MCH	1.66	0.266	≤0.4
GFSK	DH3	HCH	1.66	0.266	≤0.4
π/4DQPSK	2DH3	LCH	1.67	0.267	≤0.4
π/4DQPSK	2DH3	MCH	1.67	0.267	≤0.4
π/4DQPSK	2DH3	HCH	1.67	0.267	≤0.4
8DPSK	3DH3	LCH	1.67	0.267	≤0.4
8DPSK	3DH3	MCH	1.67	0.267	≤0.4
8DPSK	3DH3	HCH	1.67	0.267	≤0.4
GFSK	DH5	LCH	2.91	0.31	≤0.4
GFSK	DH5	MCH	2.91	0.31	≤0.4
GFSK	DH5	HCH	2.91	0.31	≤0.4
π/4DQPSK	2DH5	LCH	2.92	0.312	≤0.4
π/4DQPSK	2DH5	MCH	2.92	0.312	≤0.4
π/4DQPSK	2DH5	HCH	2.92	0.312	≤0.4
8DPSK	3DH5	LCH	2.92	0.312	≤0.4
8DPSK	3DH5	MCH	2.92	0.312	≤0.4
8DPSK	3DH5	HCH	2.92	0.312	≤0.4

Remark:

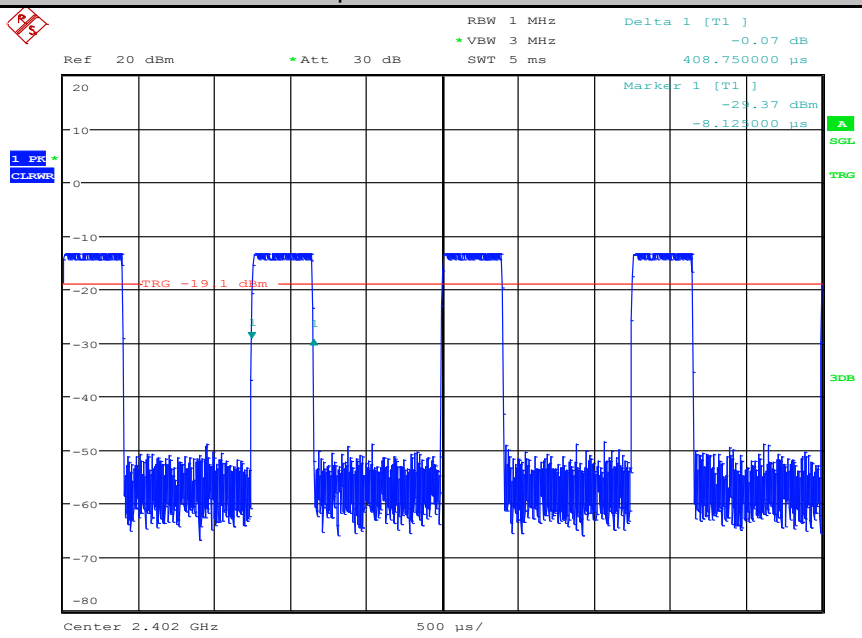
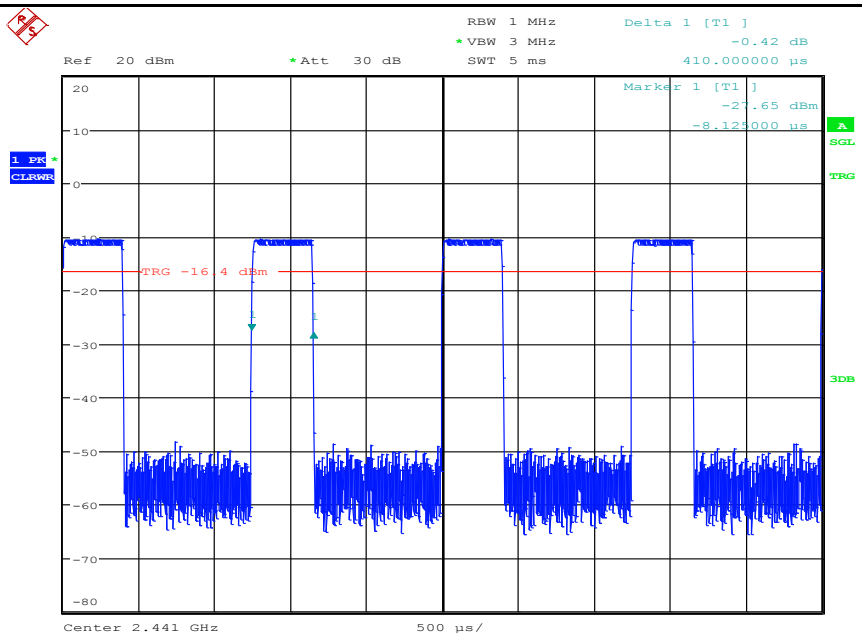
The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

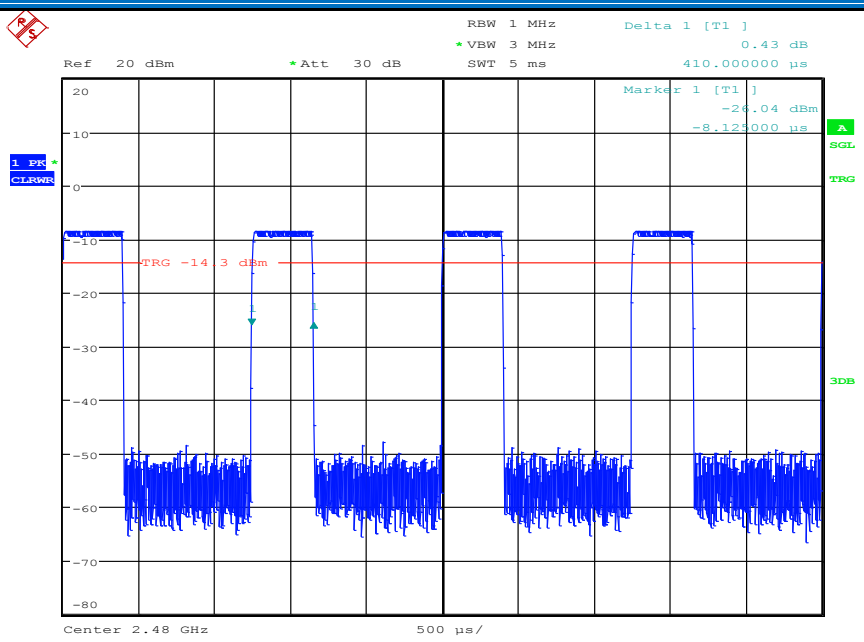
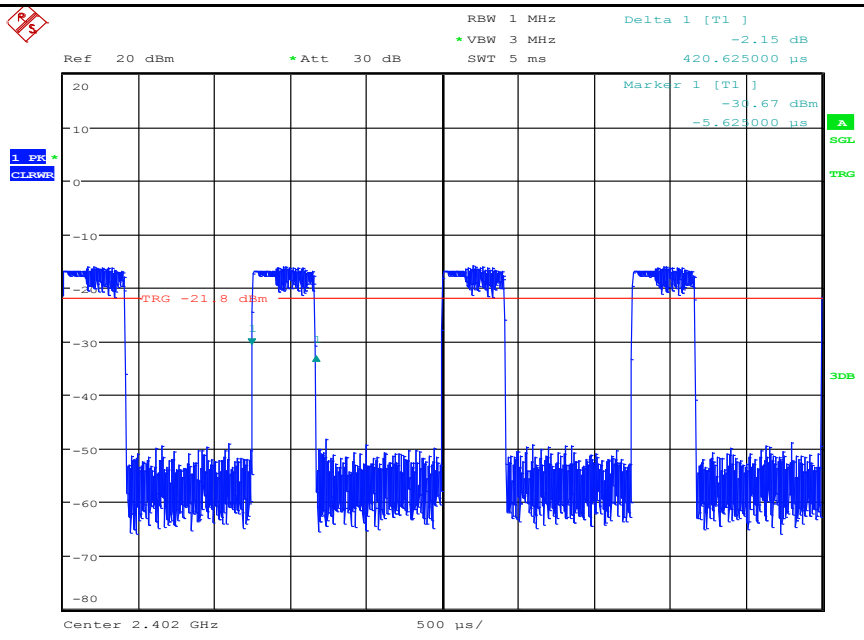
DH1/2DH1/3DH1 Dwell time = Burst Width(ms)*(1600/ (2*79))*31.6

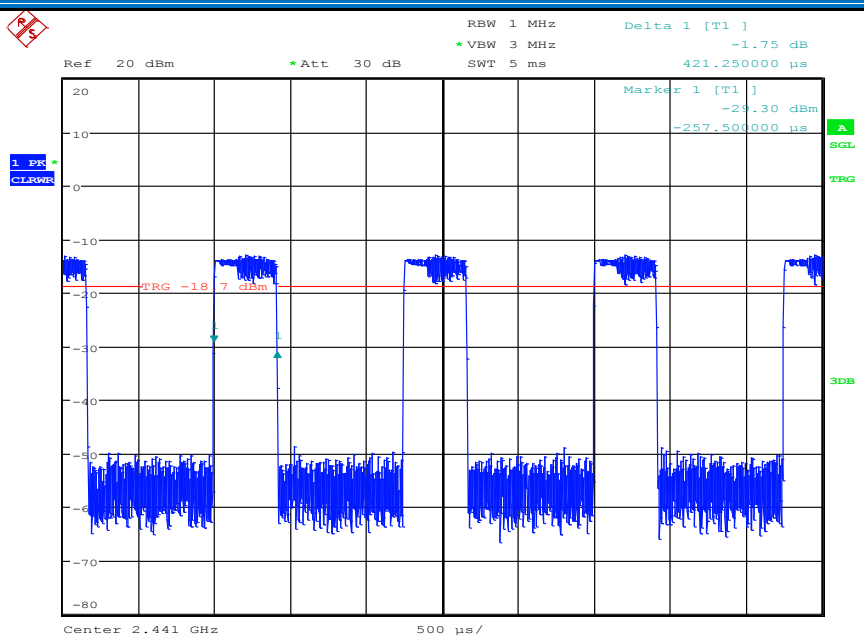
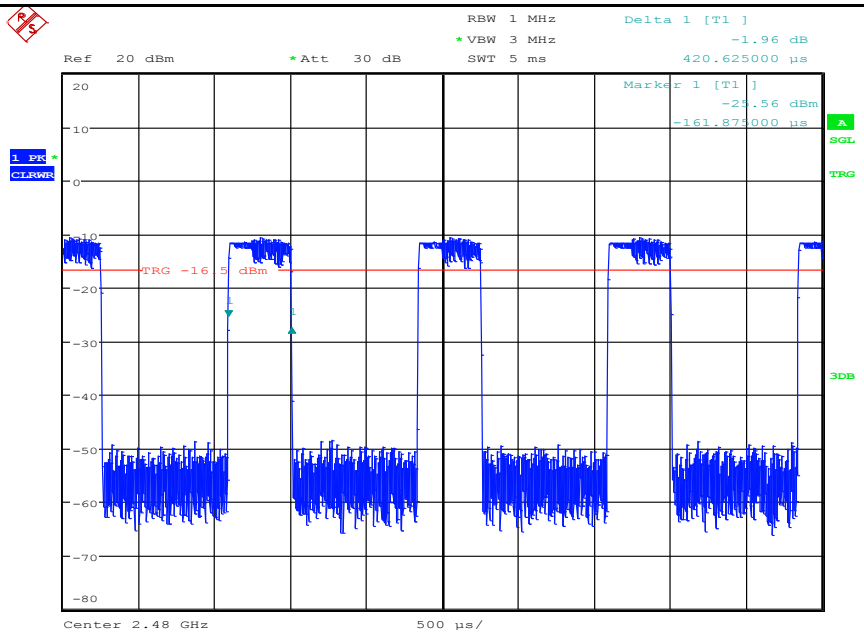
DH3/2DH3/3DH3 Dwell time = Burst Width (ms)*(1600/ (4*79))*31.6

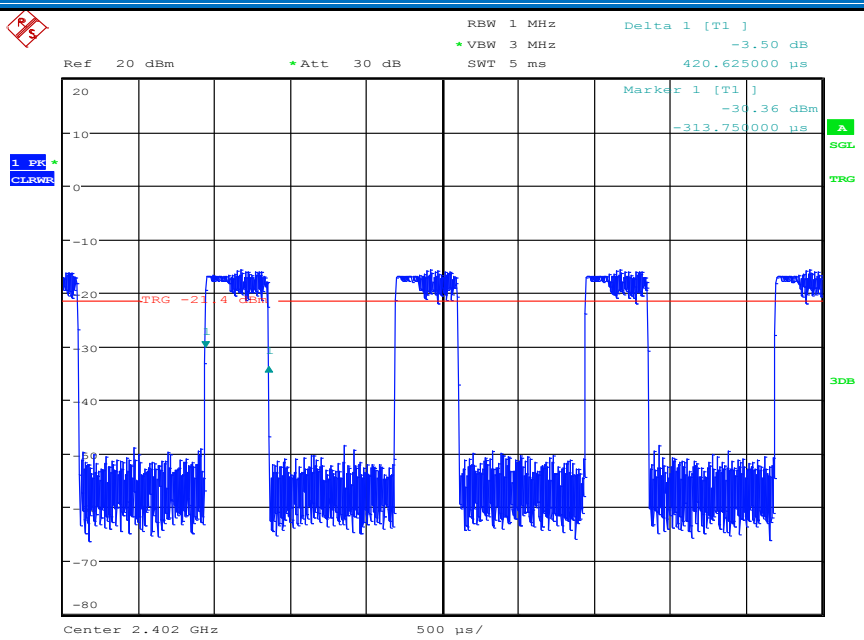
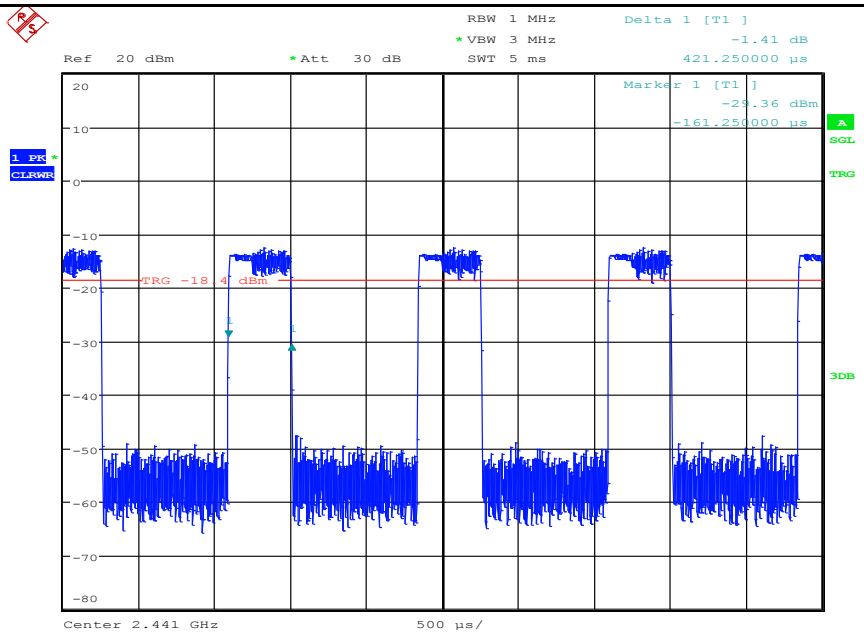
DH5/2DH5/3DH5 Dwell time = Burst Width (ms)*(1600/ (6*79))*31.6

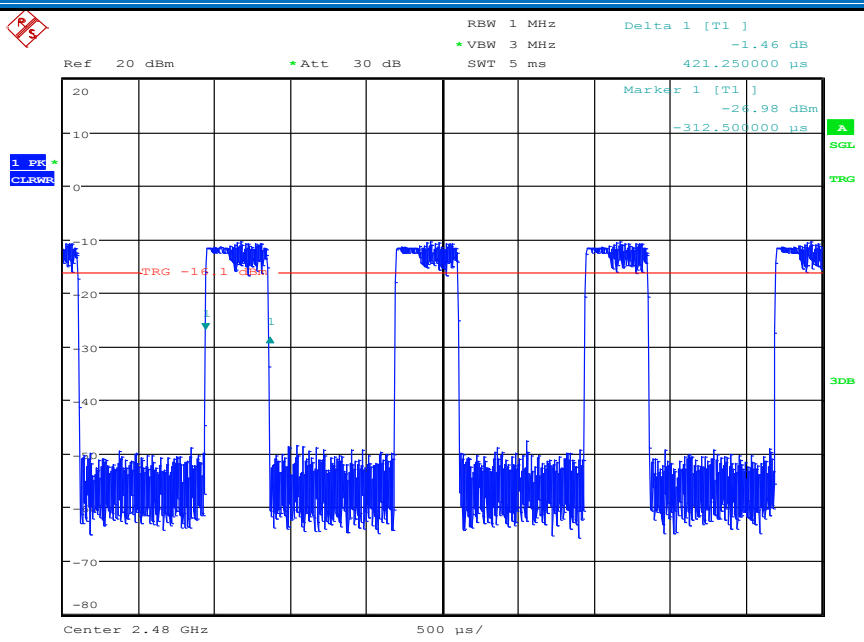
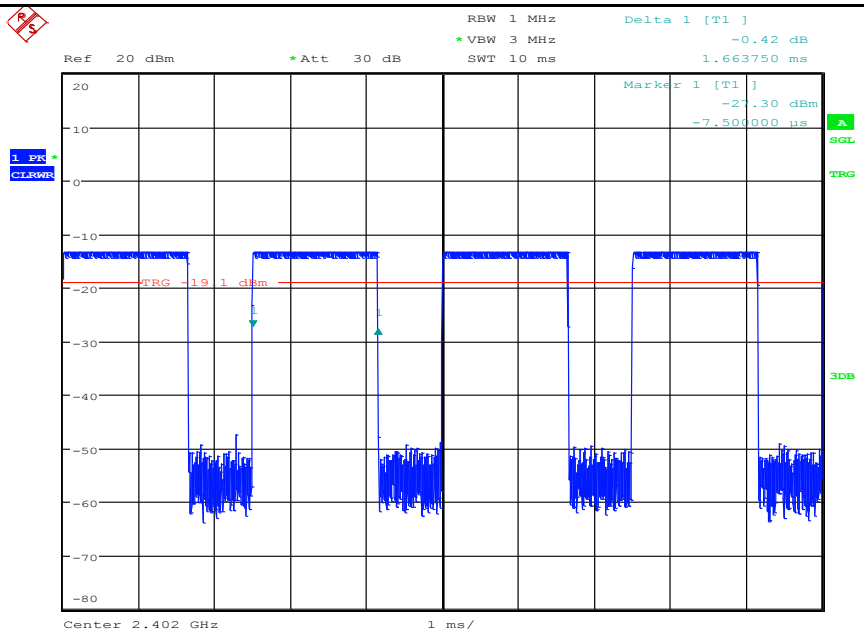
Test plot as follows:

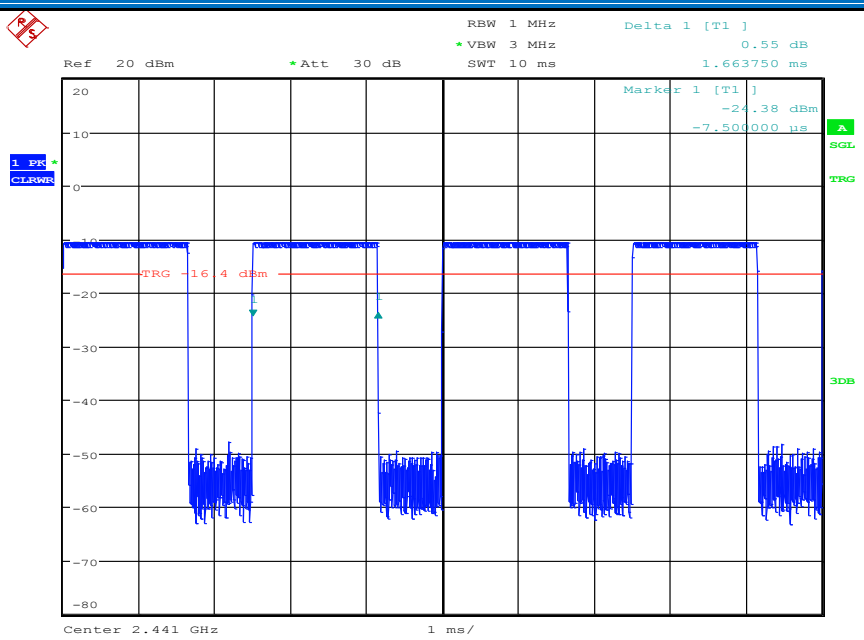
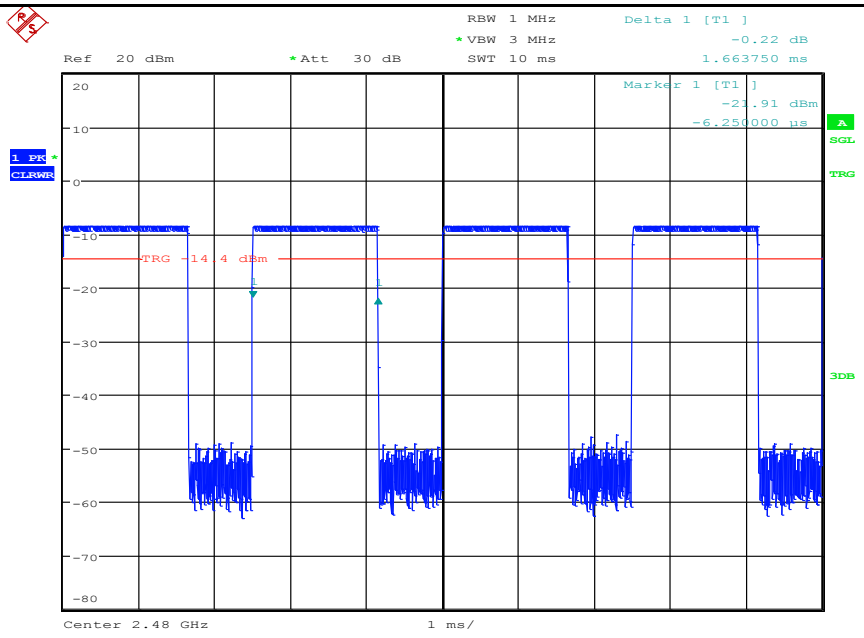
Graphs	
GFSK_DH1/LCH	 Date: 18.APR.2019 18:10:14
GFSK_DH1/MCH	 Date: 18.APR.2019 18:10:47

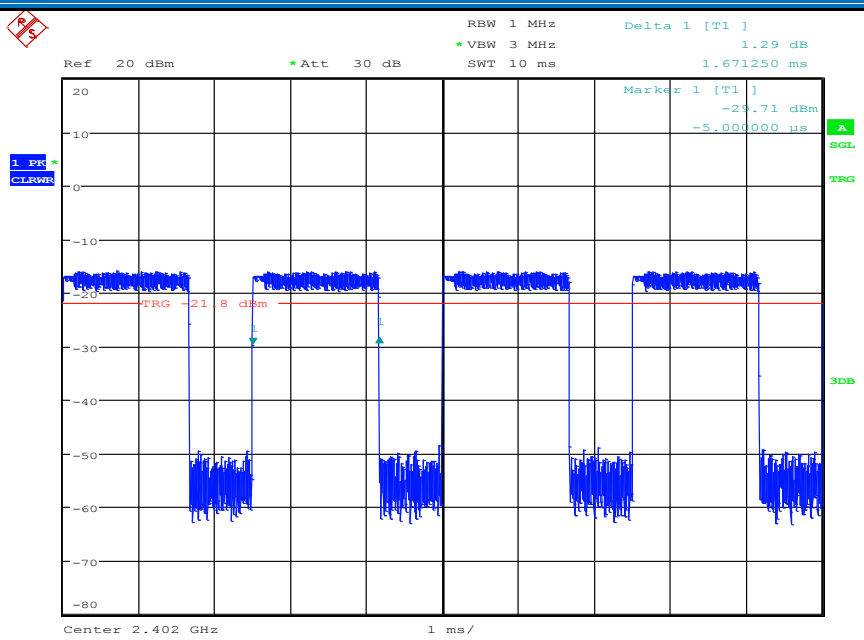
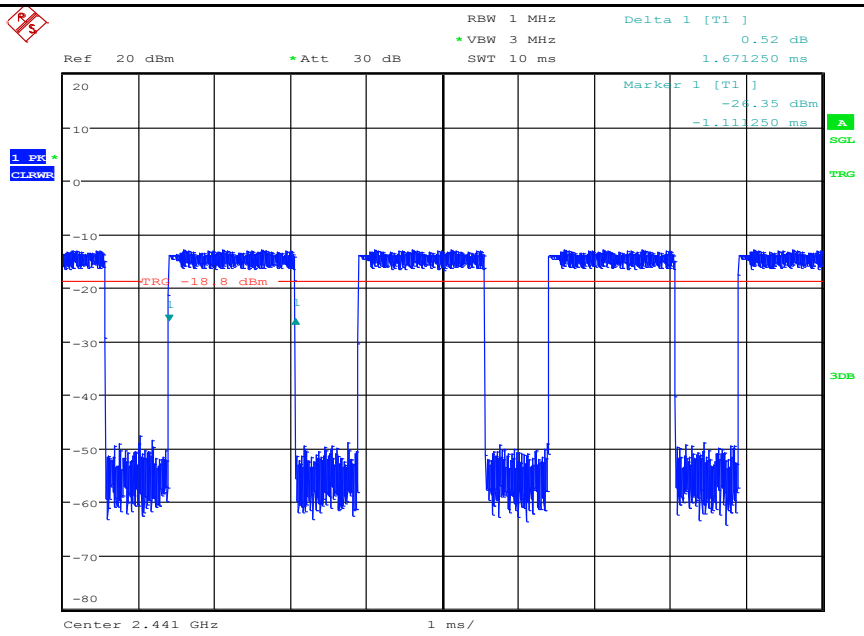
GFSK_DH1/HCH	 Date: 18.APR.2019 18:11:38
π/4DQPSK _2DH1/LCH	 Date: 18.APR.2019 18:16:21

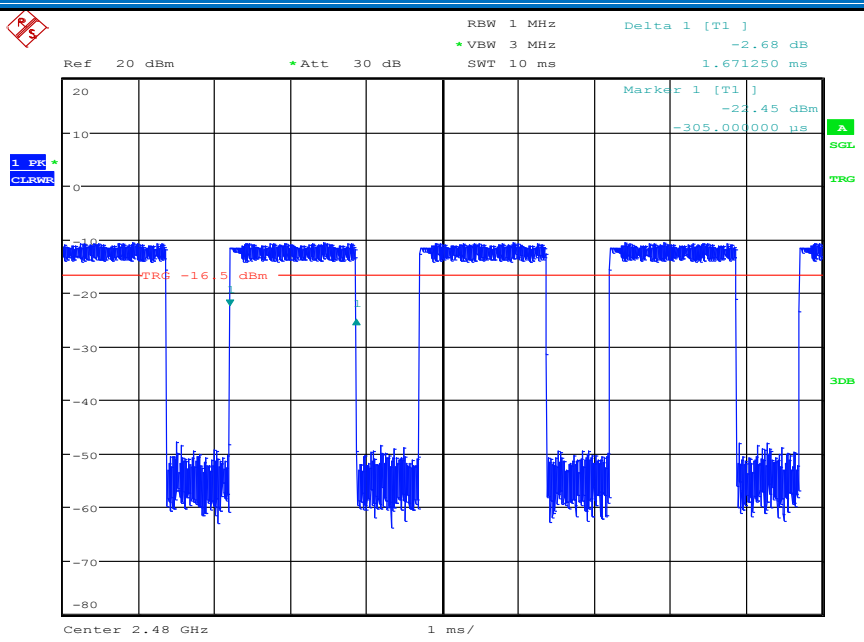
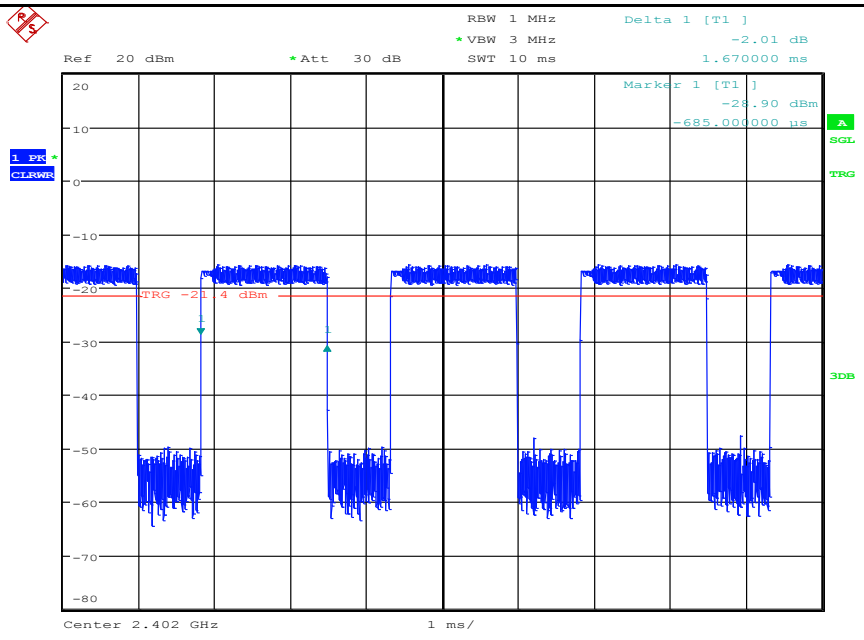
π/4DQPSK _2DH1/MCH	 Date: 18.APR.2019 18:16:52
π/4DQPSK _2DH1/HCH	 Date: 18.APR.2019 18:17:18

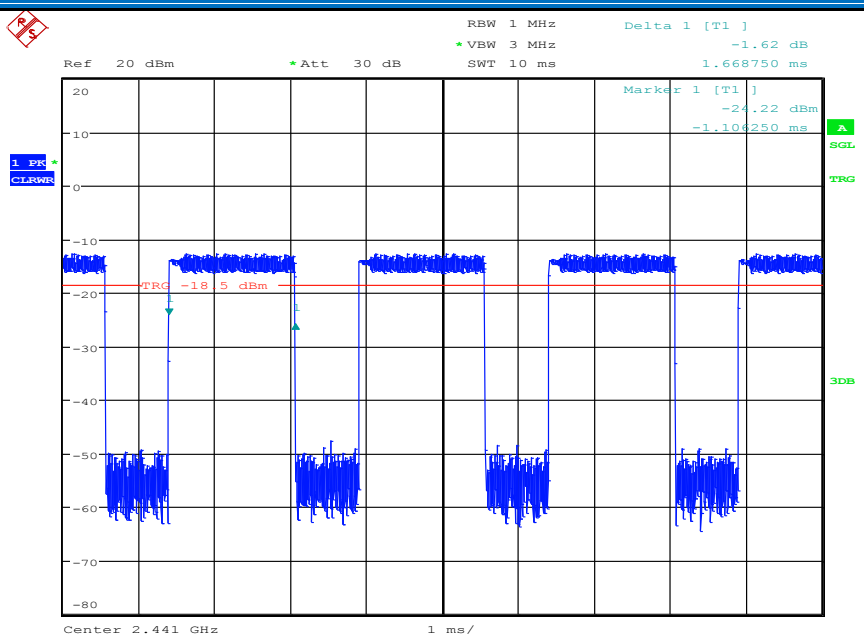
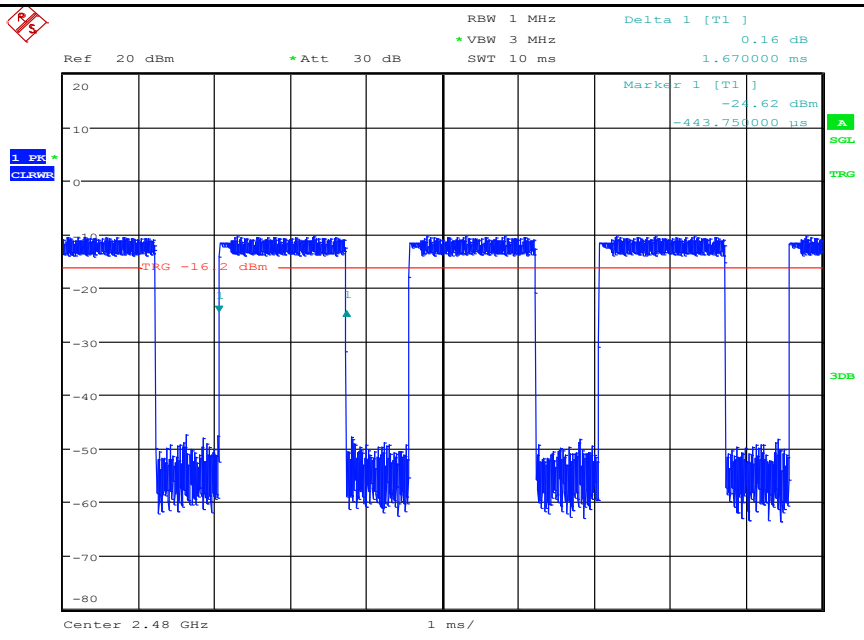
8DPSK _3DH1/LCH	 Date: 18.APR.2019 18:21:53
8DPSK _3DH1/MCH	 Date: 18.APR.2019 18:22:26

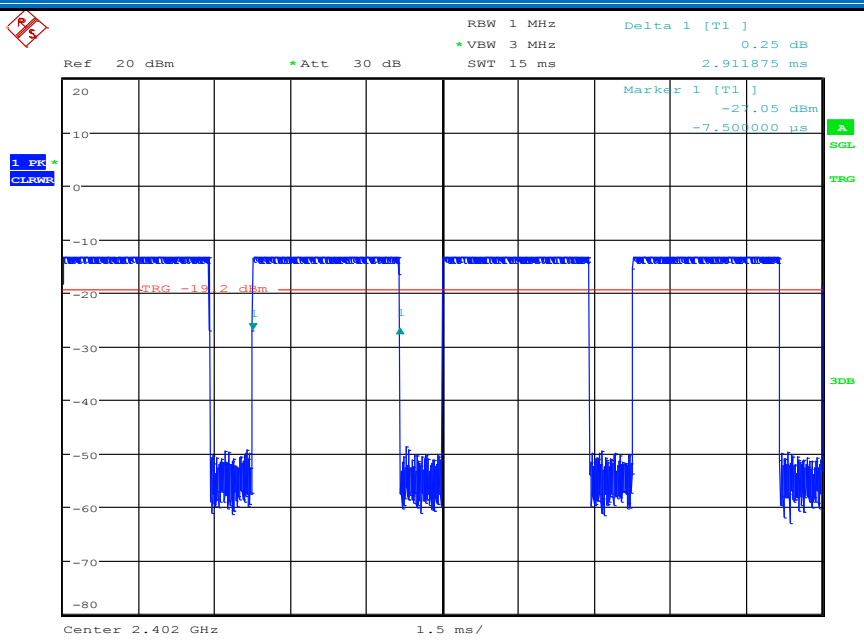
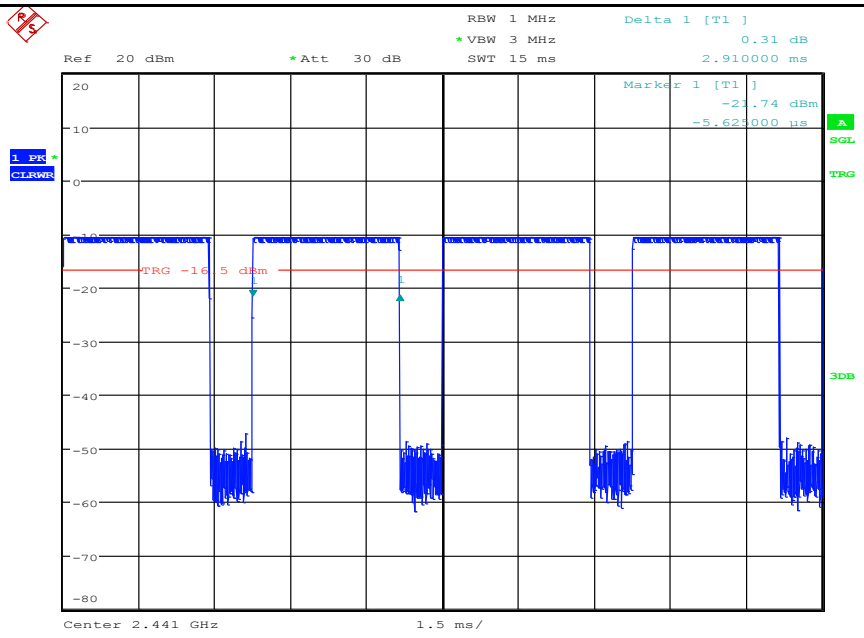
8DPSK _3DH1/HCH	
GFSK_DH3/LCH	

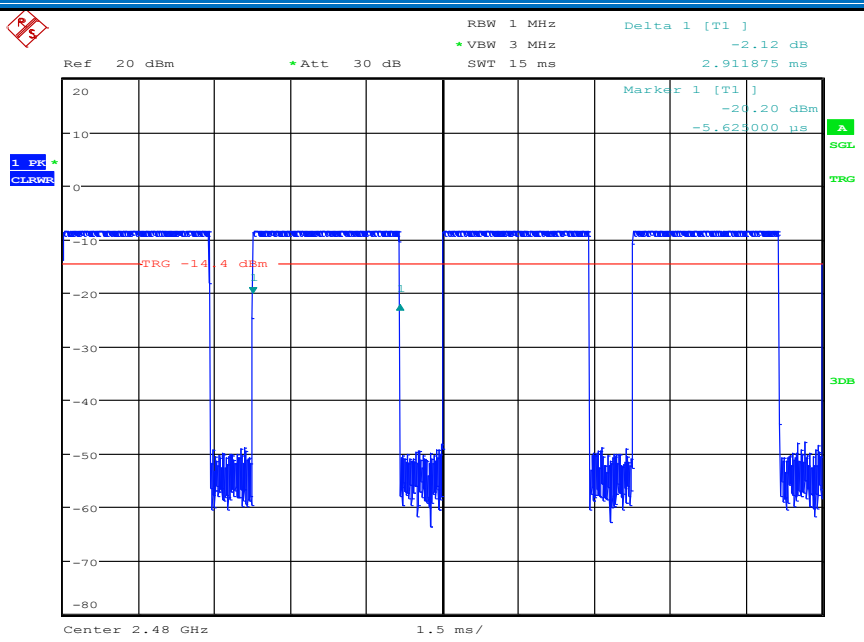
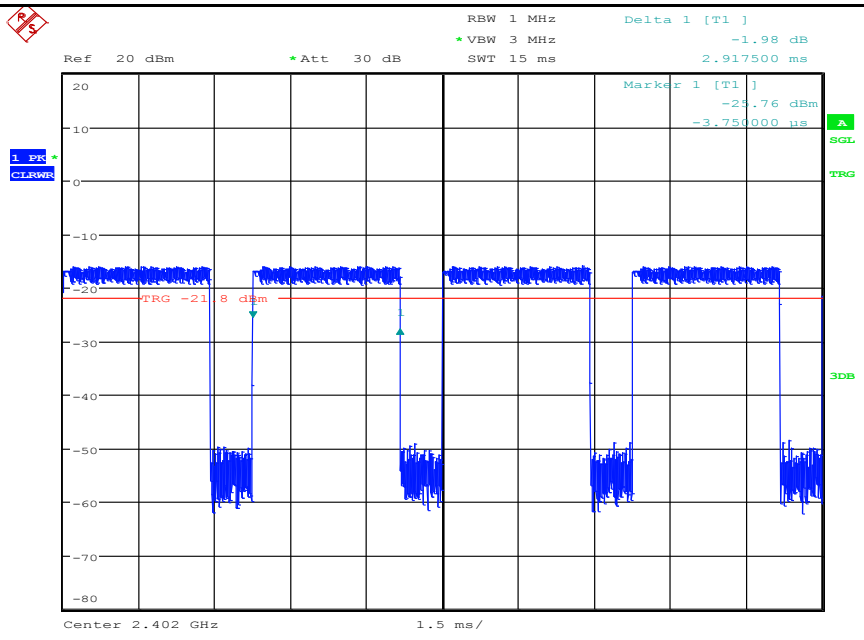
GFSK_DH3/MCH	 Date: 18.APR.2019 18:13:12
GFSK_DH3/HCH	 Date: 18.APR.2019 18:13:41

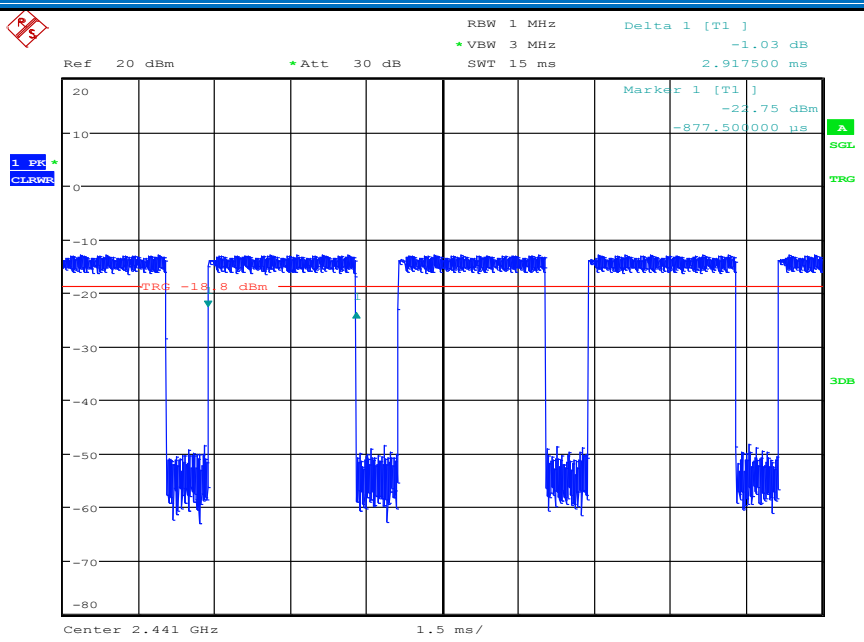
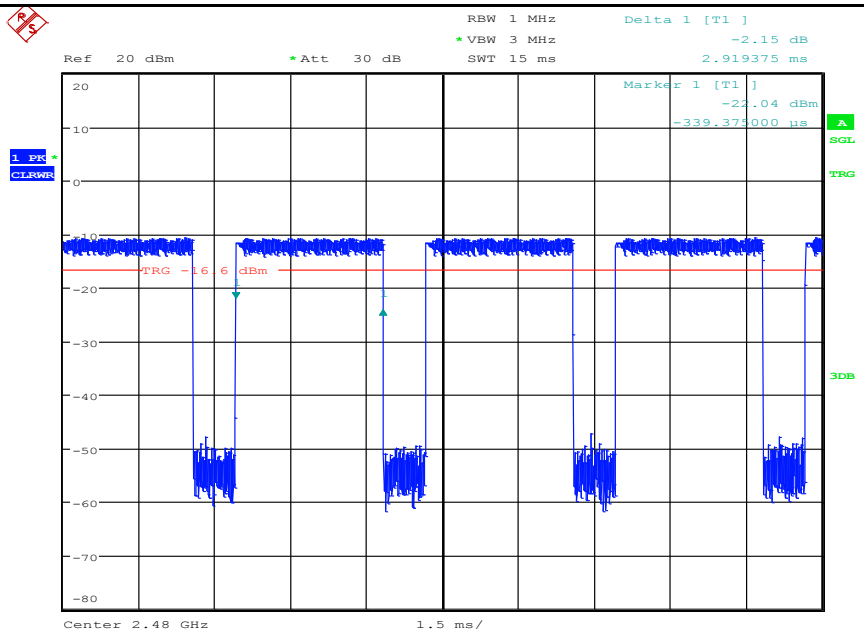
π/4DQPSK _2DH3/LCH	 Date: 18.APR.2019 18:18:21
π/4DQPSK _2DH3/MCH	 Date: 18.APR.2019 18:18:51

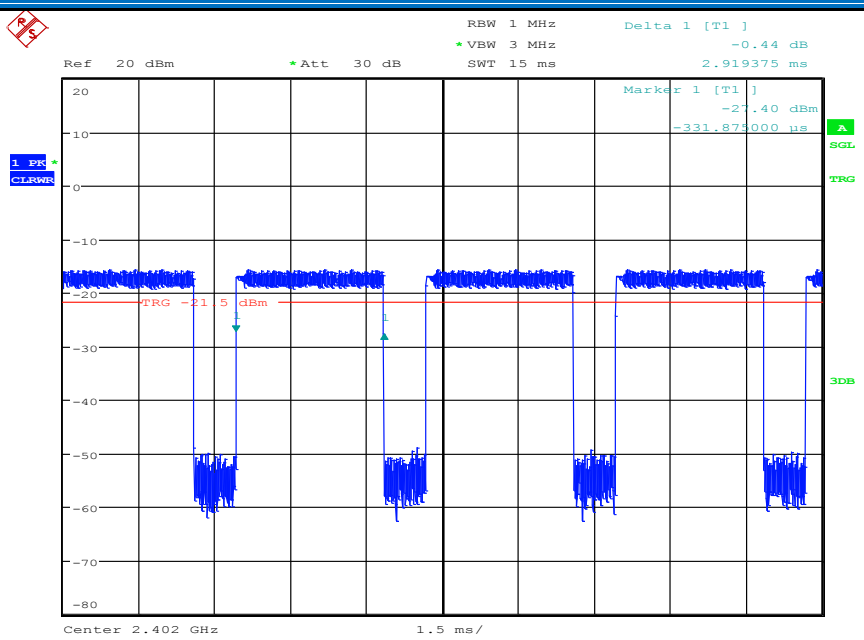
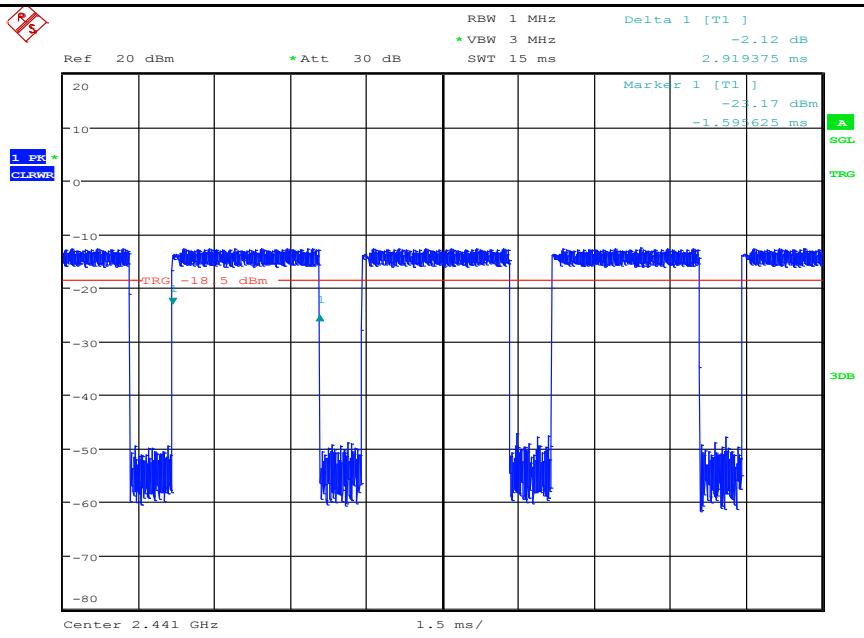
π/4DQPSK _2DH3/HCH	 Date: 18.APR.2019 18:19:28
8DPSK _3DH3/LCH	 Date: 18.APR.2019 18:23:43

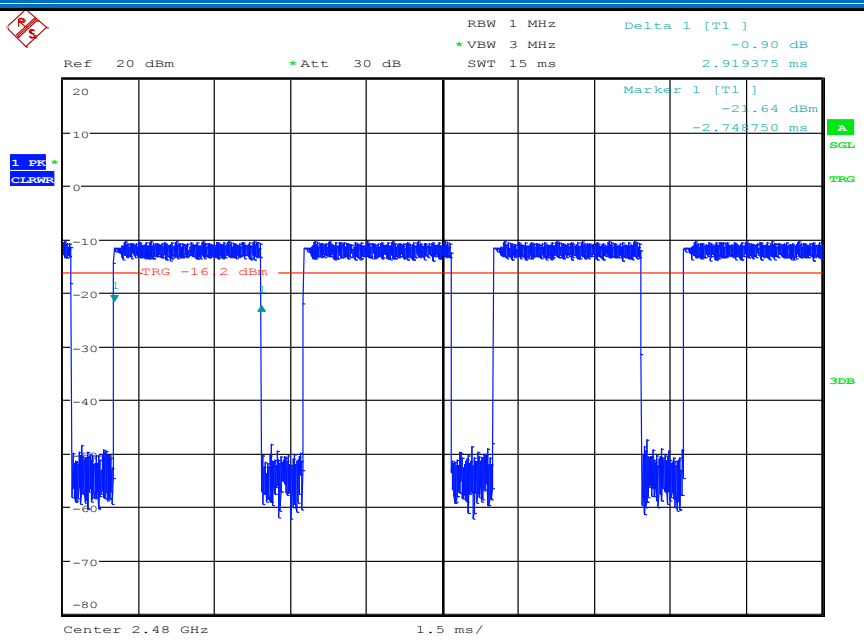
8DPSK _3DH3/MCH	
8DPSK _3DH3/HCH	

GFSK_DH5/LCH	 Date: 18.APR.2019 18:14:29
GFSK_DH5/MCH	 Date: 18.APR.2019 18:14:59

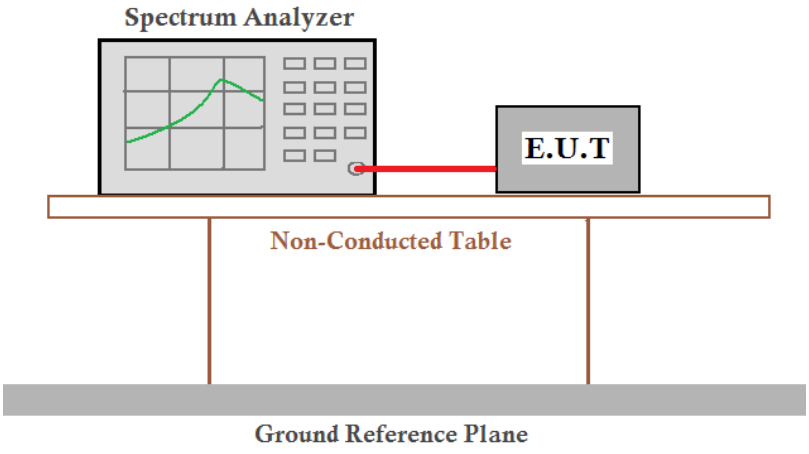
GFSK_DH5/HCH	 Date: 18.APR.2019 18:15:31
π/4DQPSK _2DH5/LCH	 Date: 18.APR.2019 18:20:15

π/4DQPSK _2DH5/MCH	 Date: 18.APR.2019 18:20:45
π/4DQPSK _2DH5/HCH	 Date: 18.APR.2019 18:21:12

8DPSK _3DH5/LCH	 Date: 18.APR.2019 18:26:23
8DPSK _3DH5/MCH	 Date: 18.APR.2019 18:26:56

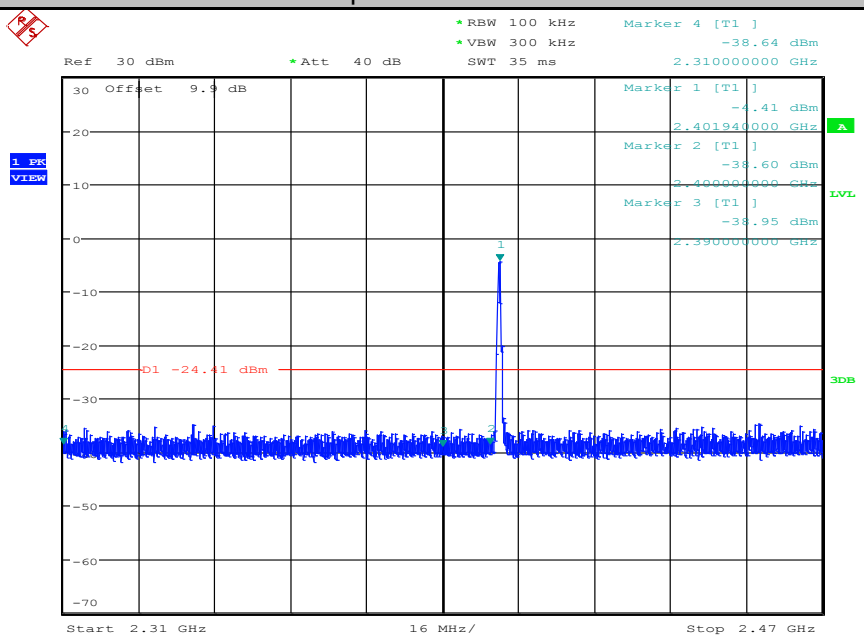
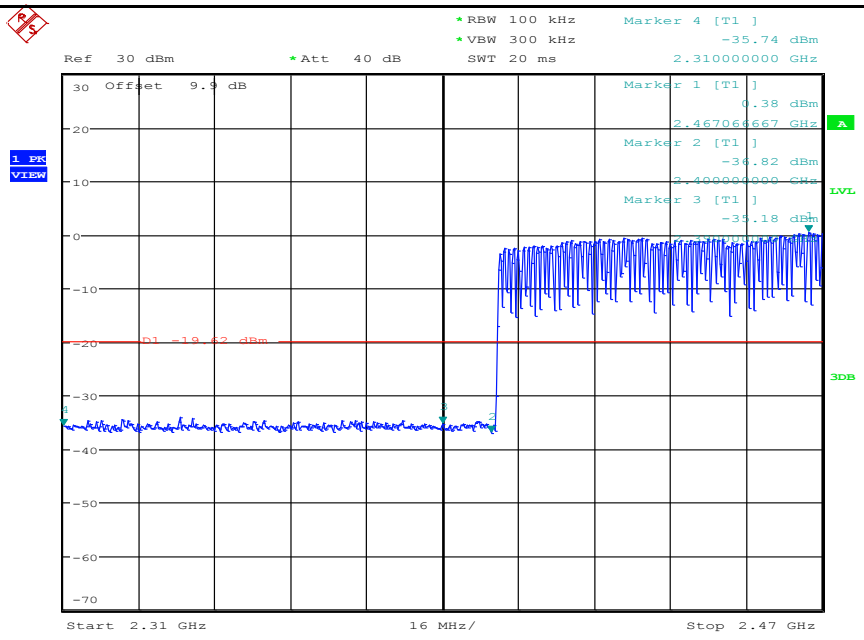
8DPSK _3DH5/HCH	

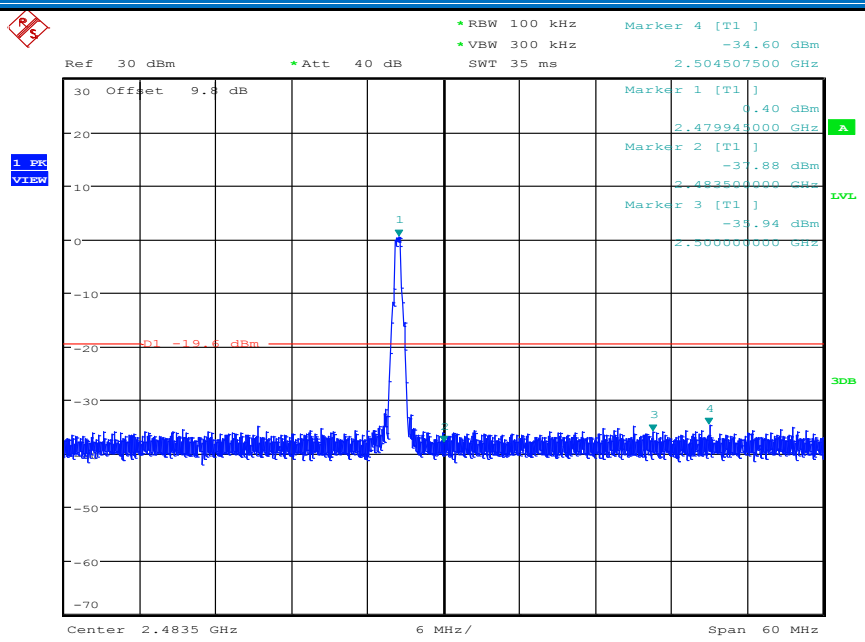
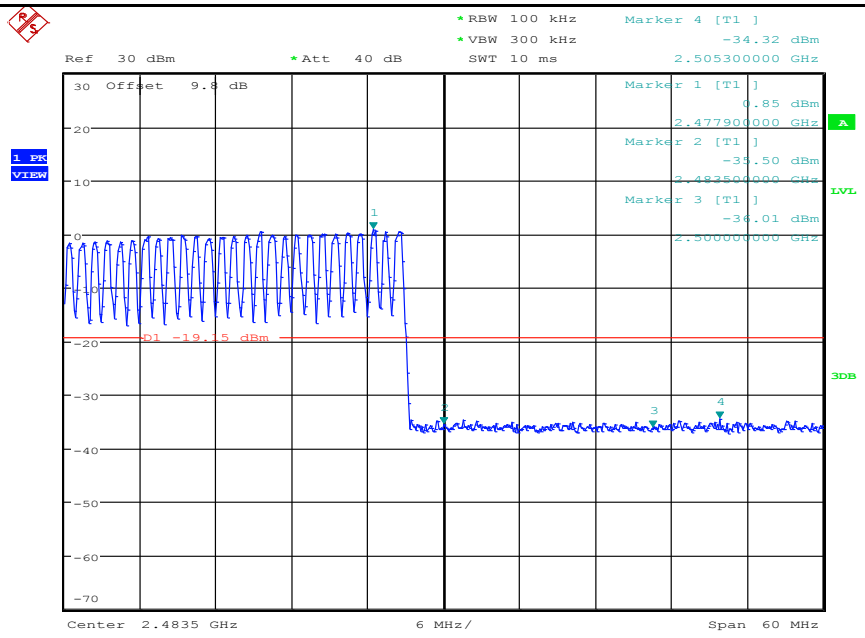
6.9 Band Edge for RF Conducted Emissions

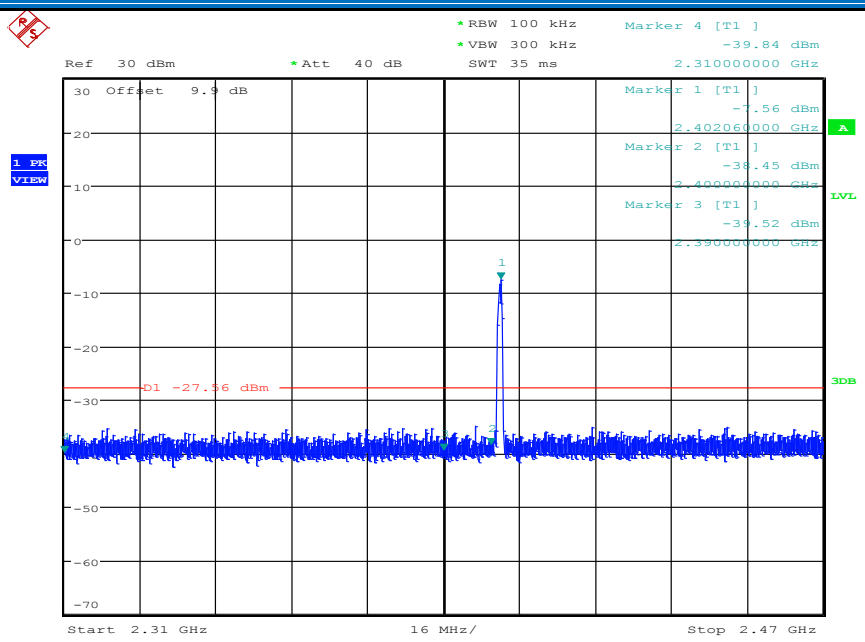
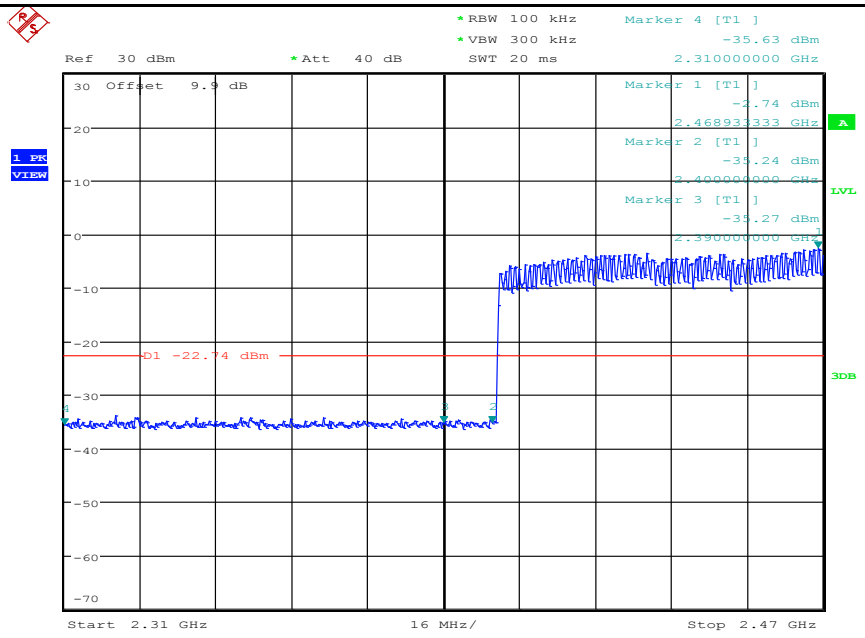
Test Requirement:	47 CFR Part 15C Section 15.247 (d), RSS 247 5.5
Test Method:	ANSI C63.10: 2013
Test Setup:	 *Remark: Offset=cable loss+ attenuation factor.*
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, 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 and Non-hopping transmitting 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 worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

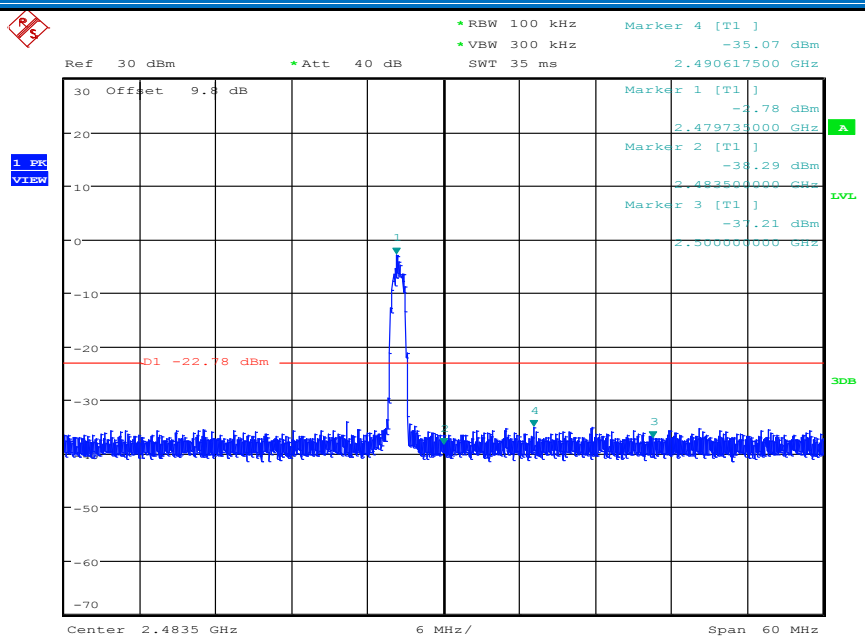
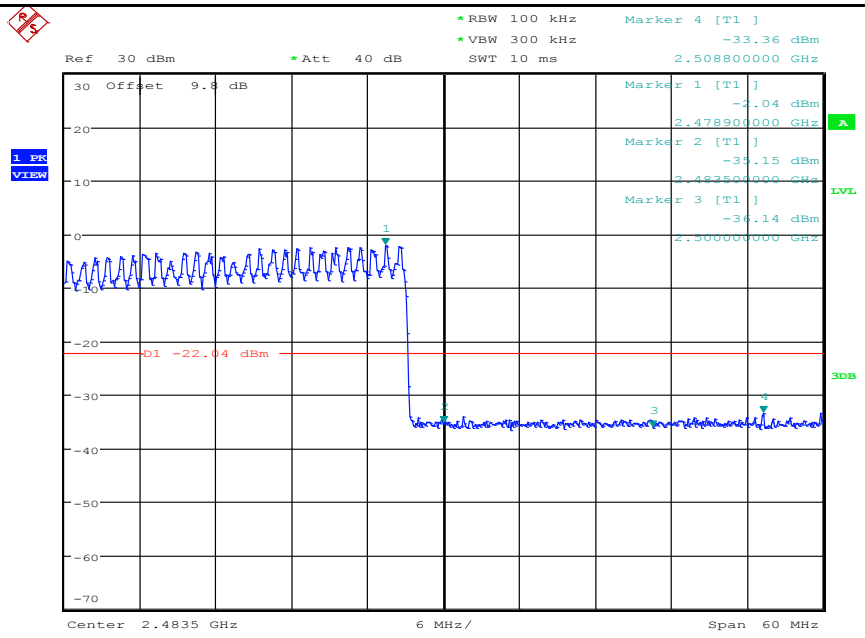
Mode	Test Channel	Frequency [MHz]	Frequency Hopping	Emission Level [dBm]	Limit [dBm]	Result
GFSK	LCH	2400	Off	-38.600	-24.41	PASS
			On	-36.820	-19.62	PASS
GFSK	HCH	2483.5	Off	-37.880	-19.6	PASS
			On	-35.500	-19.15	PASS
π/4DQPSK	LCH	2400	Off	-38.450	-27.56	PASS
			On	-35.240	-22.74	PASS
π/4DQPSK	HCH	2483.5	Off	-38.290	-22.78	PASS
			On	-35.150	-22.04	PASS
8DPSK	LCH	2400	Off	-39.200	-28.07	PASS
			On	-34.080	-22.48	PASS
8DPSK	HCH	2483.5	Off	-38.690	-22.14	PASS
			On	-34.850	-21.97	PASS

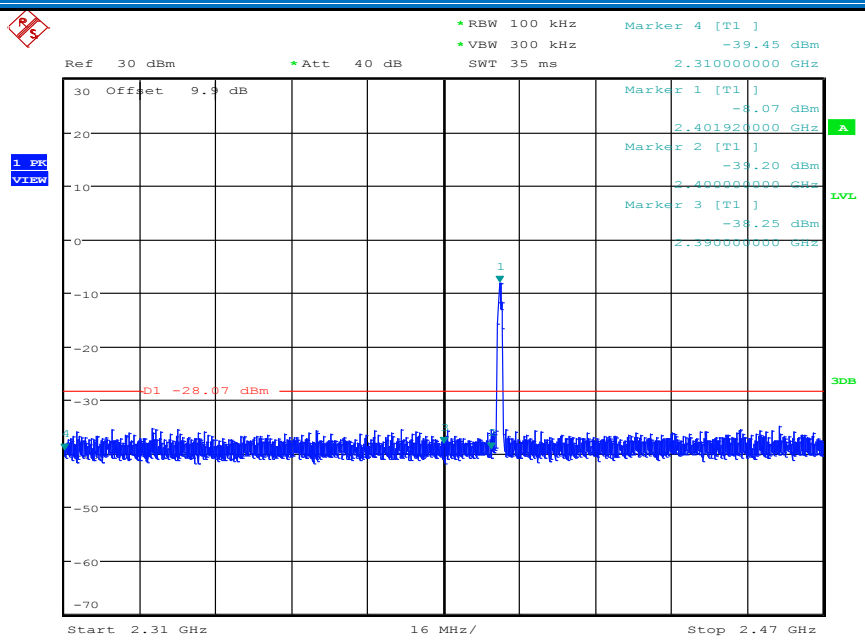
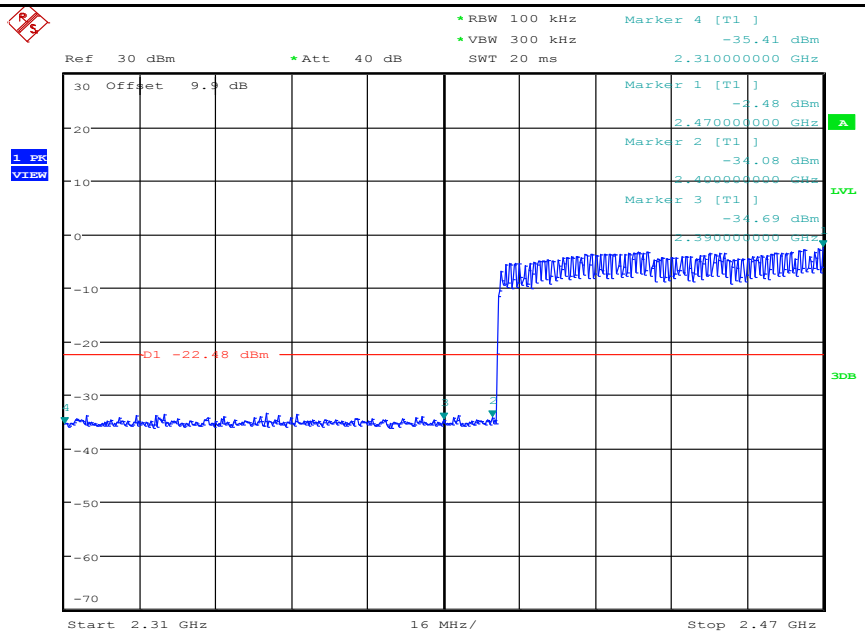
Test plot as follows:

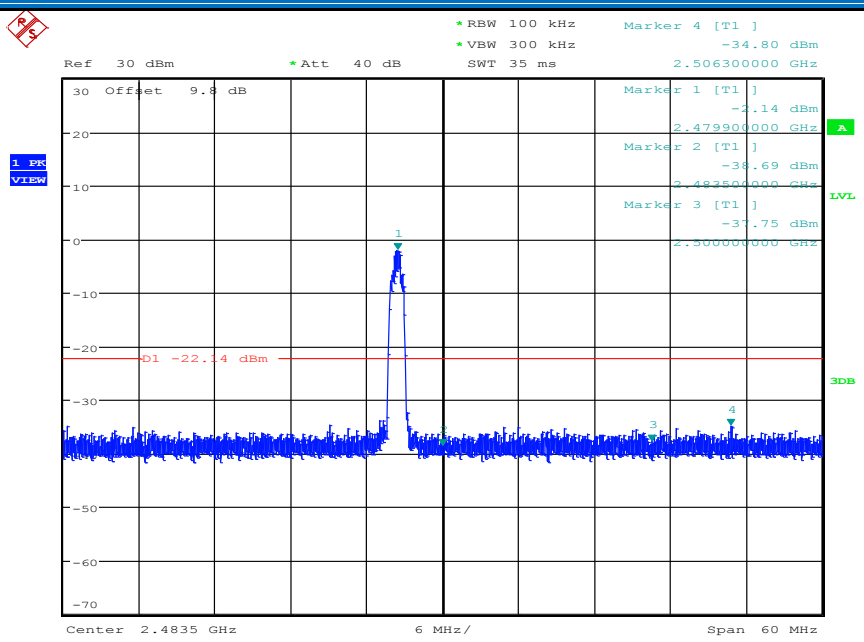
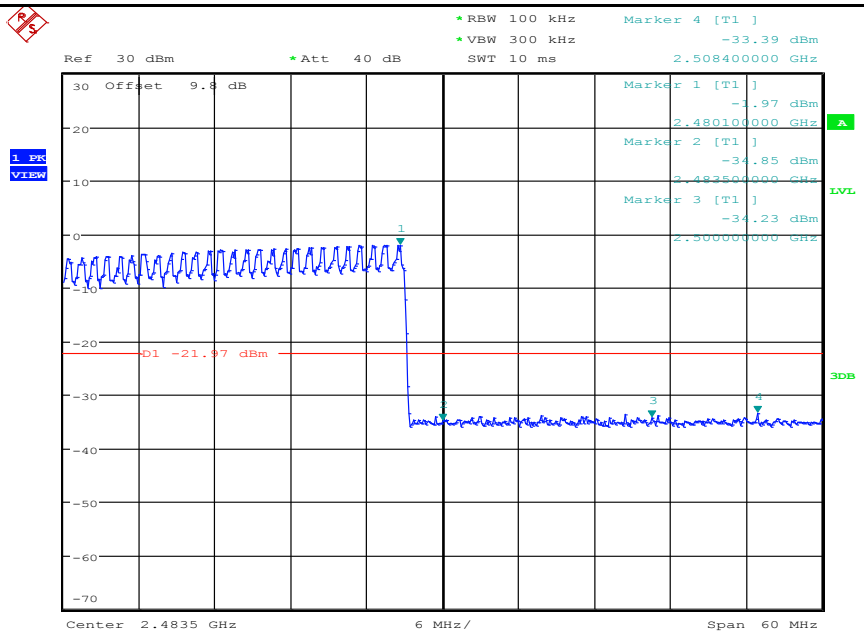
Graphs	
GFSK/LCH/No Hop	 Date: 18.APR.2019 14:51:03
GFSK/LCH/Hop	 Date: 18.APR.2019 15:34:29

GFSK/HCH/No Hop	 Date: 18.APR.2019 15:00:47
GFSK/HCH/Hop	 Date: 18.APR.2019 15:47:45

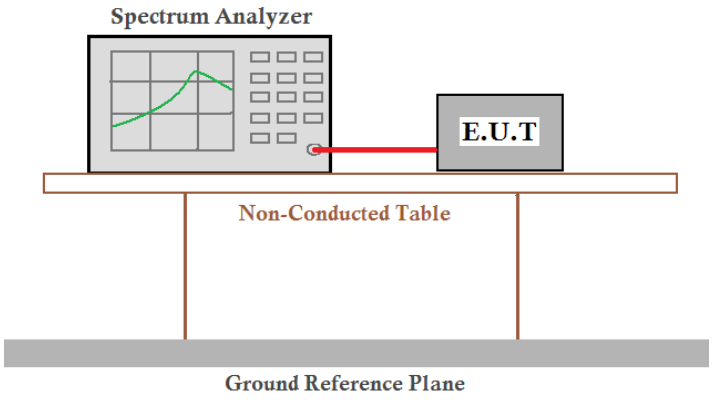
π/4DQPSK/LCH/No Hop	
π/4DQPSK/LCH/Hop	

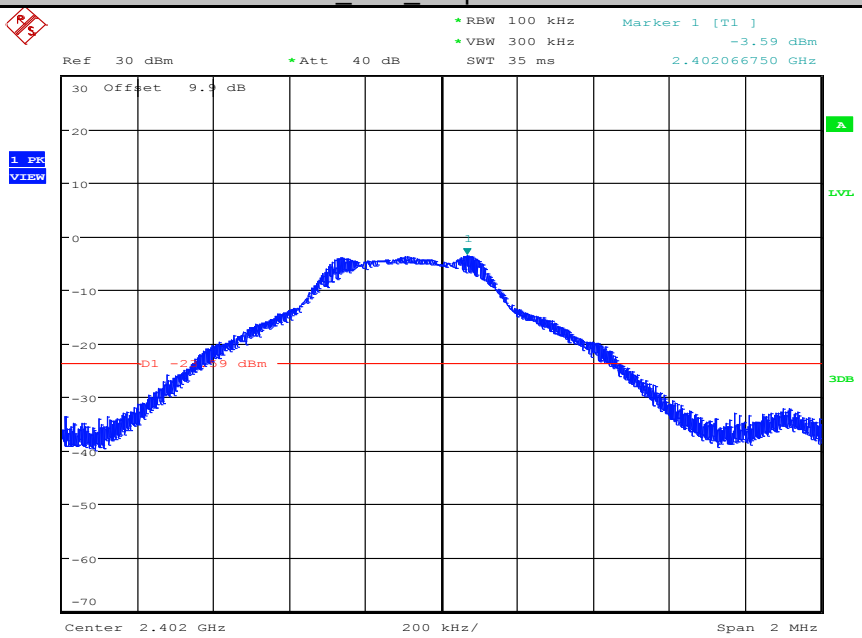
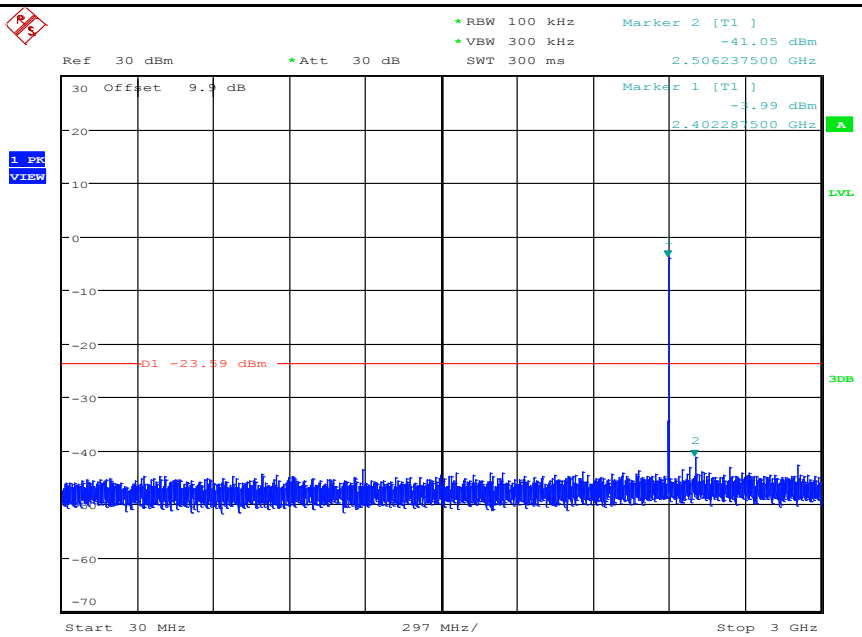
π/4DQPSK/HCH/No Hop	 Date: 18.APR.2019 15:14:30
π/4DQPSK/HCH/Hop	 Date: 18.APR.2019 16:46:51

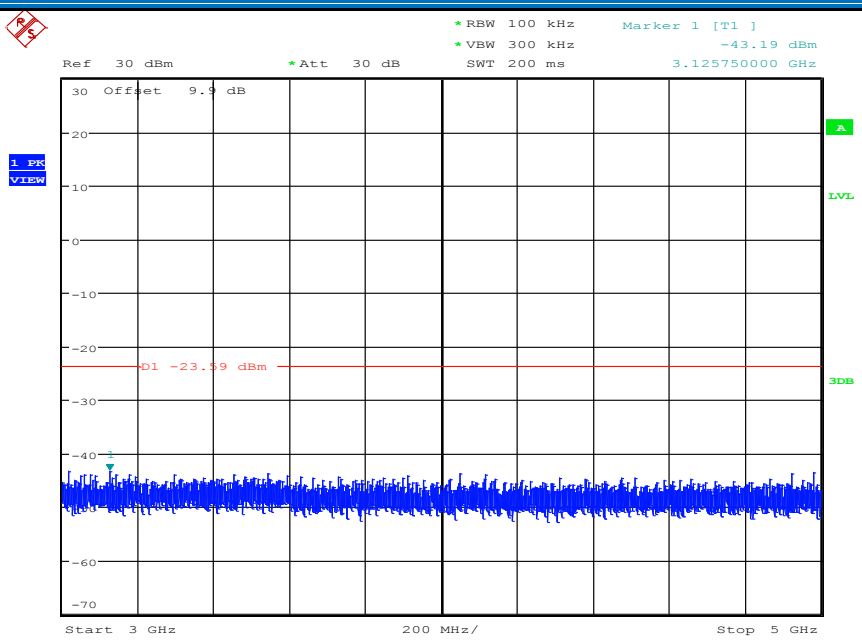
8DPSK/LCH/No Hop	 Date: 18.APR.2019 15:19:36
8DPSK/LCH/Hop	 Date: 18.APR.2019 17:27:45

8DPSK/HCH/No Hop	 Date: 18.APR.2019 15:28:36
8DPSK/HCH/Hop	 Date: 18.APR.2019 18:09:19

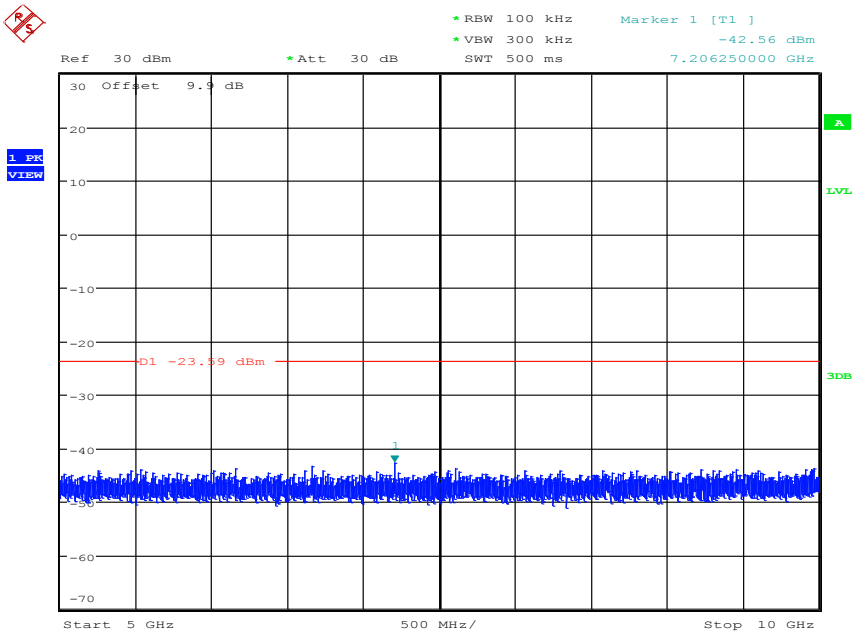
6.10 RF Antenna Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d), RSS 247 5.5
Test Method:	ANSI C63.10: 2013
Test Setup:	 *Remark: Offset=cable loss+ attenuation factor.*
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 DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

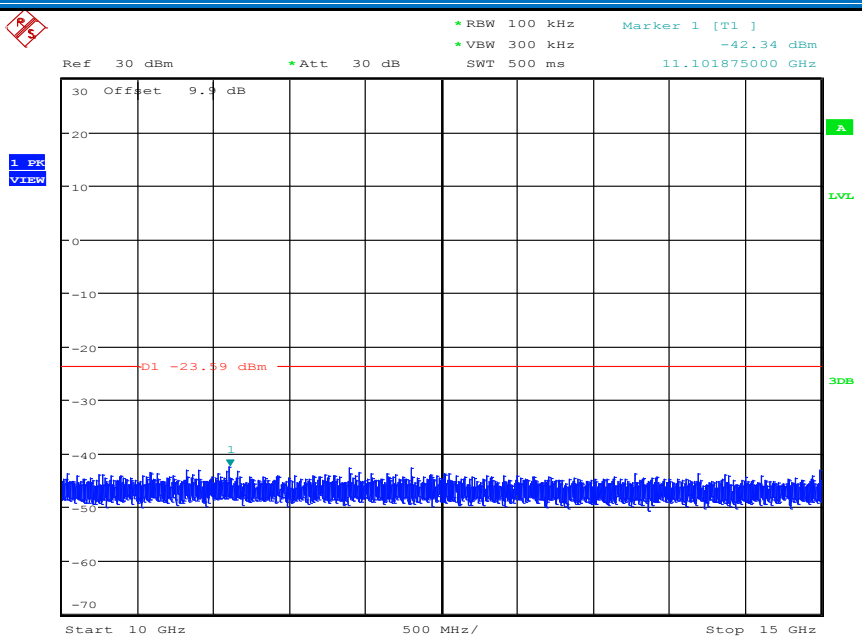
GFSK_LCH_Graphs	
Pref	 Date: 18.APR.2019 14:51:29
Puw	 Date: 18.APR.2019 14:51:42



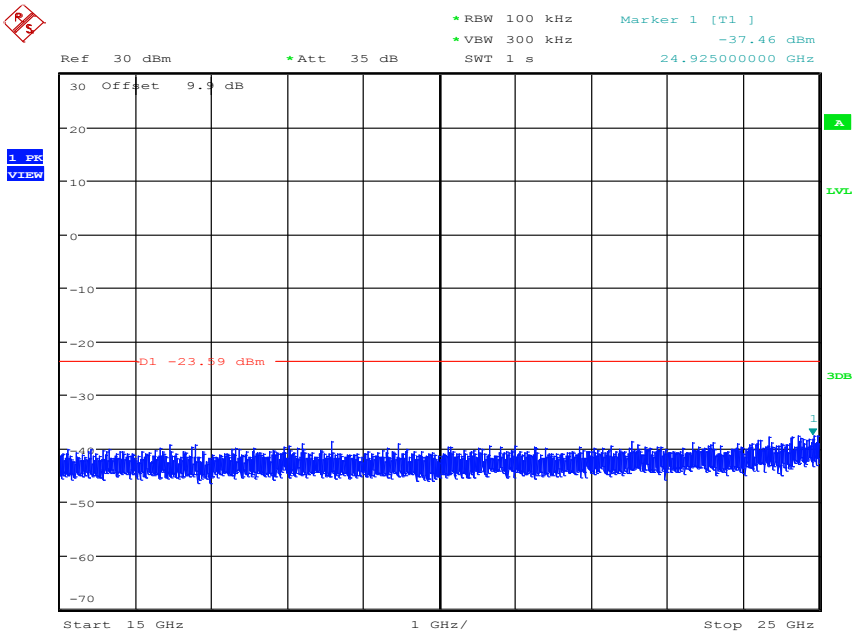
Date: 18.APR.2019 14:51:52



Date: 18.APR.2019 14:52:05

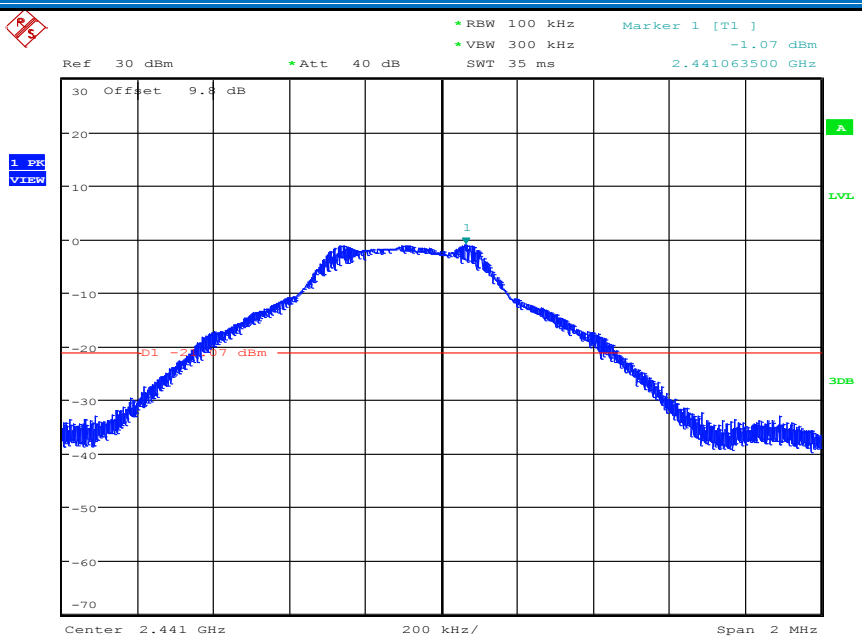
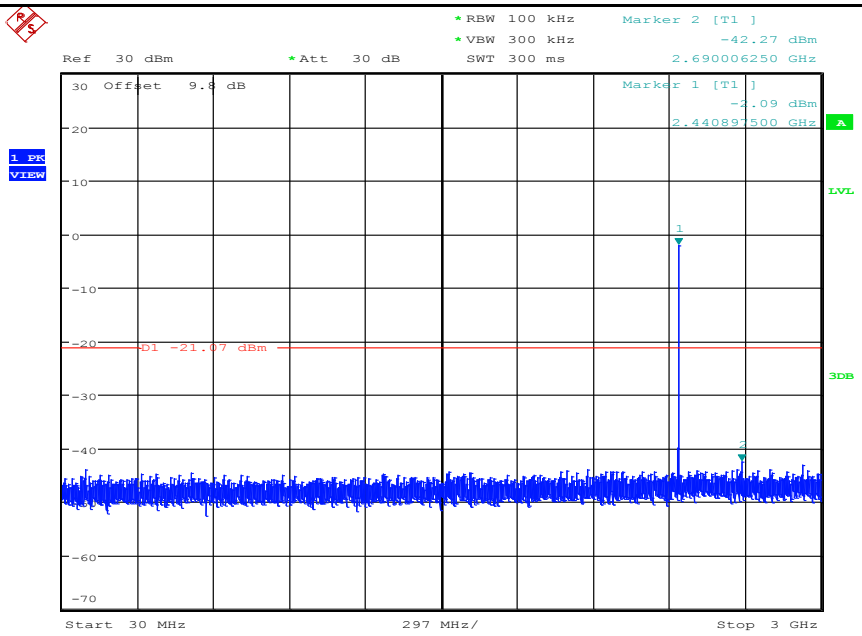


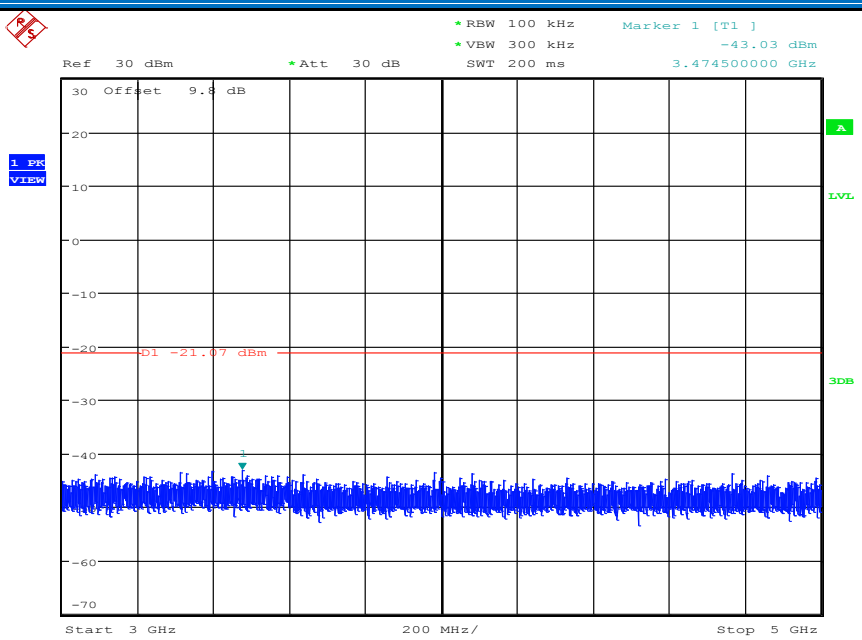
Date: 18.APR.2019 14:52:17



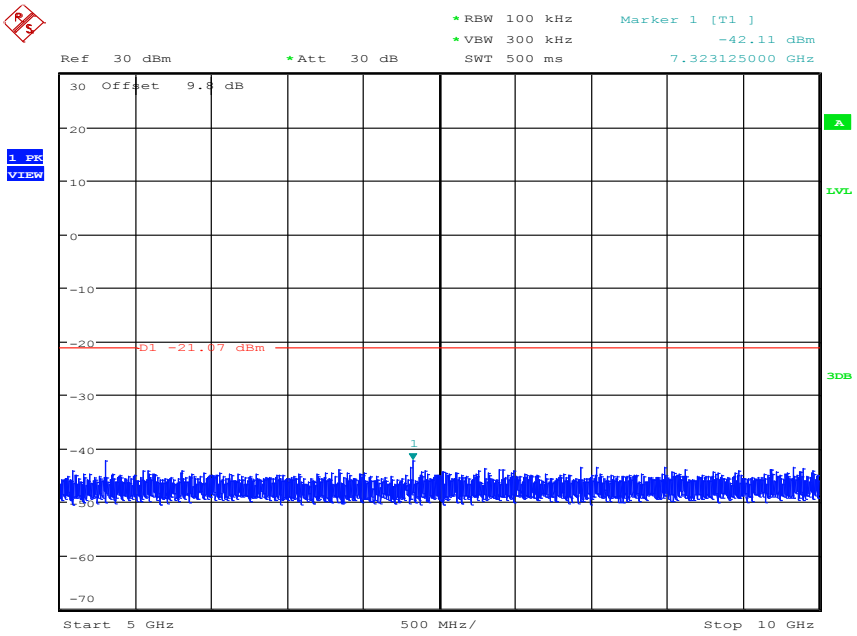
Date: 18.APR.2019 14:52:30

GFSK MCH Graphs

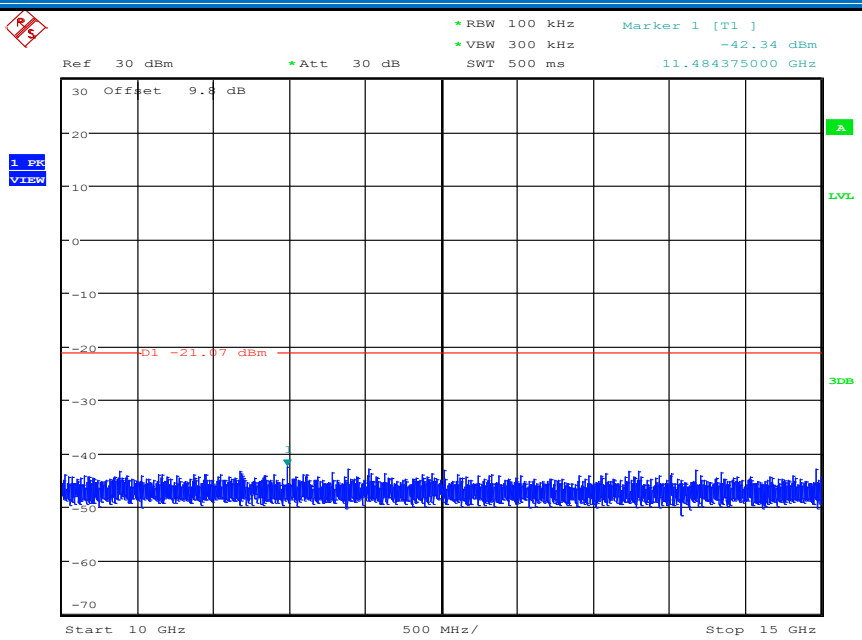
Pref	 Date: 18.APR.2019 14:55:54
Puw	 Date: 18.APR.2019 14:56:07



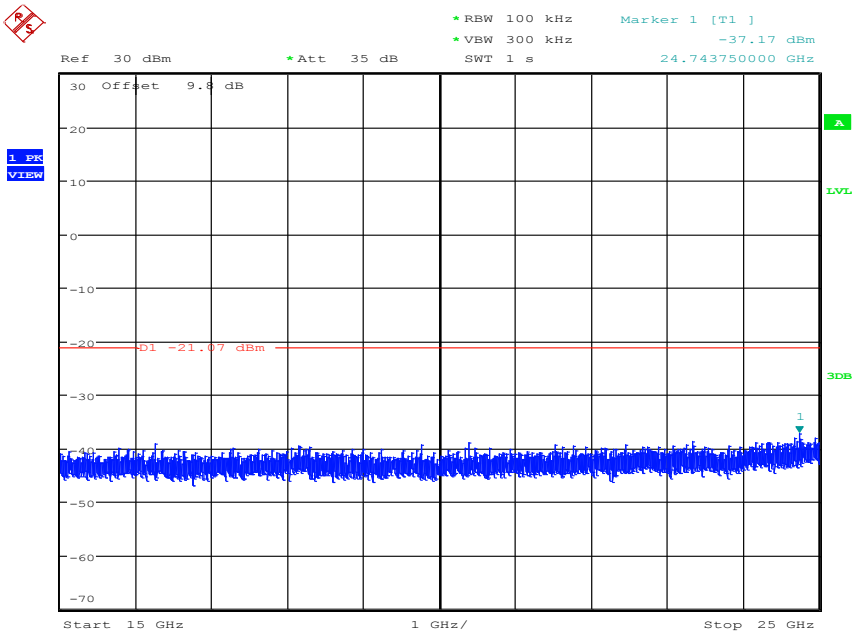
Date: 18.APR.2019 14:56:18



Date: 18.APR.2019 14:56:30



Date: 18.APR.2019 14:56:43



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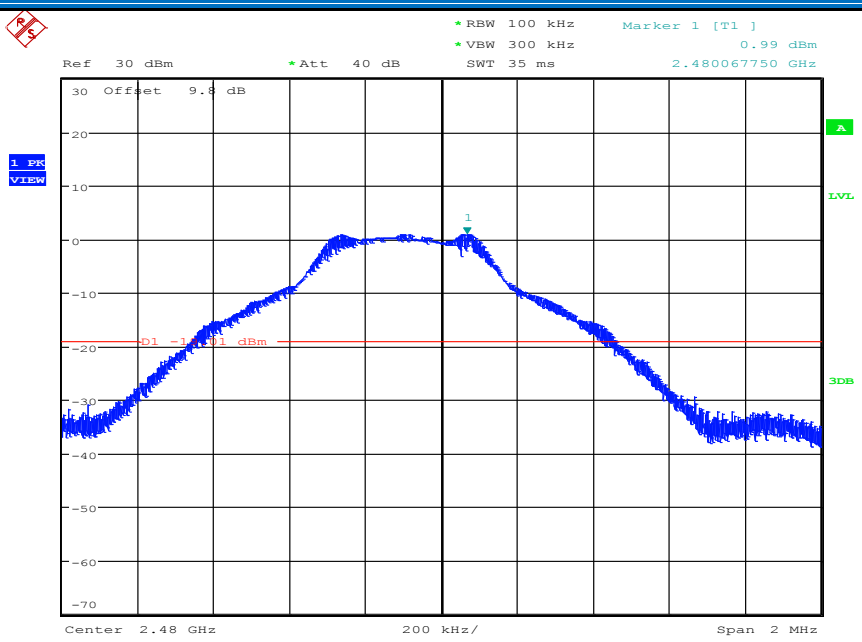
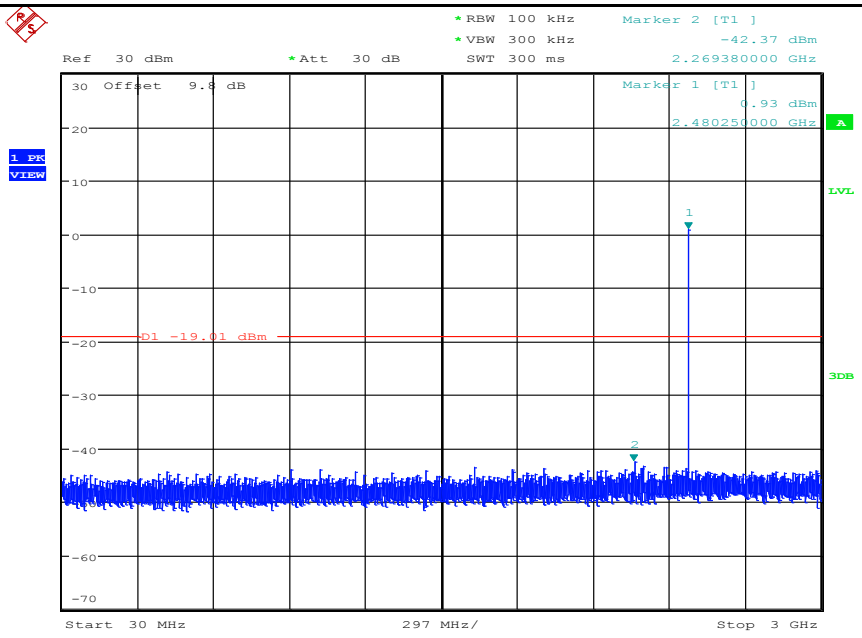
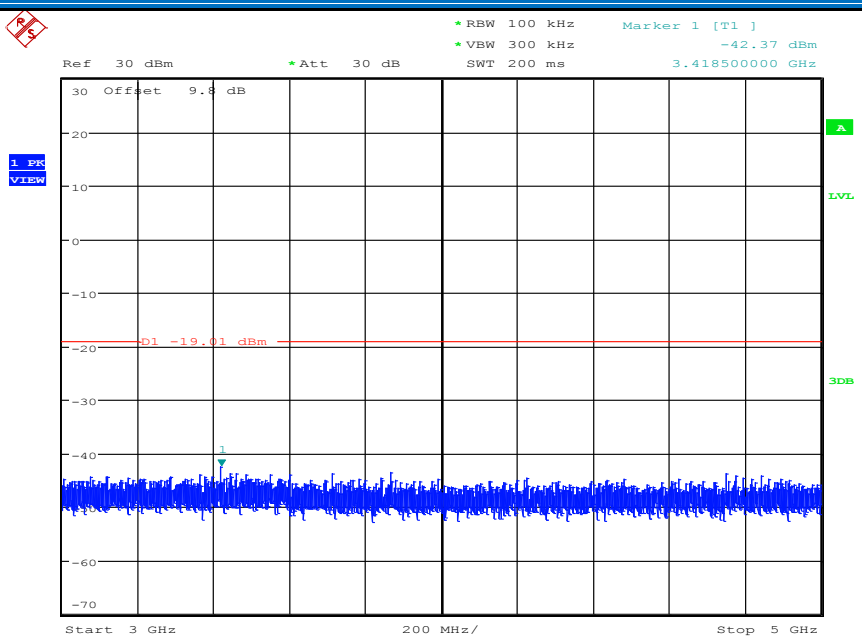
GFSK HCH Graphs

Pref	 Date: 18.APR.2019 15:01:12
Puw	 Date: 18.APR.2019 15:01:25



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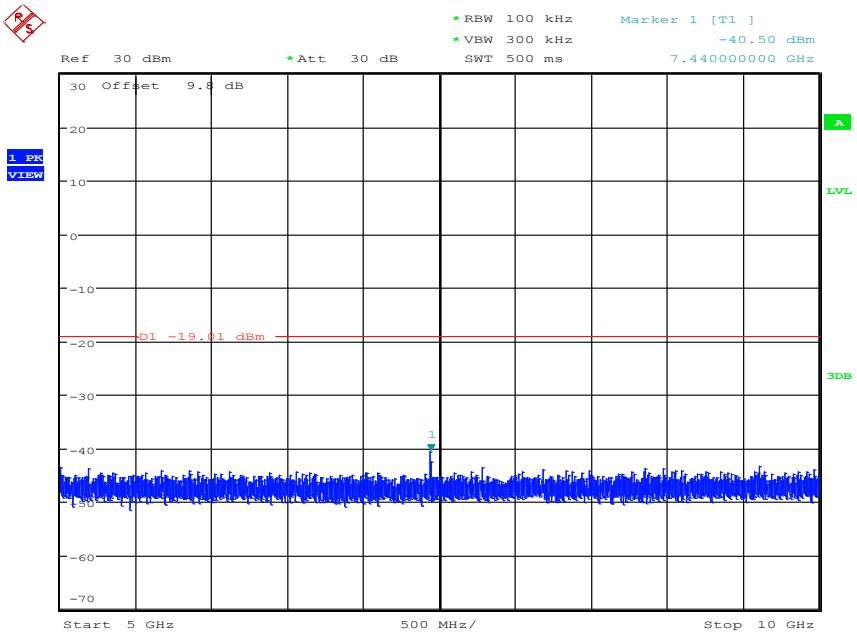

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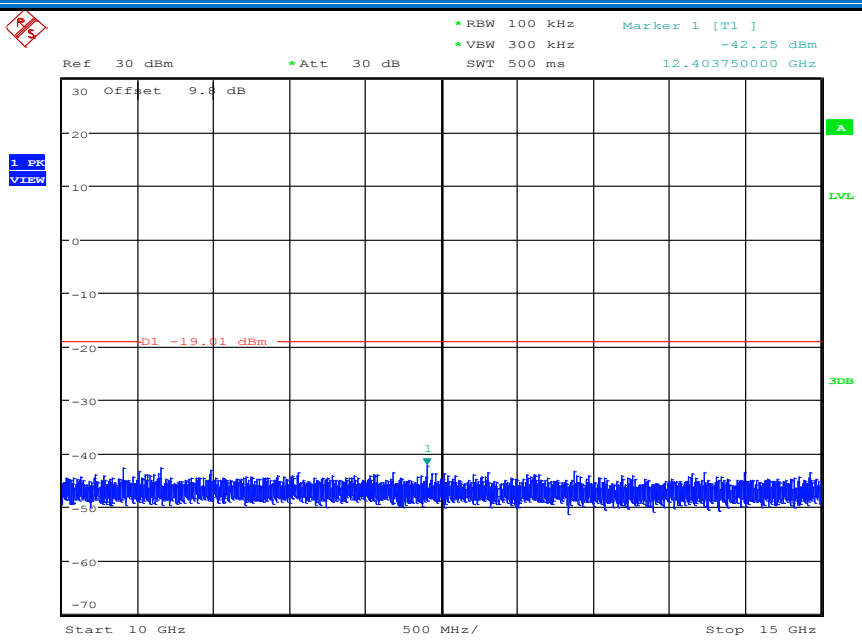

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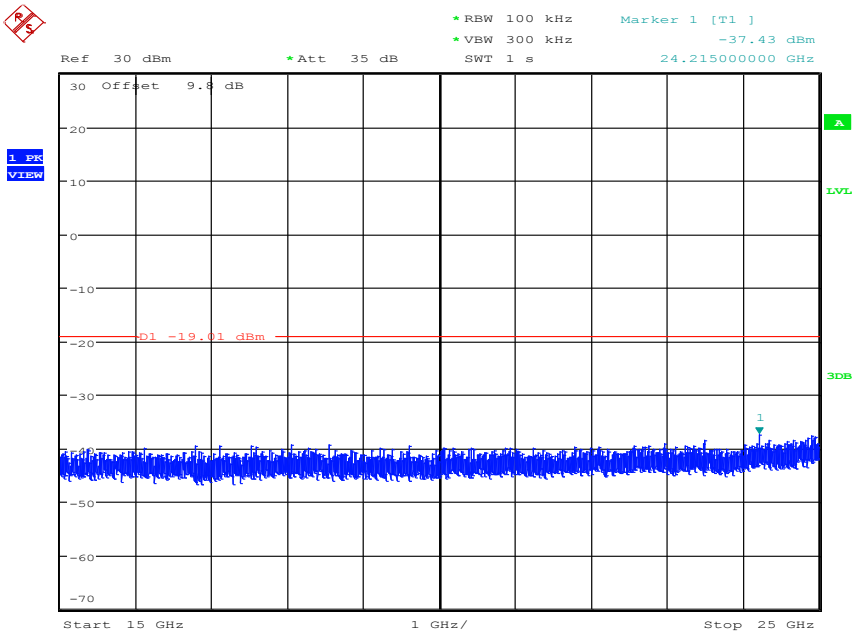

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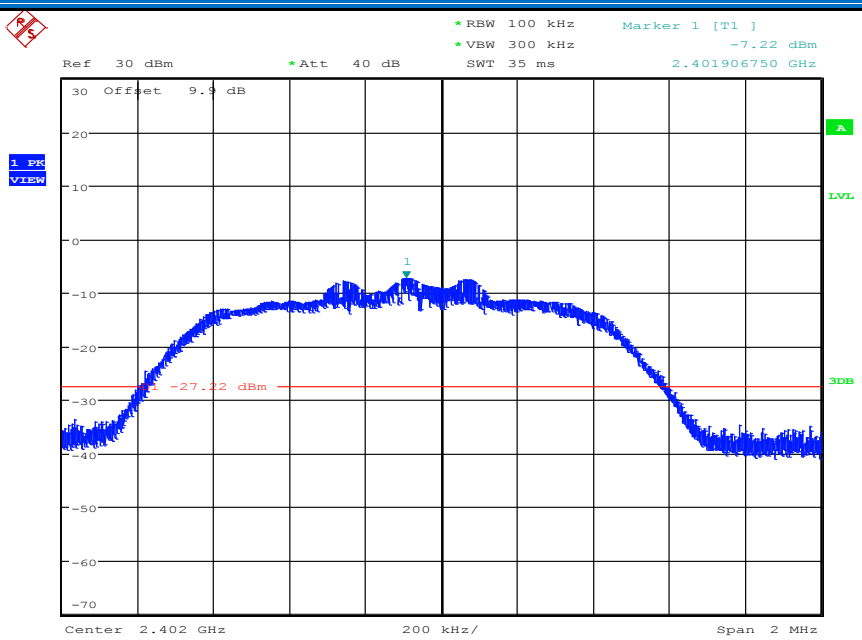
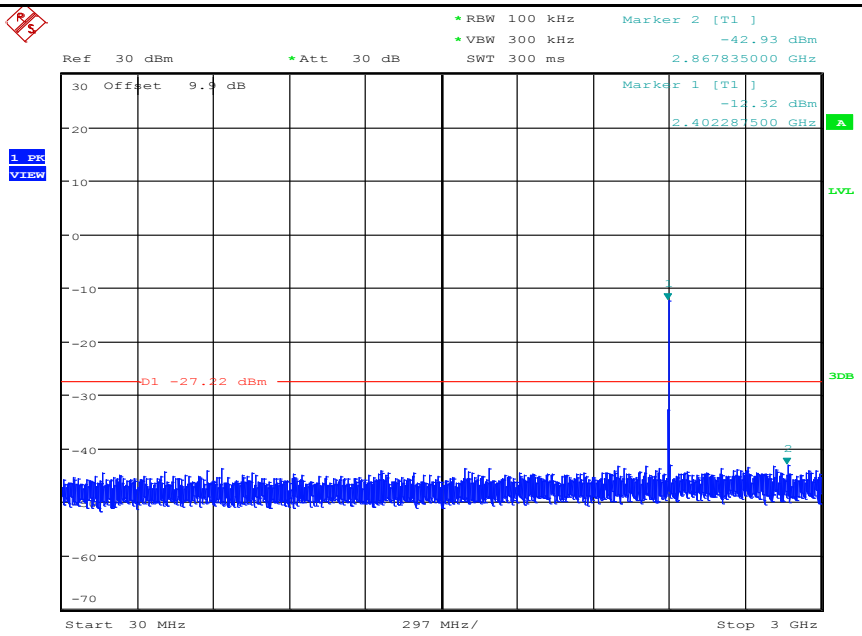
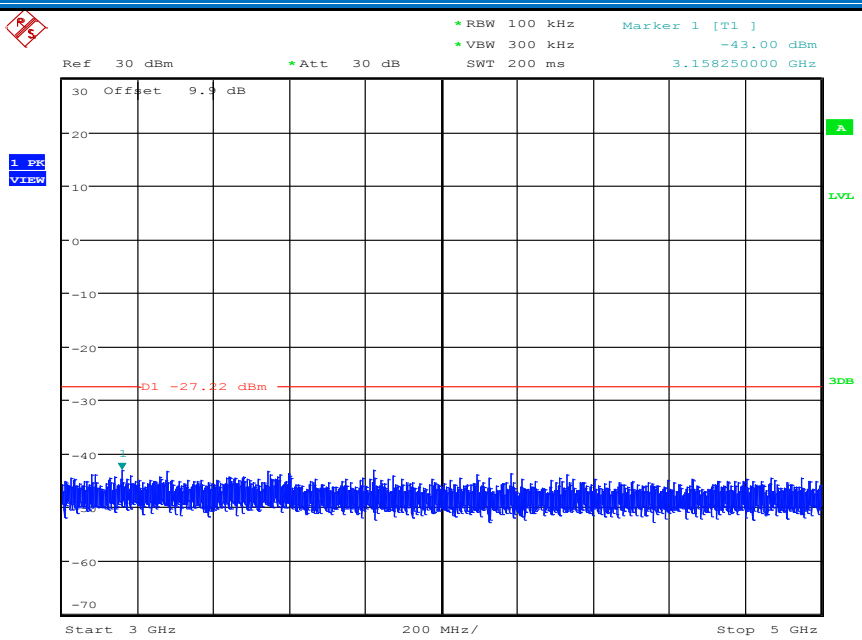
π/4DQPSK LCH Graphs

Pref	 Date: 18.APR.2019 15:06:14
Puw	 Date: 18.APR.2019 15:06:27



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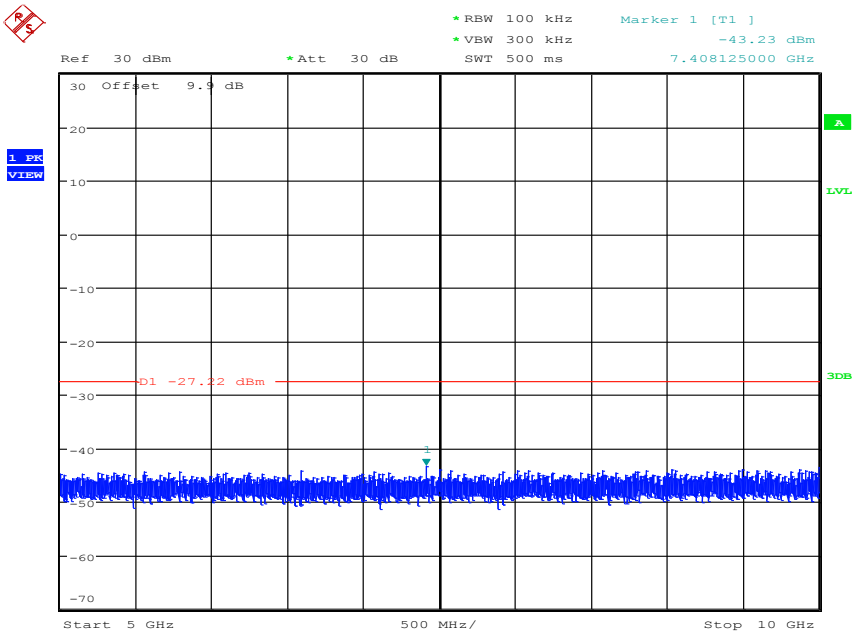

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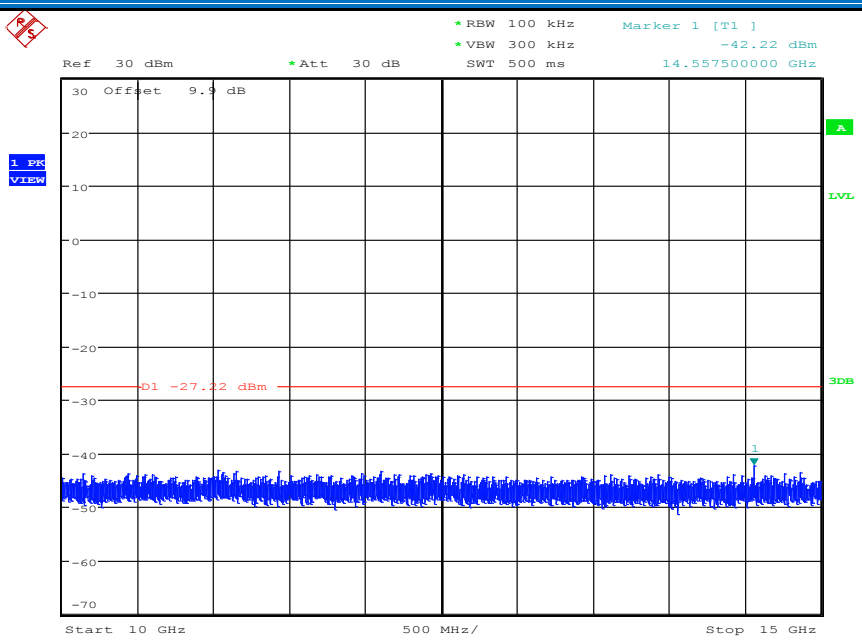

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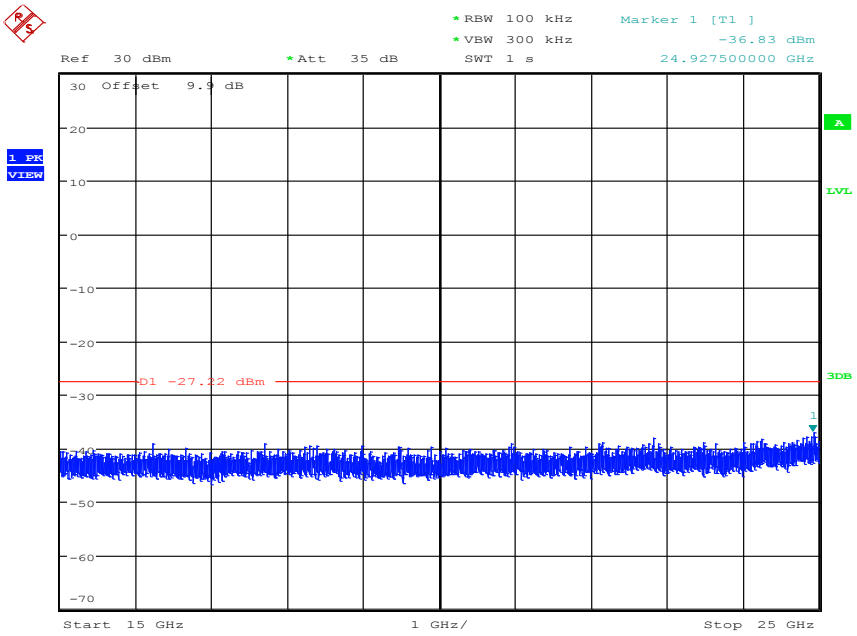

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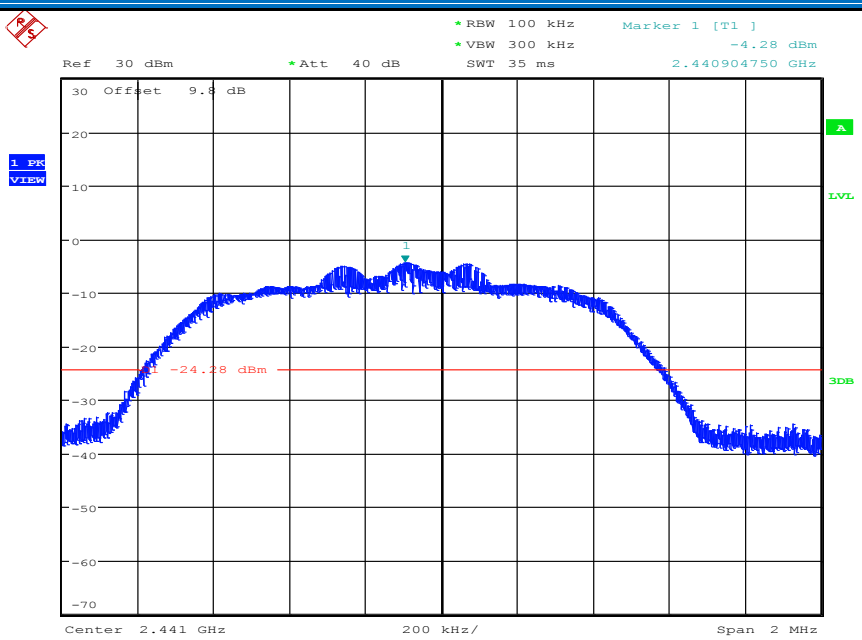
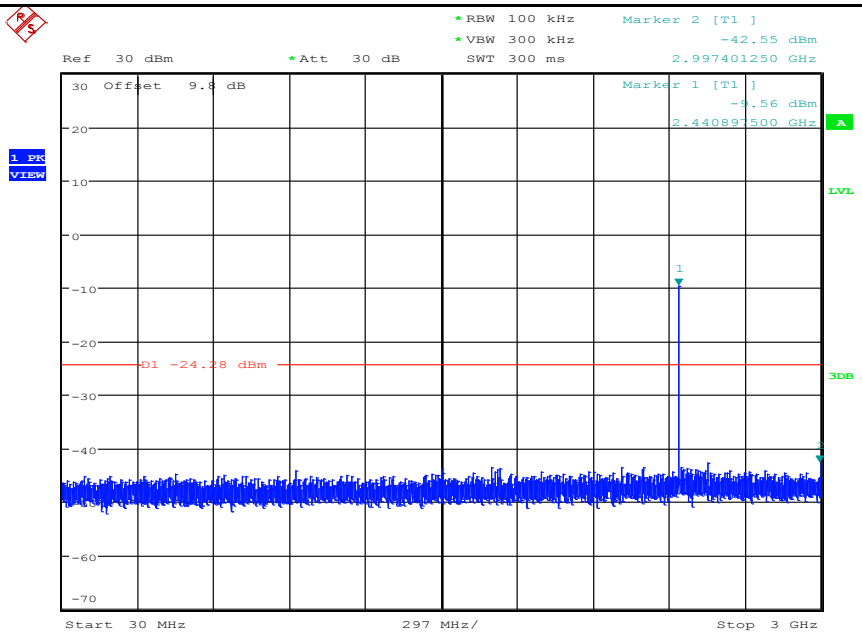
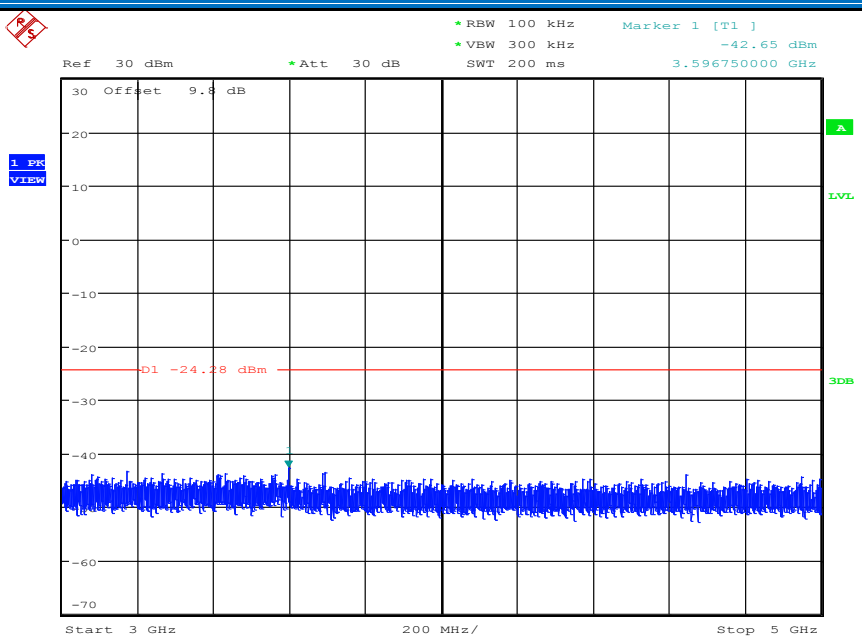
π/4DQPSK MCH Graphs

Pref	 Date: 18.APR.2019 15:10:20
Puw	 Date: 18.APR.2019 15:10:33



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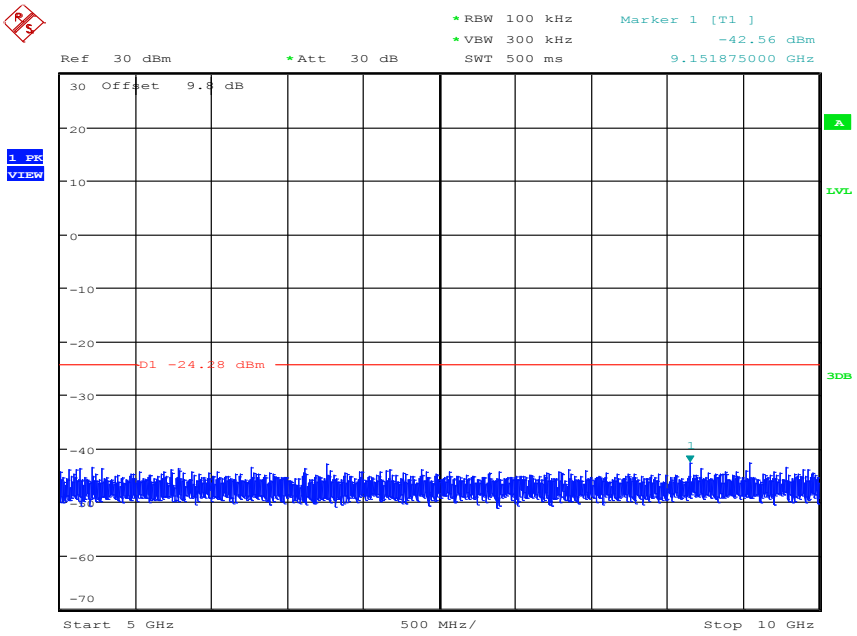

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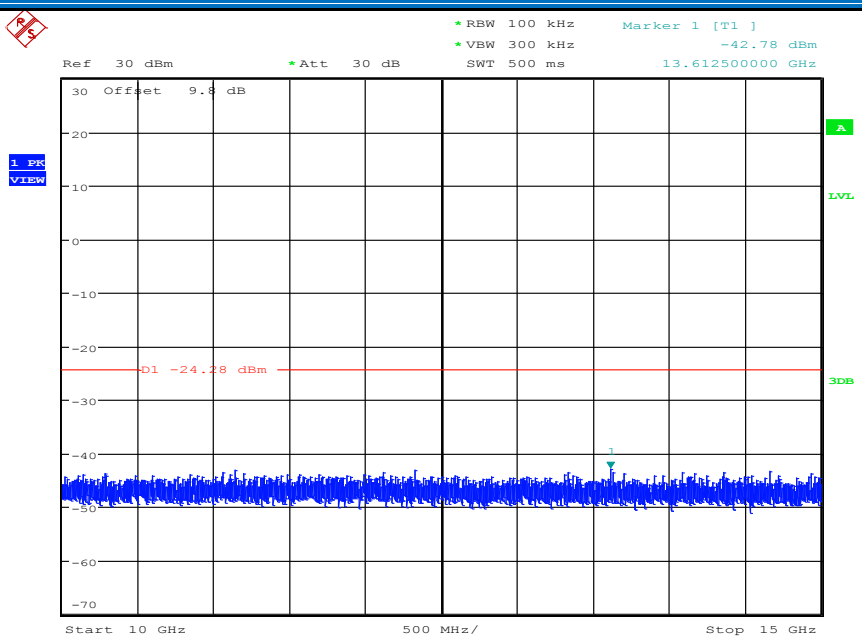

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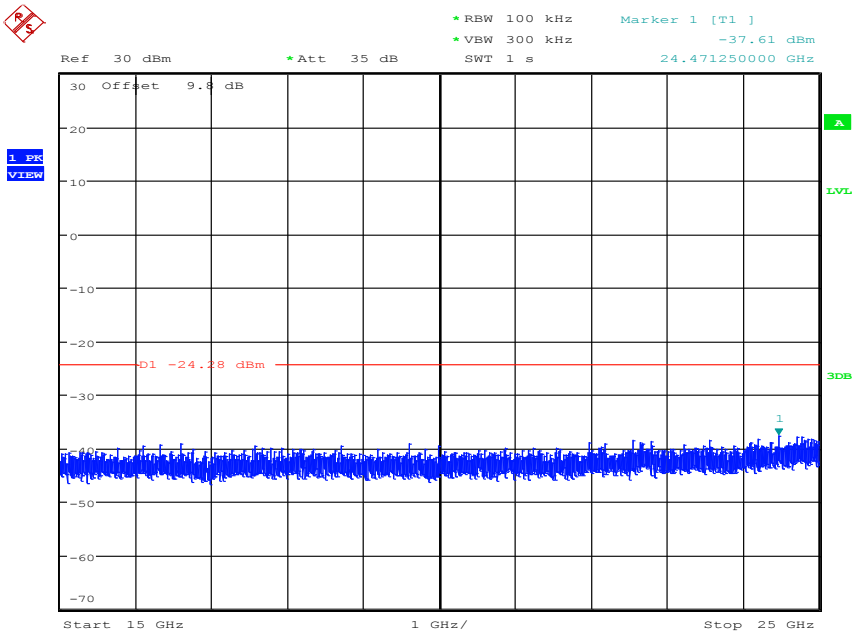

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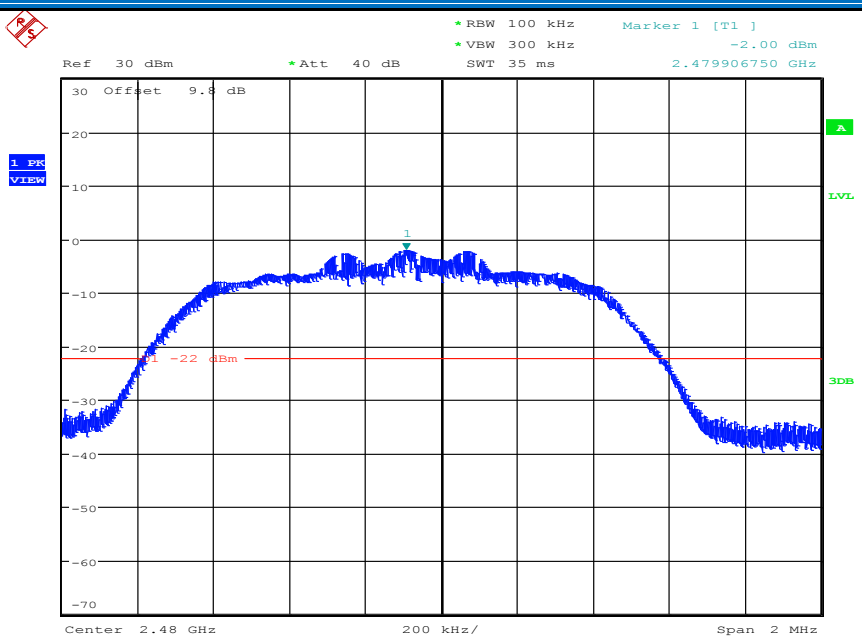
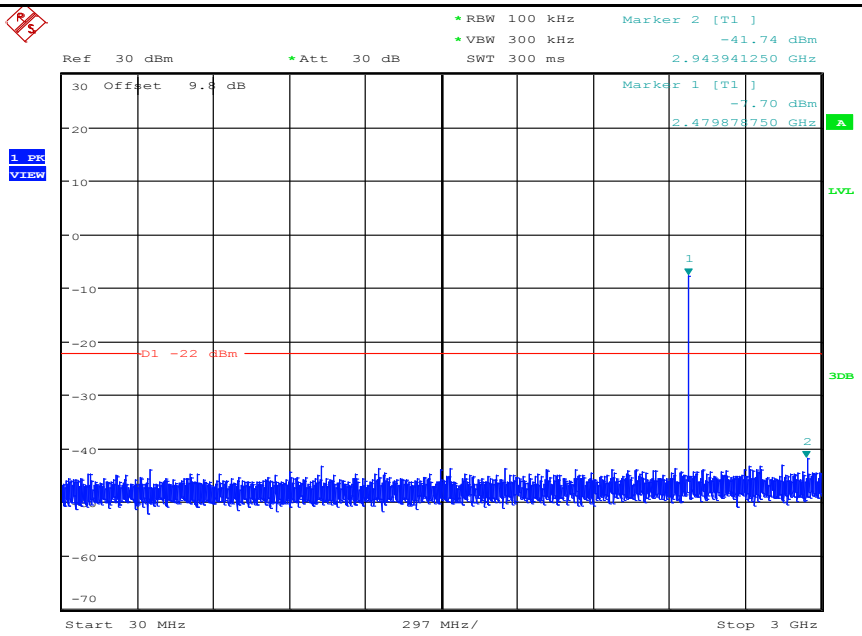
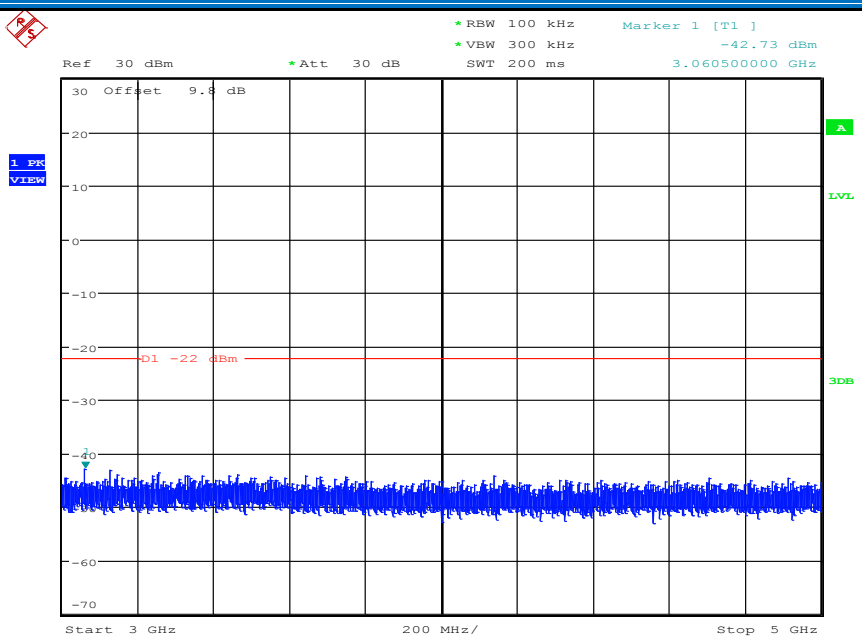
π/4DQPSK HCH Graphs

Pref	 Date: 18.APR.2019 15:14:55
Puw	 Date: 18.APR.2019 15:15:08



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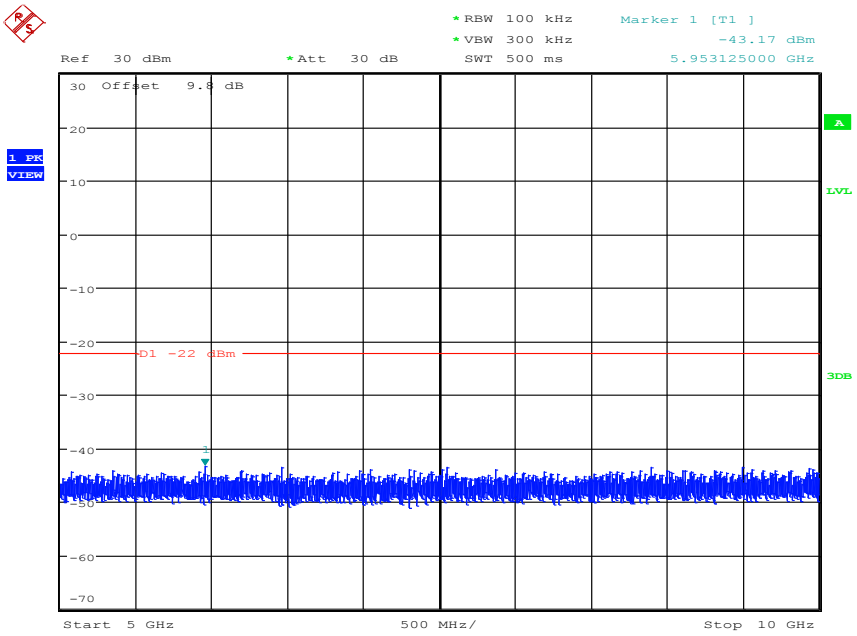

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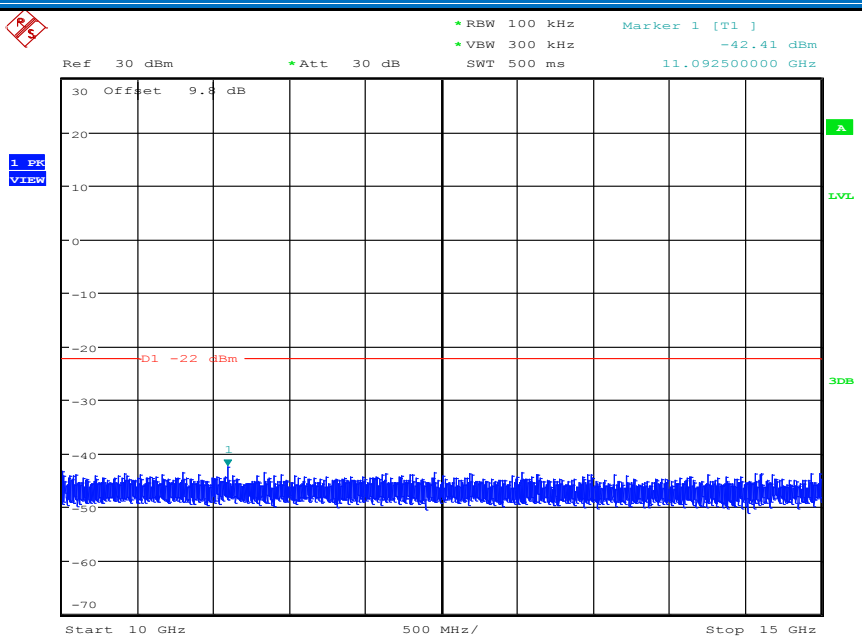

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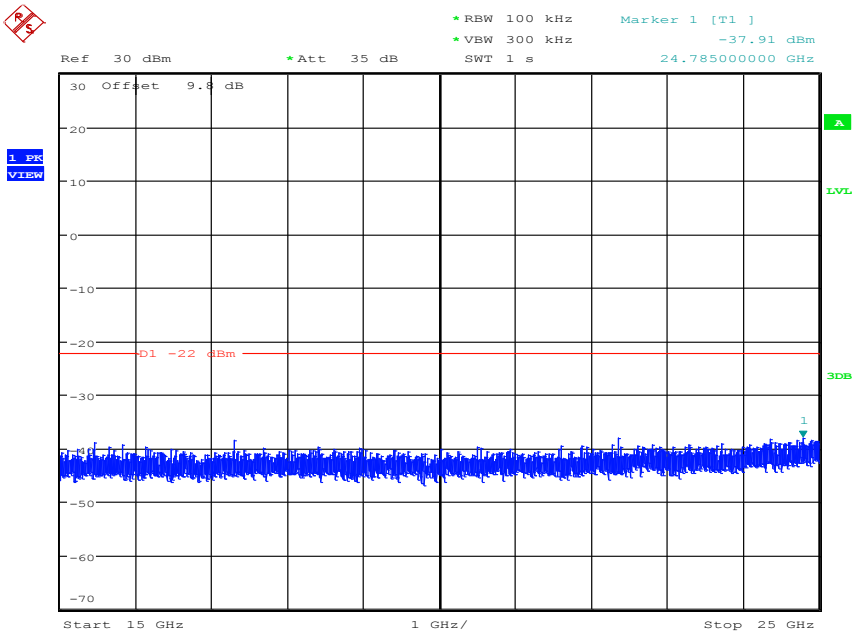

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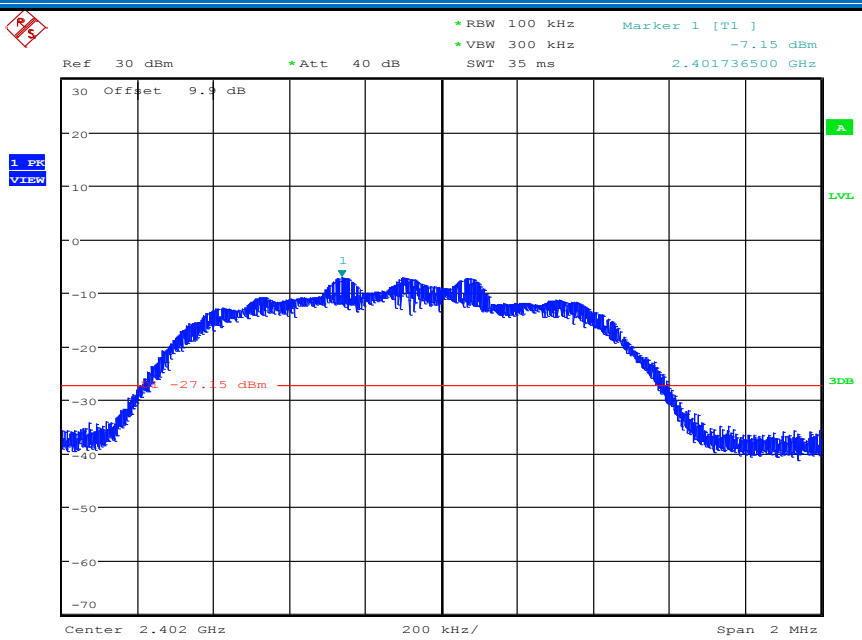
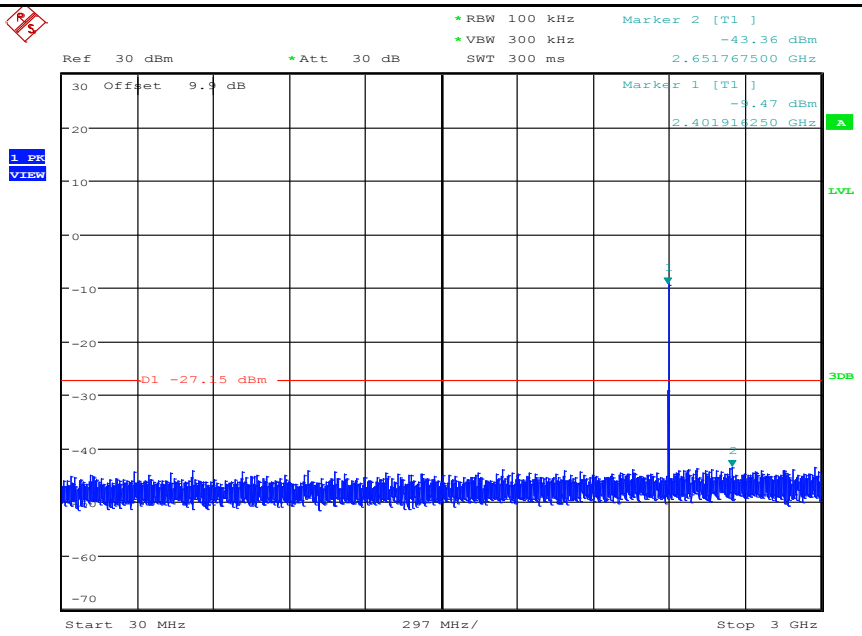
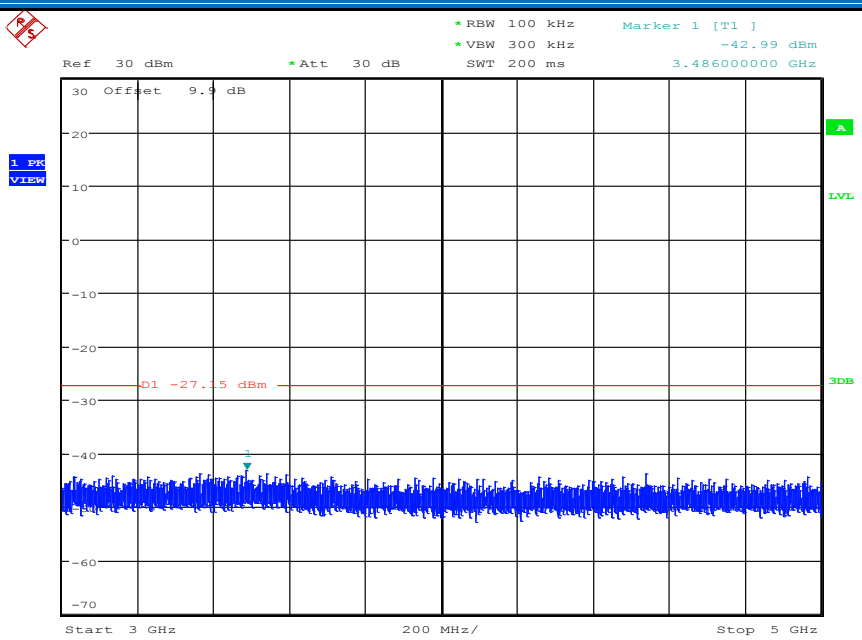
8DPSK LCH Graphs

Pref	 Date: 18.APR.2019 15:20:02
Puw	 Date: 18.APR.2019 15:20:15



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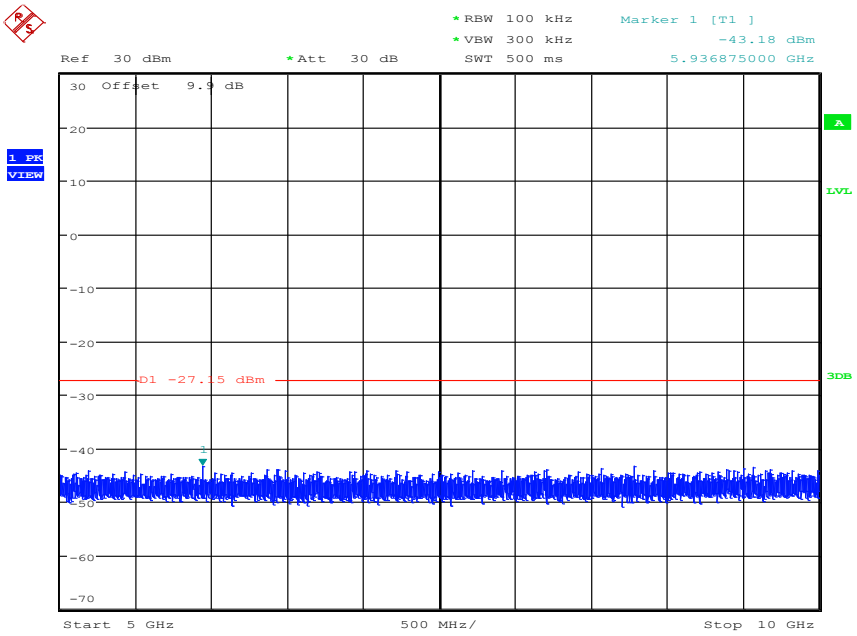

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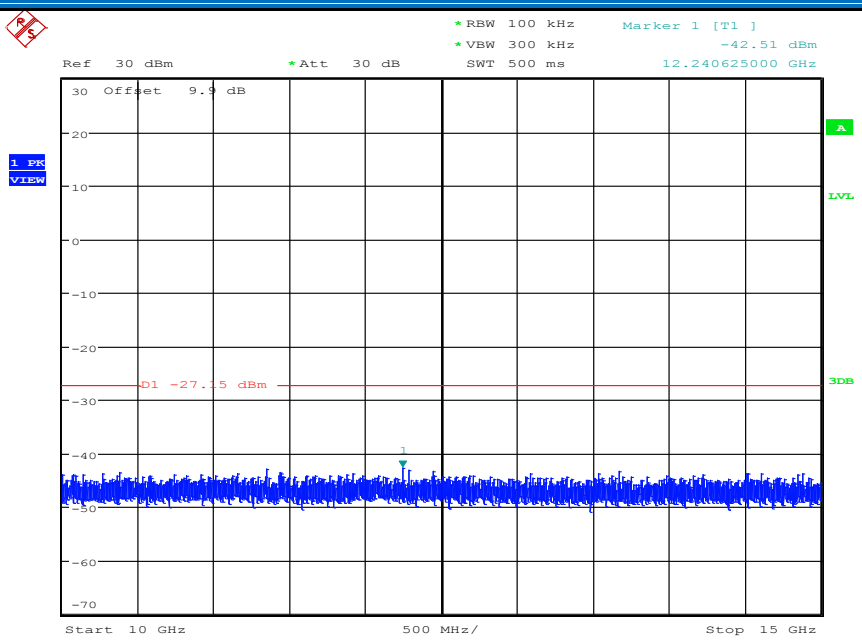

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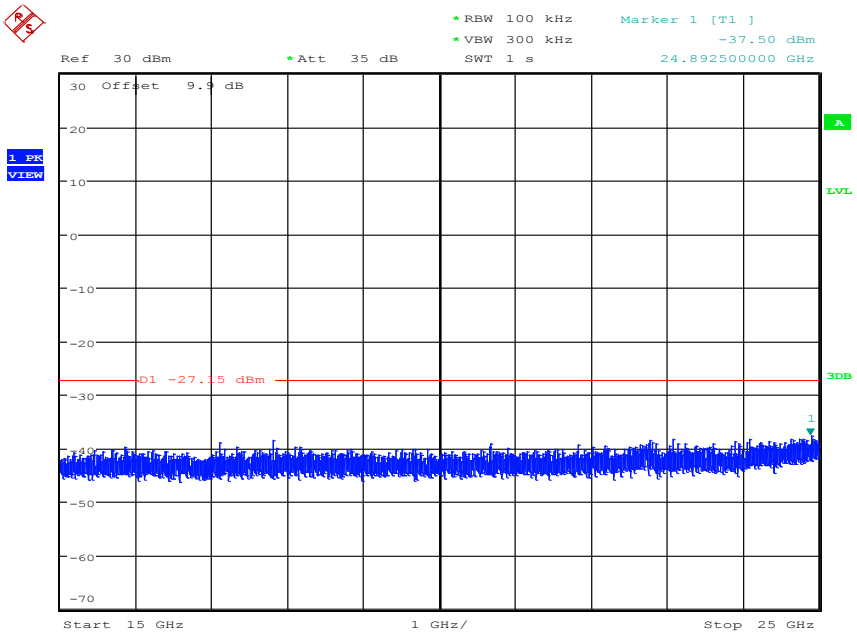

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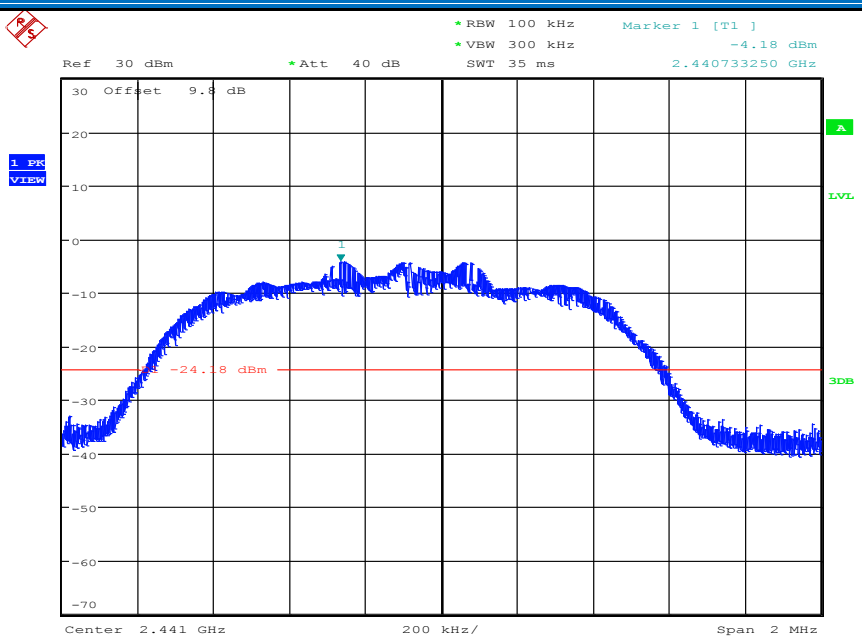
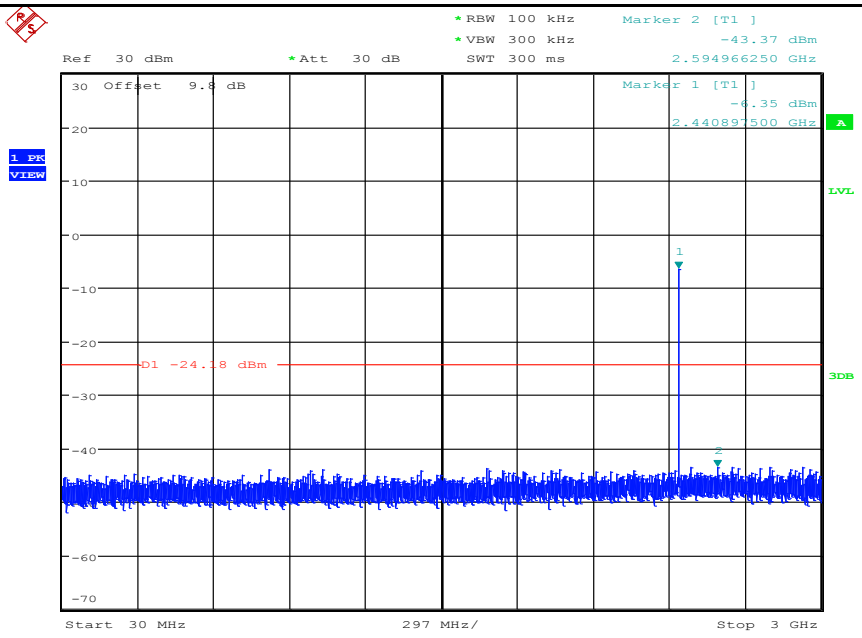
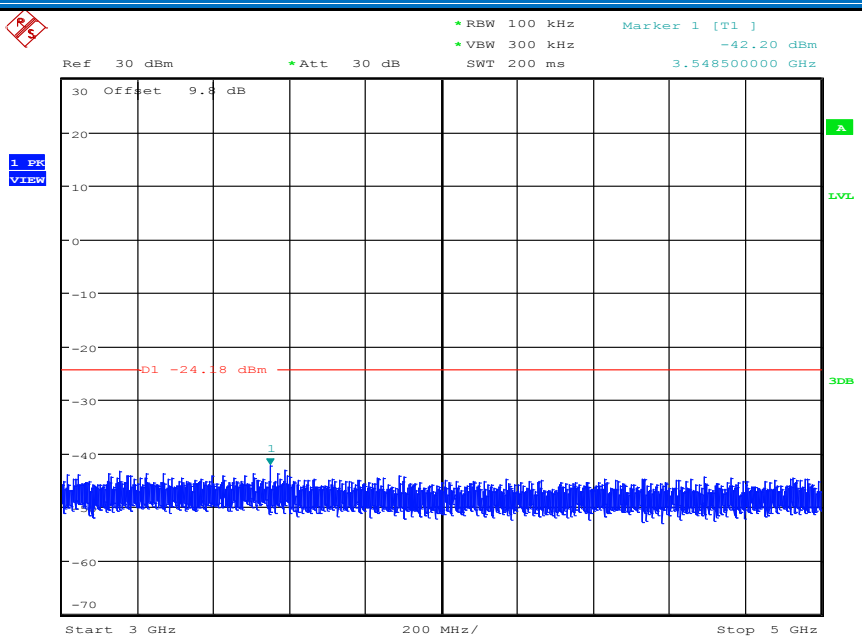
8DPSK MCH Graphs

Pref	 Date: 18.APR.2019 15:24:31
Puw	 Date: 18.APR.2019 15:24:44



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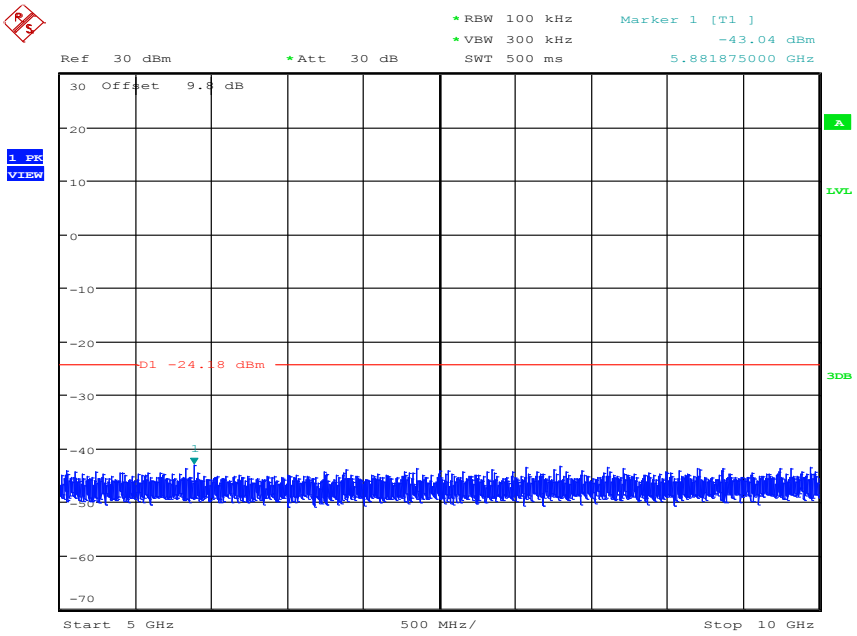

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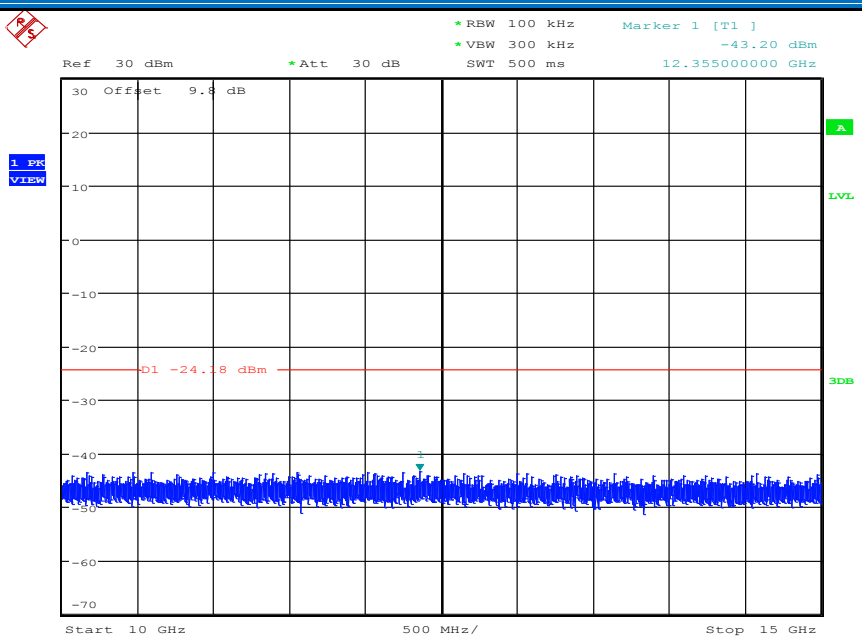

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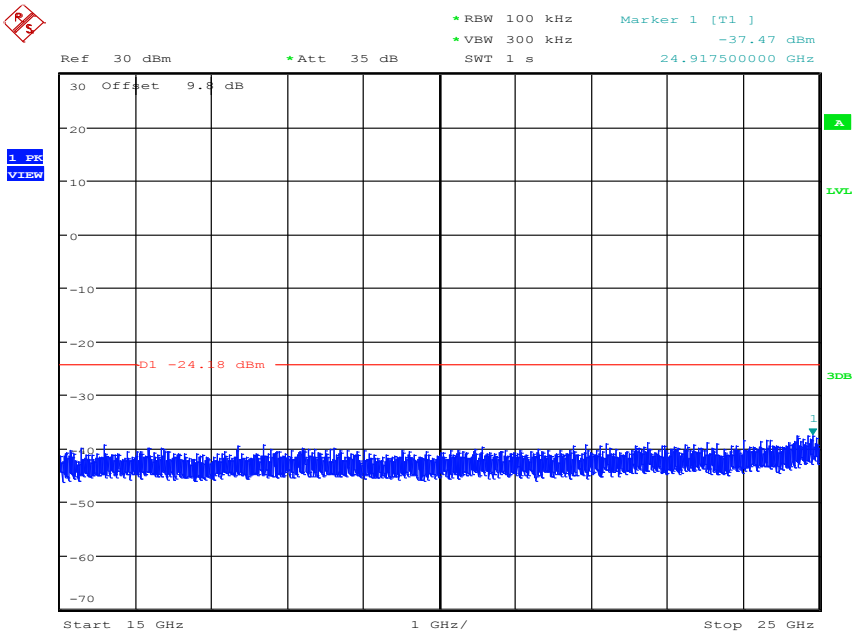

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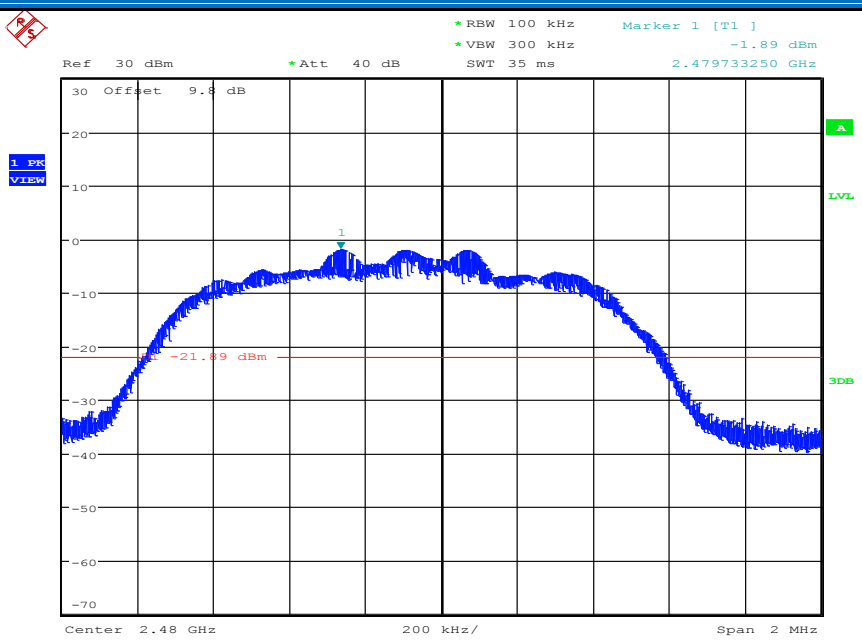
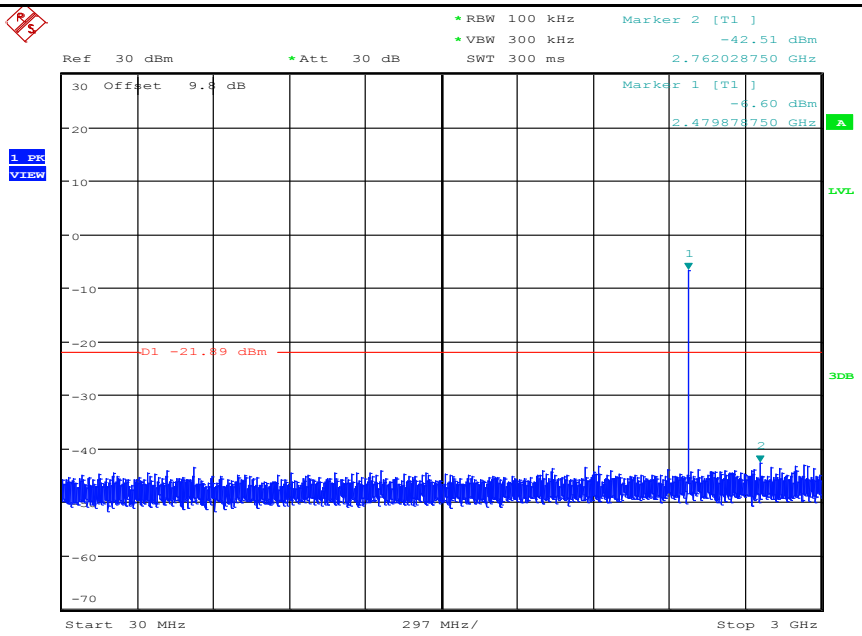
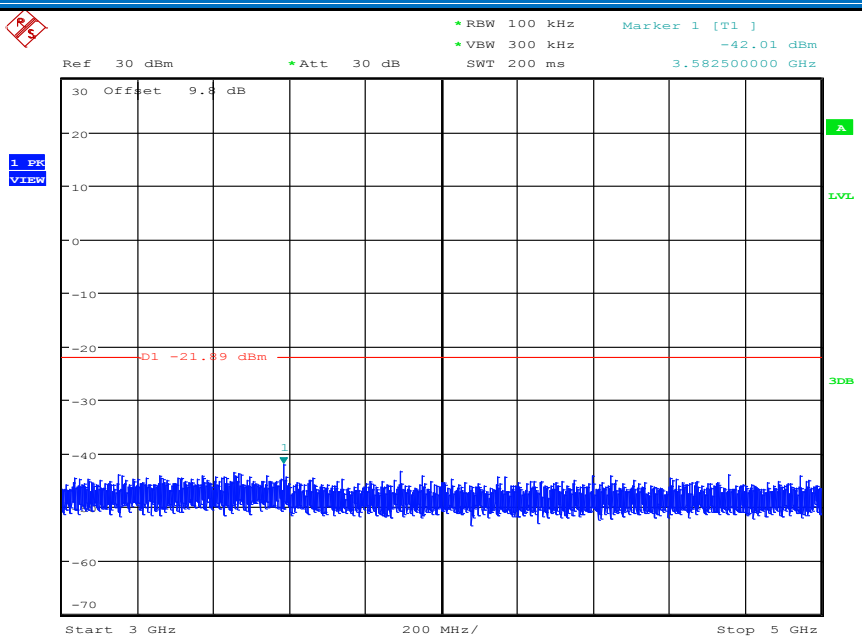
8DPSK HCH Graphs

Pref	 Date: 18.APR.2019 15:29:01
Puw	 Date: 18.APR.2019 15:29:14



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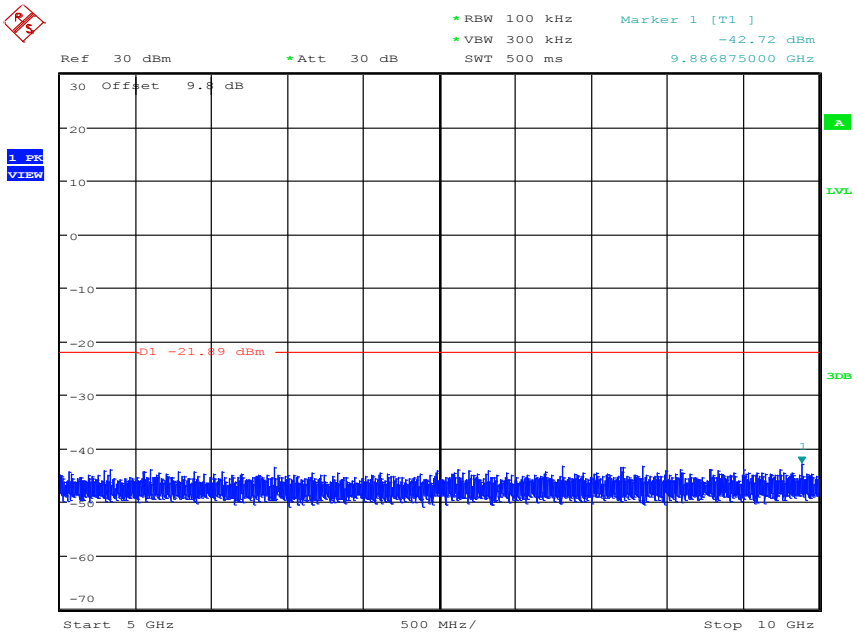

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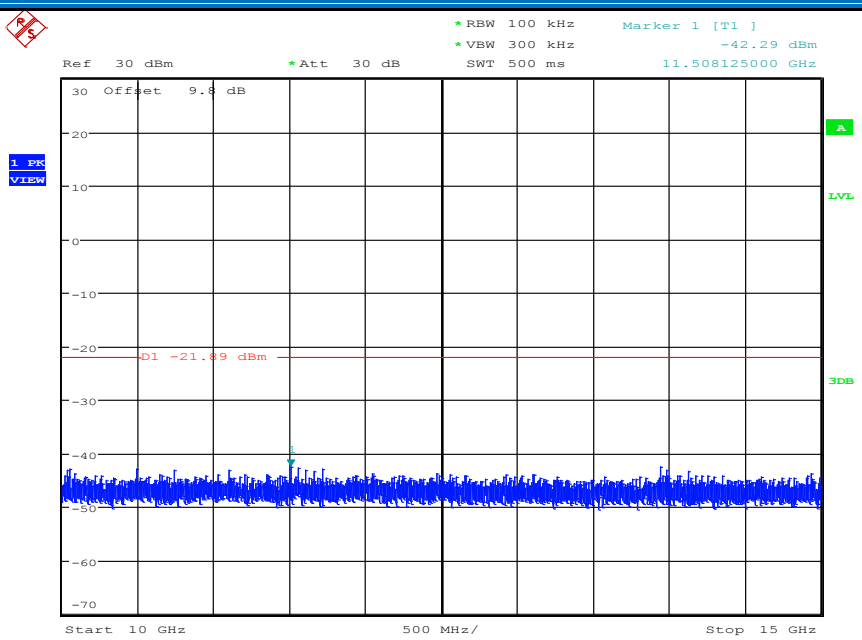

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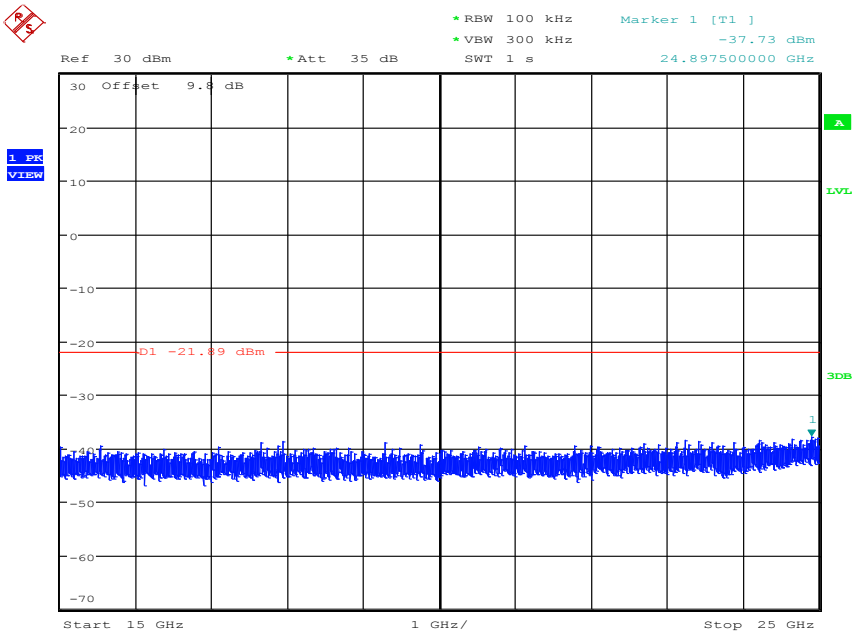
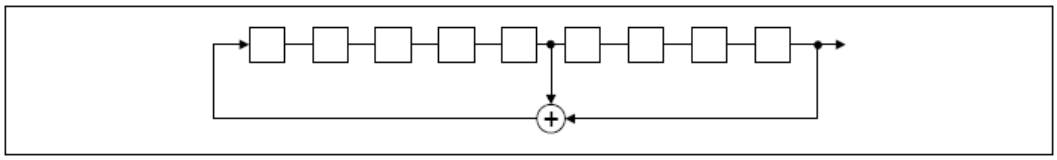
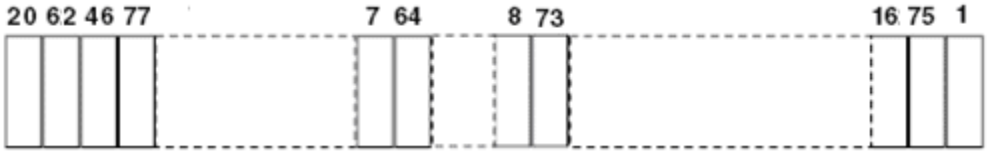


Date: 18.APR.2019 15:30:04

Remark:

Pre test 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

6.11 Pseudorandom Frequency Hopping Sequence

Test Requirement:	RSS247 5.1(2) requirement:
FHSs 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, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W. 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.	
The device does not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.	

6.12 Radiated Spurious Emission

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205, RSS-Gen Issue 5
Test Method:	ANSI C63.10: 2013 & RSS-Gen Issue 5
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.015MHz	Quasi-peak	200Hz	1kHz	Quasi-peak
0.015MHz-30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 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)	-	Quasi-peak	300
0.490MHz-1.705MHz	24000/F(kHz)	-	Quasi-peak	30
1.705MHz-30MHz	30	-	Quasi-peak	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
		74.0	Peak	3

Test Setup:

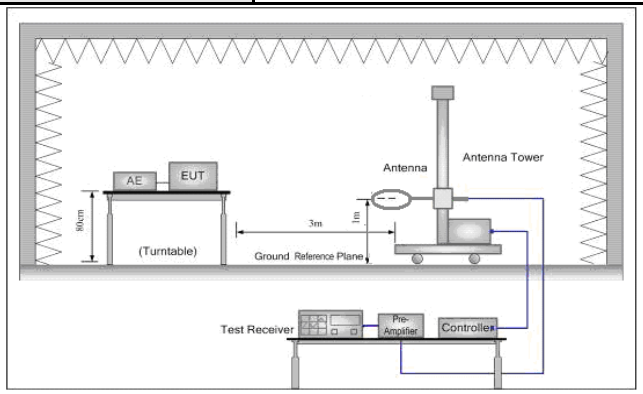


Figure 1. Below 30MHz

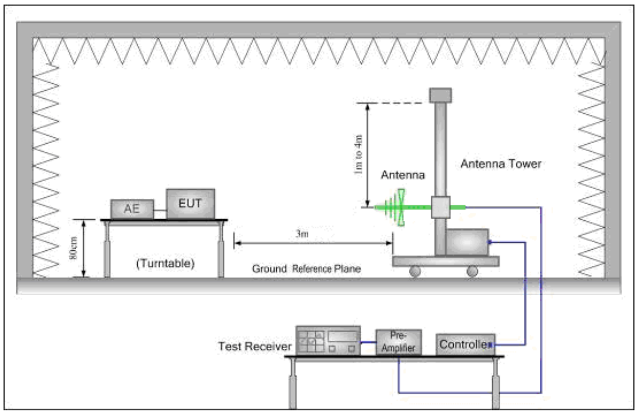


Figure 2. 30MHz to 1GHz

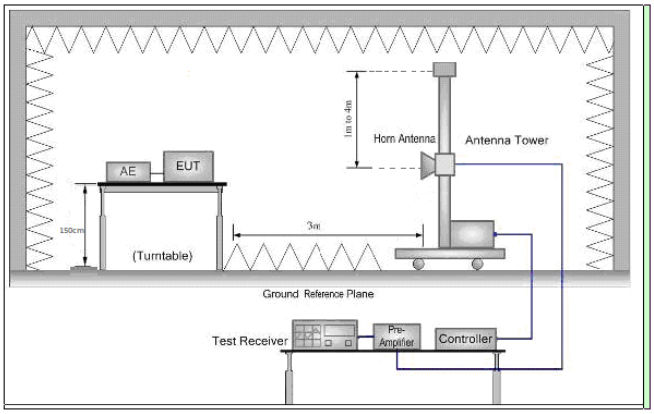
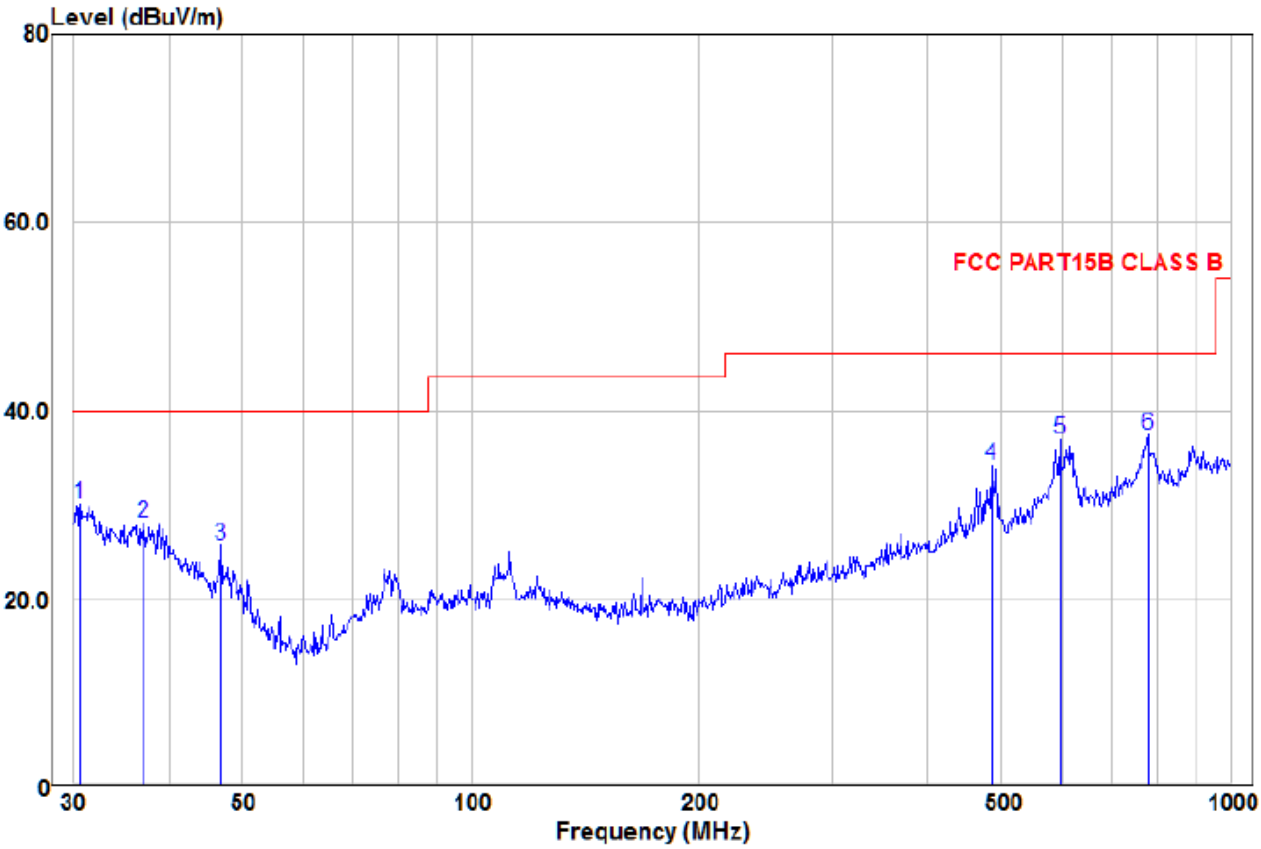


Figure 3. Above 1 GHz

Test Procedure:	a. For below 1GHz test, 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. For above 1GHz test, the EUT was placed on the top of a rotating table 1.5 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. c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. 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. e. 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 height 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. 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. h. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz) i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. j. 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 and GFSK modulation is the worst case. For below 1GHz part, through pre-scan, the worst case is the highest channel. Only the worst case is recorded in the report.
Test Results:	Pass

6.12.1 Radiated Emission below 1GHz

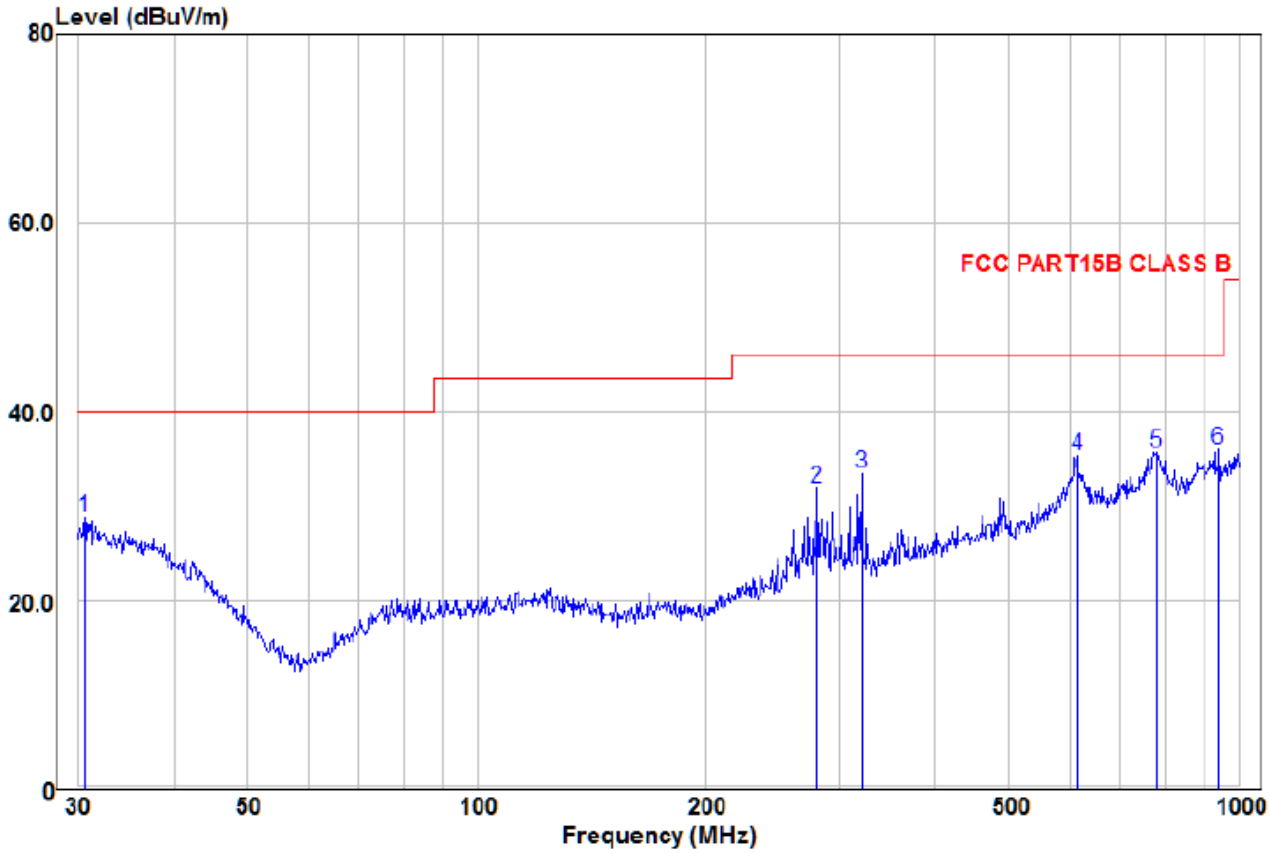
30MHz~1GHz		
Test mode:	GFSK(DH5)_TX_2480MHz	Vertical



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	30.53	12.25	17.76	30.01	40.00	-9.99	Peak	VERTICAL
2	37.02	11.01	17.00	28.01	40.00	-11.99	Peak	VERTICAL
3	46.83	14.41	11.13	25.54	40.00	-14.46	Peak	VERTICAL
4	483.91	16.42	17.63	34.05	46.00	-11.95	Peak	VERTICAL
5	597.22	17.48	19.30	36.78	46.00	-9.22	Peak	VERTICAL
6 pp	779.61	15.70	21.60	37.30	46.00	-8.70	Peak	VERTICAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

Test mode:	GFSK(DH5)_TX_2480MHz	Horizontal



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	30.53	11.01	17.76	28.77	40.00	-11.23	Peak	HORIZONTAL
2	280.02	19.34	12.59	31.93	46.00	-14.07	Peak	HORIZONTAL
3	319.94	19.65	13.86	33.51	46.00	-12.49	Peak	HORIZONTAL
4	614.21	15.73	19.61	35.34	46.00	-10.66	Peak	HORIZONTAL
5	782.35	14.11	21.58	35.69	46.00	-10.31	Peak	HORIZONTAL
6 pp	942.13	12.41	23.52	35.93	46.00	-10.07	Peak	HORIZONTAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

6.12.2 Transmitter Emission above 1GHz

Test mode:		GFSK(DH5)_TX_2402MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4804	47.92	-1.33	46.59	74	-27.41	Peak	H
7206	43.6	5.98	49.58	74	-24.42	Peak	H
4804	46.06	-1.33	44.73	74	-29.27	Peak	V
7206	44.35	5.98	50.33	74	-23.67	Peak	V
Test mode:		GFSK(DH5)_TX_2441MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4882	51.36	-0.82	50.54	74	-23.46	Peak	H
7323	44.17	5.91	50.08	74	-23.92	Peak	H
4882	50.97	-0.82	50.15	74	-23.85	Peak	V
7323	44.41	5.91	50.32	74	-23.68	Peak	V
Test mode:		GFSK(DH5)_TX_2480MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4960	48.85	-0.45	48.4	74	-25.6	Peak	H
7440	43.25	5.77	49.02	74	-24.98	Peak	H
4960	48.63	-0.45	48.18	74	-25.82	Peak	V
7440	43.77	5.77	49.54	74	-24.46	Peak	V

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 8GHz and below 30MHz was very low. 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.

Test mode:		π/4DQPSK (2DH5)_TX_2402MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4804	44.67	-1.33	43.34	74	-30.66	Peak	H
7206	43.73	5.98	49.71	74	-24.29	Peak	H
4802	45.35	-1.34	44.01	74	-29.99	Peak	V
7206	42.73	5.98	48.71	74	-25.29	Peak	V
Test mode:		π/4DQPSK (2DH5)_TX_2441MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4882	46.76	-0.82	45.94	74	-28.06	Peak	H
7323	43.32	5.91	49.23	74	-24.77	Peak	H
4882	46.74	-0.82	45.92	74	-28.08	Peak	V
7323	43.32	5.91	49.23	74	-24.77	Peak	V
Test mode:		π/4DQPSK (2DH5)_TX_2480MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4960	45.28	-0.45	44.83	74	-29.17	Peak	H
7440	42.22	5.77	47.99	74	-26.01	Peak	H
4960	45.99	-0.45	45.54	74	-28.46	Peak	V
7440	41.87	5.77	47.64	74	-26.36	Peak	V

Remark:

3) 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

4) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. 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.

Test mode:		8DPSK(3DH5)_TX_2402MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4804	45.31	-1.33	43.98	74	-30.02	Peak	H
7206	43.51	5.98	49.49	74	-24.51	Peak	H
4804	45.02	-1.33	43.69	74	-30.31	Peak	V
7206	41.83	5.98	47.81	74	-26.19	Peak	V
Test mode:		8DPSK(3DH5)_TX_2441MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4882	46.39	-0.82	45.57	74	-28.43	Peak	H
7323	43.47	5.91	49.38	74	-24.62	Peak	H
4882	46.26	-0.82	45.44	74	-28.56	Peak	V
7323	43.08	5.91	48.99	74	-25.01	Peak	V
Test mode:		8DPSK(3DH5)_TX_2480MHz					
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4960	45.74	-0.45	45.29	74	-28.71	Peak	H
7440	42.9	5.77	48.67	74	-25.33	Peak	H
4960	45	-0.45	44.55	74	-29.45	Peak	V
7440	42.71	5.77	48.48	74	-25.52	Peak	V

Remark:

5) 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

6) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. 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.

6.13 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205, RSS-Gen Issue 5
Test Method:	ANSI C63.10 2013 & RSS-Gen Issue 5
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

Test Setup:	

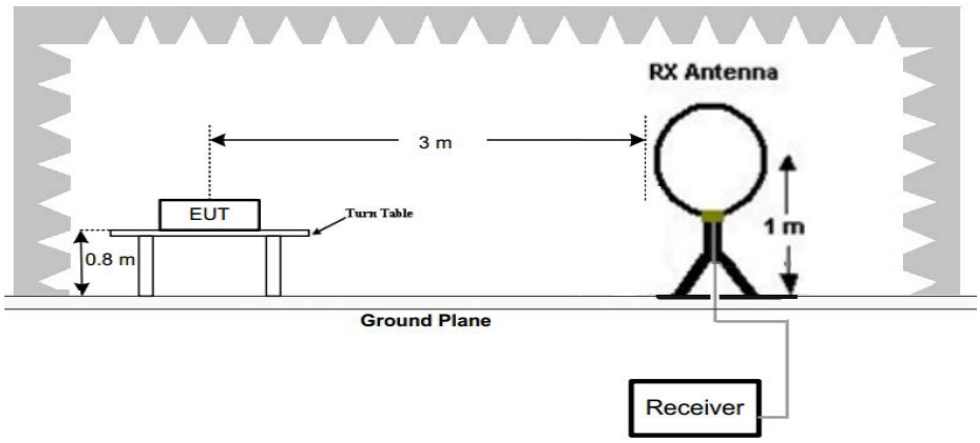


Figure 1. Below 30MHz

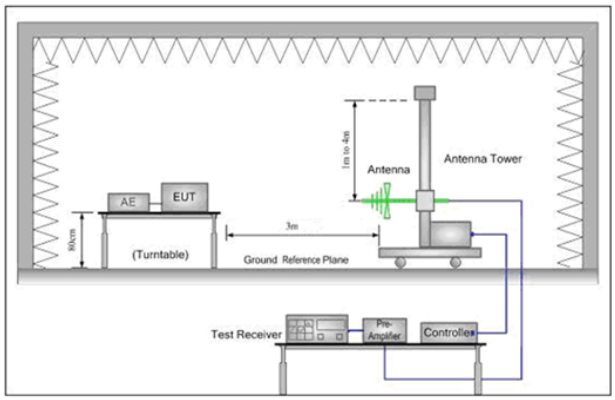


Figure 2. 30MHz to 1GHz

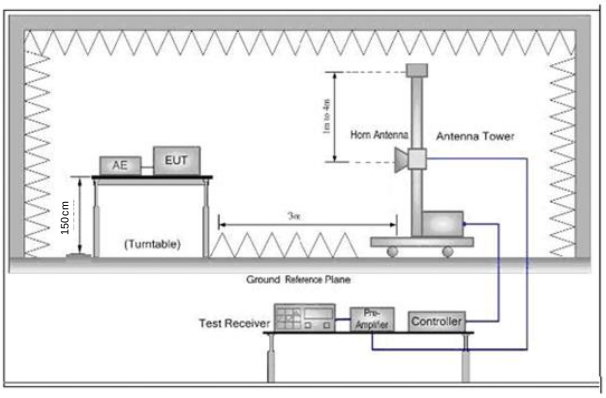
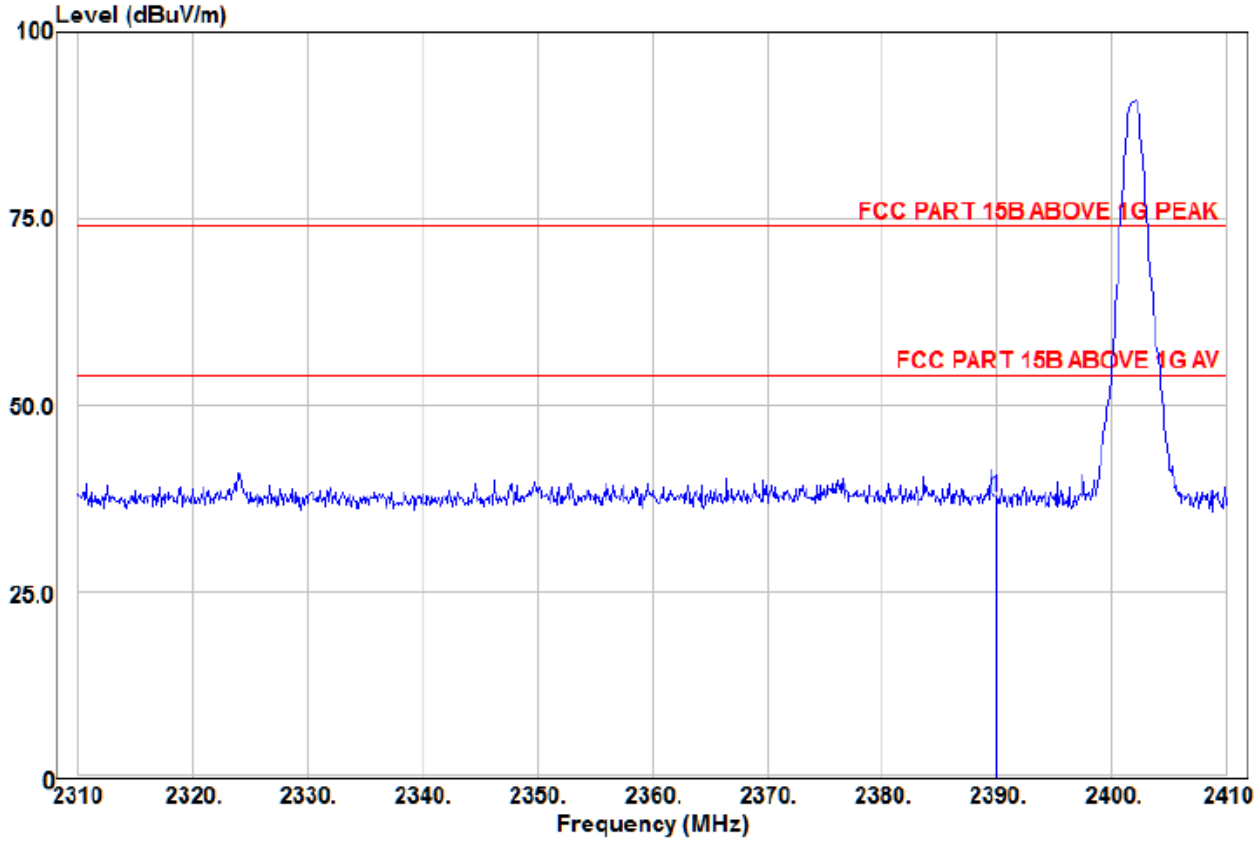


Figure 3. Above 1 GHz

Test Procedure:	k. 1) Below 1G: 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. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 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. Note: For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. l. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. m. 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. n. 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. o. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. p. 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. q. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz) r. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. s. Repeat above procedures until all frequencies measured was complete.
Test Mode:	Transmitting with GFSK, π/4DQPSK , 8DPSK at lowest, middle and highest channel.
Test Results:	Pass

Test mode:	GFSK(DH5)_TX_2402MHz	Horizontal

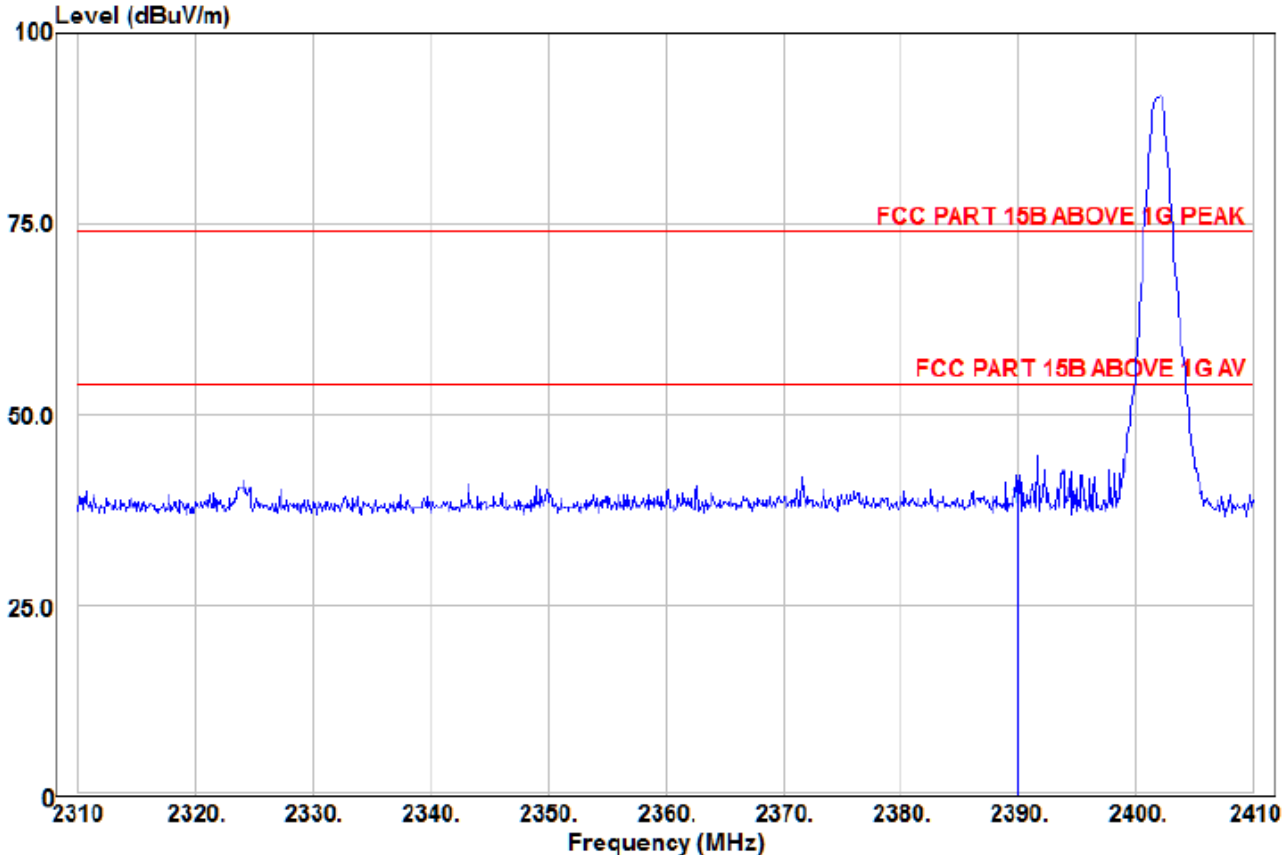


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2390.00	46.61	-8.89	37.72	74.00	-36.28	Peak	HORIZONTAL

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

Test mode:	GFSK(DH5)_TX_2402MHz	Vertical

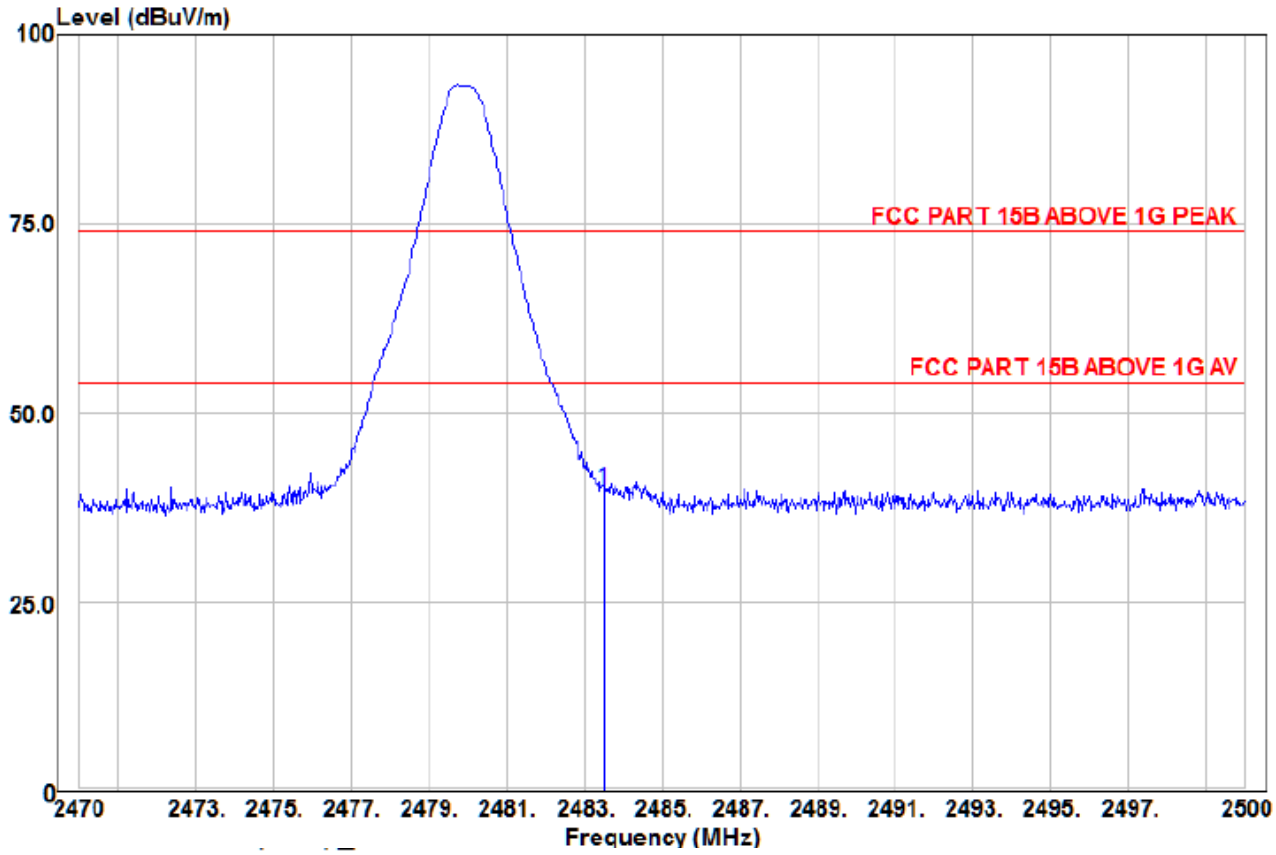


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2390.00	46.61	-8.89	37.72	74.00	-36.28	Peak	VERTICAL

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

Test mode:	GFSK(DH5)_TX_2480MHz	Horizontal

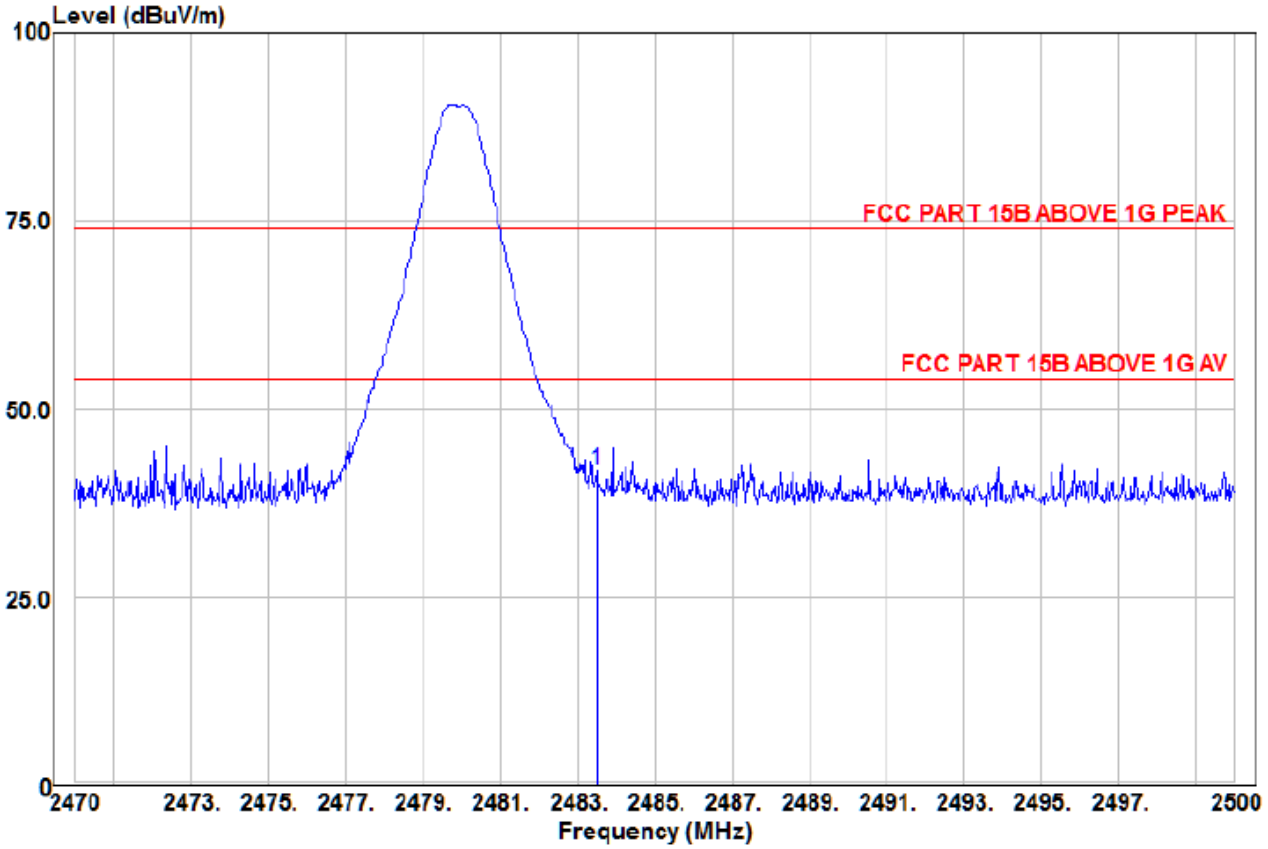


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2483.50	48.59	-8.68	39.91	74.00	-34.09	Peak	HORIZONTAL

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

Test mode:	GFSK(DH5)_TX_2480MHz	Vertical

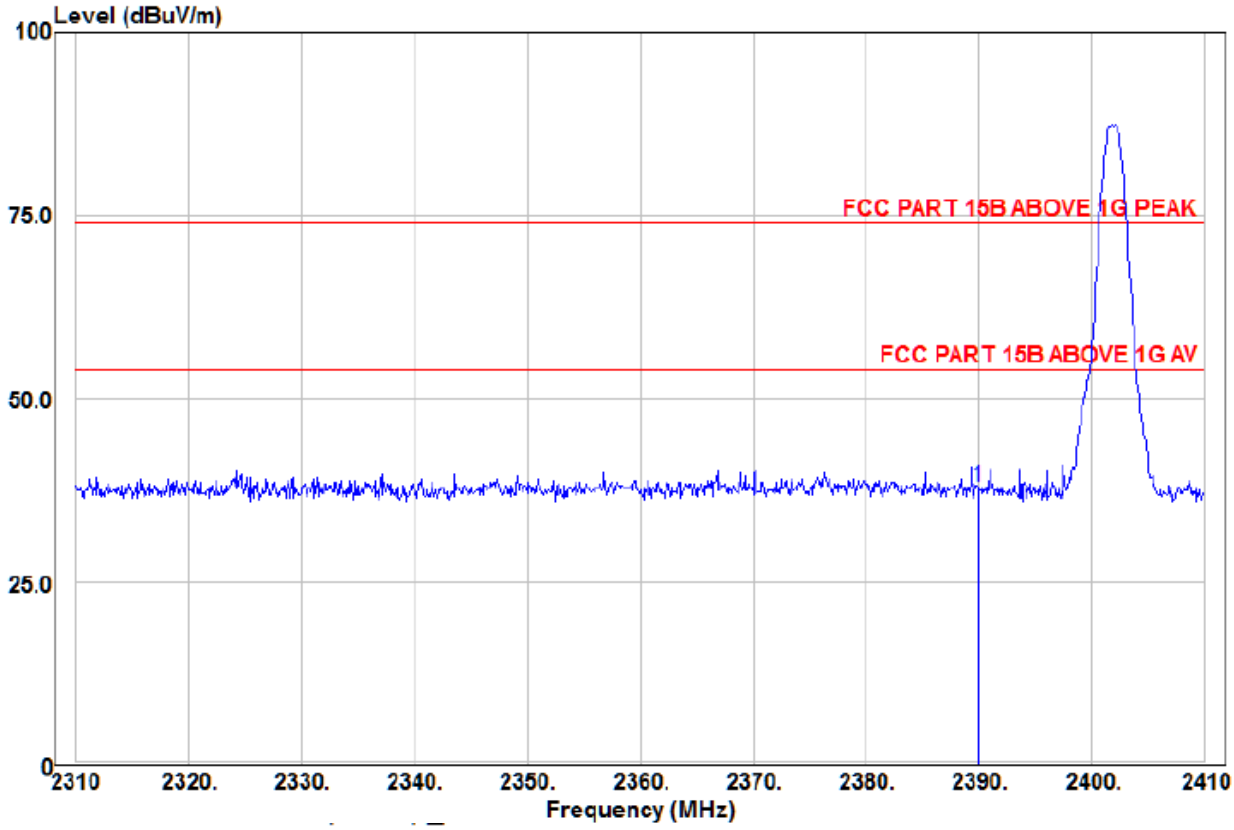


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2483.50	50.56	-8.68	41.88	74.00	-32.12	Peak	VERTICAL

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

Test mode:	π/4DQPSK (2DH5)_TX_2402MHz	Horizontal

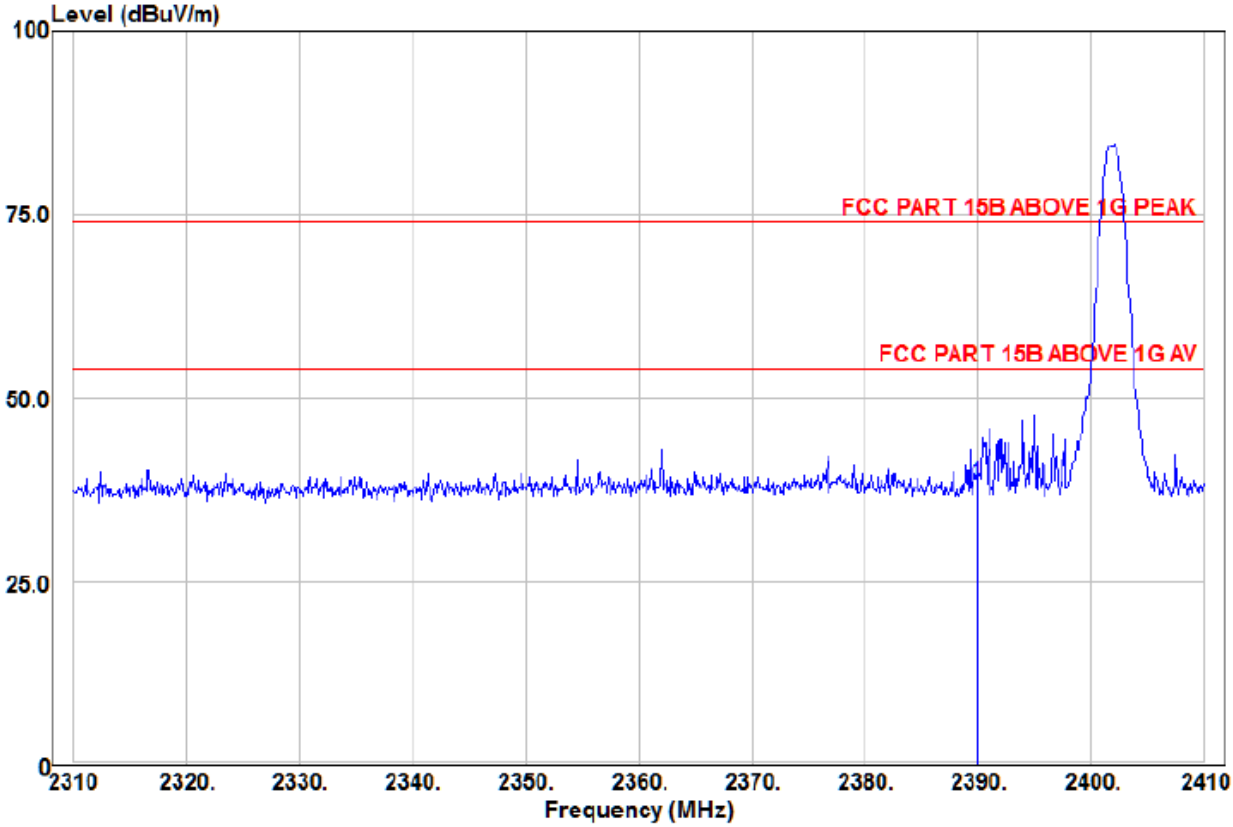


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2390.00	46.92	-8.89	38.03	74.00	-35.97	Peak	HORIZONTAL

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

Test mode:	π/4DQPSK (2DH5)_TX_2402MHz	Vertical

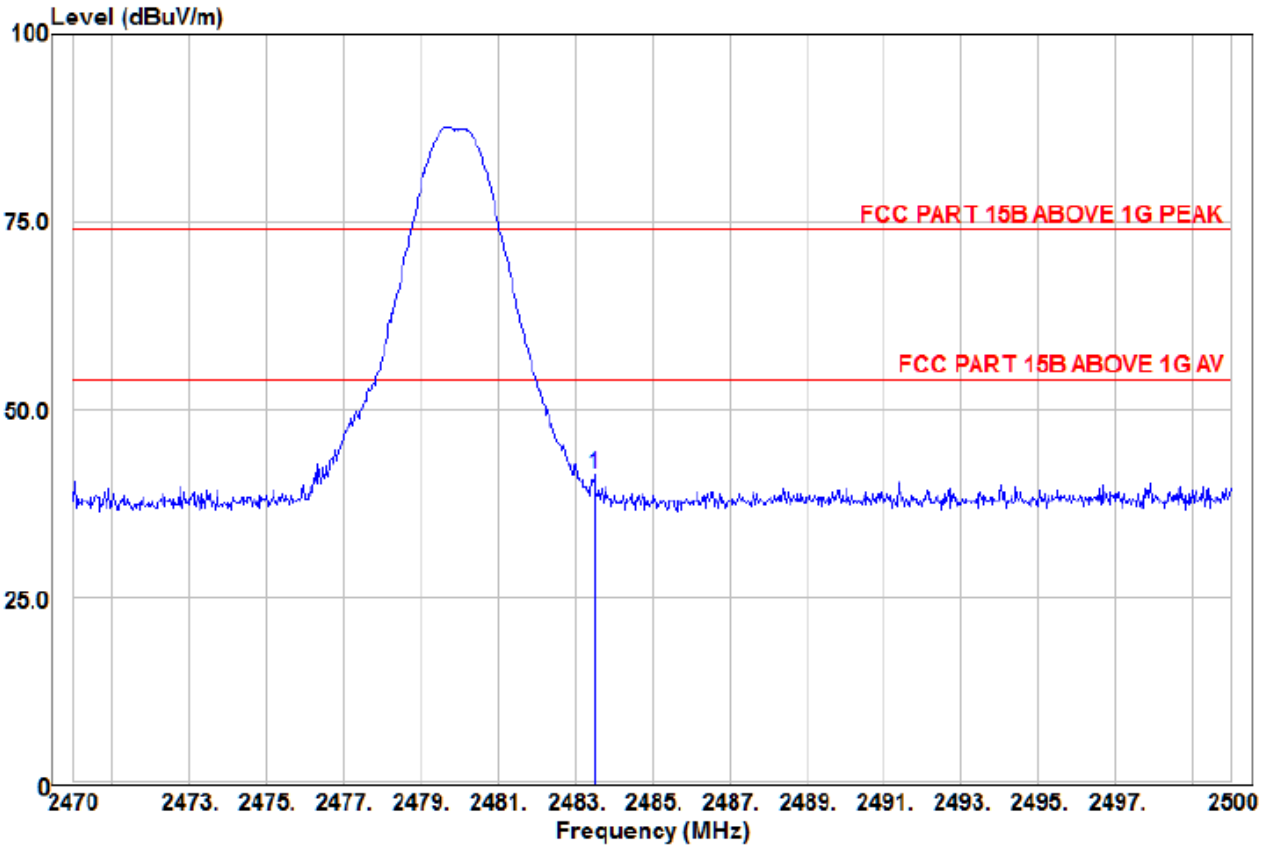


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2390.00	47.20	-8.89	38.31	74.00	-35.69	Peak	VERTICAL

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

Test mode:	π/4DQPSK (2DH5)_TX_2480MHz	Horizontal

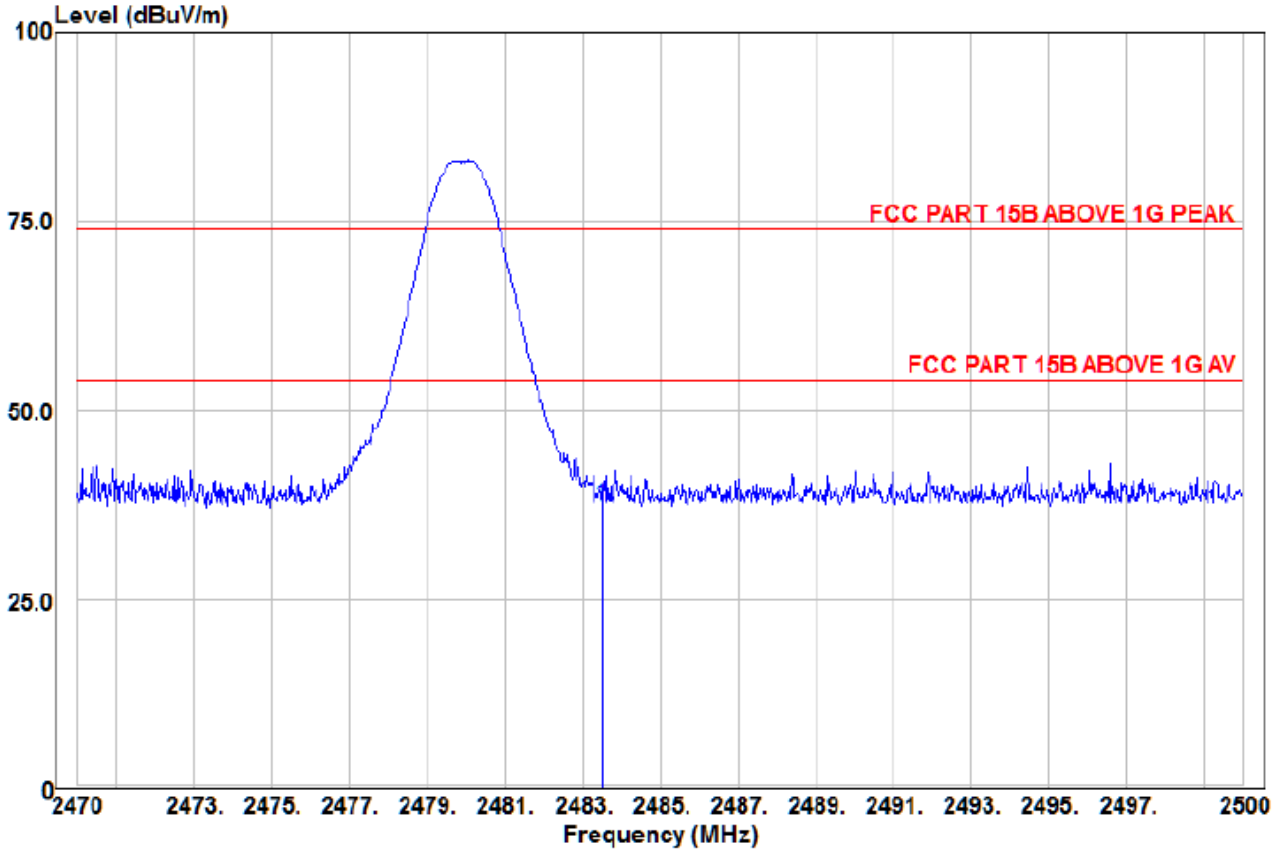


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2483.50	50.00	-8.68	41.32	74.00	-32.68	Peak	HORIZONTAL

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

Test mode:	π/4DQPSK (2DH5)_TX_2480MHz	Vertical

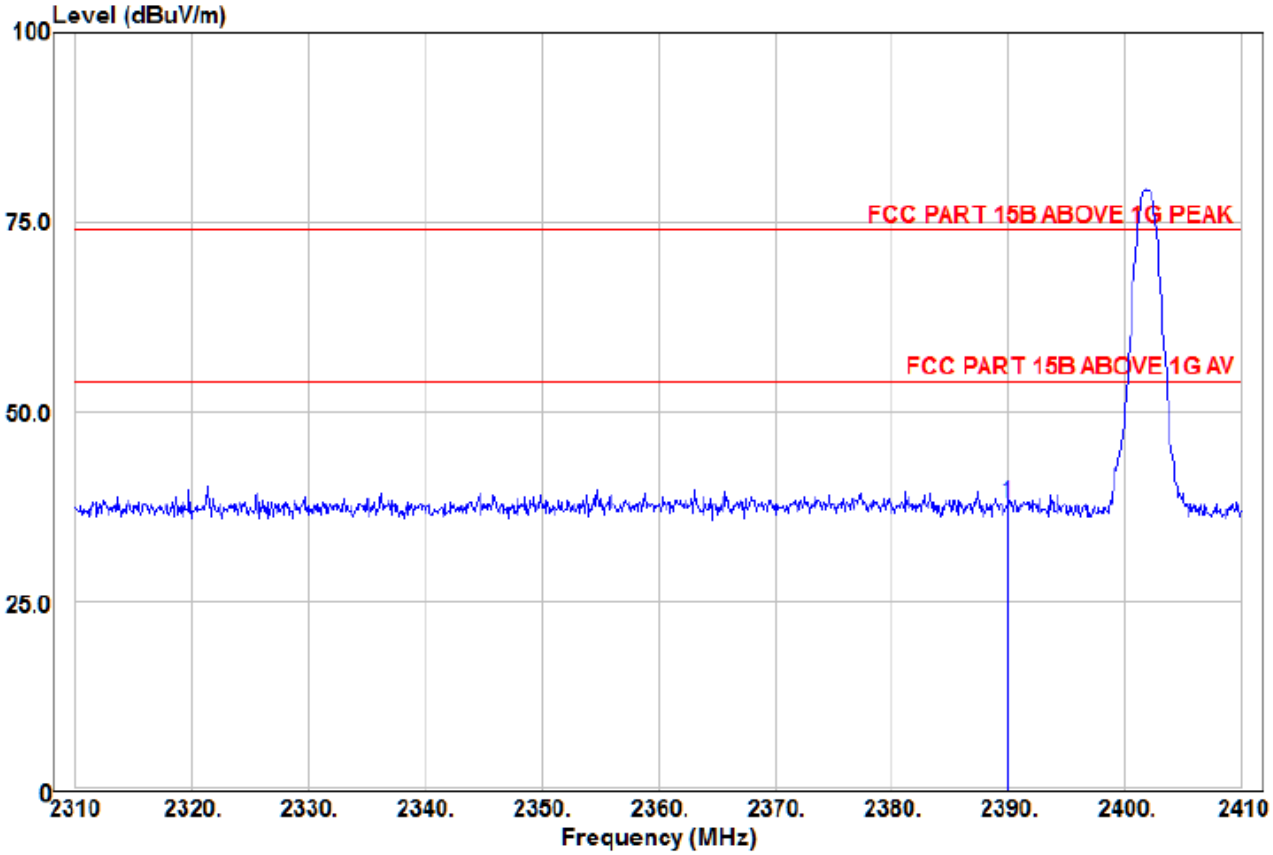


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2483.50	46.11	-8.68	37.43	74.00	-36.57	Peak	VERTICAL

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

Test mode:	8DPSK(3DH5)_TX_2402MHz	Horizontal

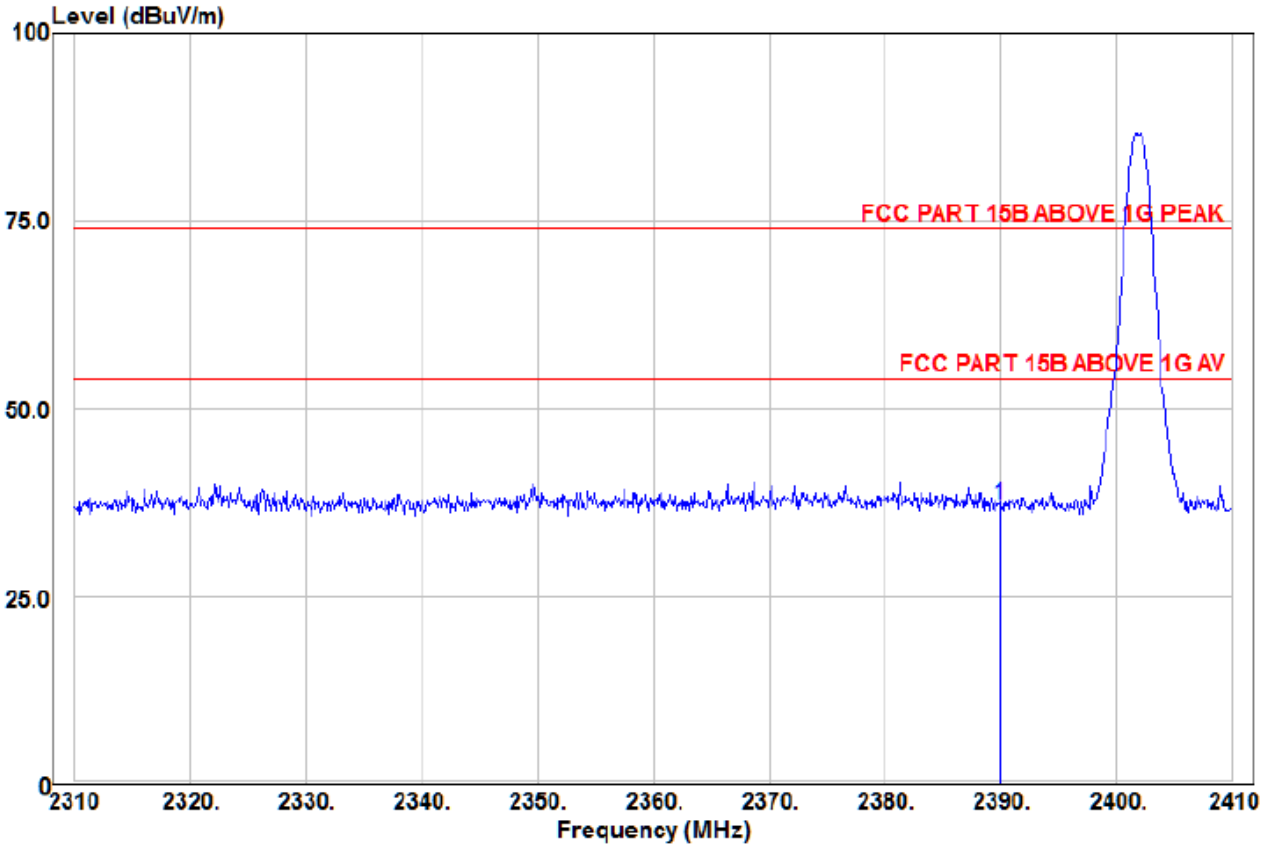


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2390.00	46.75	-8.89	37.86	74.00	-36.14	Peak	HORIZONTAL

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

Test mode:	8DPSK(3DH5)_TX_2402MHz	Vertical

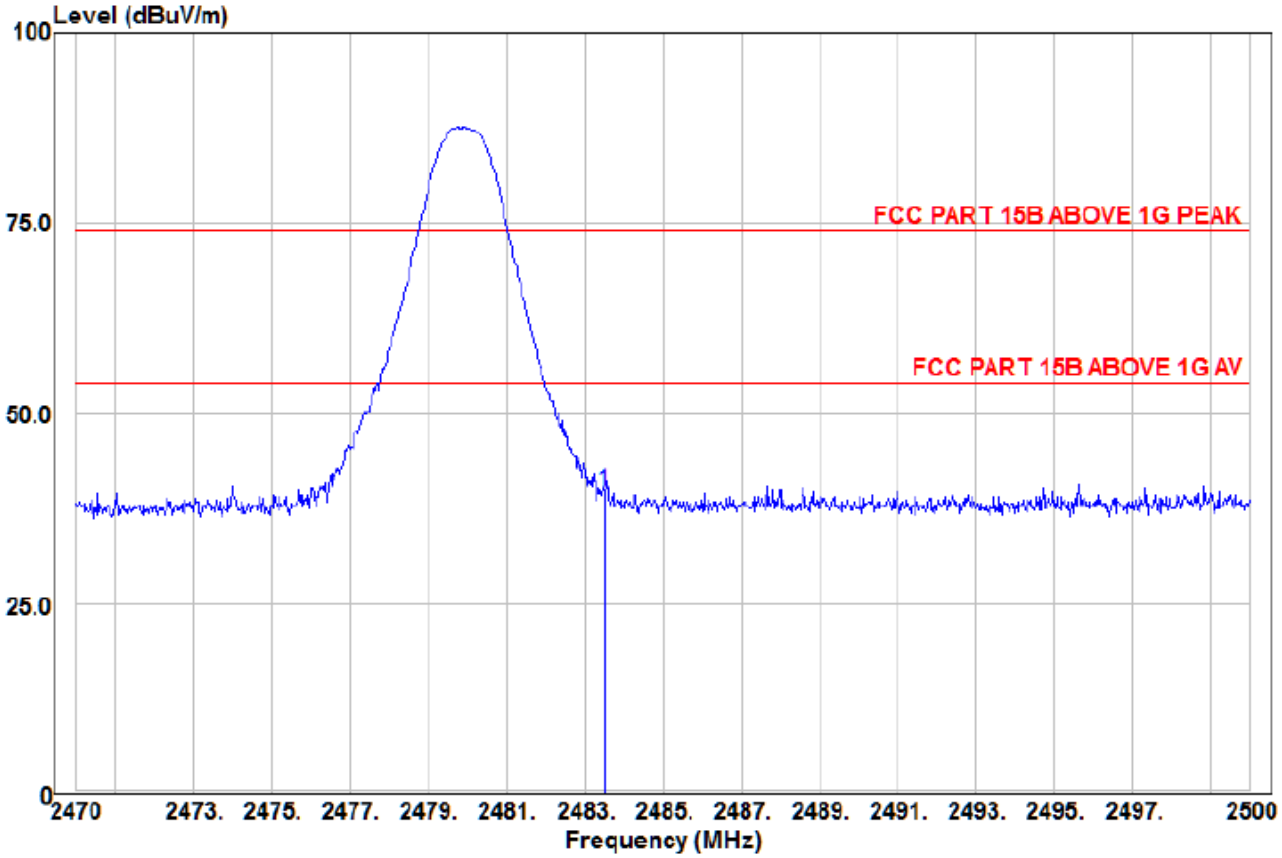


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2390.00	46.01	-8.89	37.12	74.00	-36.88	Peak	VERTICAL

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

Test mode:	8DPSK(3DH5)_TX_2480MHz	Horizontal

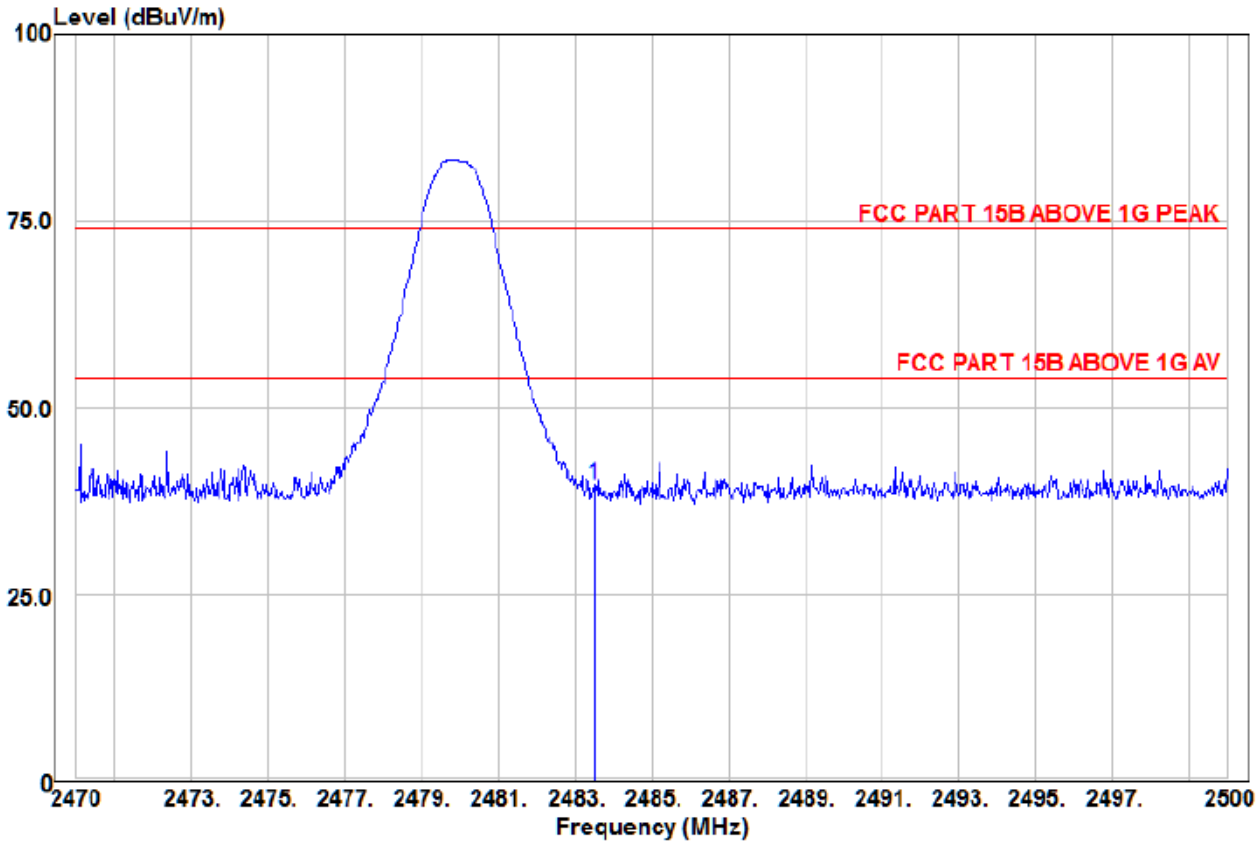


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2483.50	48.31	-8.68	39.63	74.00	-34.37	Peak	HORIZONTAL

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

Test mode:	8DPSK(3DH5)_TX_2480MHz	Vertical



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	2483.50	48.41	-8.68	39.73	74.00	-34.27	Peak	VERTICAL

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