

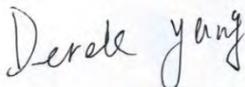
# FCC TEST REPORT

**Application No.:** AR/2020/C0002  
**Applicant:** Xiaomi Communications Co., Ltd.  
**Address of Applicant** #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085  
**Manufacturer:** Xiaomi Communications Co., Ltd.  
**Address of Manufacturer** #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085  
**EUT Description:** Mobile Phone  
**Model No.:** M2101K9G  
**Trade Mark:** XIAOMI  
**FCC ID:** 2AFZZK9G  
**Standards:** 47 CFR FCC Part 2, Subpart J  
47 CFR Part 15, Subpart C  
**Date of Receipt:** 2020/12/21  
**Date of Test:** 2020/12/21 to 2021/1/18  
**Date of Issue:** 2021/1/19

<b>Test Result :</b>	<b>PASS *</b>
----------------------	---------------

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:



Derek Yang  
Wireless Laboratory Manager



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# 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-01-19		Original

Authorized for issue by:			
Tested By		 _____ (Dee Zheng) /Project Engineer	
Checked By		 _____ (David Chen) /Reviewer	



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## 2 Test Summary

Test Item	Test Requirement	Test Method	Test Result	Result
AC Power Line Conducted Emission	15.207	ANSI C63.10 (2013)	Clause 4.3	PASS
Conducted Peak Output Power	15.247 (b)(1)	ANSI C63.10 (2013)	Clause 4.4	PASS
20dB Emission Bandwidth	15.247 (a)(1)	ANSI C63.10 (2013)	Clause 4.5	PASS
Carrier Frequencies Separation	15.247 (a)(1)	ANSI C63.10 (2013)	Clause 4.6	PASS
Hopping Channel Number	15.247 (a)(1)	ANSI C63.10 (2013)	Clause 4.7	PASS
Dwell Time	15.247 (a)(1)	ANSI C63.10 (2013)	Clause 4.8	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 (2013)	Clause 4.9	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 (2013)	Clause 4.10	PASS
Radiated Spurious emissions	15.247(d); 15.205/15.209	ANSI C63.10 (2013)	Clause 4.11	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d); 15.205/15.209	ANSI C63.10 (2013)	Clause 4.12	PASS



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### 3 General Information

#### 3.1 Details of Client

Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

#### 3.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057



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### 3.3 Test Facility

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

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.



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### 3.4 General Description of EUT

EUT Description:	Mobile Phone
Model No.:	M2101K9G
Trade Mark:	XIAOMI
Hardware Version:	P2
Software Version:	MIUI 12
Operation Frequency:	2400MHz~2483.5MHz $f_c = 2402 \text{ MHz} + N * 2 \text{ MHz}$ , where: - $f_c$ = "Operating Frequency" in MHz, - $N$ = "Channel Number" with the range from 0 to 39.
Bluetooth version:	Bluetooth V5.1
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	<input checked="" type="checkbox"/> Portable Device, <input type="checkbox"/> Module
Antenna Type:	PIFA Antenna
Antenna Gain:	-1.8dBi(ANT1);-0.9 dBi(ANT2);

**Operation Frequency of each channel**

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
2	2404MHz	22	2424MHz	42	2444MHz	62	2464MHz
3	2405MHz	23	2425MHz	43	2445MHz	63	2465MHz
4	2406MHz	24	2426MHz	44	2446MHz	64	2466MHz
5	2407MHz	25	2427MHz	45	2447MHz	65	2467MHz
6	2408MHz	26	2428MHz	46	2448MHz	66	2468MHz
7	2409MHz	27	2429MHz	47	2449MHz	67	2469MHz
8	2410MHz	28	2430MHz	48	2450MHz	68	2470MHz
9	2411MHz	29	2431MHz	49	2451MHz	69	2471MHz
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
12	2414MHz	32	2434MHz	52	2454MHz	72	2474MHz
13	2415MHz	33	2435MHz	53	2455MHz	73	2475MHz
14	2416MHz	34	2436MHz	54	2456MHz	74	2476MHz
15	2417MHz	35	2437MHz	55	2457MHz	75	2477MHz
16	2418MHz	36	2438MHz	56	2458MHz	76	2478MHz



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17	2419MHz	37	2439MHz	57	2459MHz	77	2479MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		

**Remark:**

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(CH0)	2402MHz
The Middle channel(CH39)	2441MHz
The Highest channel(CH78)	2480MHz

### 3.5 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	101.30 KPa

### 3.6 Description of Support Units

The EUT has been tested independent unit.



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## 4 Test results and Measurement Data

### 4.1 Antenna Requirement

<b>Standard requirement:</b>	47 CFR Part 15C Section 15.203 /247(c)
<p>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.</p> <p>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.</p>	
<p>The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -1.8dBi(ANT1);-0.9dBi(ANT2).</p>	



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## 4.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

### 4.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

### 4.2.2 Conclusion

Standard Requirement:

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.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, 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.

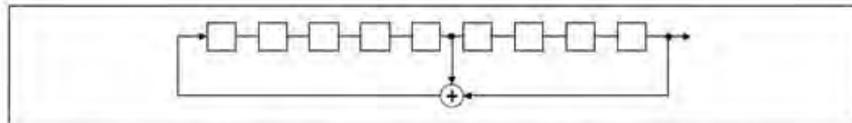
> Number of shift register stages: 9

> Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits

> Longest sequence of zeros: 8 (non-inverted signal)

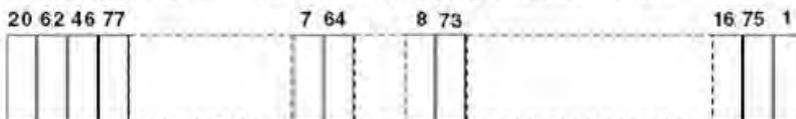
Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



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.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the RF system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels. The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.



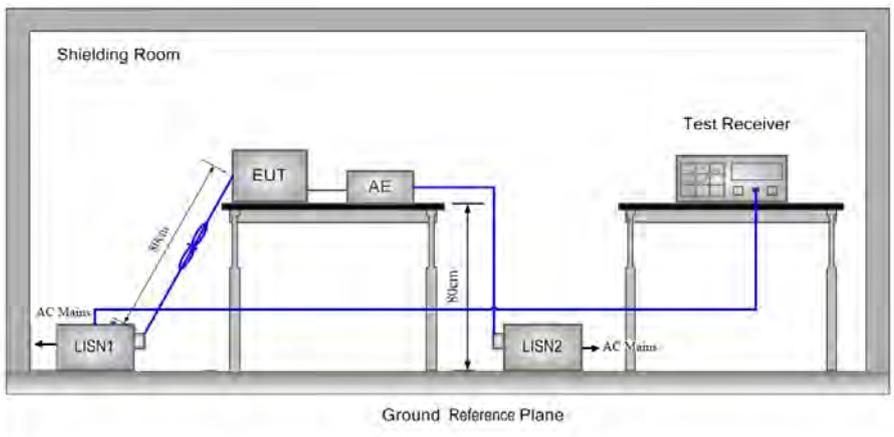
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### 4.3 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
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:	<ol style="list-style-type: none"> <li>1) The mains terminal disturbance voltage test was conducted in a shielded room.</li> <li>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.</li> <li>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.</li> <li>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.</li> <li>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.</li> </ol>		



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<p>Test Setup:</p>	
<p>Test Mode:</p>	<p>Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel.              Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the DH5 of data type and GFSK modulation at the lowest channel is the worst case.              Charge + Transmitting mode              Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details.</p>
<p>Test Results:</p>	<p>Pass</p>

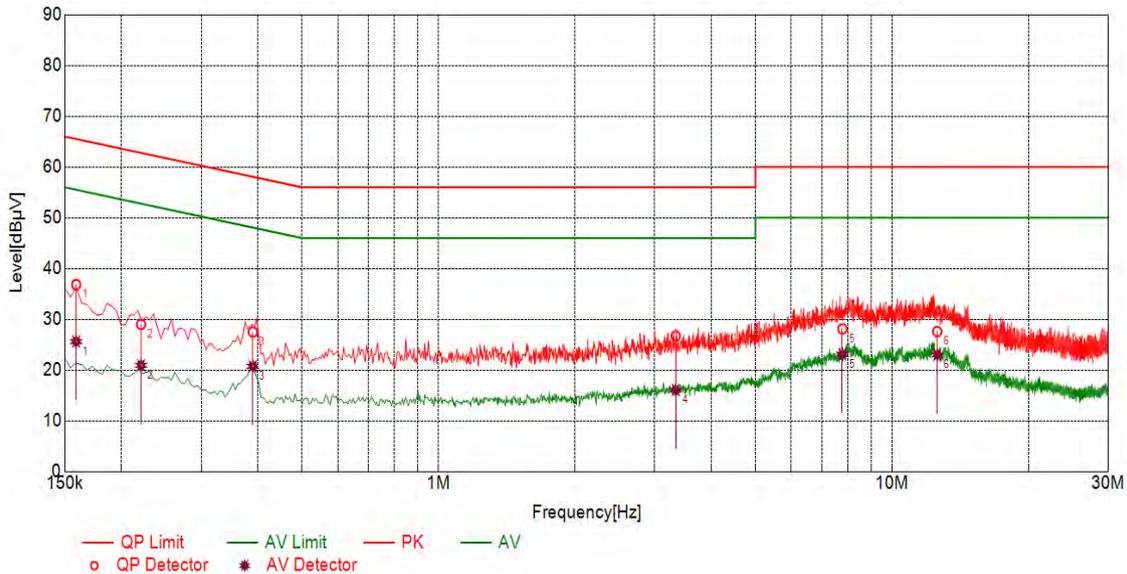


**Measurement Data**

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:**



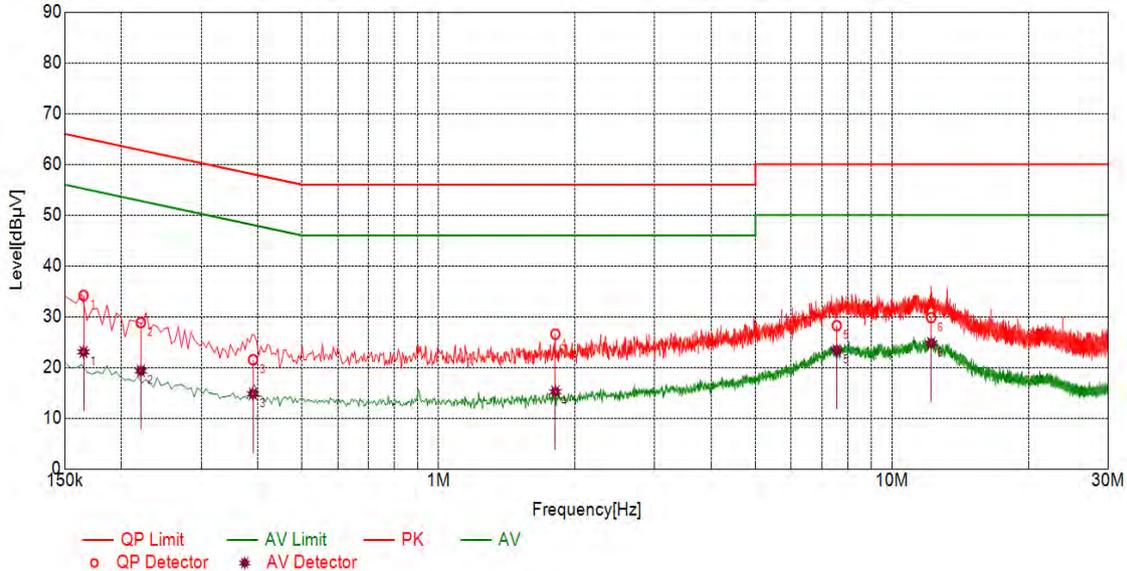
**Test Graph**

Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]
1	0.1590	10.10	36.83	65.52	28.69	25.61	55.52	29.91
2	0.2210	10.10	29.00	62.78	33.78	20.93	52.78	31.85
3	0.3898	10.10	27.50	58.07	30.57	20.75	48.07	27.32
4	3.3363	10.10	26.72	56.00	29.28	16.07	46.00	29.93
5	7.7762	10.10	28.10	60.00	31.90	23.09	50.00	26.91
6	12.5849	10.11	27.57	60.00	32.43	22.98	50.00	27.02



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Neutral Line:



Test Graph

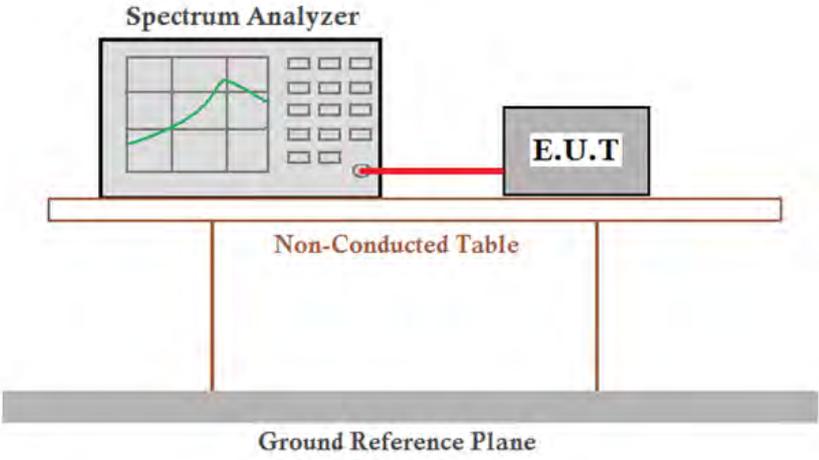
Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]
1	0.1651	10.10	34.17	65.20	31.03	23.04	55.20	32.16
2	0.2208	10.10	28.84	62.79	33.95	19.31	52.79	33.48
3	0.3902	10.10	21.51	58.06	36.55	14.78	48.06	33.28
4	1.8109	10.10	26.56	56.00	29.44	15.20	46.00	30.80
5	7.5546	10.10	28.23	60.00	31.77	23.37	50.00	26.63
6	12.2065	10.10	29.80	60.00	30.20	24.76	50.00	25.24

Remarks:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.



#### 4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013 Section 7.8.5
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
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 $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	(20.97dBm) 125mW
Test Results:	Pass



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**4.4.1 Test Results**

**Measurement Data of Peak Power:**

**ANT1:**

GFSK mode			
Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	17.41	20.97	Pass
Middle	17.90	20.97	Pass
Highest	15.44	20.97	Pass
π/4DQPSK mode			
Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	15.92	20.97	Pass
Middle	16.39	20.97	Pass
Highest	13.96	20.97	Pass
8DPSK mode			
Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	16.32	20.97	Pass
Middle	16.80	20.97	Pass
Highest	14.31	20.97	Pass



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**ANT2:**

GFSK mode			
Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	10.68	20.97	Pass
Middle	11.44	20.97	Pass
Highest	9.05	20.97	Pass
π/4DQPSK mode			
Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	9.43	20.97	Pass
Middle	10.21	20.97	Pass
Highest	7.83	20.97	Pass
8DPSK mode			
Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	9.78	20.97	Pass
Middle	10.56	20.97	Pass
Highest	8.11	20.97	Pass



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### 4.4.2 Test Plots

Test mode:	GFSK	Test channel:	Lowest	ANT1
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Date: 8 JAN 2021 10:29:55



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Test mode:	GFSK	Test channel:	Middle	ANT1
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Date: 8 JAN, 2021 10:30:17

Test mode:	GFSK	Test channel:	High	ANT1
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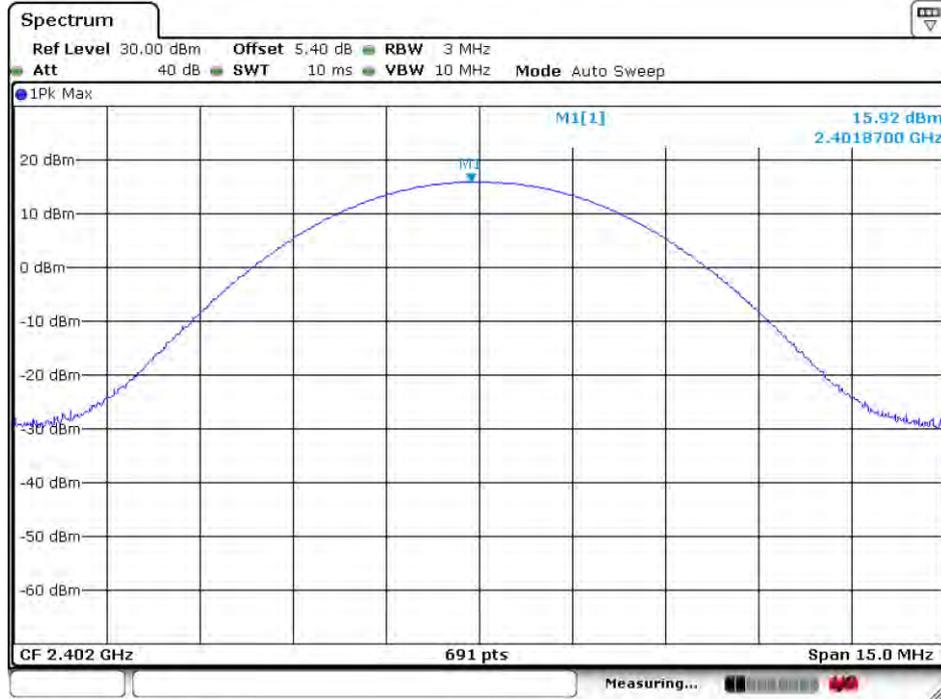
Date: 8 JAN, 2021 10:30:41



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Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest	ANT1
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Date: 8 JAN, 2021 10:31:21

Test mode:	$\pi/4$ DQPSK	Test channel:	Middle	ANT1
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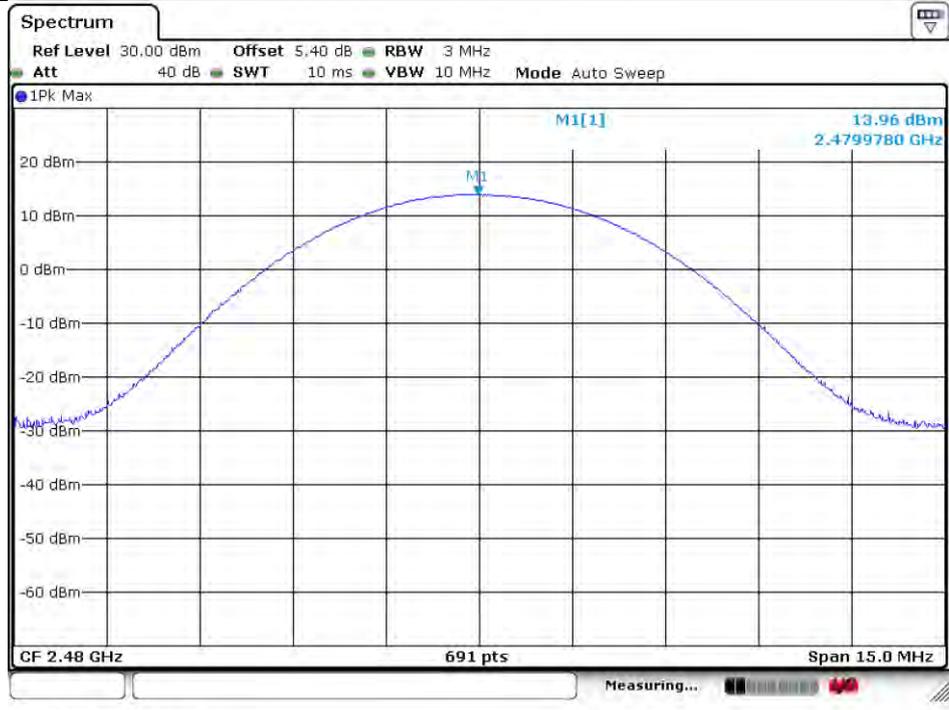


Date: 8 JAN, 2021 10:31:09



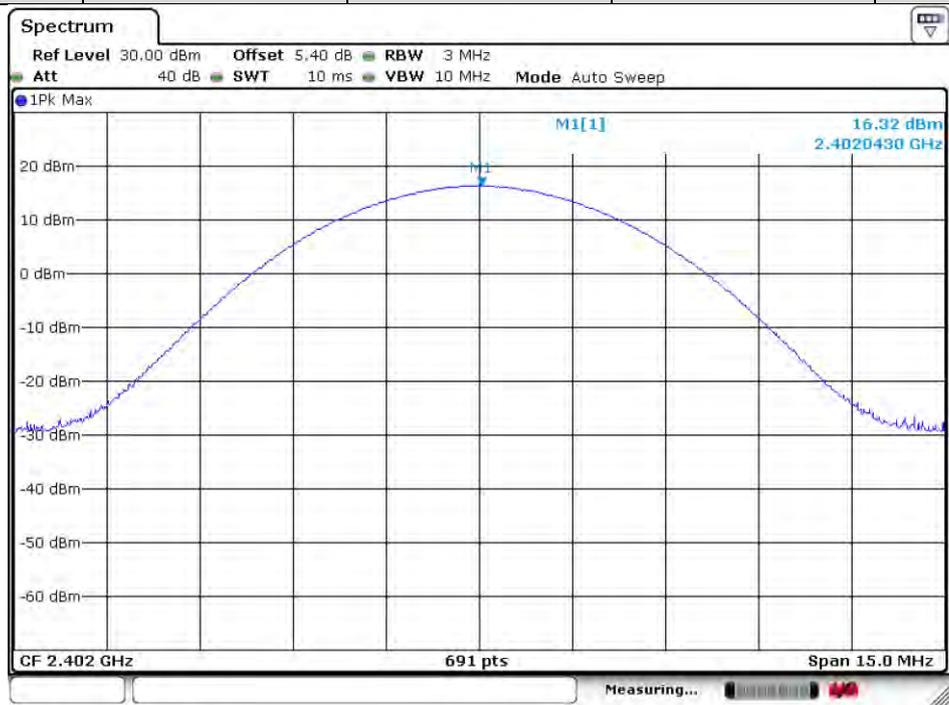
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Test mode:	$\pi/4$ DQPSK	Test channel:	High	ANT1
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Date: 8 JAN 2021 10:30:56

Test mode:	8DPSK	Test channel:	Lowest	ANT1
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Date: 8 JAN 2021 10:31:32



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Test mode:	8DPSK	Test channel:	Middle	ANT1
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Date: 8 JAN, 2021 10:31:47

Test mode:	8DPSK	Test channel:	High	ANT1
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Date: 8 JAN, 2021 10:31:57



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Test mode:	GFSK	Test channel:	Lowest	ANT2
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Date: 14 JAN 2021 18:48:27

Test mode:	GFSK	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 18:48:44



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Test mode:	GFSK	Test channel:	High	ANT2
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Date: 14 JAN 2021 18:48:55

Test mode:	$\pi/4$ QPSK	Test channel:	Lowest	ANT2
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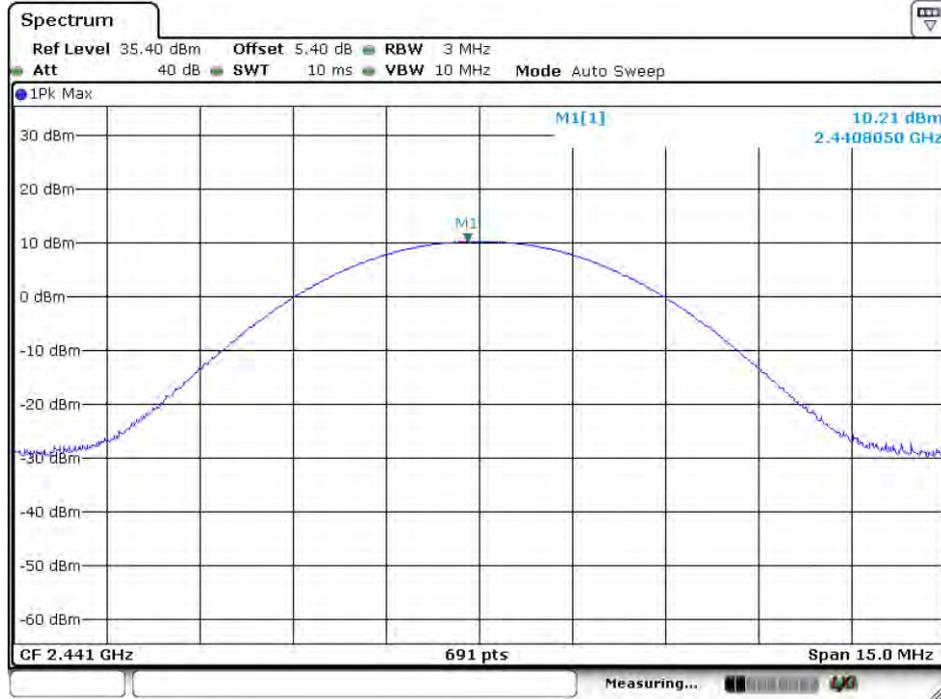
Date: 14 JAN 2021 18:49:40



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Test mode:	$\pi/4$ DQPSK	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 18:49:26

Test mode:	$\pi/4$ DQPSK	Test channel:	High	ANT2
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Date: 14 JAN 2021 18:49:11



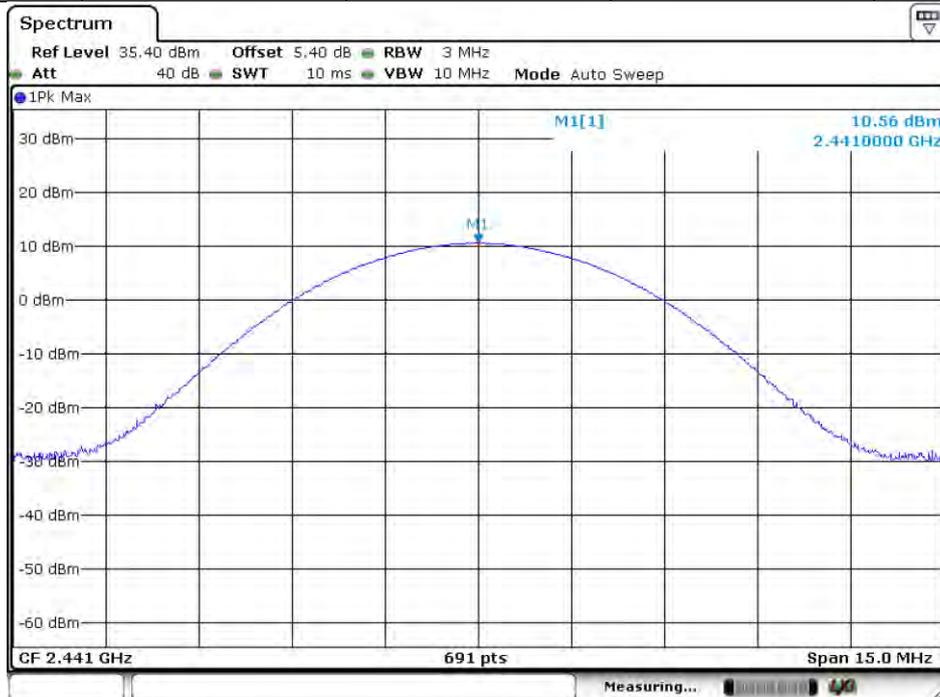
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Test mode:	8DPSK	Test channel:	Lowest	ANT2
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Date: 14 JAN 2021 18:49:50

Test mode:	8DPSK	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 18:50:02



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Test mode:	8DPSK	Test channel:	High	ANT2
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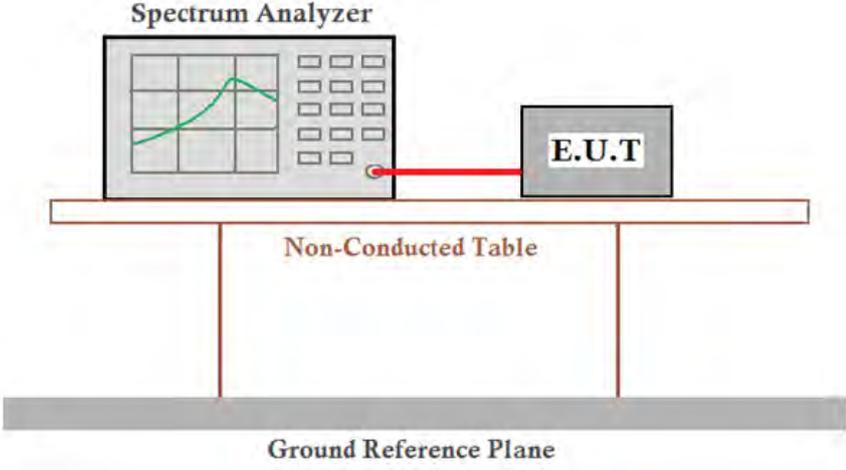
Date: 14 JAN 2021 18:50:13



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### 4.5 20dB Emission Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 Section 7.8.7
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
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 $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	NA
Test Results:	Pass



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**4.5.1 Test Results**

**Ant1:**

Mode	Test Channel	20dB Emission Bandwidth (KHz)	Result
GFSK	Lowest	942.1	Pass
	Middle	942.1	Pass
	Highest	942.1	Pass
$\pi/4$ DQPSK	Lowest	1289.4	Pass
	Middle	1289.4	Pass
	Highest	1293.8	Pass
8DPSK	Lowest	1302.5	Pass
	Middle	1302.5	Pass
	Highest	1320.5	Pass

**Ant2:**

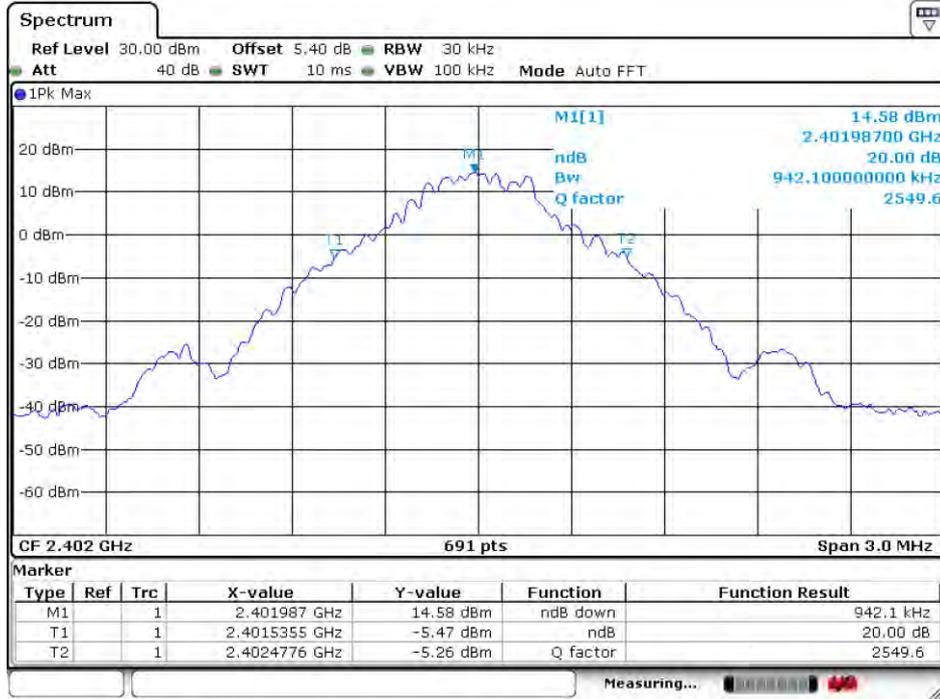
Mode	Test Channel	20dB Emission Bandwidth (KHz)	Result
GFSK	Lowest	946.5	Pass
	Middle	946.5	Pass
	Highest	942.1	Pass
$\pi/4$ DQPSK	Lowest	1315.5	Pass
	Middle	1315.5	Pass
	Highest	1319.8	Pass
8DPSK	Lowest	1302.5	Pass
	Middle	1302.5	Pass
	Highest	1302.5	Pass



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### 4.5.2 Test Plots

Test mode:	GFSK	Test channel:	Lowest	ANT1
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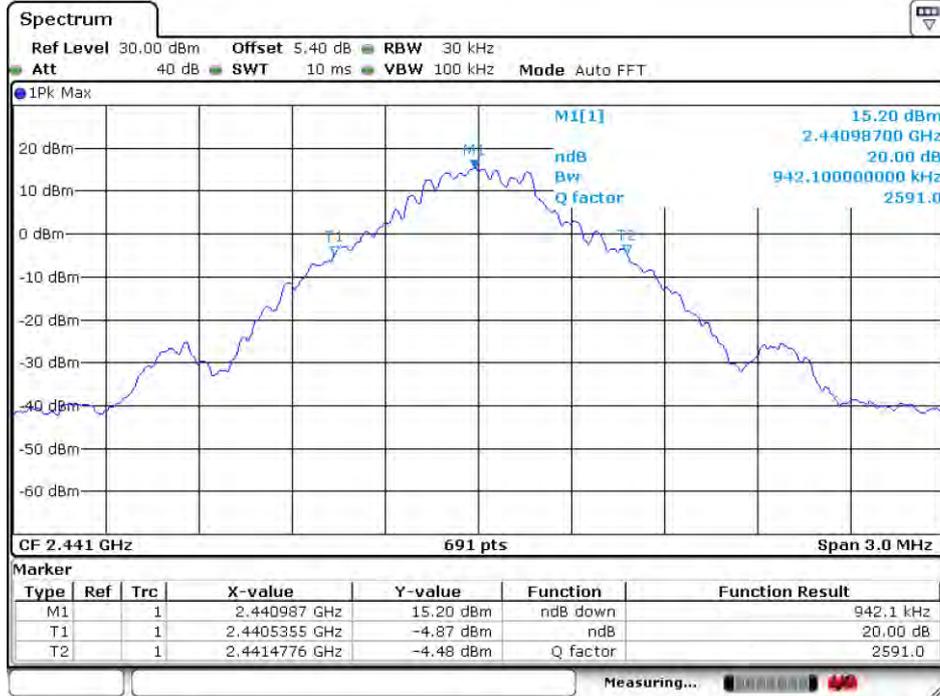
Date: 8 JAN 2021 10:37:43



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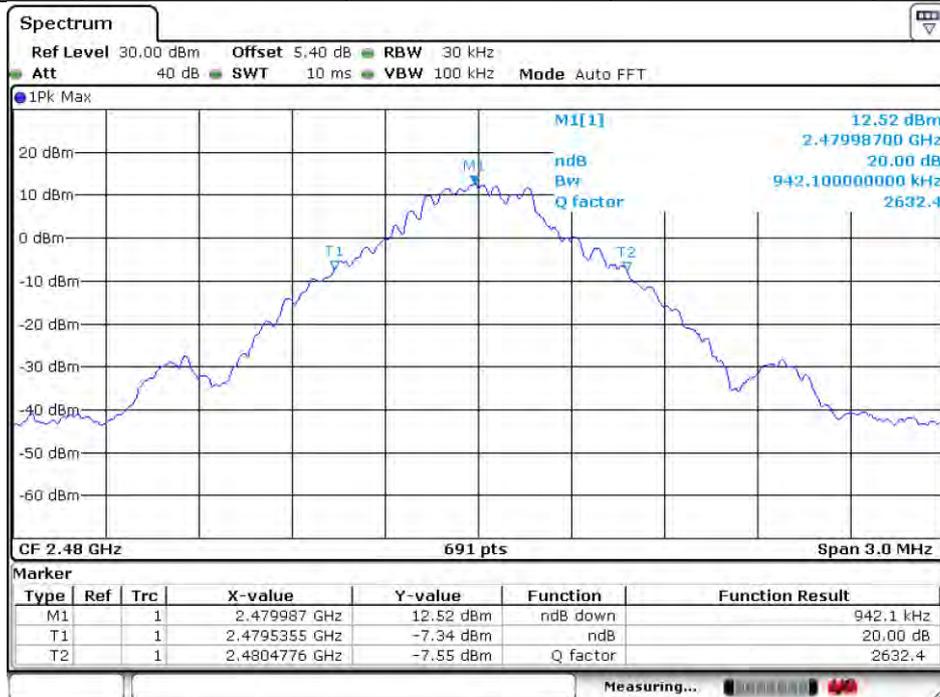
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Test mode:	GFSK	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 10:37:15

Test mode:	GFSK	Test channel:	High	ANT1
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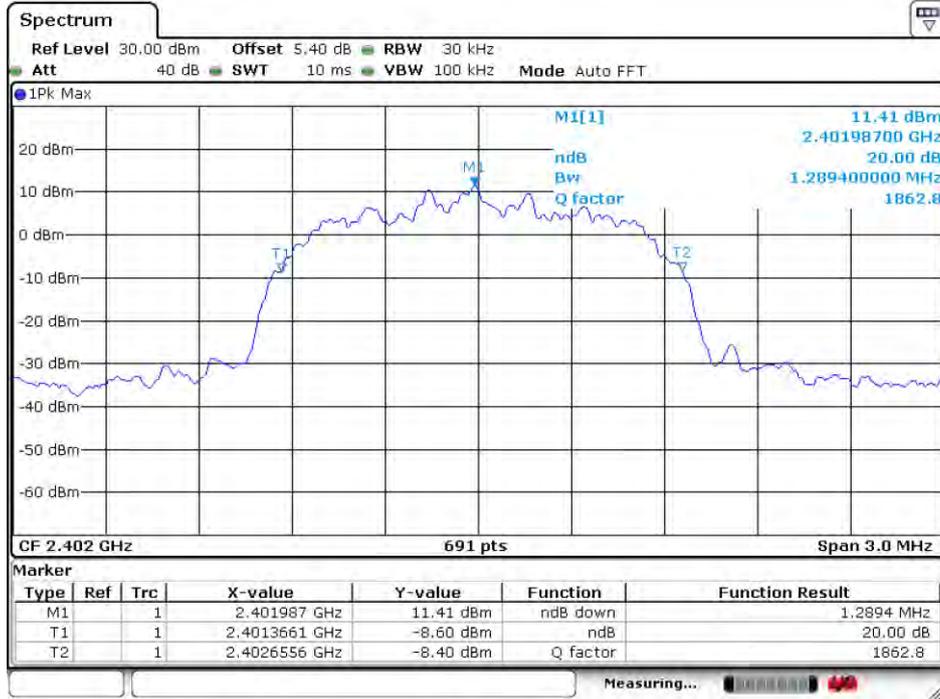


Date: 8 JAN 2021 10:36:37



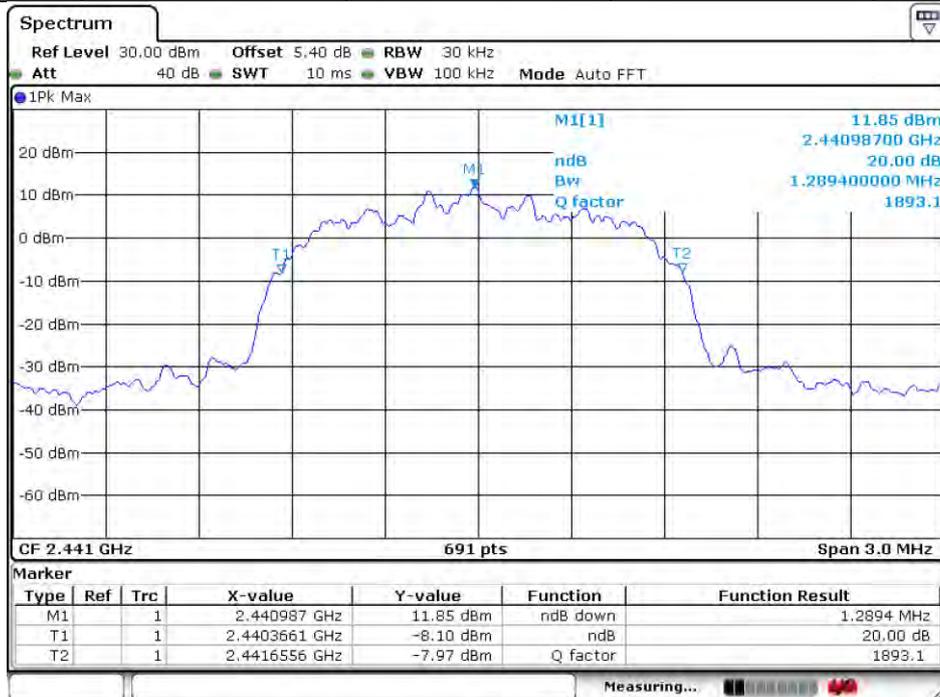
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Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest	ANT1
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Date: 8 JAN 2021 10:35:14

Test mode:	$\pi/4$ DQPSK	Test channel:	Middle	ANT1
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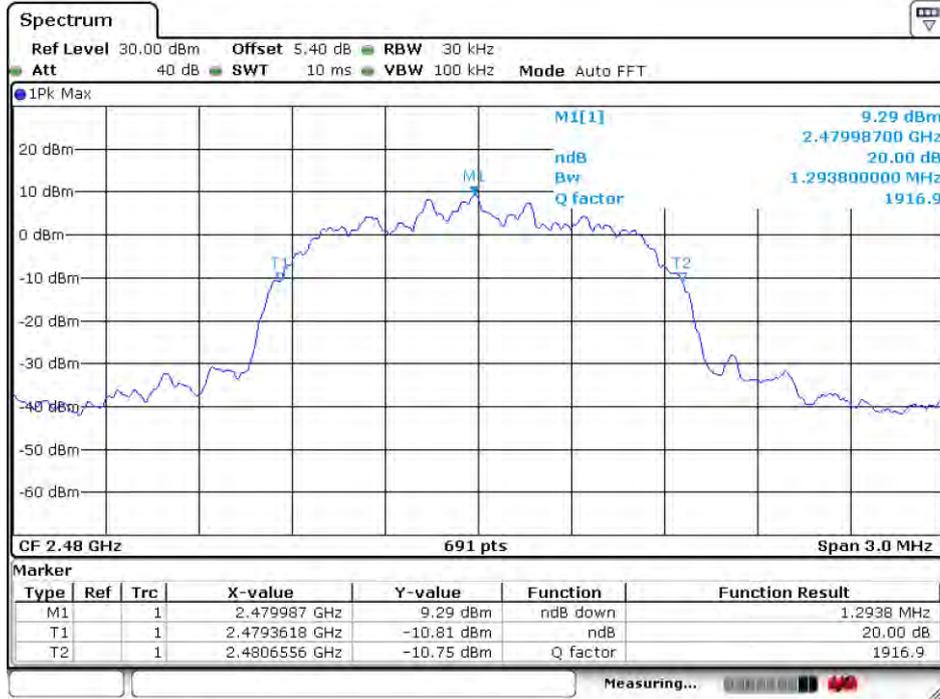


Date: 8 JAN 2021 10:35:49



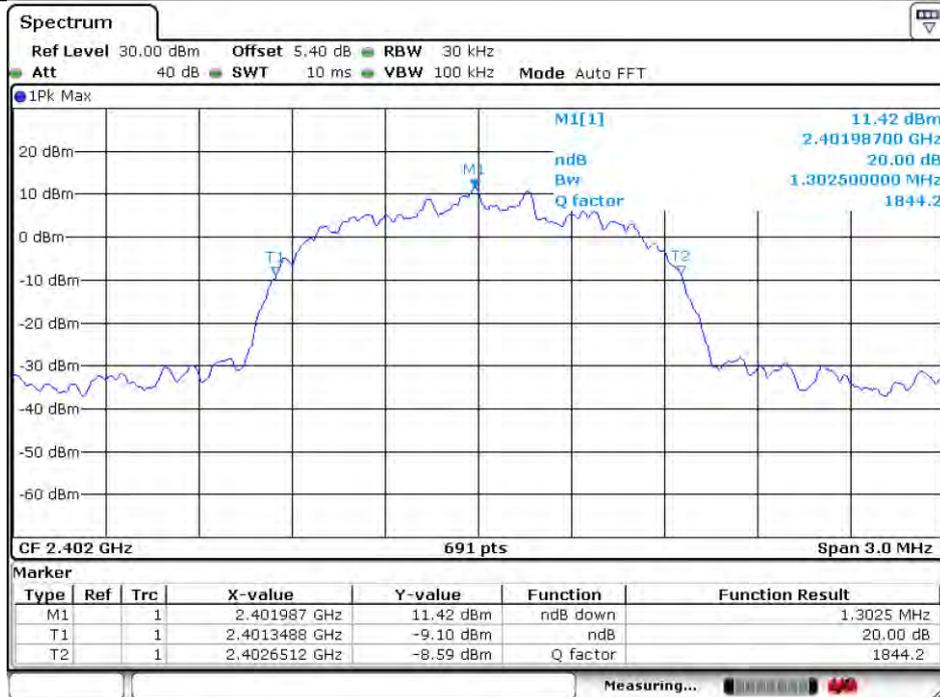
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Test mode:	$\pi/4$ DQPSK	Test channel:	High	ANT1
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Date: 8 JAN 2021 10:36:02

Test mode:	8DPSK	Test channel:	Lowest	ANT1
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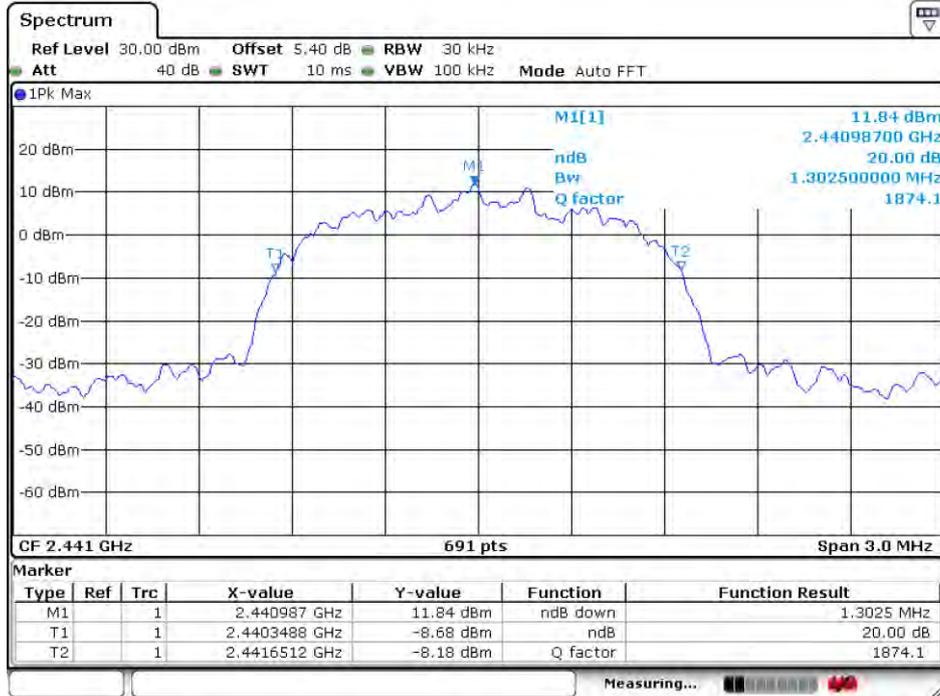


Date: 8 JAN 2021 10:34:56



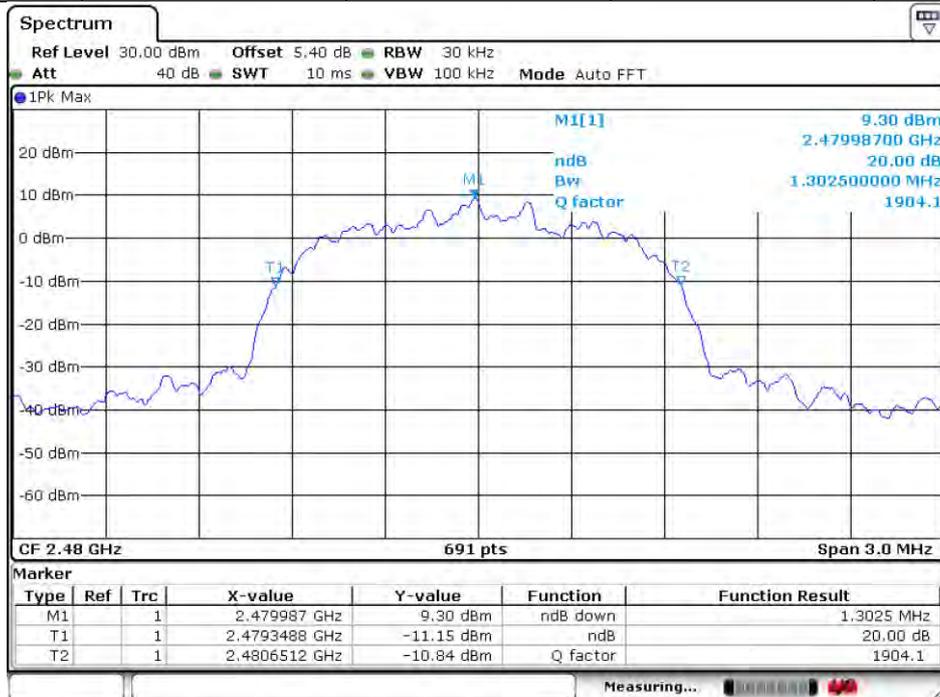
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Test mode:	8DPSK	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 10:34:22

Test mode:	8DPSK	Test channel:	High	ANT1
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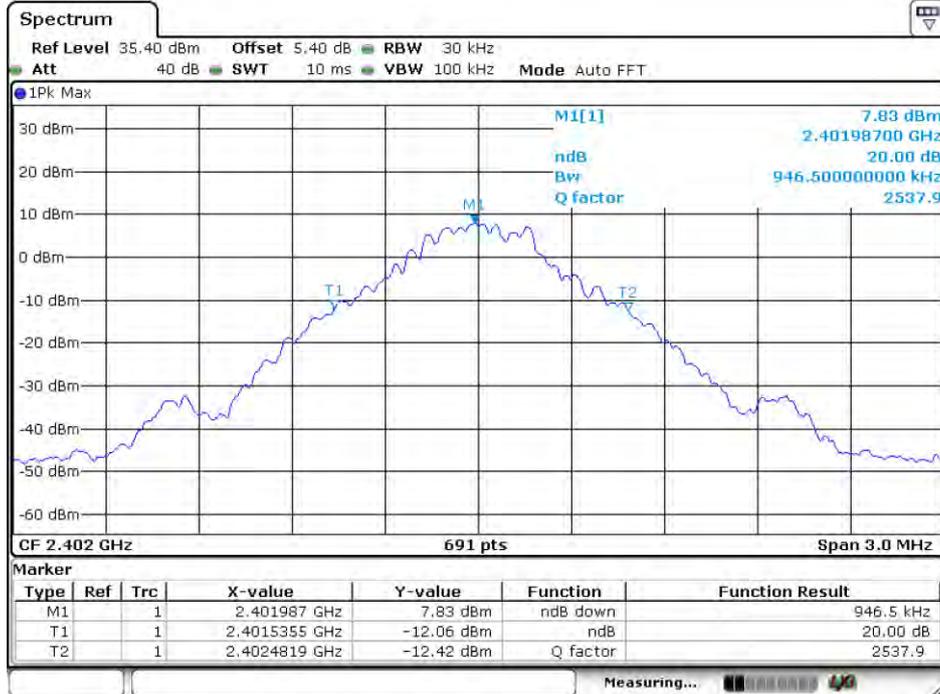


Date: 8 JAN 2021 10:33:31



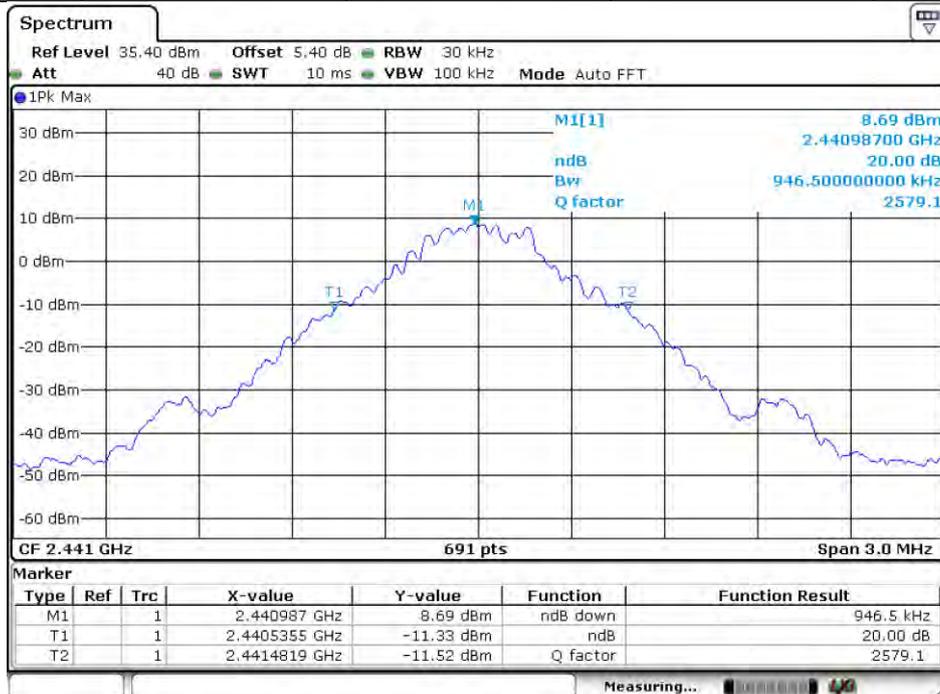
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Test mode:	GFSK	Test channel:	Lowest	ANT2
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Date: 14.JAN.2021 18:55:12

Test mode:	GFSK	Test channel:	Middle	ANT2
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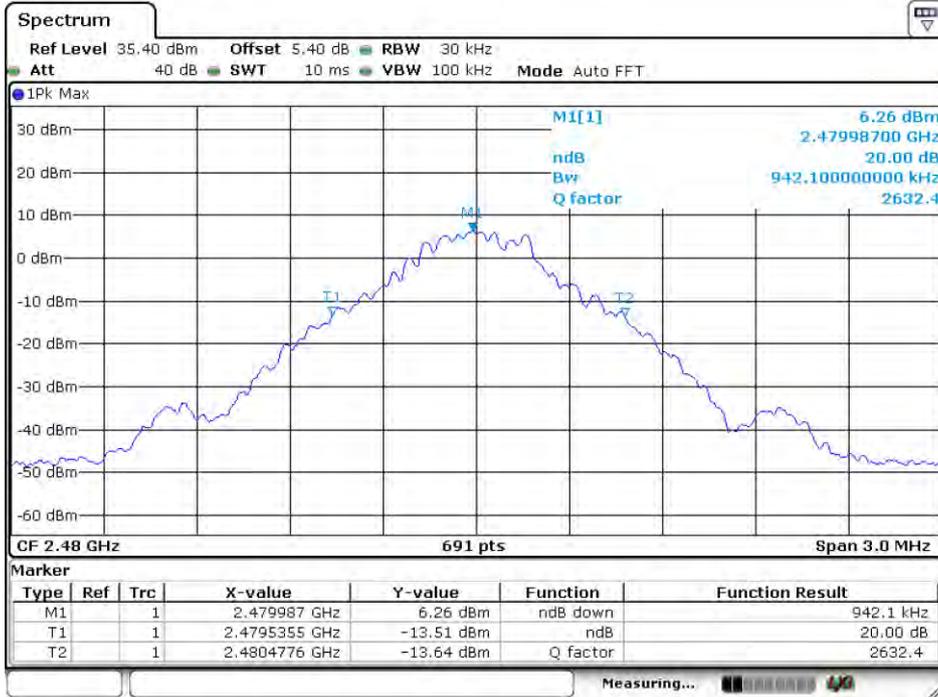
Date: 14.JAN.2021 18:54:35



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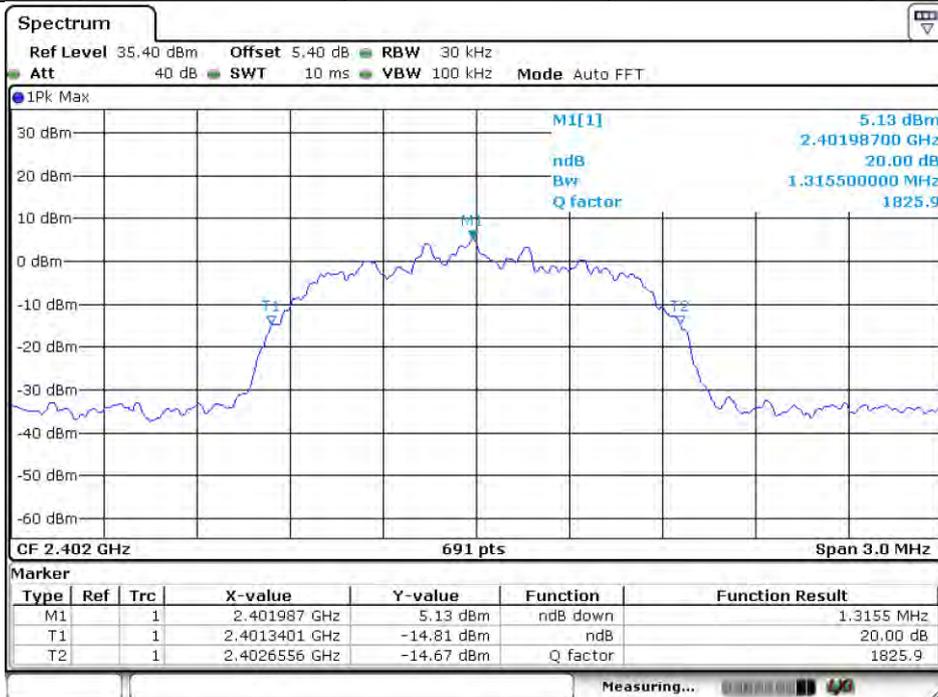
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Test mode:	GFSK	Test channel:	High	ANT2
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Date: 14.JAN.2021 18:54:20

Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest	ANT2
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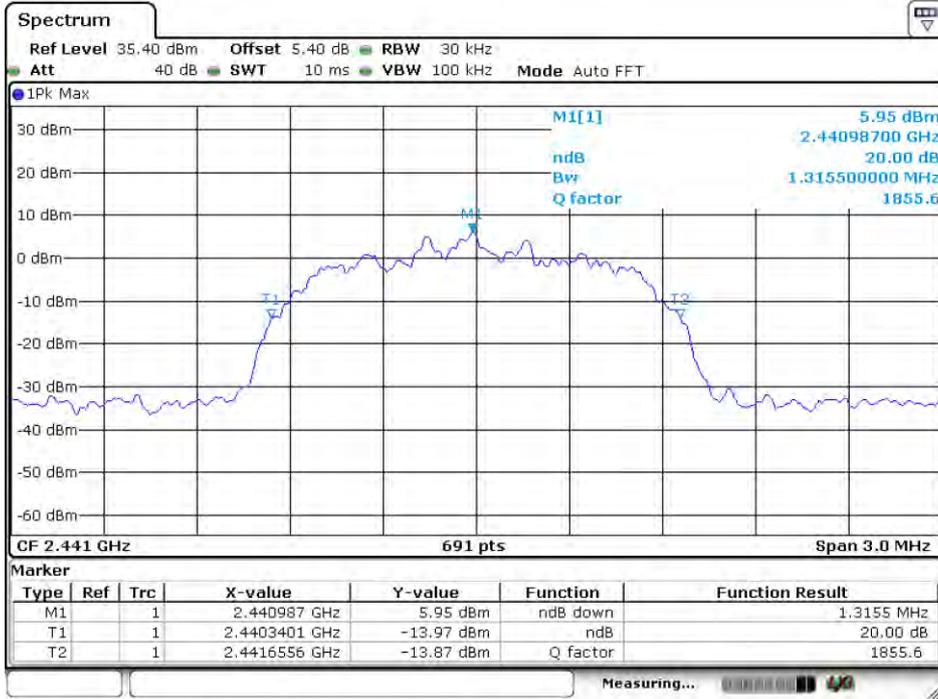
Date: 14.JAN.2021 18:51:46



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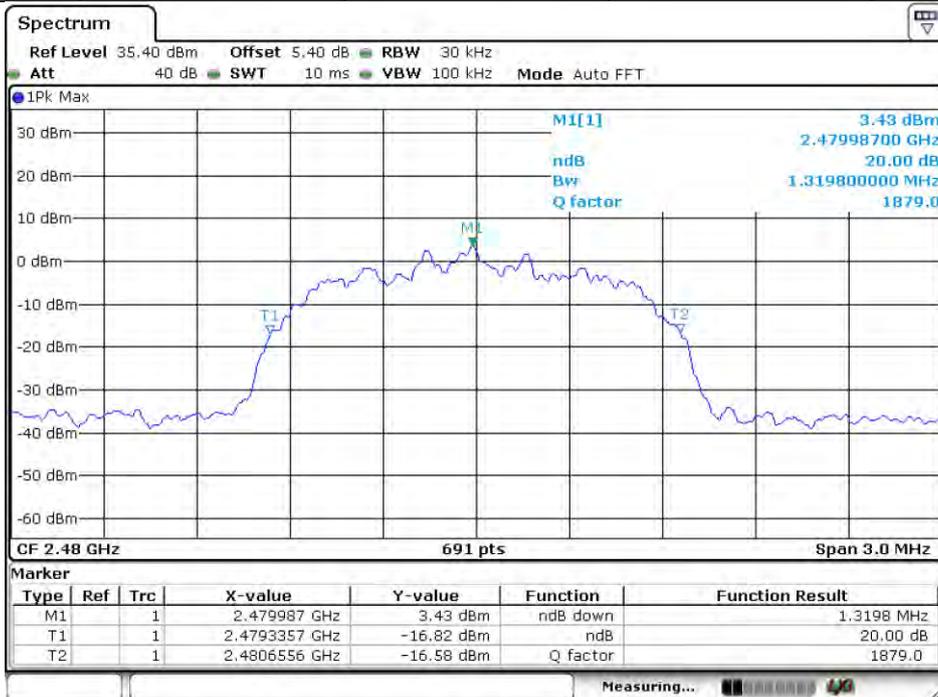
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Test mode:	$\pi/4$ DQPSK	Test channel:	Middle	ANT2
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Date: 14.JAN.2021 18:53:28

Test mode:	$\pi/4$ DQPSK	Test channel:	High	ANT2
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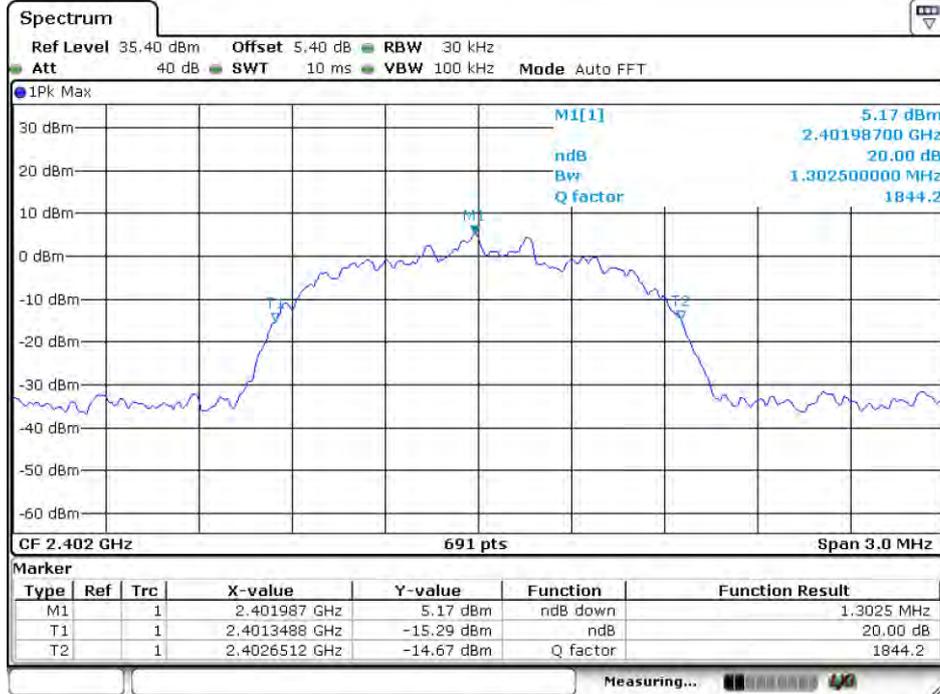


Date: 14.JAN.2021 18:53:44



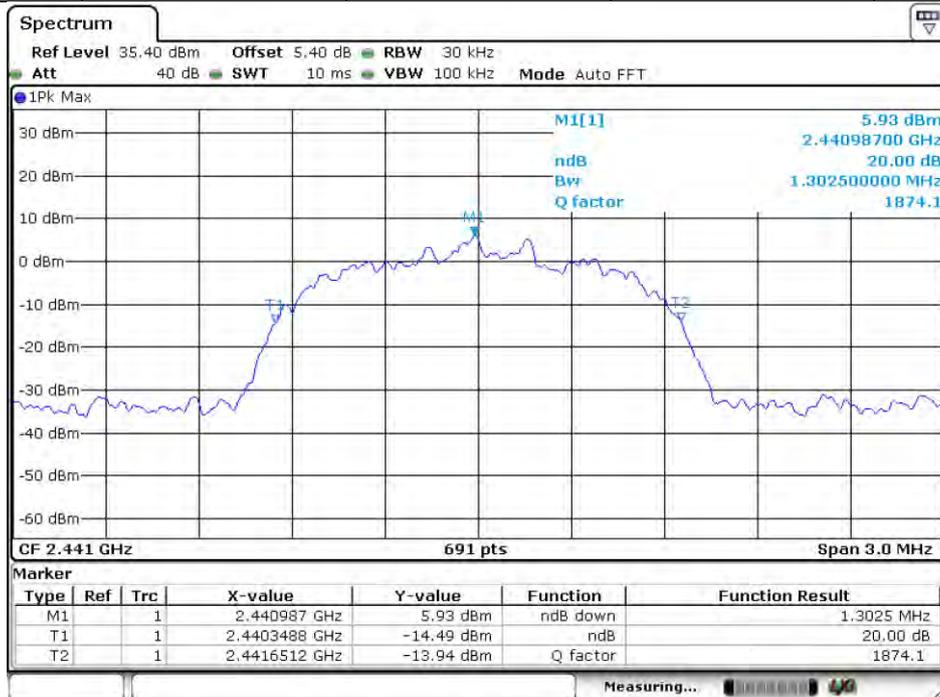
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Test mode:	8DPSK	Test channel:	Lowest	ANT2
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Date: 14 JAN.2021 18:51:30

Test mode:	8DPSK	Test channel:	Middle	ANT2
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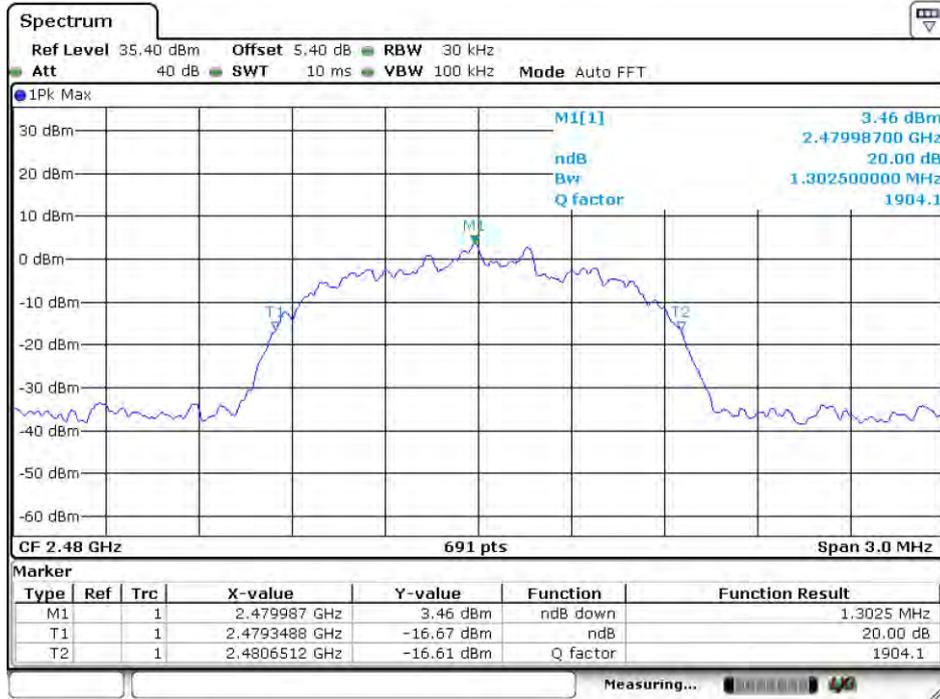


Date: 14 JAN.2021 18:50:53



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Test mode:	8DPSK	Test channel:	High	ANT2
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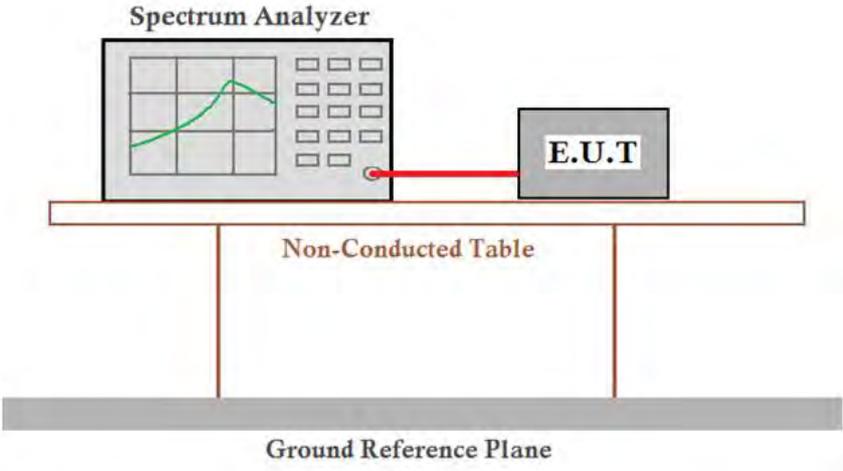
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### 4.6 Carrier Frequencies Separationy

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 Section 7.8.2
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
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 $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	2/3 of the 20dB bandwidth Remark: the transmission power is less than 0.125W.
Test Results:	Pass



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4.6.1 Test Results

ANT1:

GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1012	628.1	PASS
$\pi/4$ DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1103	862.5	PASS
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1033	880.3	PASS

Remark: According to section 4.5,

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	942.1	628.1
$\pi/4$ DQPSK	1293.8	862.5
8DPSK	1320.5	880.3



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**ANT2:**

GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1033	631.0	PASS
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1025	879.9	PASS
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Middle	1003	868.3	PASS

Remark: According to section 4.5,

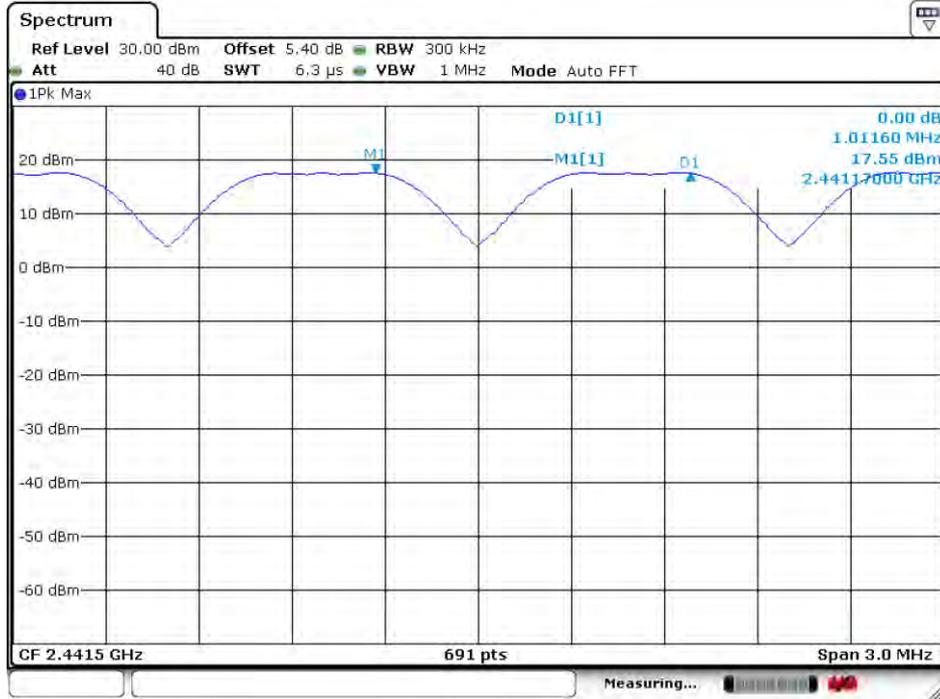
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	946.5	631.0
π/4DQPSK	1319.8	879.9
8DPSK	1302.5	868.3



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### 4.6.2 Test Plots

Test mode:	GFSK	Test channel:	Middle	ANT1
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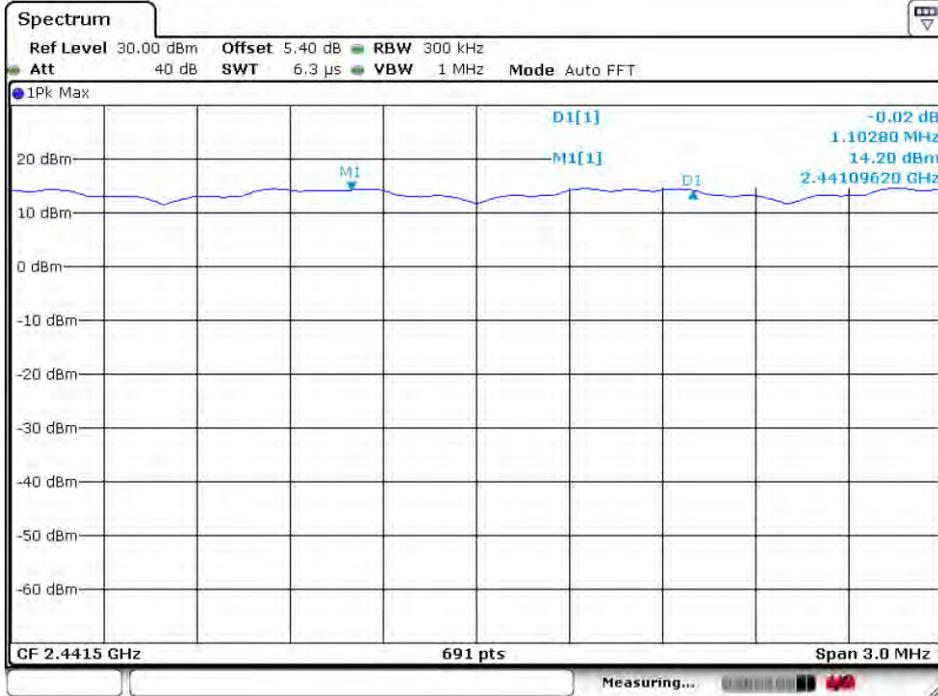
Date: 8.JAN.2021 11:07:06



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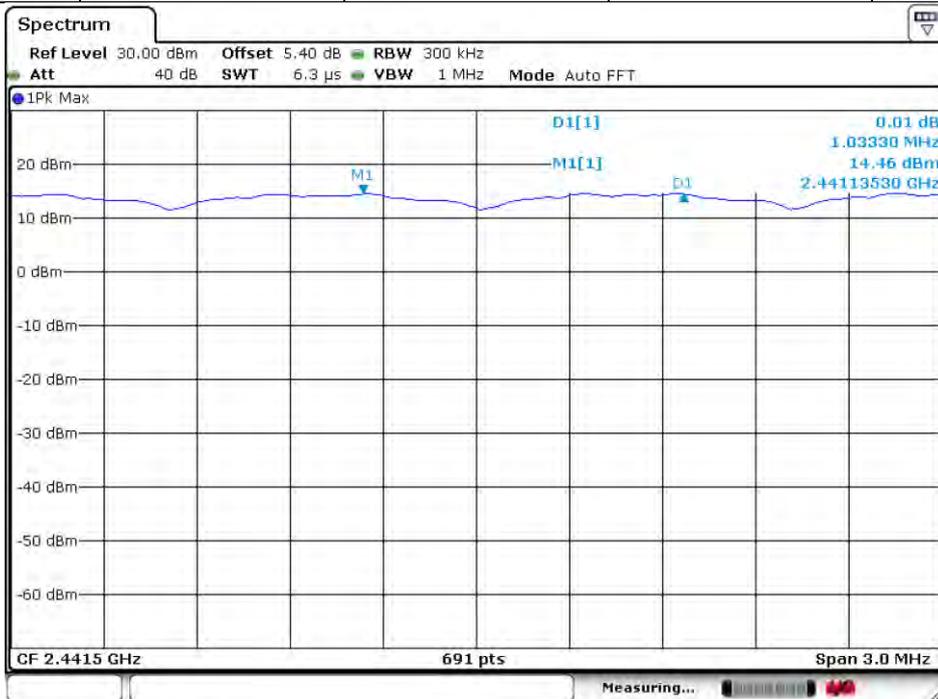
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Test mode:	$\pi/4$ DQPSK	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 11:08:32

Test mode:	8DPSK	Test channel:	Middle	ANT1
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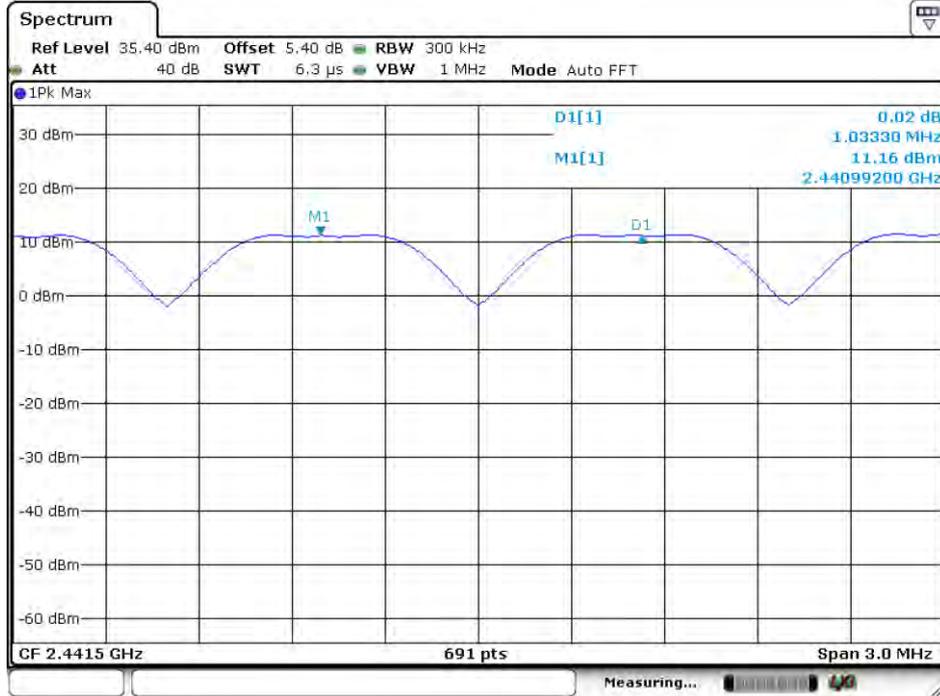
Date: 8 JAN 2021 11:14:10



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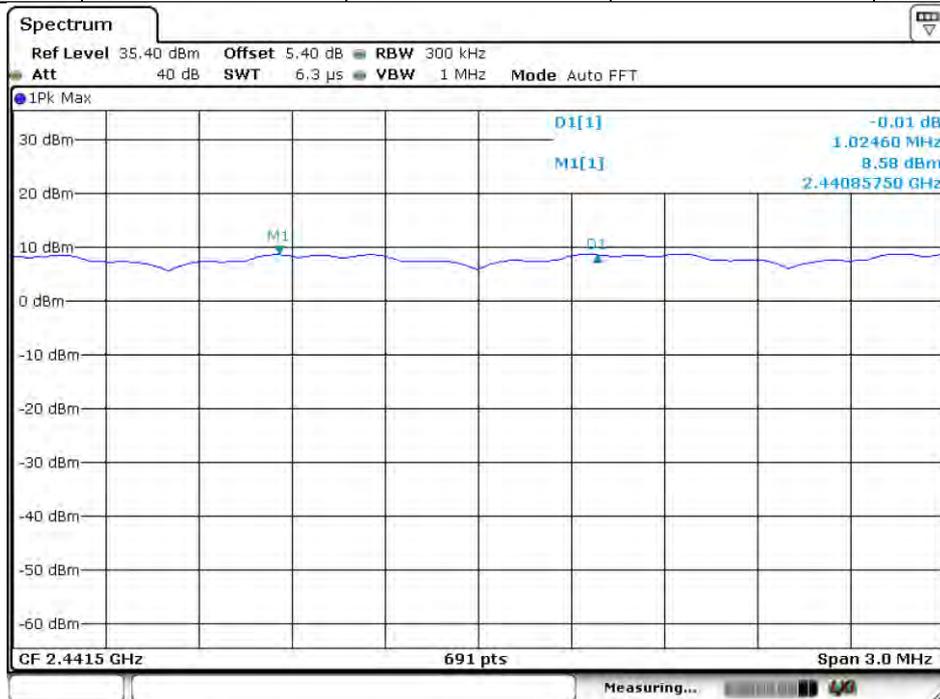
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Test mode:	GFSK	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 19:19:23

Test mode:	$\pi/4$ DQPSK	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 19:17:50

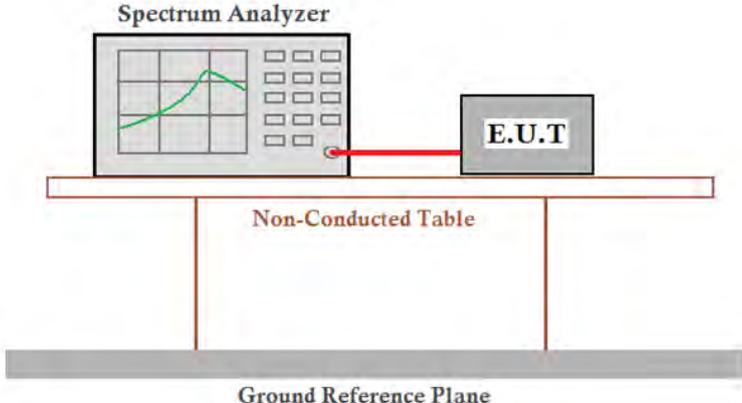


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### 4.7 Hopping Channel Number

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 Section 7.8.3
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Test Mode:	Hopping transmitting with all kind of modulation
Limit:	At least 15 channels
Test Results:	Pass

#### 4.7.1 Test Results

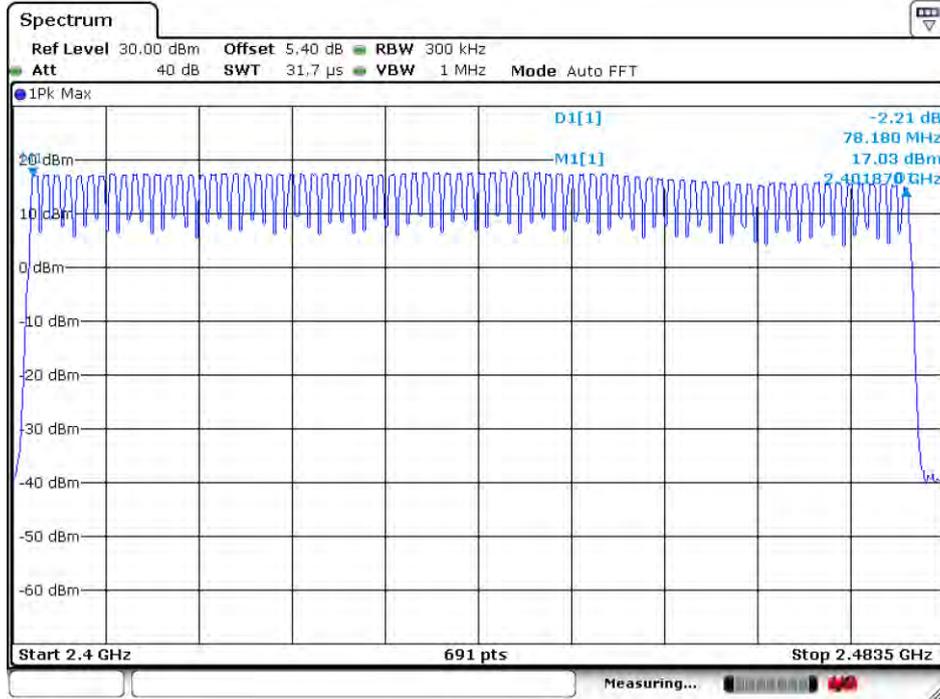
Mode	Hopping channel numbers	Limit
GFSK	79	≥15
$\pi/4$ DQPSK	79	≥15
8DPSK	79	≥15



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### 4.7.2 Test Plots

Test mode:	GFSK	ANT1
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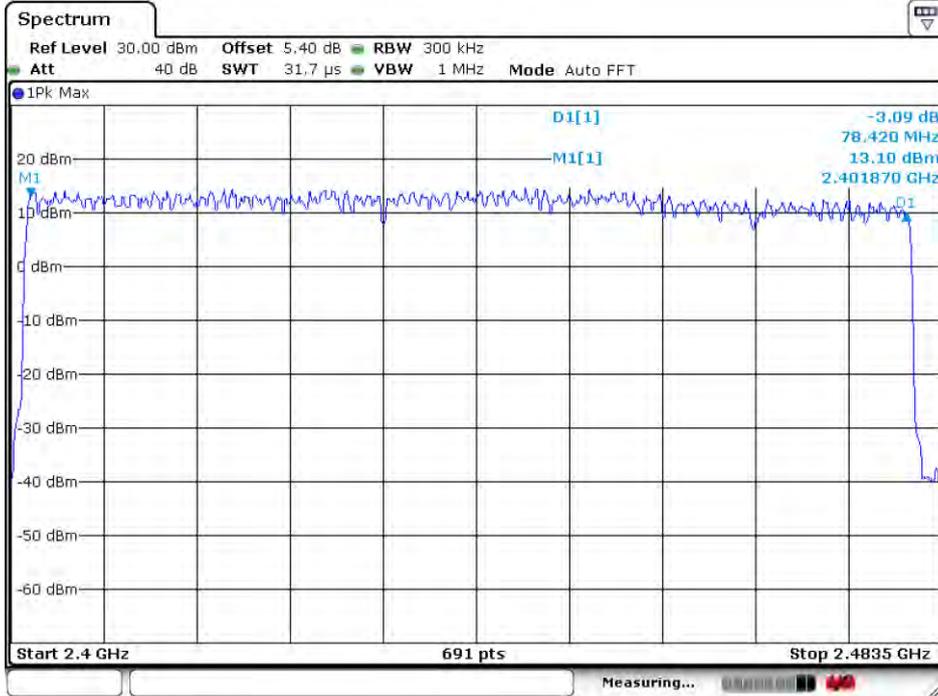
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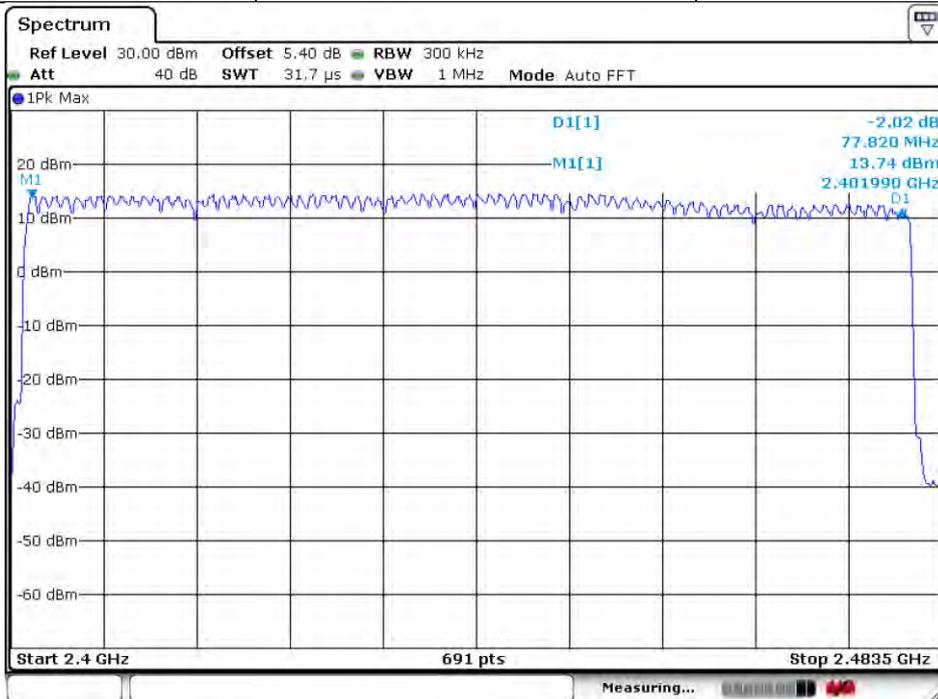
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Test mode: π/4DQPSK ANT1



Date: 8 JAN 2021 11:17:41

Test mode: 8DPSK ANT1



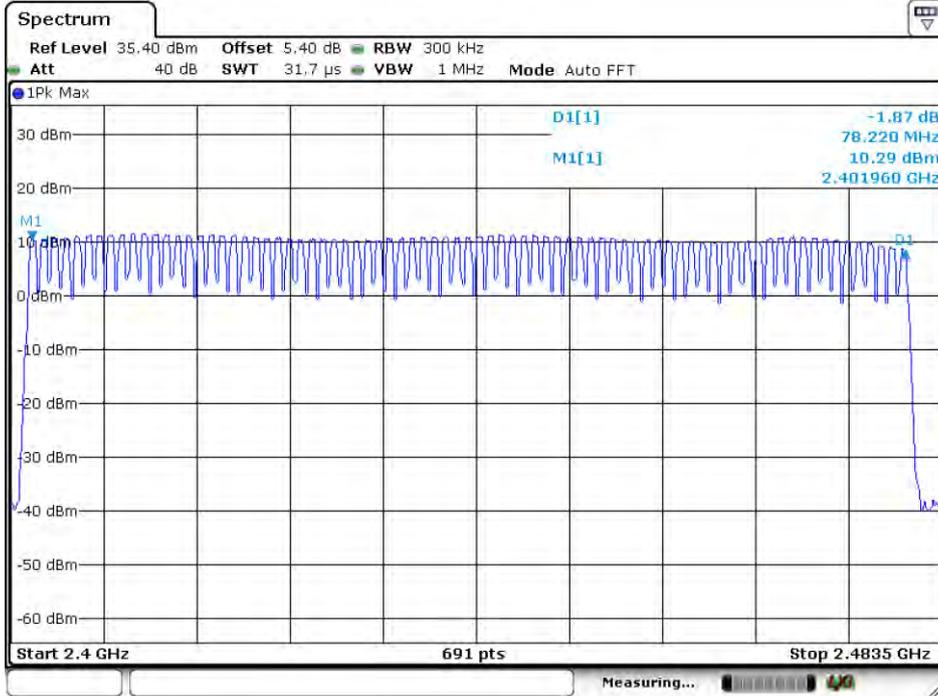
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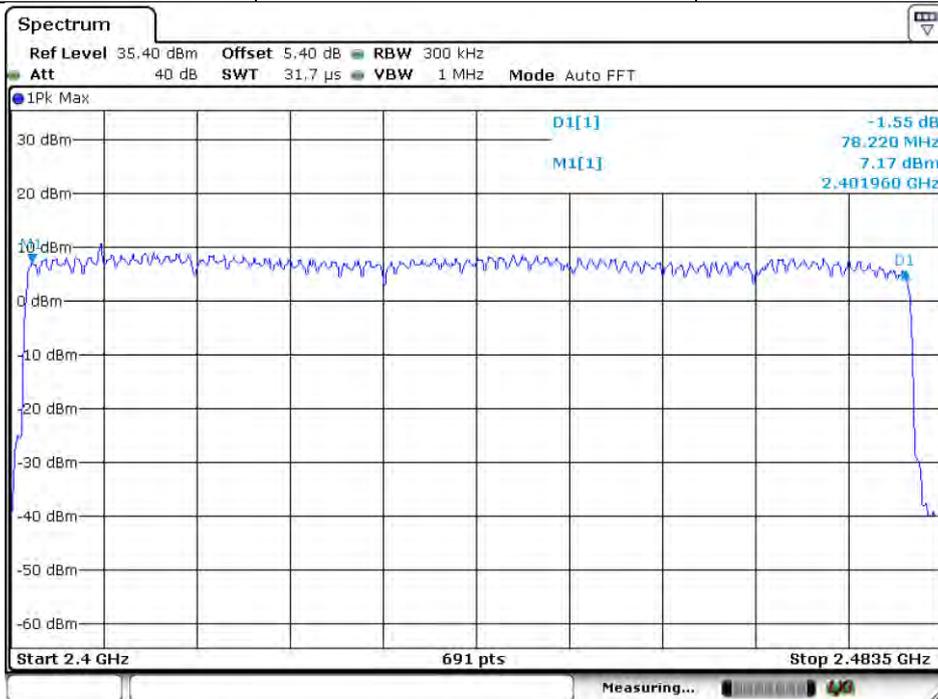
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Test mode:	GFSK	ANT2
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Date: 14 JAN 2021 19:13:24

Test mode:	$\pi/4$ DQPSK	ANT2
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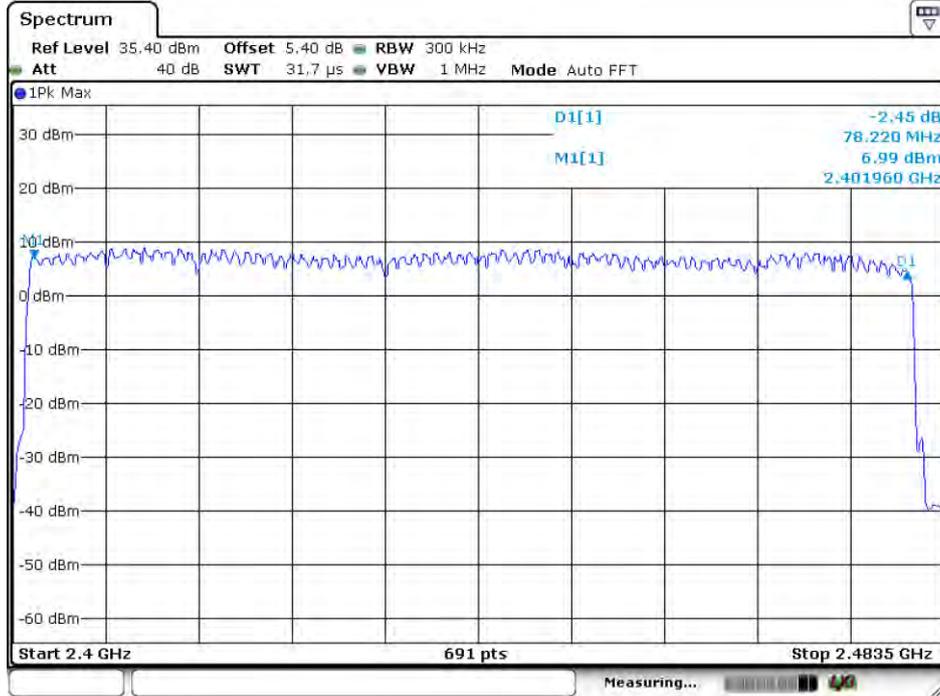
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Test mode:	8DPSK	ANT2
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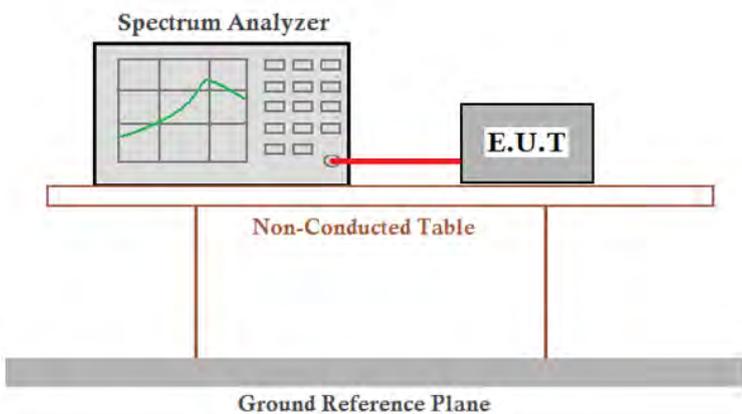
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### 4.8 Dwell Time

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 Section 7.8.4
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Limit:	0.4 Second
Test Results:	Pass



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**4.8.1 Test Results**

**ANT1:**

Operation Modes	On time (ms) on one channel
DH1	0.394
DH3	1.661
DH5	2.913
2-DH1	0.395
2-DH3	1.657
2-DH5	2.920
3-DH1	0.397
3-DH2	1.661
3-DH5	2.928

**Bluetooth Time of Occupancy Calculation**

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s, since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of  $1600/6=266.67$  hops/slot

$400\text{ms} \times 79 \text{ Channel} = 31.6 \text{ s}$  (Time of Occupancy Limit)

Worst case BT has 266.67 hops/second (for 1x/EDR modes with 3-DH5 operation)

$266.67 \text{ hops/second} / 79 \text{ channels} = 3.38 \text{ hops/second}$  (# of hops/second on one channel)

$3.38 \text{ hops/second/channel} \times 31.6 \text{ seconds} = 106.67 \text{ hops}$  (#hops over a 31.6 second period)

$106.67 \text{ hops} \times 2.928 \text{ ms/channel} = 312.33 \text{ ms}$ (worst case dwell time for one channel in 1x/EDR

modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800hops/s, AFH mode also uses 6 slots so the Bluetooth transmitter hops at a rate of  $800/6=133.3$  hops/s/slot

$400\text{ms} \times 20 \text{ Channel} = 8 \text{ s}$  (Time of Occupancy Limit)

Worst case BT has 133.3 hops/second/slot (for AFH mode with 3-DH5 operation)

$133.3 \text{ hops/second} / 20 \text{ channels} = 6.67 \text{ hops/second}$  (#hops/second on one channel)

$6.67 \text{ hops/second} \times 8 \text{ seconds} = 53.34 \text{ hops}$  (#hops over a 8 seconds period)

$53.34 \text{ hops} \times 2.928 \text{ ms/channel} = 156.18 \text{ ms}$ (worst case dwell time for one channel in AFH mode)



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**ANT2:**

Operation Modes	On time (ms) on one channel
DH1	0.393
DH3	1.674
DH5	2.949
2-DH1	0.399
2-DH3	1.665
2-DH5	2.920
3-DH1	0.402
3-DH2	1.657
3-DH5	2.942

**Bluetooth Time of Occupancy Calculation**

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s, since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of  $1600/6=266.67$  hops/slot

$400\text{ms} \times 79 \text{ Channel} = 31.6 \text{ s}$  (Time of Occupancy Limit)

Worst case BT has 266.67 hops/second (for 1x/EDR modes with 1-DH5 operation)

$266.67 \text{ hops/second} / 79 \text{ channels} = 3.38 \text{ hops/second}$  (# of hops/second on one channel)

$3.38 \text{ hops/second/channel} \times 31.6 \text{ seconds} = 106.67 \text{ hops}$  (#hops over a 31.6 second period)

$106.67 \text{ hops} \times 2.949 \text{ ms/channel} = 314.57 \text{ ms}$  (worst case dwell time for one channel in 1x/EDR

modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800hops/s, AFH mode also uses 6 slots so the Bluetooth transmitter hops at a rate of  $800/6=133.3$  hops/s/slot

$400\text{ms} \times 20 \text{ Channel} = 8 \text{ s}$  (Time of Occupancy Limit)

Worst case BT has 133.3 hops/second/slot (for AFH mode with 1-DH5 operation)

$133.3 \text{ hops/second} / 20 \text{ channels} = 6.67 \text{ hops/second}$  (#hops/second on one channel)

$6.67 \text{ hops/second} \times 8 \text{ seconds} = 53.34 \text{ hops}$  (#hops over a 8 seconds period)

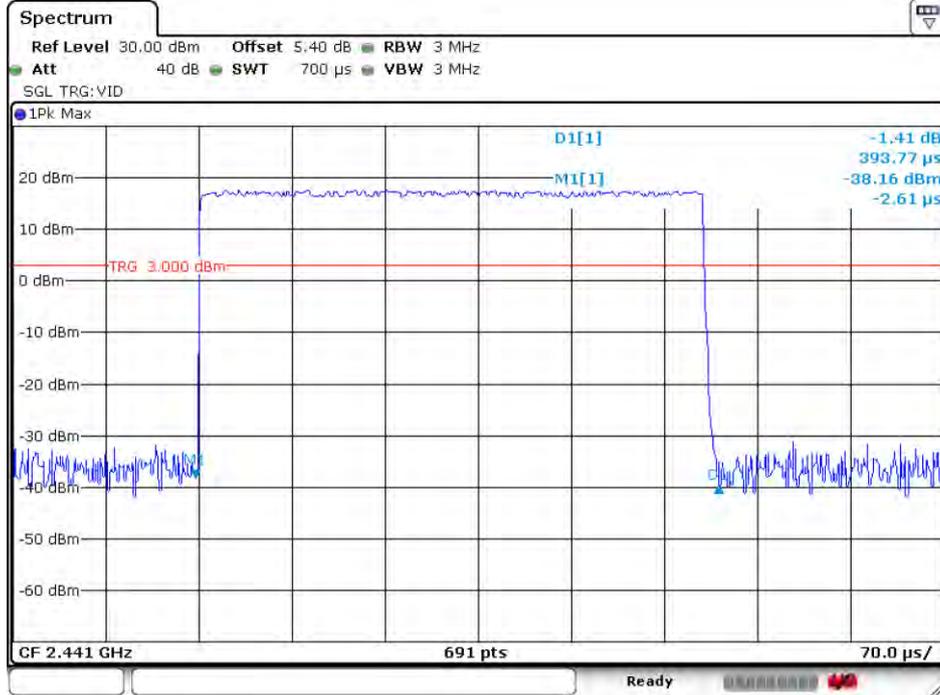
$53.34 \text{ hops} \times 2.949 \text{ ms/channel} = 154.30 \text{ ms}$  (worst case dwell time for one channel in AFH mode)



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### 4.8.2 Test Plots

Test mode:	DH1	Test channel:	Middle	ANT1
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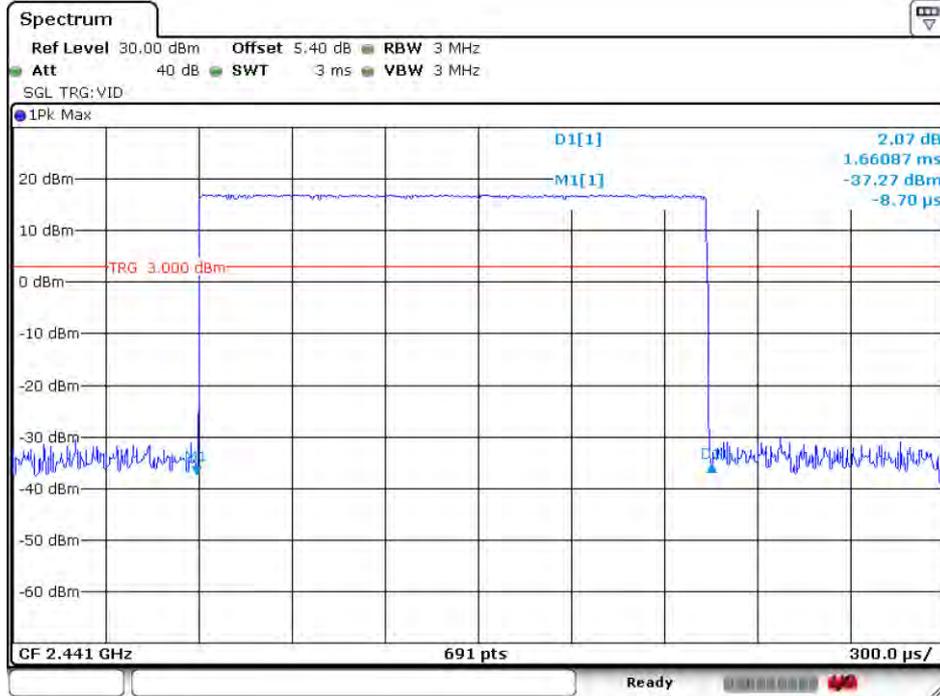
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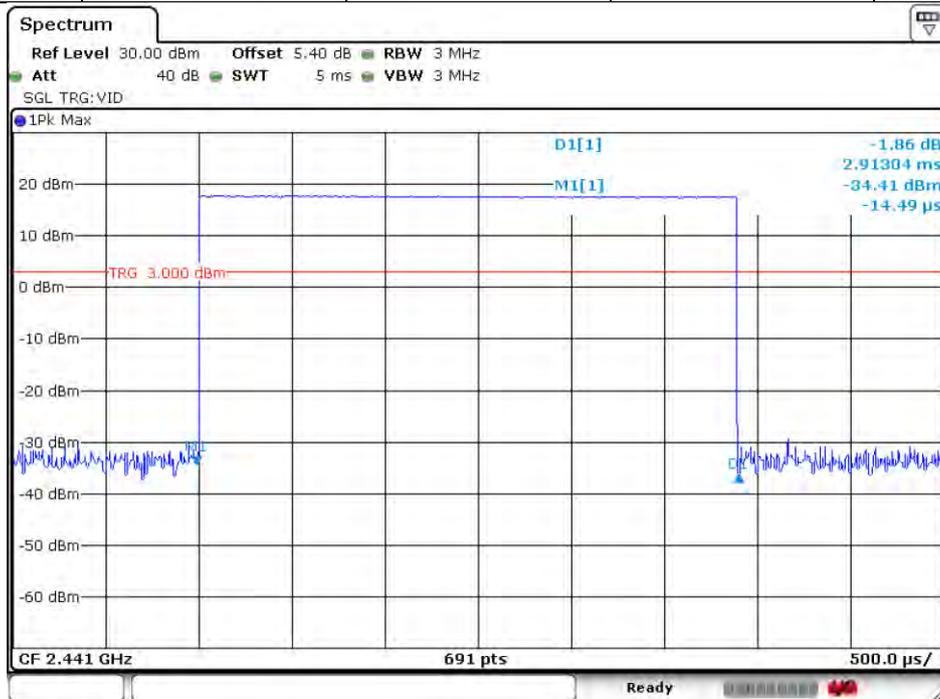
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Test mode:	DH3	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 11:22:06

Test mode:	DH5	Test channel:	Middle	ANT1
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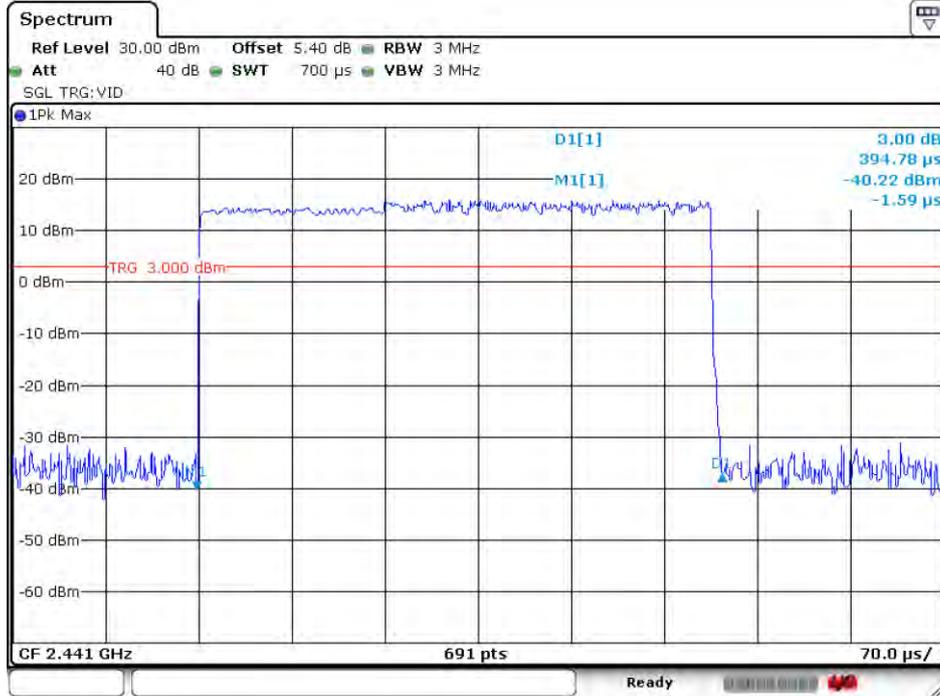
Date: 8 JAN 2021 11:20:04



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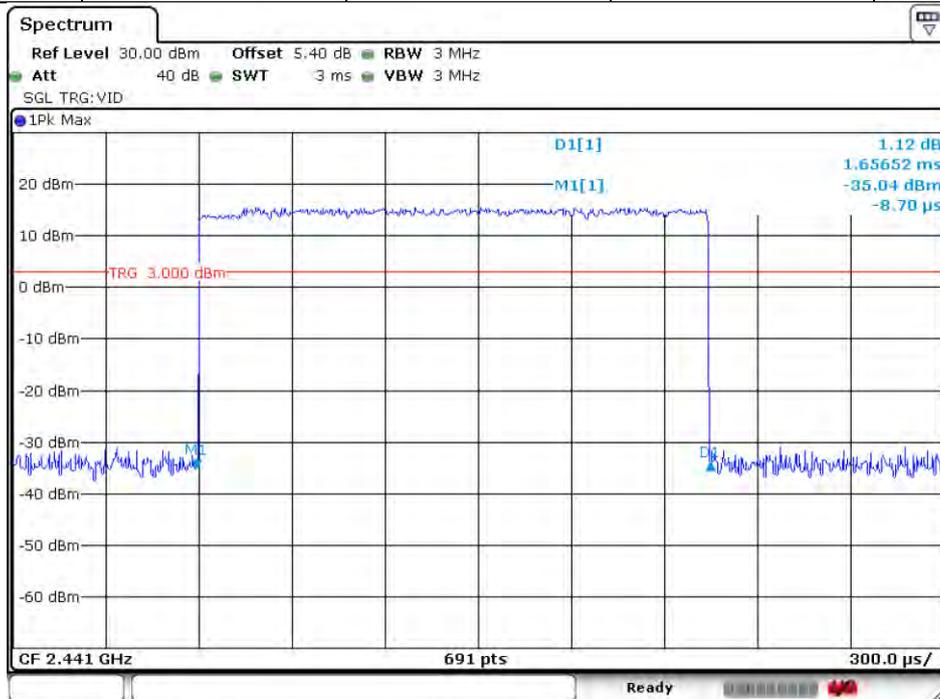
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Test mode:	2-DH1	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 11:23:01

Test mode:	2-DH3	Test channel:	Middle	ANT1
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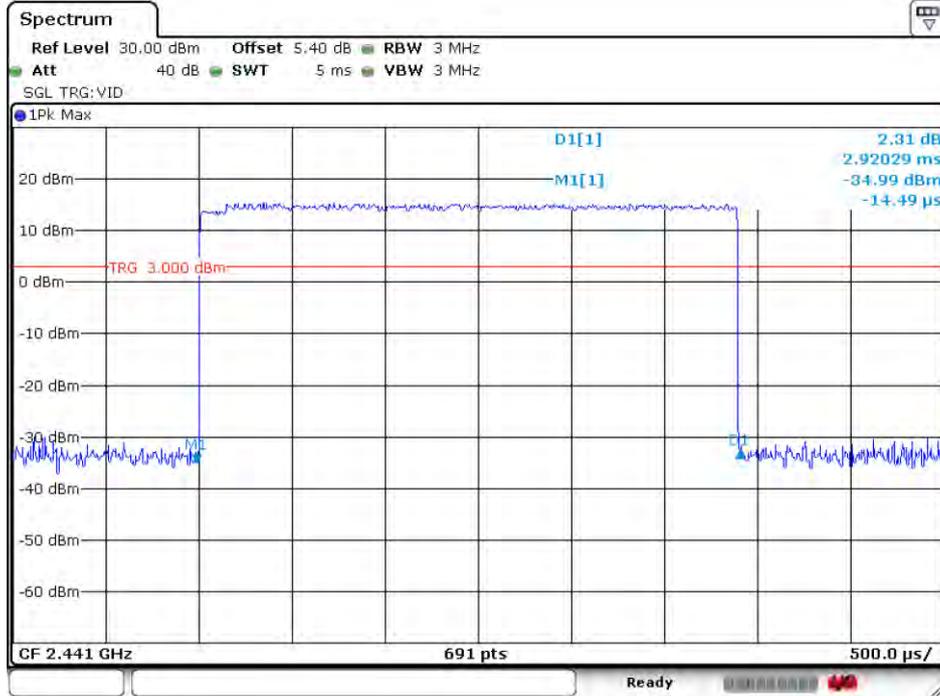
Date: 8 JAN 2021 11:21:42



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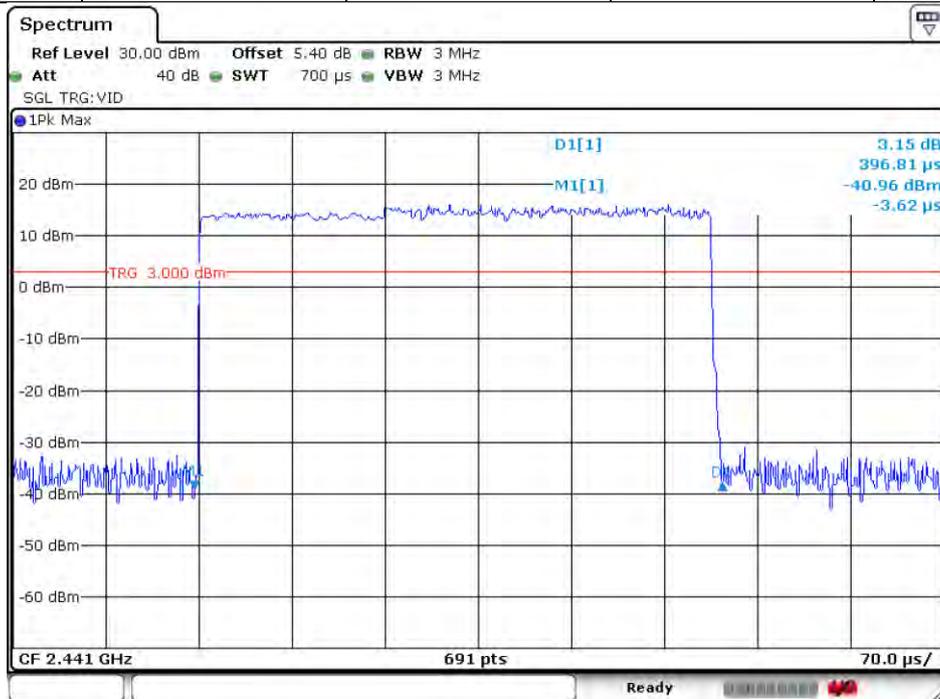
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Test mode:	2-DH5	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 11:20:26

Test mode:	3-DH1	Test channel:	Middle	ANT1
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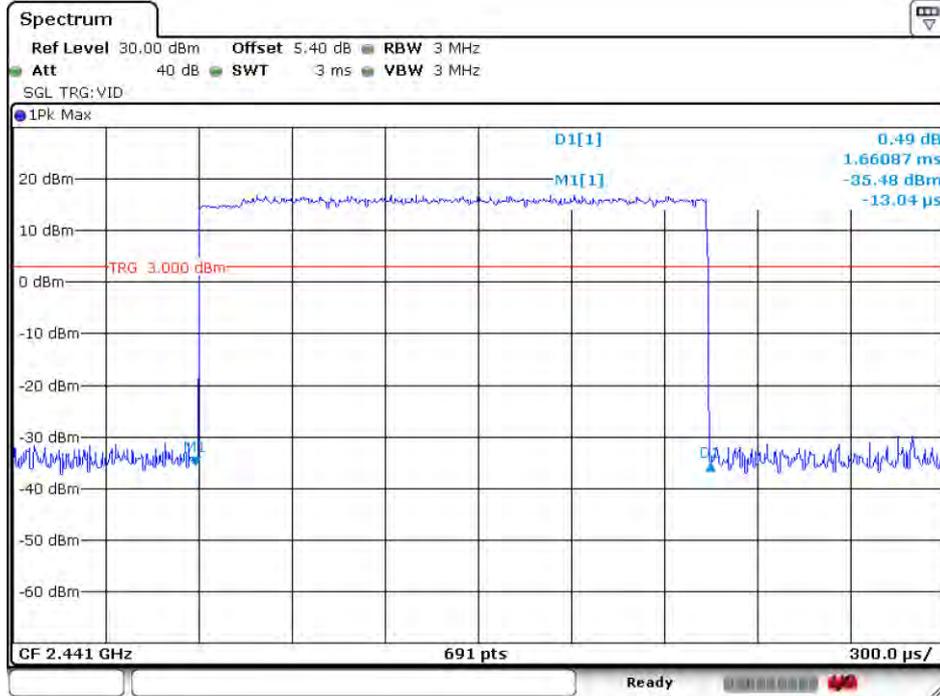
Date: 8 JAN 2021 11:23:16



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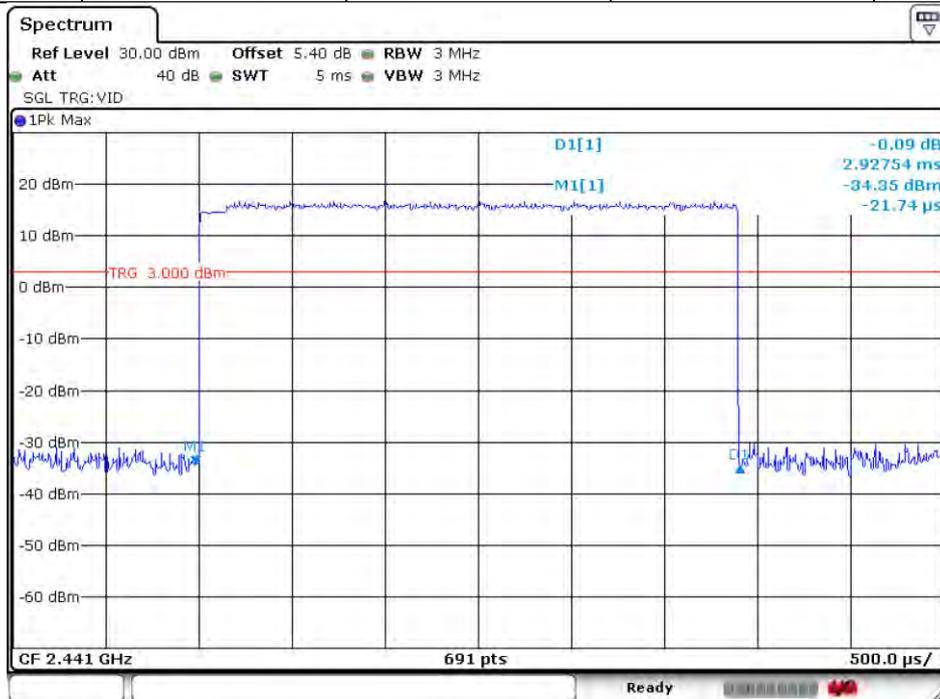
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Test mode:	3-DH3	Test channel:	Middle	ANT1
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Date: 8 JAN 2021 11:21:24

Test mode:	3-DH5	Test channel:	Middle	ANT1
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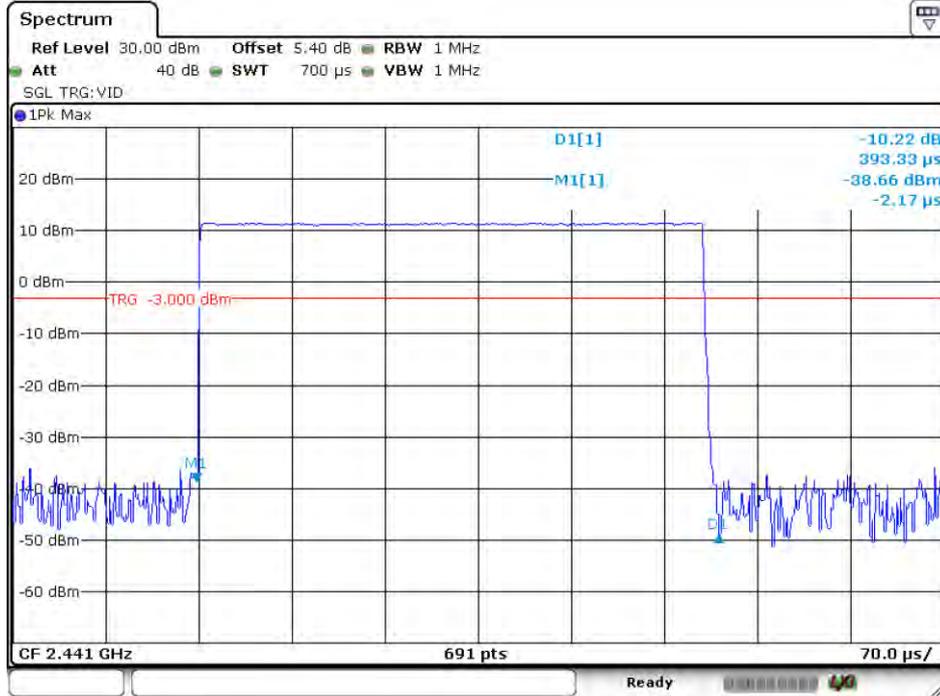
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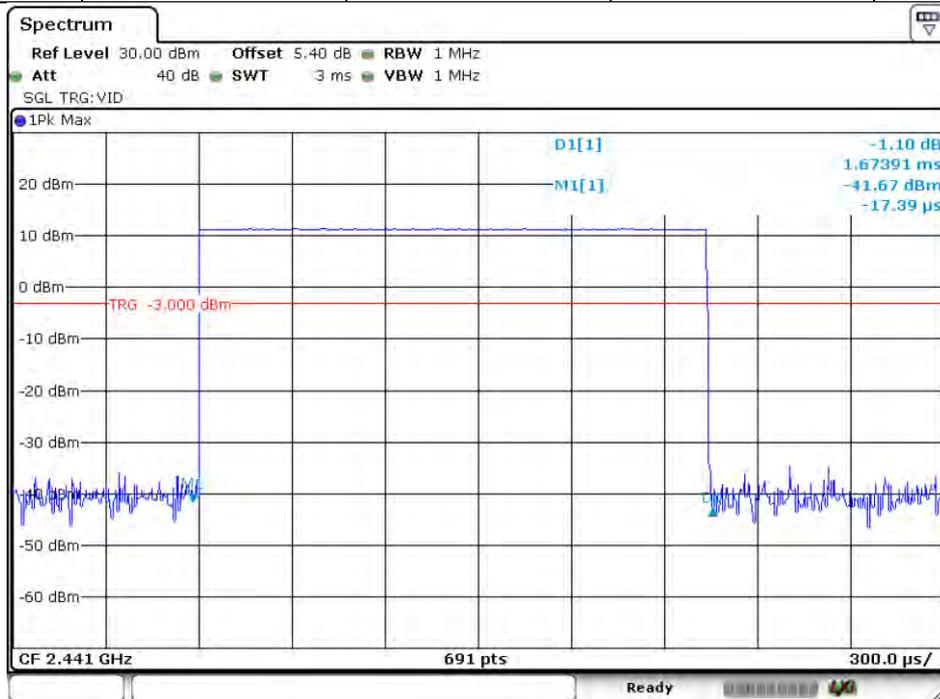
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Test mode:	DH1	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 19:22:25

Test mode:	DH3	Test channel:	Middle	ANT2
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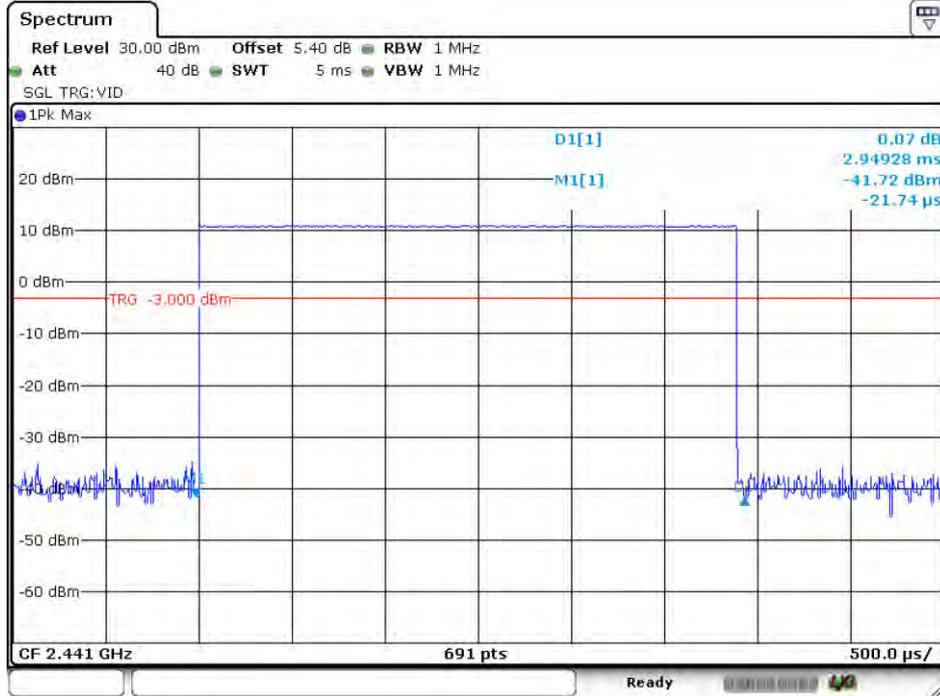
Date: 14 JAN 2021 19:22:00



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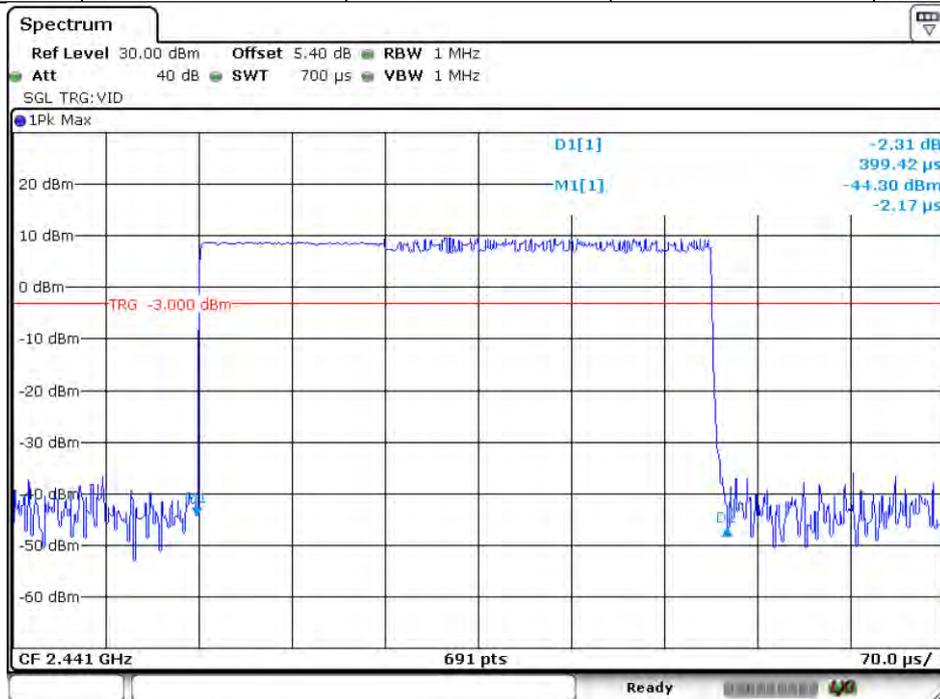
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Test mode:	DH5	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 19:20:14

Test mode:	2-DH1	Test channel:	Middle	ANT2
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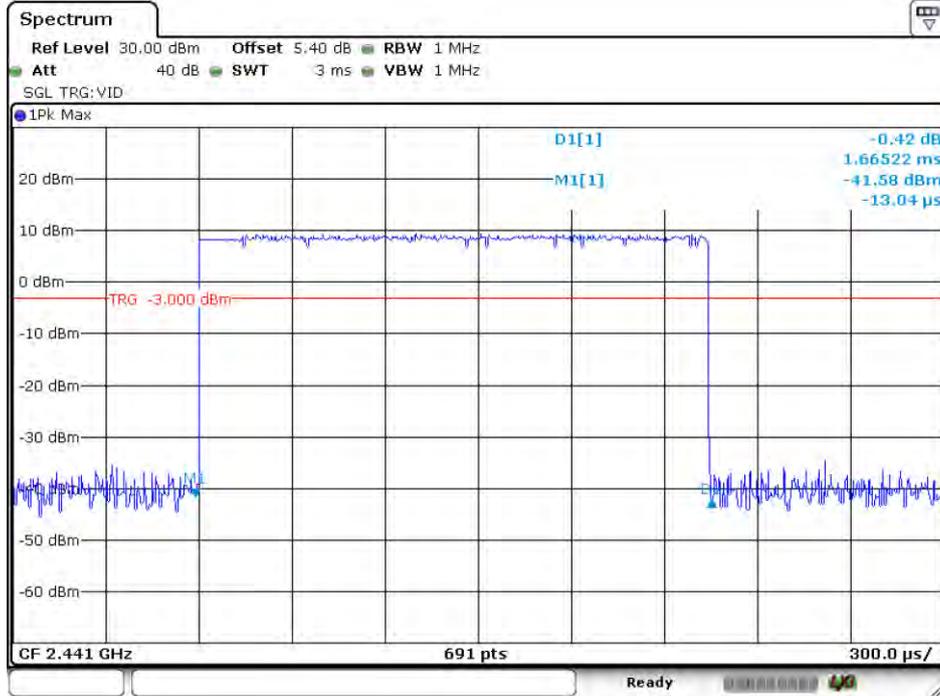
Date: 14 JAN 2021 19:22:43



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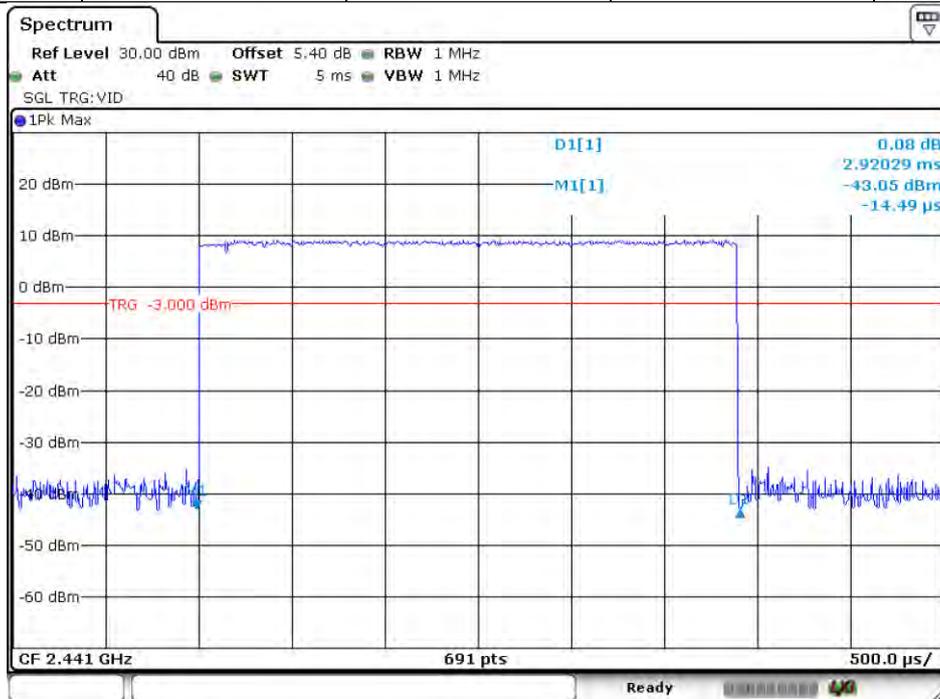
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Test mode:	2-DH3	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 19:21:38

Test mode:	2-DH5	Test channel:	Middle	ANT2
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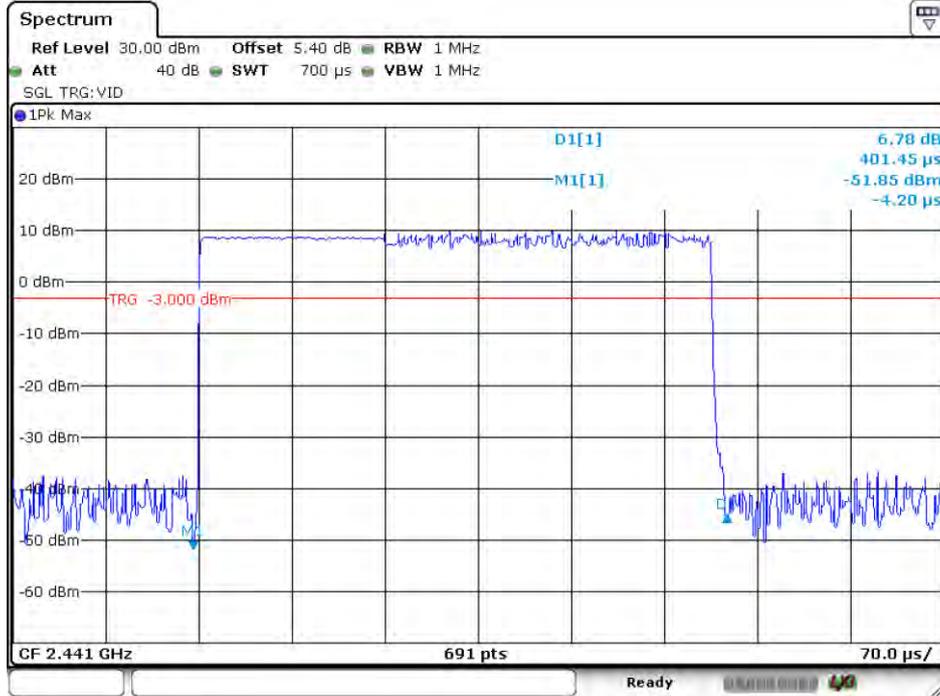
Date: 14 JAN 2021 19:20:31



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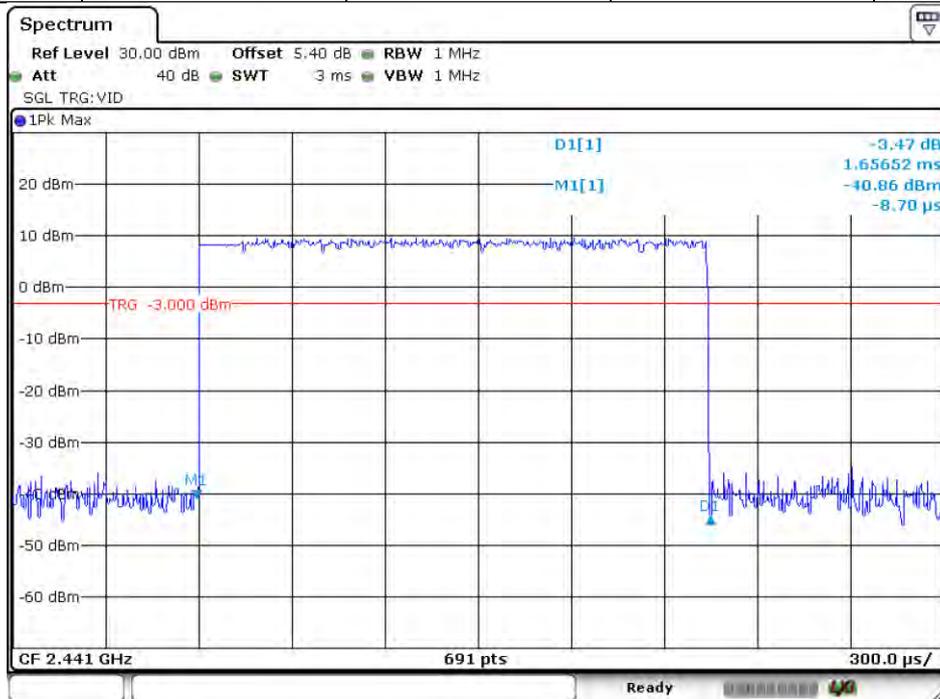
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Test mode:	3-DH1	Test channel:	Middle	ANT2
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Date: 14 JAN 2021 19:22:58

Test mode:	3-DH3	Test channel:	Middle	ANT2
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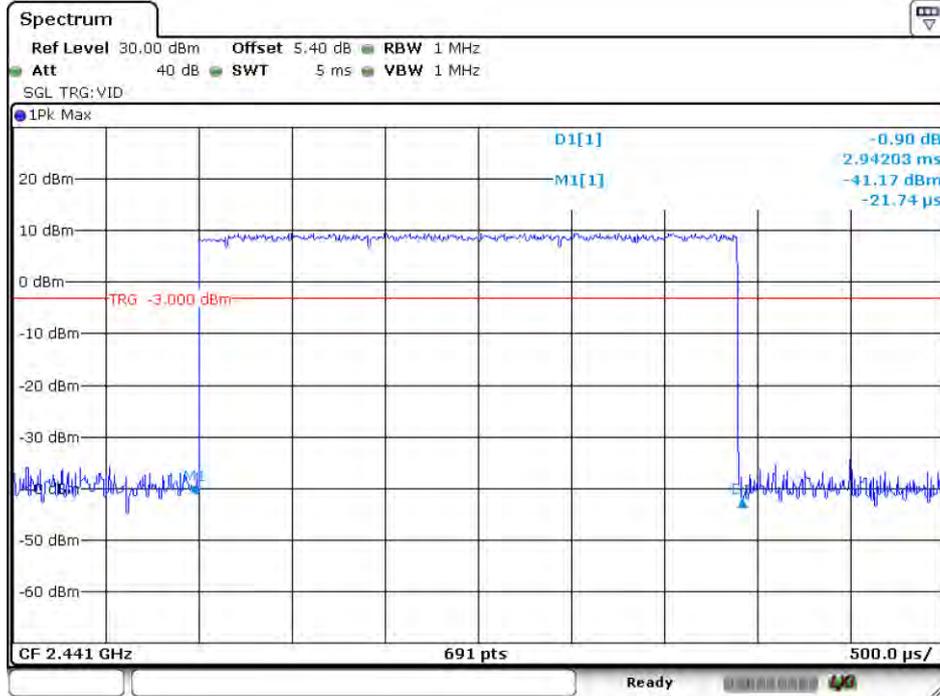


Date: 14 JAN 2021 19:21:20



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Test mode:	3-DH5	Test channel:	Middle	ANT2
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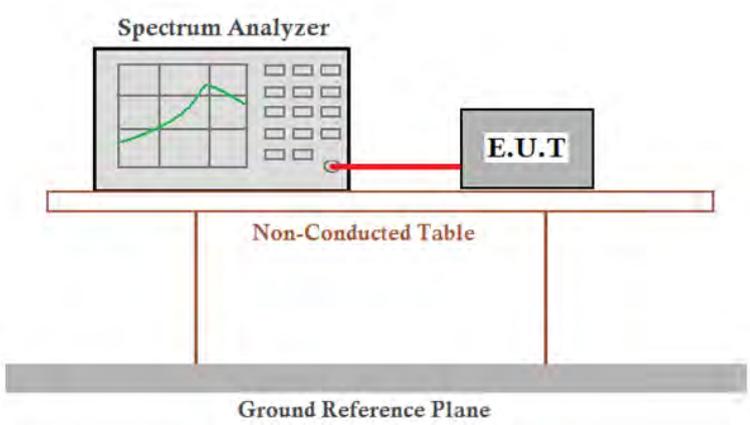
Date: 14 JAN 2021 19:20:47



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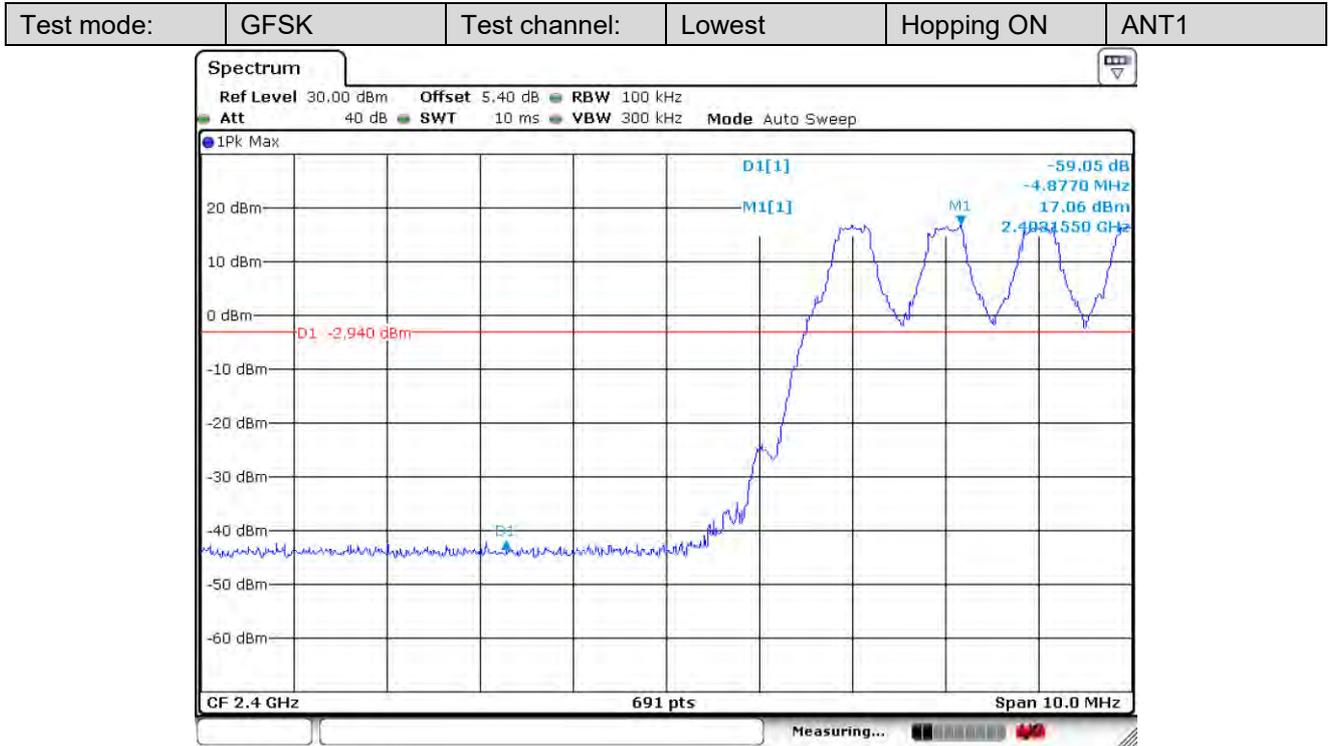
### 4.9 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 Section 7.8.6
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
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 $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass



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### 4.9.1 Test Plots

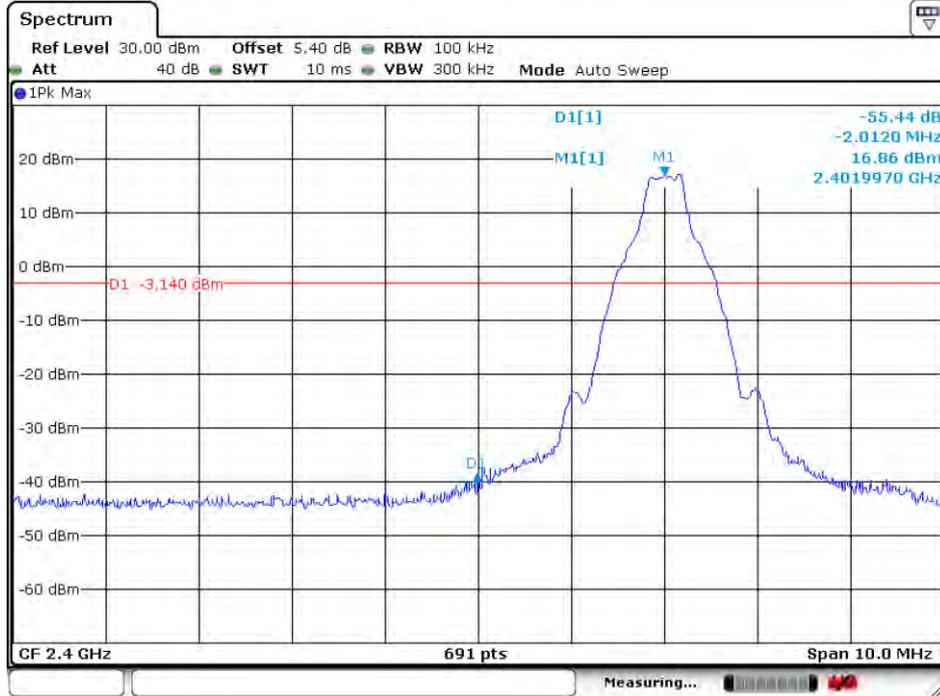


Date: 8 JAN 2021 11:06:04



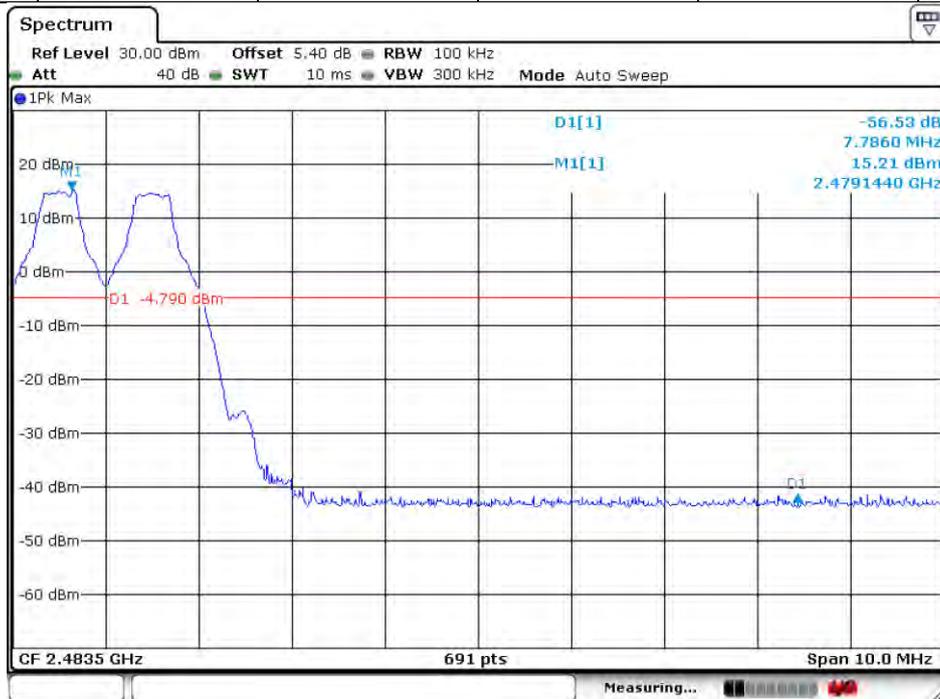
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Test mode:	GFSK	Test channel:	Lowest	Hopping OFF	ANT1
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Date: 8 JAN 2021 10:38:22

Test mode:	GFSK	Test channel:	Highest	Hopping ON	ANT1
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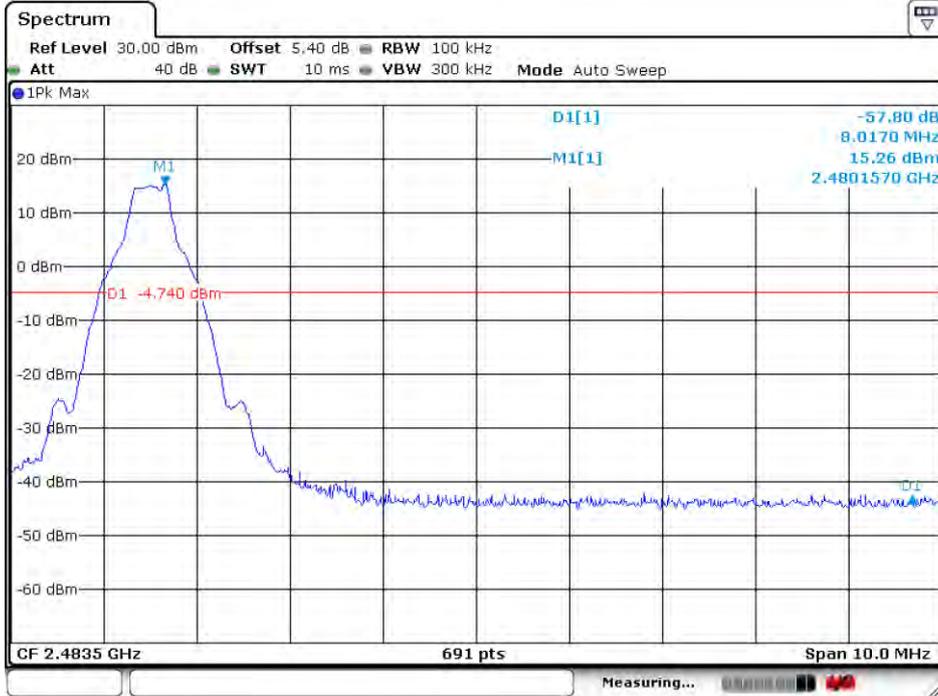


Date: 8 JAN 2021 11:05:28



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Test mode:	GFSK	Test channel:	Highest	Hopping OFF	ANT1
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Date: 8 JAN 2021 10:47:46

Test mode:	$\pi/4$ QPSK	Test channel:	Lowest	Hopping ON	ANT1
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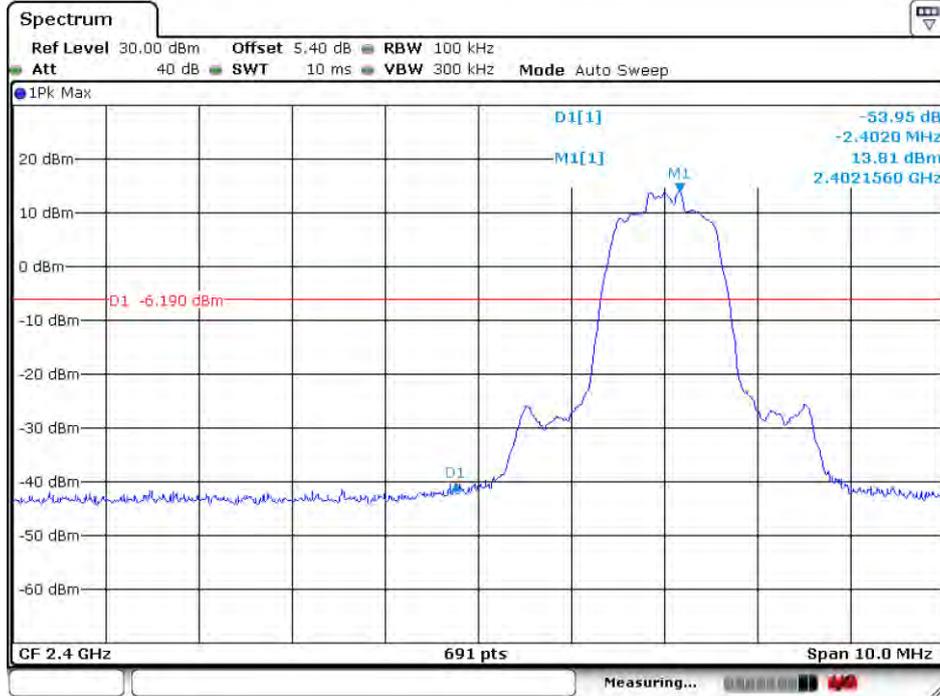


Date: 8 JAN 2021 11:00:46



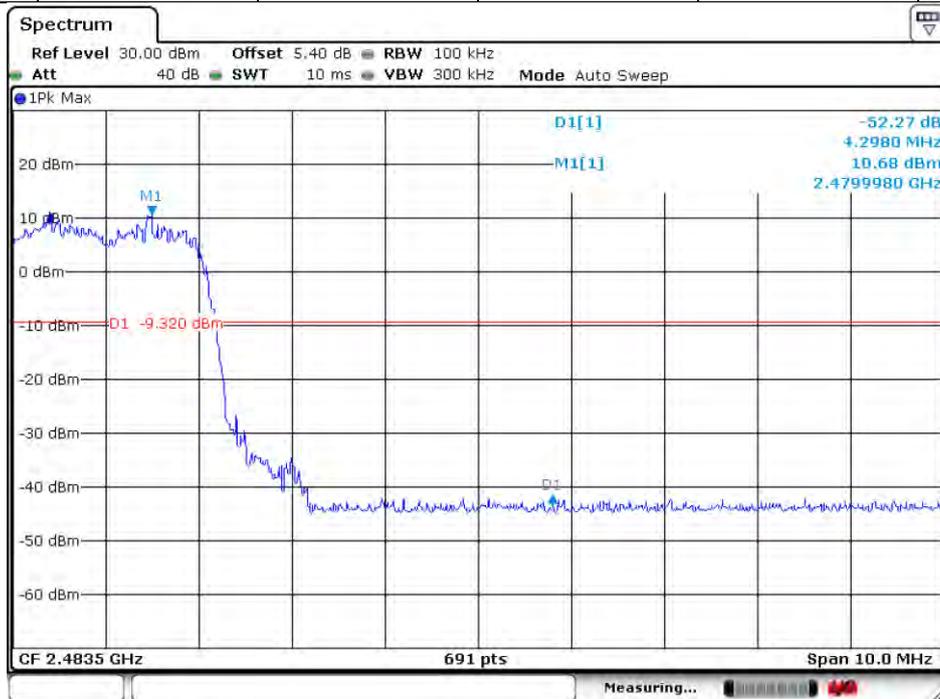
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Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest	Hopping OFF	ANT1
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Date: 8 JAN 2021 10:53:01

Test mode:	$\pi/4$ DQPSK	Test channel:	Highest	Hopping ON	ANT1
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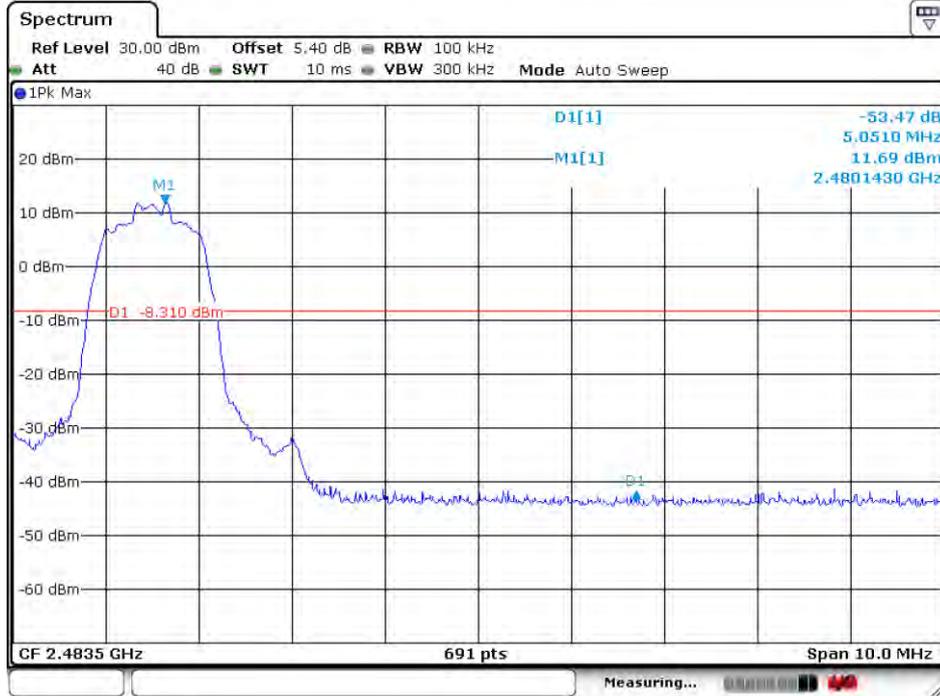


Date: 8 JAN 2021 11:01:21



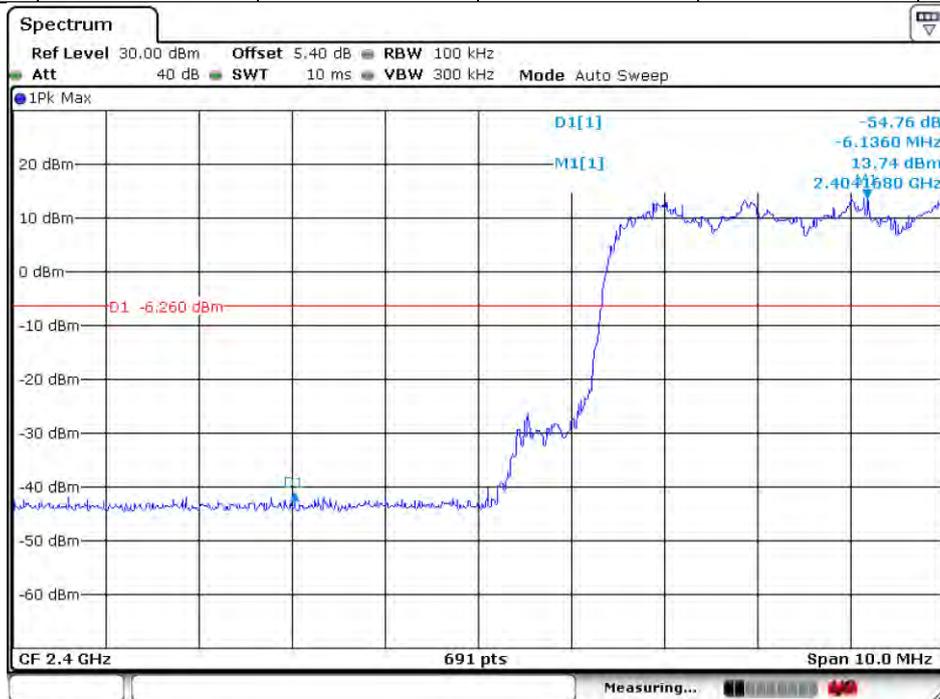
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Test mode:	$\pi/4$ DQPSK	Test channel:	Highest	Hopping OFF	ANT1
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Date: 8 JAN 2021 10:50:27

Test mode:	8DPSK	Test channel:	Lowest	Hopping ON	ANT1
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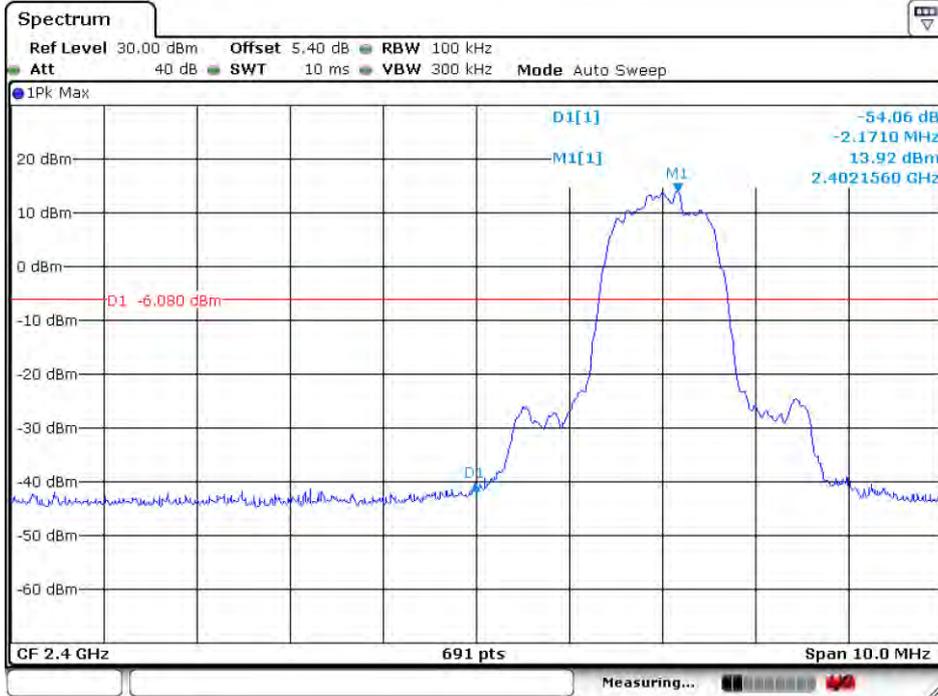


Date: 8 JAN 2021 10:59:43



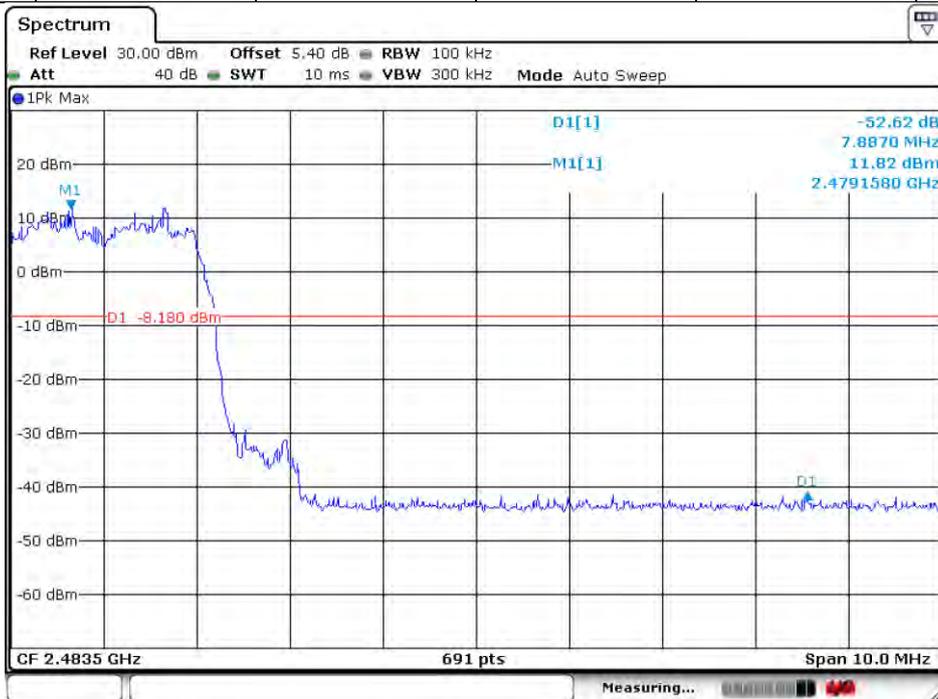
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Test mode:	8DPSK	Test channel:	Lowest	Hopping OFF	ANT1
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Date: 8 JAN 2021 10:54:21

Test mode:	8DPSK	Test channel:	Highest	Hopping ON	ANT1
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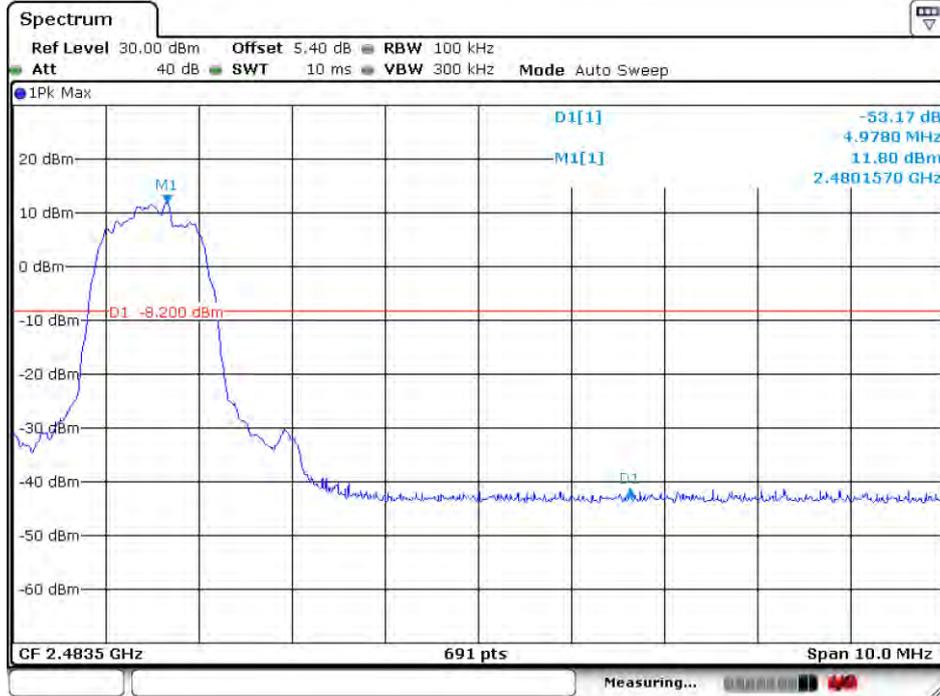
Date: 8 JAN 2021 10:58:09



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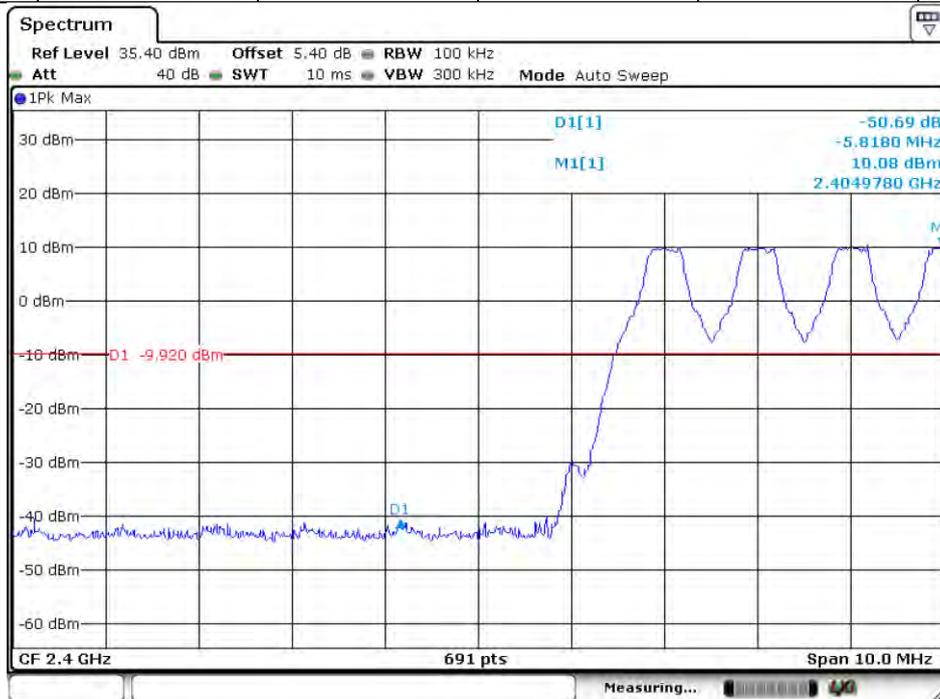
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Test mode:	8DPSK	Test channel:	Highest	Hopping OFF	ANT1
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Date: 8 JAN 2021 10:57:03

Test mode:	GFSK	Test channel:	Lowest	Hopping ON	ANT2
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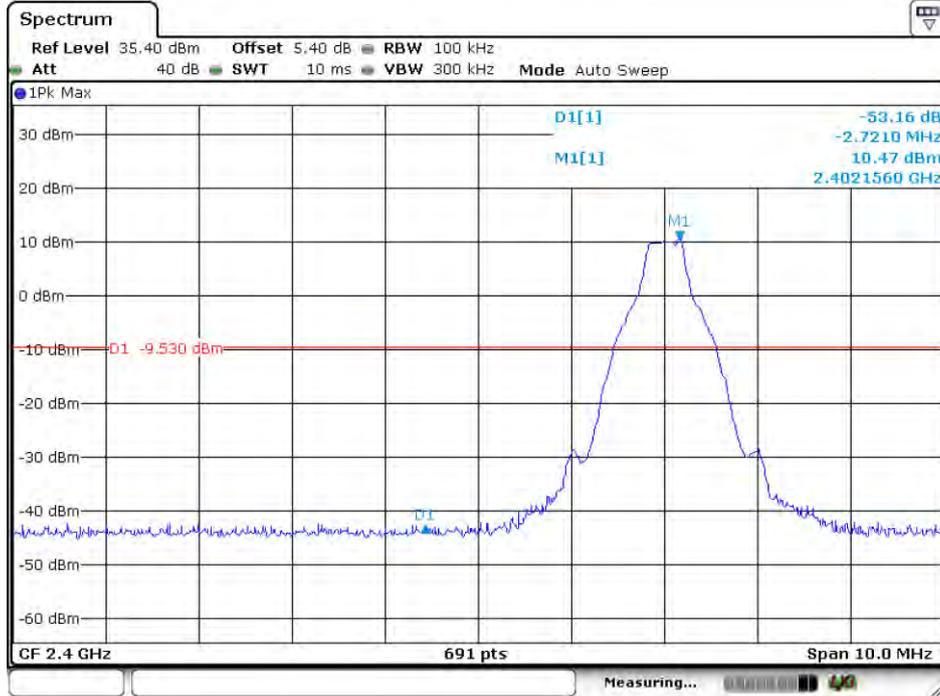
Date: 14 JAN 2021 19:11:43



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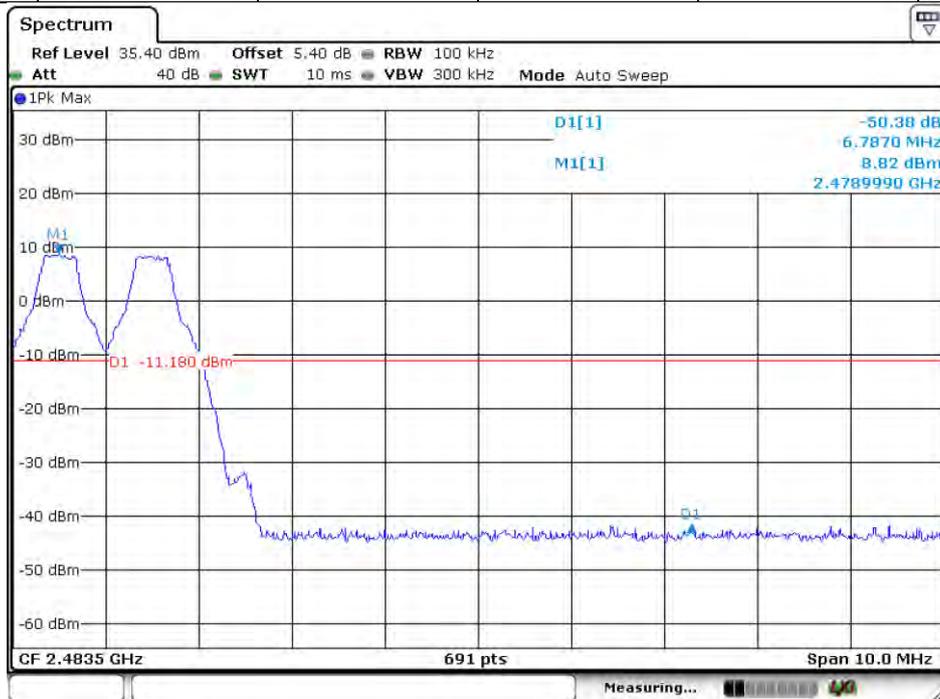
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Test mode:	GFSK	Test channel:	Lowest	Hopping OFF	ANT2
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Date: 14 JAN 2021 18:56:19

Test mode:	GFSK	Test channel:	Highest	Hopping ON	ANT2
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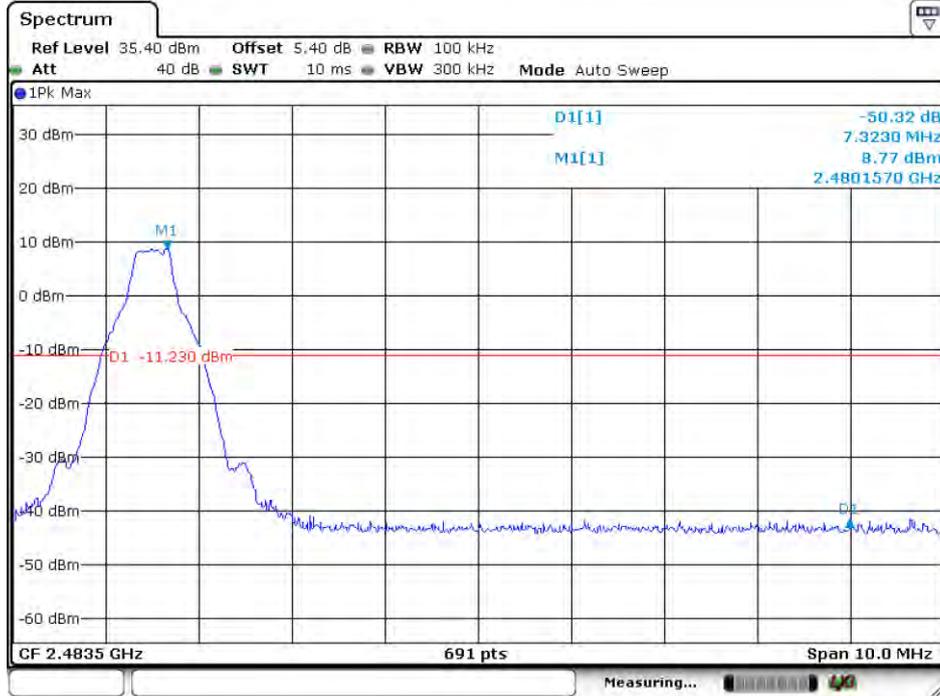


Date: 14 JAN 2021 19:09:52



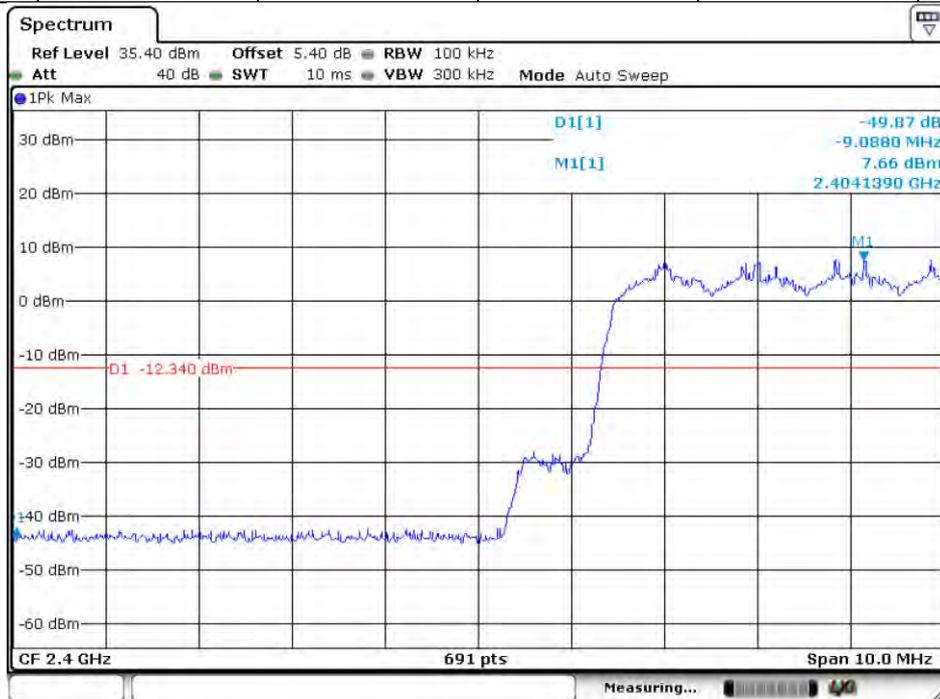
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Test mode:	GFSK	Test channel:	Highest	Hopping OFF	ANT2
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Date: 14 JAN 2021 18:58:29

Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest	Hopping ON	ANT2
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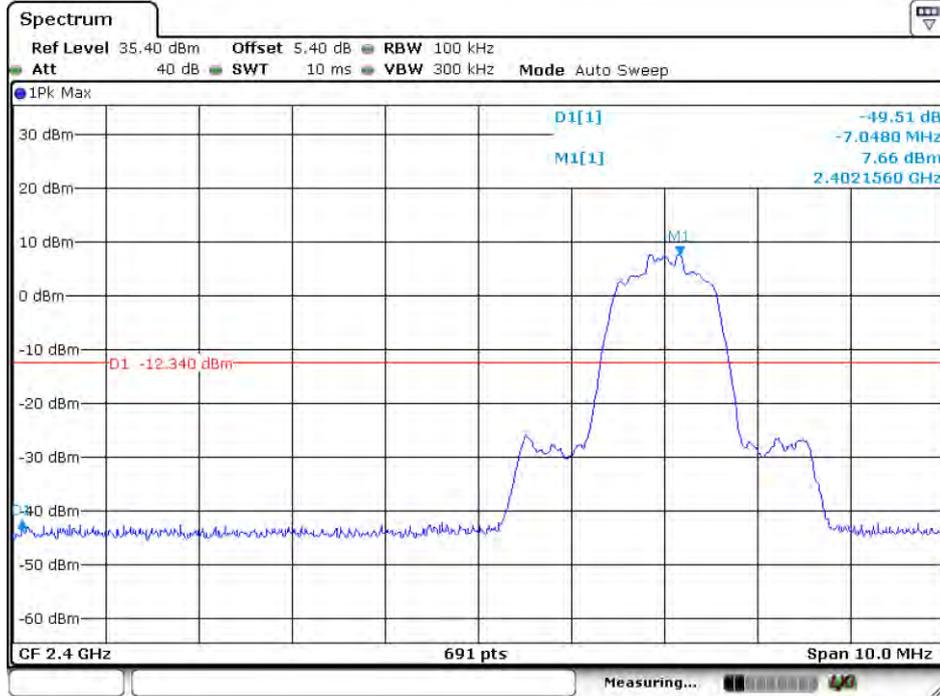
Date: 14 JAN 2021 19:07:18



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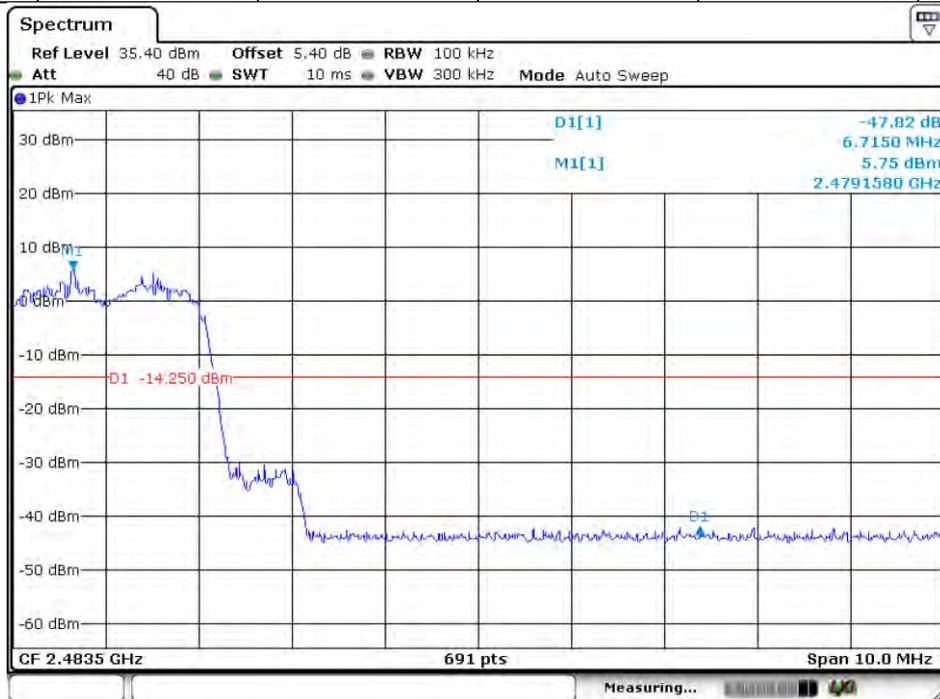
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Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest	Hopping OFF	ANT2
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Date: 14 JAN 2021 19:01:32

Test mode:	$\pi/4$ DQPSK	Test channel:	Highest	Hopping ON	ANT2
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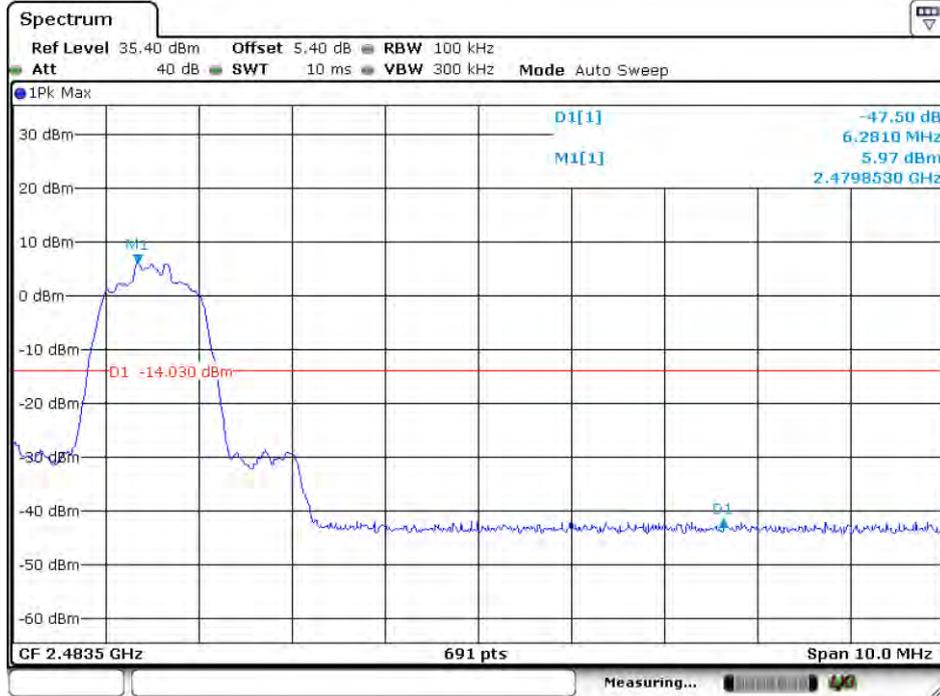


Date: 14 JAN 2021 19:08:02

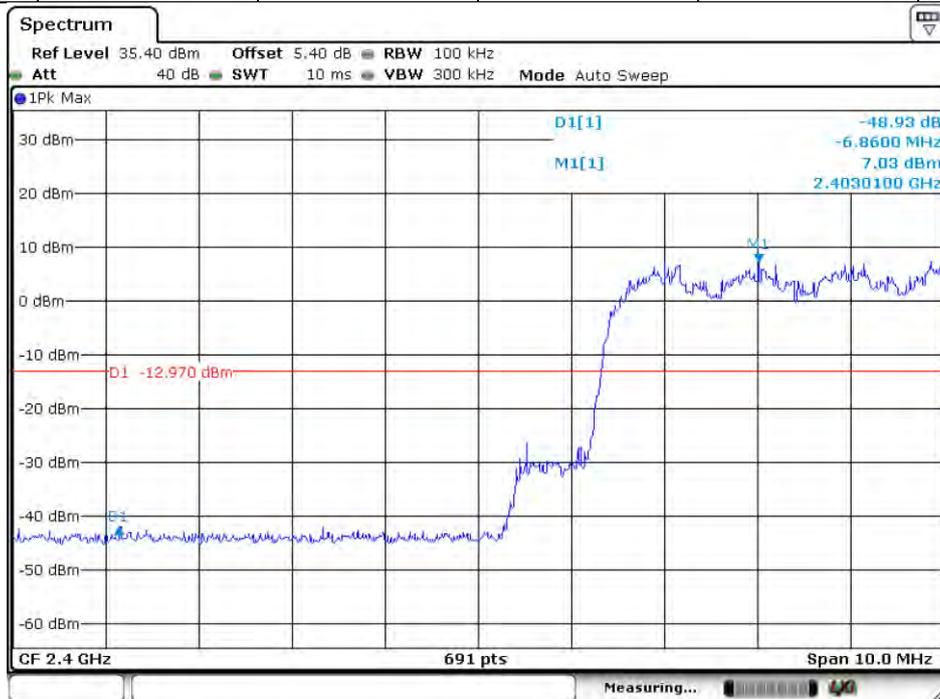


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Test mode:	$\pi/4$ DQPSK	Test channel:	Highest	Hopping OFF	ANT2
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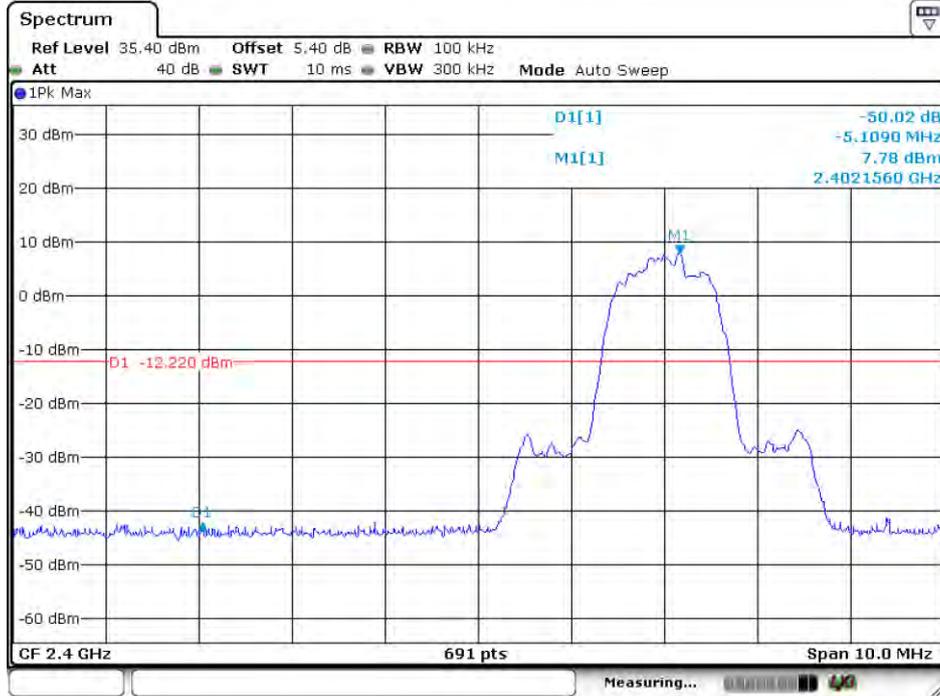
Test mode:	8DPSK	Test channel:	Lowest	Hopping ON	ANT2
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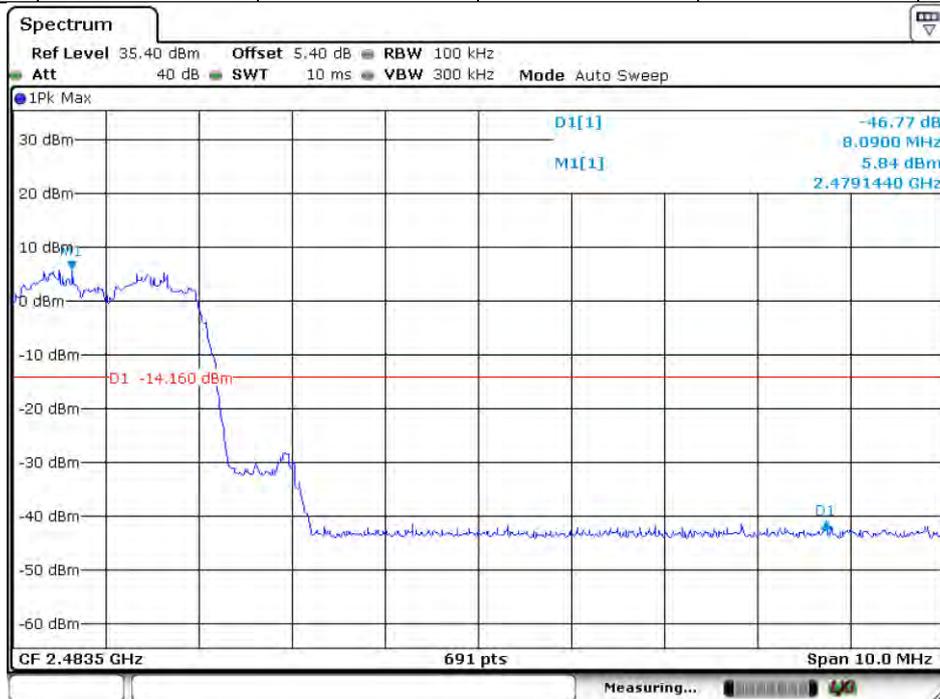
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Test mode:	8DPSK	Test channel:	Lowest	Hopping OFF	ANT2
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Date: 14 JAN 2021 19:02:19

Test mode:	8DPSK	Test channel:	Highest	Hopping ON	ANT2
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Date: 14 JAN 2021 19:05:39



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Test mode:	8DPSK	Test channel:	Highest	Hopping OFF	ANT2
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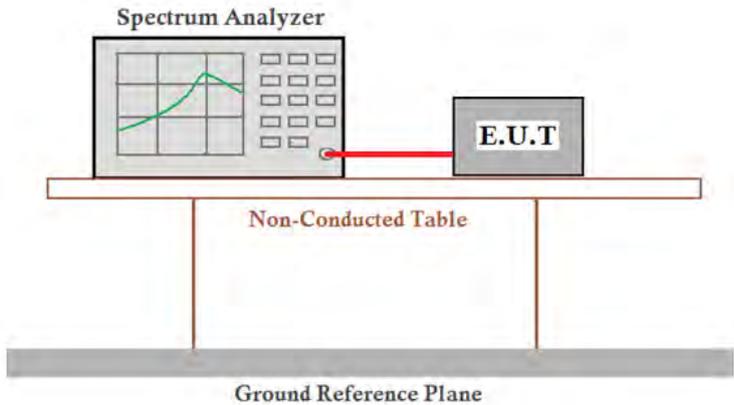
Date: 14 JAN 2021 19:03:02



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### 4.10 Spurious RF Conducted Emissions

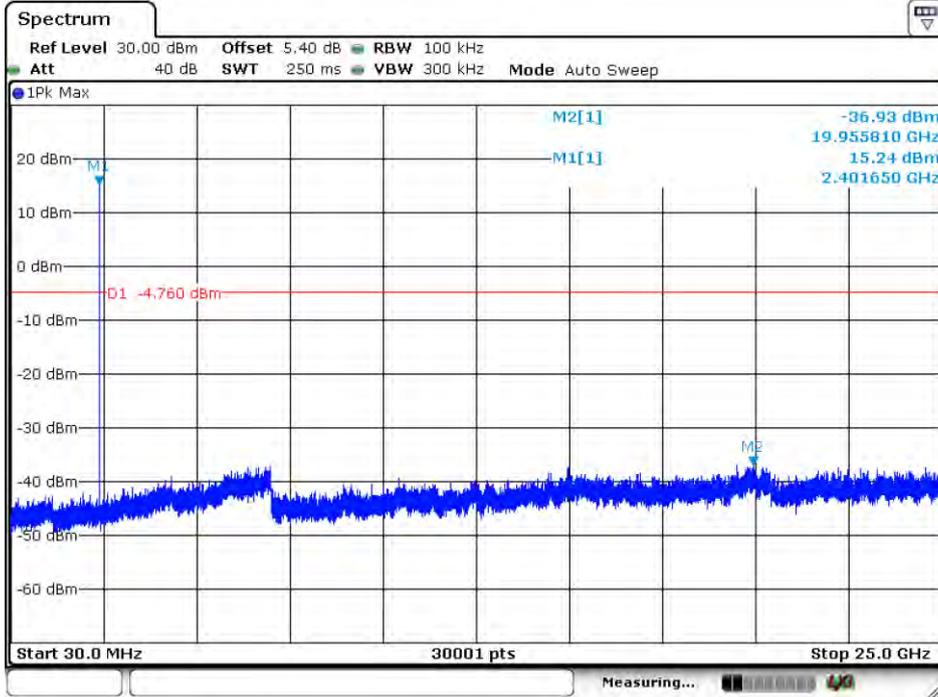
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 Section 7.8.8
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type.
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass



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### 4.10.1 Test Plots

Test mode:	GFSK	Test channel:	Lowest	ANT1
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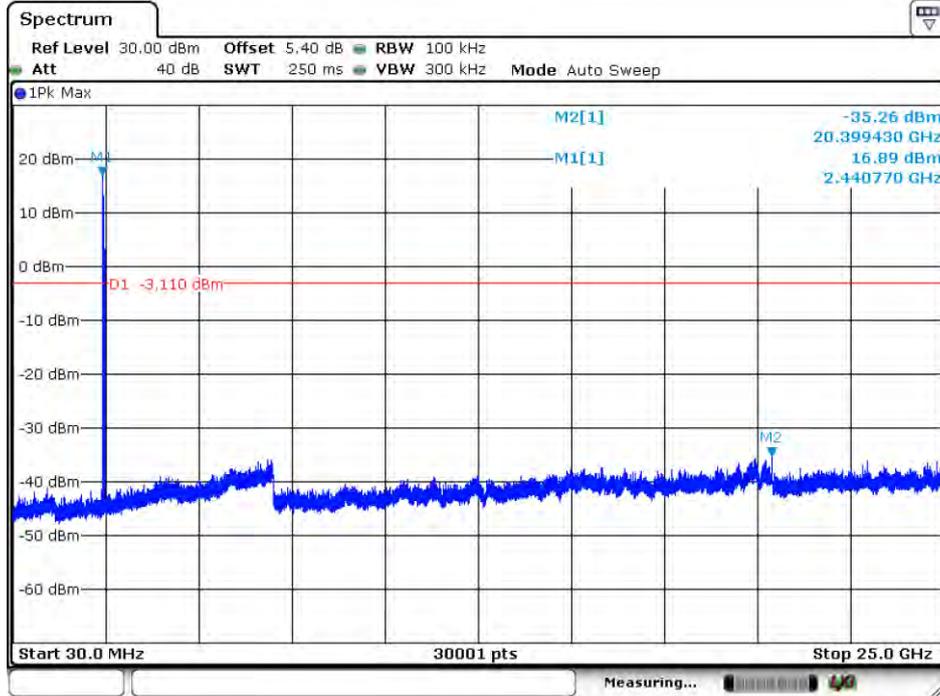


Date: 14. JAN. 2021 19:49:50

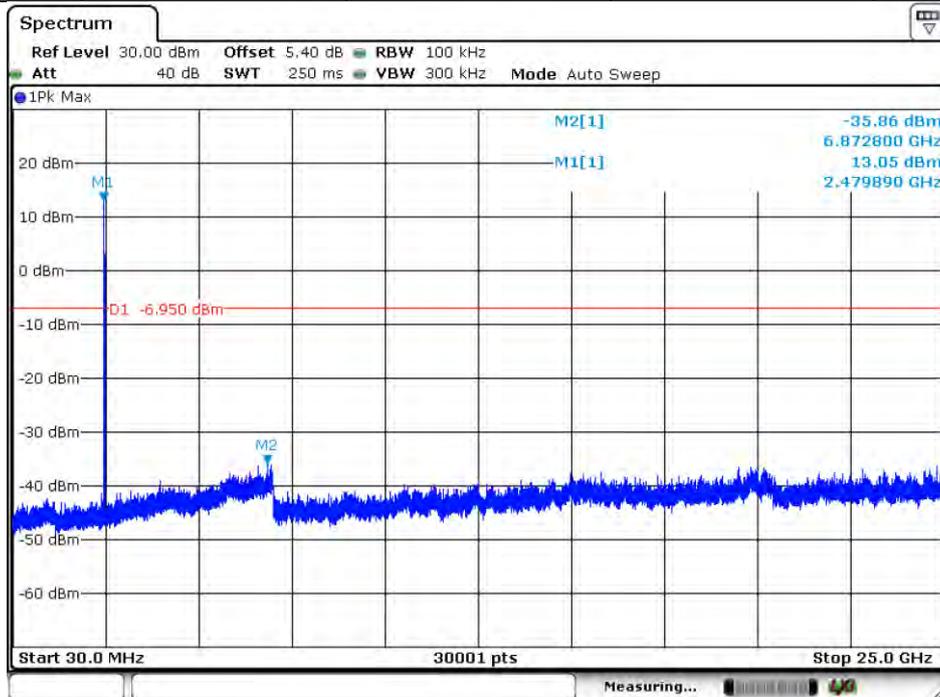


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Test mode:	GFSK	Test channel:	Middle	ANT1
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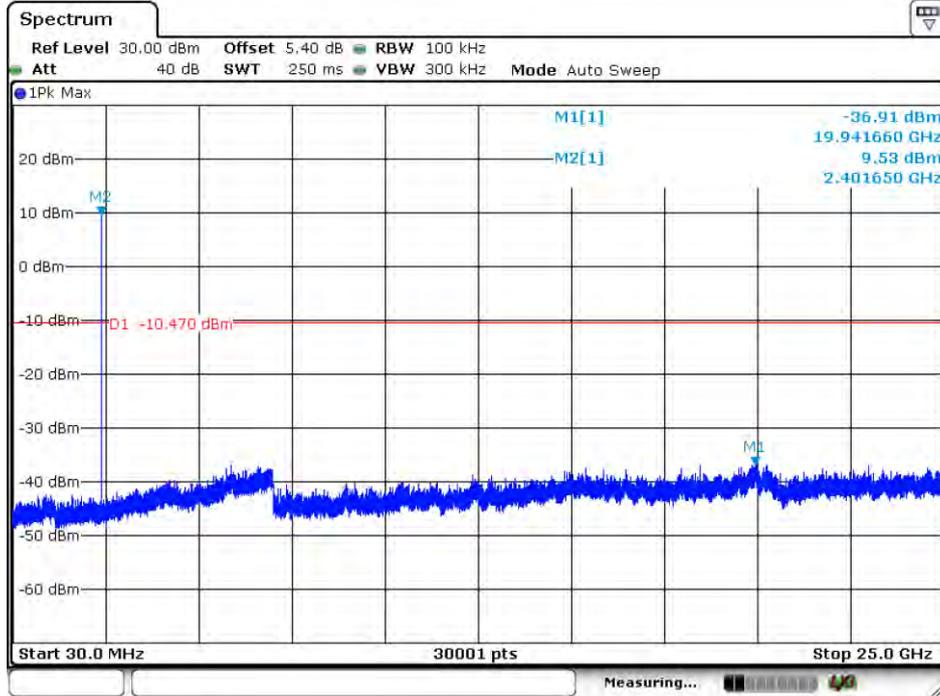
Test mode:	GFSK	Test channel:	High	ANT1
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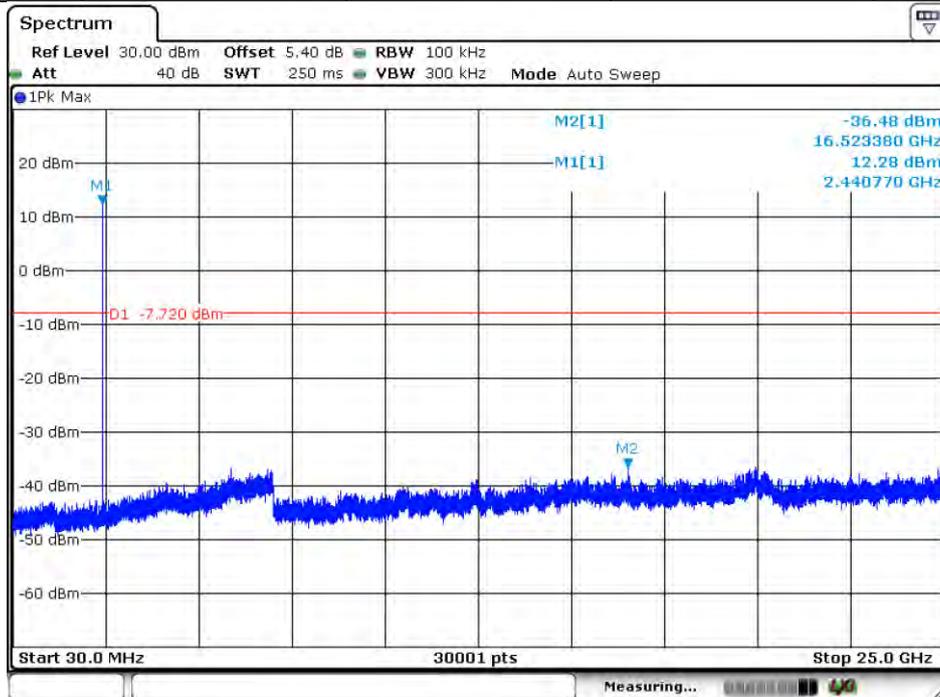
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Test mode:	$\pi/4$ QPSK	Test channel:	Lowest	ANT1
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Date: 14 JAN 2021 19:45:09

Test mode:	$\pi/4$ QPSK	Test channel:	Middle	ANT1
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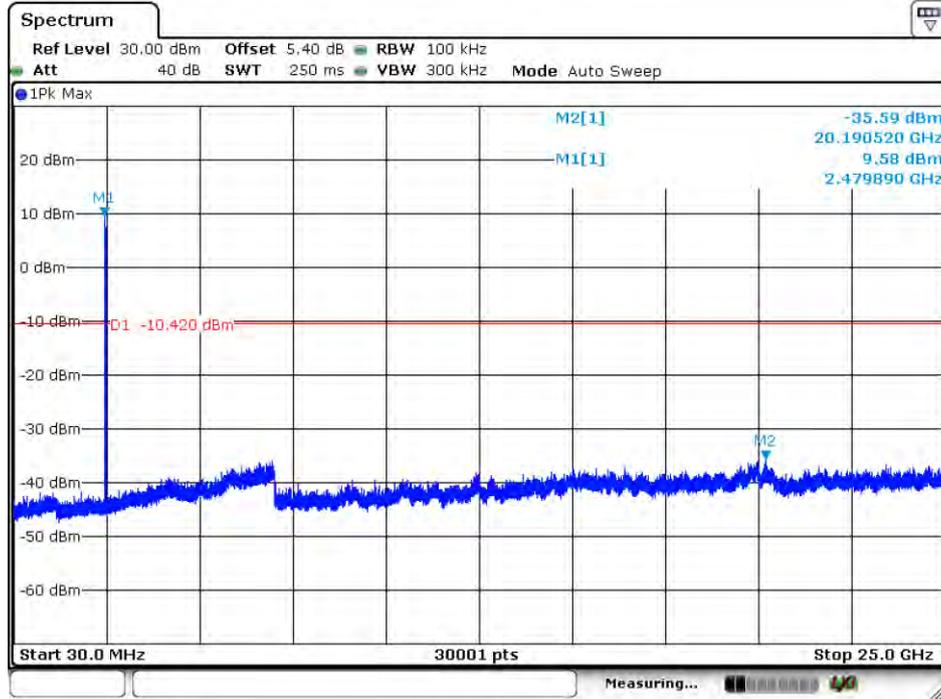


Date: 14 JAN 2021 19:45:41



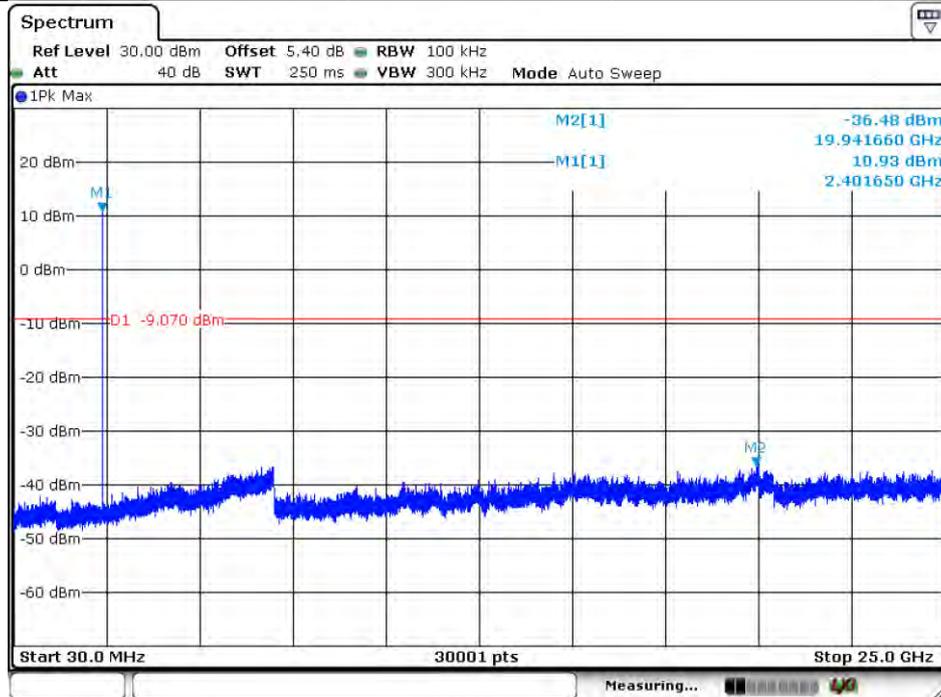
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Test mode:	$\pi/4$ DQPSK	Test channel:	High	ANT1
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Date: 14.JAN.2021 19:47:57

Test mode:	8DPSK	Test channel:	Lowest	ANT1
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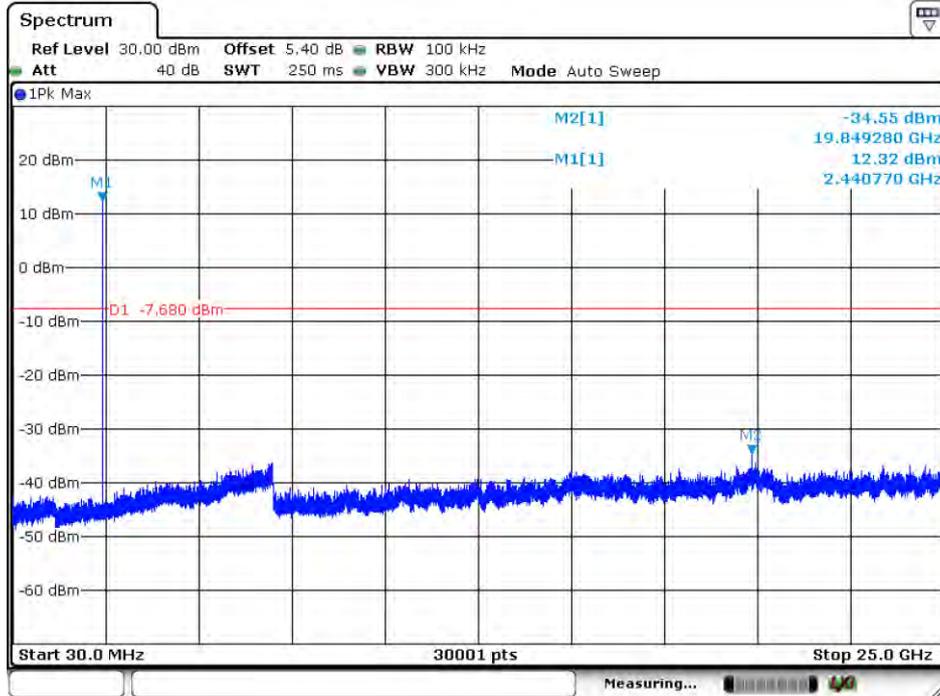
Date: 14.JAN.2021 19:44:35



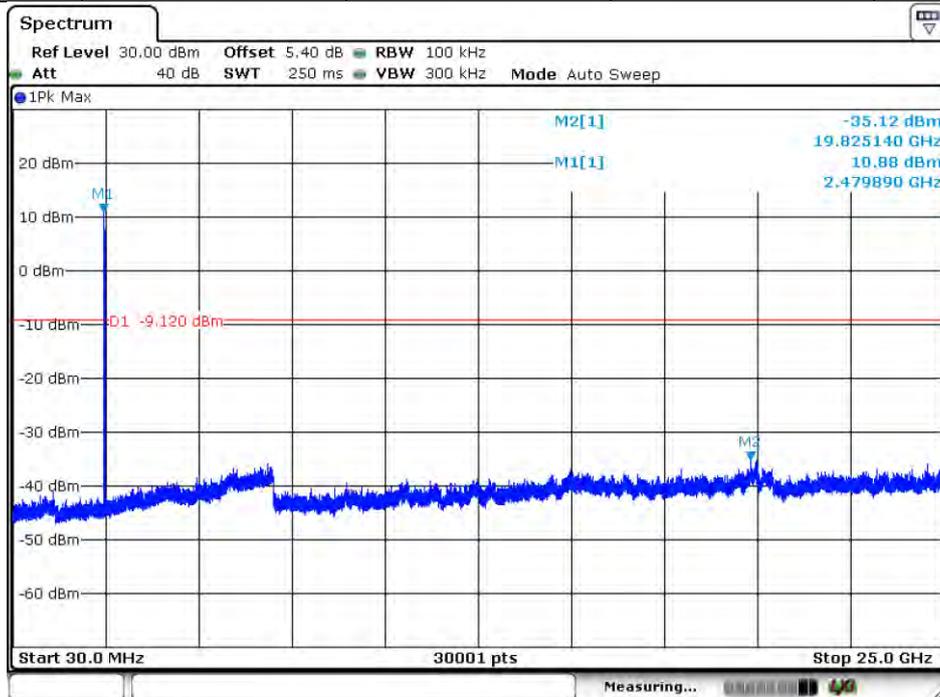
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Test mode:	8DPSK	Test channel:	Middle	ANT1
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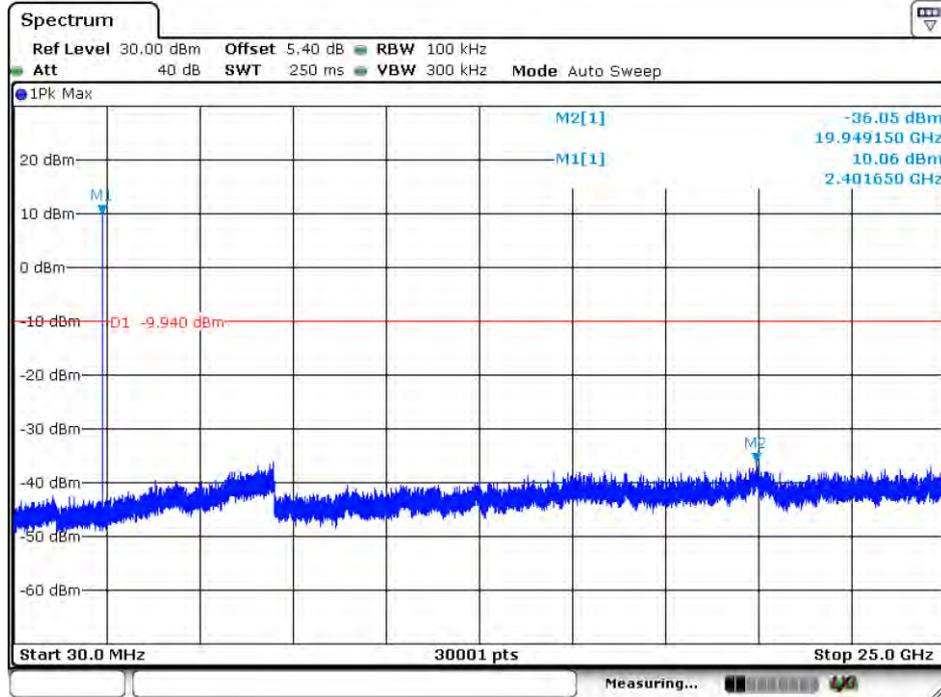
Test mode:	8DPSK	Test channel:	High	ANT1
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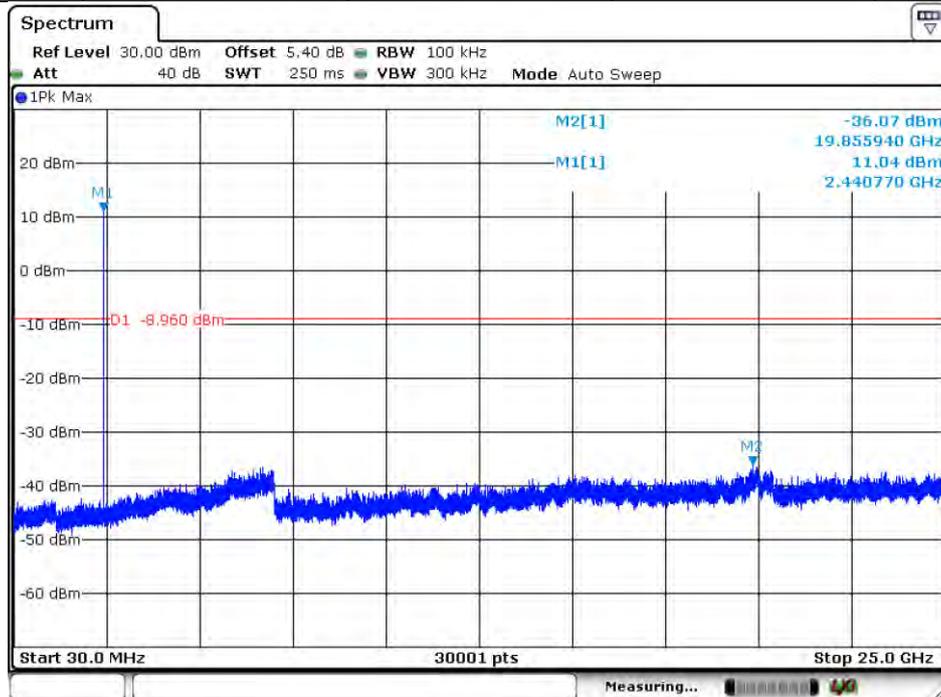
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Test mode:	GFSK	Test channel:	Lowest	ANT2
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Date: 14.JAN.2021 19:31:42

Test mode:	GFSK	Test channel:	Middle	ANT2
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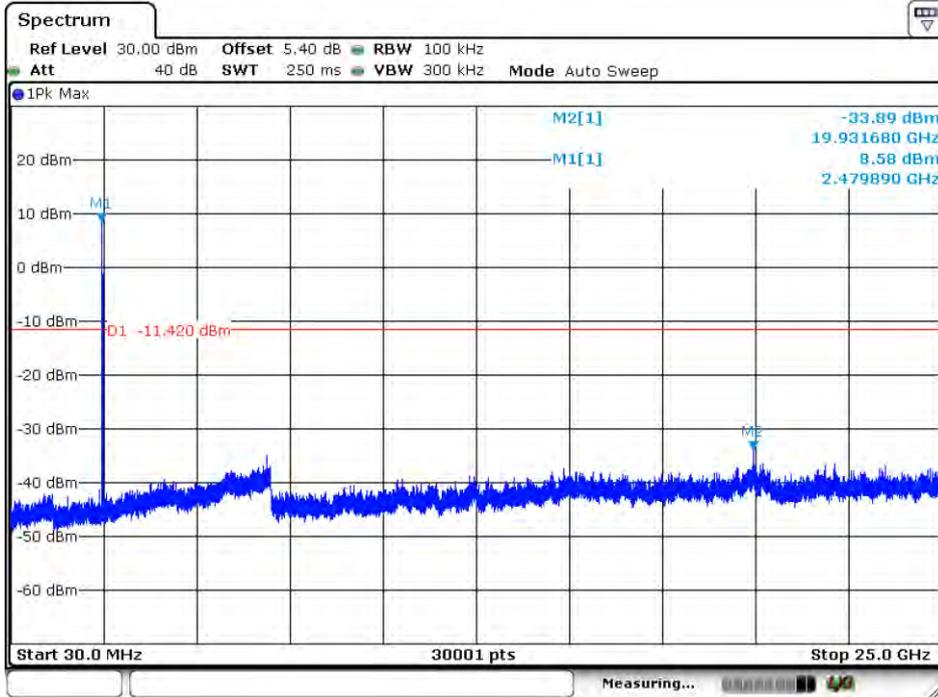


Date: 14.JAN.2021 19:32:29



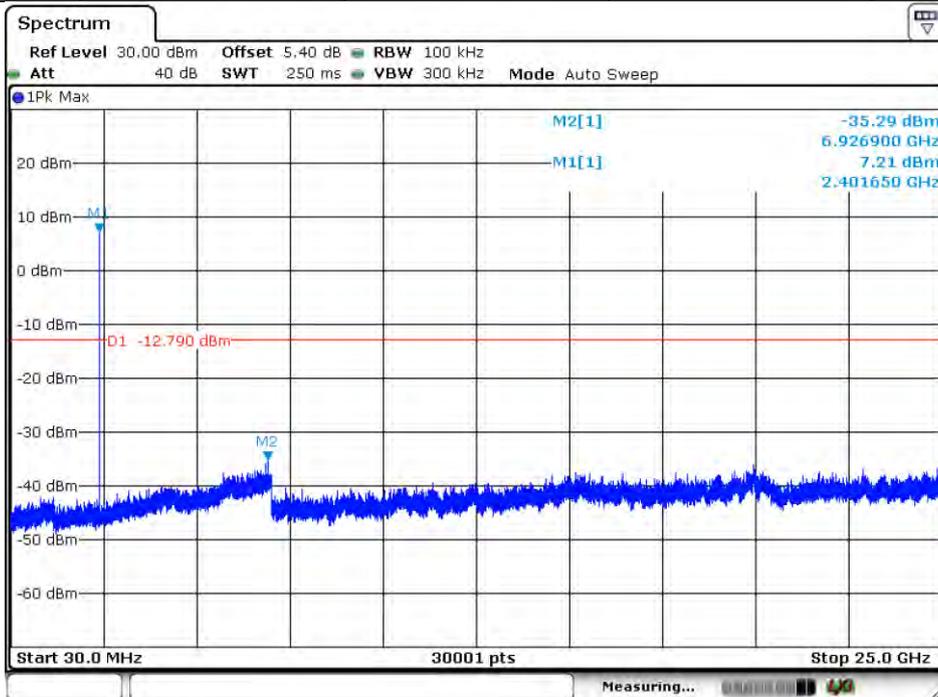
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Test mode:	GFSK	Test channel:	High	ANT2
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Date: 14 JAN 2021 19:33:04

Test mode:	$\pi/4$ QPSK	Test channel:	Lowest	ANT2
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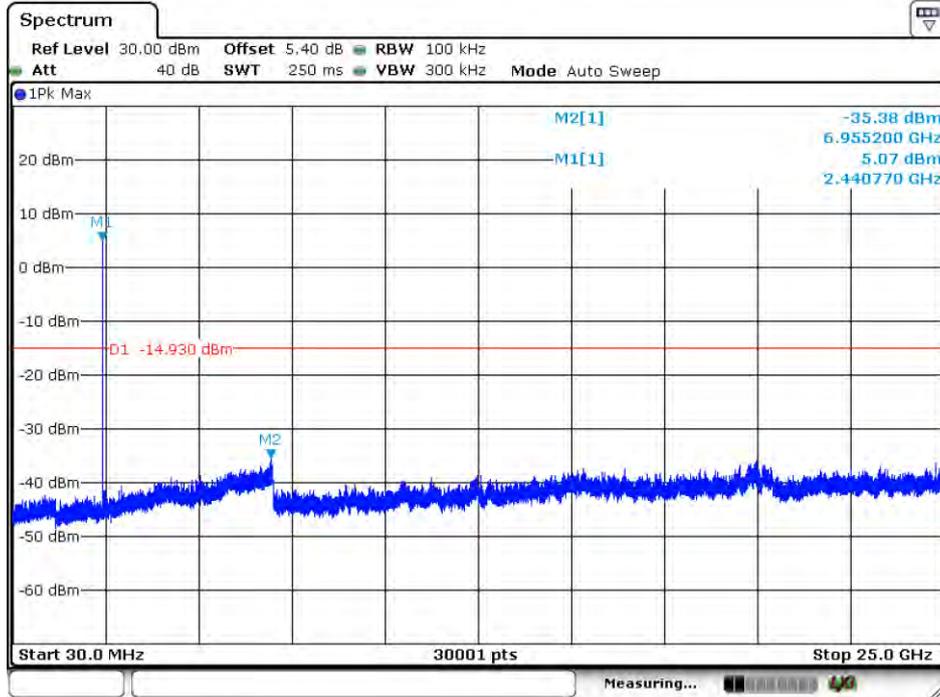
Date: 14 JAN 2021 19:35:25



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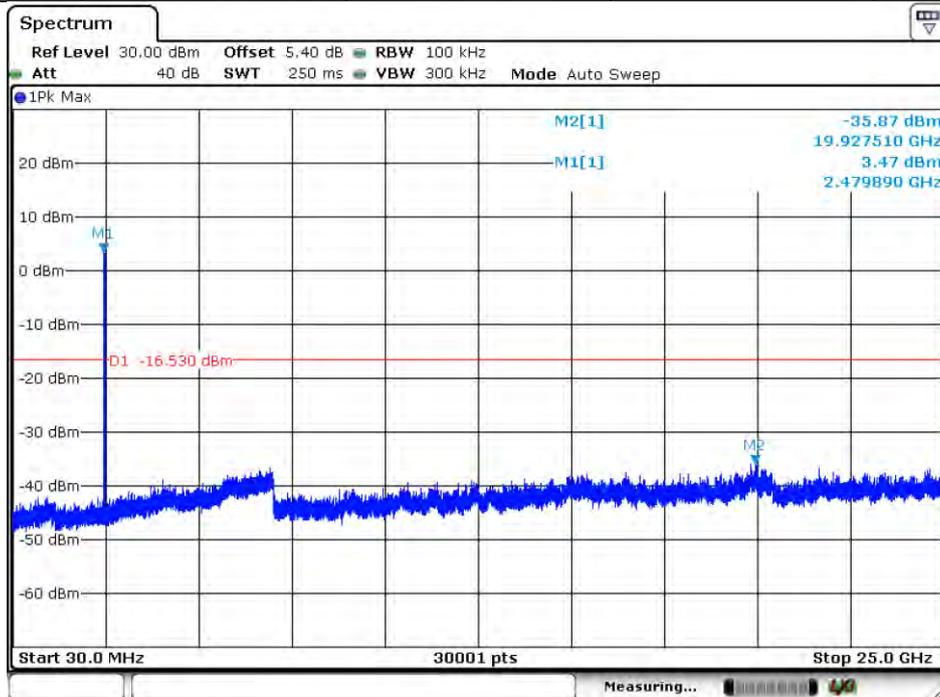
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Test mode:	$\pi/4$ QPSK	Test channel:	Middle	ANT2
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Date: 14.JAN.2021 19:34:44

Test mode:	$\pi/4$ QPSK	Test channel:	High	ANT2
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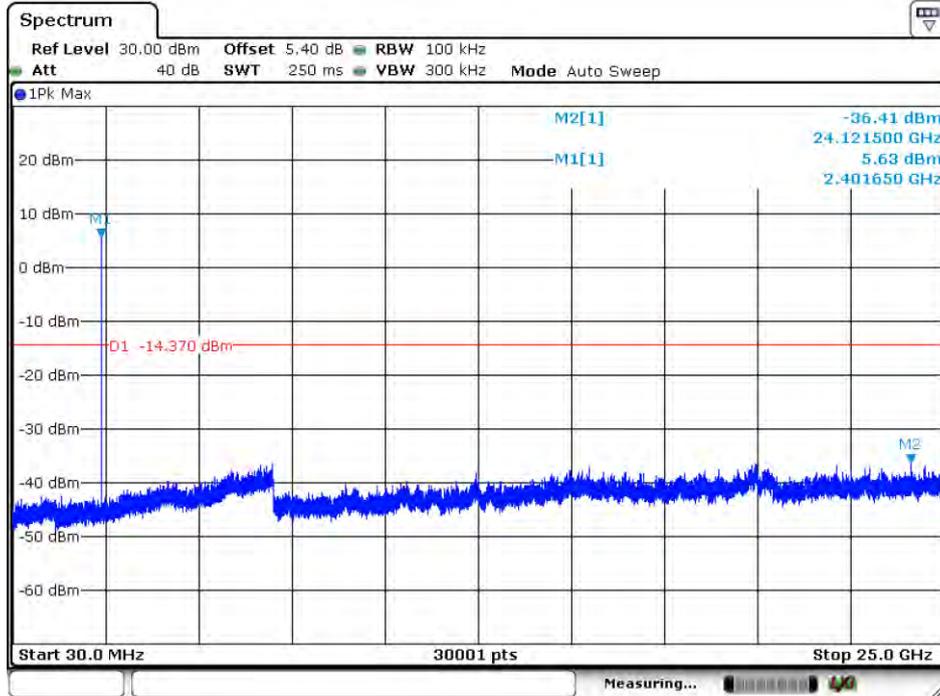
Date: 14.JAN.2021 19:33:44



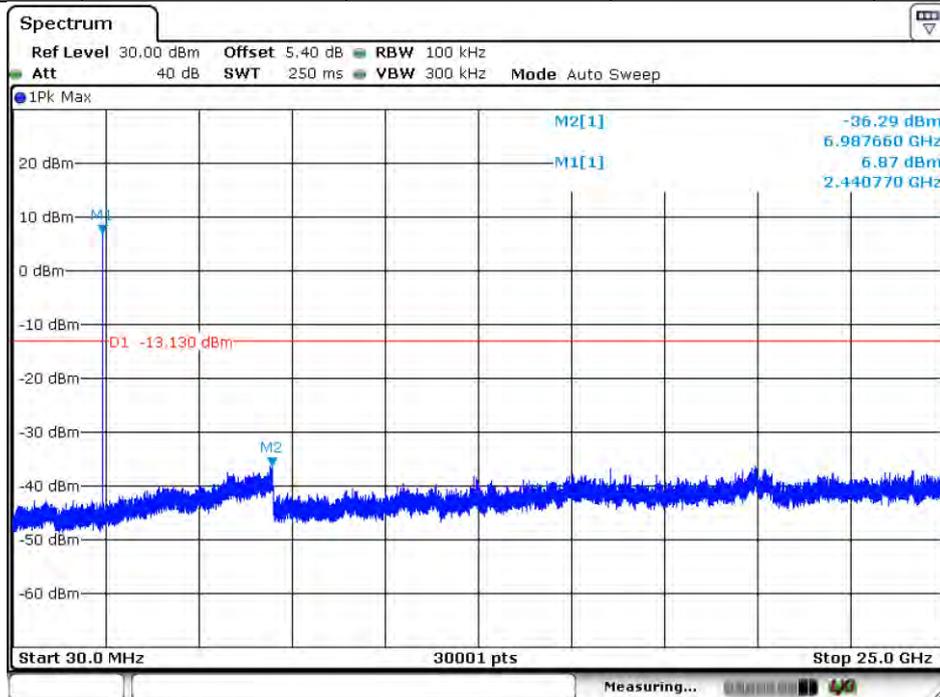
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Test mode:	8DPSK	Test channel:	Lowest	ANT2
------------	-------	---------------	--------	------



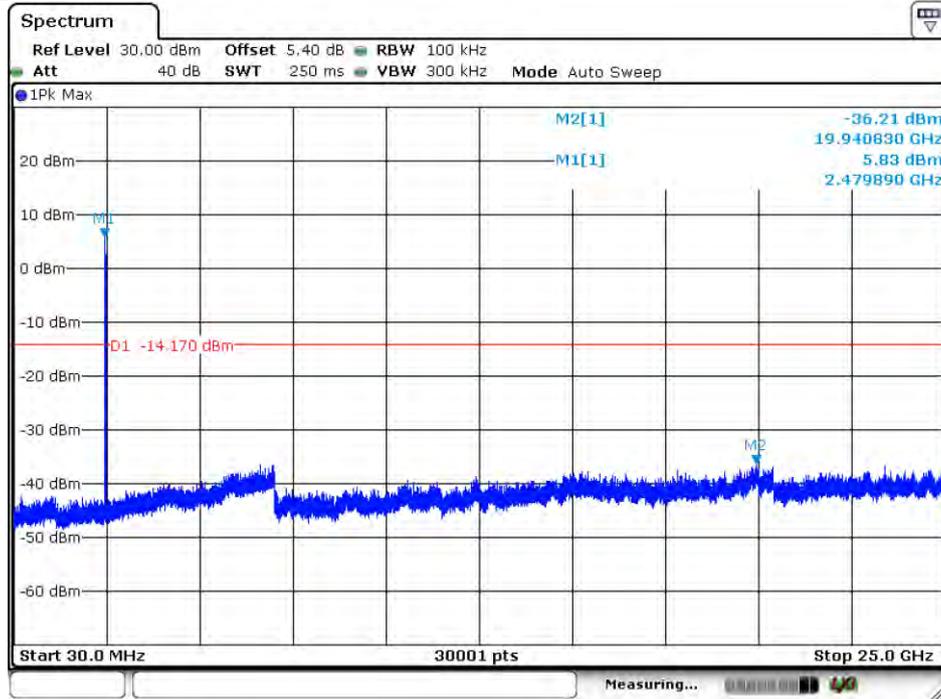
Test mode:	8DPSK	Test channel:	Middle	ANT2
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Test mode:	8DPSK	Test channel:	High	ANT2
------------	-------	---------------	------	------



Date: 14 JAN 2021 19:37:25

**Remark:**

Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



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### 4.11 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 :2013 Section 11.12				
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	100kHz	30kHz	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
Remark: 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.					



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<p><b>Test Setup:</b></p>		
<p>Figure 1. Below 30MHz</p>	<p>Figure 2. 30MHz to 1GHz</p>	
<p>Figure 3. Above 1 GHz</p>		
<p><b>Test Procedure:</b></p>	<ol style="list-style-type: none"> <li>For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation</li> <li>The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>Use the following spectrum analyzer settings:             <ol style="list-style-type: none"> <li>Span shall wide enough to fully capture the emission being measured;</li> <li>Set RBW=100 kHz for <math>f &lt; 1</math> GHz, RBW=1MHz for <math>f &gt; 1</math>GHz ; VBW <math>\geq</math> RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak</li> <li>For average measurement: use duty cycle correction factor method per 15.35(c).</li> </ol> </li> </ol>	



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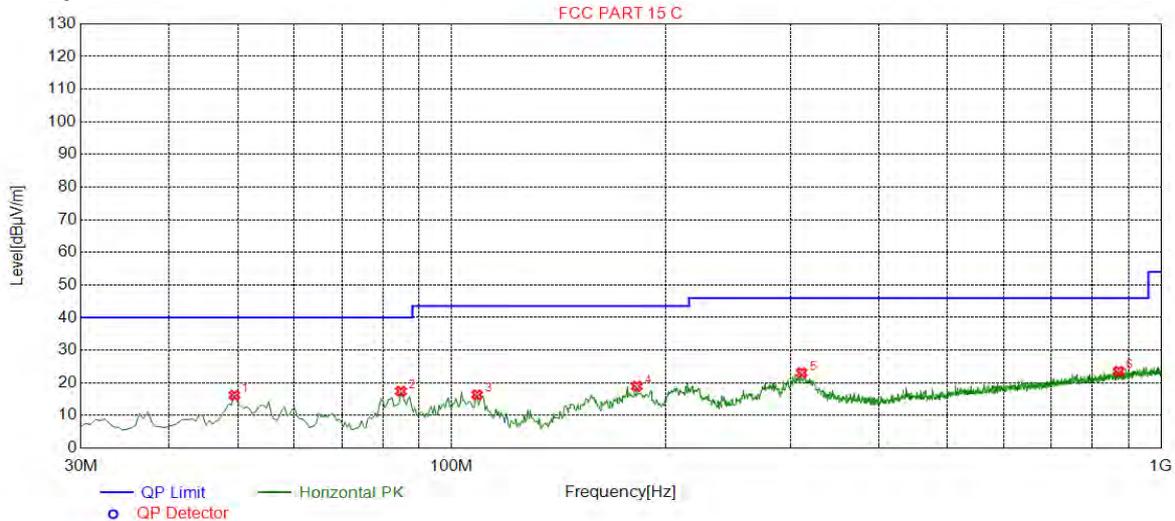
	<p>Duty cycle = On time/100 milliseconds  On time = <math>N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n</math>  Where <math>N_1</math> is number of type 1 pulses, <math>L_1</math> is length of type 1 pulses, etc.  Average Emission Level = Peak Emission Level + 20*log(Duty cycle)</p> <p>f. 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.</p> <p>g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>h. 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.</p> <p>i. Test the EUT in the lowest channel, the middle channel ,the Highest channel.</p> <p>j. 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.</p> <p>k. Repeat above procedures until all frequencies measured was complete.</p>
<p>Exploratory Test Mode:</p>	<p>Non-hopping transmitting mode with all kind of modulation and all kind of data type  Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the DH5 of data type and GFSK modulation is the worst case.  Pretest the EUT at Charge + Transmitting mode  For below 1GHz part, through pre-scan, the worst case is the lowest channel.  Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>



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### 4.11.1 Radiated emission below 1GHz

#### Test Graph



#### Suspected List

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	49.4097	16.22	40.00	23.78	150	233	Horizontal
2	84.8324	17.42	40.00	22.58	150	320	Horizontal
3	108.6093	16.36	43.50	27.14	150	248	Horizontal
4	182.3662	18.98	43.50	24.52	150	217	Horizontal
5	311.4407	23.11	46.00	22.89	150	152	Horizontal
6	871.8959	23.57	46.00	22.43	150	335	Horizontal

#### Final Data List

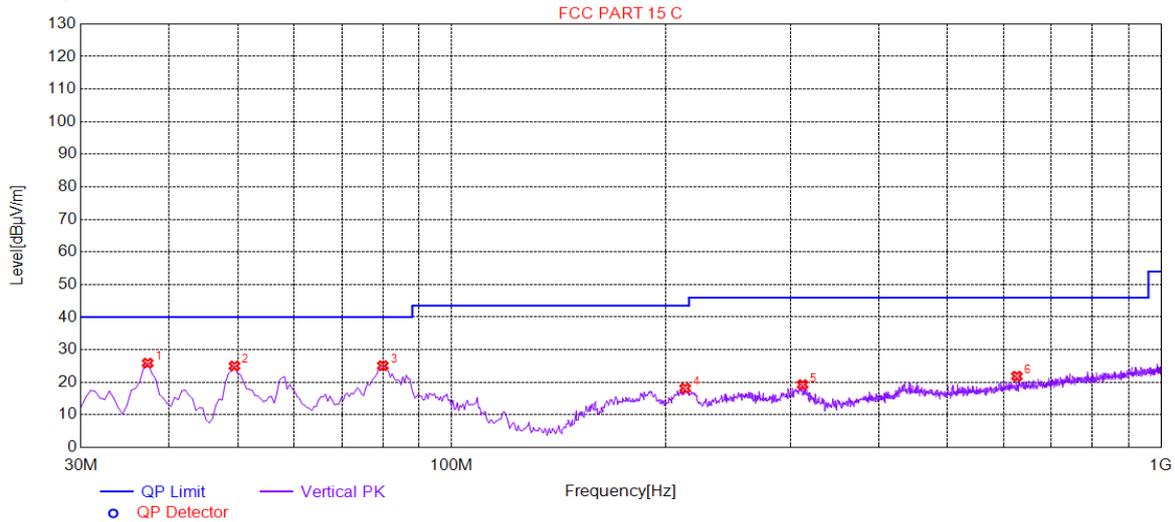


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**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	37.2786	25.89	40.00	14.11	150	166	Vertical
2	49.4097	25.02	40.00	14.98	150	358	Vertical
3	79.9800	25.11	40.00	14.89	150	206	Vertical
4	213.4217	18.16	43.50	25.34	150	22	Vertical
5	312.4112	19.29	46.00	26.71	150	339	Vertical
6	626.3632	21.88	46.00	24.12	150	86	Vertical

**Final Data List**



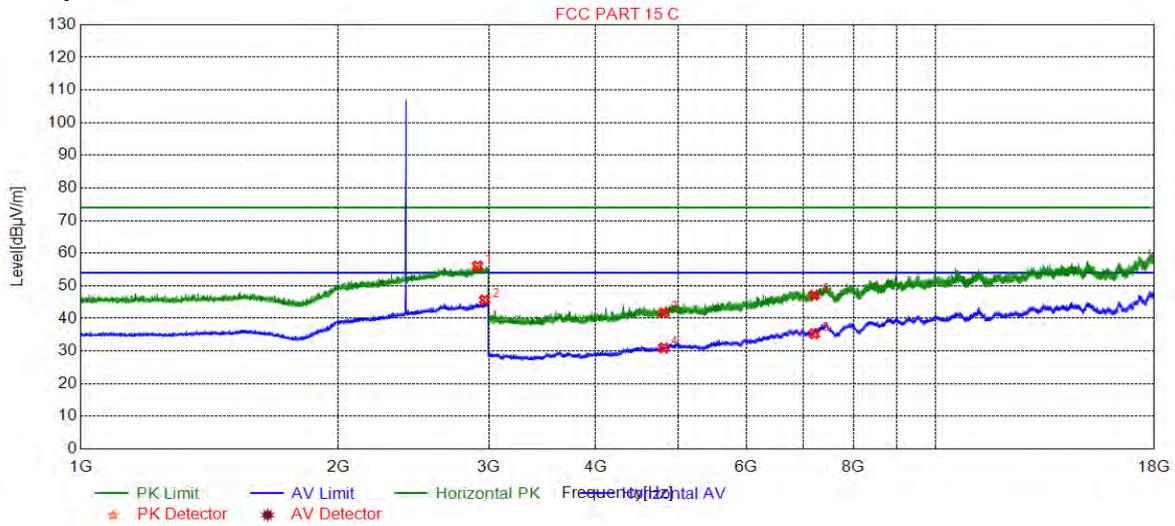
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**4.11.2 Transmitter Emission above 1GHz**

**4.11.2.1 GFSK\_Channel 0 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2909.977	56.07	74.00	17.93	150	225	Horizontal
2	2966.491	45.68	54.00	8.32	150	79	Horizontal
3	4804.000	41.75	74.00	32.25	150	346	Horizontal
4	4804.000	30.97	54.00	23.03	150	2	Horizontal
5	7206.000	35.33	54.00	18.67	150	2	Horizontal
6	7206.000	47.11	74.00	26.89	150	226	Horizontal

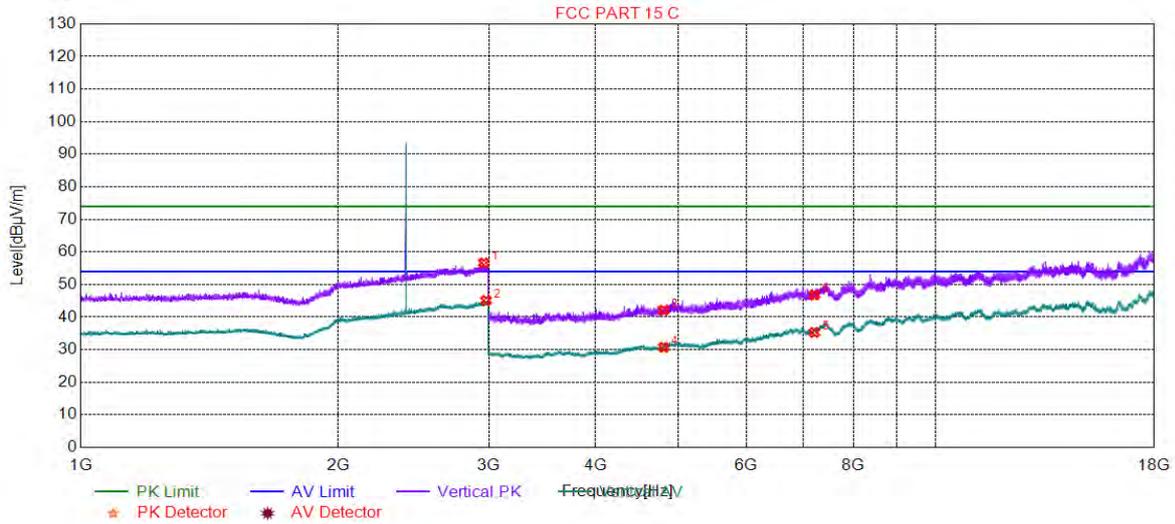
**Final Data List**



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**4.11.2.2 GFSK\_Channel 0 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.489	56.66	74.00	17.34	150	45	Vertical
2	2977.494	45.13	54.00	8.87	150	112	Vertical
3	4804.000	42.13	74.00	31.87	150	340	Vertical
4	4804.000	30.73	54.00	23.27	150	186	Vertical
5	7206.000	35.29	54.00	18.71	150	220	Vertical
6	7206.000	46.79	74.00	27.21	150	31	Vertical

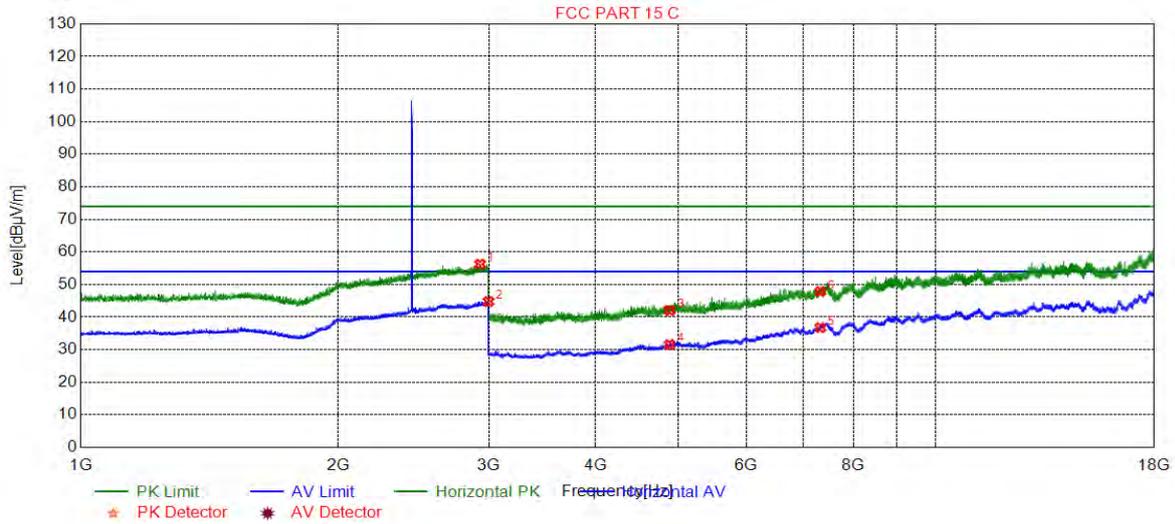
**Final Data List**



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**4.11.2.3 GFSK\_Channel 39 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2929.482	56.28	74.00	17.72	150	0	Horizontal
2	2997.499	44.78	54.00	9.22	150	205	Horizontal
3	4882.000	42.04	74.00	31.96	150	19	Horizontal
4	4882.000	31.56	54.00	22.44	150	19	Horizontal
5	7323.000	36.78	54.00	17.22	150	106	Horizontal
6	7323.000	47.85	74.00	26.15	150	226	Horizontal

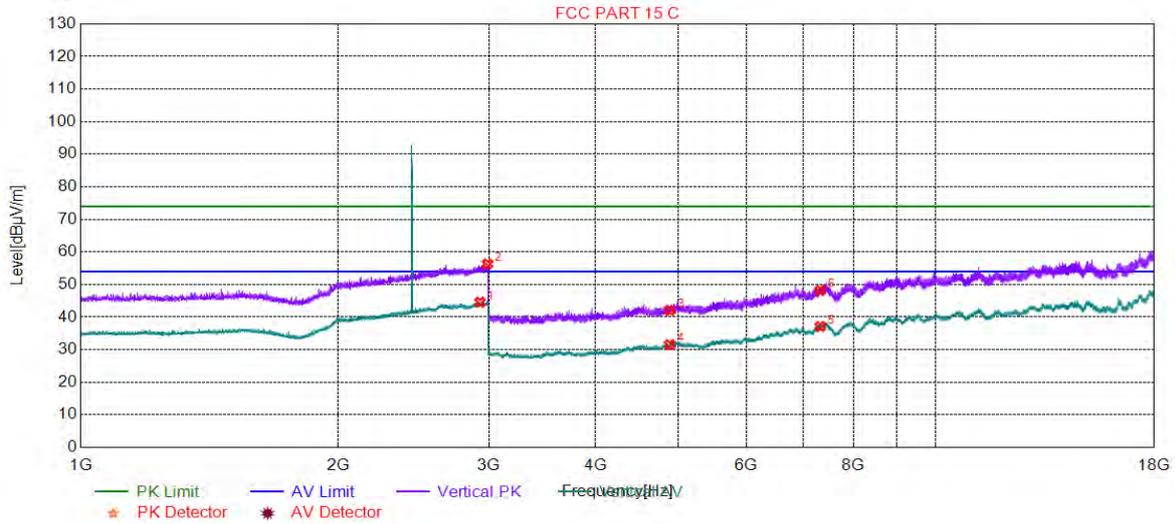
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**4.11.2.4 GFSK\_Channel 39 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2929.482	44.58	54.00	9.42	150	140	Vertical
2	2989.497	56.33	74.00	17.67	150	359	Vertical
3	4882.000	42.04	74.00	31.96	150	186	Vertical
4	4882.000	31.54	54.00	22.46	150	100	Vertical
5	7323.000	37.10	54.00	16.90	150	100	Vertical
6	7323.000	48.16	74.00	25.84	150	31	Vertical

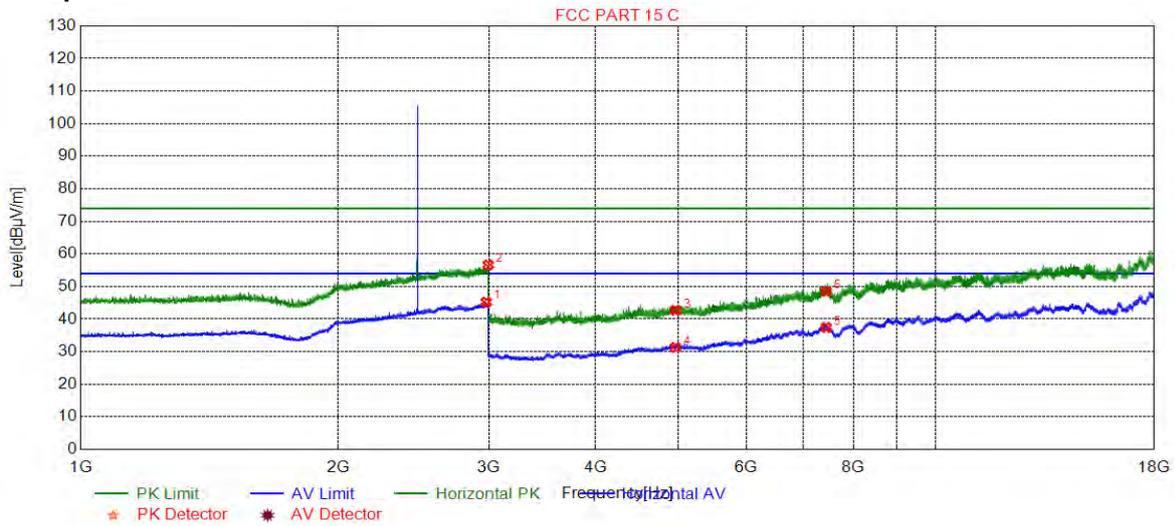
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**4.11.2.5 GFSK\_Channel 78 ANT1**

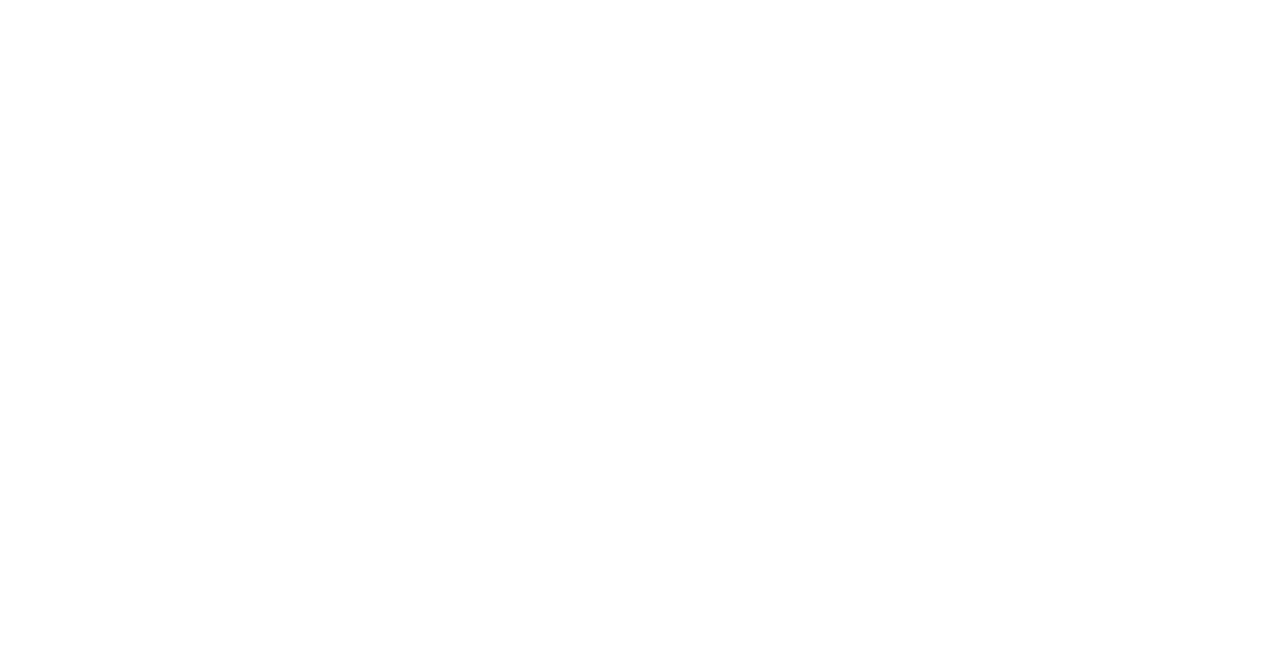
**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2979.995	45.23	54.00	8.77	150	60	Horizontal
2	2995.498	56.65	74.00	17.35	150	8	Horizontal
3	4960.000	42.71	74.00	31.29	150	329	Horizontal
4	4960.000	31.32	54.00	22.68	150	278	Horizontal
5	7440.000	37.43	54.00	16.57	150	329	Horizontal
6	7440.000	48.48	74.00	25.52	150	54	Horizontal

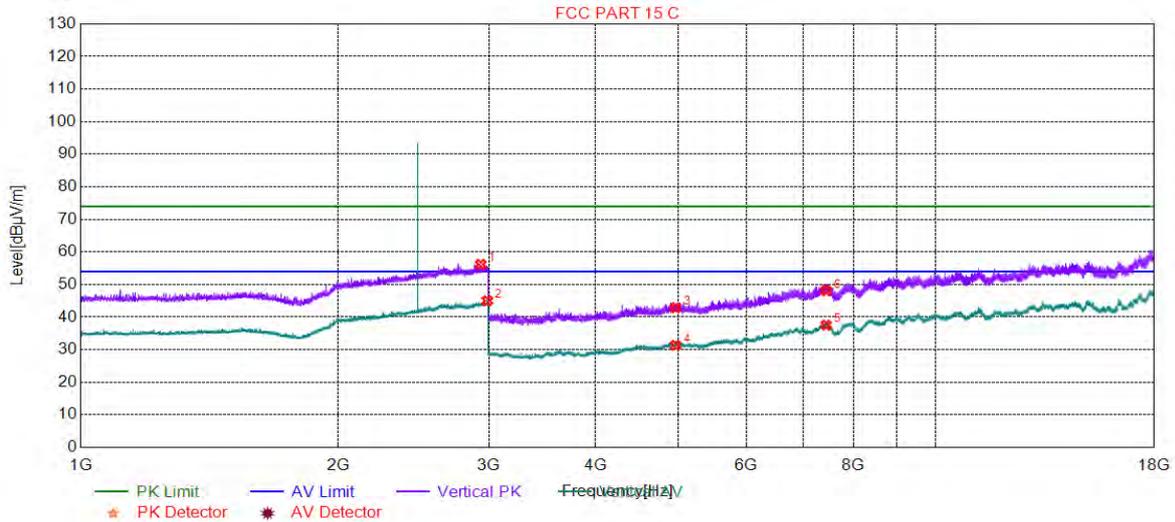
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**4.11.2.6 GFSK\_Channel 78 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2935.483	56.20	74.00	17.80	150	344	Vertical
2	2987.997	45.01	54.00	8.99	150	61	Vertical
3	4960.000	42.89	74.00	31.11	150	307	Vertical
4	4960.000	31.36	54.00	22.64	150	48	Vertical
5	7440.000	37.55	54.00	16.45	150	326	Vertical
6	7440.000	48.14	74.00	25.86	150	185	Vertical

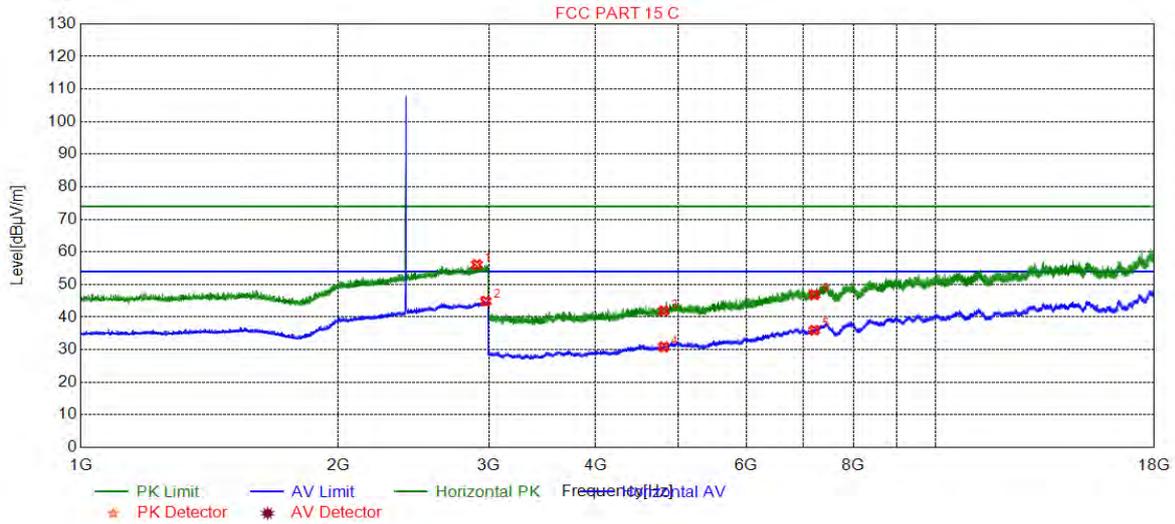
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**4.11.2.7 GFSK\_Channel 0 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2904.976	56.11	74.00	17.89	150	23	Horizontal
2	2975.493	44.91	54.00	9.09	150	23	Horizontal
3	4804.000	41.90	74.00	32.10	150	329	Horizontal
4	4804.000	30.86	54.00	23.14	150	69	Horizontal
5	7206.000	35.98	54.00	18.02	150	243	Horizontal
6	7206.000	46.90	74.00	27.10	150	155	Horizontal

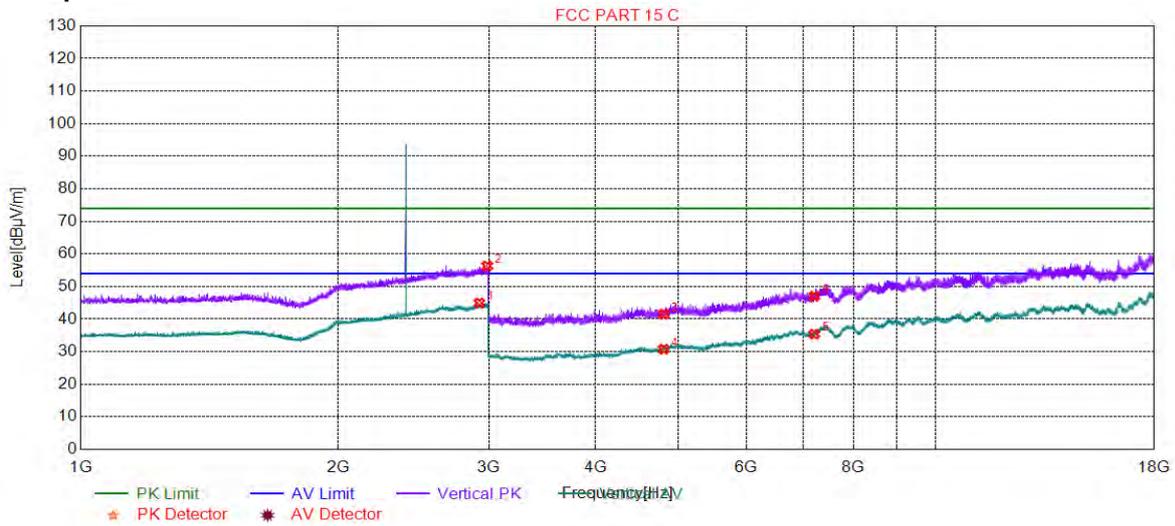
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**4.11.2.8 GFSK\_Channel 0 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2923.981	44.96	54.00	9.04	150	264	Vertical
2	2987.496	56.33	74.00	17.67	150	184	Vertical
3	4804.000	41.51	74.00	32.49	150	186	Vertical
4	4804.000	30.78	54.00	23.22	150	82	Vertical
5	7206.000	35.41	54.00	18.59	150	324	Vertical
6	7206.000	47.03	74.00	26.97	150	151	Vertical

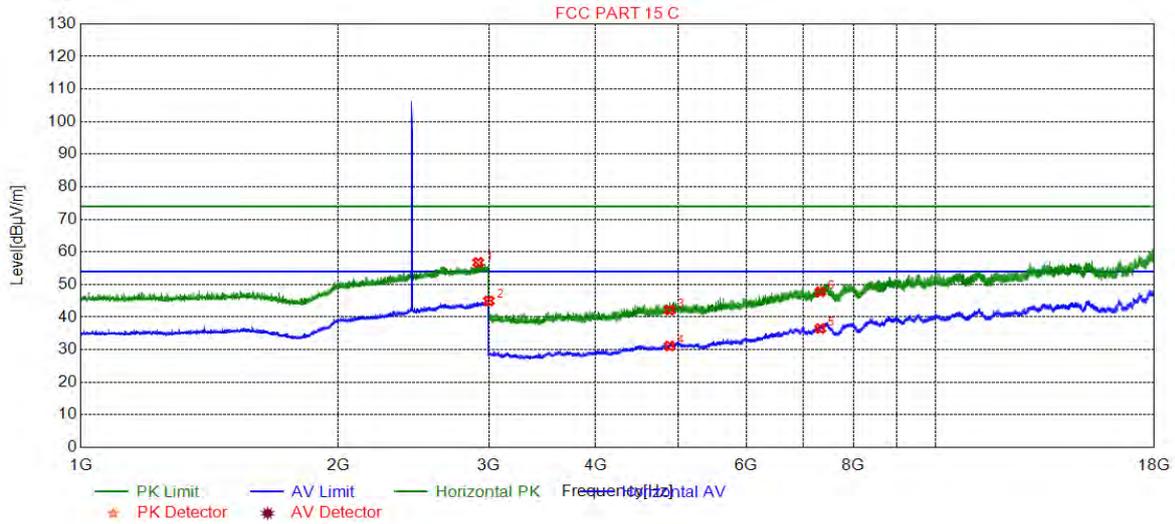
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**4.11.2.9 GFSK\_Channel 39 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2915.478	56.75	74.00	17.25	150	204	Horizontal
2	2999.499	44.97	54.00	9.03	150	129	Horizontal
3	4882.000	42.14	74.00	31.86	150	1	Horizontal
4	4882.000	31.13	54.00	22.87	150	1	Horizontal
5	7323.000	36.50	54.00	17.50	150	33	Horizontal
6	7323.000	47.78	74.00	26.22	150	172	Horizontal

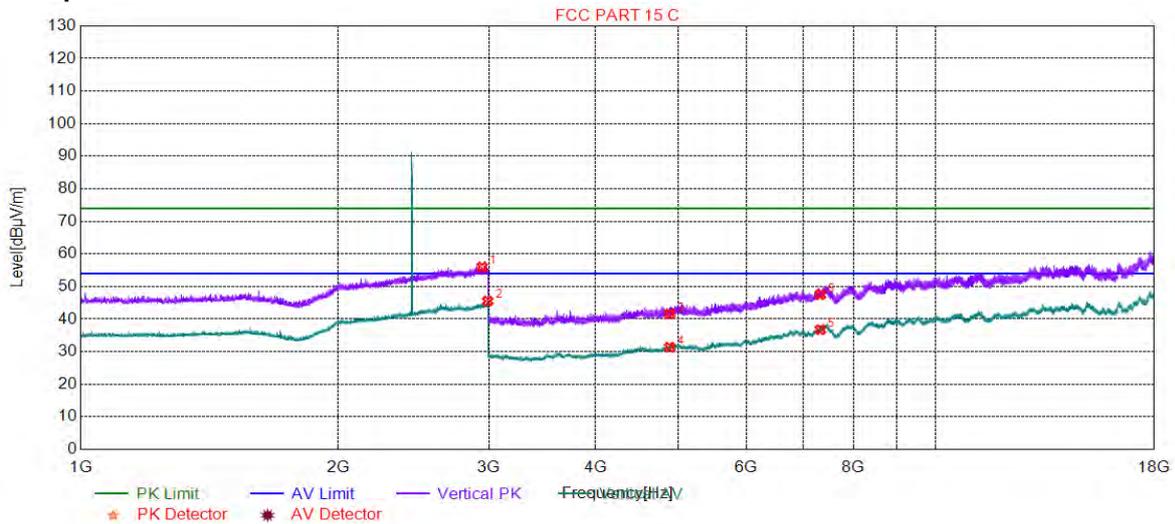
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**4.11.2.10 GFSK\_Channel 39 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2946.486	55.99	74.00	18.01	150	149	Vertical
2	2990.497	45.53	54.00	8.47	150	356	Vertical
3	4882.000	41.61	74.00	32.39	150	325	Vertical
4	4882.000	31.36	54.00	22.64	150	272	Vertical
5	7323.000	36.77	54.00	17.23	150	220	Vertical
6	7323.000	47.54	74.00	26.46	150	168	Vertical

**Final Data List**

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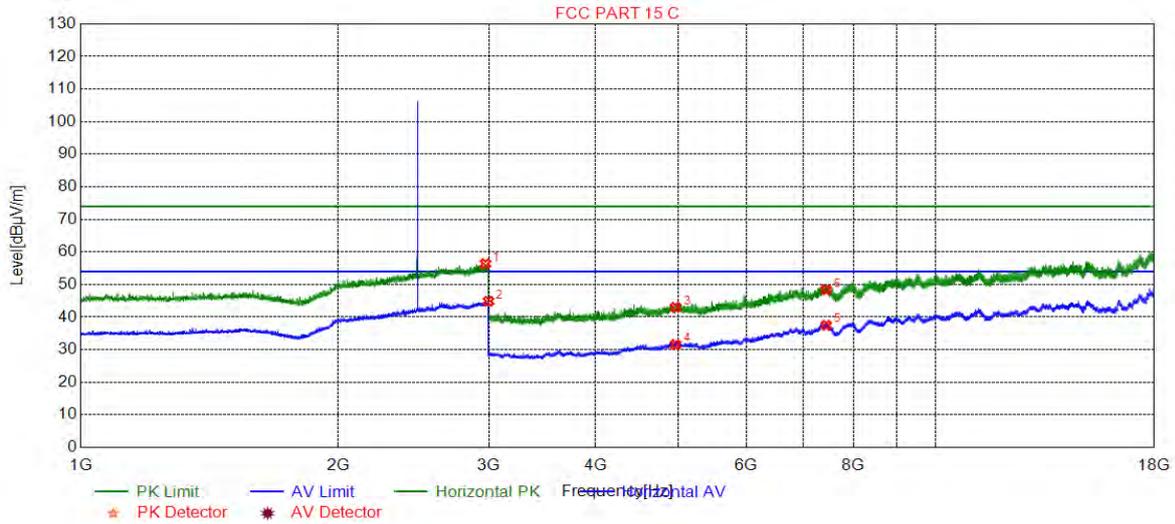


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**4.11.2.11 GFSK\_Channel 78 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.993	56.40	74.00	17.60	150	304	Horizontal
2	2996.999	44.88	54.00	9.12	150	192	Horizontal
3	4960.000	43.02	74.00	30.98	150	51	Horizontal
4	4960.000	31.56	54.00	22.44	150	295	Horizontal
5	7440.000	37.48	54.00	16.52	150	51	Horizontal
6	7440.000	48.38	74.00	25.62	150	88	Horizontal

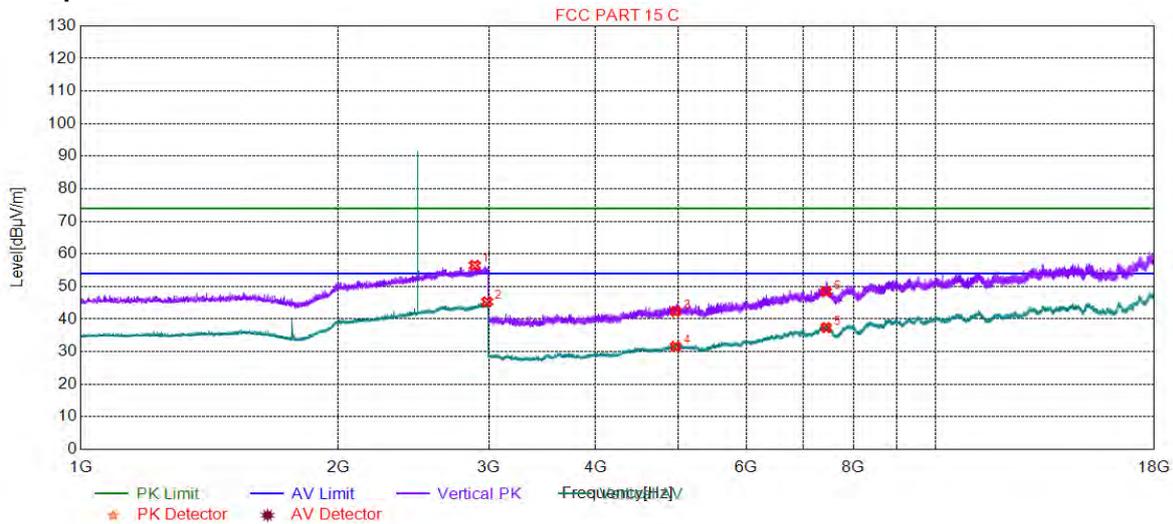
**Final Data List**



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**4.11.2.12 GFSK\_Channel 78 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2888.472	56.52	74.00	17.48	150	114	Vertical
2	2986.496	45.32	54.00	8.68	150	332	Vertical
3	4960.000	42.34	74.00	31.66	150	210	Vertical
4	4960.000	31.61	54.00	22.39	150	353	Vertical
5	7440.000	37.39	54.00	16.61	150	266	Vertical
6	7440.000	48.42	74.00	25.58	150	266	Vertical

**Final Data List**

**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 between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, 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.
- 4) All Modes have been tested, but only the worst case data displayed in this report.



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### 4.12 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013		
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
Above 1GHz		54.0	Average Value
		74.0	Peak Value
Test Setup:			

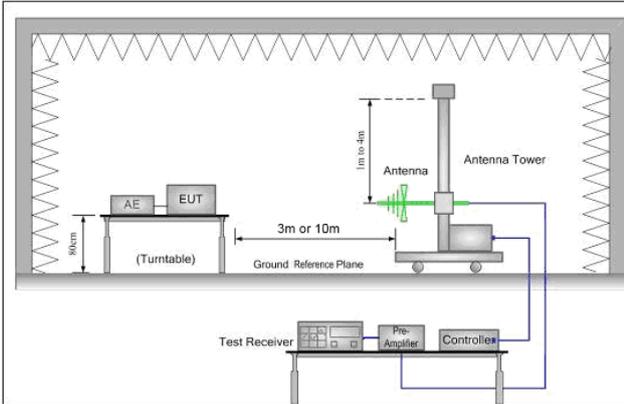


Figure 1. 30MHz to 1GHz

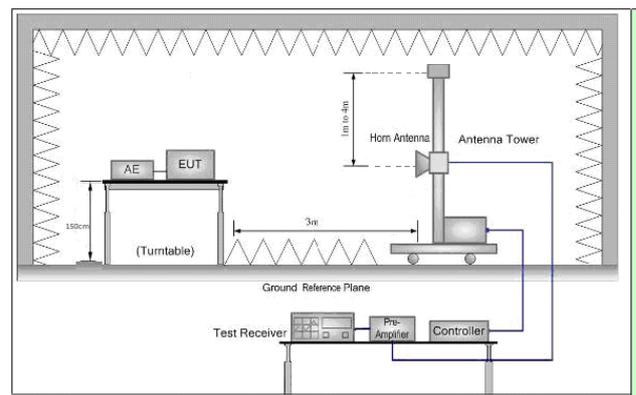


Figure 2. Above 1 GHz



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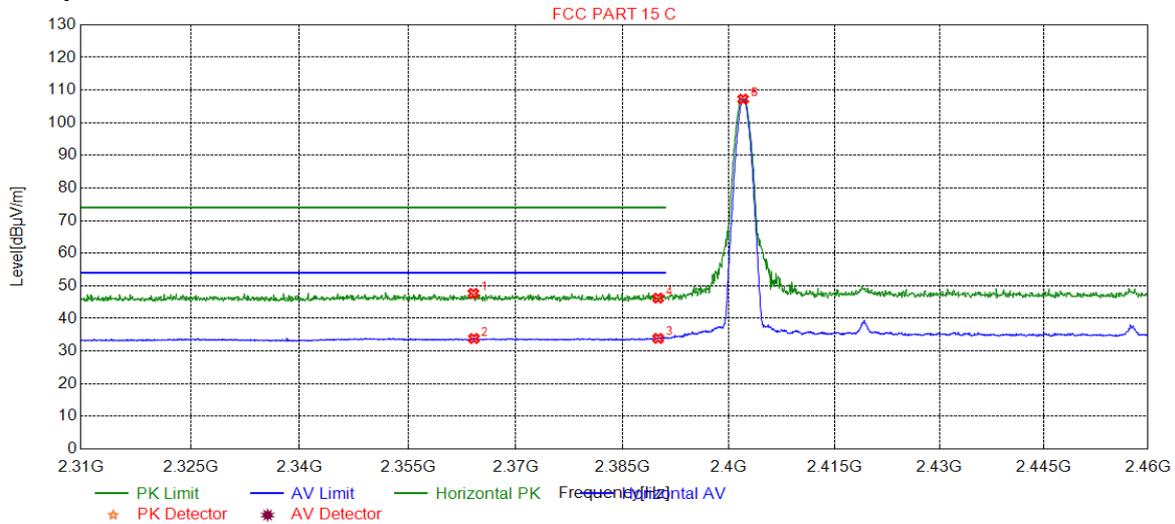
<p>Test Procedure:</p>	<ol style="list-style-type: none"> <li>a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>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.</li> <li>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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>g. 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</li> <li>h. Test the EUT in the lowest channel , the Highest channel</li> <li>i. 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.</li> <li>j. Repeat above procedures until all frequencies measured was complete.</li> </ol>
<p>Exploratory Test Mode:</p>	<p>Non-hopping transmitting mode with all kind of modulation and all kind of data type Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the DH5 of data type and GFSK modulation is the worst case. Pretest the EUT at Charge + Transmitting mode, Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>



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**4.12.1 Test Plots**  
**4.12.1.1 Worst Case Mode (GFSK(DH5))**  
**4.12.1.2 GFSK\_Channel 0 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2364.102	47.68	74.00	26.32	150	58	Horizontal
2	2364.177	33.86	54.00	20.14	150	236	Horizontal
3	2390.000	33.90	54.00	20.10	150	35	Horizontal
4	2390.000	46.26	74.00	27.74	150	74	Horizontal
5	2402.000	107.21	0.00	-107.21	150	58	Horizontal
6	2402.000	107.10	0.00	-107.10	150	58	Horizontal

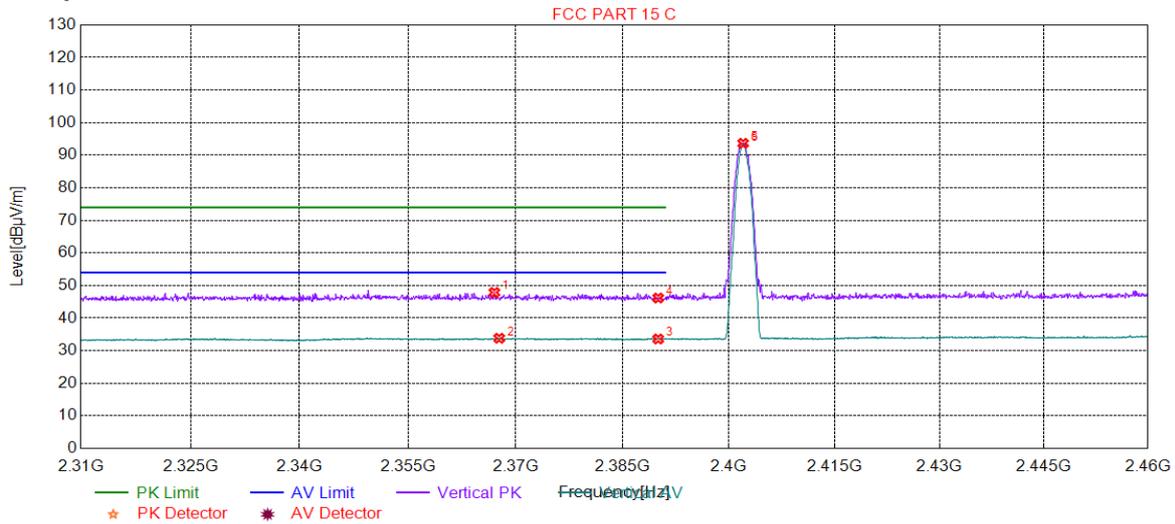
**Final Data List**



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**4.12.1.3 GFSK\_Channel 0 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2367.028	47.88	74.00	26.12	150	119	Vertical
2	2367.703	33.83	54.00	20.17	150	112	Vertical
3	2390.000	33.60	54.00	20.40	150	108	Vertical
4	2390.000	46.19	74.00	27.81	150	199	Vertical
5	2402.000	93.68	0.00	-93.68	150	176	Vertical
6	2402.000	93.44	0.00	-93.44	150	180	Vertical

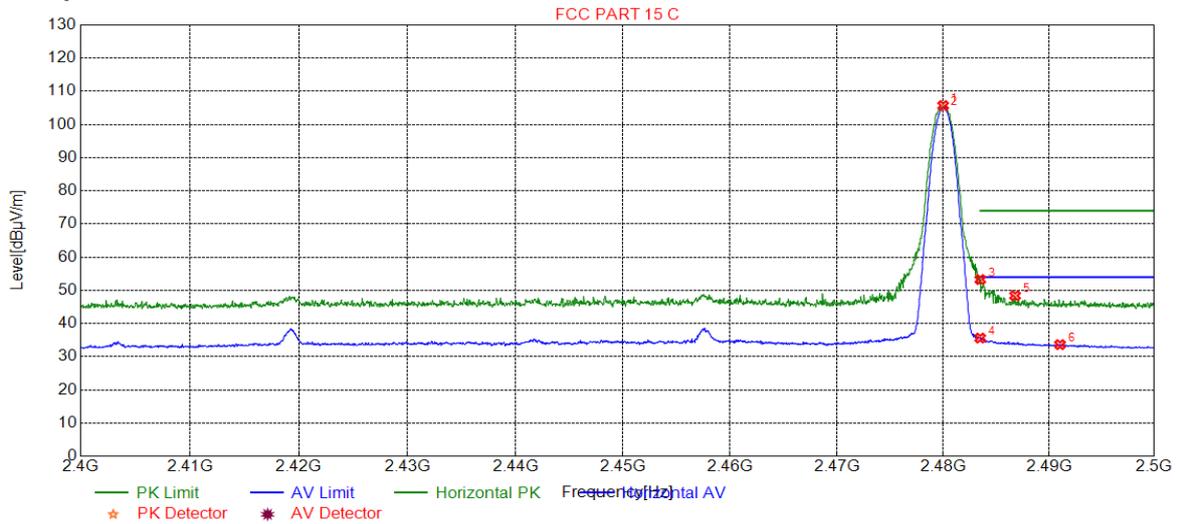
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**4.12.1.4 GFSK\_Channel 78 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.000	105.72	0.00	-105.72	150	66	Horizontal
2	2480.000	104.93	0.00	-104.93	150	59	Horizontal
3	2483.500	53.29	74.00	20.71	150	97	Horizontal
4	2483.500	35.65	54.00	18.35	150	70	Horizontal
5	2486.793	48.40	74.00	25.60	150	70	Horizontal
6	2491.045	33.67	54.00	20.33	150	62	Horizontal

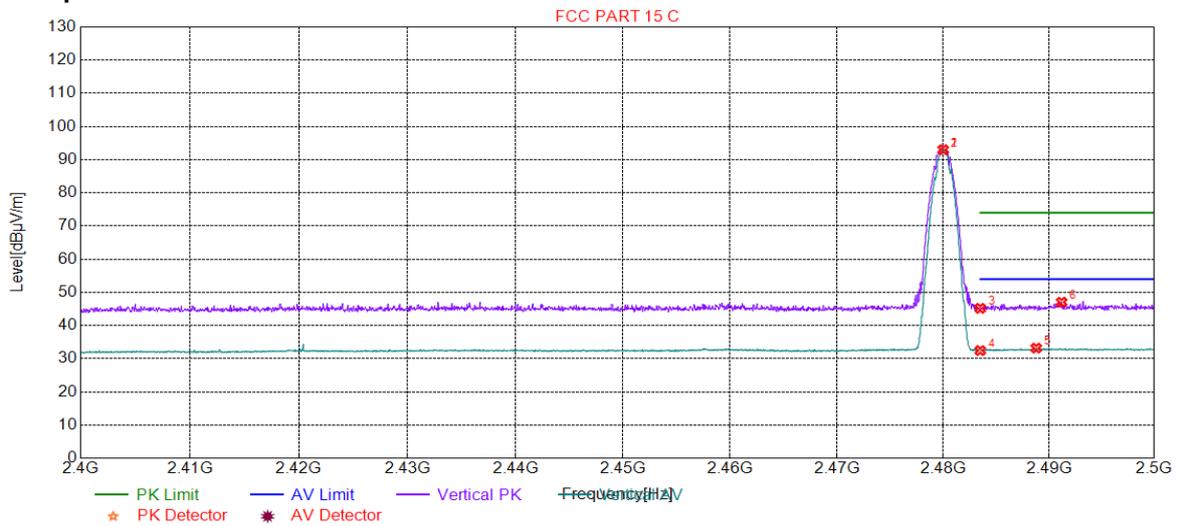
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**4.12.1.5 GFSK\_Channel 78 ANT1**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.000	93.02	0.00	-93.02	150	353	Vertical
2	2480.000	92.93	0.00	-92.93	150	353	Vertical
3	2483.500	45.21	74.00	28.79	150	114	Vertical
4	2483.500	32.48	54.00	21.52	150	319	Vertical
5	2488.794	33.22	54.00	20.78	150	359	Vertical
6	2491.195	47.06	74.00	26.94	150	87	Vertical

**Final Data List**



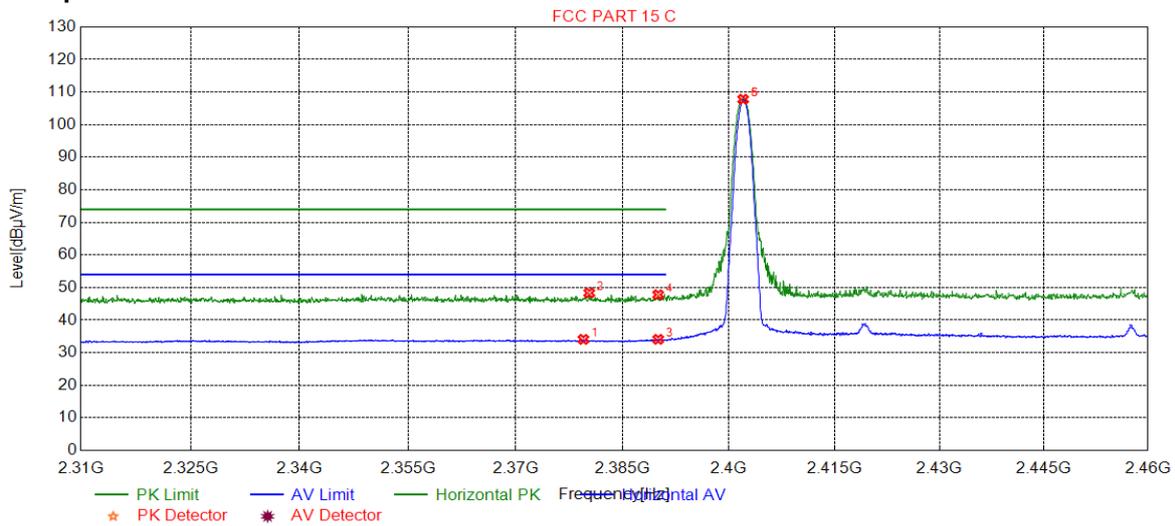
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**4.12.1.6 GFSK\_Channel 0 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2379.484	34.10	54.00	19.90	150	87	Horizontal
2	2380.310	48.34	74.00	25.66	150	21	Horizontal
3	2390.000	34.11	54.00	19.89	150	52	Horizontal
4	2390.000	47.80	74.00	26.20	150	118	Horizontal
5	2402.000	107.81	0.00	-107.81	150	56	Horizontal
6	2402.000	107.67	0.00	-107.67	150	60	Horizontal

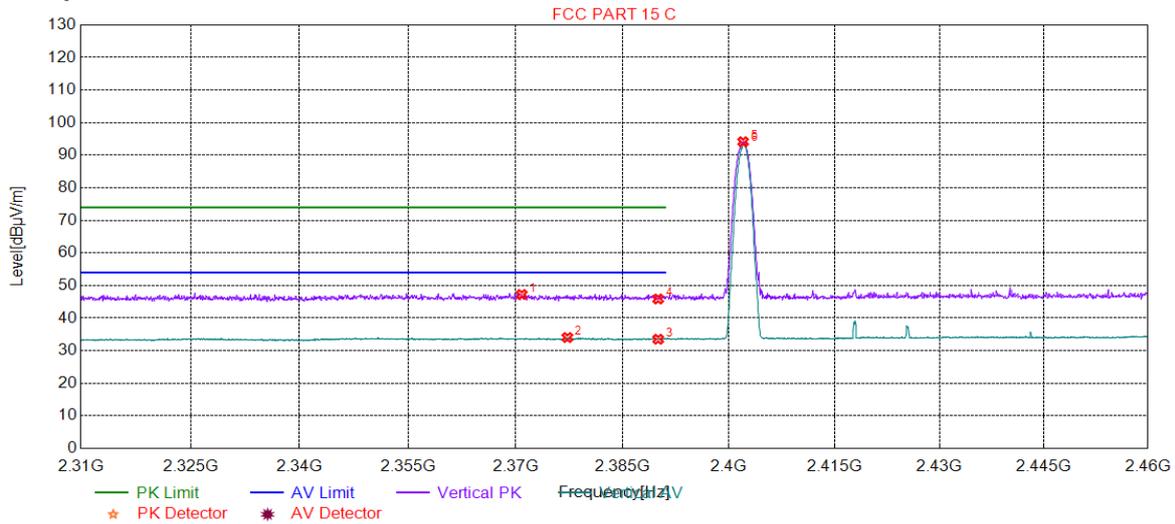
**Final Data List**



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**4.12.1.7 GFSK\_Channel 0 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2370.855	47.26	74.00	26.74	150	184	Vertical
2	2377.233	34.05	54.00	19.95	150	86	Vertical
3	2390.000	33.53	54.00	20.47	150	117	Vertical
4	2390.000	45.89	74.00	28.11	150	270	Vertical
5	2402.000	94.16	0.00	-94.16	150	168	Vertical
6	2402.000	93.53	0.00	-93.53	150	164	Vertical

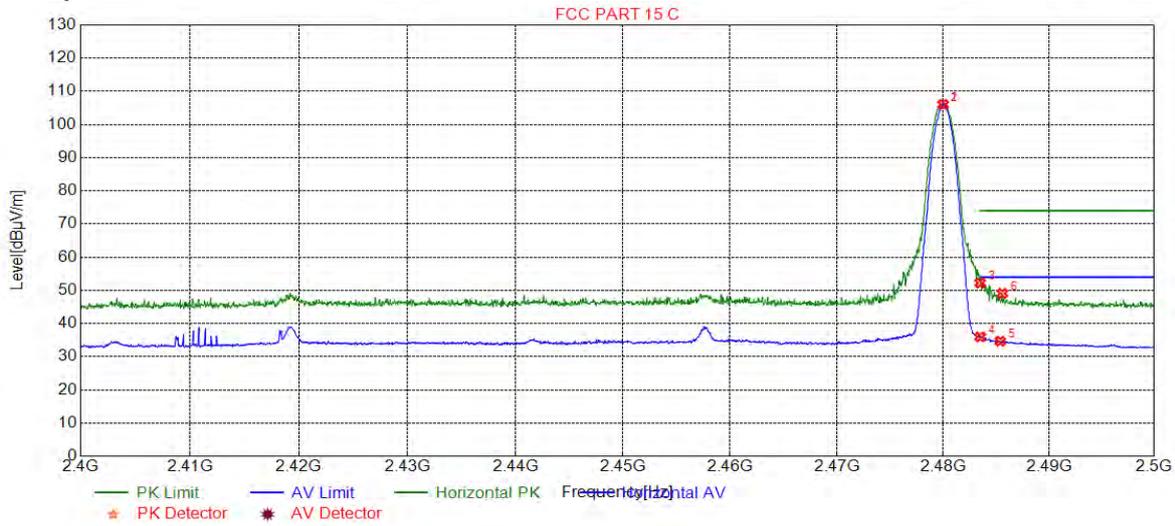
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**4.12.1.8 GFSK\_Channel 78 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.000	106.06	0.00	-106.06	150	61	Horizontal
2	2480.000	105.95	0.00	-105.95	150	61	Horizontal
3	2483.500	52.22	74.00	21.78	150	46	Horizontal
4	2483.500	36.00	54.00	18.00	150	206	Horizontal
5	2485.392	34.71	54.00	19.29	150	61	Horizontal
6	2485.592	49.10	74.00	24.90	150	202	Horizontal

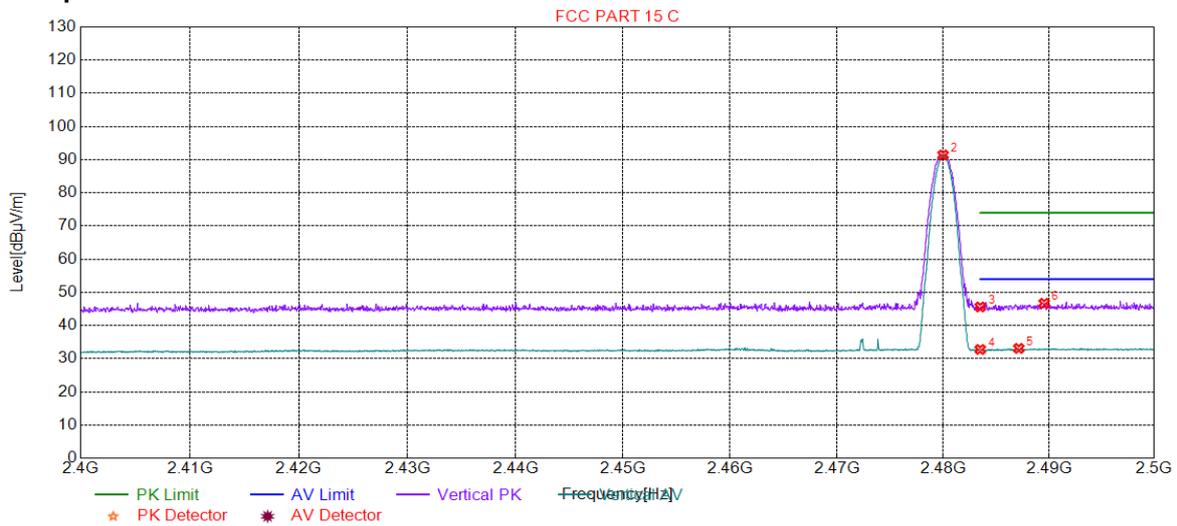
**Final Data List**



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**4.12.1.9 GFSK\_Channel 78 ANT2**

**Test Graph**



**Suspected List**

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	248.0000	31.90	0.00	-31.90	150	358	Vertical
2	2480.000	91.43	0.00	-91.43	150	170	Vertical
3	2483.500	45.63	74.00	28.37	150	78	Vertical
4	2483.500	32.81	54.00	21.19	150	143	Vertical
5	2487.143	33.14	54.00	20.86	150	78	Vertical
6	2489.544	46.72	74.00	27.28	150	128	Vertical

**Final Data List**

**Remark:**

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

All Modes have been tested, but only the worst case data displayed in this report.



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## 5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Radiated Spurious emission test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-25GHz)
5	Conduct emission test	±3.12 dB(9KHz- 30MHz)
6	Temperature test	±1°C
7	Humidity test	±3%
8	DC and low frequency voltages	±0.5%



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## 6 Equipment List

Conducted Emission					
Test Equipment	Manufacturer	Model No.	Inventory No	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2020/5/10	2023/5/9
LISN	Rohde & Schwarz	ENV216	SEM007-01	2020/7/14	2021/7/14
LISN	ETS-LINDGREN	Feb-16	SEM007-02	2020/4/1	2021/3/31
Measurement Software	AUDIX	e3 V5.4.1221c	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2020/6/12	2021/6/11
2 Line ISN	Fischer Custom Communications Inc	FCC-TLISN-T202	EMC0122	2020/2/11	2021/2/10
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020/3/2	2021/3/1

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologie Inc	66311B	W009-09	2020/7/15	2021/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2021/1/3	2022/1/2
Coaxial Cable	SGS	N/A	SEM031-01	2020/6/12	2021/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020/7/14	2021/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CPAR	W027-03	2020/10/27	2021/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2020/7/14	2021/7/14



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RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Measurement Software	AUDIX	e3V8.2014-6-2	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020/6/12	2021/6/11
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologie Inc	N9010A	SEM004-09	2020/3/12	2021/3/11
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2020/6/27	2023/6/26
Horn Antenna (0.8-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Pre-amplifier(0.1-1.3GHz)	HP	8447D	SEM005-02	2020/7/14	2021/7/14
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2020/9/3	2021/9/2
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2020/10/17	2023/10/16
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2020/3/2	2021/3/1
Band filter	N/A	N/A	SEM023-01	N/A	N/A
RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020/8/5	2023/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2020/6/12	2021/6/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologie	N9038A	SEM004-05	2020/7/14	2021/7/14
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2020/6/27	2023/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologie	8447D	SEM005-01	2020/3/2	2021/3/1



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RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No	Cal. Date (yyyy mm-dd)	Cal. Due date (yyyy-mm-dd)
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018/3/31	2021/3/30
EMI Test Receiver (9k-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2020/3/2	2021/3/1
Trilog-Broadband Antenna(25M-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2020/3/15	2022/3/14
Pre-amplifier (9k-1GHz)	Sonoma	310N	SEM005-03	2020/3/12	2021/3/11
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2020/8/22	2023/8/21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020/6/12	2021/6/11



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## 7 Photographs - EUT Constructional Details

Refer to Appendix A PCE Setup Photos.

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The End



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