FCC TEST REPORT

Application No.:	ZR/2021/40016
Applicant:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Applicant	NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China
Manufacturer:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Manufacturer	NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China
EUT Description:	Mobile Phone
Model No.:	CPH2251
Trade Mark:	OPPO
FCC ID:	R9C-CPH2251
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Date of Receipt:	2021/4/21
Date of Test:	2021/4/21 to 2021/6/4
Date of Issue:	2021/6/10
Test Result :	**PASS ***

* 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		2021-06-10		Original

Authorized for issue by:		
Prepared By		Dee.Zheng **(Dee Zheng) / Engineer**
Checked By		**(Jim Huang) / Reviewer**

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2 Test Summary

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

Remark：All test were performed by Lab A and B.
Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Lab B SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.

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3 General Information

3.1 Details of Client

Applicant:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Applicant	NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China
Manufacturer:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Manufacturer	NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China

3.2 Test Location

Lab A:

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
Test engineer:	Dee Zheng,Swing Hu,Habit Zeng

Lab B:

Company:	SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.
Address:	1/F, Unit D, Building 1, Kanghong Orange Technology Park, No.137, Keyuan 3rd Road, Fengdong New City, Xi'an, Shaanxi China
Post code:	710086
Test engineer:	Leah Chen,Ken Liu,Andy Yao

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3.3 Test Facility

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

Lab A:

• 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.

Lab B:

A2LA (Certificate No. 4854.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4854.01.

FCC-Designation Number: CN1271.

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3.4 General Description of EUT

EUT Description:	Mobile Phone
Model No.:	CPH2251
Trade Mark:	OPPO
Hardware Version:	11
Software Version:	ColorOS V11.3
Operation Frequency:	2400MHz~2483.5MHz fc = 2402 MHz + N * 2 MHz, where: -fc = “Operating Frequency” in MHz, -N = “Channel Number” with the range from 0 to 39.
Bluetooth version:	Bluetooth V5.2
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	☒ Portable Device, ☐Module
Antenna Type:	☐ External, ☒ Integrated
Antenna Gain:	-3.5dBi

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

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -3.5dBi.	

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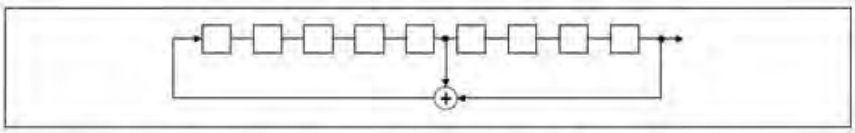
4.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

4.2.1 Test Requirement:

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

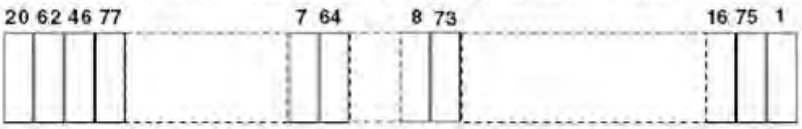
4.2.2 Conclusion

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: 29 -1 = 511 bits
> Longest sequence of zeros: 8 (non-inverted signal)
Linear Feedback Shift Register for Generation of the PRBS sequence
An example of Pseudorandom Frequency Hopping Sequence as follow:



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



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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:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane. 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.		

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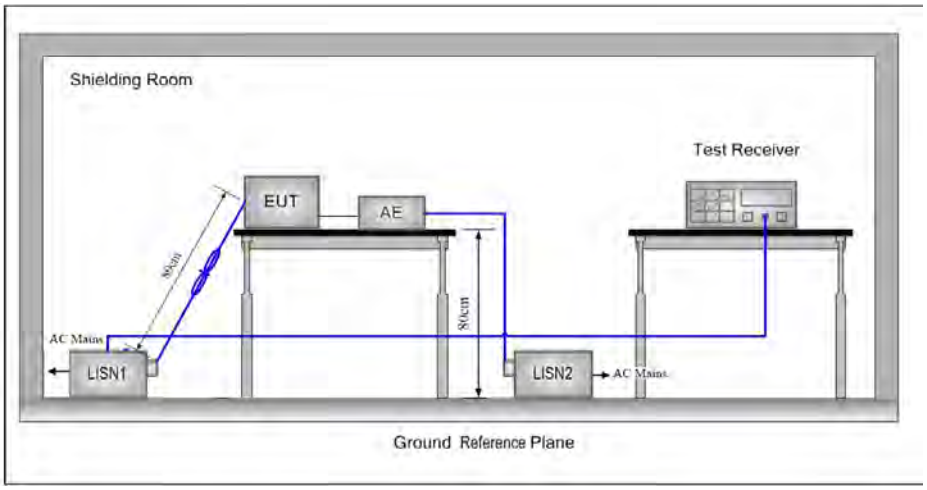
Test Setup:	
Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the DH5 of data type and GFSK modulation at the lowest channel is the worst case. Charge + Transmitting mode Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass

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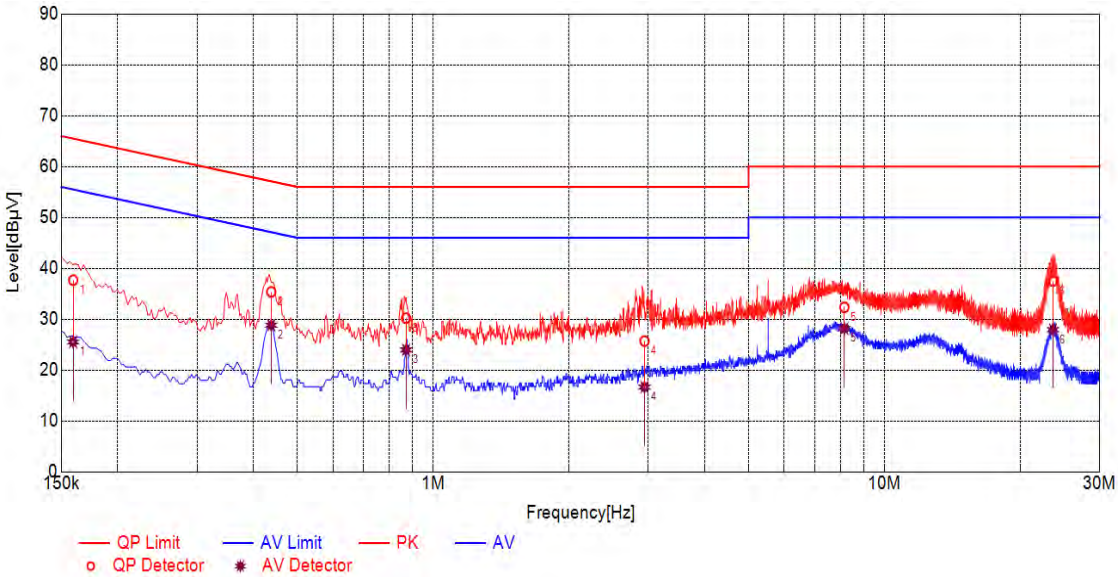
Measurement Data

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	0.1594	10.10	37.67	65.49	27.82	25.52	55.49	29.97
2	0.4379	10.10	35.37	57.10	21.73	28.83	47.10	18.27
3	0.8712	10.10	30.21	56.00	25.79	23.96	46.00	22.04
4	2.9410	10.10	25.71	56.00	30.29	16.65	46.00	29.35
5	8.1530	10.10	32.34	60.00	27.66	28.15	50.00	21.85
6	23.6440	10.11	37.50	60.00	22.50	27.95	50.00	22.05

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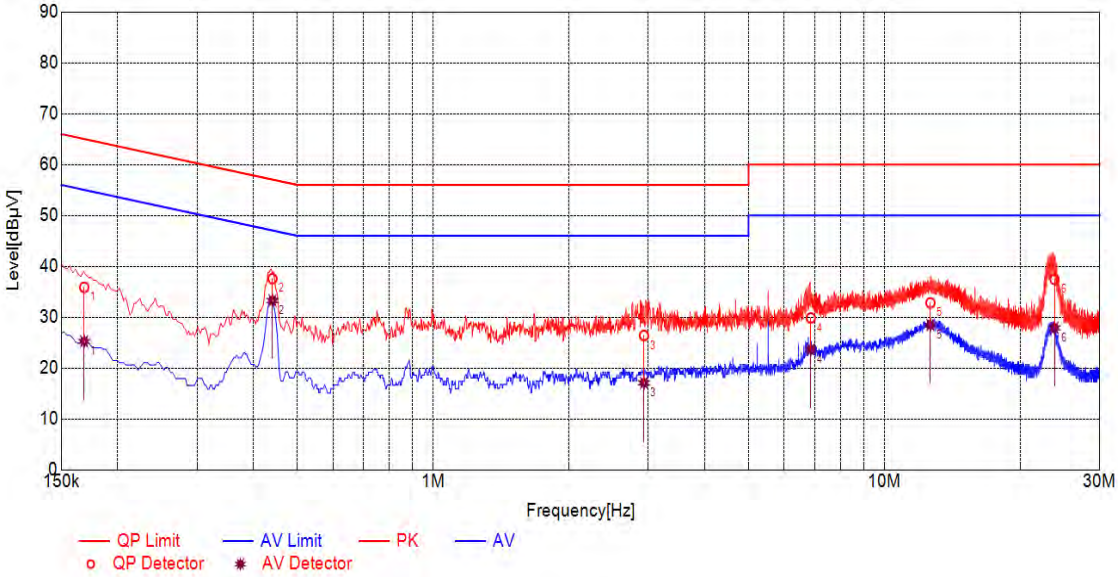
Neutral Line:



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	0.1686	10.10	35.88	65.03	29.15	25.24	55.03	29.79
2	0.4407	10.10	37.57	57.05	19.48	33.29	47.05	13.76
3	2.9333	10.10	26.41	56.00	29.59	17.09	46.00	28.91
4	6.8707	10.10	29.84	60.00	30.16	23.66	50.00	26.34
5	12.6504	10.11	32.81	60.00	27.19	28.47	50.00	21.53
6	23.8332	10.11	37.43	60.00	22.57	27.90	50.00	22.10

Remark:

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

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

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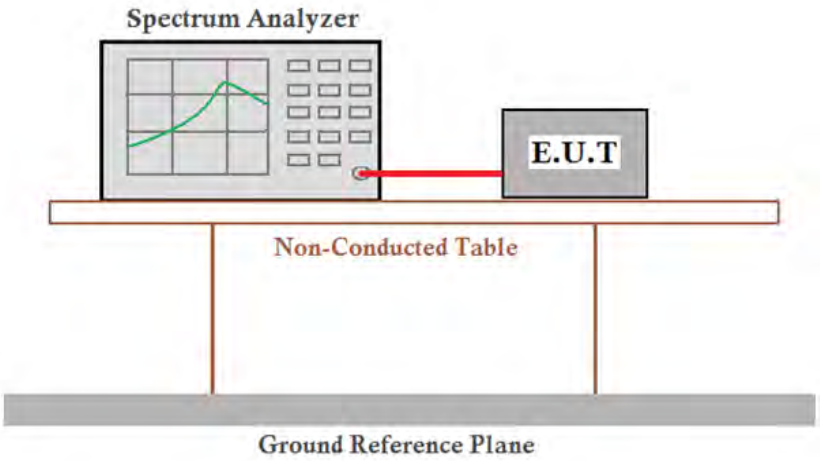
4.4 Conducted Output Power

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 6 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 π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	(20.97dBm) 125mW
Test Results:	Pass

The detailed test data see: **Appendix**

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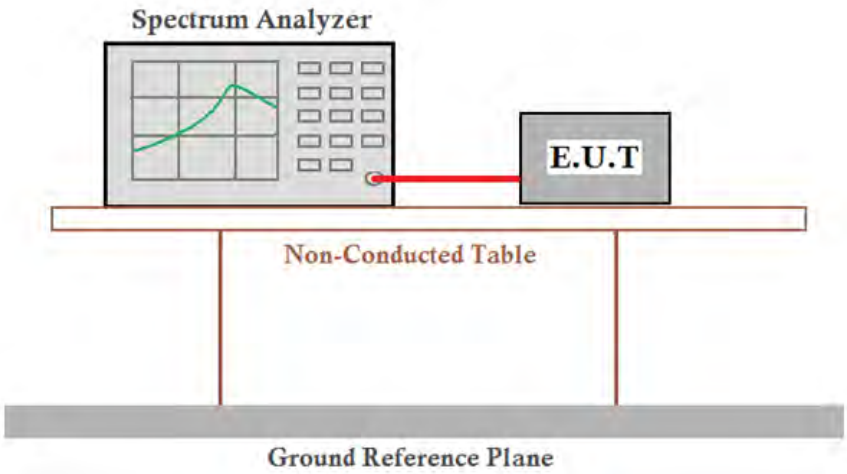
4.5 20dB Emission Bandwidth

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 6 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 π/4DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.
Limit:	NA
Test Results:	Pass

The detailed test data see: **Appendix**

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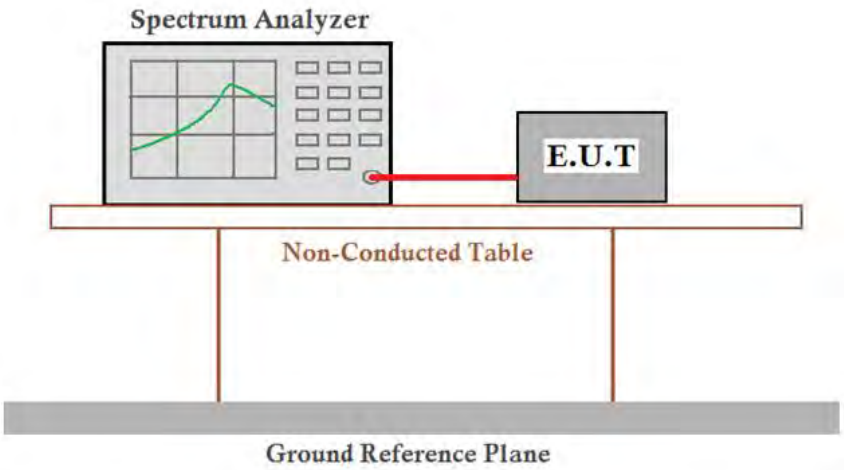
4.6 Carrier Frequencies Separationy

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 6 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 π/4DQPSK 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

The detailed test data see: **Appendix**

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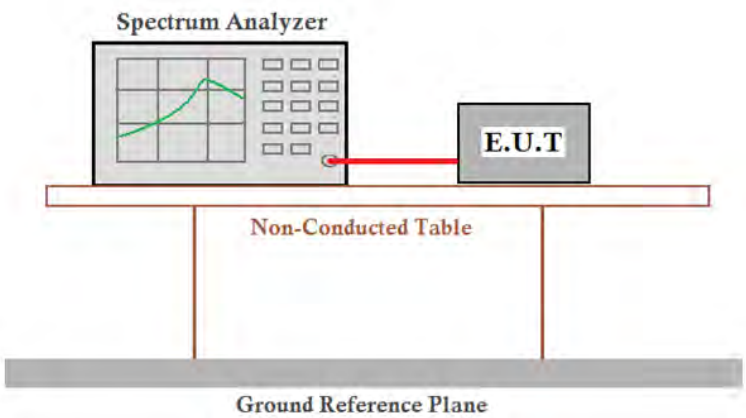
4.7 Hopping Channel Number

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 6 for details
Test Mode:	Hopping transmitting with all kind of modulation
Limit:	At least 15 channels
Test Results:	Pass

The detailed test data see: **Appendix**

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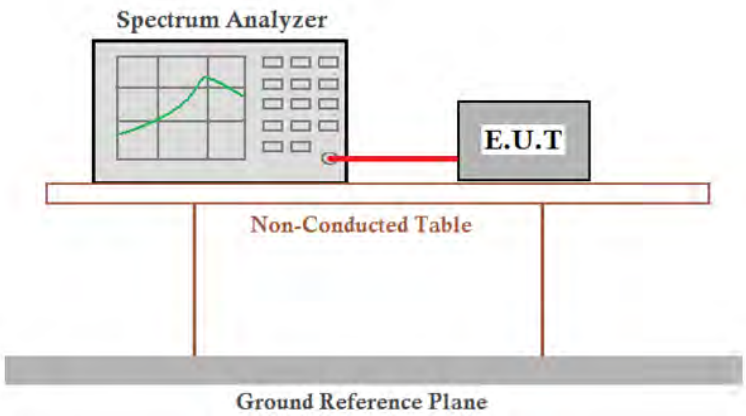
4.8 Dwell Time

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 6 for details
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Limit:	0.4 Second
Test Results:	Pass

The detailed test data see: **Appendix**

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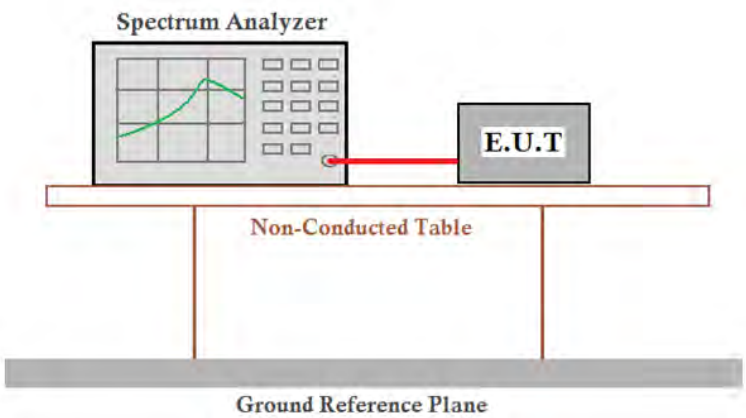
4.9 Band-edge for RF Conducted Emissions

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 6 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 π/4DQPSK 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

The detailed test data see: **Appendix**

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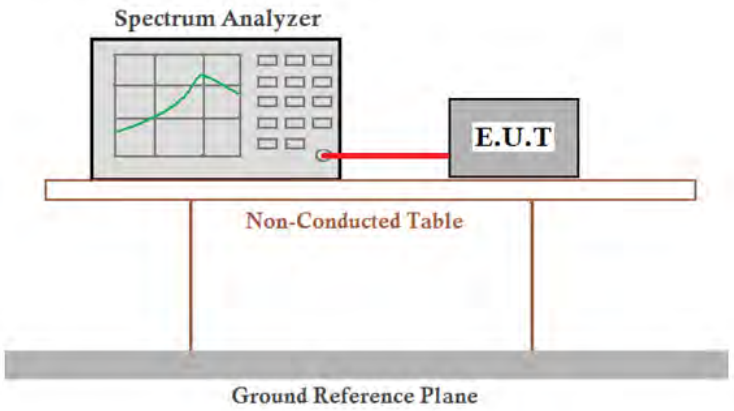
4.10 Spurious RF Conducted Emissions

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 6 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 π/4DQPSK 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

The detailed test data see: **Appendix**

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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	120kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	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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Test Setup:

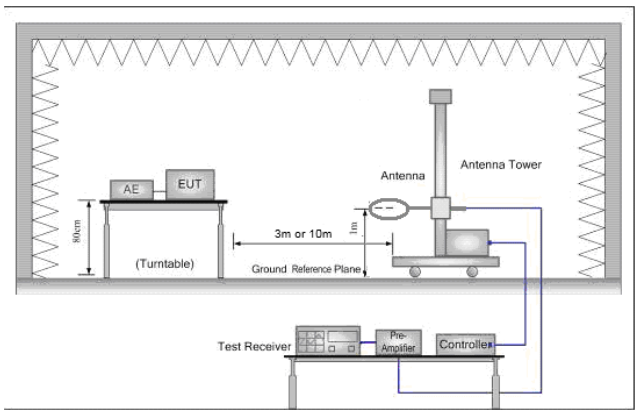

Figure 1. Below 30MHz

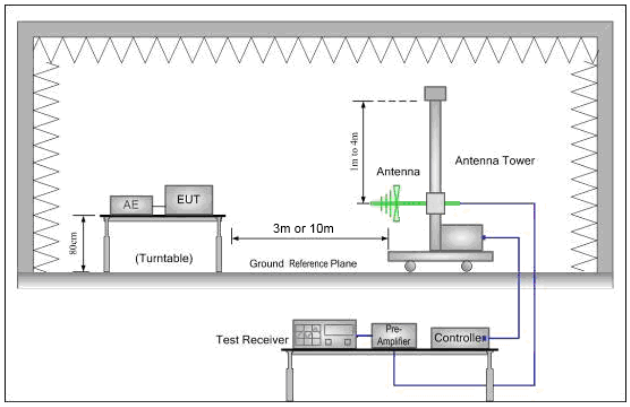

Figure 2. 30MHz to 1GHz

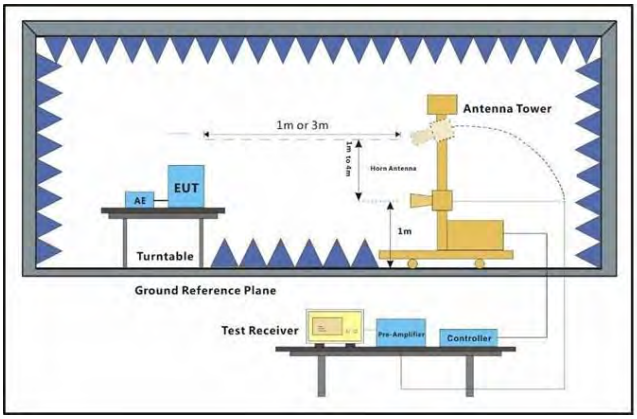

Figure 3. Above 1 GHz

Test Procedure:

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 camber. The table was rotated 360 degrees to determine the position of the highest radiation.

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 camber. The table was rotated 360 degrees to determine the position of the highest radiation

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.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. Use the following spectrum analyzer settings:

(1) Span shall wide enough to fully capture the emission being measured;

(2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto;

Detector function = peak; Trace = max hold for peak

(3) For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds

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	On time = N 1 *L 1 +N 2 *L 2 +...+N n-1 *LN n-1 +N n *L n Where N 1 is number of type 1 pulses, L 1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle) 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. g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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. i. Test the EUT in the lowest channel, the middle channel ,the Highest channel. 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. k. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type Charge + Transmitting mode.
Final Test Mode:	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.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass

The detailed test data see: **Appendix**

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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:			

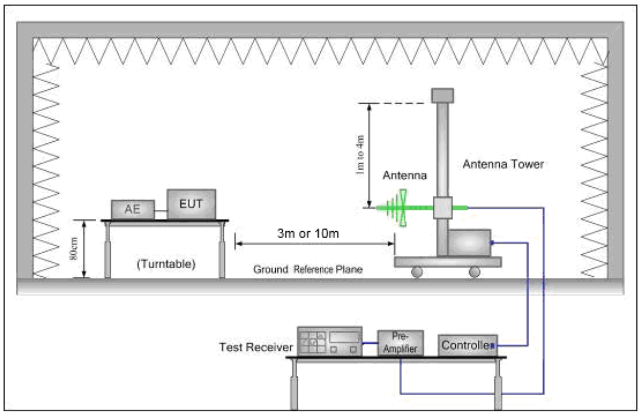

Figure 1. 30MHz to 1GHz

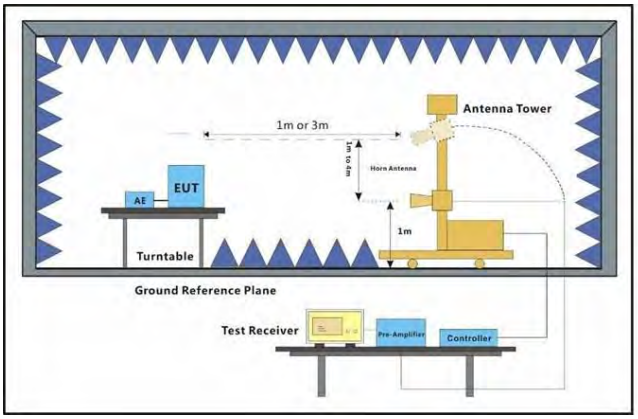

Figure 2. Above 1 GHz

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Test Procedure:	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 camber. The table was rotated 360 degrees to determine the position of the highest radiation. 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 camber. The table was rotated 360 degrees to determine the position of the highest radiation. 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. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. 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 h. Test the EUT in the lowest channel , the Highest channel 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. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type Charge + Transmitting mode.
Final Test Mode:	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.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass

The detailed test data see: **Appendix**

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

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.41dB
2	RF power density, conducted	±1.96dB
3	Spurious emissions, conducted	±0.41dB
4	Radio Frequency	$\pm 7.10 \times 10^{-8}$
5	Duty Cycle	±0.49%
6	Occupied Bandwidth	±0.2%

Lab B:

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8dB (Below 1GHz)
		± 4.8dB (1GHz to 6GHz)
		± 4.5dB (6GHz to 18GHz)
		± 5.02dB (Above 18GHz)

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6 Equipment List

RF conducted					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date (yyyy-mm-dd)**	**Cal. Due date (yyyy-mm-dd)**
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2021/4/14	2022/4/13
DC Power Supply	Rohde & Schwarz	HMP2020	W009-08	2020/7/15	2021/7/15
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2020/7/14	2021/7/13
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	HTC-1	W006-17	2021/4/14	2022/4/13

CE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2020-09-11	2021-09-10
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2020-08-04	2021-08-03
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2020-11-06	2021-11-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR

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RSE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2021-04-01	2022-03-31
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2020-09-11	2021-09-10
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2020-10-26	2021-10-25
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2020-10-26	2021-10-25
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2020-10-27	2021-10-26
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2020-10-26	2021-10-25
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2020-11-06	2021-11-05
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

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7 Photographs - EUT Constructional Details

Refer to Appendix A Setup Photos.

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Appendix A

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20dB Emission Bandwidth

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.870	2401.550	2402.420	---	PASS
		2441	0.870	2440.547	2441.417	---	PASS
		2480	0.867	2479.550	2480.417	---	PASS
2DH5	Ant1	2402	1.320	2401.343	2402.663	---	PASS
		2441	1.317	2440.343	2441.660	---	PASS
		2480	1.323	2479.340	2480.663	---	PASS
3DH5	Ant1	2402	1.311	2401.352	2402.663	---	PASS
		2441	1.311	2440.352	2441.663	---	PASS
		2480	1.308	2479.349	2480.657	---	PASS

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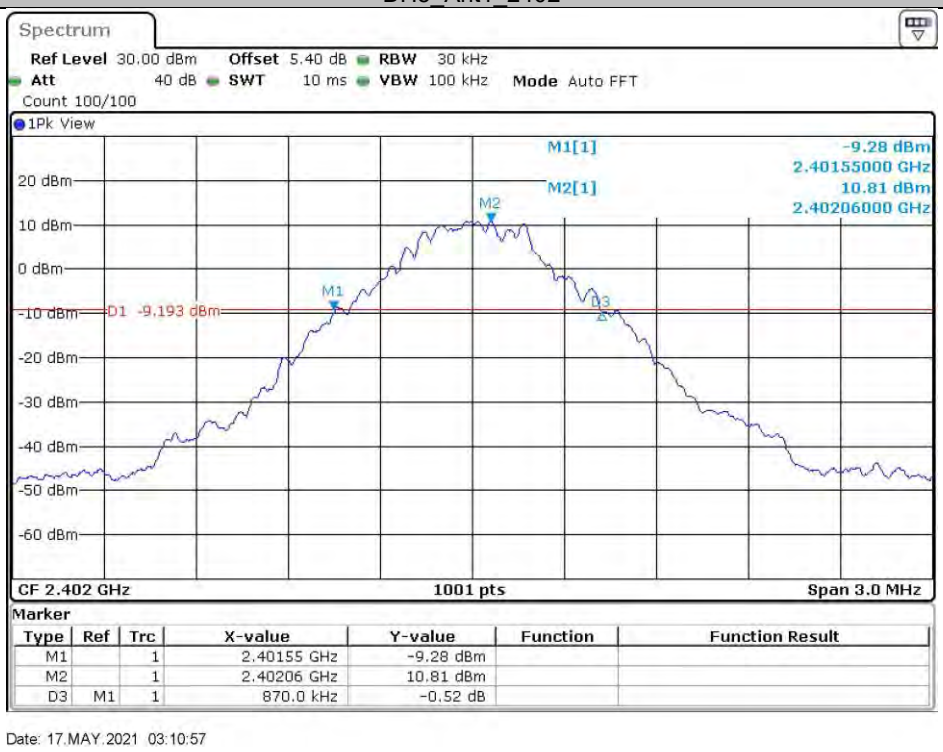
Test Graphs

DH5_Ant1_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40155 GHz	-9.28 dBm		
M2		1	2.40206 GHz	10.81 dBm		
D3	M1	1	870.0 kHz	-0.52 dB		

Date: 17.MAY.2021 03:10:57

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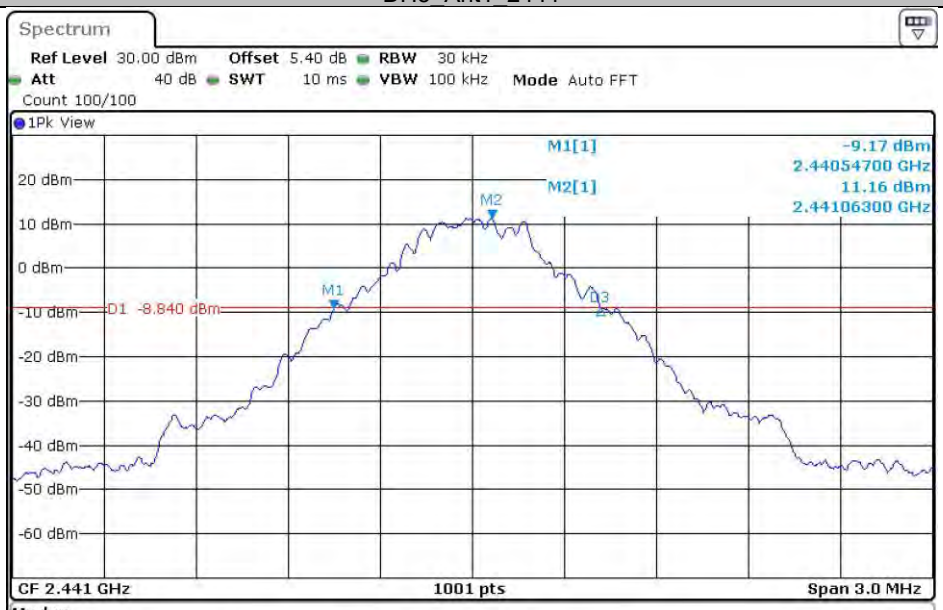
DH5_Ant1_2441

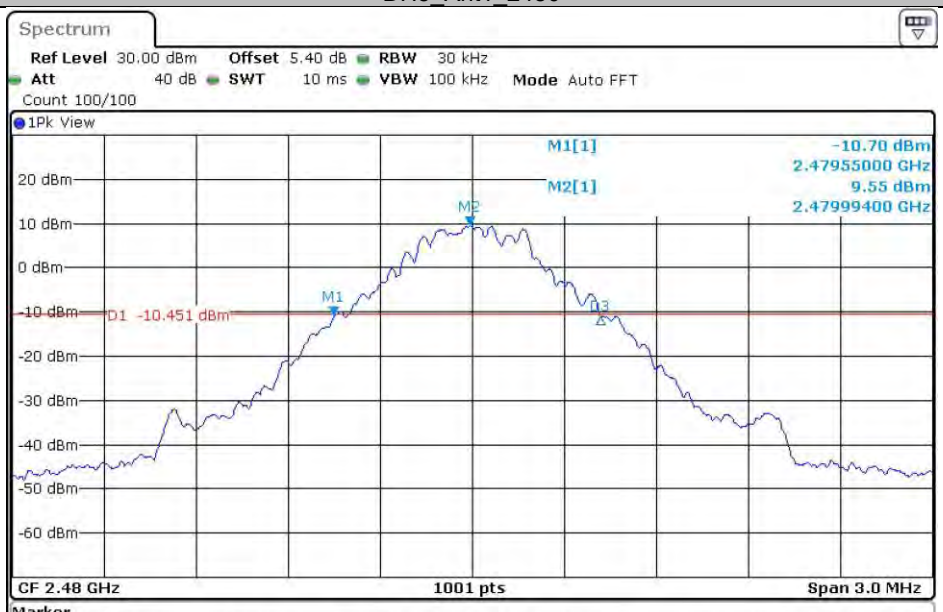


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440547 GHz	-9.17 dBm		
M2		1	2.441063 GHz	11.16 dBm		
D3	M1	1	870.0 kHz	0.33 dB		

Date: 17.MAY.2021 03:12:56

DH5_Ant1_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47955 GHz	-10.70 dBm		
M2		1	2.479994 GHz	9.55 dBm		
D3	M1	1	867.0 kHz	-0.30 dB		

Date: 17.MAY.2021 03:15:04

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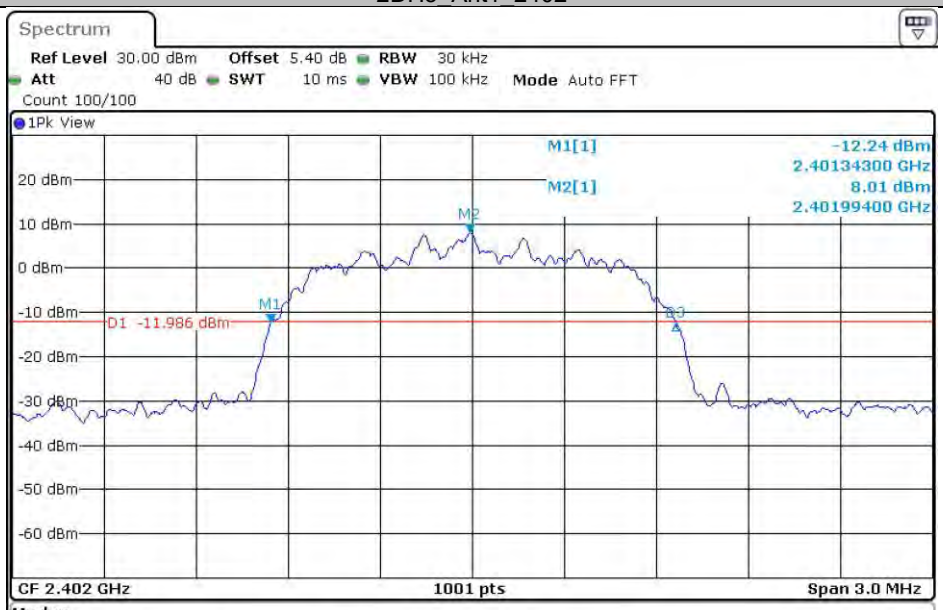
2DH5_Ant1_2402

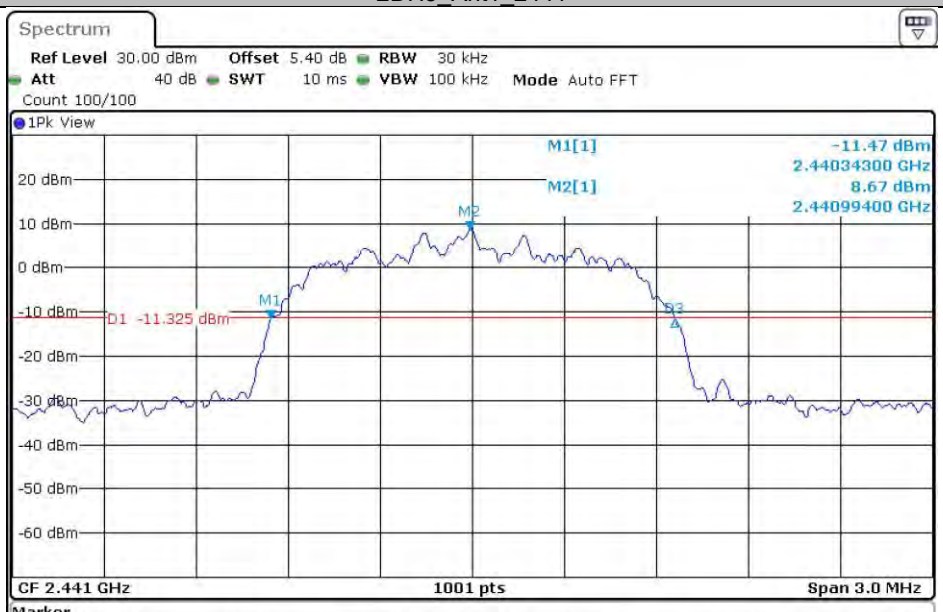


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401343 GHz	-12.24 dBm		
M2		1	2.401994 GHz	8.01 dBm		
D3	M1	1	1.32 MHz	-0.17 dB		

Date: 17.MAY.2021 03:16:32

2DH5_Ant1_2441



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440343 GHz	-11.47 dBm		
M2		1	2.440994 GHz	8.67 dBm		
D3	M1	1	1.317 MHz	0.06 dB		

Date: 17.MAY.2021 03:18:22

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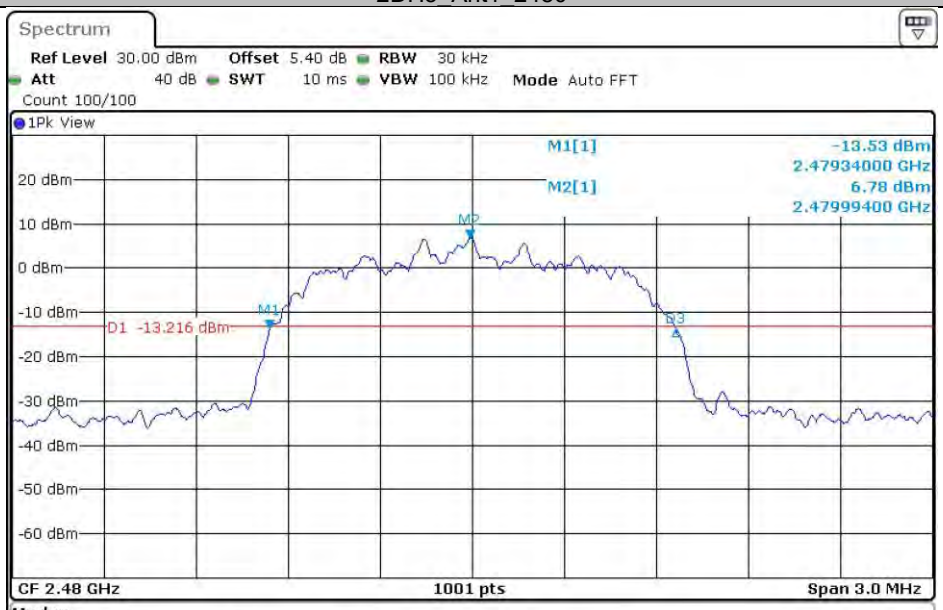
2DH5_Ant1_2480

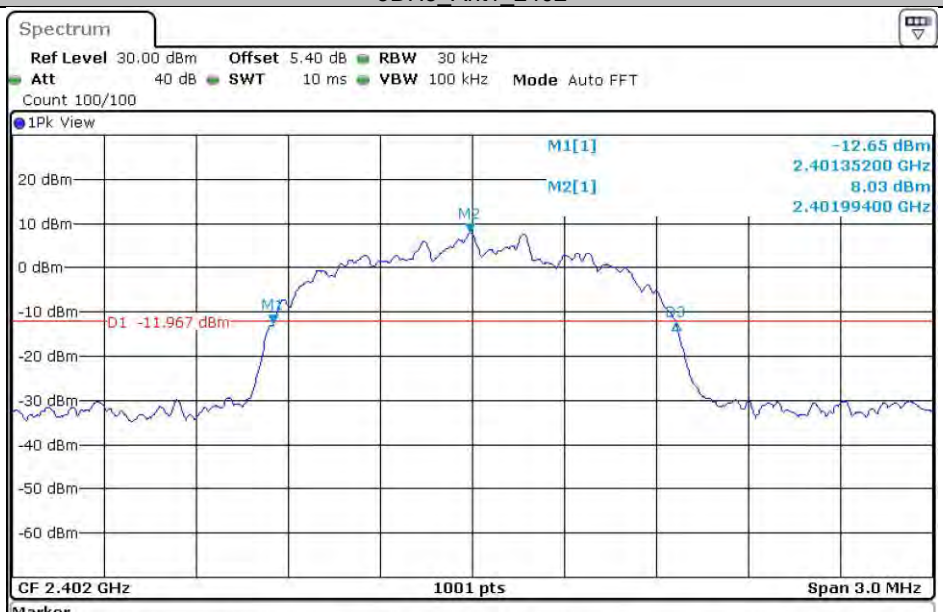


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47934 GHz	-13.53 dBm		
M2		1	2.479994 GHz	6.78 dBm		
D3	M1	1	1.323 MHz	-0.19 dB		

Date: 17.MAY.2021 03:19:55

3DH5_Ant1_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401352 GHz	-12.65 dBm		
M2		1	2.401994 GHz	8.03 dBm		
D3	M1	1	1.311 MHz	0.24 dB		

Date: 17.MAY.2021 03:22:12

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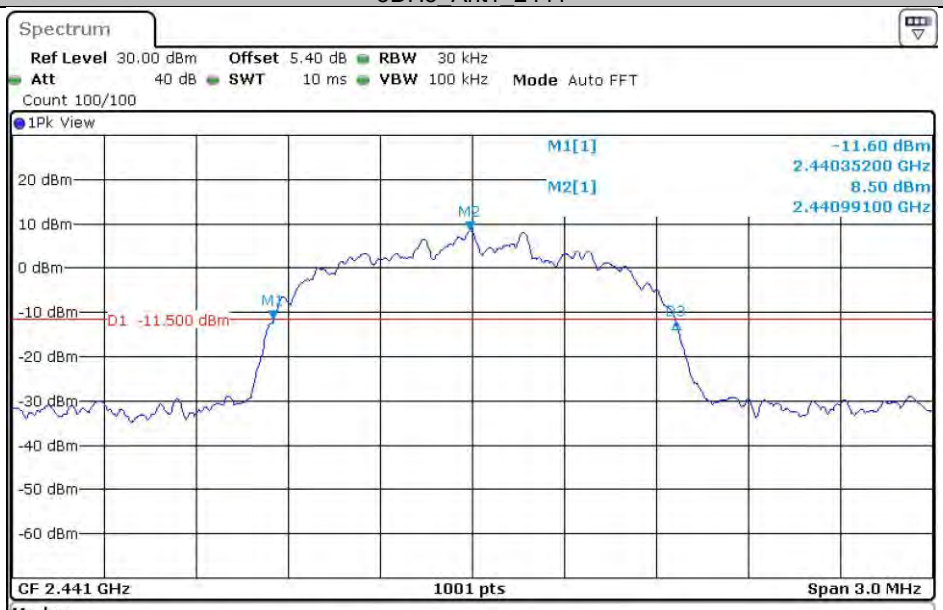
3DH5_Ant1_2441

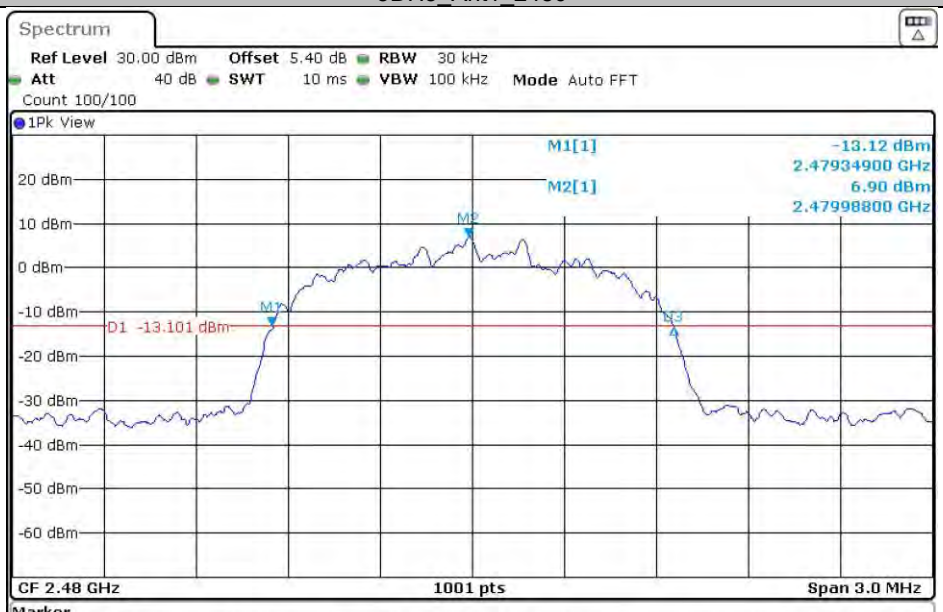


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440352 GHz	-11.60 dBm		
M2		1	2.440991 GHz	8.50 dBm		
D3	M1	1	1.311 MHz	-0.33 dB		

Date: 17.MAY.2021 03:26:40

3DH5_Ant1_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479349 GHz	-13.12 dBm		
M2		1	2.479988 GHz	6.90 dBm		
D3	M1	1	1.308 MHz	-0.21 dB		

Date: 20.MAY.2021 05:53:19

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Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.764	2401.628	2402.393	---	PASS
		2441	0.764	2440.625	2441.390	---	PASS
		2480	0.767	2479.622	2480.390	---	PASS
2DH5	Ant1	2402	1.178	2401.416	2402.593	---	PASS
		2441	1.181	2440.413	2441.593	---	PASS
		2480	1.181	2479.413	2480.593	---	PASS
3DH5	Ant1	2402	1.184	2401.416	2402.599	---	PASS
		2441	1.19	2440.410	2441.599	---	PASS
		2480	1.187	2479.407	2480.593	---	PASS

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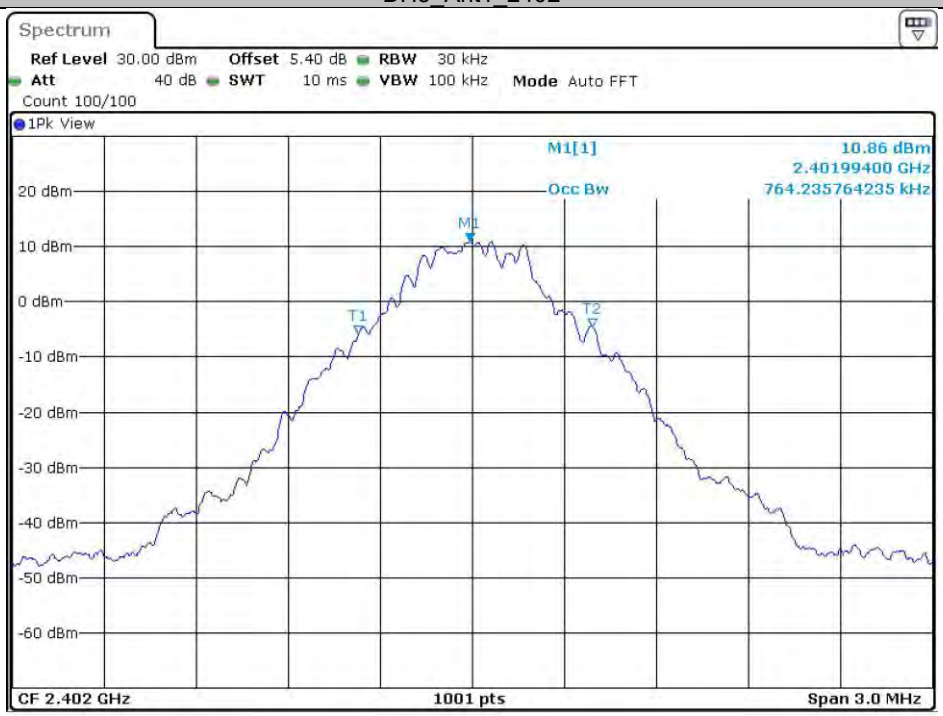
Test Graphs

DH5_Ant1_2402



Date: 17.MAY.2021 03:11:07

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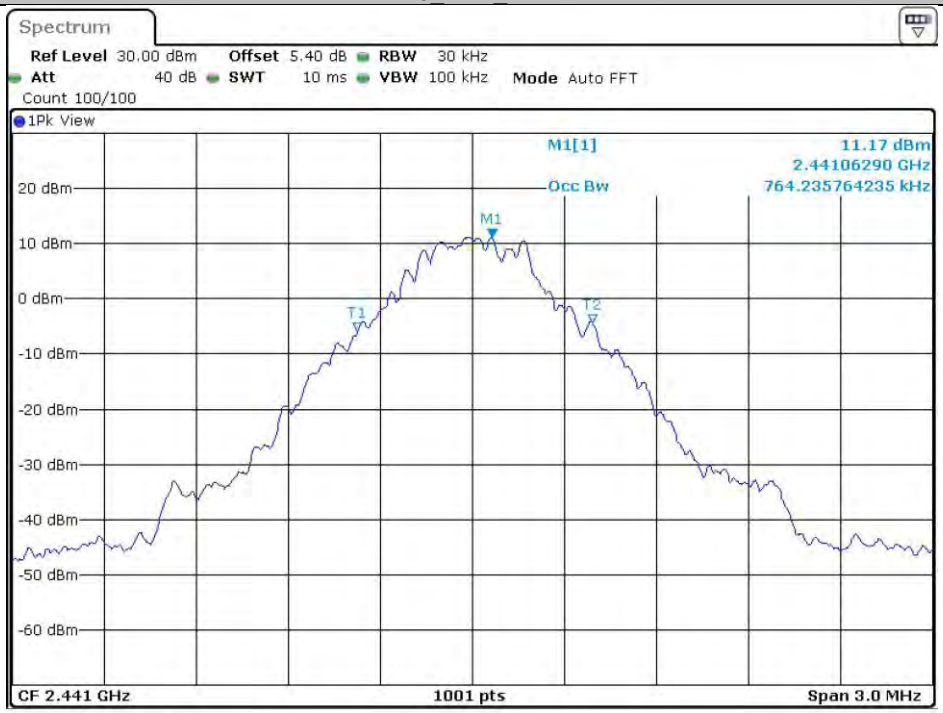
DH5_Ant1_2441



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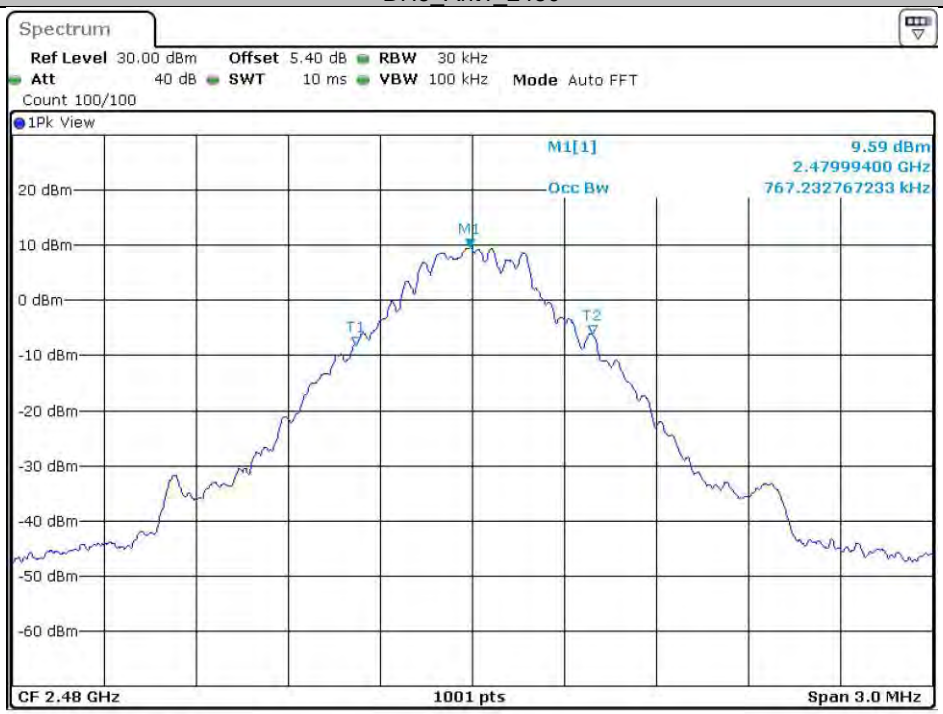
DH5_Ant1_2480



Date: 17.MAY.2021 03:15:13

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2DH5_Ant1_2402

Date: 17.MAY.2021 03:16:41

2DH5_Ant1_2441

Date: 17.MAY.2021 03:18:31

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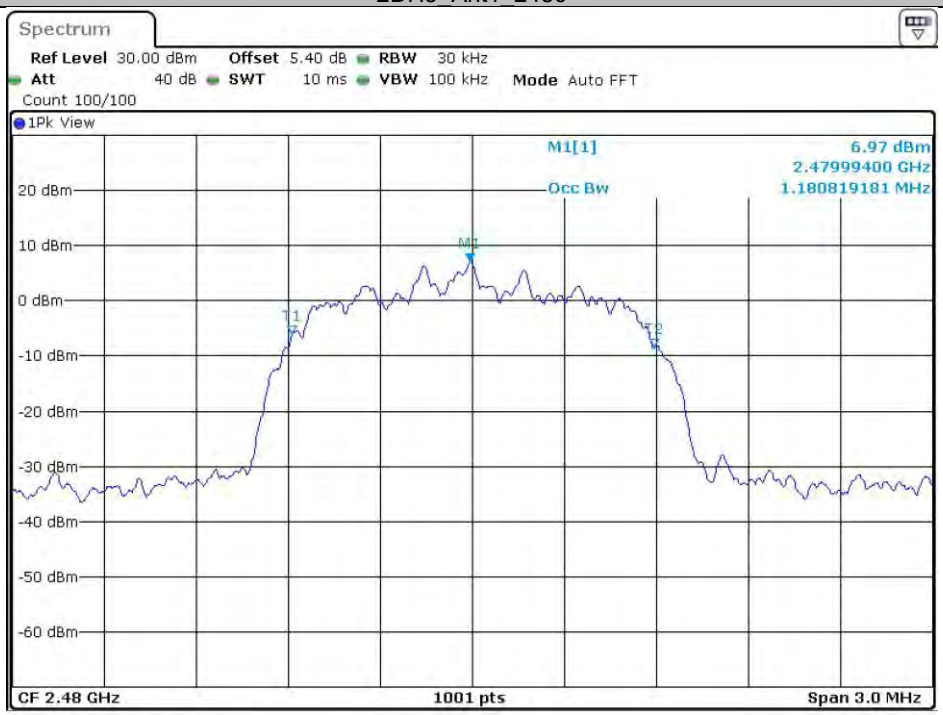
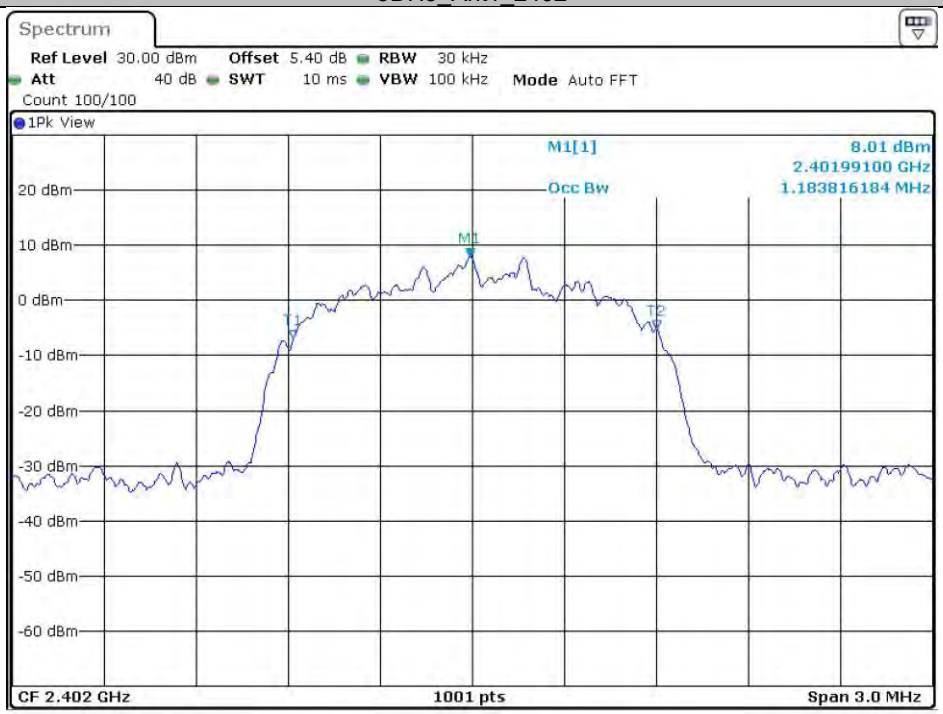
2DH5_Ant1_2480



Date: 17.MAY.2021 03:20:05

3DH5_Ant1_2402



Date: 17.MAY.2021 03:22:21

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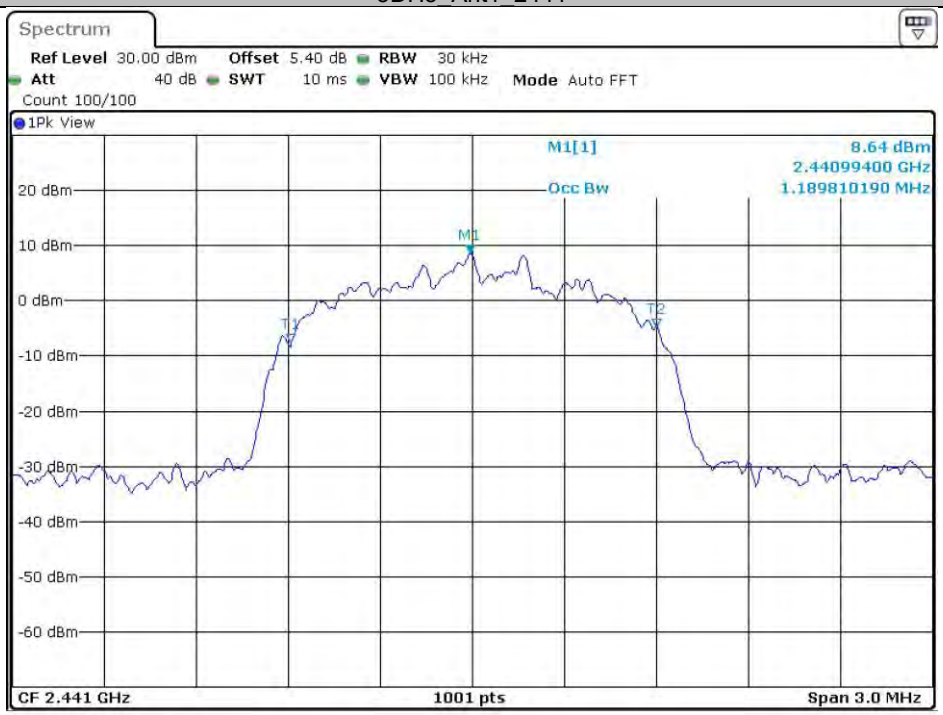
3DH5_Ant1_2441



Date: 17.MAY.2021 03:26:50

3DH5_Ant1_2480

Date: 20.MAY.2021 05:53:29

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Maximum conducted output power

Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	14.66	<=20.97	PASS
		2441	15.94	<=20.97	PASS
		2480	14.25	<=20.97	PASS
2DH5	Ant1	2402	14.67	<=20.97	PASS
		2441	15.49	<=20.97	PASS
		2480	13.81	<=20.97	PASS
3DH5	Ant1	2402	14.94	<=20.97	PASS
		2441	15.97	<=20.97	PASS
		2480	14.25	<=20.97	PASS

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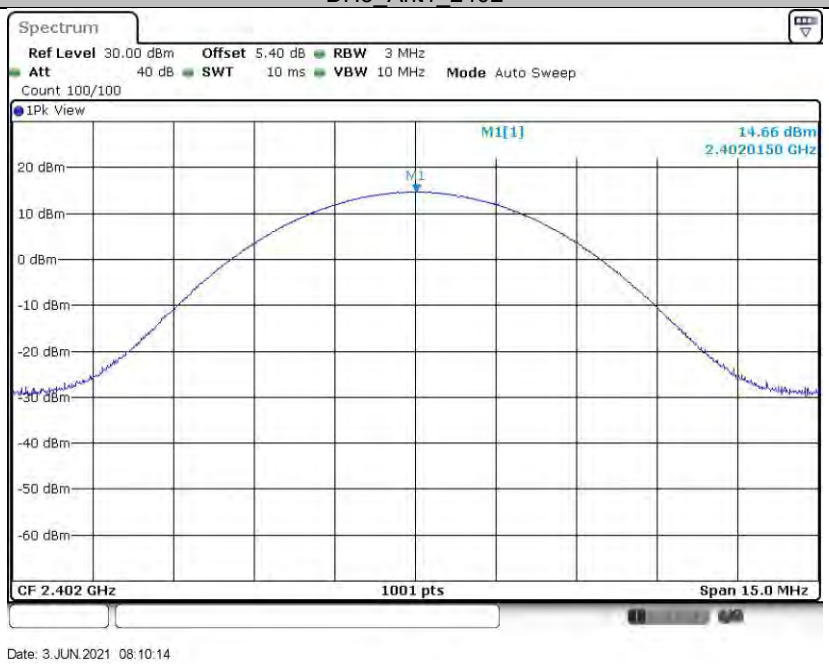
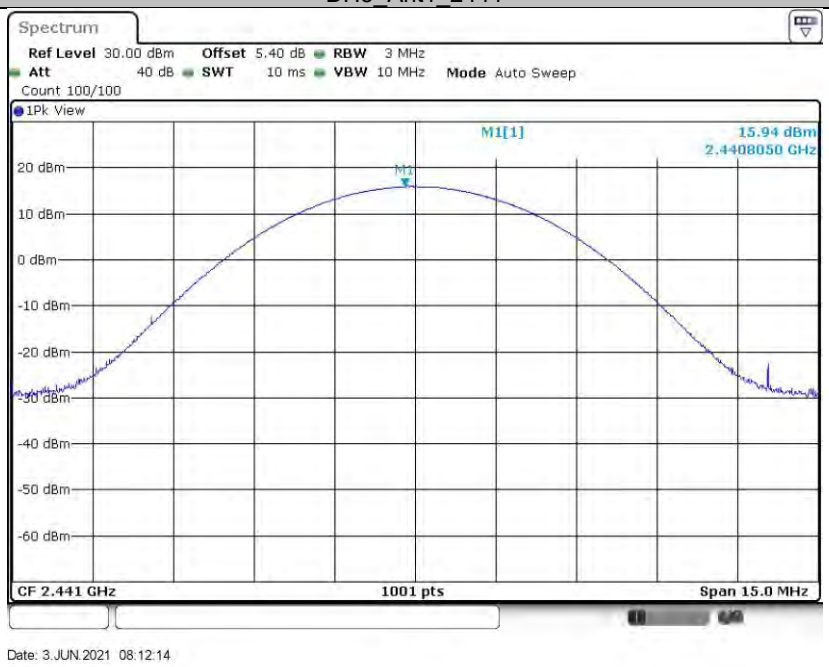
Test Graphs

DH5_Ant1_2402



DH5_Ant1_2441



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DH5_Ant1_2480

Date: 3.JUN.2021 08:12:52

2DH5_Ant1_2402

Date: 3.JUN.2021 07:29:27

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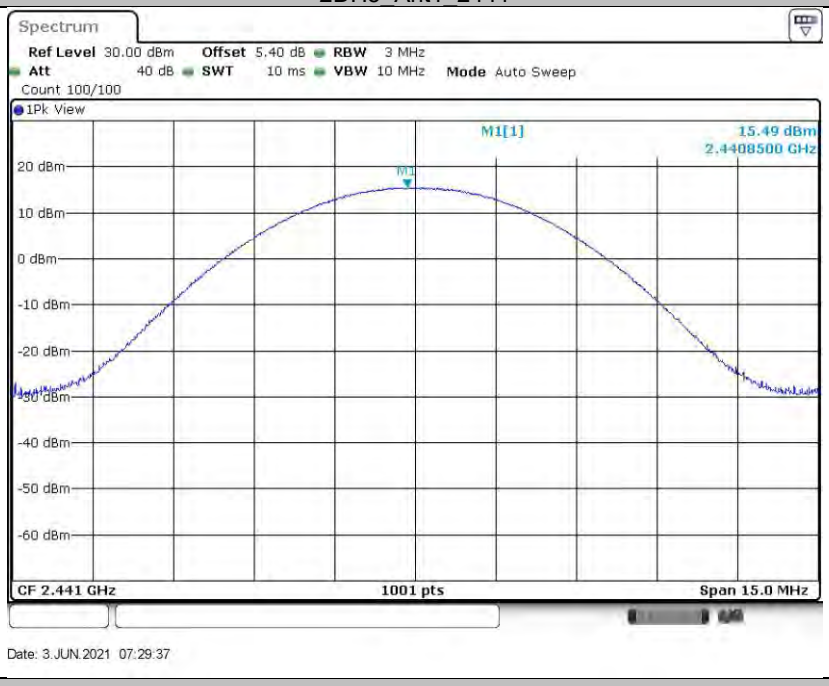
2DH5_Ant1_2441



Date: 3.JUN.2021 07:29:37

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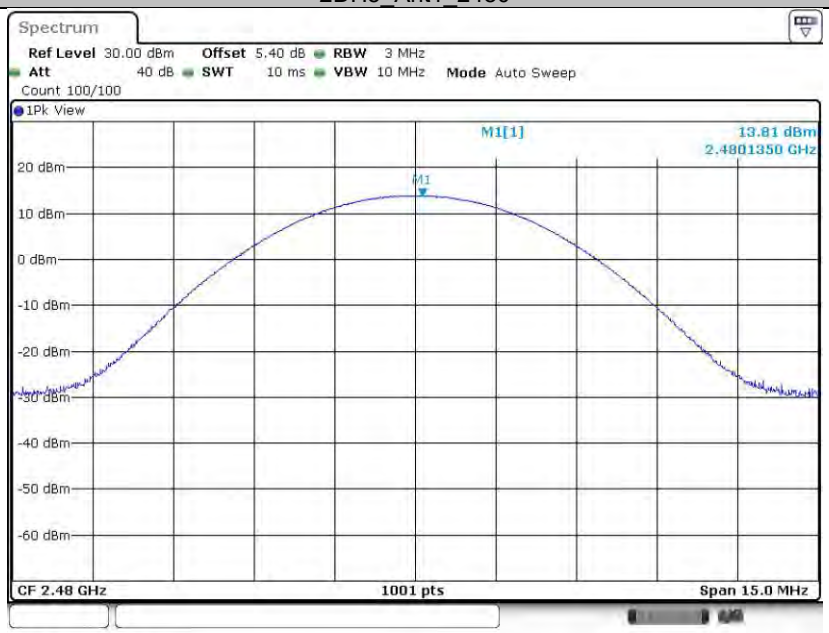

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3DH5_Ant1_2402

Date: 3.JUN.2021 07:31:10

3DH5_Ant1_2441

Date: 3.JUN.2021 07:31:39

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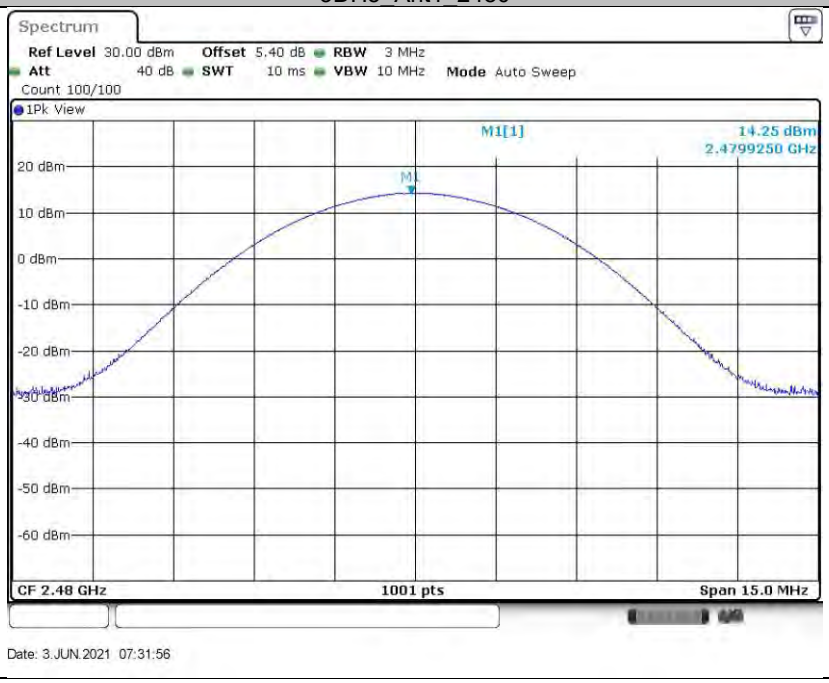
3DH5_Ant1_2480



Date: 3.JUN.2021 07:31:56

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Carrier frequency separation

Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
2DH5	Ant1	Hop	1.023	>=0.882	PASS
3DH5	Ant1	Hop	1.087	>=0.874	PASS

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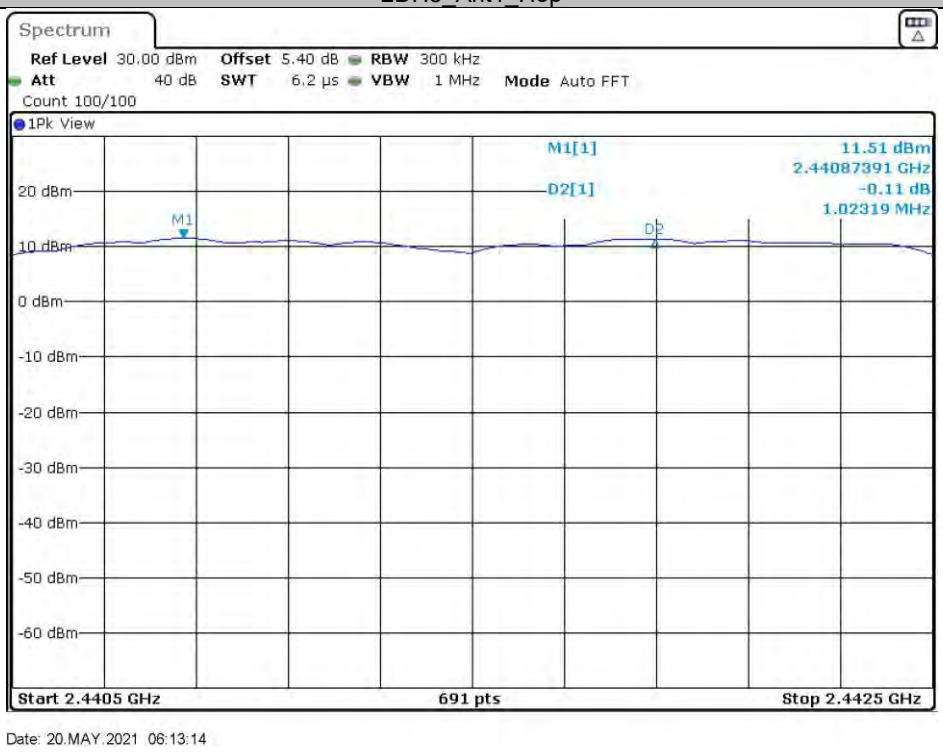
Test Graphs

2DH5_Ant1_Hop



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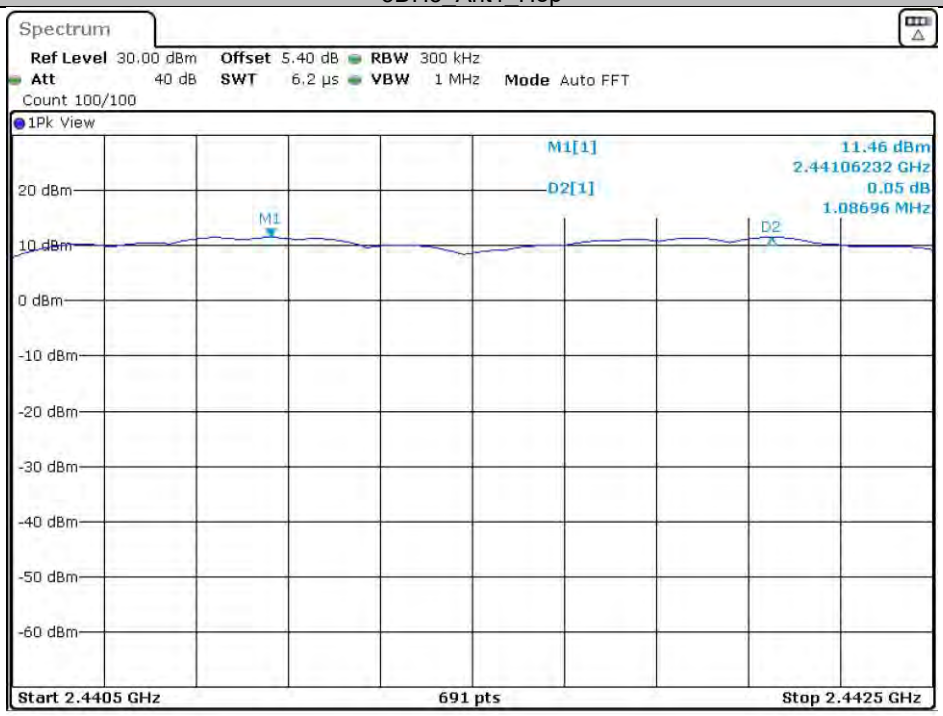
3DH5_Ant1_Hop



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Time of occupancy

Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.37	160	0.059	<=0.4	PASS
DH3	Ant1	Hop	1.62	80	0.13	<=0.4	PASS
DH5	Ant1	Hop	2.86	40	0.114	<=0.4	PASS
2DH1	Ant1	Hop	0.38	150	0.057	<=0.4	PASS
2DH3	Ant1	Hop	1.63	80	0.13	<=0.4	PASS
2DH5	Ant1	Hop	2.86	70	0.2	<=0.4	PASS
3DH1	Ant1	Hop	0.38	110	0.042	<=0.4	PASS
3DH3	Ant1	Hop	1.62	40	0.065	<=0.4	PASS
3DH5	Ant1	Hop	2.87	40	0.115	<=0.4	PASS

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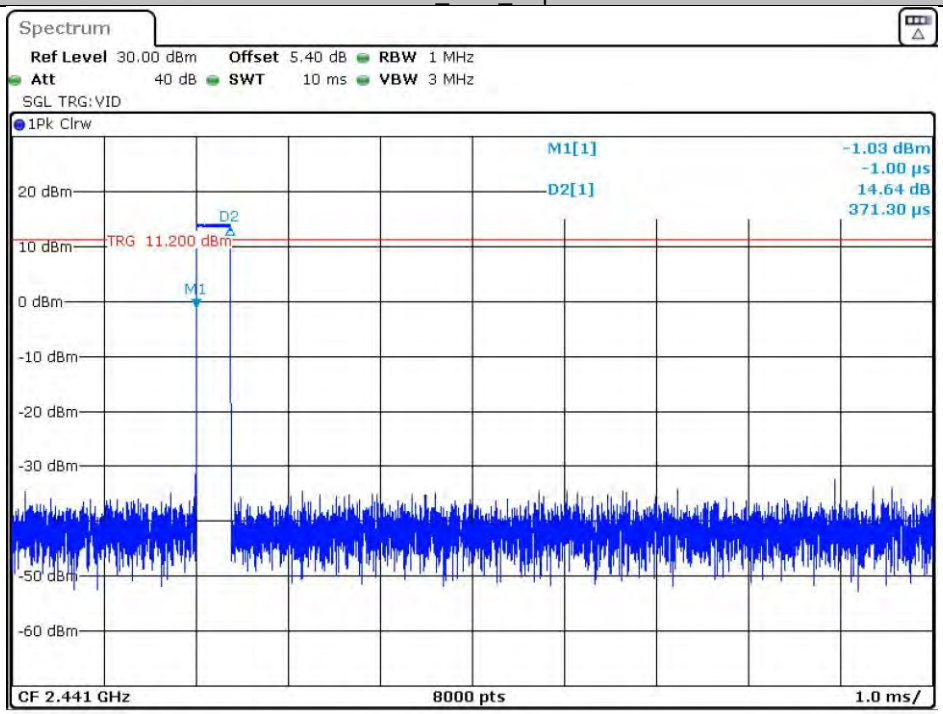
Test Graphs

DH1_Ant1_Hop



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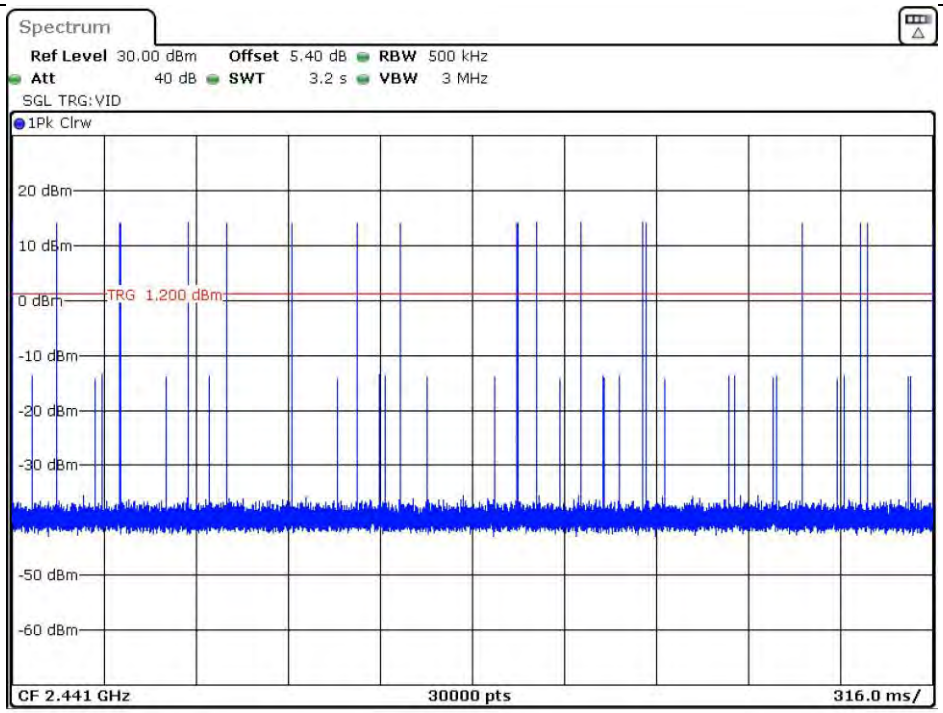

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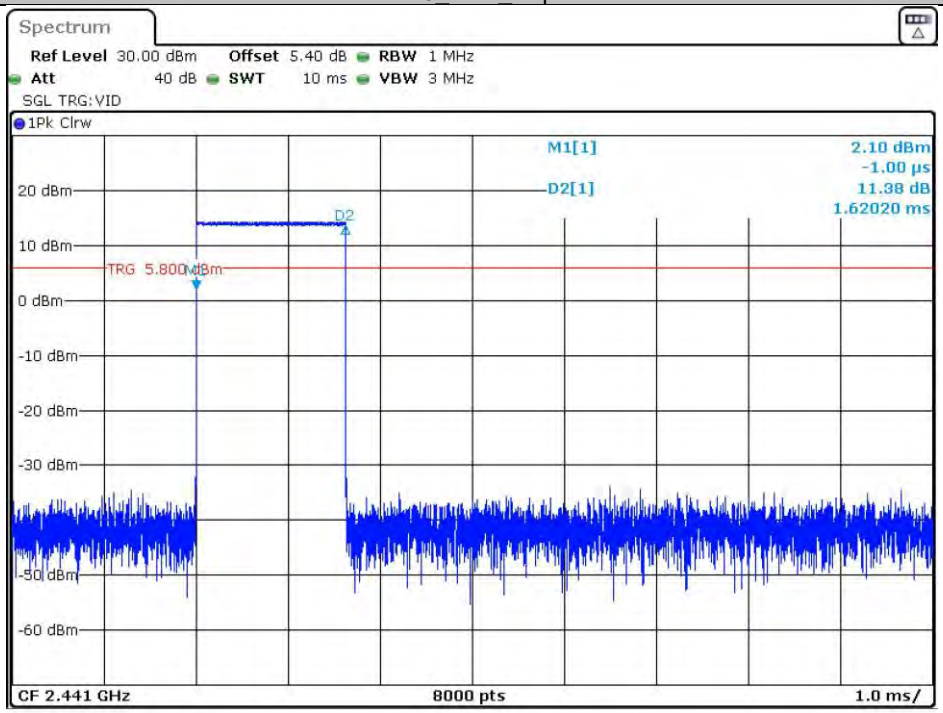
DH3_Ant1_Hop



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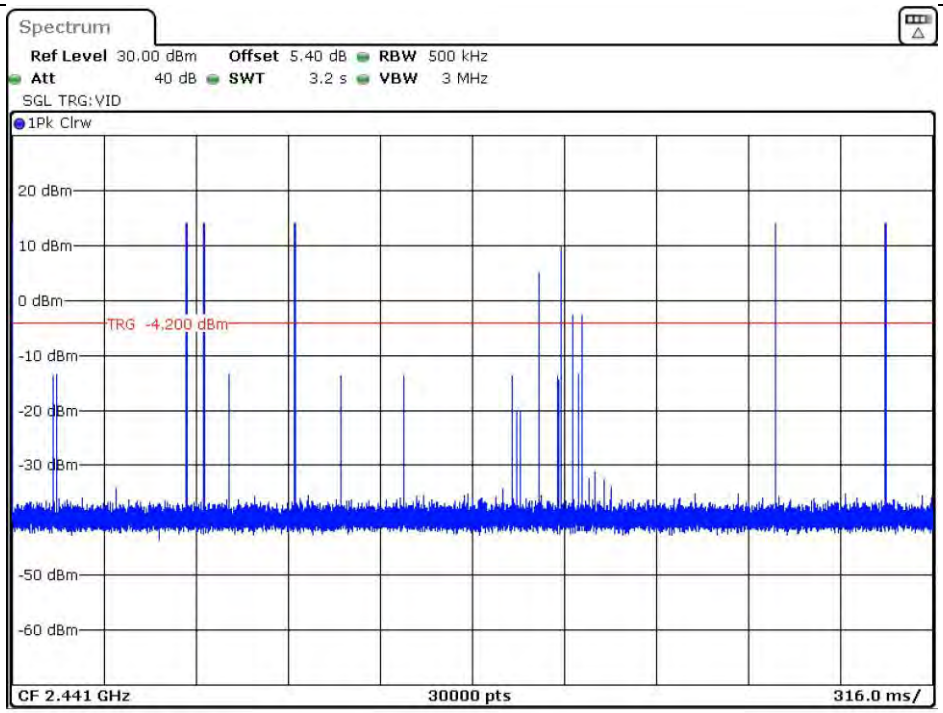

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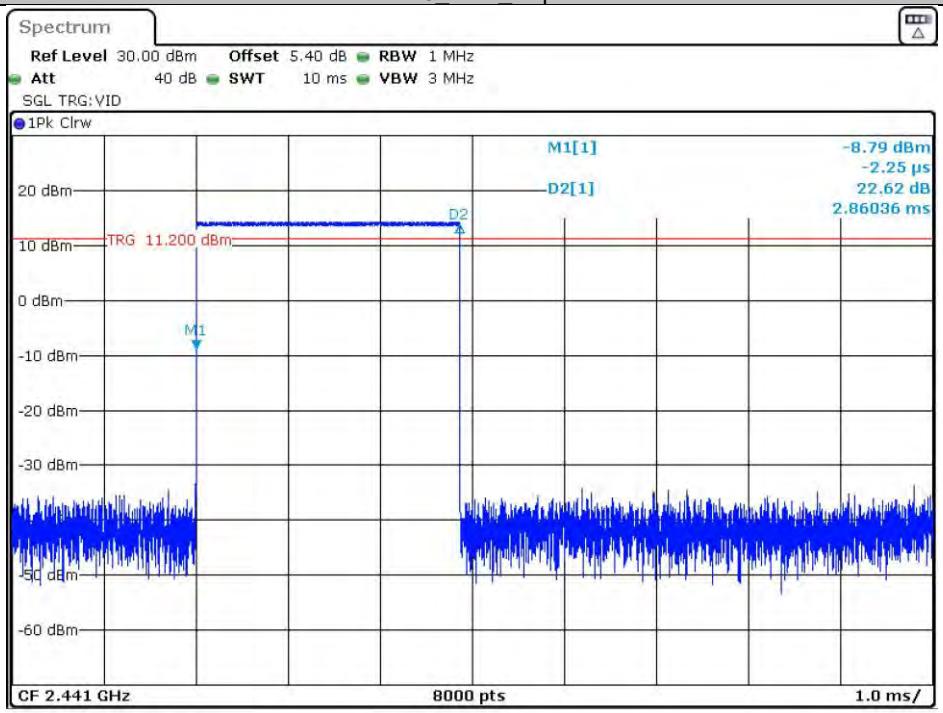
DH5_Ant1_Hop



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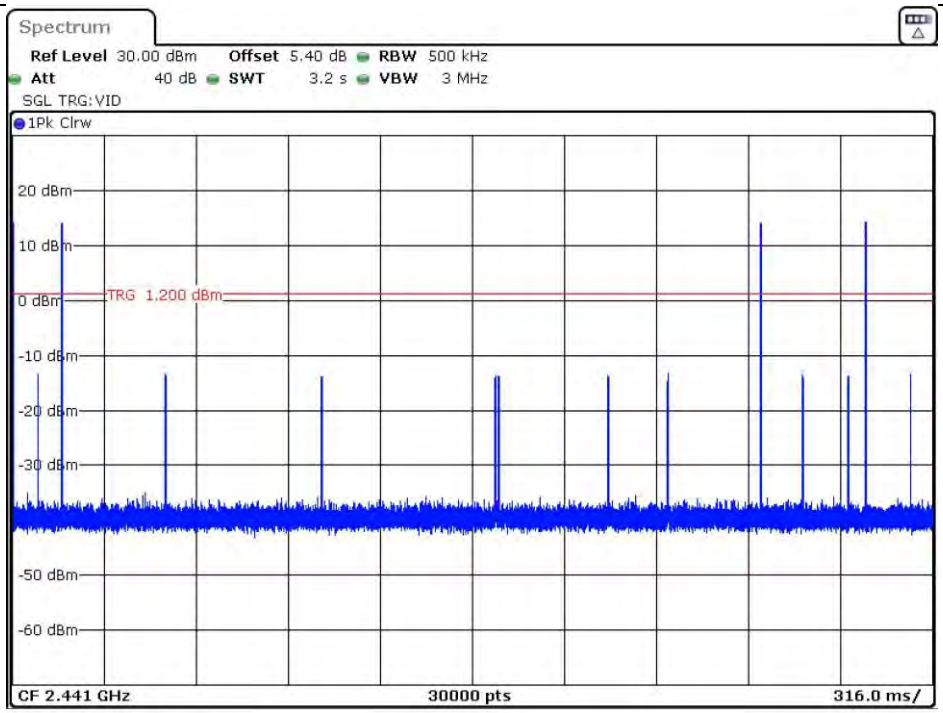

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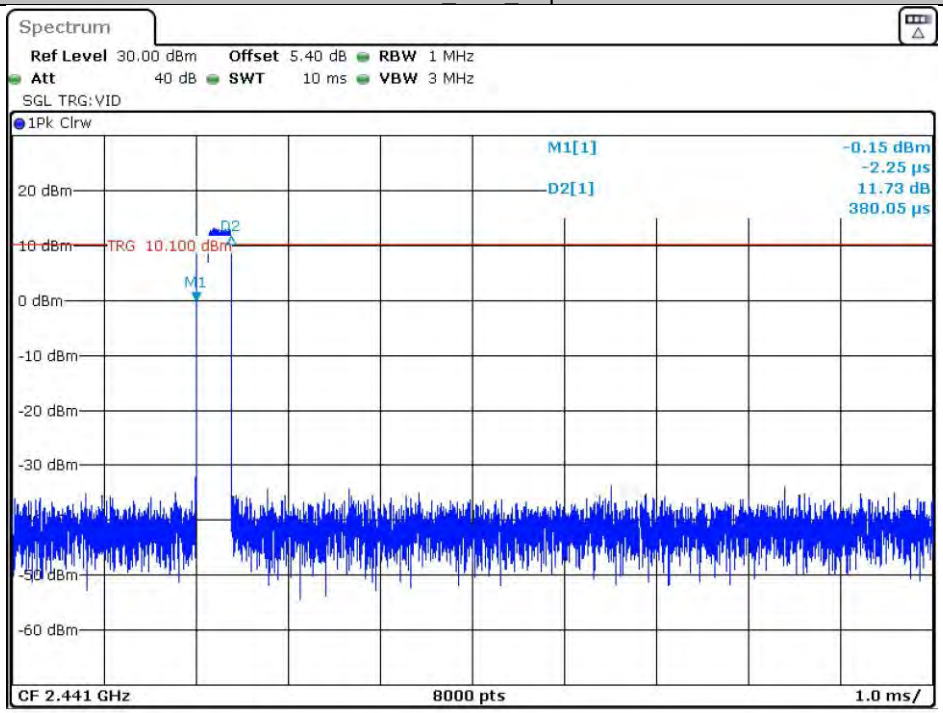
2DH1_Ant1_Hop



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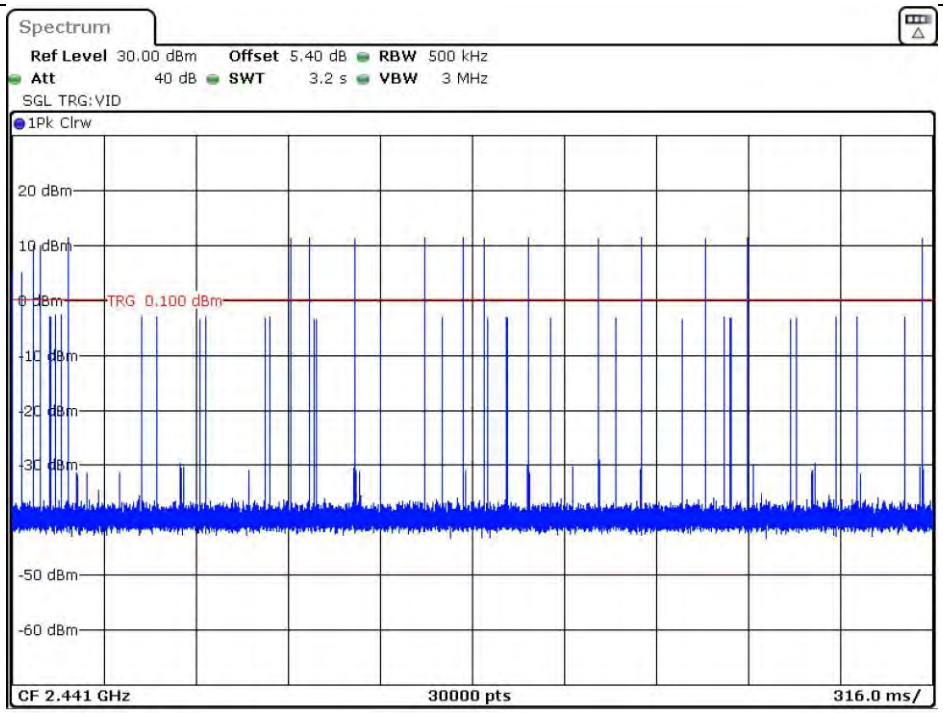

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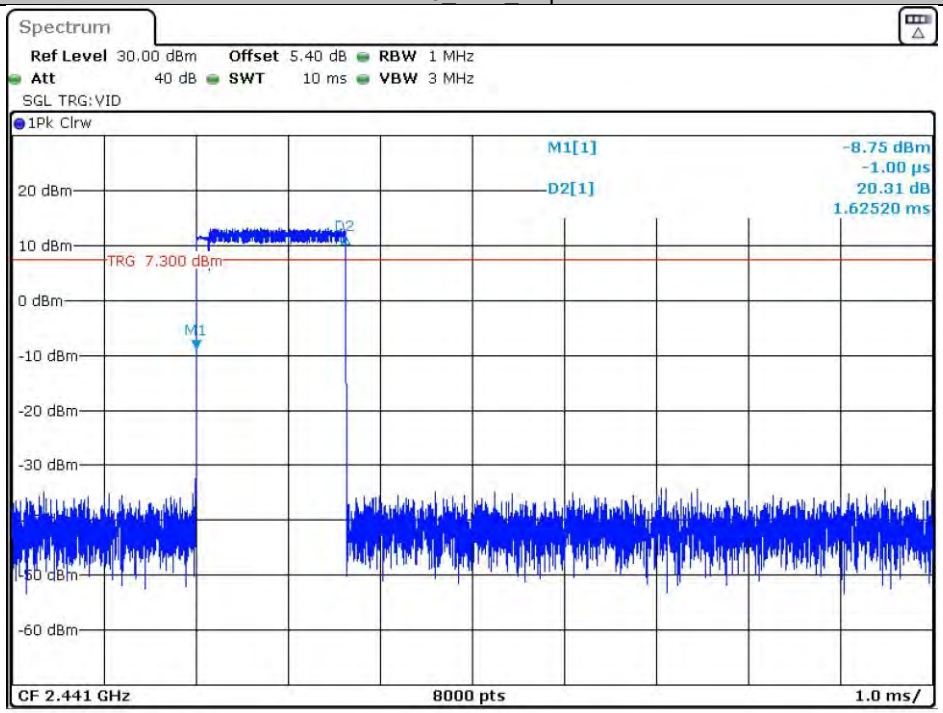
2DH3_Ant1_Hop



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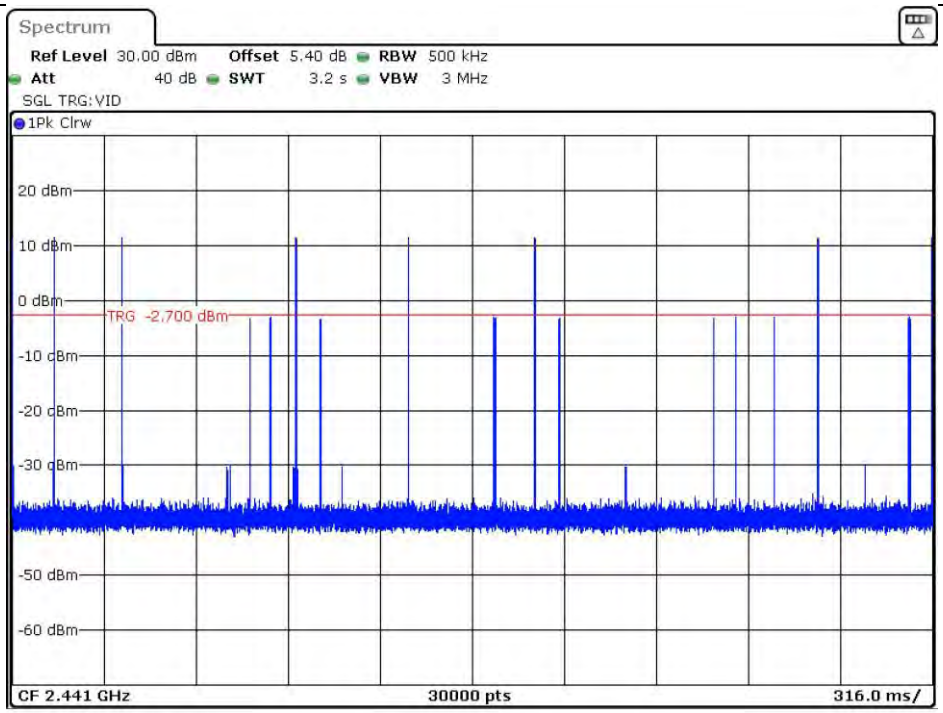

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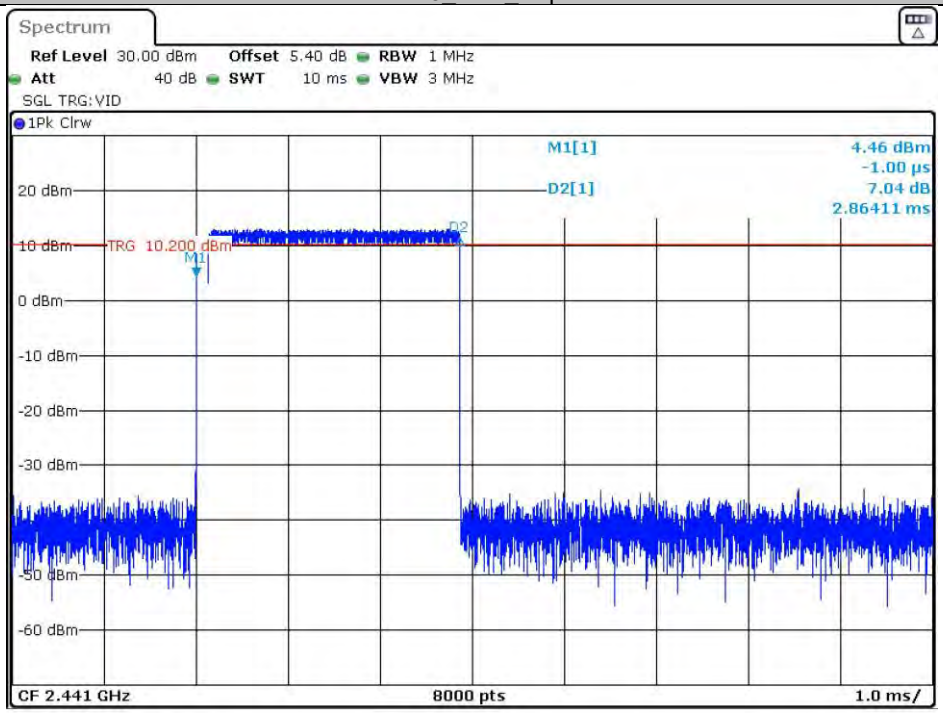

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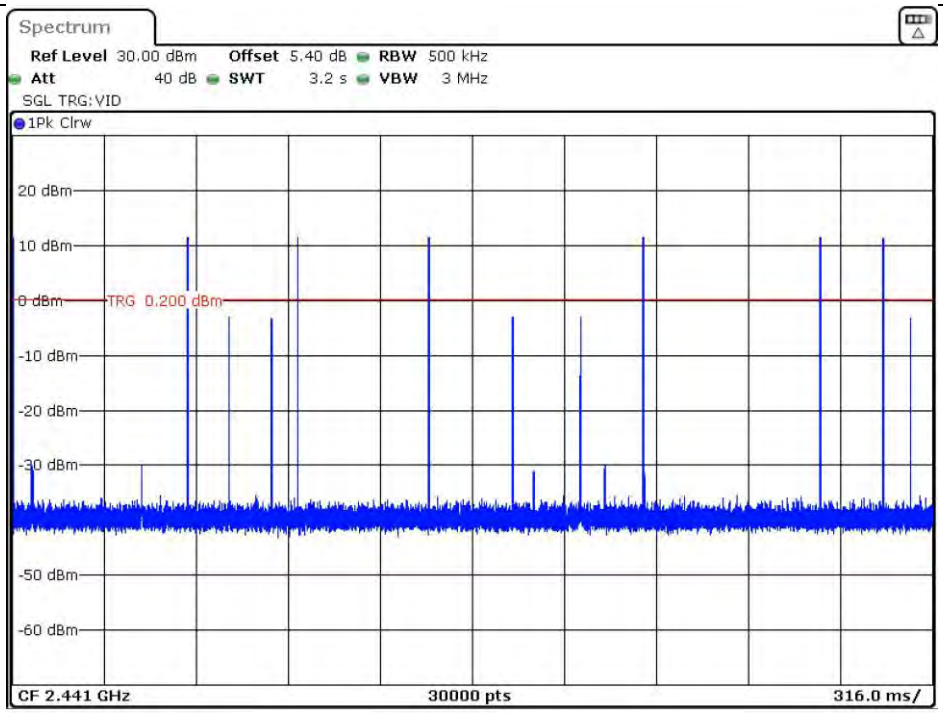

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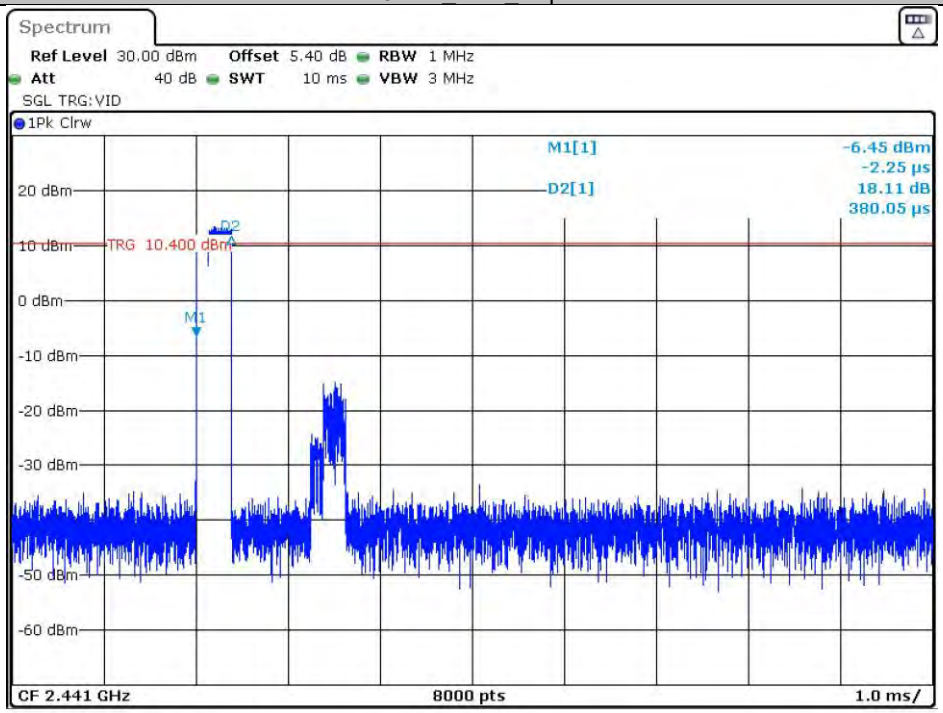

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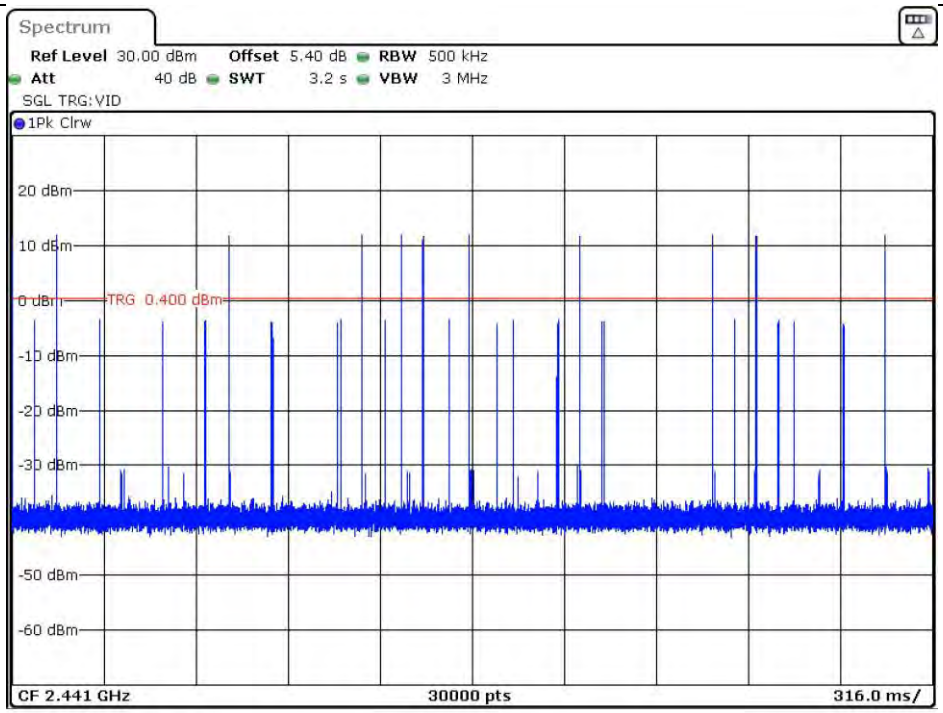

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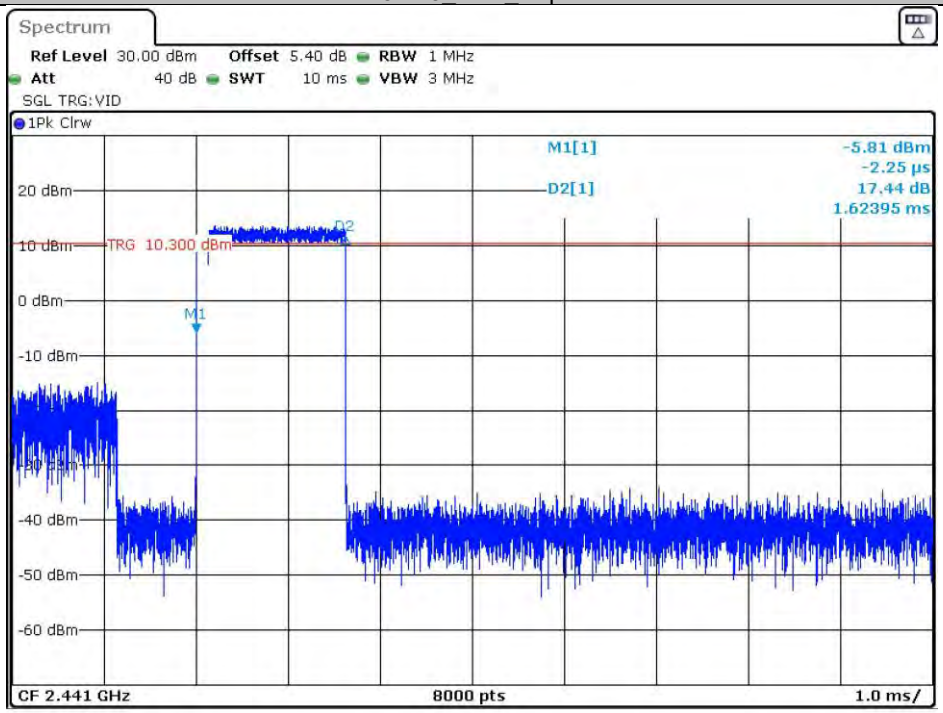
3DH3_Ant1_Hop



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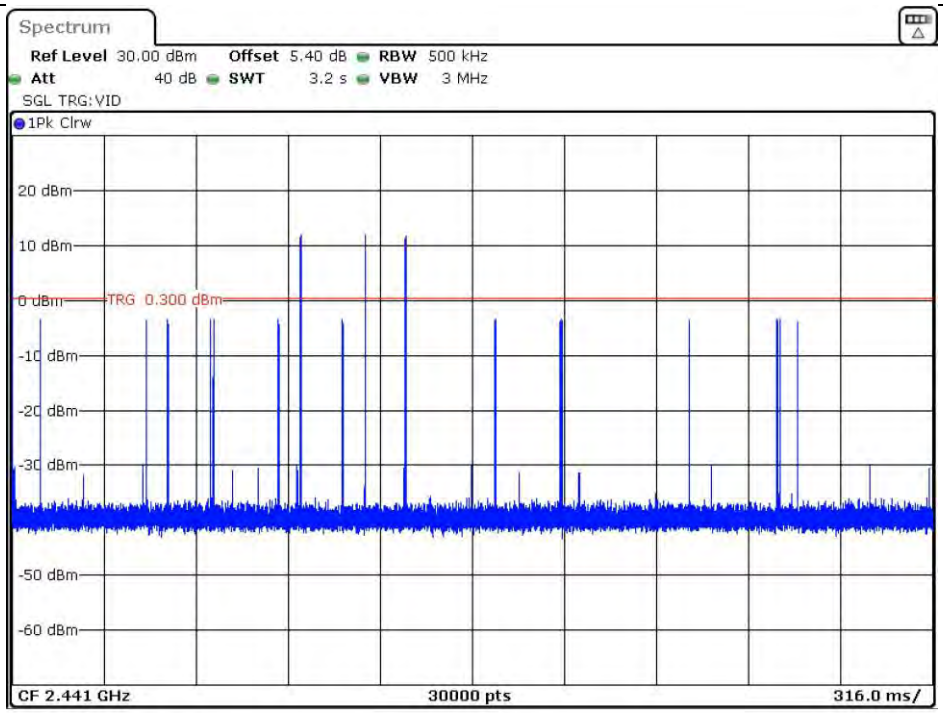

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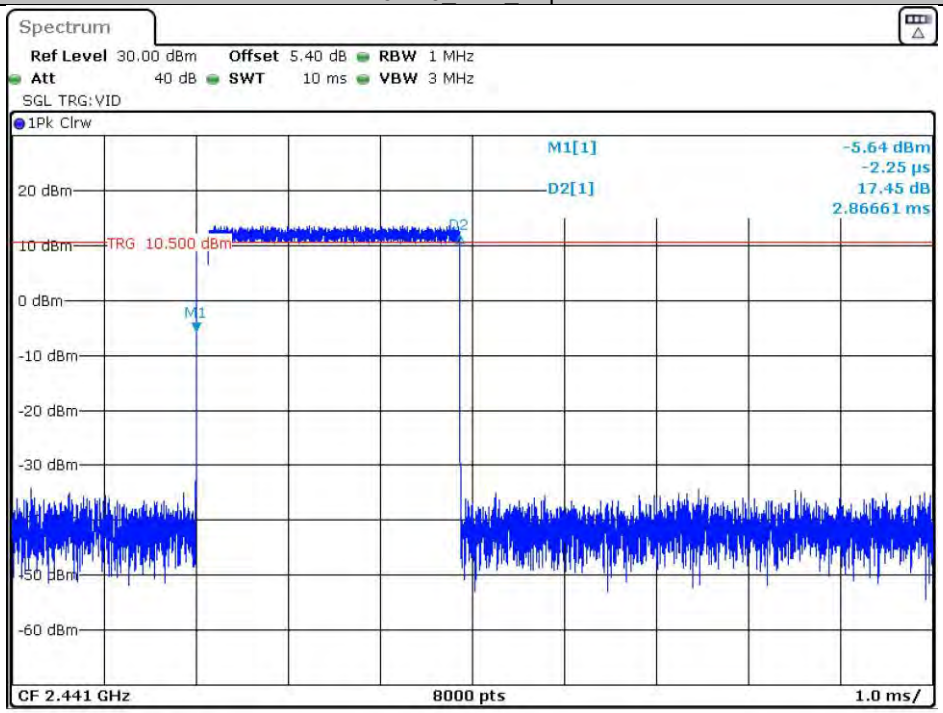
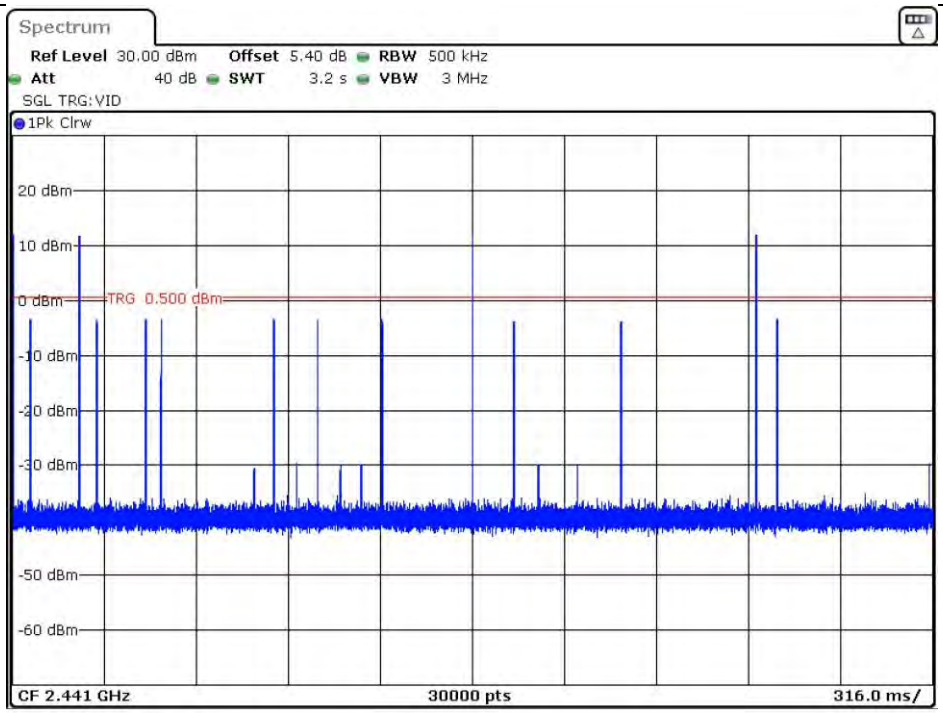
3DH5_Ant1_Hop



Date: 20.MAY.2021 06:09:11



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Number of hopping channels

Test Result

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	>=15	PASS
2DH5	Ant1	Hop	79	>=15	PASS
3DH5	Ant1	Hop	79	>=15	PASS

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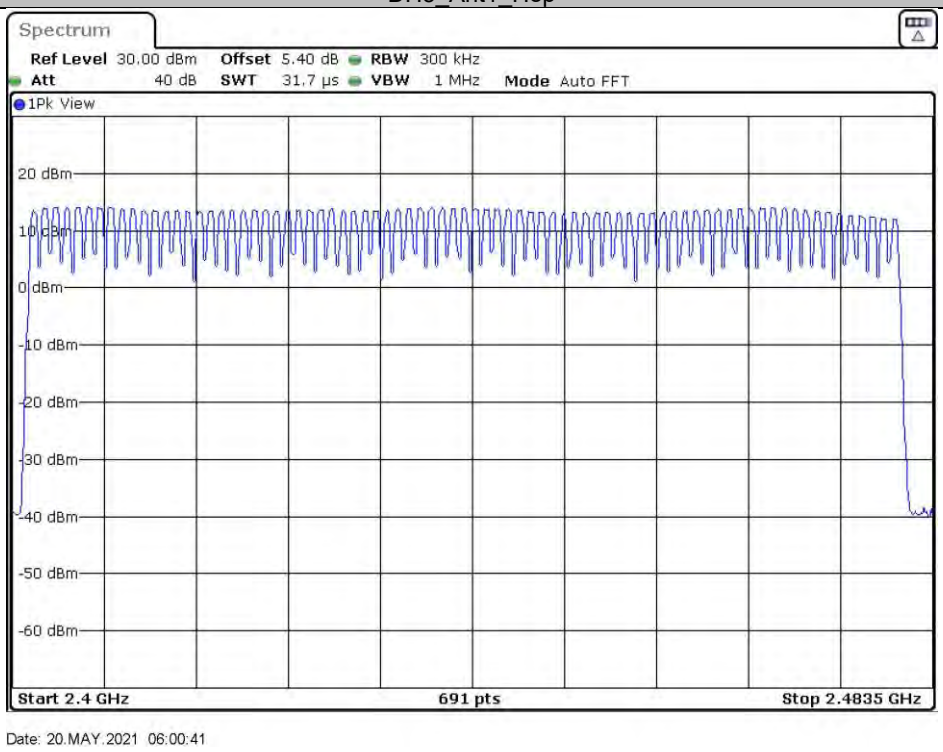
Test Graphs

DH5_Ant1_Hop



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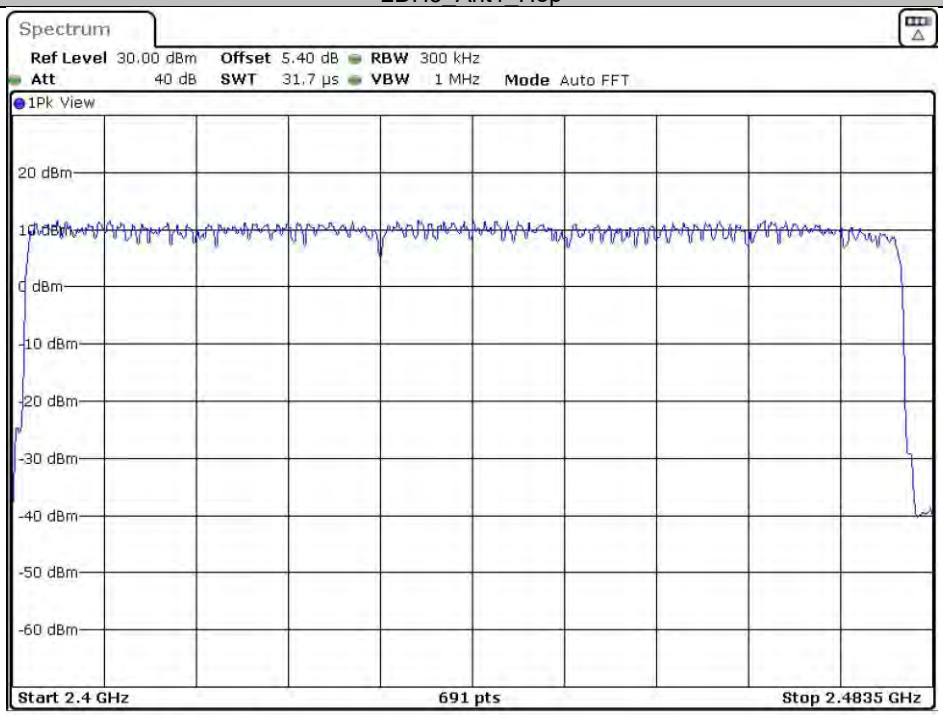
2DH5_Ant1_Hop



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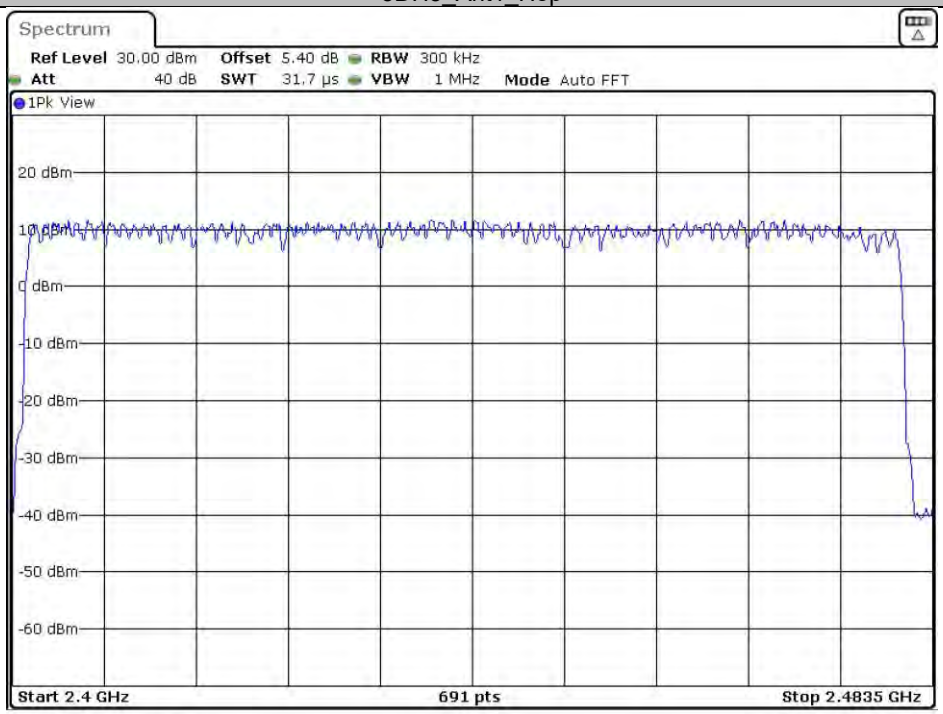
3DH5_Ant1_Hop



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Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	13.25	-41.91	<=-6.75	PASS
		High	2480	11.91	-42.44	<=-8.09	PASS
		Low	Hop_2402	13.38	-42.39	<=-6.62	PASS
		High	Hop_2480	13.52	-41.94	<=-6.48	PASS
2DH5	Ant1	Low	2402	10.16	-41.53	<=-9.84	PASS
		High	2480	8.94	-42.66	<=-11.06	PASS
		Low	Hop_2402	10.20	-42.16	<=-9.8	PASS
		High	Hop_2480	9.34	-42.17	<=-10.66	PASS
3DH5	Ant1	Low	2402	9.86	-41.48	<=-10.14	PASS
		High	2480	9.30	-42.38	<=-10.7	PASS
		Low	Hop_2402	10.29	-42.35	<=-9.71	PASS
		High	Hop_2480	9.28	-41.94	<=-10.72	PASS

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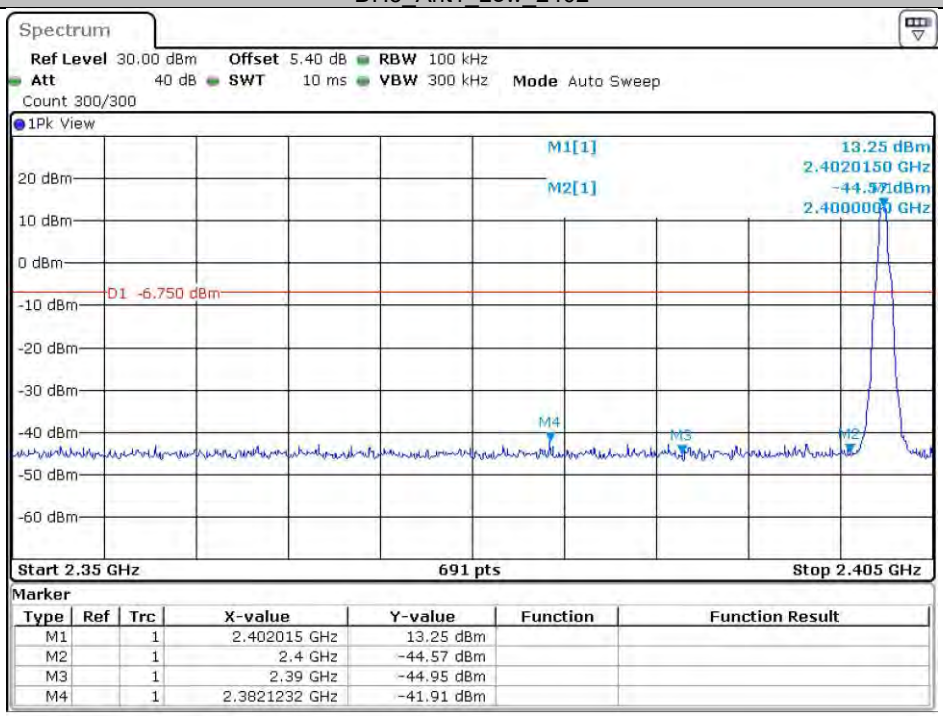
Test Graphs

DH5_Ant1_Low_2402



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	13.25 dBm		
M2		1	2.4 GHz	-44.57 dBm		
M3		1	2.39 GHz	-44.95 dBm		
M4		1	2.3821232 GHz	-41.91 dBm		

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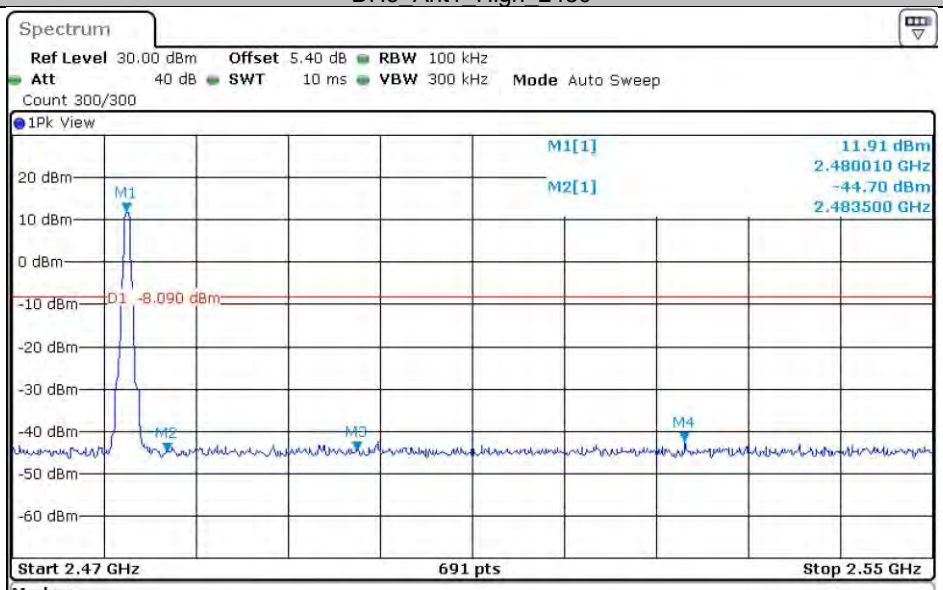
DH5_Ant1_High_2480

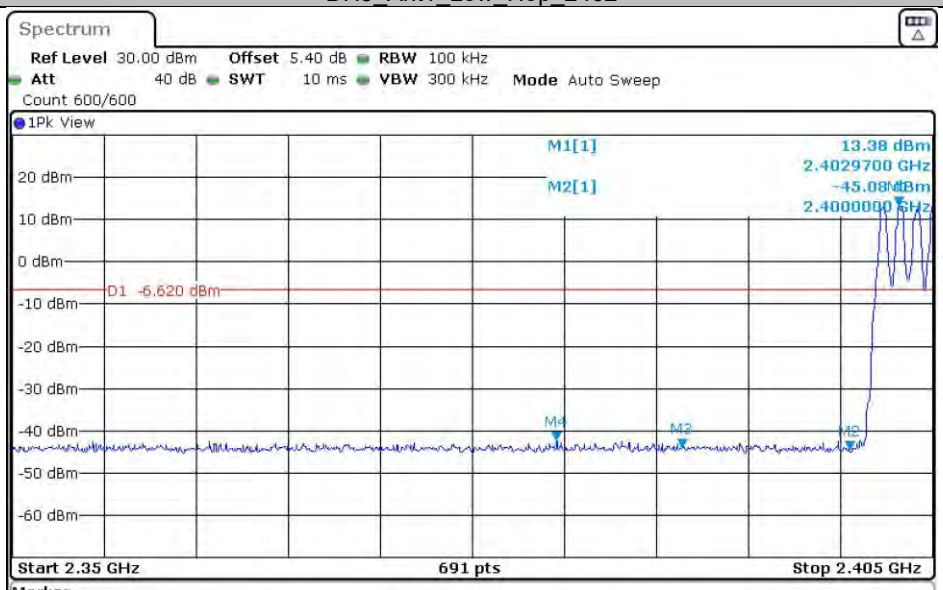


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	11.91 dBm		
M2		1	2.4835 GHz	-44.70 dBm		
M3		1	2.5 GHz	-44.43 dBm		
M4		1	2.528435 GHz	-42.44 dBm		

Date: 17.MAY.2021 03:15:21

DH5_Ant1_Low_Hop_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40297 GHz	13.38 dBm		
M2		1	2.4 GHz	-45.08 dBm		
M3		1	2.39 GHz	-44.00 dBm		
M4		1	2.3825217 GHz	-42.39 dBm		

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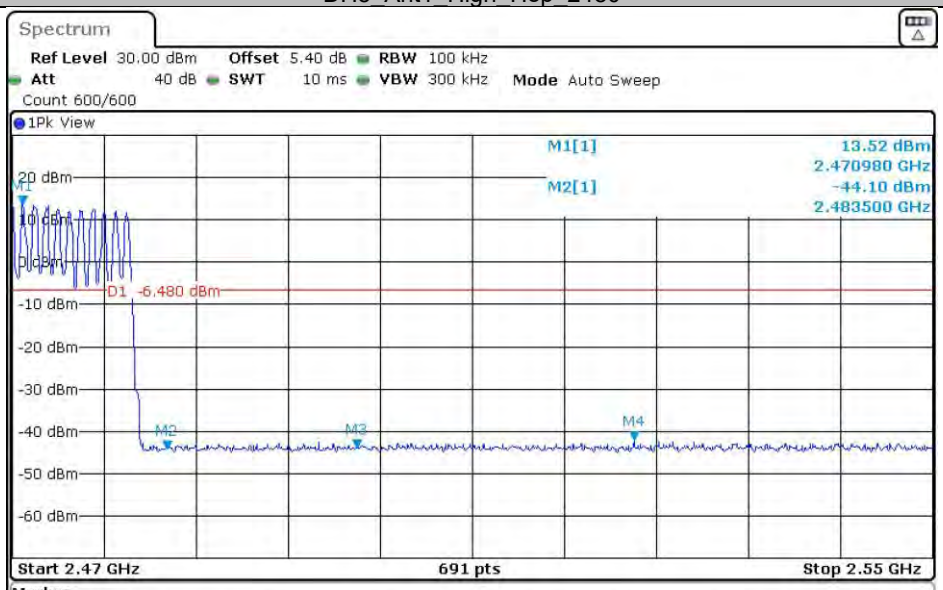
DH5_Ant1_High_Hop_2480

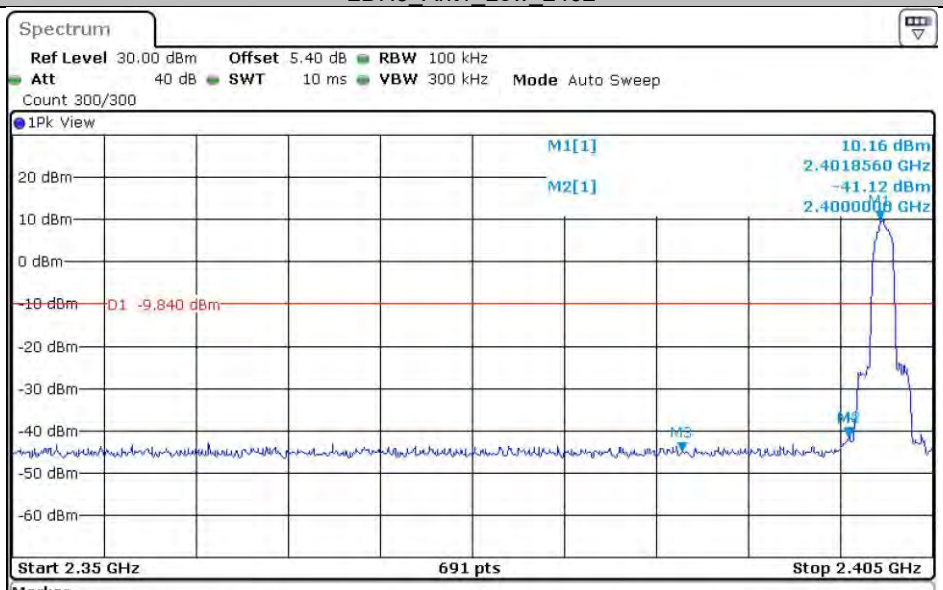


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47098 GHz	13.52 dBm		
M2		1	2.4835 GHz	-44.10 dBm		
M3		1	2.5 GHz	-43.84 dBm		
M4		1	2.524029 GHz	-41.94 dBm		

Date: 20.MAY.2021 06:02:55

2DH5_Ant1_Low_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401856 GHz	10.16 dBm		
M2		1	2.4 GHz	-41.12 dBm		
M3		1	2.39 GHz	-44.87 dBm		
M4		1	2.3999783 GHz	-41.53 dBm		

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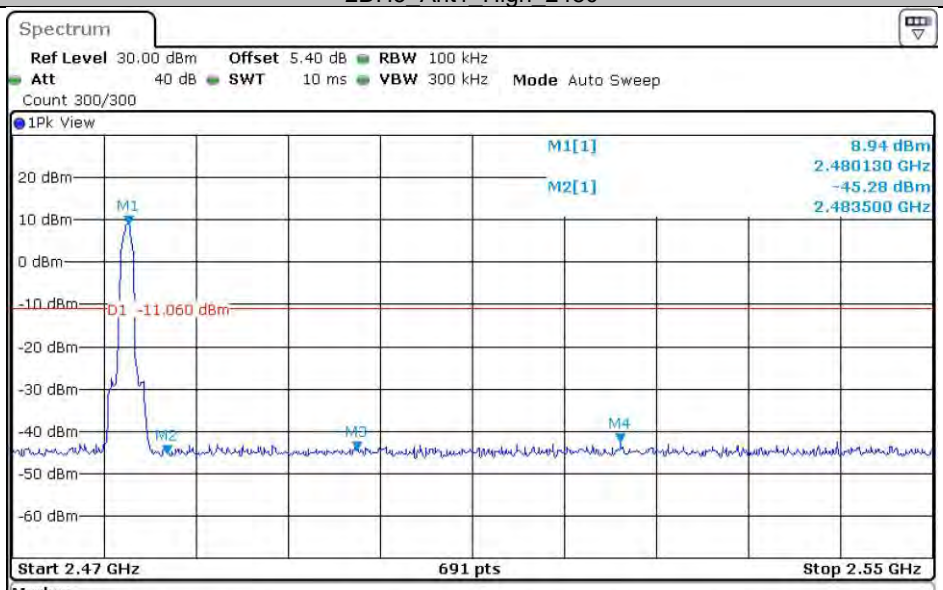
2DH5_Ant1_High_2480

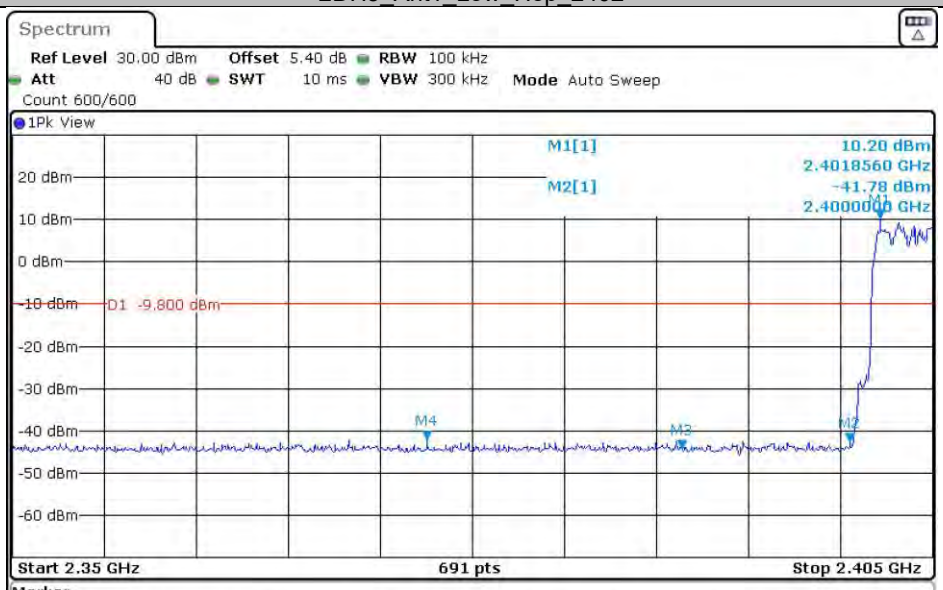


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48013 GHz	8.94 dBm		
M2		1	2.4835 GHz	-45.28 dBm		
M3		1	2.5 GHz	-44.39 dBm		
M4		1	2.52287 GHz	-42.66 dBm		

Date: 17.MAY.2021 03:20:13

2DH5_Ant1_Low_Hop_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401856 GHz	10.20 dBm		
M2		1	2.4 GHz	-41.78 dBm		
M3		1	2.39 GHz	-44.14 dBm		
M4		1	2.3747899 GHz	-42.16 dBm		

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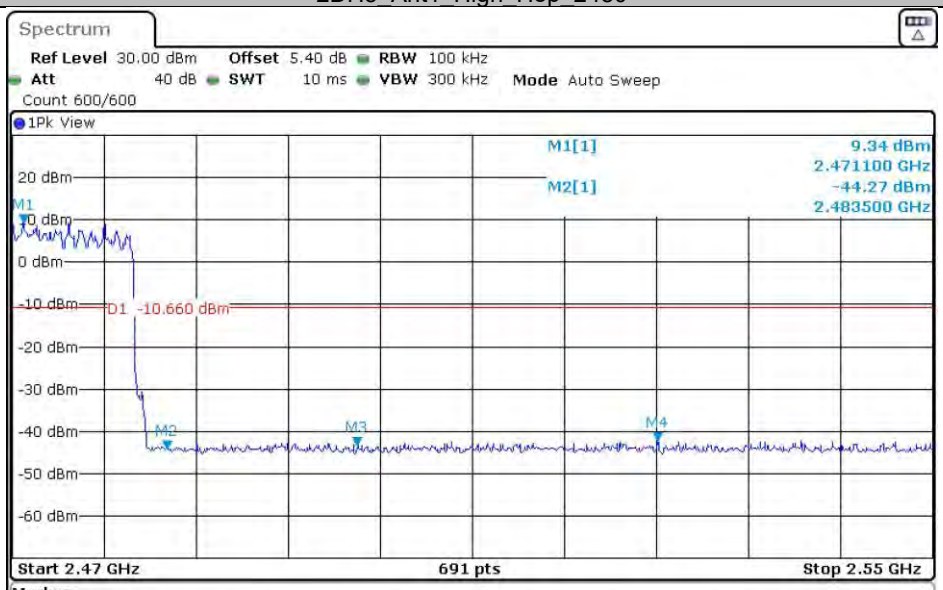
2DH5_Ant1_High_Hop_2480

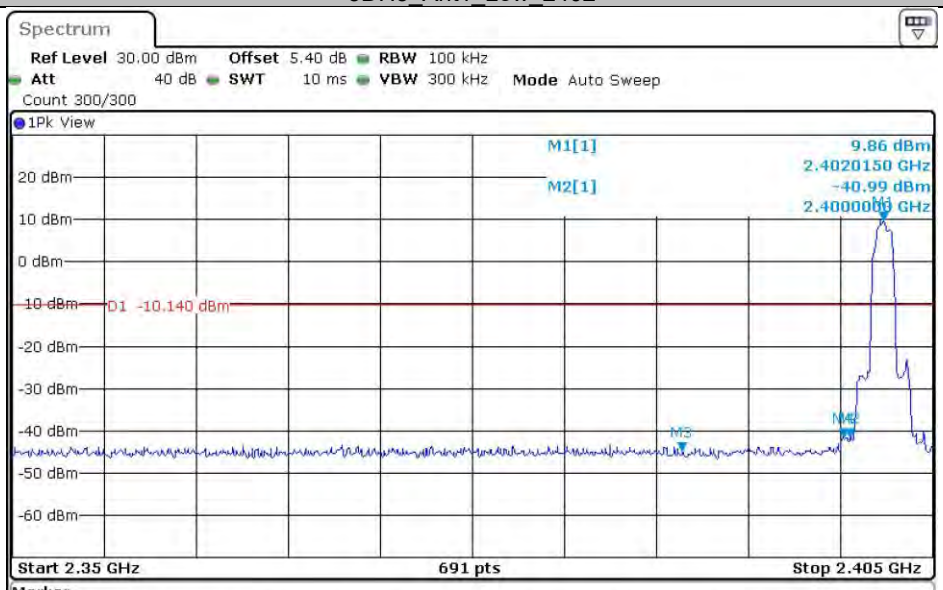


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4711 GHz	9.34 dBm		
M2		1	2.4835 GHz	-44.27 dBm		
M3		1	2.5 GHz	-43.31 dBm		
M4		1	2.526116 GHz	-42.17 dBm		

Date: 20.MAY.2021 06:07:04

3DH5_Ant1_Low_2402



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Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	9.86 dBm		
M2		1	2.4 GHz	-40.99 dBm		
M3		1	2.39 GHz	-44.83 dBm		
M4		1	2.3996594 GHz	-41.48 dBm		

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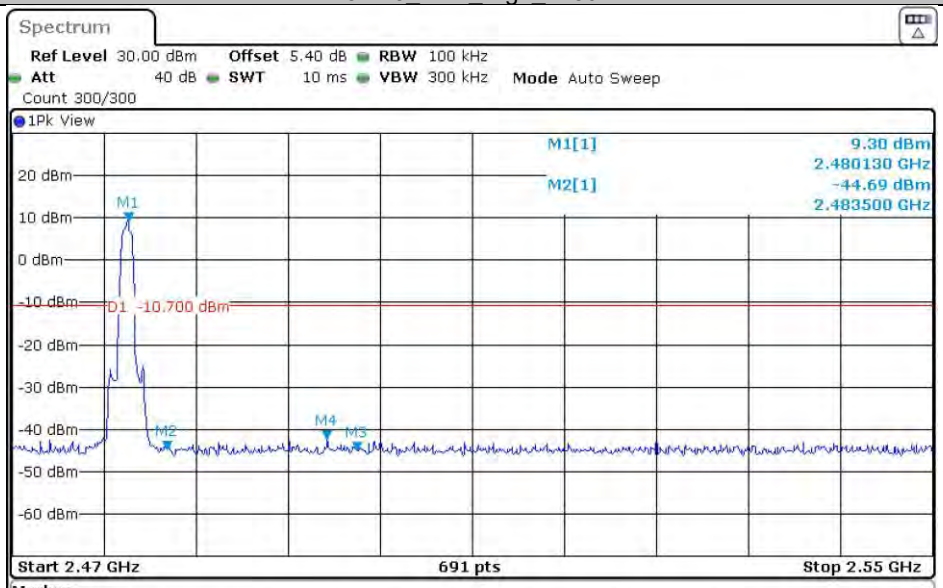
3DH5_Ant1_High_2480

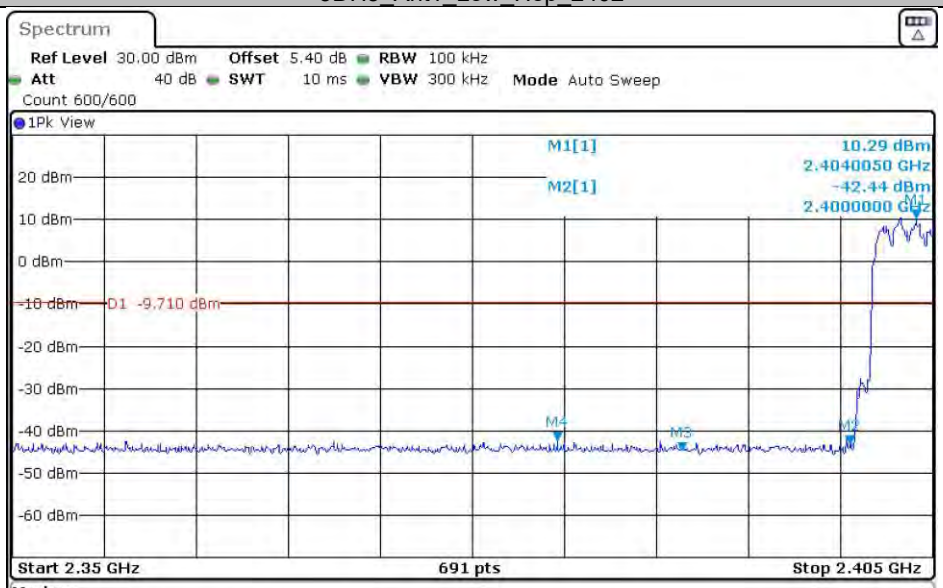


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48013 GHz	9.30 dBm		
M2		1	2.4835 GHz	-44.69 dBm		
M3		1	2.5 GHz	-45.10 dBm		
M4		1	2.497362 GHz	-42.38 dBm		

Date: 20.MAY.2021 05:53:37

3DH5_Ant1_Low_Hop_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404005 GHz	10.29 dBm		
M2		1	2.4 GHz	-42.44 dBm		
M3		1	2.39 GHz	-44.71 dBm		
M4		1	2.3826014 GHz	-42.35 dBm		

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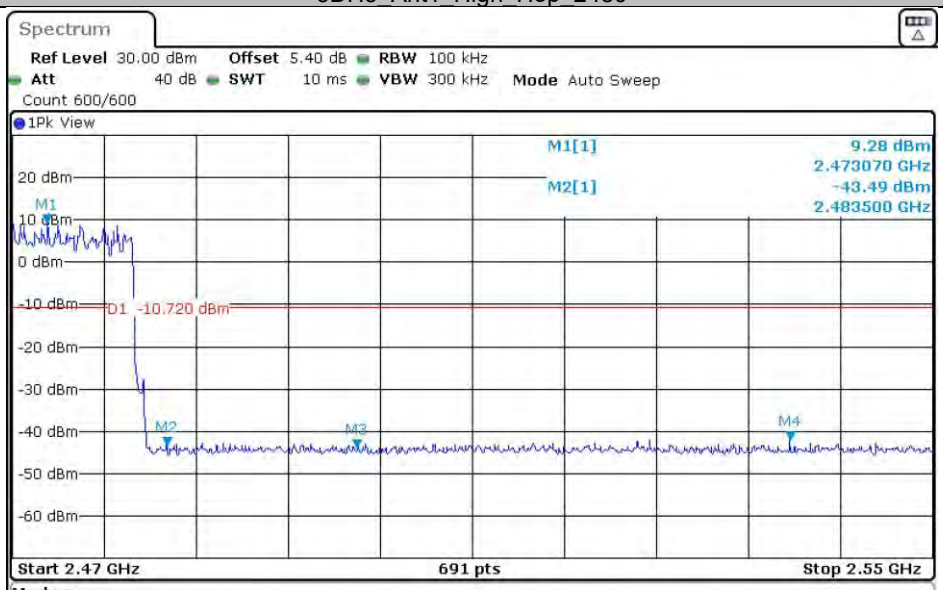
3DH5_Ant1_High_Hop_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47307 GHz	9.28 dBm		
M2		1	2.4835 GHz	-43.49 dBm		
M3		1	2.5 GHz	-43.86 dBm		
M4		1	2.537594 GHz	-41.94 dBm		

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Conducted Spurious Emission

Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	13.26	13.26	---	PASS
			30~1000	13.26	-41.84	<=-6.74	PASS
			1000~26500	13.26	-26.4	<=-6.74	PASS
		2441	Reference	13.74	13.74	---	PASS
			30~1000	13.74	-39.61	<=-6.26	PASS
			1000~26500	13.74	-26.55	<=-6.26	PASS
		2480	Reference	11.88	11.88	---	PASS
			30~1000	11.88	-40.56	<=-8.12	PASS
			1000~26500	11.88	-26.58	<=-8.12	PASS
2DH5	Ant1	2402	Reference	10.60	10.60	---	PASS
			30~1000	10.60	-40.72	<=-9.4	PASS
			1000~26500	10.60	-26.36	<=-9.4	PASS
		2441	Reference	11.14	11.14	---	PASS
			30~1000	11.14	-40.19	<=-8.86	PASS
			1000~26500	11.14	-25.37	<=-8.86	PASS
		2480	Reference	9.39	9.39	---	PASS
			30~1000	9.39	-40.84	<=-10.61	PASS
			1000~26500	9.39	-26.64	<=-10.61	PASS
3DH5	Ant1	2402	Reference	10.87	10.87	---	PASS
			30~1000	10.87	-40.88	<=-9.13	PASS
			1000~26500	10.87	-26.25	<=-9.13	PASS
		2441	Reference	11.06	11.06	---	PASS
			30~1000	11.06	-41.05	<=-8.94	PASS
			1000~26500	11.06	-26.21	<=-8.94	PASS
		2480	Reference	9.27	9.27	---	PASS
			30~1000	9.27	-41.36	<=-10.73	PASS
			1000~26500	9.27	-26.09	<=-10.73	PASS

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Test Graphs

DH5_Ant1_2402_0~Reference

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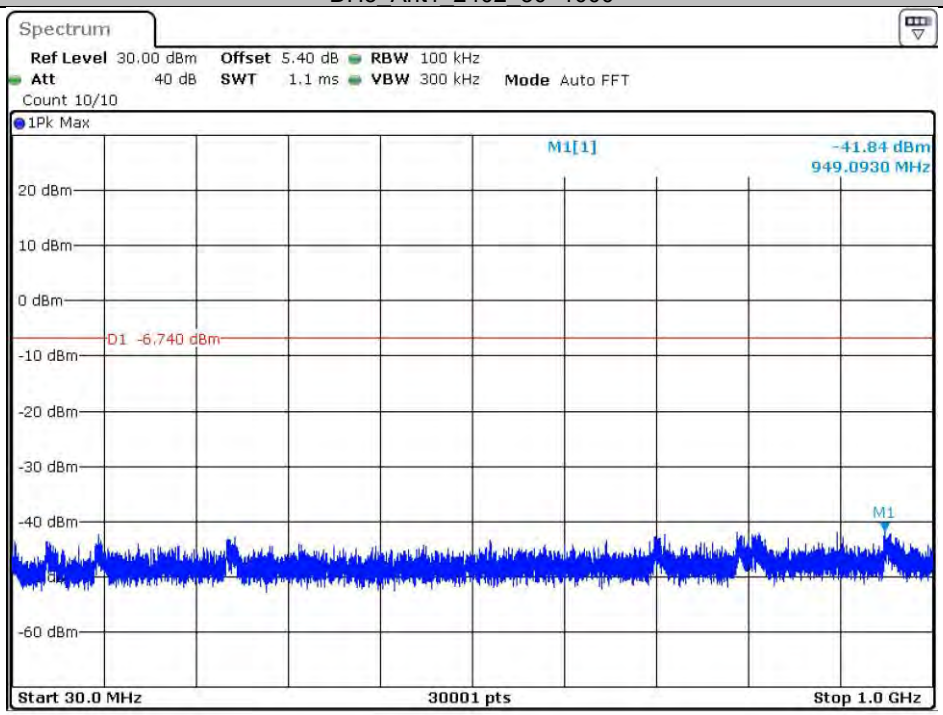
DH5_Ant1_2402_30~1000



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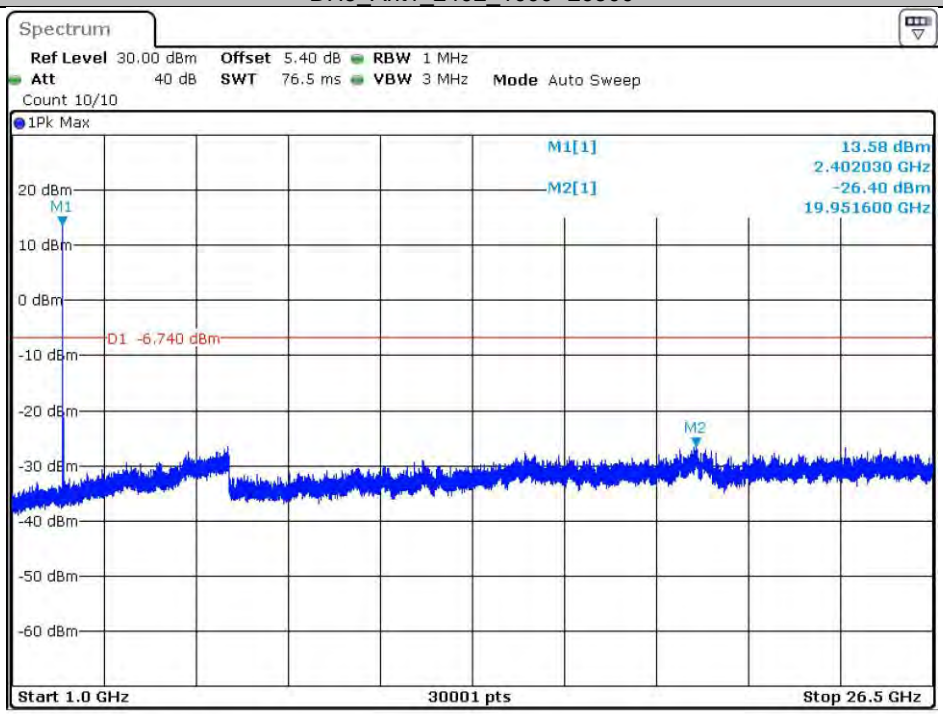
DH5_Ant1_2402_1000~26500



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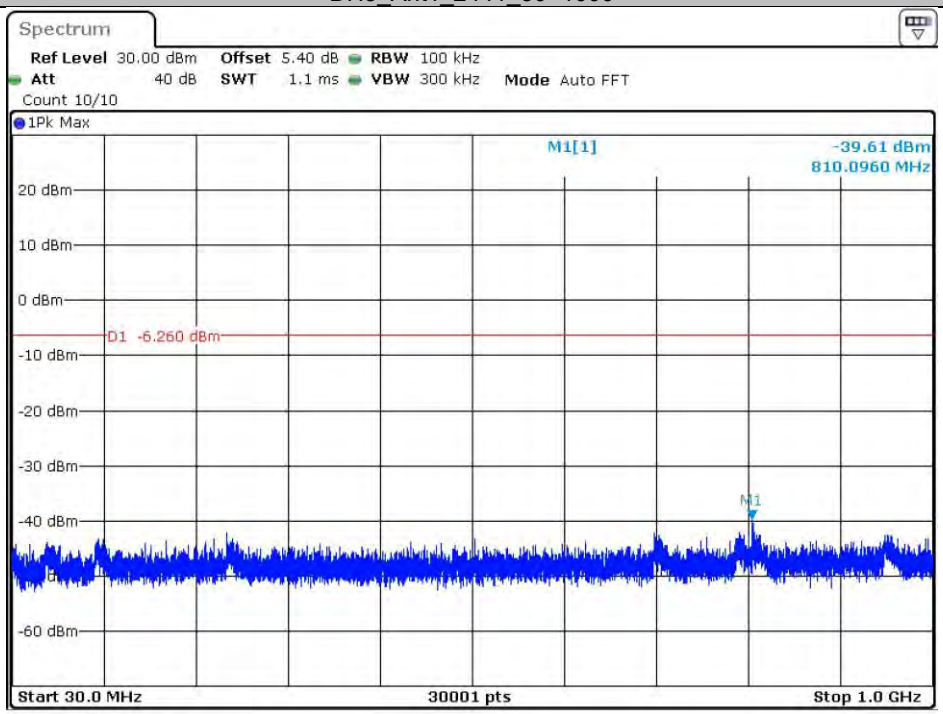
DH5_Ant1_2441_0~Reference

Date: 17.MAY.2021 03:13:10

DH5_Ant1_2441_30~1000



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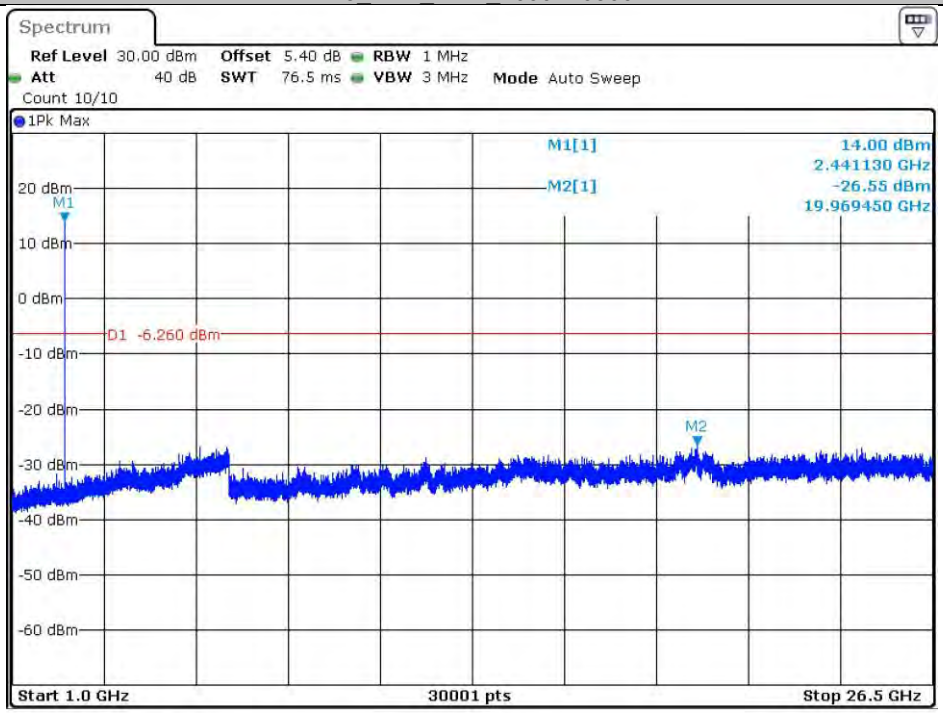
DH5_Ant1_2441_1000~26500



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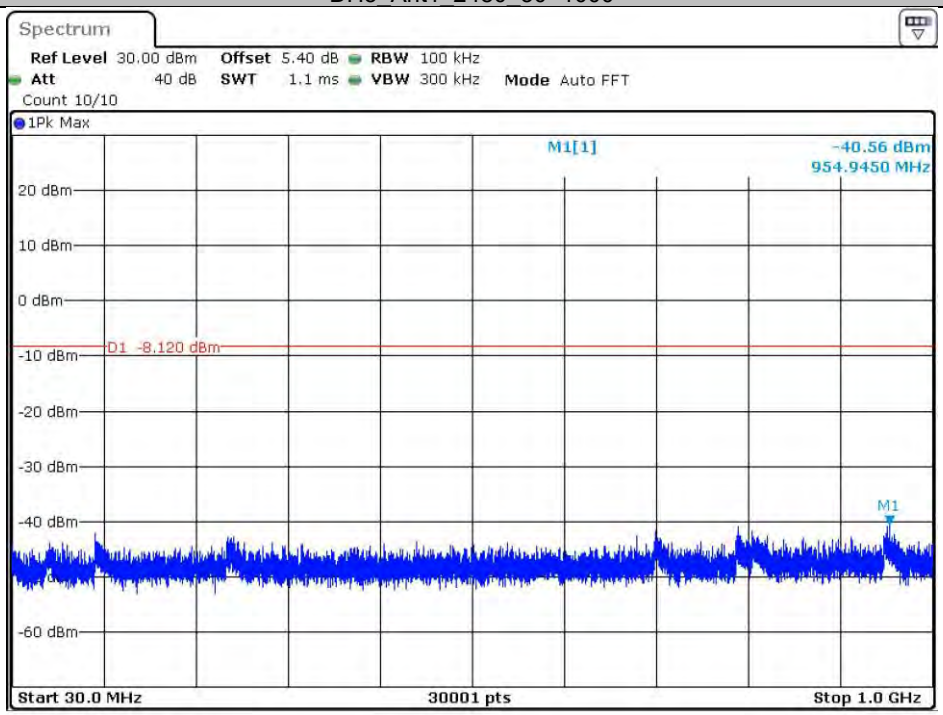
DH5_Ant1_2480_30~1000



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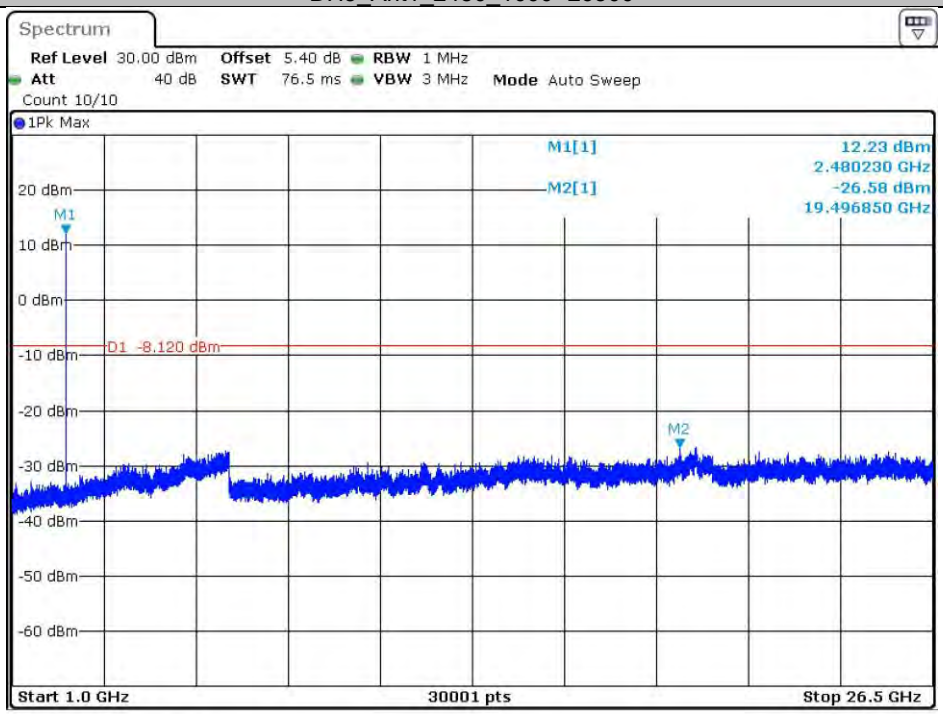

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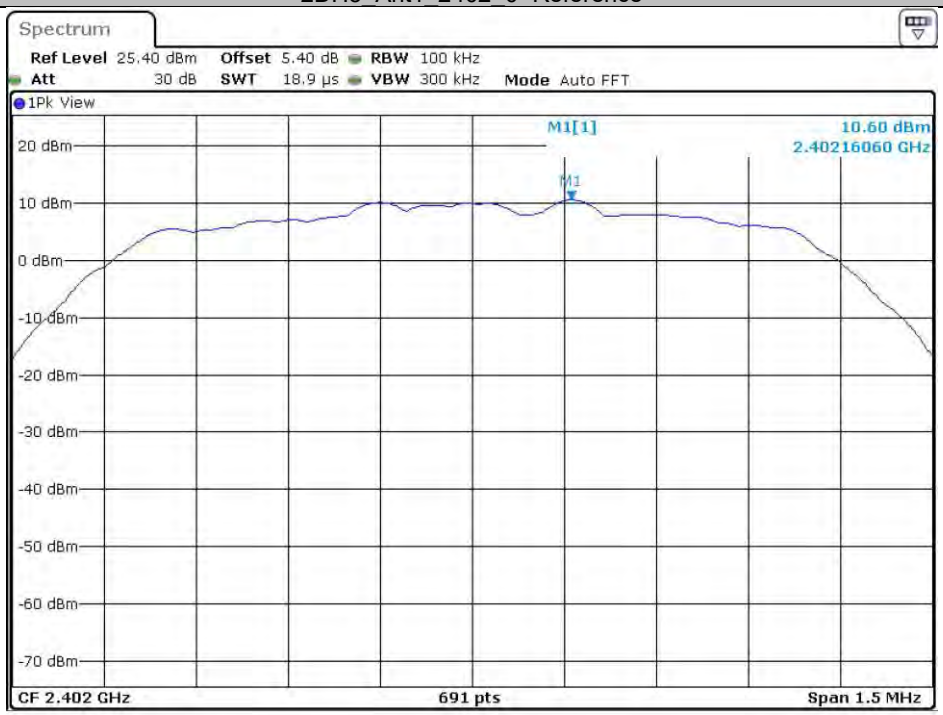
2DH5_Ant1_2402_0~Reference



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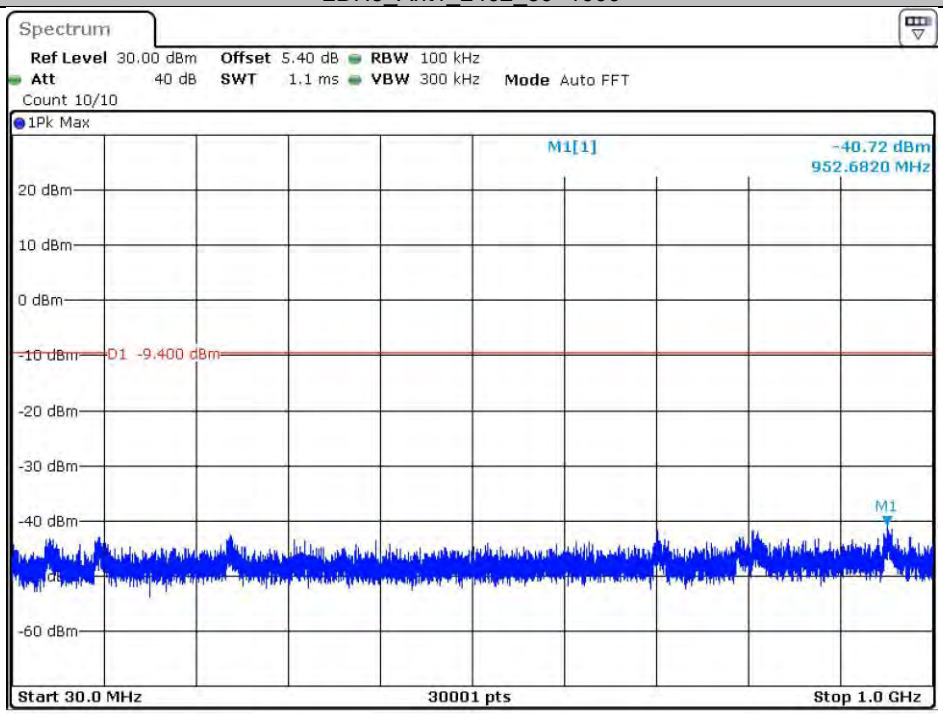

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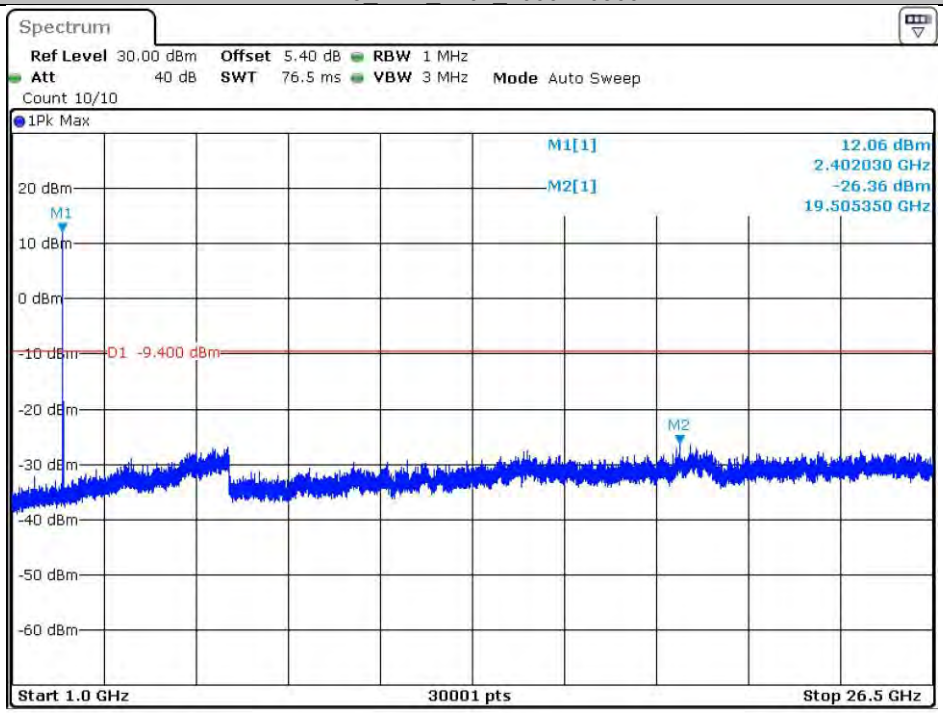
2DH5_Ant1_2402_1000~26500



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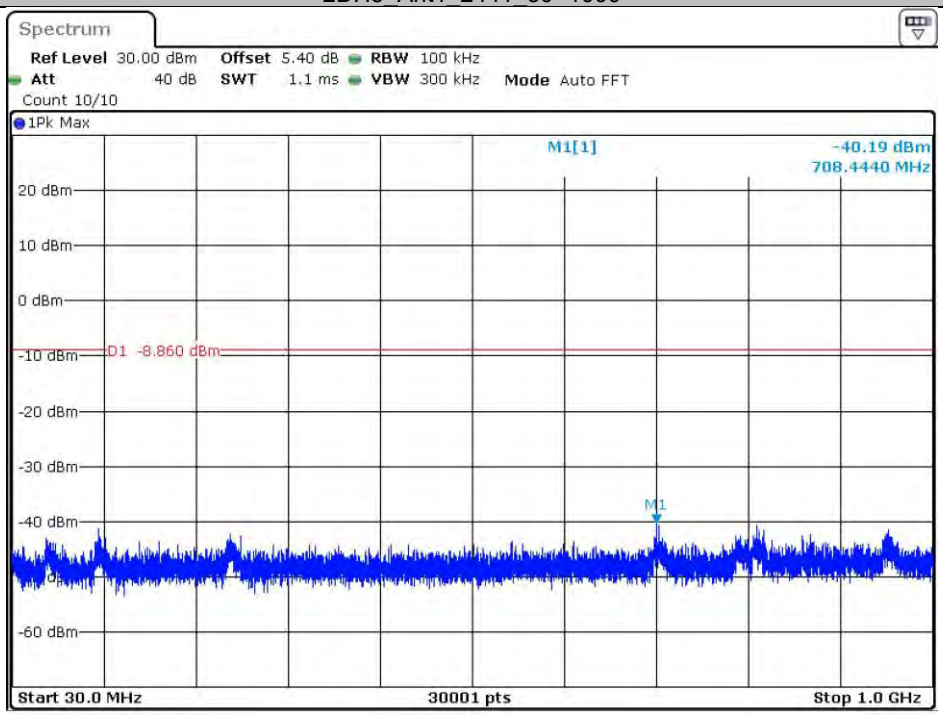
2DH5_Ant1_2441_30~1000



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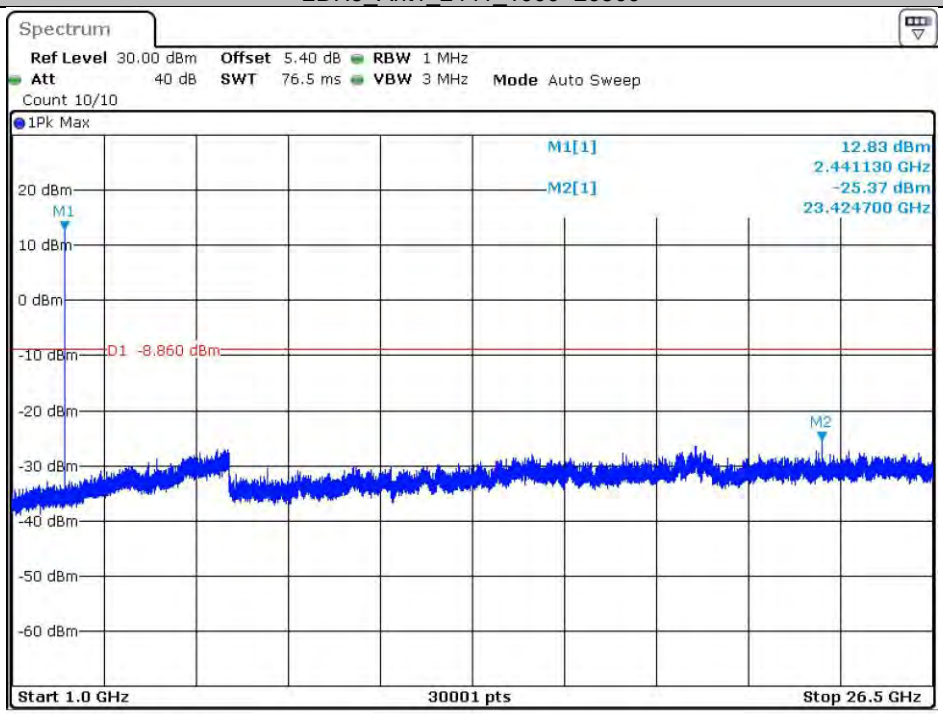

Date: 17.MAY.2021 03:19:02

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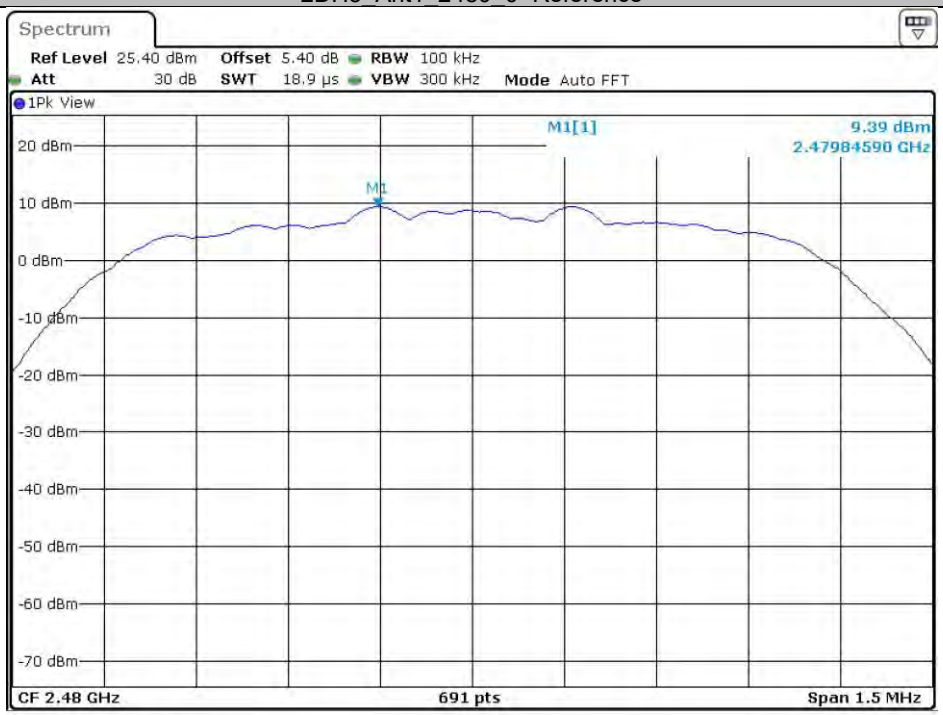
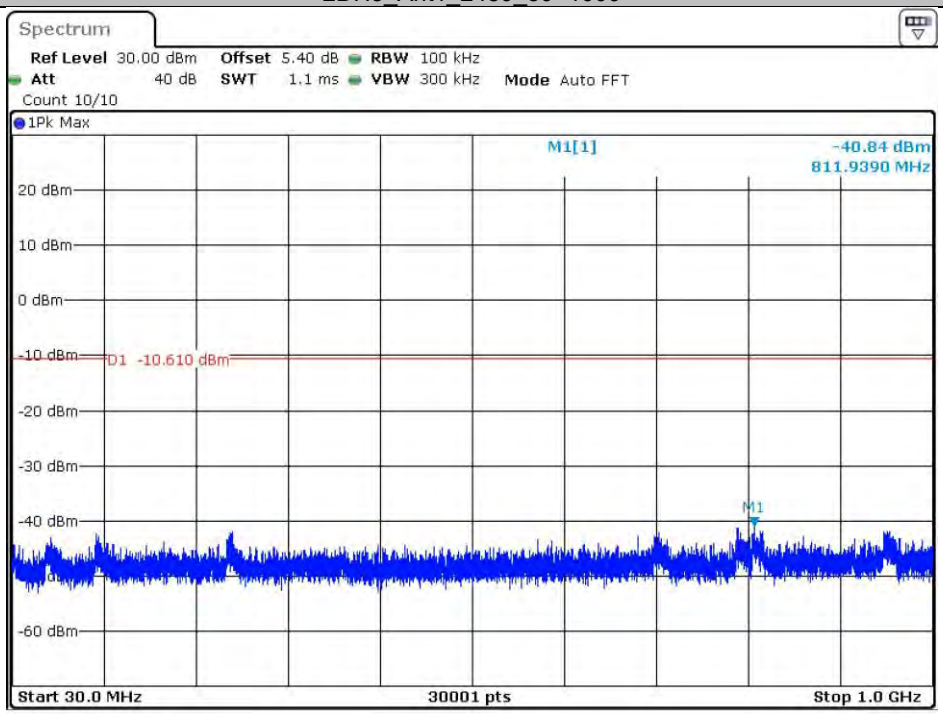
2DH5_Ant1_2480_0~Reference



Date: 17.MAY.2021 03:20:17

2DH5_Ant1_2480_30~1000



Date: 17.MAY.2021 03:20:22

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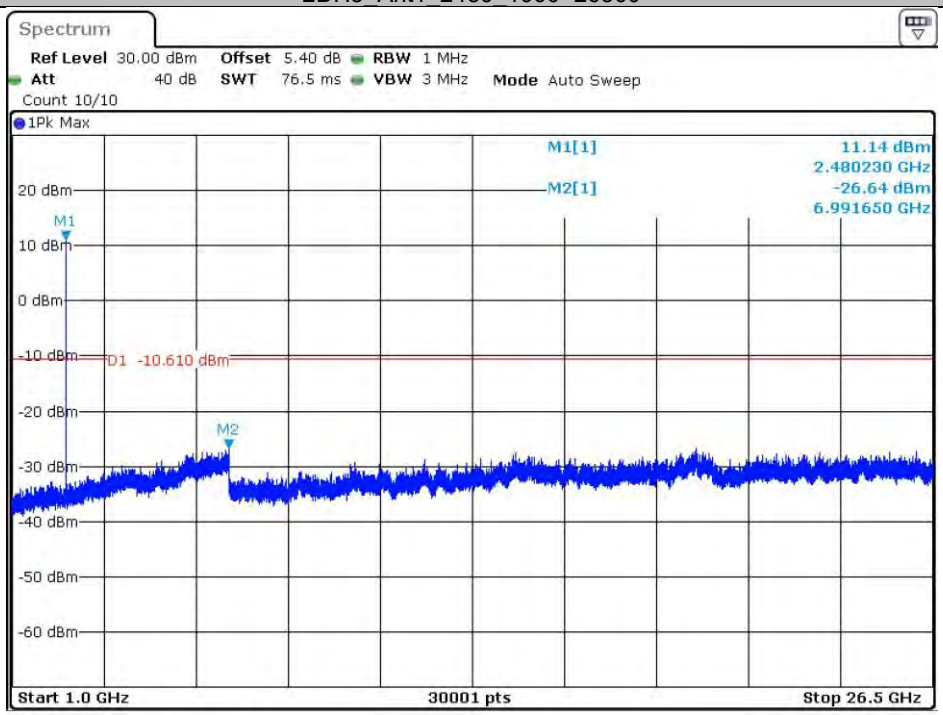

Date: 17.MAY.2021 03:20:44

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Date: 17.MAY.2021 03:22:34

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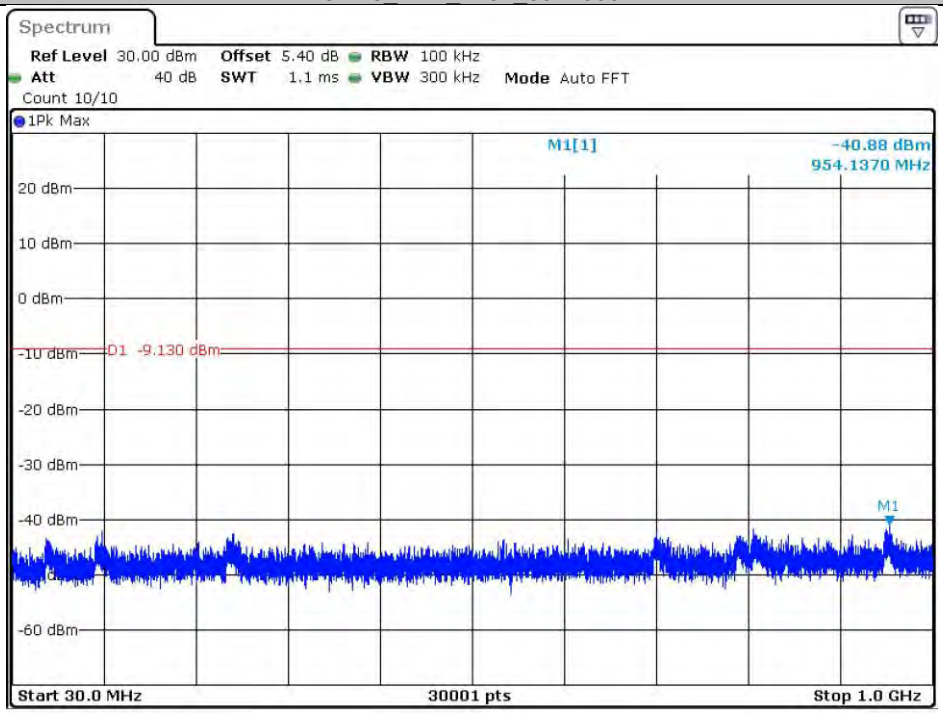

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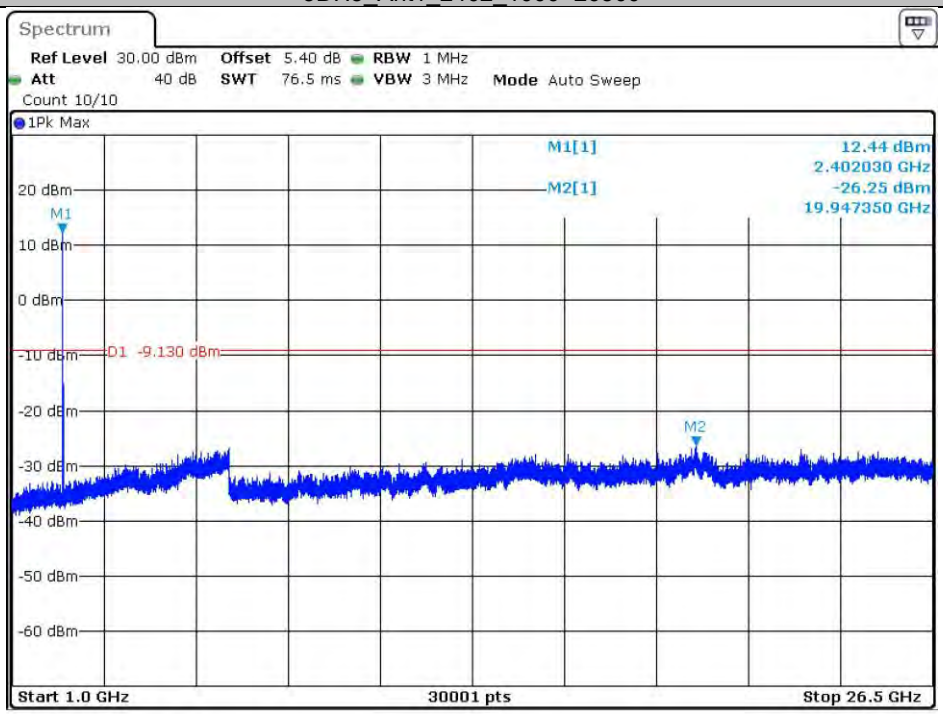

Date: 17.MAY.2021 03:23:00

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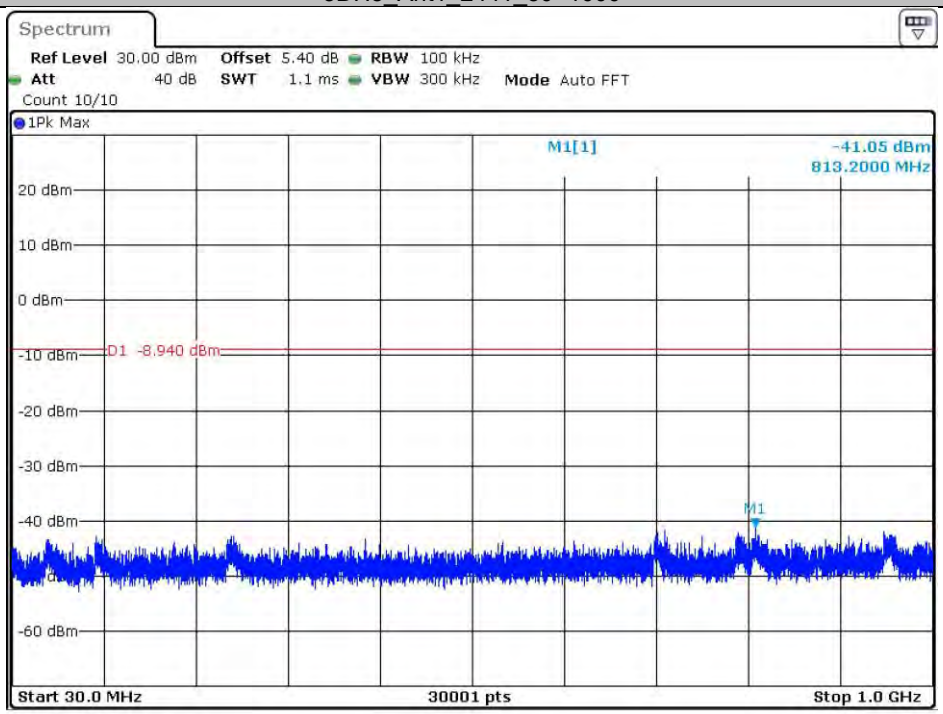
3DH5_Ant1_2441_0~Reference

Date: 17.MAY.2021 03:26:54

3DH5_Ant1_2441_30~1000



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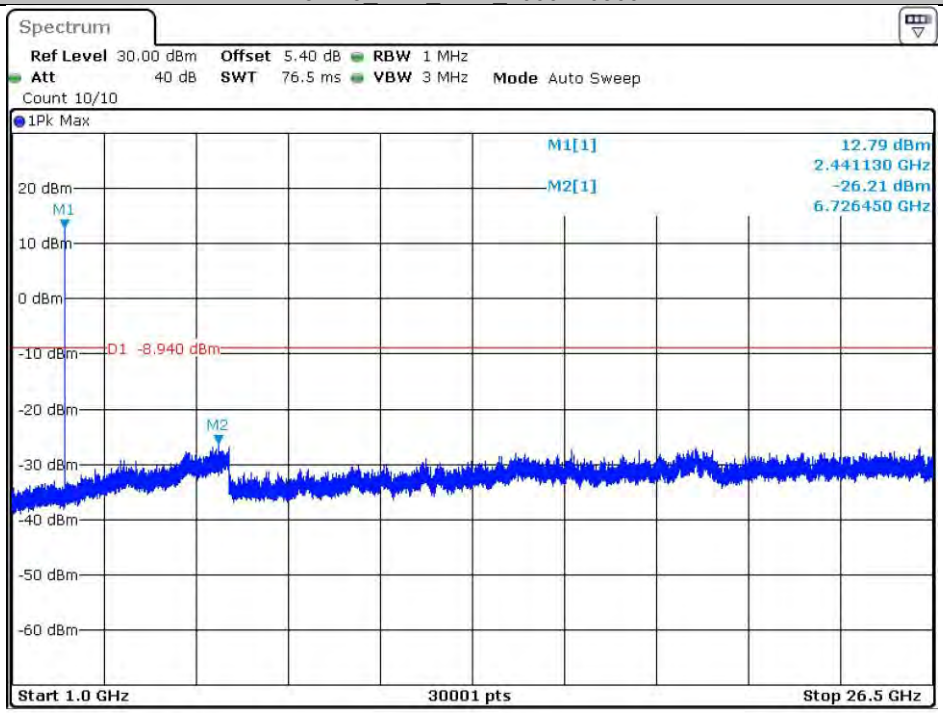
3DH5_Ant1_2441_1000~26500



Date: 17.MAY.2021 03:27:20

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Date: 20.MAY.2021 05:53:42

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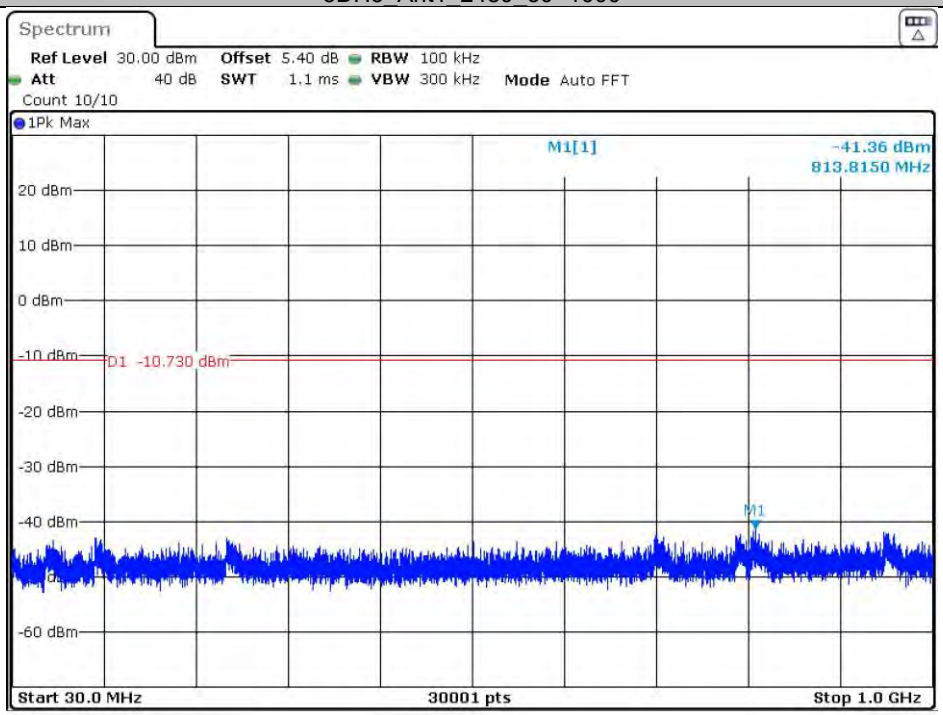

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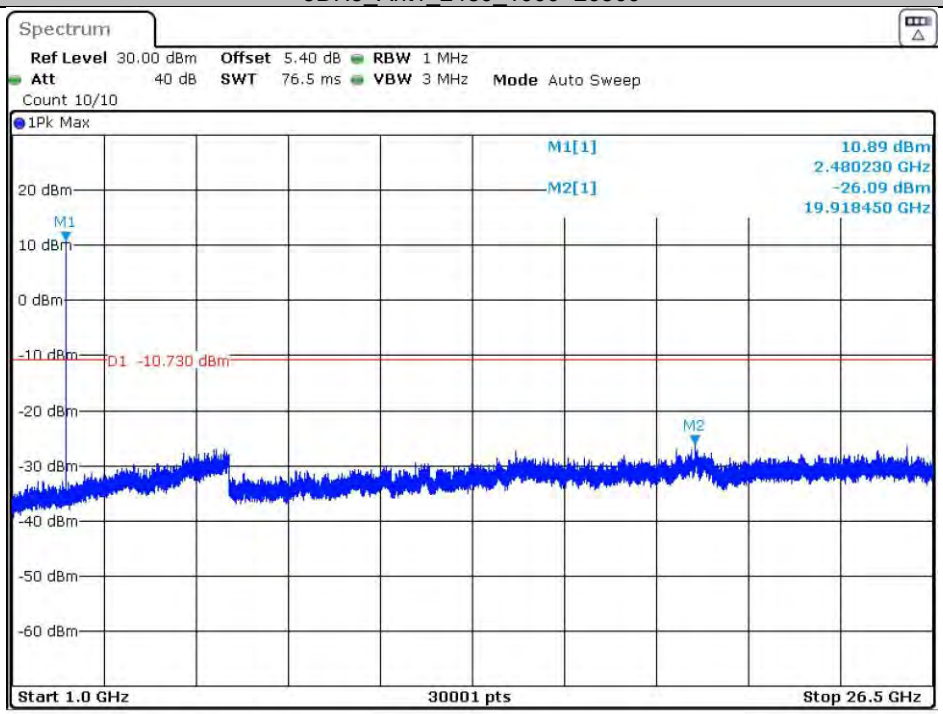

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Duty Cycle

Test Result

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
DH5	Ant1	2402	2.86	3.73	76.68	---	PASS
		2441	2.86	3.73	76.68	---	PASS
		2480	2.86	3.73	76.68	---	PASS
2DH5	Ant1	2402	2.86	3.73	76.68	---	PASS
		2441	2.86	3.73	76.68	---	PASS
		2480	2.86	3.73	76.68	---	PASS
3DH5	Ant1	2402	2.87	3.73	76.94	---	PASS
		2441	2.87	3.73	76.94	---	PASS
		2480	2.87	3.73	76.94	---	PASS

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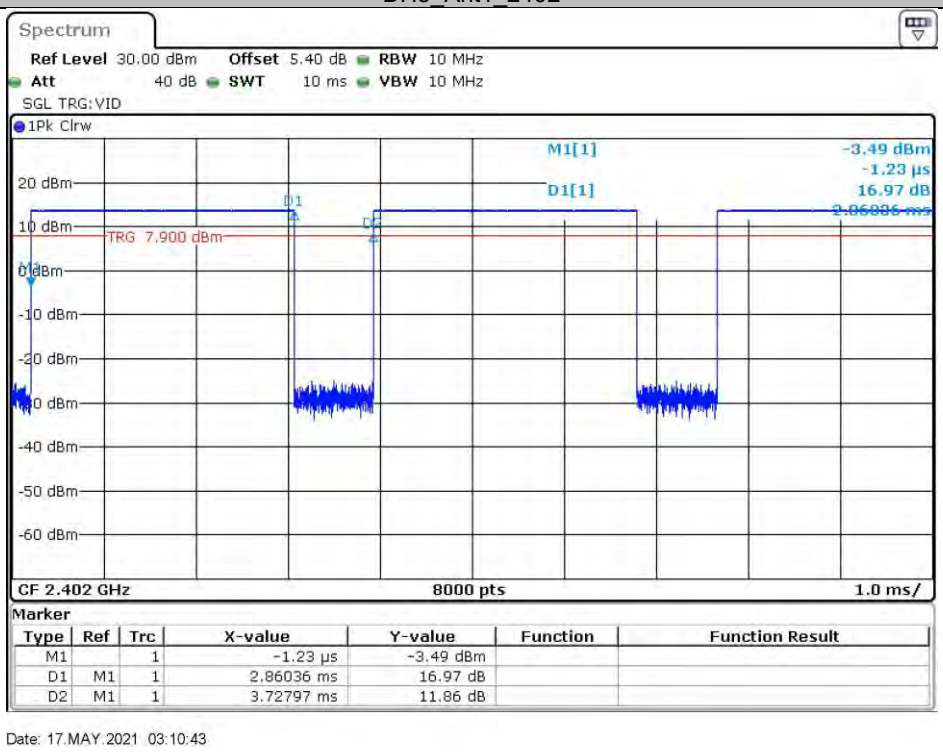
Test Graphs

DH5_Ant1_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.23 µs	-3.49 dBm		
D1	M1	1	2.86036 ms	16.97 dB		
D2	M1	1	3.72797 ms	11.86 dB		

Date: 17.MAY.2021 03:10:43

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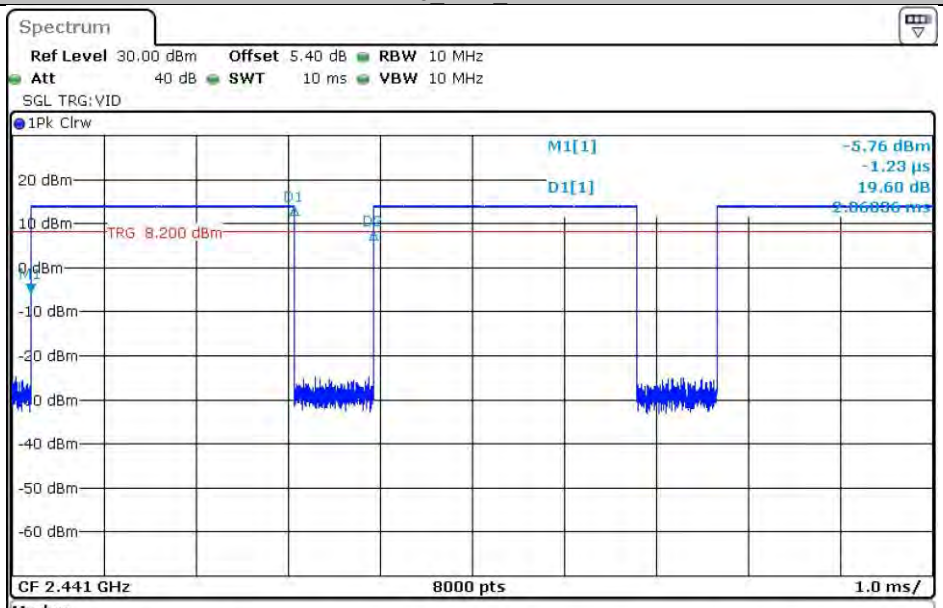
DH5_Ant1_2441

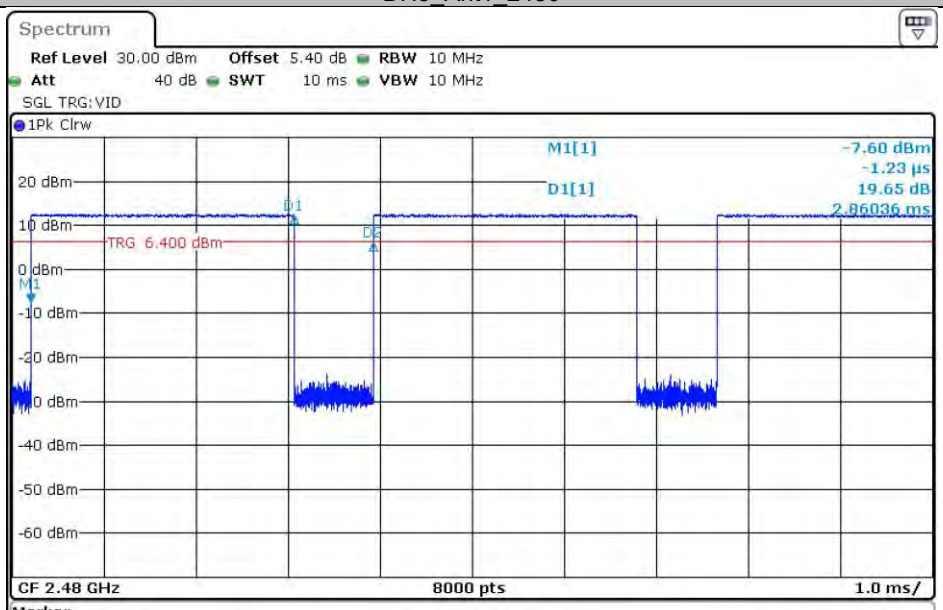


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.23 µs	-5.76 dBm		
D1	M1	1	2.86036 ms	19.60 dB		
D2	M1	1	3.72797 ms	13.94 dB		

Date: 17.MAY.2021 03:12:48

DH5_Ant1_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.23 µs	-7.60 dBm		
D1	M1	1	2.86036 ms	19.65 dB		
D2	M1	1	3.72797 ms	13.79 dB		

Date: 17.MAY.2021 03:14:50

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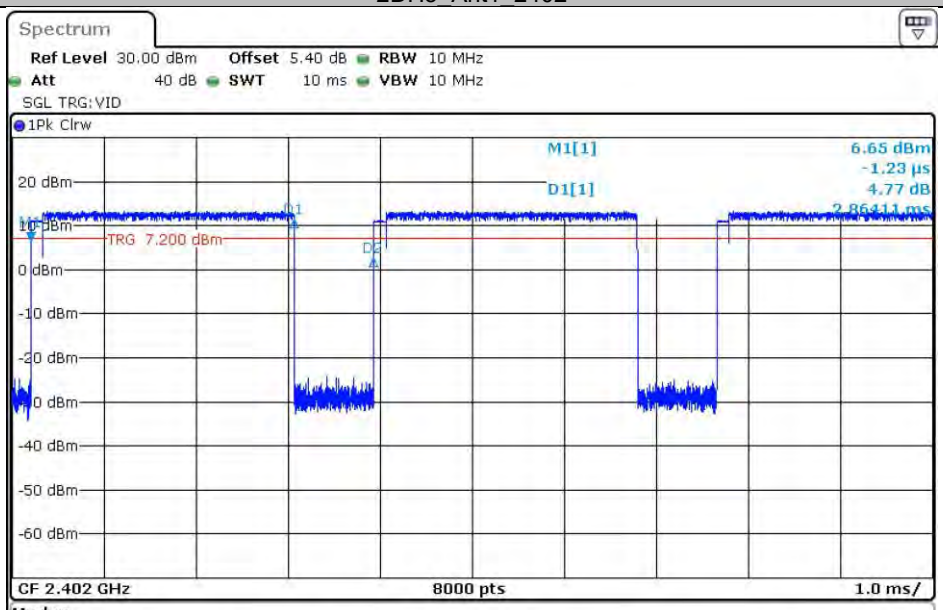
2DH5_Ant1_2402

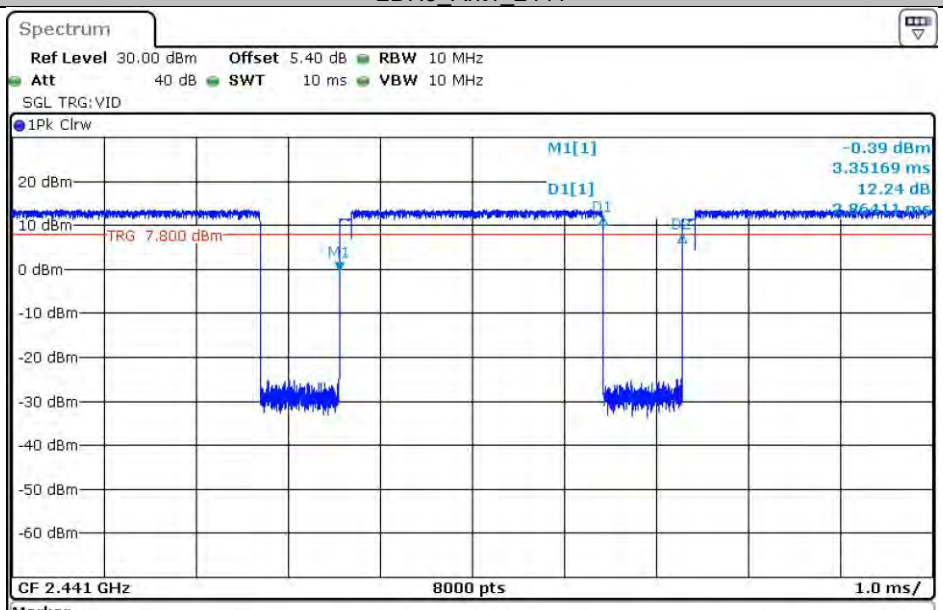


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.23 µs	6.65 dBm		
D1	M1	1	2.86411 ms	4.77 dB		
D2	M1	1	3.72672 ms	-4.08 dB		

Date: 17.MAY.2021 03:16:18

2DH5_Ant1_2441



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	3.35169 ms	-0.39 dBm		
D1	M1	1	2.86411 ms	12.24 dB		
D2	M1	1	3.72797 ms	8.31 dB		

Date: 17.MAY.2021 03:18:08

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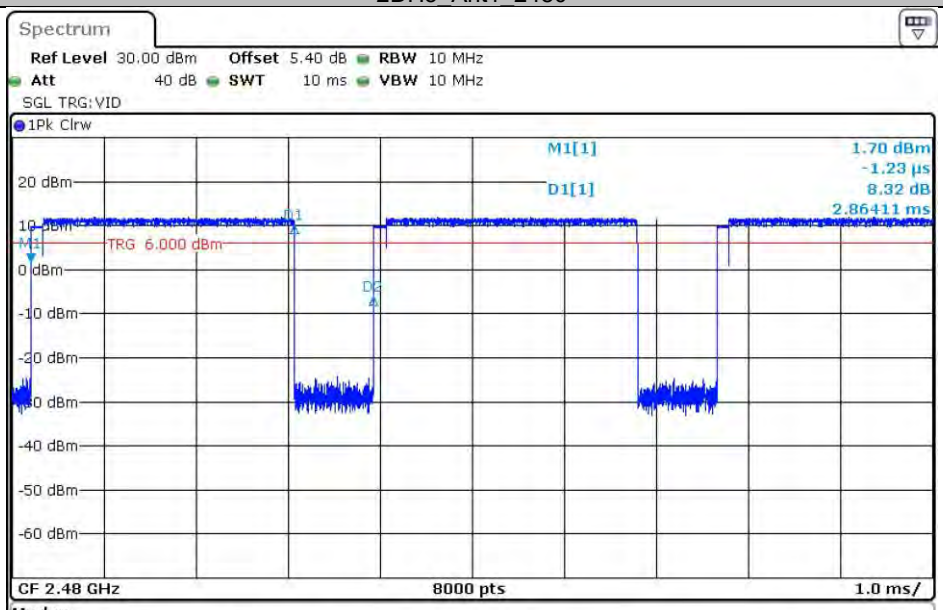
2DH5_Ant1_2480

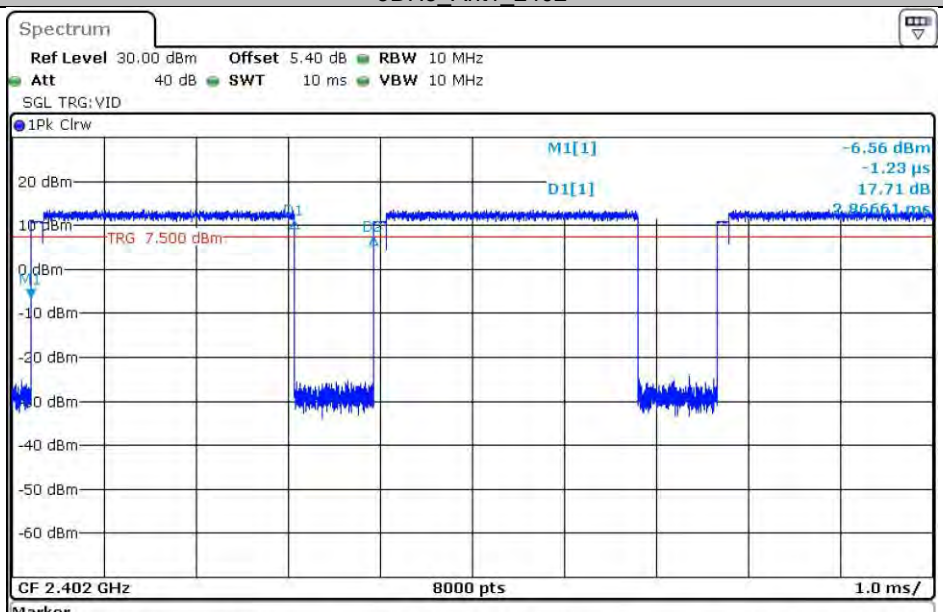


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.23 µs	1.70 dBm		
D1	M1	1	2.86411 ms	8.32 dB		
D2	M1	1	3.72672 ms	-7.94 dB		

Date: 17.MAY.2021 03:19:41

3DH5_Ant1_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-1.23 µs	-6.56 dBm		
D1	M1	1	2.86661 ms	17.71 dB		
D2	M1	1	3.72922 ms	14.05 dB		

Date: 17.MAY.2021 03:21:58

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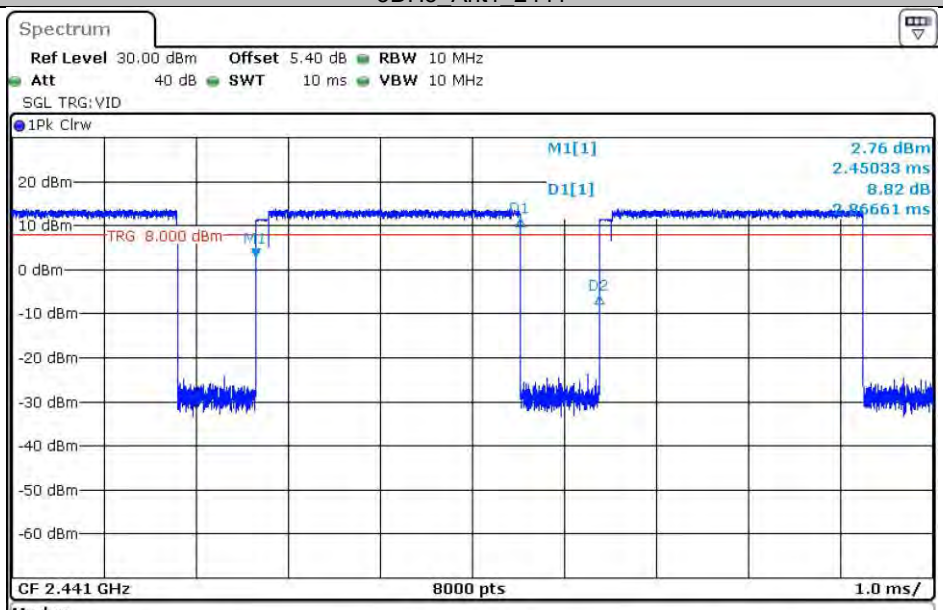
3DH5_Ant1_2441

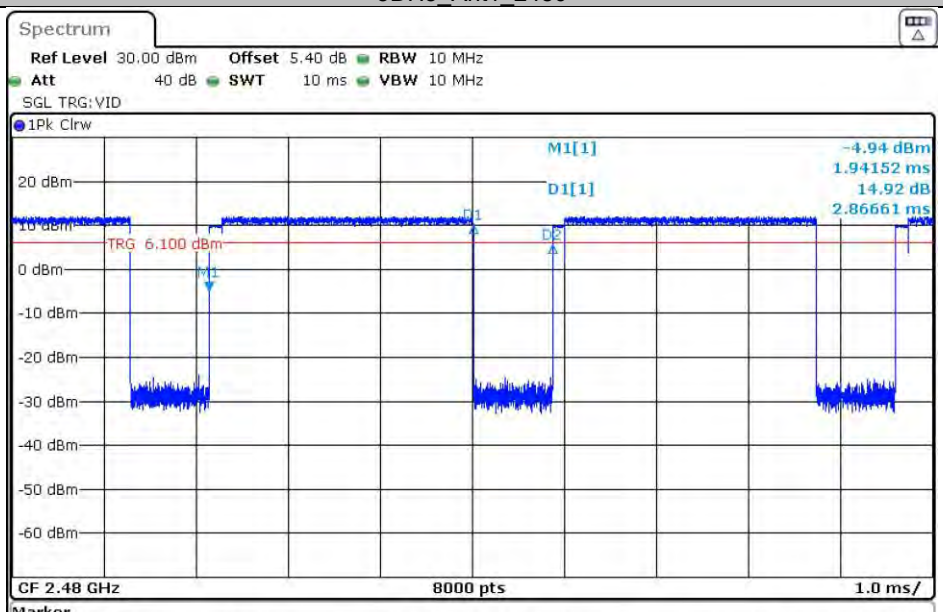


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45033 ms	2.76 dBm		
D1	M1	1	2.86661 ms	8.82 dB		
D2	M1	1	3.72672 ms	-8.54 dB		

Date: 17.MAY.2021 03:26:26

3DH5_Ant1_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.94152 ms	-4.94 dBm		
D1	M1	1	2.86661 ms	14.92 dB		
D2	M1	1	3.72797 ms	10.44 dB		

Date: 20.MAY.2021 05:53:05

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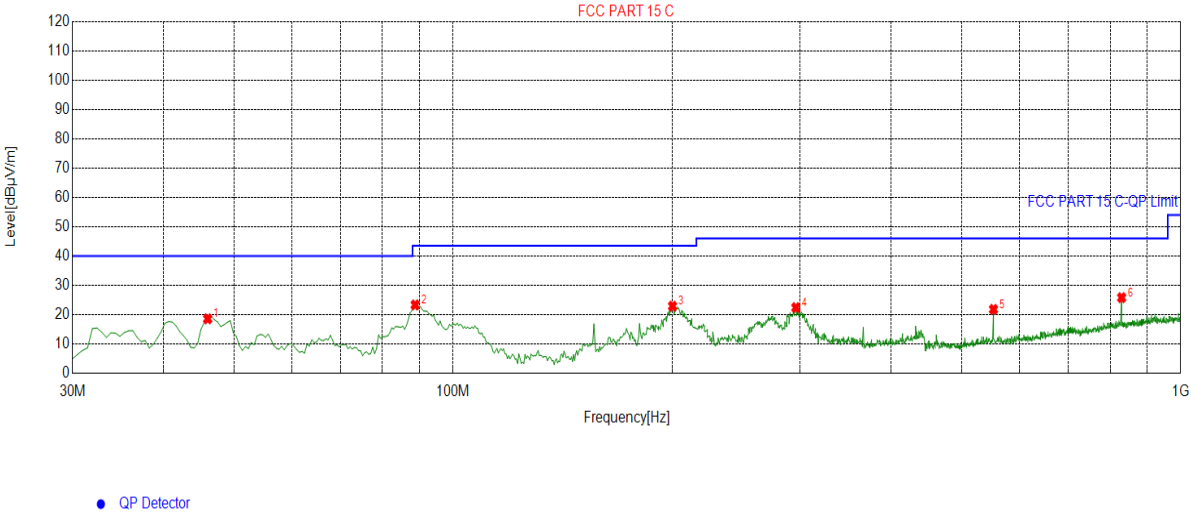
7.1 Radiated Spurious Emission

Radiated Emission below 1GHz

Charge + Transmitting

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	46.0130	18.59	-21.40	40.00	21.41	154	179	Horizontal
2	88.7144	23.33	-24.85	43.50	20.17	174	257	Horizontal
3	200.320	22.90	-22.49	43.50	20.60	165	214	Horizontal
4	295.913	22.40	-19.43	46.00	23.60	184	35	Horizontal
5	553.091	21.80	-13.03	46.00	24.20	175	286	Horizontal
6	829.679	25.80	-8.70	46.00	20.20	251	289	Horizontal

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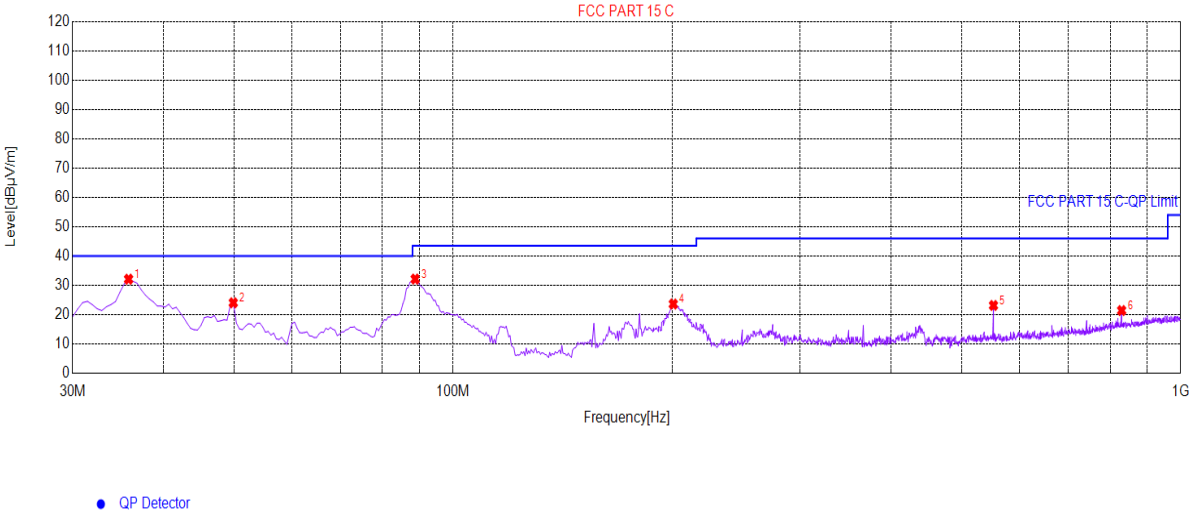

Suspected List

Suspected List								
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1	35.8229	32.10	-23.68	40.00	7.90	252	2	Vertical
2	49.8949	24.04	-21.36	40.00	15.96	174	349	Vertical
3	88.7144	32.14	-24.85	43.50	11.36	265	106	Vertical
4	200.805	23.62	-22.45	43.50	19.88	174	224	Vertical
5	553.091	23.14	-13.03	46.00	22.86	224	35	Vertical
6	829.679	21.41	-8.70	46.00	24.59	217	148	Vertical

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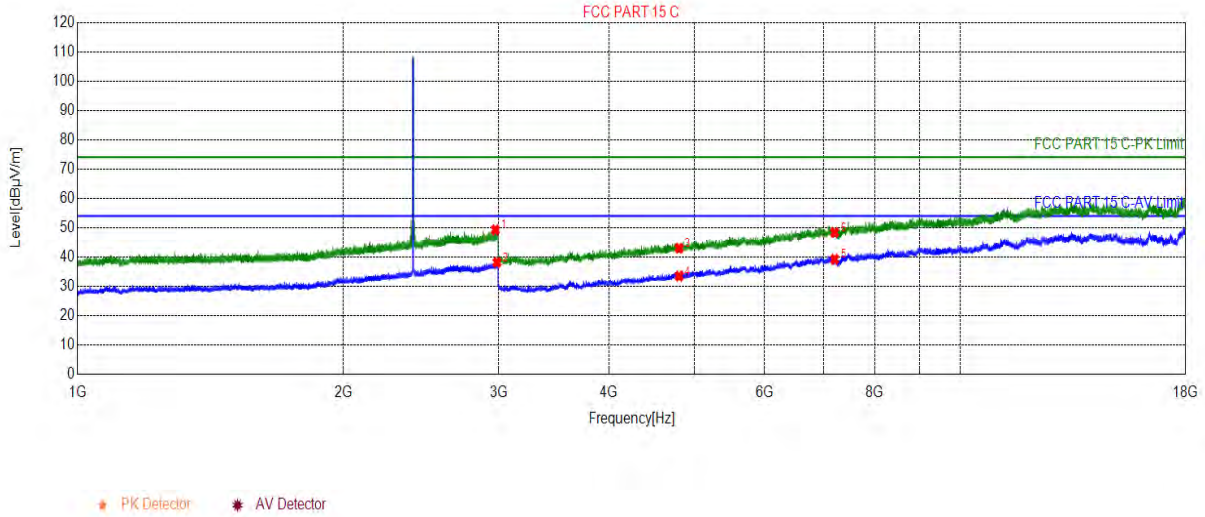
GFSK_Channel CH0

Test Graph



Suspected List

Suspected List								
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1	2974.19	49.27	10.42	74.00	24.73	258	344	Horizontal
2	2986.69	38.16	10.51	54.00	15.84	265	107	Horizontal
3	4804.00	42.99	-15.41	74.00	31.01	189	307	Horizontal
4	4804.00	33.50	-15.41	54.00	20.50	197	37	Horizontal
5	7206.00	39.22	-8.59	54.00	14.78	153	211	Horizontal
6	7206.00	48.35	-8.59	74.00	25.65	241	87	Horizontal

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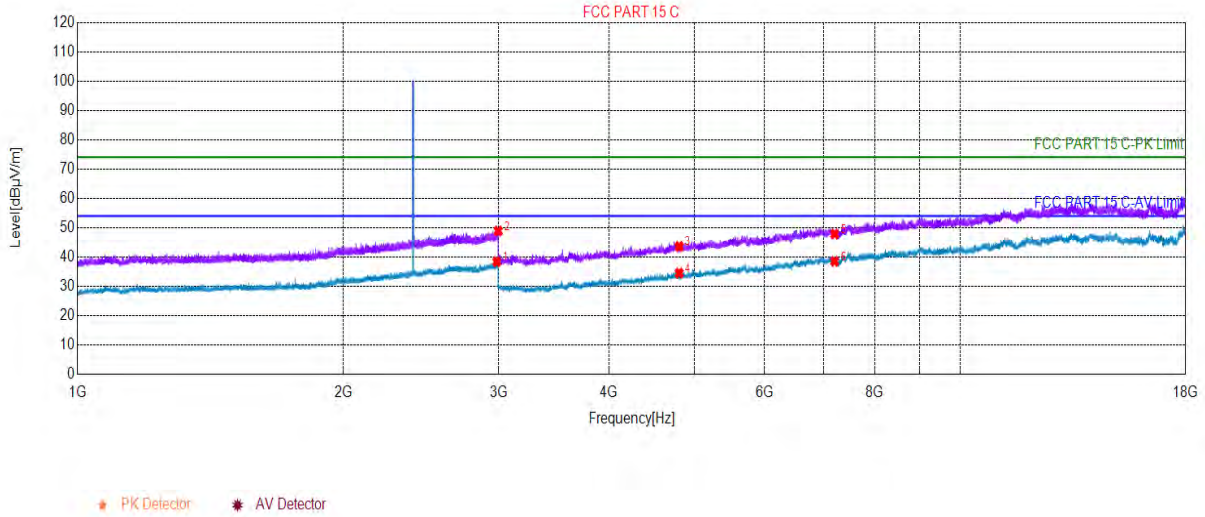
Test Graph



Suspected List

Suspected List								
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1	2984.79	38.42	10.52	54.00	15.58	185	76	Vertical
2	2995.79	48.85	10.68	74.00	25.15	196	198	Vertical
3	4804.00	43.58	-15.41	74.00	30.42	215	27	Vertical
4	4804.00	34.49	-15.41	54.00	19.51	234	176	Vertical
5	7206.00	47.83	-8.59	74.00	26.17	258	114	Vertical
6	7206.00	38.53	-8.59	54.00	15.47	291	193	Vertical

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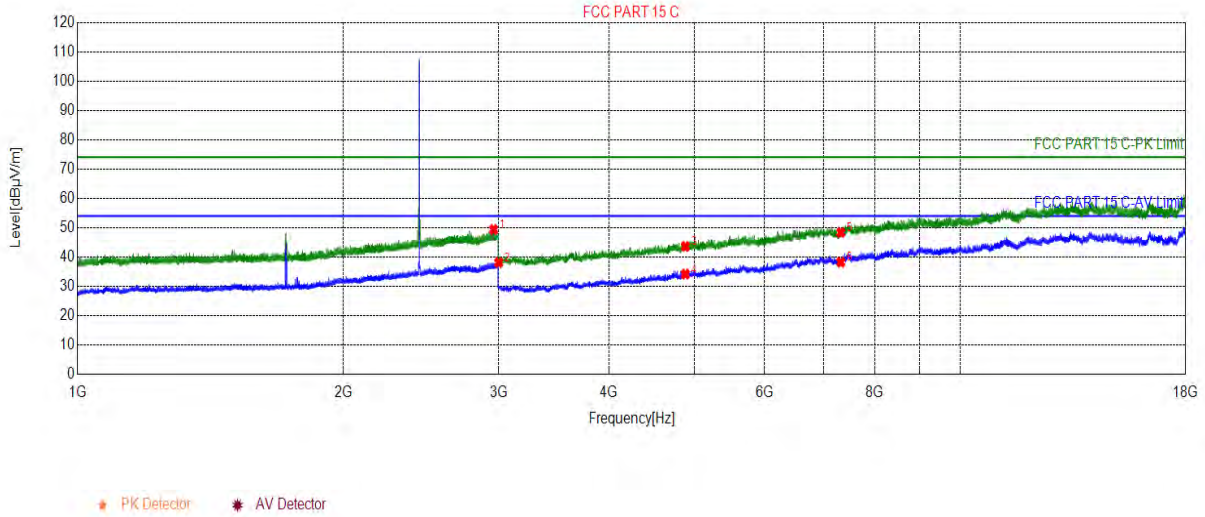
Test Graph



Suspected List

Suspected List								
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1	2959.49	49.37	10.52	74.00	24.63	218	108	Horizontal
2	2999.60	38.09	10.80	54.00	15.91	223	252	Horizontal
3	4882.00	43.62	-15.06	74.00	30.38	239	27	Horizontal
4	4882.00	34.15	-15.06	54.00	19.85	258	315	Horizontal
5	7323.00	48.36	-8.54	74.00	25.64	269	342	Horizontal
6	7323.00	38.23	-8.54	54.00	15.77	169	194	Horizontal

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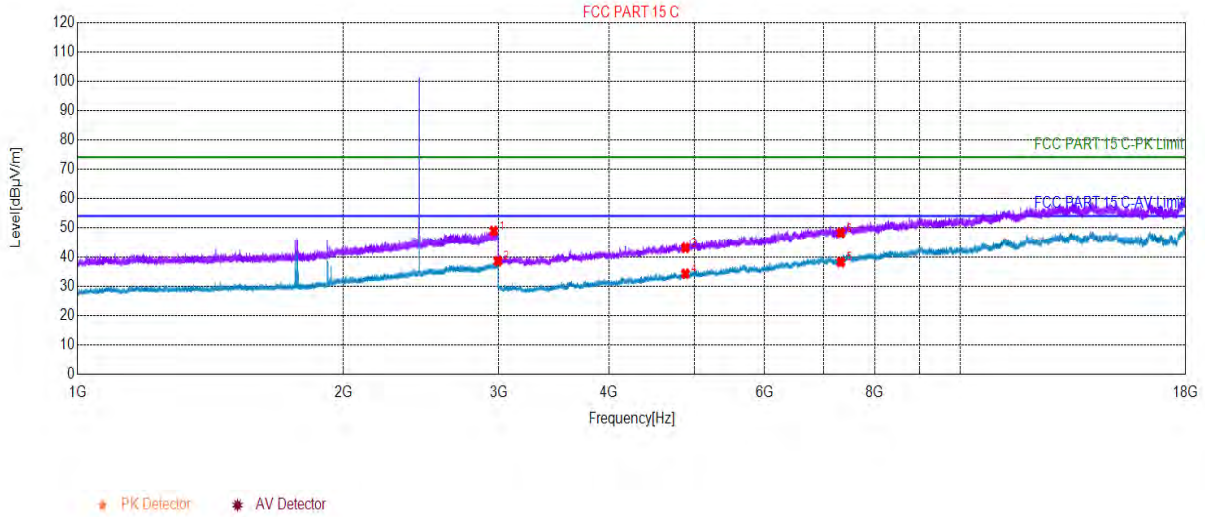
GFSK _Channel CH39

Test Graph



Suspected List

Suspected List								
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1	2960.49	48.85	10.51	74.00	25.15	257	281	Vertical
2	2993.59	38.61	10.60	54.00	15.39	139	221	Vertical
3	4882.00	43.19	-15.06	74.00	30.81	169	218	Vertical
4	4882.00	34.28	-15.06	54.00	19.72	230	218	Vertical
5	7323.00	38.25	-8.54	54.00	15.75	195	315	Vertical
6	7323.00	48.18	-8.54	74.00	25.82	209	245	Vertical

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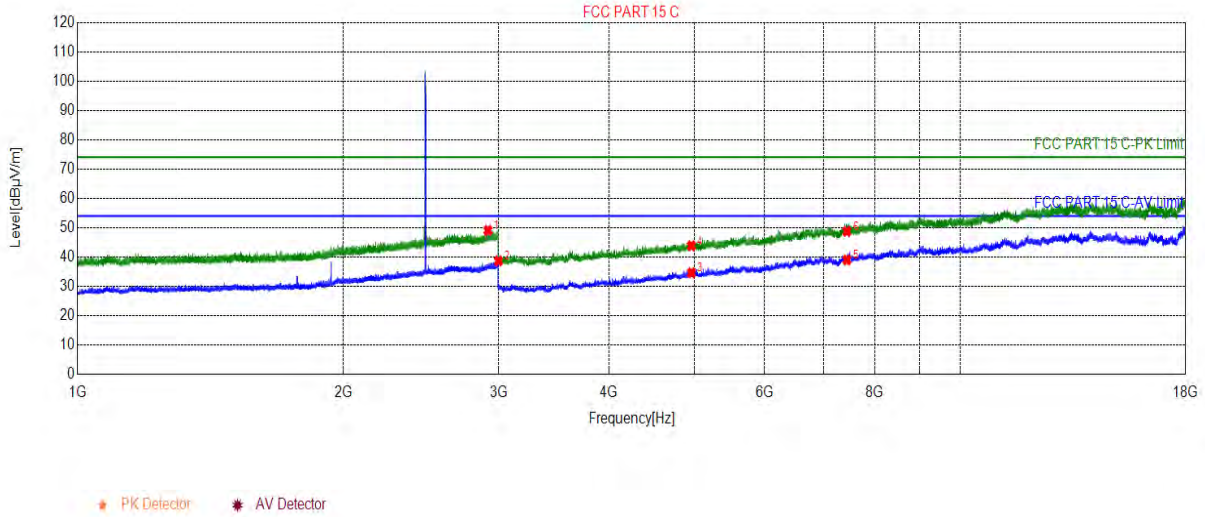
Test Graph



Suspected List

Suspected List								
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1	2917.09	49.07	10.34	74.00	24.93	158	346	Horizontal
2	2998.39	38.67	10.76	54.00	15.33	169	238	Horizontal
3	4960.00	34.60	-14.40	54.00	19.40	173	158	Horizontal
4	4960.00	43.83	-14.40	74.00	30.17	203	333	Horizontal
5	7440.00	38.99	-7.31	54.00	15.01	285	44	Horizontal
6	7440.00	48.72	-7.31	74.00	25.28	294	254	Horizontal

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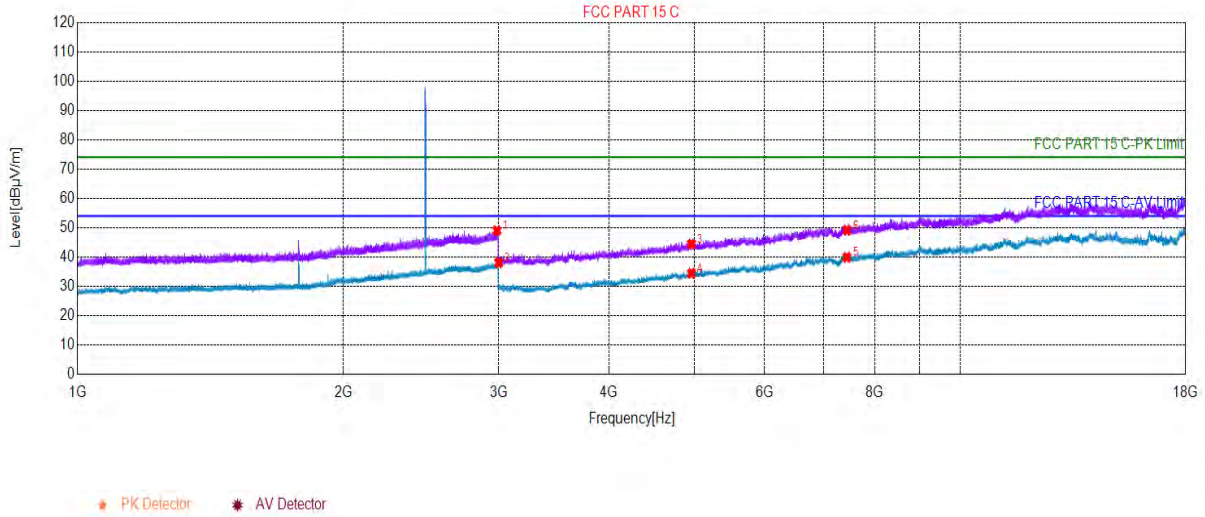
GFSK _Channel CH78

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2986.79	48.98	10.51	74.00	25.02	214	214	Vertical
2	2999.90	38.06	10.81	54.00	15.94	326	192	Vertical
3	4960.00	44.44	-14.40	74.00	29.56	218	34	Vertical
4	4960.00	34.43	-14.40	54.00	19.57	234	34	Vertical
5	7440.00	39.87	-7.31	54.00	14.13	169	342	Vertical
6	7440.00	49.13	-7.31	74.00	24.87	209	148	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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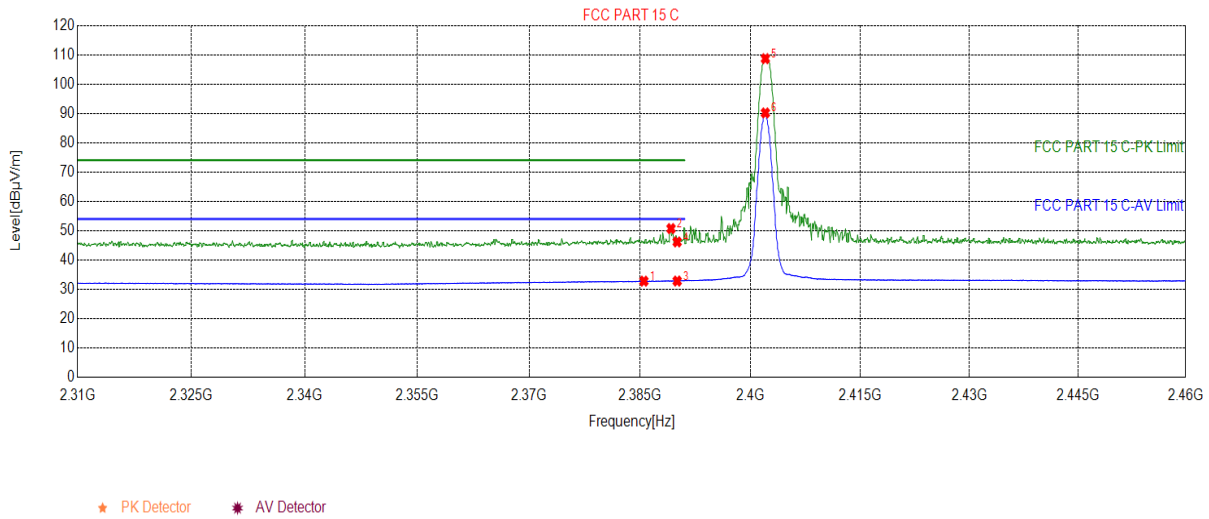
Restricted bands around fundamental frequency

GFSK_Channel 0

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2385.48	32.80	9.48	54.00	21.20	159	25	Horizontal
2	2389.16	50.71	9.58	74.00	23.29	175	39	Horizontal
3	2390.00	32.83	9.60	54.00	21.17	381	49	Horizontal
4	2390.00	46.16	9.60	74.00	27.84	223	55	Horizontal
5	2402.00	108.65	9.87	0.00	-108.65	149	123	Horizontal
6	2402.00	90.15	9.87	0.00	-90.15	132	60	Horizontal

Final Data List

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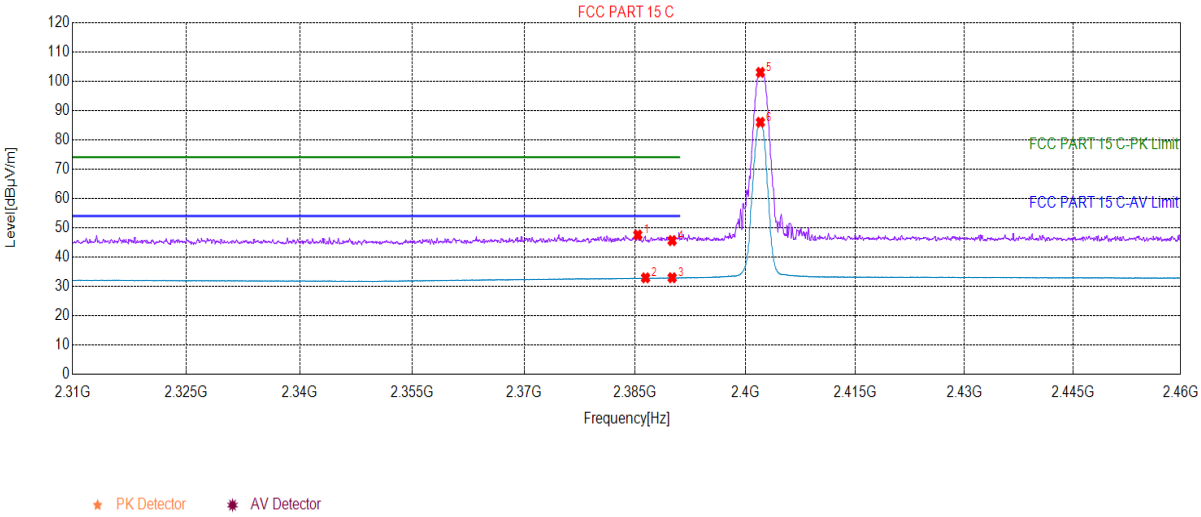
GFSK _Channel 0

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2385.33	47.52	9.48	74.00	26.48	159	253	Vertical
2	2386.38	32.89	9.50	54.00	21.11	234	195	Vertical
3	2390.00	32.92	9.60	54.00	21.08	226	168	Vertical
4	2390.00	45.59	9.60	74.00	28.41	258	173	Vertical
5	2402.00	102.95	9.87	0.00	-102.95	293	145	Vertical
6	2402.00	85.94	9.87	0.00	-85.94	354	180	Vertical

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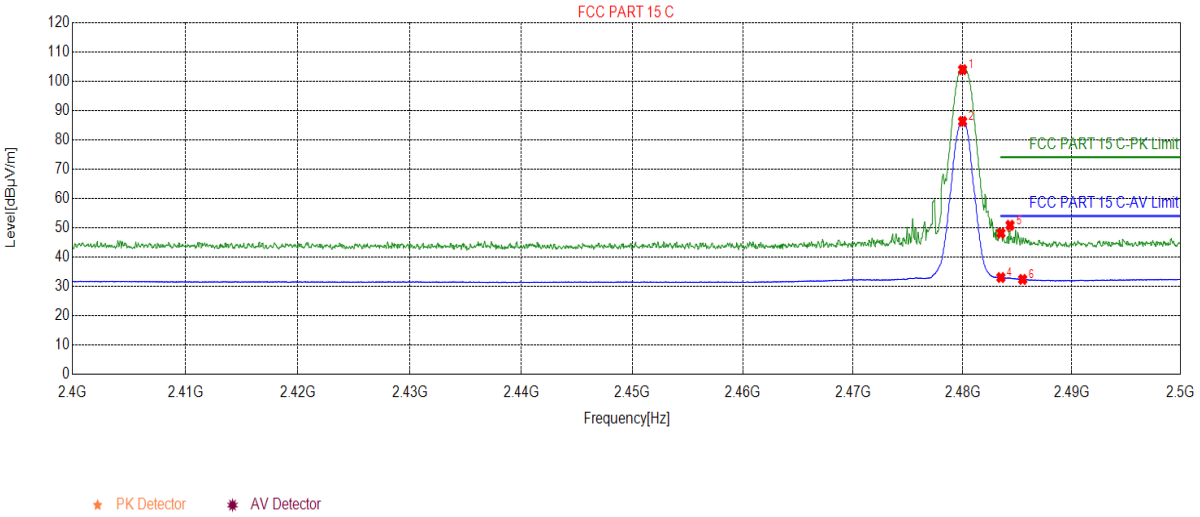
GFSK _Channel 78

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	103.88	8.47	0.00	-103.88	125	68	Horizontal
2	2480.00	86.23	8.47	0.00	-86.23	139	93	Horizontal
3	2483.50	48.12	8.48	74.00	25.88	159	123	Horizontal
4	2483.50	33.00	8.48	54.00	21.00	167	182	Horizontal
5	2484.34	50.83	8.49	74.00	23.17	183	195	Horizontal
6	2485.49	32.36	8.49	54.00	21.64	213	62	Horizontal

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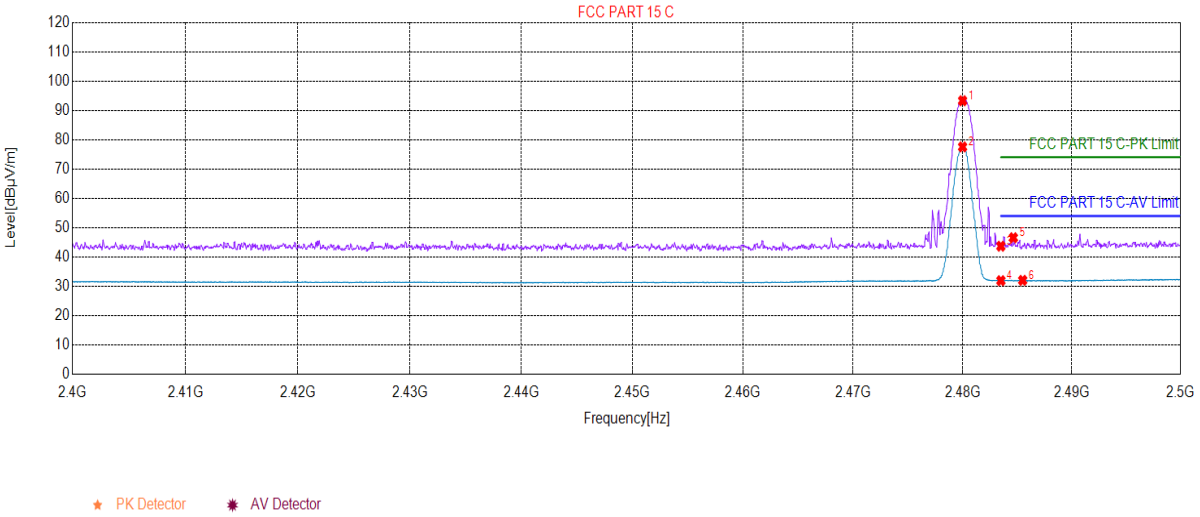
GFSK _Channel 78

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	93.28	8.47	0.00	-93.28	159	9	Vertical
2	2480.00	77.54	8.47	0.00	-77.54	258	53	Vertical
3	2483.50	43.69	8.48	74.00	30.31	276	72	Vertical
4	2483.50	31.94	8.48	54.00	22.06	294	28	Vertical
5	2484.64	46.57	8.49	74.00	27.43	308	159	Vertical
6	2485.49	32.04	8.49	54.00	21.96	352	173	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.

The End

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