FCC TEST REPORT

Application No.:	ZR/2021/40021
Applicant:	HMD Global Oy
Address of Applicant	Bertel Jungin aukio 9, 02600 Espoo, Finland
Manufacturer:	HMD Global Oy
Address of Manufacturer	Bertel Jungin aukio 9, 02600 Espoo, Finland
EUT Description:	smart phone
Model No.:	N1374DL
Trade Mark:	Nokia
FCC ID:	2AJOTTA-1374
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Date of Receipt:	2021/4/25
Date of Test:	2021/4/25 to 2021/5/28
Date of Issue:	2021/5/28
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		2021-05-28		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:	HMD Global Oy
Address of Applicant	Bertel Jungin aukio 9, 02600 Espoo, Finland
Manufacturer:	HMD Global Oy
Address of Manufacturer	Bertel Jungin aukio 9, 02600 Espoo, Finland

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:	smart phone
Model No.:	N1374DL
Trade Mark:	Nokia
Hardware Version:	V1.0
Software Version:	02US_0_029
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 V5.1
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:	-2.3dBi(ANT10)

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-2.30dBi.	

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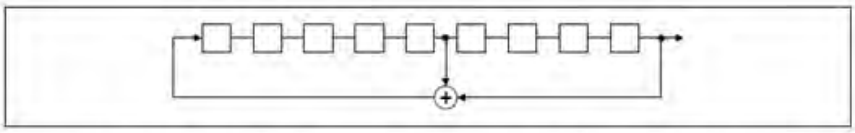
4.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

4.2.1 Test Requirement:

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

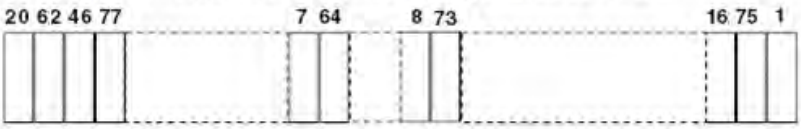
4.2.2 Conclusion

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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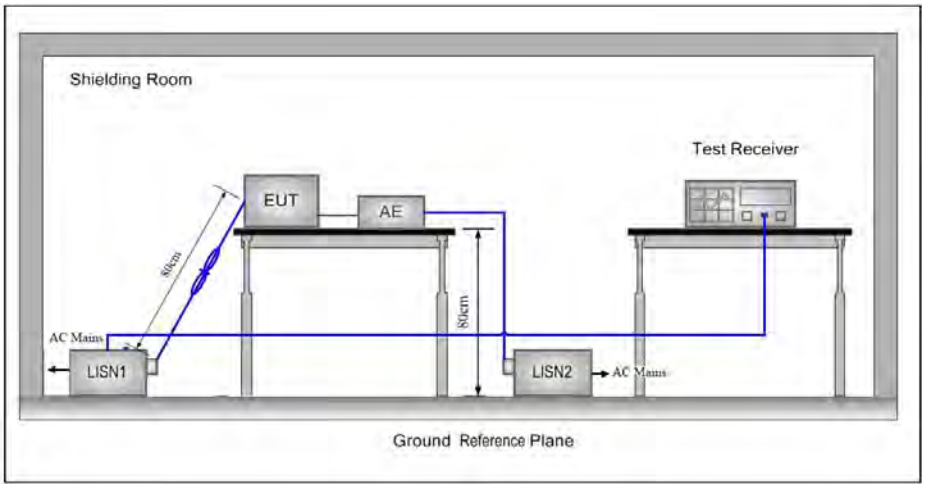
Test Setup:	
Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the DH5 of data type and GFSK modulation at the lowest channel is the worst case. Charge + 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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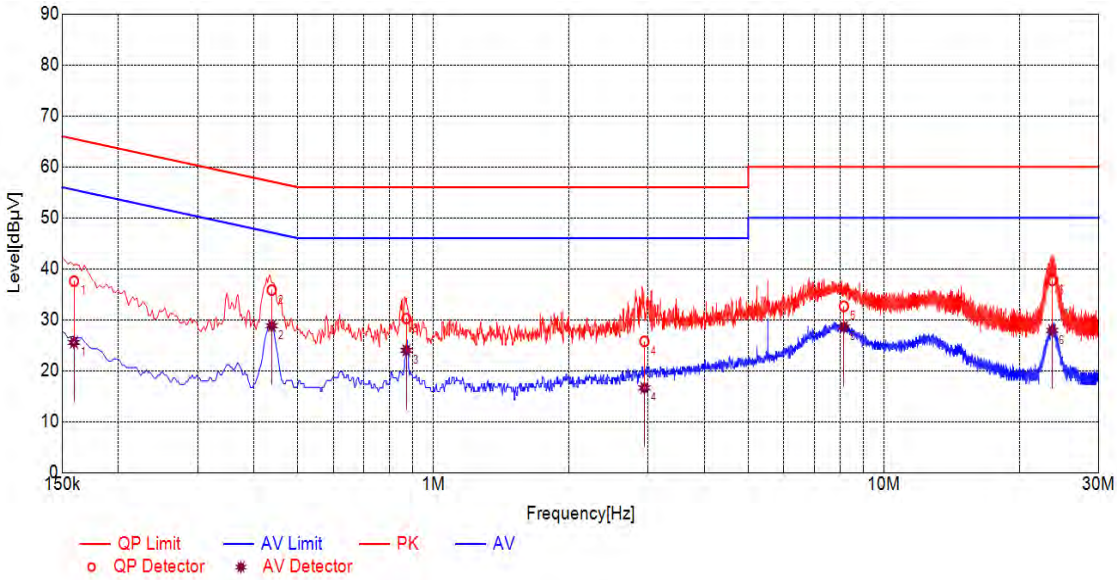
Measurement Data

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:



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	37.57	65.49	27.92	25.54	55.49	29.95
2	0.4379	10.10	35.82	57.10	21.28	28.82	47.10	18.28
3	0.8712	10.10	30.23	56.00	25.77	23.99	46.00	22.01
4	2.9410	10.10	25.76	56.00	30.24	16.62	46.00	29.38
5	8.1530	10.10	32.64	60.00	27.36	28.57	50.00	21.43
6	23.6440	10.11	37.74	60.00	22.26	27.92	50.00	22.08

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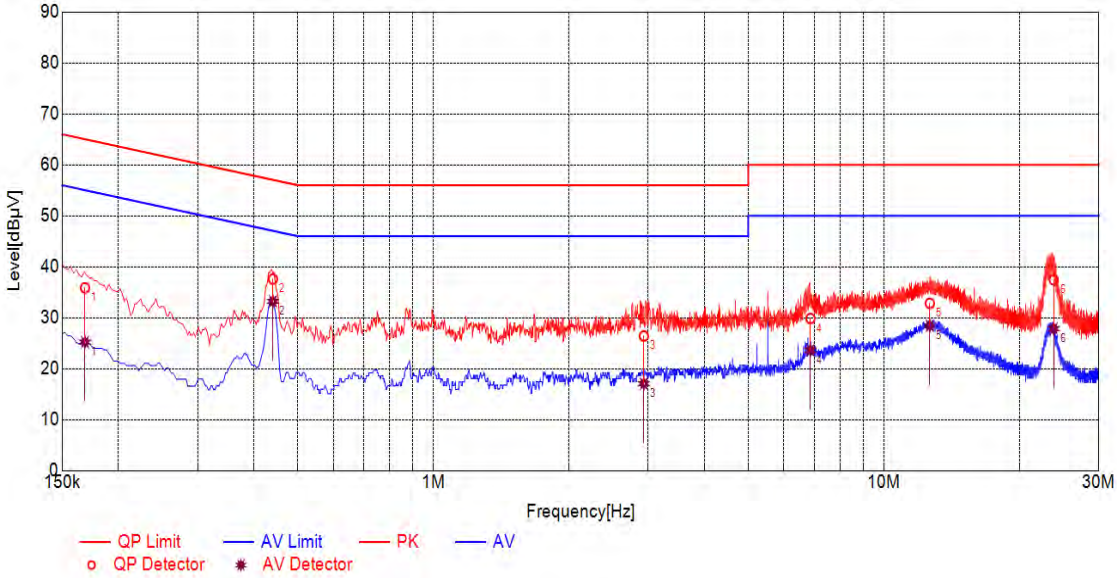
Neutral Line:



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	35.87	65.03	29.16	25.21	55.03	29.82
2	0.4407	10.10	37.59	57.05	19.46	33.21	47.05	13.84
3	2.9333	10.10	26.42	56.00	29.58	17.06	46.00	28.94
4	6.8707	10.10	29.85	60.00	30.15	23.61	50.00	26.39
5	12.6504	10.11	32.83	60.00	27.17	28.42	50.00	21.58
6	23.8332	10.11	37.43	60.00	22.57	27.85	50.00	22.15

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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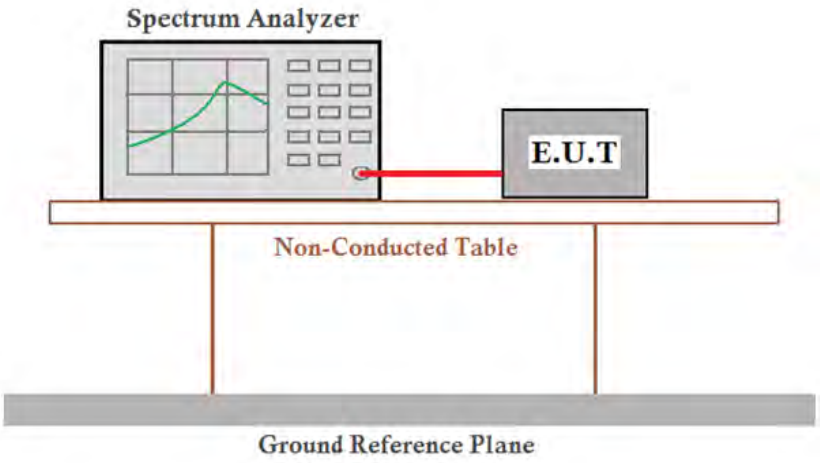
4.4 Conducted Output Power

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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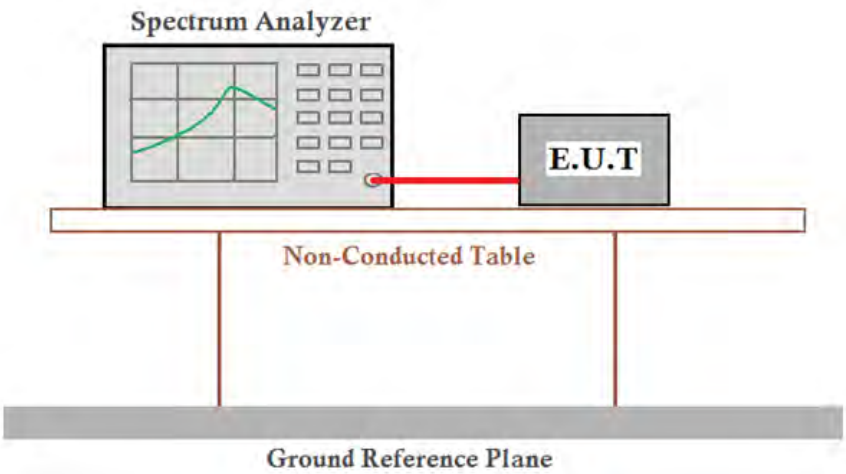
4.5 20dB Emission Bandwidth

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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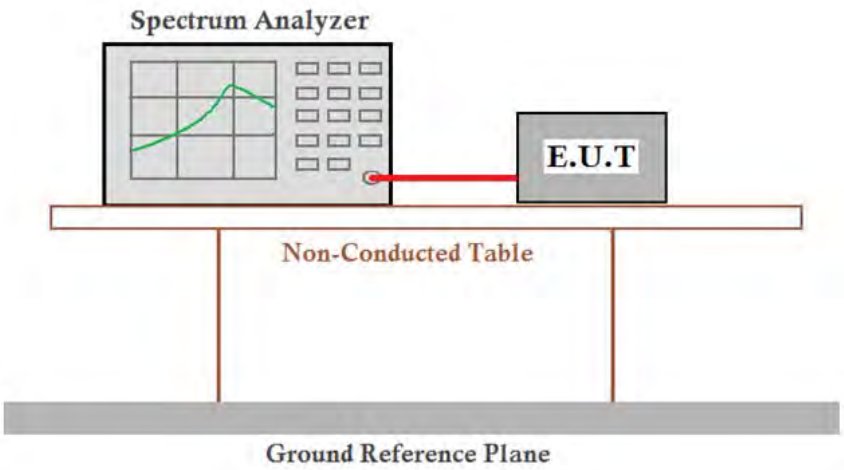
4.6 Carrier Frequencies Separationy

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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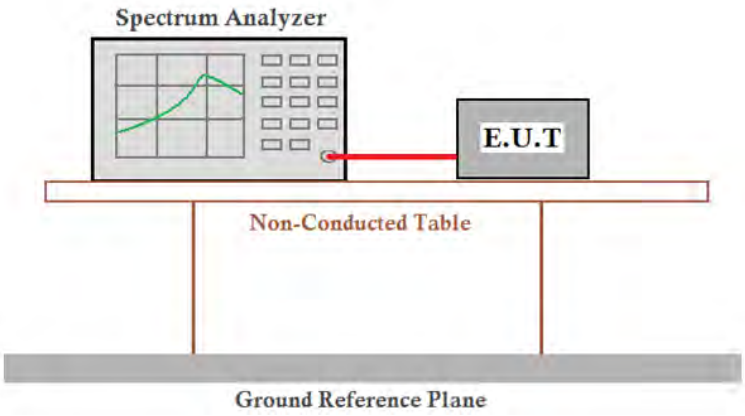
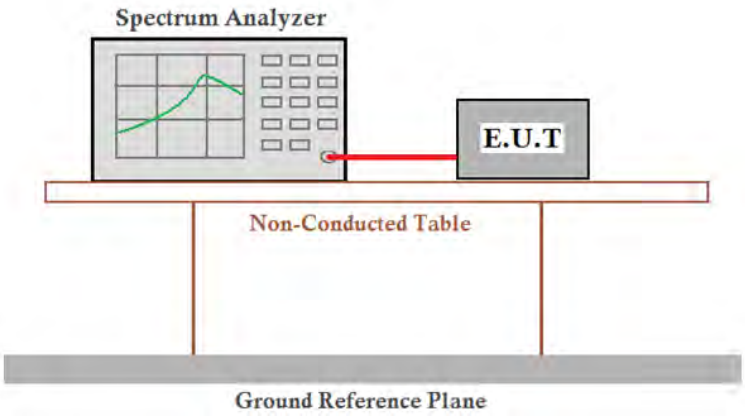
4.7 Hopping Channel Number

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

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

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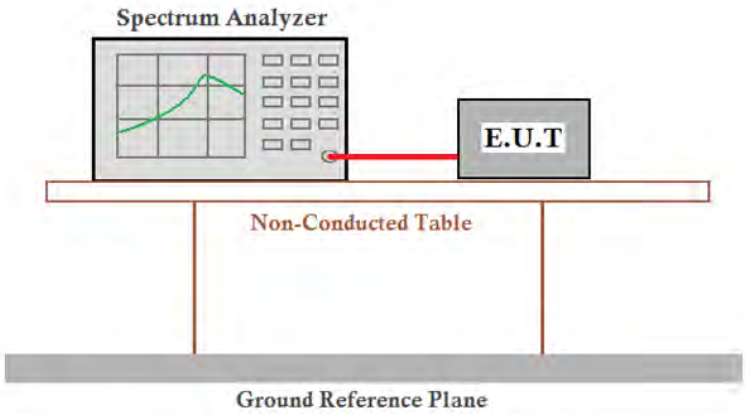
4.9 Band-edge for RF Conducted Emissions

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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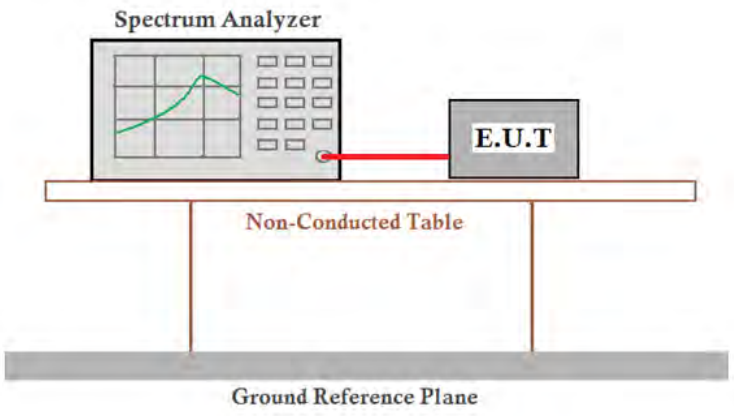
4.10 Spurious RF Conducted Emissions

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:

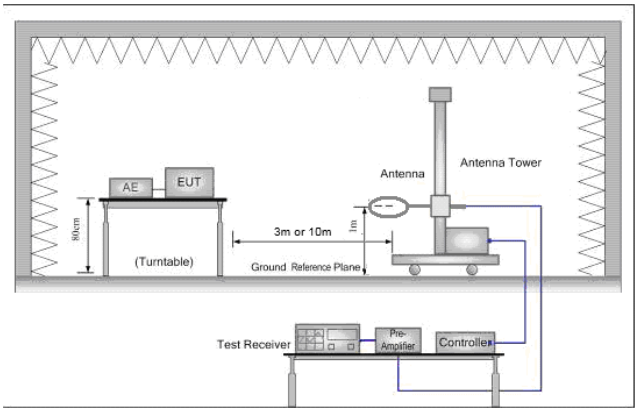

Figure 1. Below 30MHz

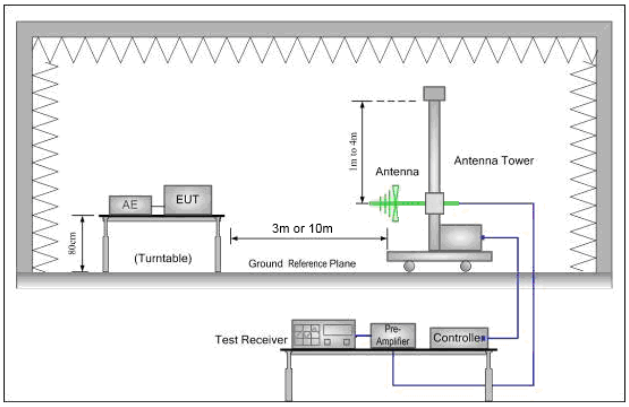

Figure 2. 30MHz to 1GHz

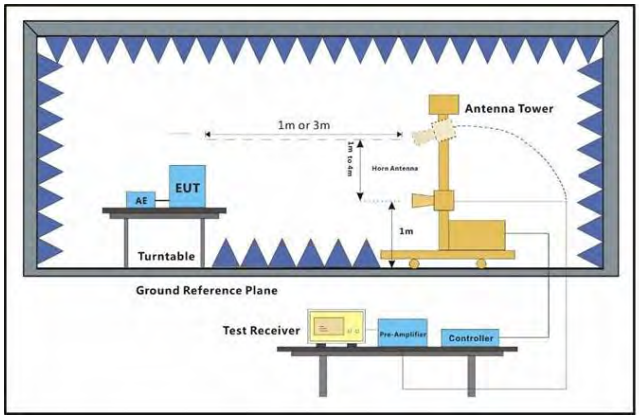

Figure 3. Above 1 GHz

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

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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:			

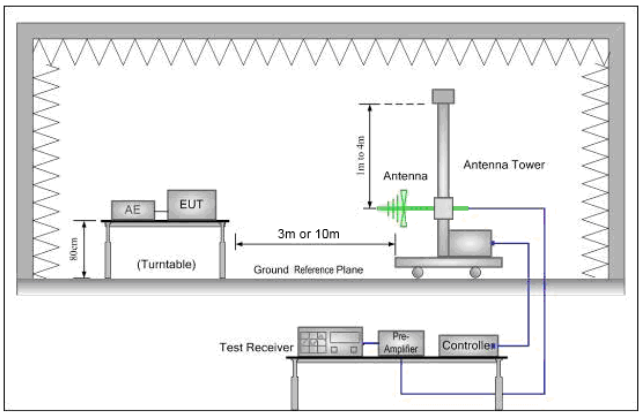

Figure 1. 30MHz to 1GHz

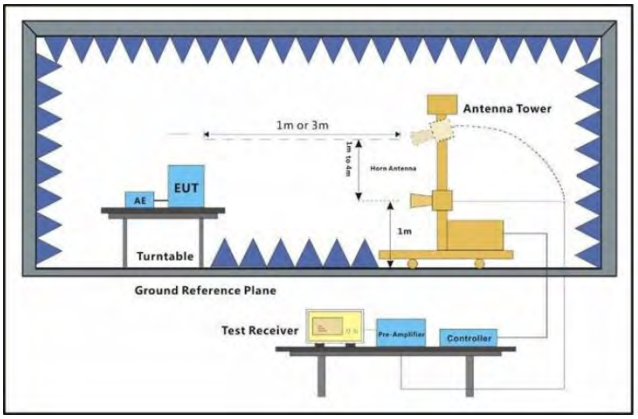

Figure 2. Above 1 GHz

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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

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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

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Radiated Spurious Emission

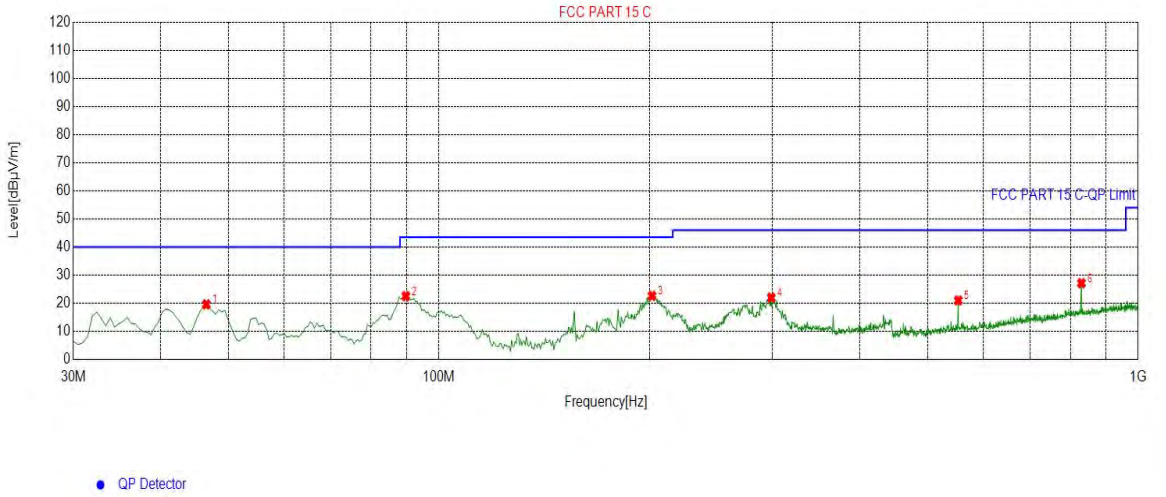
Radiated Emission below 1GHz

Charge + Transmitting

Test Report

Project Information			
EUT:		Model:	GFSK
SN:		Voltage:	
Mode:		State:	
Environment:	Temp: 25℃; Humi:60%	Engineer:	
Remark:			
Test Standard:			

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	46.4982	19.58	-21.39	40.00	20.42	252	215	Horizontal
2	89.6848	22.55	-24.58	43.50	20.95	274	282	Horizontal
3	201.775	22.64	-22.38	43.50	20.86	195	233	Horizontal
4	298.824	21.99	-19.41	46.00	24.01	148	55	Horizontal
5	553.091	20.99	-13.03	46.00	25.01	184	271	Horizontal
6	829.679	27.13	-8.70	46.00	18.87	251	303	Horizontal

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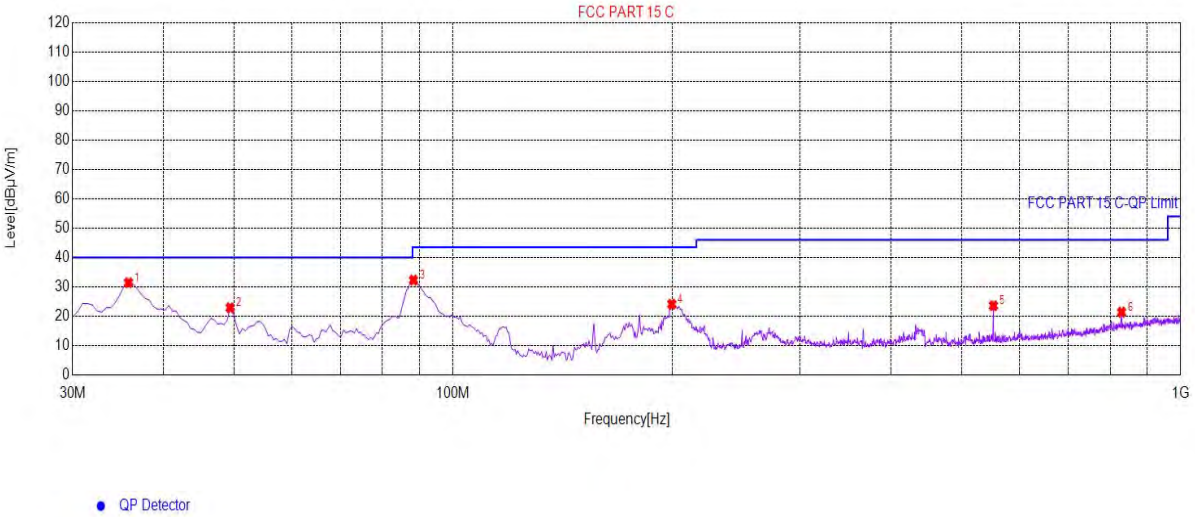
Final Data List

Test Report

Project Information			
EUT:		Model:	GFSK
SN:		Voltage:	
Mode:		State:	
Environment:	Temp: 25℃; Humi:60%	Engineer:	
Remark:			
Test Standard:			

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.8229	31.40	-23.68	40.00	8.60	251	39	Vertical
2	49.4097	22.89	-21.37	40.00	17.11	247	315	Vertical
3	88.2291	32.32	-24.99	43.50	11.18	295	95	Vertical
4	199.834	24.09	-22.53	43.50	19.41	261	230	Vertical
5	553.091	23.59	-13.03	46.00	22.41	238	53	Vertical
6	829.679	21.39	-8.70	46.00	24.61	278	145	Vertical

Final Data List

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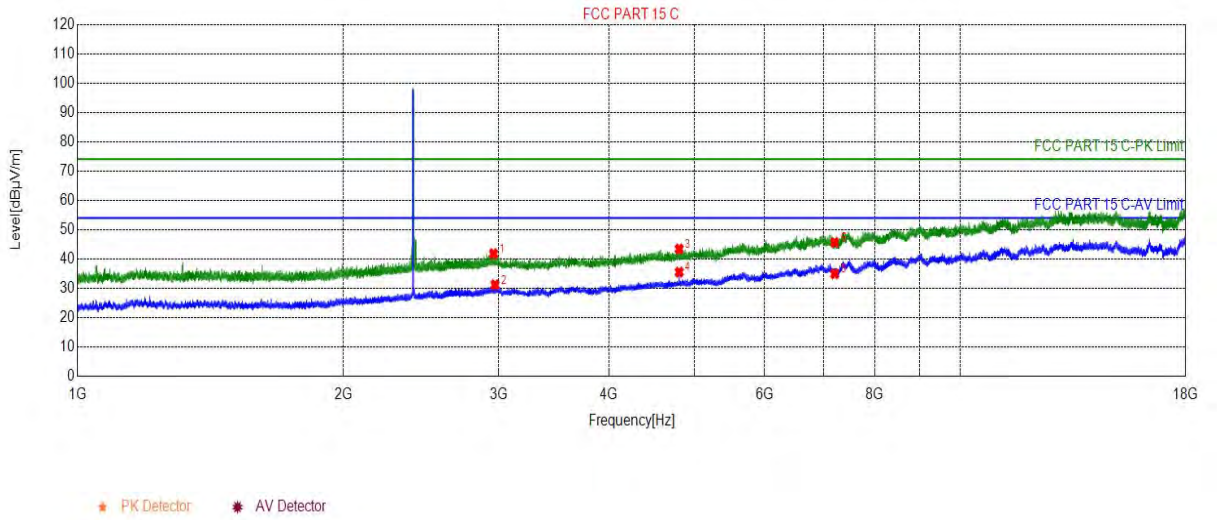
GFSK_Channel CH0

Test Graph



Suspected List

Suspected List								
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1	2959.19	41.82	10.52	74.00	32.18	254	325	Horizontal
2	2971.39	31.20	10.36	54.00	22.80	188	158	Horizontal
3	4804.00	43.43	-15.41	74.00	30.57	236	186	Horizontal
4	4804.00	35.54	-15.41	54.00	18.46	274	215	Horizontal
5	7206.00	34.94	-8.59	54.00	19.06	236	345	Horizontal
6	7206.00	45.66	-8.59	74.00	28.34	215	186	Horizontal

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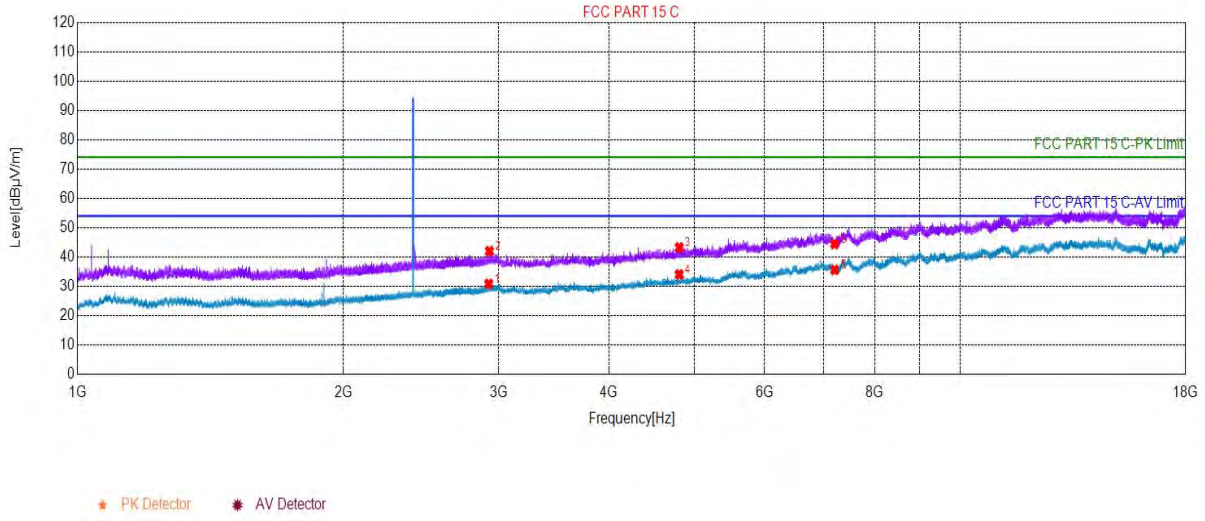
GFSK_Channel CH0

Test Graph



Suspected List

Suspected List								
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1	2922.99	30.82	10.43	54.00	23.18	236	299	Vertical
2	2928.59	41.97	10.53	74.00	32.03	174	212	Vertical
3	4804.00	43.25	-15.41	74.00	30.75	196	12	Vertical
4	4804.00	34.03	-15.41	54.00	19.97	188	158	Vertical
5	7206.00	35.60	-8.59	54.00	18.40	174	274	Vertical
6	7206.00	44.40	-8.59	74.00	29.60	165	332	Vertical

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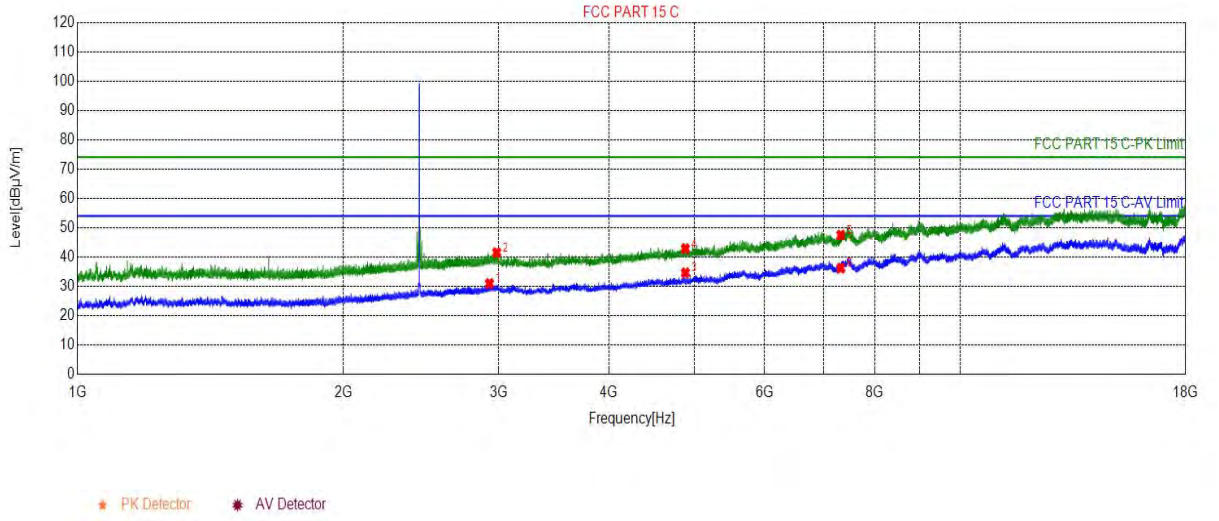
GFSK_Channel CH39

Test Graph



Suspected List

Suspected List								
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1	2928.69	30.95	10.53	54.00	23.05	287	104	Horizontal
2	2984.59	41.49	10.52	74.00	32.51	254	155	Horizontal
3	4882.00	34.61	-15.06	54.00	19.39	169	351	Horizontal
4	4882.00	42.84	-15.06	74.00	31.16	168	2	Horizontal
5	7323.00	47.47	-8.54	74.00	26.53	196	263	Horizontal
6	7323.00	36.21	-8.54	54.00	17.79	177	55	Horizontal

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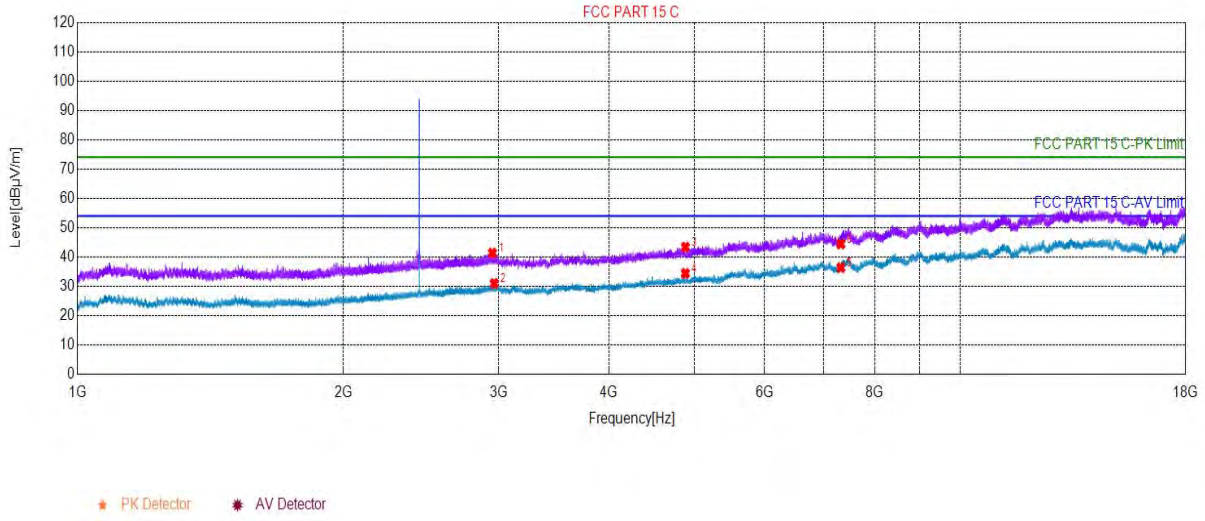
GFSK_Channel CH39

Test Graph



Suspected List

Suspected List								
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1	2950.99	41.35	10.56	74.00	32.65	247	334	Vertical
2	2965.29	30.99	10.42	54.00	23.01	189	222	Vertical
3	4882.00	43.35	-15.06	74.00	30.65	197	304	Vertical
4	4882.00	34.42	-15.06	54.00	19.58	154	245	Vertical
5	7323.00	36.39	-8.54	54.00	17.61	162	108	Vertical
6	7323.00	44.44	-8.54	74.00	29.56	177	108	Vertical

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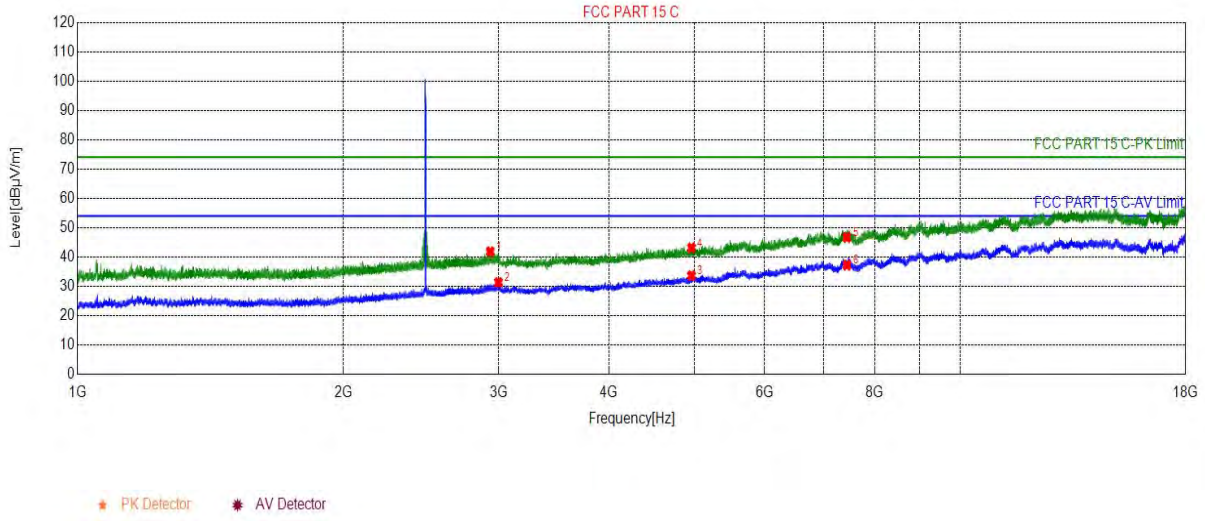
GFSK_Channel CH78

Test Graph



Suspected List

Suspected List								
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1	2934.79	41.82	10.53	74.00	32.18	215	273	Horizontal
2	2997.69	31.31	10.74	54.00	22.69	325	130	Horizontal
3	4960.00	33.63	-14.40	54.00	20.37	306	246	Horizontal
4	4960.00	43.14	-14.40	74.00	30.86	178	188	Horizontal
5	7440.00	46.68	-7.31	74.00	27.32	195	318	Horizontal
6	7440.00	37.21	-7.31	54.00	16.79	188	232	Horizontal

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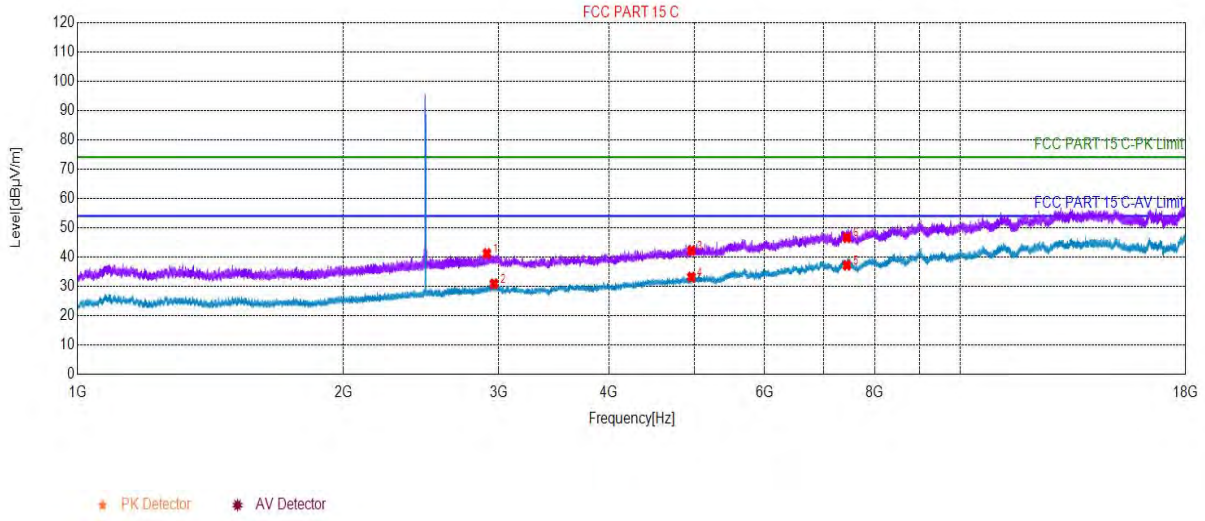
GFSK_Channel CH78

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2909.39	41.18	10.23	74.00	32.82	187	236	Vertical
2	2963.79	30.86	10.44	54.00	23.14	195	58	Vertical
3	4960.00	42.19	-14.40	74.00	31.81	166	40	Vertical
4	4960.00	33.17	-14.40	54.00	20.83	215	143	Vertical
5	7440.00	37.18	-7.31	54.00	16.82	247	333	Vertical
6	7440.00	46.57	-7.31	74.00	27.43	239	288	Vertical

Final Data List

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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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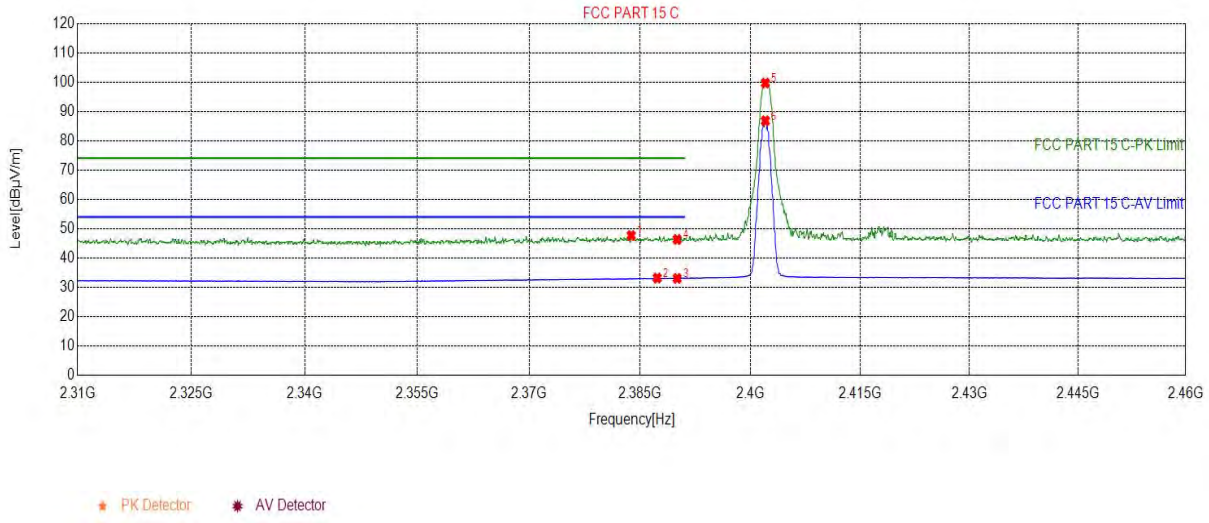
GFSK_Channel CH0

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2383.76	47.66	9.43	74.00	26.34	187	125	Horizontal
2	2387.28	33.15	9.53	54.00	20.85	196	26	Horizontal
3	2390.00	33.04	9.60	54.00	20.96	158	178	Horizontal
4	2390.00	46.32	9.60	74.00	27.68	174	249	Horizontal
5	2402.00	99.66	9.87	0.00	-99.66	166	315	Horizontal
6	2402.00	86.78	9.87	0.00	-86.78	194	225	Horizontal

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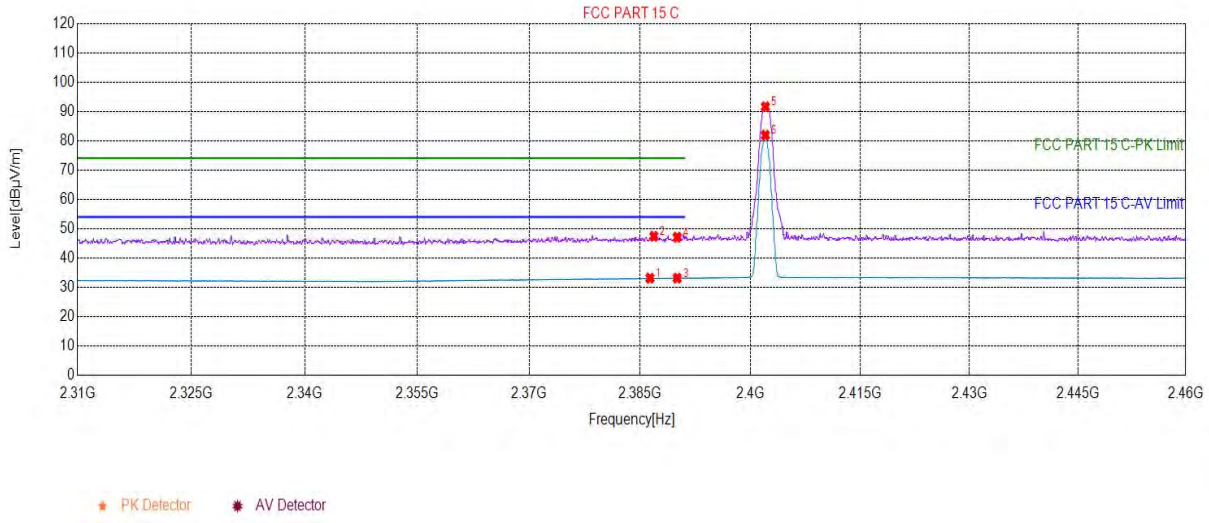
GFSK _Channel 0

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2386.31	33.12	9.50	54.00	20.88	187	326	Vertical
2	2386.83	47.41	9.52	74.00	26.59	195	2	Vertical
3	2390.00	33.12	9.60	54.00	20.88	164	198	Vertical
4	2390.00	47.07	9.60	74.00	26.93	155	177	Vertical
5	2402.00	91.56	9.87	0.00	-91.56	176	241	Vertical
6	2402.00	81.87	9.87	0.00	-81.87	198	58	Vertical

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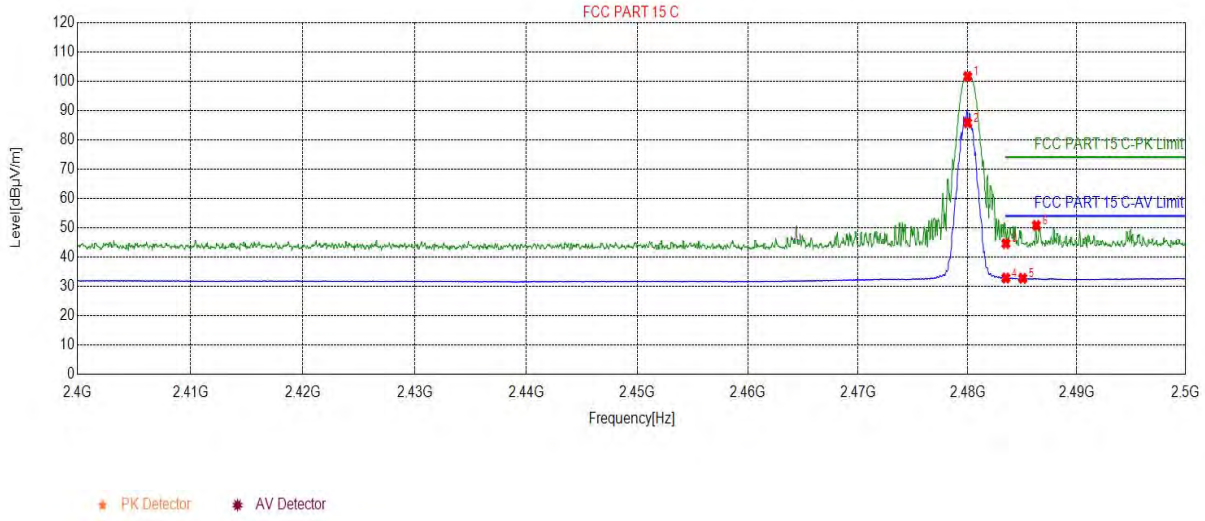
GFSK _Channel CH78

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	101.55	8.47	0.00	-101.55	187	178	Horizontal
2	2480.00	85.75	8.47	0.00	-85.75	169	195	Horizontal
3	2483.50	44.57	8.48	74.00	29.43	158	23	Horizontal
4	2483.50	32.83	8.48	54.00	21.17	174	245	Horizontal
5	2485.04	32.71	8.49	54.00	21.29	195	233	Horizontal
6	2486.29	50.76	8.49	74.00	23.24	170	345	Horizontal

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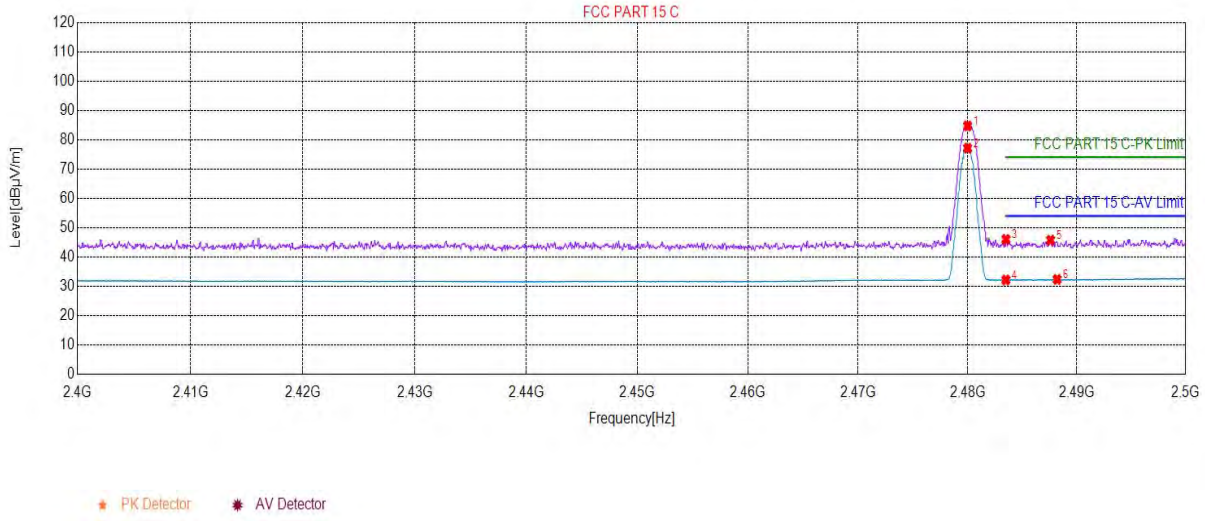
GFSK _Channel CH78

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	84.69	8.47	0.00	-84.69	179	215	Vertical
2	2480.00	77.09	8.47	0.00	-77.09	189	13	Vertical
3	2483.50	46.00	8.48	74.00	28.00	167	354	Vertical
4	2483.50	32.16	8.48	54.00	21.84	175	17	Vertical
5	2487.59	45.77	8.50	74.00	28.23	181	141	Vertical
6	2488.19	32.35	8.50	54.00	21.65	194	166	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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20dB Emission Bandwidth

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant10	2402	0.945	2401.535	2402.480	---	PASS
		2441	0.945	2440.532	2441.477	---	PASS
		2480	0.948	2479.532	2480.480	---	PASS
2DH5	Ant10	2402	1.293	2401.364	2402.657	---	PASS
		2441	1.290	2440.364	2441.654	---	PASS
		2480	1.290	2479.364	2480.654	---	PASS
3DH5	Ant10	2402	1.302	2401.349	2402.651	---	PASS
		2441	1.302	2440.349	2441.651	---	PASS
		2480	1.302	2479.349	2480.651	---	PASS

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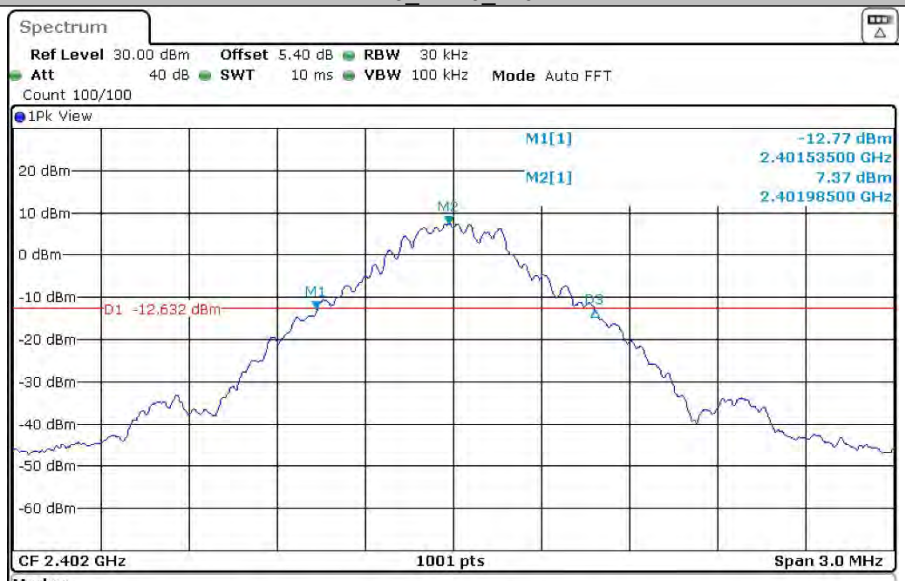
Test Graphs

DH5_Ant10_2402

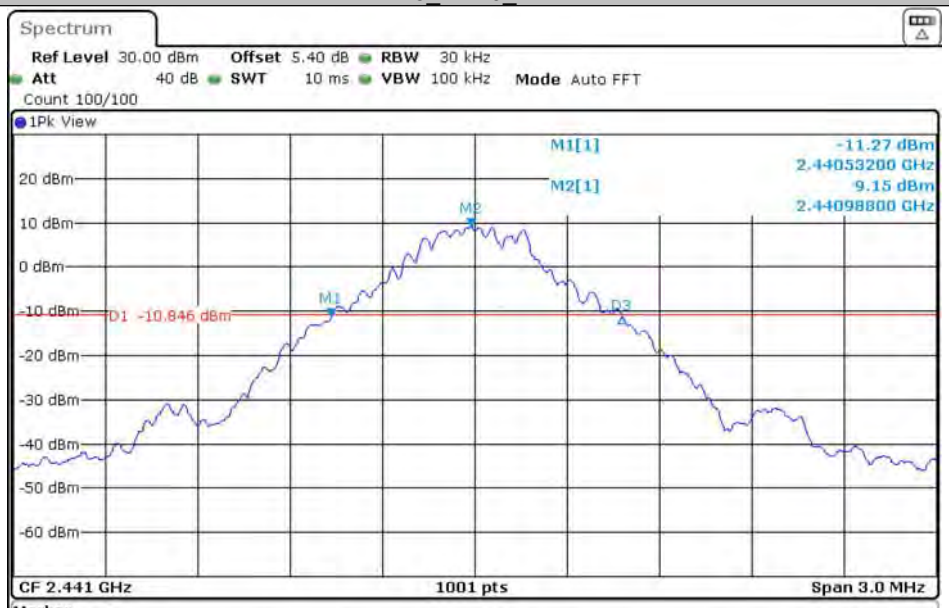


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401535 GHz	-12.77 dBm		
M2		1	2.401985 GHz	7.37 dBm		
D3	M1	1	945.0 kHz	-0.12 dB		

Date: 20.MAY.2021 20:38:25

DH5_Ant10_2441



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440532 GHz	-11.27 dBm		
M2		1	2.440988 GHz	9.15 dBm		
D3	M1	1	945.0 kHz	0.27 dB		

Date: 20.MAY.2021 20:39:53

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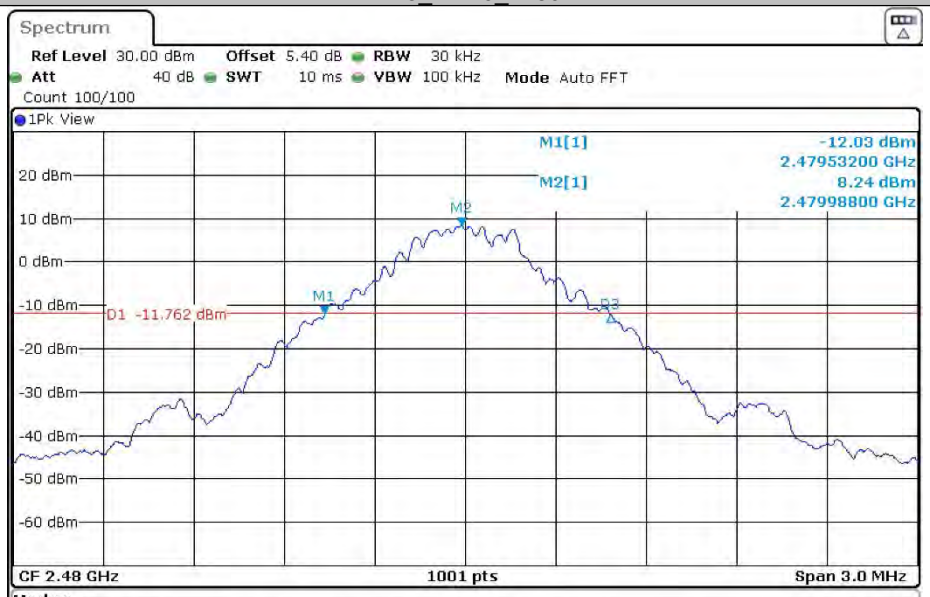
DH5_Ant10_2480

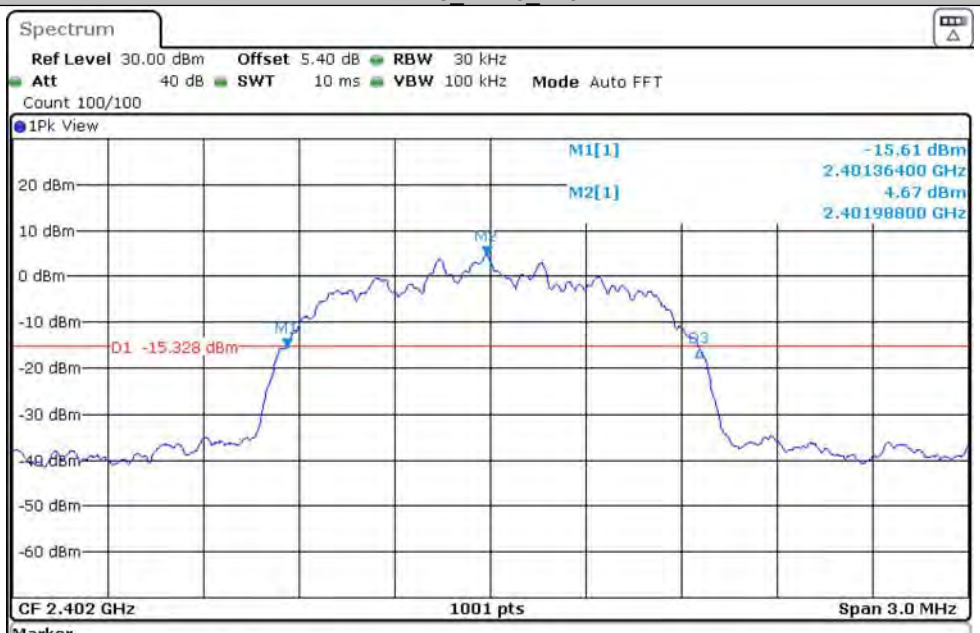


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479532 GHz	-12.03 dBm		
M2		1	2.479988 GHz	8.24 dBm		
D3	M1	1	948.0 kHz	-0.06 dB		

Date: 20.MAY.2021 20:41:17

2DH5_Ant10_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401364 GHz	-15.61 dBm		
M2		1	2.401988 GHz	4.67 dBm		
D3	M1	1	1.293 MHz	-0.22 dB		

Date. 20.MAY.2021 20:42:40

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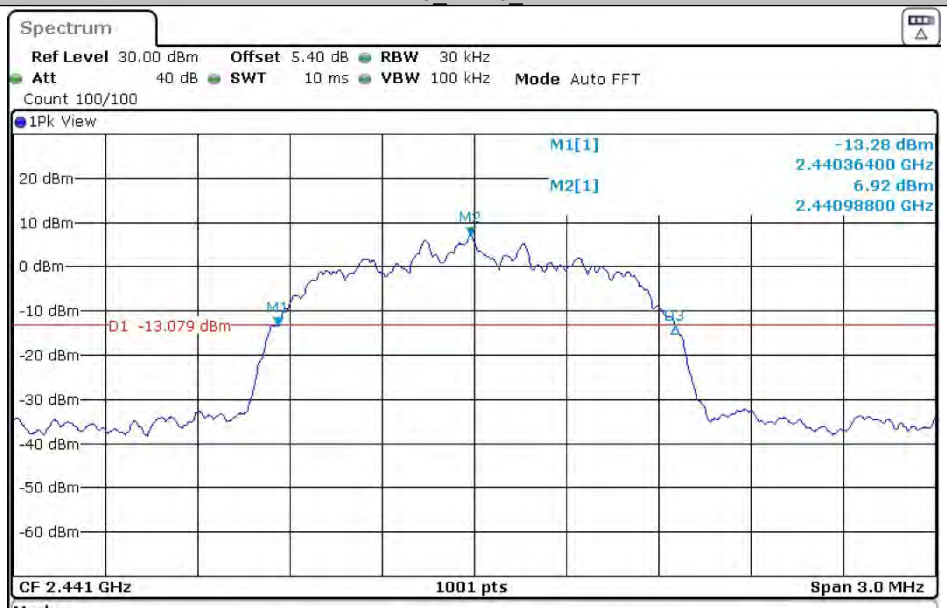
2DH5_Ant10_2441

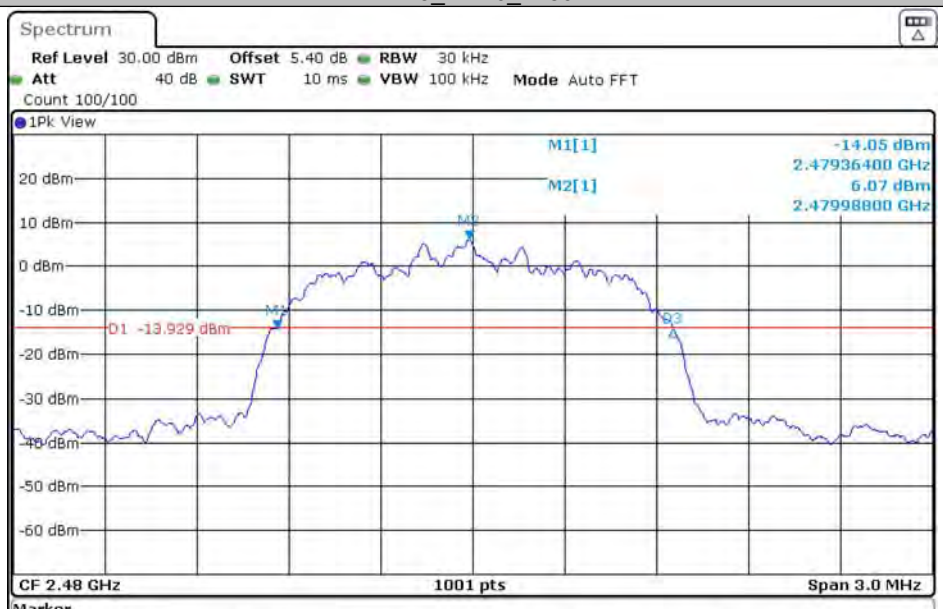


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440364 GHz	-13.28 dBm		
M2		1	2.440988 GHz	6.92 dBm		
D3	M1	1	1.29 MHz	-0.03 dB		

Date: 20.MAY.2021 20:44:06

2DH5_Ant10_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479364 GHz	-14.05 dBm		
M2		1	2.479988 GHz	6.07 dBm		
D3	M1	1	1.29 MHz	-0.06 dB		

Date: 20.MAY.2021 20:45:23

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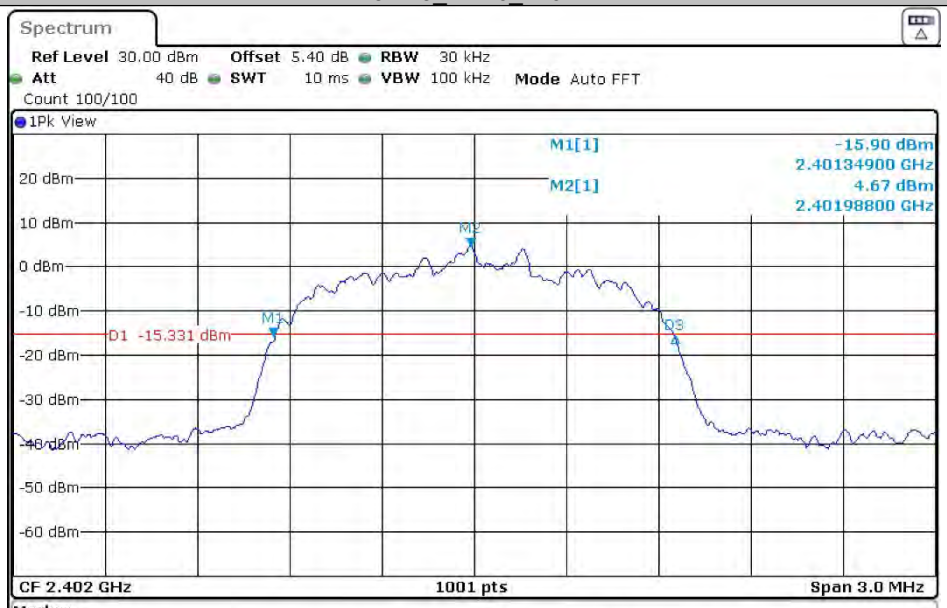
3DH5_Ant10_2402

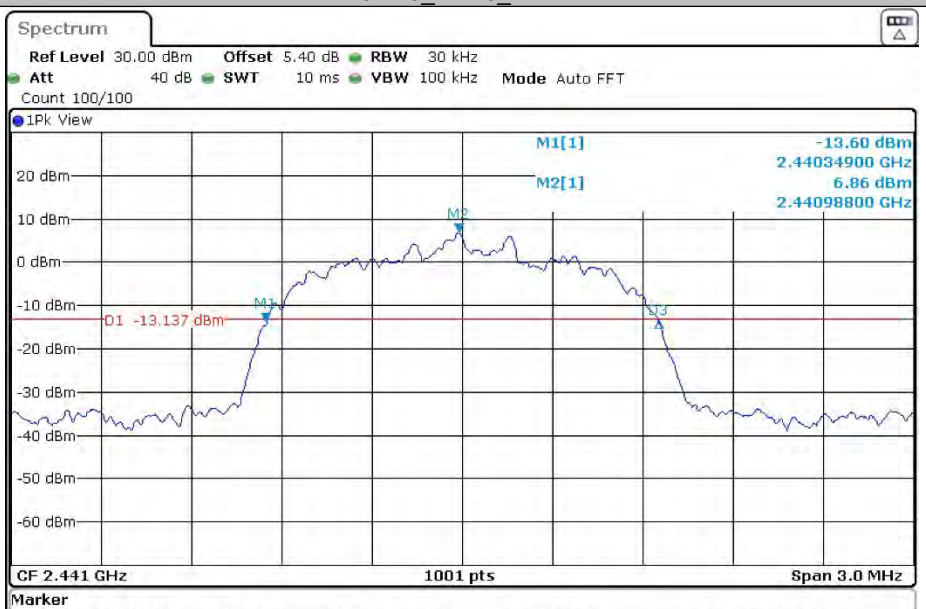


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401349 GHz	-15.90 dBm		
M2		1	2.401988 GHz	4.67 dBm		
D3	M1	1	1.302 MHz	0.31 dB		

Date: 20.MAY.2021 20:51:19

3DH5_Ant10_2441



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440349 GHz	-13.60 dBm		
M2		1	2.440988 GHz	6.86 dBm		
D3	M1	1	1.302 MHz	0.23 dB		

Date: 20.MAY.2021 20:52:36

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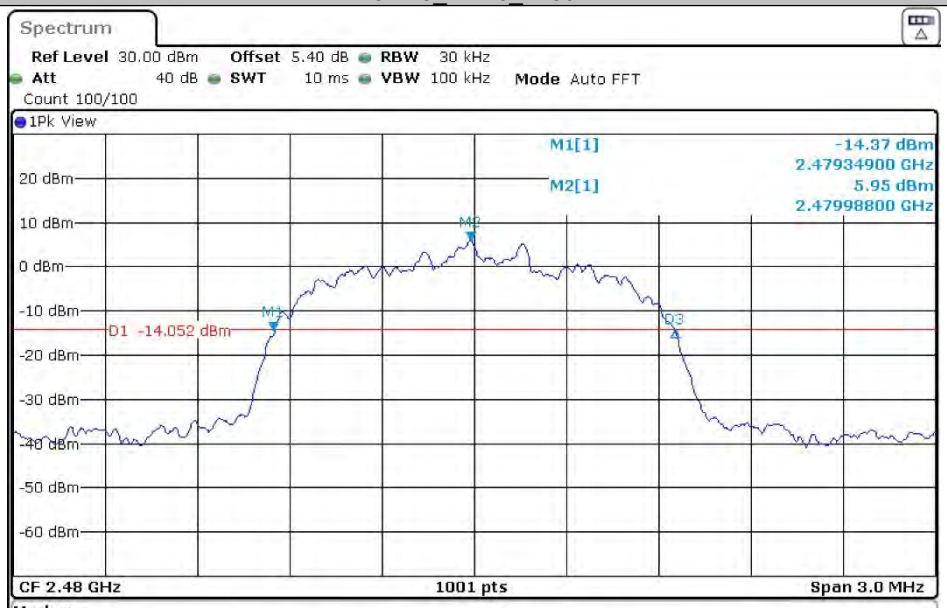
3DH5_Ant10_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479349 GHz	-14.37 dBm		
M2		1	2.479988 GHz	5.95 dBm		
D3	M1	1	1.302 MHz	0.10 dB		

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Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant10	2402	0.842	2401.577	2402.420	---	PASS
		2441	0.842	2440.574	2441.417	---	PASS
		2480	0.839	2479.577	2480.417	---	PASS
2DH5	Ant10	2402	1.172	2401.413	2402.584	---	PASS
		2441	1.175	2440.410	2441.584	---	PASS
		2480	1.172	2479.410	2480.581	---	PASS
3DH5	Ant10	2402	1.175	2401.416	2402.590	---	PASS
		2441	1.175	2440.413	2441.587	---	PASS
		2480	1.175	2479.413	2480.587	---	PASS

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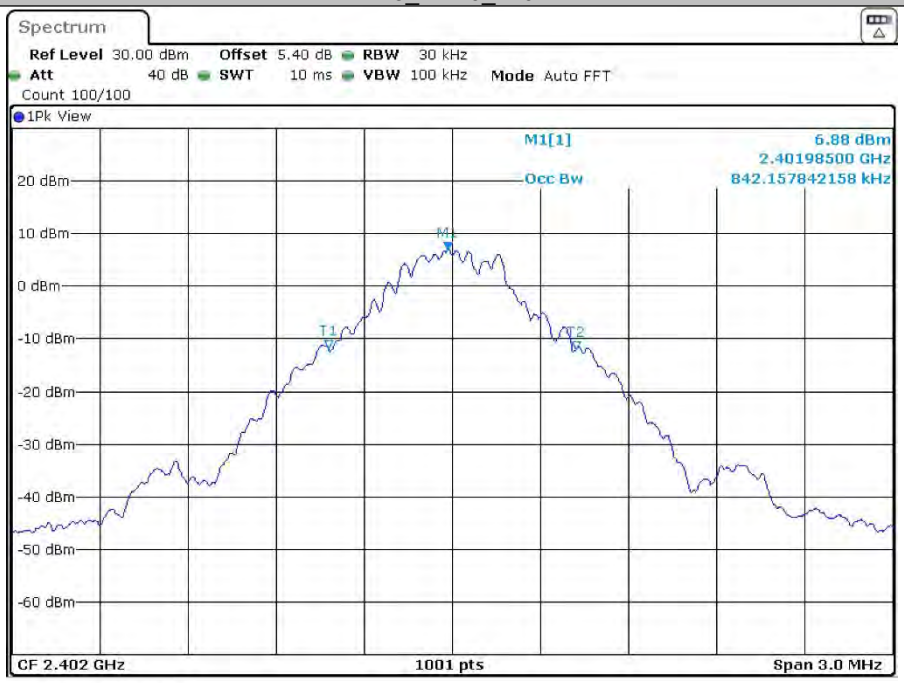
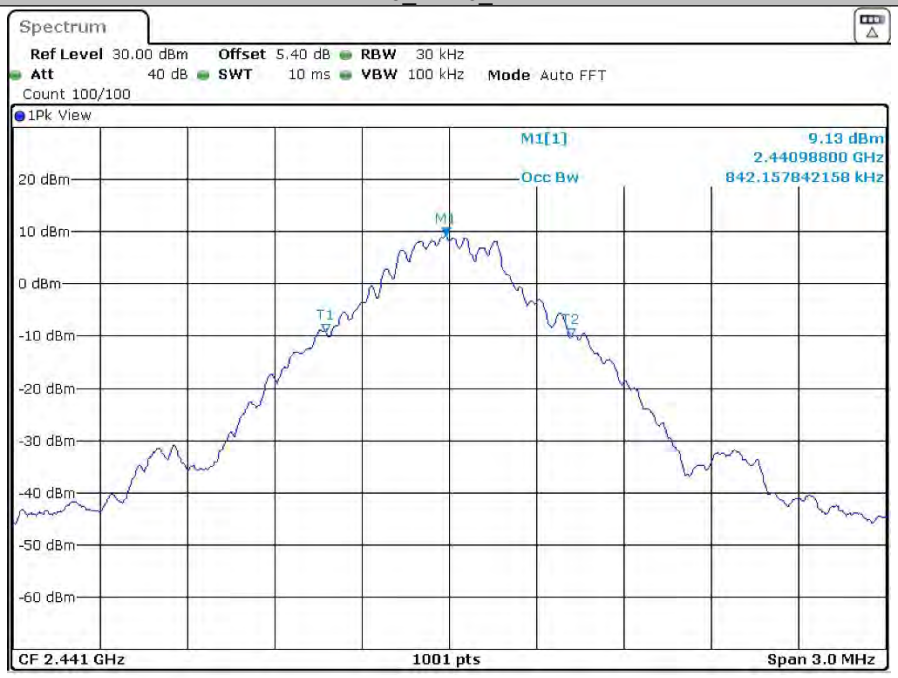
Test Graphs

DH5_Ant10_2402



Date: 20.MAY.2021 20:38:35

DH5_Ant10_2441



Date: 20.MAY.2021 20:40:03

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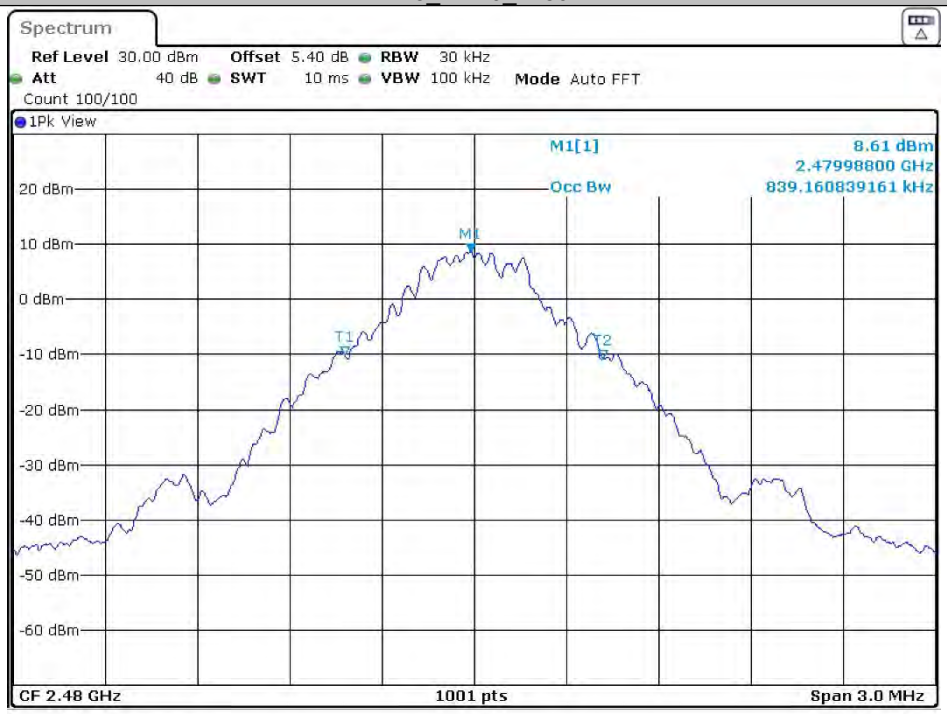
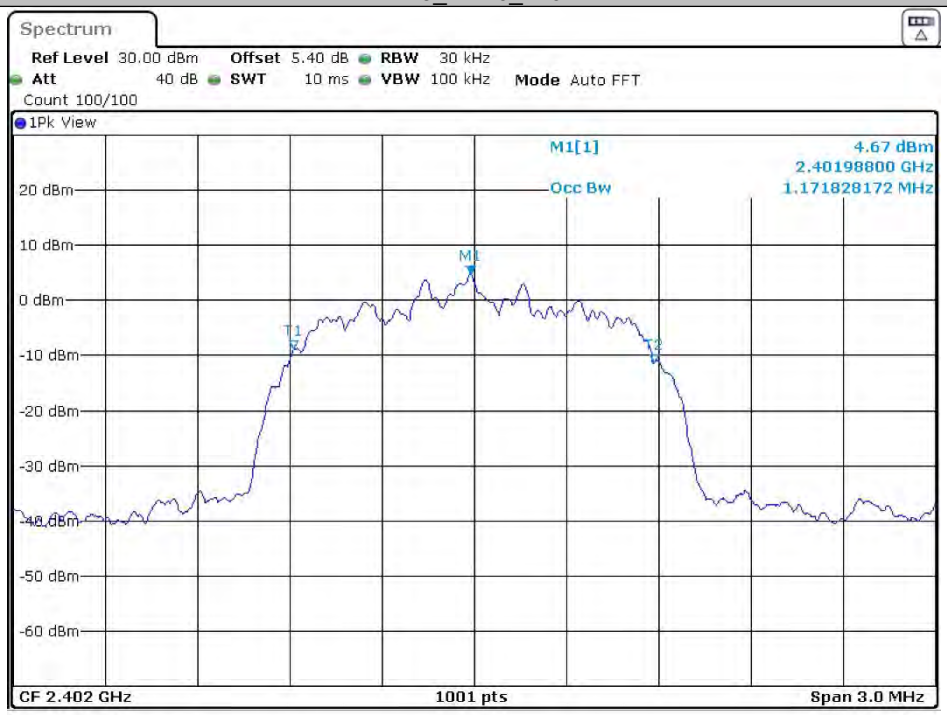
DH5_Ant10_2480



Date: 20.MAY.2021 20:41:27

2DH5_Ant10_2402



Date: 20.MAY.2021 20:42:50

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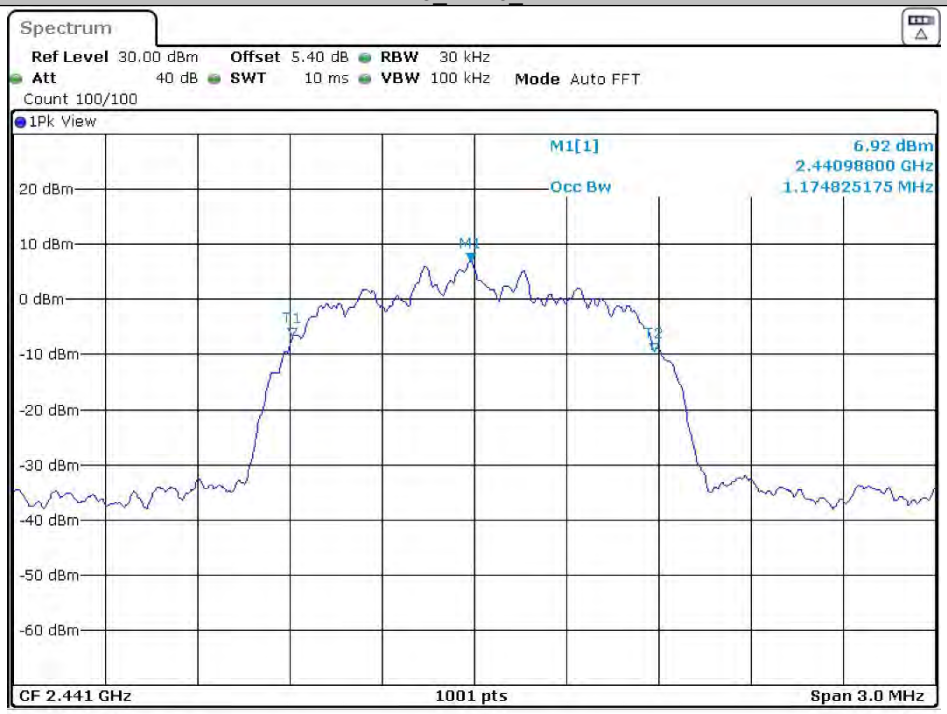
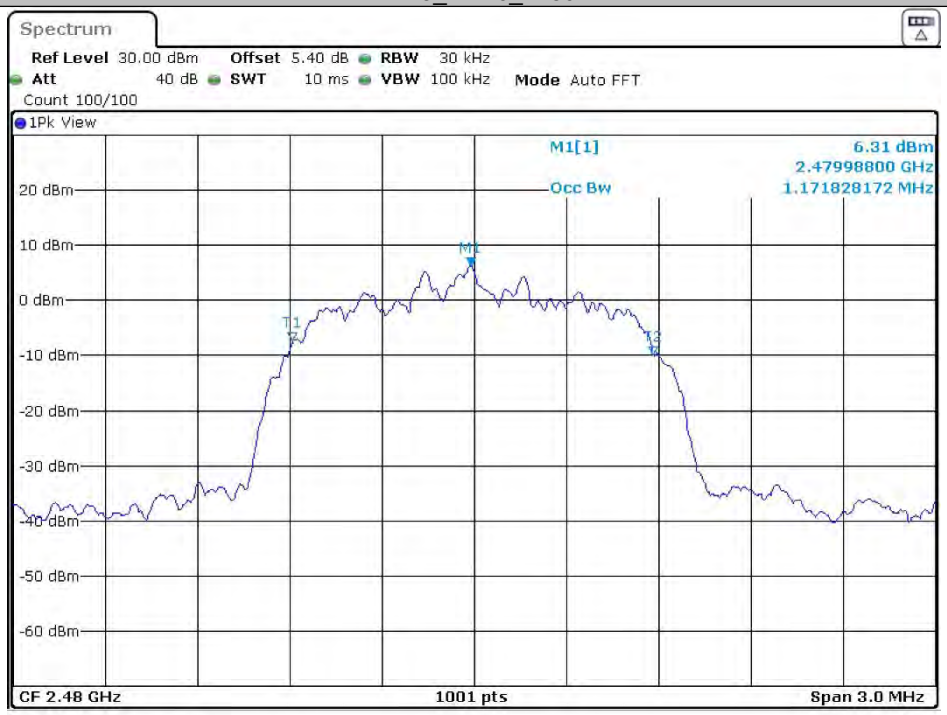
2DH5_Ant10_2441



Date: 20.MAY.2021 20:44:15

2DH5_Ant10_2480



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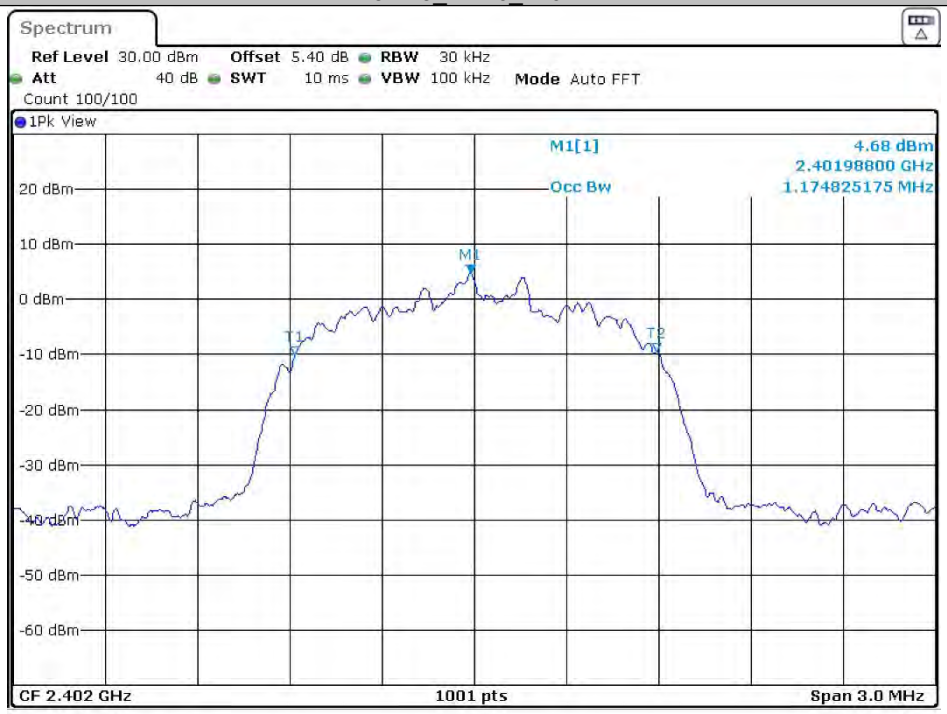
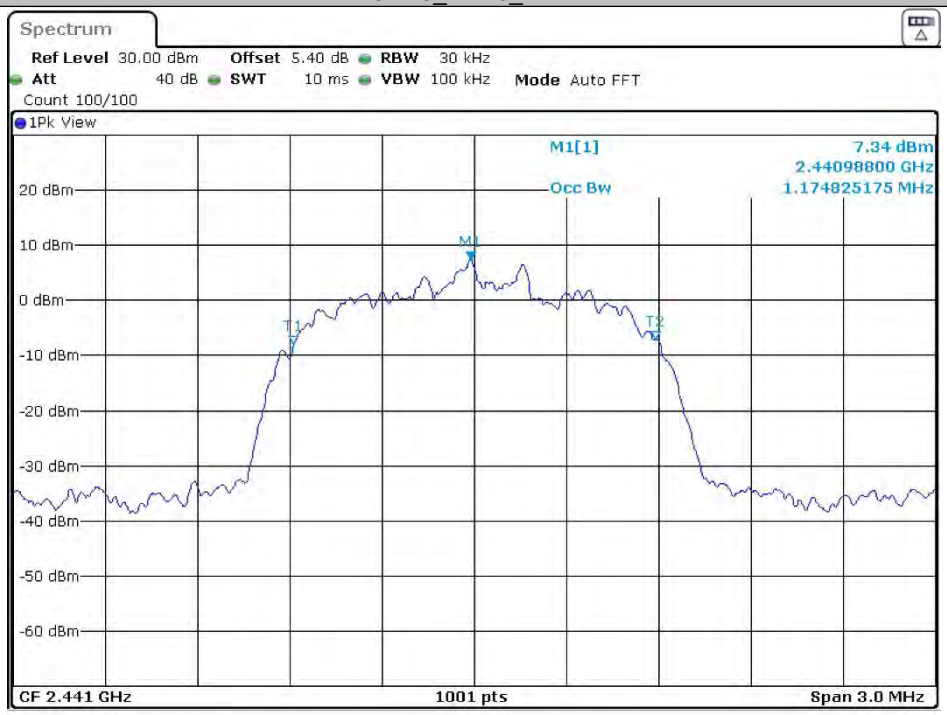
3DH5_Ant10_2402



Date: 20.MAY.2021 20:51:28

3DH5_Ant10_2441



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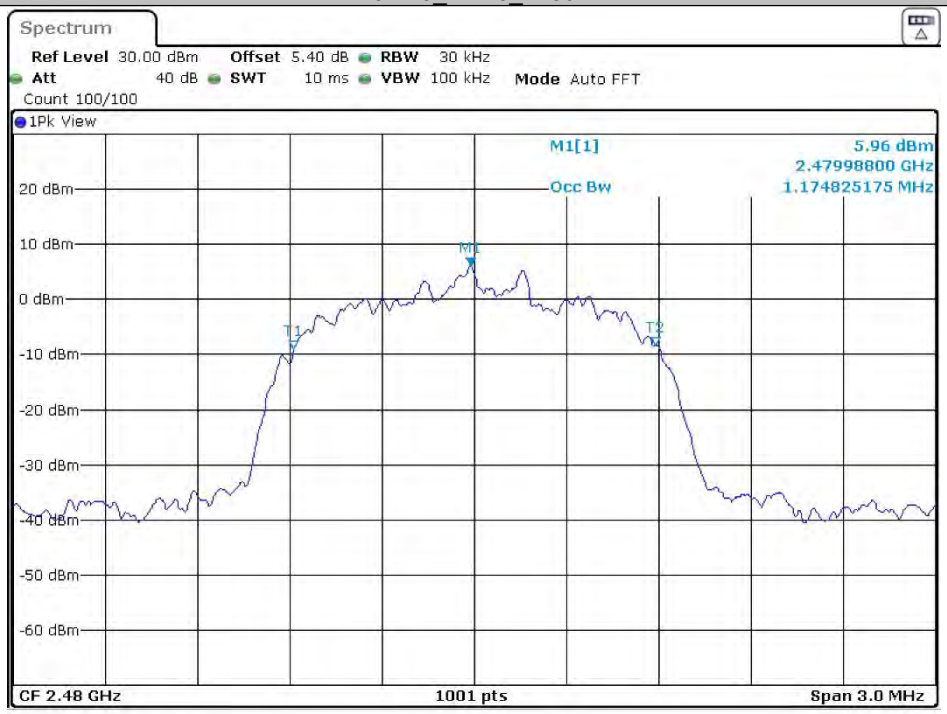

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Maximum conducted output power

Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant10	2402	10.47	<=30	PASS
		2441	12.3	<=30	PASS
		2480	11.47	<=30	PASS
2DH5	Ant10	2402	9.63	<=20.97	PASS
		2441	11.45	<=20.97	PASS
		2480	10.6	<=20.97	PASS
3DH5	Ant10	2402	9.96	<=20.97	PASS
		2441	11.84	<=20.97	PASS
		2480	10.99	<=20.97	PASS

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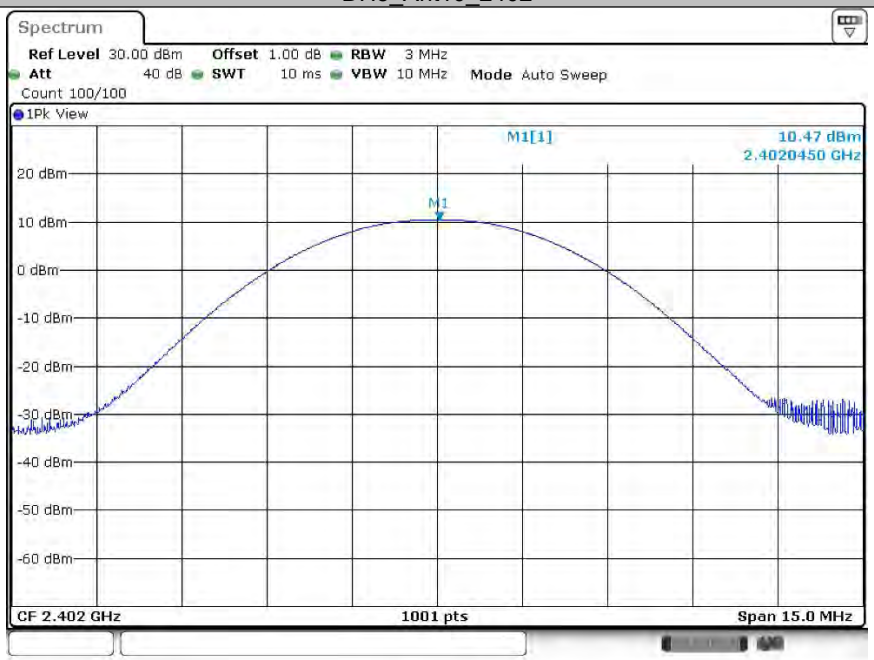

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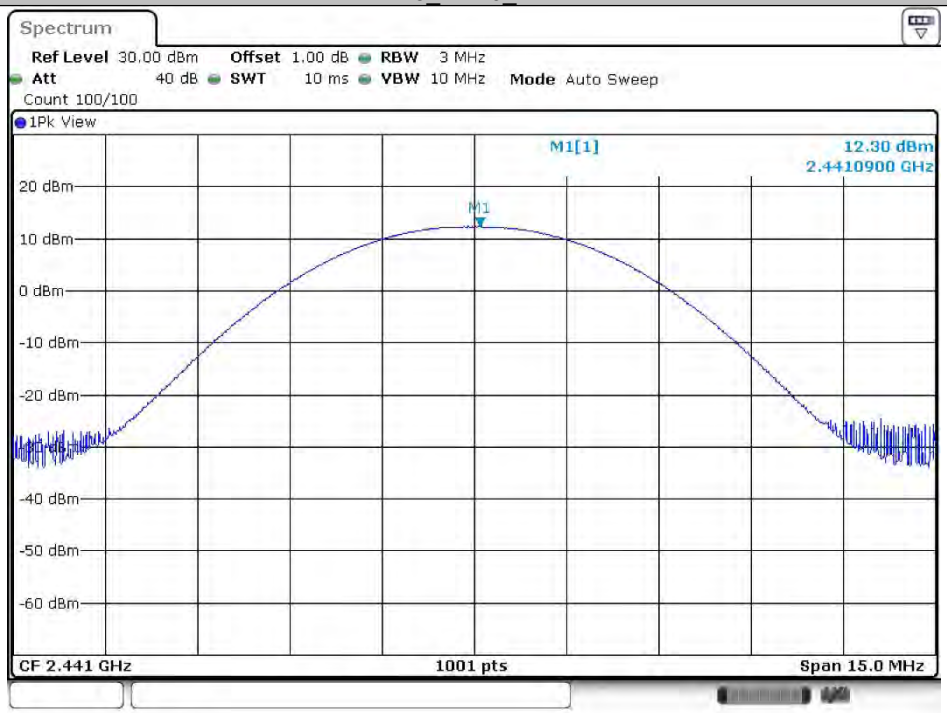
DH5_Ant10_2441



Date: 25.MAY.2021 02:10:48

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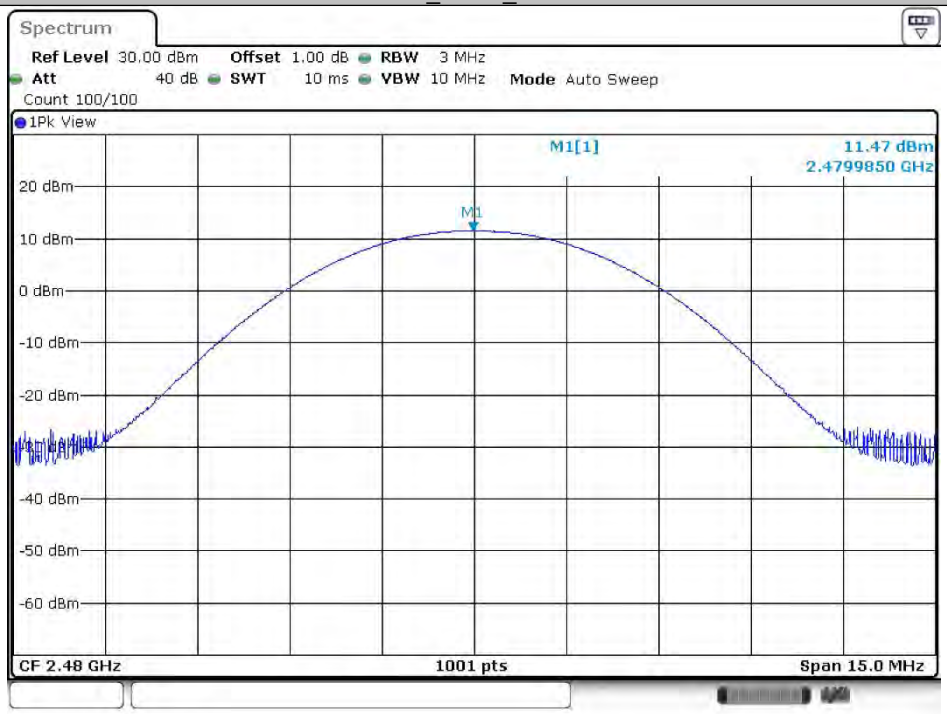

Date: 25.MAY.2021 02:11:07

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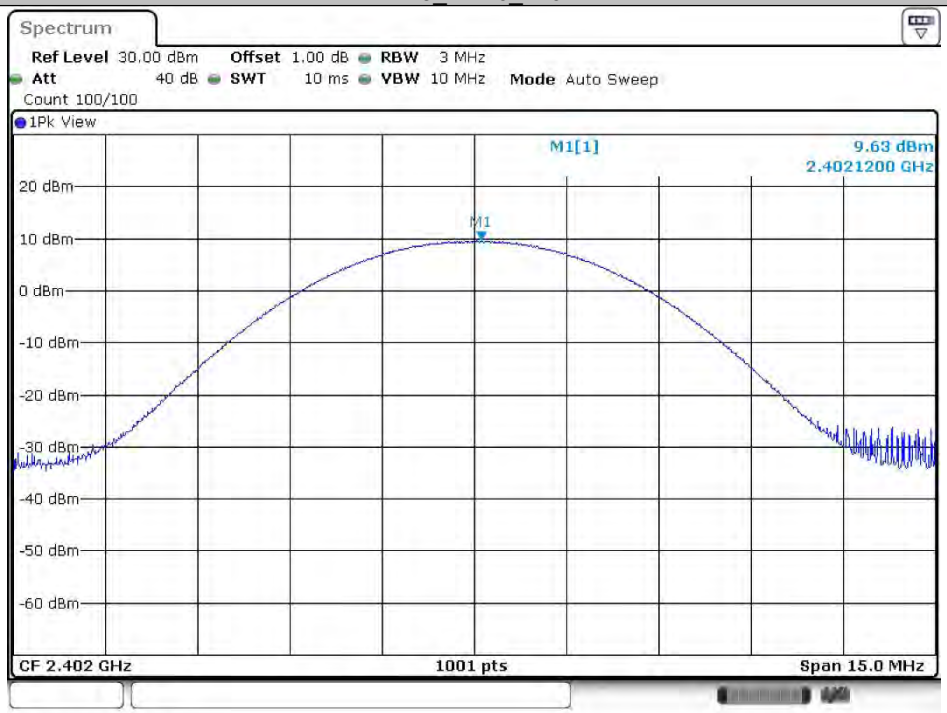
2DH5_Ant10_2402



Date: 25.MAY.2021 02:11:42

2DH5_Ant10_2441

Date: 25.MAY.2021 02:12:09

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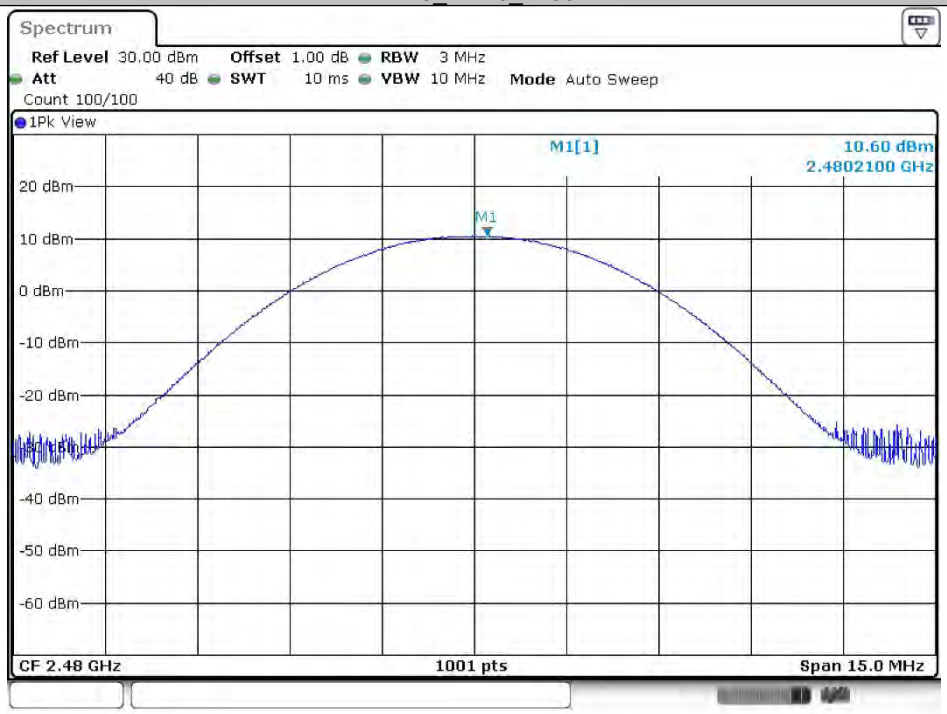

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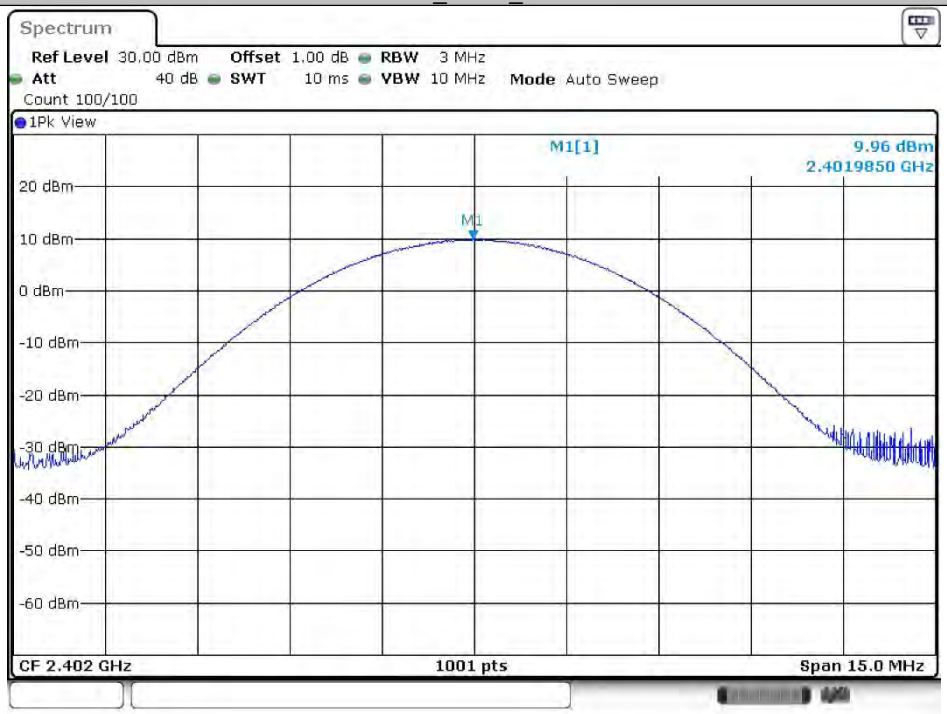

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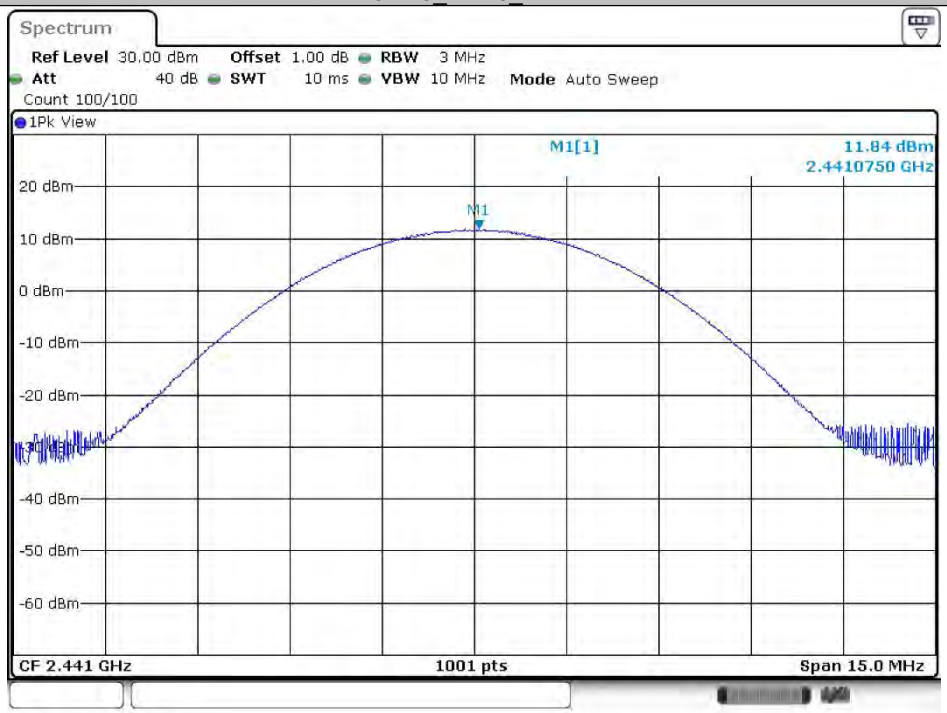

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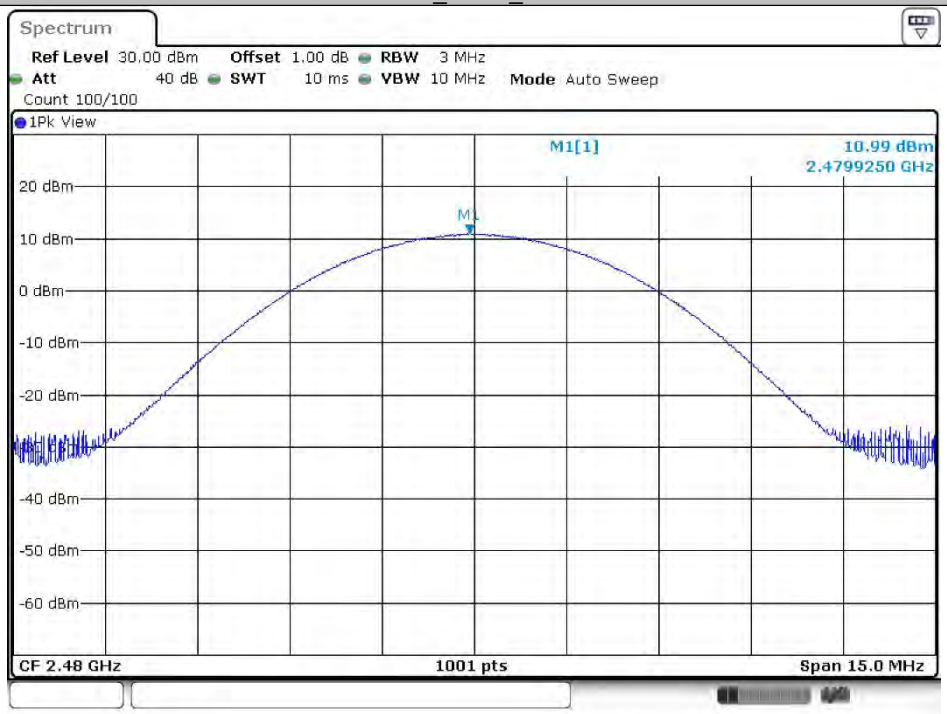

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Carrier frequency separation

Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant10	Hop	0.997	>=0.948	PASS
2DH5	Ant10	Hop	1	>=0.862	PASS
3DH5	Ant10	Hop	1.003	>=0.868	PASS

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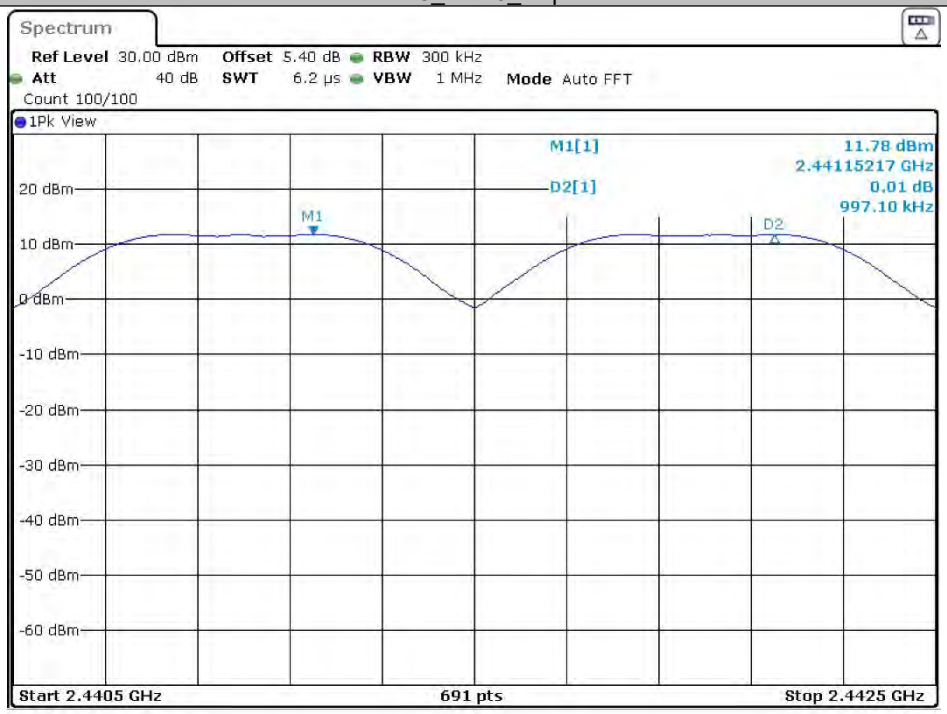
Test Graphs

DH5_Ant10_Hop



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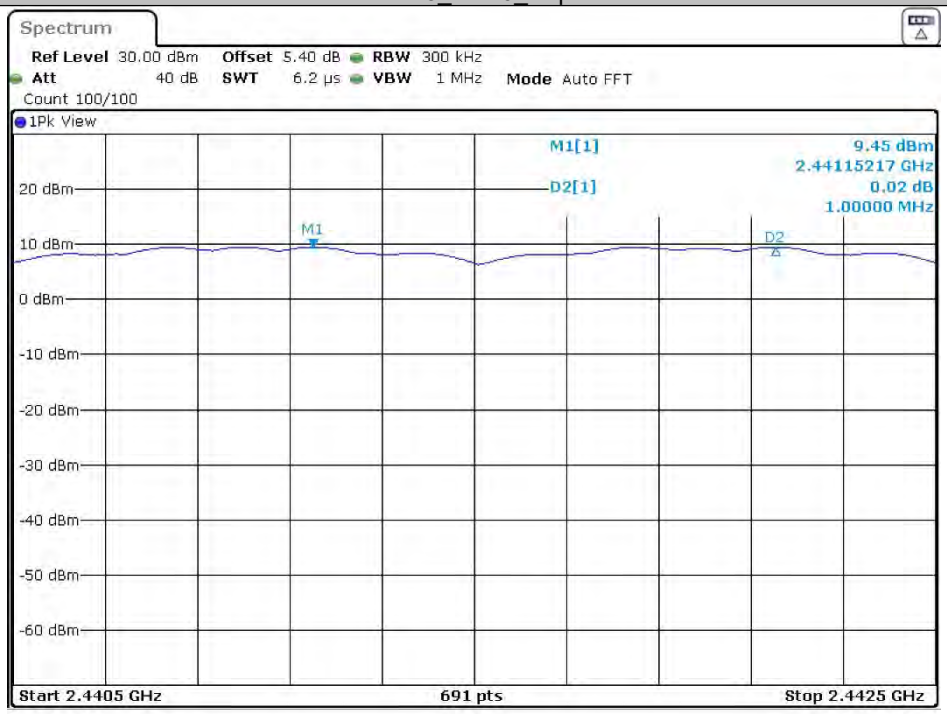

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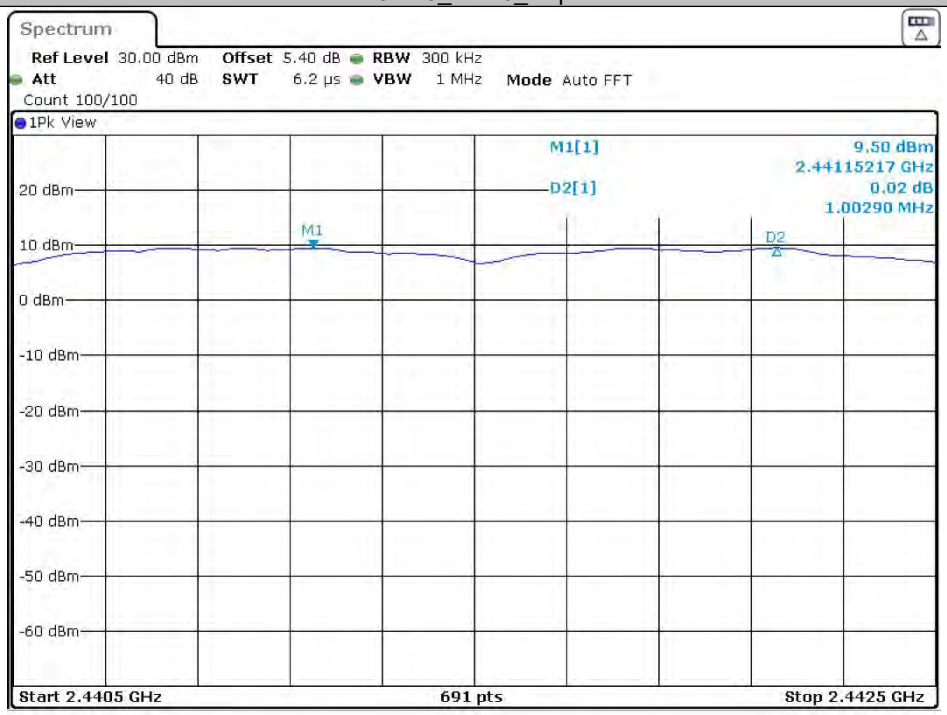

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Time of occupancy

Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant10	Hop	0.40	320	0.127	<=0.4	PASS
DH3	Ant10	Hop	1.65	180	0.296	<=0.4	PASS
DH5	Ant10	Hop	2.89	100	0.289	<=0.4	PASS
2DH1	Ant10	Hop	0.40	330	0.133	<=0.4	PASS
2DH3	Ant10	Hop	1.65	200	0.329	<=0.4	PASS
2DH5	Ant10	Hop	2.89	90	0.26	<=0.4	PASS
3DH1	Ant10	Hop	0.40	330	0.133	<=0.4	PASS
3DH3	Ant10	Hop	1.65	150	0.247	<=0.4	PASS
3DH5	Ant10	Hop	2.89	130	0.376	<=0.4	PASS

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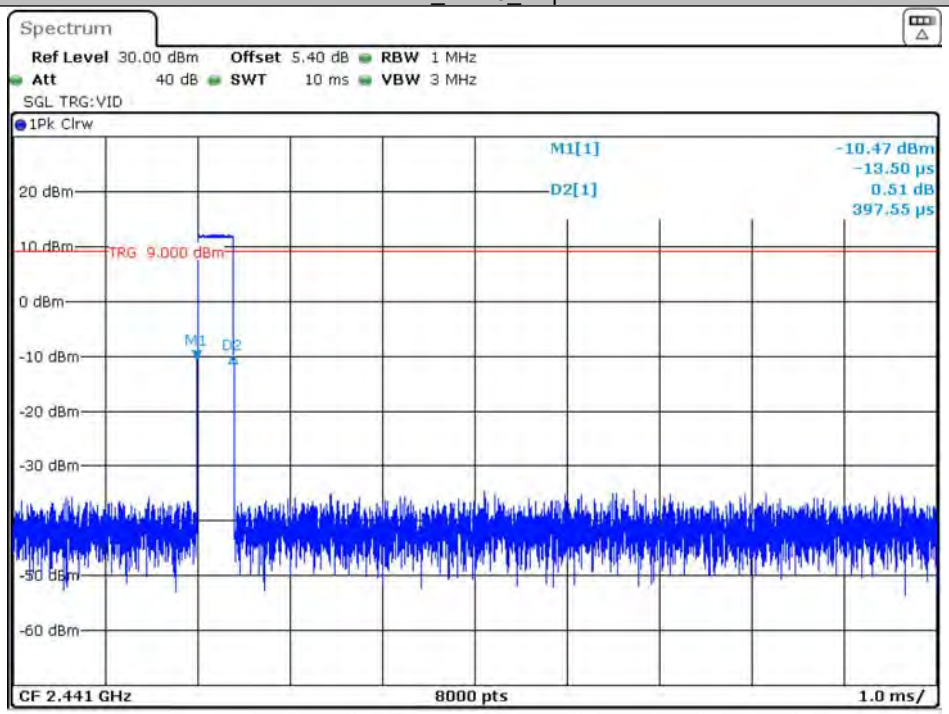
Test Graphs

DH1_Ant10_Hop



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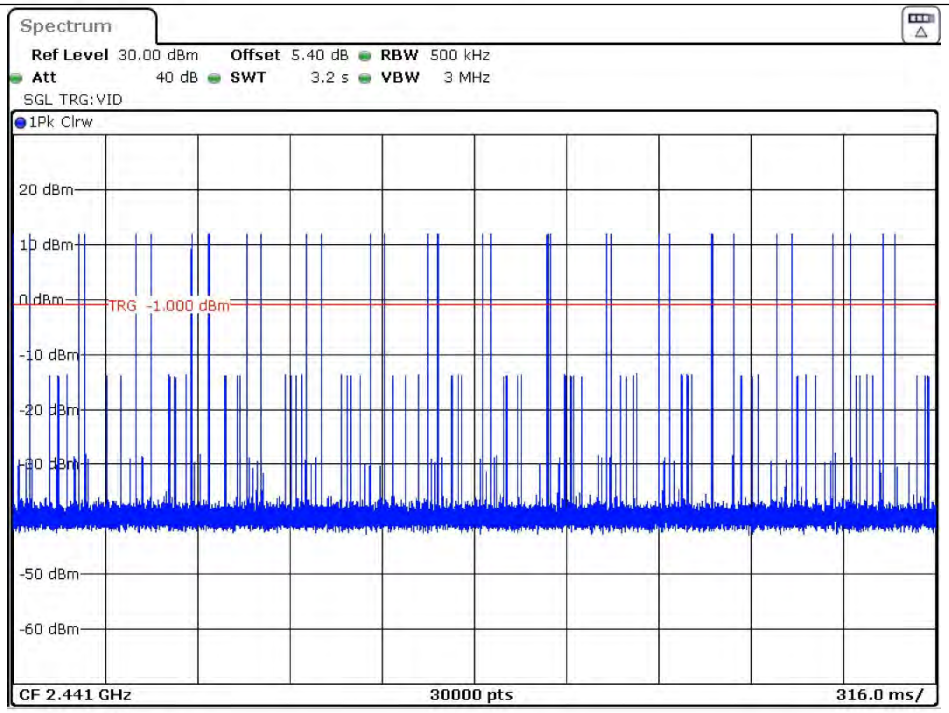

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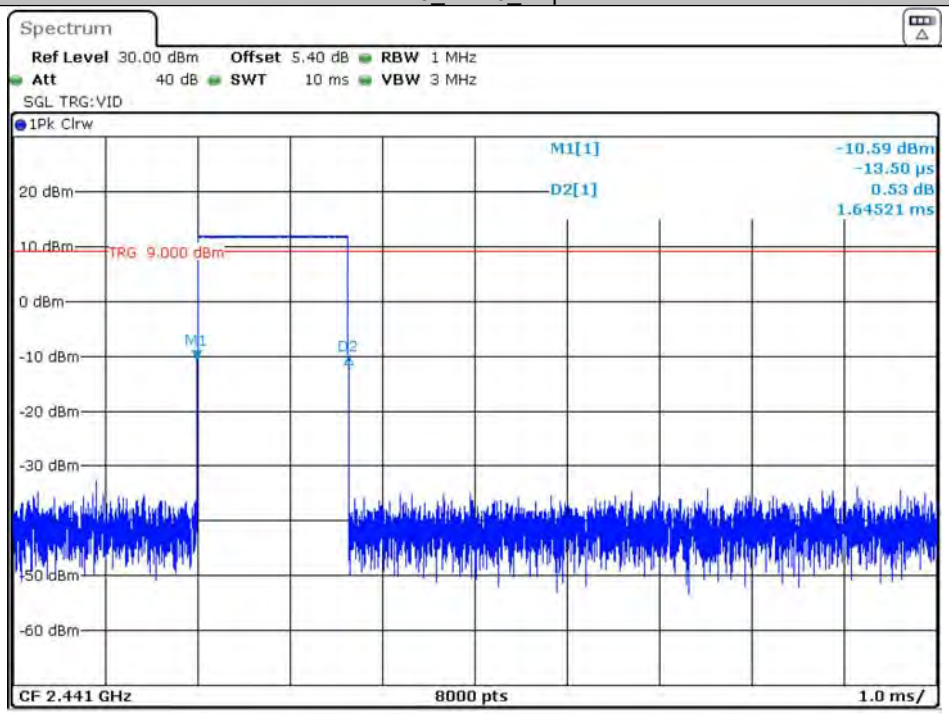

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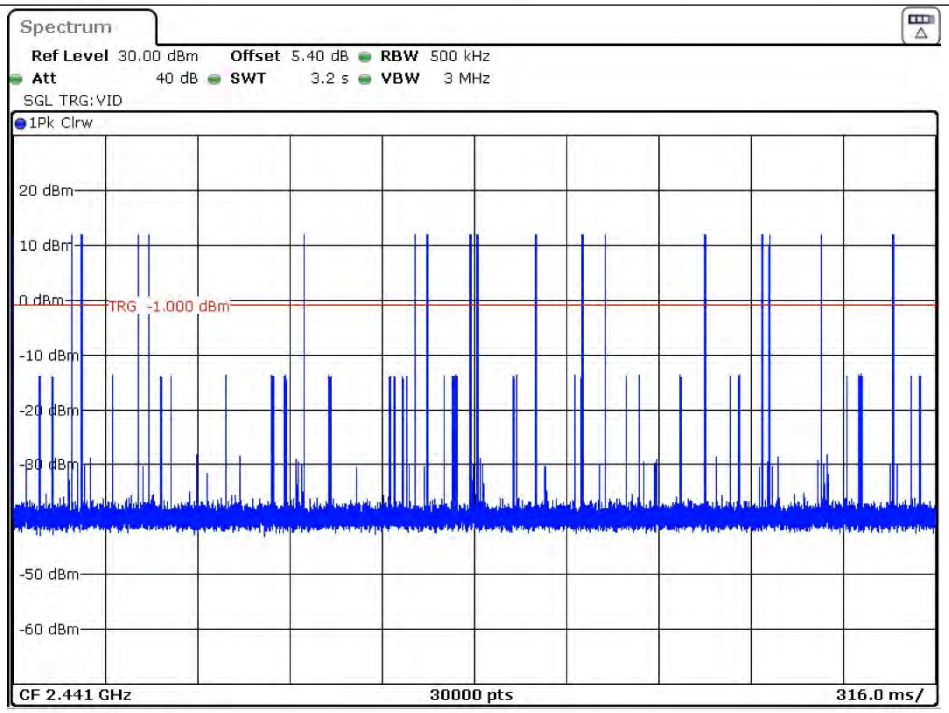

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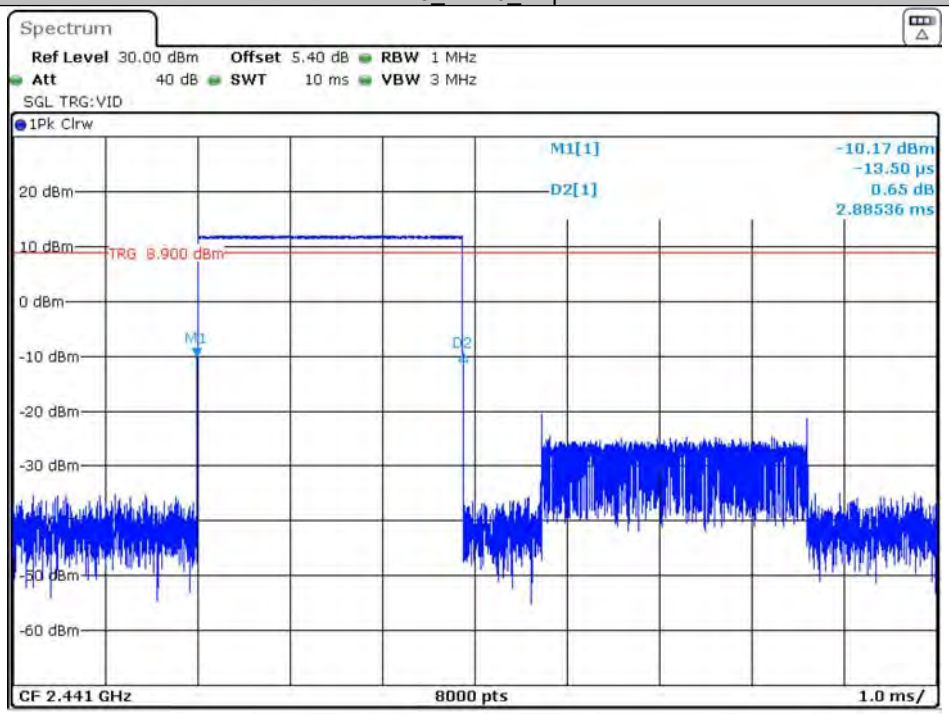

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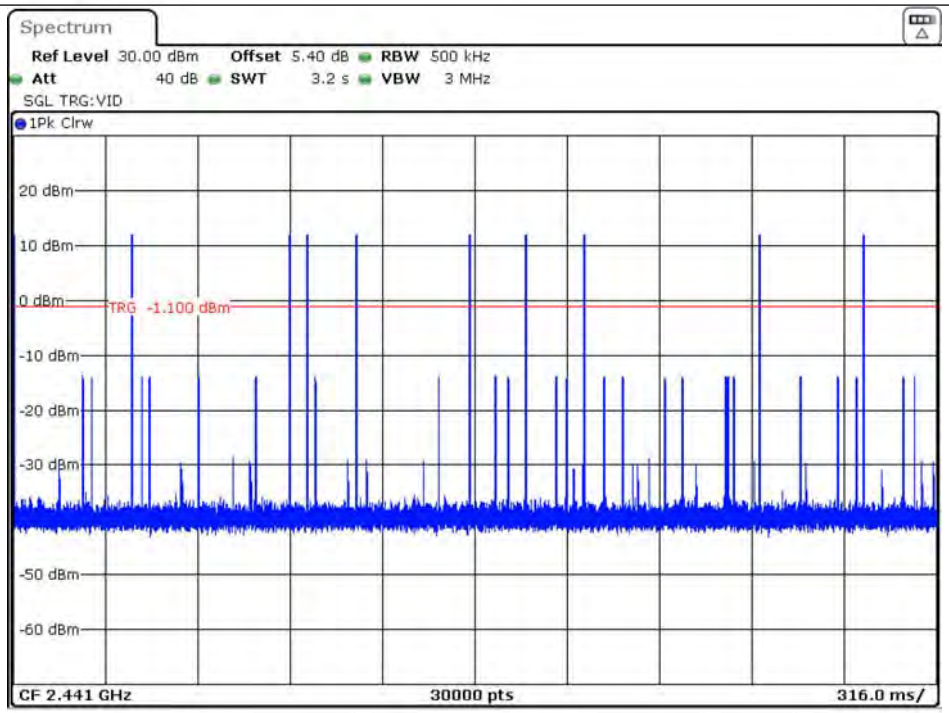

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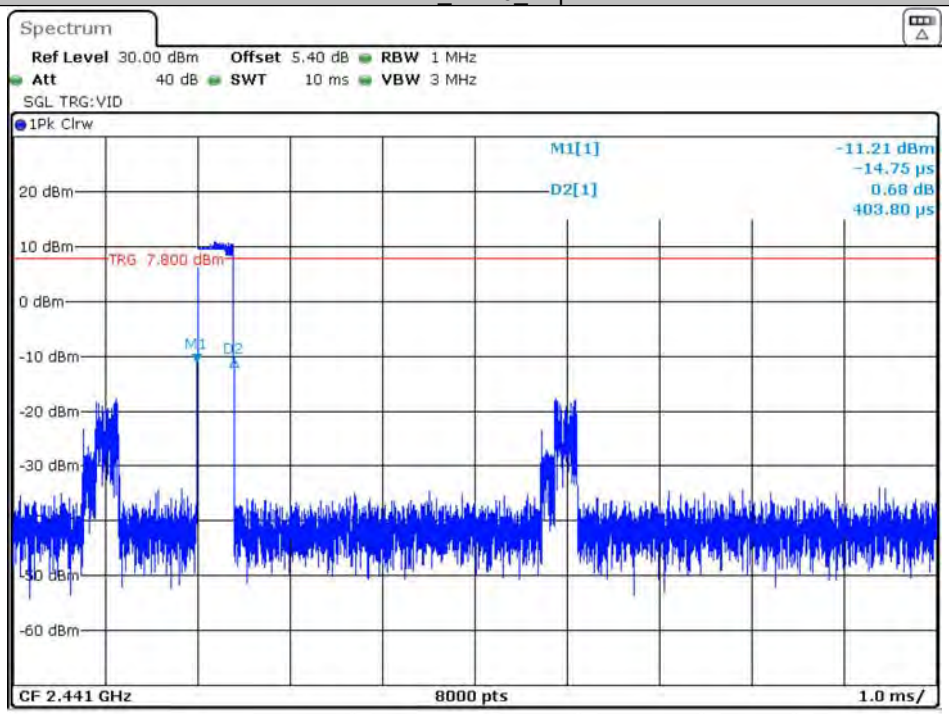

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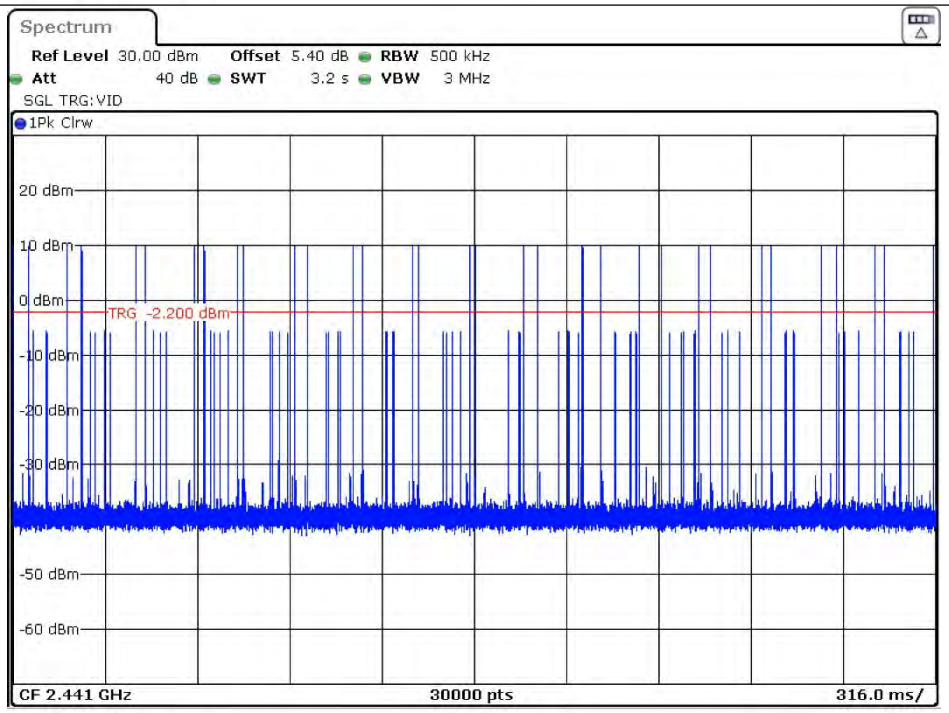

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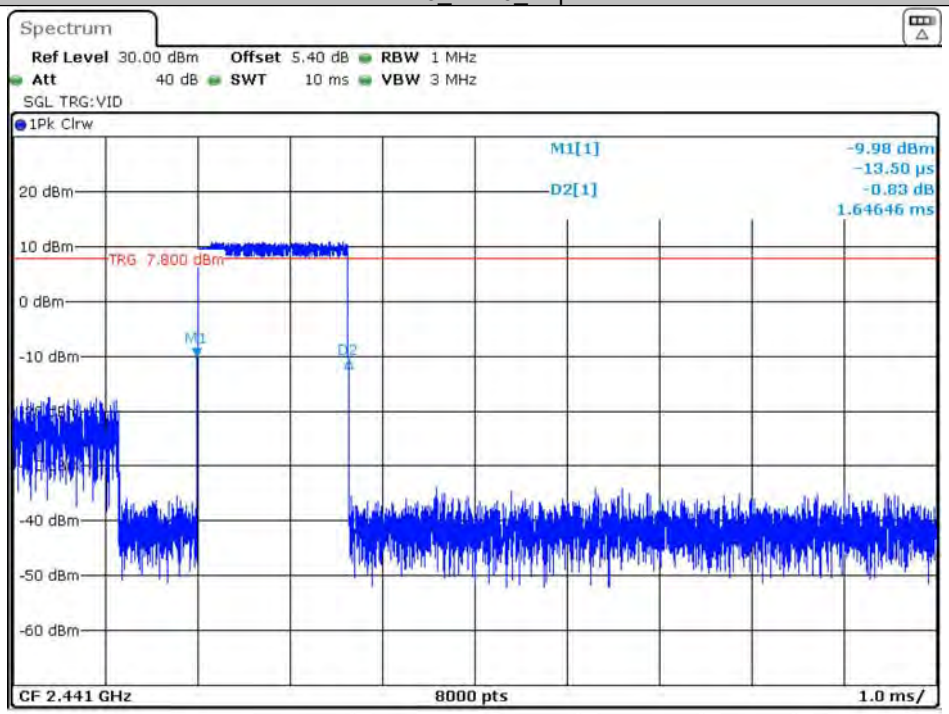

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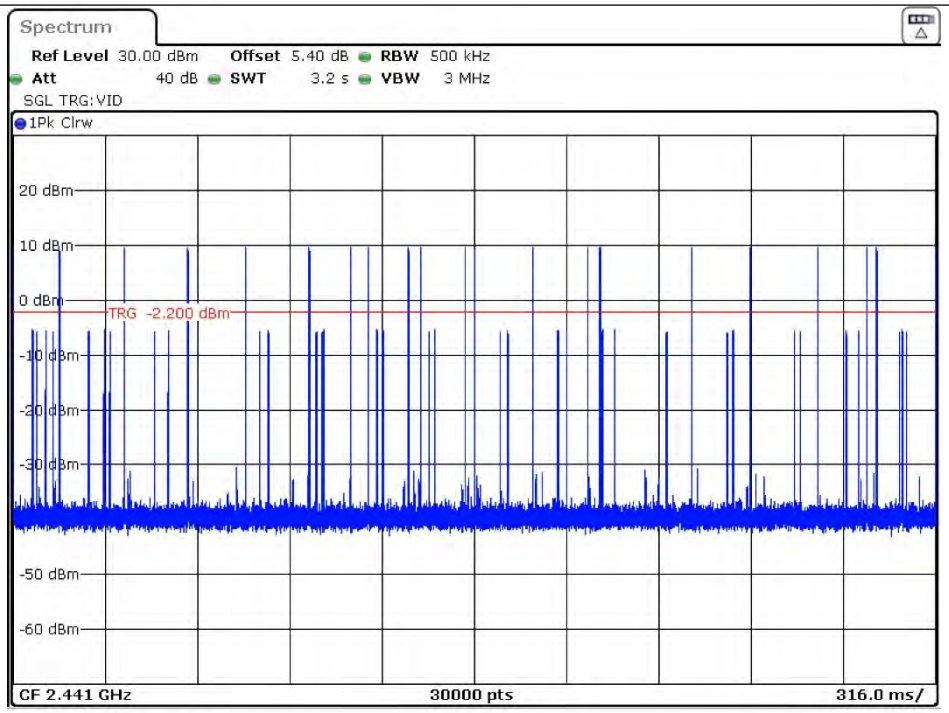

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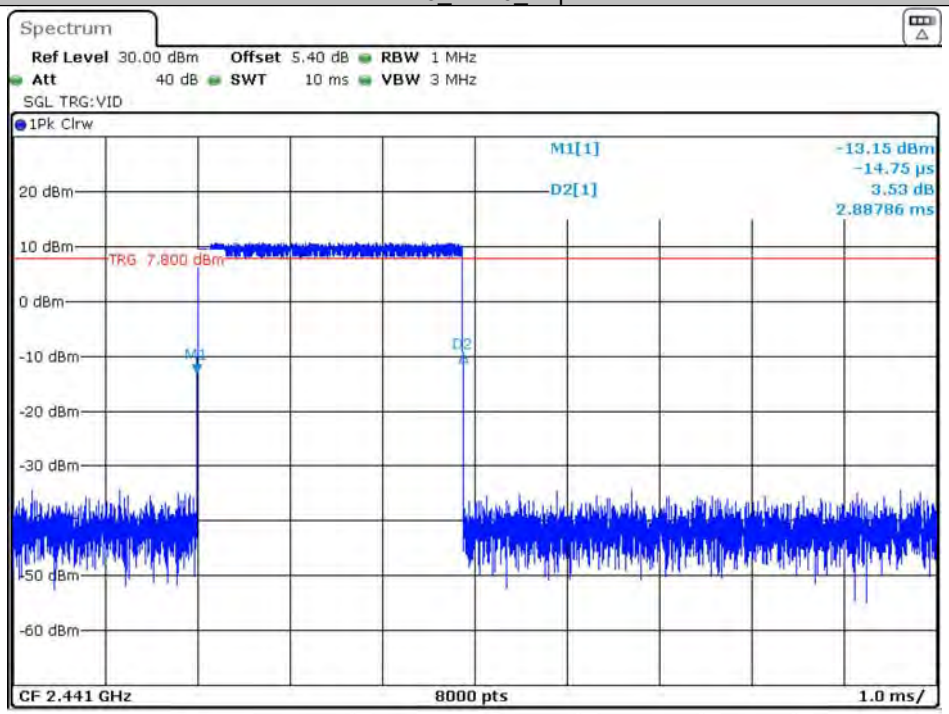
2DH5_Ant10_Hop



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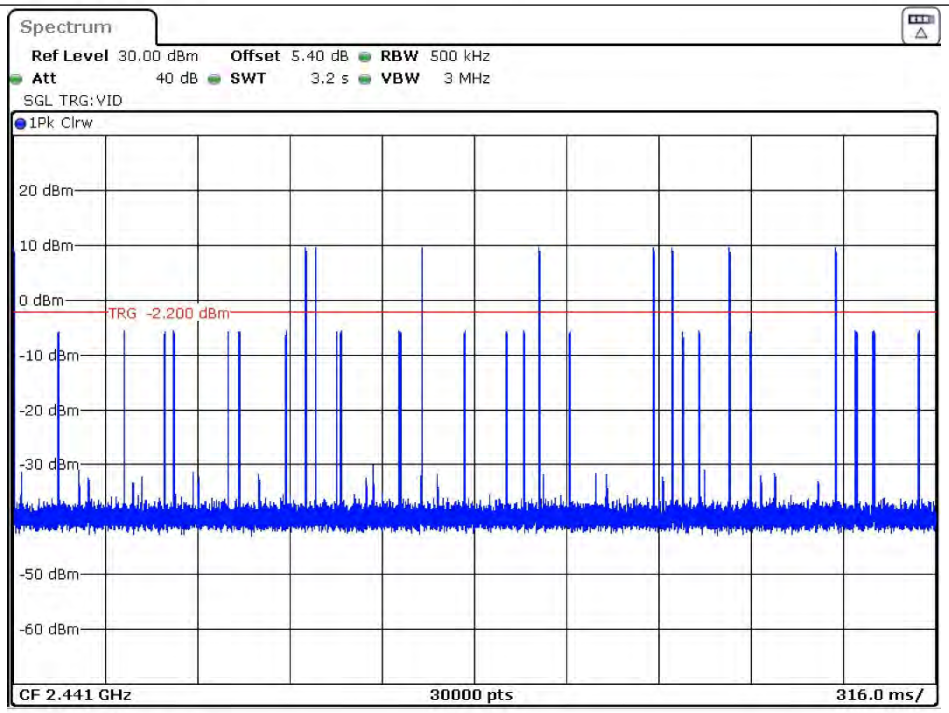

Date: 20.MAY.2021 21:17:23

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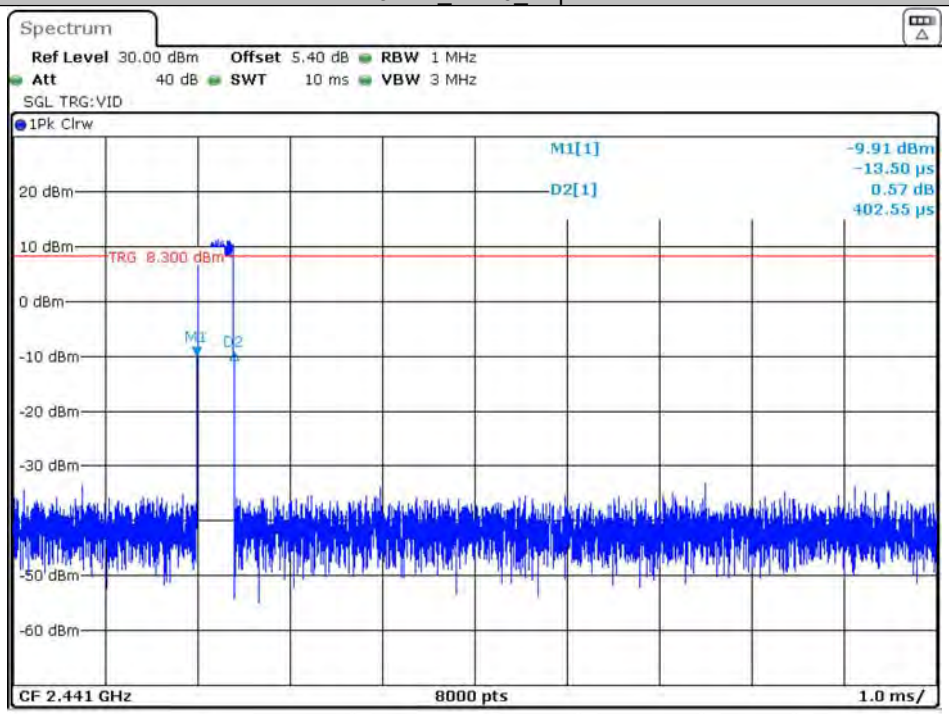
3DH1_Ant10_Hop



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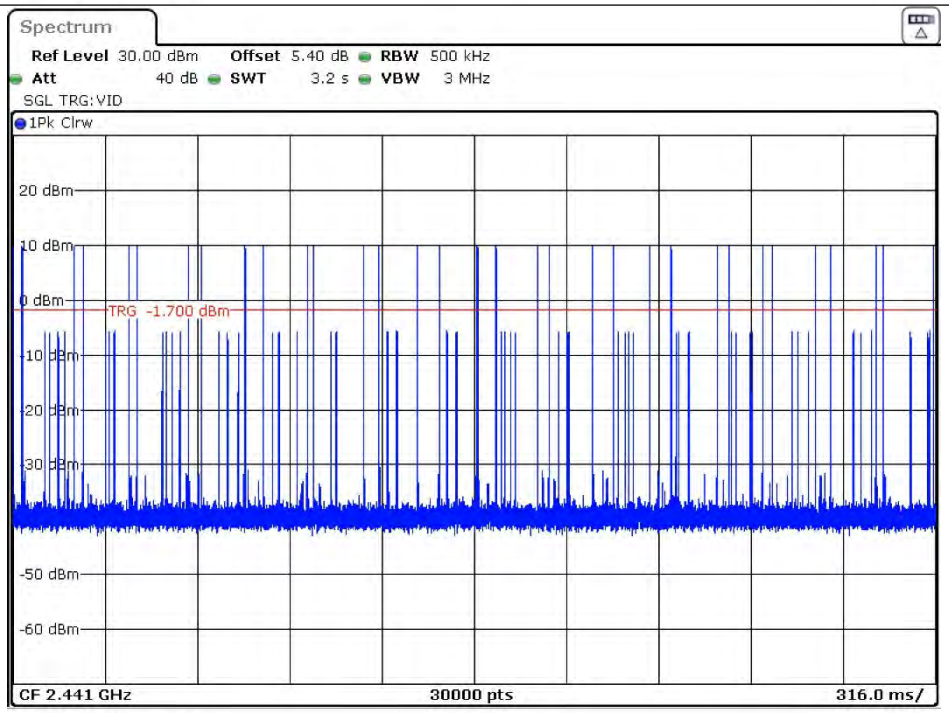

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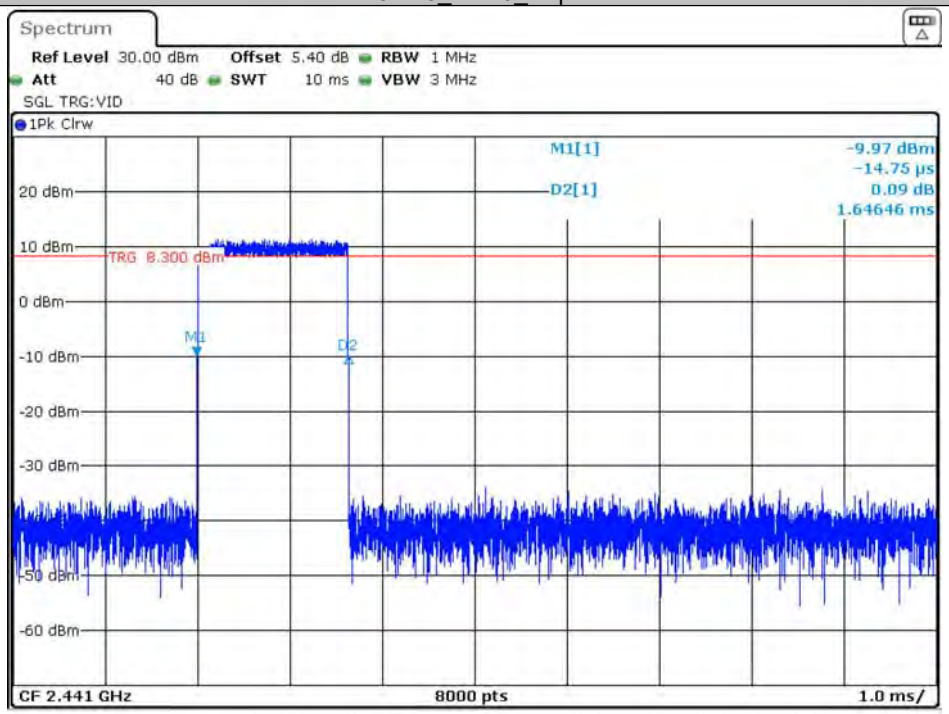
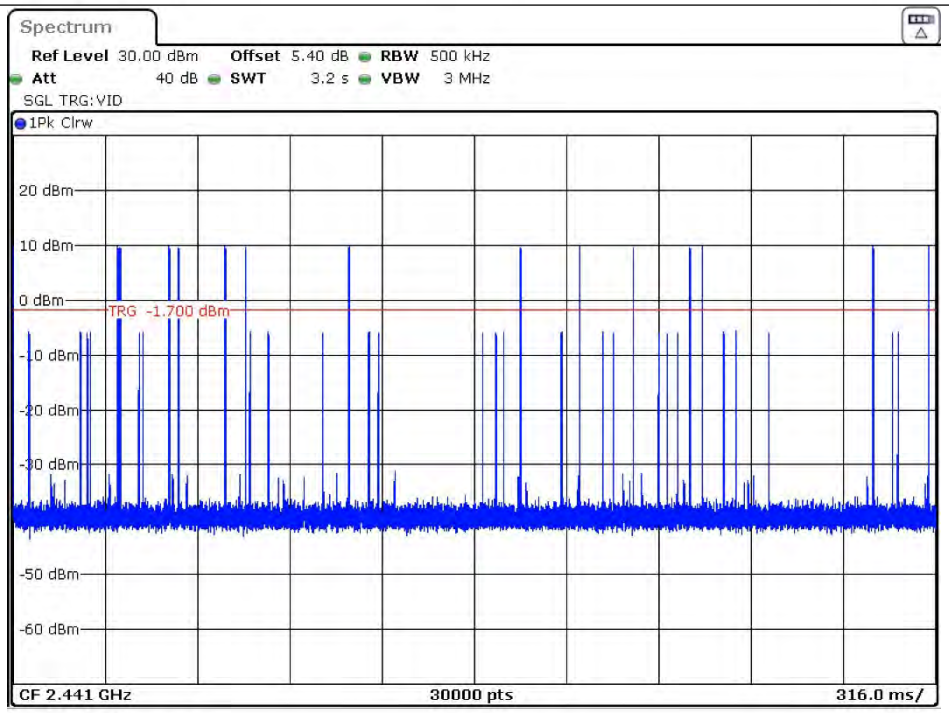
3DH3_Ant10_Hop



Date: 20.MAY.2021 21:25:31



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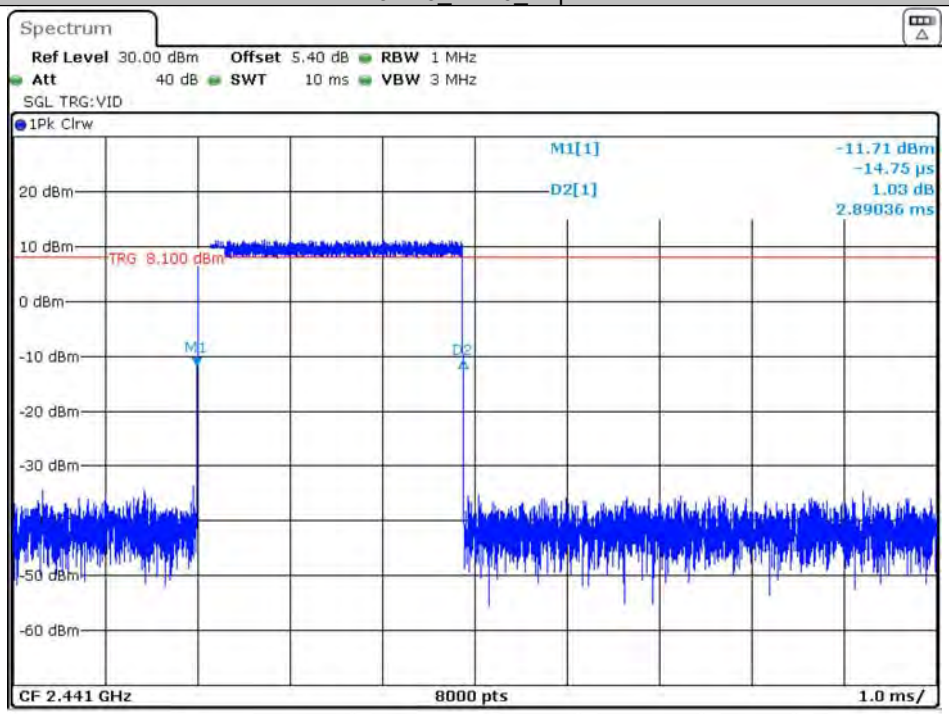
3DH5_Ant10_Hop



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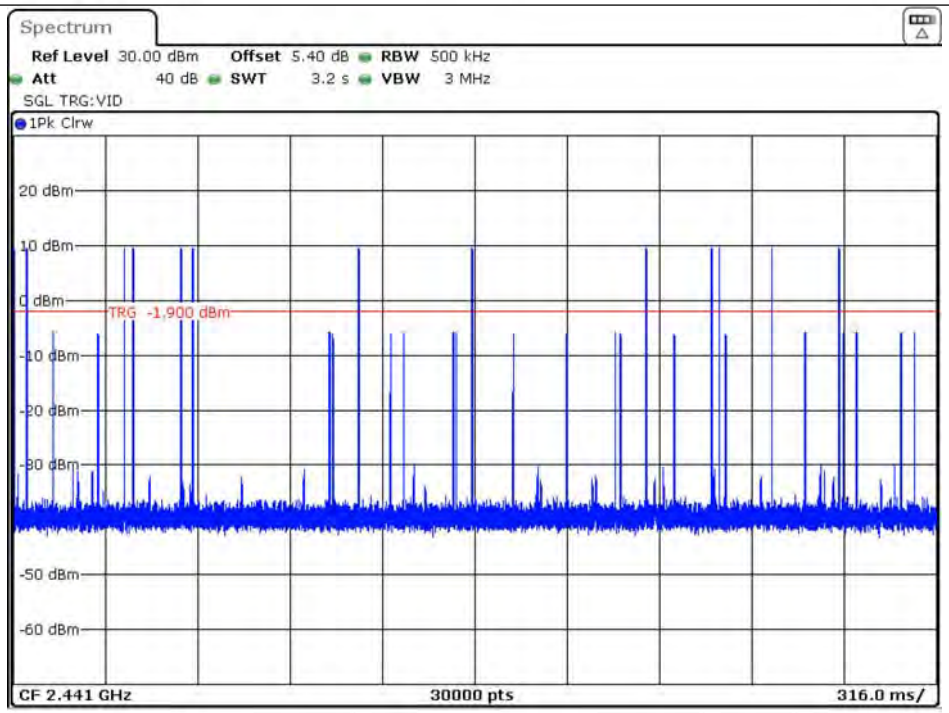

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Number of hopping channels

Test Result

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant10	Hop	79	>=15	PASS
2DH5	Ant10	Hop	79	>=15	PASS
3DH5	Ant10	Hop	79	>=15	PASS

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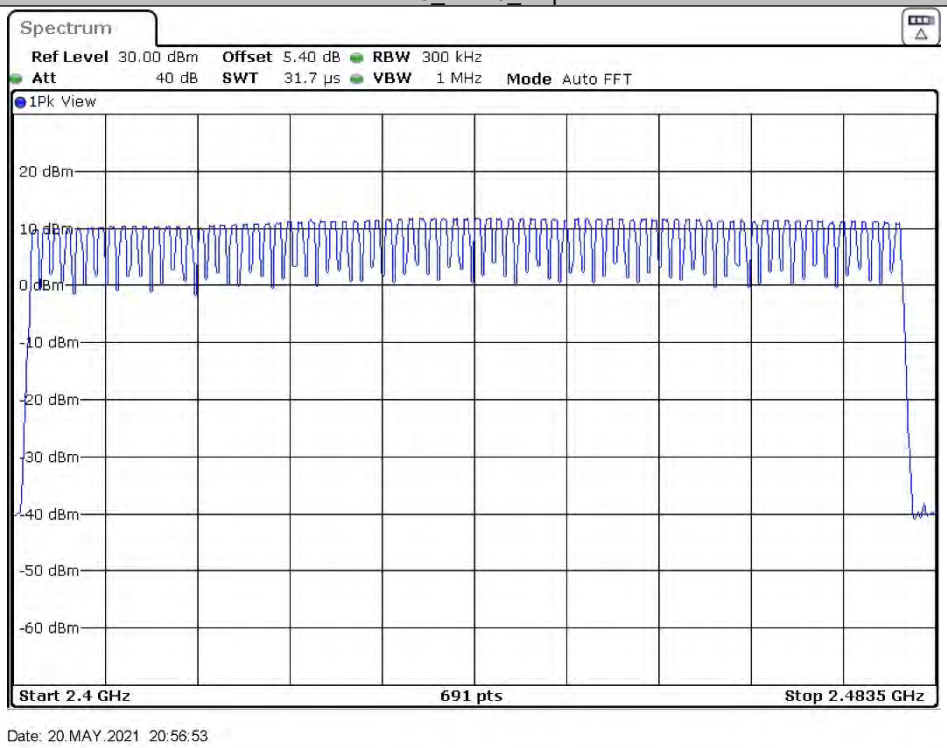
Test Graphs

DH5_Ant10_Hop



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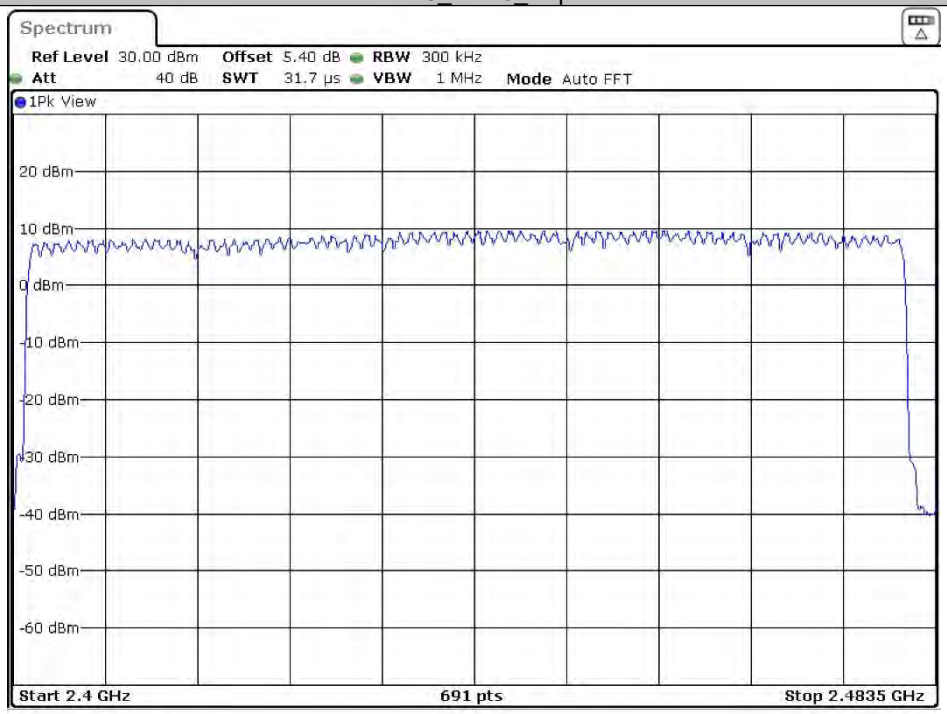
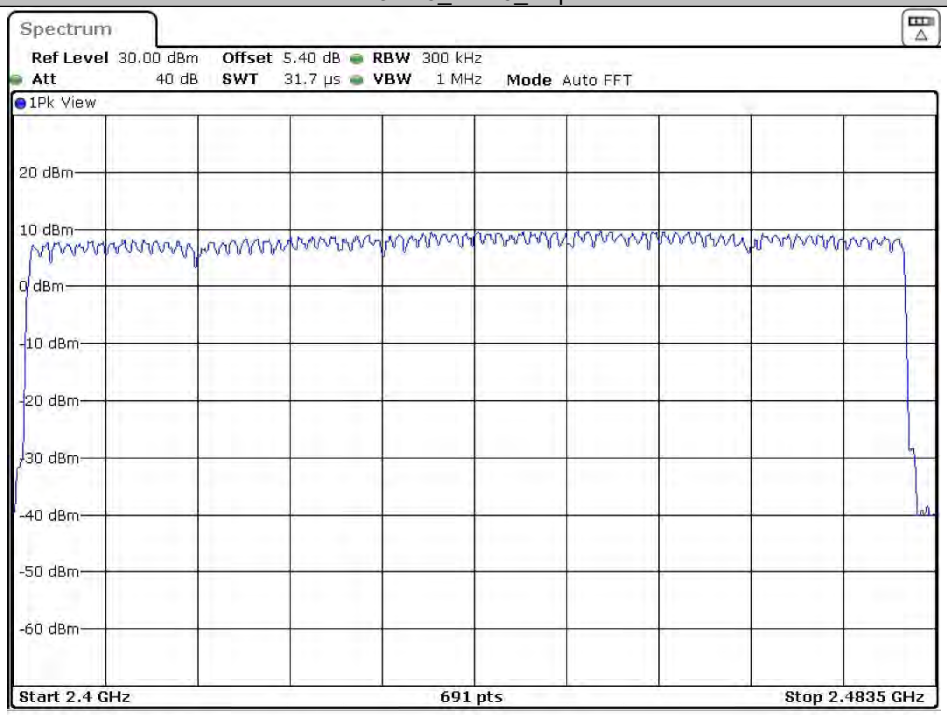
2DH5_Ant10_Hop



Date: 20.MAY.2021 21:16:07

3DH5_Ant10_Hop



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Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant10	Low	2402	9.15	-43.08	<=-10.85	PASS
		High	2480	10.89	-41.68	<=-9.11	PASS
		Low	Hop_2402	10.00	-42.47	<=-10	PASS
		High	Hop_2480	11.44	-40.93	<=-8.56	PASS
2DH5	Ant10	Low	2402	7.17	-42.6	<=-12.83	PASS
		High	2480	8.43	-42.31	<=-11.57	PASS
		Low	Hop_2402	4.50	-42.2	<=-15.5	PASS
		High	Hop_2480	8.66	-42.39	<=-11.34	PASS
3DH5	Ant10	Low	2402	7.36	-43.01	<=-12.64	PASS
		High	2480	8.29	-42.48	<=-11.71	PASS
		Low	Hop_2402	5.84	-42.92	<=-14.16	PASS
		High	Hop_2480	8.31	-42.12	<=-11.69	PASS

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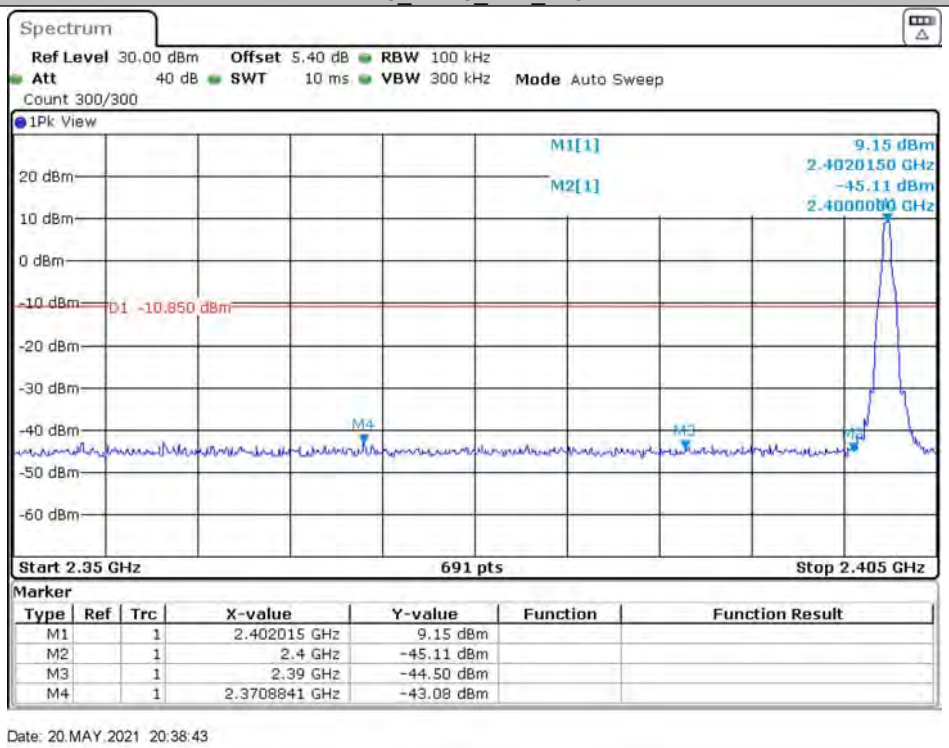
Test Graphs

DH5_Ant10_Low_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	9.15 dBm		
M2		1	2.4 GHz	-45.11 dBm		
M3		1	2.39 GHz	-44.50 dBm		
M4		1	2.3708841 GHz	-43.08 dBm		

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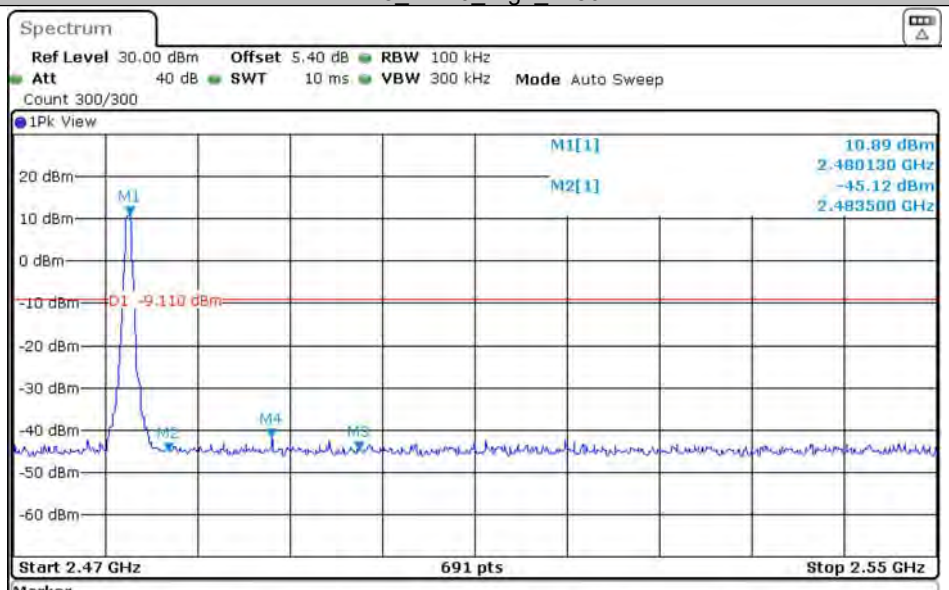
DH5_Ant10_High_2480

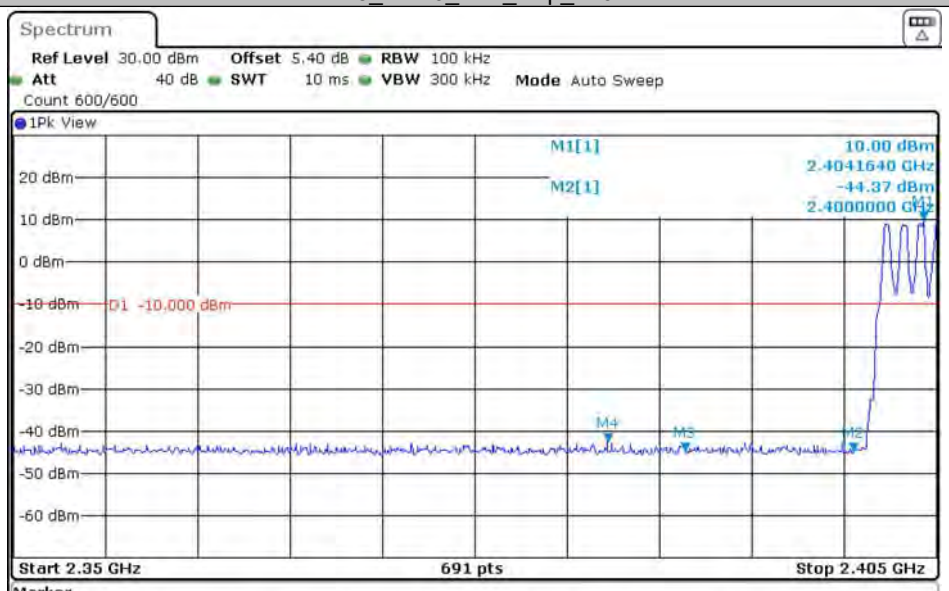


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48013 GHz	10.89 dBm		
M2		1	2.4835 GHz	-45.12 dBm		
M3		1	2.5 GHz	-44.72 dBm		
M4		1	2.492377 GHz	-41.68 dBm		

Date: 20.MAY.2021 20:41:35

DH5_Ant10_Low_Hop_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404164 GHz	10.00 dBm		
M2		1	2.4 GHz	-44.37 dBm		
M3		1	2.39 GHz	-44.70 dBm		
M4		1	2.3853913 GHz	-42.47 dBm		

Date: 20.MAY.2021 20:56:12

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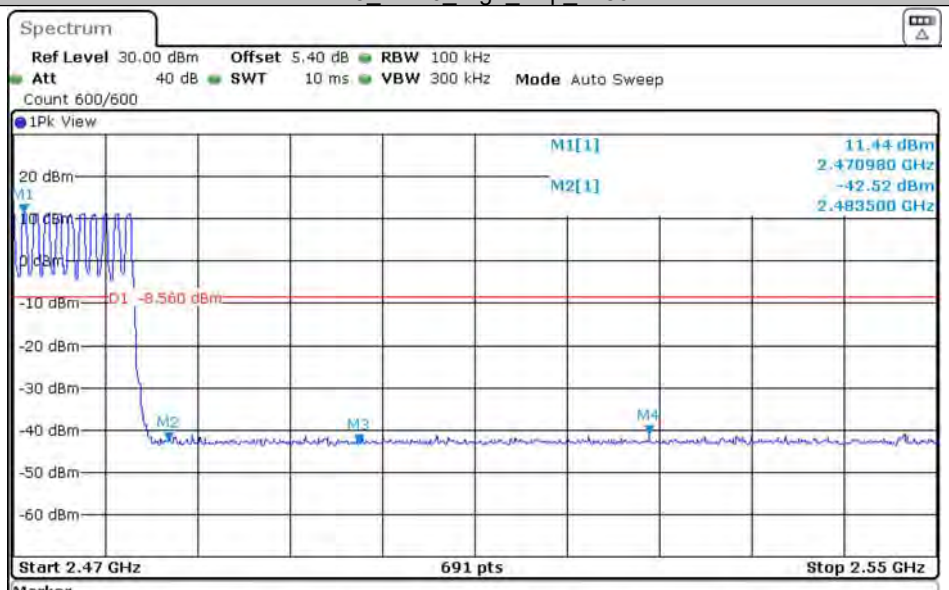
DH5_Ant10_High_Hop_2480

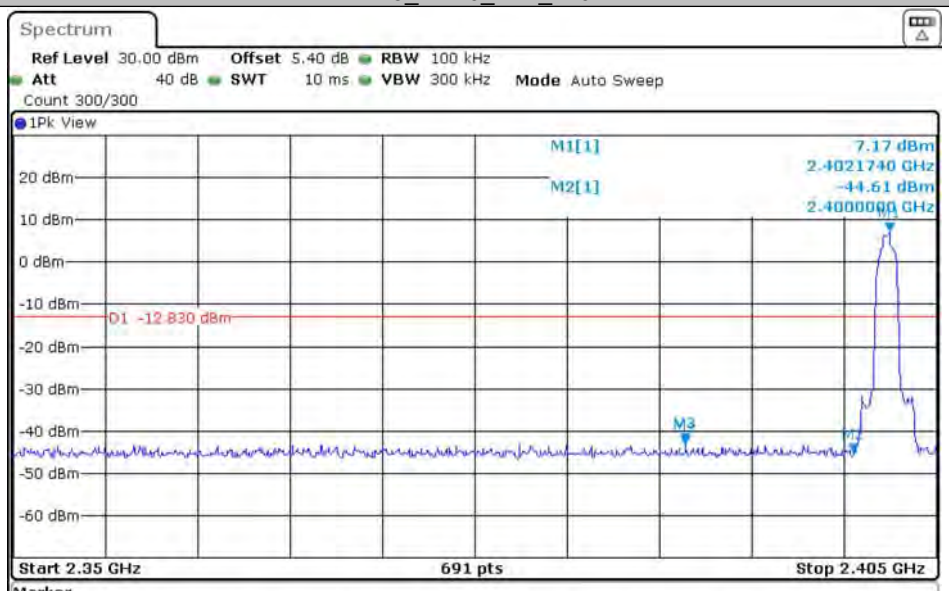


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47098 GHz	11.44 dBm		
M2		1	2.4835 GHz	-42.52 dBm		
M3		1	2.5 GHz	-43.21 dBm		
M4		1	2.525072 GHz	-40.93 dBm		

Date: 20.MAY.2021 21:12:17

2DH5_Ant10_Low_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402174 GHz	7.17 dBm		
M2		1	2.4 GHz	-44.61 dBm		
M3		1	2.39 GHz	-42.60 dBm		
M4		1	2.3900145 GHz	-42.60 dBm		

Date: 20.MAY.2021 20:42:58

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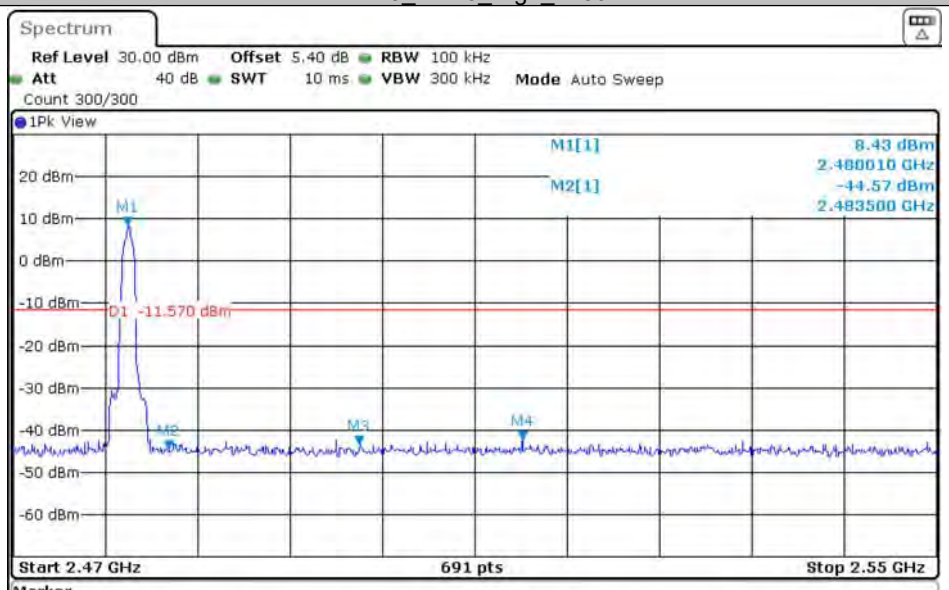
2DH5_Ant10_High_2480

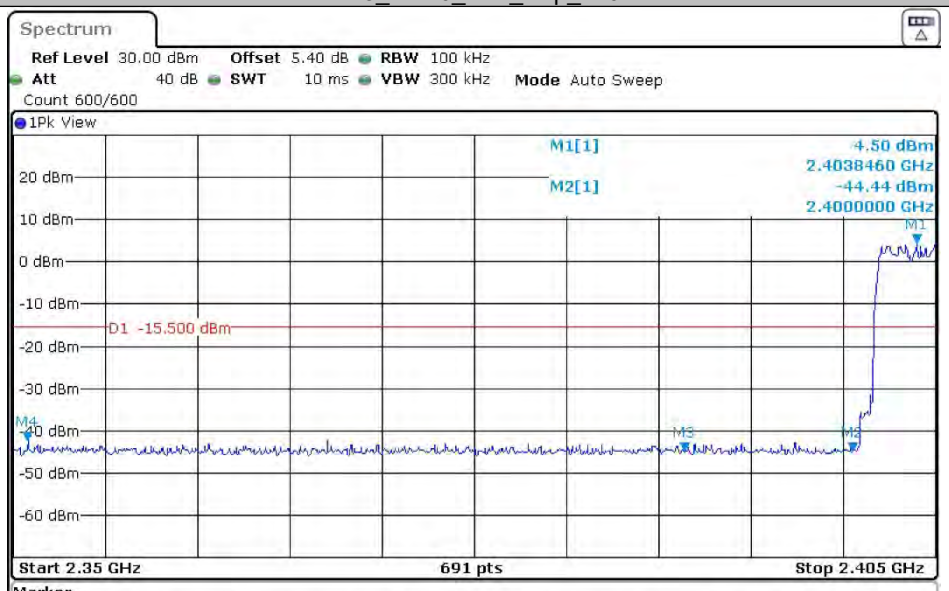


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	8.43 dBm		
M2		1	2.4835 GHz	-44.57 dBm		
M3		1	2.5 GHz	-43.53 dBm		
M4		1	2.514174 GHz	-42.31 dBm		

Date: 20.MAY.2021 20:45:41

2DH5_Ant10_Low_Hop_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403846 GHz	4.50 dBm		
M2		1	2.4 GHz	-44.44 dBm		
M3		1	2.39 GHz	-44.95 dBm		
M4		1	2.3508768 GHz	-42.20 dBm		

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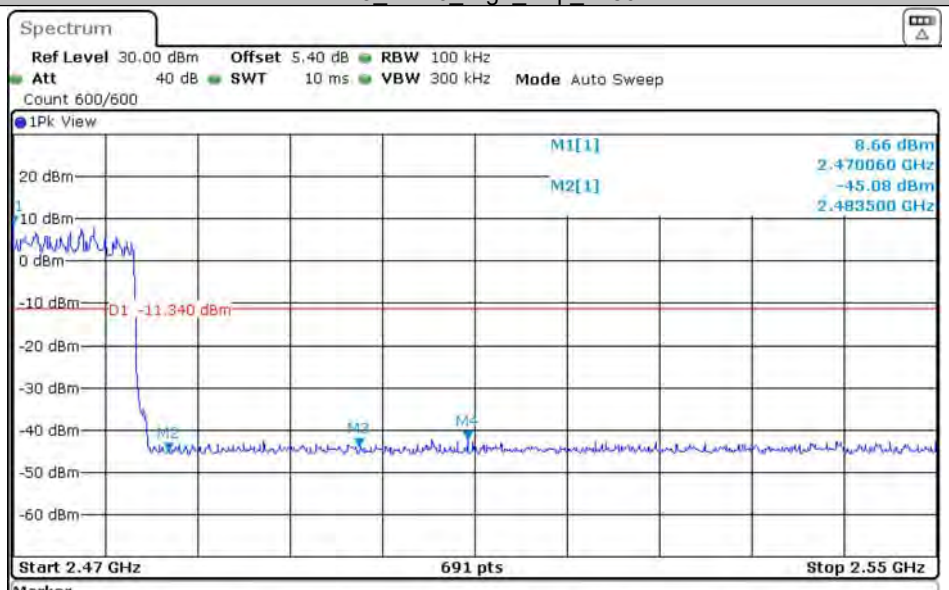
2DH5_Ant10_High_Hop_2480

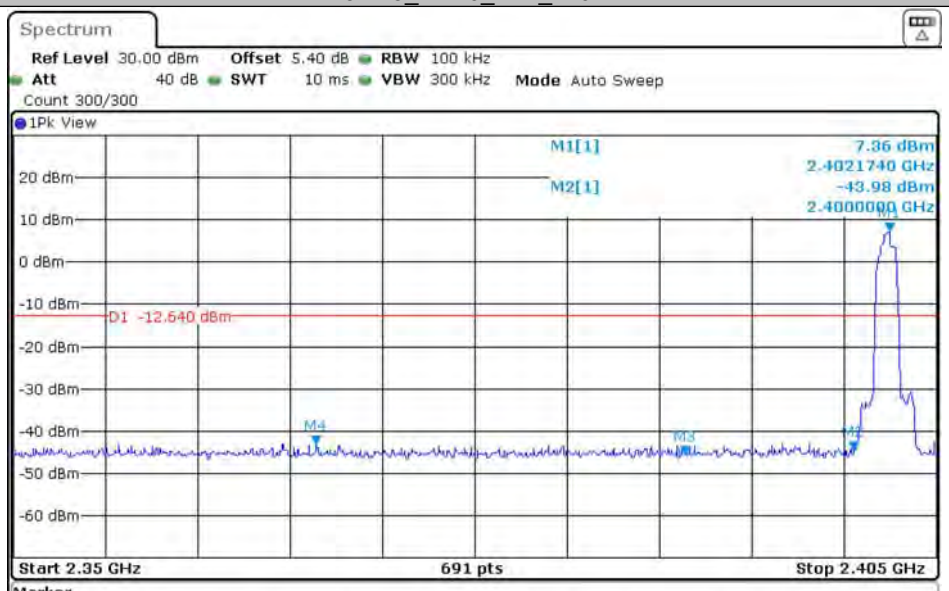


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47006 GHz	8.66 dBm		
M2		1	2.4835 GHz	-45.08 dBm		
M3		1	2.5 GHz	-43.96 dBm		
M4		1	2.50942 GHz	-42.39 dBm		

Date: 20.MAY.2021 21:17:42

3DH5_Ant10_Low_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402174 GHz	7.36 dBm		
M2		1	2.4 GHz	-43.98 dBm		
M3		1	2.39 GHz	-45.64 dBm		
M4		1	2.3680145 GHz	-43.01 dBm		

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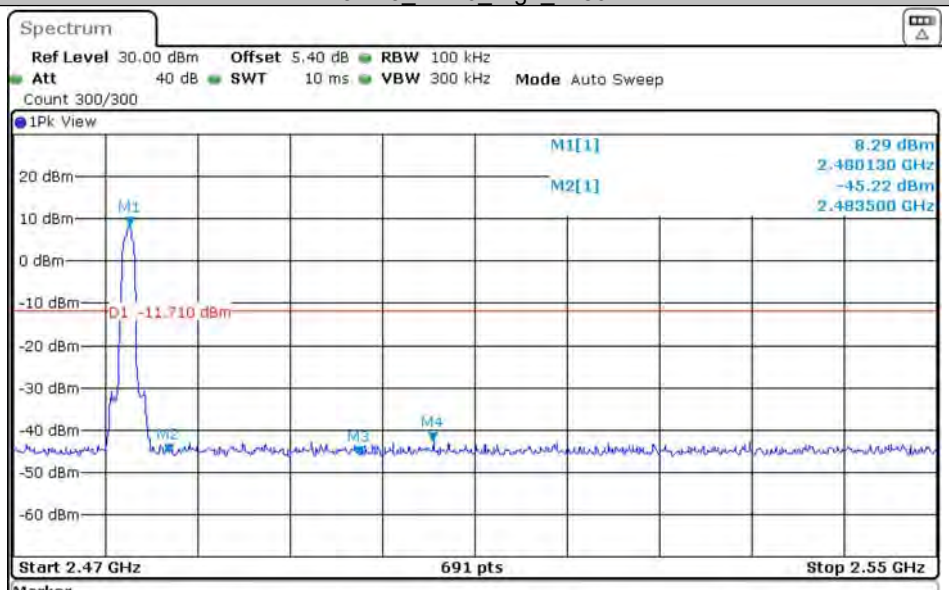
3DH5_Ant10_High_2480

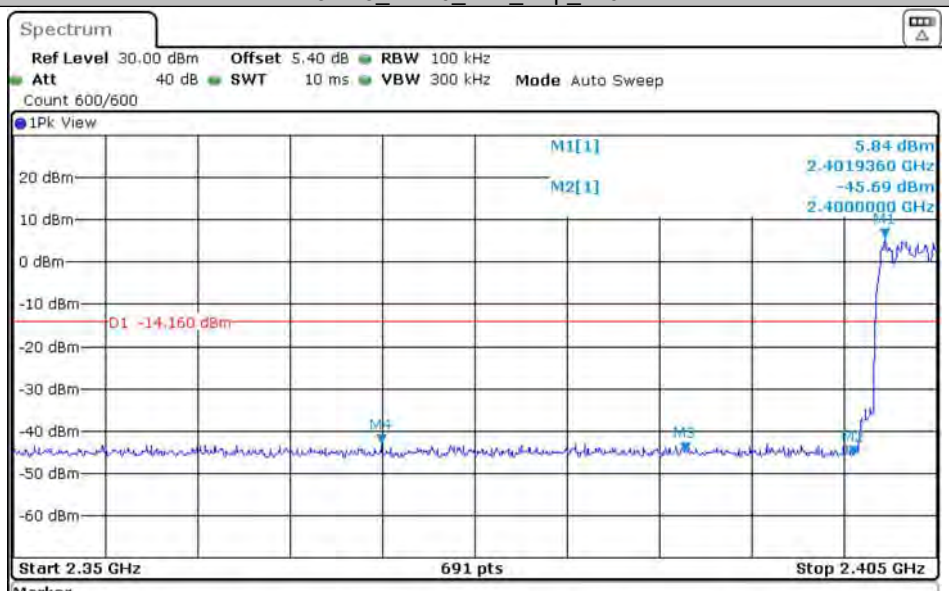


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48013 GHz	8.29 dBm		
M2		1	2.4835 GHz	-45.22 dBm		
M3		1	2.5 GHz	-45.88 dBm		
M4		1	2.506406 GHz	-42.48 dBm		

Date: 20.MAY.2021 20:54:11

3DH5_Ant10_Low_Hop_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401936 GHz	5.84 dBm		
M2		1	2.4 GHz	-45.69 dBm		
M3		1	2.39 GHz	-44.79 dBm		
M4		1	2.3719203 GHz	-42.92 dBm		

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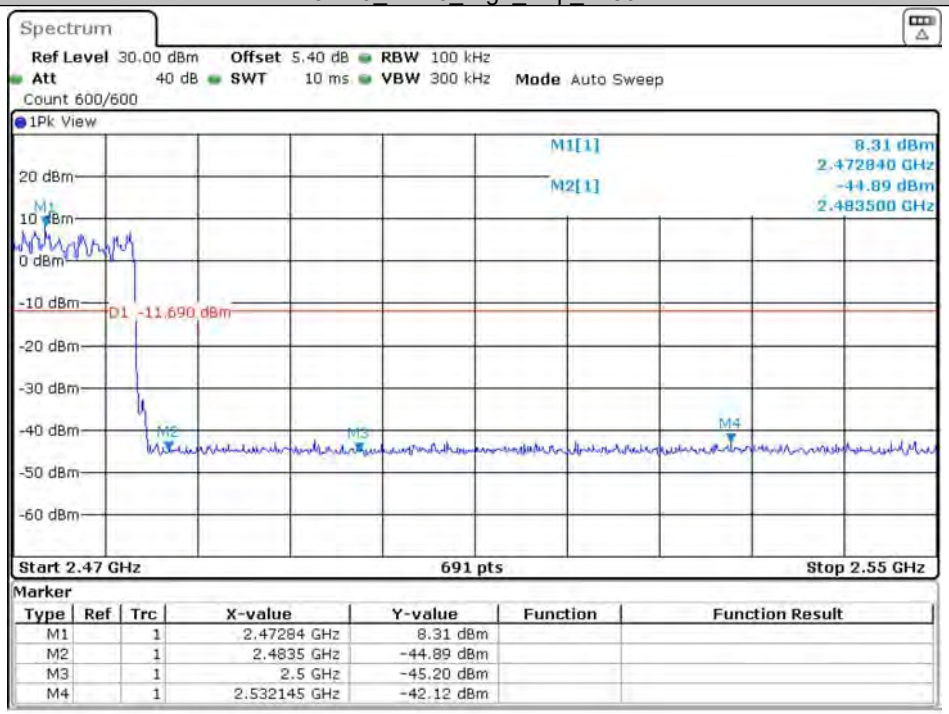
3DH5_Ant10_High_Hop_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47284 GHz	8.31 dBm		
M2		1	2.4835 GHz	-44.89 dBm		
M3		1	2.5 GHz	-45.20 dBm		
M4		1	2.532145 GHz	-42.12 dBm		

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Conducted Spurious Emission

Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant10	2402	Reference	9.50	9.50	---	PASS
			30~1000	9.50	-41.46	<=-10.5	PASS
			1000~26500	9.50	-26.15	<=-10.5	PASS
		2441	Reference	11.67	11.67	---	PASS
			30~1000	11.67	-41.06	<=-8.33	PASS
			1000~26500	11.67	-26.53	<=-8.33	PASS
		2480	Reference	10.85	10.85	---	PASS
			30~1000	10.85	-40.24	<=-9.15	PASS
			1000~26500	10.85	-26.53	<=-9.15	PASS
2DH5	Ant10	2402	Reference	7.26	7.26	---	PASS
			30~1000	7.26	-40.14	<=-12.74	PASS
			1000~26500	7.26	-26.7	<=-12.74	PASS
		2441	Reference	9.45	9.45	---	PASS
			30~1000	9.45	-41.42	<=-10.55	PASS
			1000~26500	9.45	-25.5	<=-10.55	PASS
		2480	Reference	8.57	8.57	---	PASS
			30~1000	8.57	-39.96	<=-11.43	PASS
			1000~26500	8.57	-26.2	<=-11.43	PASS
3DH5	Ant10	2402	Reference	7.89	7.89	---	PASS
			30~1000	7.89	-40.7	<=-12.11	PASS
			1000~26500	7.89	-24.88	<=-12.11	PASS
		2441	Reference	9.48	9.48	---	PASS
			30~1000	9.48	-40.56	<=-10.52	PASS
			1000~26500	9.48	-26.18	<=-10.52	PASS
		2480	Reference	8.54	8.54	---	PASS
			30~1000	8.54	-41.4	<=-11.46	PASS
			1000~26500	8.54	-26.67	<=-11.46	PASS

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Test Graphs

DH5_Ant10_2402_0~Reference

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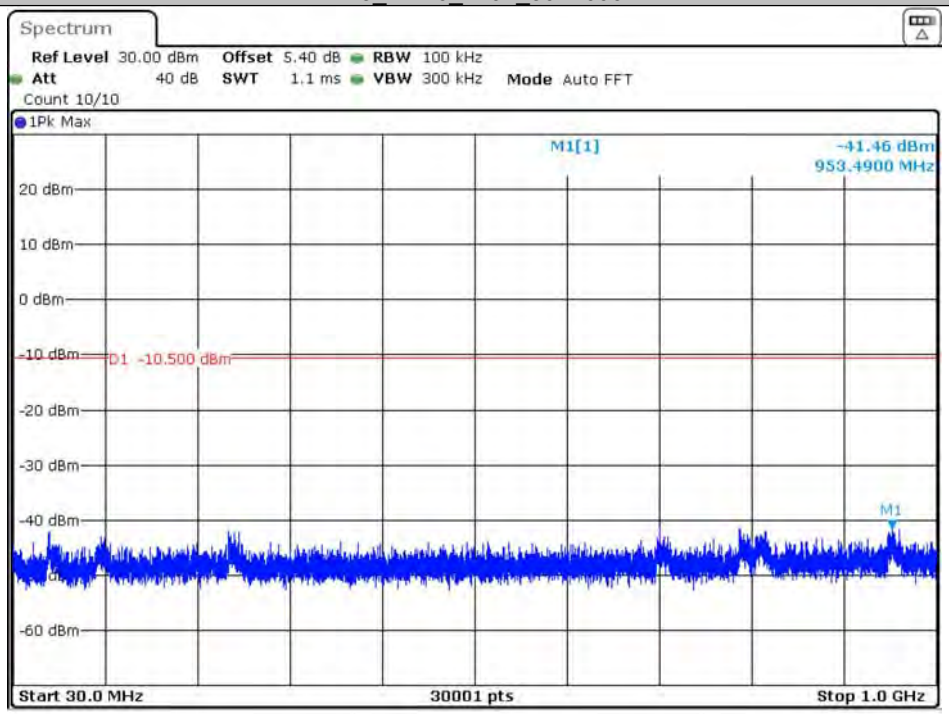
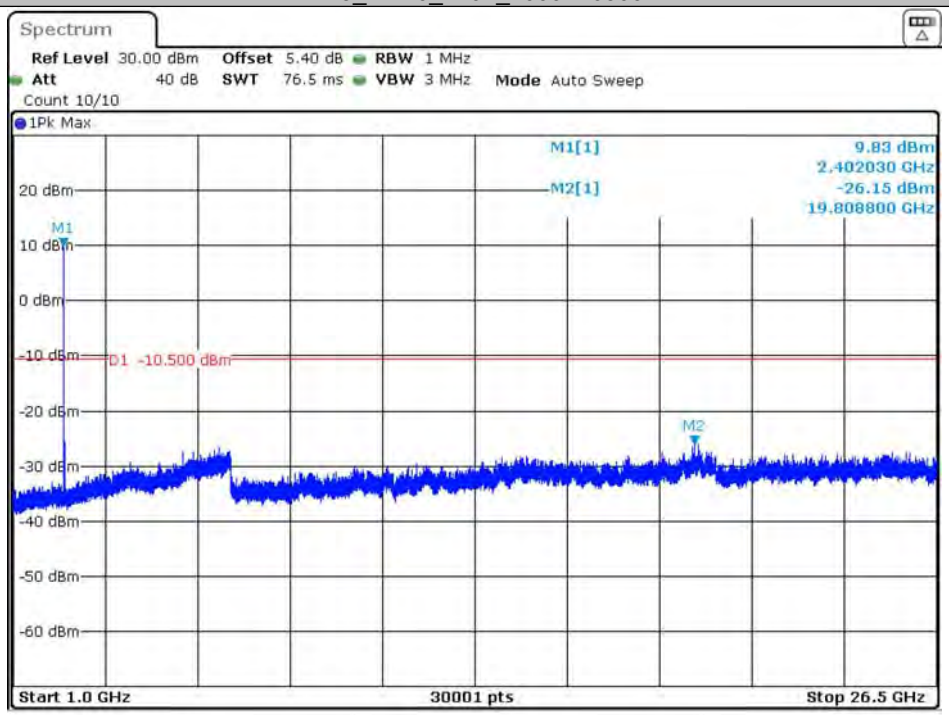


Date: 20.MAY.2021 20:38:52

DH5_Ant10_2402_1000~26500



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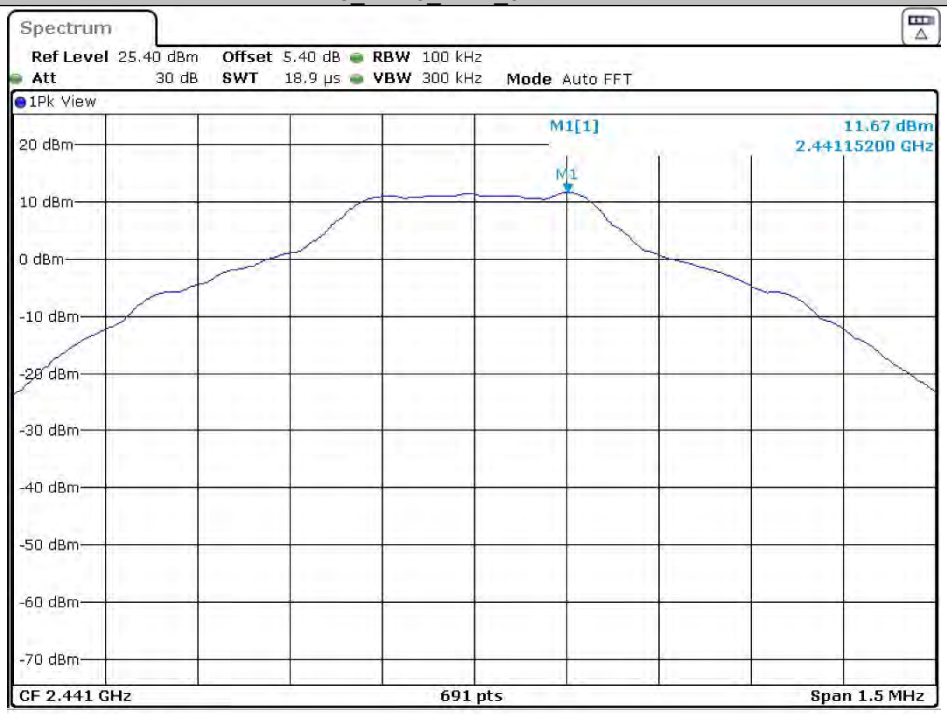
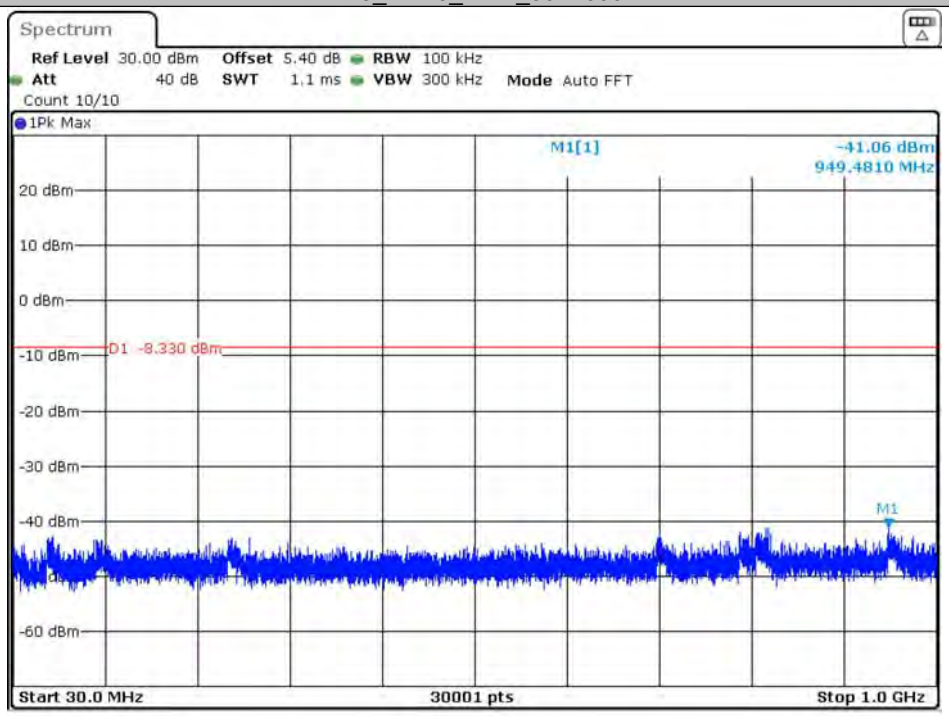


Date: 20.MAY.2021 20:40:07

DH5_Ant10_2441_30~1000



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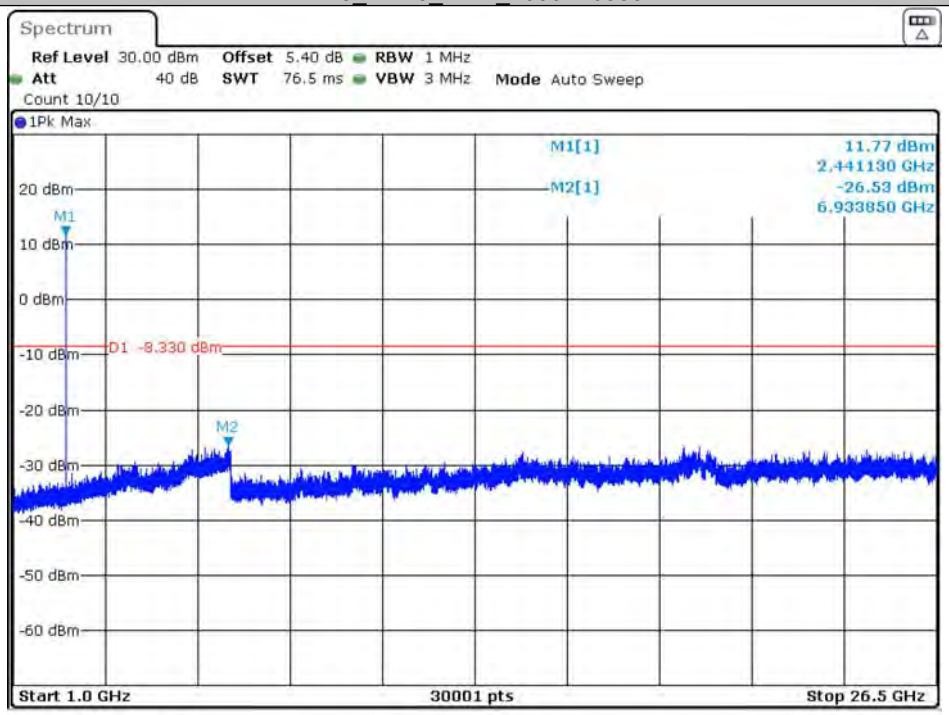
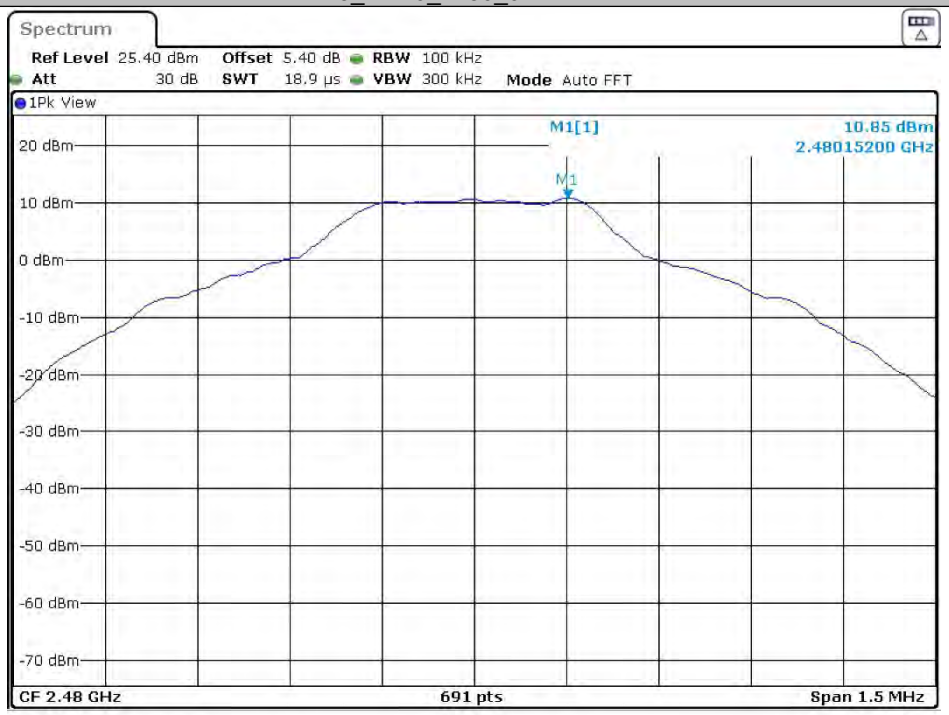
DH5_Ant10_2441_1000~26500



Date: 20.MAY.2021 20:40:33

DH5_Ant10_2480_0~Reference



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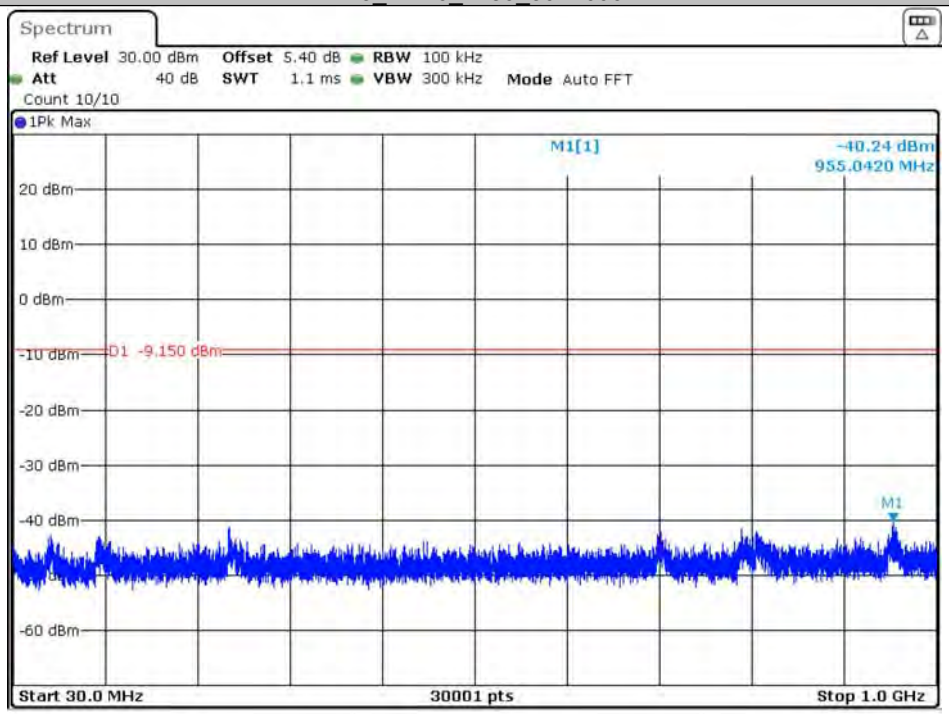
DH5_Ant10_2480_30~1000



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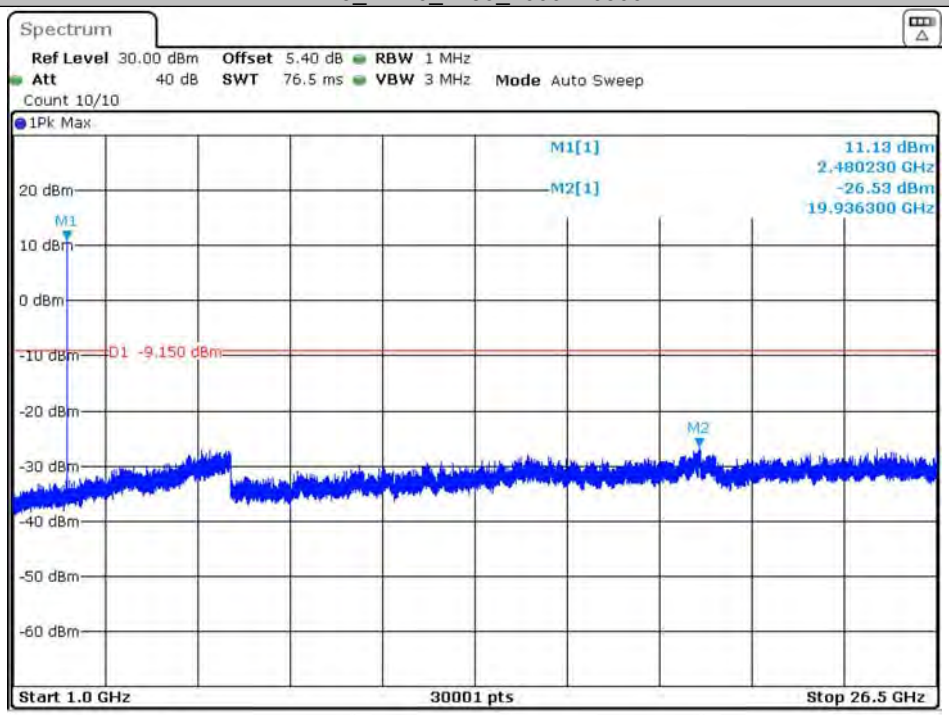
DH5_Ant10_2480_1000~26500



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

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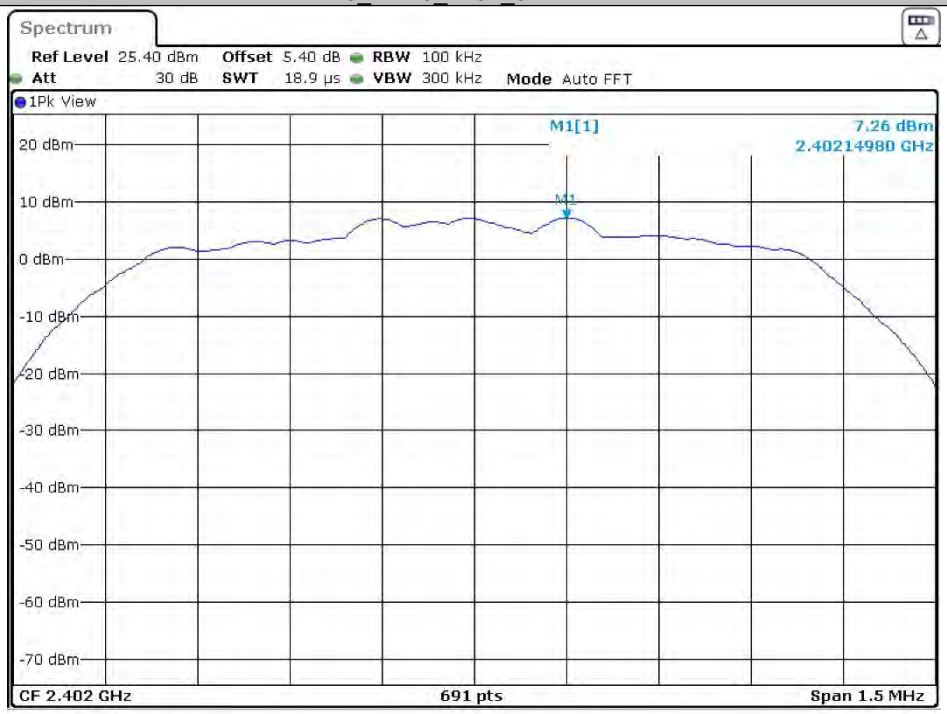
2DH5_Ant10_2402_0~Reference



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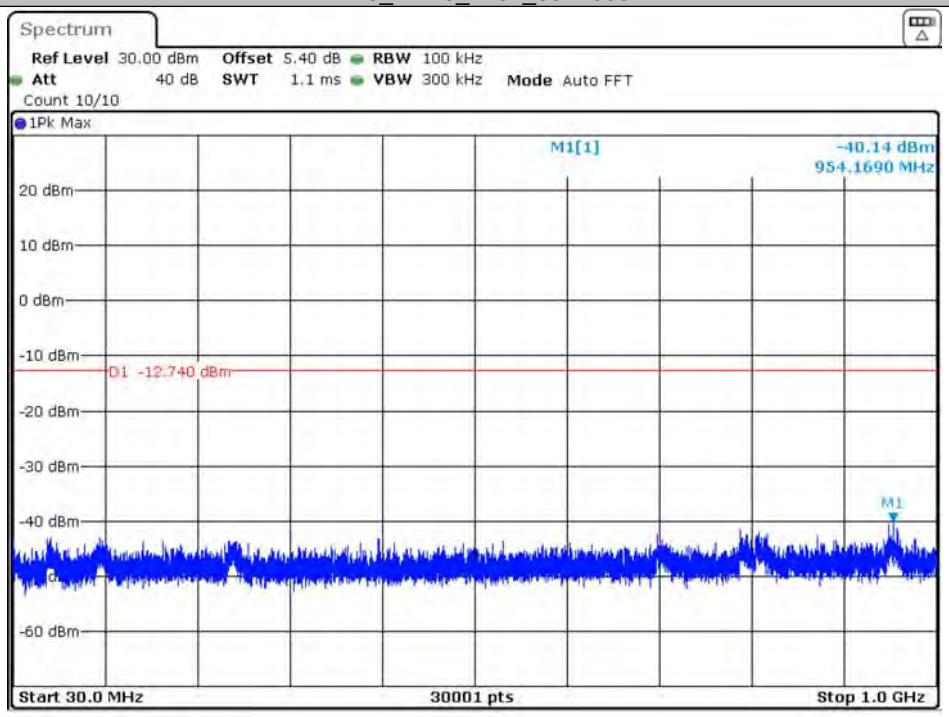

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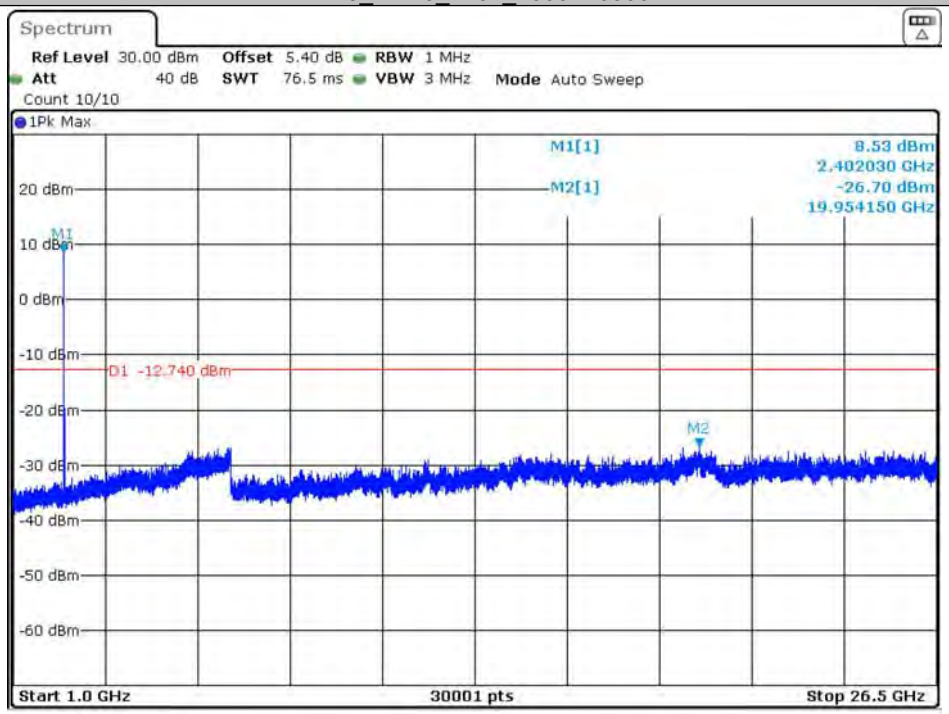

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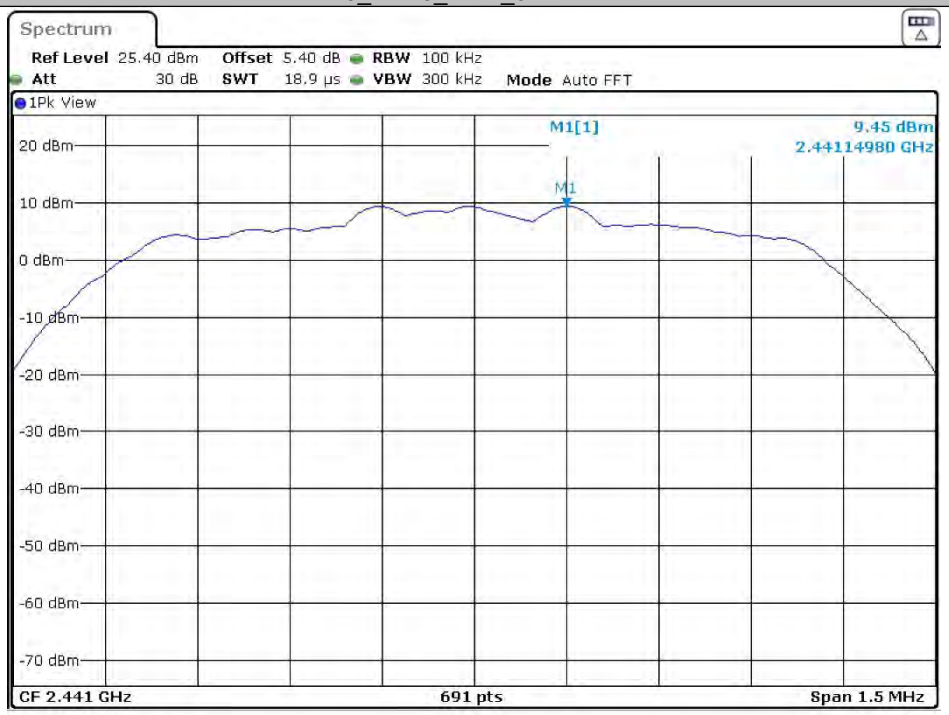
2DH5_Ant10_2441_0~Reference



Date: 20.MAY.2021 20:44:20

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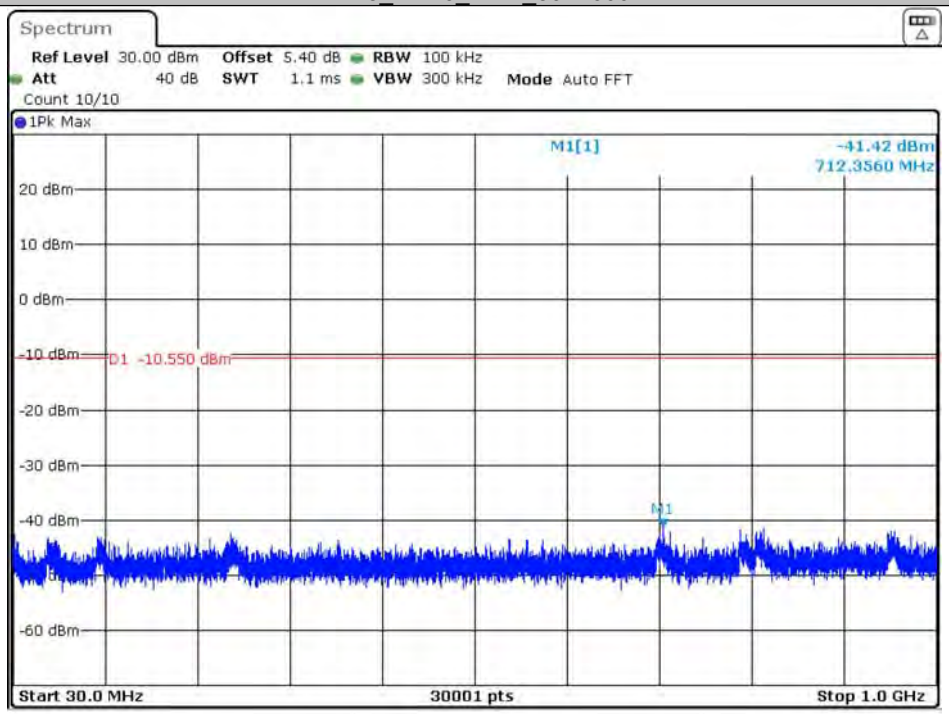
2DH5_Ant10_2441_30~1000



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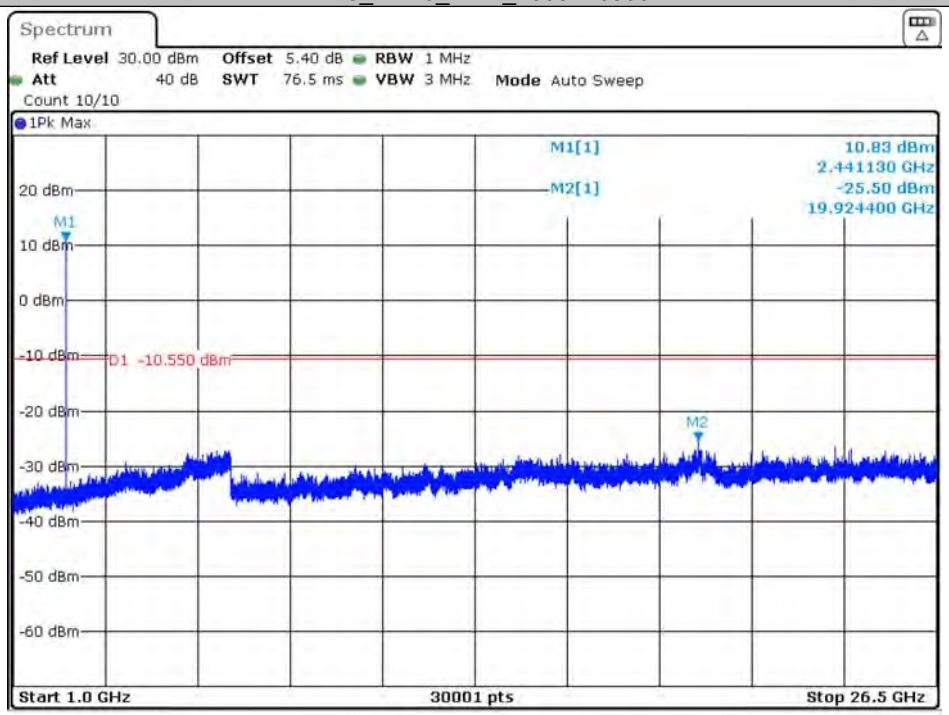

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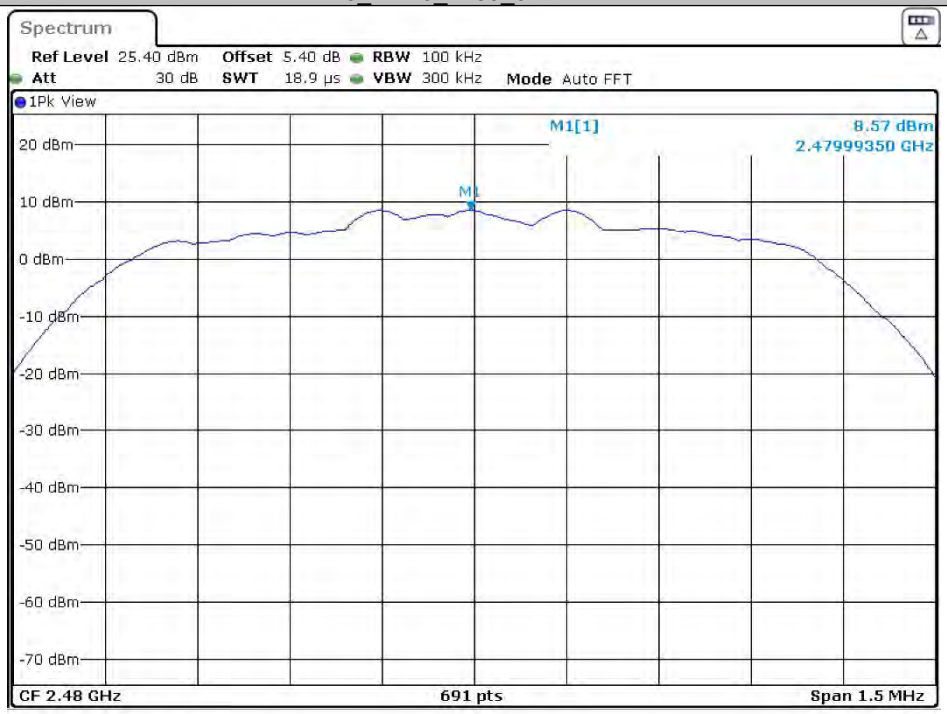
2DH5_Ant10_2480_0~Reference



Date: 20.MAY.2021 20:45:46

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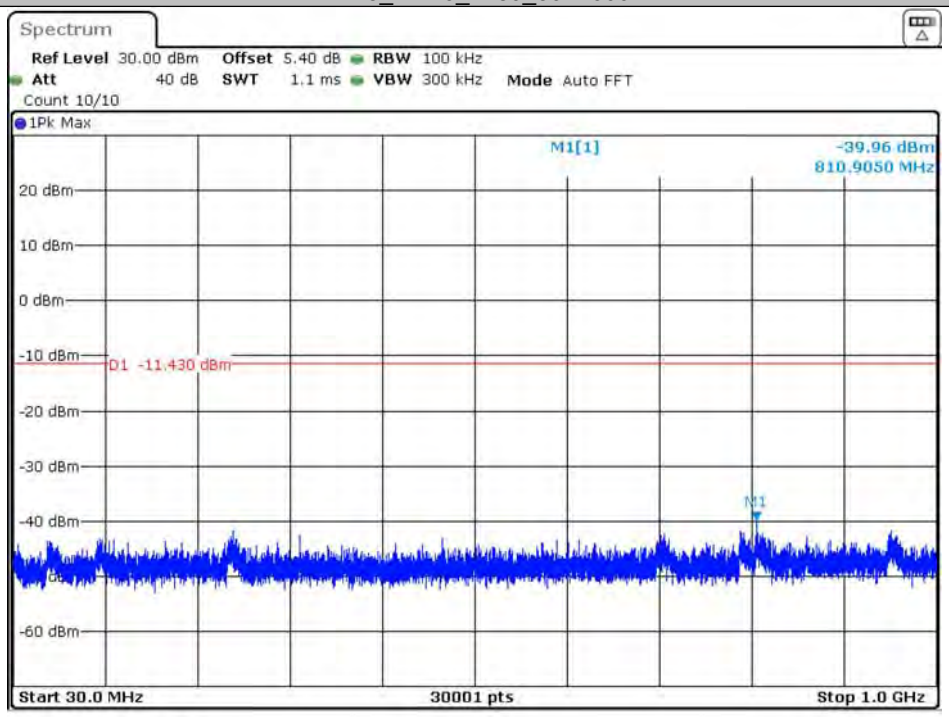

Date: 20.MAY.2021 20:45:50

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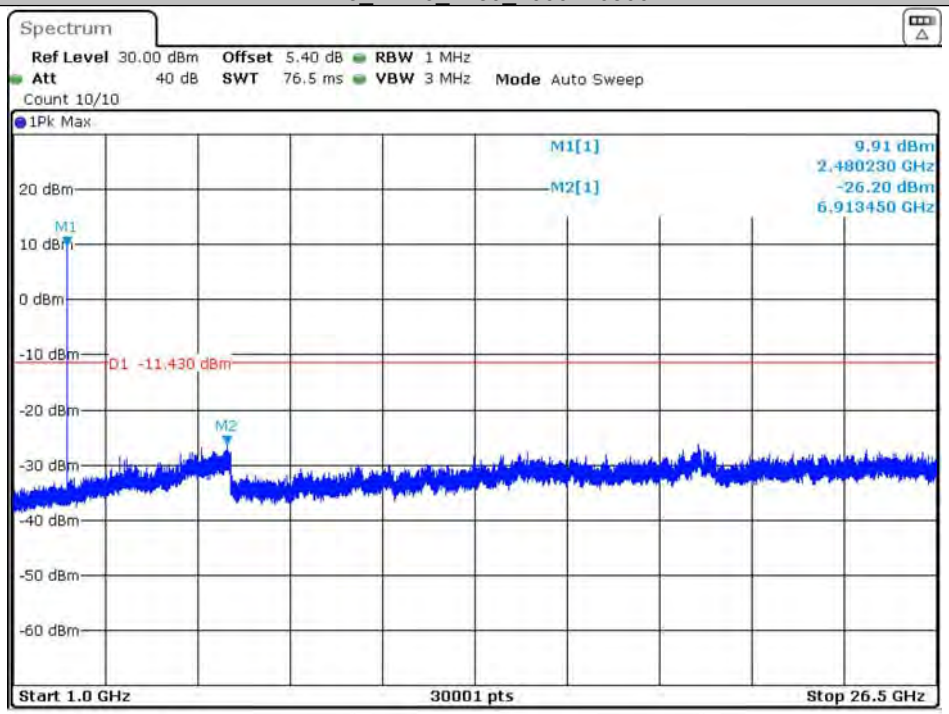
2DH5_Ant10_2480_1000~26500



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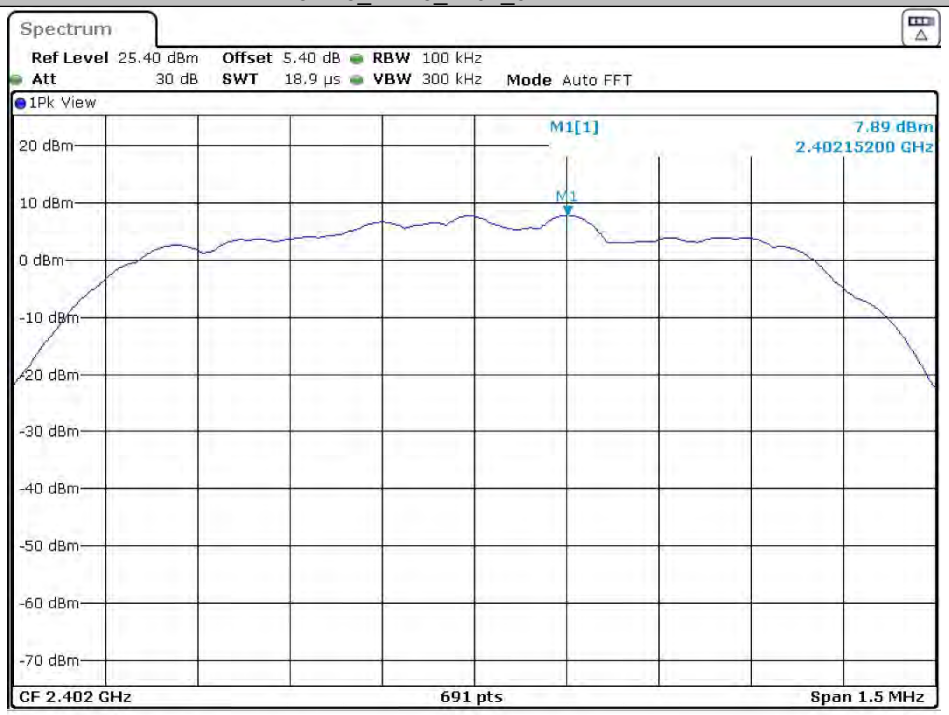

Date: 20.MAY.2021 20:51:41

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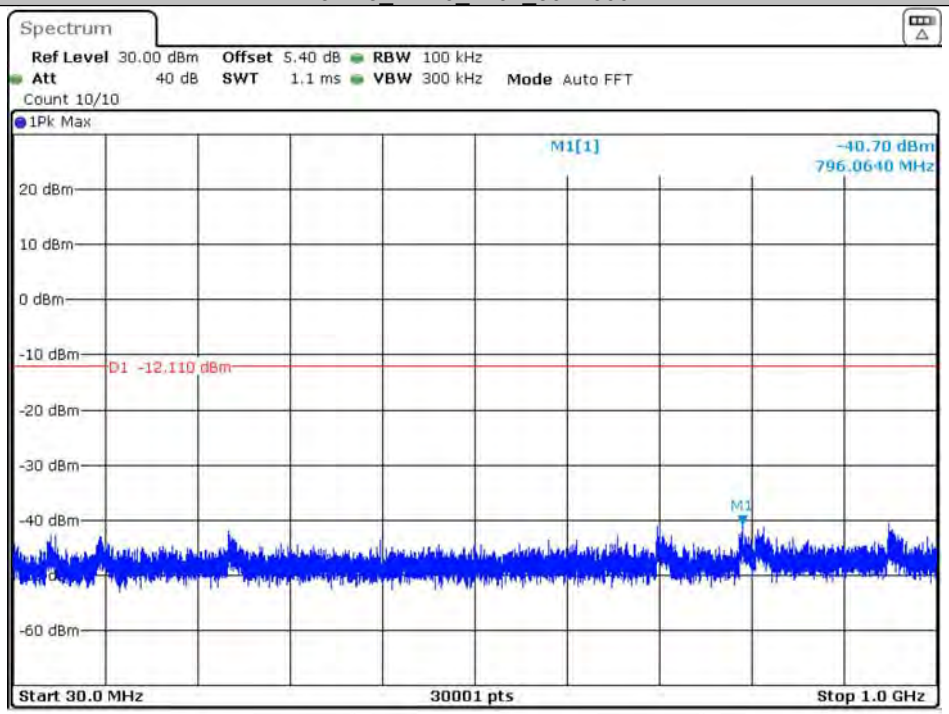

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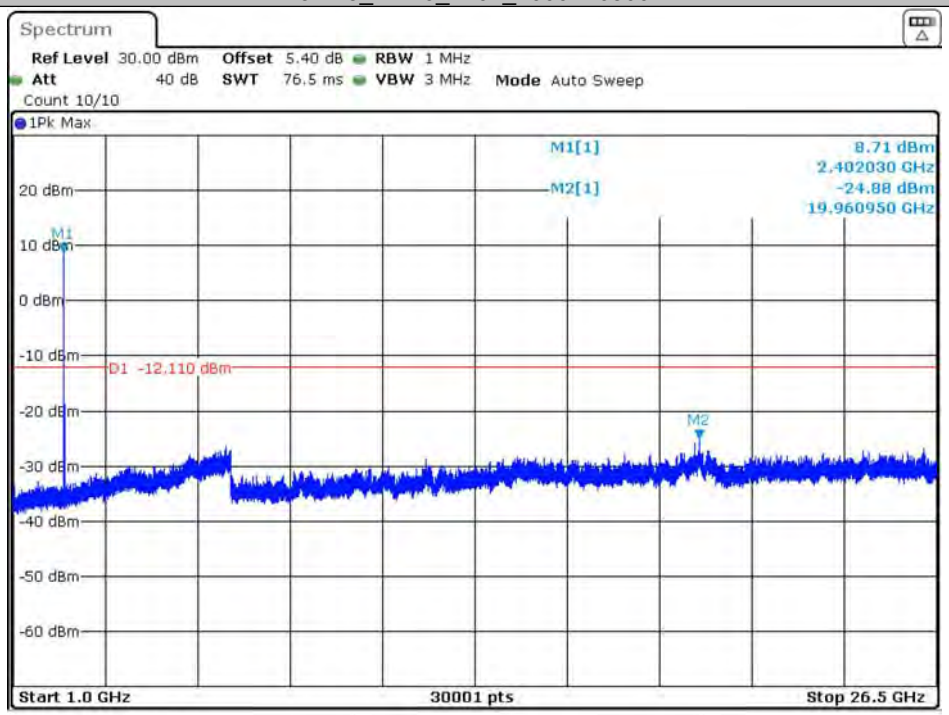

Date: 20.MAY.2021 20:52:07

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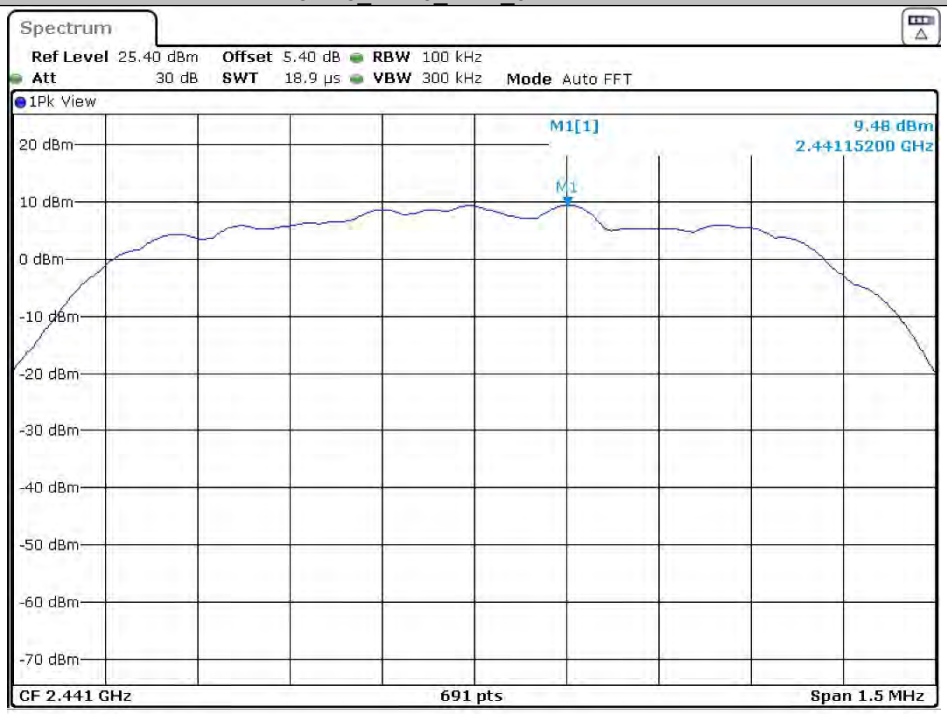

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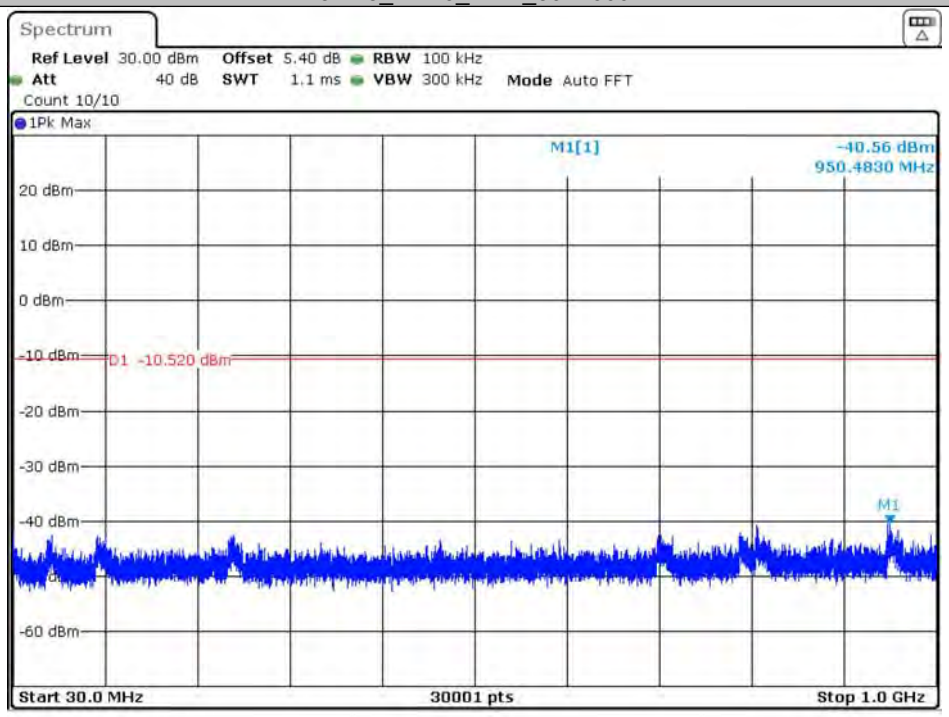

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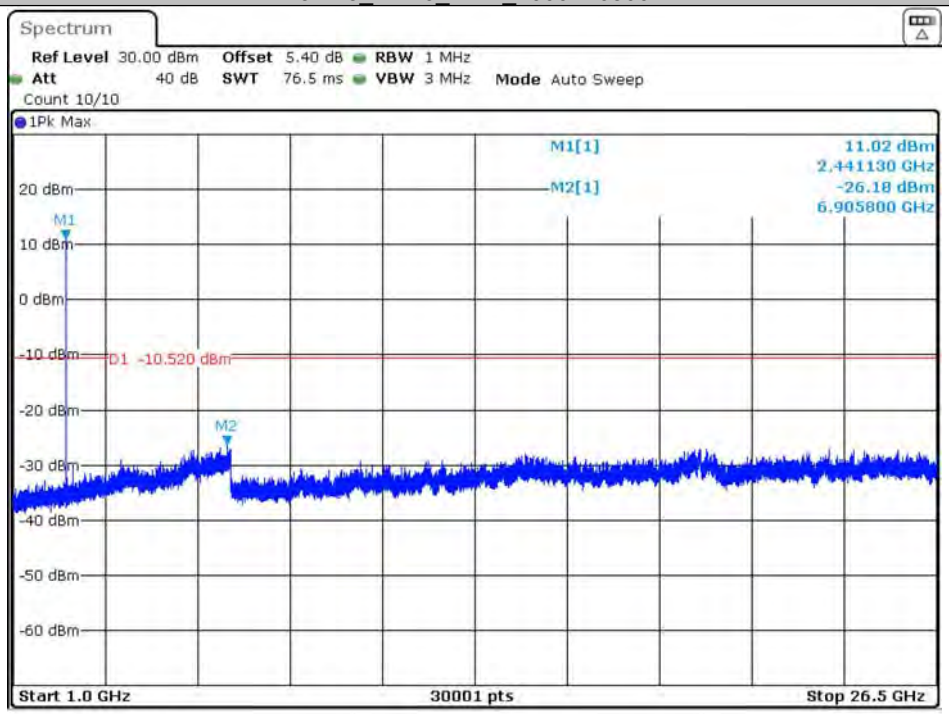

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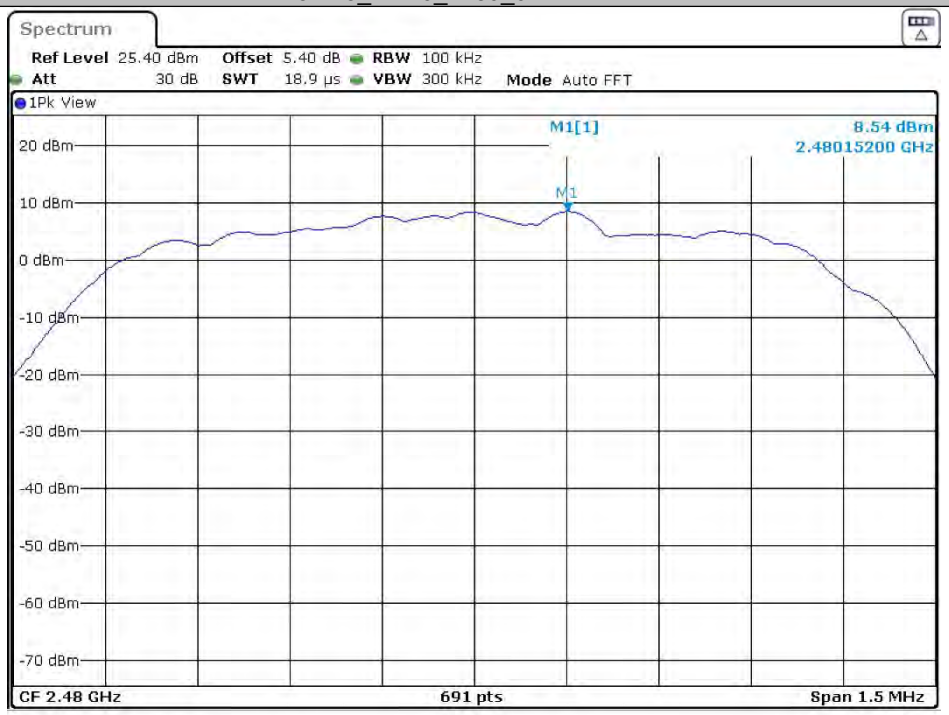

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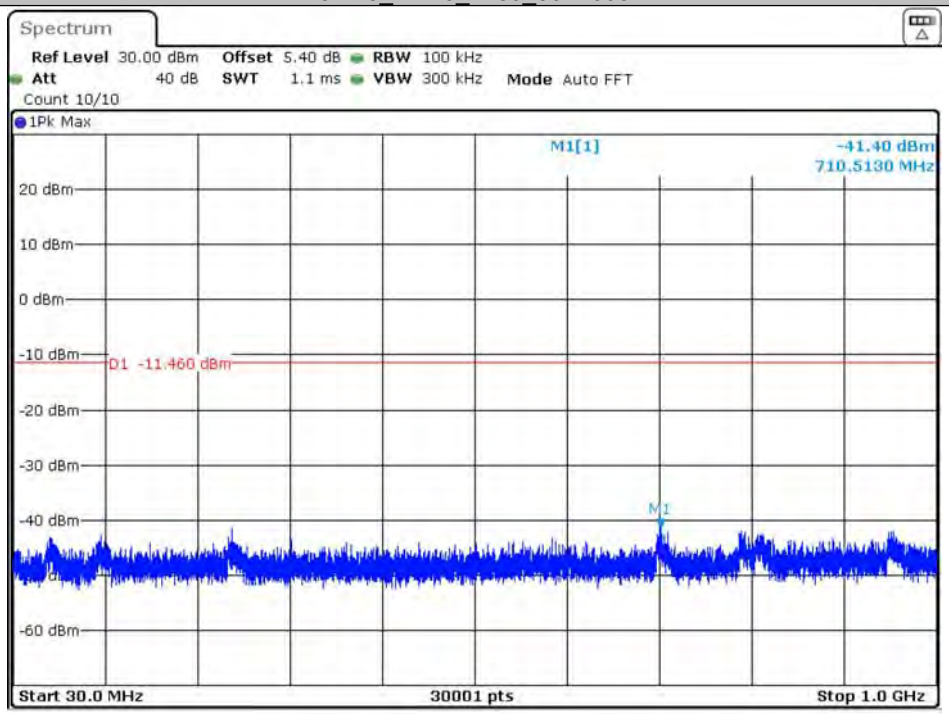

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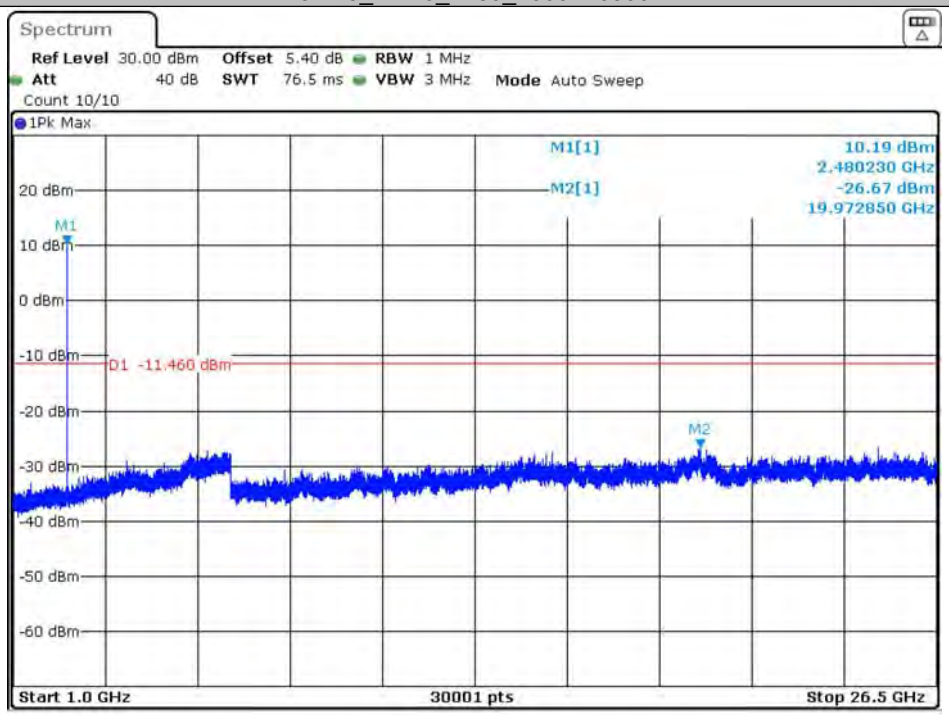

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Duty Cycle

Test Result

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
DH5	Ant10	2402	2.89	3.73	77.48	---	PASS
		2441	2.89	3.73	77.48	---	PASS
		2480	2.89	3.73	77.48	---	PASS
2DH5	Ant10	2402	2.89	3.73	77.48	---	PASS
		2441	2.89	3.73	77.48	---	PASS
		2480	2.89	3.73	77.48	---	PASS
3DH5	Ant10	2402	2.89	3.73	77.48	---	PASS
		2441	2.89	3.73	77.48	---	PASS
		2480	2.89	3.73	77.48	---	PASS

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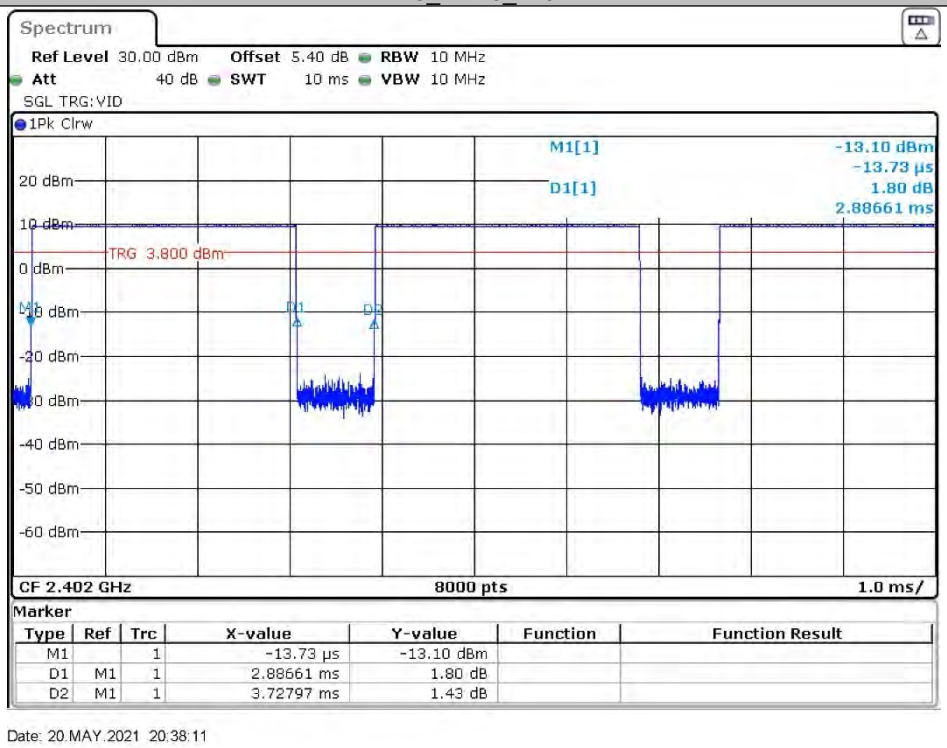
Test Graphs

DH5_Ant10_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-13.73 µs	-13.10 dBm		
D1	M1	1	2.88661 ms	1.80 dB		
D2	M1	1	3.72797 ms	1.43 dB		

Date: 20.MAY.2021 20:38:11

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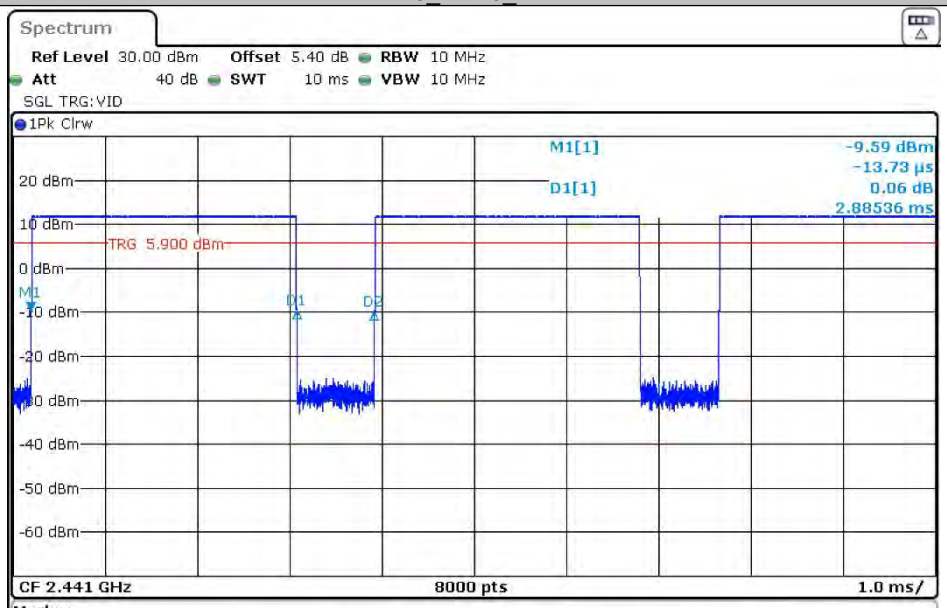
DH5_Ant10_2441

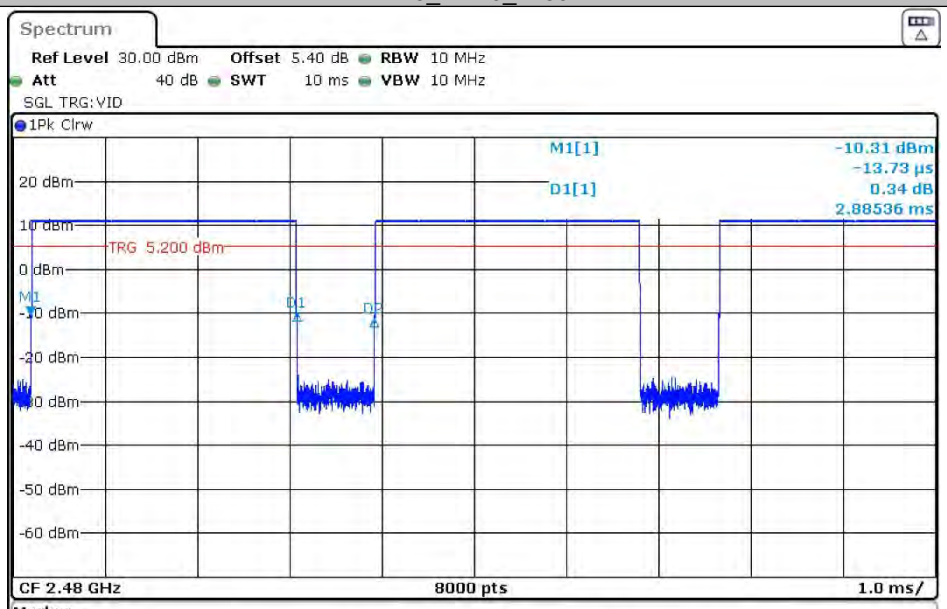


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-13.73 µs	-9.59 dBm		
D1	M1	1	2.88536 ms	0.06 dB		
D2	M1	1	3.72672 ms	-0.40 dB		

Date: 20.MAY.2021 20:39:45

DH5_Ant10_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-13.73 µs	-10.31 dBm		
D1	M1	1	2.88536 ms	0.34 dB		
D2	M1	1	3.72672 ms	-0.80 dB		

Date: 20.MAY.2021 20:41:03

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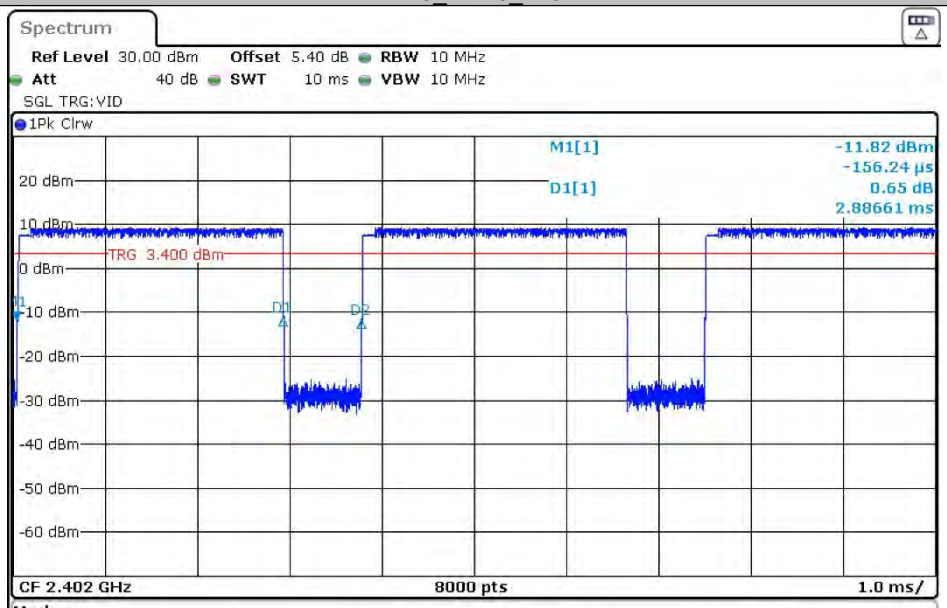
2DH5_Ant10_2402

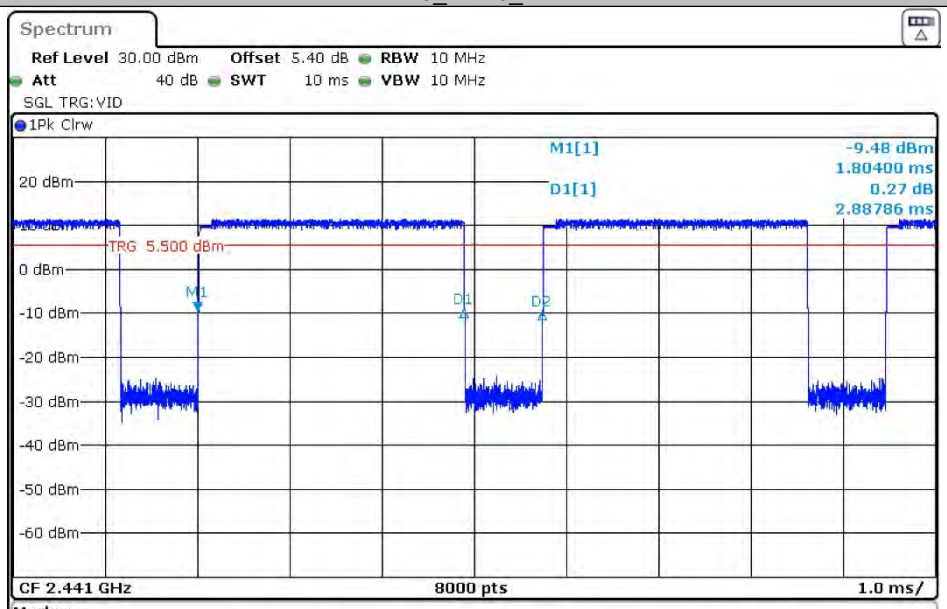


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-156.24 µs	-11.82 dBm		
D1	M1	1	2.88661 ms	0.65 dB		
D2	M1	1	3.72672 ms	0.12 dB		

Date: 20.MAY.2021 20:42:26

2DH5_Ant10_2441



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.804 ms	-9.48 dBm		
D1	M1	1	2.88786 ms	0.27 dB		
D2	M1	1	3.72672 ms	-0.26 dB		

Date: 20.MAY.2021 20:43:52

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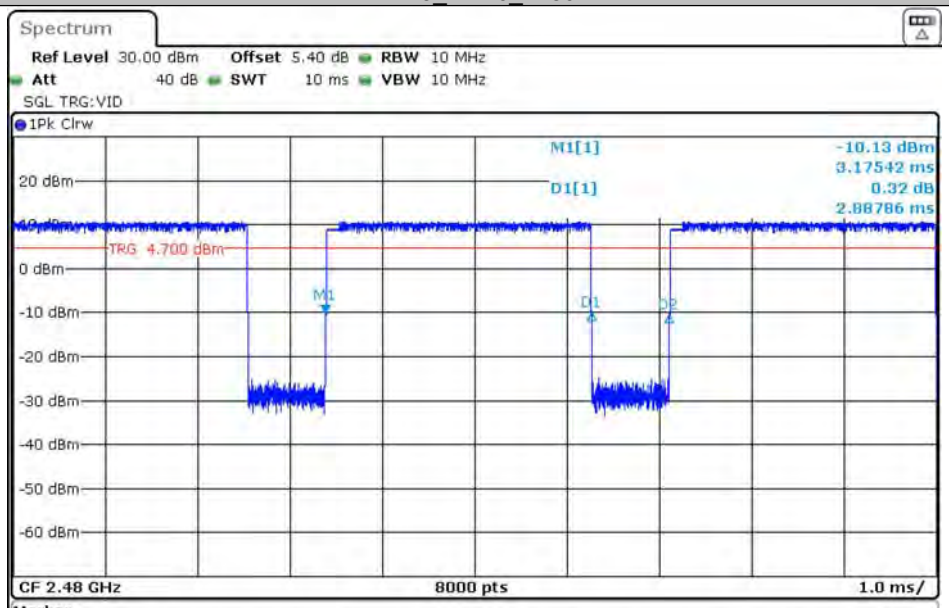
2DH5_Ant10_2480

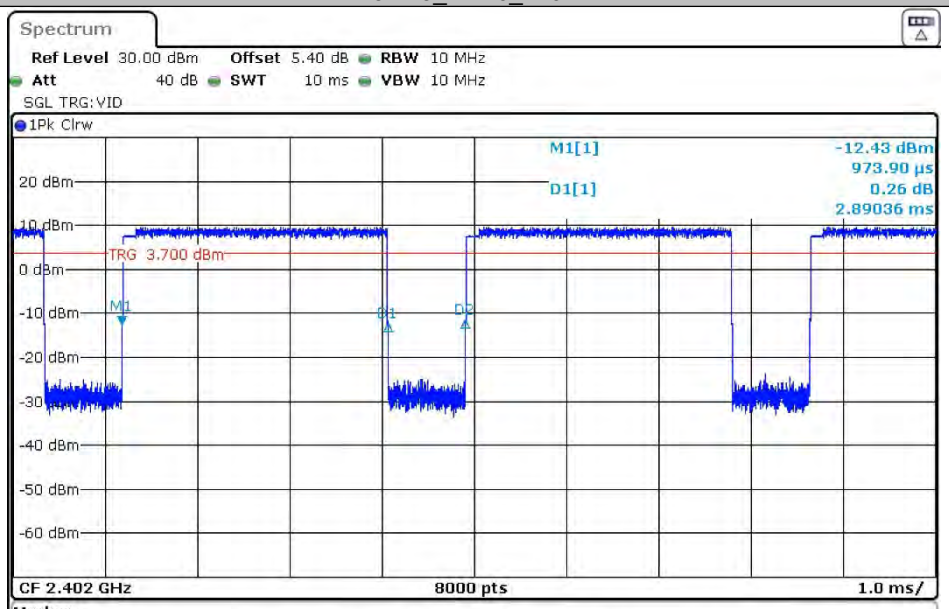


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	3.17542 ms	-10.13 dBm		
D1	M1	1	2.88786 ms	0.32 dB		
D2	M1	1	3.72797 ms	-0.19 dB		

Date: 20.MAY.2021 20:45:09

3DH5_Ant10_2402



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	973.9 µs	-12.43 dBm		
D1	M1	1	2.89036 ms	0.26 dB		
D2	M1	1	3.72672 ms	0.81 dB		

Date: 20.MAY.2021 20:51:05

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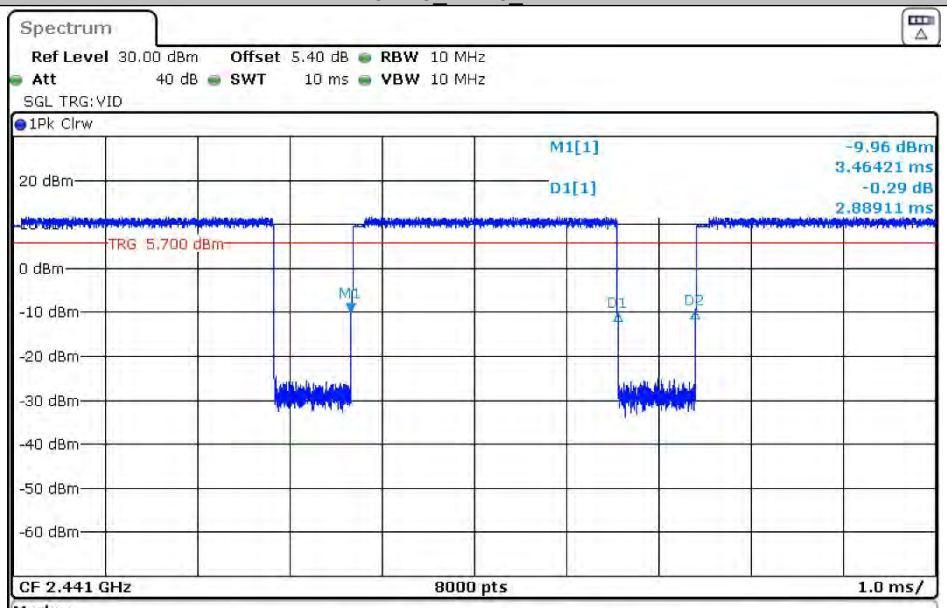
3DH5_Ant10_2441

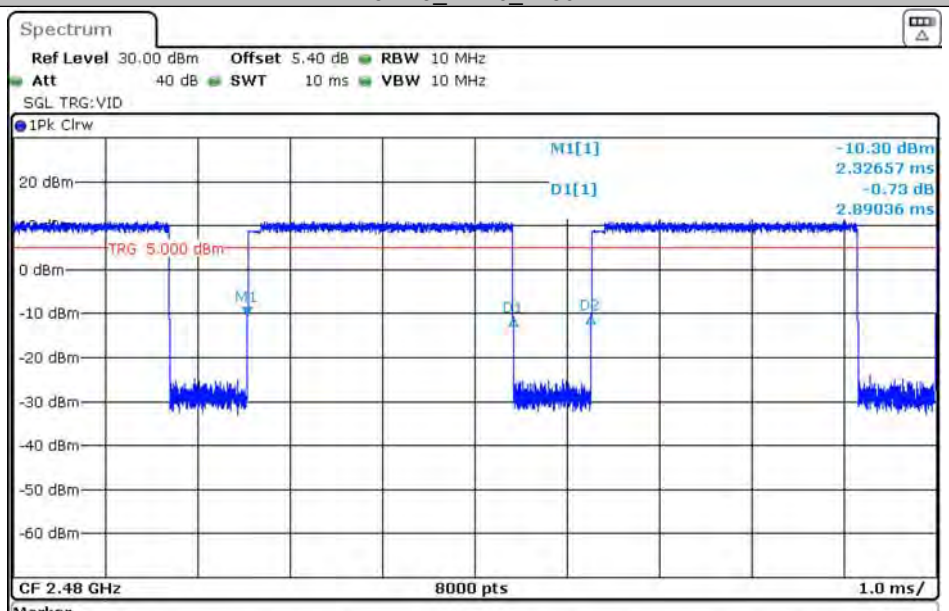


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	3.46421 ms	-9.96 dBm		
D1	M1	1	2.88911 ms	-0.29 dB		
D2	M1	1	3.72672 ms	0.29 dB		

Date: 20.MAY.2021 20:52:22

3DH5_Ant10_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.32657 ms	-10.30 dBm		
D1	M1	1	2.89036 ms	-0.73 dB		
D2	M1	1	3.72672 ms	-0.26 dB		

Date: 20.MAY.2021 20:53:39

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