



No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053

Fax: +86 (0) 755 2671 0594

Email: ee.shenzhen@sgs.com

Report No.: ZR/2019/1001202

Page: 1 of 101

FCC TEST REPORT

Application No: ZR/2019/10012
Applicant: Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address of Applicant: Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
Manufacturer: Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address of Manufacturer: Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
EUT Description: Tracker
Model No.: cp311A
FCC ID: R38YLCP311A
Standards: 47 CFR FCC Part 2, Subpart J
47 CFR Part 15, Subpart C
KDB558074 D01 15.247 Meas Guidance v05
Test Method: ANSI C63.4(2014)
ANSI C63.10 (2013)
Date of Receipt: 2019/1/10
Date of Test: 2019/1/10 to 2019/1/24
Date of Issue: 2019/1/24

Test Result:	PASS *
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. * In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Derek Yang
Wireless Laboratory Manager



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Shenzhen Branch, Testing Center, FCC Laboratory

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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2019/1/24		Original

Authorized for issue by:				
Tested By		 (Mike Hu) /Project Engineer	2019/1/24	
			Date	
Checked By		 (David Chen) /Reviewer	2019/1/24	
			Date	





2 Test Summary

Test Item	Test Requirement	Test method	Test Result	Result
AC Power Line Conducted Emission	15.207	ANSI C63.10 2013	Clause 4.2	PASS
Duty Cycle	--	--	Clause 4.3	PASS
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013	Clause 4.4	PASS
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10 2013	Clause 4.5	PASS
Power Spectral Density	15.247 (e)	ANSI C63.10 2013	Clause 4.6	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.7	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.8	PASS
Radiated Spurious Emissions	15.247(d) ;15.205/15.209	ANSI C63.10 2013	Clause 4.9	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d) ;15.205/15.209	ANSI C63.10 2013	Clause 4.10	PASS

Remark:

The difference between the main supply and the second supply is the supplier of the adapter, all the test were performed on the main supply, but only the Radiated Spurious Emission spot checked in the worst cases, and the data displayed in this report.





Contents

1	VERSION.....	2
2	TEST SUMMARY.....	3
3	GENERAL INFORMATION.....	5
3.1	CLIENT INFORMATION.....	5
3.2	TEST LOCATION.....	5
3.3	TEST FACILITY.....	5
3.4	GENERAL DESCRIPTION OF EUT.....	6
3.5	TEST ENVIRONMENT AND MODE.....	7
3.6	DESCRIPTION OF SUPPORT UNITS.....	7
4	TEST RESULTS AND MEASUREMENT DATA.....	8
4.1	ANTENNA REQUIREMENT.....	8
4.2	AC POWER LINE CONDUCTED EMISSIONS.....	9
4.3	DUTY CYCLE.....	13
4.3.1	Test Results.....	13
4.3.1	Test Plots.....	13
4.4	CONDUCTED OUTPUT POWER.....	16
4.4.1	Test Results.....	17
4.5	DTS (6 dB) BANDWIDTH & 99% OCCUPIED BANDWIDTH.....	18
4.5.1	Test Results.....	18
4.5.2	Test plots.....	19
4.6	POWER SPECTRAL DENSITY.....	31
4.6.1	Test Results.....	31
4.6.2	Test plots.....	32
4.7	BAND-EDGE FOR RF CONDUCTED EMISSIONS.....	38
4.7.1	Test plots.....	39
4.8	RF CONDUCTED SPURIOUS EMISSIONS.....	43
4.8.1	Test plots.....	44
4.9	RADIATED SPURIOUS EMISSIONS.....	50
4.9.1	Radiated emission below 1GHz.....	53
4.9.2	Transmitter emission above 1GHz.....	57
4.10	RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY.....	81
4.10.1	ANT1.....	83
5	MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2).....	99
6	EQUIPMENT LIST.....	100
7	PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS.....	101





3 General Information

3.1 Client Information

Applicant:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address of Applicant:	Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
Manufacturer:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address of Manufacturer:	Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen

3.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057
Telephone:	+86 (0) 755 2601 2053
Fax:	+86 (0) 755 2671 0594
E-mail:	ee.shenzhen@sgs.com

3.3 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **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.

• **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.



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3.4 General Description of EUT

EUT Description::	Tracker
Model No.:	cp311A
IEEE 802.11 WLAN Mode Supported	<input checked="" type="checkbox"/> 802.11B (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11G (20 MHz channel bandwidth) <input checked="" type="checkbox"/> 802.11N (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11N (40 MHz channel bandwidth)
Operation Frequency:	2400 MHz -2483.5MHz $f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:	IEEE for 802.11B: DSSS IEEE for 802.11G : OFDM IEEE for 802.11N(HT20 and HT40) : OFDM
Sample Type:	<input checked="" type="checkbox"/> Portable Device, <input type="checkbox"/> Module
Antenna Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated
Antenna Ports	<input checked="" type="checkbox"/> Ant 1, <input type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3
Smart System	<input checked="" type="checkbox"/> SISO (for 802.11B/G/N), <input type="checkbox"/> MIMO (for 802.11N): 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	-0.13dBi
Power Supply	<input checked="" type="checkbox"/> AC/DC Adapter; <input type="checkbox"/> Battery <input type="checkbox"/> PoE;; <input type="checkbox"/> Other:

Operation Frequency of each channel (802.11B/G/N HT20)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Operation Frequency of each channel (802.11N HT40)

Channel	Frequency	Channel	Frequency	Channel	Frequency	
3	2422MHz	6	2437MHz	9	2452MHz	
4	2427MHz	7	2442MHz			
5	2432MHz	8	2447MHz			





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 for 802.11B/G/N (HT20)	Frequency for 802.11N (HT40)
The Lowest channel	2412MHz	2422MHz
The Middle channel	2437MHz	2437MHz
The Highest channel	2462MHz	2452MHz

3.5 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	101.30 KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

3.6 Description of Support Units

The EUT has been tested independent unit.



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Shenzhen Branch Testing Center EEC Laboratory

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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)
<p>15.203 requirement:</p> <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement:</p> <p>The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p> <p>The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -0.13dBi.</p>	



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4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<ol style="list-style-type: none"> 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. 		

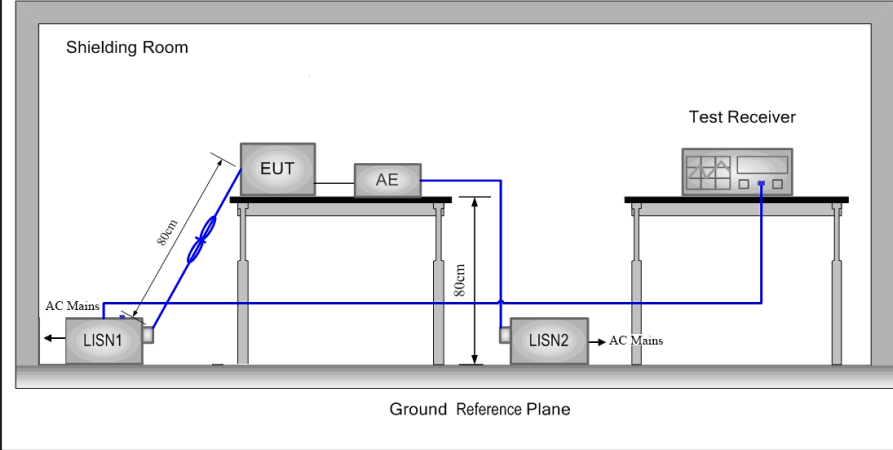


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Test Setup:	
Exploratory Test Mode:	<p>Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.</p> <p>Charge + Transmitting mode.</p>
Final Test Mode:	<p>Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case.</p> <p>Charge + Transmitting mode.</p> <p>Only the worst case is recorded in the report.</p>
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass



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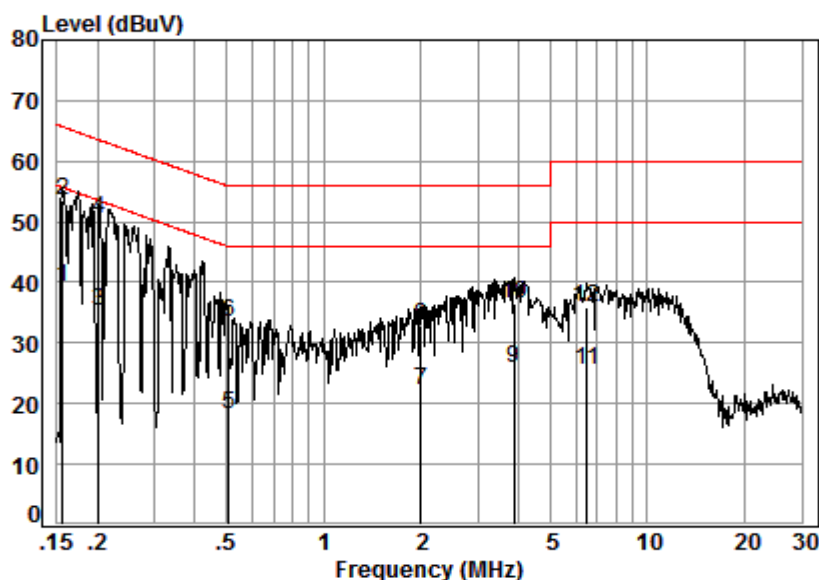
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Measurement Data

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:

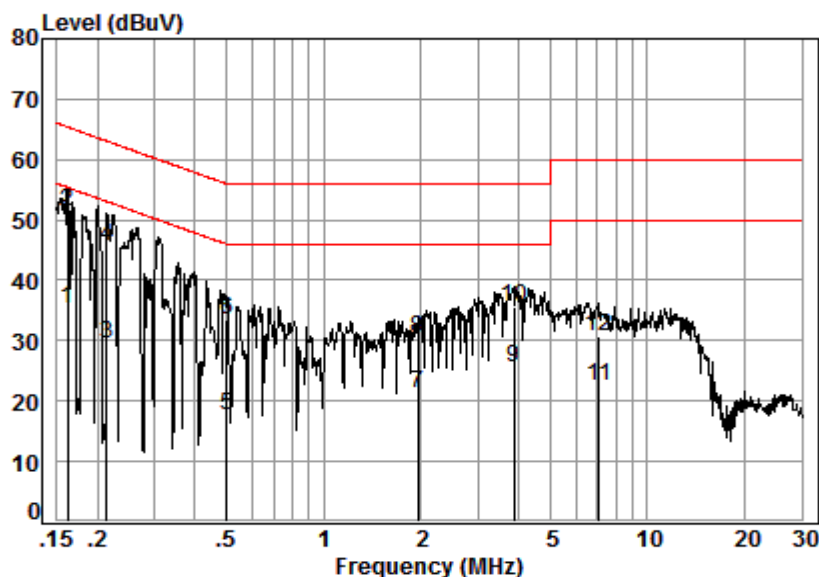


Site : Shielding Room
Condition: Line
Job No. : 10012
Test mode: d

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.16	0.01	9.66	29.45	39.12	55.65	-16.53	Average
2	0.16	0.01	9.66	43.88	53.55	65.65	-12.10	QP
3	0.20	0.02	9.66	25.60	35.28	53.54	-18.26	Average
4	0.20	0.02	9.66	40.72	50.40	63.54	-13.14	QP
5	0.51	0.06	9.67	8.39	18.12	46.00	-27.88	Average
6	0.51	0.06	9.67	23.59	33.32	56.00	-22.68	QP
7	1.99	0.16	9.72	12.32	22.20	46.00	-23.80	Average
8	1.99	0.16	9.72	22.95	32.83	56.00	-23.17	QP
9	3.88	0.16	9.72	16.07	25.95	46.00	-20.05	Average
10	3.88	0.16	9.72	26.50	36.38	56.00	-19.62	QP
11	6.52	0.17	9.77	15.58	25.52	50.00	-24.48	Average
12	6.52	0.17	9.77	26.10	36.04	60.00	-23.96	QP



Neutral Line:



Site : Shielding Room

Condition: Neutral

Job No. : 10012

Test mode: d

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.16	0.01	9.64	25.64	35.29	55.38	-20.09	Average
2	0.16	0.01	9.64	41.70	51.35	65.38	-14.03	QP
3	0.21	0.02	9.64	19.78	29.44	53.05	-23.61	Average
4	0.21	0.02	9.64	36.12	45.78	63.05	-17.27	QP
5	0.50	0.06	9.64	7.93	17.63	46.00	-28.37	Average
6	0.50	0.06	9.64	23.80	33.50	56.00	-22.50	QP
7	1.96	0.16	9.69	11.32	21.17	46.00	-24.83	Average
8	1.96	0.16	9.69	20.46	30.31	56.00	-25.69	QP
9	3.88	0.16	9.69	15.65	25.50	46.00	-20.50	Average
10	3.88	0.16	9.69	25.87	35.72	56.00	-20.28	QP
11	7.10	0.17	9.76	12.62	22.55	50.00	-27.45	Average
12	7.10	0.17	9.76	20.78	30.71	60.00	-29.29	QP

Remarks:

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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Shenzhen Branch (Technical Services Co., Ltd. Laboratory)

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4.3 Duty Cycle

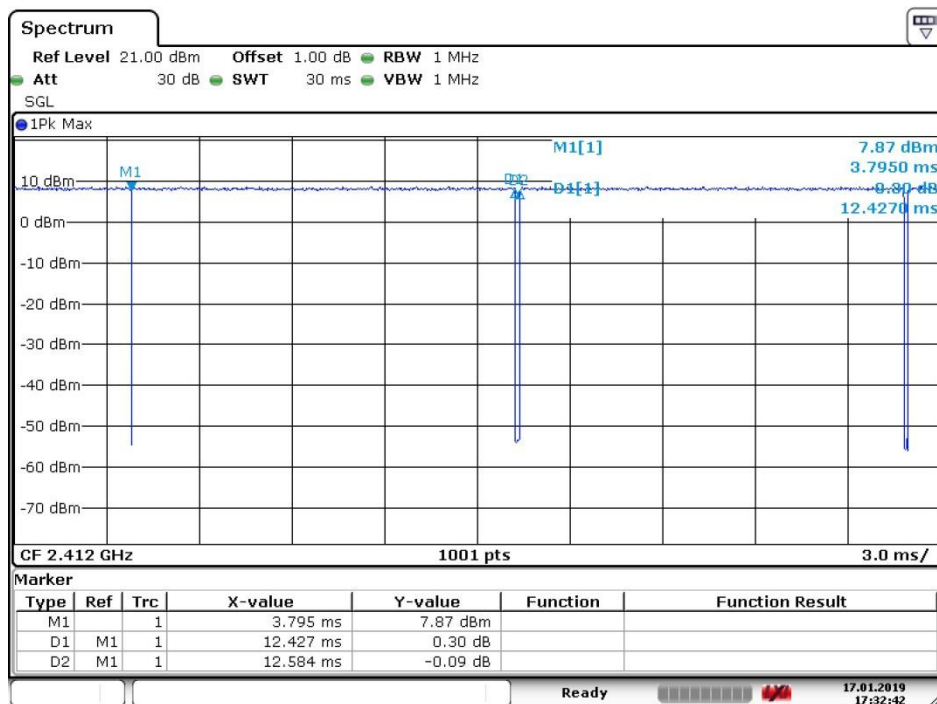
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1	98.75
11G	Ant 1: CH1	95.48
11N20	Ant 1: CH1	91.09
11N40	Ant 1: CH3	83.75

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



Date: 17. JAN.2019 17:32:43

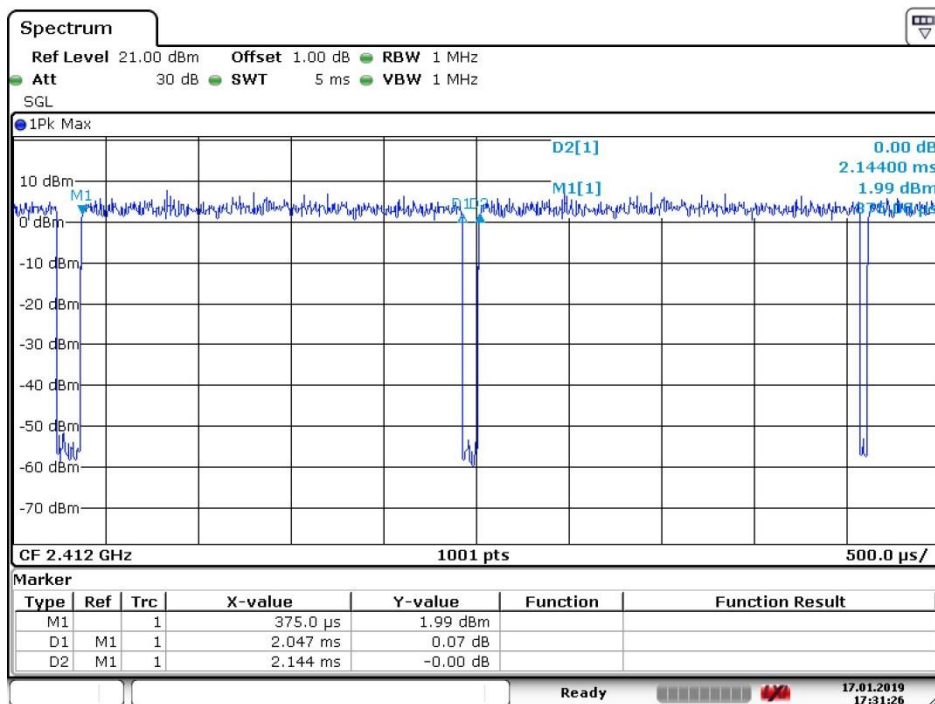


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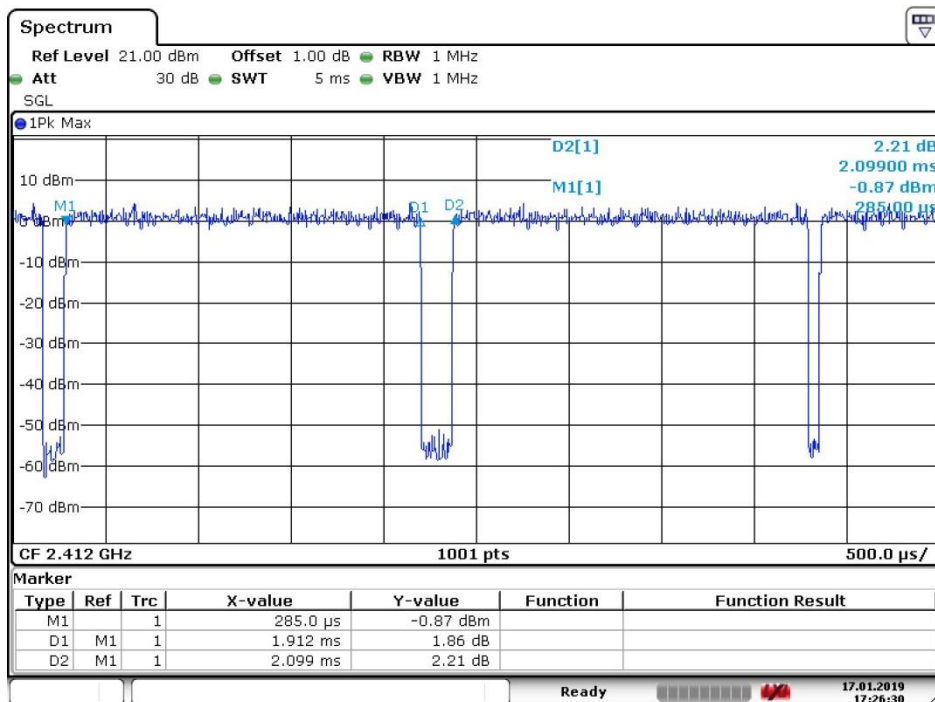
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4.3.1.1.2 11G



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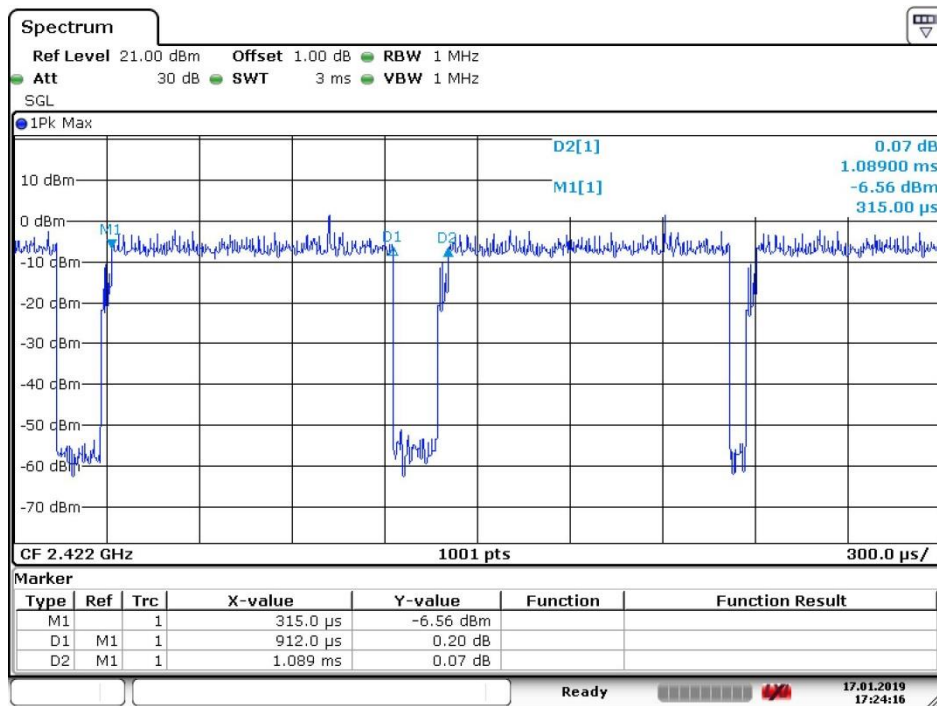
4.3.1.1.3 11N20



Date: 17. JAN.2019 17:26:30



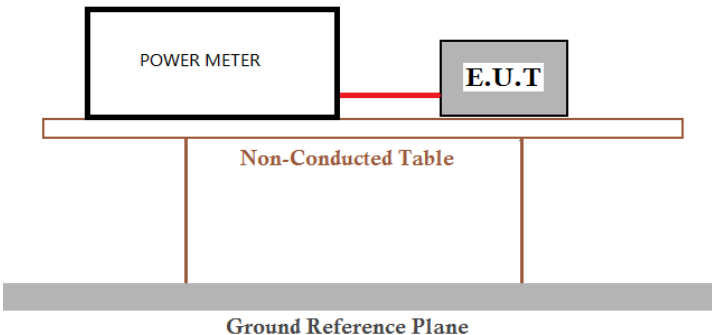
4.3.1.1.4 11N40



Date: 17.JAN.2019 17:24:16



4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.3
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	30dBm
Test Results:	Pass



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4.4.1 Test Results

Measurement Data of Average Power:

Mode	Test Channel	Average Output Power (dBm)	Result
802.11B	Lowest	14.17	Report purpose only
	Middle	13.71	Report purpose only
	Highest	13.87	Report purpose only
802.11G	Lowest	11.52	Report purpose only
	Middle	11.11	Report purpose only
	Highest	11.80	Report purpose only
802.11N20	Lowest	10.16	Report purpose only
	Middle	9.95	Report purpose only
	Highest	10.64	Report purpose only
802.11N40	Lowest	9.86	Report purpose only
	Middle	9.26	Report purpose only
	Highest	9.72	Report purpose only

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	17.95	30.00	Pass
	Middle	17.34	30.00	Pass
	Highest	17.68	30.00	Pass
802.11G	Lowest	18.69	30.00	Pass
	Middle	18.37	30.00	Pass
	Highest	19.09	30.00	Pass
802.11N20	Lowest	17.86	30.00	Pass
	Middle	18.58	30.00	Pass
	Highest	18.19	30.00	Pass
802.11N40	Lowest	18.37	30.00	Pass
	Middle	18.84	30.00	Pass
	Highest	18.28	30.00	Pass



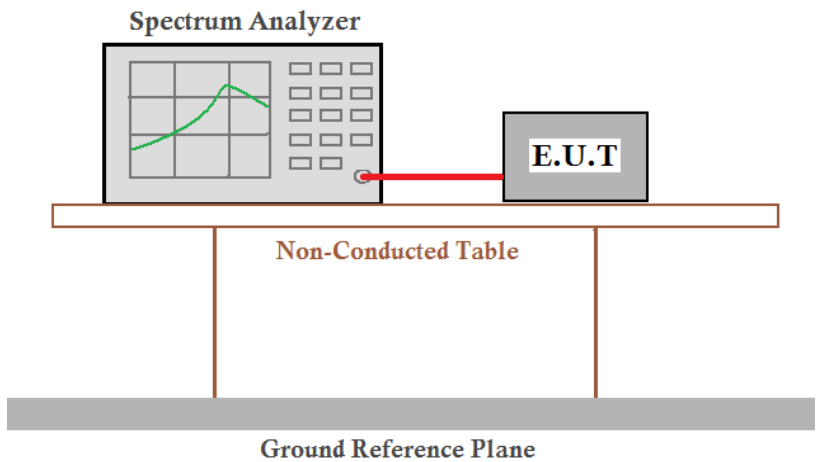
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4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8.1 Option 1
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	≥ 500 kHz
Test Results:	Pass

4.5.1 Test Results

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	15.04	10.07	≥500	Pass
	Middle	14.99	10.04	≥500	Pass
	Highest	14.93	10.04	≥500	Pass
802.11G	Lowest	16.69	16.30	≥500	Pass
	Middle	16.57	16.39	≥500	Pass
	Highest	16.54	16.18	≥500	Pass
802.11N20	Lowest	17.77	17.35	≥500	Pass
	Middle	17.71	17.32	≥500	Pass
	Highest	17.71	17.32	≥500	Pass
802.11N40	Lowest	36.14	35.37	≥500	Pass
	Middle	36.14	35.25	≥500	Pass
	Highest	36.20	35.25	≥500	Pass



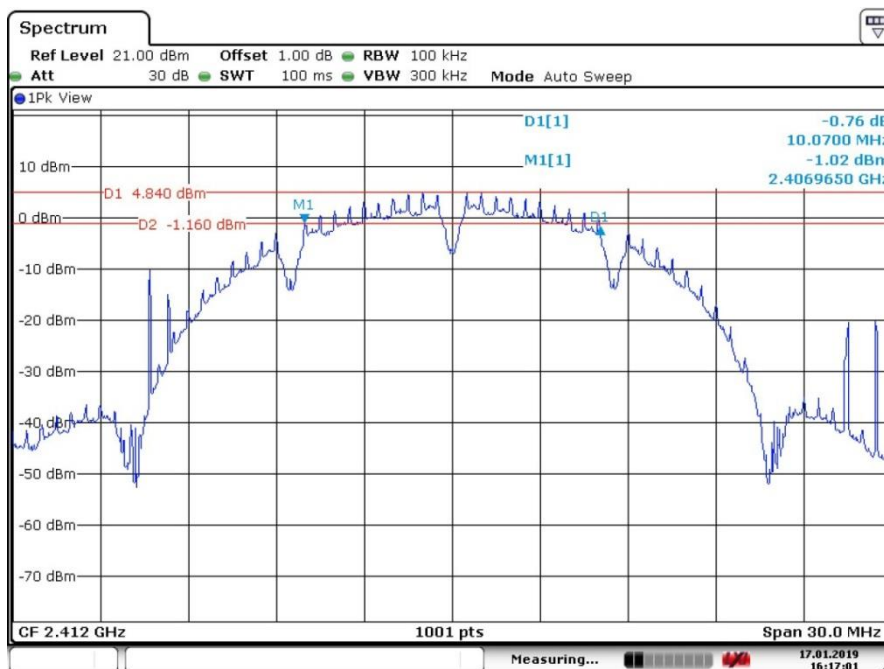
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



Date: 17.JAN.2019 16:14:52



Date: 17.JAN.2019 16:17:02



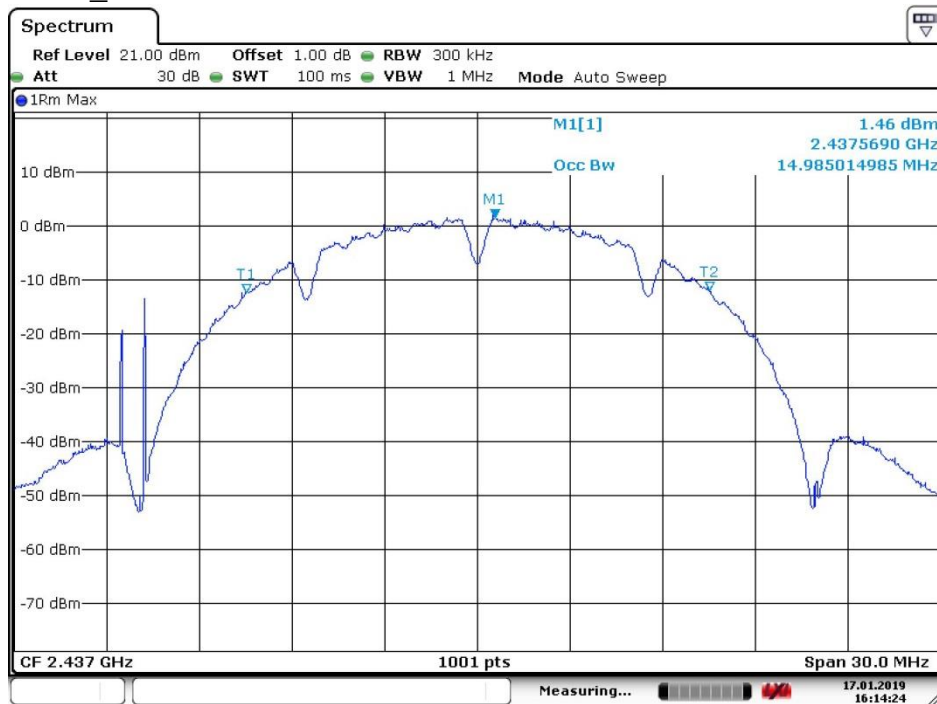
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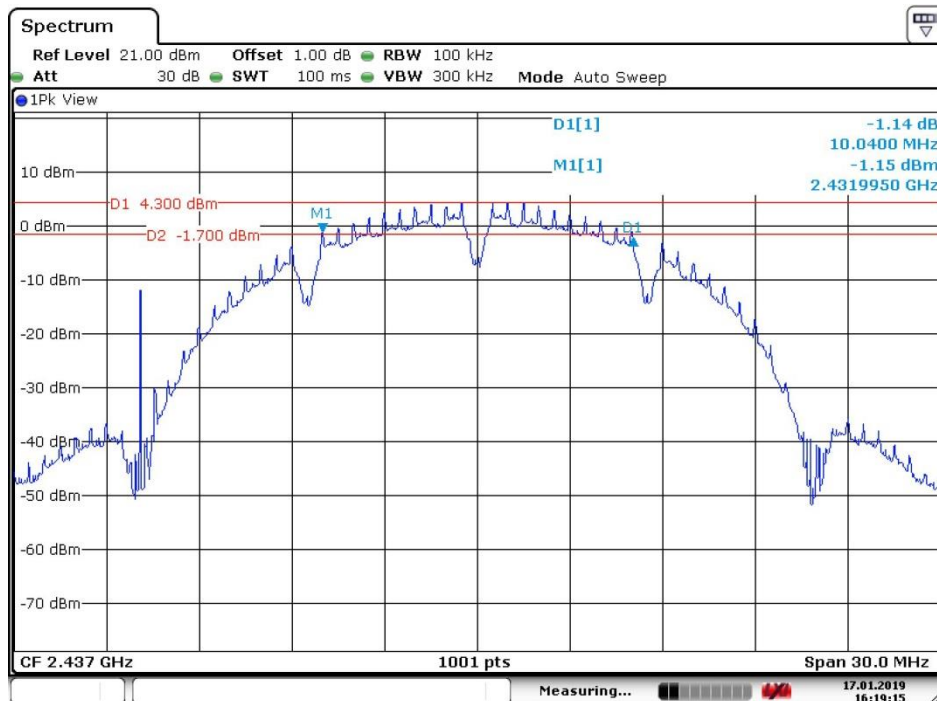
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4.5.2.1.2 802.11B_ Middle Channel



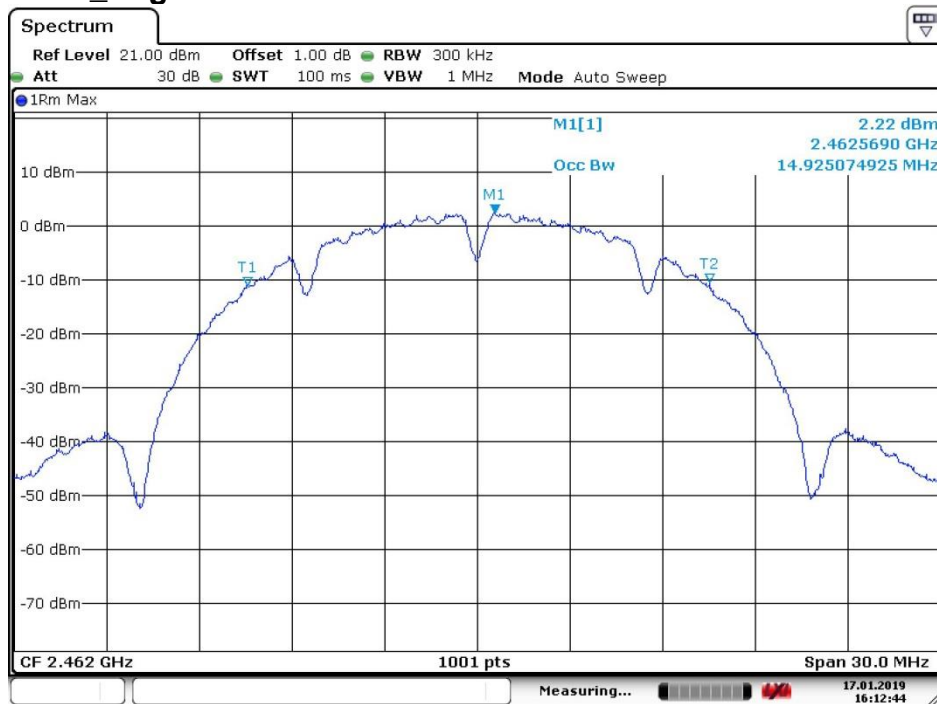
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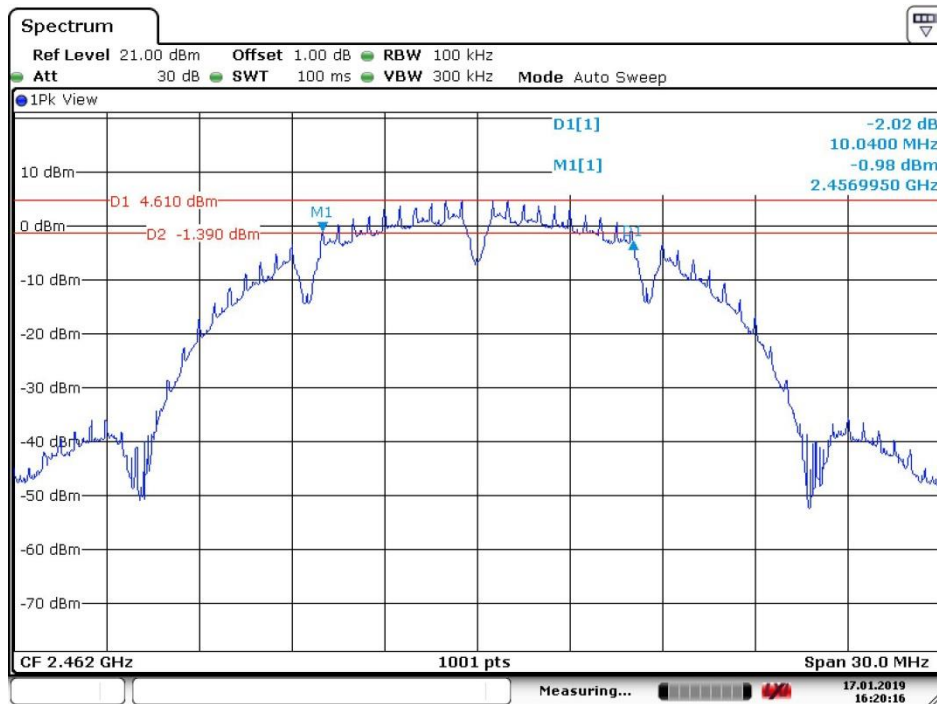
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4.5.2.1.3 802.11B_ Highest Channel



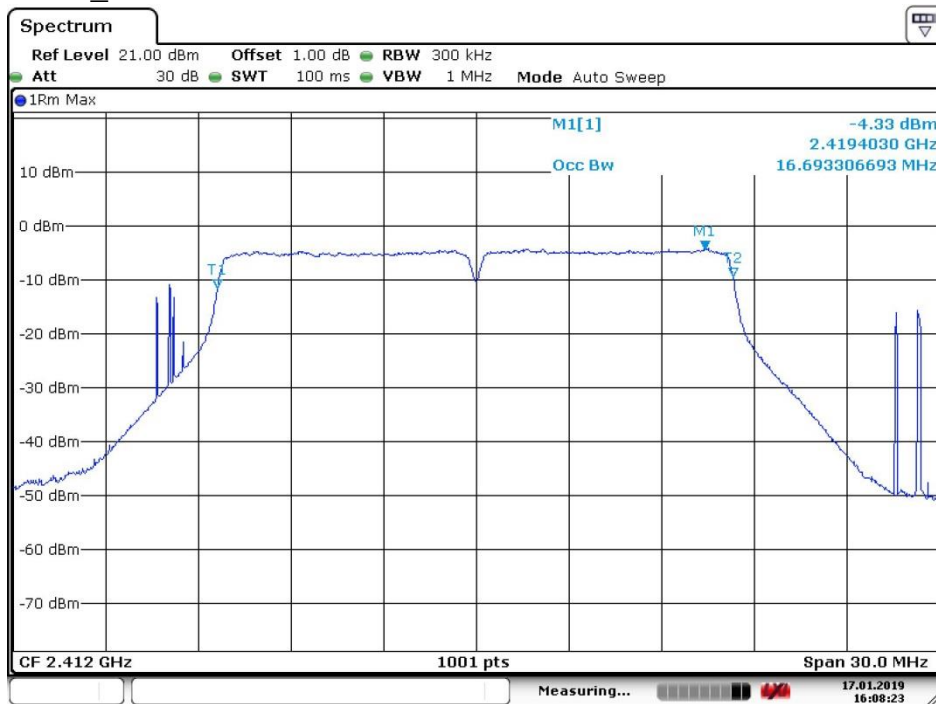
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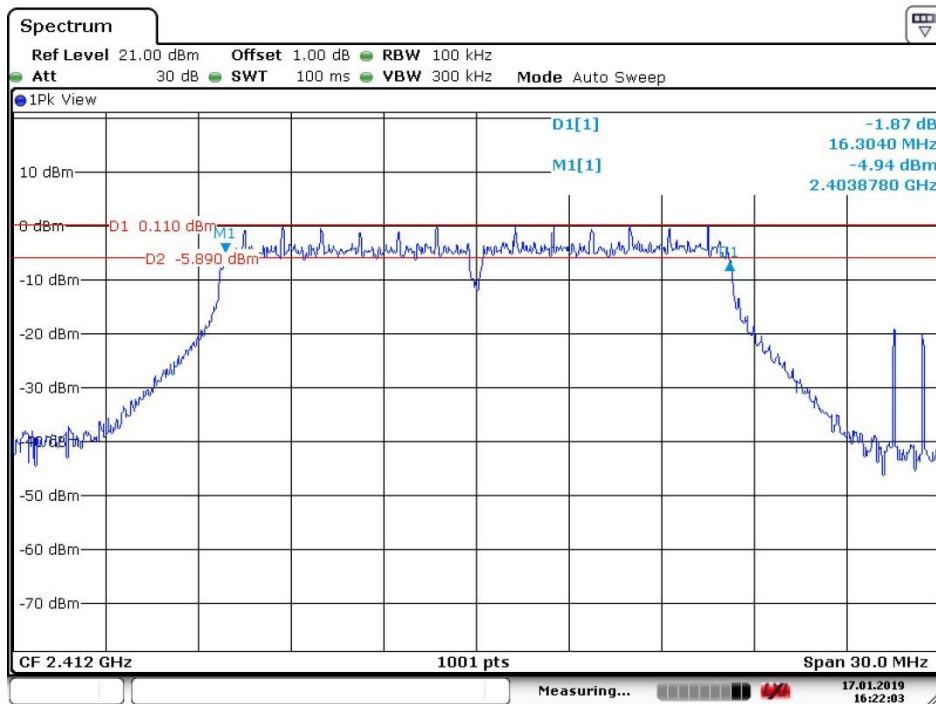
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4.5.2.1.4 802.11G_Lowest Channel



Date: 17. JAN. 2019 16:08:23



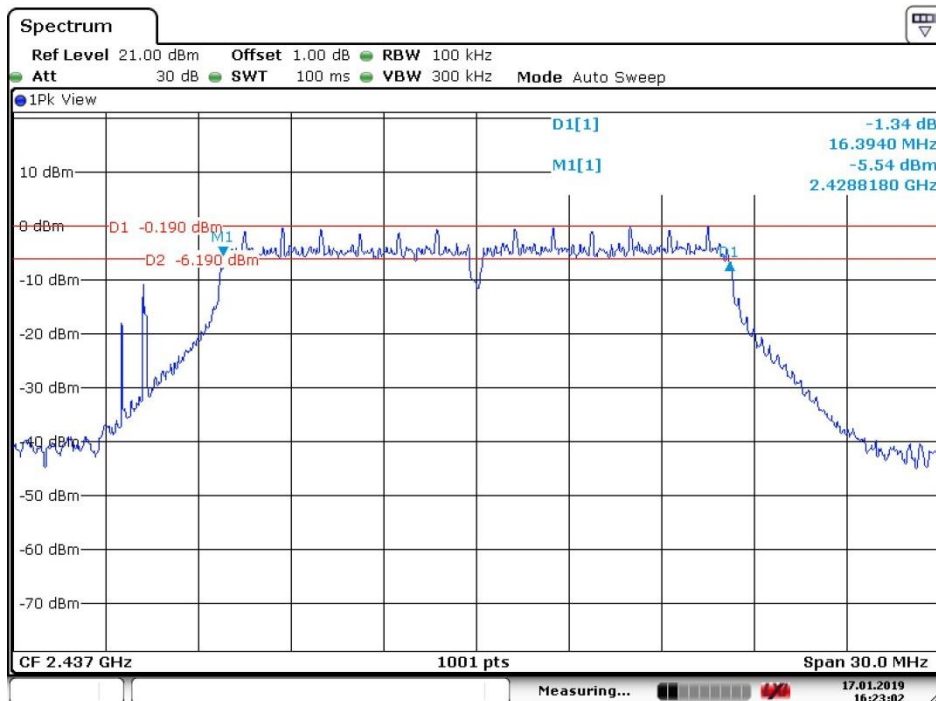
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4.5.2.1.5 802.11G_ Middle Channel



Date: 17. JAN. 2019 16:09:09



Date: 17. JAN. 2019 16:23:02



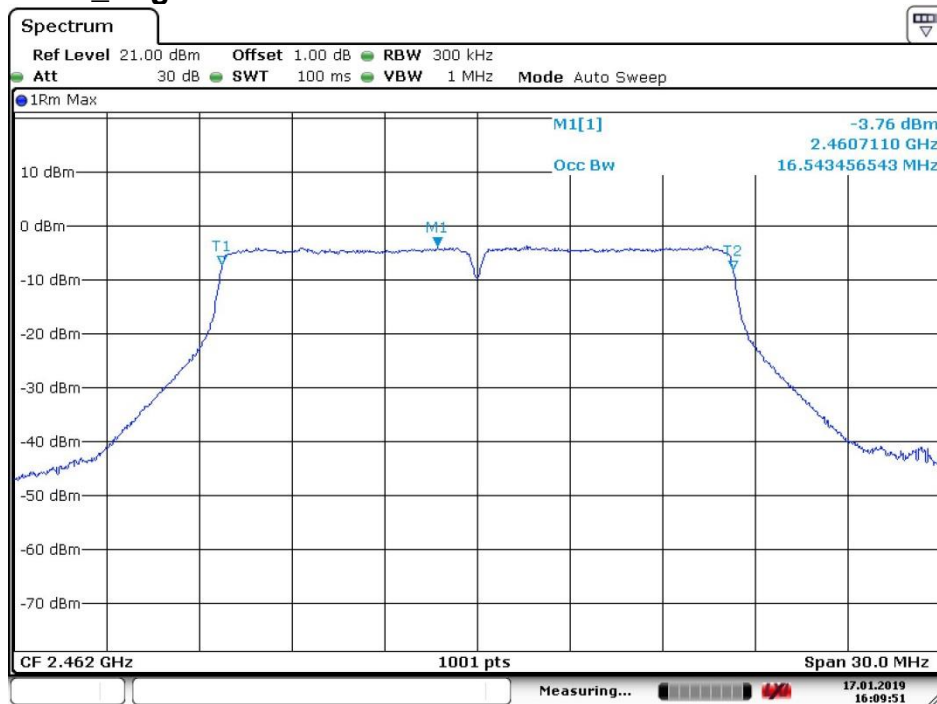
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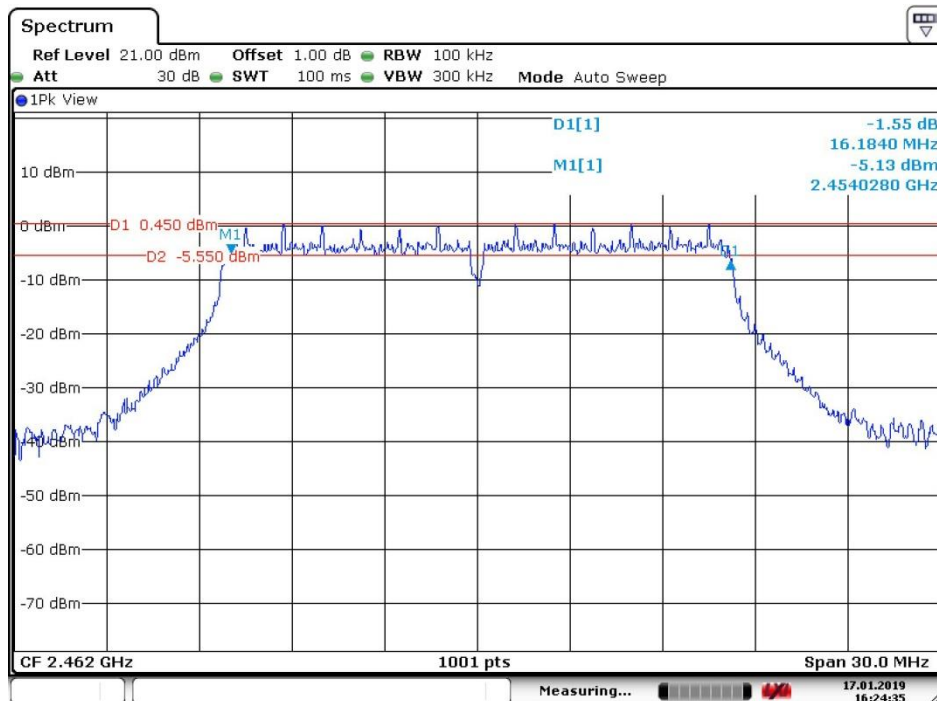
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4.5.2.1.6 802.11G_Highest Channel



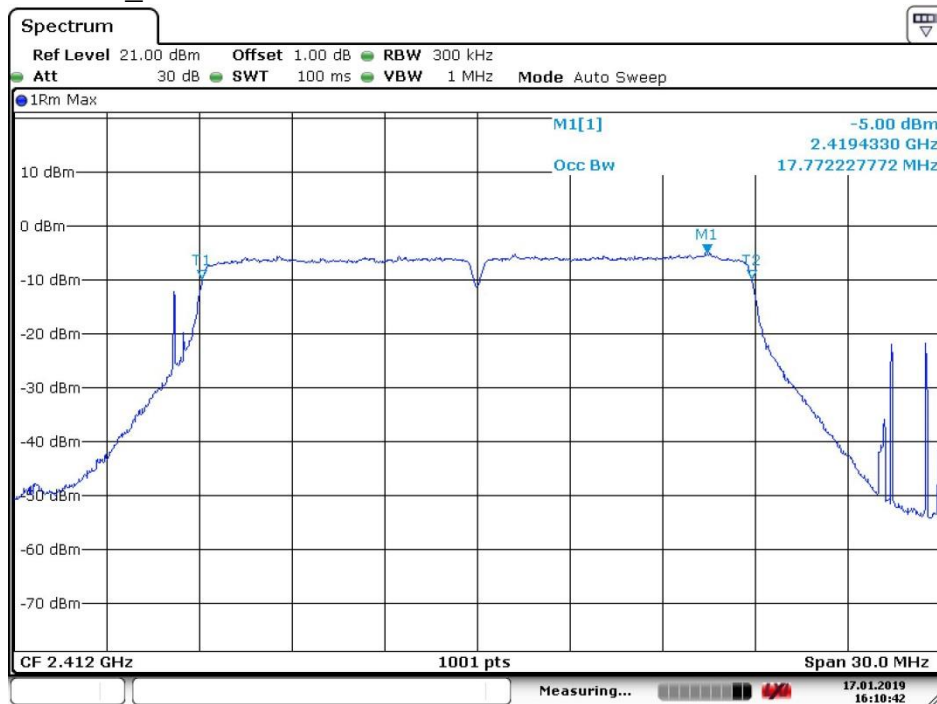
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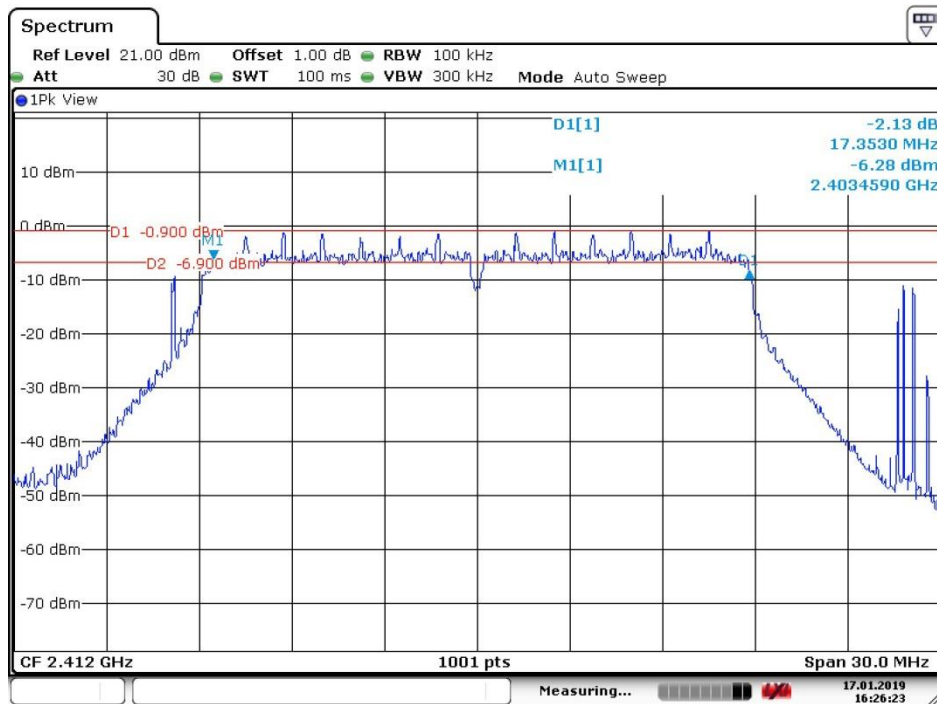
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4.5.2.1.7 802.11N20_Lowest Channel



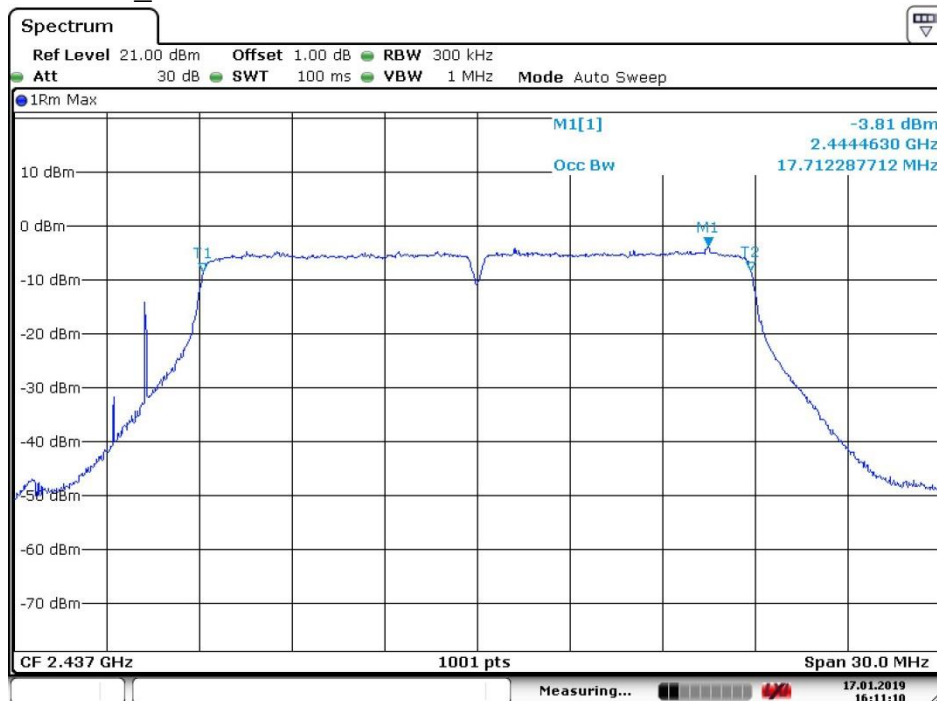
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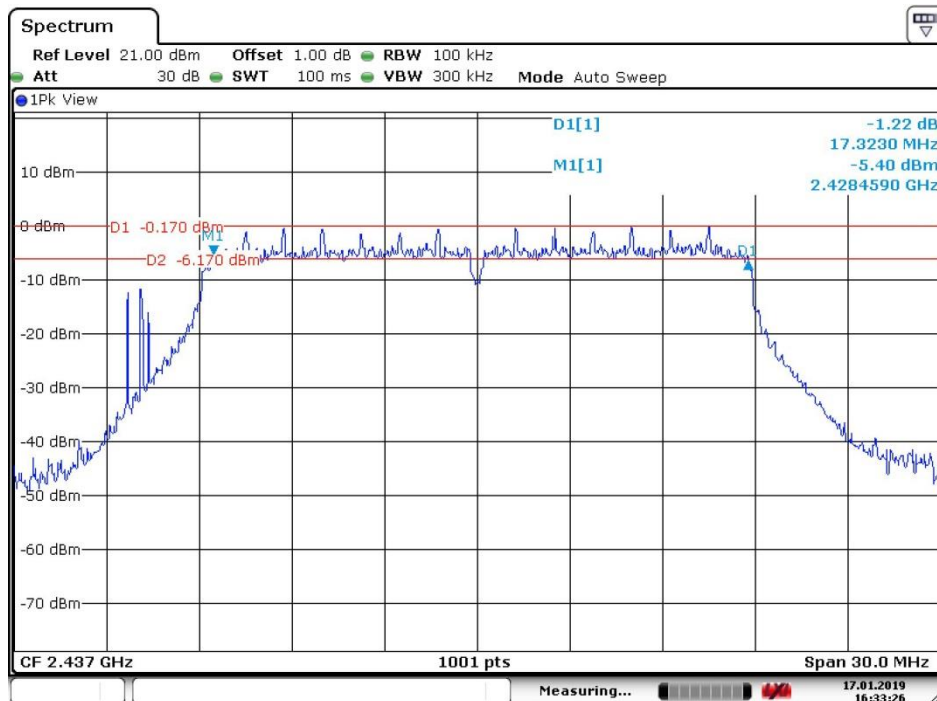
Date: 17.JAN.2019 16:26:23



4.5.2.1.8 802.11 N20_ Middle Channel



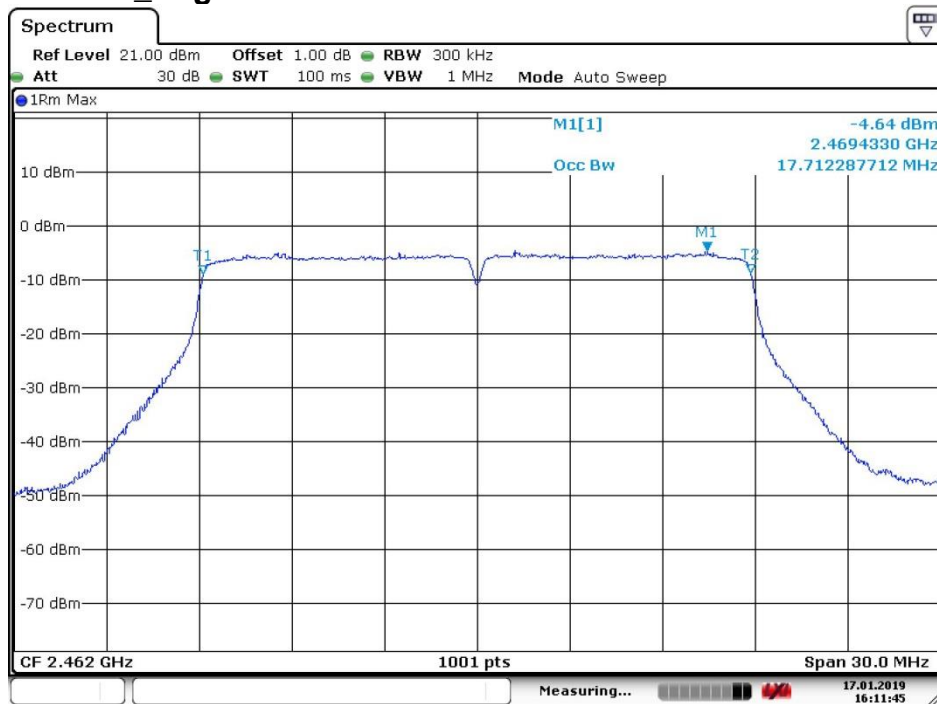
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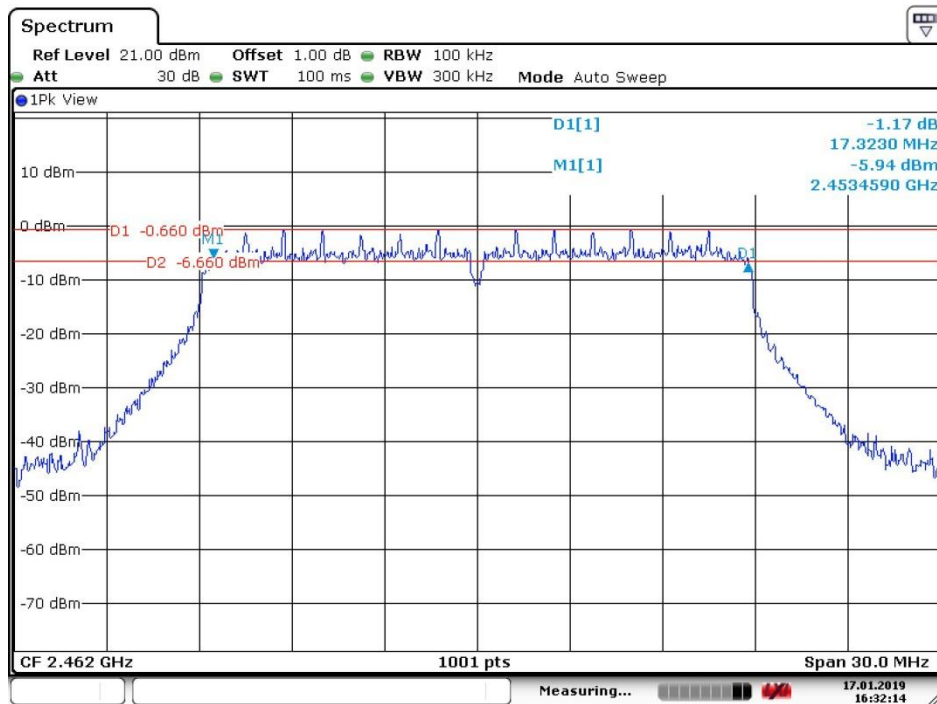
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4.5.2.1.9 802.11 N20_ Highest Channel



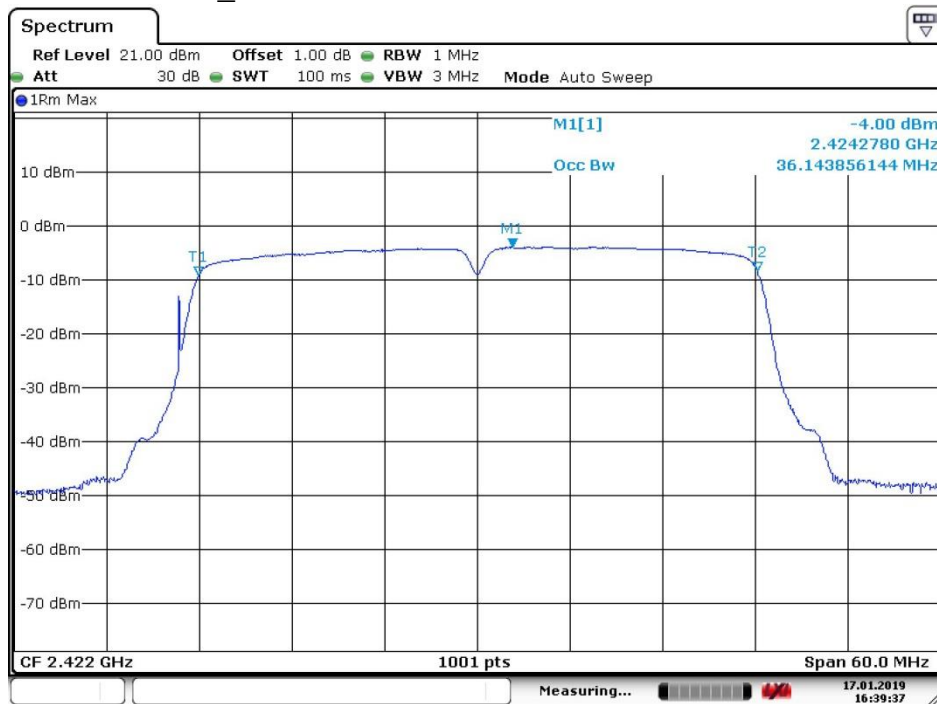
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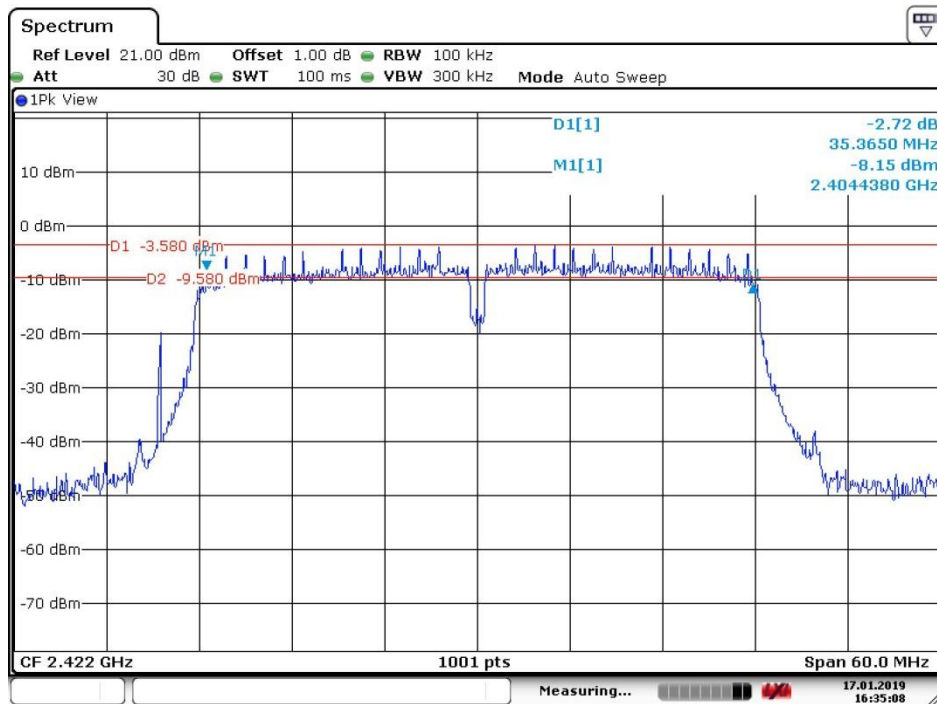
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4.5.2.1.10 802.11N40_Lowest Channel



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Date: 17. JAN. 2019 16:35:08

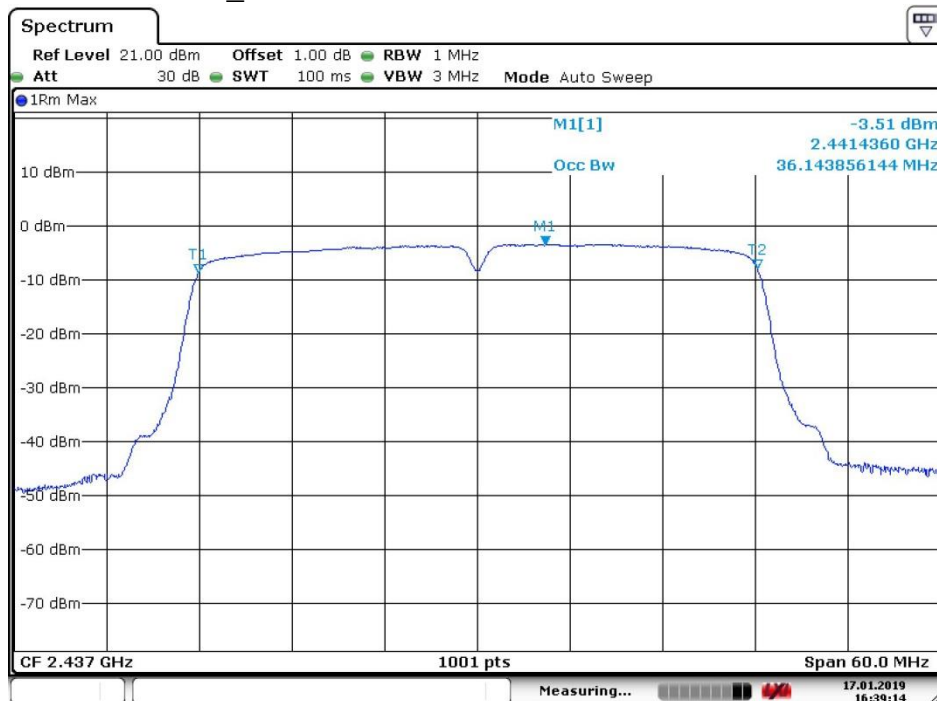


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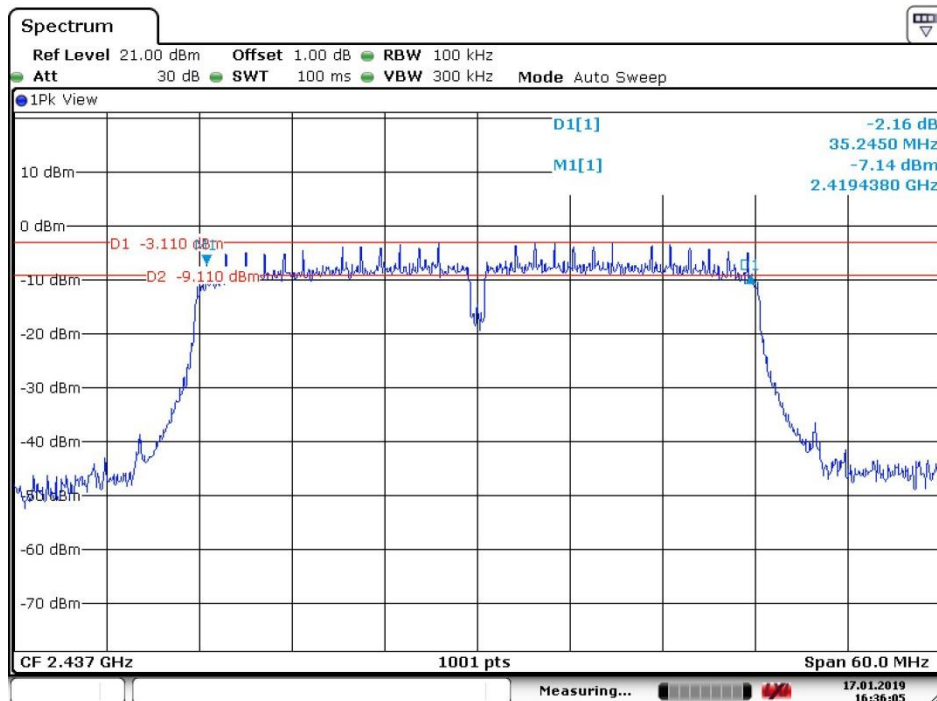
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4.5.2.1.11 802.11 N40_ Middle Channel



Date: 17. JAN. 2019 16:39:14



Date: 17. JAN. 2019 16:36:05

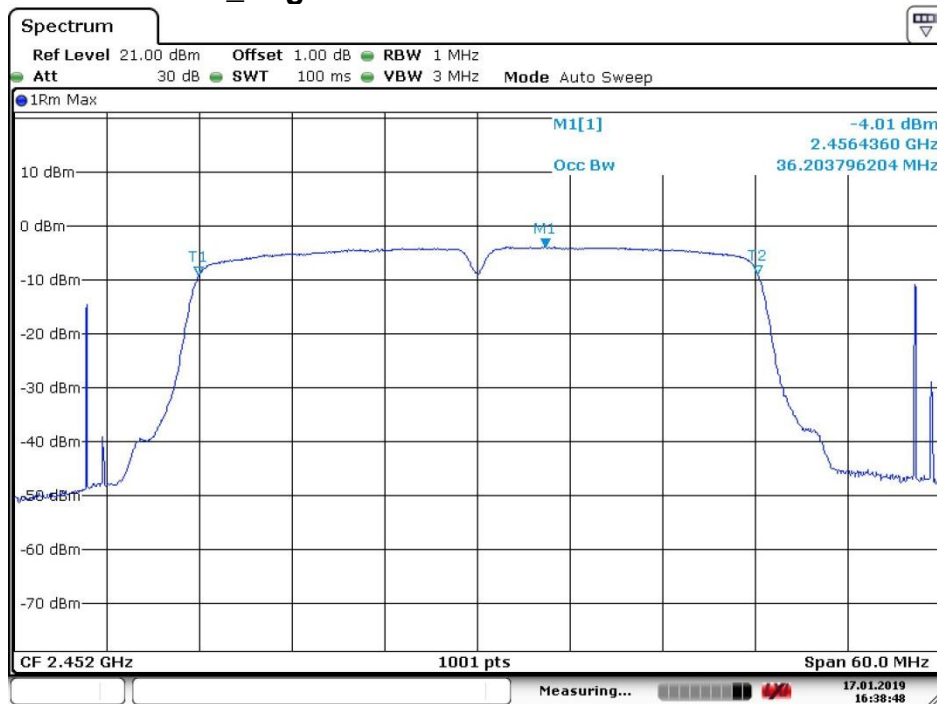


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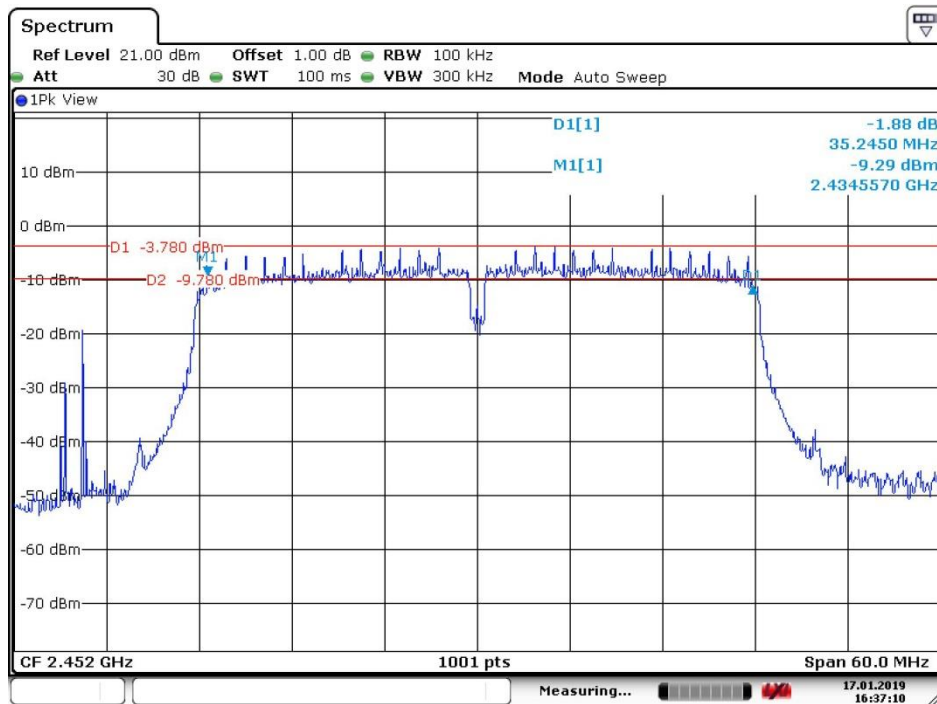
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4.5.2.1.12 802.11 N40_ Highest Channel



Date: 17.JAN.2019 16:38:48



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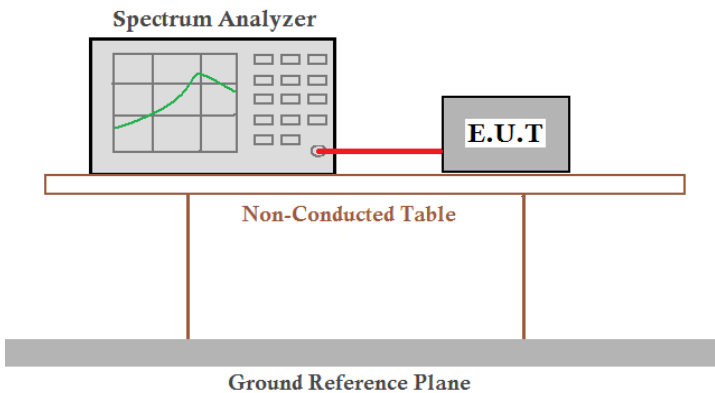


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4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

4.6.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-7.78	≤8.00	Pass
	Middle	-8.85	≤8.00	Pass
	Highest	-7.97	≤8.00	Pass
802.11G	Lowest	-13.54	≤8.00	Pass
	Middle	-13.80	≤8.00	Pass
	Highest	-13.11	≤8.00	Pass
802.11N20	Lowest	-14.36	≤8.00	Pass
	Middle	-13.36	≤8.00	Pass
	Highest	-13.51	≤8.00	Pass
802.11N40	Lowest	-17.97	≤8.00	Pass
	Middle	-17.43	≤8.00	Pass
	Highest	-17.97	≤8.00	Pass



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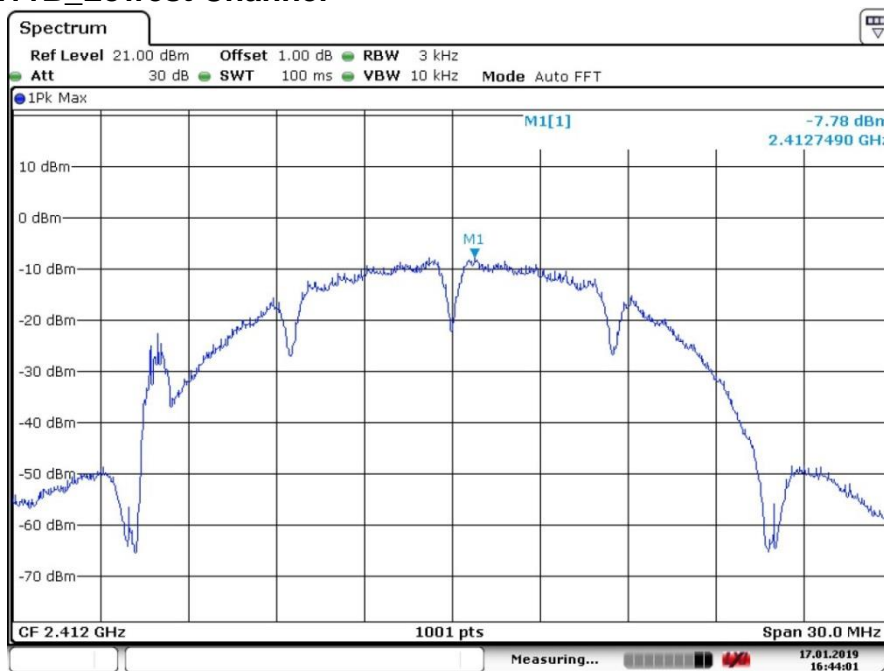
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4.6.2 Test plots

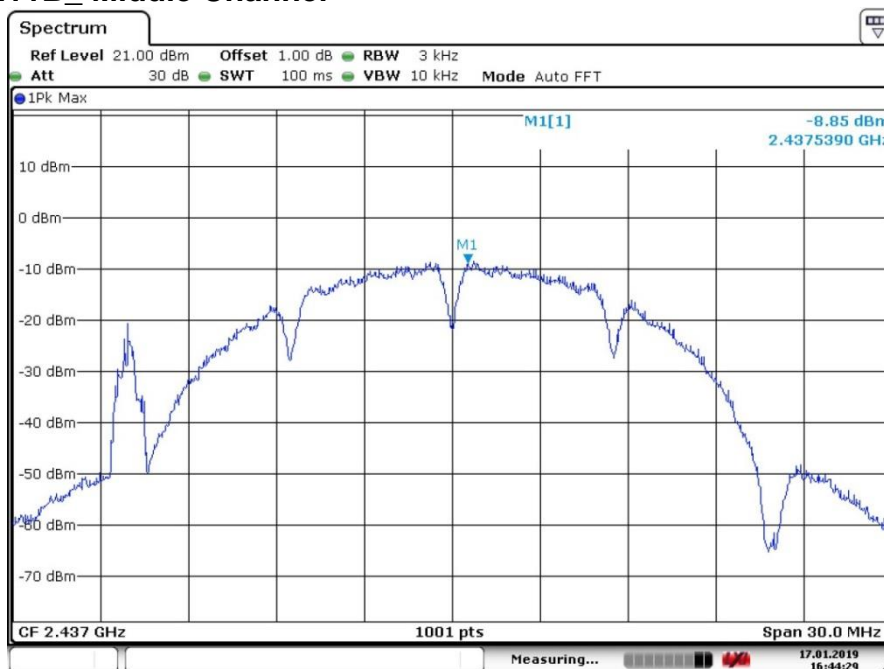
4.6.2.1 ANT1

4.6.2.1.1 802.11B_Lowest Channel



Date: 17.JAN.2019 16:44:02

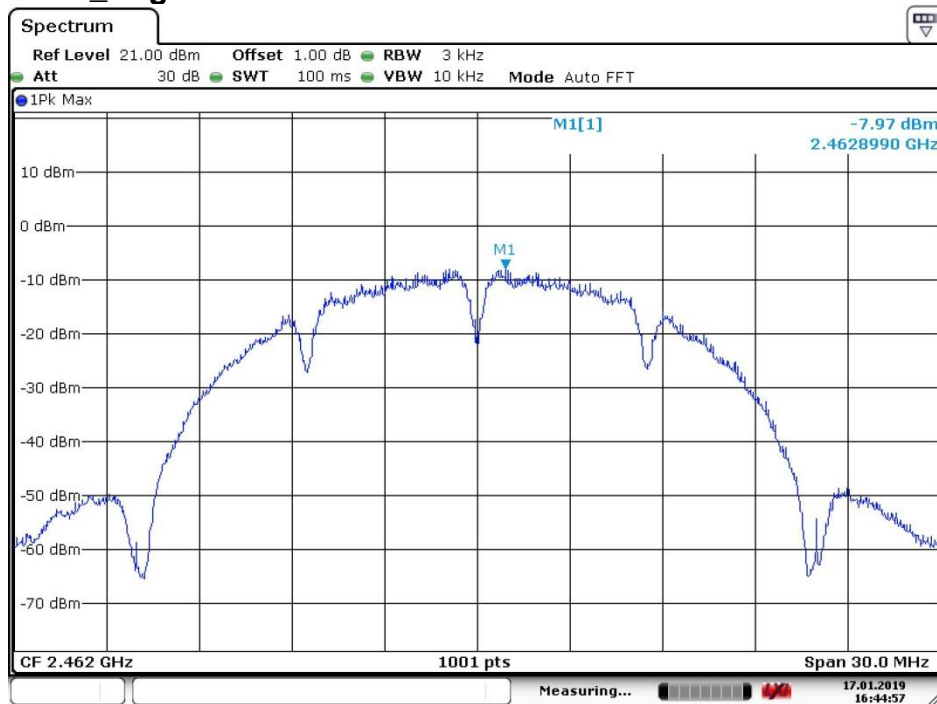
4.6.2.1.2 802.11B_Middle Channel



Date: 17.JAN.2019 16:44:29

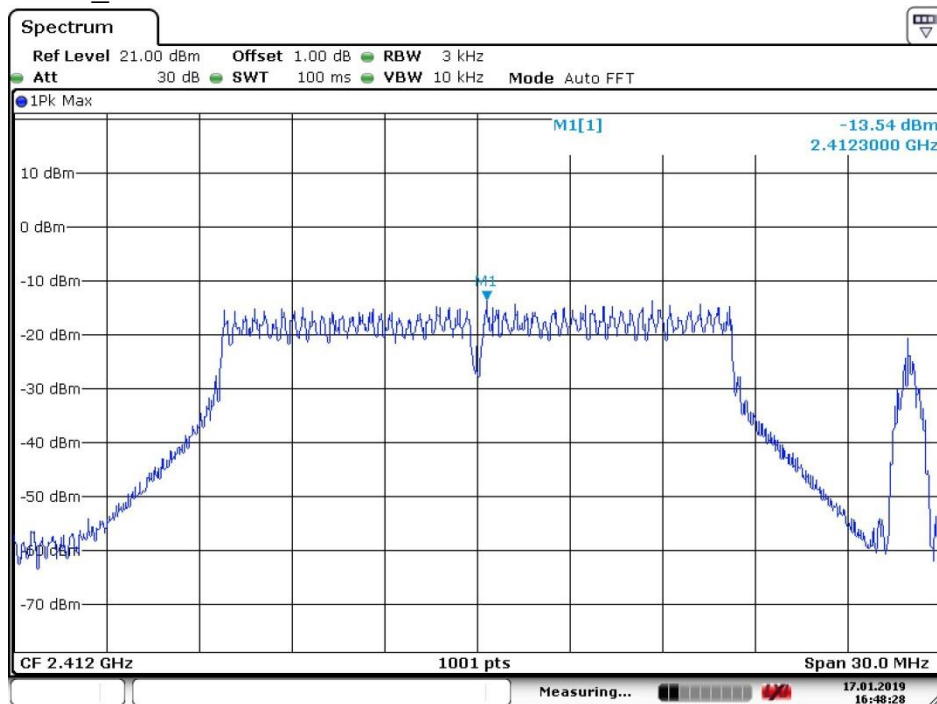


4.6.2.1.3 802.11B_Highest Channel



Date: 17. JAN. 2019 16:44:58

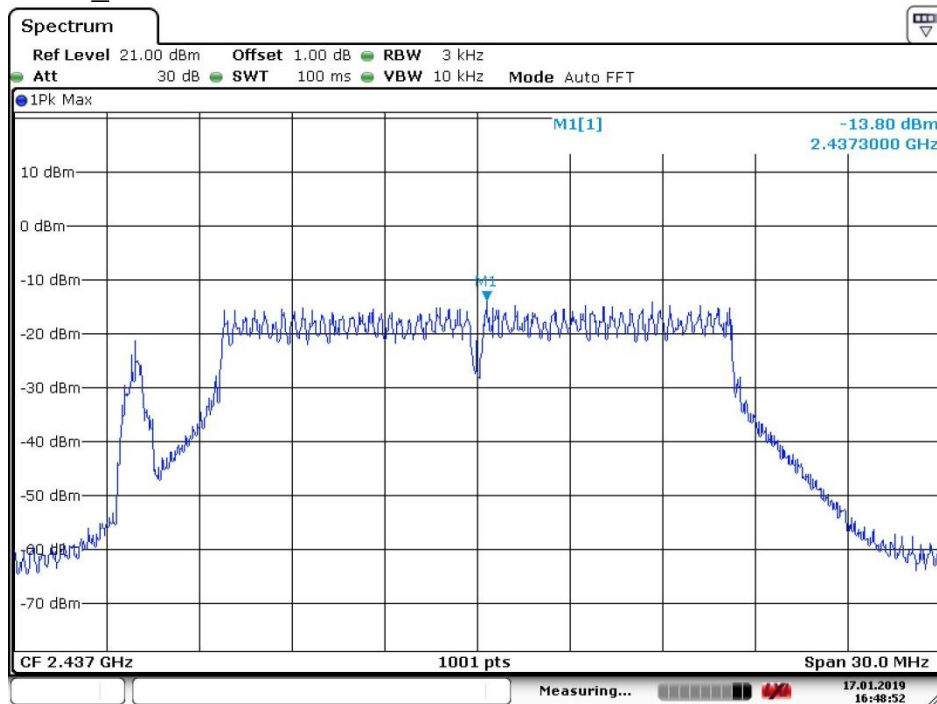
4.6.2.1.4 802.11G_Lowest Channel



Date: 17. JAN. 2019 16:48:28

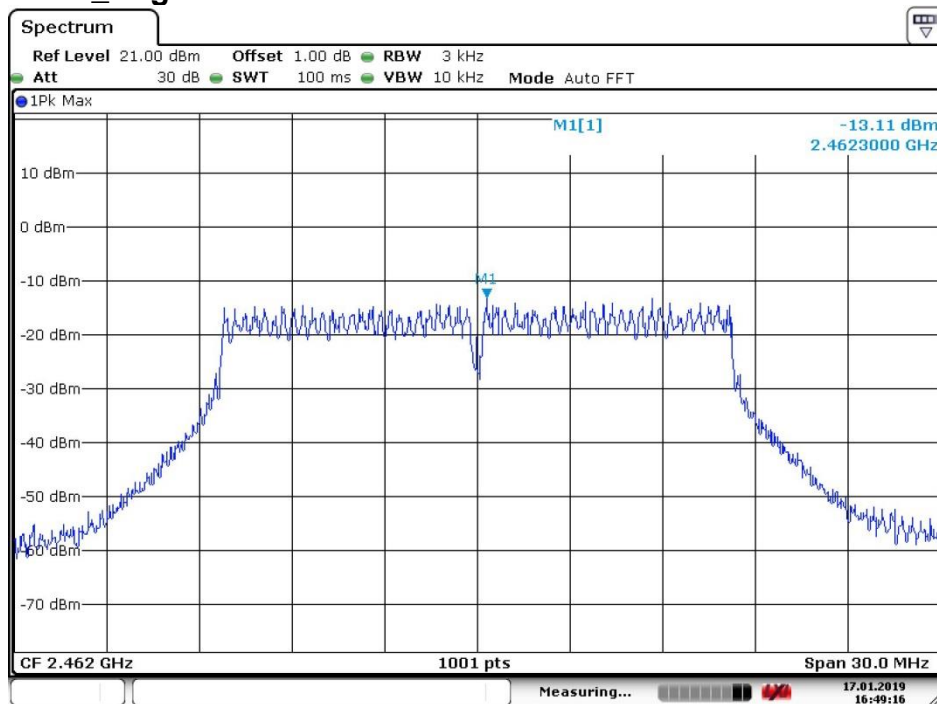


4.6.2.1.5 802.11G_Middle Channel



Date: 17. JAN. 2019 16:48:53

4.6.2.1.6 802.11G_Highest Channel



Date: 17. JAN. 2019 16:49:17

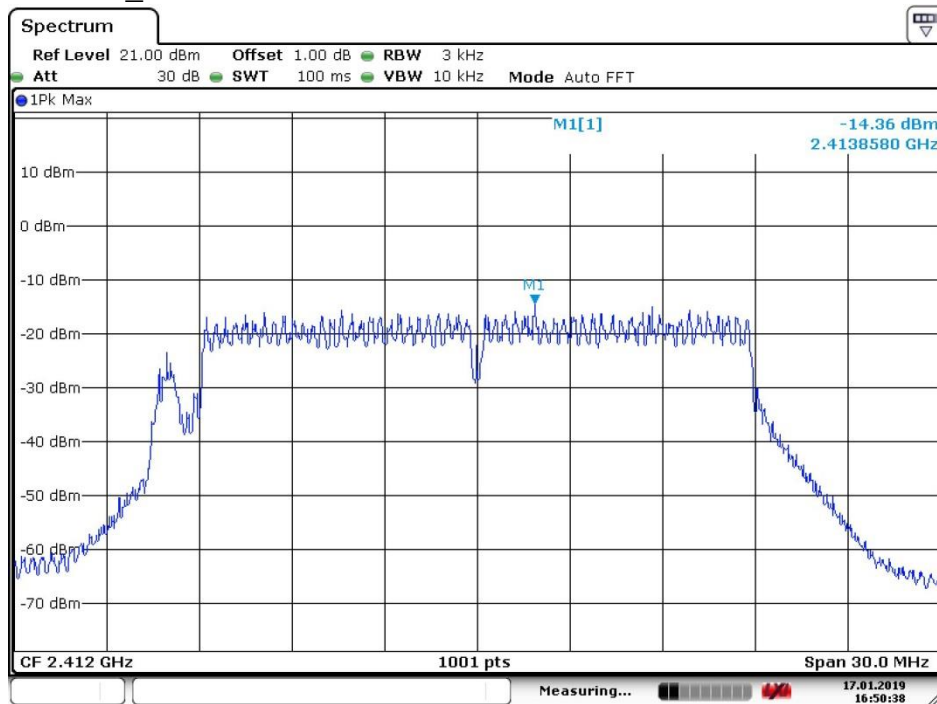


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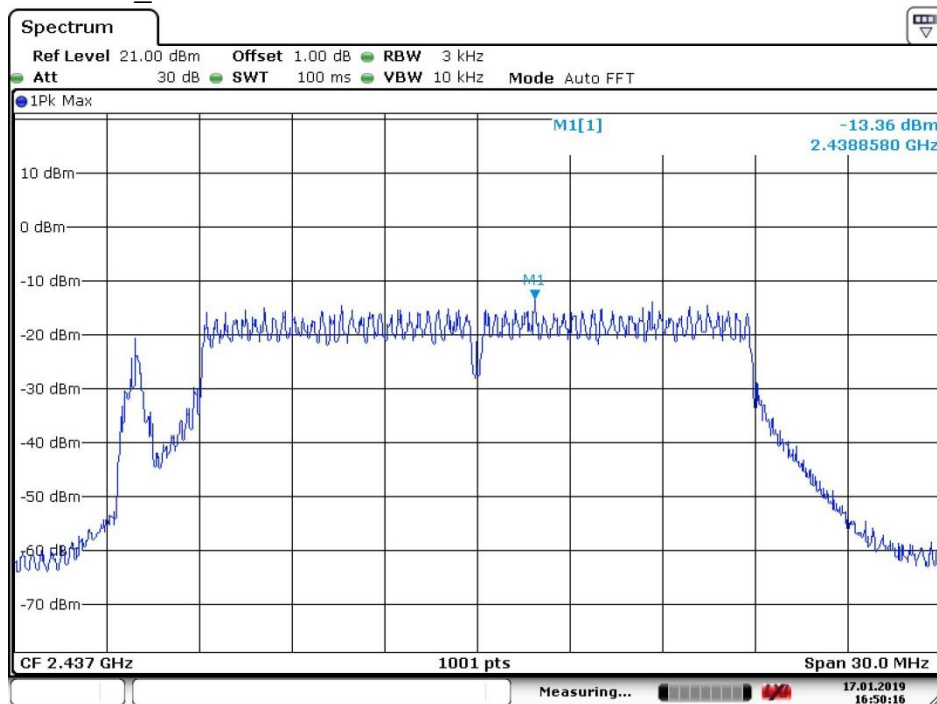
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4.6.2.1.7 802.11N20_Lowest Channel



Date: 17. JAN. 2019 16:50:38

4.6.2.1.8 802.11 N20_Middle Channel



Date: 17. JAN. 2019 16:50:16



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