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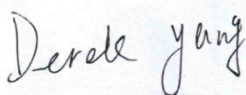
# FCC TEST REPORT

**Application No.:** ZR/2020/A0016  
**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.:** TA-1323  
**Trade Mark:** NOKIA  
**FCC ID:** 2AJOTTA-1323  
**Standards:** 47 CFR FCC Part 2, Subpart J  
47 CFR Part 15, Subpart C  
**Date of Receipt:** 2020/10/19  
**Date of Test:** 2020/10/23 to 2020/12/10  
**Date of Issue:** 2020/12/11

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

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

Authorized Signature:



Derek Yang  
Wireless Laboratory Manager



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## 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2020-12-11		Original

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



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## 2 Test Summary

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



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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

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



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### 3.3 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2017 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:	Smart Phone
Model No.:	TA-1323
Trade Mark:	NOKIA
Hardware Version:	V1.0
Software Version:	00WW_0_070
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 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) : 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:	-1.0dBi
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		



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**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)
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz

### 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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## 4 Test results and Measurement Data

### 4.1 Antenna Requirement

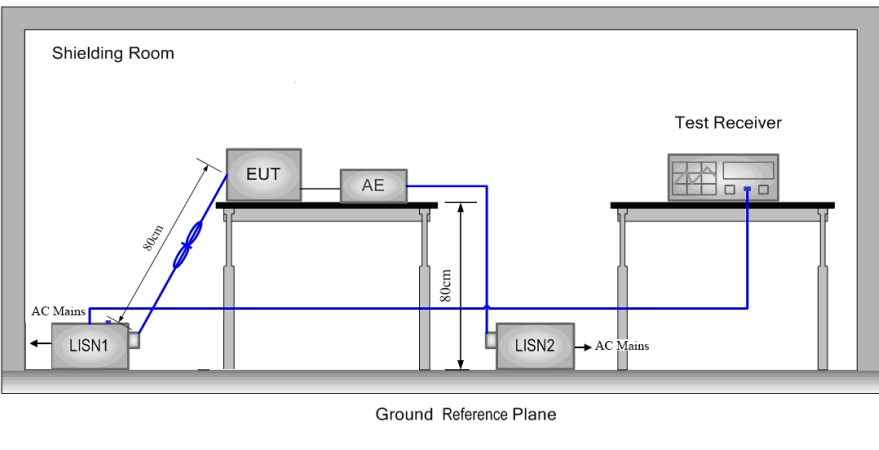
<b>Standard requirement:</b>	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p> <p>The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -1.0dBi.</p>	



## 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:	<p>1) The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>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.</p> <p>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,</p> <p>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. 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.</p>		



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



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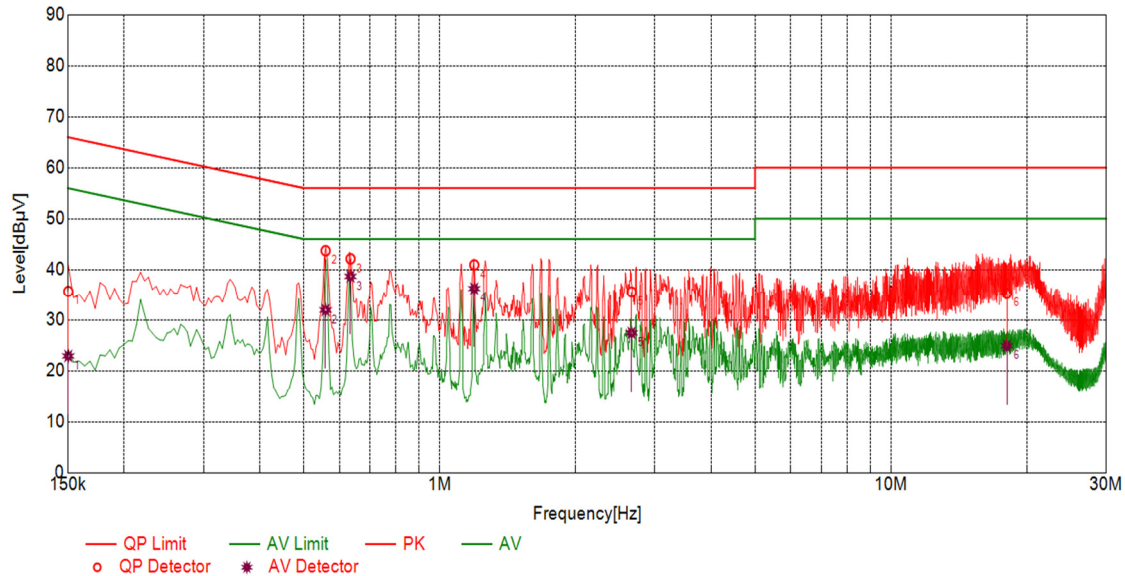
### Measurement Data

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.

### Firstly Supply:

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]	Type
1	0.1504	10.10	35.68	65.98	30.30	22.89	55.98	33.09	L
2	0.5589	10.10	43.73	56.00	12.27	31.93	46.00	14.07	L
3	0.6347	10.10	42.13	56.00	13.87	38.67	46.00	7.33	L
4	1.1931	10.10	40.93	56.00	15.07	36.25	46.00	9.75	L
5	2.6624	10.10	35.55	56.00	20.45	27.42	46.00	18.58	L
6	18.0641	10.11	35.27	60.00	24.73	24.90	50.00	25.10	L



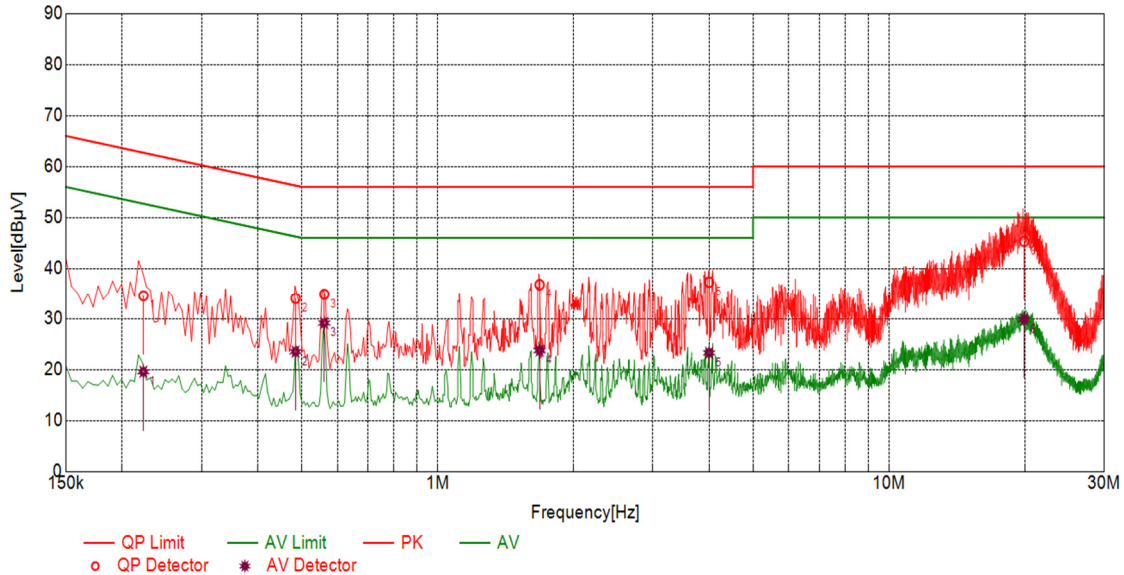
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Shenzhen Branch Testing Center EEC Laboratory.

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中国·深圳·科技园中区M-10栋一号厂房 邮编: 518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com



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]	Type
1	0.2229	10.10	34.55	62.71	28.16	19.57	52.71	33.14	N
2	0.4845	10.10	34.02	56.26	22.24	23.50	46.26	22.76	N
3	0.5609	10.10	34.86	56.00	21.14	29.13	46.00	16.87	N
4	1.6823	10.10	36.80	56.00	19.20	23.73	46.00	22.27	N
5	3.9959	10.10	37.31	56.00	18.69	23.27	46.00	22.73	N
6	19.9261	10.11	45.34	60.00	14.66	29.84	50.00	20.16	N



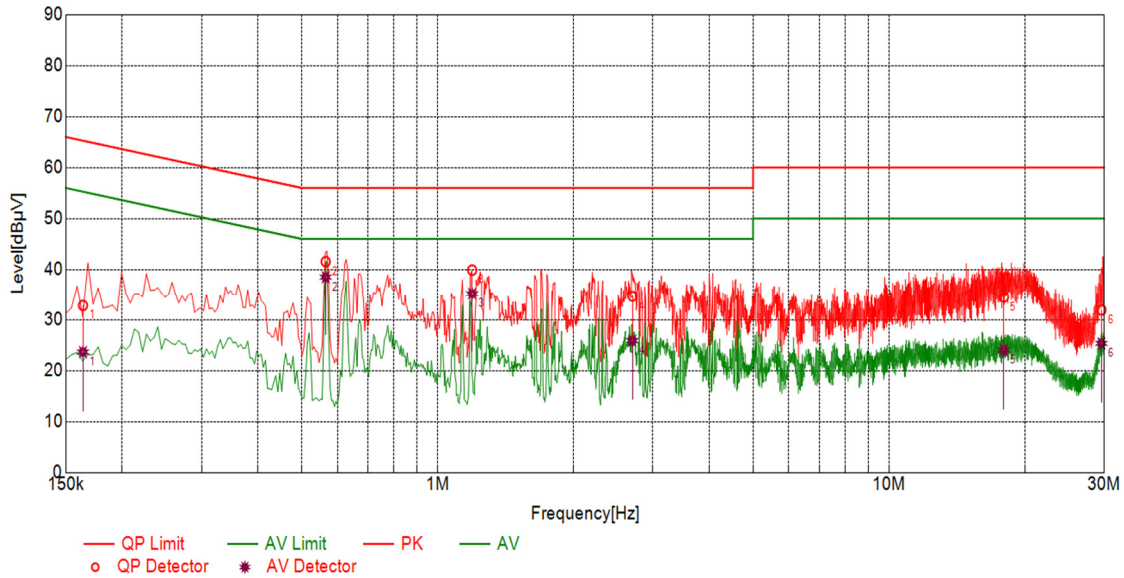
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### Secondly Supply:

Live Line:



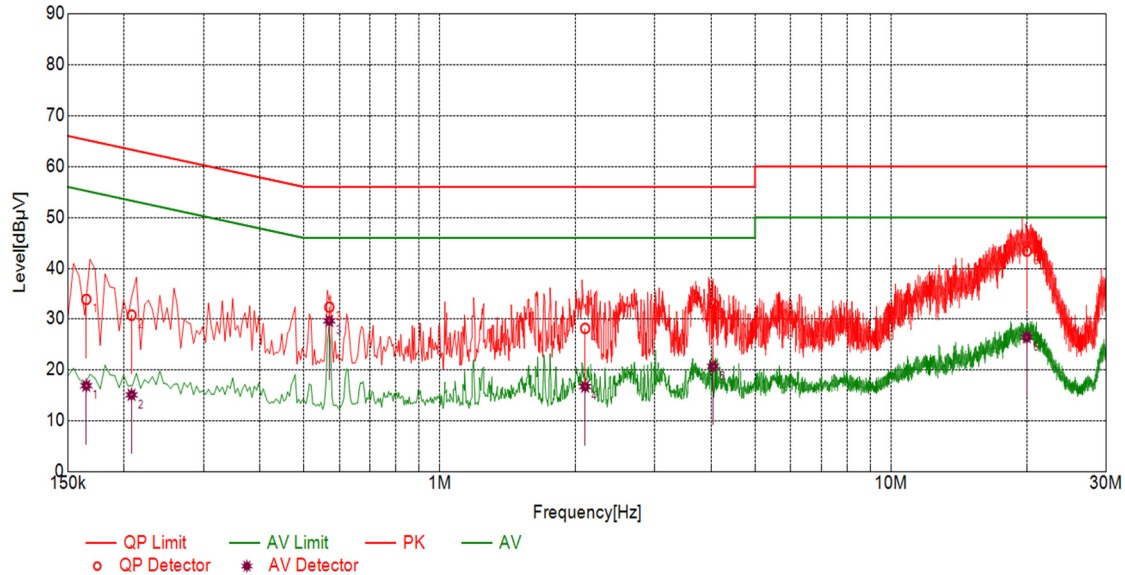
### Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type
1	0.1638	10.10	32.79	65.27	32.48	23.64	55.27	31.63	L
2	0.5650	10.10	41.55	56.00	14.45	38.51	46.00	7.49	L
3	1.1924	10.10	39.89	56.00	16.11	35.20	46.00	10.80	L
4	2.7019	10.10	34.66	56.00	21.34	25.89	46.00	20.11	L
5	17.9746	10.11	34.47	60.00	25.53	24.00	50.00	26.00	L
6	29.5575	10.11	31.90	60.00	28.10	25.34	50.00	24.66	L



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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]	Type
1	0.1649	10.10	33.76	65.21	31.45	16.82	55.21	38.39	N
2	0.2077	10.10	30.66	63.30	32.64	15.04	53.30	38.26	N
3	0.5696	10.10	32.24	56.00	23.76	29.55	46.00	16.45	N
4	2.1006	10.10	28.06	56.00	27.94	16.66	46.00	29.34	N
5	4.0374	10.10	32.85	56.00	23.15	20.63	46.00	25.37	N
6	19.9997	10.11	43.42	60.00	16.58	26.34	50.00	23.66	N

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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## 4.3 Duty Cycle

### 4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	97.67
11G	Ant 1: CH1,CH6,CH11	87.04
11N20	Ant 1: CH1,CH6,CH11	86.70



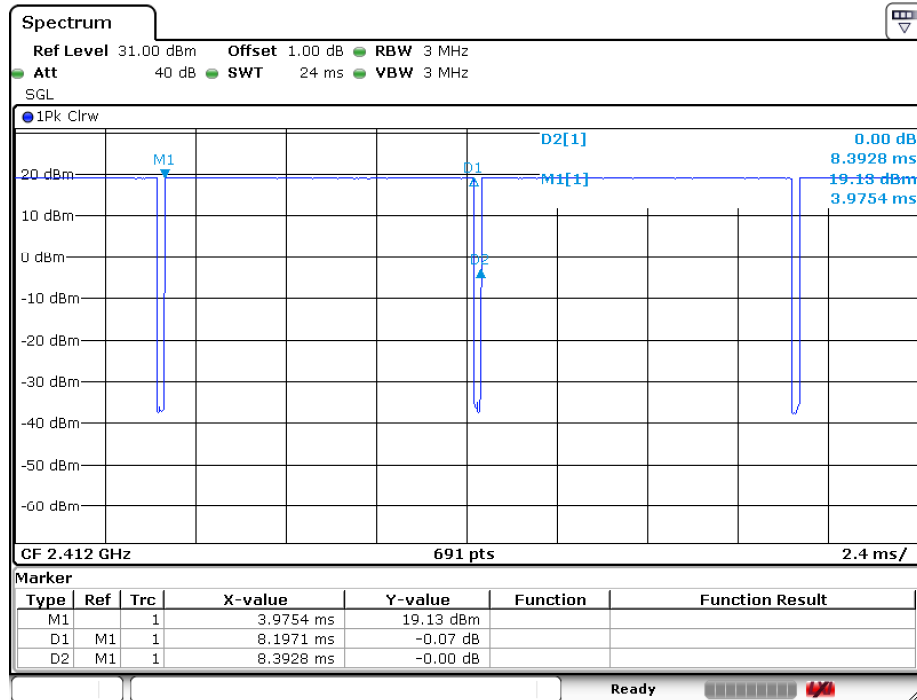
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### 4.3.2 Test Plots

#### 4.3.2.1 ANT1

##### 4.3.2.1.1 11B



Date: 8.NOV.2020 14:58:49

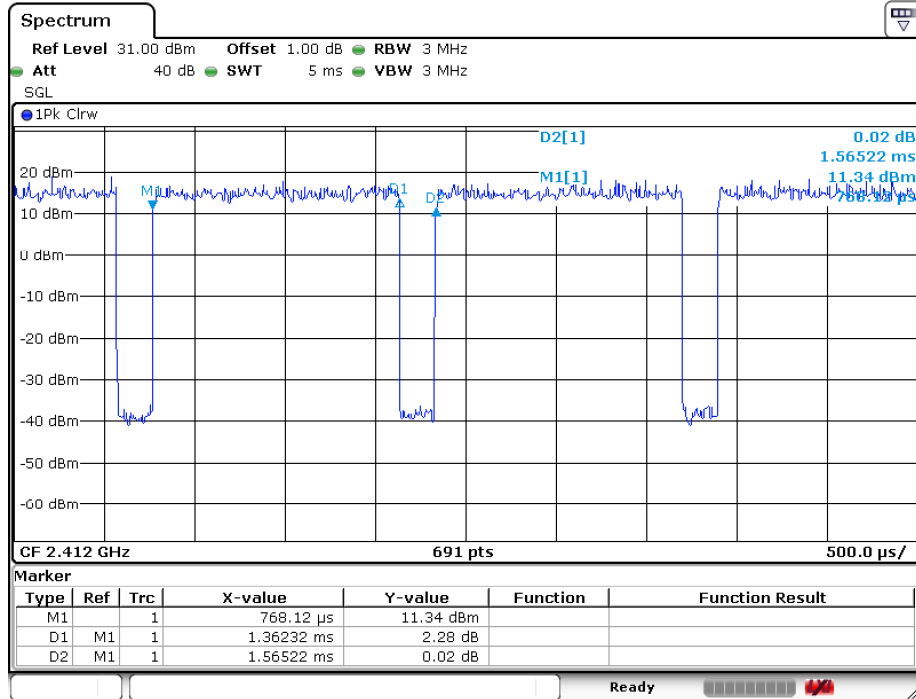


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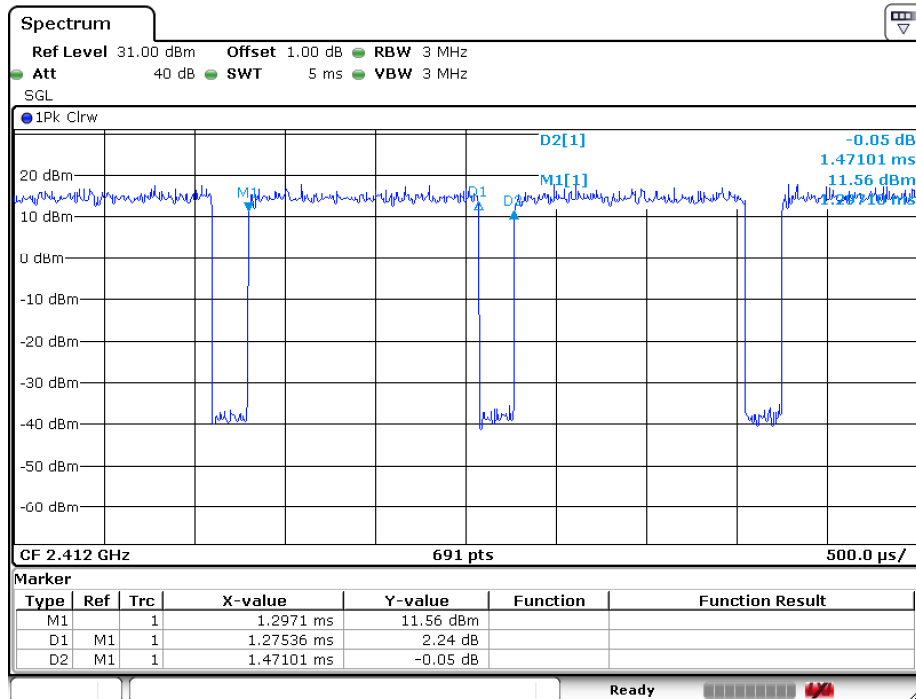


### 4.3.2.1.2 11G



Date: 8.NOV.2020 14:57:15

### 4.3.2.1.3 11N20



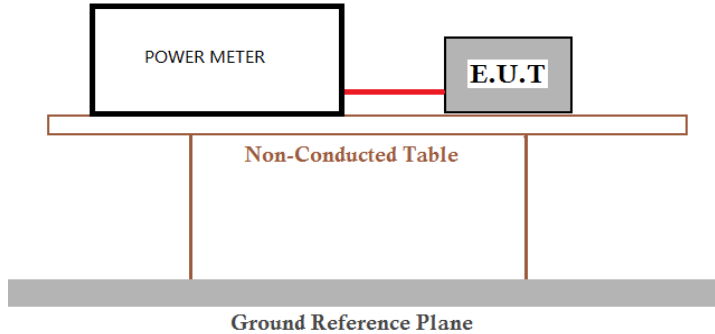
Date: 8.NOV.2020 14:57:59



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## 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);
Limit:	30dBm
Test Results:	Pass



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#### 4.4.1 Test Results

##### Measurement Data of Peak Power:

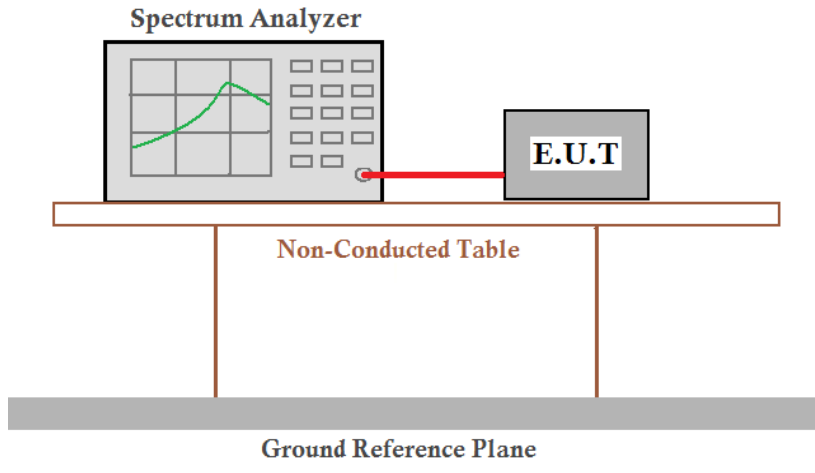
Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	19.69	30.00	Pass
	Middle	19.47	30.00	Pass
	Highest	19.21	30.00	Pass
802.11G	Lowest	16.61	30.00	Pass
	Middle	16.37	30.00	Pass
	Highest	16.37	30.00	Pass
802.11N20	Lowest	15.64	30.00	Pass
	Middle	15.25	30.00	Pass
	Highest	15.55	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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
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);
Limit:	≥ 500 kHz
Test Results:	Pass



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#### 4.5.1 Test Results

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	13.24	8.55	≥500	Pass
	Middle	13.15	9.03	≥500	Pass
	Highest	13.24	9.07	≥500	Pass
802.11G	Lowest	17.15	16.41	≥500	Pass
	Middle	17.28	16.45	≥500	Pass
	Highest	17.50	16.45	≥500	Pass
802.11N20	Lowest	18.10	17.54	≥500	Pass
	Middle	18.19	17.58	≥500	Pass
	Highest	18.32	17.58	≥500	Pass



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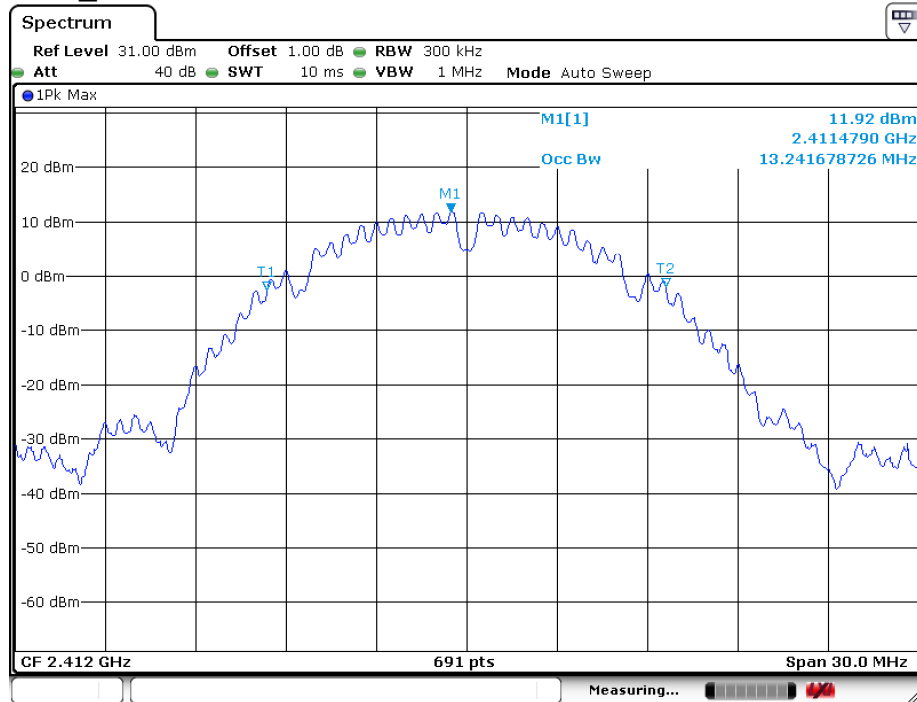
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### 4.5.2 Test Plots

#### 4.5.2.1 ANT1

##### 4.5.2.1.1 802.11B\_Lowest Channel



Date: 8.NOV.2020 14:43:42

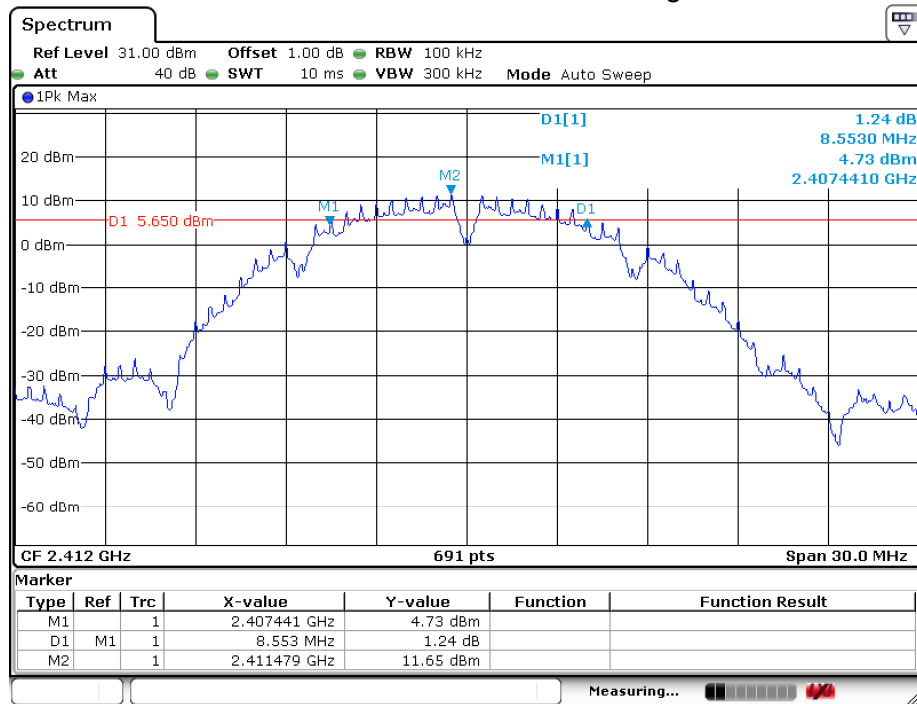


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Date: 8.NOV.2020 14:30:35



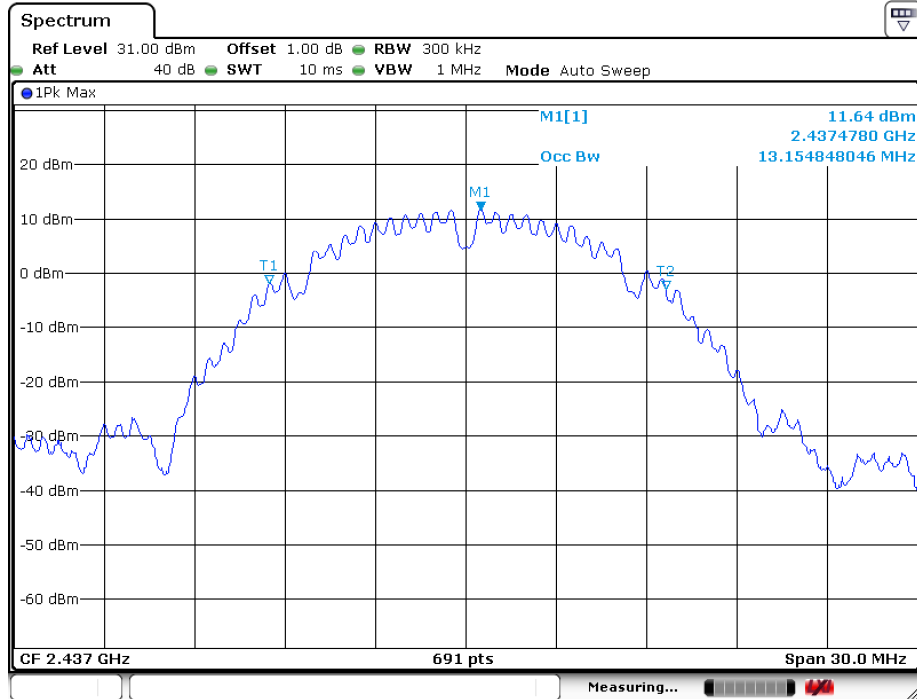
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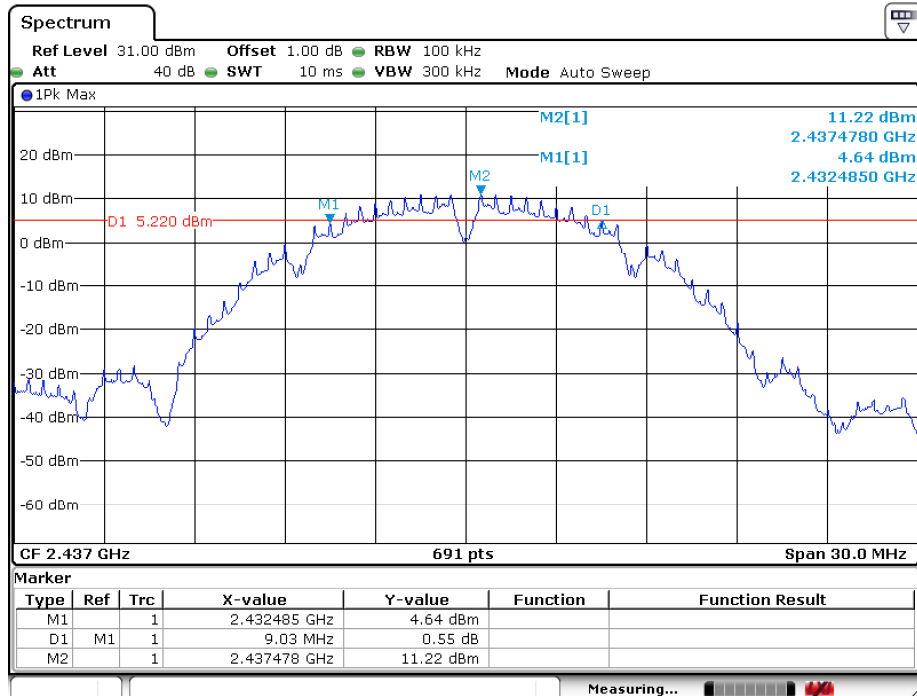
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### 4.5.2.1.2 802.11B\_Middle Channel



Date: 8.NOV.2020 14:44:03

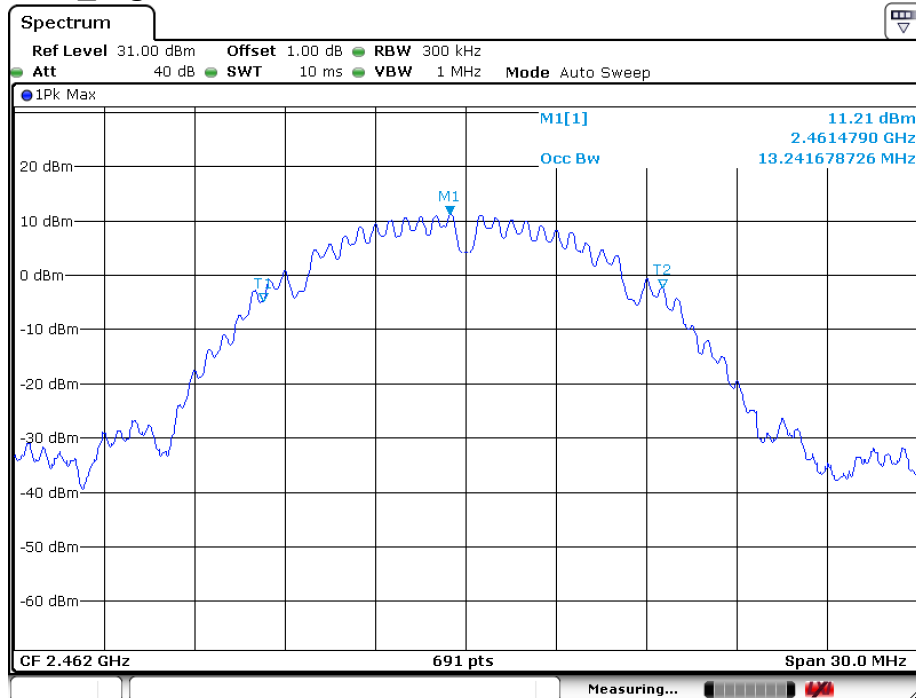


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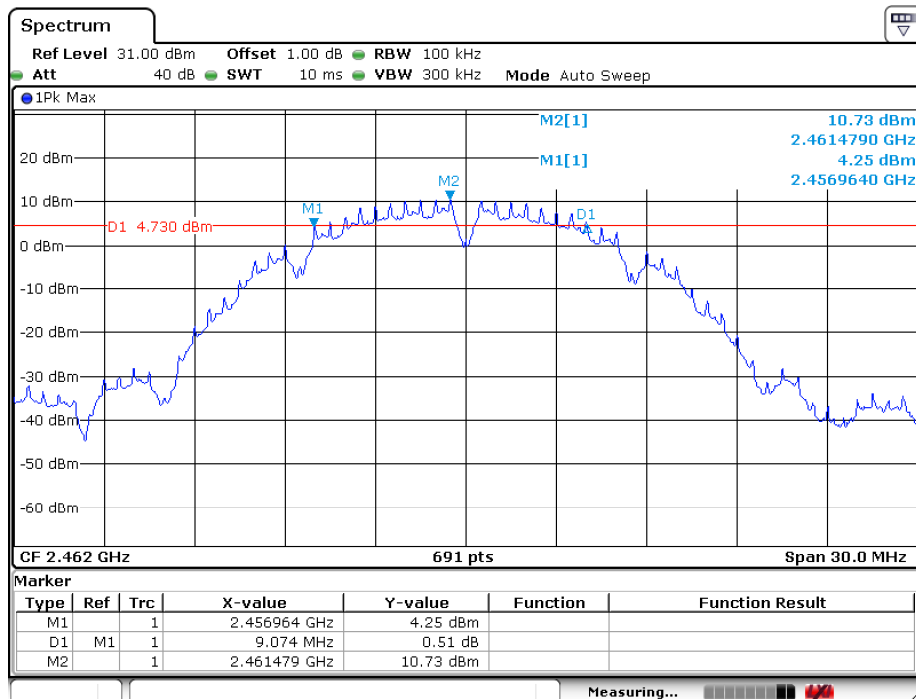


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### 4.5.2.1.3 802.11B\_Highest Channel



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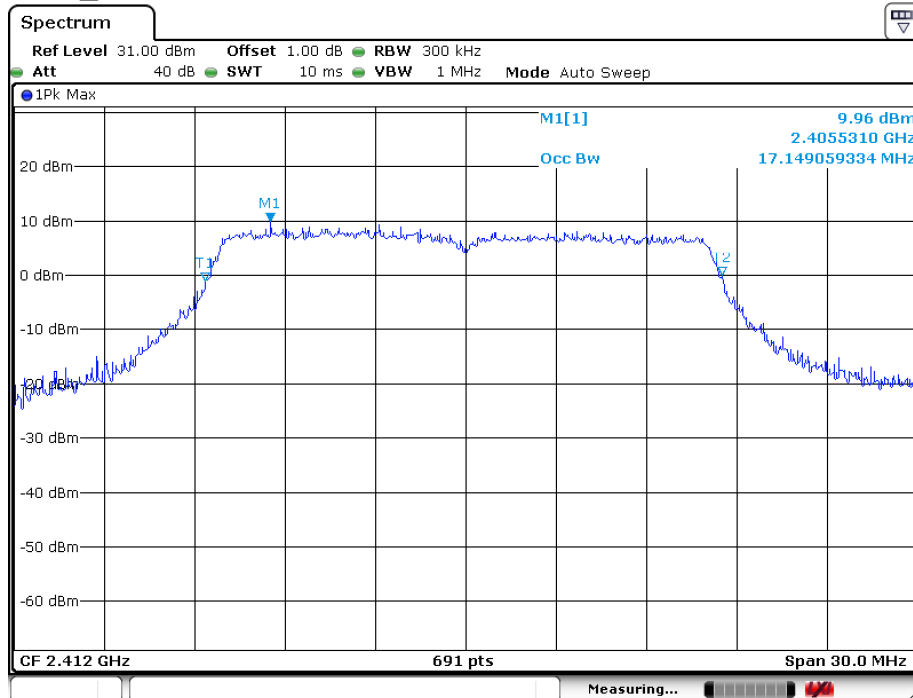


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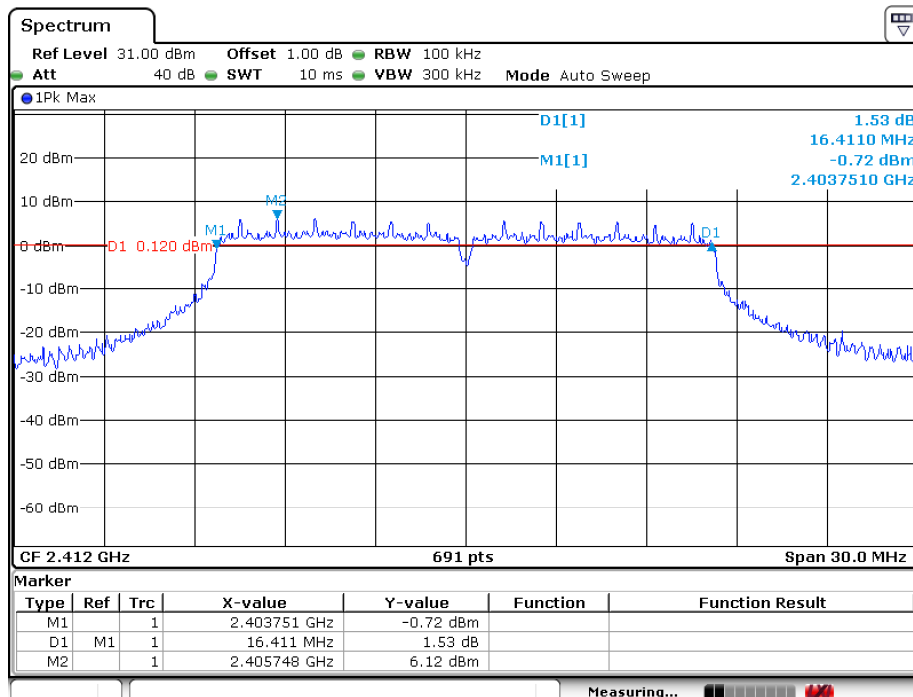
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### 4.5.2.1.4 802.11G\_Lowest Channel



Date: 8.NOV.2020 14:45:21



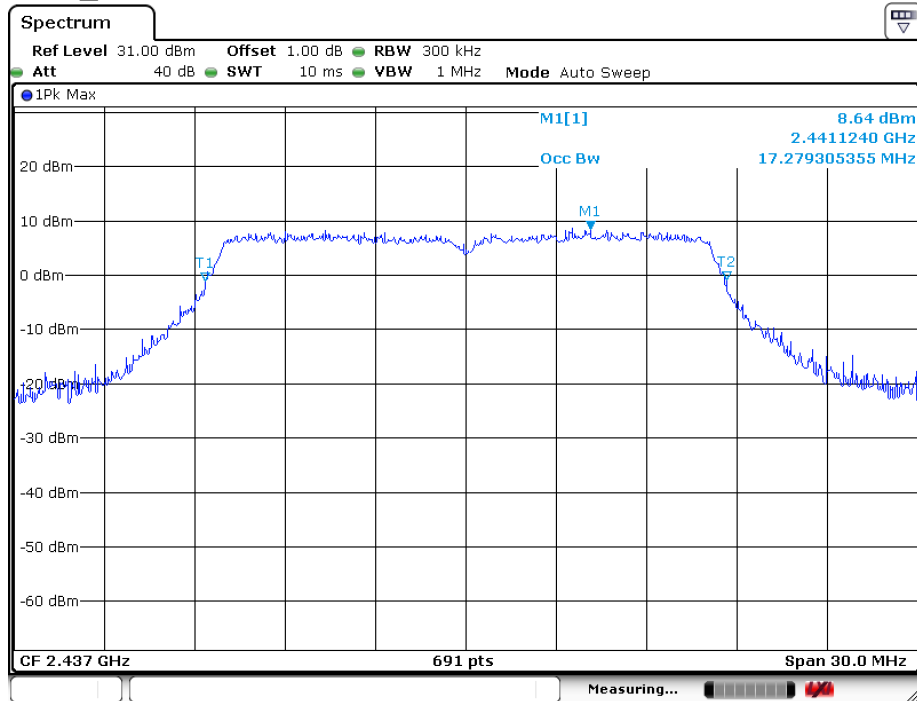
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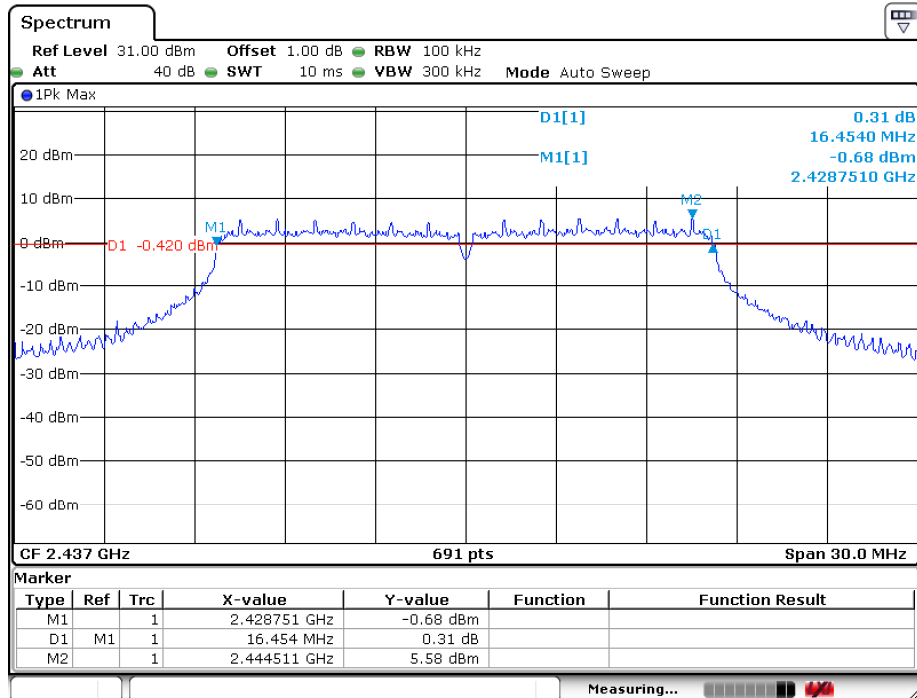
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### 4.5.2.1.5 802.11G\_Middle Channel



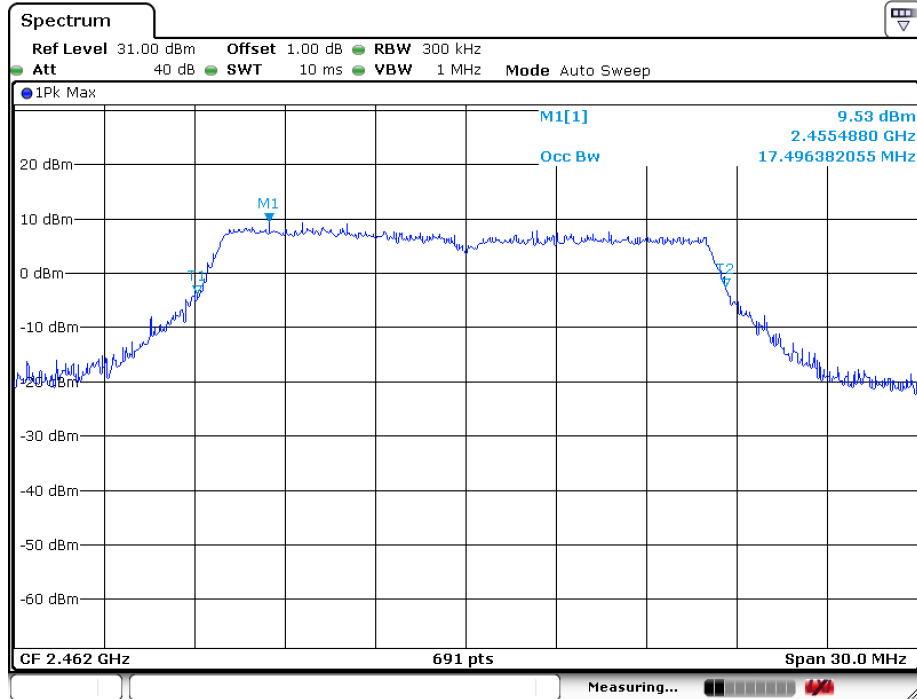
Date: 8.NOV.2020 14:45:04



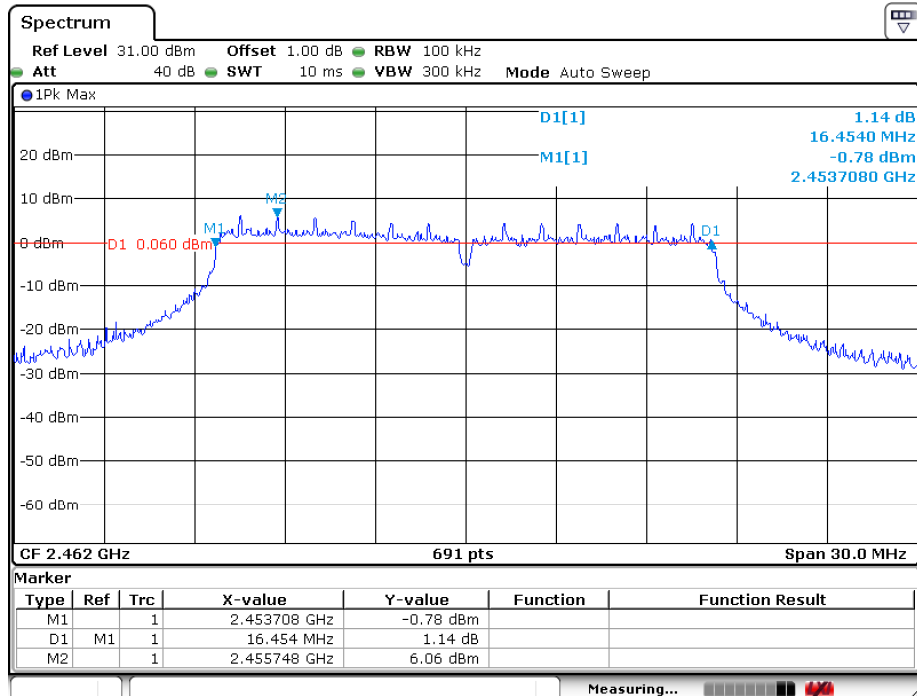
Date: 8.NOV.2020 14:29:19



### 4.5.2.1.6 802.11G\_Highest Channel



Date: 8.NOV.2020 14:44:43

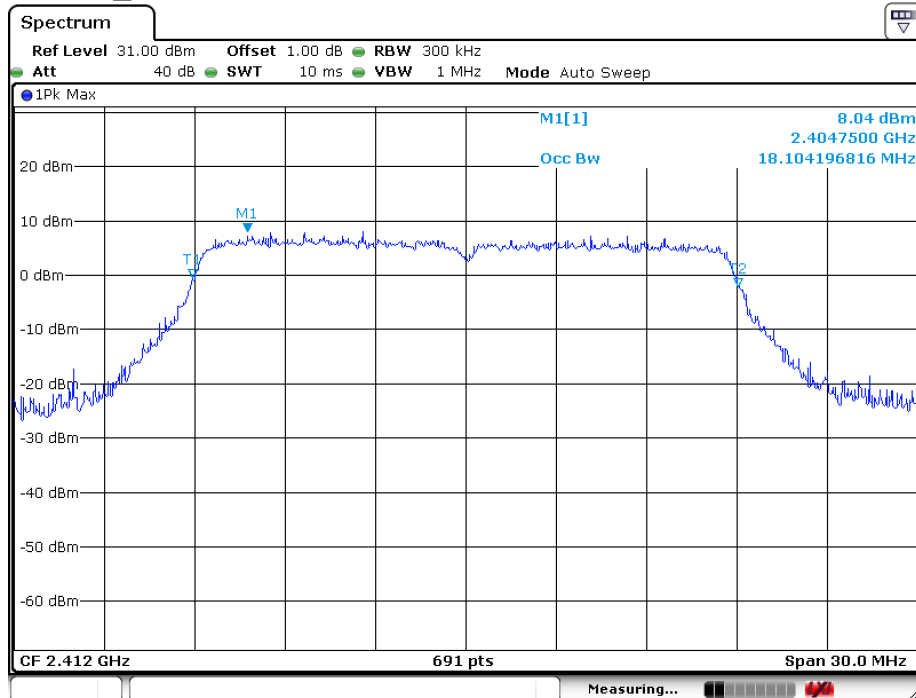


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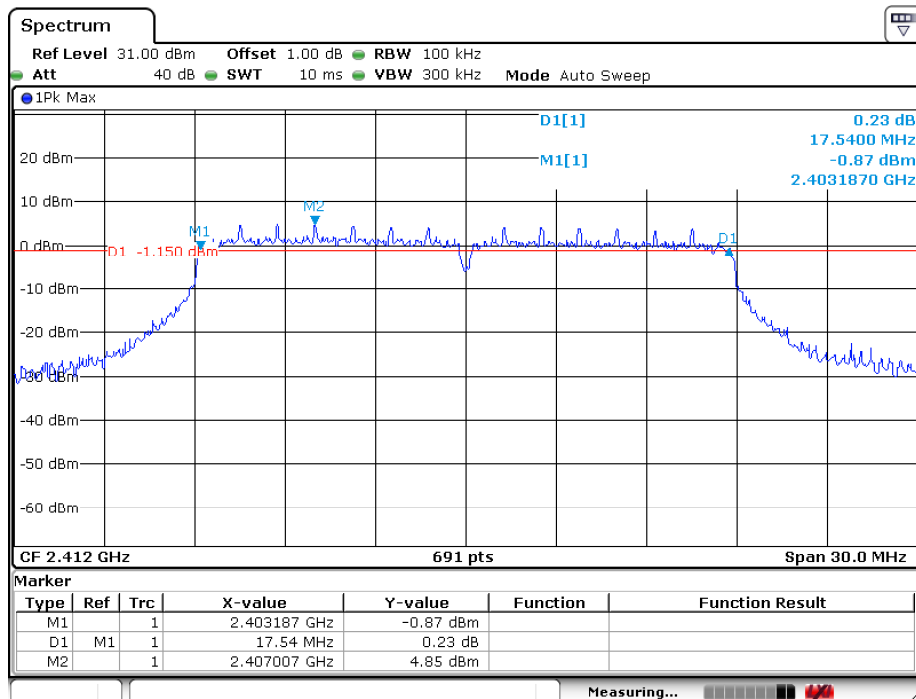


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### 4.5.2.1.7 802.11N20\_Lowest Channel



Date: 8.NOV.2020 14:42:55



Date: 8.NOV.2020 14:17:51



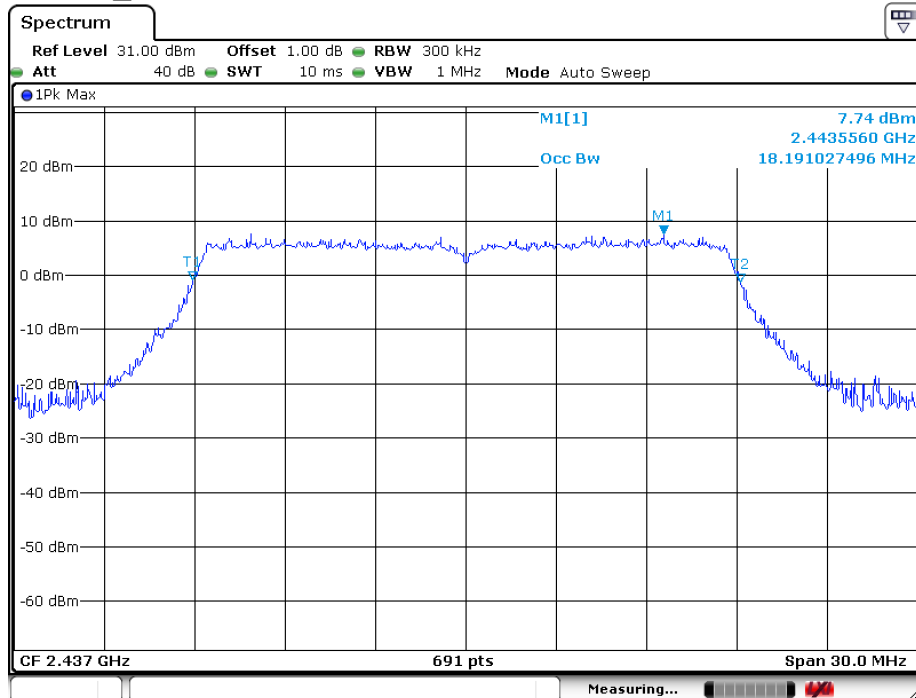
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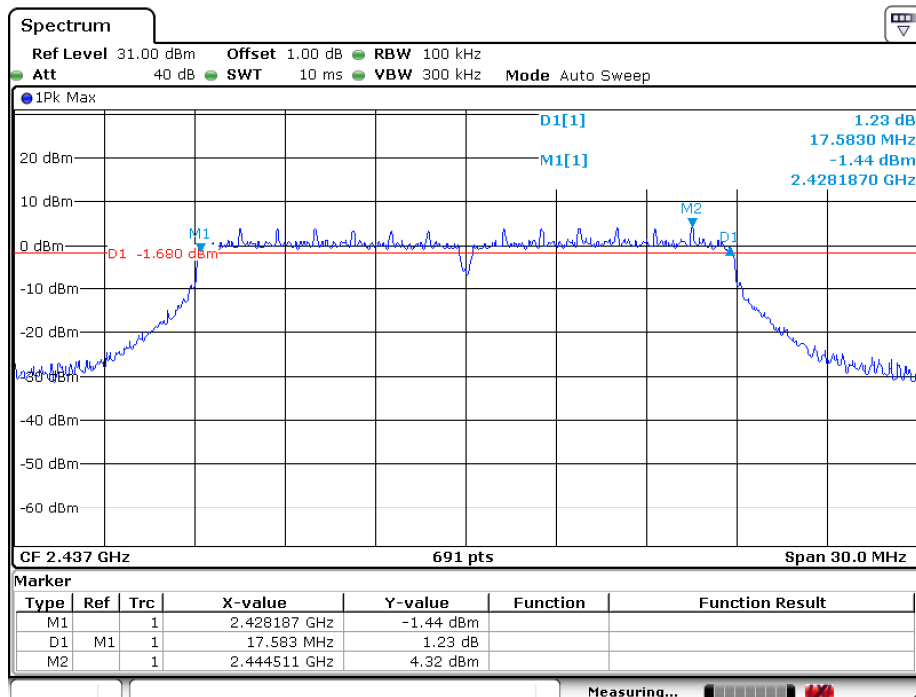
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### 4.5.2.1.8 802.11N20\_Middle Channel



Date: 8.NOV.2020 14:42:33

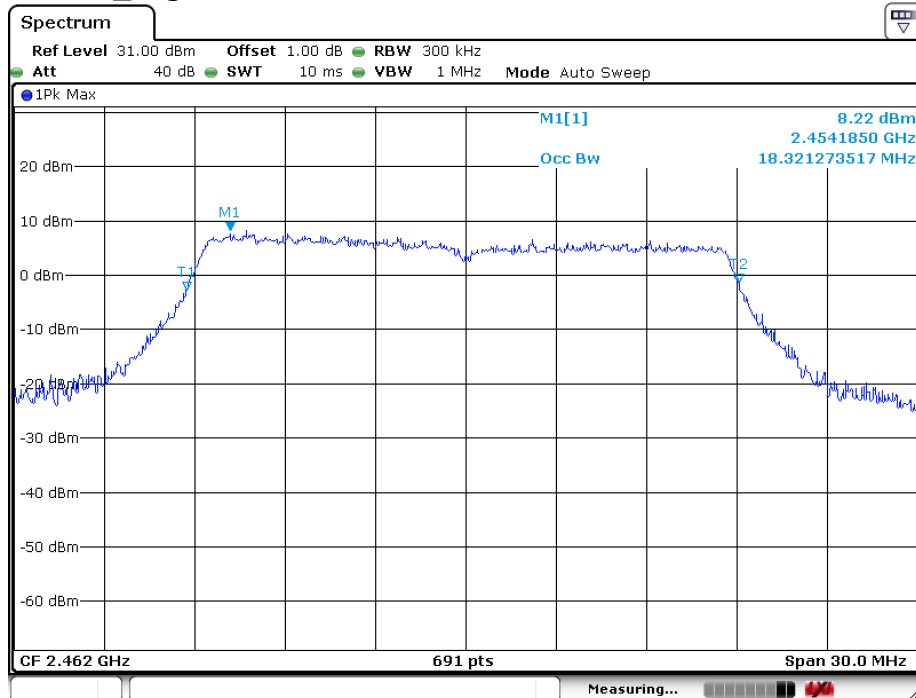


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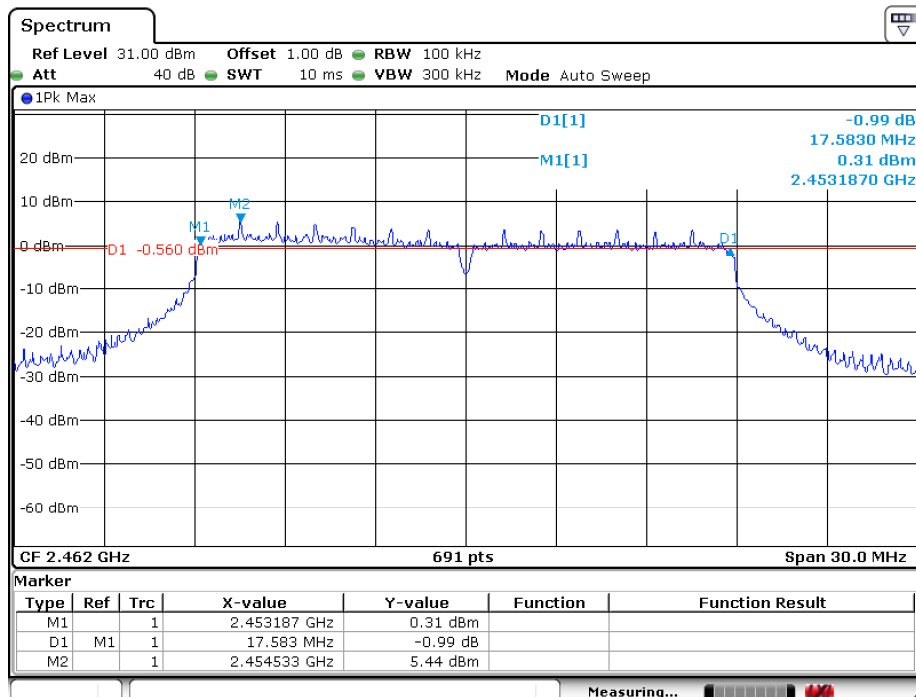


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### 4.5.2.1.9 802.11N20\_Highest Channel



Date: 8.NOV.2020 14:42:13



Date: 8.NOV.2020 14:20:27



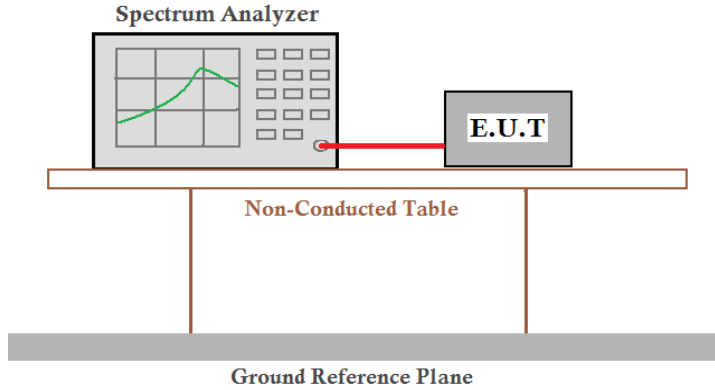
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## 4.6 Power Spectral Density

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);
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	-1.98	≤8.00	Pass
	Middle	-2.44	≤8.00	Pass
	Highest	-2.14	≤8.00	Pass
802.11G	Lowest	-7.02	≤8.00	Pass
	Middle	-5.99	≤8.00	Pass
	Highest	-6.47	≤8.00	Pass
802.11N20	Lowest	-8.04	≤8.00	Pass
	Middle	-8.66	≤8.00	Pass
	Highest	-9.00	≤8.00	Pass

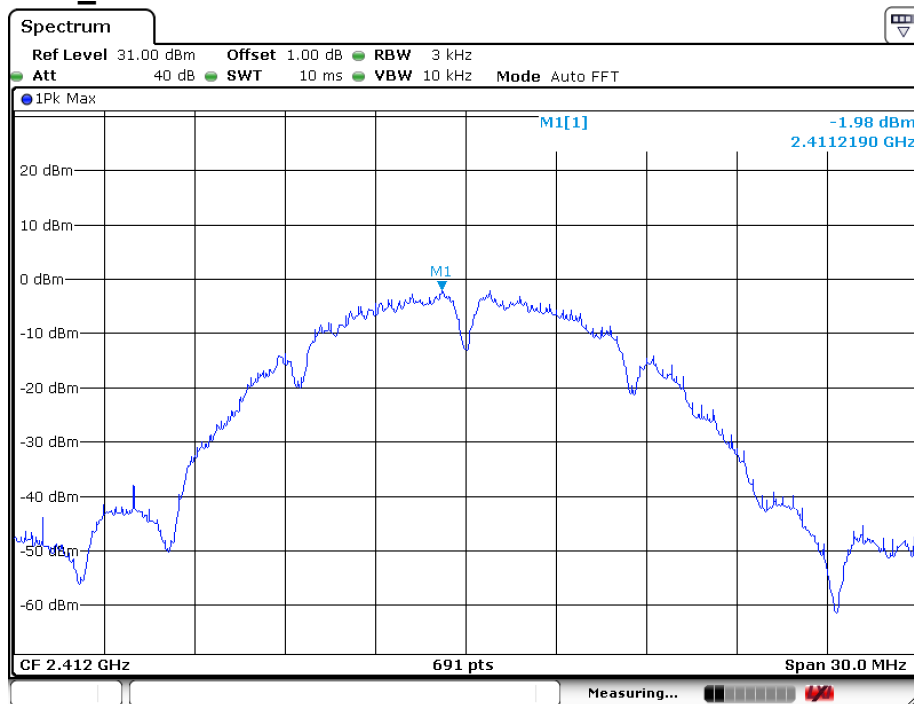


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### 4.6.2 Test Plots

#### 4.6.2.1 ANT1

##### 4.6.2.1.1 802.11B\_Lowest Channel



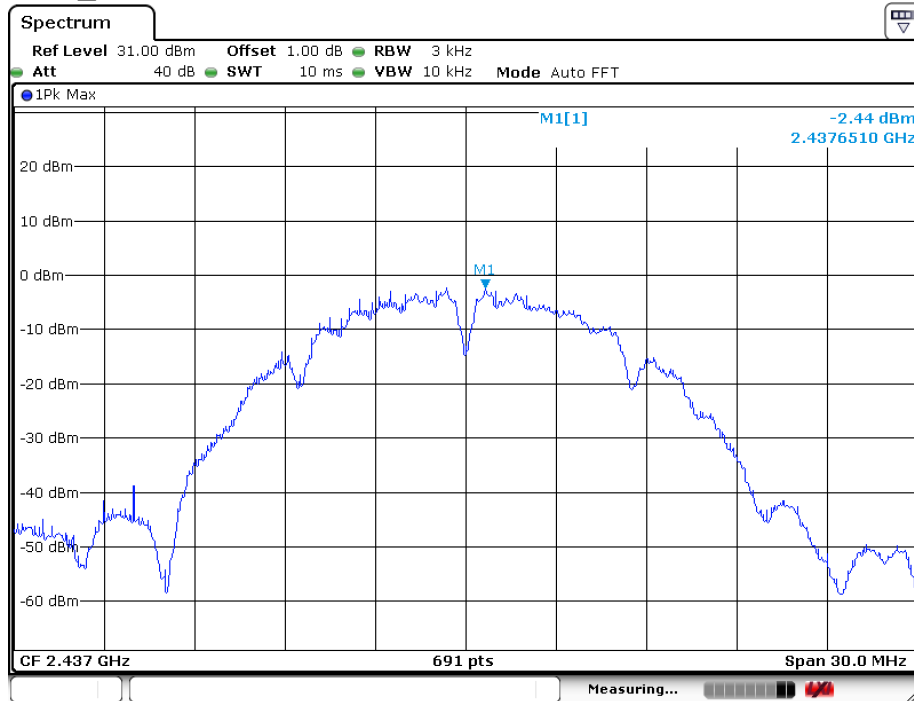
Date: 8.NOV.2020 14:47:30



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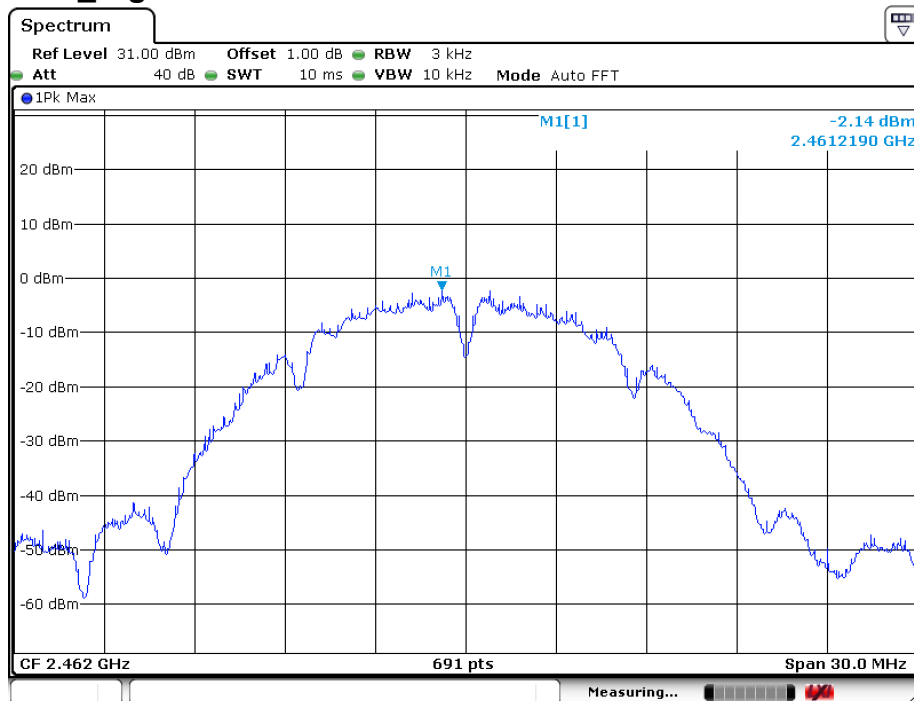
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### 4.6.2.1.2 802.11B\_Middle Channel



Date: 8.NOV.2020 14:47:08

### 4.6.2.1.3 802.11B\_Highest Channel

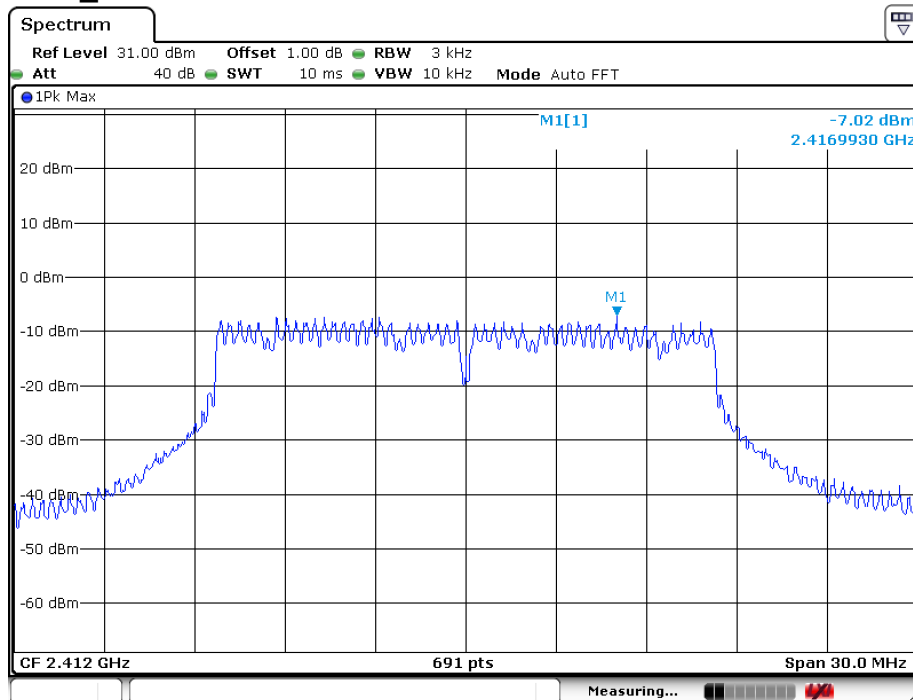


Date: 8.NOV.2020 14:46:45



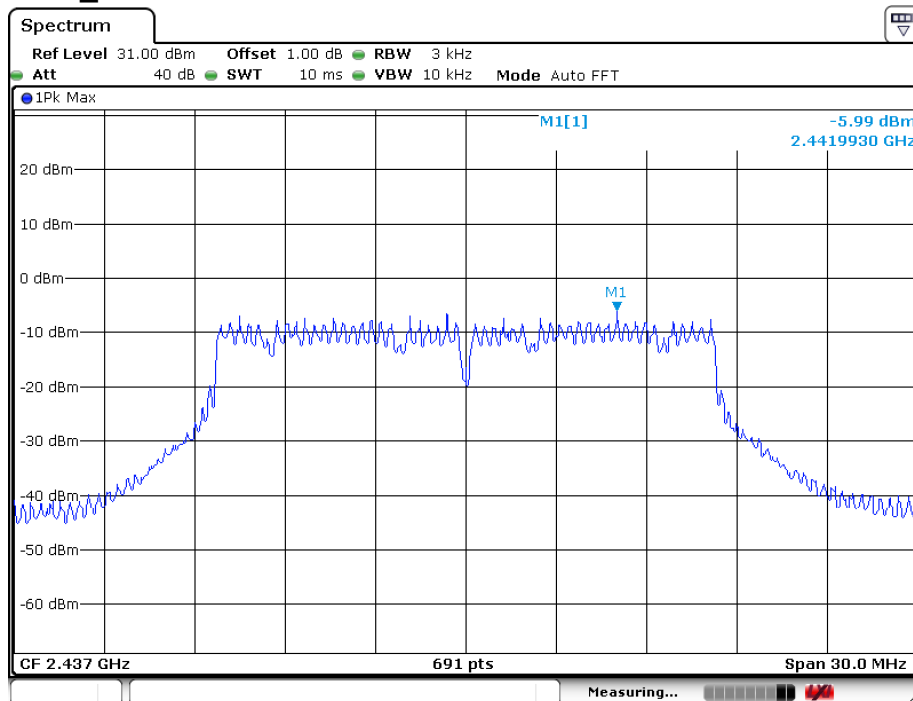
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### 4.6.2.1.4 802.11G\_Lowest Channel



Date: 8.NOV.2020 14:45:38

### 4.6.2.1.5 802.11G\_Middle Channel



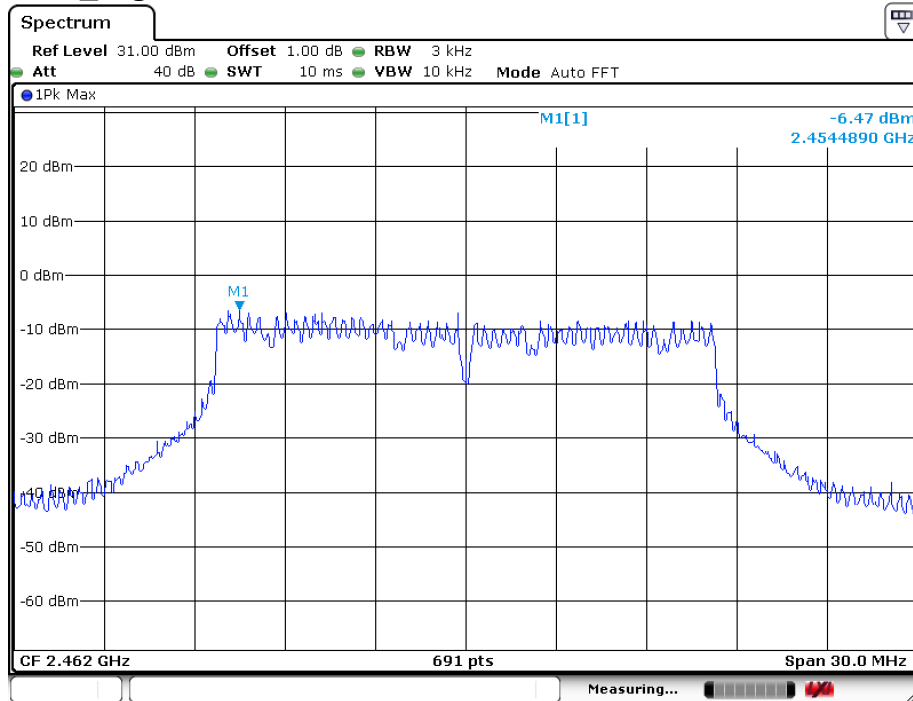
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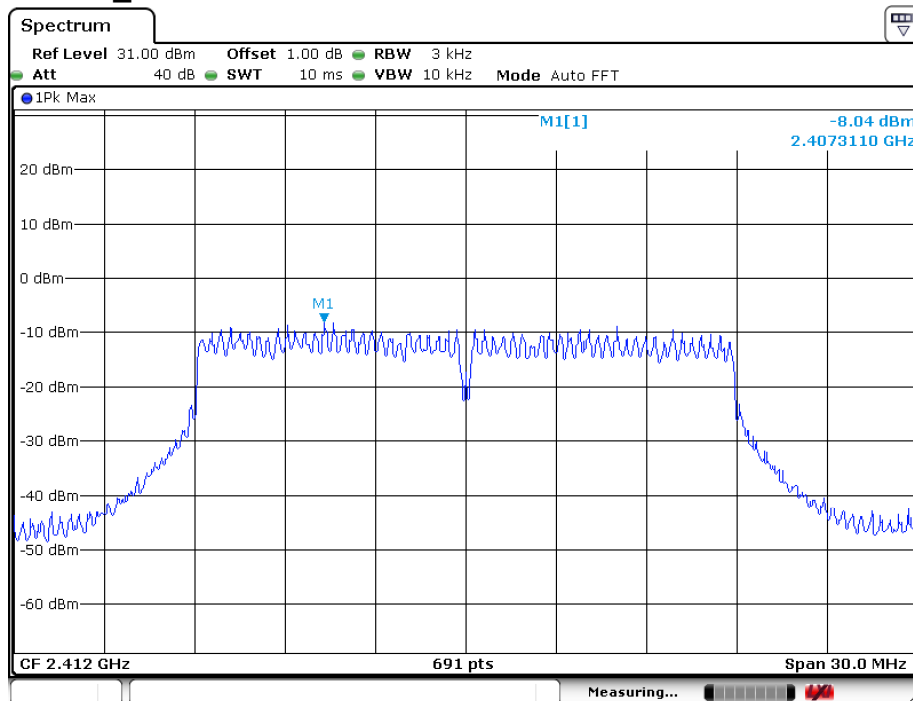
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### 4.6.2.1.6 802.11G\_Highest Channel



Date: 8.NOV.2020 14:46:26

### 4.6.2.1.7 802.11N20\_Lowest Channel



Date: 8.NOV.2020 14:48:49



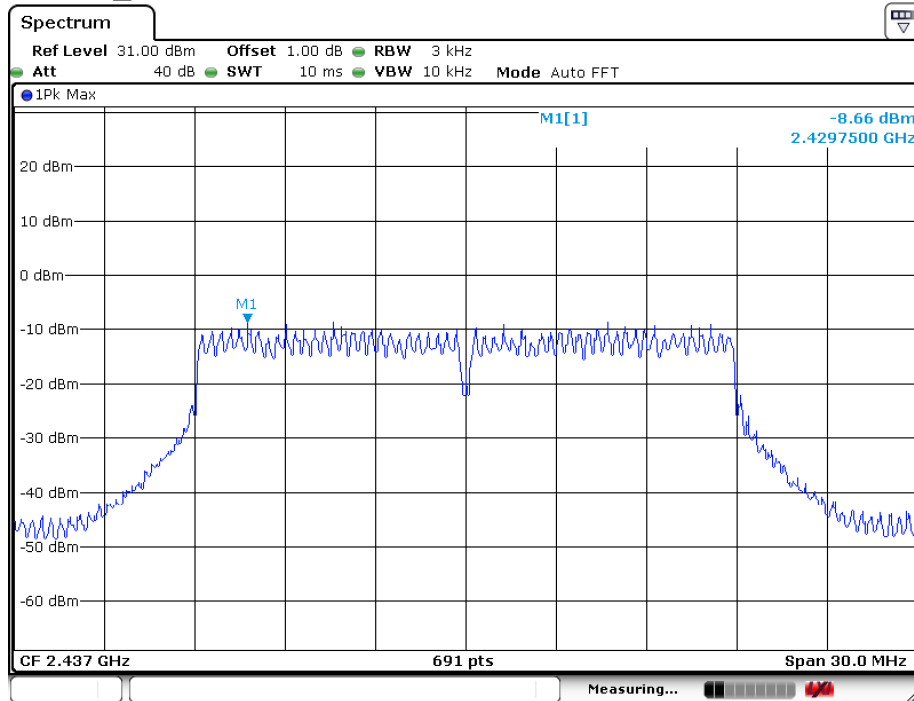
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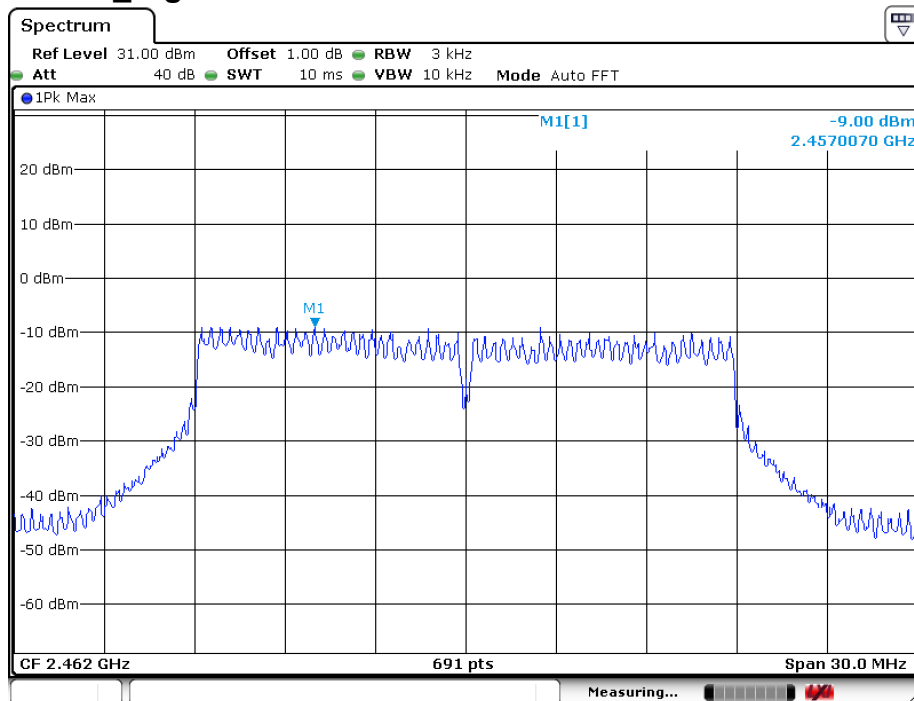


### 4.6.2.1.8 802.11N20\_Middle Channel



Date: 8.NOV.2020 14:48:31

### 4.6.2.1.9 802.11N20\_Highest Channel



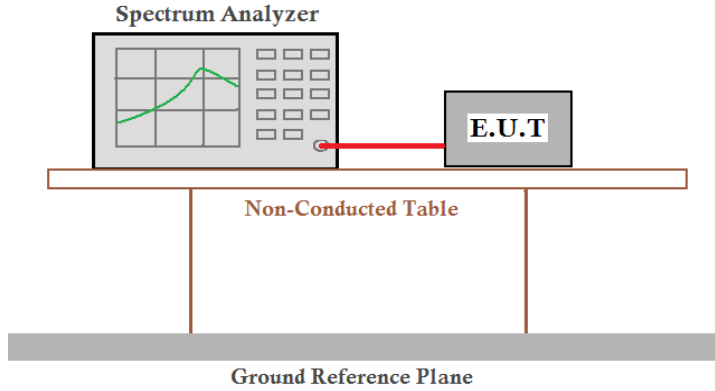
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### 4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
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:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass

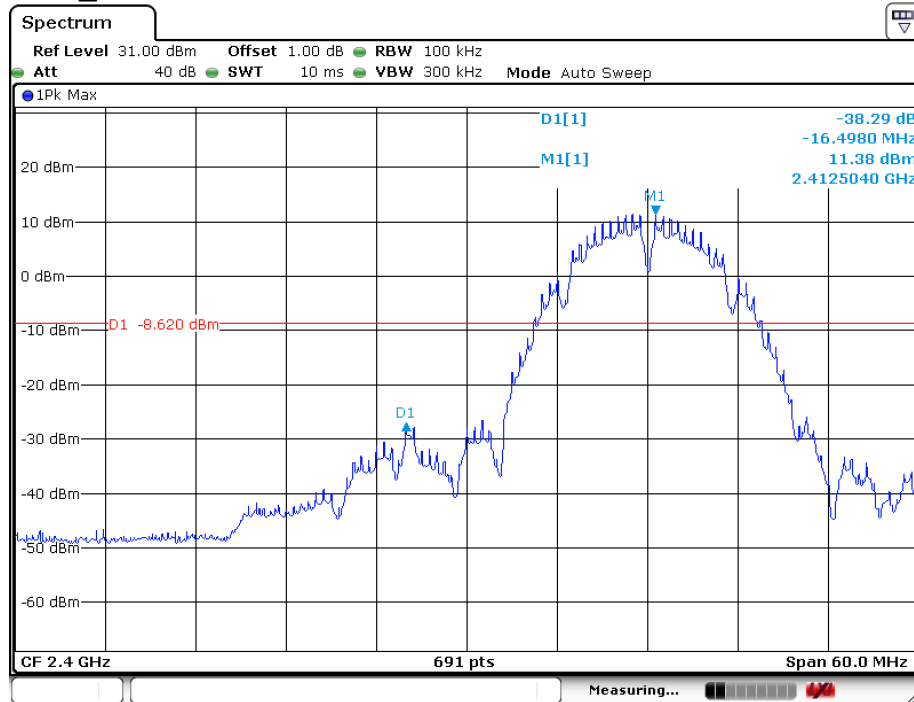


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### 4.7.1 Test Plots

#### 4.7.1.1 ANT1

##### 4.7.1.1.1 802.11B\_Lowest Channel



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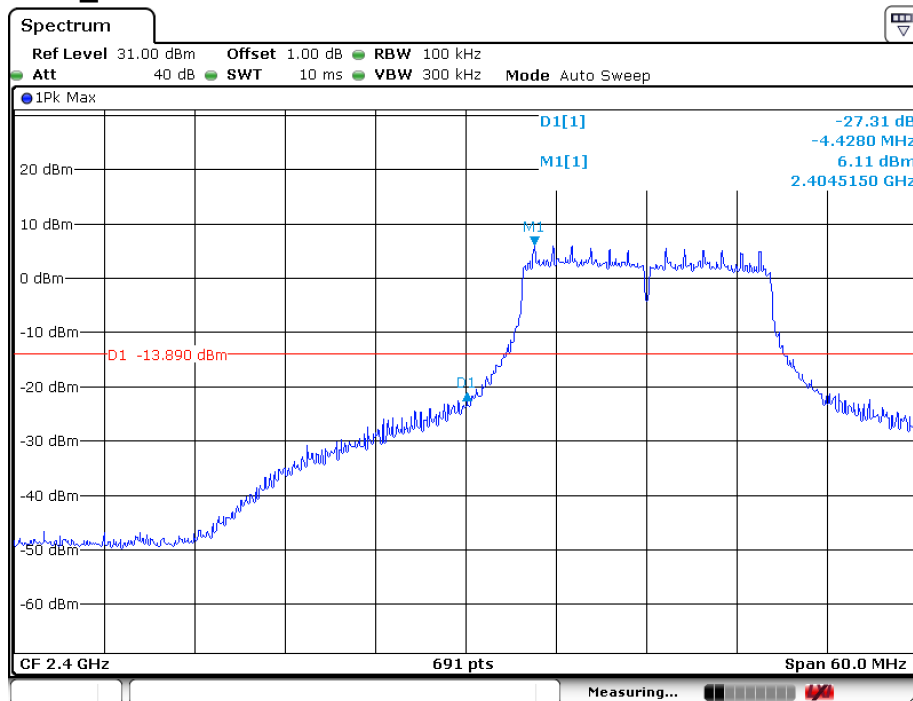
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### 4.7.1.1.2 802.11B\_Highest Channel



Date: 8.NOV.2020 14:32:24

### 4.7.1.1.3 802.11G\_Lowest Channel



Date: 8.NOV.2020 14:34:24



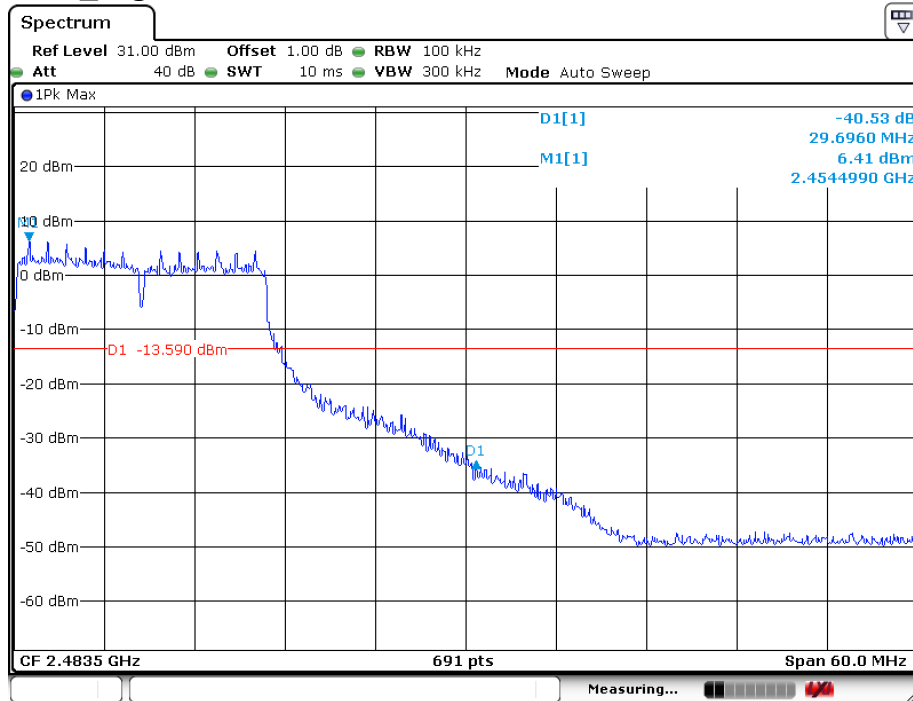
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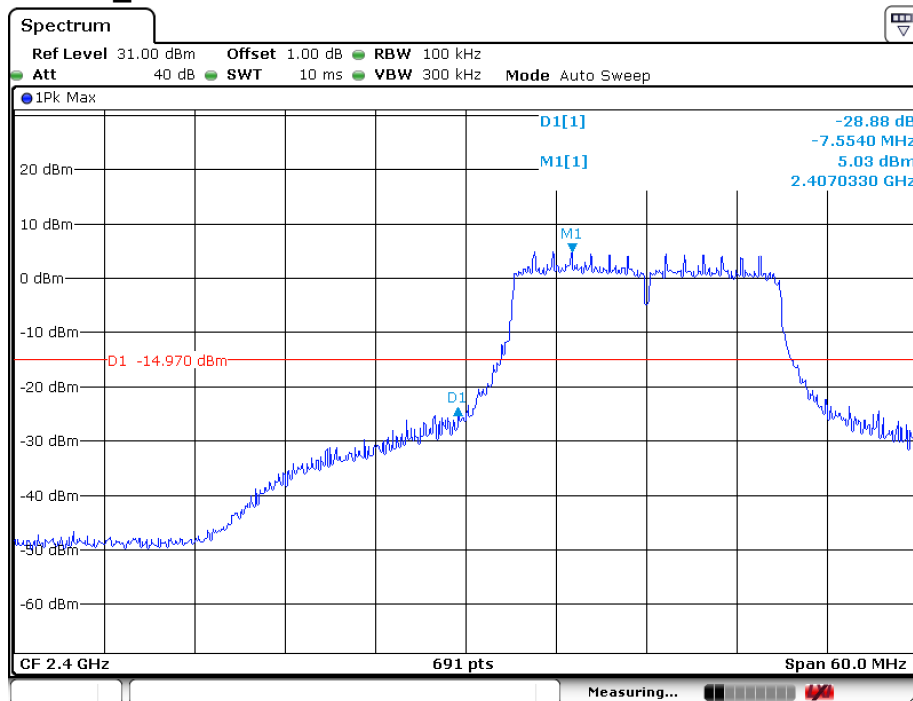
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### 4.7.1.1.4 802.11G\_Highest Channel



Date: 8.NOV.2020 14:34:57

### 4.7.1.1.5 802.11N20\_Lowest Channel



Date: 8.NOV.2020 14:40:42



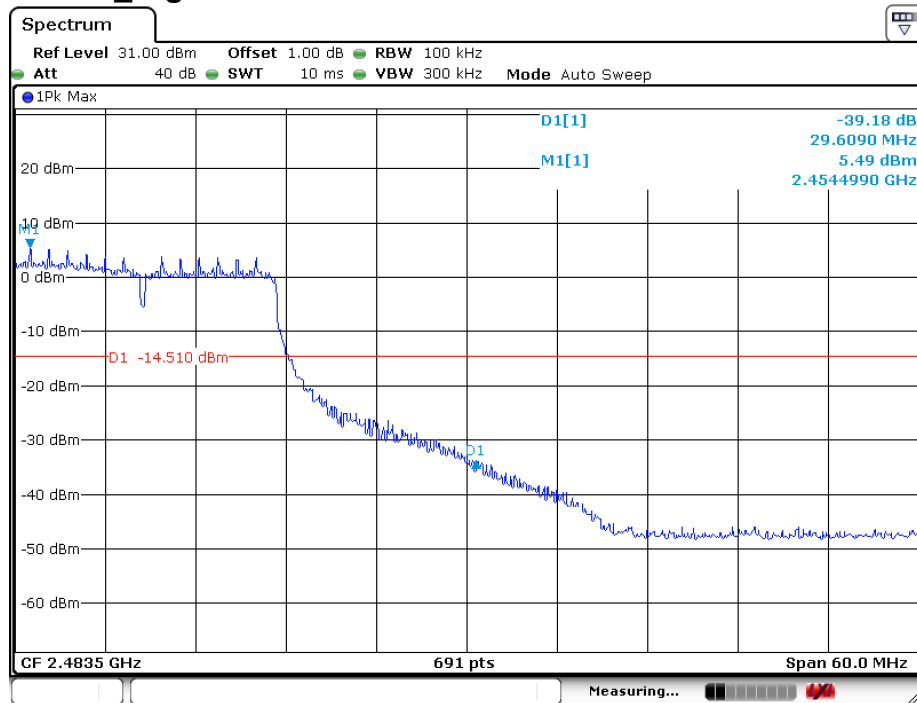
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### 4.7.1.1.6 802.11N20\_Highest Channel



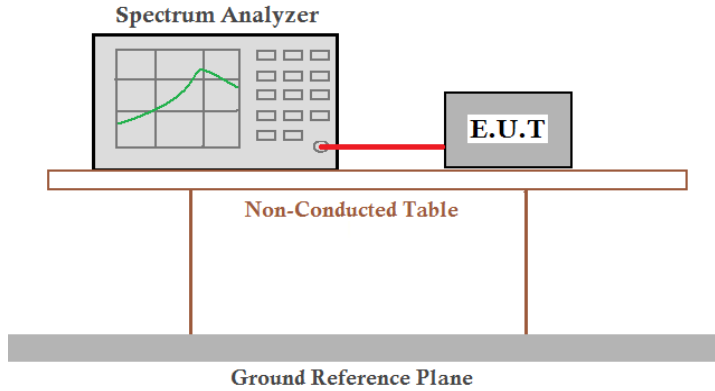
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## 4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
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);
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass

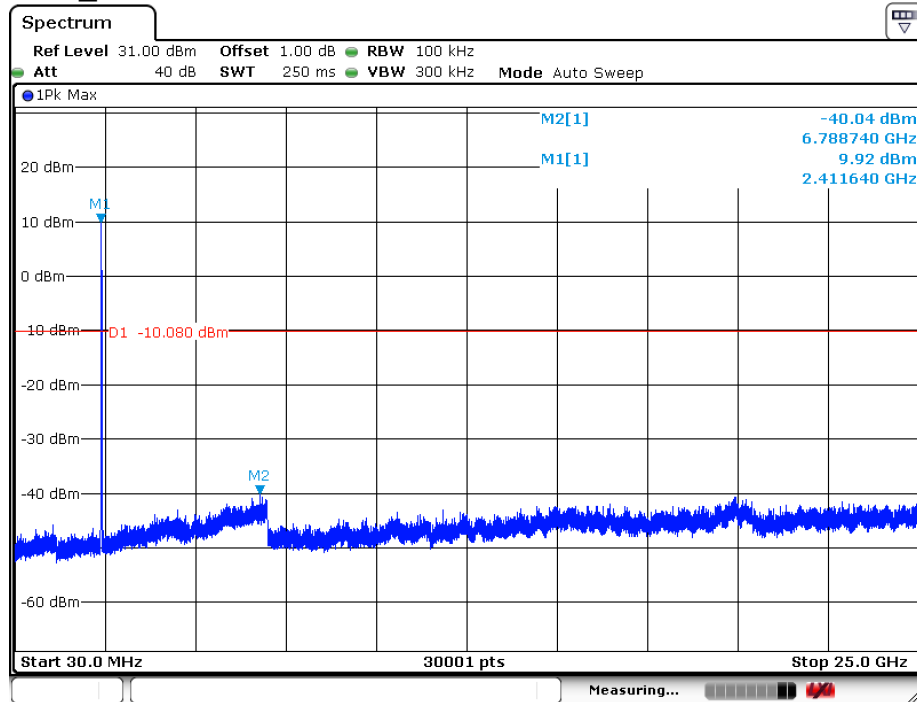


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### 4.8.1 Test Plots

#### 4.8.1.1 ANT1

##### 4.8.1.1.1 802.11B\_Lowest Channel



Date: 8.NOV.2020 14:53:43

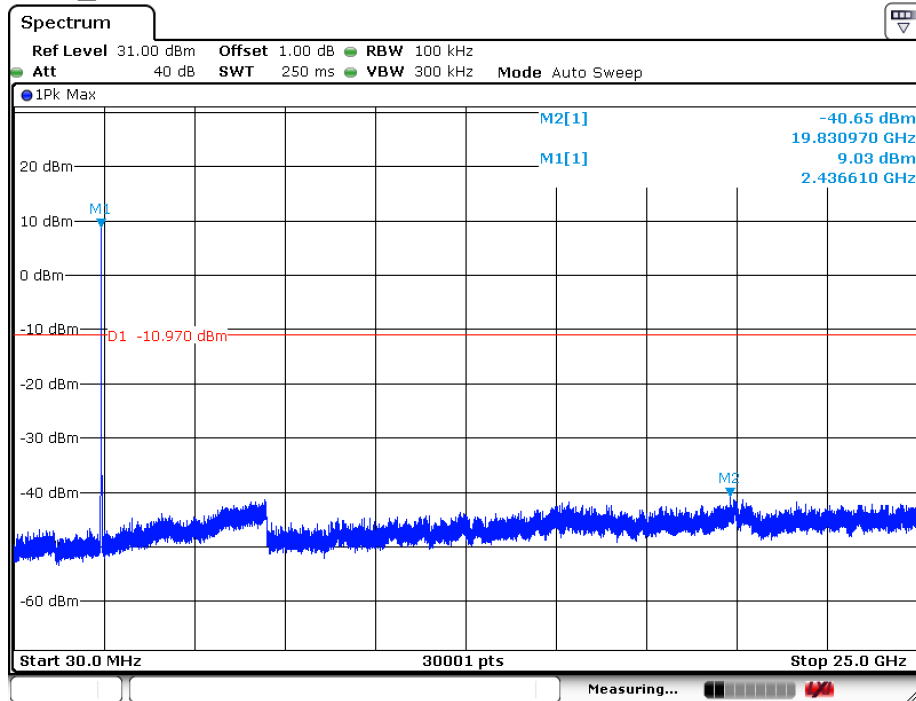


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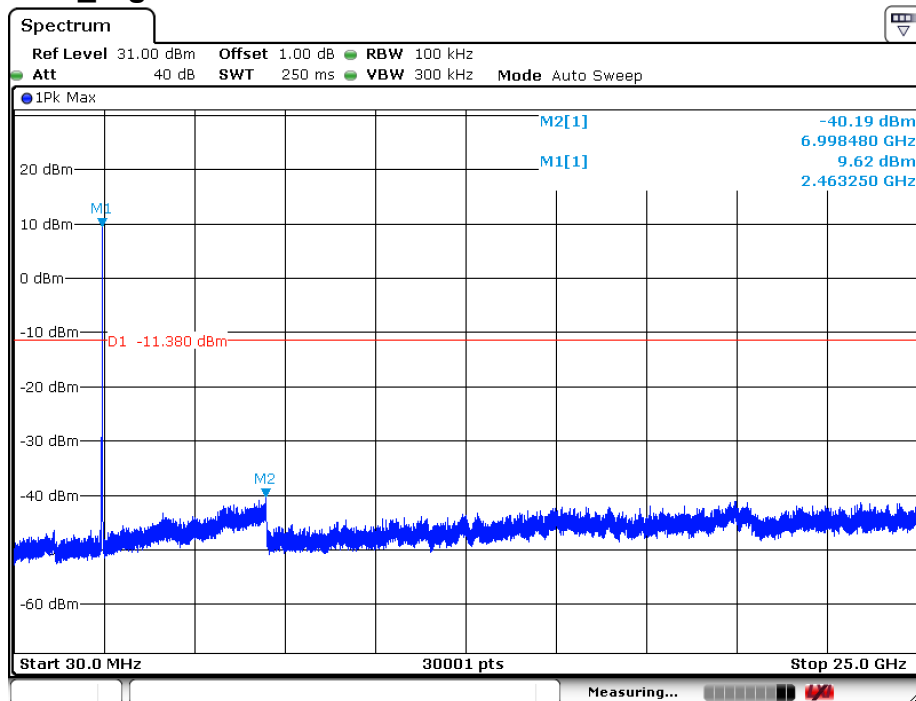
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### 4.8.1.1.2 802.11B\_Middle Channel



Date: 8.NOV.2020 14:52:38

### 4.8.1.1.3 802.11B\_Highest Channel



Date: 8.NOV.2020 14:51:56

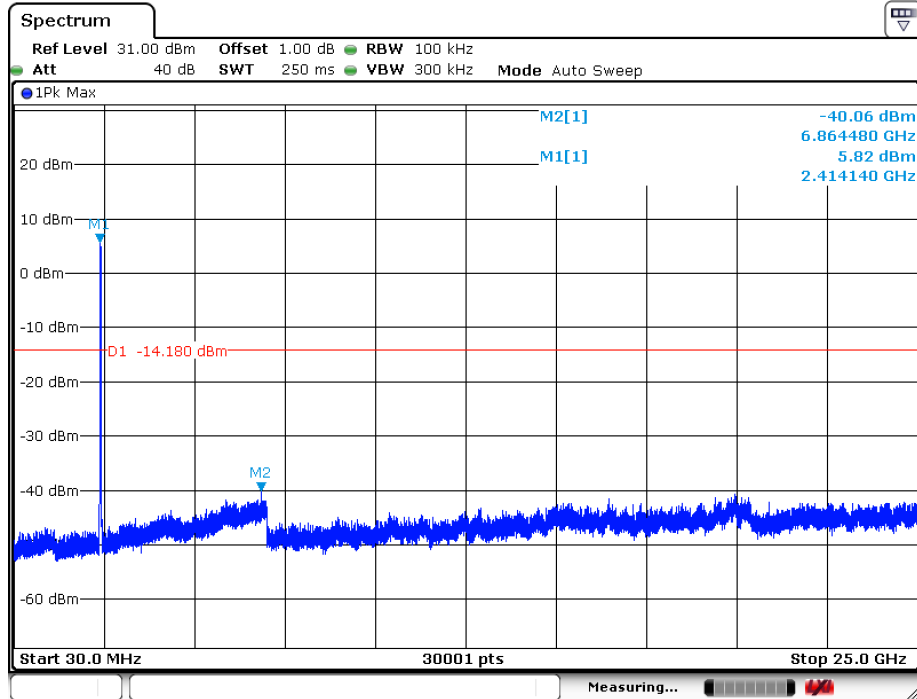


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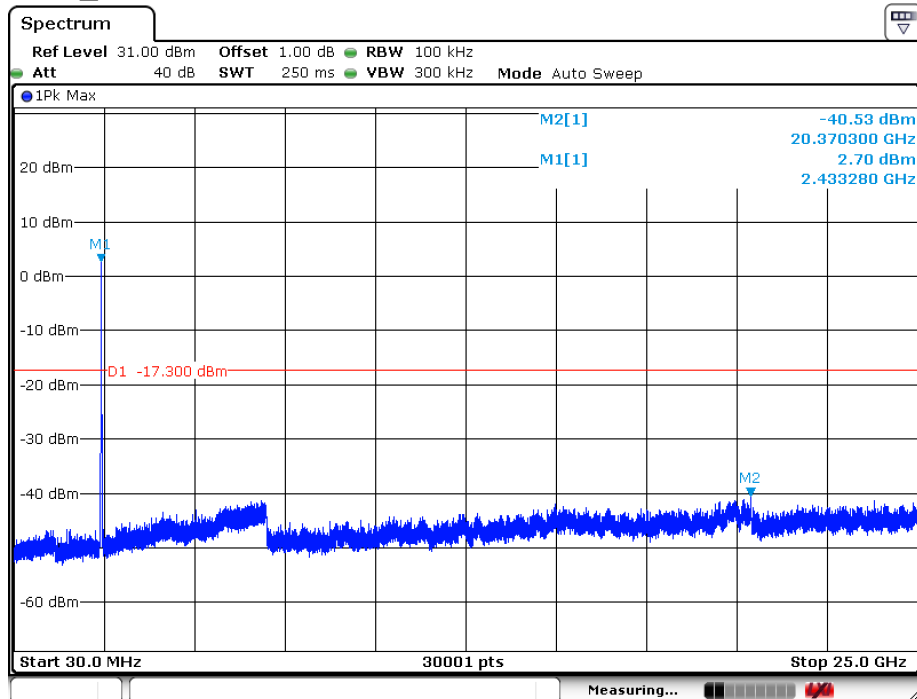
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### 4.8.1.1.4 802.11G\_Lowest Channel



Date: 8.NOV.2020 14:54:27

### 4.8.1.1.5 802.11G\_Middle Channel



Date: 8.NOV.2020 14:55:12



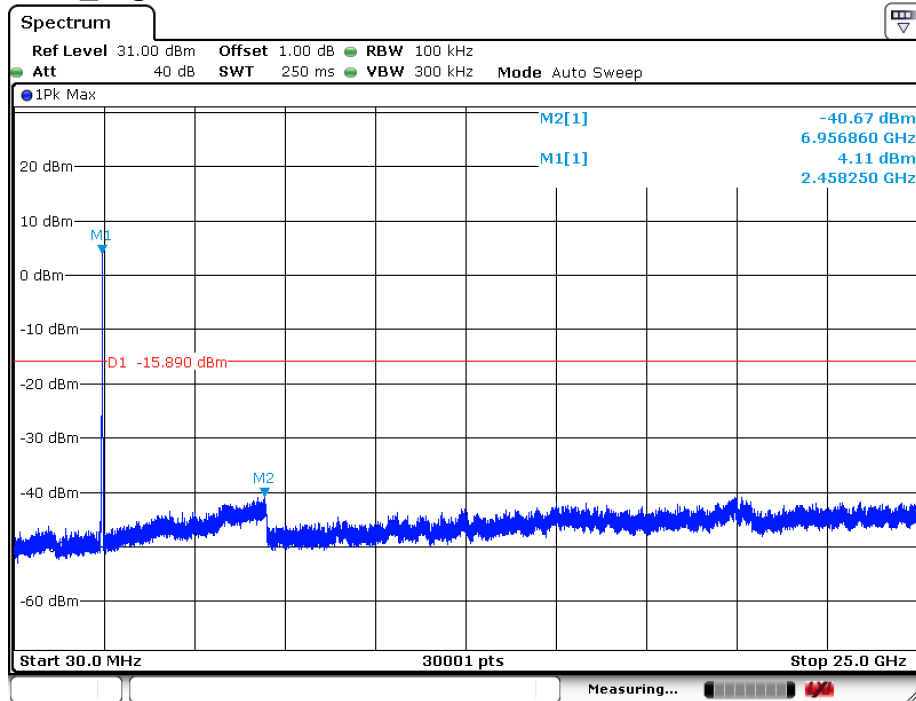
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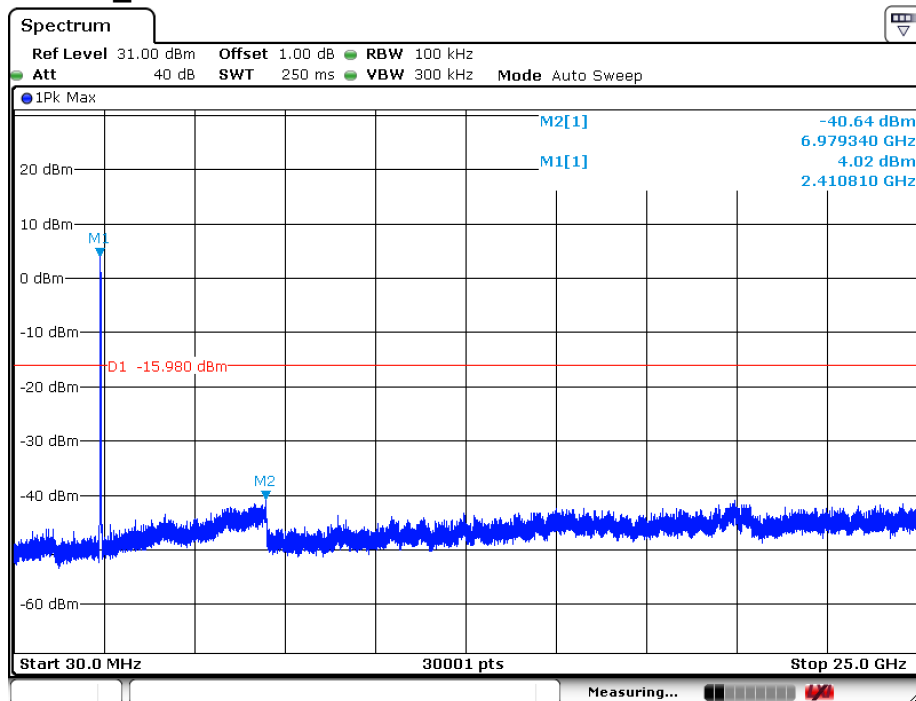
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### 4.8.1.1.6 802.11G\_Highest Channel



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### 4.8.1.1.7 802.11N20\_Lowest Channel



Date: 8.NOV.2020 14:49:49



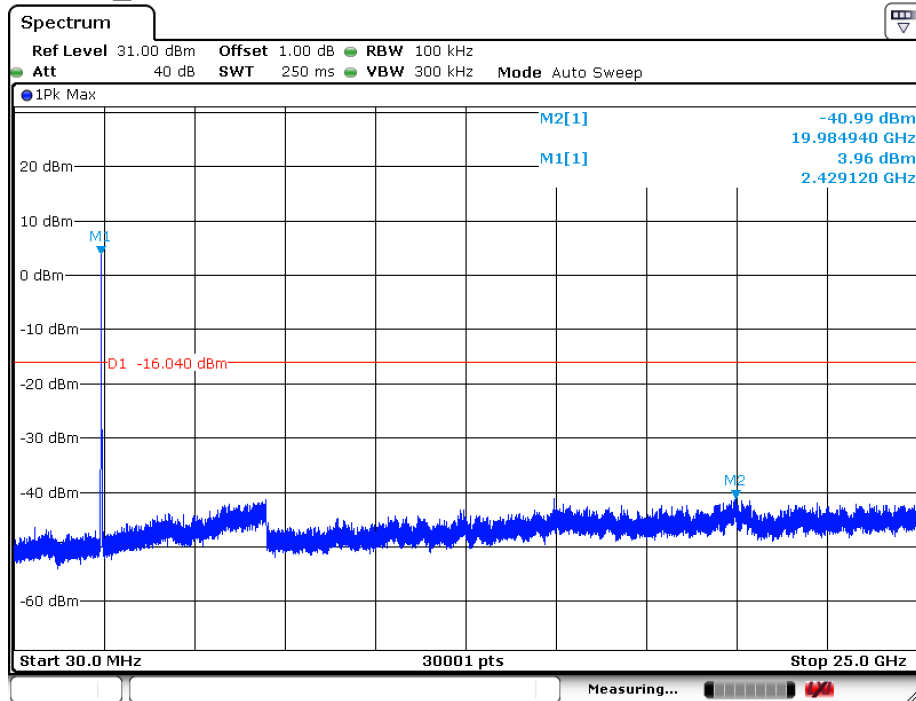
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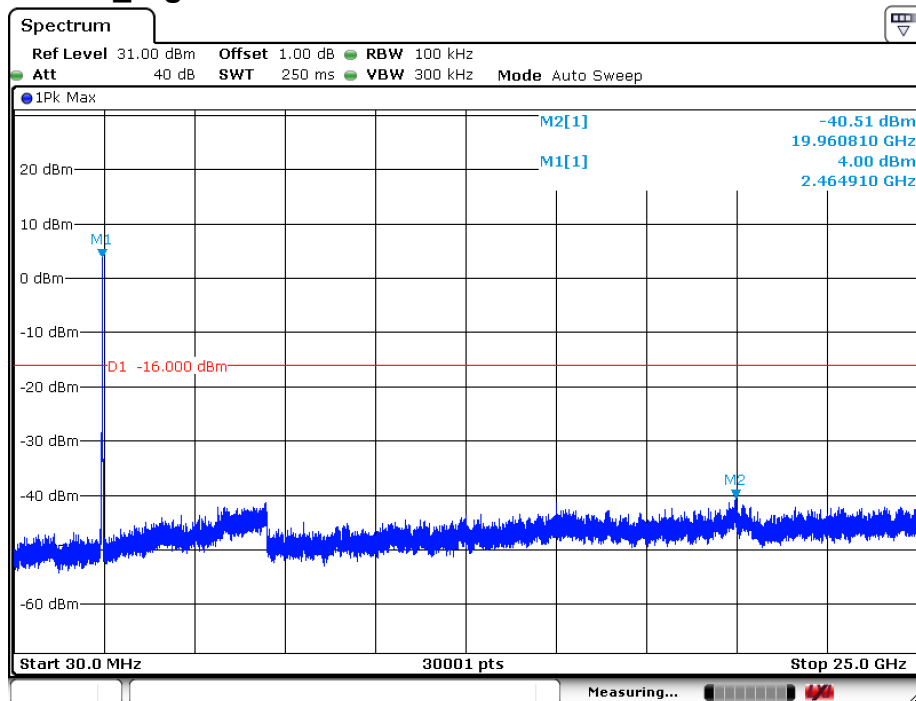
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### 4.8.1.1.8 802.11N20\_Middle Channel



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### 4.8.1.1.9 802.11N20\_Highest Channel



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#### 4.9 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 or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100kHz	30kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				



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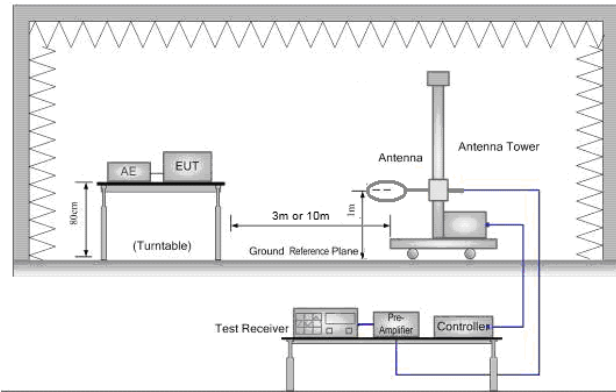


Figure 1. Below 30MHz

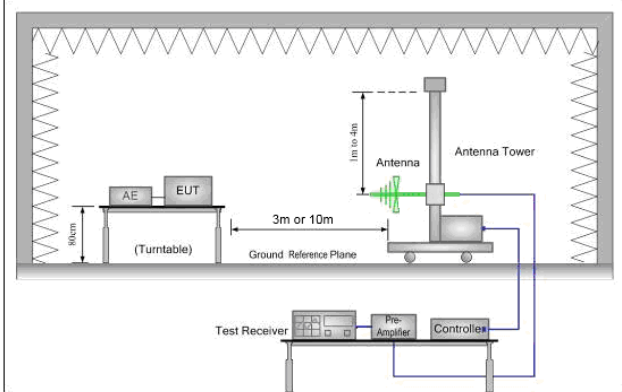


Figure 2. 30MHz to 1GHz

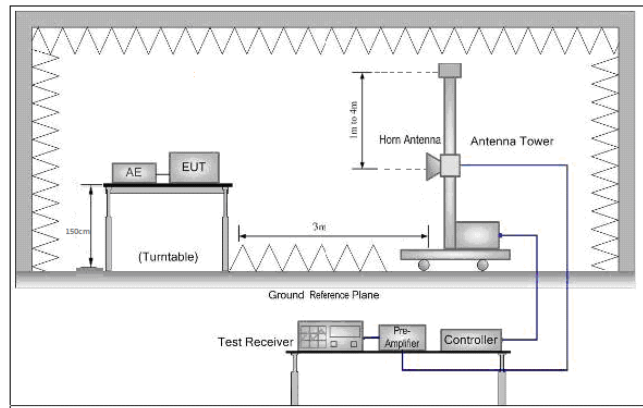


Figure 3. Above 1 GHz

### Test Procedure:

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation
- 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.
- 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.
- Use the following spectrum analyzer settings:
  - Span shall wide enough to fully capture the emission being measured;
  - Set RBW=100 kHz for  $f < 1$  GHz, RBW=1MHz for  $f > 1$ GHz ;  
VBW  $\geq$  RBW; Sweep = auto;  
Detector function = peak; Trace = max hold for peak
  - For average measurement: use duty cycle correction factor method per 15.35(c).





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	<p>Duty cycle = On time/100 milliseconds</p> <p>On time = <math>N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n</math></p> <p>Where <math>N_1</math> is number of type 1 pulses, <math>L_1</math> is length of type 1 pulses, etc.</p> <p>Average Emission Level = Peak Emission Level + <math>20 * \log(\text{Duty cycle})</math></p> <p>f. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>h. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p> <p>i. Test the EUT in the lowest channel, the middle channel, the Highest channel.</p> <p>j. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.</p> <p>k. Repeat above procedures until all frequencies measured was complete.</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	<p>Pretest the EUT at Charge + Transmitting mode.</p> <p>Through Pre-scan, find the</p> <p>1Mbps of rate is the worst case of 802.11B;</p> <p>6Mbps of rate is the worst case of 802.11G;</p> <p>6.5Mbps of rate is the worst case of 802.11N(HT20);</p> <p>For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. 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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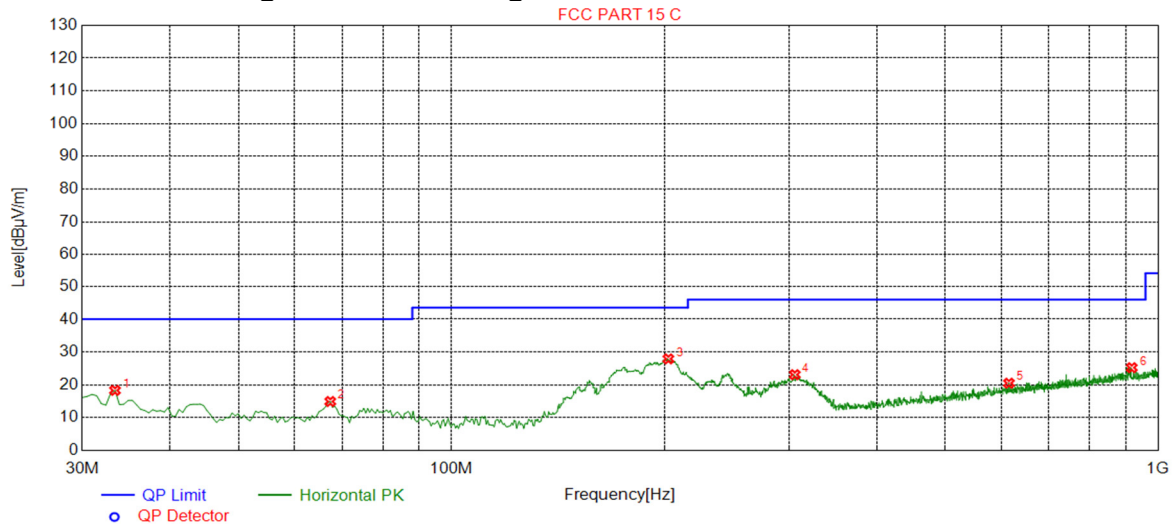
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## Firstly Supply:

### 4.9.1 Radiated emission below 1GHz

#### 4.9.1.1 Charge + Transmitting



#### Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Polarity
1	33.3967	18.33	-32.79	40.00	21.67	150	Horizontal
2	67.3637	14.94	-33.51	40.00	25.06	150	Horizontal
3	202.7464	27.93	-30.76	43.50	15.57	150	Horizontal
4	306.1031	23.12	-27.68	46.00	22.88	150	Horizontal
5	615.2026	20.52	-19.87	46.00	25.48	150	Horizontal
6	917.9940	25.25	-14.96	46.00	20.75	150	Horizontal

#### Final Data List



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