



FCC TEST REPORT

Application No: AR/2020/A0003
Applicant: Xiaomi Communications Co., Ltd.
Address of Applicant: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer: Xiaomi Communications Co., Ltd.
Address of Manufacturer: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
EUT Description: Mobile Phone
Model No.: M2007J22R
Trade Mark: Redmi
FCC ID: 2AFZZJ22G
Standards: 47 CFR FCC Part 2, Subpart J
47 CFR Part 15, Subpart C
Test Method: KDB558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10 (2013)
Date of Receipt: 2020/9/11
Date of Test: 2020/9/11 to 2020/9/24(for original report AR/2020/8000503-01)
2020/10/28 to 2020/11/6 (for new report AR/2020/A000303-01)
Date of Issue: 2021/4/20

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
01		2020/11/6		Original
02		2021/4/20		1.Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

Authorized for issue by:		
Prepared By		 _____ (Stephen liang) / Engineer
Checked By		 _____ (David Chen) /Reviewer



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 4.2	PASS	B
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013	Clause 4.3	PASS	A
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10 2013	Clause 4.4	PASS	A
Power Spectral Density	15.247 (e)	ANSI C63.10 2013	Clause 4.5	PASS	A
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.6	PASS	A
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.7	PASS	A
Radiated Spurious Emissions	15.205/15.209	ANSI C63.10 2013	Clause 4.8	PASS	B
Restricted bands around fundamental frequency (Radiated Emission)	15.205/15.209	ANSI C63.10 2013	Clause 4.9	PASS	B

Remark:

This test report (Report No.: AR/2020/A000303-01) is base on the original test report (Report No.: AR/2020/8000503-01) .

Review this report and original report, this report just changing the parts according to the declaration letter from client.

Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.

Therefore in this report only radiated spurious emissions were performed based on the worst case of the original report with report number AR/2020/8000503-01 and other test data in this report are base on the previous report with report number AR/2020/8000503-01.

All test were performed by Lab A and B.

Parts of test items above were subcontracted to Lab 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 Client Information

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

3.2 Test Location

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, Mike Hu

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:	Ben Huang, Leah Chen



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3.3 Test Facility

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

Lab A:

• A2LA (Certificate No. 3816.01)

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

• VCCI

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

• FCC –Designation Number: CN1178

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

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

• Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.

Lab B:

A2LA (Certificate No. 4854.01)

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

• FCC –Designation Number: CN1271



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3.4 General Description of EUT

EUT Description:	Mobile Phone
Model No.:	M2007J22R
Trade Mark:	Redmi
Hardware Version:	P2
Software Version:	MIUI12
Operation Frequency:	2400MHz~2483.5MHz $f_c = 2402 \text{ MHz} + N * 2 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 0 to 39.
Bluetooth Version:	Bluetooth V5.1 LE
Modulation Type:	GFSK
Number of Channel:	40
Sample Type:	<input checked="" type="checkbox"/> Portable Device, <input type="checkbox"/> Module
Antenna Type:	PIFA Antenna
Antenna Gain:	0 dBi
Power Supply:	<input type="checkbox"/> AC/DC Adapter; <input checked="" type="checkbox"/> Battery; <input type="checkbox"/> PoE;; <input type="checkbox"/> Other:

Operation Frequency of each channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
2	2406MHz	12	2426MHz	22	2446MHz	32	2466MHz
3	2408MHz	13	2428MHz	23	2448MHz	33	2468MHz
4	2410MHz	14	2430MHz	24	2450MHz	34	2470MHz
5	2412MHz	15	2432MHz	25	2452MHz	35	2472MHz
6	2414MHz	16	2434MHz	26	2454MHz	36	2474MHz
7	2416MHz	17	2436MHz	27	2456MHz	37	2476MHz
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz

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 (CH19)	2440MHz
The highest channel (CH39)	2480MHz



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3.5 Test Environment

Operating Environment	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	101.32 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

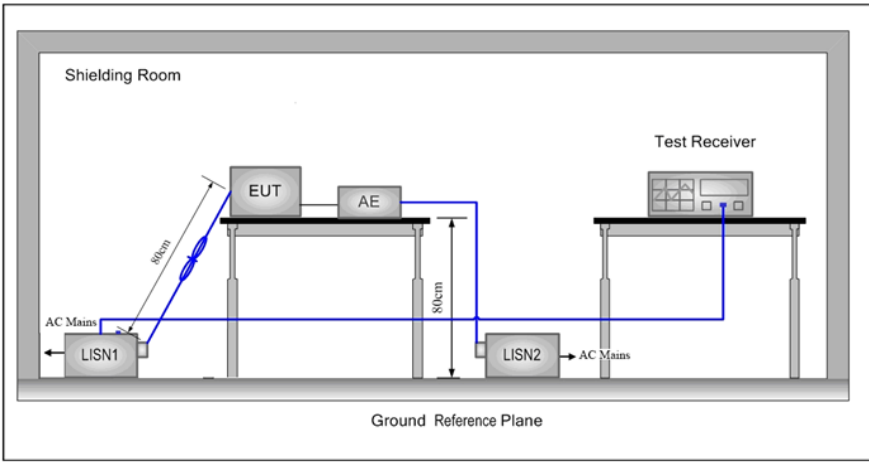
Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement:</p> <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that 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 0dBi.</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:	<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 $50\Omega/50\mu\text{H} + 5\Omega$ 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.</p> <p>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.</p>		
Test Setup:			



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Test Mode:	Transmitting with GFSK modulation. Charge +Transmitting mode.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass



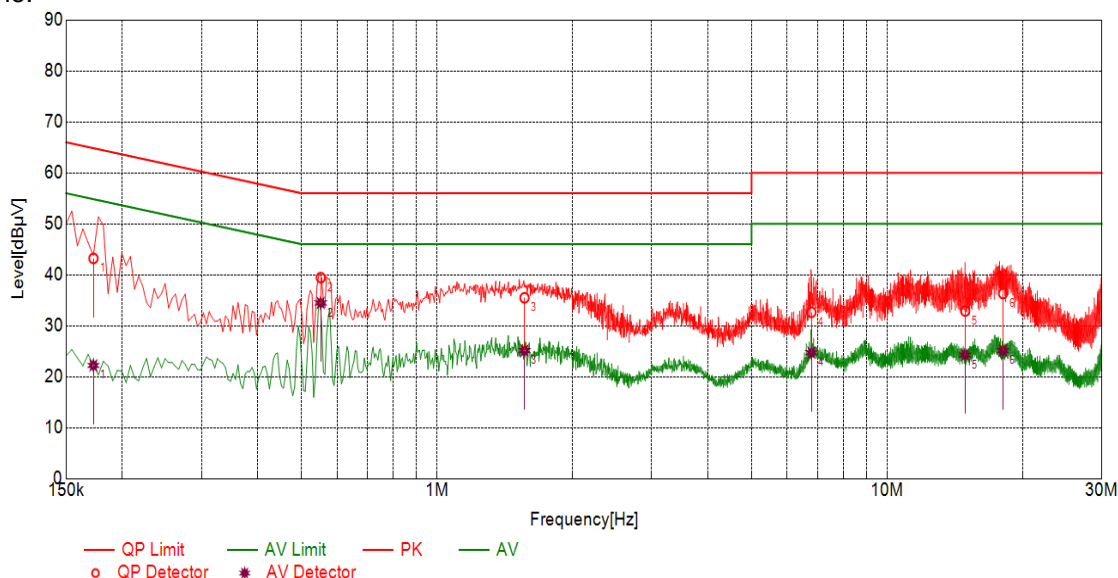
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Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

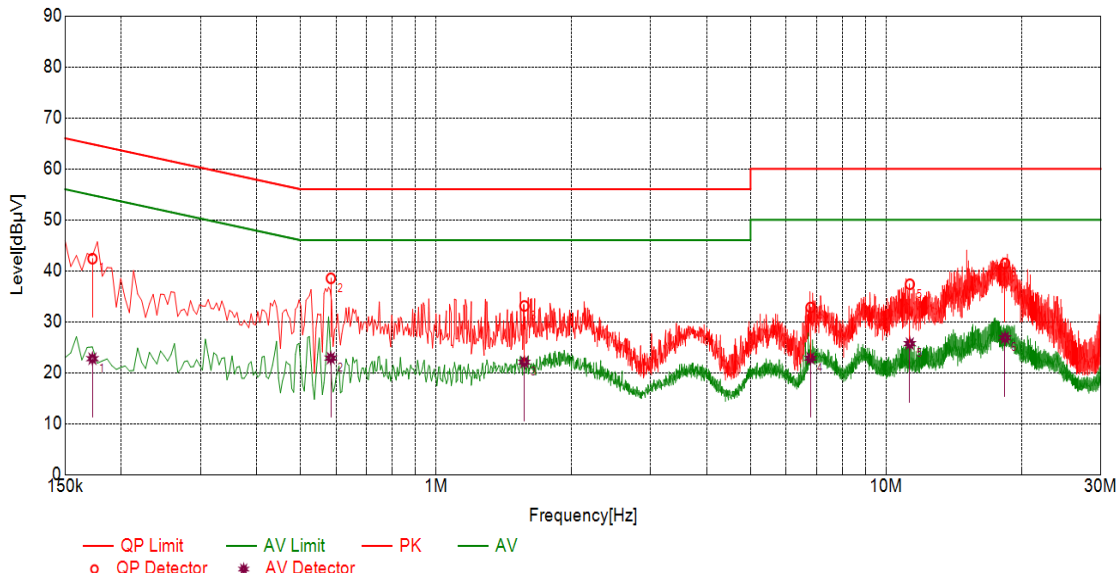
Live line:

**Test Graph**

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type
1	0.1726	10.10	43.22	64.84	21.62	22.21	54.84	32.63	L
2	0.5519	10.10	39.45	56.00	16.55	34.48	46.00	11.52	L
3	1.5651	10.10	35.48	56.00	20.52	25.13	46.00	20.87	L
4	6.7897	10.10	32.65	60.00	27.35	24.72	50.00	25.28	L
5	14.9073	10.11	32.91	60.00	27.09	24.28	50.00	25.72	L
6	18.0932	10.11	36.34	60.00	23.66	25.12	50.00	24.88	L



Neutral line:



Test Graph

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type
1	0.1726	10.10	42.38	64.84	22.46	22.75	54.84	32.09	N
2	0.5842	10.10	38.52	56.00	17.48	22.86	46.00	23.14	N
3	1.5723	10.10	33.10	56.00	22.90	22.07	46.00	23.93	N
4	6.7945	10.10	32.80	60.00	27.20	22.84	50.00	27.16	N
5	11.2923	10.10	37.35	60.00	22.65	25.70	50.00	24.30	N
6	18.3748	10.11	41.45	60.00	18.55	26.85	50.00	23.15	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

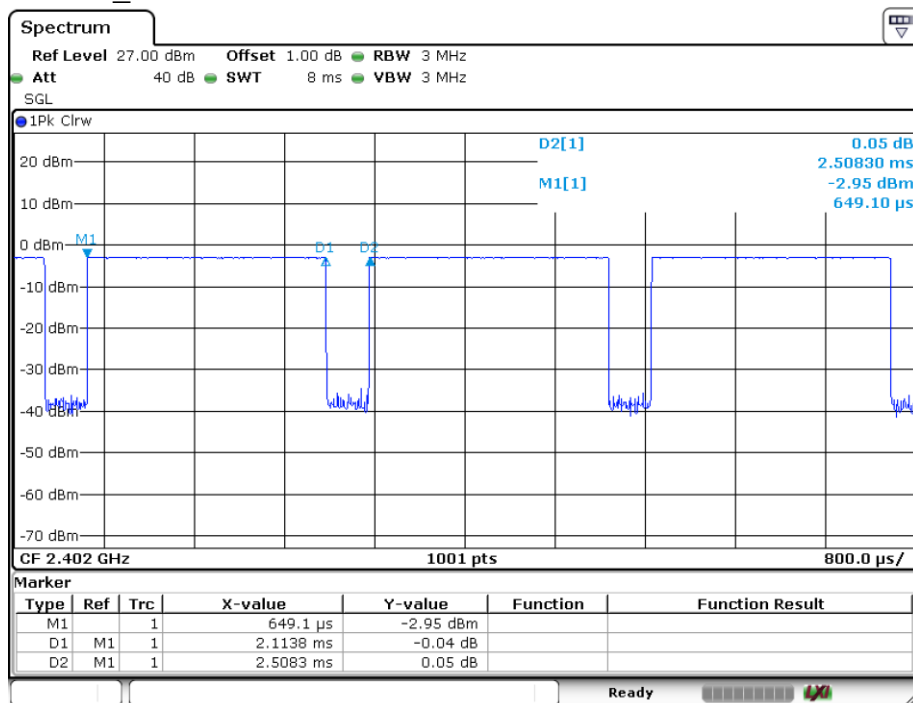
Test Mode	TX Freq. [MHz]	Duty cycle [%]
BLE_1M	CH0, CH19, CH39	84.27
BLE_2M	CH0, CH19, CH39	56.83

4.3.1

Test Plots

4.3.1.1

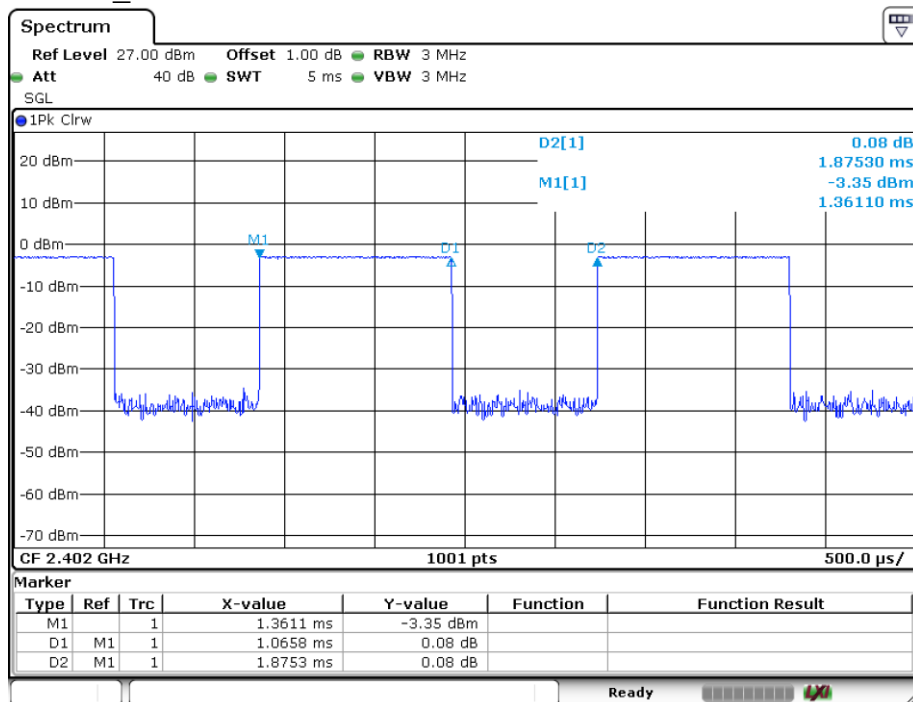
BLE_1M



Date: 20. SEP. 2020 12:43:46



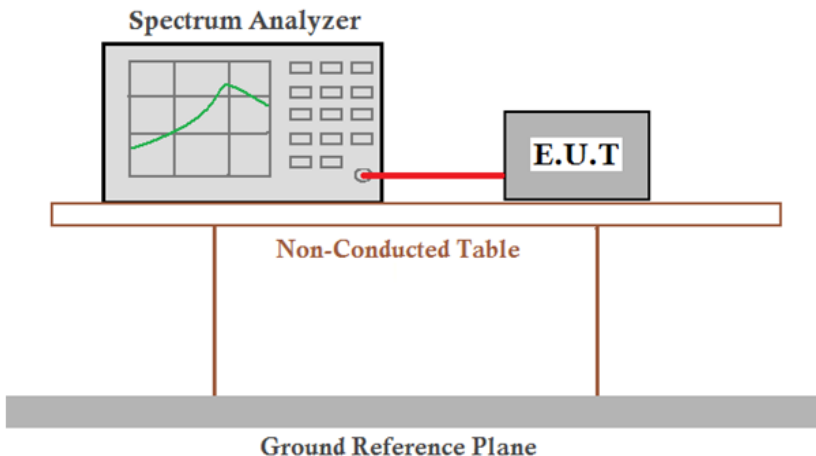
4.3.1.2 BLE_2M



Date: 20. SEP. 2020 12:43:09



4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.1
Test Setup:	
Limit:	30dBm
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass

4.4.1 Test Results

Measurement Data of Peak Power:

GFSK_1M mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-2.82	30.00	Pass
Middle	-1.76	30.00	Pass
Highest	-2.52	30.00	Pass

GFSK_2M mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-2.81	30.00	Pass
Middle	-1.78	30.00	Pass
Highest	-2.51	30.00	Pass

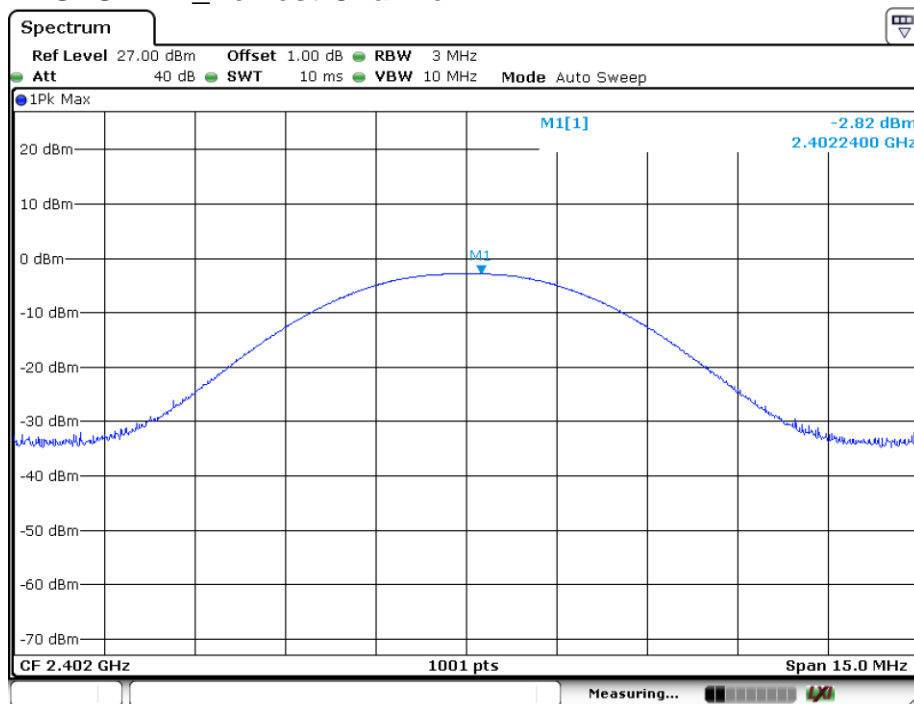


4.4.2

4.4.2.1

Test plots:

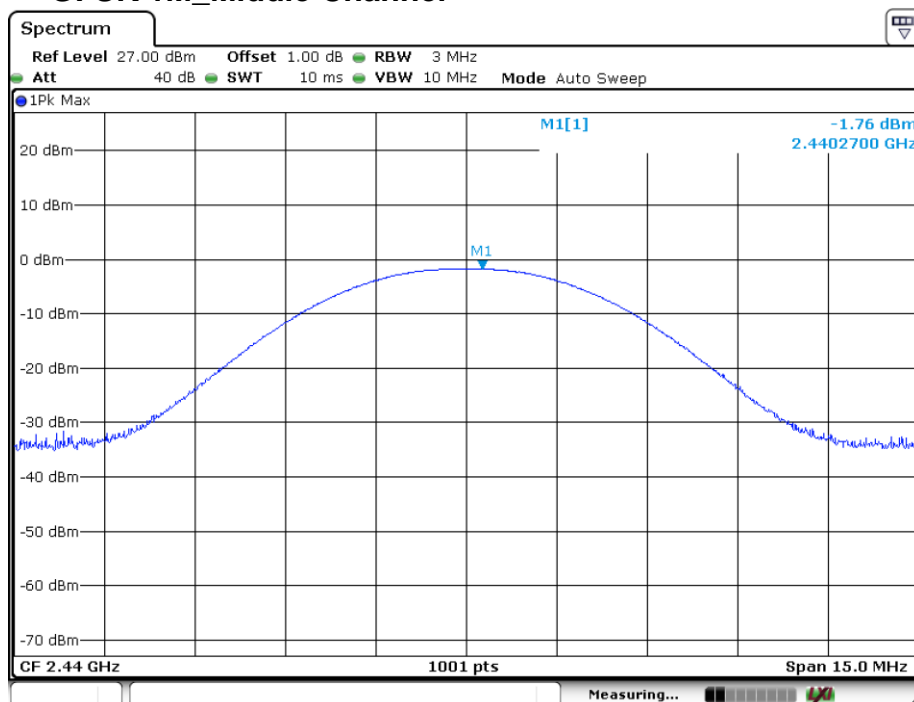
GFSK 1M_Lowest Channel



Date: 20.SEP.2020 12:44:06

4.4.2.2

GFSK 1M_Middle Channel



Date: 20.SEP.2020 12:44:22

4.4.2.3

GFSK 1M_Highest Channel

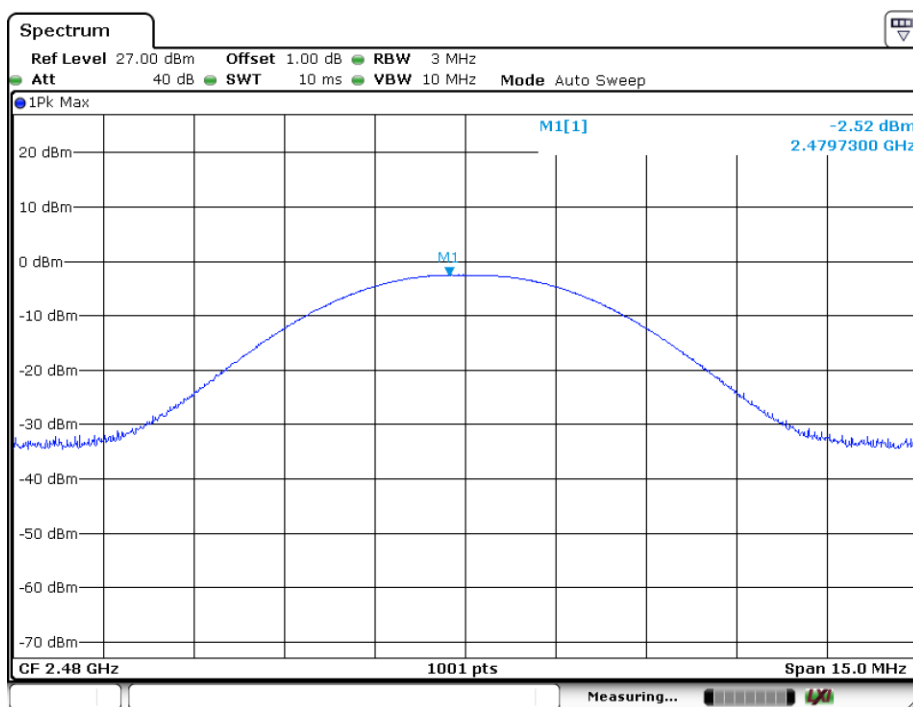


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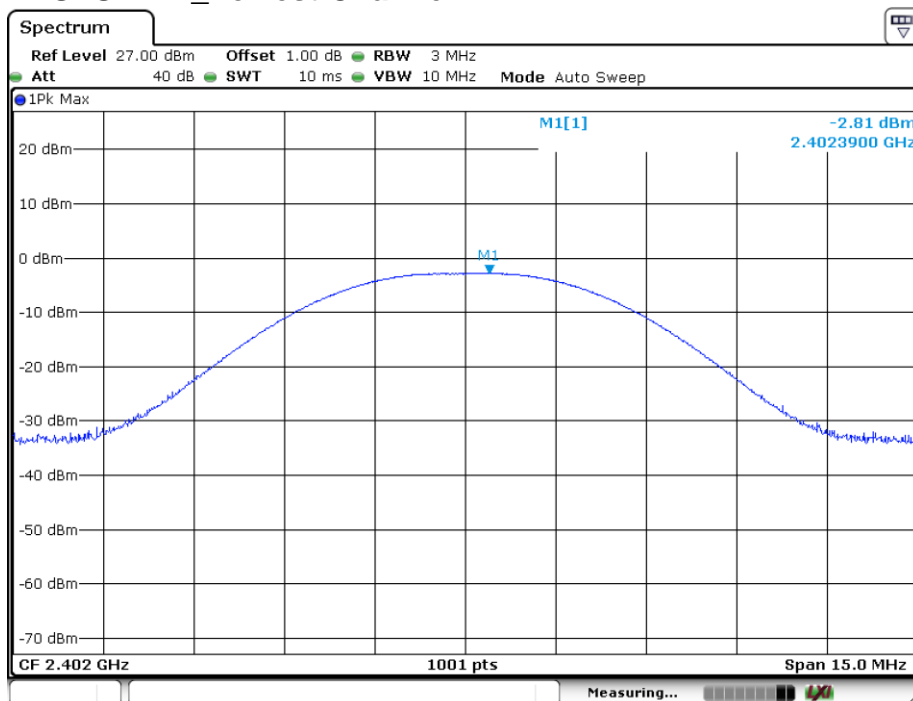
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Date: 20.SEP.2020 12:44:52

4.4.2.4 GFSK 2M_Lowest Channel



Date: 20.SEP.2020 12:50:18

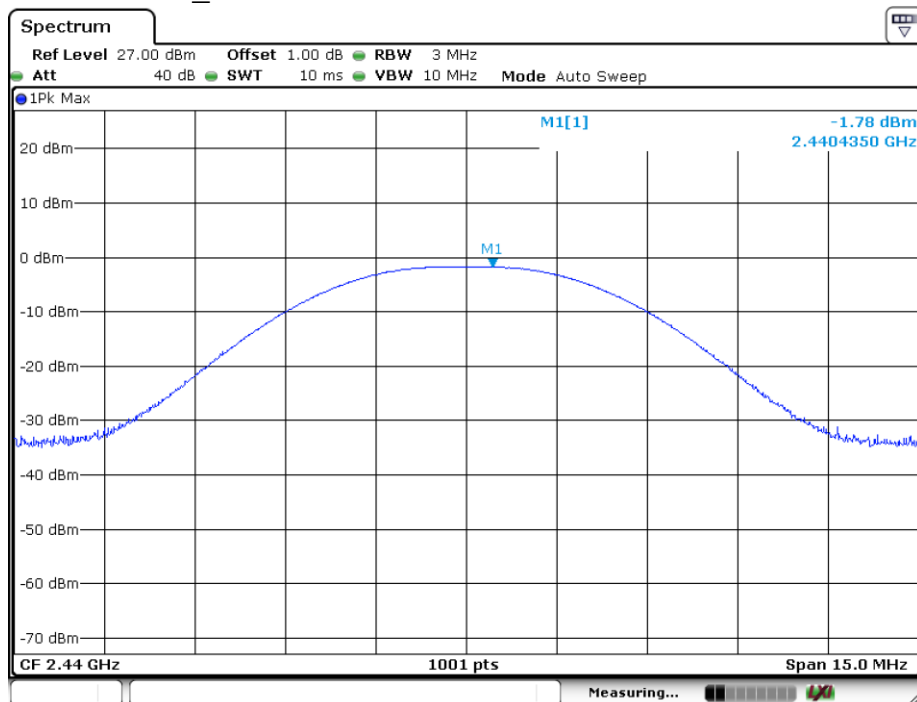


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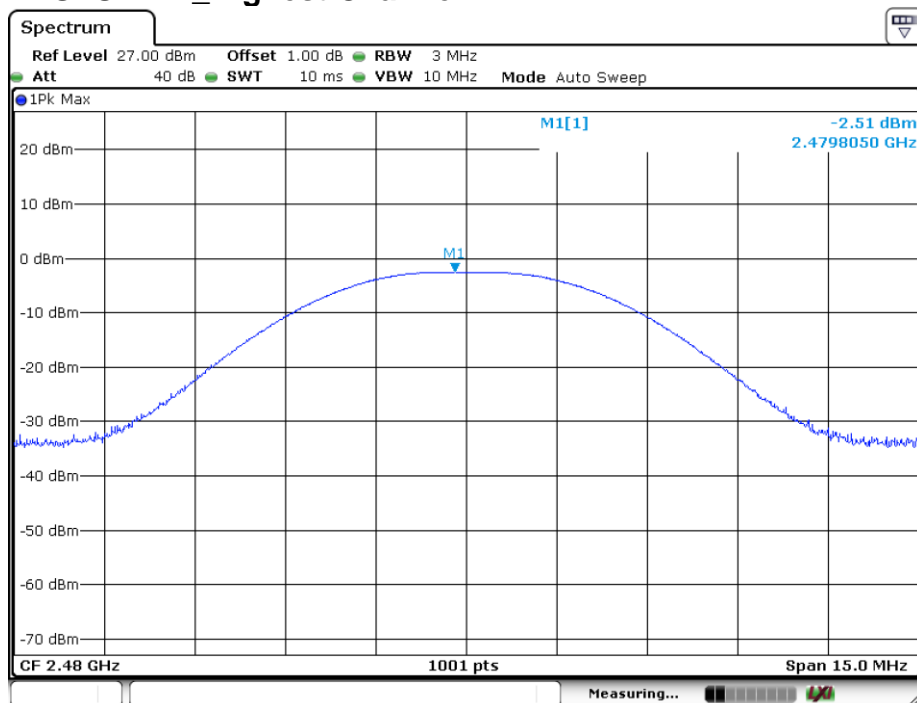
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4.4.2.5 GFSK 2M_Middle Channel



Date: 20.SEP.2020 12:50:40

4.4.2.6 GFSK 2M_Highest Channel



Date: 20.SEP.2020 12:50:54

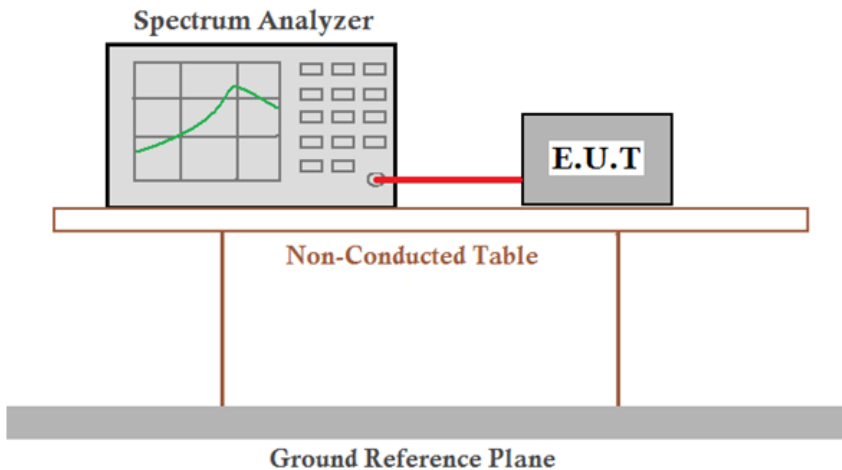


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4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8 Option 2
Test Setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Limit:	≥ 500 kHz
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass

4.5.1 Test Results

Mode	Test Channel	99% Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
GFSK_1M	Lowest	1.03	0.68	≥500	Pass
	Middle	1.03	0.67	≥500	Pass
	Highest	1.03	0.68	≥500	Pass

Mode	Test Channel	99% Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
GFSK_2M	Lowest	2.08	1.24	≥500	Pass
	Middle	2.08	1.26	≥500	Pass
	Highest	2.08	1.26	≥500	Pass



4.5.2

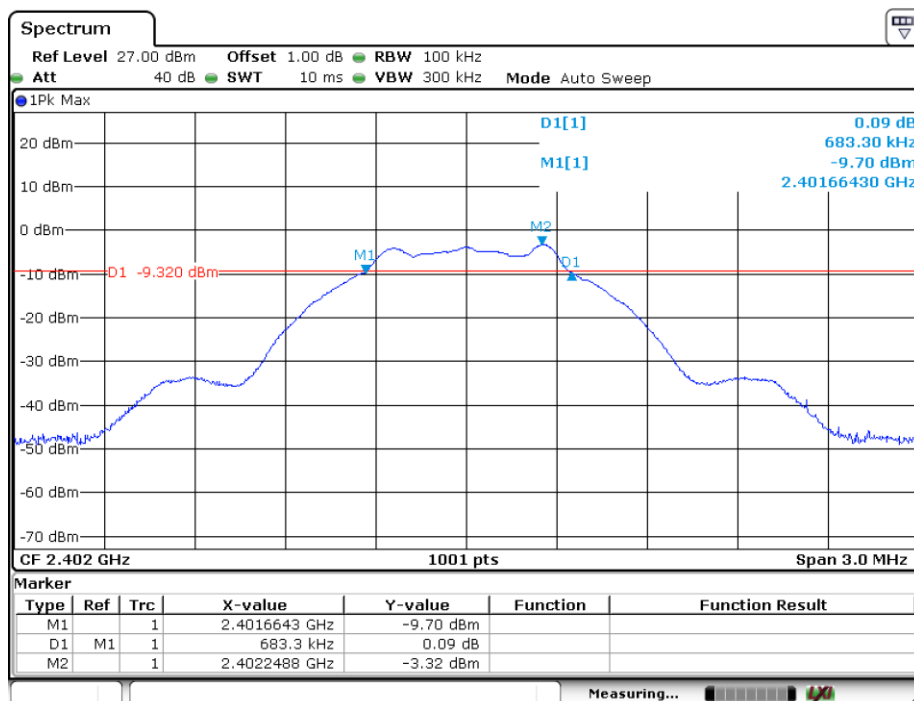
4.5.2.1

Test plots

GFSK 1M_Lowest Channel



Date: 20.SEP.2020 12:55:42



Date: 20.SEP.2020 12:49:47



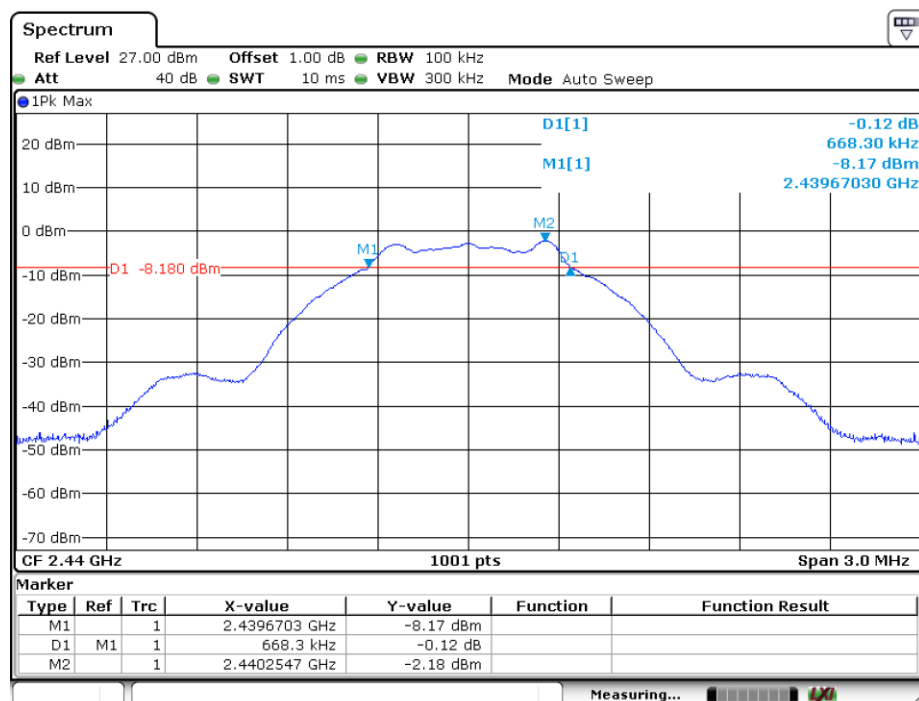
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4.5.2.2 GFSK 1M_Middle Channel



Date: 20.SEP.2020 12:55:27



Date: 20.SEP.2020 12:49:20



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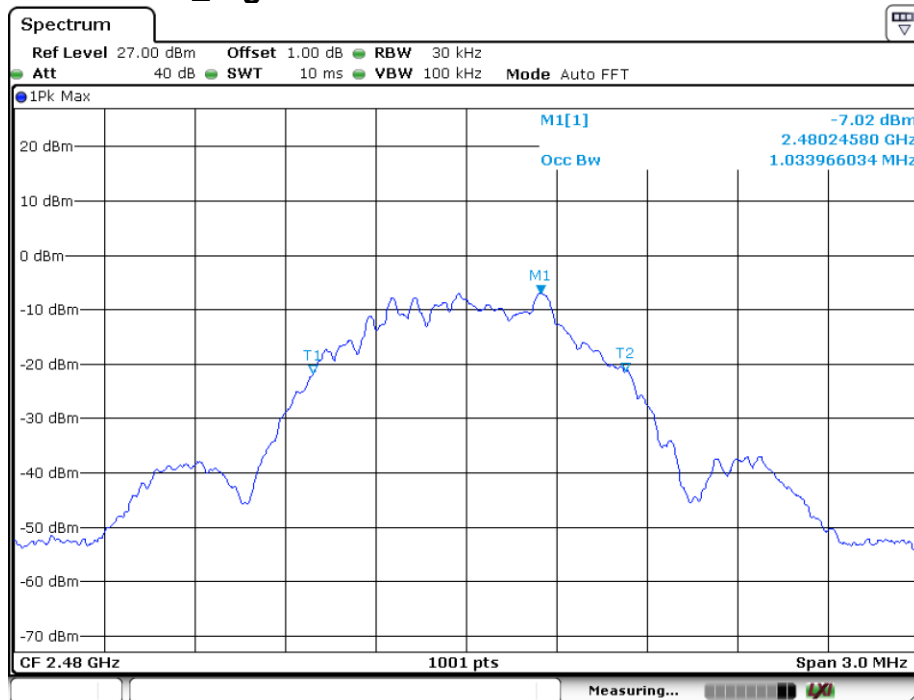
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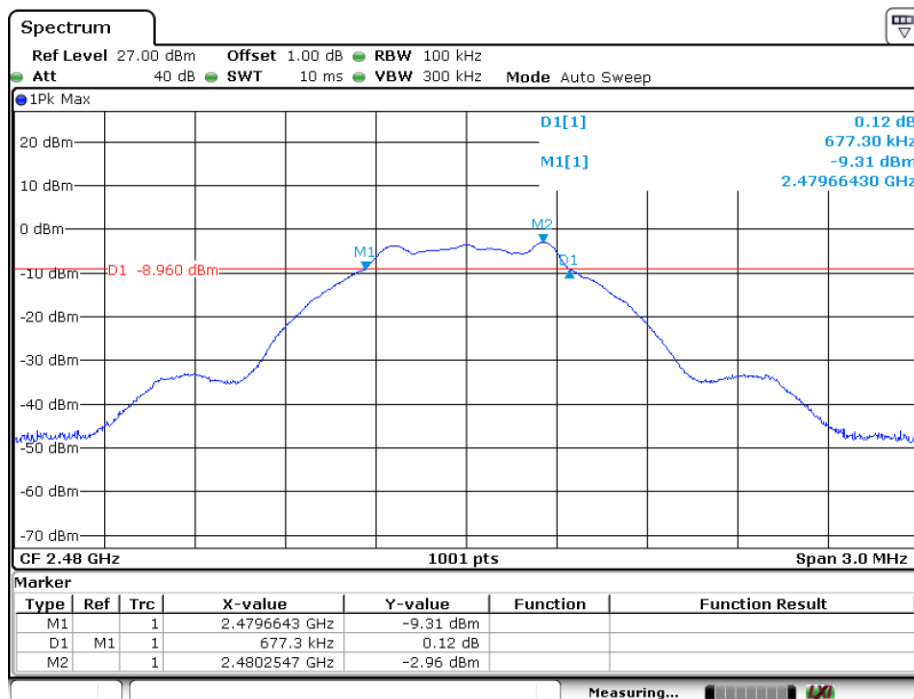
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4.5.2.3

GFSK 1M_Highest Channel



Date: 20.SEP.2020 12:55:02



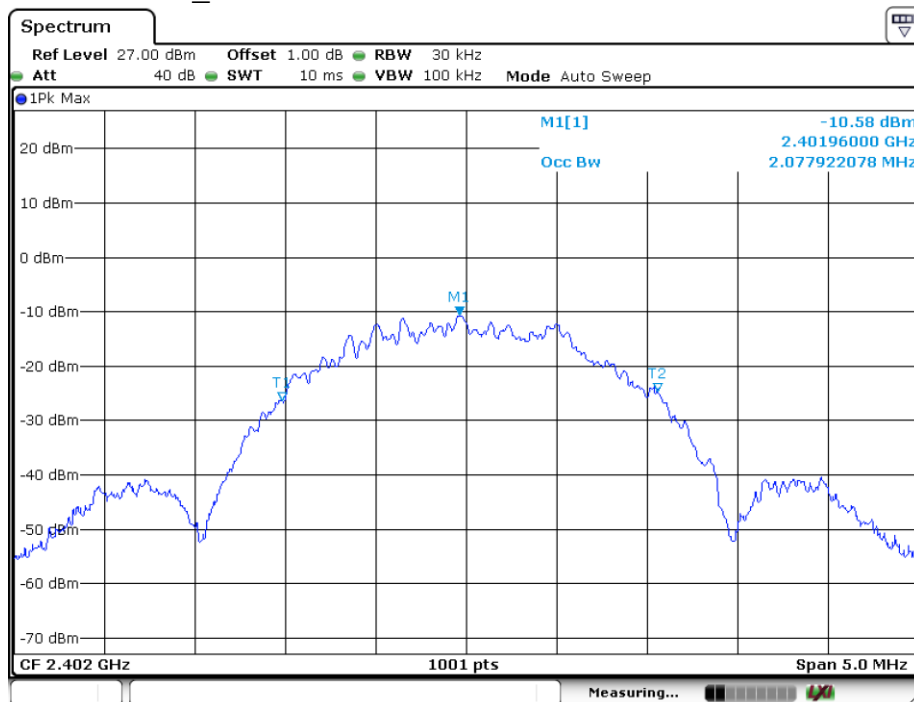
Date: 20.SEP.2020 12:48:42



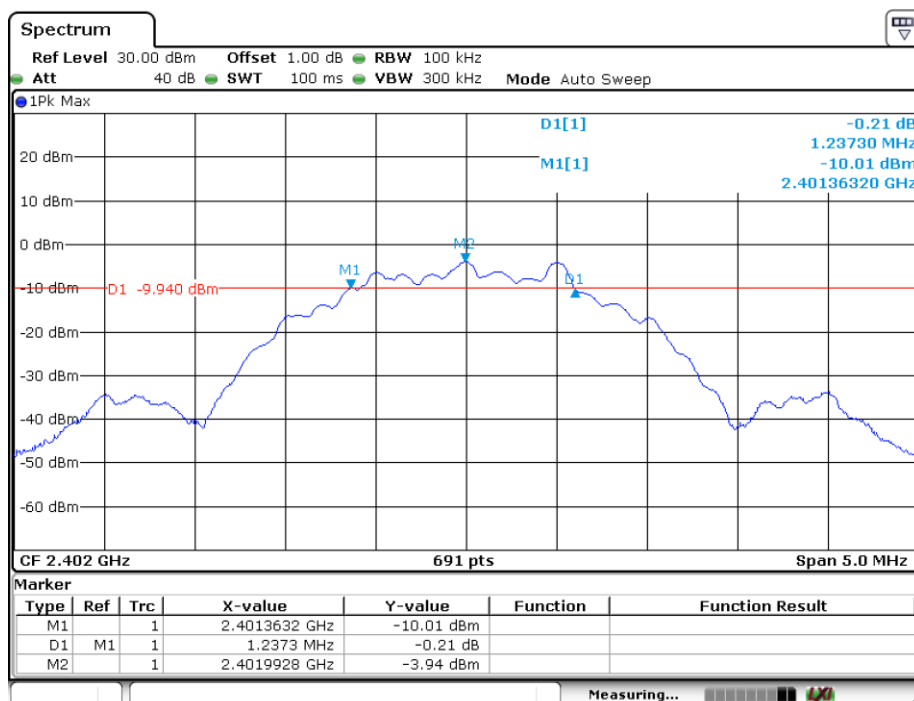
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4.5.2.4 GFSK 2M_Lowest Channel



Date: 20.SEP.2020 12:55:59



Date: 24.SEP.2020 22:15:02

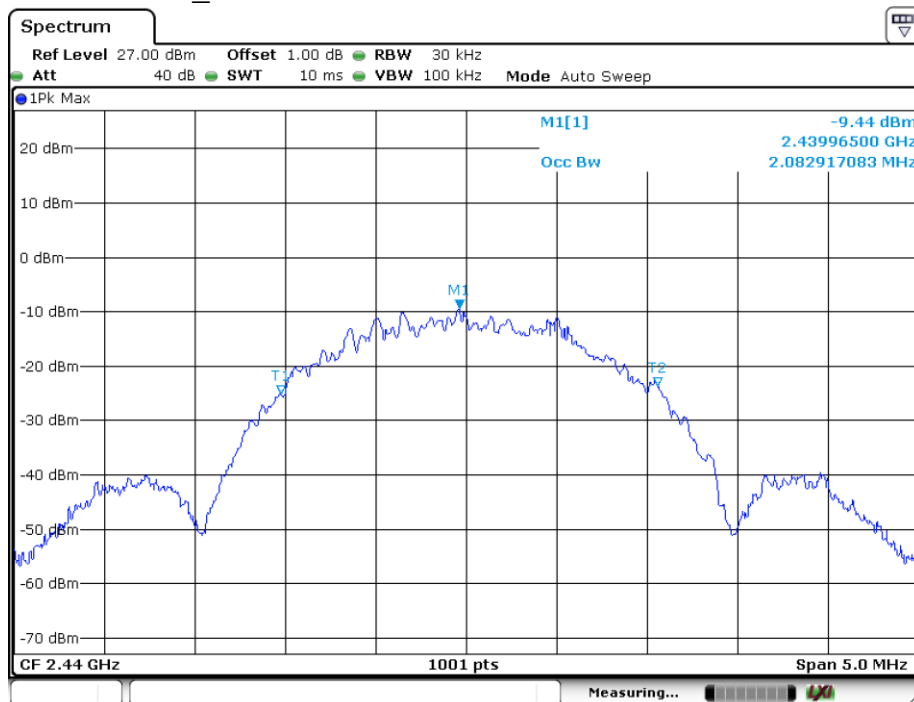


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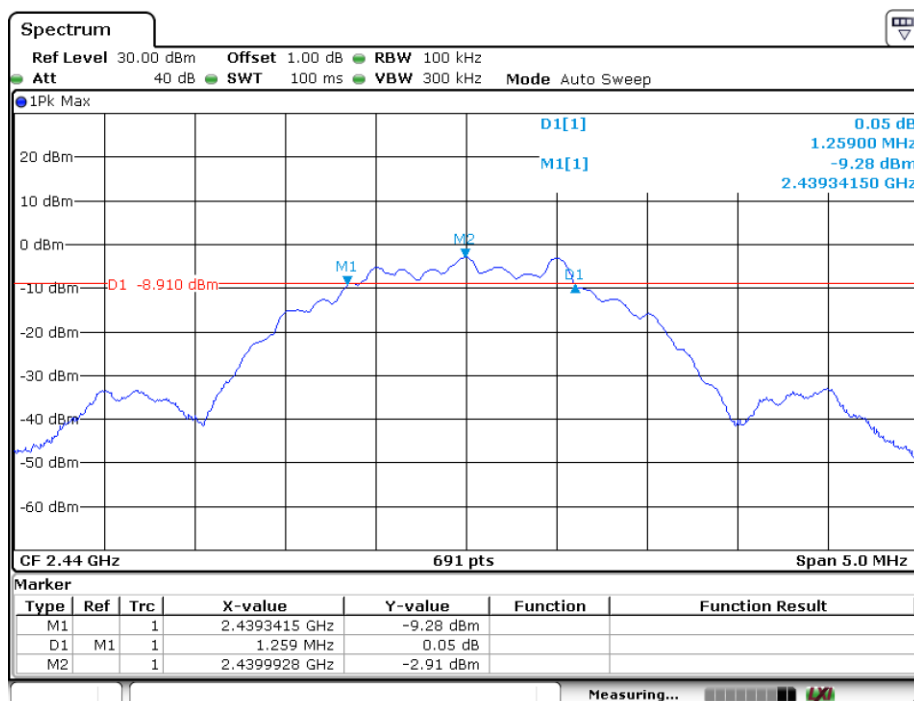
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4.5.2.5 GFSK 2M_Middle Channel



Date: 20.SEP.2020 12:56:18



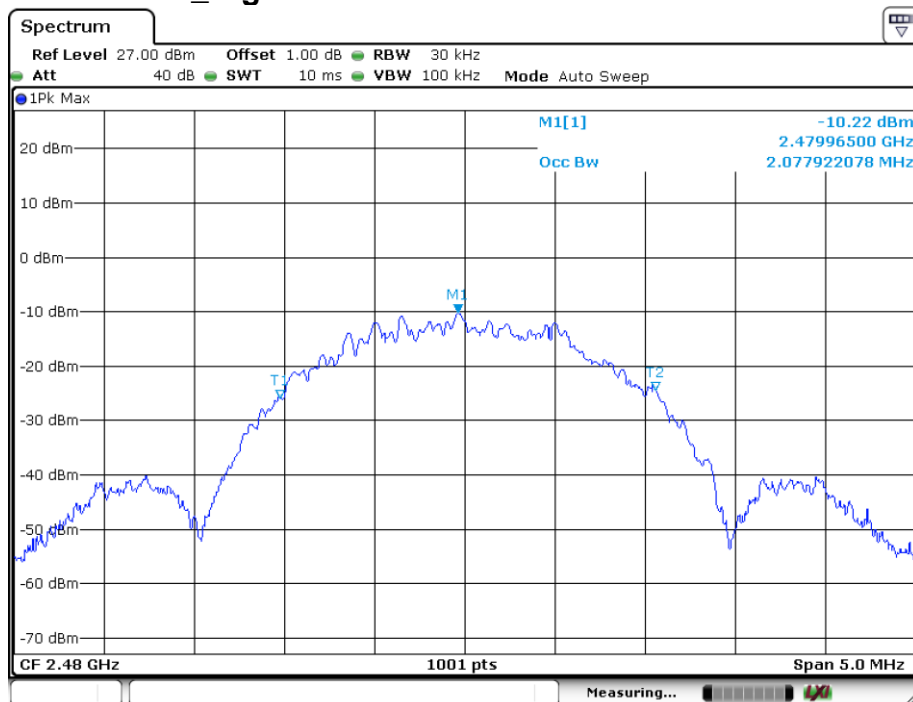
Date: 24.SEP.2020 22:15:42



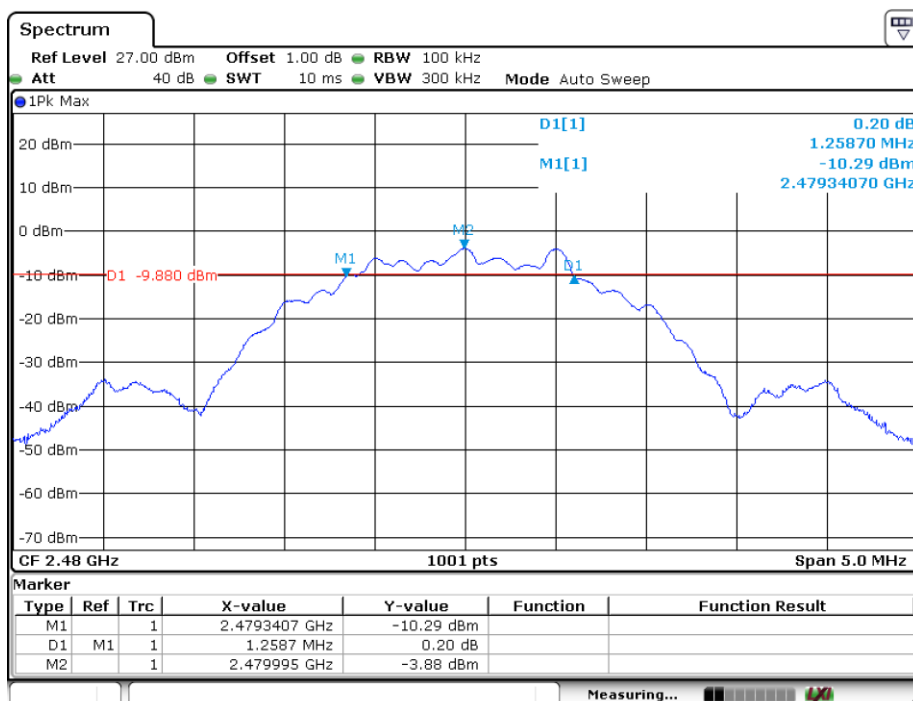
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4.5.2.6 GFSK 2M_Highest Channel

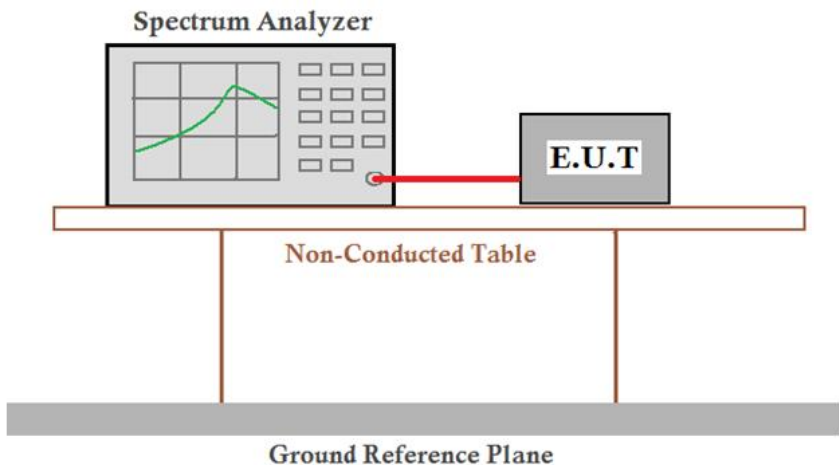


Date: 20.SEP.2020 12:56:35



Date: 20.SEP.2020 12:48:00

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:	
Limit:	$\leq 8.00 \text{ dBm/3kHz}$
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass

4.6.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK_1M	Lowest	-19.99	≤ 8.00	Pass
	Middle	-18.87	≤ 8.00	Pass
	Highest	-19.63	≤ 8.00	Pass

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK_2M	Lowest	-22.66	≤ 8.00	Pass
	Middle	-21.52	≤ 8.00	Pass
	Highest	-22.29	≤ 8.00	Pass

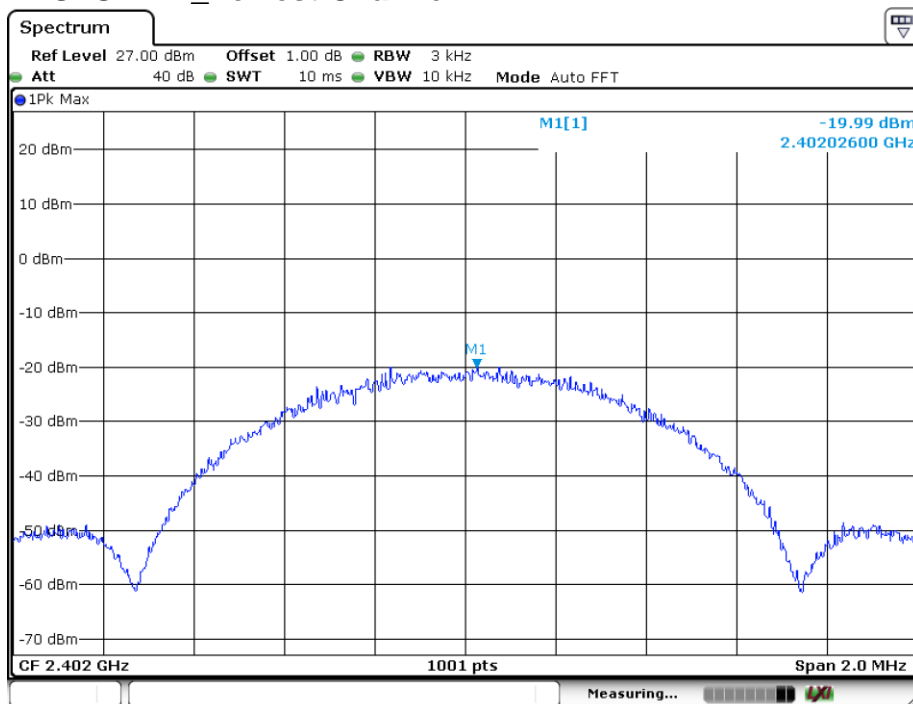


4.6.2

4.6.2.1

Test plots

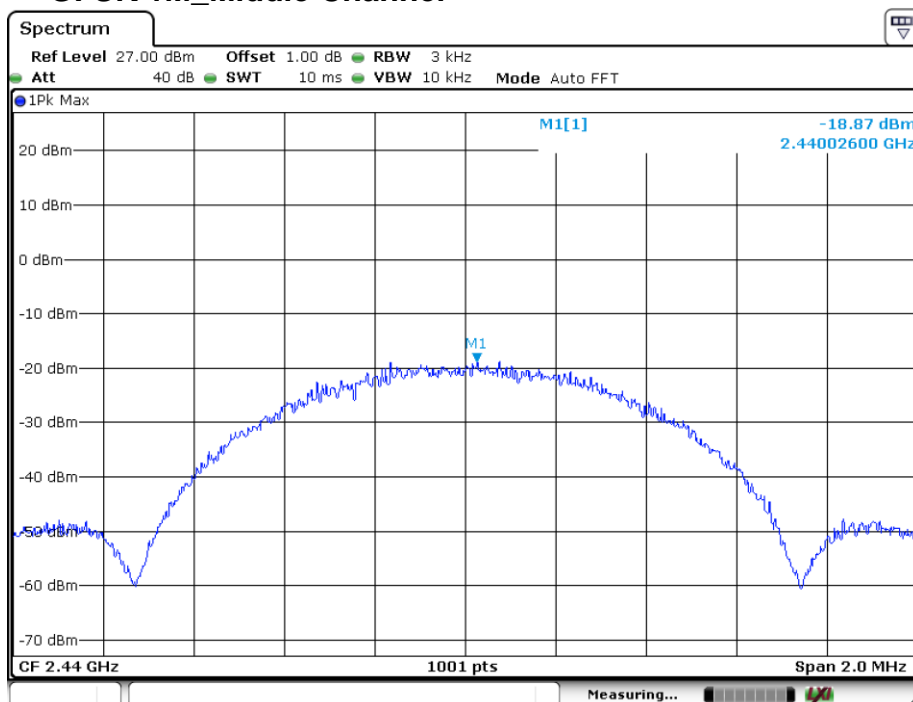
GFSK 1M_Lowest Channel



Date: 20.SEP.2020 12:53:31

4.6.2.2

GFSK 1M_Middle Channel



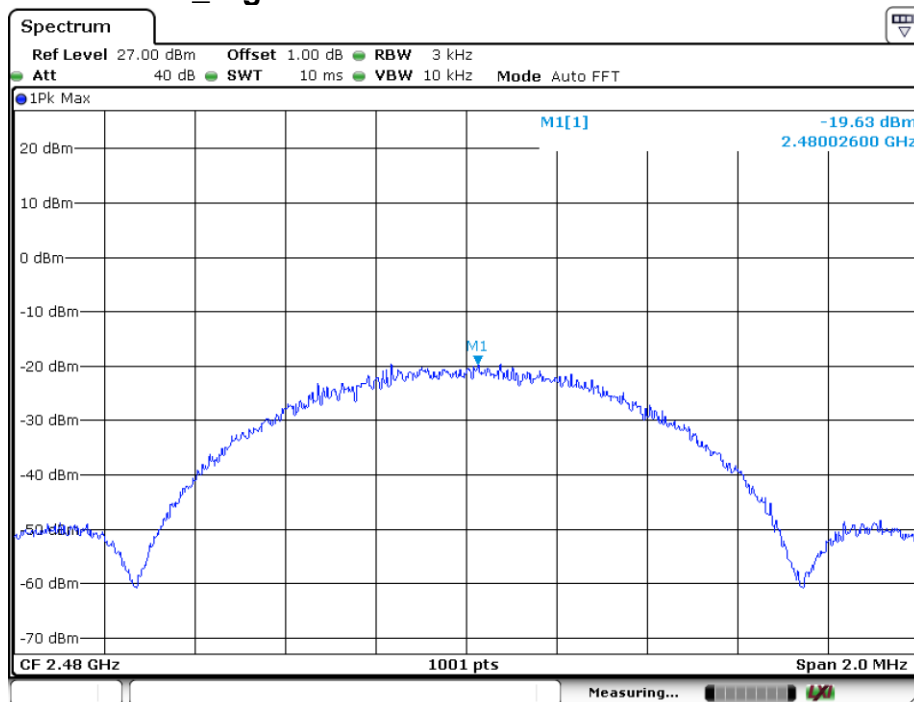
Date: 20.SEP.2020 12:53:46



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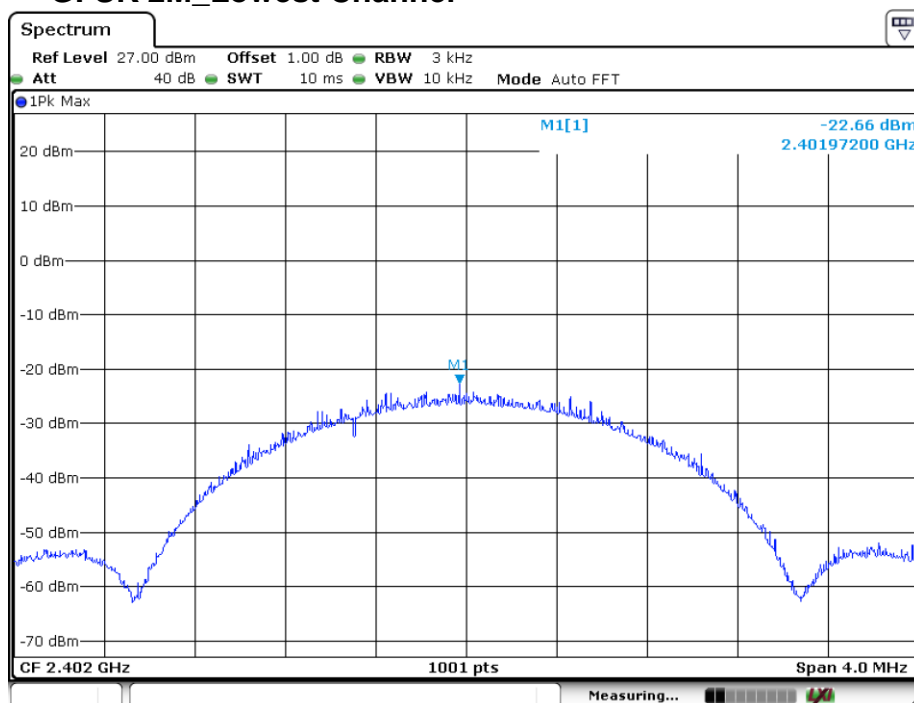
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4.6.2.3 GFSK 1M_Highest Channel



Date: 20.SEP.2020 12:54:00

4.6.2.4 GFSK 2M_Lowest Channel



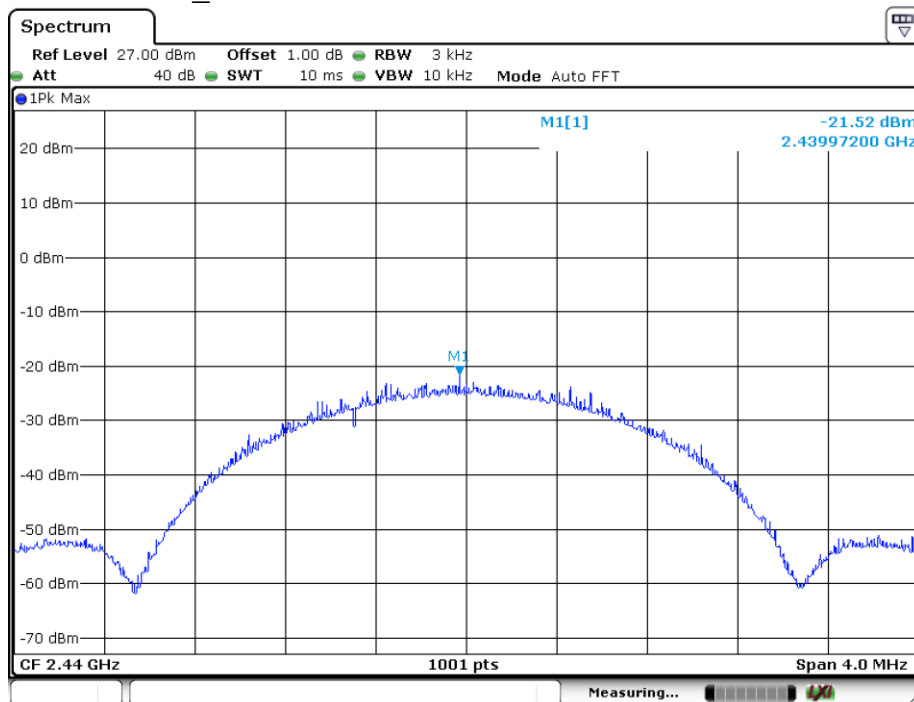
Date: 20.SEP.2020 12:53:19



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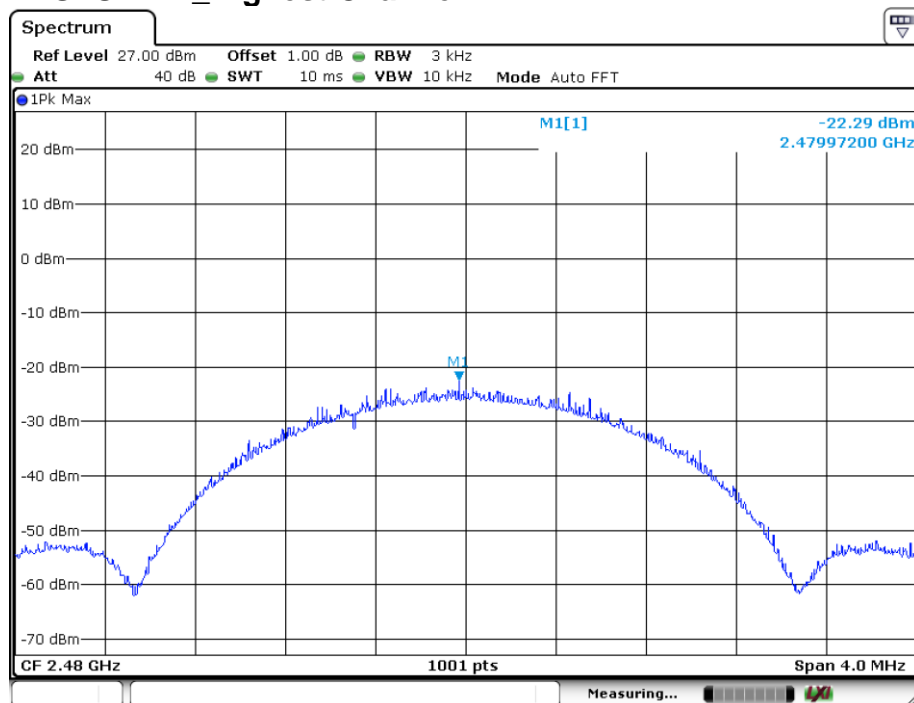
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4.6.2.5 GFSK 2M_Middle Channel



Date: 20.SEP.2020 12:53:04

4.6.2.6 GFSK 2M_Highest Channel



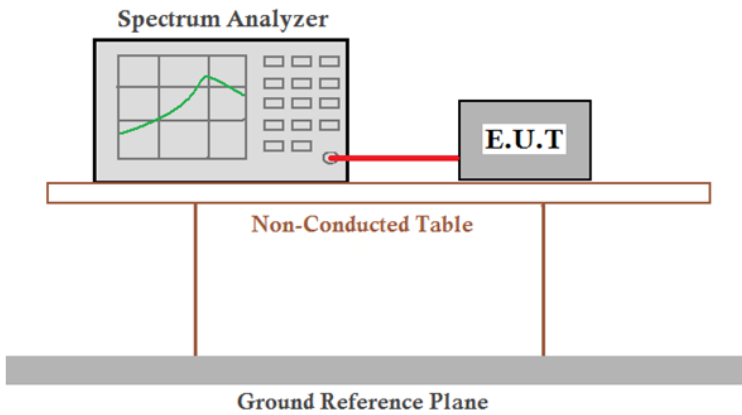
Date: 20.SEP.2020 12:52:22



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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:	
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 Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass



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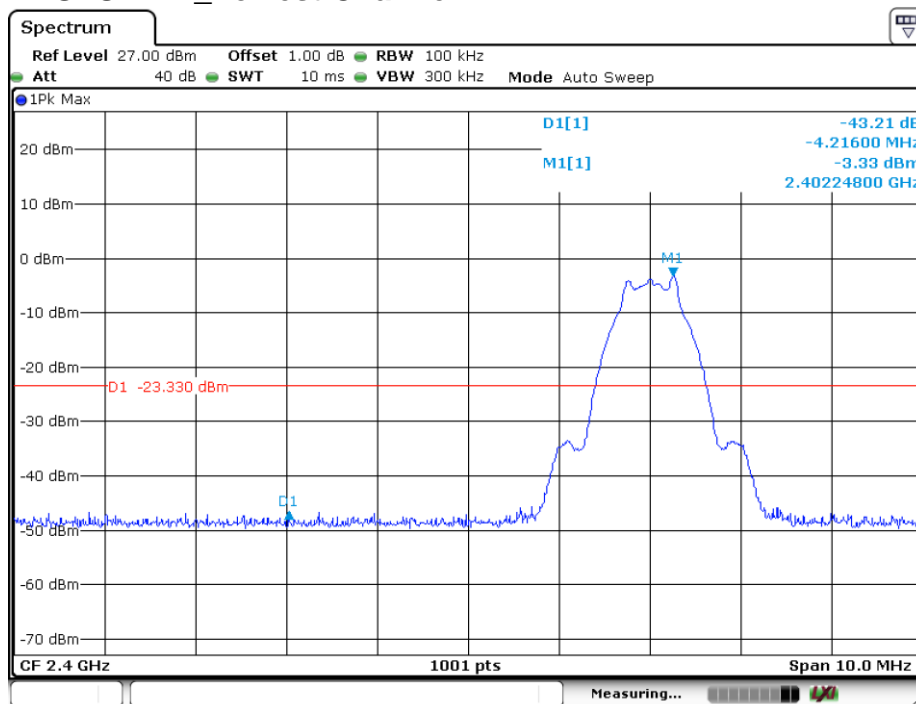
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4.7.1

4.7.1.1

Test plots

GFSK 1M_Lowest Channel



Date: 20.SEP.2020 12:59:49

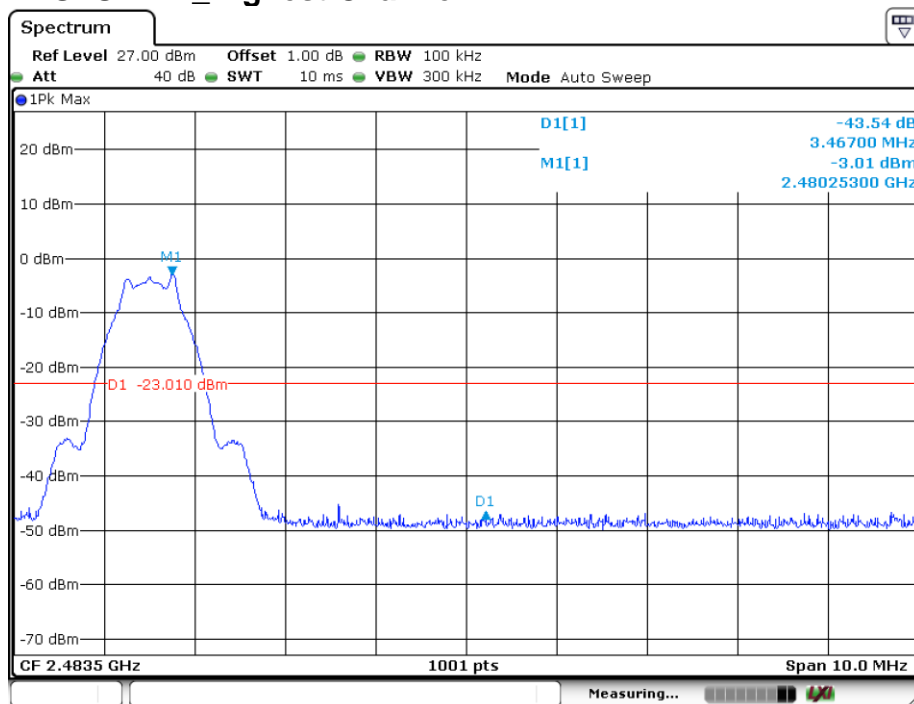


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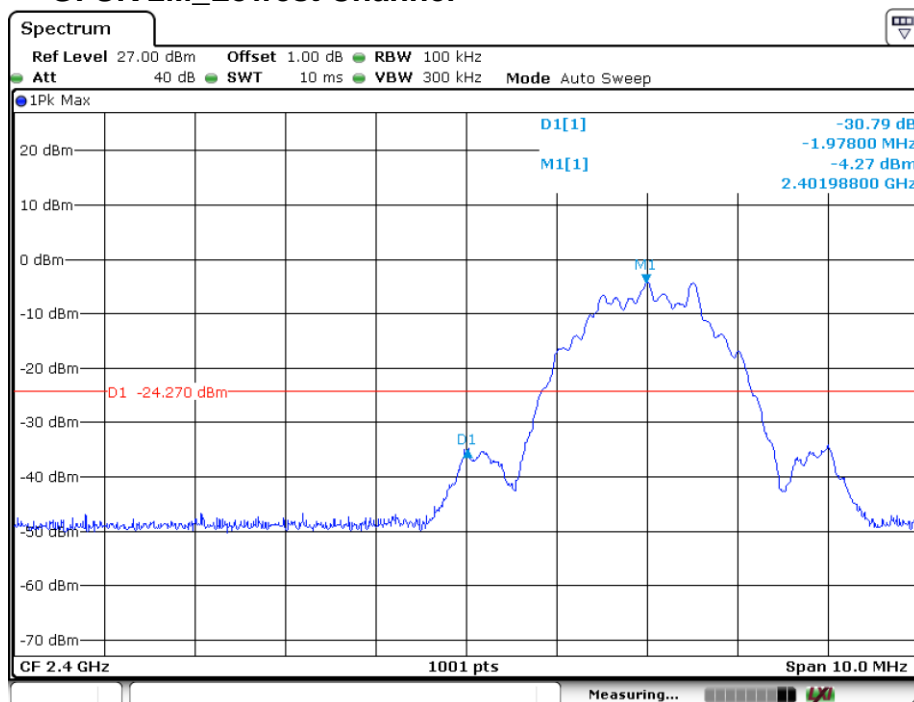
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4.7.1.2 GFSK 1M_Highest Channel



Date: 20.SEP.2020 13:00:32

4.7.1.3 GFSK 2M_Lowest Channel



Date: 20.SEP.2020 12:58:36



4.7.1.4 GFSK 2M_Highest Channel



Date: 20.SEP.2020 12:57:49

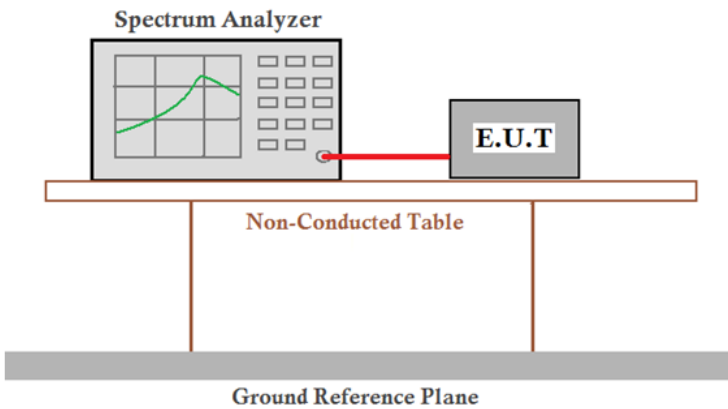


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4.8 Spurious RF Conducted Emissions

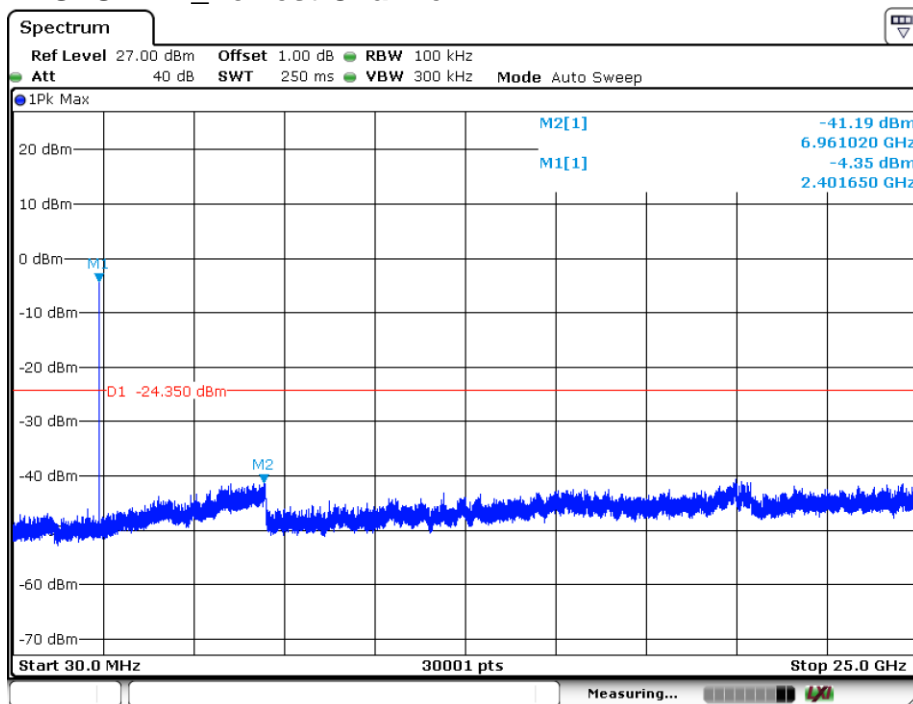
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass



4.8.1

4.8.1.1

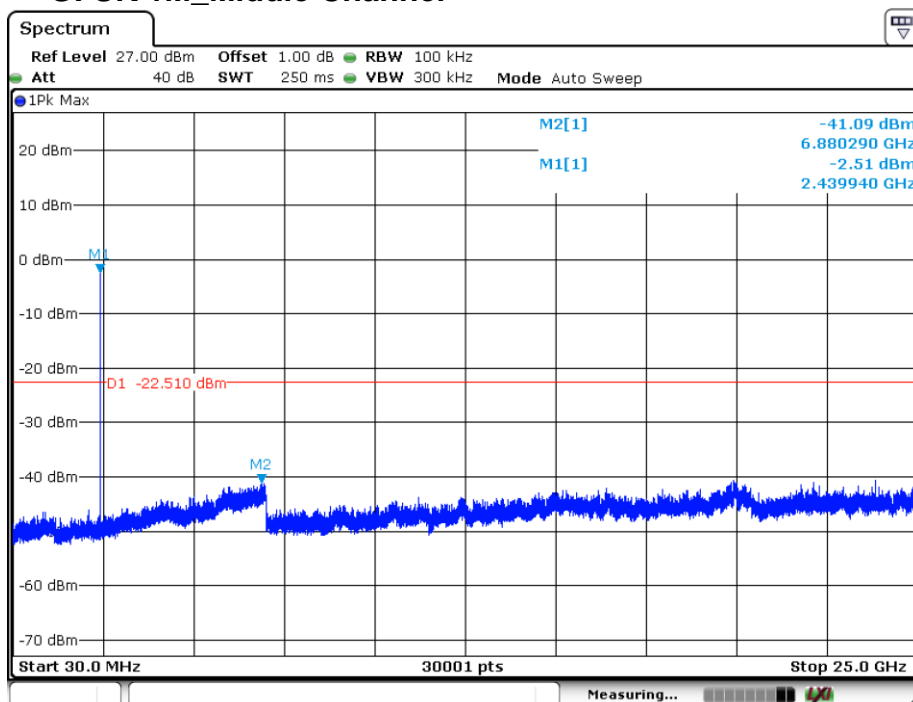
Test plots: GFSK 1M_Lowest Channel



Date: 20.SEP.2020 13:03:44

4.8.1.2

GFSK 1M_Middle Channel



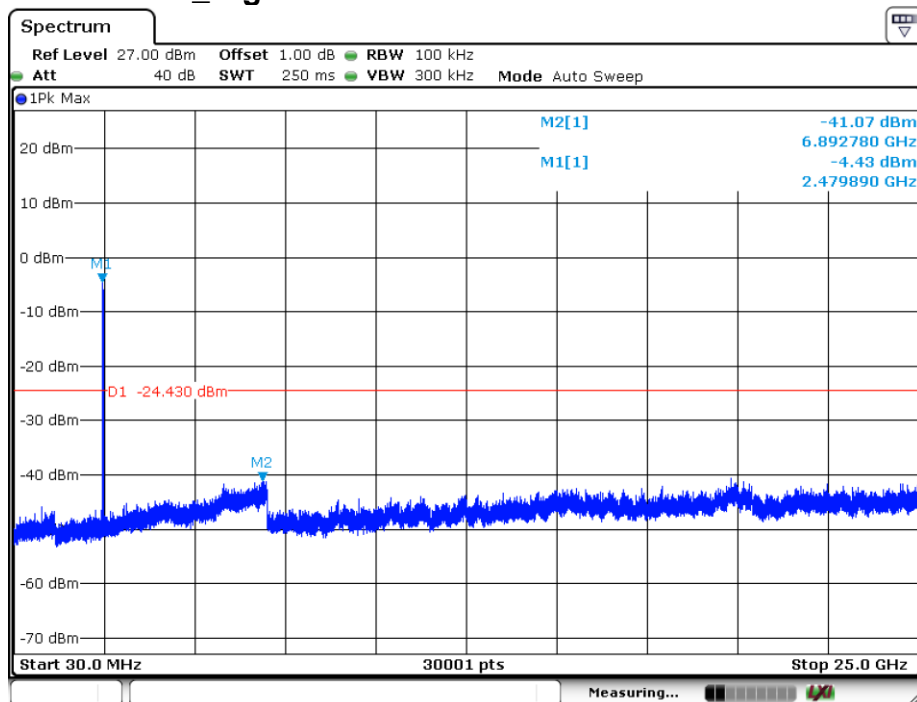
Date: 20.SEP.2020 13:02:41



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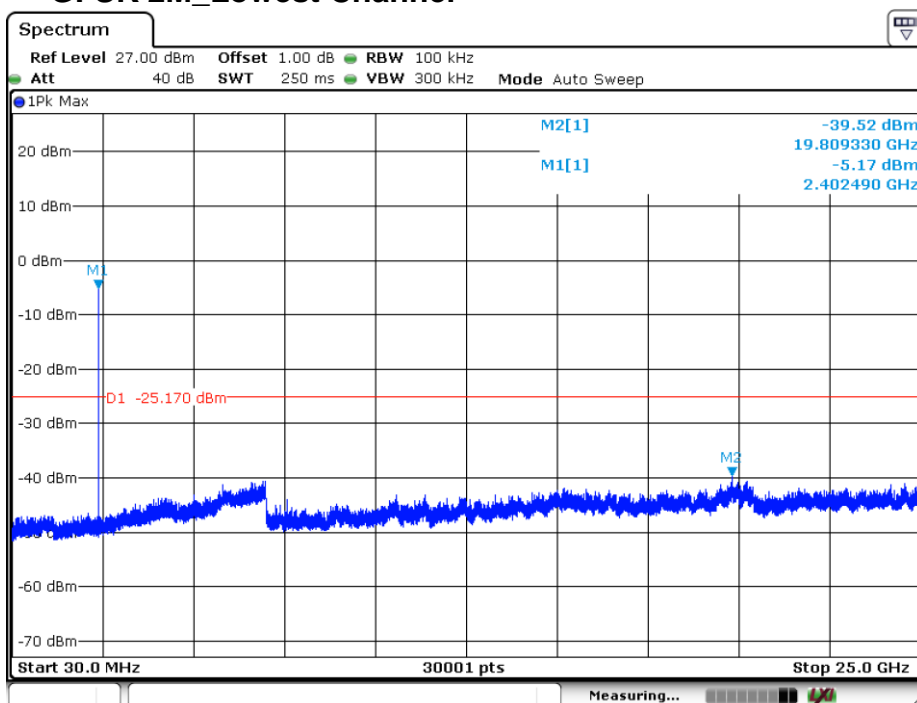
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4.8.1.3 GFSK 1M_Highest Channel



Date: 20.SEP.2020 13:01:29

4.8.1.4 GFSK 2M Lowest Channel



Date: 20.SEP.2020 13:06:20

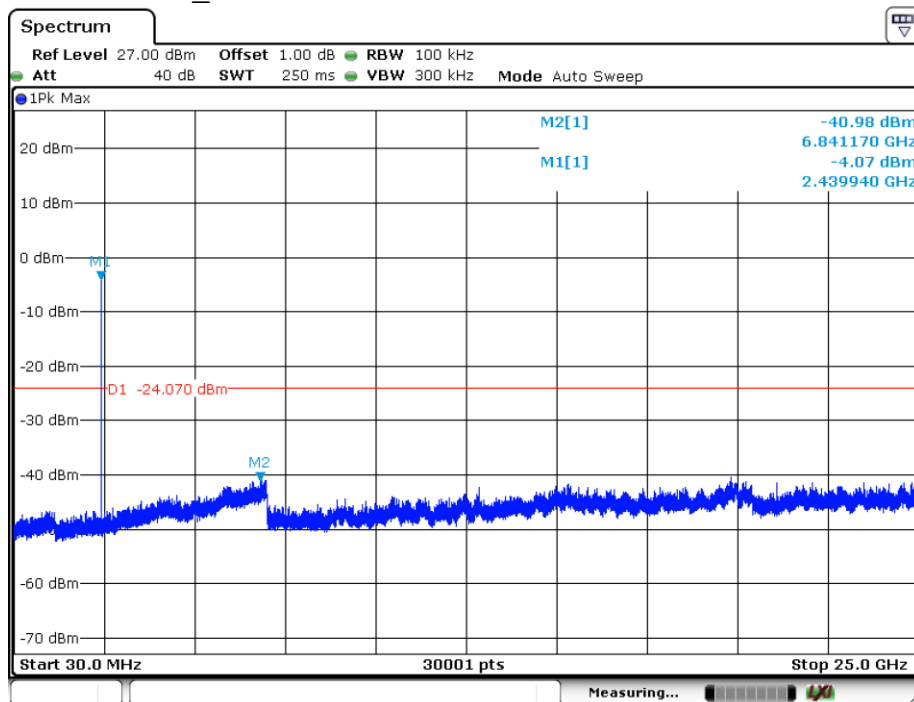


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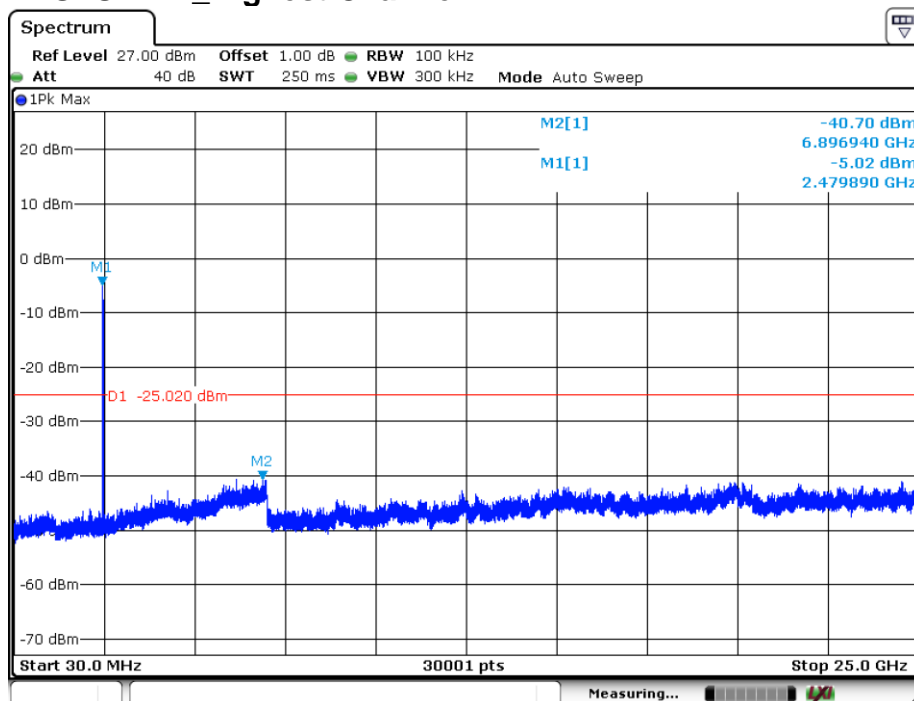
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4.8.1.5 GFSK 2M_Middle Channel



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4.8.1.6 GFSK 2M_Highest Channel



Date: 20.SEP.2020 13:09:51



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Remark:

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



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4.9 Radiated Spurious Emission

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	100 kHz	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:

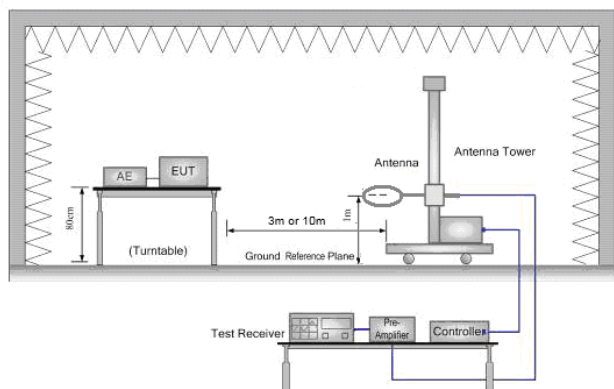


Figure 1. Below 30MHz

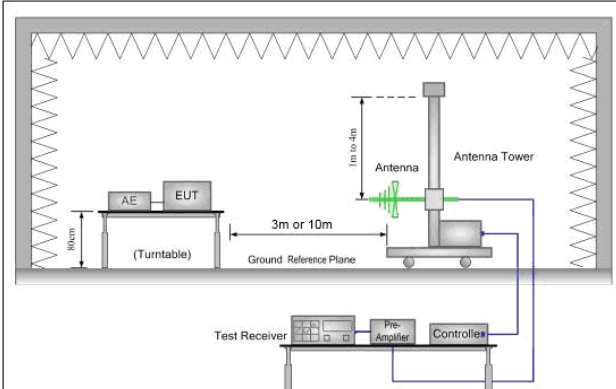


Figure 2. 30MHz to 1GHz

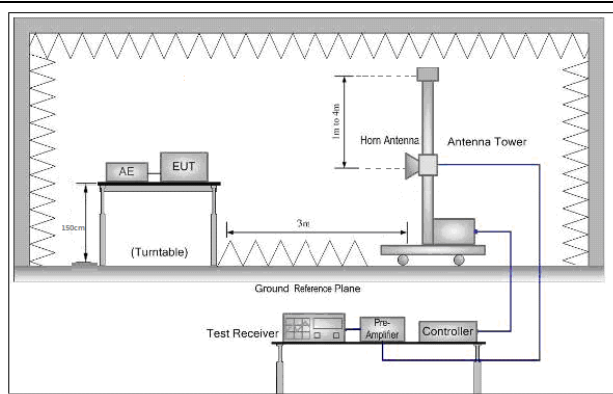


Figure 3. Above 1 GHz

Test Procedure:

- 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



	<p>(3) For average measurement: use duty cycle correction factor method per 15.35(c).</p> <p>Duty cycle = On time/100 milliseconds</p> <p>On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$</p> <p>Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.</p> <p>Average Emission Level = Peak Emission Level + $20 \cdot \log(\text{Duty cycle})$</p> <p>f. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>h. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p> <p>i. Test the EUT in the lowest channel (2402MHz), the middle channel (2440MHz), the Highest channel (2480MHz)</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 the worst case.</p> <p>k. Repeat above procedures until all frequencies measured was complete.</p>
Exploratory Test Mode:	Transmitting with GFSK modulation. Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation. 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

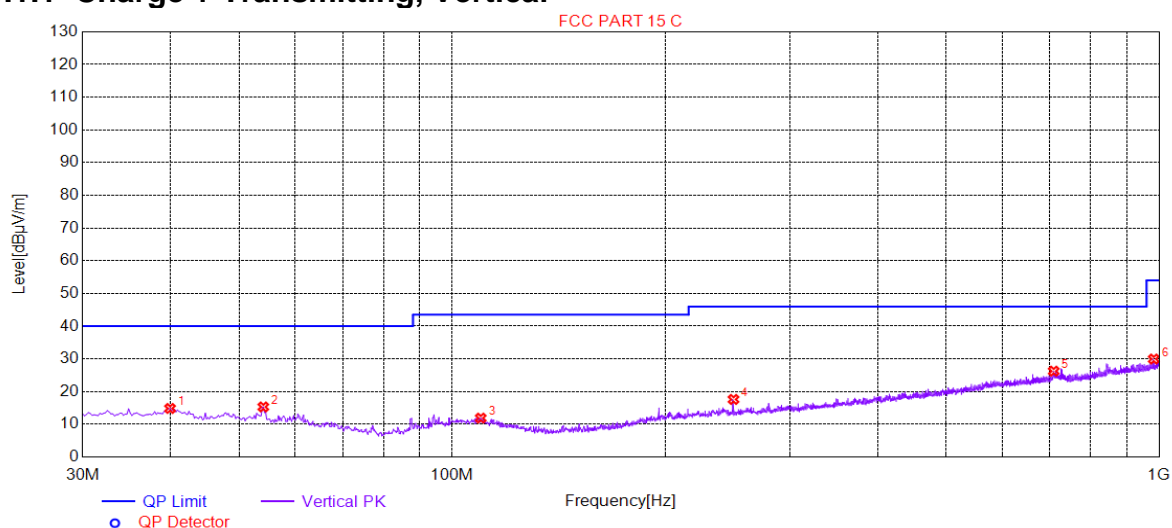


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4.9.1 Radiated Emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical



Suspected List

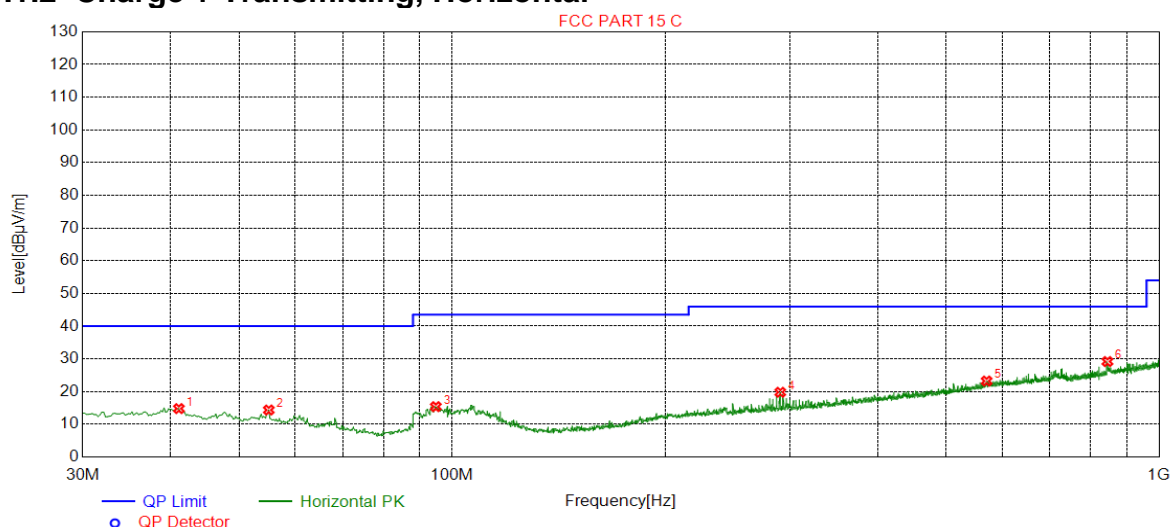
Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.8960	14.85	-28.37	40.00	25.15	183	83	Vertical
2	54.0608	15.32	-30.98	40.00	24.68	220	332	Vertical
3	109.7500	11.90	-32.00	43.50	31.60	223	40	Vertical
4	250.0400	17.62	-29.66	46.00	28.38	151	14	Vertical
5	709.5239	26.26	-19.29	46.00	19.74	158	83	Vertical
6	982.7305	29.96	-15.03	54.00	24.04	295	297	Vertical

Final Data List



4.9.1.2 Charge + Transmitting, Horizontal



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	41.0602	14.81	-28.78	40.00	25.19	130	237	Horizontal
2	55.0310	14.38	-31.12	40.00	25.62	192	277	Horizontal
3	94.8090	15.40	-32.92	43.50	28.10	210	335	Horizontal
4	291.1762	19.80	-28.60	46.00	26.20	245	246	Horizontal
5	570.2040	23.24	-21.47	46.00	22.76	217	22	Horizontal
6	845.1570	29.20	-16.97	46.00	16.80	237	278	Horizontal

Final Data List



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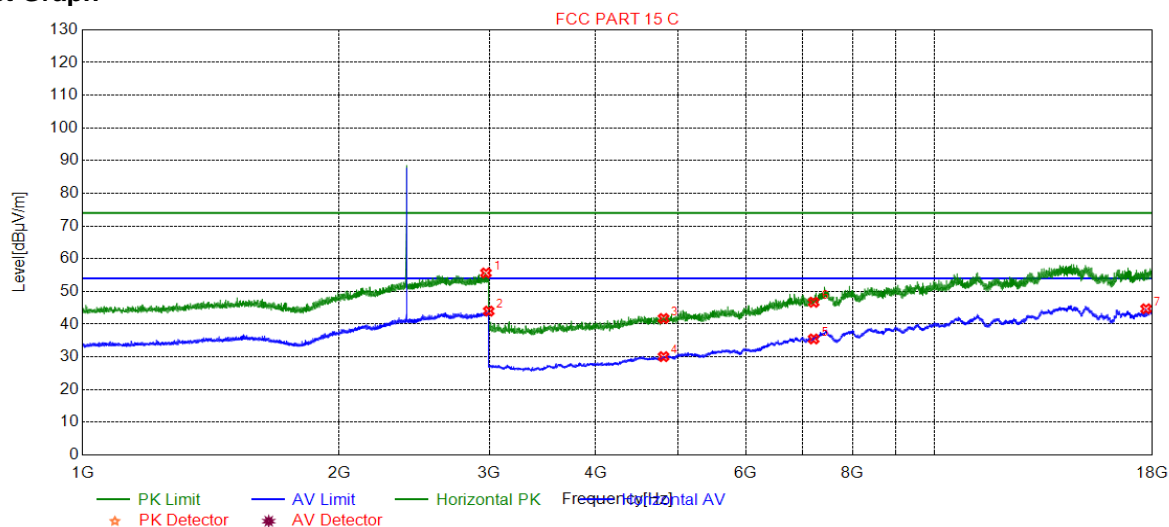
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4.9.2 Transmitter Emission above 1GHz

4.9.2.1 BLE 1M_Channel 0

Test Graph



Suspected List

Suspected List

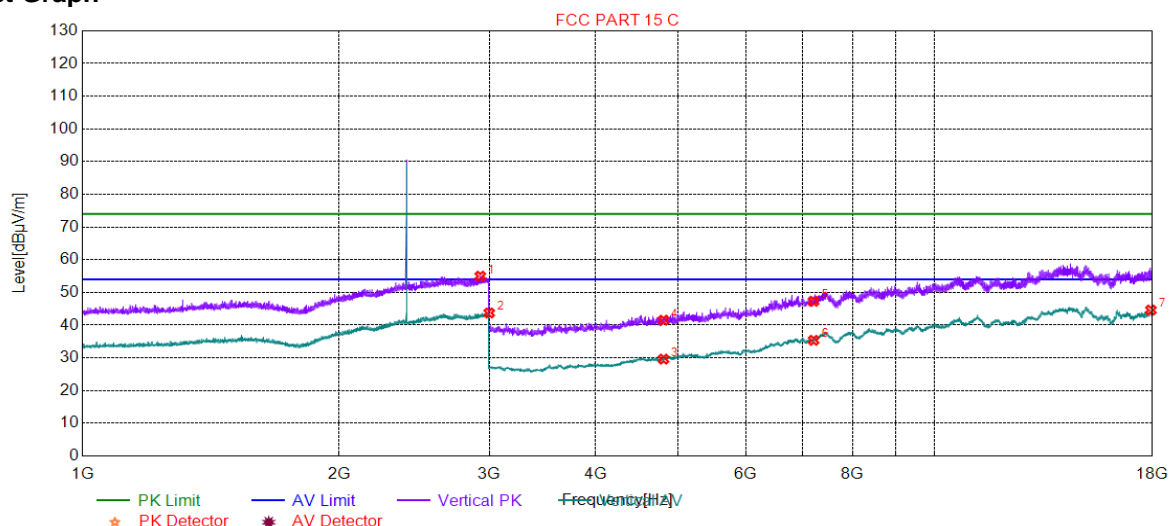
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2973.4934	55.66	9.57	74.00	18.34	158	183	Horizontal
2	2995.9990	44.00	9.47	54.00	10.00	160	18	Horizontal
3	4804.0000	41.75	-18.30	74.00	32.25	101	128	Horizontal
4	4804.0000	30.08	-18.30	54.00	23.92	118	101	Horizontal
5	7206.0000	35.49	-9.82	54.00	18.51	106	210	Horizontal
6	7206.0000	46.71	-9.82	74.00	27.29	200	73	Horizontal
7	17690.9691	44.71	-0.64	54.00	9.29	248	210	Horizontal

Final Data List



4.9.2.2 BLE 1M_Channel 0

Test Graph



Suspected List

Suspected List

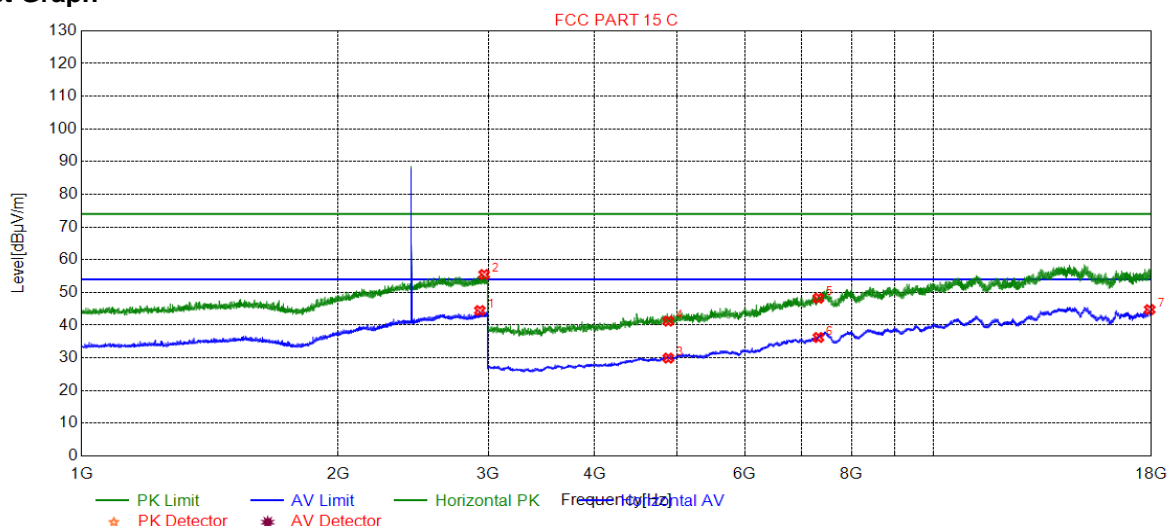
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2928.4821	54.98	9.45	74.00	19.02	227	123	Vertical
2	3000.0000	43.74	9.45	54.00	10.26	227	329	Vertical
3	4804.0000	29.63	-18.30	54.00	24.37	152	259	Vertical
4	4804.0000	41.53	-18.30	74.00	32.47	271	232	Vertical
5	7206.0000	47.31	-9.82	74.00	26.69	283	177	Vertical
6	7206.0000	35.38	-9.82	54.00	18.62	299	150	Vertical
7	17923.4923	44.64	-1.30	54.00	9.36	161	205	Vertical

Final Data List



4.9.2.3 BLE 1M_Channel 19

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2932.9832	44.48	9.50	54.00	9.52	161	140	Horizontal
2	2966.9917	55.50	9.60	74.00	18.50	135	289	Horizontal
3	4880.0000	29.94	-17.96	54.00	24.06	246	318	Horizontal
4	4880.0000	41.24	-17.96	74.00	32.76	192	45	Horizontal
5	7320.0000	48.25	-9.54	74.00	25.75	189	318	Horizontal
6	7320.0000	36.24	-9.54	54.00	17.76	246	264	Horizontal
7	17911.4911	44.77	-1.31	54.00	9.23	188	73	Horizontal

Final Data List



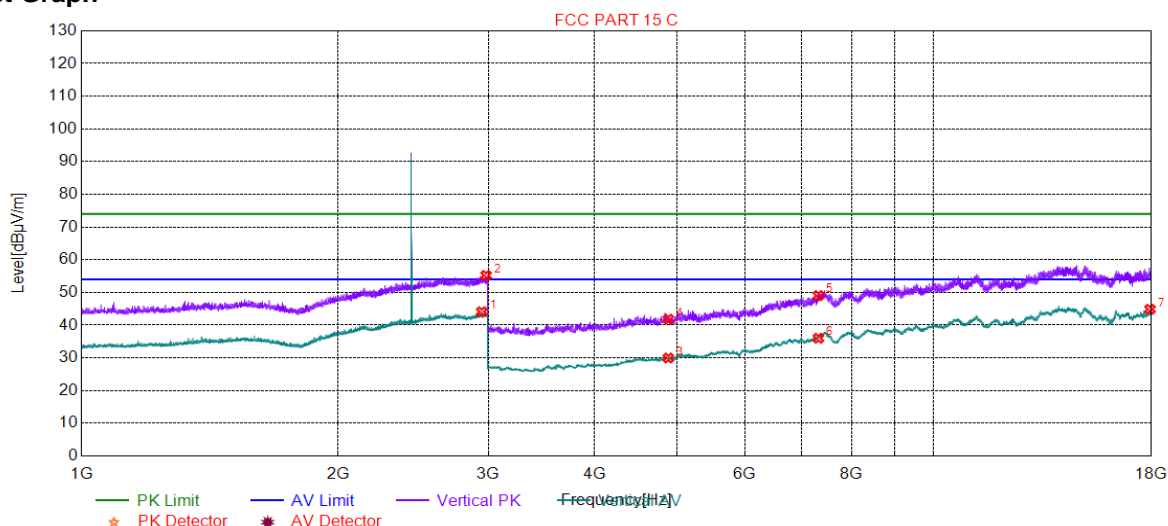
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4.9.2.4 BLE 1M_Channel 19

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2947.9870	44.13	9.66	54.00	9.87	297	12	Vertical
2	2982.4956	55.24	9.53	74.00	18.76	288	219	Vertical
3	4880.0000	29.97	-17.96	54.00	24.03	263	14	Vertical
4	4880.0000	41.86	-17.96	74.00	32.14	266	342	Vertical
5	7320.0000	49.06	-9.54	74.00	24.94	267	232	Vertical
6	7320.0000	36.01	-9.54	54.00	17.99	225	95	Vertical
7	17926.4926	44.88	-1.30	54.00	9.12	180	205	Vertical

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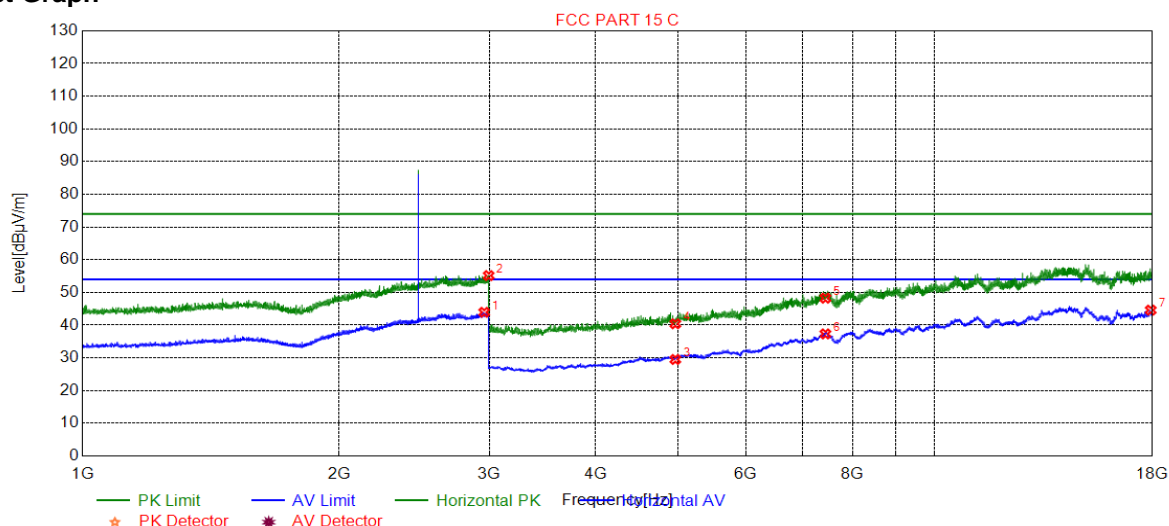
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4.9.2.5 BLE 1M_Channel 39

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.4899	43.95	9.64	54.00	10.05	206	18	Horizontal
2	2995.4989	55.16	9.47	74.00	18.84	141	32	Horizontal
3	4960.0000	29.52	-17.47	54.00	24.48	195	210	Horizontal
4	4960.0000	40.43	-17.47	74.00	33.57	203	101	Horizontal
5	7440.0000	48.27	-9.02	74.00	25.73	225	210	Horizontal
6	7440.0000	37.34	-9.02	54.00	16.66	199	238	Horizontal
7	17914.4914	44.61	-1.31	54.00	9.39	239	347	Horizontal

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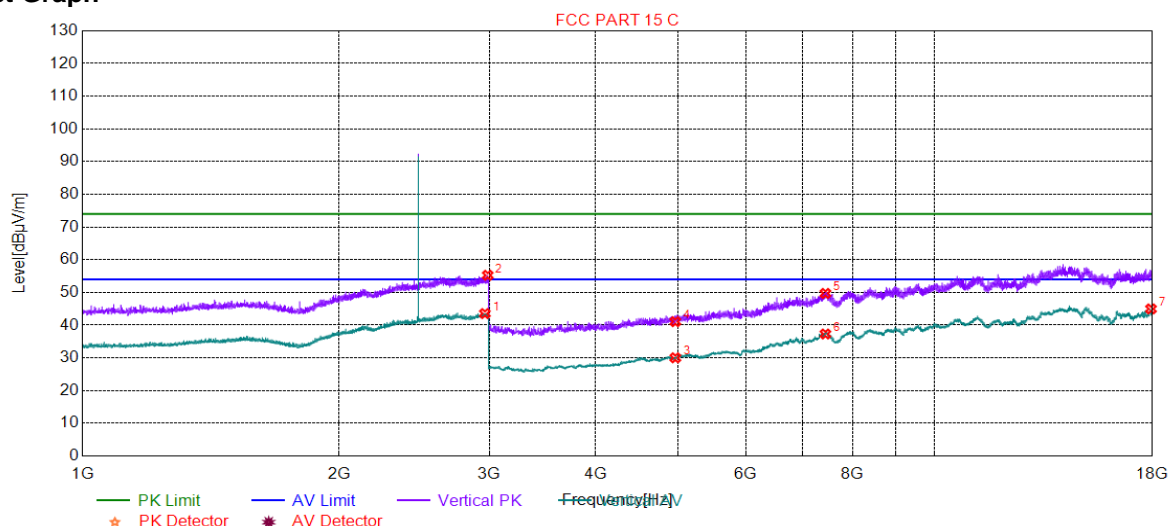
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4.9.2.6 BLE 1M_Channel 39

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2964.9912	43.56	9.61	54.00	10.44	233	26	Vertical
2	2987.9970	55.27	9.51	74.00	18.73	177	150	Vertical
3	4960.0000	30.03	-17.47	54.00	23.97	223	314	Vertical
4	4960.0000	41.09	-17.47	74.00	32.91	264	12	Vertical
5	7440.0000	49.72	-9.02	74.00	24.28	298	314	Vertical
6	7440.0000	37.31	-9.02	54.00	16.69	252	67	Vertical
7	17926.4926	44.99	-1.30	54.00	9.01	278	12	Vertical

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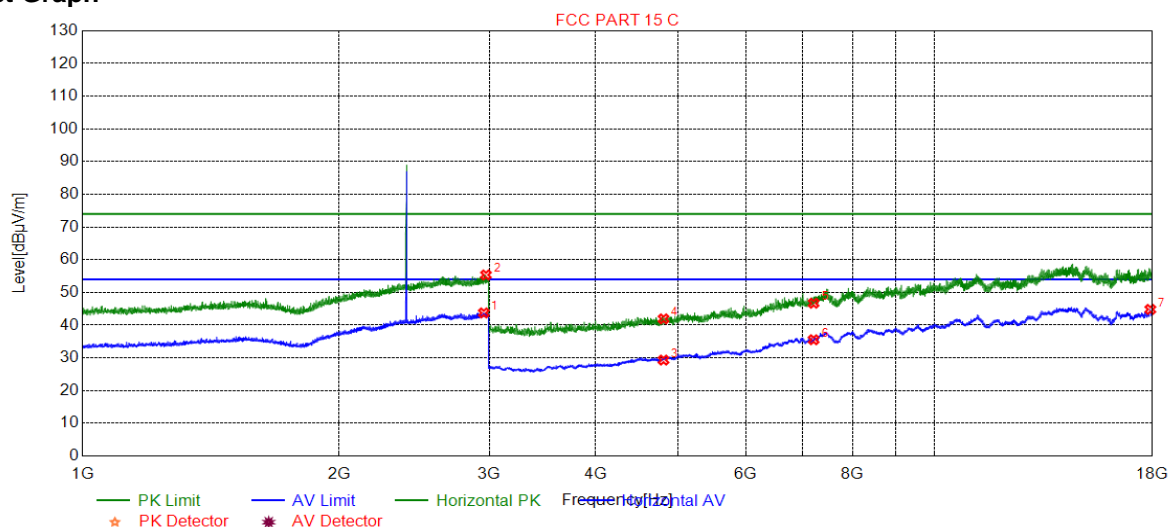
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4.9.2.7 BLE 2M_Channel 0

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2955.9890	43.75	9.65	54.00	10.25	101	224	Horizontal
2	2973.4934	55.37	9.57	74.00	18.63	209	266	Horizontal
3	4804.0000	29.34	-18.30	54.00	24.66	233	100	Horizontal
4	4804.0000	41.94	-18.30	74.00	32.06	135	72	Horizontal
5	7206.0000	46.72	-9.82	74.00	27.28	154	45	Horizontal
6	7206.0000	35.55	-9.82	54.00	18.45	142	320	Horizontal
7	17896.4896	44.83	-1.36	54.00	9.17	206	155	Horizontal

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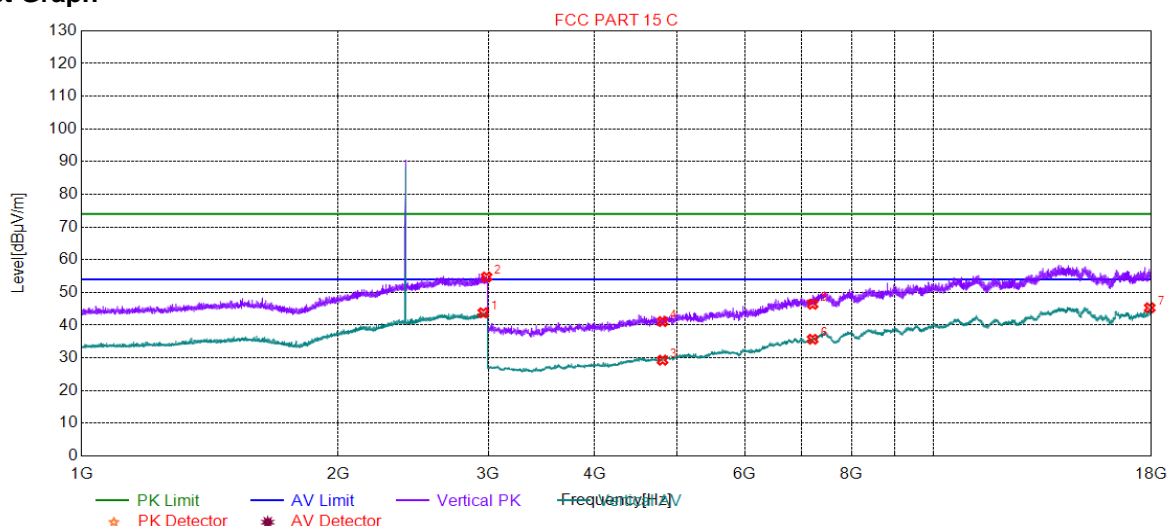
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4.9.2.8 BLE 2M_Channel 0

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.4901	43.80	9.63	54.00	10.20	198	342	Vertical
2	2986.9967	54.73	9.51	74.00	19.27	299	94	Vertical
3	4804.0000	29.31	-18.30	54.00	24.69	283	178	Vertical
4	4804.0000	41.12	-18.30	74.00	32.88	166	342	Vertical
5	7206.0000	46.41	-9.82	74.00	27.59	260	342	Vertical
6	7206.0000	35.70	-9.82	54.00	18.30	244	69	Vertical
7	17912.9913	45.32	-1.31	54.00	8.68	288	0	Vertical

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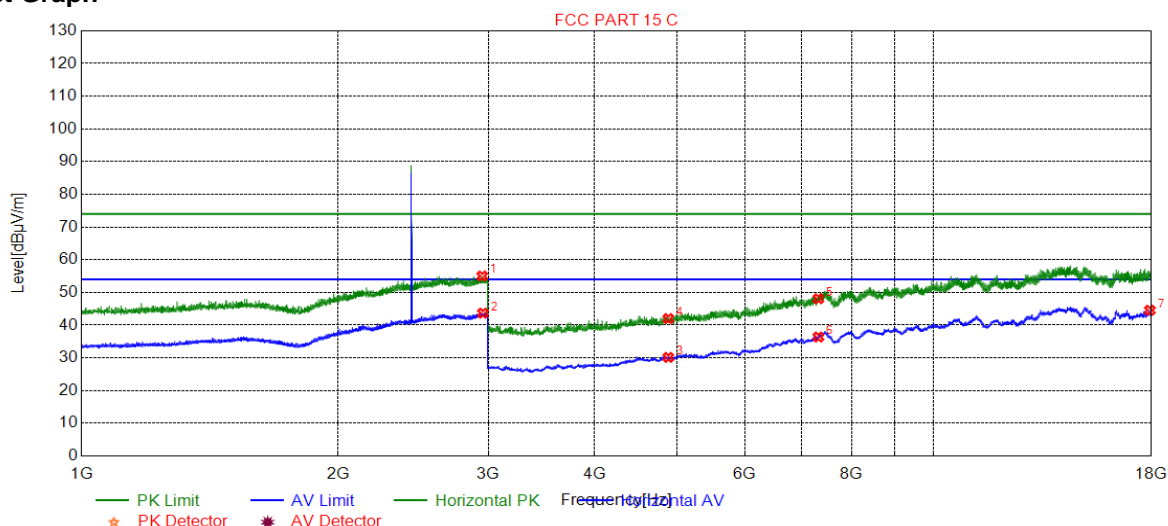
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4.9.2.9 BLE 2M_Channel 19

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2951.4879	55.04	9.67	74.00	18.96	124	183	Horizontal
2	2956.4891	43.68	9.65	54.00	10.32	186	18	Horizontal
3	4880.0000	30.15	-17.96	54.00	23.85	210	236	Horizontal
4	4880.0000	42.03	-17.96	74.00	31.97	173	360	Horizontal
5	7320.0000	48.09	-9.54	74.00	25.91	225	127	Horizontal
6	7320.0000	36.39	-9.54	54.00	17.61	207	318	Horizontal
7	17921.9922	44.57	-1.30	54.00	9.43	161	182	Horizontal

Final Data List



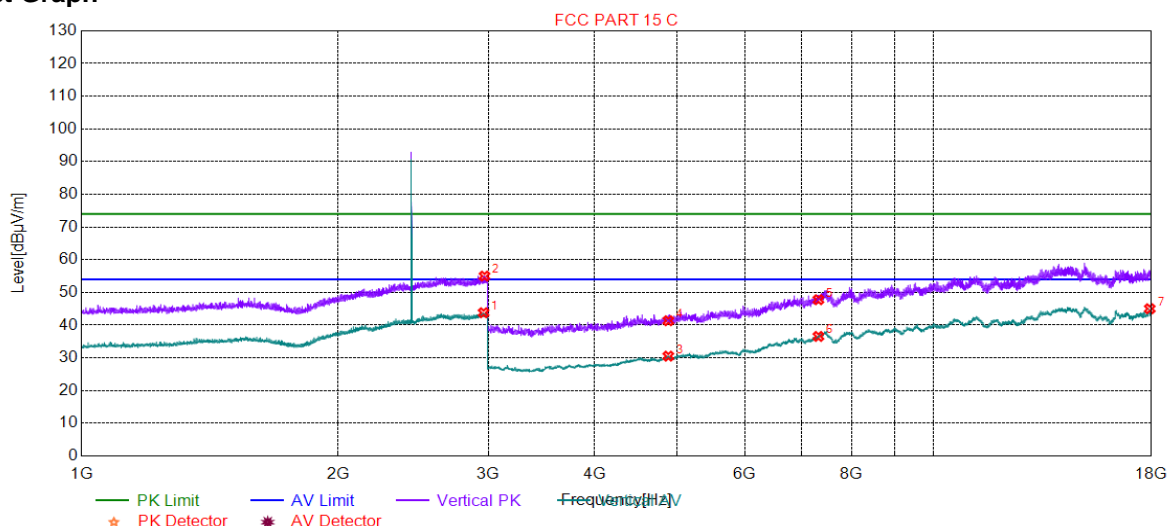
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4.9.2.10 BLE 2M_Channel 19

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2962.4906	43.81	9.62	54.00	10.19	194	150	Vertical
2	2969.9925	55.02	9.59	74.00	18.98	265	342	Vertical
3	4880.0000	30.54	-17.96	54.00	23.46	188	179	Vertical
4	4880.0000	41.36	-17.96	74.00	32.64	273	342	Vertical
5	7320.0000	47.79	-9.54	74.00	26.21	269	261	Vertical
6	7320.0000	36.57	-9.54	54.00	17.43	251	14	Vertical
7	17915.9916	45.04	-1.31	54.00	8.96	206	0	Vertical

Final Data List



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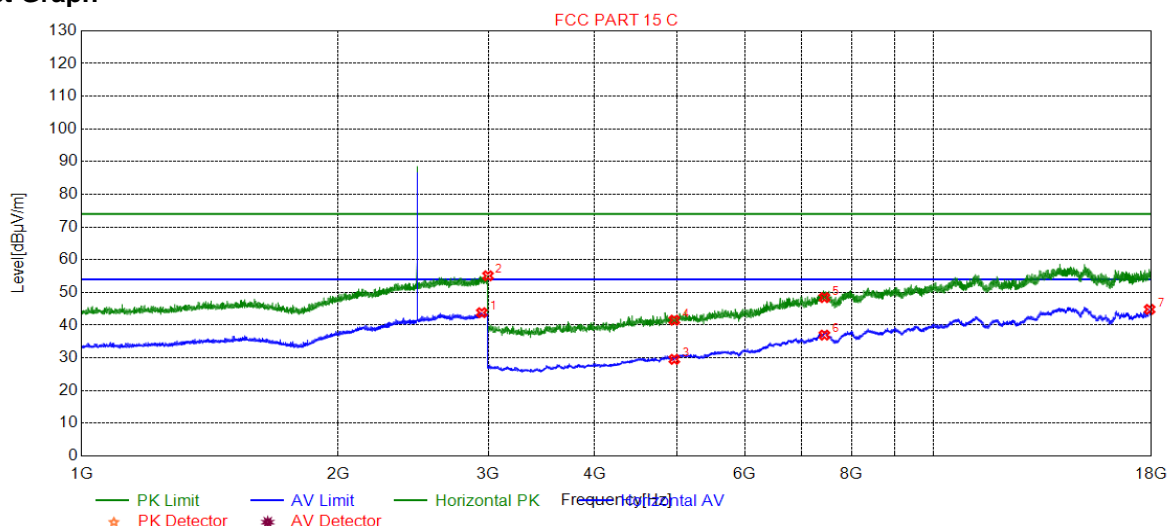
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4.9.2.11 BLE 2M_Channel 39

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2947.9870	43.83	9.66	54.00	10.17	246	266	Horizontal
2	2997.9995	55.10	9.46	74.00	18.90	117	18	Horizontal
3	4960.0000	29.56	-17.47	54.00	24.44	192	156	Horizontal
4	4960.0000	41.54	-17.47	74.00	32.46	124	73	Horizontal
5	7440.0000	48.44	-9.02	74.00	25.56	184	210	Horizontal
6	7440.0000	36.97	-9.02	54.00	17.03	169	183	Horizontal
7	17909.9910	44.84	-1.31	54.00	9.16	220	101	Horizontal

Final Data List

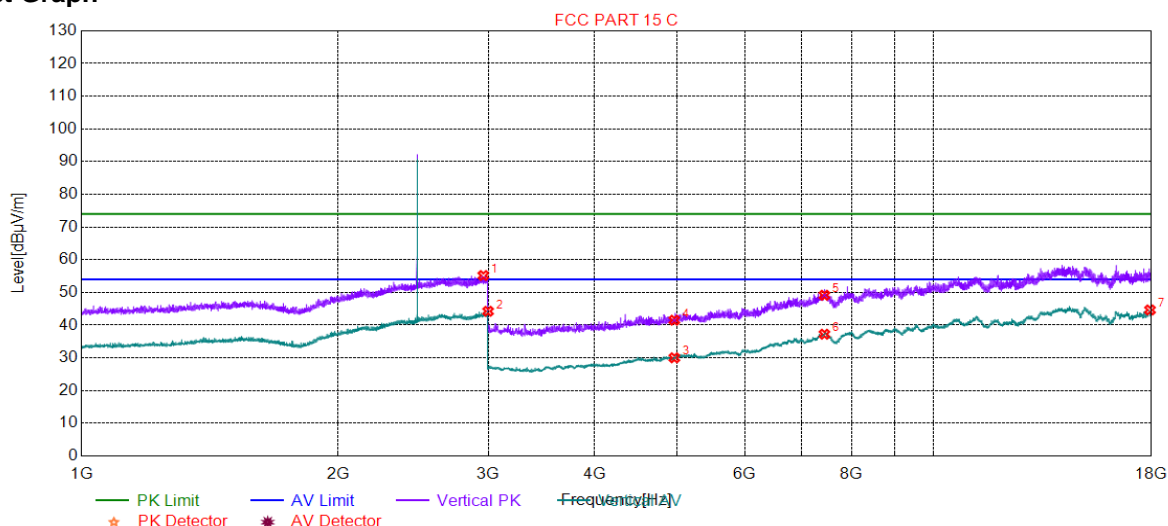


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4.9.2.12 BLE 2M_Channel 39

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.4901	55.18	9.63	74.00	18.82	169	12	Vertical
2	2998.9998	44.26	9.45	54.00	9.74	250	232	Vertical
3	4960.0000	30.03	-17.47	54.00	23.97	177	122	Vertical
4	4960.0000	41.53	-17.47	74.00	32.47	298	149	Vertical
5	7440.0000	49.16	-9.02	74.00	24.84	163	177	Vertical
6	7440.0000	37.25	-9.02	54.00	16.75	295	40	Vertical
7	17927.9928	44.66	-1.30	54.00	9.34	267	260	Vertical

Final Data List

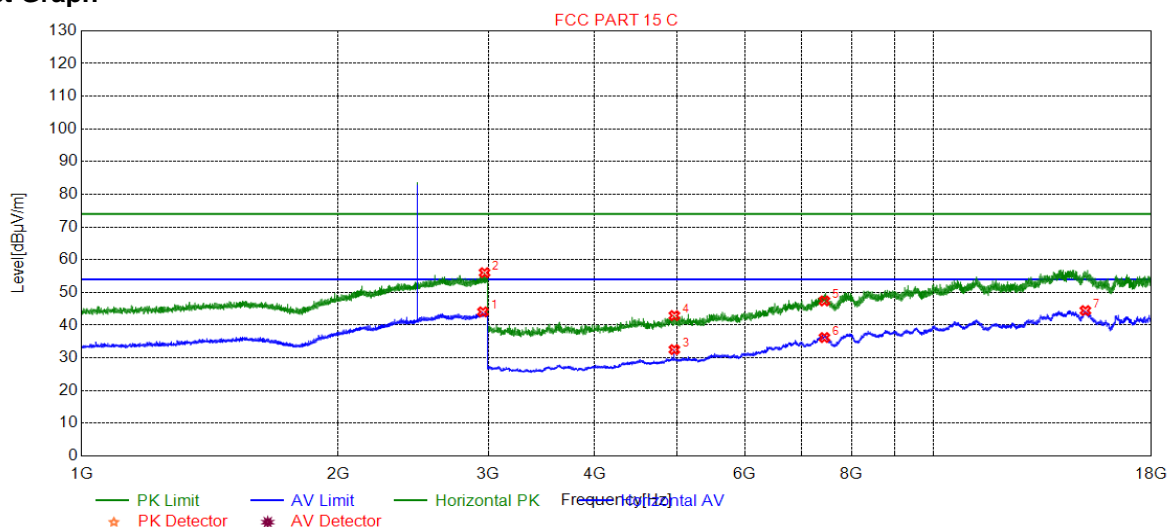


Test on the worst case:

4.9.3 Transmitter Emission above 1GHz

4.9.3.1 BLE_1M_Channel 39

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2957.48	44.08	9.65	54.00	9.92	205	270	Horizontal
2	2970.49	56.05	9.59	74.00	17.95	229	220	Horizontal
3	4960.00	32.53	-17.47	54.00	21.47	163	18	Horizontal
4	4960.00	42.93	-17.47	74.00	31.07	192	18	Horizontal
5	7440.00	47.42	-9.02	74.00	26.58	226	102	Horizontal
6	7440.00	36.22	-9.02	54.00	17.78	163	184	Horizontal
7	15056.7	44.47	2.65	54.00	9.53	152	46	Horizontal

Final Data List

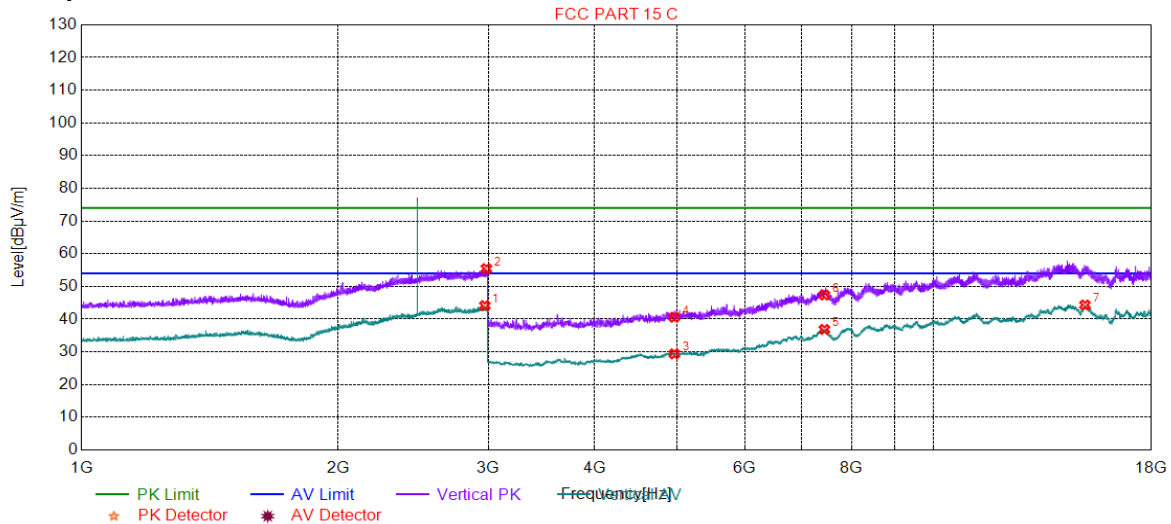


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4.9.3.2 BLE_1M_Channel 39

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.99	44.14	9.57	54.00	9.86	279	340	Vertical
2	2984.99	55.47	9.52	74.00	18.53	282	300	Vertical
3	4960.00	29.42	-17.47	54.00	24.58	208	233	Vertical
4	4960.00	40.60	-17.47	74.00	33.40	249	205	Vertical
5	7440.00	36.86	-9.02	54.00	17.14	175	15	Vertical
6	7440.00	47.40	-9.02	74.00	26.60	174	69	Vertical
7	15038.7	44.34	2.62	54.00	9.66	290	315	Vertical

Final Data List

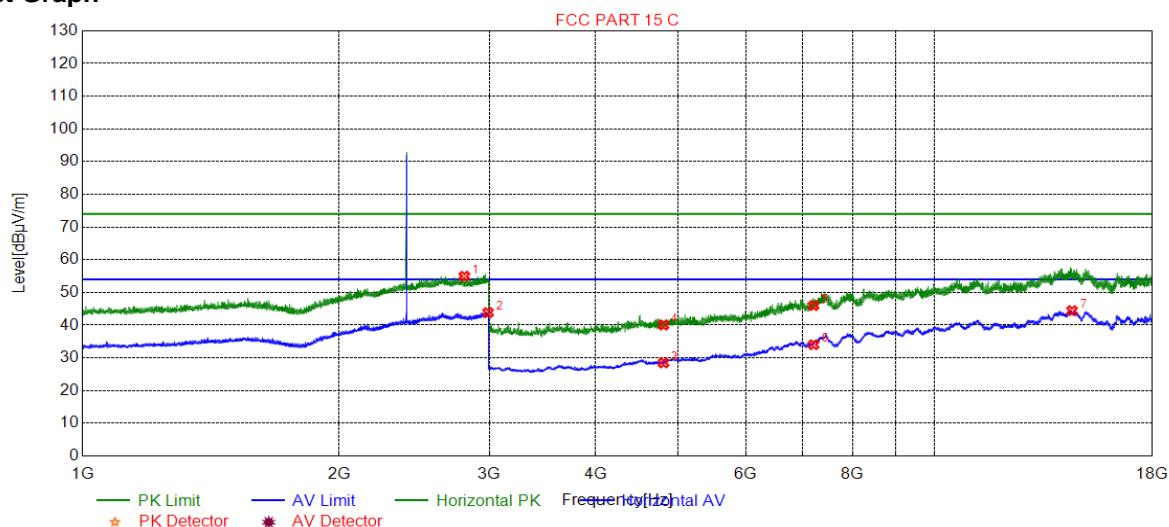


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4.9.3.3 BLE_2M_Channel 0

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2805.45	54.97	9.01	74.00	19.03	131	248	Horizontal
2	2990.99	43.84	9.49	54.00	10.16	201	360	Horizontal
3	4804.00	28.49	-18.30	54.00	25.51	140	344	Horizontal
4	4804.00	40.04	-18.30	74.00	33.96	198	153	Horizontal
5	7206.00	46.00	-9.82	74.00	28.00	152	262	Horizontal
6	7206.00	34.04	-9.82	54.00	19.96	106	126	Horizontal
7	14483.6	44.44	2.31	54.00	9.56	236	234	Horizontal

Final Data List



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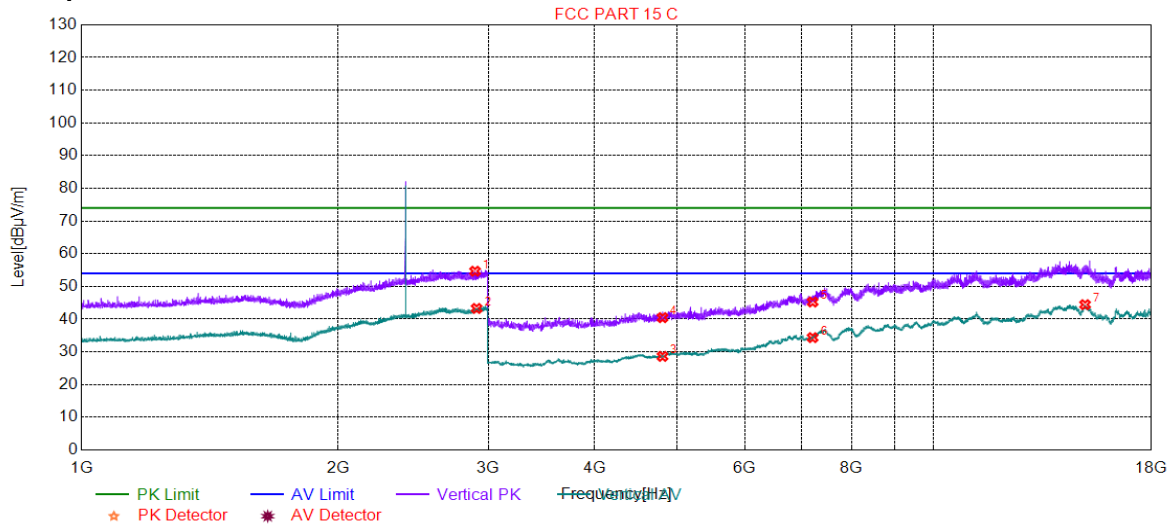
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4.9.3.4 BLE_2M_Channel 0

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2894.97	54.67	9.15	74.00	19.33	196	191	Vertical
2	2907.47	43.29	9.22	54.00	10.71	239	136	Vertical
3	4804.00	28.63	-18.30	54.00	25.37	244	314	Vertical
4	4804.00	40.48	-18.30	74.00	33.52	208	314	Vertical
5	7206.00	45.26	-9.82	74.00	28.74	155	0	Vertical
6	7206.00	34.37	-9.82	54.00	19.63	187	233	Vertical
7	15043.2	44.45	2.62	54.00	9.55	267	205	Vertical

Final Data List

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
- 4) All Modes have been tested, but only the worst case data displayed in this report.



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4.10 Restricted bands around fundamental frequency

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)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

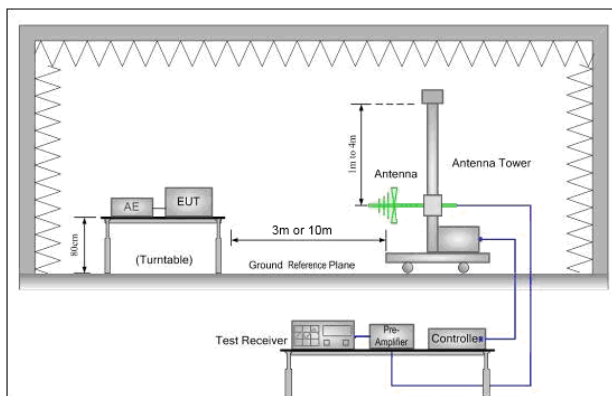


Figure 1. 30MHz to 1GHz

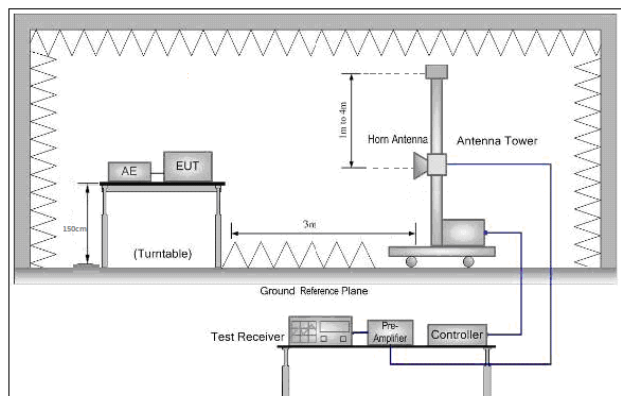


Figure 2. Above

1 GHz

Test Procedure:	<p>a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <p>b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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</p>
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	<p>h. Test the EUT in the lowest channel, the Highest channel</p> <p>i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.</p> <p>j. Repeat above procedures until all frequencies measured was complete.</p>
Exploratory Test Mode:	<p>Transmitting with GFSK modulation.</p> <p>Charge + Transmitting mode.</p>
Final Test Mode:	<p>Transmitting with GFSK modulation.</p> <p>Pretest the EUT at Charge + Transmitting mode.</p> <p>Only the worst case is recorded in the report.</p>
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass



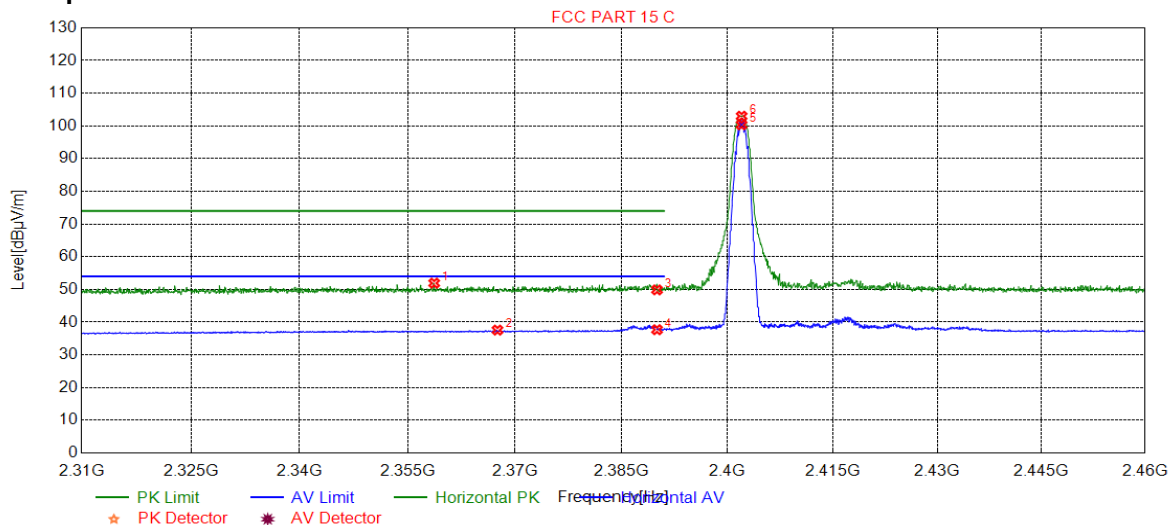
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4.10.1 Test plots

4.10.1.1 BLE 1M_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	2358.6994	51.94	7.80	74.00	22.06	162	144	Horizontal
2	2367.5538	37.58	7.79	54.00	16.42	120	226	Horizontal
3	2390.0000	49.88	7.77	74.00	24.12	236	216	Horizontal
4	2390.0000	37.70	7.77	54.00	16.30	103	216	Horizontal
5	2402.0000	100.36	7.77	0.00	-100.36	163	226	Horizontal
6	2402.0000	102.99	7.77	0.00	-102.99	240	221	Horizontal

Final Data List

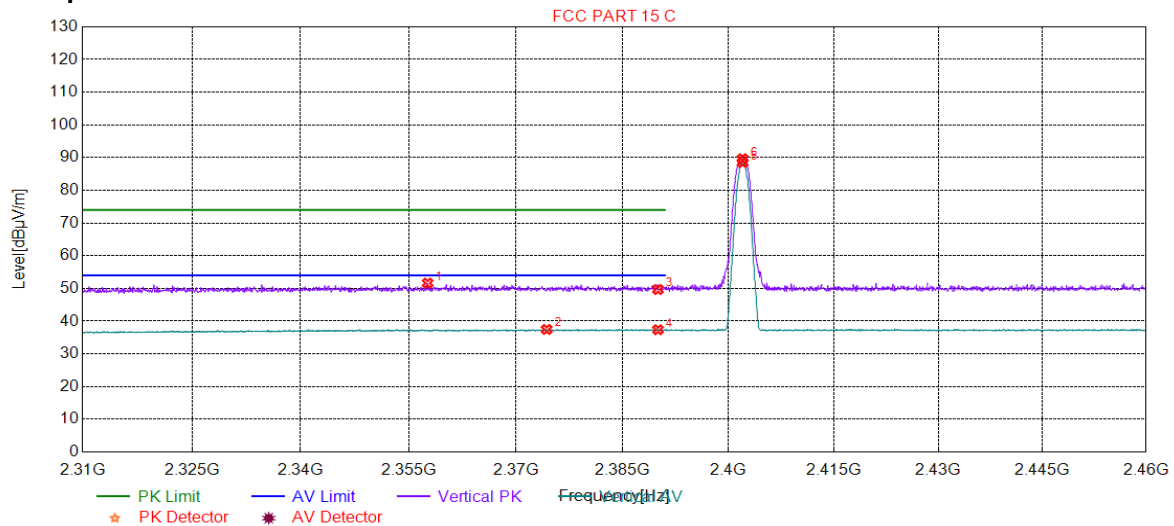


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4.10.1.2 BLE 1M_Channel 0

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2357.6488	51.64	7.80	74.00	22.36	261	234	Vertical
2	2374.3072	37.48	7.79	54.00	16.52	296	168	Vertical
3	2390.0000	49.68	7.77	74.00	24.32	217	97	Vertical
4	2390.0000	37.39	7.77	54.00	16.61	255	70	Vertical
5	2402.0000	88.55	7.77	0.00	-88.55	259	97	Vertical
6	2402.0000	89.68	7.77	0.00	-89.68	185	152	Vertical

Final Data List



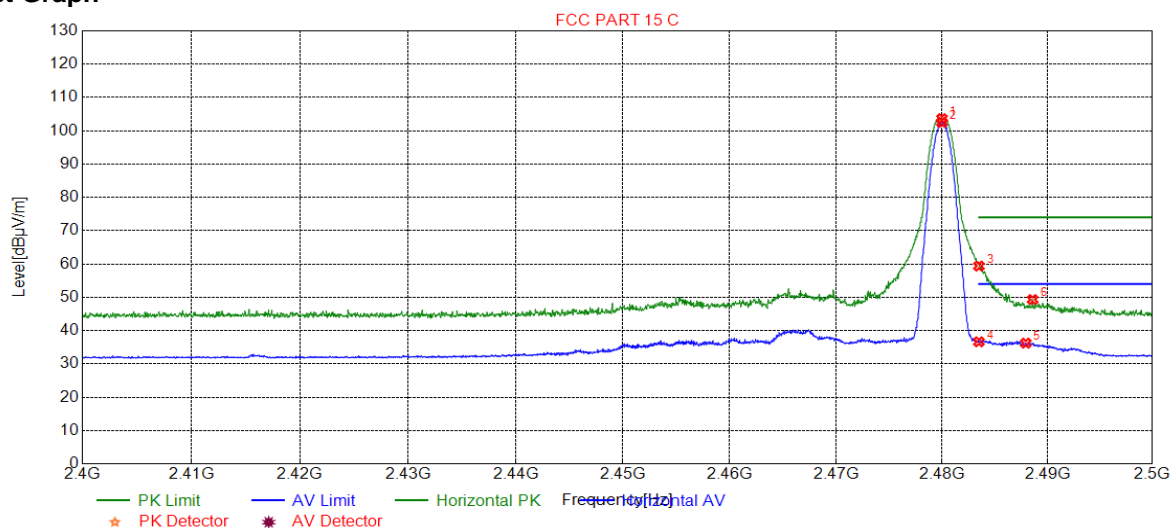
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4.10.1.3 BLE 1M_Channel 39

Test Graph



Suspected List

Suspected List

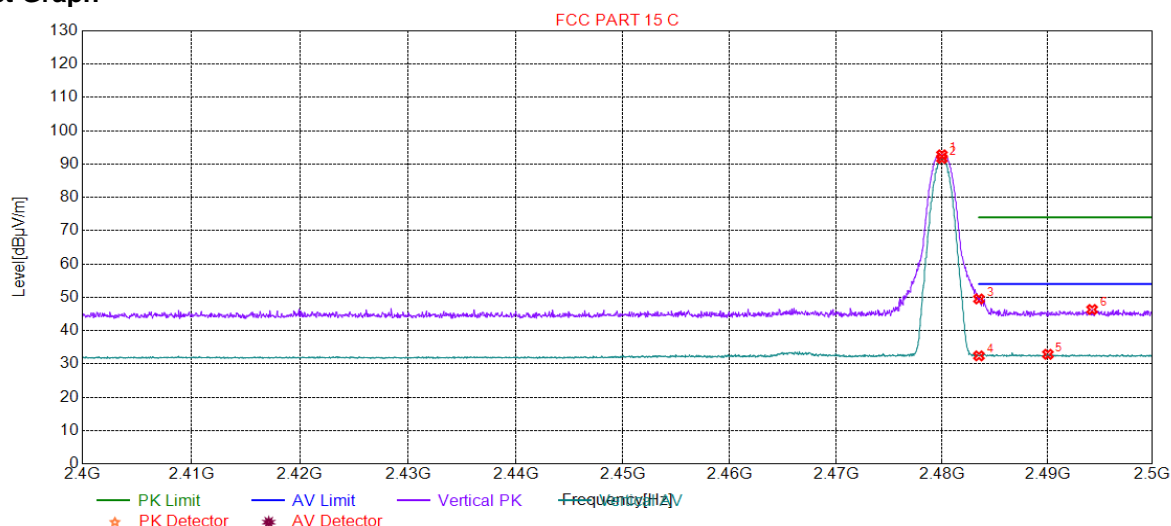
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.0000	103.65	8.01	0.00	-103.65	168	238	Horizontal
2	2480.0000	102.52	8.01	0.00	-102.52	229	248	Horizontal
3	2483.5000	59.40	8.01	74.00	14.60	226	232	Horizontal
4	2483.5000	36.67	8.01	54.00	17.33	146	238	Horizontal
5	2487.9440	36.27	8.02	54.00	17.73	141	238	Horizontal
6	2488.5943	49.34	8.02	74.00	24.66	129	238	Horizontal

Final Data List



4.10.1.4 BLE 1M_Channel 39

Test Graph



Suspected List

Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.0000	92.78	8.01	0.00	-92.78	178	210	Vertical
2	2480.0000	91.71	8.01	0.00	-91.71	218	171	Vertical
3	2483.5000	49.52	8.01	74.00	24.48	262	74	Vertical
4	2483.5000	32.44	8.01	54.00	21.56	196	171	Vertical
5	2490.0450	32.91	8.02	54.00	21.09	187	171	Vertical
6	2494.2471	46.35	8.02	74.00	27.65	277	177	Vertical

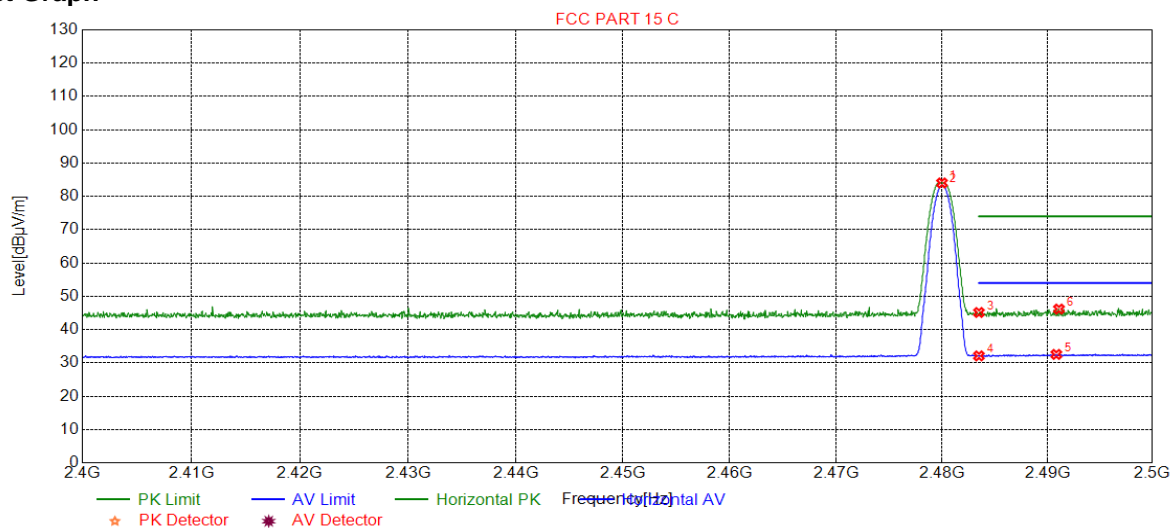
Final Data List



Test on the worst case:

4.10.1.1 BLE_1M_Channel 39

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	84.03	8.01	0.00	-84.03	184	270	Horizontal
2	2480.00	83.35	8.01	0.00	-83.35	145	260	Horizontal
3	2483.50	45.17	8.01	74.00	28.83	114	360	Horizontal
4	2483.50	32.14	8.01	54.00	21.86	243	270	Horizontal
5	2490.84	32.58	8.02	54.00	21.42	202	30	Horizontal
6	2491.09	46.19	8.02	74.00	27.81	151	330	Horizontal

Final Data List



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Shenzhen Branch Testing Center FCC Laboratory

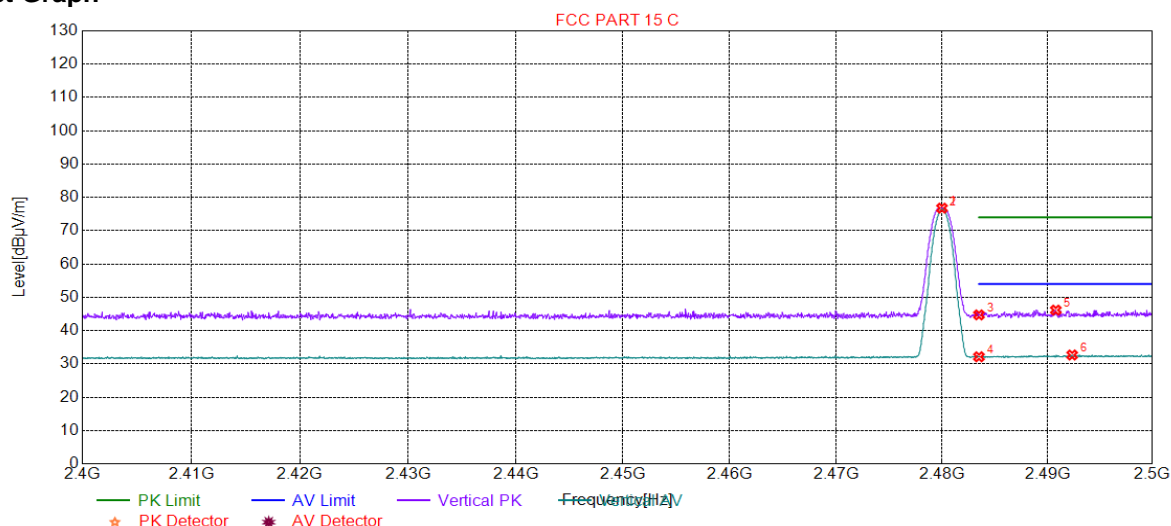
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4.10.1.2 BLE_1M_Channel 39

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	76.78	8.01	0.00	-76.78	175	340	Vertical
2	2480.00	76.49	8.01	0.00	-76.49	246	250	Vertical
3	2483.50	44.74	8.01	74.00	29.26	296	200	Vertical
4	2483.50	32.17	8.01	54.00	21.83	224	200	Vertical
5	2490.79	46.18	8.02	74.00	27.82	244	30	Vertical
6	2492.34	32.70	8.02	54.00	21.30	157	340	Vertical

Final Data List



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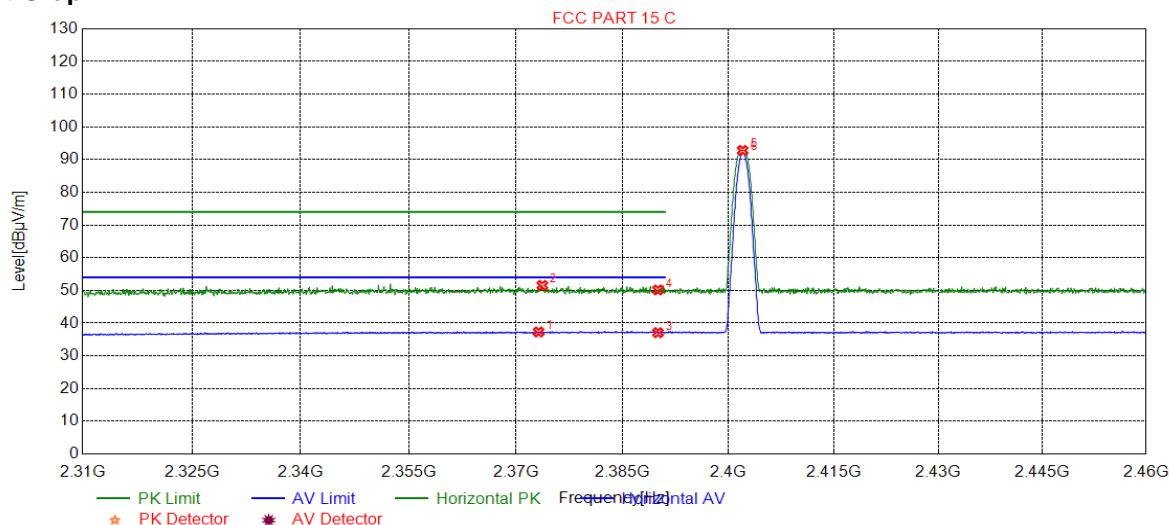
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4.10.1.3 BLE_2M_Channel 0

Test Graph



Suspected List

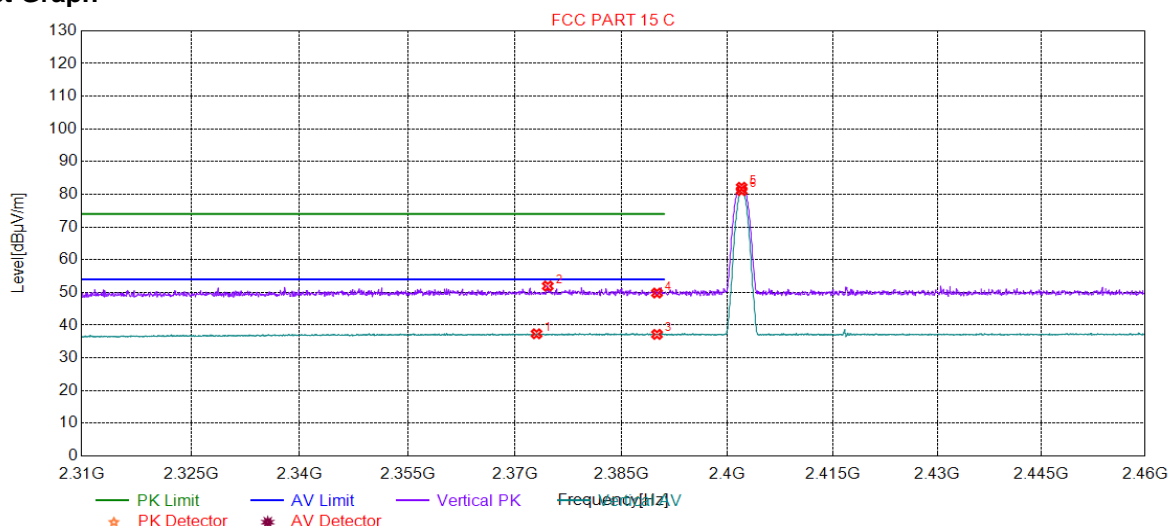
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2373.18	37.32	7.79	54.00	16.68	124	79	Horizontal
2	2373.70	51.56	7.79	74.00	22.44	134	79	Horizontal
3	2390.00	37.10	7.77	54.00	16.90	103	30	Horizontal
4	2390.00	50.17	7.77	74.00	23.83	111	112	Horizontal
5	2402.00	92.82	7.77	0.00	-92.82	192	205	Horizontal
6	2402.00	92.11	7.77	0.00	-92.11	149	205	Horizontal

Final Data List



4.10.1.4 BLE_2M_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	2373.03	37.37	7.79	54.00	16.63	170	264	Vertical
2	2374.60	51.97	7.79	74.00	22.03	232	145	Vertical
3	2390.00	37.19	7.77	54.00	16.81	234	156	Vertical
4	2390.00	49.84	7.77	74.00	24.16	205	232	Vertical
5	2402.00	82.17	7.77	0.00	-82.17	269	313	Vertical
6	2402.00	81.17	7.77	0.00	-81.17	256	303	Vertical

Final Data List

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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



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

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	$\pm 0.75\text{dB}$
2	RF power density, conducted	$\pm 2.84\text{dB}$
3	Spurious emissions, conducted	$\pm 0.75\text{dB}$
4	Temperature test	$\pm 1^{\circ}\text{C}$
5	Humidity test	$\pm 3\%$
6	DC and low frequency voltages	$\pm 0.5\%$

Lab B:

No.	Item	Measurement Uncertainty
1	Conduct emission test	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
2	Radiated Spurious emission test	$\pm 4.8\text{dB}$ (Below 1GHz)
		$\pm 4.8\text{dB}$ (1GHz to 6GHz)
		$\pm 4.5\text{dB}$ (6GHz to 18GHz)
		$\pm 5.02\text{dB}$ (Above 18GHz)



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6 Equipment List

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

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	2019-12-06	2020-12-05
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	2020-04-02	2021-04-01
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	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2019-12-03	2020-12-02
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
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 - Photographs of Set-Up for AR/2020/A0003.

The End



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