FCC TEST REPORT

Application No:	ZR/2020/30010
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.:	M2004J11G
Trade Mark:	POCO
FCC ID:	2AFZZJ11G
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:	2020/3/12
Date of Test:	2020/3/13to 2020/4/27
Date of Issue:	2021/5/1
Test Result:	**PASS ***

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Derek Yang

Derek Yang
Wireless Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00		2020/4/27		Original
01		2021/5/1	Eason Wang	1. Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

*This report supersedes our previous report ZR/2020/3001005, issued on 2020/4/27, which is hereby deemed null and void.

Authorized for issue by:		
Prepared By		Eason Wang **(Eason Wang) /Engineer**
Checked By		David Chen **(David Chen) /Reviewer**

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2 Test Summary

Test Item	Test Requirement	Test method	Test Result	Result	Test Lab*
AC Power Line Conducted Emission	15.207	ANSI C63.10 2013	Clause 4.2	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：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

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

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:	Adam Liang, 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

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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.:	M2004J11G
Trade Mark:	POCO
Hardware Version:	P1
Software Version:	MIUI11
Operation Frequency:	2400MHz~2483.5MHz fc = 2402 MHz + N * 2 MHz, where: -fc = “Operating Frequency” in MHz, -N = “Channel Number” with the range from 0 to 39.
Bluetooth Version:	Bluetooth V5.0 LE
Modulation Type:	GFSK
Number of Channel:	40
Sample Type:	☐ Portable Device, ☒Module
Antenna Type:	☐ External, ☒ Integrated
Antenna Gain:	-1.43dBi
Power Supply:	☐ AC/DC Adapter; ☒ Battery;☐ PoE:; ☐ Other:
Accessories:	

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)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -1.8dBi.	

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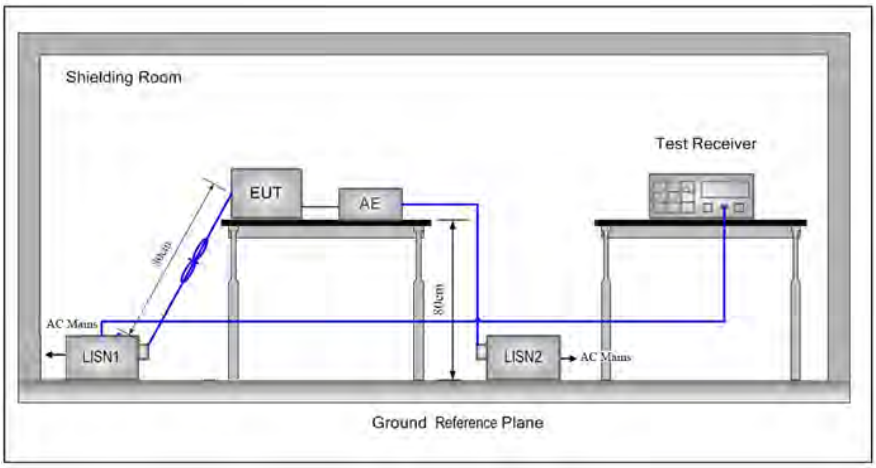
4.2 AC Power Line Conducted Emissions

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

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Test Mode:	Transmitting with GFSK modulation. Charge +Transmitting mode.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

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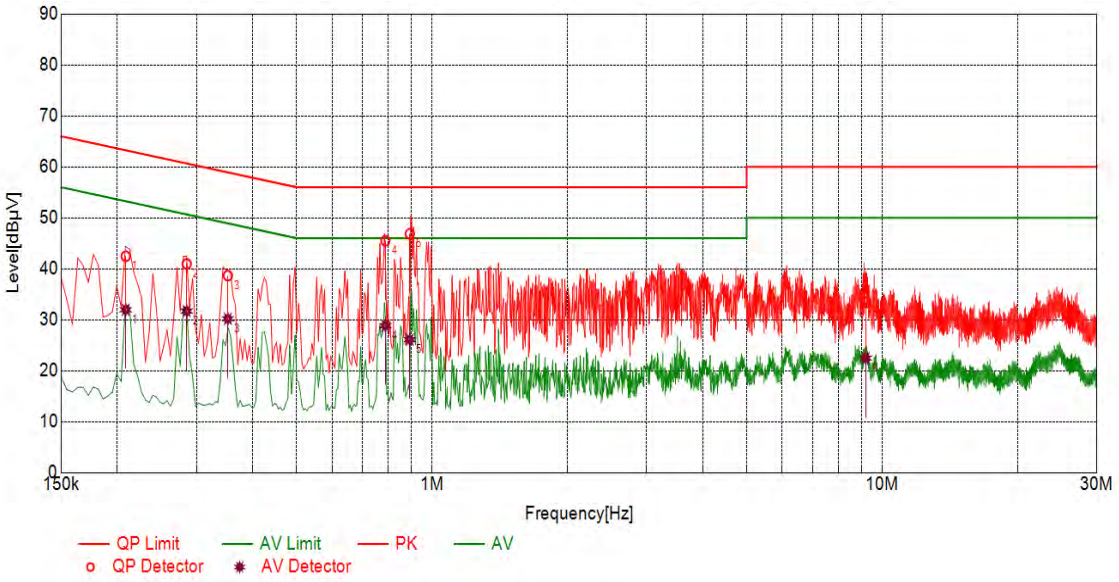
Measurement Data

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.

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	0.2088	10.10	42.46	63.25	20.79	31.96	53.25	21.29	L
2	0.2853	10.10	40.96	60.66	19.70	31.70	50.66	18.96	L
3	0.3521	10.10	38.66	58.91	20.25	30.19	48.91	18.72	L
4	0.7880	10.10	45.50	56.00	10.50	28.83	46.00	17.17	L
5	0.8929	10.10	46.88	56.00	9.12	26.08	46.00	19.92	L
6	9.1998	10.10	33.38	60.00	26.62	22.46	50.00	27.54	L

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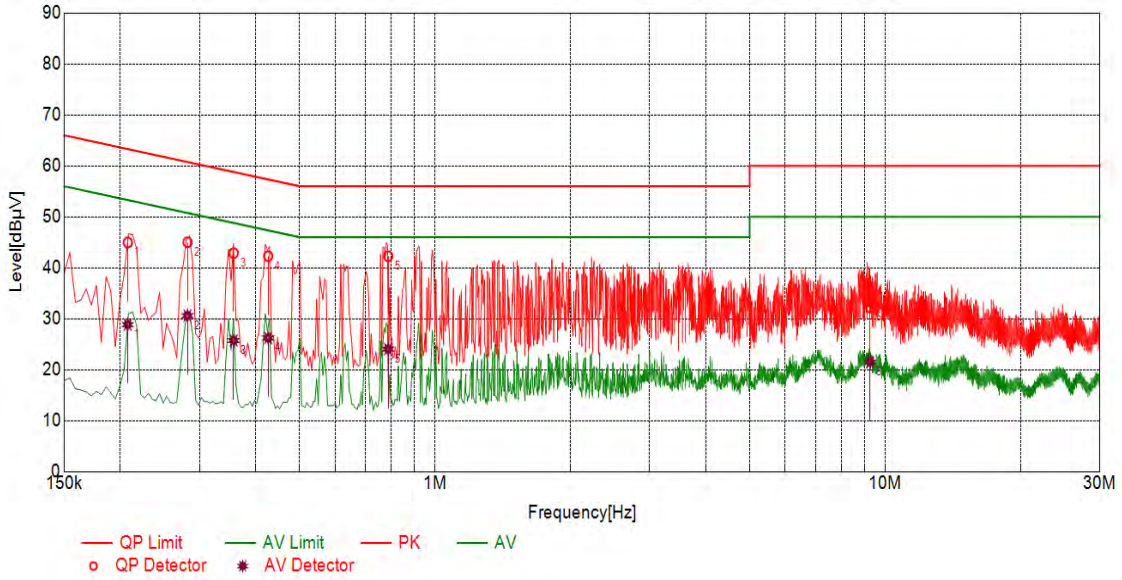
Neutral line:



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	0.2078	10.10	44.96	63.29	18.33	28.85	53.29	24.44	N
2	0.2821	10.10	45.01	60.75	15.74	30.59	50.75	20.16	N
3	0.3573	10.10	42.89	58.79	15.90	25.72	48.79	23.07	N
4	0.4261	10.10	42.28	57.33	15.05	26.22	47.33	21.11	N
5	0.7872	10.10	42.28	56.00	13.72	24.03	46.00	21.97	N
6	9.2670	10.10	32.22	60.00	27.78	21.49	50.00	28.51	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	61.98
BLE_2M	CH0, CH19, CH39	31.48

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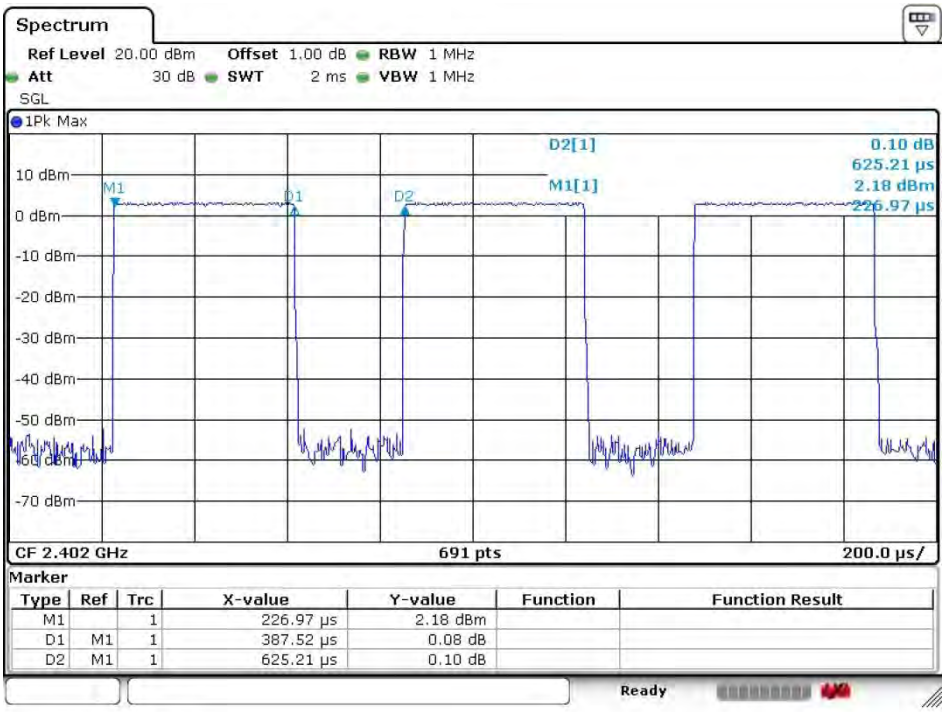
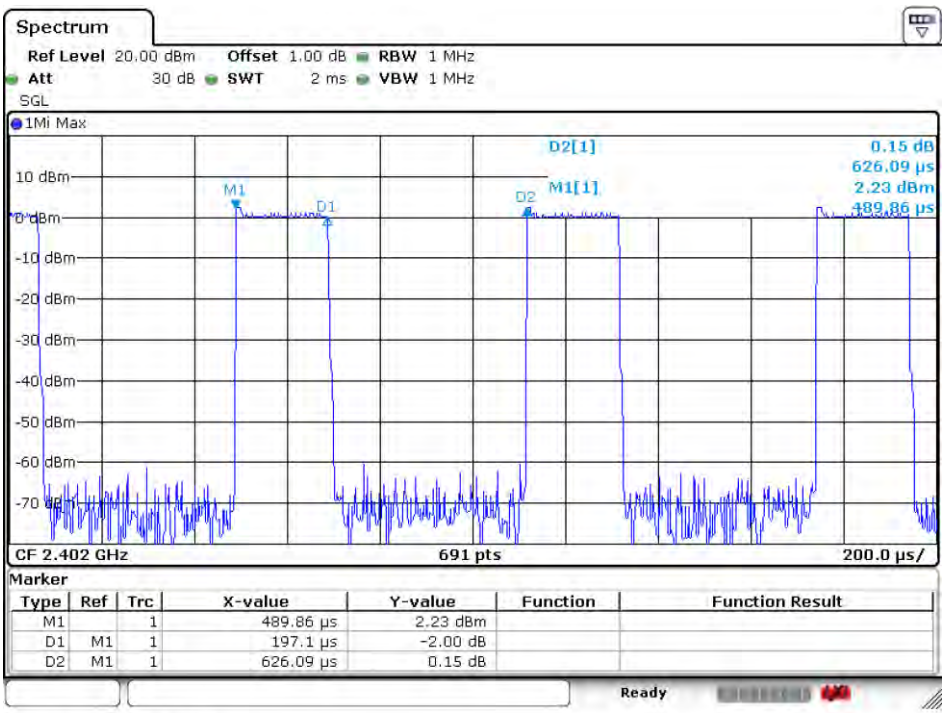
4.3.1 Test Plots

4.3.1.1 BLE



Date: 24.MAR.2020 13:32:13



Date: 25.MAR.2020 06:55:08

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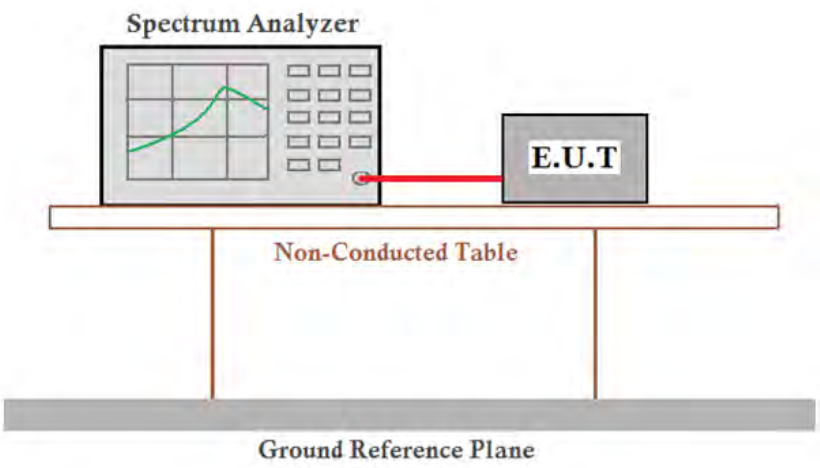
4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.1
Test Setup:	
Limit:	30dBm
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

4.4.1 Test Results

Measurement Data of Average Power

GFSK 1M mode_ANT1		
Test channel	Average Output Power (dBm)	Result
Lowest	3.16	Report purpose only
Middle	3.19	Report purpose only
Highest	2.81	Report purpose only

GFSK 2M mode_ANT1		
Test channel	Average Output Power (dBm)	Result
Lowest	-0.41	Report purpose only
Middle	0.28	Report purpose only
Highest	0.27	Report purpose only

GFSK 1M mode_ANT2		
Test channel	Average Output Power (dBm)	Result
Lowest	3.57	Report purpose only
Middle	3.61	Report purpose only
Highest	3.04	Report purpose only

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GFSK 2M_mode_ANT2		
Test channel	Average Output Power (dBm)	Result
Lowest	0.16	Report purpose only
Middle	0.61	Report purpose only
Highest	0.59	Report purpose only

Measurement Data of Peak Power:

GFSK 1M mode_ANT1			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	3.38	30.00	Pass
Middle	3.95	30.00	Pass
Highest	3.25	30.00	Pass

GFSK 2M mode_ANT1			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.99	30.00	Pass
Middle	5.78	30.00	Pass
Highest	5.35	30.00	Pass

GFSK 1M mode_ANT2			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.95	30.00	Pass
Middle	5.64	30.00	Pass
Highest	5.72	30.00	Pass

GFSK 2M mode_ANT2			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.67	30.00	Pass
Middle	5.57	30.00	Pass
Highest	4.99	30.00	Pass

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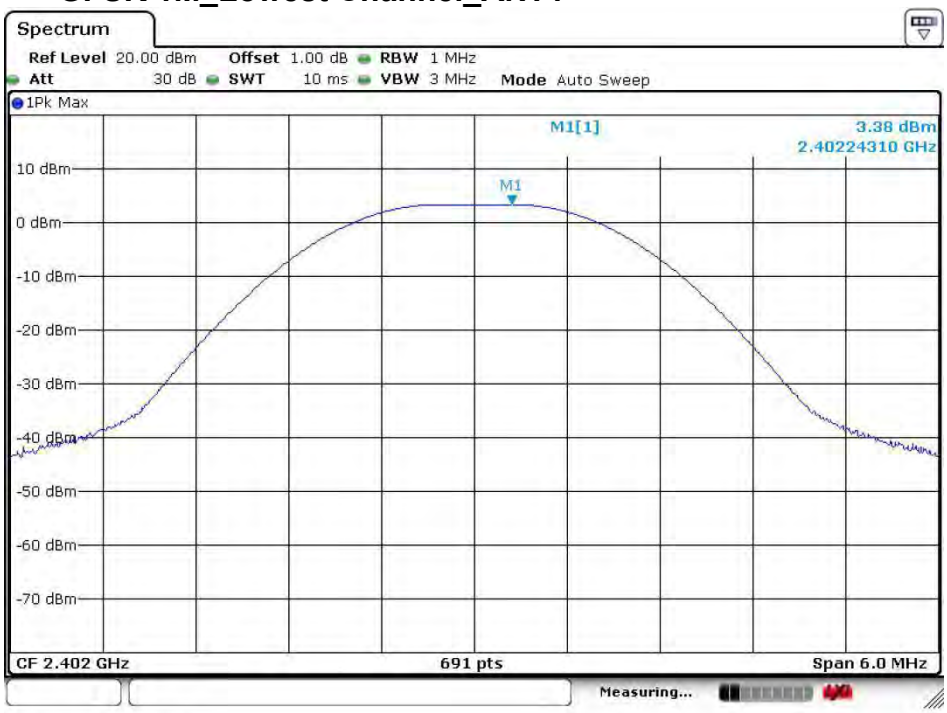
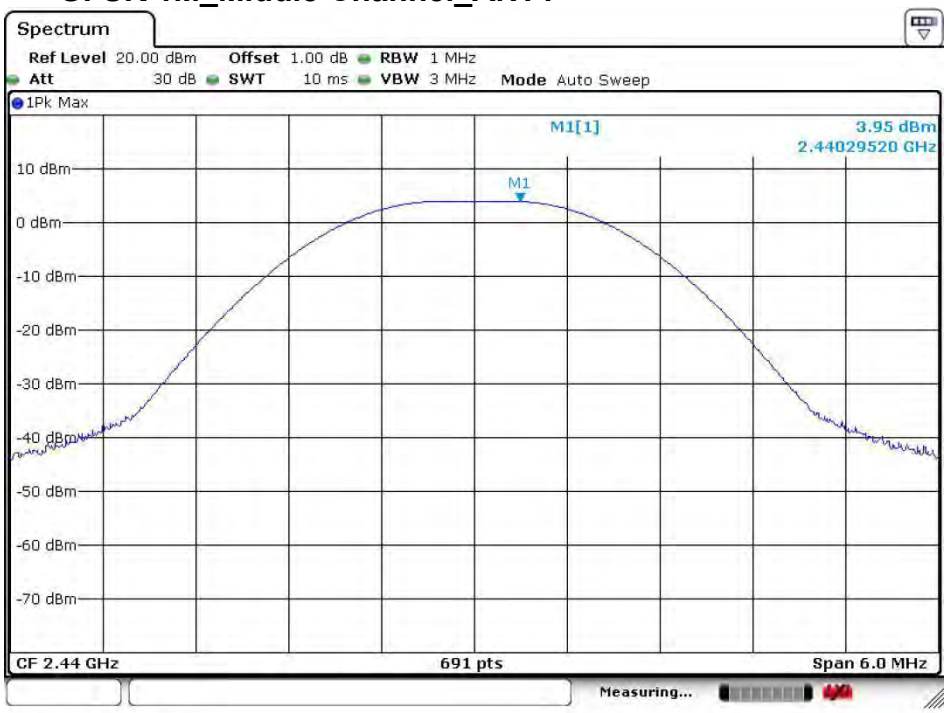
4.4.2 Test plots:

4.4.2.1 GFSK 1M_Lowest Channel_ANT1



Date: 24.MAR.2020 13:16:49

4.4.2.2 GFSK 1M_Middle Channel_ANT1



Date: 24.MAR.2020 13:17:29

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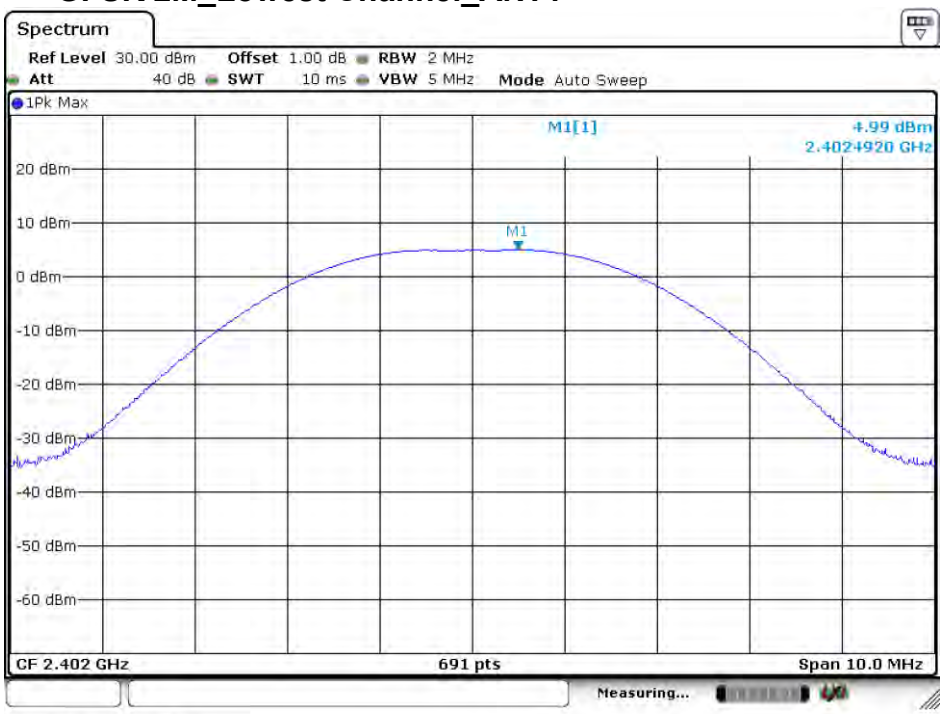
4.4.2.3 GFSK 1M_Highest Channel_ANT1

Date: 24.MAR.2020 13:17:49

4.4.2.4 GFSK 2M_Lowest Channel_ANT1



Date: 30.APR.2020 07:45:21

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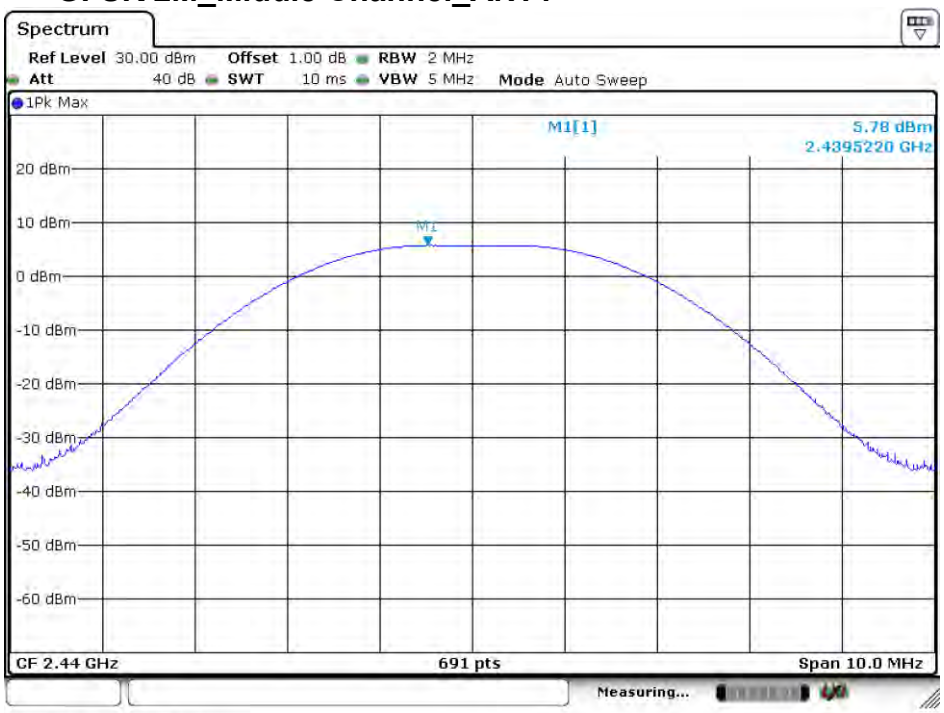
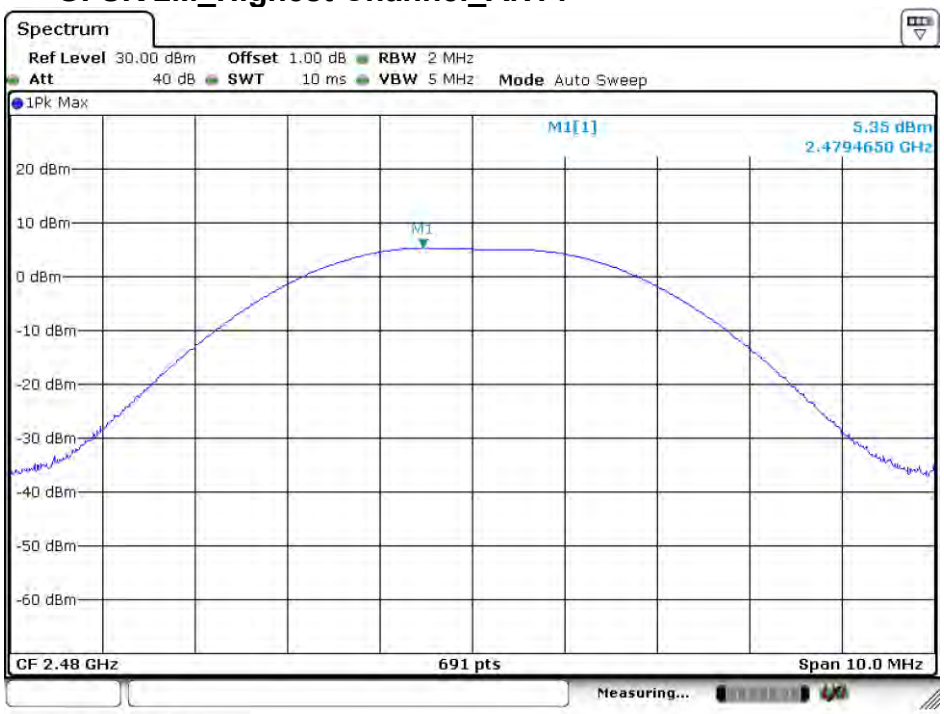
4.4.2.5 GFSK 2M_Middle Channel_ANT1



Date: 30.APR.2020 07:46:04

4.4.2.6 GFSK 2M_Highest Channel_ANT1



Date: 30.APR.2020 07:46:21

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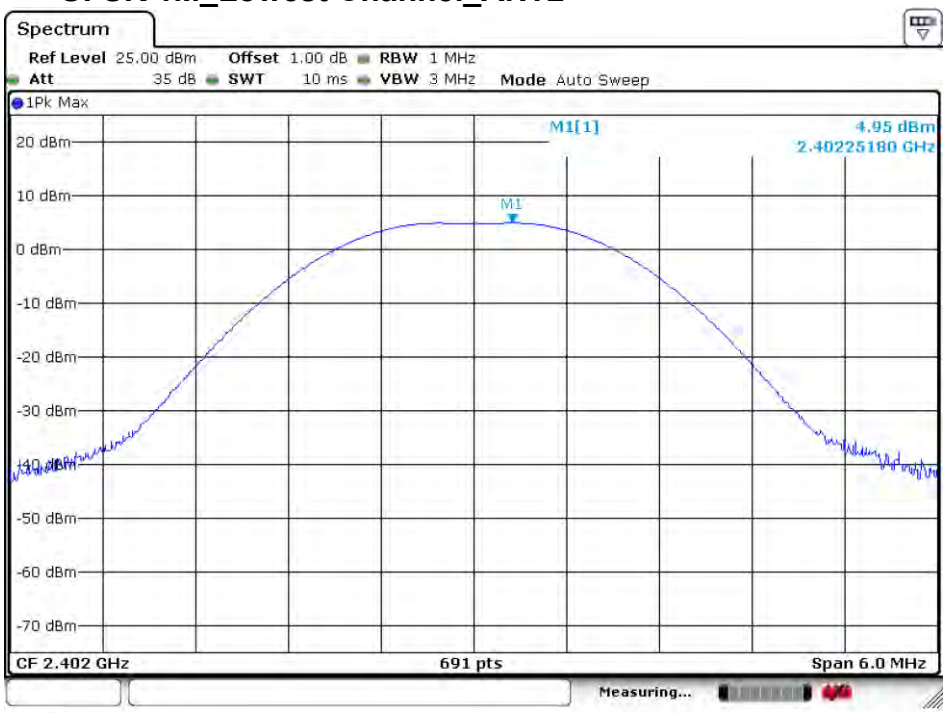
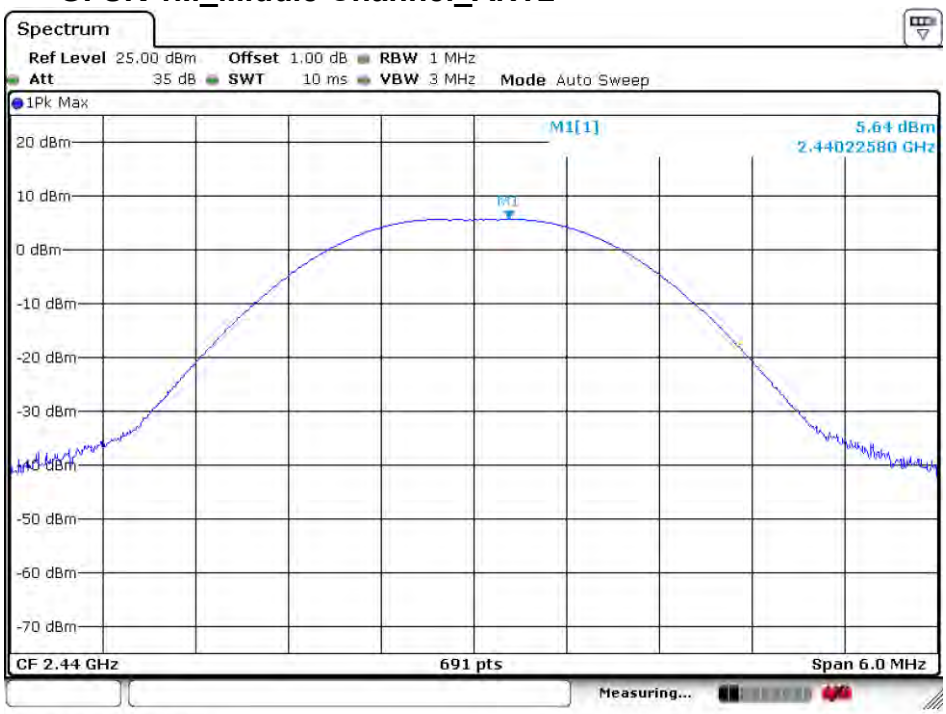
4.4.2.7 GFSK 1M_Lowest Channel_ANT2



Date: 17.APR.2020 11:19:21

4.4.2.8 GFSK 1M_Middle Channel_ANT2



Date: 17.APR.2020 11:20:08

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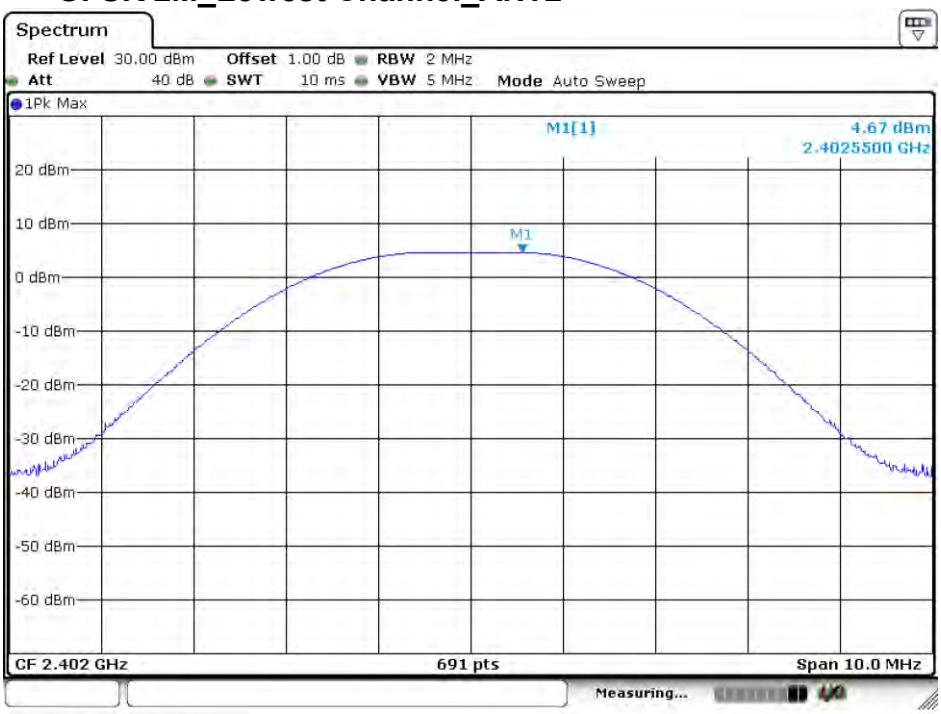
4.4.2.9 GFSK 1M_Highest Channel_ANT2

Date: 17.APR.2020 11:20:53

4.4.2.10 GFSK 2M_Lowest Channel_ANT2



Date: 30.APR.2020 07:57:05

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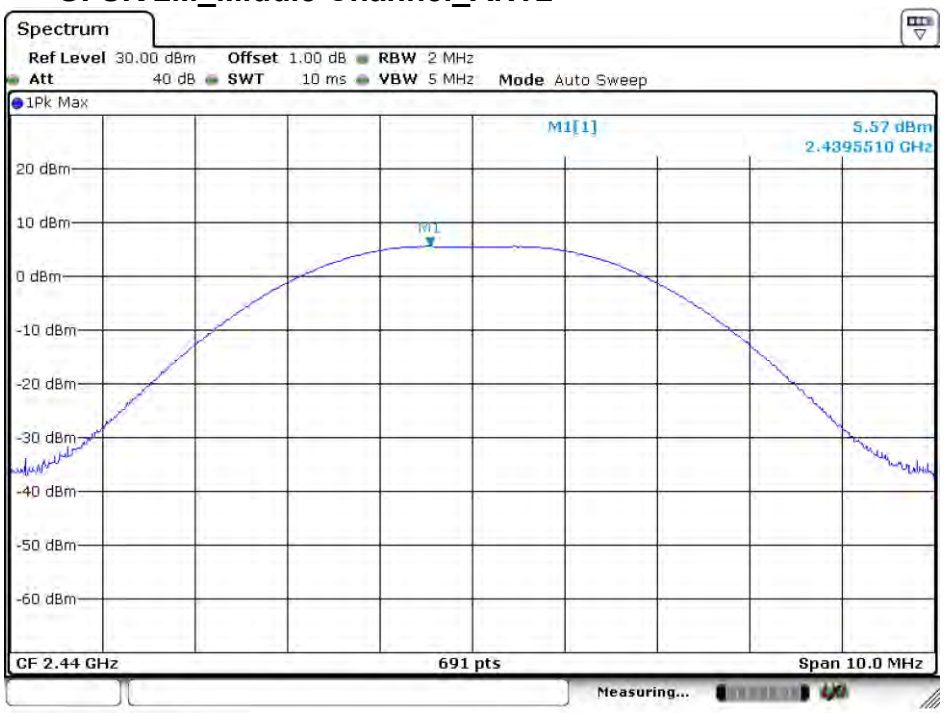
4.4.2.11 GFSK 2M_Middle Channel_ANT2



Date: 30.APR.2020 07:56:48

4.4.2.12 GFSK 2M_Highest Channel_ANT2

Date: 30.APR.2020 07:56:32

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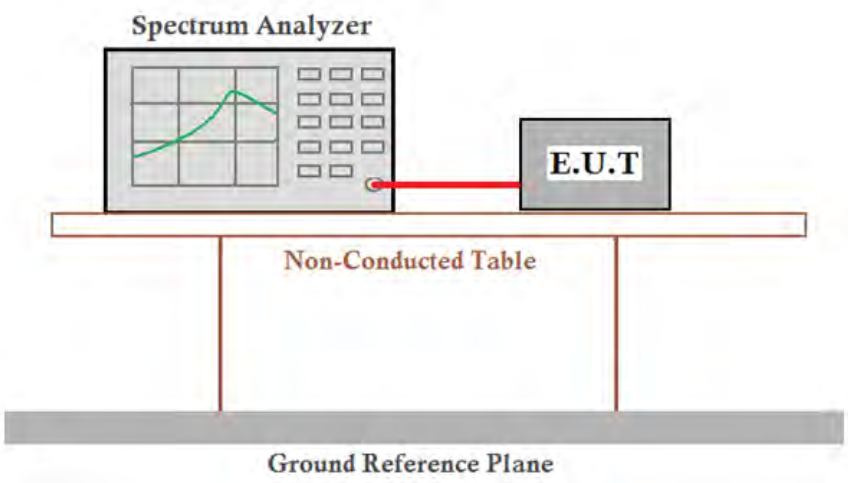
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8 Option 2
Test Setup:	
Limit:	≥ 500 kHz
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

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4.5.1 Test Results

Mode	Test Channel	99% Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
GFSK_1M _ANT1	Lowest	1.04	0.68	≥500	Pass
	Middle	1.04	0.68	≥500	Pass
	Highest	1.04	0.68	≥500	Pass

Mode	Test Channel	99% Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
GFSK_2M _ANT1	Lowest	2.03	1.17	≥500	Pass
	Middle	2.03	1.16	≥500	Pass
	Highest	2.03	1.16	≥500	Pass

Mode	Test Channel	99% Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
GFSK_1M _ANT2	Lowest	1.04	0.67	≥500	Pass
	Middle	1.04	0.68	≥500	Pass
	Highest	1.04	0.67	≥500	Pass

Mode	Test Channel	99% Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
GFSK_2M _ANT2	Lowest	2.03	1.14	≥500	Pass
	Middle	2.02	1.15	≥500	Pass
	Highest	2.02	1.15	≥500	Pass

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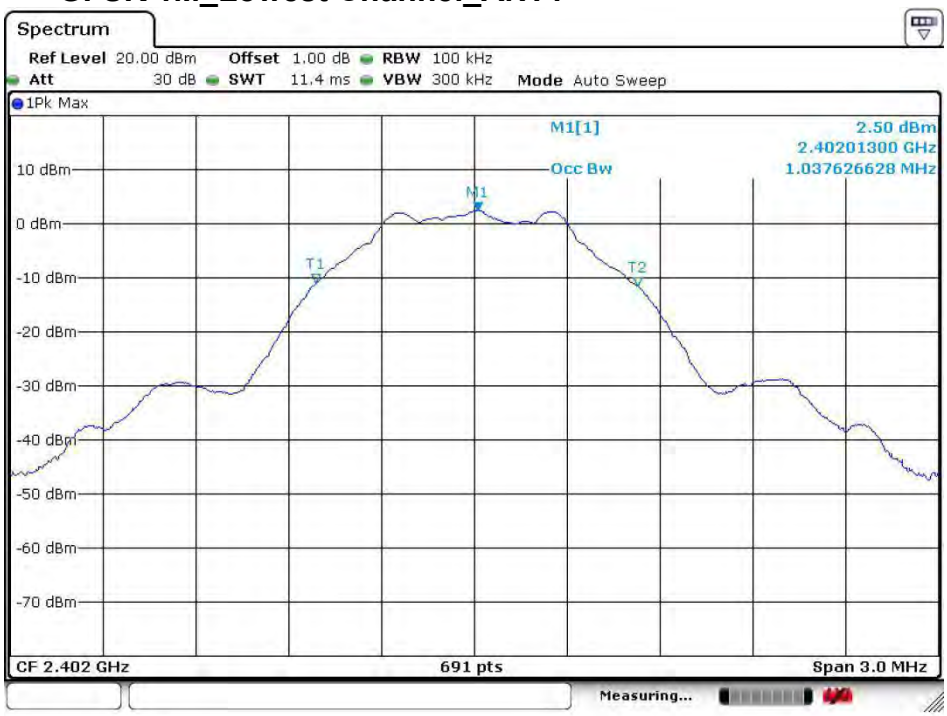
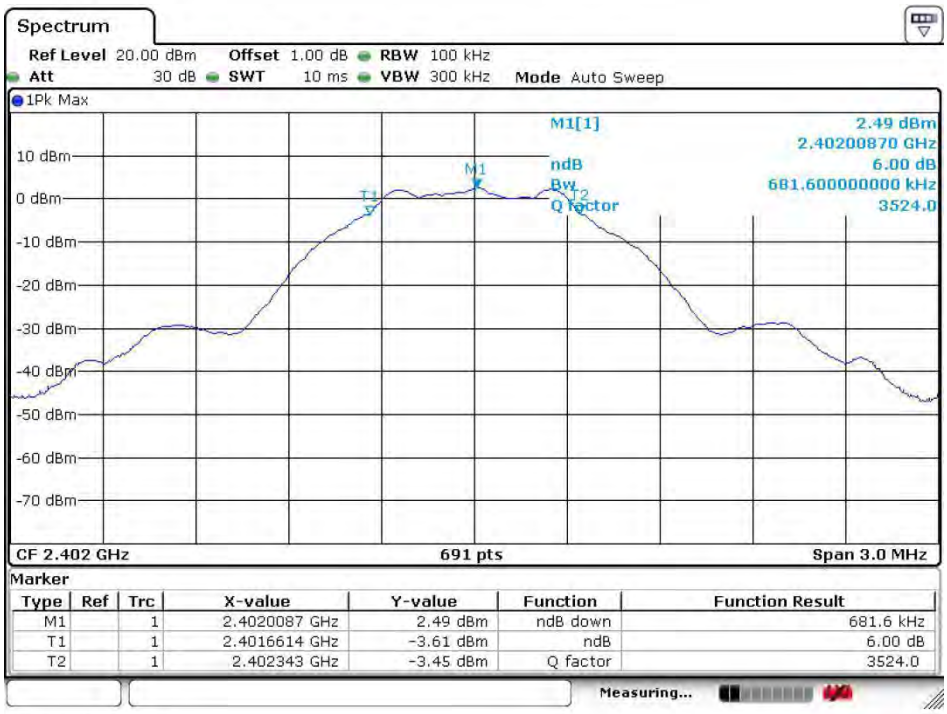
4.5.2 Test plots

4.5.2.1 GFSK 1M_Lowest Channel_ANT1



Date: 24.MAR.2020 13:24:30



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4020087 GHz	2.49 dBm	ndB down	681.6 kHz
T1		1	2.4016614 GHz	-3.61 dBm	ndB	6.00 dB
T2		1	2.402343 GHz	-3.45 dBm	Q factor	3524.0

Date: 24.MAR.2020 13:24:47

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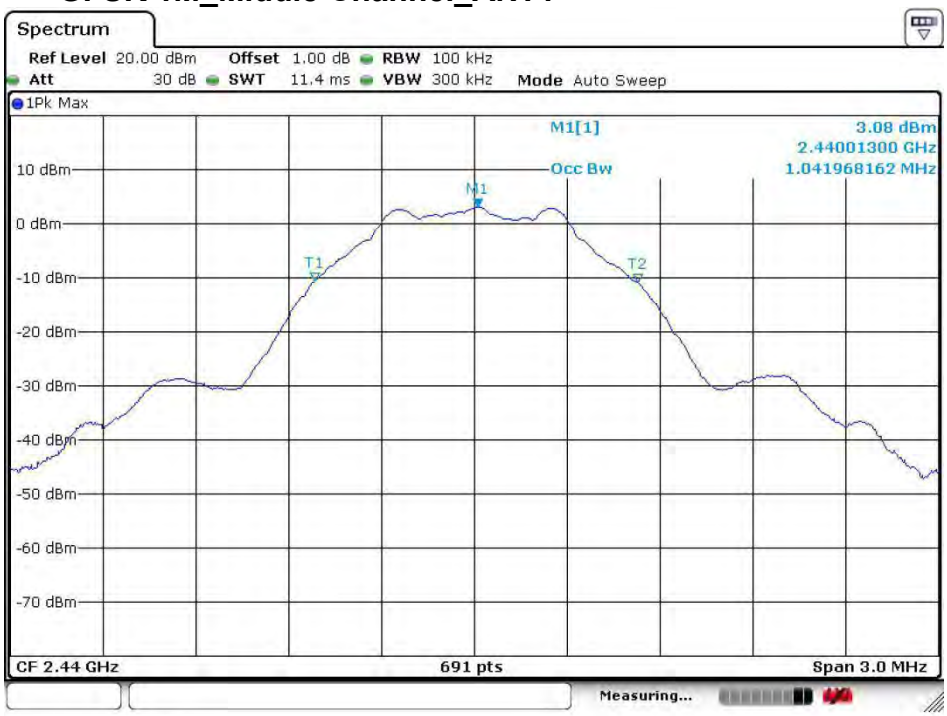
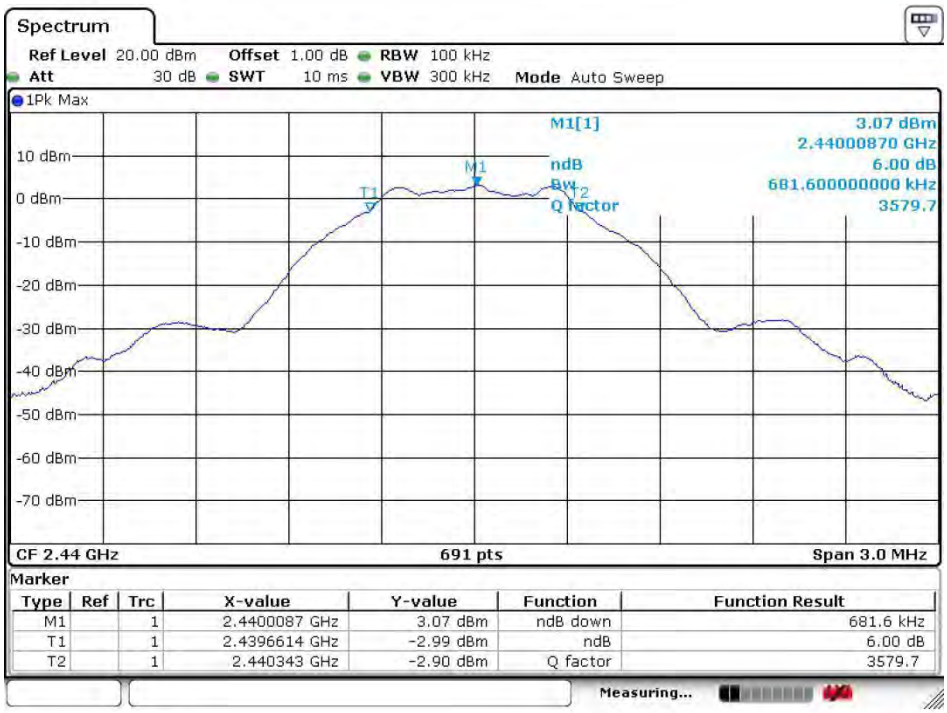
4.5.2.2 GFSK 1M_Middle Channel_ANT1



Date: 24.MAR.2020 13:25:23



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4400087 GHz	3.07 dBm	ndB down	681.6 kHz
T1		1	2.4396614 GHz	-2.99 dBm	ndB	6.00 dB
T2		1	2.440343 GHz	-2.90 dBm	Q factor	3579.7

Date: 24.MAR.2020 13:25:07

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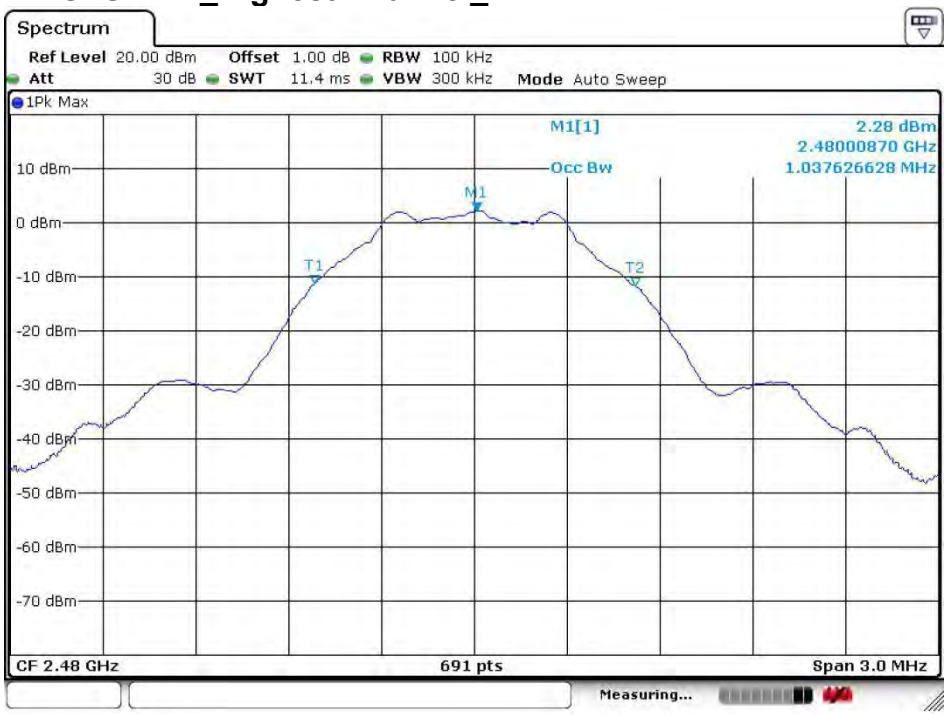
4.5.2.3 GFSK 1M_Highest Channel_ANT1



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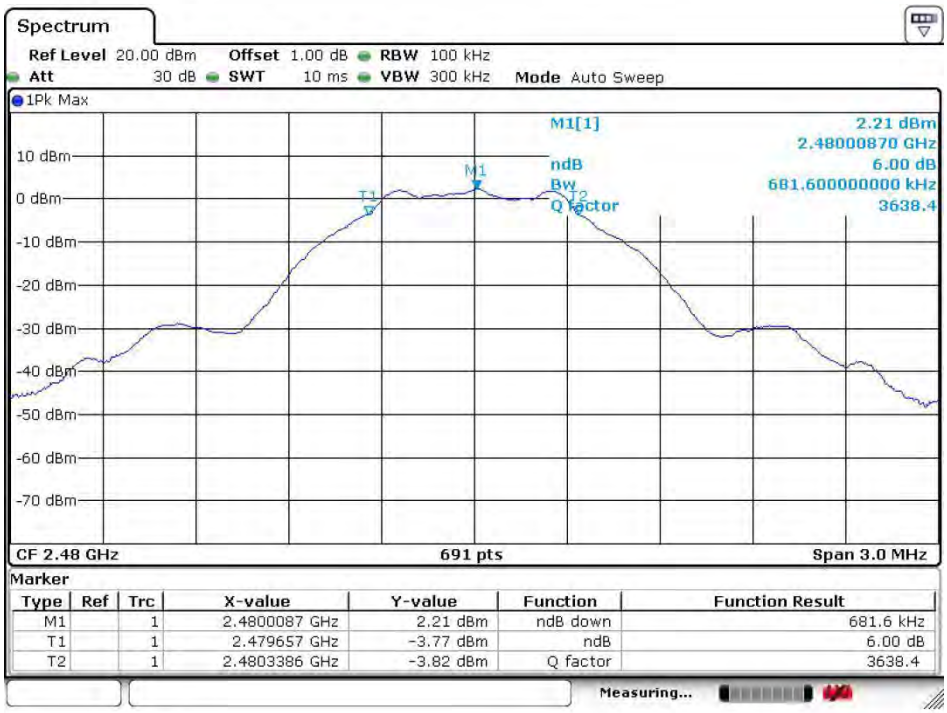

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4800087 GHz	2.21 dBm	ndB down	681.6 kHz
T1		1	2.479657 GHz	-3.77 dBm	ndB	6.00 dB
T2		1	2.4803386 GHz	-3.82 dBm	Q factor	3638.4

Date: 24.MAR.2020 13:26:05

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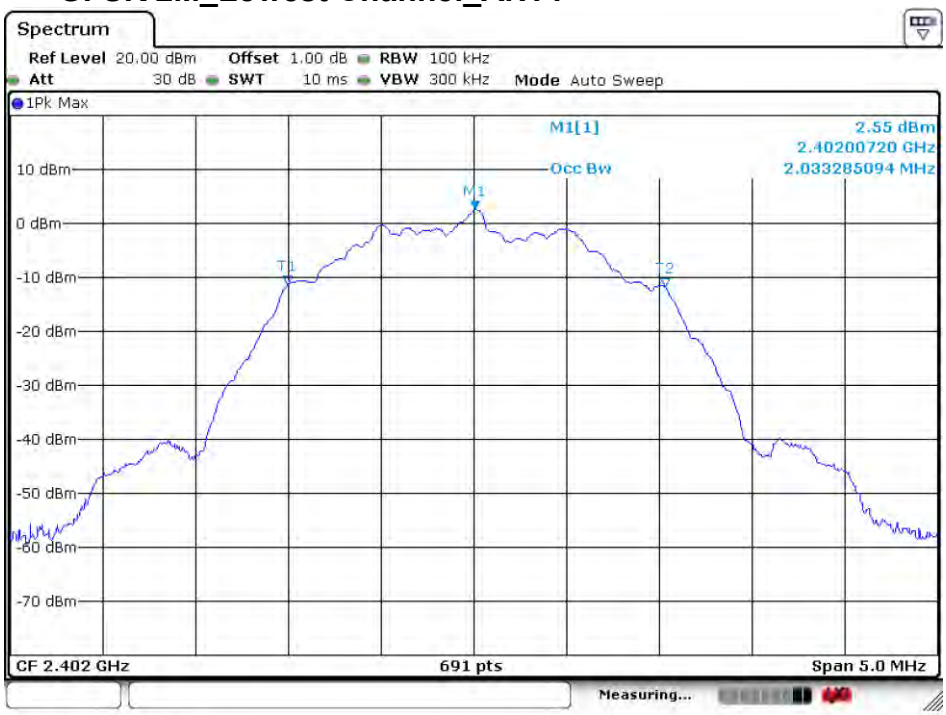
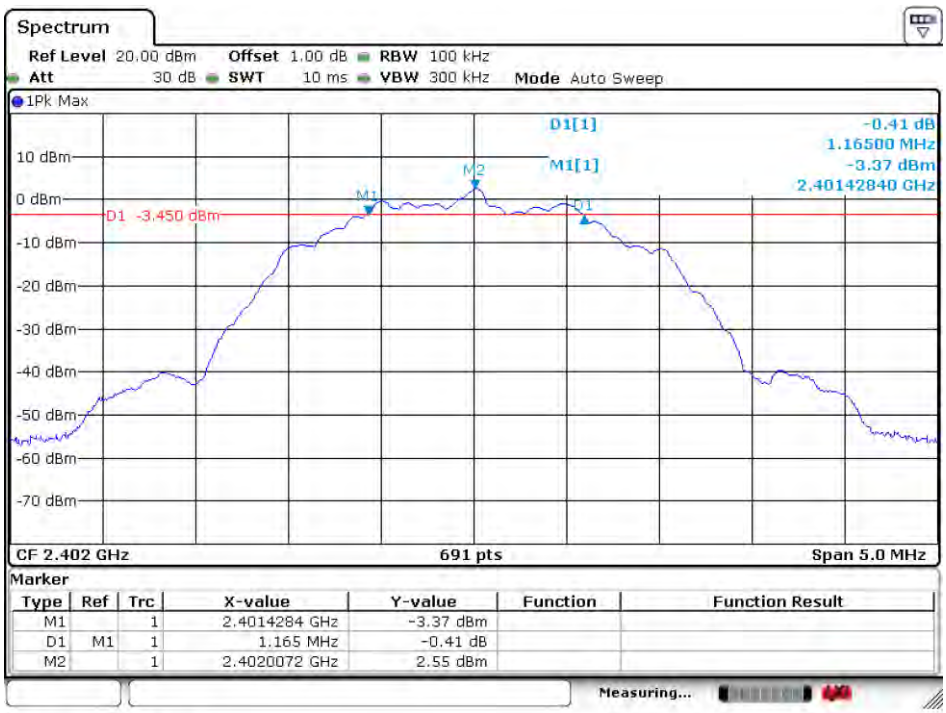
4.5.2.4 GFSK 2M_Lowest Channel_ANT1



Date: 25.MAR.2020 06:36:59



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4014284 GHz	-3.37 dBm		
D1	M1	1	1.165 MHz	-0.41 dB		
M2		1	2.4020072 GHz	2.55 dBm		

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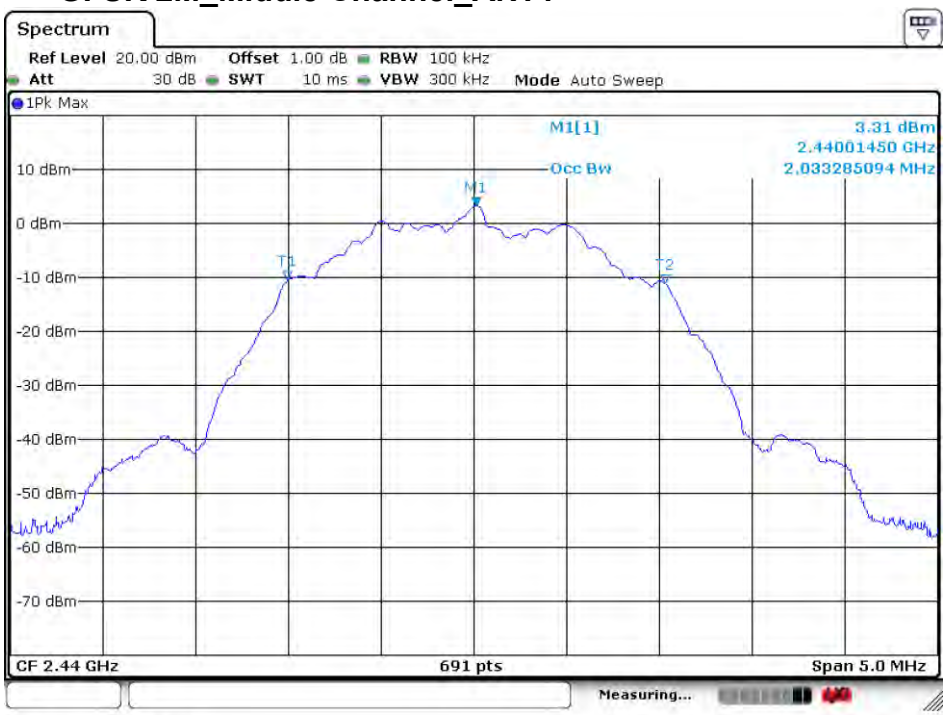
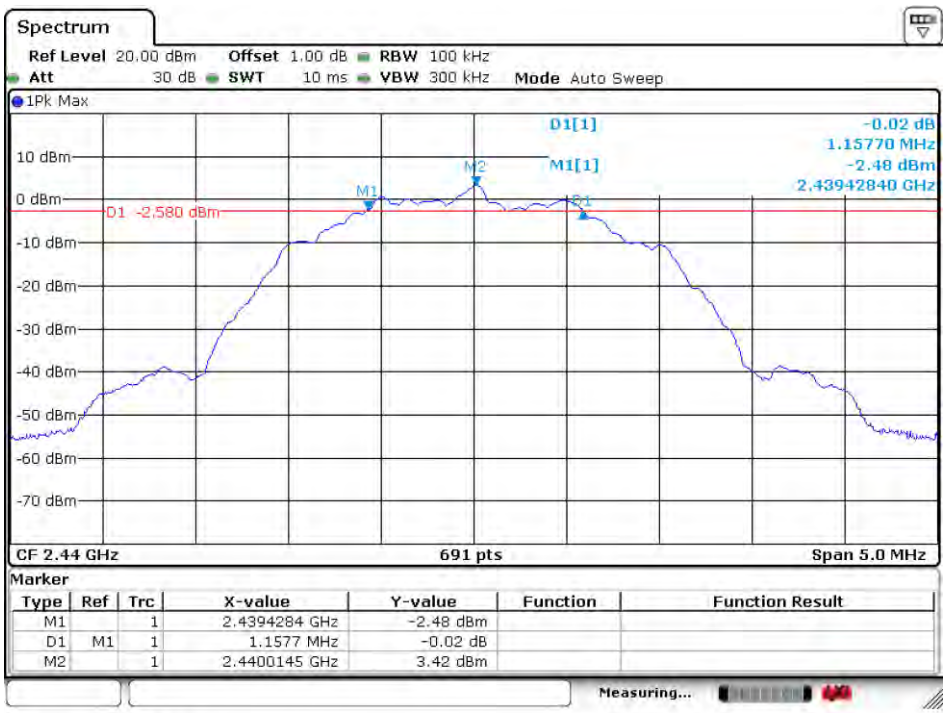
4.5.2.5 GFSK 2M_Middle Channel_ANT1



Date: 25.MAR.2020 06:35:58



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4394284 GHz	-2.48 dBm		
D1	M1	1	1.1577 MHz	-0.02 dB		
M2		1	2.4400145 GHz	3.42 dBm		

Date: 25.MAR.2020 06:45:41

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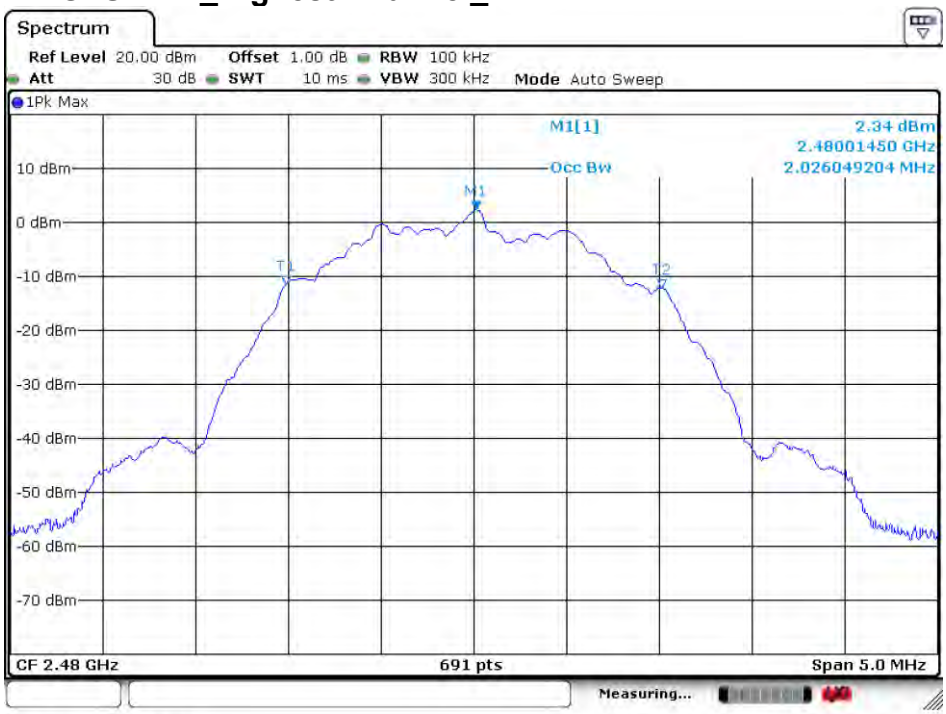
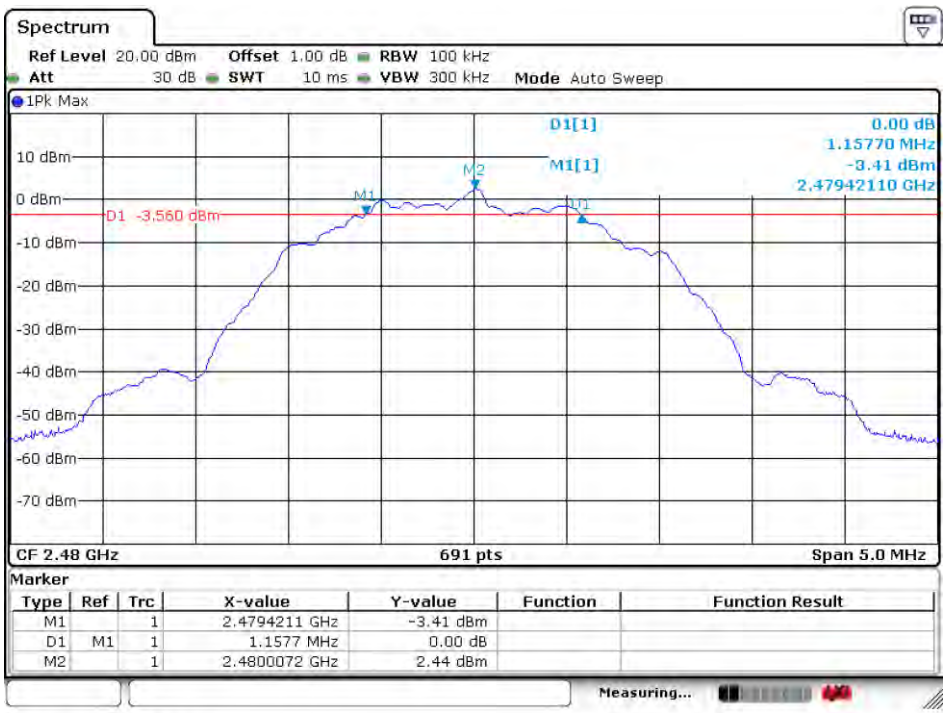
4.5.2.6 GFSK 2M_Highest Channel_ANT1



Date: 25.MAR.2020 06:36:39



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4794211 GHz	-3.41 dBm		
D1	M1	1	1.1577 MHz	0.00 dB		
M2		1	2.4800072 GHz	2.44 dBm		

Date: 25.MAR.2020 06:43:20

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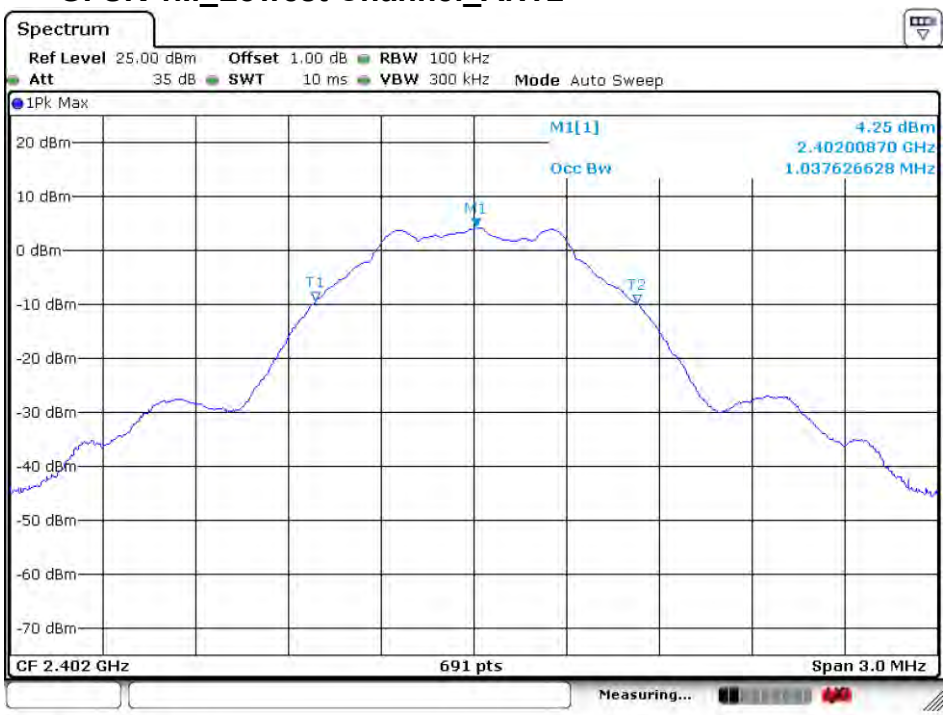
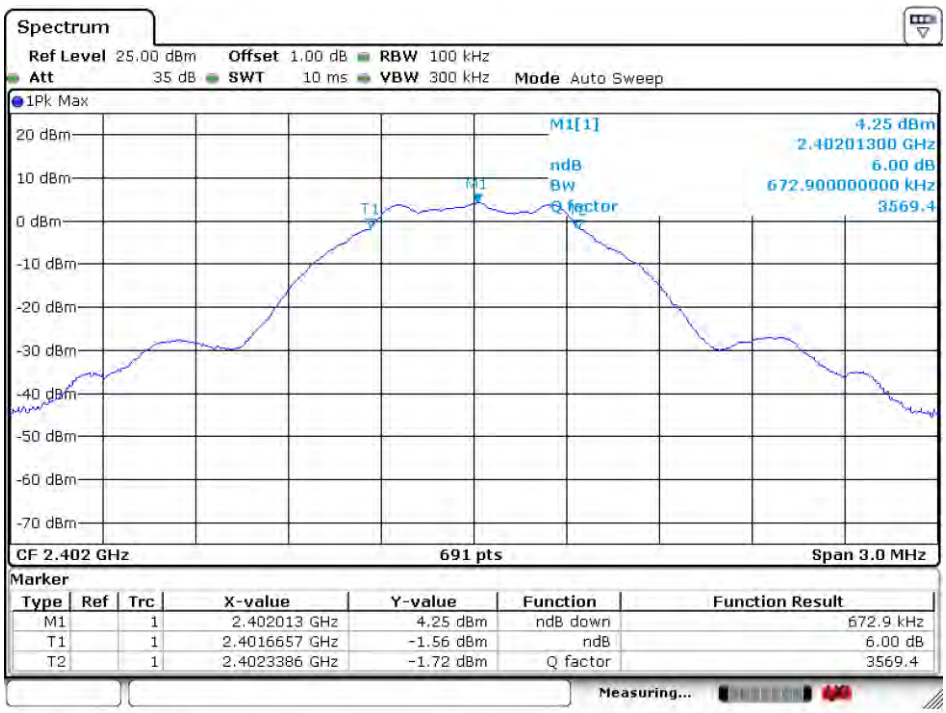
4.5.2.7 GFSK 1M_Lowest Channel_ANT2



Date: 17.APR.2020 11:26:14



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402013 GHz	4.25 dBm	ndB down	672.9 kHz
T1		1	2.4016657 GHz	-1.56 dBm	ndB	6.00 dB
T2		1	2.4023386 GHz	-1.72 dBm	Q factor	3569.4

Date: 17.APR.2020 11:25:59

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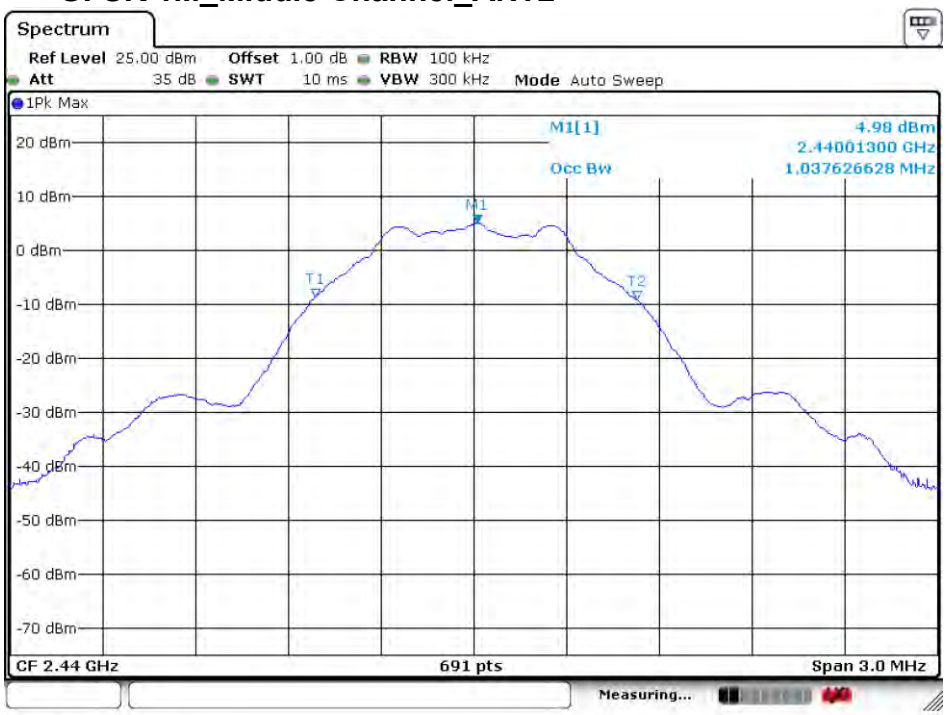
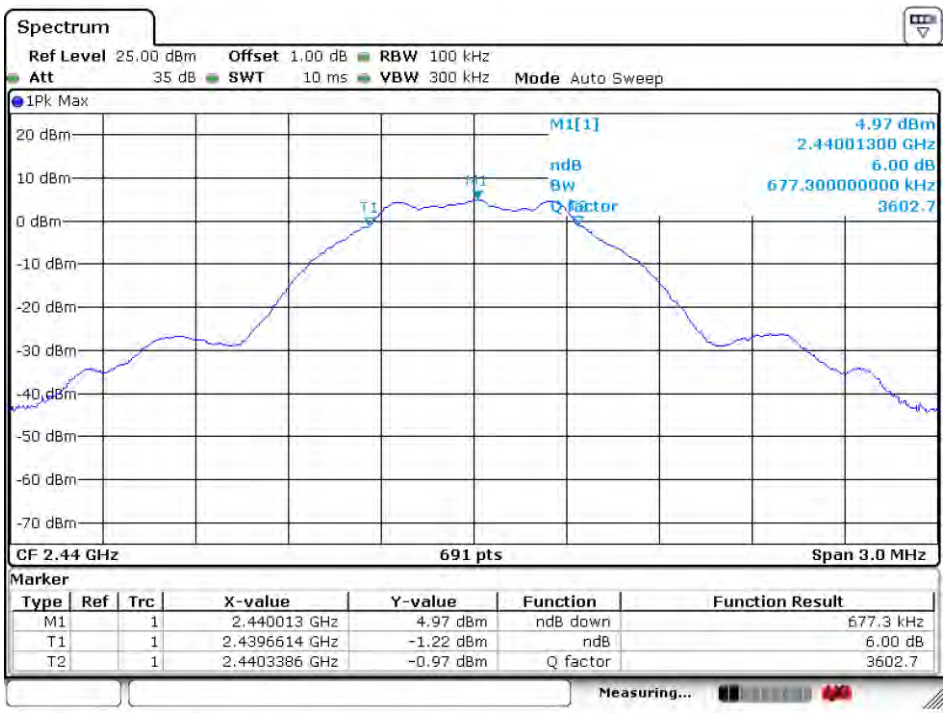
4.5.2.8 GFSK 1M_Middle Channel_ANT2



Date: 17.APR.2020 11:24:58



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440013 GHz	4.97 dBm	ndB down	677.3 kHz
T1		1	2.4396614 GHz	-1.22 dBm	ndB	6.00 dB
T2		1	2.4403386 GHz	-0.97 dBm	Q factor	3602.7

Date: 17.APR.2020 11:25:15

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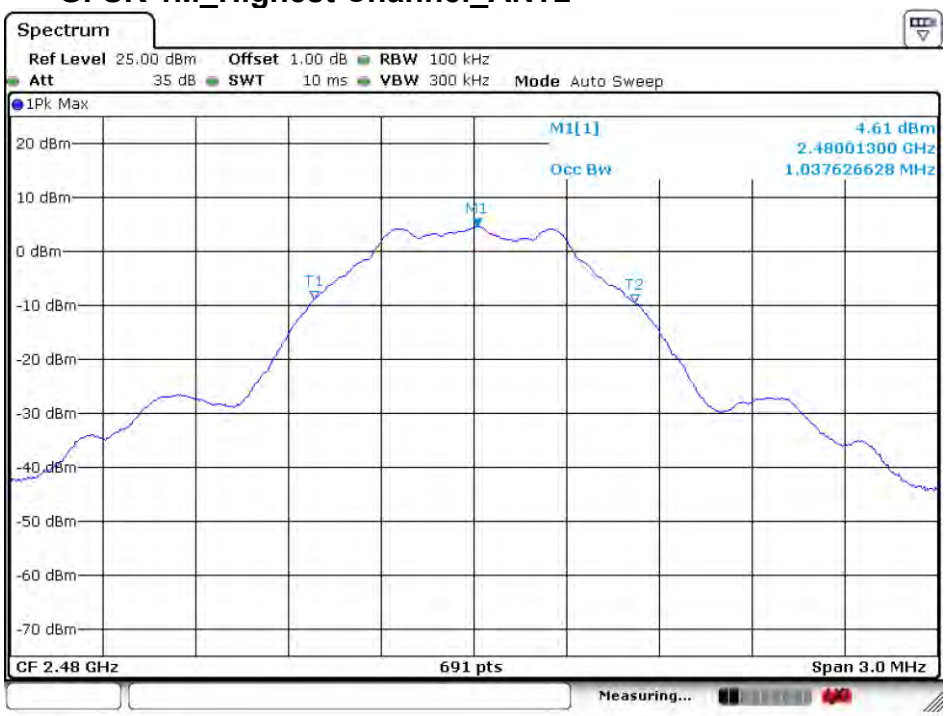
4.5.2.9 GFSK 1M_Highest Channel_ANT2



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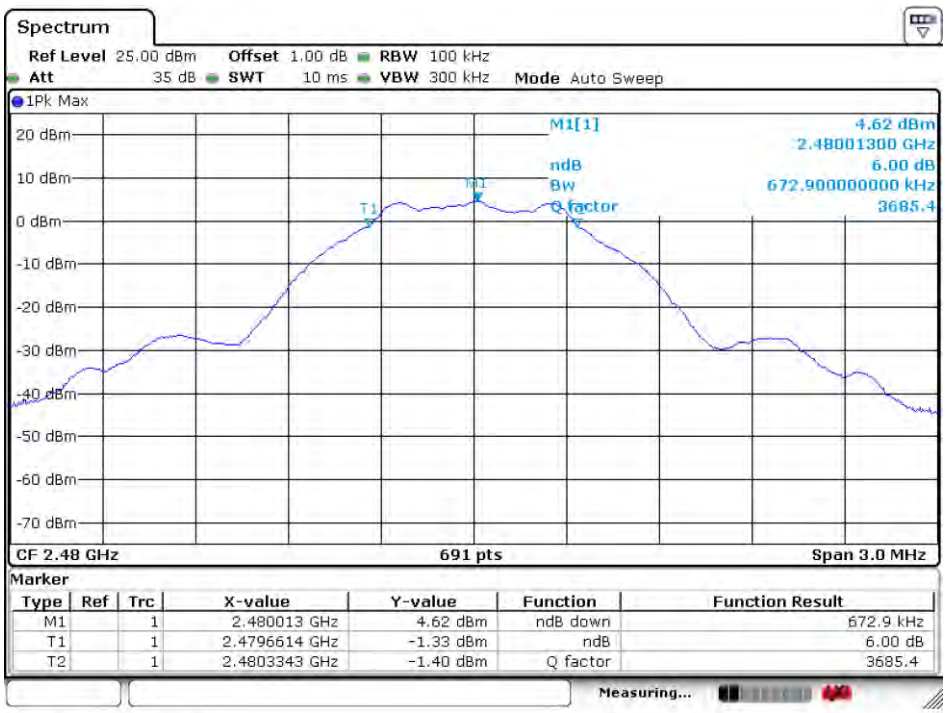

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.480013 GHz	4.62 dBm	ndB down	672.9 kHz
T1		1	2.4796614 GHz	-1.33 dBm	ndB	6.00 dB
T2		1	2.4803343 GHz	-1.40 dBm	Q factor	3685.4

Date: 17.APR.2020 11:22:48

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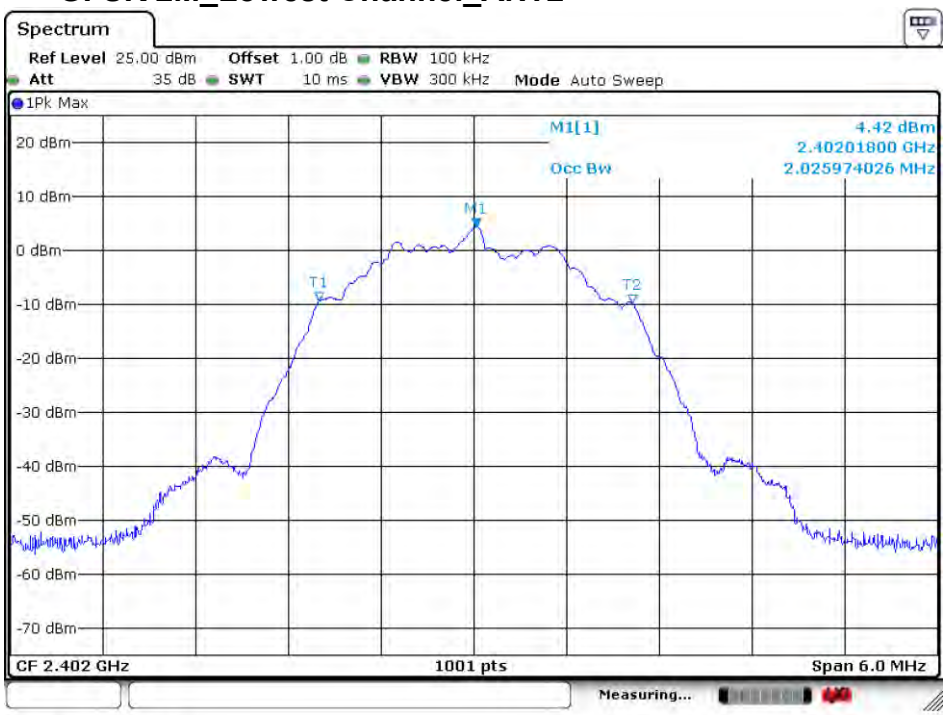
4.5.2.10 GFSK 2M_Lowest Channel_ANT2



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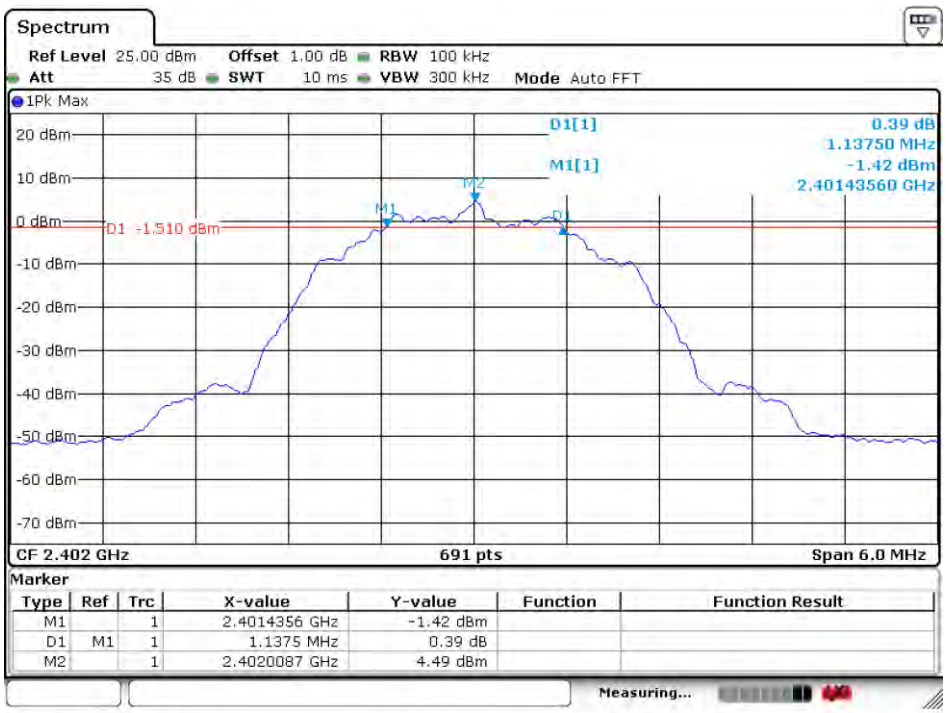

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4014356 GHz	-1.42 dBm		
D1	M1	1	1.1375 MHz	0.39 dB		
M2		1	2.4020087 GHz	4.49 dBm		

Date: 17.APR.2020 12:05:30

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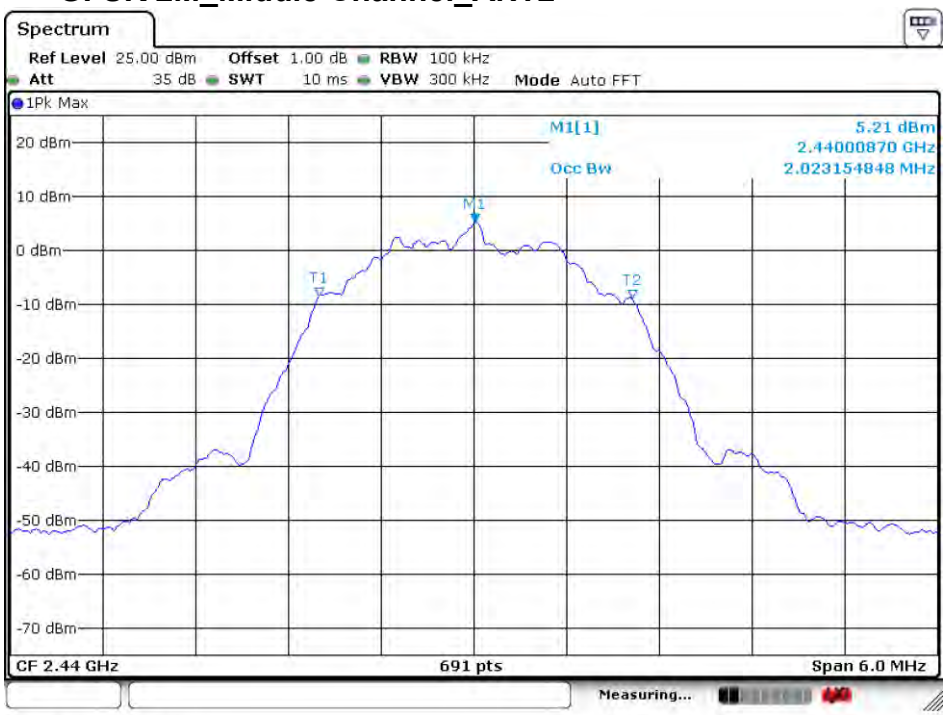
4.5.2.11 GFSK 2M_Middle Channel_ANT2



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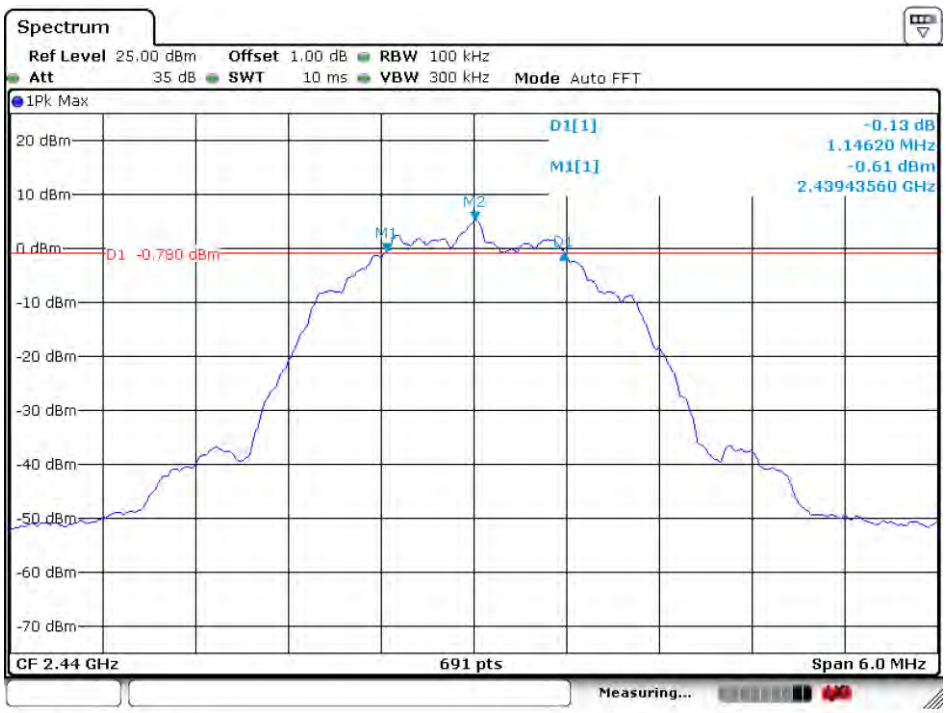

Date: 17.APR.2020 12:10:19

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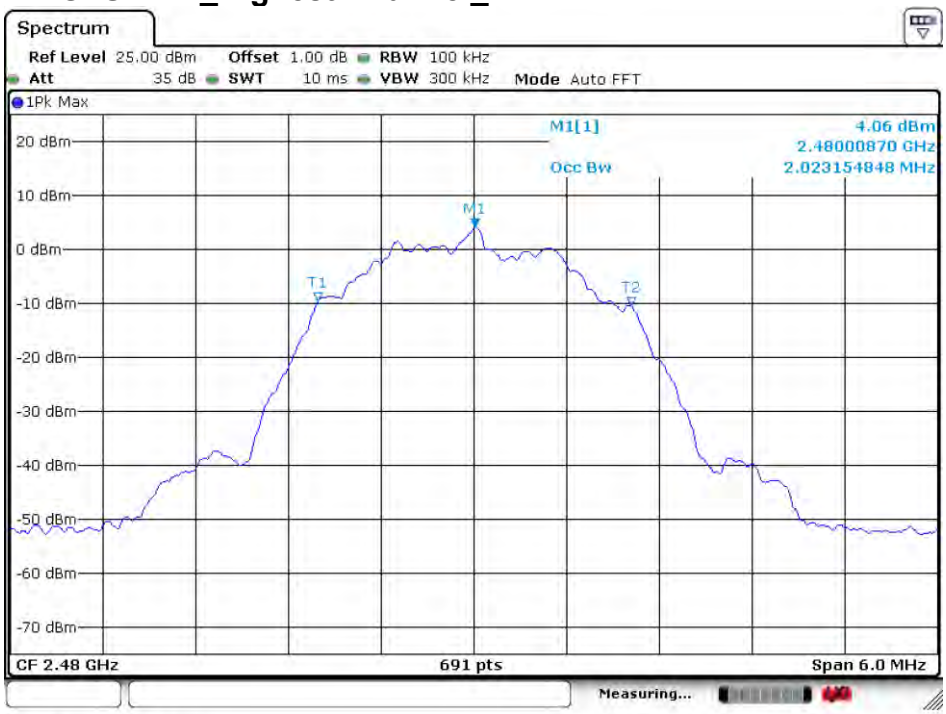
4.5.2.12 GFSK 2M_Highest Channel_ANT2



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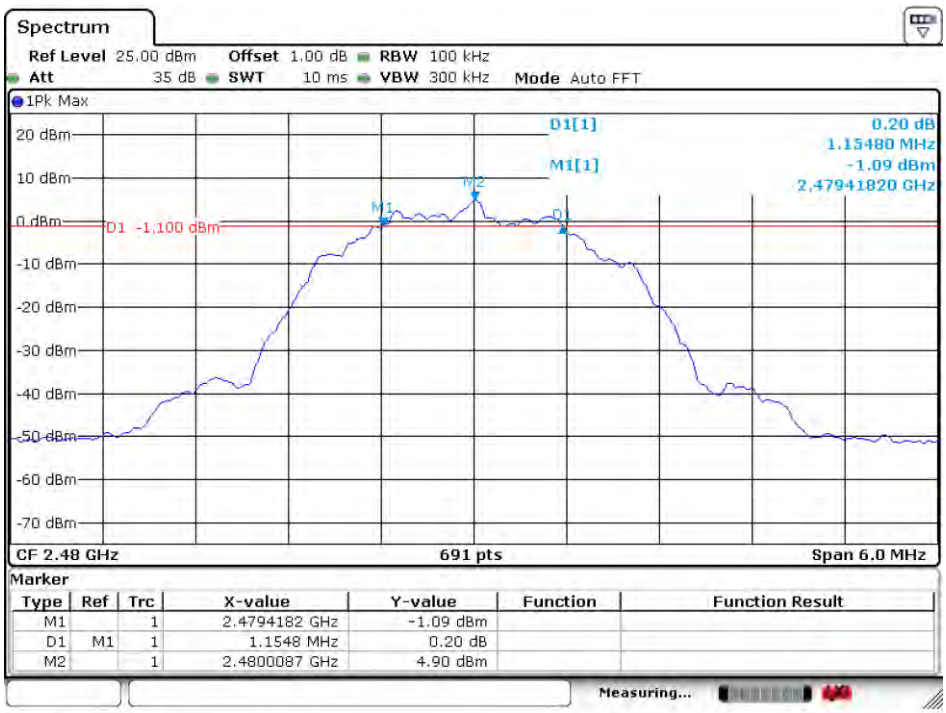

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4794182 GHz	-1.09 dBm		
D1	M1	1	1.1548 MHz	0.20 dB		
M2		1	2.4800087 GHz	4.90 dBm		

Date: 17.APR.2020 12:12:52

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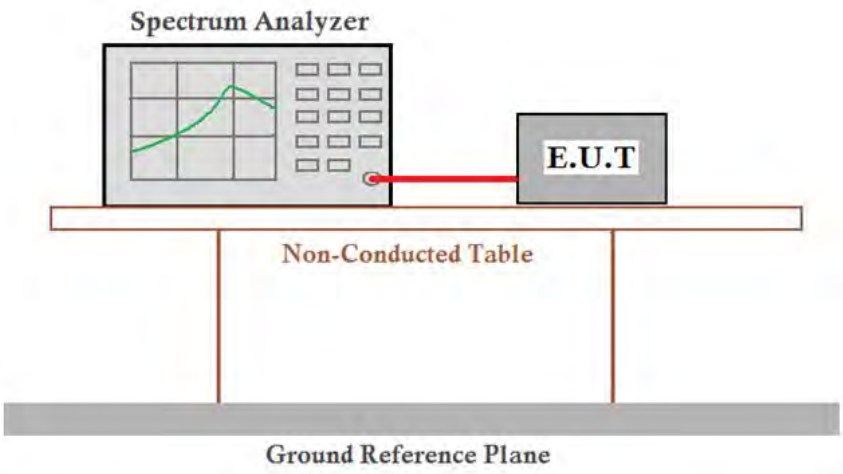
4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	
Limit:	≤8.00dBm/3kHz
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

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4.6.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK_1M_ANT1	Lowest	-11.90	≤8.00	Pass
	Middle	-11.23	≤8.00	Pass
	Highest	-12.04	≤8.00	Pass

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK_2M_ANT1	Lowest	-14.89	≤8.00	Pass
	Middle	-14.07	≤8.00	Pass
	Highest	-15.04	≤8.00	Pass

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK_1M_ANT2	Lowest	-10.26	≤8.00	Pass
	Middle	-9.88	≤8.00	Pass
	Highest	-9.87	≤8.00	Pass

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK_2M_ANT2	Lowest	-13.00	≤8.00	Pass
	Middle	-12.26	≤8.00	Pass
	Highest	-12.53	≤8.00	Pass

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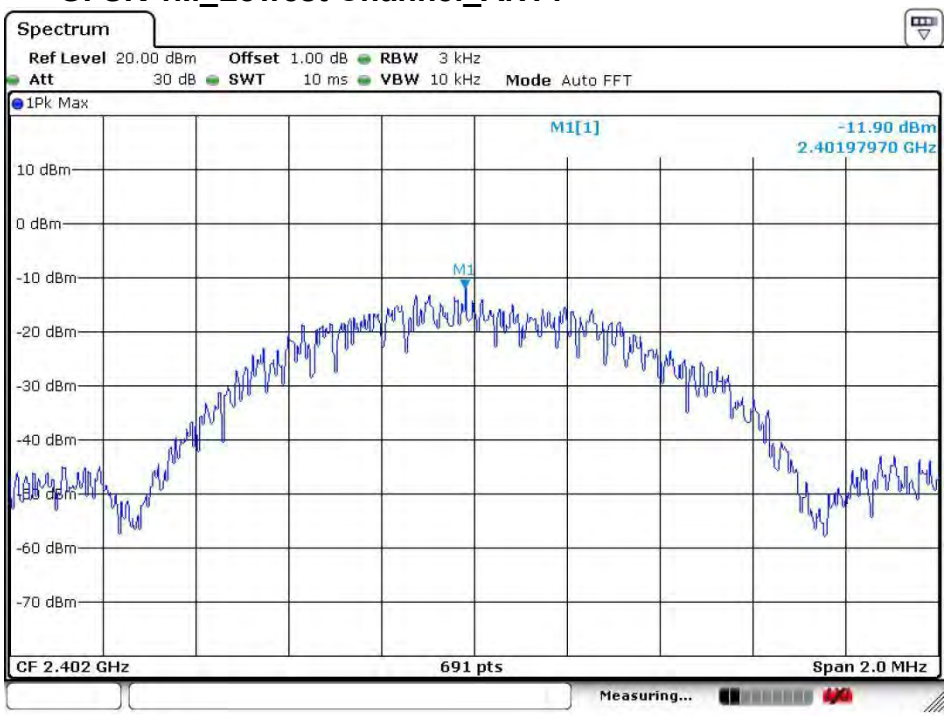
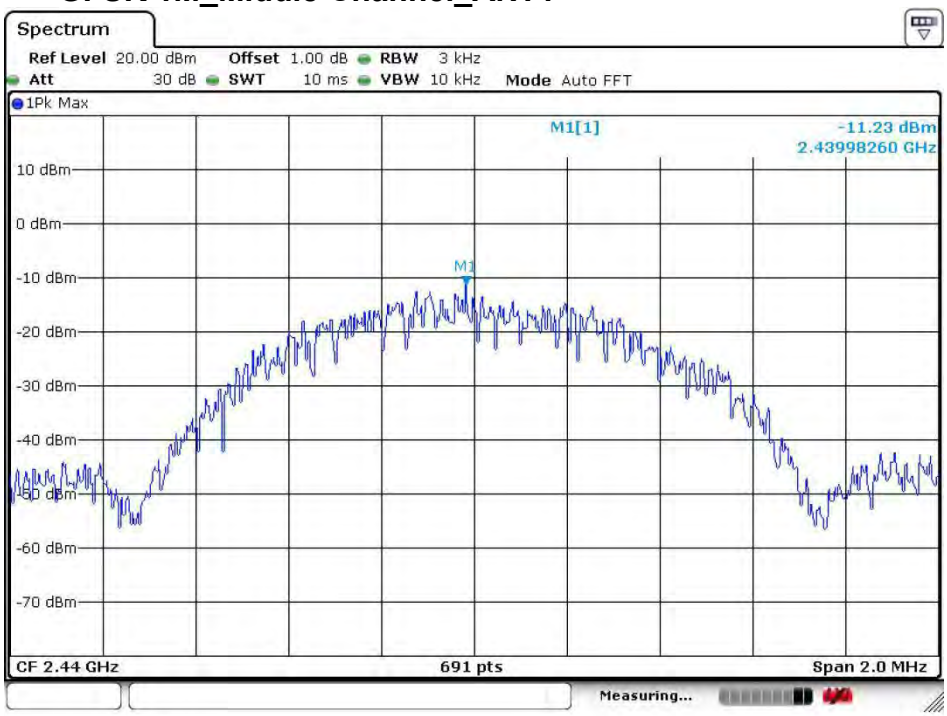
4.6.2 Test plots

4.6.2.1 GFSK 1M_Lowest Channel_ANT1



Date: 24.MAR.2020 13:23:46

4.6.2.2 GFSK 1M_Middle Channel_ANT1



Date: 24.MAR.2020 13:23:04

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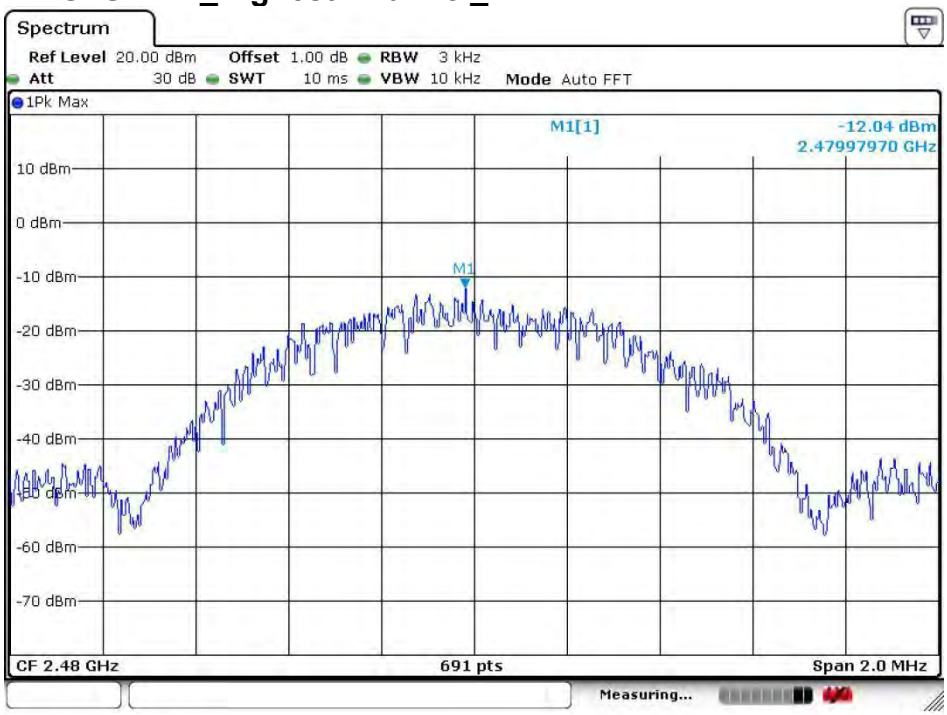
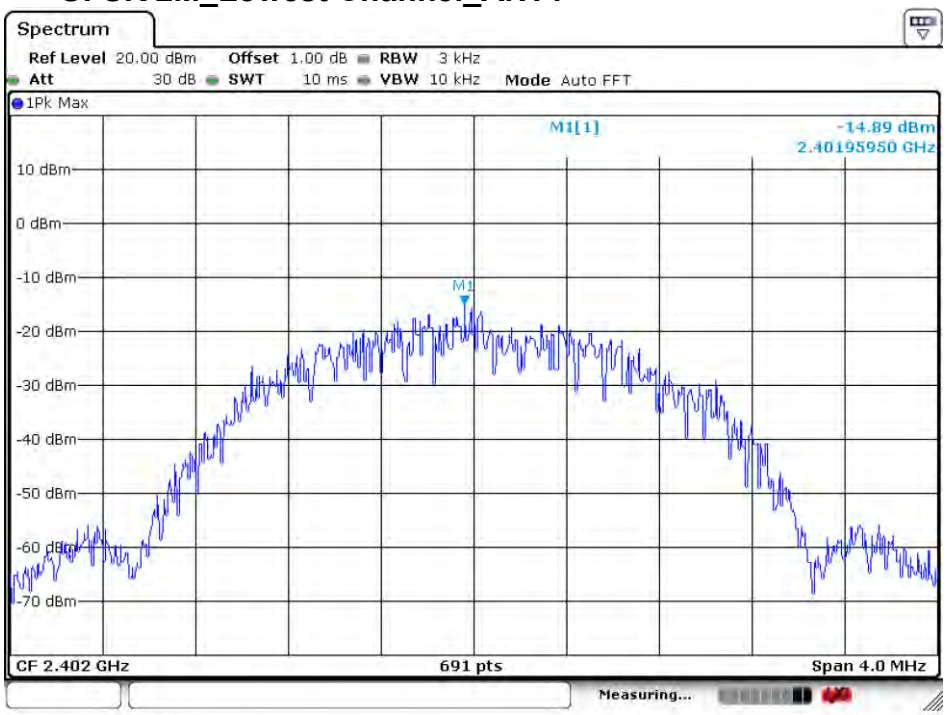
4.6.2.3 GFSK 1M_Highest Channel_ANT1



Date: 24.MAR.2020 13:23:31

4.6.2.4 GFSK 2M_Lowest Channel_ANT1



Date: 25.MAR.2020 06:34:41

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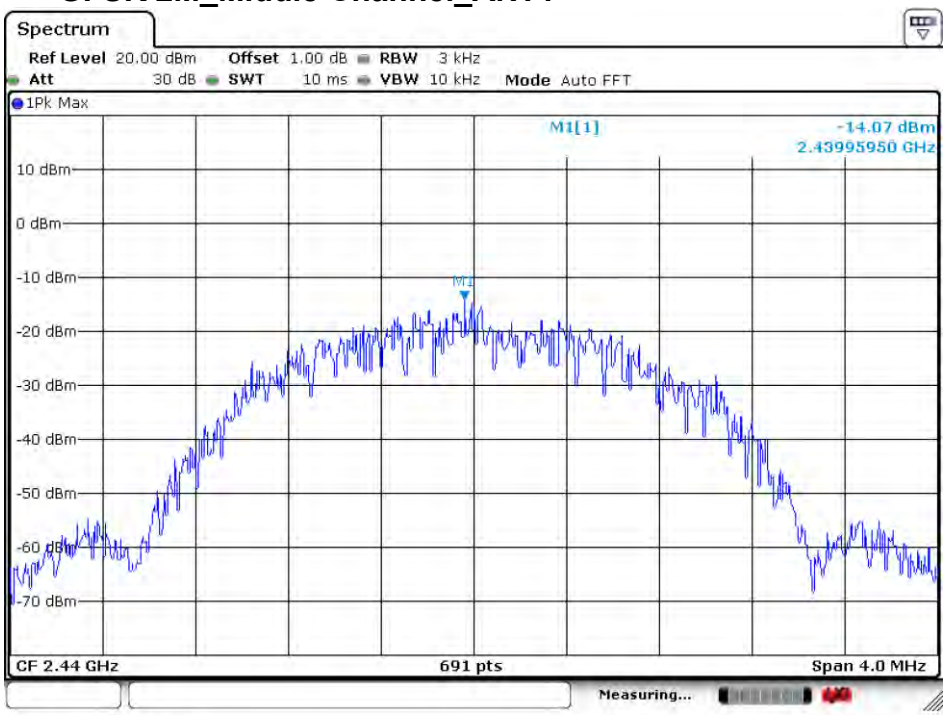
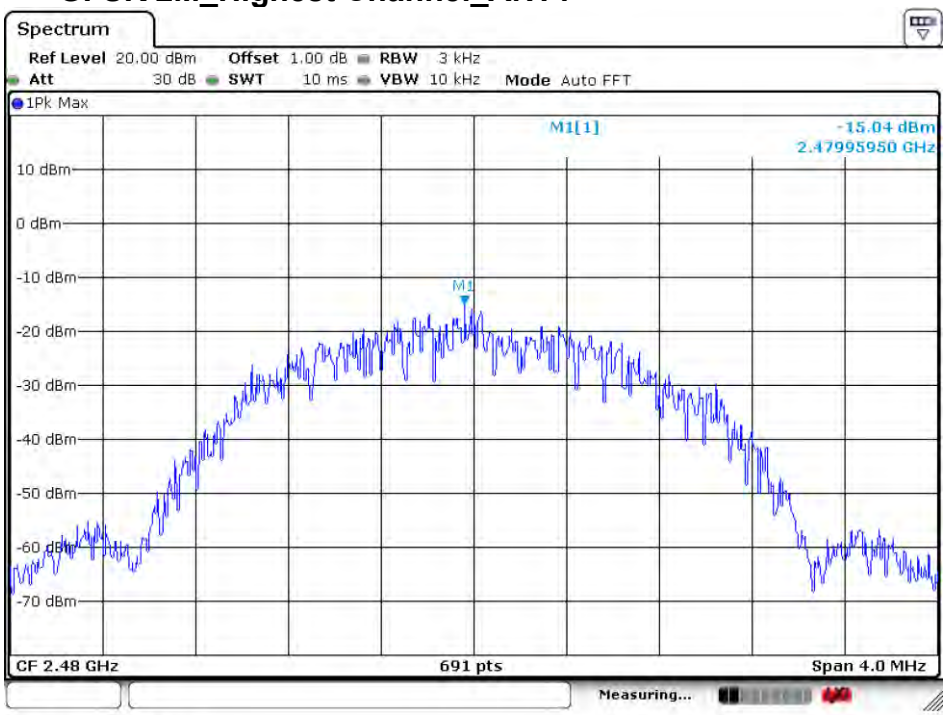
4.6.2.5 GFSK 2M_Middle Channel_ANT1



Date: 25.MAR.2020 06:35:00

4.6.2.6 GFSK 2M_Highest Channel_ANT1



Date: 25.MAR.2020 06:34:10

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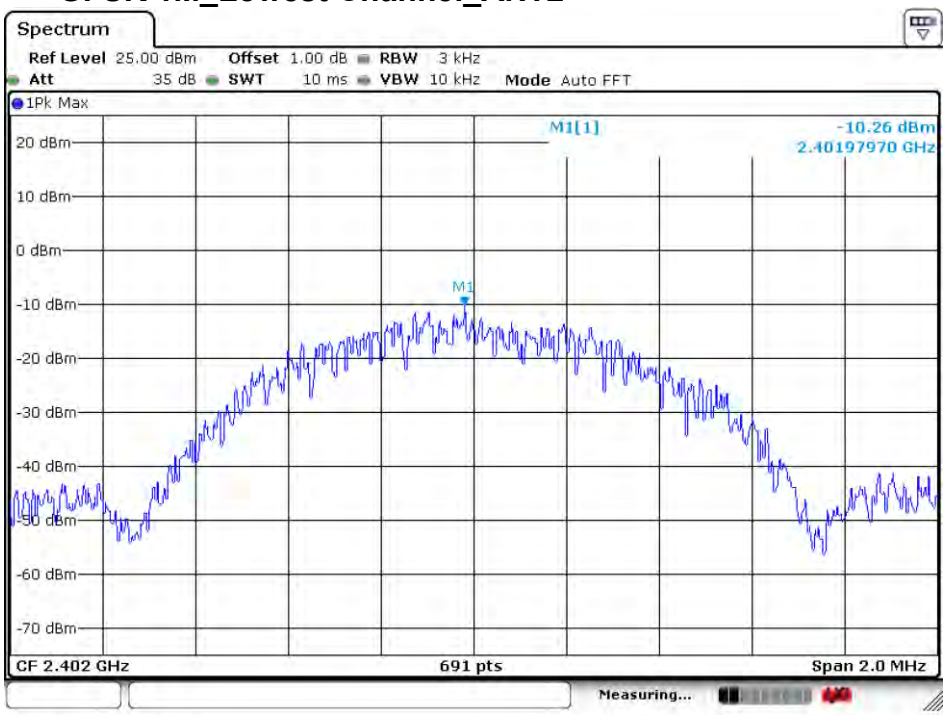
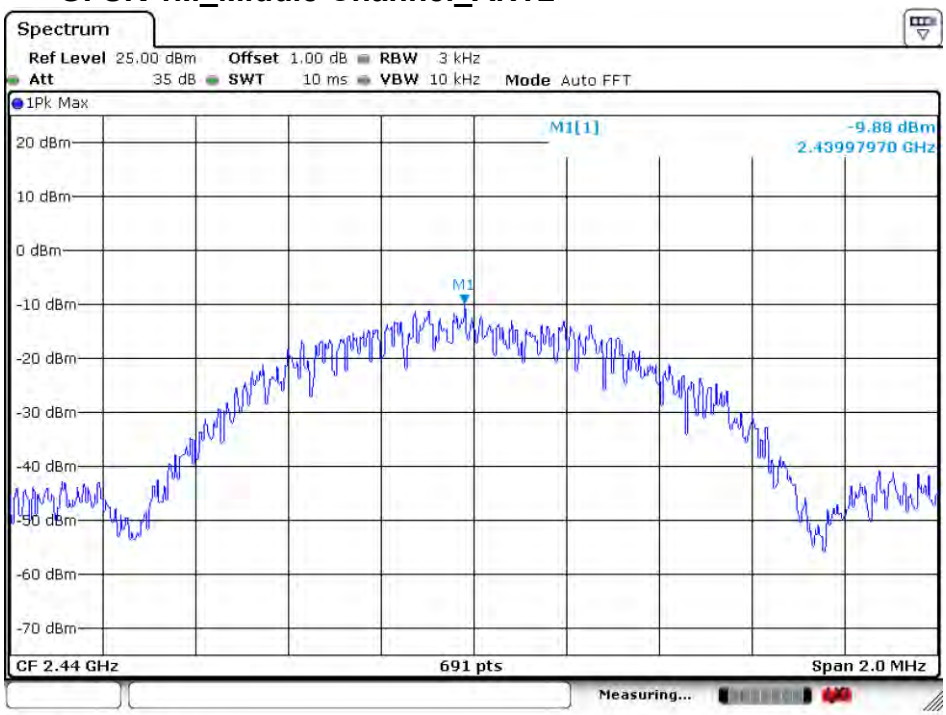
4.6.2.7 GFSK 1M_Lowest Channel_ANT2



Date: 17.APR.2020 11:40:05

4.6.2.8 GFSK 1M_Middle Channel_ANT2



Date: 17.APR.2020 12:30:06

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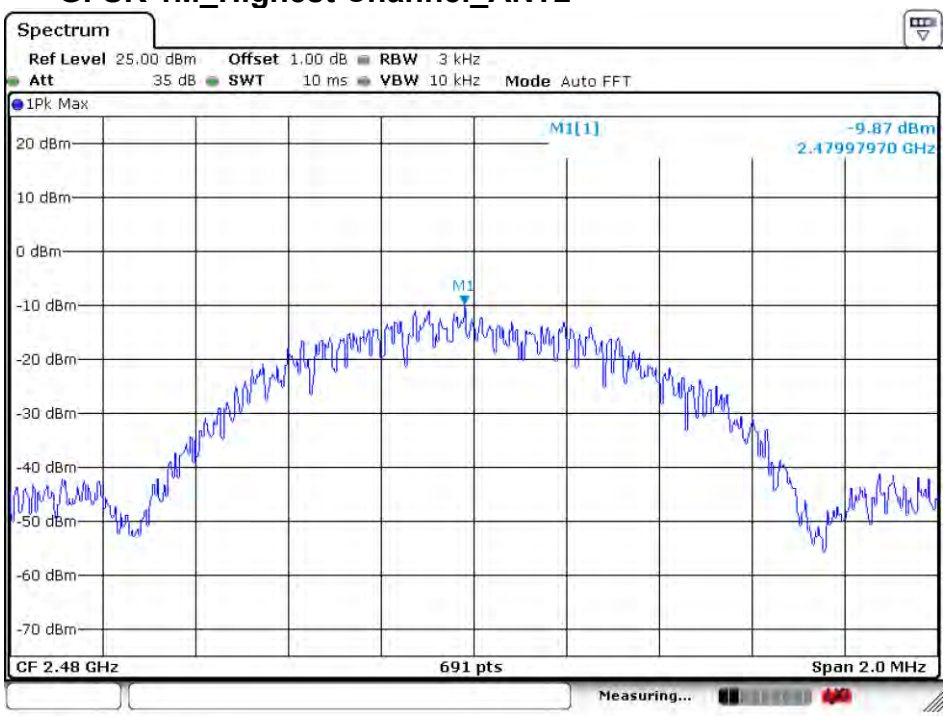
4.6.2.9 GFSK 1M_Highest Channel_ANT2



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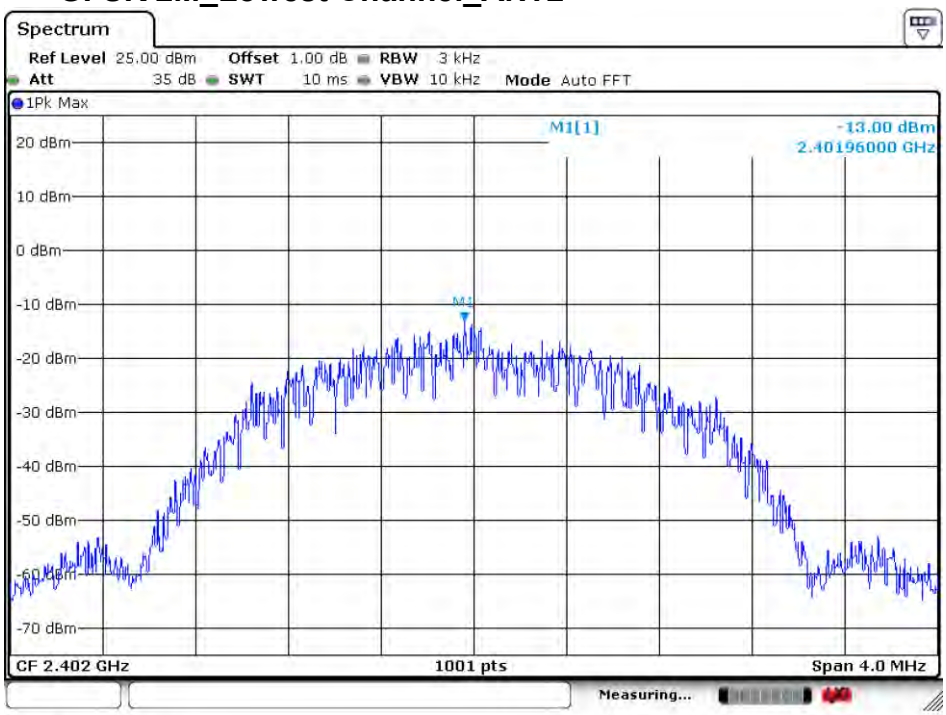
4.6.2.10 GFSK 2M_Lowest Channel_ANT2



Date: 17.APR.2020 11:59:38

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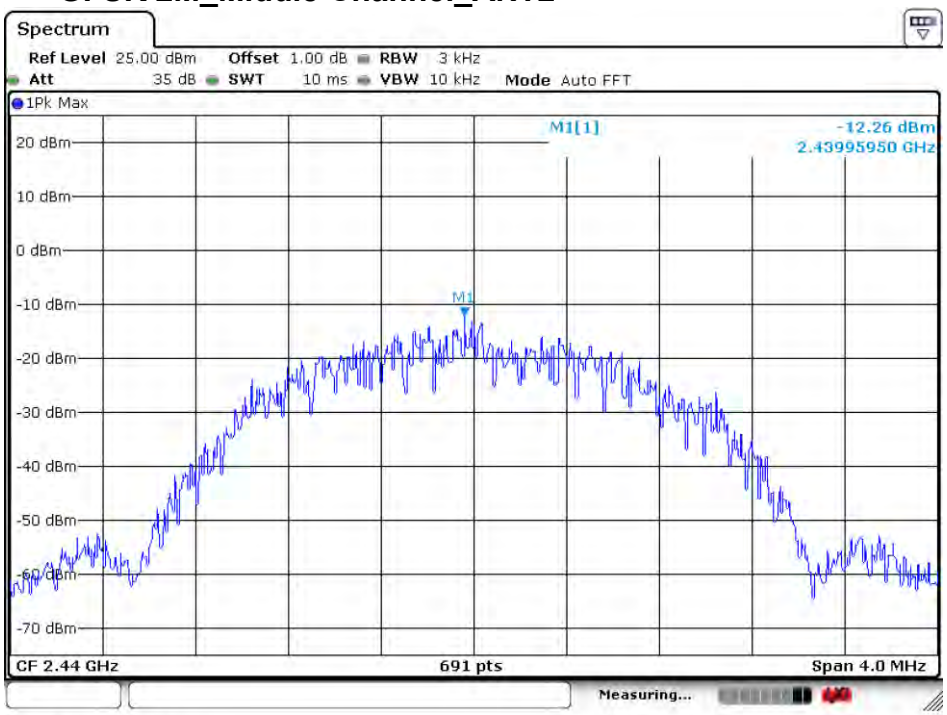
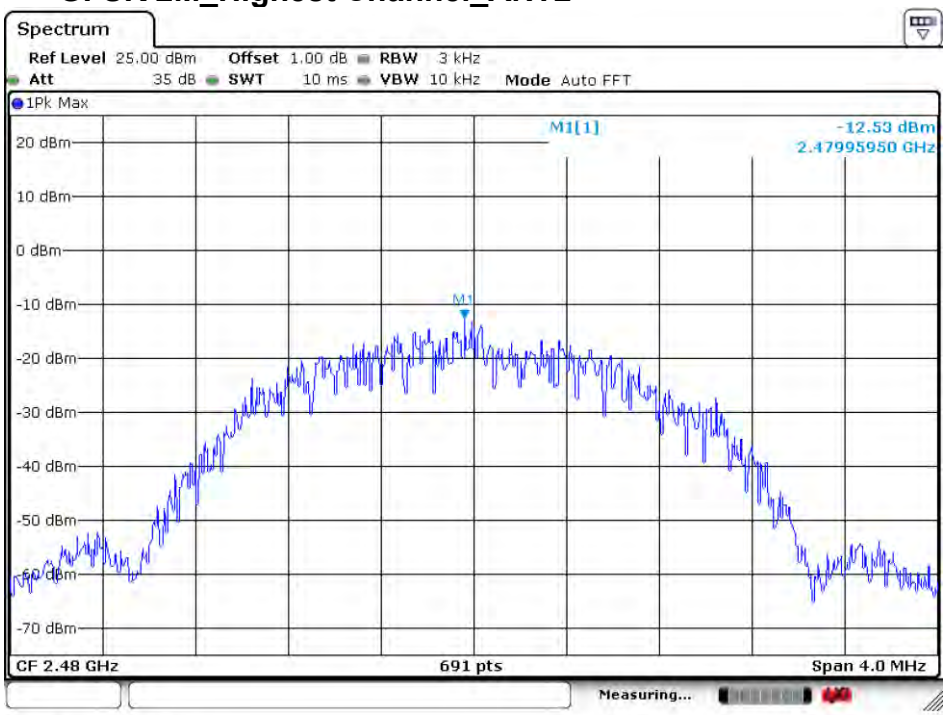
4.6.2.11 GFSK 2M_Middle Channel_ANT2



Date: 17.APR.2020 12:09:02

4.6.2.12 GFSK 2M_Highest Channel_ANT2



Date: 17.APR.2020 12:13:18

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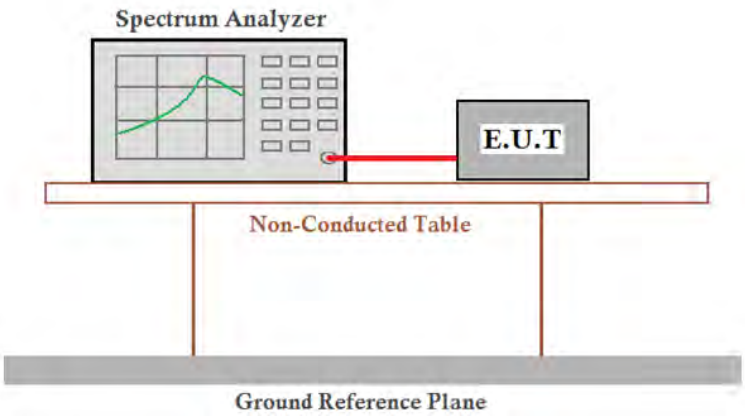
4.7 Band-edge for RF Conducted Emissions

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 5.10 for details.
Test Results:	Pass

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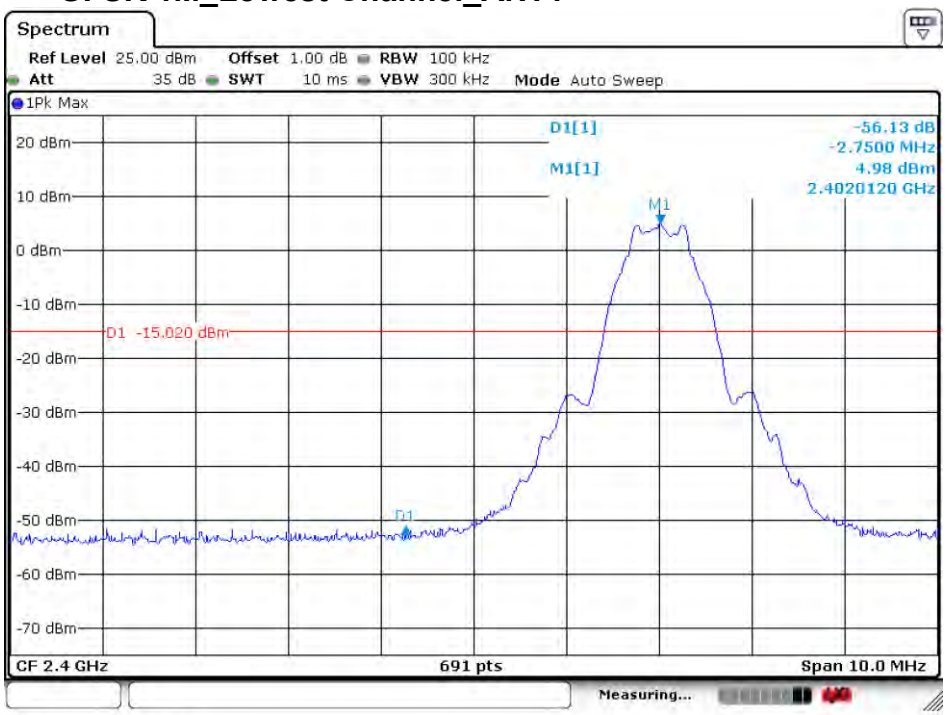
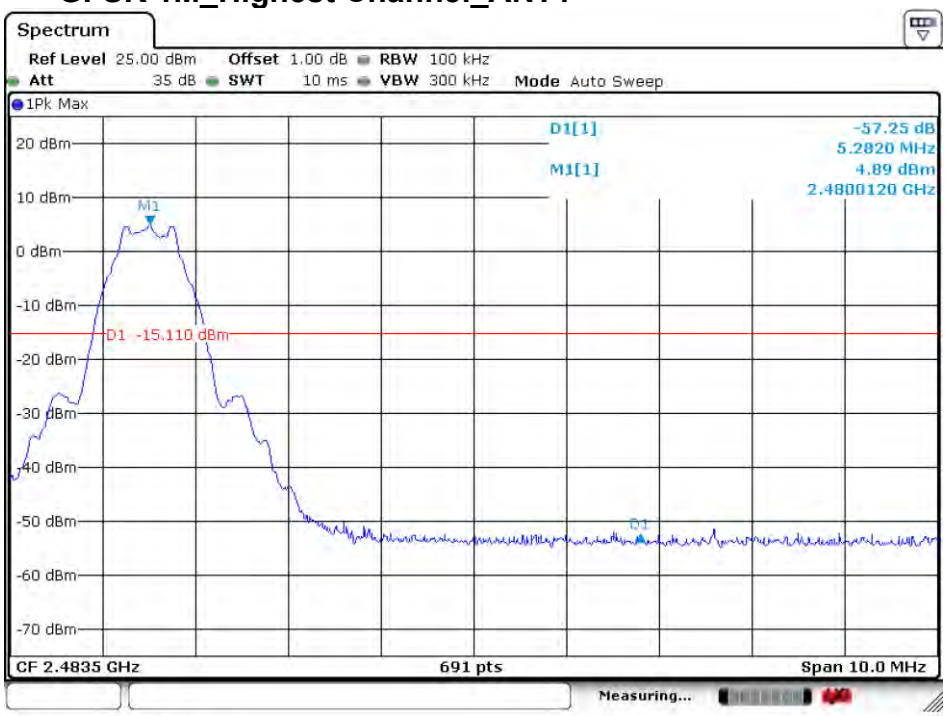
4.7.1 Test plots

4.7.1.1 GFSK 1M_Lowest Channel_ANT1



Date: 26.MAR.2020 12:56:44

4.7.1.2 GFSK 1M_Highest Channel_ANT1



Date: 26.MAR.2020 12:58:39

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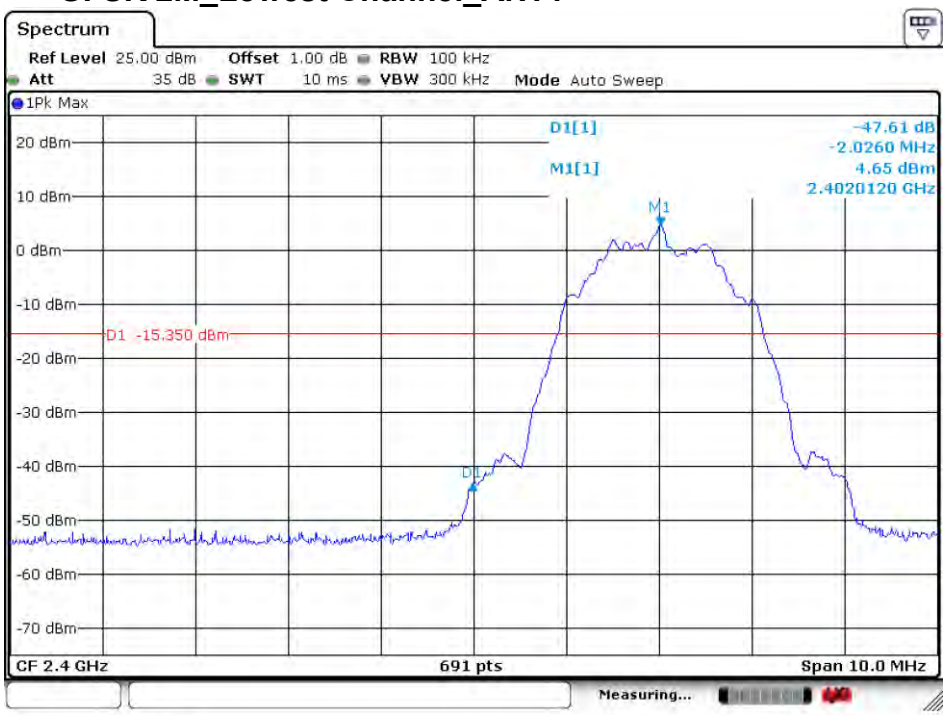
4.7.1.3 GFSK 2M_Lowest Channel_ANT1



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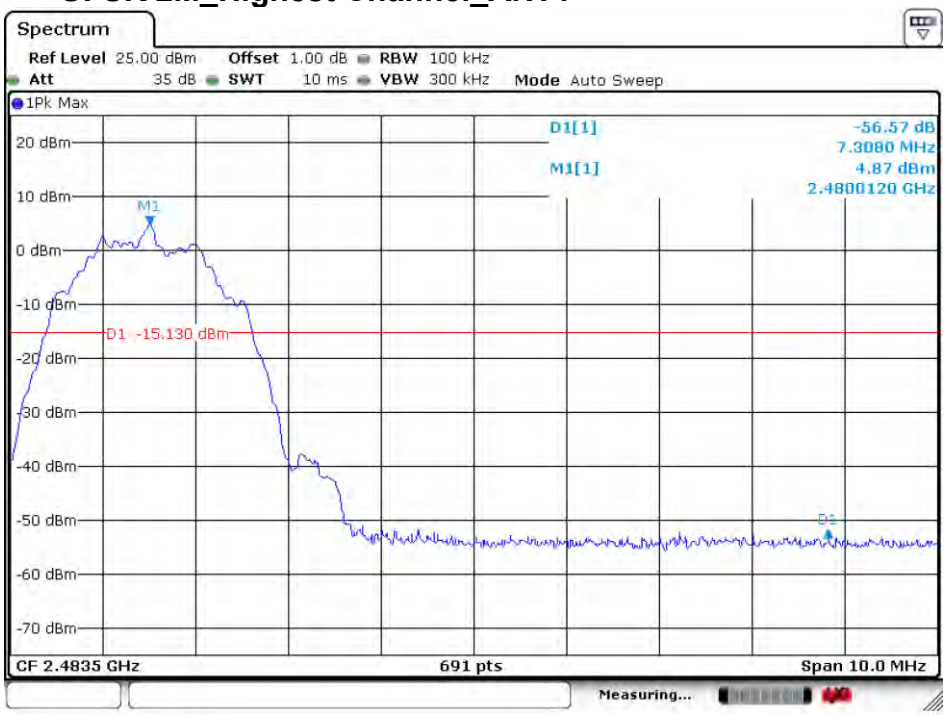
4.7.1.4 GFSK 2M_Highest Channel_ANT1



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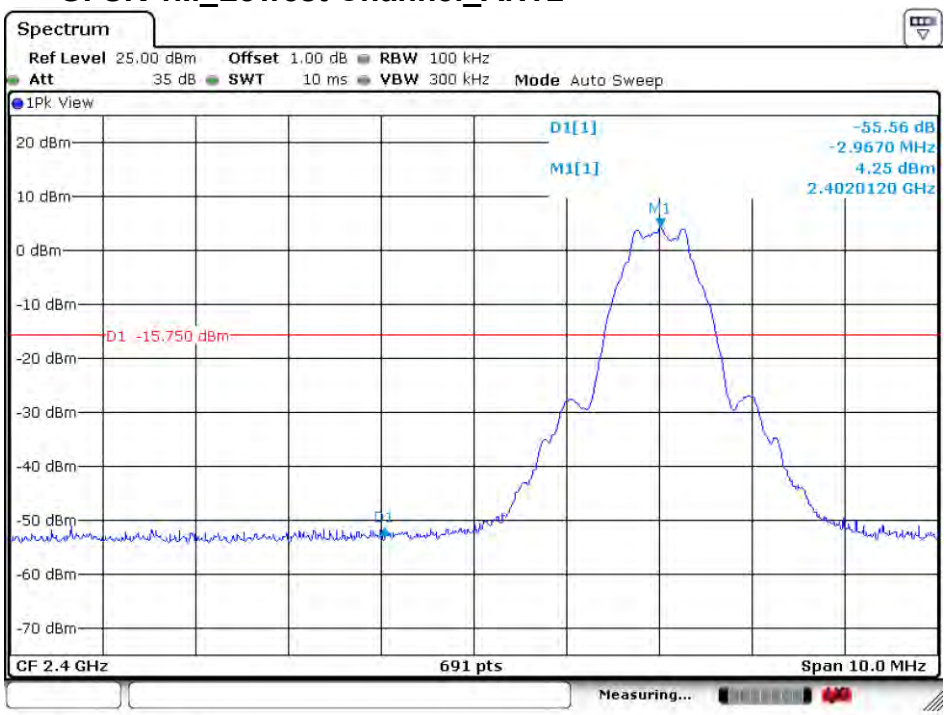
4.7.1.5 GFSK 1M_Lowest Channel_ANT2



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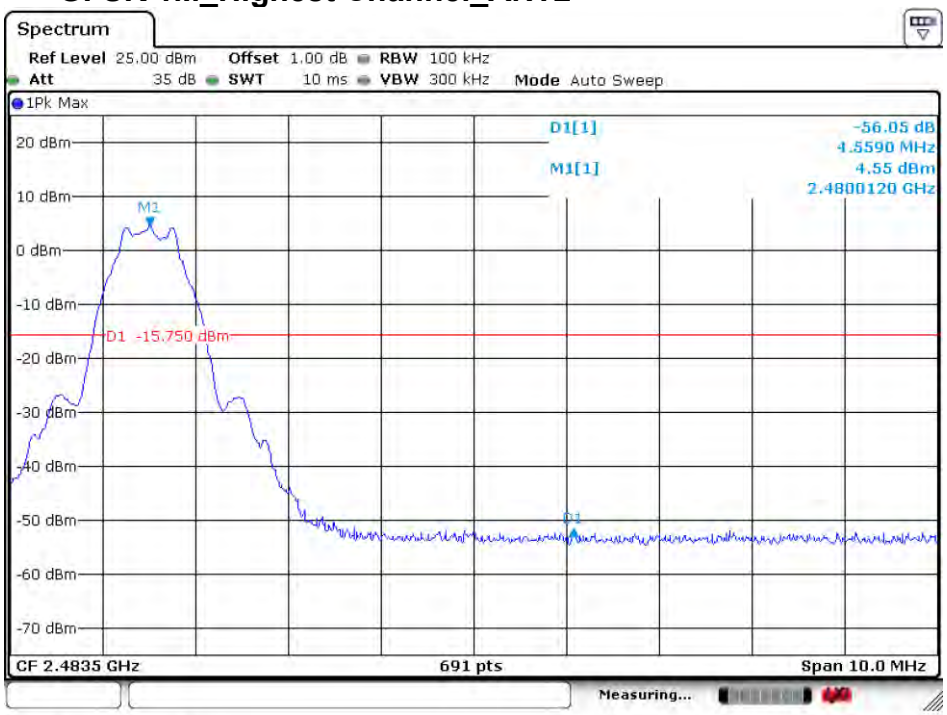
4.7.1.6 GFSK 1M_Highest Channel_ANT2



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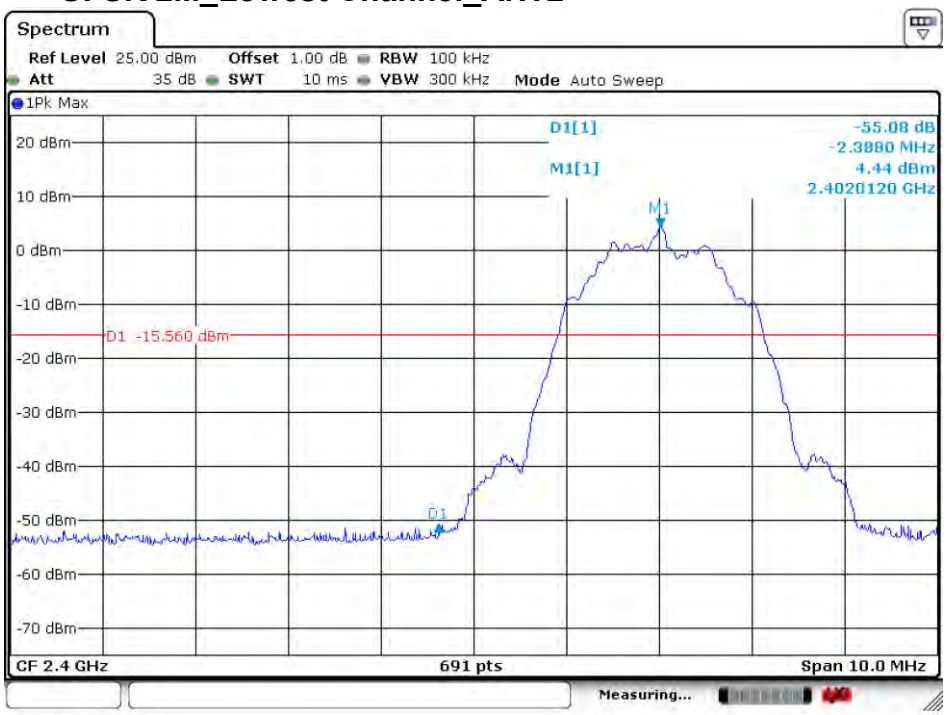
4.7.1.7 GFSK 2M_Lowest Channel_ANT2



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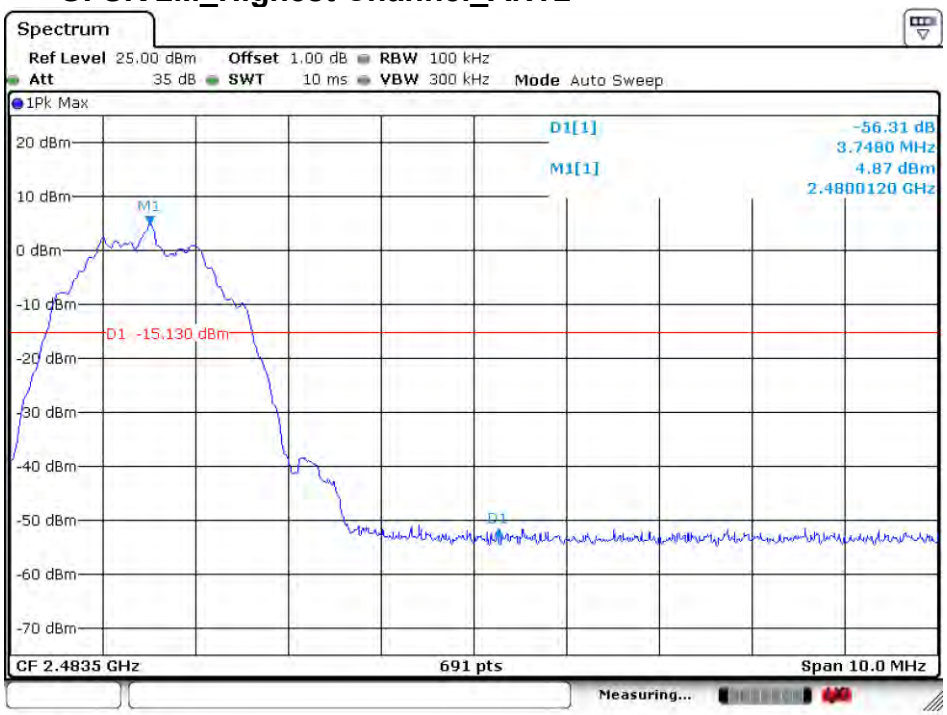
4.7.1.8 GFSK 2M_Highest Channel_ANT2



Date: 17.APR.2020 12:14:34

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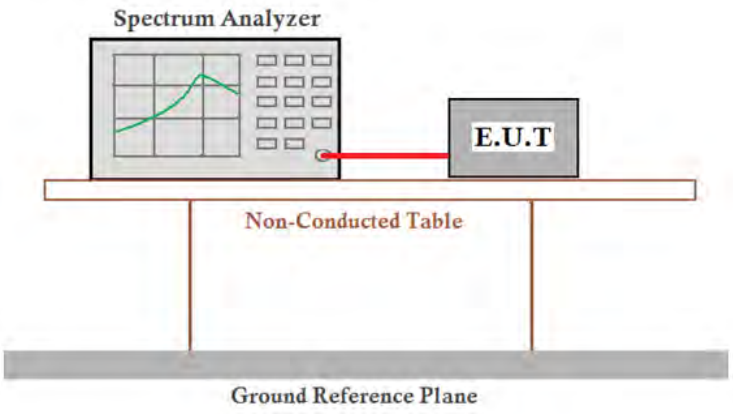
4.8 Spurious RF Conducted Emissions

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 5.10 for details.
Test Results:	Pass

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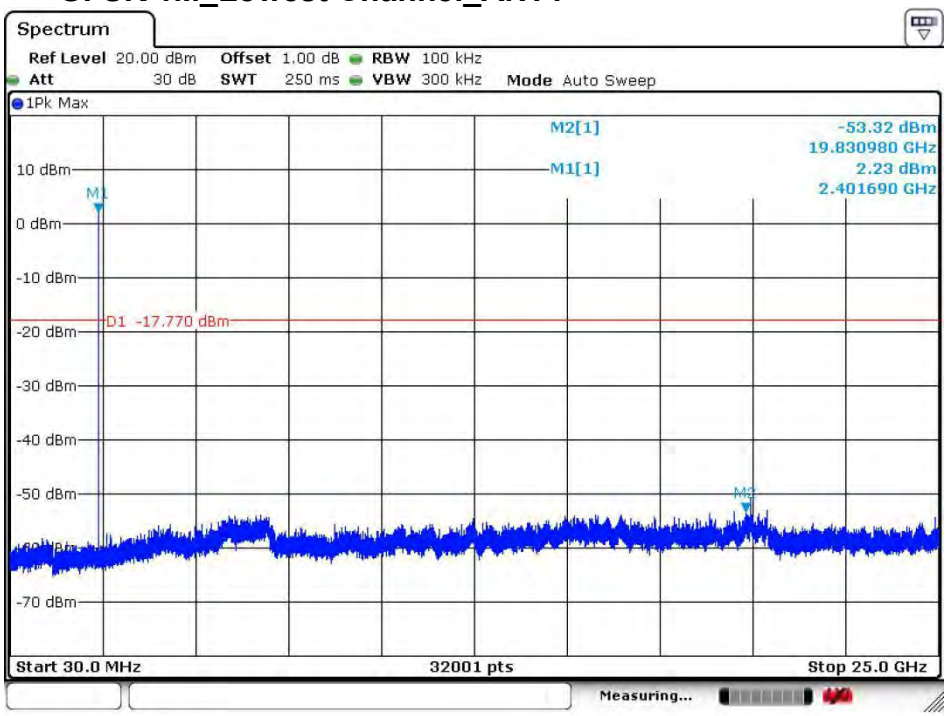
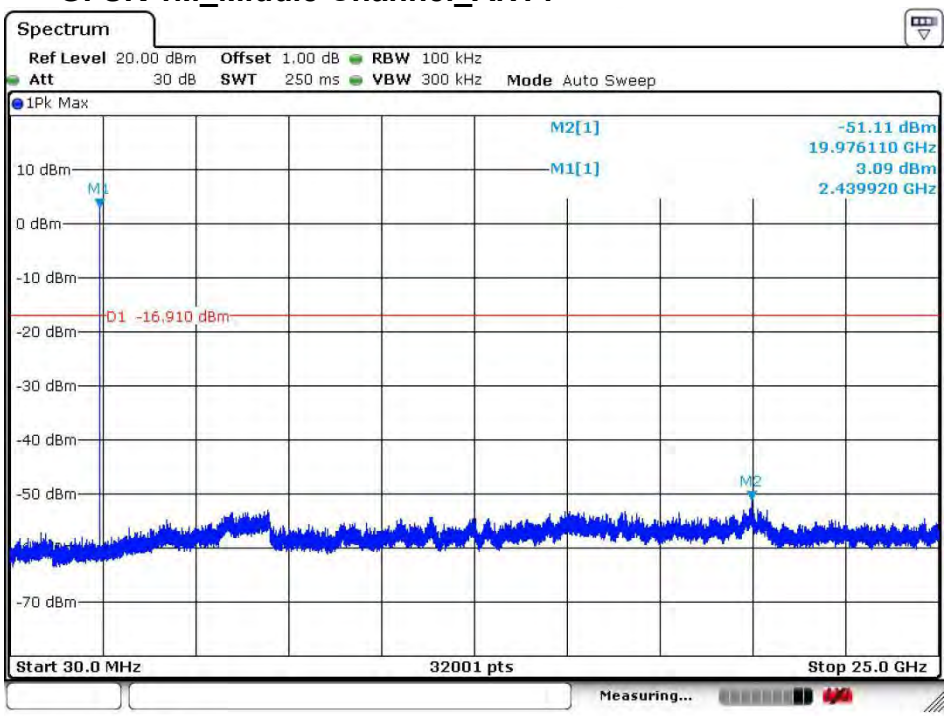
4.8.1 Test plots:

4.8.1.1 GFSK 1M_Lowest Channel_ANT1



Date: 24.MAR.2020 13:30:17

4.8.1.2 GFSK 1M_Middle Channel_ANT1



Date: 24.MAR.2020 13:29:45

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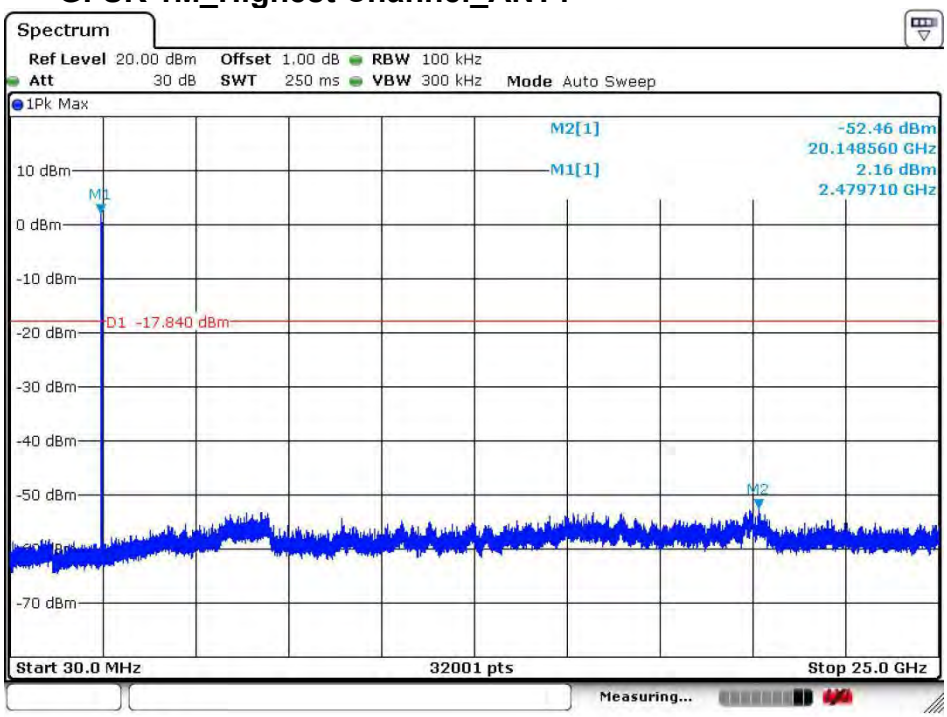
4.8.1.3 GFSK 1M_Highest Channel_ANT1



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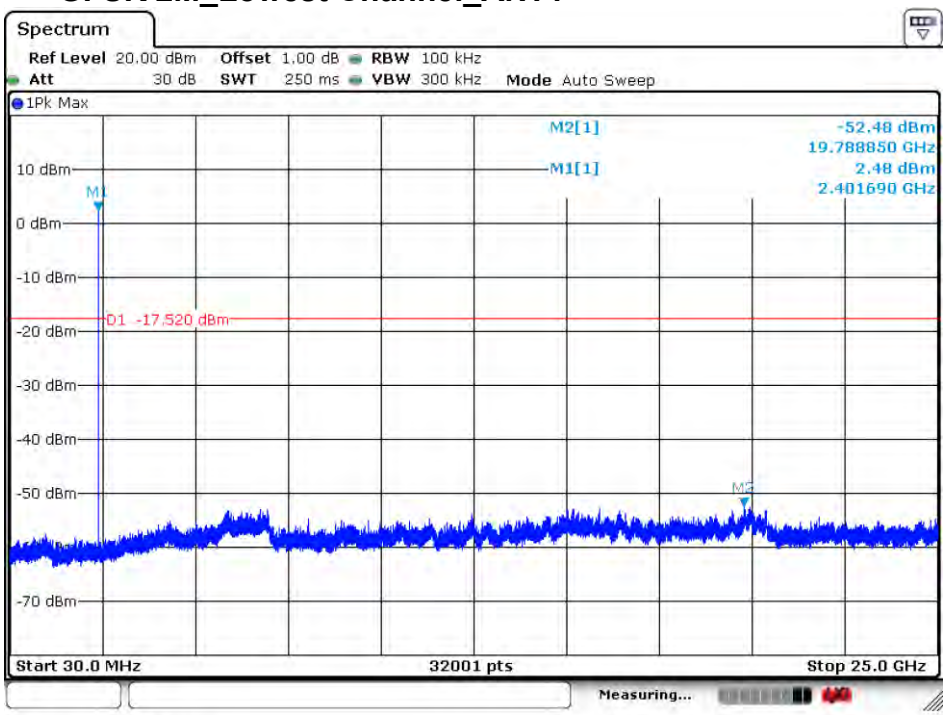
4.8.1.4 GFSK 2M_Lowest Channel_ANT1



Date: 25.MAR.2020 06:51:00

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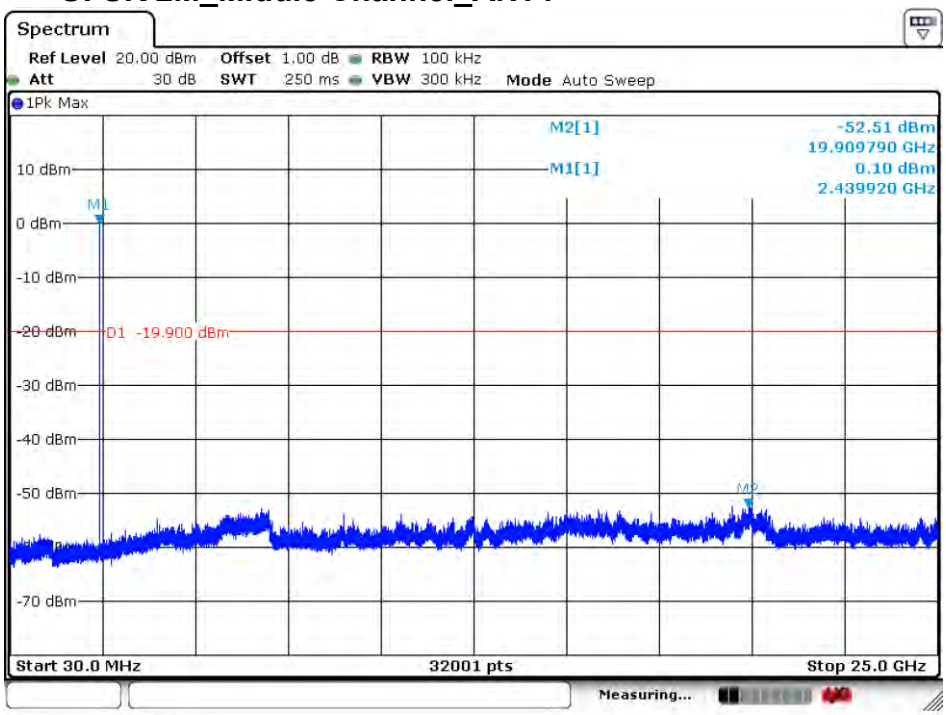
4.8.1.5 GFSK 2M_Middle Channel_ANT1



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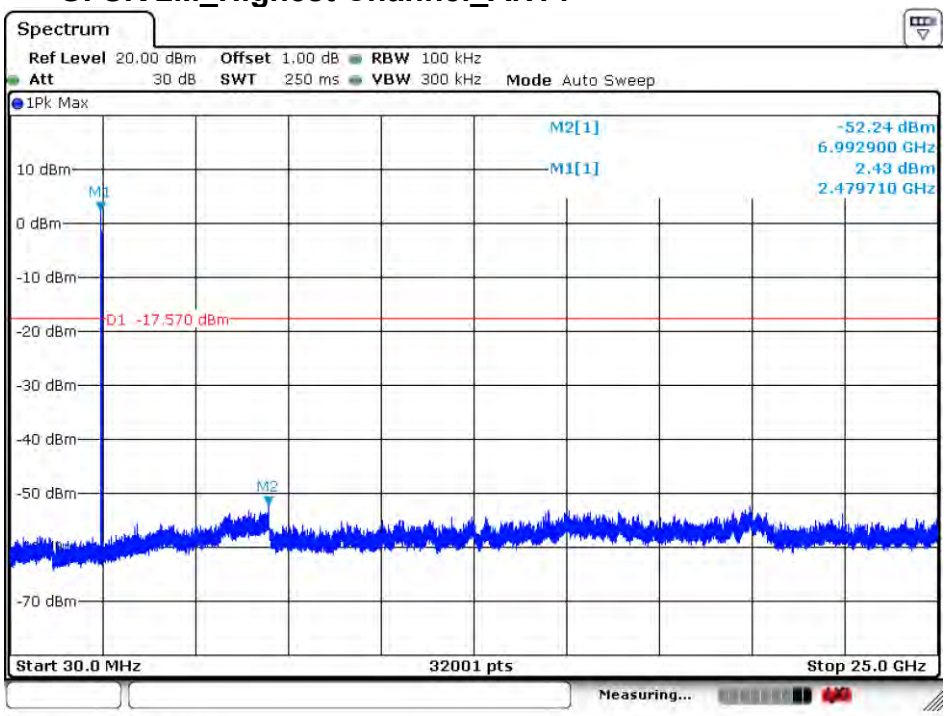
4.8.1.6 GFSK 2M_Highest Channel_ANT1



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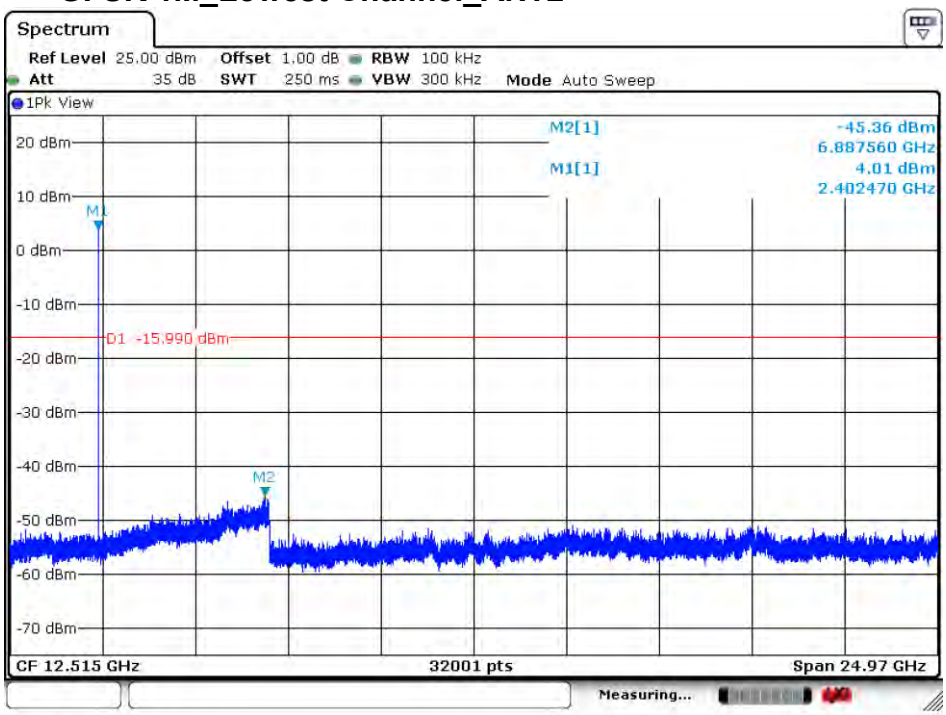
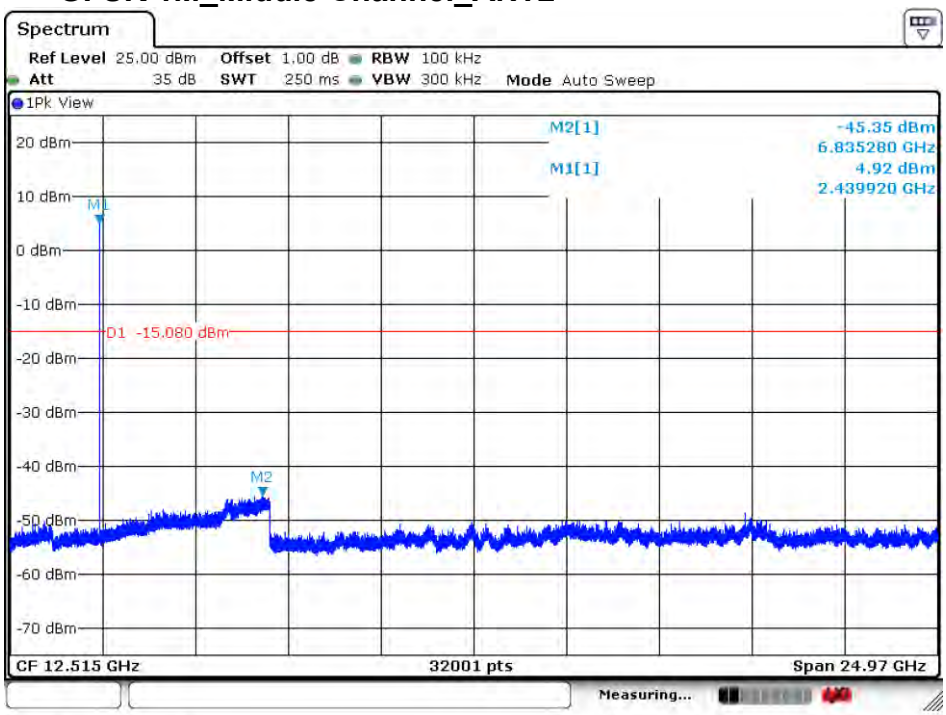
4.8.1.7 GFSK 1M_Lowest Channel_ANT2



Date: 17.APR.2020 11:41:44

4.8.1.8 GFSK 1M_Middle Channel_ANT2



Date: 17.APR.2020 11:51:53

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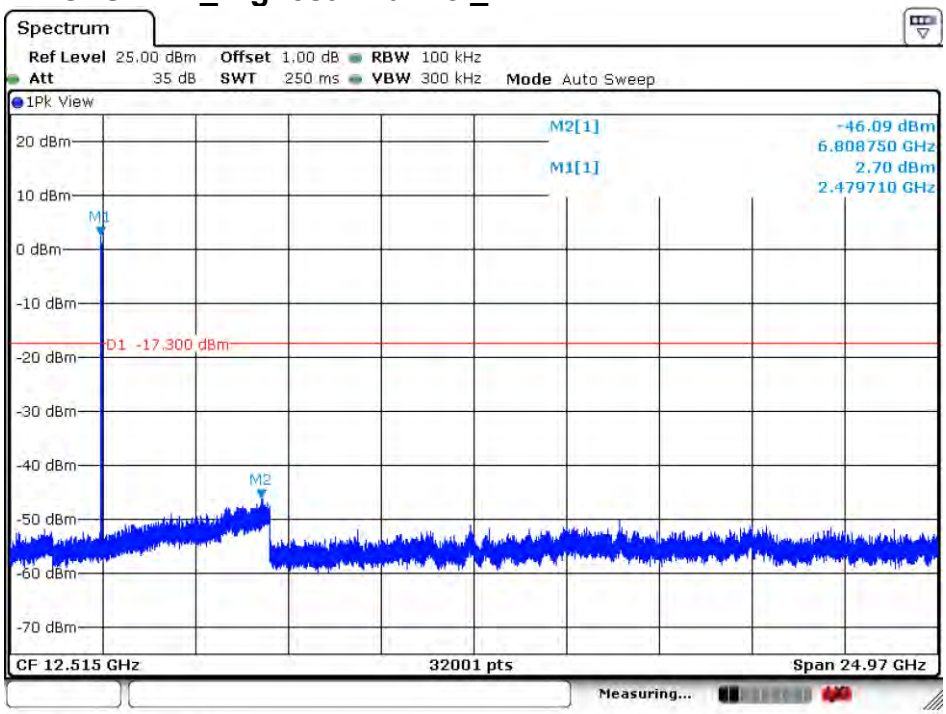
4.8.1.9 GFSK 1M_Highest Channel_ANT2



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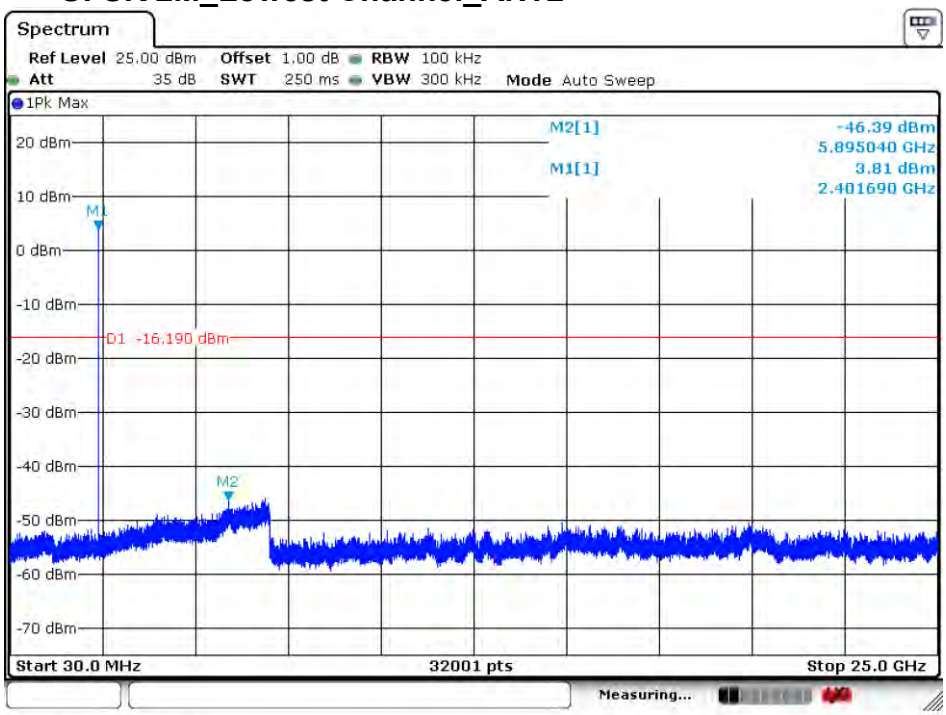
4.8.1.10 GFSK 2M_Lowest Channel_ANT2



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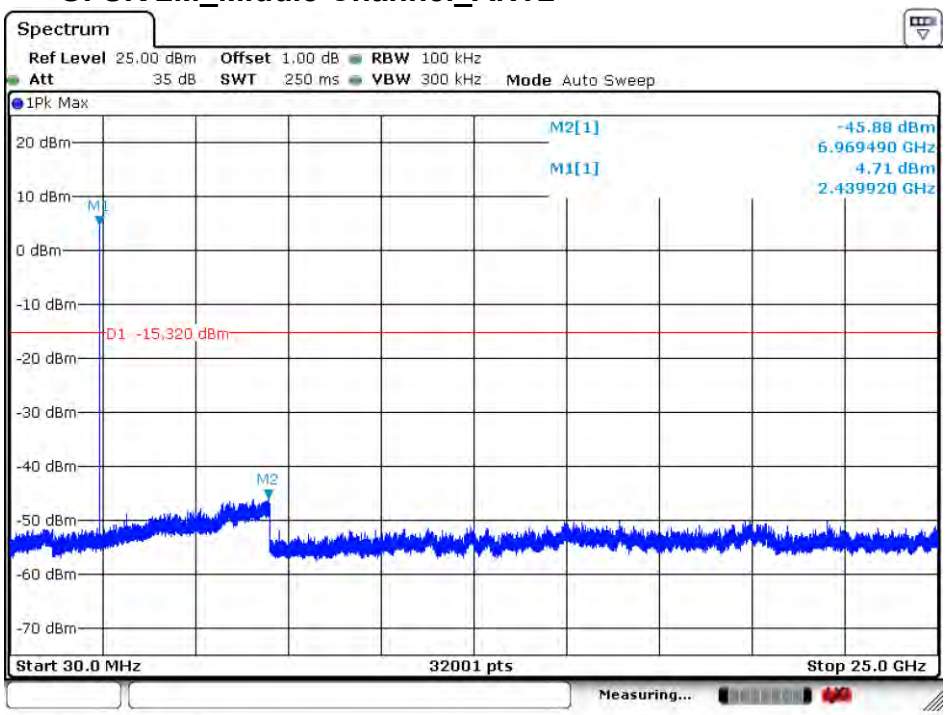
4.8.1.11 GFSK 2M_Middle Channel_ANT2



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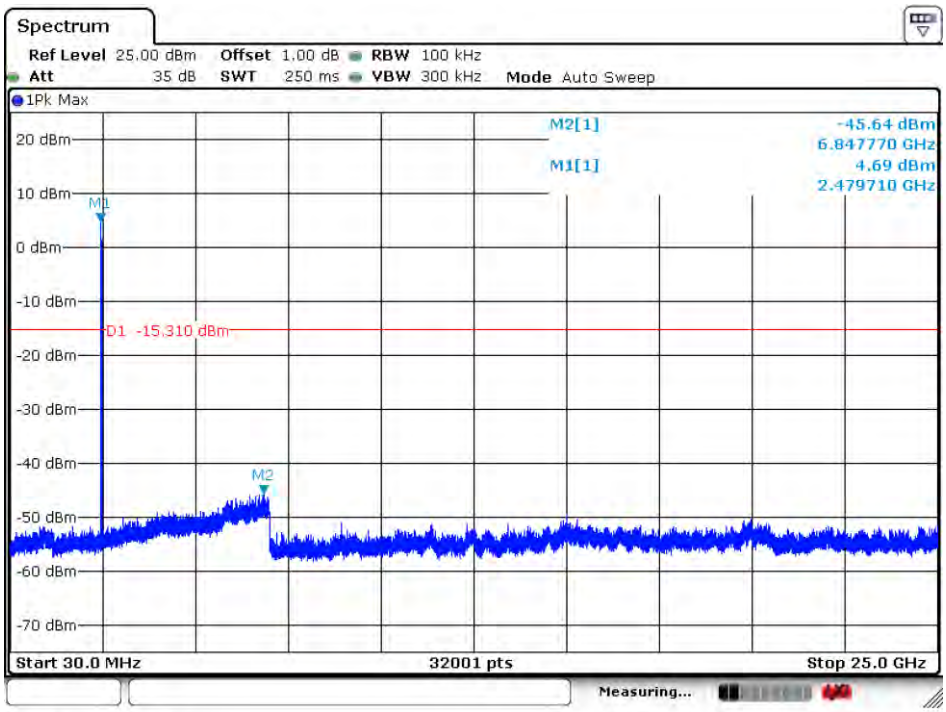
4.8.1.12 GFSK 2M_Highest Channel_ANT2



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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:

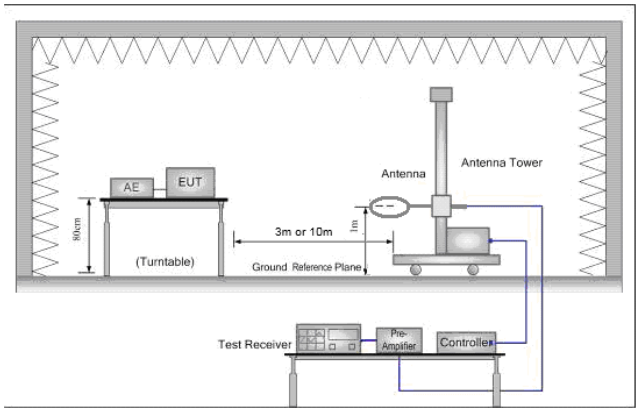

Figure 1. Below 30MHz

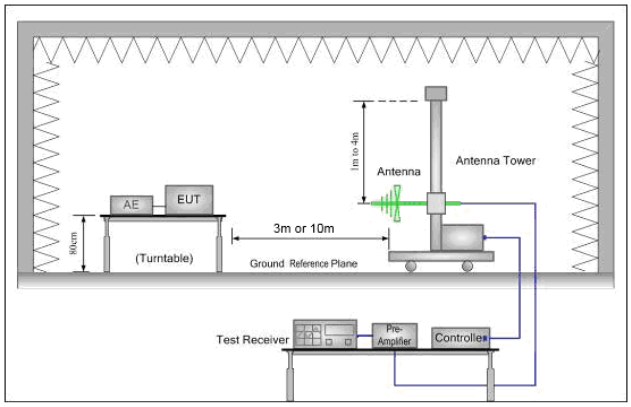

Figure 2. 30MHz to 1GHz

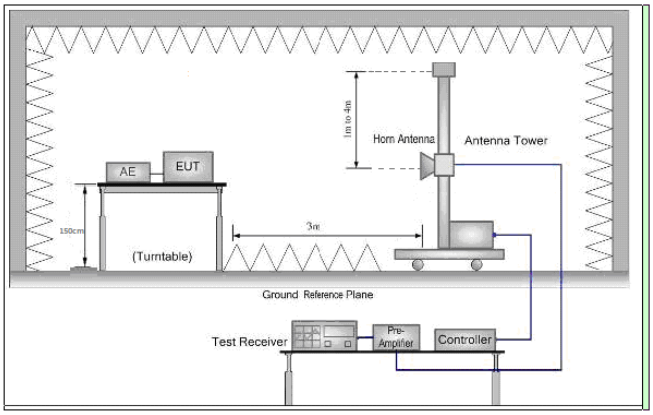

Figure 3. Above 1 GHz

Test Procedure:

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

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

e. Use the following spectrum analyzer settings:

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

(2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ;
VBW≥ RBW; Sweep = auto;
Detector function = peak; Trace = max hold for peak

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	(3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = N 1 *L 1 +N 2 *L 2 +...+N n-1 *LN n-1 +N n *L n Where N 1 is number of type 1 pulses, L 1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle) f. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. h. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. i. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz) 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. k. Repeat above procedures until all frequencies measured was complete.
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 5.10 for details.
Test Results:	Pass

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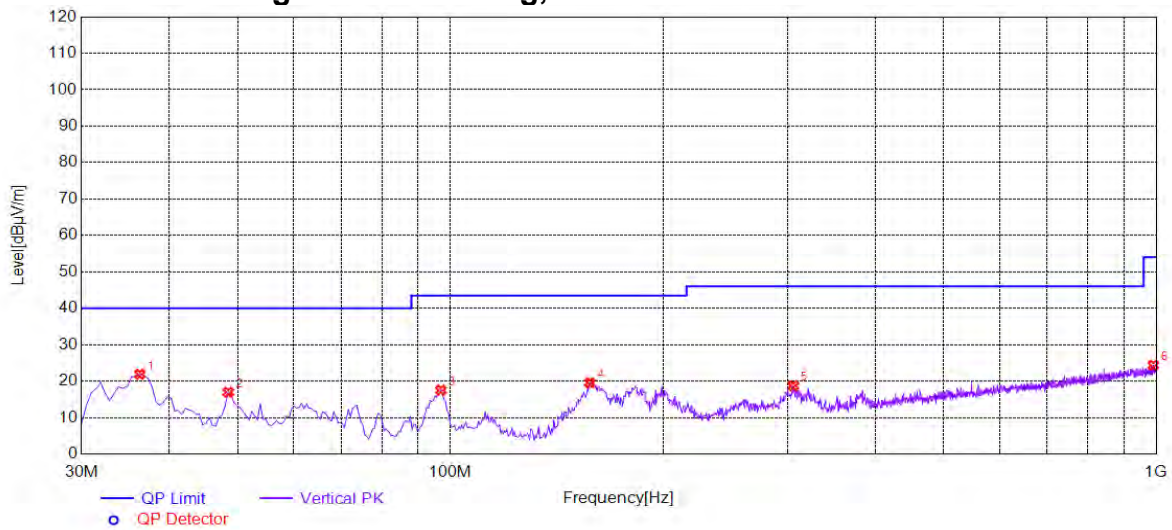
4.9.1 Radiated Emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.3082	21.89	-32.34	40.00	18.11	163	62	Vertical
2	48.4392	16.99	-30.19	40.00	23.01	180	86	Vertical
3	96.9635	17.54	-32.21	43.50	25.96	296	266	Vertical
4	157.618	19.58	-34.41	43.50	23.92	214	16	Vertical
5	306.103	18.75	-27.68	46.00	27.25	286	326	Vertical
6	990.780	24.39	-13.98	54.00	29.61	233	28	Vertical

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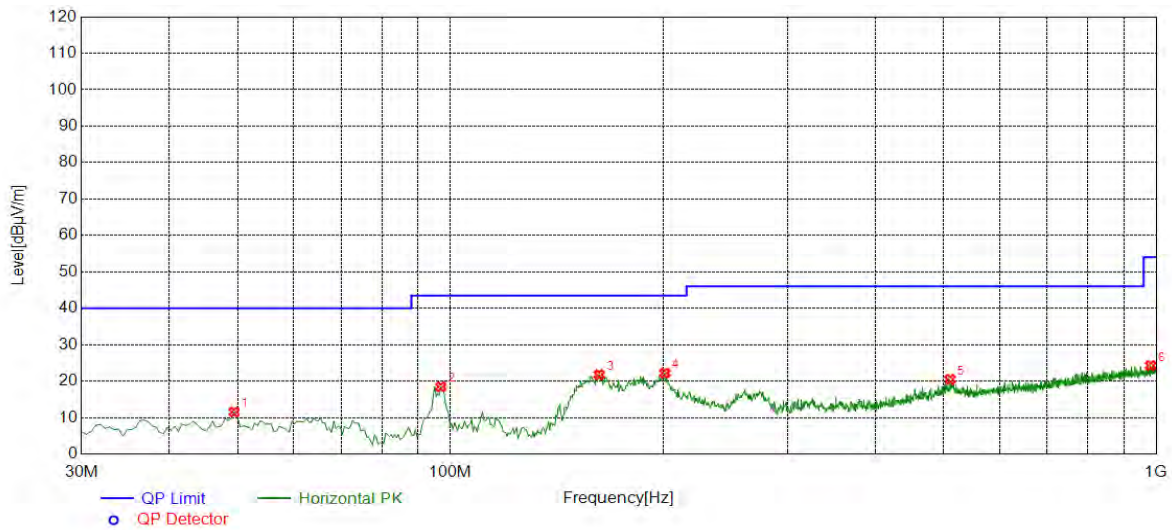
4.9.1.2 Charge + Transmitting, Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	49.4097	11.53	-30.18	40.00	28.47	194	238	Horizontal
2	96.9635	18.48	-32.21	43.50	25.02	196	257	Horizontal
3	162.471	21.80	-34.13	43.50	21.70	110	232	Horizontal
4	201.290	22.21	-30.79	43.50	21.29	209	332	Horizontal
5	510.390	20.51	-22.42	46.00	25.49	124	344	Horizontal
6	982.046	24.29	-14.09	54.00	29.71	204	289	Horizontal

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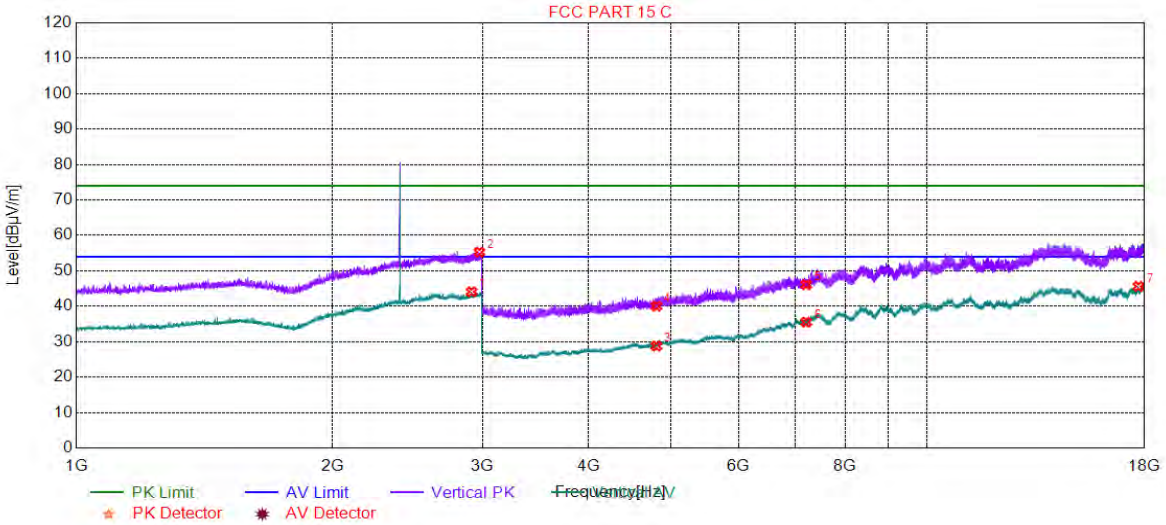
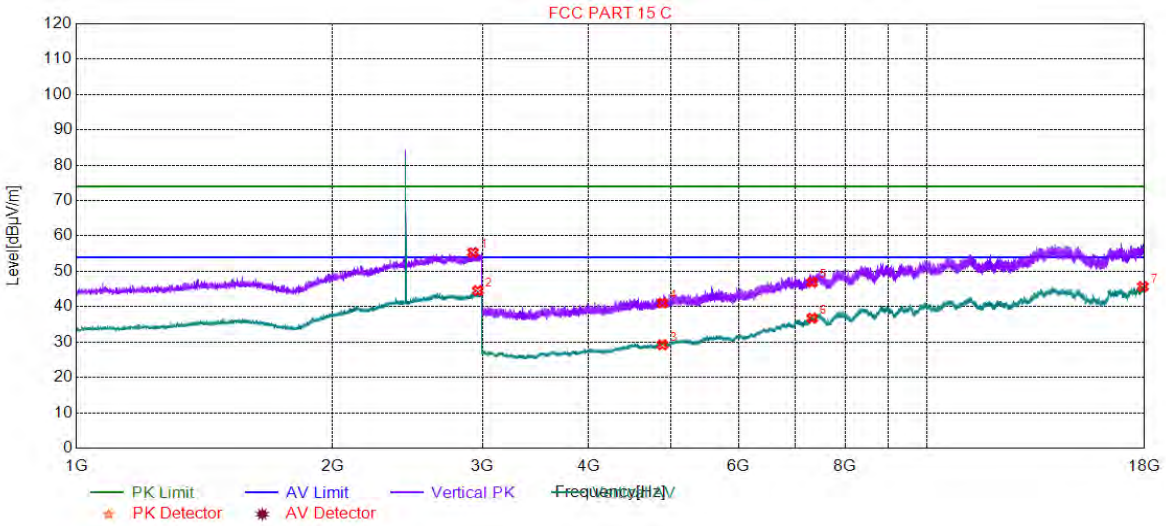
4.9.2 Transmitter Emission above 1GHz

4.9.2.1 GFSK _Lowest Channel_ Vertical_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2913.97	44.09	9.29	54.00	9.91	196	18	Vertical
2	2975.99	55.30	9.56	74.00	18.70	254	75	Vertical
3	4804.00	28.79	-18.30	54.00	25.21	173	95	Vertical
4	4804.00	40.04	-18.30	74.00	33.96	229	342	Vertical
5	7206.00	46.11	-10.09	74.00	27.89	233	18	Vertical
6	7206.00	35.53	-10.09	54.00	18.47	284	18	Vertical
7	17703.5	45.60	1.29	54.00	8.40	162	68	Vertical

4.9.2.2 GFSK _Middle Channel_ Vertical_ANT1



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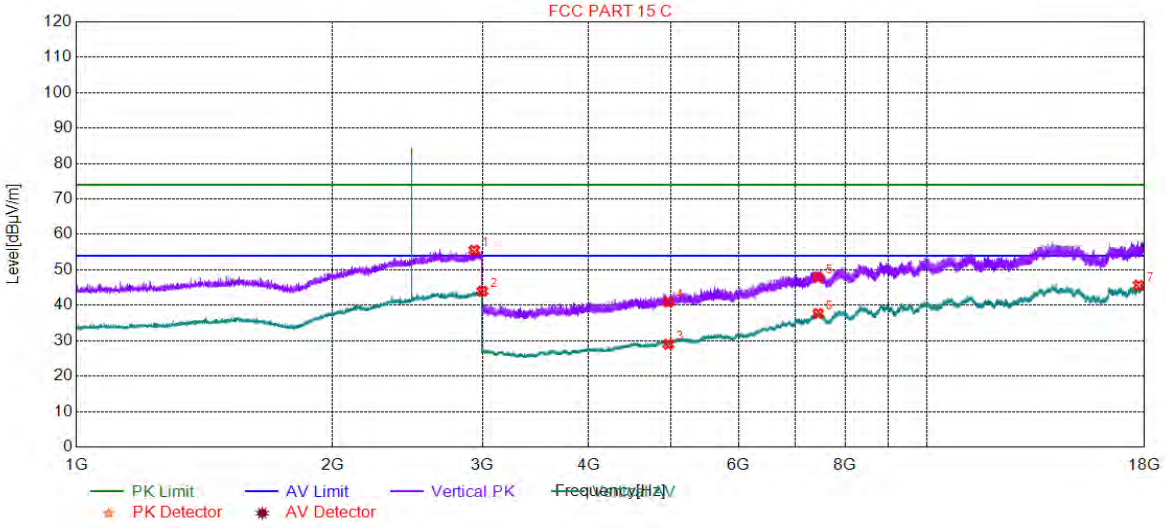
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2923.98	55.35	9.40	74.00	18.65	214	237	Vertical
2	2963.49	44.52	9.62	54.00	9.48	225	224	Vertical
3	4882.00	29.21	-17.96	54.00	24.79	260	287	Vertical
4	4882.00	41.05	-17.96	74.00	32.95	227	150	Vertical
5	7323.00	46.89	-9.71	74.00	27.11	171	119	Vertical
6	7323.00	36.77	-9.71	54.00	17.23	249	69	Vertical
7	17913.6	45.68	0.69	54.00	8.32	199	119	Vertical

4.9.2.3 GFSK _High Channel_ Vertical_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2934.48	55.55	9.51	74.00	18.45	187	115	Vertical
2	2999.49	43.97	9.45	54.00	10.03	186	359	Vertical
3	4960.00	29.03	-17.47	54.00	24.97	250	261	Vertical
4	4960.00	40.88	-17.47	74.00	33.12	207	288	Vertical
5	7440.00	47.90	-9.35	74.00	26.10	237	18	Vertical
6	7440.00	37.70	-9.35	54.00	16.30	225	18	Vertical
7	17713.4	45.65	1.09	54.00	8.35	230	118	Vertical

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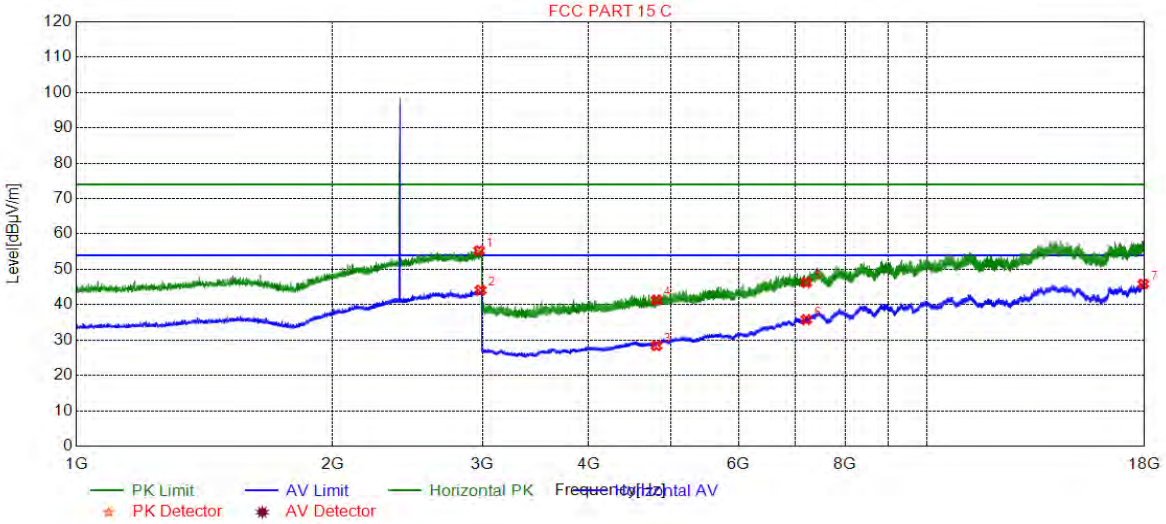
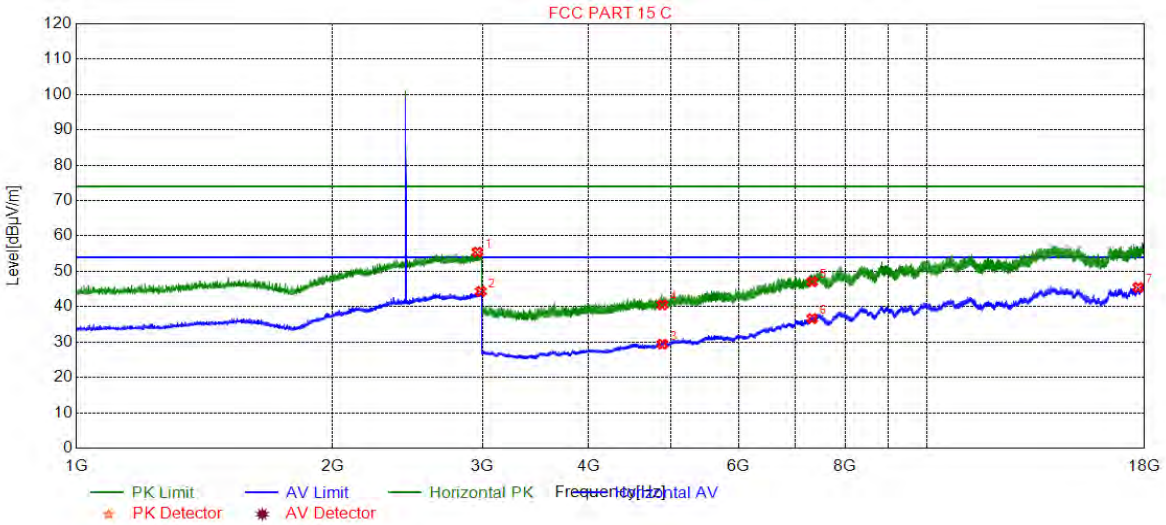
4.9.2.4 GFSK _Lowest Channel_ Horizontal_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.49	55.30	9.58	74.00	18.70	242	13	Horizontal
2	2984.99	44.11	9.52	54.00	9.89	182	301	Horizontal
3	4804.00	28.41	-18.30	54.00	25.59	120	232	Horizontal
4	4804.00	41.35	-18.30	74.00	32.65	231	205	Horizontal
5	7206.00	46.26	-10.09	74.00	27.74	126	118	Horizontal
6	7206.00	35.79	-10.09	54.00	18.21	214	18	Horizontal
7	17932.8	45.87	0.70	54.00	8.13	129	168	Horizontal

4.9.2.5 GFSK _Middle Channel_ Horizontal_ANT1



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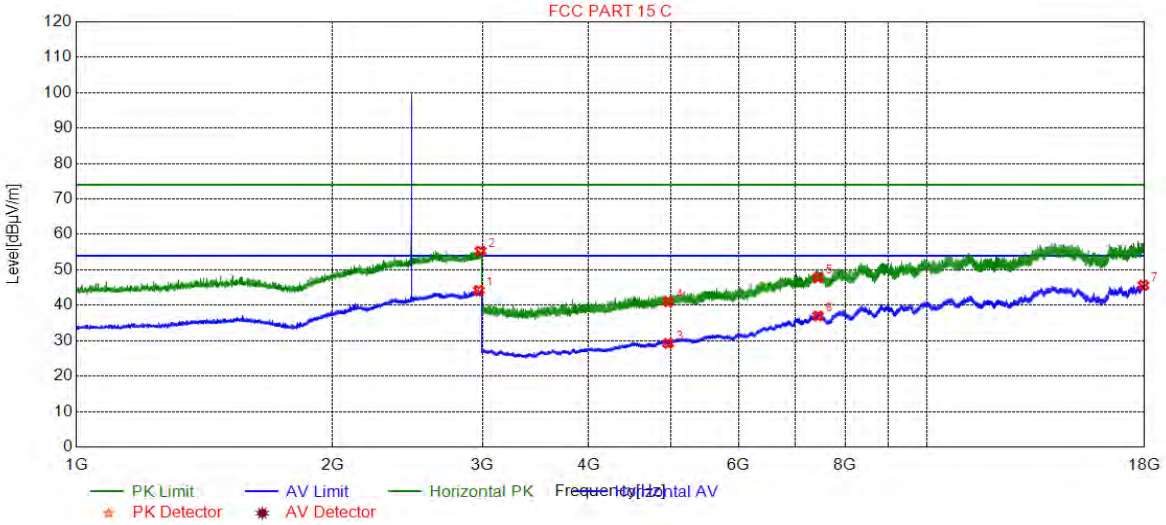
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.99	55.45	9.63	74.00	18.55	214	286	Horizontal
2	2986.99	44.33	9.51	54.00	9.67	201	187	Horizontal
3	4882.00	29.42	-17.96	54.00	24.58	162	342	Horizontal
4	4882.00	40.52	-17.96	74.00	33.48	218	123	Horizontal
5	7323.00	47.05	-9.71	74.00	26.95	156	360	Horizontal
6	7323.00	36.66	-9.71	54.00	17.34	138	119	Horizontal
7	17690.3	45.45	1.36	54.00	8.55	152	169	Horizontal

4.9.2.6 GFSK _High Channel_ Horizontal_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2970.99	44.23	9.58	54.00	9.77	167	300	Horizontal
2	2985.49	55.32	9.52	74.00	18.68	159	24	Horizontal
3	4960.00	29.24	-17.47	54.00	24.76	183	98	Horizontal
4	4960.00	41.02	-17.47	74.00	32.98	244	0	Horizontal
5	7440.00	47.83	-9.35	74.00	26.17	213	276	Horizontal
6	7440.00	36.98	-9.35	54.00	17.02	184	226	Horizontal
7	17940.0	45.65	0.70	54.00	8.35	205	18	Horizontal

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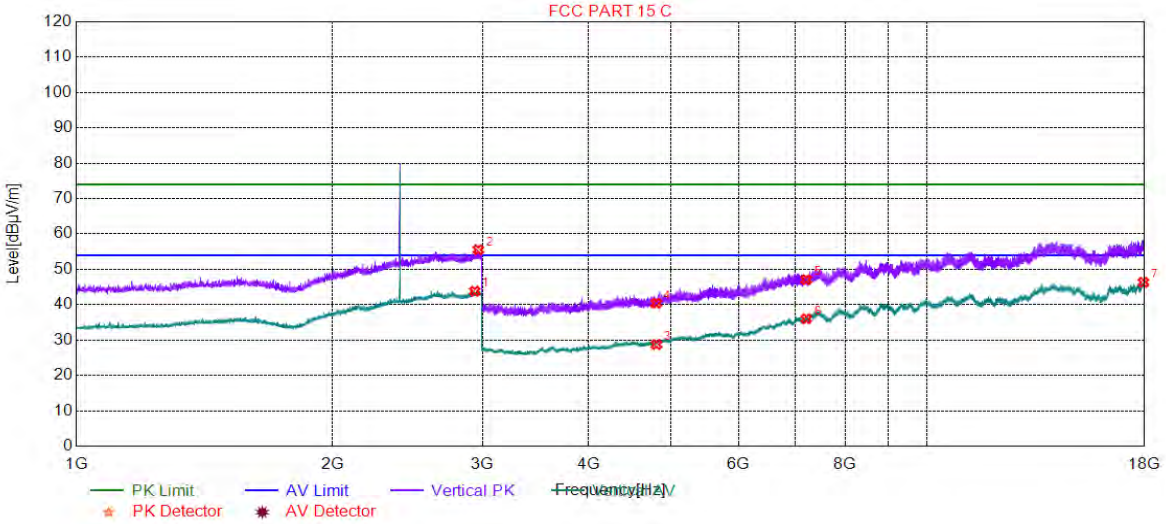
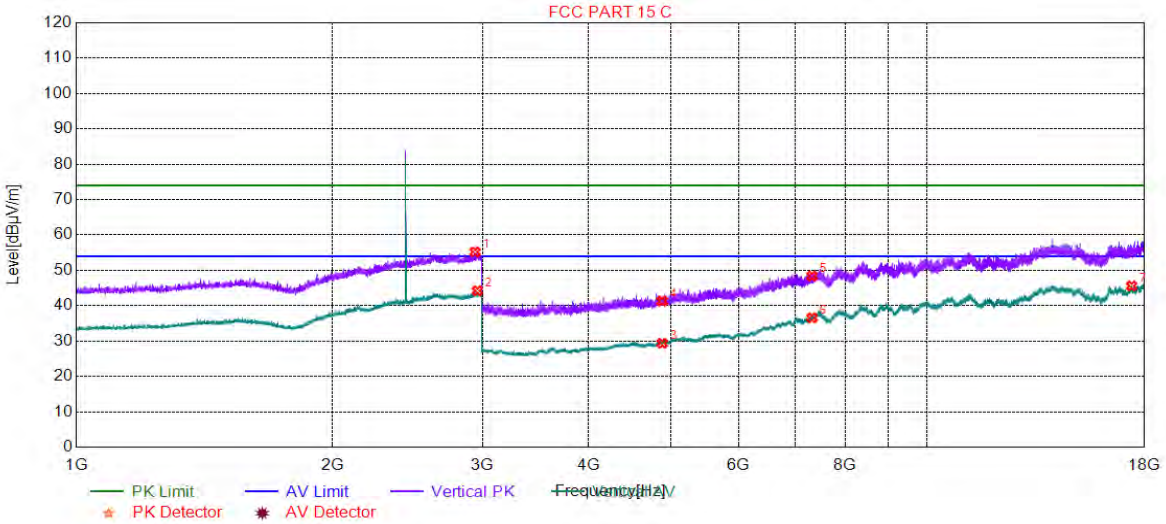
4.9.2.7 GFSK _Lowest Channel_ Vertical_ANT2



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2938.48	43.84	9.56	54.00	10.16	157	55	Vertical
2	2966.99	55.55	9.60	74.00	18.45	185	41	Vertical
3	4804.00	28.73	-18.30	54.00	25.27	244	18	Vertical
4	4804.00	40.41	-18.30	74.00	33.59	185	262	Vertical
5	7206.00	47.10	-10.09	74.00	26.90	152	292	Vertical
6	7206.00	36.02	-10.09	54.00	17.98	276	342	Vertical
7	17941.1	46.31	0.70	54.00	7.69	192	192	Vertical

4.9.2.8 GFSK _Middle Channel_ Vertical_ANT2



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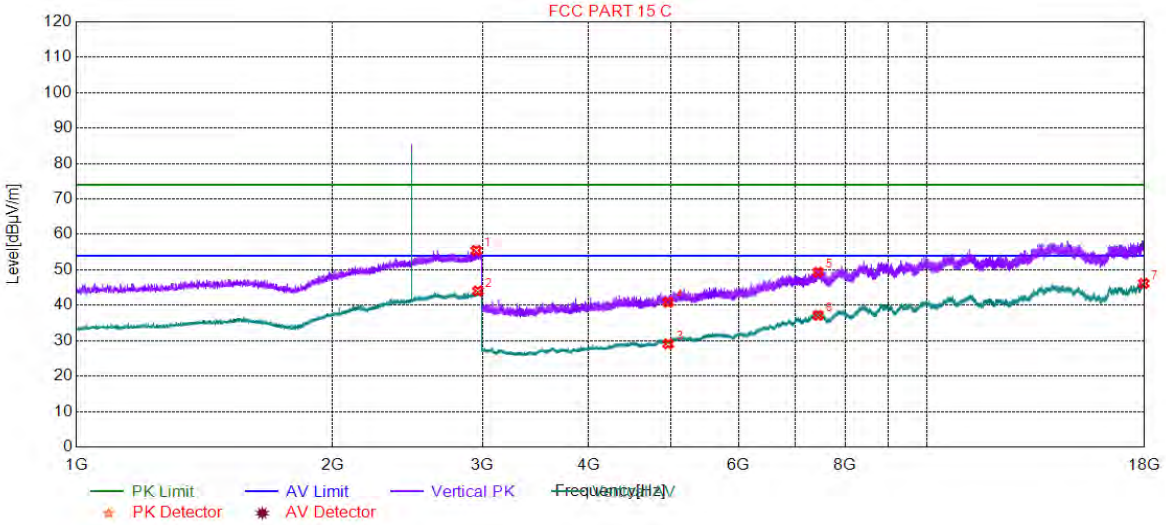
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.98	55.20	9.58	74.00	18.80	232	138	Vertical
2	2959.99	44.22	9.63	54.00	9.78	224	220	Vertical
3	4880.00	29.38	-17.97	54.00	24.62	156	326	Vertical
4	4880.00	41.31	-17.97	74.00	32.69	198	244	Vertical
5	7320.00	48.39	-9.72	74.00	25.61	210	292	Vertical
6	7320.00	36.58	-9.72	54.00	17.42	298	292	Vertical
7	17379.0	45.59	0.18	54.00	8.41	291	143	Vertical

4.9.2.9 GFSK _High Channel_ Vertical_ANT2



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2950.98	55.47	9.68	74.00	18.53	284	220	Vertical
2	2963.49	44.05	9.62	54.00	9.95	276	233	Vertical
3	4960.00	29.11	-17.47	54.00	24.89	292	72	Vertical
4	4960.00	40.85	-17.47	74.00	33.15	168	154	Vertical
5	7440.00	49.36	-9.35	74.00	24.64	181	293	Vertical
6	7440.00	37.17	-9.35	54.00	16.83	194	244	Vertical
7	17952.6	46.16	0.71	54.00	7.84	237	342	Vertical

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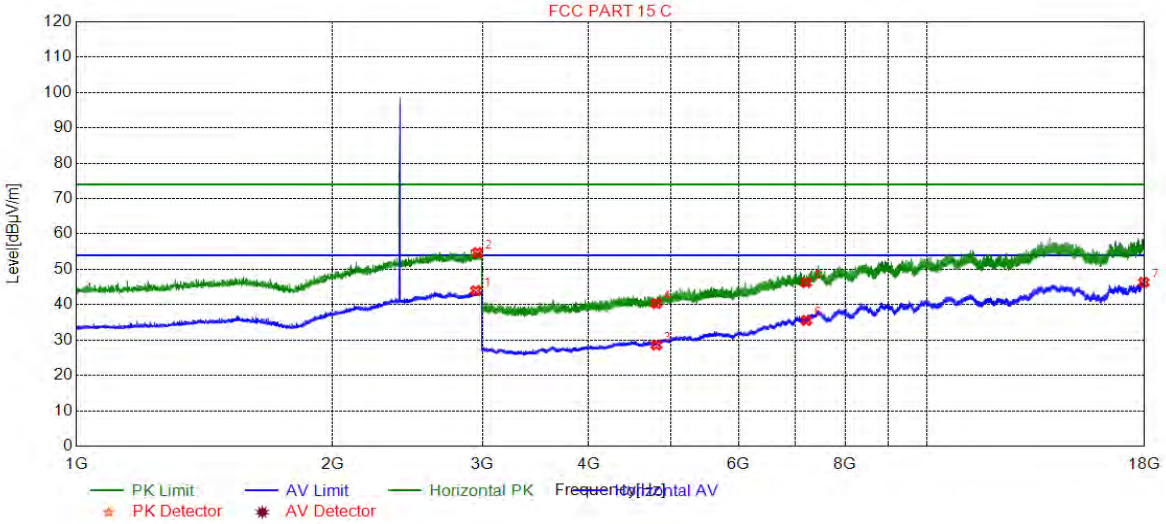
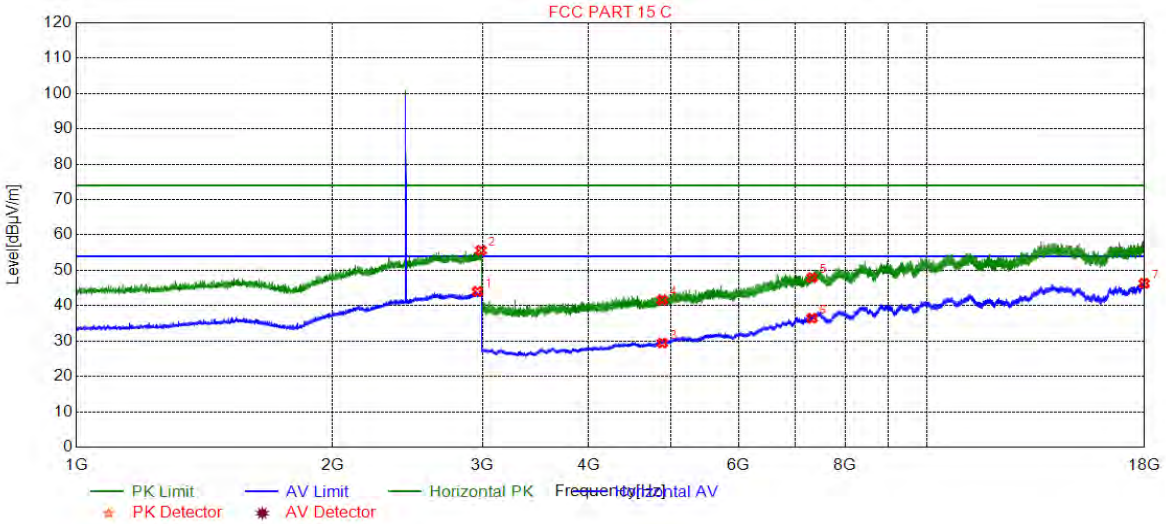
4.9.2.10 GFSK _Lowest Channel_ Horizontal_ANT2



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2947.98	43.96	9.66	54.00	10.04	231	153	Horizontal
2	2959.99	54.74	9.63	74.00	19.26	124	113	Horizontal
3	4804.00	28.61	-18.30	54.00	25.39	239	209	Horizontal
4	4804.00	40.31	-18.30	74.00	33.69	215	100	Horizontal
5	7206.00	46.26	-10.09	74.00	27.74	163	43	Horizontal
6	7206.00	35.57	-10.09	54.00	18.43	148	342	Horizontal
7	17960.9	46.33	0.71	54.00	7.67	147	93	Horizontal

4.9.2.11 GFSK _Middle Channel_ Horizontal_ANT2



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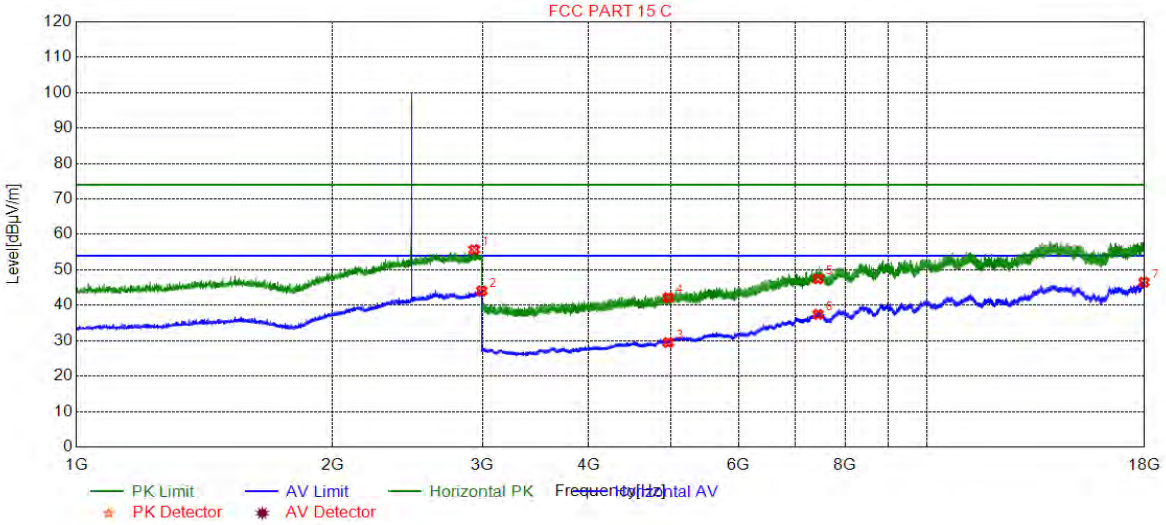
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.49	44.01	9.63	54.00	9.99	240	58	Horizontal
2	2987.99	55.65	9.51	74.00	18.35	144	290	Horizontal
3	4880.00	29.45	-17.97	54.00	24.55	157	18	Horizontal
4	4880.00	41.65	-17.97	74.00	32.35	232	343	Horizontal
5	7320.00	47.93	-9.72	74.00	26.07	218	242	Horizontal
6	7320.00	36.46	-9.72	54.00	17.54	161	143	Horizontal
7	17975.7	46.33	0.71	54.00	7.67	152	93	Horizontal

4.9.2.12 GFSK _High Channel_ Horizontal_ANT2



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Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2933.48	55.71	9.50	74.00	18.29	200	155	Horizontal
2	2994.49	44.06	9.48	54.00	9.94	170	348	Horizontal
3	4960.00	29.48	-17.47	54.00	24.52	199	18	Horizontal
4	4960.00	42.18	-17.47	74.00	31.82	105	18	Horizontal
5	7440.00	47.41	-9.35	74.00	26.59	158	0	Horizontal
6	7440.00	37.43	-9.35	54.00	16.57	171	292	Horizontal
7	17965.3	46.51	0.71	54.00	7.49	194	92	Horizontal

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:			

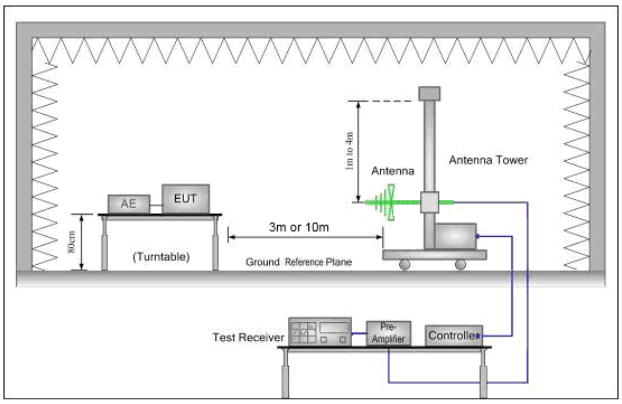

Figure 1. 30MHz to 1GHz

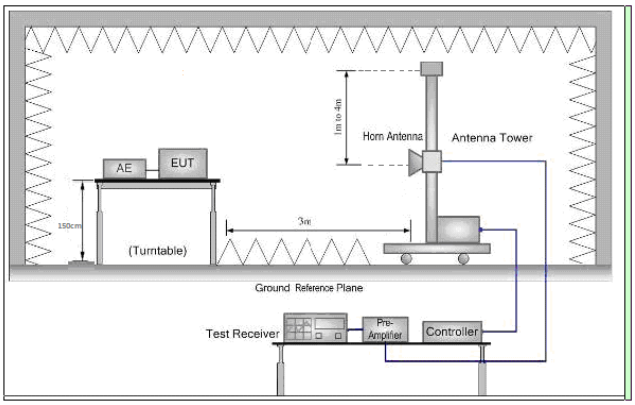

Figure 2. Above 1 GHz

Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel, the Highest channel

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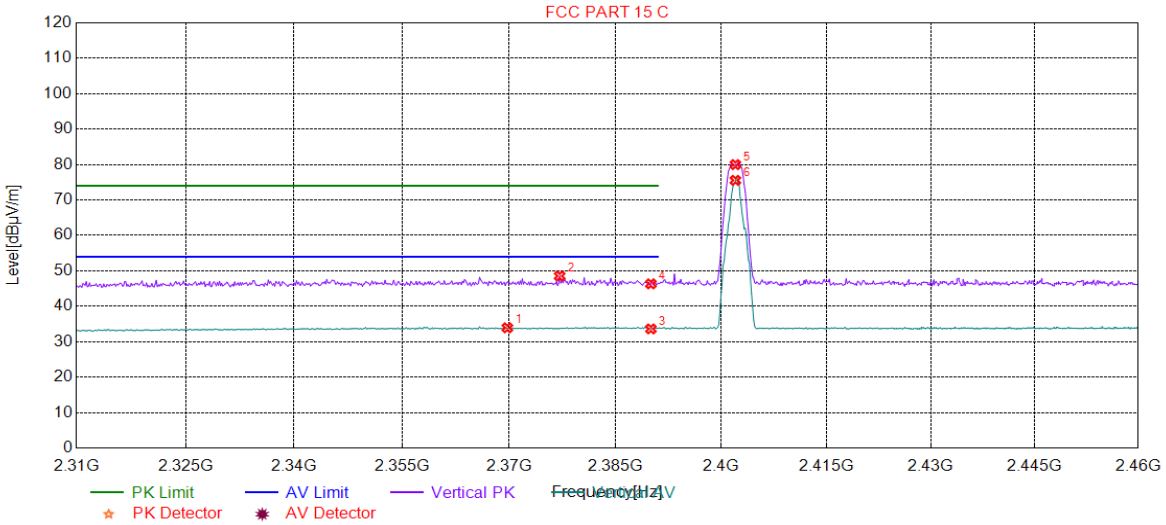
	i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with GFSK modulation. Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation. Pretest the EUT at Charge + Transmitting mode. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

4.10.1 Test plots

4.10.1.1 Worst Case Mode (GFSK) Lowest Channel_ Vertical_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2369.75	33.93	7.79	54.00	20.07	284	114	Vertical
2	2377.11	48.55	7.78	74.00	25.45	252	335	Vertical
3	2390.00	33.62	7.77	54.00	20.38	192	32	Vertical
4	2390.00	46.34	7.77	74.00	27.66	282	181	Vertical
5	2402.00	79.99	7.77	0.00	-79.99	215	310	Vertical
6	2402.00	75.55	7.77	0.00	-75.55	266	164	Vertical

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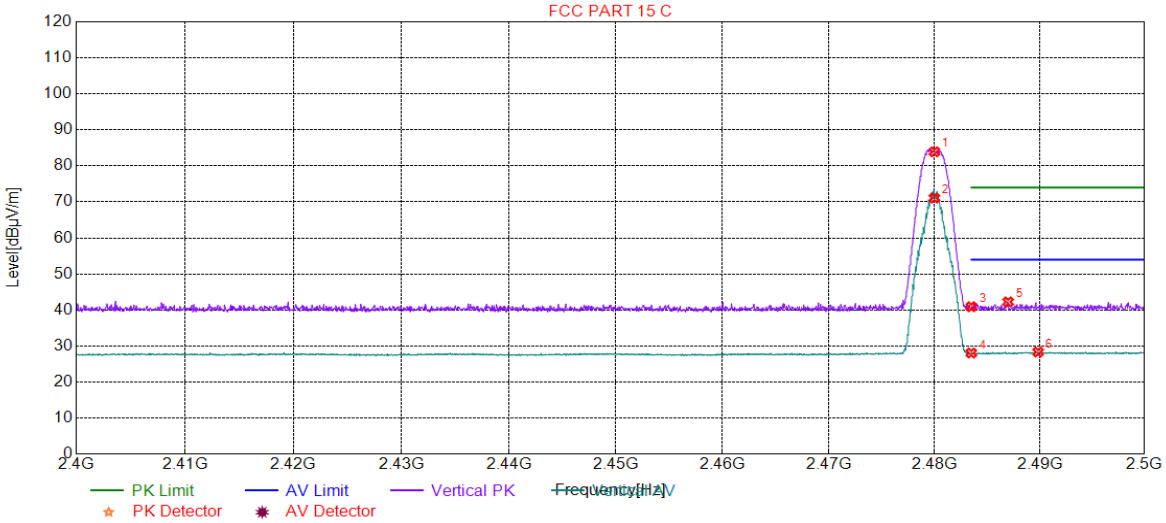
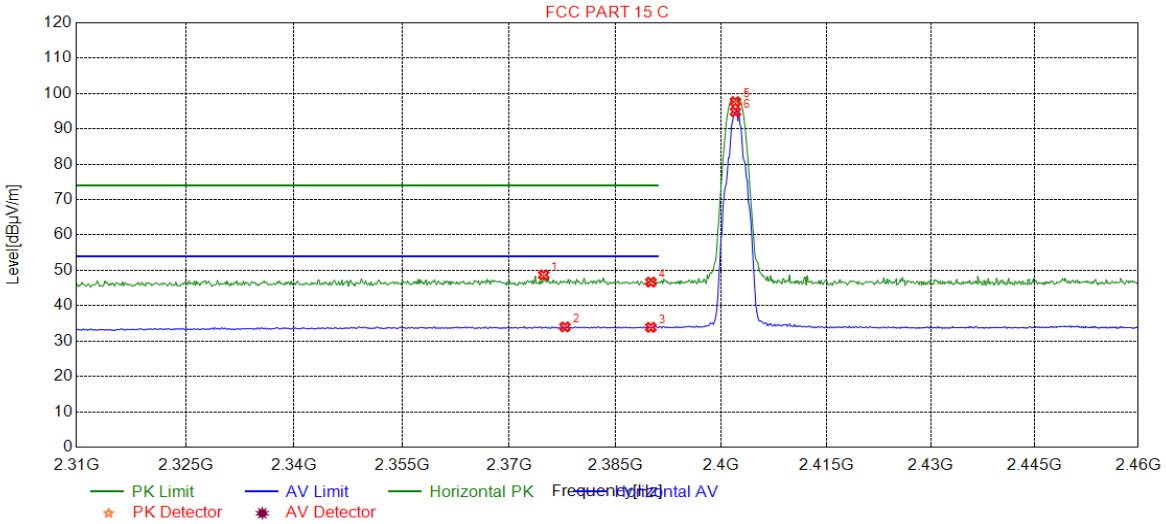
4.10.1.2 Worst Case Mode (GFSK) Highest Channel_ Vertical_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	83.92	8.01	0.00	-83.92	194	328	Vertical
2	2480.00	71.06	8.01	0.00	-71.06	223	278	Vertical
3	2483.50	40.92	8.01	74.00	33.08	235	59	Vertical
4	2483.50	28.06	8.01	54.00	25.94	166	14	Vertical
5	2486.99	42.24	8.01	74.00	31.76	213	42	Vertical
6	2489.84	28.34	8.02	54.00	25.66	224	350	Vertical

4.10.1.3 Worst Case Mode (GFSK) Lowest Channel_ Horizontal_ANT1



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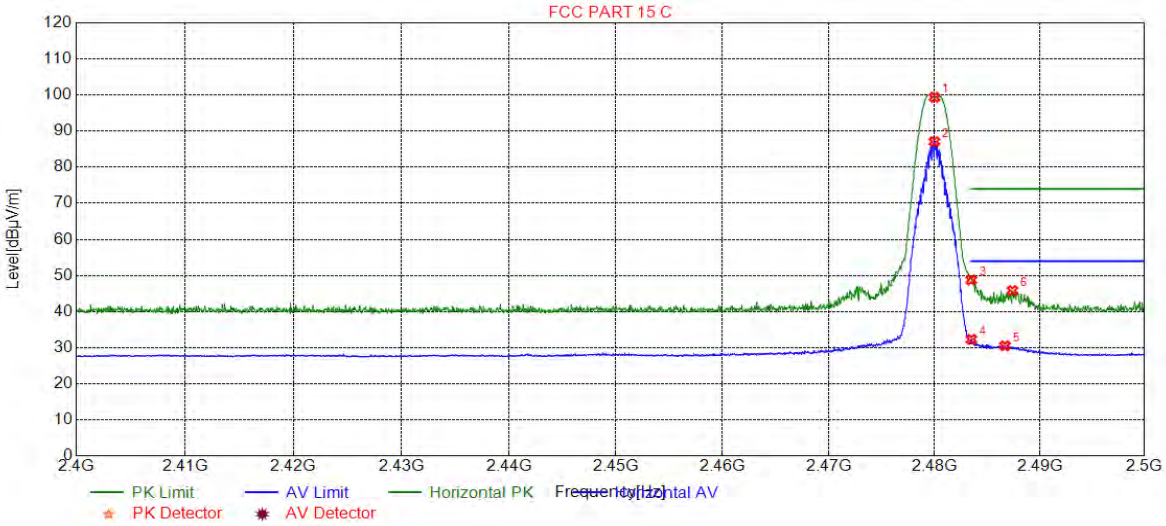
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2374.86	48.70	7.79	74.00	25.30	232	302	Horizontal
2	2377.86	34.01	7.78	54.00	19.99	246	188	Horizontal
3	2390.00	33.89	7.77	54.00	20.11	221	72	Horizontal
4	2390.00	46.68	7.77	74.00	27.32	128	172	Horizontal
5	2402.00	97.69	7.77	0.00	-97.69	220	30	Horizontal
6	2402.00	94.85	7.77	0.00	-94.85	204	30	Horizontal

4.10.1.4 Worst Case Mode (GFSK) Highest Channel_ Horizontal_ANT1



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	99.38	8.01	0.00	-99.38	244	39	Horizontal
2	2480.00	87.07	8.01	0.00	-87.07	242	45	Horizontal
3	2483.50	48.74	8.01	74.00	25.26	109	45	Horizontal
4	2483.50	32.31	8.01	54.00	21.69	115	45	Horizontal
5	2486.69	30.51	8.01	54.00	23.49	247	50	Horizontal
6	2487.39	45.84	8.01	74.00	28.16	177	28	Horizontal

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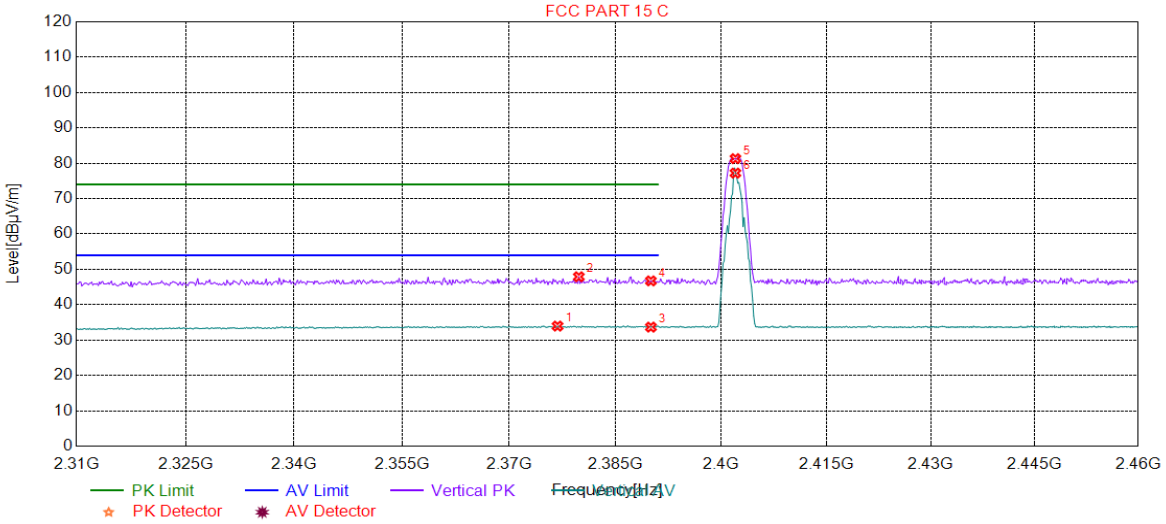
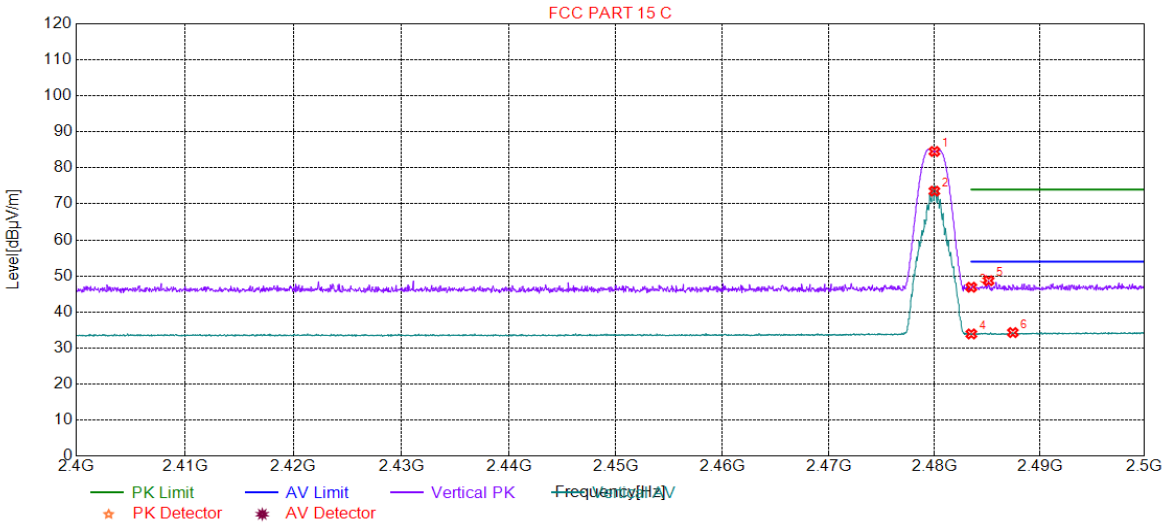
4.10.1.5 Worst Case Mode (GFSK) Lowest Channel_ Vertical_ANT2



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2376.81	33.96	7.78	54.00	20.04	196	334	Vertical
2	2379.81	47.91	7.78	74.00	26.09	204	187	Vertical
3	2390.00	33.67	7.77	54.00	20.33	242	43	Vertical
4	2390.00	46.74	7.77	74.00	27.26	156	319	Vertical
5	2402.00	81.30	7.77	0.00	-81.30	179	303	Vertical
6	2402.00	77.22	7.77	0.00	-77.22	174	249	Vertical

4.10.1.6 Worst Case Mode (GFSK) Highest Channel_ Vertical_ANT2



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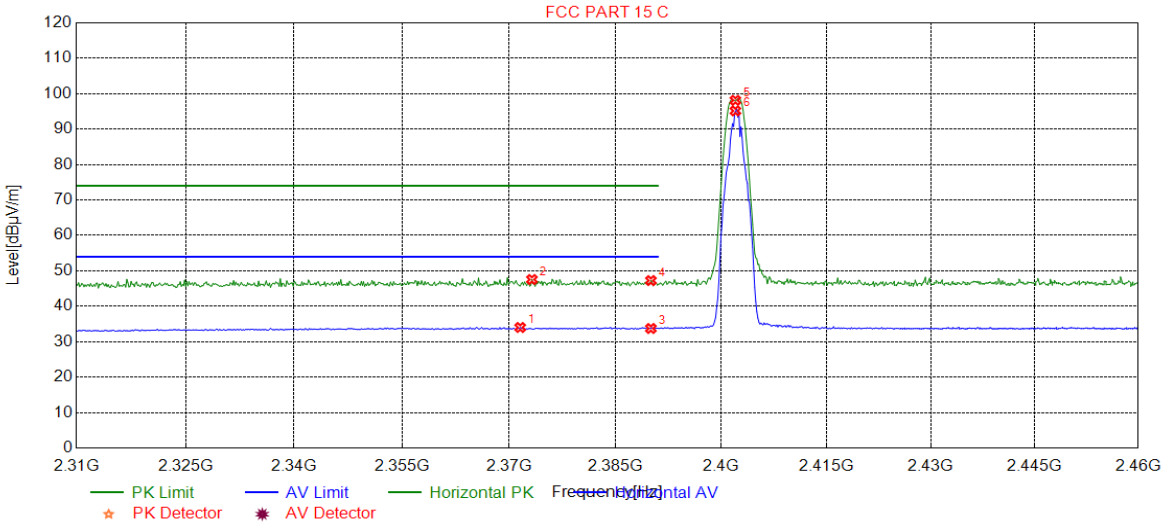
Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	84.56	8.01	0.00	-84.56	200	315	Vertical
2	2480.00	73.55	8.01	0.00	-73.55	174	320	Vertical
3	2483.50	46.88	8.01	74.00	27.12	295	3	Vertical
4	2483.50	33.91	8.01	54.00	20.09	208	19	Vertical
5	2485.14	48.68	8.01	74.00	25.32	204	309	Vertical
6	2487.44	34.29	8.01	54.00	19.71	251	3	Vertical

4.10.1.7 Worst Case Mode (GFSK) Lowest Channel_ Horizontal_ANT2



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2371.56	34.02	7.79	54.00	19.98	190	62	Horizontal
2	2373.21	47.57	7.79	74.00	26.43	193	221	Horizontal
3	2390.00	33.74	7.77	54.00	20.26	230	45	Horizontal
4	2390.00	47.26	7.77	74.00	26.74	241	255	Horizontal
5	2402.00	98.13	7.77	0.00	-98.13	187	58	Horizontal
6	2402.00	95.15	7.77	0.00	-95.15	118	71	Horizontal

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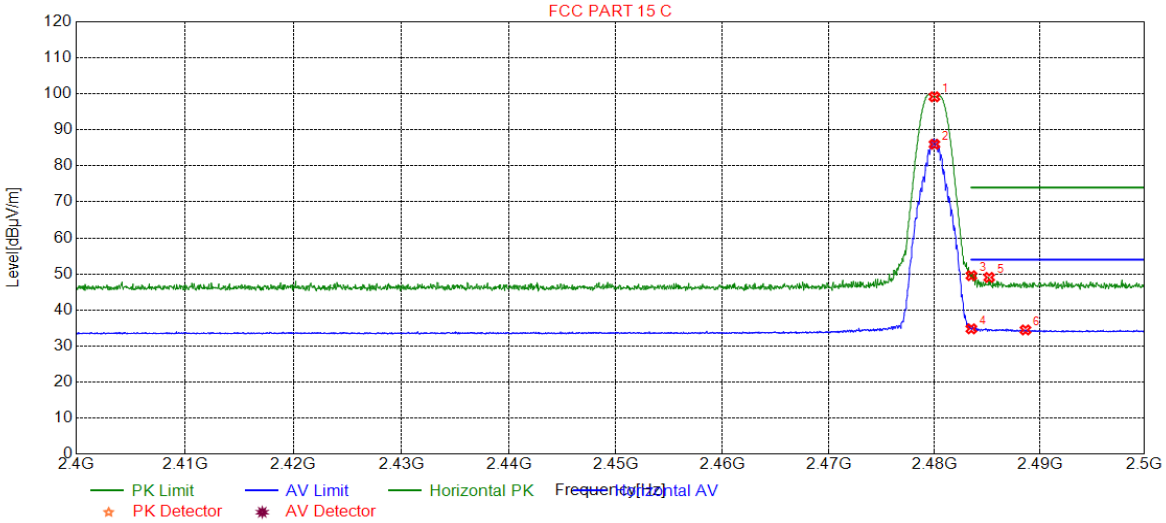
4.10.1.8 Worst Case Mode (GFSK) Highest Channel_ Horizontal_ANT2



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2480.00	99.18	8.01	0.00	-99.18	129	66	Horizontal
2	2480.00	86.00	8.01	0.00	-86.00	148	99	Horizontal
3	2483.50	49.53	8.01	74.00	24.47	172	50	Horizontal
4	2483.50	34.77	8.01	54.00	19.23	217	72	Horizontal
5	2485.19	49.04	8.01	74.00	24.96	134	39	Horizontal
6	2488.64	34.46	8.02	54.00	19.54	242	66	Horizontal

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	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Temperature test	±1°C
5	Humidity test	±3%
6	DC and low frequency voltages	±0.5%

Lab B:

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

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6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2019/7/15	2020/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/1/3	2021/1/2
Coaxial Cable	SGS	N/A	SEM031-01	2019/6/12	2020/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019/7/14	2020/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2019/10/27	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/14

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	2019-09-07	2020-09-06
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2019-07-16	2020-07-15
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	2019-06-27	2020-06-26
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
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 ZR/2020/30010

The End

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