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Report No.: SZEM141200715201
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FCC REPORT

Application No. : SZEM1412007152CR
Applicant: ACCO Brands, Inc.
Manufacturer: Kensington Computer Products Group, A division of ACCO Brands, LLC
Factory: Dongguan Newmen Electronics Technology Co.,LTD
Product Name: MP230L Performance Mouse Receiver
Model No.(EUT): M01309-D
Trade mark: Kensington
FCC ID: GV3M01309-D
Standards: 47 CFR Part 15, Subpart C (2014)
Date of Receipt: 2014-12-30
Date of Test: 2015-01-05 to 2015-01-06
Date of Issue: 2015-01-14

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

Authorized Signature:



Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2015-01-14		Original

Authorized for issue by:				
Tested By		 _____ (Eric Fu) /Project Engineer		2015-01-06
				Date
Prepared By		 _____ (Linlin Lv) /Clerk		2015-01-14
				Date
Checked By		 _____ (Kevin Feng) /Reviewer		2015-01-15
				Date



3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	ANSI C63.10 (2009)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2009)	PASS
Field Strength of the Fundamental Signal	47 CFR Part 15, Subpart C Section 15.249 (a)	ANSI C63.10 (2009)	PASS
Spurious Emissions	47 CFR Part 15, Subpart C Section 15.249 (a)/15.209	ANSI C63.10 (2009)	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.249(a)/15.205	ANSI C63.10 (2009)	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.215 (c)	ANSI C63.10 (2009)	PASS



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5 General Information

5.1 Client Information

Applicant:	ACCO Brands, Inc.
Address of Applicant:	333 Twin Dolphin Dr. 6F, Redwood City, California, 94065, USA
Manufacturer:	Kensington Computer Products Group, A division of ACCO Brands, LLC
Address of Manufacturer:	333 Twin Dolphin Dr. 6F, Redwood City, California, 94065, USA
Factory:	Dongguan Newmen Electronics Technology Co.,LTD
Address of Factory:	No.5, Xifa Road, Lin Village,Tangxia Town, Dongguan, Guangdong, China

5.2 General Description of EUT

Product Name:	MP230L Performance Mouse Receiver
Model No.:	M01309-D
Trade Mark :	Kensington
Frequency Range:	2.402GHz - 2.476GHz
Number of channel:	75 channels
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Hopping Channel Type:	Adaptive Frequency Hopping systems
Modulation Type:	GFSK
Channel Spacing:	1MHz
Sample Type:	Portable production
EUT Function:	MP230L Performance Mouse Receiver
Test Power Grade:	Default setting (manufacturer declare)
Test Software of EUT:	N/A (Manually controlled the EUT to transmitting)
Antenna Type:	Integral
Antenna Gain:	-2dBi
Power Supply:	DC 5V Powered by USB port



Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
3CH	2402 MHz	23CH	2422 MHz	43CH	2442 MHz	62CH	2462 MHz
4CH	2403 MHz	24CH	2423 MHz	44CH	2443 MHz	63CH	2463 MHz
5CH	2404 MHz	25CH	2424 MHz	45CH	2444 MHz	64CH	2464 MHz
6CH	2405 MHz	26CH	2425 MHz	46CH	2445 MHz	65CH	2465 MHz
7CH	2406 MHz	27CH	2426 MHz	47CH	2446 MHz	66CH	2466 MHz
8CH	2407 MHz	28CH	2427 MHz	48CH	2447 MHz	67CH	2467 MHz
9CH	2408 MHz	29CH	2428 MHz	49CH	2448 MHz	68CH	2468 MHz
10CH	2409 MHz	30CH	2429 MHz	50CH	2449 MHz	69CH	2469 MHz
11CH	2410 MHz	31CH	2430 MHz	51CH	2450 MHz	70CH	2470 MHz
12CH	2411 MHz	32CH	2431 MHz	52CH	2451 MHz	71CH	2471 MHz
13CH	2412 MHz	33CH	2432 MHz	53CH	2452 MHz	72CH	2472 MHz
14CH	2413 MHz	34CH	2433 MHz	54CH	2453 MHz	73CH	2473 MHz
15CH	2414 MHz	35CH	2434 MHz	55CH	2454 MHz	74CH	2474 MHz
16CH	2415 MHz	36CH	2435 MHz	56CH	2455 MHz	75CH	2475 MHz
17CH	2416 MHz	37CH	2436 MHz	57CH	2456 MHz	76CH	2476 MHz
18CH	2417 MHz	38CH	2437 MHz	58CH	2457 MHz		
19CH	2418 MHz	39CH	2438 MHz	59CH	2458 MHz		
20CH	2419 MHz	40CH	2439 MHz	60CH	2459 MHz		
21CH	2420 MHz	41CH	2440 MHz	61CH	2460 MHz		
22CH	2421 MHz	42CH	2441 MHz	62CH	2461 MHz		

Note:

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(CH1)	2402MHz
The Middle channel(CH42)	2441MHz
The Highest channel(CH76)	2476MHz

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5.3 Test Environment and Mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1015 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with modulation.

5.4 Description of Support Units

The EUT has been tested with associated equipment below

Description	Manufacturer	Model No.
PC	DELL	DCSM
LCD-displaying	DELL	SP2208WFPT
KEYBOARD	DELL	SK-8115
MOUSE	Lenovo	MO28UOL
PC	IBM	8172
LCD-displaying	Lenovo	L1711pC
KEYBOARD	IBM	SK-8115
MOUSE	Lenovo	MO28UOA
Coder	HengTong ELECTRON	HT4000
Printer	Canon	BJC-1000SP

5.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch E&E Lab,
No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China.
518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.



5.6 Test Facility

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

- **CNAS (No. CNAS L2929)**

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

- **VCCI**

The 10m Semi-anechoic chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **Industry Canada (IC)**

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

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.



5.10 Equipment List

Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2015-06-10
2	LISN	Rohde & Schwarz	ENV216	SEL0152	2015-10-24
3	LISN	ETS-LINDGREN	3816/2	SEL0021	2015-05-16
4	8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	SEL0162	2015-08-30
5	4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	SEL0163	2015-08-30
6	2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	SEL0164	2015-08-30
7	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2015-05-16
8	Coaxial Cable	SGS	N/A	SEL0025	2015-05-29
9	DC Power Supply	Zhao Xin	RXN-305D	SEL0117	2015-10-24
10	Humidity/ Temperature Indicator	Shanghai Qixiang	ZJ1-2B	SEL0103	2015-10-24
11	Barometer	Chang Chun	DYM3	SEL0088	2015-05-16



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RE in Chamber					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2015-06-10
2	EMI Test Receiver	Agilent Technologies	N9038A	SEL0312	2015-09-16
3	EMI Test software	AUDIX	E3	SEL0050	N/A
4	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2015-10-24
5	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2015-10-24
6	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2015-10-24
7	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2015-05-16
8	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2015-10-24
9	Coaxial cable	SGS	N/A	SEL0027	2015-05-29
10	Coaxial cable	SGS	N/A	SEL0189	2015-05-29
11	Coaxial cable	SGS	N/A	SEL0121	2015-05-29
12	Coaxial cable	SGS	N/A	SEL0178	2015-05-29
13	Band filter	Amindeon	82346	SEL0094	2015-05-16
14	Barometer	Chang Chun	DYM3	SEL0088	2015-05-16
15	DC Power Supply	Zhao Xin	RXN-305D	SEL0117	2015-10-24
16	Humidity/ Temperature Indicator	Shanghai Qixiang	ZJ1-2B	SEL0103	2015-10-24
17	Signal Generator (10M-27GHz)	Rohde & Schwarz	SMR27	SEL0067	2015-05-16
18	Signal Generator	Rohde & Schwarz	SMY01	SEL0155	2015-10-24
19	Loop Antenna	Beijing Daze	ZN30401	SEL0203	2015-06-04

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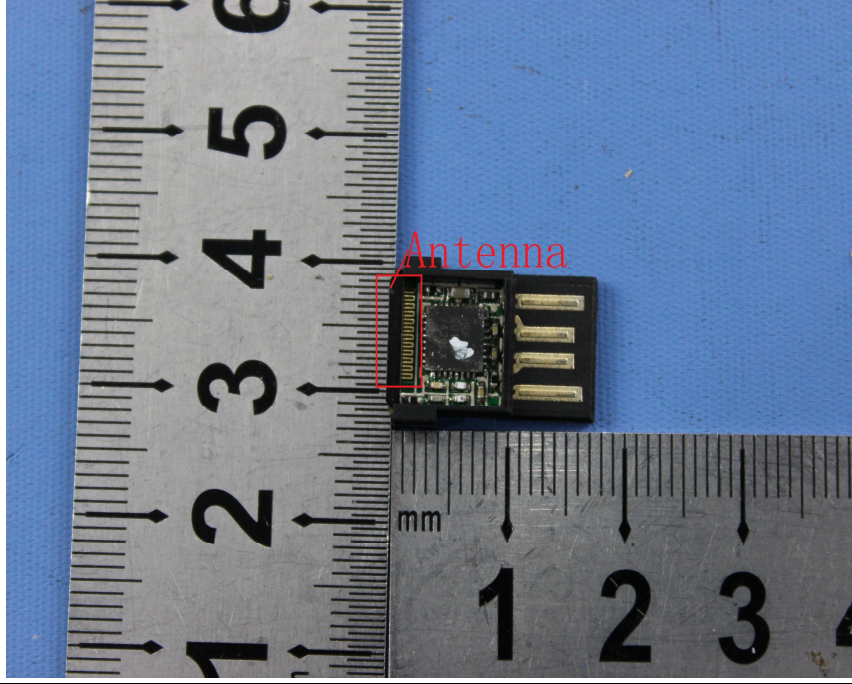
RF connected test					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	DC Power Supply	Zhao Xin	RXN-305D	SEL0117	2015-10-24
2	Humidity/ Temperature Indicator	HYGRO	ZJ1-2B	SEL0033	2015-10-24
3	Spectrum Analyzer	Rohde & Schwarz	FSP	SEL0154	2015-10-24
4	Coaxial cable	SGS	N/A	SEL0178	2015-05-29
5	Coaxial cable	SGS	N/A	SEL0179	2015-05-29
6	Barometer	ChangChun	DYM3	SEL0088	2015-05-16
7	Signal Generator	Rohde & Schwarz	SML03	SEL0068	2015-05-16
8	Band filter	amideon	82346	SEL0094	2015-05-16
9	POWER METER	R & S	NRVS	SEL0144	2015-10-24
10	Attenuator	Beijin feihang taida	TST-2-6dB	SEL0205	2015-05-16
11	Power Divider(splitter)	Agilent Technologies	11636B	SEL0130	2015-10-24

Note: The calibration interval is one year, all the instruments are valid.



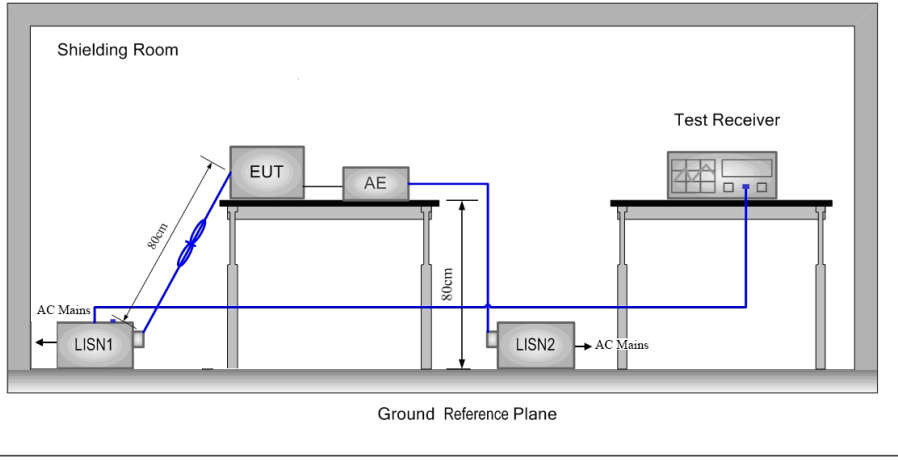
6 Test results and Measurement Data

6.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p>	
EUT Antenna:	
<p>The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -2dBi.</p>	

6.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2009		
Test Frequency Range:	150KHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<ol style="list-style-type: none"> 1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement. 		

<p>Test Setup:</p>	
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Exploratory Test Mode:</p>	<p>Transmitting mode with lowest channel, middle channel and highest channel</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the lowest channel is the worst case. Transmitting mode Only the worst case is recorded in the report.</p>
<p>Test Results:</p>	<p>Pass</p>

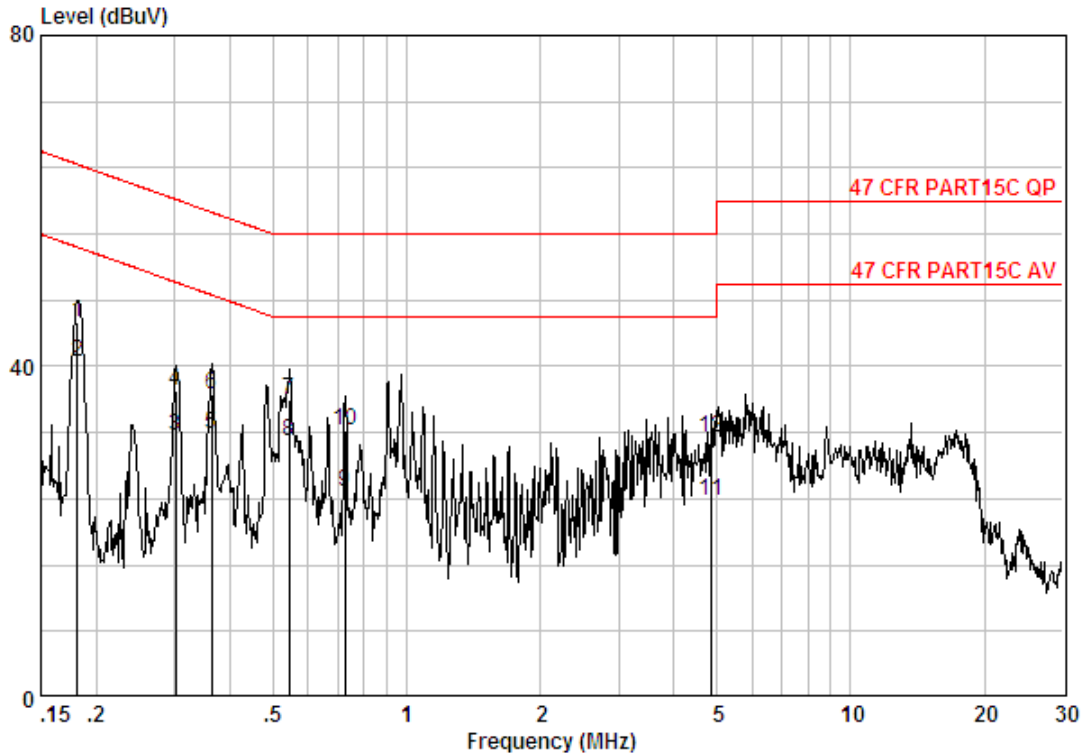
Measurement Data

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

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



Live Line:



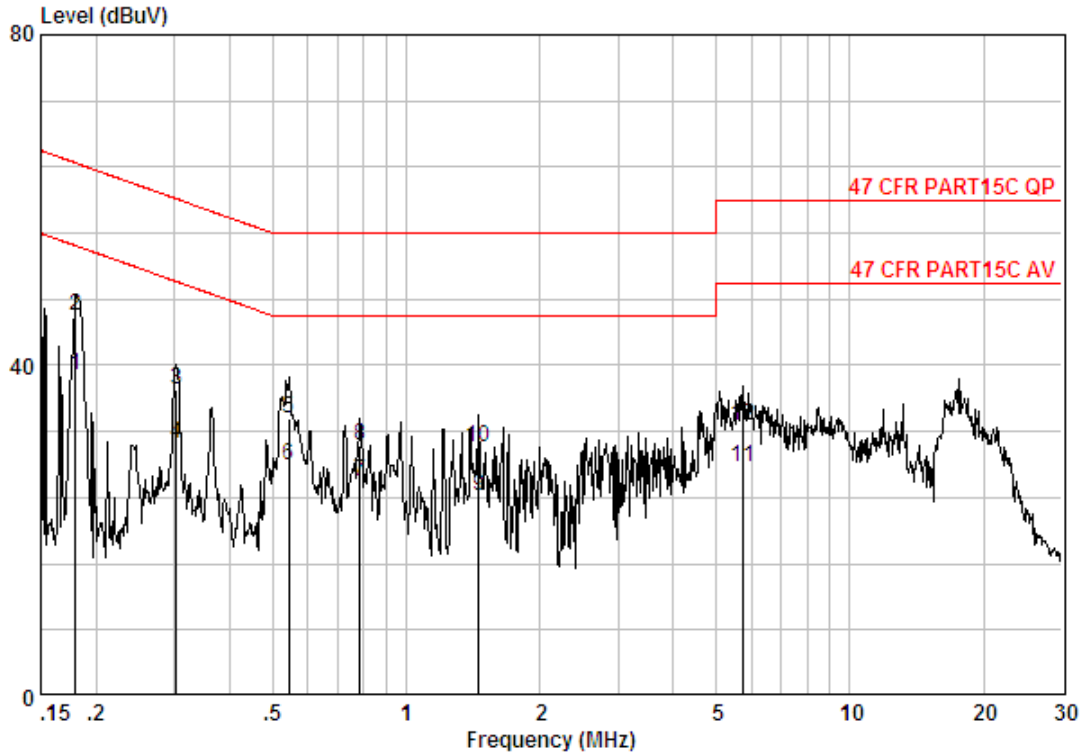
Site : Shielding Room
 Condition : 47 CFR PART15C QP CE LINE
 Job No. : 7152CR
 Mode : TX mode

	Freq	Cable Loss	LISN Factor	Read Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.18152	0.02	9.70	35.70	64.42	-19.00	QP
2 @	0.18152	0.02	9.70	30.76	40.48	-13.93	Average
3	0.30188	0.01	9.70	21.84	31.56	-18.63	Average
4	0.30188	0.01	9.70	27.26	36.97	-23.22	QP
5	0.36338	0.01	9.77	21.94	31.72	-16.93	Average
6	0.36338	0.01	9.77	26.95	36.73	-21.93	QP
7	0.54355	0.01	9.80	26.12	35.93	-20.07	QP
8	0.54355	0.01	9.80	21.18	30.99	-15.01	Average
9	0.72744	0.02	9.80	14.98	24.80	-21.20	Average
10	0.72744	0.02	9.80	22.53	32.35	-23.65	QP
11	4.848	0.01	9.90	13.77	23.68	-22.32	Average
12	4.848	0.01	9.90	21.40	31.31	-24.69	QP

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Neutral Line:



Site : Shielding Room
 Condition : 47 CFR PART15C QP CE NEUTRAL
 Job No. : 7152CR
 Mode : TX mode

	Freq	Cable Loss	LISN Factor	Read Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.17961	0.02	9.70	29.10	54.50	-15.69	Average
2	0.17961	0.02	9.70	36.17	64.50	-18.62	QP
3	0.30348	0.01	9.71	27.29	60.15	-23.14	QP
4	0.30348	0.01	9.71	20.87	50.15	-19.56	Average
5	0.54355	0.01	9.80	23.72	56.00	-22.47	QP
6	0.54355	0.01	9.80	18.09	46.00	-18.10	Average
7	0.78761	0.02	9.80	16.14	46.00	-20.04	Average
8	0.78761	0.02	9.80	20.57	56.00	-25.61	QP
9	1.456	0.02	9.80	14.47	46.00	-21.71	Average
10	1.456	0.02	9.80	20.28	56.00	-25.90	QP
11	5.713	0.01	9.94	17.76	50.00	-22.29	Average
12	5.713	0.01	9.94	22.82	60.00	-27.23	QP

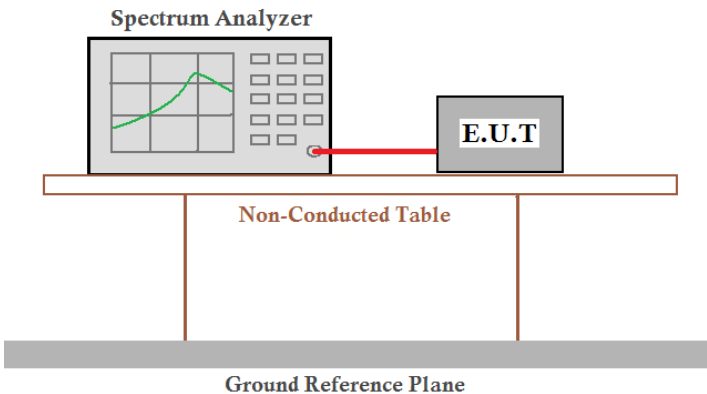
Notes:

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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6.3 Spurious Emissions

6.3.1 Duty Cycle

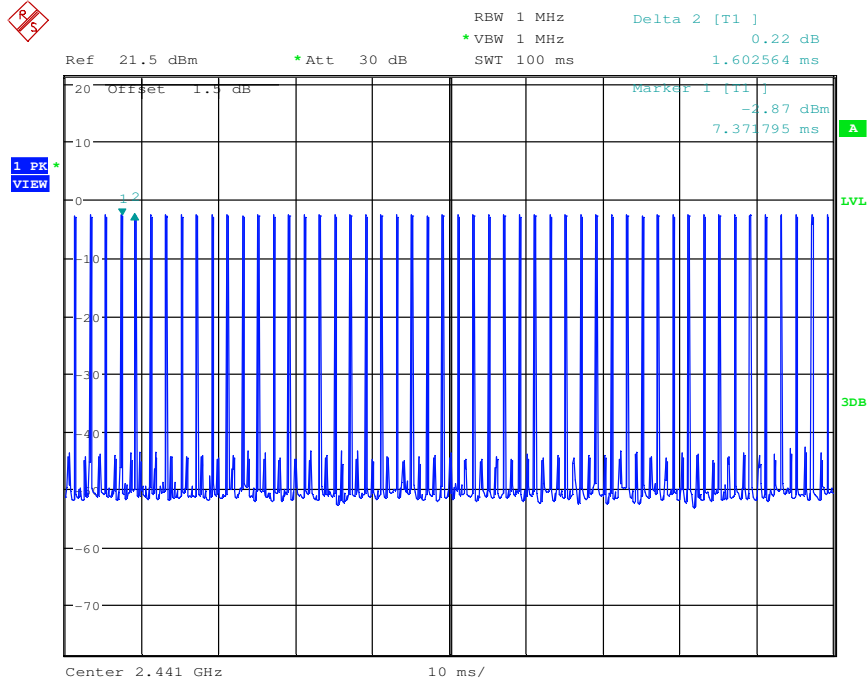
Test Requirement:	47 CFR Part 15C Section 15.35 (c)
Test Method:	ANSI C63.10:2009
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Limit:	N/A
Test Mode:	Transmitting mode
Test Results:	Pass

Measurement Data

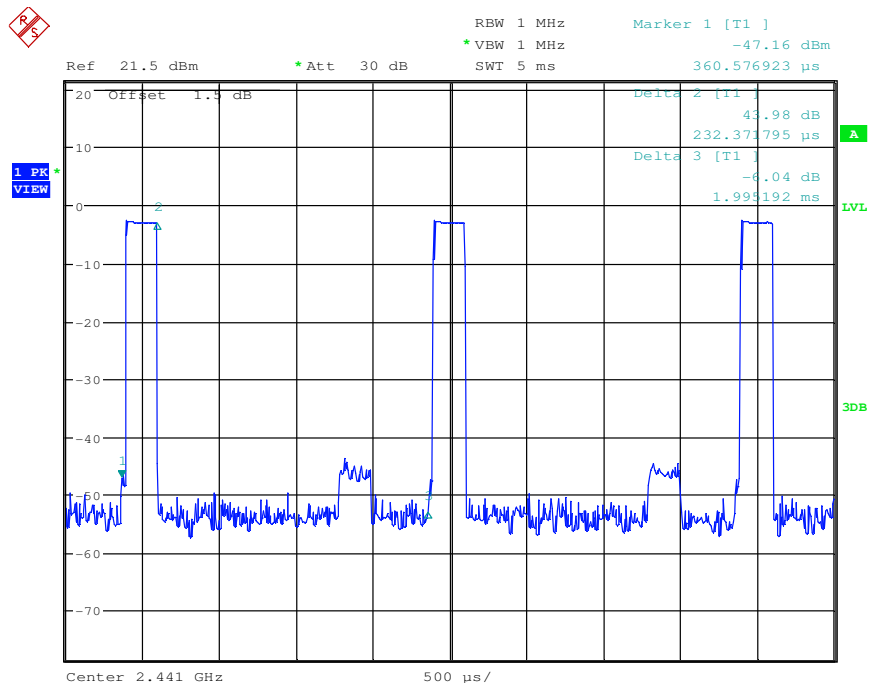
Calculate Formula:	PDCF(pulse desensitization correction factor) = $20 \log(\text{Duty cycle})$
	Duty cycle = $\text{Ton time} / \text{T period}$
Test data:	Ton time = 0.232ms
	T period = 1.995ms
	Duty cycle = 11.63%
	PDCF = -18.69



Test plot as follows:
Duty cycle numbers



Time slot:



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6.3.2 Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.249 and 15.209				
Test Method:	ANSI C63.10: 2009				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average	
Limit: (Spurious Emissions)	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
Note: 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.					
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	2400MHz-2483.5MHz	94.0		Average Value	
		114.0		Peak Value	

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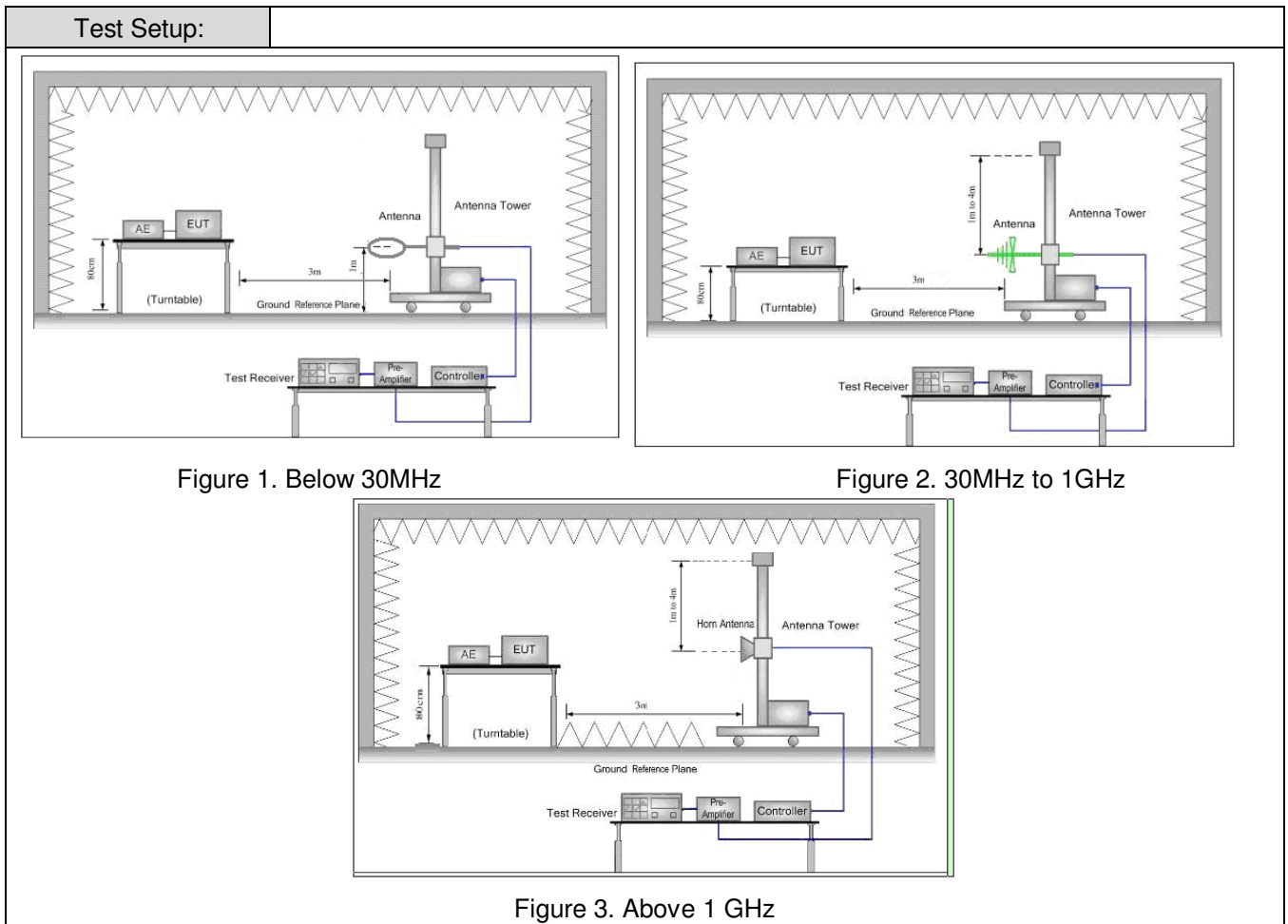


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

Figure 3. Above 1 GHz

Test Procedure:	
	<ol style="list-style-type: none"> a. The EUT was placed on the top of a rotating table 0.8 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. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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. g. Test the EUT in the lowest channel, the middle channel, the Highest channel h. The radiation measurements are performed in X, Y, Z axis positioning for

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	Transmitting mode,And found the X axis positioning which it is worse case. i. Repeat above procedures until all frequencies measured was complete.
Instruments Used:	Refer to section 5.10 for details
Test Mode:	Transmitting mode
Test Results:	Pass



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Measurement Data

6.3.2.1 Field Strength Of The Fundamental Signal

Peak value:

Low Channel

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2402.191	4.92	32.41	38.46	86.79	85.66	114	-28.34	Vertical
2402.191	4.92	32.41	38.46	91.28	90.15	114	-23.85	Horizontal

Peak value: Middle Channel

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2441.000	4.97	32.42	38.46	87.9	86.83	114	-27.17	Vertical
2441.000	4.97	32.42	38.46	92.41	91.34	114	-22.66	Horizontal

Peak value: Highest Channel

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2476.000	5.02	32.44	38.47	85.66	84.65	114	-29.35	Vertical
2476.000	5.02	32.44	38.47	95.07	94.06	114	-19.94	Horizontal



Average value

Average value= Peak value + PDCF

Lowest Channel

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2402.191	66.97	94	-27.03	Vertical
2402.191	71.46	94	-22.54	Horizontal

Middle Channel

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2402.191	68.14	94	-25.86	Vertical
2402.191	72.65	94	-21.35	Horizontal

Highest Channel

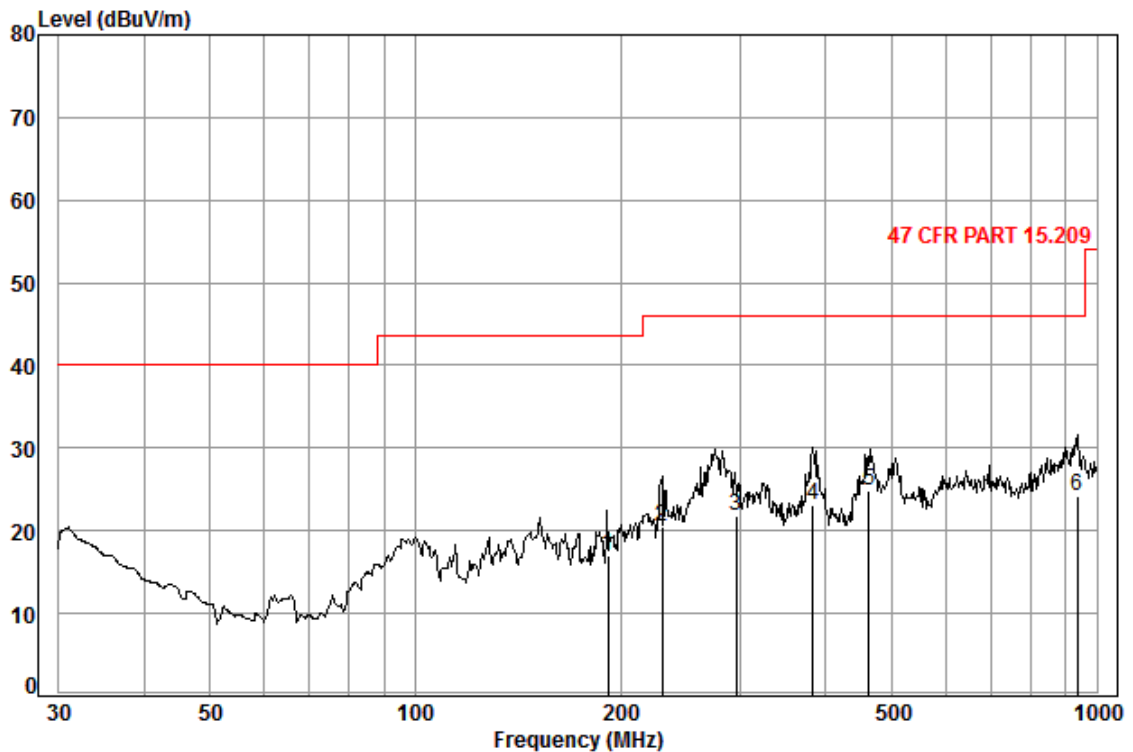
Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2402.191	65.96	94	-28.04	Vertical
2402.191	75.37	94	-18.63	Horizontal



6.3.2.2 Spurious Emissions

30MHz~1GHz Low Channel		
Test mode:	Transmitting	Horizontal

Data: 76



Condition: 47 CFR PART 15.209 3m 3142C HORIZONTAL

Job No. : 7152CR

Test mode: TX mode

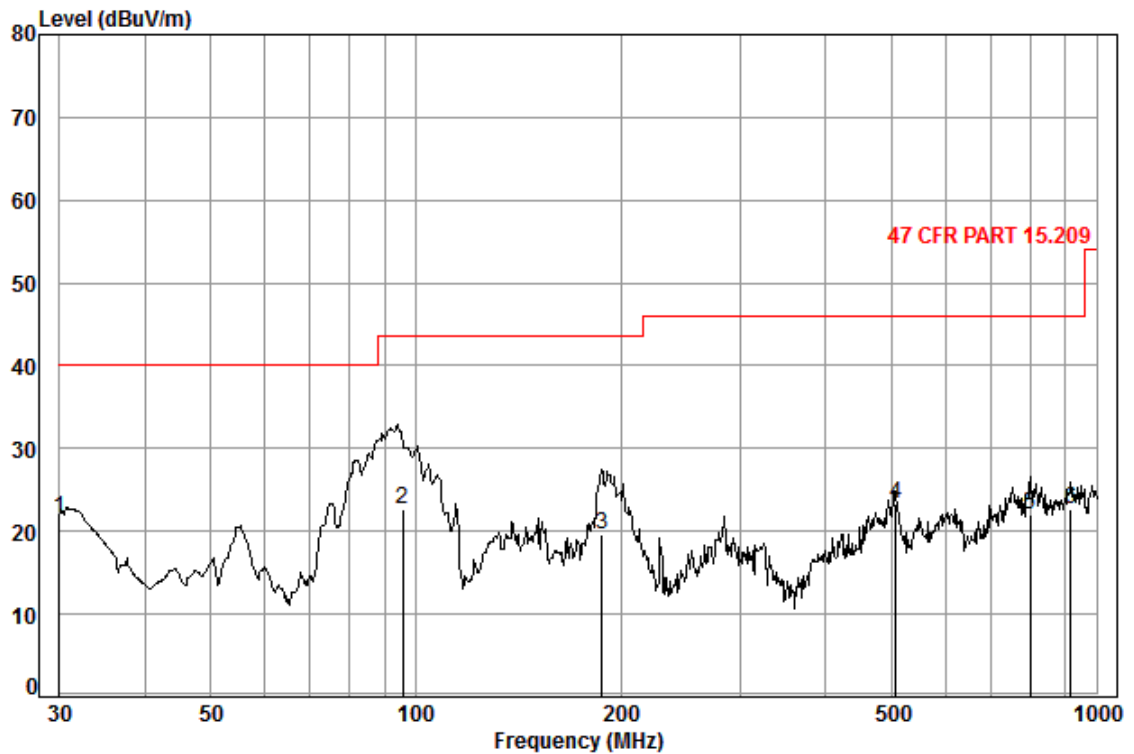
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	191.80	1.39	10.12	26.73	32.25	17.03	43.50	-26.47
2	230.48	1.57	11.68	26.59	33.89	20.55	46.00	-25.45
3	295.92	1.88	13.72	26.41	32.53	21.72	46.00	-24.28
4	382.90	2.15	16.09	27.03	31.81	23.02	46.00	-22.98
5	463.65	2.47	17.39	27.52	32.60	24.94	46.00	-21.06
6	935.33	3.64	23.30	26.61	23.92	24.25	46.00	-21.75

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Test mode:	Transmitting	Vertical
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Data: 77



Condition: 47 CFR PART 15.209 3m 3142C Vertical

Job No. : 7152CR

Test mode: TX mode

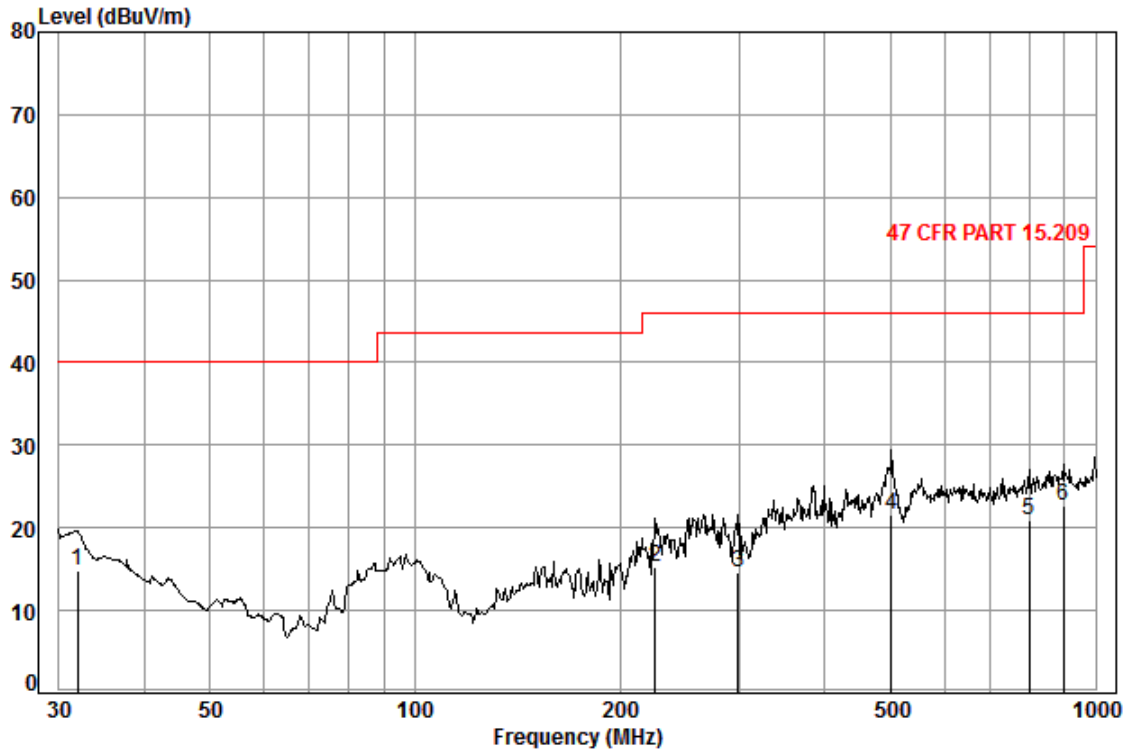
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.00	0.60	18.70	27.36	29.65	21.59	40.00	-18.41
2	95.63	1.16	8.93	27.21	39.82	22.70	43.50	-20.80
3	187.85	1.38	10.06	26.74	34.95	19.65	43.50	-23.85
4	506.98	2.61	18.00	27.69	30.35	23.27	46.00	-22.73
5	798.74	3.20	22.09	27.30	23.94	21.93	46.00	-24.07
6	916.84	3.62	23.27	26.68	22.36	22.57	46.00	-23.43

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30MHz~1GHz Middle Channel		
Test mode:	Transmitting	Horizontal

Data: 79



Condition: 47 CFR PART 15.209 3m 3142C Horizontal
 Job No. : 7152CR
 Test mode: TX mode

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	31.95	0.60	17.61	27.35	23.86	14.72	40.00	-25.28
2	225.31	1.55	11.51	26.61	28.74	15.19	46.00	-30.81
3	298.27	1.89	13.82	26.41	25.28	14.58	46.00	-31.42
4	501.90	2.60	17.85	27.69	28.82	21.58	46.00	-24.42
5	798.98	3.20	22.10	27.30	22.99	20.99	46.00	-25.01
6	897.00	3.59	23.18	26.78	22.66	22.65	46.00	-23.35

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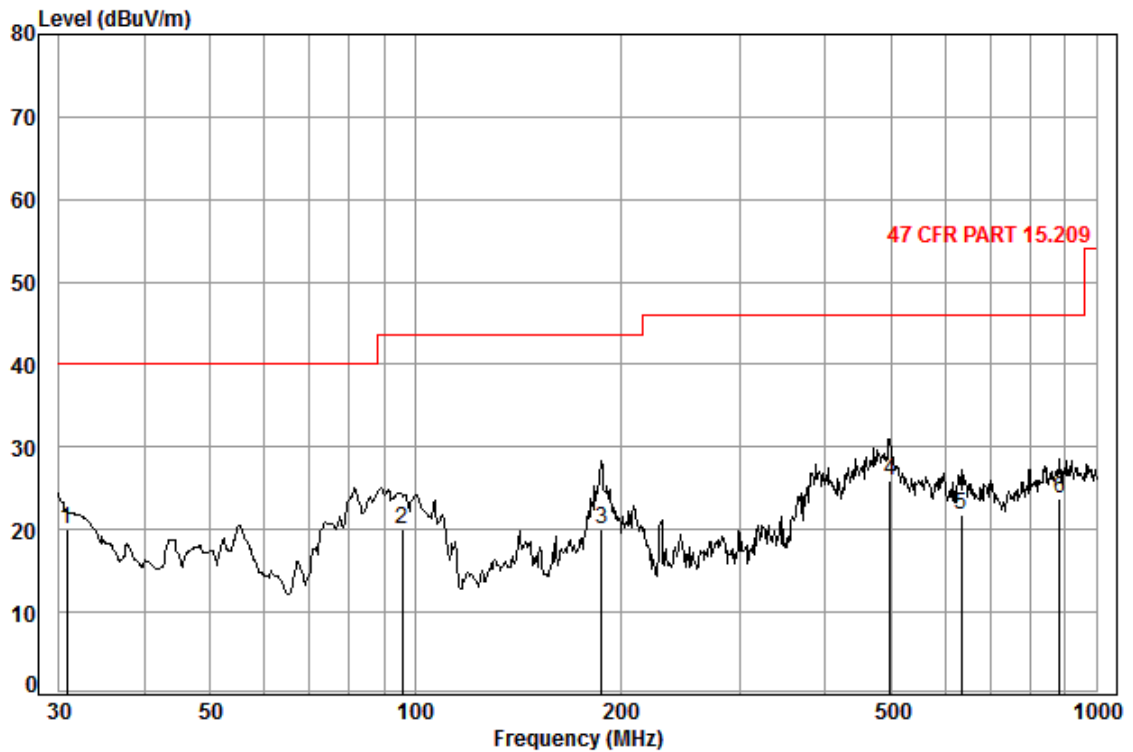
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Test mode:	Transmitting	Vertical
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Data: 78



Condition: 47 CFR PART 15.209 3m 3142C Vertical
 Job No. : 7152CR
 Test mode: TX mode

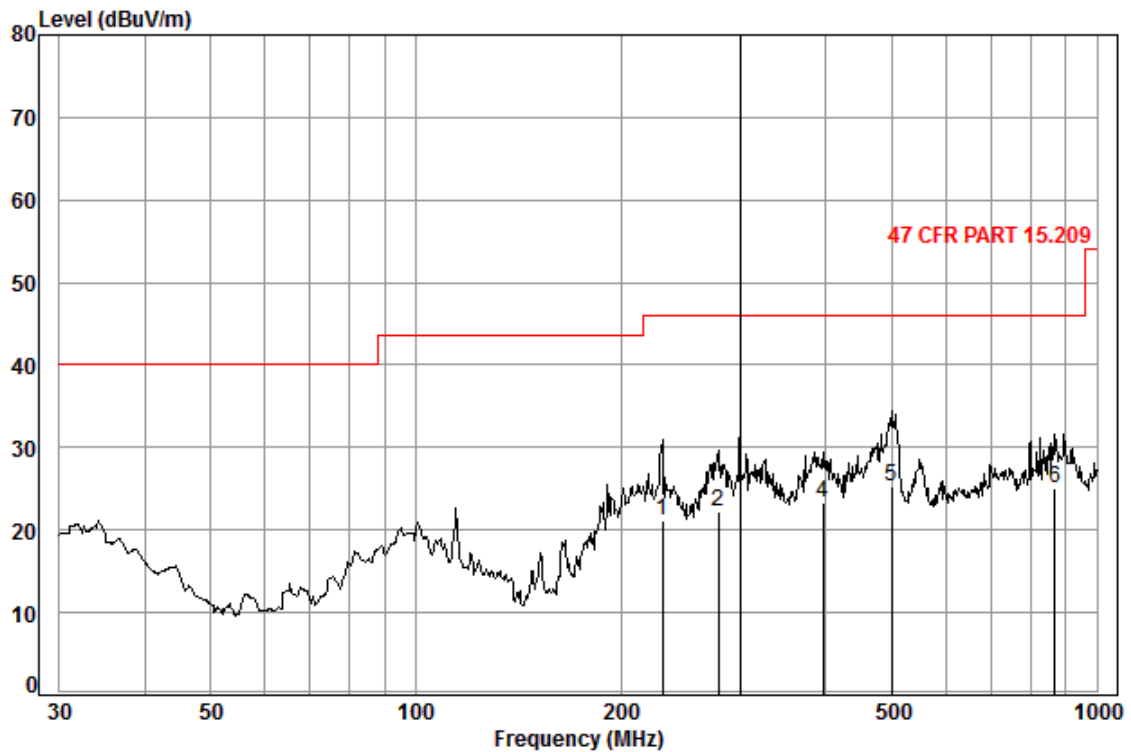
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.80	0.60	18.25	27.35	28.56	20.06	40.00	-19.94
2	95.60	1.16	8.92	27.21	37.11	19.98	43.50	-23.52
3	187.80	1.38	10.06	26.74	35.29	19.99	43.50	-23.51
4	497.68	2.59	17.80	27.70	33.25	25.94	46.00	-20.06
5	633.30	2.77	20.53	27.49	25.90	21.71	46.00	-24.29
6	884.90	3.54	23.08	26.85	23.90	23.67	46.00	-22.33

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30MHz~1GHz High Channel		
Test mode:	Transmitting	Horizontal

Data: 80



Condition: 47 CFR PART 15.209 3m 3142C Horizontal

Job No. : 7152CR

Test mode: TX mode

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	230.50	1.57	11.68	26.59	34.49	21.15	46.00	-24.85
2	278.69	1.81	12.96	26.46	33.83	22.14	46.00	-23.86
3 *	299.59	1.90	13.88	26.41	32.69	25.37	46.00	-21.37
4	396.15	2.19	16.25	27.11	31.92	23.25	46.00	-22.75
5	499.47	2.60	17.80	27.70	32.49	25.19	46.00	-20.81
6	866.79	3.47	22.80	26.96	25.66	24.97	46.00	-21.03

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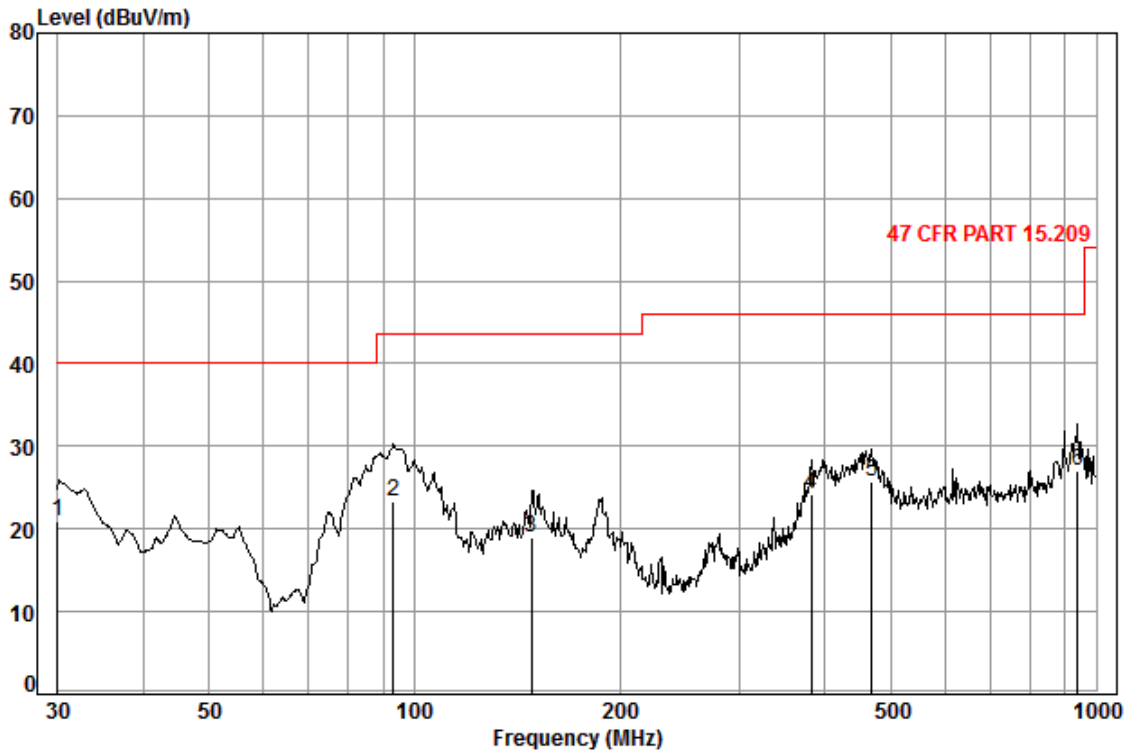
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Test mode:	Transmitting	Vertical
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Data: 81



Condition: 47 CFR PART 15.209 3m 3142C Vertical

Job No. : 7152CR

Test mode: TX mode

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.00	0.60	18.70	27.36	29.01	20.95	40.00	-19.05
2	93.11	1.13	8.82	27.21	40.48	23.22	43.50	-20.28
3	148.44	1.31	8.86	26.91	35.60	18.86	43.50	-24.64
4	382.59	2.15	16.09	27.01	33.04	24.27	46.00	-21.73
5	468.88	2.49	17.58	27.54	33.15	25.68	46.00	-20.32
6	938.26	3.64	23.30	26.58	26.68	27.04	46.00	-18.96

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Above 1GHz										
Test mode:		Transmitting		Test channel:		Lowest		Remark:		Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
3489.840	5.91	32.88	38.74	48.55	48.60	74	-25.40	Vertical		
4804.000	5.49	34.70	39.24	52.99	53.94	74	-20.06	Vertical		
5986.509	7.48	36.27	39.19	47.66	52.22	74	-21.78	Vertical		
7206.000	8.27	35.63	39.07	48.38	53.21	74	-20.79	Vertical		
9608.000	9.26	37.33	37.93	44.32	52.98	74	-21.02	Vertical		
11457.210	10.03	38.19	38.45	43.09	52.86	74	-21.14	Vertical		
3472.118	5.90	32.86	38.73	48.15	48.18	74	-25.82	Horizontal		
4804.000	5.49	34.70	39.24	49.31	50.26	74	-23.74	Horizontal		
5940.967	7.38	36.19	39.19	48.95	53.33	74	-20.67	Horizontal		
7206.000	8.27	35.63	39.07	47.39	52.22	74	-21.78	Horizontal		
9608.000	9.26	37.33	37.93	43.87	52.53	74	-21.47	Horizontal		
11312.310	9.91	38.14	38.38	43.39	53.06	74	-20.94	Horizontal		

Test mode:		Transmitting		Test channel:		Middle		Remark:		Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
3507.652	5.90	32.90	38.74	46.81	46.87	74	-27.13	Vertical		
4882.000	5.69	34.78	39.26	51.72	52.93	74	-21.07	Vertical		
5895.771	7.28	36.10	39.19	48.89	53.08	74	-20.92	Vertical		
7323.000	8.41	35.50	39.06	47.53	52.38	74	-21.62	Vertical		
9764.000	9.18	37.81	37.84	42.33	51.48	74	-22.52	Vertical		
10999.950	9.64	38.10	38.22	44.09	53.61	74	-20.39	Vertical		
3445.704	5.89	32.83	38.72	47.59	47.59	74	-26.41	Horizontal		
4882.000	5.69	34.78	39.26	51.95	53.16	74	-20.84	Horizontal		
6078.644	7.45	36.21	39.18	47.73	52.21	74	-21.79	Horizontal		
7323.000	8.41	35.50	39.06	48.05	52.90	74	-21.10	Horizontal		
9764.000	9.18	37.81	37.84	43.12	52.27	74	-21.73	Horizontal		
11084.270	9.71	38.11	38.26	44.22	53.78	74	-20.22	Horizontal		

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Test mode:		Transmitting		Test channel:		Highest		Remark:		Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
3454.486	5.90	32.84	38.72	47.95	47.97	74	-26.03	Vertical		
4952.000	5.87	34.85	39.28	51.79	53.23	74	-20.77	Vertical		
6017.064	7.50	36.28	39.18	48.31	52.91	74	-21.09	Vertical		
7428.000	8.53	35.43	39.05	47.93	52.84	74	-21.16	Vertical		
9904.000	9.10	38.22	37.76	43.97	53.53	74	-20.47	Vertical		
11056.090	9.69	38.11	38.25	43.53	53.08	74	-20.92	Vertical		
3428.206	5.89	32.81	38.71	47.33	47.32	74	-26.68	Horizontal		
4952.000	5.87	34.85	39.28	50.85	52.29	74	-21.71	Horizontal		
6078.644	7.45	36.21	39.18	47.79	52.27	74	-21.73	Horizontal		
7428.000	8.53	35.43	39.05	47.02	51.93	74	-22.07	Horizontal		
9904.000	9.10	38.22	37.76	43.91	53.47	74	-20.53	Horizontal		
11515.680	10.08	38.24	38.47	43.15	53.00	74	-21.00	Horizontal		

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Pre-amplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Pre-amplifier Factor
- 2) Scan from 9kHz to 25GHz, The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. 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.



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6.4 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2009		
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)		
Limit(band edge):	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.		
	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
	Above 1GHz	54.0	Average Value
74.0		Peak Value	
Test Setup:			

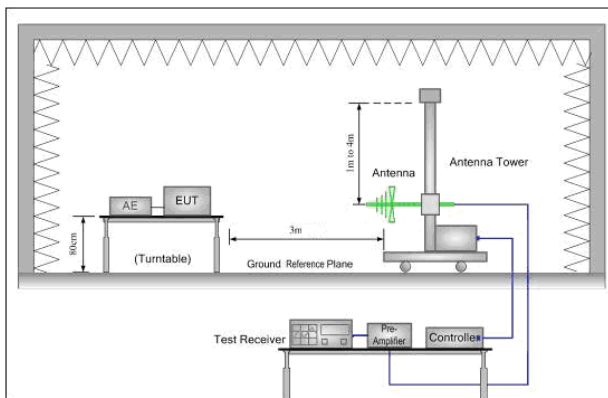


Figure 1. 30MHz to 1GHz

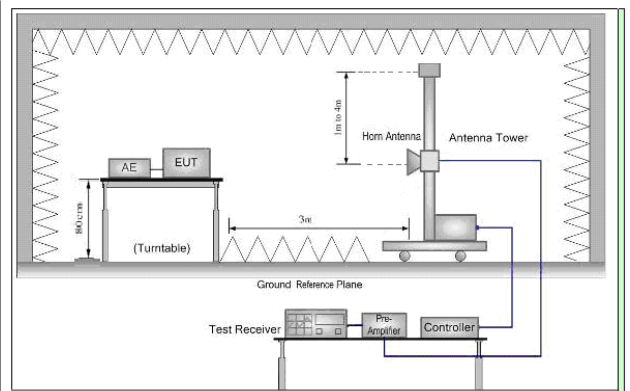


Figure 2. Above 1 GHz



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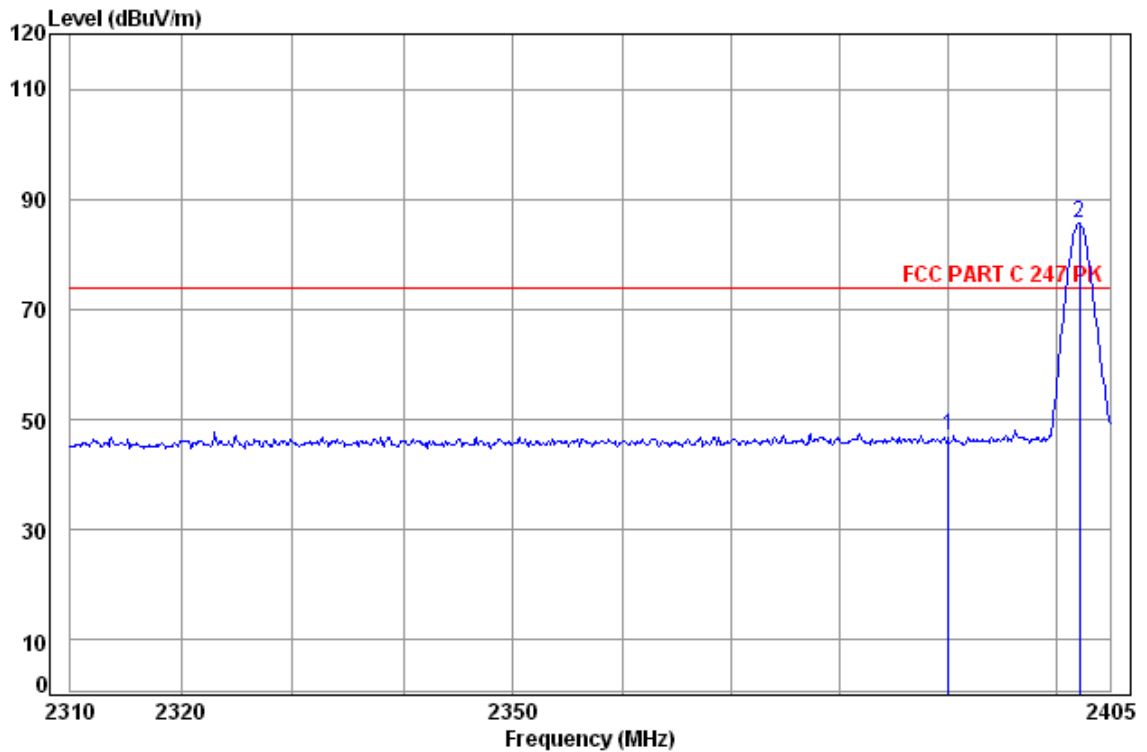
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Test Procedure:	<ol style="list-style-type: none">a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.c. 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.d. 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.e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.f. 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 channelg. Test the EUT in the lowest channel , the Highest channelh. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case..i. Repeat above procedures until all frequencies measured was complete.
Instruments Used:	Refer to section 5.10 for details
Test Mode:	Transmitting mode
Test Results:	Pass



Band edge (Radiated Emission)						
Test mode:	Transmitting	Test channel:	Lowest	Remark:	Peak	Vertical

Data: 225



Site : chamber
 Condition: FCC PART C 247 PK 3m Vertical
 Job No: : 7152CR
 Mode: : 2402 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB
1	2390.00	4.90	32.35	38.46	48.25	74.00	-26.96
2 pp	2402.19	4.92	32.41	38.46	86.79	74.00	11.66

Average value= Peak value + PDCF

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	28.35	54	-25.65	Vertical
2402.19	66.97	54	12.97	Vertical

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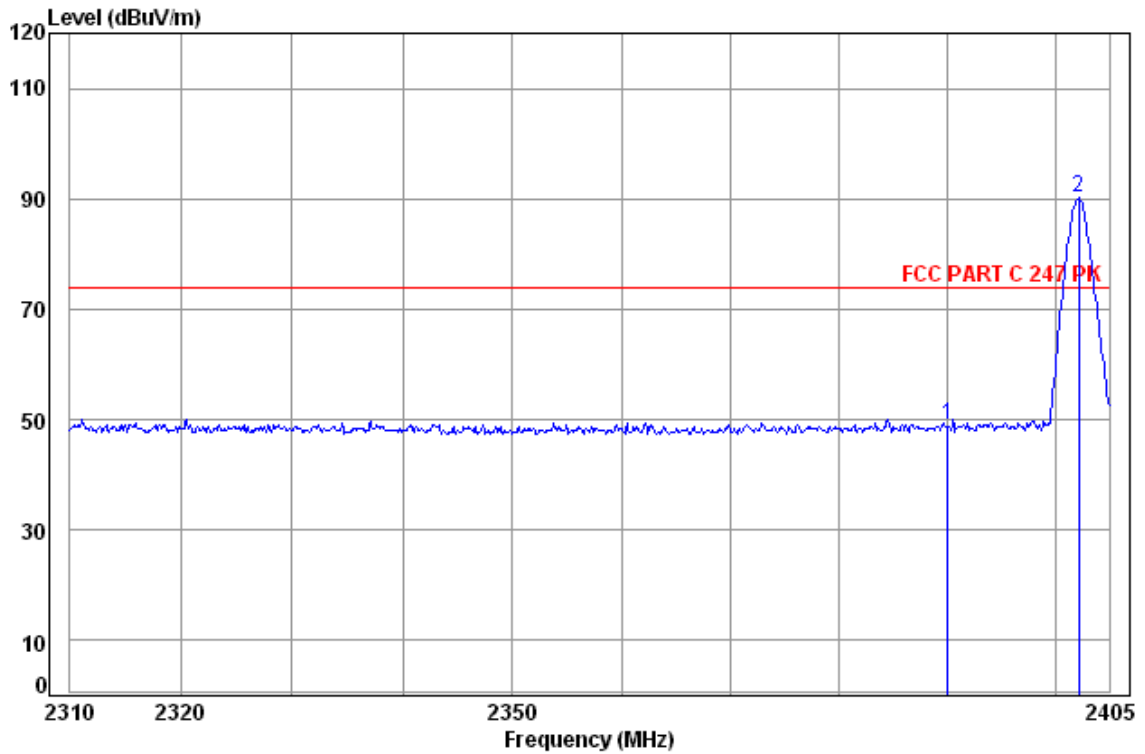
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Test mode:	Transmitting	Test channel:	Lowest	Remark:	Peak	Horizontal
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Data: 227



Site : chamber
 Condition: FCC PART C 247 PK 3m Horizontal
 Job No: : 7152CR
 Mode: : 2402 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.00	4.90	32.35	38.46	50.29	49.08	74.00	-24.92
2 pp	2402.19	4.92	32.41	38.46	91.28	90.15	74.00	16.15

Average value= Peak value + PDCF

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	30.39	54	-23.61	Horizontal
2402.19	71.46	54	17.46	Horizontal

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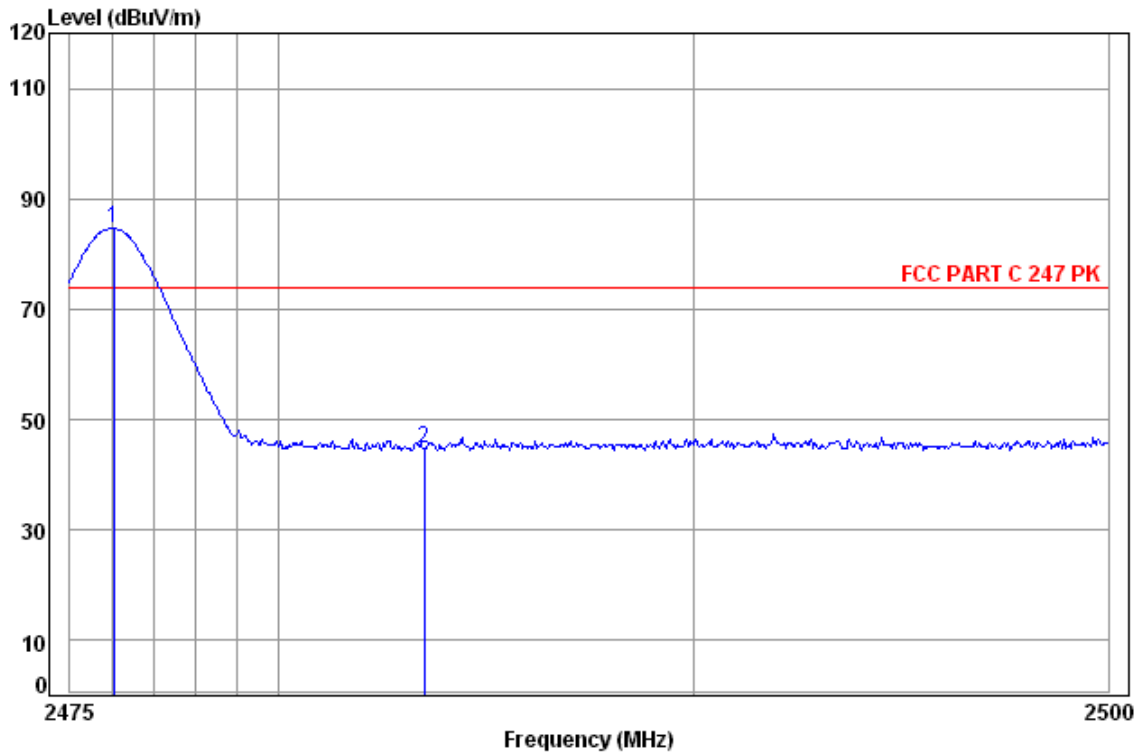
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Test mode:	Transmitting	Test channel:	Highest	Remark:	Peak	Vertical
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Data: 231



Site : chamber
 Condition: FCC PART C 247 PK 3m Vertical
 Job No: : 7152CR
 Mode: : 2476 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB
1	2476.05	5.02	32.44	38.47	85.66	74.00	10.65
2	2483.50	5.03	32.44	38.47	45.92	74.00	-29.08

Average value= Peak value + PDCF

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2476.05	65.96	54	11.96	Vertical
2483.50	26.23	54	-27.77	Vertical

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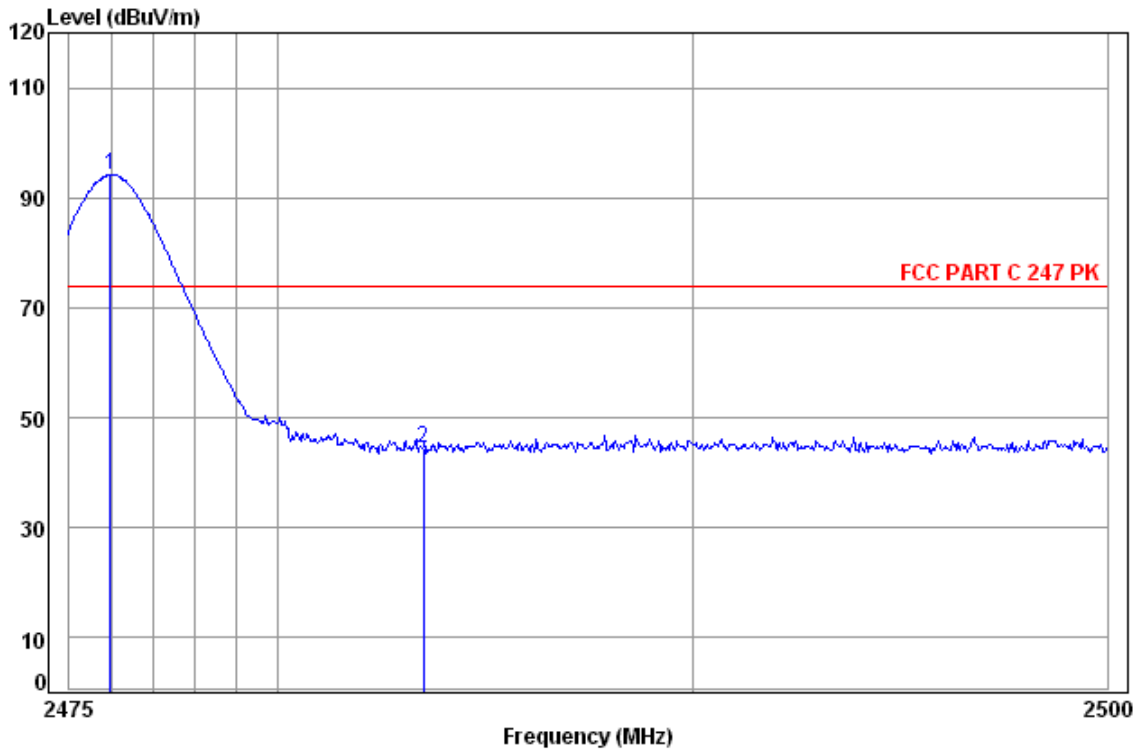
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Test mode:	Transmitting	Test channel:	Highest	Remark:	Peak	Horizontal
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Data: 229



Site : chamber
 Condition: FCC PART C 247 PK 3m Horizontal
 Job No: : 7152CR
 Mode: : 2476 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB
1 pp	2476.00	5.02	32.44	38.47	95.07	94.06	74.00 20.06
2	2483.50	5.03	32.44	38.47	45.35	44.35	74.00 -29.65

Average value= Peak value + PDCF

Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2476.00	75.37	54	21.37	Horizontal
2483.50	25.66	54	-28.34	Horizontal

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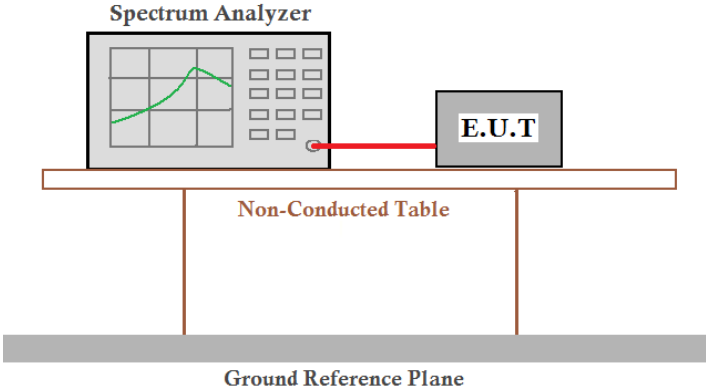
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Note:

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

6.5 20dB Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.215
Test Method:	ANSI C63.10:2009
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>
Instruments Used:	Refer to section 5.10 for details
Test mode:	Transmitting mode
Limit:	N/A
Test Results:	Pass

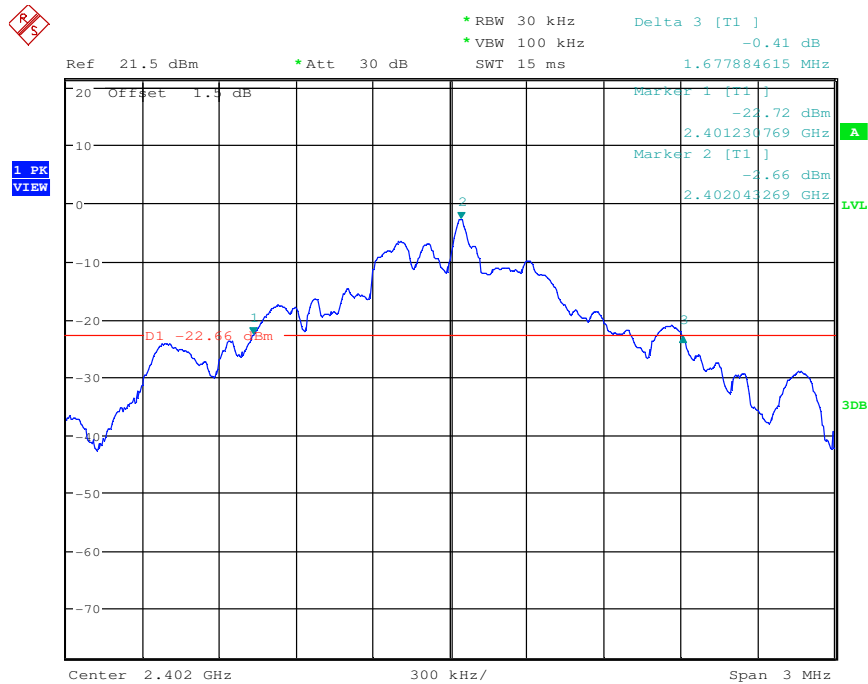
Measurement Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	1.678	Pass
Middle	1.447	Pass
Highest	1.447	Pass

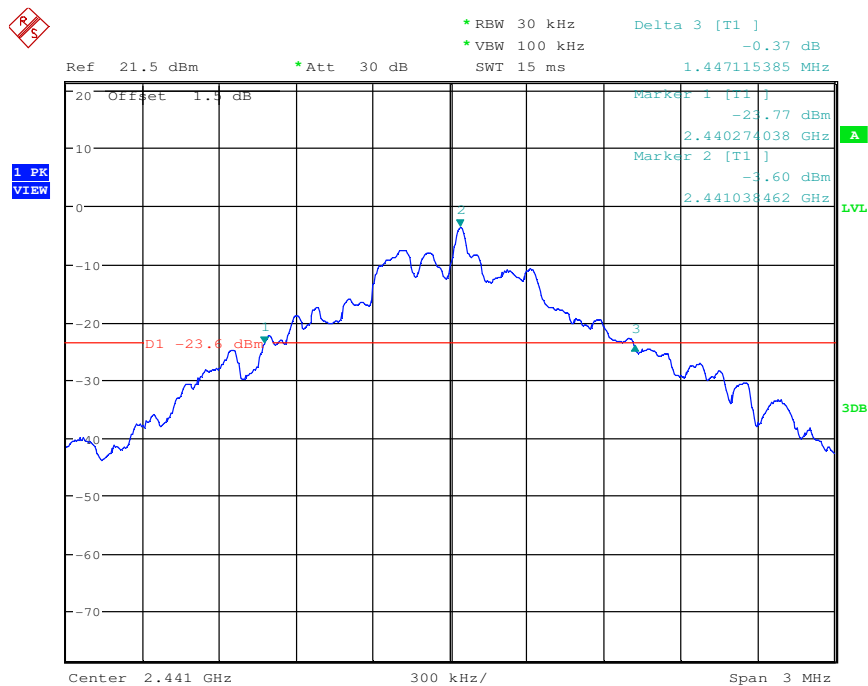


Test plot as follows:

Test channel:	Lowest
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Test channel:	Middle
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Test channel: Highest



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