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Report No.: SZEM110500015403

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FCC REPORT

Application No. : SZEM1105000154RF
Applicant: Bossa Nova Robotics Ltd.
Product Name: Mechatars
Form No.: EWSGS11075
Operation Frequency: 2450MHz
FCC ID: ZKD12011-22-33
Standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249: 2010
Date of Receipt: 2011-05-10
Date of Test: 2011-05-17 to 2011-05-20
Date of Issue: 2011-05-20

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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3 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a)/15.209	Pass
Band edge (Radiated Emission)	15.249(a)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Remark: Pass: The EUT complies with the essential requirements in the standard.

Fail: The EUT does not comply with the essential requirements in the standard.

4 General Information

4.1 Client Information

Applicant:	Bossa Nova Robotica Ltd.
Address of Applicant:	1207 Peninsula Centre, 67 Mody Road, Tsim Sha Tsui East, Kowloon, Hong Kong.
Manufacturer:	WAH SHING TOYS CO., LTD
Address of Manufacturer:	5/F Wah Shing Centre, 5 Fung Yip Street Chaiwan Hong Kong

4.2 General Description of E.U.T.

Product Name:	Mechatars
Model No.:	Wrex-12033, Kodar-12022, Alpha-12011
	Only the model No. Wrex-12033 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above items. Only the different on model number, colour and plastic shape.
Operation Frequency:	2450MHz
Channel numbers:	1
Modulation type:	MSK
Antenna Type:	Integral
Antenna gain:	0dBi
Power supply:	Wrex-12033: 6.0 DC (1.5V x 4"AAA"Size Batteries) Remote Controller : 4.5DC (1.5V x 3"AAA"Size Batteries)

4.3 E.U.T Operation mode

Operating Environment:

Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1008 mbar

Test mode:

Transmitter mode:	Transmitting a continuous modulation signal at the specific channel
Operating mode:	Remote control Mechatars with Rx

4.4 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 3m 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.: R-2197 and C-2383 respectively.
Date of Registration: September 29, 2008. Valid until September 28, 2011.
- **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 556682, June 27, 2008.
- **Industry Canada (IC)**
The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1.

4.5 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

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.6 Other Information Requested by the Customer

None.

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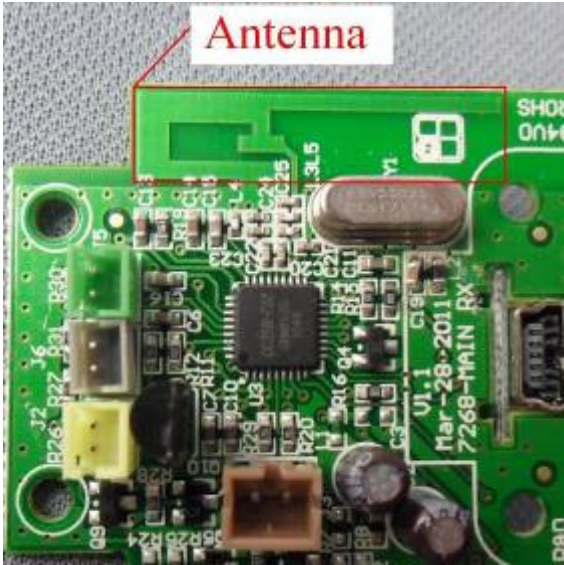
4.7 Test Instruments list:

RE in Chamber						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2010-06-17	2011-06-17
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	2010-11-05	2011-11-05
3	EMI Test software	AUDIX	E3	SEL0050	N/A	N/A
4	Coaxial cable	SGS	N/A	SEL0028	2008-06-18	2011-06-18
5	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2010-11-09	2011-11-09
6	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2010-11-09	2011-11-09
7	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2010-11-09	2011-11-09
8	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2010-06-02	2011-06-02
9	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2010-10-27	2011-10-27
10	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	SEL0080	2010-06-04	2011-06-04
11	Band filter	Amindeon	82346	SEL0094	2010-06-02	2011-06-02

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5 Test results and Measurement Data

5.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: <i>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.</i>	
E.U.T Antenna:	The antenna is integrated on the main PCB and no consideration of replacement. The maximum gain of the antenna is 0dBi.
	

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5.2 Radiated Emission

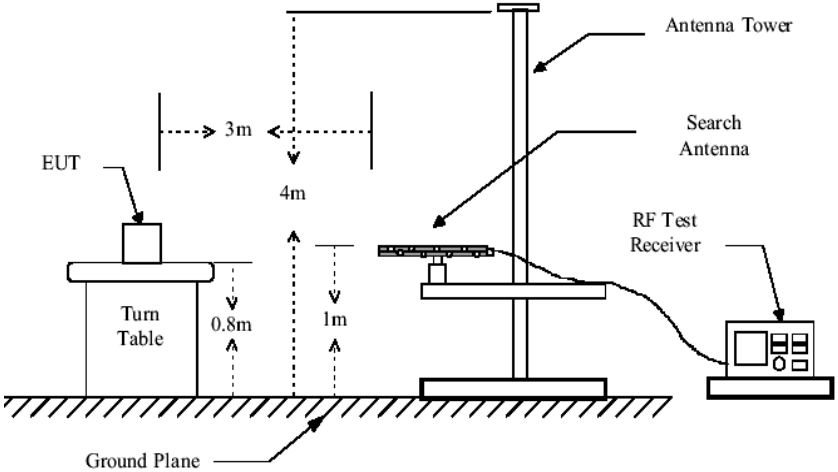
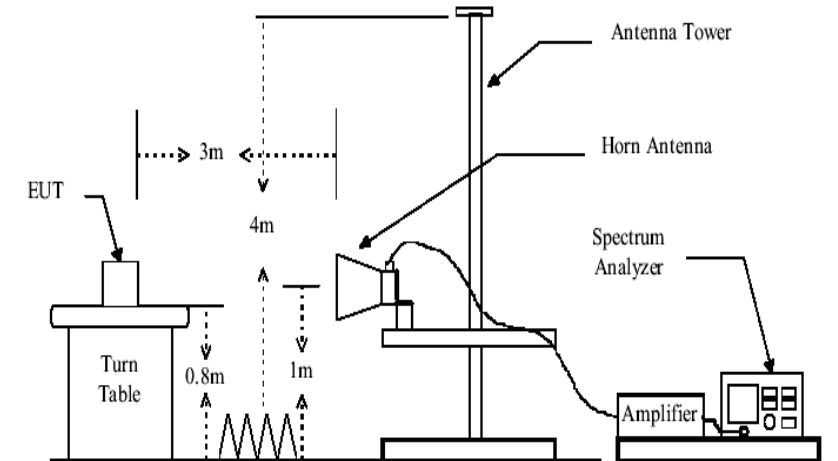
Test Requirement:	FCC Part15 C Section 15.249 and 15.209				
Test Method:	ANSI C63.10: 2009				
Test Frequency Range:	30MHz to 25000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:					
	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Peak		1MHz	10Hz	Average Value	
Limit: (Field strength of the fundamental signal)	Frequency		Limit (dBuV/m @3m)		Remark
	2400MHz-2483.5MHz		94.0		Average Value
			114.0		Peak Value
Limit: (Spurious Emissions)	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
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.				
Test Procedure:	<p>a. The EUT was placed on the top of a rotating table 0.8 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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p> <p>g. The radiation measurements are performed in X, Y, Z axis</p>				

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	positioning. Only the worst case is shown in the report.
Test Instruments:	Refer to section 4.7 for details
Test setup:	<p>Below 1GHz</p>  <p>Above 1GHz</p> 
Test mode:	Transmitter mode
Test results:	Pass

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

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Measurement Data

5.2.1 Field Strength Of The Fundamental Signal

Peak value:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Peak Level (dBuV/m)	Average Limit Line (dBuV/m)	Over Limit (dB)	polarization
2450.000	3.01	32.61	39.89	93.45	89.17	114.00	-24.83	Horizontal
2450.000	3.01	32.61	39.89	98.04	93.77	114.00	-20.23	Vertical

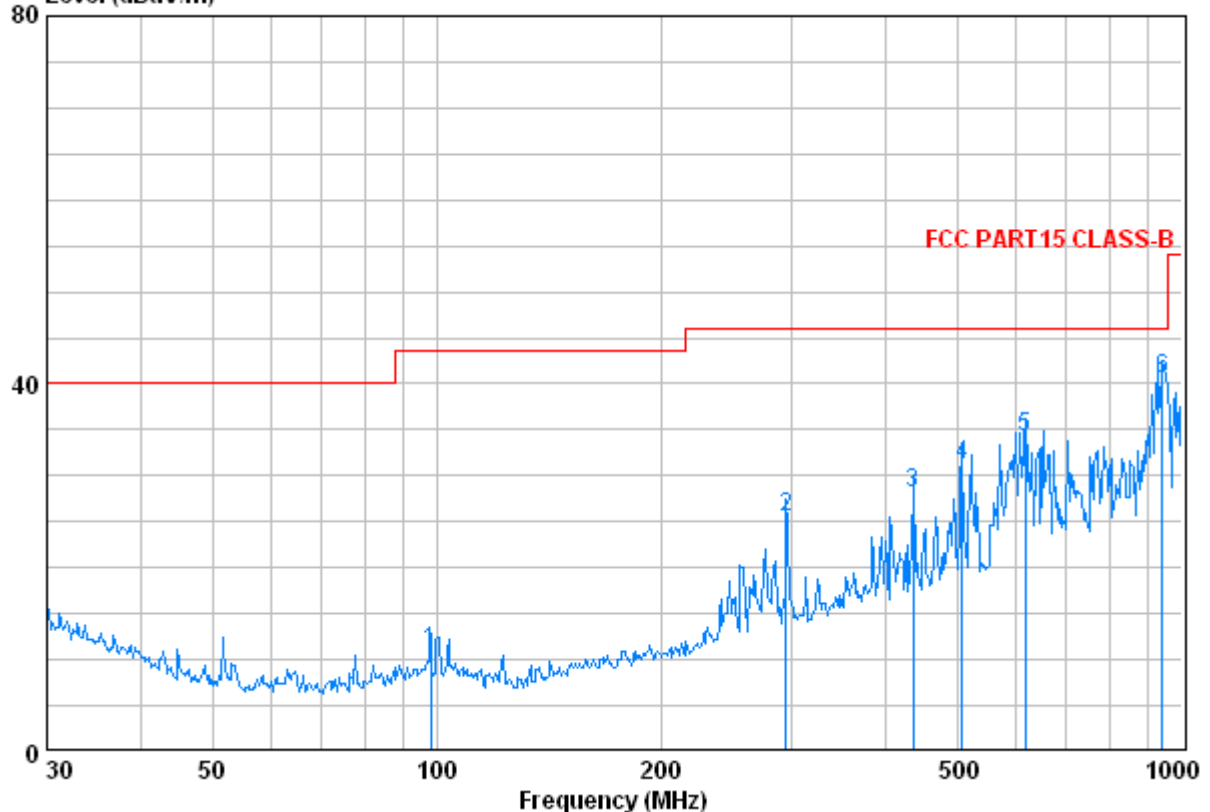
Remark:

As shown in this section, for field strength of the fundamental signal measurements, 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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5.2.2 Spurious Emissions**30MHz~1GHz**

Test mode:	Transmitting	Vertical
------------	--------------	----------

Data: 29
Level (dBuV/m)

		Frequency (MHz)			Read		Limit	Over
	Freq	Cable Loss	Antenna Factor	Preamplifier	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	98.142	1.18	9.03	27.20	27.89	10.90	43.50	-32.60
2	294.114	1.87	13.63	26.42	36.38	25.46	46.00	-20.54
3	435.590	2.35	16.62	27.35	36.57	28.18	46.00	-17.82
4	506.479	2.61	18.02	27.69	38.17	31.11	46.00	-14.89
5	616.372	2.74	20.25	27.52	38.71	34.17	46.00	-11.83
6	942.131	3.64	23.30	26.58	40.14	40.51	46.00	-5.49

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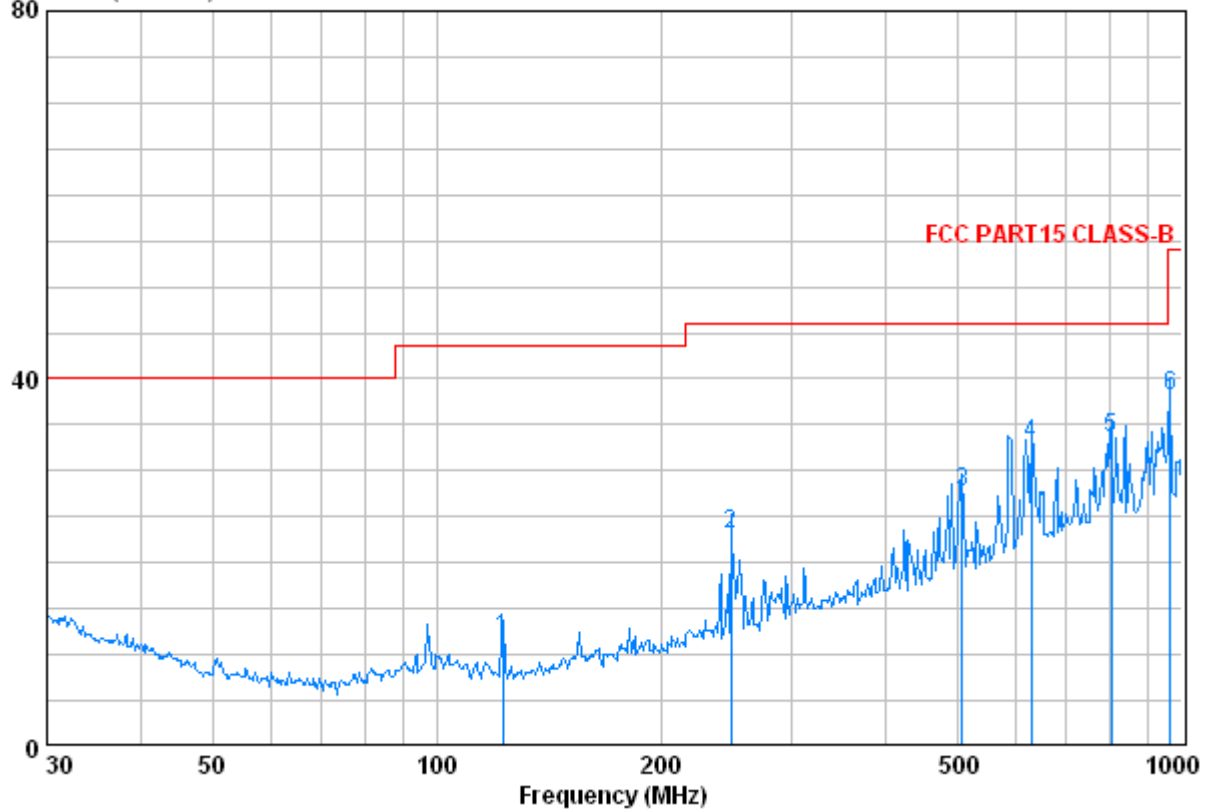
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Test mode:	Transmitting	Horizontal
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Data: 28

Level (dBuV/m)



		Cable	Antenna	Preamplifier	Read		Limit	Over
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	122.834	1.26	7.84	27.05	29.64	11.68	43.50	-31.82
2	248.552	1.67	12.27	26.54	35.78	23.18	46.00	-22.82
3	506.479	2.61	18.02	27.69	34.73	27.67	46.00	-18.33
4	627.274	2.76	20.51	27.51	37.19	32.96	46.00	-13.04
5	804.603	3.22	22.14	27.27	35.44	33.53	46.00	-12.47
6	965.542	3.67	23.70	26.47	37.30	38.19	54.00	-15.81

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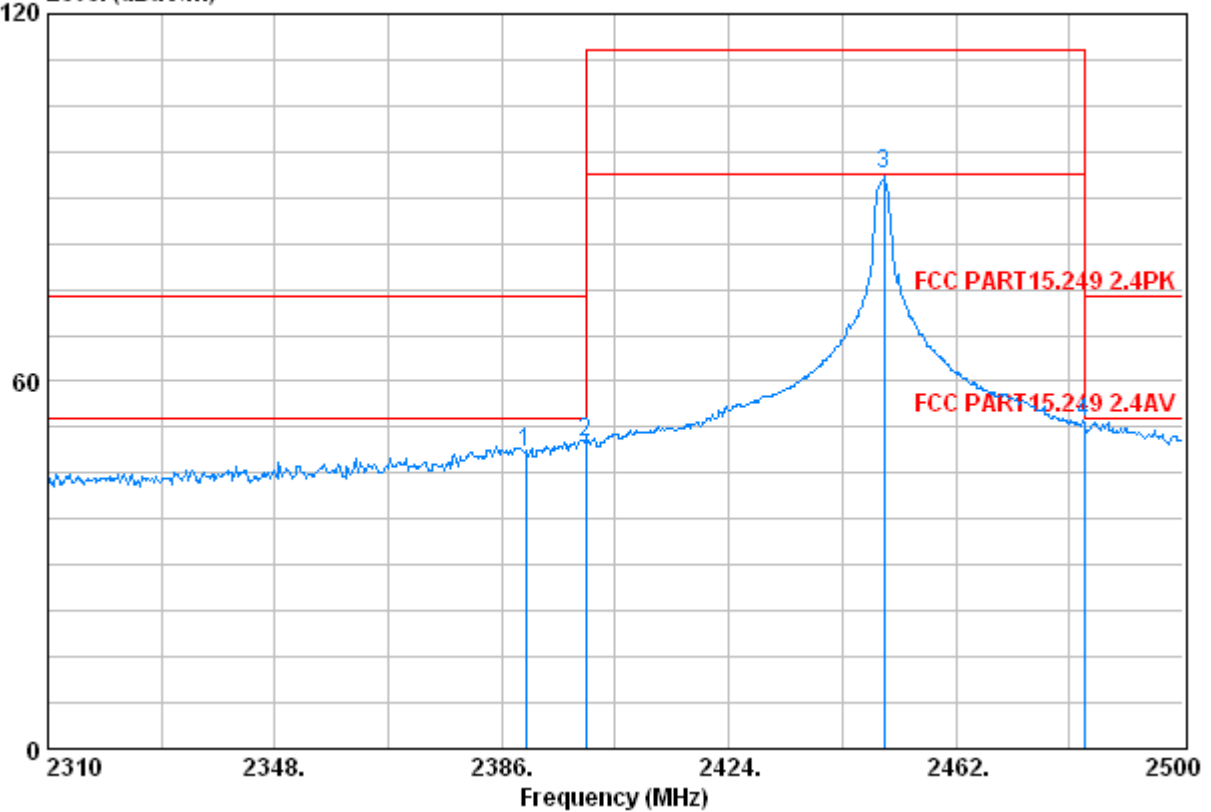
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Above 1GHz								
Peak measurement								
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4877.500	4.72	34.59	41.68	53.92	51.55	74.00	-22.45	Vertical
6005.500	5.13	35.70	40.92	51.72	51.63	74.00	-22.37	Vertical
6475.500	5.25	36.26	40.51	51.78	52.78	74.00	-21.22	Vertical
7521.250	6.15	36.00	39.61	50.97	53.51	74.00	-20.49	Vertical
8320.250	6.19	36.13	38.92	49.50	52.90	74.00	-21.10	Vertical
10188.500	6.02	37.92	37.53	47.60	54.01	74.00	-19.99	Vertical
4877.500	4.72	34.59	41.68	56.58	54.21	74.00	-19.79	Horizontal
6522.500	5.26	36.28	40.46	51.56	52.64	74.00	-21.36	Horizontal
7333.250	5.92	35.94	39.77	51.61	53.70	74.00	-20.30	Horizontal
8496.500	6.18	36.20	38.75	49.43	53.06	74.00	-20.94	Horizontal
9354.250	6.05	37.01	38.01	47.71	52.76	74.00	-21.24	Horizontal
10529.250	6.10	38.31	37.67	47.00	53.74	74.00	-20.26	Horizontal
Average measurement								
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
4877.500	4.72	34.59	41.68	40.65	38.28	54.00	-15.72	Vertical
6005.500	5.13	35.70	40.92	39.13	39.04	54.00	-14.96	Vertical
6475.500	5.25	36.26	40.51	38.98	39.98	54.00	-14.02	Vertical
7521.250	6.15	36.00	39.61	40.23	42.77	54.00	-11.23	Vertical
8320.250	6.19	36.13	38.92	40.00	43.40	54.00	-10.60	Vertical
10188.500	6.02	37.92	37.53	36.42	42.83	54.00	-11.17	Vertical
4877.500	4.72	34.59	41.68	43.27	40.90	54.00	-13.10	Horizontal
6522.500	5.26	36.28	40.46	41.31	42.39	54.00	-11.61	Horizontal
7333.250	5.92	35.94	39.77	40.72	42.81	54.00	-11.19	Horizontal
8496.500	6.18	36.20	38.75	38.79	42.42	54.00	-11.58	Horizontal
9354.250	6.05	37.01	38.01	37.54	42.59	54.00	-11.41	Horizontal
10529.250	6.10	38.31	37.67	35.58	42.32	54.00	-11.68	Horizontal

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5.2.3 Band edge (Radiated Emission)

Vertical

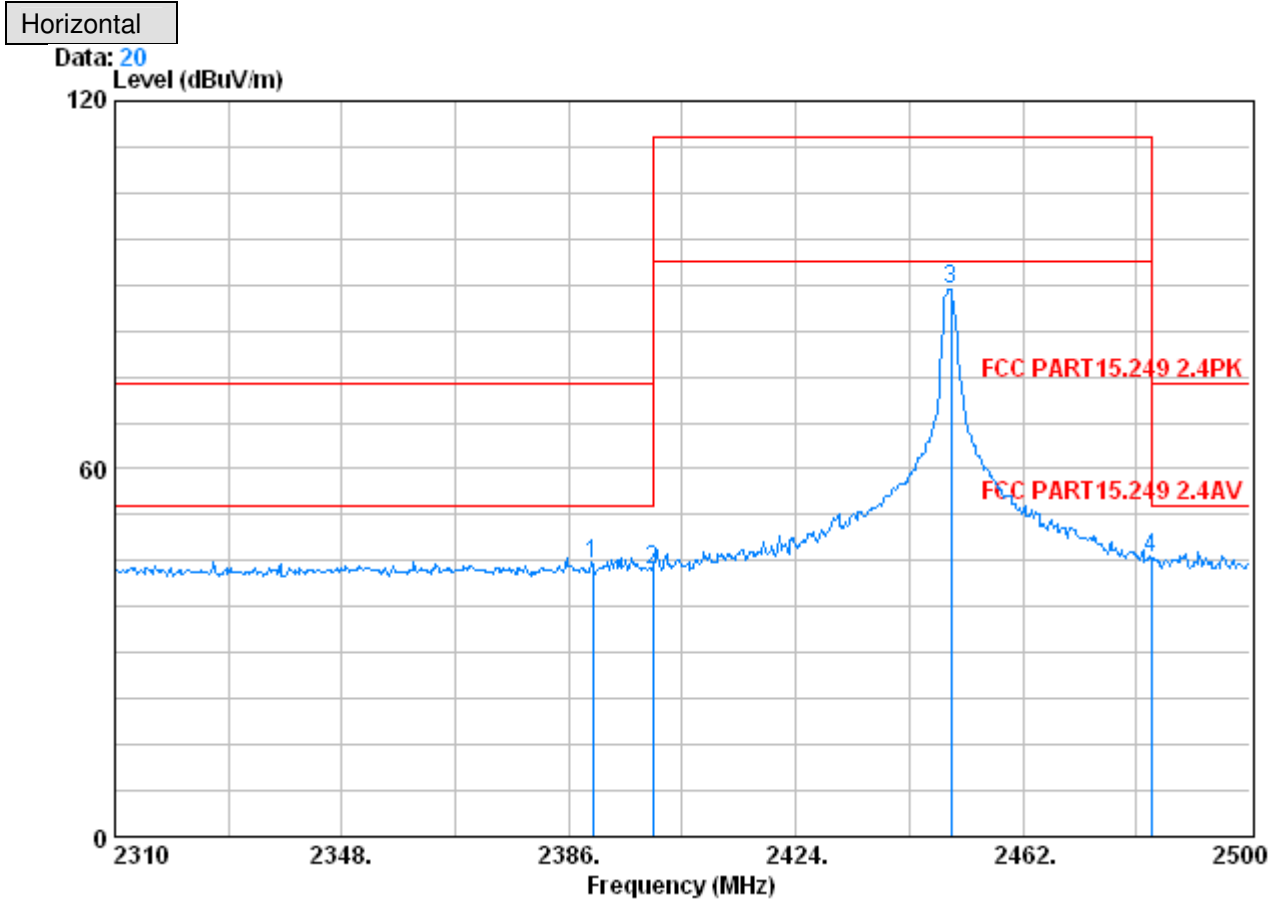
Data: 19
Level (dBuV/m)

		Cable	Antenna	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	2.98	32.51	39.85	52.90	48.55	74.00	-25.45 Peak
2	2400.000	2.98	32.51	39.86	54.35	49.98	74.00	-24.02 Peak
3 @	2450.000	3.01	32.61	39.89	98.04	93.77	114.00	-20.23 Peak
4	2483.500	3.03	32.67	39.92	57.42	53.20	74.00	-20.80 Peak

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	Freq	Cable	Antenna	Preamp	Read	Limit	Over	
		Loss	Factor	Factor	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	2.98	32.51	39.85	48.73	44.38	74.00	-29.62 Peak
2	2400.000	2.98	32.51	39.86	47.99	43.62	74.00	-30.38 Peak
3	2450.000	3.01	32.61	39.89	93.45	89.17	114.00	-24.83 Peak
4	2483.500	3.03	32.67	39.92	49.61	45.39	74.00	-28.61 Peak

Remark:

As shown in this section, for radiated Band-edge measurements, the 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.

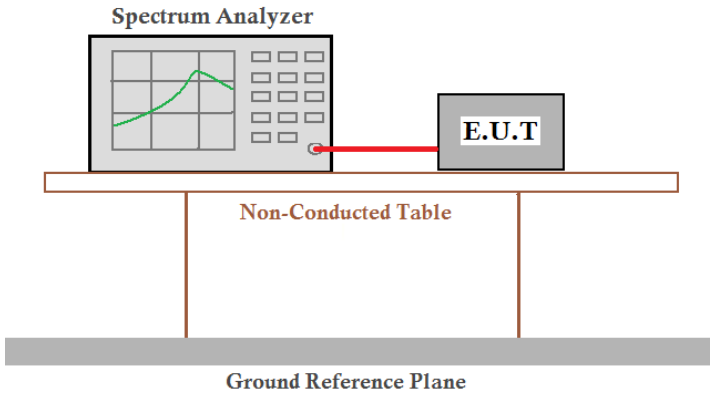
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5.2.4 20dB Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2009
Receiver setup:	RBW=100KHz, VBW=300KHz, detector: Peak
Test Procedure:	<ol style="list-style-type: none">1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.2. Set the EUT to proper test channel.3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points.4. Read 20dB bandwidth.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Electronic Under Test) unit via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 4.7 for details
Test results:	Pass

Measurement Data

Test channel	20dB bandwidth (MHz)	Results
2450MHz	0. 880	----

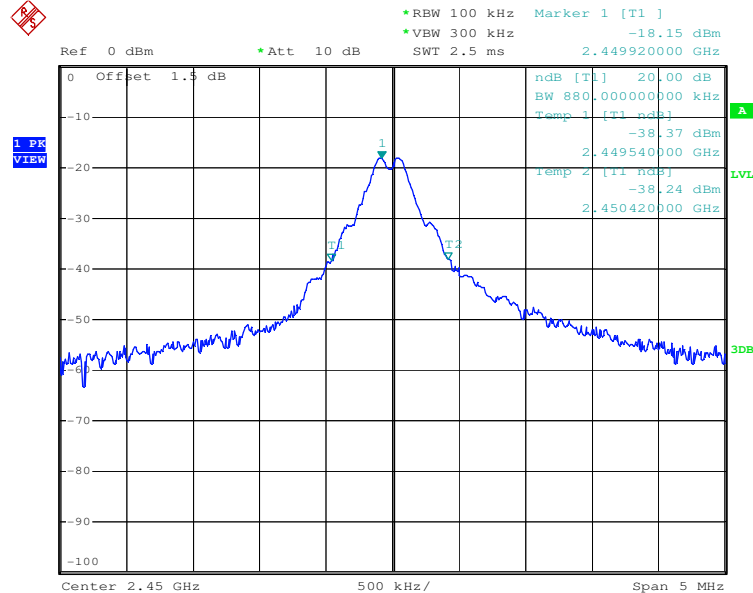
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Test plot as follows:



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