SGS-CSTC Standards Technical Services Ltd.

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057

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FCC REPORT

Application No. :	SZEM1205002733RF
Applicant:	SHENZHEN OCEAN ELECTRONICS CO., LTD.
Manufacturer:	SHENZHEN OCEAN ELECTRONICS CO., LTD.
Factory:	SHENZHEN OCEAN ELECTRONICS CO., LTD.
Product Name:	Wireless Computer Mouse 2.4GHz
Model No.(EUT):	Evolution*Series
FCC ID:	YL2EVOLUTIONR
Standards:	47 CFR Part 15, Subpart C (2011)
Date of Receipt:	2012-05-24
Date of Test:	2012-06-01 to 2012-06-21
Date of Issue:	2012-07-04
Test Result:	**PASS ***

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

Authorized Signature:

Jack Zhang
EMC Laboratory Manager

2 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
Band edge (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

3 Contents

4 General Information

4.1 Client Information

Applicant:	SHENZHEN OCEAN ELECTRONICS CO., LTD.
Address of Applicant:	B4 Building, Xinhaosheng Dingfeng Technology Park, Yonghe Rd., Fuyong Town, Baoan District, Shenzhen, China
Manufacturer:	SHENZHEN OCEAN ELECTRONICS CO., LTD.
Address of Manufacturer:	B4 Building, Xinhaosheng Dingfeng Technology Park, Yonghe Rd., Fuyong Town, Baoan District, Shenzhen, China
Factory:	SHENZHEN OCEAN ELECTRONICS CO., LTD.
Address of Factory:	B4 Building, Xinhaosheng Dingfeng Technology Park, Yonghe Rd., Fuyong Town, Baoan District, Shenzhen, China

4.2 General Description of EUT

Name:	Wireless Computer Mouse 2.4GHz
Model No.:	Evolution*Series
Trade Mark:	Sports Mouse™
Frequency Range:	2404MHz ~ 2480MHz
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK
Sample Type:	fixed production
Antenna Type:	Integral
Antenna Gain:	0dBi
Power Supply:	Dongle: PC USB port supply AC 120V 60Hz for PC

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	2404MHz
The Middle channel	2443MHz
The Highest channel	2480MHz

4.3 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	998 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode.

4.4 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
Coder	HengTong ELECTRON	HT4000
Printer	Canon	BJC-1000SP

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.

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

No tests were sub-contracted.

4.6 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 3m Semi-anechoic chamber, Full-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, G-416, 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)**
  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.

4.7 Deviation from Standards

None.

4.8 Abnormalities from Standard Conditions

None.

4.9 Other Information Requested by the Customer

None.

4.10 Test Instruments List

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	2013-06-10
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	2013-05-17
3	EMI Test software	AUDIX	E3	SEL0050	N/A
4	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2012-10-29
5	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2012-10-29
6	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2012-10-29
7	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2013-05-17
8	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2012-10-26
9	Coaxial cable	SGS	N/A	SEL0027	2013-05-29
10	Coaxial cable	SGS	N/A	SEL0189	2013-05-29
11	Coaxial cable	SGS	N/A	SEL0121	2013-05-29
12	Coaxial cable	SGS	N/A	SEL0178	2013-05-29
13	Band filter	Amindeon	82346	SEL0094	2013-05-17
14	Barometer	ChangChun	DYM3	SEL0088	2013-05-17
15	Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2012-10-28

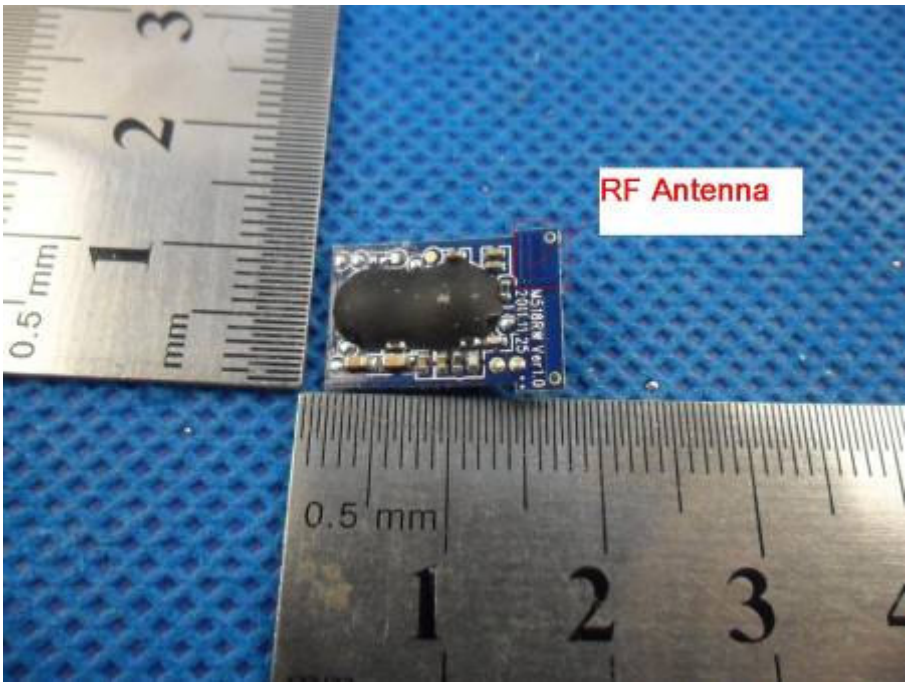
Conducted Emission					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2013-06-10
2	LISN	Rohde & Schwarz	ENV216	SEL0152	2012-10-23
3	LISN	ETS-LINDGREN	3816/2	SEL0021	2013-05-17
4	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2013-05-17
5	Coaxial Cable	SGS	N/A	SEL0024	2013-05-29

General used equipment					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0102 to SEL0103	2012-10-27
2	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0101	2012-10-27
3	Barometer	ChangChun	DYM3	SEL0088	2013-05-17

RF conducted					
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Due date (yyyy-mm-dd)**
1	Spectrum Analyzer	Rohde & Schwarz	FSP 30	SEL0154	2012-10-23
2	Coaxial cable	SGS	N/A	SEL0028	2013-05-29

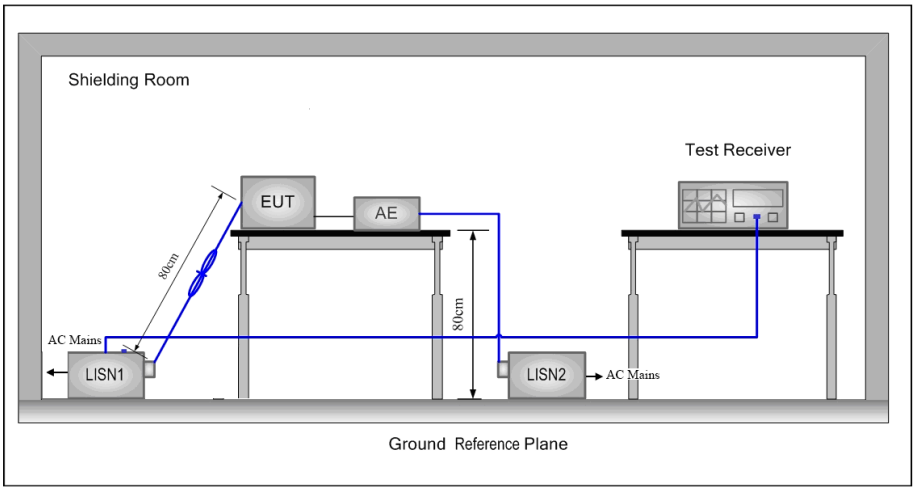
5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
EUT Antenna:	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.	
	

5.2 Conducted Emissions

Test Requirement:	FCC Part15 C 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:	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.

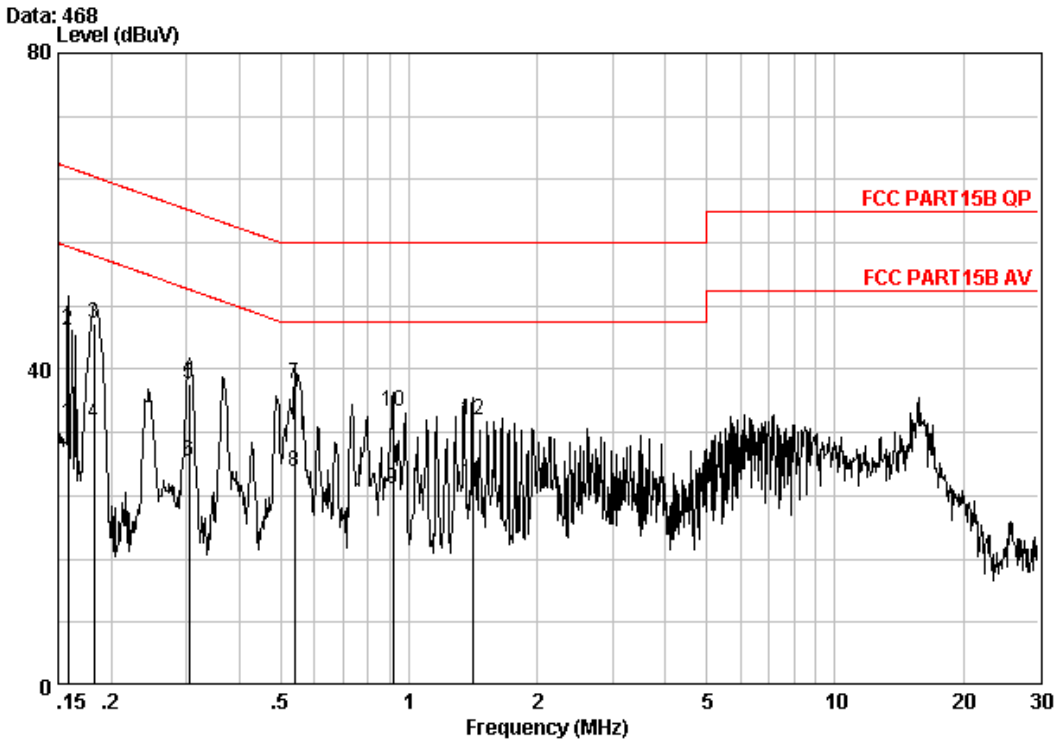
Test Setup:	
Instruments Used:	Refer to section 4.10 for details
Test Mode:	Transmitting mode
Test Results:	Pass

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.

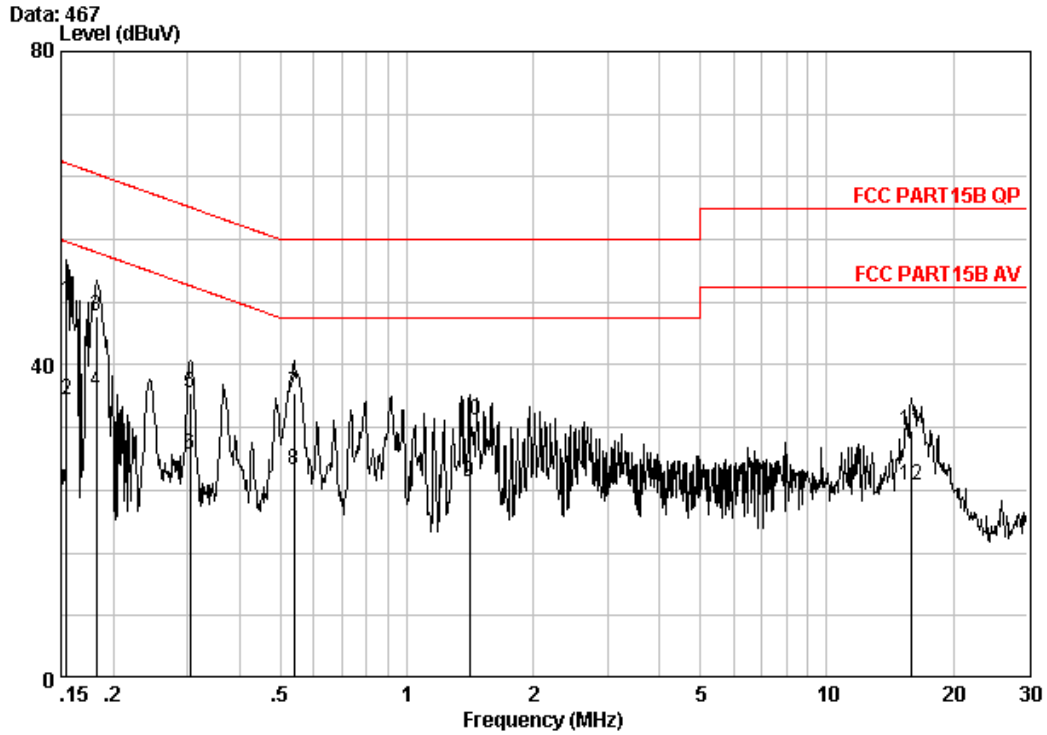
Live Line:



Site : Shielding Room
Condition : FCC PART15B QP CE-20101216 LINE
Job No. : 2733RF
Mode : Transmitting

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15816	0.04	9.60	23.52	33.16	55.56	-22.40	Average
2	0.15816	0.04	9.60	35.25	44.89	65.56	-20.67	QP
3	0.18249	0.04	9.60	36.05	45.69	64.37	-18.68	QP
4	0.18249	0.04	9.60	23.60	33.24	54.37	-21.13	Average
5	0.30509	0.05	9.60	28.42	38.07	60.10	-22.03	QP
6	0.30509	0.05	9.60	18.67	28.32	50.10	-21.78	Average
7	0.53782	0.06	9.62	28.57	38.25	56.00	-17.75	QP
8	0.53782	0.06	9.62	17.34	27.02	46.00	-18.98	Average
9	0.91842	0.08	9.70	15.18	24.95	46.00	-21.05	Average
10	0.91842	0.08	9.70	24.86	34.64	56.00	-21.36	QP
11	1.411	0.10	9.70	15.64	25.44	46.00	-20.56	Average
12	1.411	0.10	9.70	23.81	33.61	56.00	-22.39	QP

Neutral Line:



Site : Shielding Room
Condition : FCC PART15B QP CE-20101216 NEUTRAL
Job No. : 2733RF
Mode : Transmitting

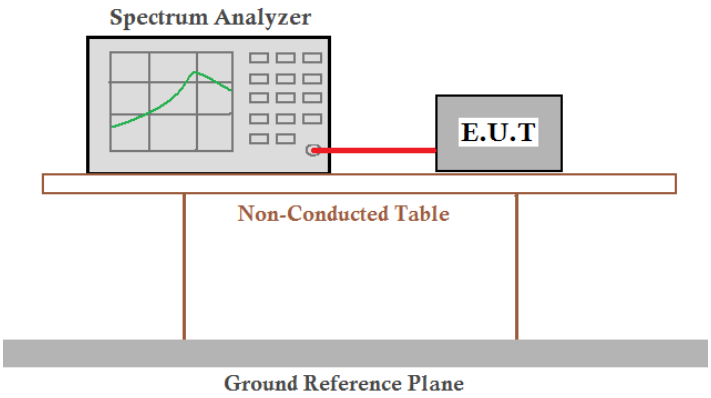
	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 @	0.15485	0.04	9.60	38.51	48.15	65.74	-17.59	QP
2	0.15485	0.04	9.60	25.85	35.49	55.74	-20.25	Average
3	0.18249	0.04	9.60	36.49	46.13	64.37	-18.24	QP
4	0.18249	0.04	9.60	27.07	36.71	54.37	-17.66	Average
5	0.30509	0.05	9.60	26.70	36.35	60.10	-23.76	QP
6	0.30509	0.05	9.60	18.95	28.60	50.10	-21.51	Average
7	0.53782	0.06	9.62	26.80	36.48	56.00	-19.52	QP
8	0.53782	0.06	9.62	16.96	26.64	46.00	-19.36	Average
9	1.411	0.10	9.70	15.30	25.10	46.00	-20.90	Average
10	1.411	0.10	9.70	23.18	32.98	56.00	-23.02	QP
11	15.885	0.25	10.02	21.35	31.62	60.00	-28.38	QP
12	15.885	0.25	10.02	14.38	24.66	50.00	-25.34	Average

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

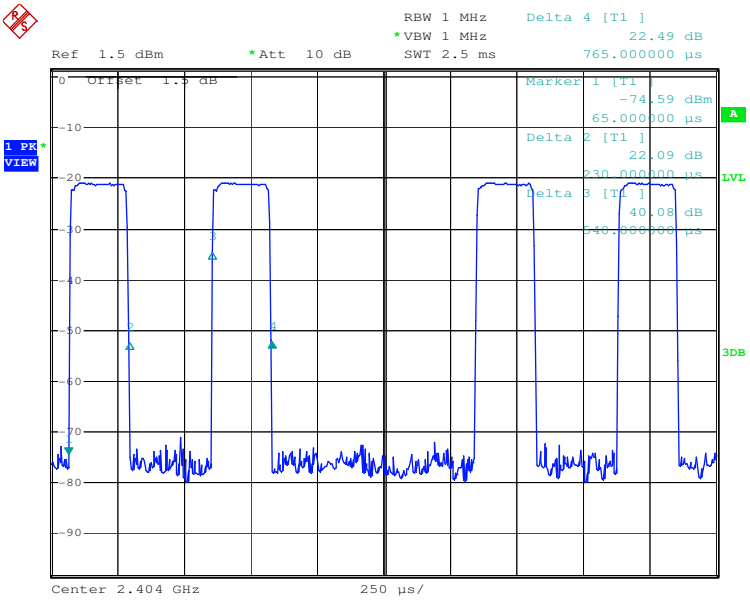
5.3 Spurious Emissions

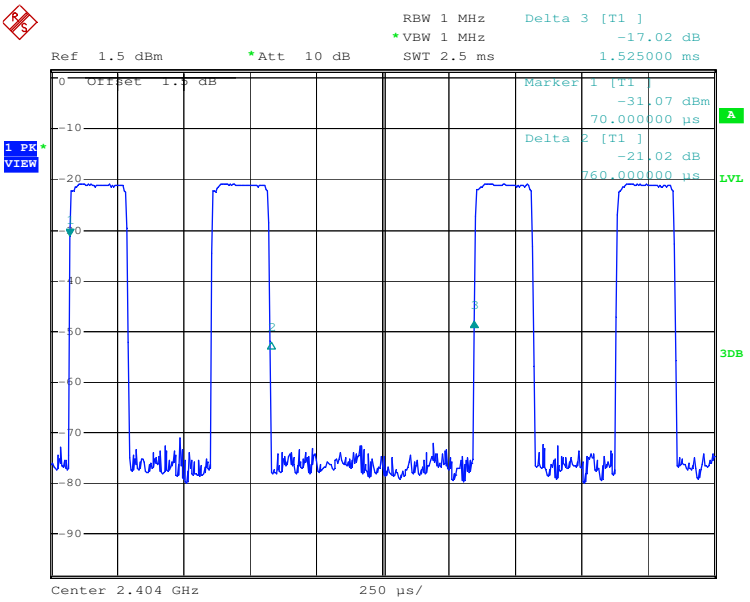
5.3.1 Duty Cycle

Test Requirement:	FCC Part15 C Section 15.35 (c)
Test Method:	ANSI C63.10:2009
Test Setup:	
Instruments Used:	Refer to section 4.10 for details
Limit:	N/A
Test Mode:	Transmitting mode
Test Results:	Pass

Test plot as follows:

Duty cycle





5.3.2 Spurious Emissions

Test Requirement:	FCC Part15 C 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	100kHz	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

Test Setup:

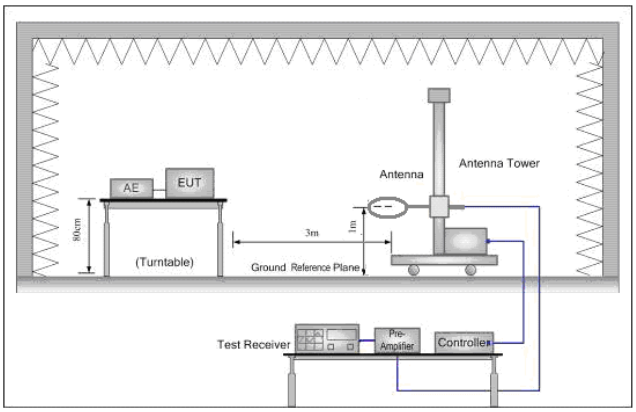


Figure 1. Below 30MHz

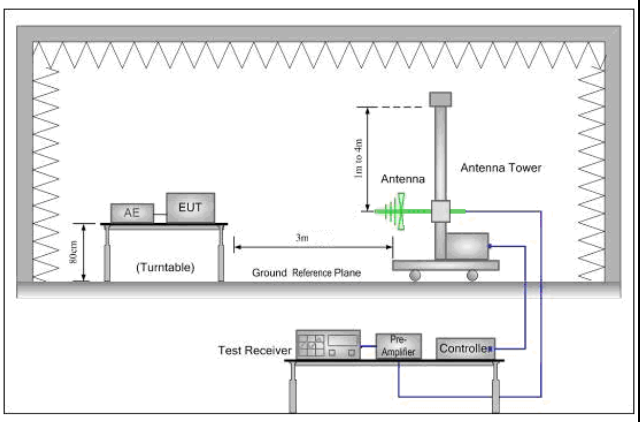


Figure 2. 30MHz to 1GHz

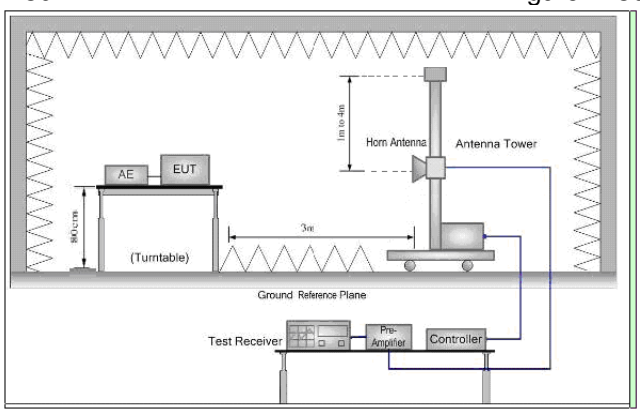


Figure 3. Above 1 GHz

Test Procedure:	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. 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. Repeat above procedures until all frequencies measured was complete.
Instruments Used:	Refer to section 4.10 for details
Test Mode:	Transmitting mode
Test Results:	Pass

Average value:	
Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)=-10.51
	Duty cycle= T on time / T period =(0.230+0.225)/1.525=29.8%
Test data:	Ton time =(0.230+0.225)ms
	T period =1.525ms

Measurement Data

5.3.2.1 Field Strength Of The Fundamental Signal

Peak value:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2404.000	2.99	32.54	39.86	95.53	91.20	114	-22.80	Horizontal
2404.000	2.99	32.54	39.86	96.06	91.73	114	-22.27	Vertical
2443.000	3.01	32.61	39.89	97.02	92.75	114	-21.25	Horizontal
2443.000	3.01	32.61	39.89	95.20	90.93	114	-23.07	Vertical
2480.000	3.03	32.67	39.92	95.32	91.10	114	-22.90	Horizontal
2480.000	3.03	32.67	39.92	93.70	89.48	114	-24.52	Vertical

Average value:

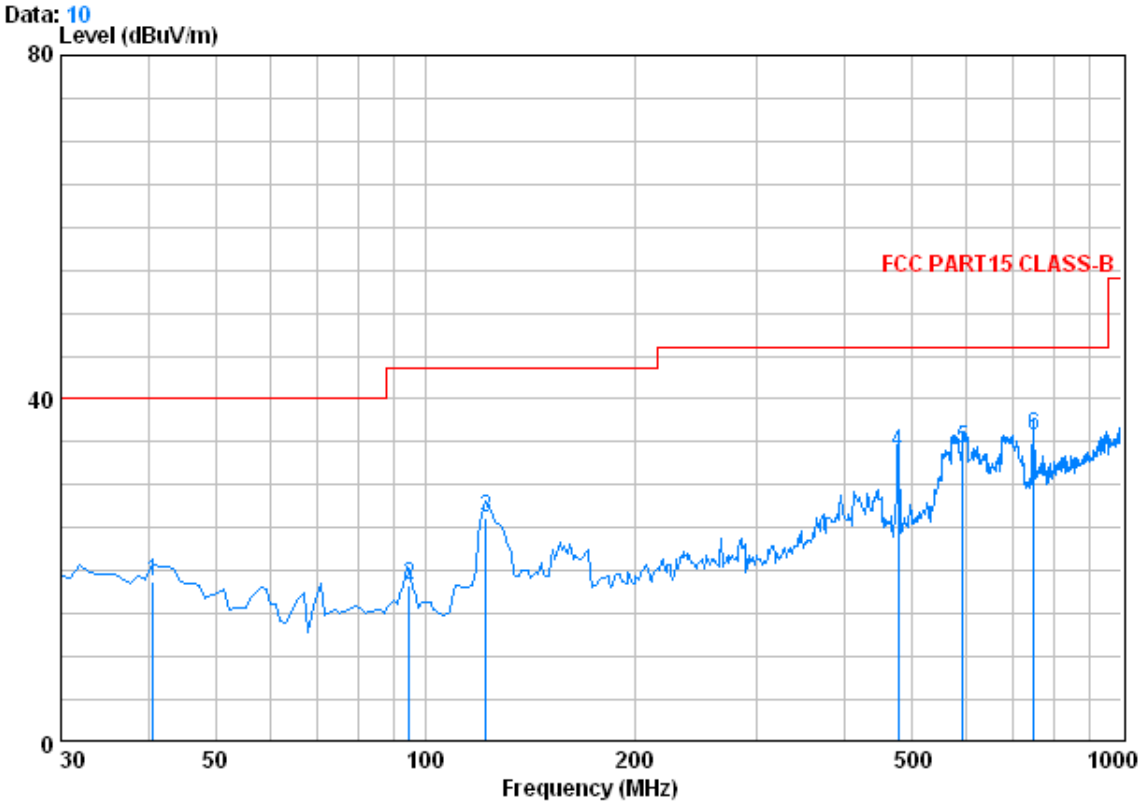
Frequency (MHz)	Peak value	PDCF	Level (dBuV/m	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2404.000	91.20	-10.51	80.69	94.00	-13.31	Horizontal
2404.000	91.73	-10.51	81.22	94.00	-12.78	Vertical
2443.000	92.75	-10.51	82.24	94.00	-11.76	Horizontal
2443.000	90.93	-10.51	80.42	94.00	-13.58	Vertical
2480.000	91.10	-10.51	80.59	94.00	-13.41	Horizontal
2480.000	89.48	-10.51	78.97	94.00	-15.03	Vertical

5.3.2.2 Spurious Emissions

30MHz~1GHz	
Test mode:	Transmitting

QP value:

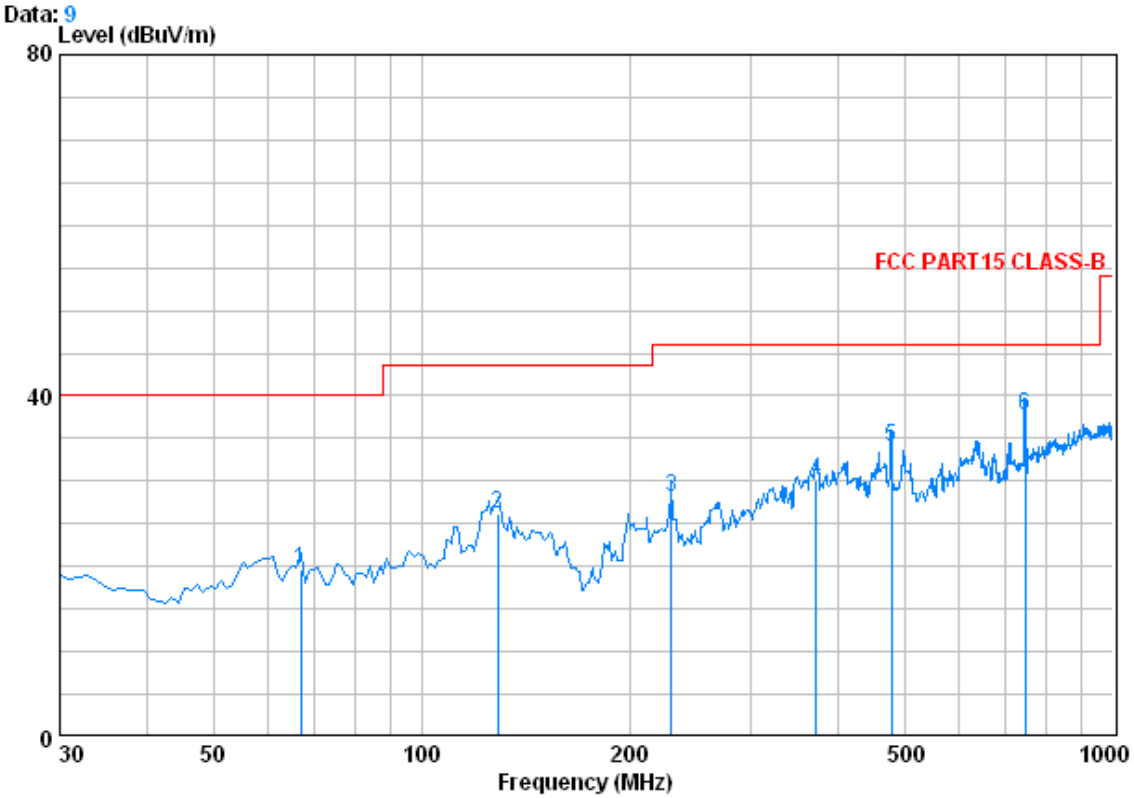
Vertical:



Condition : FCC PART15 CLASS-B 3m 0042673 VERTICAL
Job No. : 2733RF
Mode : transmitting (dongle)

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	40.670	0.62	10.93	27.32	34.50	18.73	40.00	-21.27
2	94.990	1.15	8.91	27.21	35.43	18.28	43.50	-25.22
3	122.150	1.26	7.85	27.06	44.14	26.19	43.50	-17.31
4	478.140	2.52	17.80	27.60	41.05	33.77	46.00	-12.23
5	592.600	2.69	19.57	27.55	39.53	34.23	46.00	-11.77
6	747.800	3.05	21.69	27.35	38.34	35.72	46.00	-10.28

Horizontal:



Condition : FCC PART15 CLASS-B 3m 0042673 HORIZONTAL
Job No. : 2733RF
Mode : transmitting (dongle)

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	66.860	0.80	6.99	27.25	39.10	19.63	40.00	-20.37
2	128.940	1.27	7.72	27.02	44.18	26.15	43.50	-17.35
3	229.820	1.57	11.64	26.59	41.52	28.14	46.00	-17.86
4	372.410	2.12	15.94	26.95	38.89	30.00	46.00	-16.00
5	478.140	2.52	17.80	27.60	41.21	33.93	46.00	-12.07
6 @	746.830	3.05	21.69	27.35	40.33	37.71	46.00	-8.29

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
1557.252	2.56	28.59	39.38	47.95	39.72	74	-34.28	Vertical
3625.669	3.84	33.34	40.76	48.58	45.00	74	-29.00	Vertical
4821.757	4.70	34.68	41.64	52.23	49.97	74	-24.03	Vertical
6428.771	5.24	36.20	40.55	49.44	50.33	74	-23.67	Vertical
8527.851	6.18	36.23	38.73	47.79	51.47	74	-22.53	Vertical
10669.020	6.14	38.37	37.73	46.62	53.40	74	-20.60	Vertical
1617.862	2.59	28.96	39.41	46.21	38.35	74	-35.65	Horizontal
3489.840	3.73	33.21	40.66	47.23	43.51	74	-30.49	Horizontal
4797.271	4.69	34.73	41.63	50.68	48.47	74	-25.53	Horizontal
7227.389	5.81	35.89	39.85	51.17	53.02	74	-20.98	Horizontal
9088.188	6.13	36.70	38.24	46.75	51.34	74	-22.66	Horizontal
11692.920	6.39	38.59	38.15	46.53	53.36	74	-20.64	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
1795.839	2.71	30.32	39.48	47.17	40.72	74	-33.28	Vertical
3634.910	3.85	33.37	40.77	49.54	45.99	74	-28.01	Vertical
5022.194	4.78	34.43	41.76	49.36	46.81	74	-27.19	Vertical
7338.621	5.94	35.94	39.75	51.46	53.59	74	-20.41	Vertical
9465.979	6.02	37.16	37.91	47.83	53.10	74	-20.90	Vertical
12303.620	6.55	39.21	38.40	45.84	53.20	74	-20.80	Vertical
1170.959	2.30	27.51	39.21	46.96	37.56	74	-36.44	Horizontal
1621.985	2.59	29.09	39.41	46.43	38.70	74	-35.30	Horizontal
3543.550	3.78	33.26	40.70	48.36	44.70	74	-29.30	Horizontal
4908.444	4.74	34.54	41.71	51.48	49.05	74	-24.95	Horizontal
7357.326	5.96	35.94	39.74	51.64	53.80	74	-20.20	Horizontal
11027.980	6.23	38.49	37.88	47.07	53.91	74	-20.09	Horizontal

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
1381.656	2.44	27.88	39.30	47.03	38.05	74	-35.95	Vertical
2995.538	3.31	33.38	40.30	48.12	44.51	74	-29.49	Vertical
3738.129	3.95	33.49	40.84	49.27	45.87	74	-28.13	Vertical
5244.295	4.86	34.65	41.58	49.50	47.43	74	-26.57	Vertical
9346.262	6.06	37.01	38.03	46.82	51.86	74	-22.14	Vertical
11341.140	6.30	38.43	38.00	47.03	53.76	74	-20.24	Vertical
1557.252	2.56	28.59	39.38	47.42	39.19	74	-34.81	Horizontal
3112.129	3.41	33.36	40.38	48.19	44.58	74	-29.42	Horizontal
4641.118	4.59	34.98	41.51	48.96	47.02	74	-26.98	Horizontal
4946.072	4.75	34.48	41.74	51.78	49.27	74	-24.73	Horizontal
7413.726	6.02	35.97	39.69	51.44	53.74	74	-20.26	Horizontal
8814.774	6.16	36.45	38.49	48.90	53.02	74	-20.98	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) The disturbance above 13GHz and 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.
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.

5.4 Band edge (Radiated Emission)

Test Requirement:	FCC Part15 C 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
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

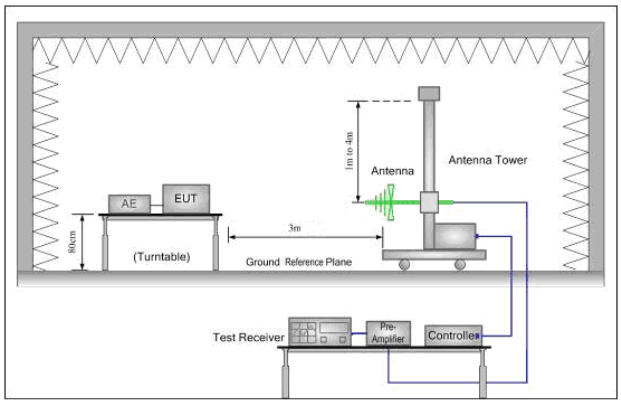


Figure 1. 30MHz to 1GHz

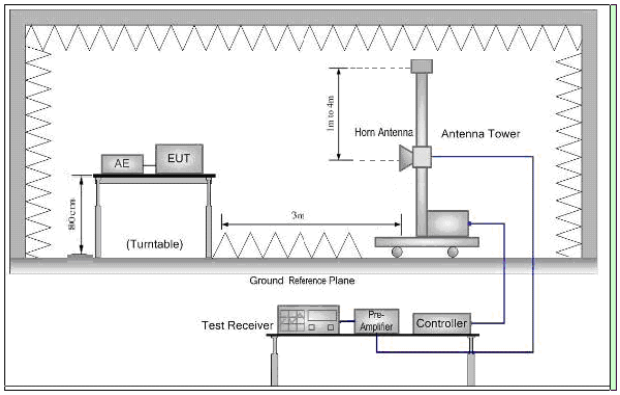


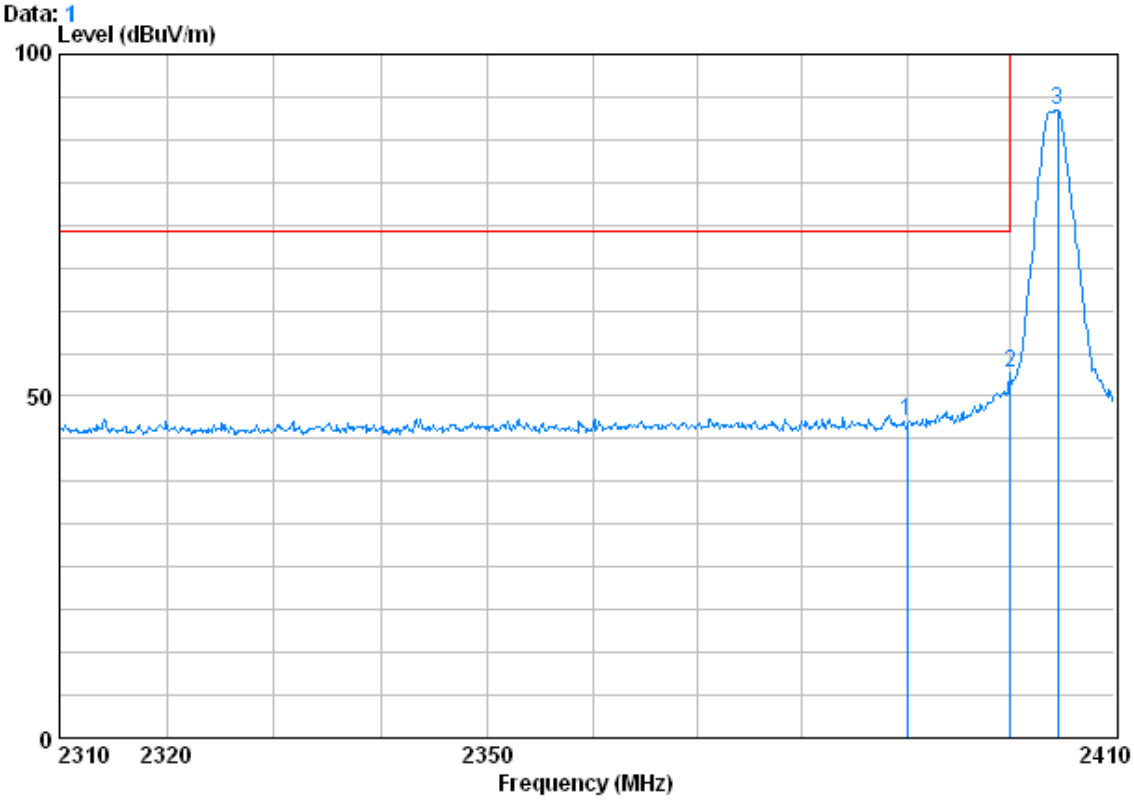
Figure 2. Above 1 GHz

Test Procedure:	a. 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. 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 channel g. Test the EUT in the lowest channel , the Highest channel h. Repeat above procedures until all frequencies measured was complete.
Instruments Used:	Refer to section 4.10 for details
Test Mode:	Transmitting mode
Test Results:	Pass

Measurement Data

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

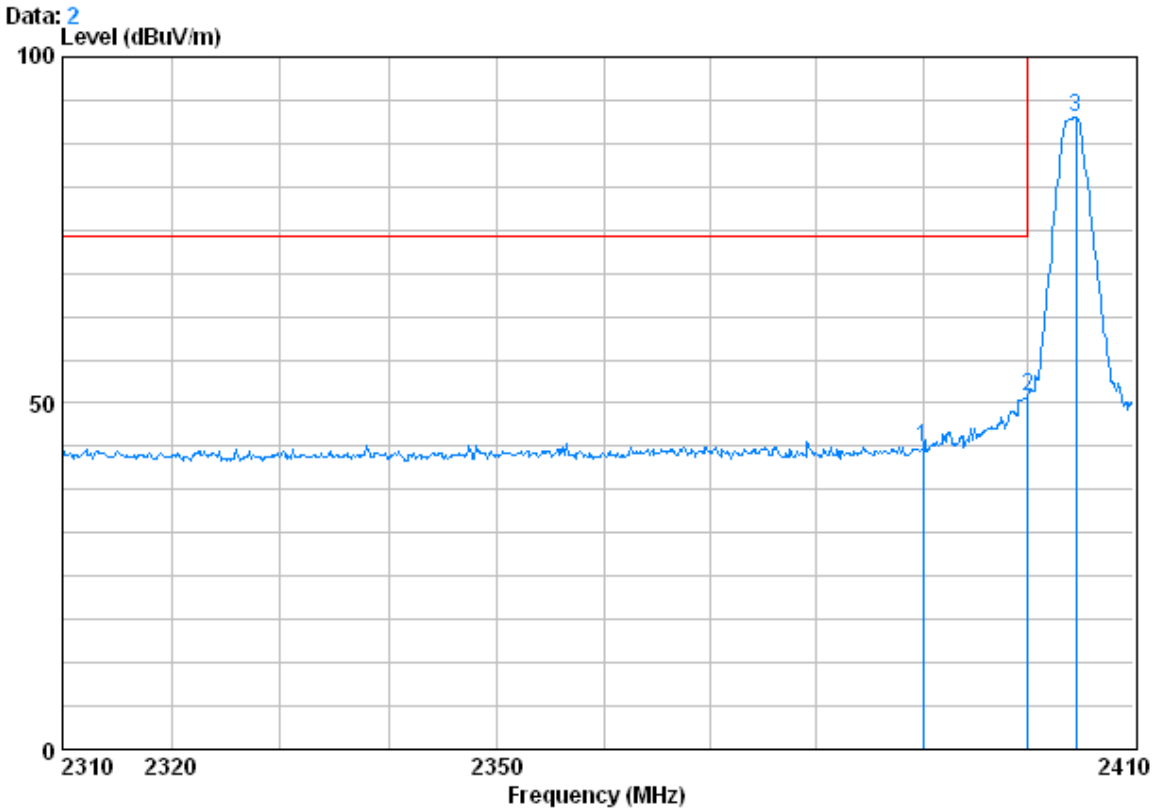
Vertical:



Condition : FCC PART15.249 2.4PK 3m VERTICAL
Job No. : 2733RF
test mode : 2404 (Dongle)

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	2.98	32.51	39.85	50.70	46.35	74.00	-27.65
2 @	2400.000	2.98	32.51	39.86	57.73	53.36	74.00	-20.64
3	2404.600	2.99	32.54	39.86	96.05	91.73	114.00	-22.27

Horizontal:

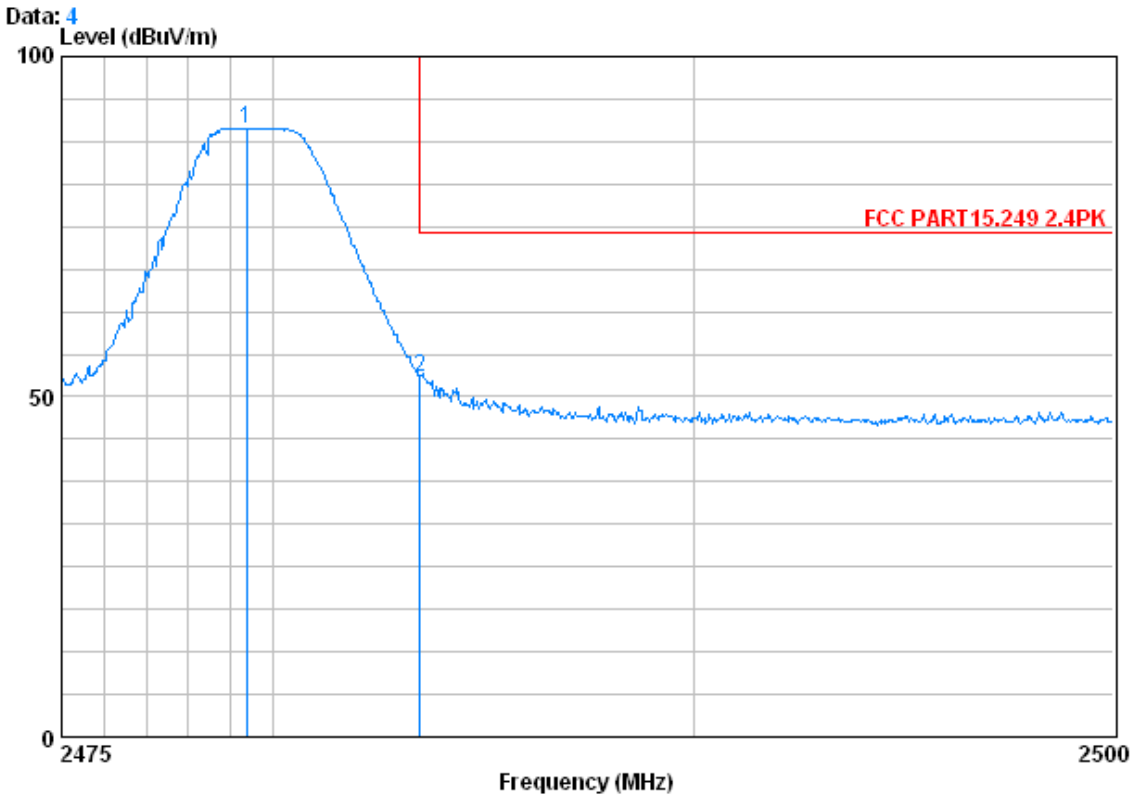


Condition : FCC PART15.249 2.4PK 3m HORIZONTAL
Job No. : 2733RF
test mode : 2404 (Dongle)

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	2.98	32.51	39.85	48.08	43.72	74.00	-30.28
2	2400.000	2.98	32.51	39.86	55.44	51.07	74.00	-22.93
3	2404.600	2.99	32.54	39.86	95.52	91.20	114.00	-22.80

Test mode:	Transmitting	Test channel:	Highest	Remark:	Peak

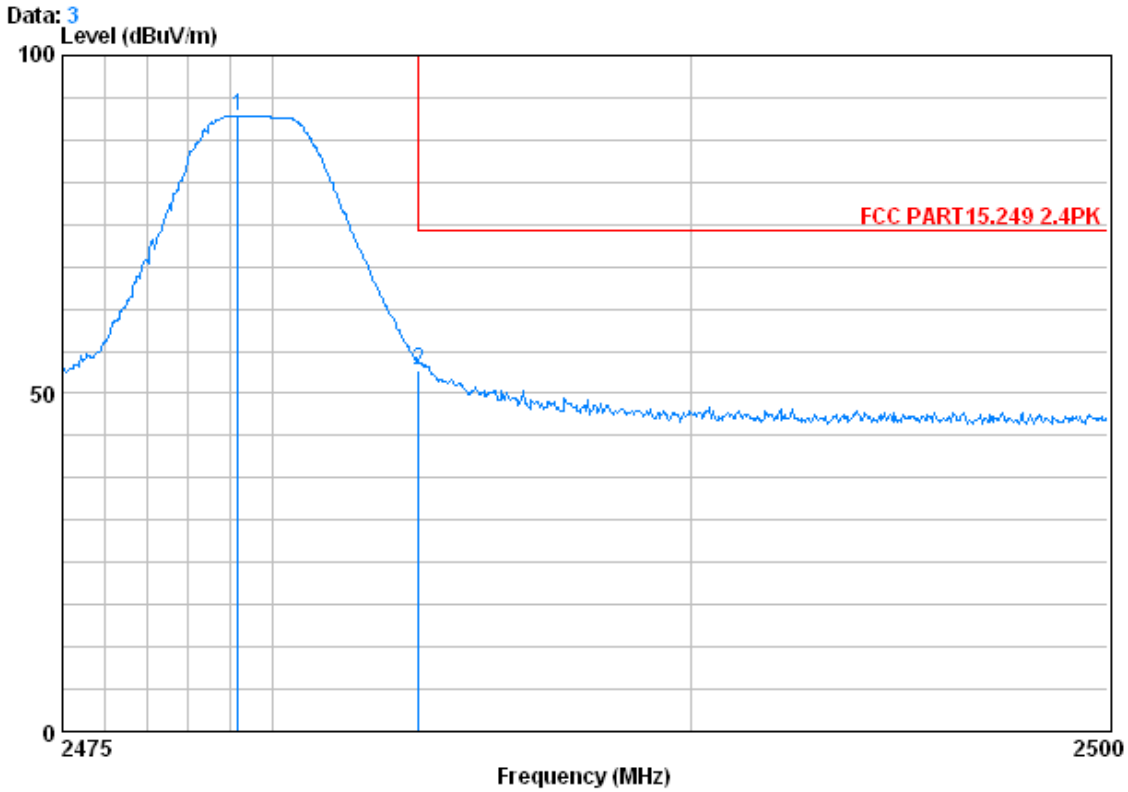
Vertical:



Condition : FCC PART15.249 2.4PK 3m VERTICAL
Job No. : 2733RF
test mode : 2480 (Dongle)

	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2479.375	3.03	32.67	39.92	93.70	89.48	114.00	-24.52
2	2483.500	3.03	32.67	39.92	57.06	52.84	74.00	-21.16

Horizontal:



Condition : FCC PART15.249 2.4PK 3m HORIZONTAL
Job No. : 2733RF
test mode : 2480 (Dongle)

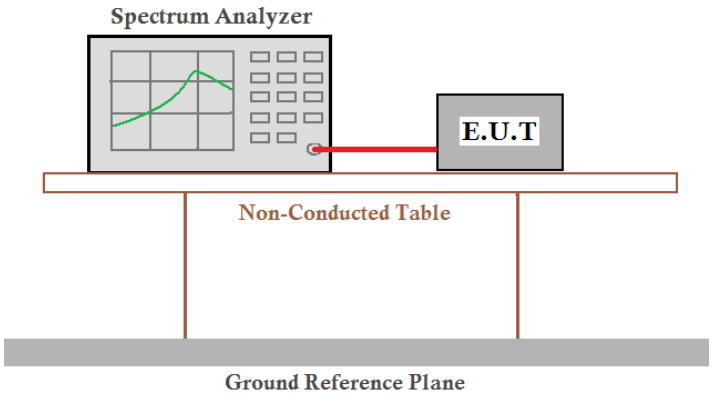
	Freq	Cable Loss	Antenna Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2479.175	3.03	32.67	39.92	95.32	91.10	114.00	-22.90
2	2483.500	3.03	32.67	39.92	57.55	53.33	74.00	-20.67

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

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.

5.5 20dB Bandwidth

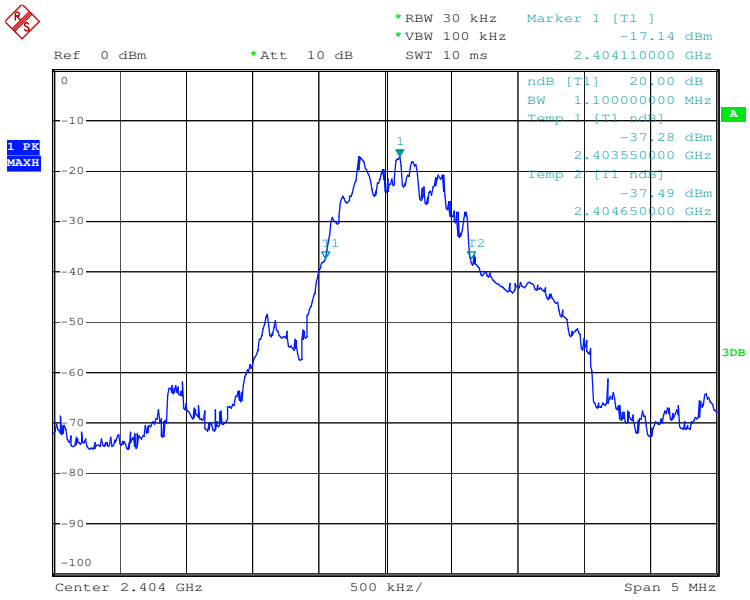
Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10:2009
Test Setup:	
Instruments Used:	Refer to section 4.7 for details
Test mode:	Transmitting mode
Limit:	N/A
Test Results:	Pass

Measurement Data

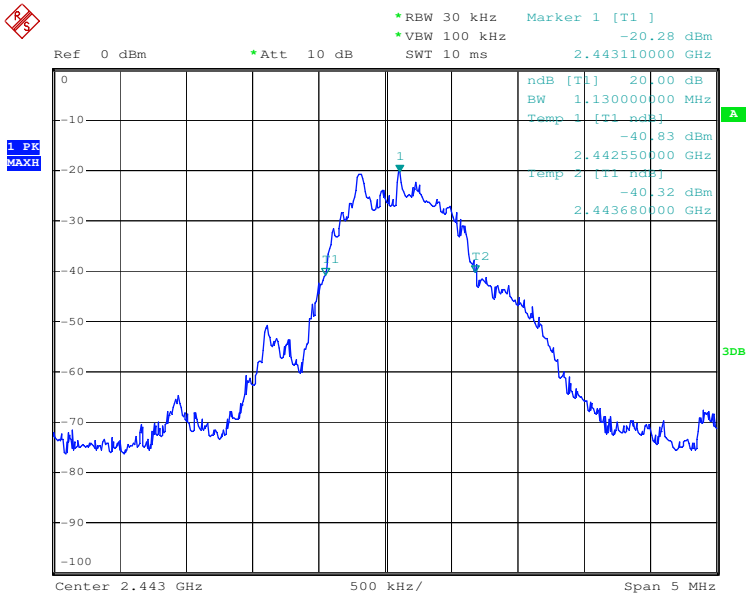
Test channel	20dB bandwidth (MHz)	Results
Lowest	1.100	Pass
Middle	1.130	Pass
Highest	1.880	Pass

Test plot as follows:

Test channel:	Lowest



Test channel:	Middle



Test channel:	Highest