FCC REPORT

Applicant:	Automotive Data Solutions Inc.
Address of Applicant:	8400 Bougainville Montreal Quebec Canada H4P 2G1
Equipment Under Test (EUT)	
Product Name:	CAR ALARM (TWO WAY)
Model No.:	AN2400A
FCC ID:	2AEPJ-AN2400A
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	04 May., 2016
Date of Test:	04 May., to 06 May, 2016
Date of report issued:	06 May, 2016
Test Result:	PASS *

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

Authorized Signature:

Bruce Zhang
Laboratory Manager

2 Version

Version No.	Date	Description
00	*06 May, 2016*	*Original*

Tested by: Casey Chen ***Date:*** *06 May, 2016*

Test Engineer

Reviewed by: Wimer Zhang ***Date:*** *06 May, 2016*

Project Engineer

3 Contents

Page

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	N/A
Conducted Peak Output Power	15.247 (b)(3)	Pass
6dB Emission Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247(d)	Pass
Spurious Emission	15.205/15.209	Pass

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

5 General Information

5.1 Client Information

Applicant:	Automotive Data Solutions Inc.
Address of Applicant:	8400 Bougainville Montreal Quebec Canada H4P 2G1
Manufacturery:	Portman Electronics (Dongguan) CO.,LTD
Address of Manufacturer:	NO.10, LUYI 2 ROAD, TANGXIA TOWN, DONGGUAN CITY, GUANGDONG PROVINCE CHINA
Factory:	DONGGUAN PORTMAN ELECTRONIC SCIENCE AND TECHNOLOGY CO.,LTD
Address of Factory:	NO.10, LUYI 2 ROAD, TANGXIA TOWN, DONGGUAN CITY, GUANGDONG PROVINCE CHINA

5.2 General Description of E.U.T.

Product Name:	CAR ALARM (TWO WAY)
Model No.:	AN2400A
Operation Frequency:	915 MHz
Channel numbers:	1
Modulation technology:	LoRa
Antenna Type:	Internal Antenna
Antenna gain:	0 dBi
Power supply:	DC 12V

5.3 Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Operation mode	Keep the EUT in continuous transmitting with modulation
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

5.4 Description of Support Units

N/A

5.5 Laboratory Facility

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

- **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. 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 out files. Registration 817957, February 27, 2012.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

5.6 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282
Fax: +86-755-23116366

5.7 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
1	3m SAC	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	08-23-2014	08-22-2017
2	BiConiLog Antenna	SCHWARZBECK	VULB9163	CCIS0005	03-25-2016	03-25-2017
3	Horn Antenna	SCHWARZBECK	BBHA9120D	CCIS0006	03-25-2016	03-25-2017
4	Pre-amplifier (10kHz-1.3GHz)	HP	8447D	CCIS0003	04-01-2016	03-31-2017
5	Pre-amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	04-01-2016	03-31-2017
6	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	04-01-2016	03-31-2017
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	04-01-2016	03-31-2017
8	Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP30	CCIS0023	03-28-2016	03-28-2017
9	EMI Test Receiver	Rohde & Schwarz	ESRP7	CCIS0167	03-28-2016	03-28-2017
10	Loop antenna	Laplace instrument	RF300	EMC0701	04-01-2016	03-31-2017
11	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
1	Shielding Room	ZhongShuo Electron	11.0(L)x4.0(W)x3.0(H)	CCIS0061	08-23-2014	08-22-2017
2	EMI Test Receiver	Rohde & Schwarz	ESCI	CCIS0002	03-24-2016	03-24-2017
3	LISN	CHASE	MN2050D	CCIS0074	03-26-2016	03-26-2017
4	Coaxial Cable	CCIS	N/A	CCIS0086	04-01-2016	03-31-2017
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

5.8 Measurement Uncertainty

Items	Expanded Uncertainty (Confidence of 95%)
Conducted Emission (9kHz ~ 30MHz)	2.14 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	4.24 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	4.35 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	4.44 dB (k=2)
Radiated Emission (18GHz ~ 26.5GHz)	4.56 dB (k=2)

6 Test results and Measurement Data

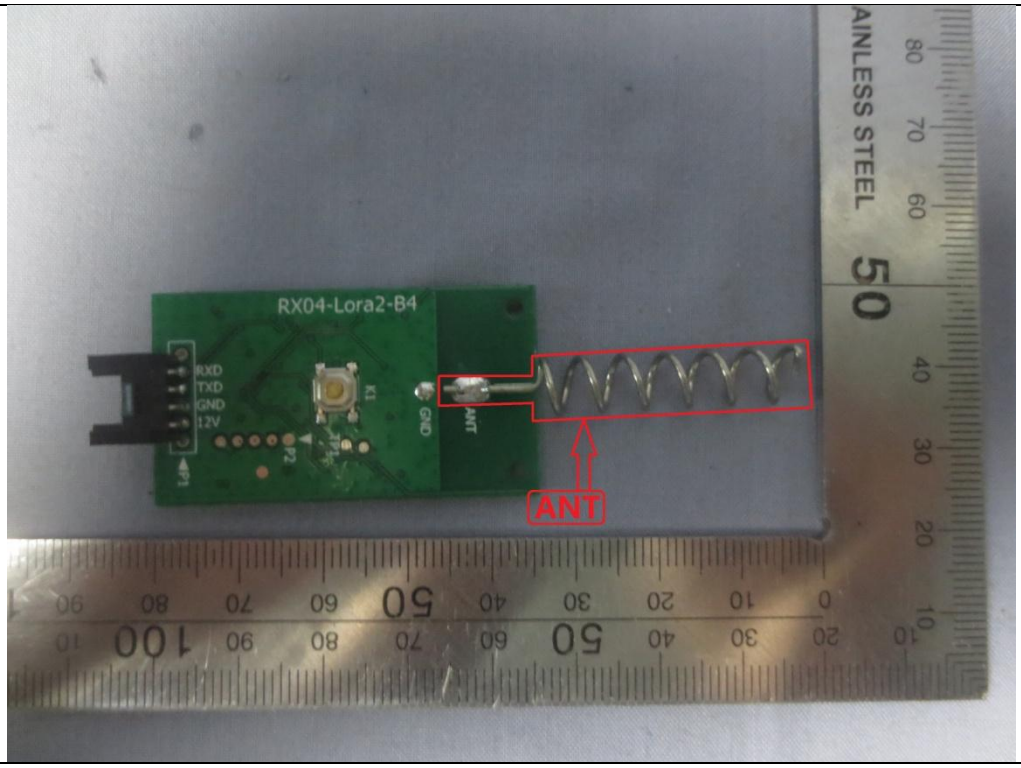
6.1 Antenna requirement:

Standard requirement:	FCC Part 15 C Section 15.203 /247(c)

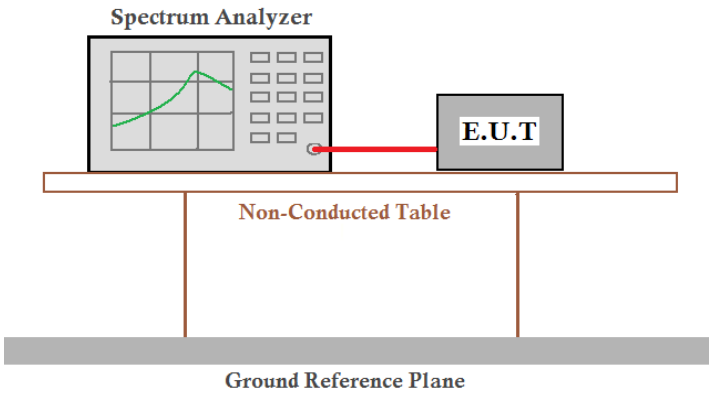
15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer 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.

E.U.T Antenna:	

The antenna is an internal antenna which cannot replace by end-user, the best case gain of the antenna is 0 dBi.



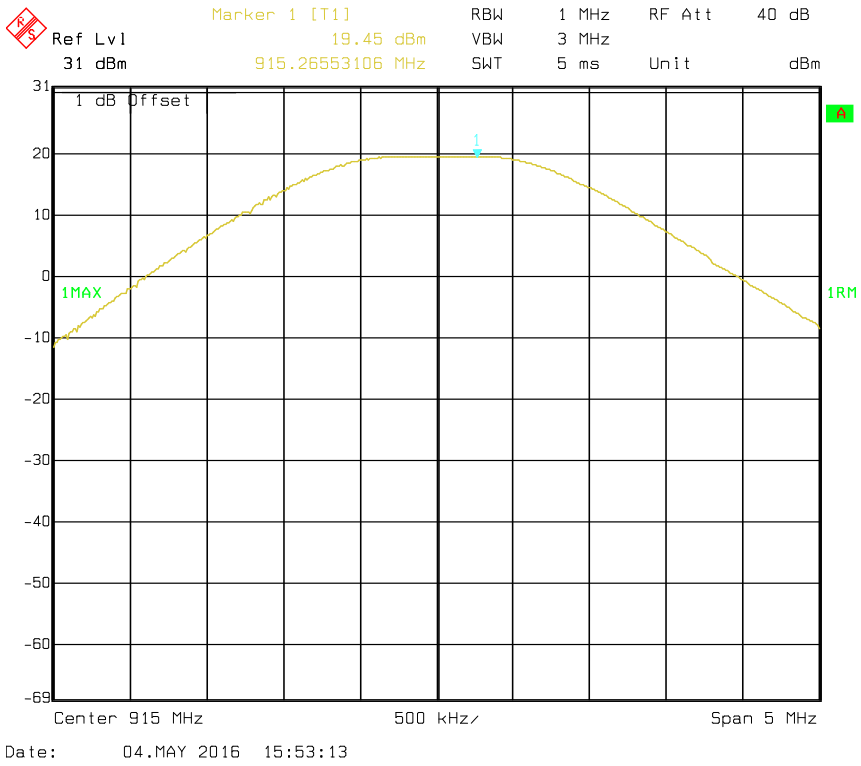
6.2 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2009 and KDB558074v03r03 section 9.2.2
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

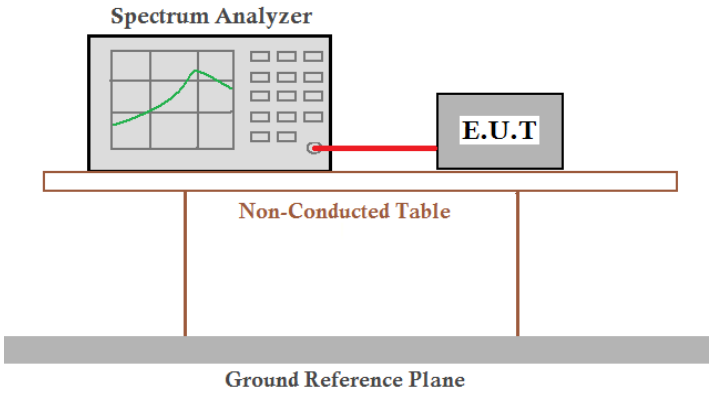
Measurement Data

Test Frequency	Maximum Conducted Output Power (dBm)	Limit(dBm)	Result
915 MHz	19.45	30.00	Pass

Test plot as follows:



6.3 Occupy Bandwidth

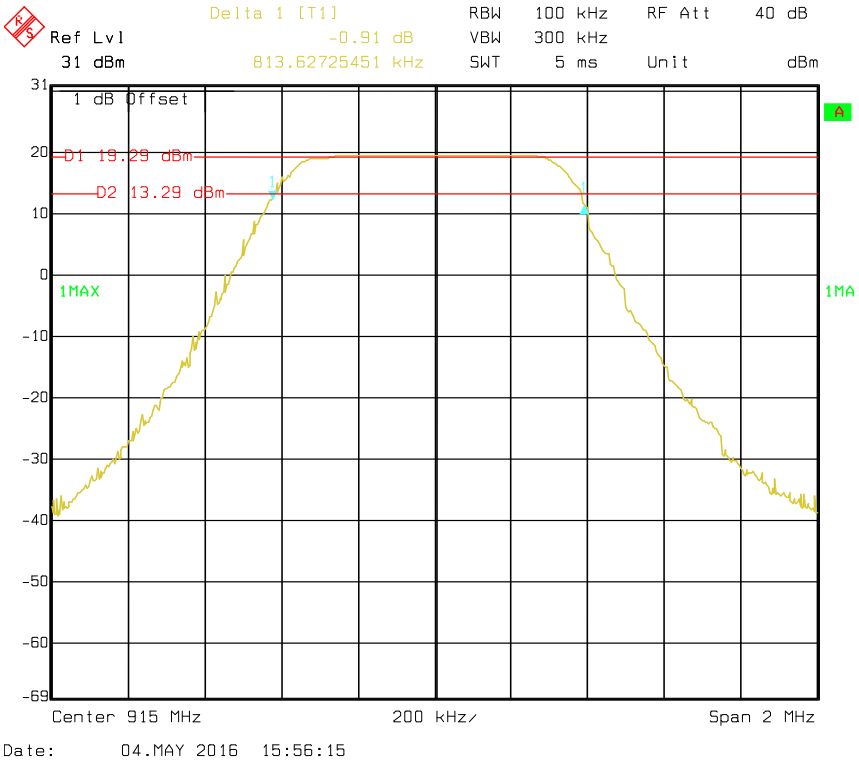
Test Requirement:	FCC Part 15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2009 and KDB558074v03r03 section 8.1
Limit:	>500kHz
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

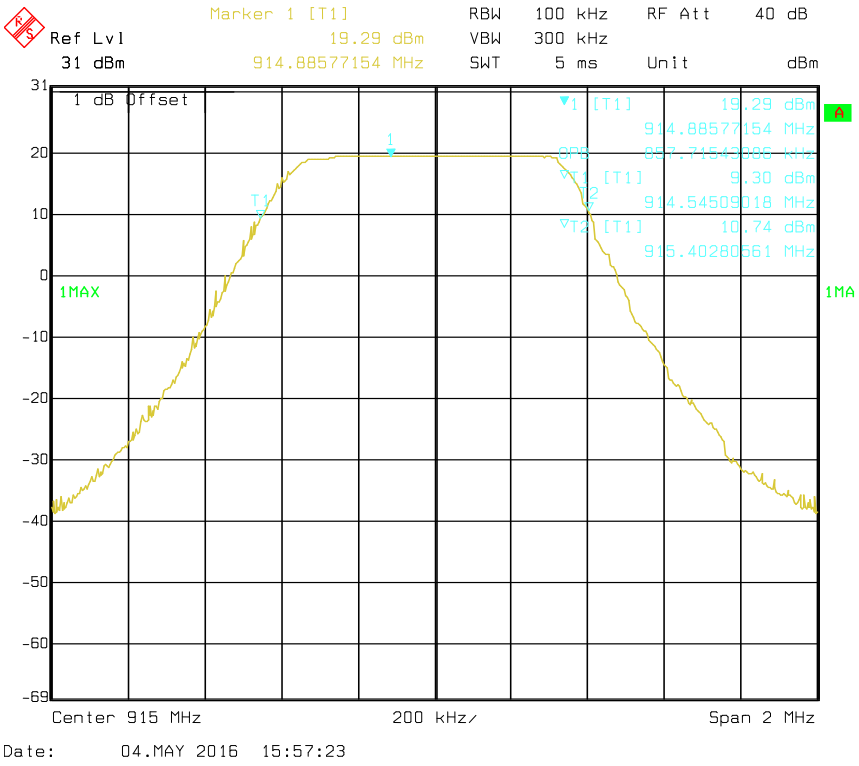
Test Frequency	6dB Emission Bandwidth (MHz)	Limit(kHz)	Result
915 MHz	0.813	>500	Pass
Test Frequency	99% Occupy Bandwidth (MHz)	Limit(kHz)	Result
915 MHz	0.858	N/A	N/A

Test plot as follows:

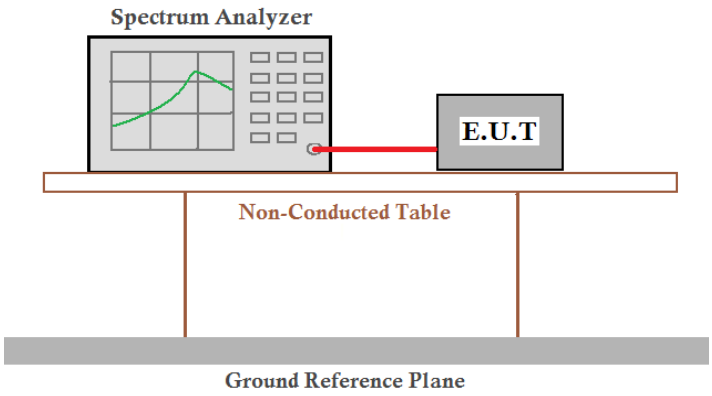
6dB EBW



99% OBW



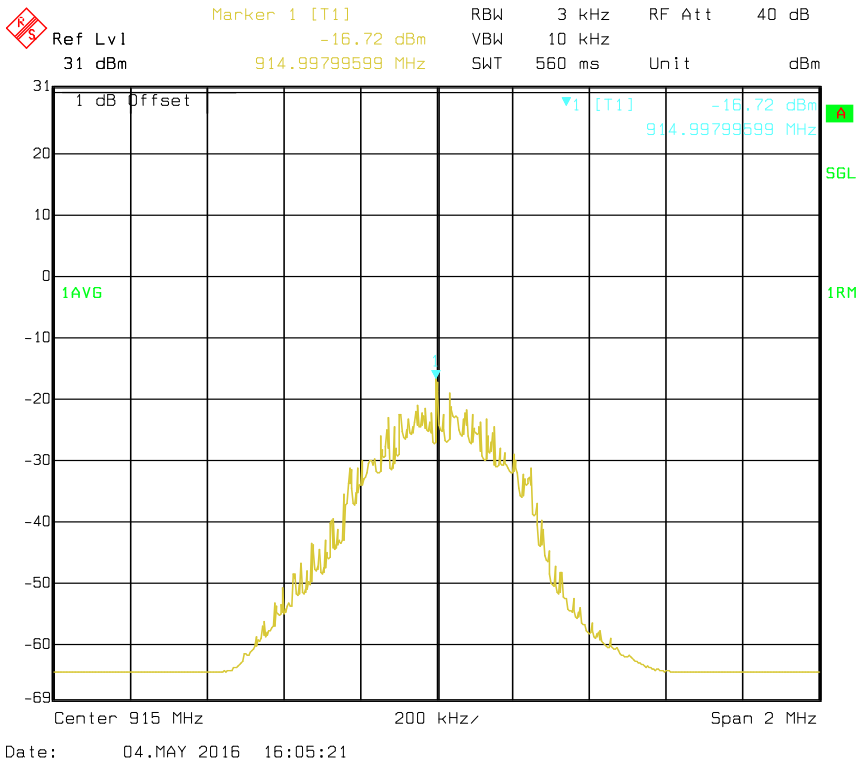
6.4 Power Spectral Density

Test Requirement:	FCC Part 15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2009 and KDB558074v03r03 section 10.3
Limit:	8 dBm
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

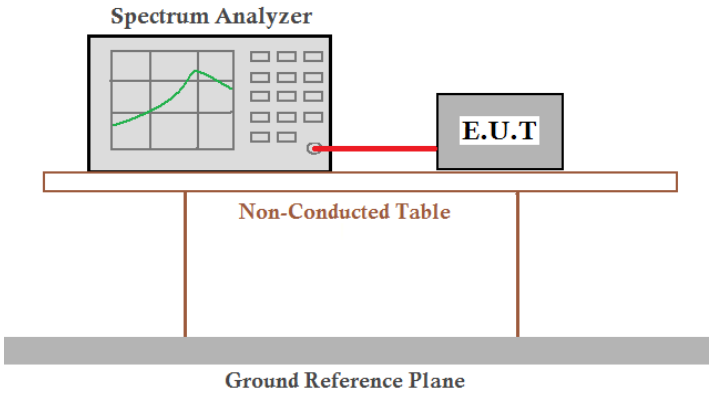
Test Frequency	Power Spectral Density (dBm)	Limit(dBm)	Result
915 MHz	-16.72	8.00	Pass

Test plots as follow:

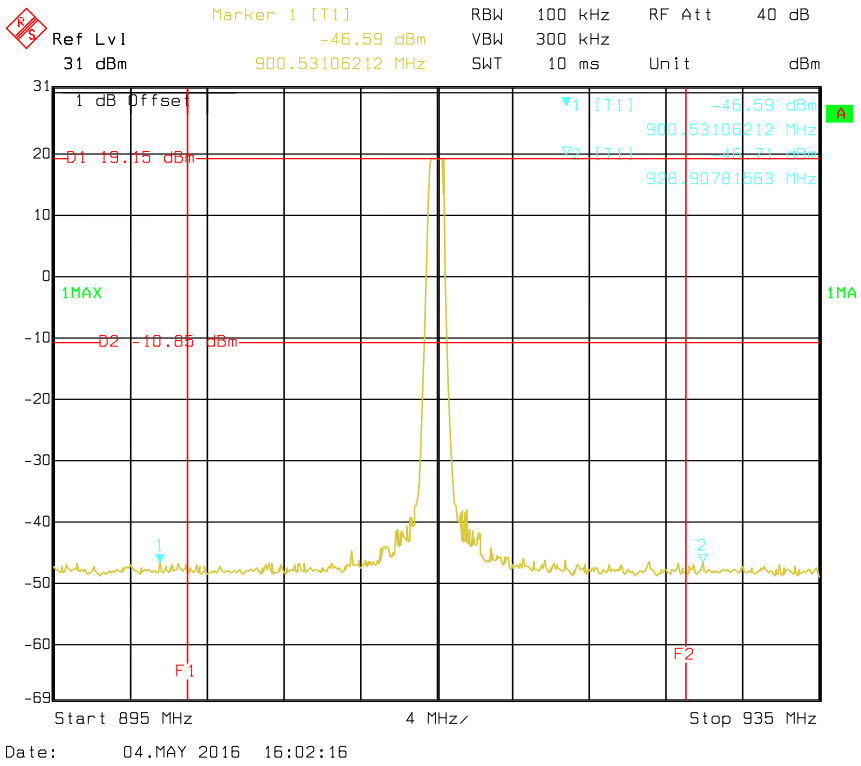


6.5 Band Edge

6.5.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009 and KDB558074v03r03 section 13
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 setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plots as follow:



6.5.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2009 and KDB 558074v03r03 section 12.1
Test Frequency Range:	Restriction band
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Remark
960MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	RMS	1MHz	3MHz	Average Value

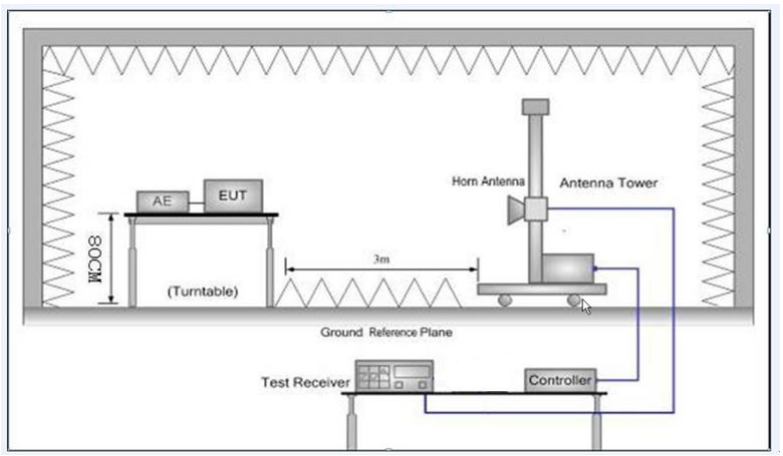
Limit:

Frequency	Limit (dBuV/m @3m)	Remark
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.00	Average Value
	74.00	Peak Value

Test Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test setup:



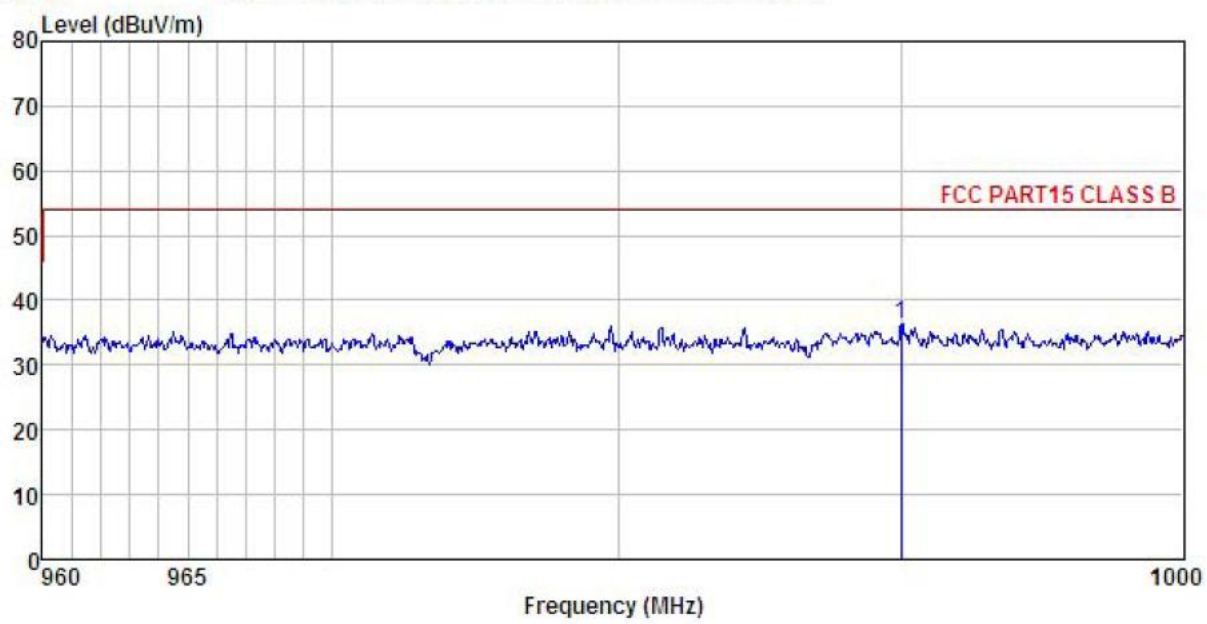
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Remark:

1. 1300 MHz to 1427 MHz is noise floor, so no shows in this report.

Below 1GHz

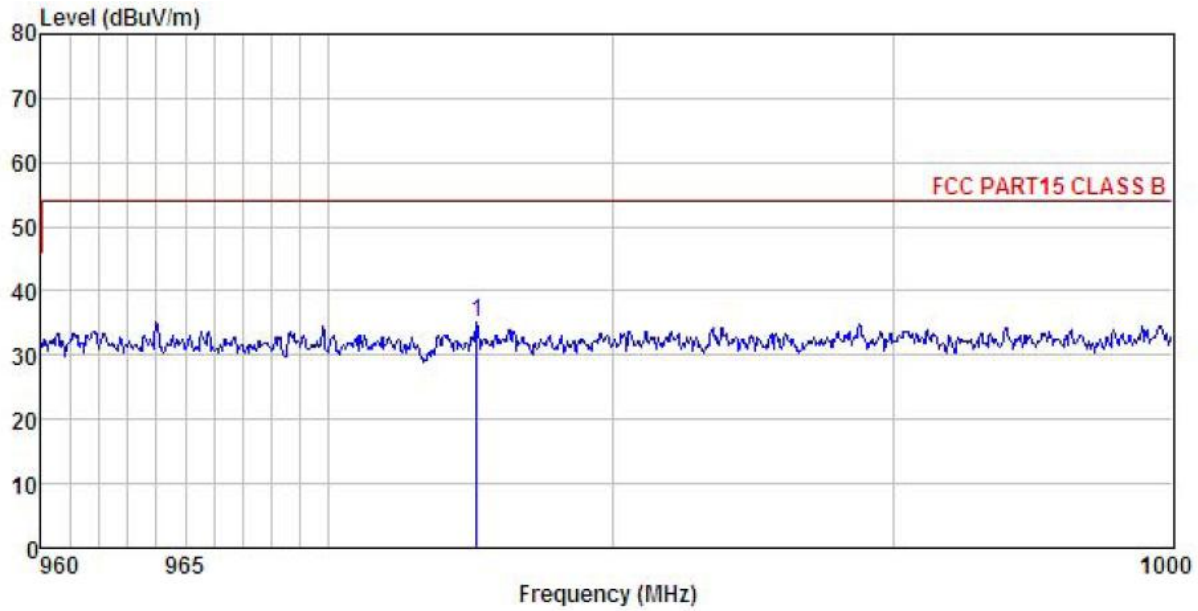
Horizontal:



Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) HORIZONTAL
EUT : CAR ALARM (TWO WAY)
Model : AN2400A
Test mode : TX mode
Power Rating : DC 12V
Environment : Temp:25.5'C Huni:55%
Test Engineer: Carey
Remark :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	989.968	9.18	22.74	4.42	0.00	36.34	54.00	-17.66	QP

Vertical:

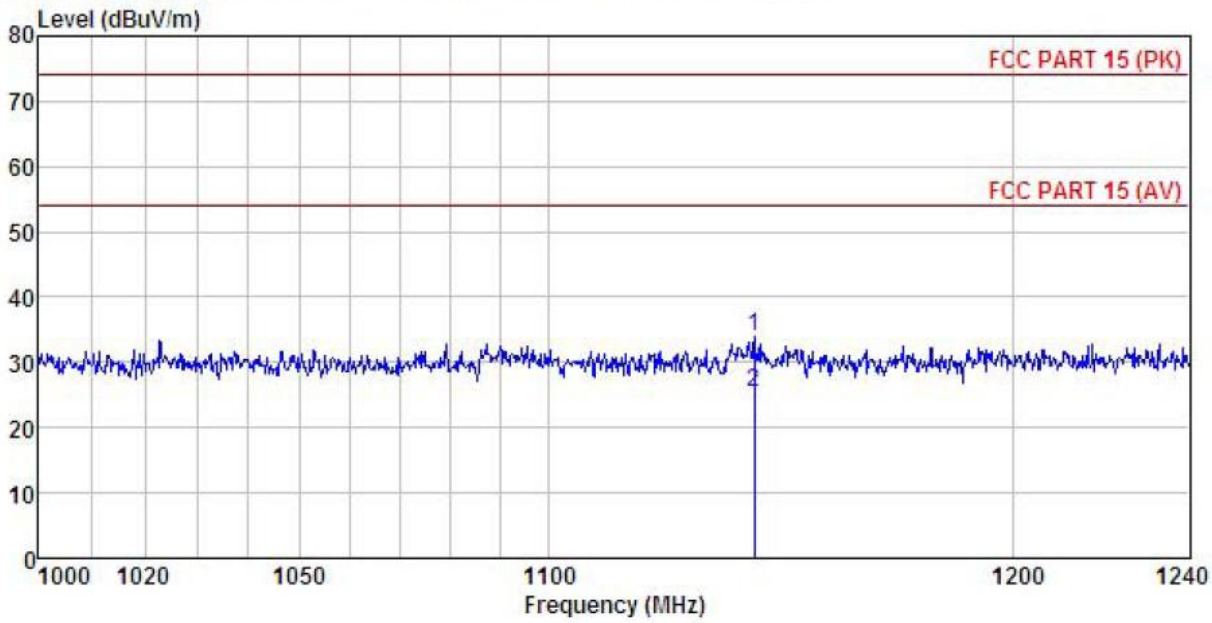


Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) VERTICAL
EUT : CAR ALARM (TWO WAY)
Model : AN2400A
Test mode : TX mode
Power Rating : DC 12V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	975.207	8.36	22.49	4.34	0.00	35.19	54.00	-18.81	QP

Adove 1GHz

Horizontal:

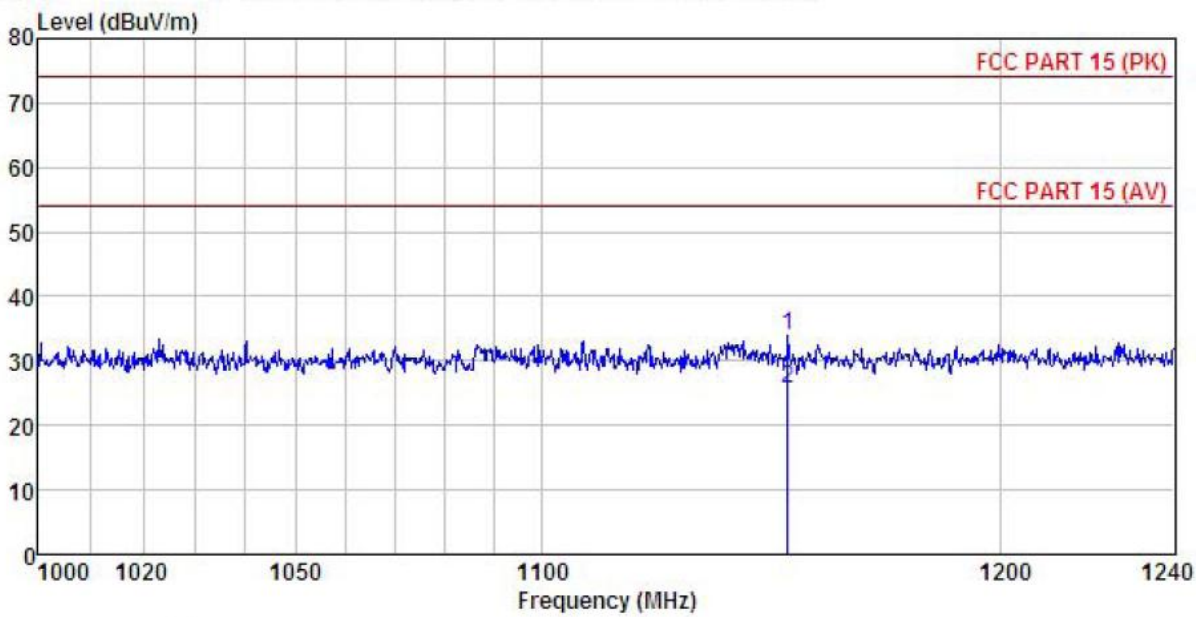


Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18) HORIZONTAL
EUT : CAR ALARM (TWO WAY)
Model : AN2400A
Test mode : TX mode
Power Rating : DC 12V
Environment : Temp:25.5'C Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1143.163	8.63	21.06	4.12	0.00	33.81	74.00	-40.19	Peak
2	1143.163	0.14	21.06	4.12	0.00	25.32	54.00	-28.68	Average

Test channel: Highest

Vertical:

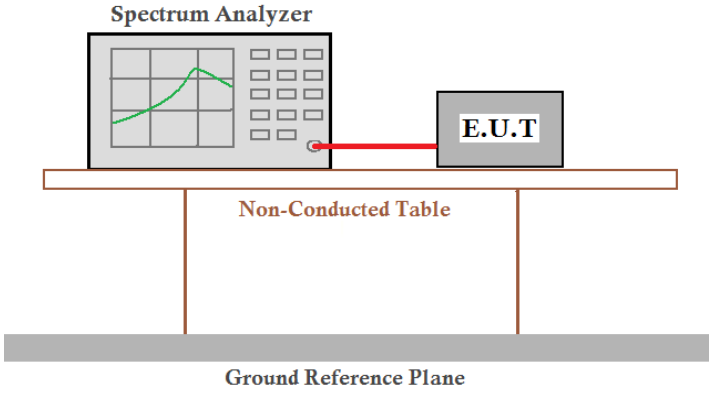


Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18) VERTICAL
EUT : CAR ALARM (TWO WAY)
Model : AN2400A
Test mode : TX mode
Power Rating : DC 12V
Environment : Temp:25.5'C Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1152.546	8.61	21.10	4.14	0.00	33.85	74.00	-40.15	Peak
2	1152.546	0.37	21.10	4.14	0.00	25.61	54.00	-28.39	Average

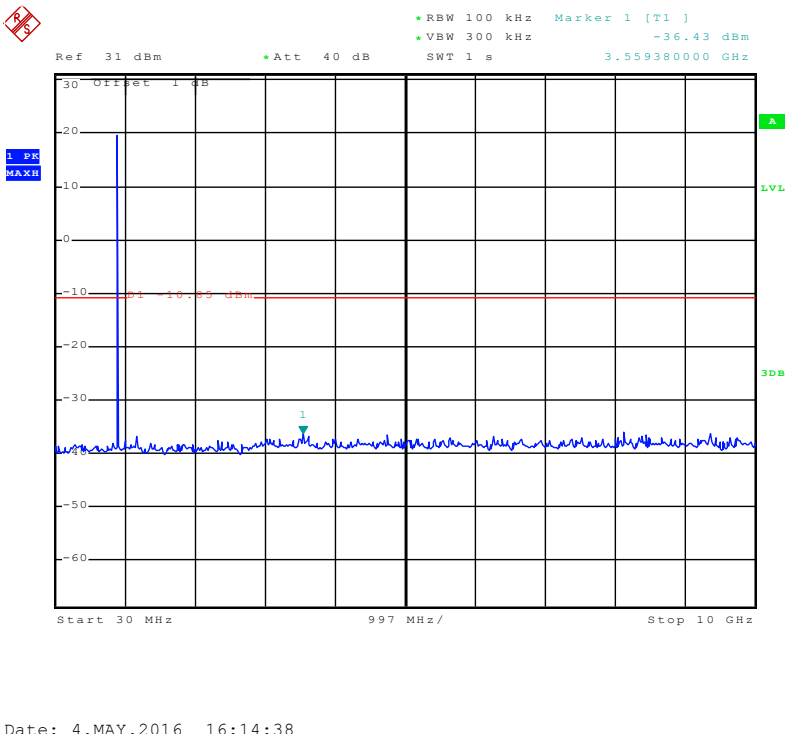
6.6 Spurious Emission

6.6.1 Conducted Emission Method

Test Requirement:	FCC Part 15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009 and KDB558074 section 11
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 setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plot as follows:

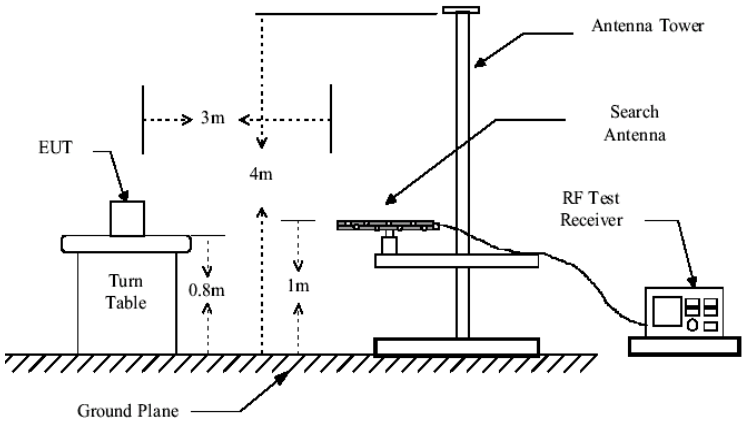
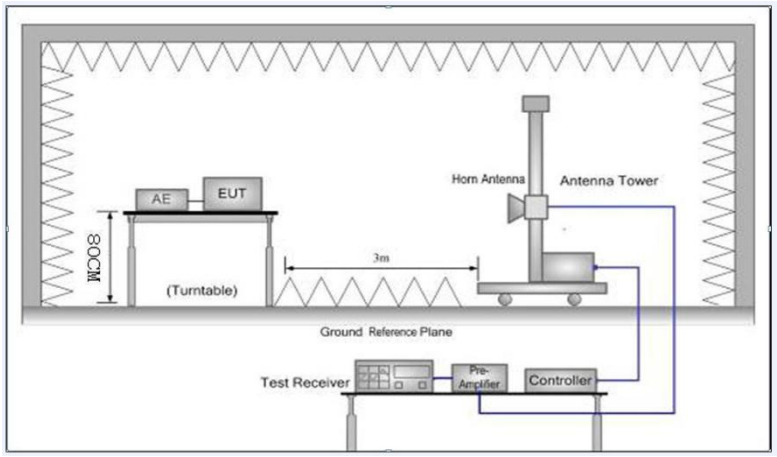
Lowest channel



30MHz~10GHz

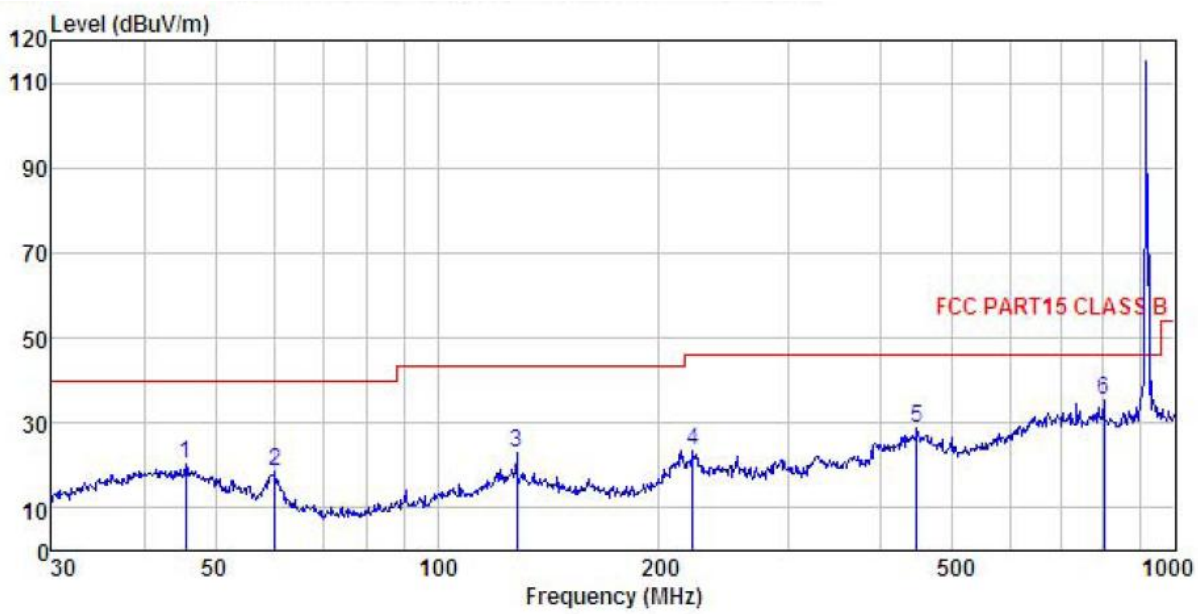
6.6.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part 15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2009</td></tr>
<tr><td>Test Frequency Range:</td><td>9KHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure:</td><td>
1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
</td></tr>
</table>

Test setup:	Below 1GHz  Above 1GHz 
Test Uncertainty:	±4.88 dB
Test Instruments:	Refer to section 5.7 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30MHz is too low, so only shows the data of above 30MHz in this report.

Below 1GHz

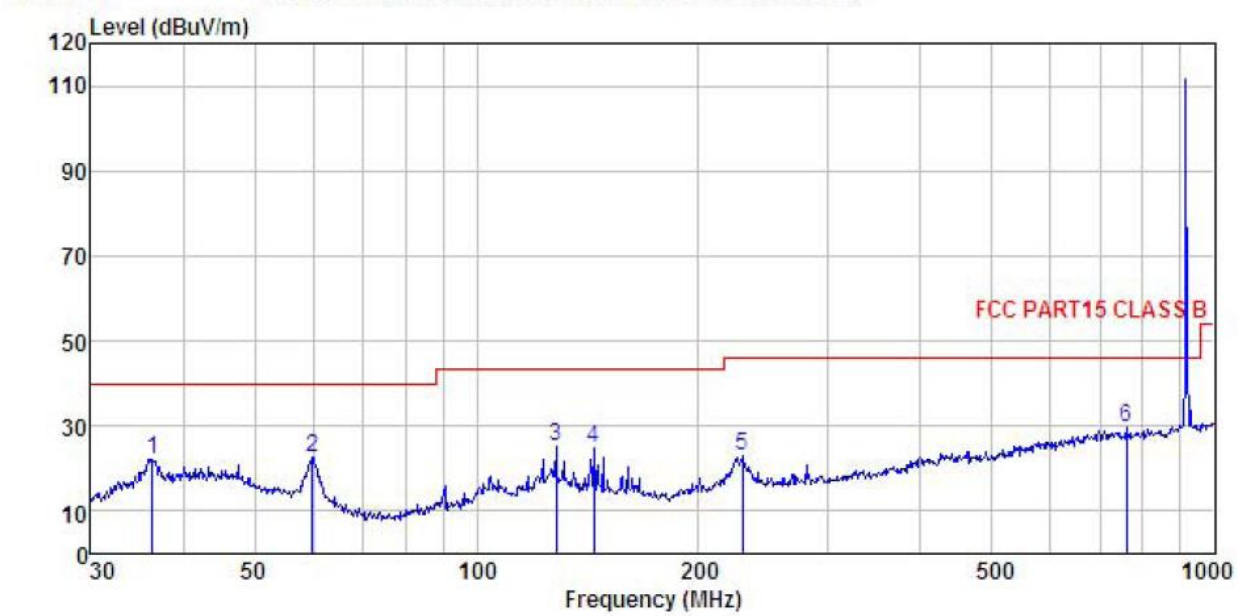
Horizontal:



Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) HORIZONTAL
EUT : CAR ALARM (TWO WAY)
Model : AN2400A
Test mode : TX mode
Power Rating : DC 12V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	45.535	31.65	17.28	1.29	29.86	20.36	40.00	-19.64	QP
2	60.280	36.78	10.09	1.38	29.77	18.48	40.00	-21.52	QP
3	128.113	37.70	12.21	2.26	29.34	22.83	43.50	-20.67	QP
4	222.170	37.77	11.52	2.84	28.69	23.44	46.00	-22.56	QP
5	446.414	38.09	16.18	3.19	28.86	28.60	46.00	-17.40	QP
6	801.786	38.54	20.60	4.34	28.19	35.29	46.00	-10.71	QP

Vertical:



Site : 3m chamber
Condition : FCC PART15 CLASS B 3m VULB9163(30M3G) VERTICAL
EUT : CAR ALARM (TWO WAY)
Model : AN2400A
Test mode : TX mode
Power Rating : DC 12V
Environment : Temp:25.5'C Huni:55%
Test Engineer: Carey
Remark :

	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	36.381	35.67	15.45	1.11	29.94	22.29	40.00	-17.71	QP
2	59.859	40.55	10.32	1.38	29.77	22.48	40.00	-17.52	QP
3	128.113	40.15	12.21	2.26	29.34	25.28	43.50	-18.22	QP
4	144.335	40.30	11.27	2.45	29.25	24.77	43.50	-18.73	QP
5	229.293	37.11	11.60	2.83	28.65	22.89	46.00	-23.11	QP
6	760.704	33.33	20.44	4.36	28.42	29.71	46.00	-16.29	QP

Above 1GHz

Peak value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1830.00	56.68	25.44	5.46	40.96	46.62	74.00	-27.38	Vertical
2745.00	47.46	28.26	7.36	40.49	42.59	74.00	-31.41	Vertical
3660.00	37.71	29.23	9.06	40.41	35.59	74.00	-38.41	Vertical
4575.00	35.36	30.98	10.33	40.55	36.12	74.00	-37.88	Vertical
5490.00	42.24	32.02	11.37	40.25	45.38	74.00	-28.62	Vertical
6405.00	44.34	34.01	11.95	41.12	49.18	74.00	-24.82	Vertical
1830.00	50.06	25.44	5.46	40.96	40.00	74.00	-34.00	Horizontal
2745.00	51.23	28.26	7.36	40.49	46.36	74.00	-27.64	Horizontal
3660.00	36.55	29.23	9.06	40.41	34.43	74.00	-39.57	Horizontal
4575.00	32.99	30.98	10.33	40.55	33.75	74.00	-40.25	Horizontal
5490.00	35.96	32.02	11.37	40.25	39.10	74.00	-34.90	Horizontal
6405.00	36.87	34.01	11.95	41.12	41.71	74.00	-32.29	Horizontal
Average value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1830.00	48.65	25.44	5.46	40.96	38.59	54.00	-15.41	Vertical
2745.00	38.64	28.26	7.36	40.49	33.77	54.00	-20.23	Vertical
3660.00	28.96	29.23	9.06	40.41	26.84	54.00	-27.16	Vertical
4575.00	28.05	30.98	10.33	40.55	28.81	54.00	-25.19	Vertical
5490.00	36.16	32.02	11.37	40.25	39.30	54.00	-14.70	Vertical
6405.00	35.66	34.01	11.95	41.12	40.50	54.00	-13.50	Vertical
1830.00	42.99	25.44	5.46	40.96	32.93	54.00	-21.07	Horizontal
2745.00	43.33	28.26	7.36	40.49	38.46	54.00	-15.54	Horizontal
3660.00	28.44	29.23	9.06	40.41	26.32	54.00	-27.68	Horizontal
4575.00	24.27	30.98	10.33	40.55	25.03	54.00	-28.97	Horizontal
5490.00	27.58	32.02	11.37	40.25	30.72	54.00	-23.28	Horizontal
6405.00	28.92	34.01	11.95	41.12	33.76	54.00	-20.24	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*