

# FCC Part 15C Measurement and Test Report

For

**Beijing iLeja Tech. Co. Ltd.**

**Room 3558, Building 3, Courtyard 29, DongBeiWang South Road, Haidian**

**District, Beijing**

**FCC ID: 2AKVNLJ-C2**

<b>FCC Rule(s):</b>	<u>FCC Part 15.239</u>
<b>Product Description:</b>	<u>Intelligent Car Terminal</u>
<b>Tested Model:</b>	<u>LJ-C2</u>
<b>Report No.:</b>	<u>STR16108134I-6</u>
<b>Tested Date:</b>	<u>2016-10-26 to 2017-02-28</u>
<b>Issued Date:</b>	<u>2017-02-28</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Beijing iLeja Tech. Co. Ltd.  
Address of applicant: Room 3558, Building 3, Courtyard 29, DongBeiWang South Road, Haidian District, Beijing

Manufacturer: Beijing iLeja Tech. Co. Ltd.  
Address of manufacturer: Room 3558, Building 3, Courtyard 29, DongBeiWang South Road, Haidian District, Beijing

General Description of EUT	
Product Name:	Intelligent Car Terminal
Trade Name:	carrobot
Model No.:	LJ-C2
Adding Model(s):	/
Rated Voltage:	DC 12V
Power Adapter Model:	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	88.1-107.9 MHz
Max. Field Strength:	51.50dBuV/m
Modulation:	FM
Quantity of Channels:	199
Channel Separation:	100kHz
Antenna Type:	External antenna
Lowest Internal Frequency of EUT:	26MHz

## 1.2 Test Standards

The following report of is prepared on behalf of the Beijing iLeja Tech. Co. Ltd. in accordance with FCC Part 15, Subpart C, and section 15.239, 15.203 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.239, 15.203 and 15.209 of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

## 1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

## 1.4 Test Facility

### **FCC – Registration No.: 934118**

Shenzhen SEM.Test Technology 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 our files and the Registration is 934118.

### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

### **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2<sup>nd</sup> Road, Bao'an District, Shenzhen, P.R.C (518101).

## 1.5 EUT Setup and Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low Channel	88.1MHz
TM2	Middle Channel	98.1MHz
TM3	High Channel	107.9MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC cable	2.44	Shielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

## 1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

## 1.6 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2016-06-04	2017-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2016-06-04	2017-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2016-06-04	2017-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2016-06-04	2017-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2016-06-04	2017-06-03
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2016-06-04	2017-06-03

## 2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	N/A
§ 15.209	Radiated Emissions	Compliant
§15.239(c)	Out of band emission	Compliant
§15.239(a)	Emission Bandwidth	Compliant
§15.239(b)	Radiated Emissions	Compliant

### **3. ANTENNA REQUIREMENT**

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#### **3.1 Standard Applicable**

According to FCC Part 15.203, 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 shall be considered sufficient to comply with the provisions of this section.

#### **3.2 Test Result**

This product has an external antenna with a dedicated connector; fulfill the requirement of this section.

## 4. RADIATED EMISSION

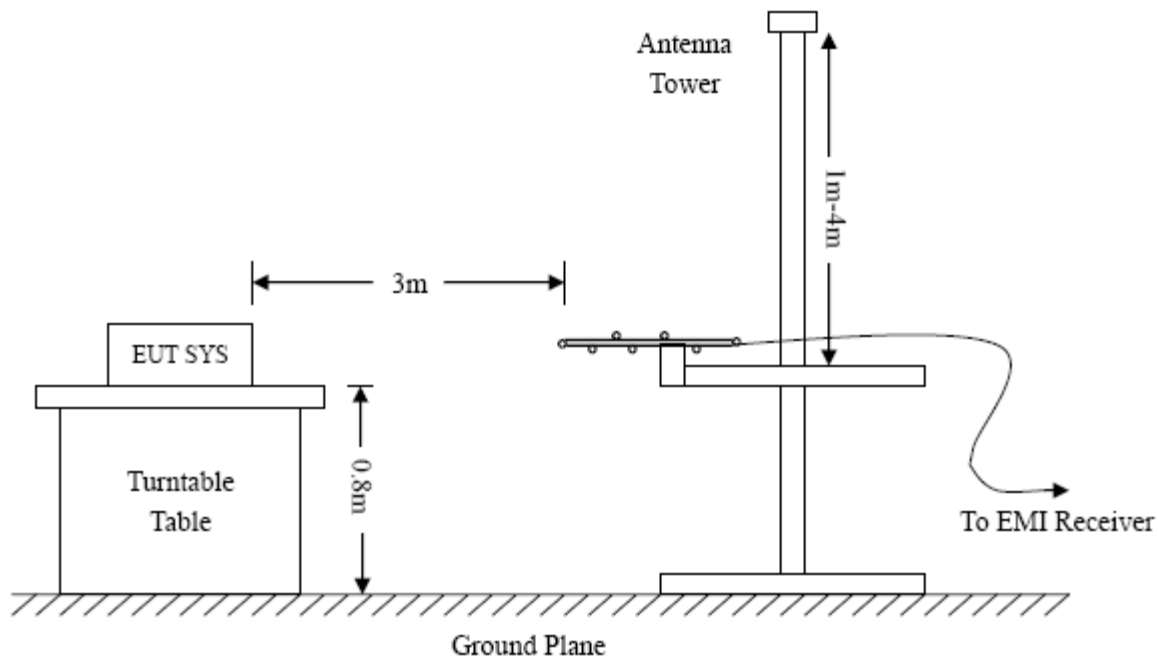
### 4.1 Standard Applicable

According to §15.239(b), The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

According to §15.239(c), The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in §15.209.

### 4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.239(b) and FCC Part 15.209 Limit.





### 4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Loss} + \text{Cab. Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB $\mu$ V means the emission is 6dB $\mu$ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.239 Limit}$$

### 4.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	50%
ATM Pressure:	1011 mbar

### 4.5 Summary of Test Results/Plots

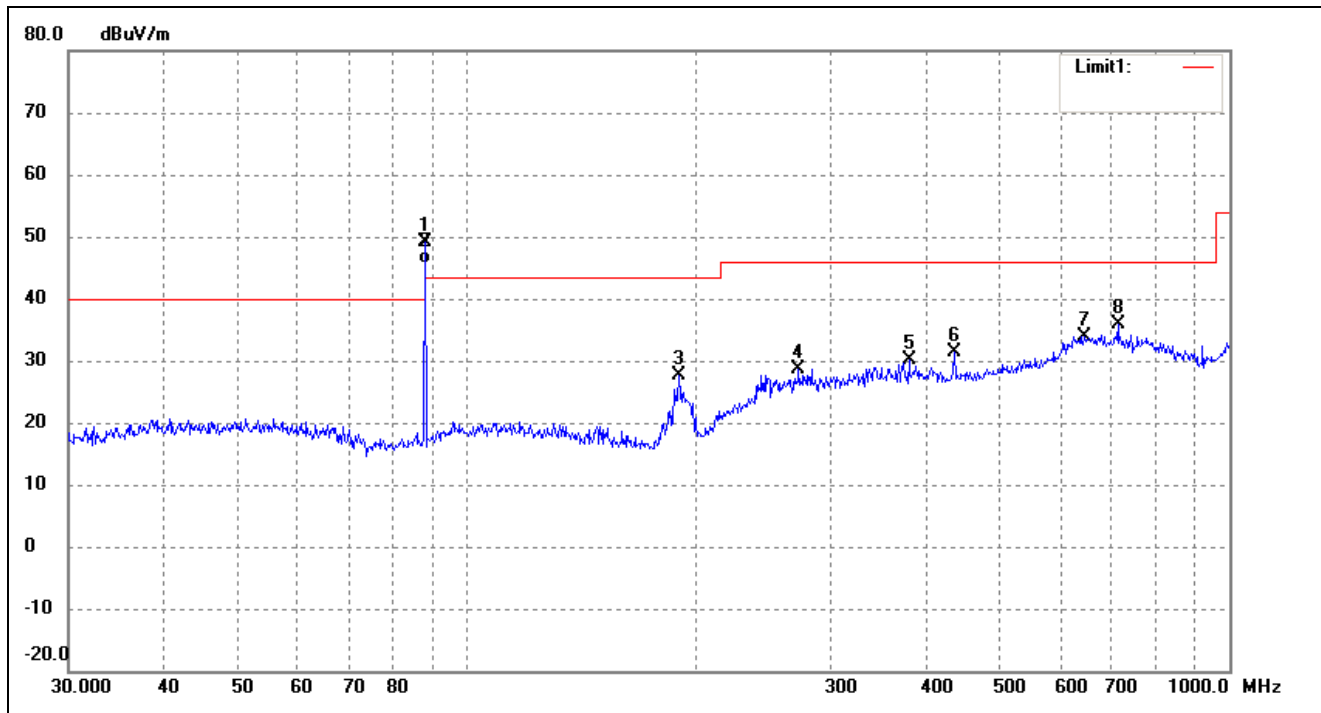
According to the data below, the FCC Part 15.209 and 15.239 standards, and had the worst margin of:

**-10.3dB at 714.1734 in the Horizontal polarization, peak, Low Channel, 9 kHz to 1 GHz, 3Meters**

***Note:** this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

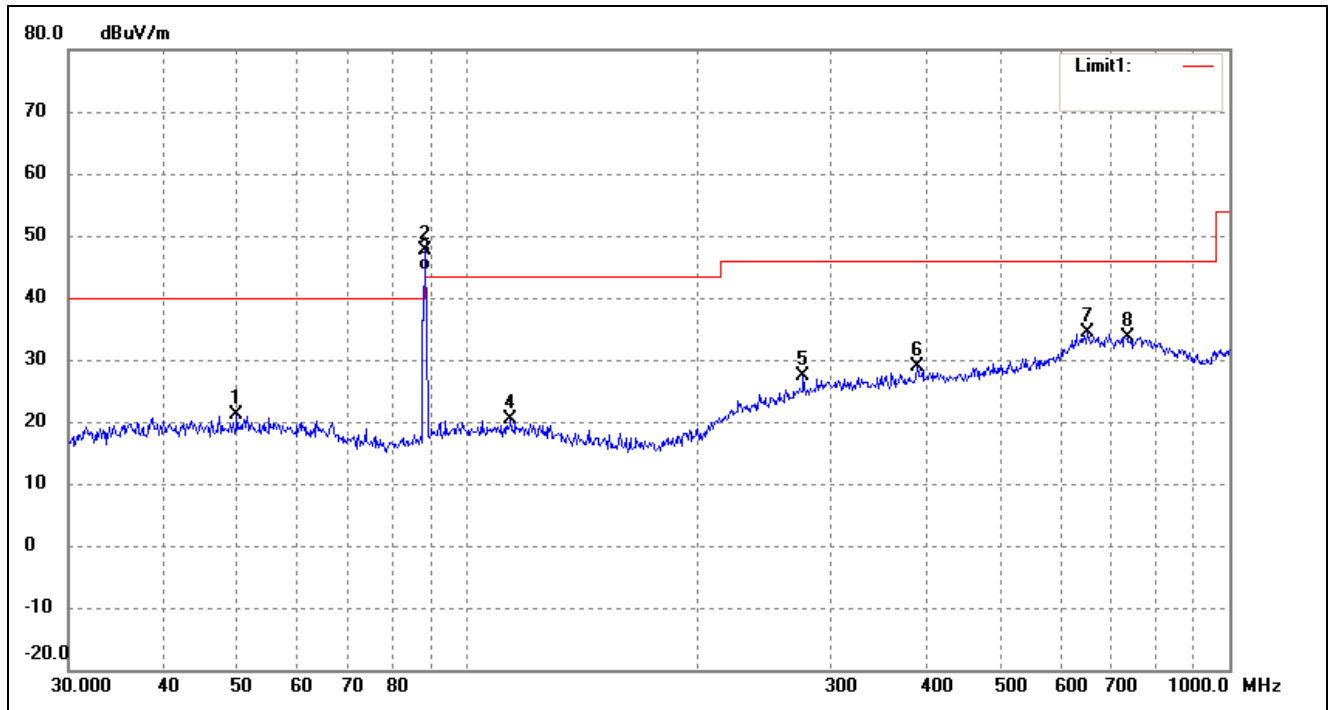
### Plot of Radiated Emissions Test Data

EUT: *Intelligent Car Terminal*  
 Tested Model: *LJ-C2*  
 Operating Condition: *Transmitting Low Channel (88.1MHz)*  
 Comment: *DC 12V*  
 Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	88.1000	46.12	3.08	49.20	68.00	-18.80	360	100	peak
2	88.1000	42.64	3.08	45.72	48.00	-2.28	360	100	AVG
3	189.7385	24.87	2.88	27.75	43.50	-15.75	360	100	peak
4	272.2776	18.12	10.58	28.70	46.00	-17.30	360	100	peak
5	379.9141	18.23	11.79	30.02	46.00	-15.98	360	100	peak
6	435.5898	19.04	12.35	31.39	46.00	-14.61	360	100	peak
7	645.1195	16.05	17.94	33.99	46.00	-12.01	360	100	peak
8	714.1734	18.34	17.63	35.97	46.00	-10.03	360	100	peak

Test Specification: Vertical

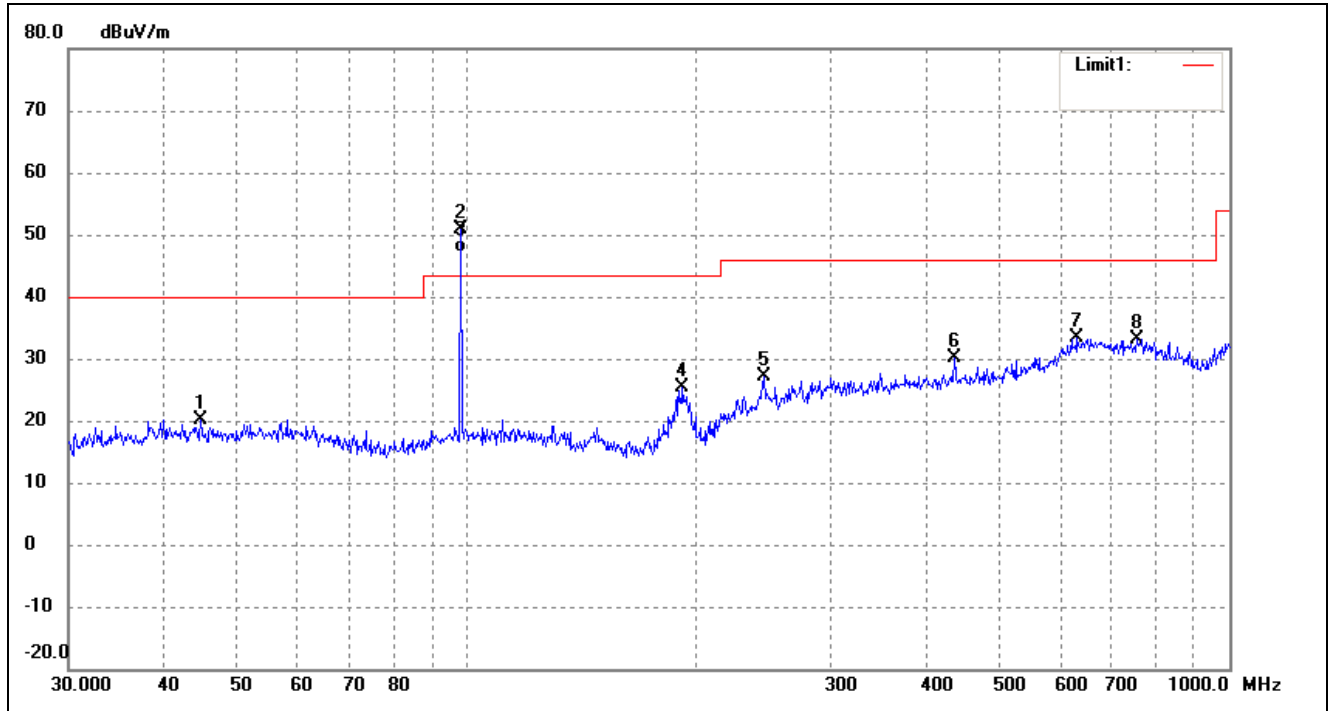


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	49.8814	16.07	4.98	21.05	40.00	-18.95	360	100	peak
2	88.1000	44.66	3.06	47.72	68.00	-20.28	360	100	peak
3	88.1000	41.27	3.08	44.35	48.00	-3.65	360	100	AVG
4	114.1138	15.58	4.85	20.43	43.50	-23.07	360	100	peak
5	276.1235	16.52	10.86	27.38	46.00	-18.62	360	100	peak
6	389.3549	16.61	12.20	28.81	46.00	-17.19	360	100	peak
7	651.9417	16.53	17.77	34.30	46.00	-11.70	360	100	peak
8	734.4913	14.99	18.69	33.68	46.00	-12.32	360	100	peak

Operating Condition: Transmitting Middle Channel (98.1MHz)

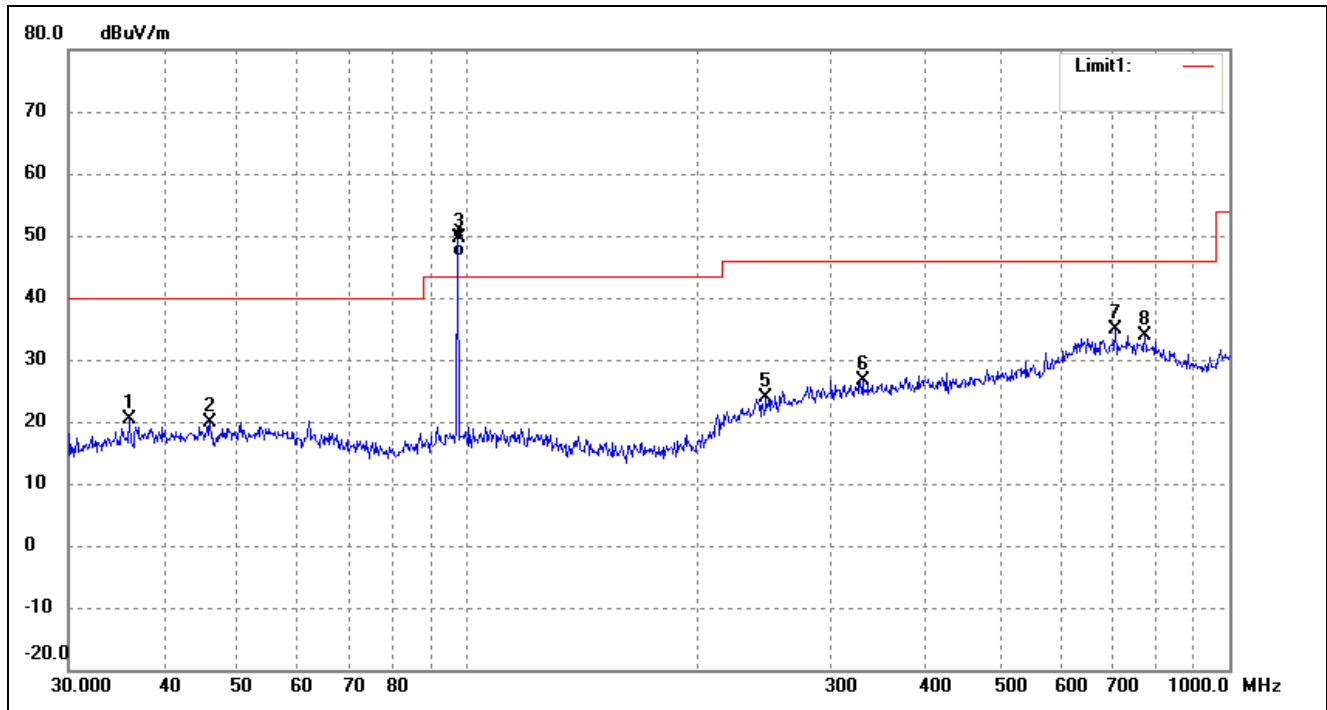
Comment: DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	44.7433	15.16	4.95	20.11	40.00	-19.89	360	100	peak
2	98.1000	46.20	4.64	50.84	68.00	-17.16	360	100	peak
3	98.1000	42.55	4.64	47.19	48.00	-0.81	360	100	AVG
4	191.7450	22.38	2.97	25.35	43.50	-18.15	360	100	peak
5	245.0900	17.94	9.13	27.07	46.00	-18.93	360	100	peak
6	435.5898	17.88	12.35	30.23	46.00	-15.77	360	100	peak
7	631.6884	15.48	17.78	33.26	46.00	-12.74	360	100	peak
8	755.3873	14.88	18.35	33.23	46.00	-12.77	360	100	peak

Test Specification: Vertical

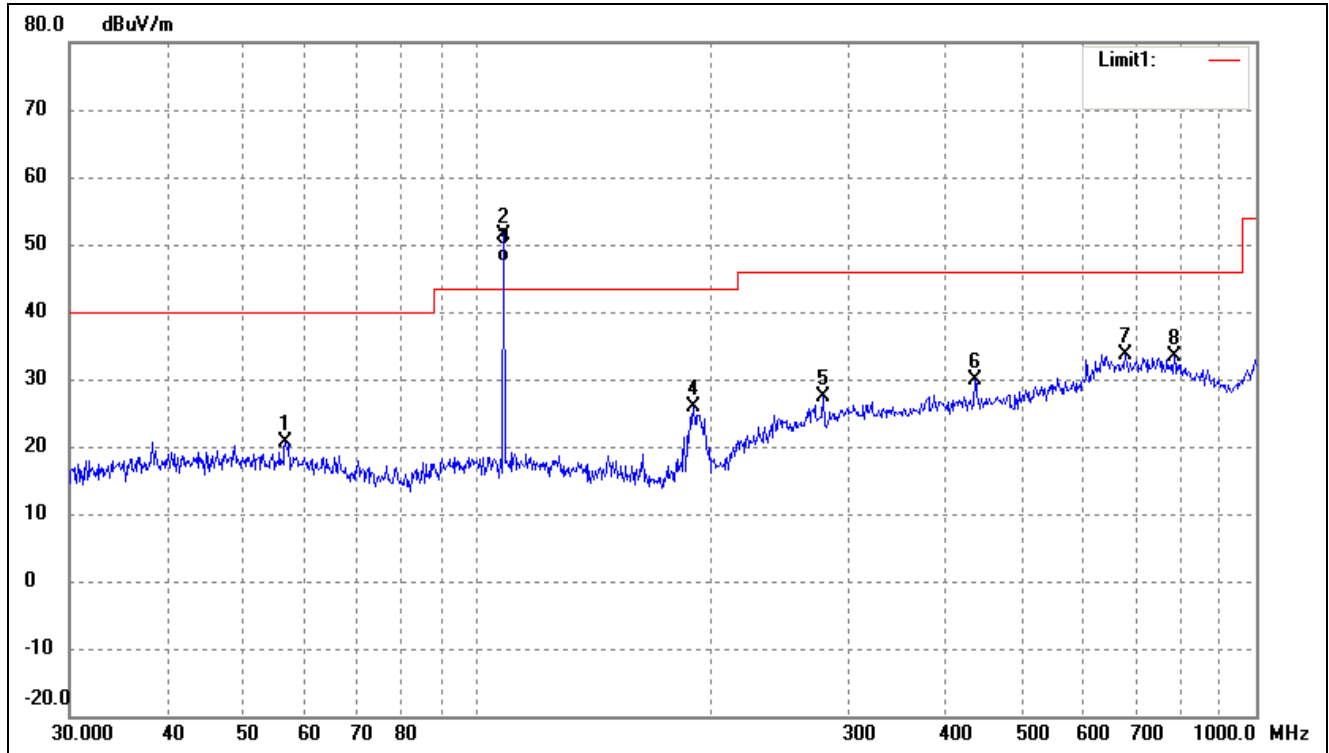


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	36.0007	15.94	4.33	20.27	40.00	-19.73	360	100	peak
2	46.0164	14.88	4.95	19.83	40.00	-20.17	360	100	peak
3	98.1000	44.95	4.64	49.59	68.00	-18.41	360	100	peak
4	98.1000	42.03	4.64	46.67	48.00	-1.33	360	100	AVG
5	246.8149	14.78	9.18	23.96	46.00	-22.04	360	100	peak
6	330.1949	15.08	11.64	26.72	46.00	-19.28	360	100	peak
7	709.1823	17.31	17.48	34.79	46.00	-11.21	360	100	peak
8	774.1584	16.60	17.19	33.79	46.00	-12.21	360	100	peak

Operating Condition: Transmitting High Channel (107.9MHz)

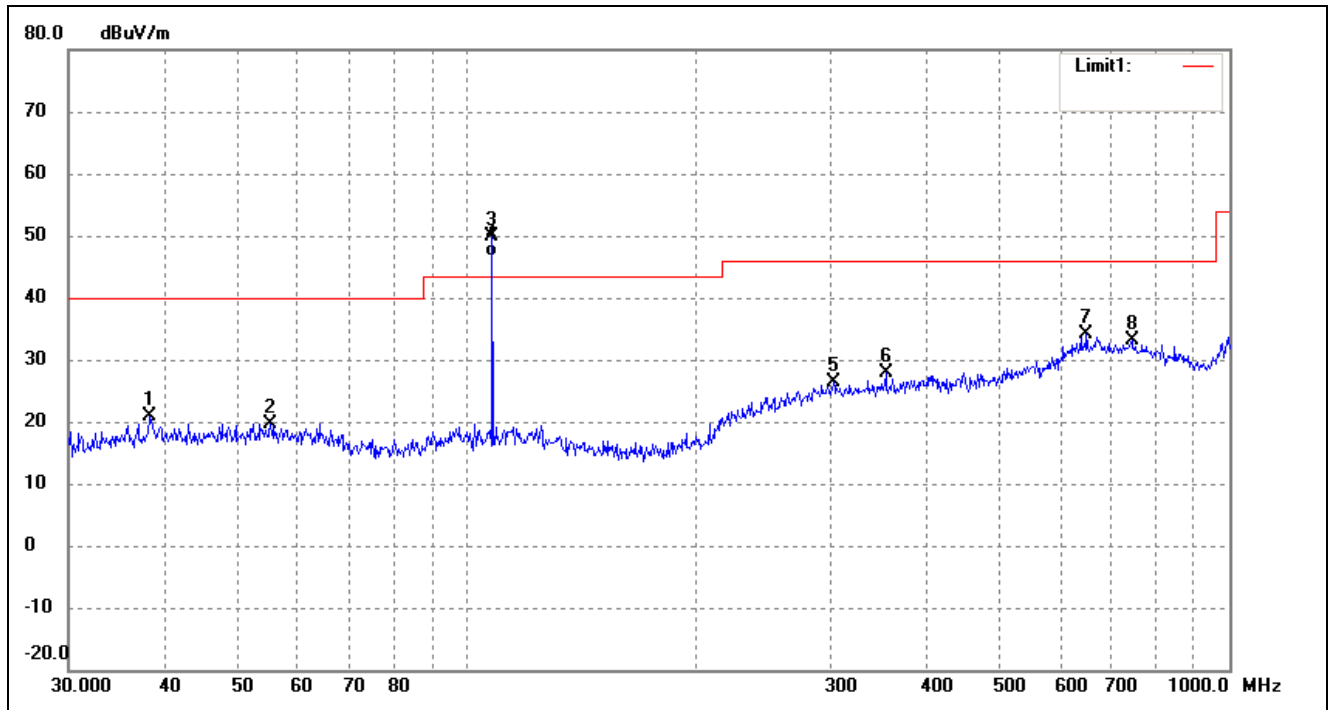
Comment: DC 12V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	56.7917	15.54	5.00	20.54	40.00	-19.46	360	100	peak
2	107.9000	46.62	4.88	51.50	68.00	-16.50	360	100	peak
3	107.9000	42.39	4.88	47.27	48.00	-0.73	360	100	AVG
4	189.7385	23.03	2.88	25.91	43.50	-17.59	360	100	peak
5	278.0668	16.32	11.00	27.32	46.00	-18.68	360	100	peak
6	435.5898	17.59	12.35	29.94	46.00	-16.06	360	100	peak
7	679.9600	14.88	18.68	33.56	46.00	-12.44	360	100	peak
8	785.0935	16.80	16.65	33.45	46.00	-12.55	360	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	38.3462	16.25	4.68	20.93	40.00	-19.07	360	100	peak
2	55.2207	14.64	5.02	19.66	40.00	-20.34	360	100	peak
3	107.9000	44.93	4.88	49.81	68.00	-18.19	360	100	peak
4	107.9000	41.87	4.88	46.75	48.00	-1.25	360	100	AVG
5	302.4812	14.52	11.95	26.47	46.00	-19.53	360	100	peak
6	354.1831	16.08	11.76	27.84	46.00	-18.16	360	100	peak
7	649.6597	16.34	17.84	34.18	46.00	-11.82	360	100	peak
8	744.8661	14.39	18.81	33.20	46.00	-12.80	360	100	peak

The measurements greater than 20dB below the limit from 9kHz to 30MHz.

## 5. EMISSION BANDWIDTH

### 5.1 Standard Applicable

According to FCC 15.239(a), Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88–108 MHz.

### 5.2 Test Procedure

According to ANSI C63.10-2013 section 8.7, the method for occupied bandwidth measurements of intentional radiators operating in the band 88 MHz to 108 MHz as follows.

- a) For the purposes of occupied bandwidth measurements, the input signal shall be a 2.5 kHz tone. The level of the tone shall be 16 dB higher than that required to produce a frequency deviation of 75 kHz, or 50% of the manufacturer's rated deviation, whichever is less.
- b) Alternatively, in the event that a 16 dB increase cannot be achieved, the level of the tone shall be set to the manufacturer's maximum rated input to the modulator.
- c) For FM modulators where only digital inputs are used, the manufacturer's maximum rated input is defined as the maximum digital input, which is 0 dB. The input shall be injected such that any filtering, emphasis, or other gain enhancements or reductions in front of the modulator are exercised in the same way that they will be when the device is operated by an end user.
- d) For all measurements, the EUT settings that can be controlled by the end user, and that can affect the FM modulated signal, shall be adjusted to their maximum.
- e) In addition to the graphical representations of the occupied bandwidth measurement results, the manufacturer's maximum rated input to the modulator shall be included in the test report.
- f) The occupied bandwidth shall be recorded as the 20 dB bandwidth and tested at the low, middle, and high channels, and it shall be wholly contained in the band 88 MHz to 108 MHz.

### 5.3 Environmental Conditions

Temperature:	21° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

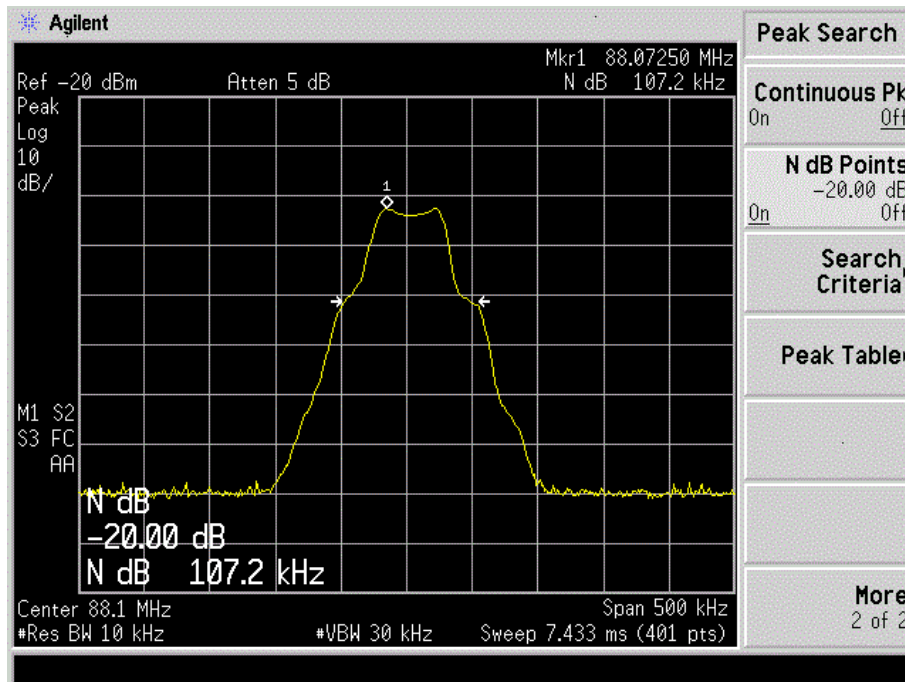
### 5.4 Summary of Test Results/Plots

Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
88.1	107.2	200	Pass
98.1	107.2	200	Pass
107.9	106	200	Pass

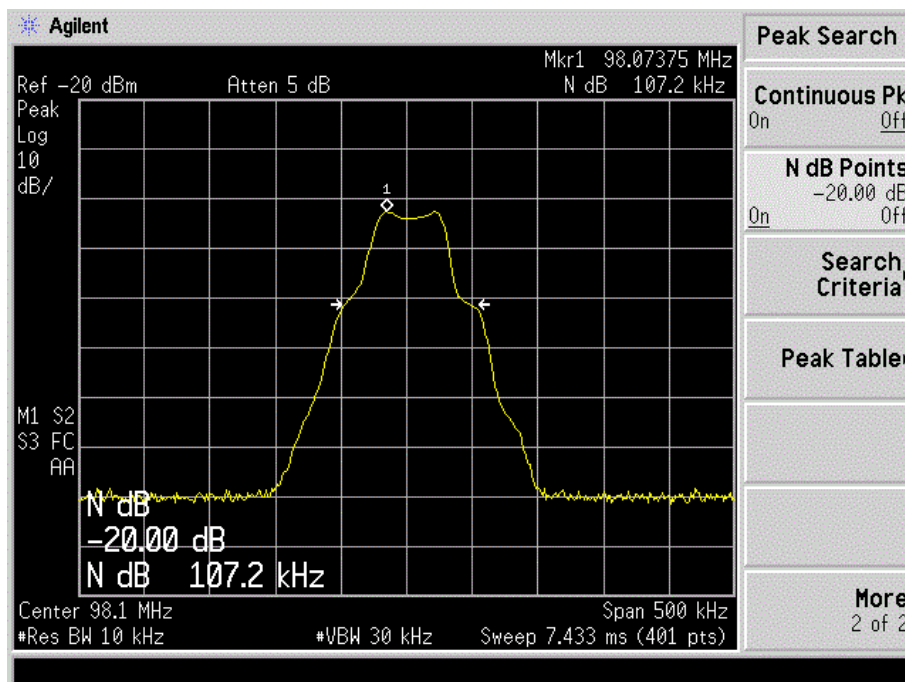


Refer to the attached plots.

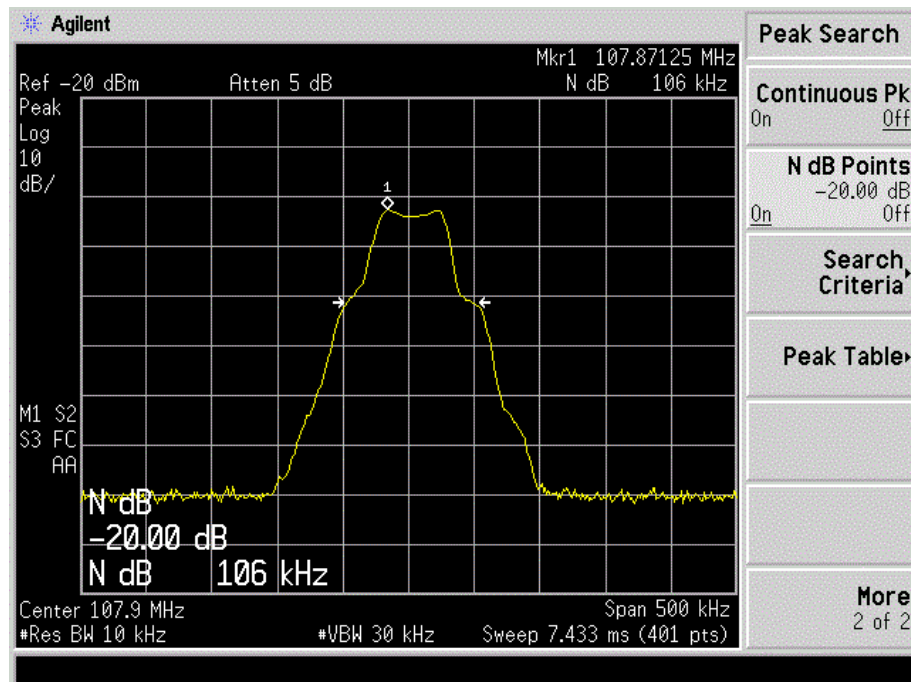
Low Channel



Middle Channel



# High Channel



## 6. OUT OF BAND EMISSIONS

### 6.1 Standard Applicable

According to §15.239(c), The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in §15.209.

### 6.2 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 88MHz to 108MHz, than mark the higher-level emission for comparing with the FCC rules.

### 6.3 Environmental Conditions

Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1012 mbar

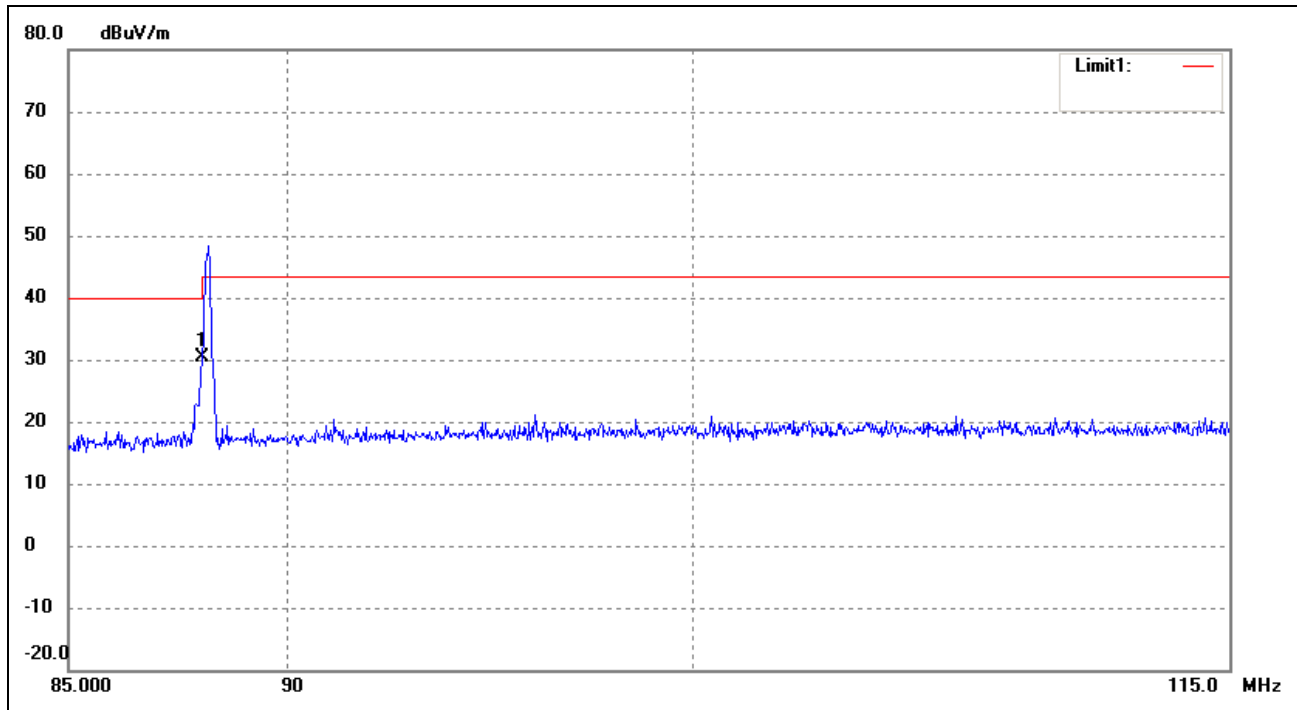
### 6.4 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBuV / dBc	
Lowest	88	<40 dBuV	Pass
Highest	108	<43.5 dBuV	Pass

The edge emissions are below the FCC Part 15.209 Limits requirements.

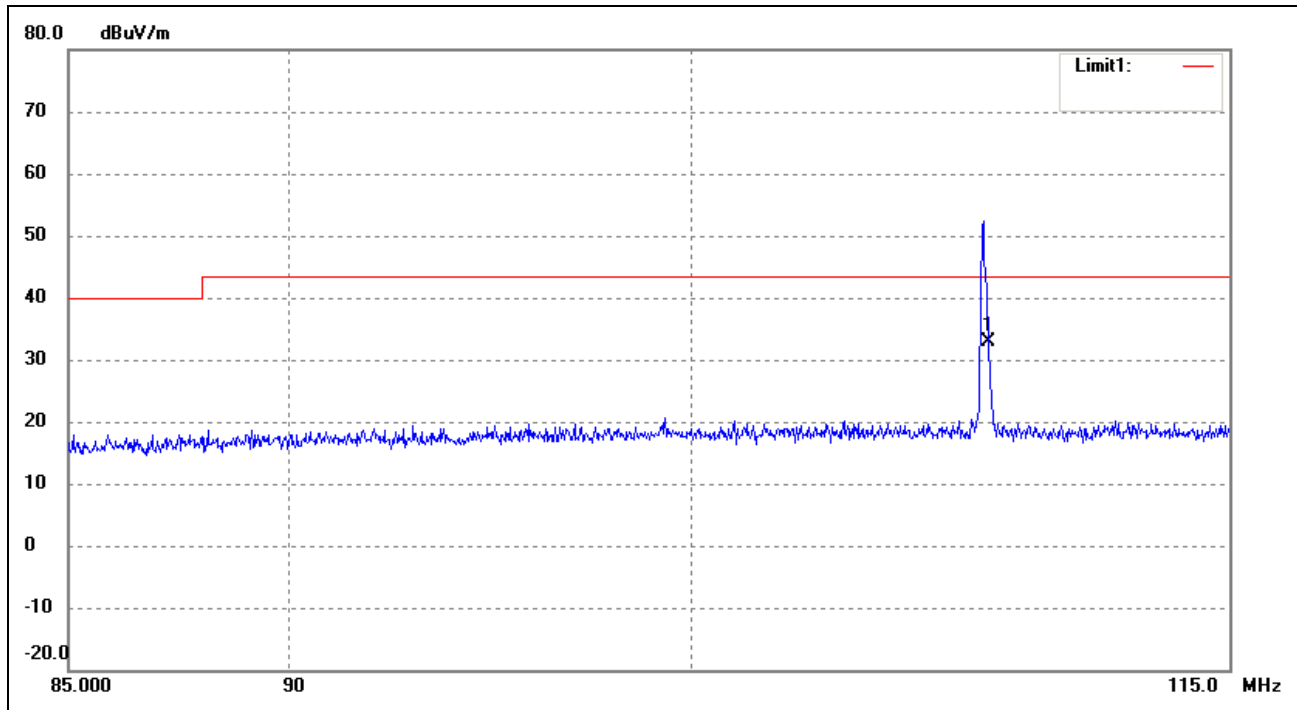
Refer to the attached plots.

## Lower Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	88.0000	27.24	3.06	30.30	40.00	-9.70	157	100	peak

## Upper Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	108.0000	28.00	4.88	32.88	43.50	-10.62	279	100	peak

\*\*\*\*\* END OF REPORT \*\*\*\*\*