

# TEST REPORT

**FCC ID: 2AMSOCAD-9900**

**Product: FM Transmitter Vent Mount**

**Model No.: CAD-9900**

**Additional Model No.: N/A**

**Trade Mark: CAR AND DRIVER**

**Report No.: TCT180509E024**

**Issued Date: May 17, 2018**

Issued for:

**Summit Electronics LLC**

**1 Rewe Street, Brooklyn, New York, 11211 United States**

Issued By:

**Shenzhen Tongce Testing Lab.**

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**Appendix A: Photographs of Test Setup**

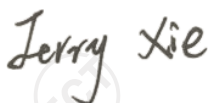
**Appendix B: Photographs of EUT**

**1. Test Certification**

<b>Product:</b>	FM Transmitter Vent Mount
<b>Model No.:</b>	CAD-9900
<b>Additional Model:</b>	N/A
<b>Trade Mark:</b>	<b>CAR AND DRIVER</b>
<b>Applicant:</b>	Summit Electronics LLC
<b>Address:</b>	1 Rewe Street, Brooklyn, New York, 11211 United States
<b>Manufacturer:</b>	Summit Electronics LLC
<b>Address:</b>	1 Rewe Street, Brooklyn, New York, 11211 United States
<b>Date of Test:</b>	May 10, 2018 – May 16, 2018
<b>Applicable Standards:</b>	FCC CFR Title 47 Part 15 Subpart C Section 15.239

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Jerry Xie

Date:

May 16, 2018

Reviewed By:



Beryl Zhao

Date:

May 17, 2018

Approved By:



Tomsin

Date:

May 17, 2018

## 2. Test Result Summary

Requirement	CFR 47 Section IC Paragraph	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	N/A
Field strength of the fundamental signal	§15.239 (b)	PASS
Spurious emissions	§15.239 (b) (c)/ §15.209	PASS
Occupied Bandwidth	§15.215 (c)	PASS

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 3. EUT Description

<b>Product:</b>	FM Transmitter Vent Mount
<b>Model No.:</b>	CAD-9900
<b>Additional Model:</b>	N/A
<b>Trade Mark:</b>	<b>CAR AND DRIVER</b>
<b>Operation Frequency:</b>	88.1MHz – 107.9MHz
<b>Channel Separation:</b>	100 kHz
<b>Number of Channel:</b>	199CH
<b>Modulation Technology:</b>	FSK
<b>Antenna Type:</b>	Internal Antenna
<b>Antenna Gain:</b>	0dBi
<b>Power Supply:</b>	DC 12/24V

#### Operation Frequency Each of Channel

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	88.1 MHz	99	97.9 MHz	197	107.7 MHz
2	88.2 MHz	100	98.0 MHz	198	107.8 MHz
3	88.3 MHz	101	98.1 MHz	199	107.9 MHz
--	--	--	--		

**Note:**

*In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:*

Channel	Frequency
The lowest channel	88.1 MHz
The middle channel	98.0 MHz
The Highest channel	107.9 MHz

## 4. Genera Information

### 4.1. 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
<p>The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) 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 &amp; 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.</p>	

### 4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID/DOC	Trade Name
/	/	/	/	/

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 5. Facilities and Accreditations

### 5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

Tel: 86-755-27673339

### 5.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

## 6. Test Results and Measurement Data

### 6.1. Antenna Requirement

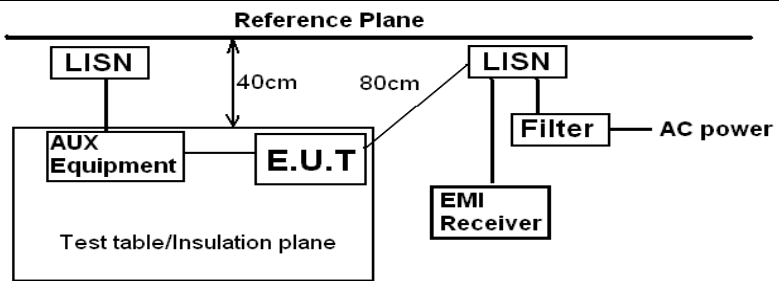
<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses 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.	
15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
<b>E.U.T Antenna:</b>	
The FM antenna is internal antenna which permanently attached, and the best case gain of the antenna is 0dBi.	





## 6.2. Conducted Emission

### 6.2.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.207														
<b>Test Method:</b>	ANSI C63.10:2013														
<b>Frequency Range:</b>	150 kHz to 30 MHz														
<b>Receiver setup:</b>	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
<b>Limits:</b>	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	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
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													
<b>Test Setup:</b>	 <p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
<b>Test Mode:</b>	Refer to section 4.1 for details														
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</li> </ol>														
<b>Test Result:</b>	The EUT is powered by car's power, So not applicable.														

### 6.3. Radiated Emission Measurement

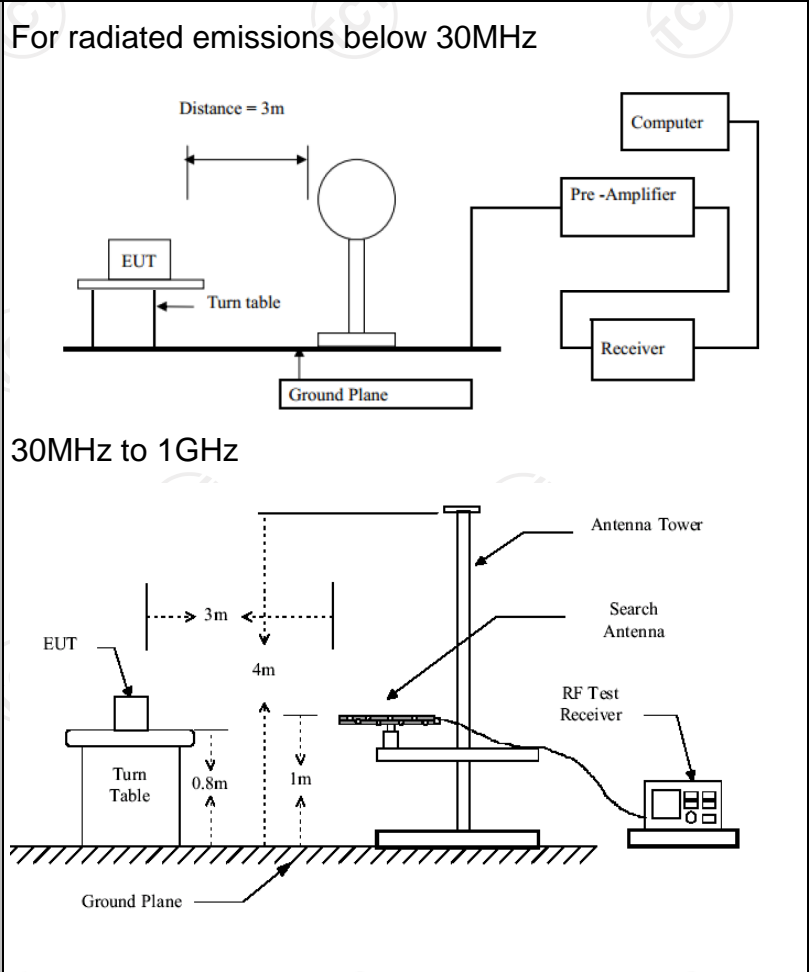
#### 6.3.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.209				
<b>Test Method:</b>	ANSI C63.10: 2013				
<b>Frequency Range:</b>	9 kHz to 1 GHz				
<b>Measurement Distance:</b>	3 m				
<b>Antenna Polarization:</b>	Horizontal & Vertical				
<b>Receiver Setup:</b>	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value
<b>Limit(Field strength of the fundamental signal):</b>	Frequency	Limit (dBuV/m @3m)		Remark	
	88-108MHz	48		Average Value	
		68		Peak Value	
<i>Note: Fcc part15.239 (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 Section 15.35 for limiting peak emissions apply.</i>					
<b>Limit(Spurious Emissions):</b>	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	
<b>Limit (band edge) :</b>	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.				
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>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</li> </ol>				



- 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 rotatable 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 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.

**Test setup:**



**Test Mode:**

Refer to section 4.1 for details

**Test results:**

PASS

6.3.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHWARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.3.3. Test Data

#### Field Strength of Fundamental

Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal /Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
88.1	31.06 (AV)	H	48	-16.94
88.1	34.25 (PK)	H	68	-33.75
88.1	29.84 (AV)	V	48	-18.16
88.1	31.97 (PK)	V	68	-36.03

Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal /Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
98.0	39.85 (AV)	H	48	-8.15
98.0	42.28 (PK)	H	68	-25.72
98.0	34.67 (AV)	V	48	-13.33
98.0	37.37 (PK)	V	68	-30.63

Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal /Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
107.9	41.09 (AV)	H	48	-6.91
107.9	44.63 (PK)	H	68	-23.37
107.9	35.76 (AV)	V	48	-12.24
107.9	38.73 (PK)	V	68	-29.27

#### Spurious Emissions

##### Frequency Range (9 kHz-30MHz)

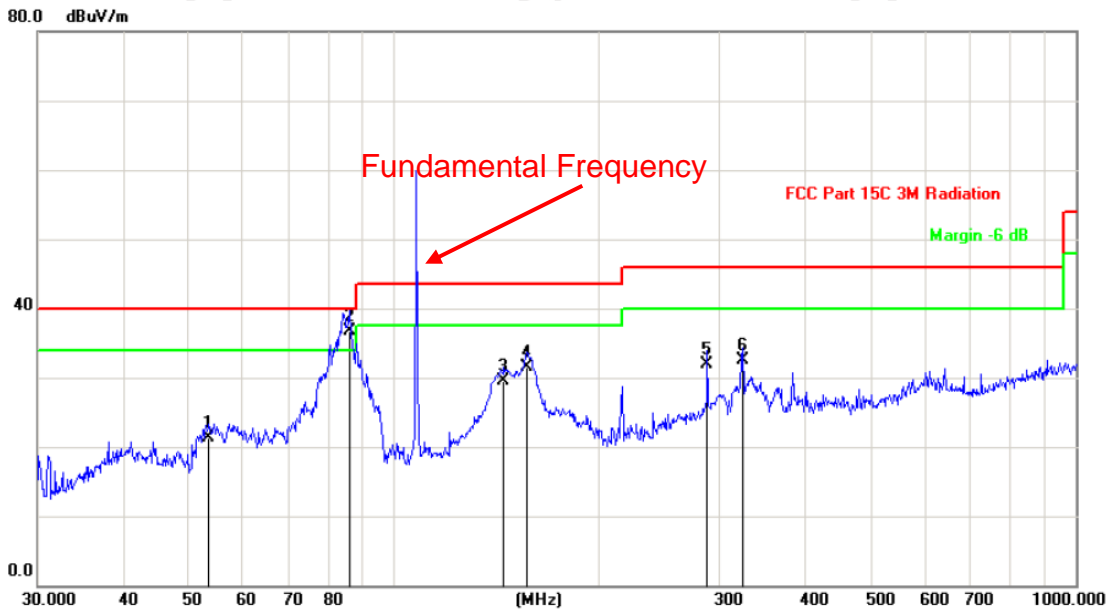
Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
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--	--	--
--	--	--
--	--	--

**Note:** 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

**Frequency Range (30MHz-1GHz)**

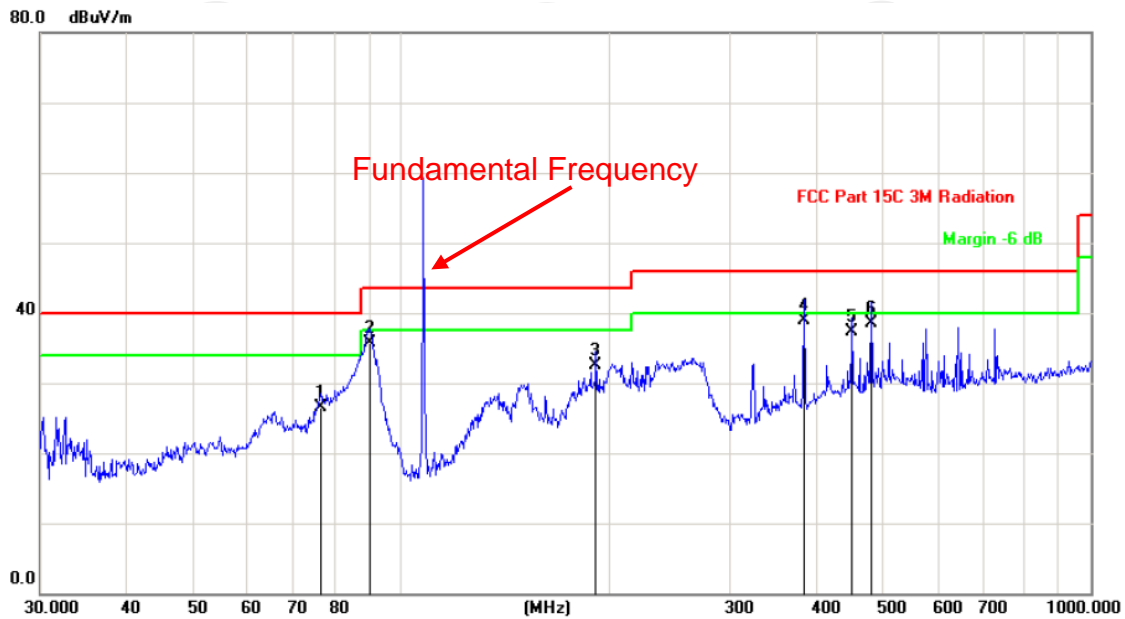
Horizontal:



Site: Polarization: *Horizontal* Temperature: 25  
Limit: FCC Part 15C 3M Radiation Power: DC 12V Humidity: 55%

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		53.5052	34.30	-12.92	21.38	40.00	-18.62	QP		
2	*	85.8983	51.80	-15.16	36.64	40.00	-3.36	QP		
3		144.8418	45.40	-15.91	29.49	43.50	-14.01	QP		
4		156.4576	47.00	-15.41	31.59	43.50	-11.91	QP		
5		287.9904	41.10	-9.20	31.90	46.00	-14.10	QP		
6		324.4560	40.40	-7.99	32.41	46.00	-13.59	QP		

Vertical:



Site: Polarization: **Vertical** Temperature: 25  
 Limit: FCC Part 15C 3M Radiation Power: DC 12V Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		76.5121	43.80	-17.29	26.51	40.00	-13.49			QP
2		90.2205	49.30	-13.63	35.67	43.50	-7.83			QP
3		191.7450	45.80	-13.24	32.56	43.50	-10.94			QP
4	*	383.9318	45.10	-6.26	38.84	46.00	-7.16			QP
5		451.1349	41.70	-4.41	37.29	46.00	-8.71			QP
6		480.5276	42.10	-3.63	38.47	46.00	-7.53			QP

**Note :** 1) QP= Quasi-peak  
 2) Emission Level = Reading Level + Antenna Factor + Cable Loss.  
 3) Measurements were conducted in all three channels (high, middle, low) and the worst case Mode (low channel) was submitted only.

### Above 1GHz

Low channel: 88.1 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
1057.2	H	42.71	---	-4.2	38.51	---	74	54	-15.49
1057.2	V	43.68	---	-4.2	39.48	---	74	54	-14.52
---	---	---	---	---	---	---	---	---	---

Middle channel: 98 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
1078.0	H	42.15	---	-3.98	38.17	---	74	54	-15.83
1078.0	V	41.63	---	-3.98	37.65	---	74	54	-16.35
---	---	---	---	---	---	---	---	---	---

High channel: 107.9 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
1079.0	H	47.51	---	-3.98	43.53	---	74	54	-10.47
1079.0	V	44.32	---	-3.98	40.34	---	74	54	-13.66
---	---	---	---	---	---	---	---	---	---

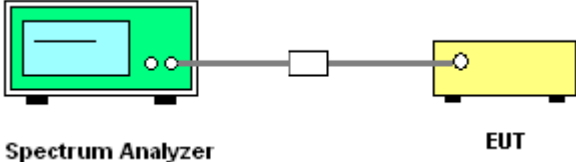
**Note:**

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB $\mu$ V/m)-Average limit (dB $\mu$ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.



## 6.4. Occupied Bandwidth

### 6.4.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.215(c)
<b>Test Method:</b>	ANSI C63.10: 2013
<b>Limit:</b>	200kHz
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; <math>RBW \geq 1\%</math> of the 20 dB bandwidth; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test setup:</b>	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>
<b>Test Mode:</b>	Refer to section 4.1 for details
<b>Test results:</b>	PASS

### 6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018

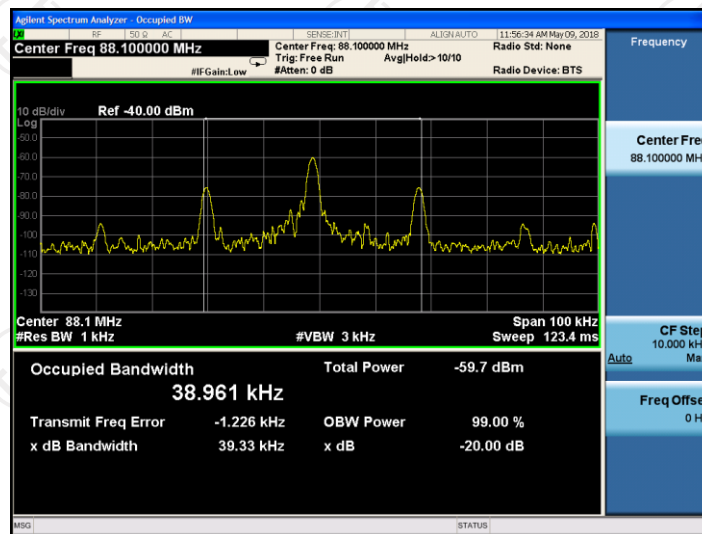
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.4.3. Test data**

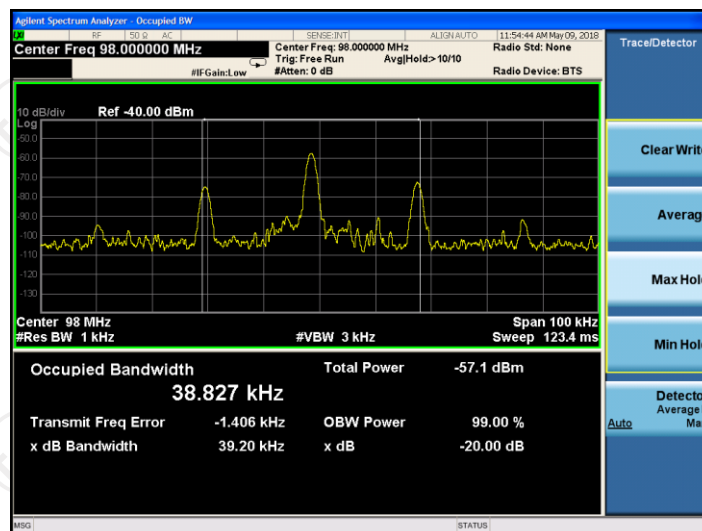
Test Channel	20dB Occupy Bandwidth (kHz)	Limit (kHz)	Conclusion
Lowest	44.36	200	PASS
Middle	42.15	200	PASS
Highest	43.78	200	PASS

Test plots as follows:

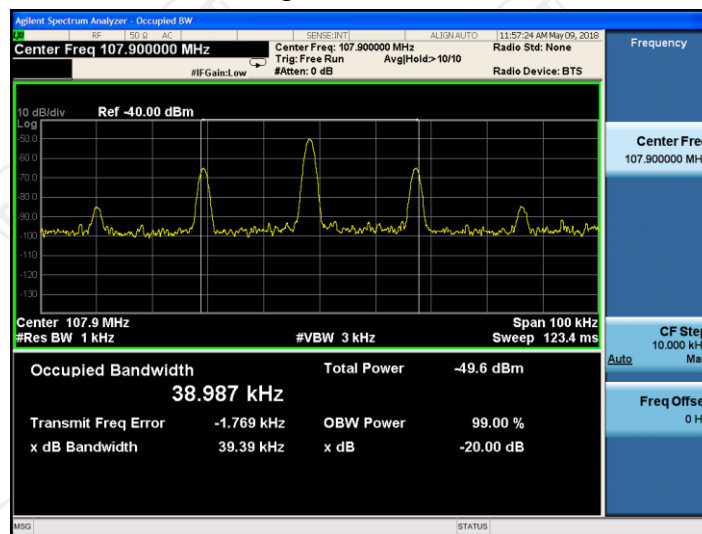
## Lowest channel



## Middle channel



## Highest channel

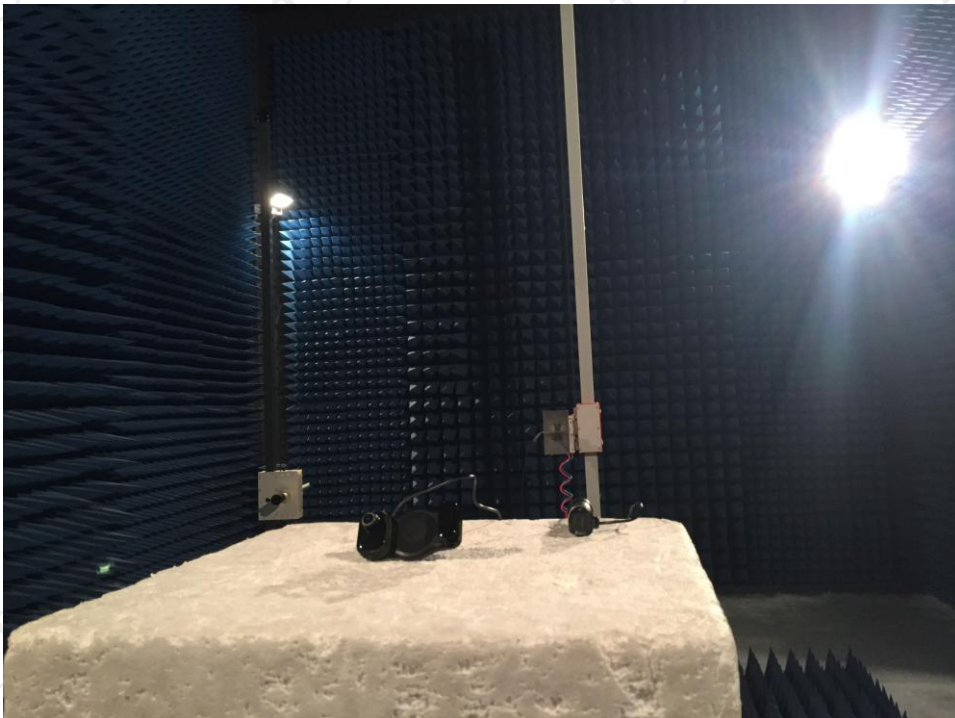
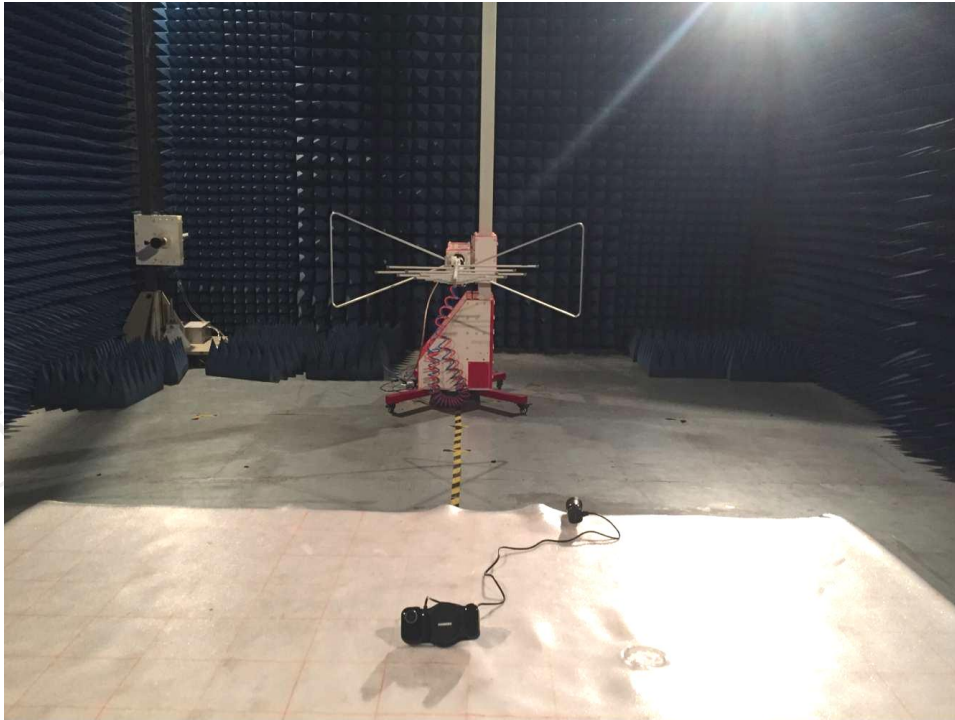


**Appendix A: Photographs of Test Setup**

Product: FM Transmitter Vent Mount

Model: CAD-9900

FM Radiated Emission



**Appendix B: Photographs of EUT**

Refer to test report TCT180509E017

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