

# FCC Part 15C Measurement and Test Report

For

**Shenzhen Aukey Smart Information Technology Co.,Ltd.**

**Building P03, South China city Electronics Trading Center ,Longgang**

**District, Shenzhen, Guangdong, 518111, China.**

**FCC ID: 2AU5S-AI-SC10**

<b>FCC Rule(s):</b>	<u>FCC Part 15.239</u>
<b>Product Description:</b>	<u>Spark</u>
<b>Tested Model:</b>	<u>AI-SC10</u>
<b>Report No.:</b>	<u>WTX19X11077753W-3</u>
<b>Sample Receipt Date:</b>	<u>2019-11-11</u>
<b>Tested Date:</b>	<u>2019-11-11 to 2020-01-08</u>
<b>Issued Date:</b>	<u>2020-01-09</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 Waltek Testing Group (Shenzhen) Co., Ltd.



**TABLE OF CONTENTS**

**1. GENERAL INFORMATION.....4**  
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....4  
1.2 TEST STANDARDS.....5  
1.4 TEST METHODOLOGY.....5  
1.4 TEST FACILITY.....5  
1.5 EUT SETUP AND TEST MODE.....6  
1.6 MEASUREMENT UNCERTAINTY.....6  
1.7 TEST EQUIPMENT LIST AND DETAILS.....7

**2. SUMMARY OF TEST RESULTS .....8**

**3. ANTENNA REQUIREMENT.....9**  
3.1 STANDARD APPLICABLE.....9  
3.2 TEST RESULT.....9

**4. RADIATED EMISSION.....10**  
4.1 STANDARD APPLICABLE.....10  
4.2 TEST PROCEDURE.....10  
4.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....11  
4.4 SUMMARY OF TEST RESULTS/PLOTS.....11

**5. EMISSION BANDWIDTH.....18**  
5.1 STANDARD APPLICABLE.....18  
5.2 TEST PROCEDURE.....18  
5.3 SUMMARY OF TEST RESULTS/PLOTS.....18

**6. OUT OF BAND EMISSIONS.....20**  
6.1 STANDARD APPLICABLE.....20  
6.2 TEST PROCEDURE.....20  
6.3 SUMMARY OF TEST RESULTS/PLOTS.....20



## Report version

Version No.	Date of issue	Description
Rev.00	2020-01-09	Original
/	/	/



## 1. GENERAL INFORMATION

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

#### Client Information

Applicant: Shenzhen Aukey Smart Information Technology Co.,Ltd.  
 Address of applicant: Building P03, South China city Electronics Trading Center ,Longgang District , Shenzhen, Guangdong, 518111, China.

Manufacturer: Shenzhen Aukey Smart Information Technology Co.,Ltd.  
 Address of manufacturer: Building P03, South China city Electronics Trading Center ,Longgang District , Shenzhen, Guangdong, 518111, China.

General Description of EUT	
Product Name:	Spark
Trade Name:	Aipower
Model No.:	AI-SC10
Adding Model(s):	/
Rated Voltage:	DC9-32V
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:	88-108MHz
Max. Field Strength:	46.01dBuV/m
Modulation:	FM
Antenna Type:	Integral Antenna

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.239**: Operation in the band 88-108MHz.

**ANSI C63.10-2013**: American National Standard for Testing Unlicensed Wireless Devices

*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, 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.

## 1.4 Test Facility

### Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C. (518101)

### FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) 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. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

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

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

### 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	Transmitting	88.1MHz
TM2	Transmitting	98.0MHz
TM3	Transmitting	107.5MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

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

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

### 1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Occupied Bandwidth	Conducted	± 1.5%
Conducted Emissions	Conducted	9-150kHz ± 3.74dB
		0.15-30MHz ± 3.34dB
Transmitter Spurious Emissions	Radiated	30-200MHz ± 4.52dB
		0.2-1GHz ± 5.56dB
		1-6GHz ± 3.84dB
		6-18GHz ± 3.92dB

### 1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2019-04-30	2020-04-29
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2019-04-30	2020-04-29
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2019-04-30	2020-04-29
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2019-04-30	2020-04-29
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2019-04-30	2020-04-29
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
SEMT-1042	Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2019-04-30	2020-04-29
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2019-04-30	2020-04-29
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2019-04-30	2020-04-29
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2019-04-30	2020-04-29
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2019-04-30	2020-04-29
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2019-04-30	2020-04-29
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2019-03-18	2020-03-17
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2019-03-18	2020-03-17
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2019-03-18	2020-03-17
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2019-03-18	2020-03-17
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2019-03-18	2020-03-17
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2019-03-18	2020-03-17

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

\*Remark: indicates software version used in the compliance certification testing



## 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

N/A: not applicable





### **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 Integral antenna, fulfill the requirement of this section.

## 4. RADIATED EMISSION

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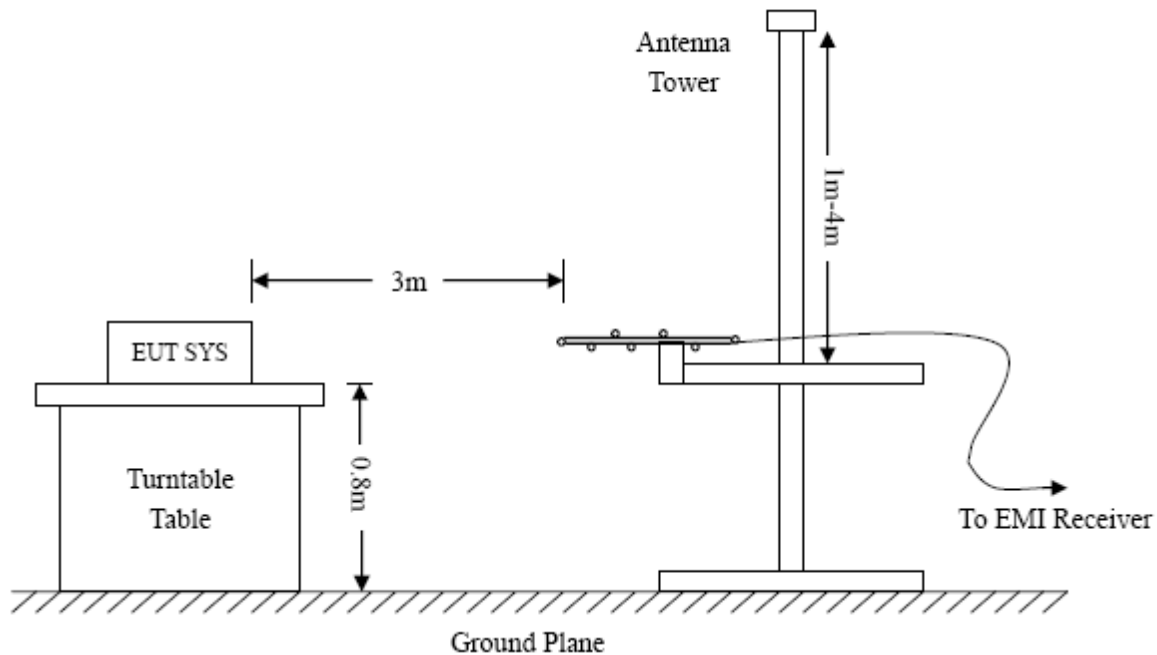
### 4.1 Standard Applicable

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  $-6\text{dB}\mu\text{V}$  means the emission is  $6\text{dB}\mu\text{V}$  below the maximum limit. The equation for margin calculation is as follows:

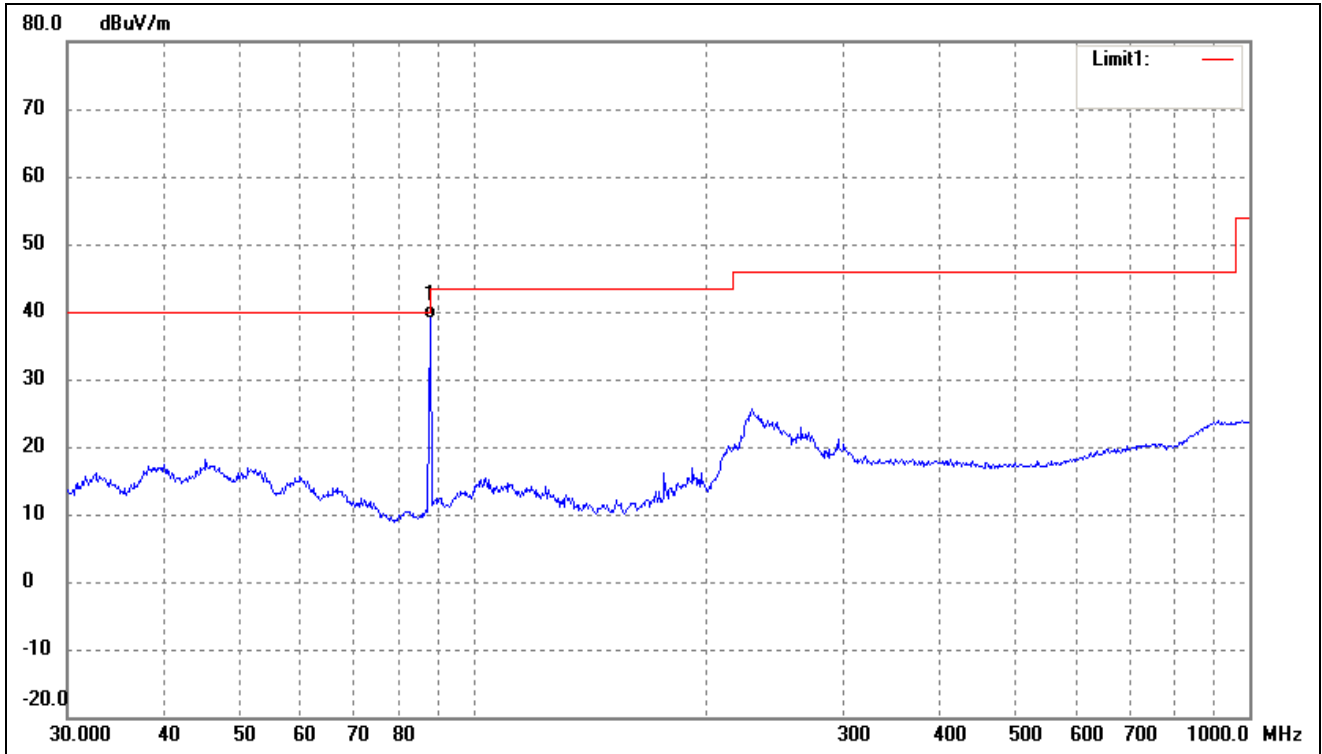
$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.239 Limit}$$

### 4.4 Summary of Test Results/Plots

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



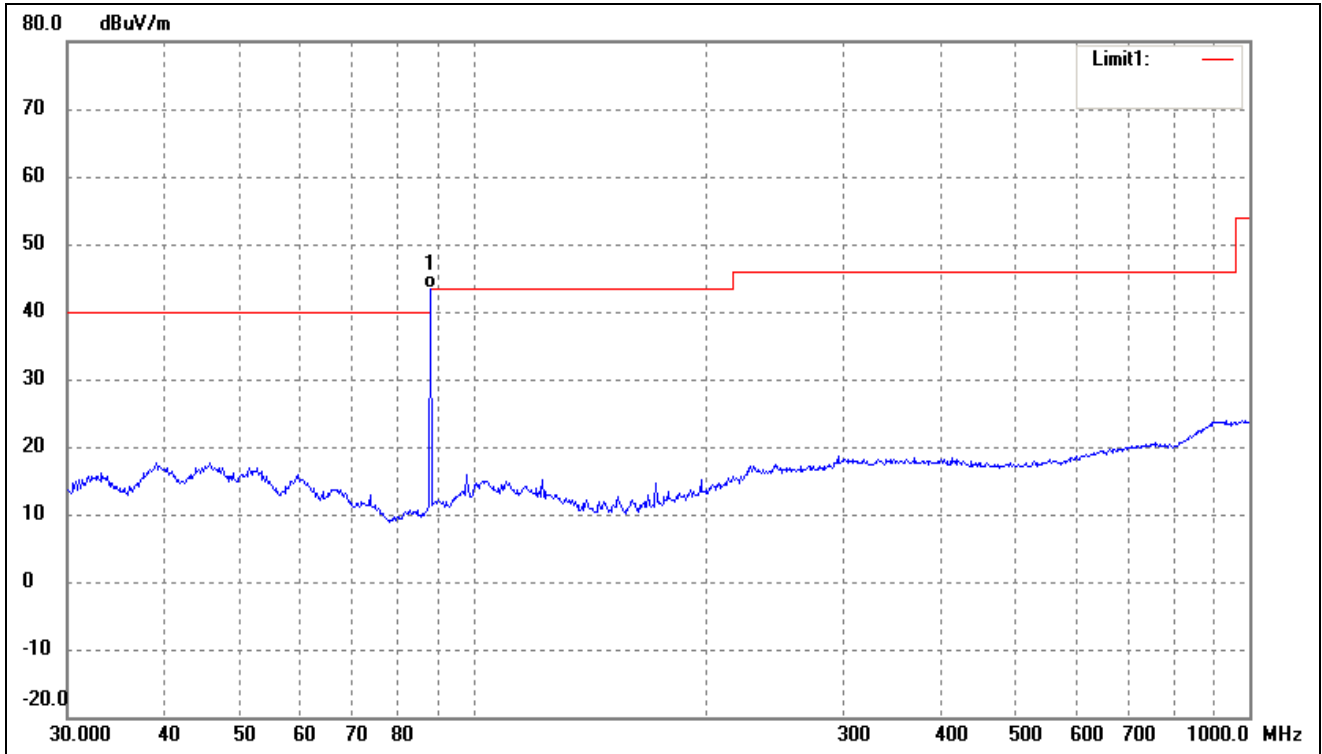
Test Mode	Low	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	88.0328	56.40	-17.40	39.00	48	-9.00	346	100	AVG



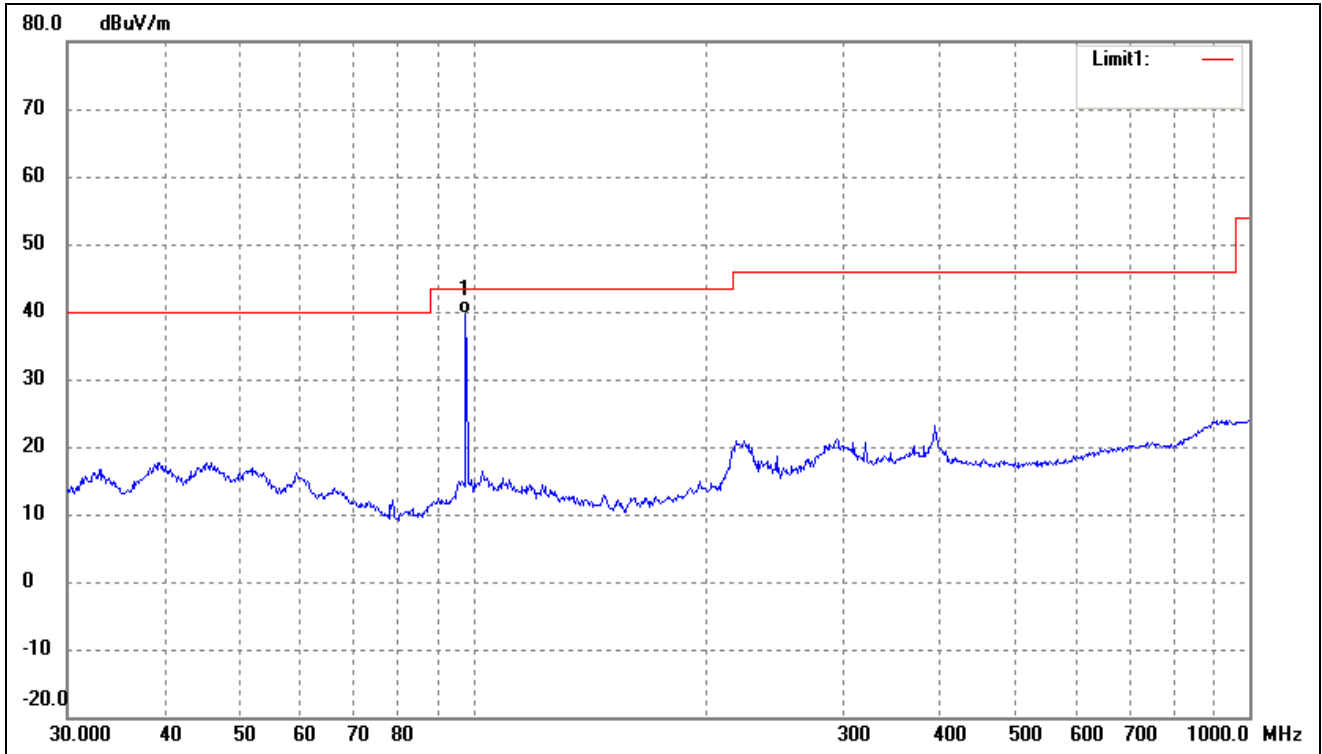
Test Mode	Low	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	88.0328	60.80	-17.40	43.4	48	-4.60	146	100	AVG



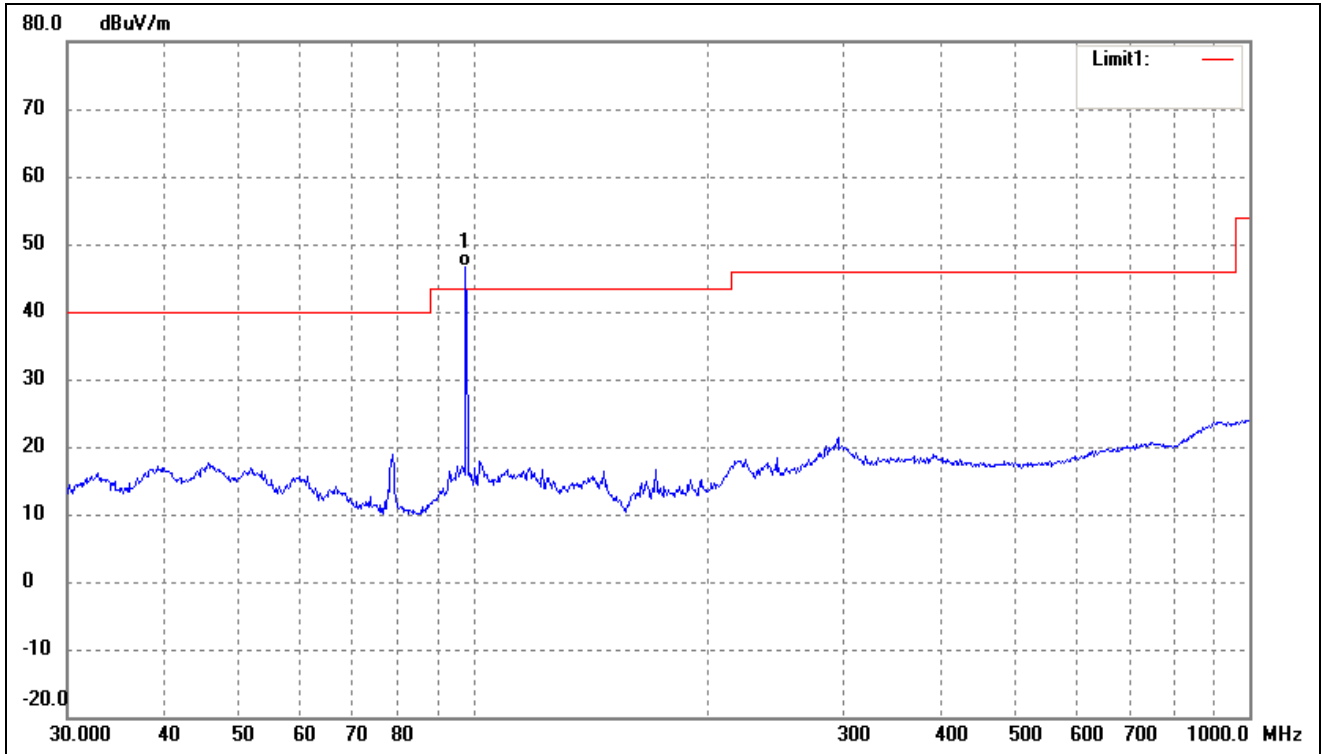
Test Mode	MID	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	97.7982	54.93	-15.36	39.57	48	-8.43	180	100	AVG



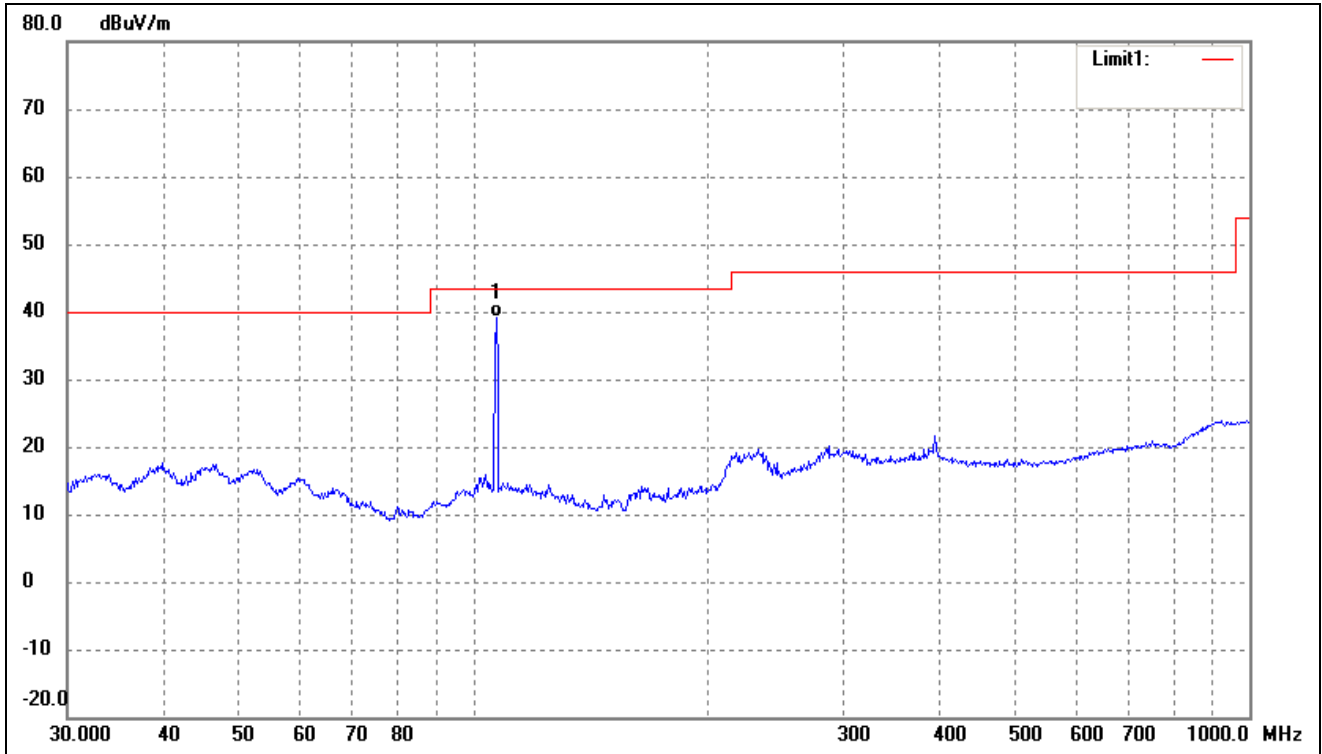
Test Mode	MID	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	97.7983	61.99	-15.36	46.01	48	-1.99	78	100	AVG



Test Mode	High	Polarity:	Horizontal
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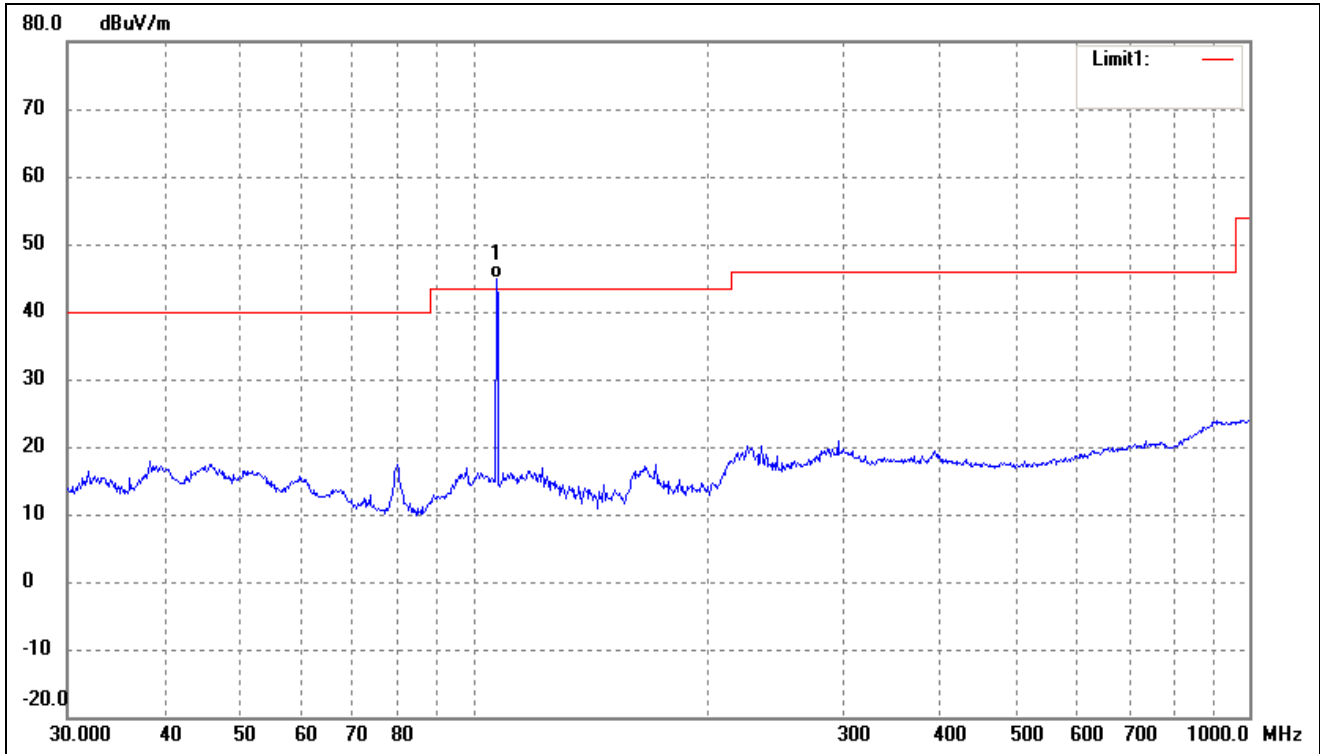


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	107.1337	53.89	-14.82	39.07	48	-8.93	189	100	AVG





Test Mode	High	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	107.1337	59.80	-14.82	44.98	48	-3.02	95	100	AVG

*Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5<sup>th</sup> Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz..*

## 5. EMISSION BANDWIDTH

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### 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 88–108MHz.

### 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 Summary of Test Results/Plots

Frequency ( MHz )	20dB Bandwidth kHz	Limit kHz	Result
88.1	142.064	200	Pass
98.0	108.474	200	Pass
107.5	130.204	200	Pass

Refer to the attached plots.



<p>88.1MHz</p>	<p>Agilent R T Trace/View</p> <p>Ch Freq 88.1 MHz Trig Free</p> <p>Occupied Bandwidth</p> <p><b>RBW 3.00000000 kHz</b></p> <p>Ref -20 dBm #Atten 0 dB</p> <p>#Peak Log 10 dB/</p> <p>Center 88.1 MHz Span 500 kHz</p> <p>#Res BW 3 kHz #VBW 10 kHz Sweep 57.18 ms (401 pts)</p> <p><b>Occupied Bandwidth 137.0927 kHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -8.197 kHz x dB Bandwidth 142.064 kHz</p> <p>Trace/View: 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2</p>
<p>98.0MHz</p>	<p>Agilent R T Trace/View</p> <p>Ch Freq 98 MHz Trig Free</p> <p>Occupied Bandwidth</p> <p><b>Center 98.00000000 MHz</b></p> <p>Ref -20 dBm #Atten 0 dB</p> <p>#Peak Log 10 dB/</p> <p>Center 98 MHz Span 500 kHz</p> <p>#Res BW 3 kHz #VBW 10 kHz Sweep 57.18 ms (401 pts)</p> <p><b>Occupied Bandwidth 103.6411 kHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -9.116 kHz x dB Bandwidth 108.474 kHz</p> <p>Trace/View: 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2</p>
<p>107.5MHz</p>	<p>Agilent R T Trace/View</p> <p>Ch Freq 107.5 MHz Trig Free</p> <p>Occupied Bandwidth</p> <p><b>Ref Level -20.00 dBm</b></p> <p>Ref -20 dBm #Atten 0 dB</p> <p>#Peak Log 10 dB/</p> <p>Center 107.5 MHz Span 500 kHz</p> <p>#Res BW 3 kHz #VBW 10 kHz Sweep 57.18 ms (401 pts)</p> <p><b>Occupied Bandwidth 125.7658 kHz</b></p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -9.589 kHz x dB Bandwidth 130.204 kHz</p> <p>Trace/View: 1 2 3 Clear Write Max Hold Min Hold View Blank More 1 of 2</p>



## 6. OUT OF BAND EMISSIONS

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### 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, then mark the higher-level emission for comparing with the FCC rules.

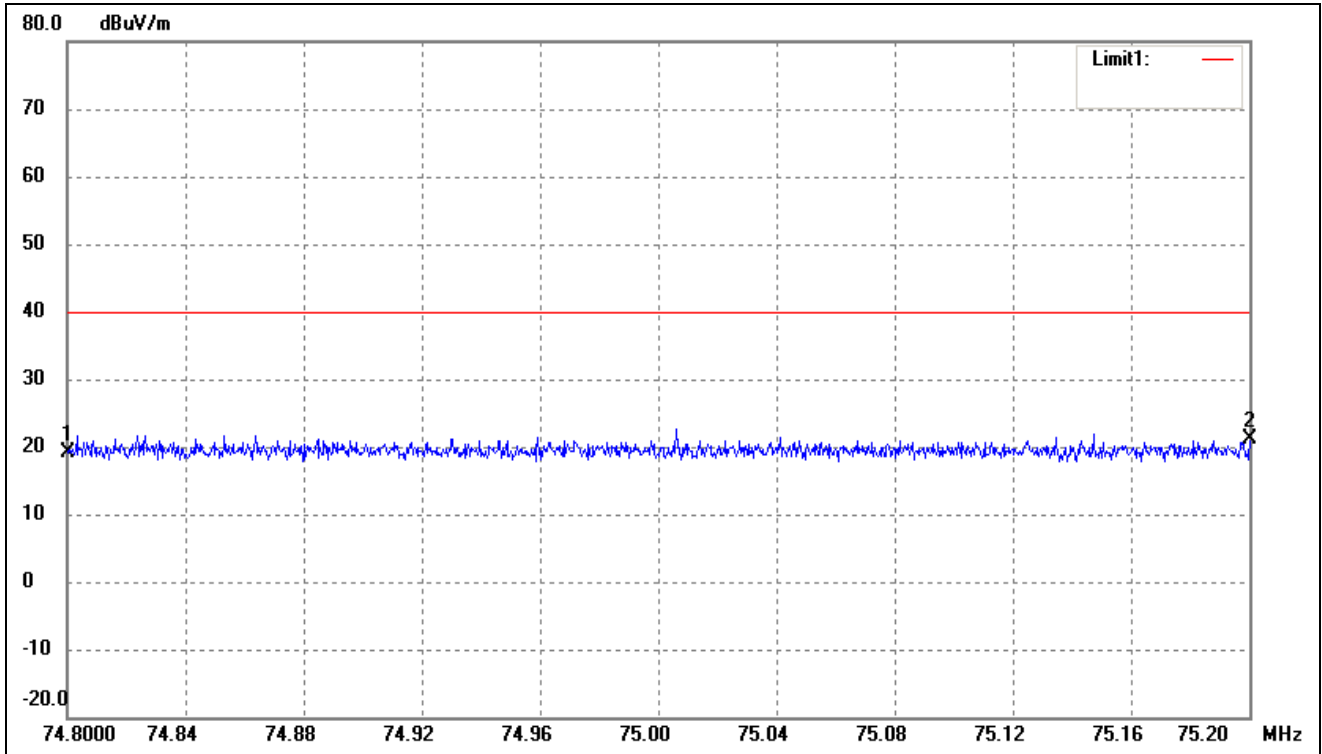
### 6.3 Summary of Test Results/Plots

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

Refer to the attached plots.



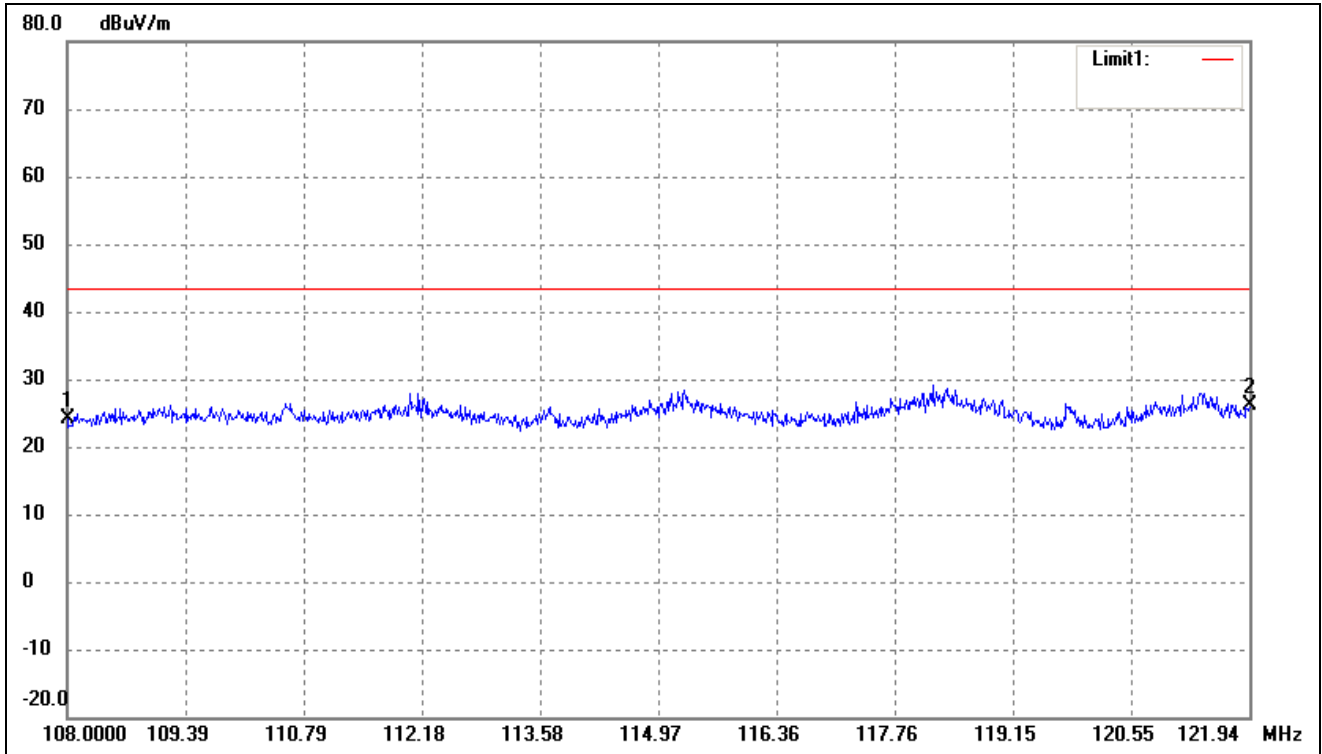
Low	Low	Polarity:	Vertical(Worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	74.8000	37.46	-18.24	19.22	40.00	-20.78	peak
2	75.2000	39.48	-18.34	21.14	40.00	-18.86	peak



High	High	Polarity:	Vertical(Worst case)
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	108.0000	39.03	-14.80	24.23	43.50	-19.27	peak
2	121.9400	42.27	-16.12	26.15	43.50	-17.35	peak

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