



# TEST REPORT

**Applicant: Avi-on Labs, Inc.**

Address: 2700 Rasmussen, Suite L-10, Park City, Utah, United States

**FCC ID: 2AFZI-AVIBG21**

**Product Name: Avi-on BG21 Module**

**Standard(s): 47 CFR Part 15, Subpart C(15.247)  
ANSI C63.10-2013  
KDB 558074 D01 15.247 Meas Guidance v05r02**

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

**Report Number: CR230850531-00**

**Date Of Issue: 2023/9/18**

**Reviewed By: Calvin Chen**

Title: RF Engineer

**Approved By: Sun Zhong**

Title: Manager

**Test Laboratory: China Certification ICT Co., Ltd (Dongguan)**

No. 113, Pingkang Road, Dalang Town, Dongguan,  
Guangdong, China  
Tel: +86-769-82016888

## Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

## Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

## CONTENTS

<b>TEST FACILITY .....</b>	<b>2</b>
<b>DECLARATIONS.....</b>	<b>2</b>
<b>DOCUMENT REVISION HISTORY .....</b>	<b>5</b>
<b>1. GENERAL INFORMATION .....</b>	<b>6</b>
<b>1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....</b>	<b>6</b>
<b>1.2 DESCRIPTION OF TEST CONFIGURATION.....</b>	<b>8</b>
1.2.1 EUT Operation Condition:.....	8
1.2.2 Support Equipment List and Details .....	8
1.2.3 Support Cable List and Details .....	8
1.2.4 Block Diagram of Test Setup.....	9
<b>1.3 MEASUREMENT UNCERTAINTY .....</b>	<b>10</b>
<b>2. SUMMARY OF TEST RESULTS .....</b>	<b>11</b>
<b>3. REQUIREMENTS AND TEST PROCEDURES .....</b>	<b>12</b>
<b>3.1 AC LINE CONDUCTED EMISSIONS.....</b>	<b>12</b>
3.1.1 Applicable Standard.....	12
3.1.2 EUT Setup.....	13
3.1.3 EMI Test Receiver Setup .....	13
3.1.4 Test Procedure .....	14
3.1.5 Corrected Amplitude & Margin Calculation.....	14
<b>3.2 RADIATION SPURIOUS EMISSIONS.....</b>	<b>15</b>
3.2.1 Applicable Standard.....	15
3.2.2 EUT Setup.....	15
3.2.3 EMI Test Receiver & Spectrum Analyzer Setup .....	16
3.2.4 Test Procedure .....	16
3.2.5 Corrected Amplitude & Margin Calculation.....	16
<b>3.3 MINIMUM 6 dB BANDWIDTH.....</b>	<b>17</b>
3.3.1 Applicable Standard.....	17
3.3.2 EUT Setup.....	17
3.3.3 Test Procedure .....	17
<b>3.4 MAXIMUM CONDUCTED OUTPUT POWER.....</b>	<b>18</b>
3.4.1 Applicable Standard.....	18
3.4.2 EUT Setup.....	18
3.4.3 Test Procedure .....	18
<b>3.5 MAXIMUM POWER SPECTRAL DENSITY.....</b>	<b>19</b>
3.5.1 Applicable Standard.....	19
3.5.2 EUT Setup.....	19
3.5.3 Test Procedure .....	19
<b>3.6 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE.....</b>	<b>20</b>
3.6.1 Applicable Standard.....	20
3.6.2 EUT Setup.....	20
3.6.3 Test Procedure .....	20

<b>3.7 DUTY CYCLE .....</b>	<b>21</b>
3.7.1 EUT Setup.....	21
3.7.2 Test Procedure .....	21
<b>3.8 ANTENNA REQUIREMENT.....</b>	<b>22</b>
3.8.1 Applicable Standard.....	22
3.8.2 Judgment.....	22
<b>4. Test DATA AND RESULTS .....</b>	<b>23</b>
<b>    4.1 AC LINE CONDUCTED EMISSIONS.....</b>	<b>23</b>
<b>    4.2 RADIATION SPURIOUS EMISSIONS.....</b>	<b>32</b>
<b>    4.3 6 DB EMISSION BANDWIDTH .....</b>	<b>49</b>
<b>    4.4 MAXIMUM CONDUCTED OUTPUT POWER.....</b>	<b>52</b>
<b>    4.5 MAXIMUM POWER SPECTRAL DENSITY .....</b>	<b>55</b>
<b>    4.6 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE.....</b>	<b>58</b>
<b>    4.7 DUTY CYCLE .....</b>	<b>61</b>
<b>5. RF EXPOSURE EVALUATION .....</b>	<b>63</b>
<b>6. EUT PHOTOGRAPHS .....</b>	<b>64</b>
<b>7. TEST SETUP PHOTOGRAPHS .....</b>	<b>65</b>

## DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	CR230850531-00	Original Report	2023/9/18

## 1. GENERAL INFORMATION

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

<b>EUT Name:</b>	Avi-on BG21 Module
<b>Trade Name:</b>	Avi-on Labs
<b>EUT Model:</b>	AVIBG21AUFL
<b>Multiple Model:</b>	AVIBG21AVIA
<b>Operation Frequency:</b>	2402-2480 MHz
<b>Maximum Peak Output Power (Conducted):</b>	10.03 dBm
<b>Modulation Type:</b>	GFSK
<b>Rated Input Voltage:</b>	DC 3.3V
<b>Serial Number:</b>	CR230850531-RF-S1 for model:AVIBG21AUFL CR230850531-RF-S2 for model: AVIBG21AVIA
<b>EUT Received Date:</b>	2023/08/06
<b>EUT Received Status:</b>	Good

**Note1:** For model AVIBG21AUFL, 6015ANT and 6016ANT are the same material, type, etc., only the length is different, please refer to the Antenna Specifications and EUT photos for more detail. For radiated emission test and Conducted Emissions Test, the worst case 6015ANT was selected to test.

**Note2:** The model AVIBG21AUFL and AVIBG21AVIA are electrically identical, the only difference is different RF Out path for different RF Connector, please refer to the declaration letter and EUT photos for more details. For RF Conducted Test, the model AVIBG21AUFL was selected to test and reported.

### Operation Frequency Detail: For BLE:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	...	...
...	...	...	...
...	...	...	...
..	...	38	2478
19	2440	39	2480

Per section 15.31(m), the below frequencies were performed the test as below:

Test Channel	Frequency (MHz)
Lowest	2402
Middle	2440
Highest	2480

**Antenna Information Detail▲:**

For model AVIBG21AVIA:

Antenna Type	input impedance (Ohm)	Frequency Range	Antenna Gain
Monopole	50	2.4~2.5GHz	0dBi

The Method of §15.203 Compliance:

Antenna must be permanently attached to the unit.  
 Antenna must use a unique type of connector to attach to the EUT.  
 Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

For model AVIBG21AUFL:

ANT No.	ANT Mode	Antenna Type	input impedance (Ohm)	Frequency Range	Antenna Gain
1	6012ANT	Monopole	50	2.4~2.5GHz	3.0dBi
2	6015ANT	Dipole	50	2.4~2.5GHz	2.13dBi
3	6016ANT	Dipole	50	2.4~2.5GHz	2.13dBi
4	6211ANT	Monopole	50	2.4~2.5GHz	3.0dBi

The Method of §15.203 Compliance:

Antenna must be permanently attached to the unit.  
 Antenna must use a unique type of connector to attach to the EUT.  
 Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

**Accessory Information:**

Accessory Description	Manufacturer	Model	Parameters
/	/	/	/

## 1.2 Description of Test Configuration

### 1.2.1 EUT Operation Condition:

For BLE:

<b>EUT Operation Mode:</b>	The system was configured for testing in Engineering Mode, which was provided by the manufacturer.		
<b>Equipment Modifications:</b>	No		
<b>EUT Exercise Software:</b>	BGTool		
The software was provided by manufacturer. The maximum power was configured as below, that was provided by the manufacturer▲:			
Test Modes	Lowest Channel	Middle Channel	Highest Channel
1Mbps	200	200	200
2Mbps	200	200	200

### 1.2.2 Support Equipment List and Details

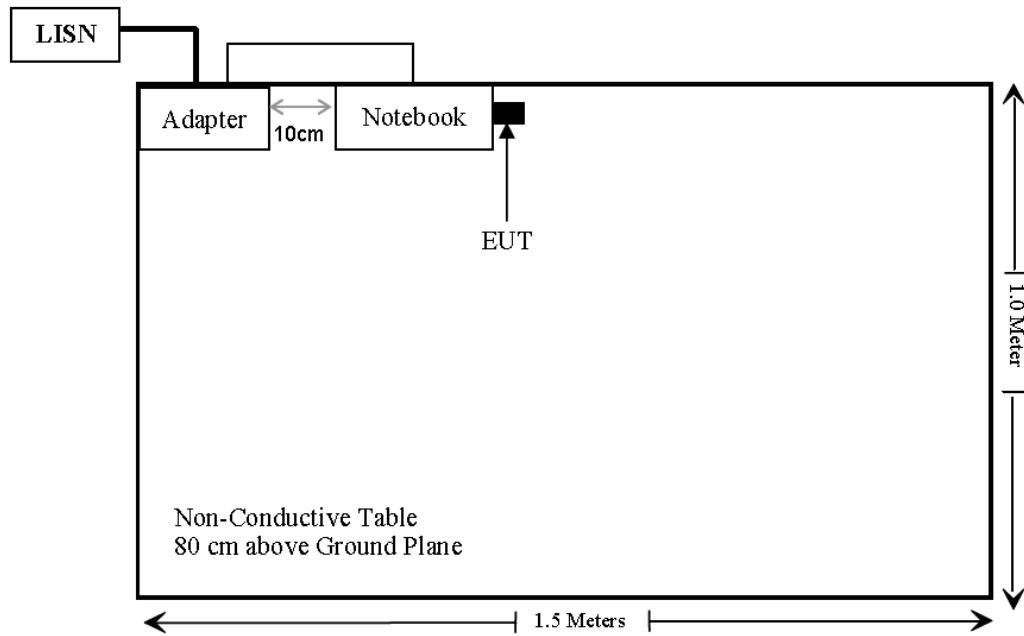
Manufacturer	Description	Model	Serial Number
DELL	Laptop	E6410	GYXJ3 A00 JSD2
DELL	Adapter	HA65NM130	CN-OFFC2Y-CH200-14M-061U-A07

### 1.2.3 Support Cable List and Details

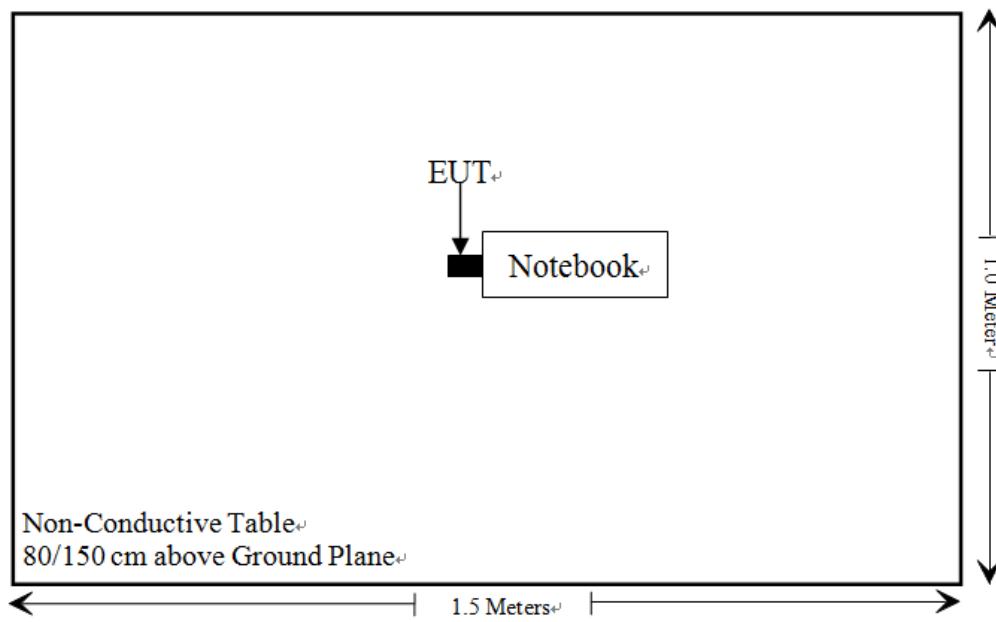
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
AC power cable	no	no	1.2	Adapter	Laptop

### 1.2.4 Block Diagram of Test Setup

AC Line Conducted Emissions:



Spurious emissions:



### 1.3 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.15 dB, 200M~1GHz: 5.61 dB, 1G~6GHz: 5.14 dB, 6G~18GHz: 5.93 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Unwanted Emissions, conducted	±1.26 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	2.8 dB (150 kHz to 30 MHz)

## 2. SUMMARY OF TEST RESULTS

Standard(s) Section	Test Items	Result
§15.207(a)	AC line conducted emissions	Compliant
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions	Compliant
§15.247 (a)(2)	Minimum 6 dB Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.203	Antenna Requirement	Compliant
FCC§15.247 (i) & §1.1307	RF Exposure Evaluation	Compliant

### 3. REQUIREMENTS AND TEST PROCEDURES

#### 3.1 AC Line Conducted Emissions

##### 3.1.1 Applicable Standard

FCC§15.207(a).

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	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.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

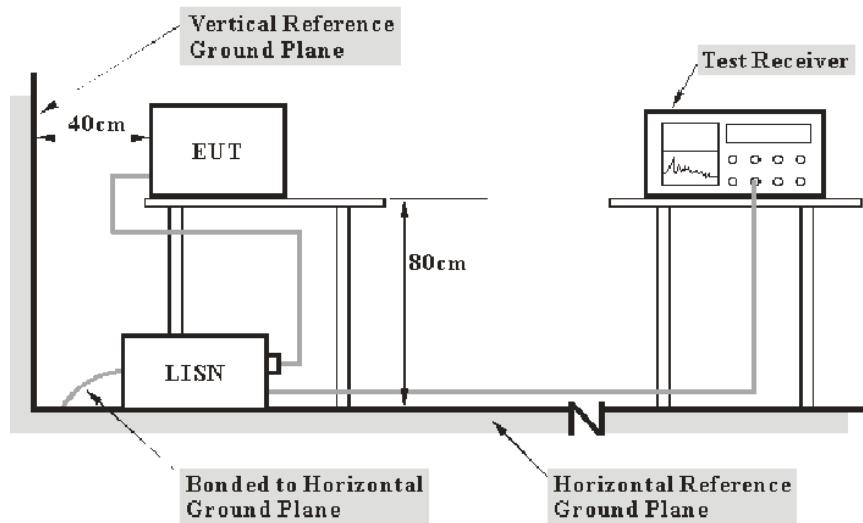
(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000  $\mu$ V within the frequency band 535-1705 kHz, as measured using a 50  $\mu$ H/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

### 3.1.2 EUT Setup



**Note:**

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter or EUT was connected to the main LISN with a 120 V/60 Hz AC power source.

### 3.1.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### 3.1.4 Test Procedure

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase (“hot”) line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

### 3.1.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor

Factor = attenuation caused by cable loss + voltage division factor of AMN

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

### 3.2 Radiation Spurious Emissions

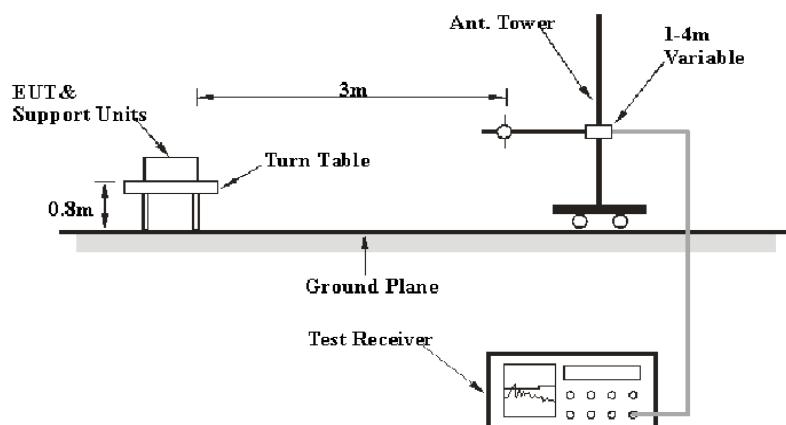
#### 3.2.1 Applicable Standard

FCC §15.247 (d);

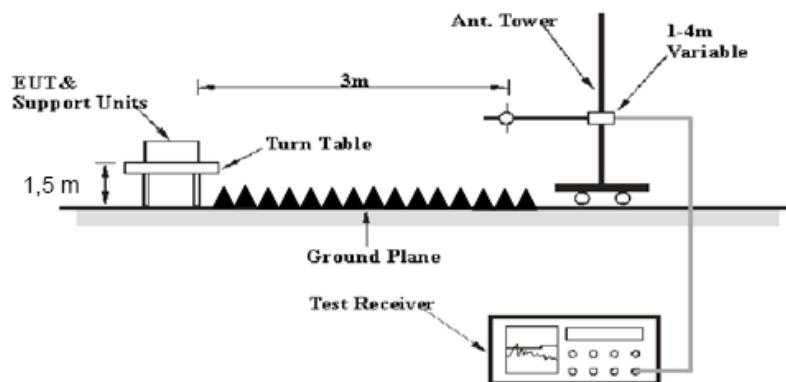
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

#### 3.2.2 EUT Setup

##### Below 1GHz:



##### Above 1GHz:



The radiated emissions were performed in the 3 meters distance, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

### 3.2.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	$\geq 1/T$

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

### 3.2.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

### 3.2.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor

Factor = Antenna Factor + Cable Loss- Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

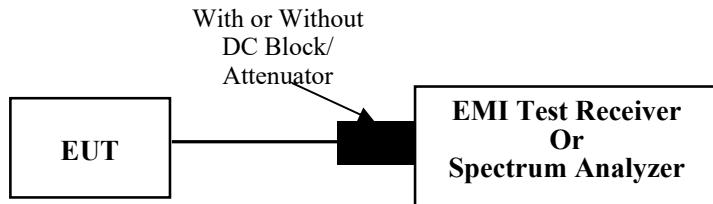
### 3.3 Minimum 6 dB Bandwidth

#### 3.3.1 Applicable Standard

FCC §15.247 (a)(2)

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.3.2 EUT Setup



#### 3.3.3 Test Procedure

According to ANSI C63.10-2013 Section 11.8

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times \text{RBW}$ .
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

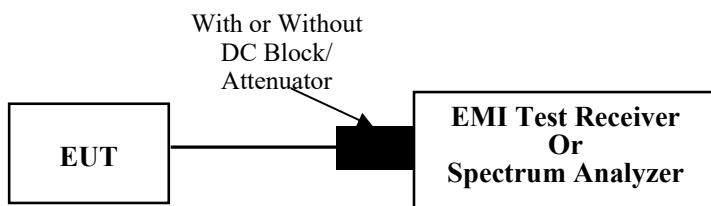
### 3.4 Maximum Conducted Output Power

#### 3.4.1 Applicable Standard

FCC §15.247 (b)(3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

#### 3.4.2 EUT Setup



#### 3.4.3 Test Procedure

According to ANSI C63.10-2013 Section 11.9.1.1

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) Set the  $RBW \geq DTS$  bandwidth.
- b) Set  $VBW \geq [3 \times RBW]$ .
- c) Set span  $\geq [3 \times RBW]$ .
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

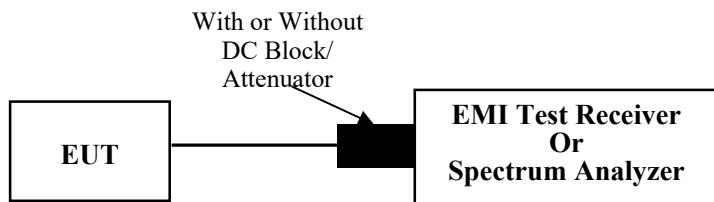
### 3.5 Maximum power spectral density

#### 3.5.1 Applicable Standard

FCC §15.247 (e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

#### 3.5.2 EUT Setup



#### 3.5.3 Test Procedure

According to ANSI C63.10-2013 Section 11.10.2

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

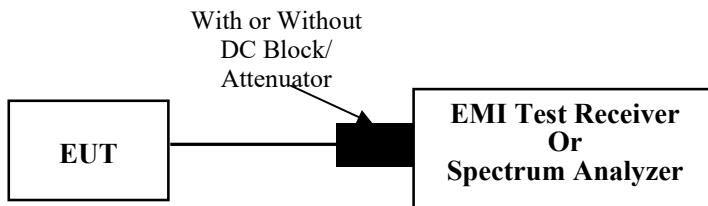
### 3.6 100 kHz Bandwidth of Frequency Band Edge

#### 3.6.1 Applicable Standard

FCC §15.247 (d);

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

#### 3.6.2 EUT Setup



#### 3.6.3 Test Procedure

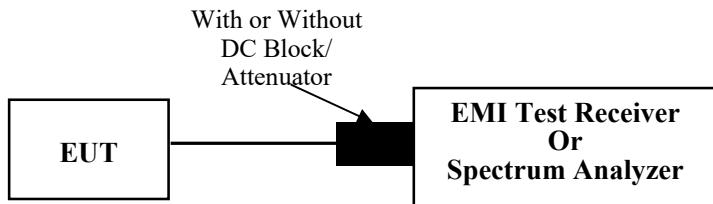
According to ANSI C63.10-2013 Section 11.11

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

### 3.7 Duty Cycle

#### 3.7.1 EUT Setup



#### 3.7.2 Test Procedure

According to ANSI C63.10-2013 Section 11.6

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

- 1) Set the center frequency of the instrument to the center frequency of the transmission.
- 2) Set  $RBW \geq OBW$  if possible; otherwise, set  $RBW$  to the largest available value.
- 3) Set  $VBW \geq RBW$ . Set detector = peak or average.
- 4) The zero-span measurement method shall not be used unless both  $RBW$  and  $VBW$  are  $> 50/T$  and the number of sweep points across duration  $T$  exceeds 100. (For example, if  $VBW$  and/or  $RBW$  are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if  $T \leq 16.7 \mu s$ .)

### **3.8 Antenna Requirement**

#### **3.8.1 Applicable Standard**

FCC §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. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

#### **3.8.2 Judgment**

**Compliant.** Please refer to the Antenna Information detail in Section 1.

## 4. Test DATA AND RESULTS

### 4.1 AC Line Conducted Emissions

Serial Number:	CR230850531-RF-S1 for model: AVIBG21AUFL; CR230850531-RF-S2 for model: AVIBG21AVIA	Test Date:	2023/09/12
Test Site:	CE	Test Mode:	Transmitting (BLE 1Mbps middle channel was the worst)
Tester:	David Huang	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	24.8	Relative Humidity: (%)	56	ATM Pressure: (kPa)	100.1

### Test Equipment List and Details:

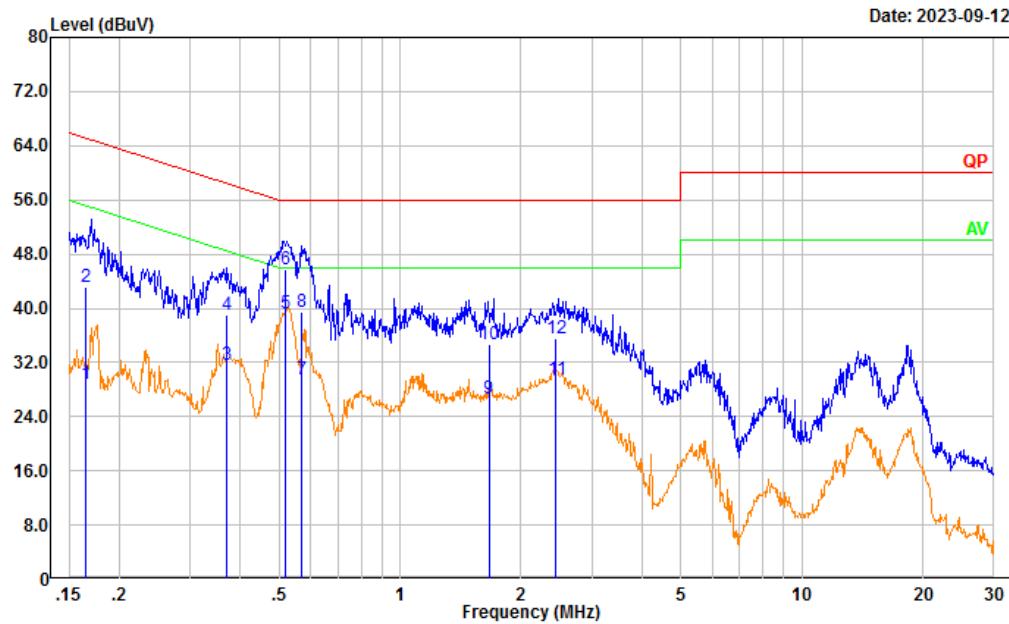
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV216	101134	2023/03/31	2024/03/30
R&S	EMI Test Receiver	ESR3	102726	2023/03/31	2024/03/30
MICRO-COAX	Coaxial Cable	UTIFLEX	C-0200-01	2023/08/06	2024/08/05
Audix	Test Software	E3	190306 (V9)	N/A	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data:

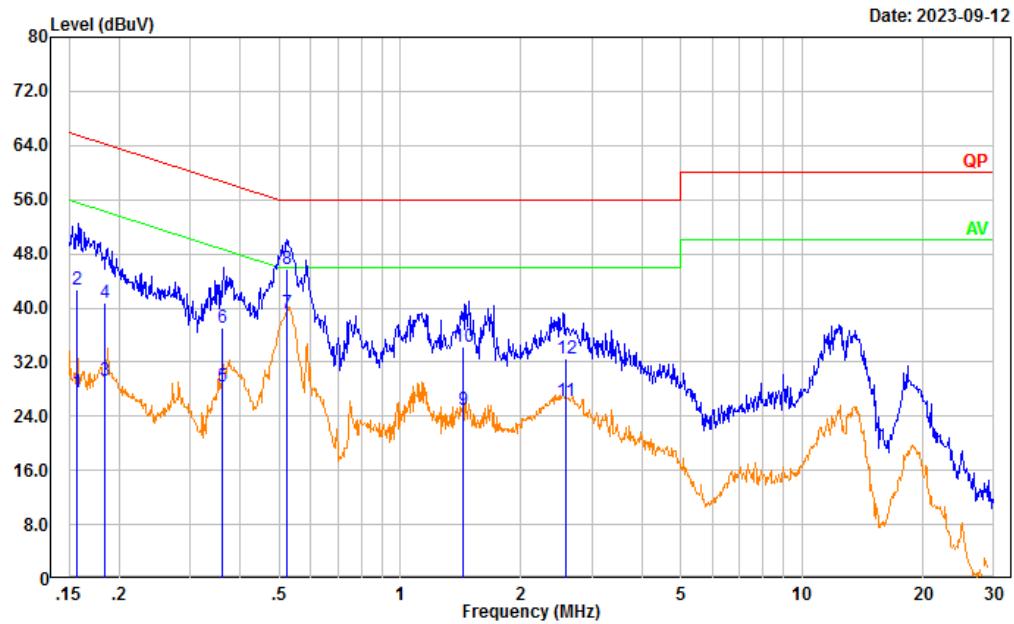
## For Model AVIBG21AVIA:

Project No.: CR230850531-RF  
Tester: David Huang  
Port: Line  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
1	0.166	19.27	9.61	28.88	55.18	26.30	Average
2	0.166	33.55	9.61	43.16	65.18	22.02	QP
3	0.372	22.04	9.61	31.65	48.47	16.82	Average
4	0.372	29.51	9.61	39.12	58.47	19.35	QP
5	0.518	29.68	9.61	39.29	46.00	6.71	Average
6	0.518	36.03	9.61	45.64	56.00	10.36	QP
7	0.571	19.96	9.62	29.58	46.00	16.42	Average
8	0.571	29.83	9.62	39.45	56.00	16.55	QP
9	1.663	17.10	9.63	26.73	46.00	19.27	Average
10	1.663	25.14	9.63	34.77	56.00	21.23	QP
11	2.444	19.85	9.64	29.49	46.00	16.51	Average
12	2.444	25.98	9.64	35.62	56.00	20.38	QP

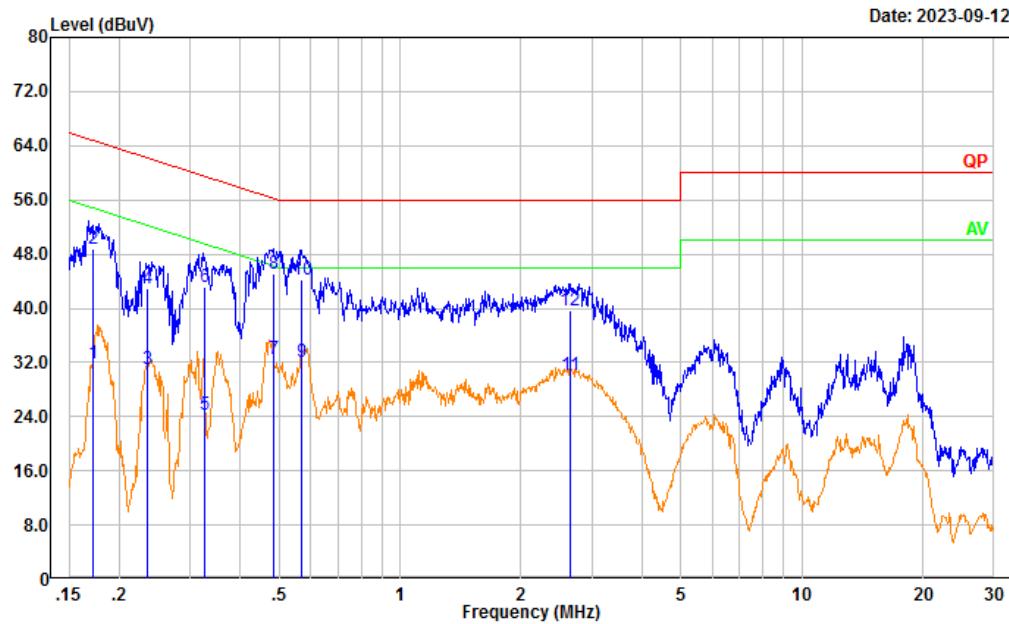
Project No.: CR230850531-RF  
Tester: David Huang  
Port: neutral  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
<hr/>							
1	0.157	17.99	9.61	27.60	55.61	28.01	Average
2	0.157	33.11	9.61	42.72	65.61	22.89	QP
3	0.184	19.62	9.61	29.23	54.31	25.08	Average
4	0.184	31.08	9.61	40.69	64.31	23.62	QP
5	0.362	18.88	9.61	28.49	48.67	20.18	Average
6	0.362	27.50	9.61	37.11	58.67	21.56	QP
7	0.525	29.69	9.61	39.30	46.00	6.70	Average
8	0.525	36.07	9.61	45.68	56.00	10.32	QP
9	1.434	15.23	9.62	24.85	46.00	21.15	Average
10	1.434	24.65	9.62	34.27	56.00	21.73	QP
11	2.579	16.52	9.64	26.16	46.00	19.84	Average
12	2.579	22.90	9.64	32.54	56.00	23.46	QP

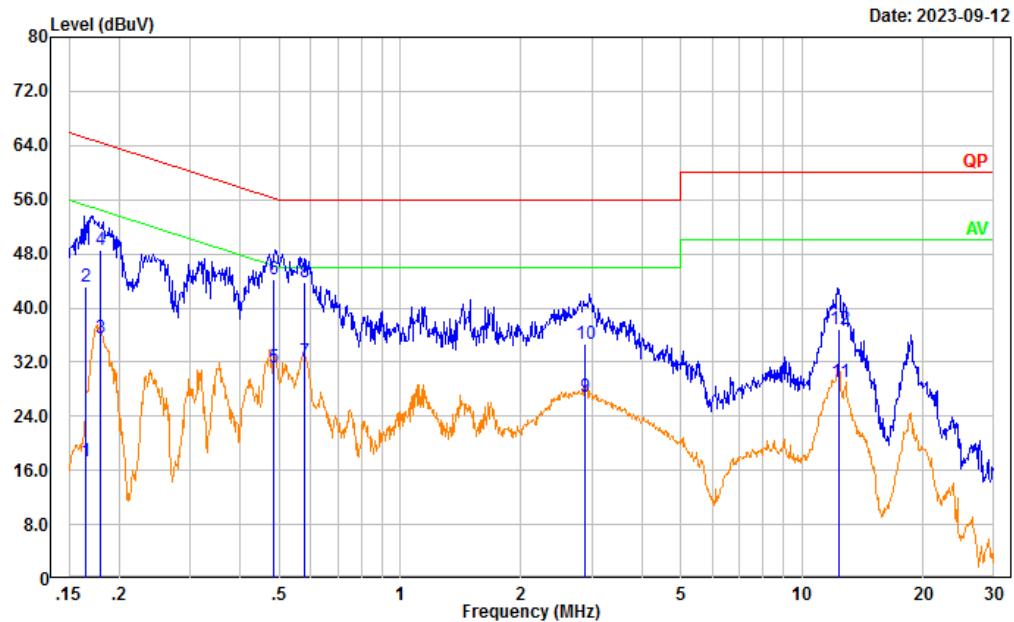
## For Model AVIBG21AUFL\_6012ANT:

Project No.: CR230850531-RF  
Tester: David Huang  
Port: Line  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
1	0.172	22.29	9.61	31.90	54.87	22.97	Average
2	0.172	39.12	9.61	48.73	64.87	16.14	QP
3	0.235	21.46	9.61	31.07	52.26	21.19	Average
4	0.235	33.37	9.61	42.98	62.26	19.28	QP
5	0.326	14.61	9.61	24.22	49.54	25.32	Average
6	0.326	33.49	9.61	43.10	59.54	16.44	QP
7	0.485	22.85	9.61	32.46	46.25	13.79	Average
8	0.485	35.52	9.61	45.13	56.25	11.12	QP
9	0.568	22.49	9.62	32.11	46.00	13.89	Average
10	0.568	34.67	9.62	44.29	56.00	11.71	QP
11	2.641	20.40	9.64	30.04	46.00	15.96	Average
12	2.641	30.00	9.64	39.64	56.00	16.36	QP

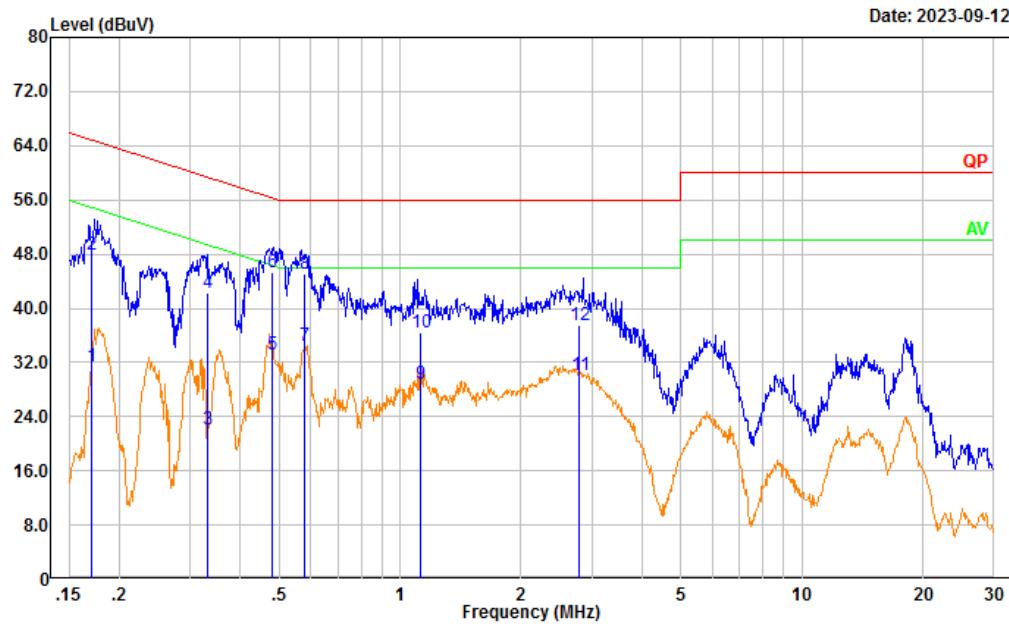
Project No.: CR230850531-RF  
Tester: David Huang  
Port: neutral  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
<hr/>							
1	0.166	7.68	9.61	17.29	55.18	37.89	Average
2	0.166	33.43	9.61	43.04	65.18	22.14	QP
3	0.180	25.91	9.61	35.52	54.48	18.96	Average
4	0.180	38.91	9.61	48.52	64.48	15.96	QP
5	0.485	21.59	9.61	31.20	46.25	15.05	Average
6	0.485	34.66	9.61	44.27	56.25	11.98	QP
7	0.577	22.48	9.62	32.10	46.00	13.90	Average
8	0.577	34.10	9.62	43.72	56.00	12.28	QP
9	2.886	17.14	9.65	26.79	46.00	19.21	Average
10	2.886	25.13	9.65	34.78	56.00	21.22	QP
11	12.397	19.36	9.67	29.03	50.00	20.97	Average
12	12.397	27.23	9.67	36.90	60.00	23.10	QP

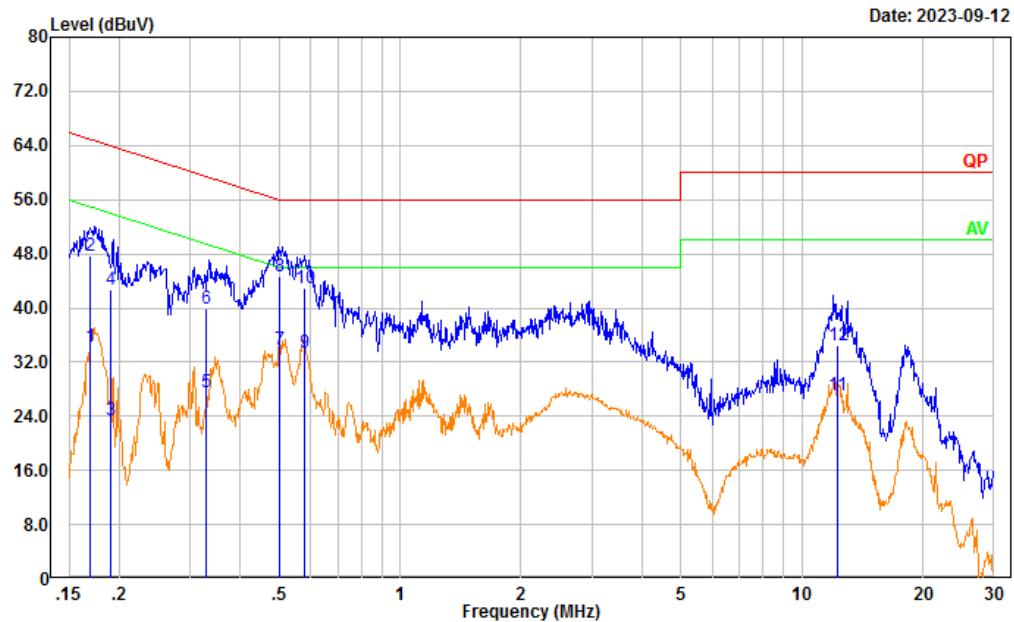
## For Model AVIBG21AUFL\_6015ANT:

Project No.: CR230850531-RF  
Tester: David Huang  
Port: Line  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
1	0.171	21.86	9.61	31.47	54.93	23.46	Average
2	0.171	38.24	9.61	47.85	64.93	17.08	QP
3	0.331	12.43	9.61	22.04	49.42	27.38	Average
4	0.331	32.58	9.61	42.19	59.42	17.23	QP
5	0.481	23.59	9.61	33.20	46.33	13.13	Average
6	0.481	35.63	9.61	45.24	56.33	11.09	QP
7	0.581	24.81	9.62	34.43	46.00	11.57	Average
8	0.581	35.56	9.62	45.18	56.00	10.82	QP
9	1.120	19.12	9.62	28.74	46.00	17.26	Average
10	1.120	26.74	9.62	36.36	56.00	19.64	QP
11	2.793	20.54	9.65	30.19	46.00	15.81	Average
12	2.793	27.95	9.65	37.60	56.00	18.40	QP

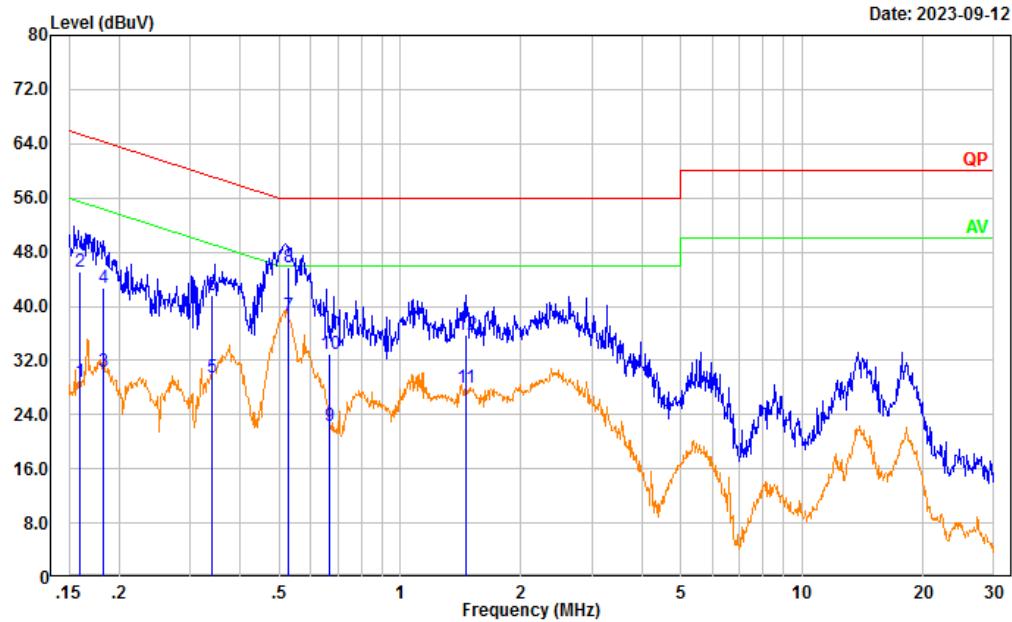
Project No.: CR230850531-RF  
Tester: David Huang  
Port: neutral  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
<hr/>							
1	0.169	24.56	9.61	34.17	54.99	20.82	Average
2	0.169	38.13	9.61	47.74	64.99	17.25	QP
3	0.191	13.75	9.61	23.36	53.99	30.63	Average
4	0.191	33.00	9.61	42.61	63.99	21.38	QP
5	0.329	17.87	9.61	27.48	49.47	21.99	Average
6	0.329	30.18	9.61	39.79	59.47	19.68	QP
7	0.501	24.20	9.61	33.81	46.00	12.19	Average
8	0.501	34.98	9.61	44.59	56.00	11.41	QP
9	0.580	23.87	9.62	33.49	46.00	12.51	Average
10	0.580	33.36	9.62	42.98	56.00	13.02	QP
11	12.262	17.50	9.67	27.17	50.00	22.83	Average
12	12.262	24.70	9.67	34.37	60.00	25.63	QP

## For Model AVIBG21AUFL\_6211ANT:

Project No.: CR230850531-RF  
Tester: David Huang  
Port: Line  
Note:



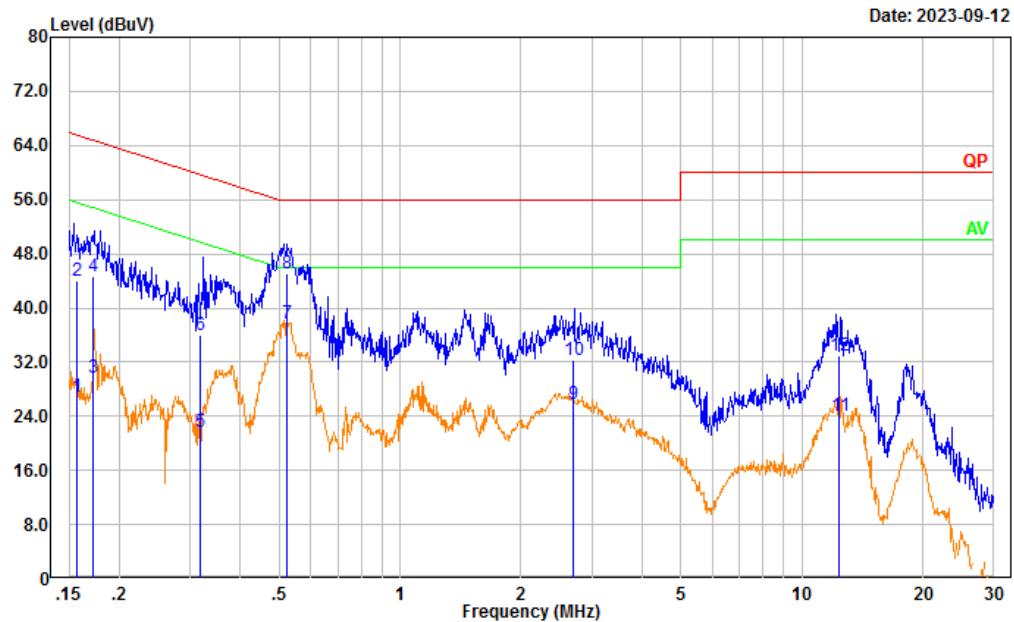
No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
1	0.159	19.24	9.61	28.85	55.51	26.66	Average
2	0.159	35.44	9.61	45.05	65.51	20.46	QP
3	0.182	20.64	9.61	30.25	54.38	24.13	Average
4	0.182	33.13	9.61	42.74	64.38	21.64	QP
5	0.340	19.90	9.61	29.51	49.19	19.68	Average
6	0.340	31.94	9.61	41.55	59.19	17.64	QP
7	0.528	28.99	9.61	38.60	46.00	7.40	Average
8	0.528	36.06	9.61	45.67	56.00	10.33	QP
9	0.670	12.77	9.62	22.39	46.00	23.61	Average
10	0.670	23.32	9.62	32.94	56.00	23.06	QP
11	1.454	18.24	9.62	27.86	46.00	18.14	Average
12	1.454	26.22	9.62	35.84	56.00	20.16	QP

Project No.: CR230850531-RF

Tester: David Huang

Port: neutral

Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Detector
1	0.156	17.28	9.61	26.89	55.65	28.76	Average
2	0.156	34.36	9.61	43.97	65.65	21.68	QP
3	0.173	20.13	9.61	29.74	54.82	25.08	Average
4	0.173	35.03	9.61	44.64	64.82	20.18	QP
5	0.318	11.97	9.61	21.58	49.76	28.18	Average
6	0.318	26.40	9.61	36.01	59.76	23.75	QP
7	0.522	28.10	9.61	37.71	46.00	8.29	Average
8	0.522	35.55	9.61	45.16	56.00	10.84	QP
9	2.703	16.24	9.64	25.88	46.00	20.12	Average
10	2.703	22.74	9.64	32.38	56.00	23.62	QP
11	12.388	14.49	9.67	24.16	50.00	25.84	Average
12	12.388	23.20	9.67	32.87	60.00	27.13	QP

## 4.2 Radiation Spurious Emissions

Serial Number:	CR230850531-RF-S1 for model: AVIBG21AUFL CR230850531-RF-S2 for model: AVIBG21AVIA	Test Date:	2023/9/7~2023/9/12
Test Site:	966-2, 966-1	Test Mode:	Transmitting
Tester:	Hugo Huo, Tao Zhu	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	23~25.6	Relative Humidity: (%)	52~64	ATM Pressure: (kPa)	100~101

### Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB6	A082520-5	2020/10/19	2023/10/18
R&S	EMI Test Receiver	ESR3	102724	2023/3/31	2024/3/30
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0470-02	2023/7/16	2024/7/15
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0780-01	2023/7/16	2024/7/15
Sonoma	Amplifier	310N	186165	2023/7/16	2024/7/15
Audix	Test Software	E3	201021 (V9)	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	9912-5985	2020/10/13	2023/10/12
R&S	Spectrum Analyzer	FSV40	101591	2023/3/31	2024/3/30
MICRO-COAX	Coaxial Cable	UFA210A-1-1200-70U300	217423-008	2023/8/6	2024/8/5
MICRO-COAX	Coaxial Cable	UFA210A-1-2362-300300	235780-001	2023/8/6	2024/8/5
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2022/11/9	2023/11/8
Audix	Test Software	E3	201021 (V9)	N/A	N/A
PASTERNACK	Horn Antenna	PE9852/2F-20	112002	2021/2/5	2024/2/4
Quinstar	Preamplifier	QLW-18405536-JO	15964001005	2022/9/16	2023/9/15
MICRO-COAX	Coaxial Cable	UFB142A-1-2362-200200	235772-001	2023/8/6	2024/8/5
E-Microwave	Band Rejection Filter	2400-2483.5MHz	OE01902424	2023/8/6	2024/8/5
Mini Circuits	High Pass Filter	VHF-6010+	31119	2023/8/6	2024/8/5

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

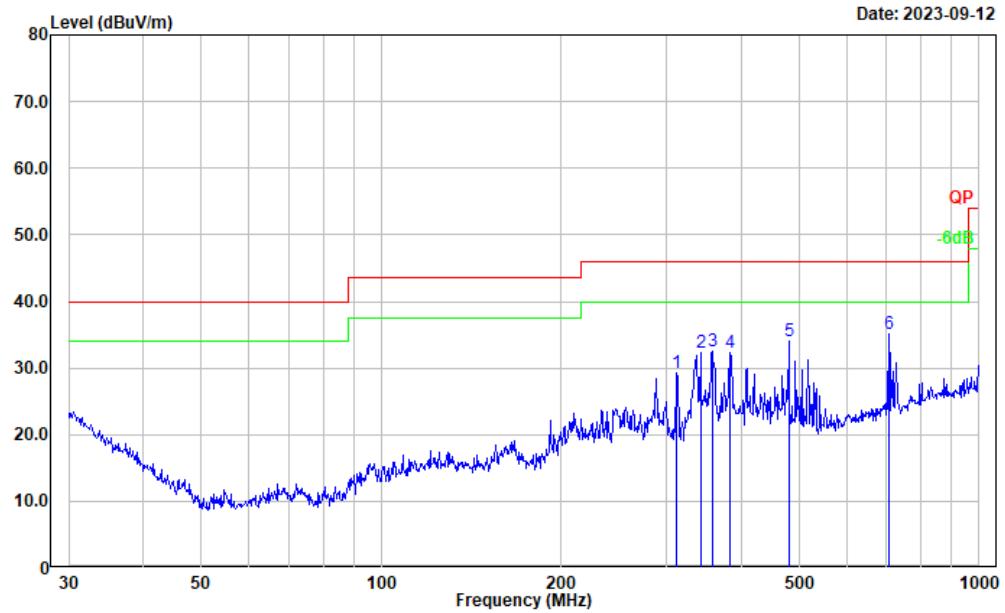
### Test Data:

Please refer to the below table and plots.

After pre-scan in the X, Y and Z axes of orientation, the worst case is below:

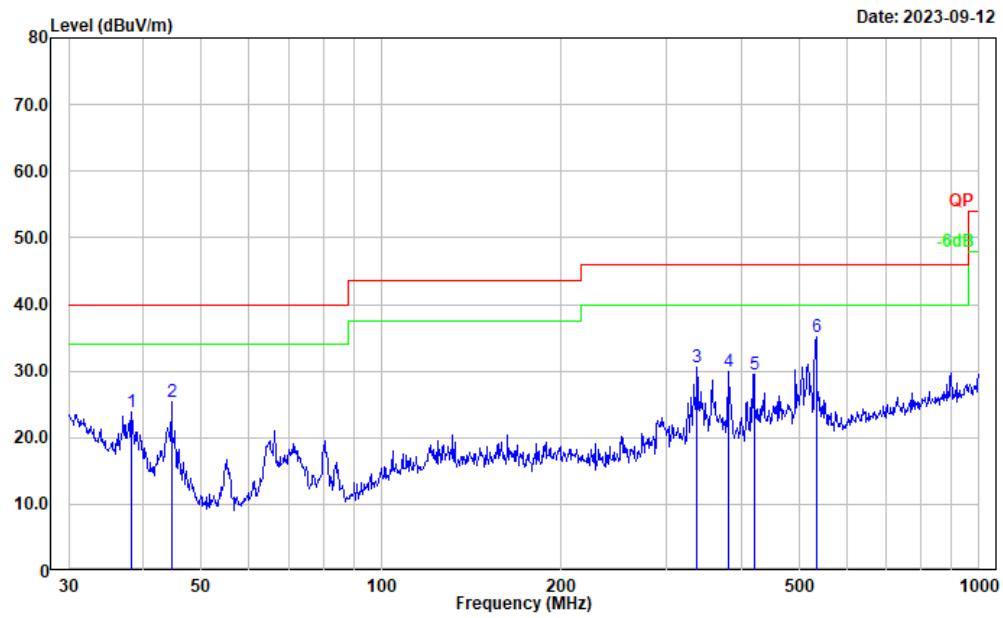
**For Model AVIBG21AVIA:****1) 30MHz-1GHz (1Mbps low channel was the worst)**

Project No.: CR230850531-RF  
Tester: Hugo Huo  
Polarization: horizontal  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	312.179	39.95	-10.60	29.35	46.00	16.65	Peak
2	341.979	42.29	-10.05	32.24	46.00	13.76	Peak
3	357.929	42.41	-9.88	32.53	46.00	13.47	Peak
4	383.932	41.42	-9.03	32.39	46.00	13.61	Peak
5	480.528	40.21	-6.25	33.96	46.00	12.04	Peak
6	706.700	38.55	-3.49	35.06	46.00	10.94	Peak

Project No.: CR230850531-RF  
Tester: Hugo Huo  
Polarization: vertical  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	38.212	33.71	-9.91	23.80	40.00	16.20	Peak
2	44.587	39.27	-14.00	25.27	40.00	14.73	Peak
3	337.216	40.69	-10.10	30.59	46.00	15.41	Peak
4	379.914	38.97	-9.10	29.87	46.00	16.13	Peak
5	420.580	37.38	-7.90	29.48	46.00	16.52	Peak
6	533.832	41.03	-6.00	35.03	46.00	10.97	Peak

**2) 1-25GHz:****BLE 1Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	28.77	PK	H	31.46	60.23	74.00	13.77
2390.000	16.11	AV	H	31.46	47.57	54.00	6.43
4804.000	41.30	PK	H	10.91	52.21	74.00	21.79
4804.000	29.68	AV	H	10.91	40.59	54.00	13.41
Middle Channel: 2440 MHz							
4880.000	39.95	PK	H	11.07	51.02	74.00	22.98
4880.000	29.05	AV	H	11.07	40.12	54.00	13.88
High Channel: 2480 MHz							
2483.500	28.15	PK	H	31.64	59.79	74.00	14.21
2483.500	16.46	AV	H	31.64	48.10	54.00	5.90
4960.000	40.39	PK	H	11.23	51.62	74.00	22.38
4960.000	29.06	AV	H	11.23	40.29	54.00	13.71

**BLE 2Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	28.10	PK	H	31.46	59.56	74.00	14.44
2390.000	16.98	AV	H	31.46	48.44	54.00	5.56
4804.000	39.59	PK	H	10.91	50.50	74.00	23.50
4804.000	27.56	AV	H	10.91	38.47	54.00	15.53
Middle Channel: 2440 MHz							
4880.000	39.53	PK	H	11.07	50.60	74.00	23.40
4880.000	27.34	AV	H	11.07	38.41	54.00	15.59
High Channel: 2480 MHz							
2483.500	29.31	PK	H	31.64	60.95	74.00	13.05
2483.500	17.38	AV	H	31.64	49.02	54.00	4.98
4960.000	38.62	PK	H	11.23	49.85	74.00	24.15
4960.000	23.95	AV	H	11.23	35.18	54.00	18.82

For Model AVIBG21AUFL\_6012ANT:

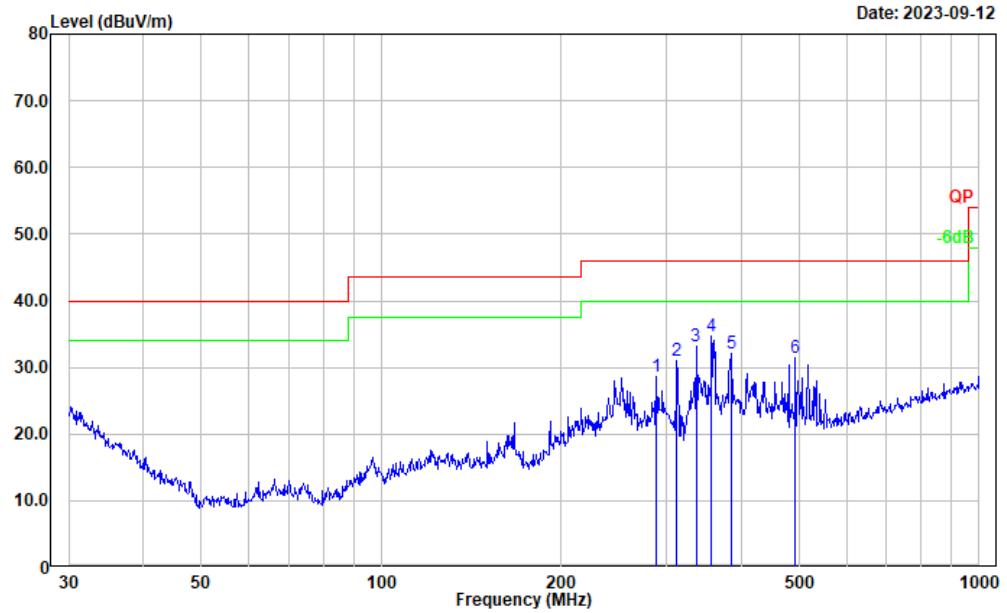
1) 30MHz-1GHz (1Mbps low channel was the worst)

Project No.: CR230850531-RF

Tester: Hugo Huo

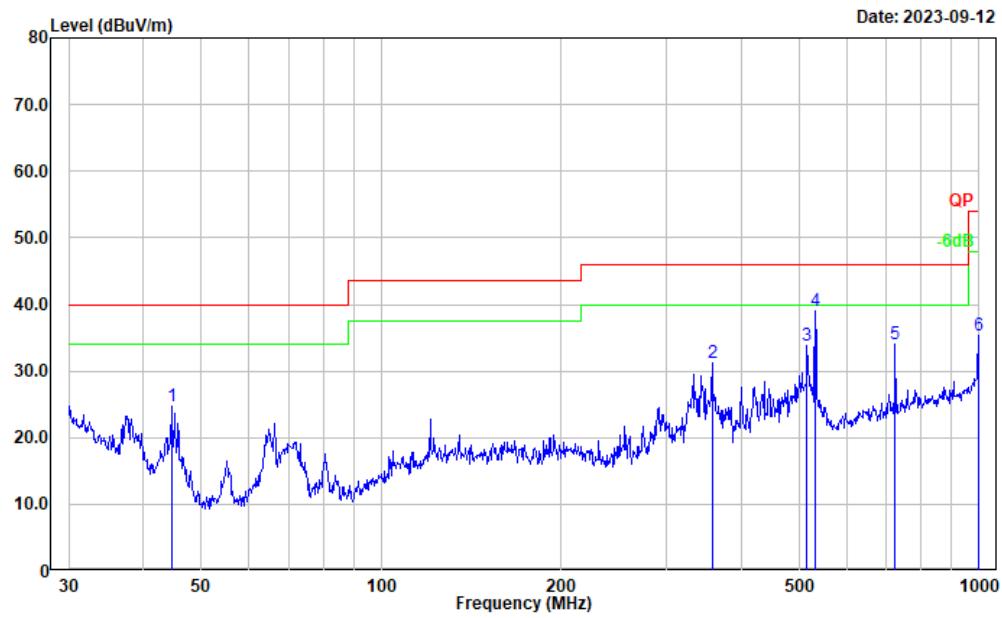
Polarization: horizontal

Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	287.990	39.85	-11.16	28.69	46.00	17.31	Peak
2	312.179	41.50	-10.60	30.90	46.00	15.10	Peak
3	336.035	43.29	-10.13	33.16	46.00	12.84	Peak
4	356.676	44.53	-9.89	34.64	46.00	11.36	Peak
5	385.281	41.15	-9.00	32.15	46.00	13.85	Peak
6	492.469	37.59	-6.18	31.41	46.00	14.59	Peak

Project No.: CR230850531-RF  
Tester: Hugo Huo  
Polarization: vertical  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	44.587	38.70	-14.00	24.70	40.00	15.30	Peak
2	357.929	41.03	-9.88	31.15	46.00	14.85	Peak
3	515.437	39.71	-5.83	33.88	46.00	12.12	Peak
4	531.964	44.93	-5.99	38.94	46.00	7.06	Peak
5	724.261	37.09	-3.10	33.99	46.00	12.01	Peak
6	996.500	34.29	0.94	35.23	54.00	18.77	Peak

**2) 1-25GHz:****BLE 1Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	28.85	PK	H	31.46	60.31	74.00	13.69
2390.000	17.12	AV	H	31.46	48.58	54.00	5.42
4804.000	41.07	PK	H	10.91	51.98	74.00	22.02
4804.000	28.60	AV	H	10.91	39.51	54.00	14.49
Middle Channel: 2440 MHz							
4880.000	39.74	PK	H	11.07	50.81	74.00	23.19
4880.000	26.42	AV	H	11.07	37.49	54.00	16.51
High Channel: 2480 MHz							
2483.500	36.85	PK	H	31.64	68.49	74.00	5.51
2483.500	19.35	AV	H	31.64	50.99	54.00	3.01
4960.000	39.64	PK	H	11.23	50.87	74.00	23.13
4960.000	26.21	AV	H	11.23	37.44	54.00	16.56

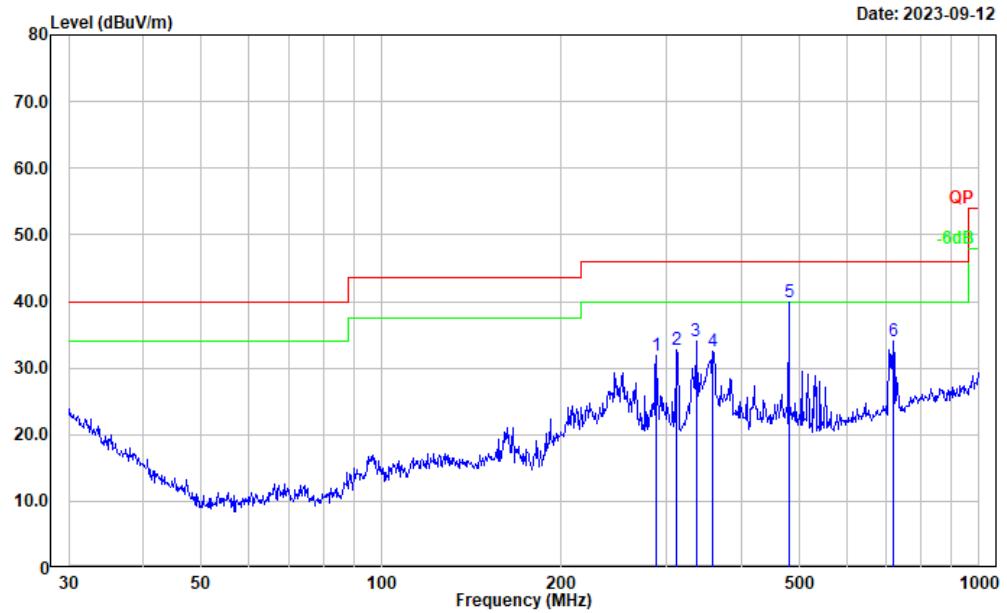
**BLE 2Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	27.79	PK	H	31.46	59.25	74.00	14.75
2390.000	16.73	AV	H	31.46	48.19	54.00	5.81
4804.000	40.49	PK	H	10.91	51.40	74.00	22.60
4804.000	28.04	AV	H	10.91	38.95	54.00	15.05
Middle Channel: 2440 MHz							
4880.000	38.97	PK	H	11.07	50.04	74.00	23.96
4880.000	26.61	AV	H	11.07	37.68	54.00	16.32
High Channel: 2480 MHz							
2483.500	36.58	PK	H	31.64	68.22	74.00	5.78
2483.500	20.22	AV	H	31.64	51.86	54.00	2.14
4960.000	38.90	PK	H	11.23	50.13	74.00	23.87
4960.000	26.71	AV	H	11.23	37.94	54.00	16.06

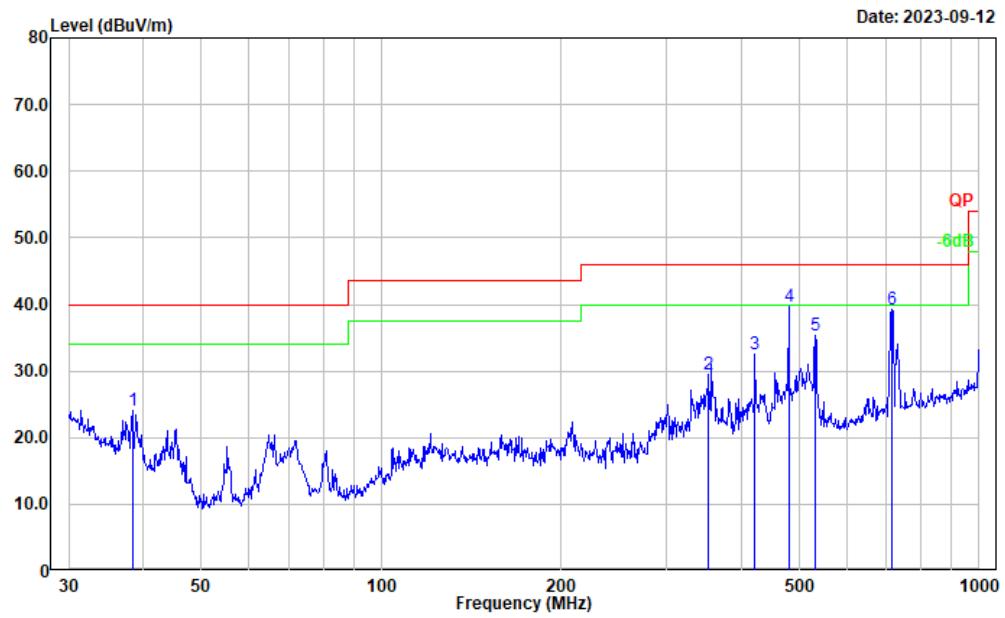
## For Model AVIBG21AUFL\_6015ANT

1) 30MHz-1GHz (1Mbps low channel was the worst)

Project No.: CR230850531-RF  
Tester: Hugo Huo  
Polarization: horizontal  
Note:



Project No.: CR230850531-RF  
Tester: Hugo Huo  
Polarization: vertical  
Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	38.346	33.99	-10.00	23.99	40.00	16.01	Peak
2	352.943	39.45	-9.98	29.47	46.00	16.53	Peak
3	422.058	40.30	-7.83	32.47	46.00	13.53	Peak
4	480.528	46.03	-6.25	39.78	46.00	6.22	Peak
5	531.964	41.36	-5.99	35.37	46.00	10.63	Peak
6	714.173	42.55	-3.39	39.16	46.00	6.84	Peak

**2) 1-25GHz:****BLE 1Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	33.27	PK	H	31.46	64.73	74.00	9.27
2390.000	16.87	AV	H	31.46	48.33	54.00	5.67
4804.000	44.17	PK	H	10.91	55.08	74.00	18.92
4804.000	37.94	AV	H	10.91	48.85	54.00	5.15
Middle Channel: 2440 MHz							
4880.000	44.00	PK	H	11.07	55.07	74.00	18.93
4880.000	38.45	AV	H	11.07	49.52	54.00	4.48
High Channel: 2480 MHz							
2483.500	33.20	PK	H	31.64	64.84	74.00	9.16
2483.500	18.02	AV	H	31.64	49.66	54.00	4.34
4960.000	44.50	PK	H	11.23	55.73	74.00	18.27
4960.000	37.67	AV	H	11.23	48.90	54.00	5.10

**BLE 2Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	32.44	PK	H	31.46	63.90	74.00	10.10
2390.000	17.07	AV	H	31.46	48.53	54.00	5.47
4804.000	43.07	PK	H	10.91	53.98	74.00	20.02
4804.000	30.76	AV	H	10.91	41.67	54.00	12.33
Middle Channel: 2440 MHz							
4880.000	42.74	PK	H	11.07	53.81	74.00	20.19
4880.000	29.52	AV	H	11.07	40.59	54.00	13.41
High Channel: 2480 MHz							
2483.500	32.62	PK	H	31.64	64.26	74.00	9.74
2483.500	18.23	AV	H	31.64	49.87	54.00	4.13
4960.000	44.38	PK	H	11.23	55.61	74.00	18.39
4960.000	35.55	AV	H	11.23	46.78	54.00	7.22

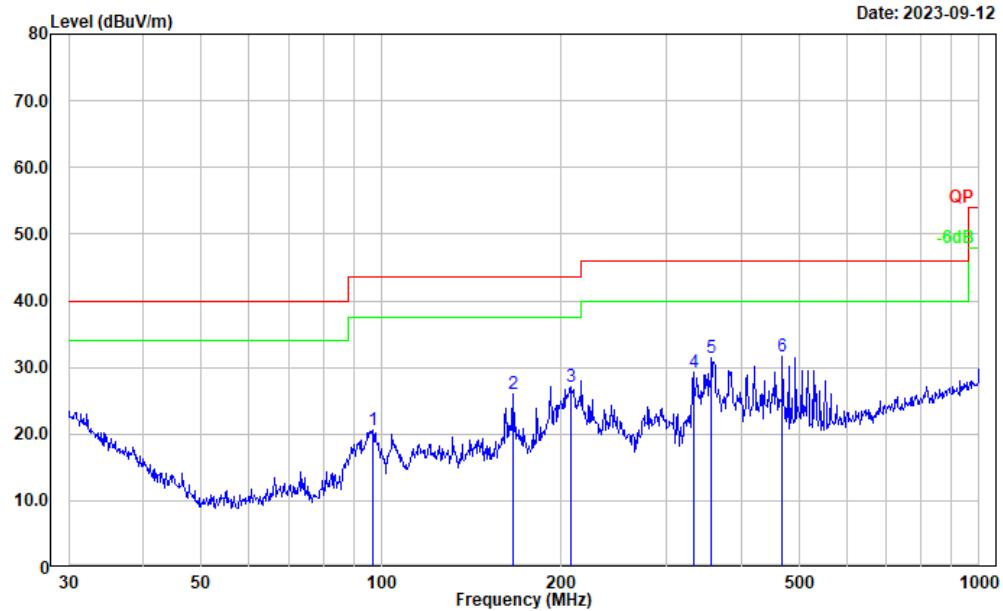
**For Model AVIBG21AUFL\_6211ANT****1) 30MHz-1GHz (1Mbps low channel was the worst)**

Project No.: CR230850531-RF

Tester: Hugo Huo

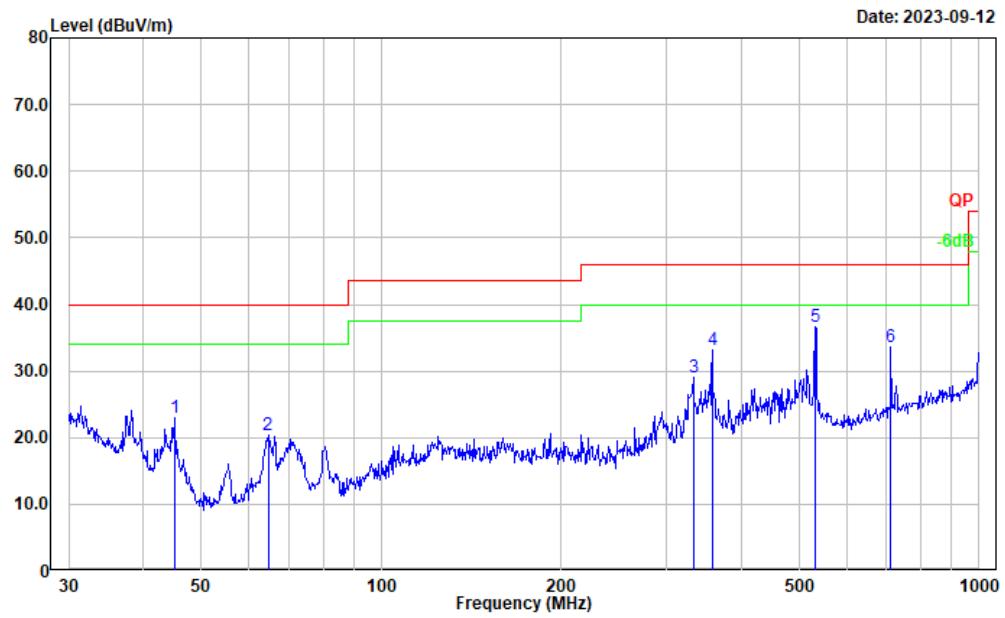
Polarization: horizontal

Note:



No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	96.775	35.70	-15.13	20.57	43.50	22.93	Peak
2	166.068	38.48	-12.54	25.94	43.50	17.56	Peak
3	207.123	39.45	-12.40	27.05	43.50	16.45	Peak
4	332.519	39.54	-10.19	29.35	46.00	16.65	Peak
5	356.676	41.28	-9.89	31.39	46.00	14.61	Peak
6	468.876	38.13	-6.38	31.75	46.00	14.25	Peak

Project No.: CR230850531-RF  
Tester: Hugo Huo  
Polarization: vertical  
Note:



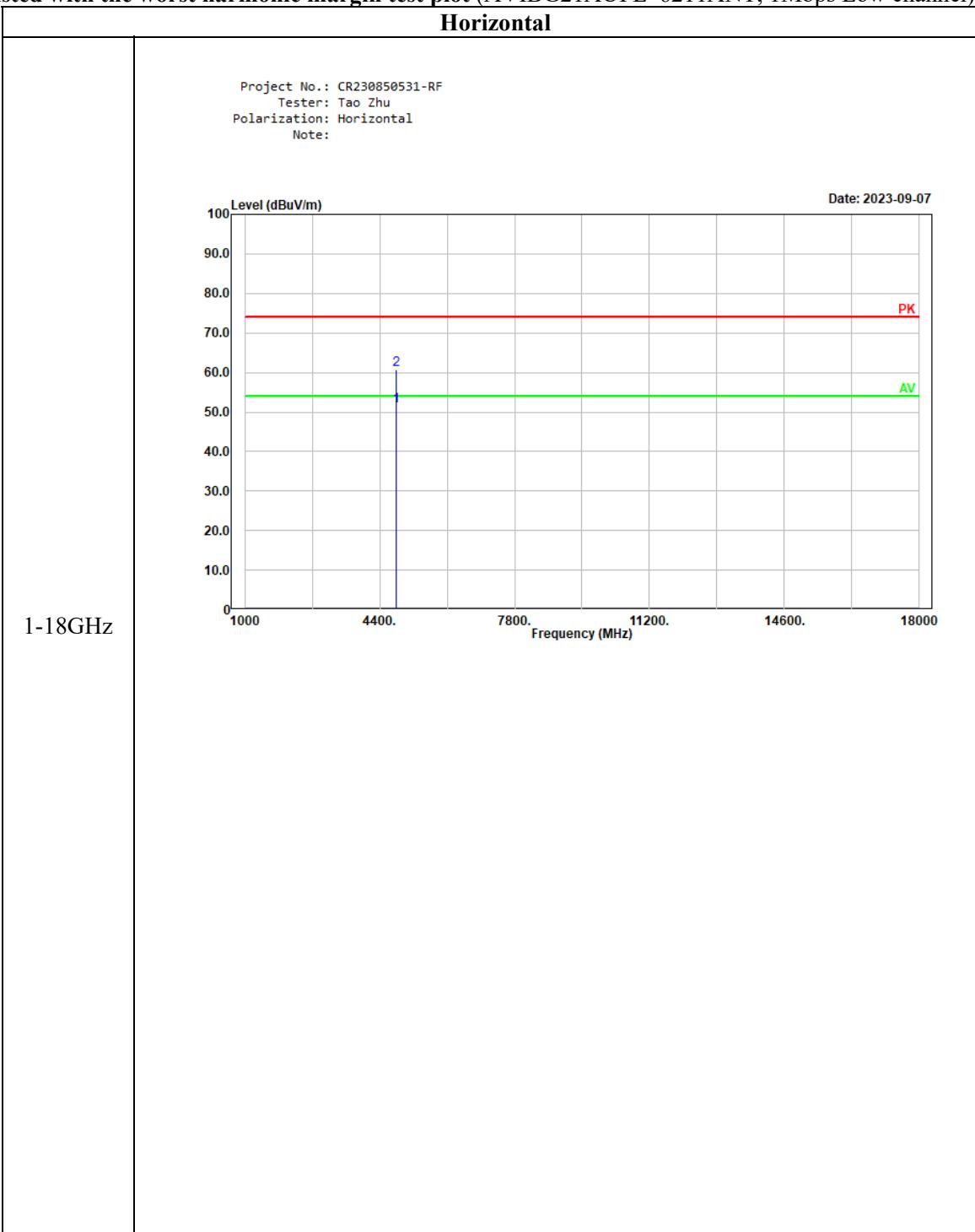
No.	Frequency (MHz)	Reading (dB $\mu$ V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
1	45.058	37.18	-14.25	22.93	40.00	17.07	Peak
2	64.659	37.26	-16.96	20.30	40.00	19.70	Peak
3	332.519	39.22	-10.19	29.03	46.00	16.97	Peak
4	357.929	43.12	-9.88	33.24	46.00	12.76	Peak
5	531.964	42.61	-5.99	36.62	46.00	9.38	Peak
6	711.674	37.13	-3.44	33.69	46.00	12.31	Peak

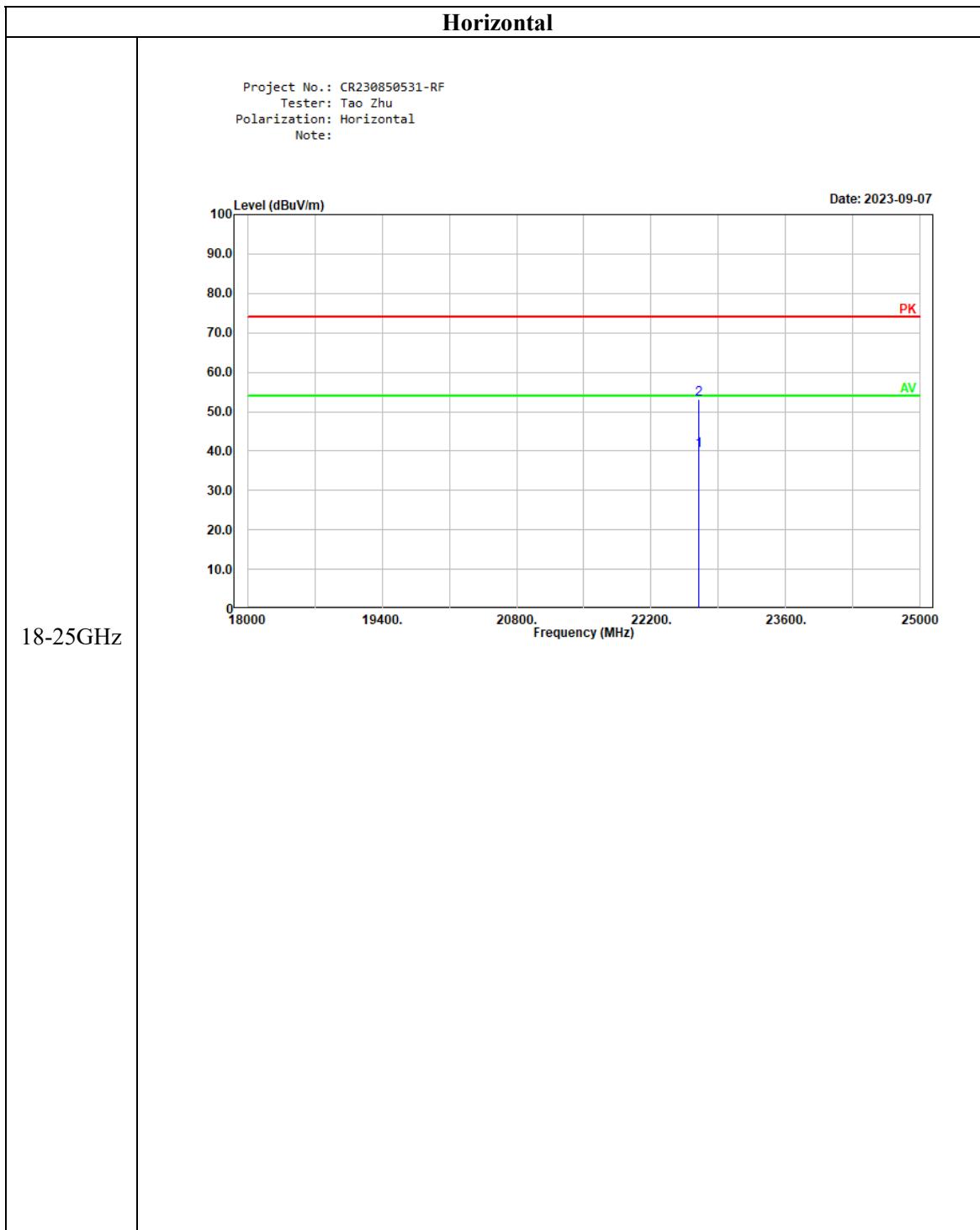
**2) 1-25GHz:****BLE 1Mbps:**

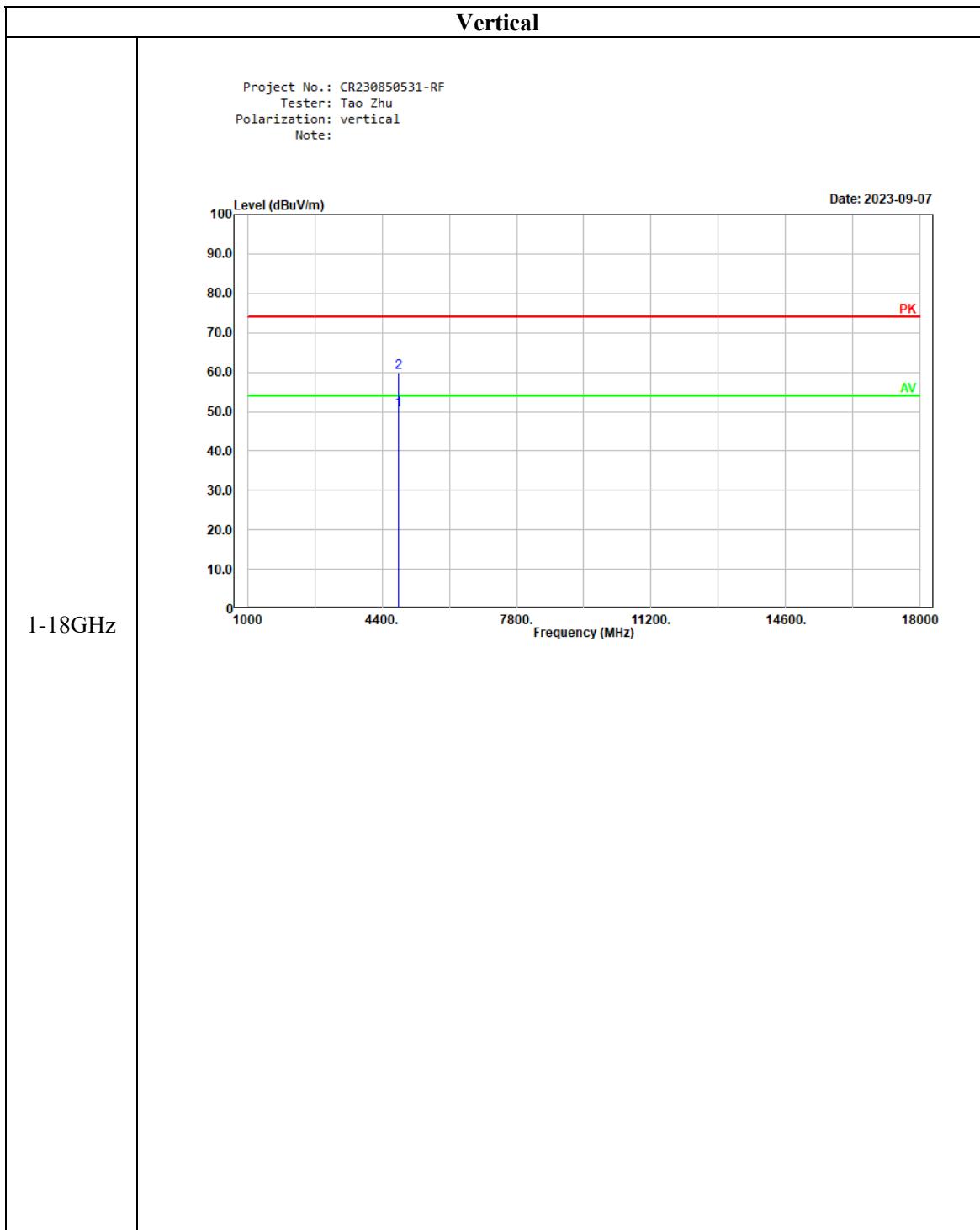
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	24.02	PK	H	31.46	55.48	74.00	18.52
2390.000	12.02	AV	H	31.46	43.48	54.00	10.52
4804.000	49.28	PK	H	10.91	60.19	74.00	13.81
4804.000	40.12	AV	H	10.91	51.03	54.00	2.97
Middle Channel: 2440 MHz							
4880.000	49.11	PK	H	11.07	60.18	74.00	13.82
4880.000	39.95	AV	H	11.07	51.02	54.00	2.98
High Channel: 2480 MHz							
2483.500	35.33	PK	H	31.64	66.97	74.00	7.03
2483.500	16.41	AV	H	31.64	48.05	54.00	5.95
4960.000	43.21	PK	H	11.23	54.44	74.00	19.56
4960.000	33.97	AV	H	11.23	45.20	54.00	8.80

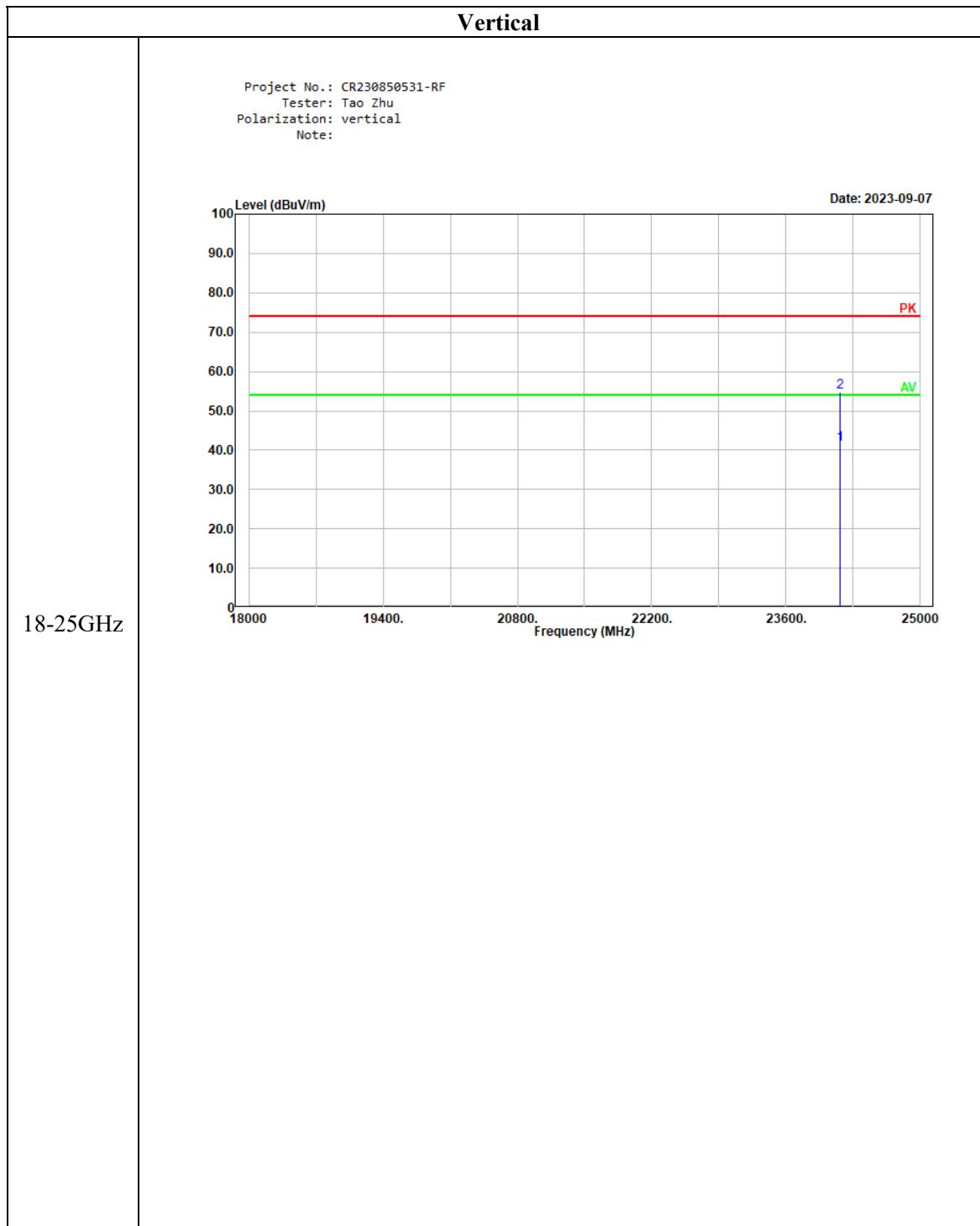
**BLE 2Mbps:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Detector					
Low Channel: 2402 MHz							
2390.000	23.13	PK	H	31.46	54.59	74.00	19.41
2390.000	12.98	AV	H	31.46	44.44	54.00	9.56
4804.000	44.14	PK	H	10.91	55.05	74.00	18.95
4804.000	37.12	AV	H	10.91	48.03	54.00	5.97
Middle Channel: 2440 MHz							
4880.000	44.90	PK	H	11.07	55.97	74.00	18.03
4880.000	35.74	AV	H	11.07	46.81	54.00	7.19
High Channel: 2480 MHz							
2483.500	31.81	PK	H	31.64	63.45	74.00	10.55
2483.500	19.81	AV	H	31.64	51.45	54.00	2.55
4960.000	45.17	PK	H	11.23	56.40	74.00	17.60
4960.000	36.02	AV	H	11.23	47.25	54.00	6.75

**Listed with the worst harmonic margin test plot (AVIBG21AUFL 6211ANT, 1Mbps Low channel)**







### 4.3 6 dB Emission Bandwidth

Serial Number:	CR230850531-RF-S1	Test Date:	2023/9/7
Test Site:	RF	Test Mode:	Transmitting
Tester:	Len Huang	Test Result:	Pass

#### Environmental Conditions:

Temperature: (°C)	25.8	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101
-------------------	------	------------------------	----	---------------------	-----

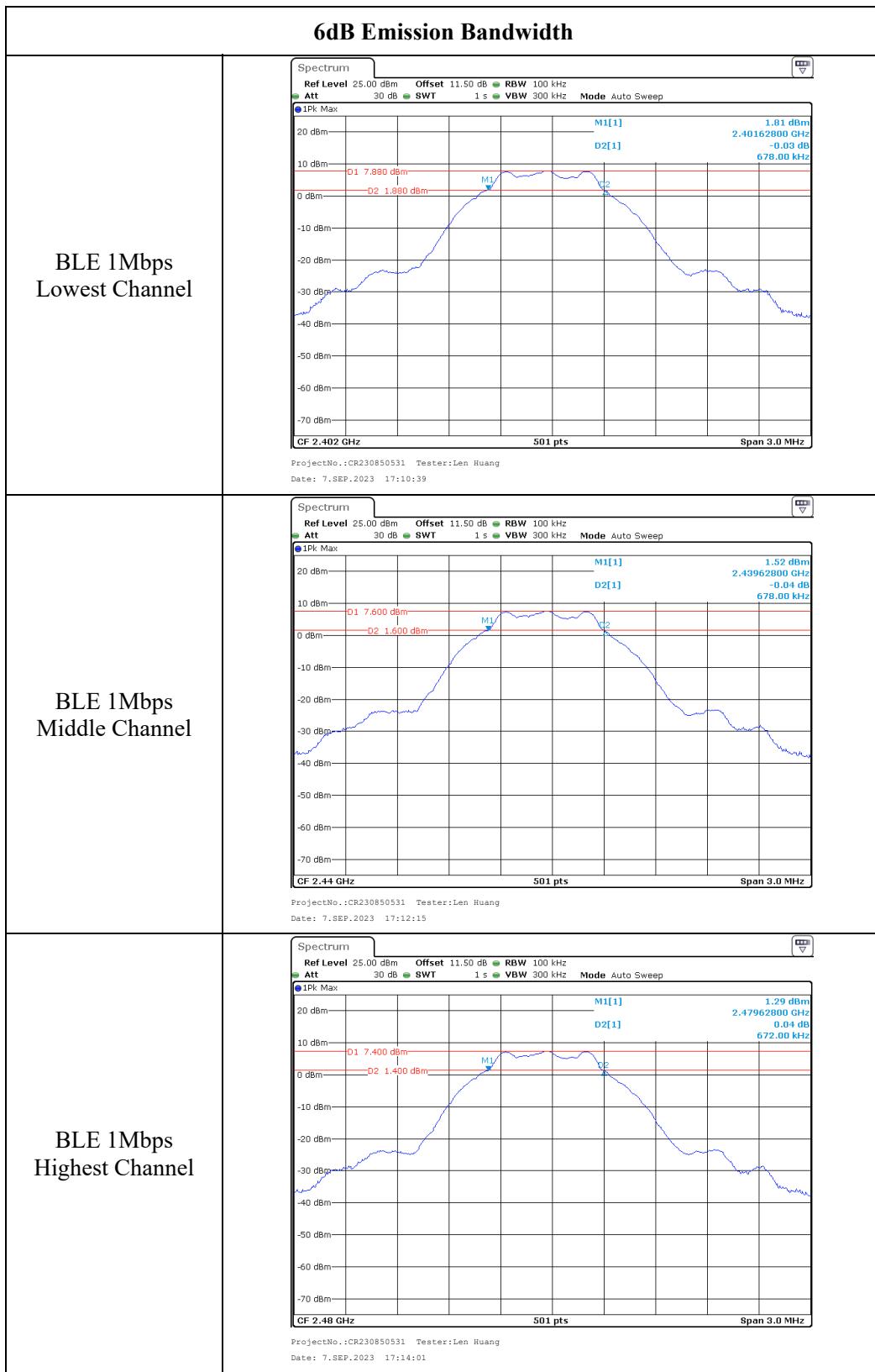
#### Test Equipment List and Details:

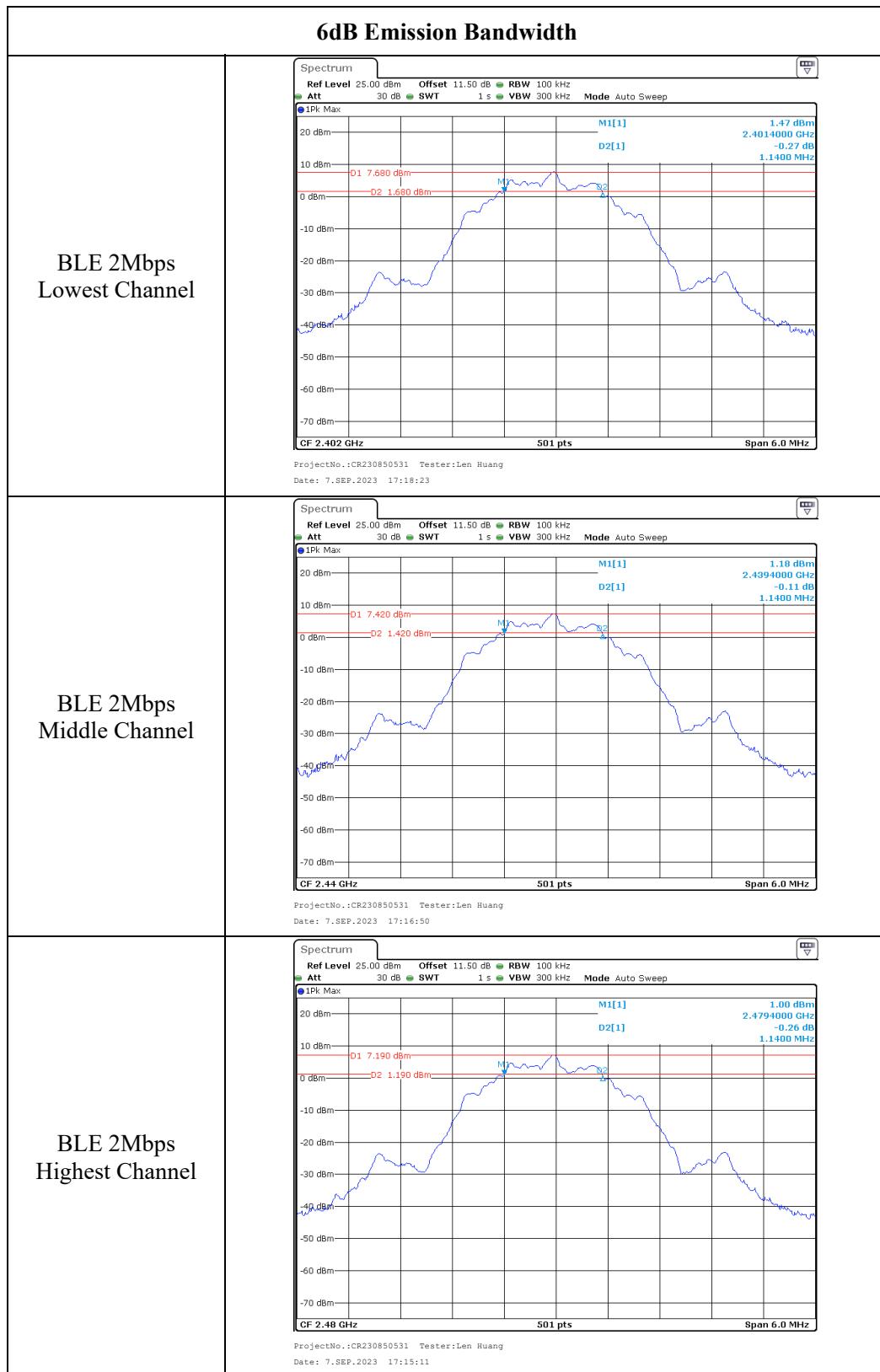
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40-N	102259	2023/4/18	2024/4/17
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### Test Data:

Test Modes	Test Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
BLE 1Mbps	2402	0.678	≥0.5
	2440	0.678	≥0.5
	2480	0.672	≥0.5
BLE 2Mbps	2402	1.140	≥0.5
	2440	1.140	≥0.5
	2480	1.140	≥0.5





#### 4.4 Maximum Conducted Output Power

Serial Number:	CR230850531-RF-S1	Test Date:	2023/9/7
Test Site:	RF	Test Mode:	Transmitting
Tester:	Len Huang	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	25.8	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101

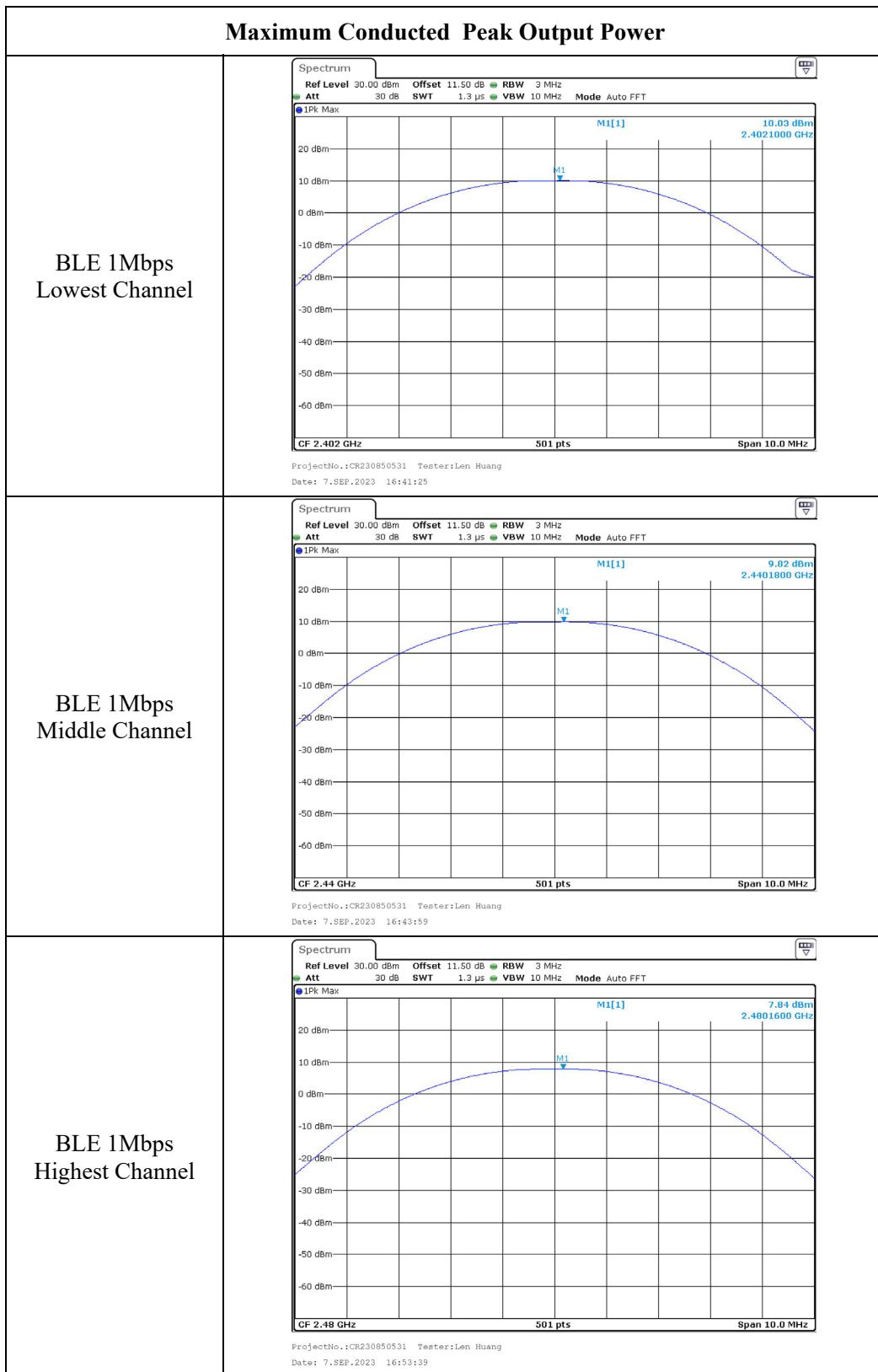
#### Test Equipment List and Details:

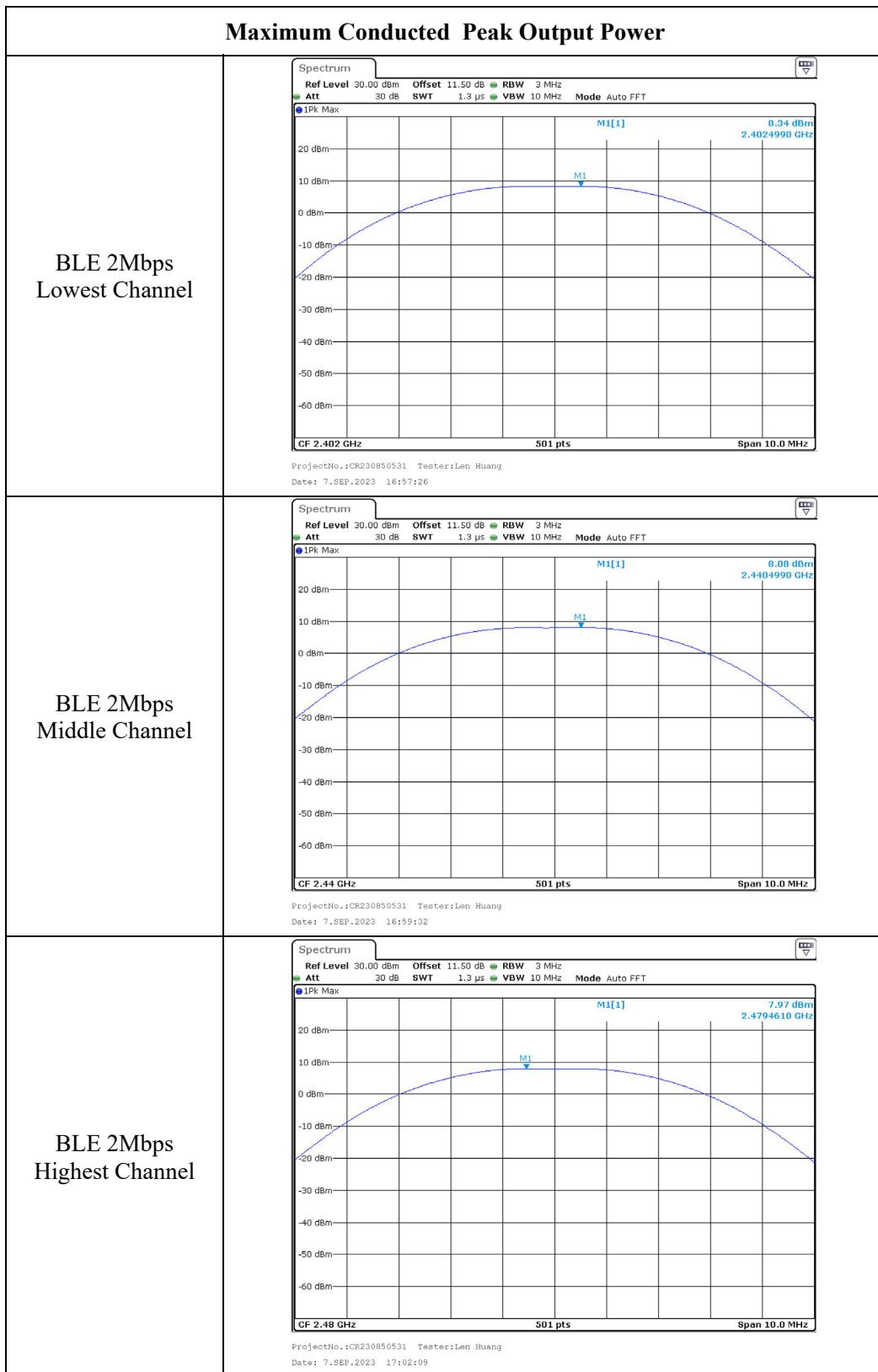
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40-N	102259	2023/4/18	2024/4/17
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### Test Data:

Test Modes	Test Frequency (MHz)	Maximum Conducted Peak Output Power (dBm)	Limit (dBm)
BLE 1Mbps	2402	10.03	≤30
	2440	9.82	≤30
	2480	7.84	≤30
BLE 2Mbps	2402	8.34	≤30
	2440	8.08	≤30
	2480	7.97	≤30





#### 4.5 Maximum power spectral density

Serial Number:	CR230850531-RF-S1	Test Date:	2023/9/7
Test Site:	RF	Test Mode:	Transmitting
Tester:	Len Huang	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	25.8	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101

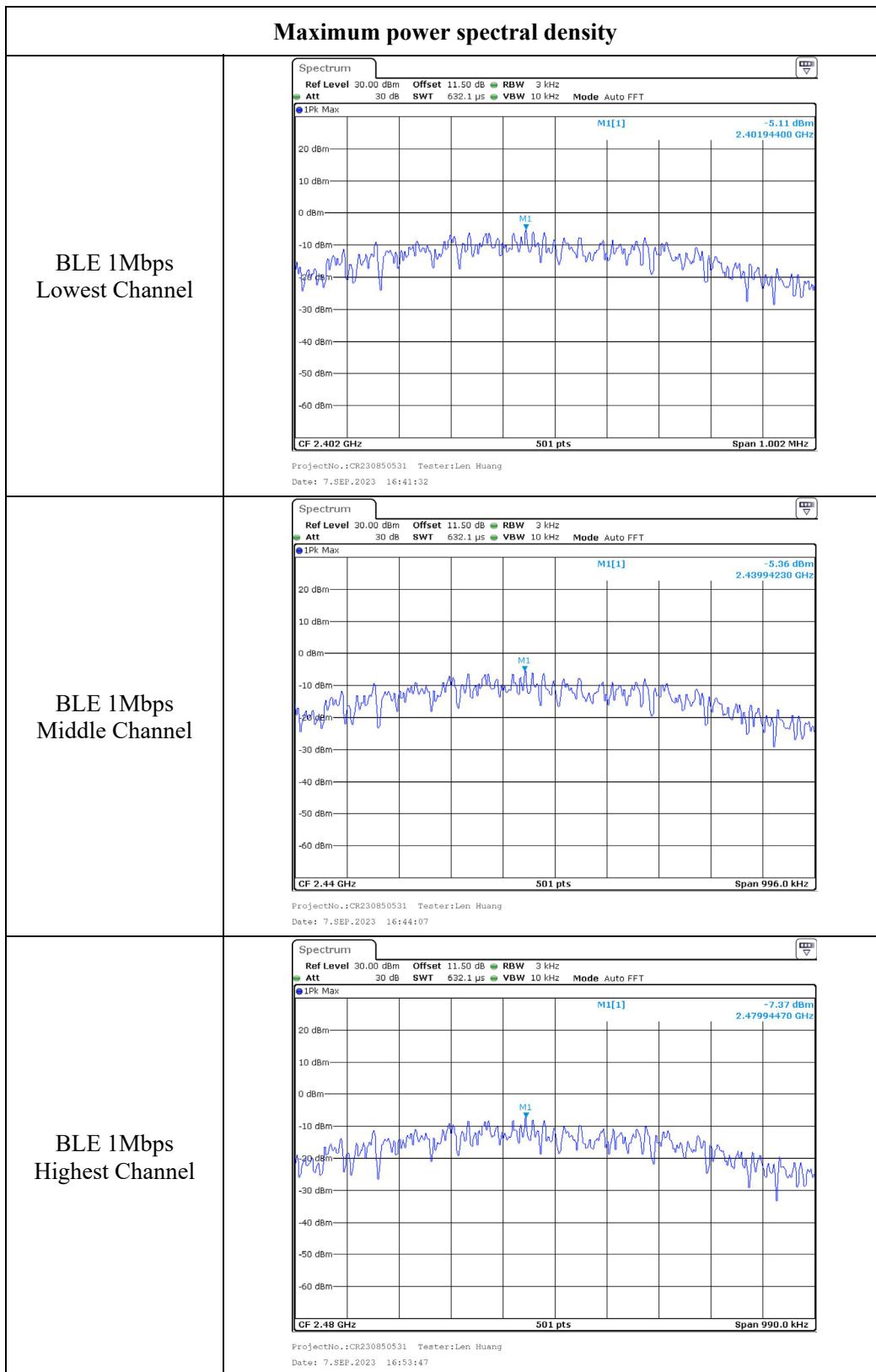
#### Test Equipment List and Details:

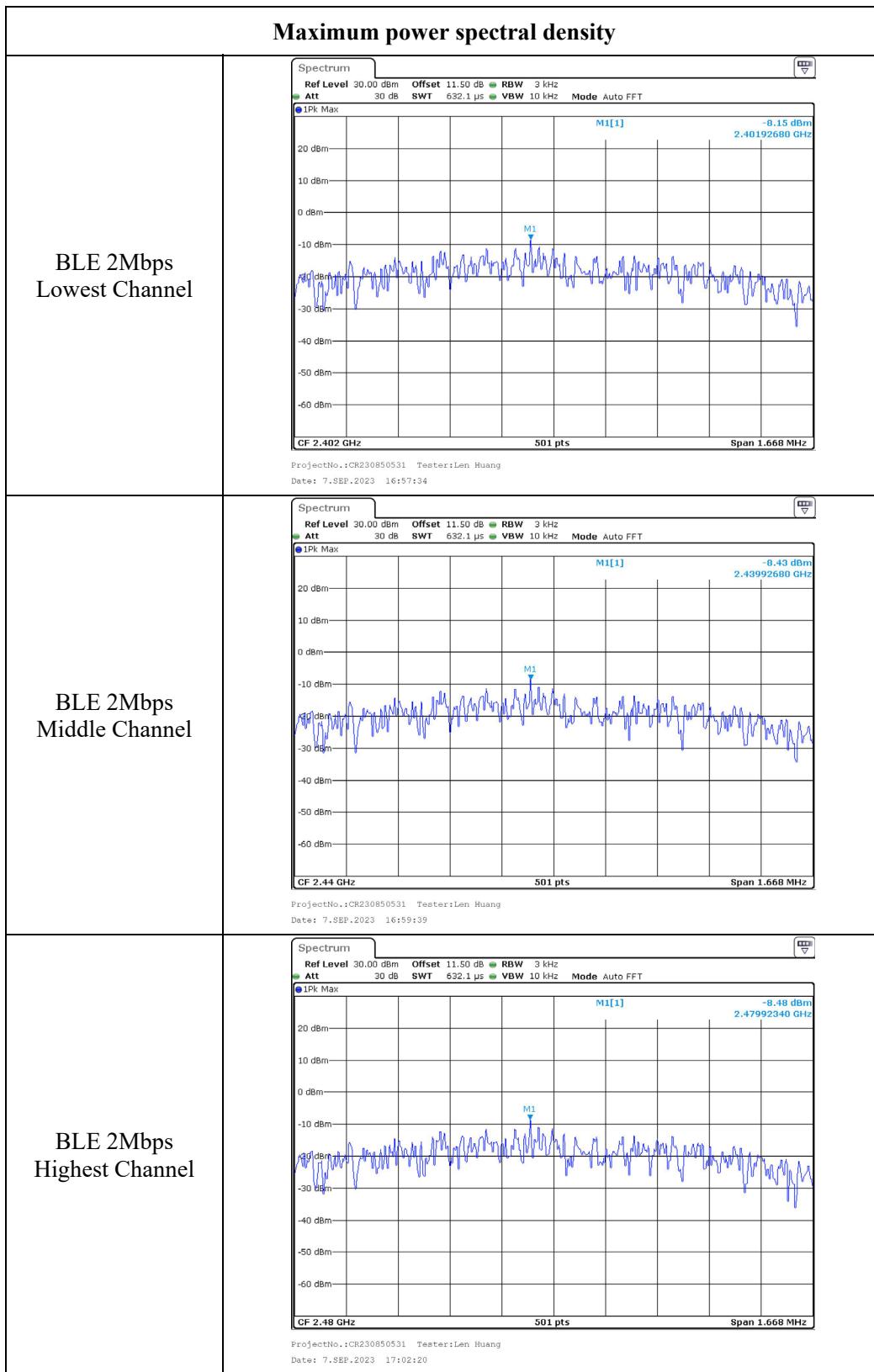
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40-N	102259	2023/4/18	2024/4/17
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### Test Data:

Test Modes	Test Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
BLE 1Mbps	2402	-5.11	≤8.00
	2440	-5.36	≤8.00
	2480	-7.37	≤8.00
BLE 2Mbps	2402	-8.15	≤8.00
	2440	-8.43	≤8.00
	2480	-8.48	≤8.00





#### 4.6 100 kHz Bandwidth of Frequency Band Edge

Serial Number:	CR230850531-RF-S1	Test Date:	2023/9/7
Test Site:	RF	Test Mode:	Transmitting
Tester:	Len Huang	Test Result:	Pass

#### Environmental Conditions:

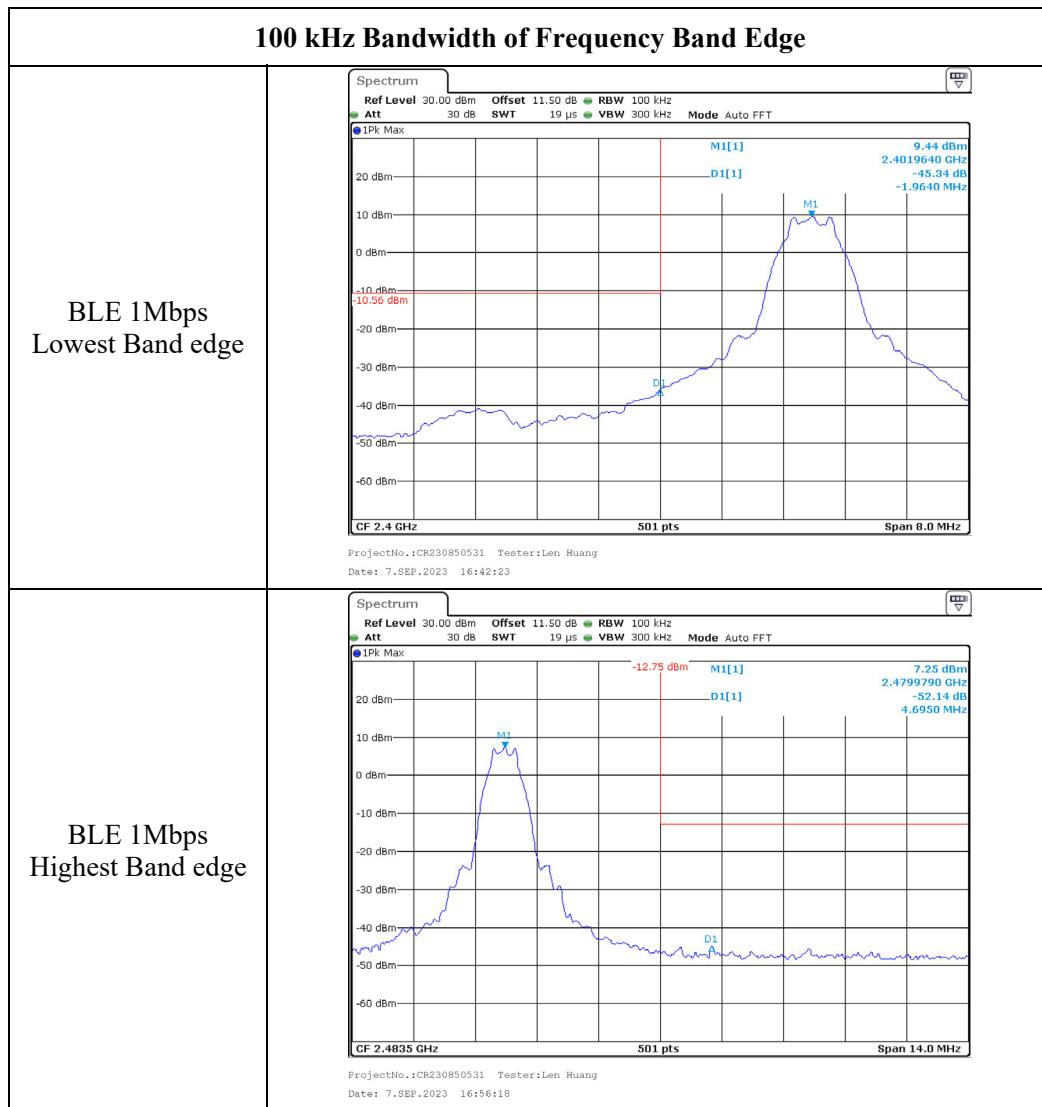
Temperature: (°C)	25.8	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101
-------------------	------	------------------------	----	---------------------	-----

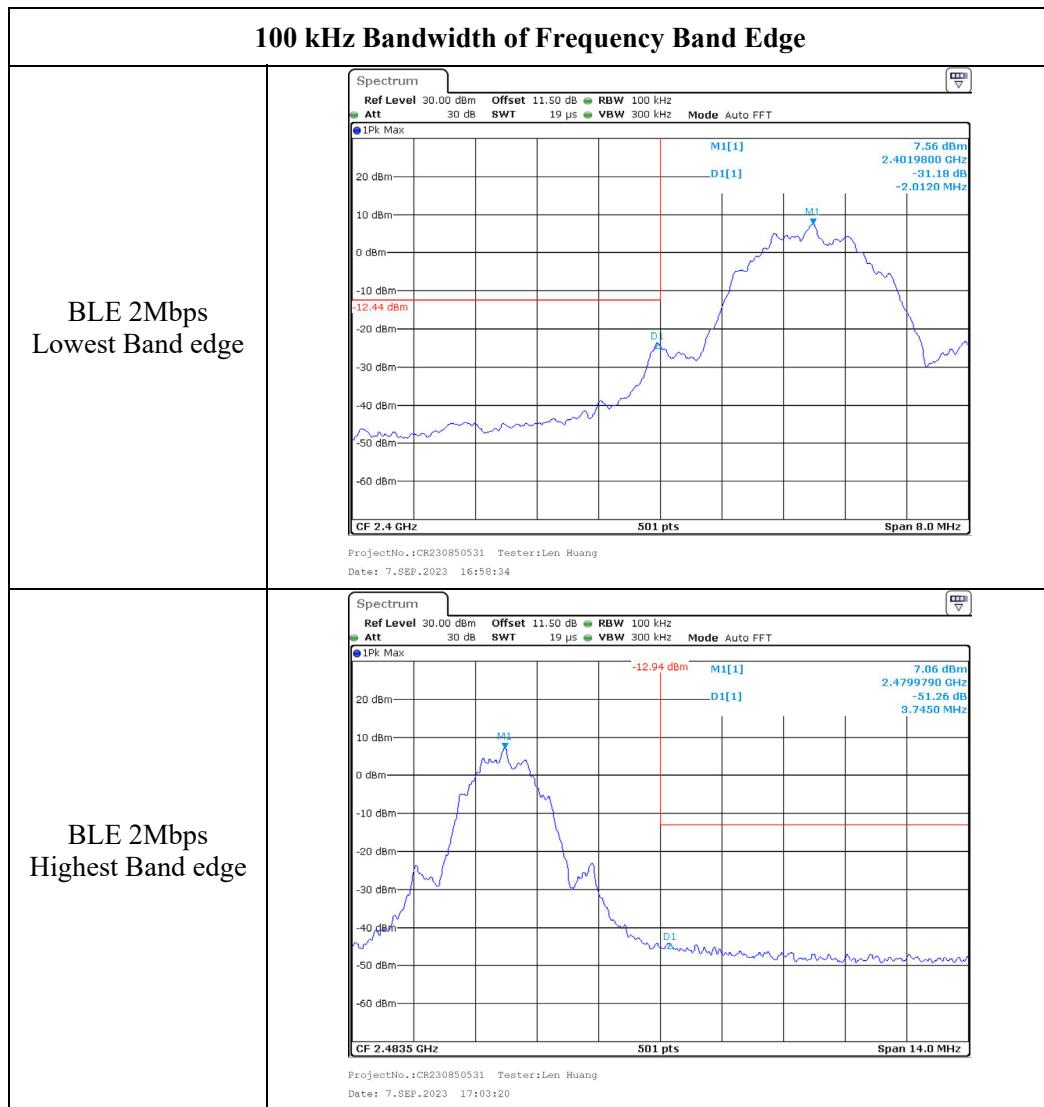
#### Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40-N	102259	2023/4/18	2024/4/17
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### Test Data:





#### 4.7 Duty Cycle

Serial Number:	CR230850531-RF-S1	Test Date:	2023/9/7
Test Site:	RF	Test Mode:	Transmitting
Tester:	Len Huang	Test Result:	Pass

#### Environmental Conditions:

Temperature: (°C)	25.8	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101
-------------------	------	------------------------	----	---------------------	-----

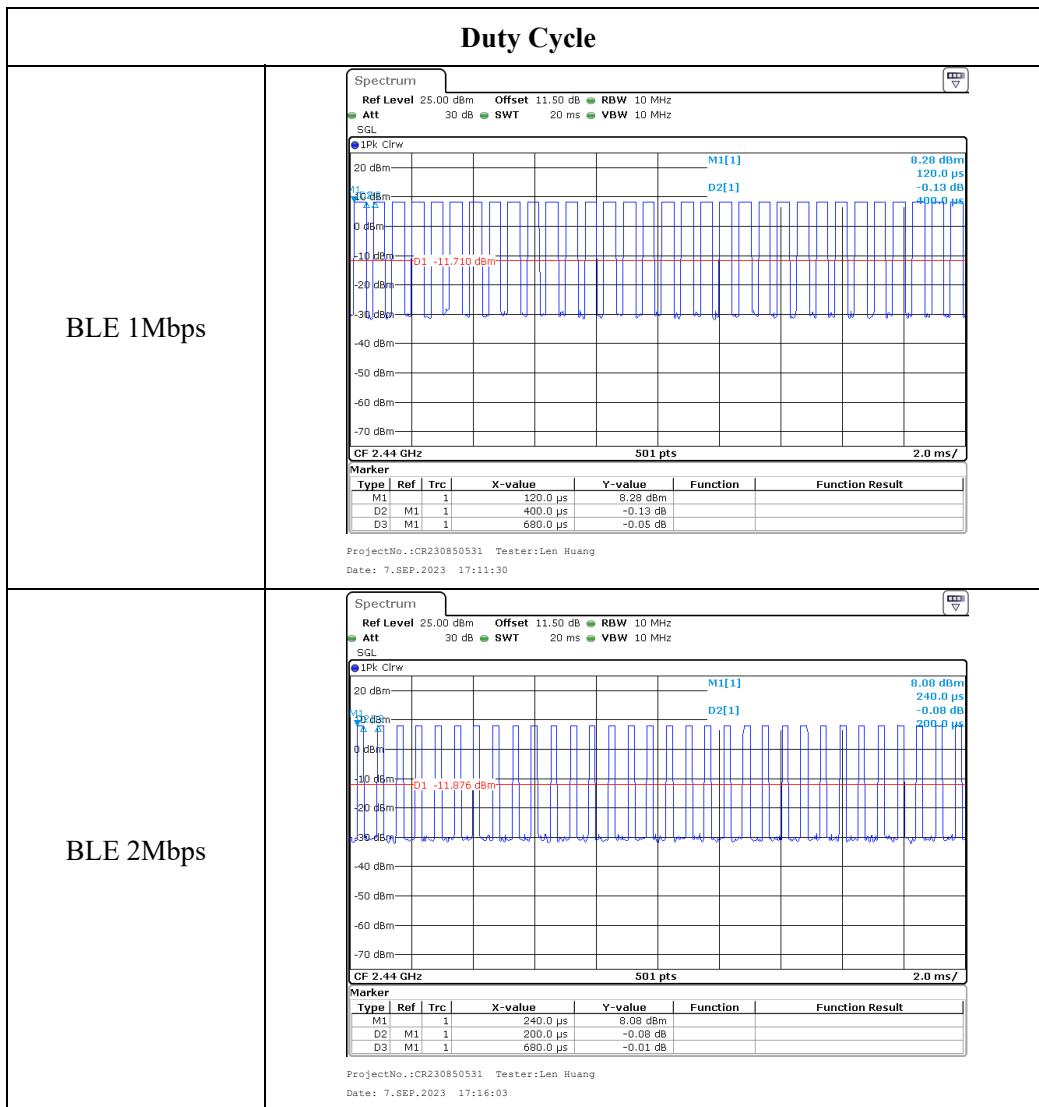
#### Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40-N	102259	2023/4/18	2024/4/17
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
eastsheep	Coaxial Attenuator	2W-SMA-JK-18G	21060301	Each time	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### Test Data:

Test Modes	Test Frequency (MHz)	Ton (ms)	Ton+off (ms)	Duty cycle (%)	1/T (Hz)	VBW Setting (kHz)
BLE 1Mbps	2440	0.40	0.68	58.82	2500	3
BLE 2Mbps	2440	0.20	0.68	29.41	5000	10



## 5. RF EXPOSURE EVALUATION

### 5.1 MPE-Based Exemption

#### 5.1.1 Applicable Standard

According to §1.1307(b)(3)(i)

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$ .
1.34-30	$3,450 R^2/f^2$ .
30-300	$3.83 R^2$ .
300-1,500	$0.0128 R^2 f$ .
1,500-100,000	$19.2R^2$ .

#### 5.1.2 Measurement Result

For worst case:

Operation Modes	Frequency (MHz)	$\lambda/2\pi$ (mm)	Distance (mm)	Exemption ERP		Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP (dBm)	MPE-Based Exemption
				(mW)	(dBm)				
BLE	2402-2480	19.88	200	768	28.85	10.5	3.0	11.35	Compliant

Note:

The Maximum Conducted Power including Tune-up Tolerance was declared by manufacturer.

**Result: The device compliant the MPE-Based Exemption at 20cm distances.**

## **6. EUT PHOTOGRAPHS**

Please refer to the attachment CR230850531-EXP EUT EXTERNAL PHOTOGRAPHS and CR230850531-INP EUT INTERNAL PHOTOGRAPHS

## **7. TEST SETUP PHOTOGRAPHS**

Please refer to the attachment CR230850531-00-TSP TEST SETUP PHOTOGRAPHS.

**===== END OF REPORT =====**