



# TEST REPORT



**Report Reference No.**..... : **CHEW19090160** Report Verification:

**Project No.**..... : **SHT1906037401EW**

**FCC ID**..... : **2AT8M-VW-S1-V2X1**

**Applicant's name**..... : **Ackcio Pte. Ltd.**

Address..... : 81, Ayer Rajah Crescent. #3-69. Singapore 139967.

Manufacturer..... : Ackcio Pte. Ltd.

Address..... : 81, Ayer Rajah Crescent. #3-69. Singapore 139967.

**Test item description** ..... : **BEAM-VW-S1**

Trade Mark ..... : -

Model/Type reference..... : BEAM-VW-S1

Listed Model(s) ..... : -

**Standard** ..... : **FCC CFR Title 47 Part 15 Subpart C Section 15.247**

Date of receipt of test sample..... : Sep.25,2019

Date of testing..... : Sep.25,2019 ~ Sep.26,2019

Date of issue..... : Sep.27,2019

**Result**..... : **PASS**

Compiled by  
( Position+Printed name+Signature) : File administrators Yueming Li *Yueming.Li*

Supervised by  
( Position+Printed name+Signature) : Project Engineer Kiki Kong *Kiki Kong*

Approved by  
( Position+Printed name+Signature) : RF Manager Hans Hu *Hans Hu*

**Testing Laboratory Name** ..... : **Shenzhen Huatongwei International Inspection Co., Ltd.**

Address..... : 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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The test report merely correspond to the test sample.

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# **1. TEST STANDARDS AND REPORT VERSION**

## **1.1. Test Standards**

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

[ANSI C63.10:2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB 558074 D01 15.247 Meas Guidance v05r02](#): Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of The FCC Rules

## **1.2. Report version**

Revision No.	Date of issue	Description
N/A	2019-09-27	Original

## **2. TEST DESCRIPTION**

<b>Test Item</b>	<b>FCC Rule</b>	<b>Result</b>	<b>Test Engineer</b>
Antenna requirement	15.203/15.247(c)	PASS	Bruce Wong
Line Conducted Emissions (AC Main)	15.207	N/A	N/A
Conducted Peak Output Power	15.247(b)(3)	PASS	Bruce Wong
Power Spectral Density	15.247(e)	PASS	Bruce Wong
6dB Bandwidth	15.247(a)(2)	PASS	Bruce Wong
Restricted band	15.247(d)/15.205	PASS	Bruce Wong
Spurious Emissions	15.247(d)/15.209	PASS	Tony.Duan

Note: The measurement uncertainty is not included in the test result.

### 3. SUMMARY

#### 3.1. Client Information

Applicant:	Ackcio Pte. Ltd.
Address:	81, Ayer Rajah Crescent. #3-69. Singapore 139967.
Manufacturer:	Ackcio Pte. Ltd.
Address:	81, Ayer Rajah Crescent. #3-69. Singapore 139967.

#### 3.2. Product Description

Name of EUT:	BEAM-VW-S1
Trade Mark:	-
Model No.:	BEAM-VW-S1
Listed Model(s):	-
Power supply:	3.6V
Adapter information:	-
Hardware version:	1.0
Software version:	1.0
<b>SRD</b>	
Version:	-
Modulation:	GFSK
Operation frequency:	902MHz - 928MHz
Channel number:	50
Channel separation:	-
Antenna type:	Omnidirectional Dipole Antenna
Antenna gain:	3 dBi

### 3.3. Operation state

#### ➤ Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

Channel	Frequency (MHz)
00	902.5
01	903
⋮	⋮
25	915
⋮	⋮
48	927
49	927.5

#### ➤ Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).
For AC power line conducted emissions:
The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.
For Radiated suprious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit(duty cycle>98%). The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

### 3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

/	Manufacturer:	/
	Model No.:	/
/	Manufacturer:	/
	Model No.:	/

### 3.5. Modifications

No modifications were implemented to meet testing criteria.

## **4. TEST ENVIRONMENT**

### **4.1. Address of the test laboratory**

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

### **4.2. Test Facility**

#### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **A2LA-Lab Cert. No.: 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### **FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection 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.

#### **IC-Registration No.:5377A**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377A.

#### **ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

### 4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

### 4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.51 dB	(1)
Conducted spurious emissions 9kHz~40GHz	0.51 dB	(1)
Conducted Disturbance 150kHz~30MHz	3.02 dB	(1)
Radiated Emissions below 1GHz	4.90 dB	(1)
Radiated Emissions above 1GHz	4.96 dB	(1)
Occupied Bandwidth	70 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.



#### 4.5. Equipments Used during the Test

● Conducted Emission						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	ESCI	101247	2018/10/27	2019/10/26
●	Artificial Mains	SCHWARZBECK	NNLK 8121	573	2018/10/27	2019/10/26
●	Pulse Limiter	R&S	ESH3-Z2	100499	2018/10/27	2019/10/26
●	RF Connection Cable	HUBER+SUHNER	EF400	N/A	2018/11/15	2019/11/14
●	Test Software	R&S	ES-K1	N/A	N/A	N/A

● Radiated Emission-6th test site						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	SAC-3m-02	N/A	2018/09/30	2021/09/29
●	EMI Test Receiver	R&S	ESCI	100900	2018/10/28	2019/10/27
●	Loop Antenna	R&S	HFH2-Z2	100020	2017/11/20	2020/11/19
●	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	546	2017/04/05	2020/04/04
●	Pre-Amplifier	SCHWARZBECK	BBV 9742	N/A	2018/11/15	2019/11/14
●	RF Connection Cable	HUBER+SUHNER	N/A	N/A	2019/09/28	2020/09/27
●	RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	2019/09/28	2020/09/27
●	Test Software	R&S	ES-K1	N/A	N/A	N/A
●	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
●	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

● Radiated emission-7th test site						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	SAC-3m-01	N/A	2018/09/30	2021/09/29
●	Spectrum Analyzer	R&S	FSP40	100597	2018/10/27	2019/10/26
●	Horn Antenna	SCHWARZBECK	9120D	1011	2017/03/27	2020/03/26
●	Pre-amplifier	BONN	BLWA0160-2M	1811887	2018/11/14	2019/11/13
●	Pre-amplifier	CD	PAP-0102	12004	2018/11/14	2019/11/13
●	Broadband Pre-amplifier	SCHWARZBECK	BBV 9718	9718-248	2019/04/26	2020/04/25
●	RF Connection Cable	HUBER+SUHNER	RE-7-FH	N/A	2018/11/15	2019/11/14
●	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	2018/11/15	2019/11/14
●	Test Software	Audix	E3	N/A	N/A	N/A
●	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
●	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

● RF Conducted Method						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2018/10/28	2019/10/27
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2018/09/29	2019/09/28

## 5. TEST CONDITIONS AND RESULTS

### 5.1. Antenna Requirement

#### Requirement

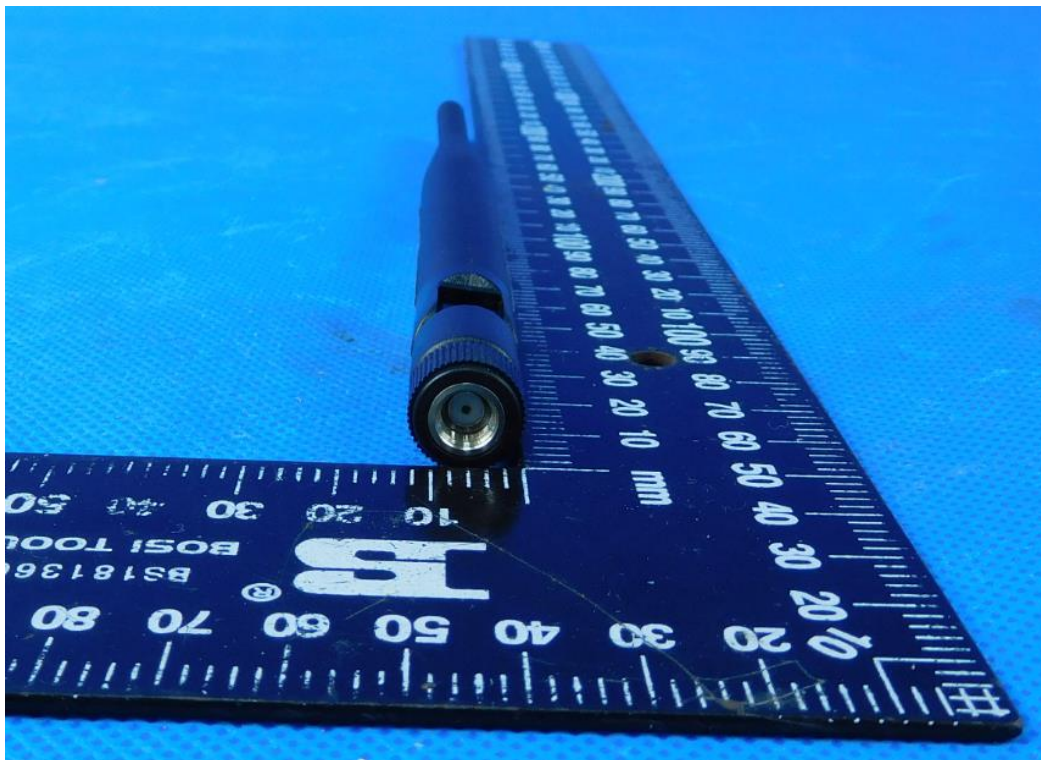
##### **FCC CFR Title 47 Part 15 Subpart C Section 15.203:**

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, 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.

#### TEST RESULTS

**Passed**       **Not Applicable**

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



## 5.2. Conducted Emissions (AC Main)

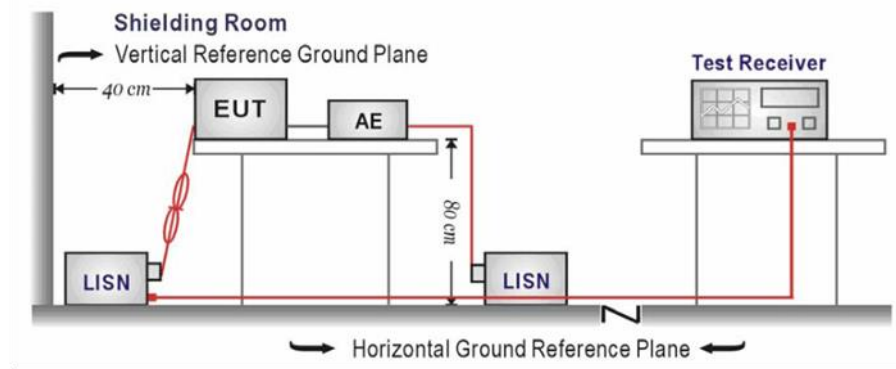
### LIMIT

#### FCC CFR Title 47 Part 15 Subpart C Section 15.207

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

\* Decreases with the logarithm of the frequency.

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

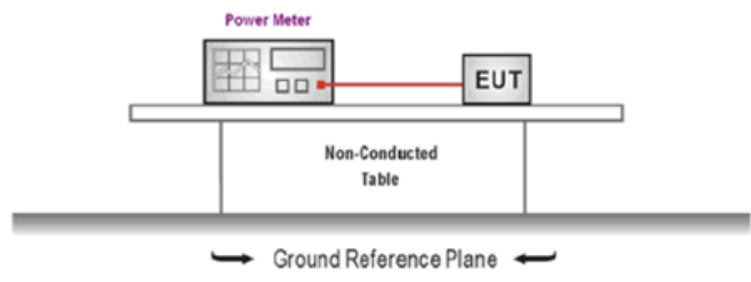
Passed       Not Applicable

### 5.3. Conducted Peak Output Power

#### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): 30 dBm

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 15.247 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
4. Record the measurement data.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

Passed       Not Applicable

Type	Channel	Output power (dBm)	Limit (dBm)	Result
2-GFSK	00	9.53	≤30.00	Pass
	25	9.38		
	49	9.25		

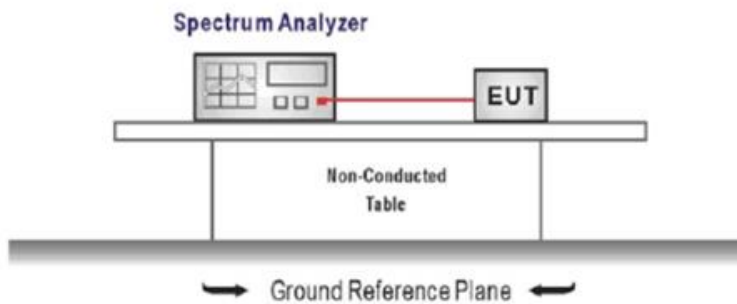
### 5.4. Power Spectral Density

#### LIMIT

#### FCC CFR Title 47 Part 15 Subpart C Section 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.

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input,
2. Configure the spectrum analyzer as shown below:  
 Center frequency=DTS channel center frequency  
 Span =1.5 times the DTS bandwidth  
 $RBW = 3\text{ kHz} \leq RBW \leq 100\text{ kHz}$ ,  $VBW \geq 3 \times RBW$   
 Sweep time = auto couple  
 Detector = peak  
 Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Use the peak marker function to determine the maximum amplitude level within the RBW.
5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### TEST MODE:

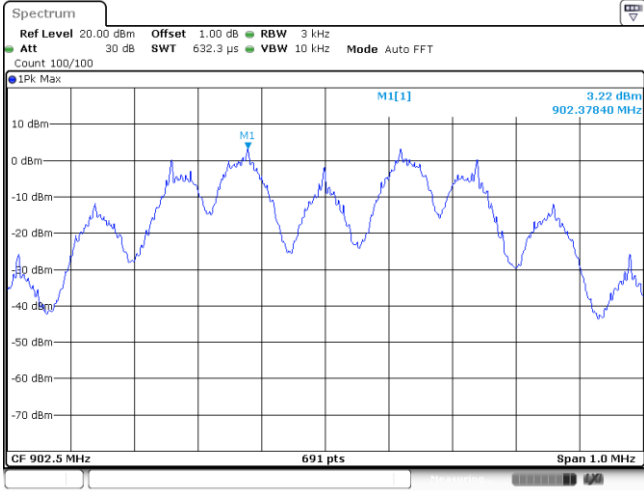
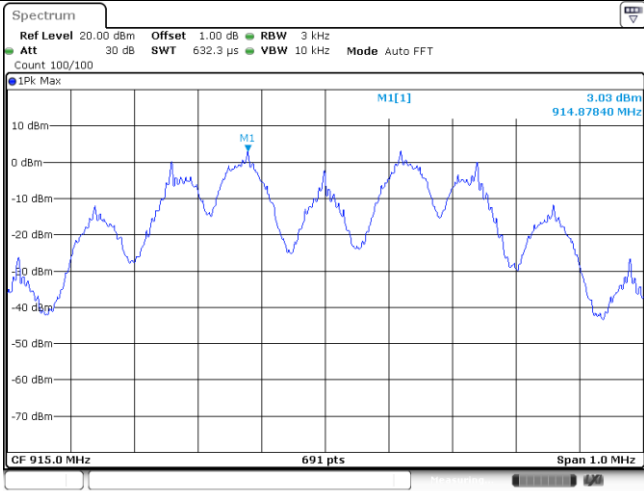
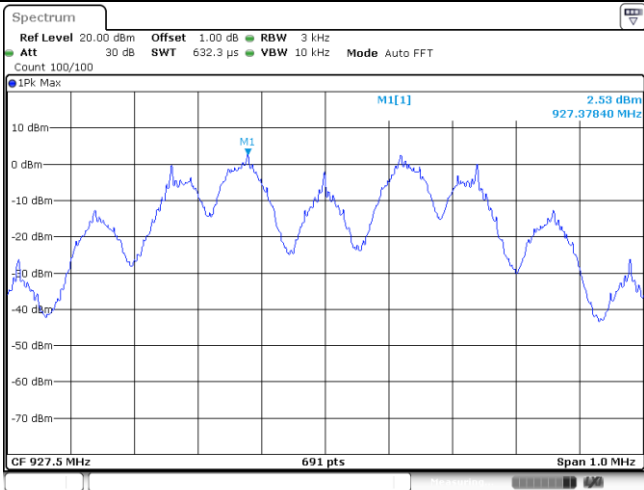
Please refer to the clause 3.3

#### TEST RESULTS

Passed       Not Applicable

Type	Channel	Power Spectral Density(dBm/3KHz)	Limit (dBm/3KHz)	Result
2-GFSK	00	3.22	≤8.00	Pass
	25	3.03		
	49	2.53		

Test plot as follows:

CH00	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz Att 30 dB SWT 632.3 μs VBW 10 kHz Mode Auto FFT Count 100/100</p> <p>1Pk Max</p> <p>M1 3.22 dBm 902.37840 MHz</p> <p>CF 902.5 MHz 691 pts Span 1.0 MHz</p> <p>Date: 23 SEP.2019 14:16:19</p>
CH25	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz Att 30 dB SWT 632.3 μs VBW 10 kHz Mode Auto FFT Count 100/100</p> <p>1Pk Max</p> <p>M1 3.03 dBm 914.87840 MHz</p> <p>CF 915.0 MHz 691 pts Span 1.0 MHz</p> <p>Date: 23 SEP.2019 14:27:42</p>
CH49	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 3 kHz Att 30 dB SWT 632.3 μs VBW 10 kHz Mode Auto FFT Count 100/100</p> <p>1Pk Max</p> <p>M1 2.53 dBm 927.37840 MHz</p> <p>CF 927.5 MHz 691 pts Span 1.0 MHz</p> <p>Date: 23 SEP.2019 14:01:51</p>

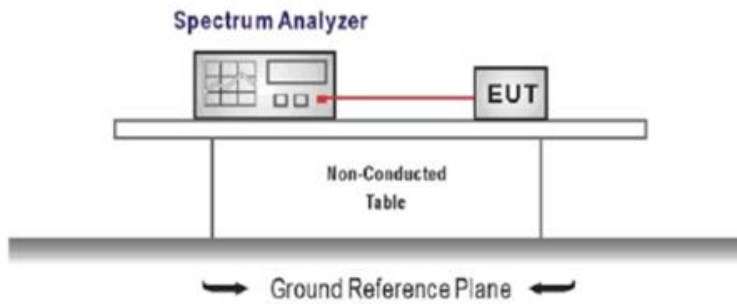
**5.5. 6dB bandwidth**

**LIMIT**

**FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):**

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

**TEST CONFIGURATION**



**TEST PROCEDURE**

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).  
 Center Frequency =DTS channel center frequency  
 Span=2 x DTS bandwidth  
 RBW = 100 kHz, VBW ≥ 3 × RBW  
 Sweep time= auto couple  
 Detector = Peak  
 Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. 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, and record the pertinent measurements.

**TEST MODE:**

Please refer to the clause 3.3

**TEST RESULTS**

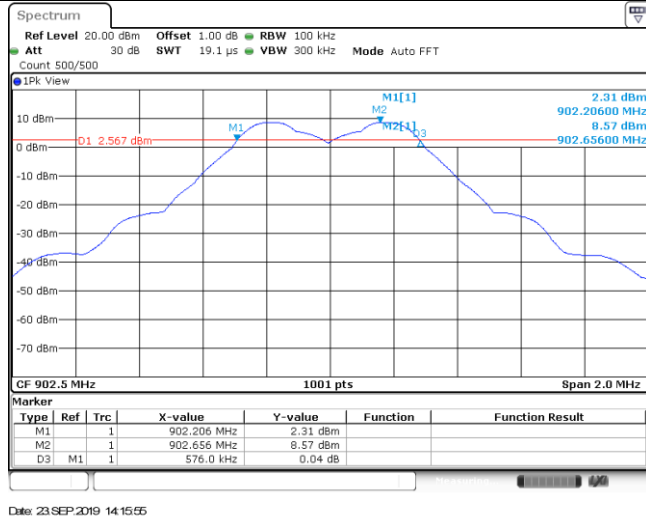
**Passed**       **Not Applicable**

Type	Channel	6dB Bandwidth(MHz)	Limit (kHz)	Result
2-GFSK	00	0.58	≥500	Pass
	25	0.58		
	49	0.58		

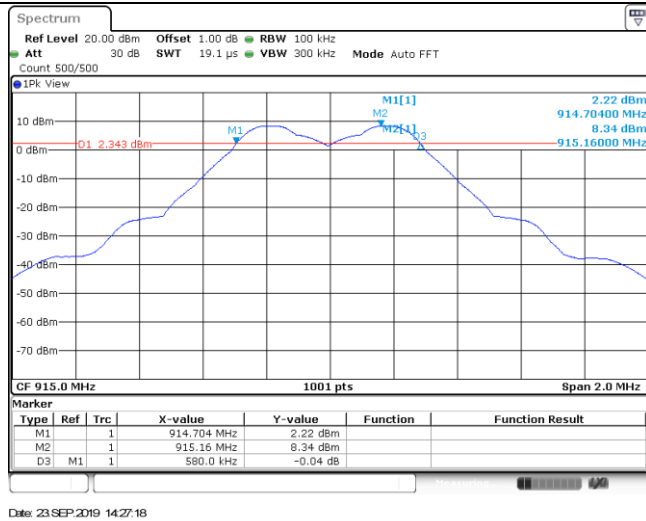
Test plot as follows:



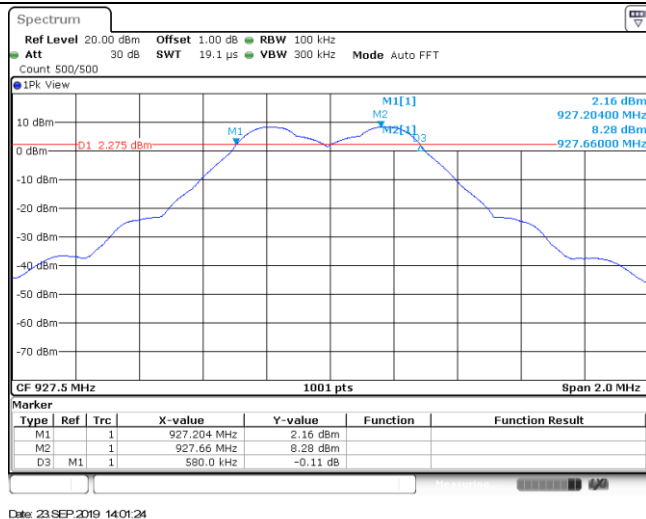
CH00



CH25



CH49



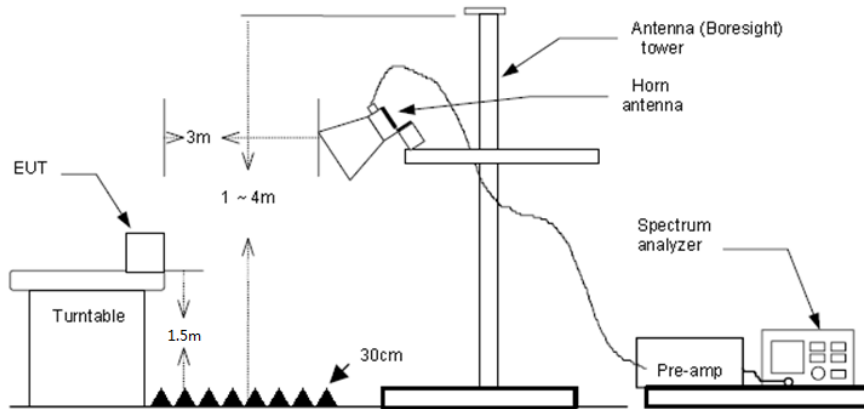
## 5.6. Restricted band

### LIMIT

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:  
 RBW=1MHz, VBW=3MHz Peak detector for Peak value.  
 RBW=1MHz, VBW=3MHz RMS detector for Average value.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

Passed       Not Applicable

Note:

- 1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
- 2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

<b>Test channel:</b>	<b>CH00</b>	<b>Polarity</b>	<b>Horizontal</b>						
<b>Suspected Data List</b>									
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector	
1	902.0000	16.98	32.20	49.18	74.00	24.82	Horizontal	PK	
2	902.0000	15.74	32.20	47.94	54.00	6.06	Horizontal	AV	
<b>Test channel:</b>	<b>CH00</b>	<b>Polarity</b>	<b>Vertical</b>						
<b>Suspected Data List</b>									
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector	
1	902.0000	15.98	32.20	48.18	74.00	25.82	Vertical	PK	
2	902.0000	15.45	32.20	47.65	54.00	6.35	Vertical	AV	

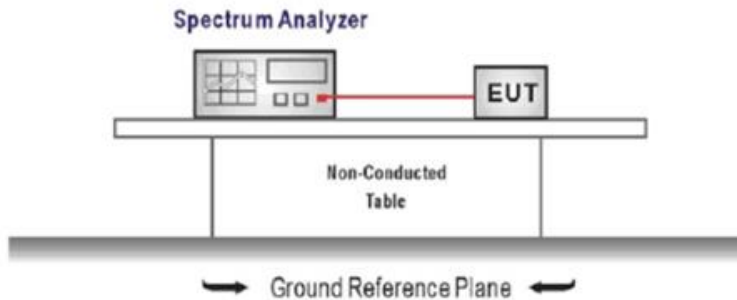
<b>Test channel:</b>	<b>CH49</b>	<b>Polarity</b>	<b>Horizontal</b>						
<b>Suspected Data List</b>									
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector	
1	928.0000	15.50	32.31	47.81	74.00	26.19	Horizontal	PK	
2	928.0000	14.88	32.31	47.19	54.00	6.81	Horizontal	AV	
<b>Test channel:</b>	<b>CH49</b>	<b>Polarity</b>	<b>Vertical</b>						
<b>Suspected Data List</b>									
NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Detector	
1	928.0000	16.92	32.31	49.23	74.00	24.77	Vertical	PK	
2	928.0000	15.80	32.31	48.11	54.00	5.89	Vertical	AV	

## 5.7. Band edge and Spurious Emissions (conducted)

### LIMIT

**FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Establish a reference level by using the following procedure  
Center frequency=DTS channel center frequency  
The span = 1.5 times the DTS bandwidth.  
RBW = 100 kHz, VBW  $\geq$  3 x RBW  
Detector = peak, Sweep time = auto couple, Trace mode = max hold  
Allow trace to fully stabilize  
Use the peak marker function to determine the maximum PSD level

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

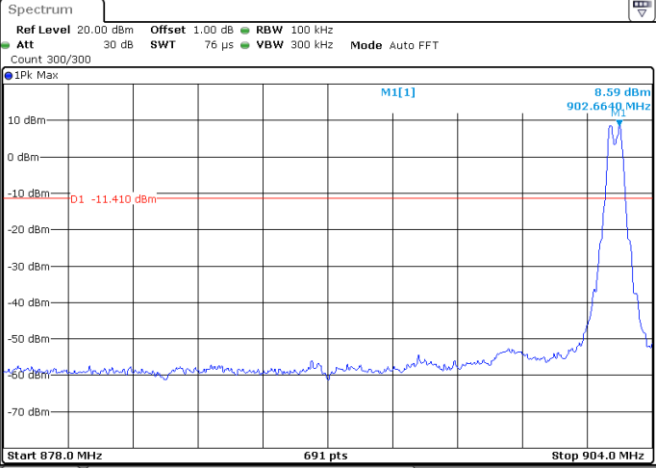
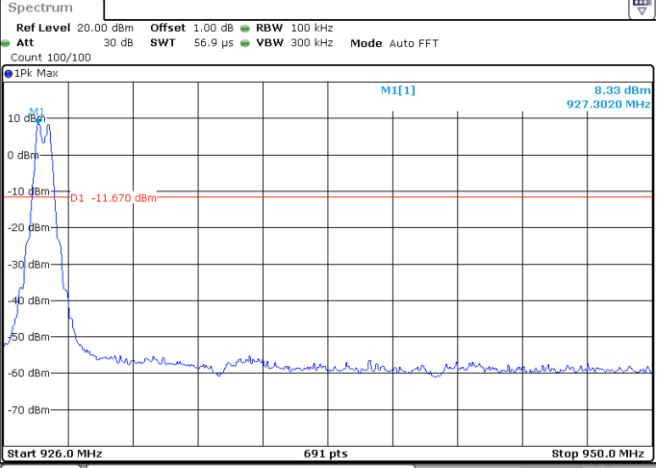
3. Emission level measurement  
Set the center frequency and span to encompass frequency range to be measured  
RBW = 100 kHz, VBW  $\geq$  3 x RBW  
Detector = peak, Sweep time = auto couple, Trace mode = max hold  
Allow trace to fully stabilize  
Use the peak marker function to determine the maximum amplitude level.
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
5. Ensure that the amplitude of all unwanted emission outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emission relative to the limit.

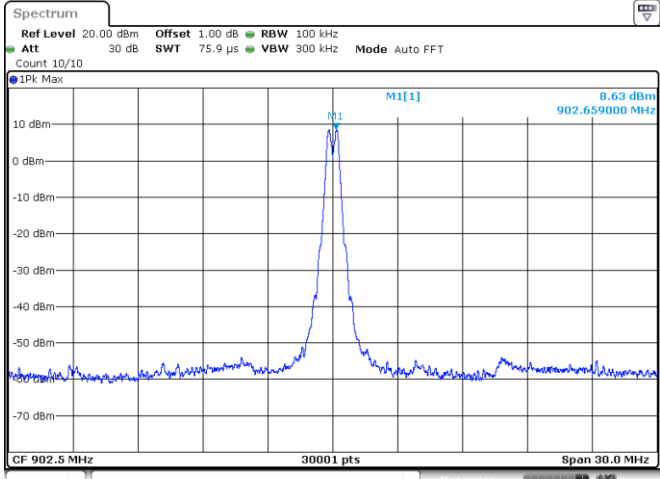
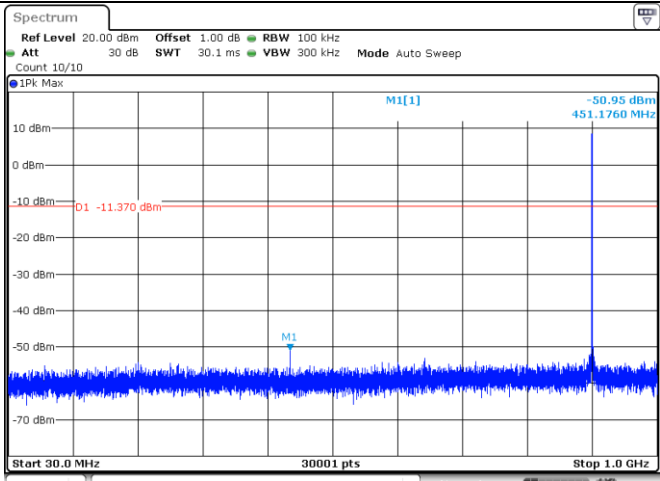
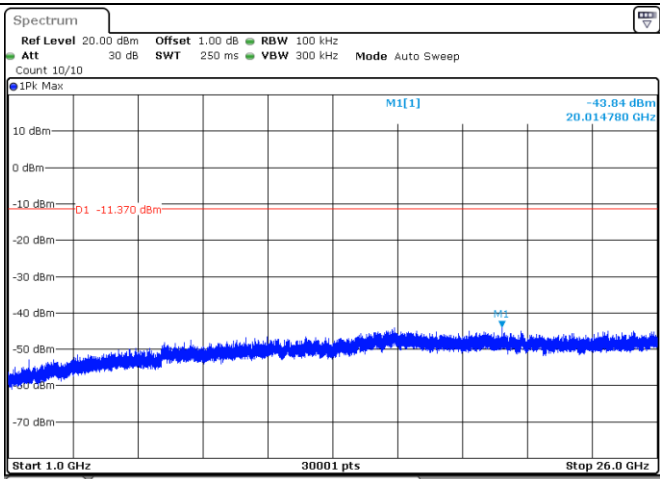
### TEST MODE:

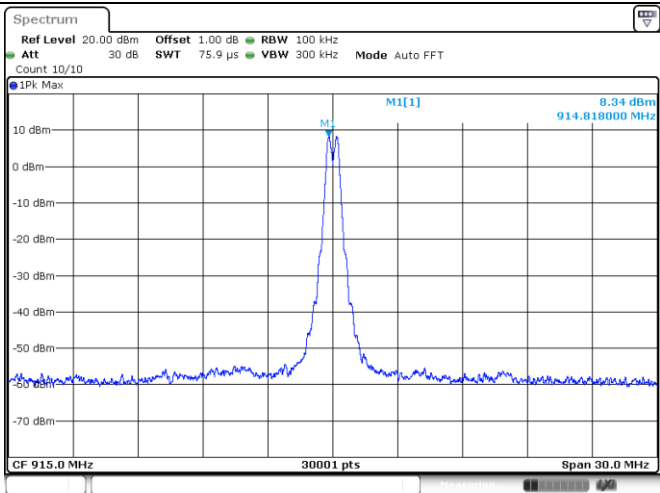
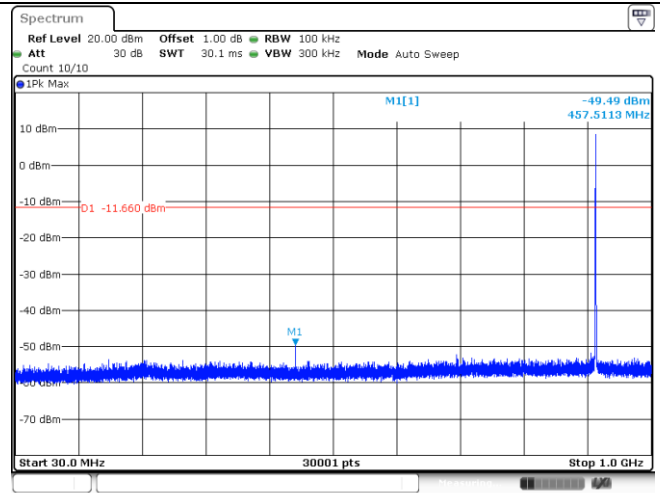
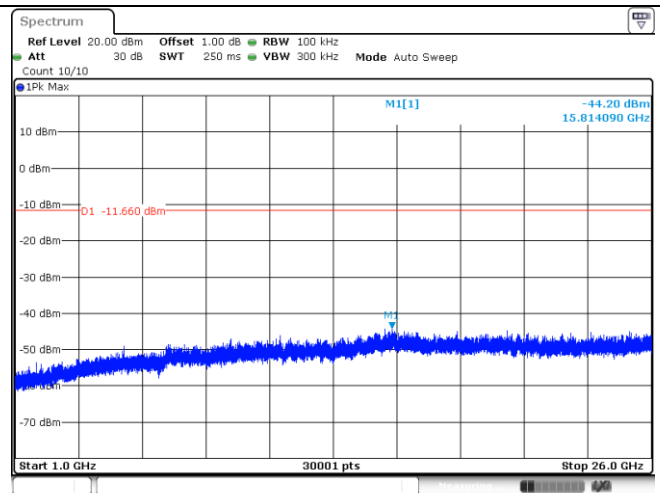
Please refer to the clause 3.3

### TEST RESULTS

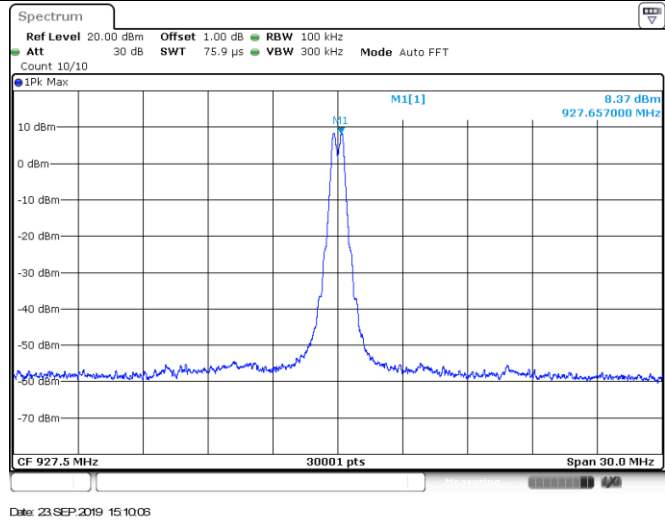
Passed       Not Applicable

Test Item:	Band edge
CH00	 <p>Spectrum</p> <p>Ref Level 20.00 dBm    Offset 1.00 dB    RBW 100 kHz Att 30 dB    SWT 76 μs    VBW 300 kHz    Mode Auto FFT Count 300/300</p> <p>1Pk Max</p> <p>M1[1] 8.59 dBm 902.6640 MHz</p> <p>-11.410 dBm</p> <p>Start 878.0 MHz    691 pts    Stop 904.0 MHz</p> <p>Date: 23 SEP 2019 14:47:45</p>
CH49	 <p>Spectrum</p> <p>Ref Level 20.00 dBm    Offset 1.00 dB    RBW 100 kHz Att 30 dB    SWT 56.9 μs    VBW 300 kHz    Mode Auto FFT Count 100/100</p> <p>1Pk Max</p> <p>M1[1] 8.33 dBm 927.3020 MHz</p> <p>-11.670 dBm</p> <p>Start 926.0 MHz    691 pts    Stop 950.0 MHz</p> <p>Date: 23 SEP 2019 15:17:01</p>

Test Item:	SE
CH00 Reference level	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 75.9 μs VBW 300 kHz Mode Auto FFT Count 10/10</p> <p>1Pk Max</p> <p>M1[1] 8.63 dBm 902.659000 MHz</p> <p>CF 902.5 MHz 30001 pts Span 30.0 MHz</p> <p>Date: 23 SEP 2019 14:49:46</p>
CH00 30MHz~1000MHz	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10</p> <p>1Pk Max</p> <p>M1[1] -50.95 dBm 451.1760 MHz</p> <p>D1 -11.370 dBm</p> <p>M1</p> <p>Start 30.0 MHz 30001 pts Stop 1.0 GHz</p> <p>Date: 23 SEP 2019 14:51:02</p>
CH00 1GHz~26GHz	 <p>Spectrum</p> <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10</p> <p>1Pk Max</p> <p>M1[1] -43.84 dBm 20.014780 GHz</p> <p>D1 -11.370 dBm</p> <p>M1</p> <p>Start 1.0 GHz 30001 pts Stop 26.0 GHz</p> <p>Date: 23 SEP 2019 14:52:37</p>

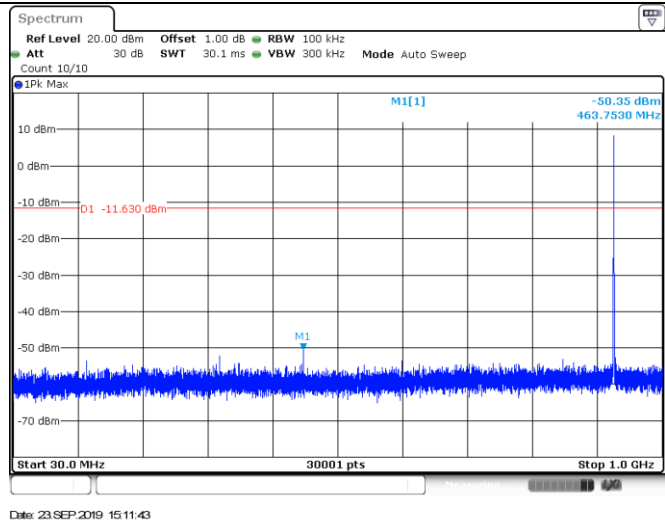
<p>CH25 Reference level</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 75.9 <math>\mu</math>s VBW 300 kHz Mode Auto FFT Count 10/10 1Pk Max M1[1] 8.34 dBm 914.818000 MHz CF 915.0 MHz 30001 pts Span 30.0 MHz Date: 23 SEP 2019 14:37:15</p>
<p>CH25 30MHz~1000MHz</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1Pk Max M1[1] -49.49 dBm 457.5113 MHz D1 -11.660 dBm Start 30.0 MHz 30001 pts Stop 1.0 GHz Date: 23 SEP 2019 14:39:38</p>
<p>CH25 1GHz~26GHz</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 1Pk Max M1[1] -44.20 dBm 15.814090 GHz D1 -11.660 dBm Start 1.0 GHz 30001 pts Stop 26.0 GHz Date: 23 SEP 2019 14:39:53</p>

CH49  
Reference level



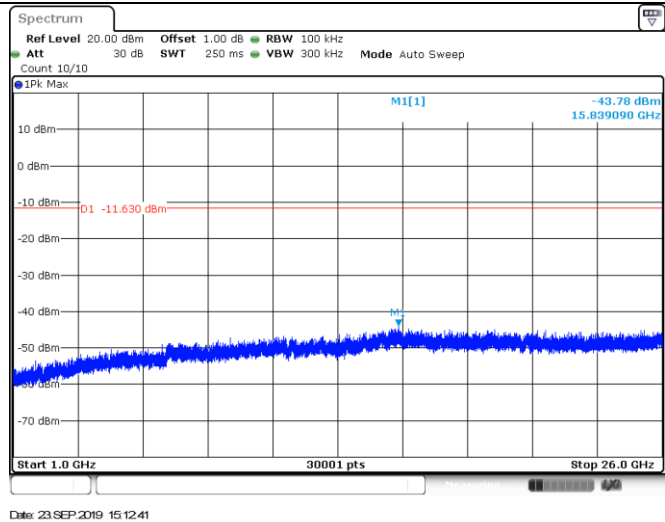
Date: 23 SEP 2019 15:10:05

CH49  
30MHz~1000MHz



Date: 23 SEP 2019 15:11:43

CH49  
1GHz~26GHz



Date: 23 SEP 2019 15:12:41



### 5.8. Spurious Emissions (radiated)

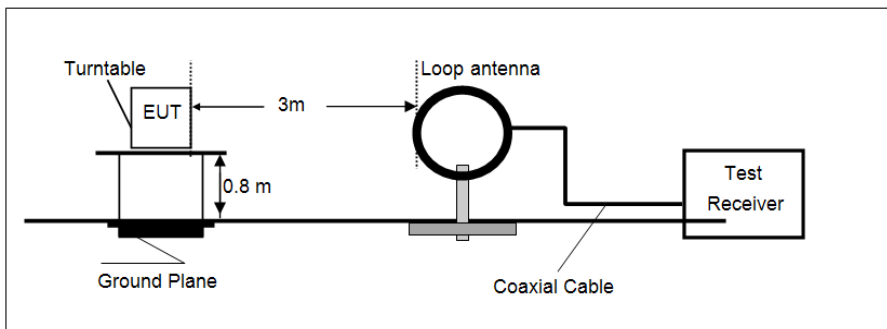
#### LIMIT

#### FCC CFR Title 47 Part 15 Subpart C Section 15.209

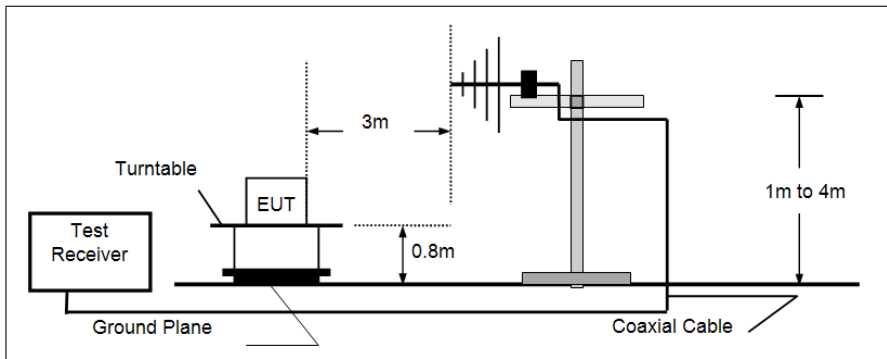
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

#### TEST CONFIGURATION

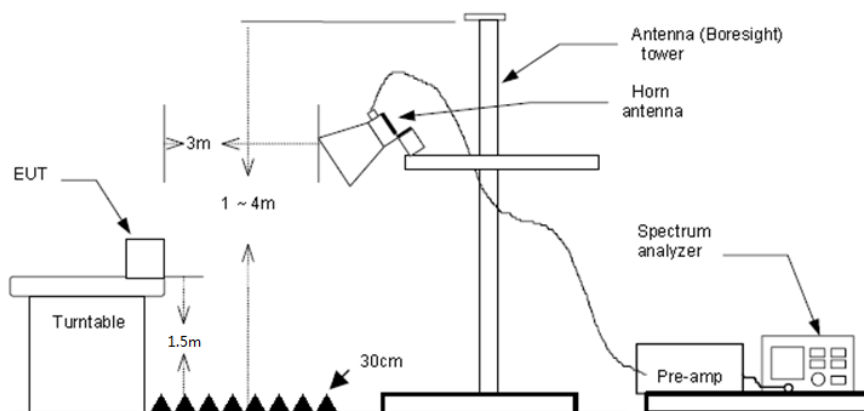
- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



- Above 1 GHz



**TEST PROCEDURE**

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Below 1 GHz:  
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;  
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
  - (3) From 1 GHz to 10<sup>th</sup> harmonic:  
RBW=1MHz, VBW=3MHz Peak detector for Peak value.  
RBW=1MHz, VBW=3MHz RMS detector for Average value.

**TEST MODE:**

Please refer to the clause 3.3

**TEST RESULTS**

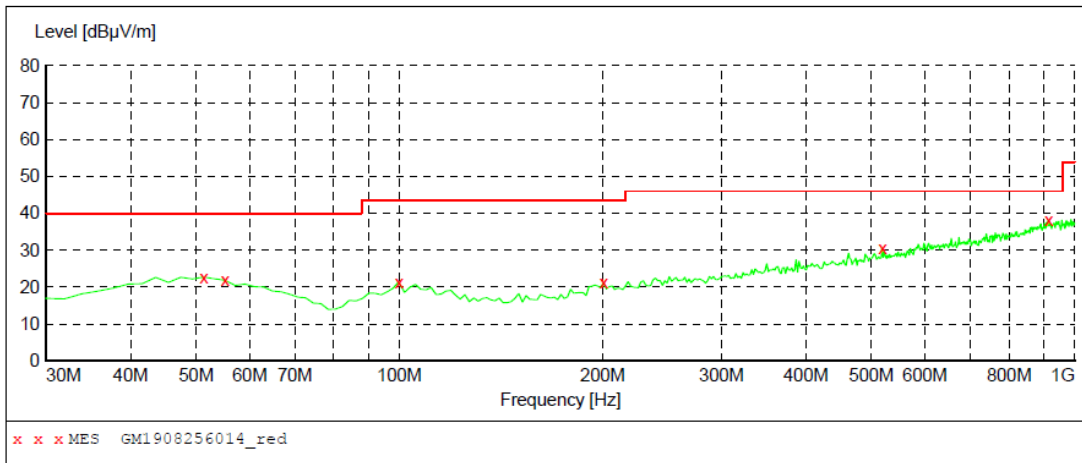
**Passed**       **Not Applicable**

**Note:**

- 1) Above 1GHz Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
  - 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- **9 kHz ~ 30 MHz**  
The EUT was pre-scanned the frequency band (9 kHz ~ 30 MHz), found the radiated level lower than the limit, so don't show on the report.
- **30 MHz ~ 1000 MHz**  
Have pre-scan all modulation mode, found the BT-BLE mode CH39 which it was worst case, so only the worst case's data on the test report.

➤ 30 MHz ~ 1 GHz

Polarization: Vertical

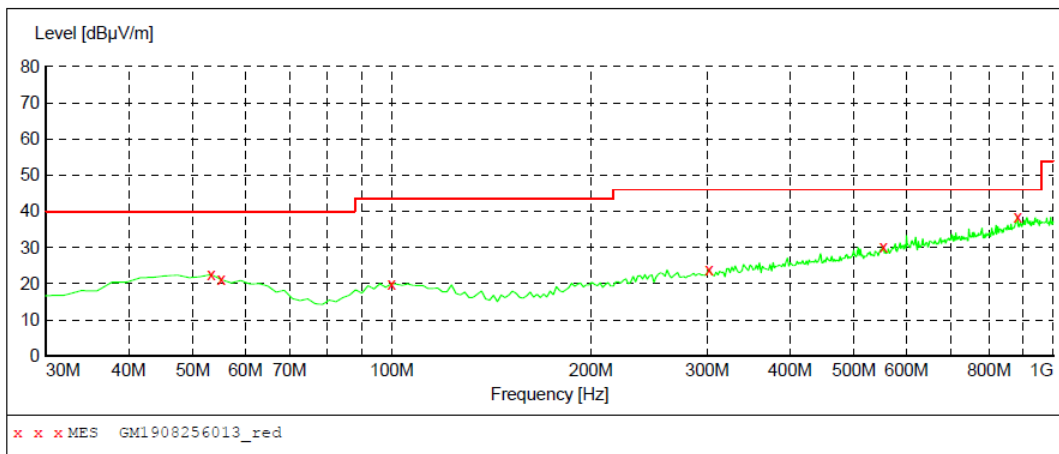


**MEASUREMENT RESULT: "GM1908256014\_red"**

8/25/2019 1:11PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
51.340000	22.70	-4.9	40.0	17.3	QP	100.0	173.00	VERTICAL
55.220000	21.80	-5.3	40.0	18.2	QP	100.0	50.00	VERTICAL
99.840000	21.40	-6.7	43.5	22.1	QP	100.0	271.00	VERTICAL
200.720000	21.10	-6.0	43.5	22.4	QP	100.0	0.00	VERTICAL
518.880000	30.50	2.4	46.0	15.5	QP	100.0	295.00	VERTICAL
914.640000	38.20	10.6	46.0	7.8	QP	100.0	50.00	VERTICAL

Polarization: Horizontal



**MEASUREMENT RESULT: "GM1908256013\_red"**

8/25/2019 1:07PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
53.280000	22.60	-5.1	40.0	17.4	QP	100.0	102.00	HORIZONTAL
55.220000	21.20	-5.3	40.0	18.8	QP	100.0	114.00	HORIZONTAL
99.840000	19.90	-6.7	43.5	23.6	QP	100.0	0.00	HORIZONTAL
301.600000	24.00	-3.5	46.0	22.0	QP	100.0	126.00	HORIZONTAL
553.800000	30.30	3.0	46.0	15.7	QP	100.0	142.00	HORIZONTAL
883.600000	38.60	10.1	46.0	7.4	QP	100.0	33.00	HORIZONTAL

## ➤ 1 GHz ~ 25 GHz

Test channel					CH00			
<b>Suspected Data List</b>								
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Factor [dB]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Polarity	Detector
1	1597.781	43.60	-6.27	37.33	74.00	36.67	Horizontal	PK
2	1803.406	39.32	-5.80	33.52	74.00	40.48	Horizontal	PK
3	2132.406	38.14	-3.67	34.47	74.00	39.53	Horizontal	PK
4	2661.156	42.25	-0.16	42.09	74.00	31.91	Horizontal	PK
5	4266.500	34.57	3.79	38.36	74.00	35.64	Horizontal	PK
6	7001.312	31.75	15.17	46.92	74.00	27.08	Horizontal	PK
<b>Suspected Data List</b>								
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Factor [dB]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Polarity	Detector
1	1804.875	56.35	-5.80	50.55	54.00	3.45	Vertical	AV
2	1804.875	56.35	-5.80	50.55	54.00	3.45	Vertical	AV
3	1804.875	59.96	-5.80	54.16	74.00	19.84	Vertical	PK
4	2458.468	44.63	-2.23	42.40	74.00	31.60	Vertical	PK
5	2664.093	46.80	-0.10	46.70	74.00	27.30	Vertical	PK
6	4263.562	40.17	3.79	43.96	74.00	30.04	Vertical	PK
7	4975.906	41.96	7.69	49.65	74.00	24.35	Vertical	PK

Test channel					CH25			
<b>Suspected Data List</b>								
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Factor [dB]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Polarity	Detector
1	1596.312	44.14	-6.26	37.88	74.00	36.12	Horizontal	PK
2	1910.625	44.43	-5.71	38.72	74.00	35.28	Horizontal	PK
3	2357.125	37.22	-2.38	34.84	74.00	39.16	Horizontal	PK
4	3867.000	34.17	2.45	36.62	74.00	37.38	Horizontal	PK
5	4981.781	35.98	7.73	43.71	74.00	30.29	Horizontal	PK
6	7305.343	30.80	16.07	46.87	74.00	27.13	Horizontal	PK
<b>Suspected Data List</b>								
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Factor [dB]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Polarity	Detector
1	1327.531	41.47	-5.57	35.90	74.00	38.10	Vertical	PK
2	1829.843	54.29	-5.81	48.48	54.00	5.52	Vertical	AV
3	1829.843	57.99	-5.81	52.18	74.00	21.82	Vertical	PK
4	2744.875	42.21	1.26	43.47	74.00	30.53	Vertical	PK
5	3507.156	34.84	1.08	35.92	74.00	38.08	Vertical	PK
6	4984.718	39.51	7.75	47.26	74.00	26.74	Vertical	PK

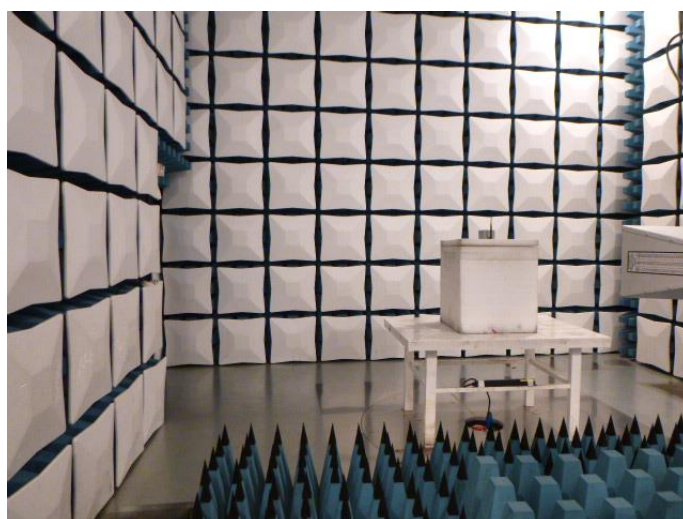
Test channel					CH49			
<b>Suspected Data List</b>								
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Factor [dB]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Polarity	Detector
1	1593.375	41.31	-6.24	35.07	74.00	38.93	Horizontal	PK
2	2128.000	37.42	-3.72	33.70	74.00	40.30	Horizontal	PK
3	2653.812	37.14	-0.30	36.84	74.00	37.16	Horizontal	PK
4	2998.968	47.21	-0.11	47.10	74.00	26.90	Horizontal	PK
5	3871.406	33.88	2.48	36.36	74.00	37.64	Horizontal	PK
6	4984.718	34.92	7.75	42.67	74.00	31.33	Horizontal	PK
<b>Suspected Data List</b>								
NO.	Freq. [MHz]	Reading [dB $\mu$ V/m]	Factor [dB]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Polarity	Detector
1	1141.000	42.96	-6.46	36.50	74.00	37.50	Vertical	PK
2	1854.812	59.27	-5.82	53.45	74.00	20.55	Vertical	PK
3	2123.593	38.89	-3.76	35.13	74.00	38.87	Vertical	PK
4	2783.062	42.98	1.84	44.82	74.00	29.18	Vertical	PK
5	3988.906	44.64	2.98	47.62	74.00	26.38	Vertical	PK
6	4986.187	43.10	7.76	50.86	74.00	23.14	Vertical	PK

## Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The peak level is lower than average limit(54dB $\mu$ V/m), this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

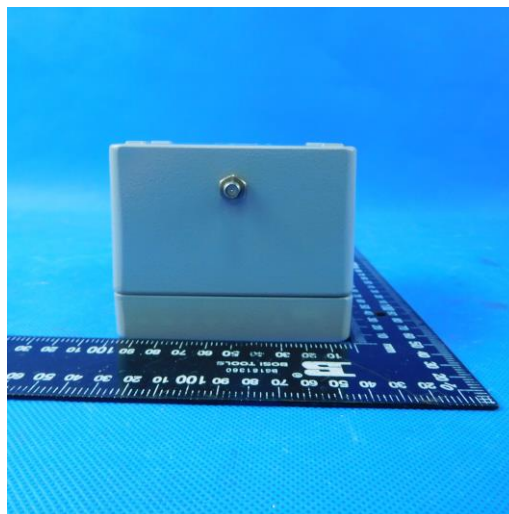
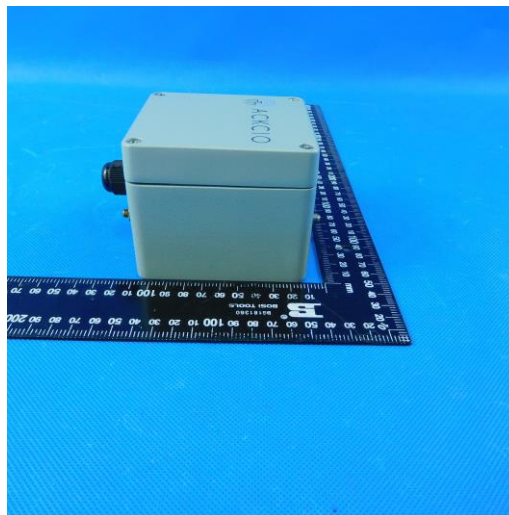
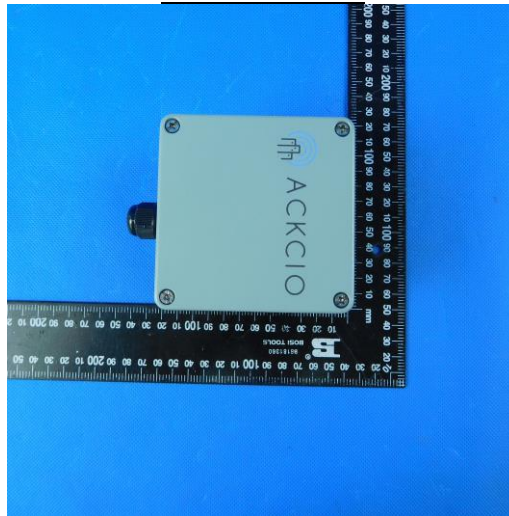
## 6. TEST SETUP PHOTOS

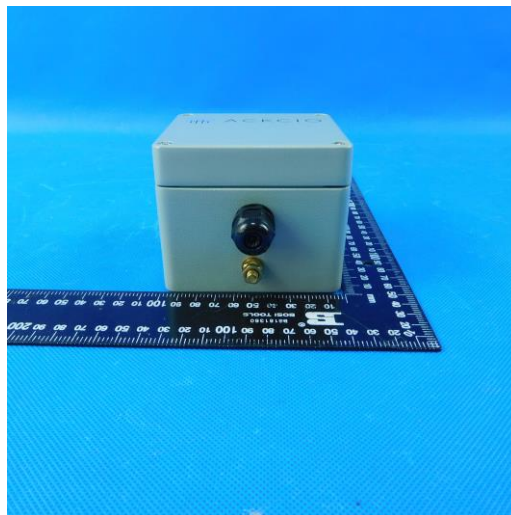
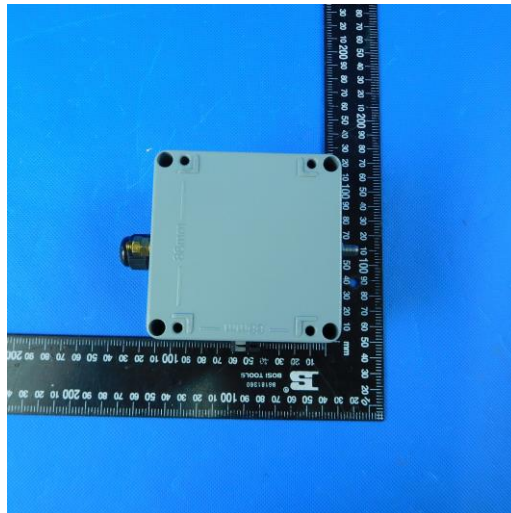
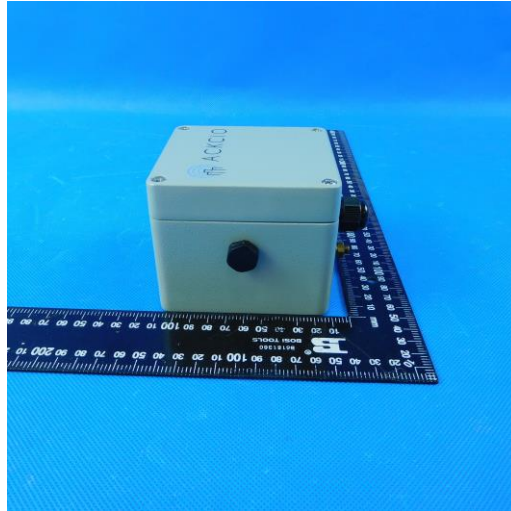
Radiated Emissions



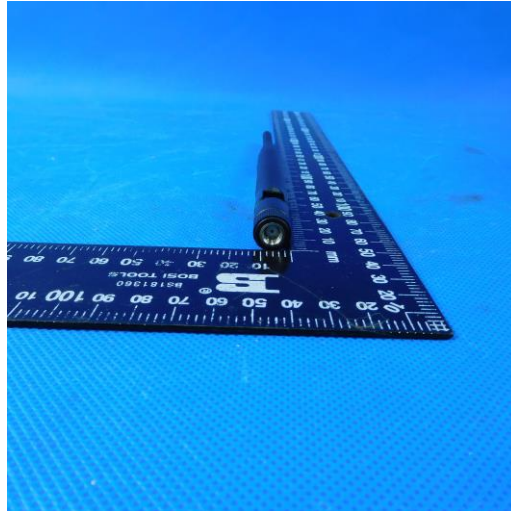
## 7. EXTERANAL AND INTERNAL PHOTOS

### External Photos

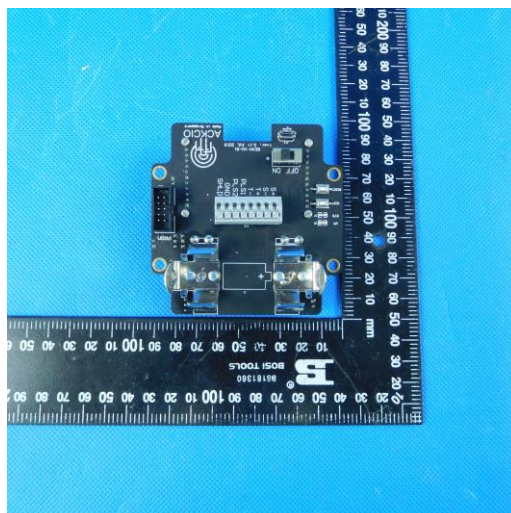
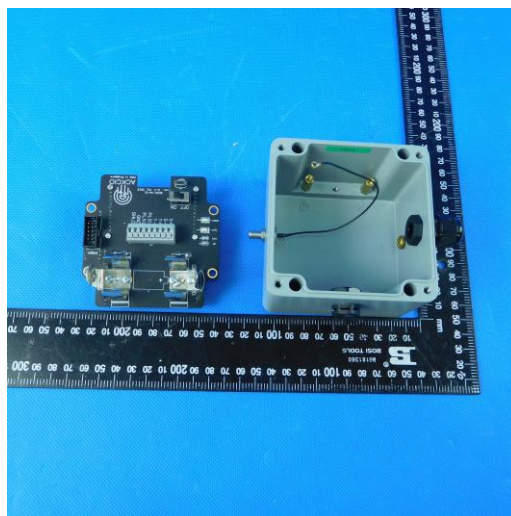
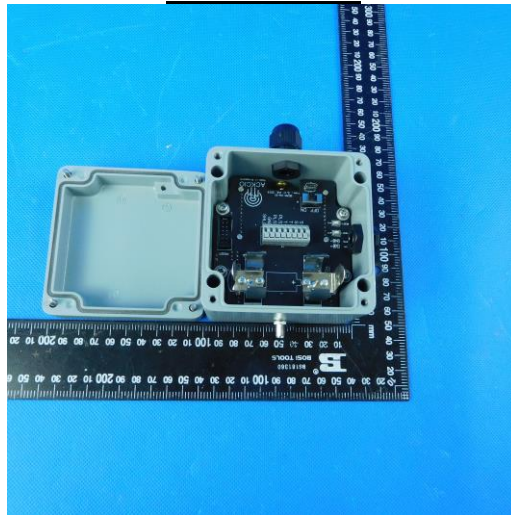


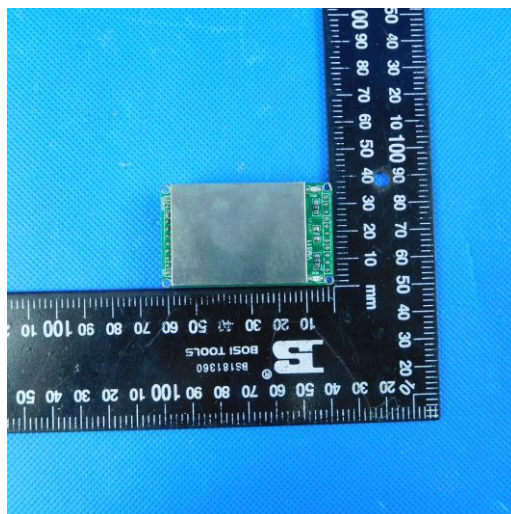
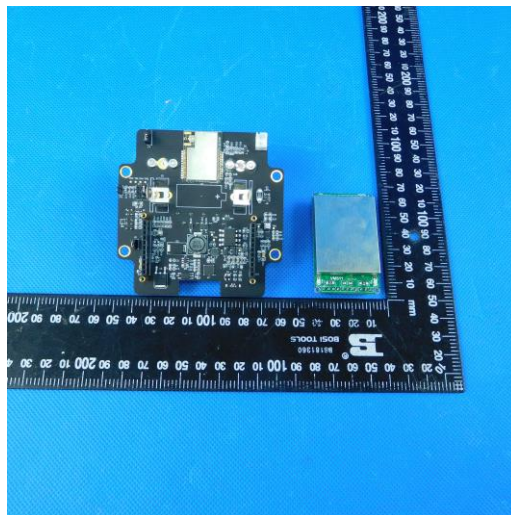
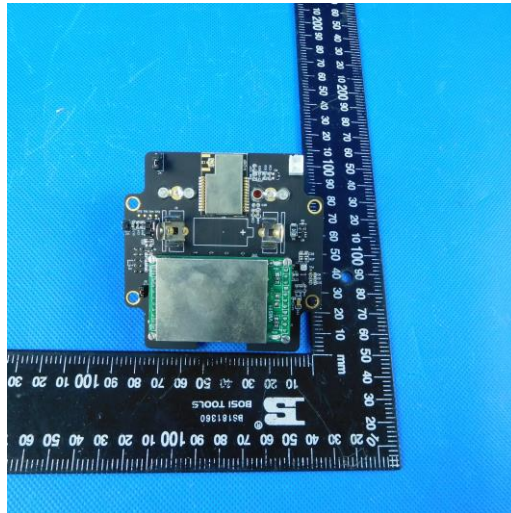


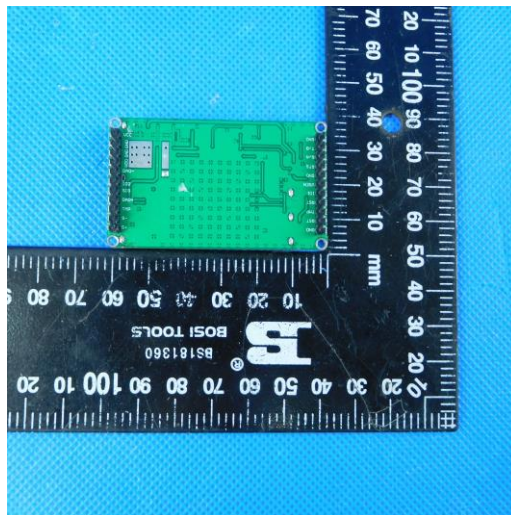
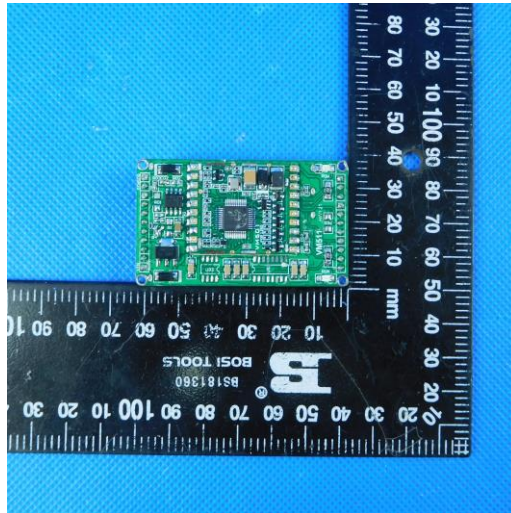




**Internal Photos**







-----End of Report-----