

FCC Test Report

Report No.:AGC07307190901FE06

FCC ID : 2ALU4DX207A07
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : Bluetooth FM Transmitter
BRAND NAME : AUTO DRIVE
MODEL NAME : VM-207
CLIENT : Huizhou Artsun Industrial Company Limited
DATE OF ISSUE : Oct.17, 2019
STANDARD(S) : FCC Part 15.239
REPORT VERSION : V1.0

Attestation of *Global Compliance*(Shenzhen) Co., Ltd

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Attestation of Global Compliance

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Oct.17, 2019	Valid	Initial Release



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1. VERIFICATION OF CONFORMITY

Applicant	Huizhou Artsun Industrial Company Limited
Address	No.2,Floor 14th,Unit one,Ruihe Commercial Square,No.1 Yandayi Road,Henan'an District,Huizhou City 516007, Guangdong, China
Manufacturer	Huizhou Artsun Industrial Company Limited
Address	No.2,Floor 14th,Unit one,Ruihe Commercial Square,No.1 Yandayi Road,Henan'an District,Huizhou City 516007, Guangdong, China
Factory	VOLANT ROC ELECTRONICS TECH CO., LTD
Address	A Building, QianLi Industrial Park, Sandong Town, Huizhou City 516025,Guangdong,China
Brand Name	Bluetooth FM Transmitter
Test Model	AUTO DRIVE
Series Model	VM-207
Date of test	Sep. 29, 2019 to Oct. 16, 2019
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/RF (2013-03-01)

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC part 15.239.

Prepared By



John Zeng
Project Engineer

Oct.16, 2019

Reviewed By



Max Zhang
Reviewer

Oct.17, 2019

Approved By



Forrest Lei
Authorized Officer

Oct.17, 2019

2. GENERAL INFORMATION

2.1.PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Operation Frequency	88.1MHz-107.9MHz
Field Strength(3m)	44.78dBuV/m(average)@3m
Modulation	FM
Number of channels	199(Channel spacing 100kHz)
Hardware Version	RRD8203S V1.1
Software Version	V5.0
Antenna Designation	Internal Antenna (Met 15.203 Antenna requirement)
Antenna Gain	0dBi
Power Supply	DC 12V to 24V

NOTE: About the EUT, please refer to User's Manual.

3. MEASUREMENT UNCERTAINTY

Conducted measurement: +/- 3.18dB

Radiated measurement: +/- 3.91dB

4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Sim TX BT Low channel GFSK + FM Low channel
2	Sim TX BT Middle channel GFSK+ FM Low channel
3	Sim TX BT High channel GFSK+ FM Low channel
4	Sim TX BT Low channel $\pi/4$ -DQPSK+ FM Low channel
5	Sim TX BT Middle channel $\pi/4$ -DQPSK+ FM Low channel
6	Sim TX BT High channel $\pi/4$ -DQPSK+ FM Low channel
7	Sim TX BT Low channel GFSK + FM Middle channel
8	Sim TX BT Middle channel GFSK+ FM Middle channel
9	Sim TX BT High channel GFSK+ FM Middle channel
10	Sim TX BT Low channel $\pi/4$ -DQPSK+ FM Middle channel
11	Sim TX BT Middle channel $\pi/4$ -DQPSK+ FM Middle channel
12	Sim TX BT High channel $\pi/4$ -DQPSK+ FM Middle channel
13	Sim TX BT Low channel GFSK + FM High channel

14	Sim TX BT Middle channel GFSK+ FM High channel
15	Sim TX BT High channel GFSK+ FM High channel
16	Sim TX BT Low channel $\pi/4$ -DQPSK+ FM High channel
17	Sim TX BT Middle channel $\pi/4$ -DQPSK+ FM High channel
18	Sim TX BT High channel $\pi/4$ -DQPSK+ FM High channel
Note: 1. For Radiated Emission, 3axis were chosen for testing for each applicable mode. 2. All the requirements have been tested by modulating the transmitter with a 2.5 kHz tone at a fixed level which set to the manufacturer's maximum rated input to the modulator. 3. Only the result of the worst case was recorded in the report, if no other cases. 4. Tuning-Range confirmed 88.1 ~ 107.9 MHz.	



5. SYSTEM TEST CONFIGURATION

5.1. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth FM Transmitter	VM-207	2ALU4DX207A07	EUT
2	Car battery	SAIL	12V 60Ah 356A	AE
3	Car battery	SAIL	12V 60Ah 356A	AE
4	Load	N/A	2ohm	AE
5	Mobile phone	J326T	N/A	AE
6	AUX in Cable	N/A	1.0m unshielded	AE
7	U Disk	Kingston	100 G3	AE

5.2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.239	Field Strength of Fundamental and Spurious Emission	Compliant
15.215	Bandwidth	Compliant
15.209	Line Conducted Emission	N/A

Note: N/A means it's not applicable to this item.

6. TEST FACILITY

TestSite	Attestation of Global Compliance(Shenzhen) Co., Ltd
Location	1-2/F,Building19,JunfengIndustrialPark,ChongqingRoad,HepingCommunity,Fuhai Street,Bao'anDistrict,Shenzhen,Guangdong,China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 20, 2018	Dec. 19, 2019
Attenuator	Warriors	W13	11324	Sep. 09, 2019	Sep. 08, 2020
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 14, 2018	Jun. 13, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 26, 2018	May. 25, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 25, 2018	Oct. 24, 2019
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep. 28, 2018	Sep. 27, 2020



7. RADIATED EMISSION

7.1. MEASUREMENT PROCEDURE

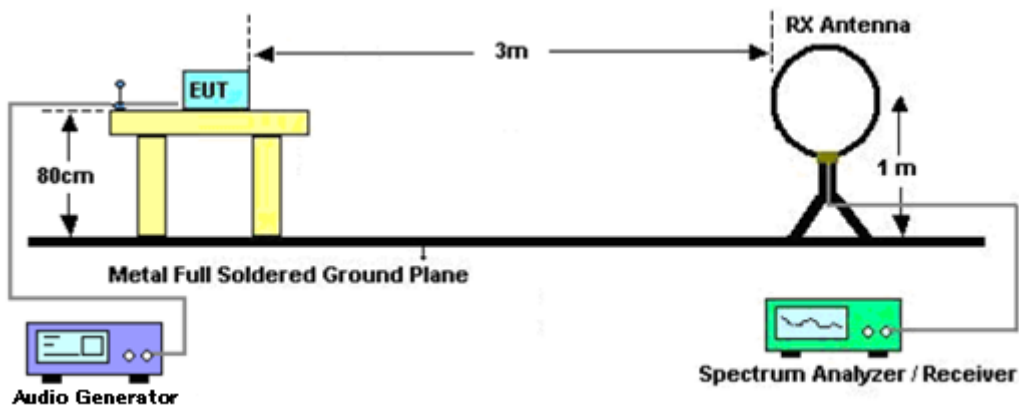
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground and opposite the horn antenna. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions below 1GHz, use 120KHz RBW and VBW>=3RBW for QP reading.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.
8. Only the worst case is reported.

The following table is the setting of spectrum analyzer and receiver.

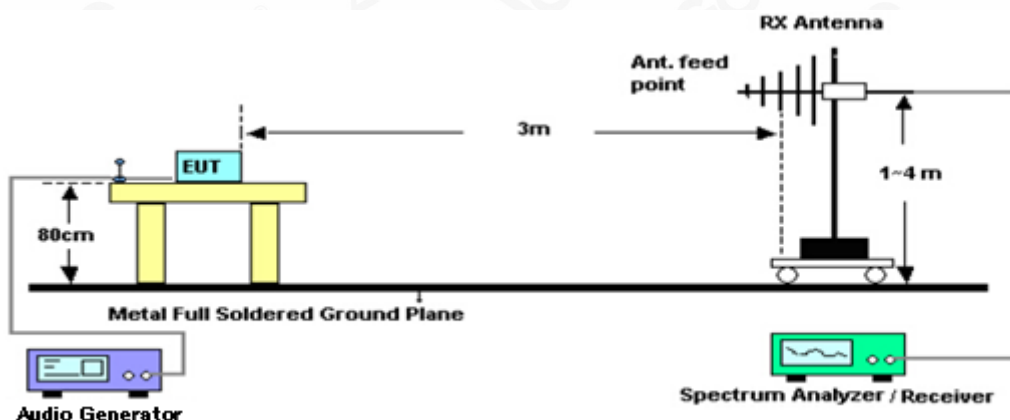
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RBW 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RBW 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RBW 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

7.2.TEST SETUP

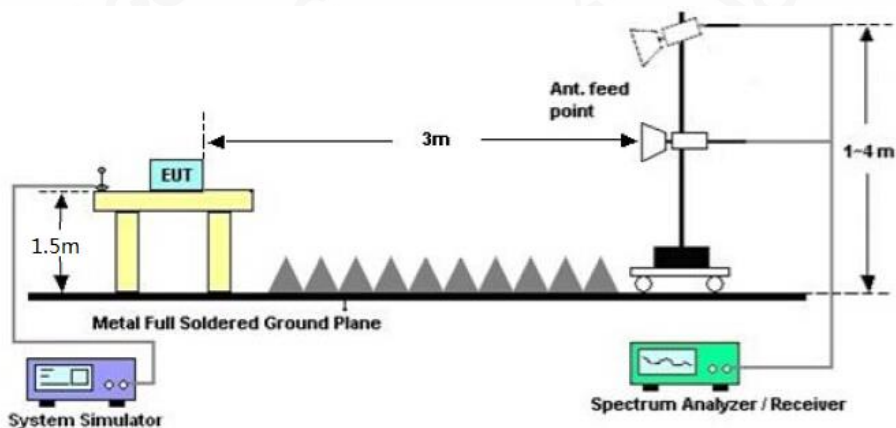
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



7.3. TEST RESULT FOR FIELD STRENGTH OF FUNDAMENTAL

Frequency MHz	Polarization	Level dB(uV/m) PK	Limit dB(uV/m) PK	Margin dB	Pass/Fail	Detector
88.100	H	45.65	67.96	22.31	Pass	PK
88.100	V	42.16	67.96	25.80	Pass	PK
98.000	H	45.42	67.96	22.54	Pass	PK
98.000	V	43.82	67.96	24.14	Pass	PK
107.900	H	45.32	67.96	22.64	Pass	PK
107.900	V	43.64	67.96	24.32	Pass	PK
Frequency MHz	Polarization	Level dB(uV/m) AV	Limit dB(uV/m) AV	Margin dB	Pass/Fail	Detector
88.100	H	43.13	47.96	4.83	Pass	AV
88.100	V	41.25	47.96	6.71	Pass	AV
98.000	H	43.85	47.96	4.11	Pass	AV
98.000	V	42.62	47.96	5.34	Pass	AV
107.900	H	44.27	47.96	3.69	Pass	AV
107.900	V	42.37	47.96	5.59	Pass	AV

8.4. TEST RESULT FOR FIELD STRENGTH OF BAND EDGE EMISSION

Frequency MHz	Polarization	Level dB(uV/m) QP	Limit dB(uV/m) QP	Margin dB	Pass/Fail	Detector
88.000	H	32.63	40	7.37	Pass	QP
88.000	V	33.15	40	6.85	Pass	QP
108.000	H	34.26	43.5	9.24	Pass	QP
108.000	V	29.77	43.5	13.73	Pass	QP

Note: The above two frequencies are the worst case for the band edge emission test.

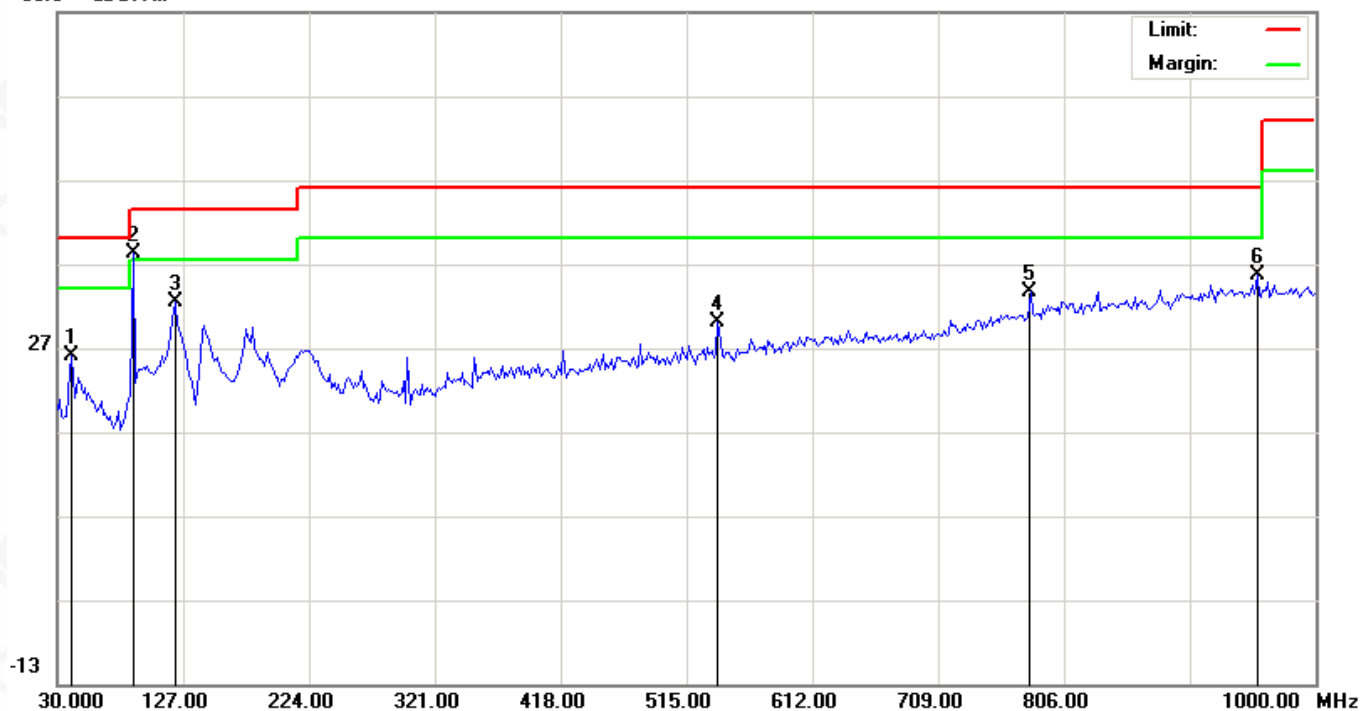
7.5. TEST RESULT FOR SPURIOUS EMISSION

RADIATED EMISSION BELOW 30MHz

No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHZ-Horizontal

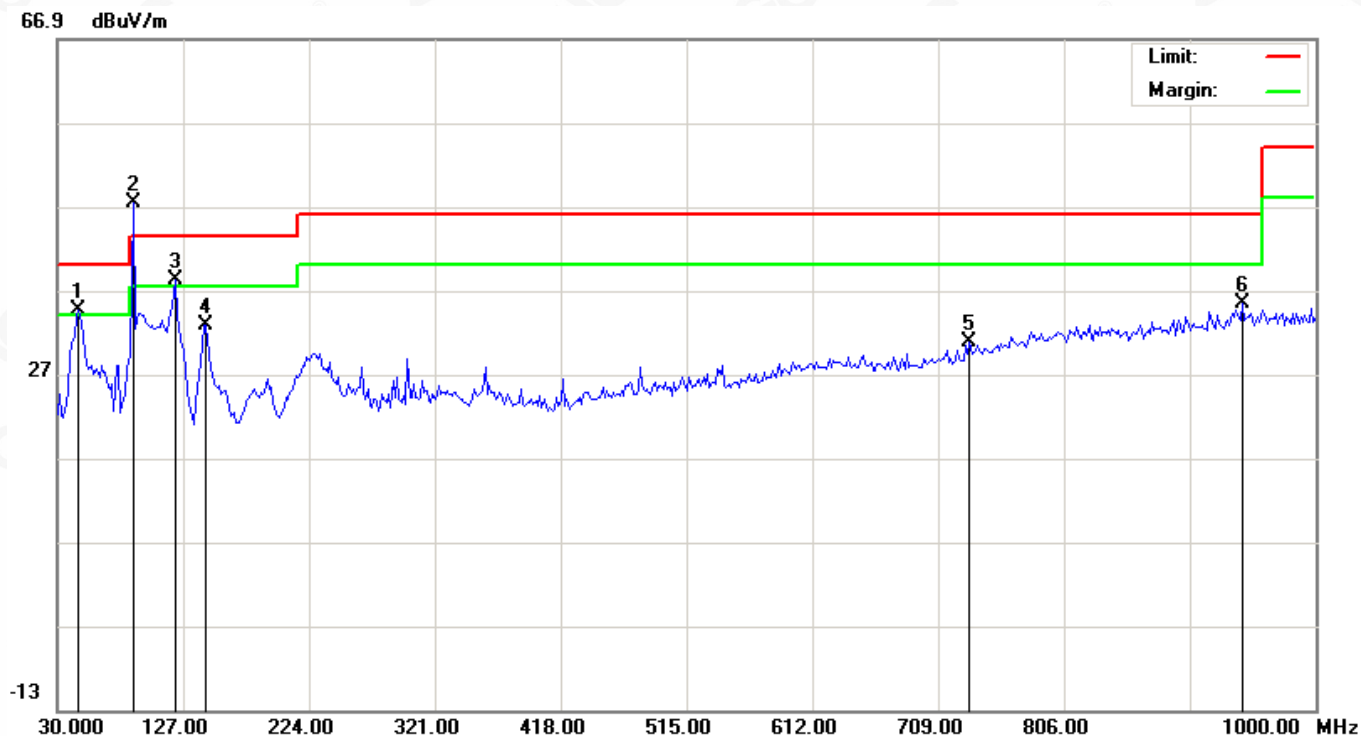
66.9 dBuV/m



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		41.3167	5.96	20.04	26.00	40.00	-14.00	peak			
2	*	88.2000	23.23	14.97	38.20	43.50	-5.30	peak			
3		120.5333	14.42	18.00	32.42	43.50	-11.08	peak			
4		539.2500	4.21	25.76	29.97	46.00	-16.03	peak			
5		780.1332	3.56	29.96	33.52	46.00	-12.48	peak			
6		954.7333	3.37	32.17	35.54	46.00	-10.46	peak			

RESULT: PASS

RADIATED EMISSION BELOW 1GHZ-Vertical



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	!	46.1667	14.79	19.87	34.66	40.00	-5.34	peak			
2	*	88.2000	32.39	14.97	47.36	43.50	3.86	peak			
3	!	120.5333	20.19	18.00	38.19	43.50	-5.31	peak			
4		144.7833	13.63	19.22	32.85	43.50	-10.65	peak			
5		733.2500	1.93	28.90	30.83	46.00	-15.17	peak			
6		943.4167	3.38	32.07	35.45	46.00	-10.55	peak			

RESULT: PASS

Note: 1. Factor=Antenna Factor+ Cable loss-Amplifier gain, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

3. All test modes had been tested. The mode 6 is the worst case and recorded in the report.

RADIATED EMISSION ABOVE 1GHZ

EUT	Bluetooth FM Transmitter	Model Name	VM-207
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	52.66	0.08	52.74	74	-21.26	peak
4804.000	47.53	0.08	47.61	54	-6.39	AVG
7206.000	46.82	2.21	49.03	74	-24.97	peak
7206.000	42.12	2.21	44.33	54	-9.67	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT	Bluetooth FM Transmitter	Model Name	VM-207
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 4	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	53.61	0.08	53.69	74	-20.31	peak
4804.000	46.43	0.08	46.51	54	-7.49	AVG
7206.000	47.88	2.21	50.09	74	-23.91	peak
7206.000	41.74	2.21	43.95	54	-10.05	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT	Bluetooth FM Transmitter	Model Name	VM-207
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 5	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	53.35	0.14	53.49	74	-20.51	peak
4882.000	45.96	0.14	46.1	54	-7.9	AVG
7323.000	48.26	2.36	50.62	74	-23.38	peak
7323.000	40.64	2.36	43	54	-11	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT	Bluetooth FM Transmitter	Model Name	VM-207
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 5	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	51.84	0.14	51.98	74	-22.02	peak
4882.000	47.22	0.14	47.36	54	-6.64	AVG
7323.000	45.4	2.36	47.76	74	-26.24	peak
7323.000	42.41	2.36	44.77	54	-9.23	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT	Bluetooth FM Transmitter	Model Name	VM-207
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	51.29	0.22	51.51	74	-22.49	peak
4960.000	47.21	0.22	47.43	54	-6.57	AVG
7440.000	45.54	2.64	48.18	74	-25.82	peak
7440.000	41.67	2.64	44.31	54	-9.69	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth FM Transmitter	Model Name	VM-207
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 6	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	50.74	0.22	50.96	74	-23.04	peak
4960.000	48.04	0.22	48.26	54	-5.74	AVG
7440.000	44.92	2.64	47.56	74	-26.44	peak
7440.000	41.46	2.64	44.1	54	-9.9	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note: Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.
Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been tested. The sim TX $\pi/4$ -DQPSK modulation+ FM low channel and recorded in the report.

8. BANDWIDTH

8.1. MEASUREMENT PROCEDURE

1. Set the parameters of SPA as below:

Centre frequency = Operation Frequency

RBW=3KHz

VBW=10KHz

Span: 300kHz

Sweep time: Auto

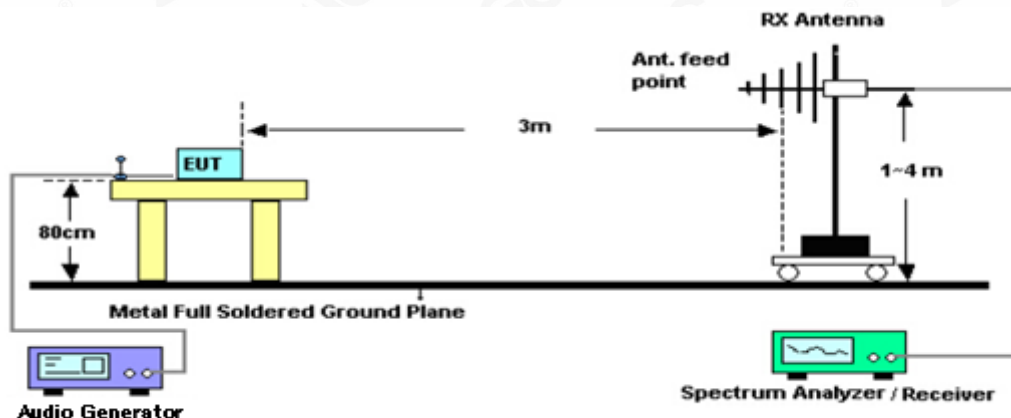
For the occupied bandwidth measurements, the input signal shall be a 2.5 kHz tone.

☐ The level of the tone shall be 16 dB higher than that required to produce a frequency deviation of 75 kHz, or 50% of the manufacturer's rated deviation, whichever is less.

☒ Alternatively, in the event that a 16 dB increase cannot be achieved, the level of the tone shall be set to the manufacturer's maximum rated input to the modulator.

2. Set the EUT to continue transmitting mode. Allow the trace to stabilize. Use the "N dB down" function of SPA to define the bandwidth.
3. Record the plots and Reported.

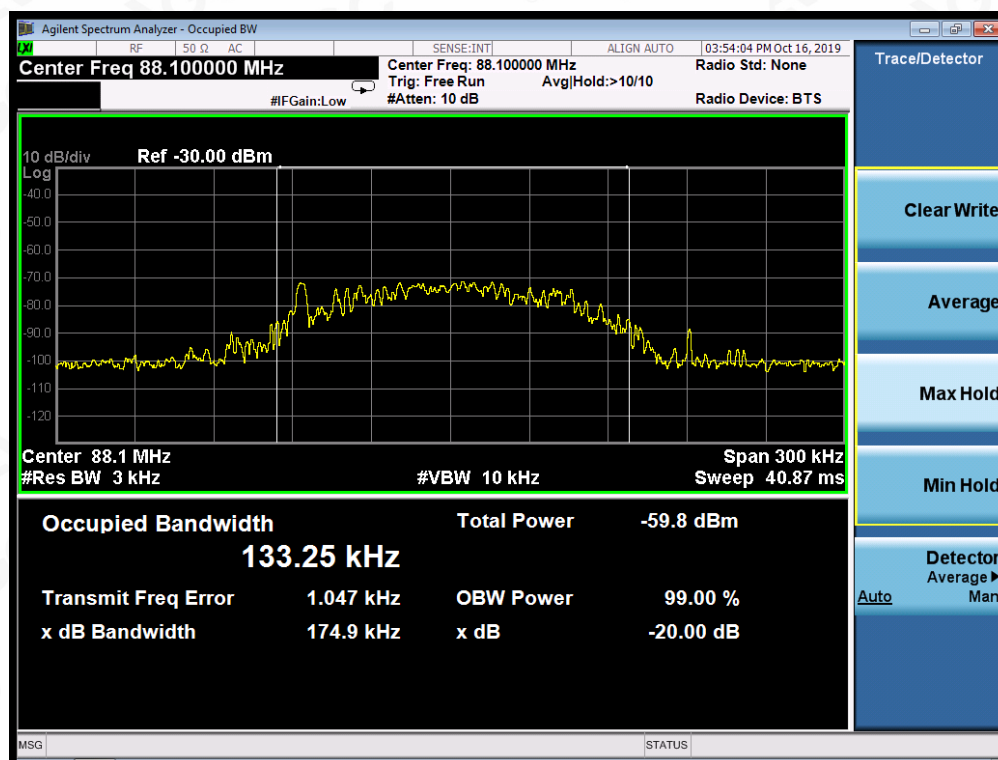
8.2. TEST SETUP



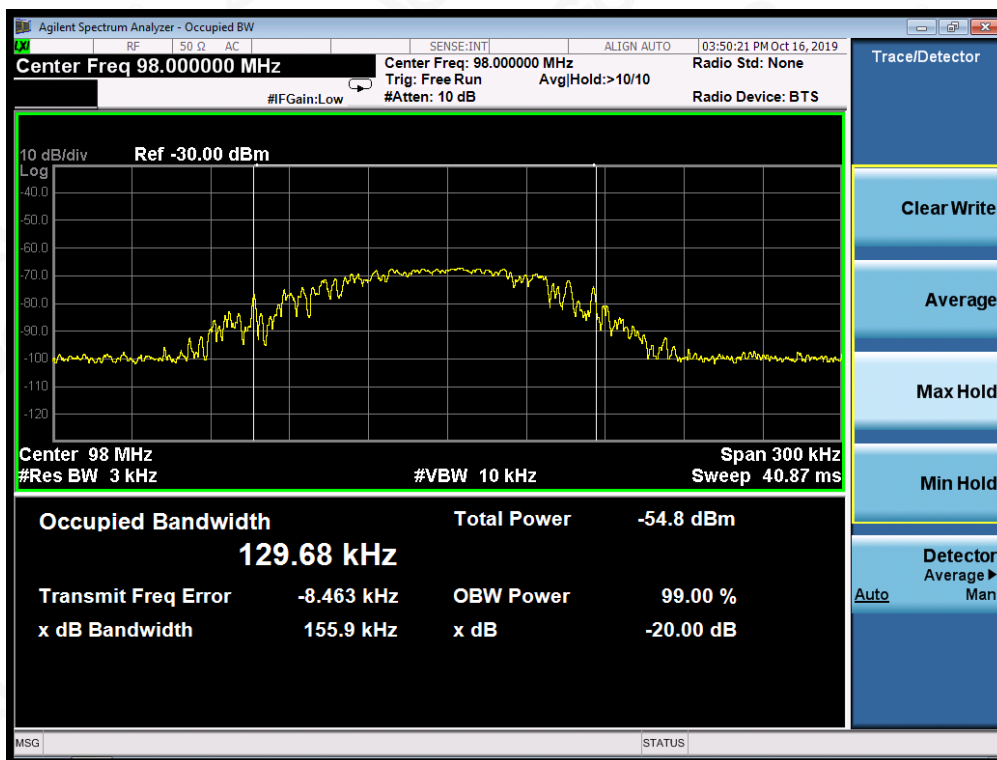
8.3. TEST RESULT

Channel	Channel Frequency(MHz)	-20dB bandwidth (kHz)	Limit(kHz)
Low	88.1	174.9	200
Middle	98.0	155.9	200
High	107.9	167.5	200

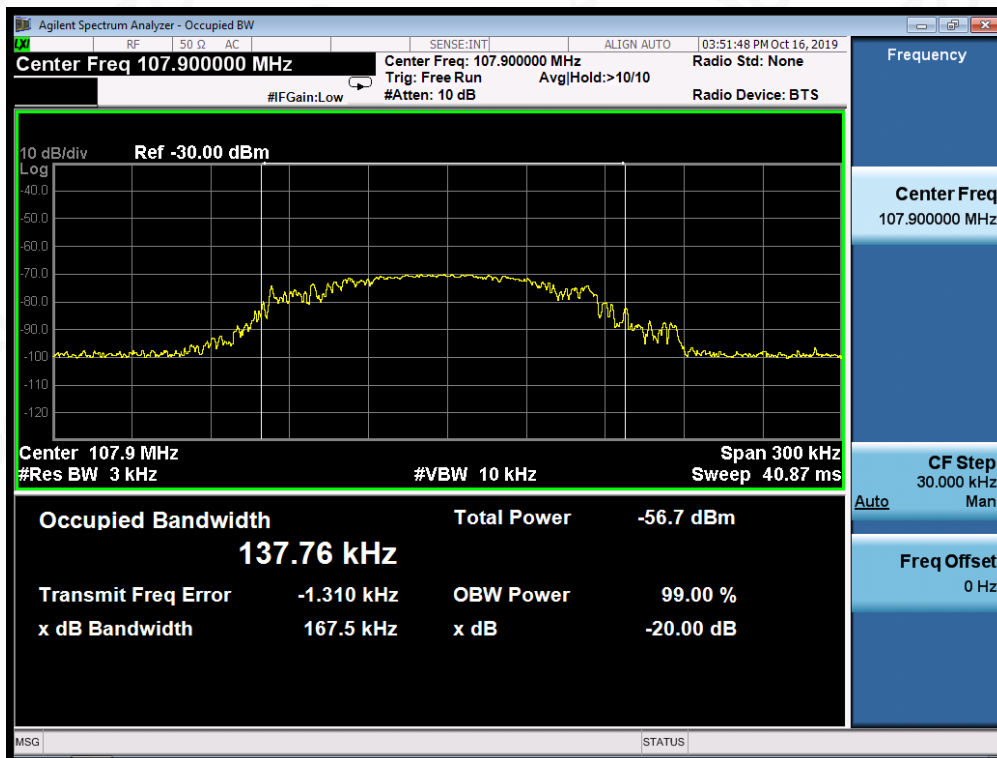
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

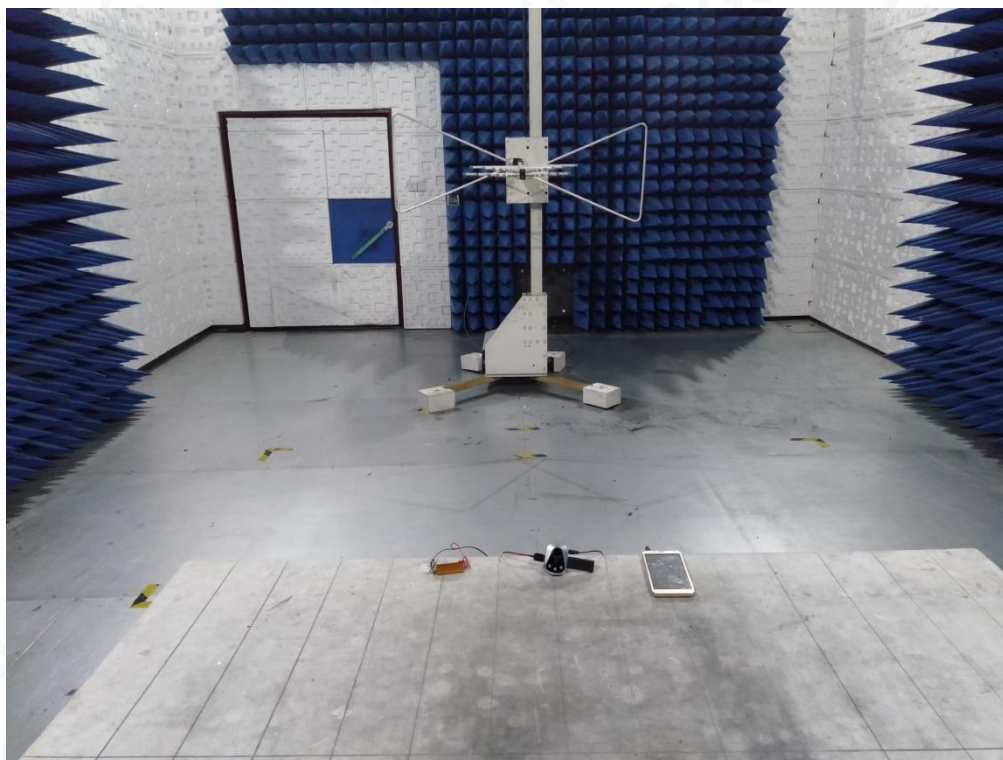


TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



APPENDIX A: PHOTOGRAPHS OF TEST SETUP**RADIATED EMISSION TEST SETUP BELOW 1G****RADIATED EMISSION TEST SETUP ABOVE 1G**

APPENDIX B: PHOTOGRAPHS OF EUT

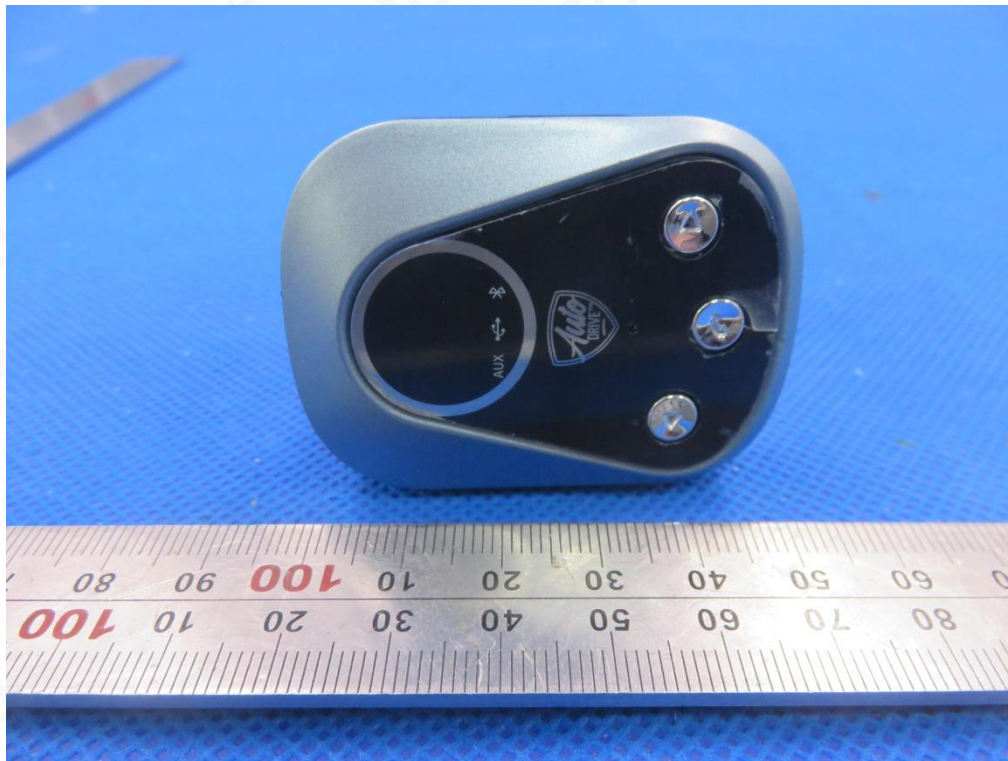
TOP VIEW OF EUT



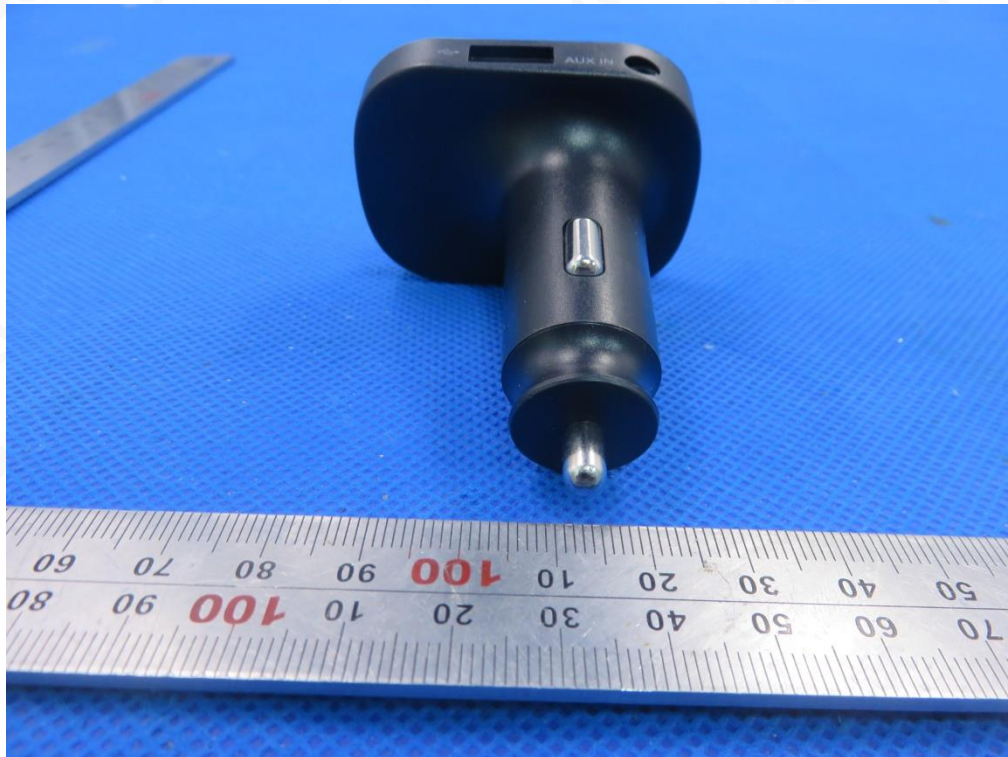
BOTTOM VIEW OF EUT



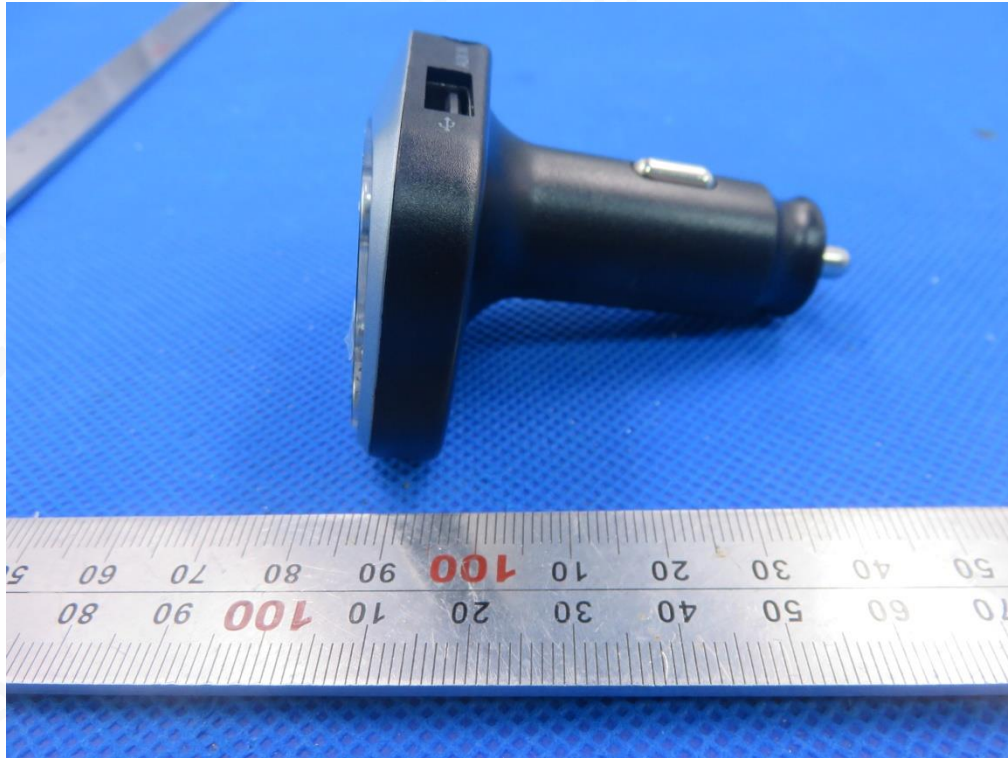
FRONT VIEW OF EUT



BACK VIEW OF EUT



LEFT VIEW OF EUT



RIGHT VIEW OF EUT (not final product identification, test sample only)



VIEW OF EUT(PORT)-1



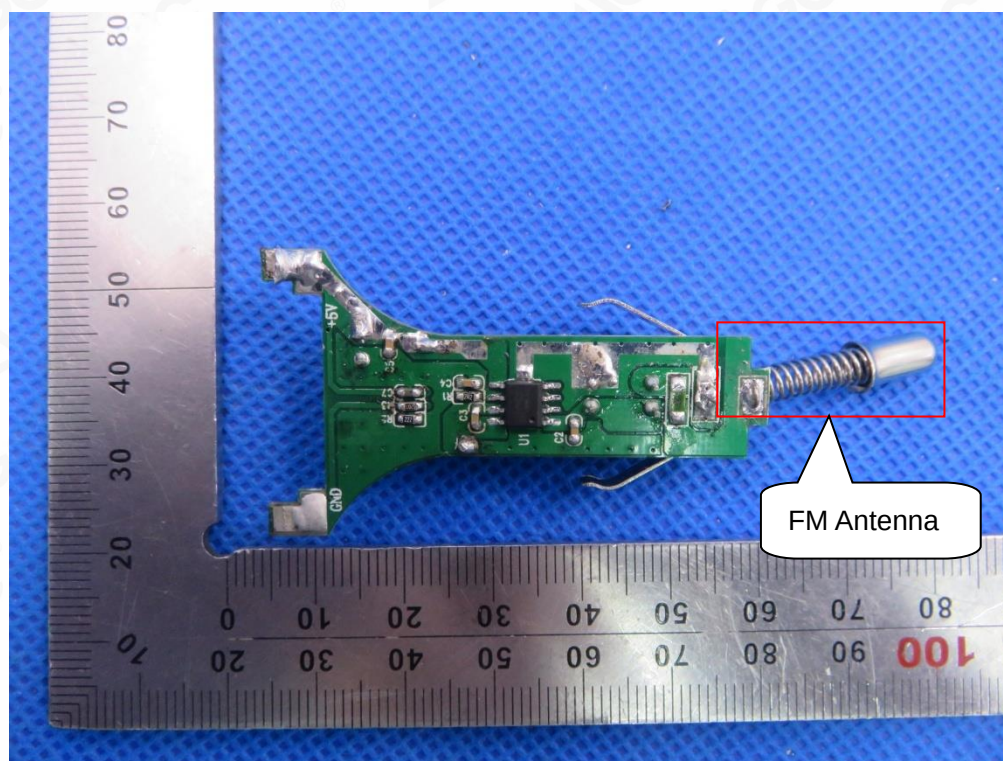
VIEW OF EUT(PORT)-2



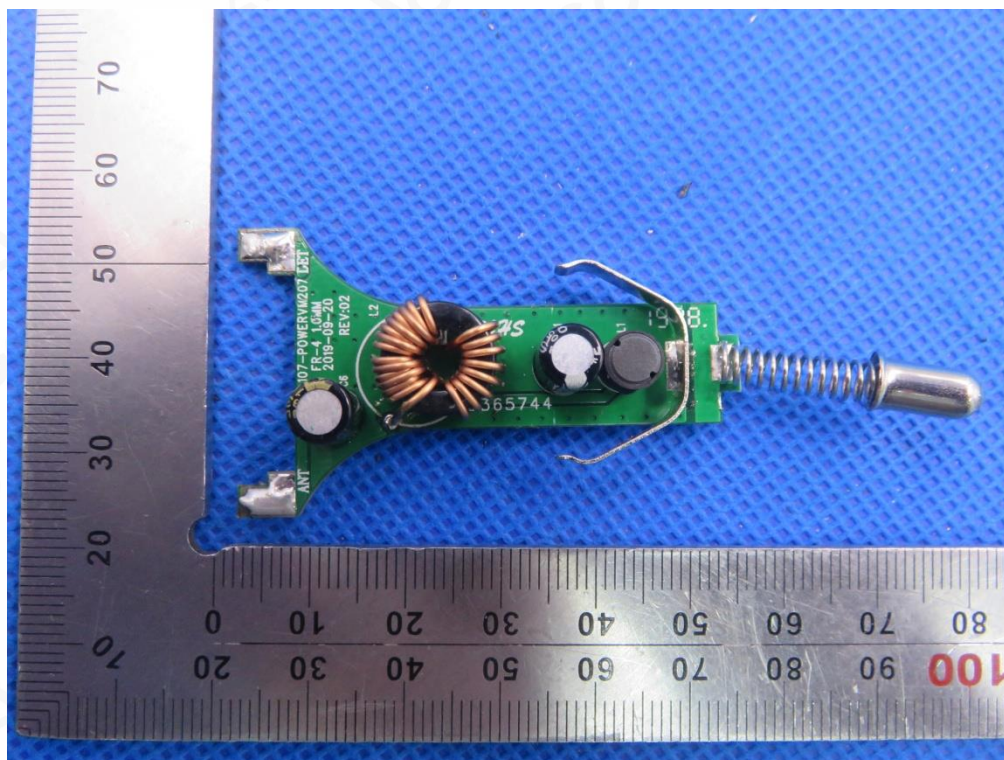
OPEN VIEW OF EUT



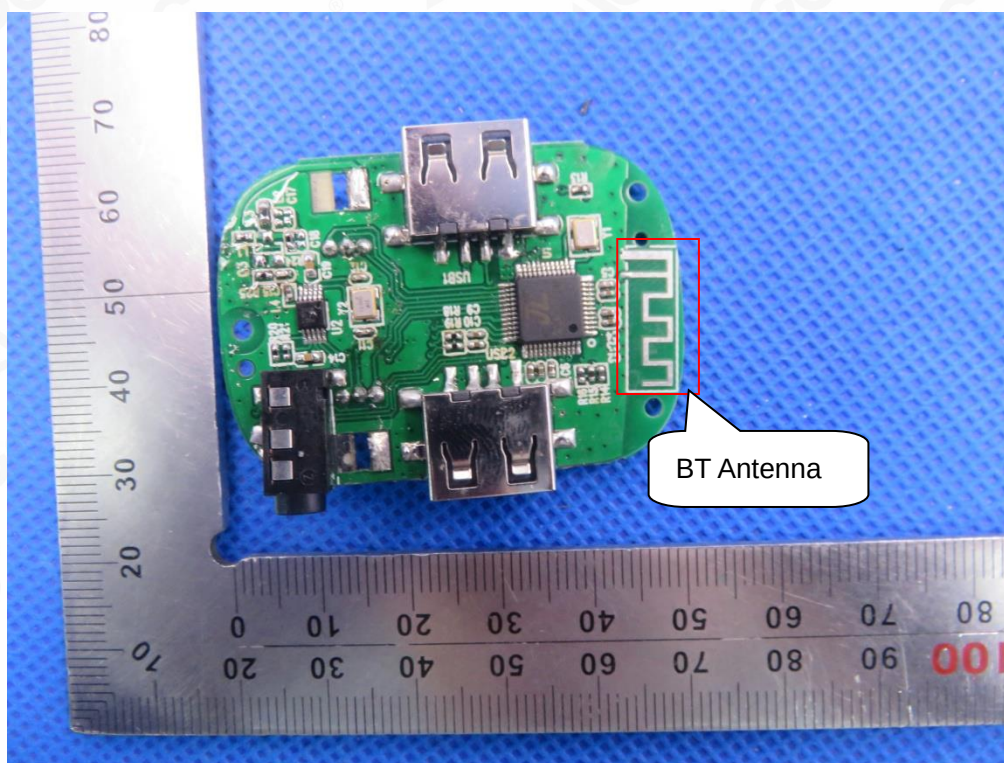
INTERNAL VIEW OF EUT-1



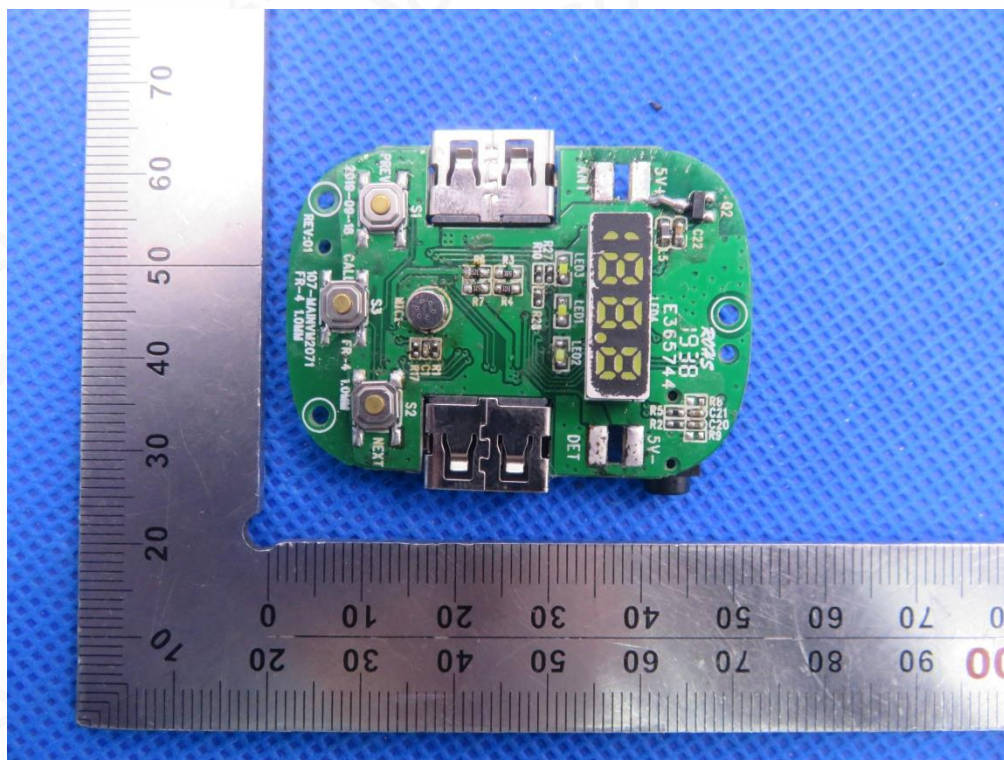
INTERNAL VIEW OF EUT-2



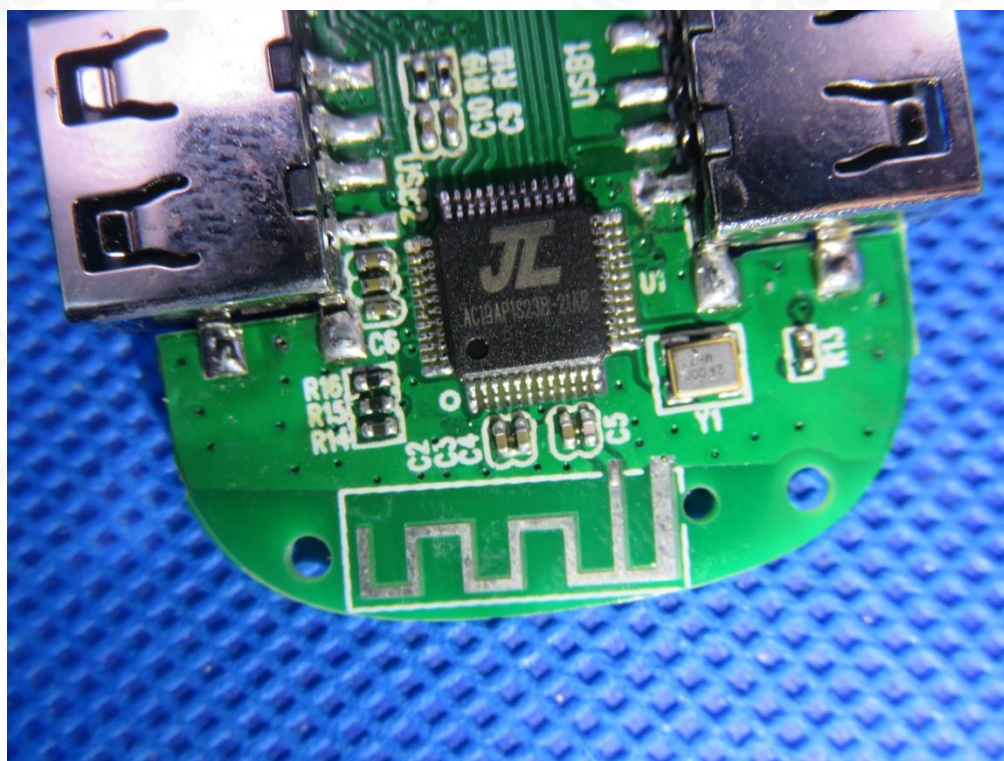
INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



-----END OF REPORT-----