

TEST REPORT

Product Name : Bluetooth module
Brand Mark : Feasycom
Model No. : FSC-BT690
FCC ID : 2AMWO-FSCBT690
Report Number : BLA-EMC-202310-A1002
Date of Sample Receipt : 2023/10/11
Date of Test : 2023/10/12 to 2023/10/18
Date of Issue : 2023/10/19
Test Standard : 47 CFR Part 15, Subpart C 15.247
Test Result : Pass

Prepared for:

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Date:

2023/10/19



REPORT REVISE RECORD

Version No.	Date	Description
00	2023/10/19	Original

TABLE OF CONTENTS

1 TEST SUMMARY	5
2 GENERAL INFORMATION	6
3 GENERAL DESCRIPTION OF E.U.T.....	6
4 OPERATION FREQUENCY EACH OF CHANNEL	7
5 TEST ENVIRONMENT	7
6 TEST MODE	7
7 MEASUREMENT UNCERTAINTY	8
8 DESCRIPTION OF SUPPORT UNIT	9
9 LABORATORY LOCATION	9
10 TEST INSTRUMENTS LIST	10
11 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)	13
11.1 LIMITS	13
11.2 BLOCK DIAGRAM OF TEST SETUP	13
11.3 PROCEDURE	13
11.4 TEST DATA	15
12 CONDUCTED BAND EDGES MEASUREMENT	17
12.1 LIMITS	17
12.2 BLOCK DIAGRAM OF TEST SETUP	18
12.3 TEST DATA	18
13 RADIATED SPURIOUS EMISSIONS	19
13.1 LIMITS	19
13.2 BLOCK DIAGRAM OF TEST SETUP	20
13.3 PROCEDURE	20
13.4 TEST DATA	22
14 ANTENNA REQUIREMENT	30
14.1 CONCLUSION	30
15 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	31
15.1 LIMITS	31
15.2 BLOCK DIAGRAM OF TEST SETUP	32

15.3 PROCEDURE	32
15.4 TEST DATA	34
16 CONDUCTED SPURIOUS EMISSIONS	38
16.1 LIMITS	38
16.2 BLOCK DIAGRAM OF TEST SETUP	39
16.3 TEST DATA	39
17 POWER SPECTRUM DENSITY	40
17.1 LIMITS	40
17.2 BLOCK DIAGRAM OF TEST SETUP	40
17.3 TEST DATA	40
18 CONDUCTED PEAK OUTPUT POWER	41
18.1 LIMITS	41
18.2 BLOCK DIAGRAM OF TEST SETUP	41
18.3 TEST DATA	42
19 MINIMUM 6DB BANDWIDTH	43
19.1 LIMITS	43
19.2 BLOCK DIAGRAM OF TEST SETUP	43
19.3 TEST DATA	43
20 APPENDIX	44
20.1 MAXIMUM CONDUCTED OUTPUT POWER	44
20.2 -6dB BANDWIDTH	46
20.3 OCCUPIED CHANNEL BANDWIDTH	48
20.4 MAXIMUM POWER SPECTRAL DENSITY LEVEL	50
20.5 BAND EDGE	52
20.6 CONDUCTED RF SPURIOUS EMISSION	55
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	59
APPENDIX B: PHOTOGRAPHS OF EUT	61

1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass

Remark:

N/A: Not Applicable

2 GENERAL INFORMATION

Applicant	Shenzhen Feasycom Co., Ltd
Address	Rm 508, Building A, Fenghuang Zhigu, No.50, Tiezai Road, Xixiang, Baoan District, Shenzhen, 518102, China
Manufacturer	Shenzhen Feasycom Co., Ltd
Address	Rm 508, Building A, Fenghuang Zhigu, No.50, Tiezai Road, Xixiang, Baoan District, Shenzhen, 518102, China
Factory	N/A
Address	N/A
Product Name	Bluetooth module
Test Model No.	FSC-BT690

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	N/A
Software Version	N/A
Engineer sample no:	BLA-EMC-202310-A10
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	Ceramic Chip Antenna
Antenna Gain:	2.12dBi(Provided by the customer)

4 OPERATION FREQUENCY EACH OF CHANNEL

BLE:

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	11	2422MHz	21	2442MHz	31	2462MHz
2	2404MHz	12	2424MHz	22	2444MHz	32	2464MHz
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

Note:

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

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2442MHz
The Highest channel	2480MHz

5 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC3.3V

6 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in transmitting mode
Remark: Only the data of the worst mode would be recorded in this report.	

7 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3.0 dB
Unwanted Emissions, conducted	±3.0 dB
Temperature	±3 °C
Supply voltages	±3 %
Time	±5 %
Radiated Emission(9kHz-30MHz)	±4.34dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB
Unwanted Radiated Emission (30MHz ~ 1000MHz)	±4.35 dB
Unwanted Radiated Emission (1GHz ~ 18GHz)	±4.44 dB

8 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	lenovo	E460C	N/A	From lab (No.BLA-ZC-BS-2022005)

9 LABORATORY LOCATION

All tests were performed at:

BlueAsia of Technical Services(Shenzhen) Co., Ltd.

Building C, No. 107, Shihuan Road, Shiyuan Sub-District, Baoan District, Shenzhen, Guangdong Province, China

Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673

No tests were sub-contracted.

10 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber 1	SKET	966	N/A	2022/11/10	2023/11/9
Chamber 2	SKET	966	N/A	2021/07/20	2024/07/19
Spectrum	R&S	FSP40	100817	2023/09/7	2024/09/6
Receiver	R&S	ESR7	101199	2022/09/15	2023/09/14
Receiver	R&S	ESPI7	101477	2022/07/16	2024/07/15
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2023/09/7	2024/09/6
Horn Antenna	Schwarzbeck	BBHA9120D	01892 P:00331	2022/09/13	2025/09/12
Amplifier	SKET	LNPA_30M01G-30	SK2021060801	2022/07/16	2024/07/15
Amplifier	SKET	PA-000318G-45	N/A	2023/09/7	2024/09/6
Amplifier	SKET	LNPA_18G40G-50	SK2022071301	2022/07/14	2024/07/13
Filter group	SKET	2.4G/5G Filter group r	N/A	2022/07/16	2024/07/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2022/9/14	2025/9/13
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A
SignalGenerator	Agilent	N5182A	MY47420955	2023/9/7	2024/9/6
Audio Analyzer	ATS-1	Audio Precision	ATS141094	2023/07/01	2024/06/30
Electric and Magnetic Field Analyzer	EHP-200A	Narda	180ZX11016	2023/03/30	2024/03/29
Audio shielding box	SB-ABT-C35	SKET	N/A	2023/09/7	2024/09/6
1kHz calibration audio source	MCS-ABT-C35	SKET	N/A	2023/09/7	2024/09/6
Free Field Microphone	MGS MP 663	SKET	0414	2023/09/09	2024/09/08

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Shield room	SKET	833	N/A	2022/11/25	2023/11/24
Receiver	R&S	ESPI3	101082	2023/09/7	2024/09/6
LISN	R&S	ENV216	3560.6550.15	2023/09/7	2024/09/6
LISN	AT	AT166-2	AKK1806000003	2023/09/7	2024/09/6
ISN	TESEQ	ISNT8-cat6	53580	2023/09/7	2024/09/6
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01045	2022/08/17	2024/08/16
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01075	2022/08/17	2024/08/16
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

Test Equipment Of RF Conducted Test

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2023/09/7	2024/09/6
Spectrum	Agilent	N9020A	MY49100060	2023/09/7	2024/09/6
Spectrum	KEYSIGHT	N9030A	MY52350152	2022/07/01	2024/06/30
Spectrum	KEYSIGHT	N9010A	MY54330814	2022/07/01	2024/06/30
Signal Generator	Agilent	N5182A	MY47420955	2023/09/7	2024/09/6
Signal Generator	Agilent	E8257D	MY44320250	2022/07/01	2024/06/30
Signal Generator	Agilent	N5181A	MY46240904	2022/08/02	2024/08/01
Signal Generator	R&S	CMW500	132429	2023/09/7	2024/09/6
BluetoothTester	Anritsu	MT8852B	06262047872	2023/09/7	2024/09/6
Power probe	DARE	RPR3006W	14100889SN042	2023/09/7	2024/09/6
DCPowersupply	zhaoxin	KXN-305D	20K305D1221363	2023/09/7	2024/09/6
DCPowersupply	zhaoxin	RXN-1505D	19R1505D050168	2023/09/7	2024/09/6

Audio Analyzer	Audioprecision	N/A	ATSI-41094	2022/7/1	2024/6/30
2.4GHz/5GHz RF Test software	MTS	MTS 8310	Version 2.0.0.0	N/A	N/A

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11 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

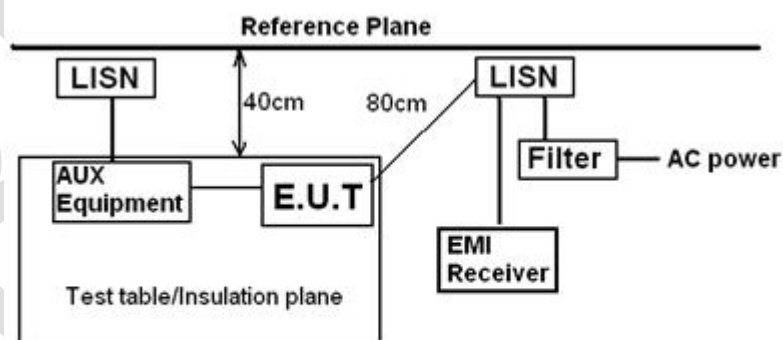
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

11.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	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.

11.2 BLOCK DIAGRAM OF TEST SETUP



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedance Stabilization Network
Test table height=0.8m

11.3 PROCEDURE

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

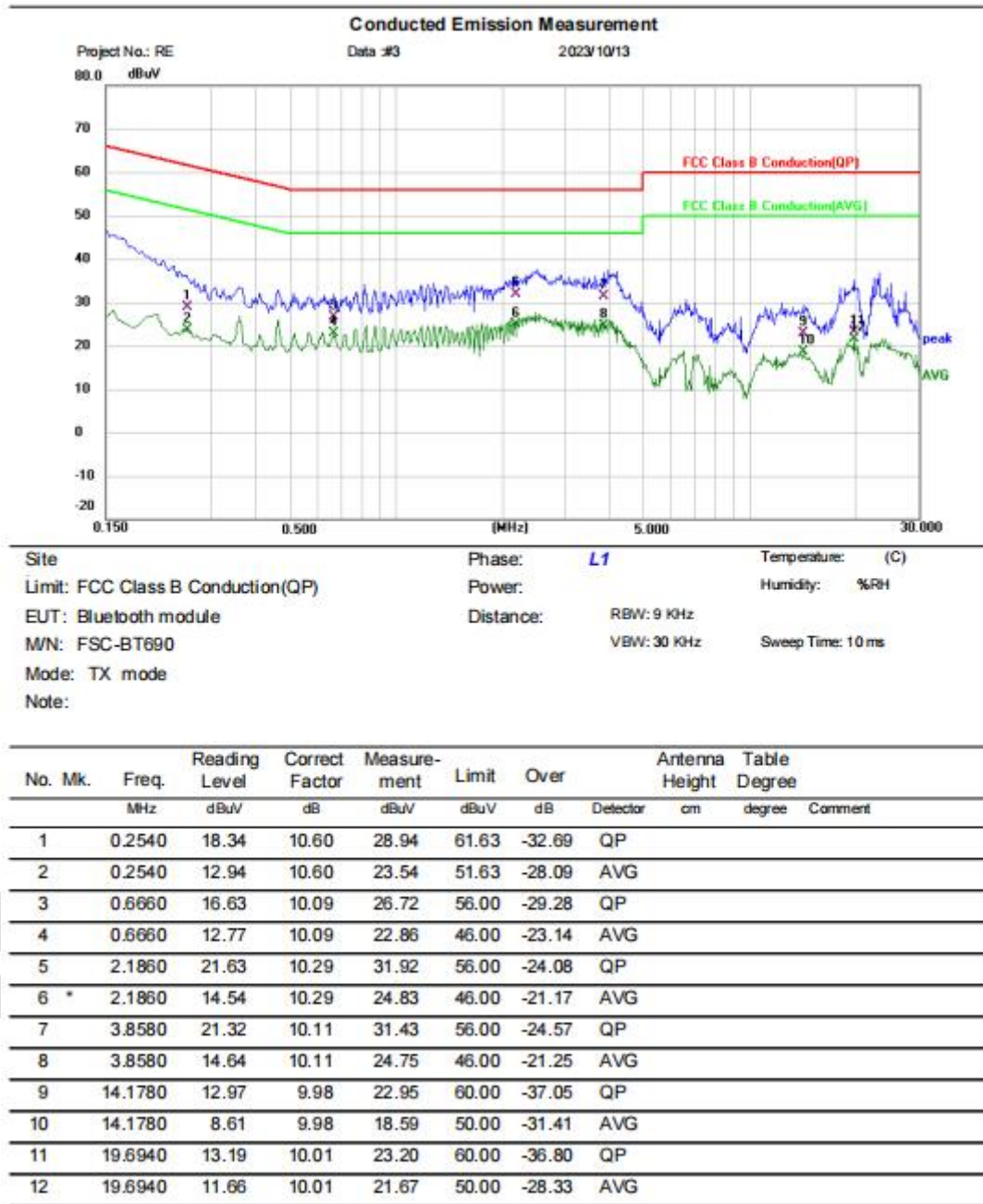
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: $LISN = Read\ Level + Cable\ Loss + LISN\ Factor$

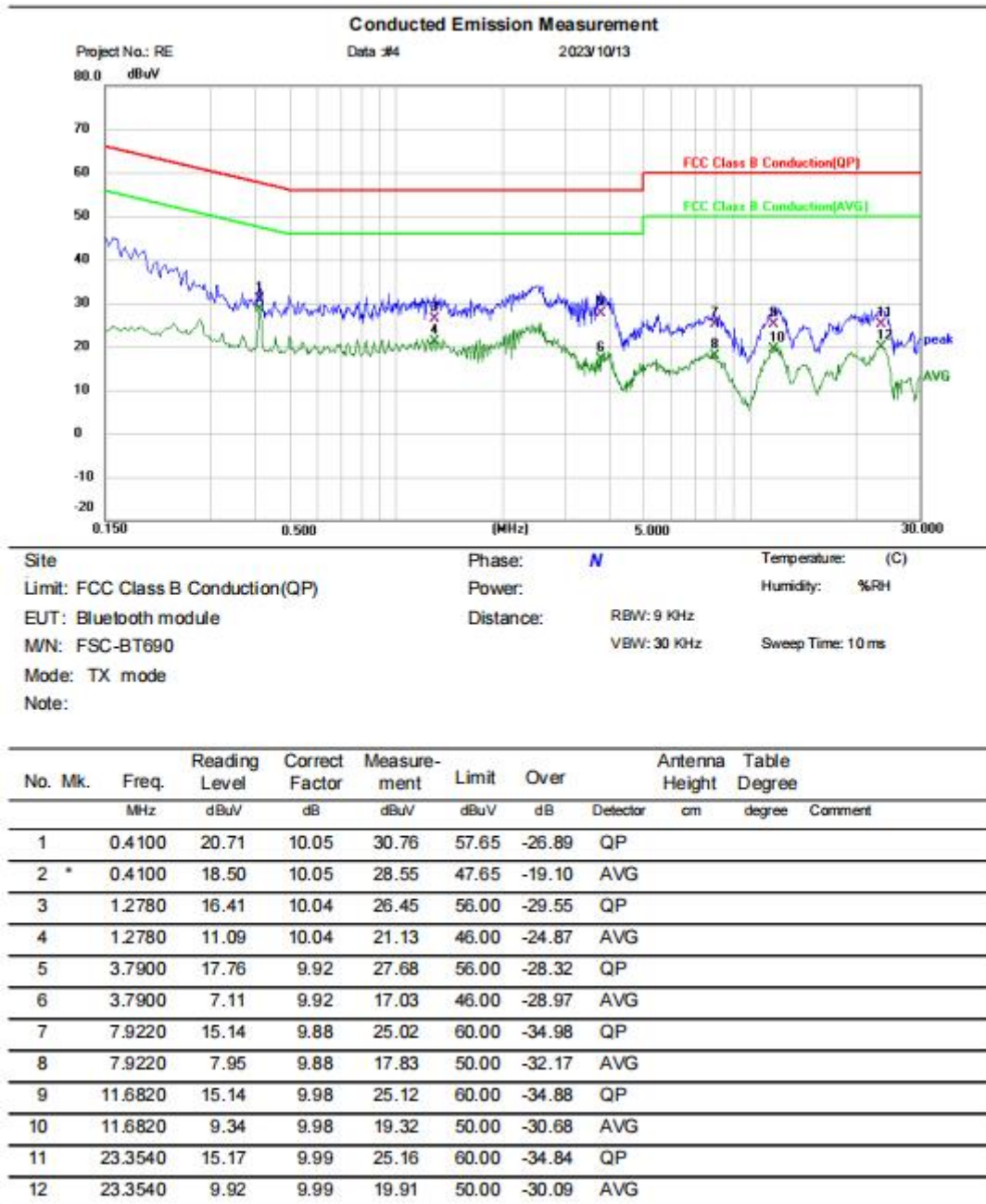
11.4 TEST DATA

[TestMode: TX]; [Line: Line];[Power:AC120V/60Hz]



Test Result: Pass

[TestMode: TX]; [Line: Neutral];[Power:AC120V/60Hz]



Test Result: Pass

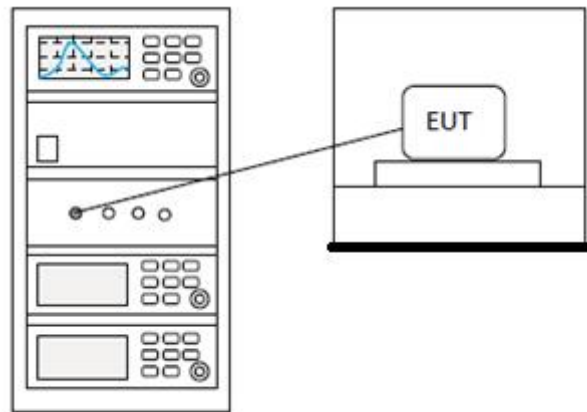
12 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25°C
Humidity	60%

12.1 LIMITS

Limit:	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)).
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12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

13 RADIATED SPURIOUS EMISSIONS

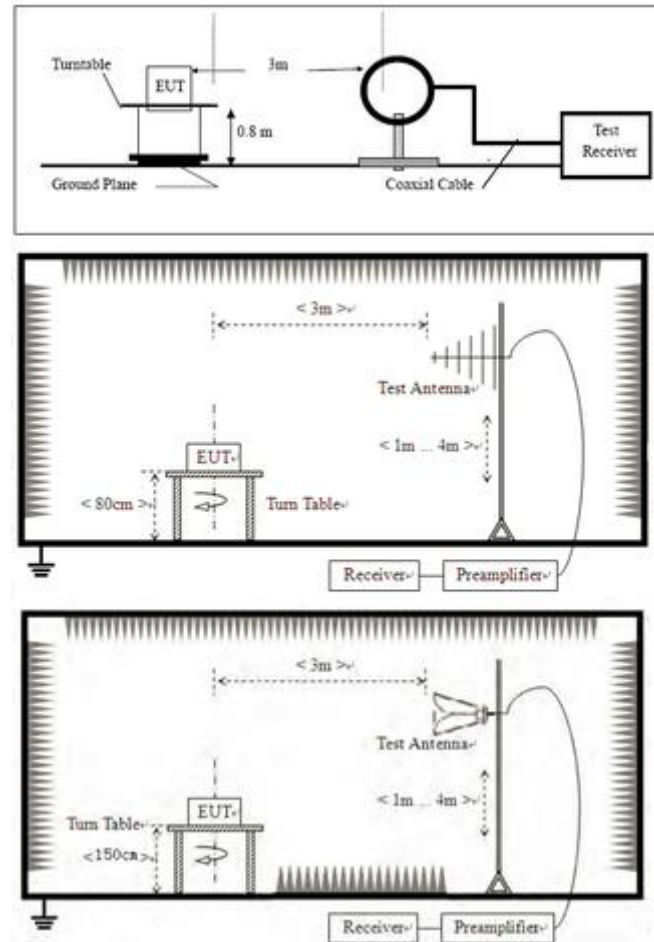
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

13.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

13.2 BLOCK DIAGRAM OF TEST SETUP



13.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.