

# TEST REPORT

**Product Name** : Bluetooth low energy module  
**Brand Mark** : MINEW  
**Model No.** : MS88SF3  
**FCC ID** : 2ABU6-MS88SF3  
**Report Number** : BLA-B-EMC-202406-A1401  
**Date of Sample Receipt** : 2020/4/22  
**Date of Test** : 2020/4/22 to 2020/5/7  
**Date of Issue** : 2024/6/12  
**Test Standard** : 47 CFR Part 15, Subpart C 15.247  
**Test Result** : Pass

Prepared for:

**SHENZHEN MINEW TECHNOLOGIES CO., LTD.**

**3rd Floor, I Building, Gangzhilong Science Park, Qinglong Road, Longhua District, Shenzhen City, China**

Prepared by:

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

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

**TEL: +86-755-23059481**

Compiled by:

*Hugh*

Review by:

*Sueels*

Approved by:

*Blue Zheng*

Date:

2024/6/12



**REPORT REVISE RECORD**

Version No.	Date	Description
00	2020/5/7	Original
01	2024/6/12	Modify antenna specifications So, This test report only the differences (radiation stray items) are evaluated and tested, while other items are referenced from the original report.

## Remark:

This report Modify antenna specifications based on the original report.

The original report No.: BLA-RF-202004-A7301 (Product Name: Bluetooth low energy module, Model No.: MS88SF3).

For the test data, see the original report: BLA-RF-202004-A7301.issued on 2020/5/7 by BlueAsia Technical Services(Shenzhen) Co.,Ltd

## TABLE OF CONTENTS

<b>1</b>	<b>TEST SUMMARY .....</b>	<b>6</b>
<b>2</b>	<b>GENERAL INFORMATION .....</b>	<b>7</b>
<b>3</b>	<b>GENERAL DESCRIPTION OF E.U.T. ....</b>	<b>7</b>
<b>4</b>	<b>TEST ENVIRONMENT .....</b>	<b>8</b>
<b>5</b>	<b>TEST MODE .....</b>	<b>8</b>
<b>6</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>8</b>
<b>7</b>	<b>DESCRIPTION OF SUPPORT UNIT .....</b>	<b>9</b>
<b>8</b>	<b>LABORATORY LOCATION .....</b>	<b>9</b>
<b>9</b>	<b>TEST INSTRUMENTS LIST .....</b>	<b>10</b>
<b>10</b>	<b>CONDUCTED BAND EDGES MEASUREMENT .....</b>	<b>13</b>
10.1	LIMITS .....	13
10.2	BLOCK DIAGRAM OF TEST SETUP .....	13
10.3	TEST DATA .....	14
<b>11</b>	<b>RADIATED SPURIOUS EMISSIONS .....</b>	<b>15</b>
11.1	LIMITS .....	15
11.2	BLOCK DIAGRAM OF TEST SETUP .....	16
11.3	PROCEDURE .....	16
11.4	TEST DATA .....	18
<b>12</b>	<b>RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS .....</b>	<b>26</b>
12.1	LIMITS .....	26
12.2	BLOCK DIAGRAM OF TEST SETUP .....	27
12.3	PROCEDURE .....	27
12.4	TEST DATA .....	29
<b>16</b>	<b>CONDUCTED SPURIOUS EMISSIONS .....</b>	<b>33</b>
16.1	LIMITS .....	33
16.2	BLOCK DIAGRAM OF TEST SETUP .....	33
16.3	TEST DATA .....	34
<b>17</b>	<b>POWER SPECTRUM DENSITY .....</b>	<b>35</b>
17.1	LIMITS .....	35
17.2	BLOCK DIAGRAM OF TEST SETUP .....	35

17.3	TEST DATA .....	35
<b>18</b>	<b>CONDUCTED PEAK OUTPUT POWER .....</b>	<b>36</b>
18.1	LIMITS .....	36
18.2	BLOCK DIAGRAM OF TEST SETUP .....	36
18.3	TEST DATA .....	37
<b>19</b>	<b>MINIMUM 6DB BANDWIDTH .....</b>	<b>38</b>
19.1	LIMITS .....	38
19.2	BLOCK DIAGRAM OF TEST SETUP .....	38
19.3	TEST DATA .....	38
<b>20</b>	<b>ANTENNA REQUIREMENT .....</b>	<b>39</b>
20.1	CONCLUSION .....	39
<b>21</b>	<b>CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ) .....</b>	<b>40</b>
21.1	LIMITS .....	40
21.2	BLOCK DIAGRAM OF TEST SETUP .....	40
21.3	PROCEDURE .....	40
21.4	TEST DATA .....	42
<b>22</b>	<b>APPENDIX .....</b>	<b>44</b>
22.1	APPENDIXA: DTS BANDWIDTH .....	44
22.1.1	<i>Test Result</i> .....	44
22.1.2	<i>Test Graphs</i> .....	45
22.2	APPENDIXB: OCCUPIED CHANNEL BANDWIDTH .....	47
22.2.1	<i>Test Result</i> .....	47
22.2.2	<i>Test Graphs</i> .....	48
22.3	APPENDIXC: MAXIMUM CONDUCTED OUTPUT POWER .....	50
22.3.1	<i>Test Result</i> .....	50
22.3.2	<i>Test Graphs</i> .....	51
22.4	APPENDIXD: MAXIMUM POWER SPECTRAL DENSITY .....	53
22.4.1	<i>Test Result</i> .....	53
22.4.2	<i>Test Graphs</i> .....	54
22.5	APPENDIXE: BAND EDGE MEASUREMENTS .....	56
22.5.1	<i>Test Result</i> .....	56
22.5.2	<i>Test Graphs</i> .....	57
22.6	APPENDIXF: CONDUCTED SPURIOUS EMISSION .....	58
22.6.1	<i>Test Result</i> .....	58

22.6.2 Test Graphs .....	59
<b>APPENDIX A: PHOTOGRAPHS OF TEST SETUP .....</b>	<b>63</b>
<b>APPENDIX B: PHOTOGRAPHS OF EUT .....</b>	<b>64</b>

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## 1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
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
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
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
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

## 2 GENERAL INFORMATION

<b>Applicant</b>	SHENZHEN MINEW TECHNOLOGIES CO., LTD.
<b>Address</b>	3rd Floor, I Building, Gangzhilong Science Park, Qinglong Road, Longhua District, Shenzhen City, China
<b>Manufacturer</b>	SHENZHEN MINEW TECHNOLOGIES CO., LTD.
<b>Address</b>	3rd Floor, I Building, Gangzhilong Science Park, Qinglong Road, Longhua District, Shenzhen City, China
<b>Product Name</b>	Bluetooth low energy module
<b>Test Model No.</b>	MS88SF3

## 3 GENERAL DESCRIPTION OF E.U.T.

<b>Hardware Version</b>	1.X.X
<b>Software Version</b>	1.X.X
<b>Spectrum Spread Technology:</b>	DTS
<b>Operation Frequency:</b>	2402MHz-2480MHz
<b>Modulation Type:</b>	GFSK
<b>Channel Spacing:</b>	2MHz
<b>Number of Channels:</b>	40
<b>Antenna Type:</b>	PCB Antenna
<b>Antenna Gain:</b>	3.06dBi

#### 4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC3.3V

#### 5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in transmitting mode with modulation

Remark: Only the data of the worst mode would be recorded in this report.

#### 6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission	±4.34dB
Radiated Emission	±4.24dB
Radiated Emission	±4.68dB
AC Power Line Conducted Emission	±3.45dB

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 (30MHz ~ 1000MHz)	±4.35 dB
Radiated Emission (1GHz ~ 18GHz)	±4.44 dB



## 7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	HASEE	K610D	N/A	N/A

## 8 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

## 9 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber 1	SKET	966	N/A	2021/11/10	2024/11/9
Chamber 2	SKET	966	N/A	2022/07/20	2024/11/9
Spectrum	R&S	FSP40	100817	2023/08/30	2024/08/29
Receiver	R&S	ESR7	101199	2023/08/30	2024/08/29
Receiver	R&S	ESPI7	101477	2023/07/07	2024/07/06
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2022/10/12	2025/10/11
Horn Antenna	Schwarzbeck	BBHA9120D	01892 P:00331	2022/09/13	2025/09/12
Horn Antenna	Schwarzbeck	BBHA 9170	1106	2022/04/24	2024/04/23
Amplifier	SKET	LNPA_30M01G-30	SK2021060801	2023/07/07	2024/07/06
Amplifier	SKET	PA-000318G-45	N/A	2023/08/30	2024/08/29
Amplifier	SKET	LNPA_18G40G-50	SK2022071301	2023/07/14	2024/07/13
Filter group	SKET	2.4G/5G Filter group r	N/A	2023/07/07	2024/07/06
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2022/09/14	2025/09/13
1kHz calibration audio source	SKET	MCS-ABT-C35	N/A	2023/09/04	2024/09/03
Free Field Microphone	SKET	MGS MP 663	0414	2023/09/04	2024/09/03
Audio shielding box	SKET	SB-ABT-C35	N/A	2023/03/30	2024/03/29
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
Signal Generator DTV	ECREDIX	DSG-1000	N/A	N/A	N/A

<b>Test Equipment Of Conducted Spurious Emissions</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>S/N</b>	<b>Cal.Date</b>	<b>Cal.Due</b>
Spectrum	R&S	FSP40	100817	7/4/2019	7/3/2020
Spectrum	Agilent	N9020A	MY49100060	12/18/2019	12/17/2020
Signal Generator	Agilent	N5182A	MY49060650	12/18/2019	12/17/2020
Signal Generator	Agilent	E8257D	MY44320250	5/7/2019	5/6/2020

<b>Test Equipment Of Power Spectrum Density</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>S/N</b>	<b>Cal.Date</b>	<b>Cal.Due</b>
Spectrum	R&S	FSP40	100817	7/4/2019	7/3/2020
Spectrum	Agilent	N9020A	MY49100060	12/18/2019	12/17/2020
Signal Generator	Agilent	N5182A	MY49060650	12/18/2019	12/17/2020
Signal Generator	Agilent	E8257D	MY44320250	5/7/2019	5/6/2020

<b>Test Equipment Of Conducted Peak Output Power</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>S/N</b>	<b>Cal.Date</b>	<b>Cal.Due</b>
Spectrum	R&S	FSP40	100817	7/4/2019	7/3/2020
Spectrum	Agilent	N9020A	MY49100060	12/18/2018	12/17/2019
Signal Generator	Agilent	N5182A	MY49060650	12/18/2018	12/17/2019
Signal Generator	Agilent	E8257D	MY44320250	5/7/2019	5/6/2020

<b>Test Equipment Of Minimum 6dB Bandwidth</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>S/N</b>	<b>Cal.Date</b>	<b>Cal.Due</b>
Spectrum	R&S	FSP40	100817	7/4/2019	7/3/2020
Spectrum	Agilent	N9020A	MY49100060	12/18/2019	12/17/2020
Signal Generator	Agilent	N5182A	MY49060650	12/18/2019	12/17/2020
Signal Generator	Agilent	E8257D	MY44320250	5/7/2019	5/6/2020

<b>Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>S/N</b>	<b>Cal.Date</b>	<b>Cal.Due</b>
Shield room	SKET	833	N/A	6/10/2018	6/9/2021
Receiver	R&S	ESPI3	101082	5/7/2019	5/7/2020
LISN	R&S	ENV216	3560.6550.15	7/4/2019	7/3/2020
LISN	AT	AT166-2	AKK1806000003	12/18/2019	12/17/2020
EMI software	EZ	EZ-EMC	N/A	N/A	N/A

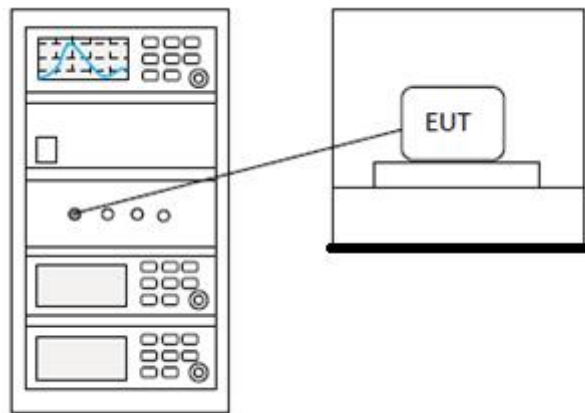
## 10 CONDUCTED BAND EDGES MEASUREMENT

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

### 10.1 LIMITS

<b>Limit:</b>	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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### 10.2 BLOCK DIAGRAM OF TEST SETUP



### 10.3 TEST DATA

**Pass: Please Refer To Appendix: Appendix1 For Details**

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## 11 RADIATED SPURIOUS EMISSIONS

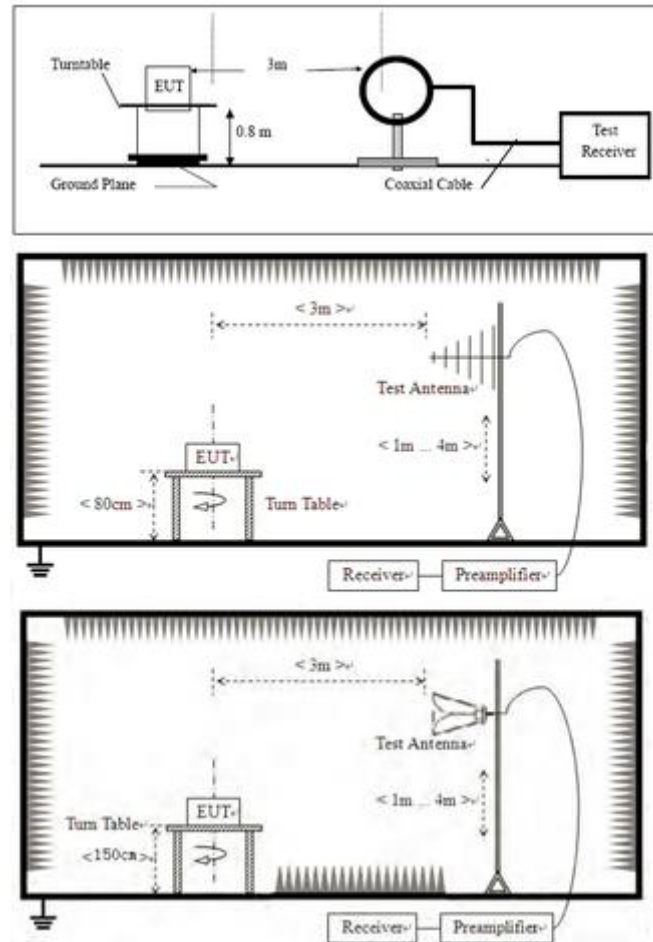
<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 6.4,6.5,6.6
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	23°C
<b>Humidity</b>	55%

### 11.1 LIMITS

<b>Frequency(MHz)</b>	<b>Field strength(microvolts/meter)</b>	<b>Measurement distance(meters)</b>
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.

## 11.2 BLOCK DIAGRAM OF TEST SETUP



## 11.3 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.



- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

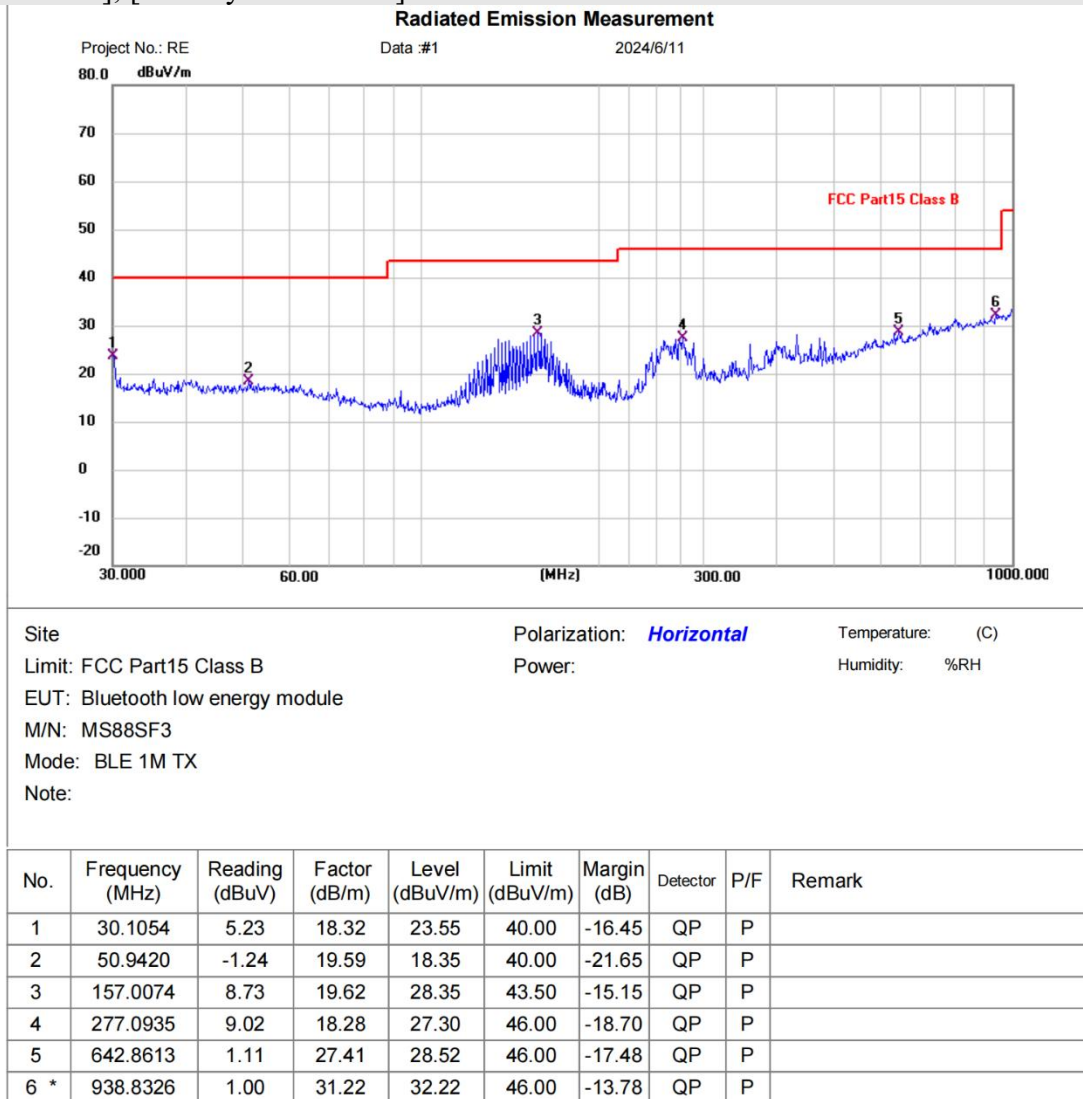
Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor + Preamplifier Factor
- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

### 11.4 TEST DATA

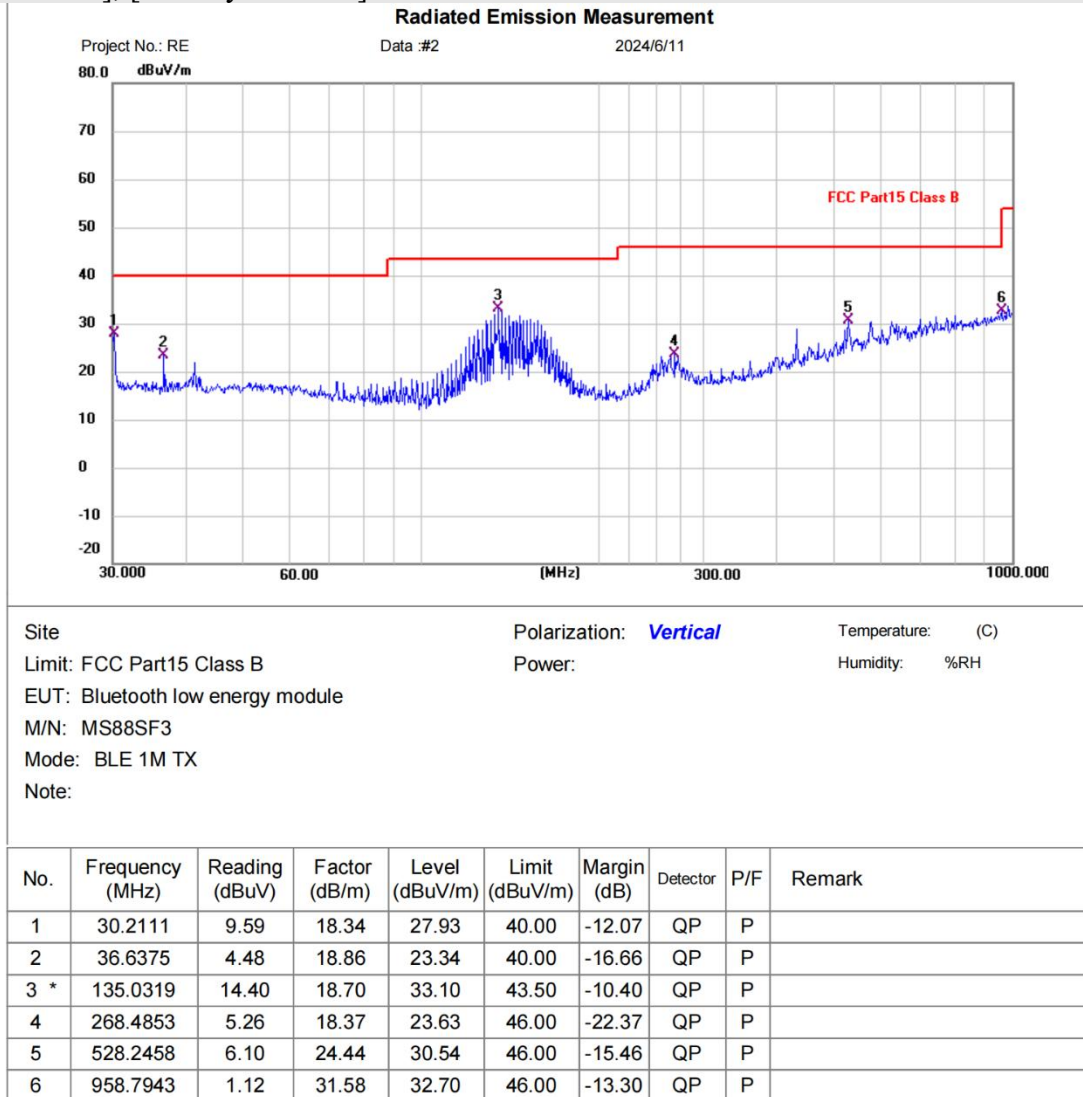
Below 1GHz

[Test mode: TX]; [Polarity: Horizontal]



**Test Result: Pass**

[Test mode: TX]; [Polarity: Vertical]

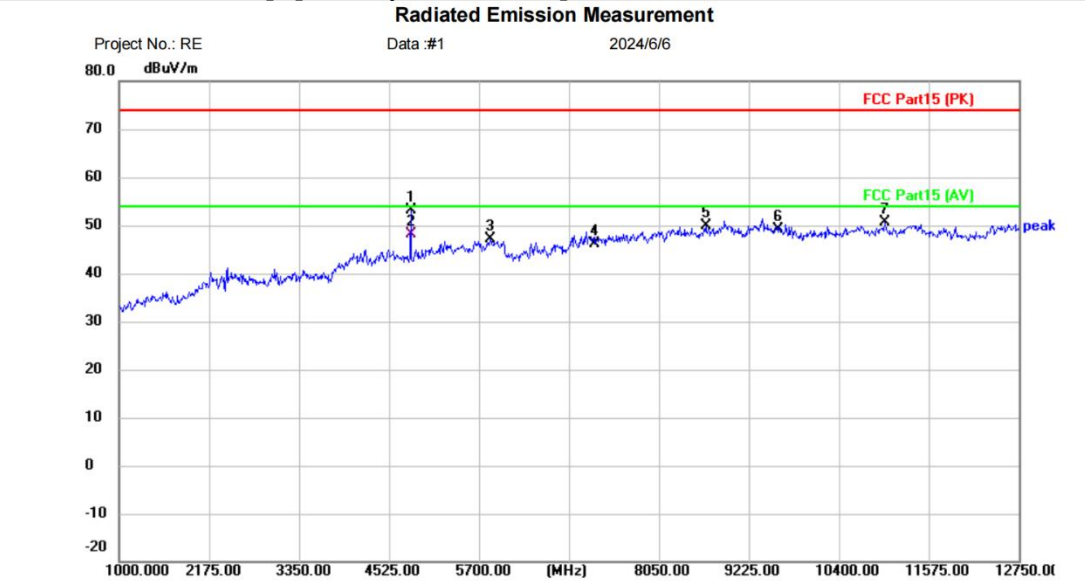


\*Maximum data      uOver limit      lower margin

**Test Result: Pass**

Above 1GHz:

[Test mode: TX low channel]; [Polarity: Horizontal]



Site:      Polarization: **Horizontal**      Temperature: (C)  
 Limit: FCC Part15 (PK)      Power:      Humidity: %RH  
 EUT: Bluetooth low energy module  
 M/N: MS88SF3  
 Mode: BLE1M TX 2402  
 Note:

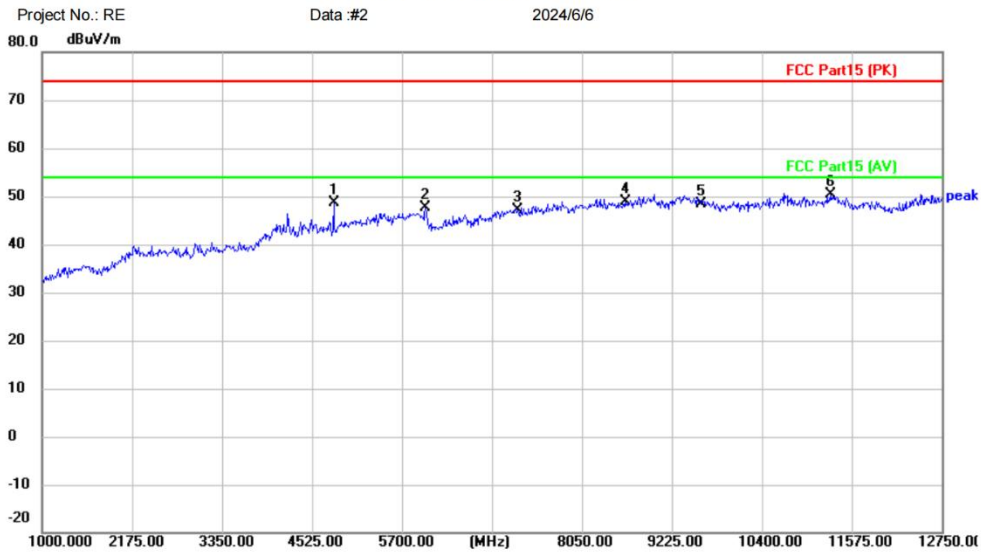
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	4807.000	47.58	5.64	53.22	74.00	-20.78	peak	
2		4807.000	42.54	5.64	48.18	74.00	-25.82	QP	
3		5852.750	38.80	8.42	47.22	74.00	-26.78	peak	
4		7206.000	37.00	9.24	46.24	74.00	-27.76	peak	
5		8661.000	38.50	11.34	49.84	74.00	-24.16	peak	
6		9608.000	36.82	12.31	49.13	74.00	-24.87	peak	
7		10999.25	37.13	13.48	50.61	74.00	-23.39	peak	

\*:Maximum data    x:Over limit    !:over margin      <Reference Only  
 Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**

[Test mode: TX low channel]; [Polarity: Vertical]

**Radiated Emission Measurement**



Site	Polarization: <b>Vertical</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth low energy module		
M/N: MS88SF3		
Mode: BLE1M TX 2402		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4807.000	43.01	5.64	48.65	74.00	-25.35	peak	
2		6005.500	41.92	5.61	47.53	74.00	-26.47	peak	
3		7206.000	37.84	9.24	47.08	74.00	-26.92	peak	
4		8614.000	37.75	11.16	48.91	74.00	-25.09	peak	
5		9608.000	35.95	12.31	48.26	74.00	-25.74	peak	
6	*	11293.00	37.60	12.70	50.30	74.00	-23.70	peak	

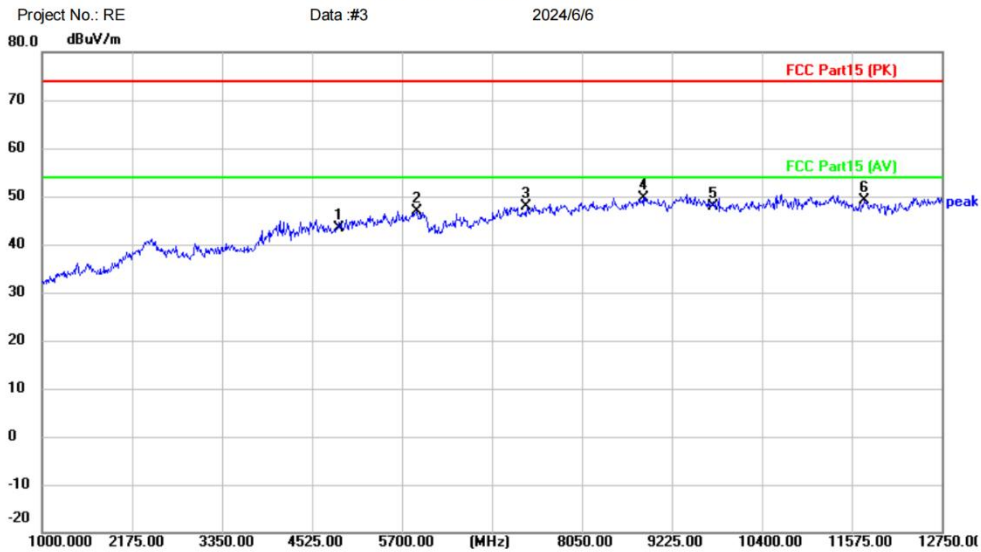
\*:Maximum data    x:Over limit    !:over margin      <Reference Only

Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**

[Test mode: TX middle channel]; [Polarity: Horizontal]

**Radiated Emission Measurement**



Site	Polarization: <b>Horizontal</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth low energy module		
M/N: MS88SF3		
Mode: BLE1M TX 2442		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4884.000	37.65	5.75	43.40	74.00	-30.60	peak	
2		5888.000	38.33	8.60	46.93	74.00	-27.07	peak	
3		7326.000	38.34	9.43	47.77	74.00	-26.23	peak	
4	*	8849.000	37.93	11.77	49.70	74.00	-24.30	peak	
5		9768.000	35.67	12.22	47.89	74.00	-26.11	peak	
6		11739.50	37.26	11.80	49.06	74.00	-24.94	peak	

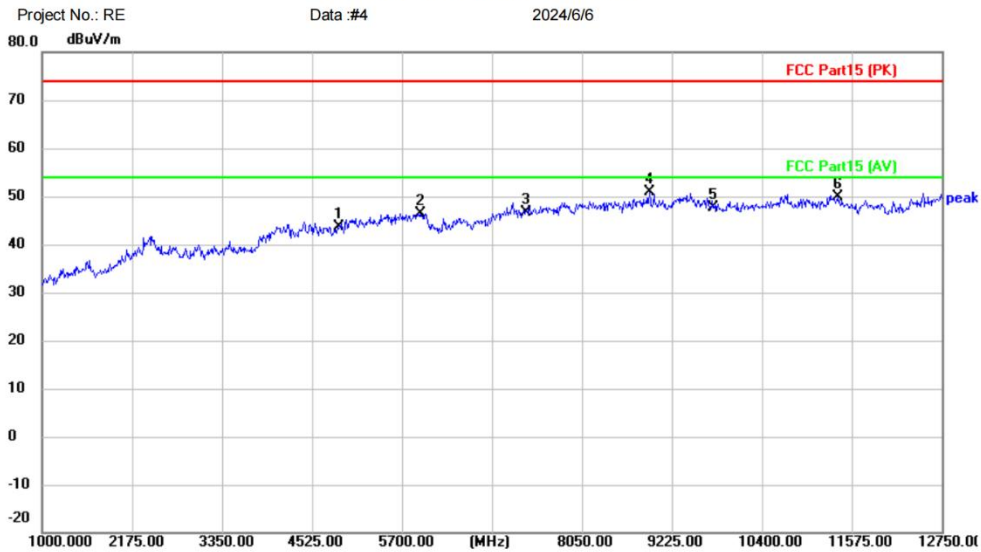
\*:Maximum data    x:Over limit    !:over margin      <Reference Only

Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**

[Test mode: TX middle channel]; [Polarity: Vertical]

**Radiated Emission Measurement**



Site	Polarization: <b>Vertical</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth low energy module		
M/N: MS88SF3		
Mode: BLE1M TX 2442		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4884.000	37.91	5.75	43.66	74.00	-30.34	peak	
2		5935.000	37.78	8.70	46.48	74.00	-27.52	peak	
3		7326.000	37.12	9.43	46.55	74.00	-27.45	peak	
4	*	8931.250	38.57	12.19	50.76	74.00	-23.24	peak	
5		9768.000	35.42	12.22	47.64	74.00	-26.36	peak	
6		11398.75	37.23	12.61	49.84	74.00	-24.16	peak	

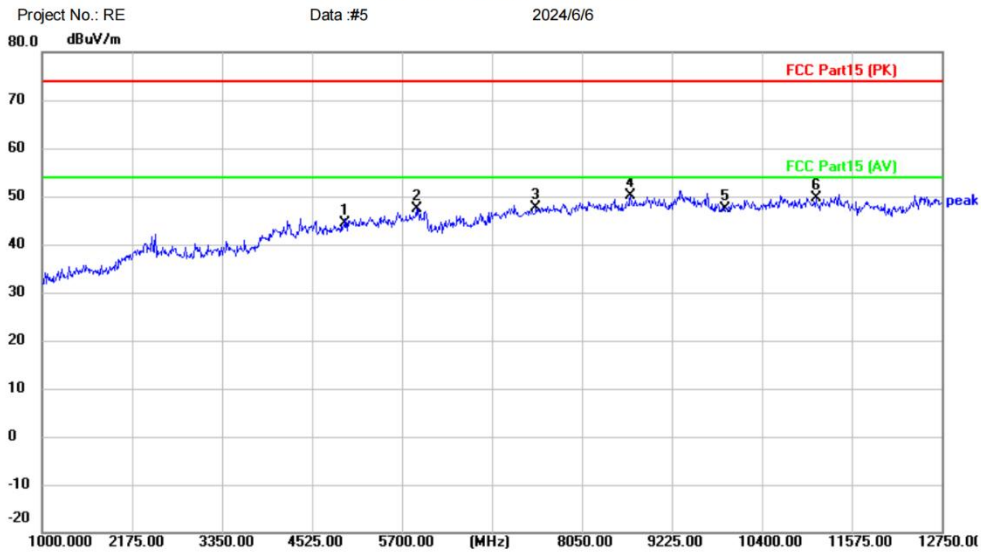
\*:Maximum data    x:Over limit    !:over margin      <Reference Only

Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**

[Test mode: TX High channel]; [Polarity: Horizontal]

**Radiated Emission Measurement**



Site	Polarization: <b>Horizontal</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth low energy module		
M/N: MS88SF3		
Mode: BLE1M TX 2480		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4960.000	37.87	6.60	44.47	74.00	-29.53	peak	
2		5888.000	38.82	8.60	47.42	74.00	-26.58	peak	
3		7440.000	37.97	9.64	47.61	74.00	-26.39	peak	
4	*	8684.500	38.79	11.44	50.23	74.00	-23.77	peak	
5		9920.000	35.18	12.14	47.32	74.00	-26.68	peak	
6		11105.000	36.96	12.79	49.75	74.00	-24.25	peak	

\*:Maximum data    x:Over limit    !:over margin      <Reference Only

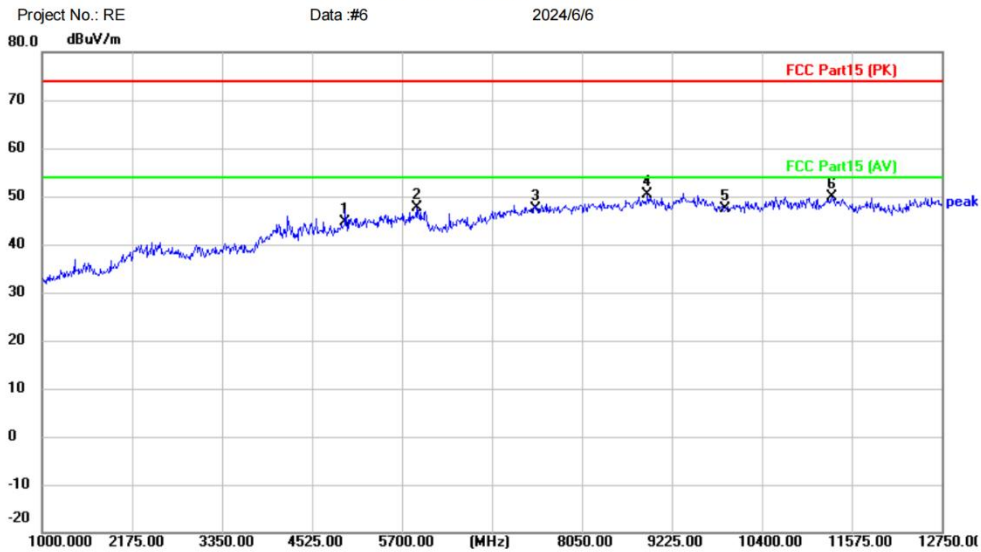
Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**



[Test mode: TX High channel]; [Polarity: Vertical]

**Radiated Emission Measurement**



Site	Polarization: <b>Vertical</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth low energy module		
M/N: MS88SF3		
Mode: BLE1M TX 2480		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4960.000	38.13	6.60	44.73	74.00	-29.27	peak	
2		5888.000	38.95	8.60	47.55	74.00	-26.45	peak	
3		7440.000	37.82	9.64	47.46	74.00	-26.54	peak	
4	*	8907.750	38.19	12.10	50.29	74.00	-23.71	peak	
5		9920.000	35.25	12.14	47.39	74.00	-26.61	peak	
6		11316.50	37.20	12.69	49.89	74.00	-24.11	peak	

\*:Maximum data    x:Over limit    !:over margin      <Reference Only

Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**

## 12 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

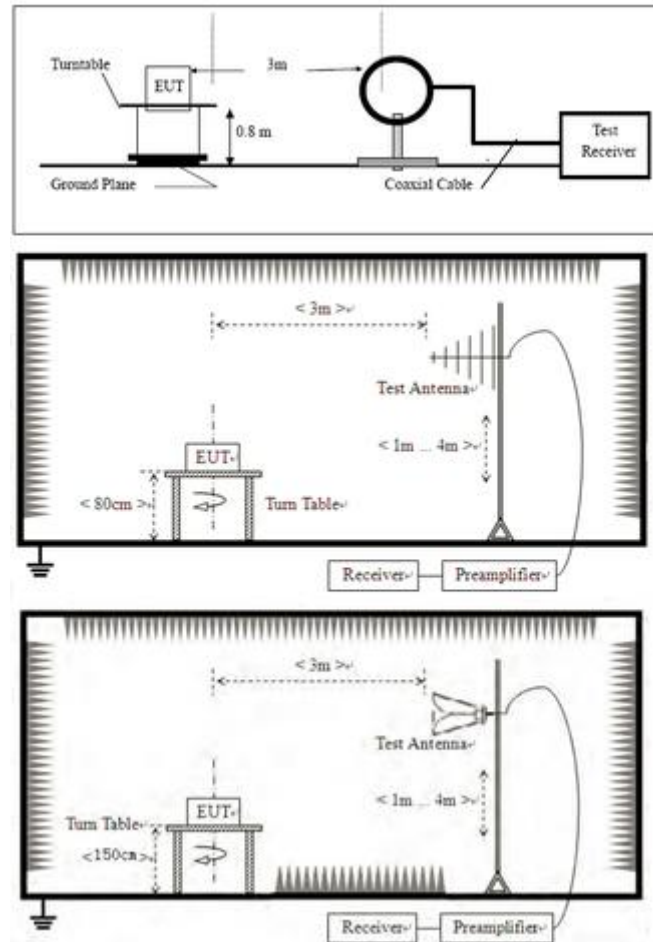
<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 6.10.5
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25°C
<b>Humidity</b>	60%

### 12.1 LIMITS

<b>Frequency(MHz)</b>	<b>Field strength(microvolts/meter)</b>	<b>Measurement distance(meters)</b>
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.

## 12.2 BLOCK DIAGRAM OF TEST SETUP



## 12.3 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.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

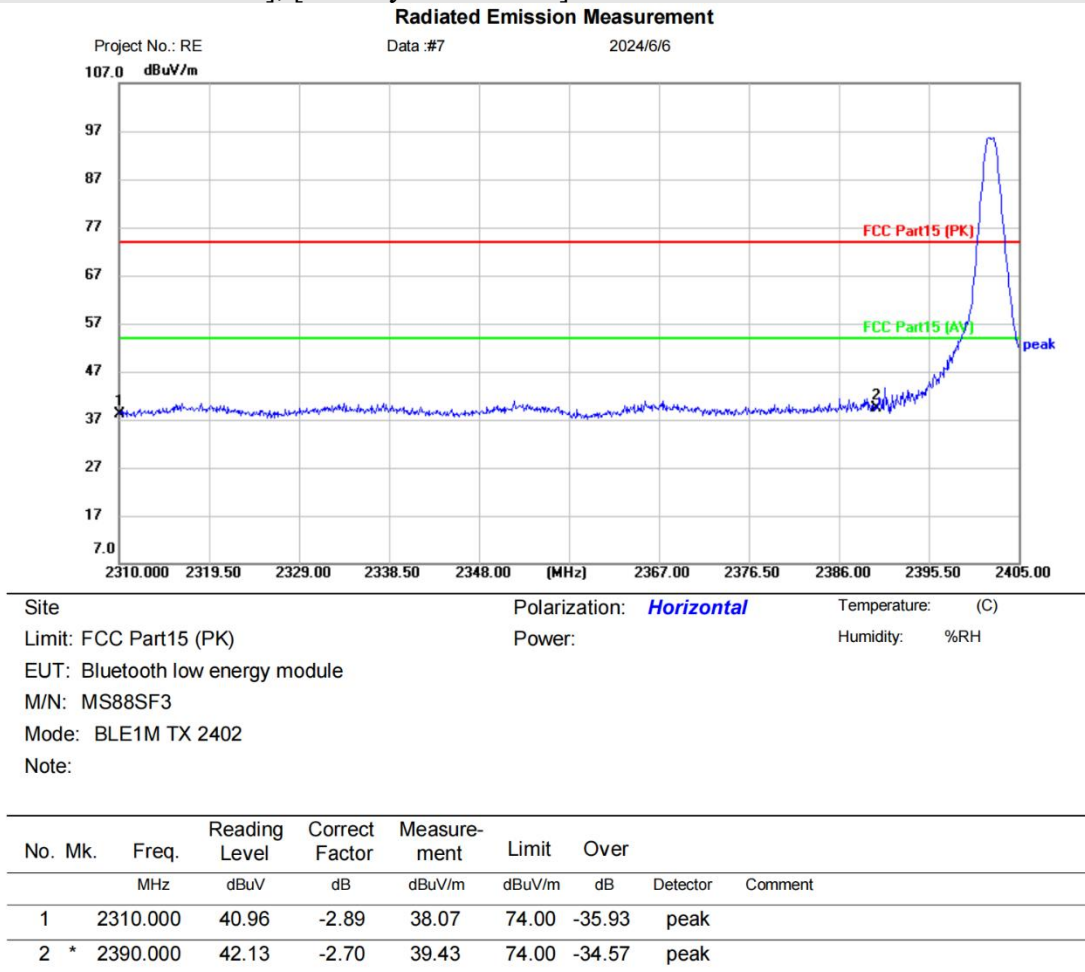
Remark 1:  $Level = Read\ Level + Cable\ Loss + Antenna\ Factor - Preamp\ Factor$

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

BlueAsia

### 12.4 TEST DATA

[Test mode: TX low channel]; [Polarity: Horizontal]



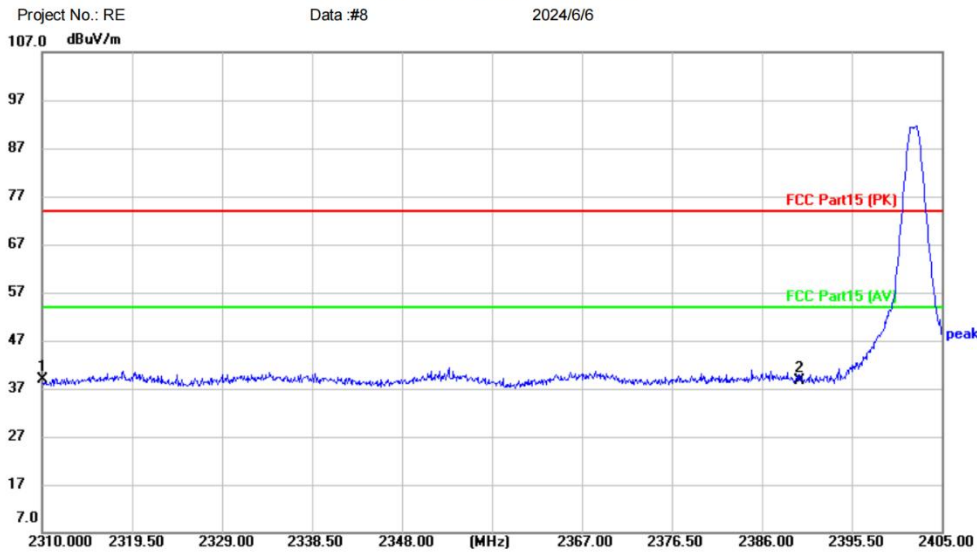
\*:Maximum data    x:Over limit    !:over margin                      <Reference Only

Receiver:            ESR\_1                      Spectrum Analyzer:            FSP40

**Test Result: Pass**

[Test mode:TX low channel]; [Polarity: Vertical]

**Radiated Emission Measurement**



Site	Polarization: <b>Vertical</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth low energy module		
M/N: MS88SF3		
Mode: BLE1M TX 2402		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	2310.000	41.82	-2.89	38.93	74.00	-35.07	peak	
2		2390.000	41.23	-2.70	38.53	74.00	-35.47	peak	

\*:Maximum data    x:Over limit    !:over margin      <Reference Only

Receiver:      ESR\_1      Spectrum Analyzer:      FSP40

**Test Result: Pass**