

# TEST REPORT

<b>Product Name</b>	:	Bluetooth Module
<b>Brand Mark</b>	:	N/A
<b>Model No.</b>	:	HS5010-03
<b>Report Number</b>	:	BLA-EMC-202308-A1802
<b>FCC ID</b>	:	2BCGR-HS501003
<b>Date of Sample Receipt</b>	:	2023/8/8
<b>Date of Test</b>	:	2023/8/8 to 2023/8/21
<b>Date of Issue</b>	:	2023/8/21
<b>Test Standard</b>	:	47 CFR Part 15, Subpart C 15.247
<b>Test Result</b>	:	Pass

Prepared for:

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**Unit 602, No. 21 Pingcheng North Road, Haicang District, Xiamen, Fujian Province**

Prepared by:

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Date:

2023/8/21



**REPORT REVISE RECORD**

Version No.	Date	Description
00	2023/8/21	Original

BlueAsia

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## 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
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

## 2 GENERAL INFORMATION

<b>Applicant</b>	Xiamen Zhuoye Technology Co., Ltd.
<b>Address</b>	Unit 602, No. 21 Pingcheng North Road, Haicang District, Xiamen, Fujian Province
<b>Manufacturer</b>	Xiamen Zhuoye Technology Co., Ltd.
<b>Address</b>	Unit 602, No. 21 Pingcheng North Road, Haicang District, Xiamen, Fujian Province
<b>Factory</b>	Shenzhen HOSotech Technology Co., Ltd.
<b>Address</b>	506 R&D Center, Hongfa High-tech Park, Tangtou, Shiyan Street, Baoan District, Shenzhen
<b>Product Name</b>	Bluetooth Module
<b>Test Model No.</b>	HS5010-03

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

<b>Hardware Version</b>	N/A
<b>Software Version</b>	N/A
<b>Operation Frequency:</b>	2402MHz-2480MHz
<b>Modulation Type:</b>	GFSK
<b>Rate data:</b>	1Mbps
<b>Channel Spacing:</b>	2MHz
<b>Number of Channels:</b>	40
<b>Antenna Type:</b>	PCB Antenna
<b>Antenna Gain:</b>	3dBi (Provided by the applicant)

**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

#### 4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	3.3Vdc

#### 5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation.

#### 6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30MHz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±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 %
Unwanted Radiated Emission (30MHz ~ 1000MHz)	±4.35 dB
Unwanted 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, Shiyan 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	2020/11/10	2023/11/9
Chamber 2	SKET	966	N/A	2021/07/20	2024/07/19
Spectrum	R&S	FSP40	100817	2022/09/15	2023/09/14
Receiver	R&S	ESR7	101199	2022/09/15	2023/09/14
Receiver	R&S	ESPI7	101477	2022/07/16 2023/07/14	2023/07/15 2024/07/13
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2022/09/15	2023/09/14
Horn Antenna	Schwarzbeck	BBHA9120D	01892 P:00331	2022/09/13	2025/09/12
Amplifier	SKET	LNPA_30M01G-30	SK2021060801	2022/07/16 2023/07/14	2023/07/15 2024/07/13
Amplifier	SKET	PA-000318G-45		2022/09/13	2023/09/12
Amplifier	SKET	LNPA_18G40G-50	SK2022071301	2022/07/14 2023/07/14	2023/07/13 2024/07/13
Filter group	SKET	2.4G/5G Filter group r		N/A	2022/07/16 2023/07/15 2023/07/14
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

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	2020/11/25	2023/11/24
Receiver	R&S	ESPI3	101082	2022/09/14	2023/09/13
LISN	R&S	ENV216	3560.6550.15	2022/09/14	2023/09/13
LISN	AT	AT166-2	AKK1806000003	2022/09/14	2023/09/13
ISN	TESEQ	ISNT8-cat6	53580	2022/09/14	2023/09/13
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01045	2022/08/17	2023/08/16
				2023/08/16	2024/08/15
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01075	2022/08/17	2023/08/16
				2023/08/16	2024/08/15
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	2022/09/15	2023/09/14
Spectrum	Agilent	N9020A	MY49100060	2022/09/07	2023/09/06
Spectrum	KEYSIGHT	N9030A	MY52350152	2022/07/01	2023/06/30
Spectrum	KEYSIGHT	N9010A	MY54330814	2022/07/01	2023/06/30
Signal Generator	Agilent	N5182A	MY47420955	2022/09/07	2023/09/06
Signal Generator	Agilent	E8257D	MY44320250	2022/07/01	2023/06/30
Signal Generator	Agilent	N5181A	MY46240904	2022/08/02	2023/08/01
Signal Generator	R&S	CMW500	132429	2022/09/07	2023/09/06
BluetoothTester	Anritsu	MT8852B	06262047872	2022/09/07	2023/09/06
Power probe	DARE	RPR3006W	14I00889SN042	2022/09/07	2023/09/06
DCPowersupply	zhaoxin	KXN-305D	20K305D1221363	2022/09/14	2023/09/13
DCPowersupply	zhaoxin	RXN-1505D	19R1505D050168	2022/09/14	2023/09/13
2.4GHz/5GHz RF Test software	MTS	MTS 8310	Version 2.0.0.0	N/A	N/A
Audio Analyzer	Audioprecision	N/A	ATSI-41094	2022/7/1	2023/6/30

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

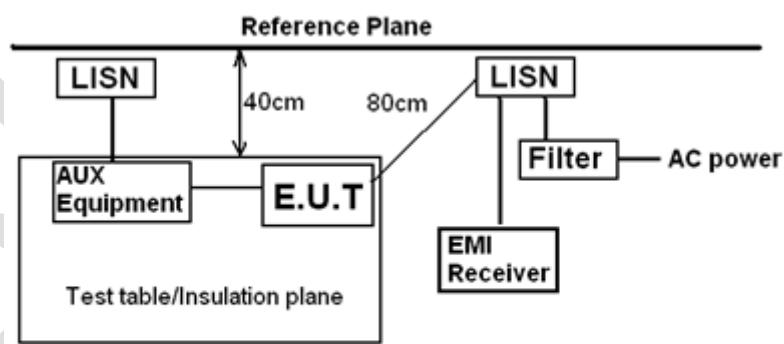
<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 6.2
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25 °C
<b>Humidity</b>	60%

### 10.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

### 10.2 BLOCK DIAGRAM OF TEST SETUP



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

### 10.3 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 + 50hm 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.

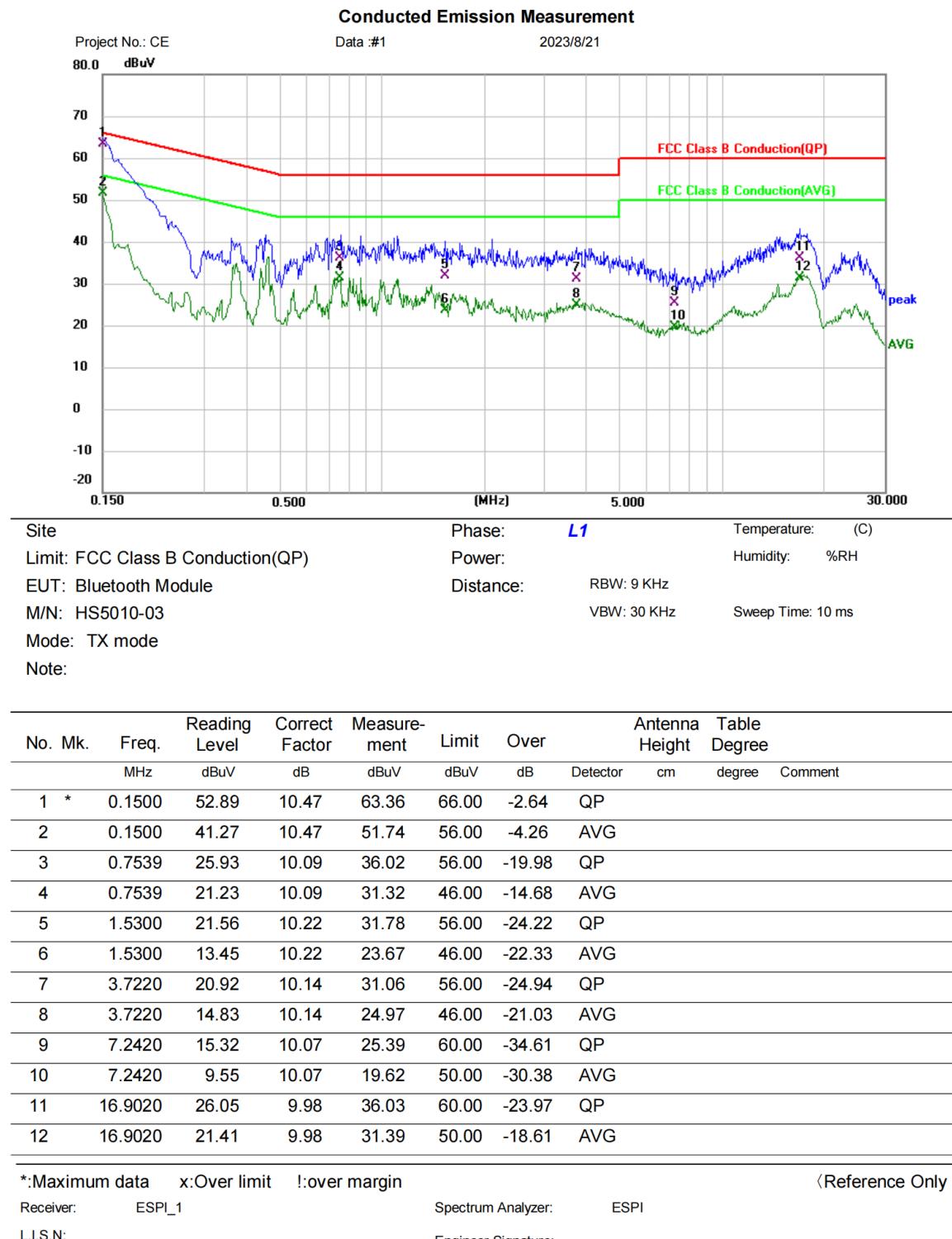
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from 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

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## 10.4 TEST DATA

[TestMode: Transmitting mode]; [Line: Line] ;[Power:AC120V/60Hz]



**Test Result: Pass**

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

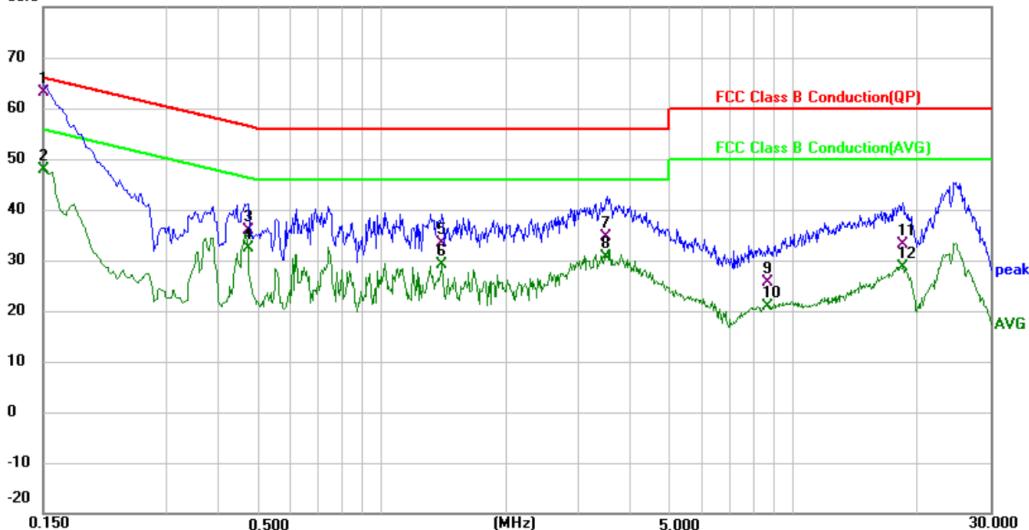
## Conducted Emission Measurement

Project No.: CE

Data #:2

2023/8/21

80.0 dBuV



Site

Phase: **N**

Temperature: (C)

Limit: FCC Class B Conduction(QP)

Power:

Humidity: %RH

EUT: Bluetooth Module

Distance:

RBW: 9 KHz

M/N: HS5010-03

VBW: 30 KHz

Sweep Time: 10 ms

Mode: TX mode

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
			Level	Factor	ment					Comment
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	cm	degree
1	*	0.1500	52.82	10.37	63.19	66.00	-2.81	QP		
2		0.1500	37.56	10.37	47.93	56.00	-8.07	AVG		
3		0.4700	25.73	10.06	35.79	56.51	-20.72	QP		
4		0.4700	22.37	10.06	32.43	46.51	-14.08	AVG		
5		1.3980	23.44	10.05	33.49	56.00	-22.51	QP		
6		1.3980	18.98	10.05	29.03	46.00	-16.97	AVG		
7		3.5020	24.78	9.96	34.74	56.00	-21.26	QP		
8		3.5020	20.63	9.96	30.59	46.00	-15.41	AVG		
9		8.6459	15.63	9.90	25.53	60.00	-34.47	QP		
10		8.6459	10.98	9.90	20.88	50.00	-29.12	AVG		
11		18.3900	23.16	10.02	33.18	60.00	-26.82	QP		
12		18.3900	18.49	10.02	28.51	50.00	-21.49	AVG		

\*:Maximum data x:Over limit !:over margin

⟨Reference Only

Receiver: ESPI\_1

Spectrum Analyzer: ESPI

L.I.S.N:

Engineer Signature:

**Test Result: Pass**

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

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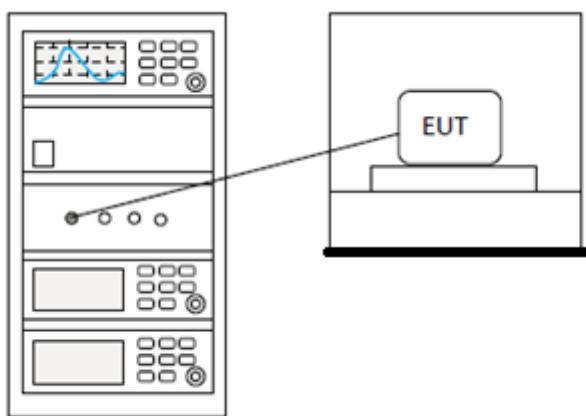
## 11 CONDUCTED BAND EDGES MEASUREMENT

<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%

### 11.1 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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### 11.2 BLOCK DIAGRAM OF TEST SETUP



### 11.3 TEST DATA

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

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## 12 RADIATED SPURIOUS EMISSIONS

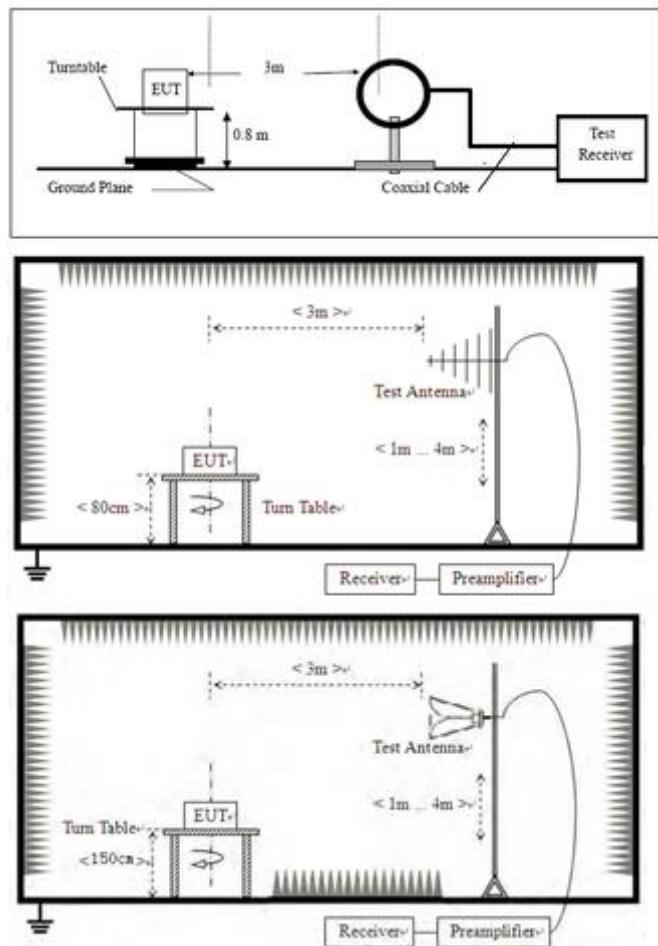
<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 6.4,6.5,6.6
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25 °C
<b>Humidity</b>	60%

### 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.

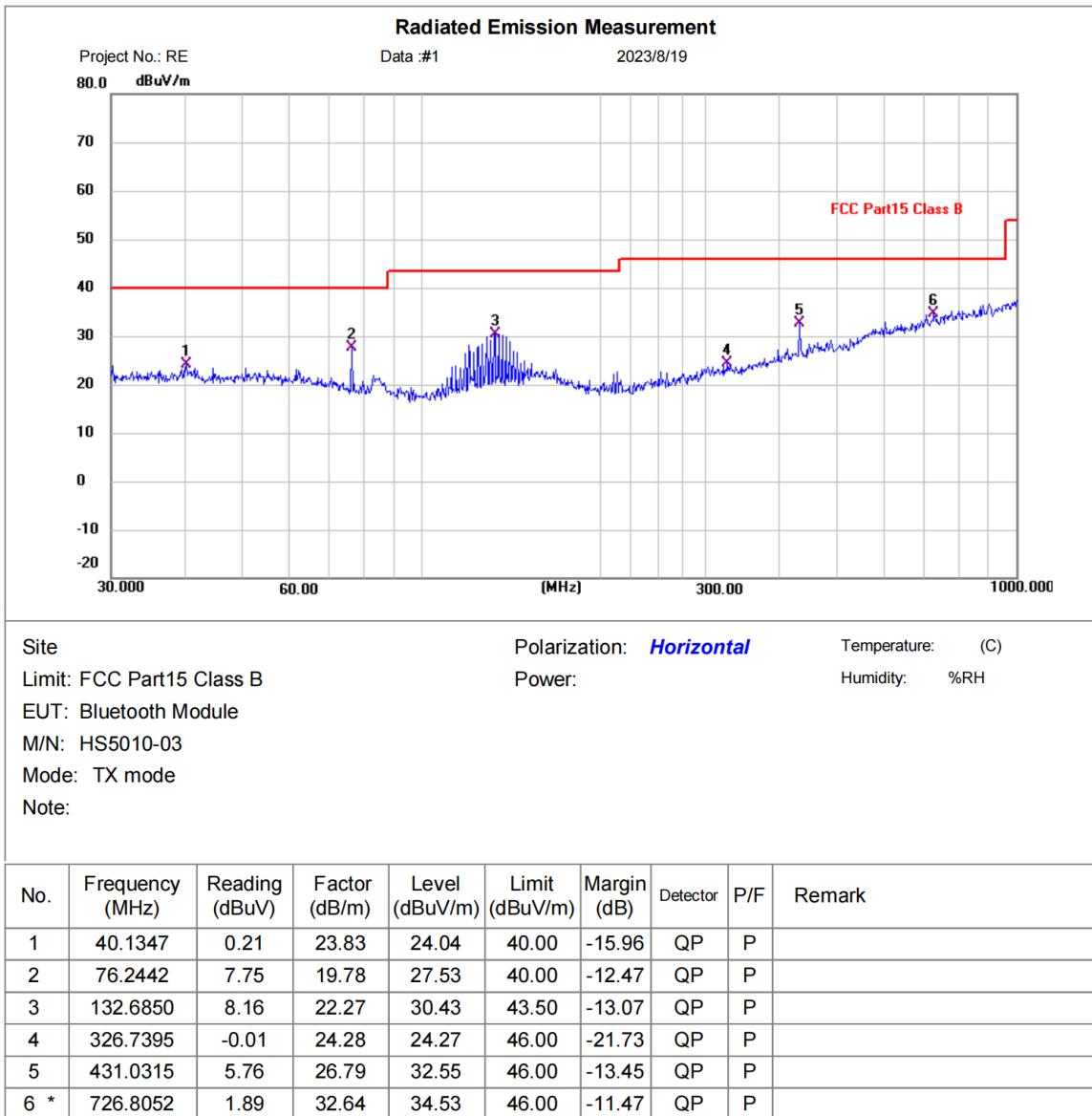
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was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

Remark:

- 1) 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 12.75GHz 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. fundamental frequency is blocked by filter, and only spurious emission is shown.
- 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.

## 12.4 TEST DATA

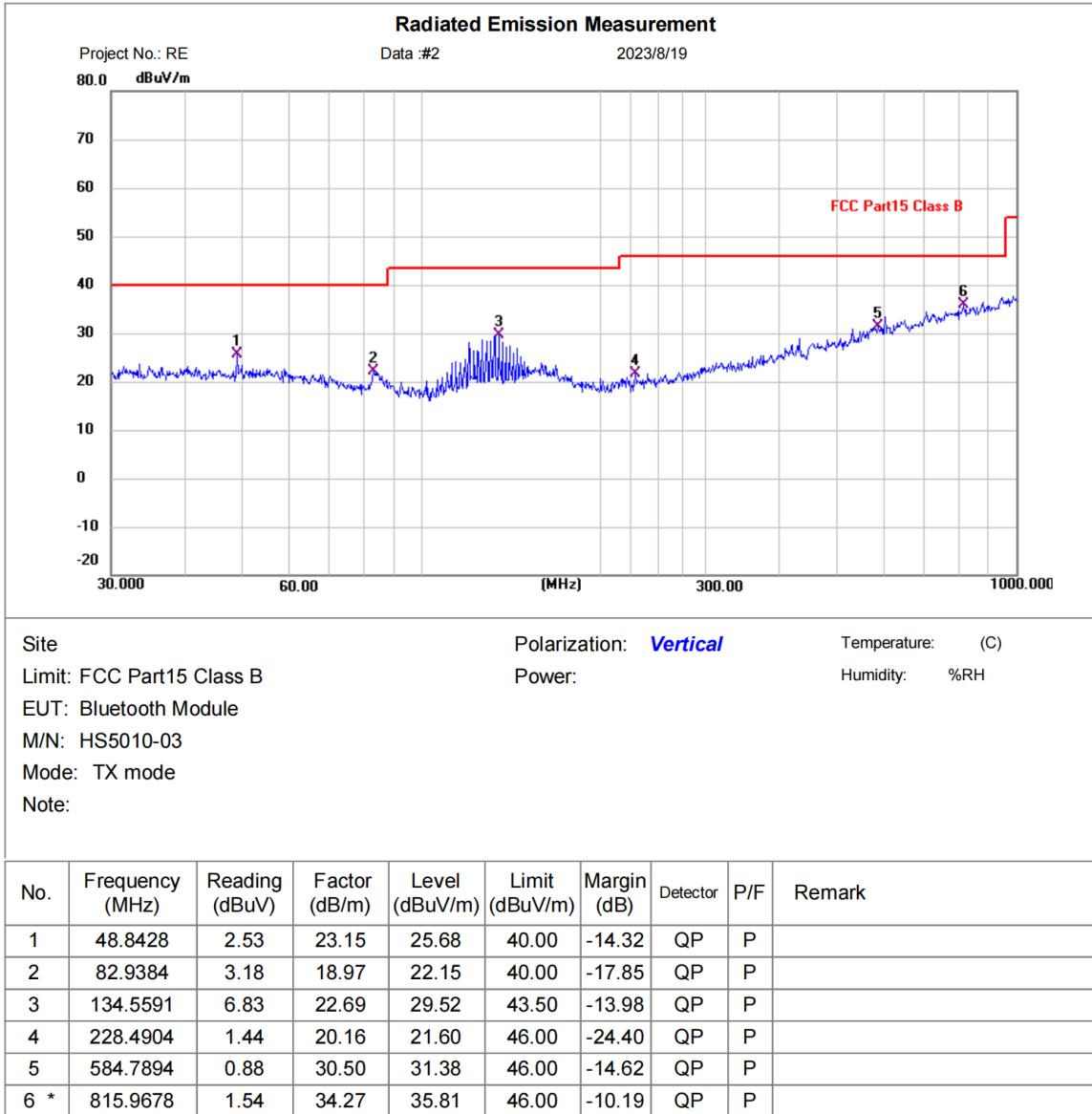
[TestMode: TX below 1G]; [Polarity: Horizontal]



\*:Maximum data    x:Over limit    !:over margin

**Test Result: Pass**

[TestMode: TX below 1G]; [Polarity: Vertical]

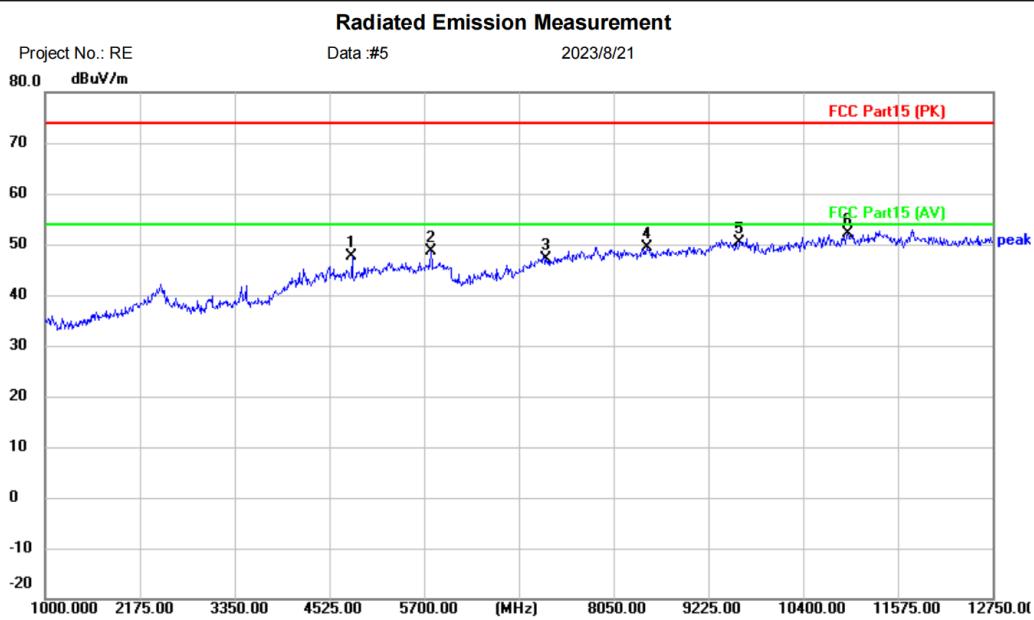


\*:Maximum data    x:Over limit    !:over margin

**Test Result: Pass**

Above 1GHz:

[TestMode: TX low channel]; [Polarity: Horizontal]



Site

Polarization: **Horizontal**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-L

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Over	
								Detector	Comment
1	4804.000	43.22	4.51	47.73	74.00	-26.27	peak		
2	5782.250	42.34	6.27	48.61	74.00	-25.39	peak		
3	7206.000	39.77	7.41	47.18	74.00	-26.82	peak		
4	8461.250	40.04	9.25	49.29	74.00	-24.71	peak		
5	9608.000	38.67	11.59	50.26	74.00	-23.74	peak		
6	*	10952.25	38.44	13.62	52.06	74.00	-21.94	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only

Receiver: ESR\_1

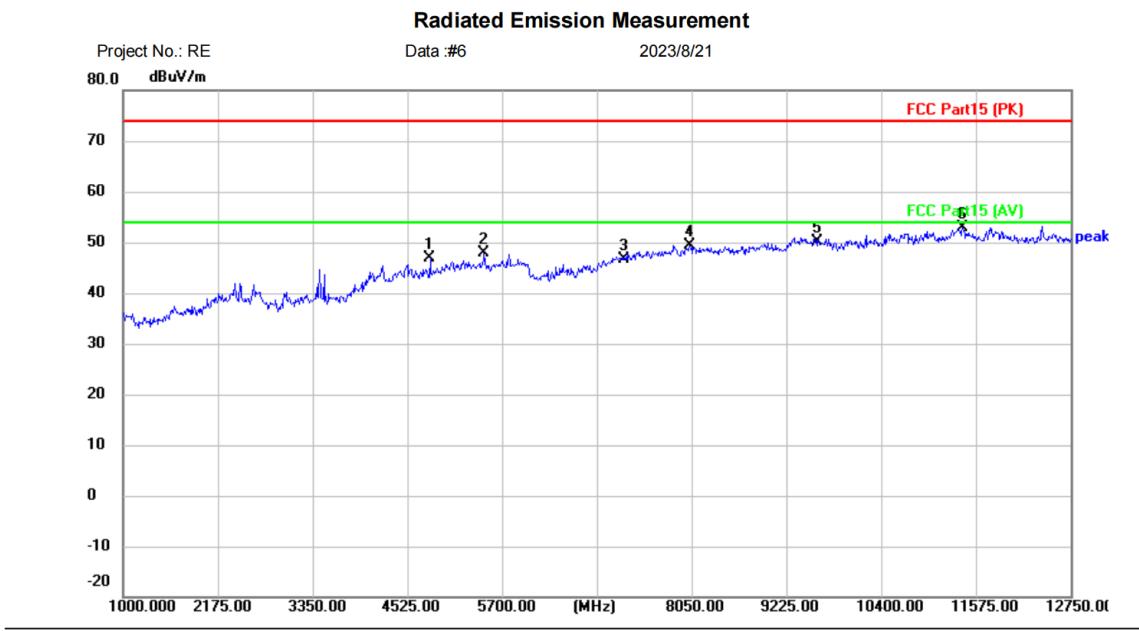
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

[TestMode: TX low channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-L

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		4804.000	42.34	4.51	46.85	74.00	-27.15	peak	
2		5476.750	41.57	6.24	47.81	74.00	-26.19	peak	
3		7206.000	39.13	7.41	46.54	74.00	-27.46	peak	
4		8026.500	40.76	8.65	49.41	74.00	-24.59	peak	
5		9608.000	38.53	11.59	50.12	74.00	-23.88	peak	
6	*	11410.50	39.56	13.42	52.98	74.00	-21.02	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only⟩

Receiver: ESR\_1

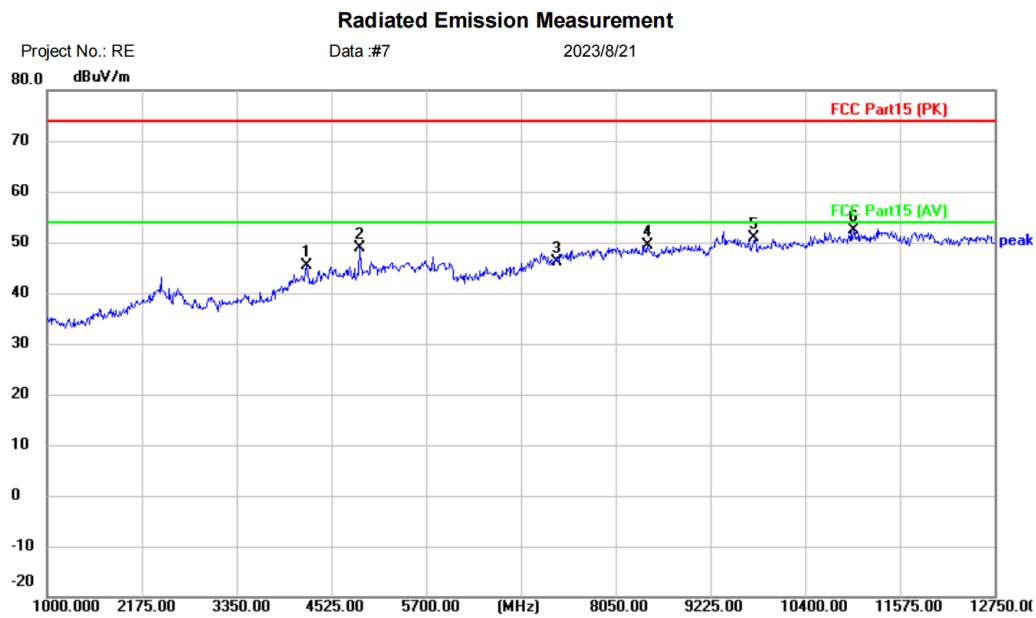
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

[TestMode: TX mid channel]; [Polarity: Horizontal]



Site

Polarization: **Horizontal**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-M

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dB <sub>uV</sub>	dB	dB <sub>uV/m</sub>				
1		4219.500	41.01	4.45	45.46	74.00	-28.54	peak	
2		4877.500	44.24	4.59	48.83	74.00	-25.17	peak	
3		7326.000	38.35	7.82	46.17	74.00	-27.83	peak	
4		8449.500	40.16	9.19	49.35	74.00	-24.65	peak	
5		9768.000	39.03	11.77	50.80	74.00	-23.20	peak	
6	*	10999.25	38.56	13.82	52.38	74.00	-21.62	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only⟩

Receiver: ESR\_1

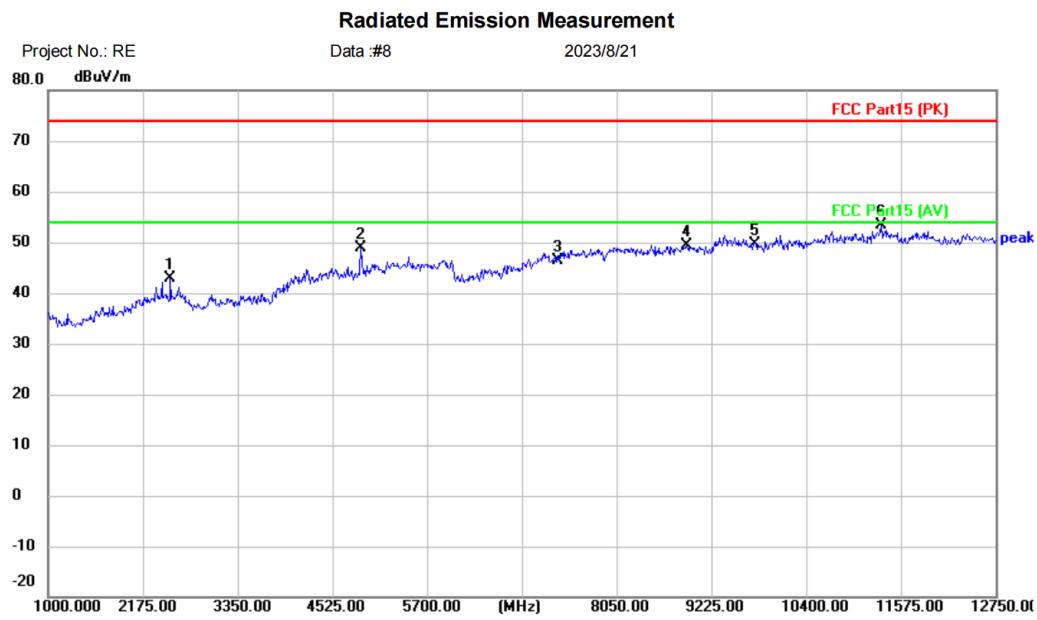
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

[TestMode: TX mid channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-M

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		2515.750	46.11	-3.13	42.98	74.00	-31.02	peak	
2		4877.500	44.19	4.59	48.78	74.00	-25.22	peak	
3		7326.000	38.49	7.82	46.31	74.00	-27.69	peak	
4		8919.500	38.90	10.40	49.30	74.00	-24.70	peak	
5		9768.000	37.89	11.77	49.66	74.00	-24.34	peak	
6	*	11328.25	40.09	13.39	53.48	74.00	-20.52	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only⟩

Receiver: ESR\_1

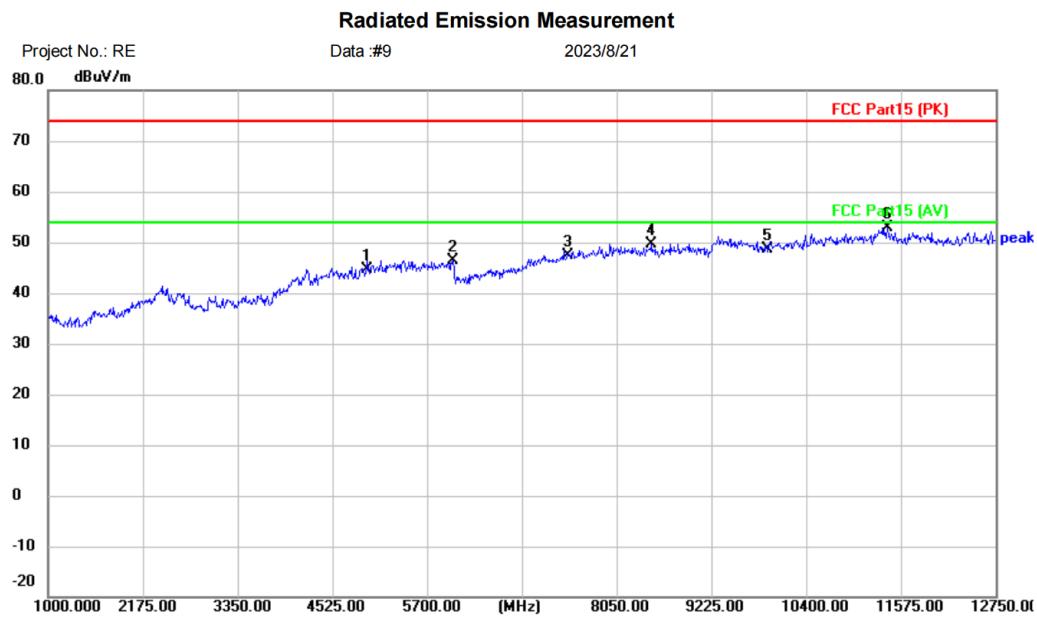
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

[TestMode: TX high channel]; [Polarity: Horizontal]



Site

Polarization: **Horizontal**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-H

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		4960.000	39.10	5.47	44.57	74.00	-29.43	peak	
2		6017.250	42.71	3.57	46.28	74.00	-27.72	peak	
3		7440.000	39.17	8.24	47.41	74.00	-26.59	peak	
4		8484.750	40.22	9.37	49.59	74.00	-24.41	peak	
5		9920.000	36.73	11.96	48.69	74.00	-25.31	peak	
6	*	11410.50	39.39	13.42	52.81	74.00	-21.19	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only⟩

Receiver: ESR\_1

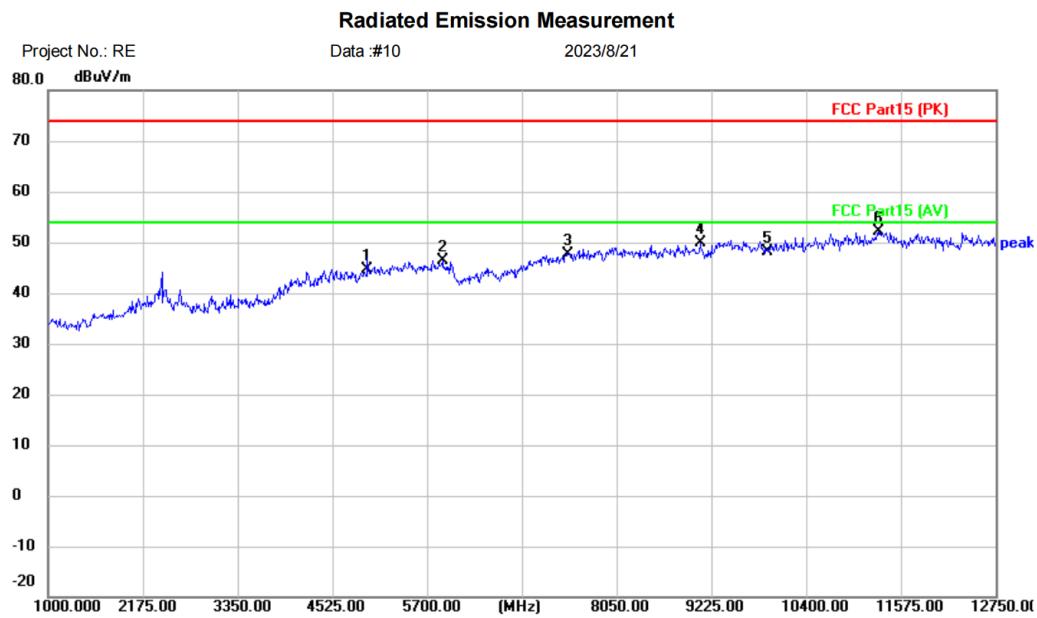
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

[TestMode: TX high channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-H

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		4960.000	39.21	5.47	44.68	74.00	-29.32	peak	
2		5888.000	39.71	6.71	46.42	74.00	-27.58	peak	
3		7440.000	39.32	8.24	47.56	74.00	-26.44	peak	
4		9084.000	39.07	10.77	49.84	74.00	-24.16	peak	
5		9920.000	36.24	11.96	48.20	74.00	-25.80	peak	
6	*	11293.00	38.66	13.37	52.03	74.00	-21.97	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only⟩

Receiver: ESR\_1

Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

Remark:

1. Final Level = Receiver Read level + Correct factor
2. Correct factor = Antenna Factor + Cable Loss – Preamplifier Factor
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

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## 13 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

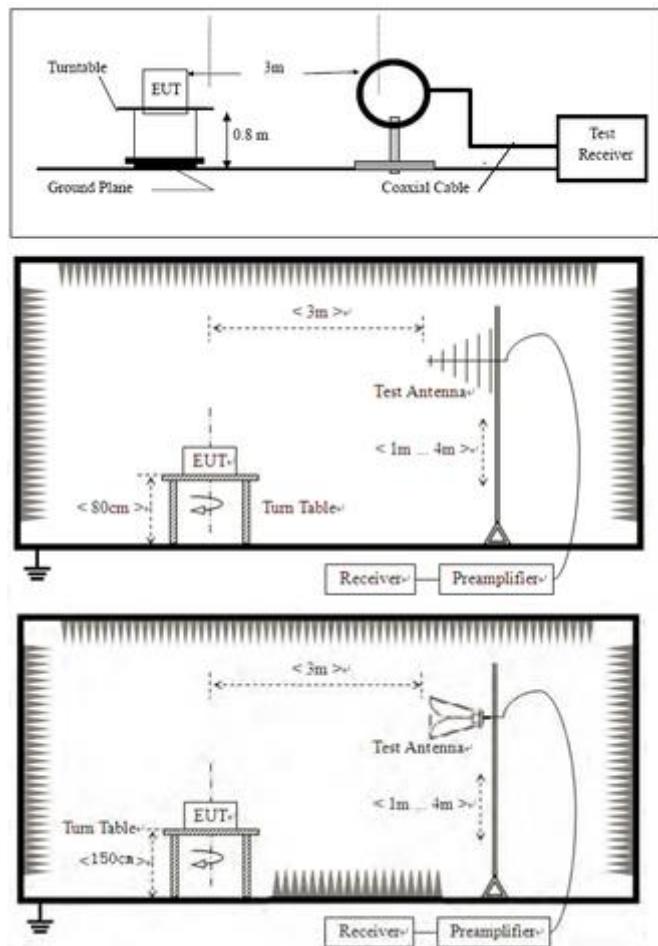
<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 6.10.5
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25 °C
<b>Humidity</b>	60%

### 13.1 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.

### 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.

- 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.

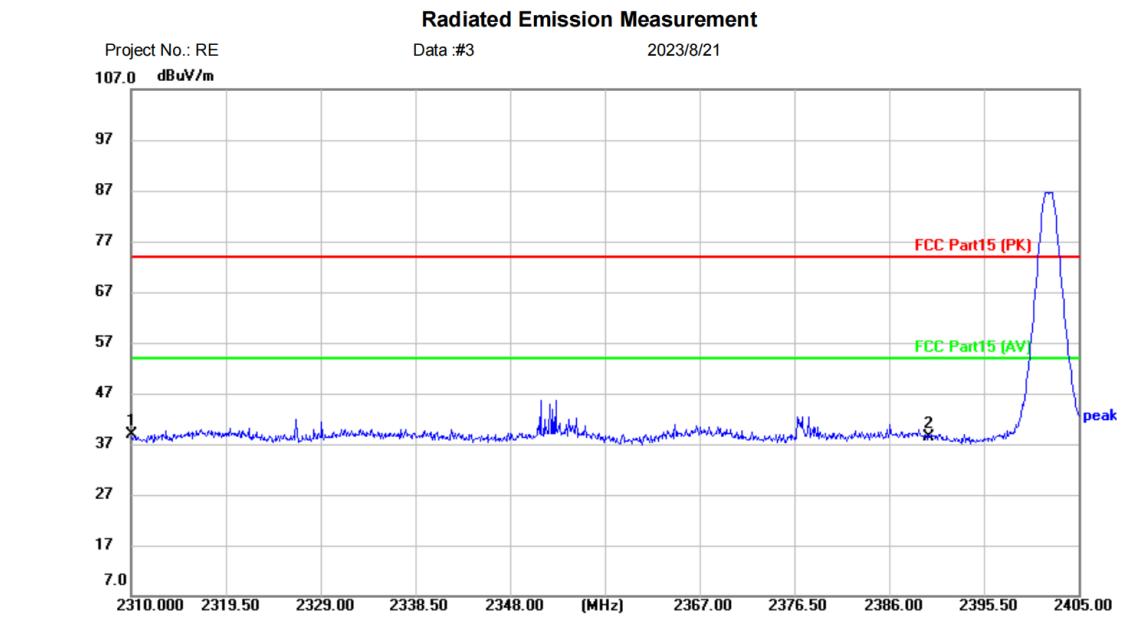
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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.

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## 13.4 TEST DATA

[TestMode: TX low channel]; [Polarity: Horizontal]



Site: Limit: FCC Part15 (PK) Polarization: **Horizontal** Temperature: (C)  
EUT: Bluetooth Module Power: Humidity: %RH  
M/N: HS50 10-03  
Mode: TX-L  
Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
1	*	2310.000	43.28	-4.40	38.88	74.00	-35.12	peak
2		2390.000	42.57	-4.31	38.26	74.00	-35.74	peak

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only

Receiver: ESR\_1

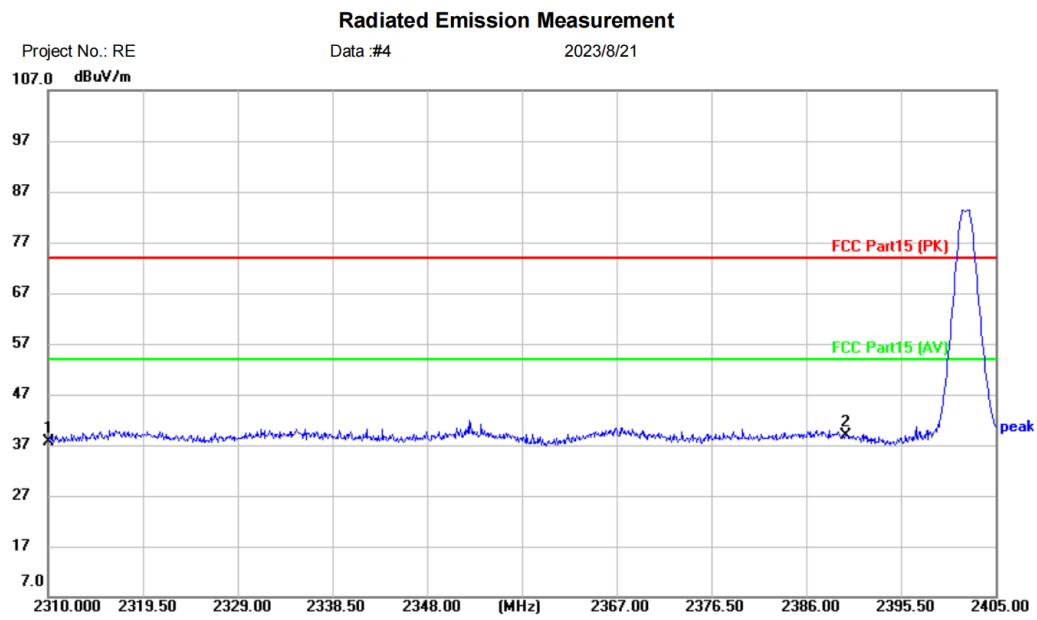
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

## Test Result: Pass

[TestMode: TX low channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-L

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		2310.000	42.02	-4.40	37.62	74.00	-36.38	peak	
2	*	2390.000	43.25	-4.31	38.94	74.00	-35.06	peak	

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only

Receiver: ESR\_1

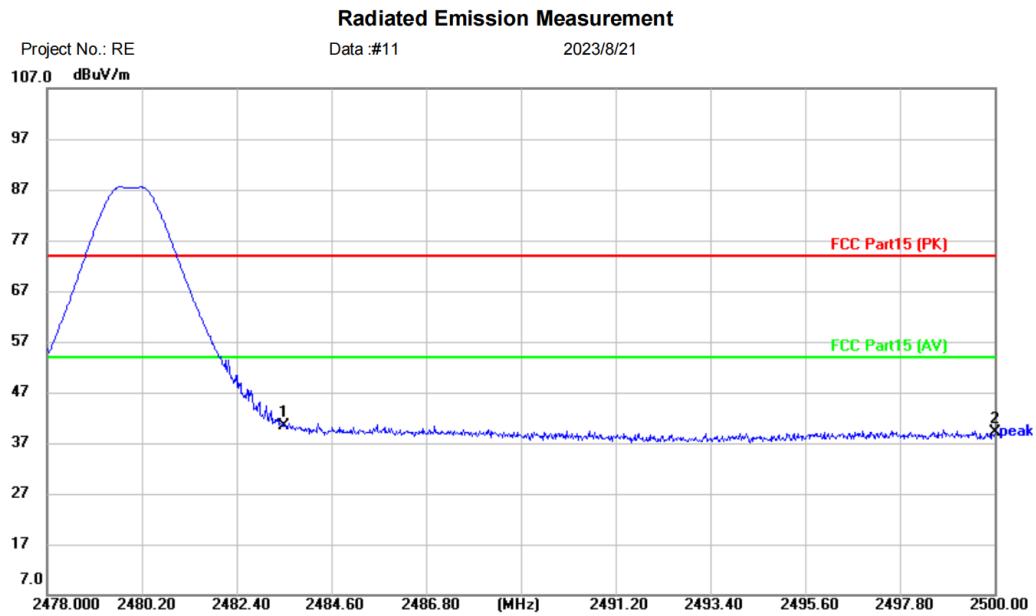
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

[TestMode: TX high channel]; [Polarity: Horizontal]



Site	Polarization: <b>Horizontal</b>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth Module		
M/N: HS50 10-03		
Mode: TX-H		
Note:		

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
1	*	2483.500	45.03	-4.64	40.39	74.00	-33.61	peak
2		2500.000	43.88	-4.75	39.13	74.00	-34.87	peak

\*:Maximum data    x:Over limit    !:over margin

⟨Reference Only

Receiver: ESR\_1

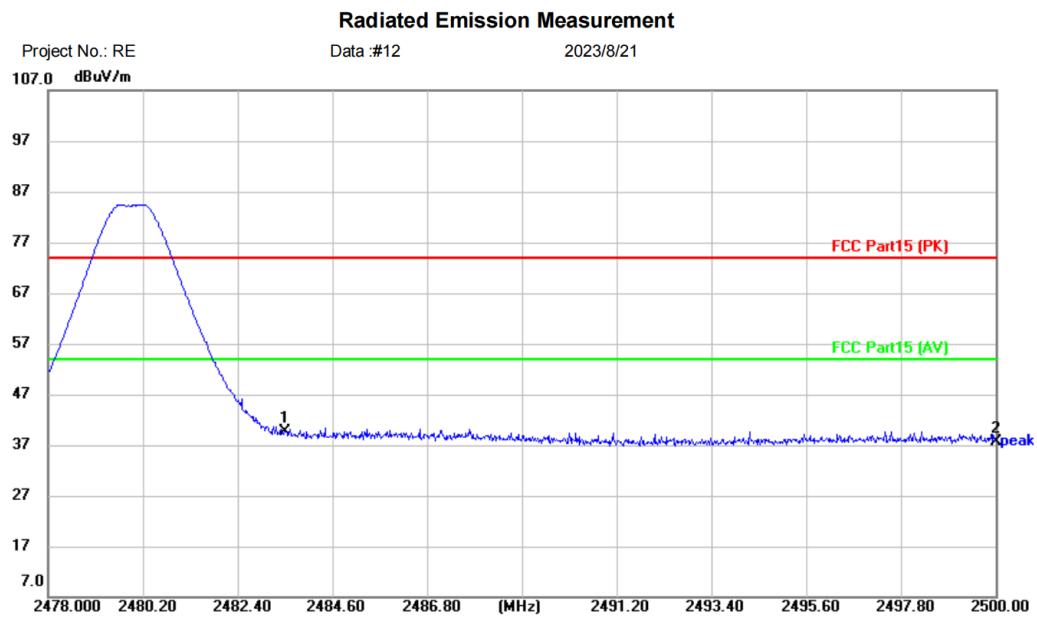
Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

## Test Result: Pass

[TestMode: TX high channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth Module

M/N: HS50 10-03

Mode: TX-H

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
			MHz	dBuV	dB	dBuV/m	dB		
1	*	2483.500	44.18	-4.64	39.54	74.00	-34.46	peak	
2		2500.000	42.40	-4.75	37.65	74.00	-36.35	peak	

\*:Maximum data   x:Over limit   !:over margin

⟨Reference Only⟩

Receiver: ESR\_1

Spectrum Analyzer: FSP40

Antenna: EZ 9120D 1G-18G new

Engineer Signature:

**Test Result: Pass**

Remark:

1. Final Level = Receiver Read level + Correct factor
2. Correct factor = Antenna Factor + Cable Loss – Preamplifier Factor
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

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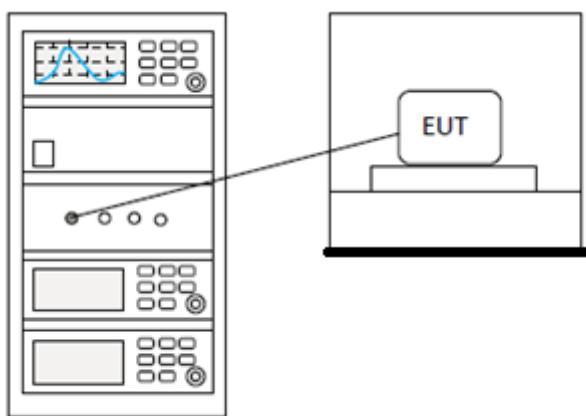
## 14 CONDUCTED SPURIOUS EMISSIONS

<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
<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%

### 14.1 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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### 14.2 BLOCK DIAGRAM OF TEST SETUP



#### 14.3 TEST DATA

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

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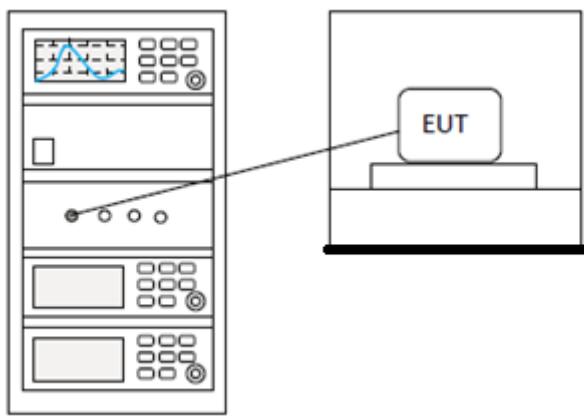
## 15 POWER SPECTRUM DENSITY

<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 11.10.2
<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%

### 15.1 LIMITS

**Limit:**  $\leq 8\text{dBm}$  in any 3 kHz band during any time interval of continuous transmission

### 15.2 BLOCK DIAGRAM OF TEST SETUP



### 15.3 TEST DATA

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

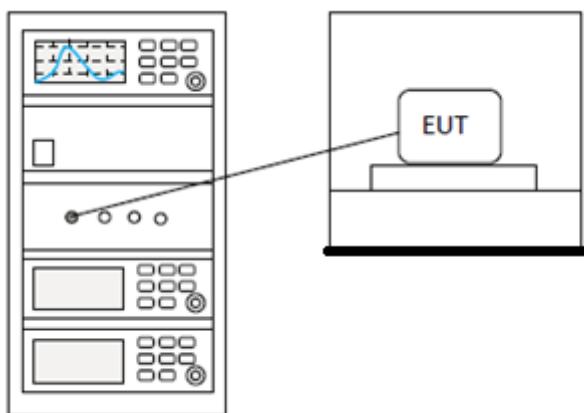
## 16 CONDUCTED PEAK OUTPUT POWER

<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 7.8.5
<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%

### 16.1 LIMITS

<b>Frequency range(MHz)</b>	<b>Output power of the intentional radiator(watt)</b>
902-928	1 for $\geq 50$ hopping channels
	0.25 for $25 \leq$ hopping channels $< 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

### 16.2 BLOCK DIAGRAM OF TEST SETUP



### 16.3 TEST DATA

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

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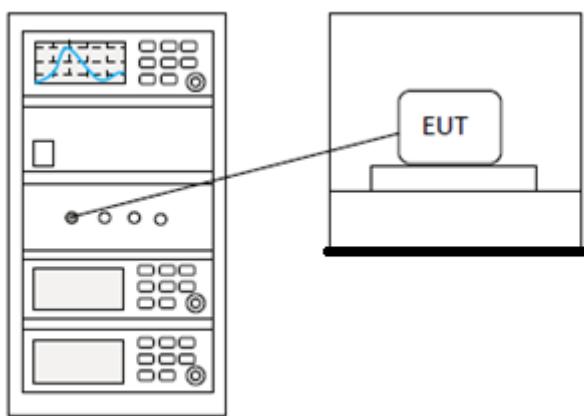
## 17 MINIMUM 6DB BANDWIDTH

<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 11.8.1
<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%

### 17.1 LIMITS

**Limit:**  $\geq 500$  kHz

### 17.2 BLOCK DIAGRAM OF TEST SETUP



### 17.3 TEST DATA

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

## 18 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

### 18.1 CONCLUSION

Standard Requirement:

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The best case gain of the antenna is 3dBi.

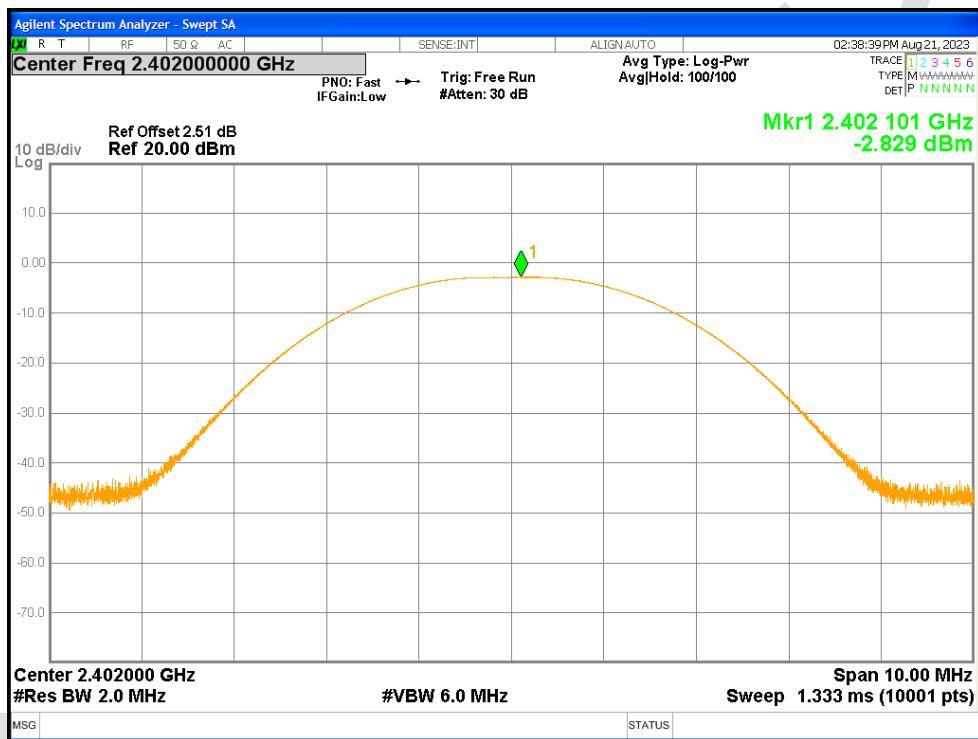
## 19 APPENDIX

## Appendix1

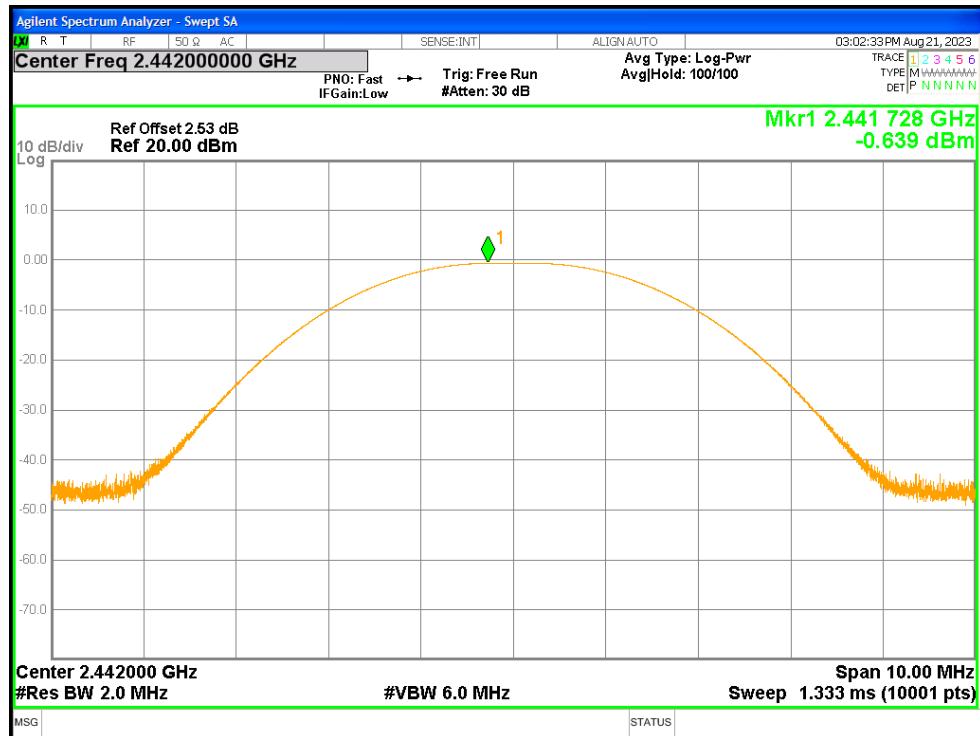
## Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE	2402	Ant1	-2.829	30	Pass
NVNT	BLE	2442	Ant1	-0.639	30	Pass
NVNT	BLE	2480	Ant1	-1.814	30	Pass

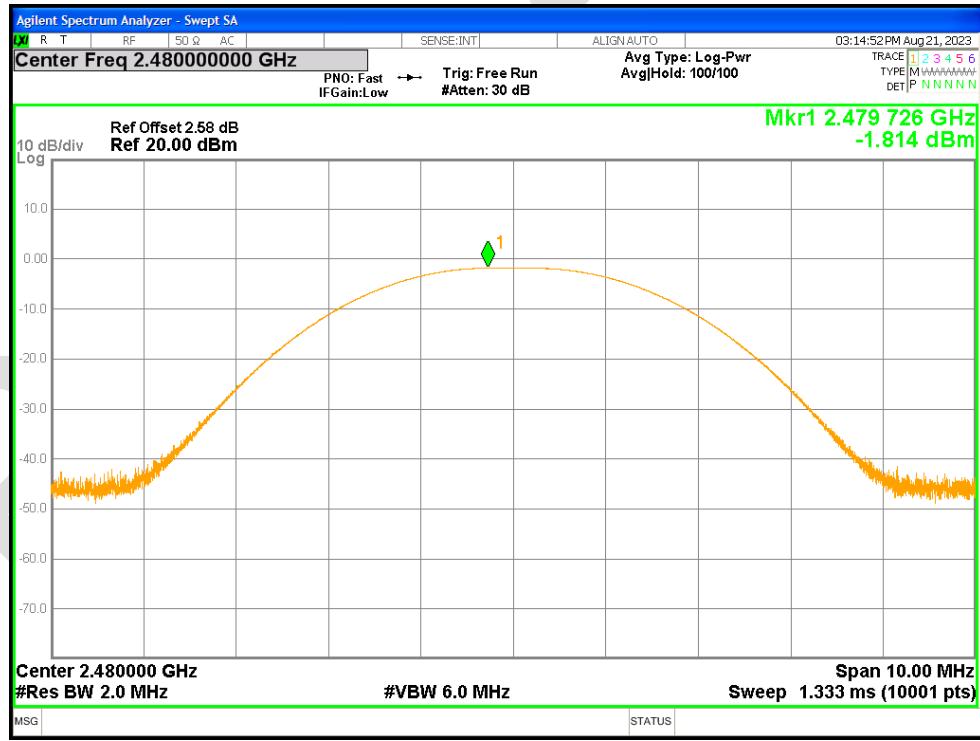
## Power NVNT BLE 2402MHz Ant1



## Power NVNT BLE 2442MHz Ant1

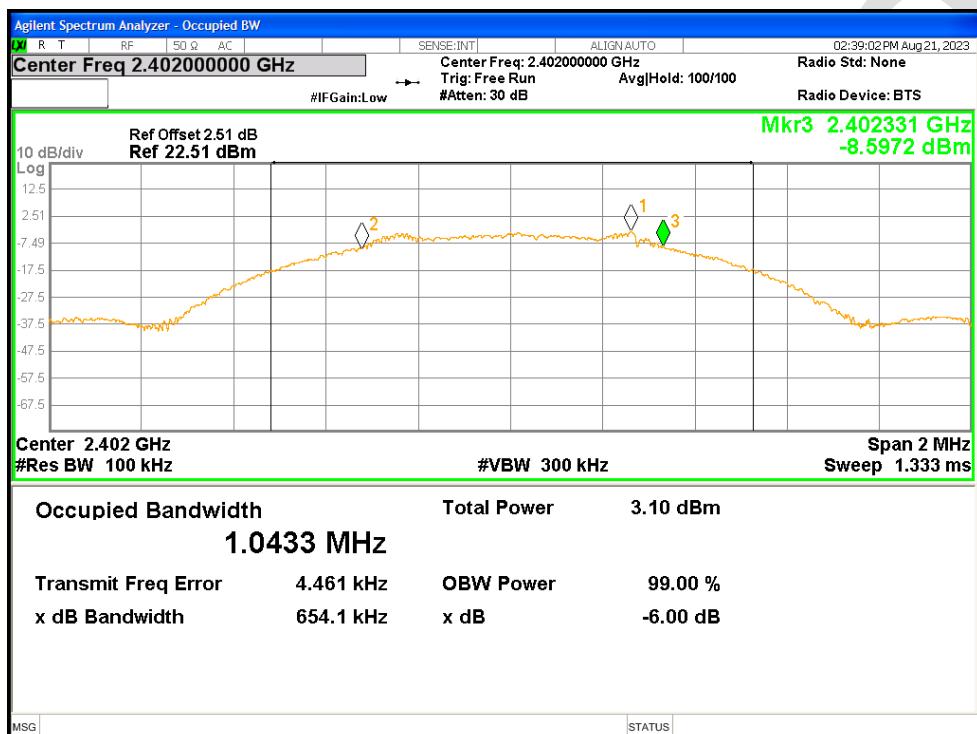


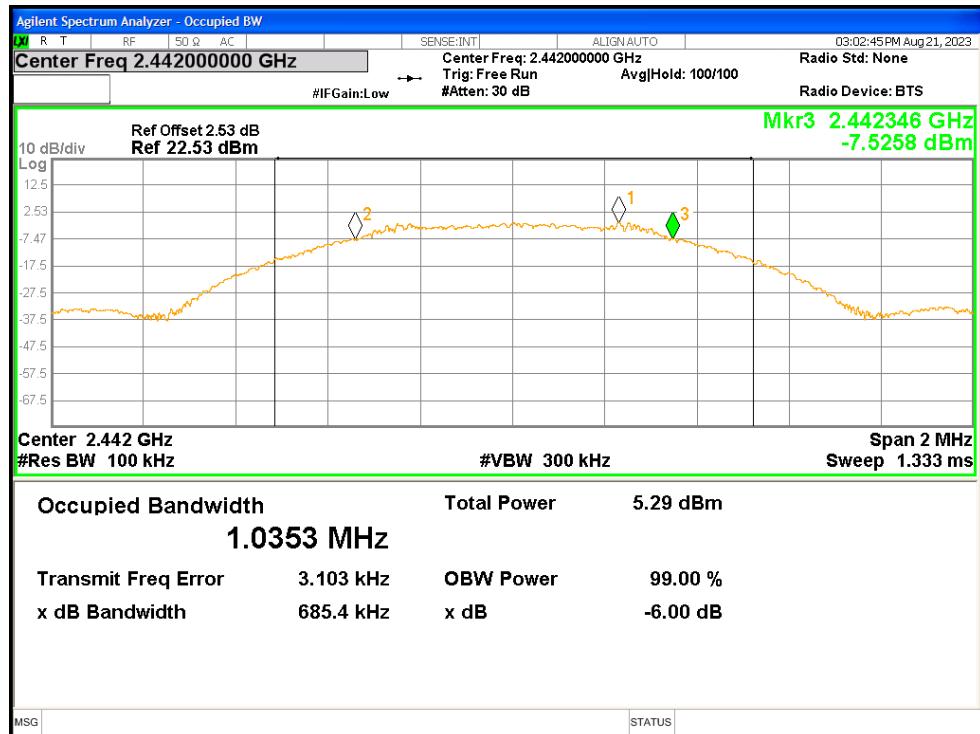
### Power NVNT BLE 2480MHz Ant1



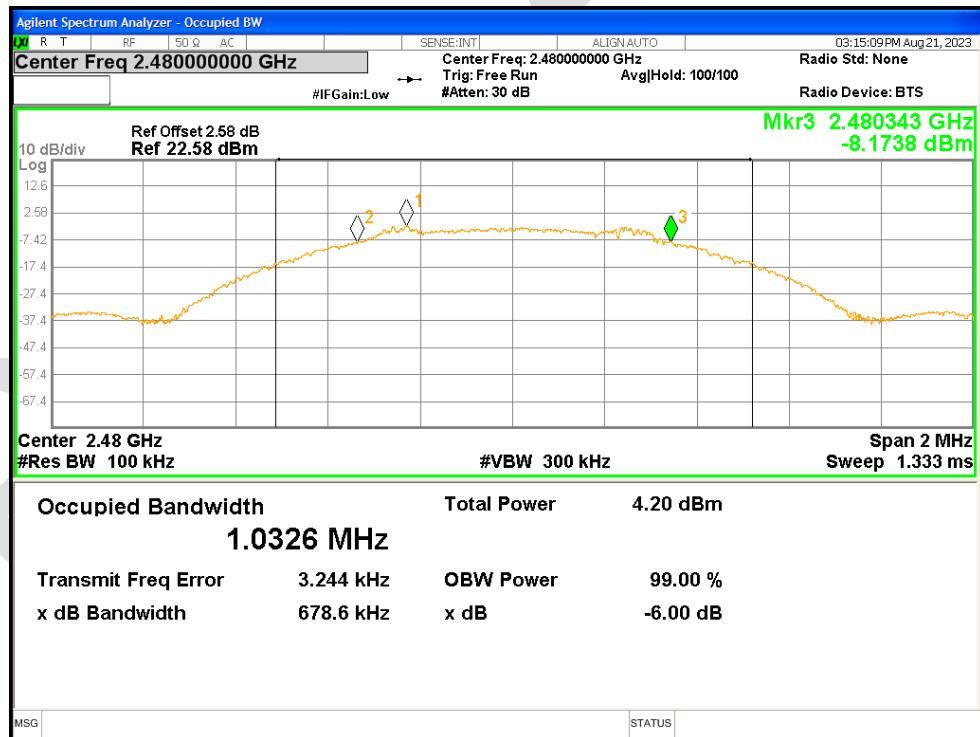
**-6dB Bandwidth**

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE	2402	Ant1	0.654	0.5	Pass
NVNT	BLE	2442	Ant1	0.685	0.5	Pass
NVNT	BLE	2480	Ant1	0.679	0.5	Pass

**-6dB Bandwidth NVNT BLE 2402MHz Ant1**

**-6dB Bandwidth NVNT BLE 2442MHz Ant1**



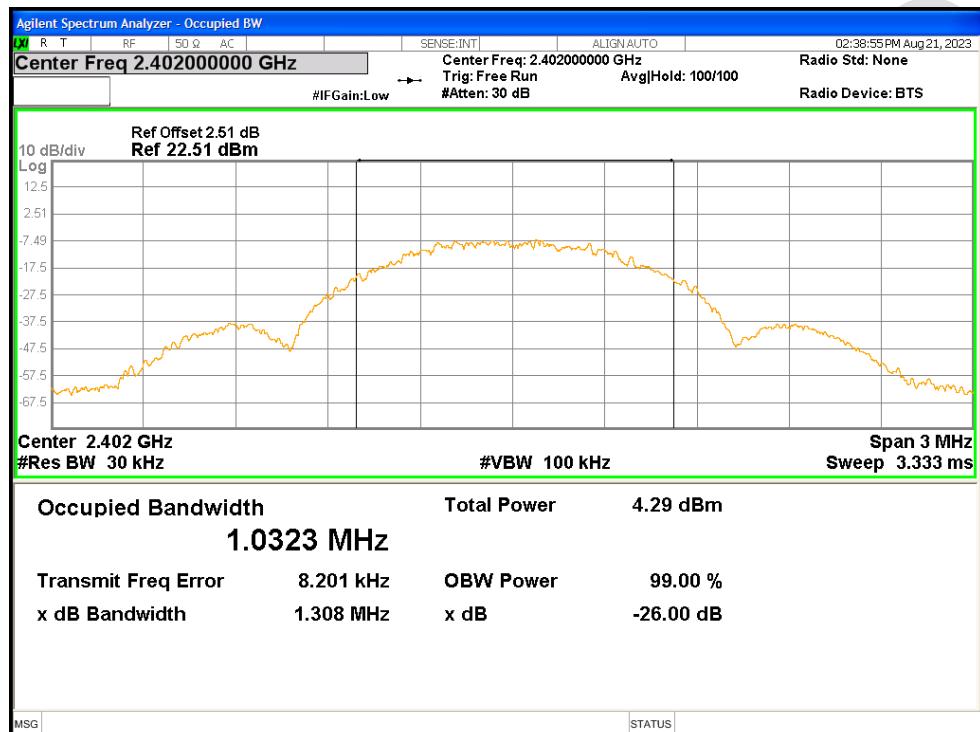
### -6dB Bandwidth NVNT BLE 2480MHz Ant1



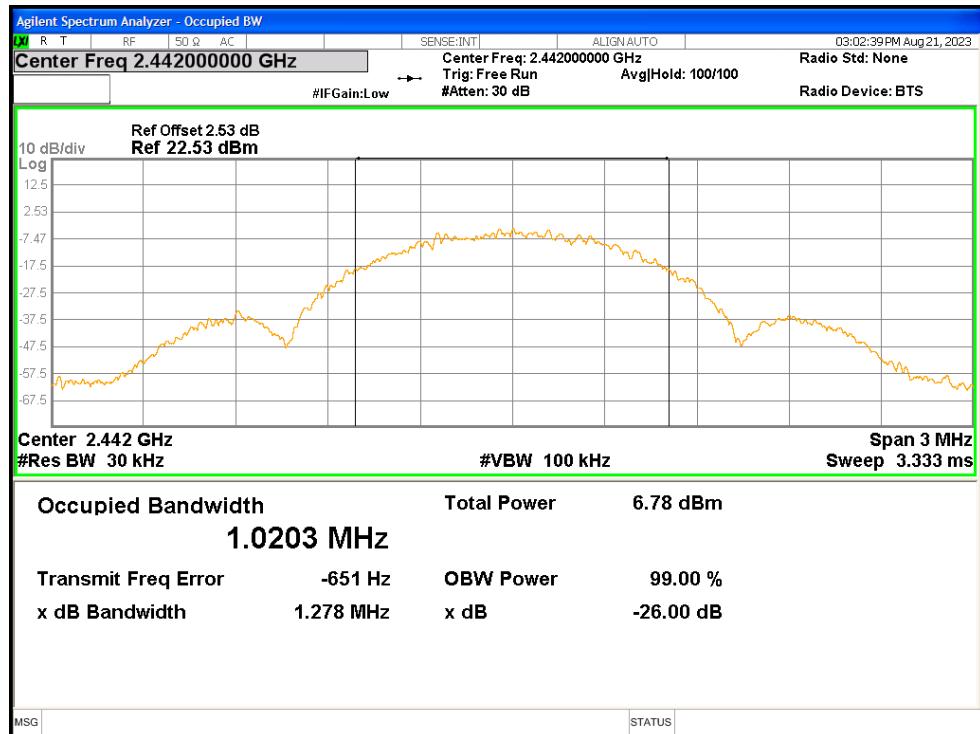
**Occupied Channel Bandwidth**

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE	2402	Ant1	1.0323
NVNT	BLE	2442	Ant1	1.0203
NVNT	BLE	2480	Ant1	1.0223

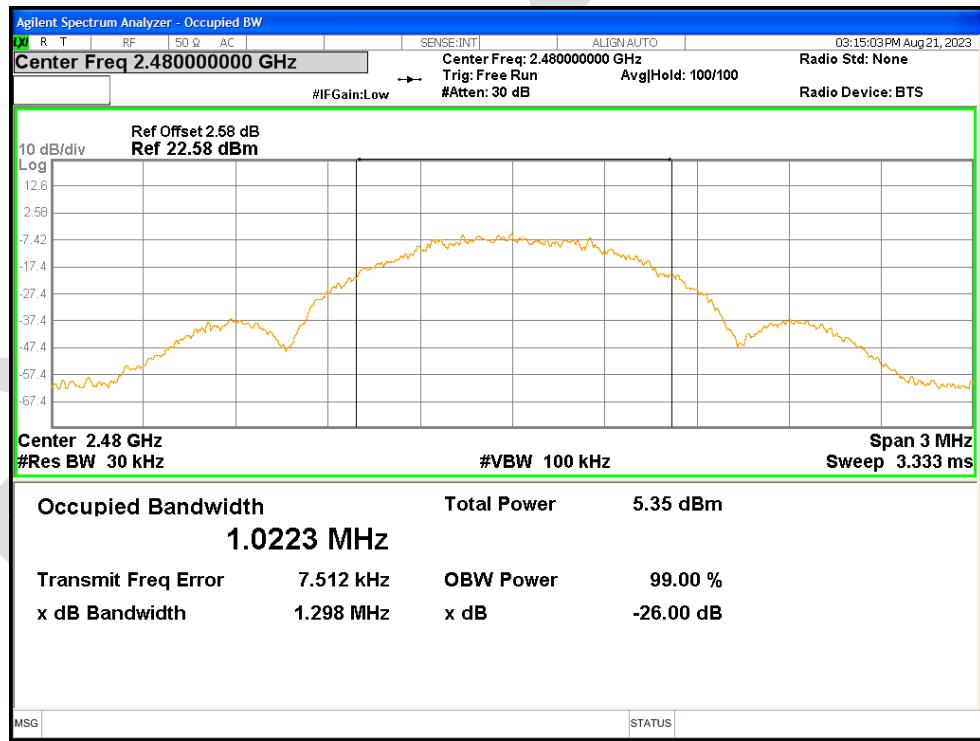
**OBW NVNT BLE 2402MHz Ant1**



**OBW NVNT BLE 2442MHz Ant1**

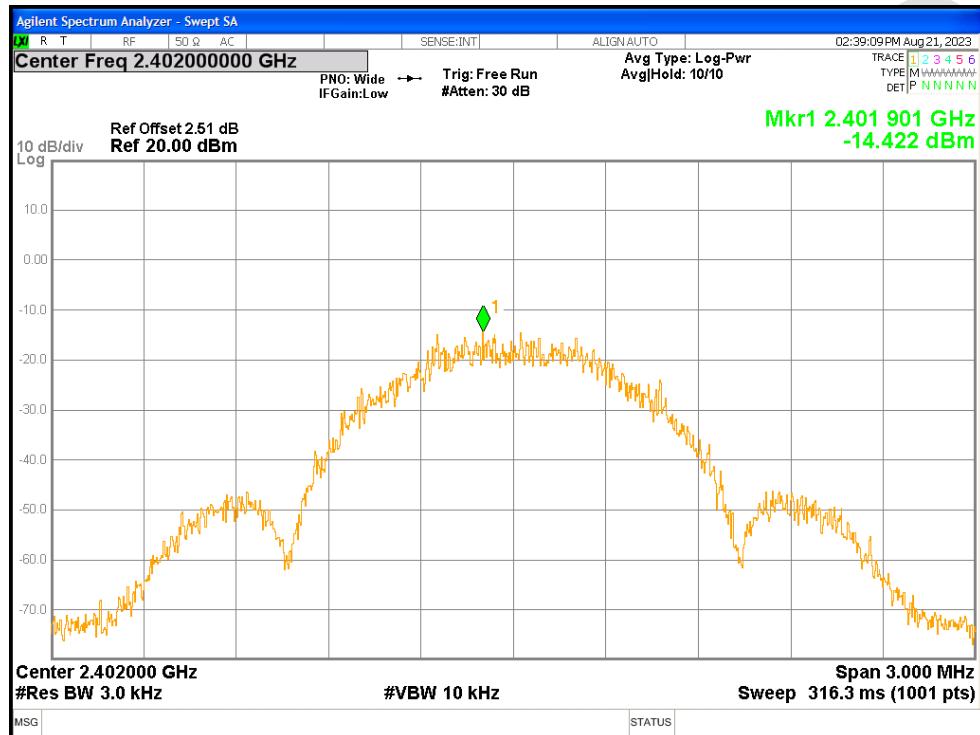


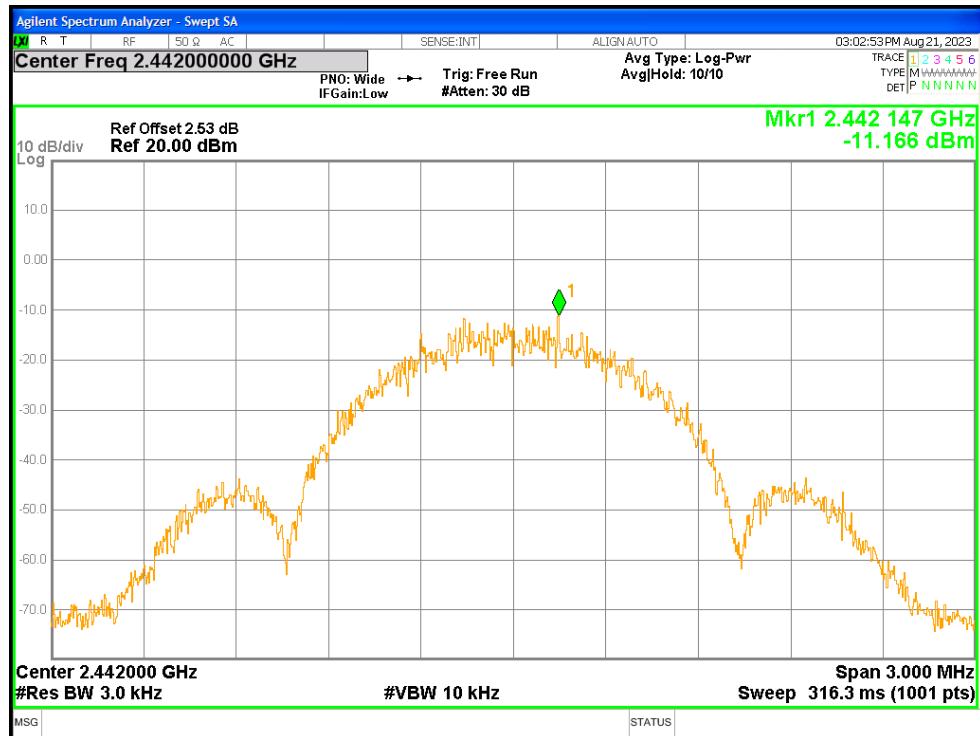
### OBW NVNT BLE 2480MHz Ant1



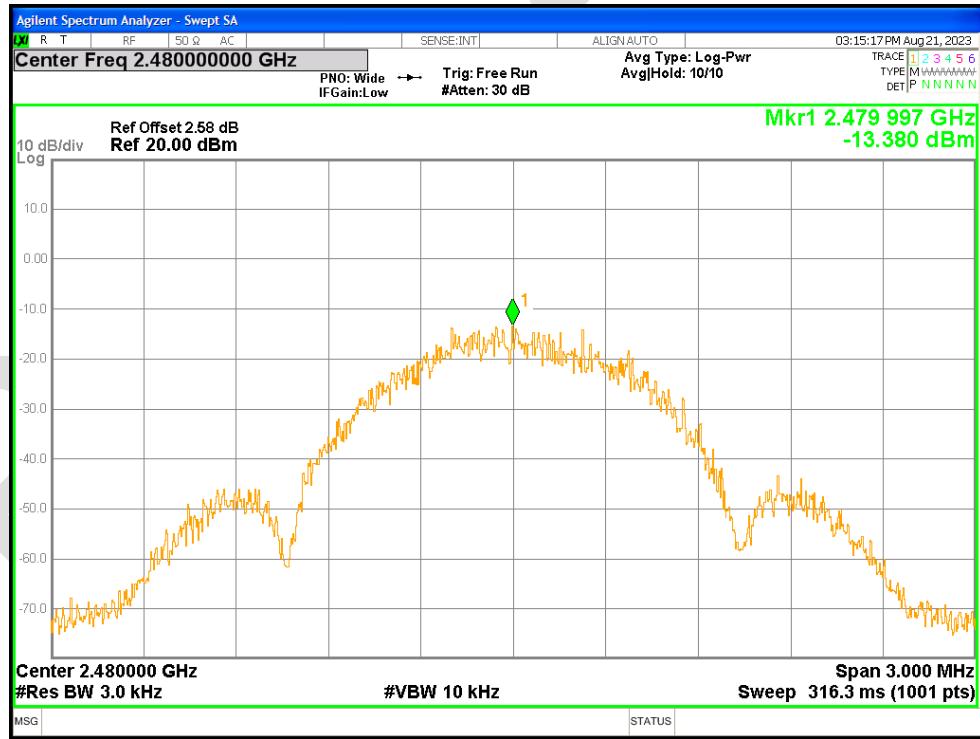
**Maximum Power Spectral Density Level**

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE	2402	Ant1	-14.422	8	Pass
NVNT	BLE	2442	Ant1	-11.166	8	Pass
NVNT	BLE	2480	Ant1	-13.38	8	Pass

**PSD NVNT BLE 2402MHz Ant1**

**PSD NVNT BLE 2442MHz Ant1**

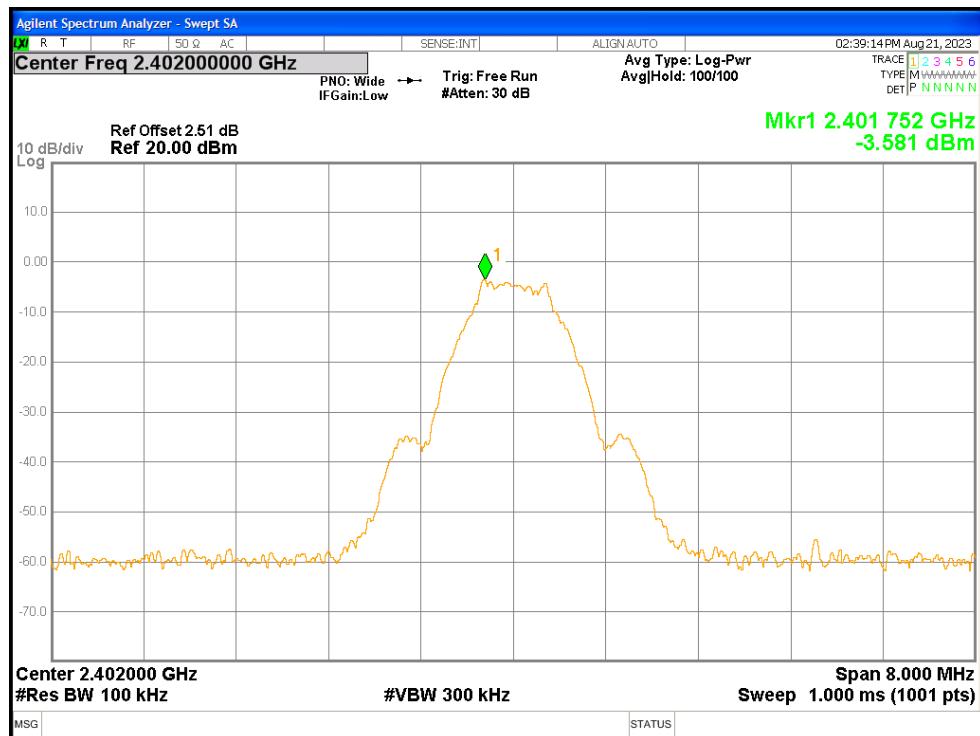


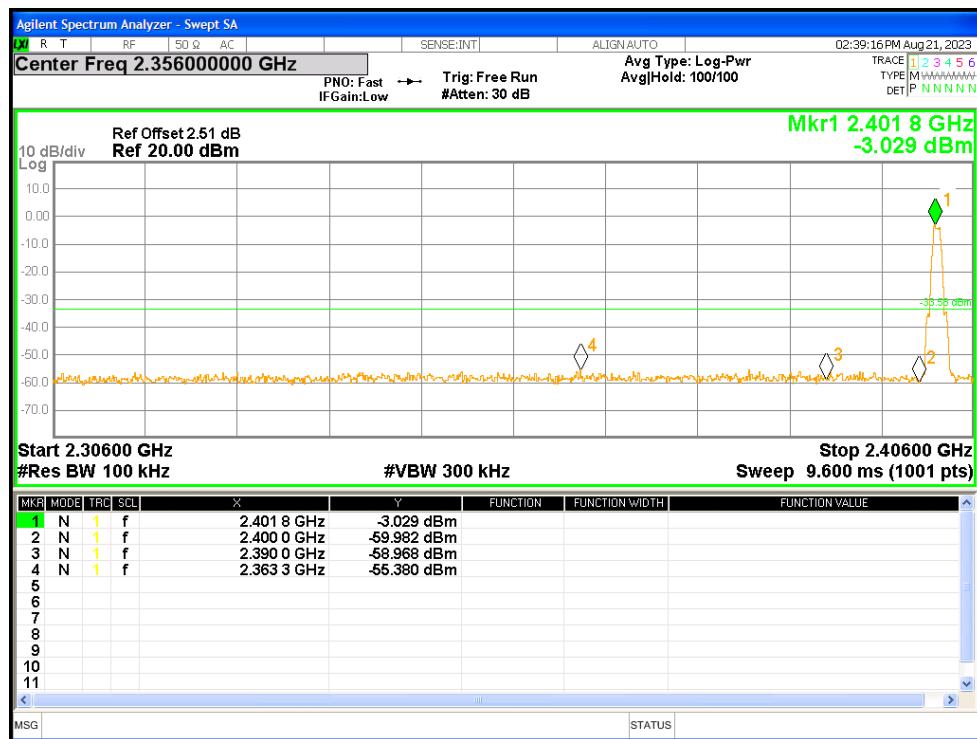
### PSD NVNT BLE 2480MHz Ant1



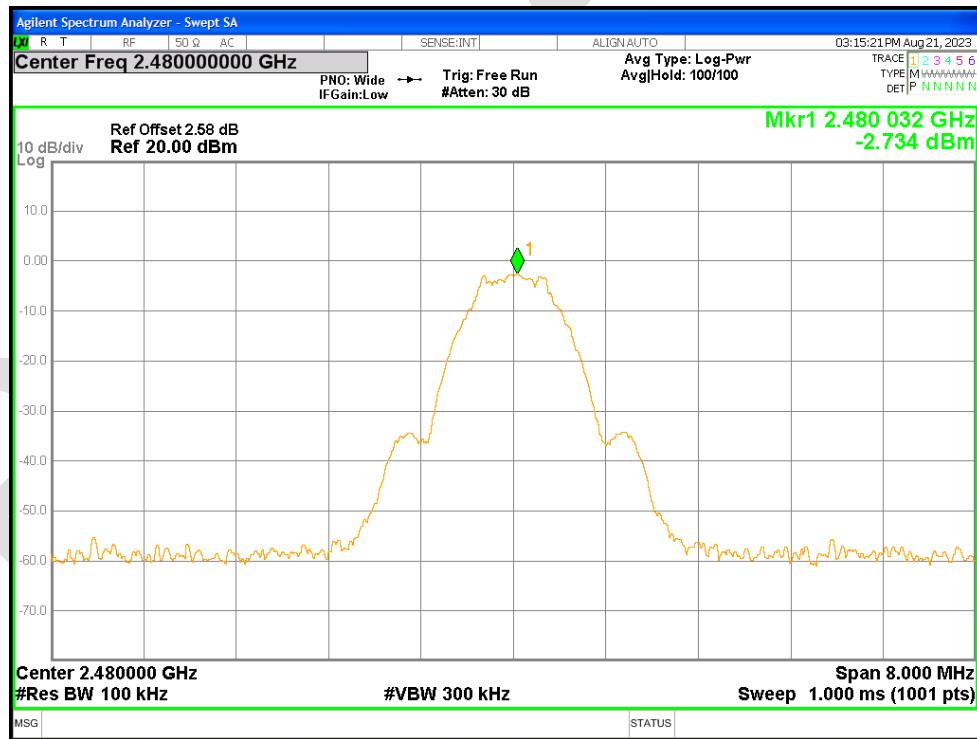
**Band Edge**

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE	2402	Ant1	-51.79	-30	Pass
NVNT	BLE	2480	Ant1	-50.22	-30	Pass

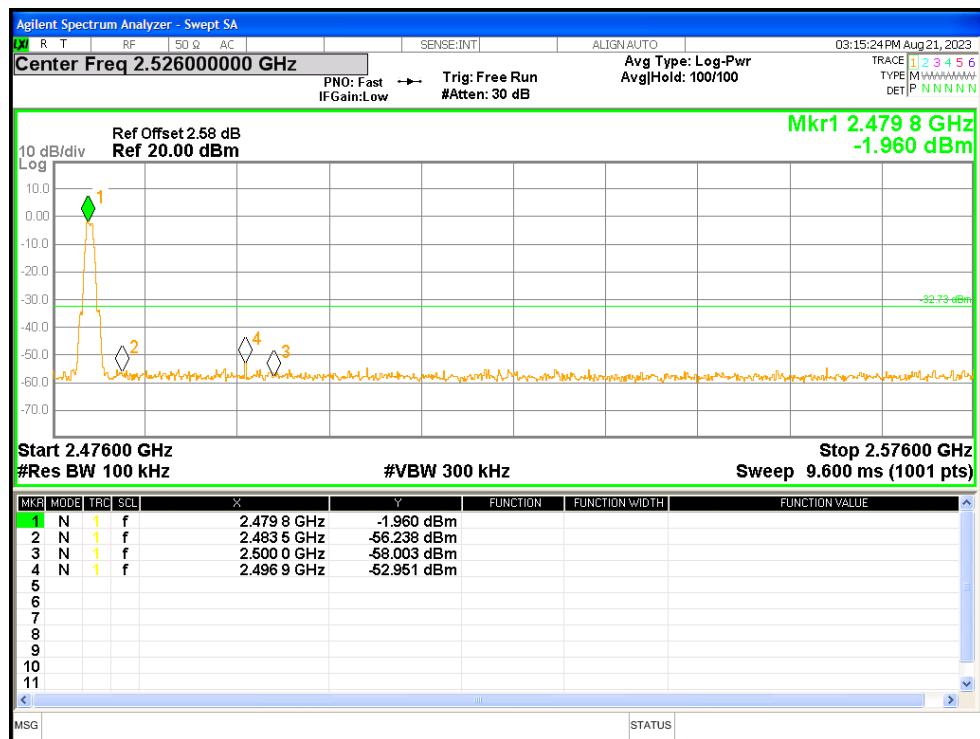
**Band Edge NVNT BLE 2402MHz Ant1 Ref**

**Band Edge NVNT BLE 2402MHz Ant1 Emission**



Band Edge NVNT BLE 2480MHz Ant1 Ref

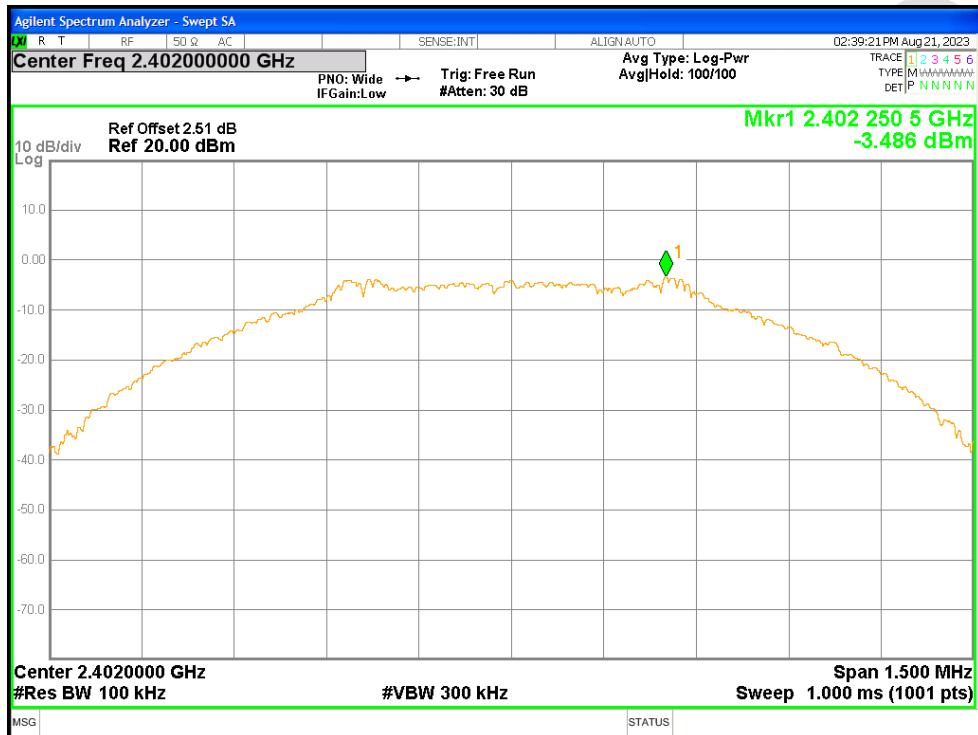


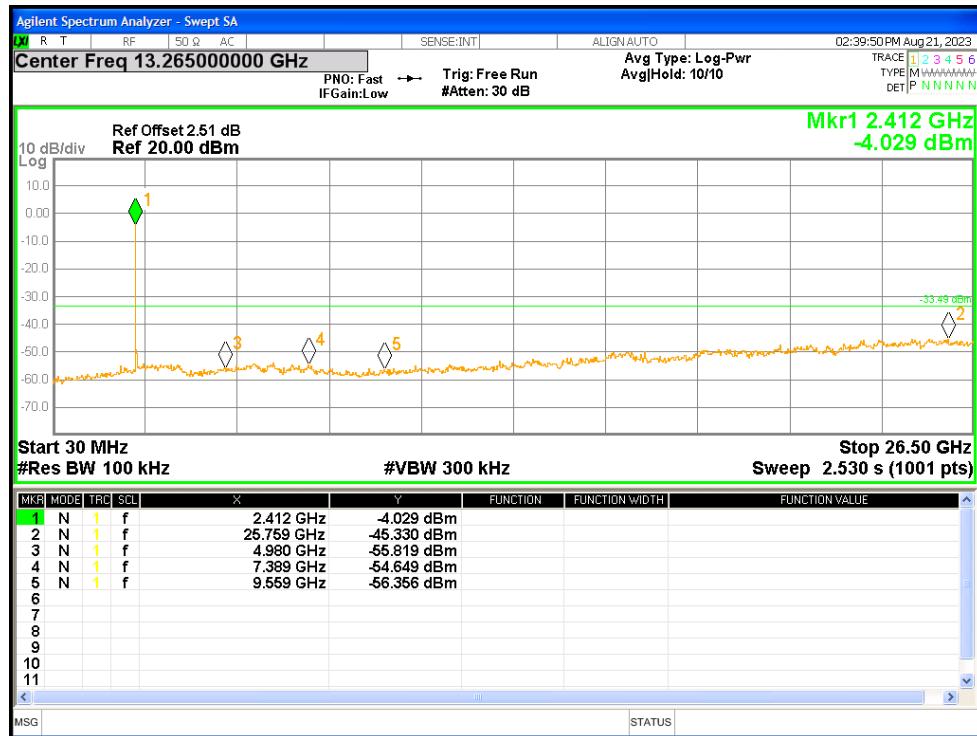
Band Edge NVNT BLE 2480MHz Ant1 Emission



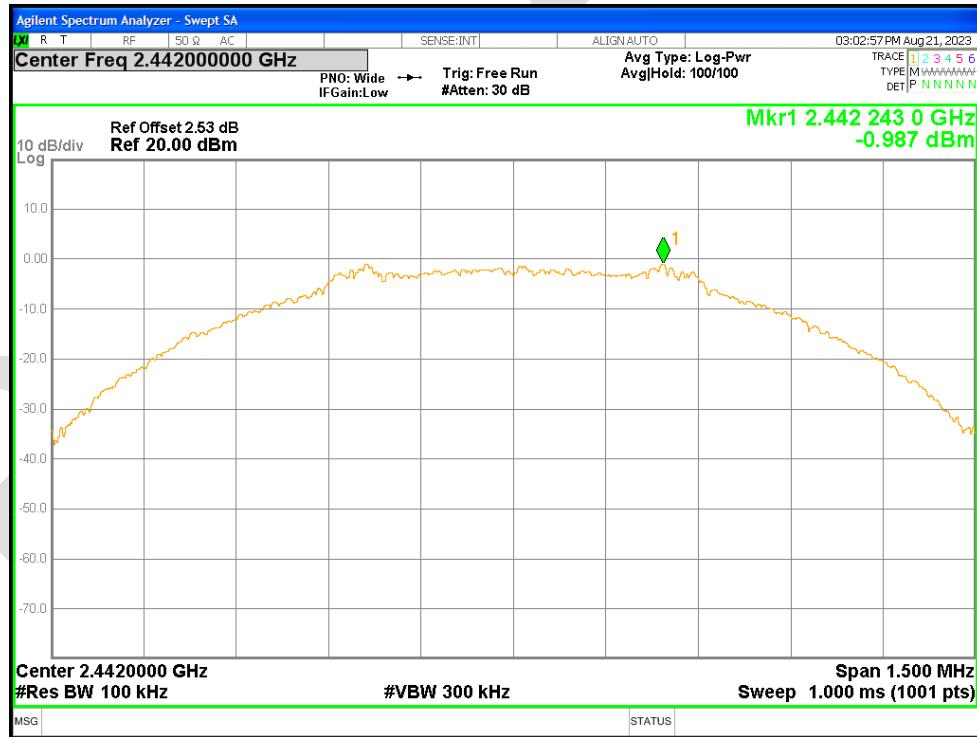
**Conducted RF Spurious Emission**

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE	2402	Ant1	-41.84	-30	Pass
NVNT	BLE	2442	Ant1	-44.05	-30	Pass
NVNT	BLE	2480	Ant1	-42.99	-30	Pass

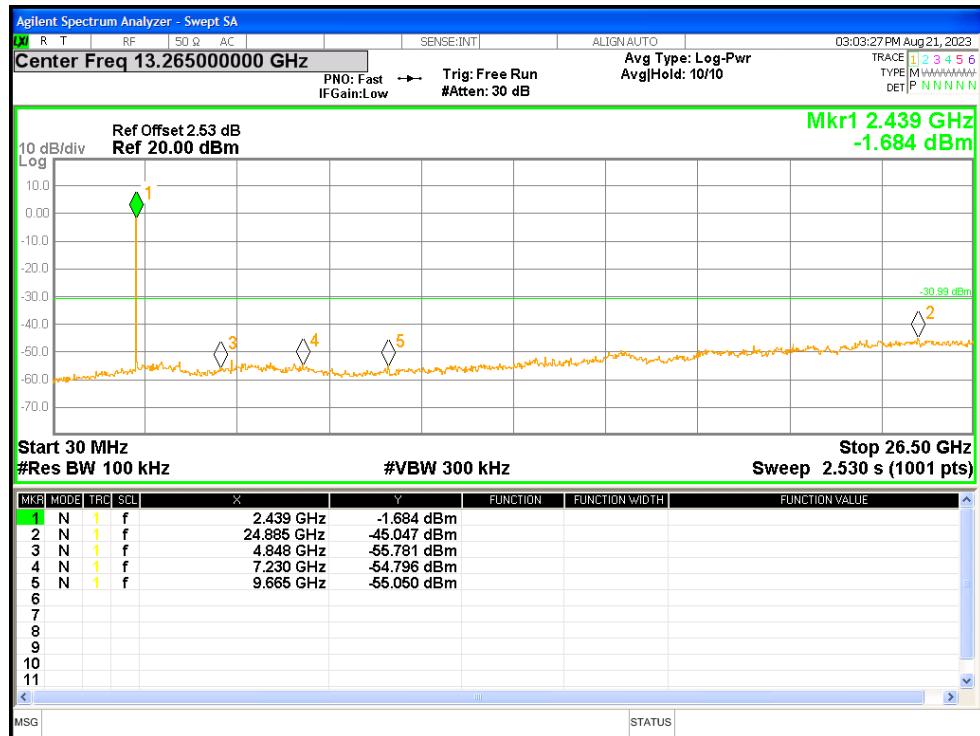
**Tx. Spurious NVNT BLE 2402MHz Ant1 Ref**

**Tx. Spurious NVNT BLE 2402MHz Ant1 Emission**



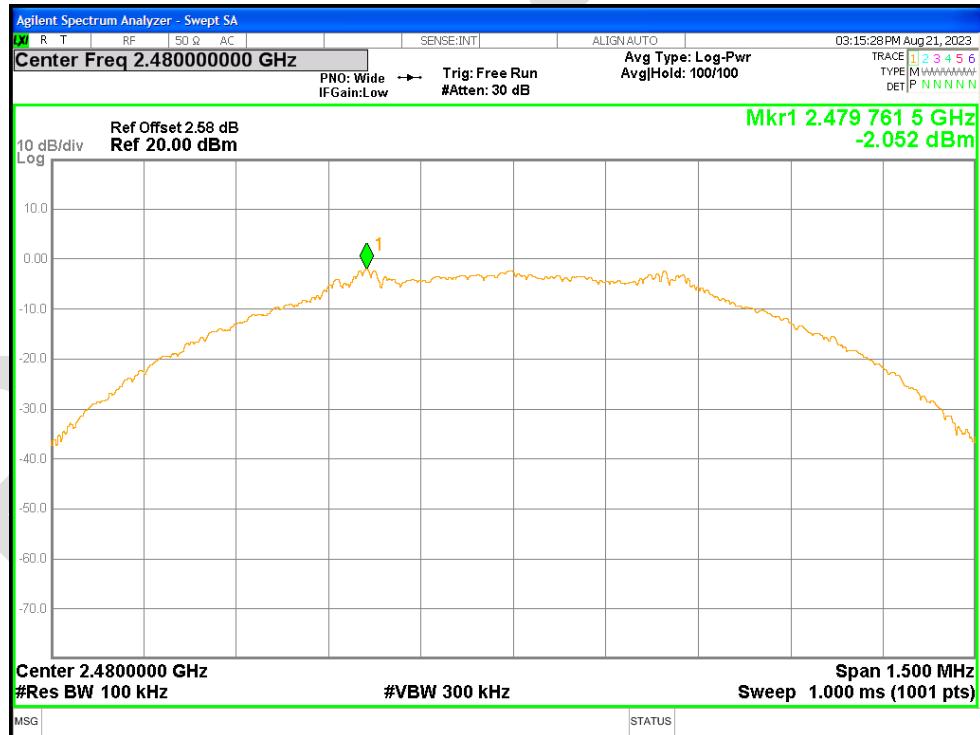
Tx. Spurious NVNT BLE 2442MHz Ant1 Ref



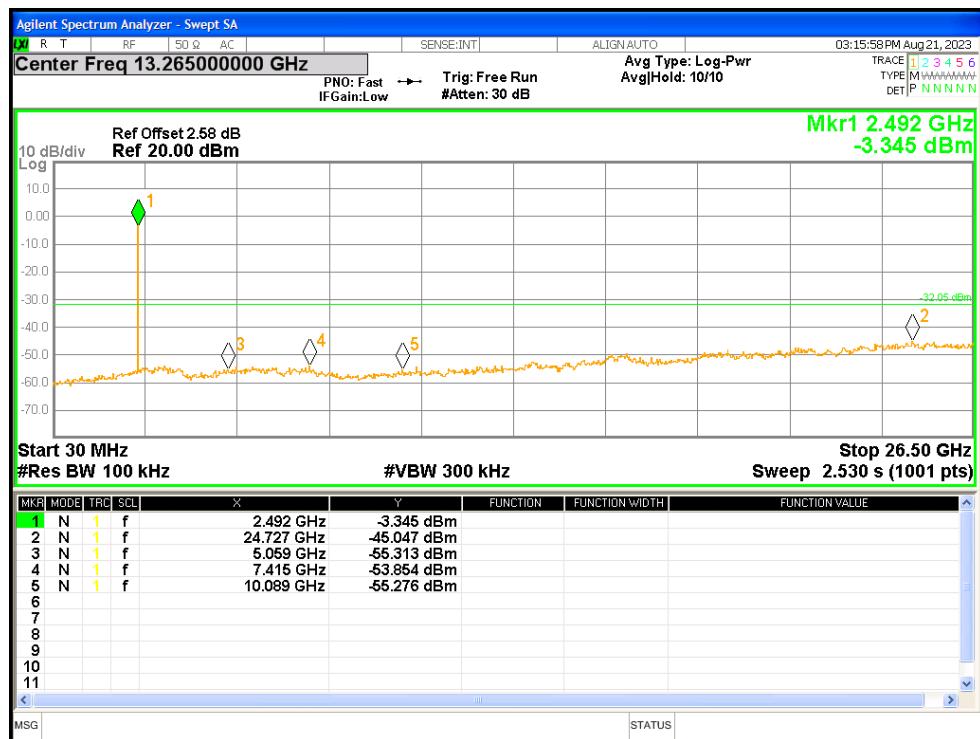
Tx. Spurious NVNT BLE 2442MHz Ant1 Emission



Tx. Spurious NVNT BLE 2480MHz Ant1 Ref

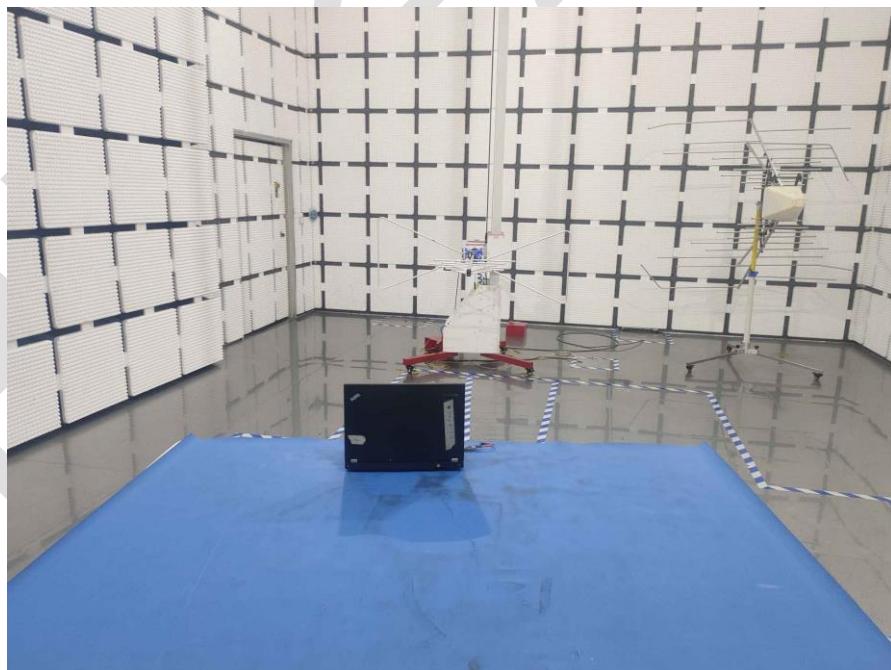


Tx. Spurious NVNT BLE 2480MHz Ant1 Emission



## APPENDIX A: PHOTOGRAPHS OF TEST SETUP

**Radiated Spurious Emissions**



**Conducted Emissions at AC Power Line (150kHz-30MHz)**



**APPENDIX B: PHOTOGRAPHS OF EUT**

Reference to the test report No. BLA-EMC-202308-A1801

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

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