

BLE-2Mbps:

EUT: Active Subwoofer

M/N: YY2089C2

Test date: 2024-10-10

Pressure: 101.3±1.0 kpa

Humidity: 52.4±3.0%

Tested by: Winter

Test site: RF site

Temperature: 23.1±0.6°C

Test Mode	Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)
GFSK	2402	2.0683	N/A
	2440	2.0699	
	2480	2.0697	

Conclusion: Pass

GFSK

2402MHz



2440MHz



2480MHz



7. MAXIMUM PEAK OUTPUT POWER TEST

7.1. Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Mar.16,24	1 Year
2.	RF Cable	Eastsheep	RM086-SMA/N-JJ-2000	NO.1	Jun.19,24	1 Year
3.	Attenuator(10dB)	Agilent	8491B	MY39269201	Mar.16,24	1 Year
4.	USB Wideband Power Sensor	Agilent	U2021XA	MY54180007	Mar.16,24	1Year

7.2. Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak output Power shall not exceed 1W(30dBm).

7.3. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.9.1:

Connected the EUT's Antenna port to PXA signal analyzer;

For Peak output power: Connected the EUT's Antenna port to PXA signal analyzer.

For Average power: Connected the EUT's Antenna port to power meter.

7.4. Test Results

EUT: Active Subwoofer		
M/N: YY2089C2		
Date: 2024-08-29	Pressure: 102.4 ± 1.0 kpa	Humidity: $54.7 \pm 3.0\%$
Tested by: Winter	Test site: RF site	Temperature: 23.6 ± 0.6 °C

BLE-1Mbps:

Test Mode	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Average Power (dBm) (Without Duty cycle Factor)	Duty cycle Factor (dBm)	Average Power (dBm) (with Duty cycle Factor)	Limit (dBm)
GFSK	2402	5	4.540	4.055	0.62	4.675	30
	2440	5	4.408	4.097	0.62	4.717	
	2480	5	4.404	3.949	0.62	4.569	

Conclusion: Pass

Remark: Duty cycle Factor= $10 \cdot \log(1/\text{duty cycle})$

BLE-2Mbps:

Test Mode	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Average Power (dBm) (Without Duty cycle Factor)	Duty cycle Factor (dBm)	Average Power (dBm) (with Duty cycle Factor)	Limit (dBm)
GFSK	2402	5	4.403	3.305	0.55	3.855	30
	2440	5	4.248	3.340	0.55	3.890	
	2480	5	4.256	3.379	0.55	3.929	

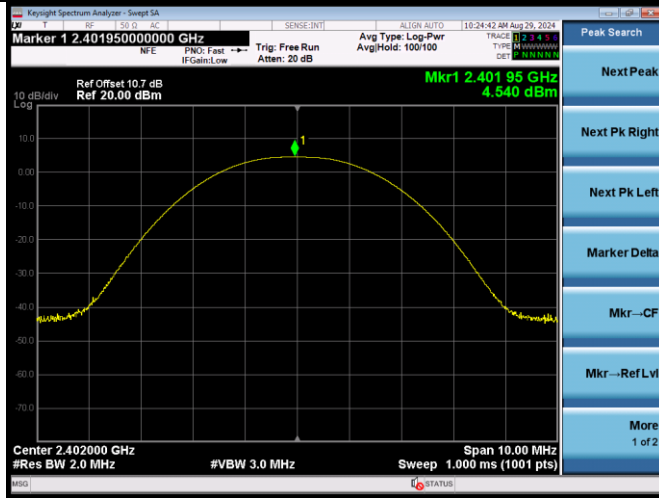
Conclusion: Pass

Remark: Duty cycle Factor= $10 \cdot \log(1/\text{duty cycle})$

BLE-1Mbps:

GFSK

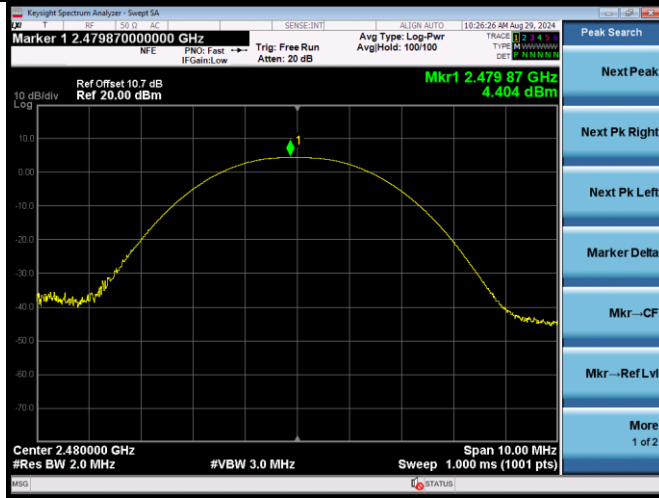
2402MHz



2440MHz



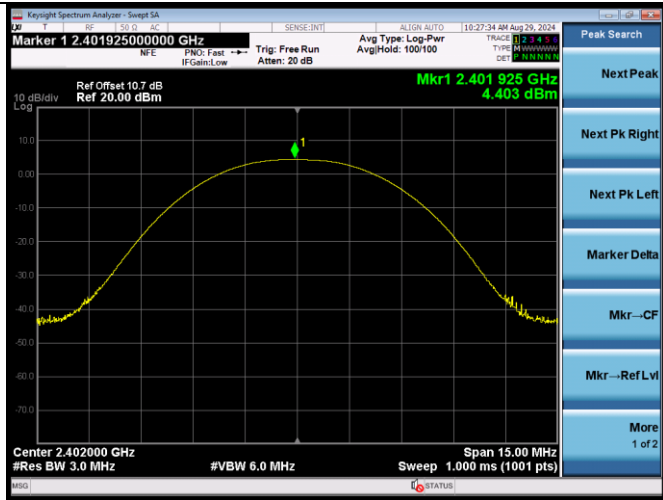
2480MHz



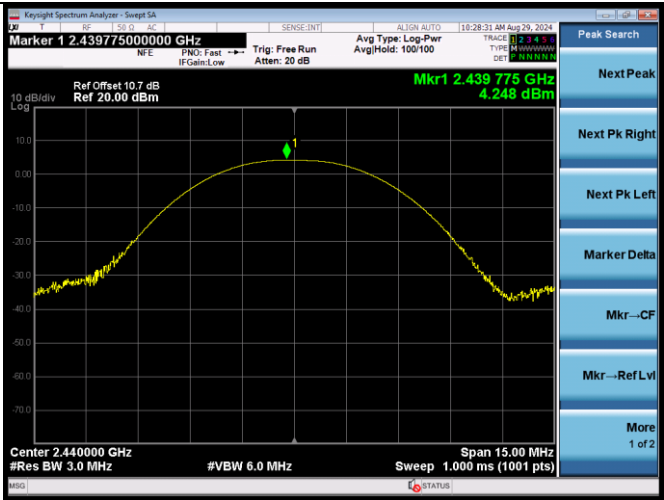
BLE-2Mbps:

GFSK

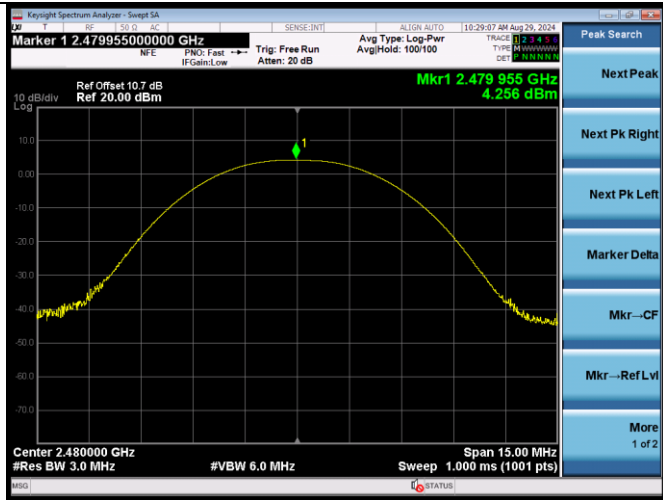
2402MHz



2440MHz



2480MHz



8. BAND EDGE COMPLIANCE TEST

8.1. Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	3m Chamber(NSA)	AUDIX	N/A	N/A	Aug.11,22	3Year
2.	3m Chamber(SE)	AUDIX	N/A	N/A	Sep.16,22	3 Year
3.	Signal Analyzer	Rohde & Schwarz	FSV40	101608	Nov.07,23	1 Year
4.	Amplifier	HP	8447D	2944A11159	Mar.17,24	1 Year
5.	RF Cable	TIMES MICROWAVE	SFT205-NMSM-10.00M	689241	Aug.13,24	1 Year
6.	Test Software	AUDIX	e3	6.100913a	N/A	N/A
7.	Horn Antenna	EMCO	3115	9510-4580	Jan.08,22	3 Year

Note: N/A means Not applicable.

8.2. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.3. Test Produce

Use the test method described in ANSI C63.10 clause 6.10:

For upper band emissions that are up to two bandwidths(2MHz) away (2483.5MHz to 2485.5MHz) from the band-edge use below produce:

1. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 100KHz and with a video bandwidth 300KHz. Record the peak levels of the fundamental emission and the relevant band-edge emission, Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
2. Subtract the delta measured in step (1) from the maximum field strengths measured in clause 4 .The resultant field strengths are then used to determine band-edge compliance as required by Section 15.205

For emissions above two bandwidths away from the band-edge use below produce:

1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

4. Set the spectrum analyzer in the following setting in order to capture the lower and upperband-edges of the emission:

(a) PEAK: RBW=1MHz ;VBW=3MHz, PK detector, Sweep=AUTO

(b) This is pulse Modulation device a duty cycle factor was used to calculate average level based measured peak level.

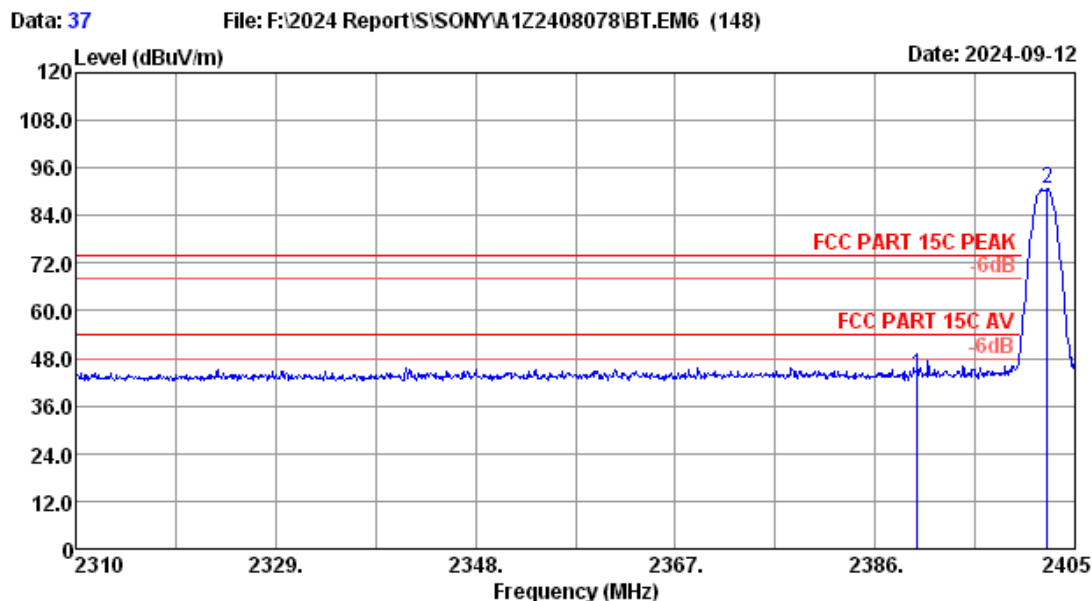
8.4. Test Results

Pass (The testing data was attached in the next pages.)

Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

Test Mode	ANT. PLO.	Frequency (MHz)	Peak(dBuv/m)		Margin	Duty cycle factor (dB)	AV(dBuv/m)		Margin	Conclusion
			Emission Level	Limit			Emission Level	Limit		
BLE-1M	V	2390	43.88	74	30.120	-1.230	42.650	54	11.350	Pass
BLE-1M	H	2390	45.09	74	28.910	-1.230	43.860	54	10.140	Pass
BLE-1M	H	2483.5	46.86	74	27.140	-1.230	45.630	54	8.370	Pass
BLE-1M	H	2500	45.26	74	28.740	-1.230	44.030	54	9.970	Pass
BLE-1M	V	2483.5	45.16	74	28.840	-1.230	43.930	54	10.070	Pass
BLE-1M	V	2500	44.32	74	29.680	-1.230	43.090	54	10.910	Pass
BLE-2M	H	2390	44.92	74	29.080	-1.096	43.824	54	10.176	Pass
BLE-2M	V	2390	46.11	74	27.890	-1.096	45.014	54	8.986	Pass
BLE-2M	V	2483.5	45.85	74	28.150	-1.096	44.754	54	9.246	Pass
BLE-2M	V	2500	44.60	74	29.400	-1.096	43.504	54	10.496	Pass
BLE-2M	H	2483.5	48.43	74	25.570	-1.096	47.334	54	6.666	Pass
BLE-2M	H	2500	44.32	74	29.680	-1.096	43.224	54	10.776	Pass

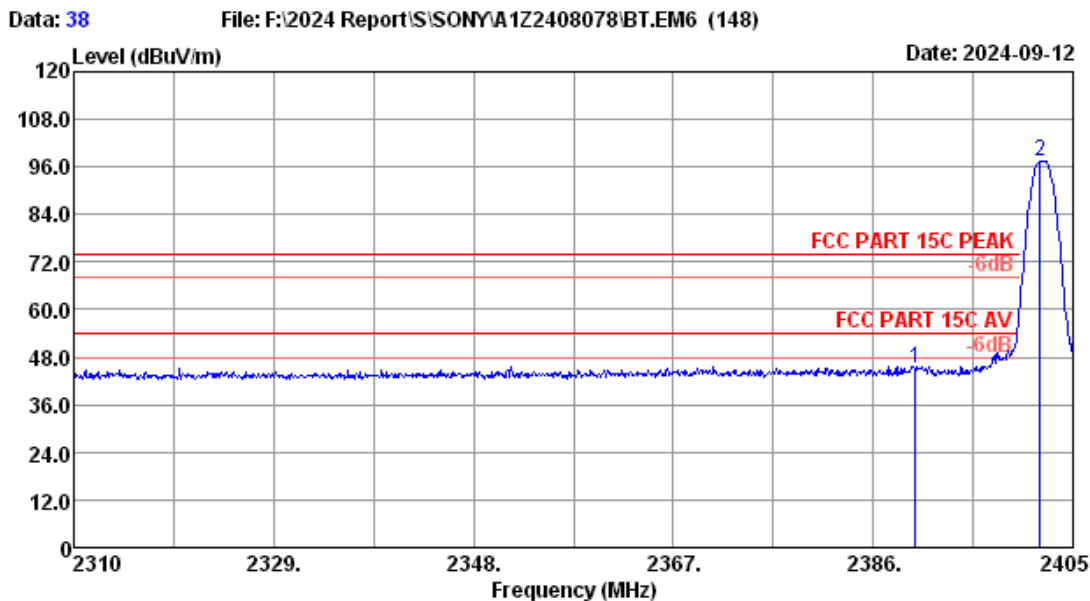
BLE-1Mbps:



Site no. : 3m Chamber Data no. : 37
Dis. / Ant. : 3m 2022 3115-4580 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2°C/52.5% Engineer : WINTER
Test Mode : BLE1M 2402 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	28.10	5.30	42.18	31.70	43.88	74.00	30.12	Peak
2	2402.34	28.11	5.32	88.86	31.70	90.59	-----	-----	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
- Amp factor.
2. The emission levels that are 20dB below the official
limit are not reported.

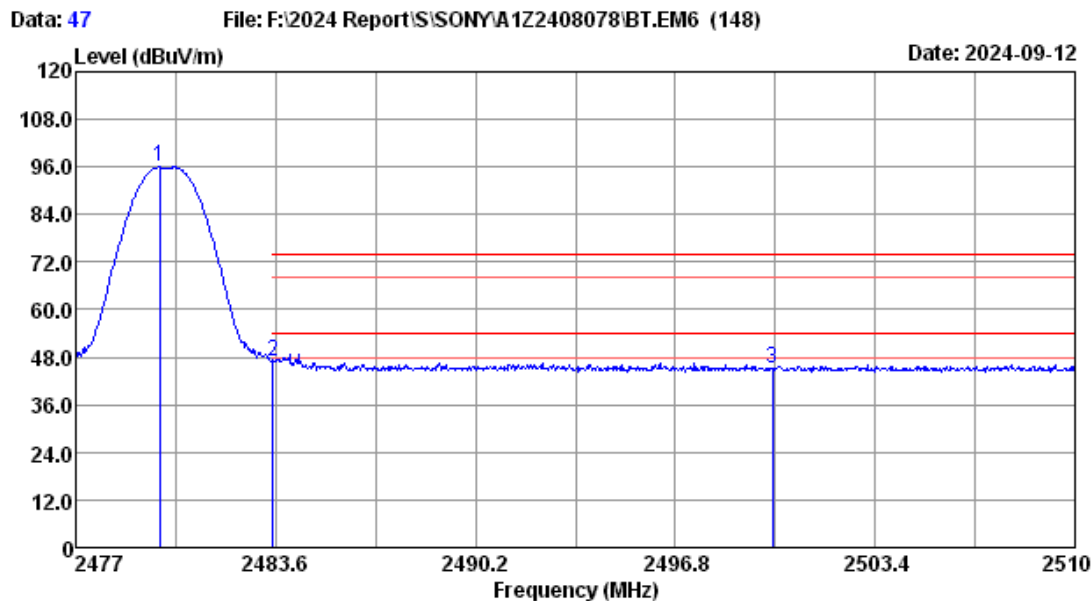


Site no.	: 3m Chamber	Data no.	: 38
Dis. / Ant.	: 3m 2022 3115-4580	Ant. pol.	: HORIZONTAL
Limit	: FCC PART 15C PEAK		
Env. / Ins.	: 23.2°C/52.5%	Engineer	: WINTER
Test Mode	: BLE1M 2402 TX Mode		

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	28.10	5.30	43.39	31.70	45.09	74.00	28.91	Peak
2	2401.87	28.11	5.32	95.73	31.70	97.46	-----	-----	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
-Amp factor.

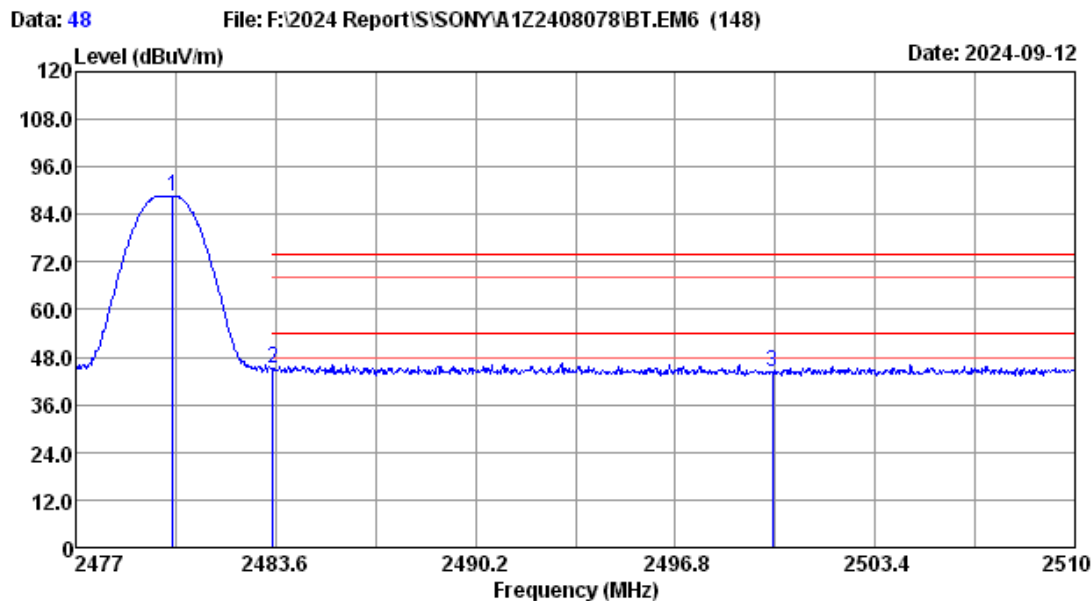
2. The emission levels that are 20dB below the official
limit are not reported.



Site no. : 3m Chamber Data no. : 47
 Dis. / Ant. : 3m 2022 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 23.2°C/52.5% Engineer : WINTER
 Test Mode : BLE1M 2480 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.77	28.30	5.41	93.86	31.66	95.91	-----	-----	Peak
2	2483.50	28.30	5.41	44.81	31.66	46.86	74.00	27.14	Peak
3	2500.00	28.30	5.44	43.17	31.65	45.26	74.00	28.74	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp factor.
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 48
 Dis. / Ant. : 3m 2022 3115-4580 Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 23.2°C/52.5% Engineer : WINTER
 Test Mode : BLE1M 2480 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.20	28.30	5.41	86.61	31.66	88.66	-----	-----	Peak
2	2483.50	28.30	5.41	43.11	31.66	45.16	74.00	28.84	Peak
3	2500.00	28.30	5.44	42.23	31.65	44.32	74.00	29.68	Peak

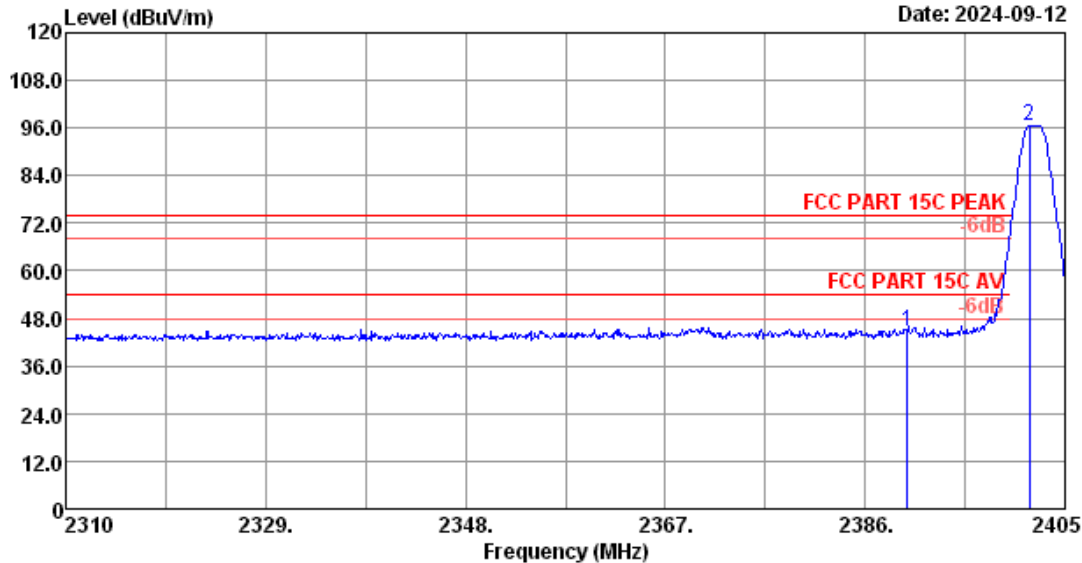
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp factor.
 2. The emission levels that are 20dB below the official
 limit are not reported.

BLE-2Mbps:

Data: 53

File: F:\2024 Report\SI\SONYA1Z2408078\BT.EM6 (148)

Date: 2024-09-12



Site no. : 3m Chamber

Data no. : 53

Dis. / Ant. : 3m 2022 3115-4580

Ant. pol. : HORIZONTAL

Limit : FCC PART 15C PEAK

Env. / Ins. : 23.2°C/52.5%

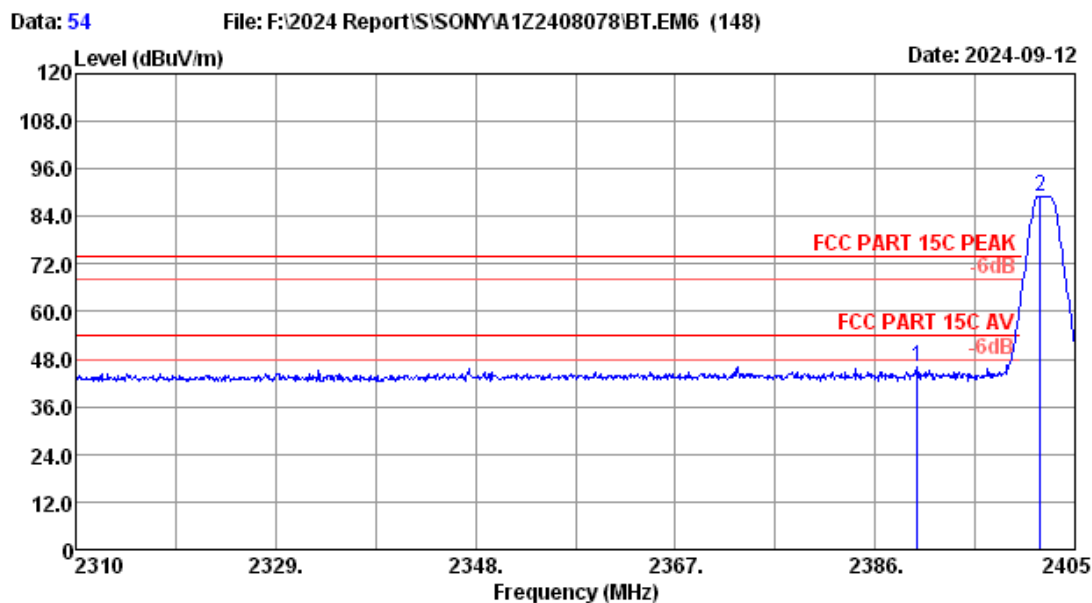
Engineer : WINTER

Test Mode : BLE2M 2402 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	28.10	5.30	43.22	31.70	44.92	74.00	29.08	Peak
2	2401.58	28.11	5.32	94.90	31.70	96.63	-----	-----	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
-Amp factor.

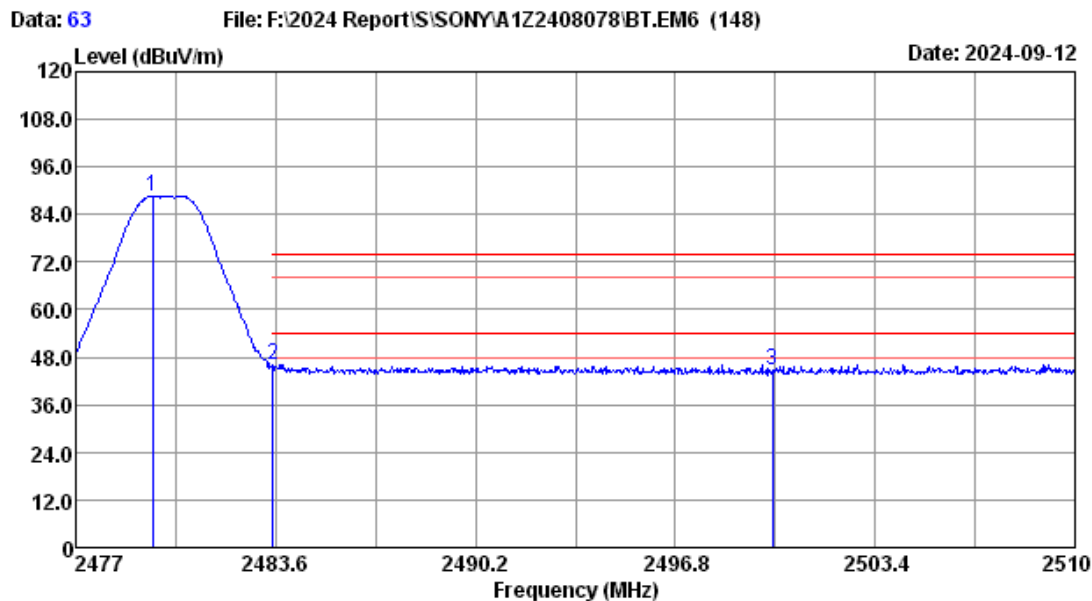
2. The emission levels that are 20dB below the official
limit are not reported.



Site no. : 3m Chamber Data no. : 54
 Dis. / Ant. : 3m 2022 3115-4580 Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 23.2°C/52.5% Engineer : WINTER
 Test Mode : BLE2M 2402 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	28.10	5.30	44.41	31.70	46.11	74.00	27.89	Peak
2	2401.68	28.11	5.32	87.44	31.70	89.17	-----	-----	Peak

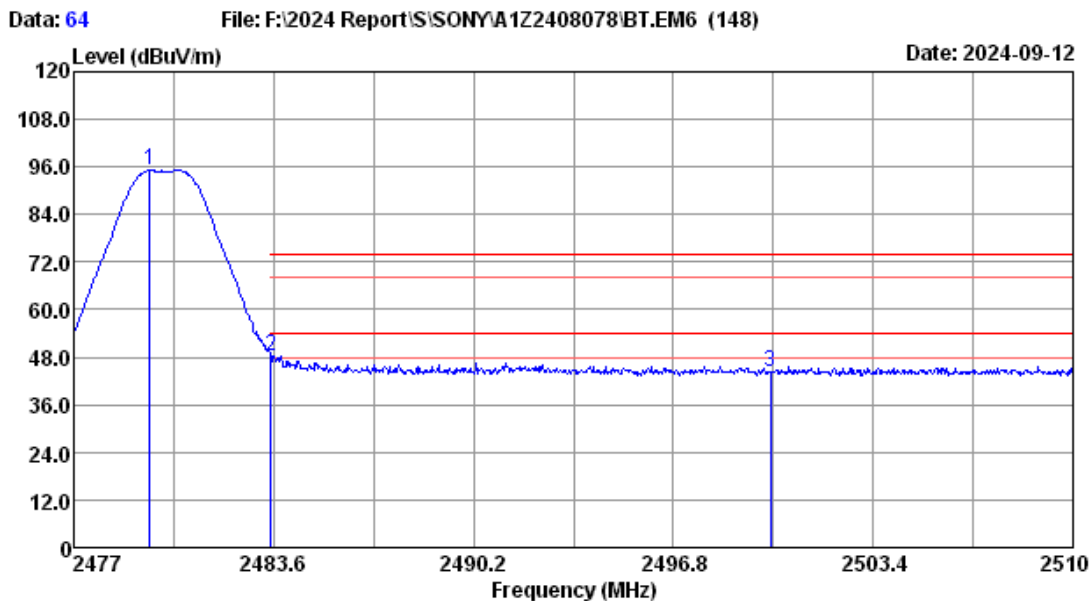
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp factor.
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 63
 Dis. / Ant. : 3m 2022 3115-4580 Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 23.2°C/52.5% Engineer : WINTER
 Test Mode : BLE2M 2480 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.54	28.30	5.41	86.52	31.66	88.57	-----	-----	Peak
2	2483.50	28.30	5.41	43.80	31.66	45.85	74.00	28.15	Peak
3	2500.00	28.30	5.44	42.51	31.65	44.60	74.00	29.40	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp factor.
 2. The emission levels that are 20dB below the official
 limit are not reported.



Site no. : 3m Chamber Data no. : 64
 Dis. / Ant. : 3m 2022 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : 23.2°C/52.5% Engineer : WINTER
 Test Mode : BLE2M 2480 TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.51	28.30	5.41	93.04	31.66	95.09	-----	-----	Peak
2	2483.50	28.30	5.41	46.38	31.66	48.43	74.00	25.57	Peak
3	2500.00	28.30	5.44	42.23	31.65	44.32	74.00	29.68	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 -Amp factor.
 2. The emission levels that are 20dB below the official
 limit are not reported.

9. POWER SPECTRAL DENSITY TEST

9.1. Test Equipments

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Mar.16,24	1 Year
2.	RF Cable	esatsheep	RM086-SMA/N-JJ-2000	NO.1	Jun.19,24	1 Year
3.	Attenuator(10dB)	Agilent	8491B	MY39269201	Mar.16,24	1 Year

9.2. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

9.3. Test Procedure

Use the test method described in ANSI C63.10 clause 11.10.2:

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
- If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

9.4. Test Results

EUT: Active Subwoofer		
M/N: YY2089C2		
Date: 2024-09-03	Pressure: 102.4 ± 1.0 kpa	Humidity: $54.7 \pm 3.0\%$
Tested by: Winter	Test site: RF site	Temperature: $23.6 \pm 0.6^{\circ}\text{C}$

BLE-1Mbps:

Test Mode	Frequency (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-11.201	8
	2440	-11.119	8
	2480	-11.001	8
Conclusion : PASS			

BLE-2Mbps:

Test Mode	Frequency (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-14.668	8
	2440	-14.293	8
	2480	-14.218	8
Conclusion : PASS			

BLE-1Mbps:

GFSK

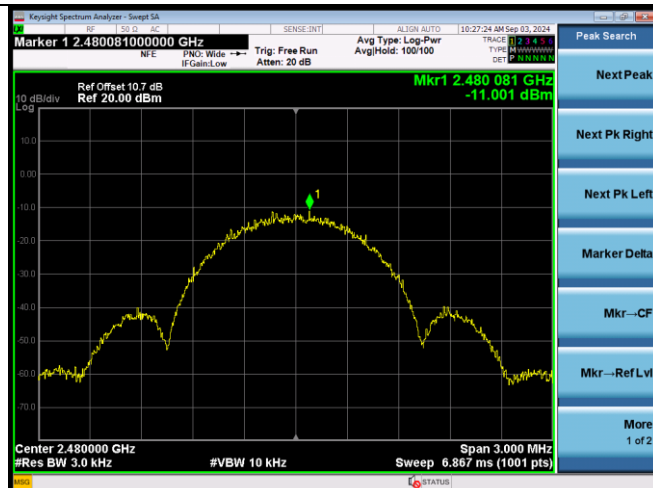
2402MHz



2440MHz



2480MHz



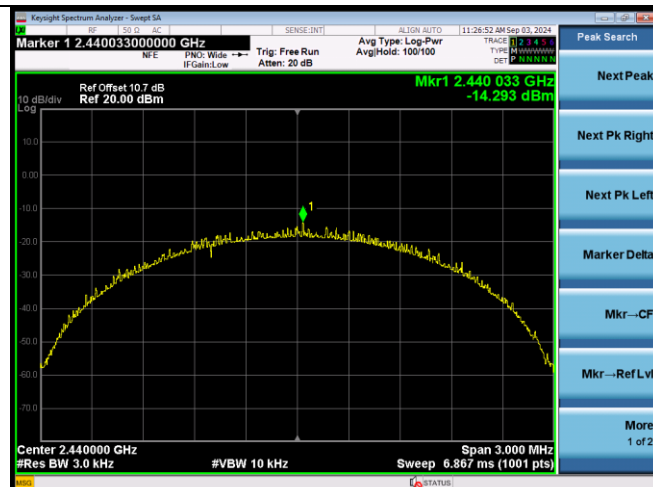
BLE-2Mbps:

GFSK

2402MHz



2440MHz



2480MHz



10. ANTENNA REQUIREMENT

10.1. STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2. ANTENNA CONNECTED CONSTRUCTION

The antennas used for this product are PCB Antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2.1dBi.

11. DEVIATION TO TEST SPECIFICATIONS

[NONE]

..... **THE END**