

Test Report

Applicant : Felion Technologies Company Limited
Room 304 3F Fuxing Building No.6 Binglang
Address : Road Fubao Community Futian District
Shenzhen
Product Name : VOS TAG
Brand Mark : ATUVOS/VOCOLINC/ISOOCO
Model : AT2301
Series model : VT2201
FCC ID : 2AXT8-2301T
Report Number : BLA-EMC-202404-A3202
Date of Receipt : 2024.4.15
Date of Test : 2024.4.16 to 2024.4.24
Test Standard : 47 CFR Part 15, Subpart C 15.247
Test Result : Pass

Compiled by: *charlie* Review by: *Sueels* Approved by: *Blue Zheng*
Issued Date: 2024.04.25



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

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



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Revise Record

Version No.	Date	Description
01	2024.04.25	Original

1 General information

1.1 General information

Applicant	Felion Technologies Company Limited
Address	Room 304 3F Fuxing Building No.6 Binglang Road Fubao Community Futian District Shenzhen
Manufacturer	Felion Technologies Company Limited
Address	Room 304 3F Fuxing Building No.6 Binglang Road Fubao Community Futian District Shenzhen
Factory	N/A
Address	N/A

1.2 General description of EUT

Product Name	VOS TAG
Model No.	AT2301
Series model	VT2201
Differences of Series model	All models are electrically identical, only the model and color are different.
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	PCB Antenna
Antenna Gain:	1.13dBi(Provided by customer)
Power supply or adapter information	Battery:DC3V
Hardware Version	VT2301T-V01
Software Version	1.2.0

Note: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

2 Test summary

No.	Test item	Result	Remark
1	Antenna Requirement	Pass	
2	Conducted Emissions at AC Power Line (150kHz-30MHz)	N/A	
3	Conducted Peak Output Power	Pass	
4	Minimum 6dB Bandwidth	Pass	
5	Power Spectrum Density	Pass	
6	Conducted Band Edges Measurement	Pass	
7	Conducted Spurious Emissions	Pass	
8	Radiated Spurious Emissions	Pass	
9	Radiated Emissions which fall in the restricted bands	Pass	

N/A: Not Applicable

3 Test Configuration

3.1 Test mode

Test Mode ^{Note 1}	Description
TX	Keep the EUT in continuously transmitting with modulation mode.
RX	Keep the EUT in receiving mode
TX Low channel	Keep the EUT in continuously transmitting mode in low channel
TX middle channel	Keep the EUT in continuously transmitting mode in middle channel
TX high channel	Keep the EUT in continuously transmitting mode in high channel

Note 1: The EUT was configured to measure its highest possible emission and/or immunity level. The test modes were adapted according to the operation manual for use; the EUT was operated in the engineering mode ^{Note 2} to fix the TX or Rx frequency that was for the purpose of the measurements.

3.2 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

3.3 Test channel

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

3.4 Auxiliary equipment

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

Note:

“--” mean no any auxiliary device during testing.

3.5 Test environment

Environment	Temperature	Voltage
Normal	25°C	DC 3V

4 Laboratory information

4.1 Laboratory and accreditations

The test facility is recognized, certified, or accredited by the following organizations:

Company name:	BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Address:	Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
CNAS accredited No.:	L9788
A2LA Cert. No.:	5071.01
FCC Designation No.:	CN1252
ISED CAB identifier No.:	CN0028
Telephone:	+86-755-28682673
FAX:	+86-755-28682673

4.2 Measurement uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

Parameter	Expanded Uncertainty
Radiated Emission(9kHz-30MHz)	± 4.34 dB
Radiated Emission(30Mz-1000MHz)	± 4.24 dB
Radiated Emission(1GHz-18GHz)	± 4.68 dB
AC Power Line Conducted Emission(150kHz-30MHz)	± 3.45 dB
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 %

5 Test equipment

Equipment No.	Equipment Name	Model No.	Manufacture	S/N	Cal. Date	Next Cal. Date
BLA-EMC-008	Spectrum	FSP40	R&S	100817	2023/08/30	2024/08/29
BLA-EMC-009	EMI Receiver	ESR7	R&S	101199	2023/08/30	2024/08/29
BLA-EMC-012	broad band Antenna	VULB9168	Schwarz beck	00836 P:00227	2022/10/12	2025/10/11
BLA-EMC-013	Horn Antenna	BBHA9120D	Schwarz beck	01892	2022/09/13	2025/09/12
BLA-EMC-014	Amplifier	PA_000318G-45	SKET	PA2018043003	2023/08/30	2024/08/29
BLA-EMC-016	Signal Generator	N5182A	Agilent	MY52420567	2023/11/16	2024/11/15
BLA-EMC-028	Spectrum	N9020A	Agilent	MY53420839	2023/11/16	2024/11/15
BLA-EMC-038	Spectrum	N9020A	Agilent	MY49100060	2023/08/30	2024/08/29
BLA-EMC-042	Power sensor	RPR3006W	DARE	14I00889SN042	2023/09/01	2024/08/31
BLA-EMC-043	Loop antenna	FMZB1519B	SCHNARZBECK	00102	2022/09/14	2025/09/13
BLA-EMC-044	Wideband radio communication tester	CMW500	R&S	132429	2023/08/30	2024/08/29
BLA-EMC-046	Filter bank	2.4G/5G Filter bank	SKET	N/A	2023/07/07	2024/07/06
BLA-EMC-061	Receiver	ESPI7	R&S	101477	2023/07/07	2024/07/06
BLA-EMC-062	Signal Generator	N5181A	Agilent	MY46240904	2023/07/07	2024/07/06
BLA-EMC-064	Signal Generator	N5182B	KEYSIGHT	MY58108892	2023/07/07	2024/07/06
BLA-EMC-065	broadband Antenna	VULB9168	Schwarz beck	01065P	2022/12/12	2025/12/11
BLA-EMC-066	Amplifier	LNPA_30M01G-30	SKET	SK2021060801	2023/07/07	2024/07/06
BLA-EMC-079	Spectrum	N9020A	Agilent	MY54420161	2023/08/30	2024/08/29
BLA-EMC-080	Signal Generator	N5182A	Agilent	MY47420955	2023/08/30	2024/08/29
BLA-EMC-086	Amplifier	LNPA_18G40G-50dB	SKET	SK2022071301	2023/08/14	2024/08/13

6 Test result

6.1 Antenna requirement

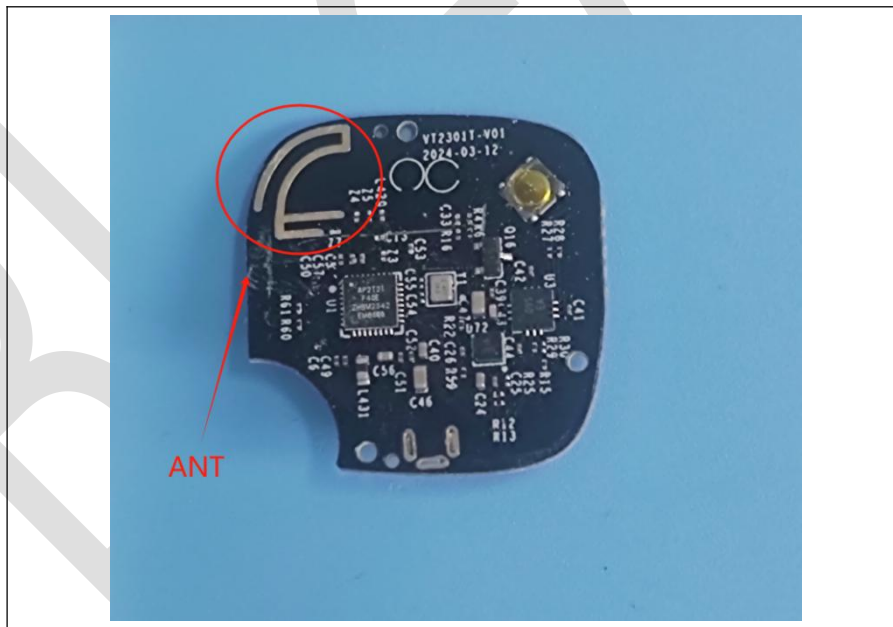
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

6.1.1 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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of a 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 antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 1.13 dBi.



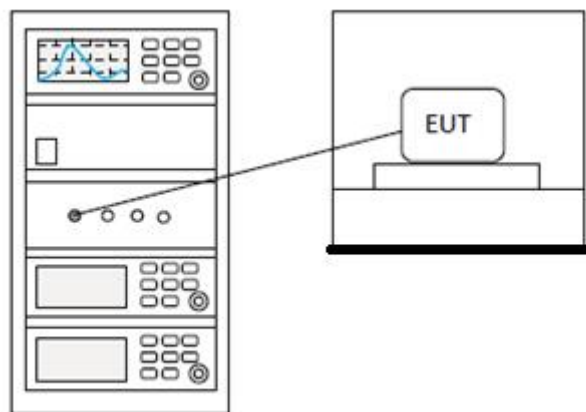
6.2 Conducted peak output Power

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.2.1 Limit

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 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

6.2.2 Test setup



6.2.3 Test data

Pass: Please refer to appendix A for details

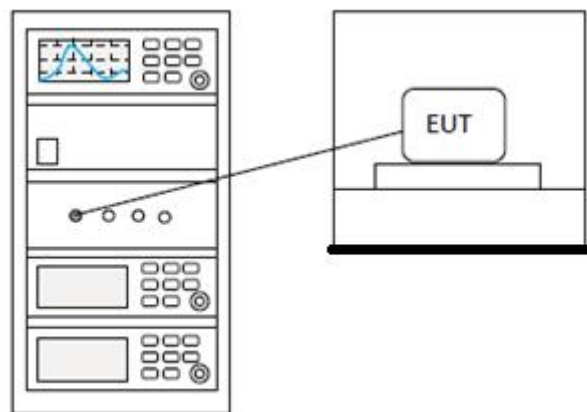
6.3 Minimum 6dB bandwidth

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.8.1
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.3.1 Limit

≥500 kHz

6.3.2 Test setup



6.3.3 Test data

Pass: Please refer to appendix A for details

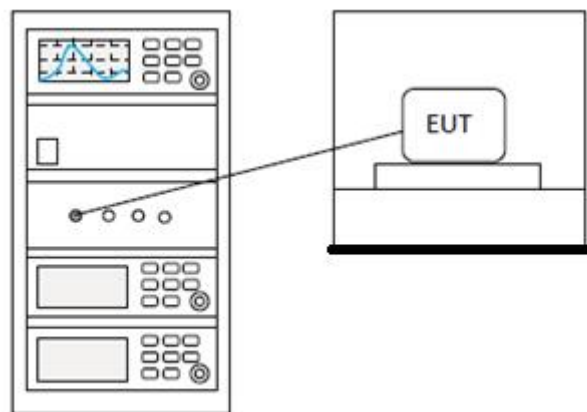
6.4 Power spectrum density

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.10.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.4.1 Limit

≤8dBm in any 3 kHz band during any time interval of continuous transmission

6.4.2 Test setup



6.4.3 Test data

Pass: Please refer to appendix A for details

6.5 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

6.5.1 Limit

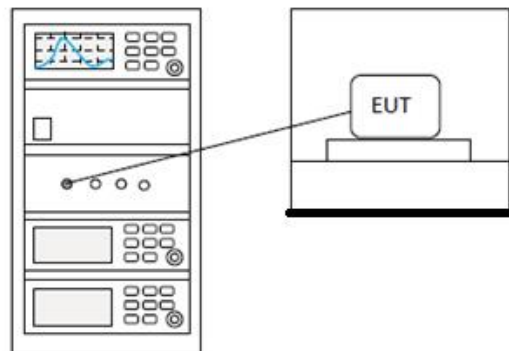
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 20dB.

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)).

6.5.2 Test setup



6.5.3 Test data

Pass: Please refer to appendix A for details

6.6 Conducted spurious emissions

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.6.1 Limit

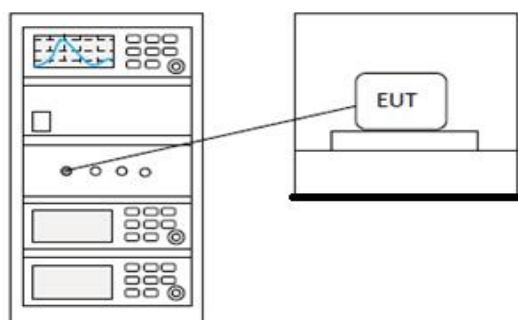
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 20dB.

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)).

6.6.2 Test setup



6.6.3 Test data

Pass: Please refer to appendix A for details

6.7 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

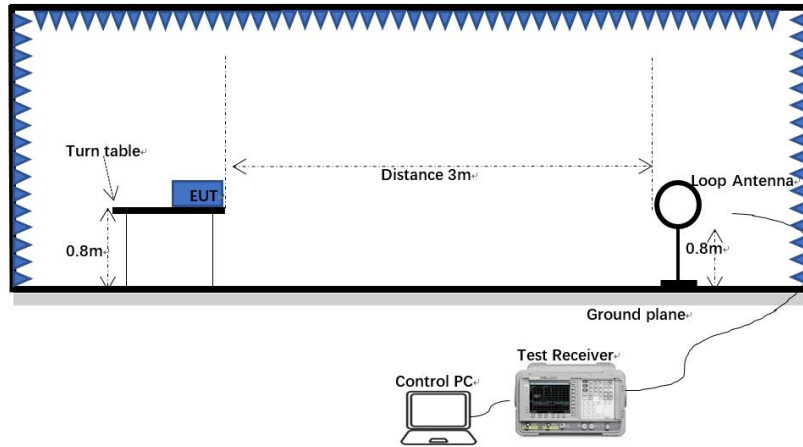
6.7.1 Limit

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

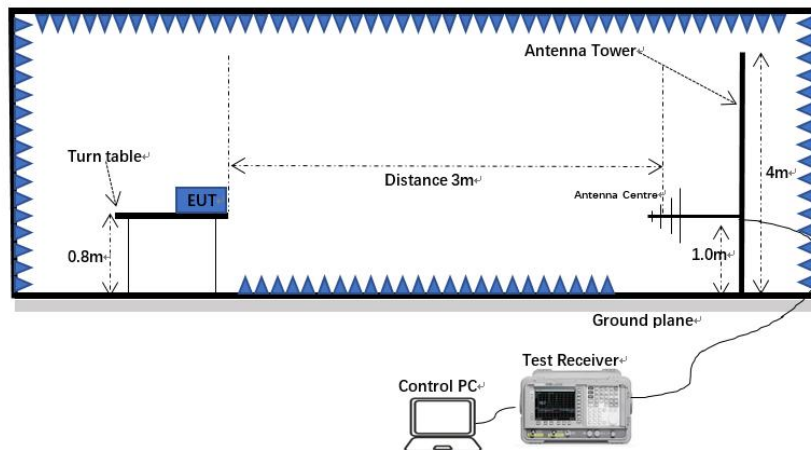
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field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

6.7.2 Test setup

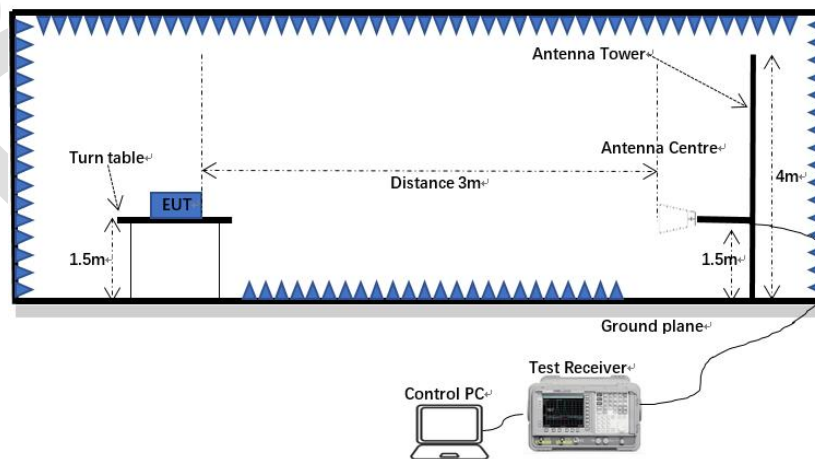
Below 1GHz:



30MHz-1GHz:



Above 1GHz:



6.7.3 Procedure

- a) 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.
- b) 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.
- c) 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.
- d) 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.
- e) 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.
- f) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g) 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.

Note 1: Scan from 9 kHz 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.

Note 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.

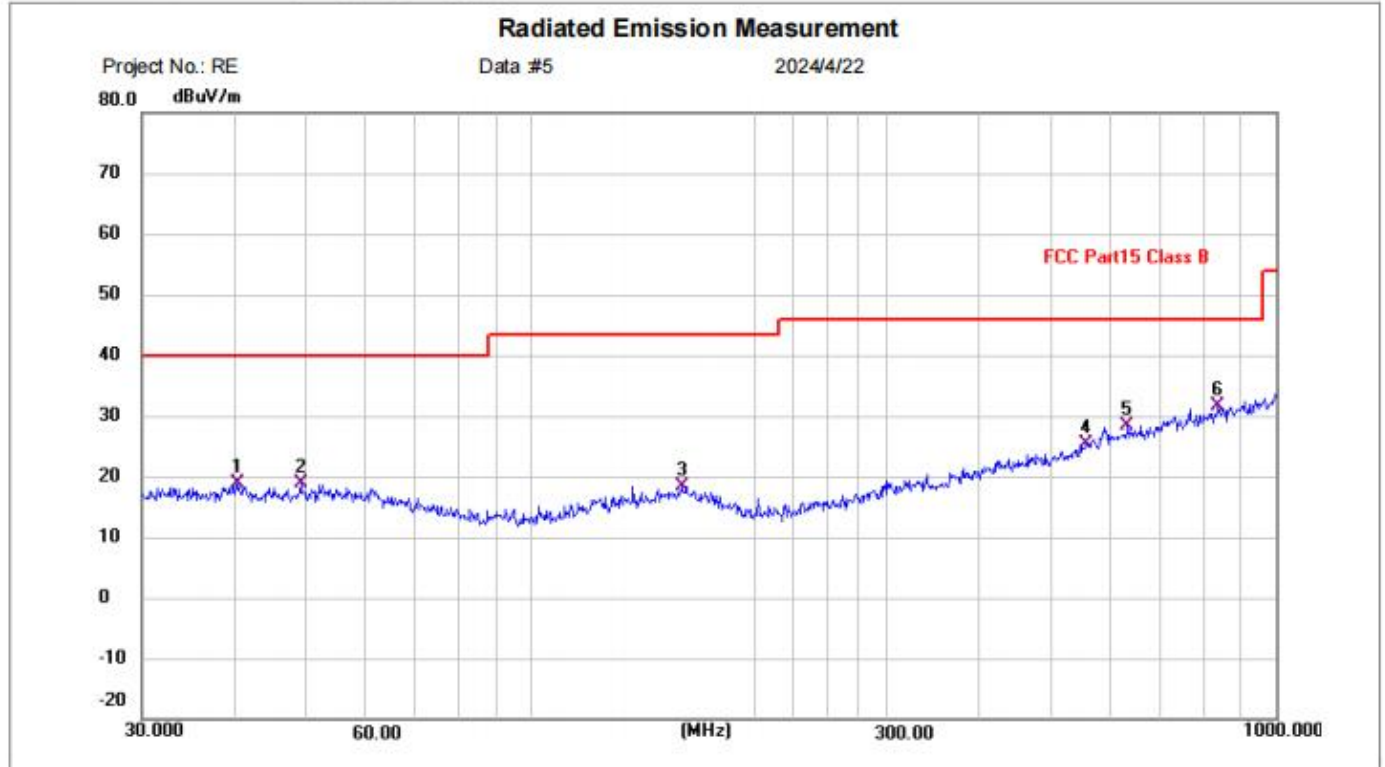
Note 3: The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Level (dBuV)} = \text{Reading (dBuV)} + \text{Factor (dB/m)}$$

6.7.4 Test data

Below 1GHz

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

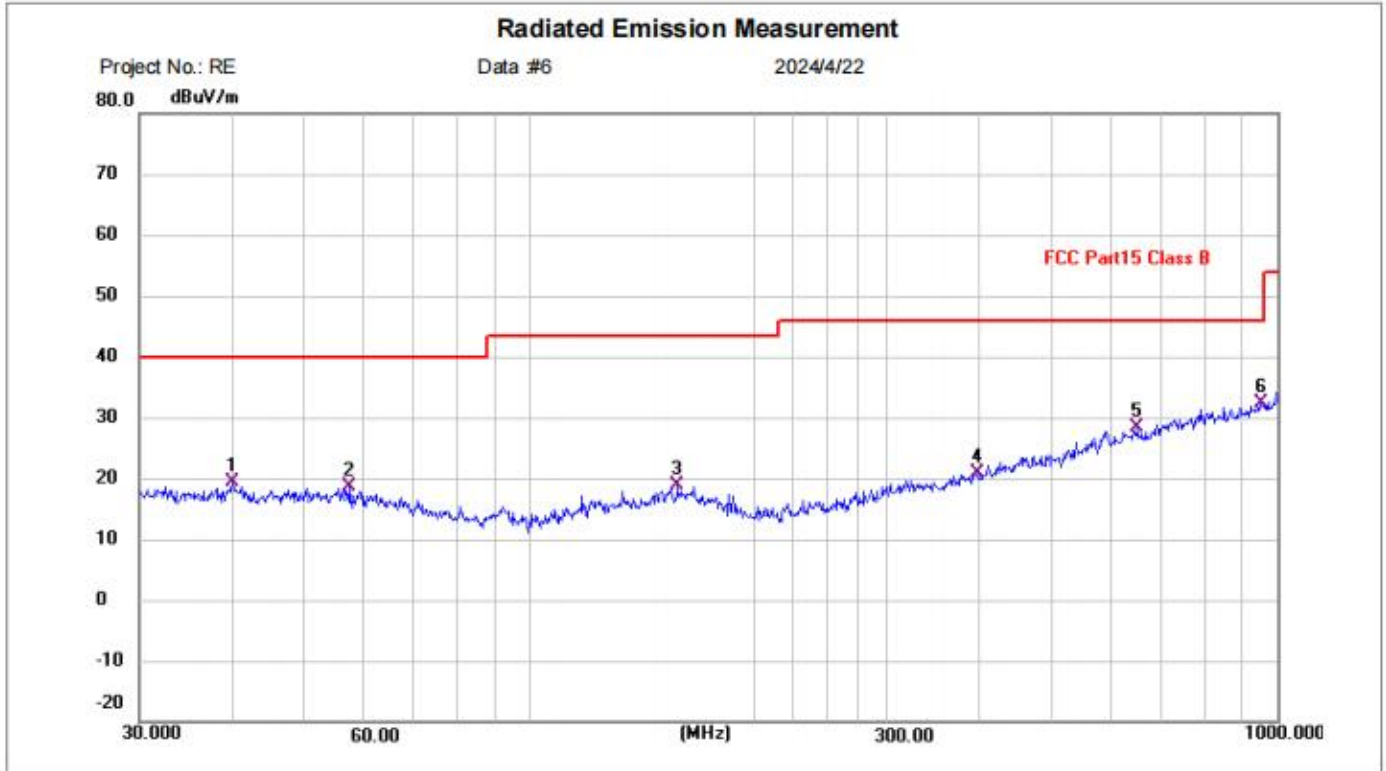


Site: Polarization: **Horizontal** Temperature: (C)
 Limit: FCC Part15 Class B Power: Humidity: %RH
 EUT:
 M/N:
 Mode: BLE TX
 Note:

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	40.4172	-0.82	19.80	18.98	40.00	-21.02	QP	P	
2	49.0145	-0.42	19.20	18.78	40.00	-21.22	QP	P	
3	159.2251	-1.17	19.64	18.47	43.50	-25.03	QP	P	
4	556.7744	-0.03	25.36	25.33	46.00	-20.67	QP	P	
5	631.6884	1.03	27.32	28.35	46.00	-17.65	QP	P	
6 *	836.2443	1.57	30.13	31.70	46.00	-14.30	QP	P	

Test Result: Pass

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



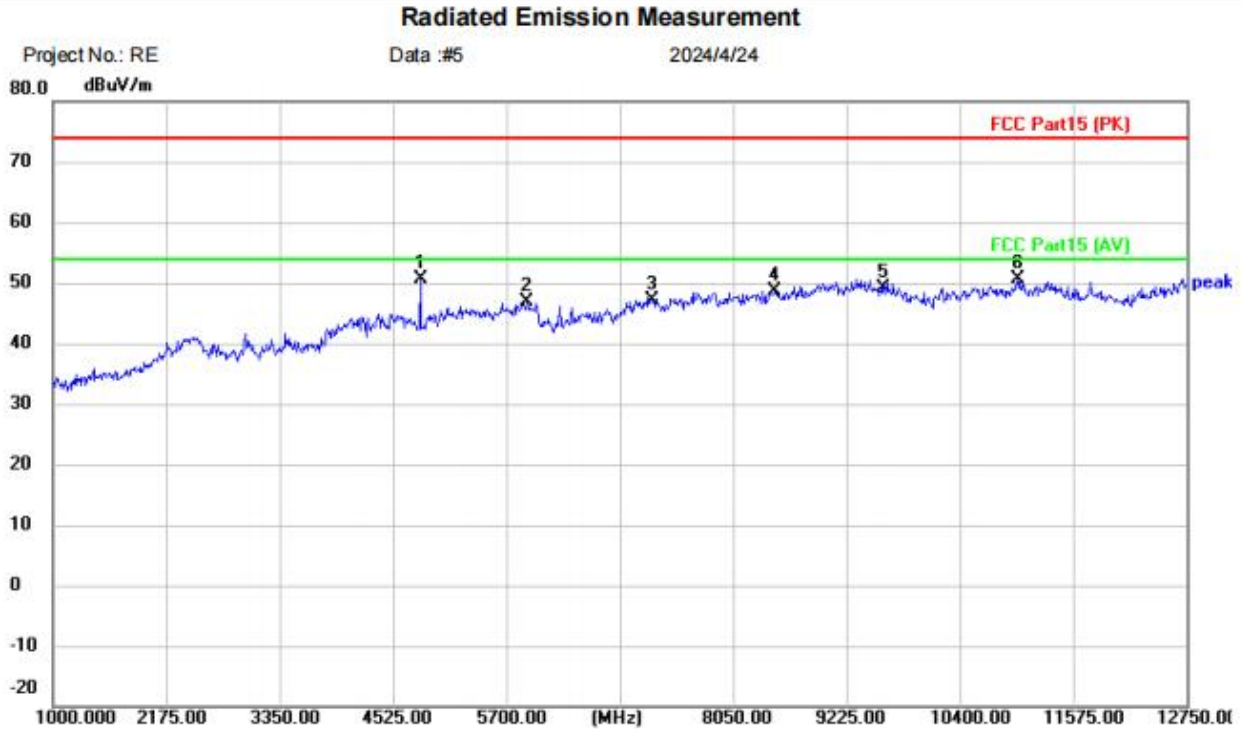
Site	Polarization: Vertical	Temperature: (C)
Limit: FCC Part15 Class B	Power:	Humidity: %RH
EUT:		
M/N:		
Mode: BLE TX		
Note:		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	39.9942	-0.58	19.84	19.26	40.00	-20.74	QP	P	
2	57.3923	-0.17	18.88	18.71	40.00	-21.29	QP	P	
3	157.5588	-0.54	19.33	18.79	43.50	-24.71	QP	P	
4	397.6334	-1.23	21.99	20.76	46.00	-25.24	QP	P	
5	649.6597	1.37	27.09	28.46	46.00	-17.54	QP	P	
6 *	952.0937	0.44	31.88	32.32	46.00	-13.68	QP	P	

Test Result: Pass

Above 1GHz:

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

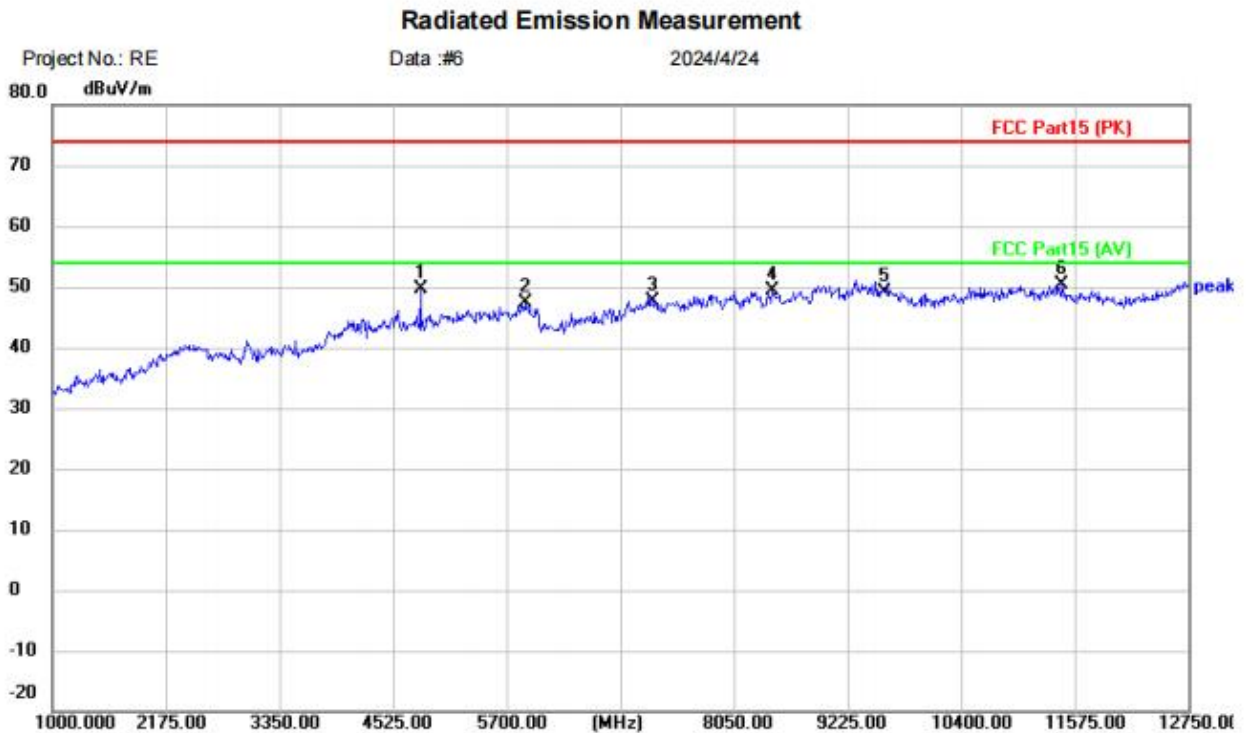


Site	Polarization: Horizontal	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: VOS TAG		
M/N: AT2301		
Mode: BLE TX 2402		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	4807.000	45.03	5.64	50.67	74.00	-23.33	peak	
2		5911.500	38.17	8.68	46.85	74.00	-27.15	peak	
3		7206.000	37.92	9.24	47.16	74.00	-26.84	peak	
4		8484.750	37.80	10.84	48.64	74.00	-25.36	peak	
5		9608.000	36.89	12.31	49.20	74.00	-24.80	peak	
6		10999.25	37.11	13.48	50.59	74.00	-23.41	peak	

Test Result: Pass

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

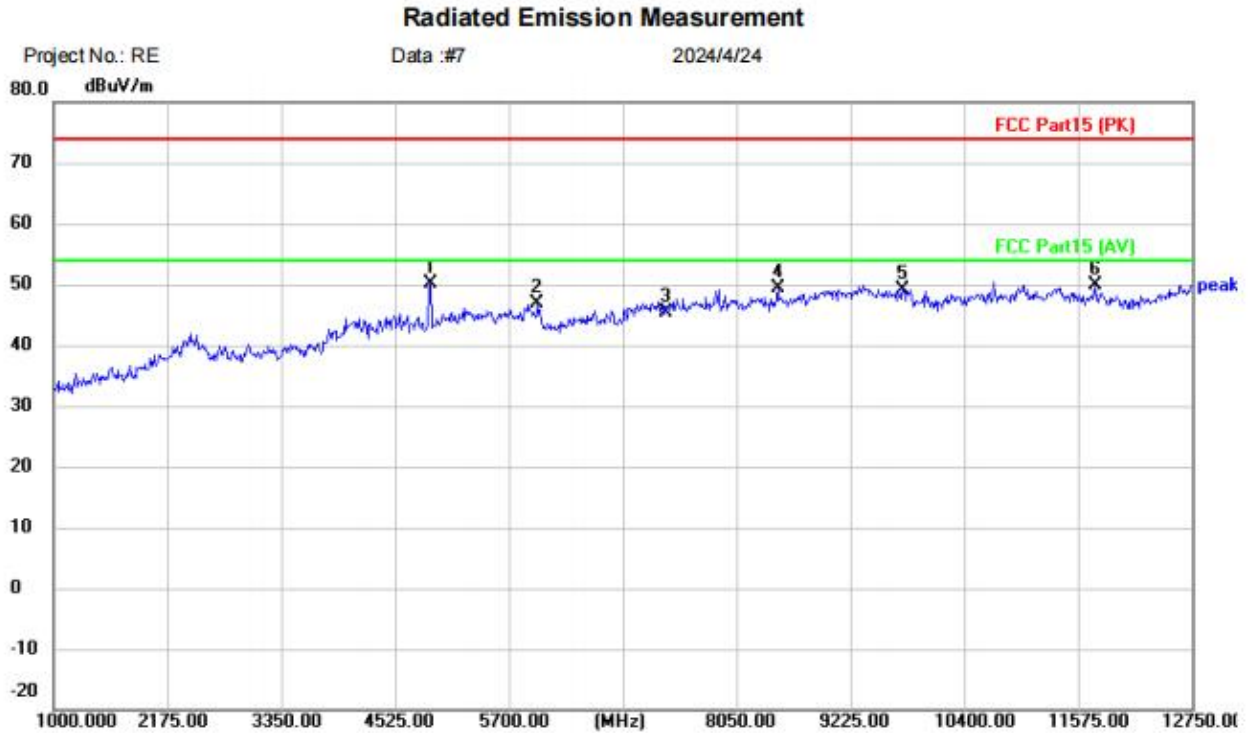


Site	Polarization: Vertical	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: VOS TAG		
M/N: AT2301		
Mode: BLE TX 2402		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4807.000	43.96	5.64	49.60	74.00	-24.40	peak	
2		5888.000	38.88	8.60	47.48	74.00	-26.52	peak	
3		7206.000	38.27	9.24	47.51	74.00	-26.49	peak	
4		8449.500	38.72	10.63	49.35	74.00	-24.65	peak	
5		9608.000	36.89	12.31	49.20	74.00	-24.80	peak	
6	*	11445.75	37.80	12.62	50.42	74.00	-23.58	peak	

Test Result: Pass

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

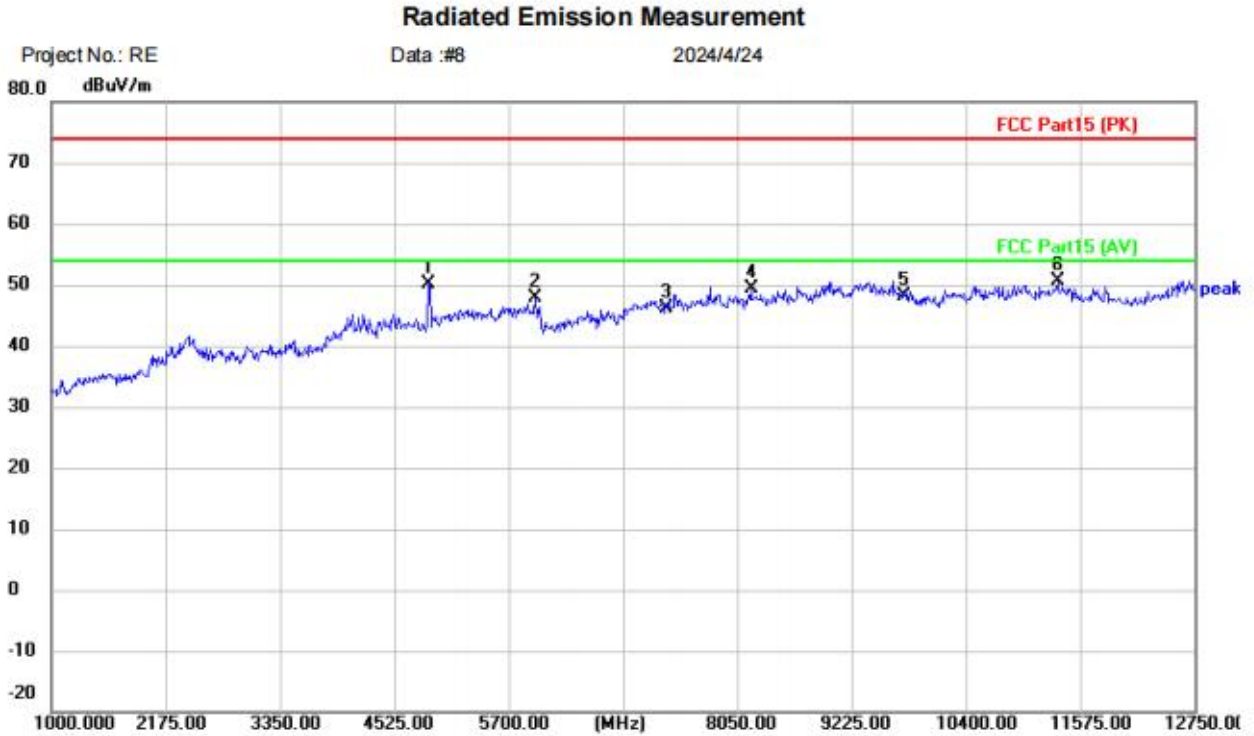


Site	Polarization: Horizontal	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: VOS TAG		
M/N: AT2301		
Mode: BLE TX 2442		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	4889.250	44.49	5.75	50.24	74.00	-23.76	peak	
2		5993.750	38.02	8.75	46.77	74.00	-27.23	peak	
3		7326.000	36.01	9.43	45.44	74.00	-28.56	peak	
4		8473.000	38.57	10.77	49.34	74.00	-24.66	peak	
5		9768.000	36.79	12.22	49.01	74.00	-24.99	peak	
6		11751.25	38.09	11.79	49.88	74.00	-24.12	peak	

Test Result: Pass

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



Site Polarization: **Vertical** Temperature: (C)

Limit: FCC Part15 (PK) Power: Humidity: %RH

EUT: VOS TAG

M/N: AT2301

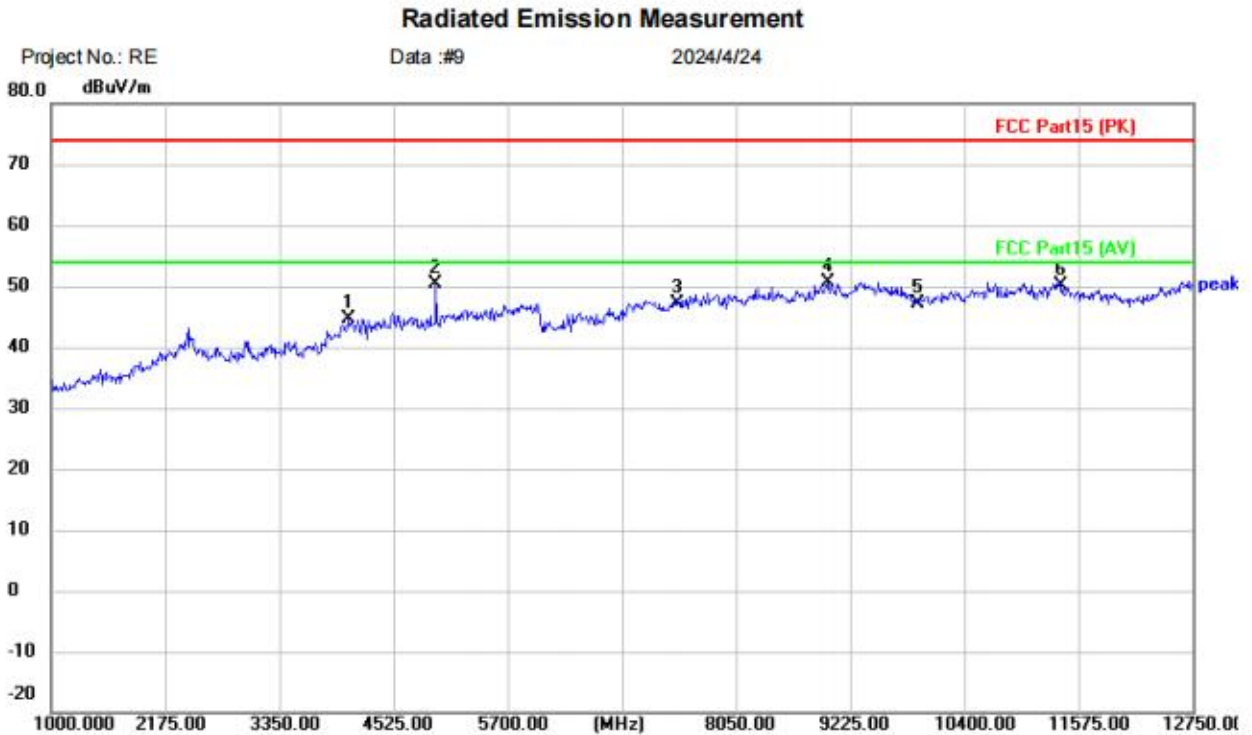
Mode: BLE TX 2442

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4884.000	44.26	5.75	50.01	74.00	-23.99	peak	
2		5970.250	39.12	8.72	47.84	74.00	-26.16	peak	
3		7326.000	36.77	9.43	46.20	74.00	-27.80	peak	
4		8191.000	39.54	9.88	49.42	74.00	-24.58	peak	
5		9768.000	36.03	12.22	48.25	74.00	-25.75	peak	
6	*	11340.00	38.02	12.67	50.69	74.00	-23.31	peak	

Test Result: Pass

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

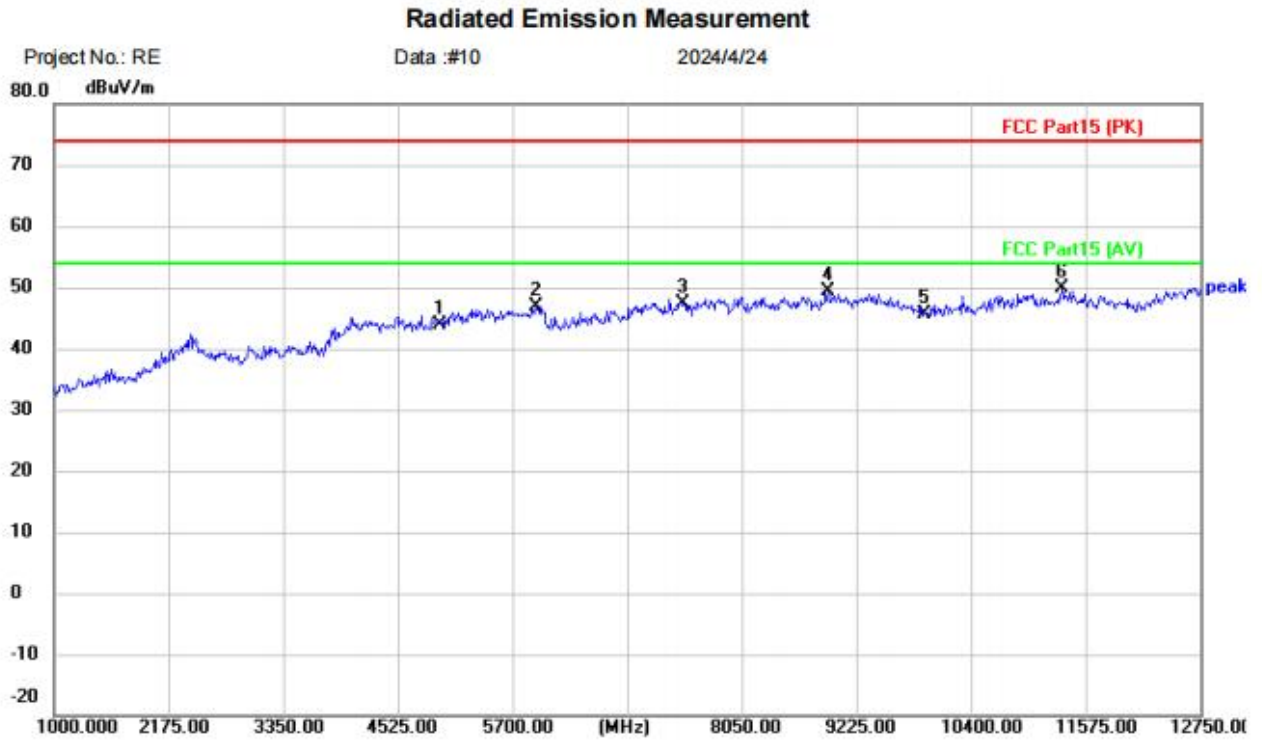


Site	Polarization: Horizontal	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: VOS TAG		
M/N: AT2301		
Mode: BLE TX 2480		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4055.000	41.06	3.62	44.68	74.00	-29.32	peak	
2		4959.750	43.71	6.60	50.31	74.00	-23.69	peak	
3		7440.000	37.40	9.64	47.04	74.00	-26.96	peak	
4	*	8990.000	38.32	12.42	50.74	74.00	-23.26	peak	
5		9920.000	35.06	12.14	47.20	74.00	-26.80	peak	
6		11398.75	37.52	12.61	50.13	74.00	-23.87	peak	

Test Result: Pass

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



Site Polarization: **Vertical** Temperature: (C)

Limit: FCC Part15 (PK) Power: Humidity: %RH

EUT: VOSTAG

M/N: AT2301

Mode: BLE 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	37.26	6.60	43.86	74.00	-30.14	peak	
2		5946.750	38.26	8.71	46.97	74.00	-27.03	peak	
3		7440.000	37.66	9.64	47.30	74.00	-26.70	peak	
4		8931.250	37.26	12.19	49.45	74.00	-24.55	peak	
5		9920.000	33.38	12.14	45.52	74.00	-28.48	peak	
6	*	11328.25	37.13	12.67	49.80	74.00	-24.20	peak	

Test Result: Pass

6.8 Radiated emissions which fall in the restricted bands

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

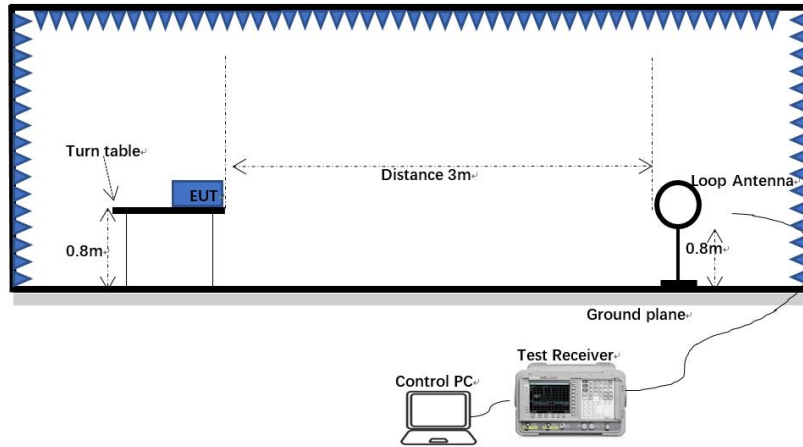
6.8.1 Limit

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

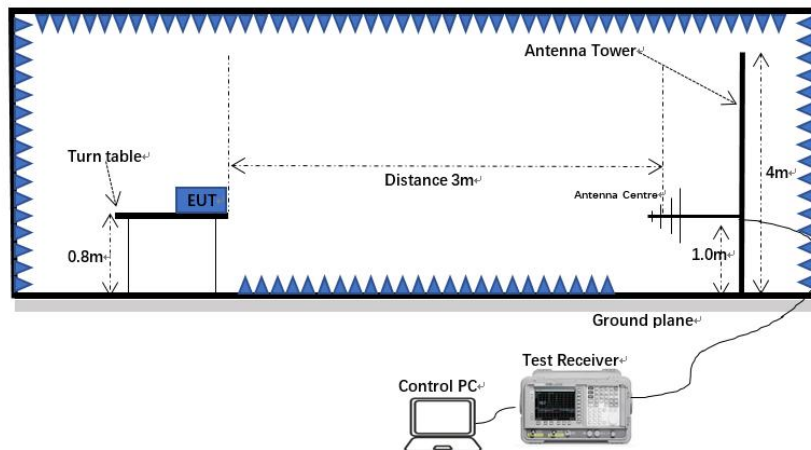
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field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

6.8.2 Test setup

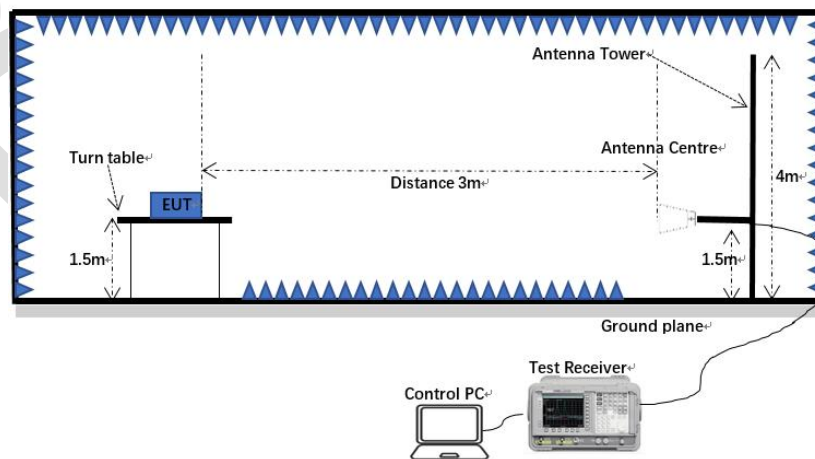
Below 1GHz:



30MHz-1GHz:



Above 1GHz:



6.8.3 Procedure

- a) 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.
- b) 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.
- c) 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.
- d) 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.
- e) 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.
- f) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g) 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.

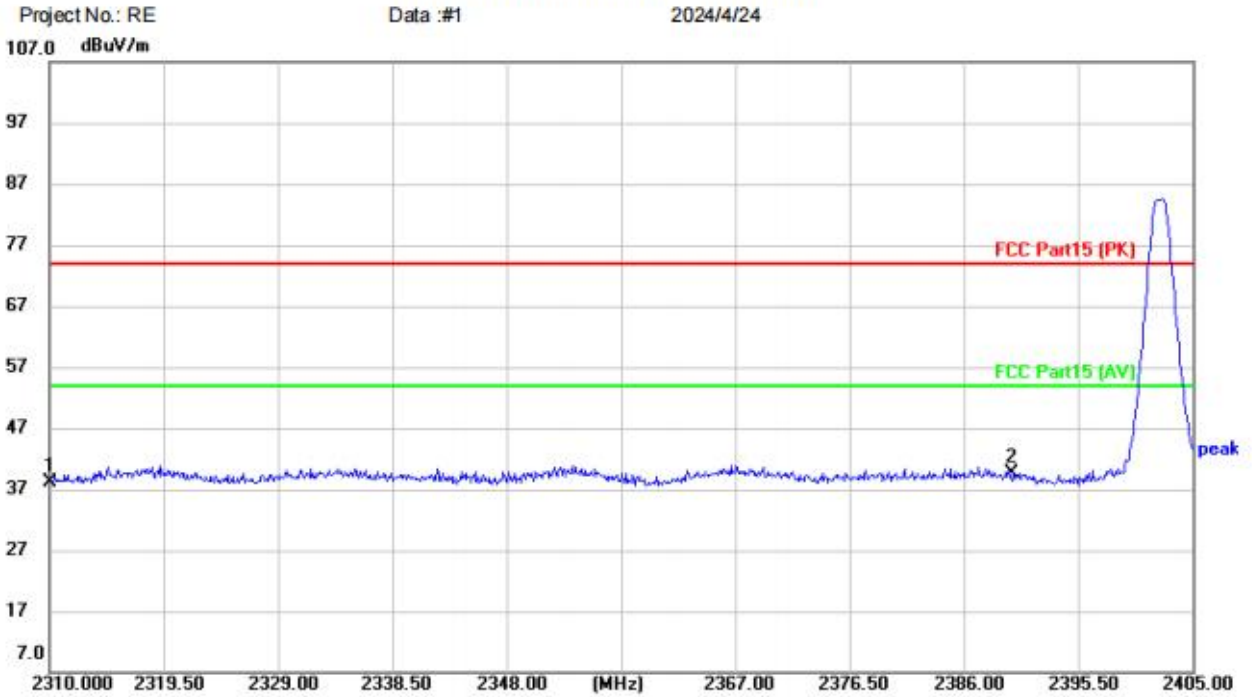
Note 1: $Level (dBuV) = Reading (dBuV) + Factor (dB/m)$

Note 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.

6.8.4 Test data

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

Radiated Emission Measurement



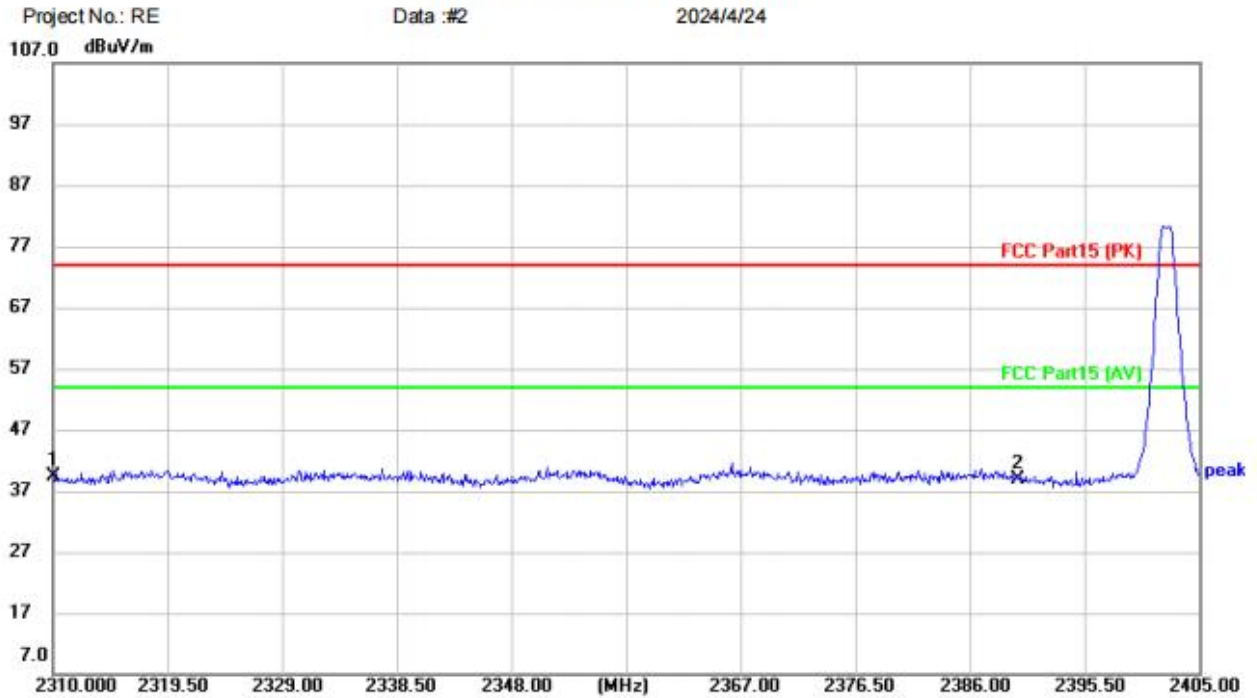
Site Polarization: **Horizontal** Temperature: (C)
 Limit: FCC Part15 (PK) Power: Humidity: %RH
 EUT: VOS TAG
 M/N: AT2301
 Mode: BLE TX 2402
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2310.000	41.03	-2.89	38.14	74.00	-35.86	peak	
2	*	2390.000	42.25	-2.70	39.55	74.00	-34.45	peak	

Test Result: Pass

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

Radiated Emission Measurement

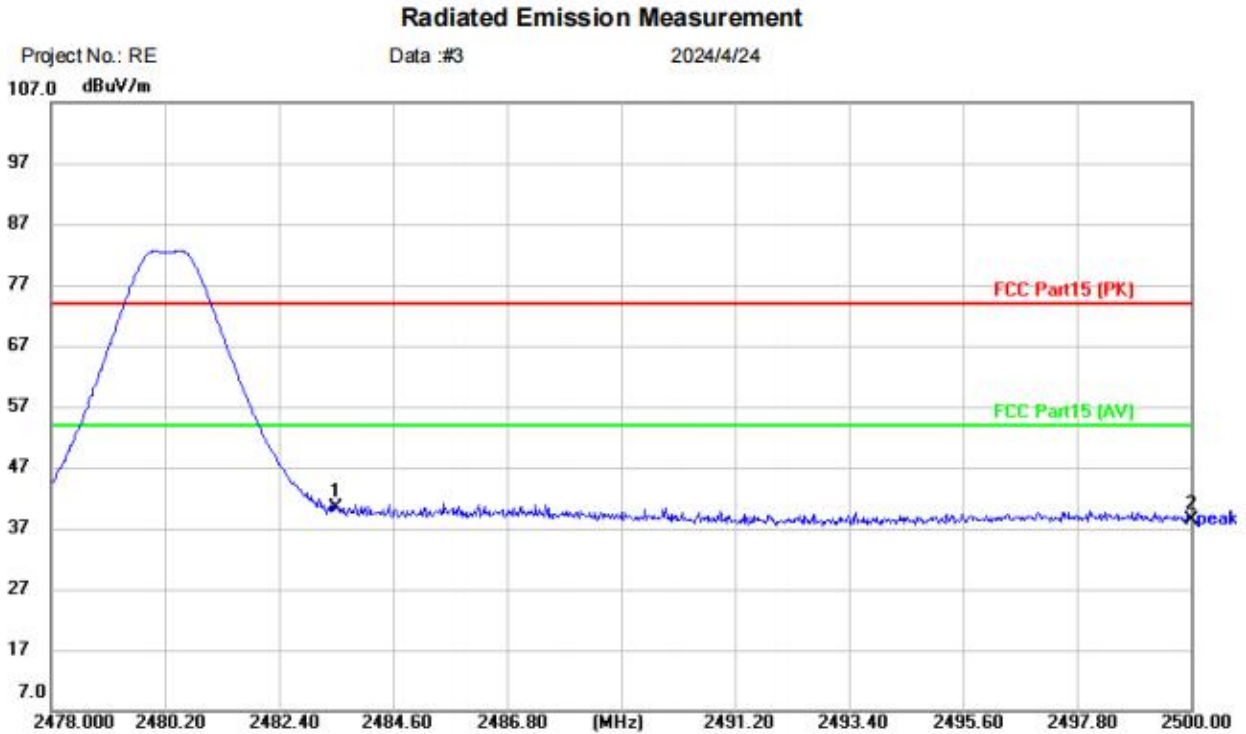


Site Polarization: **Vertical** Temperature: (C)
 Limit: FCC Part15 (PK) Power: Humidity: %RH
 EUT: VOS TAG
 M/N: AT2301
 Mode: BLE TX 2402
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2310.000	42.28	-2.89	39.39	74.00	-34.61	peak	
2		2390.000	41.63	-2.70	38.93	74.00	-35.07	peak	

Test Result: Pass

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



Site Polarization: **Horizontal** Temperature: (C)

Limit: FCC Part15 (PK) Power: Humidity: %RH

EUT: VOS TAG

M/N: AT2301

Mode: BLE TX 2480

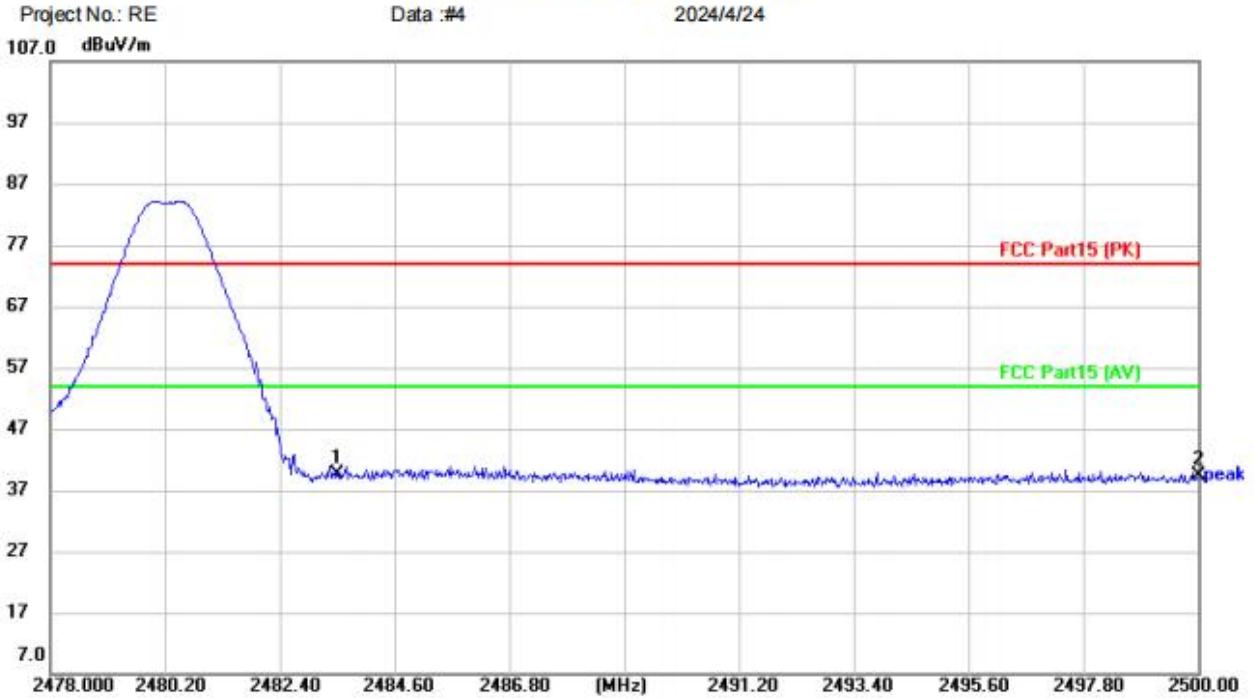
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	2483.500	43.25	-2.91	40.34	74.00	-33.66	peak	
2		2500.000	41.30	-3.00	38.30	74.00	-35.70	peak	

Test Result: Pass

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

Radiated Emission Measurement



Site Polarization: **Vertical** Temperature: (C)
 Limit: FCC Part15 (PK) Power: Humidity: %RH
 EUT: VOS TAG
 M/N: AT2301
 Mode: BLE TX 2480
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	2483.500	42.50	-2.91	39.59	74.00	-34.41	peak	
2		2500.000	42.33	-3.00	39.33	74.00	-34.67	peak	

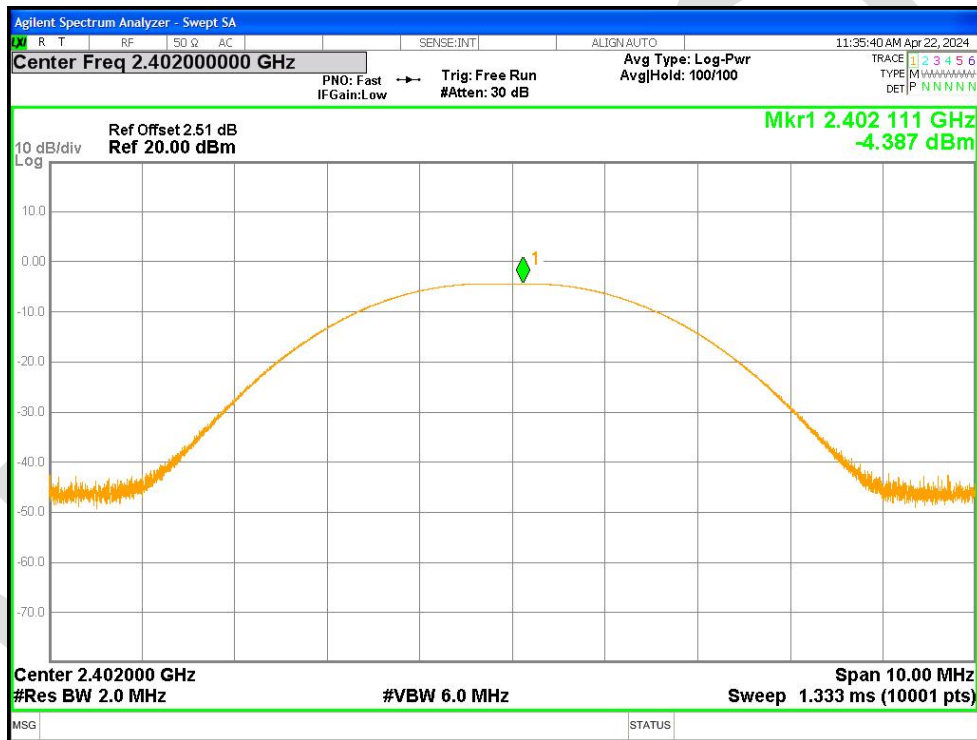
Test Result: Pass

7 Appendix A

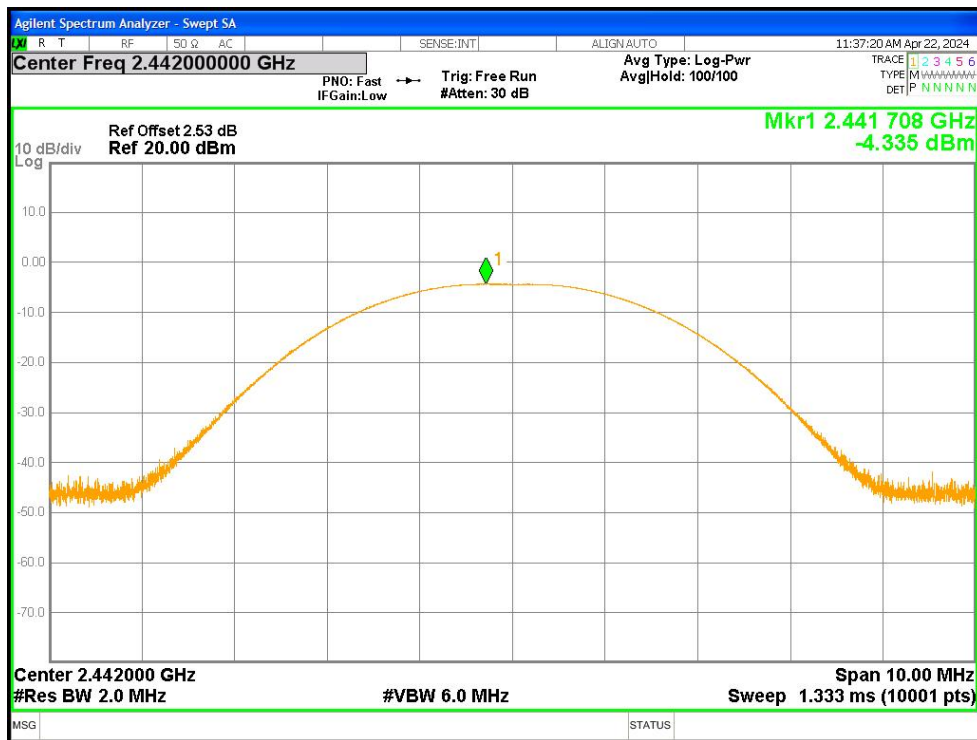
7.1 Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-4.387	30	Pass
NVNT	BLE 1M	2442	Ant1	-4.335	30	Pass
NVNT	BLE 1M	2480	Ant1	-6.065	30	Pass

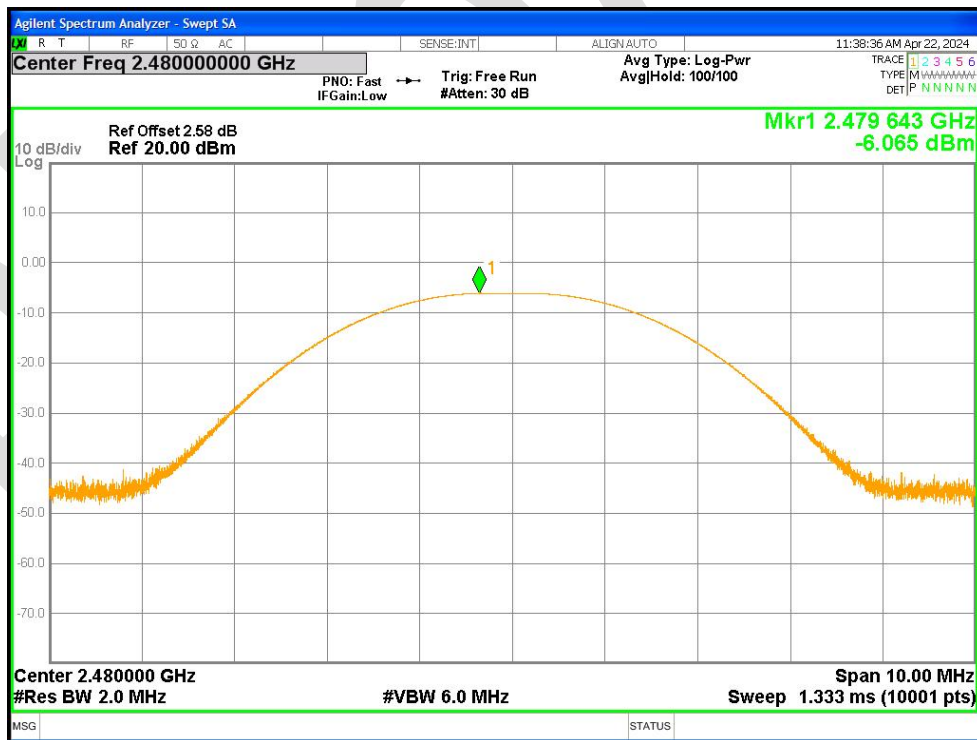
Power NVNT BLE 1M 2402MHz Ant1



Power NVNT BLE 1M 2442MHz Ant1



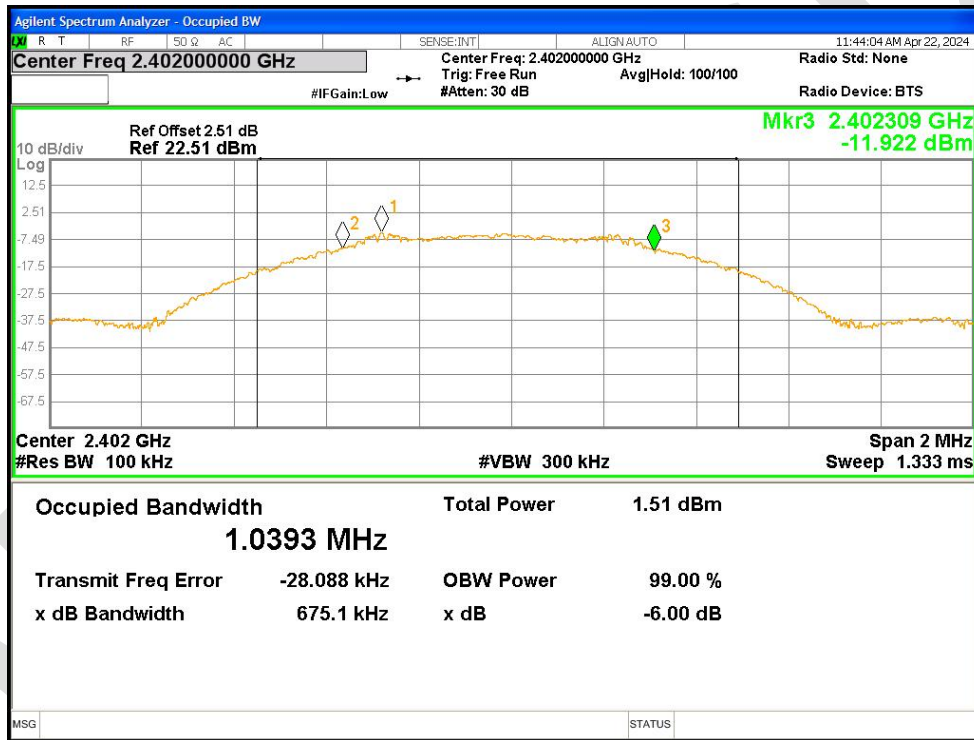
Power NVNT BLE 1M 2480MHz Ant1



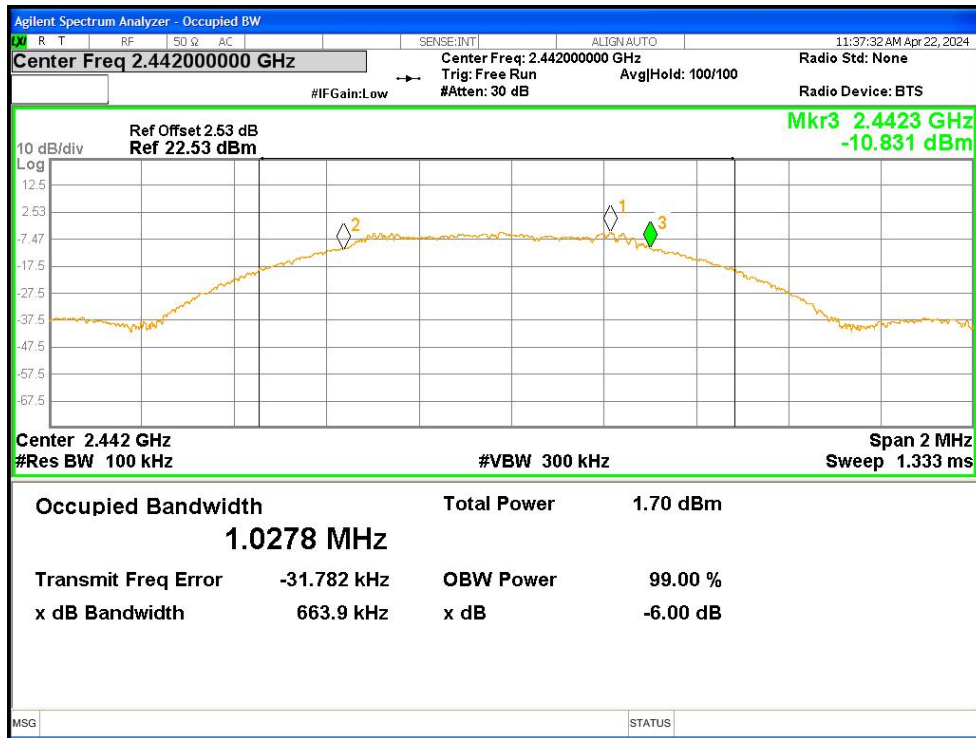
7.2 -6dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.675	0.5	Pass
NVNT	BLE 1M	2442	Ant1	0.664	0.5	Pass
NVNT	BLE 1M	2480	Ant1	0.668	0.5	Pass

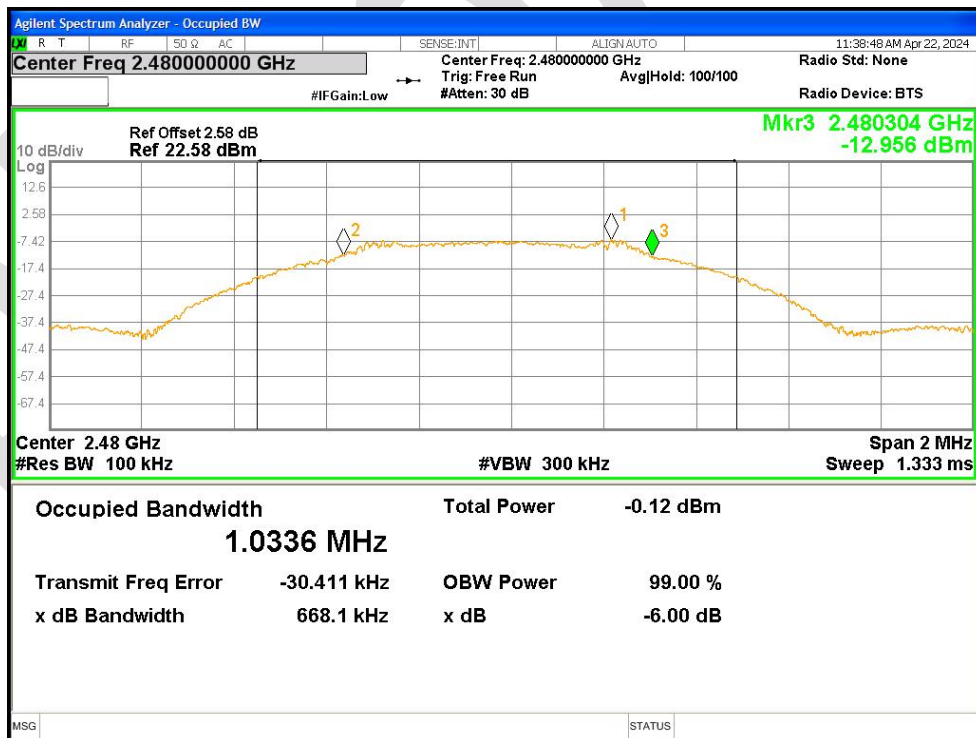
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2442MHz Ant1



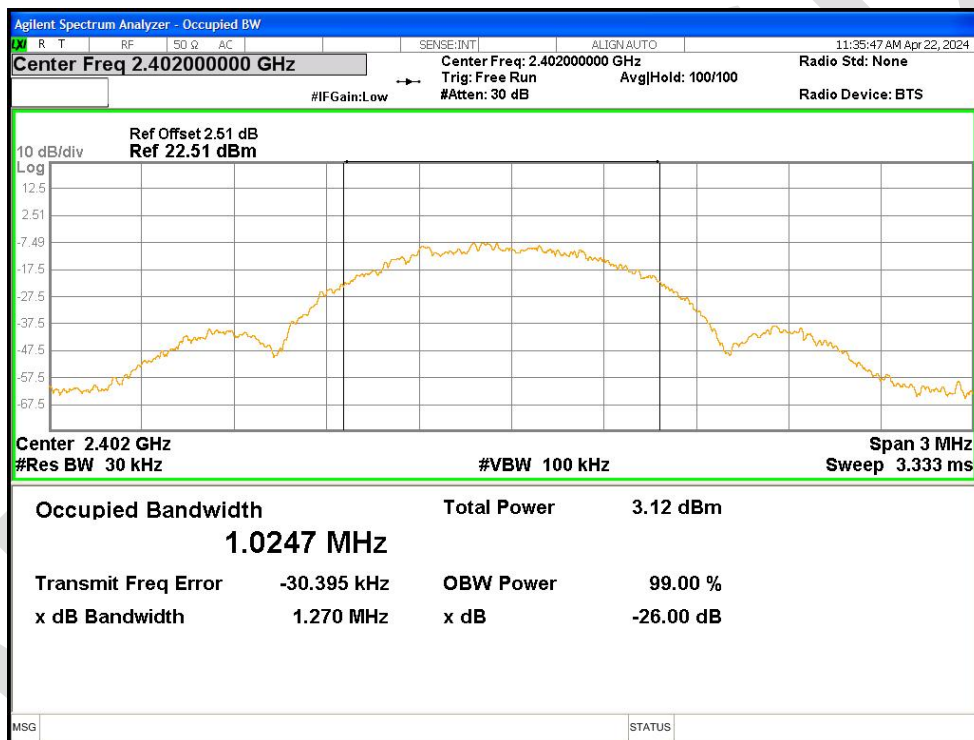
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



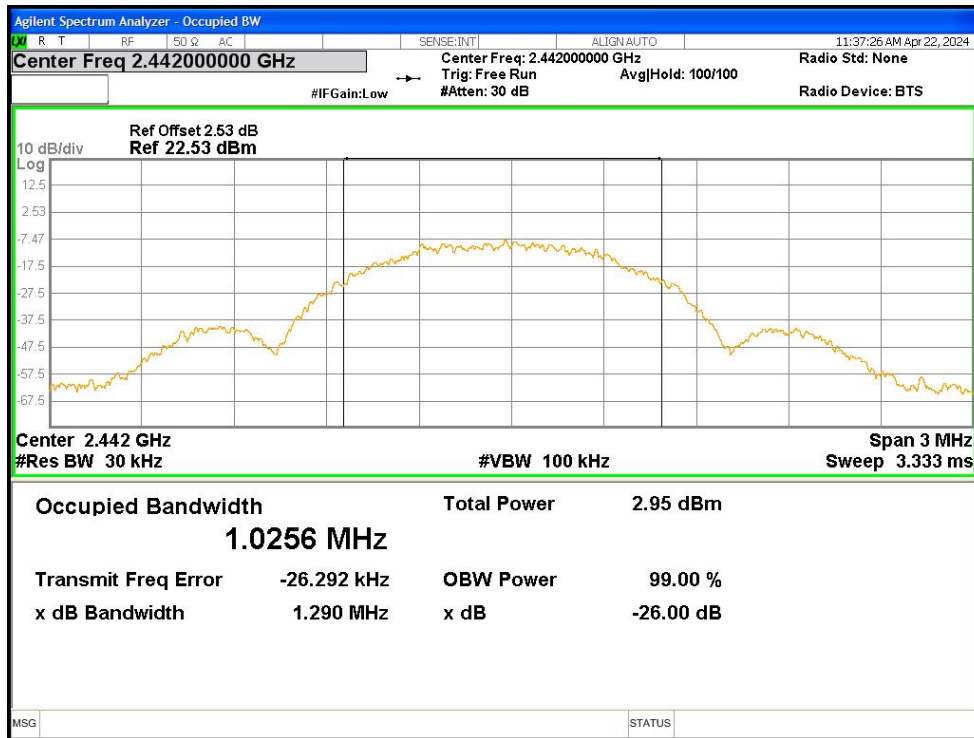
7.3 Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE 1M	2402	Ant1	1.0247
NVNT	BLE 1M	2442	Ant1	1.0256
NVNT	BLE 1M	2480	Ant1	1.0231

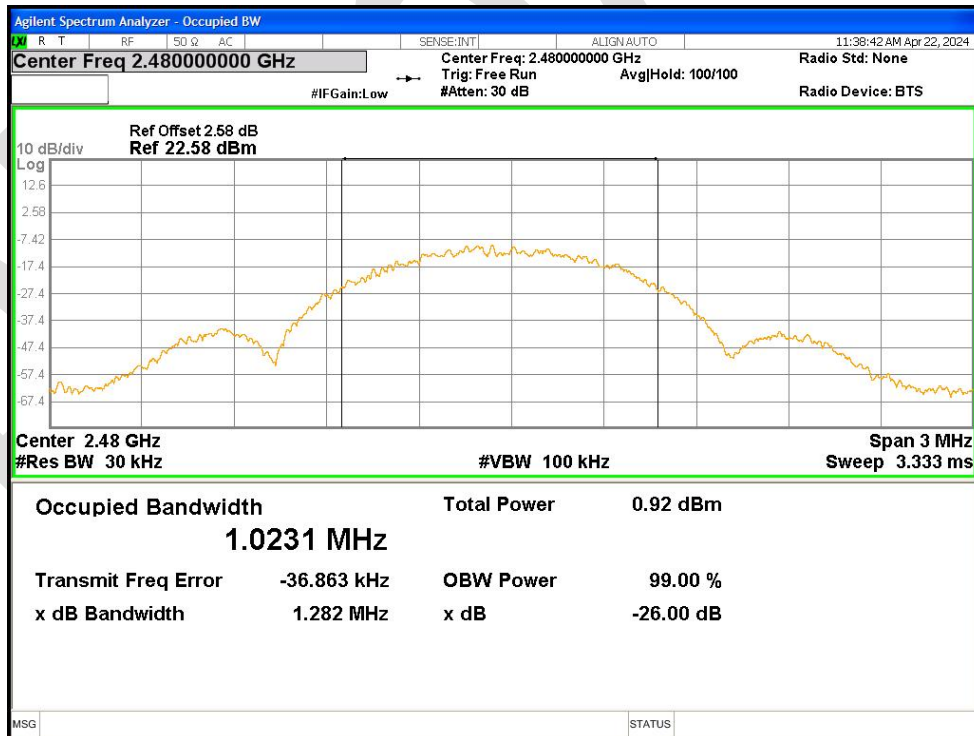
OBW NVNT BLE 1M 2402MHz Ant1



OBW NVNT BLE 1M 2442MHz Ant1



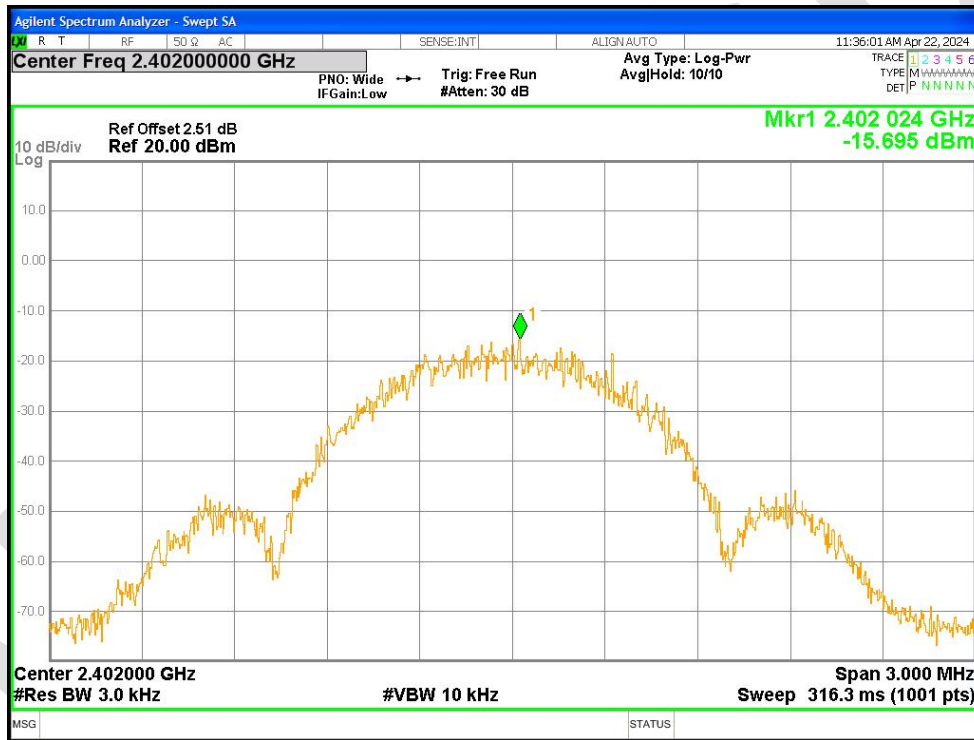
OBW NVNT BLE 1M 2480MHz Ant1



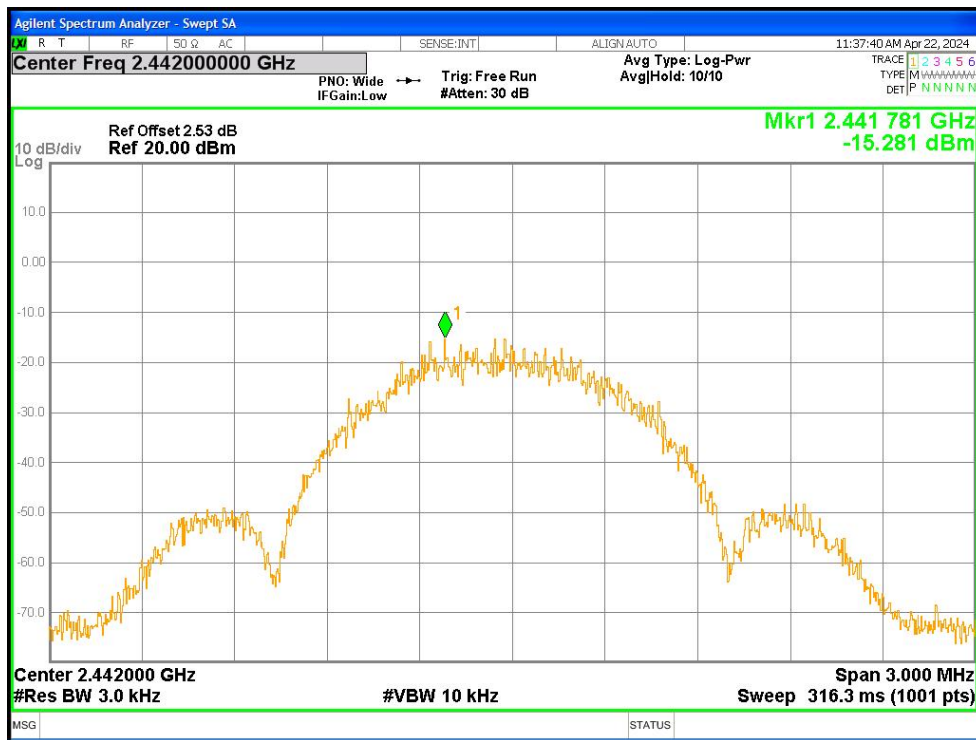
7.4 Maximum Power Spectral Density Level

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-15.695	8	Pass
NVNT	BLE 1M	2442	Ant1	-15.281	8	Pass
NVNT	BLE 1M	2480	Ant1	-17.09	8	Pass

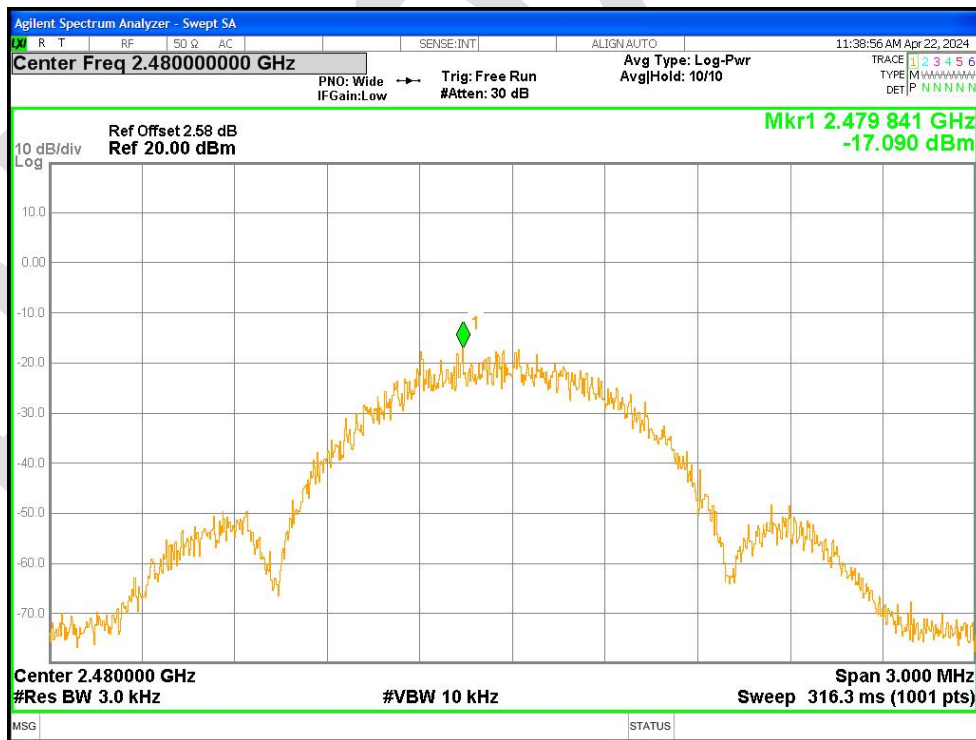
PSD NVNT BLE 1M 2402MHz Ant1



PSD NVNT BLE 1M 2442MHz Ant1



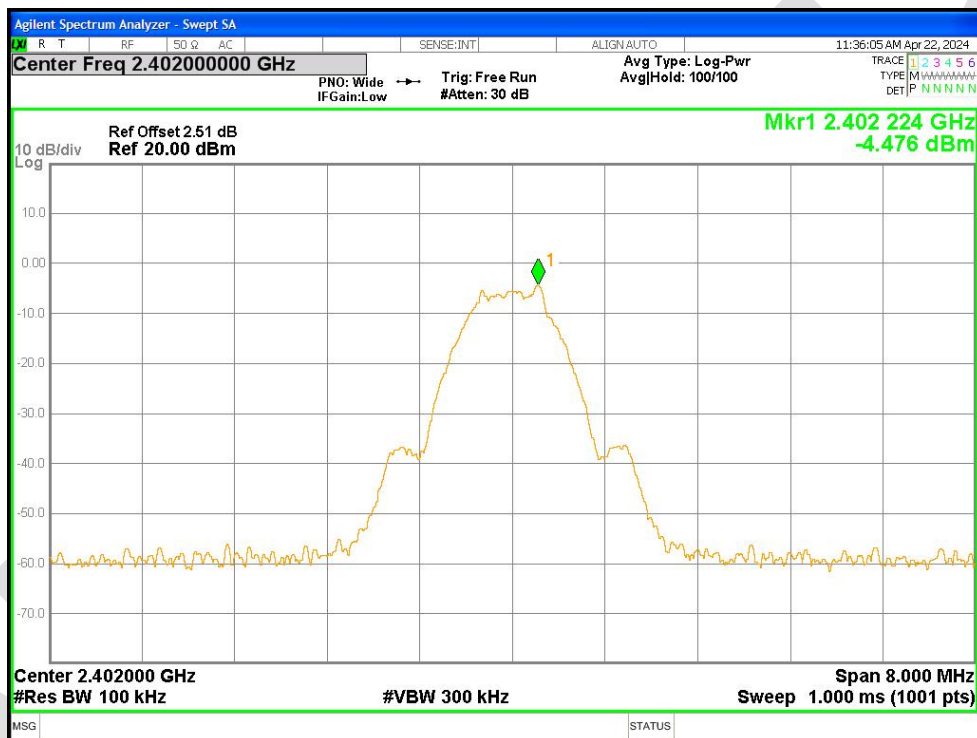
PSD NVNT BLE 1M 2480MHz Ant1



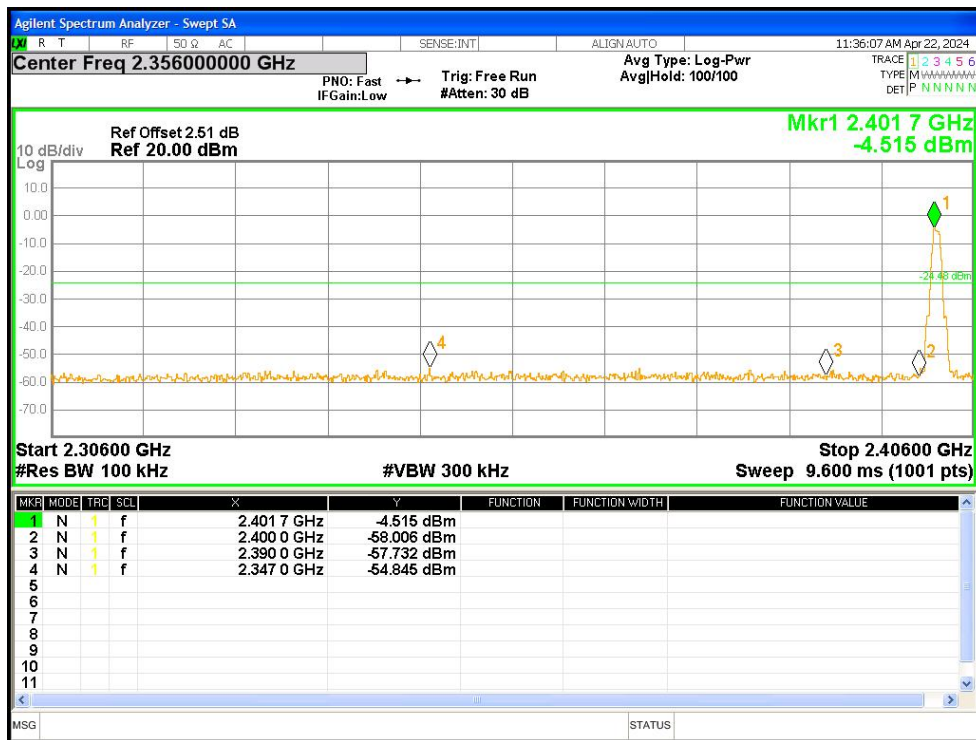
7.5 Band Edge

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-50.36	-20	Pass
NVNT	BLE 1M	2480	Ant1	-48.61	-20	Pass

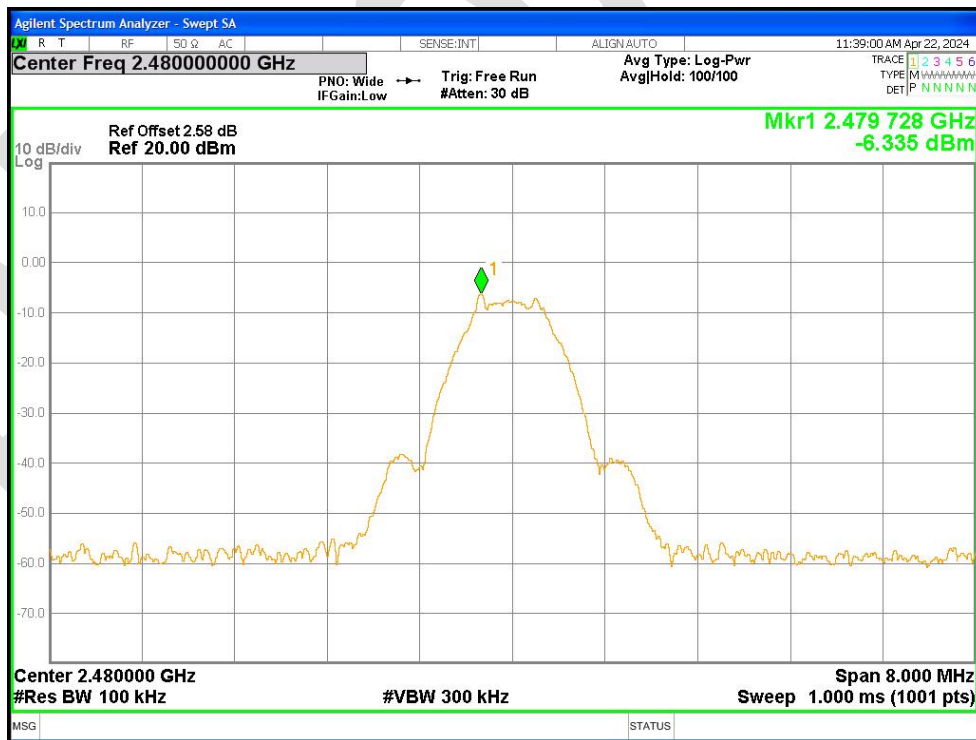
Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



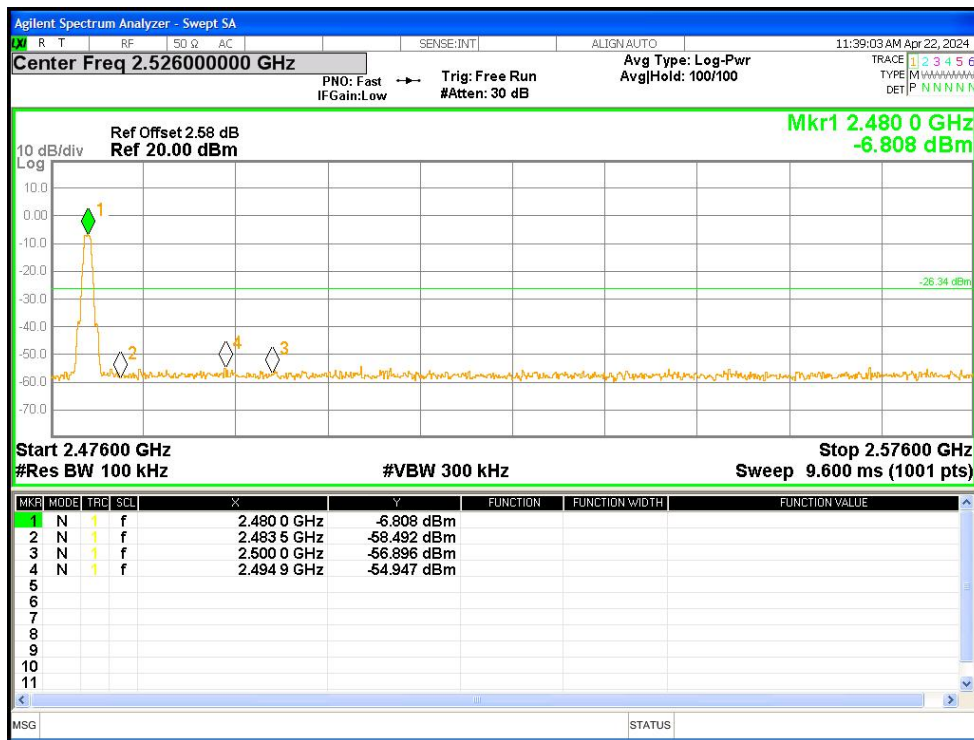
Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



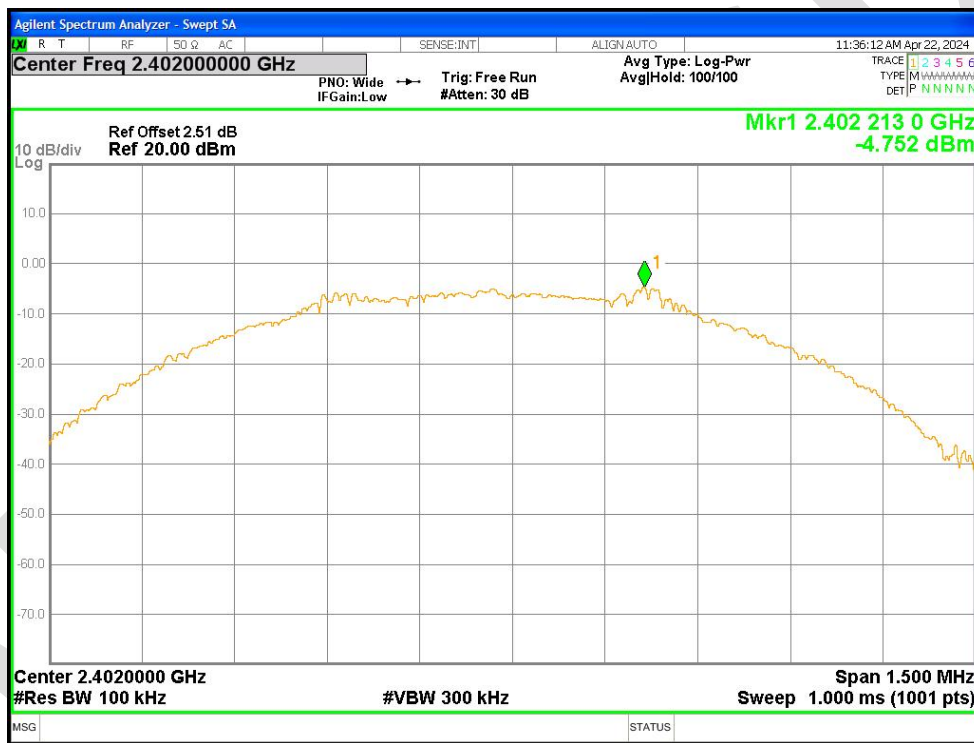
Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



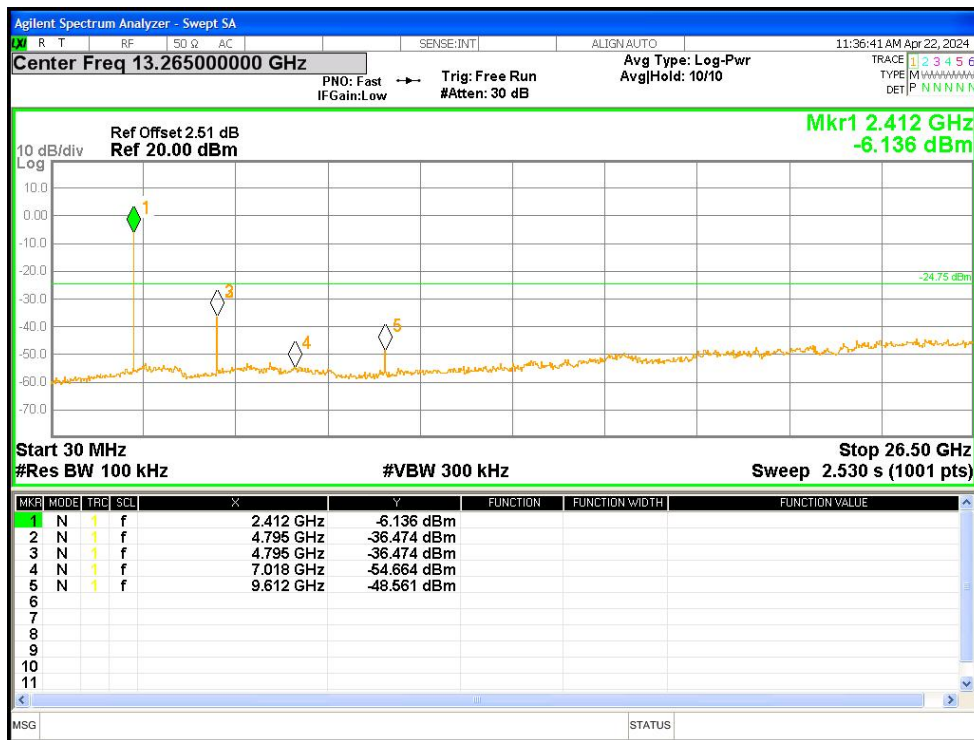
7.6 Conducted RF Spurious Emission

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-31.72	-20	Pass
NVNT	BLE 1M	2442	Ant1	-30.42	-20	Pass
NVNT	BLE 1M	2480	Ant1	-31.14	-20	Pass

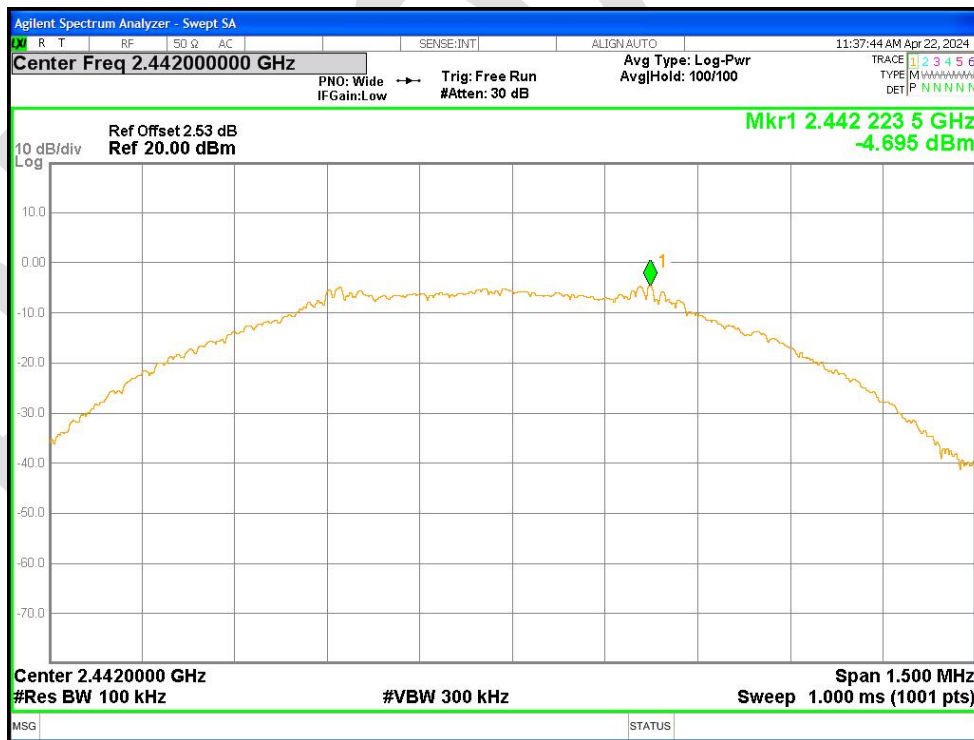
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



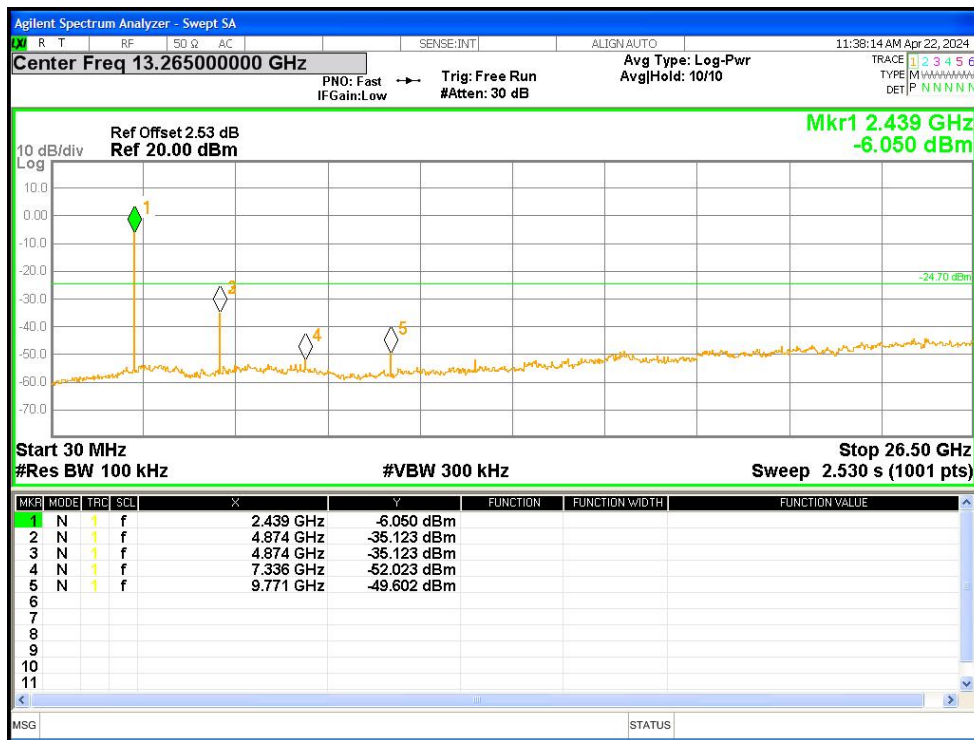
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



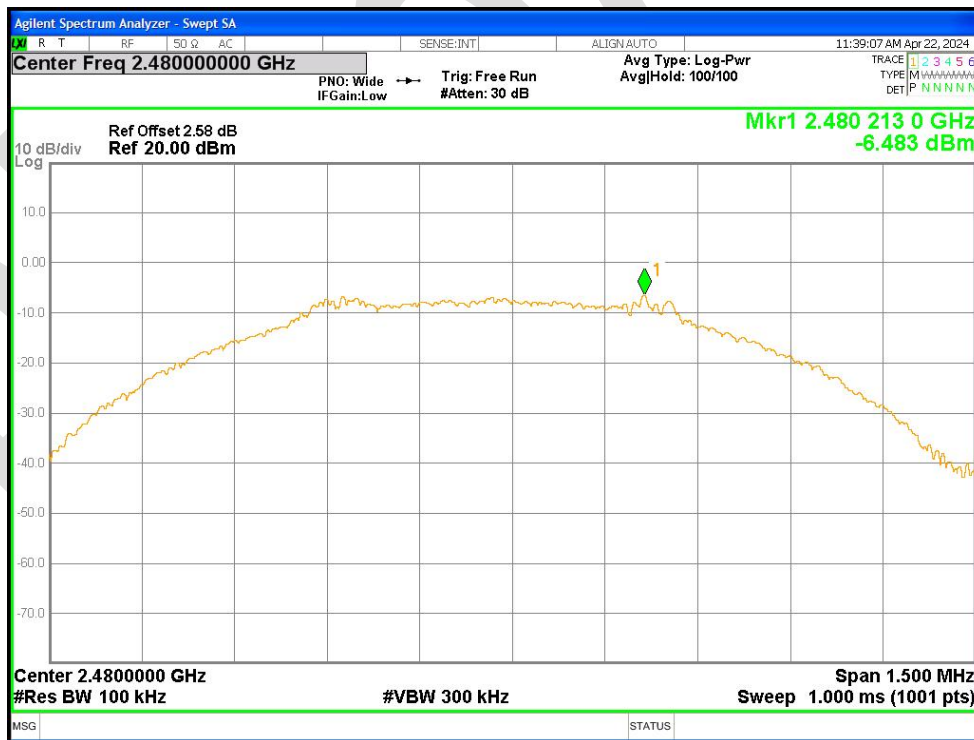
Tx. Spurious NVNT BLE 1M 2442MHz Ant1 Ref



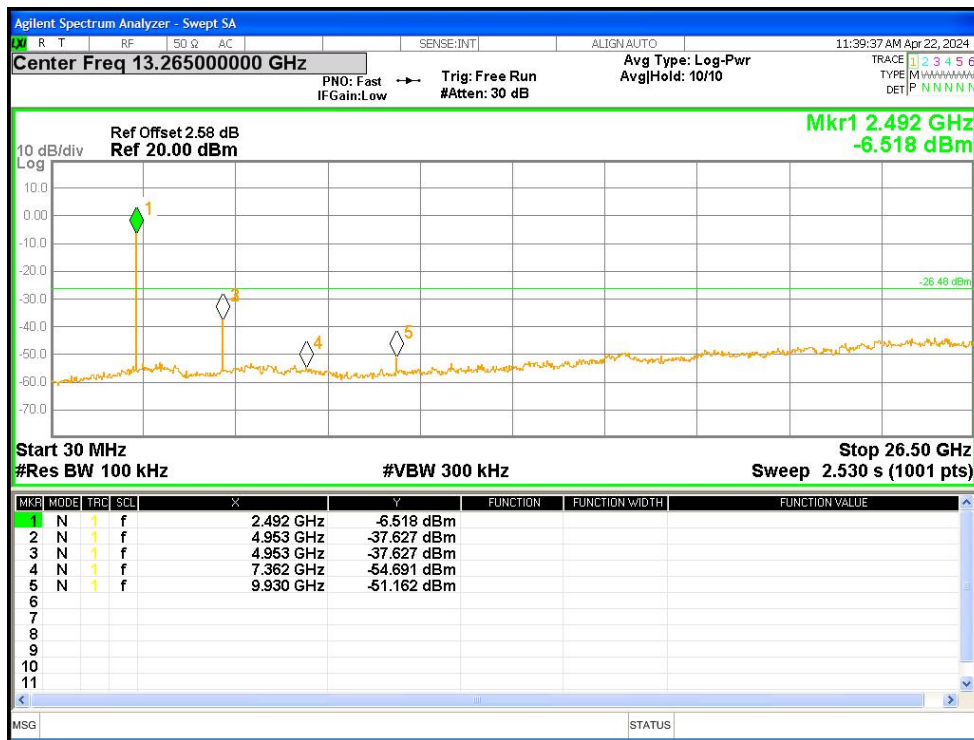
Tx. Spurious NVNT BLE 1M 2442MHz Ant1 Emission



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref

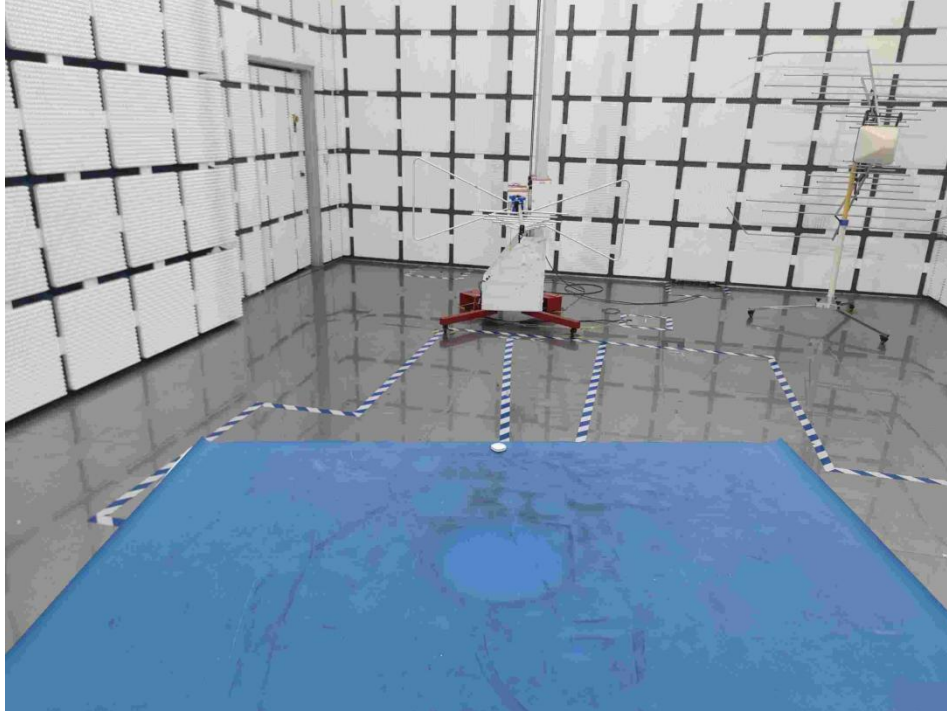


Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



Appendix B: photographs of test setup

Radiated Emissions (30MHz-1GHz)



Radiated Emissions (above 1GHz)



Appendix C: photographs of EUT

Reference to the test report no. BLA-EMC-202404-A3201

----END OF REPORT----

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