

FCC CERTIFICATION TEST REPORT

Applicant	:	HANSHOW PTE. LTD.
Address	:	138 ROBINSON ROAD #02-33 OXLEY TOWER SINGAPORE(068906)
Manufacturer	:	HANSHOW PTE. LTD.
Address	:	138 ROBINSON ROAD #02-33 OXLEY TOWER SINGAPORE(068906)
Equipment under Test	:	electronic shelf label
Model No.	:	Nebular Ultra 346Q-N
Trade Mark	:	N/A
FCC ID	:	2BPF3-NU1-346Q
Report No.	:	LS-R26041307-7F03
Issue Date	:	Jun. 02, 2026



LabSure Testing Services (Suzhou) Co., Ltd.

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Test Report Declare

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Address	:	138 ROBINSON ROAD #02-33 OXLEY TOWER SINGAPORE(068906)
Equipment under Test	:	electronic shelf label
Model No.	:	Nebular Ultra 346Q-N
Trade Name	:	N/A

Test Standard Used:

47 CFR FCC Part 15 Subpart C (Section 15.247)

Test Procedure Used:

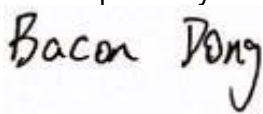
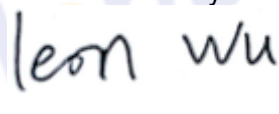
ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024

We Declare:

The equipment described above is tested by LabSure Testing Services (Suzhou) Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and LabSure Testing Services (Suzhou) Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC&ISED standards.

Report No:	LS-R26041307-7F03		
Date of Receipt:	Apr. 27, 2026	Date of Test:	May. 27, 2026~ May. 31, 2026

Prepared By: 	Reviewed By: 	Authorized By: 
Bacon Dong/Engineer	Leon Wu/Director	Chris Zhong/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of LabSure Testing Services (Suzhou) Co., Ltd. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification. The results reported herein have been performed in accordance with the laboratory's terms of accreditation.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Jun. 02, 2026	

1. Summary of Test Results

The EUT have been tested according to the applicable standards as referenced below.		
Description of Test Item	Standard	Verdict
6 dB Bandwidth	FCC Part 15.247 (a) (2)	Pass
Peak Output Power	FCC Part 15.247 (b) (3)	Pass
Power Spectral Density	FCC Part 15.247 (e)	Pass
Band Edge Compliance (conducted method)	FCC Part 15.247 (d)	Pass
Radiation Emission	FCC Part 15.209 FCC Part 15.205	Pass
RF Conducted Spurious Emissions	FCC Part 15.247 (d)	Pass
Emission in Restricted Frequency Bands	FCC Part 15.209 FCC Part 15.205	Pass
Power Line Conducted Emission	FCC Part 15.207	N/A
Antenna Requirement	FCC Part 15.203	Pass
Note: The measurement result for the sample received is <Pass> according to <ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024; FCC CFR 47 Part 2, FCC CFR 47 Part 15C(Part 15.247), when <Simple Acceptance> decision rule is applied.		

2. General Test Information

2.1. Description of EUT

EUT* Name	: electronic shelf label
Model Number	: Nebular Ultra 346Q-N
Test Model	: Nebular Ultra 346Q-N
Hardware Version	: N/A
Software Version	: N/A
Difference of model number	: N/A
EUT function description	: Please reference user manual of this device.
Power Supply	: DC 3V by Polymer Li-ion built-in battery
Operation Frequency	: 2402MHz-2480MHz
Modulation	: GFSK
Data Rate	: 1Mbps & 2Mbps
Antenna Type	: PCB Antenna
Antenna Gain	For BLE: : PCB antenna 1, maximum PK gain: -2.02 dBi (Declare by customer and the lab isn't responsible for the value)
Serial Number	: N/A

Note1: The lab isn't responsible for the value provide by customer (Such as RF cable loss, antenna gain etc..)

Channel information					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
Notebook	ASUS	FX506L	N/A	Supplied by lab

2.4. Block diagram of EUT configuration for test



Test software: RF_Test, Version: V1.0.2.4

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

The pathloss of external cable: 1dB

Tested mode, channel, and data rate information			
Mode	Setting Tx Power	Channel	Frequency (MHz)
BLE_1M Tx mode	-1	Ch Low	2402
	-1	Ch Middle	2440
	-1	Ch High	2480
BLE_2M Tx mode	-1	Ch Low	2404
	-1	Ch Middle	2440
	-1	Ch High	2478

Modulation Type	TX Configuration
GFSK	1TX

2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Environment Parameter	Selected Values During Tests
Relative Humidity	40-75%
Atmospheric Pressure:	86-106 kPa
Temperature	21-25 °C
Voltage:	N/A

2.6. Deviations of test standard

No deviation.

2.7. Test laboratory

Lab Information	Company Name: LabSure Testing Services (Suzhou) Co., Ltd. Address: Phase II, No.16 Runsheng Road, Suzhou Industrial Park, Suzhou, People's Republic of China. Tel: +86-0512-62531270, E-mail: labsure@lab-sure.com, www.lab-sure.com
Accreditation Certificate	A2LA (Certificate No.: 7346.01) LabSure Testing Services (Suzhou) Co., Ltd. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1397) LabSure Testing Services (Suzhou) Co., Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. IC (IC Designation No.: 32952; CAB No.:CN0182) LabSure Testing Services (Suzhou) Co., Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.
Note 1: All tests measurement facilities use to collect the measurement data are located at Phase II, No.16 Runsheng Road, Suzhou Industrial Park, Suzhou, China. Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS. Note 3: The test anechoic chamber in LabSure Testing Services (Suzhou) Co., Ltd. had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.	

2.8. Measurement uncertainty

Test Item	Uncertainty
Bandwidth	0.14%
Peak Output Power (Conducted) (Spectrum Analyzer)	0.12 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	0.32 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Peak Output Power (Conducted) (Power Sensor)	0.51 dB
Power Spectral Density	0.12 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	0.32 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	3.4×10^{-8} (Conducted method)
Conducted Spurious Emissions	0.12 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	0.32 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
	0.52 dB ($8 \text{ GHz} \leq f < 22 \text{ GHz}$)
Uncertainty for Radio Frequency (RBW < 20 kHz)	3×10^{-7}
Uncertainty for Radiation Emission Test (9kHz - 1 GHz)	9kHz-30MHz: 4.5 dB
	30MHz-1000MHz: 4.2 dB
Uncertainty for Radiation Emission Test (1 GHz - 40 GHz)	1GHz – 6GHz: 4.3 dB
	6GHz – 18GHz: 4.6 dB

	18GHz – 40GHz: 4.3 dB
Uncertainty for Power Line Conduction Emission Test	3.4 dB (150 kHz - 30 MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

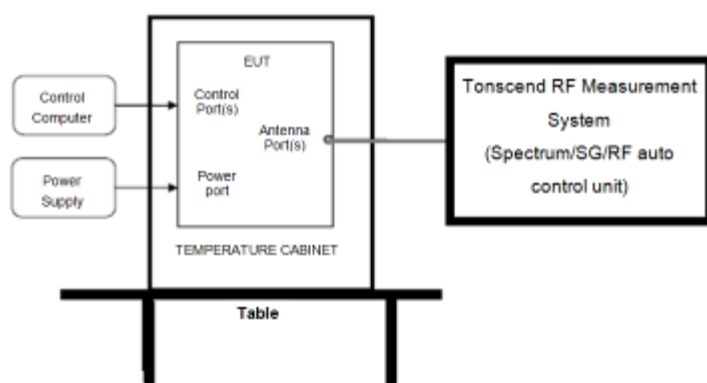
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Conducted Test					
EXG Analog Signal Generator	Keysight	N5173B	MY53270968	2026/02/11	1 Year
MXG Vector Signal Generator	Keysight	N5182A	MY50143288	2026/02/11	1 Year
PXA Signal Analyzer	Keysight	N9030B	MY56320639	2026/03/14	1 Year
PXA Signal Analyzer	Keysight	N9010A	MY53281492	2026/02/11	1 Year
Wideband Radio Communication Tester	R&S	CMW500	158800	2026/02/11	1 Year
Power Sensor	KEYSIGHT	U2021XA	MY59150007	2026/02/11	1 Year
DC Power Supply	inSTEK	PSP-2010	EN122317	2026/01/13	1 Year
Test Software	MWRFtest	MTS8200	N/A	N/A	N/A
Radiated Spurious Emission 3m EMI Chamber					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
3m Anechoic Chamber	CeRuiTong	3m-SAC	N/A	2024/05/10	3 Year
EMI Test Receiver	R&S	ESCi7	101138	2026/01/25	1 Year
Signal Analyzer	R&S	FSV40-N	101730	2026/01/25	1 Year
Hybrid antenna	TESEQ	CBL6141B	27421	2024/01/10	3 Year
Horn Antenna	ETS	ETS 3117	157735	2024/01/19	3 Year
Pre-Amplifier_HF	COM-MW	DPA8-1000-18000-1012	05231357	2026/01/25	1 Year
Low Noise Amplifier	Tonscend	TAP10M1G40N	806JSAP039904251006	2026/01/25	1 Year
Temperature, humidity and pressure recorder	Huahanwei	TH10R	c0222020002F	2026/1/29	1 Year
Test software	TONSCEND	JS35-RSE	5.0.1	N/A	N/A
Power Line Conducted Emissions Test					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde & Schwarz	ESCi3	101705	2026/01/25	1 Year
Two-Line V-Network	Rohde & Schwarz	ENV216	101063	2026/01/25	1 Year
Test software	TONSCEND	JS32-CE	5.0.0	N/A	N/A

4. 6 dB Bandwidth

4.1. General Information

Test date	Jun. 01, 2026	Test engineer	Luke Li	
Climate condition	Ambient temperature	21.7℃	Relative humidity	63.9%
	Atmospheric pressure	101.3kPa		
Test place	EMC Room 1#			

4.2. Block diagram of test setup



4.3. Limits

FCC Part15 (15.247), Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC Part 15.247 (a) (2)	6dB Bandwidth	$\geq 500\text{kHz}$	2400-2483.5

4.4. Test procedure

- Connect EUT's antenna output to spectrum analyzer by RF cable.
- 6 dB Bandwidth set the spectrum analyzer as follows:

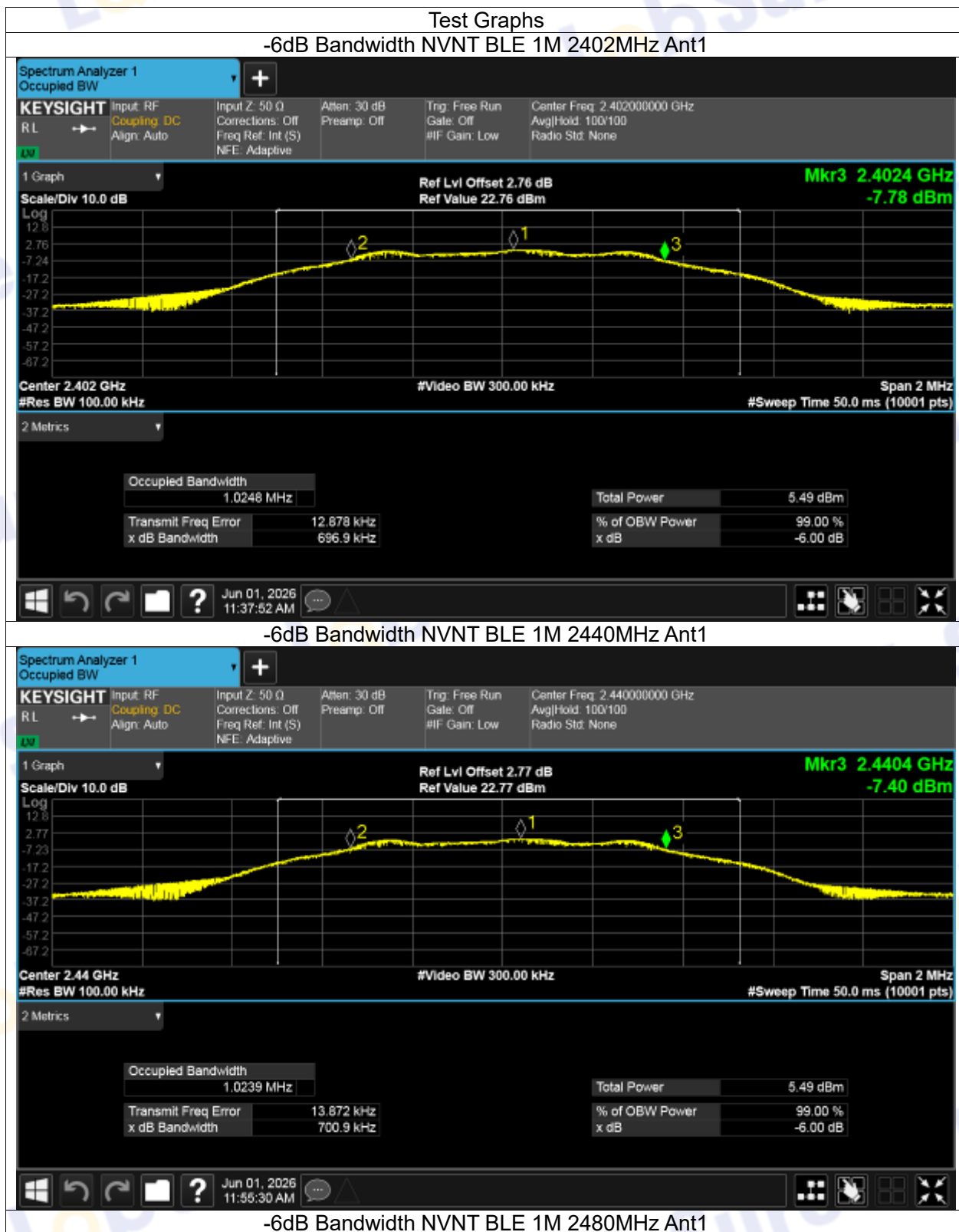
RBW:	100 kHz
VBW:	300 kHz
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold
- Allow the trace to stabilize, measure the 6 dB of signal.

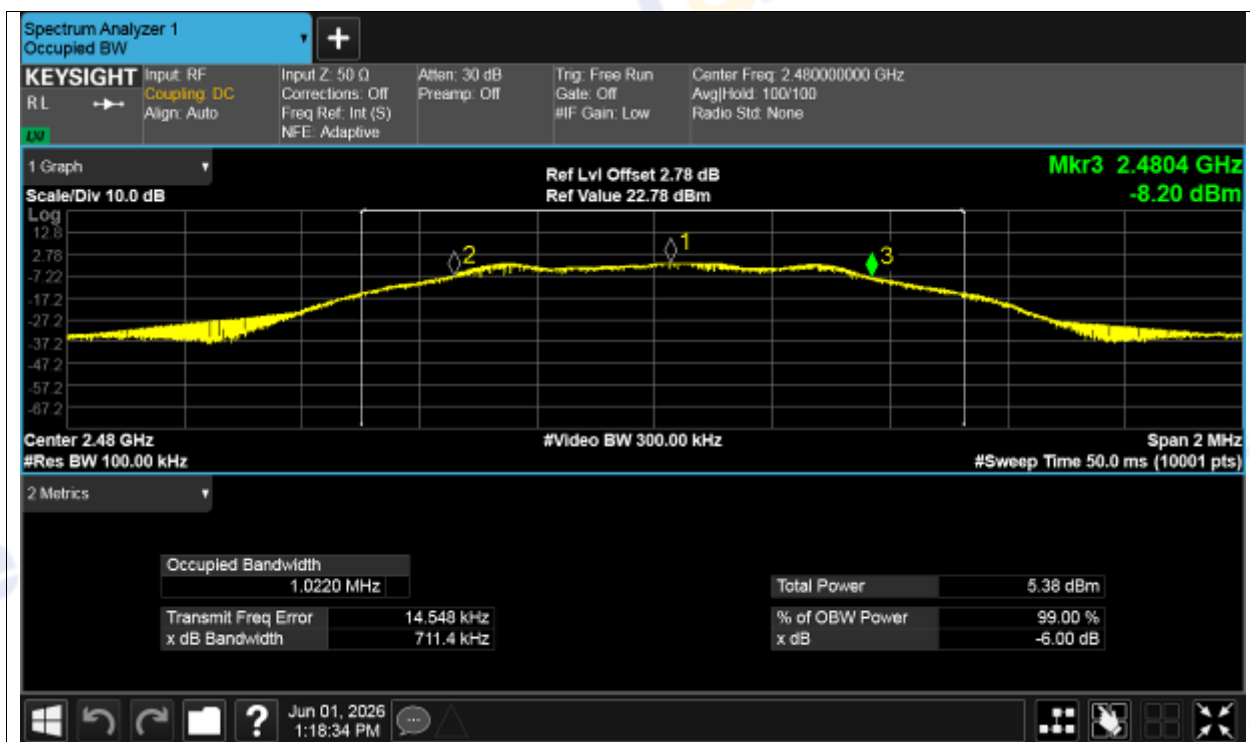
4.5. Test result

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.697	0.5	Pass
NVNT	BLE 1M	2440	Ant1	0.701	0.5	Pass
NVNT	BLE 1M	2480	Ant1	0.711	0.5	Pass
NVNT	BLE 2M	2404	Ant1	1.212	0.5	Pass
NVNT	BLE 2M	2440	Ant1	1.208	0.5	Pass
NVNT	BLE 2M	2478	Ant1	1.209	0.5	Pass

4.6. Original test data

6 dB Bandwidth

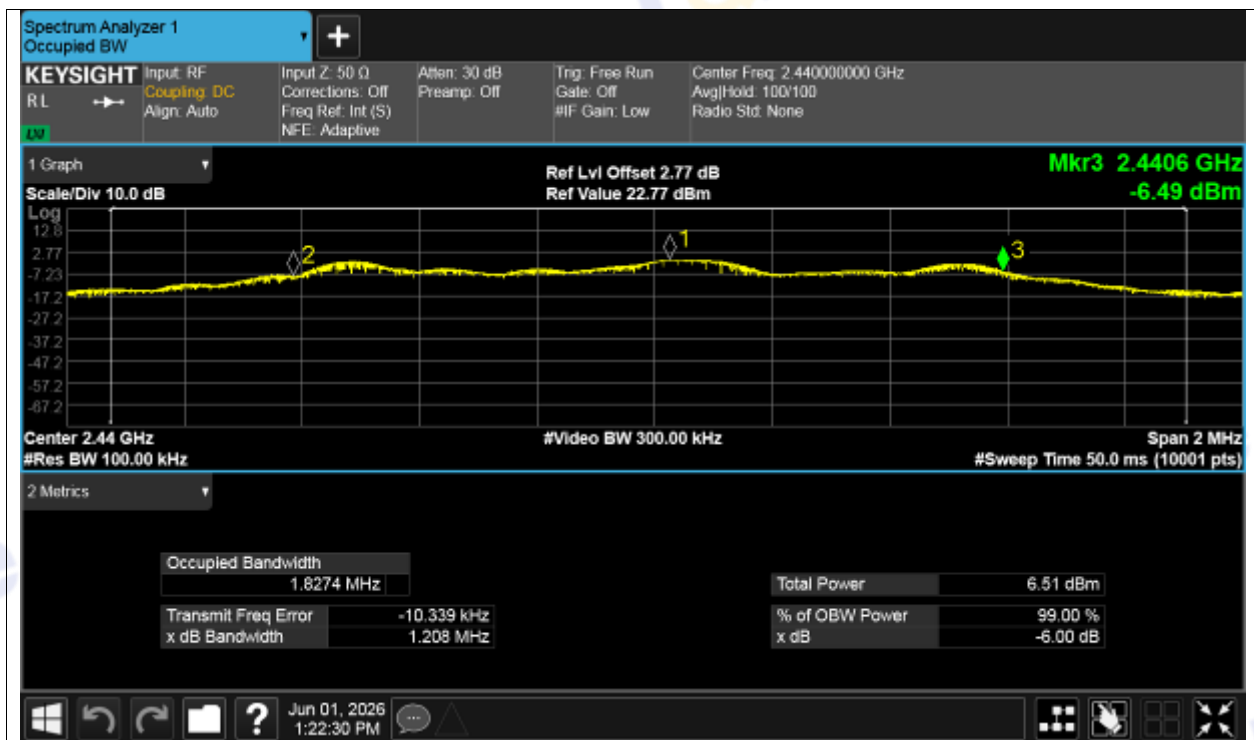




-6dB Bandwidth NVNT BLE 2M 2404MHz Ant1



-6dB Bandwidth NVNT BLE 2M 2440MHz Ant1



-6dB Bandwidth NVNT BLE 2M 2478MHz Ant1



5. Maximum Peak Output Power

5.1. General Information

Test date	Jun. 01, 2026	Test engineer	Luke Li	
Climate condition	Ambient temperature	21.7°C	Relative humidity	63.9%
	Atmospheric pressure	101.3kPa		
Test place	EMC Room 1#			

5.2. Block diagram of test setup

Same with 4.1

5.3. Limits

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC Part 15.247 (b)(3)	Output Power	1 watt or 30dBm	2400-2483.5
		4 watt or 36dBm (EIRP)	

If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.4. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

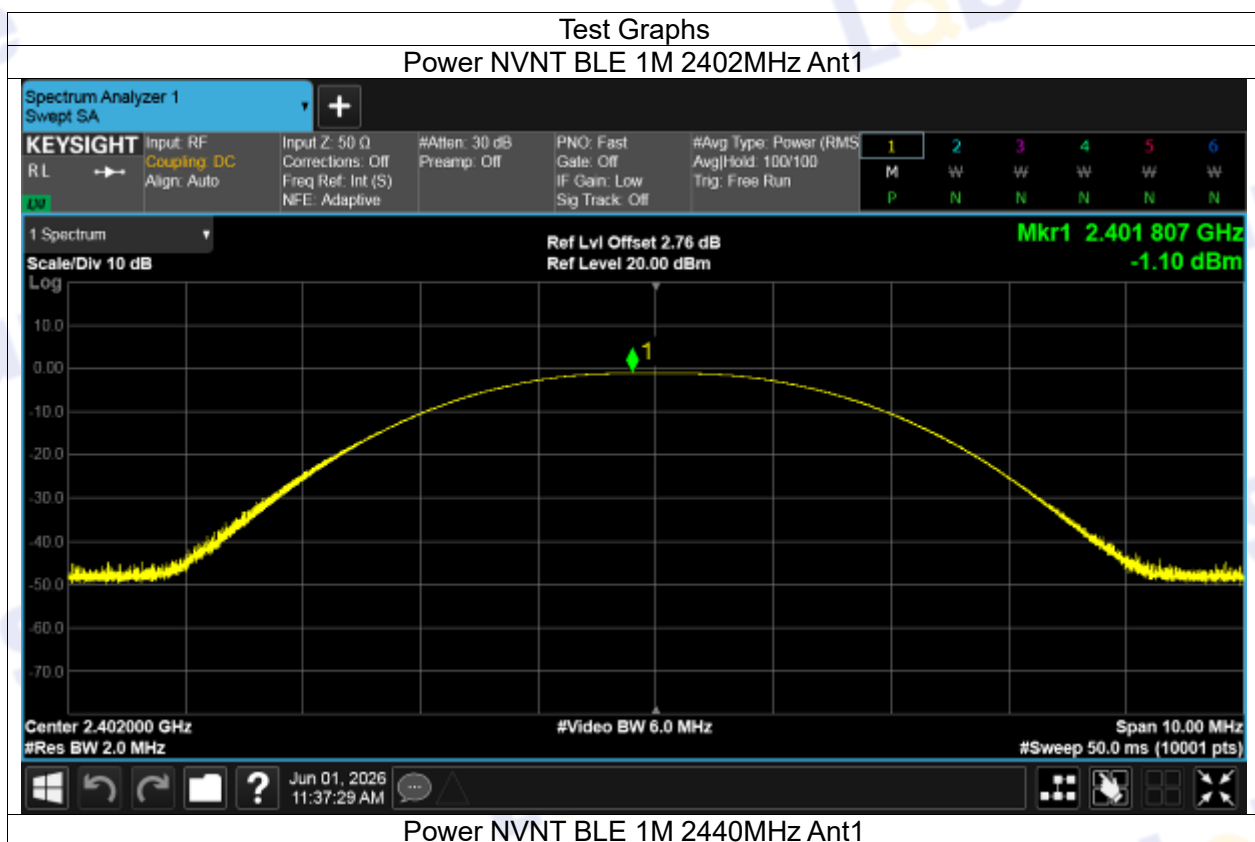
RBW:	≥DTS bandwidth
VBW:	≥3 x RBW
Span	≥3 x RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

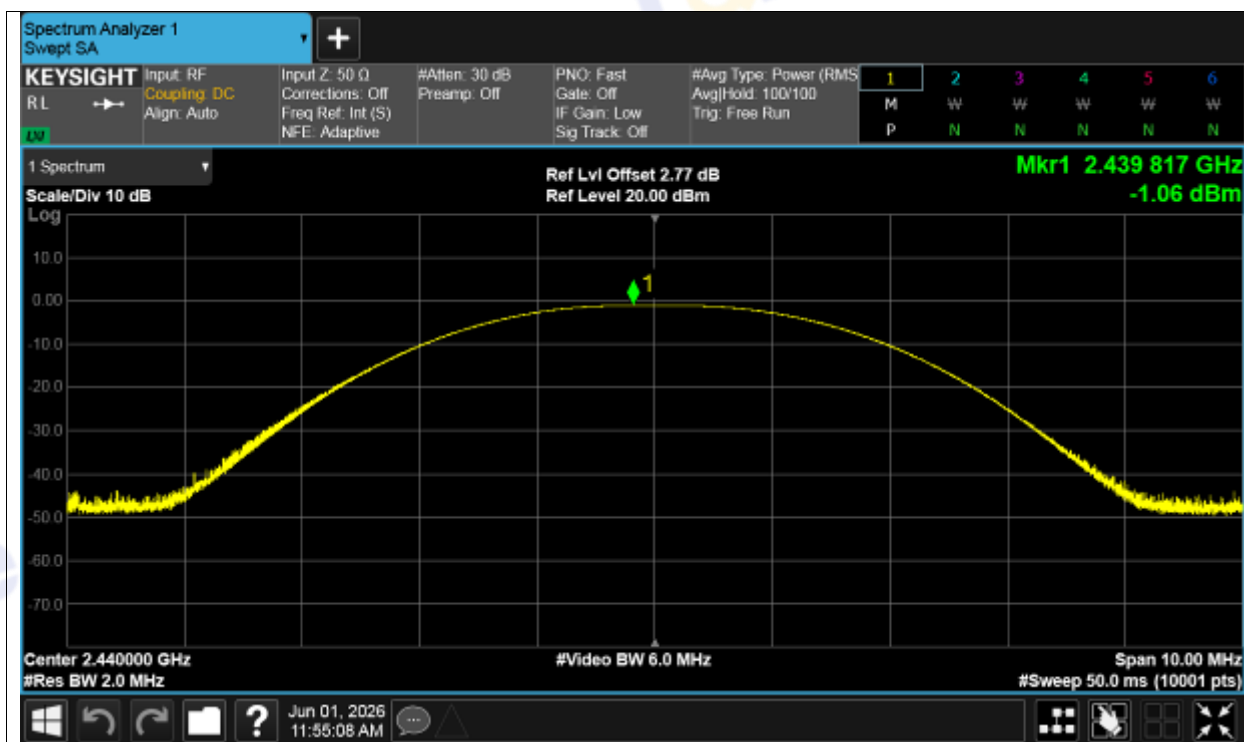
(3) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the PK output power.

5.5. Test result

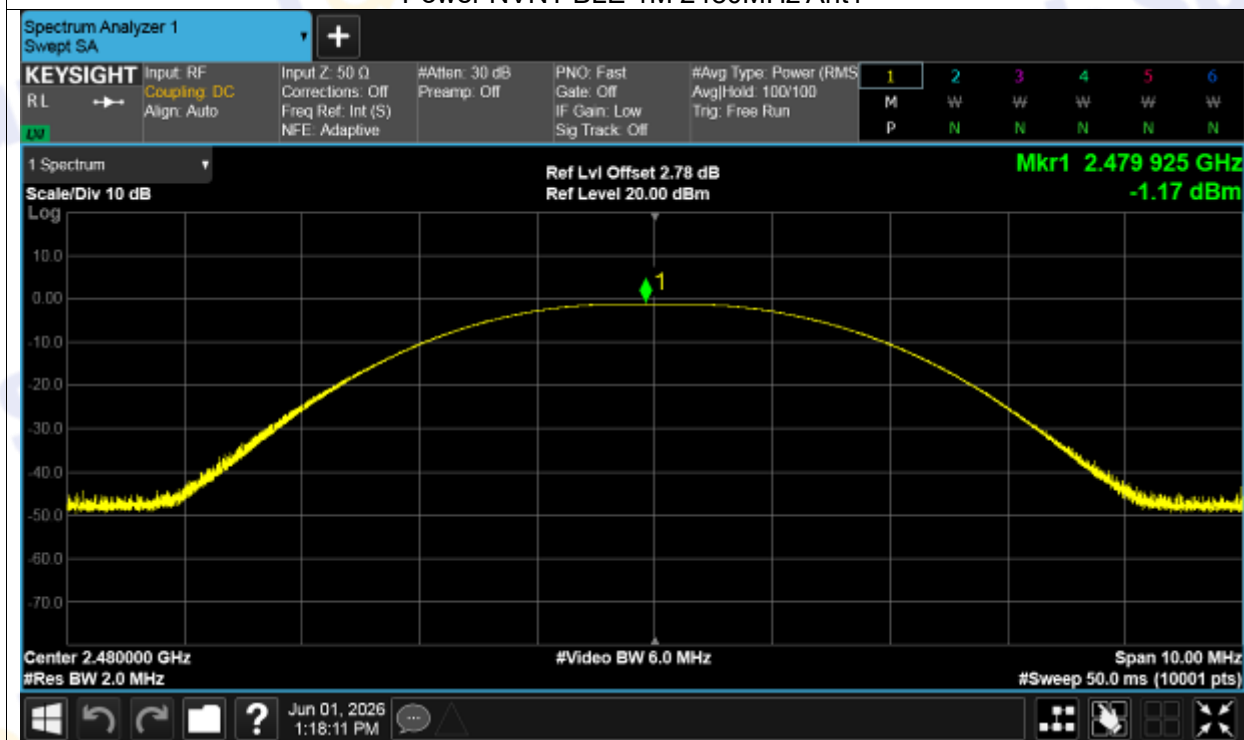
Condition	Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-1.10	30	Pass
NVNT	BLE 1M	2440	Ant1	-1.06	30	Pass
NVNT	BLE 1M	2480	Ant1	-1.17	30	Pass
NVNT	BLE 2M	2404	Ant1	-1.06	30	Pass
NVNT	BLE 2M	2440	Ant1	-1.03	30	Pass
NVNT	BLE 2M	2478	Ant1	-1.16	30	Pass

5.6. Original test data

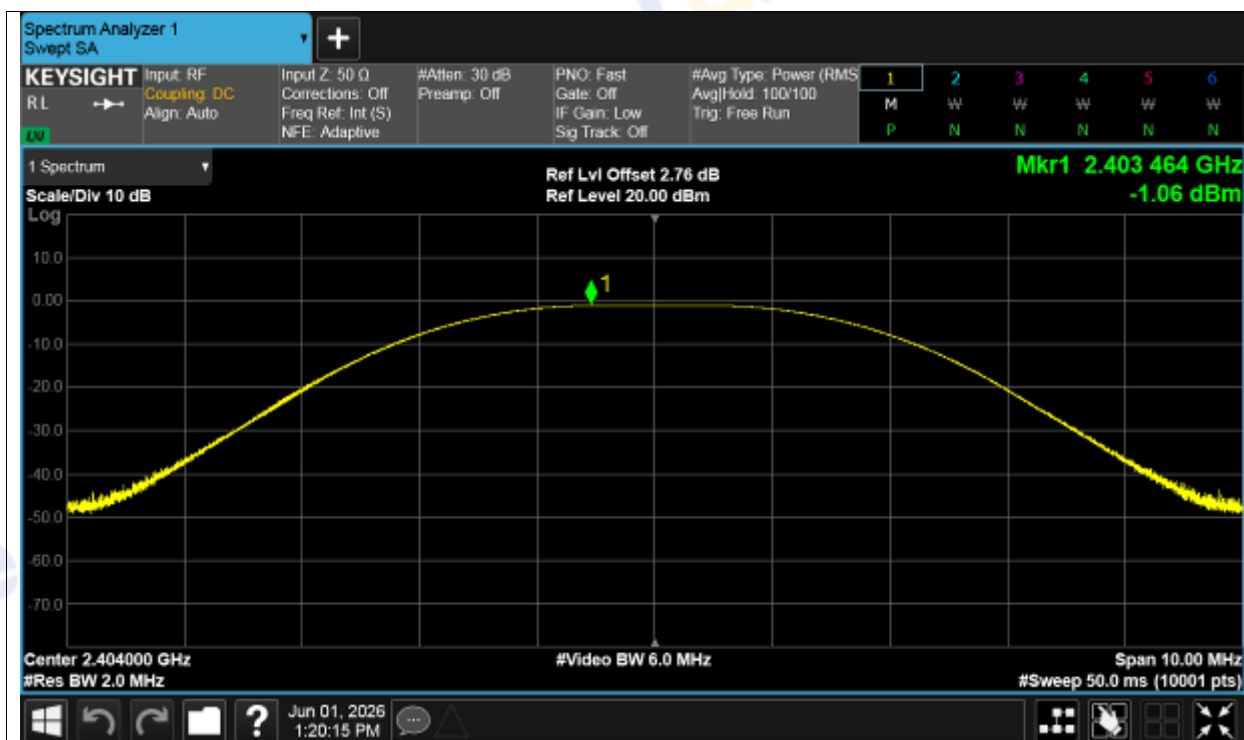




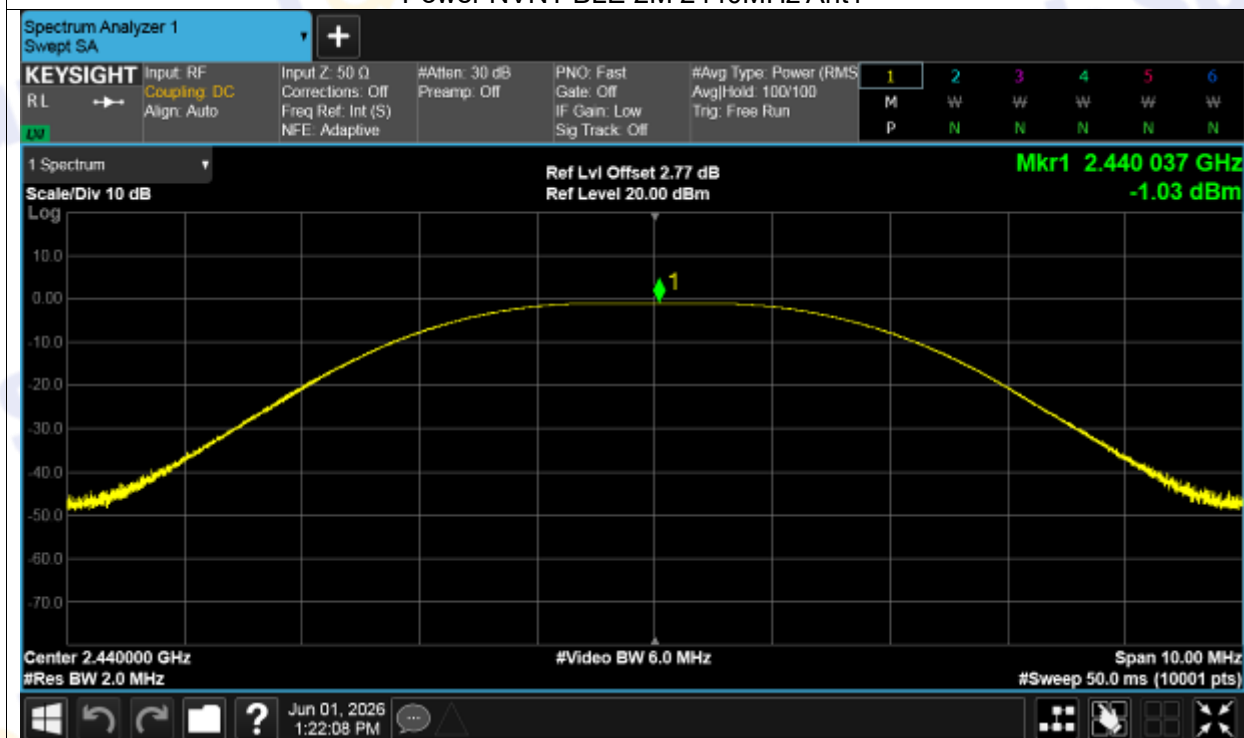
Power NVNT BLE 1M 2480MHz Ant1



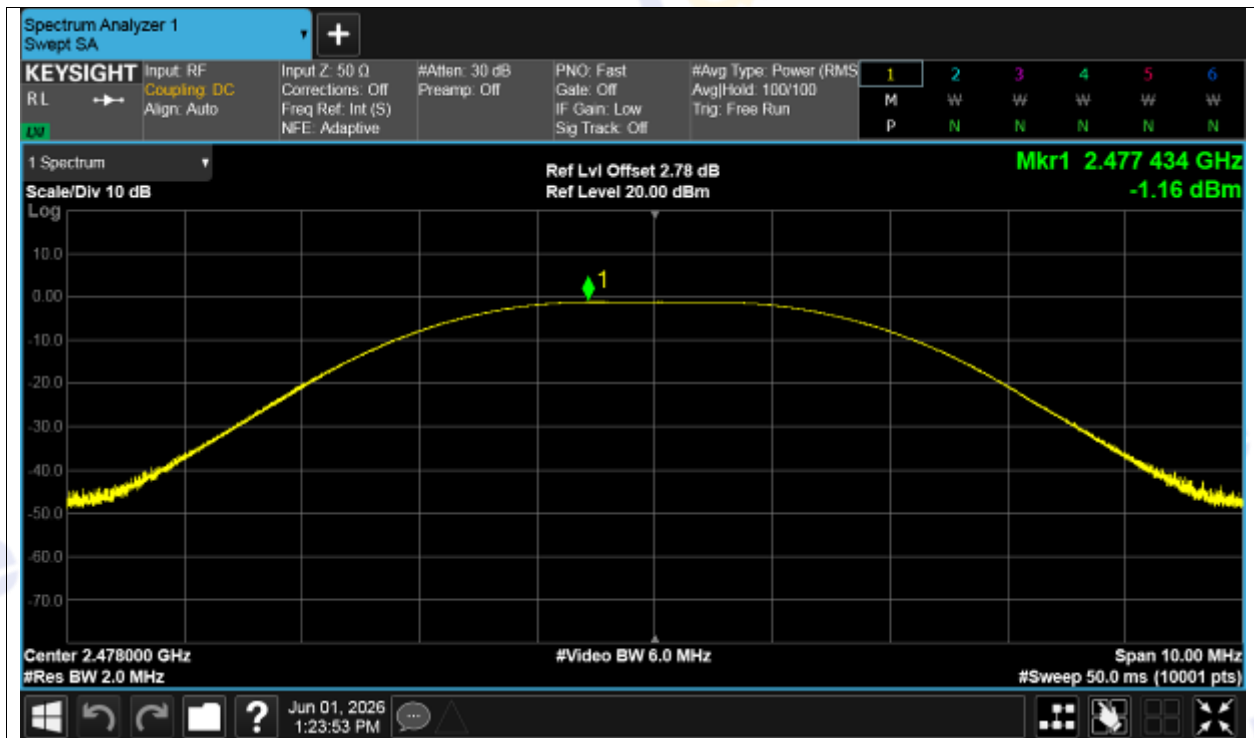
Power NVNT BLE 2M 2404MHz Ant1



Power NVNT BLE 2M 2440MHz Ant1



Power NVNT BLE 2M 2478MHz Ant1



6. Power Spectral Density

6.1. General Information

Test date	Jun. 01, 2026	Test engineer	Luke Li	
Climate condition	Ambient temperature	21.7℃	Relative humidity	63.9%
	Atmospheric pressure	101.3kPa		
Test place	EMC Room 1#			

6.2. Block diagram of test setup

Same with 4.1

6.3. Limits

FCC Part15 (15.247), Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC Part 15.247 (e)	Power Spectral Density	8 dBm/3 kHz	2400-2483.5

6.4. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

Center frequency	DTS Channel center frequency
RBW:	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW:	$\geq 3\text{RBW}$
Span	1.5 times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

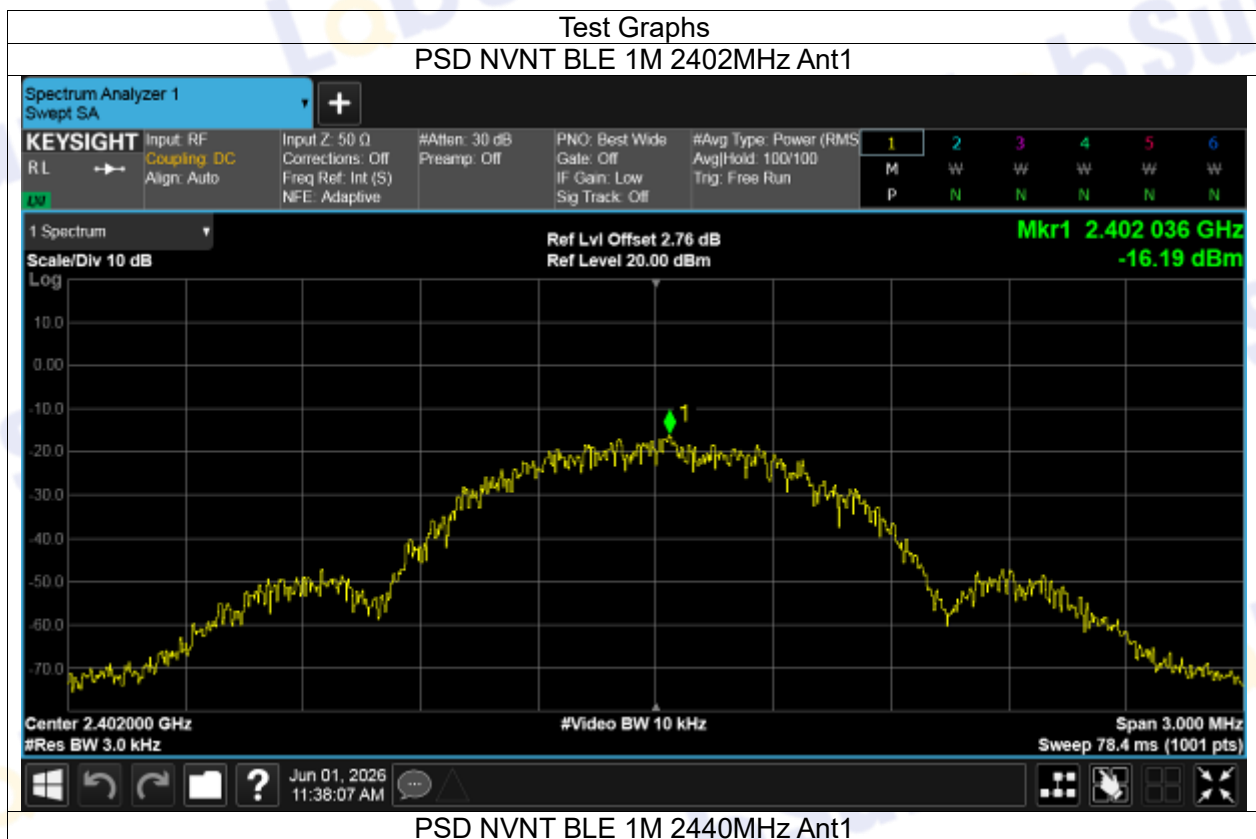
(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

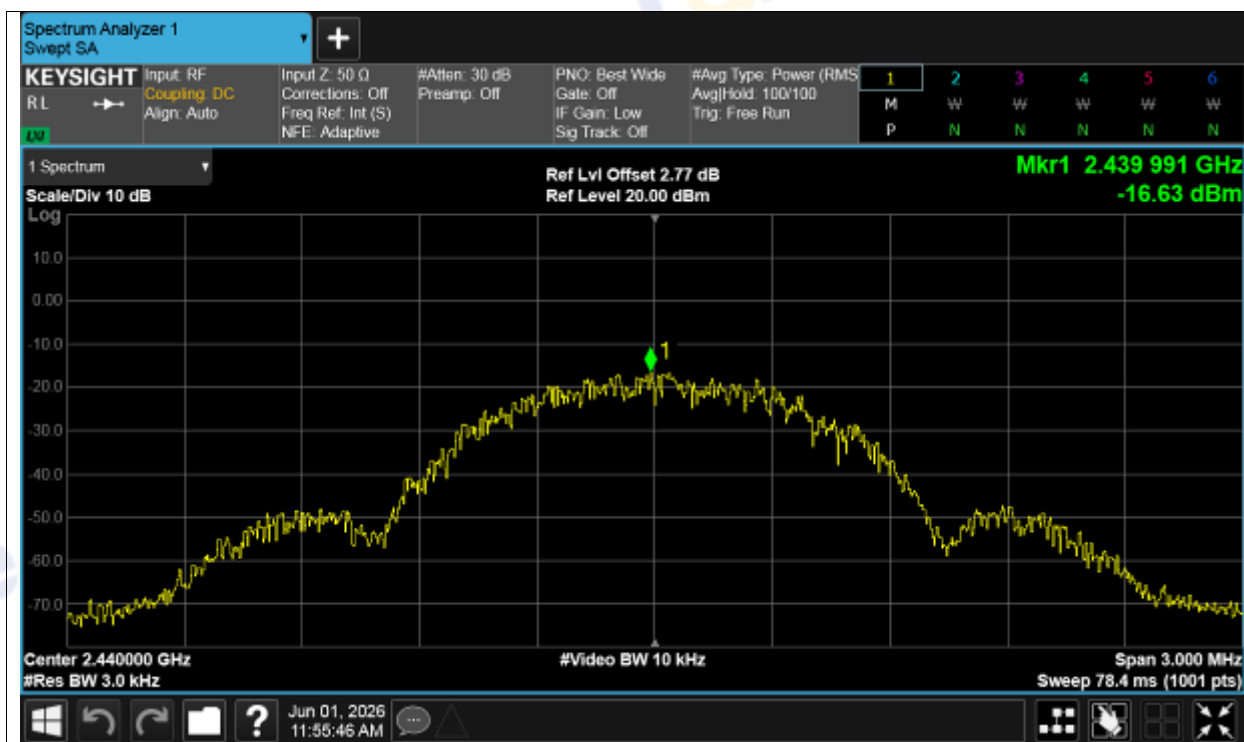
(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.5. Test result

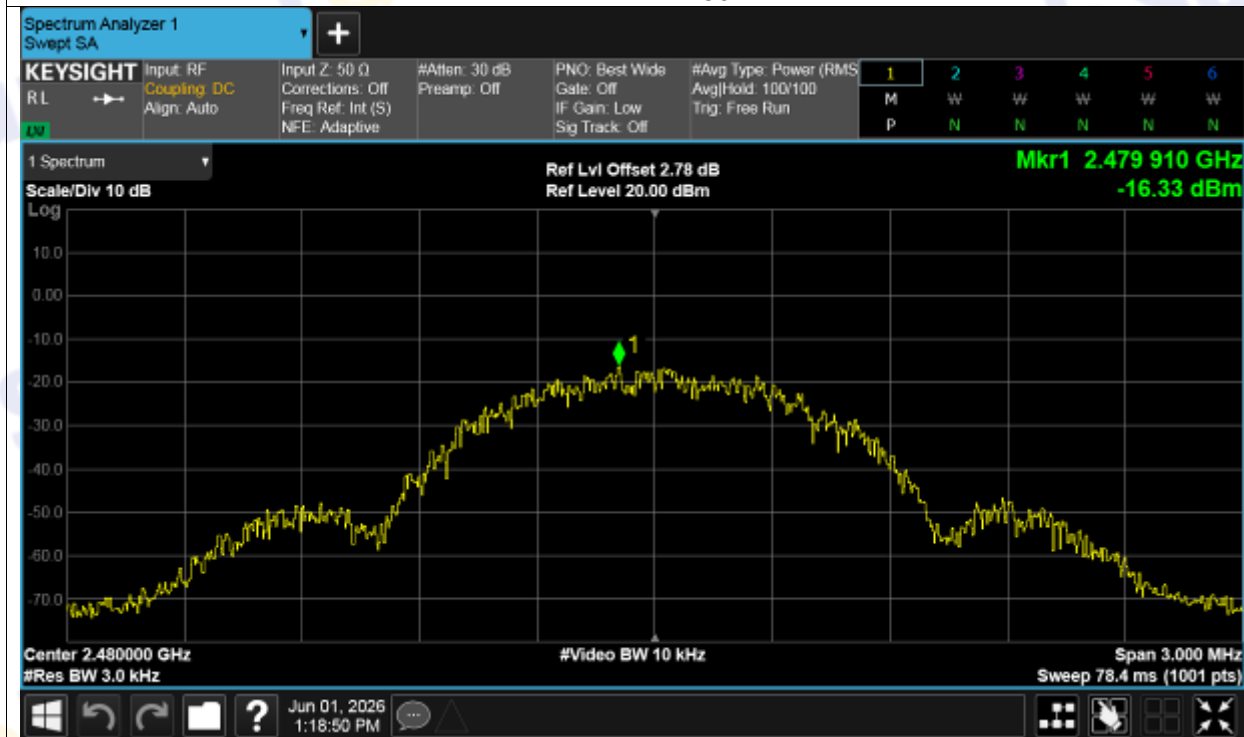
Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm)	Duty Factor (dB)	Total PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-16.19	0	-16.19	8	Pass
NVNT	BLE 1M	2440	Ant1	-16.63	0	-16.63	8	Pass
NVNT	BLE 1M	2480	Ant1	-16.33	0	-16.33	8	Pass
NVNT	BLE 2M	2404	Ant1	-15.3	0	-15.3	8	Pass
NVNT	BLE 2M	2440	Ant1	-15.59	0	-15.59	8	Pass
NVNT	BLE 2M	2478	Ant1	-15.62	0	-15.62	8	Pass

6.6. Original test data

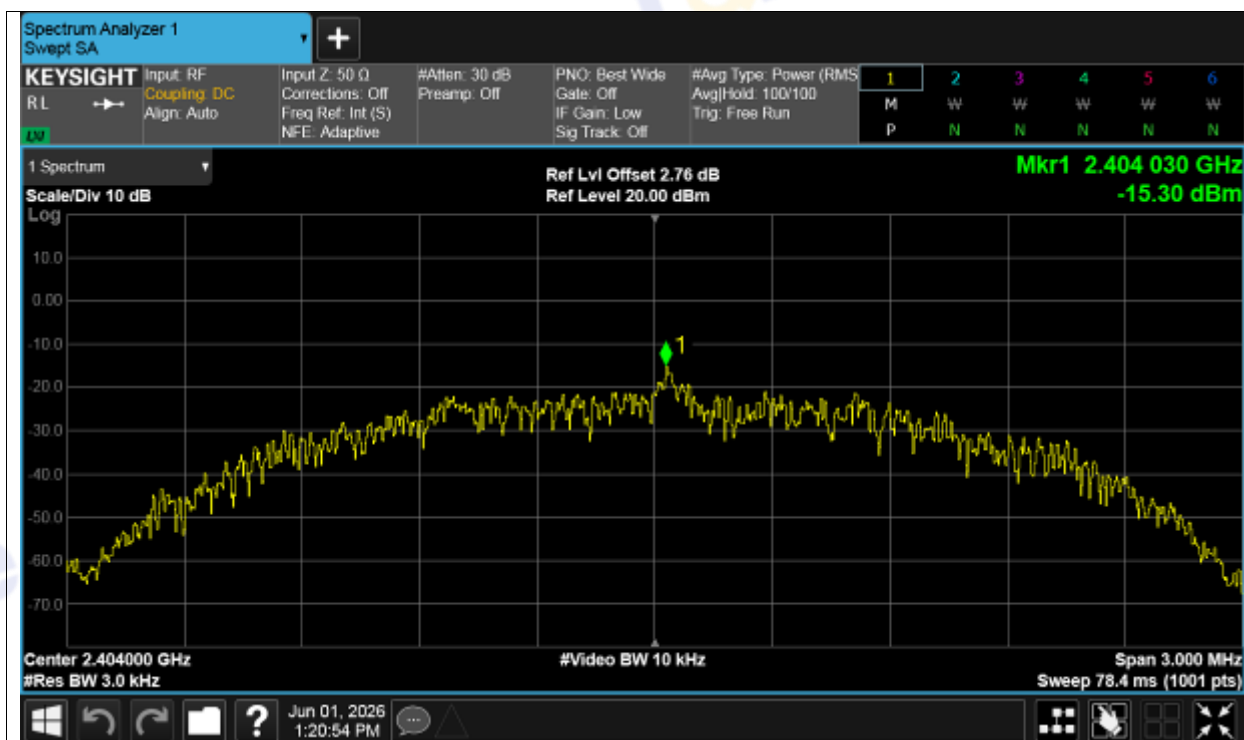




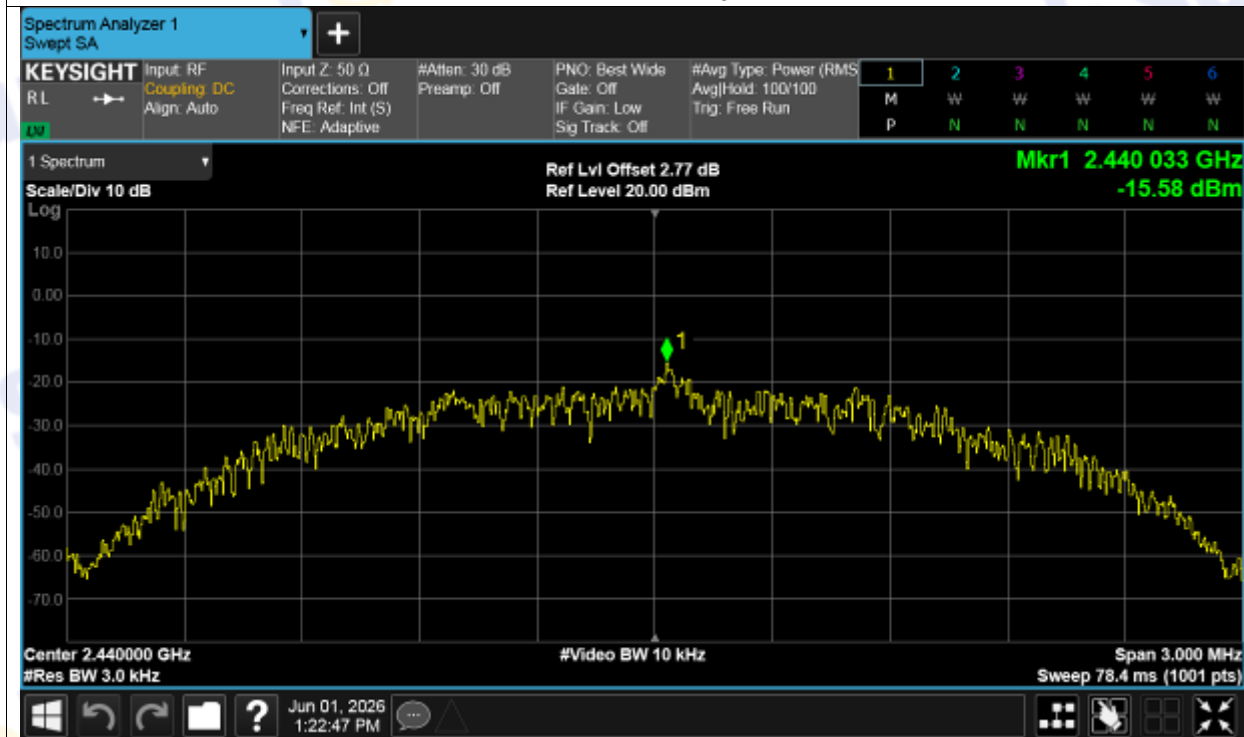
PSD NVNT BLE 1M 2480MHz Ant1



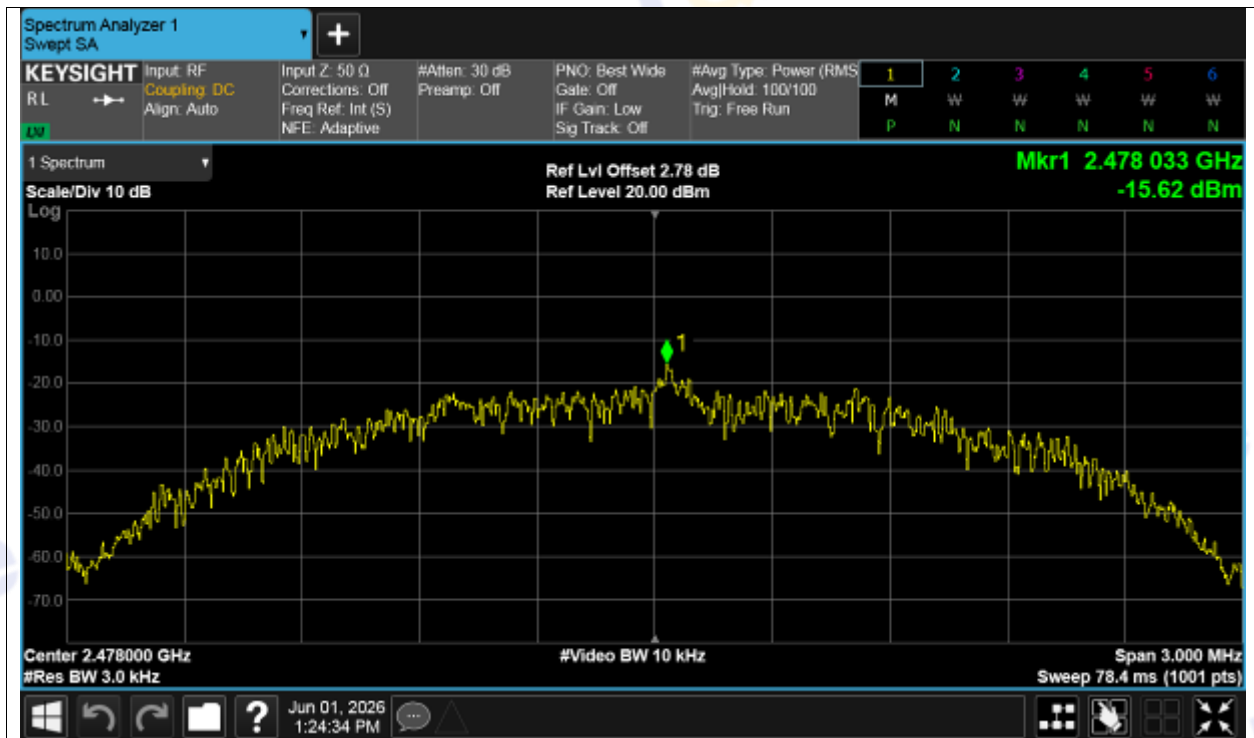
PSD NVNT BLE 2M 2404MHz Ant1



PSD NVNT BLE 2M 2440MHz Ant1



PSD NVNT BLE 2M 2478MHz Ant1



7. Band Edge Compliance (Conducted Method)

7.1. General Information

Test date	Jun. 01, 2026	Test engineer	Luke Li	
Climate condition	Ambient temperature	21.7℃	Relative humidity	63.9%
	Atmospheric pressure	101.3kPa		
Test place	EMC Room 1#			

7.2. Block diagram of test setup

Same with 4.1

7.3. Limits

FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge	In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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.

7.4. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

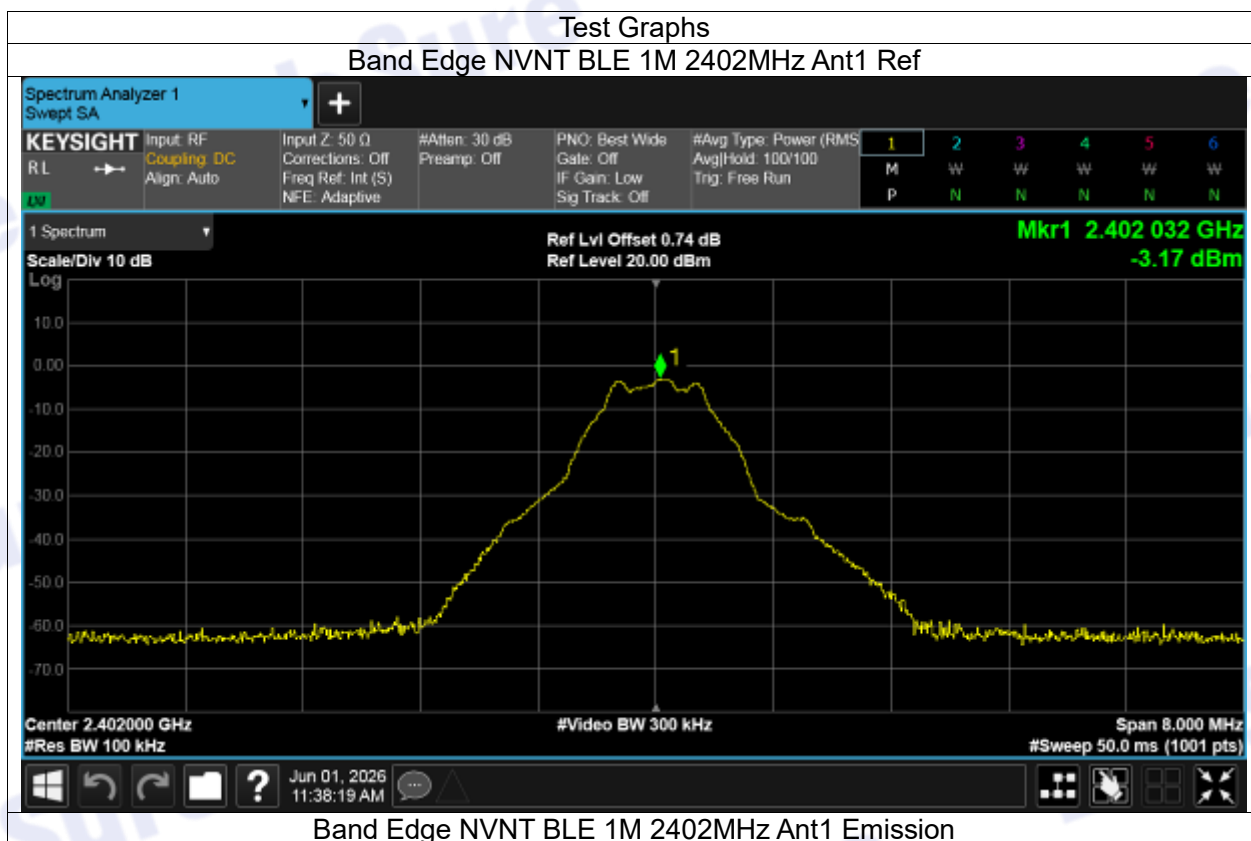
RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Number of measurement points	$\geq \text{span/RBW}$
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

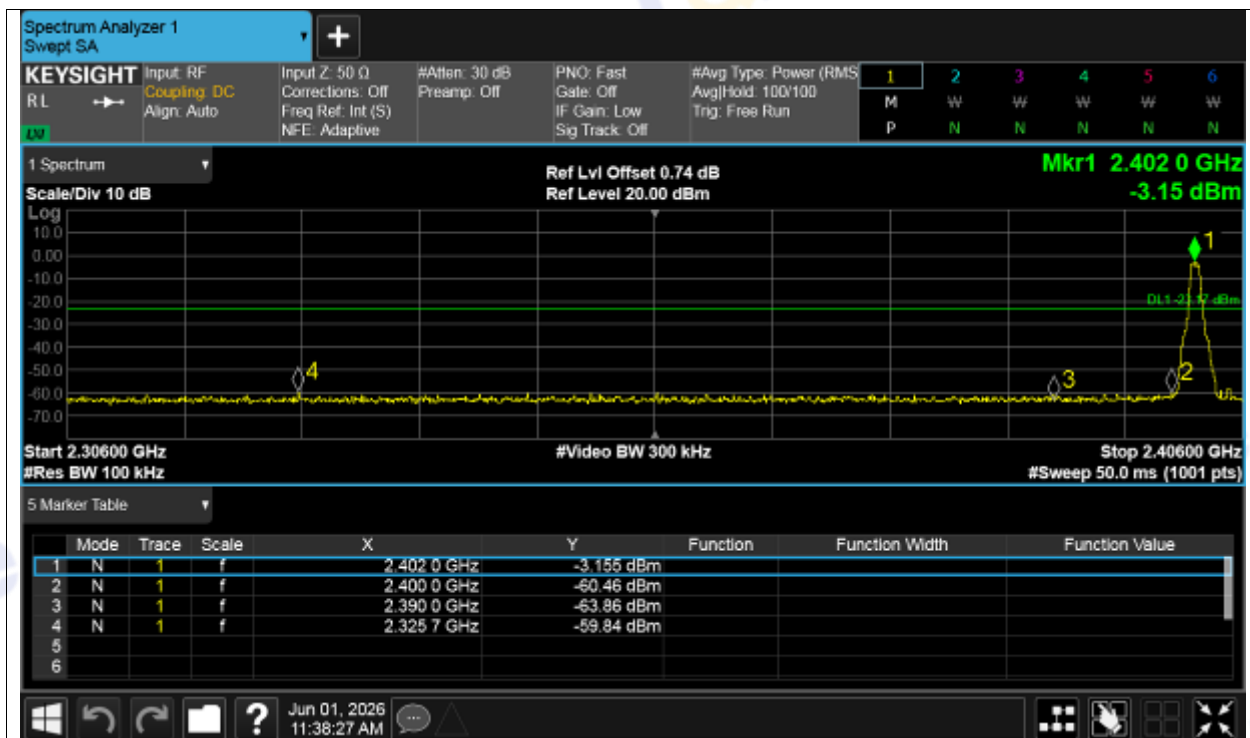
(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

7.5. Test result

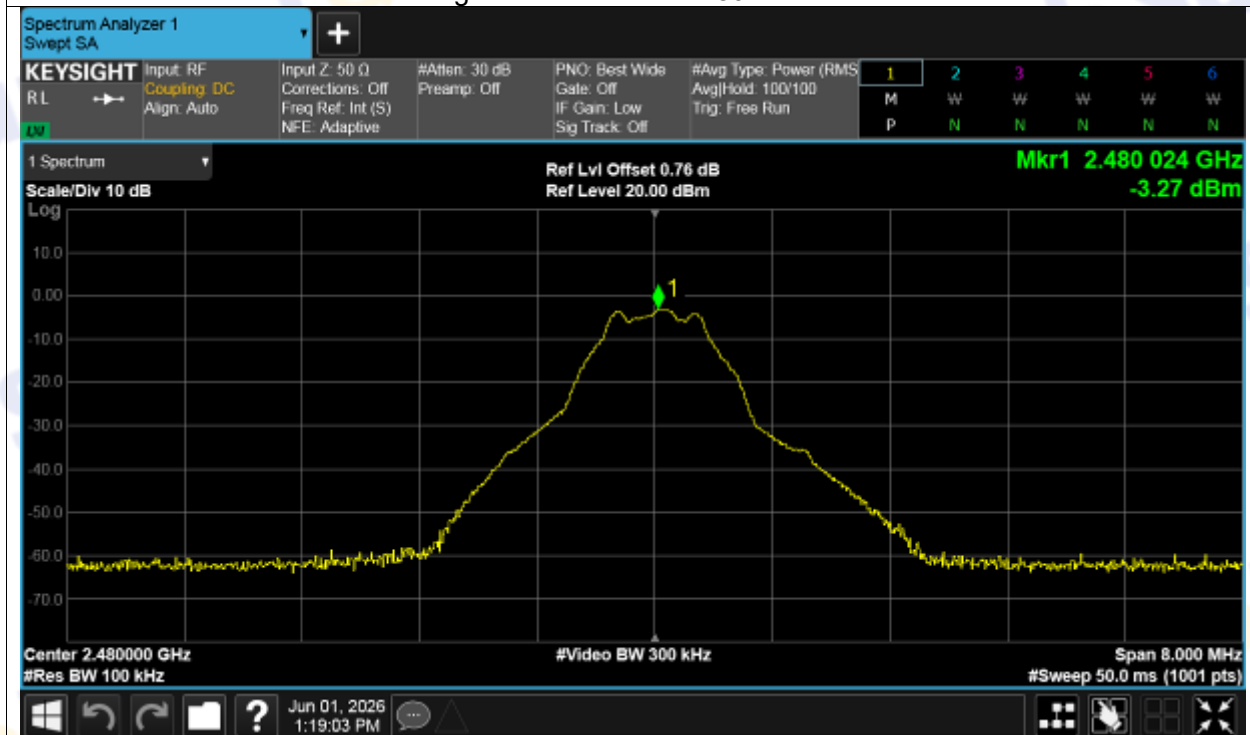
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-56.67	-20	Pass
NVNT	BLE 1M	2480	Ant1	-57.71	-20	Pass
NVNT	BLE 2M	2404	Ant1	-56.06	-20	Pass
NVNT	BLE 2M	2478	Ant1	-57.17	-20	Pass

7.6. Original test data

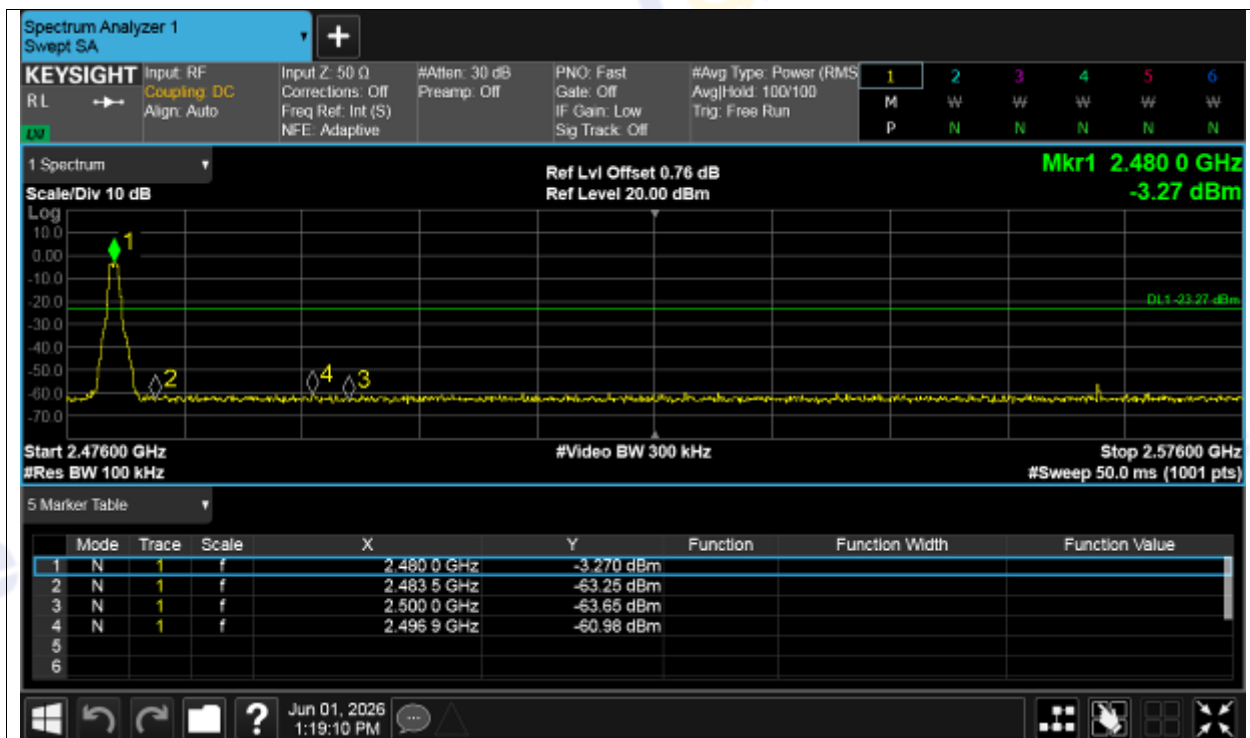




Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



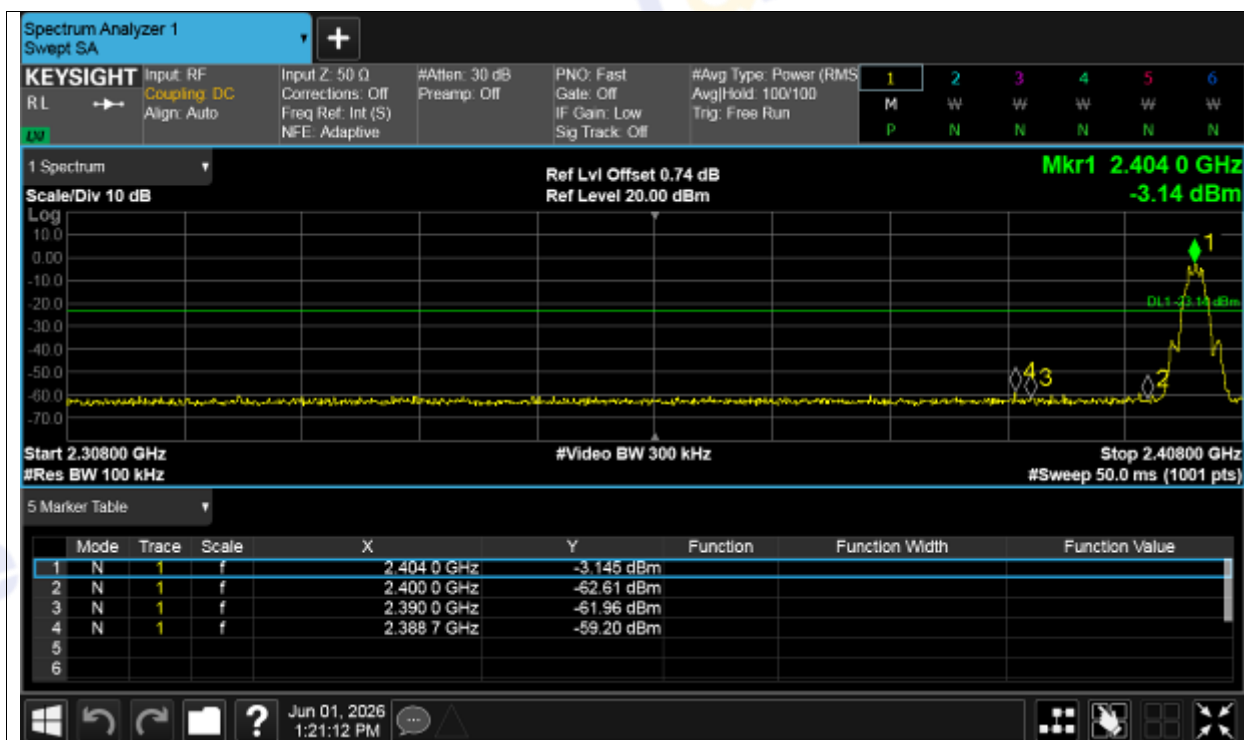
Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



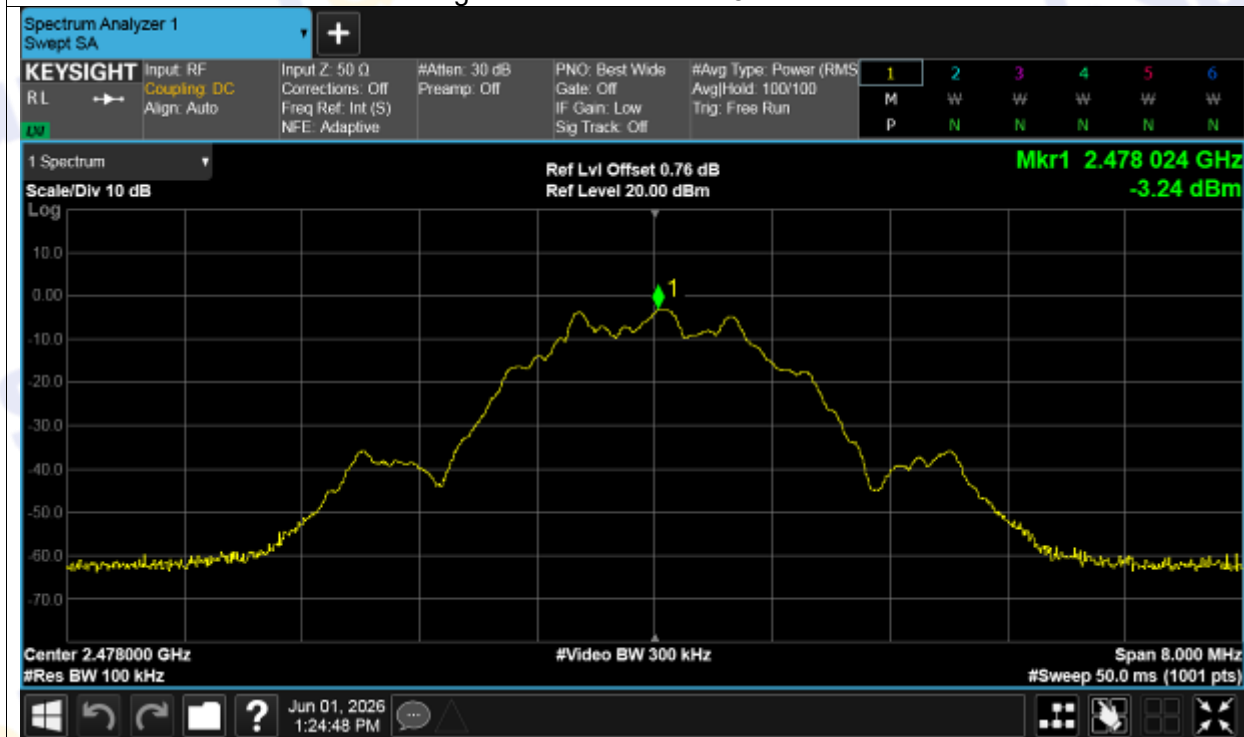
Band Edge NVNT BLE 2M 2404MHz Ant1 Ref



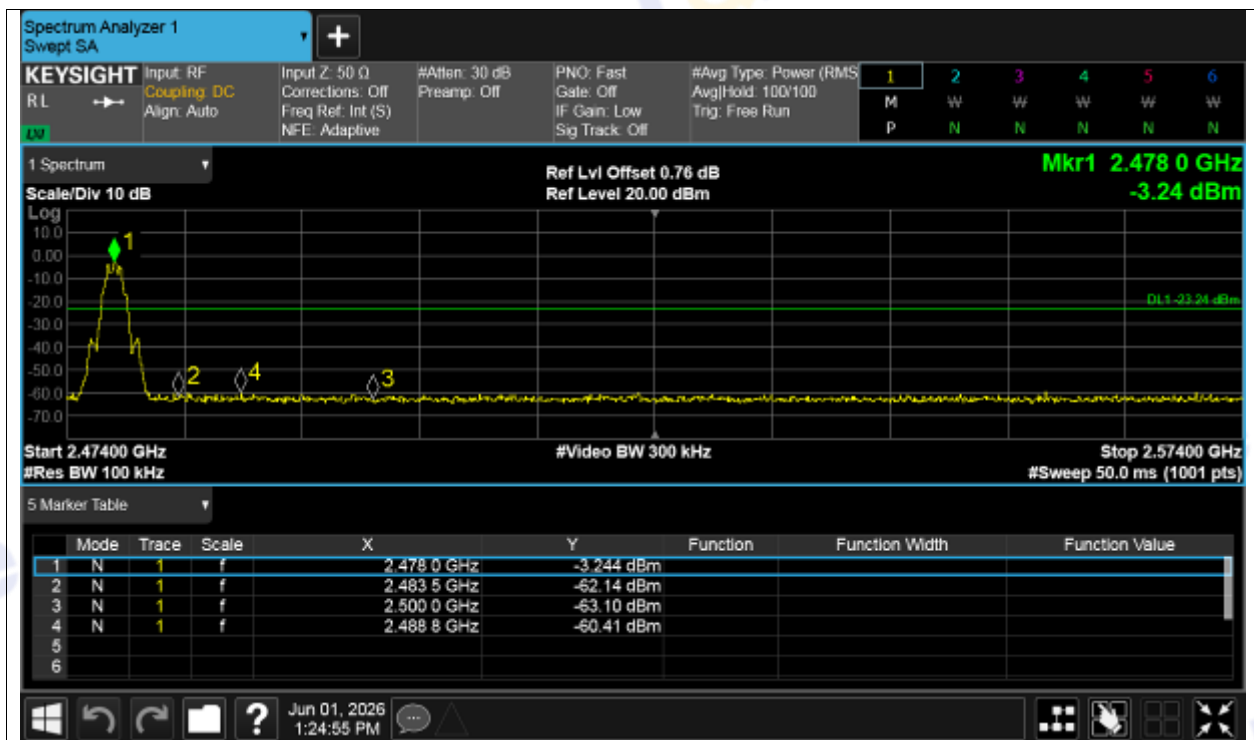
Band Edge NVNT BLE 2M 2404MHz Ant1 Emission



Band Edge NVNT BLE 2M 2478MHz Ant1 Ref



Band Edge NVNT BLE 2M 2478MHz Ant1 Emission



8. RF Conducted Spurious Emissions

8.1. General Information

Test date	Jun. 01, 2026	Test engineer	Luke Li	
Climate condition	Ambient temperature	21.7℃	Relative humidity	63.9%
	Atmospheric pressure	101.3kPa		
Test place	EMC Room 1#			

8.2. Block diagram of test setup

Same as section 4.1

8.3. Limits

FCC Part15 (15.247), Subpart C		
Section	Test Item	Limit
FCC Part 15.247 (d)	Conducted Spurious Emissions	In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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.

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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.

8.4. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	Test frequency
RBW:	100 kHz
VBW:	300 kHz
Span	Wide enough to capture the peak level of the in-band emission
Detector Mode:	Peak

Sweep time: auto

Trace mode Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW: 100 kHz

VBW: 300 kHz

Span Encompass frequency range to be measured

Number of measurement points $\geq \text{span/RBW}$

Detector Mode: Peak

Sweep time: auto

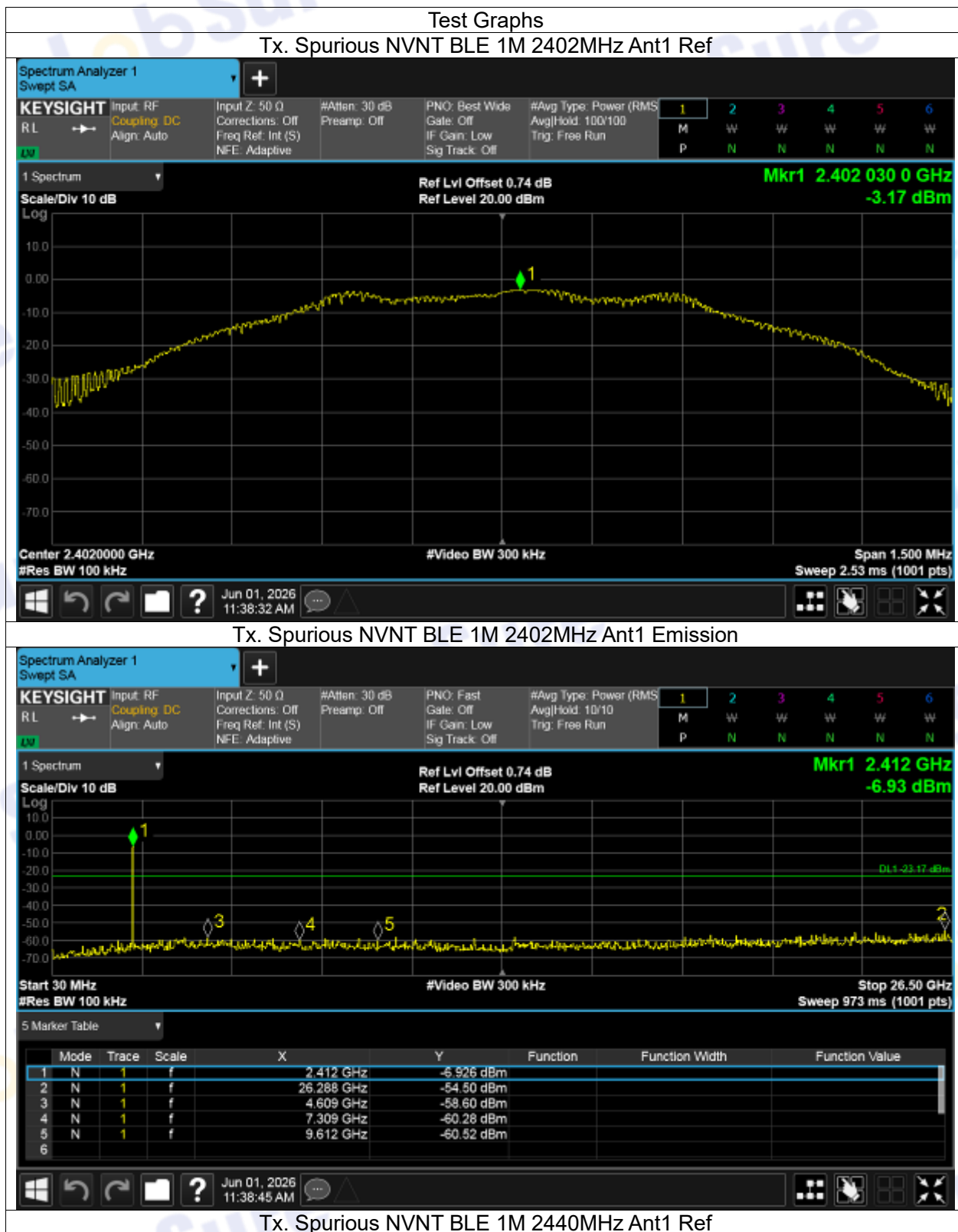
Trace mode Max hold

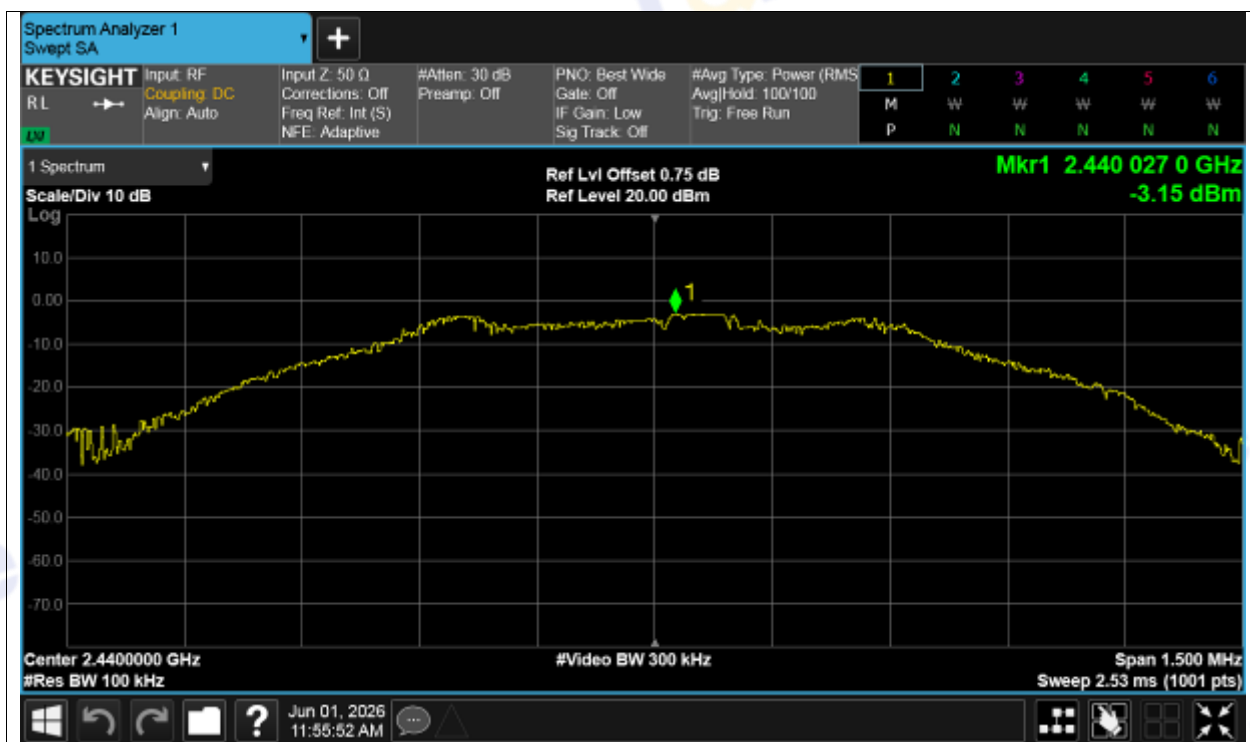
(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

8.5. Test result

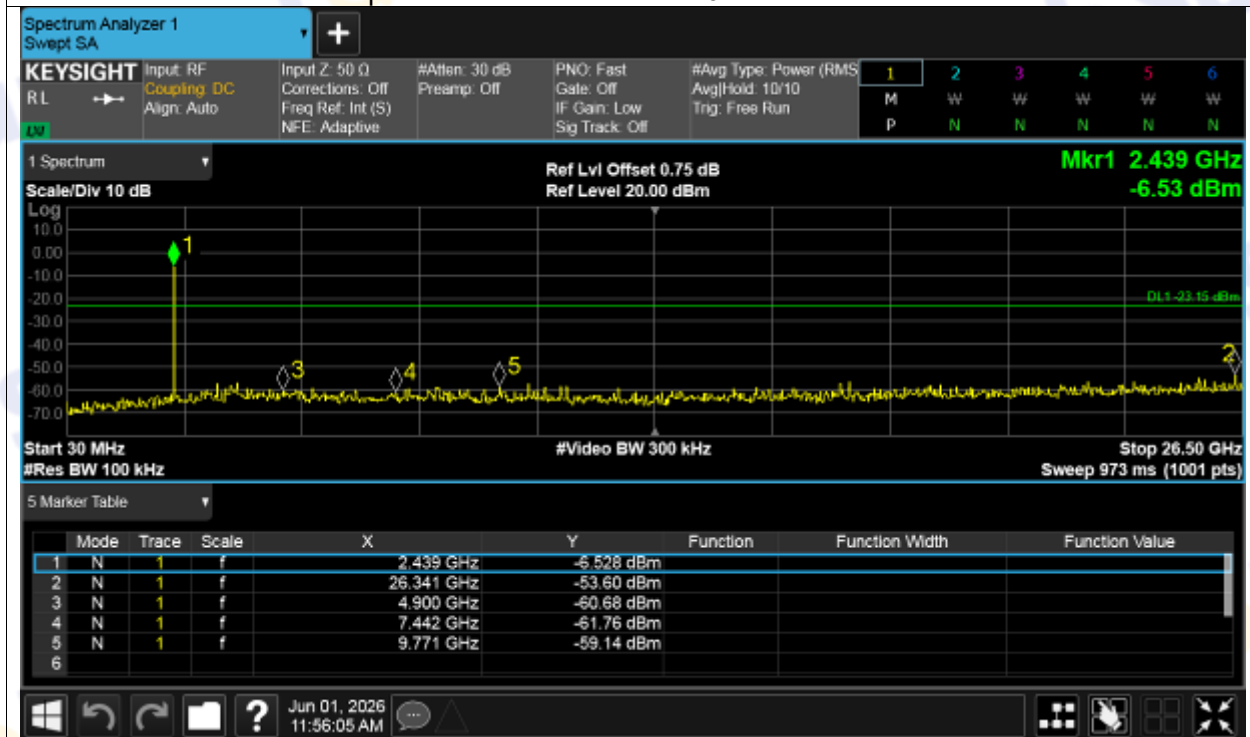
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-51.33	-20	Pass
NVNT	BLE 1M	2440	Ant1	-50.45	-20	Pass
NVNT	BLE 1M	2480	Ant1	-52.13	-20	Pass
NVNT	BLE 2M	2404	Ant1	-52.41	-20	Pass
NVNT	BLE 2M	2440	Ant1	-52.51	-20	Pass
NVNT	BLE 2M	2478	Ant1	-52.18	-20	Pass

8.6. Original test data

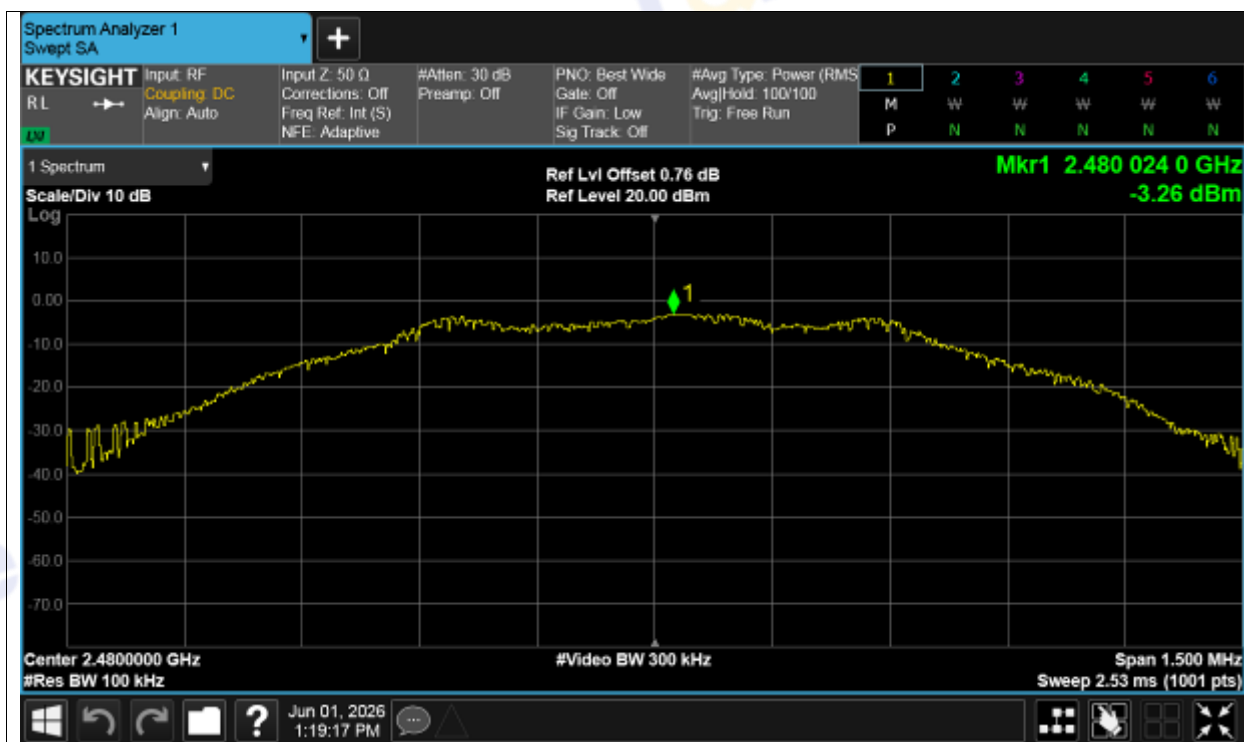




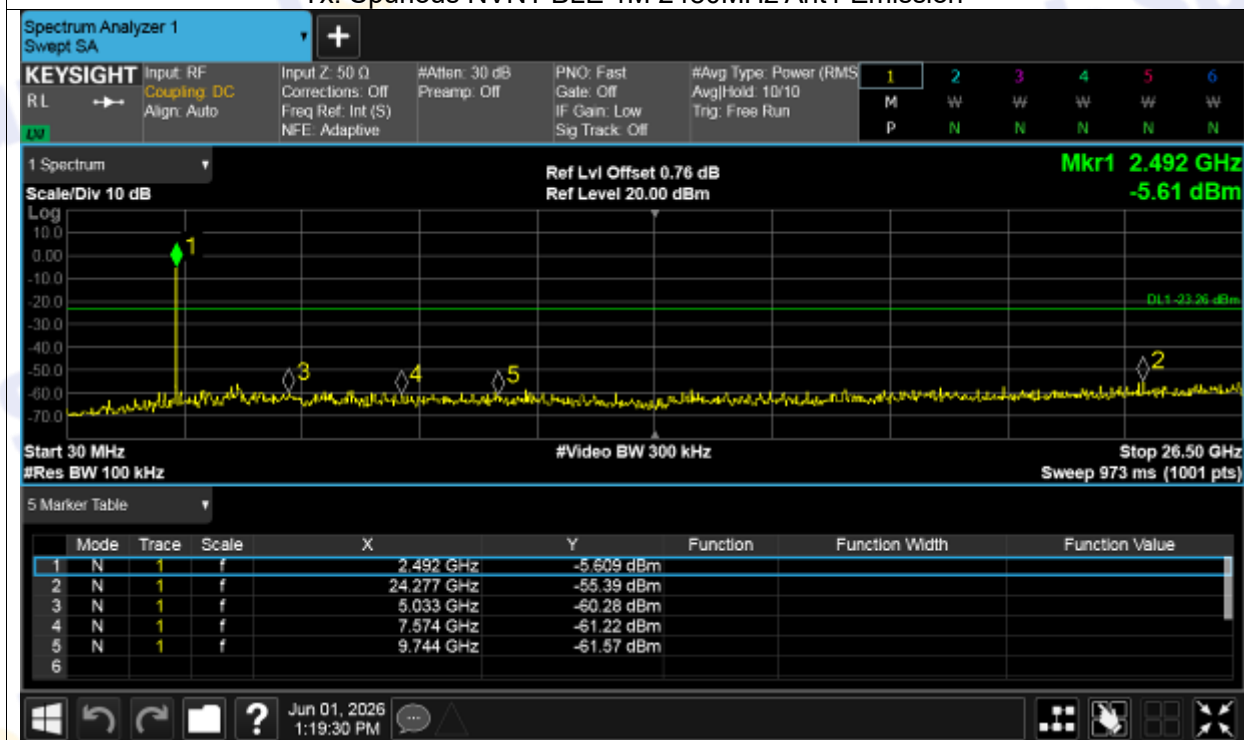
Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



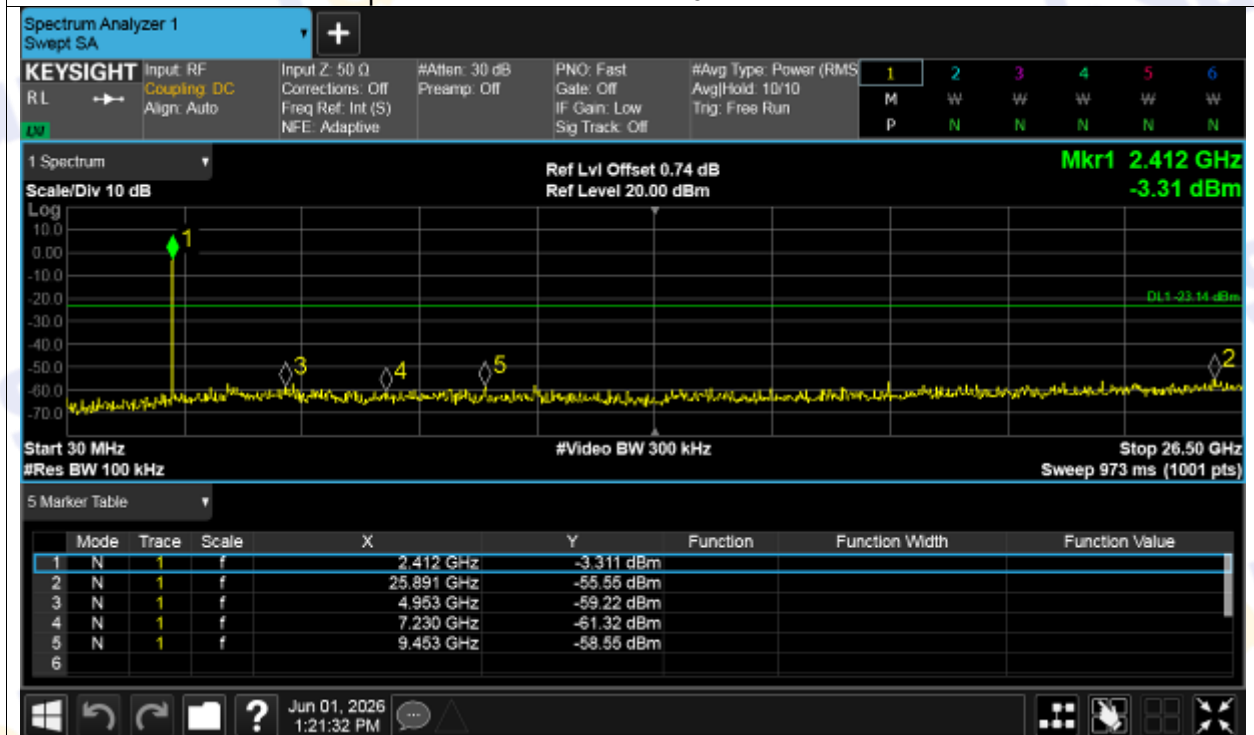
Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



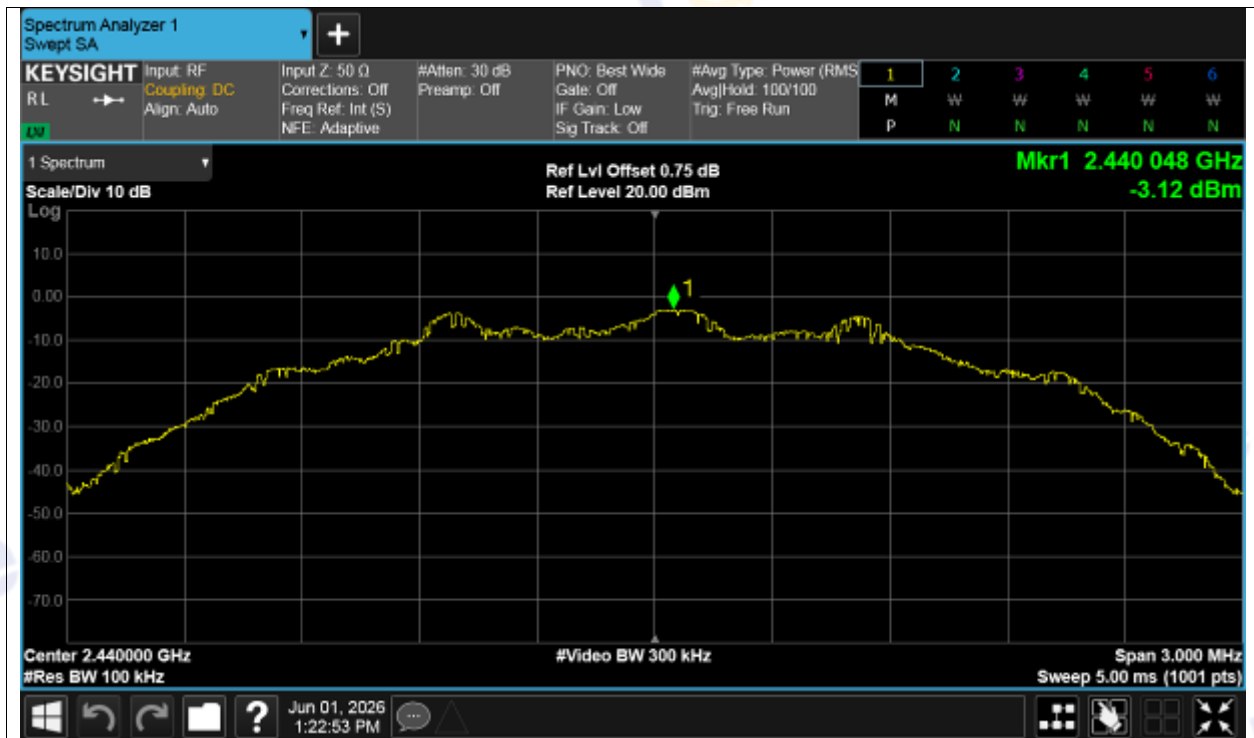
Tx. Spurious NVNT BLE 2M 2404MHz Ant1 Ref



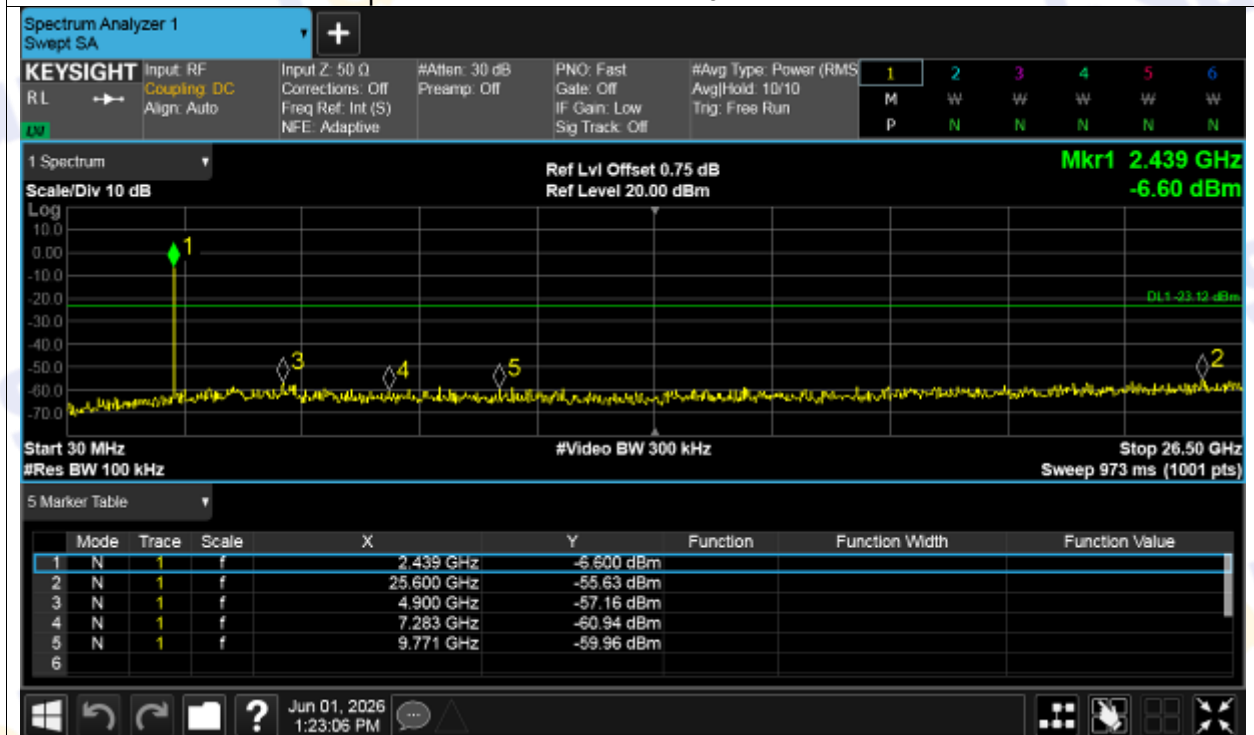
Tx. Spurious NVNT BLE 2M 2404MHz Ant1 Emission



Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Ref



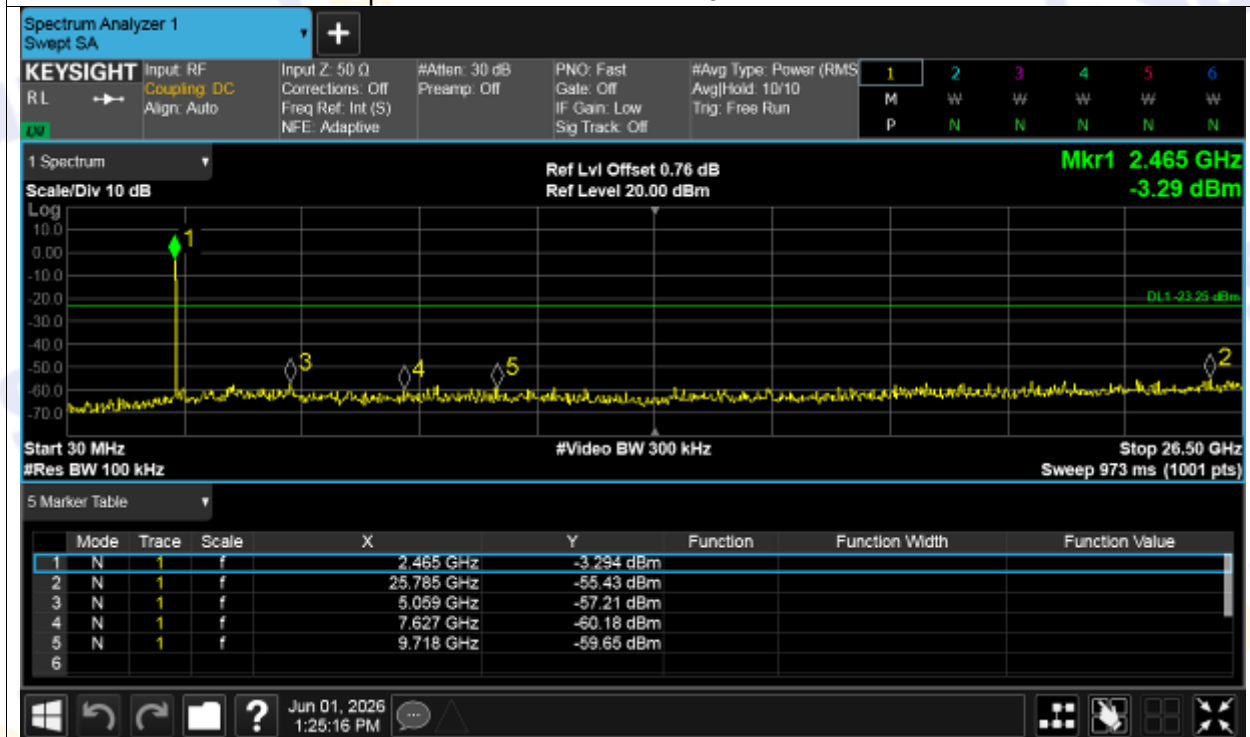
Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Emission



Tx. Spurious NVNT BLE 2M 2478MHz Ant1 Ref



Tx. Spurious NVNT BLE 2M 2478MHz Ant1 Emission



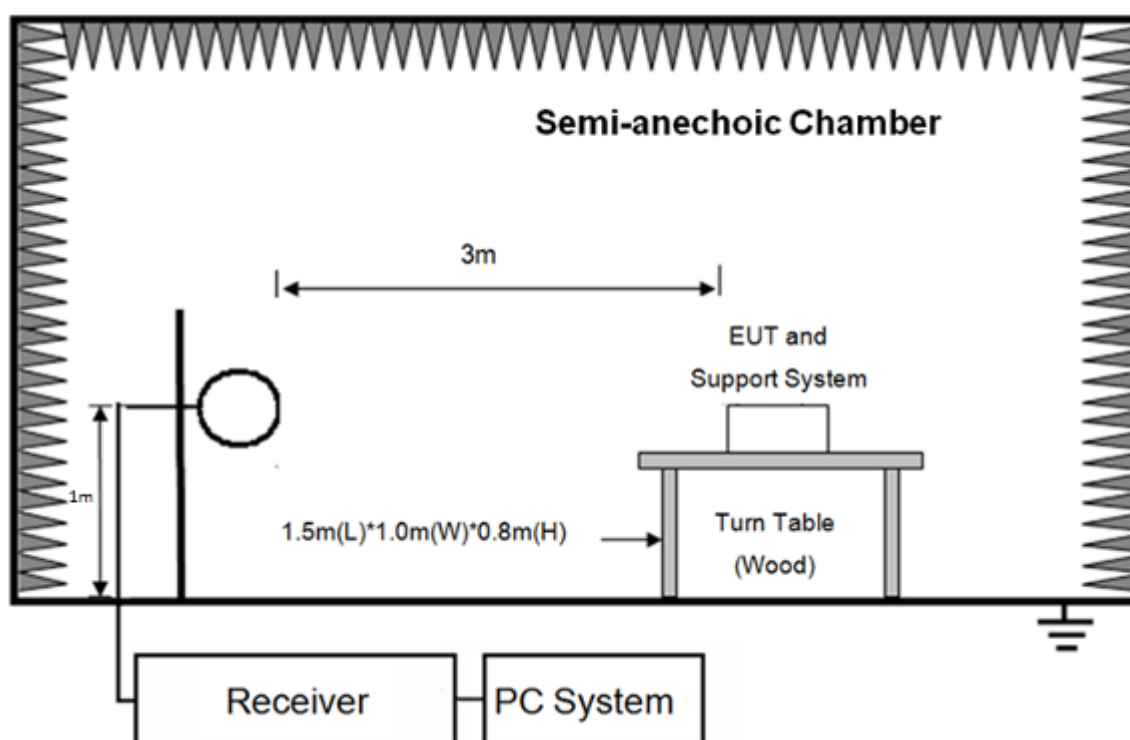
9. Radiated Emission

9.1. General Information

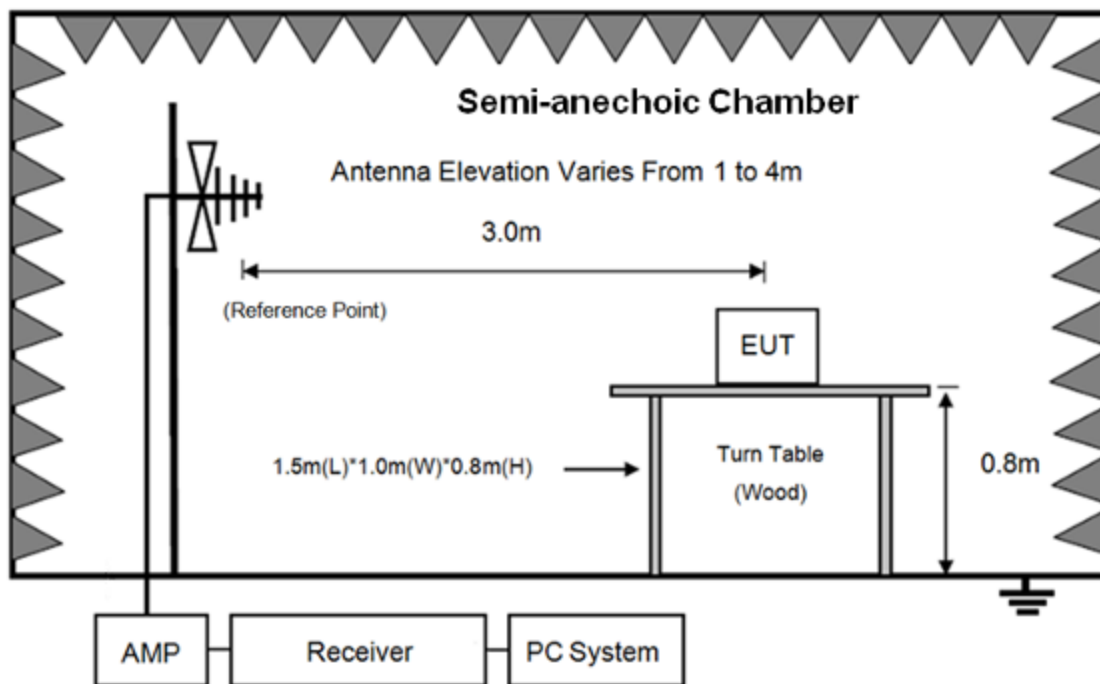
Test date	May. 27, 2026 ~ May. 31, 2026	Test engineer	Cheney Qu	
Climate condition	Ambient temperature	24.6°C	Relative humidity	48.7%
	Atmospheric pressure	101.2kPa		
Test place	EMC Room 1#			

9.2. Block diagram of test setup

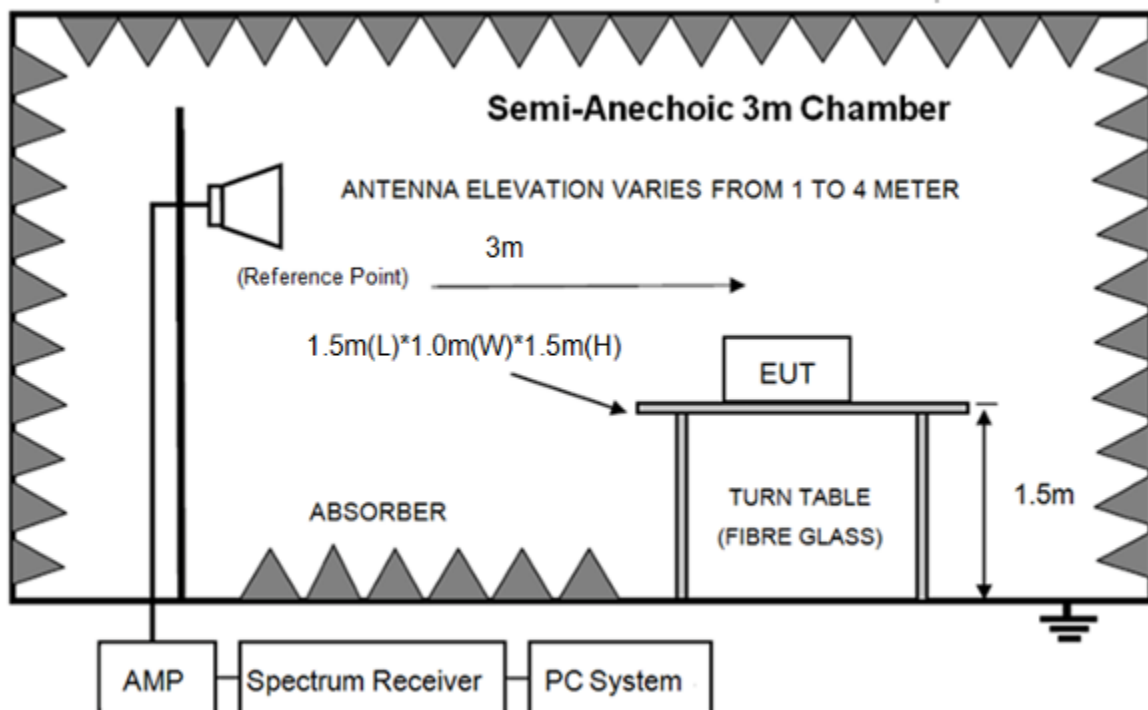
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

9.3. Limit

8.2.1 FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6

8.2.2 FCC 15.209

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3m}(\text{dBuV/m}) = \text{Limit}_{30m}(\text{dBuV/m}) + 40\text{Log}(30m/3m)$$

8.2.3 Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions or comply with 15.209 limits.

9.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 10 mm above the ground plane inside a semi-anechoic chamber for below 1 GHz and 150 cm above the ground plane inside a semi-anechoic chamber for above 1 GHz.
- (2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9 kHz - 30 MHz	Active Loop antenna	3 m
30 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz - 18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz - 40 GHz)	3 m

According ANSI C63.10:2020+CORR.1:2023 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also is positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. For measurement above 30 MHz, the Trilog Broadband Antenna or Horn Antenna was located 3 m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

- (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

- (b) Change work frequency or channel of device if practicable.

- (c) Change modulation type of device if practicable.

- (d) Change power supply range from 85% to 115% of the rated supply voltage

- (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so below final test was performed with frequency range from 30 MHz to 18 GHz.

- (4) For final emissions measurements at each frequency of interest, the EUT was rotated and the

antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024 on Radiated Emission test.

- (5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz, for emissions from 9 kHz - 90 kHz, 110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.
- (6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW

Frequency band	RBW
9 kHz - 150 kHz	200 Hz
150 kHz - 30 MHz	9 kHz
30 MHz - 1 GHz	120 kHz

- (7) For emissions above 1 GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; According ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024 clause 4.1.4.2.2 procedure for average measure.
- (8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

9.5. Test result

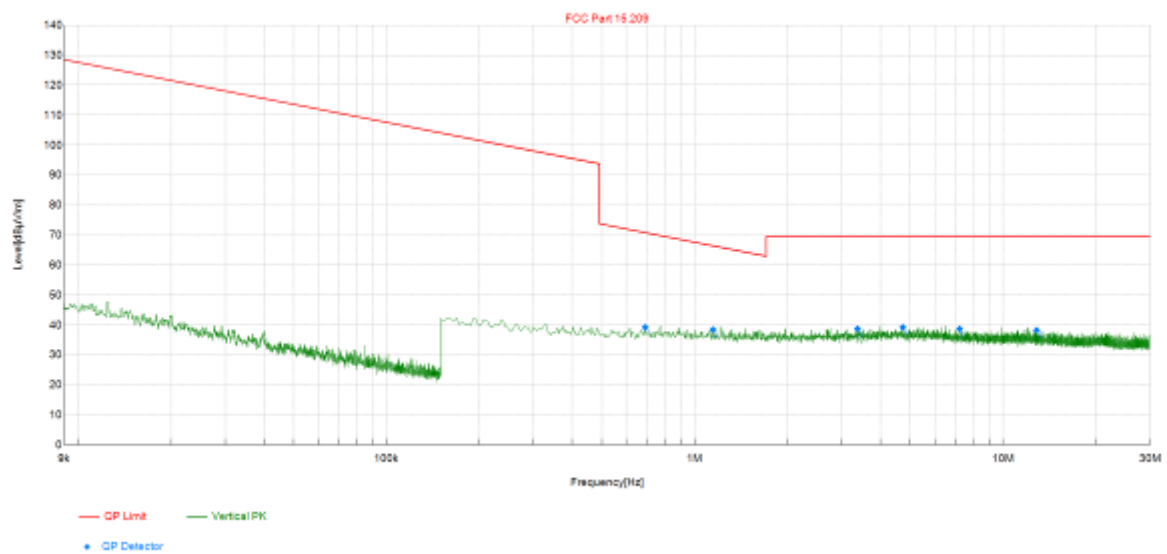
Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limit.

Note1: For emissions 9KHz to 30 MHz and 18 GHz to 26 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions 9KHz to 30 MHz and 18 GHz to 26 GHz, the final test was only performed with EUT working in the worst case 2Mbps, Tx 2440 MHz mode.

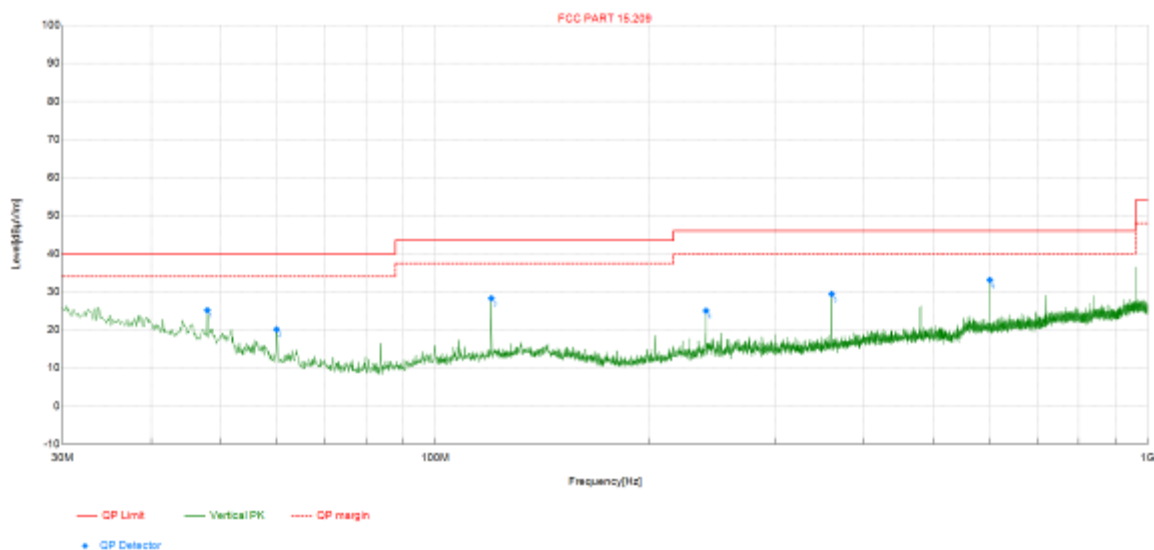
Note2: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Radiated Emission test (9Khz-30MHz)

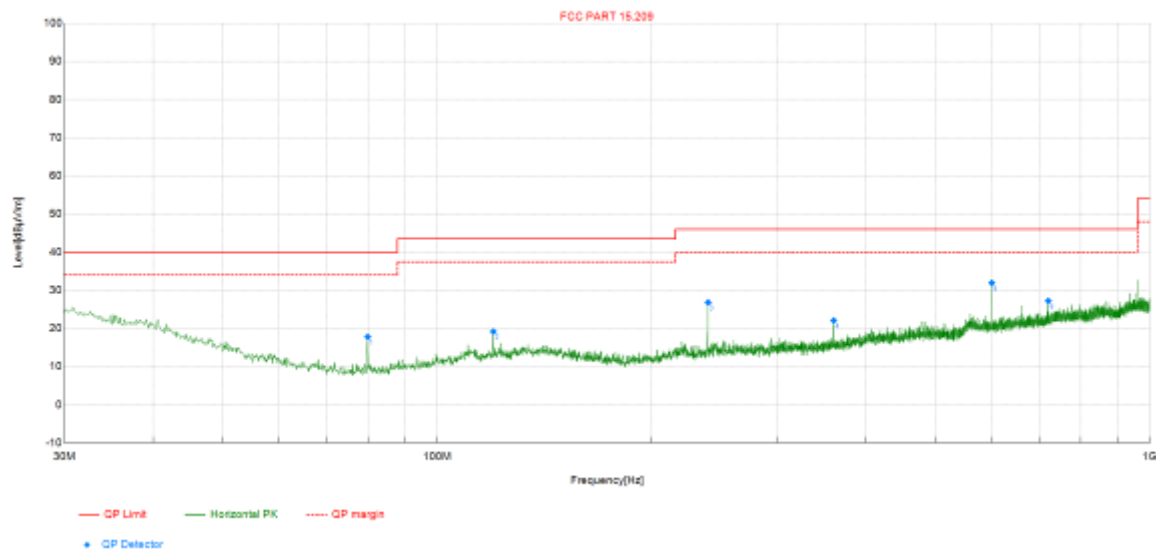


NO.	Frequency [MHz]	Factor [dB/m]	QP Reading [dBμV]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Pol	Verdict
1	0.69	20.14	19.12	39.26	70.81	31.55	V	PASS
2	1.15	20.05	18.4	38.45	66.42	27.97	V	PASS
3	3.37	20.23	18.53	38.76	69.54	30.78	V	PASS
4	4.73	20.32	18.91	39.23	69.54	30.31	V	PASS
5	7.24	20.29	18.42	38.71	69.54	30.83	V	PASS
6	12.85	20.04	18.25	38.29	69.54	31.25	V	PASS

Radiated Emission test (30MHz-1GHz)



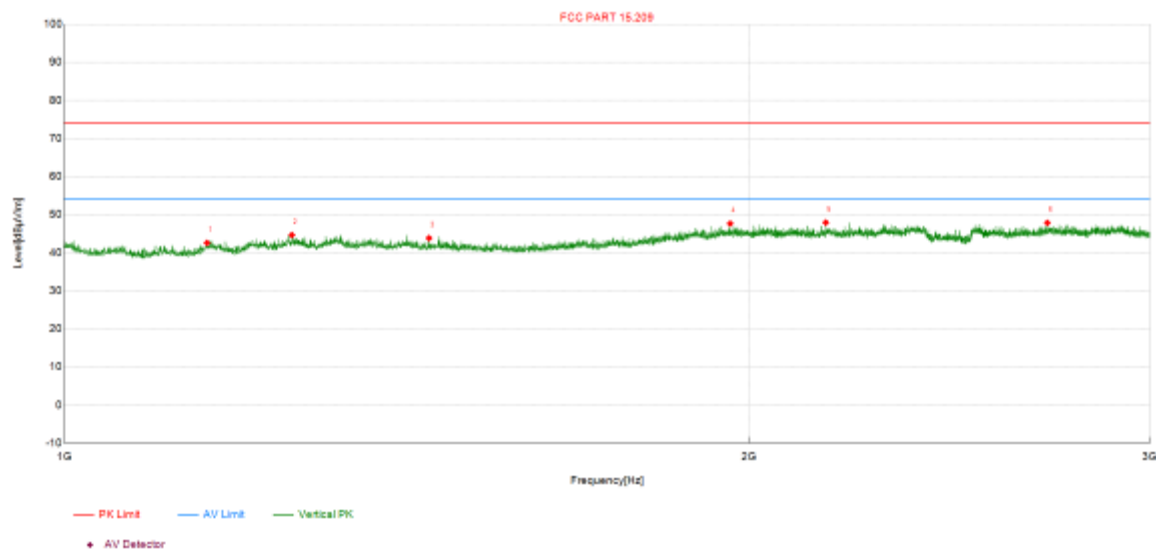
NO.	Frequency [MHz]	Factor [dB/m]	QP Reading [dBμV]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin[dB]	Pol	Verdict
1	47.95	-20.74	45.88	25.14	40.00	14.86	V	PASS
2	59.95	-25.80	45.92	20.12	40.00	19.88	V	PASS
3	119.97	-23.13	51.41	28.28	43.50	15.22	V	PASS
4	240.01	-22.05	47.06	25.01	46.00	20.99	V	PASS
5	360.04	-18.80	48.2	29.40	46.00	16.60	V	PASS
6	600.00	-12.92	46.02	33.10	46.00	12.90	V	PASS



NO.	Frequency [MHz]	Factor [dB/m]	QP Reading [dBμV]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Pol	Verdict
1	79.96	-27.63	45.45	17.82	40.00	22.18	H	PASS
2	119.97	-23.13	42.33	19.20	43.50	24.30	H	PASS
3	240.01	-22.05	48.88	26.83	46.00	19.17	H	PASS
4	360.04	-18.80	40.88	22.08	46.00	23.92	H	PASS
5	600.00	-12.92	44.88	31.96	46.00	14.04	H	PASS
6	720.03	-10.88	38.12	27.24	46.00	18.76	H	PASS

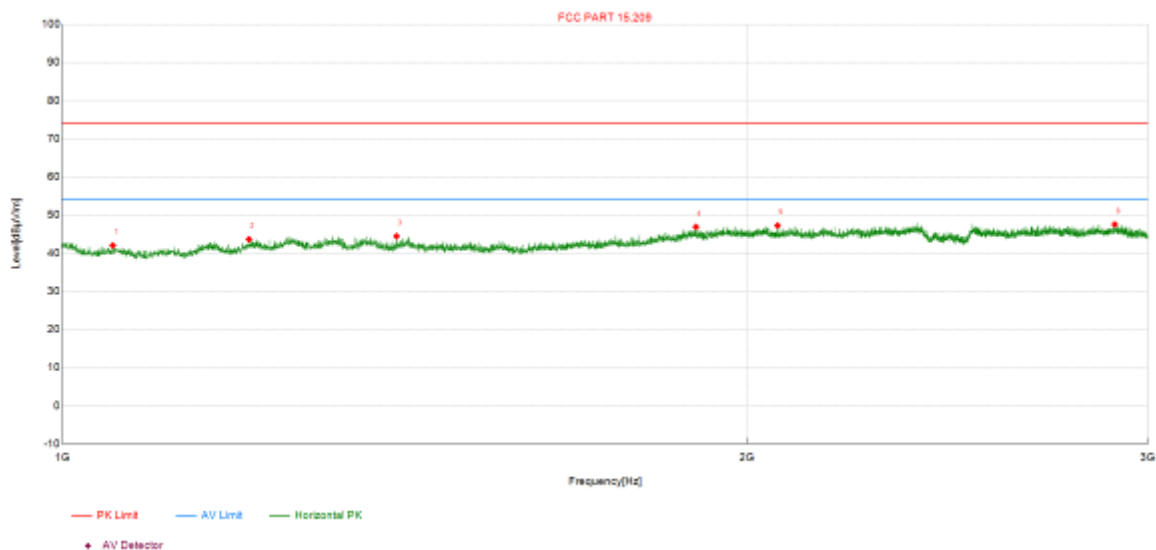
Radiated Emission test (1GHz-3GHz)

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2402MHz	Vertical



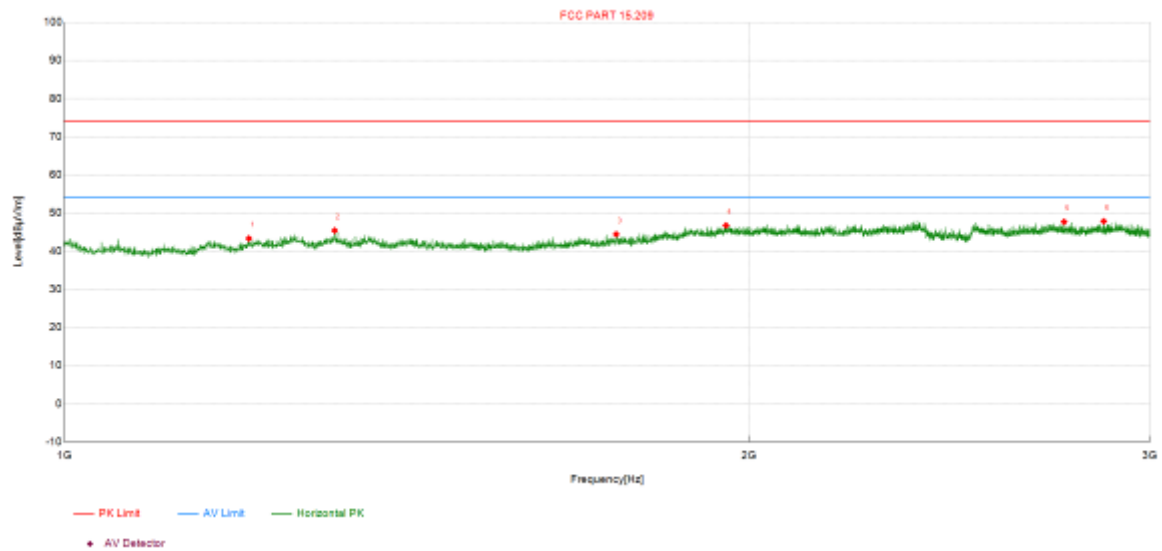
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1155.50	57.41	42.58	-14.83	74.00	31.42	PK	V	PASS
2	1259.00	57.63	44.64	-12.99	74.00	29.36	PK	V	PASS
3	1446.50	57.78	43.84	-13.94	74.00	30.16	PK	V	PASS
4	1961.75	57.66	47.65	-10.01	74.00	26.35	PK	V	PASS
5	2161.00	57.61	47.93	-9.68	74.00	26.07	PK	V	PASS
6	2704.00	56.27	47.84	-8.43	74.00	26.16	PK	V	PASS

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2402MHz	Horizontal



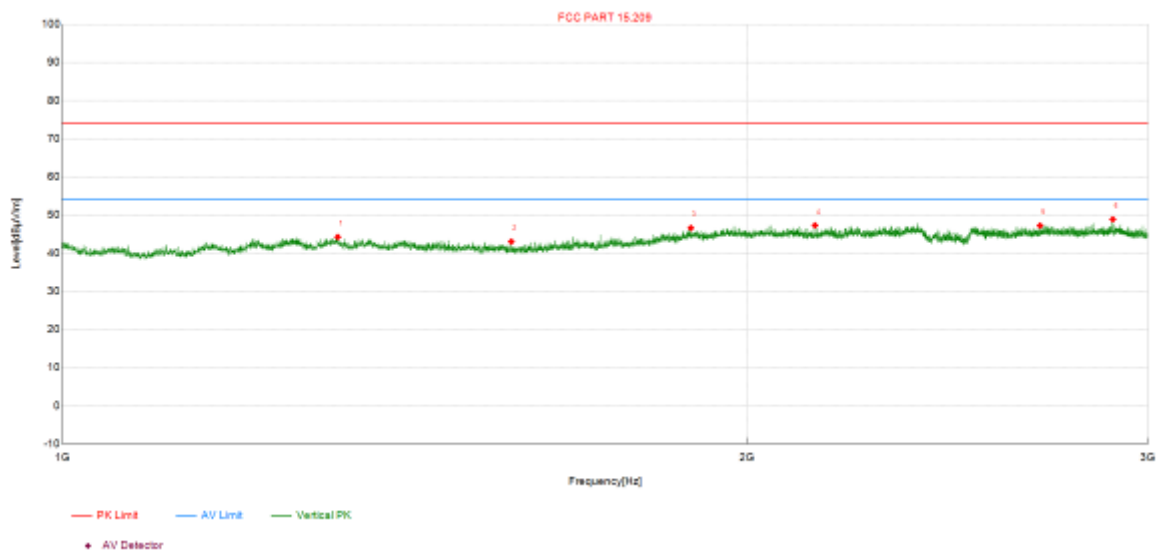
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1052.50	58.07	42.02	-16.05	74.00	31.98	PK	H	PASS
2	1208.00	57.79	43.64	-14.15	74.00	30.36	PK	H	PASS
3	1402.50	57.93	44.45	-13.48	74.00	29.55	PK	H	PASS
4	1898.75	57.37	46.89	-10.48	74.00	27.11	PK	H	PASS
5	2062.25	57.00	47.24	-9.76	74.00	26.76	PK	H	PASS
6	2900.75	55.36	47.54	-7.82	74.00	26.46	PK	H	PASS

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2440MHz	Vertical



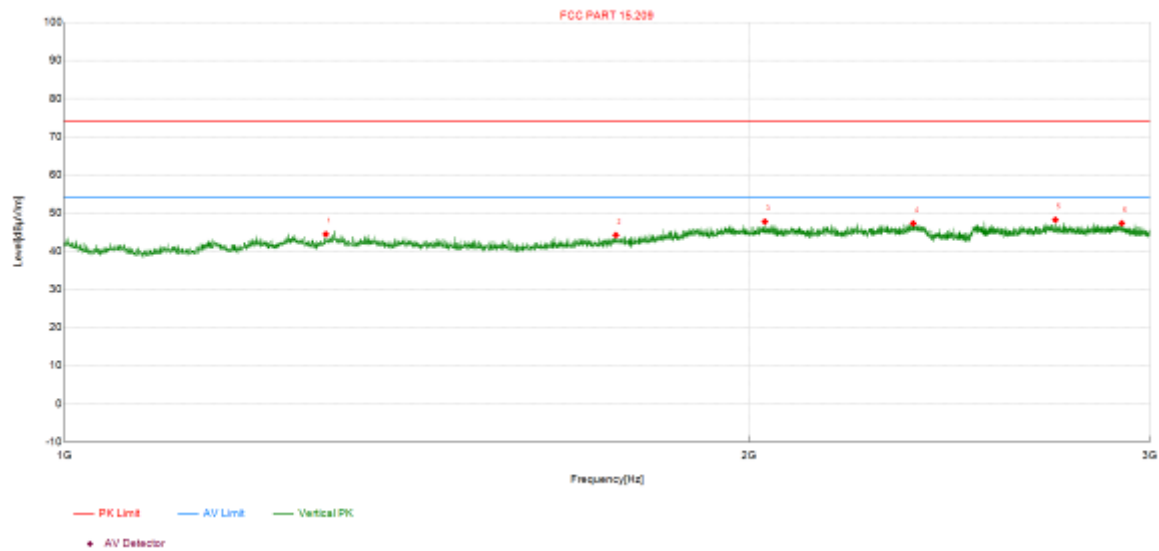
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1205.50	57.55	43.33	-14.22	74.00	30.67	PK	V	PASS
2	1314.75	58.30	45.42	-12.88	74.00	28.58	PK	V	PASS
3	1748.00	57.43	44.44	-12.99	74.00	29.56	PK	V	PASS
4	1953.50	56.81	46.75	-10.06	74.00	27.25	PK	V	PASS
5	2750.25	56.07	47.69	-8.38	74.00	26.31	PK	V	PASS
6	2862.75	56.02	47.85	-8.17	74.00	26.15	PK	V	PASS

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2440MHz	Horizontal



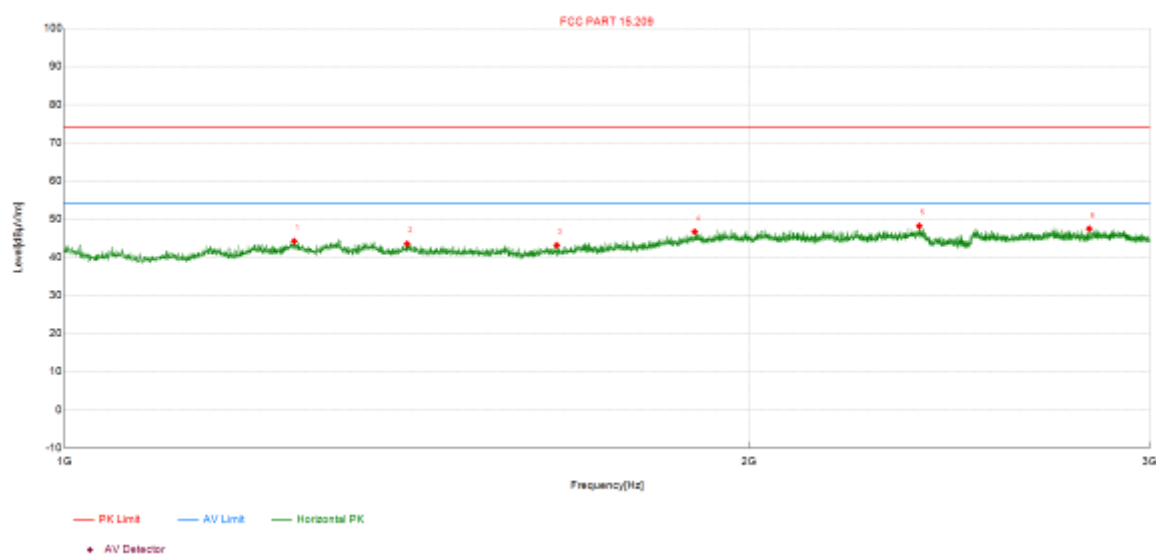
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1321.50	57.17	44.24	-12.93	74.00	29.76	PK	H	PASS
2	1575.25	57.58	43.03	-14.55	74.00	30.97	PK	H	PASS
3	1889.00	57.23	46.60	-10.63	74.00	27.40	PK	H	PASS
4	2141.75	57.00	47.29	-9.71	74.00	26.71	PK	H	PASS
5	2689.50	55.81	47.22	-8.59	74.00	26.78	PK	H	PASS
6	2895.00	56.72	48.87	-7.85	74.00	25.13	PK	H	PASS

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2480MHz	Vertical



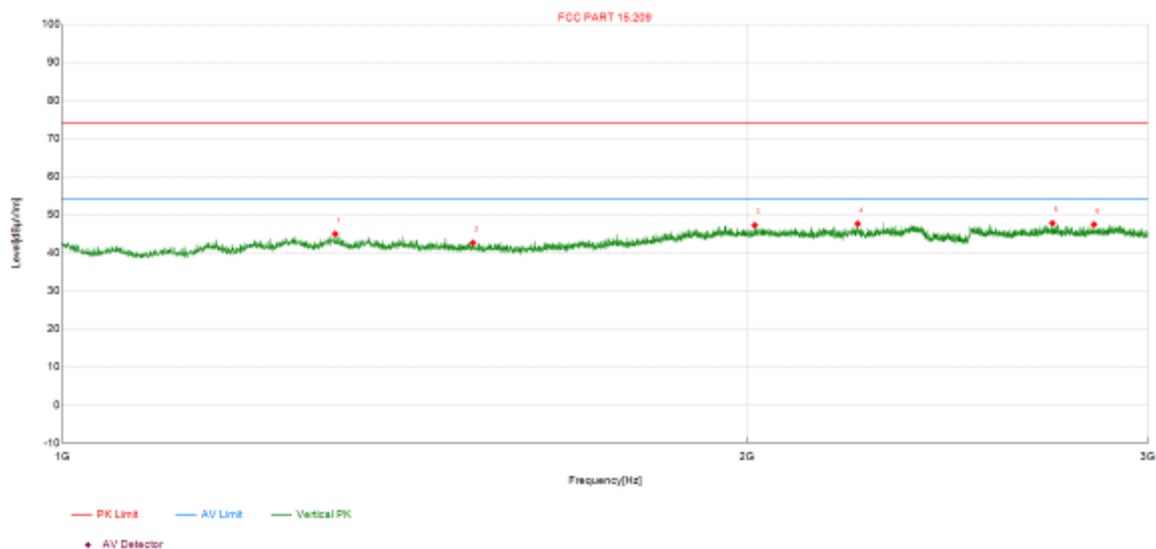
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1303.00	57.25	44.45	-12.80	74.00	29.55	PK	V	PASS
2	1747.50	57.20	44.21	-12.99	74.00	29.79	PK	V	PASS
3	2031.75	57.51	47.74	-9.77	74.00	26.26	PK	V	PASS
4	2360.75	56.06	47.28	-8.78	74.00	26.72	PK	V	PASS
5	2726.00	56.62	48.21	-8.41	74.00	25.79	PK	V	PASS
6	2915.50	55.28	47.31	-7.97	74.00	26.69	PK	V	PASS

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2480MHz	Horizontal



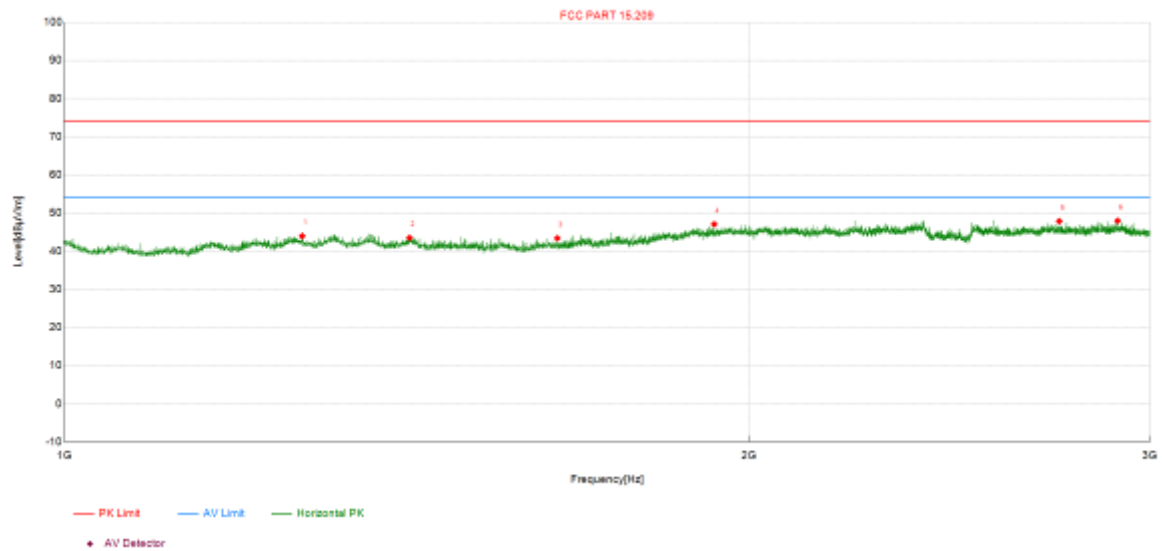
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1262.00	57.16	44.19	-12.97	74.00	29.81	PK	H	PASS
2	1414.75	57.10	43.48	-13.62	74.00	30.52	PK	H	PASS
3	1646.00	57.06	43.13	-13.93	74.00	30.87	PK	H	PASS
4	1892.50	57.22	46.65	-10.57	74.00	27.35	PK	H	PASS
5	2375.25	56.81	48.17	-8.64	74.00	25.83	PK	H	PASS
6	2821.00	55.93	47.47	-8.46	74.00	26.53	PK	H	PASS

Mode	Test channel	Ant. Pol.
BLE-2Mbps	2404MHz	Vertical



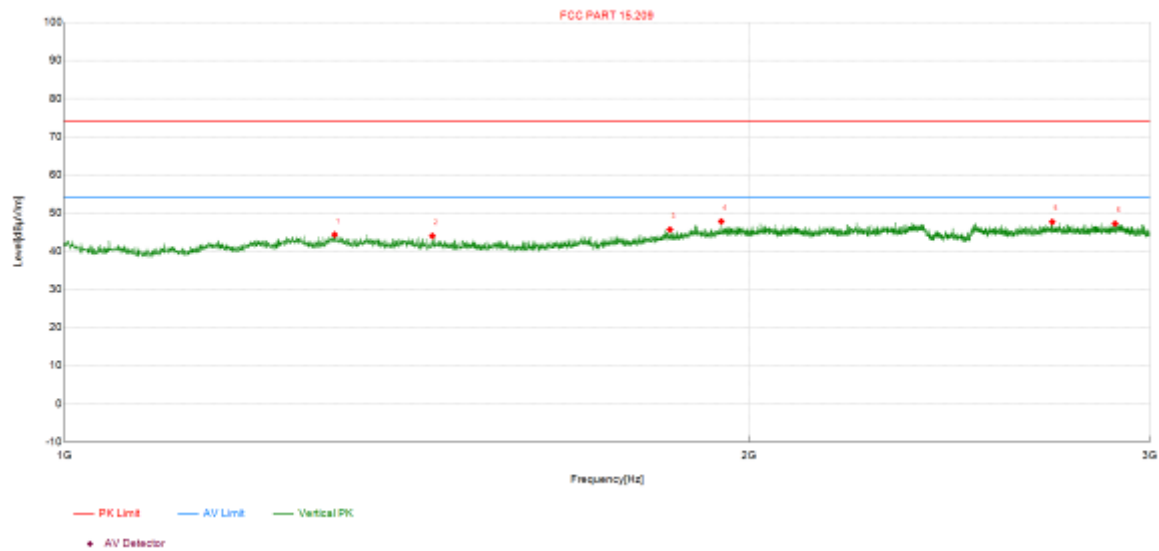
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1318.00	57.84	44.93	-12.91	74.00	29.07	PK	V	PASS
2	1515.25	56.87	42.60	-14.27	74.00	31.40	PK	V	PASS
3	2015.00	56.99	47.22	-9.77	74.00	26.78	PK	V	PASS
4	2236.50	57.01	47.60	-9.41	74.00	26.40	PK	V	PASS
5	2723.50	56.15	47.73	-8.42	74.00	26.27	PK	V	PASS
6	2840.50	55.76	47.42	-8.34	74.00	26.58	PK	V	PASS

Mode	Test channel	Ant. Pol.
BLE-2Mbps	2404MHz	Horizontal



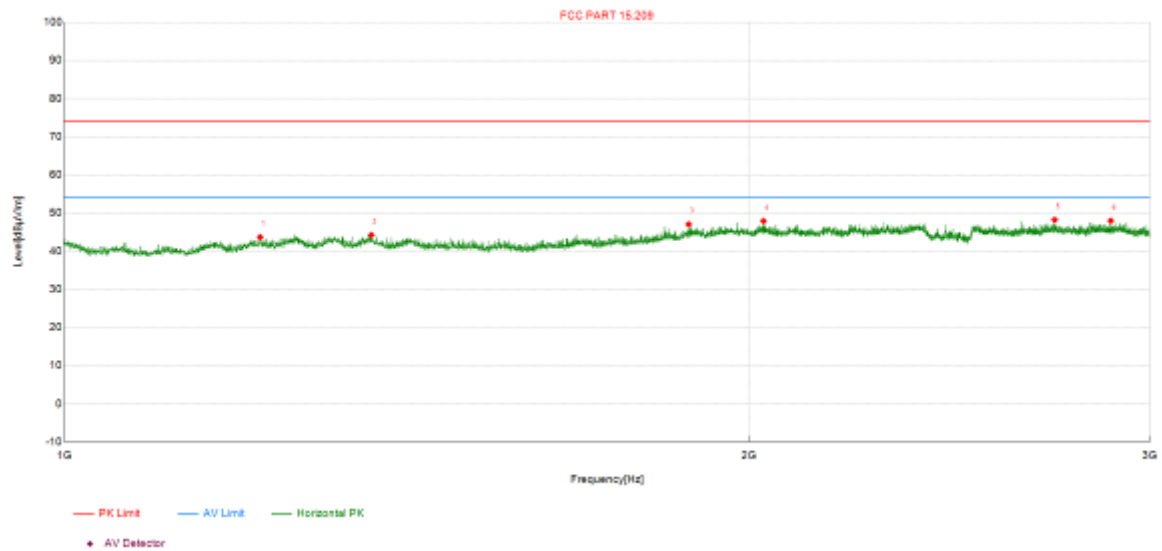
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1272.25	56.89	43.96	-12.93	74.00	30.04	PK	H	PASS
2	1418.25	57.15	43.49	-13.66	74.00	30.51	PK	H	PASS
3	1647.00	57.32	43.40	-13.92	74.00	30.60	PK	H	PASS
4	1930.25	57.31	47.07	-10.24	74.00	26.93	PK	H	PASS
5	2736.75	56.24	47.85	-8.39	74.00	26.15	PK	H	PASS
6	2903.25	55.82	47.98	-7.84	74.00	26.02	PK	H	PASS

Mode	Test channel	Ant. Pol.
BLE-2Mbps	2440MHz	Vertical



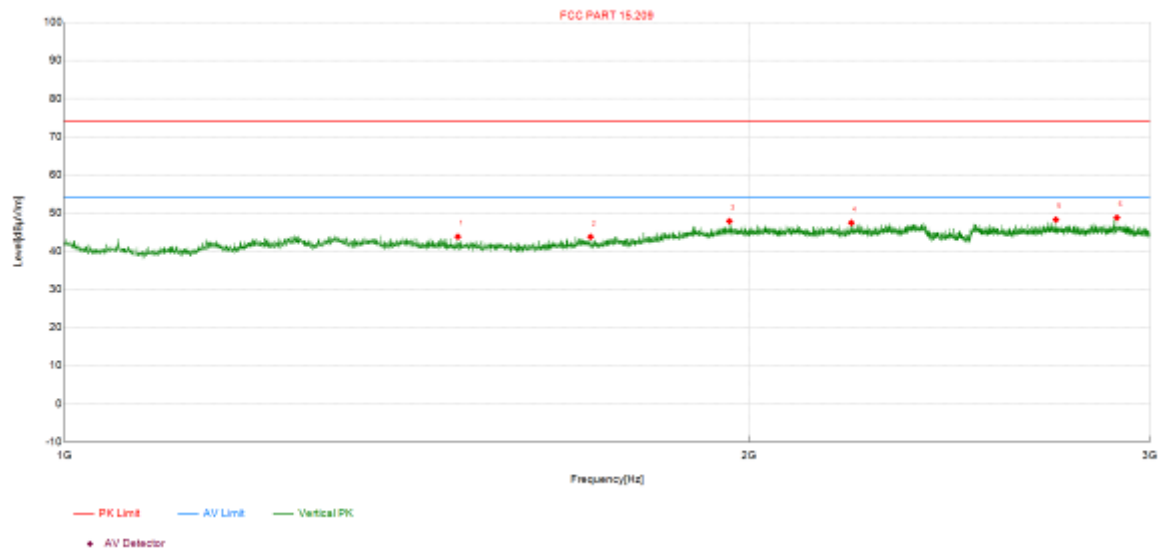
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1314.75	57.22	44.34	-12.88	74.00	29.66	PK	V	PASS
2	1451.25	57.98	43.99	-13.99	74.00	30.01	PK	V	PASS
3	1845.75	56.98	45.66	-11.32	74.00	28.34	PK	V	PASS
4	1944.00	57.93	47.80	-10.13	74.00	26.20	PK	V	PASS
5	2717.50	56.09	47.67	-8.42	74.00	26.33	PK	V	PASS
6	2895.75	55.07	47.22	-7.85	74.00	26.78	PK	V	PASS

Mode	Test channel	Ant. Pol.
BLE-2Mbps	2440MHz	Horizontal



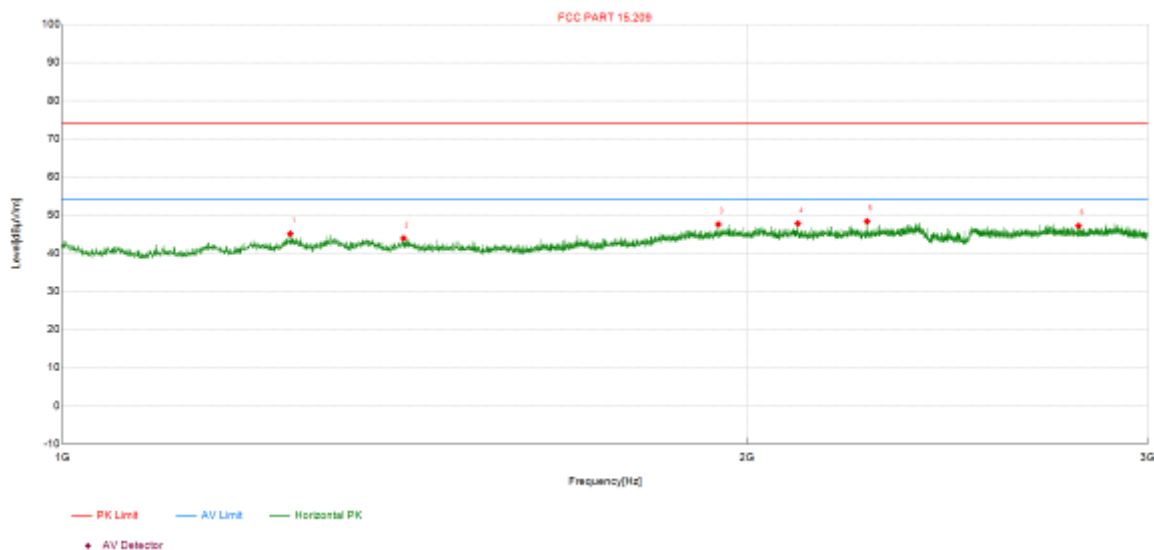
NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1219.25	57.52	43.67	-13.85	74.00	30.33	PK	H	PASS
2	1364.50	57.45	44.23	-13.22	74.00	29.77	PK	H	PASS
3	1881.00	57.80	47.05	-10.75	74.00	26.95	PK	H	PASS
4	2029.00	57.69	47.91	-9.78	74.00	26.09	PK	H	PASS
5	2724.00	56.63	48.22	-8.41	74.00	25.78	PK	H	PASS
6	2883.25	55.95	47.98	-7.97	74.00	26.02	PK	H	PASS

Mode	Test channel	Ant. Pol.
BLE-2Mbps	2478MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1489.25	57.91	43.79	-14.12	74.00	30.21	PK	V	PASS
2	1703.25	57.05	43.76	-13.29	74.00	30.24	PK	V	PASS
3	1960.25	57.89	47.87	-10.02	74.00	26.13	PK	V	PASS
4	2217.50	56.96	47.44	-9.52	74.00	26.56	PK	V	PASS
5	2727.50	56.67	48.26	-8.41	74.00	25.74	PK	V	PASS
6	2901.00	56.60	48.78	-7.82	74.00	25.22	PK	V	PASS

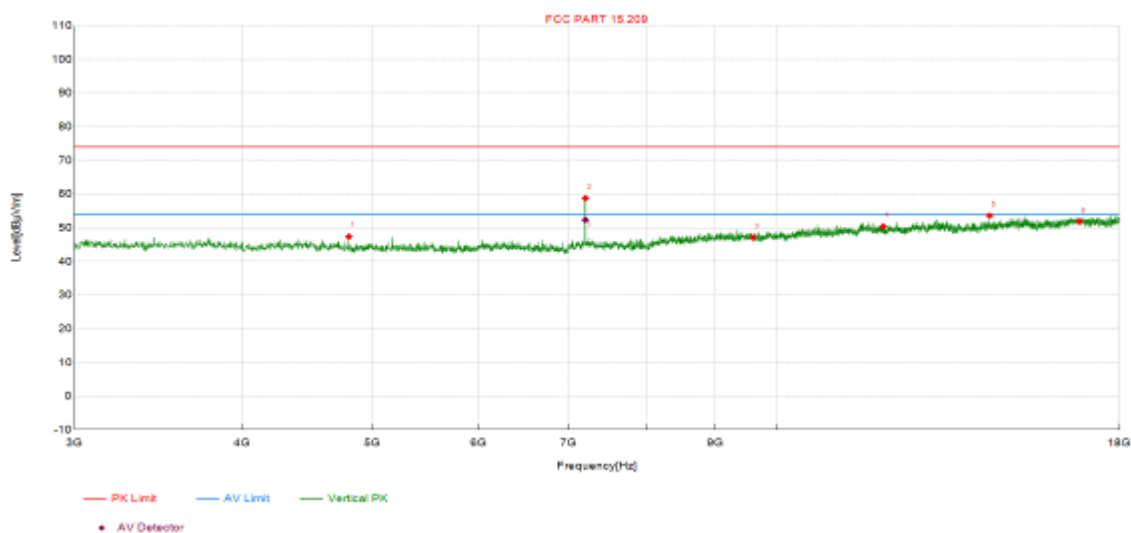
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2478MHz	Horizontal



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	1259.50	58.06	45.07	-12.99	74.00	28.93	PK	H	PASS
2	1412.50	57.49	43.90	-13.59	74.00	30.10	PK	H	PASS
3	1942.25	57.69	47.55	-10.14	74.00	26.45	PK	H	PASS
4	2105.00	57.46	47.76	-9.70	74.00	26.24	PK	H	PASS
5	2257.75	57.65	48.34	-9.31	74.00	25.66	PK	H	PASS
6	2796.50	55.72	47.15	-8.57	74.00	26.85	PK	H	PASS

Radiated Emission test (3GHz-18GHz)

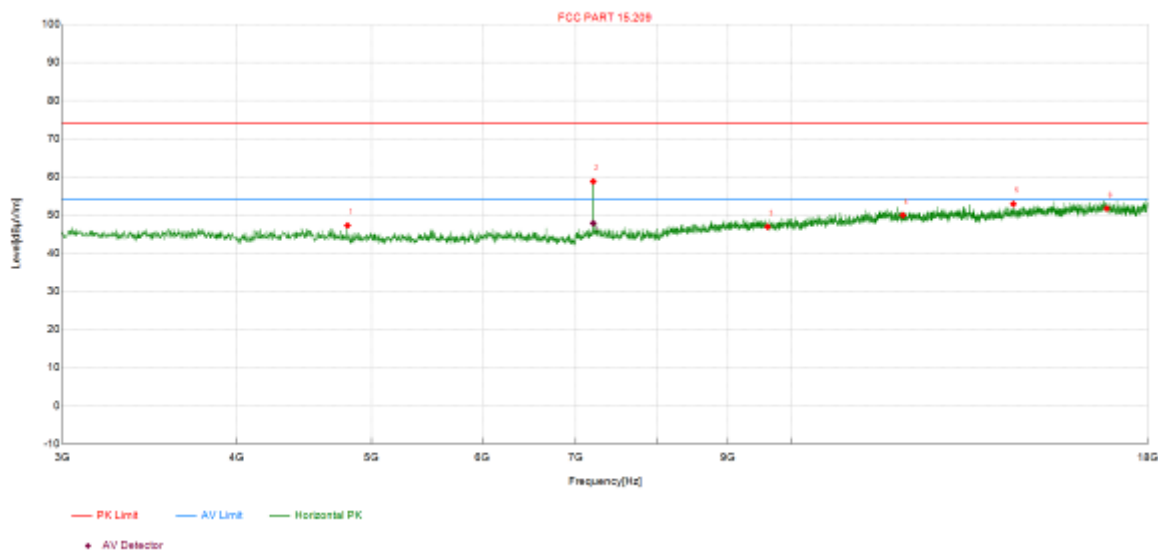
Mode	Test channel	Ant. Pol.
BLE-1Mbps	2402MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4803.75	54.04	47.38	-6.66	74.00	26.62	PK	V	PASS
2	7206.00	62.61	58.80	-3.81	74.00	15.20	PK	V	PASS
3	9608.00	47.74	47.11	-0.63	74.00	26.89	PK	V	PASS
4	12010.00	47.42	50.43	3.01	74.00	23.57	PK	V	PASS
5	14412.00	48.14	53.62	5.48	74.00	20.38	PK	V	PASS
6	16814.00	42.40	51.87	9.47	74.00	20.13	PK	V	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7206.00	-3.81	56.19	52.38	54.00	1.62	V	PASS

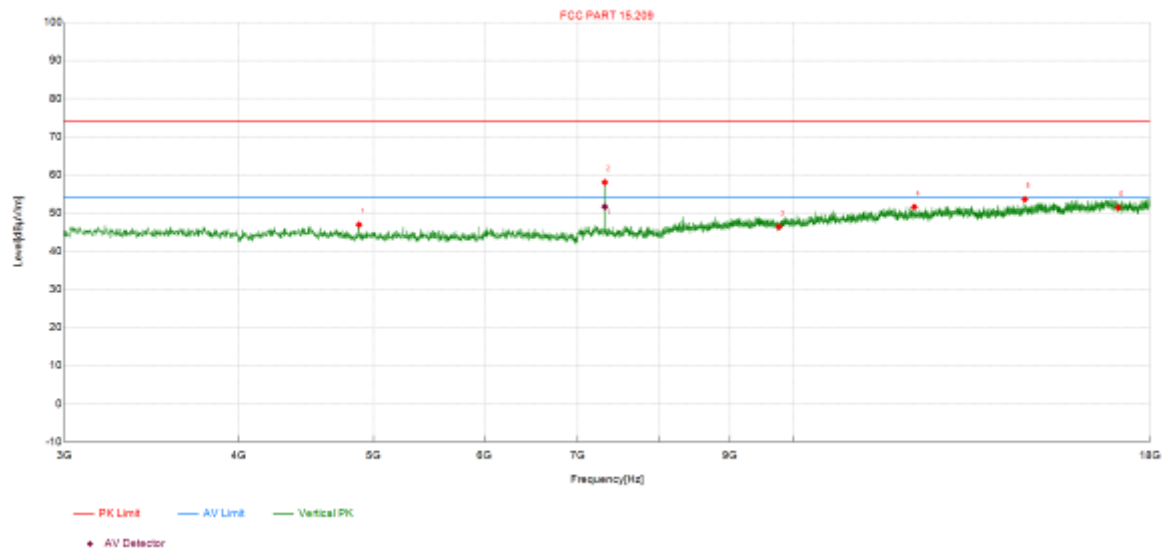
Mode	Test channel	Ant. Pol.
BLE-1Mbps	2402MHz	Horizontal



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4803.75	53.92	47.26	-6.66	74.00	26.74	PK	H	PASS
2	7206.00	62.61	58.80	-3.81	74.00	15.20	PK	H	PASS
3	9608.00	47.56	46.93	-0.63	74.00	27.07	PK	H	PASS
4	12010.00	46.96	49.97	3.01	74.00	24.03	PK	H	PASS
5	14412.00	47.41	52.89	5.48	74.00	21.11	PK	H	PASS
6	16814.00	42.24	51.71	9.47	74.00	21.49	PK	H	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7206.00	-3.81	51.66	47.85	54.00	6.15	H	PASS

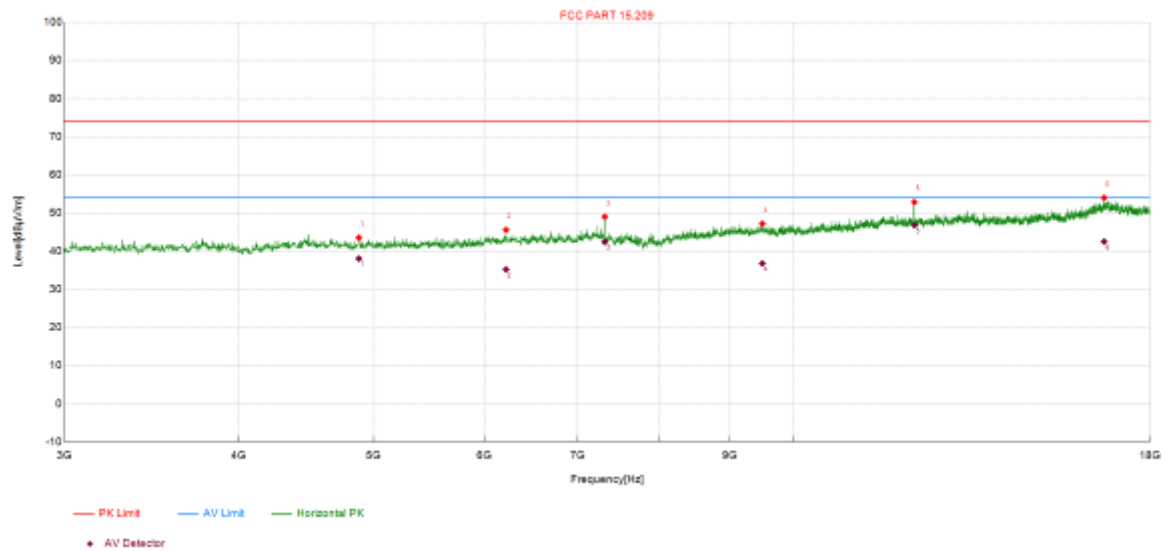
Mode	Test channel	Ant. Pol.
BLE-1Mbps	2440MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4880.00	53.28	46.94	-6.34	74.00	27.06	PK	V	PASS
2	7320.00	61.89	58.05	-3.84	74.00	15.95	PK	V	PASS
3	9760.00	46.57	46.37	-0.20	74.00	27.63	PK	V	PASS
4	12200.00	48.28	51.59	3.31	74.00	22.41	PK	V	PASS
5	14640.00	47.50	53.62	6.12	74.00	20.38	PK	V	PASS
6	17080.00	42.06	51.38	9.32	74.00	22.02	PK	V	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7320.00	-3.84	55.5	51.66	54.00	2.34	V	PASS

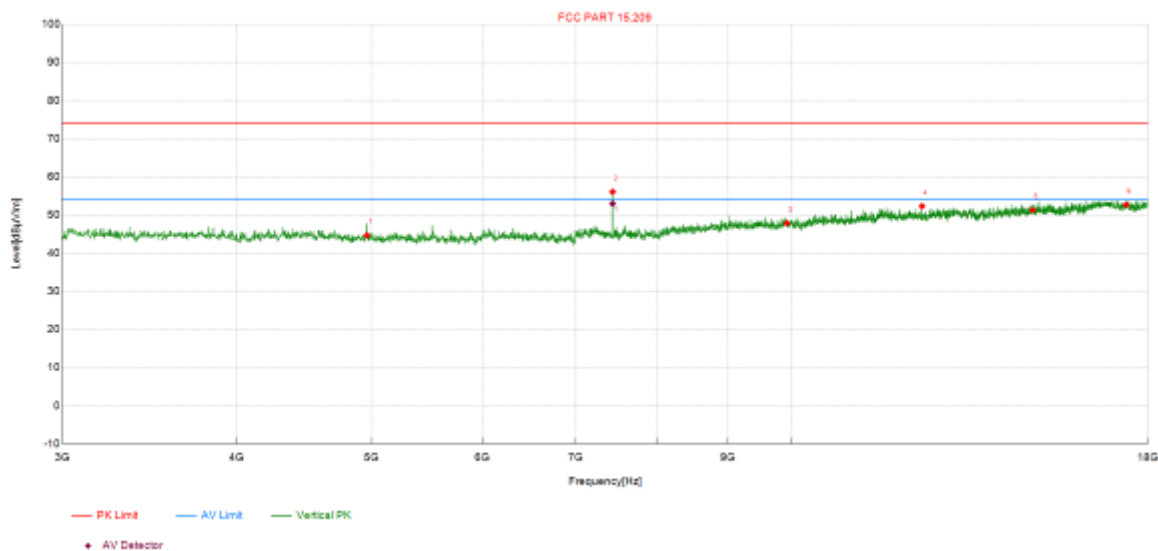
Mode	Test channel	Ant. Pol.
BLE-1Mbps	2440MHz	Horizontal



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4878.75	53.66	47.29	-6.37	74.00	26.71	PK	H	PASS
2	7320.00	61.08	57.24	-3.84	74.00	16.76	PK	H	PASS
3	9760.00	47.57	47.37	-0.20	74.00	26.63	PK	H	PASS
4	12200.00	47.73	51.04	3.31	74.00	22.96	PK	H	PASS
5	14640.00	45.38	51.50	6.12	74.00	22.50	PK	H	PASS
6	17080.00	42.30	51.62	9.32	74.00	22.38	PK	H	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7320.00	-3.84	54.61	50.77	54.00	3.23	H	PASS

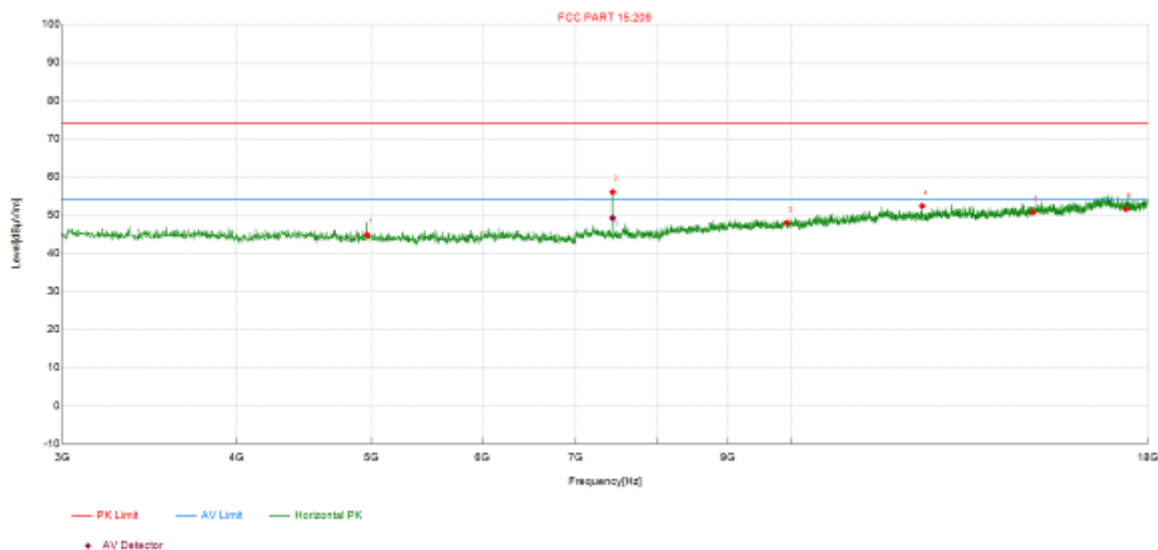
Mode	Test channel	Ant. Pol.
BLE-1Mbps	2480MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4960.00	50.65	44.70	-5.95	74.00	29.30	PK	V	PASS
2	7440.00	59.77	56.07	-3.70	74.00	17.93	PK	V	PASS
3	9920.00	47.77	47.83	0.06	74.00	26.17	PK	V	PASS
4	12397.50	48.84	52.32	3.48	74.00	21.68	PK	V	PASS
5	14880.00	44.85	51.29	6.44	74.00	22.71	PK	V	PASS
6	17360.00	43.02	52.70	9.68	74.00	21.30	PK	V	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7440.00	-3.70	56.68	52.98	54.00	1.02	V	PASS

Mode	Test channel	Ant. Pol.
BLE-1Mbps	2480MHz	Horizontal

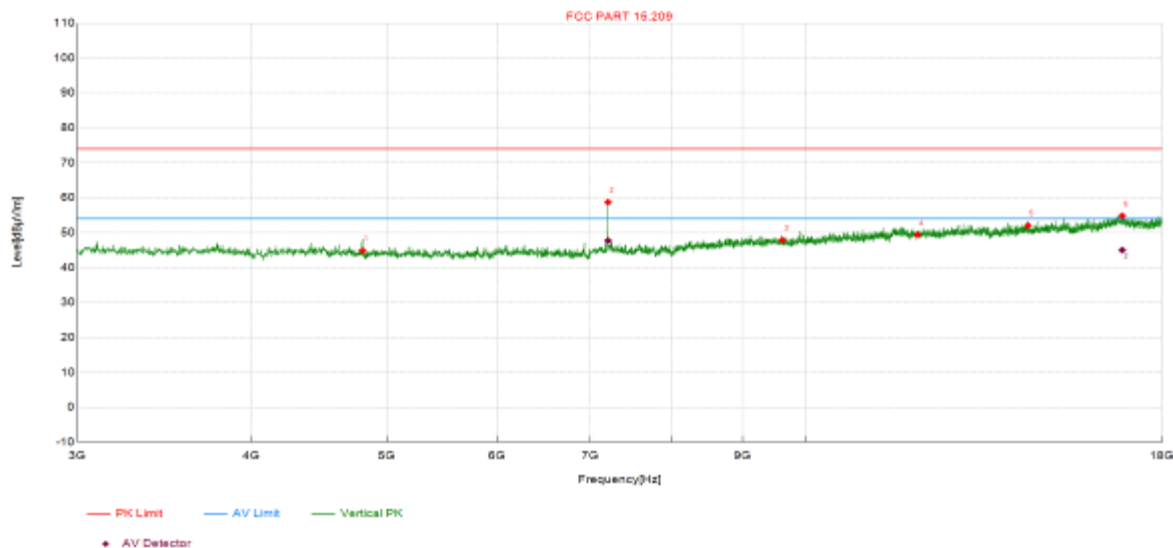


Suspected Data List

NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Det	Pol	Verdict
1	4960.00	50.77	44.82	-5.95	74.00	29.18	100	309	PK	H	PASS
2	7440.00	59.73	56.03	-3.70	74.00	17.97	200	318	PK	H	PASS
3	9920.00	47.84	47.90	0.06	74.00	26.10	200	345	PK	H	PASS
4	12400.00	48.89	52.36	3.47	74.00	21.64	100	2	PK	H	PASS
5	14880.00	44.23	50.67	6.44	74.00	23.33	100	249	PK	H	PASS
6	17360.00	41.88	51.56	9.68	74.00	22.44	200	31	PK	H	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7440.00	-3.70	52.91	49.21	54.00	4.79	H	PASS

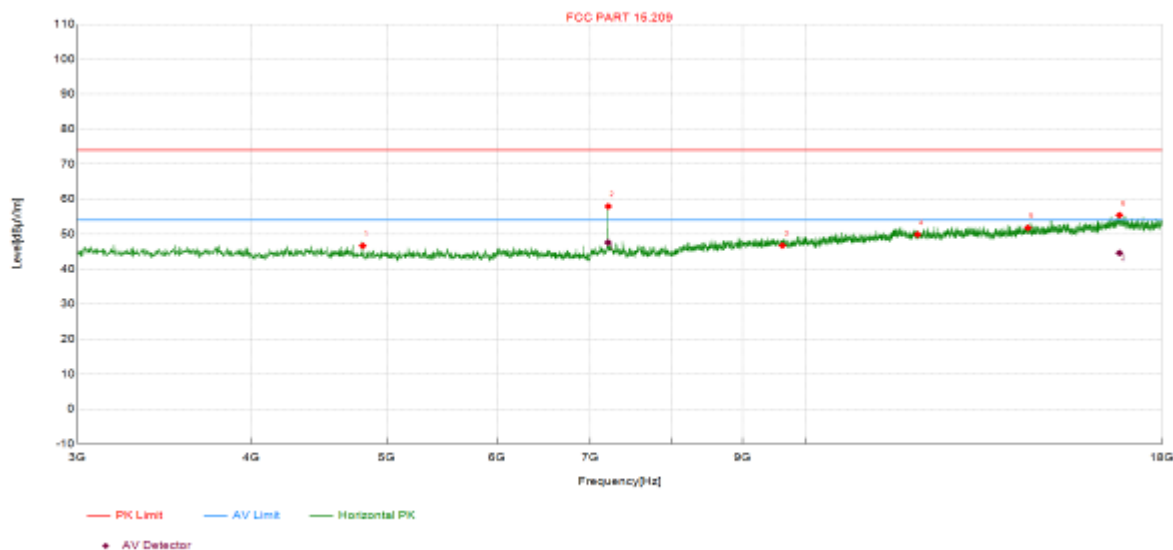
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2404MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4808.00	51.50	44.84	-6.66	74.00	29.16	PK	V	PASS
2	7209.38	62.53	58.73	-3.80	74.00	15.27	PK	V	PASS
3	9616.00	48.51	47.88	-0.63	74.00	26.12	PK	V	PASS
4	12020.00	46.42	49.43	3.01	74.00	24.57	PK	V	PASS
5	14424.00	46.51	52.04	5.53	74.00	21.96	PK	V	PASS
6	16828.00	43.77	53.20	9.43	74.00	20.80	PK	V	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7209.38	-3.80	51.51	47.71	54.00	6.29	V	PASS
2	16854.38	9.37	35.65	45.02	54.00	8.98	V	PASS

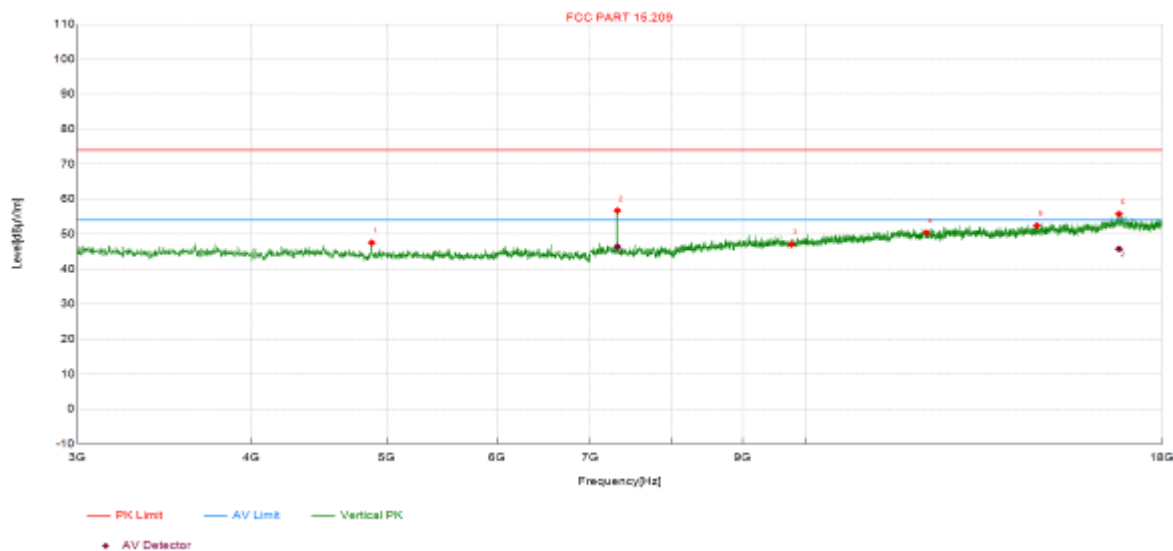
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2404MHz	Horizontal



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4808.00	53.32	46.66	-6.66	74.00	27.34	PK	H	PASS
2	7212.00	61.71	57.93	-3.78	74.00	16.07	PK	H	PASS
3	9616.00	47.37	46.74	-0.63	74.00	27.26	PK	H	PASS
4	12020.00	46.88	49.89	3.01	74.00	24.11	PK	H	PASS
5	14424.00	46.25	51.78	5.53	74.00	22.22	PK	H	PASS
6	16828.00	43.95	53.38	9.43	74.00	20.62	PK	H	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7209.38	-3.80	51.39	47.59	54.00	6.41	H	PASS
2	16777.50	9.47	35.13	44.60	54.00	9.40	H	PASS

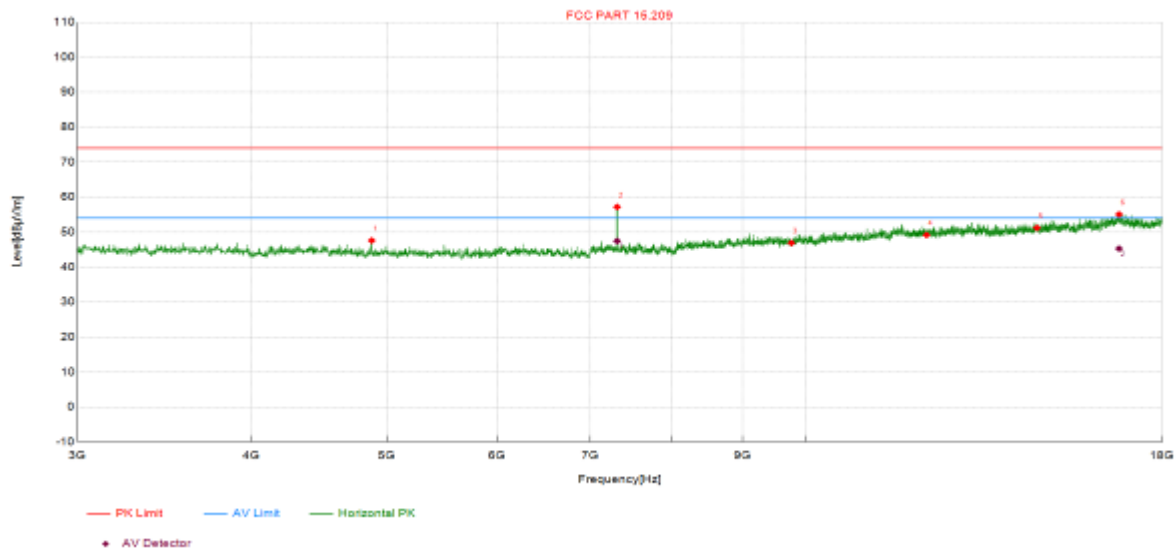
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2440MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4880.00	53.87	47.53	-6.34	74.00	26.47	PK	V	PASS
2	7321.88	60.57	56.73	-3.84	74.00	17.27	PK	V	PASS
3	9760.00	47.24	47.04	-0.20	74.00	26.96	PK	V	PASS
4	12200.00	47.09	50.40	3.31	74.00	23.60	PK	V	PASS
5	14640.00	46.30	52.42	6.12	74.00	21.58	PK	V	PASS
6	17080.00	42.95	52.27	9.32	74.00	21.73	PK	V	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7321.88	-3.84	50.26	46.42	54.00	7.58	V	PASS
2	16764.38	9.47	36.30	45.77	54.00	8.23	V	PASS

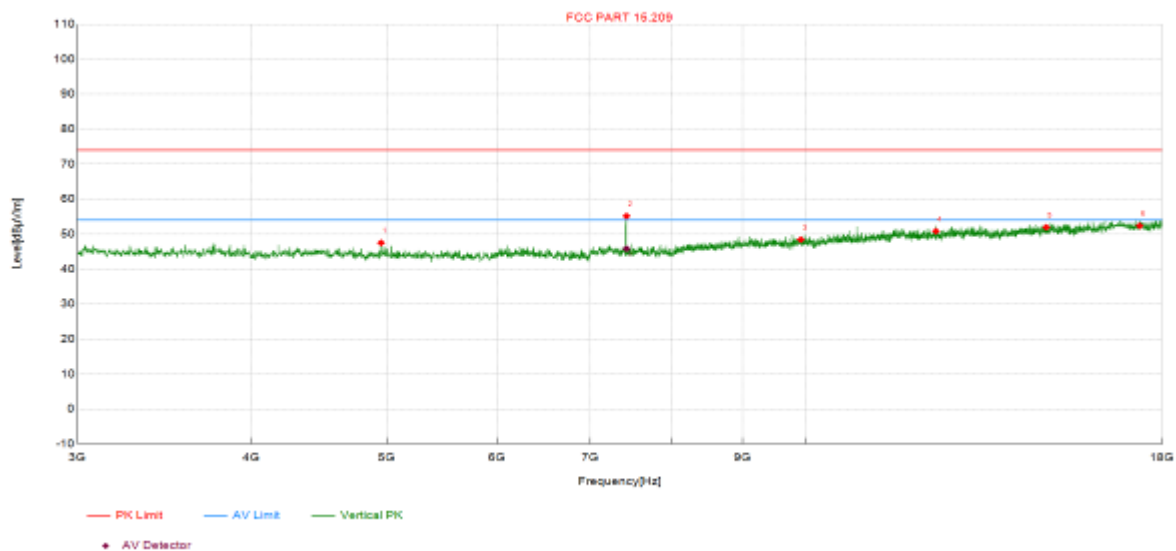
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2440MHz	Horizontal



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4880.00	53.94	47.60	-6.34	74.00	26.40	PK	H	PASS
2	7318.13	61.03	57.19	-3.84	74.00	16.81	PK	H	PASS
3	9760.00	47.10	46.90	-0.20	74.00	27.10	PK	H	PASS
4	12200.00	45.88	49.19	3.31	74.00	24.81	PK	H	PASS
5	14640.00	45.09	51.21	6.12	74.00	22.79	PK	H	PASS
6	17080.00	42.99	52.31	9.32	74.00	21.69	PK	H	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7318.13	-3.84	51.31	47.47	54.00	6.53	H	PASS
2	16766.25	9.47	35.82	45.29	54.00	8.71	H	PASS

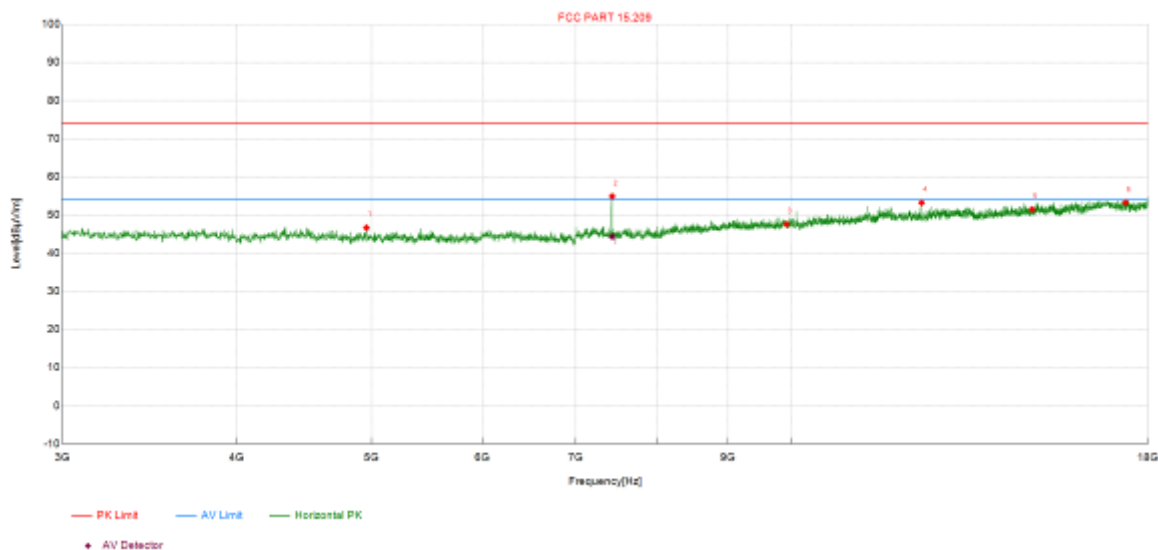
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2478MHz	Vertical



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4956.00	53.45	47.50	-5.95	74.00	26.50	PK	V	PASS
2	7432.50	58.90	55.16	-3.74	74.00	18.84	PK	V	PASS
3	9912.00	48.34	48.42	0.08	74.00	25.58	PK	V	PASS
4	12390.00	47.36	50.85	3.49	74.00	23.15	PK	V	PASS
5	14868.00	45.53	51.96	6.43	74.00	22.04	PK	V	PASS
6	17346.00	42.66	52.37	9.71	74.00	21.63	PK	V	PASS

NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7432.50	-3.74	49.57	45.83	54.00	8.17	V	PASS

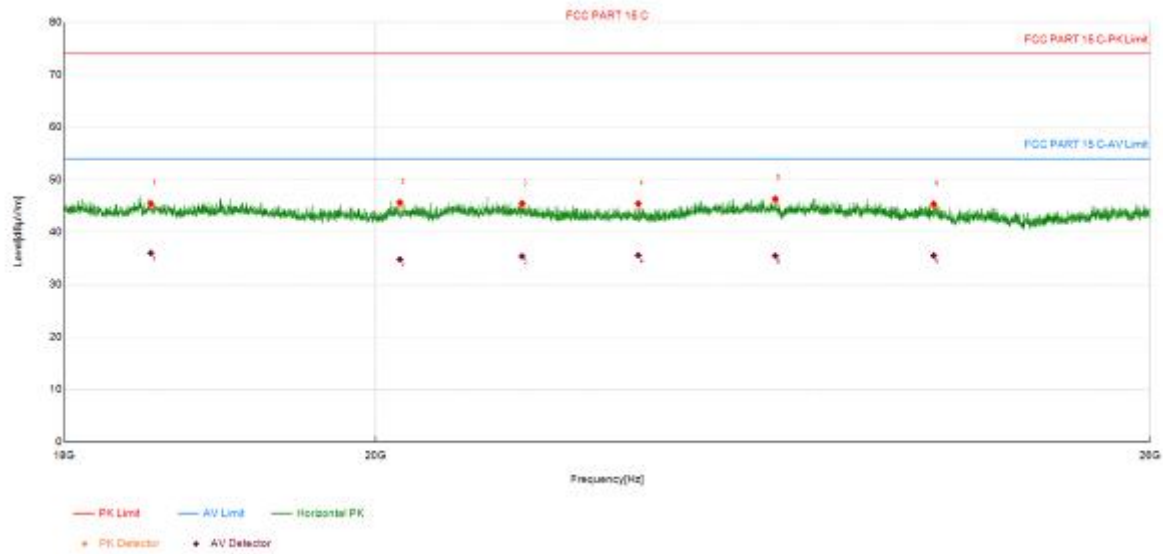
Mode	Test channel	Ant. Pol.
BLE-2Mbps	2478MHz	Horizontal



NO.	Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Det	Pol	Verdict
1	4956.00	52.61	46.66	-5.95	74.00	27.34	PK	H	PASS
2	7434.38	58.66	54.92	-3.74	74.00	19.08	PK	H	PASS
3	9912.00	47.50	47.58	0.08	74.00	26.42	PK	H	PASS
4	12388.13	49.73	53.22	3.49	74.00	20.78	PK	H	PASS
5	14868.00	45.06	51.49	6.43	74.00	22.51	PK	H	PASS
6	17346.00	43.57	53.28	9.71	74.00	20.72	PK	H	PASS

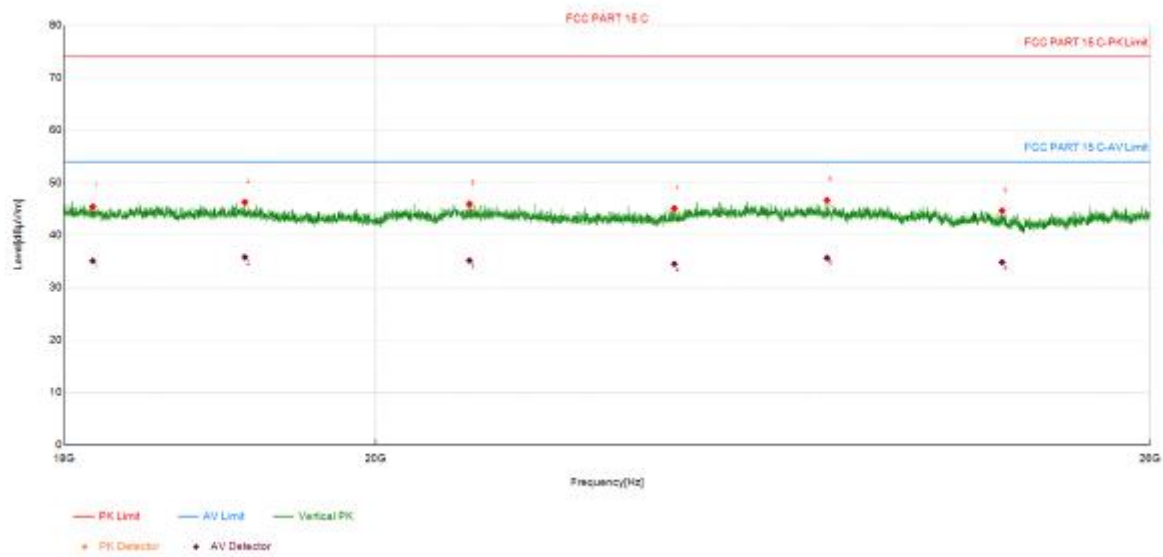
NO.	Frequency [MHz]	Factor [dB/m]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	7434.38	-3.74	48.06	44.32	54.00	9.68	H	PASS

Radiated Emission test (18GHz-26GHz)



Final Data List

NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	18536.00	-1.02	46.02	45.00	74.00	29.00	37.02	36.00	54.00	18.00	H	PASS
2	20167.00	-3.08	48.42	45.34	74.00	28.66	37.87	34.79	54.00	19.21	H	PASS
3	21019.00	-3.75	48.98	45.23	74.00	28.77	39.14	35.39	54.00	18.61	H	PASS
4	21863.00	-4.55	49.85	45.30	74.00	28.70	40.13	35.58	54.00	18.42	H	PASS
5	22901.00	-2.99	48.99	46.00	74.00	28.00	38.48	35.49	54.00	18.51	H	PASS
6	24163.00	-3.98	48.92	44.94	74.00	29.06	39.50	35.52	54.00	18.48	H	PASS



Final Data List

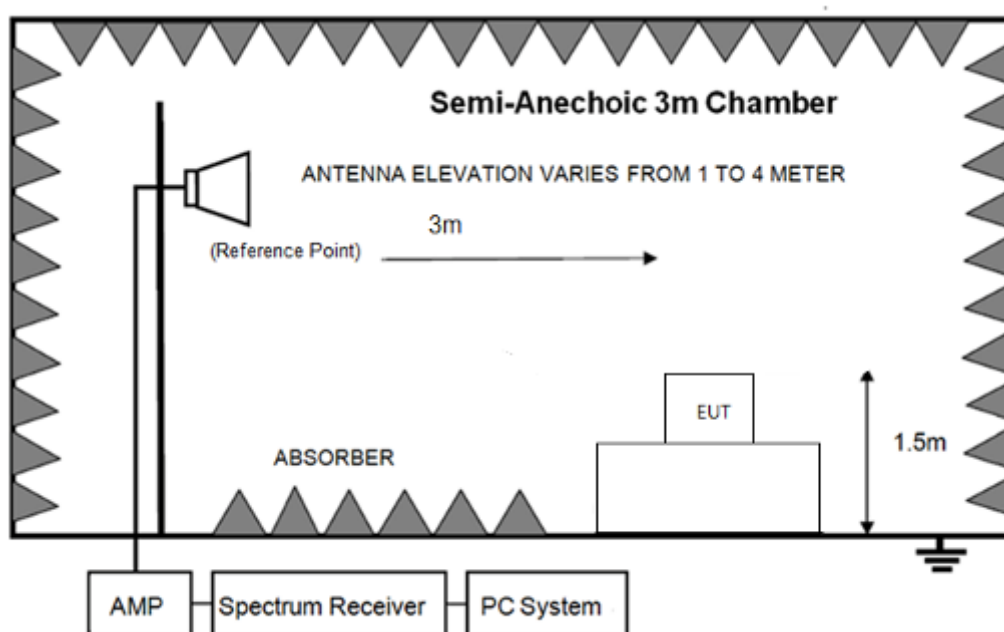
NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	18175.00	-0.91	46.22	45.31	74.00	28.69	35.98	35.07	54.00	18.93	V	PASS
2	19136.00	-1.91	48.01	46.10	74.00	27.90	37.69	35.78	54.00	18.22	V	PASS
3	20648.00	-3.53	49.14	45.61	74.00	28.39	38.68	35.15	54.00	18.85	V	PASS
4	22131.00	-3.87	48.73	44.86	74.00	29.14	38.38	34.51	54.00	19.49	V	PASS
5	23306.00	-3.29	49.96	46.67	74.00	27.33	38.95	35.66	54.00	18.34	V	PASS
6	24729.00	-4.48	49.03	44.55	74.00	29.45	39.32	34.84	54.00	19.16	V	PASS

10. Emissions in Restricted Frequency Bands

10.1. General Information

Test date	May. 27, 2026	Test engineer	Cheney Qu	
Climate condition	Ambient temperature	21.3°C	Relative humidity	74.5%
	Atmospheric pressure	100.7 kPa		
Test place	3m Chamber			

10.2. Block diagram of test setup



10.3. Limit

All restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400 MHz to 2483.5 MHz shall be at least 20dB below the fundamental emissions or comply with FCC 15.209 limits.

10.4. Test Procedure

Same with clause 8.3 except change investigated frequency range from 2310 MHz to 2410 MHz and 2475 MHz to 2500 MHz.

Remark: All restriction band have been tested, and only the worst case is shown in report.

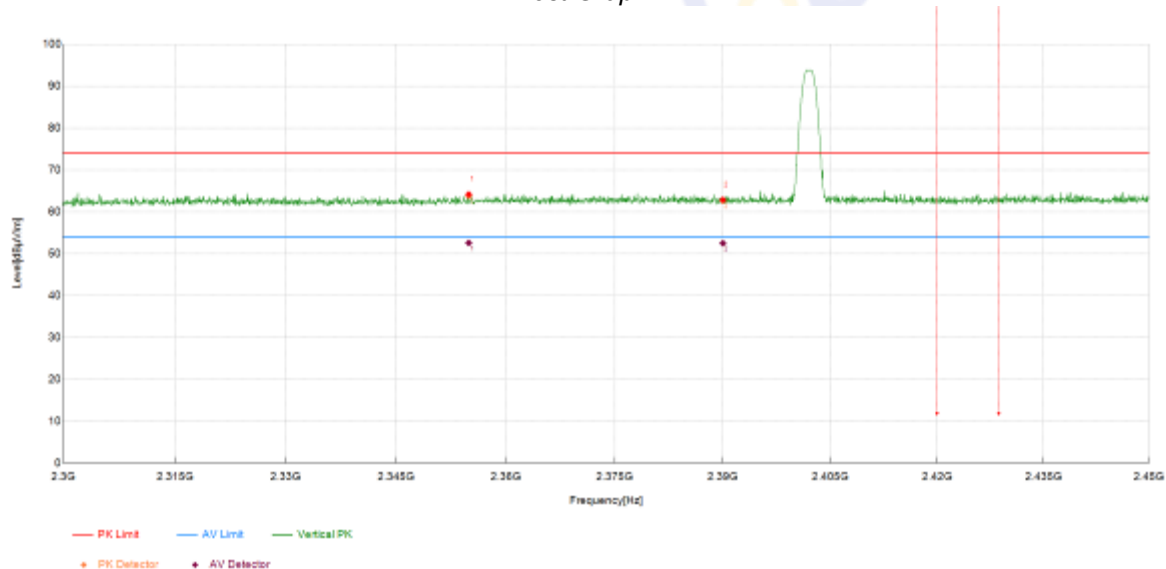
10.5. Test result

Pass. (See below detailed test result)

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-1M	2402MHz	Vertical

Test Graph

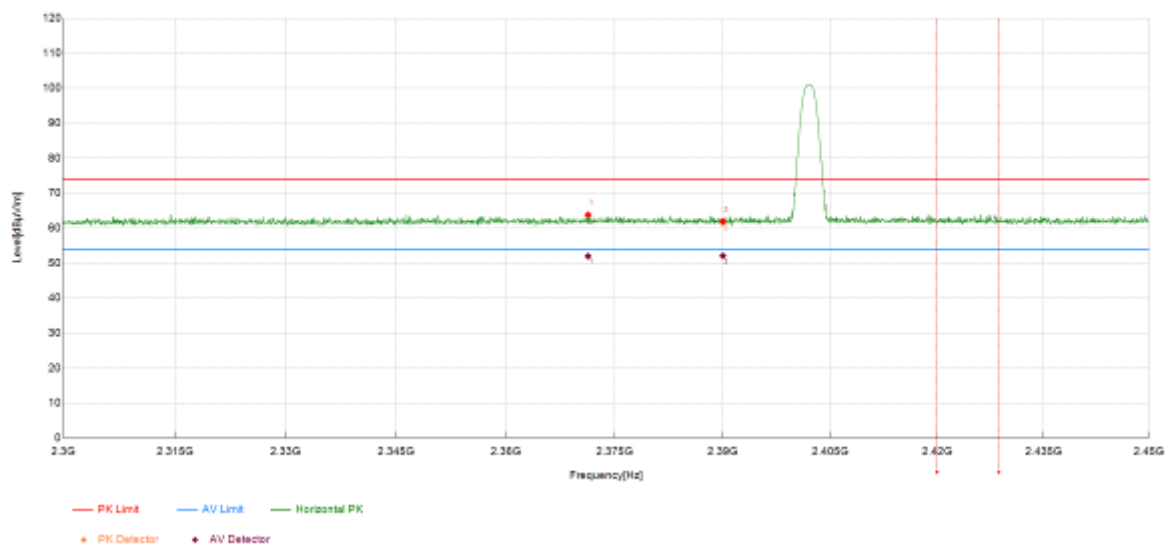


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2354.92	7.15	56.61	63.76	74.00	10.24	45.42	52.57	54.00	1.43	V	PASS
2	2390.00	7.50	55.14	62.64	74.00	11.36	45.00	52.50	54.00	1.50	V	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-1M	2402MHz	Horizontal

Test Graph

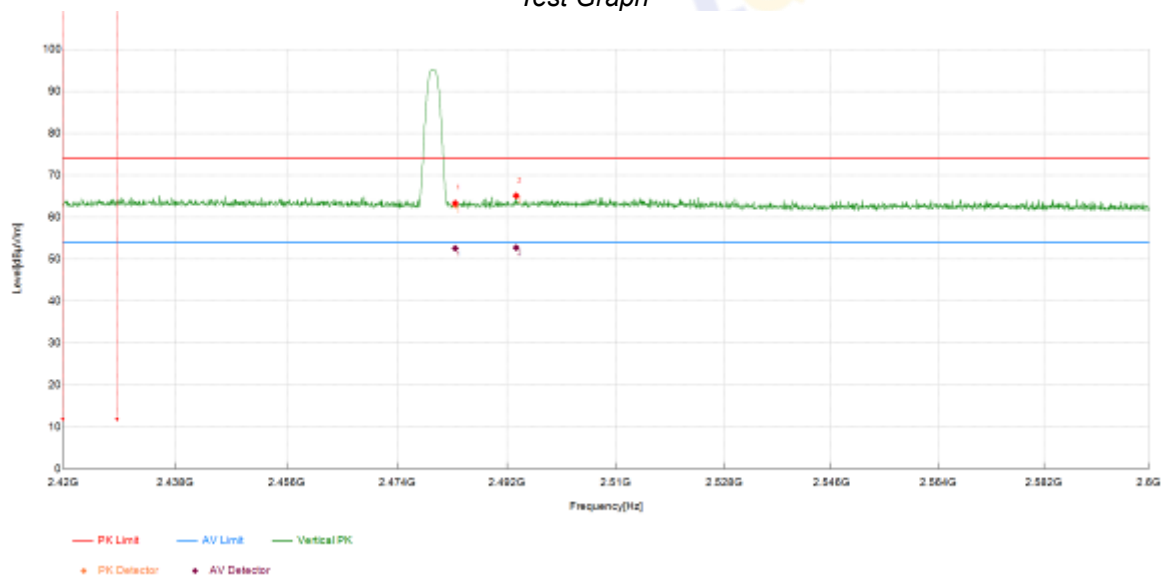


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2371.32	7.31	56.47	63.78	74.00	10.22	44.66	51.97	54.00	2.03	H	PASS
2	2390.00	7.50	53.99	61.49	74.00	12.51	44.56	52.06	54.00	1.94	H	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-1M	2480MHz	Vertical

Test Graph

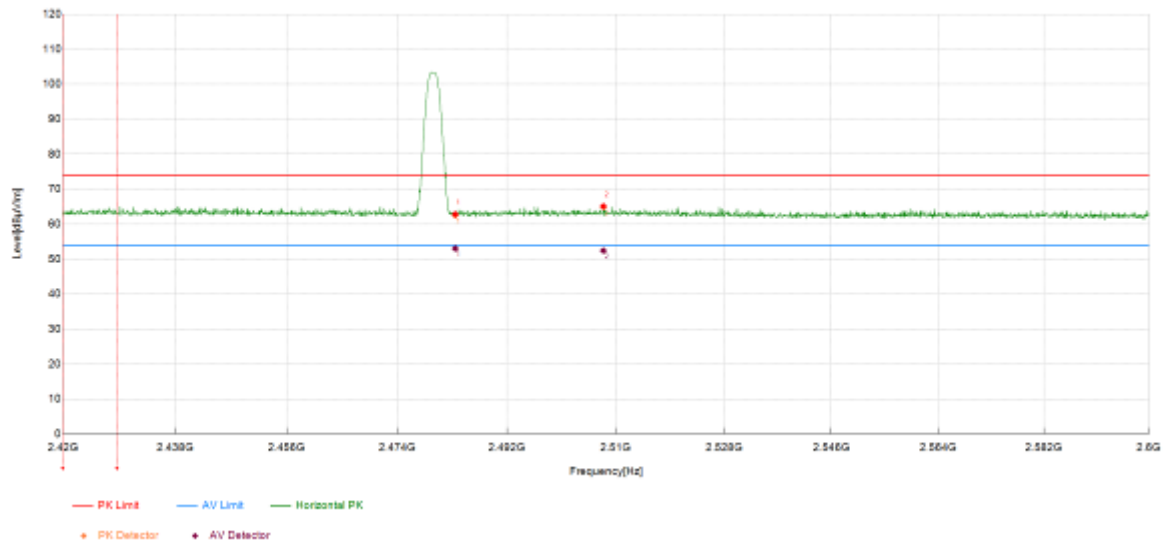


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2483.50	7.43	55.43	62.86	74.00	11.14	45.13	52.56	54.00	1.44	V	PASS
2	2493.52	7.43	57.63	65.06	74.00	8.94	45.30	52.73	54.00	1.27	V	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-1M	2480MHz	Horizontal

Test Graph

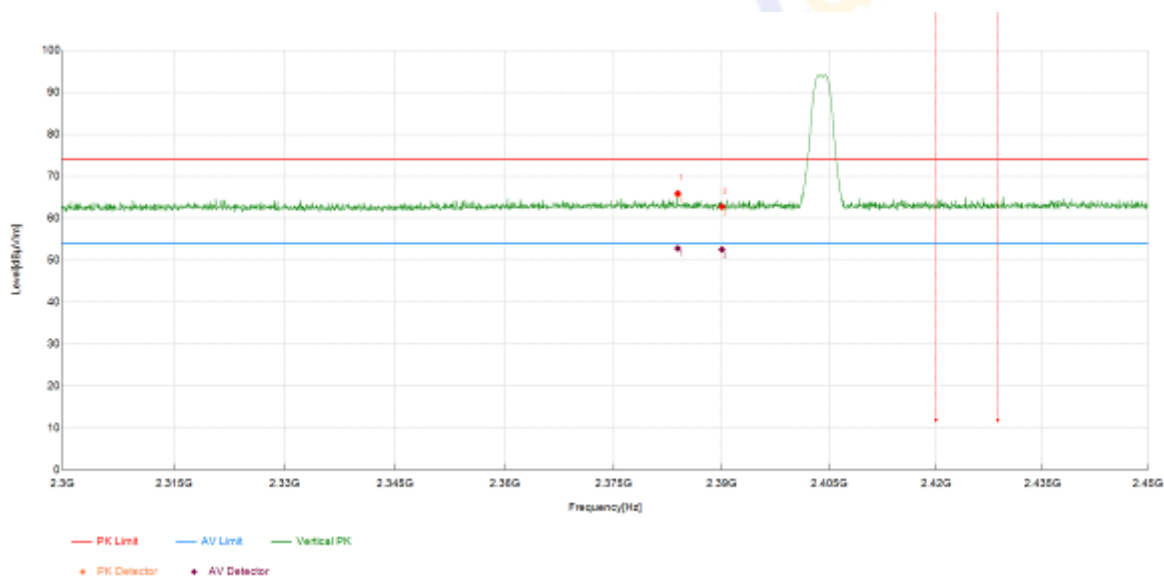


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2483.50	7.43	55.04	62.47	74.00	11.53	45.60	53.03	54.00	0.97	H	PASS
2	2507.93	7.36	57.56	64.92	74.00	9.08	45.06	52.42	54.00	1.58	H	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-2M	2404MHz	Vertical

Test Graph

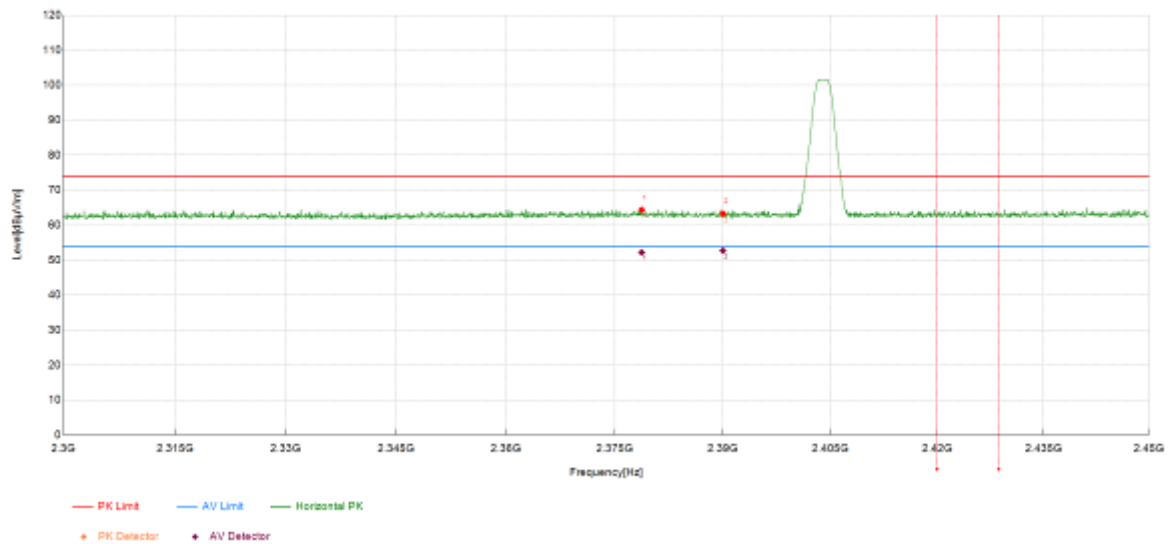


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2383.88	7.45	58.1	65.55	74.00	8.45	45.34	52.79	54.00	1.21	V	PASS
2	2390.00	7.50	55.09	62.59	74.00	11.41	45.03	52.53	54.00	1.47	V	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-2M	2404MHz	Horizontal

Test Graph

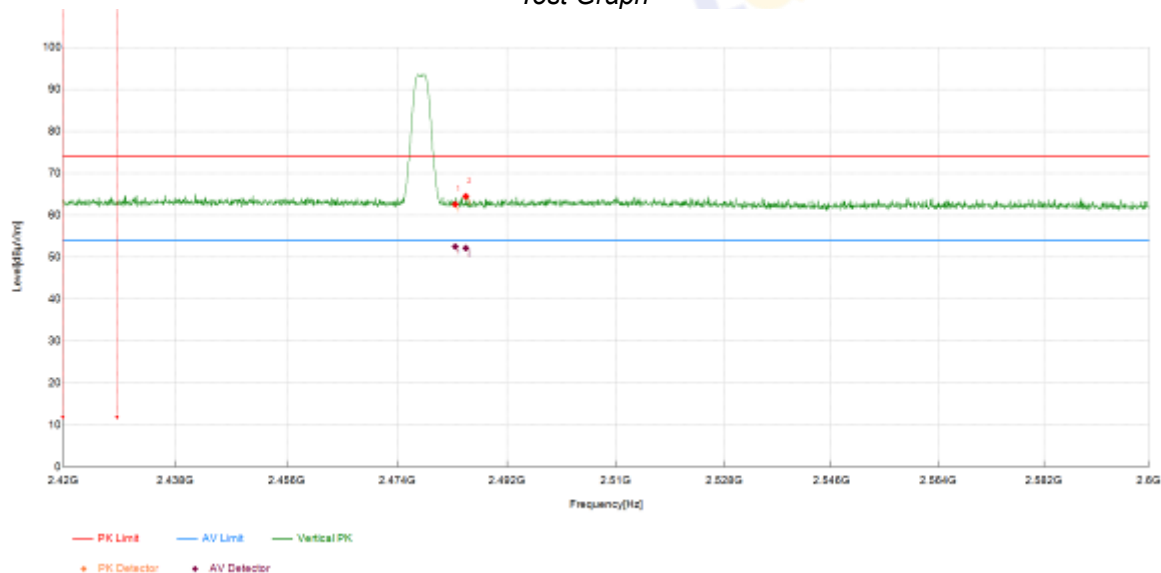


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2378.73	7.39	56.92	64.31	74.00	9.69	44.79	52.18	54.00	1.82	H	PASS
2	2390.00	7.50	55.54	63.04	74.00	10.96	45.20	52.70	54.00	1.30	H	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-2M	2478MHz	Vertical

Test Graph

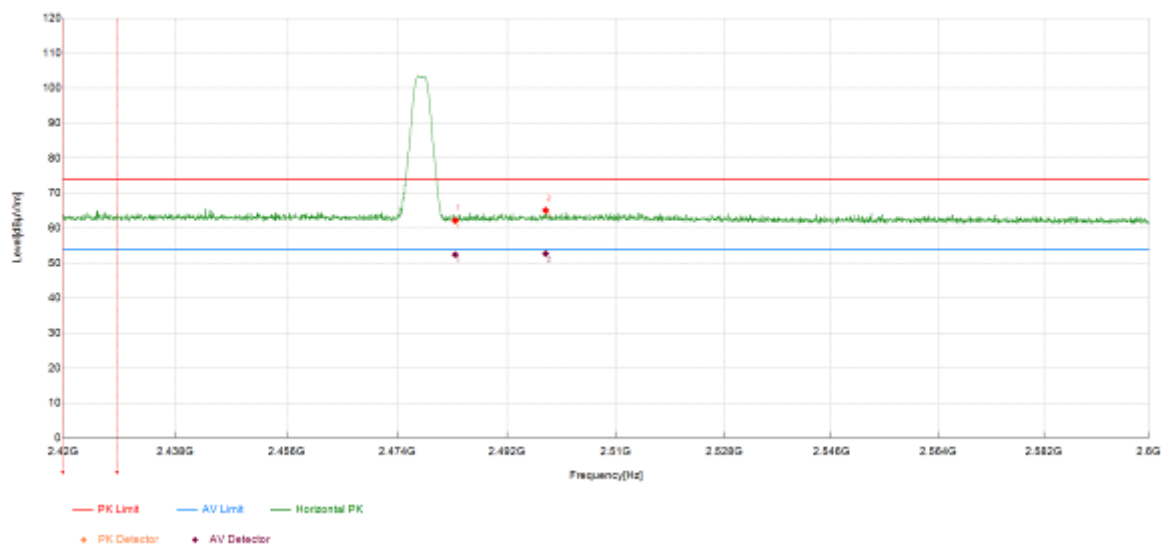


NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2483.50	7.43	55.07	62.50	74.00	11.50	45.07	52.50	54.00	1.50	V	PASS
2	2485.24	7.43	56.9	64.33	74.00	9.67	44.71	52.14	54.00	1.86	V	PASS

Radiated Emission Test Result

Mode	Test channel	Ant. Pol.
BLE-2M	2478MHz	Horizontal

Test Graph



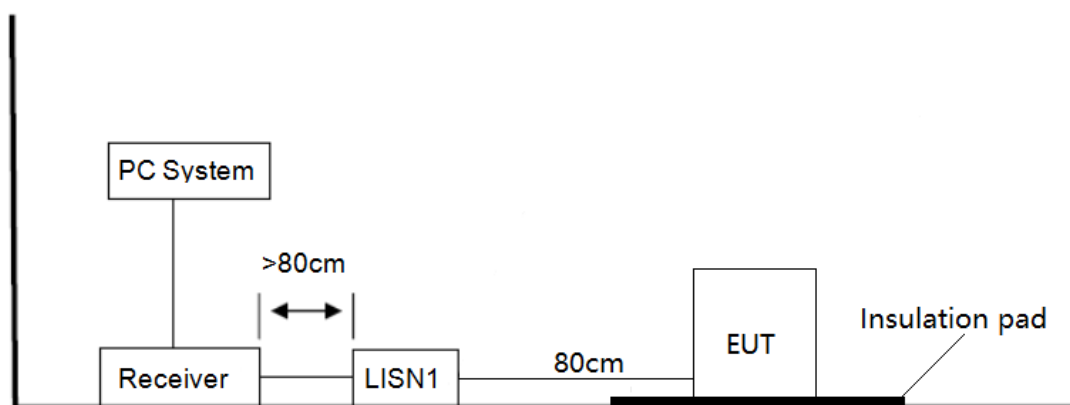
NO.	Frequency [MHz]	Factor [dB/m]	PK Reading [dBμV]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Reading [dBμV]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Pol	Verdict
1	2483.50	7.43	54.52	61.95	74.00	12.05	44.97	52.40	54.00	1.60	H	PASS
2	2498.39	7.42	57.57	64.99	74.00	9.01	45.27	52.69	54.00	1.31	H	PASS

11. Power Line Conducted Emission

11.1. General Information

Test date	N/A	Test engineer	N/A
Climate condition	Ambient temperature	N/A	Relative humidity
	Atmospheric pressure	N/A	N/A
Test place	EMC Room 1#		

11.2. Block diagram of test setup



11.3. Power line conducted emission limits

Frequency	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150 kHz ~ 500 kHz	66 ~ 56*	56 ~ 46*
500 kHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

11.4. Test procedure

The EUT and Support equipment, if needed, were put placed on a Insulation pad, 10 mm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

11.5. Test result

N/A

12. Antenna Requirements

12.1. Limit

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 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

12.2. Result

The antennas used for this product are PCB antenna and 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 only -2.02 dBi.

13. Test Setup Photograph

Please find the Test Setup photos of EUT in APPENDIXES.

14. Photos of the EUT

Please refer to the appendix file.

END OF REPORT