SZ ZUVI TECHNOLOGY CO., LTD.

RF TEST REPORT

Report Type:
FCC Part 15.247 & ISED RSS-247 RF report

Model:
HS200

REPORT NUMBER:
2311A1300SHA-001

ISSUE DATE:
December 7, 2023

DOCUMENT CONTROL NUMBER:
TTRF15.247-02_V1 © 2018 Intertek

Intertek Testing Services Shanghai
Building No.86, 1198 Qinzhou Road (North)
Caohejing Development Zone
Shanghai 200233, China

Telephone: 86 21 6127 8200
www.intertek.com

Total Quality. Assured.

TEST REPORT

Report no.: 2311A1300SHA-001

Applicant:	SZ ZUVI TECHNOLOGY CO., LTD. Room 613, HKUST SZ IER Building, Yuexing 1st Road, Nanshan District, Shenzhen, Guangdong, China 518057
Manufacturer:	SZ ZUVI TECHNOLOGY CO., LTD. Room 613, HKUST SZ IER Building, Yuexing 1st Road, Nanshan District, Shenzhen, Guangdong, China 518057
Factory	SZ ZUVI FUYONG INTELLIGENT MANUFACTURING TECHNOLOGY CO., LTD. Room 301, Building A, Kebixin Industrial Park, No. 47 Fuyuan 1st Road, Bao'an District, Shenzhen, Guangdong Province, China 518103
FCC ID:	2BCUI-HS200

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2017): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
Project Engineer Damon Ding	Reviewer Eric Li

Total Quality. Assured.

TEST REPORT

Content

Revision History

Report No.	Version	Description	Issued Date
2311A1300SHA-001	Rev. 01	Initial issue of report	December 7, 2023

Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	Pass
Power spectrum density	15.247(e)	Pass
Emission outside the frequency band	15.247(d)	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	Pass
Power line conducted emission	15.207(a)	Pass
Occupied bandwidth	-	Tested
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	AirLight Pro
Type/Model/PMN/HVIN:	HS200
Description of EUT:	EUT is an AirLight Pro. EUT supports RF ID and Bluetooth function.
Rating:	120Vac/60Hz, 1800W
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	2023.11.14
Date of test:	2023.11.14-2023.12.7

1.2 Technical Specification

Frequency Band:	2402MHz to 2480MHz
Support Standards:	Bluetooth Low Energy
Type of Modulation:	GFSK
Channel Number:	40
Date Rate	1Mbps
Channel Separation:	2MHz
Antenna Information:	2.39dBi, PCB antenna

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	A2LA Accreditation Lab Certificate Number: 3309.02

TEST REPORT

Subcontractor:
All tests were performed at CTC Laboratories, Inc.

Name:	CTC Laboratories, Inc.
Address:	1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China
Telephone:	+86-755- 27521059
Telefax:	+86-755- 27521011

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. L5365
	FCC Accredited Lab Designation Number: CN1208
	IC Registration Lab CAB identifier.: CN0029
	A2LA Accreditation Lab Certificate Number: 4340.01

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2019)
ANSI C63.10 (2013)
KDB 558074 (v05r02)

2.2 Mode of operation during the test

The lowest, middle and highest channel were tested as representatives.

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

Data rate VS Power:
The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	PhyPlusKit		
Working Mode	BLE		
Test Channel	2402MHz	2440MHz	2480MHz
Power Setting	Default	Default	Default

2.3 Test software list

Test Items	Software	Manufacturer	Serial No
Conducted emission	EMC32	R&S	6.10.10
Radiated emission	EZ-EMC	R&S	FA-03A2

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	Lenovo ThinkBook 14G3 ACL	

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	25°C	52% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	24°C	53% RH
Power line conducted emission	24°C	52% RH

2.6 Instrument list

RF Test System					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14, 2024
2	Spectrum Analyzer	R&S	FSV40-N	101654	Aug. 07, 2024
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
4	MXA Signal Analyzer	Keysight	N9020A	MY46471737	Dec. 16, 2023
5	MXA Signal Analyzer	Keysight	N9020A	MY52091402	Aug. 22, 2024
6	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 16, 2023
7	PSG Analog Signal Generator	Agilent	E8257D	MY46521908	Dec. 16, 2023
8	EXG Analog Signal Generator	Keysight	N5173B	MY59100842	Dec. 16, 2023
9	MXG Vector Signal Generator	Keysight	N5182B	MY59100212	Dec. 16, 2023
10	Wideband Radio Communication Tester	R&S	CMW500	102257	May 25, 2024
11	Wideband Radio Communication Tester	R&S	CMW500	102414	Dec. 16, 2023
12	High and low temperature test chamber	ESPEC	MT3035	/	Mar. 24, 2024
13	RF Control Unit	Tonscend	JS0806-2	/	Aug. 22, 2024
14	Test Software	Tonscend	JS1120-3	V3.3.38	/

Radiated Emission (3m chamber 2)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 07, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-648	Dec. 07, 2024
3	Loop Antenna	ETS	6507	1446	Dec. 13, 2023
4	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
5	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14 2024
6	Pre-Amplifier	SONOMA	310	186194	Dec. 16, 2023
7	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 16, 2023
8	Test Receiver	R&S	ESCI7	100967	Dec. 16, 2023
9	3m chamber 2	Frankonia	EE025	/	Oct. 23, 2024
10	Test Software	FARA	EZ-EMC	FA-03A2	/

TEST REPORT

Radiated Emission (3m chamber 3)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9163	01026	Dec. 18, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 01, 2024
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 16, 2023
4	Broadband Amplifier	SCHWARZBECK	BBV9743B	259	Dec. 16, 2023
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 16, 2023
6	3m chamber 3	YIHENG	EE106	/	Aug. 28, 2026
7	Test Software	FARA	EZ-EMC	FA-03A2	/

Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	LISN	R&S	ENV216	101112	Dec. 16, 2023
2	LISN	R&S	ENV216	101113	Dec. 16, 2023
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 16, 2023
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 16, 2023
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 16, 2023
6	Test Software	R&S	EMC32	6.10.10	/

2.7 Measurement uncertainty

Test Items	Measurement Uncertainty	Notes
DTS Bandwidth	±0.0196%	(1)
Maximum Conducted Output Power	±0.686 dB	(1)
Maximum Power Spectral Density Level	±0.743 dB	(1)
Band-edge Compliance	±1.328 dB	(1)
Unwanted Emissions In Non-restricted Freq Bands	9kHz-1GHz: ±0.746dB 1GHz-26GHz: ±1.328dB	(1)
Conducted Emissions 9kHz~30MHz	±3.08 dB	(1)
Radiated Emissions 30~1000MHz	±4.51 dB	(1)
Radiated Emissions 1~18GHz	±5.84 dB	(1)
Radiated Emissions 18~40GHz	±6.12 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3 Minimum 6dB bandwidth

Test result: Pass

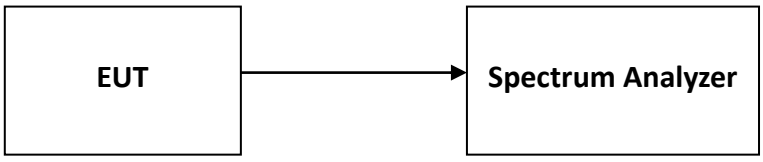
3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

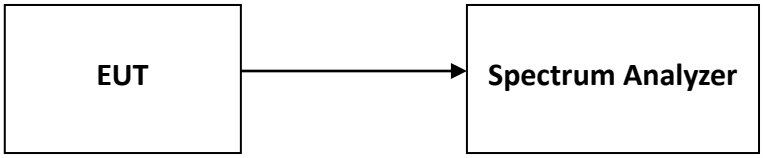
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3 × RBW.
c) Set span ≥ 3 x RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

5 Power spectrum density

Test result: **Pass**

5.1 Limit

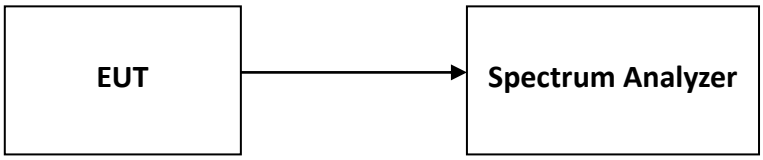
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 × RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix A

6 Emission outside the frequency band

Test result: **Pass**

6.1 Limit

In any 100 kHz bandwidth outside the frequency band 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.

6.2 Measurement Procedure

Reference level measurement

Establish a reference level by using the following procedure:

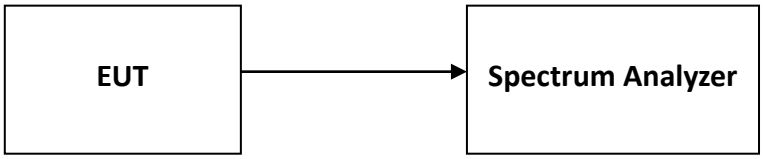
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (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

7.2 Measurement Procedure

The EUT was tested according to Subclause 11.12 of ANSI C63.10.

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

TEST REPORT

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) The height of antenna 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.

d) 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

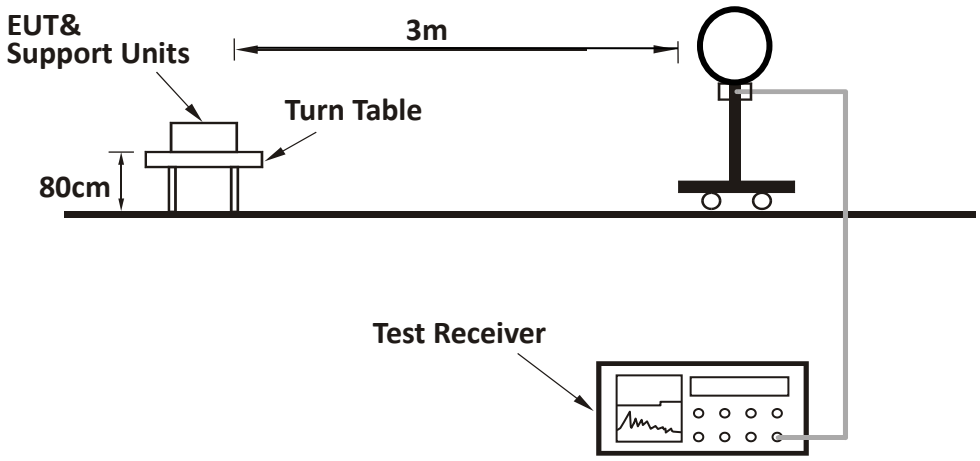
f) The test-receiver system was set to peak and average detector function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

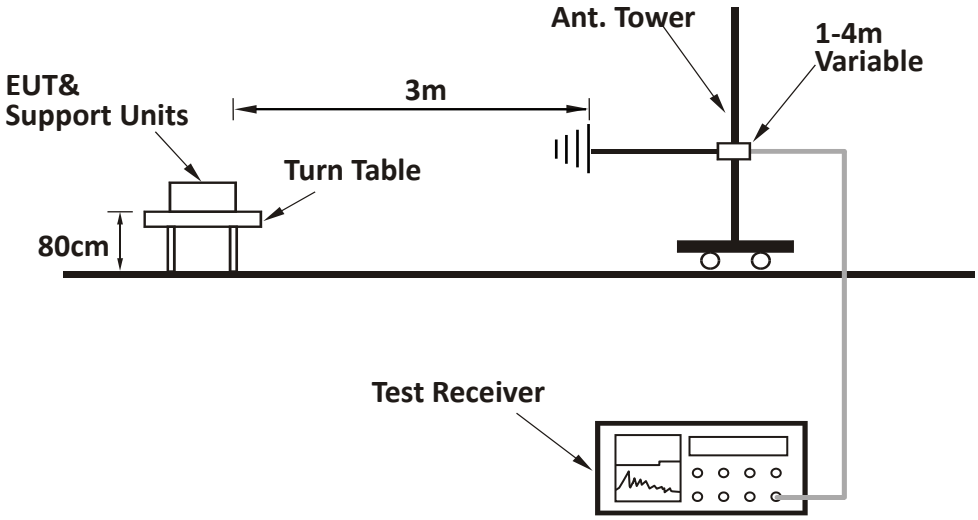
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were and the worst-case emissions were reported.

7.3 Test Configuration

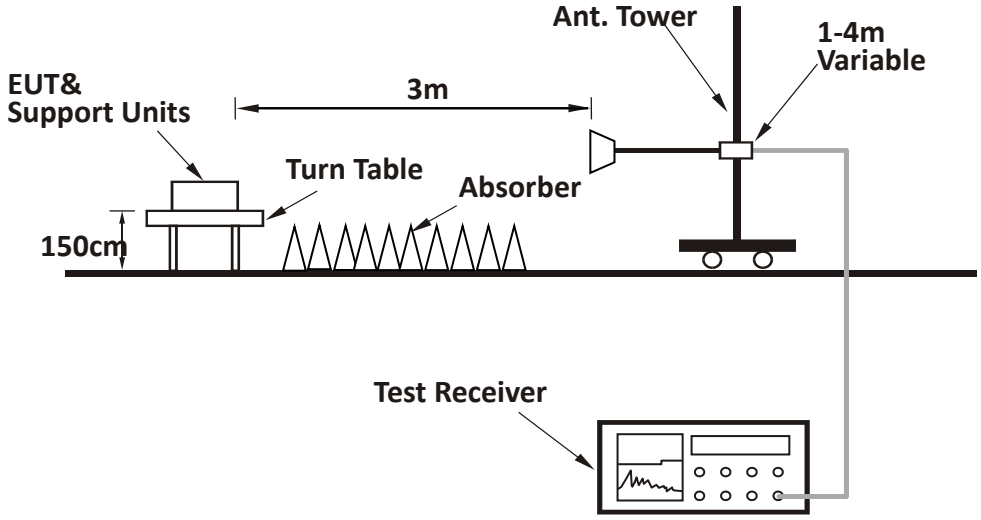
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

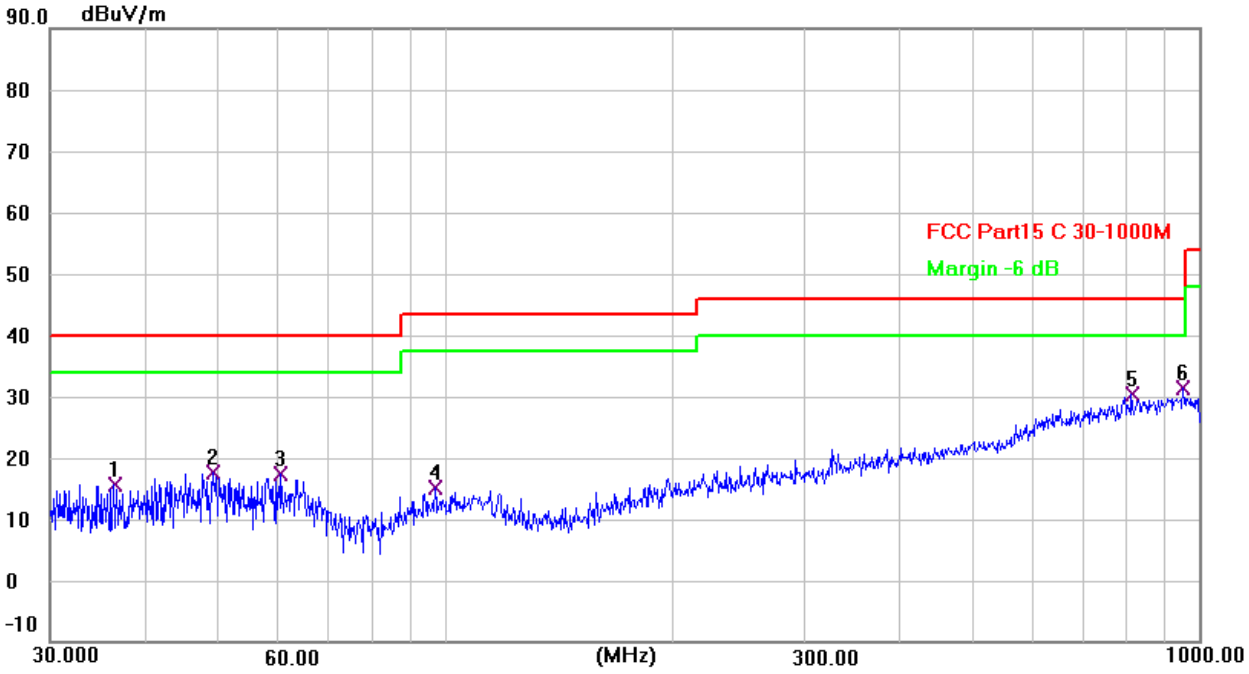


7.4 Test Results of Radiated Emissions

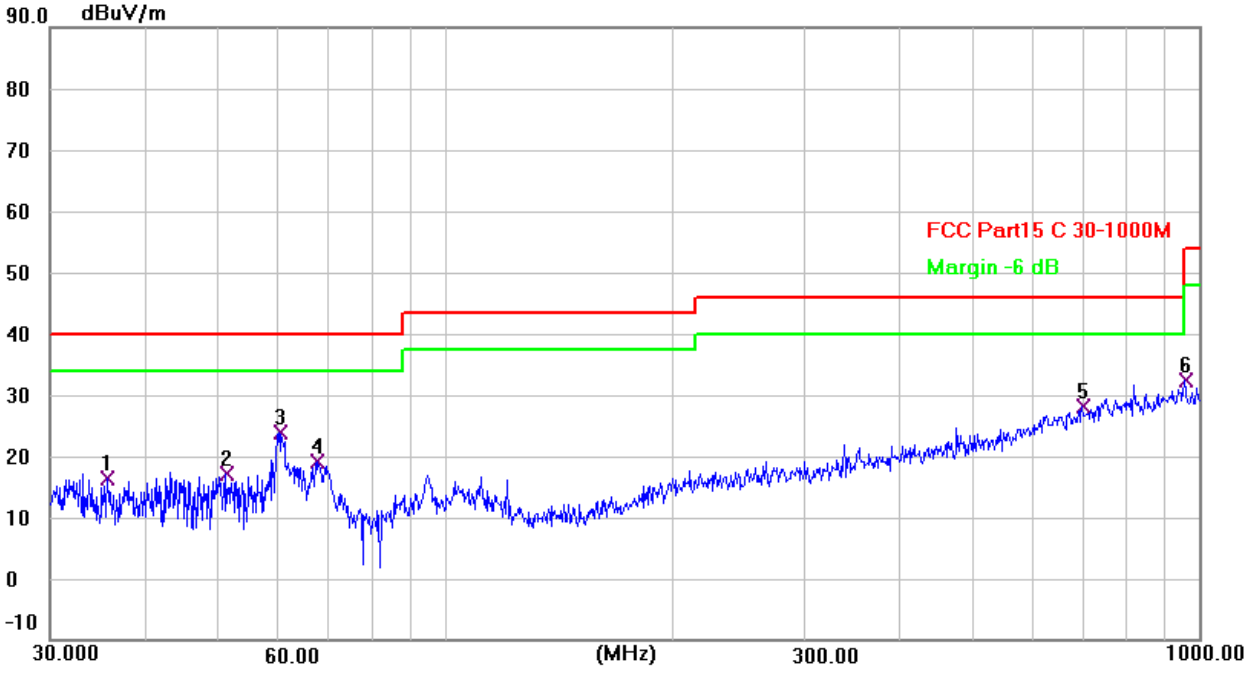
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



TEST REPORT

Test data below 1GHz

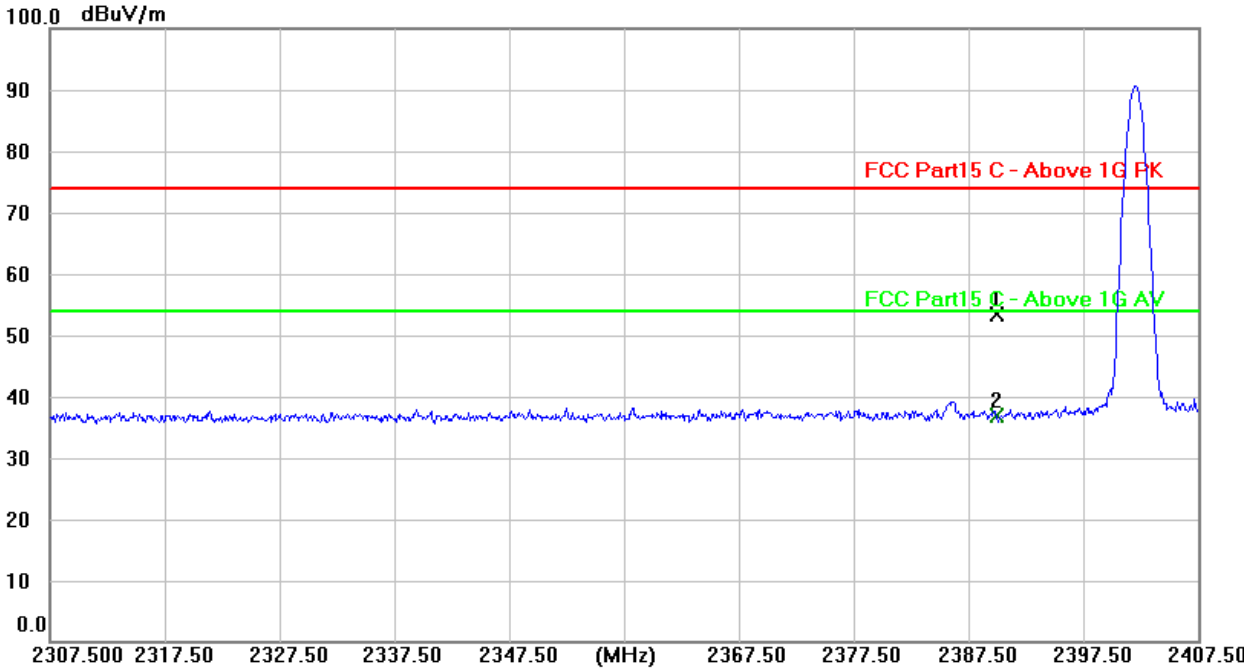
Antenna	Frequency (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	36.38	15.54	40.00	-24.46	QP
H	49.35	17.72	40.00	-22.28	QP
H	60.70	17.32	40.00	-22.68	QP
H	97.11	15.08	43.50	-28.42	QP
H	813.11	30.35	46.00	-15.65	QP
H	952.09	31.48	46.00	-14.52	QP
V	35.7490	16.43	40.00	-23.57	QP
V	51.3005	17.21	40.00	-22.79	QP
V	60.2801	23.89	40.00	-16.11	QP
V	67.6751	19.09	40.00	-20.91	QP
V	699.3046	28.11	46.00	-17.89	QP
V	955.4381	32.29	46.00	-13.71	QP

TEST REPORT

Test result above 1GHz:

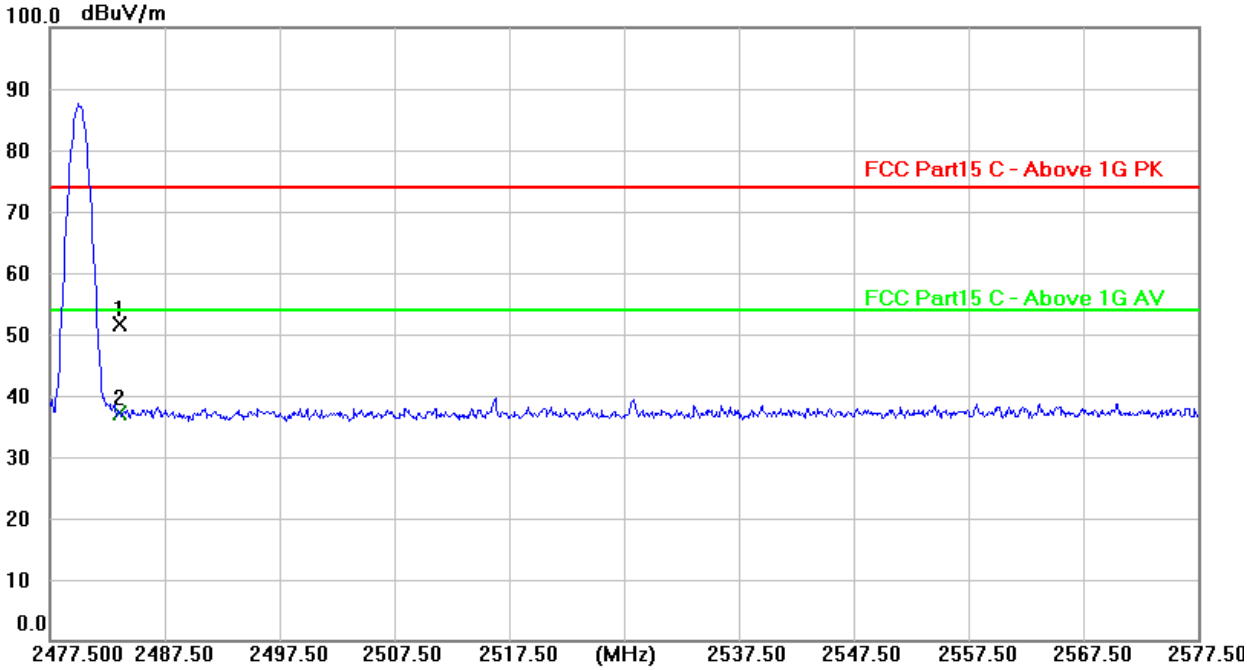
The emission was conducted from 1GHz to 25GHz

Vertical



Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2390.000	22.12	31.31	53.43	74.00	-20.57	peak
2390.000	5.47	31.31	36.78	54.00	-17.22	AVG

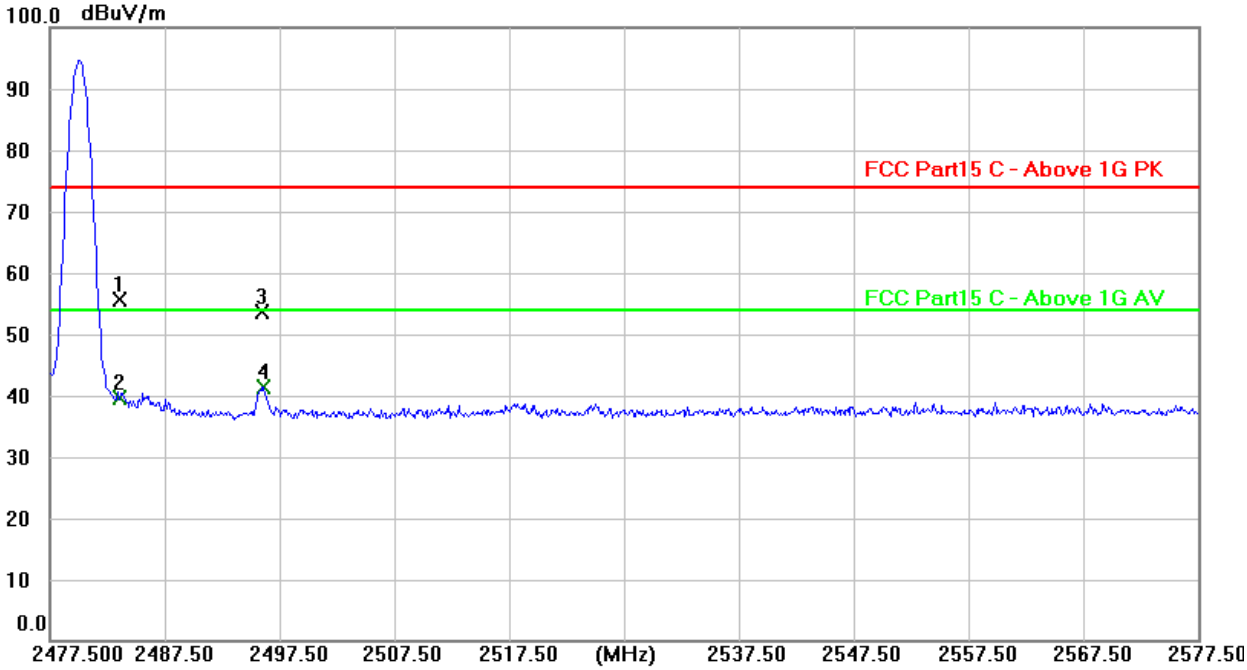
TEST REPORT



Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2483.500	20.16	31.48	51.64	74.00	-22.36	peak
2483.500	5.58	31.48	37.06	54.00	-16.94	AVG

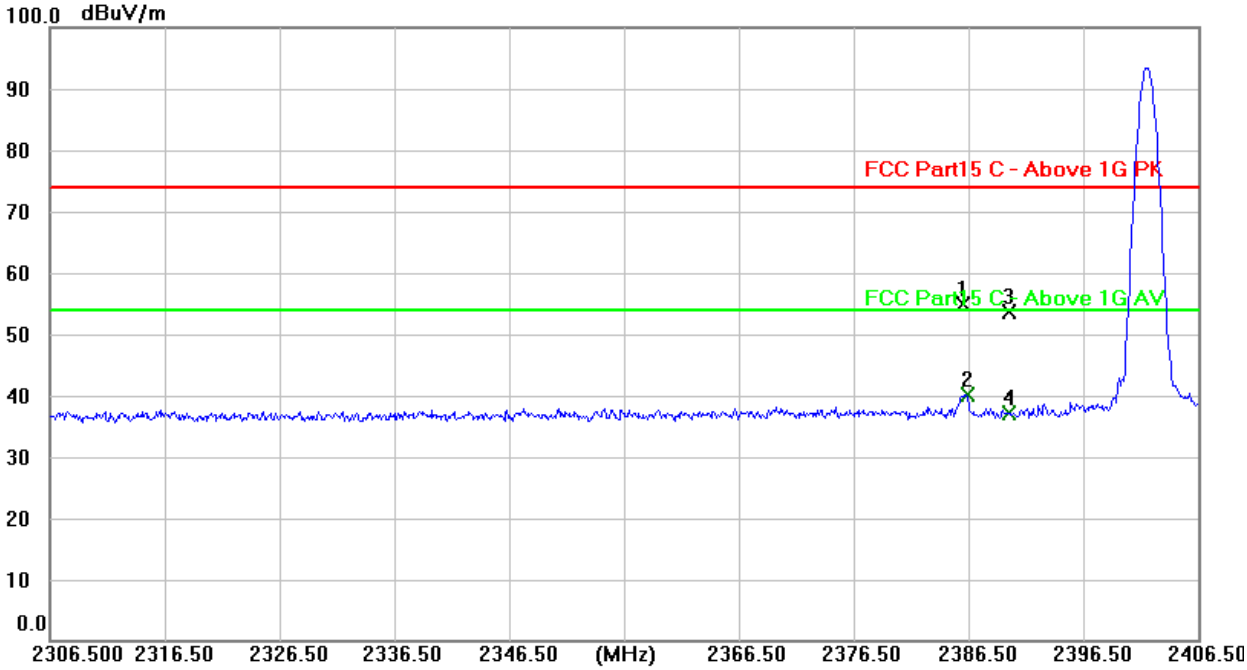
TEST REPORT

Horizontal



Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2483.500	24.18	31.48	55.66	74.00	-18.34	peak
2483.500	8.26	31.48	39.74	54.00	-14.26	AVG
2496.000	22.10	31.51	53.61	74.00	-20.39	peak
2496.067	9.92	31.51	41.43	54.00	-12.57	AVG

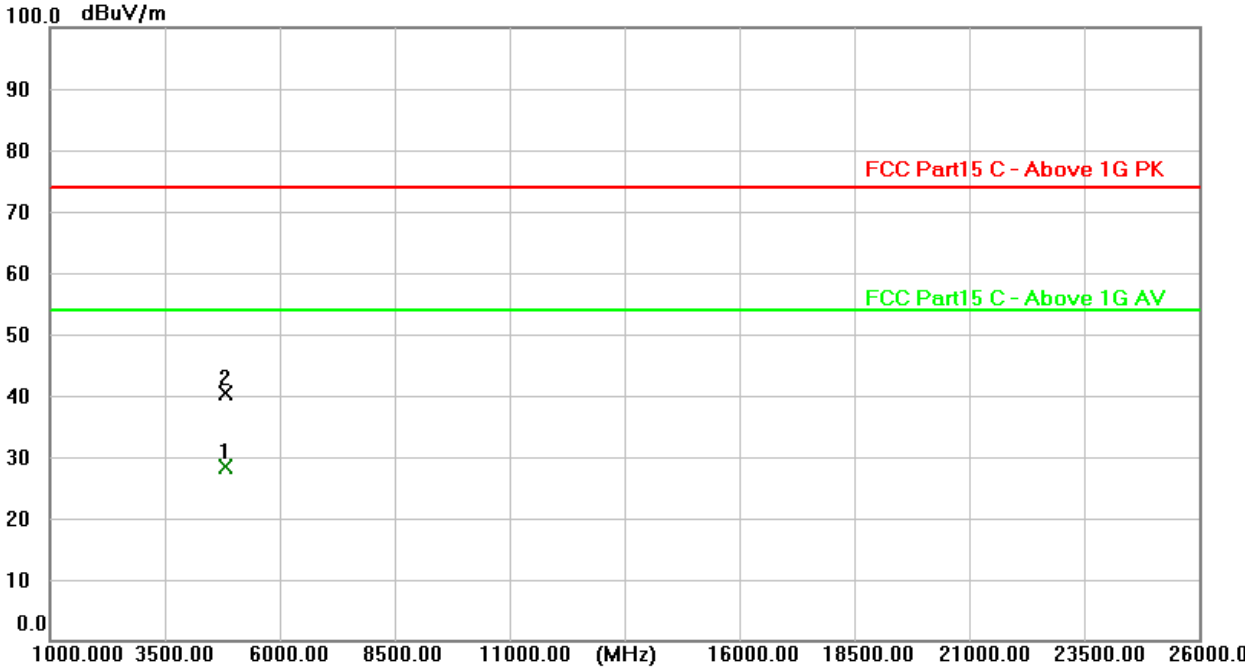
TEST REPORT



Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
2386.000	23.63	31.31	54.94	74.00	-19.06	peak
2386.367	8.76	31.31	40.07	54.00	-13.93	AVG
2390.000	22.24	31.31	53.55	74.00	-20.45	peak
2390.000	5.75	31.31	37.06	54.00	-16.94	AVG

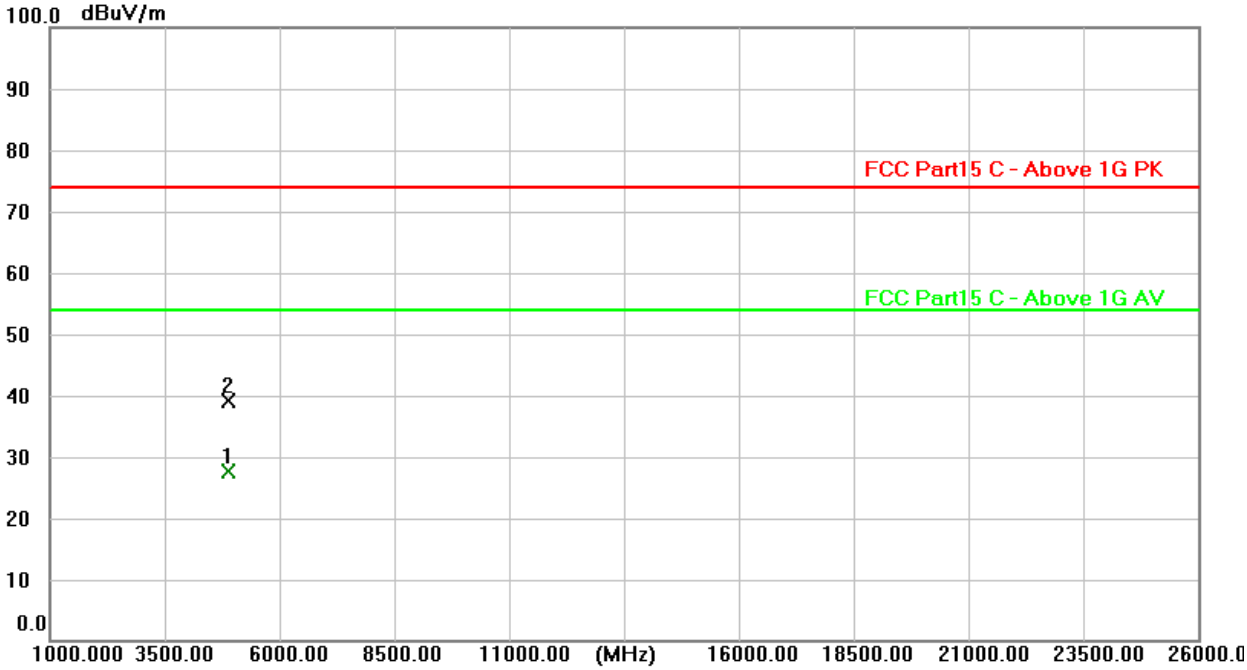
TEST REPORT

Vertical



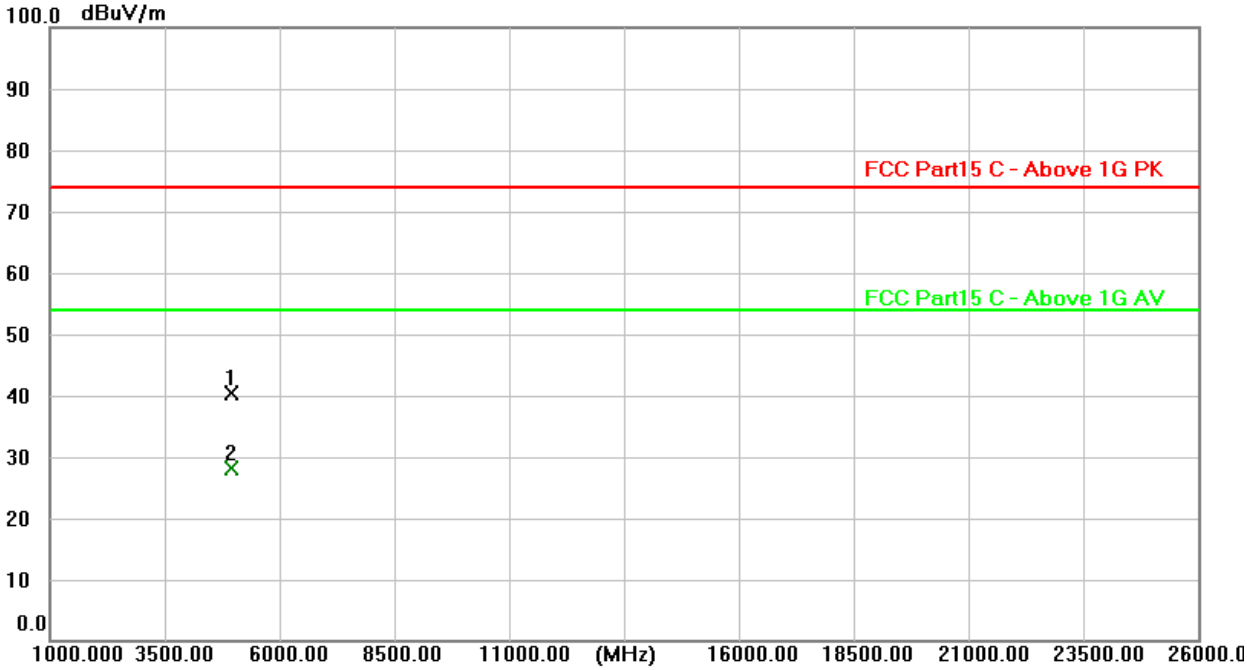
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
4803.009	26.26	2.07	28.33	54.00	-25.67	AVG
4803.616	38.41	2.08	40.49	74.00	-33.51	peak

TEST REPORT



Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
4880.350	25.55	2.18	27.73	54.00	-26.27	AVG
4880.587	36.84	2.18	39.02	74.00	-34.98	peak

TEST REPORT



Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
4959.025	38.03	2.30	40.33	74.00	-33.67	peak
4959.983	25.91	2.30	28.21	54.00	-25.79	AVG

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Reading-Limit
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 10.20dBuV/m - 40.00dBuV/m = -29.80dB.

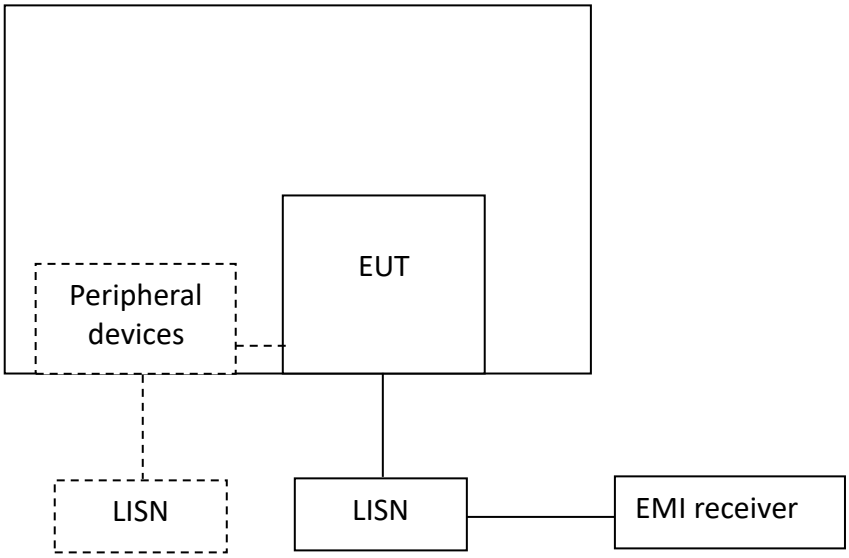
8 Power line conducted emission

Test result: **Pass**

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

8.2 Test Configuration



8.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

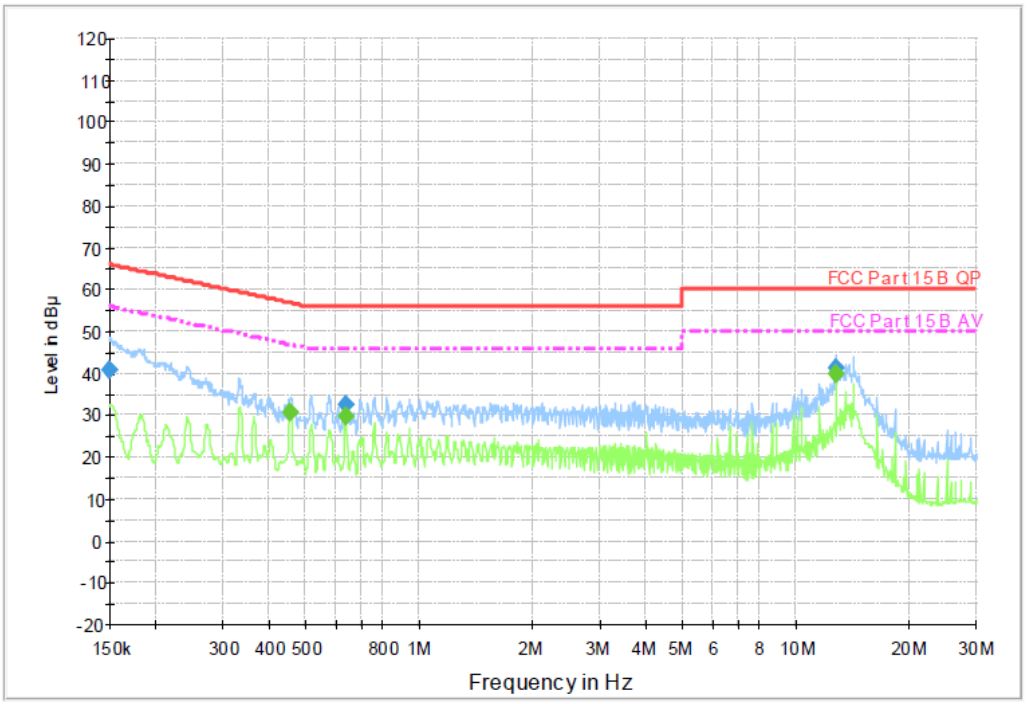
The bandwidth of the test receiver is set at 9 kHz.

TEST REPORT

8.4 Test Results of Power line conducted emission

Test Curve:

L



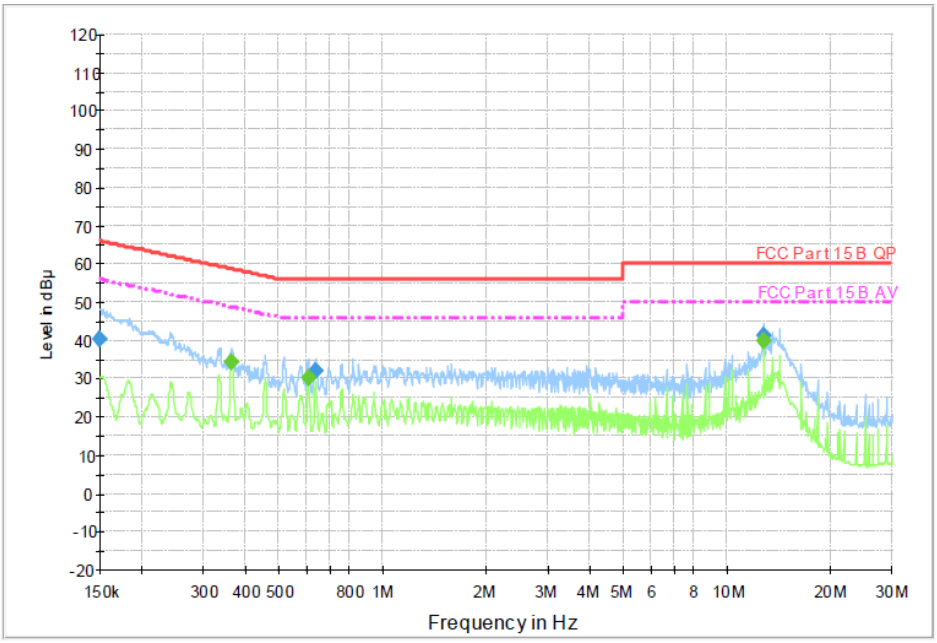
Test Data:

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.150600	40.9	1000.00	9.000	On	L1	9.4	25.1	66.0
0.633810	32.7	1000.00	9.000	On	L1	9.5	23.3	56.0
12.705160	41.1	1000.00	9.000	On	L1	9.8	18.9	60.0

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.453240	30.6	1000.00	9.000	On	L1	9.5	16.2	46.8
0.633810	29.9	1000.00	9.000	On	L1	9.5	16.1	46.0
12.705160	40.0	1000.00	9.000	On	L1	9.8	10.0	50.0

TEST REPORT

N



Test Data:

Frequency (MHz)	QuasiPeak (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.150600	40.2	1000.00	9.000	On	N	9.3	25.8	66.0
0.633810	32.2	1000.00	9.000	On	N	9.4	23.8	56.0
12.705160	41.0	1000.00	9.000	On	N	9.6	19.0	60.0

Frequency (MHz)	Average (dBµ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.362440	34.2	1000.00	9.000	On	N	9.4	14.5	48.7
0.604170	30.1	1000.00	9.000	On	N	9.4	15.9	46.0
12.705160	40.0	1000.00	9.000	On	N	9.6	10.0	50.0

Remark:

1. Margin= Limit- QuasiPeak(Average)
2. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

9 Occupied Bandwidth

Test result: **Tested**

9.1 Limit

None

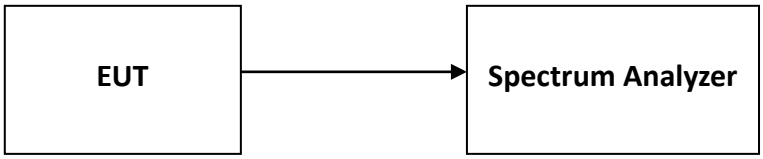
9.2 Measurement Procedure

The occupied bandwidth per RSS-Gen was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Configuration



9.4 The results of Occupied Bandwidth

Please refer to Appendix A

10 Antenna requirement

Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

TEST REPORT

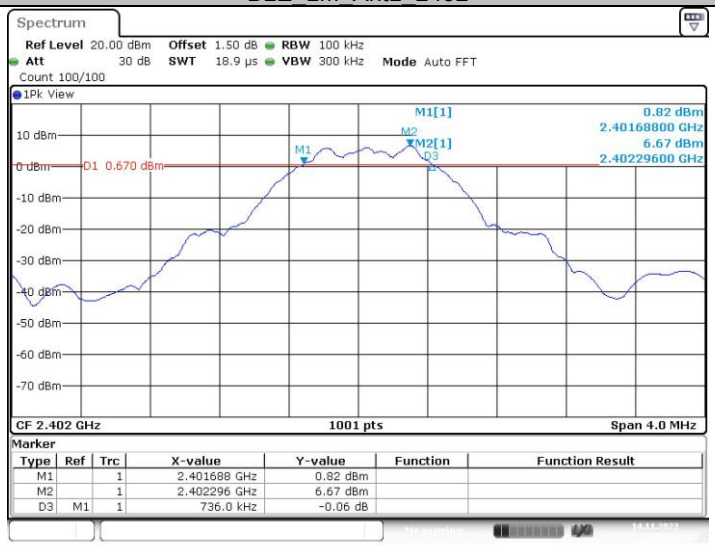
Appendix A: Test results

Test Result

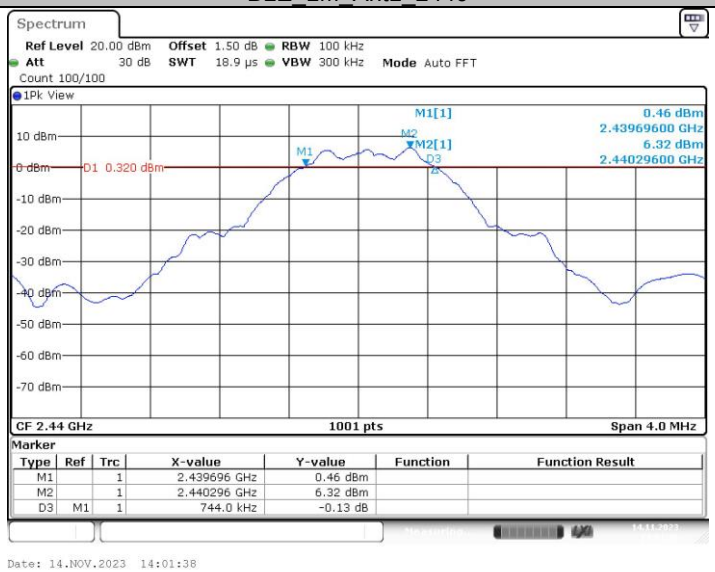
Test Mode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.74	2401.69	2402.42	0.5	PASS
		2440	0.74	2439.70	2440.44	0.5	PASS
		2480	0.76	2479.68	2480.44	0.5	PASS

Test Graphs

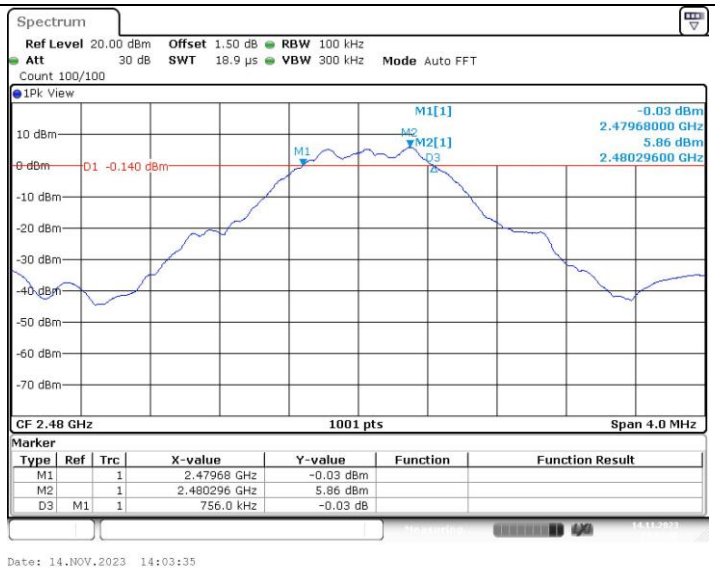
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

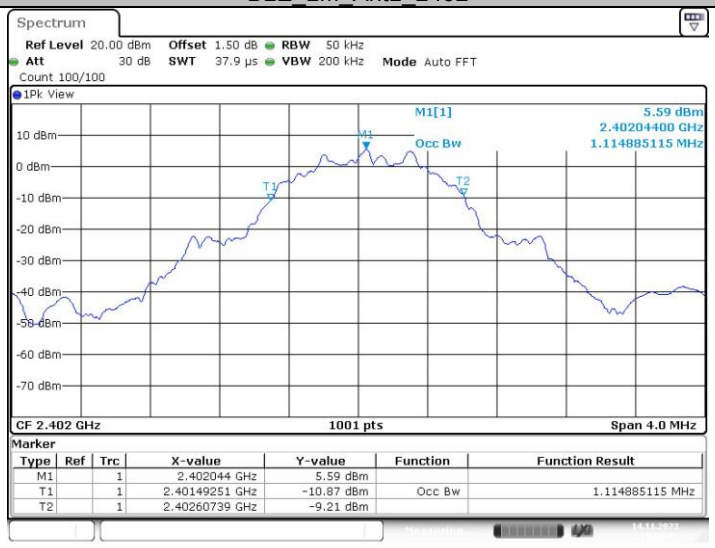

Spectrum
Ref Level 20.00 dBm Offset 1.50 dB RBW 100 kHz
Att 30 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -0.03 dBm
2.47968000 GHz
M2[1] 5.86 dBm
2.48029600 GHz
D1 -0.140 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
1001 pts
Span 4.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47968 GHz -0.03 dBm
M2 1 2.480296 GHz 5.86 dBm
D3 M1 1 756.0 kHz -0.03 dB
Date: 14.NOV.2023 14:03:35

Occupied Channel Bandwidth
Test Result

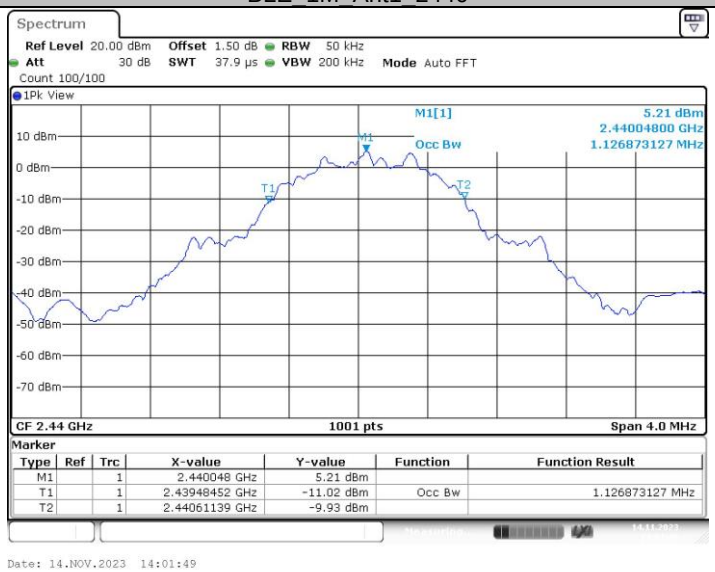
Test Mode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.115	2401.493	2402.607	---	PASS
		2440	1.127	2439.485	2440.611	---	PASS
		2480	1.139	2479.481	2480.619	---	PASS

Test Graphs

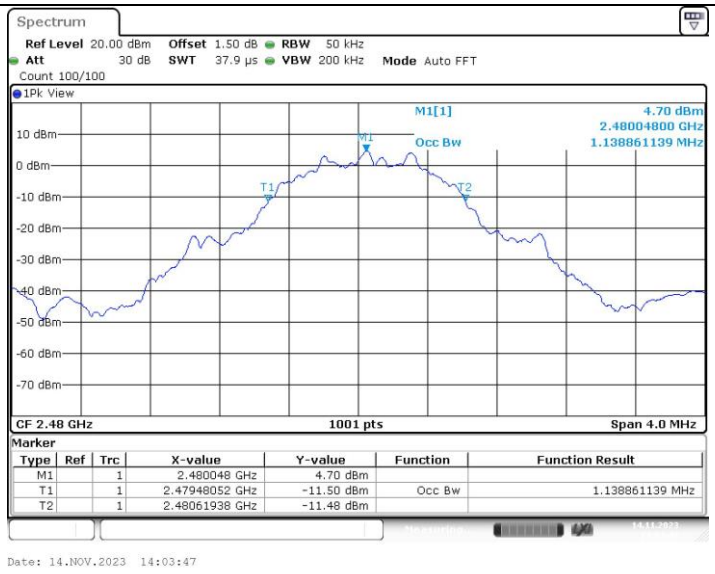
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

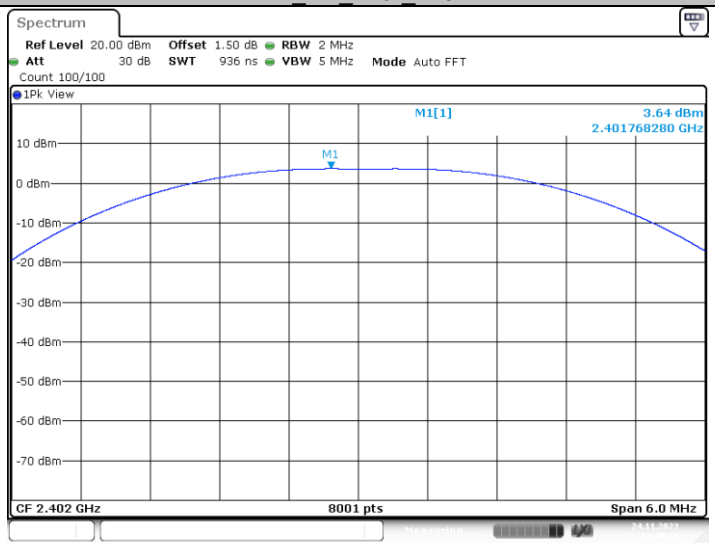

Spectrum
Ref Level 20.00 dBm Offset 1.50 dB RBW 50 kHz
Att 30 dB SWT 37.9 µs VBW 200 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] 4.70 dBm
2.48004800 GHz
Occ Bw 1.138861139 MHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
1001 pts
Span 4.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.480048 GHz 4.70 dBm
T1 1 2.47948052 GHz -11.50 dBm Occ Bw 1.138861139 MHz
T2 1 2.48061938 GHz -11.48 dBm
Date: 14.NOV.2023 14:03:47

Maximum conducted output power
Test Result Peak

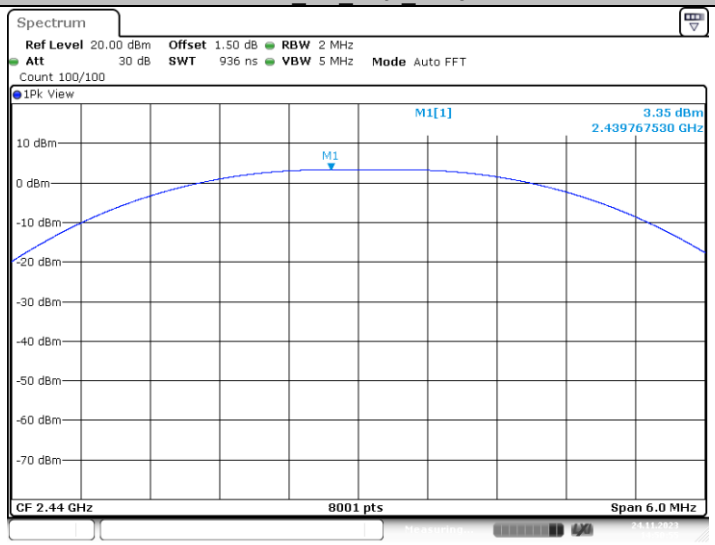
Test Mode	Antenna	Freq(MHz)	Conducted Peak Powert[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
BLE_1M	Ant1	2402	3.64	≤30	6.03	≤36	PASS
		2440	3.35	≤30	5.74	≤36	PASS
		2480	3.81	≤30	6.20	≤36	PASS

Test Graphs Peak

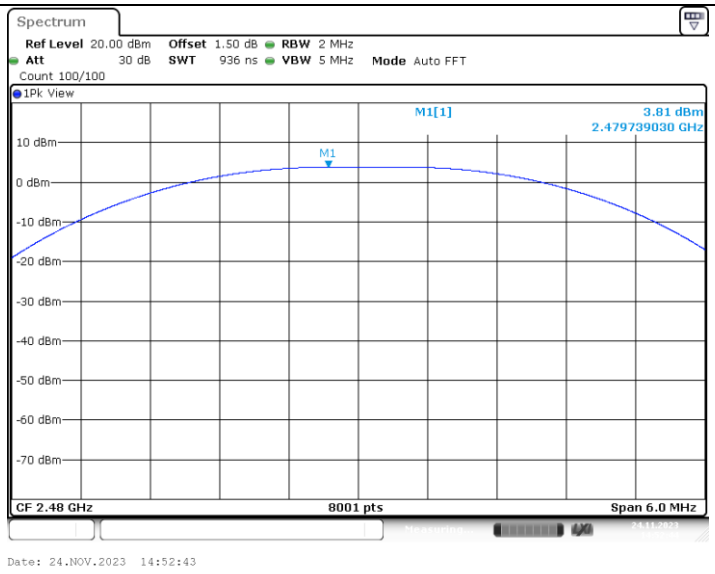
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

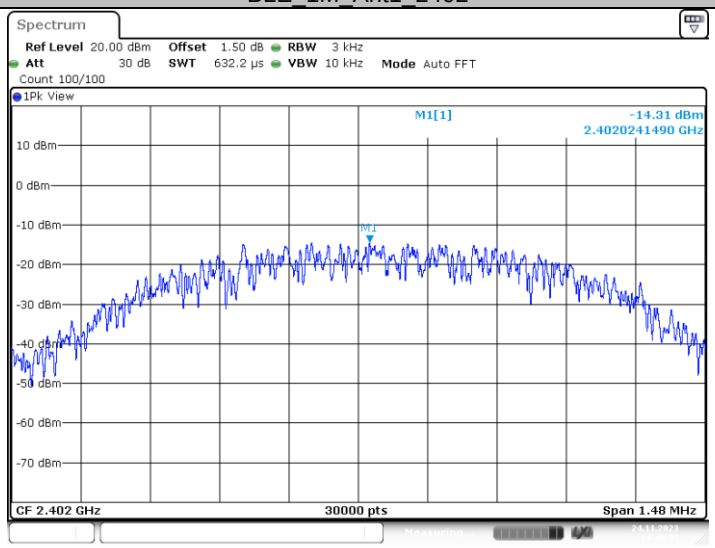

Spectrum
Ref Level 20.00 dBm Offset 1.50 dB RBW 2 MHz
Att 30 dB SWT 936 ns VBW 5 MHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] 3.81 dBm
2.479739030 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
8001 pts
Span 6.0 MHz
Date: 24.NOV.2023 14:52:43

Maximum power spectral density
Test Result

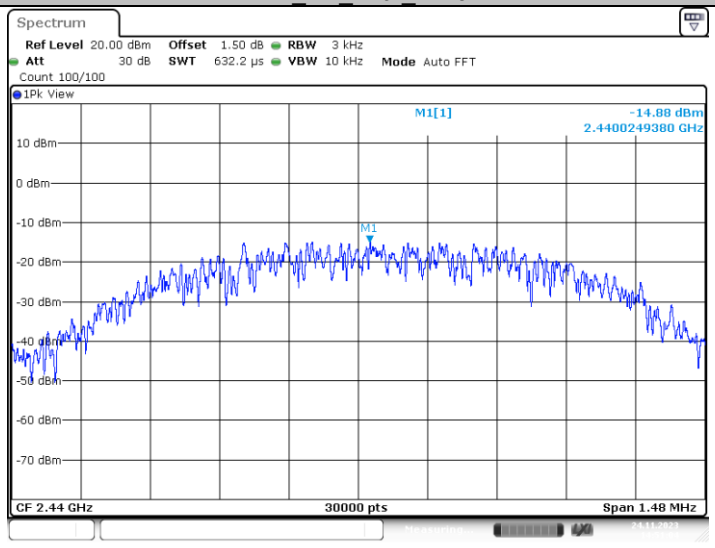
Test Mode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-14.31	≤8.00	PASS
		2440	-14.88	≤8.00	PASS
		2480	-14.45	≤8.00	PASS

Test Graphs

BLE_1M_Ant1_2402

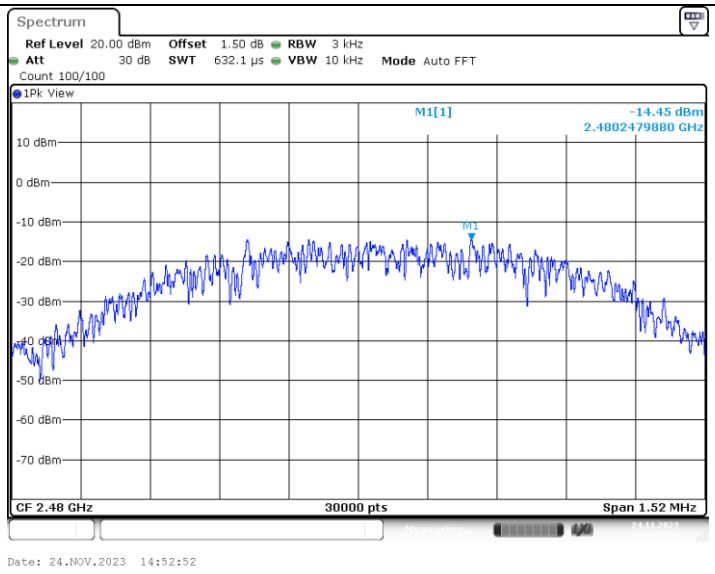


BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

TEST REPORT

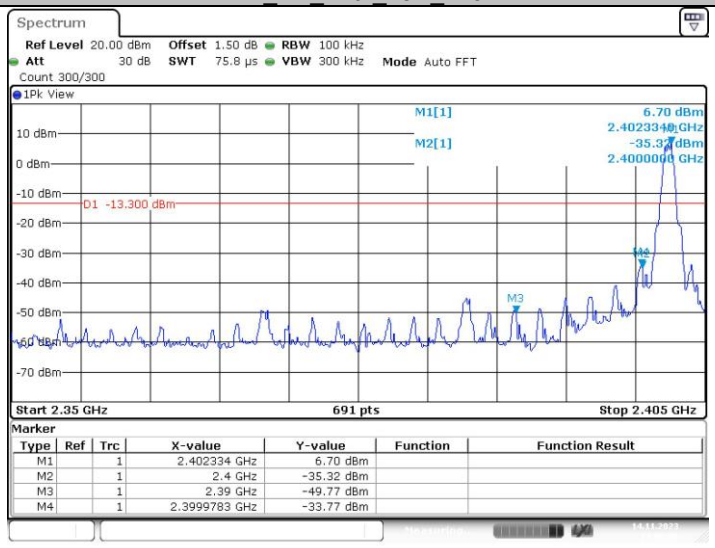

Spectrum
Ref Level 20.00 dBm Offset 1.50 dB RBW 3 kHz
Att 30 dB SWT 632.1 µs VBW 10 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -14.45 dBm
2.4802479880 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.48 GHz
30000 pts
Span 1.52 MHz
Date: 24.NOV.2023 14:52:52

Band edge measurements
Test Result

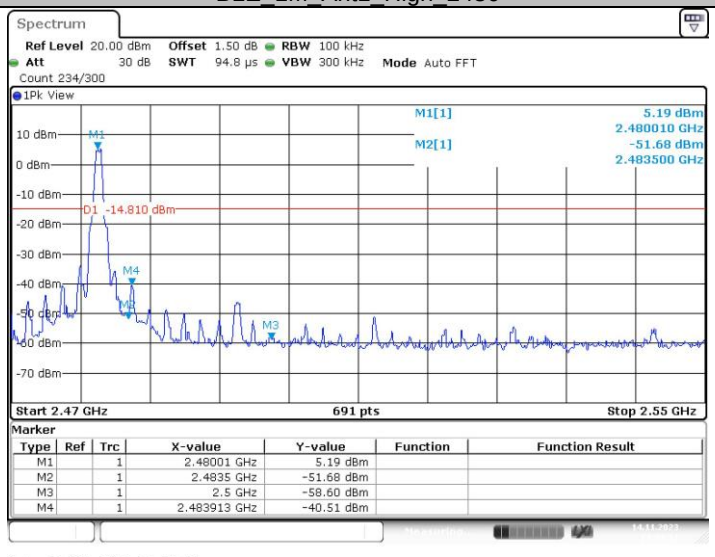
Test Mode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	6.70	-33.77	≤-13.30	PASS
		High	2480	5.19	-40.51	≤-14.81	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



Conducted Spurious Emission

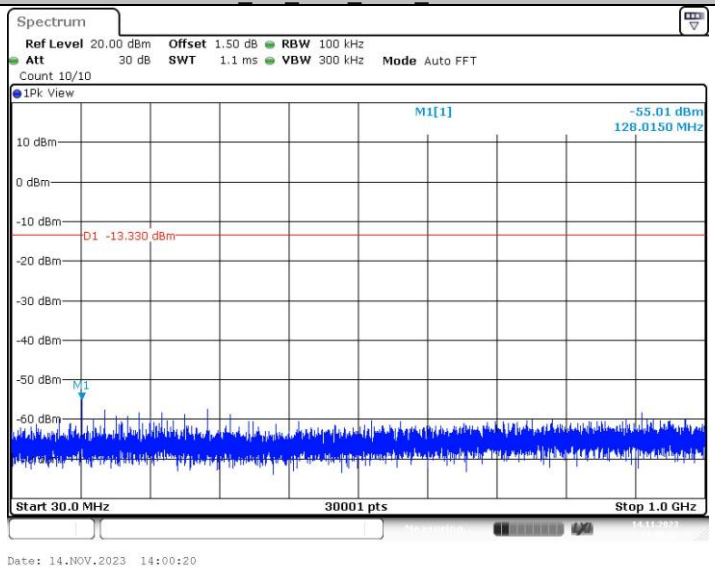
Test Result

Test Mode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	6.67	6.67	---	PASS
			30~1000	6.67	-55.01	≤-13.33	PASS
			1000~26500	6.67	-40.17	≤-13.33	PASS
		2440	Reference	6.31	6.31	---	PASS
			30~1000	6.31	-56.54	≤-13.69	PASS
			1000~26500	6.31	-40.65	≤-13.69	PASS
		2480	Reference	5.83	5.83	---	PASS
			30~1000	5.83	-56.39	≤-14.17	PASS
			1000~26500	5.83	-40.53	≤-14.17	PASS

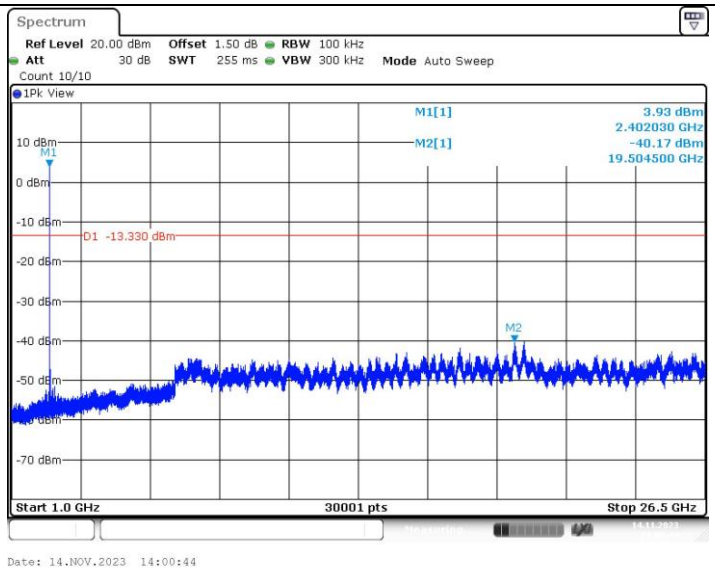
Test Graphs

BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000

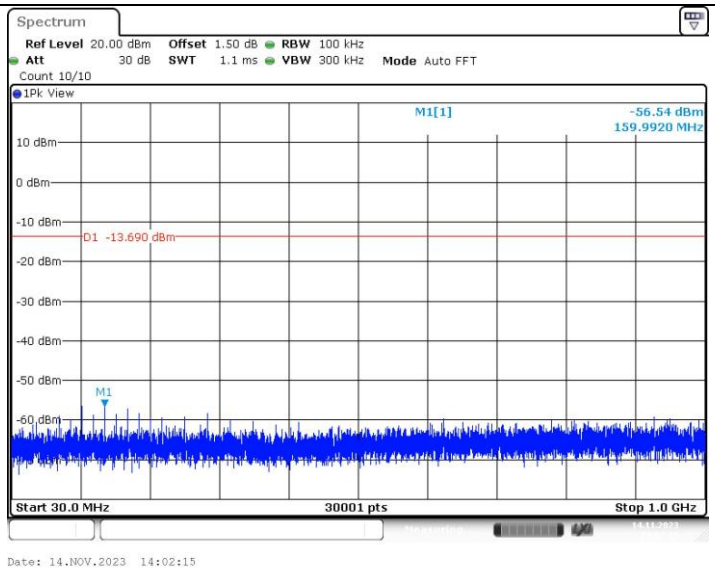


BLE_1M_Ant1_2402_1000~26500

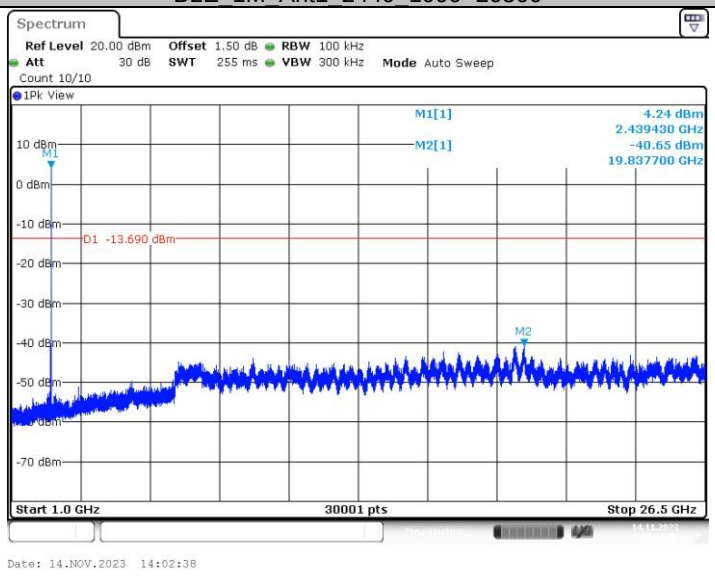


BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000

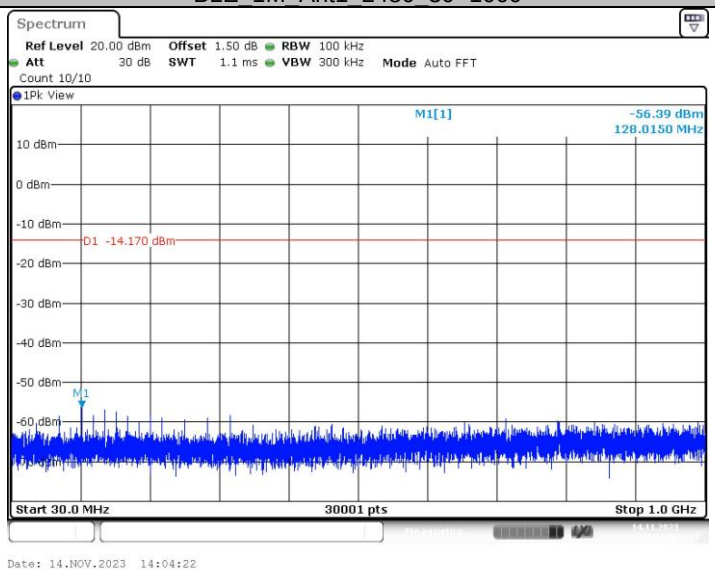


BLE_1M_Ant1_2440_1000~26500



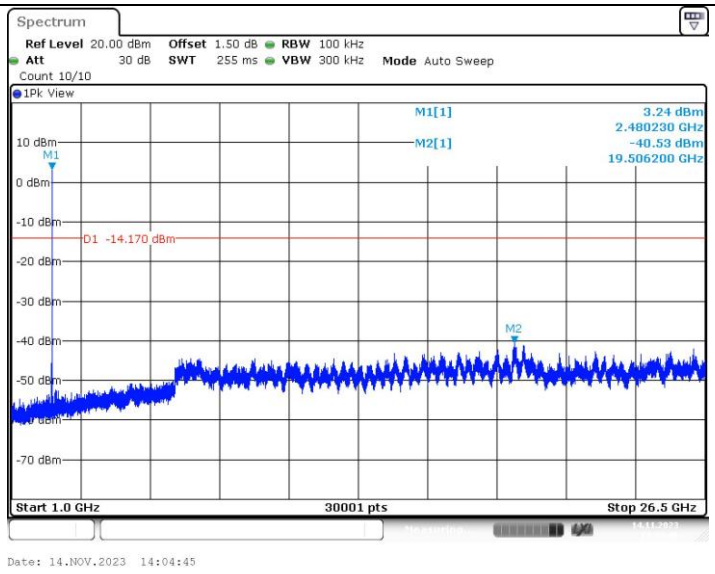
BLE_1M_Ant1_2480_0~Reference

BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500

TEST REPORT


Spectrum
Ref Level 20.00 dBm Offset 1.50 dB RBW 100 kHz
Att 30 dB SWT 255 ms VBW 300 kHz Mode Auto Sweep
Count 10/10
1Pk View
M1[1] 3.24 dBm
2.480230 GHz
M2[1] -40.53 dBm
19.506200 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
M1
M2
D1 -14.170 dBm
Start 1.0 GHz
30001 pts
Stop 26.5 GHz
Date: 14.NOV.2023 14:04:45

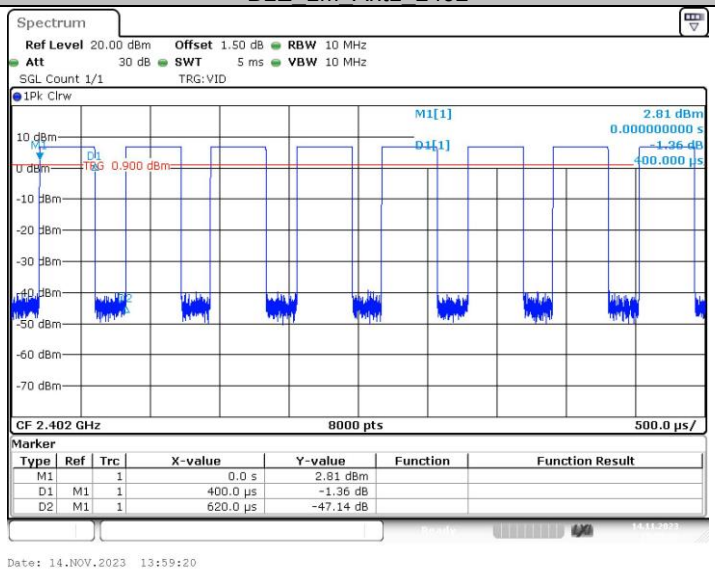
TEST REPORT

Duty Cycle
Test Result

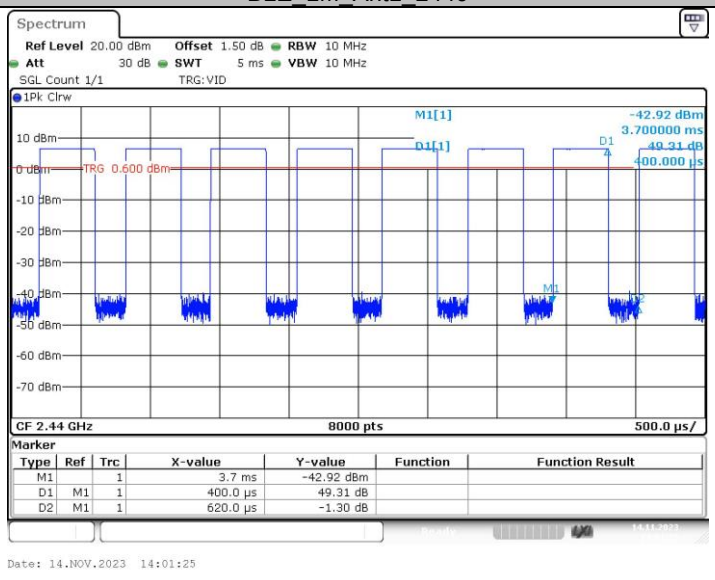
Test Mode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	0.40	0.62	0.6452	64.52	1.90	---	PASS
		2440	0.40	0.62	0.6452	64.52	1.90	---	PASS
		2480	0.40	0.62	0.6452	64.52	1.90	---	PASS

Test Graphs

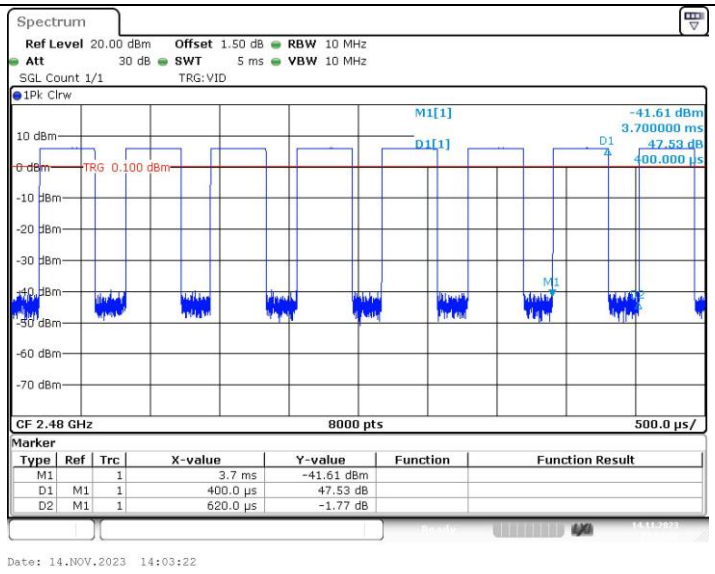
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Spectrum
Ref Level 20.00 dBm Offset 1.50 dB RBW 10 MHz
Att 30 dB SWT 5 ms VBW 10 MHz
SGL Count 1/1 TRG:VID
1Pk Clrw
M1[1] -41.61 dBm
3.700000 ms
D1[1] 47.53 dB
400.000 µs
10 dBm
0 dBm
TRG 0.100 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
8000 pts
500.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 3.7 ms -41.61 dBm
D1 M1 1 400.0 µs 47.53 dB
D2 M1 1 620.0 µs -1.77 dB
Date: 14.NOV.2023 14:03:22

********** END **********