Tineco Intelligent Technology Co., Ltd.

RF TEST REPORT

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FCC Part 15.247 RF report

MODEL:
FW14******

REPORT NUMBER:
231200464SHA-002

ISSUE DATE:
January 29, 2024

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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

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TEST REPORT

Report no.: 231200464SHA-002

Applicant:	Tineco Intelligent Technology Co., Ltd. No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215168 P.R.China
Manufacturer:	Tineco Intelligent Technology Co., Ltd. No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215168 P.R.China
Factory:	Tineco Intelligent Technology Co., Ltd. No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215168 P.R.China
FCC ID:	2AV7A-FW14

SUMMARY:

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

47CFR Part 15 (2021): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2020): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
	
Project Engineer Sky Yang	Reviewer Eric Li

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
231200464SHA-002	Rev. 01	Initial issue of report	January 29, 2024

Measurement result summary

TEST ITEM	FCC REFERENCE	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	-	Pass
Antenna requirement	15.203	Pass

Notes:
1: NA =Not Applicable
2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.
3: Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Cordless Floor Washer
Type/Model:	FW14****** * can be 0 to 9 or A to Z. The suffix ****** in model name can be numbers or letters, which represents country, marketing channel, product color, function and configuration of auxiliary equipment.
Description of EUT:	The EUT is a floor washer with WIFI and Bluetooth function. FW14****** series can be used with drying & charging dock AA2339B, and all models have the same electronic circuit. We choose FW144100US to test as representative and list the results in this report.
Rating:	Working: 21.6VDC, 220W Drying & Charging Dock AA2339B: Input(charging): 120VAC, 60Hz, 0.5A Input(drying): 120VAC, 60Hz, 3.8A Output: 26VDC, 1A
Category of EUT:	Class B
EUT type:	☐ Table top ☒ Floor standing
Software Version:	/
Hardware Version:	/
Sample Identification No.:	A231219-11-002
Sample received date:	December 19, 2023
Date of test:	January 2, 2024 ~ January 21, 2024

1.2 Technical Specification

Frequency Band:	2400MHz ~ 2483.5MHz
Support Standards:	Bluetooth LE 4.2
Type of Modulation:	GFSK
Channel Number:	40
Data Rate:	1Mbps, 2Mbps
Channel Separation:	2MHz
Antenna Information:	3.96dBi, 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 Member No.: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2020)
KDB 558074 (v05or02)

2.2 Mode of operation during the test

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

Frequency Band (MHz)				2400 ~ 2483.5			
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 applicant. 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	EspRFTestTool V3.6		
Working Mode	BLE		
Test Channel	2402MHz	2440MHz	2480MHz

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Radiated test mode: EUT transmitted signal with antenna;

Conducted test mode: EUT transmitted signal from RF port connected to SPA directly;

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	SKET Auto EMC Test Software	Keleto	V3.0
Radiated emission	SKET Auto EMC Test Software	Keleto	V3.0

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	HP ProBook 6470b	100-240V AC, 50/60Hz

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	23°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	22°C	53% RH
Power line conducted emission	22°C	55% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-19
☒	Shielded room	Zhongyu	-	EC 2838	2025-01-10
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-22
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2024-02-14
☒	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2024-12-07
☒	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2026-09-12
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-05
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2024-06-15
☒	Test Receiver	R&S	ESCI 7	EC 4501	2024-03-09
☒	Signal generator	Agilent	N5182A	EC 6172	2024-08-08
☒	Signal generator	Agilent	N5181A	EC 6171	2024-08-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	Testo	175h1	EC 6640	2024-08-28
☒	Therom-Hygrograph	Testo	175h1	EC6642	2024-08-28
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Power spectrum density	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB
Minimum 6dB Bandwidth	$\pm 0.84 \times 10^{-7}$
Occupied bandwidth	$\pm 0.84 \times 10^{-7}$

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

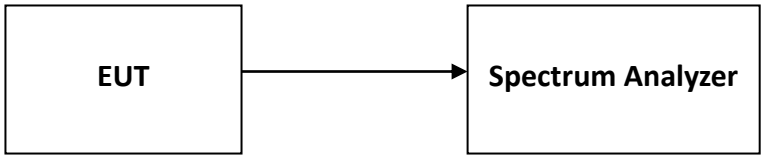
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The minimum 6dB bandwidth is measured using the Spectrum Analyzer according to DTS test procedure of "558074 D01 15.247 Meas Guidance v05r02" (clause 8.2) for compliance requirements.

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)

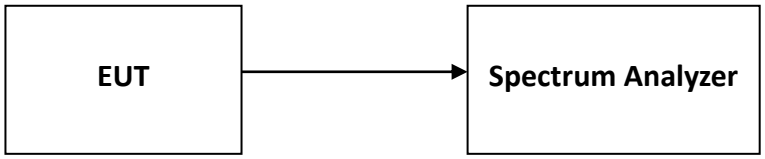
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “558074 D01 15.247 Meas Guidance v05r02” (clause 8.3.1) for compliance requirements.

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.

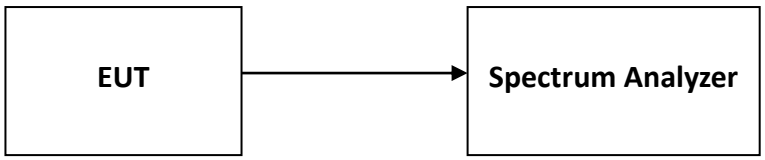
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

The power output was tested according to DTS test procedure of “558074 D01 15.247 Meas Guidance v05r02” (clause 8.4) for compliance requirements.

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

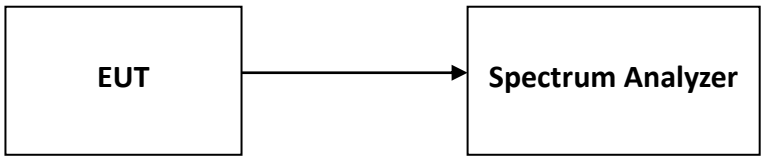
The EUT was tested according to DTS test procedure of "558074 D01 15.247 Meas Guidance v05r02" (clause 8.5) for compliance requirements.

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

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter 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.

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.1 meters above the ground at 3 meter 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.

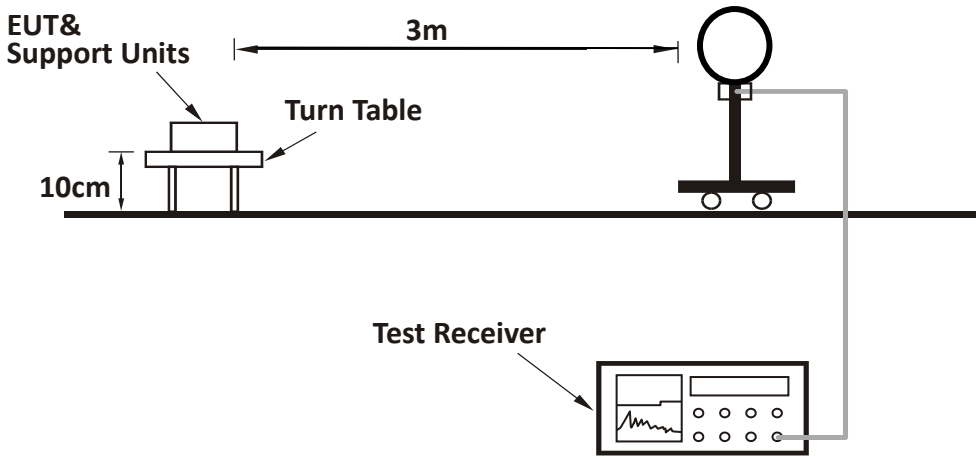
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

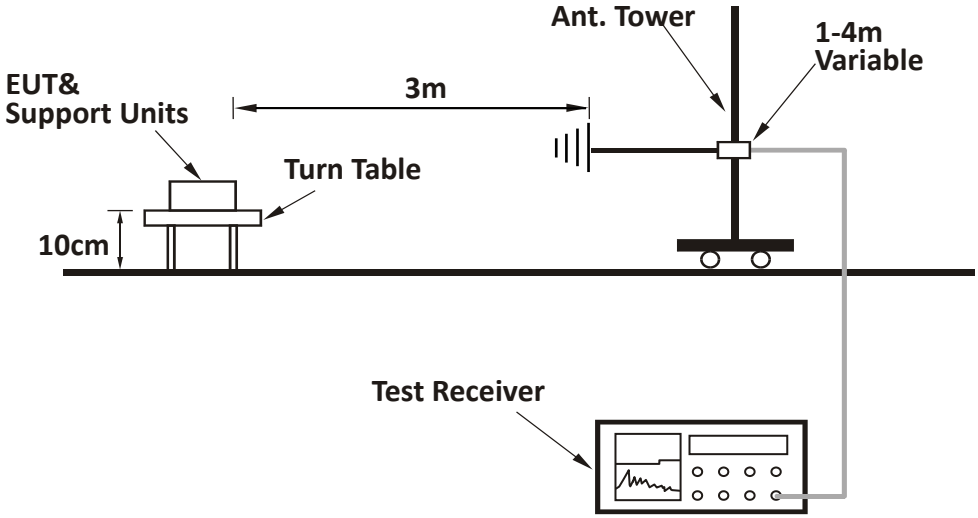
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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 investigated and the worst-case emissions are reported

7.3 Test Configuration

For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



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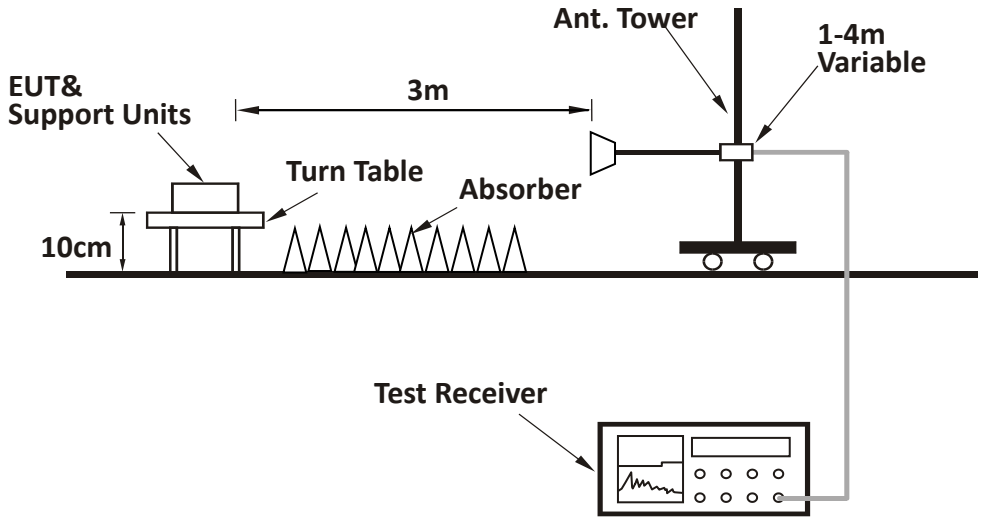
For Radiated emission above 1GHz:



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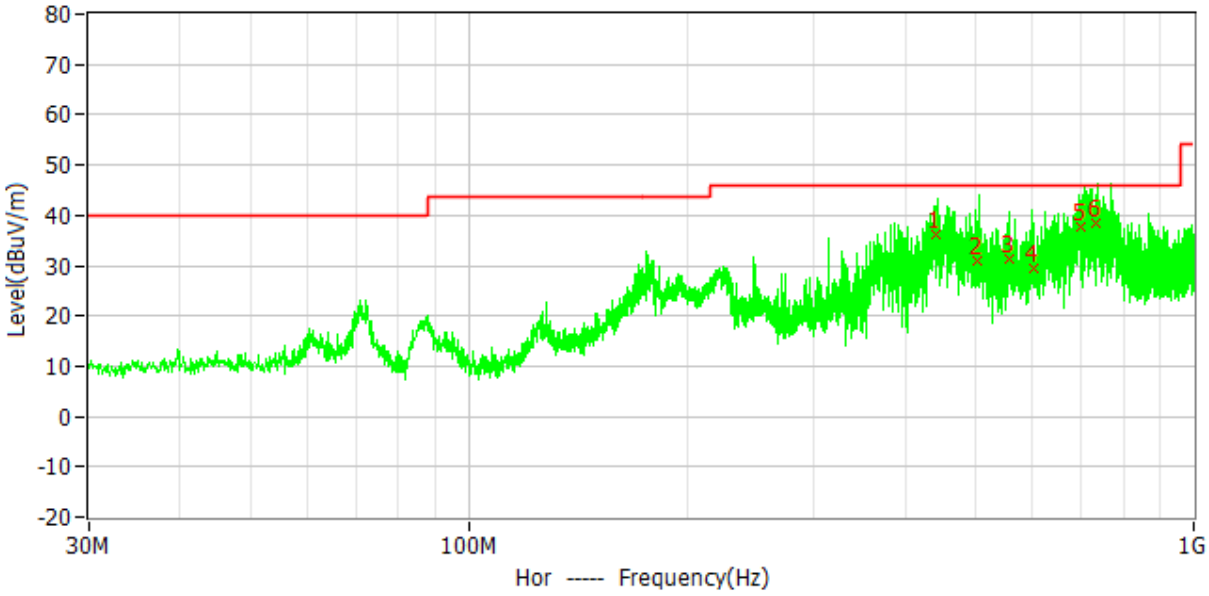
7.4 Test Results of Radiated Emissions

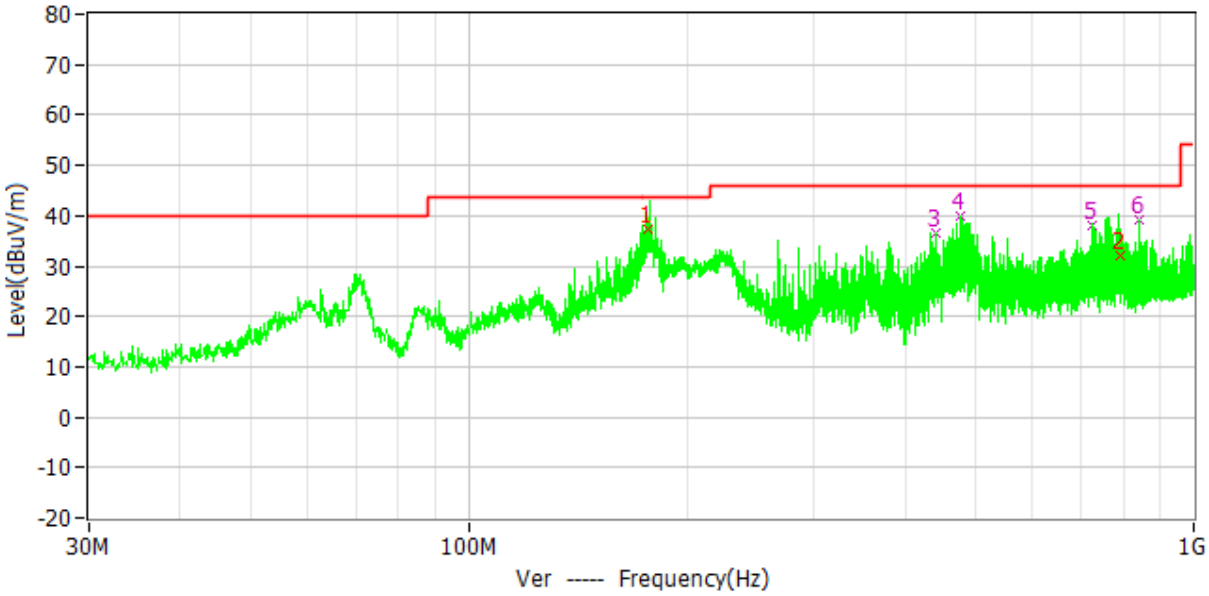
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

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

Horizontal



Vertical



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Test data:

Antenna	Frequency	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)	Detector
H	442.073MHz	46.0	36.2	9.8	QP
	504.390MHz	46.0	31.0	15.0	QP
	555.725MHz	46.0	31.2	14.8	QP
	601.929MHz	46.0	29.5	16.5	QP
	697.153MHz	46.0	37.8	8.2	QP
	734.718MHz	46.0	38.6	7.4	QP
V	176.856MHz	43.5	37.2	6.3	QP
	793.538MHz	46.0	31.9	14.1	QP
	440.116MHz	46.0	36.6	9.4	PK
	478.043MHz	46.0	39.8	6.2	PK
	726.072MHz	46.0	38.2	7.8	PK
	841.405MHz	46.0	39.0	7.0	PK

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. Level = Original Receiver Reading + Correct Factor
3. Margin = Limit - Level
4. If the PK Level 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;
Level = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz, the worst results are listed as below.

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	53.7	74.0	20.3	PK
	H	2390.00	42.3	54.0	11.7	AV
	V	2390.00	53.8	74.0	20.2	PK
	V	2390.00	41.4	54.0	12.6	AV
	H	4804.00	50.2	74.0	23.8	PK
	V	4804.00	49.5	74.0	24.5	PK
M	H	4880.00	50.3	74.0	23.7	PK
	V	4880.00	49.1	74.0	24.9	PK
H	H	2483.50	54.0	74.0	20.0	PK
	H	2483.50	42.5	54.0	11.5	AV
	V	2483.50	53.1	74.0	20.9	PK
	V	2483.50	41.3	54.0	12.7	AV
	H	4960.00	49.2	74.0	24.8	PK
	V	4960.00	49.0	74.0	25.0	PK

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 = Limit - Measured Level
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;
Measured Level = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

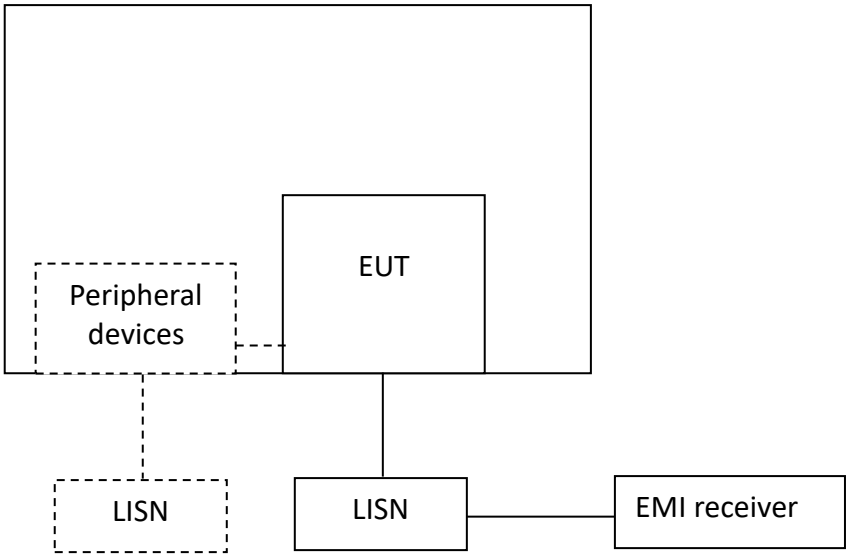
8 Power line conducted emission

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.

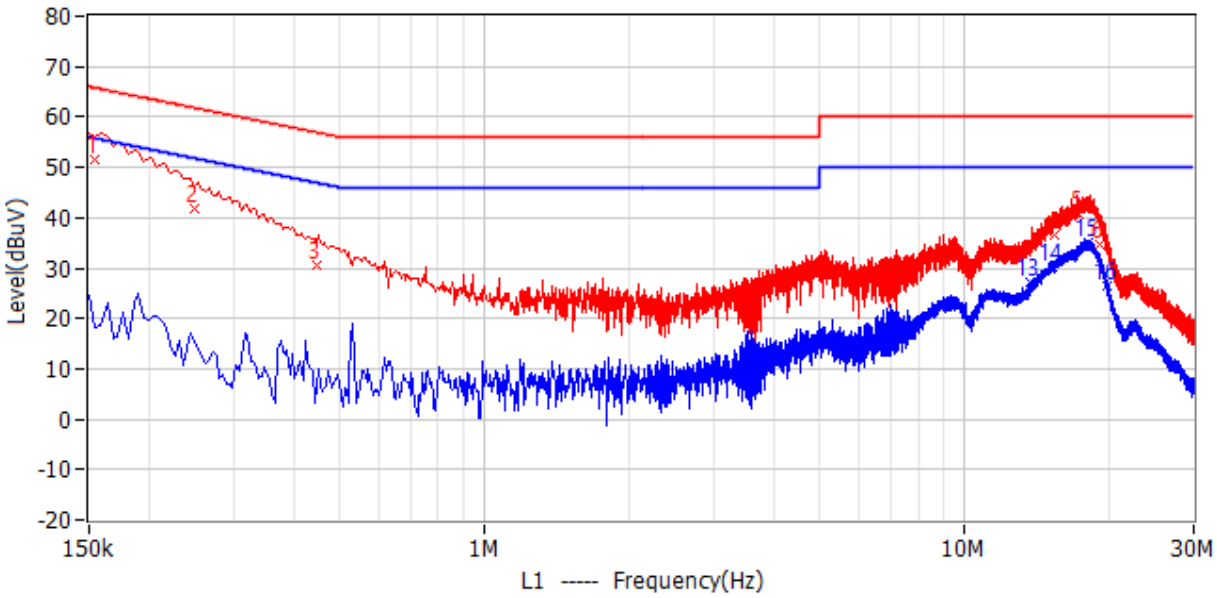
The bandwidth of the test receiver is set at 9 kHz.

8.4 Test Results of Power line conducted emission

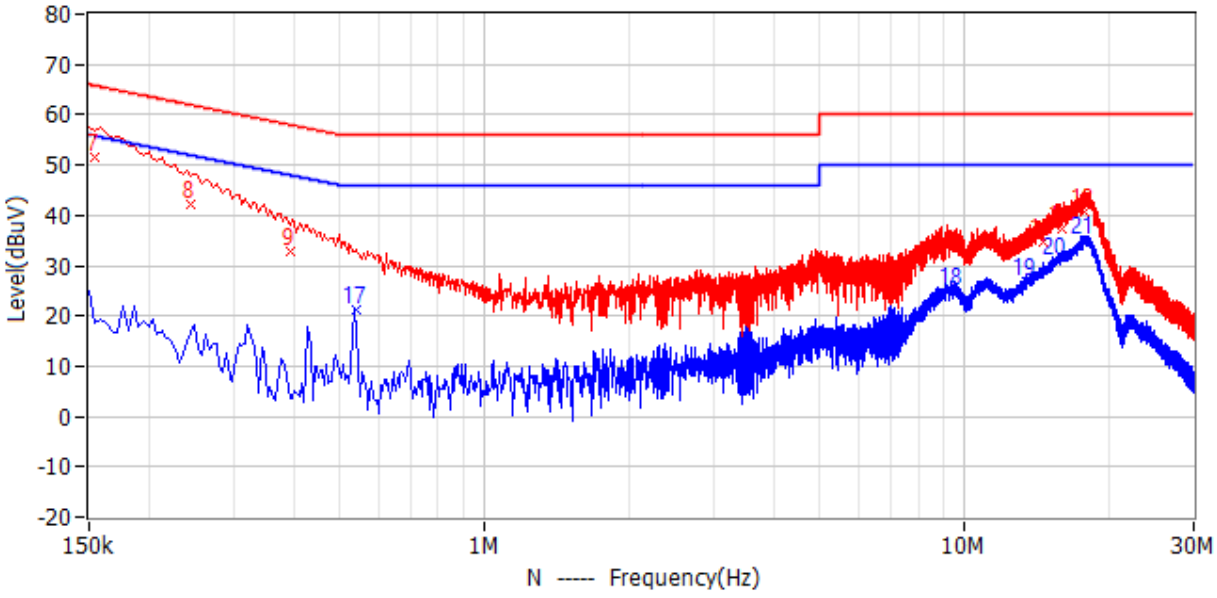
Test Voltage: 120V/60Hz

Test Curve:

L Line



N Line



TEST REPORT

Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Detector	Phase
1	154.500kHz	65.8	51.7	-14.1	QP	L
2	249.000kHz	61.8	41.8	-20.0	QP	L
3	447.000kHz	56.9	30.4	-26.5	QP	L
4	15.333MHz	60.0	36.6	-23.4	QP	L
5	17.259MHz	60.0	40.6	-19.4	QP	L
6	19.037MHz	60.0	34.8	-25.2	QP	L
7	154.500kHz	65.8	51.6	-14.2	QP	N
8	244.500kHz	61.9	42.2	-19.7	QP	N
9	393.000kHz	58.0	32.7	-25.3	QP	N
10	14.636MHz	60.0	34.5	-25.5	QP	N
11	15.945MHz	60.0	37.2	-22.8	QP	N
12	17.781MHz	60.0	40.7	-19.3	QP	N
13	13.655MHz	50.0	27.1	-22.9	CAV	L
14	15.194MHz	50.0	30.3	-19.7	CAV	L
15	18.038MHz	50.0	35.1	-14.9	CAV	L
16	19.725MHz	50.0	26.5	-23.5	CAV	L
17	541.500kHz	46.0	21.2	-24.8	CAV	N
18	9.411MHz	50.0	25.0	-25.0	CAV	N
19	13.403MHz	50.0	26.9	-23.1	CAV	N
20	15.549MHz	50.0	30.9	-19.1	CAV	N
21	17.822MHz	50.0	35.0	-15.0	CAV	N

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Level = Original Receiver Reading + Factor
3. Delta = Level - Limit
4. If the PK Level is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Factor = 10.00 + 2.00 = 12.00dB;
Level = 10dBuV + 12.00dB = 22.00dBuV;
Delta = 22.00dBuV - 66.00dBuV = -44.00dB.

9 Occupied Bandwidth

Test result: **Tested**

9.1 Limit

None

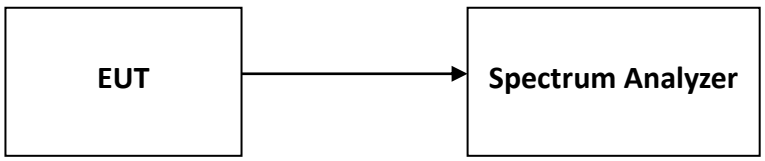
9.2 Measurement Procedure

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.

Appendix A: Test results

DTS Bandwidth

Test Result

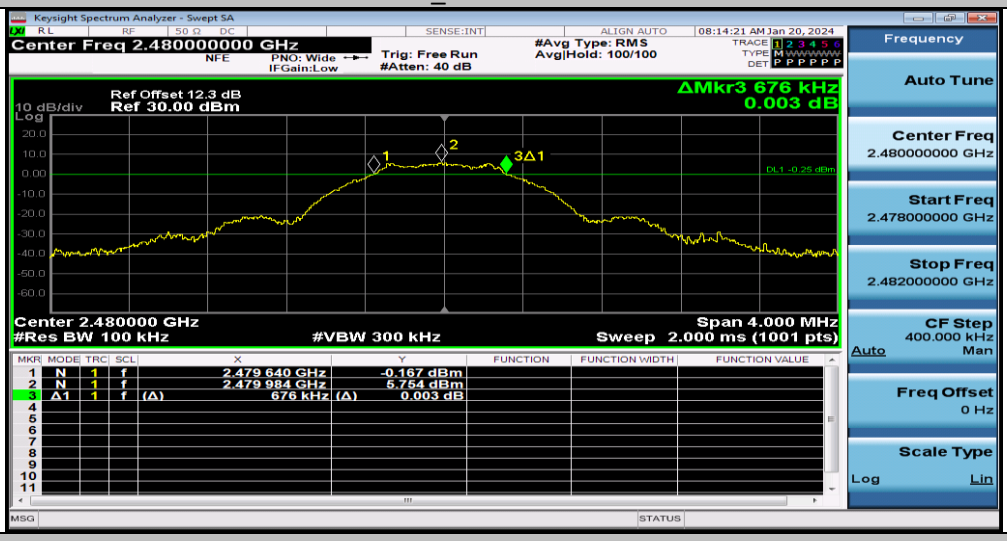
Test Mode	Frequency [MHz]	DTS BW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
BLE_1M	2402	0.672	2401.640	2402.312	0.5	PASS
BLE_1M	2440	0.668	2439.648	2440.316	0.5	PASS
BLE_1M	2480	0.676	2479.640	2480.316	0.5	PASS
BLE_2M	2402	1.136	2401.420	2402.556	0.5	PASS
BLE_2M	2440	1.144	2439.408	2440.552	0.5	PASS
BLE_2M	2480	1.136	2479.404	2480.540	0.5	PASS

TEST REPORT

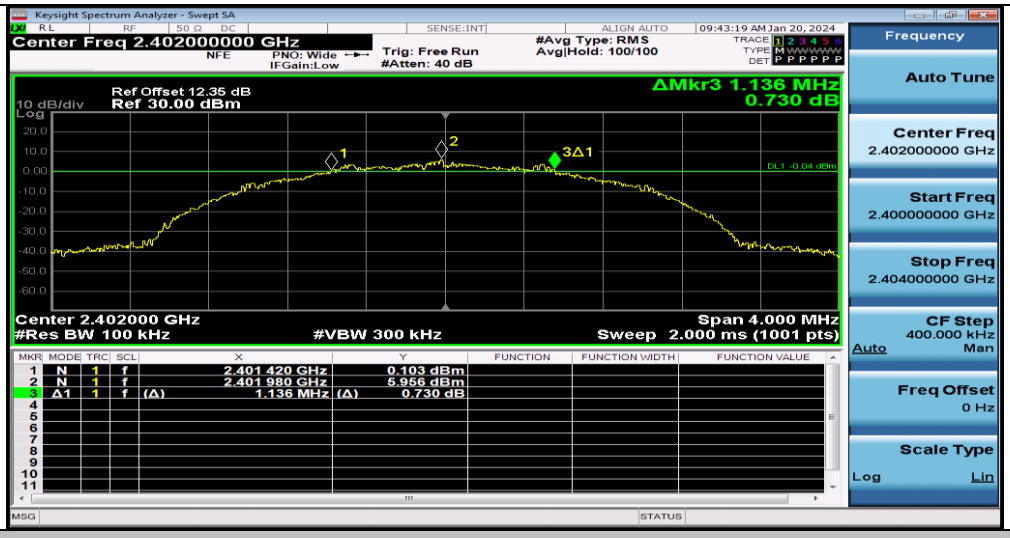
Test Graphs

BLE_1M-Ant1-2402

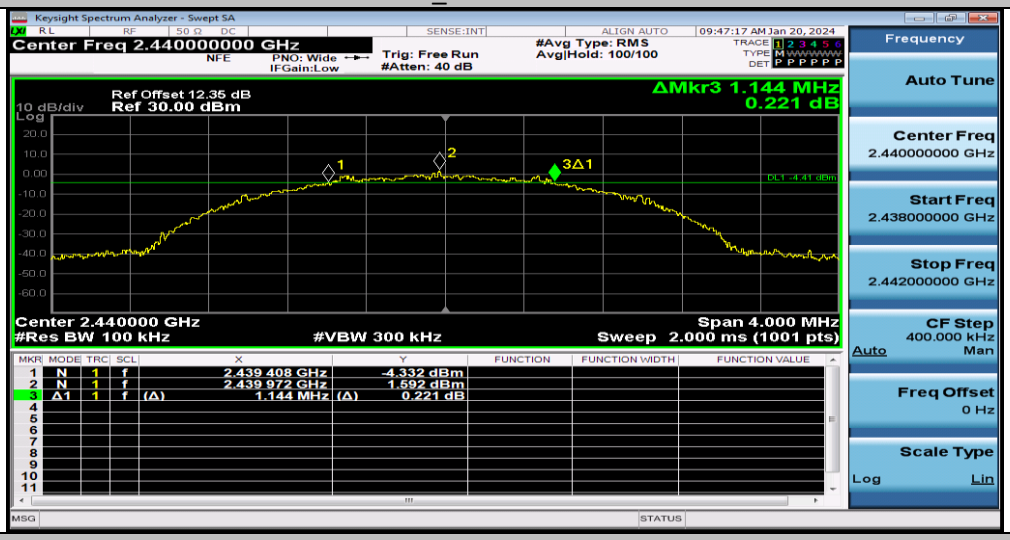
BLE_1M-Ant1-2440



BLE_1M-Ant1-2480



BLE_2M-Ant1-2402



BLE_2M-Ant1-2440

BLE_2M-Ant1-2480

TEST REPORT

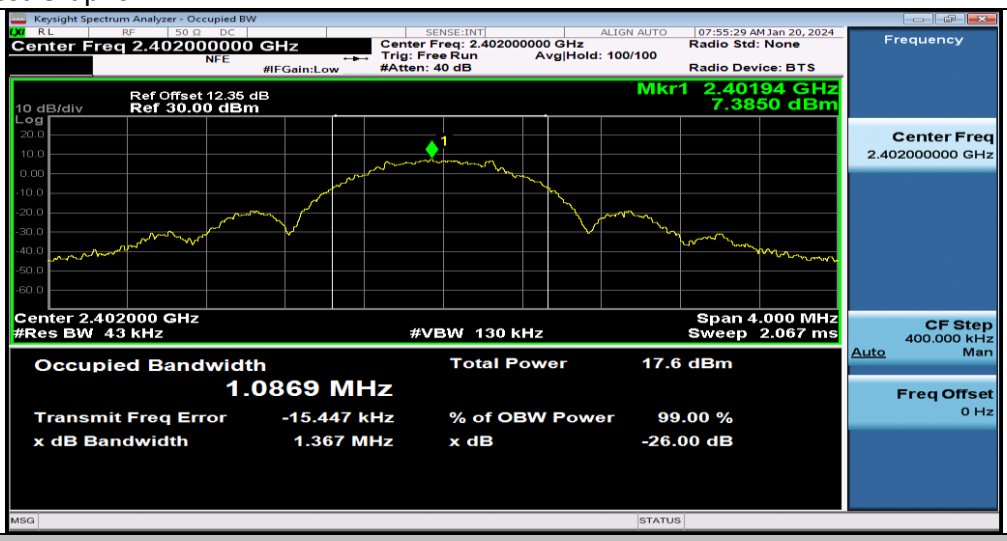
Occupied Channel Bandwidth

Test Result

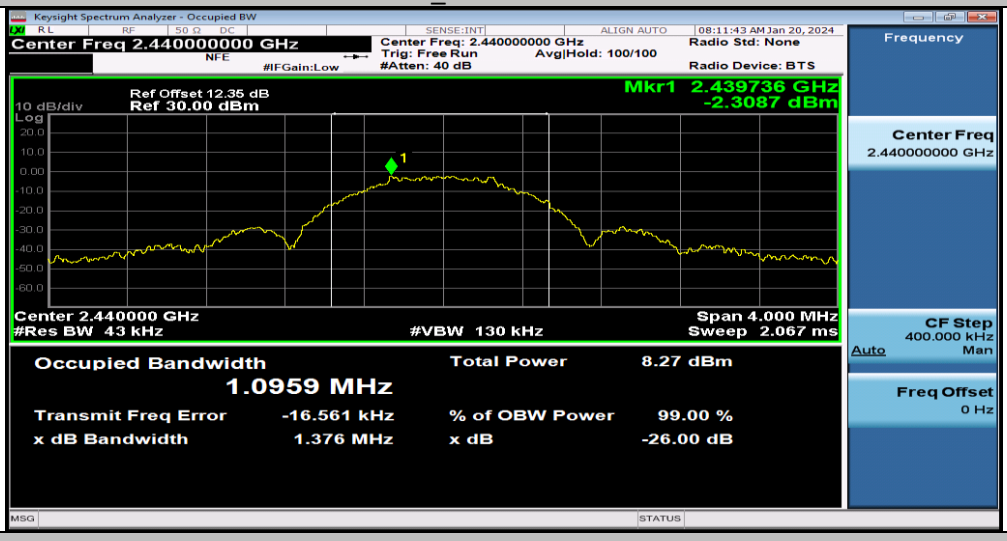
Test Mode	Frequency [MHz]	OCB [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
BLE_1M	2402	1.0869	2401.4411	2402.5280	---	---
BLE_1M	2440	1.0959	2439.4355	2440.5314	---	---
BLE_1M	2480	1.0959	2479.4352	2480.5311	---	---
BLE_2M	2402	2.0658	2400.9595	2403.0253	---	---
BLE_2M	2440	2.0750	2438.9540	2441.0290	---	---
BLE_2M	2480	2.0872	2478.9426	2481.0298	---	---

TEST REPORT

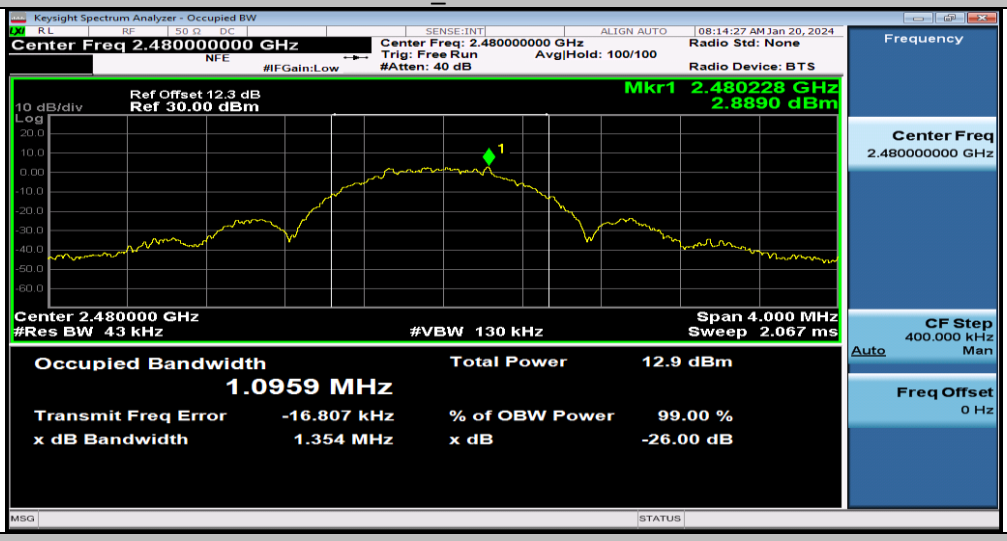
Test Graphs



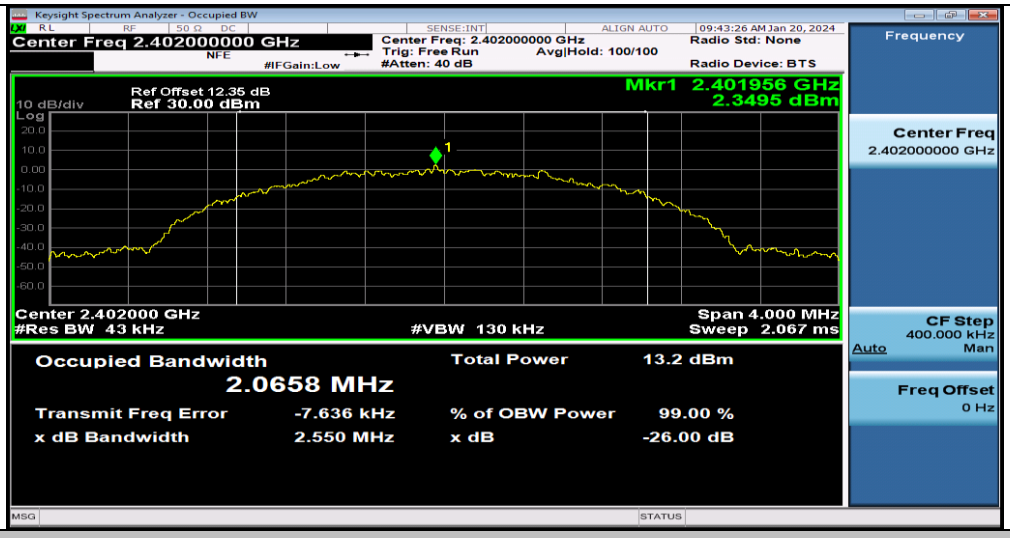
BLE_1M-Ant1-2402



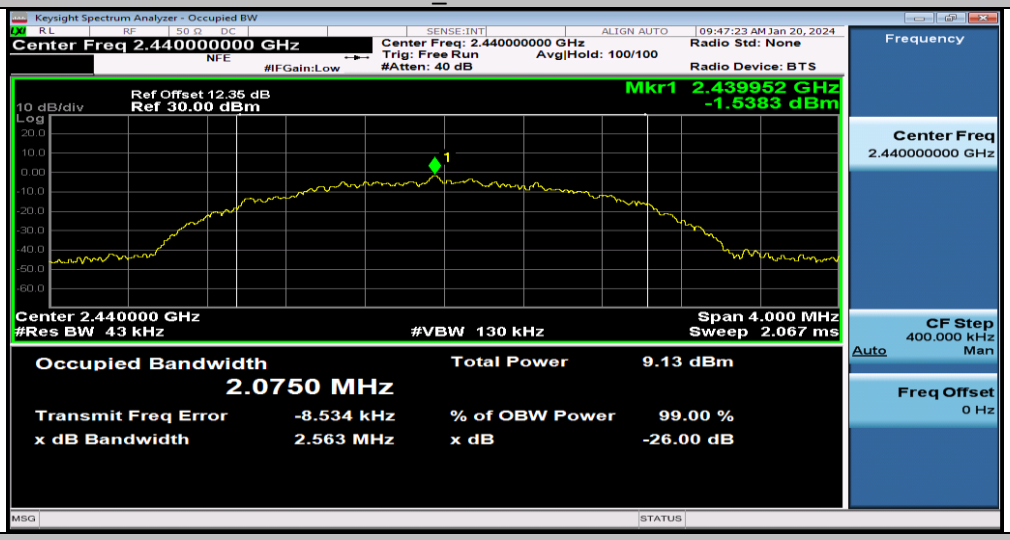
BLE_1M-Ant1-2440



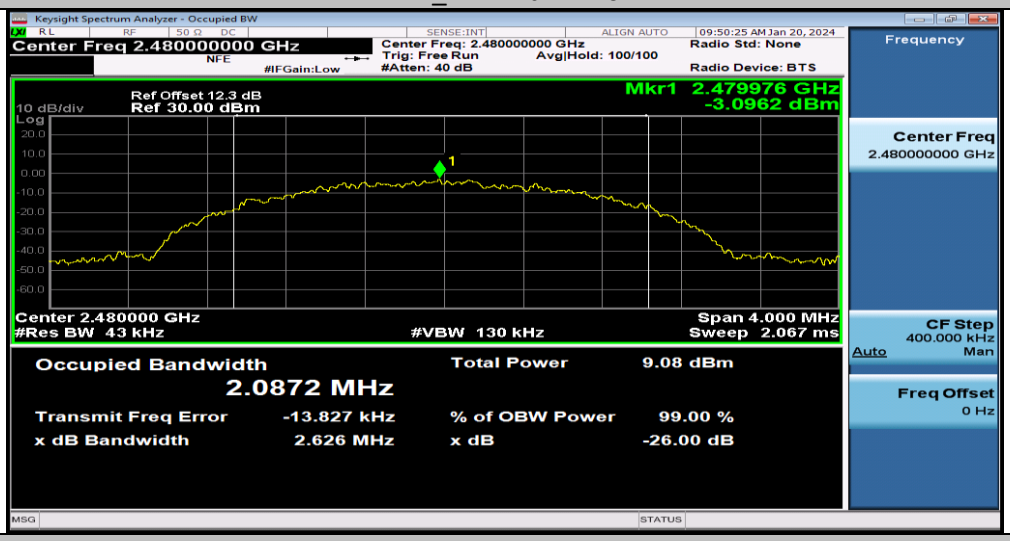
BLE_1M-Ant1-2480



BLE_2M-Ant1-2402



BLE_2M-Ant1-2440



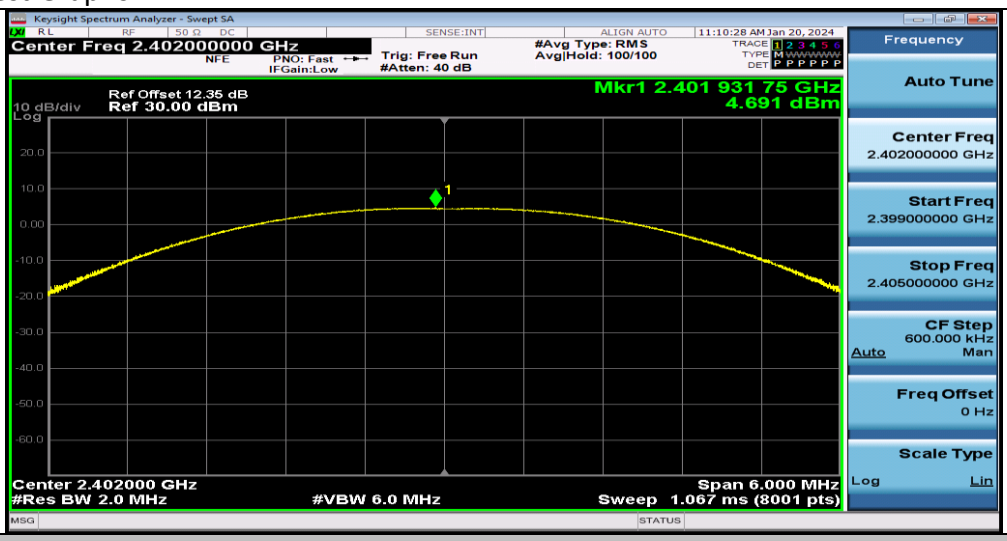
BLE_2M-Ant1-2480

Maximum conducted output power

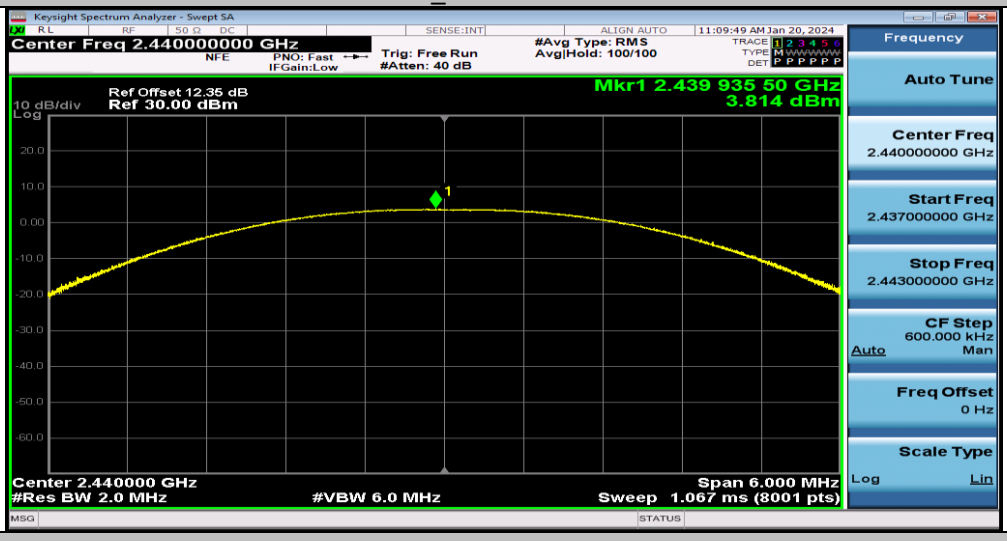
Test Result

Test Mode	Frequency [MHz]	Conducted Power [dBm]	Conducted Limit [dBm]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
BLE_1M	2402	4.69	≤30	8.65	≤36	PASS
BLE_1M	2440	3.81	≤30	7.77	≤36	PASS
BLE_1M	2480	3.17	≤30	7.13	≤36	PASS
BLE_2M	2402	4.71	≤30	8.67	≤36	PASS
BLE_2M	2440	3.73	≤30	7.69	≤36	PASS
BLE_2M	2480	3.19	≤30	7.15	≤36	PASS

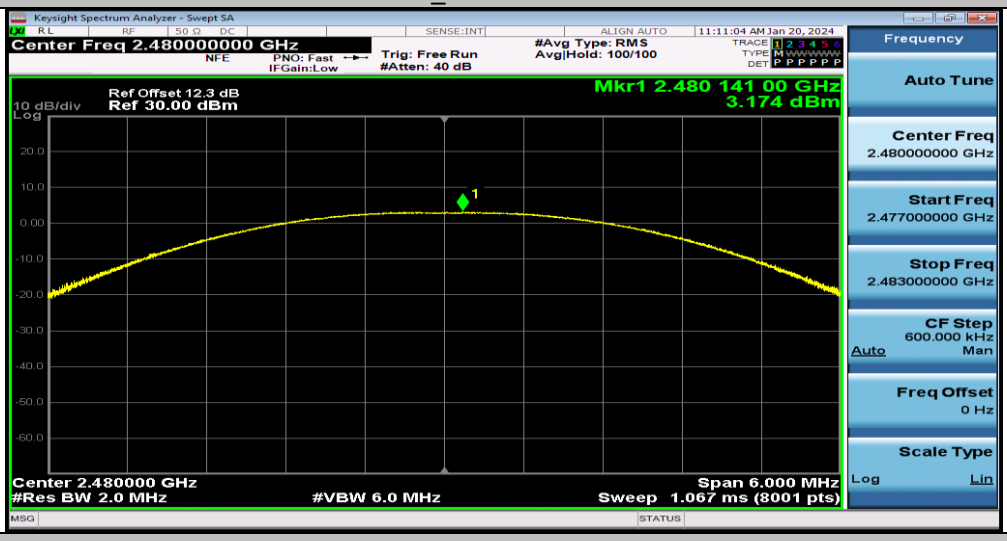
Test Graphs



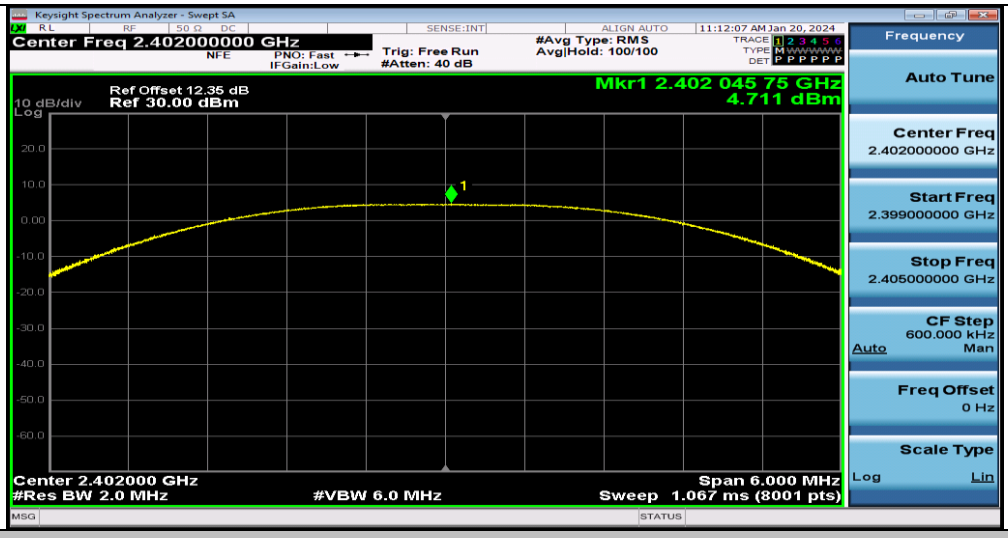
BLE_1M-Ant1-2402



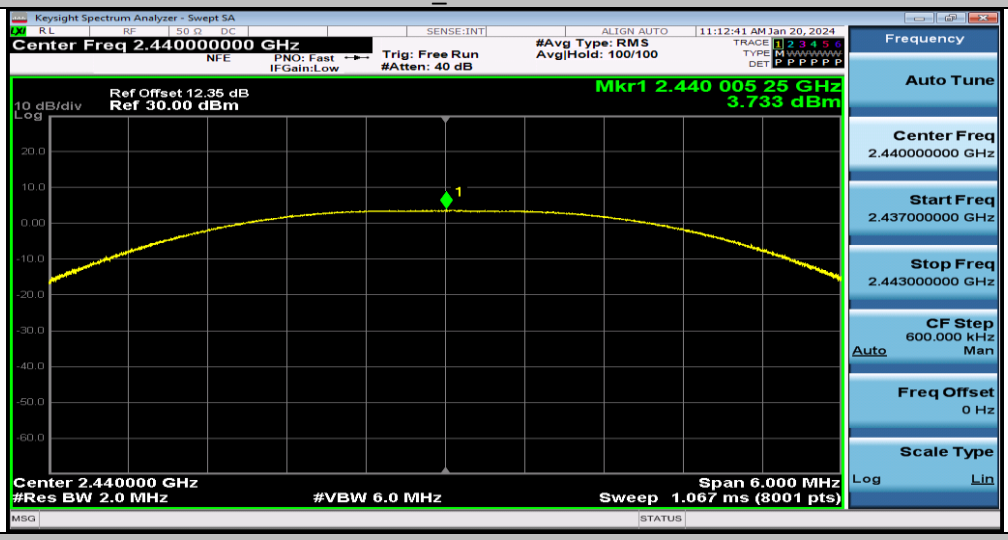
BLE_1M-Ant1-2440



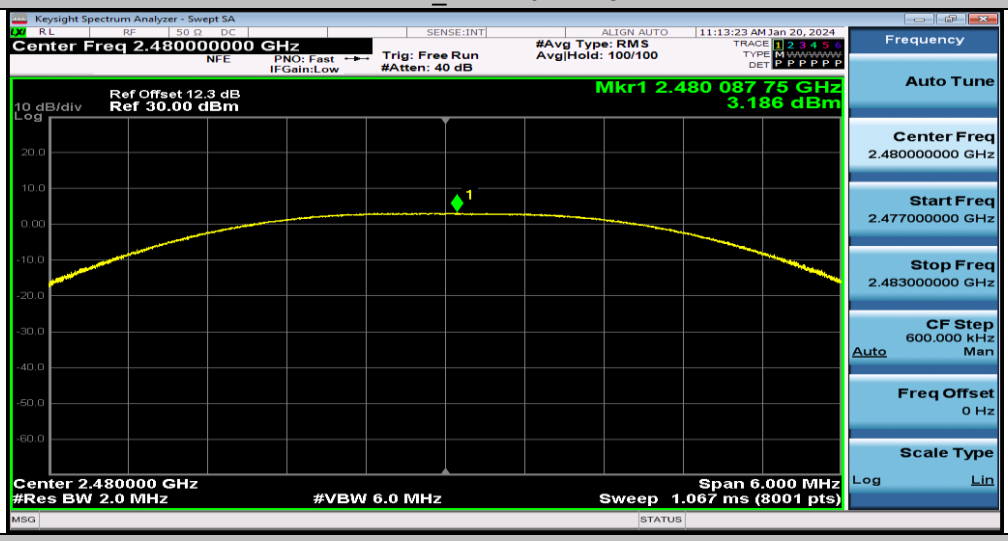
BLE_1M-Ant1-2480



BLE_2M-Ant1-2402



BLE_2M-Ant1-2440



BLE_2M-Ant1-2480

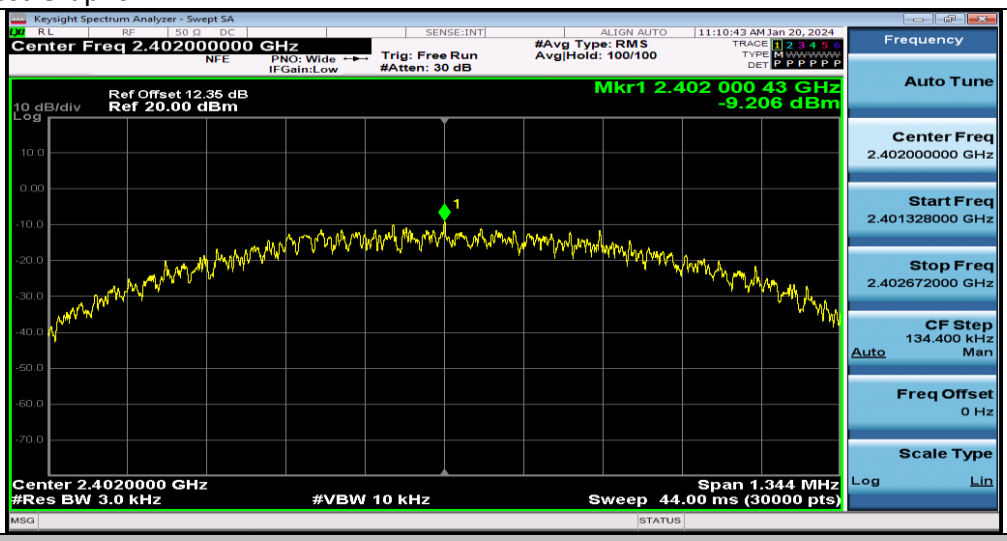
Maximum power spectral density

Test Result

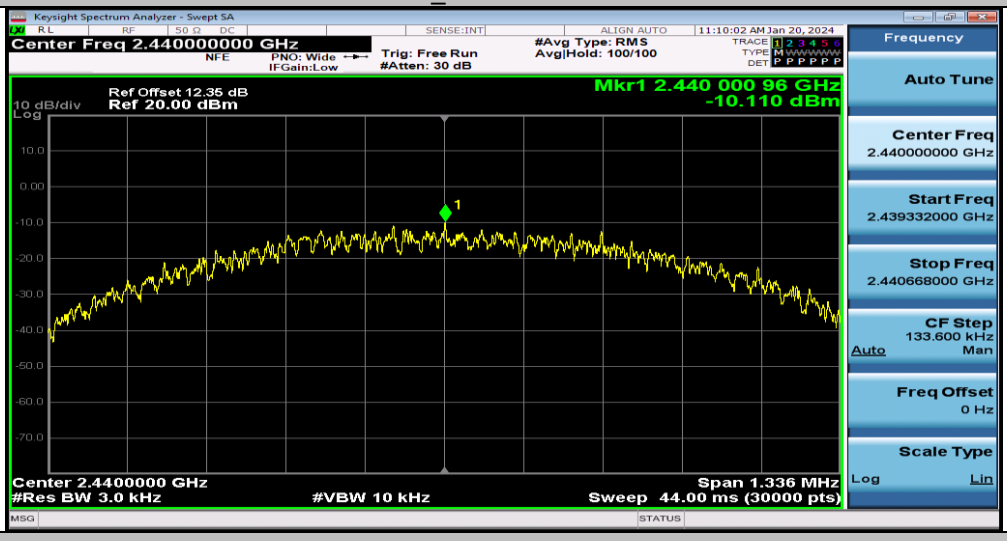
Test Mode	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE_1M	2402	-9.21	≤8.00	PASS
BLE_1M	2440	-10.11	≤8.00	PASS
BLE_1M	2480	-10.77	≤8.00	PASS
BLE_2M	2402	-11.74	≤8.00	PASS
BLE_2M	2440	-12.7	≤8.00	PASS
BLE_2M	2480	-13.35	≤8.00	PASS

TEST REPORT

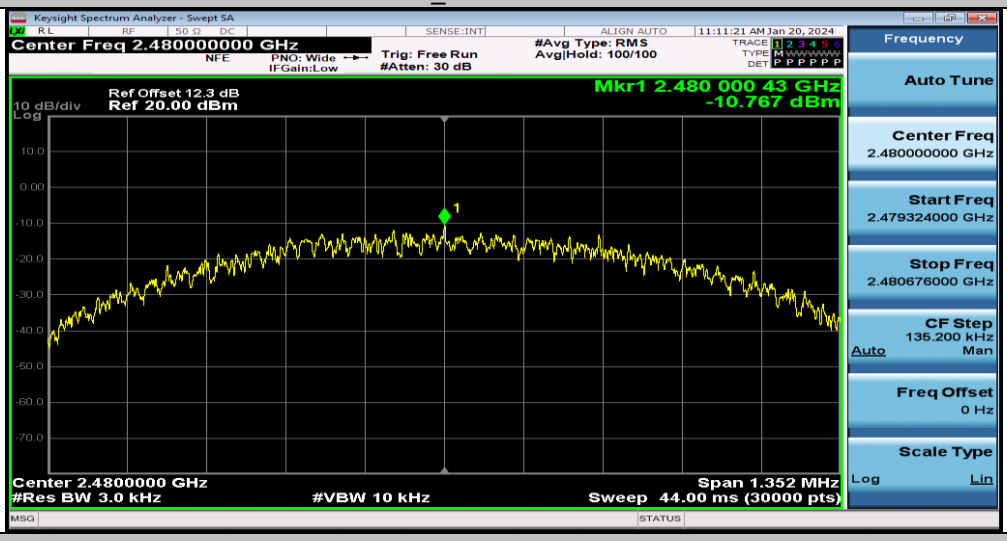
Test Graphs



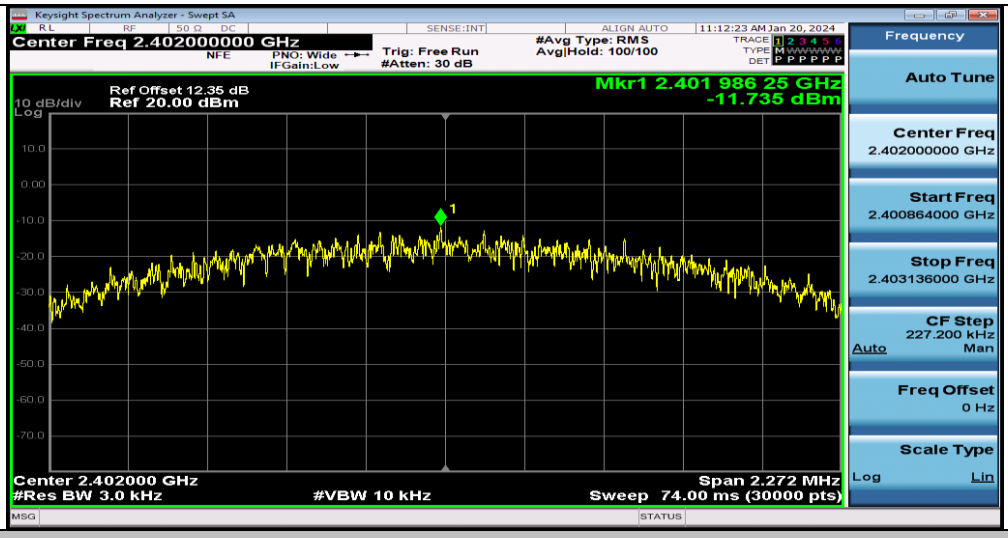
BLE_1M-Ant1-2402



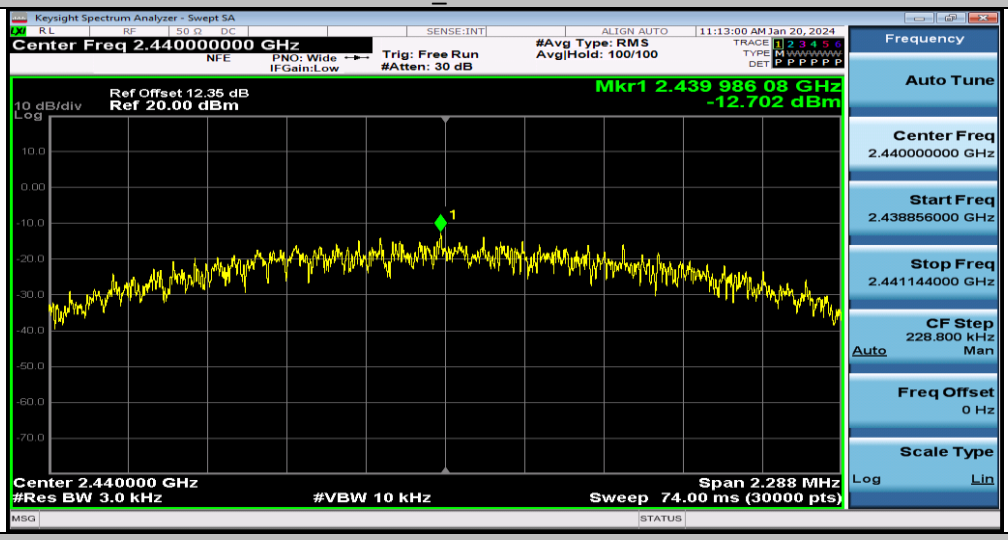
BLE_1M-Ant1-2440



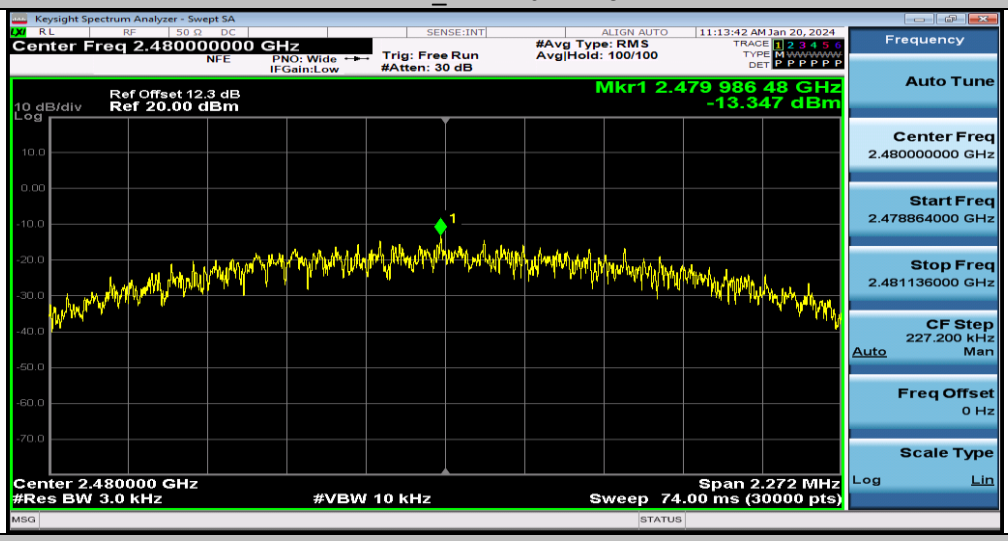
BLE_1M-Ant1-2480



BLE_2M-Ant1-2402



BLE_2M-Ant1-2440



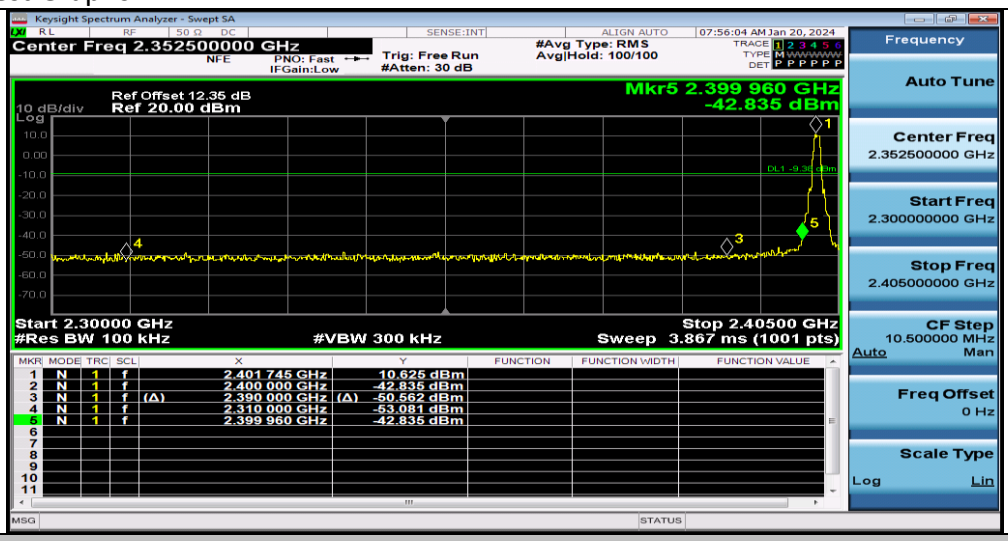
BLE_2M-Ant1-2480

Band edge measurements

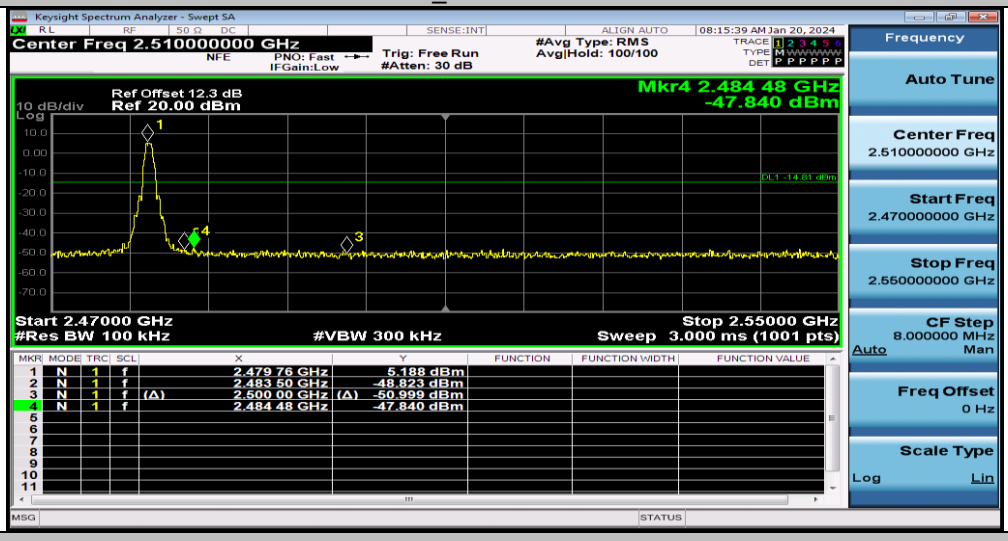
Test Result

Test Mode	ChName	Frequency [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
BLE_1M	Low	2402	10.63	-42.84	≤-9.38	PASS
BLE_1M	High	2480	5.19	-47.84	≤-14.81	PASS
BLE_2M	Low	2402	5.15	-46.18	≤-14.85	PASS
BLE_2M	High	2480	1.90	-47.79	≤-18.1	PASS

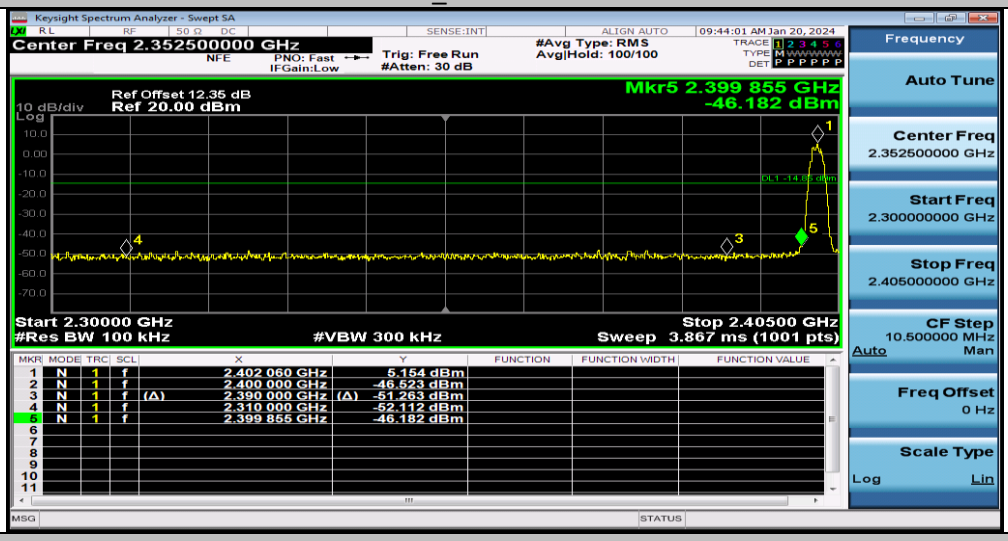
Test Graphs



BLE_1M-Ant1-2402

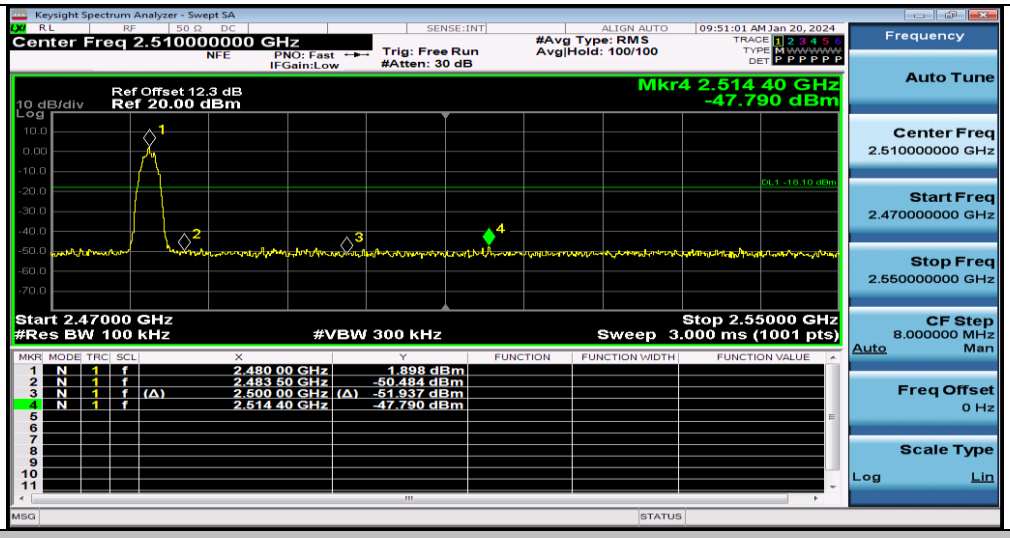


BLE_1M-Ant1-2480



BLE_2M-Ant1-2402

TEST REPORT



BLE_2M-Ant1-2480

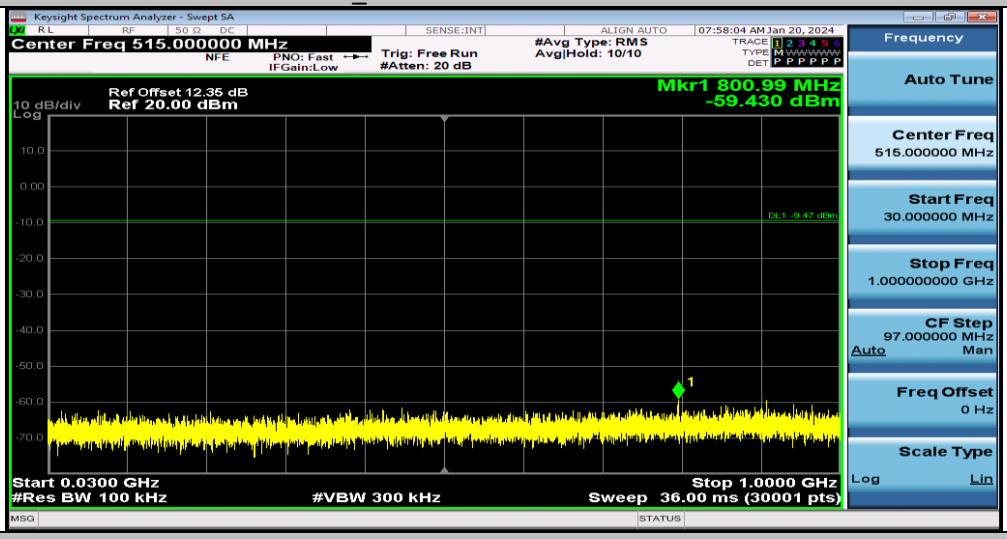
Conducted Spurious Emission

Test Result

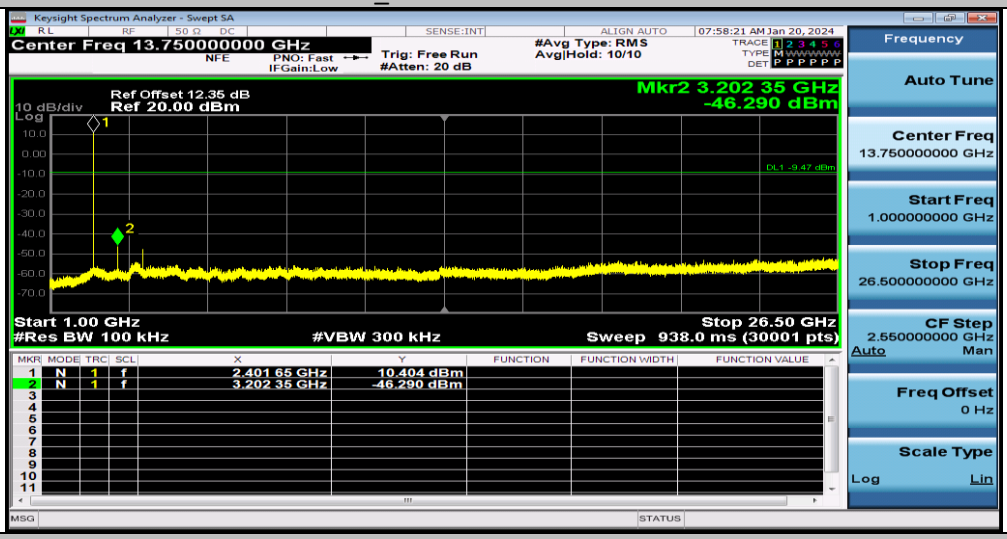
Test Mode	Frequency [MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
BLE_1M	2402	0~Reference	10.53	10.53	---	PASS
BLE_1M	2402	30~1000	10.53	-59.43	≤-9.47	PASS
BLE_1M	2402	1000~26500	10.53	-46.29	≤-9.47	PASS
BLE_1M	2440	0~Reference	3.96	3.96	---	PASS
BLE_1M	2440	30~1000	3.96	-60.66	≤-16.04	PASS
BLE_1M	2440	1000~26500	3.96	-49.68	≤-16.04	PASS
BLE_1M	2480	0~Reference	5.87	5.87	---	PASS
BLE_1M	2480	30~1000	5.87	-60.16	≤-14.13	PASS
BLE_1M	2480	1000~26500	5.87	-49.09	≤-14.13	PASS
BLE_2M	2402	0~Reference	5.21	5.21	---	PASS
BLE_2M	2402	30~1000	5.21	-60.46	≤-14.79	PASS
BLE_2M	2402	1000~26500	5.21	-50.54	≤-14.79	PASS
BLE_2M	2440	0~Reference	1.56	1.56	---	PASS
BLE_2M	2440	30~1000	1.56	-60.45	≤-18.44	PASS
BLE_2M	2440	1000~26500	1.56	-52.25	≤-18.44	PASS
BLE_2M	2480	0~Reference	1.65	1.65	---	PASS
BLE_2M	2480	30~1000	1.65	-60.54	≤-18.35	PASS
BLE_2M	2480	1000~26500	1.65	-52.37	≤-18.35	PASS

Test Graphs

BLE_1M-Ant1-2402-0~Reference

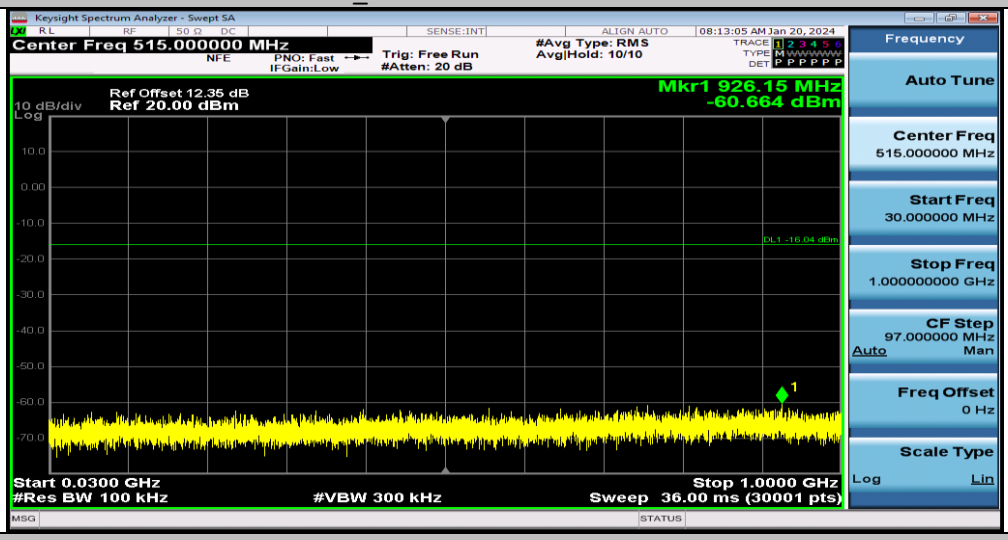


BLE_1M-Ant1-2402-30~1000

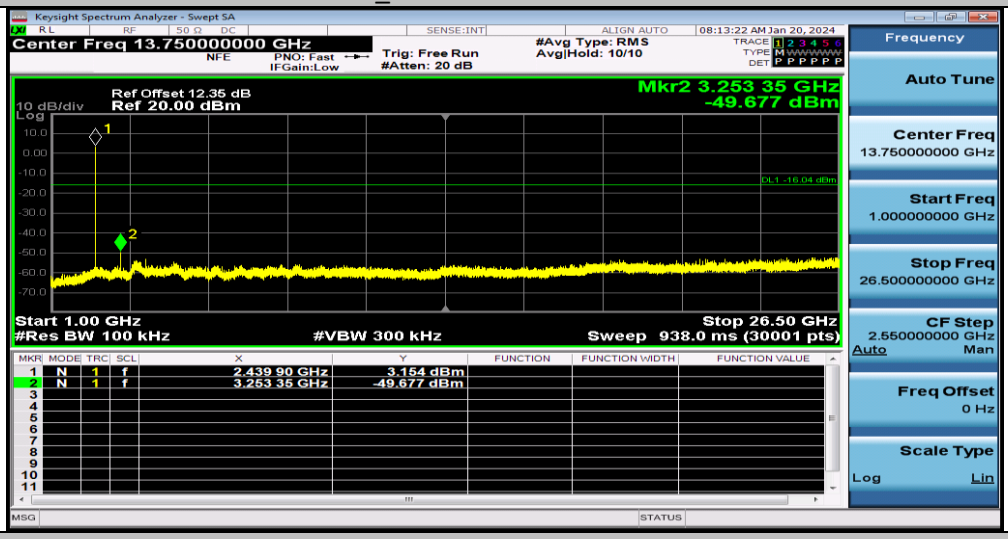


BLE_1M-Ant1-2402-1000~26500

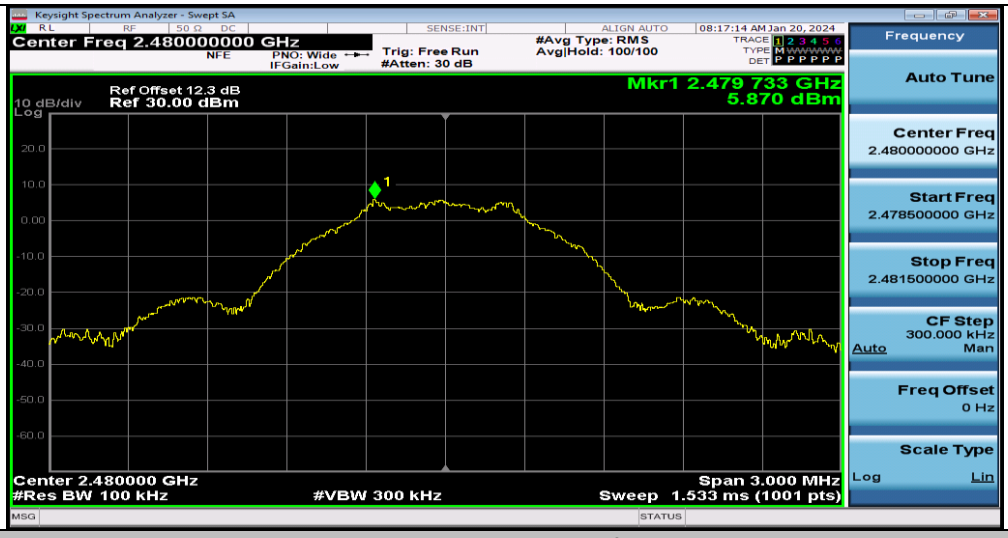
BLE_1M-Ant1-2440-0~Reference



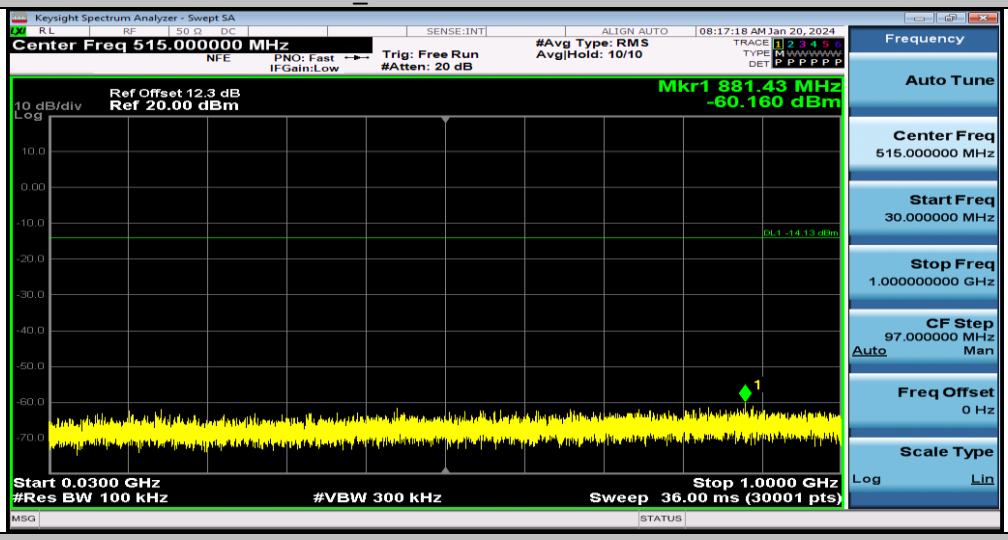
BLE_1M-Ant1-2440-30~1000



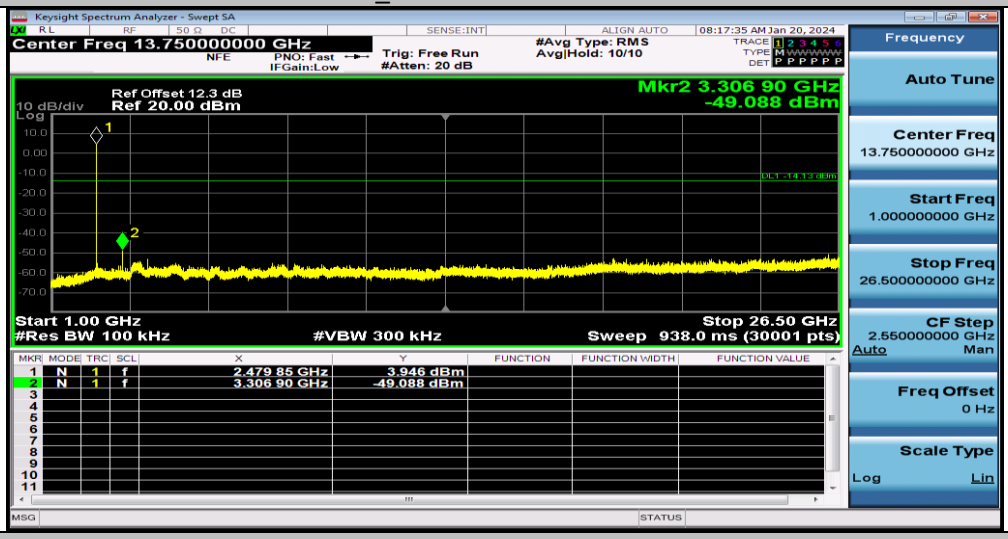
BLE_1M-Ant1-2440-1000~26500



BLE_1M-Ant1-2480-0~Reference

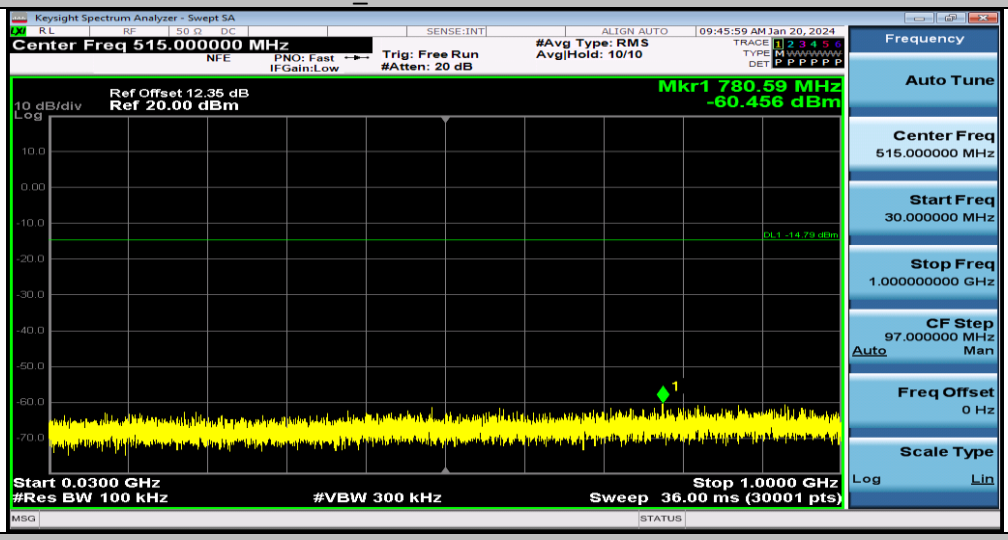


BLE_1M-Ant1-2480-30~1000

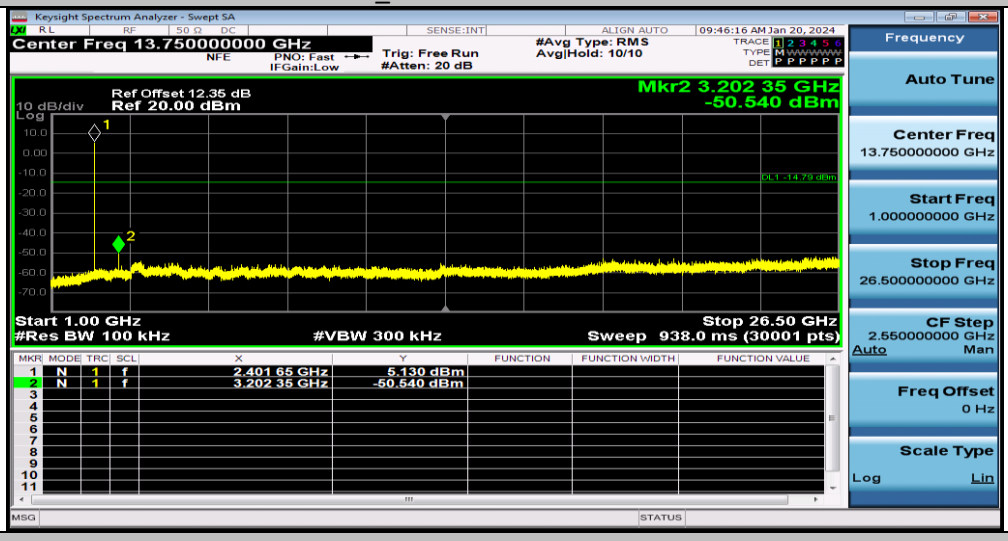


BLE_1M-Ant1-2480-1000~26500

BLE_2M-Ant1-2402-0~Reference

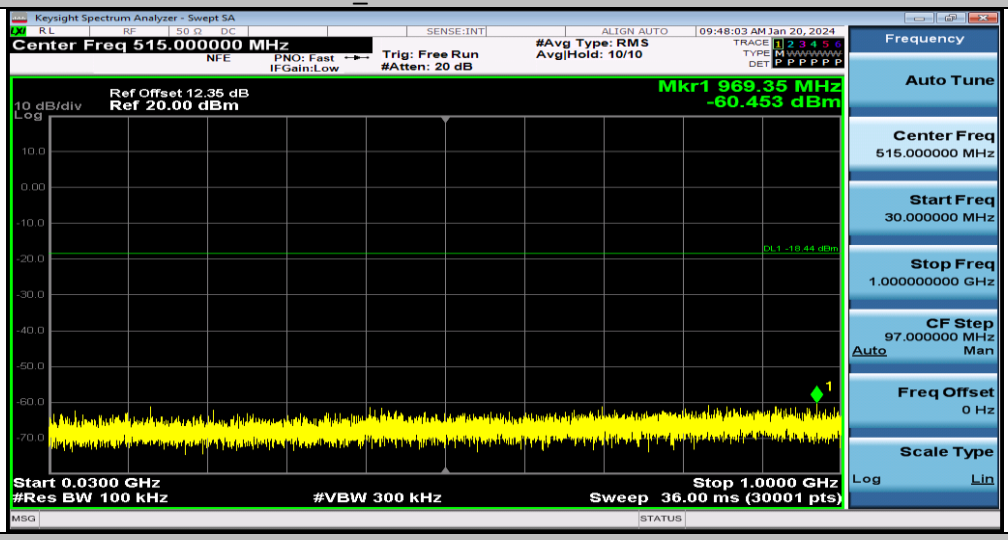


BLE_2M-Ant1-2402-30~1000

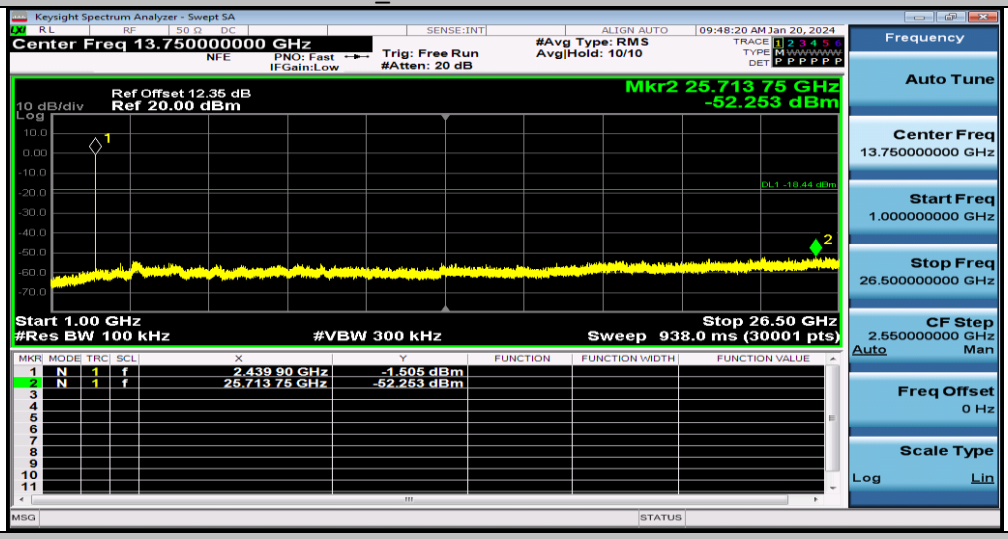


BLE_2M-Ant1-2402-1000~26500

BLE_2M-Ant1-2440-0~Reference

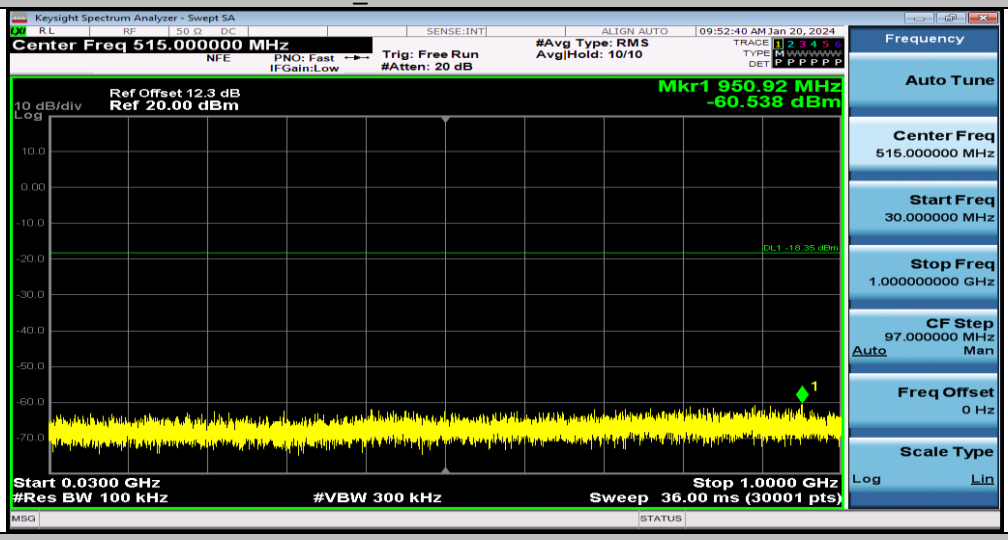


BLE_2M-Ant1-2440-30~1000

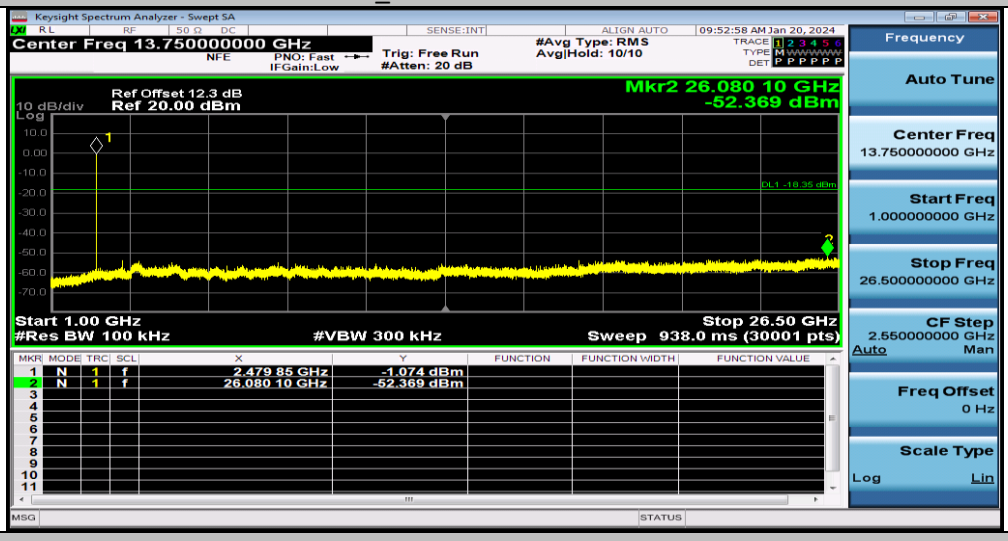


BLE_2M-Ant1-2440-1000~26500

BLE_2M-Ant1-2480-0~Reference



BLE_2M-Ant1-2480-30~1000



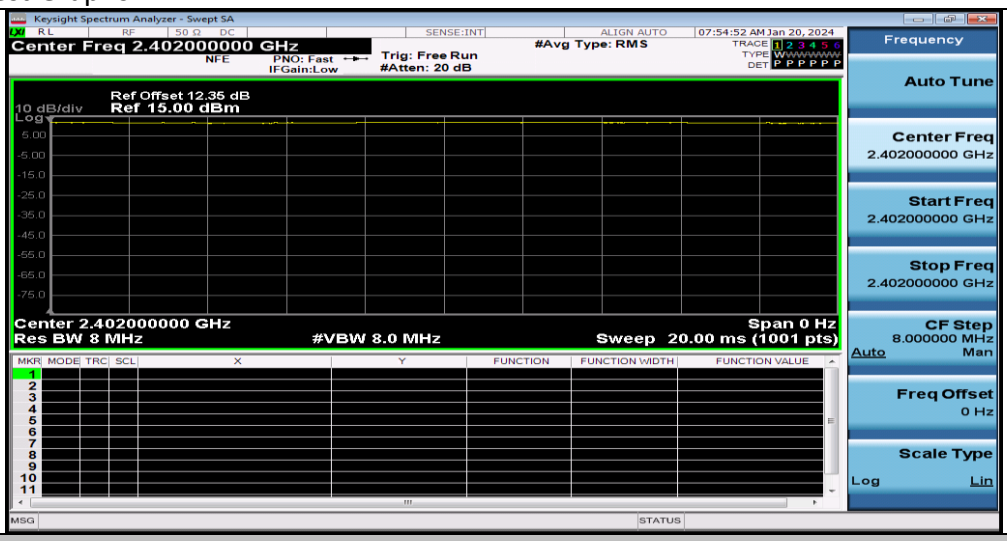
BLE_2M-Ant1-2480-1000~26500

Duty Cycle

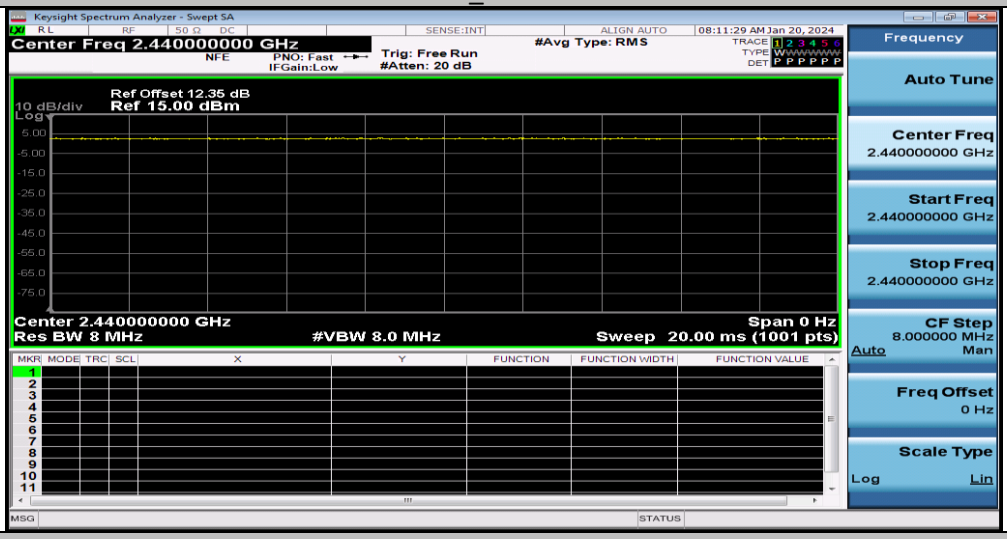
Test Result

Test Mode	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
BLE_1M	2402	20.00	20.00	100.00	0.00
BLE_1M	2440	20.00	20.00	100.00	0.00
BLE_1M	2480	20.00	20.00	100.00	0.00
BLE_2M	2402	20.00	20.00	100.00	0.00
BLE_2M	2440	20.00	20.00	100.00	0.00
BLE_2M	2480	20.00	20.00	100.00	0.00

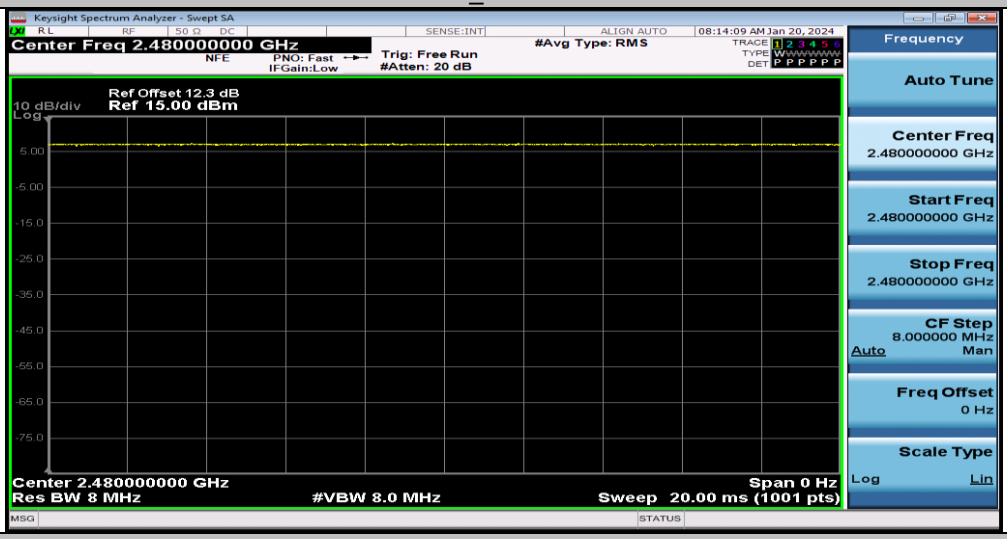
Test Graphs



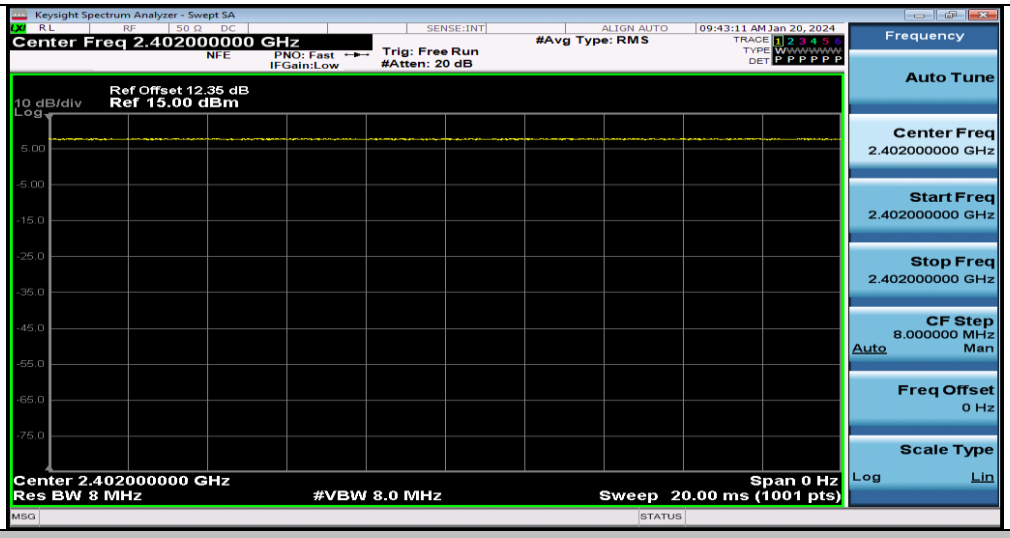
NTNV-BLE_1M-Ant1-2402



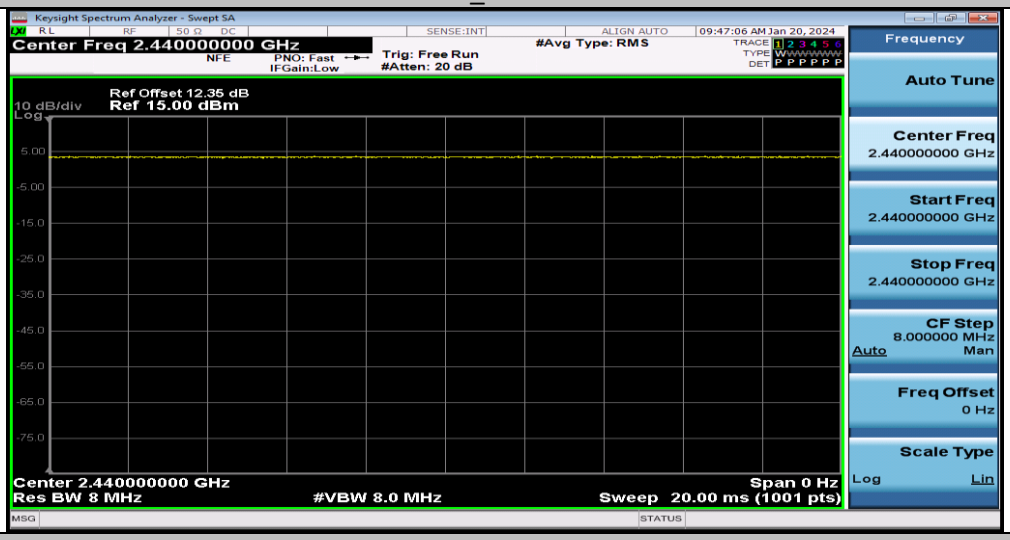
NTNV-BLE_1M-Ant1-2440



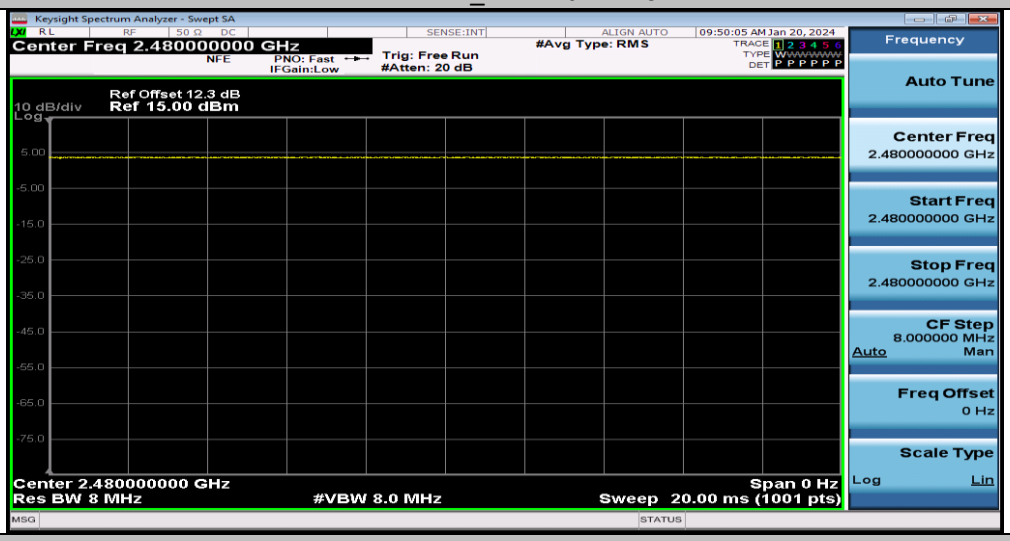
NTNV-BLE_1M-Ant1-2480



NTNV-BLE_2M-Ant1-2402



NTNV-BLE_2M-Ant1-2440



NTNV-BLE_2M-Ant1-2480

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