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Bestway (Hong Kong) International Ltd.

RF TEST REPORT

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FCC Part 15.247 & ISED RSS-247 RF report

Model:
S200206

Report Number:
2405B1900SHA-002

Issue Date:
June 19, 2024

Document Control Number:
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TEST REPORT

Report no.: 2405B1900SHA-002

Applicant:	Bestway (Hong Kong) International Ltd. SUITE 713, 7/FLOOR, EAST WING, TSIM SHA TSUI CENTRE, 66 MODY ROAD, KOWLOON, HONG KONG
Manufacturer:	Bestway Inflatables & Material Corp. No. 208 Jin Yuan Wu Road, Shanghai, 201812, China
Manufacturing site:	Bestway (Nantong) Recreation Corp. No. 8, West Huimin Road, Rugao Economic and Technology Development Zone, Jiangsu, 226503, China
FCC ID:	2AS3R-200206R
IC:	26017-200206R

SUMMARY:

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

47CFR Part 15 (2023): Radio Frequency Devices (Subpart C)

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

RSS-247 Issue 3 (August 2023): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (February 2021) Amendment 2: General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
Scout Gong	Eric Li
Project Engineer	Reviewer

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
2405B1900SHA-002	Rev. 01	Initial issue of report	June 19, 2024

Measurement Result Summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 3 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 3 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 3 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 3 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	RSS-Gen Issue 5 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 5 Clause 6.6	Tested
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.

TEST REPORT

1 General Information

1.1 Description of Equipment Under Test (EUT)

Product name:	Electric Spas
Type/Model:	S200206
HVIN:	26017-200206R
Description of EUT:	EUT is a wireless Electric Spas with BLE and Wi-Fi module.
Rating:	110-120 VAC, 60Hz, 12A
Category of EUT:	Class B
EUT type:	☐ Tabletop ☒ Floor standing
Software Version:	-
Hardware Version:	-
Sample Identification No.:	0240330-18-003
Sample received date:	March 30, 2024
Date of test:	March 30, 2024, to June 19, 2024

1.2 Technical Specification

Frequency Band:	2400MHz ~ 2483.5MHz
Support Standards:	Bluetooth Low Energy
Type of Modulation:	GFSK
Channel Number:	40
Data Rate:	1Mbps
Channel Separation:	2MHz

1.3 Antenna Information

No.	Antenna Type	Gain	Note
1	PCB antenna	2 dBi	Internal type

1.4 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 (2023)
ANSI C63.10 (2020)
KDB 558074 (v05or02)
RSS-247 Issue 3 (August 2023)
RSS-Gen Issue 5, (February 2021) Amendment 2

2.2 Mode of Operation During the Test

The lowest, middle and highest channels 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 were used, and the worst case was found and used in all test cases.

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

While testing transmitting mode of EUT, the internal modulation and continuous 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	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71
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	DELL 5480	100-240V AC, 50/60Hz

2.5 Test Environment Condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	20°C	50% 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	21°C	52% RH
Power line conducted emission	21°C	52% RH

2.6 Instrument List

Conducted Emission						
Used	Equipment	Manufacturer	Type	Internal no.	Calibration date	Due date
☑	Test Receiver	R&S	ESR7	EC 6194	2024-02-08	2025-02-07
☑	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-20	2024-11-19
☑	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2023-12-08	2024-12-07
☑	Shielded room	Zhongyu	-	EC 2838	2024-01-11	2025-01-10
Radiated Emission						
Used	Equipment	Manufacturer	Type	Internal no.	Calibration date	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2023-08-23	2024-08-22
☑	Test Receiver	R&S	ESR	EC 6501	2023-09-25	2024-09-24
☑	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2023-09-13	2024-09-12
☑	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-08	2024-12-07
☑	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15	2025-02-14
☑	Horn antenna	ETS	3117	EC 4792-1	2023-09-16	2024-09-15
☑	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2023-09-13	2024-09-12
☑	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2023-09-25	2024-09-24
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-13	2024-07-12
RF test						
Used	Equipment	Manufacturer	Type	Internal no.	Calibration date	Due date
☑	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-08	2025-03-07
☑	Vector Signal Generator	Agilent	N5182B	EC 5175	2024-03-08	2025-03-07
☑	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2024-03-08	2025-03-07
☑	Test Receiver	R&S	ESCI 7	EC 4501	2024-03-08	2025-03-07
☑	Signal generator	Agilent	N5182A	EC 6172	2023-08-09	2024-08-08
☑	Signal generator	Agilent	N5181A	EC 6171	2023-08-09	2024-08-08
☑	Climate chamber	GWS	MT3065	EC 6021	2024-03-08	2025-03-07
Additional instrument						
Used	Equipment	Manufacturer	Type	Internal no.	Calibration date	Due date
☑	Thermo-Hygrograph	Testo	175h1	EC 6643	2023-08-29	2024-08-28
☑	Pressure meter	YM3	Shanghai Mengde	EC 3320	2023-08-17	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

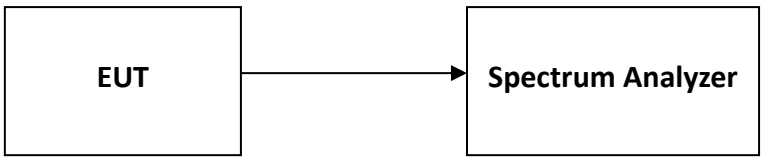
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

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)

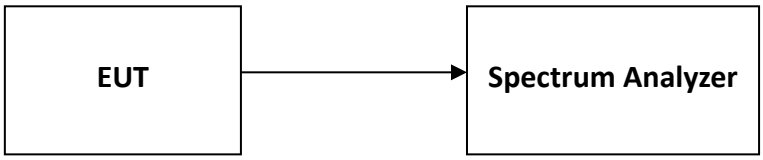
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

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.

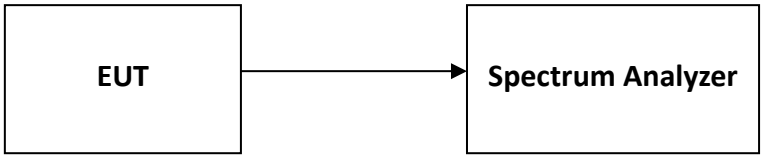
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

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:

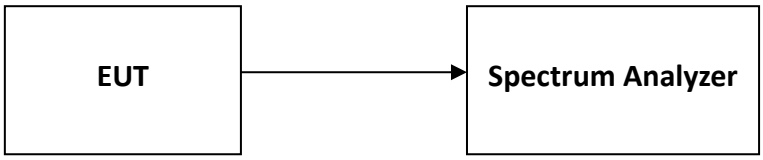
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker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

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For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.1 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 varies 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.

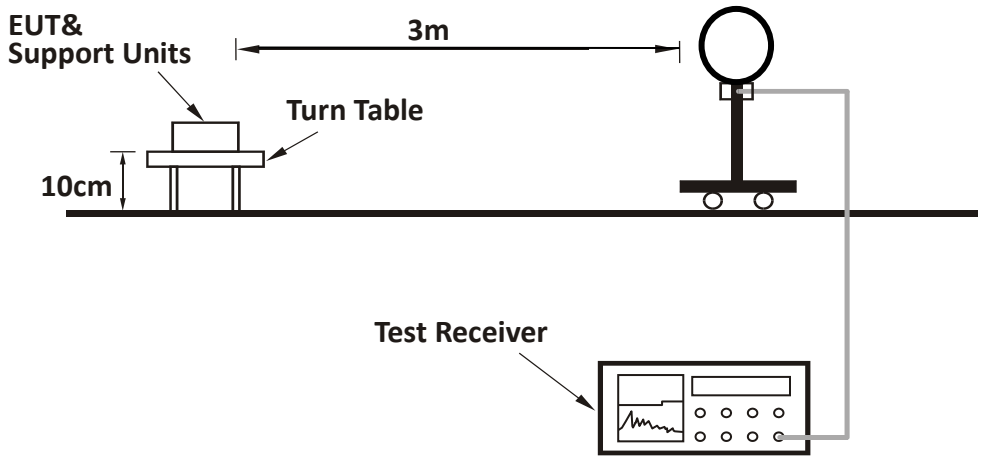
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets the average limit, measurement with the average detector is unnecessary.

Note:

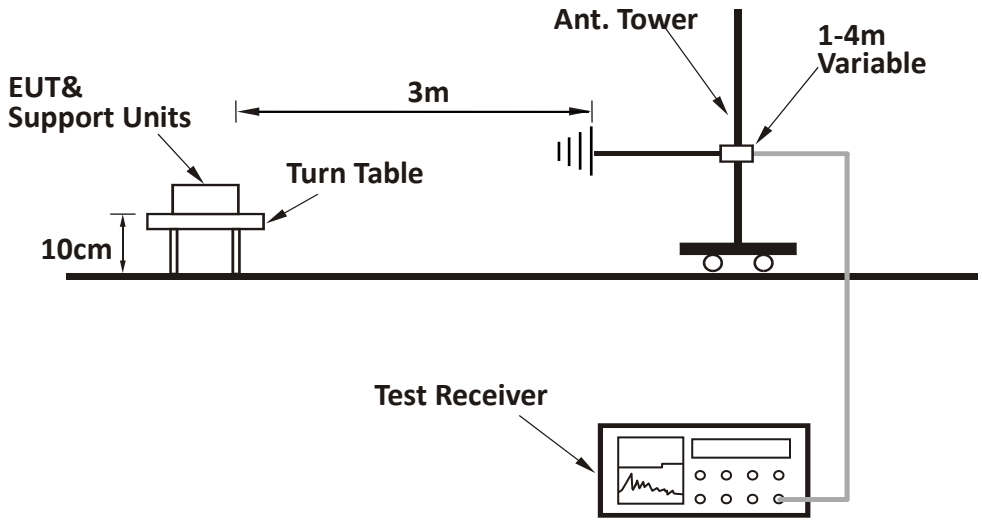
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz, and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

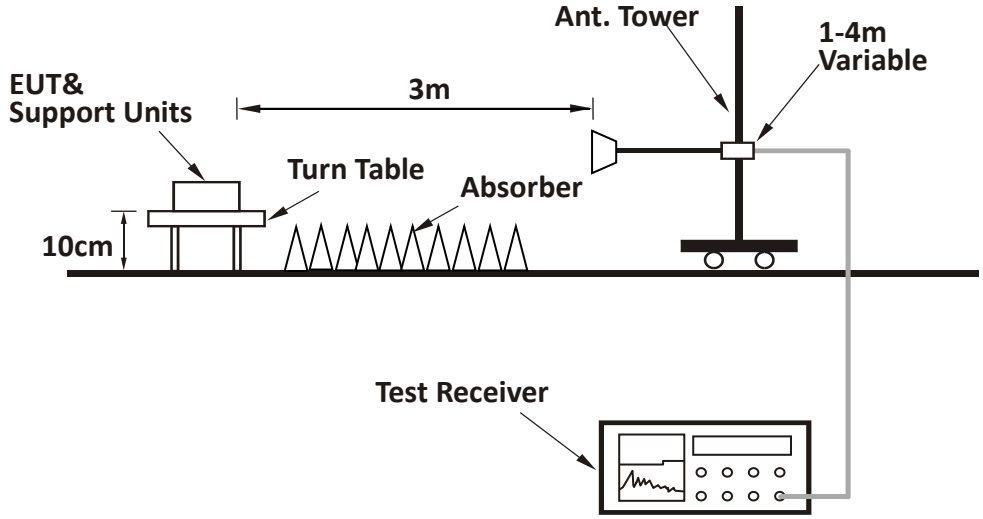


For radiated emission 30MHz to 1GHz:



TEST REPORT

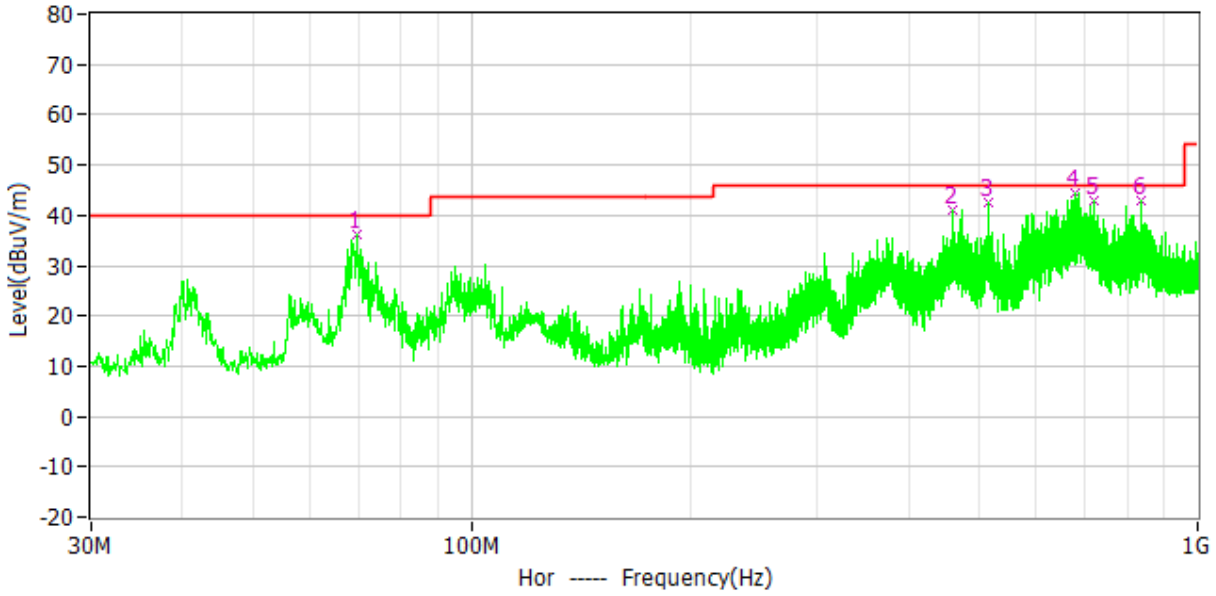
For radiated emission above 1GHz:

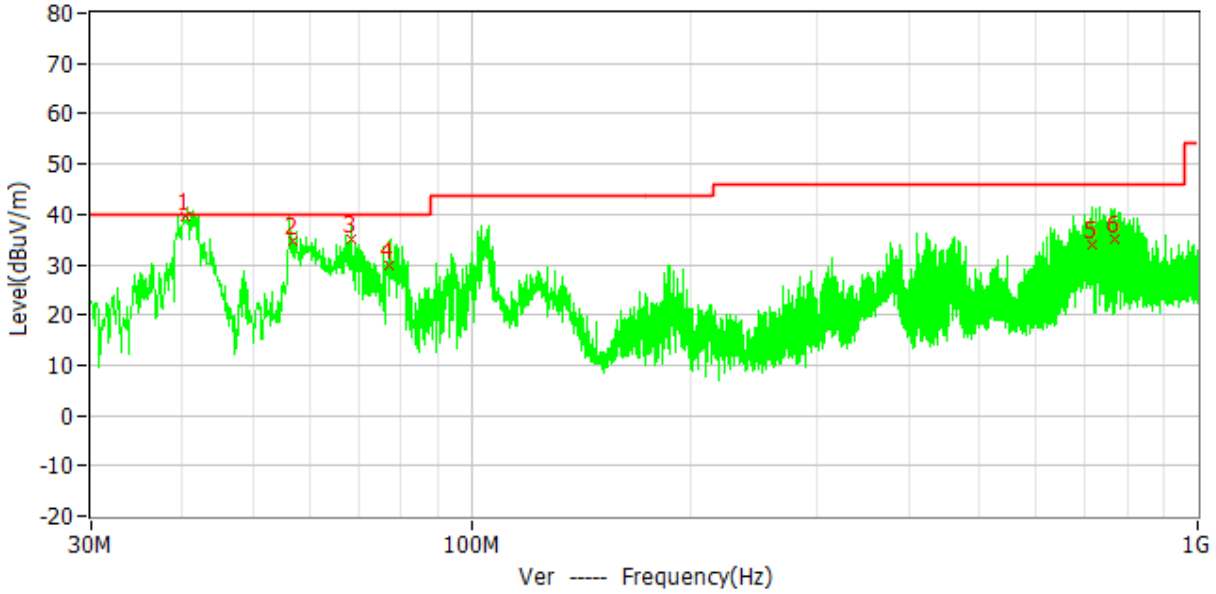


7.4 Test Results of Radiated Emissions

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:

Test Curve (30MHz to 1GHz):





TEST REPORT

Test Data:

Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Original Receiver Reading (dBuV)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB/m)	Detector
H	69.479	36.10	23.60	12.50	40.00	3.90	PK
	460.195	40.90	21.40	19.50	46.00	5.10	PK
	516.358	42.40	21.50	20.90	46.00	3.60	PK
	676.699	44.50	20.70	23.80	46.00	1.50	PK
	719.088	43.10	18.70	24.40	46.00	2.90	PK
	834.809	42.90	16.60	26.30	46.00	3.10	PK
V	40.360	39.40	25.40	14.00	40.00	0.60	QP
	56.714	34.80	20.70	14.10	40.00	5.20	QP
	68.375	35.00	22.30	12.70	40.00	5.00	QP
	77.310	29.80	18.90	10.90	40.00	10.20	QP
	717.318	33.90	9.50	24.40	46.00	12.10	QP
	769.006	34.90	9.70	25.20	46.00	11.10	QP

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 - Corrected Reading*
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.
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m.
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

TEST REPORT

Test Result Above 1GHz:

The emission was conducted from 1GHz to 25GHz.

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	31.70	46.30	74.00	27.70	PK
	V	2390.00	31.70	46.00	74.00	28.00	PK
	H	4804.00	-15.10	34.40	74.00	39.60	PK
	V	4804.00	-15.10	34.30	74.00	39.70	PK
M	H	4880.00	-15.00	34.60	74.00	39.40	PK
	V	4880.00	-15.00	34.20	74.00	39.80	PK
H	H	2483.50	31.90	45.70	74.00	28.30	PK
	V	2483.50	31.90	45.30	74.00	28.70	PK
	H	4960.00	-14.90	34.70	74.00	39.30	PK
	V	4960.00	-14.90	35.60	74.00	38.40	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 - Corrected Reading

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.
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m.
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

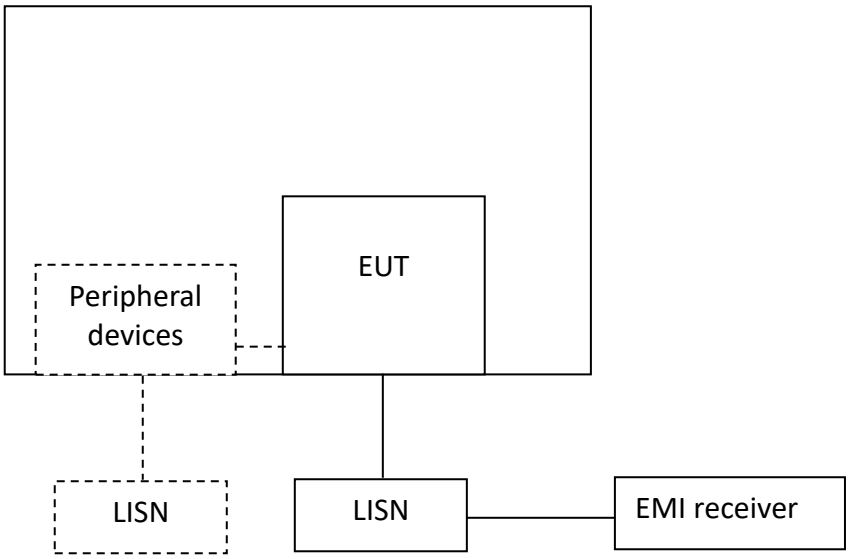
8 Power Line Conducted Emission

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

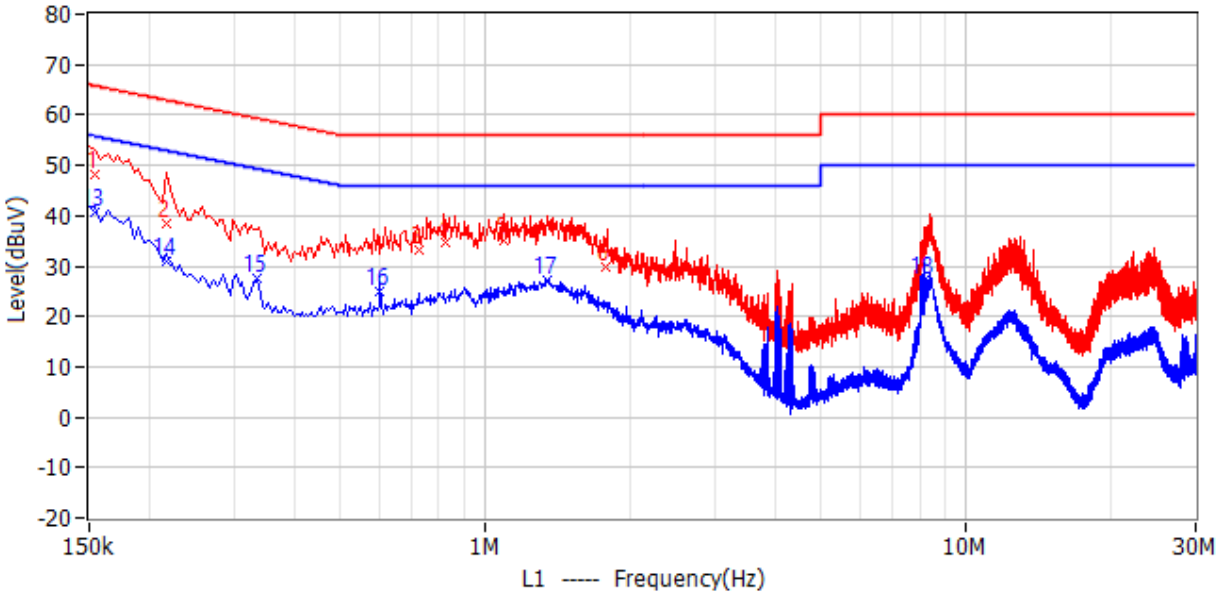
Measured levels of ac powerline conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be 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.

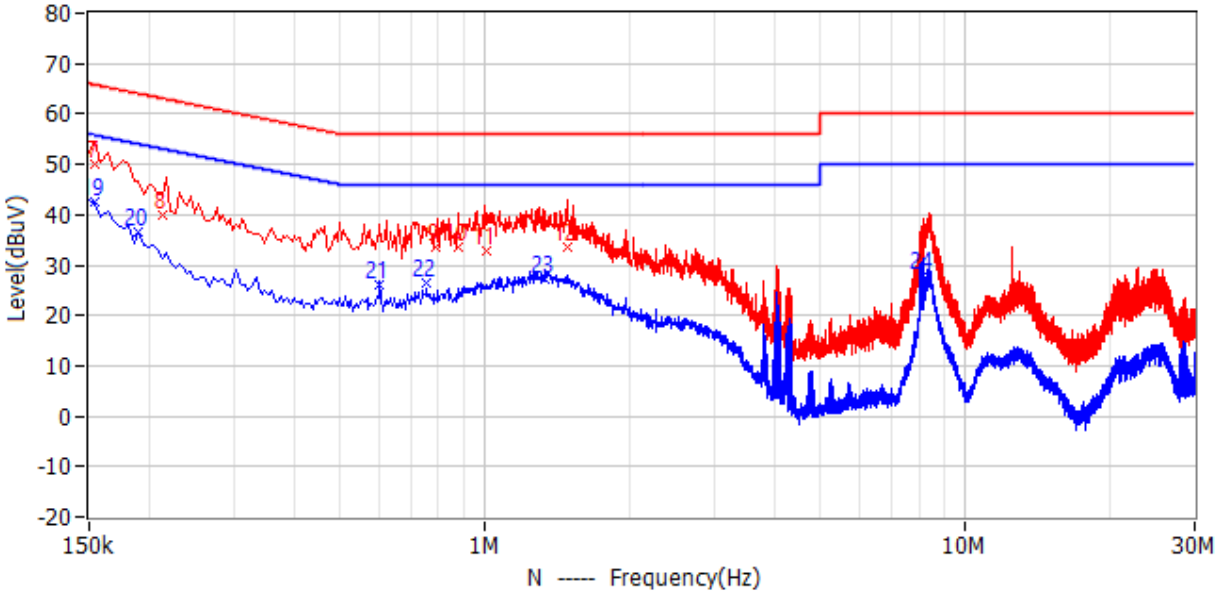
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on 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 AC / 60 Hz
Test Curve:





TEST REPORT

Test Data:

Frequency	Limit (dBuV)	Corrected Reading (dBuV)	Margin (dB)	Original Receiver Reading (dBuV)	Correct Factor (dB)	Detector	Phase
154.500kHz	65.80	48.30	17.40	42.10	6.20	QP	L1
217.500kHz	62.90	38.50	24.40	32.30	6.20	QP	L1
726.000kHz	56.00	33.00	23.00	26.80	6.20	QP	L1
825.000kHz	56.00	34.60	21.40	28.40	6.20	QP	L1
1.091MHz	56.00	35.20	20.80	29.00	6.20	QP	L1
1.779MHz	56.00	29.80	26.20	23.60	6.20	QP	L1
154.500kHz	65.80	50.20	15.50	44.00	6.20	QP	N
213.000kHz	63.10	40.00	23.00	33.80	6.20	QP	N
789.000kHz	56.00	33.40	22.60	27.20	6.20	QP	N
879.000kHz	56.00	33.50	22.50	27.30	6.20	QP	N
1.010MHz	56.00	32.90	23.10	26.70	6.20	QP	N
1.482MHz	56.00	33.70	22.30	27.50	6.20	QP	N
154.500kHz	55.80	40.60	15.10	34.40	6.20	CAV	L1
217.500kHz	52.90	30.80	22.10	24.60	6.20	CAV	L1
334.500kHz	49.30	27.50	21.90	21.30	6.20	CAV	L1
604.500kHz	46.00	25.00	21.00	18.80	6.20	CAV	L1
1.347MHz	46.00	27.30	18.70	21.10	6.20	CAV	L1
8.196MHz	50.00	27.20	22.80	20.70	6.50	CAV	L1
154.500kHz	55.80	42.60	13.20	36.40	6.20	CAV	N
190.500kHz	54.00	36.60	17.40	30.50	6.10	CAV	N
604.500kHz	46.00	25.90	20.10	19.70	6.20	CAV	N
757.500kHz	46.00	26.40	19.60	20.20	6.20	CAV	N
1.329MHz	46.00	27.30	18.70	21.10	6.20	CAV	N
8.187MHz	50.00	27.90	22.10	21.40	6.50	CAV	N

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. 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.

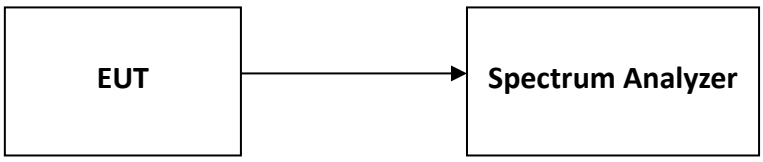
9.2 Measurement Procedure

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.

11 Appendix A: Test Results

11.1 DTS Bandwidth

Test Data

Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	0.664	2401.652	2402.316	0.5	PASS
		2440	0.672	2439.644	2440.316	0.5	PASS
		2480	0.680	2479.644	2480.324	0.5	PASS

Test Plots

BLE_1M-Ant1-2402-PASS

BLE_1M-Ant1-2440-PASS

TEST REPORT

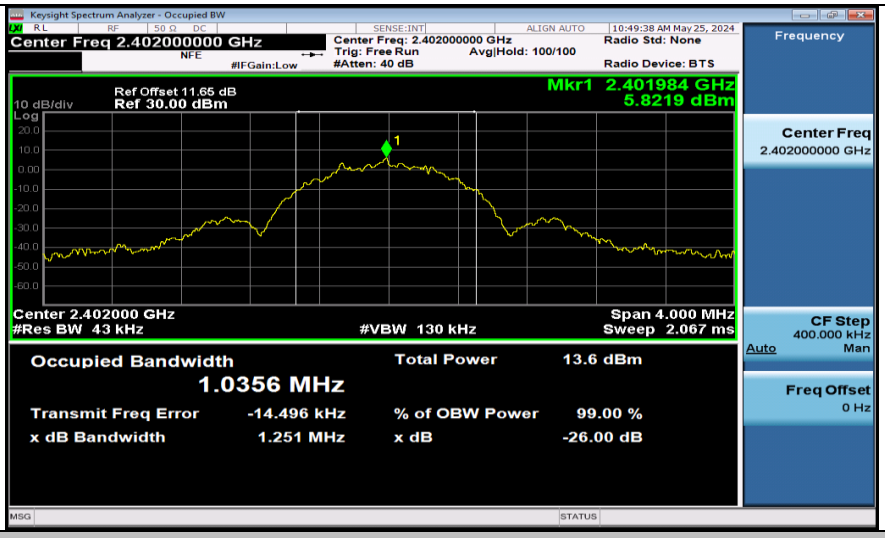
BLE_1M-Ant1-2480-PASS

11.2 Occupied Channel Bandwidth

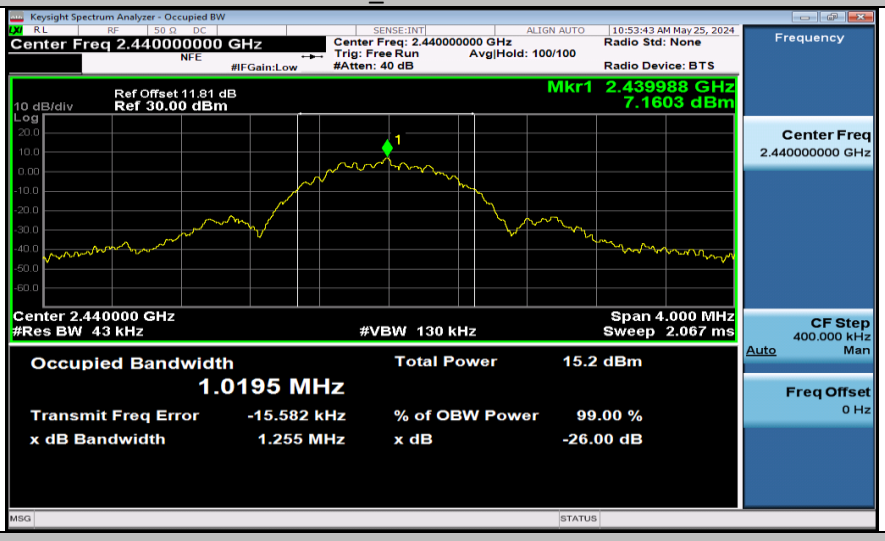
Test Data

Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	1.0356	2401.4677	2402.5033	---	---
		2440	1.0195	2439.4747	2440.4942	---	---
		2480	1.0286	2479.4782	2480.5068	---	---

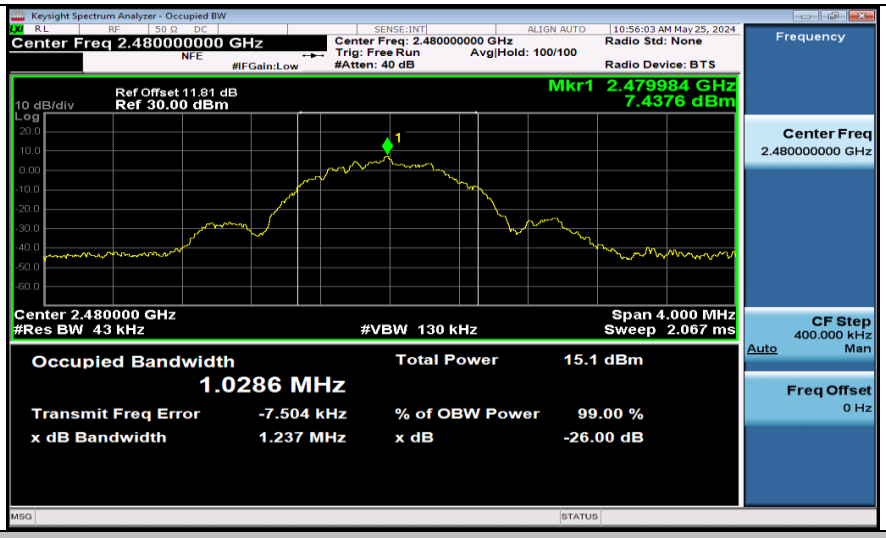
Test Plots



BLE_1M-Ant1-2402



BLE_1M-Ant1-2440



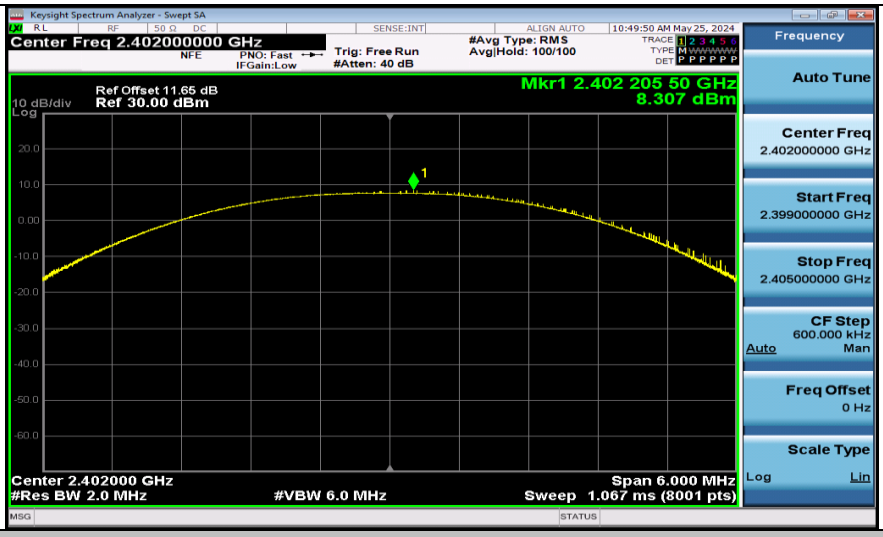
BLE_1M-Ant1-2480

11.3 Maximum Conducted Output Power

Test Data

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power [dBm]	Conducted Limit [dBm]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
BLE_1M	Ant1	2402	8.31	≤30	10.31	≤36	PASS
		2440	9.59	≤30	11.59	≤36	PASS
		2480	**9.61**	≤30	11.61	≤36	PASS

Test Plots



BLE_1M-Ant1-2402-PASS

BLE_1M-Ant1-2440-PASS

TEST REPORT

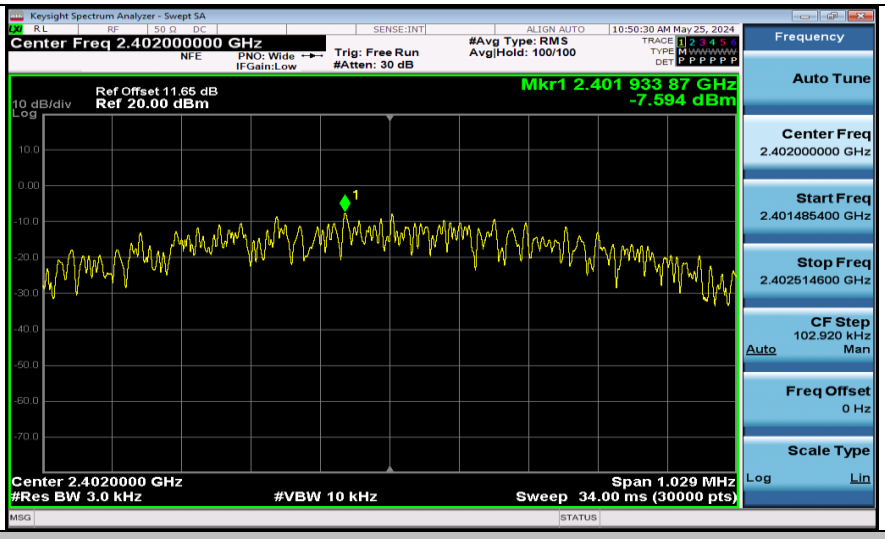
BLE_1M-Ant1-2480-PASS

11.4 Maximum Power Spectral Density

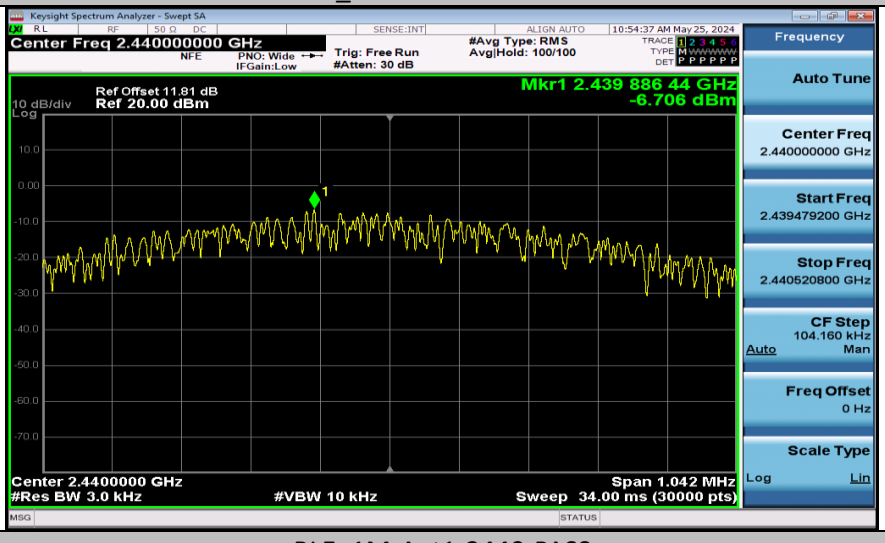
Test Data

Test Mode	Antenna	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-7.59	≤8.00	PASS
		2440	-6.71	≤8.00	PASS
		2480	-7.40	≤8.00	PASS

Test Plots

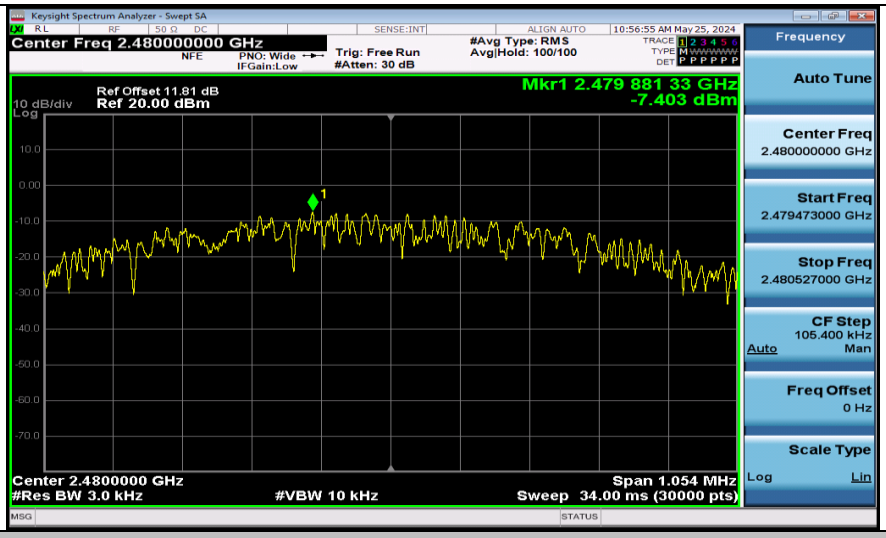


BLE_1M-Ant1-2402-PASS



BLE_1M-Ant1-2440-PASS

TEST REPORT



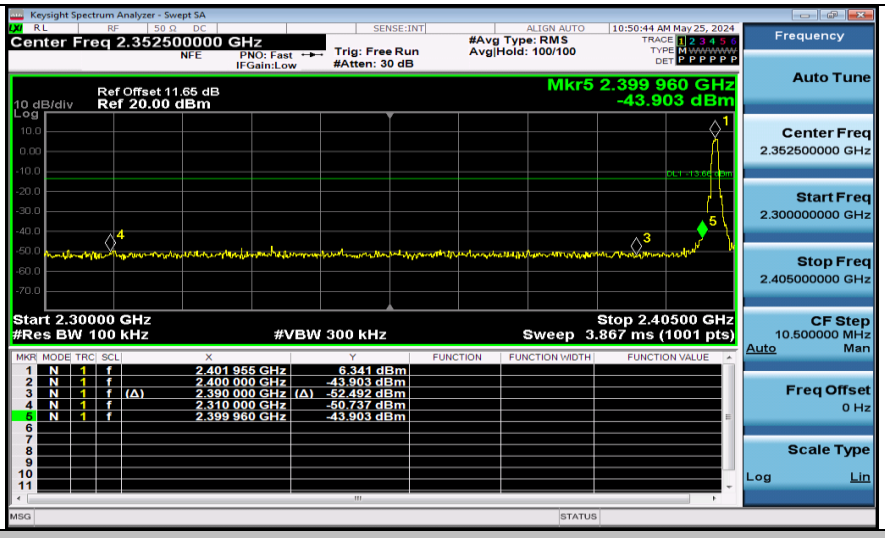
BLE_1M-Ant1-2480-PASS

11.5 Band Edge Measurements

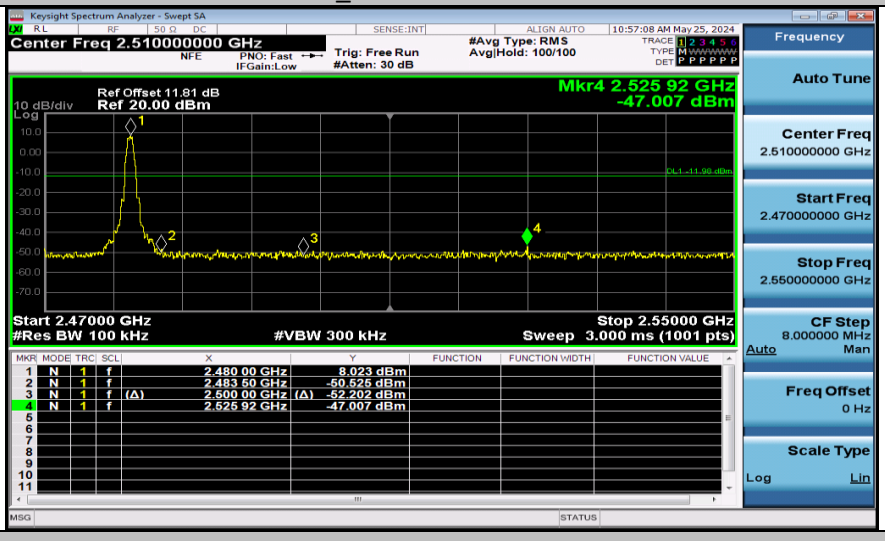
Test Data

Test Mode	Antenna	ChName	Frequency [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
BLE_1M	Ant1	Low	2402	6.34	-43.9	≤-13.66	PASS
		High	2480	8.02	-47.01	≤-11.98	PASS

Test Plots



BLE_1M-Ant1-2402-PASS



BLE_1M-Ant1-2480-PASS

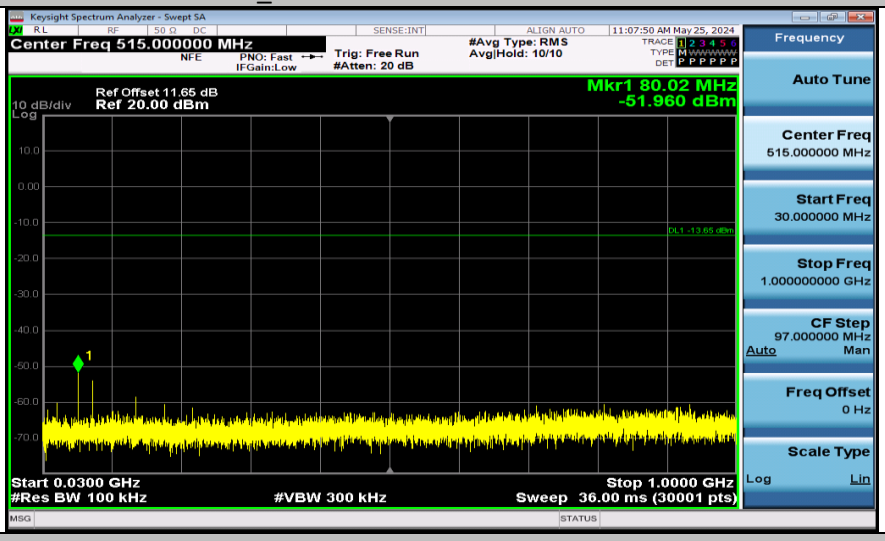
11.6 Conducted Spurious Emission

Test Data

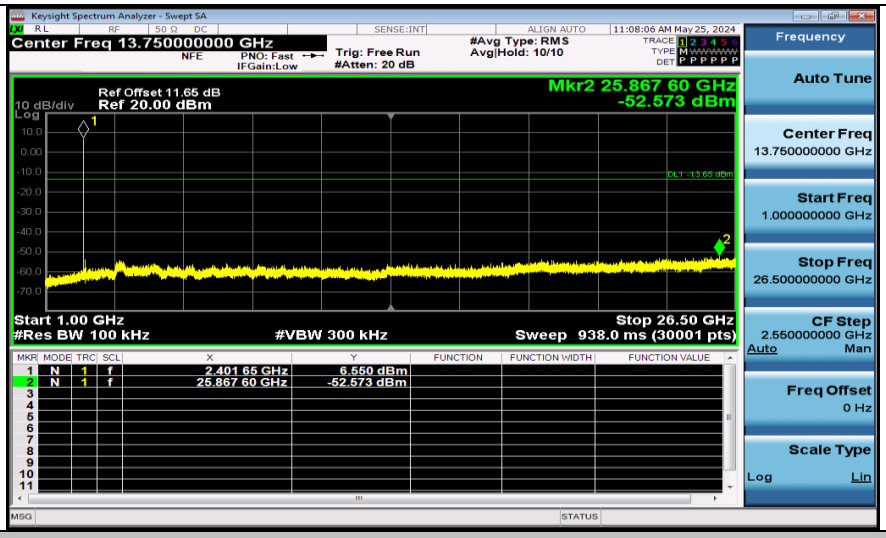
Test Mode	Antenna	Frequency [MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	6.35	6.35	---	PASS
			30~1000	6.35	-51.96	≤-13.65	PASS
			1000~26500	6.35	-52.57	≤-13.65	PASS
		2440	Reference	7.17	7.17	---	PASS
			30~1000	7.17	-51.55	≤-12.83	PASS
			1000~26500	7.17	-51.23	≤-12.83	PASS
		2480	Reference	7.77	7.77	---	PASS
			30~1000	7.77	-51.14	≤-12.23	PASS
			1000~26500	7.77	-51.9	≤-12.23	PASS

Test Plots

BLE_1M-Ant1-2402-0~Reference-PASS

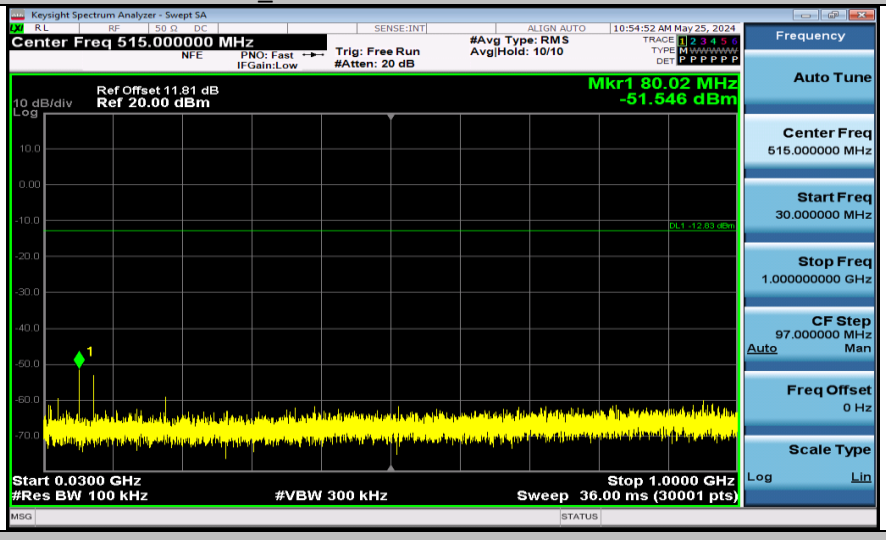


BLE_1M-Ant1-2402-30~1000-PASS



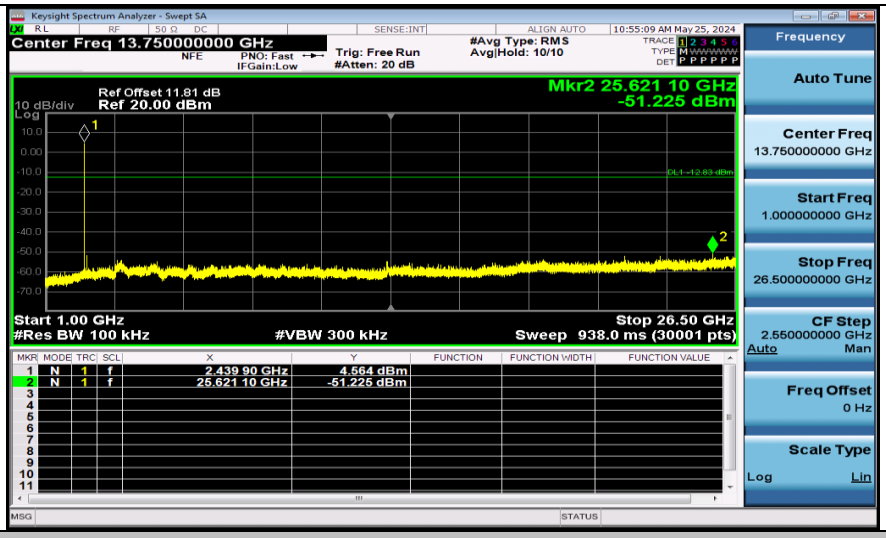
BLE_1M-Ant1-2402-1000~26500-PASS

BLE_1M-Ant1-2440-0~Reference-PASS



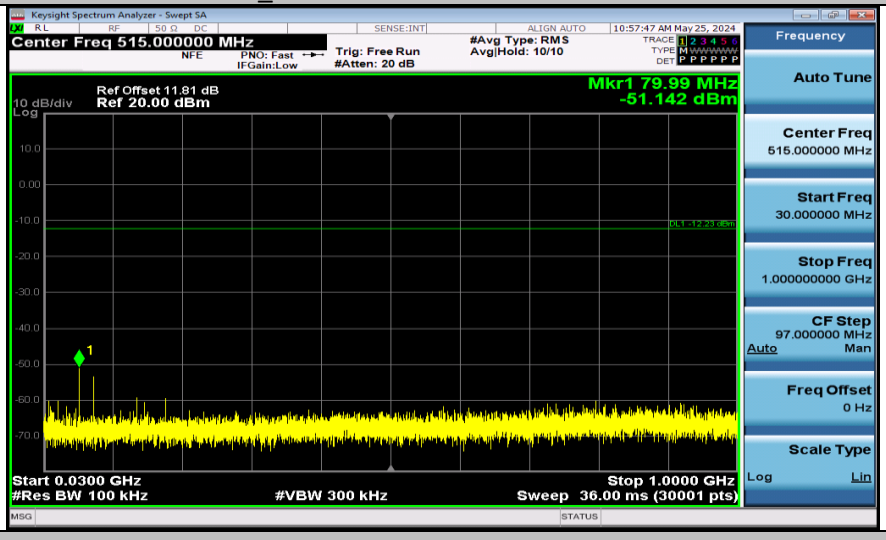
BLE_1M-Ant1-2440-30~1000-PASS

TEST REPORT



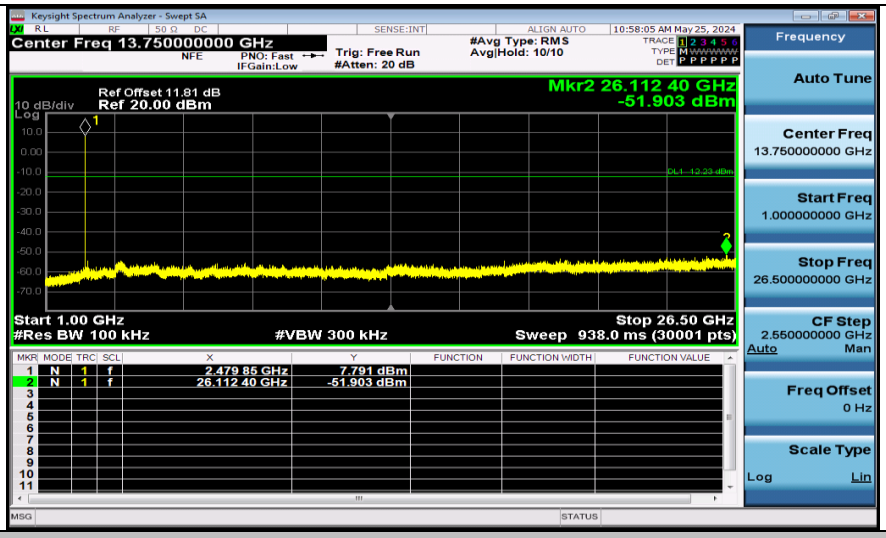
BLE_1M-Ant1-2440-1000~26500-PASS

BLE_1M-Ant1-2480-0~Reference-PASS



BLE_1M-Ant1-2480-30~1000-PASS

TEST REPORT



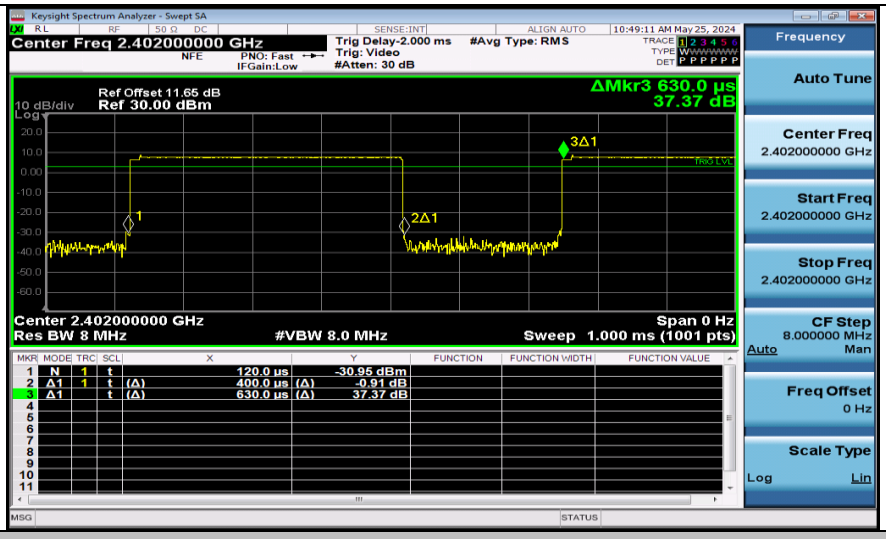
BLE_1M-Ant1-2480-1000~26500-PASS

11.7 Duty Cycle

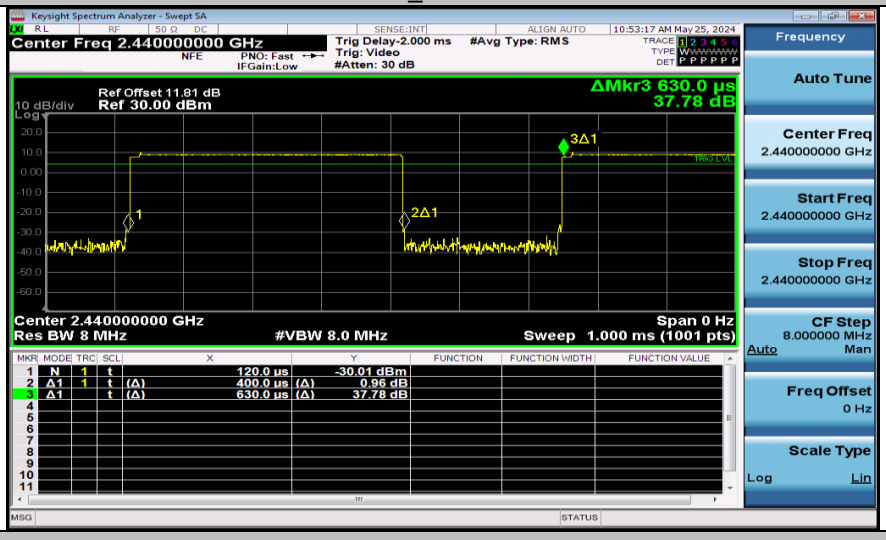
Test Data

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
BLE_1M	Ant1	2402	0.40	0.63	63.49	1.97
		2440	0.40	0.63	63.49	1.97
		2480	0.40	0.63	63.49	1.97

Test Plots

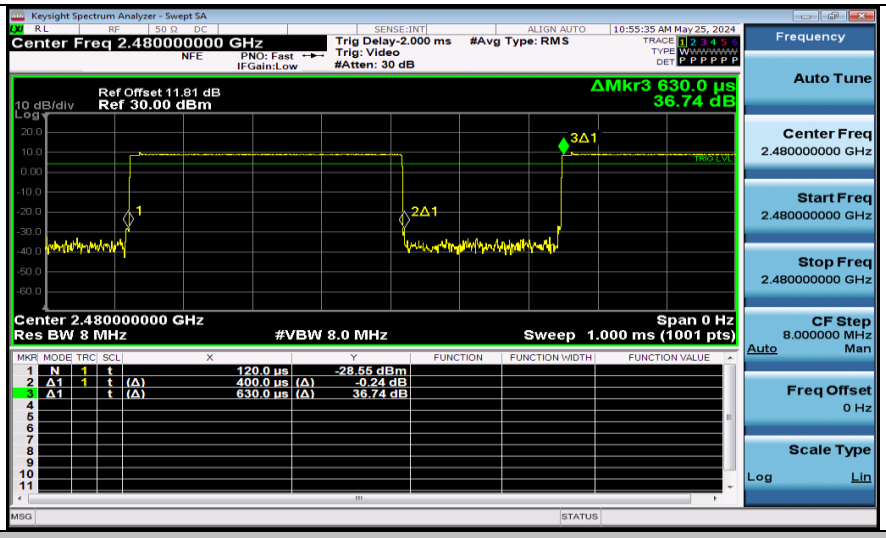


NTNV-BLE_1M-Ant1-2402



NTNV-BLE_1M-Ant1-2440

TEST REPORT



NTNV-BLE_1M-Ant1-2480

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