

Delos Living LLC

RF TEST REPORT

Report Type:

FCC Part 15.247 & ISED RSS-247 RF report

Model:

WA280

REPORT NUMBER:

230800860SHA-001

ISSUE DATE:

August 19, 2024

DOCUMENT CONTROL NUMBER:

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Manufacturer Site: SHENZHEN DINGXIN TECHNOLOGY CO., LTD
201, Building F, No. 9, Gelan Road, Dahe Community, Guanhu Street,
Longhua District, Shenzhen, China

Product Name: Air purifier

Type/Model: WA280

FCC ID: 2BCO6-WA280

IC: 31915-WA280

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

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TEST REPORT

Content

REVISION HISTORY.....	5
MEASUREMENT RESULT SUMMARY	6
1 GENERAL INFORMATION	7
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	7
1.2 TECHNICAL SPECIFICATION.....	7
1.3 DESCRIPTION OF TEST FACILITY	8
2 TEST SPECIFICATIONS.....	9
2.1 STANDARDS OR SPECIFICATION	9
2.2 MODE OF OPERATION DURING THE TEST	9
2.3 TEST SOFTWARE LIST	9
2.4 TEST PERIPHERALS LIST.....	9
2.5 TEST ENVIRONMENT CONDITION:.....	10
2.6 INSTRUMENT LIST	11
2.7 MEASUREMENT UNCERTAINTY.....	13
3 MINIMUM 6DB BANDWIDTH.....	14
3.1 LIMIT	14
3.2 MEASUREMENT PROCEDURE	14
3.3 TEST CONFIGURATION	14
3.4 TEST RESULTS OF MINIMUM 6DB BANDWIDTH.....	14
4 MAXIMUM CONDUCTED OUTPUT POWER AND E.I.R.P.....	15
4.1 LIMIT	15
4.2 MEASUREMENT PROCEDURE	15
4.3 TEST CONFIGURATION	16
4.4 TEST RESULTS OF MAXIMUM CONDUCTED OUTPUT POWER.....	16
5 POWER SPECTRUM DENSITY	17
5.1 LIMIT	17
5.2 MEASUREMENT PROCEDURE	17
5.3 TEST CONFIGURATION	18
5.4 TEST RESULTS OF POWER SPECTRUM DENSITY	18
6 EMISSION OUTSIDE THE FREQUENCY BAND	19
6.1 LIMIT	19
6.2 MEASUREMENT PROCEDURE	19
6.3 TEST CONFIGURATION	20
6.4 THE RESULTS OF EMISSION OUTSIDE THE FREQUENCY BAND.....	20
7 RADIATED EMISSIONS IN RESTRICTED FREQUENCY BANDS.....	21
7.1 LIMIT	21
7.2 MEASUREMENT PROCEDURE	21
7.3 TEST CONFIGURATION	23
7.4 TEST RESULTS OF RADIATED EMISSIONS	25
8 POWER LINE CONDUCTED EMISSION.....	28
8.1 LIMIT	28
8.2 TEST CONFIGURATION	28
8.3 MEASUREMENT PROCEDURE	29

TEST REPORT

8.4	TEST RESULTS OF POWER LINE CONDUCTED EMISSION	30
9	OCCUPIED BANDWIDTH	32
9.1	LIMIT	32
9.2	MEASUREMENT PROCEDURE	32
9.3	TEST CONFIGURATION	32
9.4	THE RESULTS OF OCCUPIED BANDWIDTH	32
10	ANTENNA REQUIREMENT	33
	APPENDIX A: TEST RESULTS	34
	DTS BANDWIDTH	34
	<i>Test Result</i>	34
	<i>Test Graphs</i>	35
	OCCUPIED CHANNEL BANDWIDTH.....	37
	<i>Test Result</i>	37
	<i>Test Graphs</i>	38
	MAXIMUM CONDUCTED OUTPUT POWER	40
	<i>Test Result</i>	40
	<i>Test Graphs</i>	41
	MAXIMUM POWER SPECTRAL DENSITY	43
	<i>Test Result</i>	43
	<i>Test Graphs</i>	44
	BAND EDGE MEASUREMENTS	46
	<i>Test Result</i>	46
	<i>Test Graphs</i>	47
	CONDUCTED SPURIOUS EMISSION.....	48
	<i>Test Result</i>	48
	<i>Test Graphs</i>	49
	DUTY CYCLE.....	53
	<i>Test Result</i>	53
	<i>Test Graphs</i>	54

Revision History

Report No.	Version	Description	Issued Date
230800860SHA-001	Rev. 01	Initial issue of report	August 19, 2024

Measurement result summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 2 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 2 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 2 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 2 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

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Air purifier
Type/Model/PMN/HVIN:	WA280
Description of EUT:	The EUT is Air purifier, it supports Thread and 60G mm functions, there is only one model. we test them and list the worst results in this report.
Rating:	DC 12V, 15W Input: 120VAC, 60Hz 1.5A Output: Type-C 5.0V $\approx$ 3.0A, 9.0V $\approx$ 2.2A, 12.0V $\approx$ 1.7A 20W max
EUT type:	☒ Table top ☐ Floor standing
Software Version:	V1.0.5
Hardware Version:	V1.2
Product Marketing Name:	WA280
HVIN:	WA280
Sample Identification No.:	0231226-05-001(for radiation sample), 0231226-05-002(for conduction sample)
Sample received date:	August 25, 2023
Date of test:	August 25, 2023 ~ November 20, 2023

1.2 Technical Specification

Frequency Range:	2405-2480MHz
Support Standards:	IEEE 802.15.4
Type of Modulation:	Thread O-QPSK
Channel Number:	16
Data Rate:	250kbps
Antenna Information:	0.5dBi, PCB antenna

1.3 Description of Test Facility

Name:	Intertek Testing Services (Shanghai FTZ) Co., Ltd.
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 L21189
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

TEST REPORT

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2023)

ANSI C63.10 (2020)

RSS-247 Issue 3 (August 2023)

RSS-Gen Issue 5 (April 2018)

KDB 558074 (v05)

2.2 Mode of operation during the test

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

Frequency Band (MHz)				2405 ~ 2480			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	18	2440	25	2475	26	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	SSCOM V5.13.1			
Working Mode	Thread			
Test Channel	2405MHz	2440MHz	2475MHz	2480MHz
Power Setting	pos8dBm	pos8dBm	pos8dBm	neg4dBm

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

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	22°C	53%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	23°C	54%RH

TEST REPORT

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
☐	A.M.N.	R&S	ENV4200	EC 3558	2024-06-05
☒	Attenuator	Hua Xiang	Ts5-6db-6g	EC 6194-1	2023-12-07
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-22
☒	Test Receiver	R&S	ESR	EC6501	2024-09-24
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-09-12
☒	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-07
☒	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15
☐	Horn antenna	ETS	3117	EC 4792-1	2024-09-15
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2026-09-12
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-05
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2024-03-16
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2024-03-05
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2024-03-05
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2024-03-05
☐	Mobile Test System	Litepoint	lqxel	EC 5176	2024-01-11
☐	Test Receiver	R&S	ESCI 7	EC 4501	2024-03-09
☐	Climate chamber	GWS	MT3065	EC 6021	2024-03-06
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2024-06-15
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2024-01-11
☐	Shielded room	Zhongyu	-	EC 2839	2024-01-11
☒	Semi-anechoic	Albatross	-	EC 3048	2024-07-08

TEST REPORT

	chamber	project			
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-09
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2024-02-28
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2024-04-11
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5201	2024-04-09
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

TEST REPORT

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	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

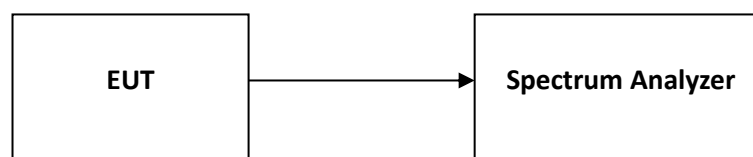
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The EUT was tested according to Subclause 11.8 of ANSI C63.10.

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ 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

TEST REPORT

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 Subclause 11.9.2.2 of ANSI C63.10.

- a) Measure the duty cycle, x , of the transmitter output signal as described in Section 6.0.
- b) Set span to at least $1.5 \times \text{OBW}$.
- c) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
- d) Set VBW $\geq 3 \times \text{RBW}$.
- e) Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This gives bin-to-bin spacing $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- f) Sweep time = auto.
- g) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- h) Do not use sweep triggering. Allow the sweep to “free run”.
- i) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.
- j) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- k) Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on- and off-times of the transmission). For example, add $10 \log (1/0.25) = 6 \text{ dB}$ if the duty cycle is 25 %.

TEST REPORT**4.3 Test Configuration****4.4 Test Results of Maximum conducted output power**

Please refer to Appendix A

TEST REPORT

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.

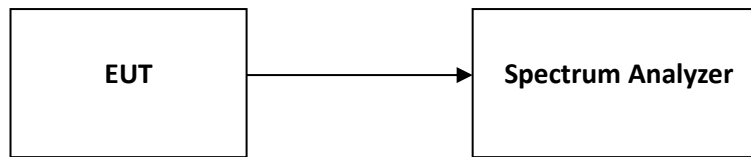
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and $8 + (6 - \text{antenna gain} - \text{beam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

5.2 Measurement Procedure

The EUT was tested according to Subclause 11.10 of ANSI C63.10.

This procedure is applicable when the EUT cannot be configured to transmit continuously (i.e., duty cycle < 98 %), and when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than $\pm 2\%$):

- a) Measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.
- b) Set instrument center frequency to DTS channel center frequency.
- c) Set span to at least $1.5 \times \text{OBW}$.
- d) Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e) Set VBW $\geq 3 \times \text{RBW}$.
- f) Detector = power averaging (RMS) or sample detector (when RMS not available).
- g) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- h) Sweep time = auto couple.
- i) Do not use sweep triggering. Allow sweep to "free run".
- j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- k) Use the peak marker function to determine the maximum amplitude level.
- l) Add $10 \log(1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.
- m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

TEST REPORT**5.3 Test Configuration****5.4 Test Results of Power spectrum density**

Please refer to Appendix A

TEST REPORT

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 30 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 Subclause 11.11 of ANSI C63.10.

Reference level measurement

Establish a reference level by using the following procedure:

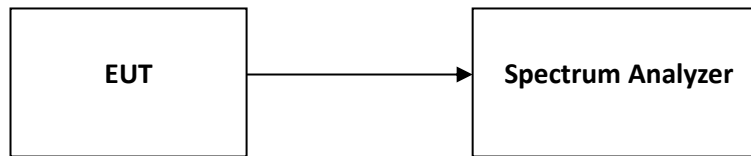
- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to ≥ 1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW $\geq 3 \times$ RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.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

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. For the floor-standing devices, the EUT was placed on the top of a rotating table 0.1 meters above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- 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.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

TEST REPORT**For Radiated emission above 30MHz:**

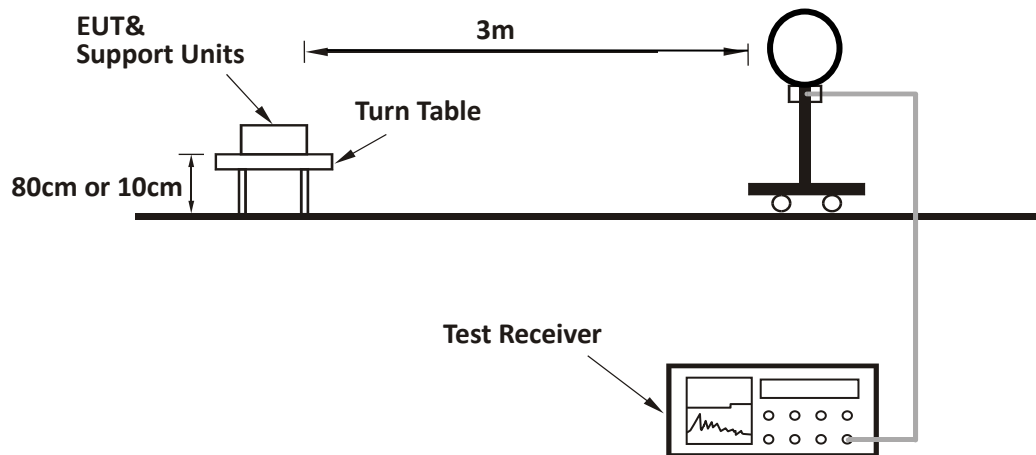
- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. For the floor-standing devices, the EUT was placed on the top of a rotating table 0.1 meters above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine 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:

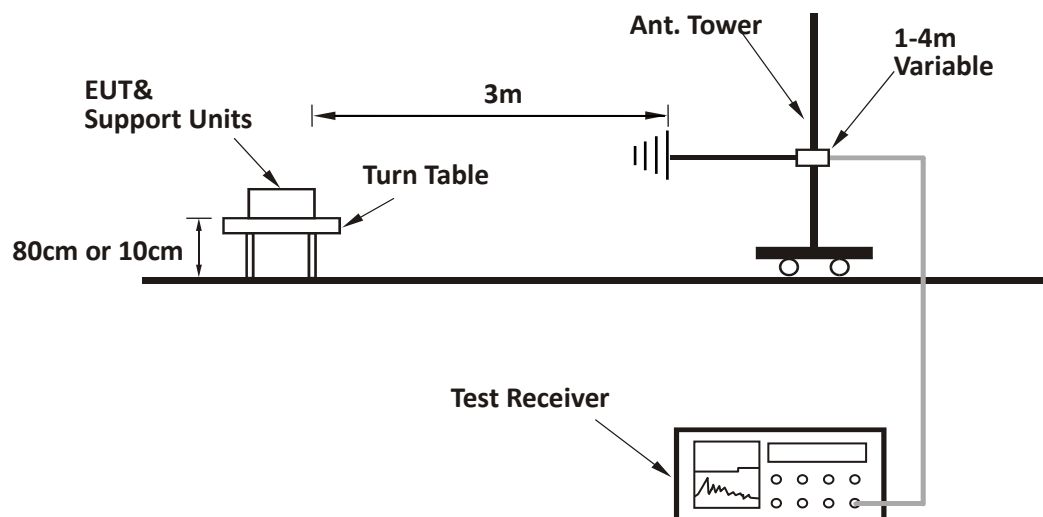
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

7.3 Test Configuration

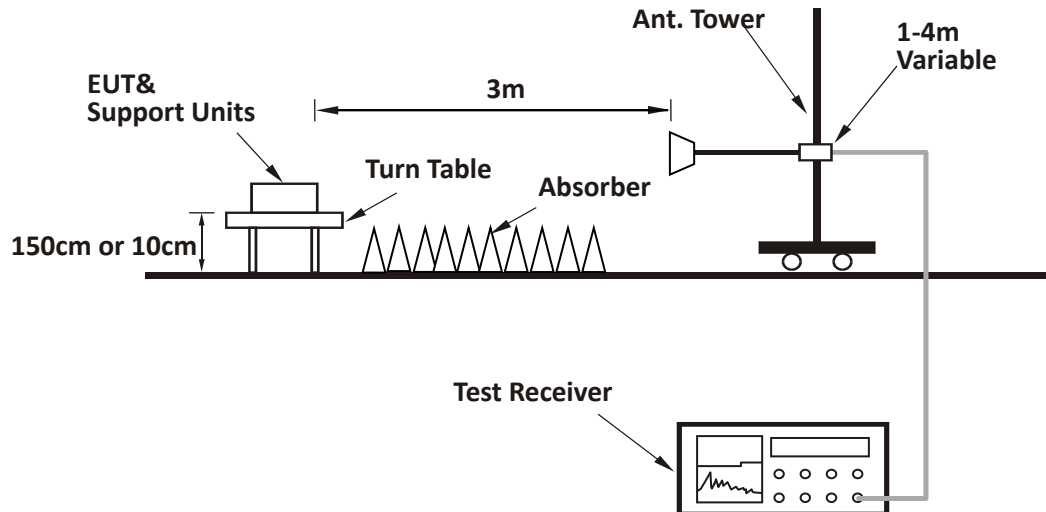
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:

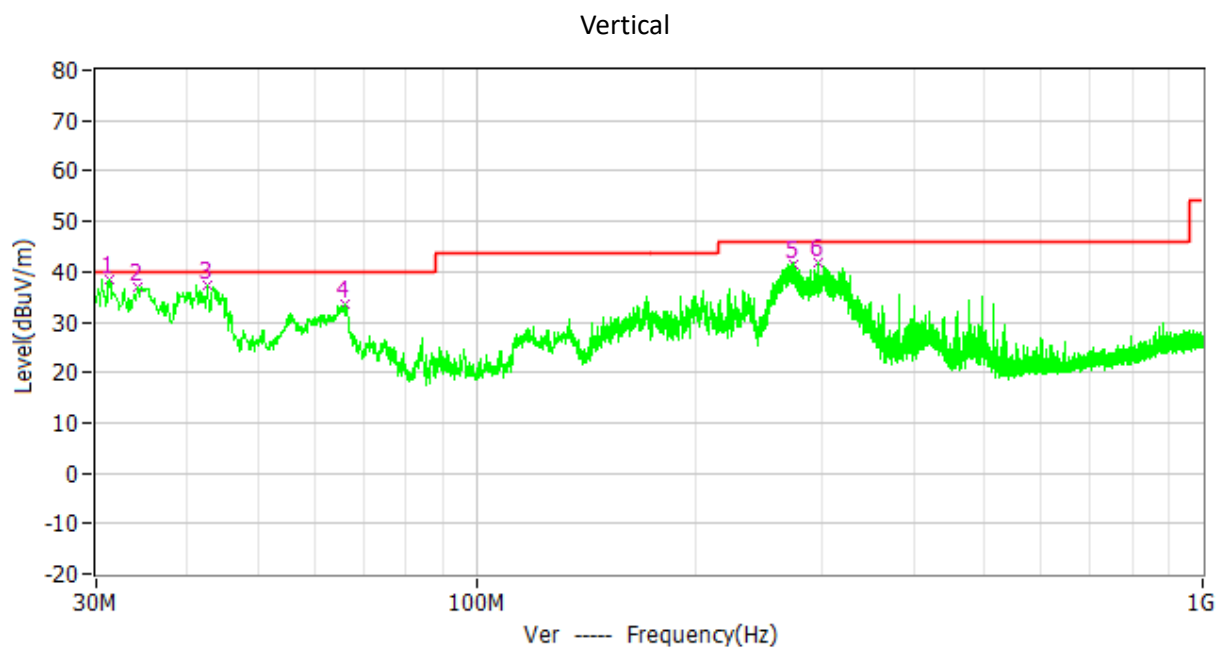
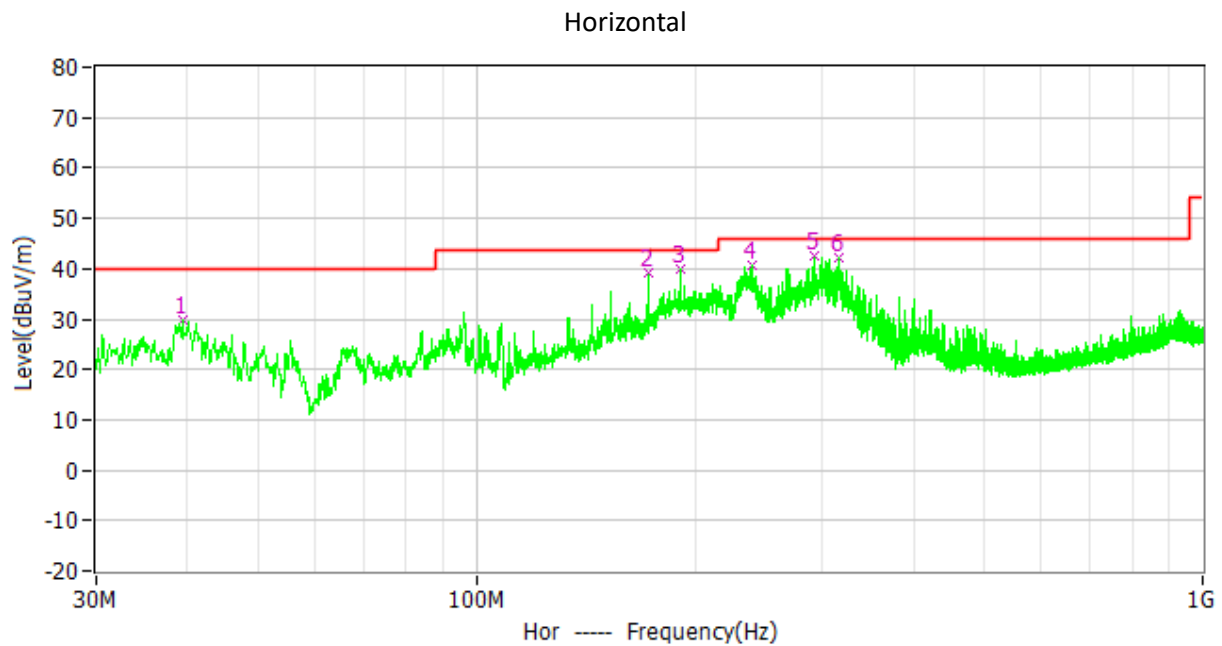


For Radiated emission above 1GHz:



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.



TEST REPORT

Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	39.506	29.7	40.0	10.3	QP
H	172.299	39.0	43.5	4.5	QP
H	191.408	39.8	43.5	3.7	QP
H	239.229	40.8	46.0	5.2	QP
H	291.706	42.4	46.0	3.6	QP
H	314.889	42.2	46.0	3.8	QP
V	31.261	37.4	40.0	2.6	QP
V	34.268	36.0	40.0	4.0	QP
V	42.610	36.3	40.0	3.7	QP
V	65.987	32.5	40.0	7.5	QP
V	272.985	40.6	46.0	5.4	QP
V	295.004	40.7	46.0	5.3	QP

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	2405.00	31.7	101.1	Fundamental	/	PK
	V	2405.00	31.7	90.3	Fundamental	/	PK
	H	2390.00	31.7	45.6	74.00	28.4	PK
	V	2390.00	31.7	47.6	74.00	26.4	PK
	H	4810.00	-15.1	49.6	74.00	24.4	PK
	H	7215.00	-9.0	44.5	74.00	29.5	PK
	V	4810.00	-15.1	43.1	74.00	30.9	PK
	V	7215.00	-9.0	44.6	74.00	29.4	PK
M	H	4880.00	-15.1	49.2	74.00	24.8	PK
	H	7320.00	-9.0	44.3	74.00	29.7	PK
	V	4880.00	-15.1	43.2	74.00	30.8	PK
	V	7320.00	-9.0	44.9	74.00	29.1	PK
H	H	2475.00	31.9	98.1	Fundamental	/	PK
	V	2475.00	31.9	93.4	Fundamental	/	PK
	H	2483.50	31.9	53.8	74.00	20.2	PK

TEST REPORT

	V	2483.50	31.9	50.1	74.00	23.9	PK
	H	4950.00	-15.1	47.2	74.00	26.8	PK
	H	7425.00	-8.9	45.8	74.00	28.2	PK
	V	4950.00	-15.1	42.3	74.00	31.7	PK
	V	7425.00	-8.9	47.9	74.00	26.1	PK
H	H	2480.00	31.9	96.7	Fundamental	/	PK
	V	2480.00	31.9	92.6	Fundamental	/	PK
	H	2483.50	31.9	55.8	74.00	18.2	PK
	H	2483.50	31.9	47.2	54.00	6.8	AV
	V	2483.50	31.9	51.5	74.00	22.5	PK
	H	4960.00	-15.1	47.8	74.00	26.2	PK
	H	7440.00	-8.9	46.1	74.00	27.9	PK
	V	4960.00	-15.1	42.6	74.00	31.4	PK
	V	7440.00	-8.9	48.0	74.00	26.0	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 - 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

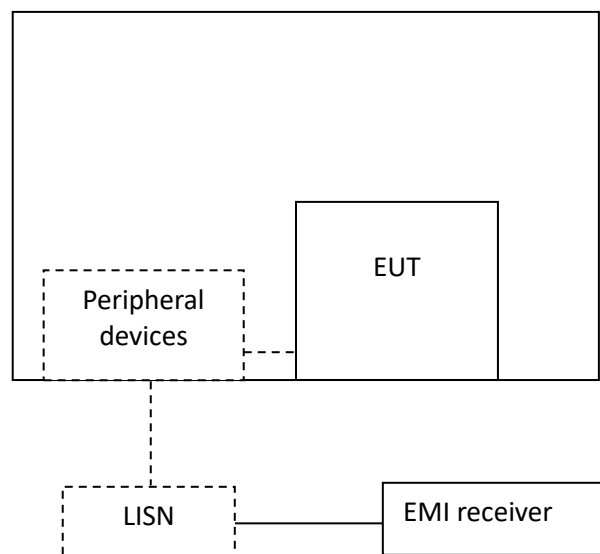
Test result: Pass

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



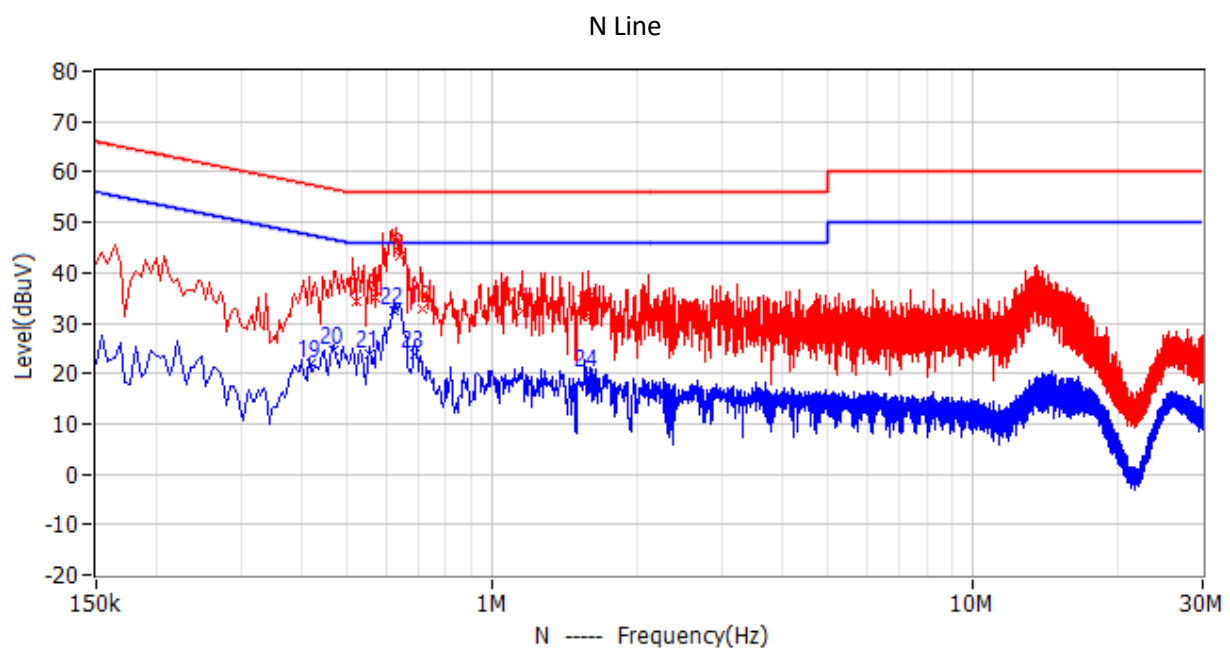
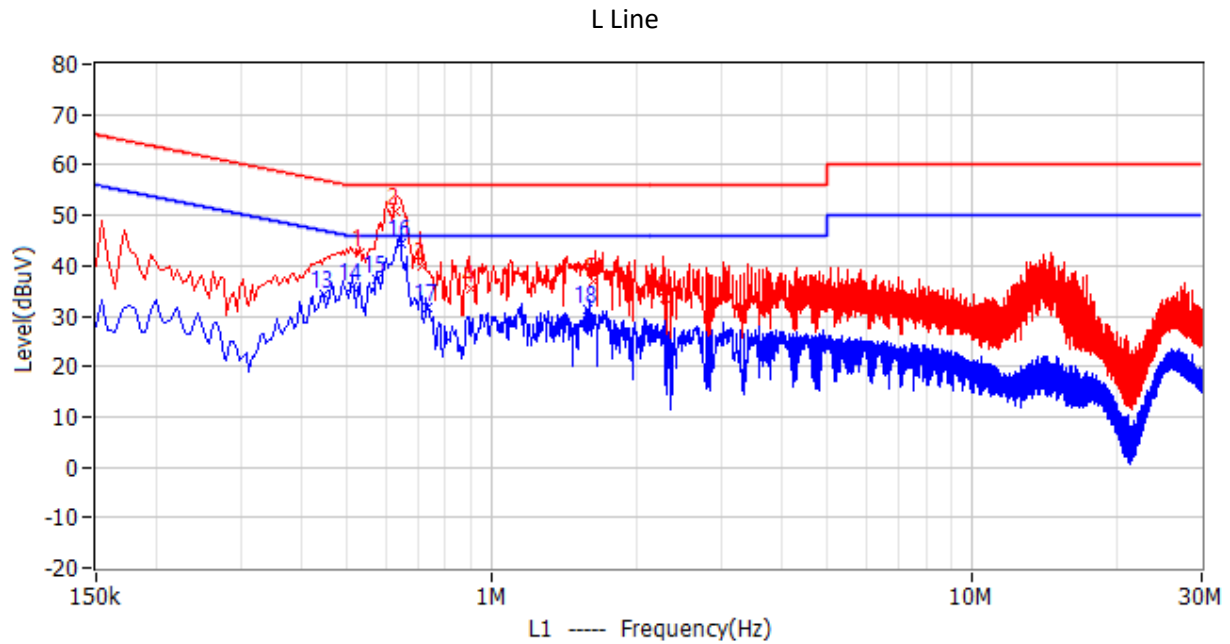
TEST REPORT**8.3 Measurement Procedure**

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 REPORT

Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Margin dB	Reading dBuV	Factor dB	Detector	Phase
1	532.500kHz	56.0	42.6	13.4	36.4	6.2	QP	L1
2	631.500kHz	56.0	50.8	5.2	44.5	6.3	QP	L1
3	712.500kHz	56.0	39.8	16.2	33.5	6.3	QP	L1
4	901.500kHz	56.0	35.5	20.5	29.2	6.3	QP	L1
5	1.626MHz	56.0	37.1	18.9	30.8	6.3	QP	L1
6	2.283MHz	56.0	33.4	22.6	27.1	6.3	QP	L1
7	519.000kHz	56.0	34.4	21.6	28.2	6.2	QP	N
8	573.000kHz	56.0	34.9	21.1	28.7	6.2	QP	N
9	640.500kHz	56.0	43.3	12.7	37.0	6.3	QP	N
10	717.000kHz	56.0	32.7	23.3	26.4	6.3	QP	N
11	1.154MHz	56.0	32.3	23.7	26.0	6.3	QP	N
12	1.599MHz	56.0	31.4	24.6	25.1	6.3	QP	N
13	447.000kHz	46.9	34.3	12.6	28.1	6.2	AV	L1
14	510.000kHz	46.0	35.7	10.3	29.5	6.2	AV	L1
15	577.500kHz	46.0	37.3	8.7	31.0	6.3	AV	L1
16	645.000kHz	46.0	44.5	1.5	38.2	6.3	AV	L1
17	735.000kHz	46.0	31.5	14.5	25.2	6.3	AV	L1
18	1.586MHz	46.0	31.4	14.6	25.1	6.3	AV	L1
19	420.000kHz	47.4	21.9	25.5	15.7	6.2	AV	N
20	469.500kHz	46.5	24.4	22.2	18.2	6.2	AV	N
21	555.000kHz	46.0	23.9	22.1	17.7	6.2	AV	N
22	622.500kHz	46.0	32.4	13.6	26.2	6.2	AV	N
23	690.000kHz	46.0	24.0	22.0	17.7	6.3	AV	N
24	1.577MHz	46.0	19.9	26.1	13.6	6.3	AV	N

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

2. Level = Reading + Factor

3. Margin = Limit - Level

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 Issue 4 Clause 6.6 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

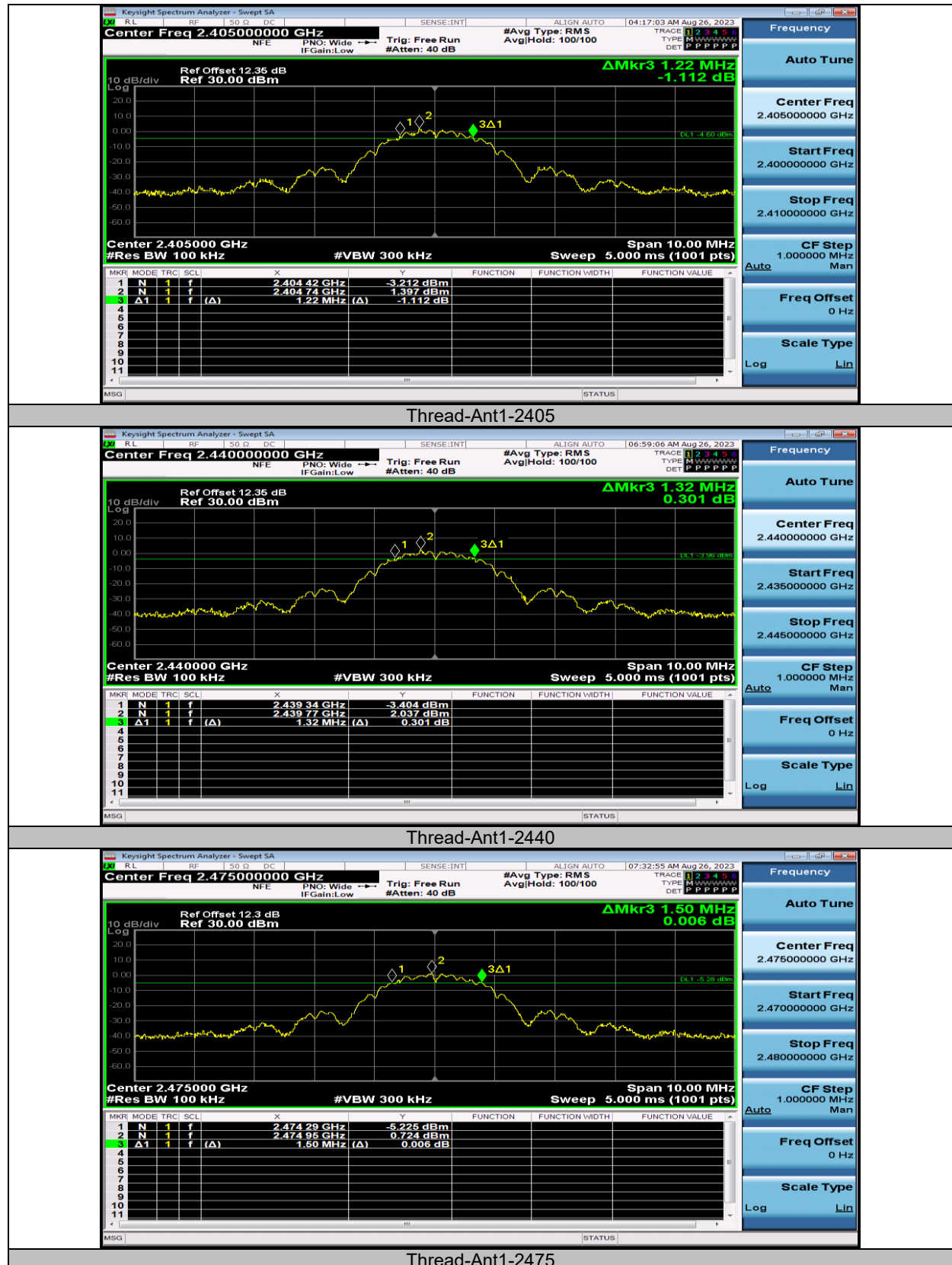
DTS Bandwidth

Test Result

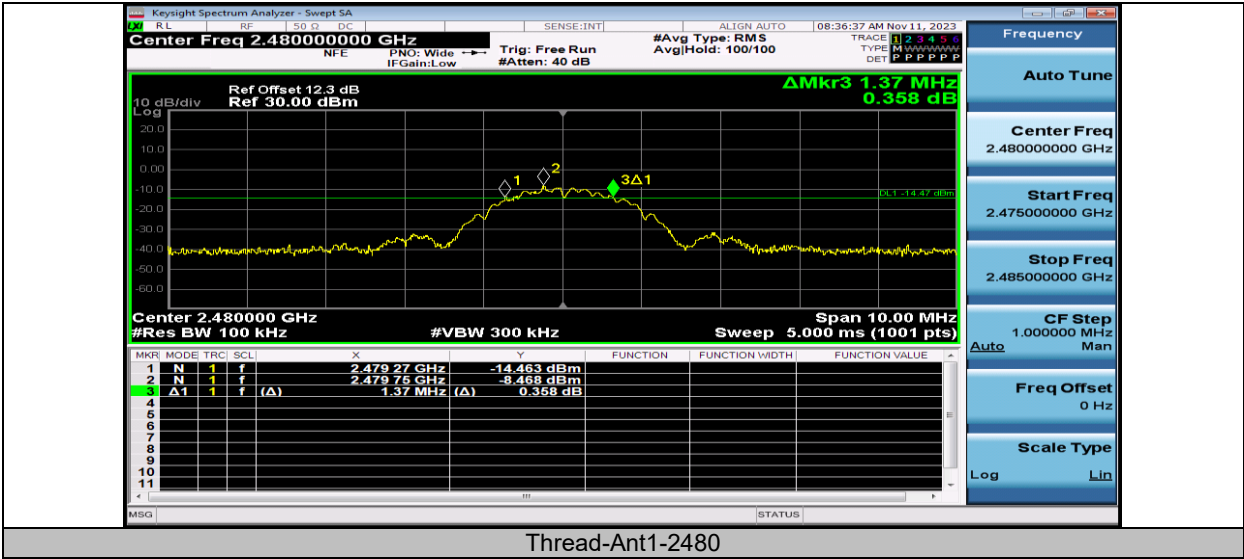
Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
Thread	Ant1	2405	1.220	2404.420	2405.640	0.5	PASS
Thread	Ant1	2440	1.320	2439.340	2440.660	0.5	PASS
Thread	Ant1	2475	1.500	2474.290	2475.790	0.5	PASS
Thread	Ant1	2480	1.370	2479.270	2480.640	0.5	PASS

TEST REPORT

Test Graphs



TEST REPORT



TEST REPORT

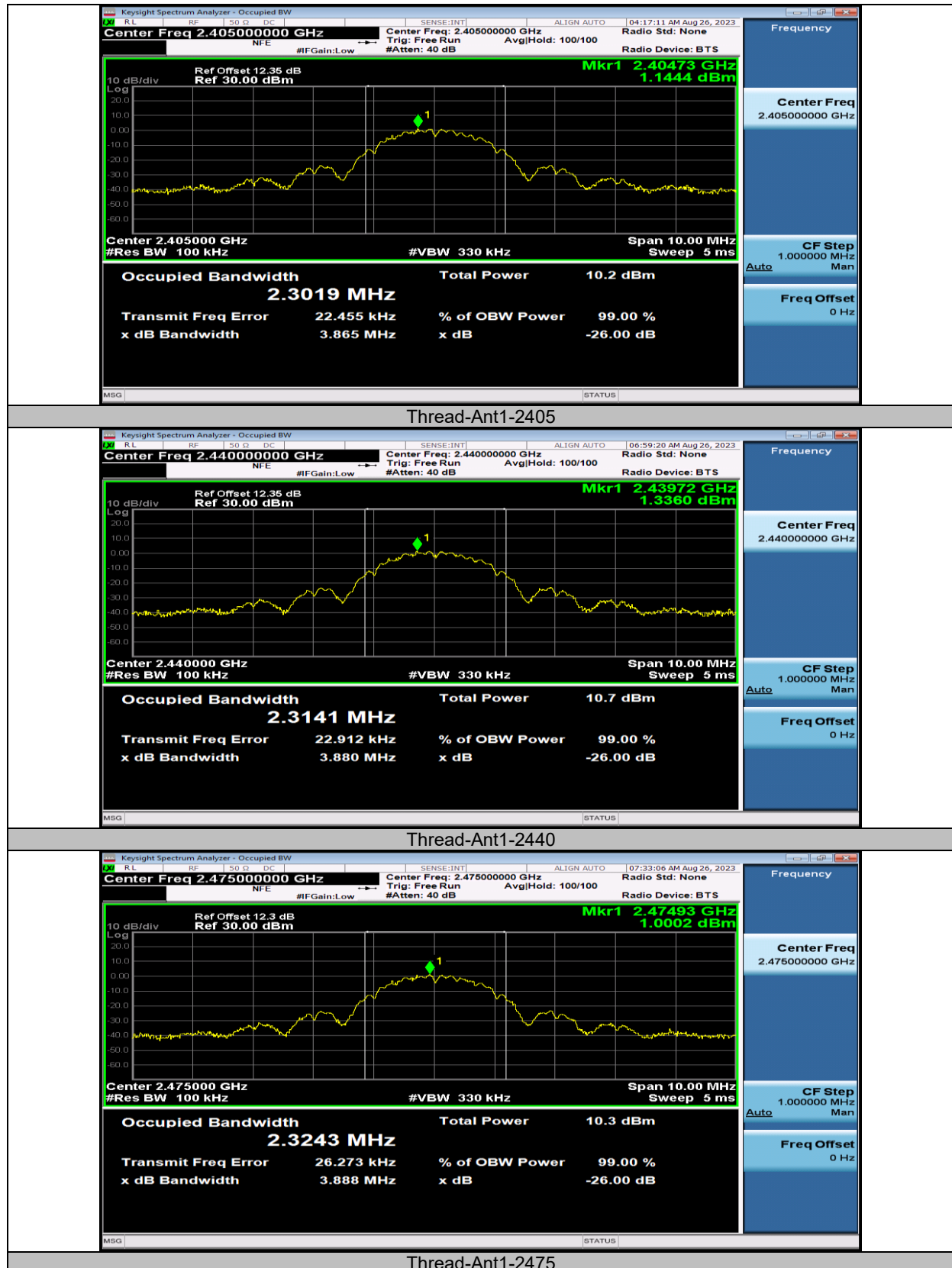
Occupied Channel Bandwidth

Test Result

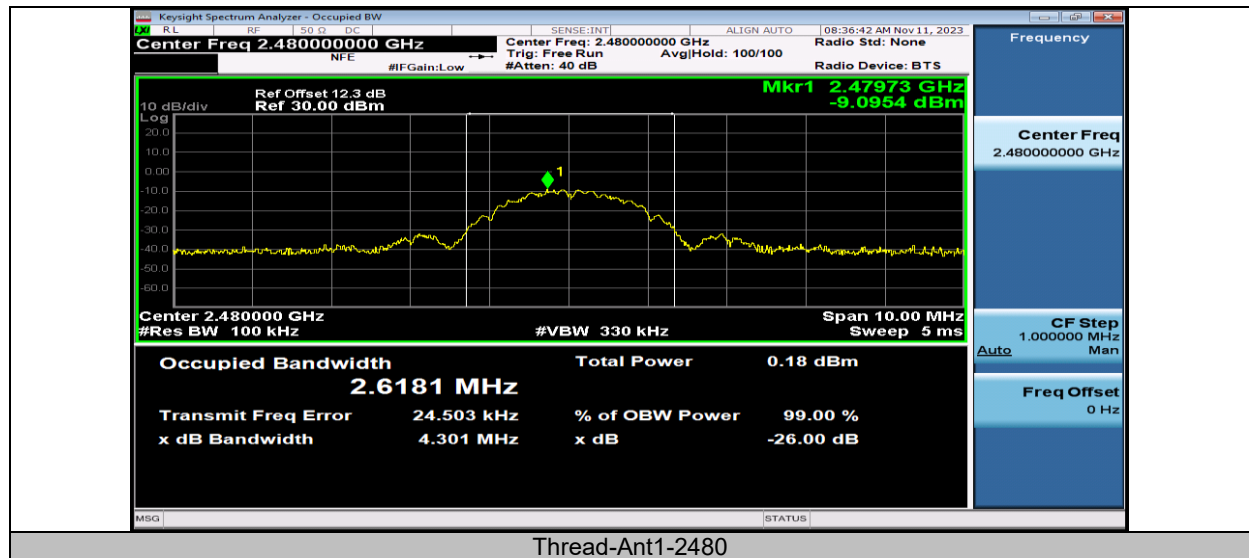
Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
Thread	Ant1	2405	2.3019	2403.8715	2406.1734	---	---
Thread	Ant1	2440	2.3141	2438.8659	2441.1800	---	---
Thread	Ant1	2475	2.3243	2473.8641	2476.1884	---	---
Thread	Ant1	2480	2.6181	2478.7155	2481.3336	---	---

TEST REPORT

Test Graphs



TEST REPORT



Thread-Ant1-2480

TEST REPORT

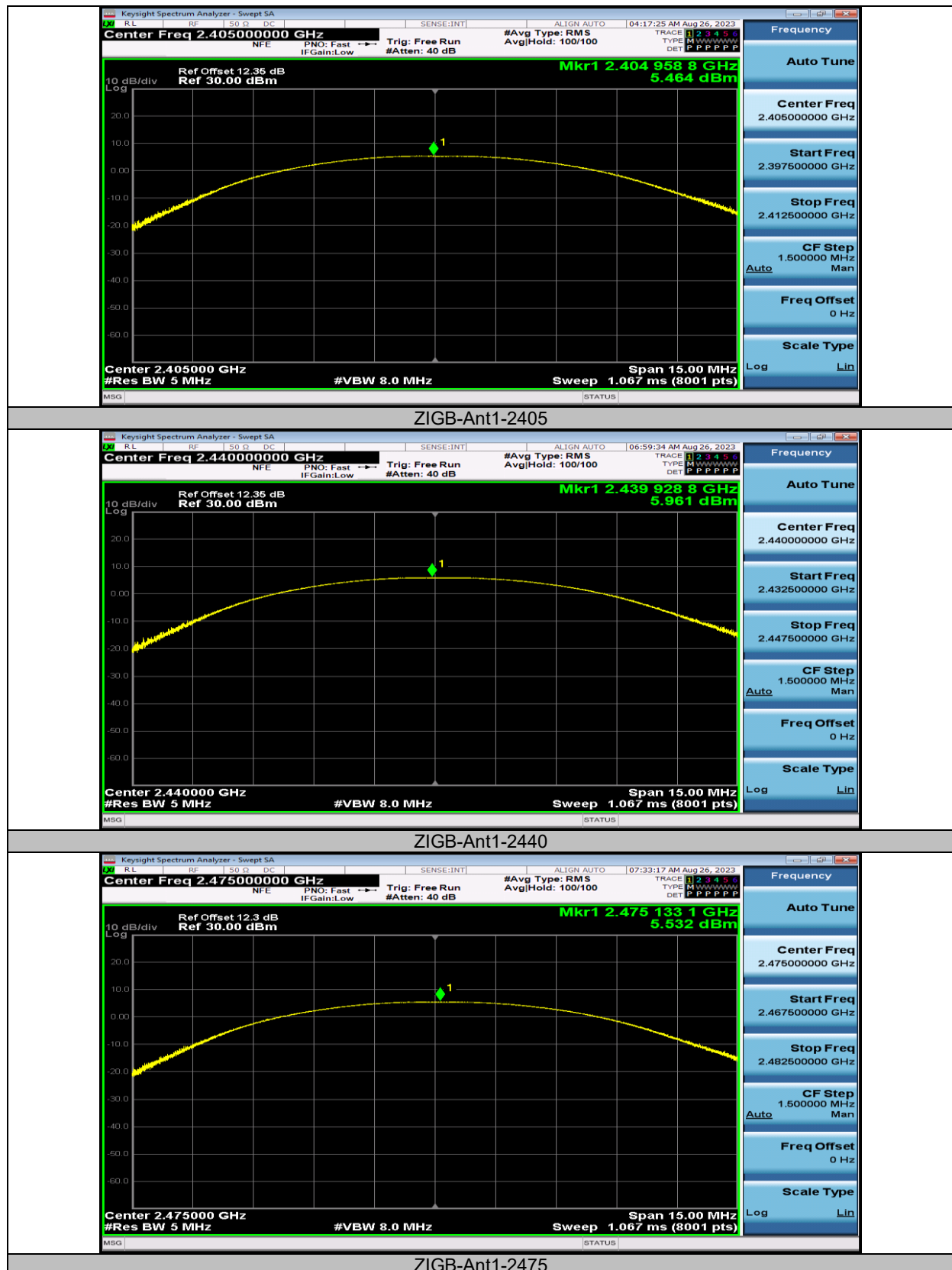
Maximum conducted output power

Test Result

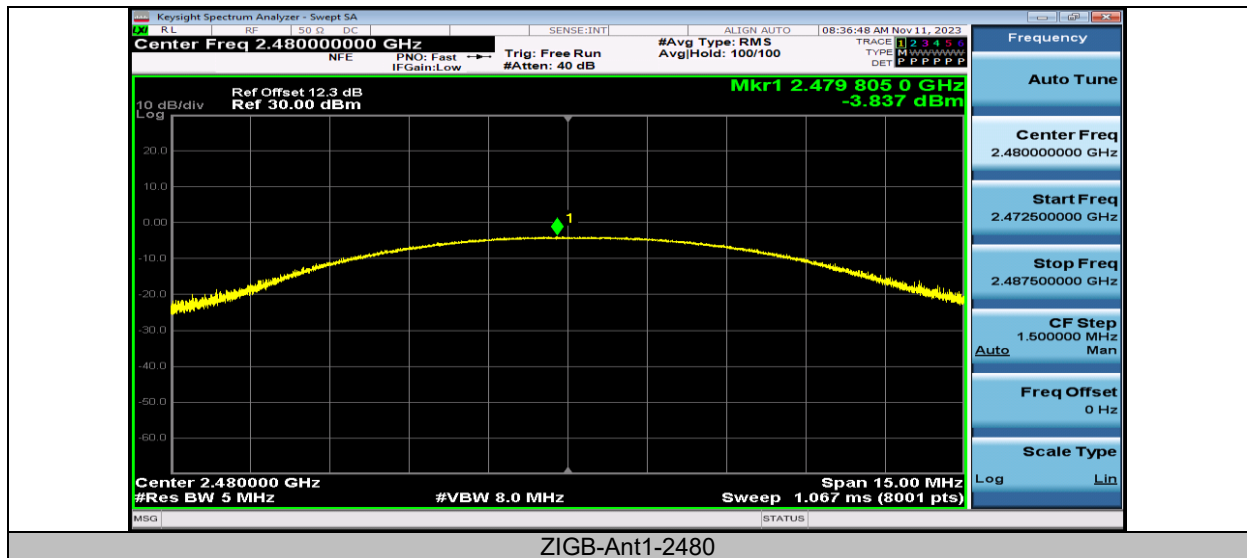
Test Mode	Antenna	Frequency [MHz]	Result[dBm]	ERIP [dBm]	Limit[dBm]	Verdict
Thread	Ant1	2405	5.46	5.96	≤30	PASS
Thread	Ant1	2440	5.96	6.46	≤30	PASS
Thread	Ant1	2475	5.53	6.03	≤30	PASS
Thread	Ant1	2480	-3.84	-3.34	≤30	PASS

TEST REPORT

Test Graphs



TEST REPORT



TEST REPORT

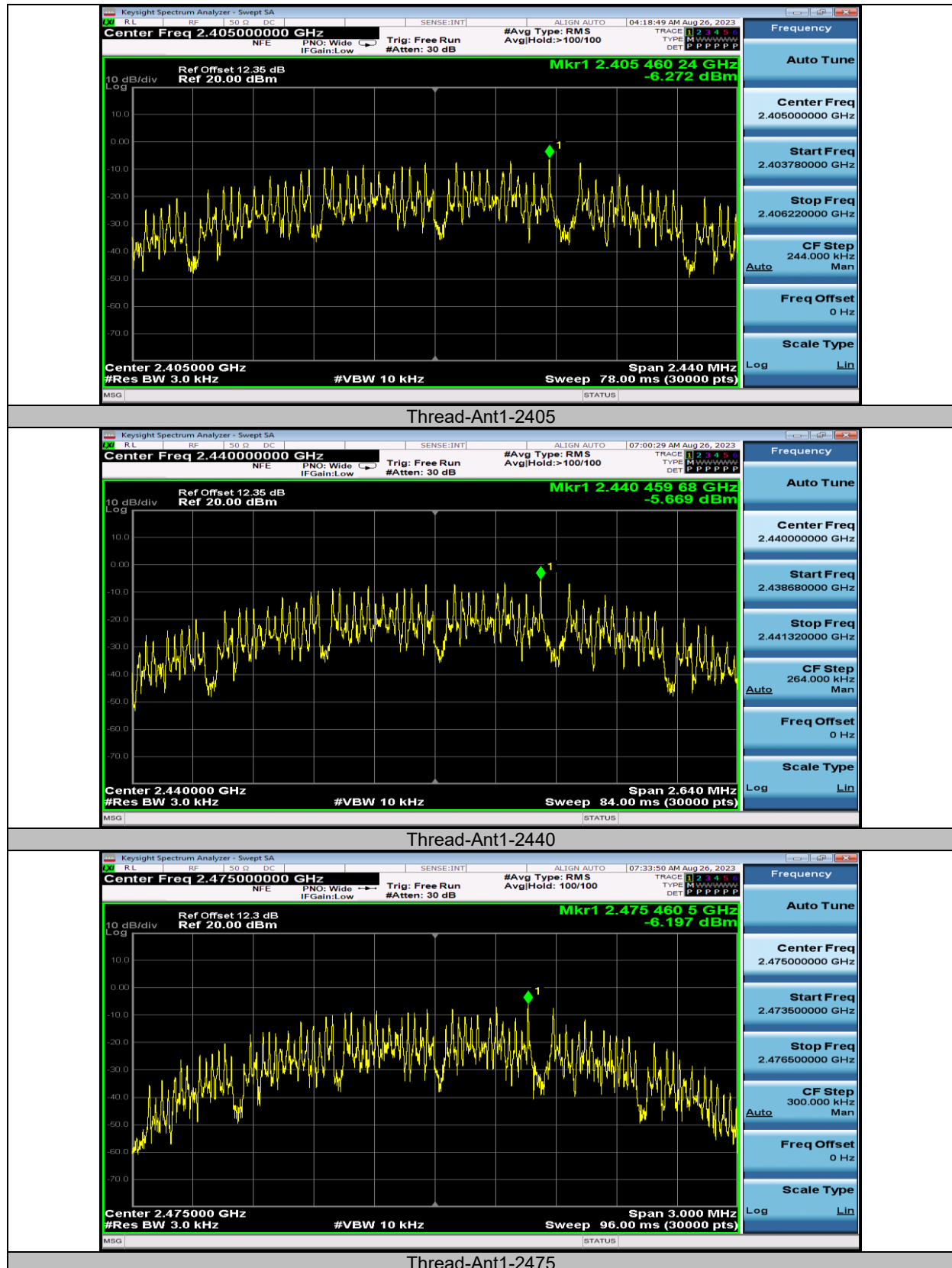
Maximum power spectral density

Test Result

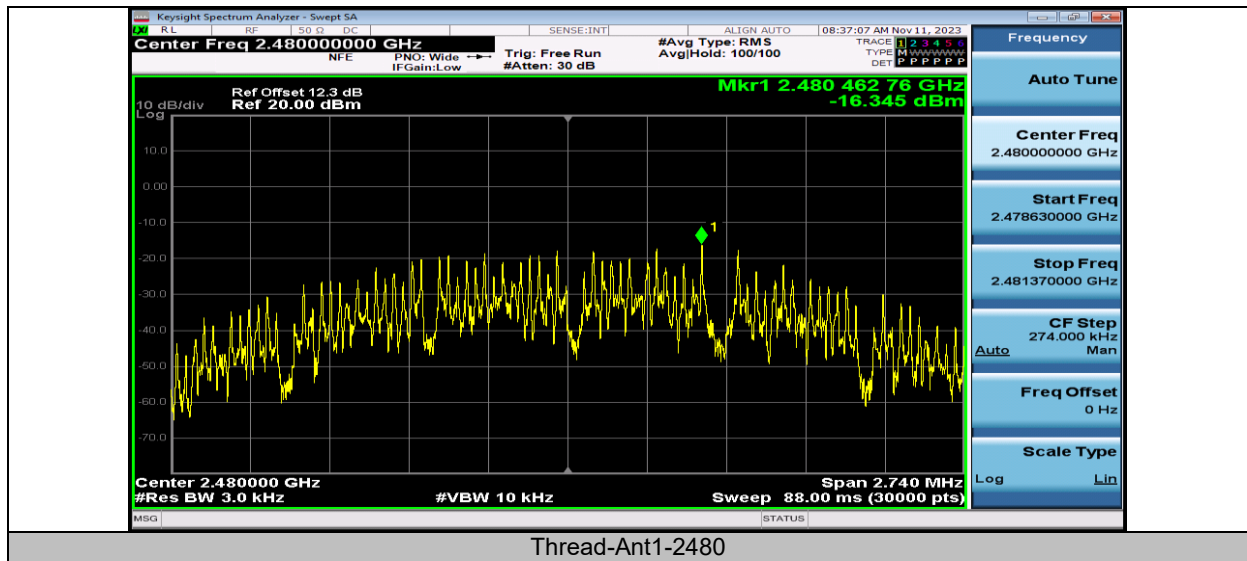
Test Mode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
Thread	Ant1	2405	-6.27	≤8.00	PASS
Thread	Ant1	2440	-5.67	≤8.00	PASS
Thread	Ant1	2475	-6.2	≤8.00	PASS
Thread	Ant1	2480	-16.35	≤8.00	PASS

TEST REPORT

Test Graphs



TEST REPORT



TEST REPORT

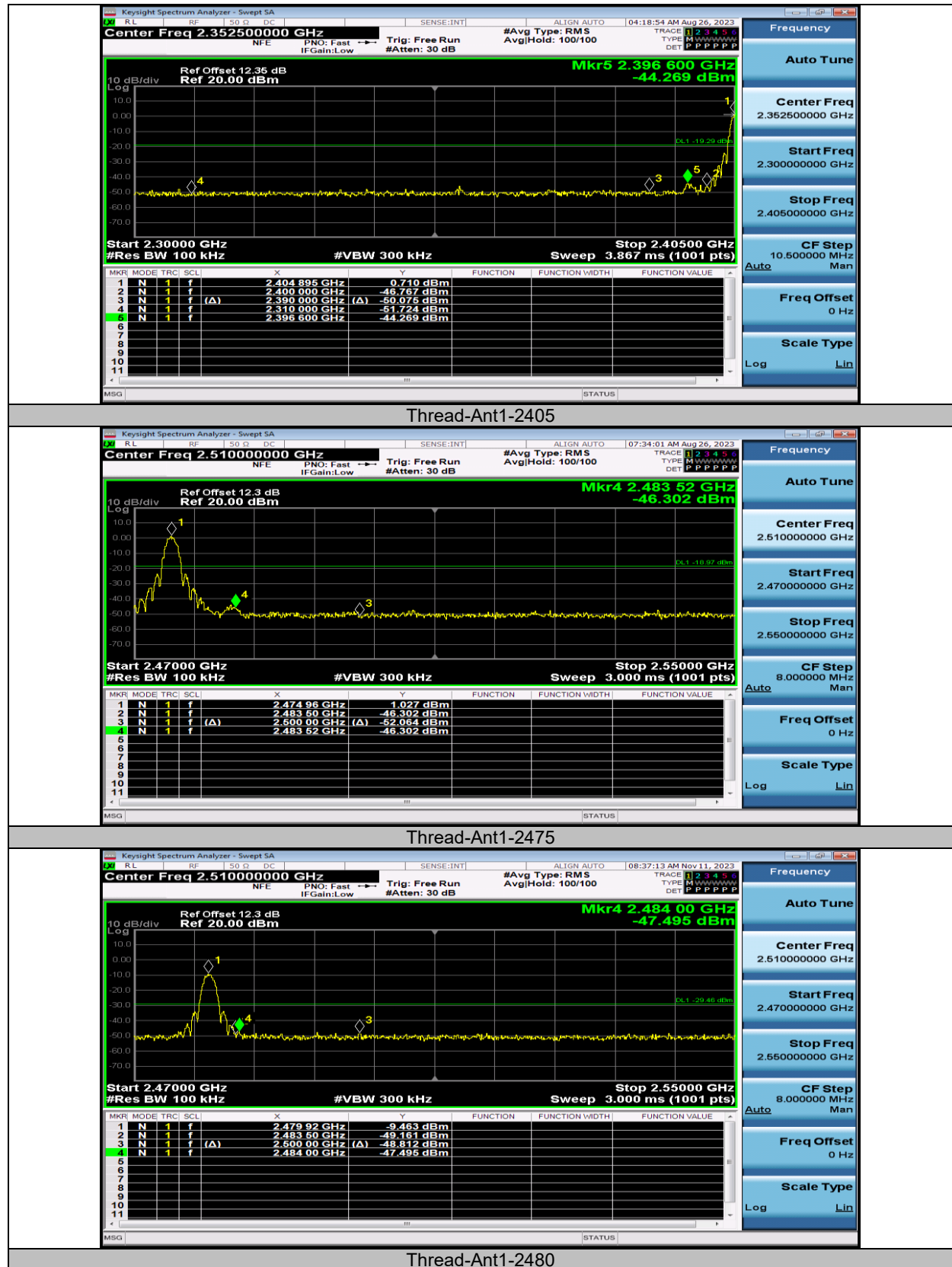
Band edge measurements

Test Result

Test Mode	Antenna	ChName	Frequency [MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
Thread	Ant1	Low	2405	0.71	-44.27	≤ -19.29	PASS
Thread	Ant1	High	2475	1.03	-46.3	≤ -18.97	PASS
Thread	Ant1	High	2480	-9.46	-47.5	≤ -29.46	PASS

TEST REPORT

Test Graphs



TEST REPORT

Conducted Spurious Emission

Test Result

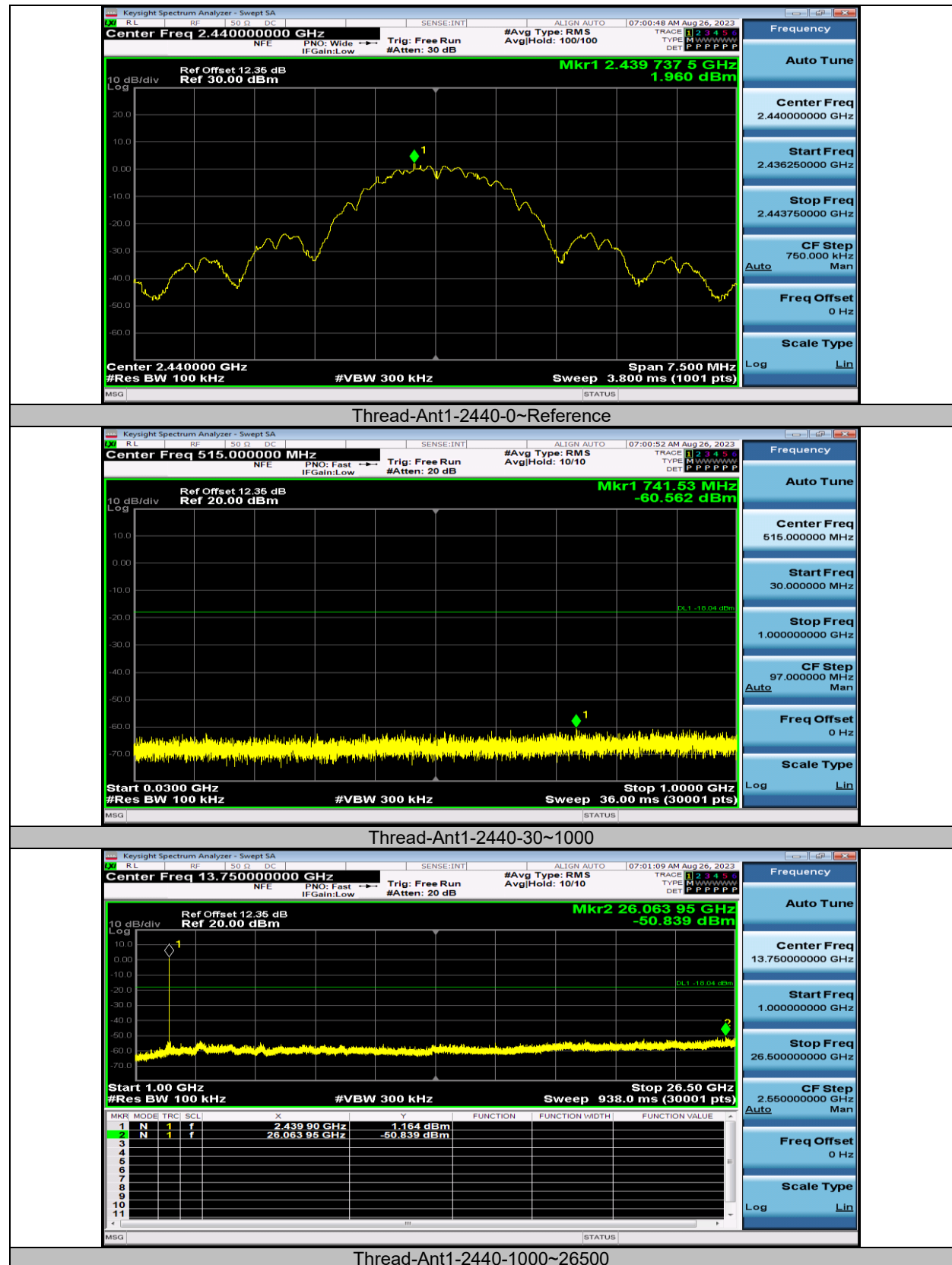
Test Mode	Antenna	Frequency [MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
Thread	Ant1	2405	0~Reference	0.92	0.92	---	PASS
Thread	Ant1	2405	30~1000	0.92	-60.08	≤-19.08	PASS
Thread	Ant1	2405	1000~26500	0.92	-50.62	≤-19.08	PASS
Thread	Ant1	2440	0~Reference	1.96	1.96	---	PASS
Thread	Ant1	2440	30~1000	1.96	-60.56	≤-18.04	PASS
Thread	Ant1	2440	1000~26500	1.96	-50.84	≤-18.04	PASS
Thread	Ant1	2475	0~Reference	1.33	1.33	---	PASS
Thread	Ant1	2475	30~1000	1.33	-60.71	≤-18.67	PASS
Thread	Ant1	2475	1000~26500	1.33	-51.24	≤-18.67	PASS
Thread	Ant1	2480	0~Reference	-8.63	-8.63	---	PASS
Thread	Ant1	2480	30~1000	-8.63	-59.22	≤-28.63	PASS
Thread	Ant1	2480	1000~26500	-8.63	-51.72	≤-28.63	PASS

TEST REPORT

Test Graphs



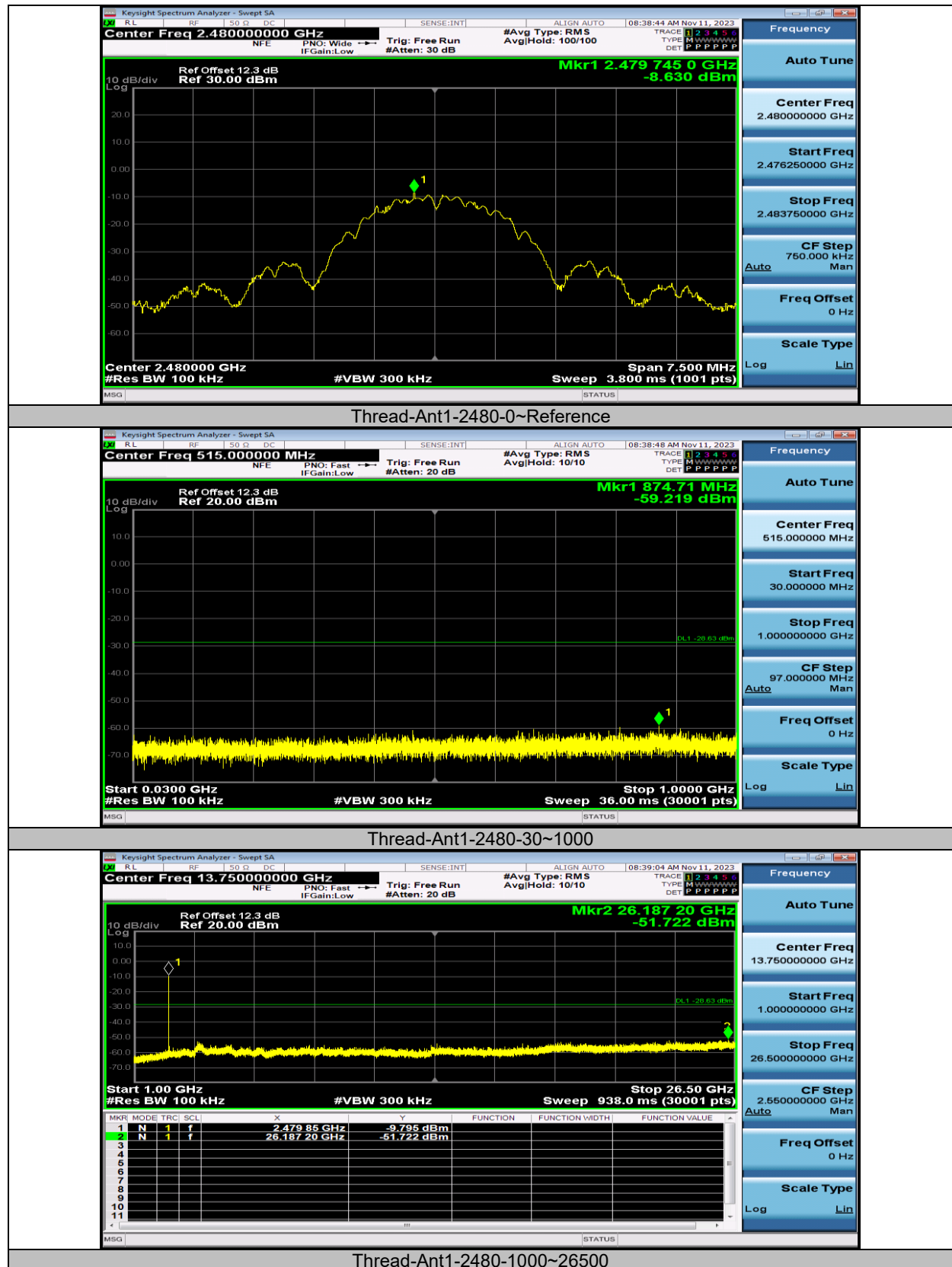
TEST REPORT



TEST REPORT



TEST REPORT



TEST REPORT

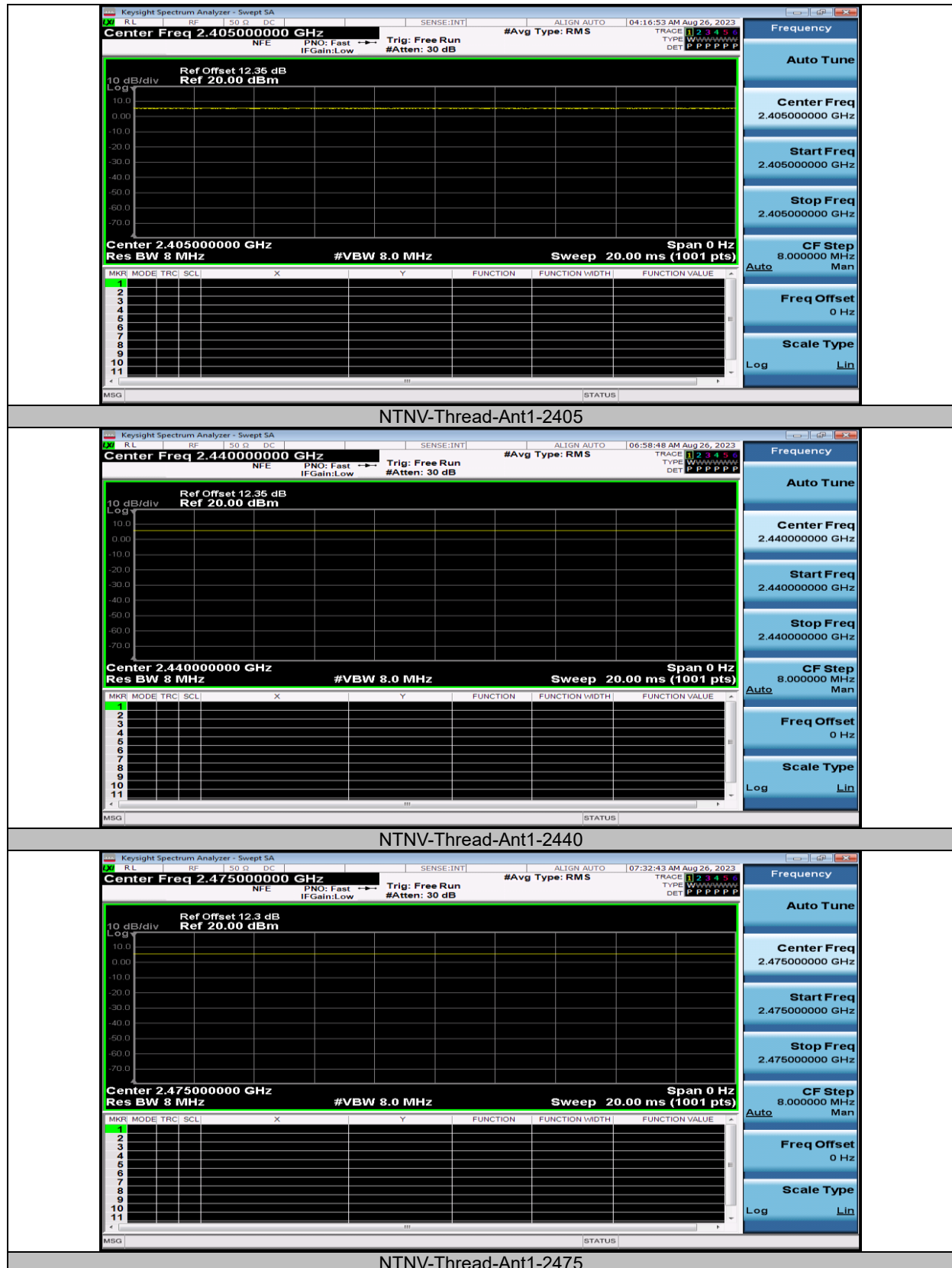
Duty Cycle

Test Result

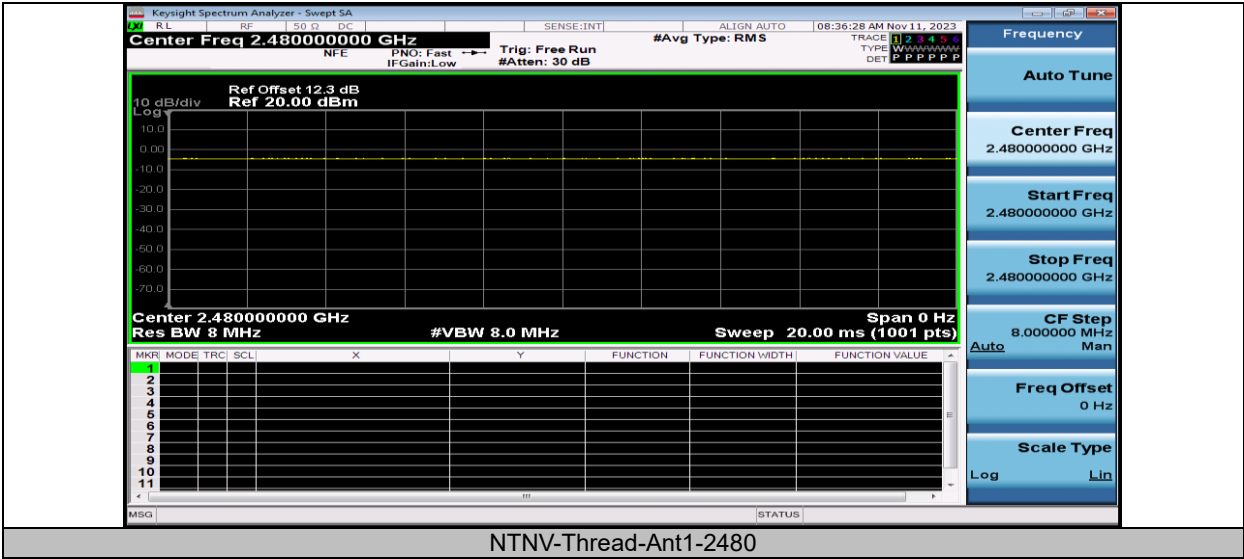
Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
Thread	Ant1	2405	20.00	20.00	100.00	---	---
Thread	Ant1	2440	20.00	20.00	100.00	---	---
Thread	Ant1	2475	20.00	20.00	100.00	---	---
Thread	Ant1	2480	20.00	20.00	100.00	---	---

TEST REPORT

Test Graphs



TEST REPORT



***** END *****