

VSM Group AB

RF TEST REPORT

Report Type:

FCC Part 15.247 & ISED RSS-247 RF report

Model:

SE9180

REPORT NUMBER:

220900874SHA-001

ISSUE DATE:

May 11, 2023

DOCUMENT CONTROL NUMBER:

TTRF15.247-03_V1 © 2018 Intertek



Applicant: VSM Group AB
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SE-554 74 Jonkoping

Manufacturer: VSM Group AB
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SE-554 74 Jonkoping

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No. 8, Middle Miaoqiao Road, Tangqiao Town, Zhangjiagang City,
Jiangsu Province

Factory 2: Singer (Shanghai) Sewing Machine Co., Ltd.
1078 Dayao Road, Minhang, Shanghai, P. R. China

FCC ID: 2BBQS-GC596910

IC ID: 30483-MATADOR

SUMMARY:

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

47CFR Part 15 (2019): Radio Frequency Devices (Subpart C)

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

RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (March 2019) Amendment 1: General Requirements for Compliance of Radio Apparatus

PREPARED BY:**REVIEWED BY:**

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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 ANTENNA INFORMATION	7
1.4 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	10
2.4 TEST PERIPHERALS LIST	10
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	29
8.1 LIMIT	29
8.2 TEST CONFIGURATION	29
8.3 MEASUREMENT PROCEDURE	30

TEST REPORT

8.4	TEST RESULTS OF POWER LINE CONDUCTED EMISSION.....	31
9	OCCUPIED BANDWIDTH	33
9.1	LIMIT	33
9.2	MEASUREMENT PROCEDURE	33
9.3	TEST CONFIGURATION	33
9.4	THE RESULTS OF OCCUPIED BANDWIDTH.....	33
10	ANTENNA REQUIREMENT.....	34
	APPENDIX A: TEST RESULTS	35

Revision History

Report No.	Version	Description	Issued Date
220900874SHA-001	Rev. 01	Initial issue of report	May 11, 2023

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

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Sewing Machine for household use
Type/Model/PMN/HVIN:	SE9180
Description of EUT:	EUT is a Sewing Machine for household use. EUT supports WIFI function.
Rating:	110-240V, 60Hz, 45W
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample Identification No.:	0221569-27-001
Sample received date:	2023.1.30
Date of test:	2023.3.30-2023.5.11

1.2 Technical Specification

Frequency Band:	2400MHz ~ 2483.5MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n(HT20)
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n(HT20): OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Operating Frequency:	2412MHz to 2462MHz for IEEE 802.11b/g/n(HT20)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20)
Channel Separation:	5 MHz
Antenna:	PCB Antenna, 2.23dBi

1.3 Antenna information

Mode	Tx/Rx Function	Beamforming function	CDD function	Directional gain (dBi)
802.11b	1Tx/1Rx	NO	NO	-
802.11g	1Tx/1Rx	NO	NO	-
802.11n(HT20)HTHT	1Tx/1Rx	NO	NO	-

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

TEST REPORT

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2019)

ANSI C63.10 (2013)

KDB 558074 (v05r02)

RSS-247 Issue 2 (February 2017)

RSS-Gen Issue 5 (March 2019) Amendment 1

2.2 Mode of operation during the test

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

Software name	Manufacturer	Version	Supplied by
AmebaZ2 PG Tool	-	-	Client

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

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462

Data rate and Power setting:

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. After this pre-scan, we choose the following table of the data rate as the worst case.

Frequency Band (MHz)	Mode	Worst case data rate	Power Setting
2400-2483.5	802.11b	1Mbps	ATT=30
	802.11g	6Mbps	ATT=30
	802.11n(HT20)	MCS0	ATT=30

TEST REPORT

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	21°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	56%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	ESCS 30	EC 2107	2023-07-13
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☐	A.M.N.	R&S	ENV 216	EC 3393	2023-07-13
☐	A.M.N.	R&S	ENV4200	EC 3558	2023-06-10
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2023-09-14
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2023-09-22
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2023-06-10
☐	Horn antenna	R&S	HF 906	EC 3049	2024-01-16
☒	Horn antenna	ETS	3117	EC 4792-1	2024-02-24
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2023-07-08
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-03-13
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-15
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2024-03-15
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2024-03-15
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2022-12-08
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2024-03-15
☐	Mobile Test System	Litepoint	lqxel	EC 5176	2024-01-15
☐	Test Receiver	R&S	ESCI 7	EC 4501	2023-09-14
☐	Climate chamber	GWS	MT3065	EC 6021	2023-07-03
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2023-06-10
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

TEST REPORT

☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-13
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2023-07-13
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-02
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2024-01-04
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2024-01-04
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2023-09-03
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2023-07-13

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	$\pm 3.19\text{dB}$

TEST REPORT

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

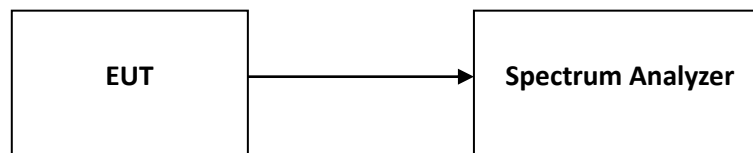
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

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**

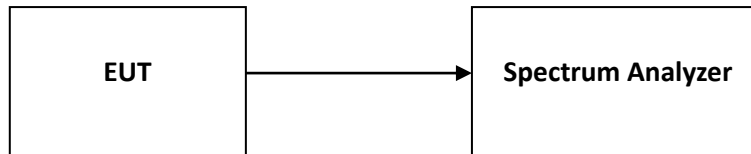
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

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.

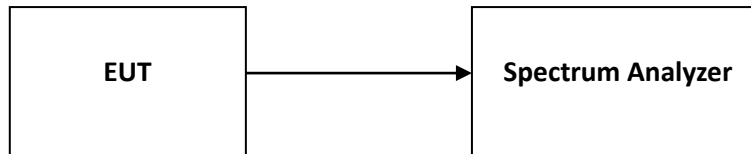
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

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 $\geq 2 \times \text{span/RBW}$.
- 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

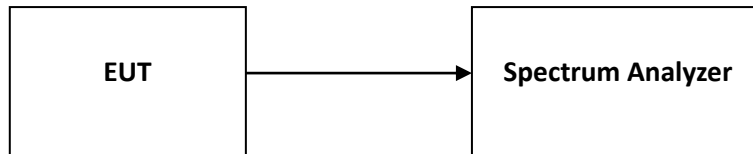
Establish a reference level by using the following procedure:

- 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.

TEST REPORT**6.3 Test Configuration****6.4 The results of Emission outside the frequency band**

Please refer to Appendix A

TEST REPORT

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. 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 (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detector function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

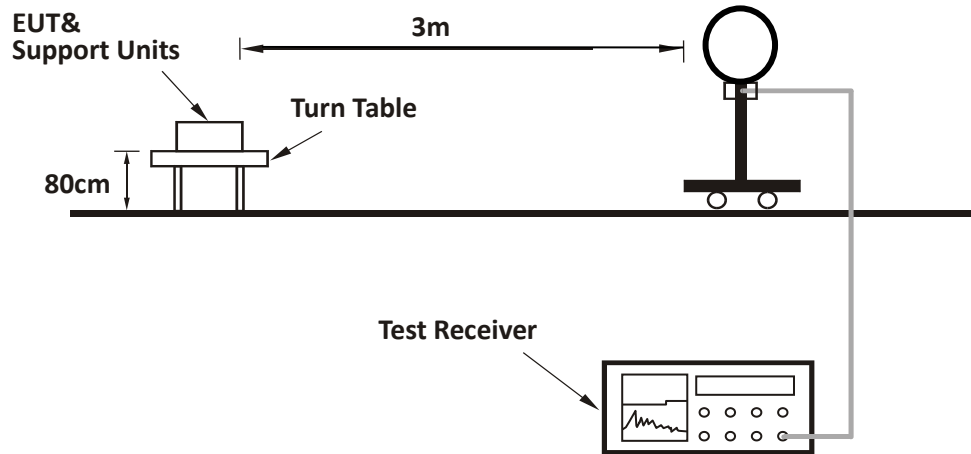
Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 3 x 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.

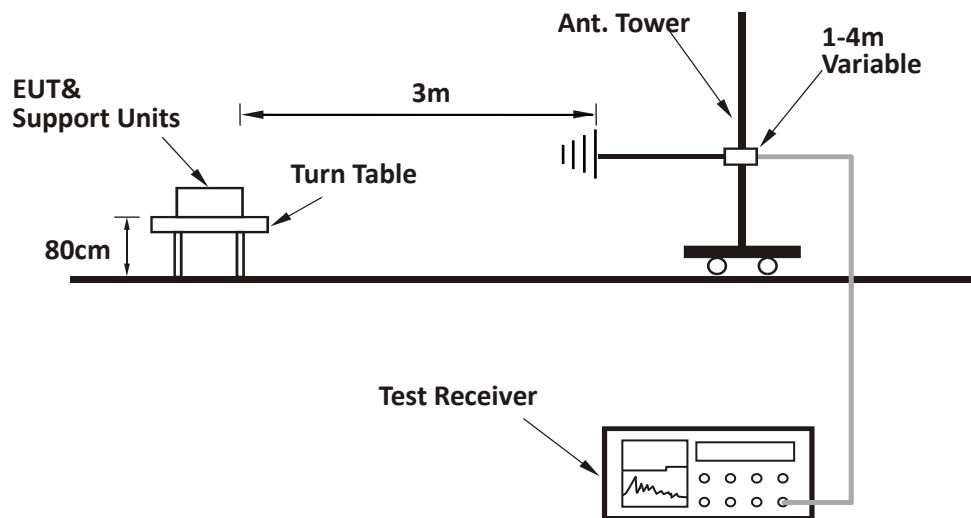
TEST REPORT

7.3 Test Configuration

For Radiated emission below 30MHz:

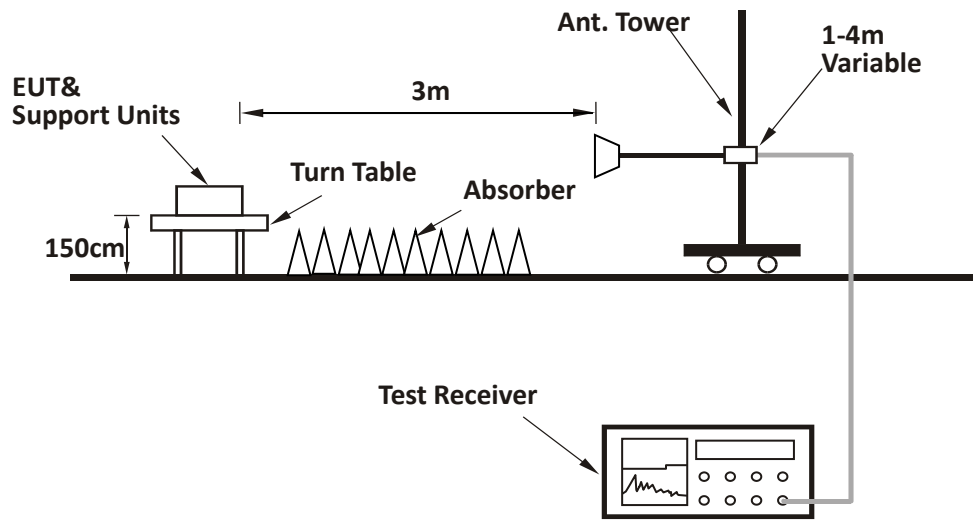


For Radiated emission 30MHz to 1GHz:



TEST REPORT

For Radiated emission above 1GHz:

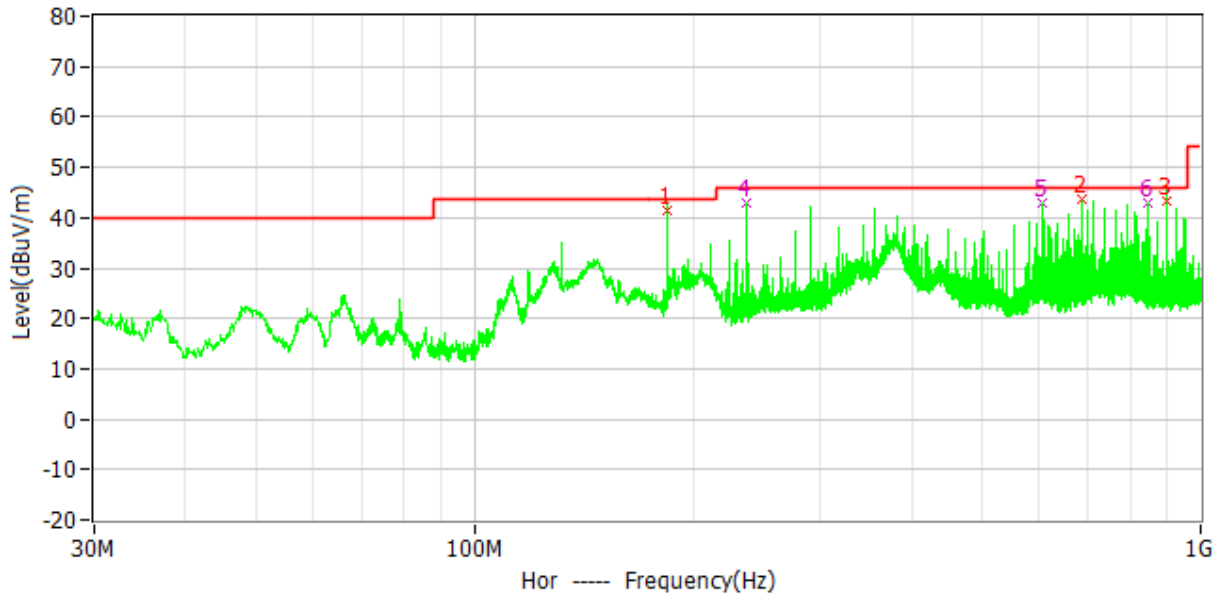


TEST REPORT

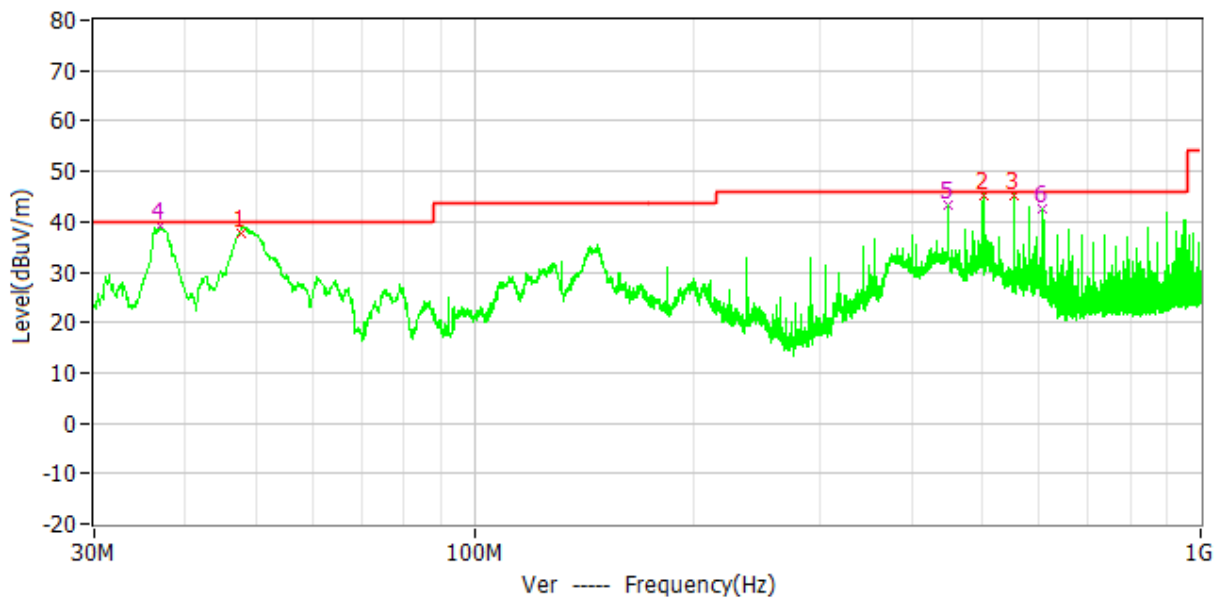
7.4 Test Results of Radiated Emissions

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.

Horizontal



Vertical



TEST REPORT

Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	184.81	41.60	43.50	1.90	QP
H	686.41	43.60	46.00	2.40	QP
H	897.62	43.30	46.00	2.70	QP
H	237.58	42.90	46.00	3.10	PK
H	607.24	42.90	46.00	3.10	PK
H	844.89	43.00	46.00	3.00	PK
V	47.70	37.70	40.00	2.30	QP
V	501.62	45.20	46.00	0.80	QP
V	554.39	45.30	46.00	0.70	QP
V	36.98	39.00	40.00	1.00	PK
V	448.84	43.20	46.00	2.80	PK
V	607.24	42.50	46.00	3.50	PK

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390	50.80	74.00	23.20	PK
	V	2390	50.50	74.00	23.50	PK
	H	4824	49.20	74.00	23.80	PK
M	H	4874	46.66	74.00	27.34	PK
H	H	2483.5	53.50	74.00	20.50	PK
	V	2483.5	50.50	74.00	23.50	PK
	H	4924	47.90	74.00	26.10	PK

TEST REPORT

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390	53.50	74.00	20.50	PK
	H	2390	48.50	54.00	5.50	AV
	V	2390	53.50	74.00	20.50	PK
	V	2390	47.60	54.00	6.40	AV
	H	4824	46.80	74.00	27.20	PK
M	H	4874	49.20	74.00	24.80	PK
H	H	2483.5	56.50	74.00	17.50	PK
	H	2483.5	49.20	54.00	4.80	AV
	V	2483.5	56.10	74.00	17.90	PK
	V	2483.5	47.70	54.00	6.30	AV
	H	4924	45.30	74.00	28.70	PK

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390	61.30	74.00	12.70	PK
	H	2390	49.90	54.00	4.10	AV
	V	2390	53.80	74.00	20.20	PK
	V	2390	49.50	54.00	4.50	AV
	H	4824	47.80	74.00	26.20	PK
M	H	4874	48.20	74.00	25.80	PK
H	H	2483.5	62.50	74.00	11.50	PK
	H	2483.5	51.30	54.00	2.70	AV
	V	2483.5	59.30	74.00	14.70	PK
	V	2483.5	50.40	54.00	3.60	AV
	H	4924	48.70	74.00	25.30	PK

TEST REPORT

802.11n(HT40)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	V	2390.00	57.30	74.00	16.70	PK
	V	2390.00	50.70	54.00	3.30	AV
	V	4844.00	50.40	74.00	23.60	PK
M	V	4874.00	50.70	74.00	23.30	PK
H	V	2483.50	59.20	74.00	14.80	PK
	V	2483.50	51.80	54.00	2.20	AV
	V	4904.00	50.90	74.00	23.10	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.

TEST REPORT

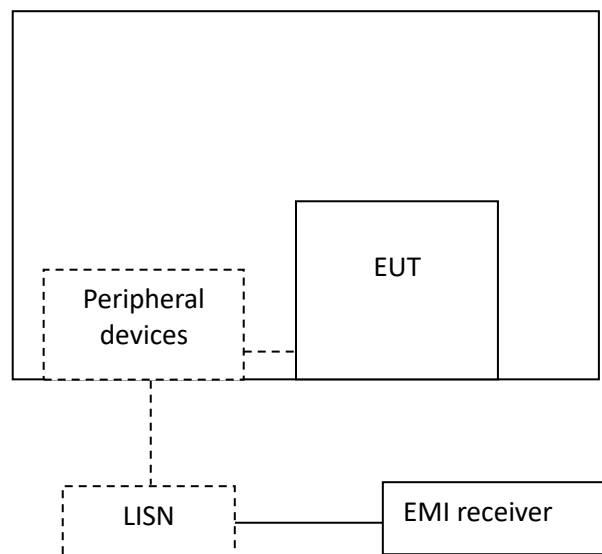
8 Power line conducted emission

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.

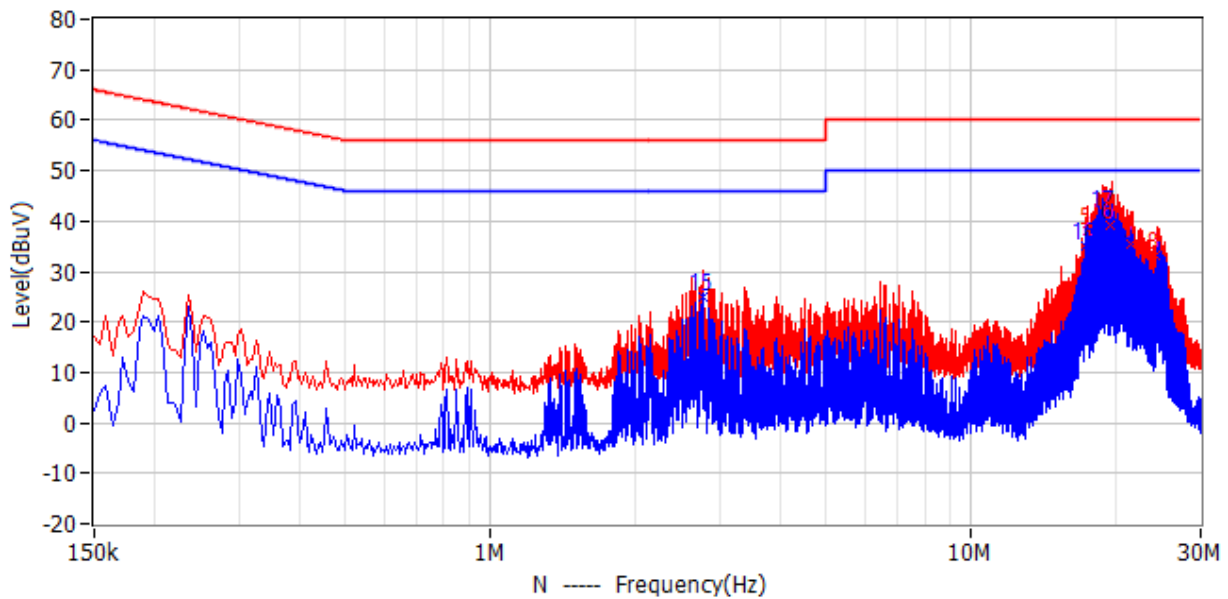
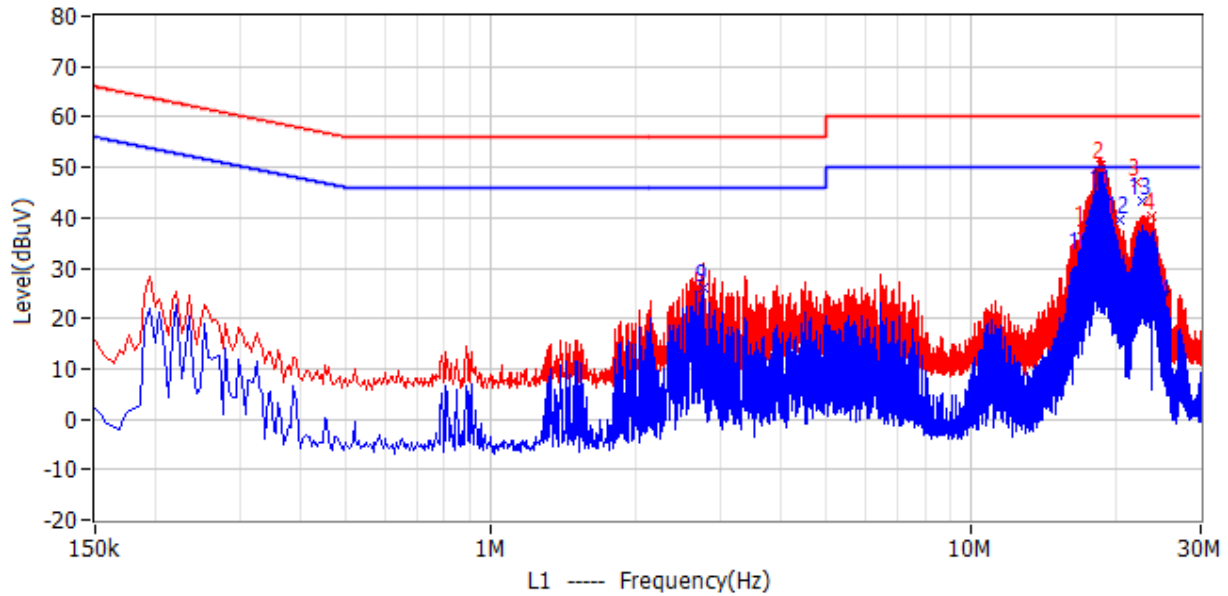
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on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

TEST REPORT

8.4 Test Results of Power line conducted emission

Test Curve:



TEST REPORT

Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
1	16.958MHz	60.0	37.8	-22.2	31.4	6.4	QP	L1
2	18.578MHz	60.0	50.3	-9.7	43.9	6.4	QP	L1
3	22.061MHz	60.0	47.0	-13.0	40.6	6.4	QP	L1
4	23.744MHz	60.0	40.4	-19.6	34.0	6.4	QP	L1
5	17.493MHz	60.0	38.0	-22.0	31.5	6.5	QP	N
6	19.446MHz	60.0	39.3	-20.7	32.8	6.5	QP	N
7	21.570MHz	60.0	35.3	-24.7	28.8	6.5	QP	N
8	24.203MHz	60.0	33.3	-26.7	26.8	6.5	QP	N
9	2.778MHz	46.0	25.9	-20.1	19.7	6.2	CAV	L1
10	17.007MHz	50.0	32.3	-17.7	25.9	6.4	CAV	L1
11	18.704MHz	50.0	44.8	-5.2	38.4	6.4	CAV	L1
12	20.328MHz	50.0	39.5	-10.5	33.1	6.4	CAV	L1
13	22.596MHz	50.0	43.4	-6.6	37.0	6.4	CAV	L1
14	24.770MHz	50.0	23.1	-26.9	16.6	6.5	CAV	L1
15	2.778MHz	46.0	25.1	-20.9	18.8	6.3	CAV	N
16	17.304MHz	50.0	35.2	-14.8	28.7	6.5	CAV	N
17	18.848MHz	50.0	41.5	-8.5	35.0	6.5	CAV	N
18	21.728MHz	50.0	27.3	-22.7	20.8	6.5	CAV	N
19	24.581MHz	50.0	23.7	-26.3	17.2	6.5	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 + Correct Factor

3. Delta = Level - Limit

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

TEST REPORT

9 Occupied Bandwidth

Test result: Tested

9.1 Limit

None

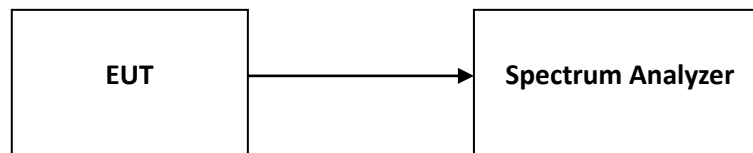
9.2 Measurement Procedure

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

TEST REPORT

10 Antenna requirement

Requirement:

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

Result:

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

TEST REPORT

Appendix A: Test results

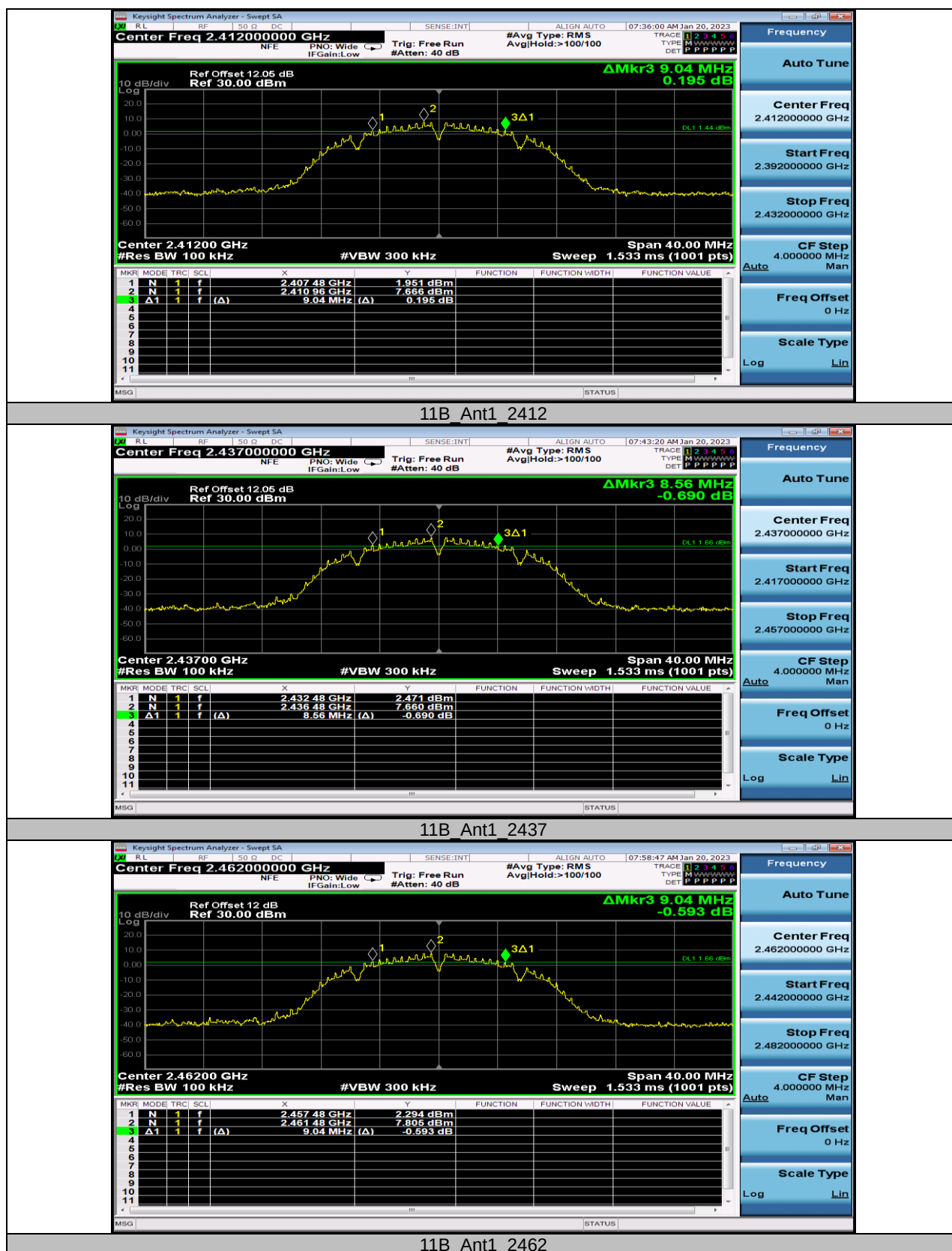
DTS Bandwidth

Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.040	2407.480	2416.520	0.5	PASS
		2437	8.560	2432.480	2441.040	0.5	PASS
		2462	9.040	2457.480	2466.520	0.5	PASS
11G	Ant1	2412	15.080	2404.440	2419.520	0.5	PASS
		2437	15.120	2429.440	2444.560	0.5	PASS
		2462	15.040	2454.440	2469.480	0.5	PASS
11N20SISO	Ant1	2412	15.080	2404.440	2419.520	0.5	PASS
		2437	13.880	2430.680	2444.560	0.5	PASS
		2462	15.040	2454.440	2469.480	0.5	PASS

TEST REPORT

Test Graphs



TEST REPORT



11G_Ant1_2412



11G_Ant1_2437



11G_Ant1_2462

TEST REPORT



11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462

TEST REPORT

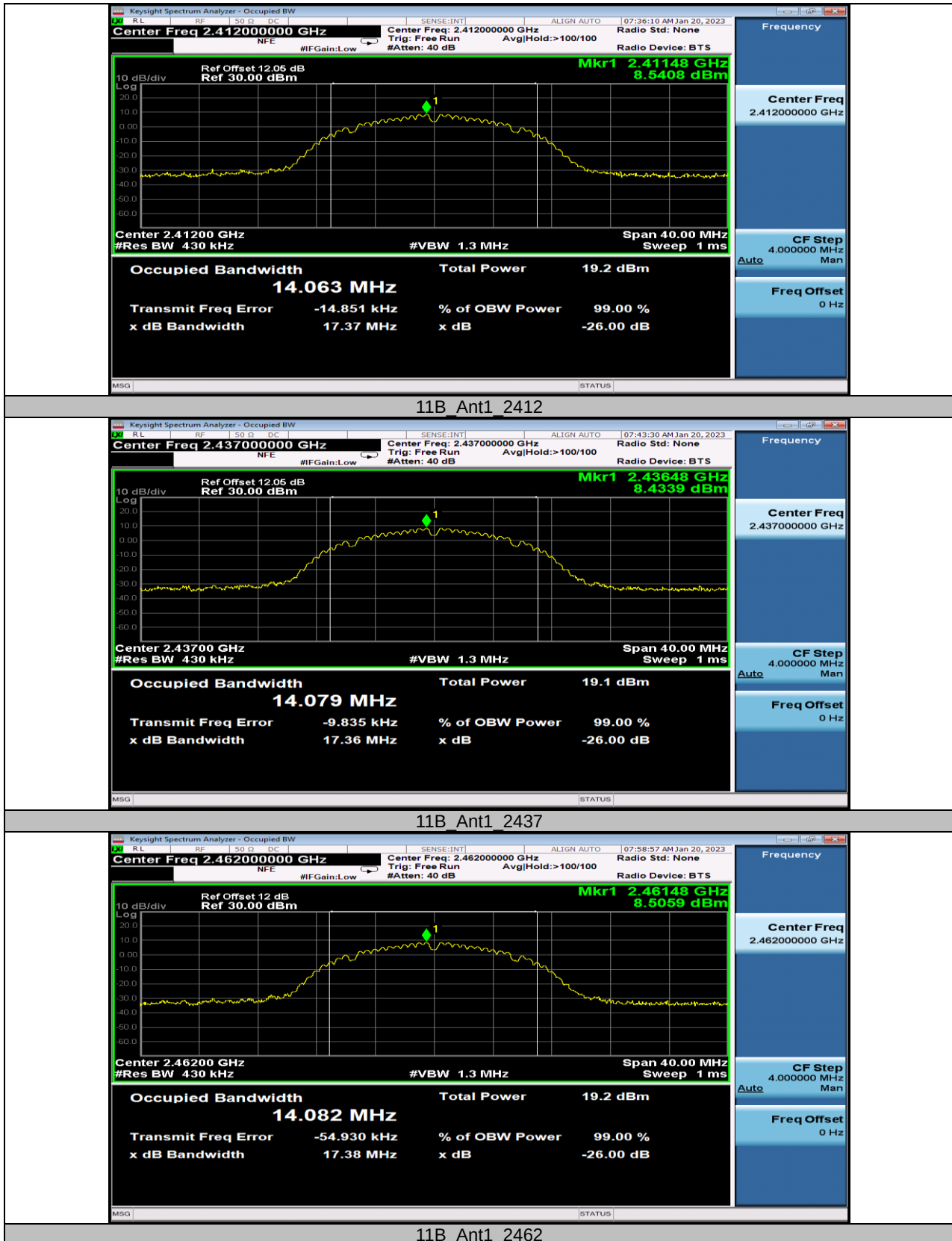
Occupied Channel Bandwidth

Test Result

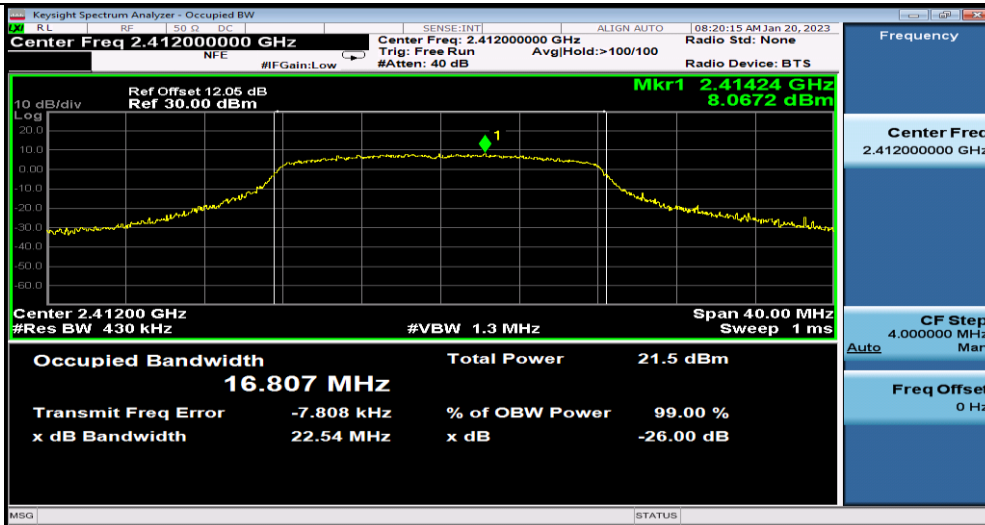
TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.058	2404.956	2419.014	---	---
		2437	14.073	2429.953	2444.026	---	---
		2462	14.078	2454.905	2468.983	---	---
11G	Ant1	2412	16.793	2403.593	2420.386	---	---
		2437	16.815	2428.577	2445.392	---	---
		2462	16.777	2453.558	2470.335	---	---
11N20SISO	Ant1	2412	17.809	2403.090	2420.899	---	---
		2437	17.835	2428.063	2445.898	---	---
		2462	17.810	2453.032	2470.842	---	---

TEST REPORT

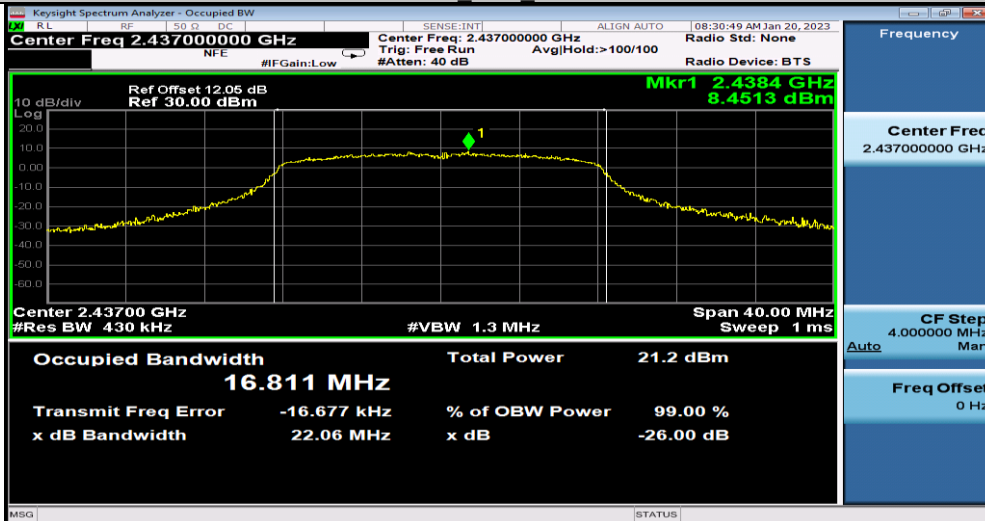
Test Graphs



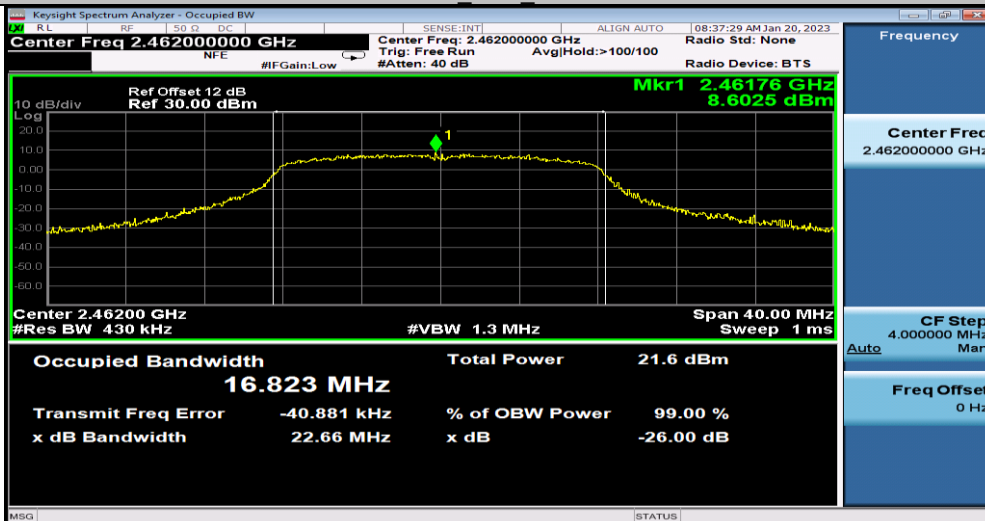
TEST REPORT



11G_Ant1_2412



11G_Ant1_2437



11G_Ant1_2462



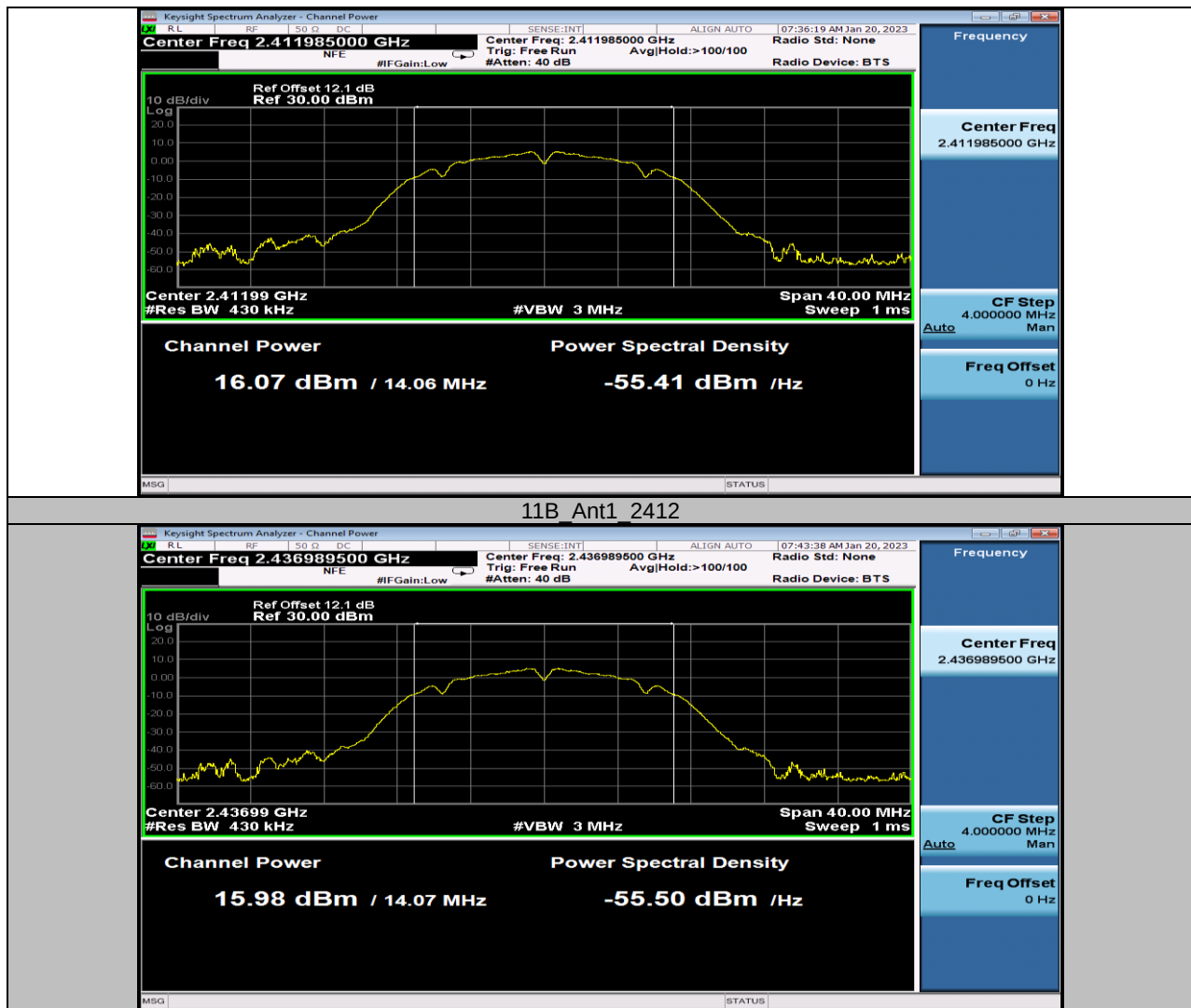
TEST REPORT

Appendix C: Maximum conducted output power

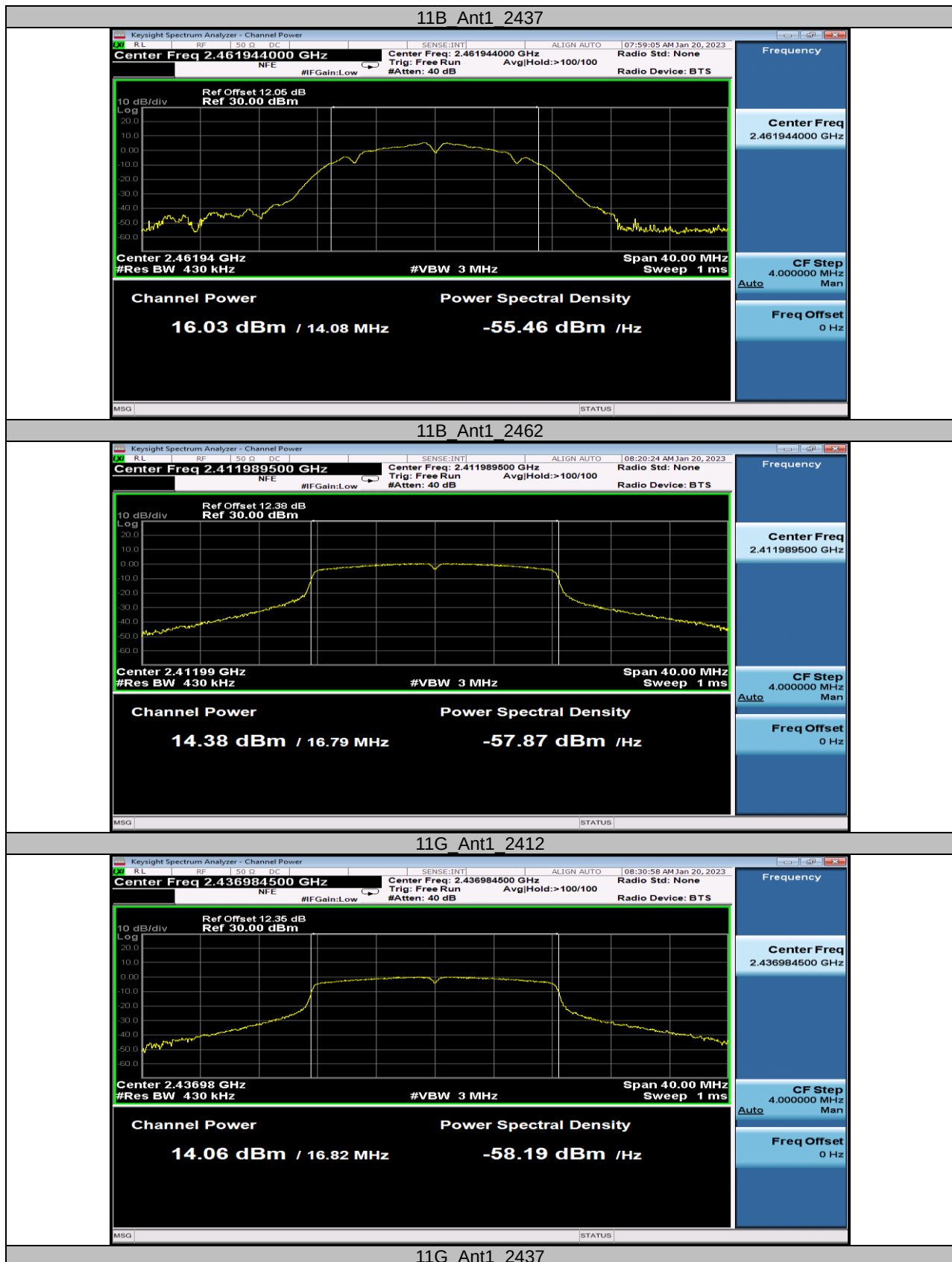
Test Result Peak

TestMode	Antenna	Frequency [MHz]	Set Power	Peak Power[dBm]	Conducted Limit[dBm]	EIRP [dBm]	EIRP Limit[dBm]	Verdict
11B	Ant1	2412	---	16.07	≤30.00	18.30	≤36.00	PASS
		2437	---	15.98	≤30.00	18.21	≤36.00	PASS
		2462	---	16.03	≤30.00	18.26	≤36.00	PASS
11G	Ant1	2412	---	14.38	≤30.00	16.61	≤36.00	PASS
		2437	---	14.09	≤30.00	16.32	≤36.00	PASS
		2462	---	14.35	≤30.00	16.58	≤36.00	PASS
11N20SIS O	Ant1	2412	---	13.70	≤30.00	15.93	≤36.00	PASS
		2437	---	13.63	≤30.00	15.86	≤36.00	PASS
		2462	---	13.65	≤30.00	15.88	≤36.00	PASS

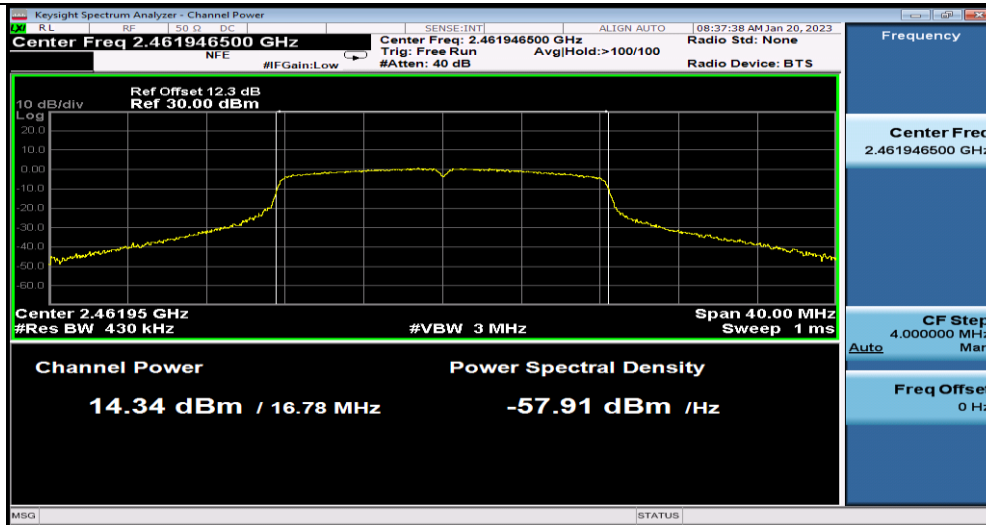
Test Graphs Peak



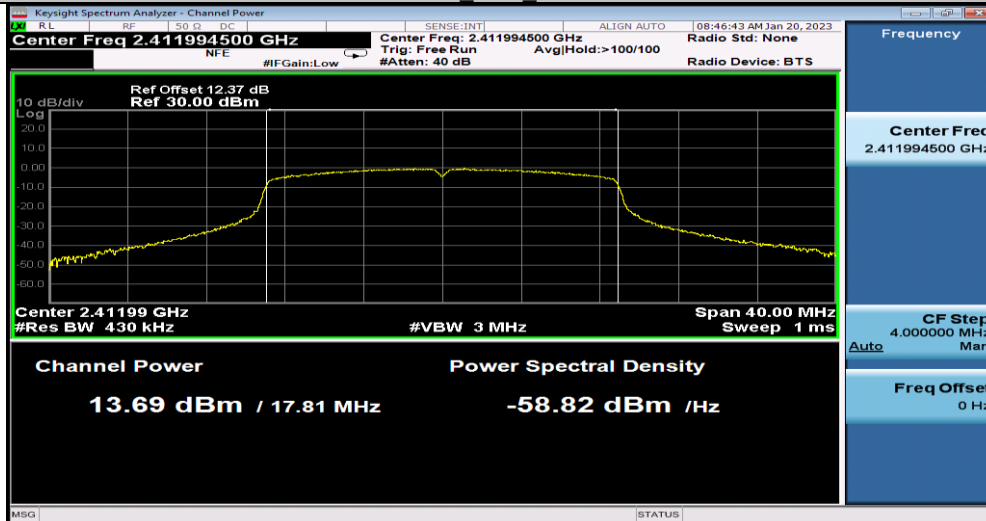
TEST REPORT



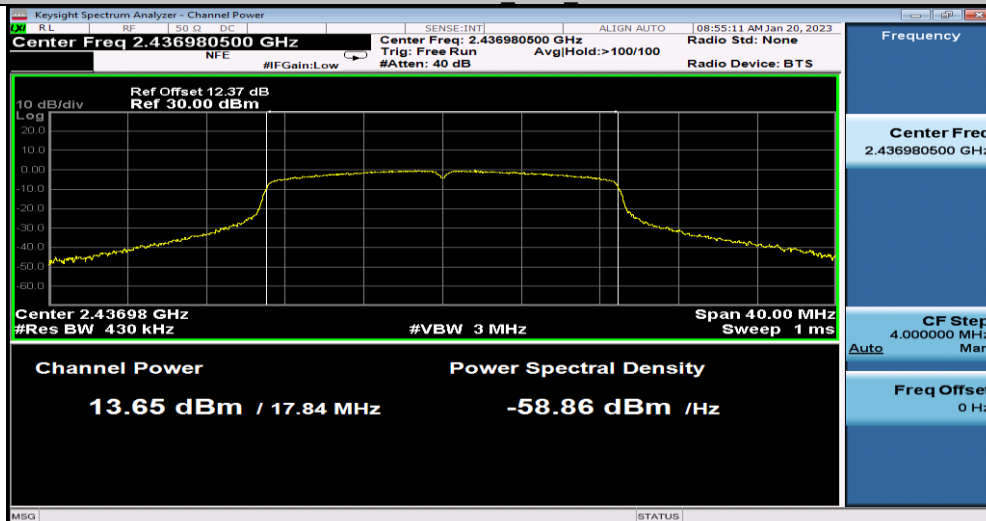
TEST REPORT



11G_Ant1_2462

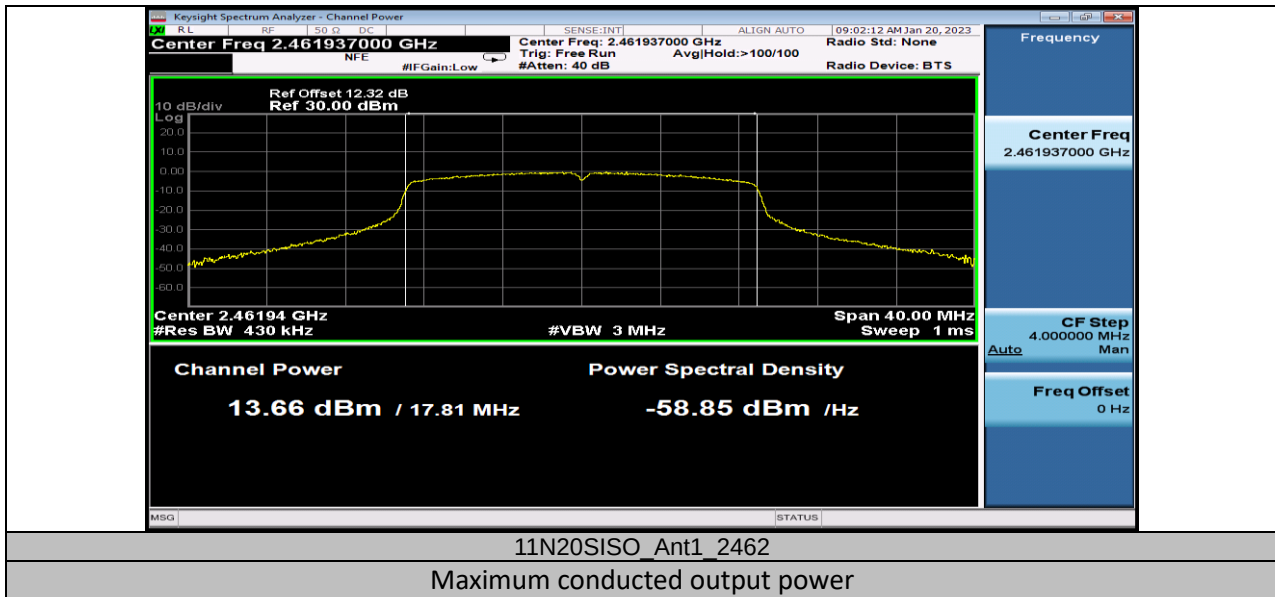


11N20SISO_Ant1_2412



11N20SISO_Ant1_2437

TEST REPORT



TEST REPORT

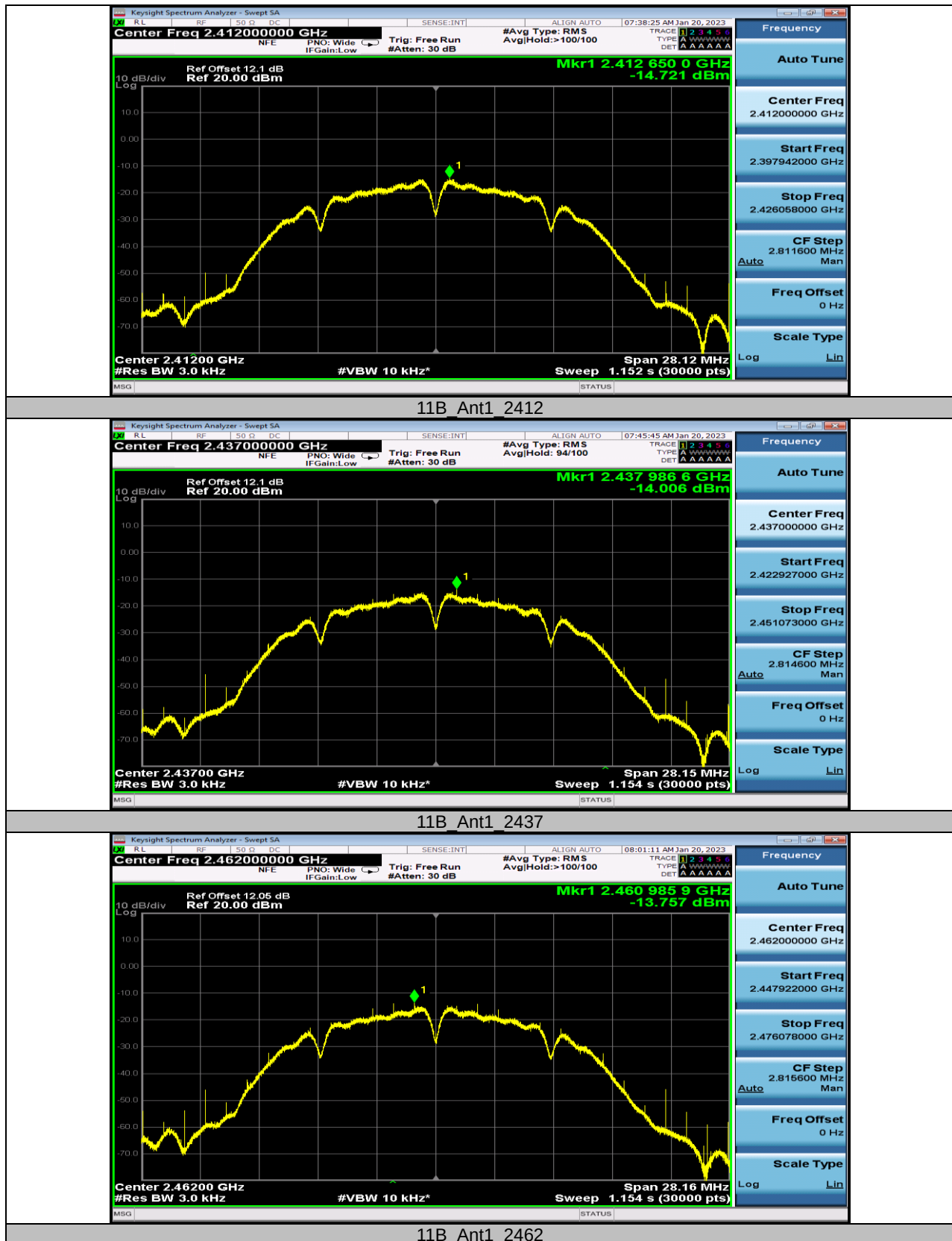
Appendix D: Maximum power spectral density

Test Result

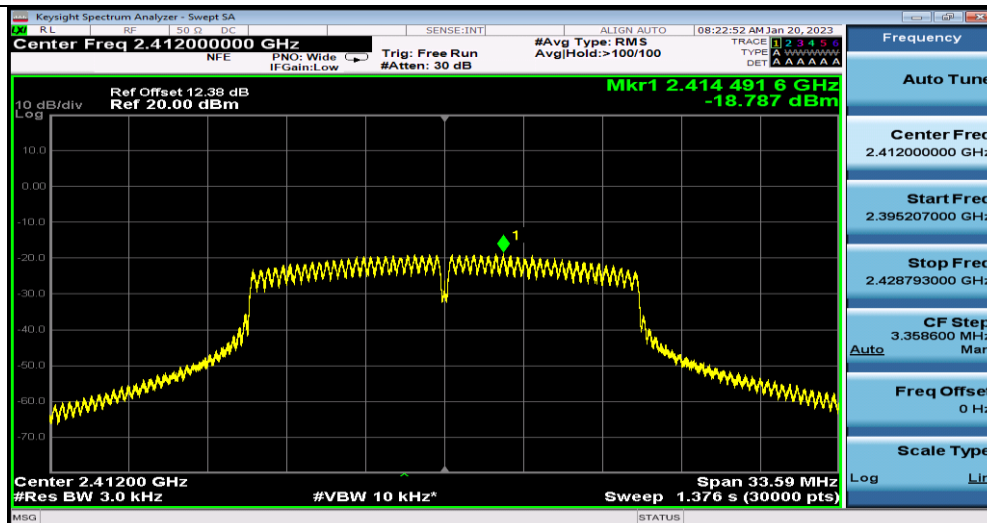
TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-14.72	≤8.00	PASS
		2437	-14.01	≤8.00	PASS
		2462	-13.76	≤8.00	PASS
11G	Ant1	2412	-18.79	≤8.00	PASS
		2437	-18.79	≤8.00	PASS
		2462	-18.56	≤8.00	PASS
11N20SISO	Ant1	2412	-18.92	≤8.00	PASS
		2437	-18.96	≤8.00	PASS
		2462	-19.44	≤8.00	PASS

TEST REPORT

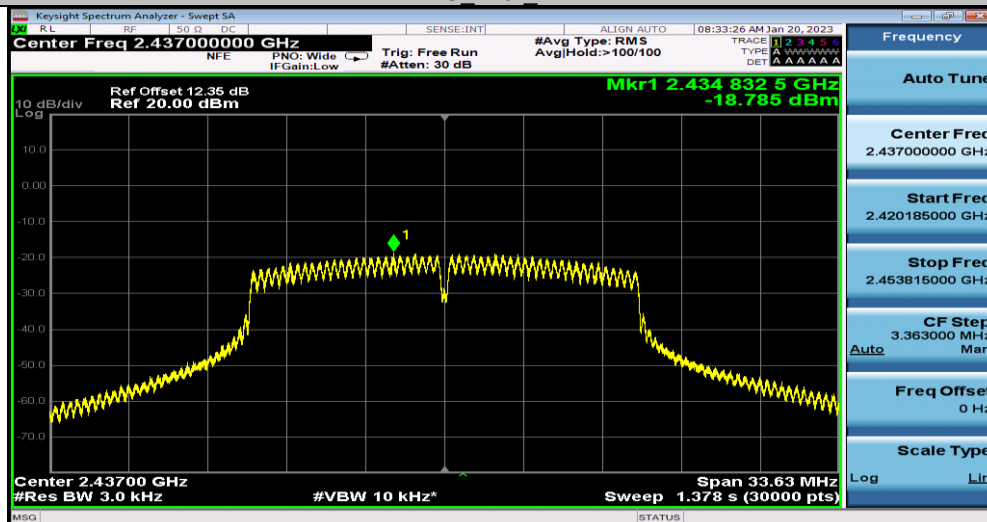
Test Graphs



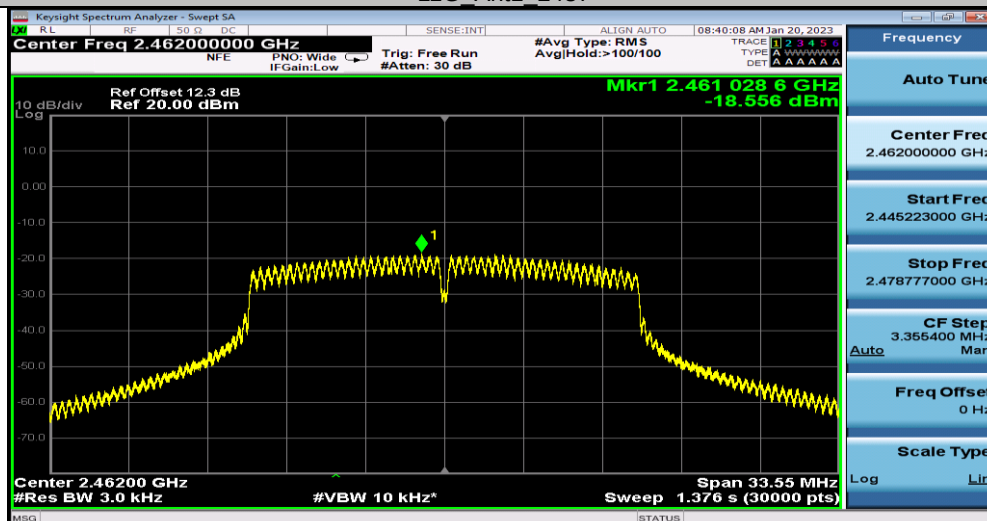
TEST REPORT



11G_Ant1_2412

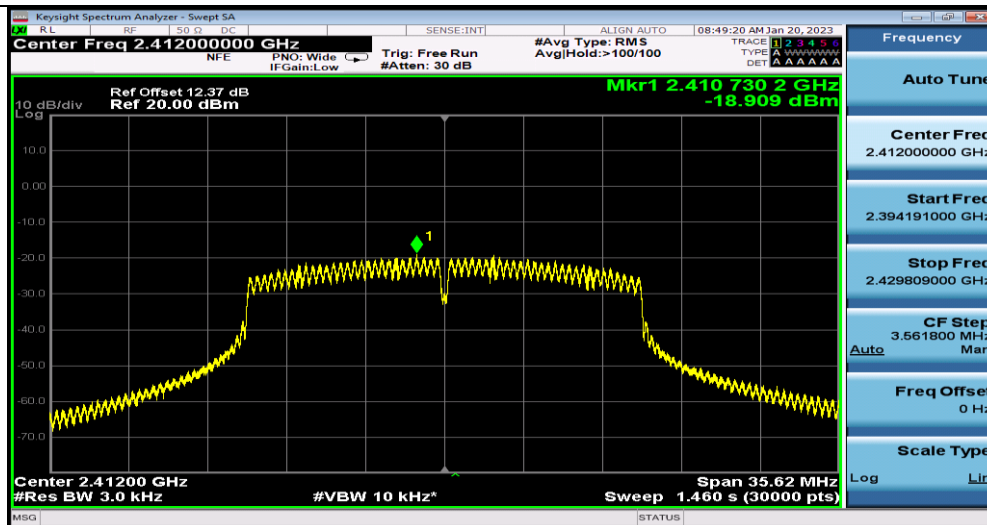


11G_Ant1_2437

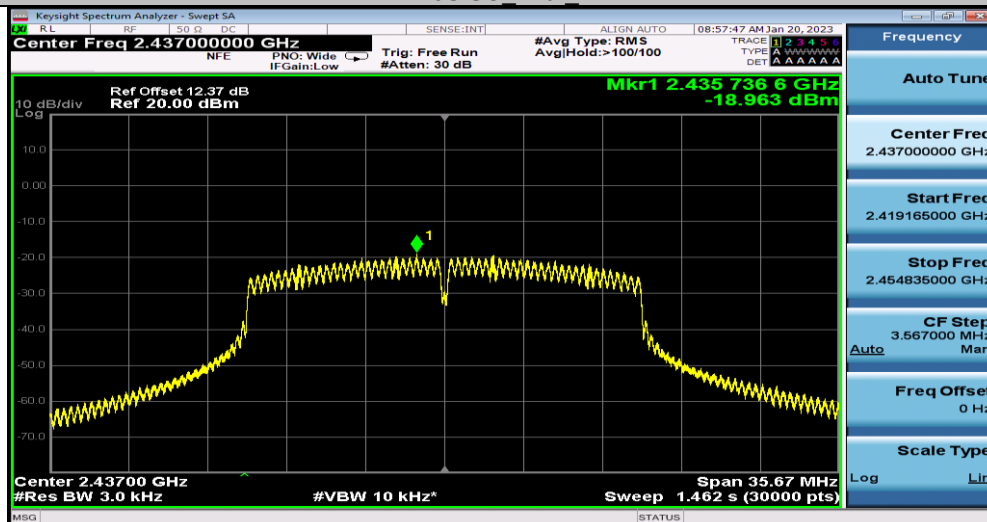


11G_Ant1_2462

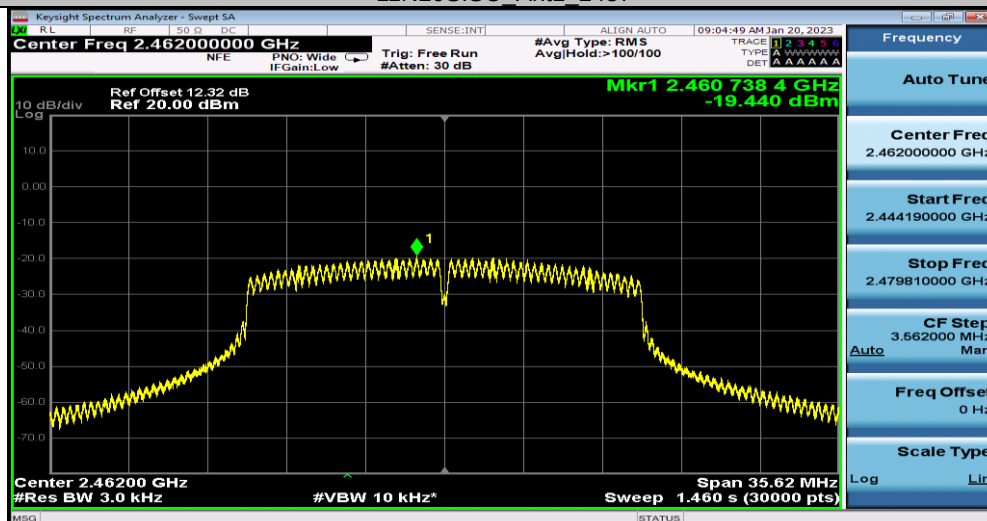
TEST REPORT



11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462

TEST REPORT

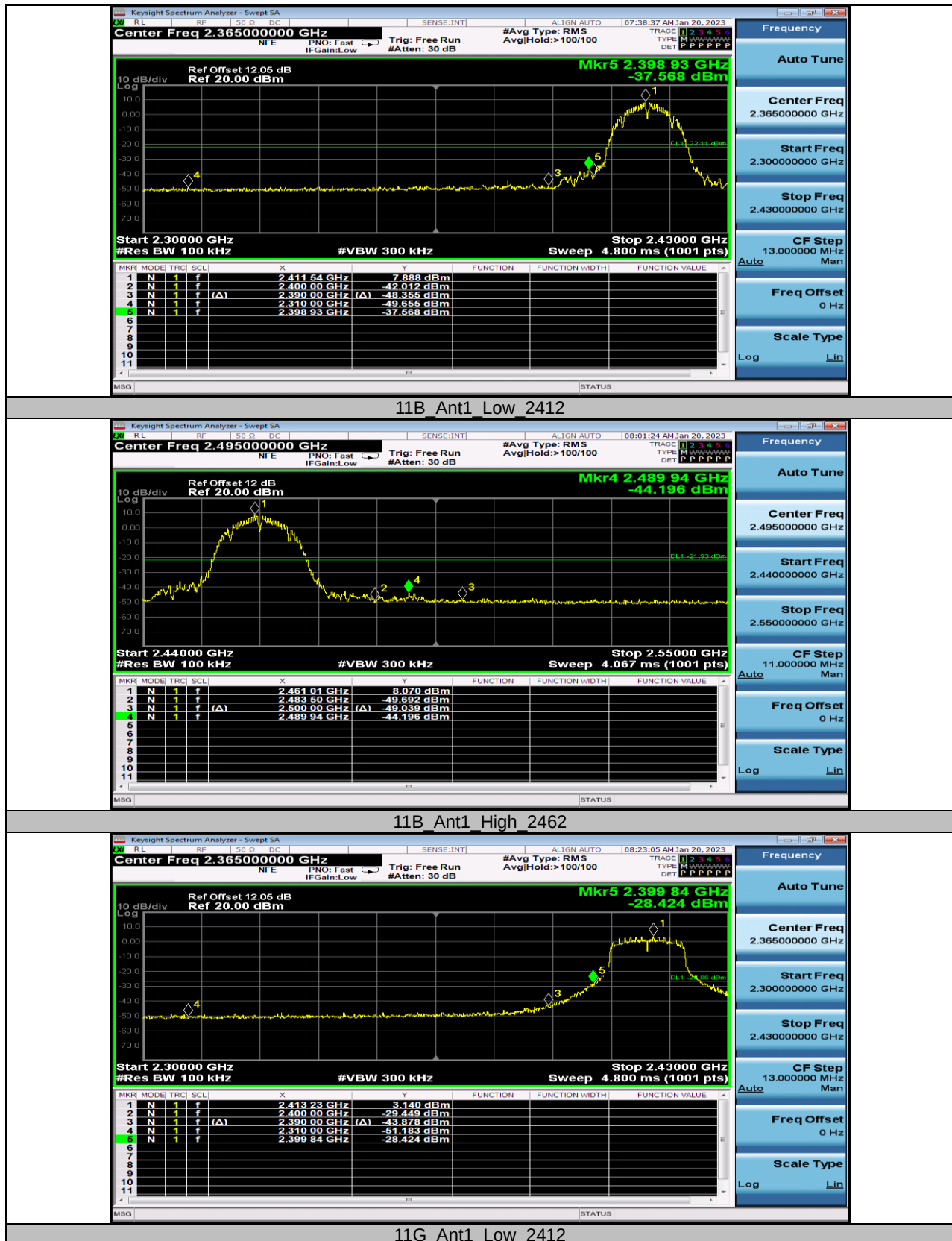
Appendix E: Band edge measurements

Test Result

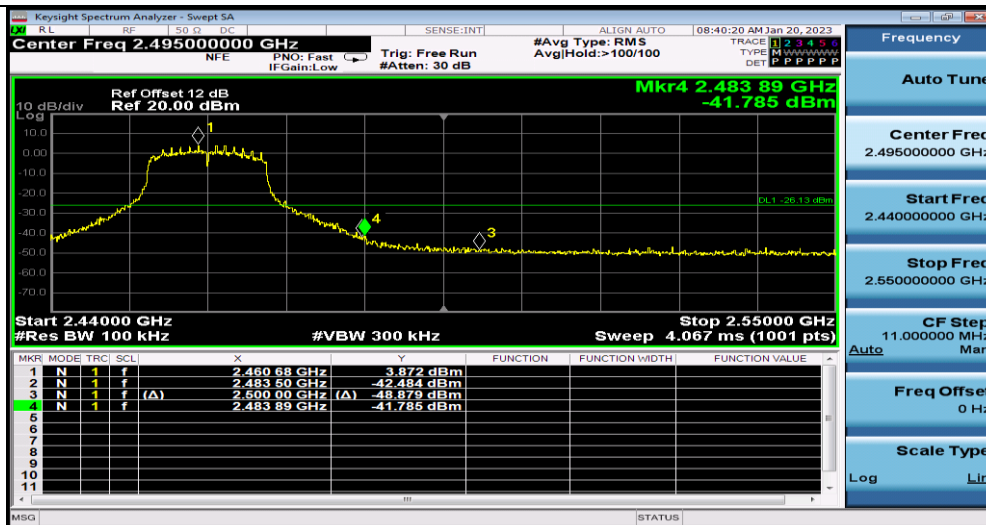
TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	7.89	-37.57	≤-22.11	PASS
		High	2462	8.07	-44.2	≤-21.93	PASS
11G	Ant1	Low	2412	3.14	-28.42	≤-26.86	PASS
		High	2462	3.87	-41.79	≤-26.13	PASS
11N20SISO	Ant1	Low	2412	3.67	-27.93	≤-26.33	PASS
		High	2462	3.25	-40.86	≤-26.75	PASS

TEST REPORT

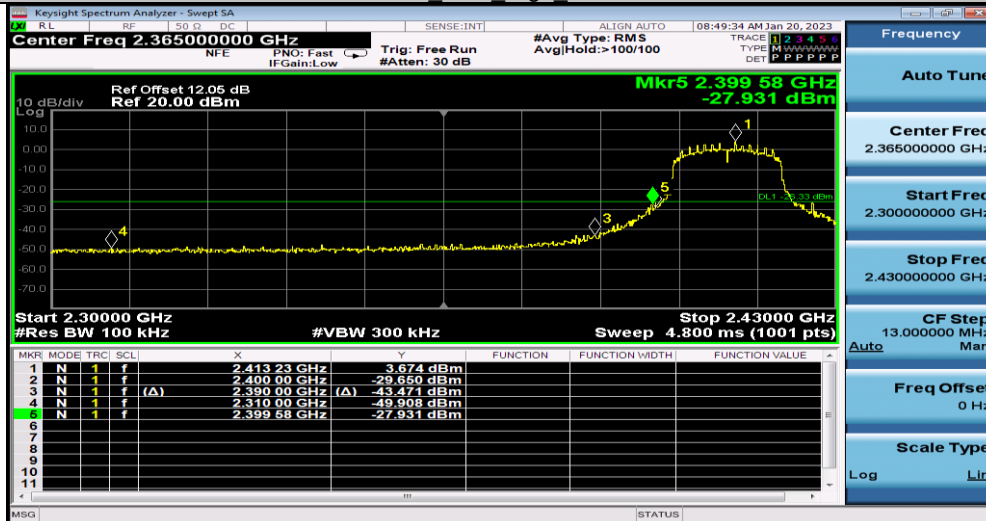
Test Graphs



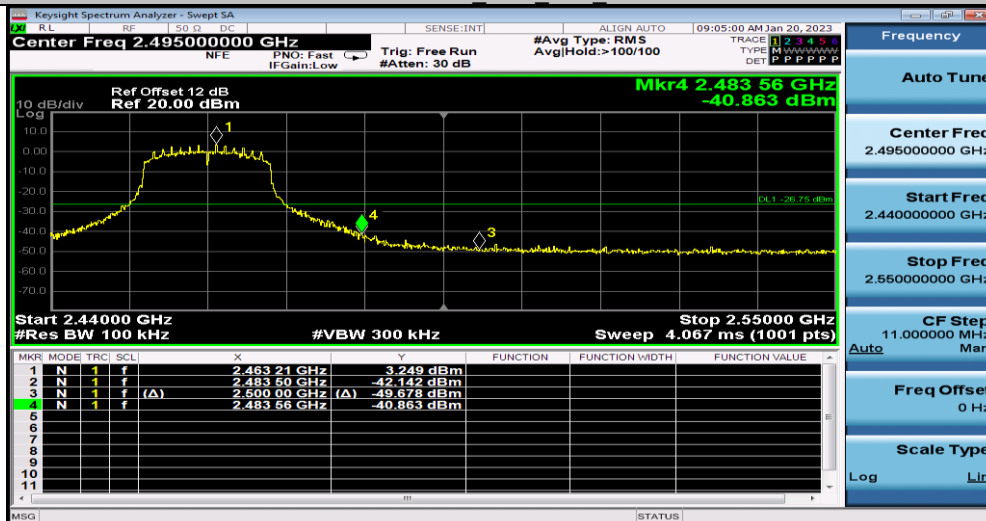
TEST REPORT



11G_Ant1_High_2462



11N20SISO_Ant1_Low_2412



11N20SISO_Ant1_High_2462

TEST REPORT

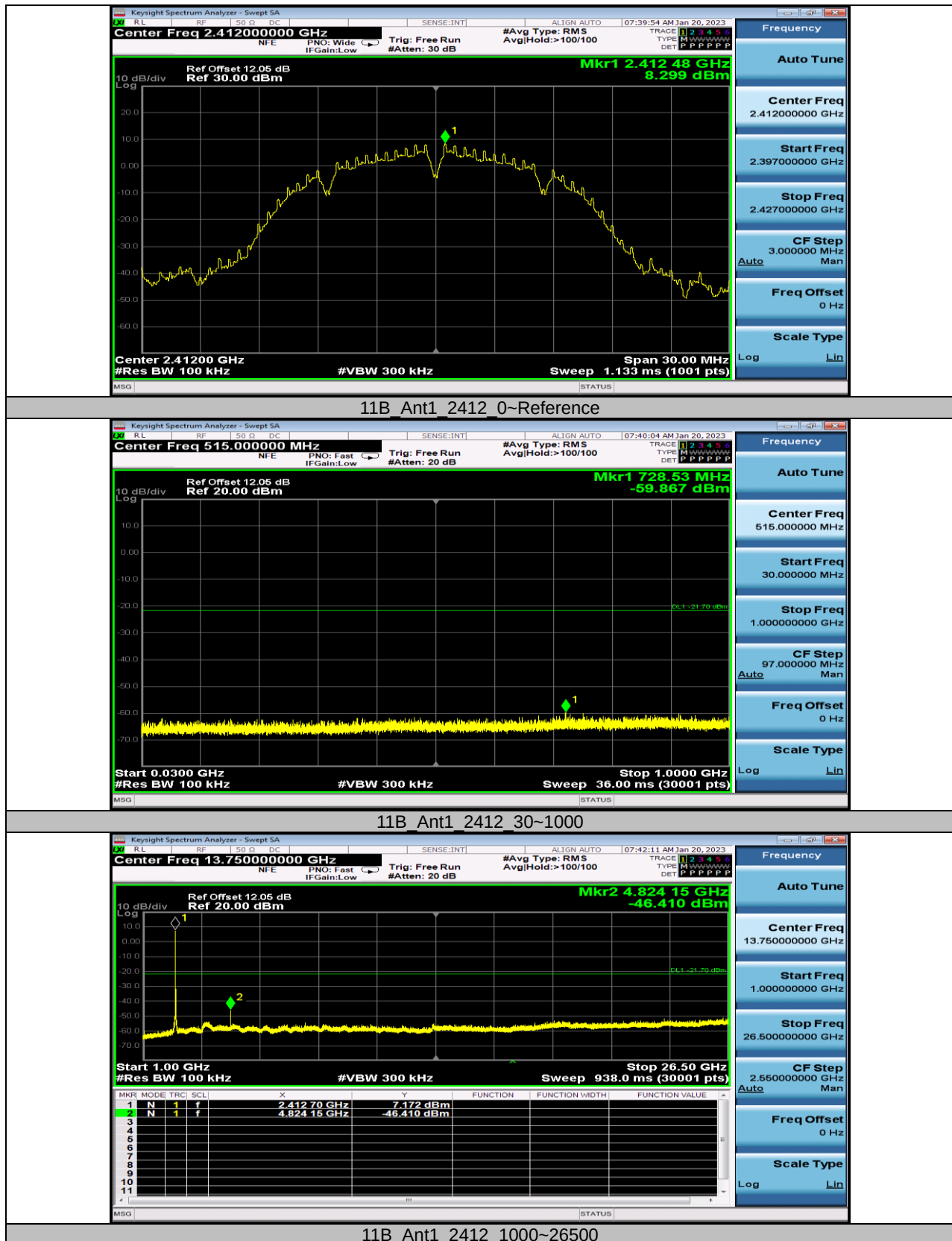
Appendix F: Conducted Spurious Emission

Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	8.30	8.30	---	PASS
			30~1000	8.30	-59.87	≤-21.7	PASS
			1000~26500	8.30	-46.41	≤-21.7	PASS
		2437	Reference	8.02	8.02	---	PASS
			30~1000	8.02	-60.25	≤-21.98	PASS
			1000~26500	8.02	-47.58	≤-21.98	PASS
		2462	Reference	8.33	8.33	---	PASS
			30~1000	8.33	-60.26	≤-21.67	PASS
			1000~26500	8.33	-47.04	≤-21.67	PASS
11G	Ant1	2412	Reference	3.63	3.63	---	PASS
			30~1000	3.63	-58.75	≤-26.37	PASS
			1000~26500	3.63	-51.32	≤-26.37	PASS
		2437	Reference	3.59	3.59	---	PASS
			30~1000	3.59	-59	≤-26.41	PASS
			1000~26500	3.59	-51.51	≤-26.41	PASS
		2462	Reference	3.84	3.84	---	PASS
			30~1000	3.84	-60.48	≤-26.16	PASS
			1000~26500	3.84	-49.9	≤-26.16	PASS
11N20SISO	Ant1	2412	Reference	3.13	3.13	---	PASS
			30~1000	3.13	-59.91	≤-26.87	PASS
			1000~26500	3.13	-51.93	≤-26.87	PASS
		2437	Reference	3.06	3.06	---	PASS
			30~1000	3.06	-59.7	≤-26.94	PASS
			1000~26500	3.06	-51.89	≤-26.94	PASS
		2462	Reference	3.23	3.23	---	PASS
			30~1000	3.23	-59.92	≤-26.77	PASS
			1000~26500	3.23	-51.99	≤-26.77	PASS

TEST REPORT

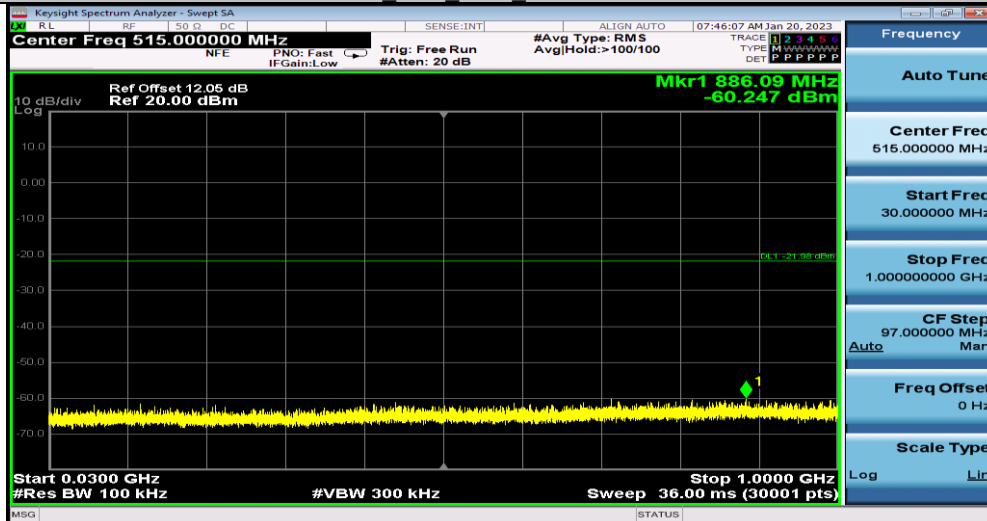
Test Graphs



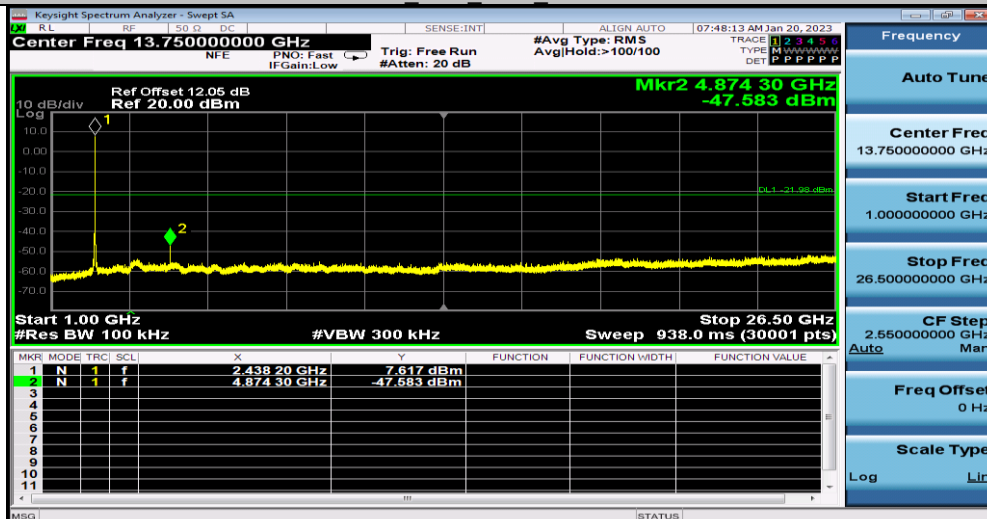
TEST REPORT



11B_Ant1_2437_0-Reference



11B_Ant1_2437_30-1000

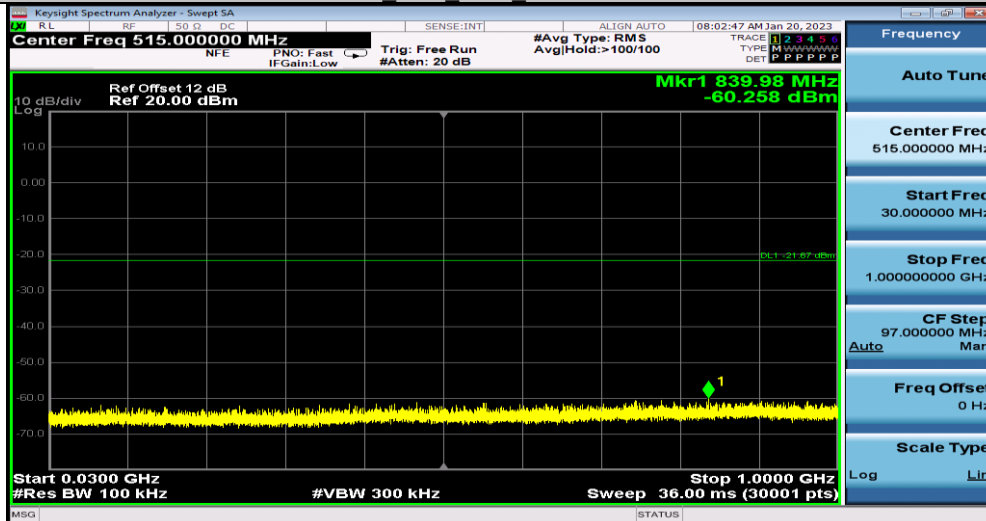


11B_Ant1_2437_1000-26500

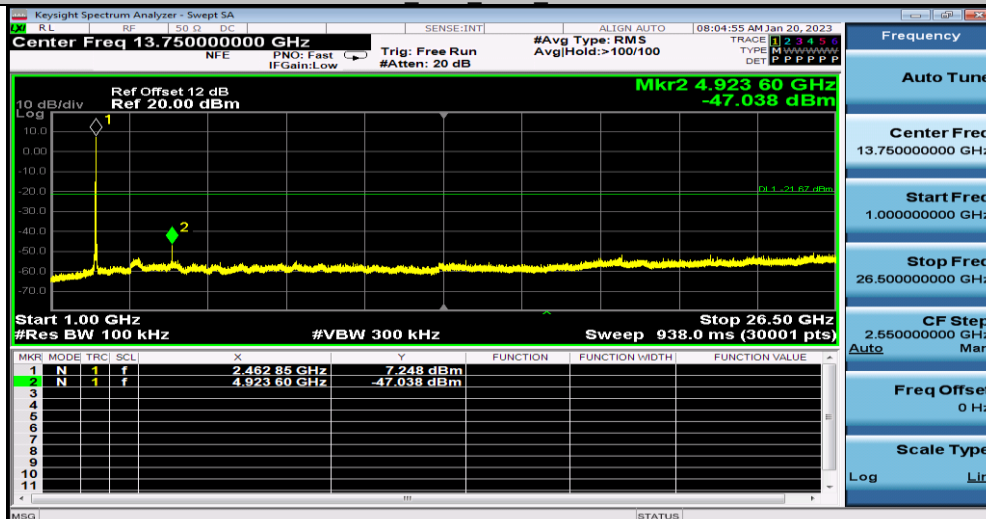
TEST REPORT



11B_Ant1_2462_0-Reference



11B_Ant1_2462_30-1000

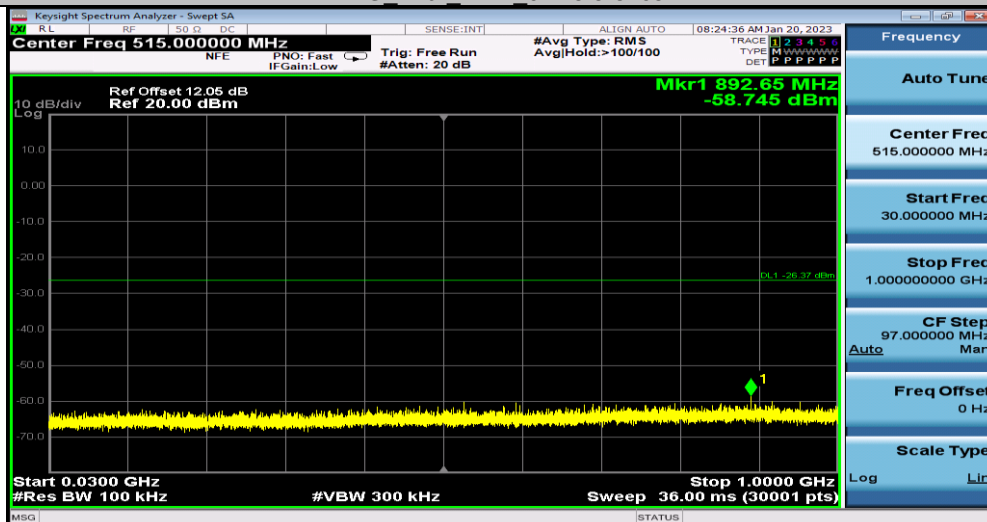


11B_Ant1_2462_1000-26500

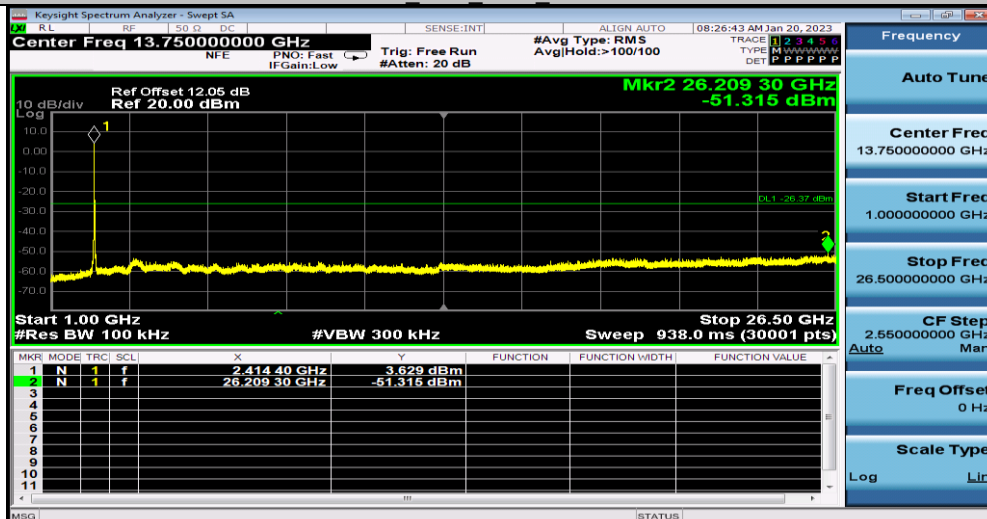
TEST REPORT



11G_Ant1_2412_0~Reference



11G_Ant1_2412_30~1000

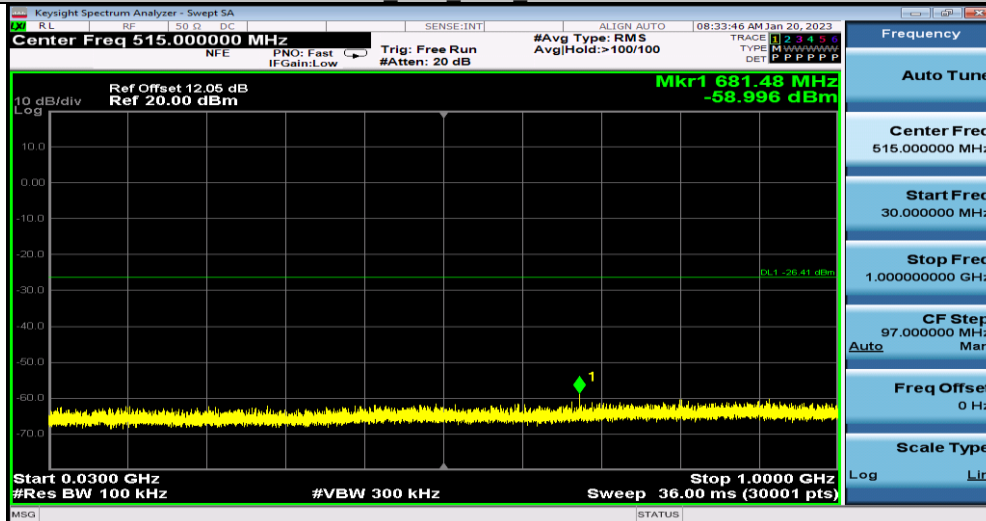


11G_Ant1_2412_1000~26500

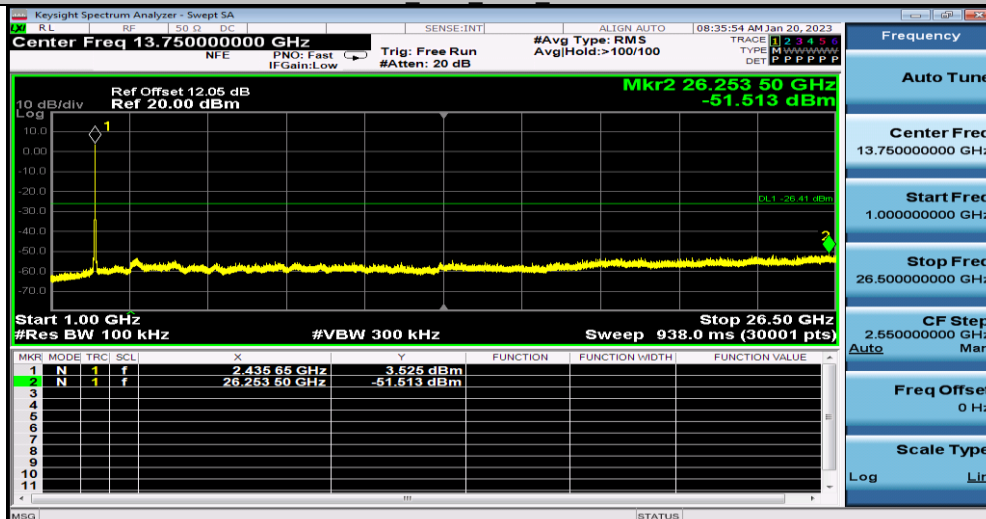
TEST REPORT



11G_Ant1_2437_0~Reference

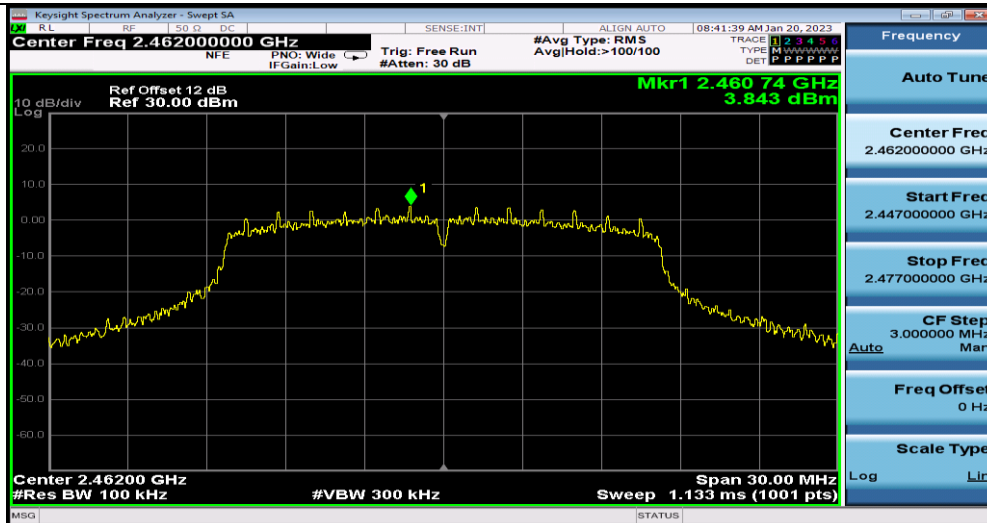


11G_Ant1_2437_30~1000

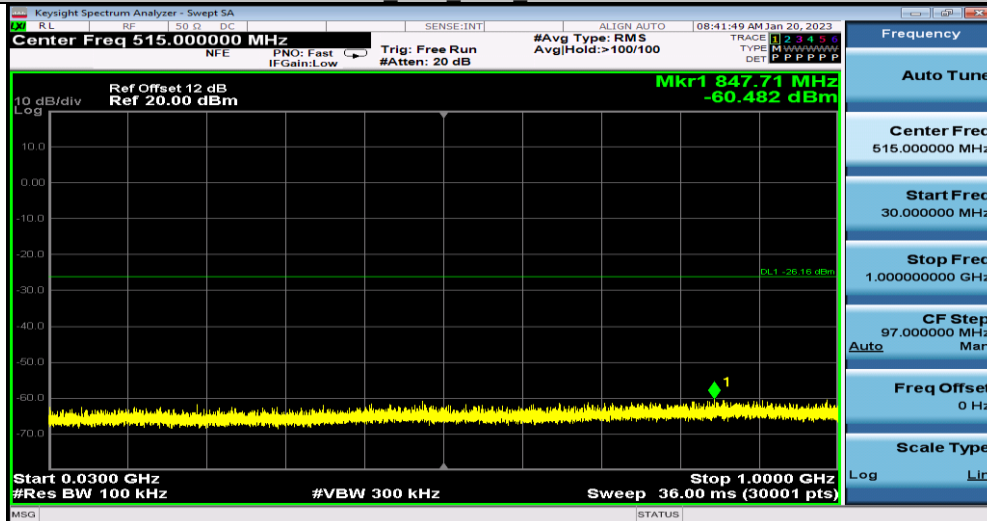


11G_Ant1_2437_1000~26500

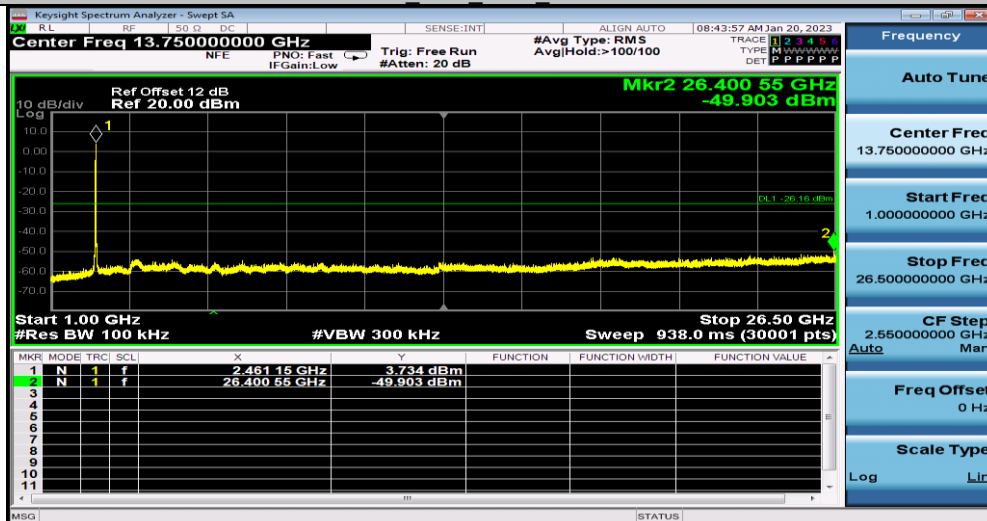
TEST REPORT



11G_Ant1_2462_0~Reference



11G_Ant1_2462_30~1000



11G_Ant1_2462_1000~26500