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Atlas Copco (Wuxi) Compressor Co., Ltd.

RF TEST REPORT

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

Model:
ZBP 2000, ZBP 2000 PREDEFINED

REPORT NUMBER:
230900297SHA-001

ISSUE DATE:
December 14, 2023

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TEST REPORT

Report no.: 230900297SHA-001

APPLICANT:	Atlas Copco (Wuxi) Compressor Co., Ltd. No.45 Ximei Road, Xinwu District, Wuxi, Jiangsu, China
MANUFACTURER:	Atlas Copco (Wuxi) Compressor Co., Ltd. No.45 Ximei Road, Xinwu District, Wuxi, Jiangsu, China
Factory:	Atlas Copco (Wuxi) Compressor Co., Ltd. No.45 Ximei Road, Xinwu District, Wuxi, Jiangsu, China
FCC ID:	2BBHM-ZBP2000
IC:	30663-ZBP2000

SUMMARY:

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

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

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

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 (March 2019) Amendment1: General Requirements for Compliance of Radio Apparatus

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

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Revision History

Report No.	Version	Description	Issued Date
230900297SHA-001	Rev. 01	Initial issue of report	November 17, 2023
230900297SHA-001	Rev. 02	Modify the EUT rating.	December 14, 2023

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 6.7	Tested
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	LITHIUM-ION POWER STATION
Type/Model:	ZBP 2000 PREDEFINED, ZBP 2000
Description of EUT:	The EUT is a mobile energy storage power supply with WIFI function. Two models are electrically identical except that ZBP 2000 doesn't have heating film. We test ZBP 2000 PREDEFINED as representative and list the results in this report.
Rating:	AC Input: 120VAC, 50Hz/60Hz, 15A Max Solar Input: 12~60VDC, 15A Max AC Output: 120VAC, 50/60Hz, 16.6A Max 120VAC, 50/60Hz, 15A (when input is connected with AC mains together) USB-A Output: 5V/3A, 9V/2A, 12V/1.5A, 18W Max USB-C Output: 5V/3A, 9V/2A, 12V/1.5A, 18W Max USB-A+C Output: 5V/2A, 10W
Category of EUT:	Class A
EUT type:	☐ Table top ☒ Floor standing
Software Version:	-
Hardware Version:	-
Sample Identification No.:	0230310-21-001
Sample received date:	March 13, 2023
Date of test:	March 15, 2023 ~ April 21, 2023

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)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7
Channel Separation:	5 MHz
Antenna Information:	-1.27dBi, PCB Antenna

1.3 Description of Test Facility

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

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Member No.: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2020)
KDB 558074 (v05r02)
RSS-247 Issue 3 (August 2023)
RSS-Gen Issue 5 (March 2019) Amendment1

2.2 Mode of operation during the test

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

Software name	Manufacturer	Version	Supplied by
EspRFTestTool	-	V2.8	applicant

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 VS Power:
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 rata as the worst case.

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

And there have the following test mode:
Radiated test mode:
Mode 1: EUT transmitted signal with internal antenna;

Conducted test mode:
Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;

We have verified all test modes, and list all the results in this report.

2.3 Test software list

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

2.4 Test peripherals list

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

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	23°C	52% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Power line conducted emission	22°C	53% RH
Radiated Emissions in restricted frequency bands	22°C	55% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-08
☒	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-08-22
☒	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-07
☒	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2024-07-28
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-05
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2024-06-15
☒	Test Receiver	R&S	ESCI 7	EC 4501	2024-03-05
☒	Signal generator	Agilent	N5182A	EC 6172	2024-08-08
☒	Signal generator	Agilent	N5181A	EC 6171	2024-08-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5199	2024-03-13
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

2.7 Measurement uncertainty

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

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
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

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

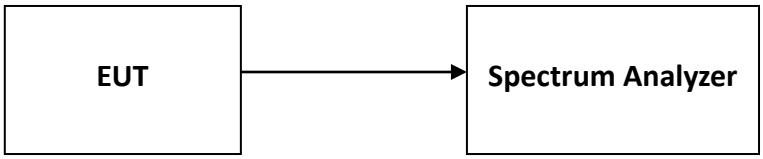
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The minimum 6dB bandwidth is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (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)

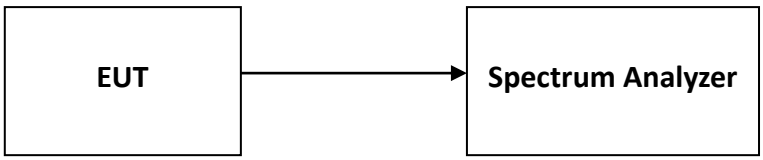
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 9.2.2.2) for compliance requirements.

a) Set span to at least 1.5OBW.
b) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ 3RBW.
d) Number of points in sweep ≥ 2span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto.
f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
g) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
i) 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.

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).

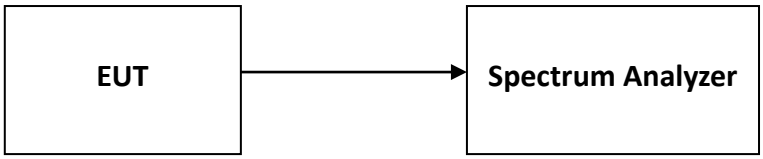
5.2 Measurement Procedure

The power outputwas tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 10.3) for compliance requirements.

This procedure may be used when the maximum (average) conducted output power was used to demonstrate compliance to the output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has an RMS power averaging detector, it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously (duty cycle ≥ 98 %); otherwise sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter off time is to be considered).

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥ 3RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If measured value exceeds limit, 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).

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 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

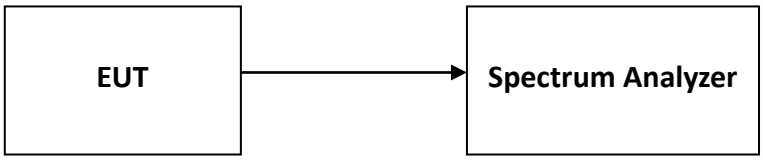
The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 11.0) for compliance requirements.

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

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

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

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

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

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Measurement Procedure

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.1 meters (for 30MHz ~ 1GHz) / 0.1 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 is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

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

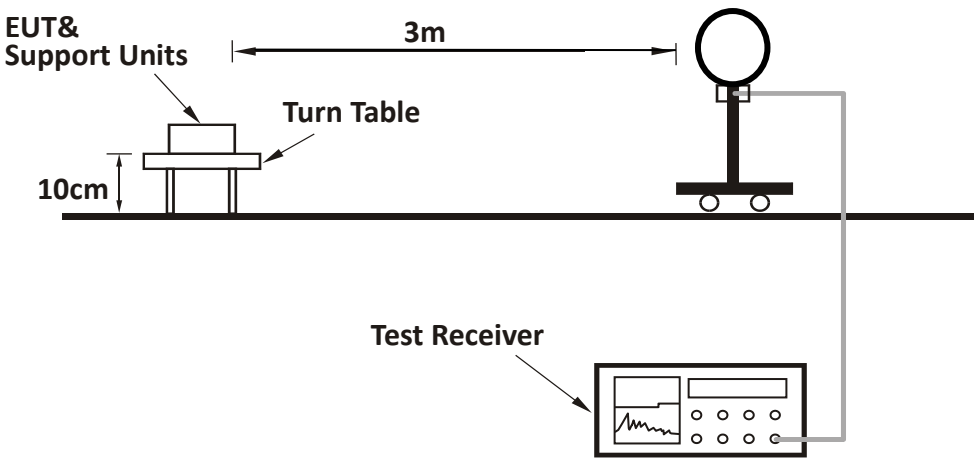
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

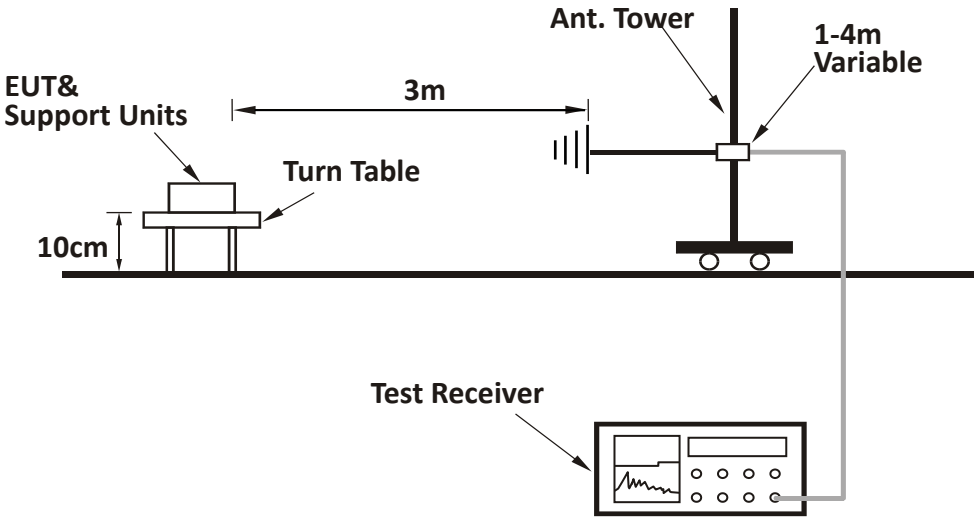
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

7.3 Test Configuration

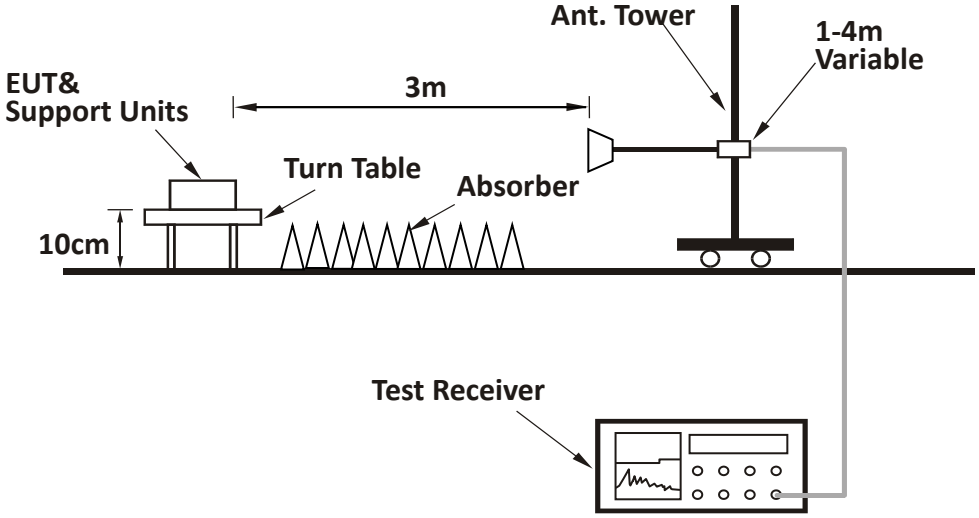
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

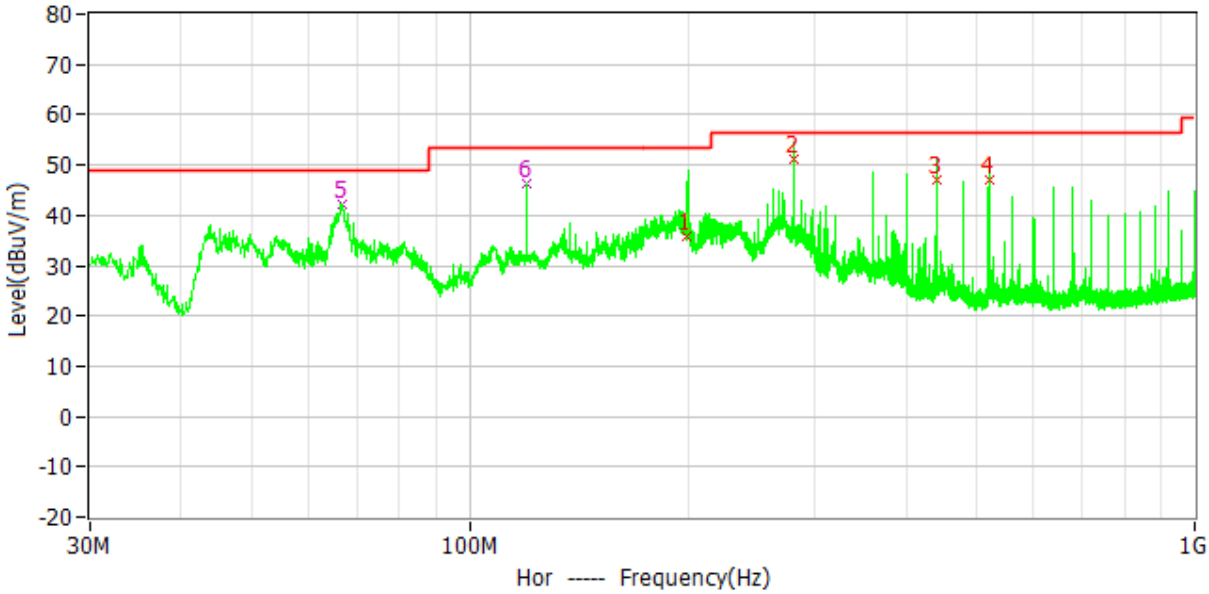


7.4 Test Results of Radiated Emissions

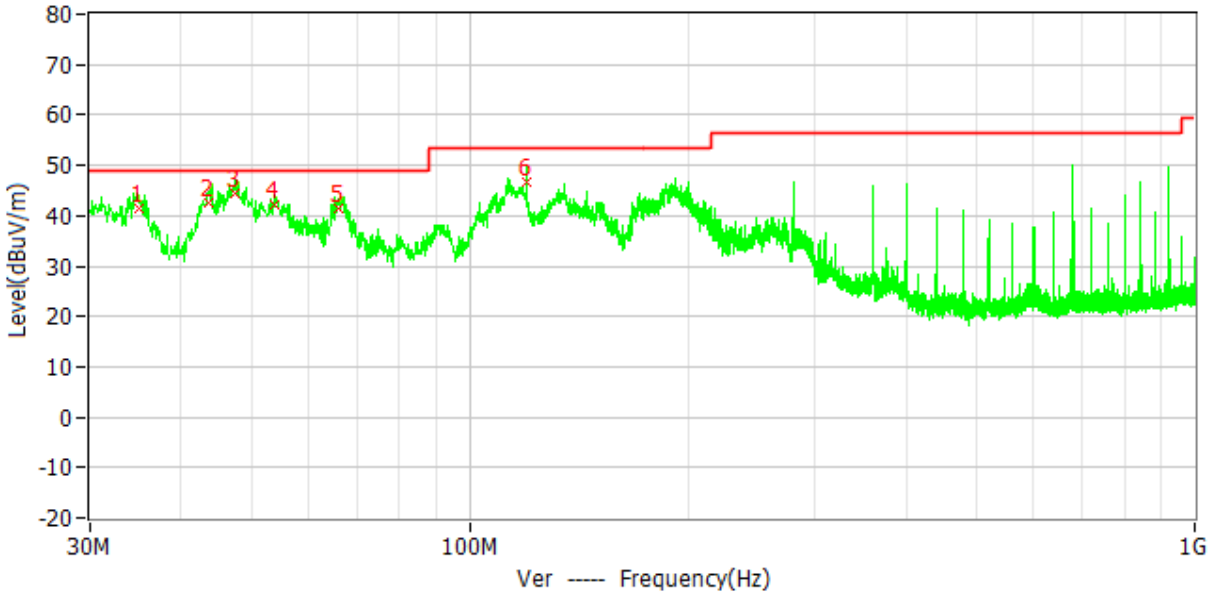
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

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

Horizontal



Vertical



Test data:

Antenna	Frequency (MHz)	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)	Detector
H	199.85	53.5	35.8	17.7	QP
	280.02	56.5	51.3	5.2	QP
	440.01	56.5	47.1	9.4	QP
	520.01	56.5	47.1	9.4	QP
	66.76	49.0	42.3	6.7	PK
	120.01	53.5	46.4	7.1	PK
V	35.02	49.0	41.5	7.5	QP
	43.80	49.0	42.4	6.6	QP
	47.54	49.0	44.4	4.6	QP
	53.93	49.0	42.1	6.9	QP
	66.02	49.0	41.6	7.4	QP
	120.00	53.5	46.5	7.0	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. Level = Original Receiver Reading + Correct Factor
3. Margin = Limit - Level
4. If the PK Level is lower than AV limit, the AV test can be elided.

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

Test result above 1GHz:
The emission was conducted from 1GHz to 25GHz

802.11b:

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	59.8	74.0	14.2	PK
	H	2390.00	46.8	54.0	7.2	AV
	V	2390.00	57.2	74.0	16.8	PK
	V	2390.00	44.5	54.0	9.5	AV
	H	4824.00	55.3	74.0	18.7	PK
	H	4824.00	45.8	54.0	8.2	AV
	V	4824.00	54.7	74.0	19.3	PK
	V	4824.00	44.6	54.0	9.4	AV
	H	7236.00	53.1	74.0	20.9	PK
	V	7236.00	52.4	74.0	21.6	PK
M	H	4874.00	54.9	74.0	19.1	PK
	H	4874.00	44.6	54.0	9.4	AV
	V	4874.00	54.2	74.0	19.8	PK
	V	4874.00	43.9	54.0	10.1	AV
	H	7311.00	52.6	74.0	21.4	PK
	V	7311.00	51.3	74.0	22.7	PK
H	H	2483.50	56.8	74.0	17.2	PK
	H	2483.50	45.1	54.0	8.9	AV
	V	2483.50	58.8	74.0	15.2	PK
	V	2483.50	46.1	54.0	7.9	AV
	H	4924.00	54.7	74.0	19.3	PK
	H	4924.00	44.5	54.0	9.5	AV
	V	4924.00	54.8	74.0	19.2	PK
	V	4924.00	44.1	54.0	9.9	AV
	H	7386.00	53.1	74.0	20.9	PK
	V	7386.00	52.6	74.0	21.4	PK

802.11g:

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	58.2	74.0	15.8	PK
	H	2390.00	46.3	54.0	7.7	AV
	V	2390.00	55.5	74.0	18.5	PK
	V	2390.00	46.0	54.0	8.0	AV
	H	4824.00	54.7	74.0	19.3	PK
	H	4824.00	45.2	54.0	8.8	AV
	V	4824.00	54.2	74.0	19.8	PK
	V	4824.00	44.5	54.0	9.5	AV
	H	7236.00	52.8	74.0	21.2	PK
	V	7236.00	51.6	74.0	22.4	PK
M	H	4874.00	55.1	74.0	18.9	PK

	H	4874.00	44.3	54.0	9.7	AV
	V	4874.00	54.2	74.0	19.8	PK
	V	4874.00	44.7	54.0	9.3	AV
	H	7311.00	52.6	74.0	21.4	PK
	V	7311.00	51.0	74.0	23.0	PK
H	H	2483.50	58.3	74.0	15.7	PK
	H	2483.50	45.7	54.0	8.3	AV
	V	2483.50	54.3	74.0	19.7	PK
	V	2483.50	42.9	54.0	11.1	AV
	H	4924.00	56.9	74.0	17.1	PK
	H	4924.00	46.3	54.0	7.7	AV
	V	4924.00	56.5	74.0	17.5	PK
	V	4924.00	46.2	54.0	7.8	AV
	H	7386.00	53.4	74.0	20.6	PK
	V	7386.00	50.7	74.0	23.3	PK

802.11n (HT20):

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2390.00	56.1	74.0	17.9	PK
	H	2390.00	45.2	54.0	8.8	AV
	V	2390.00	56.6	74.0	17.4	PK
	V	2390.00	44.1	54.0	9.9	AV
	H	4824.00	55.0	74.0	19.0	PK
	H	4824.00	44.3	54.0	9.7	AV
	V	4824.00	54.6	74.0	19.4	PK
	V	4824.00	43.8	54.0	10.2	AV
	H	7236.00	52.7	74.0	21.3	PK
	V	7236.00	51.8	74.0	22.2	PK
M	H	4874.00	54.9	74.0	19.1	PK
	H	4874.00	44.6	54.0	9.4	AV
	V	4874.00	54.5	74.0	19.5	PK
	V	4874.00	43.8	54.0	10.2	AV
	H	7311.00	52.3	74.0	21.7	PK
	V	7311.00	51.7	74.0	22.3	PK
H	H	2483.50	59.1	74.0	14.9	PK
	H	2483.50	46.8	54.0	7.2	AV
	V	2483.50	55.1	74.0	18.9	PK
	V	2483.50	44.0	54.0	10.0	AV
	H	4924.00	56.3	74.0	17.7	PK
	H	4924.00	46.5	54.0	7.5	AV
	V	4924.00	56.5	74.0	17.5	PK
	V	4924.00	45.9	54.0	8.1	AV
	H	7386.00	53.3	74.0	20.7	PK
	V	7386.00	51.7	74.0	22.3	PK

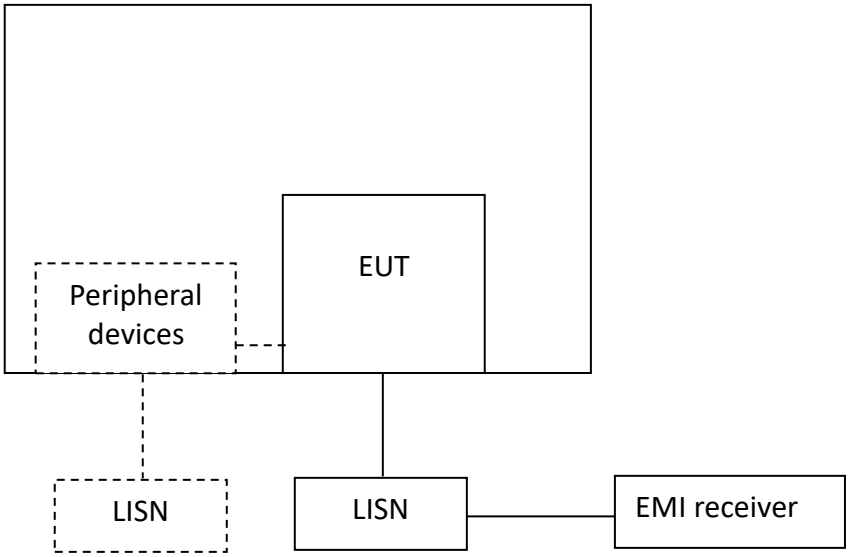
8 Power line conducted emission

Test result: **Pass**

8.1 Limit

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

8.2 Test Configuration



8.3 Measurement Procedure

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

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

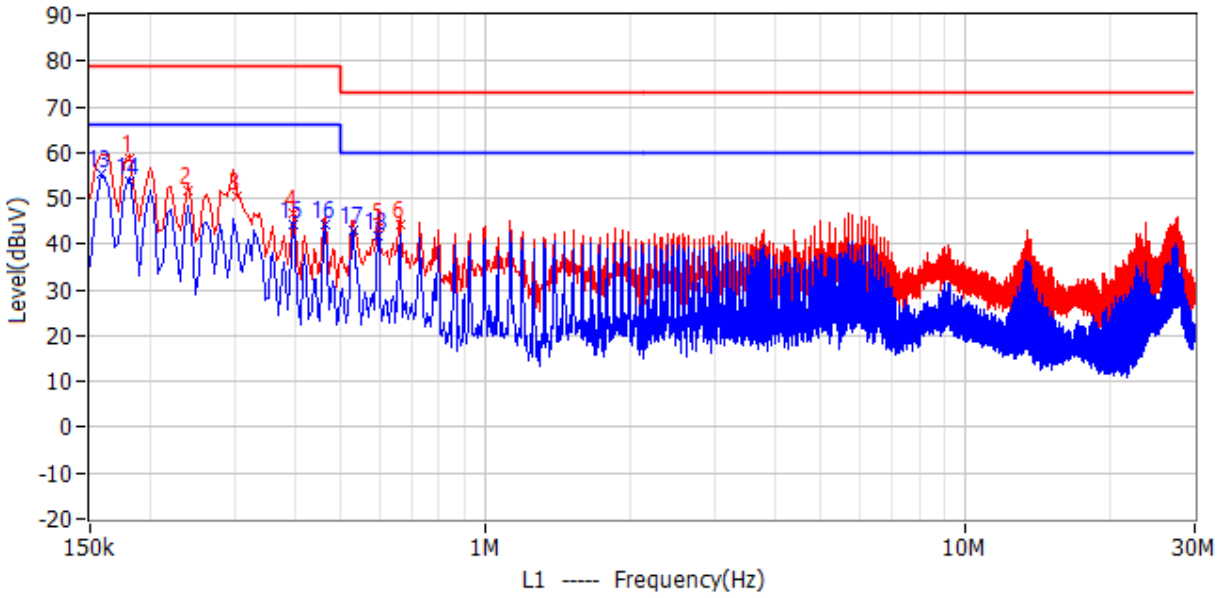
The bandwidth of the test receiver is set at 9 kHz.

8.4 Test Results of Power line conducted emission

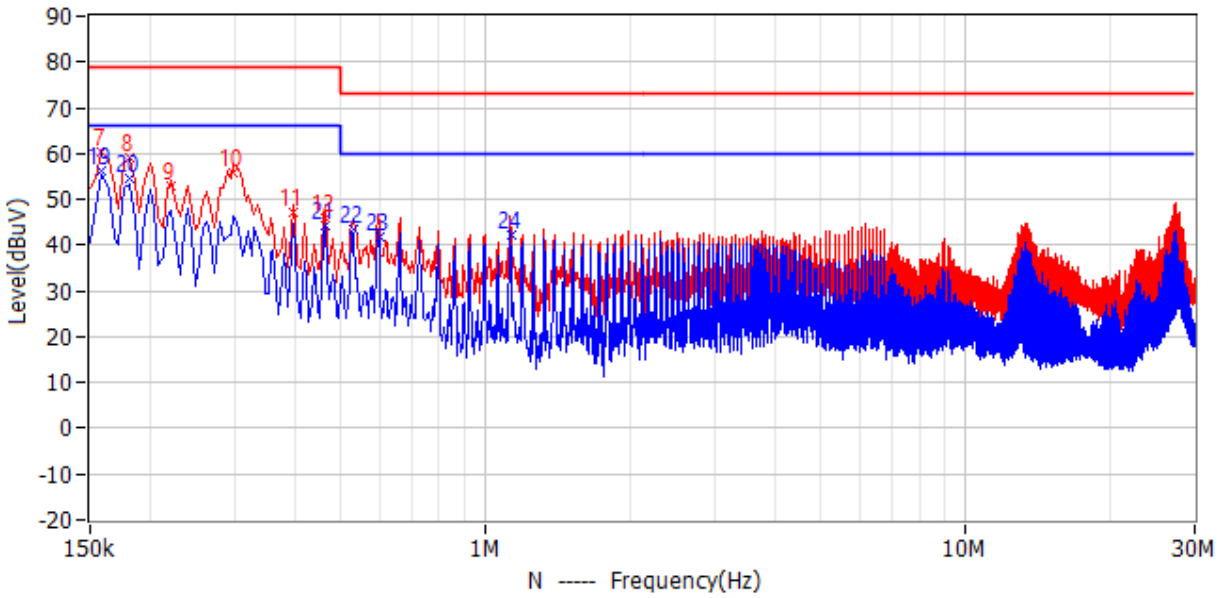
Test Voltage: 120V/60Hz

Test Curve:

L Line



N Line



TEST REPORT

Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Detector	Phase
1	181.500kHz	79.0	58.8	-20.2	QP	L1
2	240.000kHz	79.0	51.8	-27.2	QP	L1
3	303.000kHz	79.0	50.3	-28.7	QP	L1
4	397.500kHz	79.0	46.8	-32.2	QP	L1
5	600.000kHz	73.0	43.9	-29.1	QP	L1
6	663.000kHz	73.0	44.4	-28.6	QP	L1
7	159.000kHz	79.0	60.2	-18.8	QP	N
8	181.500kHz	79.0	59.0	-20.0	QP	N
9	222.000kHz	79.0	52.8	-26.2	QP	N
10	298.500kHz	79.0	55.8	-23.2	QP	N
11	397.500kHz	79.0	47.3	-31.7	QP	N
12	465.000kHz	79.0	45.8	-33.2	QP	N
13	159.000kHz	66.0	55.5	-10.5	CAV	L1
14	181.500kHz	66.0	53.8	-12.2	CAV	L1
15	397.500kHz	66.0	44.1	-21.9	CAV	L1
16	465.000kHz	66.0	44.1	-21.9	CAV	L1
17	532.500kHz	60.0	43.0	-17.0	CAV	L1
18	595.500kHz	60.0	41.7	-18.3	CAV	L1
19	159.000kHz	66.0	56.1	-9.9	CAV	N
20	181.500kHz	66.0	54.5	-11.5	CAV	N
21	465.000kHz	66.0	44.3	-21.7	CAV	N
22	532.500kHz	60.0	43.5	-16.5	CAV	N
23	600.000kHz	60.0	41.8	-18.2	CAV	N
24	1.131MHz	60.0	42.3	-17.7	CAV	N

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

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

9 Occupied Bandwidth

Test result: **Pass**

9.1 Limit

None

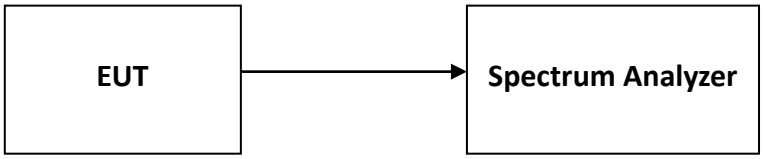
9.2 Measurement Procedure

The occupied bandwidth per RSS-Gen Issue 5 Clause 6.7 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.

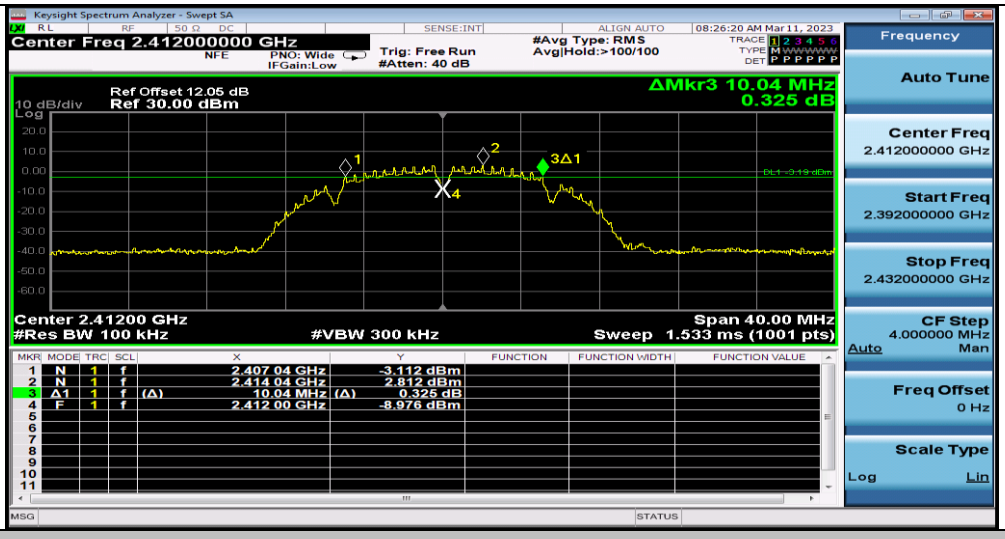
Appendix A: Test results

DTS Bandwidth

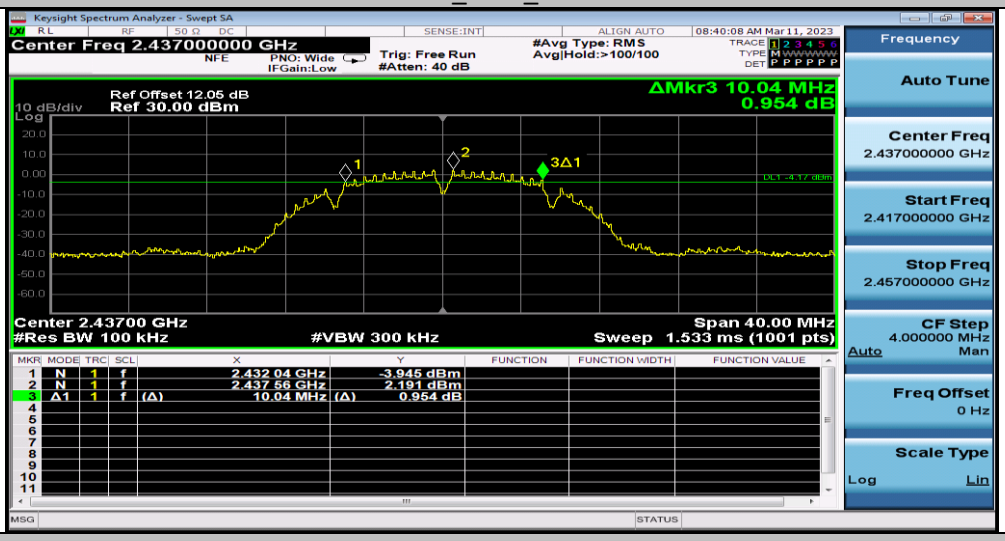
Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	10.040	2407.040	2417.080	0.5	PASS
		2437	10.040	2432.040	2442.080	0.5	PASS
		2462	9.560	2457.040	2466.600	0.5	PASS
11G	Ant1	2412	16.080	2404.160	2420.240	0.5	PASS
		2437	16.280	2428.920	2445.200	0.5	PASS
		2462	16.320	2453.880	2470.200	0.5	PASS
11N20SISO	Ant1	2412	16.880	2403.680	2420.560	0.5	PASS
		2437	16.960	2428.640	2445.600	0.5	PASS
		2462	16.560	2453.640	2470.200	0.5	PASS

TEST REPORT

Test Graphs



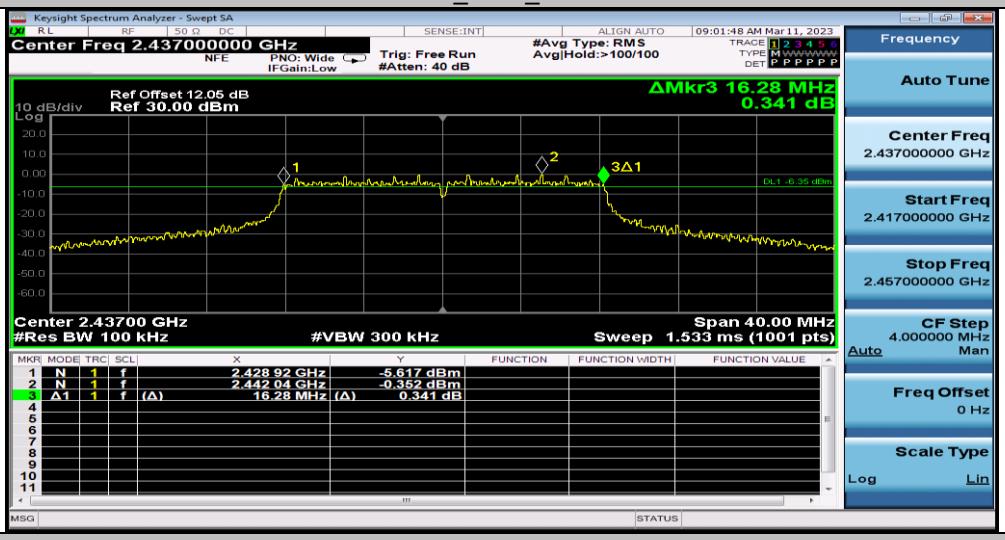
11B_Ant1_2412



11B_Ant1_2437

11B_Ant1_2462

11G_Ant1_2412

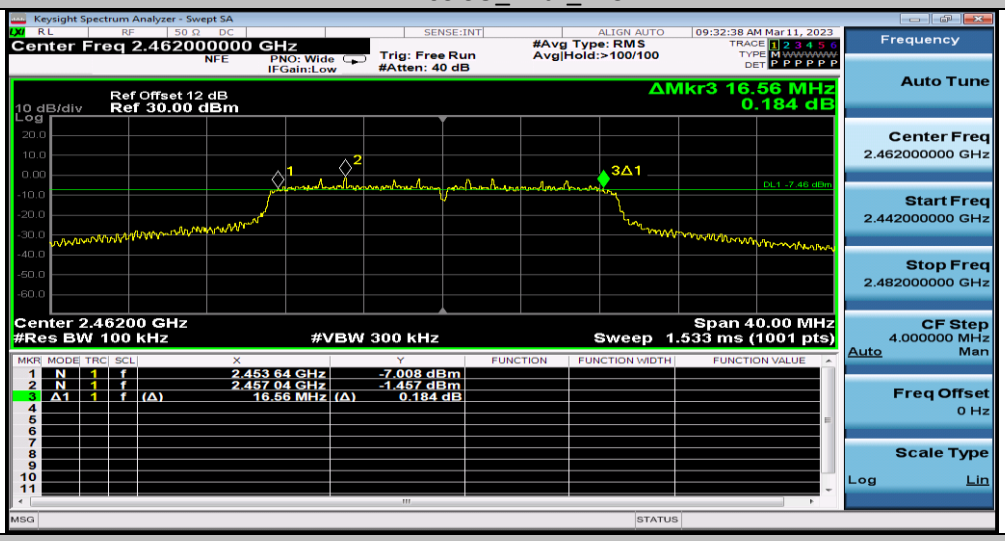


11G_Ant1_2437

11G_Ant1_2462

11N20SISO_Ant1_2412

11N20SISO_Ant1_2437



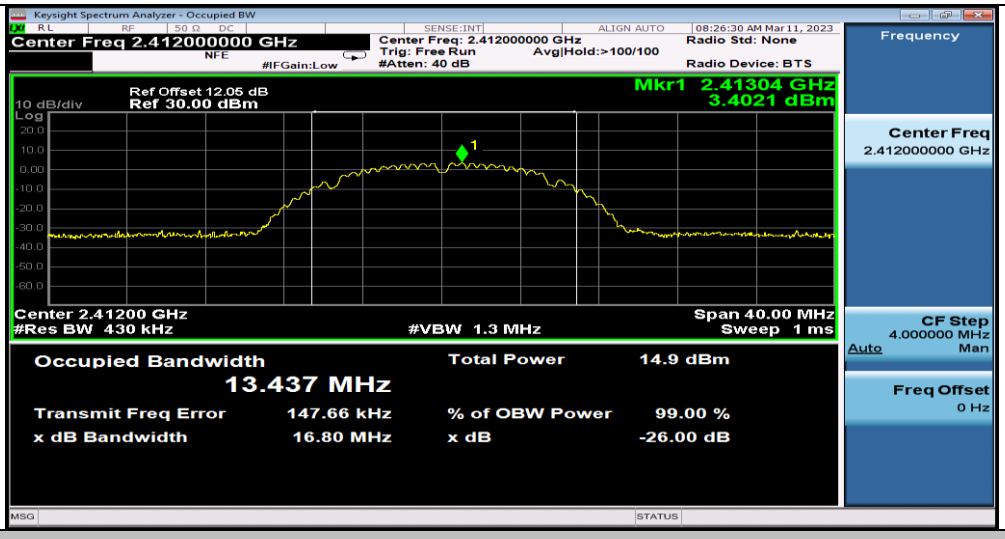
11N20SISO_Ant1_2462

Occupied Channel Bandwidth

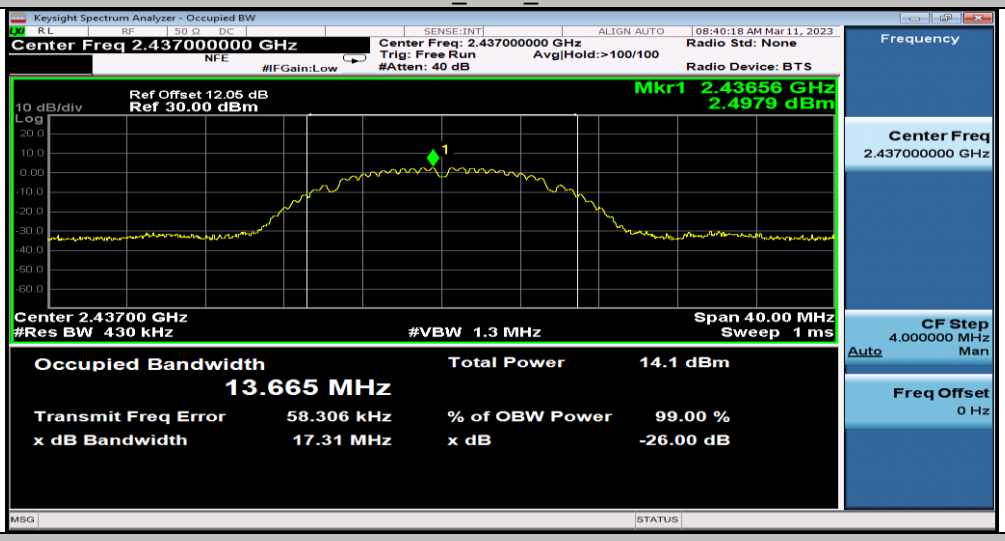
Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	Limit [MHz]	Verdict
11B	Ant1	2412	13.437	---	---
		2437	13.665	---	---
		2462	13.987	---	---
11G	Ant1	2412	17.021	---	---
		2437	17.234	---	---
		2462	17.639	---	---
11N20SISO	Ant1	2412	17.895	---	---
		2437	18.132	---	---
		2462	18.372	---	---

TEST REPORT

Test Graphs



11B_Ant1_2412



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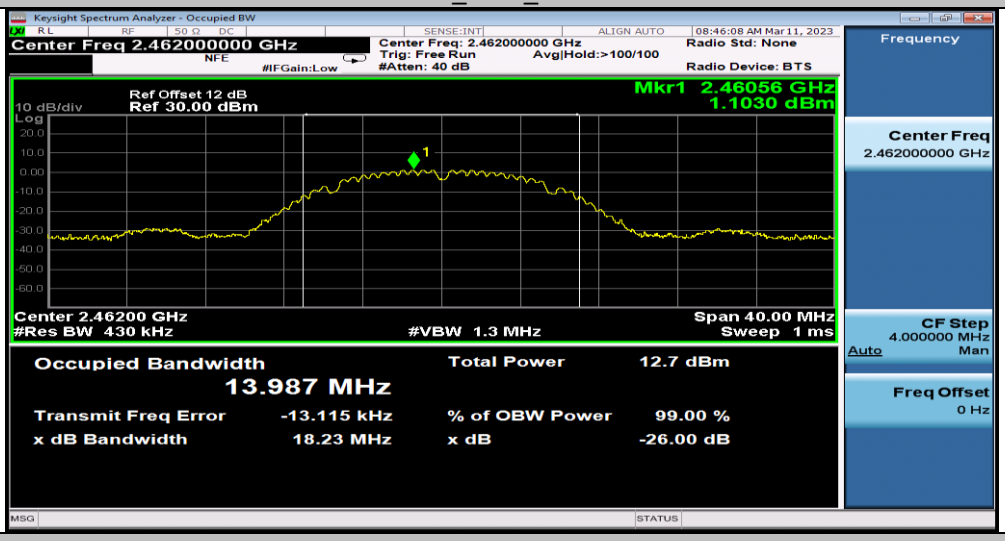
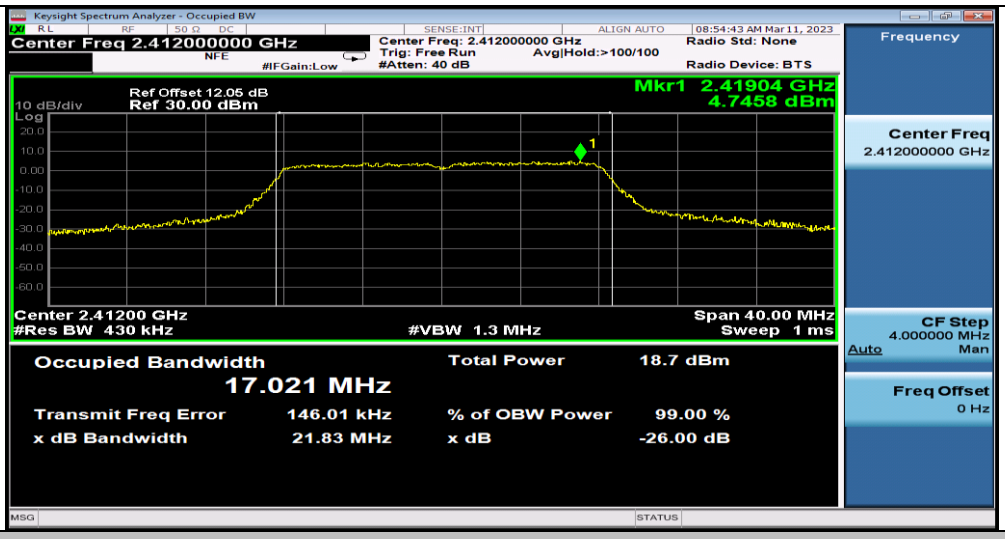
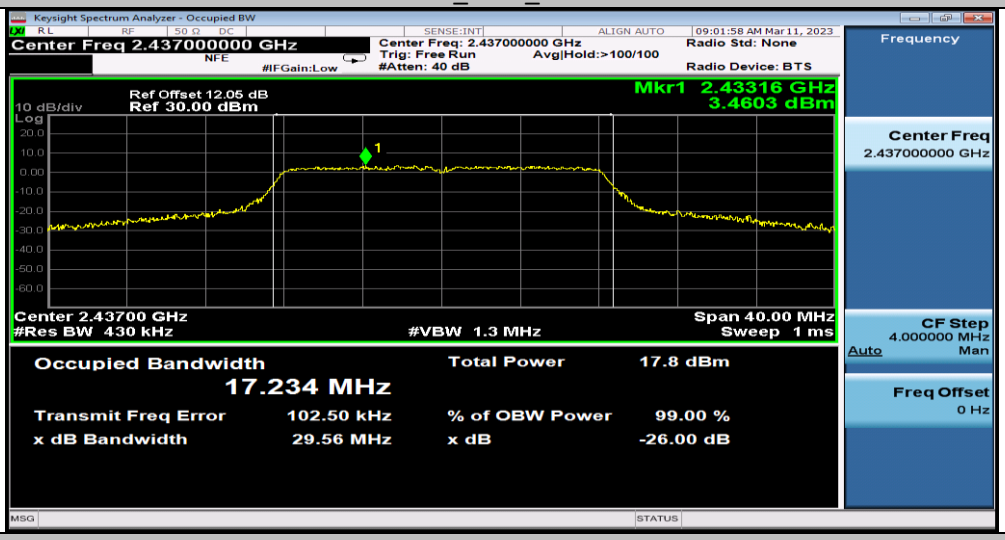


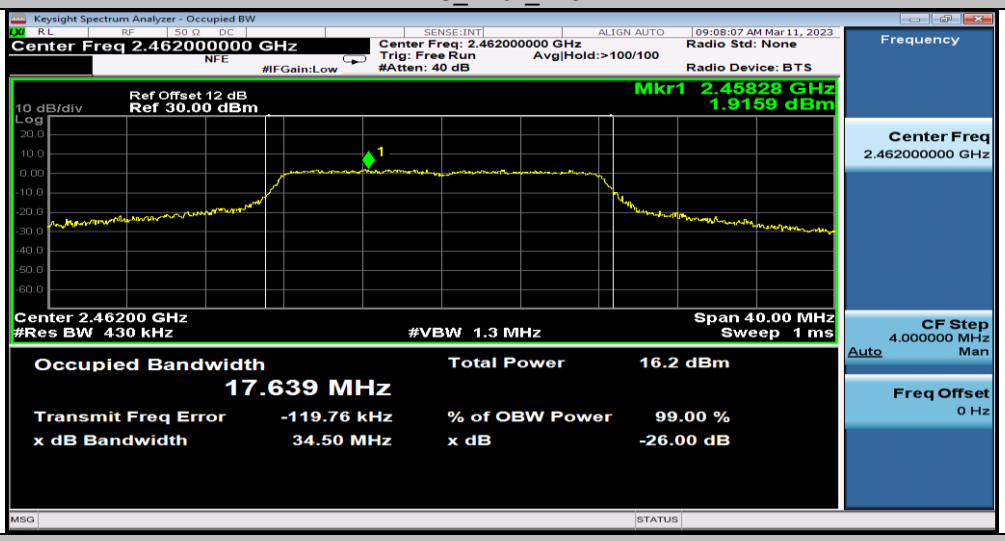
11B_Ant1_2462



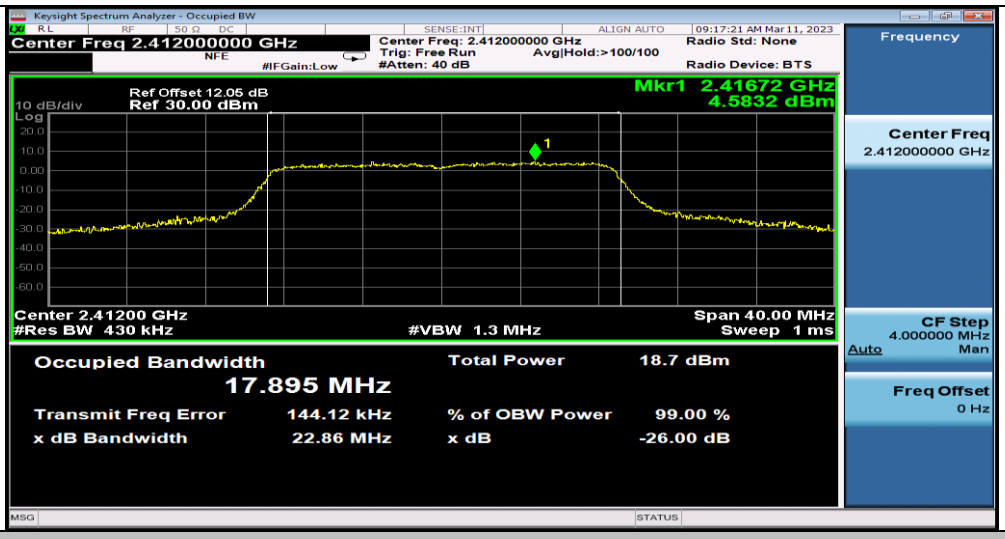
11G_Ant1_2412



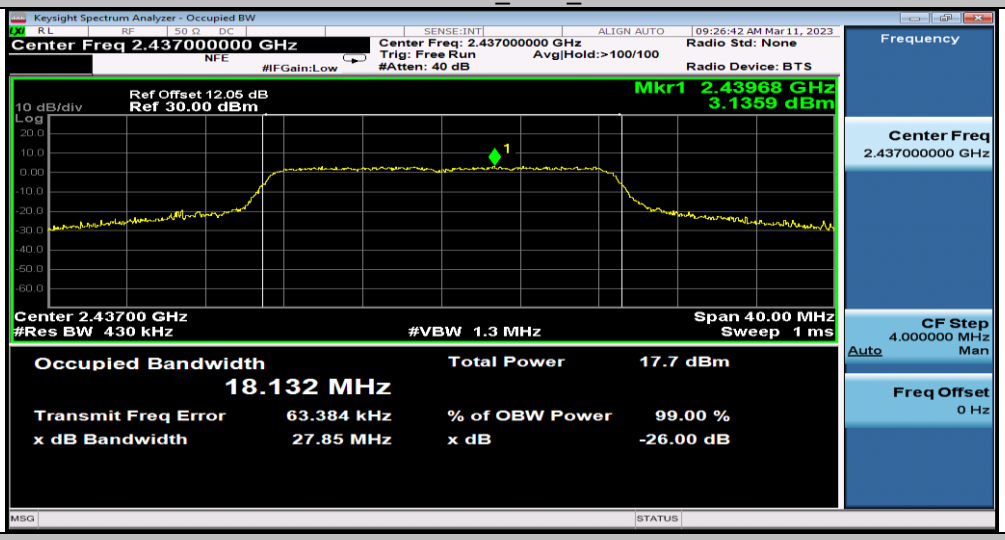
11G_Ant1_2437



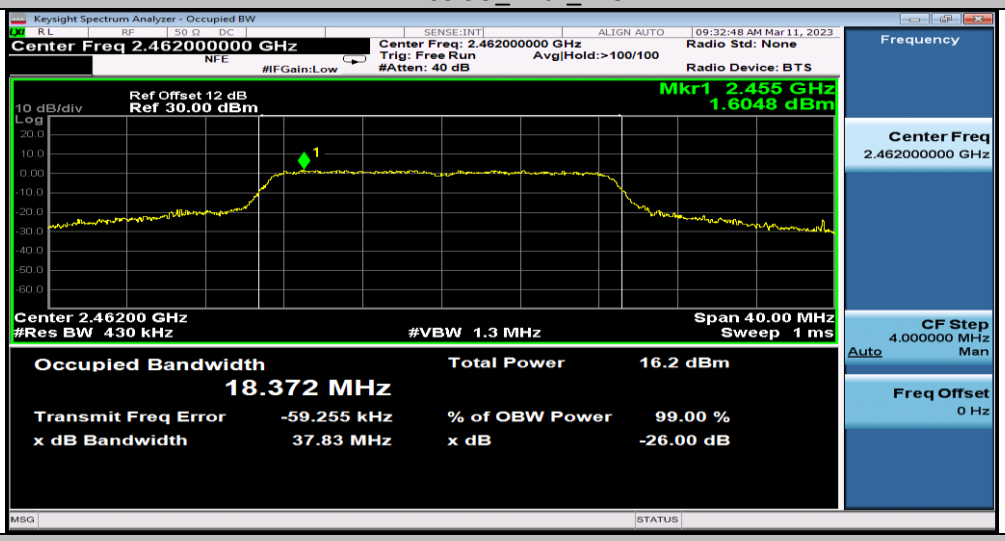
11G_Ant1_2462



11N20SISO_Ant1_2412



11N20SISO_Ant1_2437

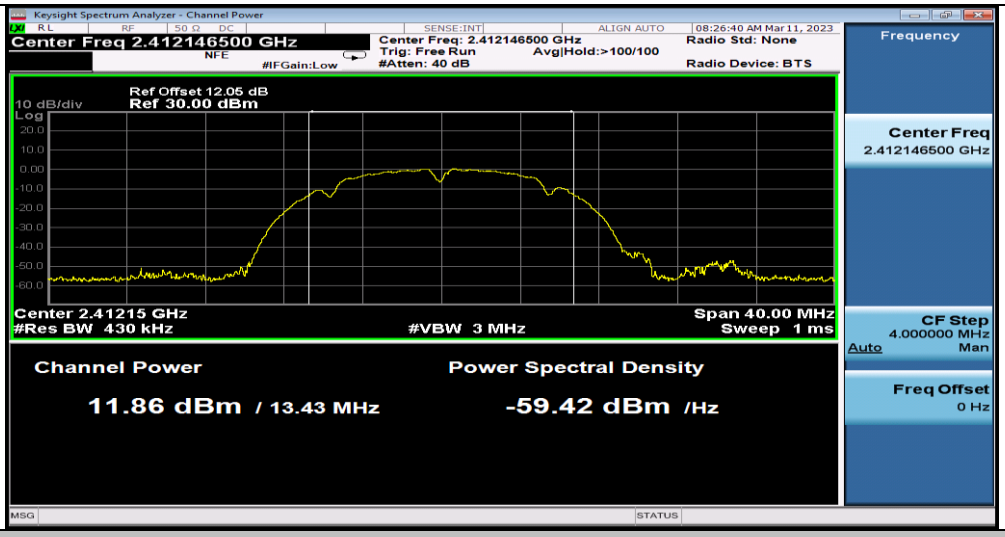


11N20SISO_Ant1_2462

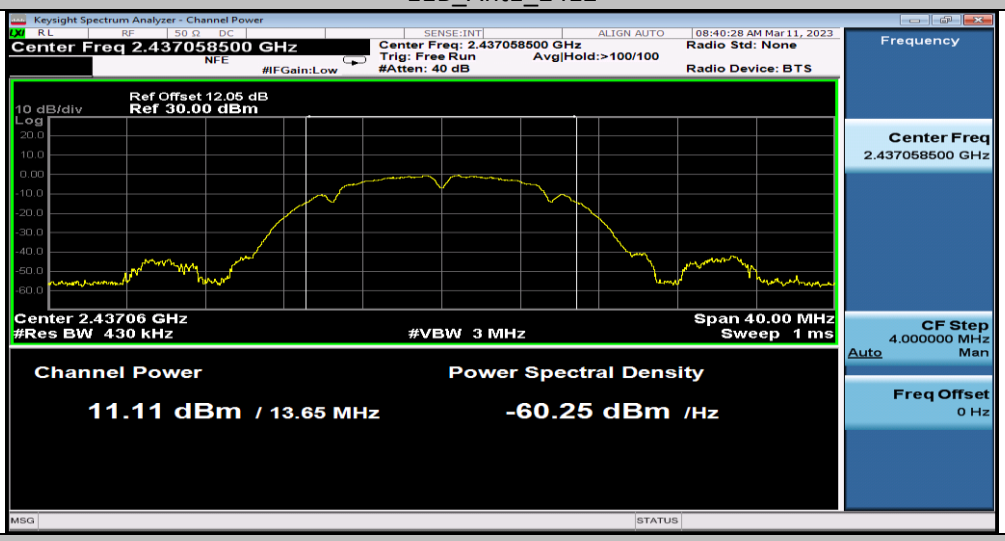
Maximum conducted output power

Test Mode	Antenna	Frequency [MHz]	Power [dBm]	Conducted Limit[dBm]	EIRP [dBm]	EIRP Limit[dBm]	Verdict
11B	Ant1	2412	11.86	≤30.00	10.59	≤36.00	PASS
		2437	11.11	≤30.00	9.84	≤36.00	PASS
		2462	11.12	≤30.00	9.85	≤36.00	PASS
11G	Ant1	2412	11.63	≤30.00	10.36	≤36.00	PASS
		2437	10.64	≤30.00	9.37	≤36.00	PASS
		2462	10.68	≤30.00	9.41	≤36.00	PASS
11N20 SISO	Ant1	2412	11.55	≤30.00	10.28	≤36.00	PASS
		2437	10.58	≤30.00	9.31	≤36.00	PASS
		2462	10.63	≤30.00	9.36	≤36.00	PASS

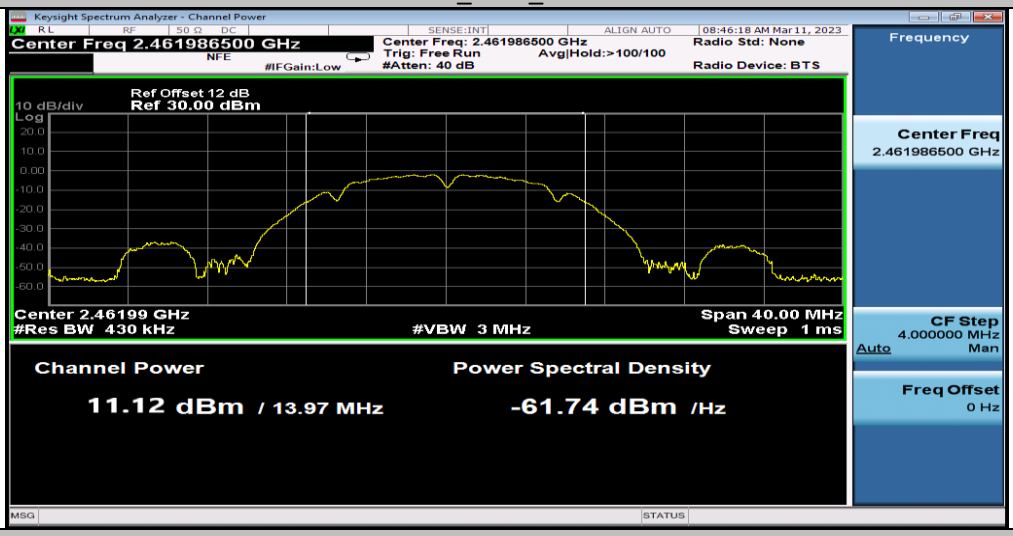
Test Graphs



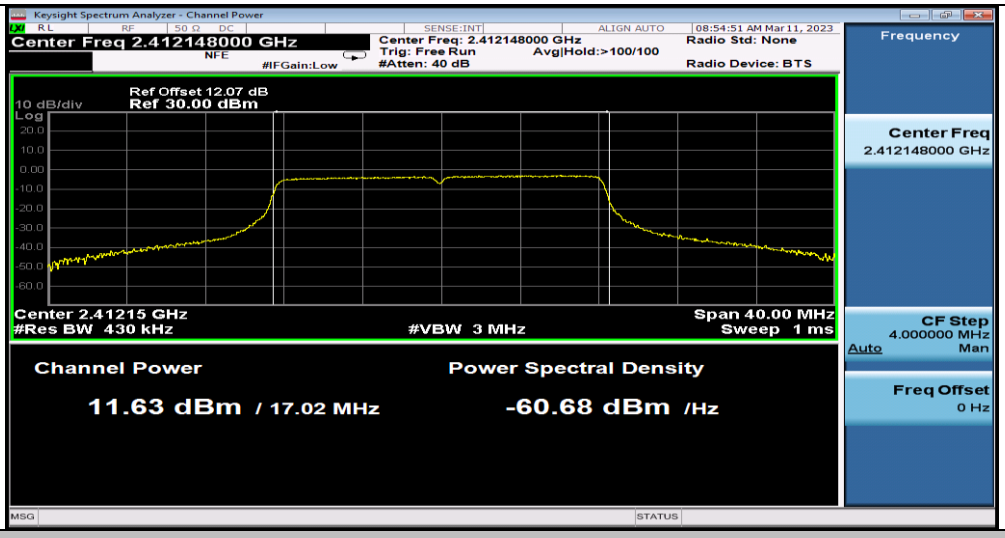
11B_Ant1_2412



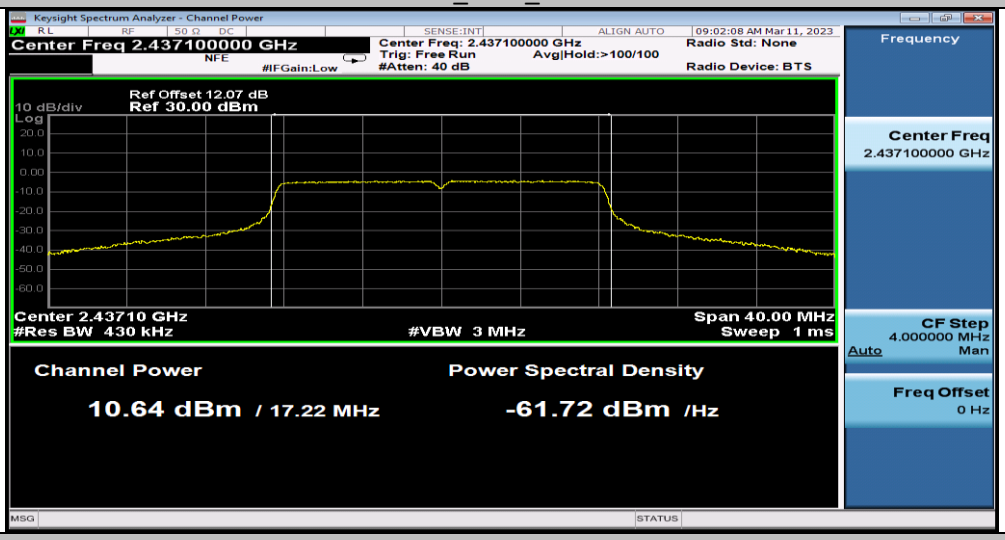
11B_Ant1_2437



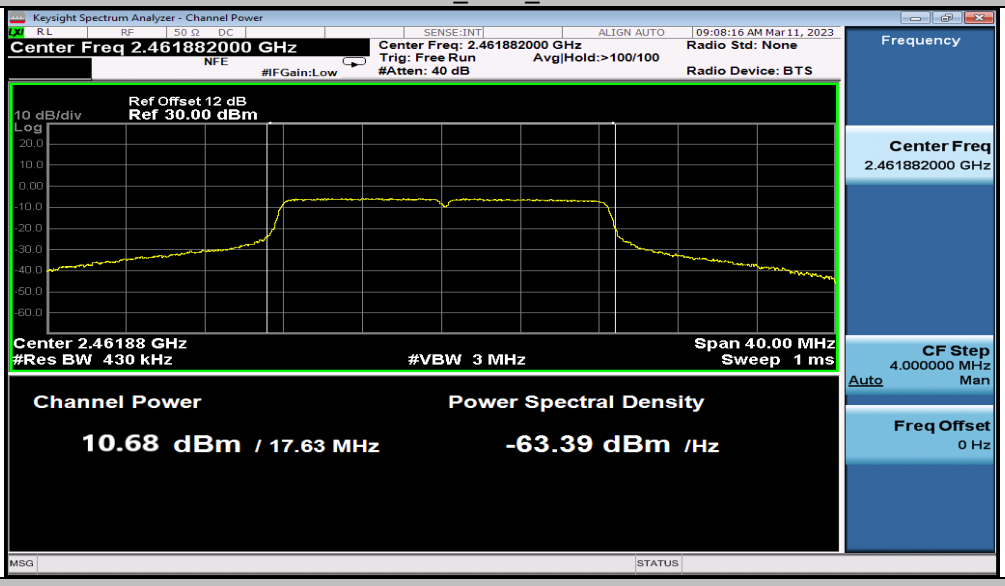
11B_Ant1_2462



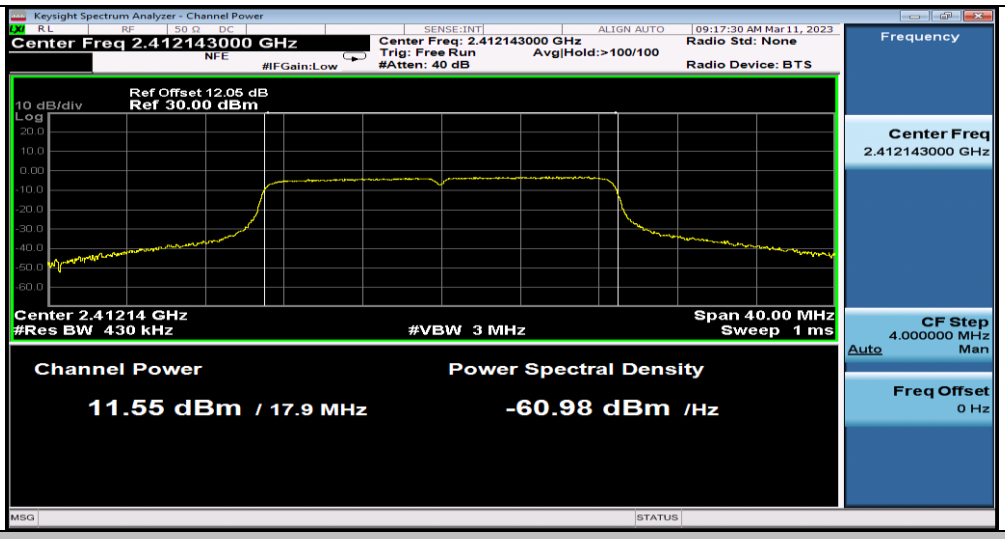
11G_Ant1_2412



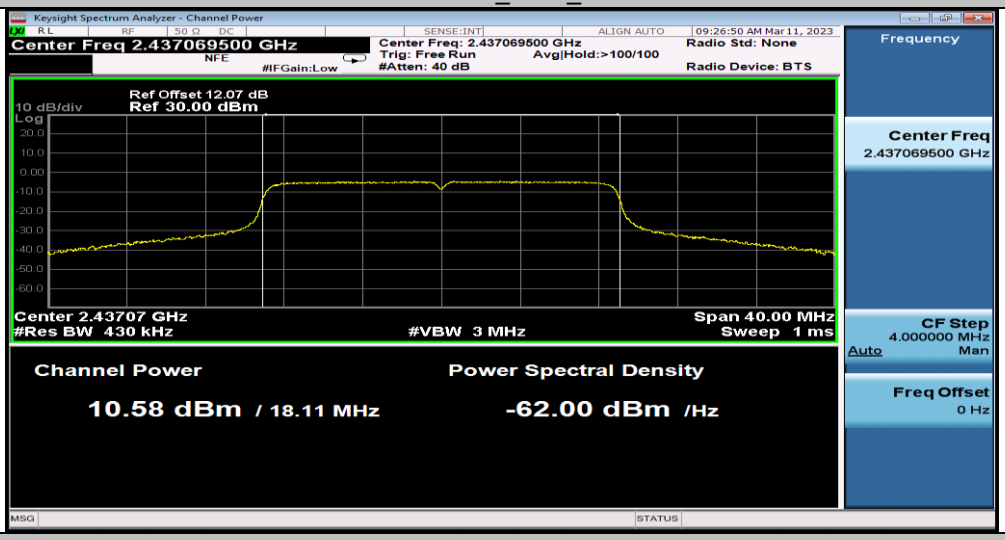
11G_Ant1_2437



11G_Ant1_2462



11N20SISO_Ant1_2412



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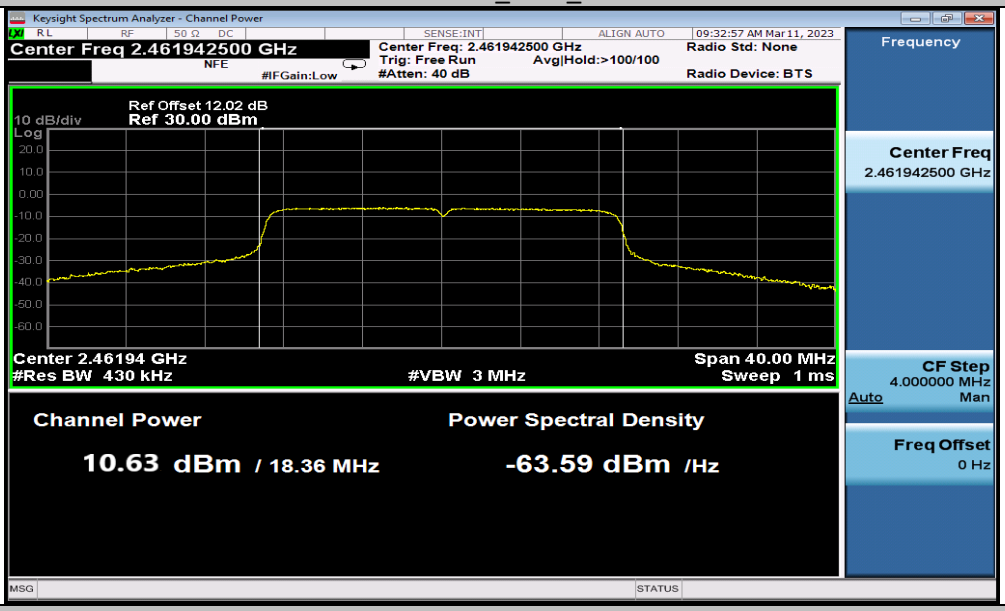

11N20SISO_Ant1_2462