

FCC RF Test Report


(BLE)

Applicant: Inepro BV
Address of Applicant: Pondweg 7, 2153 PK Nieuw-Venep, The Netherlands

Equipment Under Test (EUT)

Product Name: Red Spider
Model No.: Red Spider Desktop HF
Trade Mark: Red Spider
FCC ID: 2AFBFRSDHF1
Applicable Standards: FCC CFR Title 47 Part 15C (§15.247)
Date of Sample Receipt: 08 Sep., 2022
Date of Test: 09 Sep., 2022 to 20 Feb., 2023
Date of Report Issued: 21 Feb., 2023
Test Result: PASS

Tested by:	<u>Mike Ou</u> Test Engineer	Date:	<u>21 Feb., 2023</u>
Reviewed by:	<u>Wenwen Zhao</u> Project Engineer	Date:	<u>21 Feb., 2023</u>
Approved by:	<u>Zhao</u> Manager	Date:	<u>21 Feb., 2023</u>



This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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1 Version

Version No.	Date	Description
00	23 Nov., 2022	Original
01	21 Feb., 2023	1. Update section 3.5, 3.9, 5. 2. Update test setup photo.

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3 General Information

3.1 Client Information

Applicant:	Inepro BV
Address:	Pondweg 7, 2153 PK Nieuw-Vennep, The Netherlands
Manufacturer/Factory:	Inepro BV
Address:	Pondweg 7, 2153 PK Nieuw-Vennep, The Netherlands

3.2 General Description of E.U.T.

Product Name:	Red Spider
Model No.:	Red Spider Desktop HF
Operation Frequency:	2402 MHz - 2480 MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Technology:	GFSK
Data Speed:	1 Mbps (LE 1M PHY)
Antenna Type:	Internal Antenna
Antenna Gain:	0.5dBi (declare by applicant)
Antenna transmit mode:	SISO (1TX, 1RX)
Power Supply:	DC 5V
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

3.3 Test Mode and Test Environment

Test Mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
<i>Remark: For AC power line conducted emission and radiated spurious emission (below 1GHz), pre-scan all data speed, found 1 Mbps (LE 1M PHY) was worse case mode. The report only reflects the test data of worst mode.</i>	
Operating Environment:	
Temperature:	15°C ~ 35°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar

3.4 Description of Test Auxiliary Equipment

The EUT has been tested as an independent unit.

3.5 Measurement Uncertainty

Please reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.

3.6 Additions to, Deviations, or Exclusions from the Method

No

3.7 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Designation No.: CN1211**
JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.
- **ISED – CAB identifier.: CN0021**
The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.
- **CNAS - Registration No.: CNAS L15527**
JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527.
- **A2LA - Registration No.: 4346.01**
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

3.8 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.
 Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.
 Tel: +86-755-23118282, Fax: +86-755-23116366
 Email: info-JYTee@lets.com, Website: <http://jyt.lets.com>

3.9 Test Instruments List

Conducted Method:					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Keysight	N9010B	WXJ004-3	10-27-2021	10-26-2022
				10-17-2022	10-16-2023
Temperature Humidity Chamber	ZHONG ZHI	CZ-A-80D	WXJ032-3	03-19-2021	03-18-2023
Power Detector Box	MWRFTTEST	MW100-PSB	WXJ007-4	11-19-2021	11-18-2022
				10-17-2022	10-16-2023
DC Power Supply	Keysight	E3642A	WXJ025-2	N/A	
RF Control Unit	MWRFTTEST	MW100-RFCB	WXG006	N/A	
Test Software	MWRFTTEST	MTS 8310	Version: 2.0.0.0		

4 Measurement Setup and Procedure

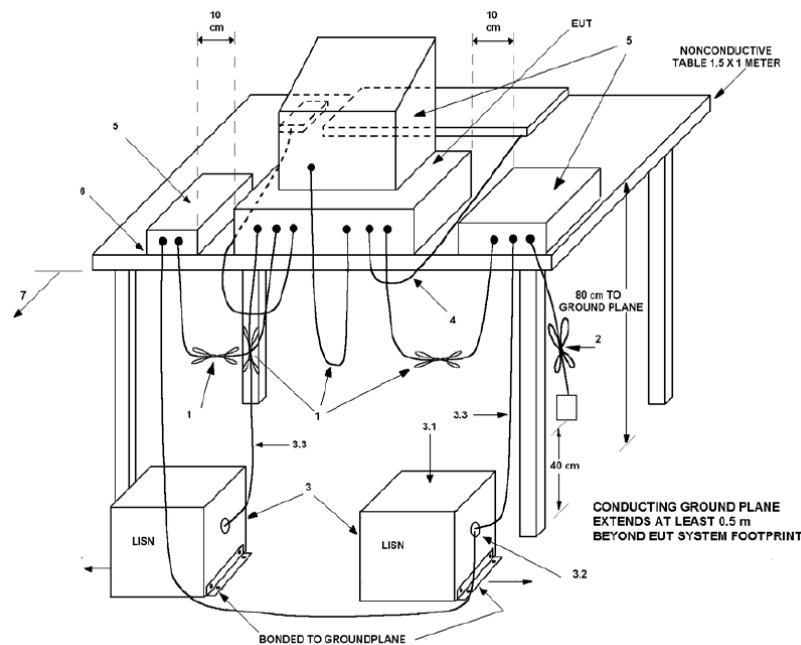
4.1 Test Channel

According to ANSI C63.10-2013 chapter 5.6.1 Table 4 requirement, select lowest channel, middle channel, and highest channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:

Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	20	2442	39	2480

4.2 Test Setup

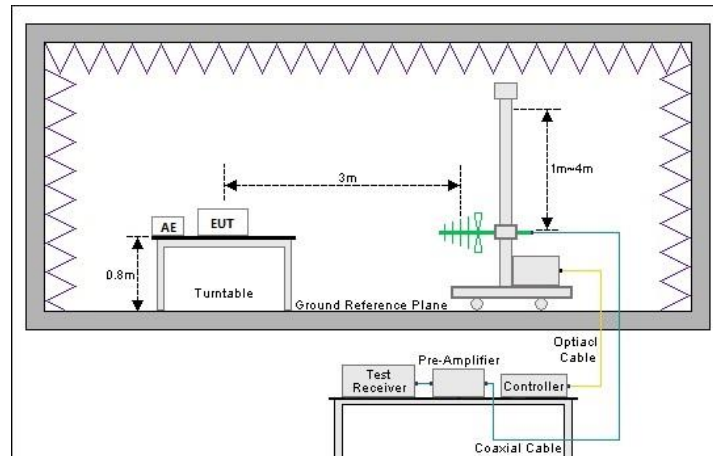
1) Conducted emission measurement:

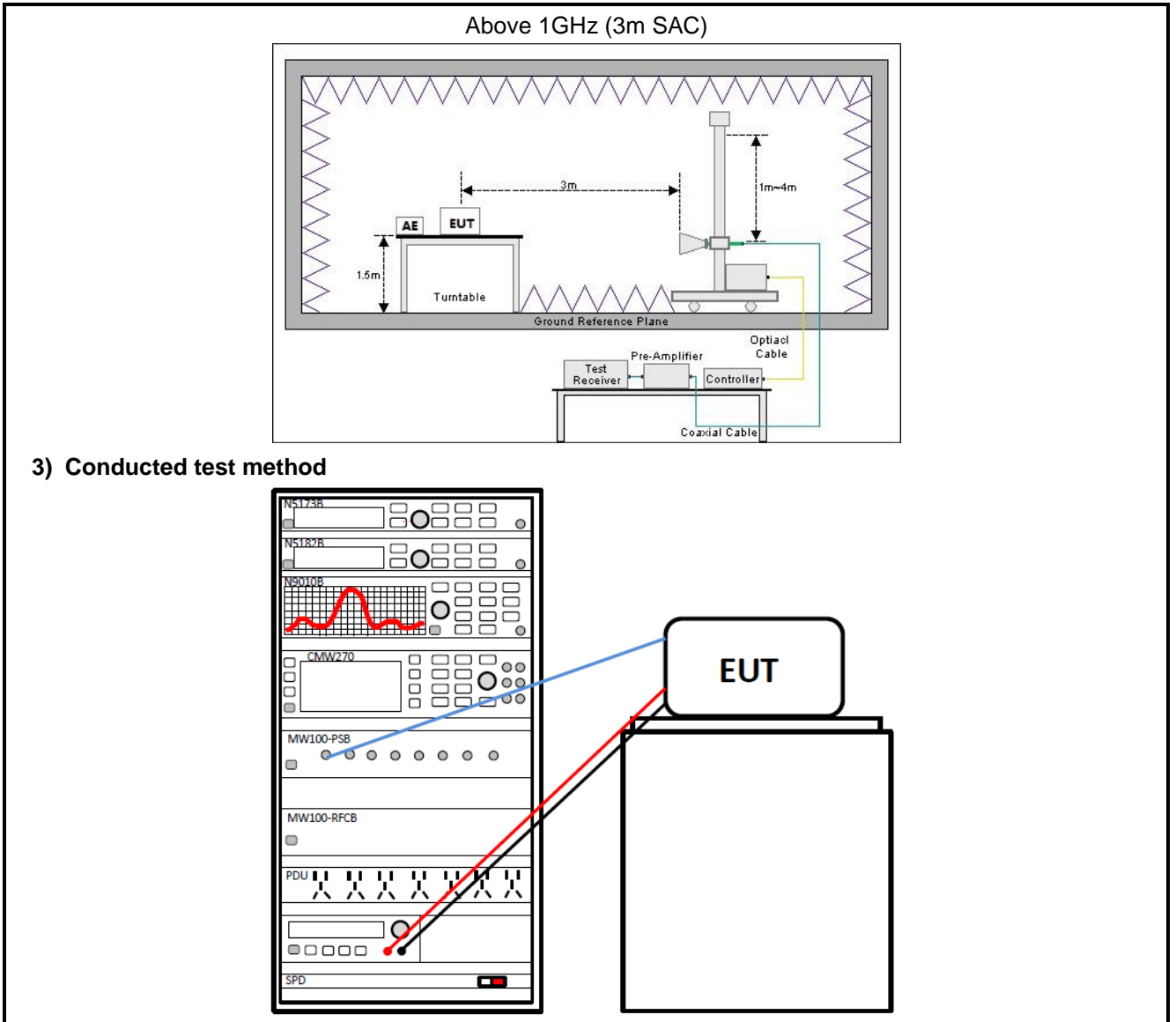


Note: The detailed descriptions please refer to Figure 8 of ANSI C63.4:2014.

2) Radiated emission measurement:

Below 1GHz (3m SAC)





4.3 Test Procedure

Test method	Test step
Conducted emission	<ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
Radiated emission	<p>For below 1GHz:</p> <ol style="list-style-type: none"> 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested , and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data. <p>For above 1GHz:</p> <ol style="list-style-type: none"> 1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested , and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
Conducted test method	<ol style="list-style-type: none"> 1. The BLE antenna port of EUT was connected to the test port of the test system through an RF cable. 2. The EUT is keeping in continuous transmission mode and tested in all modulation modes. 3. Open the test software, prepare a test plan, and control the system through the software. After the test is completed, the test report is exported through the test software.

5 Test Results

5.1 Summary

5.1.1 Clause and Data Summary

Please refer to FCC ID: 2AFBFRSHF01, report No.: JYTSZ-R12-2201851 issue by JianYan Testing Group Shenzhen Co., Ltd. The Red Spider Desktop HF and the Red Spider HF model are the same internally, including circuit design, layout, components used and internal wiring. The differences between them are as follows: The Red Spider Desktop HF have four electrical cables. So only add part of spot-check.

Test items	Standard clause	Test data	Result
Antenna Requirement	15.203 15.247 (b)(4)	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
AC Power Line Conducted Emission	15.207	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
Conducted Output Power	15.247 (b)(3)	1. Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01. 2. See Section 5.2	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
6dB Emission Bandwidth 99% Occupied Bandwidth	15.247 (a)(2)	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
Power Spectral Density	15.247 (e)	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
Band-edge Emission Conduction Spurious Emission	15.247 (d)	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
Emissions in Restricted Frequency Bands	15.205 15.247 (d)	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
Emissions in Non-restricted Frequency Bands	15.209 15.247(d)	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.	Reference report JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01.
Remark: 1. The report is that of JYTSZ-R12-2201851, FCC ID: 2AFBFRSHF01 issue by JianYan Testing Group Shenzhen Co., Ltd. 2. N/A: Not Applicable. 3. The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB (provided by the customer).			
Test Method:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02		

5.1.2 Test Limit

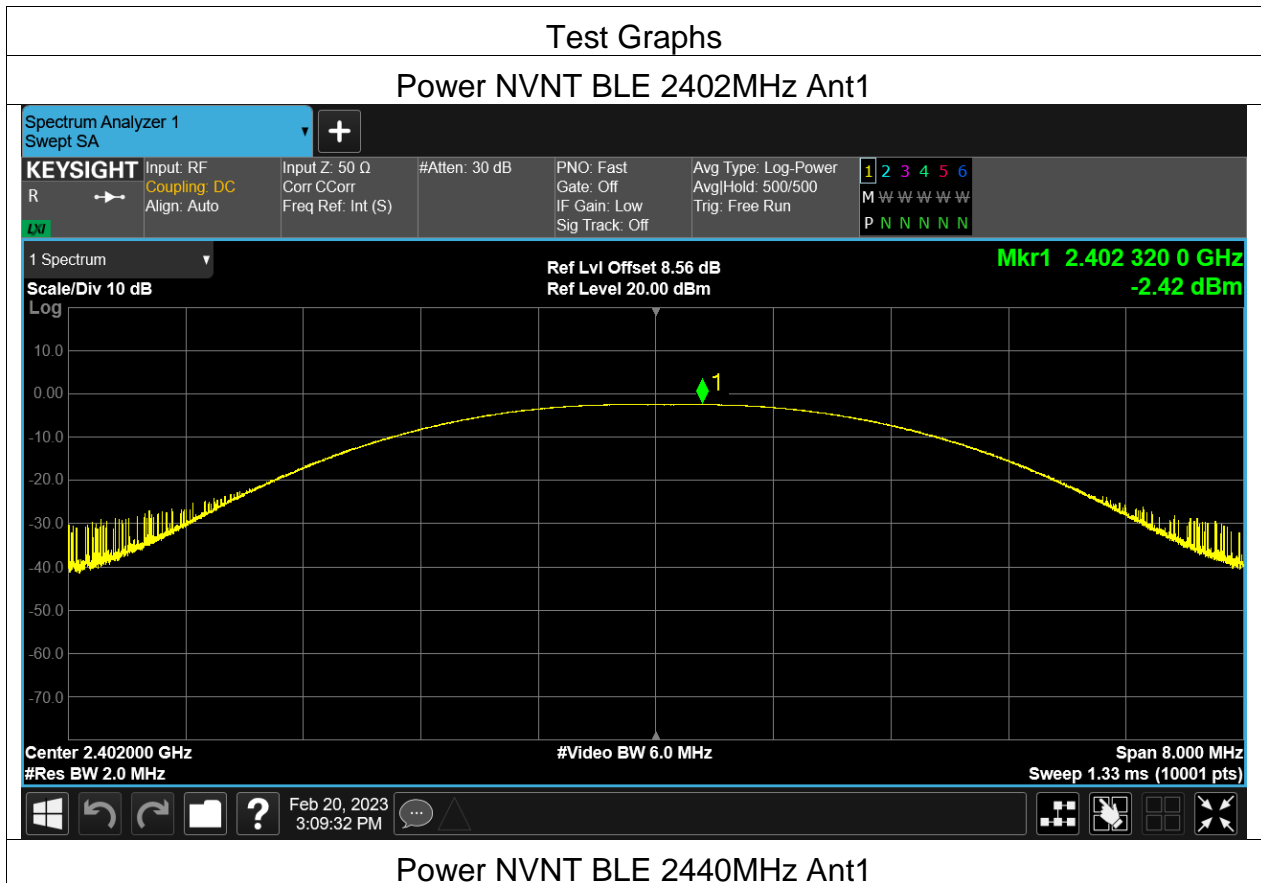
Test items	Limit																														
AC Power Line Conducted Emission	<table border="1"> <thead> <tr> <th rowspan="2">Frequency (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>Quasi-Peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 – 0.5</td> <td>66 to 56 <small>Note 1</small></td> <td>56 to 46 <small>Note 1</small></td> </tr> <tr> <td>0.5 – 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 – 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>Note 1: The limit level in dBμV decreases linearly with the logarithm of frequency. Note 2: The more stringent limit applies at transition frequencies.</p>	Frequency (MHz)	Limit (dB μ V)		Quasi-Peak	Average	0.15 – 0.5	66 to 56 <small>Note 1</small>	56 to 46 <small>Note 1</small>	0.5 – 5	56	46	5 – 30	60	50																
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Conducted Output Power	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.																														
6dB Emission Bandwidth	The minimum 6 dB bandwidth shall be at least 500 kHz.																														
99% Occupied Bandwidth	N/A																														
Power Spectral Density	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.																														
Band-edge Emission Conduction Spurious Emission	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).																														
Emissions in Restricted Frequency Bands Emissions in Non-restricted Frequency Bands	<table border="1"> <thead> <tr> <th rowspan="2">Frequency (MHz)</th> <th colspan="2">Limit (dBμV/m)</th> <th rowspan="2">Detector</th> </tr> <tr> <th>@ 3m</th> <th>@ 10m</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>40.0</td> <td>30.0</td> <td>Quasi-peak</td> </tr> <tr> <td>88 – 216</td> <td>43.5</td> <td>33.5</td> <td>Quasi-peak</td> </tr> <tr> <td>216 – 960</td> <td>46.0</td> <td>36.0</td> <td>Quasi-peak</td> </tr> <tr> <td>960 – 1000</td> <td>54.0</td> <td>44.0</td> <td>Quasi-peak</td> </tr> </tbody> </table> <p>Note: The more stringent limit applies at transition frequencies.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency</th> <th colspan="2">Limit (dBμV/m) @ 3m</th> </tr> <tr> <th>Average</th> <th>Peake</th> </tr> </thead> <tbody> <tr> <td>Above 1 GHz</td> <td>54.0</td> <td>74.0</td> </tr> </tbody> </table> <p>Note: The measurement bandwidth shall be 1 MHz or greater.</p>	Frequency (MHz)	Limit (dB μ V/m)		Detector	@ 3m	@ 10m	30 – 88	40.0	30.0	Quasi-peak	88 – 216	43.5	33.5	Quasi-peak	216 – 960	46.0	36.0	Quasi-peak	960 – 1000	54.0	44.0	Quasi-peak	Frequency	Limit (dB μ V/m) @ 3m		Average	Peake	Above 1 GHz	54.0	74.0
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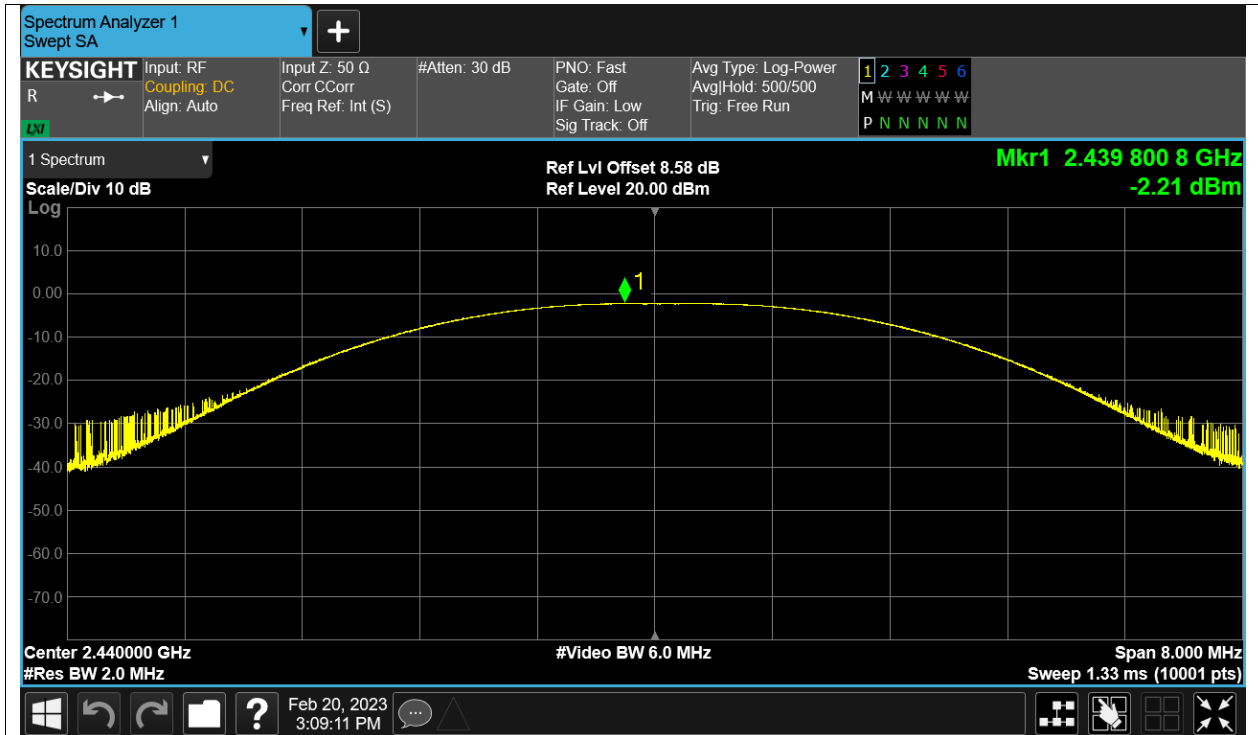
5.2 Test Results

5.2.1 RF Output Power Spot-check.

Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE	2402	Ant1	-2.419	30	Pass
NVNT	BLE	2440	Ant1	-2.206	30	Pass
NVNT	BLE	2480	Ant1	-2.261	30	Pass





Power NVNT BLE 2480MHz Ant1



-----End of report-----