



427 West 12800 South  
Draper, UT 84020

## Test Report Certification

|                                  |                                        |
|----------------------------------|----------------------------------------|
| <b>FCC ID</b>                    | SWX-WAVEAM                             |
| <b>IC ID</b>                     | 6545A-WAVEAM                           |
| <b>Equipment Under Test</b>      | Wave-AP-Micro                          |
| <b>Test Report Serial Number</b> | TR7569_01                              |
| <b>Date of Tests</b>             | August 12, through September 12, 2022, |
| <b>Report Issue Date</b>         | October 19, 2022                       |

| <b>Test Specification</b>                        | <b>Applicant</b>                                                  |
|--------------------------------------------------|-------------------------------------------------------------------|
| 47 CFR FCC Part 15, Subpart C<br>RSS-GEN Issue 5 | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |



NVLAP LAB CODE 600241-0

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## Certification of Engineering Report

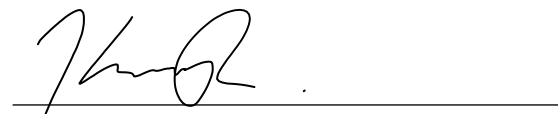
This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

|                     |               |
|---------------------|---------------|
| <b>Applicant</b>    | Ubiquiti Inc. |
| <b>Manufacturer</b> | Ubiquiti Inc. |
| <b>Brand Name</b>   | Wave          |
| <b>Model Number</b> | Wave-AP-Micro |
| <b>FCC ID</b>       | SWX-WAVEAM    |
| <b>IC ID</b>        | 6545A-WAVEAM  |

On this 19<sup>th</sup> day of October 2022, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory



Written By: Kimberly Rodriguez



Reviewed By: Richard L. Winter

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| Revision History |                         |                  |
|------------------|-------------------------|------------------|
| Revision         | Description             | Date             |
| 01               | Original Report Release | October 19, 2022 |

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# 1 Client Information

## 1.1 Applicant

|                     |                                                                   |
|---------------------|-------------------------------------------------------------------|
| <b>Company</b>      | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |
| <b>Contact Name</b> | Alex Macon                                                        |
| <b>Title</b>        | Compliance Manager                                                |

## 1.2 Manufacturer

|                     |                                                                   |
|---------------------|-------------------------------------------------------------------|
| <b>Company</b>      | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |
| <b>Contact Name</b> | Alex Macon                                                        |
| <b>Title</b>        | Compliance Manager                                                |

## 2 Equipment Under Test (EUT)

### 2.1 Identification of EUT

|                        |                                   |
|------------------------|-----------------------------------|
| <b>Brand Name</b>      | Wave                              |
| <b>Model Number</b>    | Wave-AP-Micro                     |
| <b>Serial Number</b>   | 0418D6A28CB3                      |
| <b>Dimensions (cm)</b> | 28.4      x    15.6      x    7.6 |

### 2.2 Description of EUT

The Wave-AP-Micro is 60 GHz point-to-multipoint customer premise equipment that features wave technology with a 1.5+ Gbps throughput rate. The Wave-AP-Micro is also equipped with a 5 GHz Wi-Fi 6 backup radio to sustain connectivity during a 60 GHz link disruption caused by inclement weather conditions. A Bluetooth LE transceiver is included for device management. The Wave-AP-Micro is an outdoor device and has an Ethernet port which is used for data transfer and to provide power using an Ubiquiti U-POE-at 48-volt PoE power adapter.

This report covers the circuitry of the device subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory test report.

### 2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

| <b>Brand Name<br/>Model Number<br/>Serial Number</b>       | <b>Description</b>      | <b>Name of Interface Ports /<br/>Interface Cables</b> |
|------------------------------------------------------------|-------------------------|-------------------------------------------------------|
| BN: Wave<br>MN: Wave-AP-Micro (Note 1)<br>SN: 0418D6A28CB3 | Wireless P-P/P-MP Radio | See Section 2.4                                       |
| BN: Ubiquiti<br>MN: U-POE-at<br>SN: N/A                    | PoE Power Adapter       | Shielded or Un-shielded cat 5e cable                  |
| BN: Dell<br>MN: XPS 13<br>SN: N/A                          | Laptop Computer         | Shielded or Un-shielded cat 5e cable                  |

Notes: (1) EUT

(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

## 2.4 Interface Ports on EUT

| Name of Ports | No. of Ports Fitted to EUT | Cable Description/Length                     |
|---------------|----------------------------|----------------------------------------------|
| PoE In        | 1                          | Shielded or Un-shielded cat 5e cable/7 meter |

## 2.5 Operating Environment

|                     |                                     |
|---------------------|-------------------------------------|
| Power Supply        | 48 Volts PoE (120V to PoE Injector) |
| AC Mains Frequency  | 60Hz to PoE Injector                |
| Temperature         | 22.0-22.7 °C                        |
| Humidity            | 18.7-22.9 %                         |
| Barometric Pressure | 1009 mBar                           |

## 2.6 Operating Modes

The Wave-AP-Micro was connected to a personal computer laptop and tested using test software in order to enable to constant duty cycle greater or equal to 98% of the Bluetooth transceiver.

## 2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.

## 2.8 Block Diagram of Test Configuration

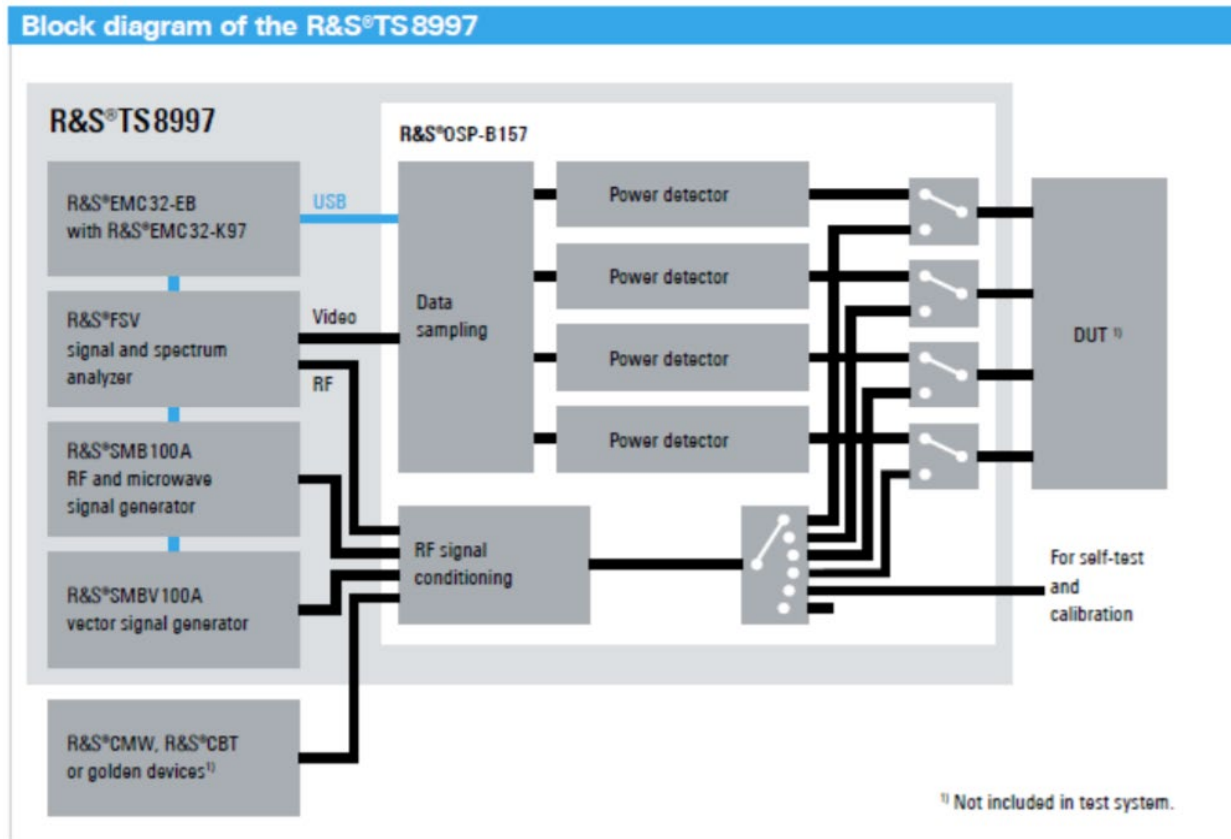


Diagram 1: Test Configuration Block Diagram

## 2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

## 2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

There were no deviations, opinions, additional information or interpretations from the test specification.

### 3 Test Specification, Method and Procedures

#### 3.1 Test Specification

|                        |                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Title</b>           | -47 CFR FCC Part 15, Subpart C 15.203, 15.209 and 15.247<br>Limits and methods of measurement of radio interference characteristics of radio frequency devices.<br>-RSS-Gen, issue 5, General Requirements for Compliance of Radio Apparatus<br>-RSS-247, Issue Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices |
| <b>Purpose of Test</b> | The tests were performed to demonstrate initial compliance                                                                                                                                                                                                                                                                                                                                   |

#### 3.2 Methods & Procedures

##### 3.2.1 47 CFR FCC Part 15 Section 15.203 / RSS-Gen Section 6.8

See test standard for details.

##### 3.2.2 47 CFR FCC Part 15 Section 15.207 / RSS-Gen Section 6.13

See test standard for details.

##### 3.2.3 47 CFR FCC Part 15 Section 15.247 / RSS-247 Section 5

See test standard for details.

#### 3.3 FCC Part 15, Subpart C / RSS-247 / RSS-GEN

##### 3.3.1 Summary of Tests

| FCC Section | ISED Section  | Environmental Phenomena              | Frequency Range (MHZ)  | Result    |
|-------------|---------------|--------------------------------------|------------------------|-----------|
| 15.203      | N/A           | Antenna requirements                 | Structural Requirement | Compliant |
| 15.207      | RSS-Gen       | Conducted Disturbance at Mains Port  | 0.15 to 30             | Compliant |
| 15.247(a)   | RSS-247 § 5.2 | Bandwidth Requirement                | 2400 to 2480           | Compliant |
| 15.247(b)   | RSS-247 § 5.4 | Peak Output Power                    | 2400 to 2480           | Compliant |
| 15.247(d)   | RSS-247 § 5.4 | Antenna Conducted Spurious Emissions | 0.009 to 40000         | N/A       |
| 15.247(d)   | RSS-247 § 5.4 | Radiated Spurious Emissions          | 30 to 40000            | Compliant |
| 15.247(e)   | RSS-247 § 5.2 | Peak Power Spectral Density          | 2400 to 2480           | Compliant |

The testing was performed according to the procedures in ANSI C63.10-2013, KDB 558074 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.

### **3.4 Results**

In the configuration tested, the EUT complied with the requirements of the specification.

### **3.5 Test Location**

Testing was performed at the Unified Compliance Laboratory 3-meter and 10-meter chamber located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2023. This site has also been registered with Innovations, Science and Economic Development (ISED) department and was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until 30 June 2023. Unified Compliance Laboratory has been assigned Conformity Assessment Number US0223 by ISED and has registered MRA Test Site number US5037.

## 4 Test Equipment

### 4.1 Conducted Emissions at Mains Ports

| Type of Equipment | Manufacturer        | Model Number | Asset Number | Date of Last Calibration | Due Date of Calibration |
|-------------------|---------------------|--------------|--------------|--------------------------|-------------------------|
| EMI Receiver      | AFJ                 | FFT3010      | UCL-6754     | 12/8/2021                | 12/8/2022               |
| LISN              | AFJ                 | LS16C/10     | UCL-6749     | 12/6/2021                | 12/6/2023               |
| Cat6 ISN          | Teseq               | ISN T8-Cat6  | UCL-2971     | 1/30/2022                | 1/30/2023               |
| ISN               | Teseq               | ISN T800     | UCL-2974     | 6/27/2022                | 6/27/2023               |
| LISN              | Com-Power           | LIN-120C     | UCL-2612     | 1/6/2022                 | 1/6/2023                |
| AC Power Source   | Laplace Instruments | AC1000A      | UCL-2857     | N/A                      | N/A                     |
| Test Software     | UCL                 | Revision 1   | UCL-3107     | N/A                      | N/A                     |

Table 1: List of equipment used for Conducted Emissions Testing at Mains Port

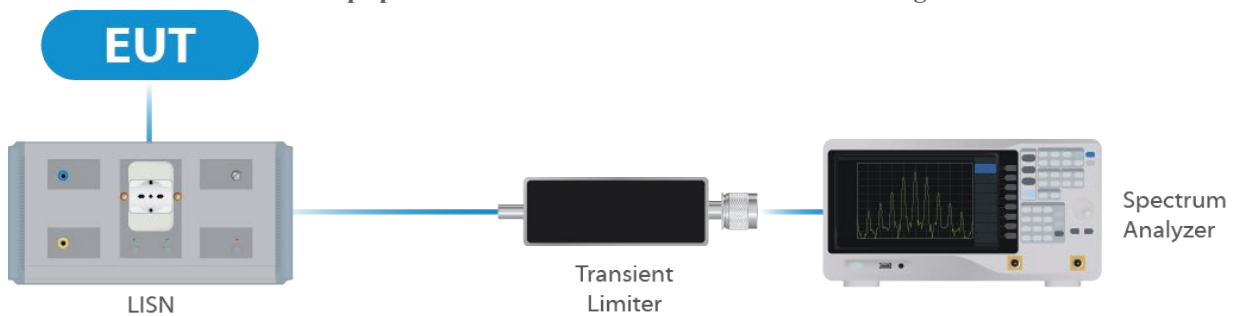


Figure 1: Conducted Emissions Test

## 4.2 Direct Connect at the Antenna Port Tests

| Type of Equipment       | Manufacturer | Model Number | Asset Number | Date of Last Calibration | Due Date of Calibration |
|-------------------------|--------------|--------------|--------------|--------------------------|-------------------------|
| Spectrum Analyzer       | R&S          | FSV40        | UCL-2861     | 1/03/2022                | 1/03/2023               |
| Signal Generator        | R&S          | SMB100A      | UCL-2864     | N/A                      | N/A                     |
| Vector Signal Generator | R&S          | SMBV100A     | UCL-2873     | N/A                      | N/A                     |
| Switch Extension        | R&S          | OSP-B157WX   | UCL-2867     | 1/03/2022                | 1/03/2023               |
| Switch Extension        | R&S          | OSP-150W     | UCL-2870     | 1/03/2022                | 1/03/2023               |

Table 2: List of equipment used for Direct Connect at the Antenna Port

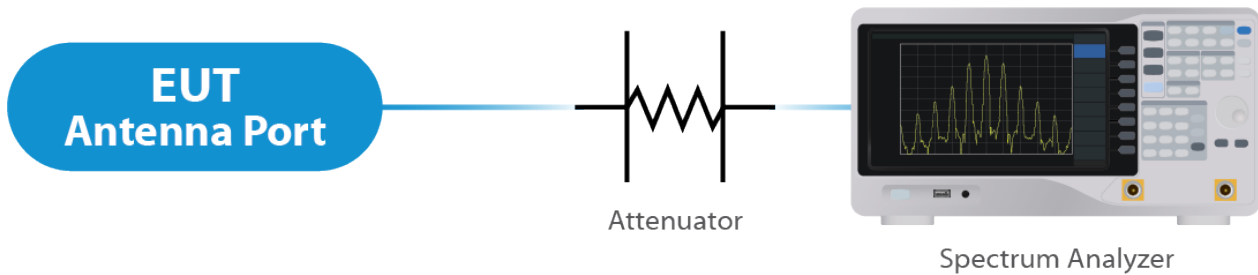
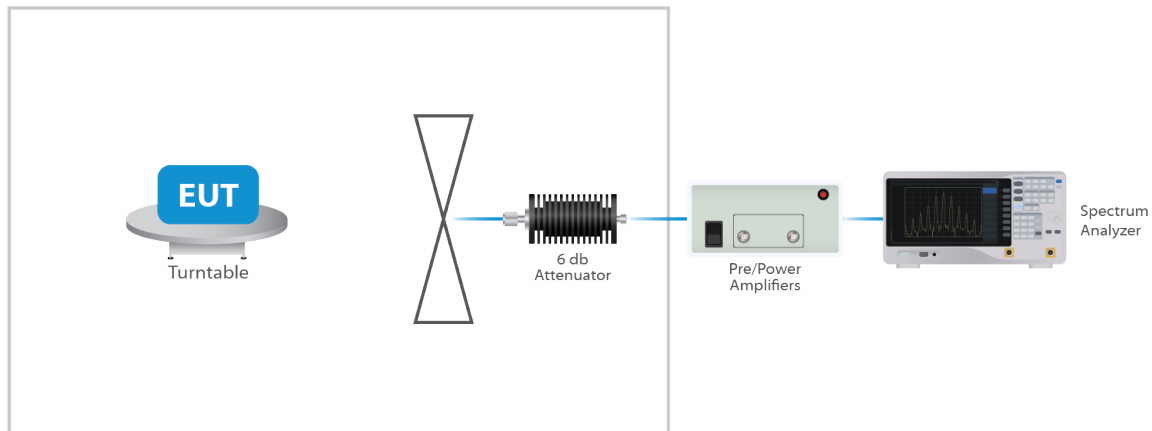


Figure 2: Direct Connect at the Antenna Port Test

### 4.3 Radiated Emissions

| Type of Equipment              | Manufacturer          | Model Number  | Asset Number | Date of Last Calibration | Due Date of Calibration |
|--------------------------------|-----------------------|---------------|--------------|--------------------------|-------------------------|
| EMI Receiver                   | Keysight              | N9038A        | UCL-2778     | 1/4/2022                 | 1/4/2023                |
| Pre-Amplifier<br>9 kHz – 1 GHz | Sonoma<br>Instruments | 310N          | UCL-2889     | 10/7/2021                | 11/7/2022               |
| Broadband<br>Antenna           | Scwarzbeck            | VULB 9163     | UCL-3062     | 9/13/2022                | 9/13/2024               |
| Broadband<br>Antenna           | Scwarzbeck            | VULB 9163     | UCL-3071     | 6/08/2022                | 6/22/2024               |
| Double Ridge<br>Horn Antenna   | Scwarzbeck            | BBHA<br>9120D | UCL-3065     | 9/22/2022                | 9/22/2024               |
| Log Periodic                   | Scwarzbeck            | STLP 9129     | UCL-3068     | 11/16/2020               | 11/16/2022              |
| 15 - 40 GHz<br>Horn Antenna    | Scwarzbeck            | BBHA 9170     | UCL-2487     | 6/09/2022                | 6/09/2024               |
| 1 – 18 GHz<br>Amplifier        | Com-Power             | PAM 118A      | UCL-3833     | 10/7/2021                | 11/7/2022               |
| Test Software                  | UCL                   | Revision 1    | UCL-3108     | N/A                      | N/A                     |

**Table 3: List of equipment used for Radiated Emissions**



**Figure 3: Radiated Emissions Test**

### 4.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

## 4.5 Measurement Uncertainty

| Test                                  | Uncertainty ( $\pm$ dB) | Confidence (%) |
|---------------------------------------|-------------------------|----------------|
| Conducted Emissions                   | 1.44                    | 95             |
| Radiated Emissions (9 kHz to 30 MHz)  | 2.50                    | 95             |
| Radiated Emissions (30 MHz to 1 GHz)  | 4.38                    | 95             |
| Radiated Emissions (1 GHz to 18 GHz)  | 4.37                    | 95             |
| Radiated Emissions (18 GHz to 40 GHz) | 3.93                    | 95             |
| <b>Direct Connect Tests</b>           | <b>K Factor</b>         | <b>Value</b>   |
| Emissions Bandwidth                   | 2                       | 2.0%           |
| Output Power                          | 2                       | 1.0 dB         |
| Peak Power Spectral Density           | 2                       | 1.3 dB         |
| Band Edge                             | 2                       | 0.8 dB         |
| Transmitter Spurious Emissions        | 2                       | 1.8 dB         |

## **5 Test Results**

### **5.1 §15.203 Antenna Requirements**

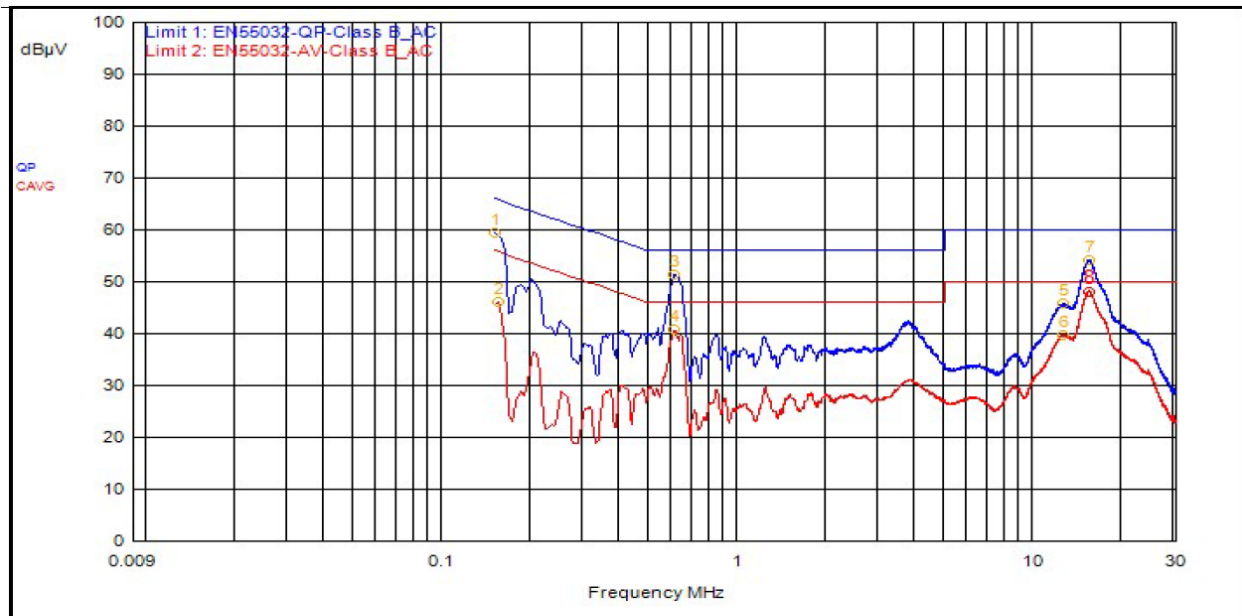
The EUT uses an integral antenna. The Maximum gain of the antenna is 3.5 dBi. The antenna is not user replaceable.

## Results

The EUT complied with the specification

## 5.2 Conducted Emissions at Mains Ports Data

### 5.2.1 PoE Injector AC Mains (Line)



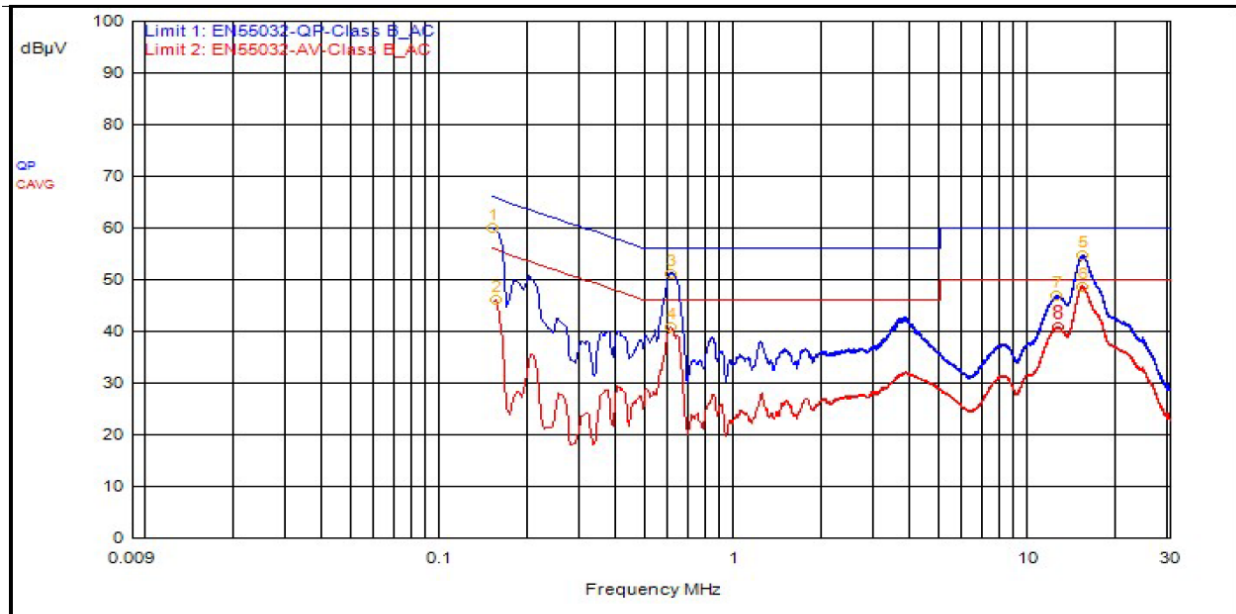
| ID | Frequency  | Probe | Cable | Atten. | Detector | Meter Read | Meas Level | Limit 1 | Limit 1 Dist. | Limit 2 | Limit 2 Dist. |
|----|------------|-------|-------|--------|----------|------------|------------|---------|---------------|---------|---------------|
| 3  | 606,000kHz | 9.5   | 0.2   |        | QPeak    | 41.7       | 51.4       | 56.0    | -4.6          |         |               |
| 7  | 15.327MHz  | 9.7   | 0.2   |        | QPeak    | 44.3       | 54.2       | 60.0    | -5.8          |         |               |
| 1  | 150,000kHz | 9.5   | 0.0   |        | QPeak    | 49.9       | 59.4       | 66.0    | -6.6          |         |               |
| 5  | 12.462MHz  | 9.6   | 0.3   |        | QPeak    | 35.8       | 45.7       | 60.0    | -14.3         |         |               |
| 2  | 153,000kHz | 9.5   | 0.0   |        | C_AVG    | 36.6       | 46.1       |         |               | 55.8    | -9.7          |
| 4  | 606,000kHz | 9.5   | 0.2   |        | C_AVG    | 31.0       | 40.7       |         |               | 46.0    | -5.3          |
| 6  | 12.465MHz  | 9.6   | 0.3   |        | C_AVG    | 29.9       | 39.8       |         |               | 50.0    | -10.2         |
| 8  | 15.255MHz  | 9.7   | 0.2   |        | C_AVG    | 38.3       | 48.1       |         |               | 50.0    | -1.9          |

Meas. Level = Meter Read + Probe + Cable

## Result

The EUT complied with the specification limit.

## 5.2.2 PoE Injector AC Mains (Neutral)



| ID | Frequency  | Probe | Cable | Atten. | Detector | Meter Read | Meas Level | Limit 1 | Limit 1 Dist. | Limit 2 | Limit 2 Dist. |
|----|------------|-------|-------|--------|----------|------------|------------|---------|---------------|---------|---------------|
| 3  | 603,000kHz | 9.5   | 0.2   |        | QPeak    | 41.5       | 51.2       | 56.0    | -4.8          |         |               |
| 5  | 15.084MHz  | 9.6   | 0.2   |        | QPeak    | 44.9       | 54.7       | 60.0    | -5.3          |         |               |
| 1  | 150,000kHz | 9.5   | 0.0   |        | QPeak    | 50.3       | 59.9       | 66.0    | -6.1          |         |               |
| 7  | 12.354MHz  | 9.6   | 0.3   |        | QPeak    | 37.0       | 46.9       | 60.0    | -13.1         |         |               |
| 2  | 153,000kHz | 9.5   | 0.0   |        | C_AVG    | 36.7       | 46.2       |         |               | 55.8    | -9.6          |
| 4  | 606,000kHz | 9.5   | 0.2   |        | C_AVG    | 31.1       | 40.8       |         |               | 46.0    | -5.2          |
| 6  | 15.072MHz  | 9.6   | 0.2   |        | C_AVG    | 38.9       | 48.7       |         |               | 50.0    | -1.3          |
| 8  | 12.453MHz  | 9.6   | 0.3   |        | C_AVG    | 30.8       | 40.7       |         |               | 50.0    | -9.3          |

Meas. Level = Meter Read + Probe + Cable

### Result

The EUT complied with the specification limit.

---

### 5.3 §15.247(a)(2) Emissions Bandwidth

| Frequency<br>(MHz) | Emissions 6 dB Bandwidth<br>(MHz) | Emissions 99% Bandwidth<br>(MHz) |
|--------------------|-----------------------------------|----------------------------------|
| 2402               | 0.653                             | 0.990                            |
| 2442               | 0.653                             | 0.995                            |
| 2480               | 0.673                             | 1.005                            |

#### Result

In the configuration tested, the 6 dB bandwidth was greater than 500 kHz; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plot within the Annex).

## 5.4 §15.247(b)(3) Maximum Average Output Power

The maximum average RF conducted output power measured for this device was 5.9 dBm or 3.9 mW. The limit is 30 dBm or 1 Watt when using antennas with 6 dBi or less gain. The antenna has a gain of 3.5 dBi.

| Frequency<br>(MHz) | Measured Output Power<br>(dBm) | Output Power<br>(mW) |
|--------------------|--------------------------------|----------------------|
| 2402               | 5.7                            | 3.7                  |
| 2442               | 5.9                            | 3.9                  |
| 2480               | 4.2                            | 2.6                  |

### Result

In the configuration tested, the maximum average RF output power was less than 1 watt; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plot within the Annex).

## 5.5 §15.247(d) Spurious Emissions

### 5.5.1 Conducted Spurious Emissions

The frequency range is from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The table show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown within the Annex are plots with the EUT tuned to the upper and lower channels. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be attenuated 30 dB below the highest power spectral density level measured within the authorized band as measured with a 100 kHz RBW.

#### Result

Conducted spurious emissions were attenuated 30 dB or more below the fundamental; therefore, the EUT complies with the specification.

### 5.5.2 Radiated Spurious Emissions in the Restricted Bands of §15.205

The frequency range is from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emissions was investigated to measure any radiated emissions in the restricted bands. The following tables show measurements of any emissions that fell into the restricted bands of §15.205. The tables show the worst-case emissions measured from the EUT. For frequencies above 18.0 GHz, a measurement distance of 1 meter was used. The noise floor was a minimum of 6 dB below the limits. The emissions in the restricted bans must meet the limits specified in §15.209. Tabular data for each of the spurious emissions is shown below for each of the units. Plots of the band edges are also shown.

#### Result

All emissions in the restricted bands of §15.205 met the limits specified in §15.209; therefore, the EUT complies with the specification.

| Frequency  | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol.       | Meas. Time (s) | RBW (Hz) | Detector | Correction (dB) |
|------------|----------------|----------------|-------------|-------------|------------|------------|----------------|----------|----------|-----------------|
| 7.4408 GHz | 45.759         | 74             | -28.241     | 310         | 3.802      | Horizontal | 5              | 1000000  | Peak     | -3.853          |
| 7.4408 GHz | 32.392         | 54             | -21.608     | 310         | 3.802      | Horizontal | 5              | 1000000  | Average  | -3.853          |
| 7.2068 GHz | 49.92          | 74             | -24.08      | 36          | 1.643      | Horizontal | 5              | 1000000  | Peak     | -4.337          |
| 7.2068 GHz | 37.373         | 54             | -16.627     | 36          | 1.643      | Horizontal | 5              | 1000000  | Average  | -4.337          |
| 7.3269 GHz | 46.98          | 74             | -27.02      | 325         | 3.802      | Horizontal | 5              | 1000000  | Peak     | -3.733          |
| 7.3269 GHz | 33.527         | 54             | -20.473     | 325         | 3.802      | Horizontal | 5              | 1000000  | Average  | -3.733          |
| 17.006 GHz | 32.693         | 54             | -21.307     | 178         | 1.500      | Vertical   | 5              | 1000000  | Average  | -4.552          |
| 17.006 GHz | 45.707         | 74             | -28.293     | 178         | 1.500      | Vertical   | 5              | 1000000  | Peak     | -4.552          |
| 17.243 GHz | 46.04          | 74             | -27.96      | 312         | 1.500      | Vertical   | 5              | 1000000  | Peak     | -5.038          |
| 17.243 GHz | 32.165         | 54             | -21.835     | 312         | 1.500      | Vertical   | 5              | 1000000  | Average  | -5.038          |

### 5.5.3 Band Edge Results

#### Band Edge low (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

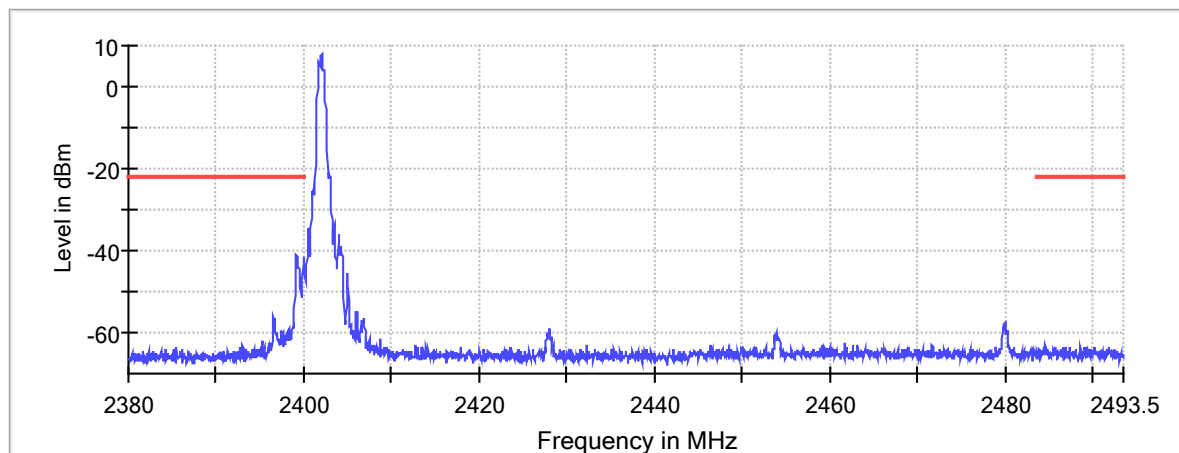
#### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |

#### Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2399.175000     | -40.8       | 19.0        | -21.9       | PASS   |
| 2399.975000     | -41.6       | 19.7        | -21.9       | PASS   |
| 2399.225000     | -41.7       | 19.8        | -21.9       | PASS   |
| 2399.275000     | -42.3       | 20.4        | -21.9       | PASS   |
| 2399.125000     | -42.8       | 20.9        | -21.9       | PASS   |
| 2399.925000     | -43.5       | 21.6        | -21.9       | PASS   |
| 2399.425000     | -44.0       | 22.1        | -21.9       | PASS   |
| 2399.375000     | -44.1       | 22.2        | -21.9       | PASS   |
| 2399.325000     | -44.3       | 22.4        | -21.9       | PASS   |
| 2399.475000     | -44.3       | 22.4        | -21.9       | PASS   |
| 2399.075000     | -46.0       | 24.1        | -21.9       | PASS   |
| 2399.525000     | -46.4       | 24.5        | -21.9       | PASS   |
| 2399.875000     | -46.7       | 24.8        | -21.9       | PASS   |
| 2399.025000     | -47.8       | 25.9        | -21.9       | PASS   |
| 2399.575000     | -47.9       | 26.0        | -21.9       | PASS   |

Band Edge



— Limit — Sum Level × Fail

## Emissions in restricted frequency bands (Average) (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

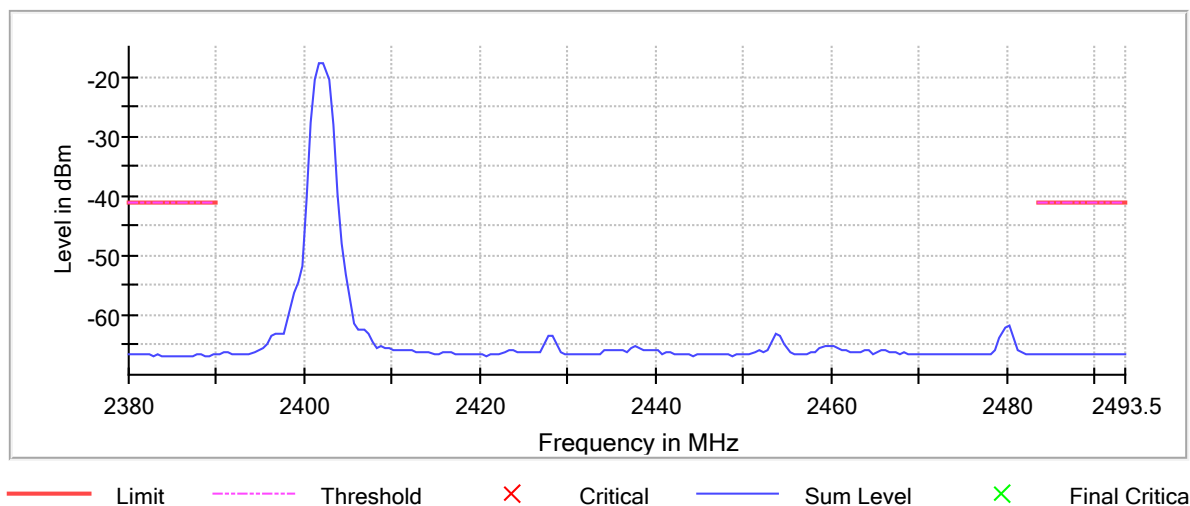
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |

### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2489.750000     | -66.4       | 25.2        | -41.2       |
| 2490.750000     | -66.4       | 25.2        | -41.2       |
| 2486.750000     | -66.4       | 25.2        | -41.2       |
| 2489.250000     | -66.5       | 25.3        | -41.2       |
| 2485.750000     | -66.5       | 25.3        | -41.2       |
| 2486.250000     | -66.5       | 25.3        | -41.2       |
| 2490.250000     | -66.5       | 25.3        | -41.2       |
| 2381.750000     | -66.5       | 25.3        | -41.2       |
| 2380.250000     | -66.5       | 25.3        | -41.2       |
| 2380.000000     | -66.5       | 25.3        | -41.2       |
| 2483.750000     | -66.5       | 25.3        | -41.2       |
| 2488.750000     | -66.5       | 25.3        | -41.2       |
| 2488.250000     | -66.5       | 25.3        | -41.2       |
| 2484.750000     | -66.5       | 25.3        | -41.2       |
| 2485.250000     | -66.6       | 25.4        | -41.2       |

Restricted Band



## Emissions in restricted frequency bands (Peak) (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

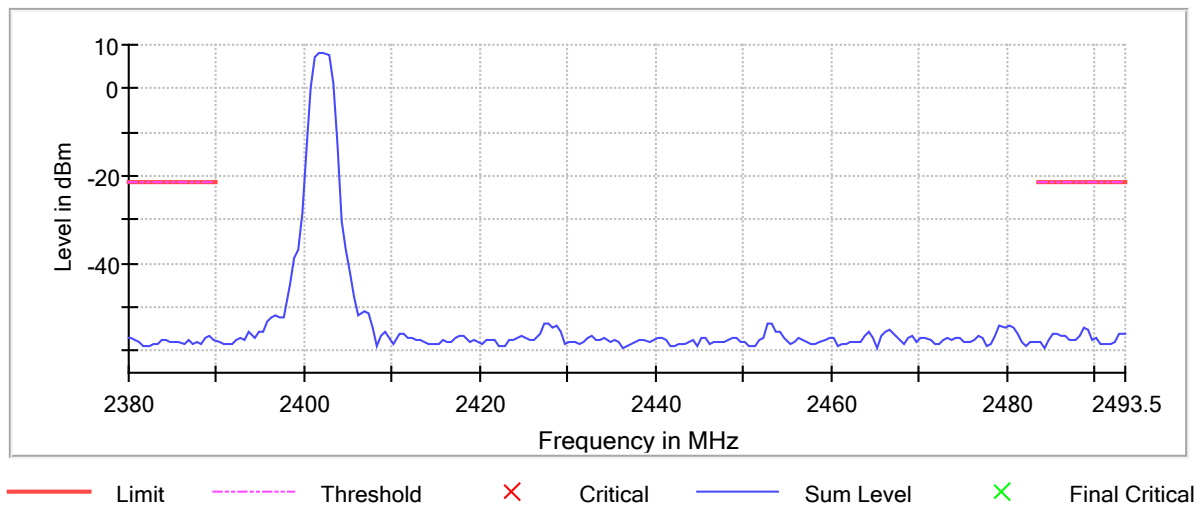
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |

### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2488.750000     | -54.6       | 33.4        | -21.2       |
| 2489.250000     | -55.0       | 33.8        | -21.2       |
| 2492.750000     | -55.9       | 34.7        | -21.2       |
| 2485.750000     | -56.0       | 34.8        | -21.2       |
| 2493.500000     | -56.0       | 34.8        | -21.2       |
| 2493.250000     | -56.0       | 34.8        | -21.2       |
| 2485.250000     | -56.1       | 34.9        | -21.2       |
| 2488.250000     | -56.5       | 35.3        | -21.2       |
| 2486.250000     | -56.7       | 35.5        | -21.2       |
| 2486.750000     | -56.7       | 35.5        | -21.2       |
| 2389.250000     | -56.8       | 35.6        | -21.2       |
| 2380.250000     | -57.0       | 35.8        | -21.2       |
| 2380.000000     | -57.0       | 35.8        | -21.2       |
| 2388.750000     | -57.0       | 35.8        | -21.2       |
| 2490.250000     | -57.3       | 36.1        | -21.2       |

Restricted Band



## Band Edge low (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

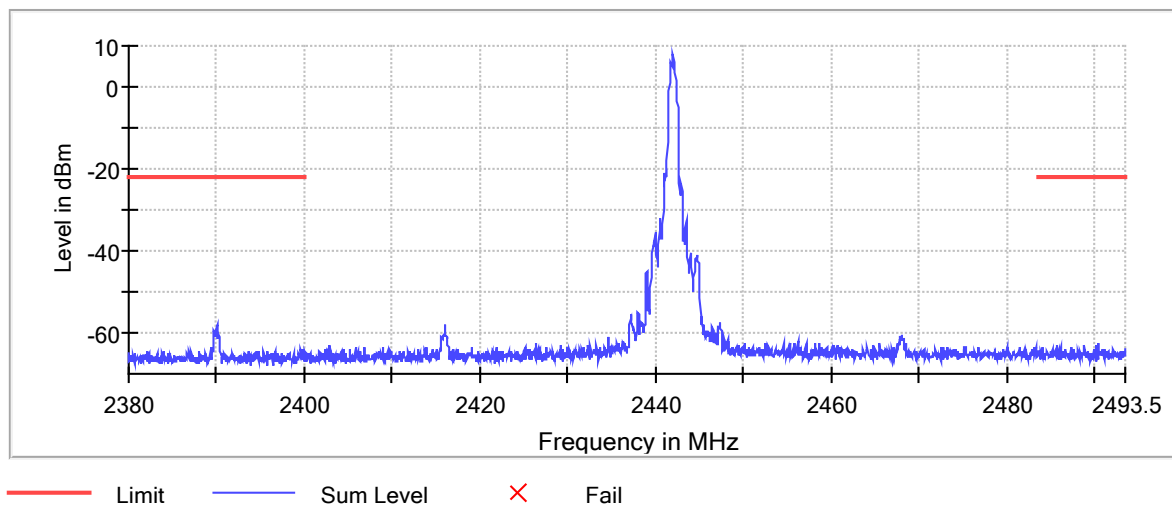
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2442.000000         | PASS   |

### Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2390.025000     | -58.2       | 36.2        | -22.0       | PASS   |
| 2389.975000     | -59.3       | 37.3        | -22.0       | PASS   |
| 2389.725000     | -59.6       | 37.6        | -22.0       | PASS   |
| 2390.125000     | -59.8       | 37.8        | -22.0       | PASS   |
| 2390.225000     | -60.2       | 38.2        | -22.0       | PASS   |
| 2389.925000     | -60.2       | 38.2        | -22.0       | PASS   |
| 2389.775000     | -60.6       | 38.6        | -22.0       | PASS   |
| 2389.875000     | -60.7       | 38.7        | -22.0       | PASS   |
| 2390.075000     | -60.8       | 38.8        | -22.0       | PASS   |
| 2390.275000     | -61.0       | 39.0        | -22.0       | PASS   |
| 2389.825000     | -61.1       | 39.1        | -22.0       | PASS   |
| 2389.675000     | -61.1       | 39.1        | -22.0       | PASS   |
| 2390.175000     | -61.7       | 39.7        | -22.0       | PASS   |
| 2389.625000     | -62.0       | 40.0        | -22.0       | PASS   |
| 2390.325000     | -62.2       | 40.2        | -22.0       | PASS   |

Band Edge



## Emissions in restricted frequency bands (Average) (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

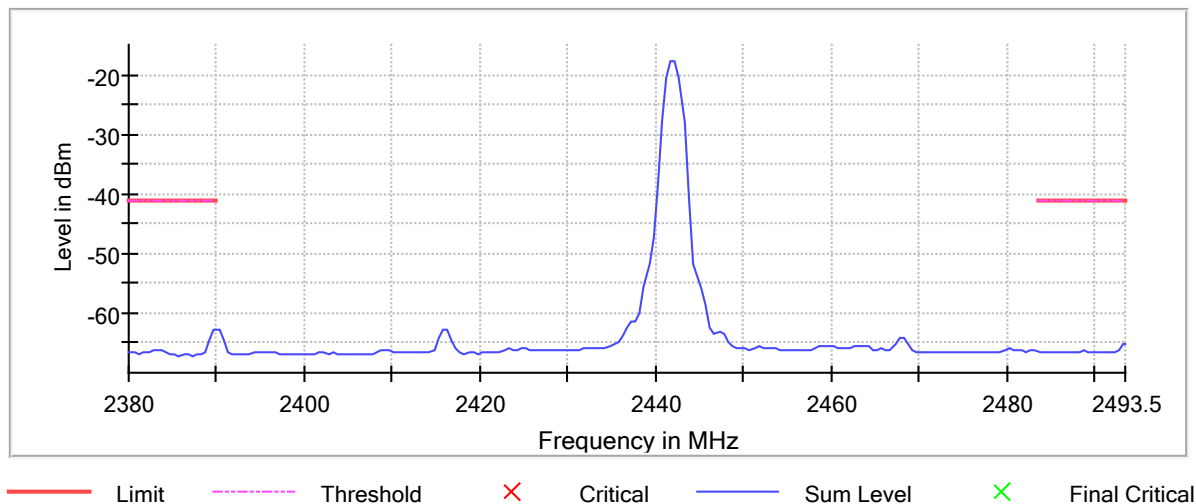
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2442.000000         | PASS   |

### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2389.750000     | -62.7       | 21.5        | -41.2       |
| 2389.250000     | -64.5       | 23.3        | -41.2       |
| 2493.500000     | -65.1       | 23.9        | -41.2       |
| 2493.250000     | -65.1       | 23.9        | -41.2       |
| 2383.250000     | -66.1       | 24.9        | -41.2       |
| 2383.750000     | -66.1       | 24.9        | -41.2       |
| 2382.750000     | -66.3       | 25.1        | -41.2       |
| 2492.750000     | -66.4       | 25.2        | -41.2       |
| 2488.750000     | -66.4       | 25.2        | -41.2       |
| 2380.250000     | -66.4       | 25.2        | -41.2       |
| 2380.000000     | -66.4       | 25.2        | -41.2       |
| 2487.250000     | -66.5       | 25.3        | -41.2       |
| 2487.750000     | -66.5       | 25.3        | -41.2       |
| 2388.750000     | -66.5       | 25.3        | -41.2       |
| 2484.750000     | -66.5       | 25.3        | -41.2       |

Restricted Band



## Emissions in restricted frequency bands (Peak) (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

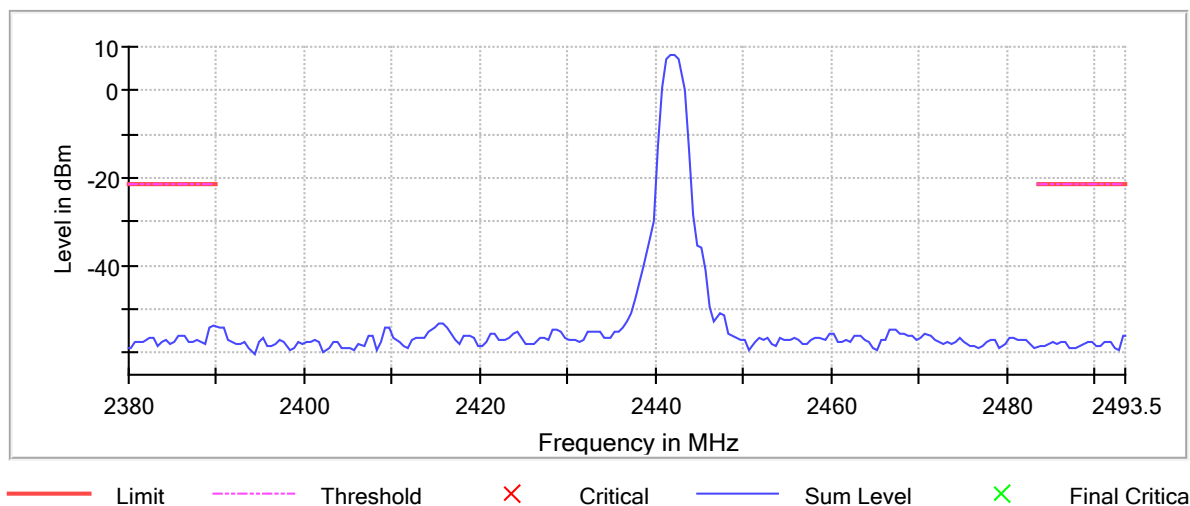
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2442.000000         | PASS   |

### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2389.750000     | -54.0       | 32.8        | -21.2       |
| 2389.250000     | -54.3       | 33.1        | -21.2       |
| 2385.750000     | -56.1       | 34.9        | -21.2       |
| 2493.500000     | -56.2       | 35.0        | -21.2       |
| 2493.250000     | -56.2       | 35.0        | -21.2       |
| 2386.250000     | -56.2       | 35.0        | -21.2       |
| 2382.250000     | -56.6       | 35.4        | -21.2       |
| 2382.750000     | -56.6       | 35.4        | -21.2       |
| 2387.750000     | -56.9       | 35.7        | -21.2       |
| 2384.250000     | -57.1       | 35.9        | -21.2       |
| 2491.750000     | -57.3       | 36.1        | -21.2       |
| 2491.250000     | -57.3       | 36.1        | -21.2       |
| 2489.750000     | -57.4       | 36.2        | -21.2       |
| 2386.750000     | -57.4       | 36.2        | -21.2       |
| 2387.250000     | -57.4       | 36.2        | -21.2       |

Restricted Band



## Band Edge low (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

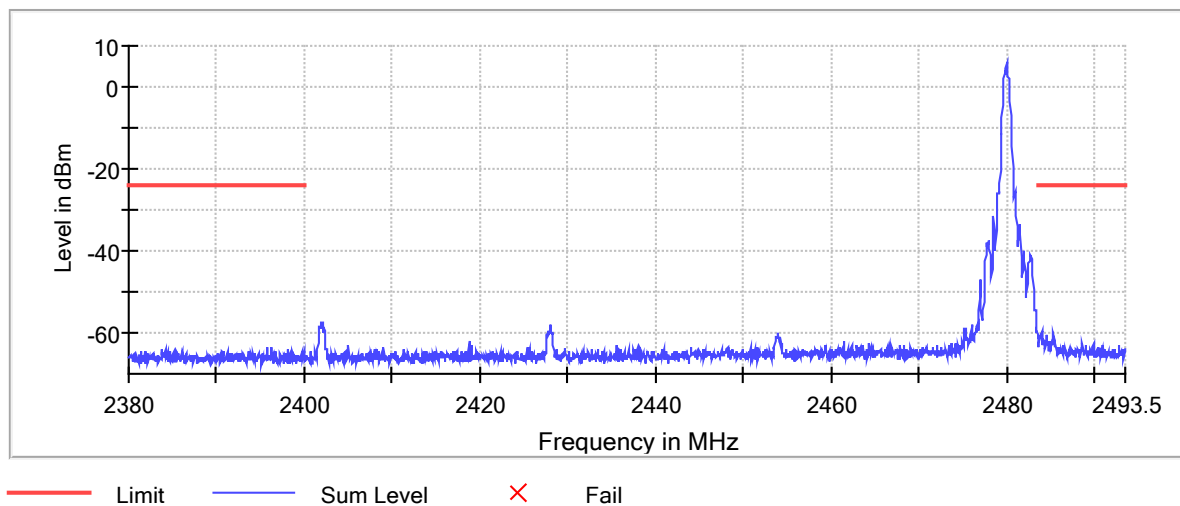
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |

### Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2483.975000     | -59.7       | 35.7        | -24.0       | PASS   |
| 2485.375000     | -59.9       | 35.9        | -24.0       | PASS   |
| 2485.325000     | -60.3       | 36.3        | -24.0       | PASS   |
| 2484.525000     | -60.3       | 36.3        | -24.0       | PASS   |
| 2483.525000     | -60.5       | 36.5        | -24.0       | PASS   |
| 2483.625000     | -60.7       | 36.7        | -24.0       | PASS   |
| 2483.825000     | -61.0       | 37.0        | -24.0       | PASS   |
| 2483.775000     | -61.1       | 37.1        | -24.0       | PASS   |
| 2483.925000     | -61.2       | 37.2        | -24.0       | PASS   |
| 2485.275000     | -61.2       | 37.2        | -24.0       | PASS   |
| 2483.875000     | -61.5       | 37.5        | -24.0       | PASS   |
| 2484.125000     | -61.5       | 37.5        | -24.0       | PASS   |
| 2484.175000     | -61.5       | 37.5        | -24.0       | PASS   |
| 2483.575000     | -61.7       | 37.7        | -24.0       | PASS   |
| 2485.175000     | -61.7       | 37.7        | -24.0       | PASS   |

Band Edge



## Emissions in restricted frequency bands (Average) (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

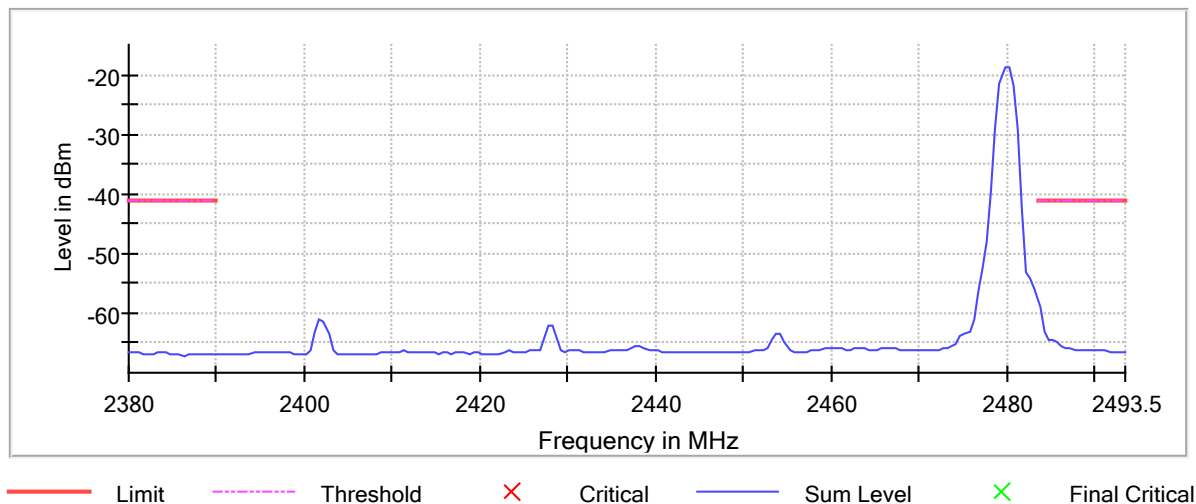
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |

### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2483.750000     | -58.9       | 17.7        | -41.2       |
| 2484.250000     | -63.0       | 21.8        | -41.2       |
| 2484.750000     | -64.6       | 23.4        | -41.2       |
| 2485.250000     | -64.6       | 23.4        | -41.2       |
| 2485.750000     | -64.8       | 23.6        | -41.2       |
| 2486.250000     | -65.5       | 24.3        | -41.2       |
| 2486.750000     | -65.8       | 24.6        | -41.2       |
| 2487.250000     | -65.9       | 24.7        | -41.2       |
| 2488.250000     | -66.1       | 24.9        | -41.2       |
| 2487.750000     | -66.1       | 24.9        | -41.2       |
| 2489.250000     | -66.1       | 24.9        | -41.2       |
| 2488.750000     | -66.2       | 25.0        | -41.2       |
| 2489.750000     | -66.2       | 25.0        | -41.2       |
| 2490.250000     | -66.3       | 25.1        | -41.2       |
| 2491.250000     | -66.3       | 25.1        | -41.2       |

Restricted Band



## Emissions in restricted frequency bands (Peak) (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

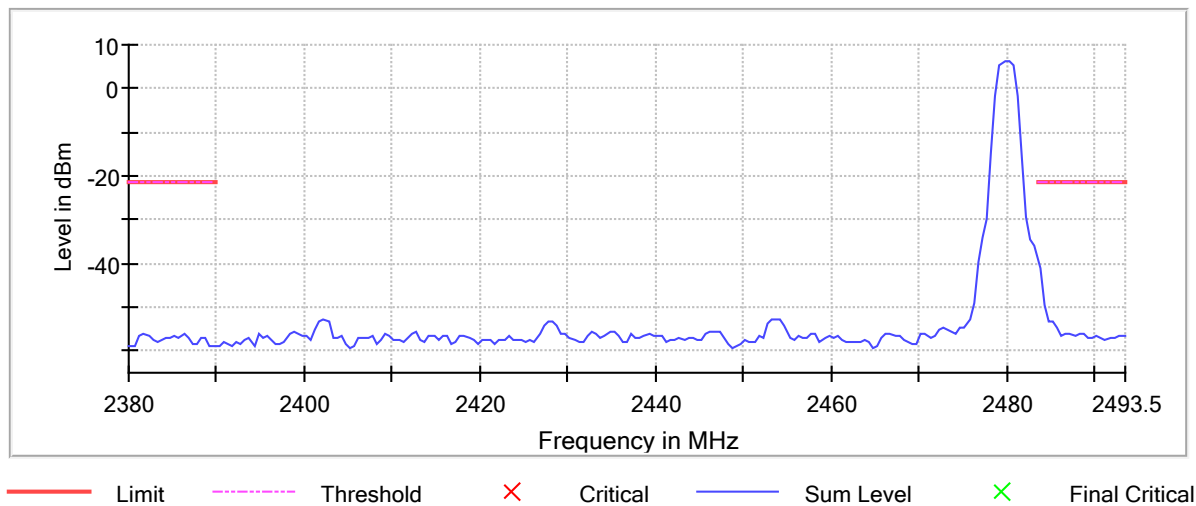
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |

### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2483.750000     | -41.0       | 19.8        | -21.2       |
| 2484.250000     | -49.7       | 28.5        | -21.2       |
| 2485.250000     | -53.2       | 32.0        | -21.2       |
| 2484.750000     | -53.3       | 32.1        | -21.2       |
| 2485.750000     | -54.9       | 33.7        | -21.2       |
| 2487.250000     | -56.1       | 34.9        | -21.2       |
| 2488.750000     | -56.1       | 34.9        | -21.2       |
| 2486.750000     | -56.1       | 34.9        | -21.2       |
| 2386.250000     | -56.2       | 35.0        | -21.2       |
| 2381.750000     | -56.2       | 35.0        | -21.2       |
| 2488.250000     | -56.3       | 35.1        | -21.2       |
| 2382.250000     | -56.4       | 35.2        | -21.2       |
| 2486.250000     | -56.4       | 35.2        | -21.2       |
| 2493.500000     | -56.5       | 35.3        | -21.2       |
| 2493.250000     | -56.5       | 35.3        | -21.2       |

Restricted Band



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## 5.6 §15.247(e) Maximum Average Power Spectral Density

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. Results of this testing are summarized.

| Frequency<br>(MHz) | Measurement<br>(dBm) | Criteria<br>(dBm) |
|--------------------|----------------------|-------------------|
| 2402               | -2.1                 | 8.0               |
| 2442               | -1.8                 | 8.0               |
| 2480               | -3.5                 | 8.0               |

### Result

The maximum average power spectral density was less than the limit of 8 dBm; therefore, the EUT complies with the specification.

## Test Results

---

## FCC Part 47 §15.247 2400-2483.5 MHz 2018

### Hardware Setup: WMS Measurements\TS8997 Hardware Setup

|                    |                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Spectrum Analyzer: | SA FSV 40 (SA FSV 40) @ VISA (ADR<br>TCPIP::192.168.48.100::inst0::instr), SN 1321.3008K40/101752, FW<br>3.70                           |
| Vector Generator:  | VG SMW200A (VG SMW200A) @ VISA (ADR TCPIP0::A-N5182B-<br>301471::inst0::INSTR), SN 101752, FW 3.70                                      |
| Generator:         | SMB100A (SMB100A) @ VISA (ADR<br>TCPIP::192.168.48.110::inst0::INSTR), SN 180599, FW 3.20.390.24<br>/ Drv:Rev 2.21.0, 07/2016, CVI 2015 |
| OSP:               | OSP-B157W8PLUS (OSP-B157W8PLUS) @ VISA (ADR<br>TCPIP::192.168.48.157::inst0::instr), SN 1527.1144.06 / 100955, FW<br>2.00.1.0           |

## Summary

| Test                                              | Frequency (MHz) | Nominal Power (dBm) | Nominal Bandwidth (MHz) | Result |
|---------------------------------------------------|-----------------|---------------------|-------------------------|--------|
| RF output power                                   | 2402.000        | 15.0                | 1.000000                | PASS   |
| Minimum Emission Bandwidth 6 dB                   | 2402.000        | 15.0                | 1.000000                | PASS   |
| Peak Power Spectral Density                       | 2402.000        | 15.0                | 1.000000                | PASS   |
| Occupied Channel Bandwidth 99%                    | 2402.000        | 15.0                | 1.000000                | PASS   |
| Band Edge low                                     | 2402.000        | 15.0                | 1.000000                | PASS   |
| Tx Spurious Emission                              | 2402.000        | 15.0                | 1.000000                | PASS   |
| Emissions in restricted frequency bands (Average) | 2402.000        | 15.0                | 1.000000                | PASS   |
| Minimum Emission Bandwidth 6 dB                   | 2442.000        | 15.0                | 1.000000                | PASS   |
| Occupied Channel Bandwidth 99%                    | 2442.000        | 15.0                | 1.000000                | PASS   |
| Tx Spurious Emission                              | 2442.000        | 15.0                | 1.000000                | PASS   |
| Emissions in restricted frequency bands (Average) | 2442.000        | 15.0                | 1.000000                | PASS   |
| Minimum Emission Bandwidth 6 dB                   | 2480.000        | 15.0                | 1.000000                | PASS   |
| Occupied Channel Bandwidth 99%                    | 2480.000        | 15.0                | 1.000000                | PASS   |
| Band Edge high                                    | 2480.000        | 15.0                | 1.000000                | PASS   |
| Tx Spurious Emission                              | 2480.000        | 15.0                | 1.000000                | PASS   |
| Emissions in restricted frequency bands (Average) | 2480.000        | 15.0                | 1.000000                | PASS   |

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**RF output power (2402 MHz; 15.000 dBm; 1 MHz)**

Customized settings.

**Result**

| DUT Frequency<br>(MHz) | Gated RMS<br>(dBm) | Limit Max<br>(dBm) | Gated EIRP<br>(dBm) | DutyCycle<br>(%) | Result |
|------------------------|--------------------|--------------------|---------------------|------------------|--------|
| 2402.000000            | 5.7                | 30.0               | 9.2                 | 62.675           | PASS   |

**OSP PowerMeter settings**

| Setting          | Instrument<br>Value | Target<br>Value |
|------------------|---------------------|-----------------|
| Measurement Time | 1.000 s             | 1.000 s         |
| Points           | 1000000             | 1000000         |
| Time resolution  | 1.000 $\mu$ s       | 1.000 $\mu$ s   |

## Minimum Emission Bandwidth 6 dB (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

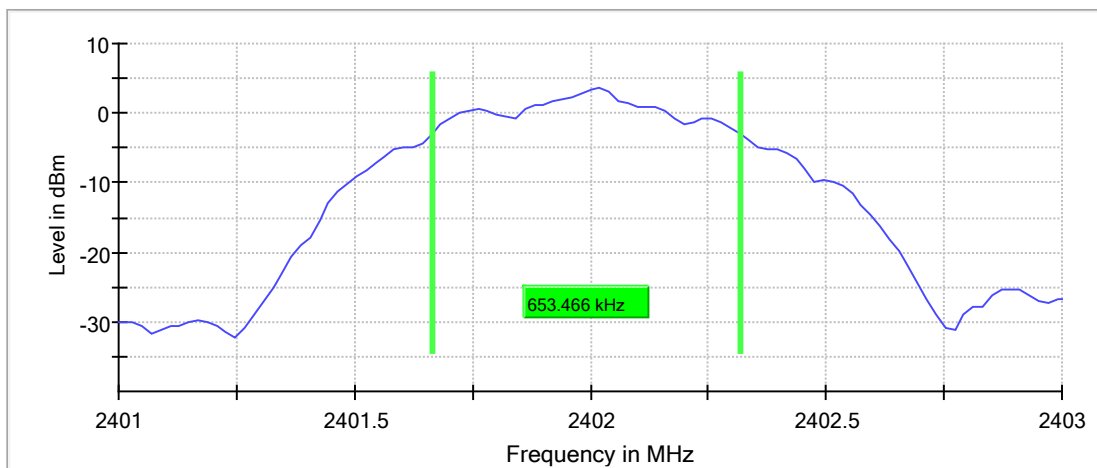
### 6 dB Bandwidth

| DUT Frequency (MHz) | Bandwidth (MHz) | Limit Min (MHz) | Limit Max (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---------------------|-----------------|-----------------|-----------------|----------------------|-----------------------|
| 2402.000000         | 0.653466        | 0.500000        | ---             | 2401.663366          | 2402.316832           |

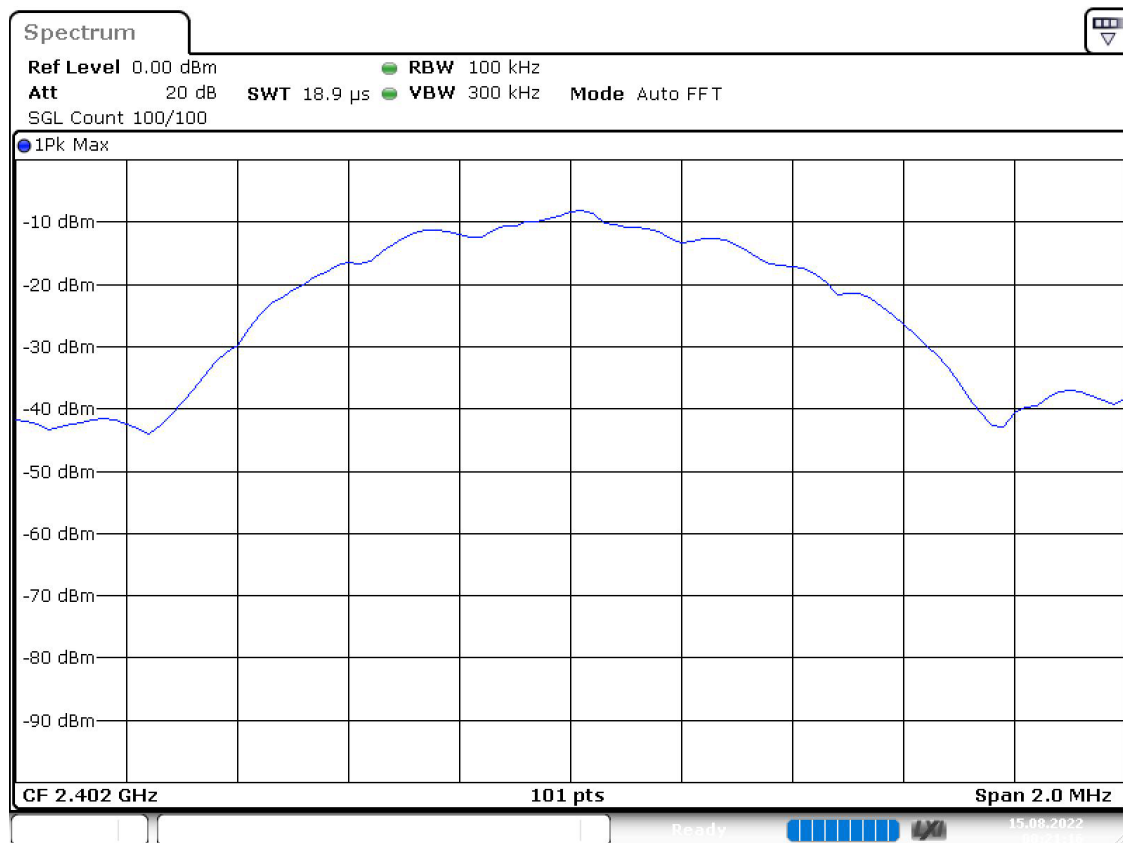
(continuation of the "6 dB Bandwidth" table from column 6 ...)

| DUT Frequency (MHz) | Max Level (dBm) | Result |
|---------------------|-----------------|--------|
| 2402.000000         | 3.6             | PASS   |

6 dB Bandwidth



Bandwidth



Date: 15.AUG.2022 00:21:16

## Measurement

| Setting         | Instrument Value | Target Value  |
|-----------------|------------------|---------------|
| Start Frequency | 2.40100 GHz      | 2.40100 GHz   |
| Stop Frequency  | 2.40300 GHz      | 2.40300 GHz   |
| Span            | 2.000 MHz        | 2.000 MHz     |
| RBW             | 100.000 kHz      | ~ 100.000 kHz |
| VBW             | 300.000 kHz      | ~ 300.000 kHz |
| SweepPoints     | 101              | ~ 40          |
| SweepTime       | 18.938 $\mu$ s   | AUTO          |
| Reference Level | 0.000 dBm        | 0.000 dBm     |
| Attenuation     | 20.000 dB        | AUTO          |
| Detector        | MaxPeak          | MaxPeak       |
| SweepCount      | 100              | 100           |
| Filter          | 3 dB             | 3 dB          |
| Trace Mode      | Max Hold         | Max Hold      |
| SweepType       | FFT              | AUTO          |
| Preamp          | off              | off           |

## Peak Power Spectral Density (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

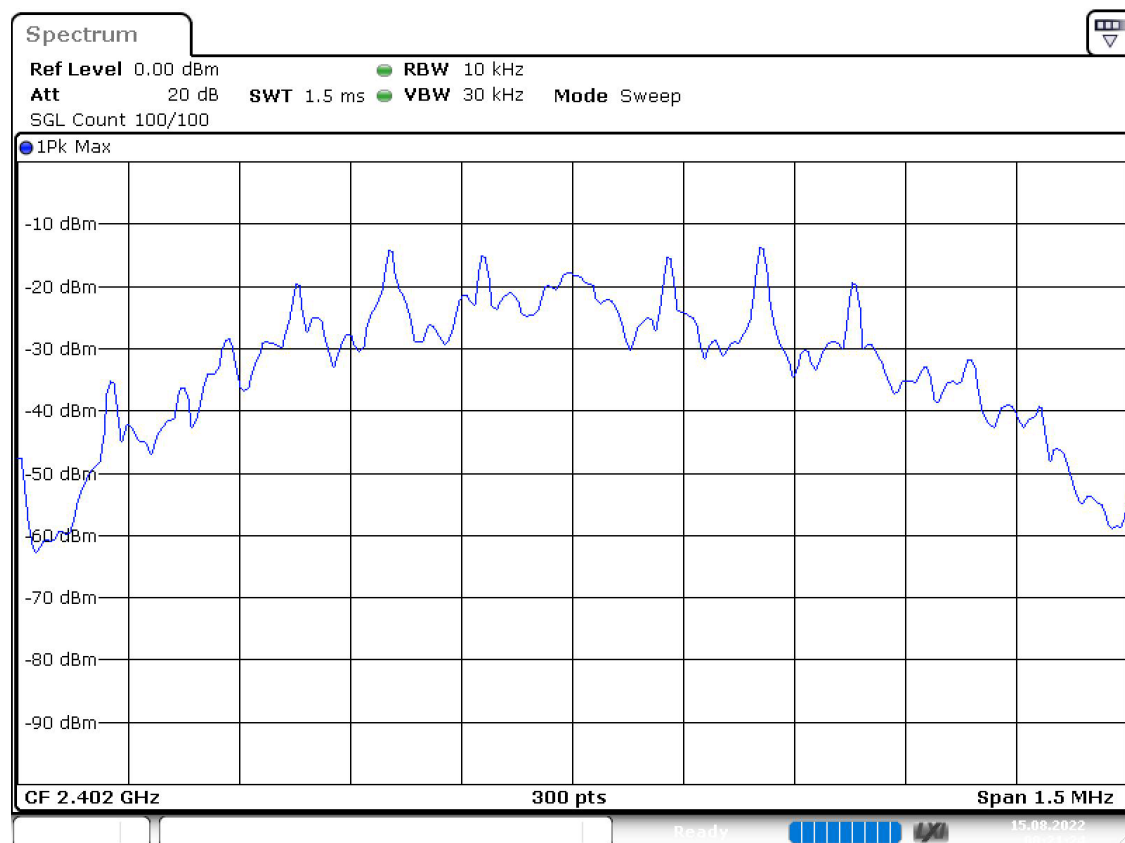
### Result

| DUT Frequency (MHz) | Frequency (MHz) | PSD (dBm) | Limit Max (dBm) | Result |
|---------------------|-----------------|-----------|-----------------|--------|
| 2402.000000         | 2402.252500     | -2.057    | 8.0             | PASS   |

### Ports

| Port | State |
|------|-------|
| 1    | used  |

PSD Connector 1



Date: 15.AUG.2022 00:21:25

## Measurement

| Setting         | Instrument Value | Target Value  |
|-----------------|------------------|---------------|
| Start Frequency | 2.40125 GHz      | 2.40125 GHz   |
| Stop Frequency  | 2.40275 GHz      | 2.40275 GHz   |
| Span            | 1.500 MHz        | 1.500 MHz     |
| RBW             | 10.000 kHz       | <= 10.000 kHz |
| VBW             | 30.000 kHz       | >= 30.000 kHz |
| SweepPoints     | 300              | ~ 300         |
| SweepTime       | 1.500 ms         | AUTO          |
| Reference Level | 0.000 dBm        | 0.000 dBm     |
| Attenuation     | 20.000 dB        | AUTO          |
| Detector        | MaxPeak          | MaxPeak       |
| SweepCount      | 100              | 100           |
| Filter          | 3 dB             | 3 dB          |
| Trace Mode      | Max Hold         | Max Hold      |
| SweepType       | Sweep            | Sweep         |
| Preamp          | off              | off           |

## Occupied Channel Bandwidth 99% (2402 MHz; 15.000 dBm; 1 MHz)

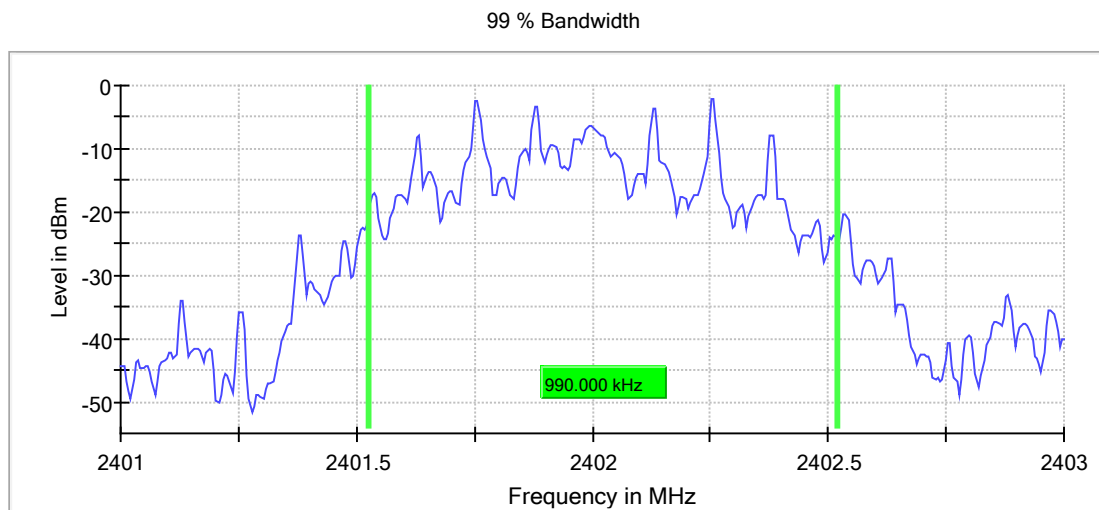
Customized settings.

### 99 % Bandwidth

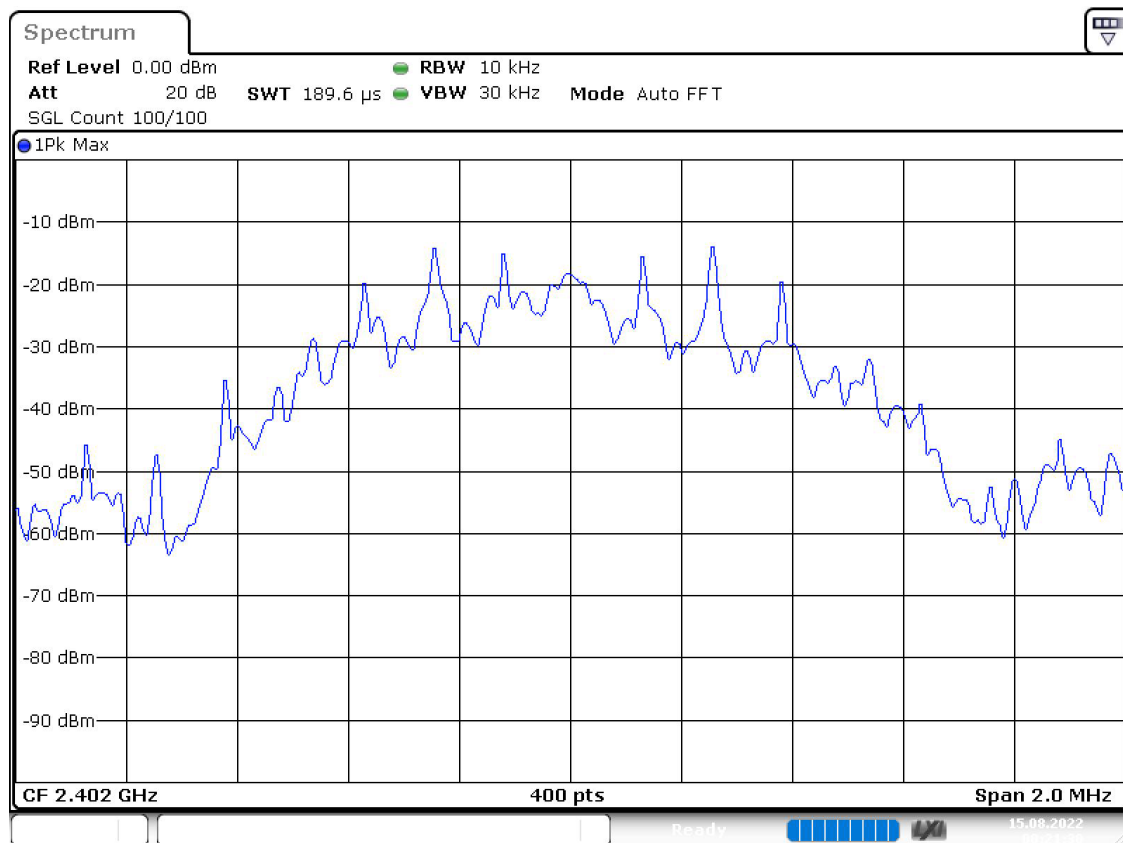
| DUT Frequency (MHz) | Bandwidth (MHz) | Limit Min (MHz) | Limit Max (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---------------------|-----------------|-----------------|-----------------|----------------------|-----------------------|
| 2402.000000         | 0.990000        | ---             | ---             | 2401.527500          | 2402.517500           |

(continuation of the "99 % Bandwidth" table from column 6 ...)

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |



Bandwidth



Date: 15.AUG.2022 00:21:30

## Measurement

| Setting         | Instrument Value | Target Value      |
|-----------------|------------------|-------------------|
| Start Frequency | 2.40100 GHz      | 2.40100 GHz       |
| Stop Frequency  | 2.40300 GHz      | 2.40300 GHz       |
| Span            | 2.000 MHz        | 2.000 MHz         |
| RBW             | 10.000 kHz       | $\geq 10.000$ kHz |
| VBW             | 30.000 kHz       | $\geq 30.000$ kHz |
| SweepPoints     | 400              | ~ 400             |
| SweepTime       | 189.648 $\mu$ s  | AUTO              |
| Reference Level | 0.000 dBm        | 0.000 dBm         |
| Attenuation     | 20.000 dB        | AUTO              |
| Detector        | MaxPeak          | MaxPeak           |
| SweepCount      | 100              | 100               |
| Filter          | 3 dB             | 3 dB              |
| Trace Mode      | Max Hold         | Max Hold          |
| SweepType       | FFT              | AUTO              |
| Preamp          | off              | off               |

## Band Edge low (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

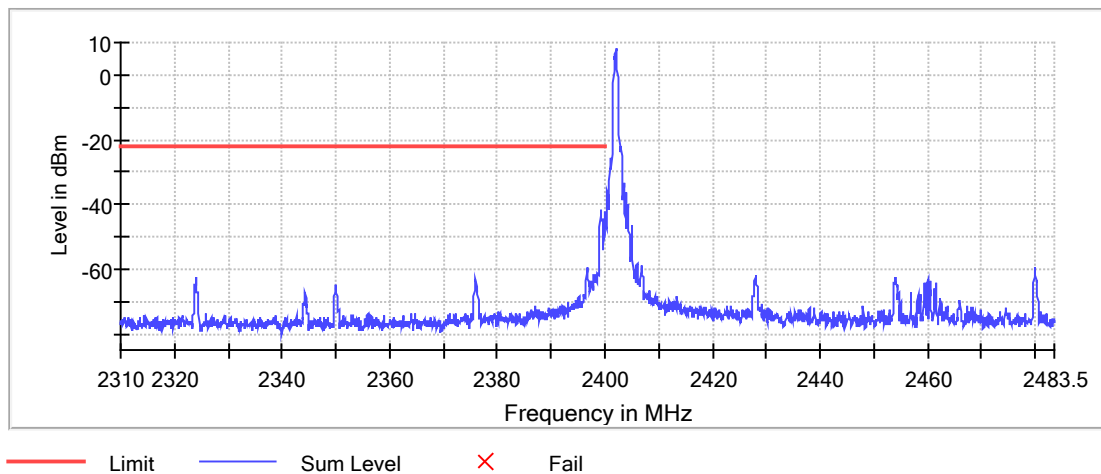
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |

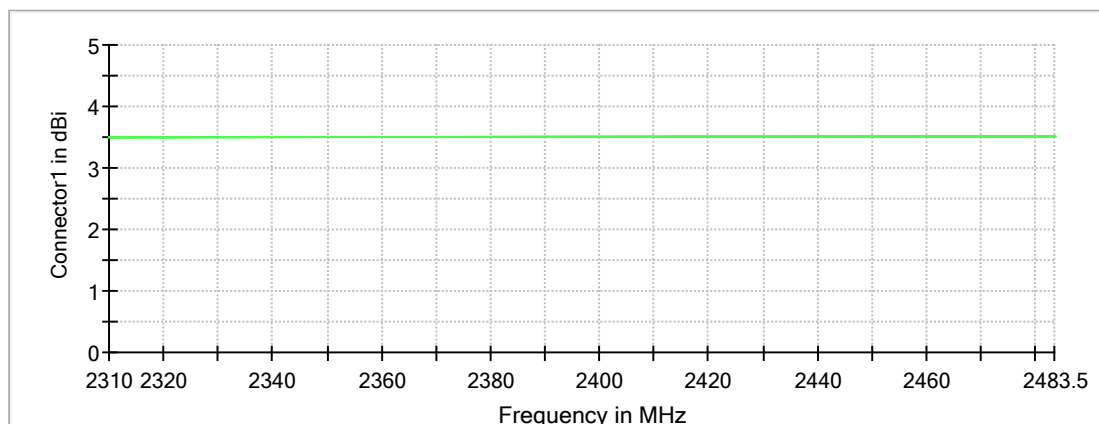
### Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2399.225000     | -41.4       | 19.5        | -22.0       | PASS   |
| 2399.175000     | -41.5       | 19.5        | -22.0       | PASS   |
| 2399.275000     | -42.7       | 20.7        | -22.0       | PASS   |
| 2399.125000     | -43.2       | 21.2        | -22.0       | PASS   |
| 2399.425000     | -44.6       | 22.6        | -22.0       | PASS   |
| 2399.975000     | -44.6       | 22.6        | -22.0       | PASS   |
| 2399.475000     | -44.6       | 22.7        | -22.0       | PASS   |
| 2399.325000     | -45.0       | 23.0        | -22.0       | PASS   |
| 2399.375000     | -45.4       | 23.5        | -22.0       | PASS   |
| 2399.075000     | -47.1       | 25.1        | -22.0       | PASS   |
| 2399.525000     | -47.5       | 25.6        | -22.0       | PASS   |
| 2399.925000     | -47.6       | 25.7        | -22.0       | PASS   |
| 2399.875000     | -49.1       | 27.1        | -22.0       | PASS   |
| 2399.825000     | -49.1       | 27.1        | -22.0       | PASS   |
| 2399.575000     | -49.5       | 27.5        | -22.0       | PASS   |

Band Edge

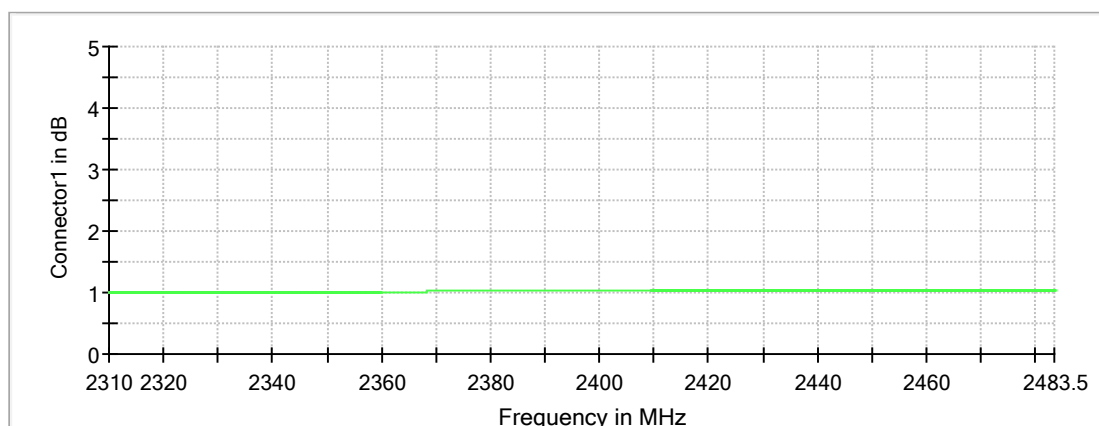


Gain



Connector1

Attenuation



Connector1

## Measurement 1

| Setting         | Instrument Value | Target Value       |
|-----------------|------------------|--------------------|
| Start Frequency | 2.31000 GHz      | 2.31000 GHz        |
| Stop Frequency  | 2.40000 GHz      | 2.40000 GHz        |
| Span            | 90.000 MHz       | 90.000 MHz         |
| RBW             | 100.000 kHz      | $\leq 100.000$ kHz |
| VBW             | 300.000 kHz      | $\geq 300.000$ kHz |
| SweepPoints     | 1800             | ~ 1800             |
| SweepTime       | 113.672 $\mu$ s  | AUTO               |
| Reference Level | -20.000 dBm      | -30.000 dBm        |
| Attenuation     | 10.000 dB        | AUTO               |
| Detector        | MaxPeak          | MaxPeak            |
| SweepCount      | 100              | 100                |
| Filter          | 3 dB             | 3 dB               |
| Trace Mode      | Max Hold         | Max Hold           |
| SweepType       | FFT              | AUTO               |
| Preamp          | off              | off                |

## Measurement 2

| Setting         | Instrument Value | Target Value   |
|-----------------|------------------|----------------|
| Start Frequency | 2.40000 GHz      | 2.40000 GHz    |
| Stop Frequency  | 2.48350 GHz      | 2.48350 GHz    |
| Span            | 83.500 MHz       | 83.500 MHz     |
| RBW             | 100.000 kHz      | <= 100.000 kHz |
| VBW             | 300.000 kHz      | >= 300.000 kHz |
| SweepPoints     | 1670             | ~ 1670         |
| SweepTime       | 94.727 $\mu$ s   | AUTO           |
| Reference Level | -20.000 dBm      | -30.000 dBm    |
| Attenuation     | 10.000 dB        | AUTO           |
| Detector        | MaxPeak          | MaxPeak        |
| SweepCount      | 100              | 100            |
| Filter          | 3 dB             | 3 dB           |
| Trace Mode      | Max Hold         | Max Hold       |
| SweepType       | FFT              | AUTO           |
| Preamp          | off              | off            |

## Tx Spurious Emission (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |

### Final measurements

| Frequency (MHz) | Level Pre Measurement (dBm) | level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------------------------|-------------|-------------|-------------|--------|
| ---             | ---                         | ---         | ---         | ---         | ---    |

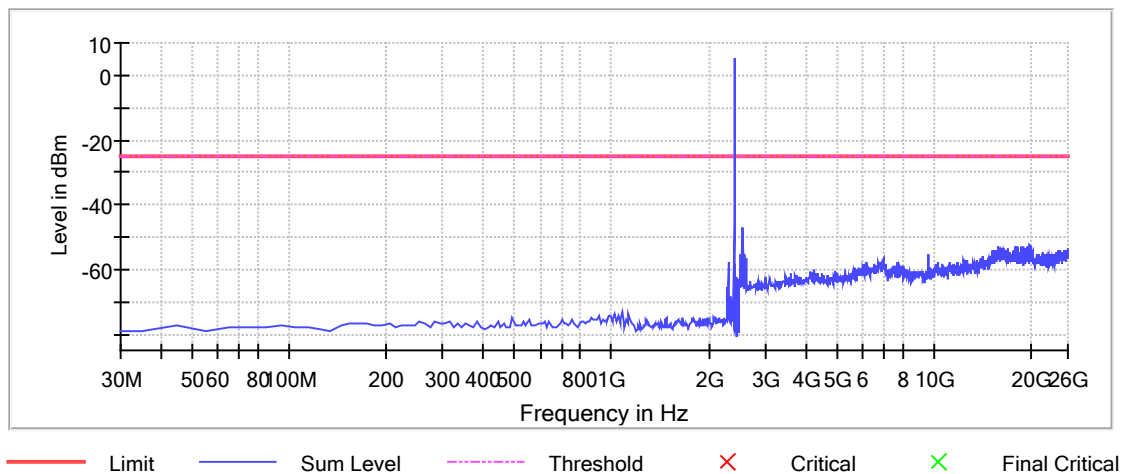
### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2395.021008     | -45.4       | 20.5        | -24.9       |
| 2558.456970     | -47.0       | 22.1        | -24.9       |
| 2528.474182     | -49.4       | 24.5        | -24.9       |
| 19848.531343    | -52.6       | 27.7        | -24.9       |
| 19858.525606    | -52.8       | 27.9        | -24.9       |
| 17859.673077    | -52.9       | 28.0        | -24.9       |
| 18879.087867    | -52.9       | 28.0        | -24.9       |
| 15840.832023    | -52.9       | 28.0        | -24.9       |
| 19498.732150    | -53.1       | 28.2        | -24.9       |
| 17889.655865    | -53.1       | 28.2        | -24.9       |
| 18539.282937    | -53.2       | 28.3        | -24.9       |
| 15880.809074    | -53.2       | 28.3        | -24.9       |
| 18159.500956    | -53.2       | 28.3        | -24.9       |
| 16870.241075    | -53.3       | 28.3        | -24.9       |
| 16170.642690    | -53.3       | 28.4        | -24.9       |

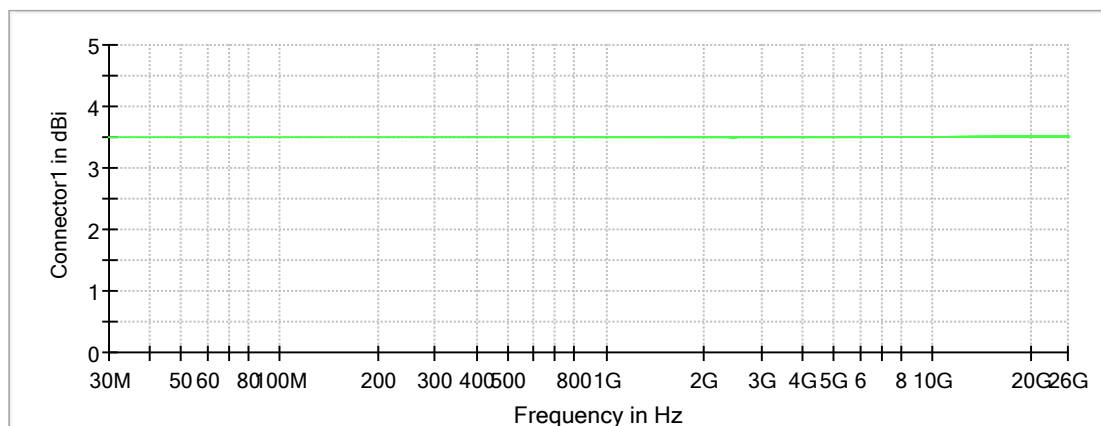
### Measurement Settings

| Start Frequency (MHz) | Stop Frequency (MHz) | Pre Measurement | Final Measurement |
|-----------------------|----------------------|-----------------|-------------------|
| 30.000000             | 2400.000000          | 1               | 1                 |
| 2400.000000           | 2483.500000          | 1               | 1                 |
| 2483.500000           | 26000.000000         | 1               | 1                 |

Spurious

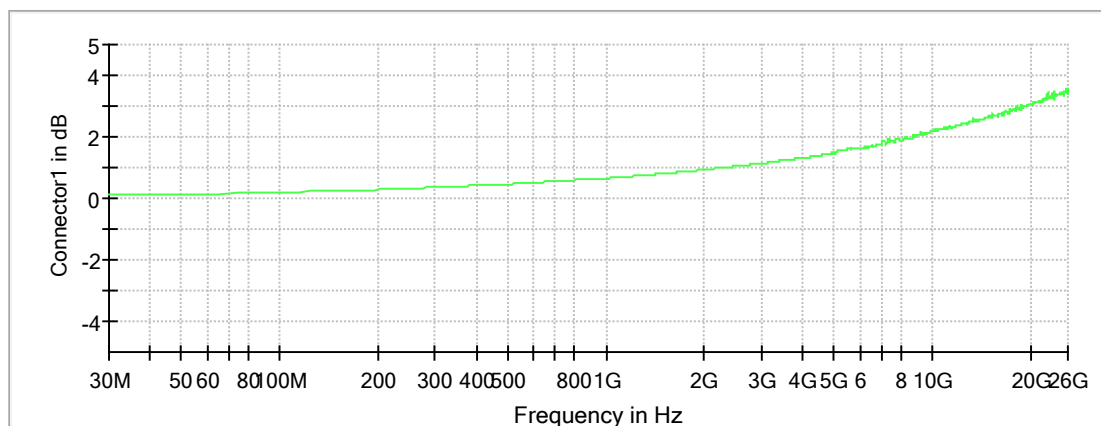


Gain



Connector1

Attenuation



Connector1

## Pre Measurement 1

| Setting         | Instrument Value | Target Value       |
|-----------------|------------------|--------------------|
| RBW             | 100.000 kHz      | $\leq 100.000$ kHz |
| VBW             | 300.000 kHz      | $\geq 300.000$ kHz |
| SweepPoints     | 238              | ~ 238              |
| SweepTime       | 23.700 ms        | AUTO               |
| Reference Level | -20.000 dBm      | -30.000 dBm        |
| Attenuation     | 10.000 dB        | AUTO               |
| Detector        | MaxPeak          | MaxPeak            |
| SweepCount      | 3                | 3                  |
| Filter          | 3 dB             | 3 dB               |
| Trace Mode      | Max Hold         | Max Hold           |
| SweepType       | Sweep            | AUTO               |
| Preamp          | off              | off                |

## Emissions in restricted frequency bands (Average) (2402 MHz; 15.000 dBm; 1 MHz)

Customized settings.

### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2402.000000         | PASS   |

### Final measurements

| Frequency (MHz) | Level Pre Measurement (dBm) | level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------------------------|-------------|-------------|-------------|--------|
| ---             | ---                         | ---         | ---         | ---         | ---    |

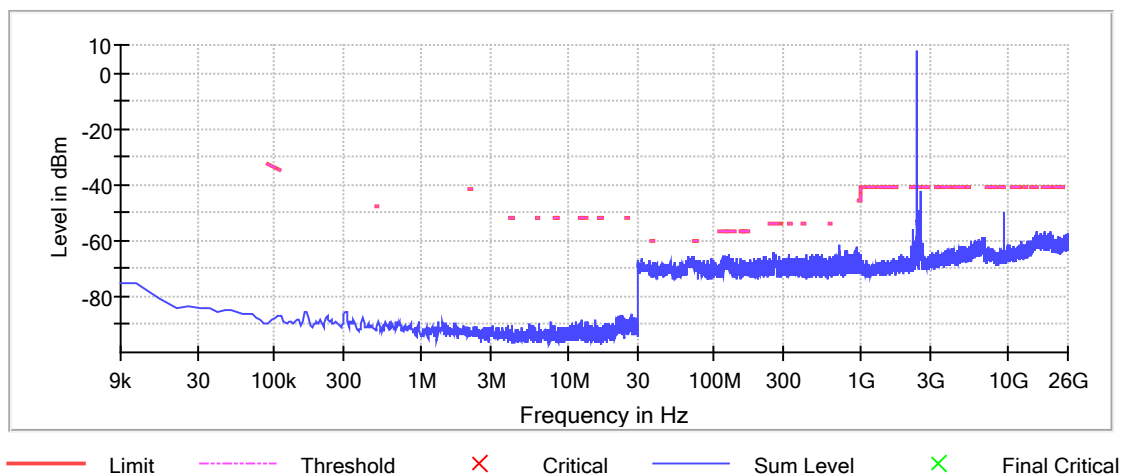
### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 73.275000       | -65.9       | 6.0         | -59.9       |
| 73.225000       | -66.4       | 6.5         | -59.9       |
| 73.325000       | -66.9       | 7.0         | -59.9       |
| 74.225000       | -67.0       | 7.1         | -59.9       |
| 74.175000       | -67.1       | 7.2         | -59.9       |
| 73.775000       | -67.1       | 7.2         | -59.9       |
| 74.075000       | -67.1       | 7.2         | -59.9       |
| 74.025000       | -67.5       | 7.6         | -59.9       |
| 73.375000       | -67.6       | 7.7         | -59.9       |
| 75.175000       | -67.6       | 7.7         | -59.9       |
| 73.725000       | -67.7       | 7.8         | -59.9       |
| 74.975000       | -67.8       | 7.9         | -59.9       |
| 75.025000       | -67.8       | 7.9         | -59.9       |
| 73.825000       | -68.0       | 8.1         | -59.9       |
| 74.875000       | -68.1       | 8.2         | -59.9       |

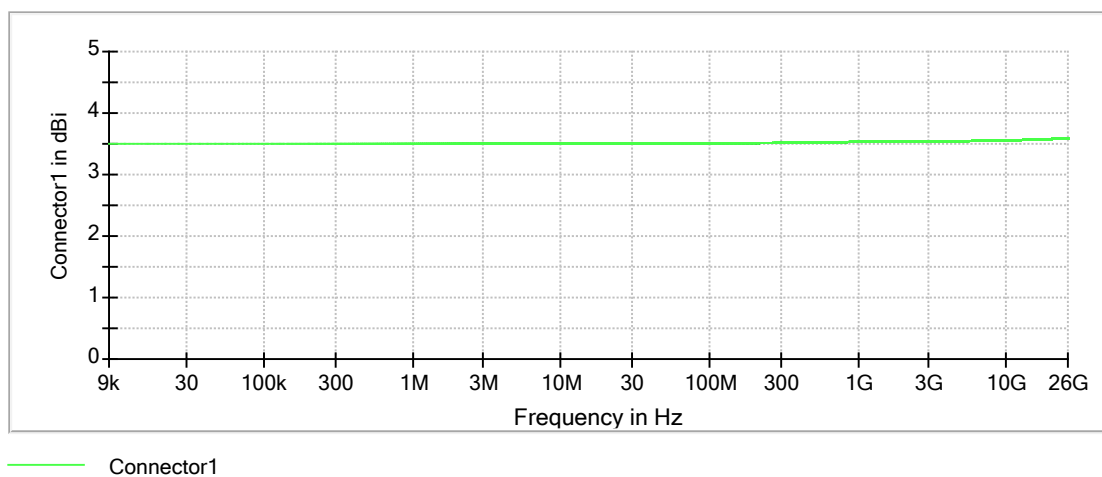
### Measurement Settings

| Start Frequency (MHz) | Stop Frequency (MHz) | Pre Measurement | Final Measurement |
|-----------------------|----------------------|-----------------|-------------------|
| 0.009000              | 30.000000            | 2               | 2                 |
| 30.000000             | 1000.000000          | 2               | 2                 |
| 1000.000000           | 7000.000000          | 1               | 1                 |
| 7000.000000           | 26000.000000         | 1               | 1                 |

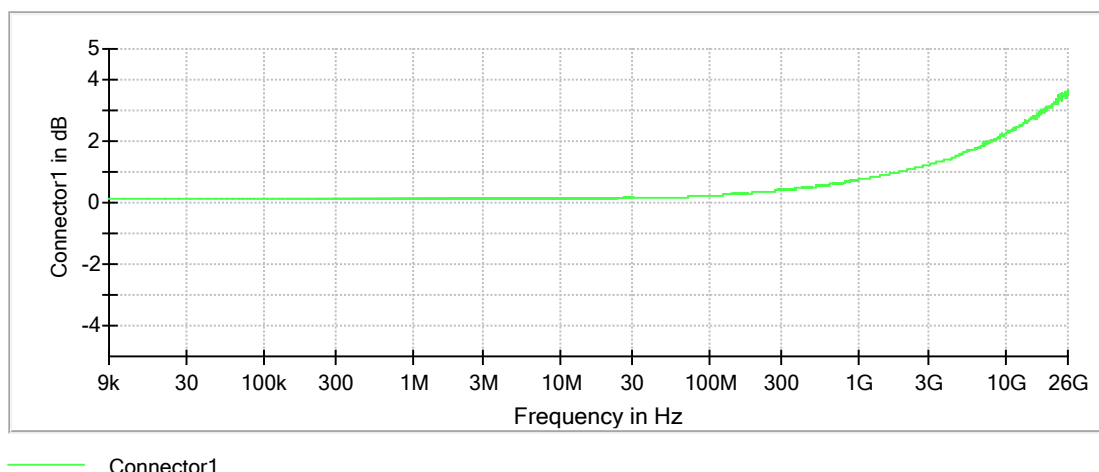
Restricted Band



Gain



Attenuation



## Pre Measurement 1

| Setting         | Instrument Value | Target Value     |
|-----------------|------------------|------------------|
| RBW             | 1.000 MHz        | $\leq 1.000$ MHz |
| VBW             | 3.000 MHz        | $\geq 3.000$ MHz |
| SweepPoints     | 12000            | ~ 12000          |
| SweepTime       | 12.000 ms        | AUTO             |
| Reference Level | -20.000 dBm      | -30.000 dBm      |
| Attenuation     | 10.000 dB        | AUTO             |
| Detector        | Average          | Average          |
| SweepCount      | 100              | 100              |
| Filter          | 3 dB             | 3 dB             |
| Trace Mode      | Max Hold         | Max Hold         |
| SweepType       | Sweep            | AUTO             |
| Preamp          | off              | off              |

## Pre Measurement 2

| Setting         | Instrument Value | Target Value      |
|-----------------|------------------|-------------------|
| RBW             | 10.000 kHz       | $\leq 10.000$ kHz |
| VBW             | 30.000 kHz       | $\geq 30.000$ kHz |
| SweepPoints     | 5998             | ~ 5998            |
| SweepTime       | 1.327 ms         | AUTO              |
| Reference Level | -20.000 dBm      | -30.000 dBm       |
| Attenuation     | 10.000 dB        | AUTO              |
| Detector        | MaxPeak          | MaxPeak           |
| SweepCount      | 30               | 30                |
| Filter          | 3 dB             | 3 dB              |
| Trace Mode      | Max Hold         | Max Hold          |
| SweepType       | FFT              | AUTO              |
| Preamp          | off              | off               |

## Minimum Emission Bandwidth 6 dB (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

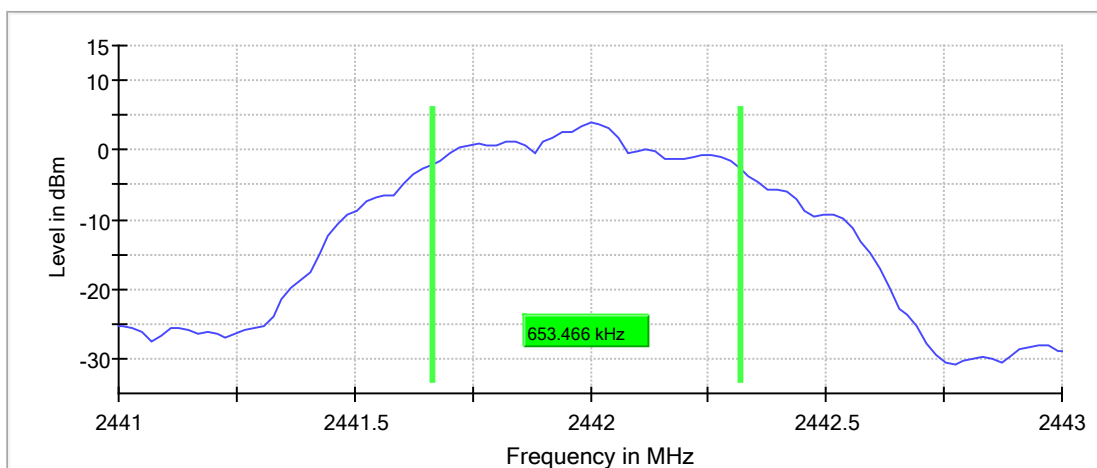
### 6 dB Bandwidth

| DUT Frequency (MHz) | Bandwidth (MHz) | Limit Min (MHz) | Limit Max (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---------------------|-----------------|-----------------|-----------------|----------------------|-----------------------|
| 2442.000000         | 0.653466        | 0.500000        | ---             | 2441.663366          | 2442.316832           |

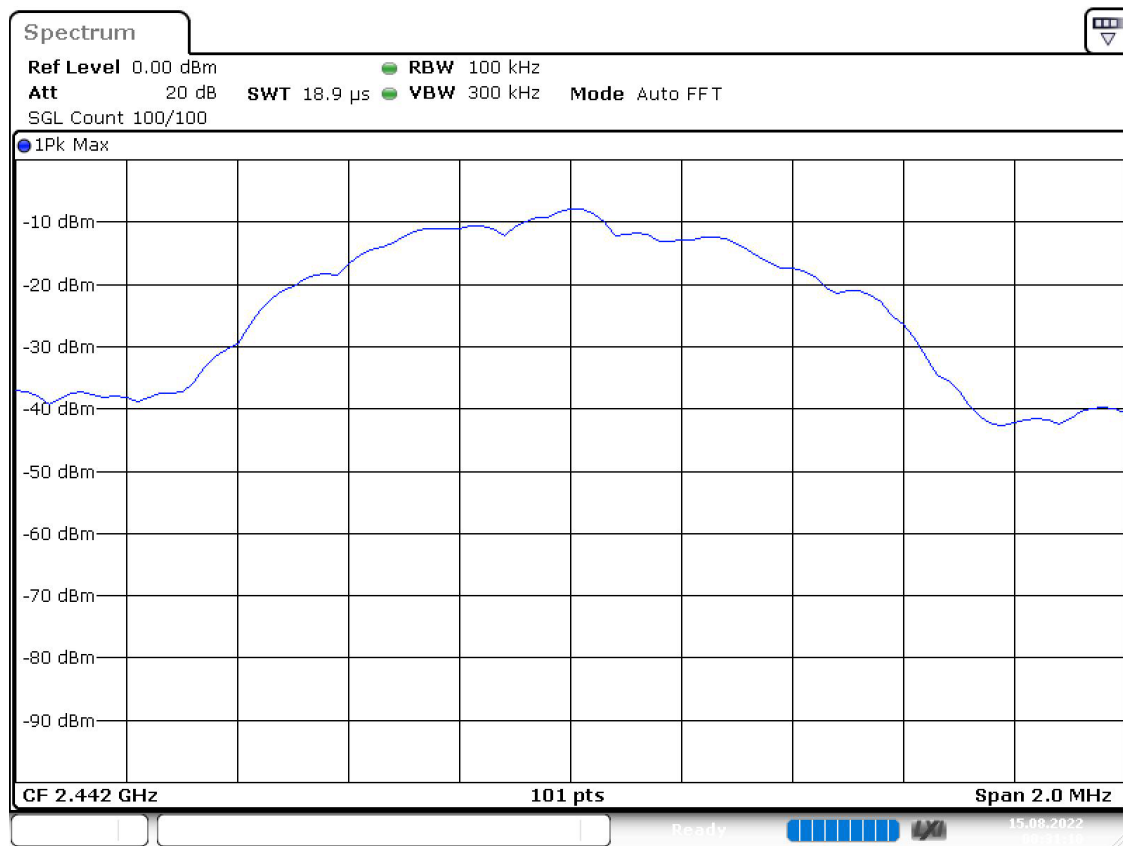
(continuation of the "6 dB Bandwidth" table from column 6 ...)

| DUT Frequency (MHz) | Max Level (dBm) | Result |
|---------------------|-----------------|--------|
| 2442.000000         | 3.8             | PASS   |

6 dB Bandwidth



Bandwidth



Date: 15.AUG.2022 00:31:11

## Occupied Channel Bandwidth 99% (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

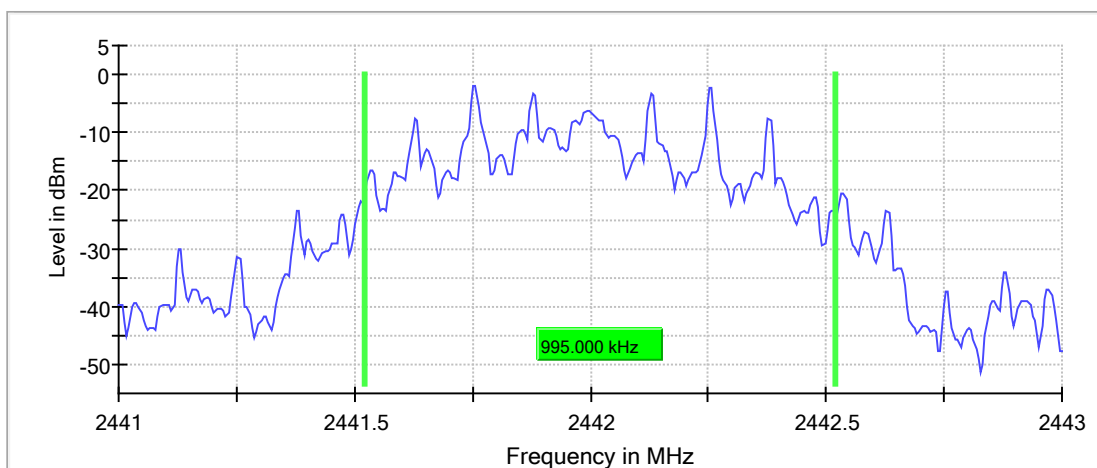
### 99 % Bandwidth

| DUT Frequency (MHz) | Bandwidth (MHz) | Limit Min (MHz) | Limit Max (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---------------------|-----------------|-----------------|-----------------|----------------------|-----------------------|
| 2442.000000         | 0.995000        | ---             | ---             | 2441.522500          | 2442.517500           |

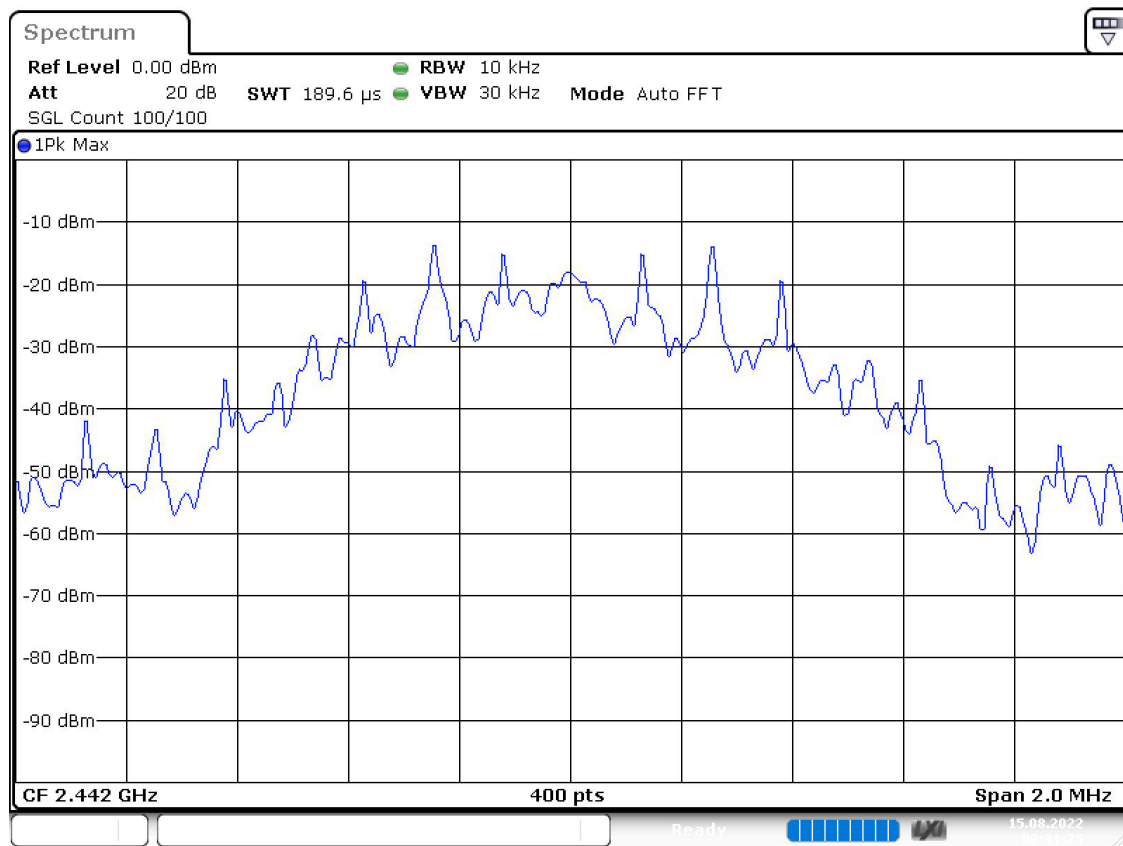
(continuation of the "99 % Bandwidth" table from column 6 ...)

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2442.000000         | PASS   |

99 % Bandwidth



Bandwidth



Date: 15.AUG.2022 00:31:25

## Tx Spurious Emission (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2442.000000         | PASS   |

### Final measurements

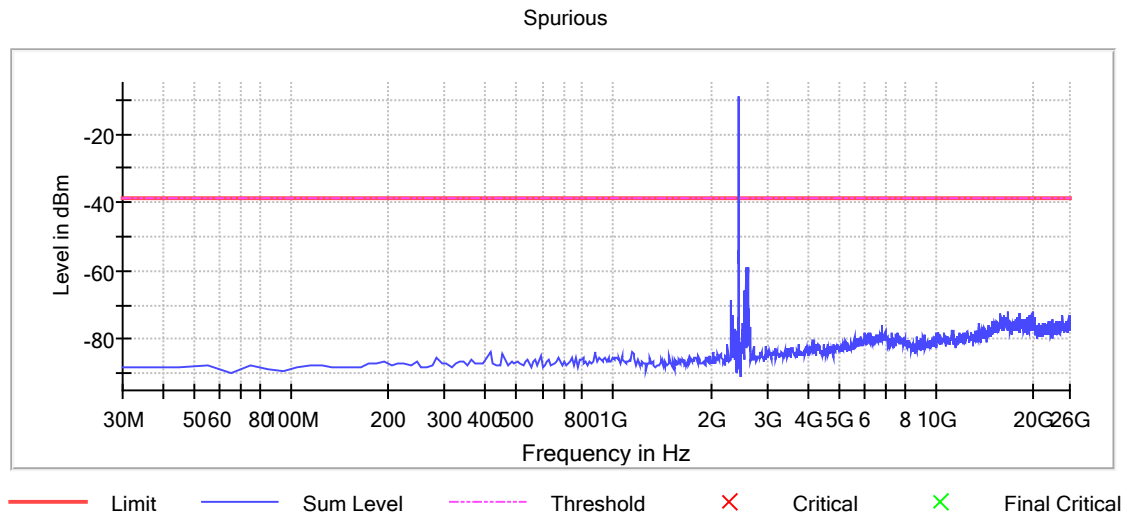
| Frequency (MHz) | Level Pre Measurement (dBm) | level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------------------------|-------------|-------------|-------------|--------|
| ---             | ---                         | ---         | ---         | ---         | ---    |

### Pre Measurements

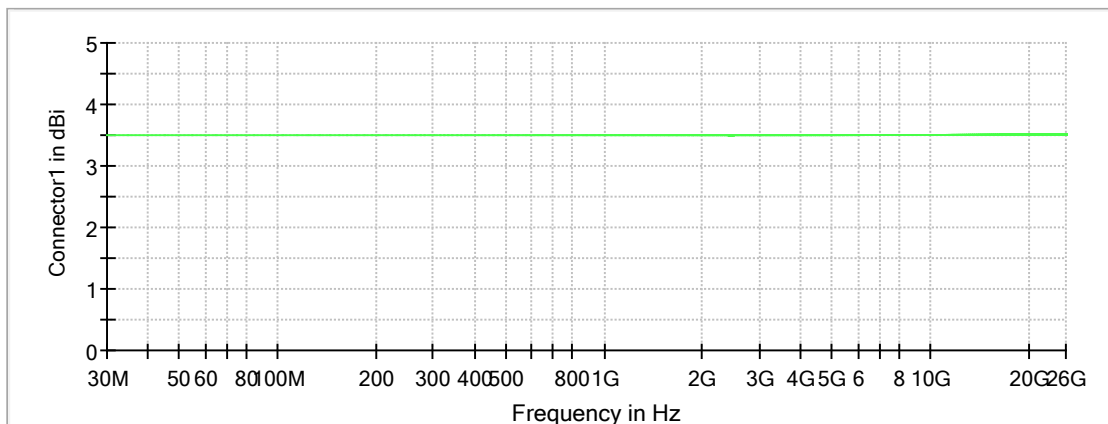
| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2598.434020     | -59.0       | 20.3        | -38.7       |
| 2568.451232     | -59.2       | 20.5        | -38.7       |
| 2548.462707     | -65.9       | 27.2        | -38.7       |
| 2315.357143     | -68.7       | 30.0        | -38.7       |
| 2628.416808     | -71.0       | 32.3        | -38.7       |
| 19928.485444    | -71.8       | 33.1        | -38.7       |
| 16800.281237    | -72.1       | 33.4        | -38.7       |
| 19918.491181    | -72.4       | 33.6        | -38.7       |
| 18199.478007    | -72.6       | 33.9        | -38.7       |
| 15810.849235    | -72.7       | 34.0        | -38.7       |
| 18169.495219    | -72.8       | 34.1        | -38.7       |
| 19528.714938    | -72.9       | 34.2        | -38.7       |
| 24525.846260    | -72.9       | 34.2        | -38.7       |
| 16200.625478    | -72.9       | 34.2        | -38.7       |
| 19908.496919    | -72.9       | 34.2        | -38.7       |

### Measurement Settings

| Start Frequency (MHz) | Stop Frequency (MHz) | Pre Measurement | Final Measurement |
|-----------------------|----------------------|-----------------|-------------------|
| 30.000000             | 2400.000000          | 1               | 1                 |
| 2400.000000           | 2483.500000          | 1               | 1                 |
| 2483.500000           | 26000.000000         | 1               | 1                 |

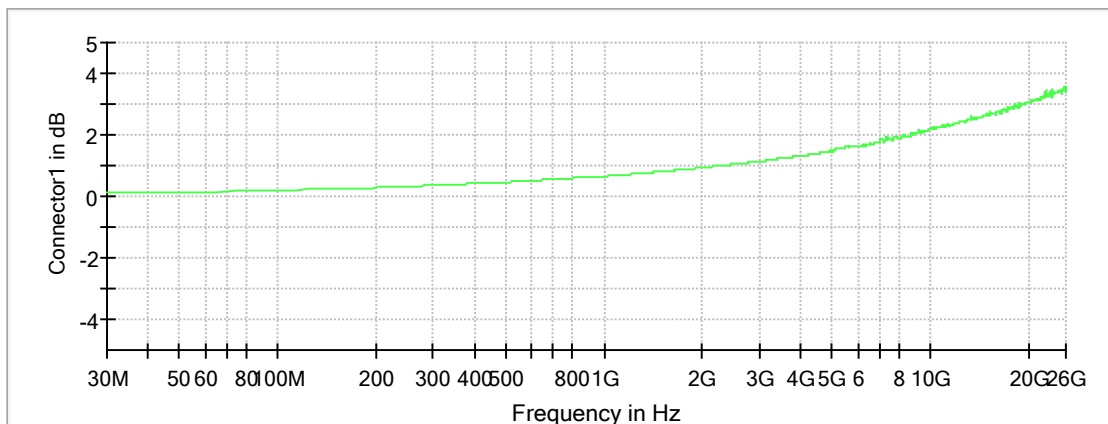


Gain



Connector1

Attenuation



Connector1

## Emissions in restricted frequency bands (Average) (2442 MHz; 15.000 dBm; 1 MHz)

Customized settings.

### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2442.000000         | PASS   |

### Final measurements

| Frequency (MHz) | Level Pre Measurement (dBm) | level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------------------------|-------------|-------------|-------------|--------|
| ---             | ---                         | ---         | ---         | ---         | ---    |

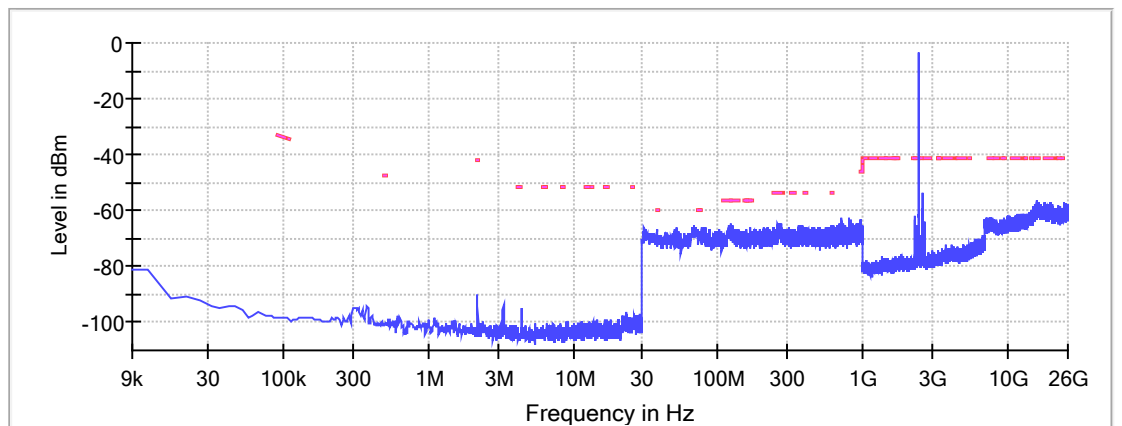
### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 73.075000       | -66.8       | 6.9         | -59.9       |
| 73.025000       | -67.1       | 7.2         | -59.9       |
| 73.125000       | -67.3       | 7.4         | -59.9       |
| 73.175000       | -67.4       | 7.5         | -59.9       |
| 73.725000       | -67.6       | 7.7         | -59.9       |
| 73.225000       | -67.6       | 7.7         | -59.9       |
| 73.275000       | -67.6       | 7.7         | -59.9       |
| 74.225000       | -67.6       | 7.7         | -59.9       |
| 74.175000       | -67.7       | 7.8         | -59.9       |
| 74.125000       | -67.7       | 7.8         | -59.9       |
| 73.675000       | -67.8       | 7.9         | -59.9       |
| 75.025000       | -68.0       | 8.1         | -59.9       |
| 73.325000       | -68.0       | 8.1         | -59.9       |
| 74.075000       | -68.1       | 8.2         | -59.9       |
| 74.975000       | -68.2       | 8.3         | -59.9       |

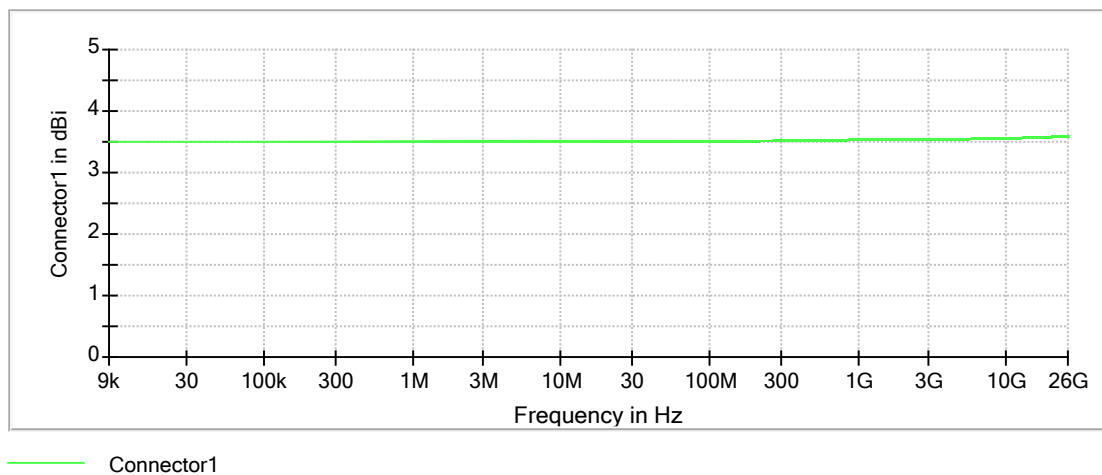
### Measurement Settings

| Start Frequency (MHz) | Stop Frequency (MHz) | Pre Measurement | Final Measurement |
|-----------------------|----------------------|-----------------|-------------------|
| 0.009000              | 30.000000            | 2               | 2                 |
| 30.000000             | 1000.000000          | 2               | 2                 |
| 1000.000000           | 7000.000000          | 1               | 1                 |
| 7000.000000           | 26000.000000         | 1               | 1                 |

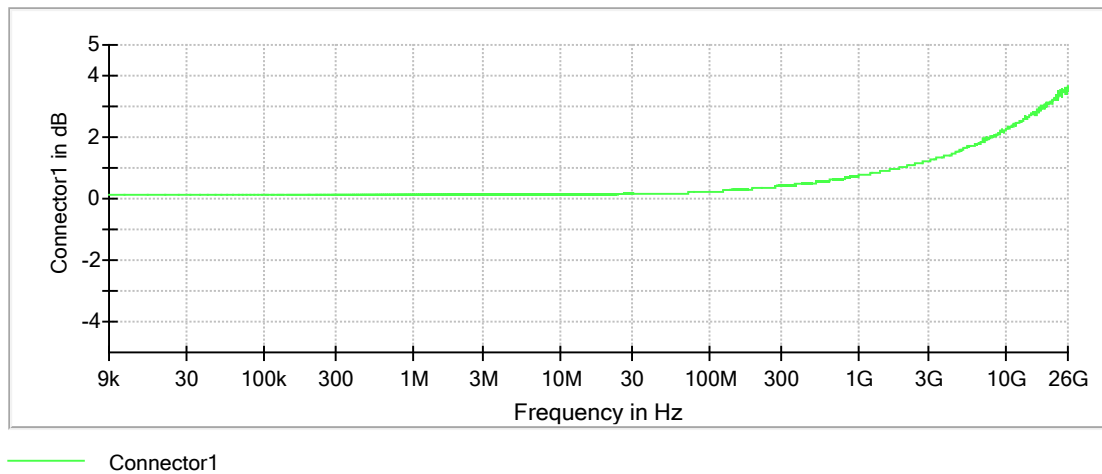
Restricted Band



Gain



Attenuation



## Minimum Emission Bandwidth 6 dB (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

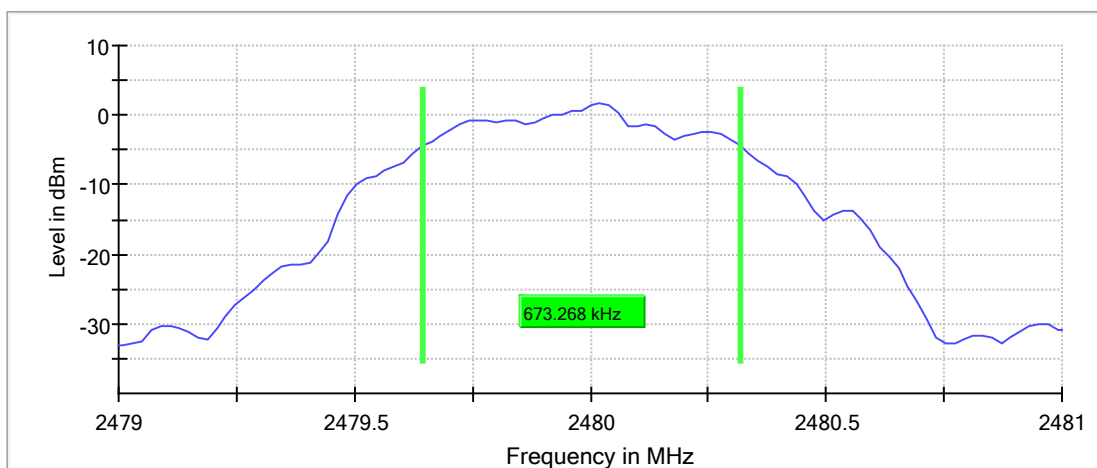
### 6 dB Bandwidth

| DUT Frequency (MHz) | Bandwidth (MHz) | Limit Min (MHz) | Limit Max (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---------------------|-----------------|-----------------|-----------------|----------------------|-----------------------|
| 2480.000000         | 0.673268        | 0.500000        | ---             | 2479.643564          | 2480.316832           |

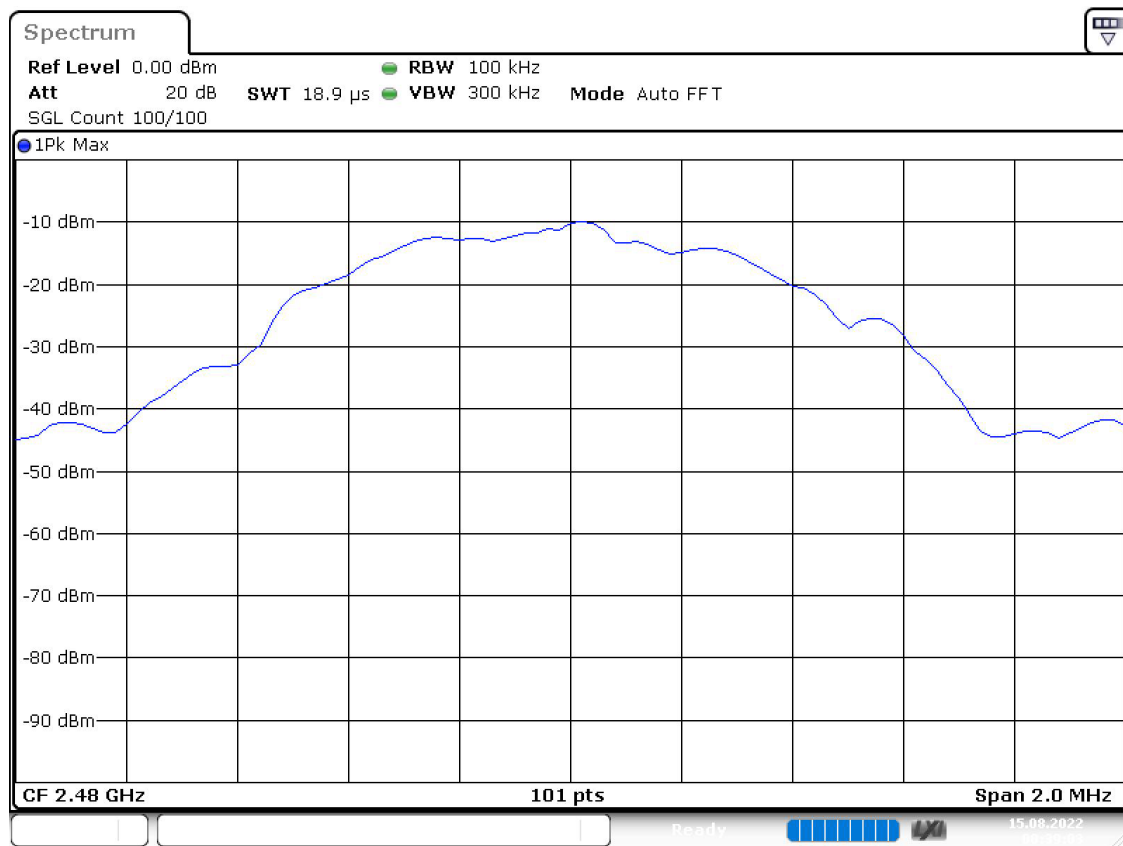
(continuation of the "6 dB Bandwidth" table from column 6 ...)

| DUT Frequency (MHz) | Max Level (dBm) | Result |
|---------------------|-----------------|--------|
| 2480.000000         | 1.8             | PASS   |

6 dB Bandwidth



Bandwidth



Date: 15.AUG.2022 00:39:03

## Occupied Channel Bandwidth 99% (2480 MHz; 15.000 dBm; 1 MHz)

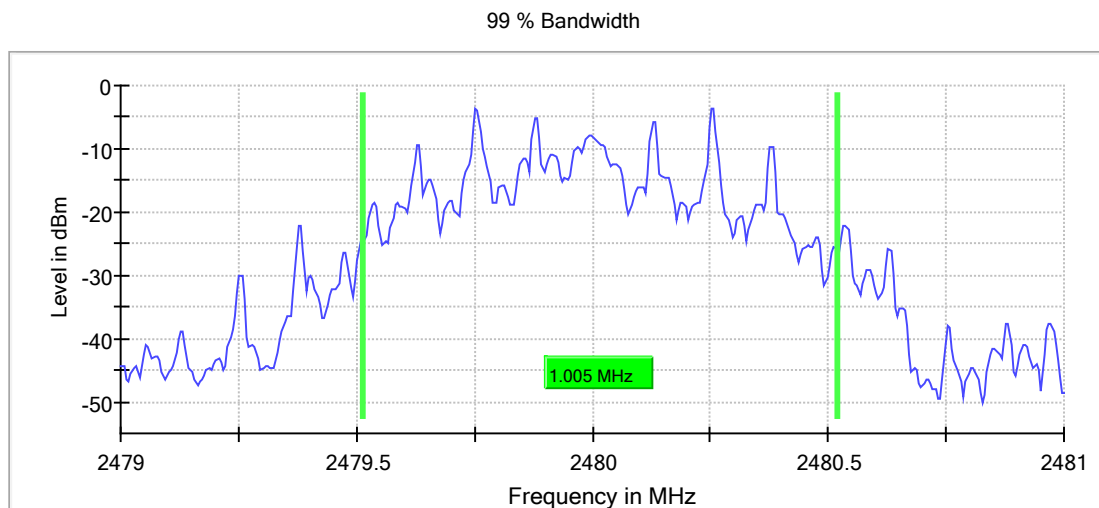
Customized settings.

### 99 % Bandwidth

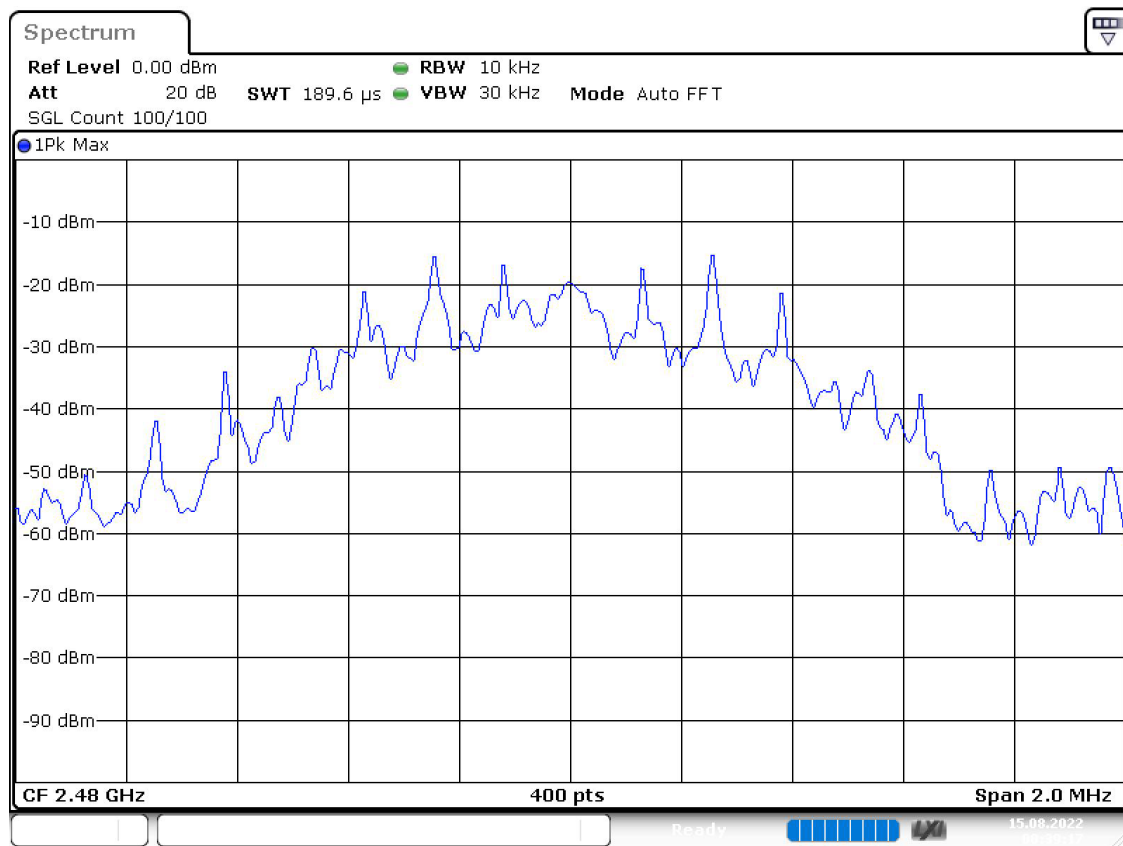
| DUT Frequency (MHz) | Bandwidth (MHz) | Limit Min (MHz) | Limit Max (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---------------------|-----------------|-----------------|-----------------|----------------------|-----------------------|
| 2480.000000         | 1.005000        | ---             | ---             | 2479.512500          | 2480.517500           |

(continuation of the "99 % Bandwidth" table from column 6 ...)

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |



Bandwidth



Date: 15.AUG.2022 00:39:17

## Band Edge high (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

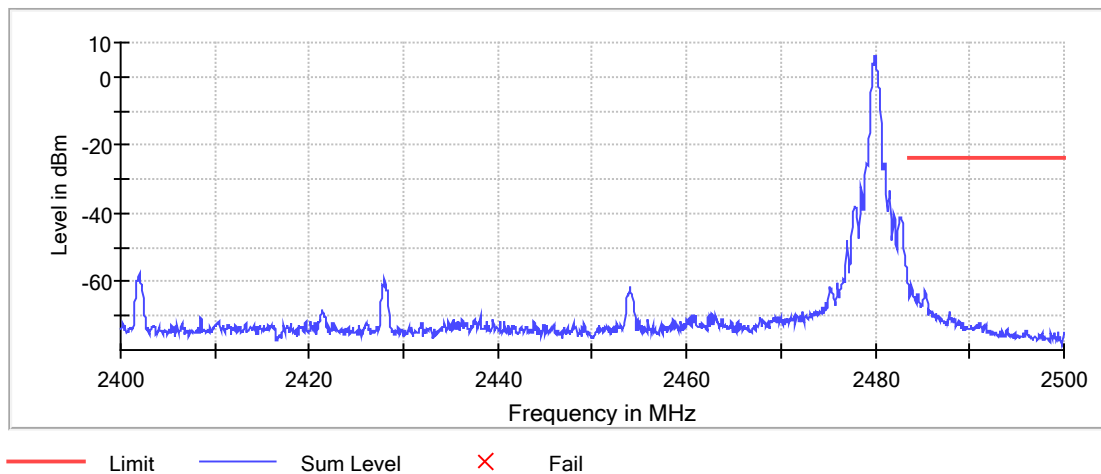
### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |

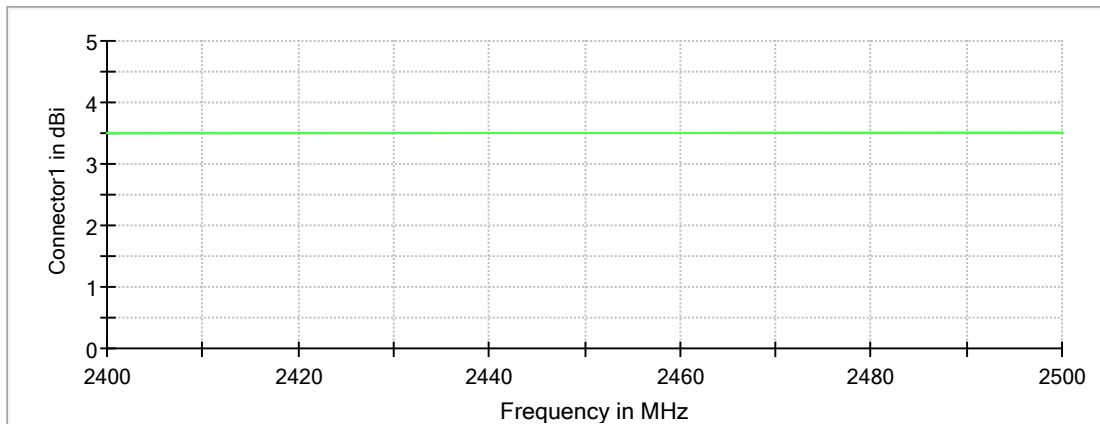
### Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) | Result |
|-----------------|-------------|-------------|-------------|--------|
| 2483.825000     | -61.0       | 37.0        | -24.0       | PASS   |
| 2483.875000     | -61.0       | 37.0        | -24.0       | PASS   |
| 2483.525000     | -61.1       | 37.0        | -24.0       | PASS   |
| 2483.925000     | -62.6       | 38.6        | -24.0       | PASS   |
| 2485.275000     | -62.7       | 38.7        | -24.0       | PASS   |
| 2483.575000     | -62.8       | 38.8        | -24.0       | PASS   |
| 2485.225000     | -62.8       | 38.8        | -24.0       | PASS   |
| 2483.775000     | -62.9       | 38.9        | -24.0       | PASS   |
| 2483.975000     | -63.0       | 39.0        | -24.0       | PASS   |
| 2484.025000     | -63.0       | 39.0        | -24.0       | PASS   |
| 2485.325000     | -63.4       | 39.4        | -24.0       | PASS   |
| 2485.375000     | -63.5       | 39.4        | -24.0       | PASS   |
| 2483.725000     | -63.6       | 39.6        | -24.0       | PASS   |
| 2483.625000     | -63.6       | 39.6        | -24.0       | PASS   |
| 2484.525000     | -63.7       | 39.7        | -24.0       | PASS   |

Band Edge

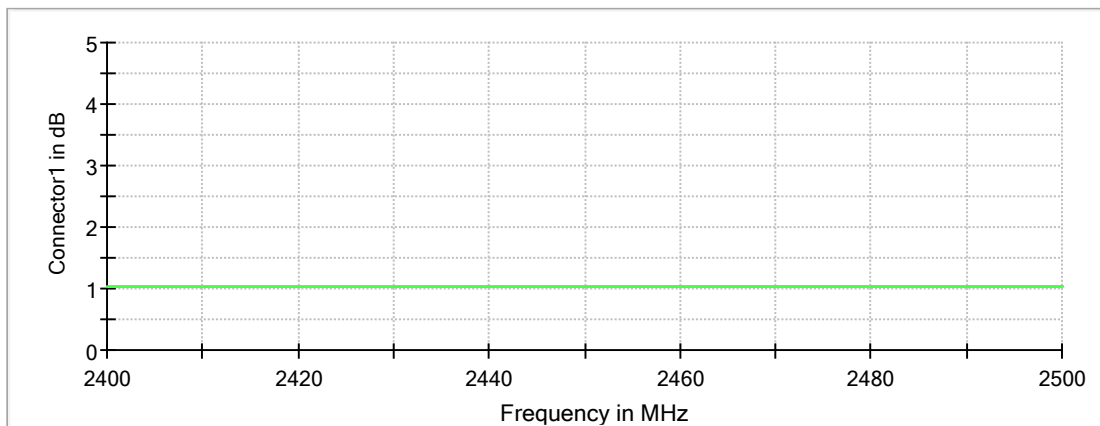


Gain



Connector1

Attenuation



Connector1

## Tx Spurious Emission (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |

### Final measurements

| Frequency (MHz) | Level Pre Measurement (dBm) | level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------------------------|-------------|-------------|-------------|--------|
| ---             | ---                         | ---         | ---         | ---         | ---    |

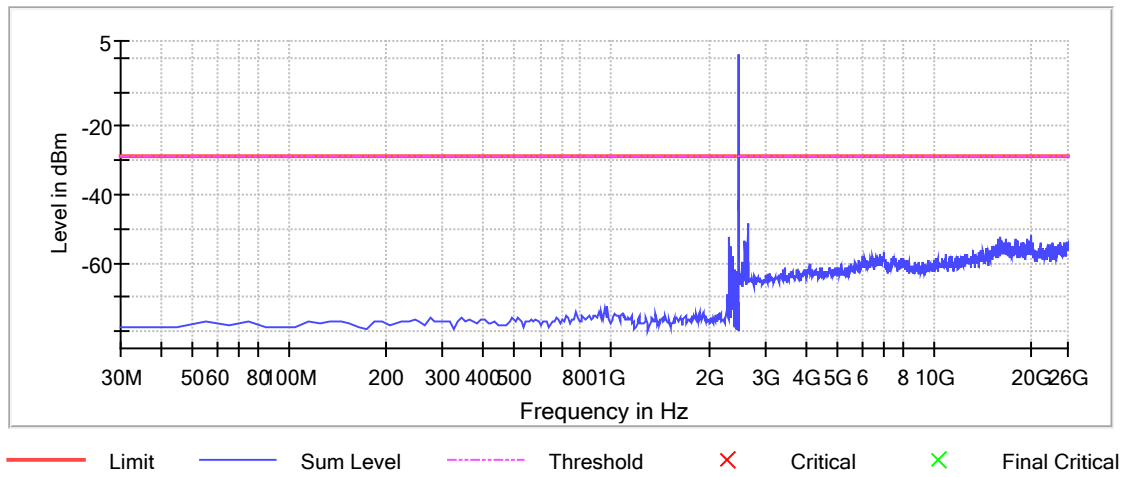
### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2638.411071     | -48.5       | 19.8        | -28.7       |
| 19898.502656    | -51.8       | 23.2        | -28.7       |
| 16120.671377    | -52.5       | 23.8        | -28.7       |
| 15940.774649    | -52.6       | 23.9        | -28.7       |
| 2325.315126     | -52.6       | 23.9        | -28.7       |
| 19958.468232    | -52.6       | 24.0        | -28.7       |
| 15790.860710    | -52.8       | 24.1        | -28.7       |
| 19558.697726    | -53.0       | 24.3        | -28.7       |
| 19908.496919    | -53.0       | 24.4        | -28.7       |
| 17889.655865    | -53.0       | 24.4        | -28.7       |
| 16130.665640    | -53.2       | 24.5        | -28.7       |
| 16790.286974    | -53.2       | 24.5        | -28.7       |
| 19568.691989    | -53.4       | 24.7        | -28.7       |
| 2588.439758     | -53.5       | 24.8        | -28.7       |
| 19548.703464    | -53.5       | 24.8        | -28.7       |

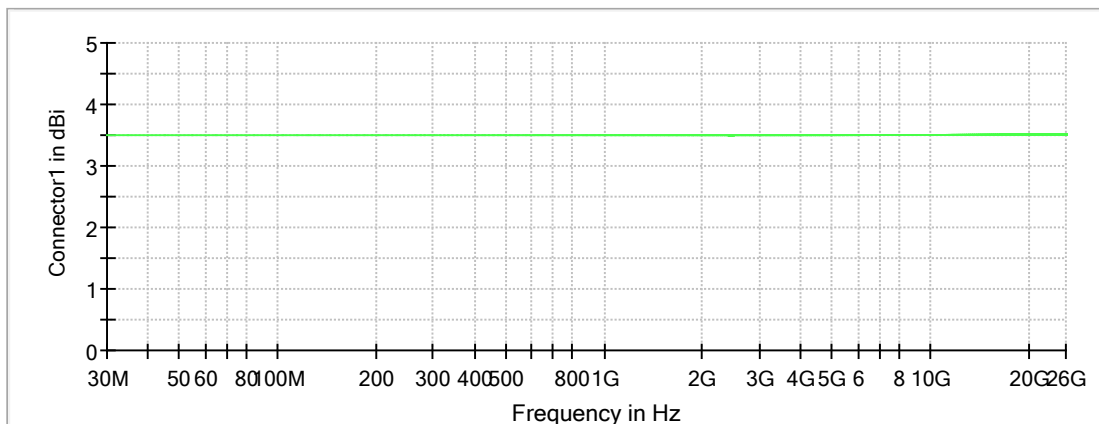
### Measurement Settings

| Start Frequency (MHz) | Stop Frequency (MHz) | Pre Measurement | Final Measurement |
|-----------------------|----------------------|-----------------|-------------------|
| 30.000000             | 2400.000000          | 1               | 1                 |
| 2400.000000           | 2483.500000          | 1               | 1                 |
| 2483.500000           | 26000.000000         | 1               | 1                 |

Spurious

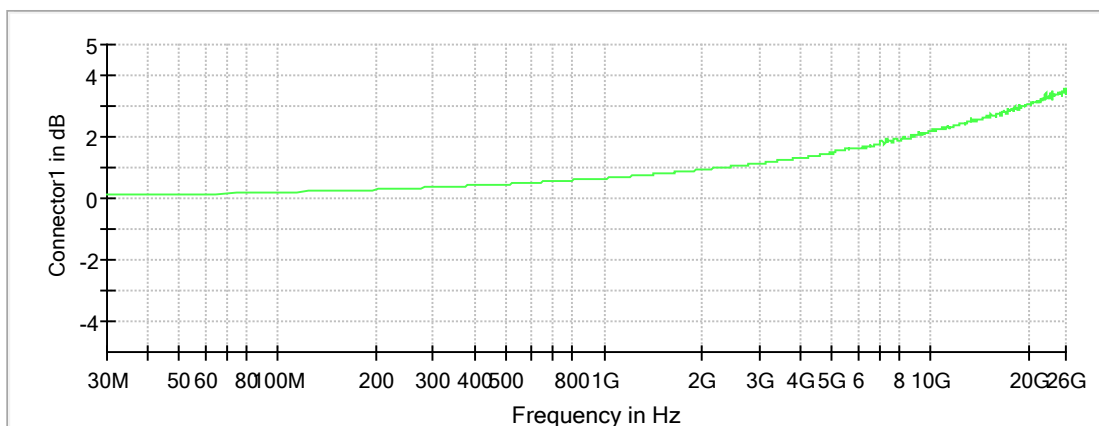


Gain



Connector1

Attenuation



Connector1

## Emissions in restricted frequency bands (Average) (2480 MHz; 15.000 dBm; 1 MHz)

Customized settings.

### Result

| DUT Frequency (MHz) | Result |
|---------------------|--------|
| 2480.000000         | PASS   |

### Final measurements

| Frequency (MHz) | Level Pre Measurement (dBm) | level (dBm) | Limit (dBm) | Margin (dB) | Result |
|-----------------|-----------------------------|-------------|-------------|-------------|--------|
| 2483.750000     | -40.6                       | -42.1       | -41.2       | 0.9         | PASS   |

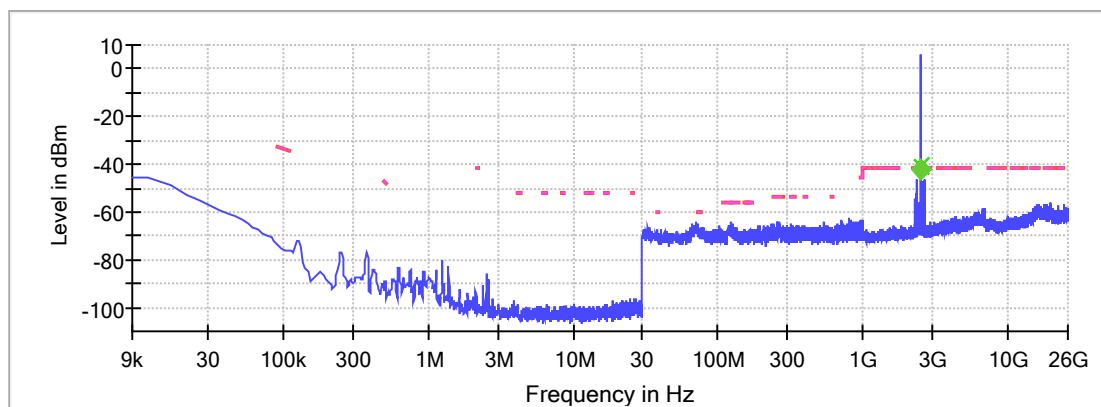
### Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|-------------|-------------|-------------|
| 2483.750000     | -40.6       | -0.6        | -41.2       |
| 2324.250000     | -46.7       | 5.5         | -41.2       |
| 73.125000       | -65.8       | 5.9         | -59.9       |
| 2324.750000     | -47.3       | 6.1         | -41.2       |
| 73.075000       | -66.4       | 6.5         | -59.9       |
| 73.175000       | -66.4       | 6.5         | -59.9       |
| 2323.750000     | -48.0       | 6.8         | -41.2       |
| 73.775000       | -66.9       | 7.0         | -59.9       |
| 73.825000       | -67.0       | 7.1         | -59.9       |
| 73.675000       | -67.3       | 7.4         | -59.9       |
| 73.625000       | -67.3       | 7.4         | -59.9       |
| 73.275000       | -67.5       | 7.6         | -59.9       |
| 73.425000       | -67.7       | 7.8         | -59.9       |
| 37.525000       | -67.7       | 7.8         | -59.9       |
| 74.275000       | -67.8       | 7.9         | -59.9       |

### Measurement Settings

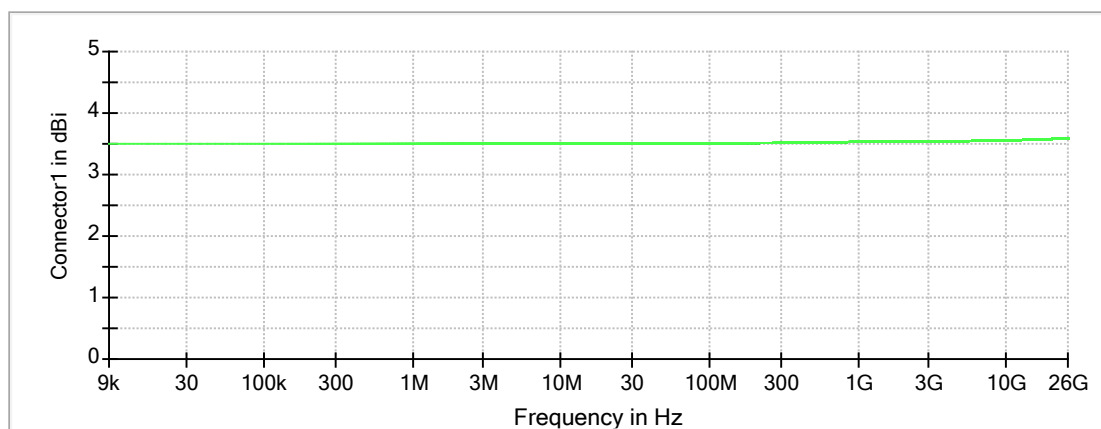
| Start Frequency (MHz) | Stop Frequency (MHz) | Pre Measurement | Final Measurement |
|-----------------------|----------------------|-----------------|-------------------|
| 0.009000              | 30.000000            | 2               | 2                 |
| 30.000000             | 1000.000000          | 2               | 2                 |
| 1000.000000           | 7000.000000          | 1               | 1                 |
| 7000.000000           | 26000.000000         | 1               | 1                 |

Restricted Band



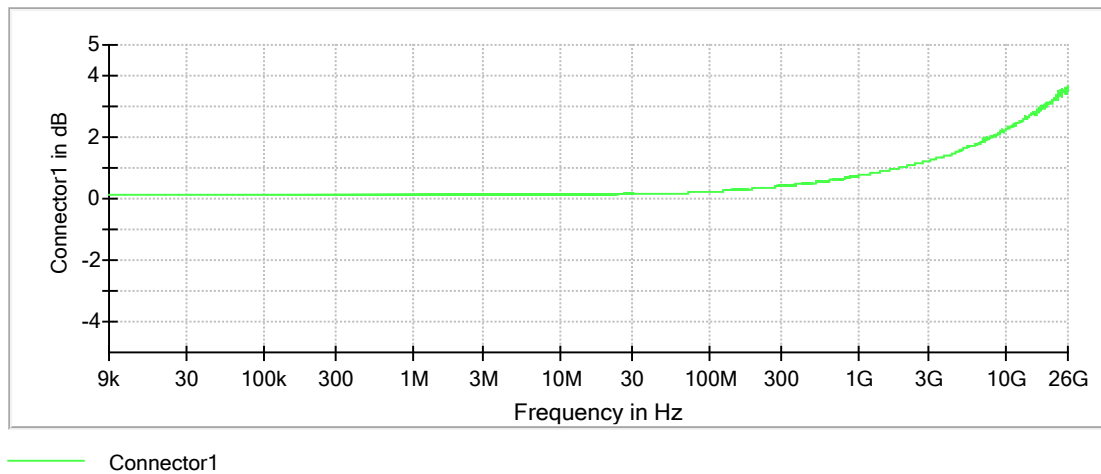
— Limit    
 - - - Threshold    
 x Critical    
 — Sum Level  
x Final Critical    
♦ Fail    
♦ Pass

Gain



— Connector1

Attenuation



-- End of Test Report --