



## FCC / ISSED Test Report

FOR:

Garmin International, Inc.

Model Name:

A04281

Product Description:

Mobile mounted digital recording device

FCC ID: IPH-04281

ISED ID: 1792A-04281

Applied Rules and Standards:

47 CFR Part 15.407 (NII) & 5 GHz (UNII)

RSS-247 Issue 2 (DTSs) & (LE-LAN), and RSS-Gen Issue 5

REPORT #: EMC\_GARMI-107-22001\_15.407\_UNII\_Rev1

DATE: 12-05-2022



A2LA Accredited

IC recognized #  
3462B-1

**CETECOM Inc.**

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: [info@cetecom.com](mailto:info@cetecom.com) • <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

**TABLE OF CONTENTS**

|           |                                                                            |           |
|-----------|----------------------------------------------------------------------------|-----------|
| <b>1</b>  | <b>ASSESSMENT.....</b>                                                     | <b>3</b>  |
| <b>2</b>  | <b>ADMINISTRATIVE DATA .....</b>                                           | <b>4</b>  |
| 2.1       | IDENTIFICATION OF THE TESTING LABORATORY ISSUING THE EMC TEST REPORT ..... | 4         |
| 2.2       | IDENTIFICATION OF THE CLIENT .....                                         | 4         |
| 2.3       | IDENTIFICATION OF THE MANUFACTURER.....                                    | 4         |
| <b>3</b>  | <b>EQUIPMENT UNDER TEST (EUT).....</b>                                     | <b>5</b>  |
| 3.1       | EUT SPECIFICATIONS .....                                                   | 5         |
| 3.2       | EUT SAMPLE DETAILS .....                                                   | 6         |
| 3.3       | ACCESSORY EQUIPMENT (AE) DETAILS.....                                      | 6         |
| 3.4       | TEST SAMPLE CONFIGURATION .....                                            | 6         |
| 3.5       | JUSTIFICATION FOR WORST CASE MODE OF OPERATION.....                        | 6         |
| <b>4</b>  | <b>SUBJECT OF INVESTIGATION .....</b>                                      | <b>7</b>  |
| <b>5</b>  | <b>MEASUREMENT RESULTS SUMMARY .....</b>                                   | <b>7</b>  |
| <b>6</b>  | <b>MEASUREMENT UNCERTAINTY.....</b>                                        | <b>8</b>  |
| 6.1       | ENVIRONMENTAL CONDITIONS DURING TESTING:.....                              | 8         |
| 6.2       | DATES OF TESTING: .....                                                    | 8         |
| <b>7</b>  | <b>MEASUREMENT PROCEDURES .....</b>                                        | <b>9</b>  |
| 7.1       | RADIATED MEASUREMENT.....                                                  | 9         |
| 7.2       | POWER LINE CONDUCTED MEASUREMENT PROCEDURE .....                           | 11        |
| 7.3       | RF CONDUCTED MEASUREMENT PROCEDURE .....                                   | 11        |
| <b>8</b>  | <b>TEST RESULT DATA .....</b>                                              | <b>12</b> |
| 8.1       | MAXIMUM OUTPUT POWER.....                                                  | 12        |
| 8.2       | POWER SPECTRAL DENSITY .....                                               | 15        |
| 8.3       | EMISSION BANDWIDTH 6 dB, 26 dB, AND 99% .....                              | 18        |
| 8.4       | FREQUENCY STABILITY .....                                                  | 32        |
| 8.5       | RADIATED TRANSMITTER SPURIOUS EMISSIONS AND BAND EDGE COMPLIANCE.....      | 33        |
| <b>9</b>  | <b>TEST SETUP PHOTOS .....</b>                                             | <b>61</b> |
| <b>10</b> | <b>TEST EQUIPMENT AND ANCILLARIES USED FOR TESTING .....</b>               | <b>61</b> |
| <b>11</b> | <b>HISTORY .....</b>                                                       | <b>62</b> |

## 1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.407 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

| Company                    | Description                             | Model # |
|----------------------------|-----------------------------------------|---------|
| Garmin International, Inc. | Mobile mounted digital recording device | A04281  |

### Responsible for Testing Laboratory:

| 12-05-2022 | Compliance | Arndt Stoecker<br>(Director of Regulatory Services) |           |
|------------|------------|-----------------------------------------------------|-----------|
| Date       | Section    | Name                                                | Signature |

### Responsible for the Report:

| 12-05-2022 | Compliance | Kris Lazarov<br>(EMC Engineer) |           |
|------------|------------|--------------------------------|-----------|
| Date       | Section    | Name                           | Signature |

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

## 2 **Administrative Data**

### 2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

|                                         |                        |
|-----------------------------------------|------------------------|
| <b>Company Name:</b>                    | CETECOM Inc.           |
| <b>Department:</b>                      | Compliance             |
| <b>Street Address:</b>                  | 411 Dixon Landing Road |
| <b>City/Zip Code</b>                    | Milpitas, CA 95035     |
| <b>Country</b>                          | USA                    |
| <b>Telephone:</b>                       | +1 (408) 586 6200      |
| <b>Fax:</b>                             | +1 (408) 586 6299      |
| <b>Director of Regulatory Services:</b> | Arndt Stoecker         |
| <b>Responsible Project Leader:</b>      | Sangeetha Sivaraman    |

### 2.2 Identification of the Client

|                        |                            |
|------------------------|----------------------------|
| <b>Client's Name:</b>  | Garmin International, Inc. |
| <b>Street Address:</b> | 1200 East 151st Street     |
| <b>City/Zip Code</b>   | Olathe, KS / 66062         |
| <b>Country</b>         | USA                        |

### 2.3 Identification of the Manufacturer

|                               |                |
|-------------------------------|----------------|
| <b>Manufacturer's Name:</b>   | Same as Client |
| <b>Manufacturers Address:</b> |                |
| <b>City/Zip Code</b>          |                |
| <b>Country</b>                |                |

### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

|                                                     |                                                                                                                                       |                   |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Model No:</b>                                    | A04281                                                                                                                                |                   |
| <b>HW Version :</b>                                 | 0                                                                                                                                     |                   |
| <b>SW Version :</b>                                 | 0.42                                                                                                                                  |                   |
| <b>FCC-ID :</b>                                     | IPH-04281                                                                                                                             |                   |
| <b>IC-ID:</b>                                       | 1792A-04281                                                                                                                           |                   |
| <b>FWIN:</b>                                        | A04281                                                                                                                                |                   |
| <b>HVIN:</b>                                        | A04281                                                                                                                                |                   |
| <b>PMN:</b>                                         | A04281                                                                                                                                |                   |
| <b>Product Description:</b>                         | Mobile mounted digital recording device                                                                                               |                   |
| <b>Frequency Range / number of channels:</b>        | Frequency Range (MHz)                                                                                                                 | Channel Number    |
|                                                     | 5150-5250                                                                                                                             | 36-48 [4]         |
|                                                     | 5725-5850                                                                                                                             | 149-165 [5]       |
| <b>Modes of Operation / Channel Bandwidths:</b>     | IEEE Std. 802.11(xxxx)                                                                                                                | Data Rate / MCS   |
|                                                     | a                                                                                                                                     | 6-54 Mbps         |
|                                                     | n/ac: HT20 / HT40 / HT80                                                                                                              | MCS 0-7; MCS 8-15 |
| <b>Transmit Chains(N<sub>TX</sub>)</b>              | 1                                                                                                                                     |                   |
| <b>Antenna Information as declared:</b>             | Frequency (MHz)                                                                                                                       | Peak Gain (dBi)   |
|                                                     | 5150-5250                                                                                                                             | 1.98              |
|                                                     | 5725-5850                                                                                                                             | -1.39             |
| <b>Max. Output Power:</b>                           | 18 dBm                                                                                                                                |                   |
| <b>Power Supply/ Rated Operating Voltage Range:</b> | 5Vdc, 2A                                                                                                                              |                   |
| <b>Operating Temperature Range</b>                  | -20°C to + 70°C                                                                                                                       |                   |
| <b>Other Radios included in the device:</b>         | Bluetooth (LE)<br>WiFi 802.11b/g/n (2.4GHz)<br>Cellular LTE Bands 2, 4, 5, 12, 66                                                     |                   |
| <b>Sample Revision</b>                              | <input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production |                   |

### 3.2 EUT Sample details

| EUT # | Serial Number | HW Version | SW Version | Notes/Comments |
|-------|---------------|------------|------------|----------------|
| 1     | 3408476455    | 0          | 0.42       | Conducted      |
| 2     | 3418387316    | 0          | 0.42       | Radiated       |

### 3.3 Accessory Equipment (AE) details

| AE # | Type                | Model        | Manufacturer | Serial Number |
|------|---------------------|--------------|--------------|---------------|
| 1    | Vehicle Power Cable | 320-00845-04 | Garmin       | N/A           |

### 3.4 Test Sample Configuration

| EUT Set-up # | Combination of AE used for test set up | Comments                                                                                                                                                                                                                             |
|--------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | EUT#1                                  | The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle using software that is not available to the end user. The measurement equipment was connected to the 50 ohm RF port of the EUT. |
| 2            | EUT#2 + AE#1                           | The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle using software that is not available to the end user. The internal antenna was connected.                                       |

### 3.5 Justification for Worst Case Mode of Operation

For Frequency Stability testing at extreme conditions the 802.11n mode was used as a representative of the combination of high PSD, and emissions bandwidth.

For Spurious Emissions testing the 802.11a mode was used because of the highest PSD. During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

For Band Edge the higher emissions bandwidth 802.11ac modes were evaluated in addition to 802.11a mode.

#### 4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.407 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under the FCC ID: IPH-04281 and ISED ID: 1792A-04281.

#### 5 Measurement Results Summary

| Test Specification                                          | Test Case                      | Temperature and Voltage Conditions | Mode         | Pass | NA | NP | Result   |
|-------------------------------------------------------------|--------------------------------|------------------------------------|--------------|------|----|----|----------|
| §15.407(e)<br>RSS-247 6.2.4.1                               | Emission Bandwidth             | Nominal                            | 802.11a/n/ac | ■    | □  | □  | Complies |
| §15.407(a)<br>RSS-247 6                                     | Power Spectral Density         | Nominal                            | 802.11a/n/ac | ■    | □  | □  | Complies |
| §15.407(a)<br>RSS-247 6                                     | Maximum Output Power           | Nominal                            | 802.11a/n/ac | ■    | □  | □  | Complies |
| §15.407(g)                                                  | Frequency stability            | Extreme temperature                | 802.11n      | ■    | □  | □  | Complies |
| §15.407; 15.205<br>RSS-247 6; RSS-Gen 8.10                  | Band Edge Compliance           | Nominal                            | 802.11a/ac   | ■    | □  | □  | Complies |
| §15.407(b); §15.209; 15.205<br>RSS-247 6; RSS-Gen 8.9; 8.10 | Radiated TX Spurious Emissions | Nominal                            | 802.11a      | ■    | □  | □  | Complies |
| §15.207(a)<br>RSS Gen 8.8                                   | AC Conducted Emissions         | Nominal                            | N/A          | □    | ■  | □  | Complies |

**Note:** NA= Not Applicable; NP= Not Performed.

## 6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=2.

| Measurement System               | EMC 1   | EMC 2   |
|----------------------------------|---------|---------|
| Conducted emissions (mains port) | 1.12 dB | 0.46 dB |
| Radiated emissions               |         |         |
| (< 30 MHz)                       | 3.66 dB | 3.88 dB |
| (30 MHz – 1GHz)                  | 3.17 dB | 3.34 dB |
| (1 GHz – 3 GHz)                  | 5.01 dB | 4.45 dB |
| (>3 GHz)                         | 4.0 dB  | 4.79 dB |

### 6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

### 6.2 Dates of Testing:

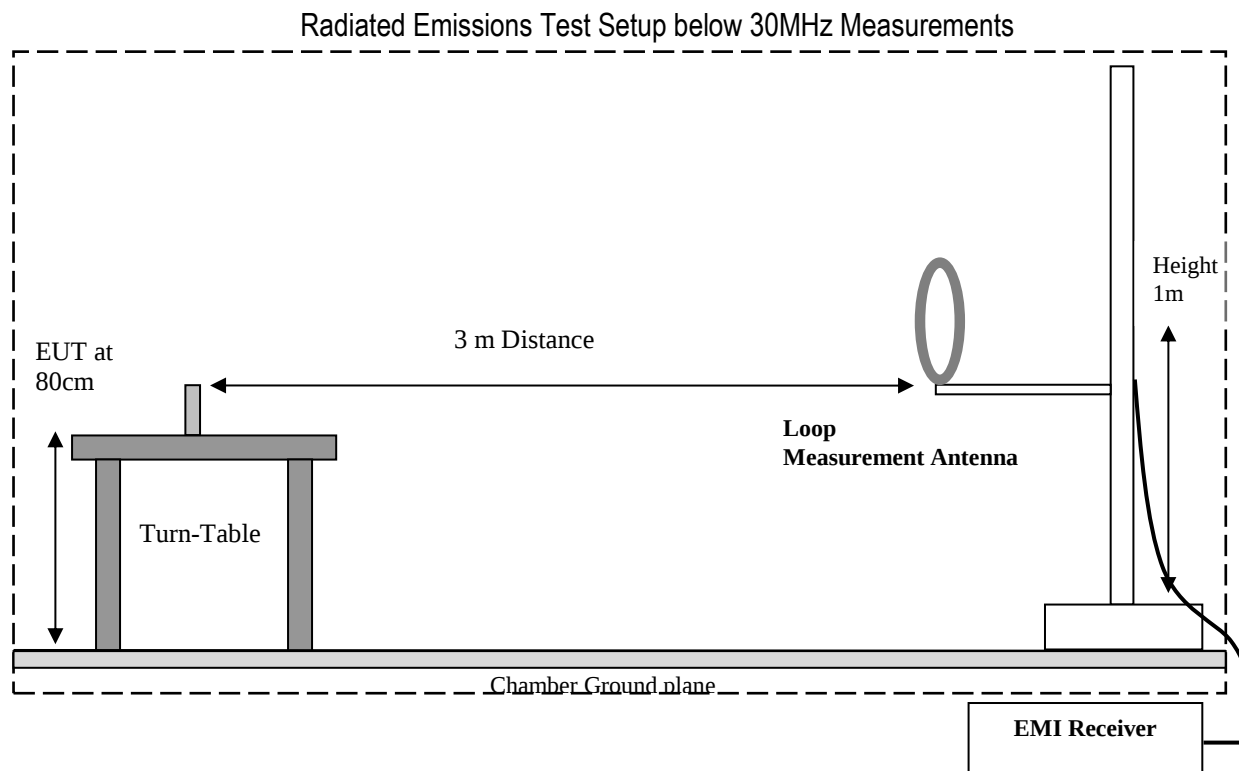
07/21/2022 - 08/01/2022

## 7 Measurement Procedures

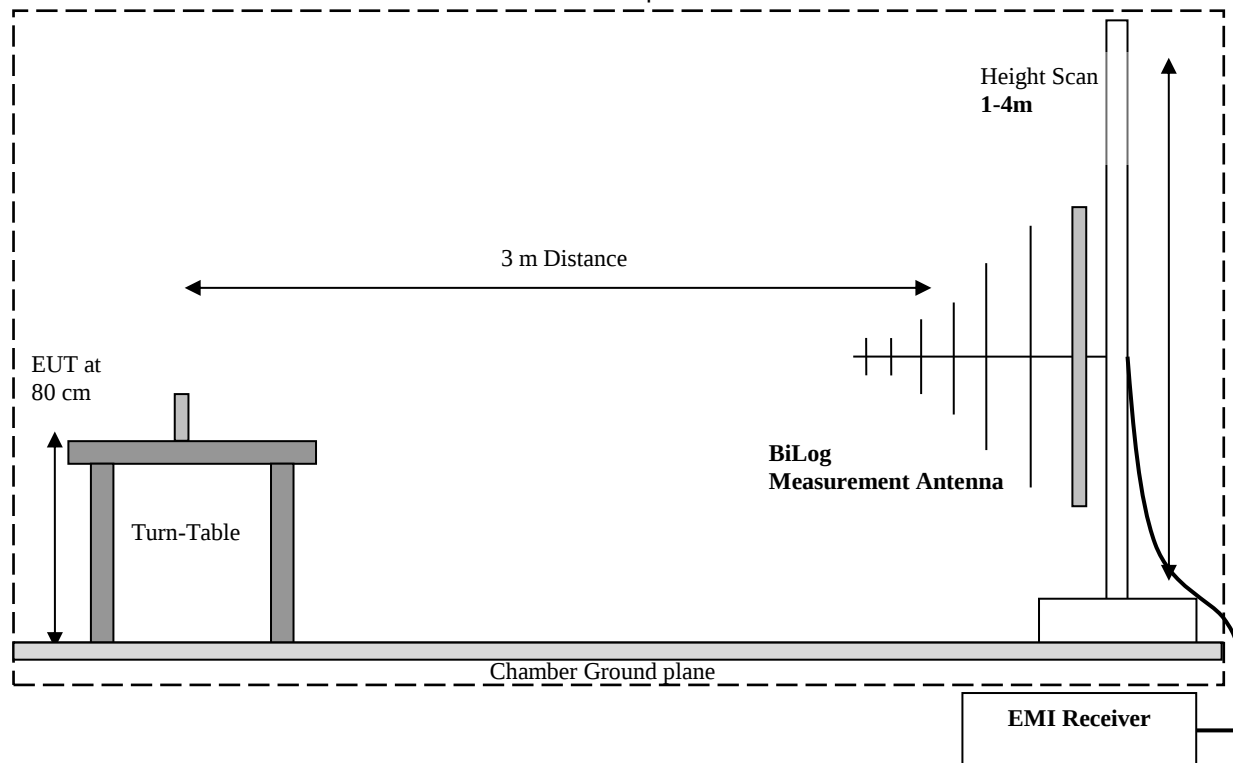
### 7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

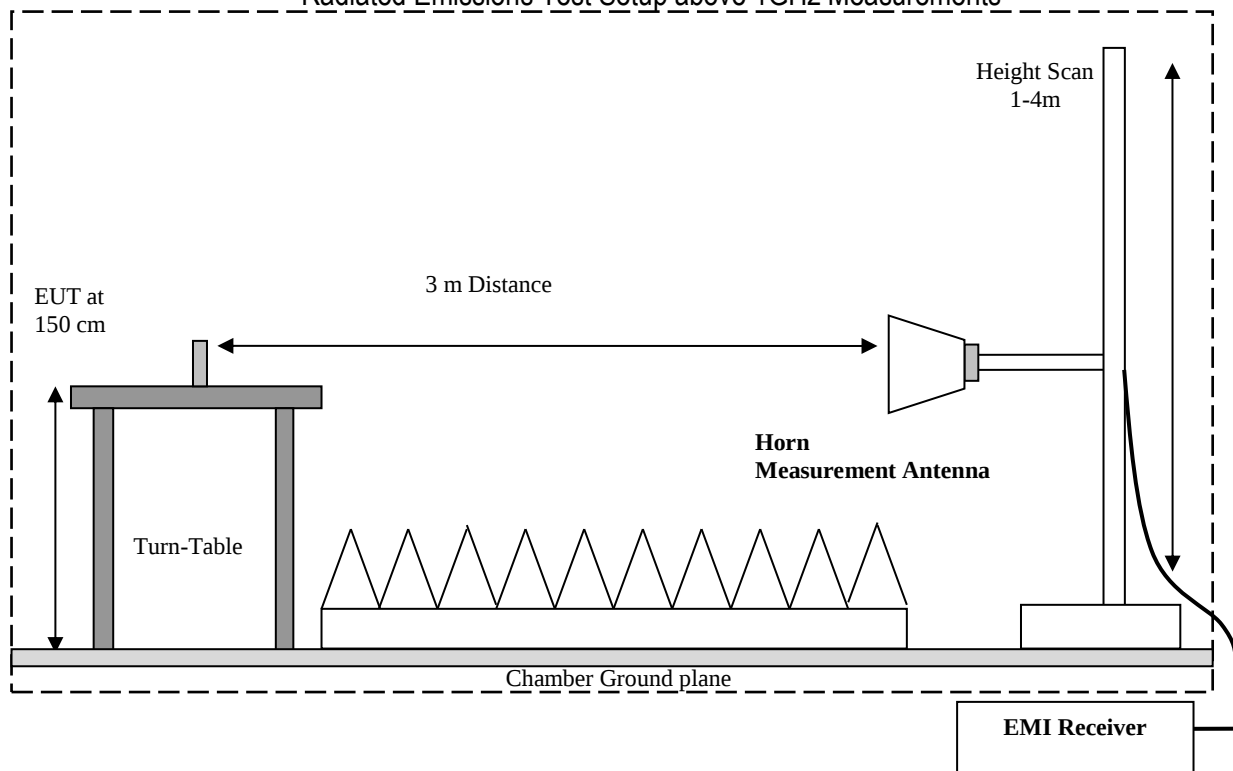
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



## Radiated Emissions Test Setup 30MHz-1GHz Measurements



## Radiated Emissions Test Setup above 1GHz Measurements



### 7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB $\mu$ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

| Frequency (MHz) | Measured SA (dB $\mu$ V) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dB $\mu$ V/m) |
|-----------------|--------------------------|-----------------|--------------------------------|--------------------------------------|
| 1000            | 80.5                     | 3.5             | 14                             | 98.0                                 |

### 7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

### 7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

## 8 Test Result Data

### 8.1 Maximum Output Power

#### 8.1.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

##### Spectrum Analyzer settings for method SA-1:

- Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- Set RBW = 1 MHz
- Set the VBW  $\geq$  3 MHz
- Detector = RMS
- Number of points in sweep  $\geq$  2 Span / RBW. (This ensures that bin-to-bin spacing is  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
- Sweep time = Auto Couple
- Trace mode = Trace average at least 100 traces in power averaging (i.e., RMS mode).
- If transmit duty cycle  $<$  98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle  $\geq$  98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
- Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

#### 8.1.2 Limits:

FCC§15.407

##### Sub-band 5150-5250 MHz

- For AP the maximum conducted output power over the frequency band of operation shall not exceed 1 W
- For Client Devices the maximum conducted output power over the frequency band of operation shall not exceed 250 mW

##### Sub-band 5725-5850 MHz

- The maximum conducted output power over the frequency band of operation shall not exceed 1 W

RSS-247

##### Sub-band 5150-5250 MHz

- For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or  $1.76 + 10 \log_{10} B$ , dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
- For other devices, the maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10} B$ , dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

### Sub-band 5725-5850 MHz

- The maximum conducted output power shall not exceed 1 W.

Note: All limits are conducted. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.1.3 Test conditions and setup:

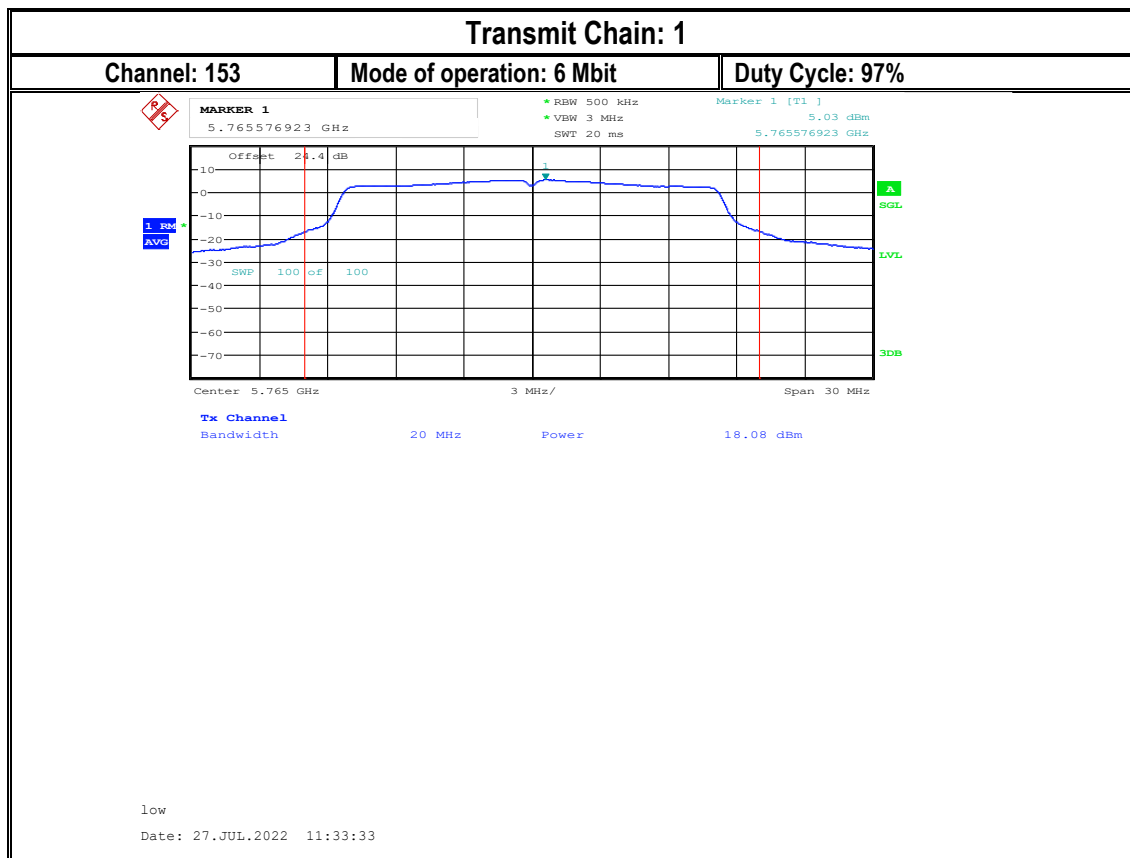
| Ambient Temperature | EUT Set-Up # | EUT operating mode          | Power Input | Antenna Gain                      |
|---------------------|--------------|-----------------------------|-------------|-----------------------------------|
| 22° C               | 1            | Continuous fixed channel TX | 12 VDC      | UNII-1 1.98dBi<br>UNII-3 -1.39dBi |

### 8.1.4 Measurement result:

| UNII-1    |                                  |                       |                                  |                       |                                  |                       |                |        |
|-----------|----------------------------------|-----------------------|----------------------------------|-----------------------|----------------------------------|-----------------------|----------------|--------|
| Mode      | CH36<br>Conducted<br>Power (dBm) | CH36<br>EIRP<br>(dBm) | CH40<br>Conducted<br>Power (dBm) | CH40<br>EIRP<br>(dBm) | CH48<br>Conducted<br>Power (dBm) | CH48<br>EIRP<br>(dBm) | Limit<br>(dBm) | Result |
| 6 Mbit    | 17.37                            | 19.35                 | 17.00                            | 18.98                 | 16.71                            | 18.69                 | 23             | Pass   |
| MCS0 HT20 | 16.97                            | 18.95                 | 16.56                            | 18.54                 | 16.45                            | 18.43                 | 23             | Pass   |
| Mode      | CH38<br>Conducted<br>Power (dBm) | CH38<br>EIRP<br>(dBm) | CH42<br>Conducted<br>Power (dBm) | CH42<br>EIRP<br>(dBm) | CH46<br>Conducted<br>Power (dBm) | CH46<br>EIRP<br>(dBm) | Limit<br>(dBm) | Result |
| MCS0 HT40 | 14.89                            | 16.87                 | -                                | -                     | 15.07                            | 17.05                 | 23             | Pass   |
| MCS0 HT80 | -                                | -                     | 14.47                            | 16.45                 | -                                | -                     | 23             | Pass   |

| UNII-3    |                                   |                        |                                   |                        |                                   |                        |                |        |
|-----------|-----------------------------------|------------------------|-----------------------------------|------------------------|-----------------------------------|------------------------|----------------|--------|
| Mode      | CH149<br>Conducted<br>Power (dBm) | CH149<br>EIRP<br>(dBm) | CH153<br>Conducted<br>Power (dBm) | CH153<br>EIRP<br>(dBm) | CH165<br>Conducted<br>Power (dBm) | CH165<br>EIRP<br>(dBm) | Limit<br>(dBm) | Result |
| 6 Mbit    | 17.99                             | 16.6                   | 18                                | 16.61                  | 17.55                             | 16.16                  | 30             | Pass   |
| MCS0 HT20 | 17.75                             | 16.36                  | 17.64                             | 16.25                  | 17.24                             | 15.85                  | 30             | Pass   |
| Mode      | CH151<br>Conducted<br>Power (dBm) | CH151<br>EIRP<br>(dBm) | CH155<br>Conducted<br>Power (dBm) | CH155<br>EIRP<br>(dBm) | CH159<br>Conducted<br>Power (dBm) | CH159<br>EIRP<br>(dBm) | Limit<br>(dBm) | Result |
| MCS0 HT40 | 14.49                             | 13.10                  | -                                 | -                      | 15.03                             | 13.64                  | 30             | Pass   |
| MCS0 HT80 | -                                 | -                      | 14.49                             | 13.10                  | -                                 | -                      | 30             | Pass   |

### 8.1.5 Highest Power Measurement Plot:



## 8.2 Power Spectral Density

### 8.2.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

#### Spectrum Analyzer Settings for Peak PSD in 1 MHz Band with Method SA-1:

- Use the settings in section 8.1.1
- Use the peak marker function to determine the maximum amplitude level within the RBW. The result is the Maximum PSD over 1 MHz reference bandwidth

#### Spectrum Analyzer Settings for Peak PSD in 500 kHz Band with Method SA-1:

- Set RBW 500 kHz
- Set VBW  $\geq 3$  RBW.
- Measure the Maximum PSD in 500 kHz reference bandwidth for sub-band 5725-5850 MHz

### 8.2.2 Limits:

#### FCC§15.407

##### Sub-band 5150-5250 MHz

- For AP the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band
- For Client Devices the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band

##### Sub-band 5725-5850 MHz

- The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band

#### RSS-247

##### Sub-band 5150-5250 MHz

- PSD shall be less than 10 dBm in any 1 MHz band- EIRP

##### Sub-band 5725-5850 MHz

- PSD shall be less than 30 dBm in any 500 kHz band

Note: All limits are conducted. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.2.3 Test conditions and setup:

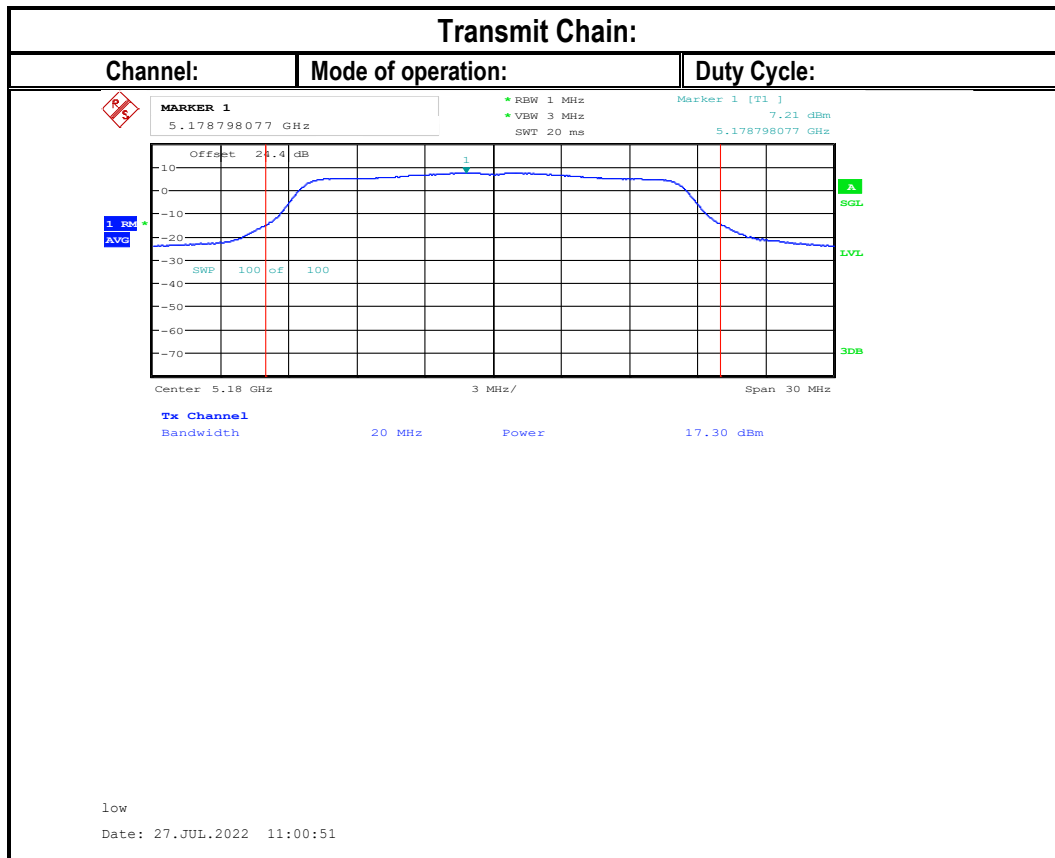
| Ambient Temperature | EUT Set-Up # | EUT operating mode          | Power Input | Antenna Gain                      |
|---------------------|--------------|-----------------------------|-------------|-----------------------------------|
| 22° C               | 1            | Continuous fixed channel TX | 12 VDC      | UNII-1 1.98dBi<br>UNII-3 -1.39dBi |

## 8.2.4 Measurement result:

| UNII-1    |                               |                                             |                               |                                             |                               |                                             |                  |        |
|-----------|-------------------------------|---------------------------------------------|-------------------------------|---------------------------------------------|-------------------------------|---------------------------------------------|------------------|--------|
| Mode      | Measured PSD CH 36 (dBm/1MHz) | Antenna Gain Corrected PSD CH 36 (dBm/1MHz) | Measured PSD CH 40 (dBm/1MHz) | Antenna Gain Corrected PSD CH 40 (dBm/1MHz) | Measured PSD CH 48 (dBm/1MHz) | Antenna Gain Corrected PSD CH 48 (dBm/1MHz) | Limit (dBm/1MHz) | Result |
| 6 Mbit    | 7.21                          | 9.19                                        | 6.77                          | 8.75                                        | 6.7                           | 8.68                                        | 10               | Pass   |
| MCS0 HT20 | 6.72                          | 8.7                                         | 6.15                          | 8.13                                        | 6.18                          | 8.16                                        | 10               | Pass   |
|           |                               |                                             |                               |                                             |                               |                                             |                  |        |
| Mode      | Measured PSD CH 38 (dBm/1MHz) | Antenna Gain Corrected PSD CH 38 (dBm/1MHz) | Measured PSD CH 42 (dBm/1MHz) | Antenna Gain Corrected PSD CH 42 (dBm/1MHz) | Measured PSD CH 46 (dBm/1MHz) | Antenna Gain Corrected PSD CH 46 (dBm/1MHz) | Limit (dBm/1MHz) | Result |
| MCS0 HT40 | 1.75                          | 3.73                                        | -                             | -                                           | 1.95                          | 3.93                                        | 10               | Pass   |
| MCS0 HT80 | -                             | -                                           | -1.55                         | 0.43                                        | -                             | -                                           | 10               | Pass   |

| UNII-3    |                                  |                                                |                                  |                                                |                                  |                                                |                    |        |
|-----------|----------------------------------|------------------------------------------------|----------------------------------|------------------------------------------------|----------------------------------|------------------------------------------------|--------------------|--------|
| Mode      | Measured PSD CH 149 (dBm/0.5MHz) | Antenna Gain Corrected PSD CH 149 (dBm/0.5MHz) | Measured PSD CH 157 (dBm/0.5MHz) | Antenna Gain Corrected PSD CH 157 (dBm/0.5MHz) | Measured PSD CH 165 (dBm/0.5MHz) | Antenna Gain Corrected PSD CH 165 (dBm/0.5MHz) | Limit (dBm/0.5MHz) | Result |
| 6 Mbit    | 5.14                             | 3.75                                           | 5.03                             | 3.64                                           | 4.87                             | 3.48                                           | 30                 | Pass   |
| MCS0 HT20 | 4.61                             | 3.22                                           | 4.62                             | 3.23                                           | 4.21                             | 2.82                                           | 30                 | Pass   |
|           |                                  |                                                |                                  |                                                |                                  |                                                |                    |        |
| Mode      | Measured PSD CH 151 (dBm/0.5MHz) | Antenna Gain Corrected PSD CH 151 (dBm/0.5MHz) | Measured PSD CH 155 (dBm/0.5MHz) | Antenna Gain Corrected PSD CH 155 (dBm/0.5MHz) | Measured PSD CH 159 (dBm/0.5MHz) | Antenna Gain Corrected PSD CH 159 (dBm/0.5MHz) | Limit (dBm/0.5MHz) | Result |
| MCS0 HT40 | -1.67                            | -3.06                                          | -                                | -                                              | -1.03                            | -2.42                                          | 30                 | Pass   |
| MCS0 HT80 | -                                | -                                              | -4.27                            | -5.66                                          | -                                | -                                              | 30                 | Pass   |

## 8.2.5 Highest PSD Measurement Plots:



### 8.3 Emission Bandwidth 6 dB, 26 dB, and 99%

#### 8.3.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

- For the band 5.150-5.250 GHz the 26 dB and 99% EBW is measured
- For the band 5.725-5.850 GHz the 6 dB and 99% EBW is measured

#### Spectrum Analyzer Settings for 6 dB EBW in band 5.725 – 5.850 GHz:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW
- Detector = Peak
- Trace mode = max hold
- Sweep = auto couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

#### Spectrum Analyzer Settings for 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency
- Set span = 1.5 times to 5.0 times the OBW
- Set RBW = 1% to 5% of the OBW
- Set VBW  $\geq 3 \times$  RBW
- Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used
- Use the 99% power bandwidth function of the instrument (if available)
- If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies

#### 8.3.2 Limits:

FCC §15.247(e) and RSS-407 6.2.4.1

- For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 8.3.3 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode          | Power Input |
|---------------------|--------------|-----------------------------|-------------|
| 22° C               | 1            | Continuous fixed channel TX | 12 VDC      |

## 8.3.4 Measurement result:

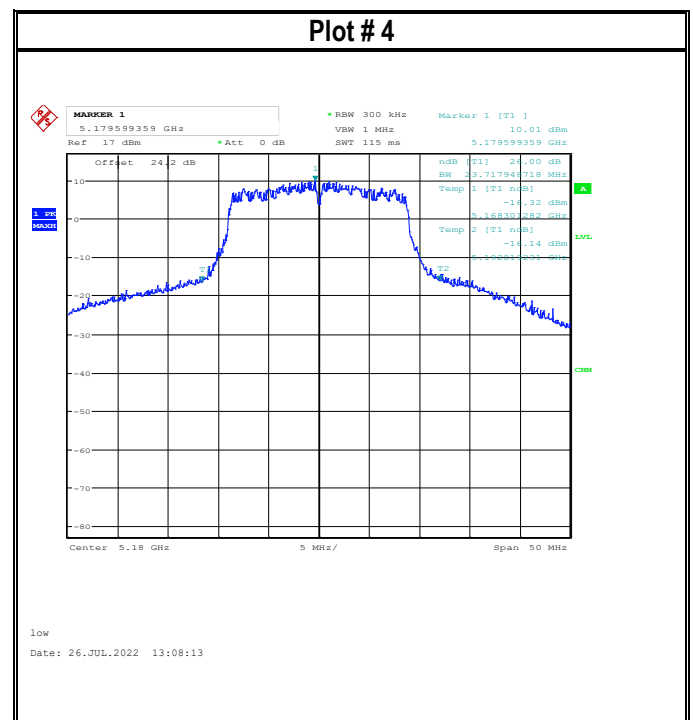
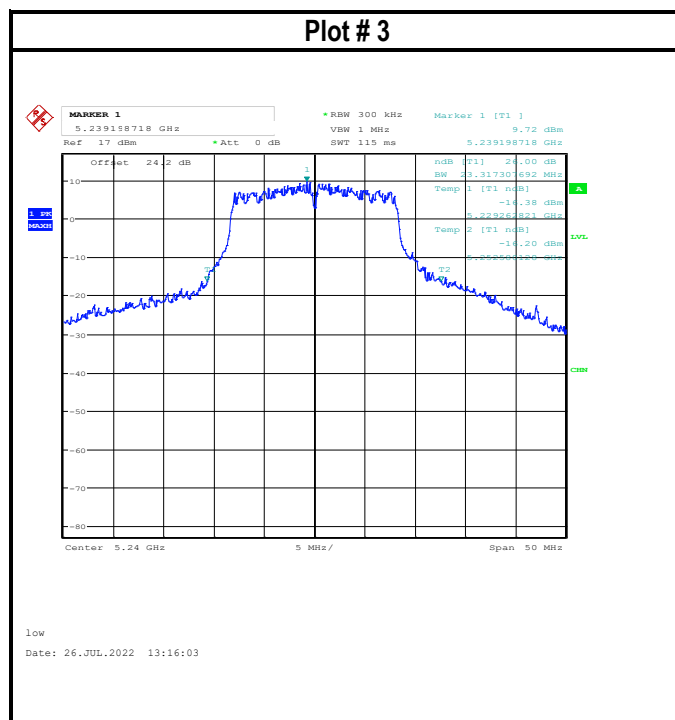
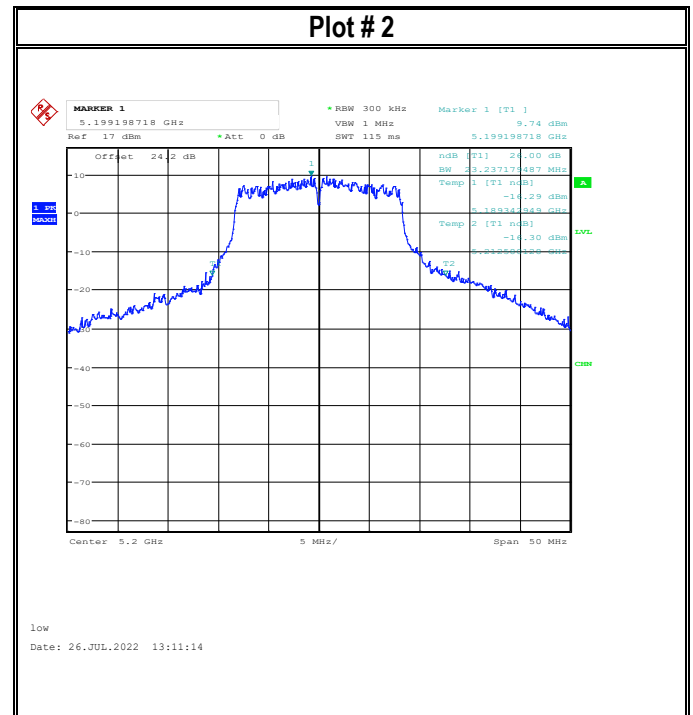
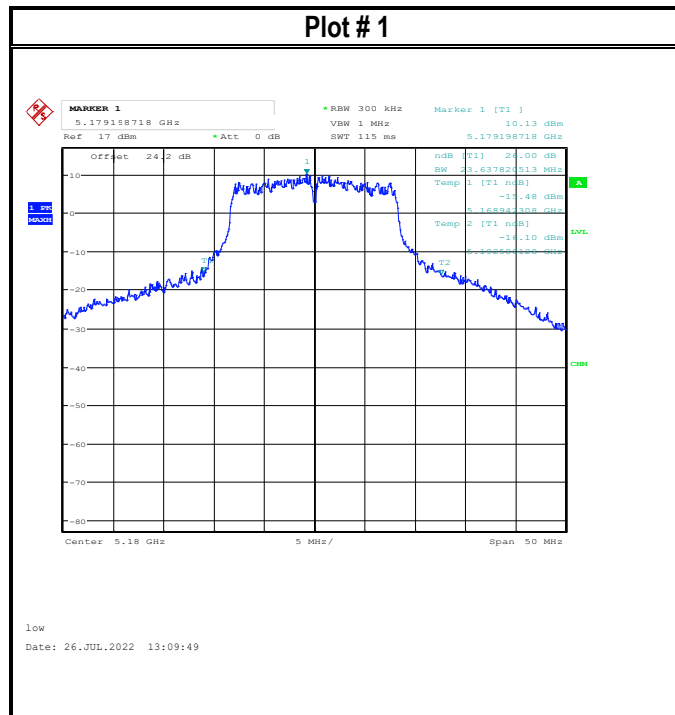
| Plot # | Mode of Operation | Channel | 26dB Emissions Bandwidth (MHz) |
|--------|-------------------|---------|--------------------------------|
| 1      | 6 Mbit            | 36      | 23.6                           |
| 2      | 6 Mbit            | 40      | 23.2                           |
| 3      | 6 Mbit            | 48      | 23.5                           |
| 4      | MCS0 20MHz        | 36      | 23.7                           |
| 5      | MCS0 20MHz        | 40      | 23.3                           |
| 6      | MCS0 20MHz        | 48      | 23.6                           |
| 7      | MCS0 40MHz        | 38      | 40.7                           |
| 8      | MCS0 40MHz        | 46      | 40.9                           |
| 9      | MCS0 80MHz        | 42      | 83.6                           |

| Plot # | Mode of Operation | Channel | 99% Emissions Bandwidth (MHz) |
|--------|-------------------|---------|-------------------------------|
| 10     | 6 Mbit            | 36      | 17.5                          |
| 11     | 6 Mbit            | 40      | 17.5                          |
| 12     | 6 Mbit            | 48      | 18.5                          |
| 13     | MCS0 20MHz        | 36      | 18.4                          |
| 14     | MCS0 20MHz        | 40      | 17.6                          |
| 15     | MCS0 20MHz        | 48      | 18.5                          |
| 16     | MCS0 40MHz        | 38      | 36.6                          |
| 17     | MCS0 40MHz        | 46      | 36.5                          |
| 18     | MCS0 80MHz        | 42      | 75.9                          |

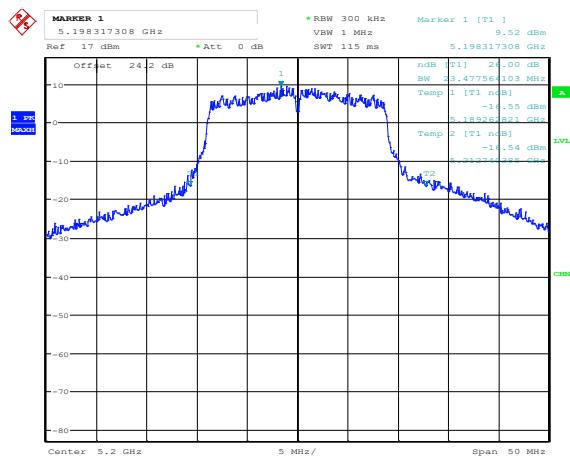
| Plot # | Mode of Operation | Channel | 6dB Emissions Bandwidth (MHz) | Limit (MHz) | Result |
|--------|-------------------|---------|-------------------------------|-------------|--------|
| 19     | 6 Mbit            | 149     | 16.4                          | > 0.5       | Pass   |
| 20     | 6 Mbit            | 157     | 16.4                          | > 0.5       | Pass   |
| 21     | 6 Mbit            | 165     | 16.4                          | > 0.5       | Pass   |
| 22     | MCS0 20MHz        | 149     | 17.6                          | > 0.5       | Pass   |
| 23     | MCS0 20MHz        | 157     | 17.6                          | > 0.5       | Pass   |
| 24     | MCS0 20MHz        | 165     | 17.6                          | > 0.5       | Pass   |
| 25     | MCS0 40MHz        | 151     | 36.2                          | > 0.5       | Pass   |
| 26     | MCS0 40MHz        | 159     | 35.9                          | > 0.5       | Pass   |
| 27     | MCS0 80MHz        | 155     | 75.8                          | > 0.5       | Pass   |

| Plot # | Mode of Operation | Channel | 99% Emissions Bandwidth (MHz) | Limit (MHz) | Result |
|--------|-------------------|---------|-------------------------------|-------------|--------|
| 28     | 6 Mbit            | 149     | 17.6                          | > 0.5       | Pass   |
| 29     | 6 Mbit            | 157     | 17.7                          | > 0.5       | Pass   |
| 30     | 6 Mbit            | 165     | 17.7                          | > 0.5       | Pass   |
| 31     | MCS0 20MHz        | 149     | 18.6                          | > 0.5       | Pass   |
| 32     | MCS0 20MHz        | 157     | 18.6                          | > 0.5       | Pass   |
| 33     | MCS0 20MHz        | 165     | 18.6                          | > 0.5       | Pass   |
| 34     | MCS0 40MHz        | 151     | 36.6                          | > 0.5       | Pass   |
| 35     | MCS0 40MHz        | 159     | 36.5                          | > 0.5       | Pass   |
| 36     | MCS0 80MHz        | 155     | 75.8                          | > 0.5       | Pass   |

### 8.3.5 Measurement Plots:

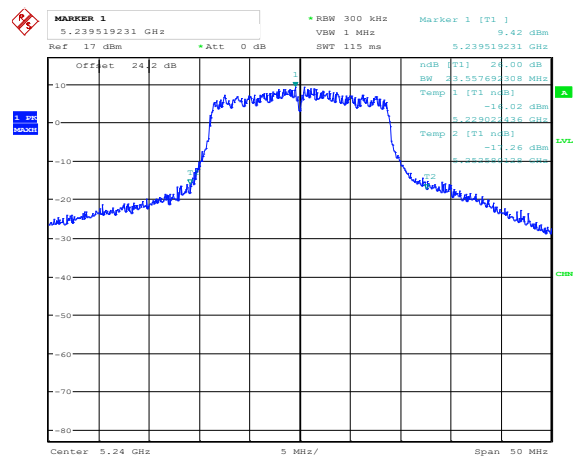


Plot # 5



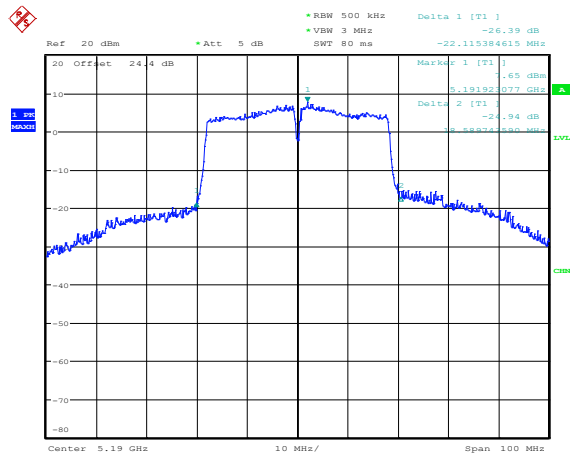
low  
Date: 26.JUL.2022 13:13:27

Plot # 6



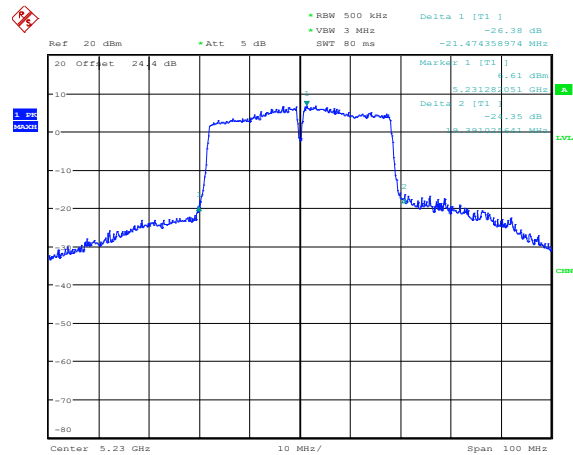
low  
Date: 26.JUL.2022 13:14:45

Plot # 7

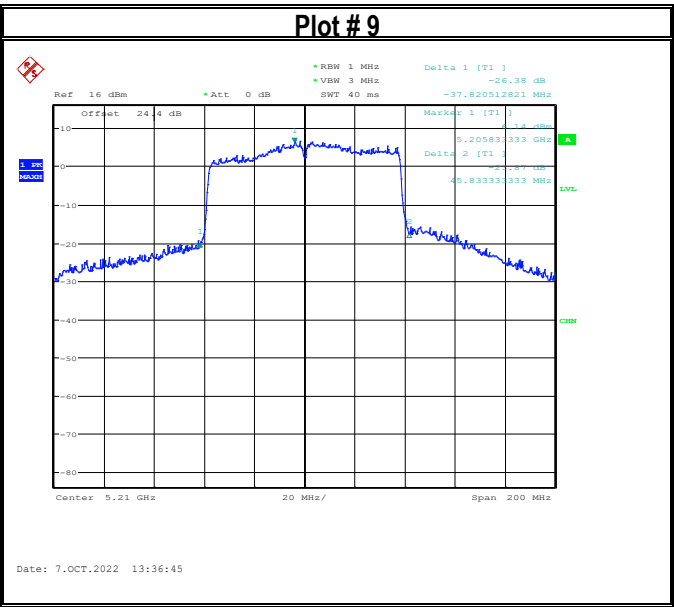


Date: 7.OCT.2022 13:41:55

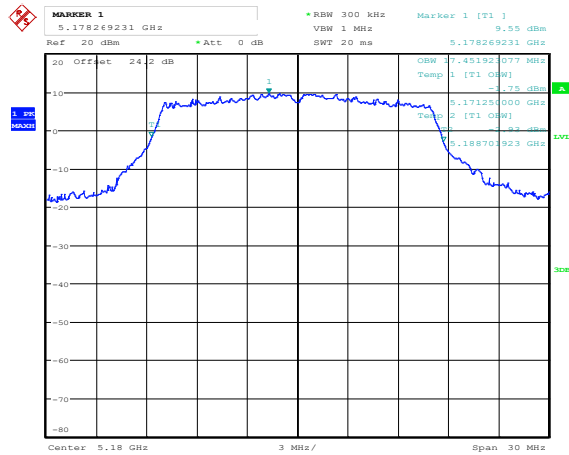
Plot # 8



Date: 7.OCT.2022 13:44:06



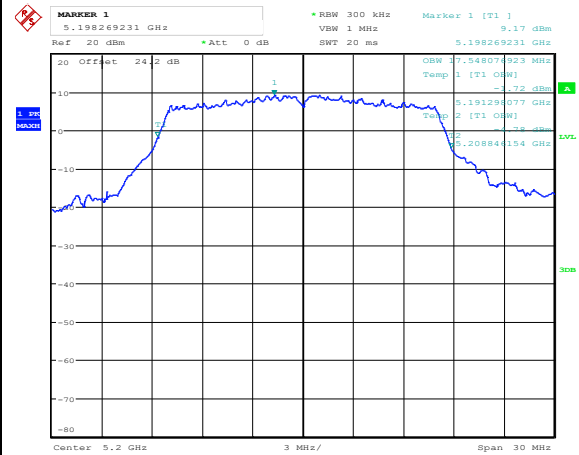
### Plot # 10



low

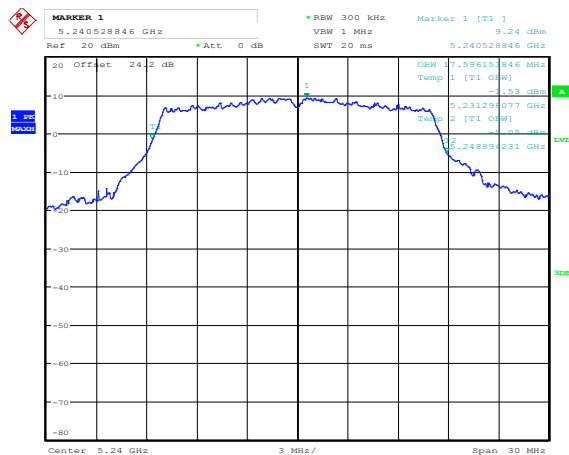
Date: 26.JUL.2022 13:22:11

### Plot # 11



low  
Date: 26.JUL.2022 13:21:11

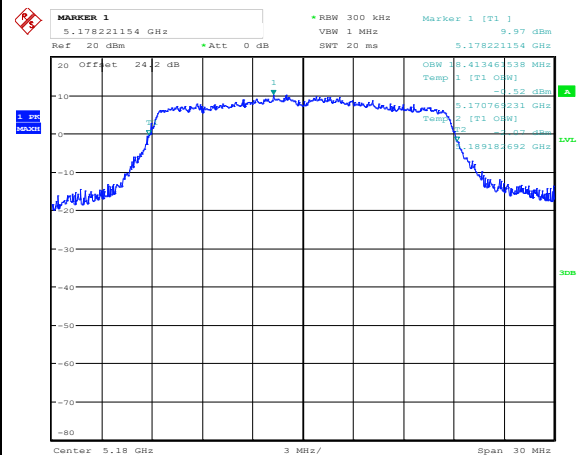
## Plot # 12



low

Date: 26.JUL.2022 13:18:18

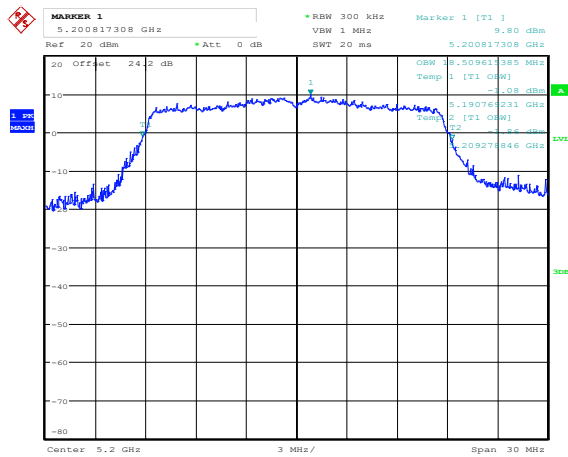
### Plot # 13



low  
Date: 26.JUL.2022 13:23:12

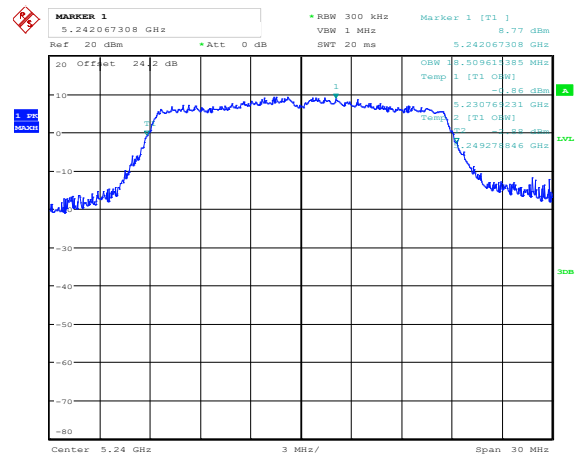


Plot # 14



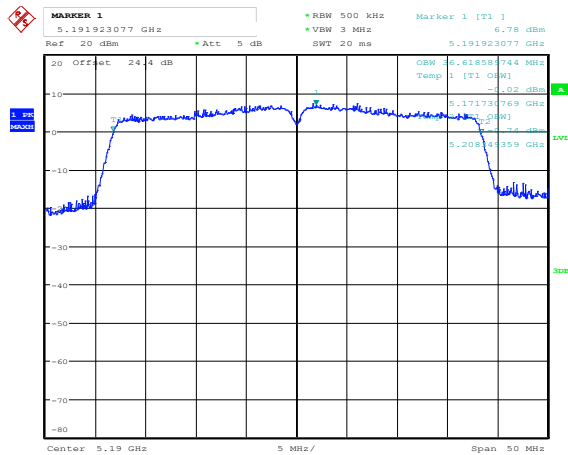
low  
Date: 26.JUL.2022 13:20:26

Plot # 15



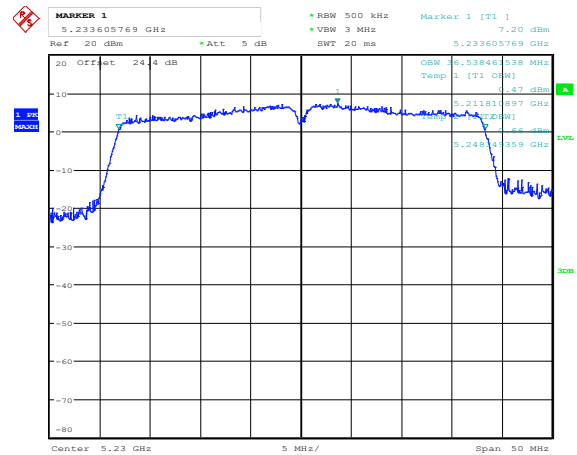
low  
Date: 26.JUL.2022 13:19:16

Plot # 16

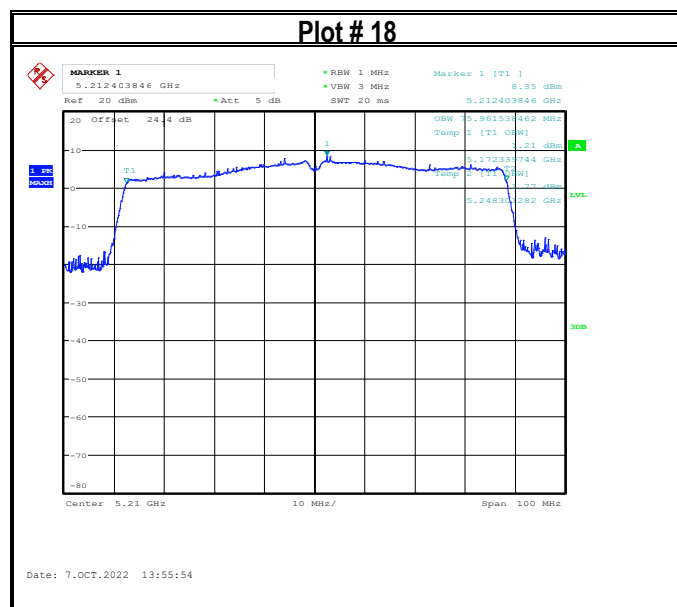


Date: 7.OCT.2022 13:48:38

Plot # 17

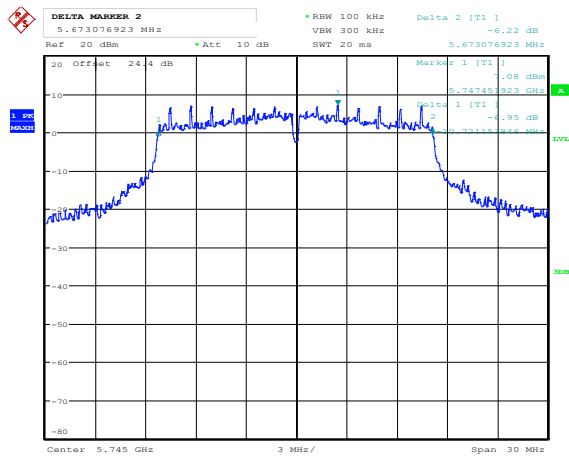


Date: 7.OCT.2022 13:46:53



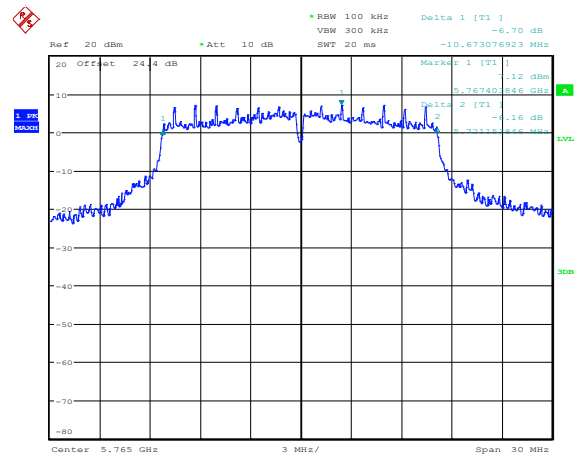


Plot # 19



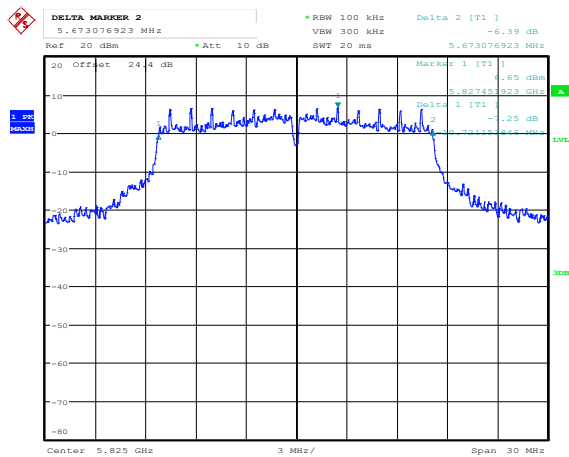
low  
Date: 22.JUL.2022 14:17:35

Plot # 20



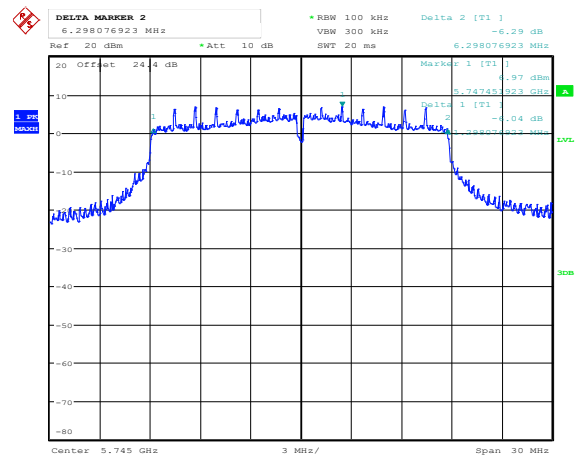
low  
Date: 22.JUL.2022 13:56:34

Plot # 21



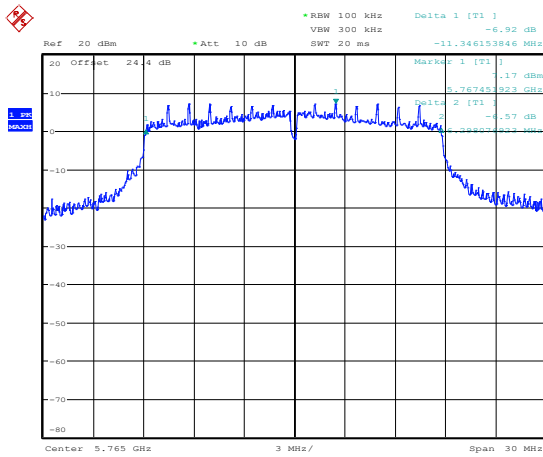
low  
Date: 22.JUL.2022 14:09:17

Plot # 22



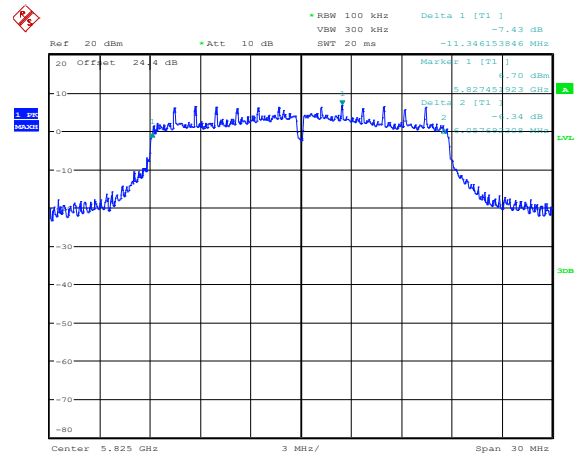
low  
Date: 22.JUL.2022 14:20:02

Plot # 23



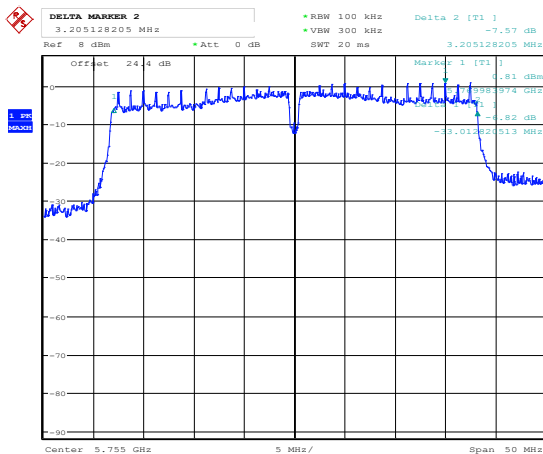
low  
Date: 22.JUL.2022 14:01:25

Plot # 24



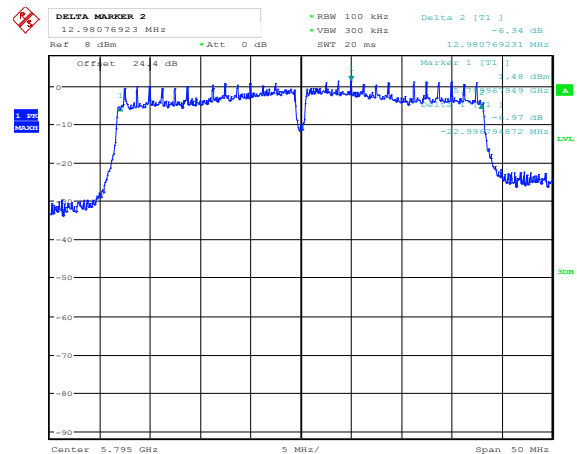
low  
Date: 22.JUL.2022 14:07:36

Plot # 25



Date: 7.OCT.2022 13:18:23

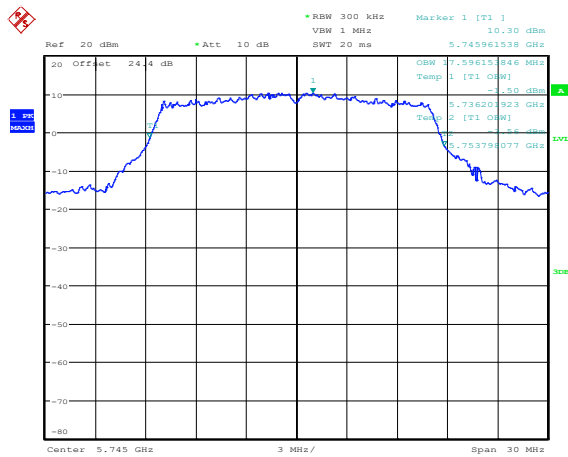
Plot # 26



Date: 7.OCT.2022 13:20:29

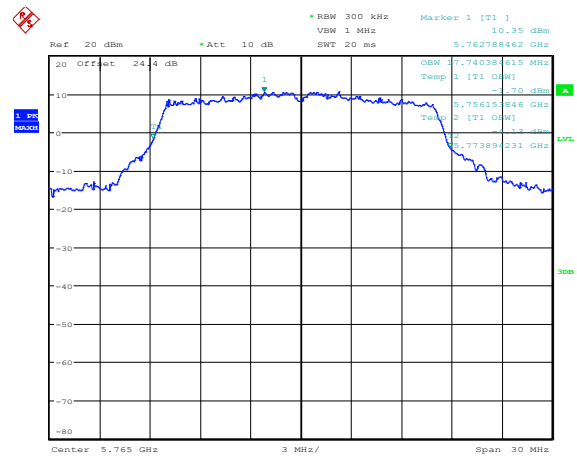


Plot # 28



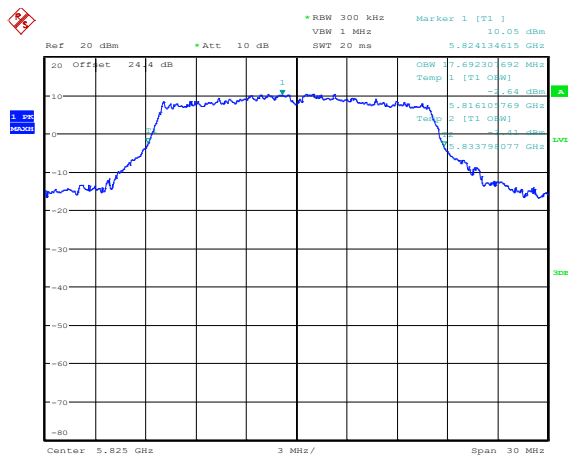
low  
Date: 22.JUL.2022 14:26:33

Plot # 29



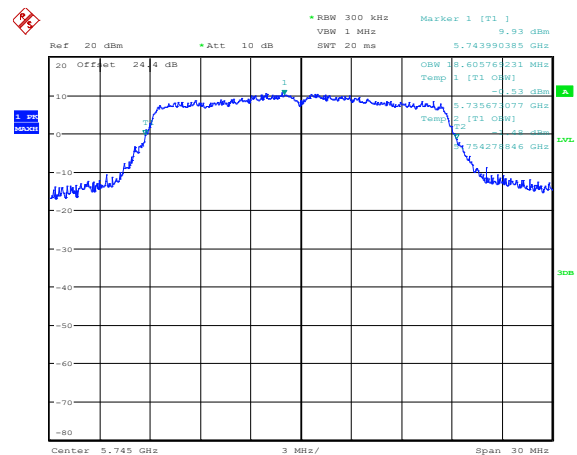
low  
Date: 22.JUL.2022 14:31:57

Plot # 30



low  
Date: 22.JUL.2022 14:33:11

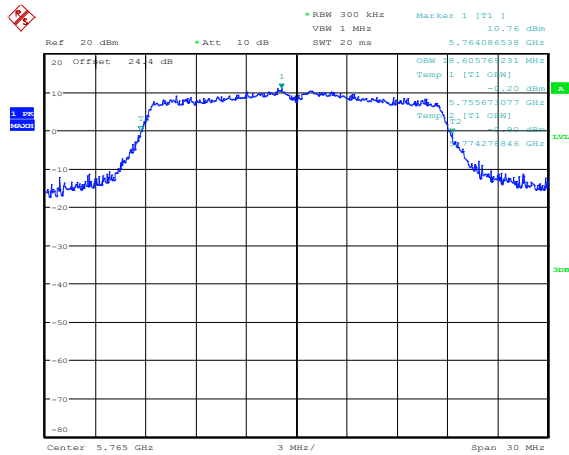
Plot # 31



low  
Date: 22.JUL.2022 14:29:37

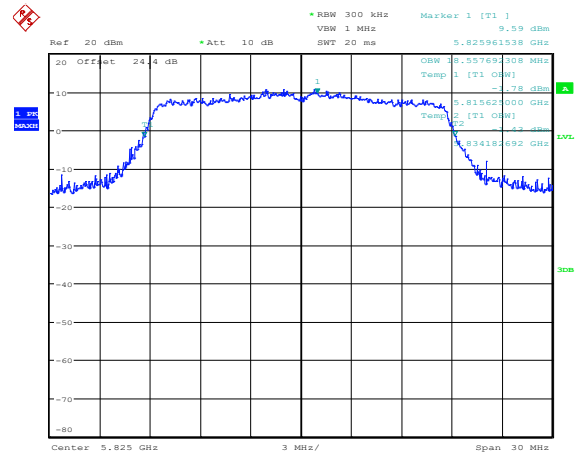


Plot # 32



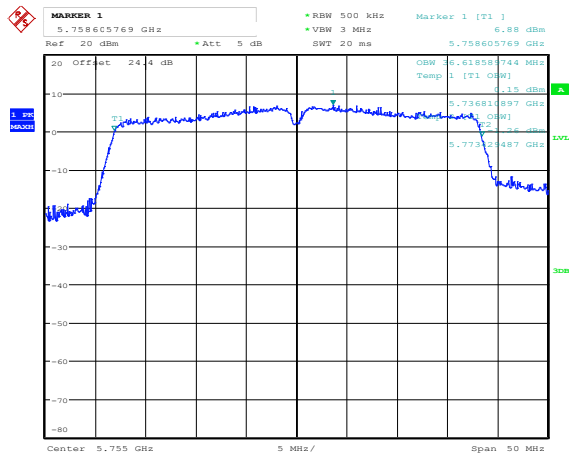
low  
Date: 22.JUL.2022 14:31:04

Plot # 33



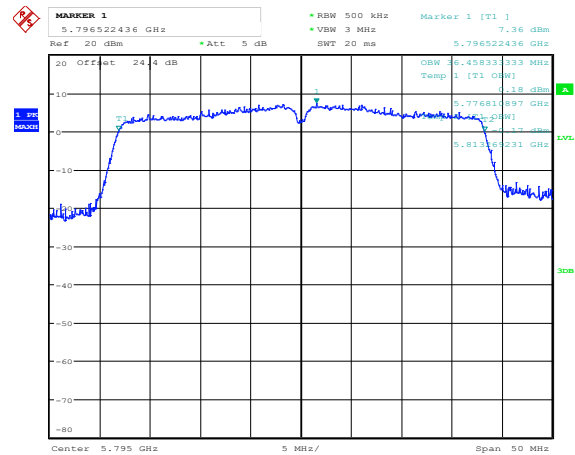
low  
Date: 22.JUL.2022 14:34:02

Plot # 34

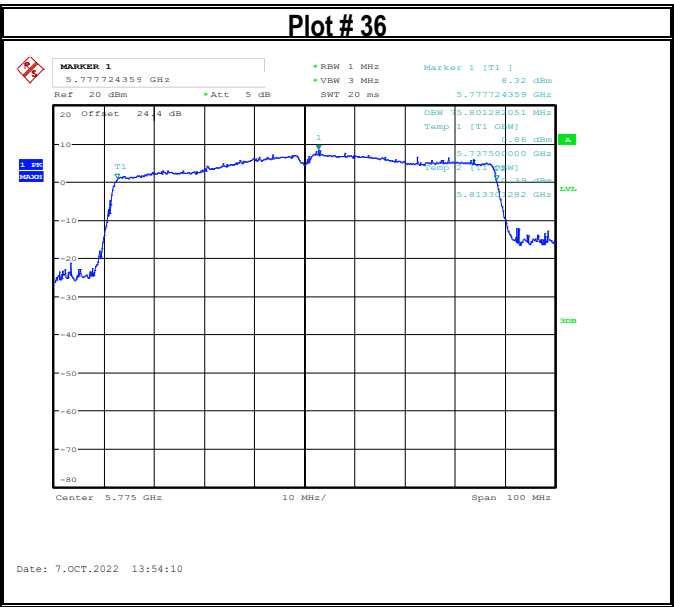


Date: 7.OCT.2022 13:50:01

Plot # 35



Date: 7.OCT.2022 13:51:16



## 8.4 Frequency stability

### 8.4.1 Measurement Procedure

- The EUT was placed inside temperature chamber
- Set the EUT to the operation mode needed
- Set the chamber to the highest temperature specified
- Allow sufficient time for the temperature of the chamber to stabilize, measure the operating frequency
- Repeat step with the temperature chamber set to lowest temperature

### 8.4.2 Limits:

FCC §15.407(g)

- Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual

### 8.4.3 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode          | Power Input |
|---------------------|--------------|-----------------------------|-------------|
| 22                  | 1            | Continuous fixed channel TX | 12 VDC      |

### 8.4.4 Measurement result:

| Temp  | 802.11n_HT20 | Measured CF GHz | ACF GHz | Frequency Stability (ppm) |
|-------|--------------|-----------------|---------|---------------------------|
| 25°C  | 36           | 5.180           | 5.180   | -9.65                     |
|       | 40           | 5.200           | 5.200   | 9.62                      |
|       | 48           | 5.240           | 5.240   | -14.31                    |
|       | 149          | 5.745           | 5.745   | 0.00                      |
|       | 153          | 5.765           | 5.765   | 8.67                      |
|       | 165          | 5.825           | 5.825   | -8.58                     |
| -20°C | 36           | 5.180           | 5.180   | 9.65                      |
|       | 40           | 5.200           | 5.200   | 14.42                     |
|       | 48           | 5.240           | 5.240   | 0.00                      |
|       | 149          | 5.745           | 5.745   | 13.05                     |
|       | 153          | 5.765           | 5.765   | 13.01                     |
|       | 165          | 5.825           | 5.825   | 8.58                      |
| 70°C  | 36           | 5.180           | 5.180   | 9.65                      |
|       | 40           | 5.200           | 5.200   | 33.65                     |
|       | 48           | 5.240           | 5.240   | 14.31                     |
|       | 149          | 5.745           | 5.745   | 17.41                     |
|       | 153          | 5.765           | 5.765   | 39.03                     |
|       | 165          | 5.825           | 5.825   | 8.58                      |

## 8.5 Radiated Transmitter Spurious Emissions and Band Edge Compliance

### 8.5.1 Measurement according to ANSI C63.10 (2013)

- Band edge was tested on the modes with the highest PSD, and widest bandwidth.

#### Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak
- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)
- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz
- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing frequencies below 30 MHz at distance other than the specified in the standard, the limit conversion is calculated by using the FCC materials for the ANSI 63 committee issued on January, 27 1991.

### 8.5.2 Limits:

FCC§15.407 (b); RSS-247 6

- For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.
- The provisions of §15.205 apply to intentional radiators operating under this section.

## FCC §15.209 &amp; RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency of emission (MHz) | Field strength ( $\mu\text{V/m}$ ) | Measurement Distance (m) | Field strength @ 3m ( $\text{dB}\mu\text{V/m}$ ) |
|-----------------------------|------------------------------------|--------------------------|--------------------------------------------------|
| 0.009–0.490                 | 2400/F(kHz) / -----                | 300                      | -                                                |
| 0.490–1.705                 | 24000/F(kHz) / -----               | 30                       | -                                                |
| 1.705–30.0                  | 30 / (29.5)                        | 30                       | -                                                |
| 30–88                       | 100                                | 3                        | 40 $\text{dB}\mu\text{V/m}$                      |
| 88–216                      | 150                                | 3                        | 43.5 $\text{dB}\mu\text{V/m}$                    |
| 216–960                     | 200                                | 3                        | 46 $\text{dB}\mu\text{V/m}$                      |
| Above 960                   | 500                                | 3                        | 54 $\text{dB}\mu\text{V/m}$                      |

## FCC §15.205 &amp; RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 10.495-0.505      | 16.69475-16.69525   | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.80425-16.80475   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | Above 38.6  |
| 13.36-13.41       |                     |               |             |

- 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)).

\*PEAK LIMIT= 74  $\text{dB}\mu\text{V/m}$

\*AVG. LIMIT= 54  $\text{dB}\mu\text{V/m}$

### 8.5.3 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode            | Power Input |
|---------------------|--------------|-------------------------------|-------------|
| 22° C               | 2            | GFSK continuous fixed channel | 12 VDC      |

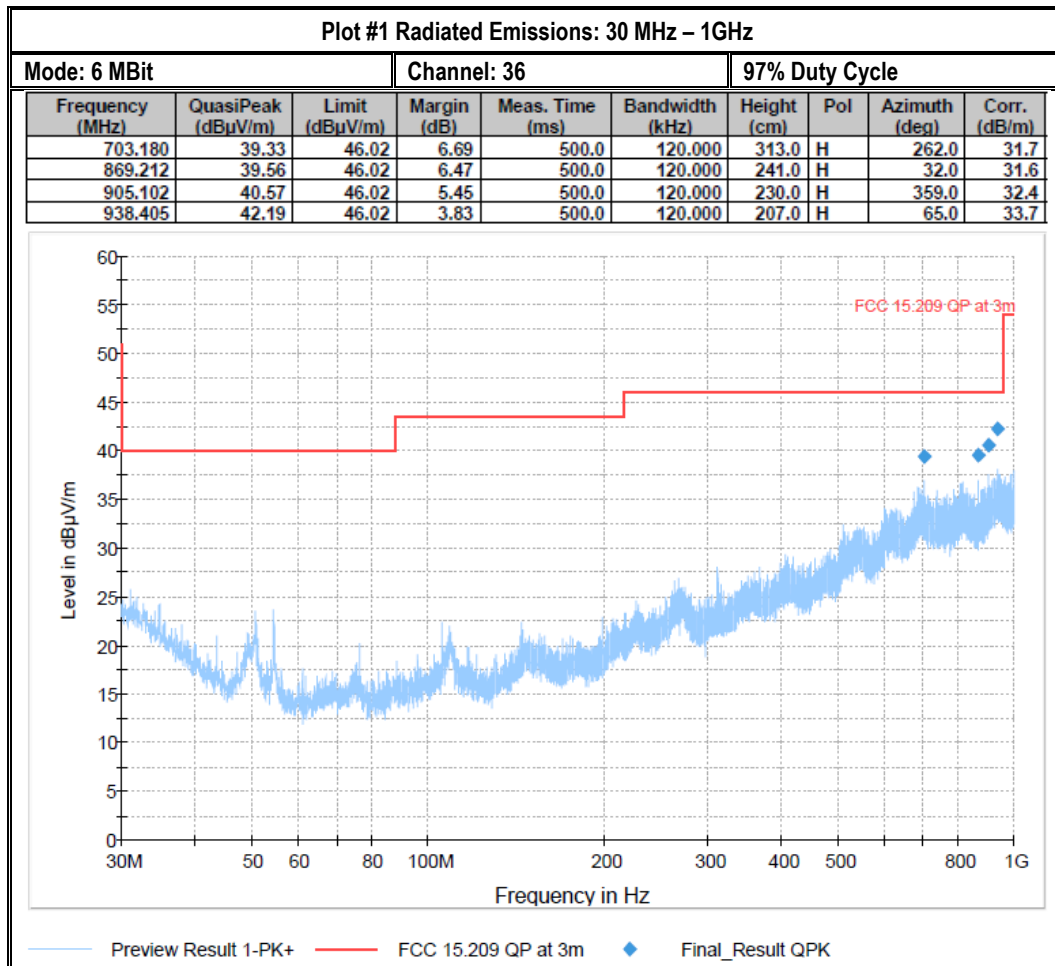
### 8.5.4 Measurement result:

| Plot # | Channel # | Scan Frequency  | Limit             | Result |
|--------|-----------|-----------------|-------------------|--------|
| 1-3    | 36        | 30 MHz – 18 GHz | See section 8.5.2 | Pass   |
| 4-8    | 40        | 9 kHz – 26 GHz  | See section 8.5.2 | Pass   |
| 9-11   | 48        | 30 MHz – 18 GHz | See section 8.5.2 | Pass   |
| 12-14  | 149       | 30 MHz – 18 GHz | See section 8.5.2 | Pass   |
| 15-19  | 153       | 9 kHz – 26 GHz  | See section 8.5.2 | Pass   |
| 20-22  | 165       | 30 MHz – 18 GHz | See section 8.5.2 | Pass   |

#### Restricted Band Edge @ 5.15GHz

| Plot # | EUT operating mode | Band Edge              | Band Edge Max<br>( dB $\mu$ V/m ) | Limit<br>( dB $\mu$ V/m ) | Result |
|--------|--------------------|------------------------|-----------------------------------|---------------------------|--------|
| 23     | 6 Mbit 20MHz       | Restricted <b>Peak</b> | 70                                | 74                        | Pass   |
| 24     | 6 Mbit 40MHz       | Restricted <b>AVG</b>  | 52                                | 54                        | Pass   |
| 25     | MCS0 40MHz         | Restricted <b>Peak</b> | 68                                | 74                        | Pass   |
| 26     | MCS0 40MHz         | Restricted <b>AVG</b>  | 51                                | 54                        | Pass   |
| 27     | MCS0 80MHz         | Restricted <b>Peak</b> | 67                                | 74                        | Pass   |
| 28     | MCS0 80MHz         | Restricted <b>AVG</b>  | 51                                | 54                        | Pass   |

### 8.5.5 Measurement Plots:



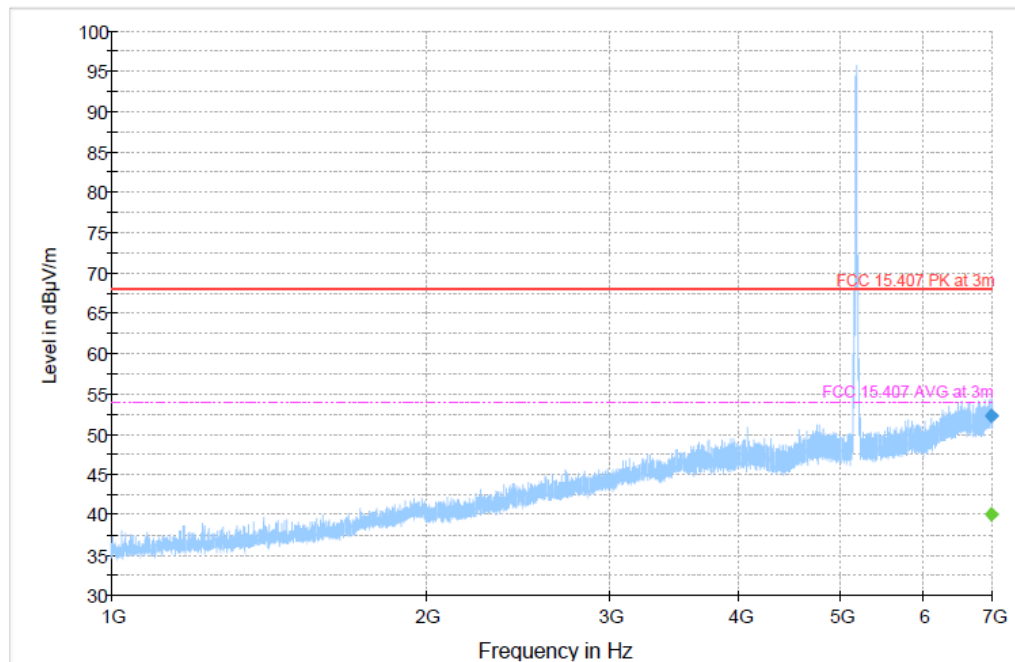
## Plot # 2 Radiated Emissions: 1-7 GHz

Mode: 6 MBit

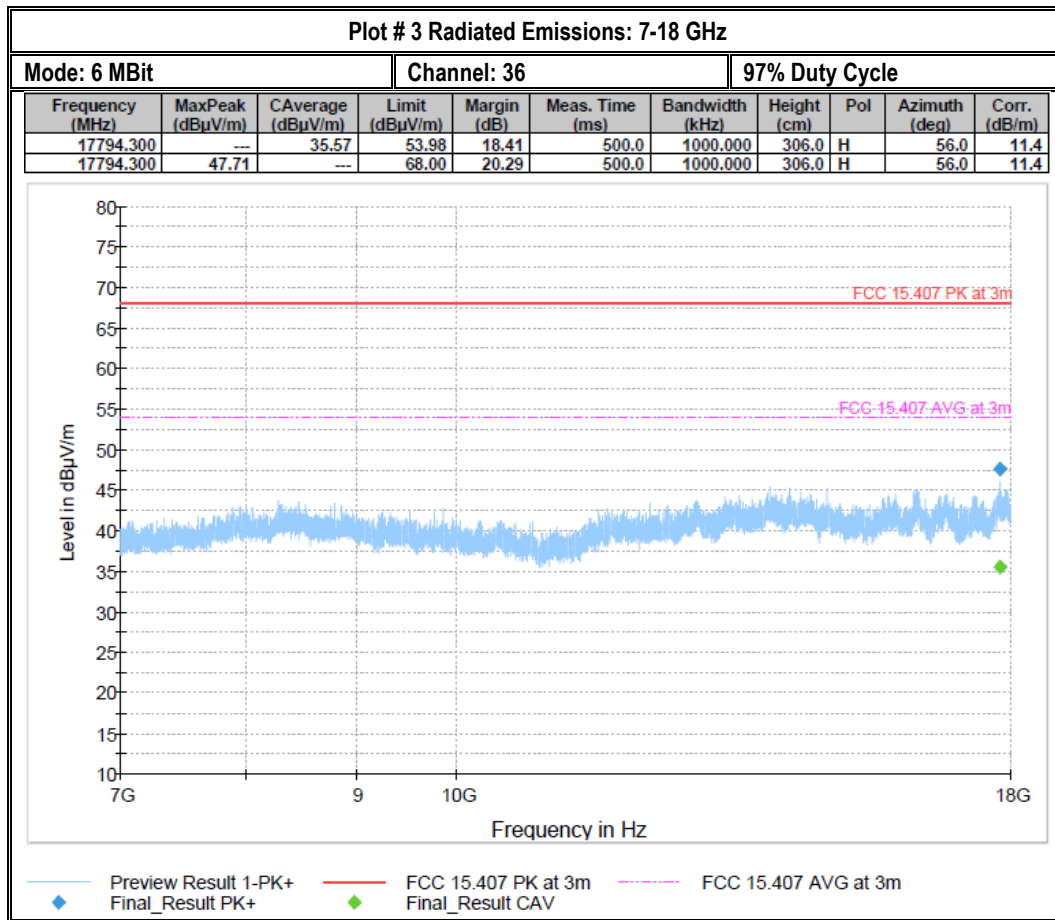
Channel: 36

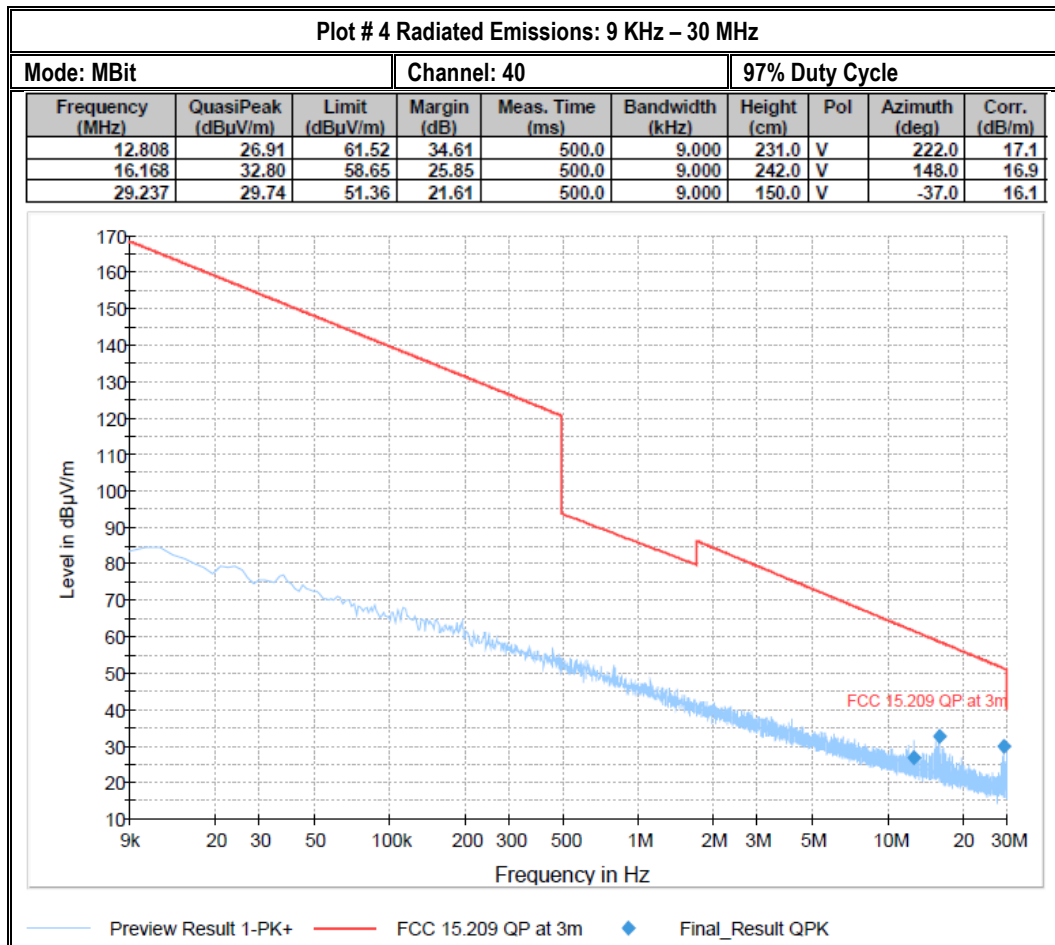
97% Duty Cycle

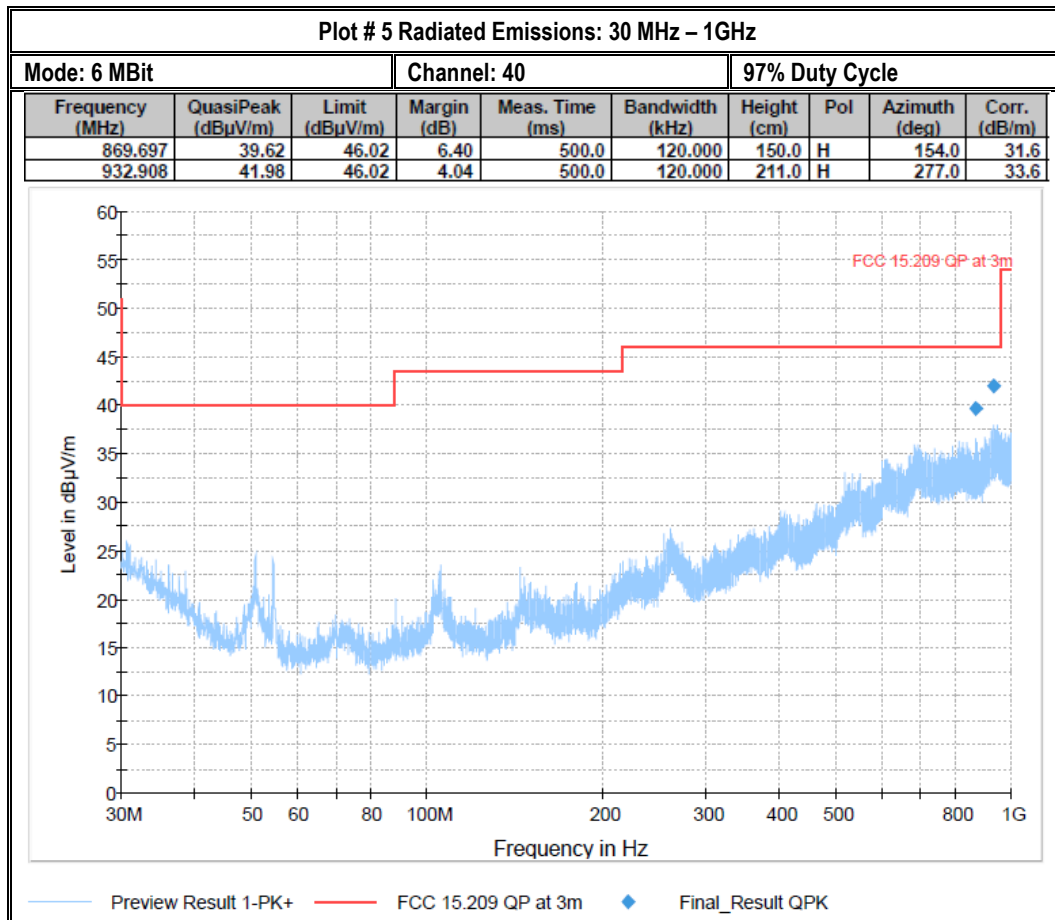
| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 6976.100        | ---              | 40.06             | 53.98          | 13.91       | 500.0           | 1000.000        | 265.0       | H   | -45.0         | 19.9         |
| 6976.100        | 52.32            | ---               | 68.00          | 15.68       | 500.0           | 1000.000        | 265.0       | H   | -45.0         | 19.9         |



Preview Result 1-PK+ Final\_Result PK+ FCC 15.407 PK at 3m Final\_Result CAV FCC 15.407 AVG at 3m







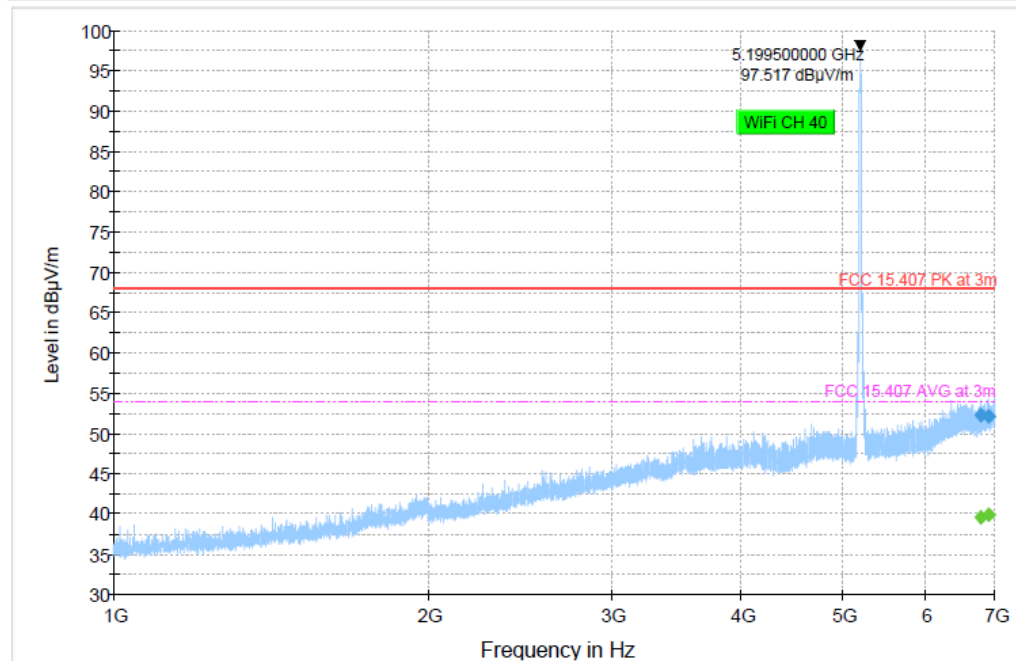
## Plot # 6 Radiated Emissions: 1-7 GHz

Mode: 6 MBit

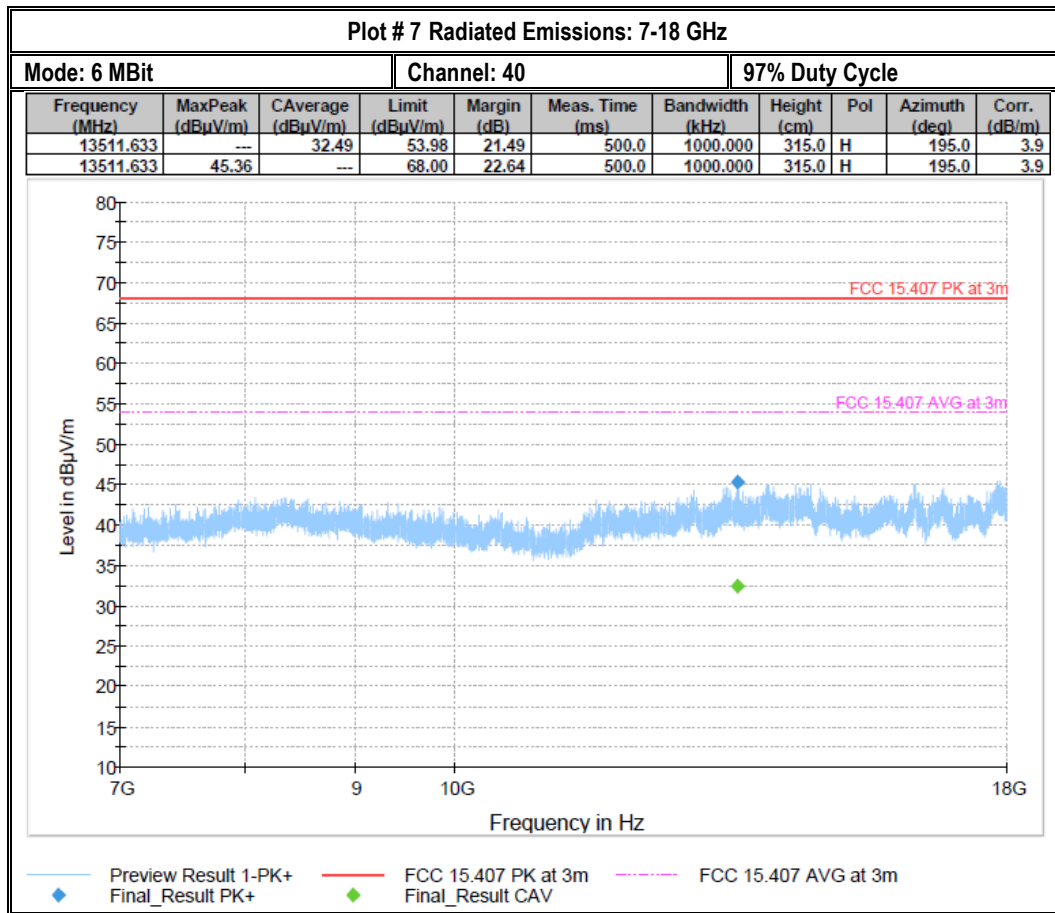
Channel: 40

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 6778.200        | ---              | 39.57             | 53.98          | 14.41       | 500.0           | 1000.000        | 299.0       | H   | 133.0         | 19.4         |
| 6778.200        | 52.35            | ---               | 68.00          | 15.65       | 500.0           | 1000.000        | 299.0       | H   | 133.0         | 19.4         |
| 6908.350        | ---              | 39.90             | 53.98          | 14.08       | 500.0           | 1000.000        | 175.0       | H   | 268.0         | 19.8         |
| 6908.350        | 52.16            | ---               | 68.00          | 15.84       | 500.0           | 1000.000        | 175.0       | H   | 268.0         | 19.8         |



Preview Result 1-PK+ Final\_Result PK+ FCC 15.407 PK at 3m Final\_Result CAV FCC 15.407 AVG at 3m



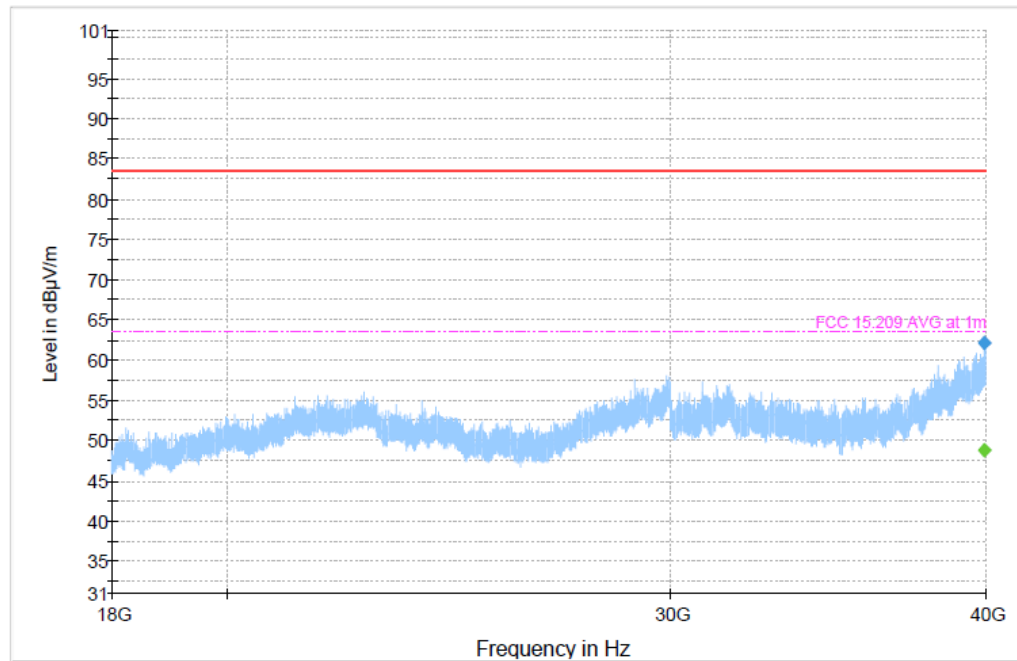
## Plot # 8 Radiated Emissions: 18-40 GHz

Mode: 6 MBit

Channel: 40

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 39974.063       | ---              | 48.84             | 63.50          | 14.66       | 500.0           | 1000.000        | 150.0       | H   | 219.0         | 24.9         |
| 39974.063       | 62.20            | ---               | 83.50          | 21.30       | 500.0           | 1000.000        | 150.0       | H   | 219.0         | 24.9         |



Preview Result 1-PK+      FCC 15.209 PK at 1m      FCC 15.209 AVG at 1m  
Final\_Result PK+      Final\_Result CAV

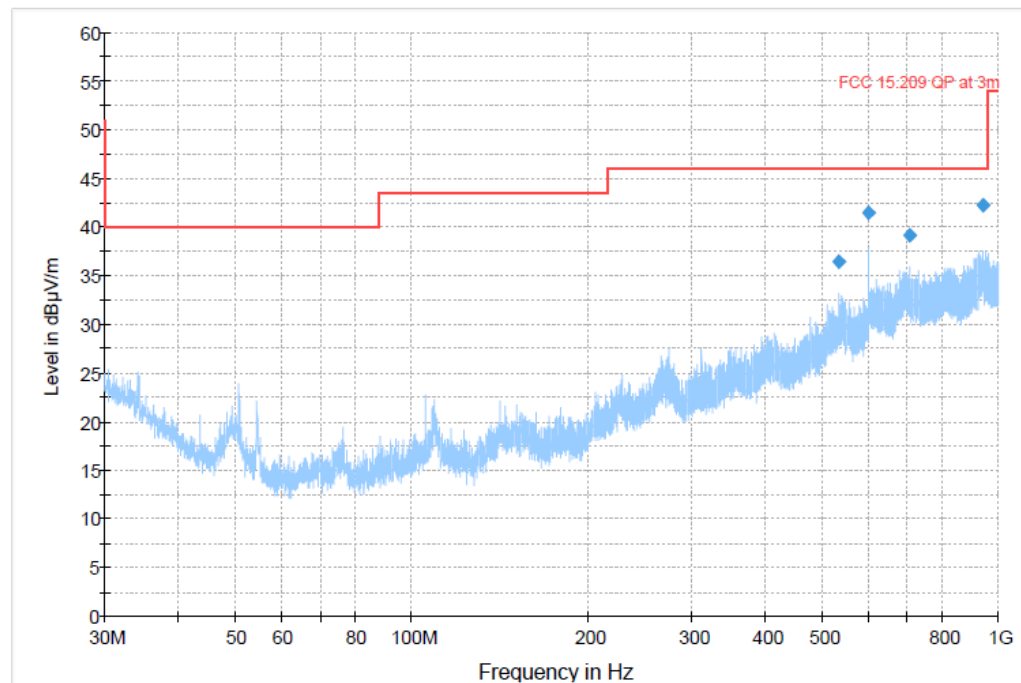
## Plot # 9 Radiated Emissions: 30 MHz – 1GHz

Mode: 6 MBit

Channel: 48

97% Duty Cycle

| Frequency (MHz) | QuasiPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 535.305         | 36.49              | 46.02          | 9.53        | 500.0           | 120.000         | 315.0       | H   | -5.0          | 29.3         |
| 600.004         | 41.44              | 46.02          | 4.58        | 500.0           | 120.000         | 163.0       | H   | 163.0         | 29.7         |
| 705.476         | 39.16              | 46.02          | 6.86        | 500.0           | 120.000         | 231.0       | H   | 265.0         | 31.6         |
| 939.472         | 42.18              | 46.02          | 3.84        | 500.0           | 120.000         | 164.0       | H   | -25.0         | 33.8         |



— Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final\_Result QPK

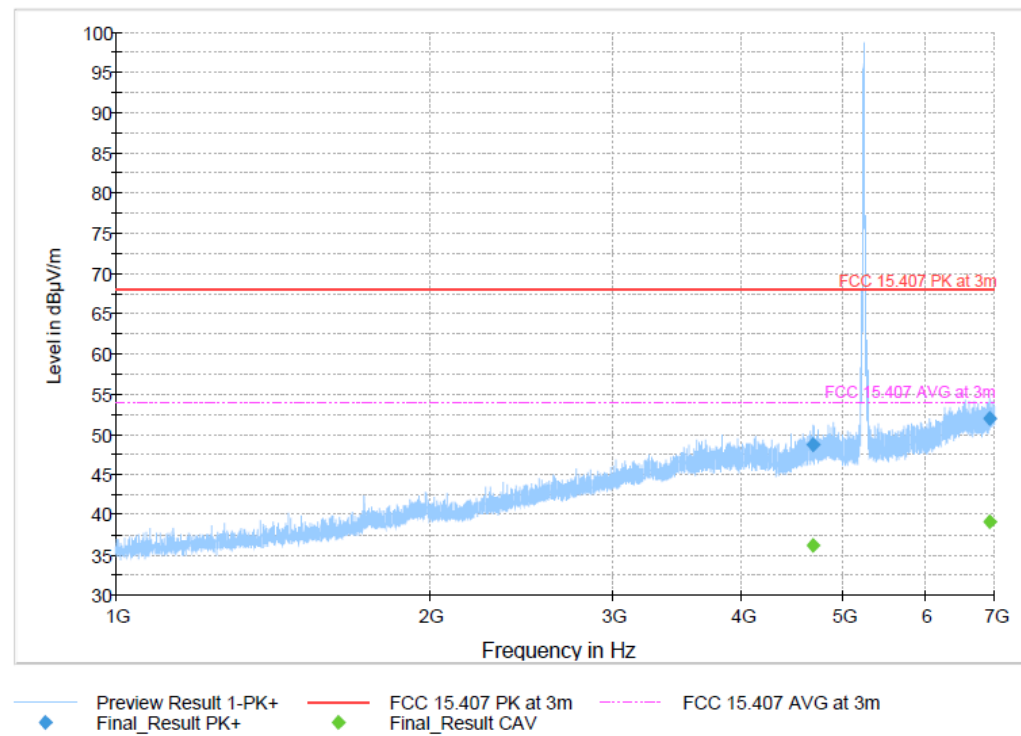
## Plot # 10 Radiated Emissions: 1-7 GHz

Mode: 6 MBit

Channel: 48

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 4688.100        | ---              | 36.13             | 53.98          | 17.85       | 500.0           | 1000.000        | 196.0       | H   | -33.0         | 15.1         |
| 4688.100        | 48.79            | ---               | 68.00          | 19.21       | 500.0           | 1000.000        | 196.0       | H   | -33.0         | 15.1         |
| 6923.700        | ---              | 39.07             | 53.98          | 14.91       | 500.0           | 1000.000        | 175.0       | V   | 280.0         | 18.9         |
| 6923.700        | 52.04            | ---               | 68.00          | 15.96       | 500.0           | 1000.000        | 175.0       | V   | 280.0         | 18.9         |



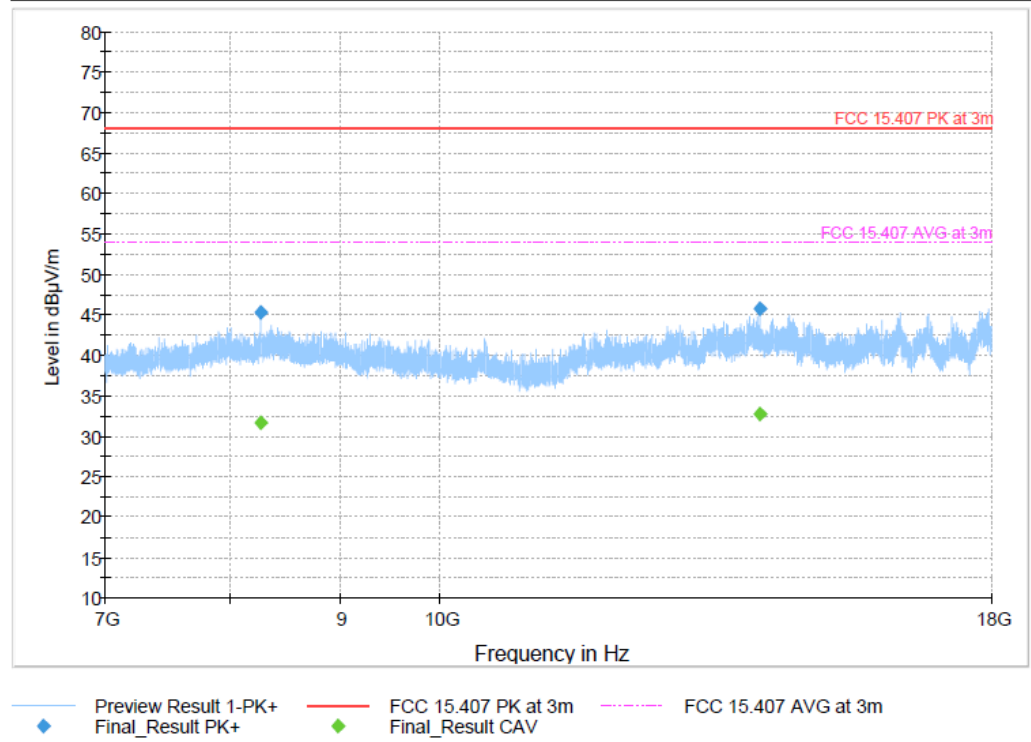
## Plot # 11 Radiated Emissions: 7-18 GHz

Mode: 6 MBit

Channel: 48

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBμV/m) | CAverage (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 8258.400        | 45.26            | ---               | 68.00          | 22.74       | 500.0           | 1000.000        | 269.0       | V   | 285.0         | 1.9          |
| 8258.400        | ---              | 31.61             | 53.98          | 22.37       | 500.0           | 1000.000        | 269.0       | V   | 285.0         | 1.9          |
| 14073.000       | 45.73            | ---               | 68.00          | 22.27       | 500.0           | 1000.000        | 196.0       | V   | 112.0         | 4.5          |
| 14073.000       | ---              | 32.81             | 53.98          | 21.16       | 500.0           | 1000.000        | 196.0       | V   | 112.0         | 4.5          |



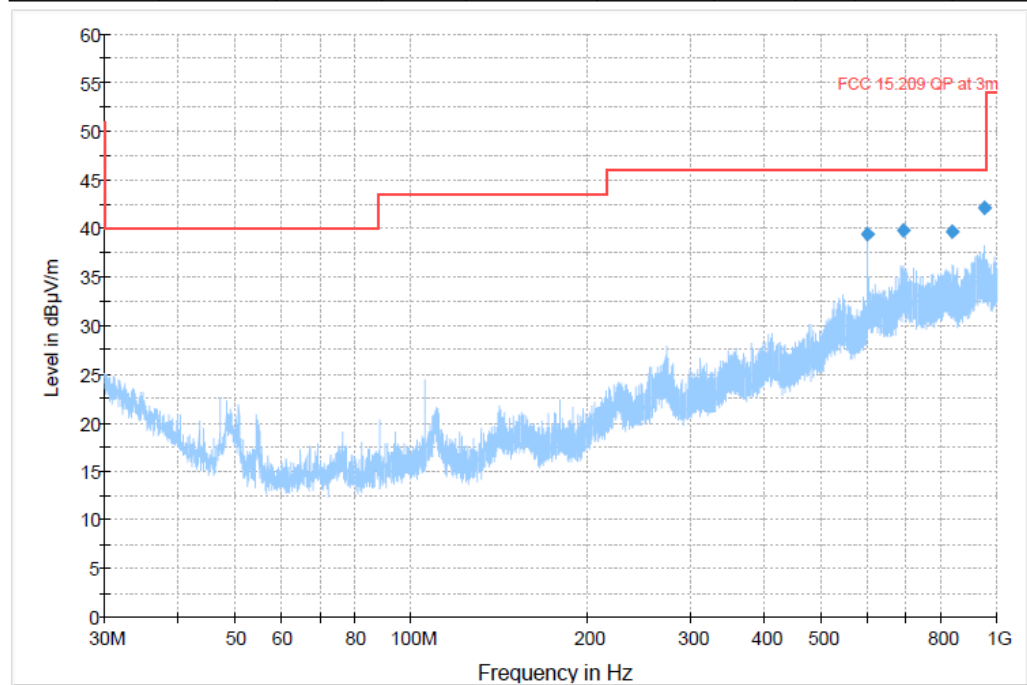
Plot # 12 Radiated Emissions: 30 MHz – 1GHz

Mode: 6 MBit

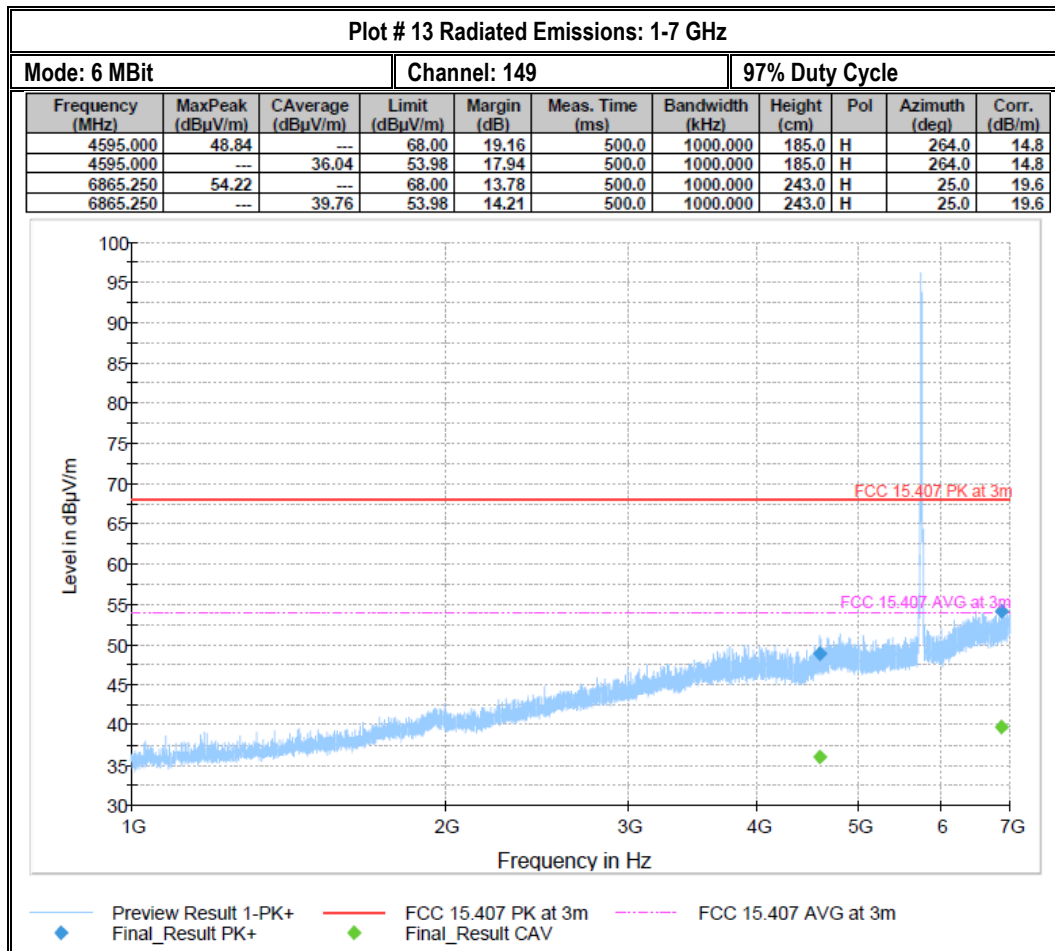
Channel: 149

97% Duty Cycle

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 600.004         | 39.44              | 46.02          | 6.58        | 500.0           | 120.000         | 165.0       | H   | 149.0         | 29.7         |
| 689.891         | 39.73              | 46.02          | 6.29        | 500.0           | 120.000         | 273.0       | H   | -45.0         | 32.1         |
| 840.015         | 39.64              | 46.02          | 6.38        | 500.0           | 120.000         | 274.0       | H   | 197.0         | 31.7         |
| 948.687         | 42.11              | 46.02          | 3.91        | 500.0           | 120.000         | 315.0       | H   | 159.0         | 33.7         |



— Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final\_Result QPK



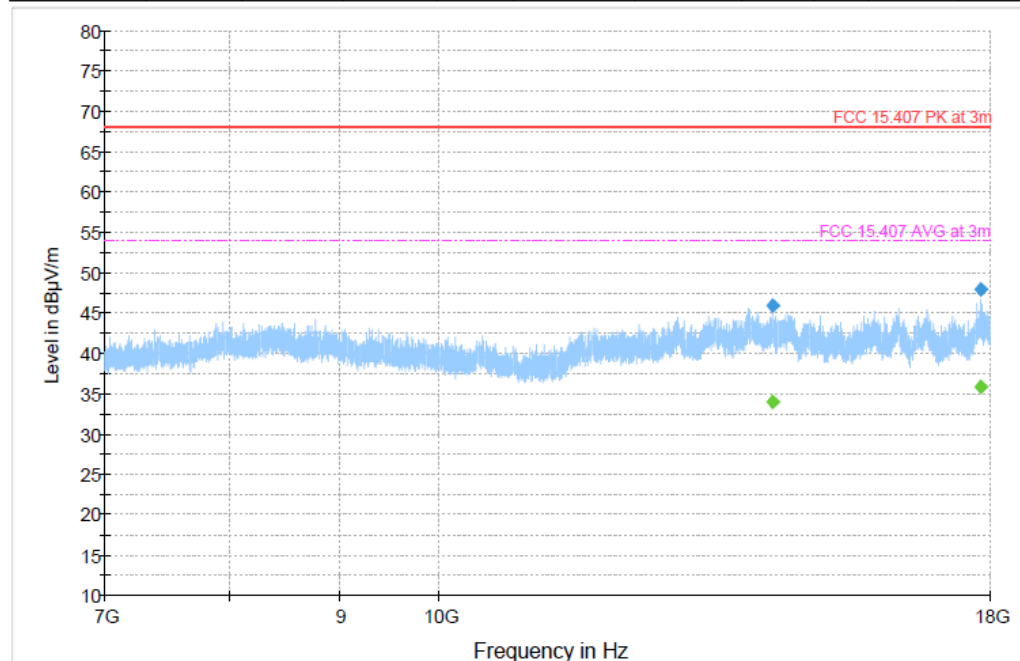
## Plot # 14 Radiated Emissions: 7-18 GHz

Mode: 6 MBit

Channel: 149

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 14274.667       | ---              | 33.96             | 53.98          | 20.02       | 500.0           | 1000.000        | 150.0       | V   | 134.0         | 5.4          |
| 14274.667       | 45.99            | ---               | 68.00          | 22.01       | 500.0           | 1000.000        | 150.0       | V   | 134.0         | 5.4          |
| 17827.667       | ---              | 35.87             | 53.98          | 18.11       | 500.0           | 1000.000        | 315.0       | V   | 220.0         | 11.6         |
| 17827.667       | 48.01            | ---               | 68.00          | 19.99       | 500.0           | 1000.000        | 315.0       | V   | 220.0         | 11.6         |



Preview Result 1-PK+ Final\_Result PK+ FCC 15.407 PK at 3m Final\_Result CAV FCC 15.407 AVG at 3m

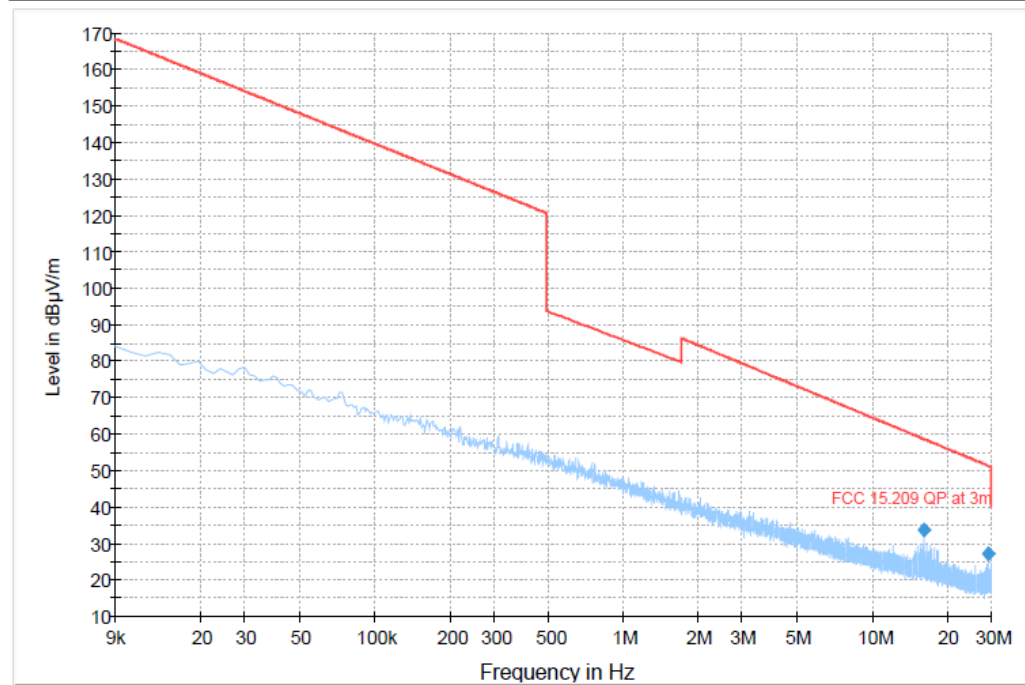
## Plot # 15 Radiated Emissions: 9 KHz – 30 MHz

Mode: 6 MBit

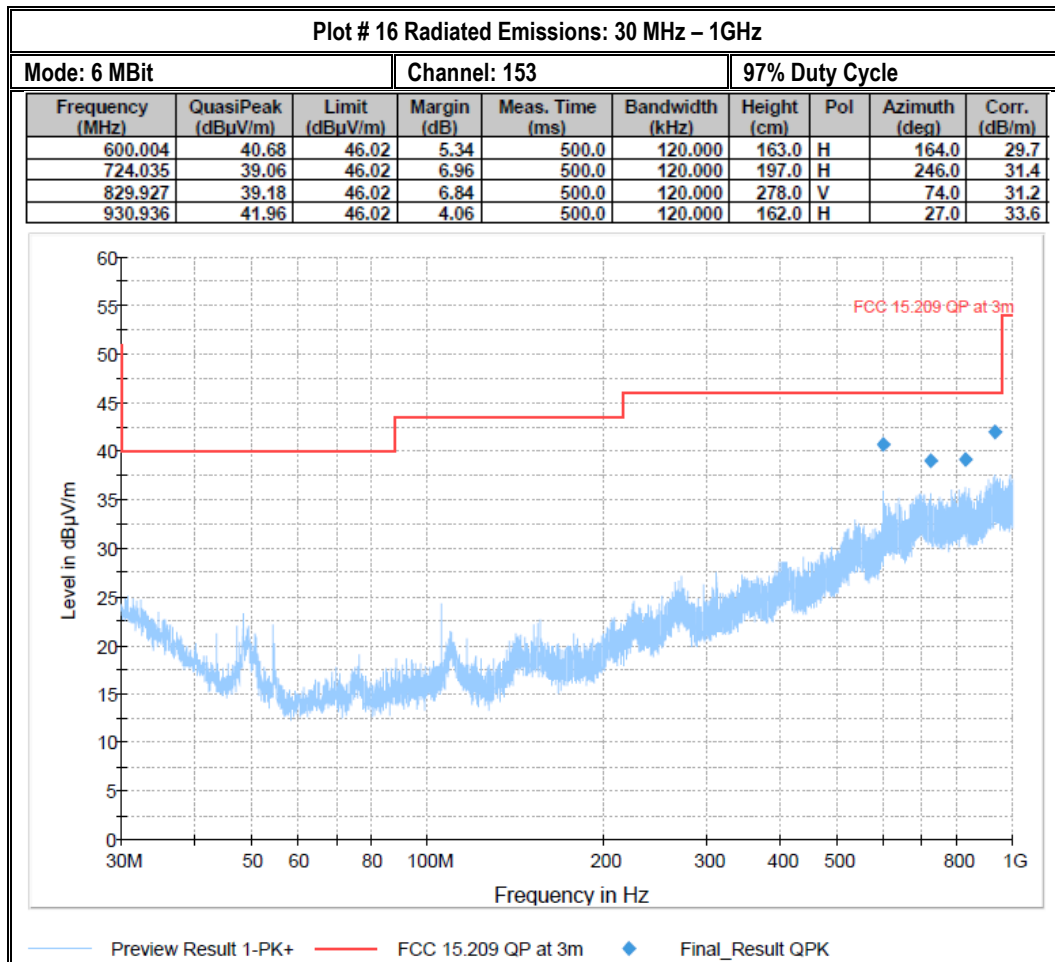
Channel: 153

97% Duty Cycle

| Frequency (MHz) | QuasiPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 16.228          | 33.60              | 58.60          | 25.00       | 500.0           | 9.000           | 196.0       | V   | 249.0         | 16.9         |
| 29.237          | 27.10              | 51.36          | 24.26       | 500.0           | 9.000           | 306.0       | V   | 194.0         | 16.1         |



Preview Result 1-PK+    FCC 15.209 QP at 3m    Final\_Result QPK



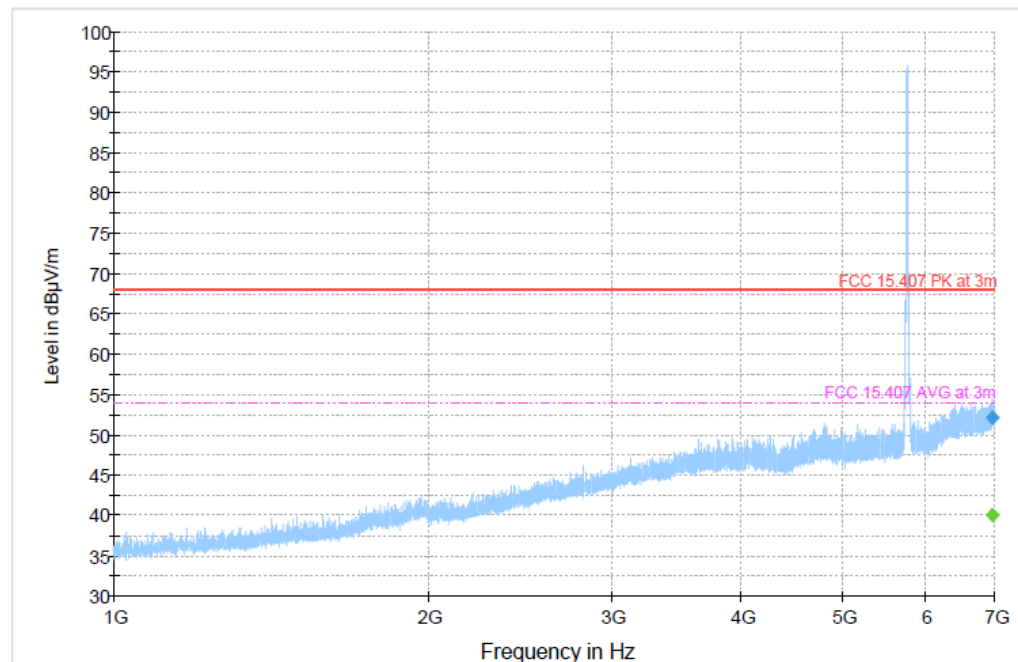
## Plot # 17 Radiated Emissions: 1-7 GHz

Mode: 6 MBit

Channel: 153

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 6967.100        | ---              | 40.04             | 53.98          | 13.94       | 500.0           | 1000.000        | 149.0       | H   | 286.0         | 19.9         |
| 6967.100        | 52.10            | ---               | 68.00          | 15.90       | 500.0           | 1000.000        | 149.0       | H   | 286.0         | 19.9         |



Preview Result 1-PK+ Final\_Result PK+ FCC 15.407 PK at 3m Final\_Result CAV FCC 15.407 AVG at 3m

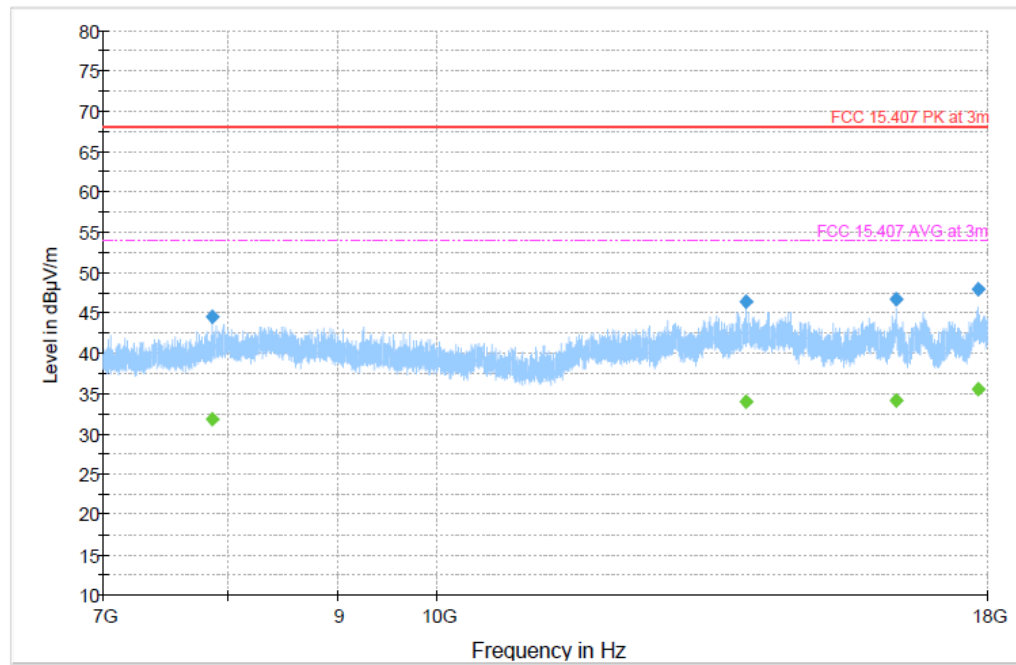
## Plot # 18 Radiated Emissions: 7-18 GHz

Mode: 6 MBit

Channel: 153

97% Duty Cycle

| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 7869.000        | 44.47            | ---               | 68.00          | 23.53       | 500.0           | 1000.000        | 229.0       | V   | 293.0         | 1.7          |
| 7869.000        | ---              | 31.80             | 53.98          | 22.18       | 500.0           | 1000.000        | 229.0       | V   | 293.0         | 1.7          |
| 13916.433       | ---              | 33.99             | 53.98          | 19.99       | 500.0           | 1000.000        | 177.0       | H   | 286.0         | 5.1          |
| 13916.433       | 46.39            | ---               | 68.00          | 21.61       | 500.0           | 1000.000        | 177.0       | H   | 286.0         | 5.1          |
| 16325.067       | ---              | 34.09             | 53.98          | 19.89       | 500.0           | 1000.000        | 315.0       | H   | 195.0         | 7.3          |
| 16325.067       | 46.77            | ---               | 68.00          | 21.23       | 500.0           | 1000.000        | 315.0       | H   | 195.0         | 7.3          |
| 17838.667       | 47.95            | ---               | 68.00          | 20.05       | 500.0           | 1000.000        | 175.0       | V   | 286.0         | 11.7         |
| 17838.667       | ---              | 35.56             | 53.98          | 18.42       | 500.0           | 1000.000        | 175.0       | V   | 286.0         | 11.7         |



Preview Result 1-PK+ Final\_Result PK+ FCC 15.407 PK at 3m Final\_Result CAV FCC 15.407 AVG at 3m

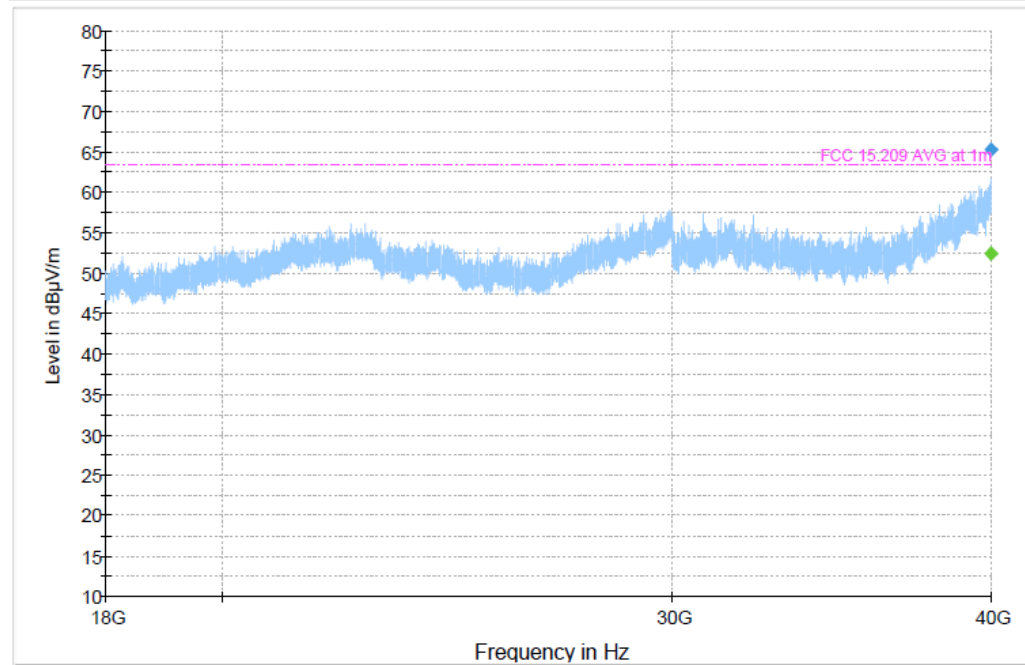
Plot # 19 Radiated Emissions: 18-40 GHz

Mode: 6 MBit

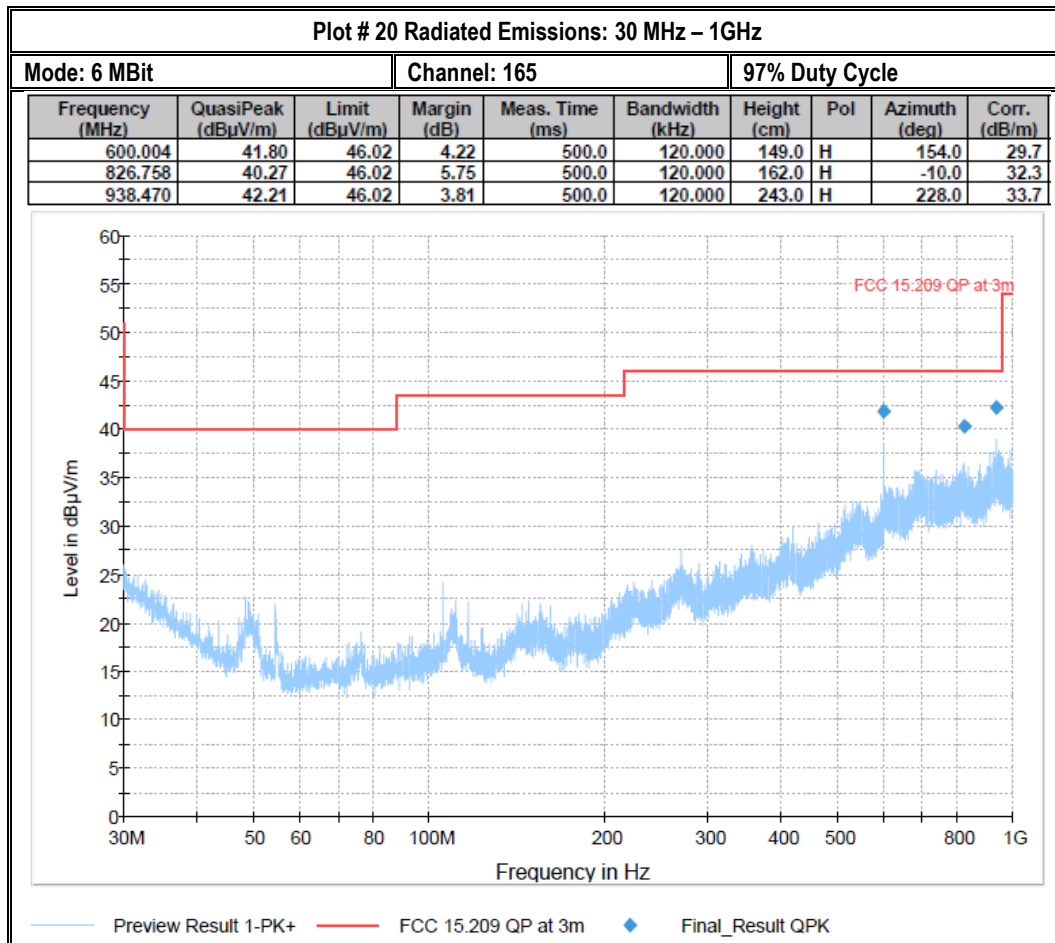
Channel: 153

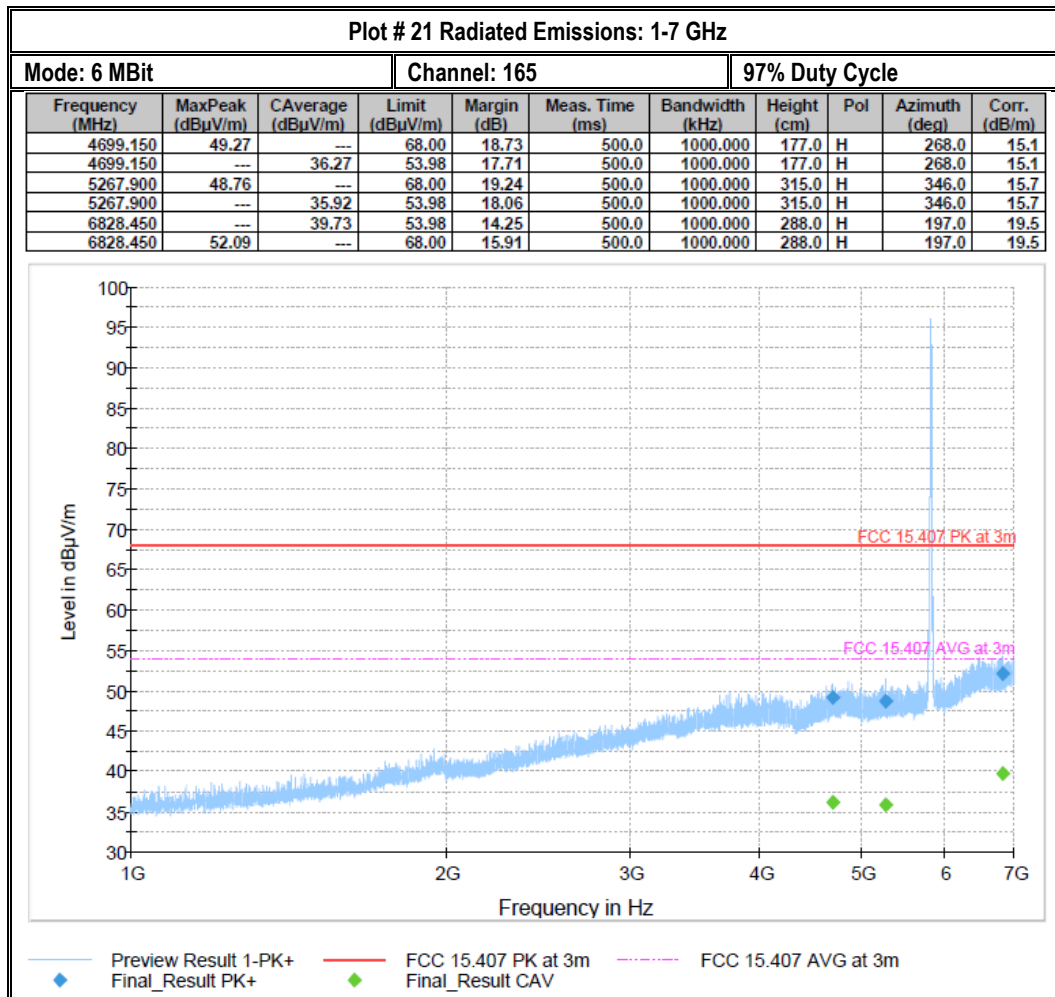
97% Duty Cycle

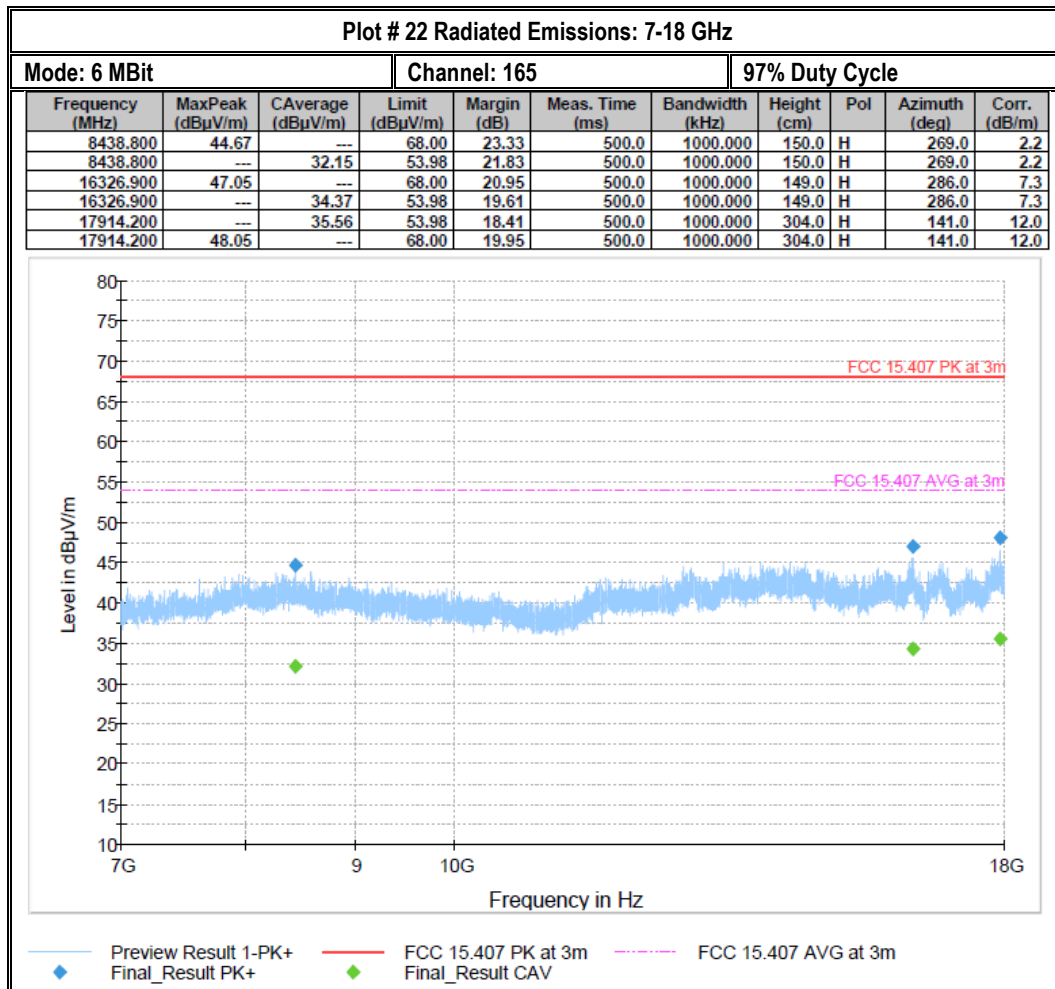
| Frequency (MHz) | MaxPeak (dBuV/m) | CAverage (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 39997.500       | ---              | 52.51             | 63.50          | 10.99       | 500.0           | 1000.000        | 150.0       | H   | 261.0         | 25.0         |
| 39997.500       | 65.34            | ---               | 83.50          | 18.16       | 500.0           | 1000.000        | 150.0       | H   | 261.0         | 25.0         |



Preview Result 1-PK+ Final\_Result PK+    FCC 15.209 PK at 1m Final\_Result CAV    FCC 15.209 AVG at 1m





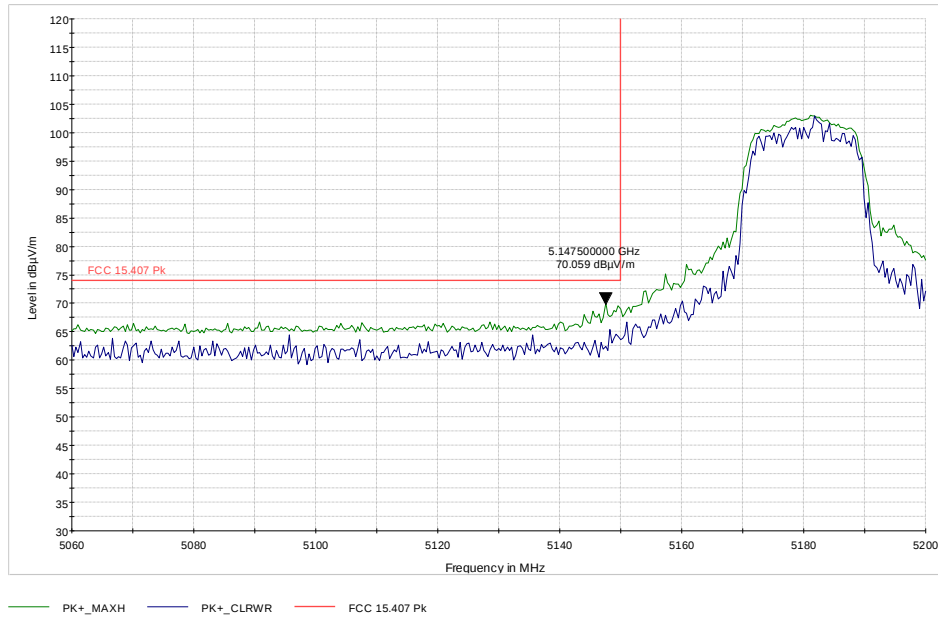


Plot # 23 Peak Restricted Band Edge @ 5.15GHz

Mode: 6 MBit

Channel: 36

97% Duty Cycle

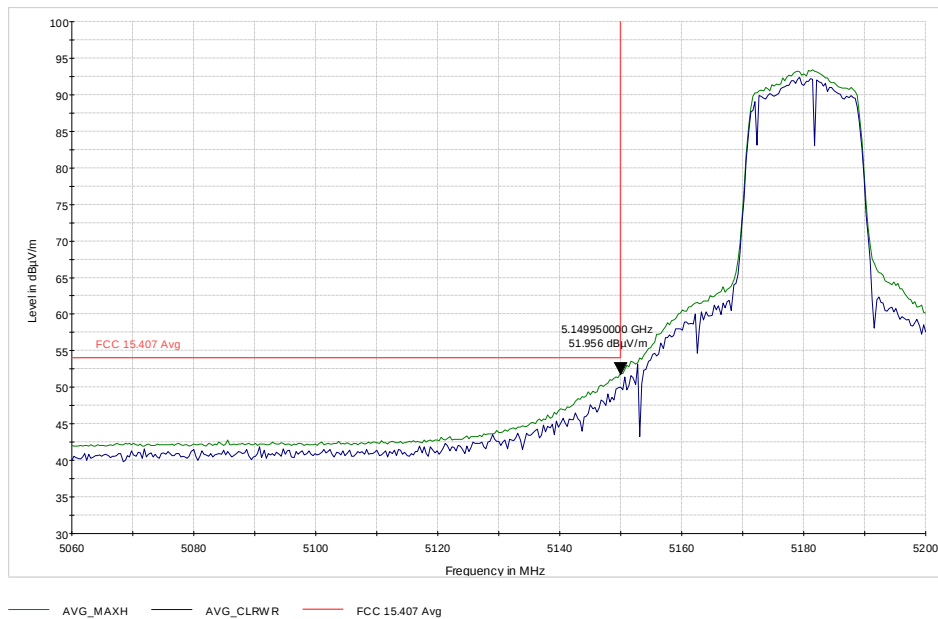


Plot # 24 AVG Restricted Band Edge @ 5.15GHz

Mode: 6 MBit

Channel: 36

97% Duty Cycle

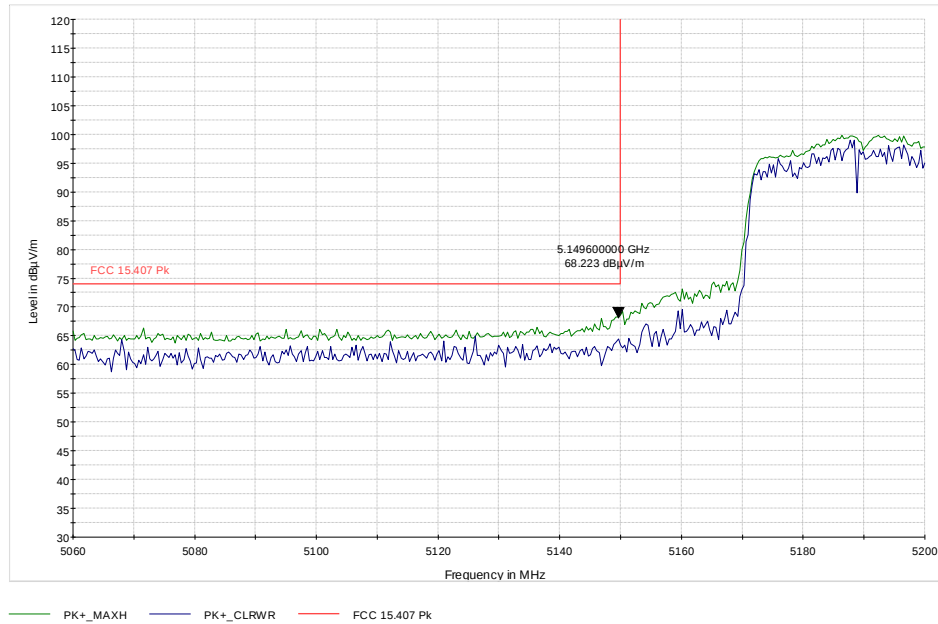


Plot # 25 Peak Restricted Band Edge @ 5.15GHz

Mode: MCS0 40MHz

Channel: 38

97% Duty Cycle

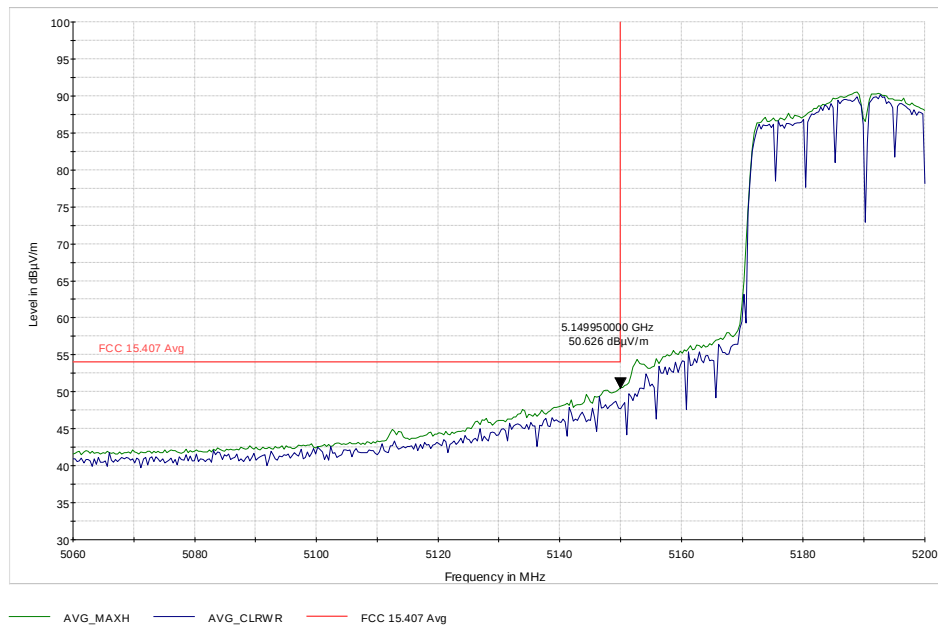


Plot # 26 AVG Restricted Band Edge @ 5.15GHz

Mode: MCS0 40MHz

Channel: 38

97% Duty Cycle

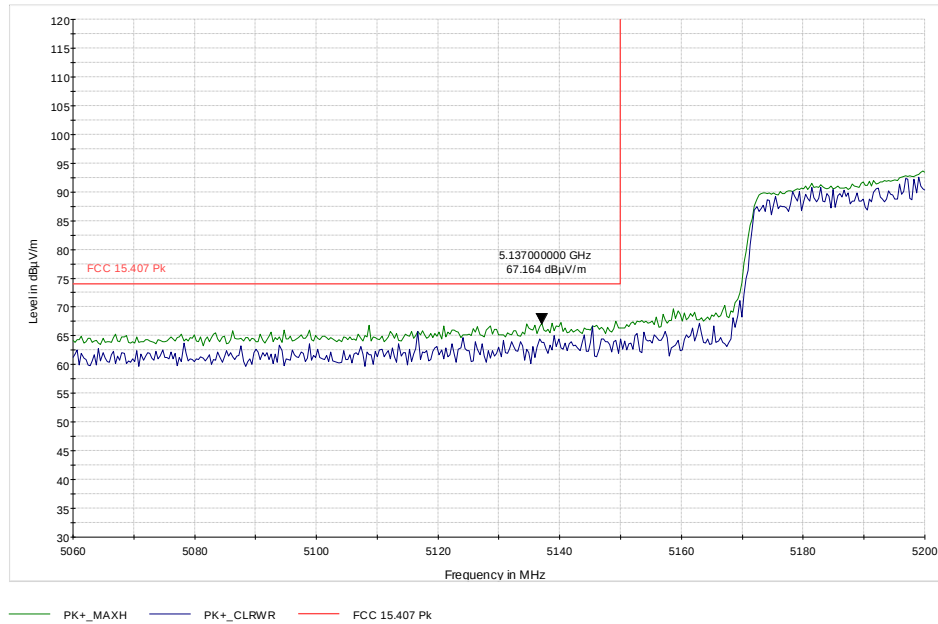


Plot # 27 Peak Restricted Band Edge @ 5.15GHz

Mode: MCS0 80MHz

Channel: 42

97% Duty Cycle

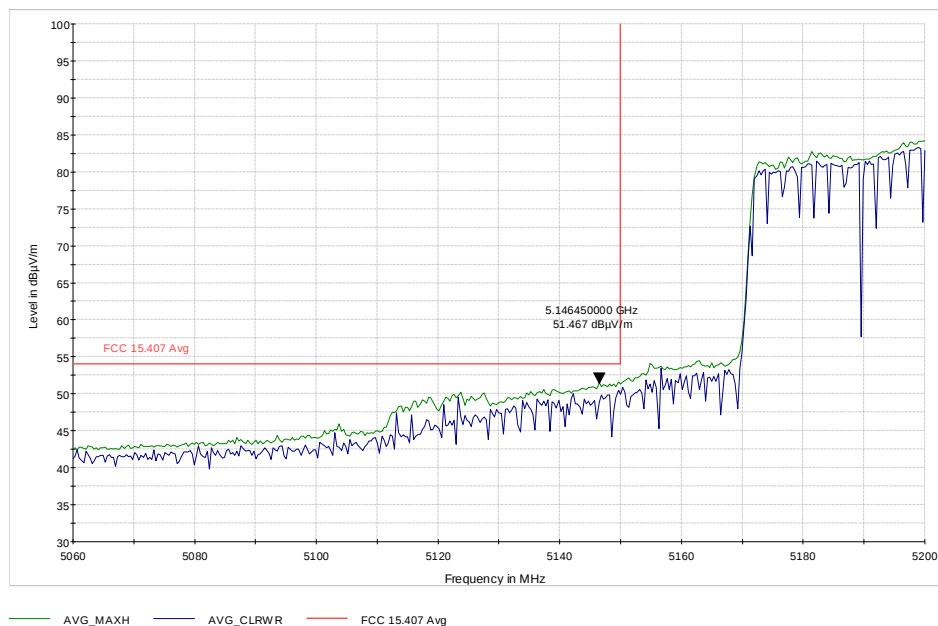


Plot # 28 AVG Restricted Band Edge @ 5.15GHz

Mode: MCS0 80MHz

Channel: 42

97% Duty Cycle



## 9 Test setup photos

Setup photos are included in supporting file name: "EMC\_GARMI-107-22001\_RSE\_Setup\_Photos.pdf"

## 10 Test Equipment And Ancillaries Used For Testing

| Equipment Name/Type | Manufacturer    | Model     | Serial #  | Calibration Cycle | Last Calibration Date |
|---------------------|-----------------|-----------|-----------|-------------------|-----------------------|
| EMI Receiver        | Rohde & Schwarz | ESW44     | 101715    | 3 Years           | 9/13/2021             |
| Signal Analyzer     | Rohde & Schwarz | FSV40     | 101022    | 3 Years           | 9/14/2021             |
| Active Loop antenna | ETS Lindgren    | 6507      | 161344    | 3 Years           | 10/30/2020            |
| Biconlog Antenna    | AH systems      | BiLA2G    | 569       | 3 years           | 12/1/2020             |
| Horn Antenna        | EMCO            | 3115      | 35111     | 3 years           | 9/30/2021             |
| Horn Antenna        | ETS Lindgren    | 3117-PA   | 169547    | 3 years           | 9/1/2020              |
| Horn Antenna        | ETS Lindgren    | 3116C-PA  | 169535    | 3 years           | 9/30/2020             |
| Digital Thermometer | Control Company | 36934-164 | 191872028 | 3 Years           | 10/20/2021            |
| Digital Barometer   | VWR             | 10510-922 | 200236891 | 3 Years           | 4/13/2020             |
|                     |                 |           |           |                   |                       |

**Note:** Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

**11 History**

| Date       | Template Revision                    | Changes to report                              | Prepared by  | Approved by |
|------------|--------------------------------------|------------------------------------------------|--------------|-------------|
| 9-14-2022  | EMC_GARMI-107-22001_15.407_UNII      | Initial Version                                | Kris Lazarov |             |
| 12-05-2022 | EMC_GARMI-107-22001_15.407_UNII_Rev1 | Added testing notes to sections 3.5, and 8.5.1 | Kris Lazarov |             |
|            |                                      |                                                |              |             |
|            |                                      |                                                |              |             |
|            |                                      |                                                |              |             |
|            |                                      |                                                |              |             |

&lt;&lt;&lt; The End &gt;&gt;&gt;