



# FCC Test Report

**For:**

LENNOX Industries Inc.

**Brand:**

Lennox

**Marketing Name:**

Lennox S40 Smart Thermostat

**Model #:**

Lennox S40 Smart Thermostat

**Product Description:**

S40 Thermostat is an electronic communicating thermostat. This module shall be the user interface, sensor data aggregator and internet gateway for residential air conditioning system.

**FCC ID:** 2A6F9-S4022A

**IC ID:** 28687-S4022A

**Applied Rules and Standards:**

47 CFR Part 15.407 (UNII) & 5 GHz (UNII)  
RSS-247 Issue 2 (DTSS) & RSS-Gen Issue 5

**REPORT #:** EMC\_LENNX\_007\_21001\_FCC\_15.407\_ISED\_UNII\_Rev1

**DATE:** 7/27/2022



A2LA Accredited

IC recognized #  
3462B

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## 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.

According to section 5 of this report, the overall result is Pass.

| Company                | Description                                                                                                                                                                             | Model #                     |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| LENNOX Industries Inc. | S40 Thermostat is an electronic communicating thermostat. This module shall be the user interface, sensor data aggregator and internet gateway for residential air conditioning system. | Lennox S40 Smart Thermostat |

### Responsible for Testing Laboratory:

| 7/27/2022 | Compliance | Wang, Kevin<br>(EMC Lab Manager) |           |
|-----------|------------|----------------------------------|-----------|
| Date      | Section    | Name                             | Signature |

### Responsible for the Report:

| 7/27/2022 | Compliance | Ghanma, Issa<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

|                             |                        |
|-----------------------------|------------------------|
| Company Name:               | CETECOM Inc.           |
| Department:                 | Compliance             |
| Street Address:             | 411 Dixon Landing Road |
| City/Zip Code               | Milpitas, CA 95035     |
| Country                     | USA                    |
| Telephone:                  | +1 (408) 586 6200      |
| Fax:                        | +1 (408) 586 6299      |
| EMC Lab Manager:            | Wang, Kevin            |
| Responsible Project Leader: | Baskaran, Akanksha     |

### 2.2 Identification of the Client

|                   |                        |
|-------------------|------------------------|
| Applicant's Name: | LENNOX Industries Inc. |
| Street Address:   | 1600 Metrocrest Dr.    |
| City/Zip Code     | Carrollton, TX 75006   |
| Country           | USA                    |

### 2.1 Identification of the Manufacturer

|                        |                           |
|------------------------|---------------------------|
| Manufacturer's Name:   | ---Same as Applicant----- |
| Manufacturers Address: | -----                     |
| City/Zip Code          | -----                     |
| Country                | -----                     |

### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Model No:</b>                                    | Lennox S40 Smart Thermostat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Contains FCC-IDs:</b>                            | 2A6F9-S4022A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Contains IC-IDs:</b>                             | 28687-S4022A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>HW Version :</b>                                 | EQ1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>SW Version :</b>                                 | 04.00.0275.iii - SW Bundle No: 316                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Product Description:</b>                         | S40 Thermostat is an electronic communicating thermostat. This module shall be the user interface, sensor data aggregator and internet gateway for residential air conditioning system.                                                                                                                                                                                                                                                                                                                                       |
| <b>Power Supply/ Rated Operating Voltage Range:</b> | 18V (Low) / 24V (Nominal) / 32V (Max), AC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Operating Temperature Range</b>                  | T min: 4 °F / T max: 158 °F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Sample Revision</b>                              | <input checked="" type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Module:</b>                                      | <ul style="list-style-type: none"> <li>❖ Wi-Fi: Texas Instruments WL1807MOD <ul style="list-style-type: none"> <li>• FCC ID: Z64-WL18DBMOD</li> <li>• IC ID: 451I-WL18DBMOD</li> <li>• Part Number: WL1807MODGIMOCR</li> <li>• Technology/Modes: OFDM <ul style="list-style-type: none"> <li>▪ 802.11 a/g: 6-54 Mbps</li> <li>▪ 802.11 n: MCS0-MCS7</li> </ul> </li> <li>• UNII-1 Channels: 36-48 → 5180 – 5240 MHz</li> <li>• Bandwidth: 20 MHz; SISO only</li> <li>• Tune-up tolerance: +1 dB; -3 dB</li> </ul> </li> </ul> |
| <b>Antenna Information as declared:</b>             | <ul style="list-style-type: none"> <li>❖ Laird <ul style="list-style-type: none"> <li>• Dual band Flex PIFA</li> <li>• Part Number: 001-0016</li> <li>• Peak Gain: 2.4 GHz: +2.5 dBi; 5 GHz: +3 dBi</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                    |
| <b>EUT Dimensions[Inch]:</b>                        | L 7.047" x W 4.469" x Thickness ~1.1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Maximum measured conducted Output Power:</b>     | 12.31 dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Other Radios included in the device:</b></p> | <ul style="list-style-type: none"> <li>❖ Wi-Fi: Texas Instruments WL1807MOD <ul style="list-style-type: none"> <li>• FCC ID: Z64-WL18DBMOD</li> <li>• IC ID: 451I-WL18DBMOD</li> <li>• Part Number: WL1807MODGIMOCR</li> <li>• Technology/Modes: <ul style="list-style-type: none"> <li>▪ 802.11 b/g/n: Channels 1-11→2412 – 2462 MHz</li> </ul> </li> <li>• Bandwidth: 20 MHz; SISO only</li> <li>• Tune-up tolerance: +1 dB; -3 dB</li> <li>• Antenna: Laird <ul style="list-style-type: none"> <li>▪ Dual band: Flex PIFA 2.4 GHz and 5 GHz</li> <li>▪ Part Number: 001-0016</li> <li>▪ Peak Gain: 2.4GHz: +2.5 dBi; 5 GHz: +3 dBi</li> </ul> </li> </ul> </li> <li>❖ Bluetooth: Silicon Labs <ul style="list-style-type: none"> <li>• FCC ID: QOQGM210P</li> <li>• IC ID: 5123A-GM210P</li> <li>• Part Number: BGM210PA32JIA2</li> <li>• Technology/Modes: BLE 5.0 or 5.1; GFSK; 1Mb/s</li> <li>• Channels 0-39: 2402 – 2480 MHz</li> <li>• Tune-up tolerance: ±1.5 dB</li> <li>• Antenna: Laird <ul style="list-style-type: none"> <li>▪ Flex PIFA</li> <li>▪ Part Number: 001-0014</li> <li>▪ Peak Gain: +2 dBi</li> </ul> </li> <li>• Wi-Fi (Disabled)</li> </ul> </li> </ul> |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3.2 EUT Sample details

| EUT # | Serial Number | HW Version | SW Version                         | Notes/Comments |
|-------|---------------|------------|------------------------------------|----------------|
| 1     | 0001          | EQ1        | 04.00.0275.lii - SW Bundle No: 316 | -              |

### 3.3 Accessory Equipment (AE) details

| AE # | Type | Model | Manufacturer |
|------|------|-------|--------------|
| N/A  | -    | -     | -            |

### 3.4 Test Sample Configuration

| EUT Set-up # | Comments                                                                                                                                                                                                                          |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | The radio of the EUT was configured to a fixed channel transmission with dynamic 100% duty cycle using Windows command prompt to configure the EUT.<br>The measurement instrument was connected to the 50 ohm RF port of the EUT. |
| 2            | The radio of the EUT was configured to a fixed channel transmission with dynamic 100% duty cycle using Windows command prompt to configure the EUT.<br>The external antenna was connected.                                        |

### 3.5 Mode of Operation details

| Mode of Operation | Description of Operating modes | Additional Information                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Op. 1             | Wi-Fi 5 GHz                    | ❖ The radio was configured to: <ul style="list-style-type: none"> <li>• Max Power settings: 19</li> <li>• Select TX paths: SISO</li> <li>• Mode: UNII-1 → 802.11n-HT20</li> <li>• Transmit mode: Continuous TX</li> <li>• Hopping: No</li> <li>• Hopping Type: Single Frequency</li> <li>• Channel: 36 - 48</li> <li>• Data rate: 802.11n-HT20 → MCS0</li> <li>• Duty cycle: ~ 56%</li> </ul> |
| Op. 2             | Op. 1 + Bluetooth LE           | ❖ The Bluetooth LE radio was configured to: <ul style="list-style-type: none"> <li>• Mode: GFSK</li> <li>• Transmit mode: Continuous TX</li> <li>• Duty cycle: 100%</li> <li>• Max Power settings: 19</li> <li>• Hopping: No</li> <li>• Hopping Type: Single Frequency</li> <li>• Channel: Low: Ch 0; Mid: Ch 19; High: Ch 39</li> <li>• Data rate: 1 Mbps</li> </ul>                         |
| Op.3              | Idle                           | ❖ All radios not transmitting, and EUT in fully functional mode.                                                                                                                                                                                                                                                                                                                              |

### **3.6 Justification for Worst Case Mode of Operation**

During the testing process, the EUT was tested with transmitter sets on Low, Mid, and high channel(s), and highest possible duty cycle and output power simultaneously with Bluetooth LE representing the worst case mode of operation.

For radiated measurements;

- All data in this report show the worst case of Wi-Fi radio transmitting at the highest output power band representing worst case transmission mode.
- All data in this report show the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

#### **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 that contains:

- FCC IDs: Z64-WL18DBMOD / QOQGM210P
- IC IDs: 451I-WL18DBMOD / 5123A-GM210P

## 5 Measurement Results Summary

| Test Specification          | Test Case                      | Temperature and Voltage Conditions | Mode  | Pass                                | NA                       | NP                                  | Result                   |
|-----------------------------|--------------------------------|------------------------------------|-------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
| §15.407(e)                  | Emission Bandwidth             | Nominal                            | -     | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | See Note 1<br>See Note 2 |
| §15.407(a)                  | Power Spectral Density         | Nominal                            | -     | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | See Note 1<br>See Note 2 |
| §15.407(a)                  | Maximum Output Power           | Nominal                            | Op. 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies                 |
| §15.407; 15.205             | Band Edge Compliance           | Nominal                            | -     | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | See Note 1<br>See Note 2 |
| §15.407(b); §15.209; 15.205 | Radiated TX Spurious Emissions | Nominal                            | Op.2  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies                 |
| §15.207(a)                  | AC Conducted Emissions         | Nominal                            | Op.3  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies                 |

**Note 1:** NA= Not Applicable; NP= Not Performed.

**Note 2:** Leveraged from module certification report(s) # FR4O0971D and FR4O0971E; under FCC ID: Z64-WL18DBMOD; and report(s) # FR741330E under IC ID: 451I-WL18DBMOD;

## 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  $k=1$ .

| 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 |

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

### 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:

6/8/2022 – 6/27/2022

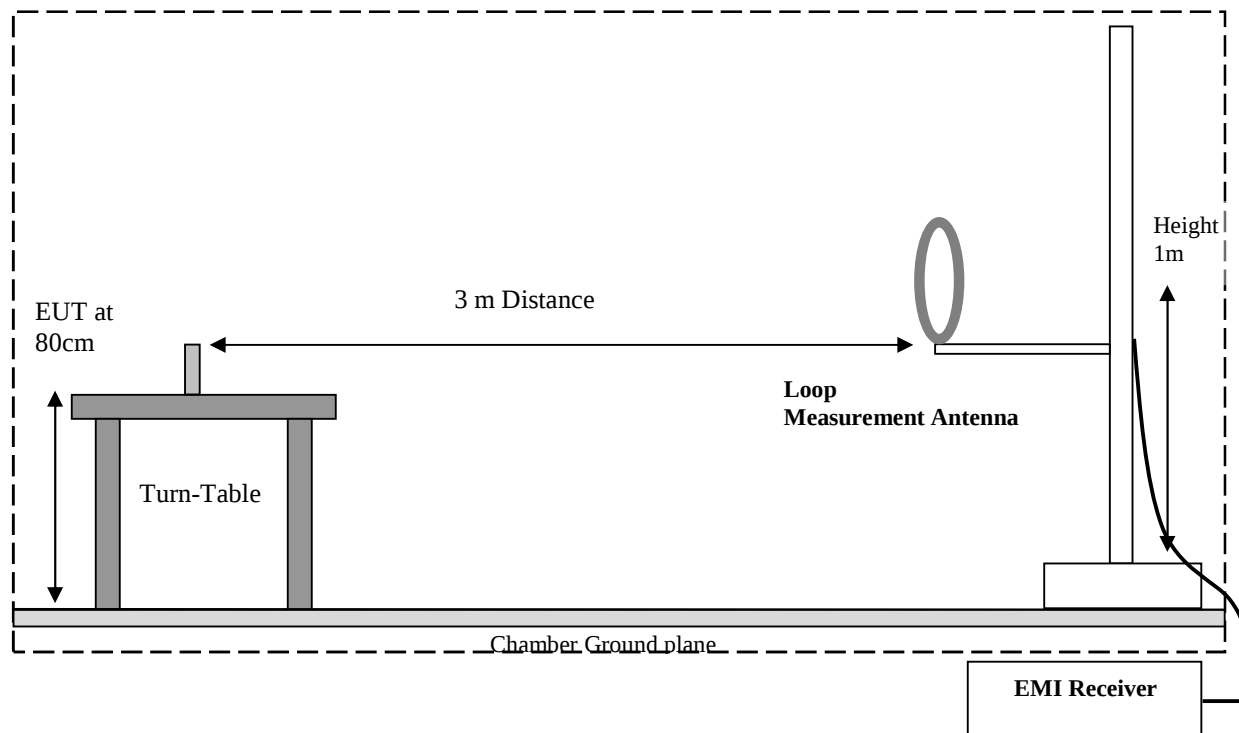
## 7 Measurement Procedures

### 7.1 Radiated Measurement

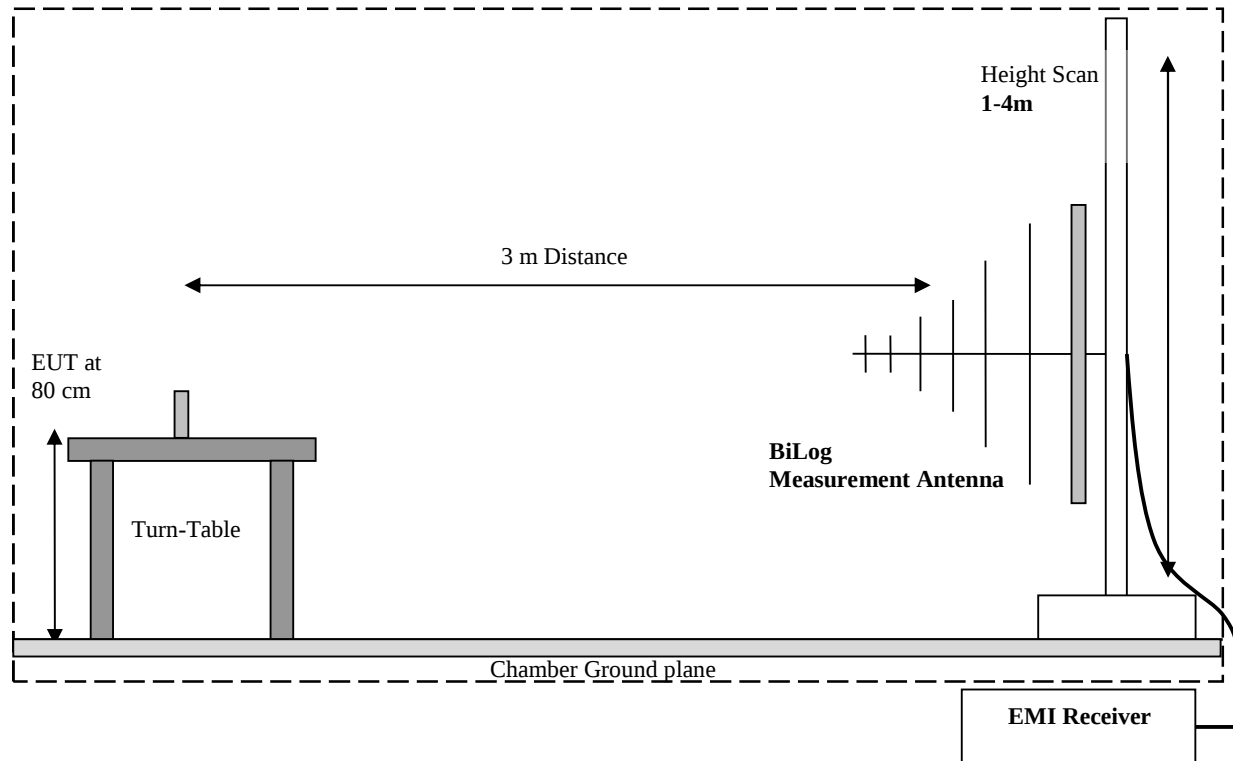
The radiated measurement is performed according to ANSI C63.10 (2013)

- 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 axes 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 the frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and all supported modulations.
- In case there are no emissions above the 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.

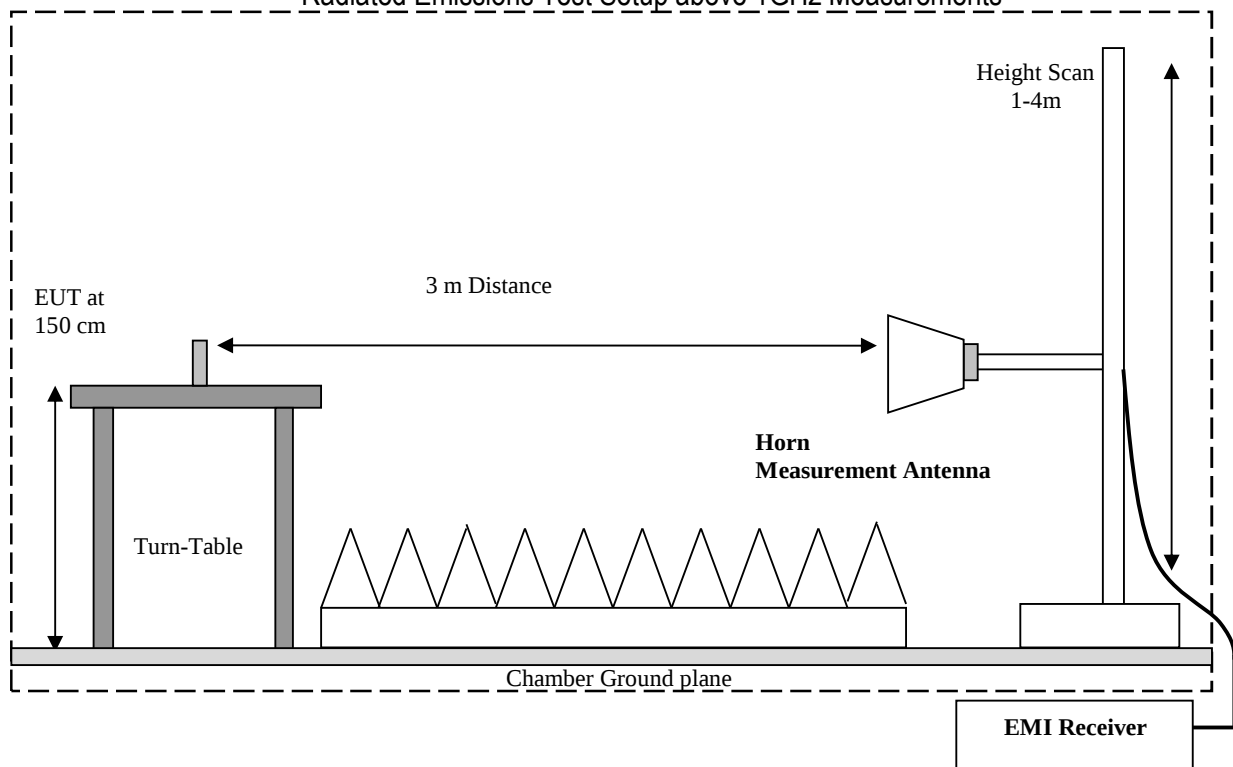
Radiated Emissions Test Setup below 30MHz Measurements



### 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:

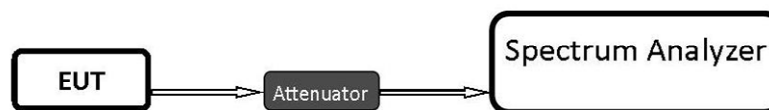
| Frequency (MHz) | Measured SA (dB $\mu$ V) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dB $\mu$ V/m) |
|-----------------|--------------------------|-----------------|--------------------------------|--------------------------------------|
| 1000            | 80.5  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

#### 8.1.1 Measurement according to ANSI C63.10 section 12.2 Duty cycle (D), transmissions duration (T), and maximum power control level;

b) Measurements of duty cycle and transmission duration shall be performed using the following technique:

- 2) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on-and off-times of transmitted signal:
  - I. Set the center frequency of the instrument to the center frequency of the transmission.
  - II. Set RBW  $\geq$  EBW if possible; otherwise, set RBW to the largest available value.
  - III. Set detector = peak.
  - IV. The zero-span measurement method shall not be used unless both RBW and VBW are  $>50/T$  and the number of sweep points across duration T exceeds 100.  
(For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if  $T \geq 16.7$  microseconds.)

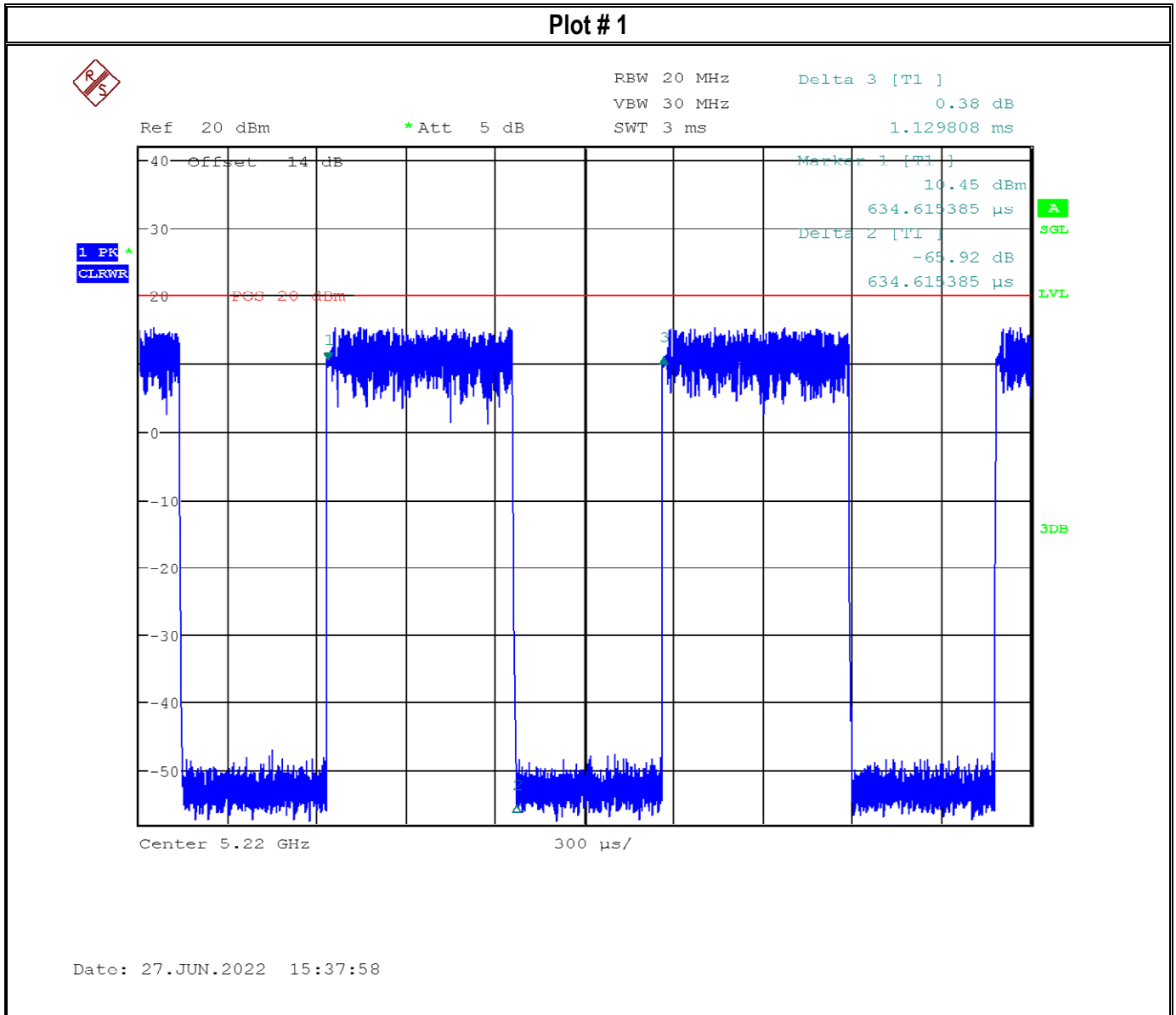
#### 8.1.2 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode | Power Input |
|---------------------|--------------|--------------------|-------------|
| 23.8°C              | 1            | Op.1               | 24V AC      |

#### 8.1.3 Measurement result:

| Plot # | Mode    | TX Frequency | Data Rate     | Duty cycle |
|--------|---------|--------------|---------------|------------|
| 1      | 802.11n | 5220 MHz     | MCS0 6.5 Mb/s | ~ 56.0 %   |

## 8.1.4 Measurement plots:



## 8.2 Maximum Output Power

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

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

- I. Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- II. Set RBW = 1 MHz
- III. Set the VBW  $\geq 3$  MHz
- IV. Detector = RMS
- V. 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.)
- VI. Sweep time = Auto Couple
- VII. Trace mode = Trace average at least 100 traces in power averaging (i.e., RMS mode).
- VIII. 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."
- IX. 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.

### 8.2.2 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 an indoor access point, the maximum conducted output power over the frequency band of operation shall not exceed 1 W
- For fixed point-to-point access points, 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

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.
- Additional requirements

In addition to the above requirements, devices shall comply with the following, where applicable:

- a) Outdoor fixed devices with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where  $\theta$  is the angle above the local horizontal plane (of the Earth) as shown below:

- |                                           |                                          |
|-------------------------------------------|------------------------------------------|
| i. -13 dBW/MHz                            | for $0^\circ \leq \theta < 8^\circ$      |
| ii. $-13 - 0.716 (\theta - 8)$ dBW/MHz    | for $8^\circ \leq \theta < 40^\circ$     |
| iii. $-35.9 - 1.22 (\theta - 40)$ dBW/MHz | for $40^\circ \leq \theta \leq 45^\circ$ |
| iv. -42 dBW/MHz                           | for $\theta > 45^\circ$                  |

The measurement procedure defined in Annex A of this document shall be used to verify the compliance to the e.i.r.p. at different elevations.

b) Devices, other than outdoor fixed devices, having an e.i.r.p. greater than 200 mW shall comply with either i. or ii. below:

i. devices shall comply with the e.i.r.p. elevation mask in 6.2.2.3(a); or

ii. devices shall implement a method to permanently reduce their e.i.r.p. via a firmware feature in the event that the Department requires it. The test report must demonstrate how the device's power table can be updated to meet this firmware requirement. The manufacturer shall provide this firmware to update all systems automatically in compliance with the directions received from the Department.

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.

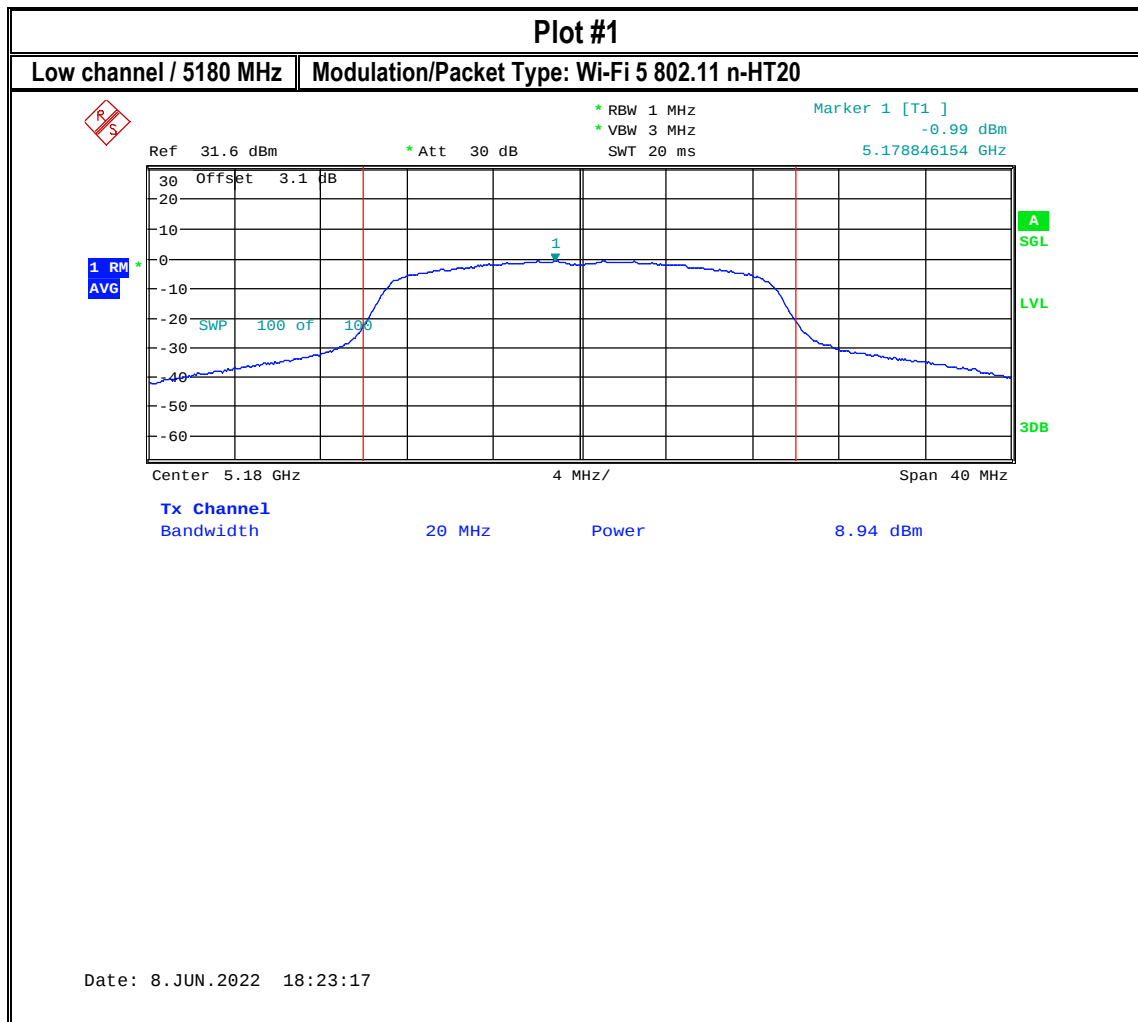
### 8.2.3 Test conditions and setup:

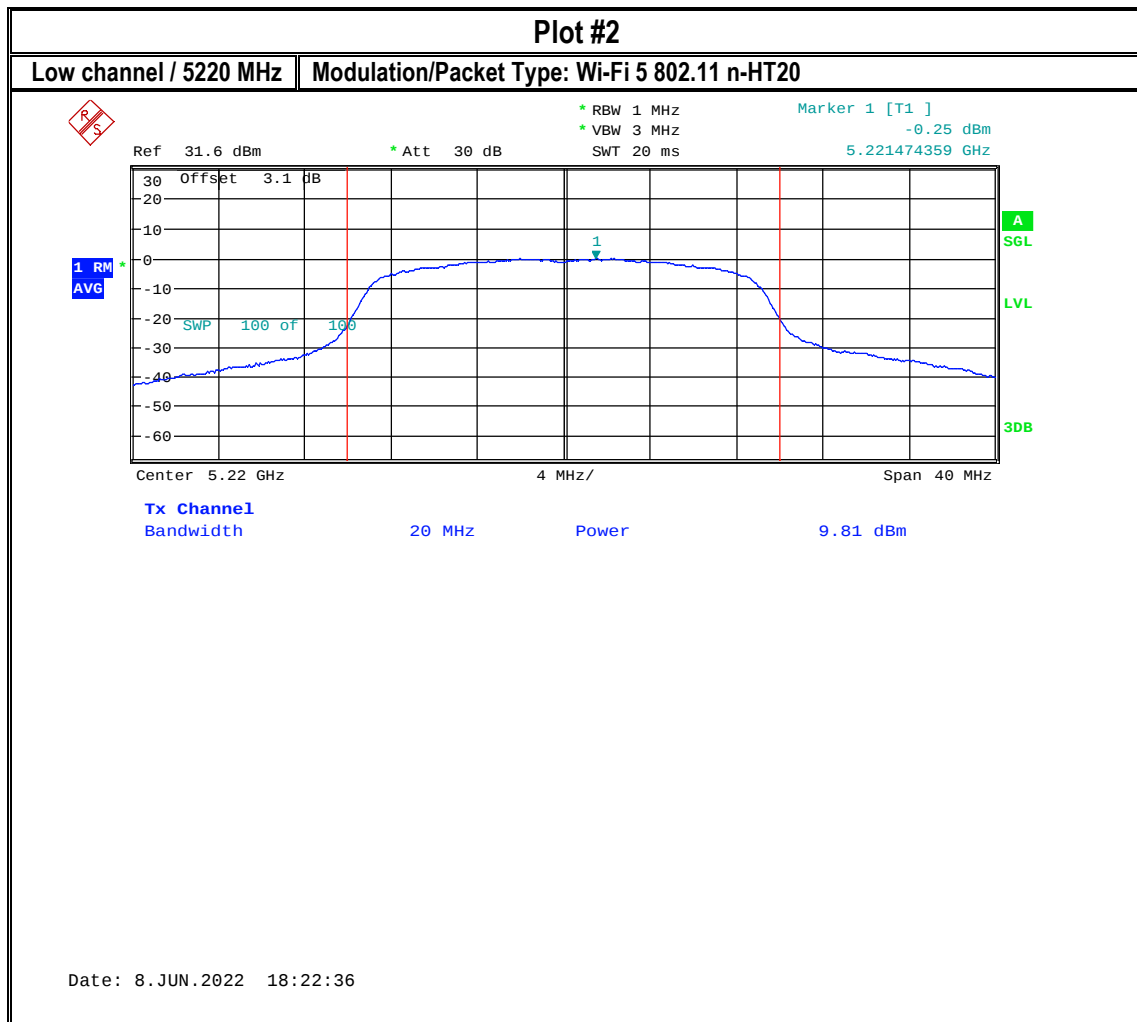
| Ambient Temperature | EUT Set-Up # | EUT operating mode | Power Input | Antenna Gain |
|---------------------|--------------|--------------------|-------------|--------------|
| 23° C               | 1            | Op.1               | 24V AC      | 3 dBi        |

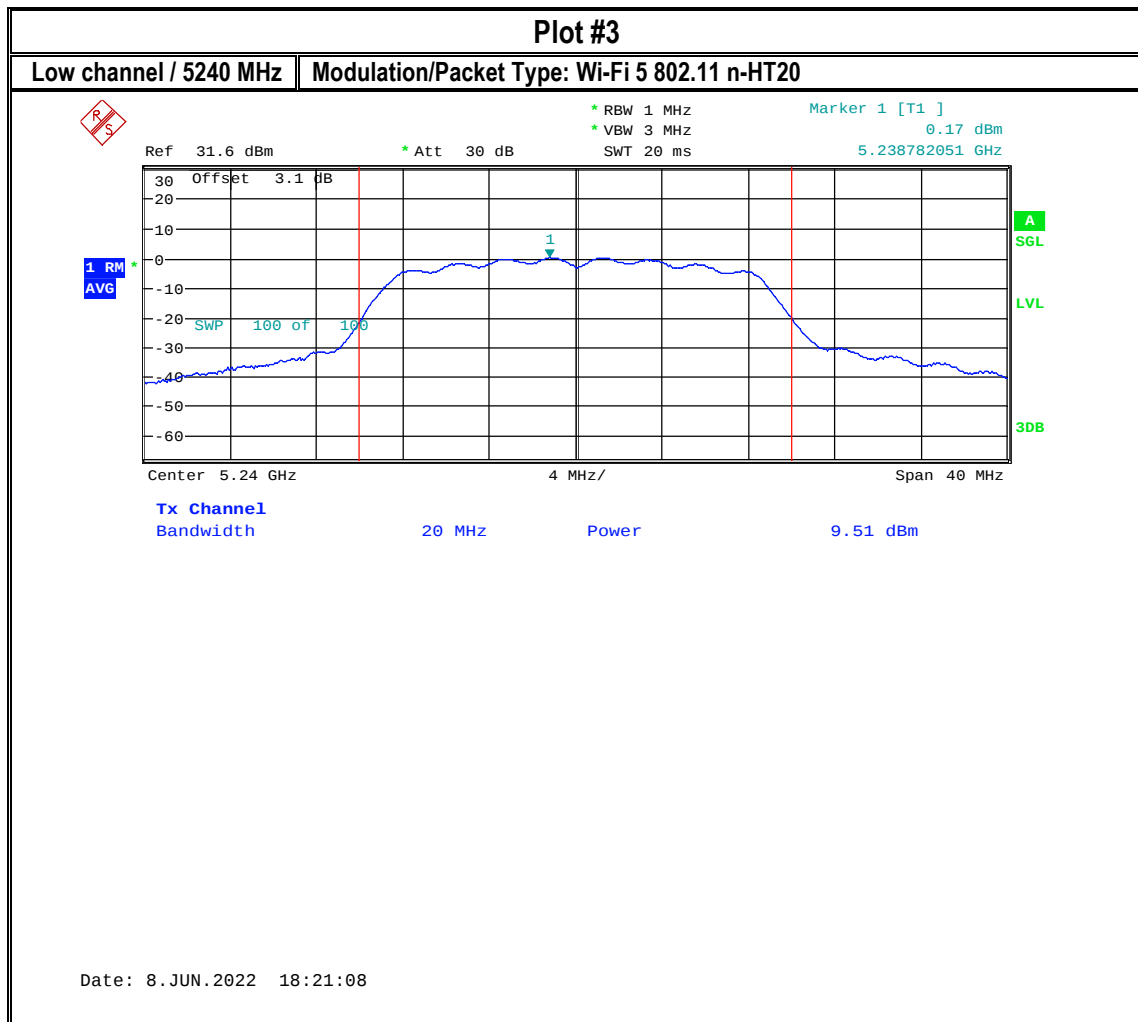
### 8.2.4 Measurement result:

| Mode   | Channel | Frequency (MHz) | Maximum Output Power (dBm) | Apply Duty cycle correction factor (dBm) | EIRP <sup>1</sup> (dBm) | Limit             | Result |
|--------|---------|-----------------|----------------------------|------------------------------------------|-------------------------|-------------------|--------|
| n-HT20 | 36      | 5180            | 8.94                       | 11.44                                    | 15.44                   | See Section 8.2.2 | Pass   |
| n-HT20 | 44      | 5220            | 9.81                       | 12.31                                    | 16.31                   | See Section 8.2.2 | Pass   |
| n-HT20 | 48      | 5240            | 9.51                       | 12.01                                    | 16.01                   | See Section 8.2.2 | Pass   |

1: EIRP= Maximum conducted output power corrected for duty cycle + Antenna gain + Tune-up tolerance.







### 8.3 Radiated Transmitter Spurious Emissions

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

##### 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.

#### 8.3.2 Limits:

##### FCC §15.407

- 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

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

## FCC §15.205

- 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 dB $\mu$ V/m  
 \*AVG. LIMIT= 54 dB $\mu$ V/m

### 8.3.3 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode | Power Input |
|---------------------|--------------|--------------------|-------------|
| 23.8°C              | 2            | Op.2               | 24V AC      |

### 8.3.4 Measurement result:

| Plot #  | Scan Frequency  | Channel # | Op.# | Lowest margin emissions<br>(dB $\mu$ V/m) | Limit             | Result |
|---------|-----------------|-----------|------|-------------------------------------------|-------------------|--------|
| 1 – 4   | 30 MHz – 18 GHz | Low (36)  | Op.2 | 42.31                                     | See section 8.3.2 | Pass   |
| 5 – 11  | 9 kHz – 40 GHz  | Mid (44)  | Op.2 | 37.98                                     | See section 8.3.2 | Pass   |
| 12 – 15 | 30 MHz – 18 GHz | High (48) | Op.2 | 40.67                                     | See section 8.3.2 | Pass   |

### 8.3.5 Measurement Plots:

#### CH 36

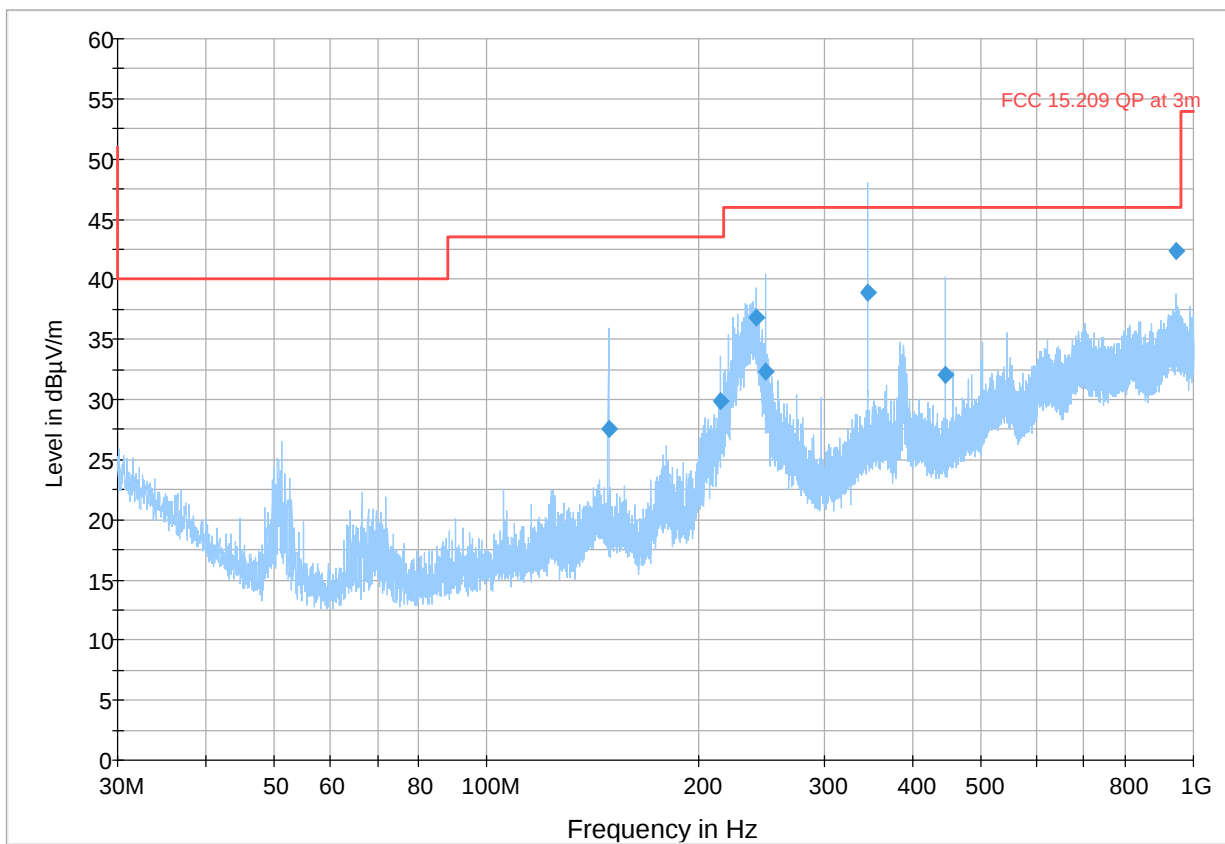
#### Plot # 1 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 5180 MHz

Mode: 802.11n-HT20

#### Final Result

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 148.469         | 27.60              | 43.50          | 15.90       | 500.0           | 120.000         | 266.0       | V   | 82.0          | 17.2         |
| 213.880         | 29.90              | 43.50          | 13.60       | 500.0           | 120.000         | 162.0       | H   | 118.0         | 19.5         |
| 240.264         | 36.82              | 46.02          | 9.20        | 500.0           | 120.000         | 149.0       | H   | 105.0         | 20.7         |
| 247.506         | 32.28              | 46.02          | 13.74       | 500.0           | 120.000         | 186.0       | H   | 73.0          | 20.9         |
| 346.511         | 38.88              | 46.02          | 7.14        | 500.0           | 120.000         | 315.0       | V   | -24.0         | 24.2         |
| 445.483         | 32.09              | 46.02          | 13.93       | 500.0           | 120.000         | 197.0       | V   | 320.0         | 25.1         |
| 947.652         | 42.31              | 46.02          | 3.71        | 500.0           | 120.000         | 298.0       | H   | 310.0         | 33.7         |



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

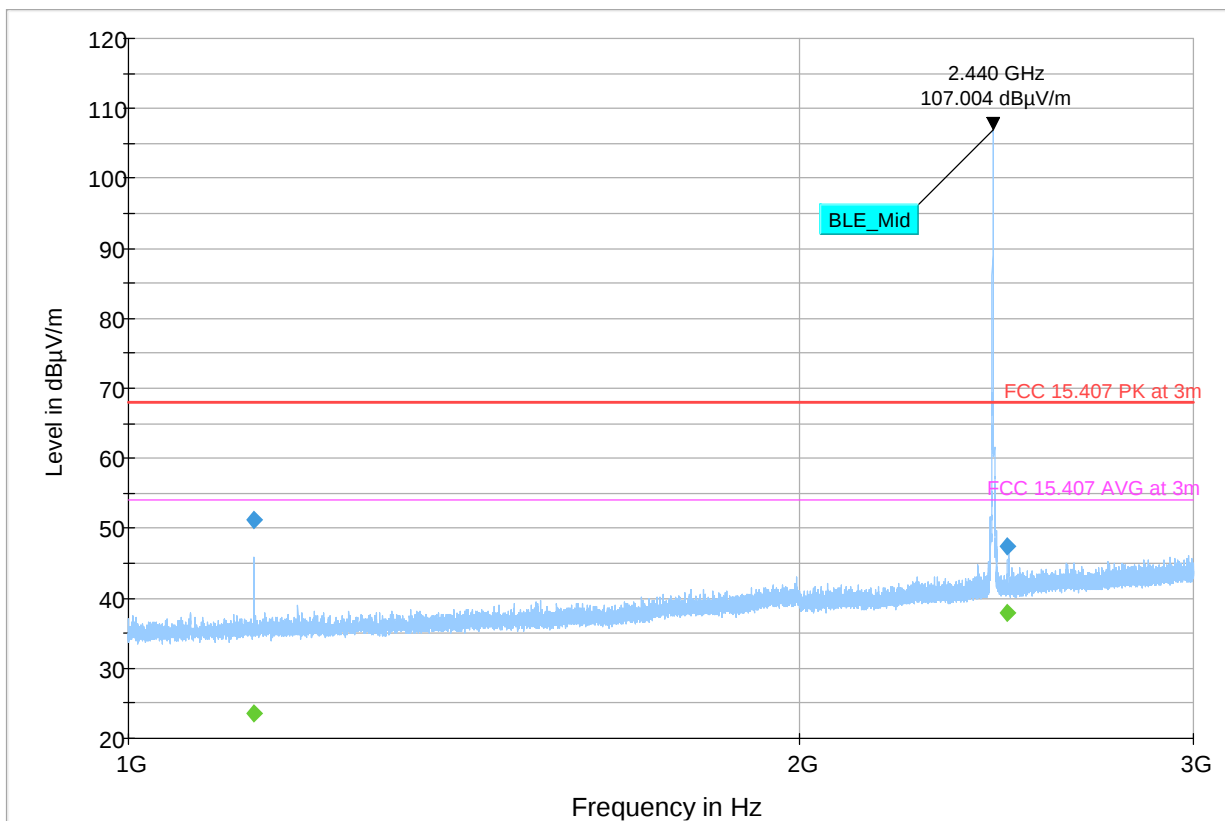
**Plot # 2 Radiated Emissions: 1 – 3 GHz**

Tx Frequency: 5180 MHz

Mode: 802.11n-HT20

**Final\_Result**

| 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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 1138.567        | ---              | 23.51             | 53.98          | 30.47       | 500.0           | 1000.000        | 162.0       | H   | 93.0          | 3.4          |
| 1138.567        | 51.22            | ---               | 68.00          | 16.78       | 500.0           | 1000.000        | 162.0       | H   | 93.0          | 3.4          |
| 2478.150        | ---              | 37.85             | 53.98          | 16.13       | 500.0           | 1000.000        | 150.0       | H   | 231.0         | 8.8          |
| 2478.150        | 47.42            | ---               | 68.00          | 20.58       | 500.0           | 1000.000        | 150.0       | H   | 231.0         | 8.8          |



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

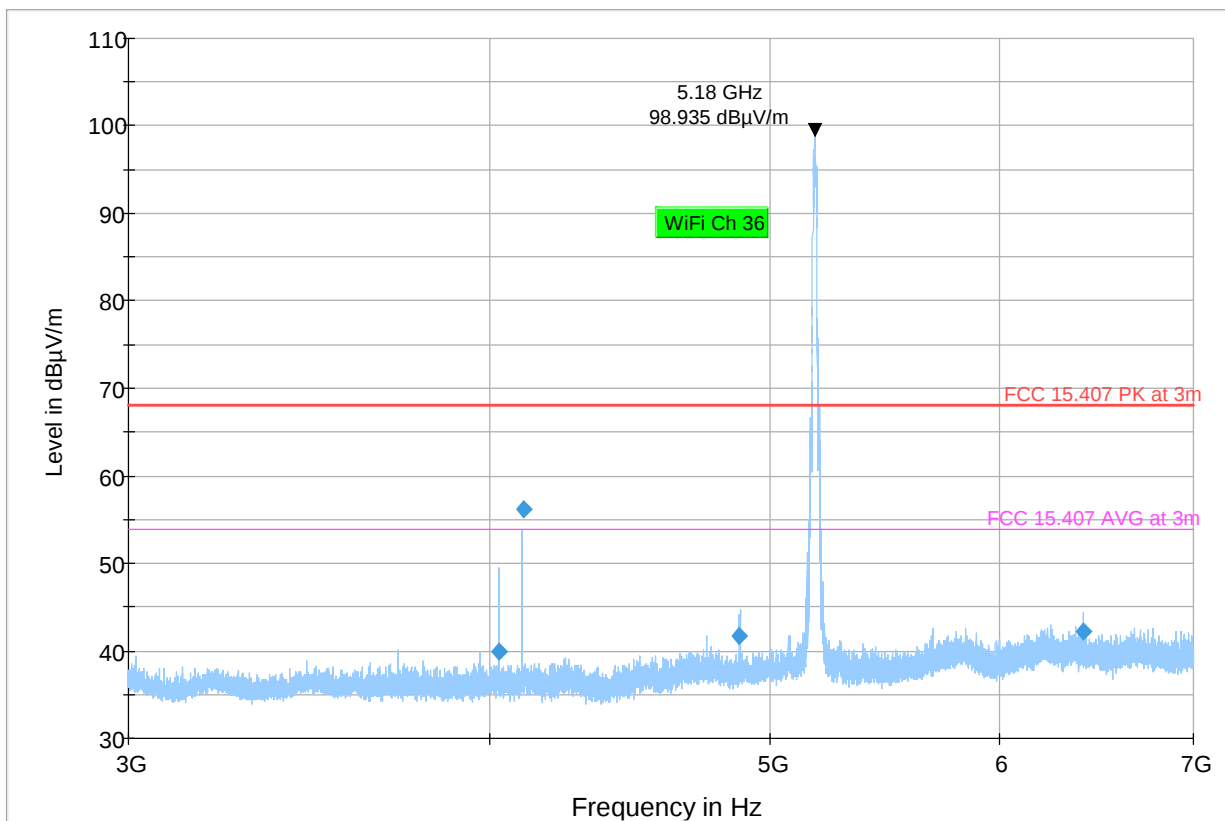
**Plot # 3 Radiated Emissions: 3 – 7 GHz**

Tx Frequency: 5180 MHz

Mode: 802.11n-HT20

**Final\_Result**

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 4030.600        | 39.95            | 68.00          | 28.05       | 500.0           | 1000.000        | 315.0       | V   | 314.0         | -5.3         |
| 4107.667        | 56.17            | 68.00          | 11.83       | 500.0           | 1000.000        | 150.0       | V   | 239.0         | -4.9         |
| 4879.433        | 41.71            | 68.00          | 26.29       | 500.0           | 1000.000        | 196.0       | V   | 145.0         | -4.4         |
| 6413.833        | 42.25            | 68.00          | 25.75       | 500.0           | 1000.000        | 150.0       | H   | 143.0         | -0.1         |



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

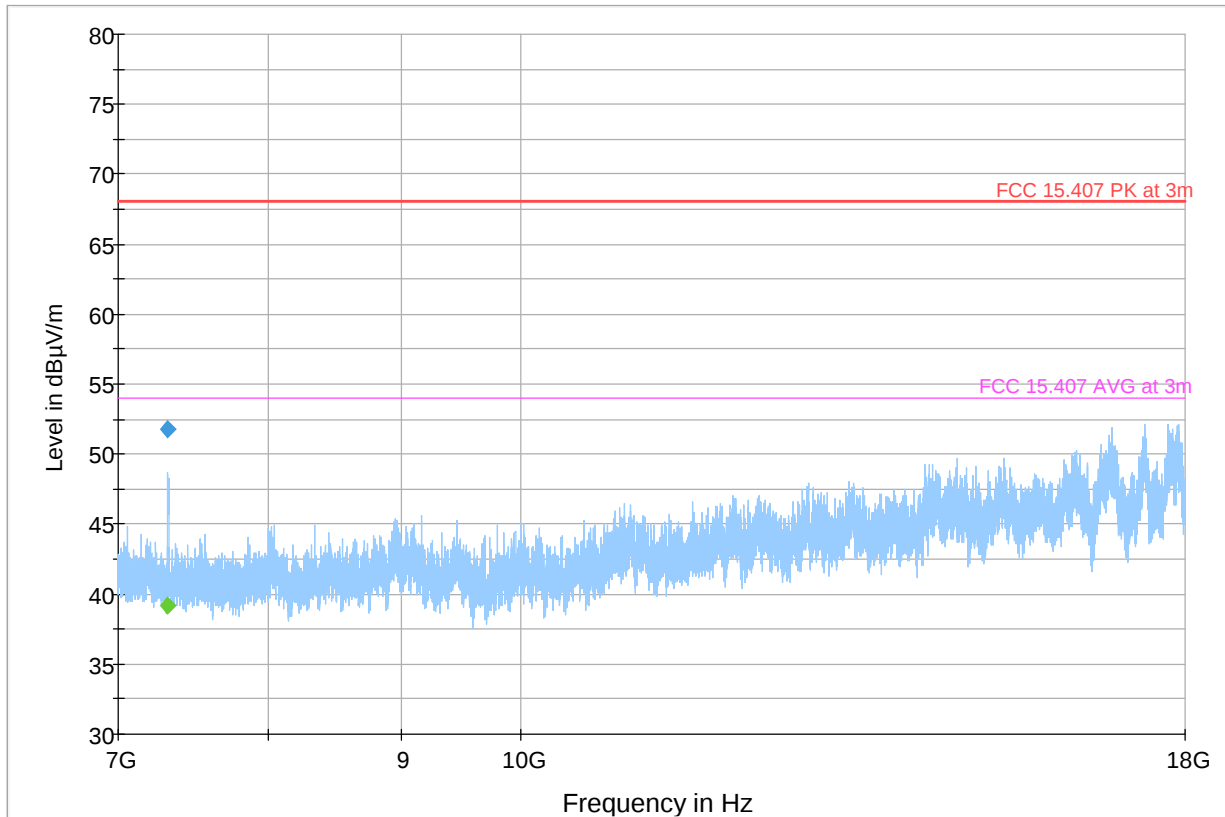
**Plot # 4 Radiated Emissions: 7 – 18 GHz**

Tx Frequency: 5180 MHz

Mode: 802.11n-HT20

**Final\_Result**

| 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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 7318.76         | ---              | 39.14             | 53.98          | 14.84       | 500.0           | 1000.0          | 134.0       | V   | 193.0         | -0.4         |
| 7318.76         | 51.80            | ---               | 68.00          | 16.20       | 500.0           | 1000.0          | 134.0       | V   | 193.0         | -0.4         |



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

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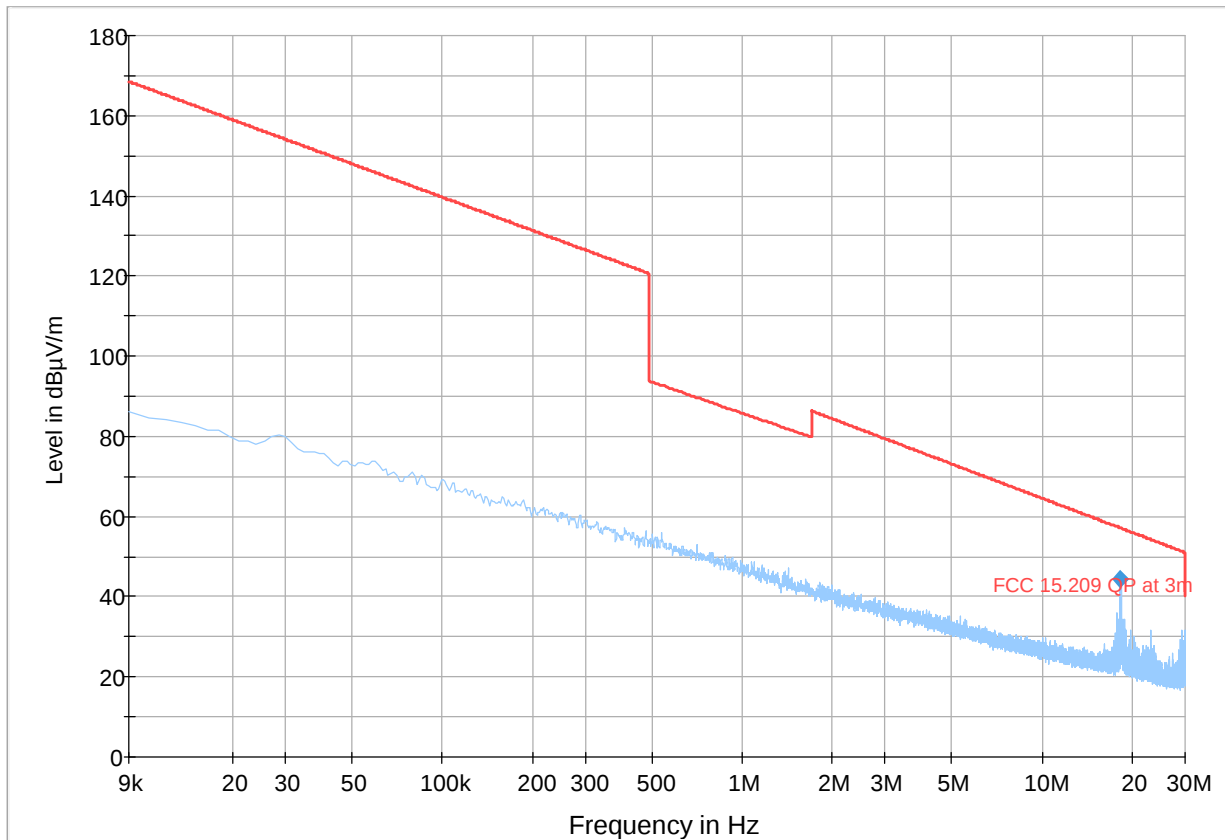
**Plot # 5 Radiated Emissions: 9 kHz – 30 MHz**

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20

**Final\_Result**

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 18.31           | 44.46            | 57.12          | 12.66       | 500.0           | 3.0             | 107.0       | H   | 24.0          | 16.6         |



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

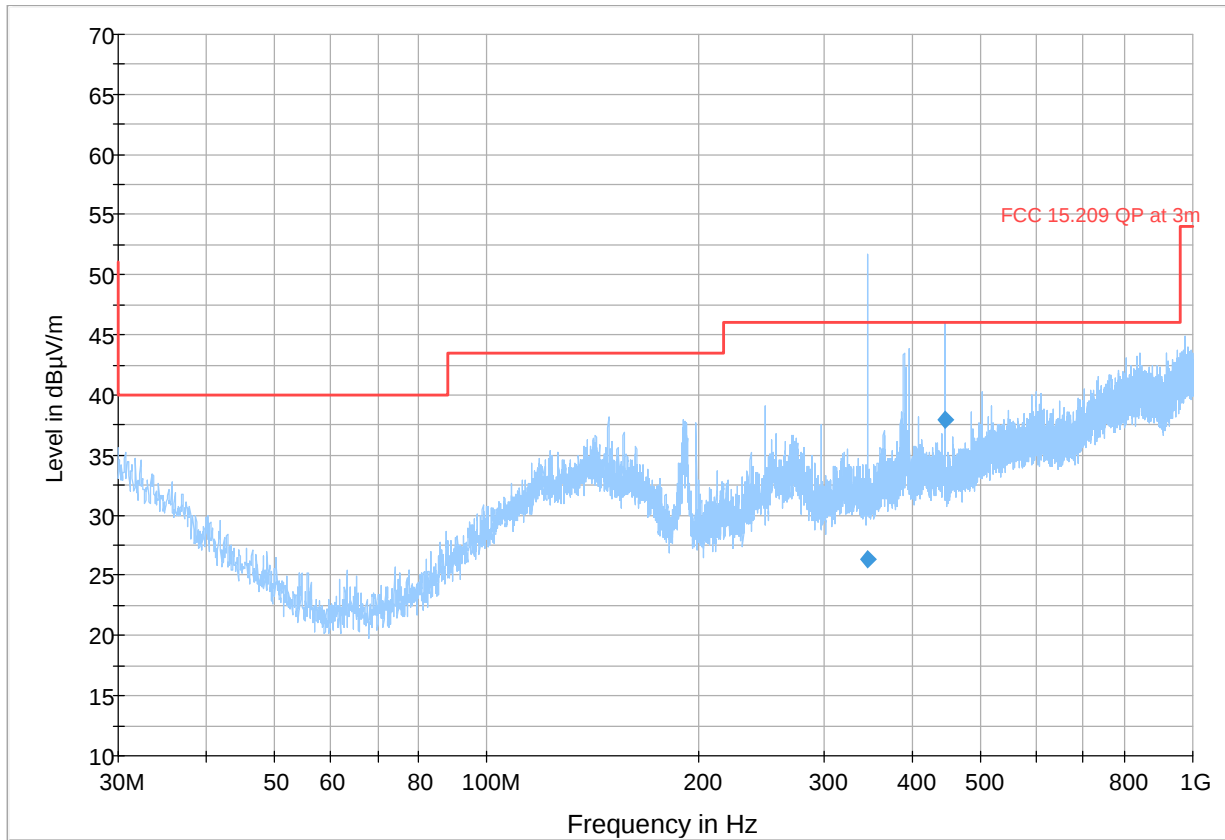
**Plot # 6 Radiated Emissions: 30 MHz – 1 GHz**

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20

**Final\_Result**

| Frequency (MHz) | QuasiPeak (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------------|----------------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 346.46          | 26.34                    | 46.02                | 19.68       | 500.0           | 120.0           | 100.0       | H   | 133.0         | 21.7         |
| 445.45          | 37.98                    | 46.02                | 8.04        | 500.0           | 120.0           | 219.0       | H   | 0.0           | 24.1         |



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

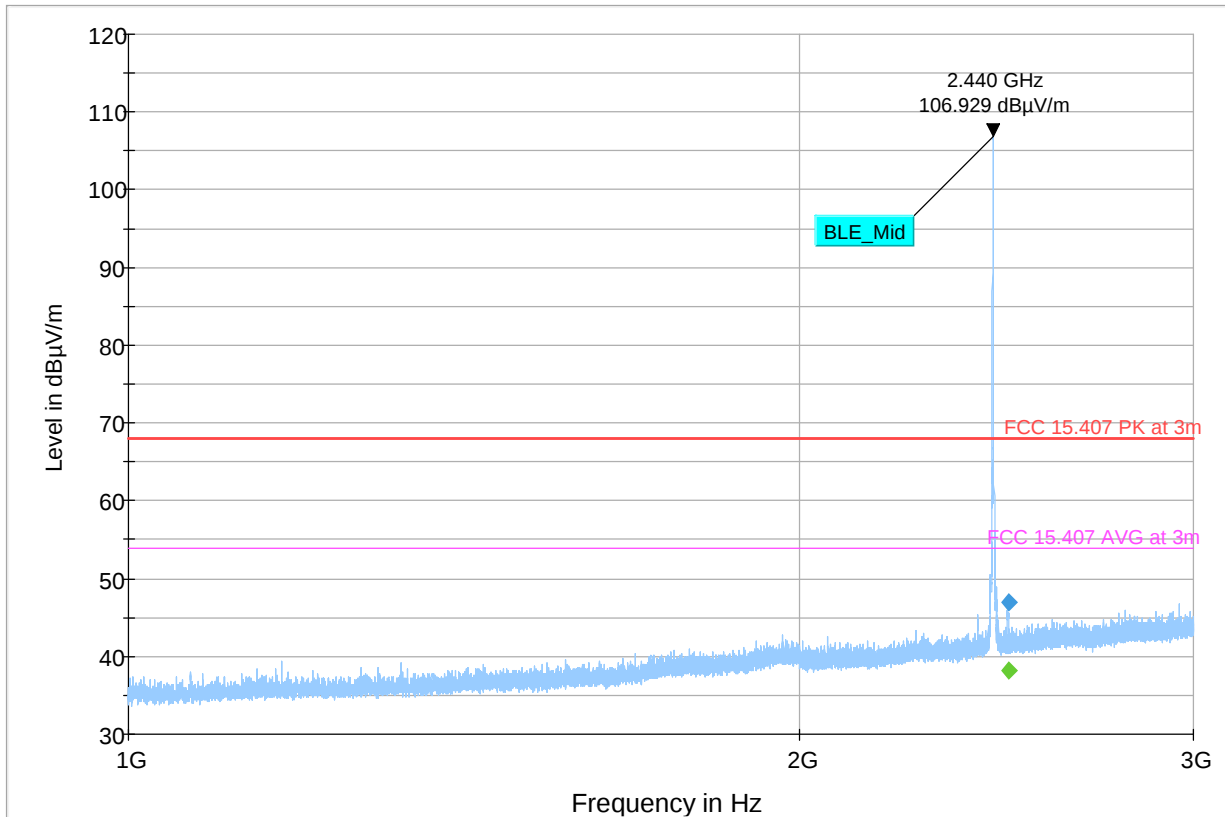
**Plot # 7 Radiated Emissions: 1 – 3 GHz**

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20

**Final\_Result**

| 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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 2478.217        | ---              | 38.18             | 53.98          | 15.80       | 500.0           | 1000.000        | 149.0       | H   | 226.0         | 8.8          |
| 2478.217        | 46.89            | ---               | 68.00          | 21.11       | 500.0           | 1000.000        | 149.0       | H   | 226.0         | 8.8          |



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

— FCC 15.407 PK at 3m — FCC 15.407 AVG at 3m

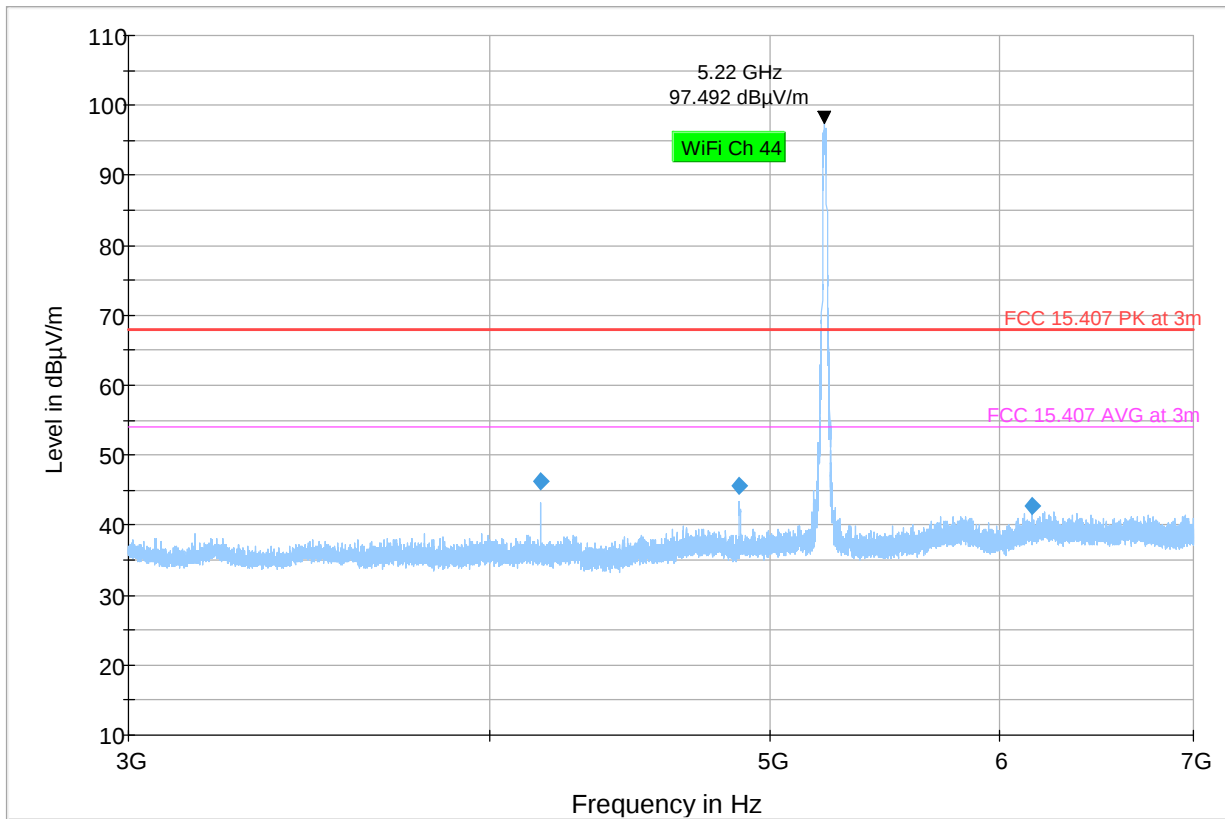
**Plot # 8 Radiated Emissions: 3 – 7 GHz**

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20

**Final\_Result**

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 4166.067        | 46.30            | 68.00          | 21.70       | 500.0           | 1000.000        | 150.0       | H   | 3.0           | -4.8         |
| 4879.433        | 45.69            | 68.00          | 22.31       | 500.0           | 1000.000        | 149.0       | V   | 331.0         | -4.4         |
| 6154.100        | 42.65            | 68.00          | 25.35       | 500.0           | 1000.000        | 150.0       | V   | 18.0          | -0.2         |



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

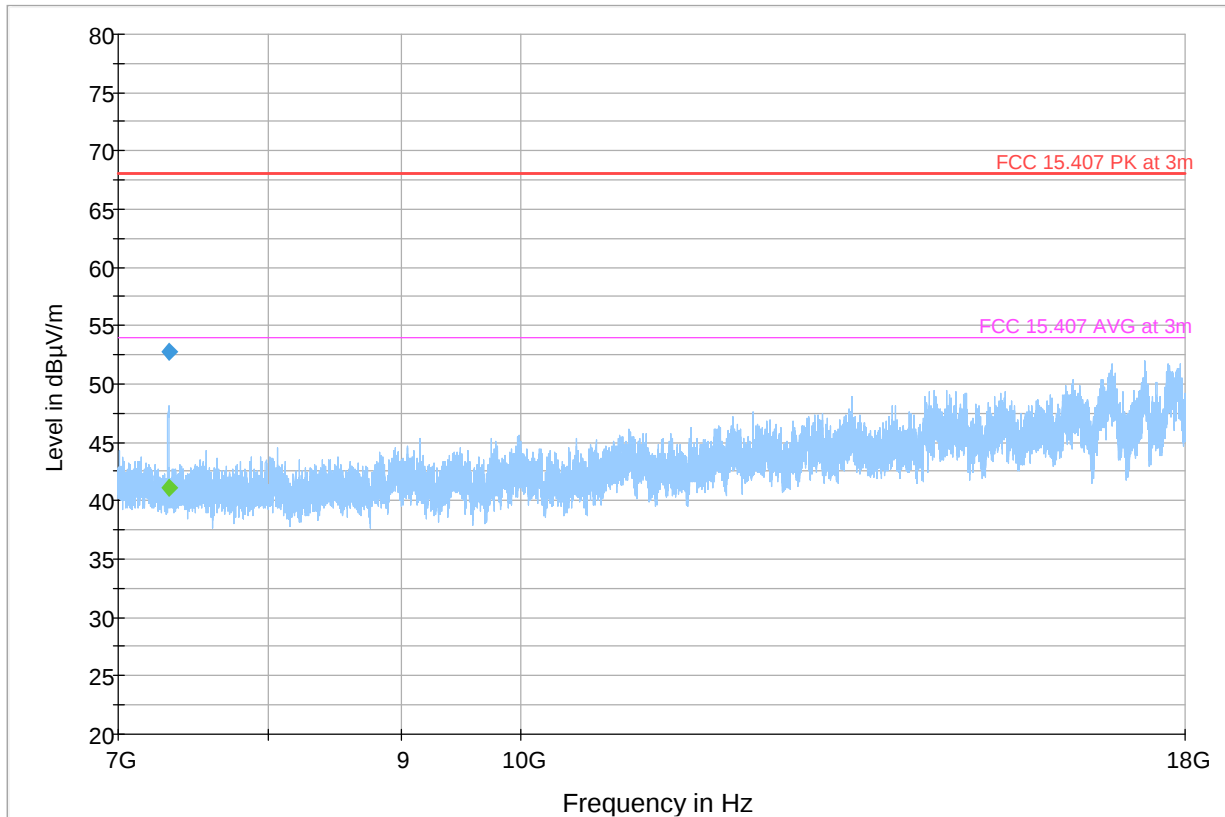
**Plot # 9 Radiated Emissions: 7 – 18 GHz**

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20

**Final\_Result**

| Frequency (MHz) | MaxPeak (dB $\mu$ V/m) | CAverage (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------------|-------------------------|----------------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 7320.47         | ---                    | 41.08                   | 53.98                | 12.90       | 500.0           | 1000.0          | 100.0       | H   | 185.0         | -0.4         |
| 7320.47         | 52.84                  | ---                     | 68.00                | 15.16       | 500.0           | 1000.0          | 100.0       | H   | 185.0         | -0.4         |

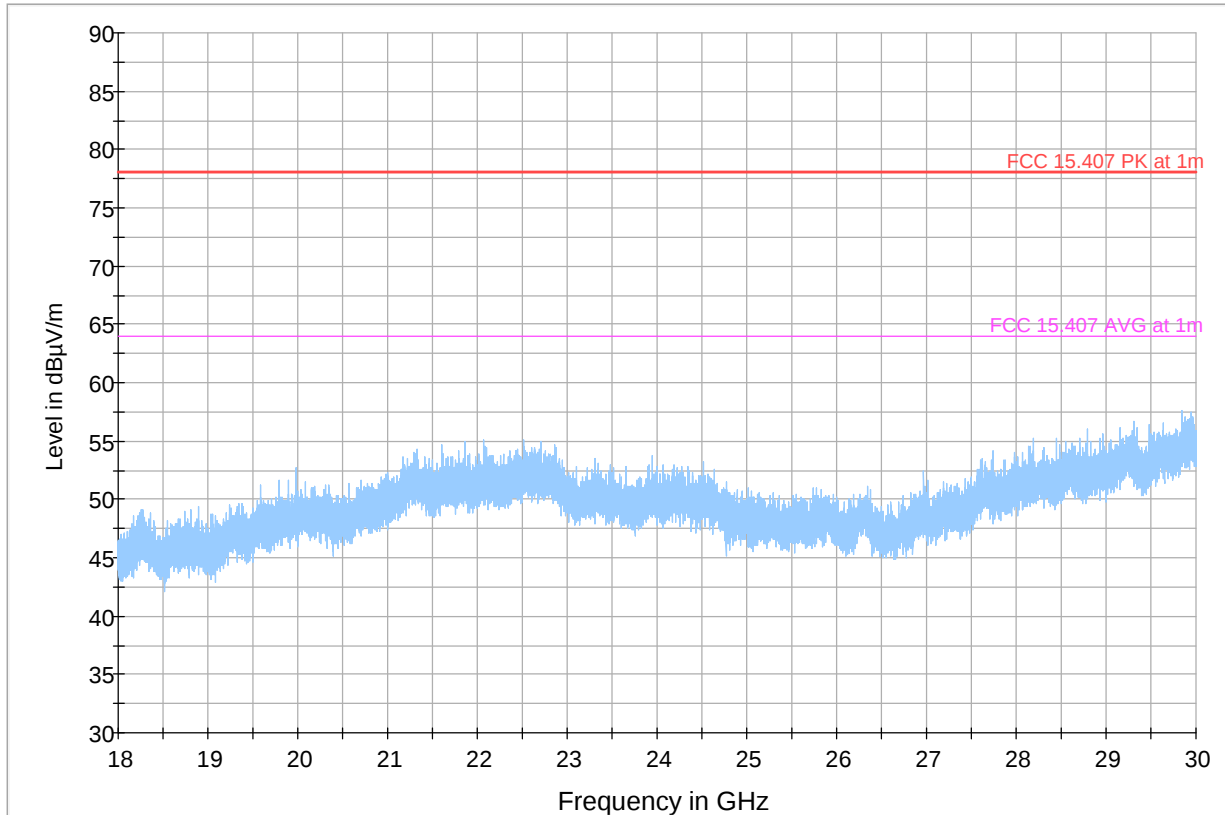


— Preview Result 1-PK+ — FCC 15.407 PK at 3m — FCC 15.407 AVG at 3m  
◆ Final\_Result PK+ ◆ Final\_Result CAV

### Plot # 10 Radiated Emissions: 18 – 30 GHz

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20

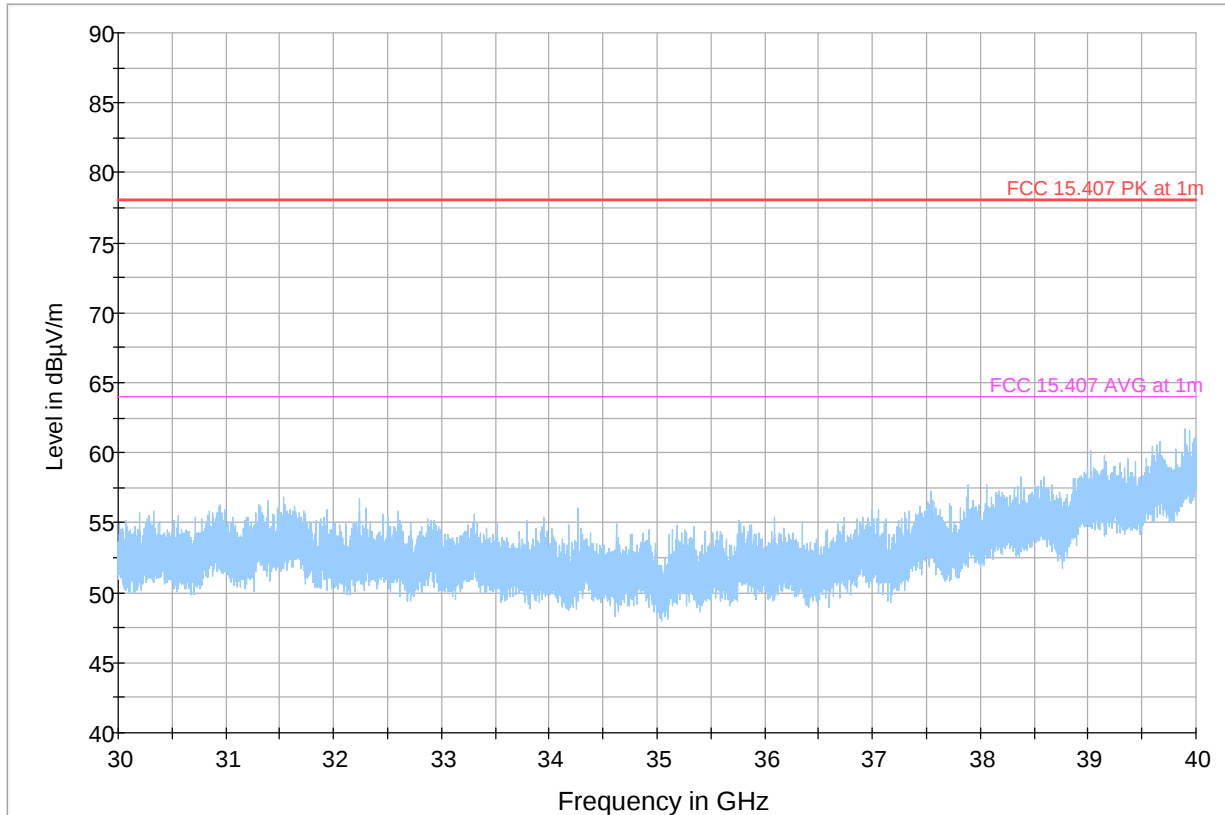


— Preview Result 1-PK+     \* Critical\_Freqs PK+     — FCC 15.407 PK at 1m  
— FCC 15.407 AVG at 1m     ◆ Final\_Result PK+     ◆ Final\_Result CAV

### Plot # 11 Radiated Emissions: 30 – 40 GHz

Tx Frequency: 5220 MHz

Mode: 802.11n-HT20



— Preview Result 1-PK+     \* Critical\_Freqs PK+     — FCC 15.407 PK at 1m  
— FCC 15.407 AVG at 1m     ◆ Final\_Result PK+     ◆ Final\_Result CAV

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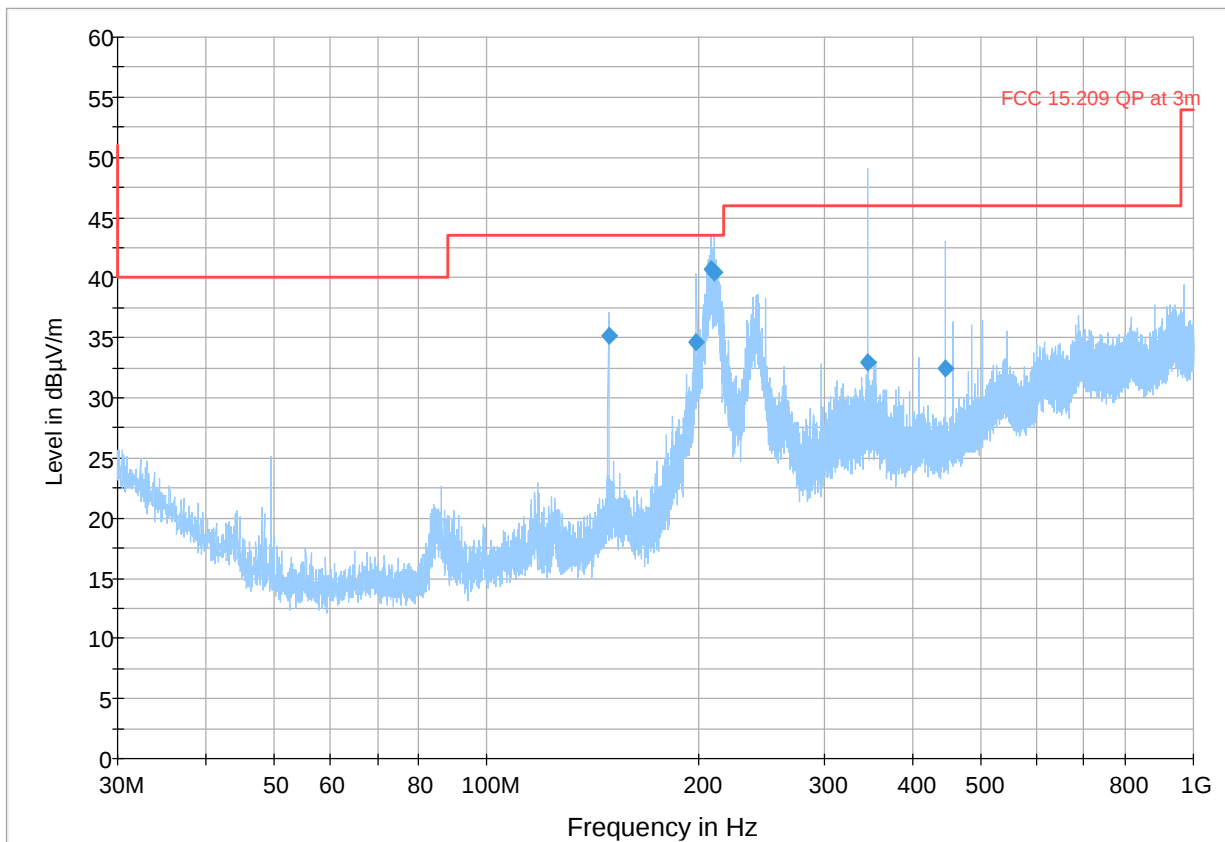
**Plot # 12 Radiated Emissions: 30 MHz – 1 GHz**

**Tx Frequency: 5240 MHz**

**Mode: 802.11n-HT20**

**Final Result**

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 148.502         | 35.18              | 43.50          | 8.32        | 500.0           | 120.000         | 225.0       | V   | 81.0          | 17.2         |
| 197.972         | 34.68              | 43.50          | 8.82        | 500.0           | 120.000         | 175.0       | H   | 24.0          | 18.1         |
| 207.478         | 40.67              | 43.50          | 2.83        | 500.0           | 120.000         | 173.0       | H   | 24.0          | 19.3         |
| 209.644         | 40.48              | 43.50          | 3.02        | 500.0           | 120.000         | 150.0       | H   | 17.0          | 19.5         |
| 346.511         | 32.97              | 46.02          | 13.05       | 500.0           | 120.000         | 163.0       | H   | 38.0          | 24.3         |
| 445.516         | 32.48              | 46.02          | 13.54       | 500.0           | 120.000         | 296.0       | H   | 341.0         | 25.3         |



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

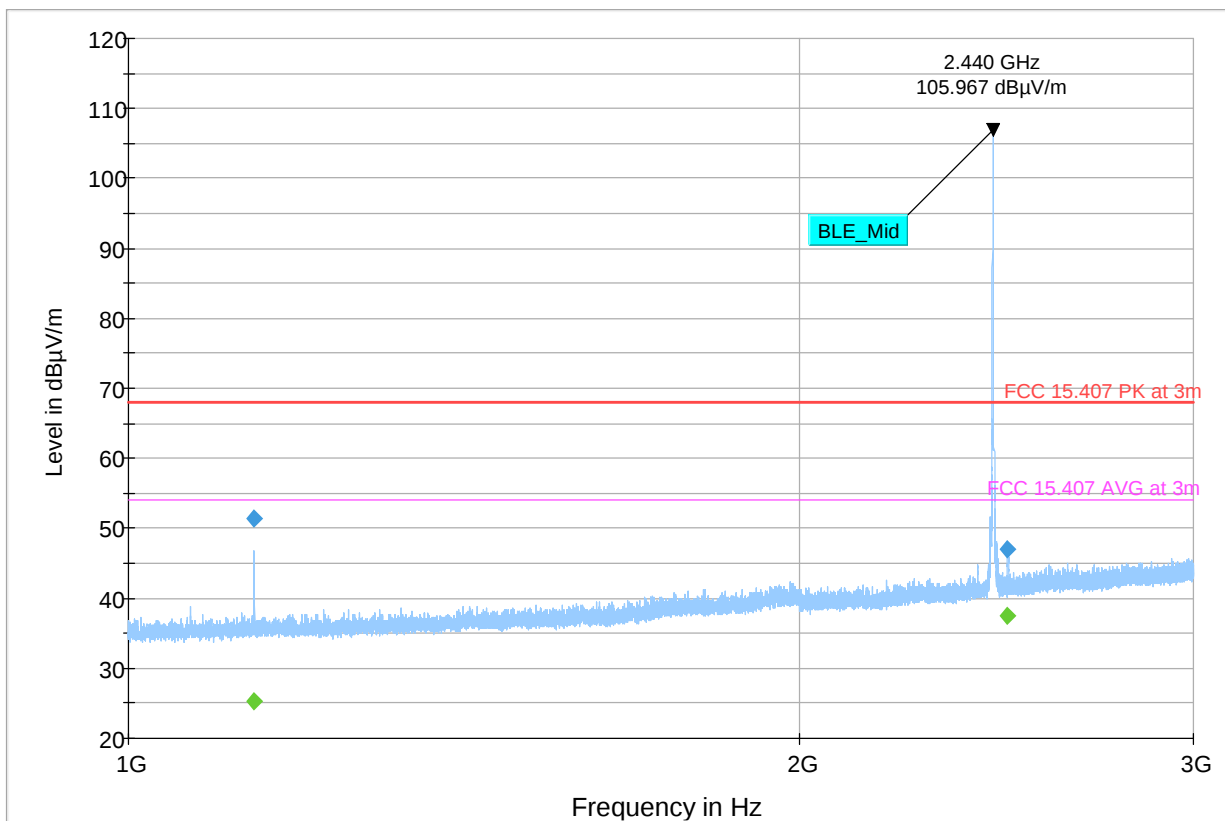
**Plot # 13 Radiated Emissions: 1 – 3 GHz**

Tx Frequency: 5240 MHz

Mode: 802.11n-HT20

**Final\_Result**

| 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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 1138.800        | 51.36            | ---               | 68.00          | 16.64       | 500.0           | 1000.000        | 149.0       | H   | 235.0         | 3.4          |
| 1138.800        | ---              | 25.41             | 53.98          | 28.57       | 500.0           | 1000.000        | 149.0       | H   | 235.0         | 3.4          |
| 2478.067        | 47.06            | ---               | 68.00          | 20.94       | 500.0           | 1000.000        | 150.0       | H   | 214.0         | 8.8          |
| 2478.067        | ---              | 37.45             | 53.98          | 16.53       | 500.0           | 1000.000        | 150.0       | H   | 214.0         | 8.8          |



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

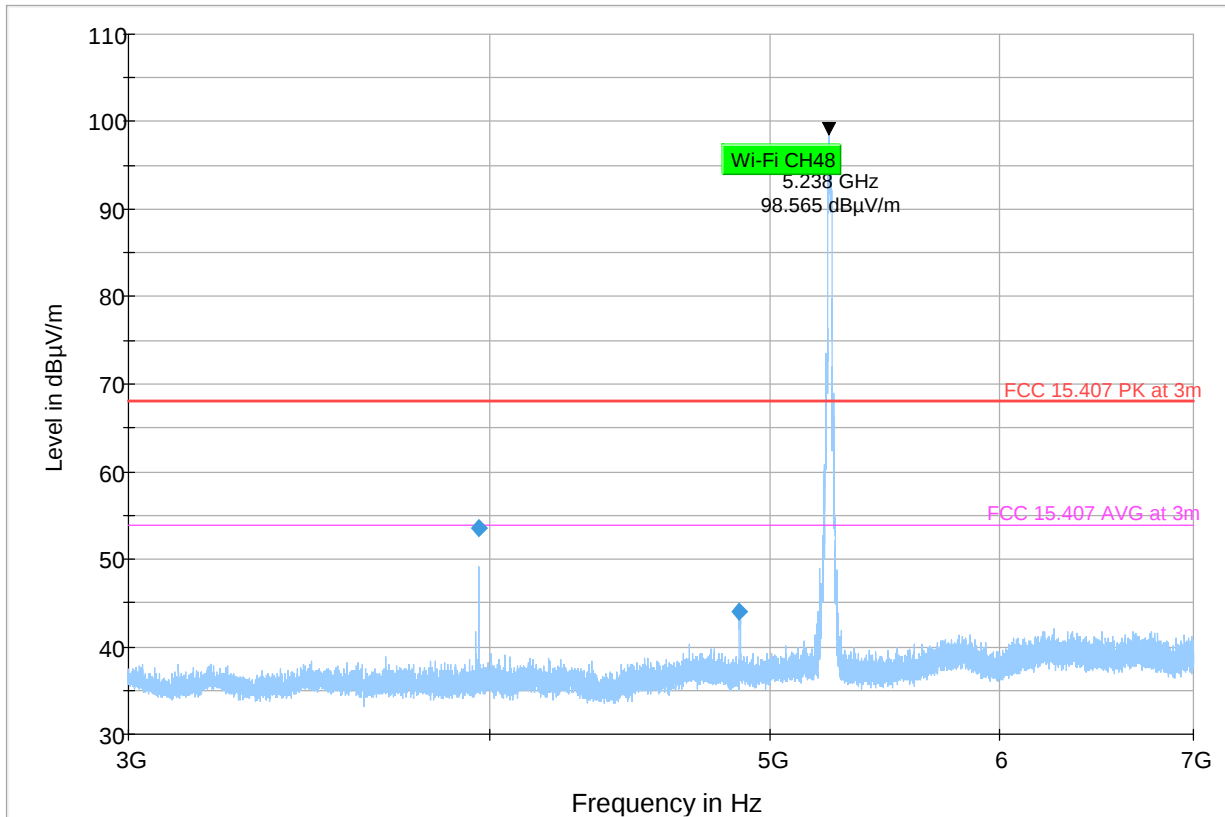
**Plot # 14 Radiated Emissions: 3 – 7 GHz**

Tx Frequency: 5240 MHz

Mode: 802.11n-HT20

**Final Result**

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 3965.367        | 53.52            | 68.00          | 14.48       | 500.0           | 1000.000        | 198.0       | H   | -7.0          | -5.3         |
| 4880.033        | 43.95            | 68.00          | 24.05       | 500.0           | 1000.000        | 255.0       | V   | 159.0         | -4.4         |



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

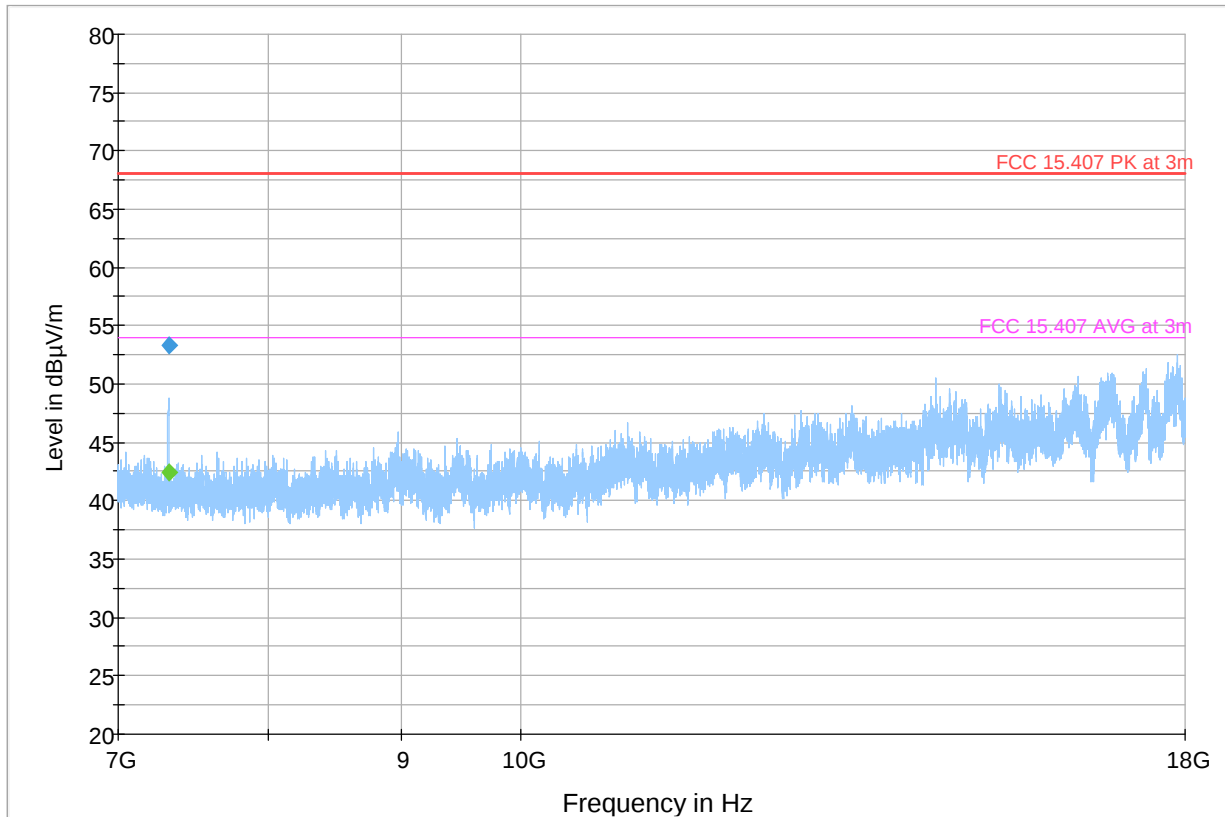
**Plot # 15 Radiated Emissions: 7 – 18 GHz**

Tx Frequency: 5240 MHz

Mode: 802.11n-HT20

**Final\_Result**

| 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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 7319.73         | ---              | 42.38             | 53.98          | 11.59       | 500.0           | 1000.0          | 100.0       | H   | 184.0         | -0.4         |
| 7319.73         | 53.37            | ---               | 68.00          | 14.63       | 500.0           | 1000.0          | 100.0       | H   | 184.0         | -0.4         |



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

## 8.4 AC Power Line Conducted Emissions

### 8.4.1 Measurement according to ANSI C63.4

#### Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

### 8.4.2 Limits: §15.207 & RSS-Gen 8.8

#### FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

| Frequency of emissions (MHz) | Conducted limit (dB $\mu$ V) |           |
|------------------------------|------------------------------|-----------|
|                              | Quasi-peak                   | Average   |
| 0.15-0.5                     | 66 to 56*                    | 56 to 46* |
| 5-30                         | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

**8.4.3 Test conditions and setup:**

| Ambient Temperature °C | Power line<br>(L1, L2, L3, N) | Power Input |
|------------------------|-------------------------------|-------------|
| 23° C                  | Line & Neutral                | 120V / 60Hz |

**8.4.4 Measurement Result:**

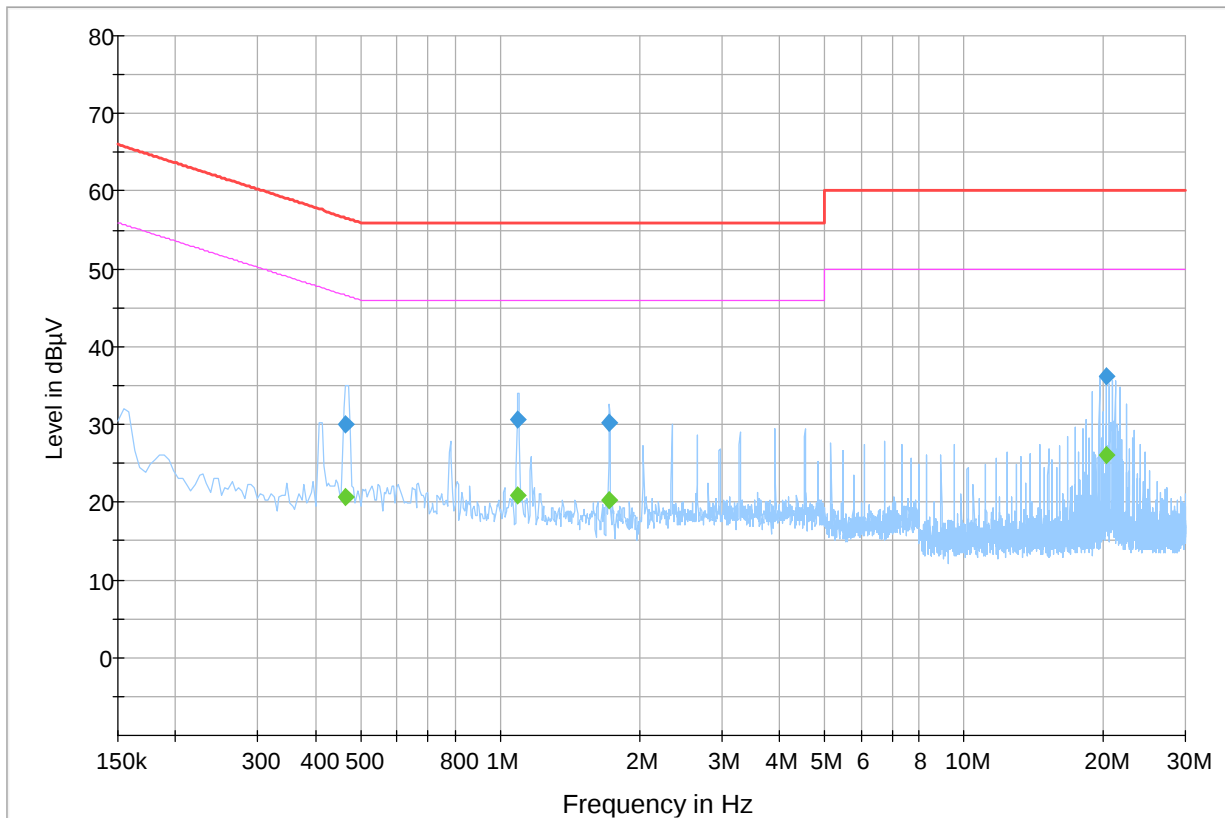
| Plot # | Port     | EUT operating mode | Scan Frequency   | Limit             | Result |
|--------|----------|--------------------|------------------|-------------------|--------|
| 4      | AC Mains | Op.3               | 150 kHz – 30 MHz | See section 8.4.2 | Pass   |

## 8.4.5 Measurement Plot:

Plot # 16 AC Conducted Emissions: 150 kHz – 30 MHz

## Final\_Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE  | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 0.466           | ---              | 20.61           | 46.58        | 25.97       | 500.0           | 9.000           | L1   | GND | 10.0       |
| 0.466           | 30.06            | ---             | 56.58        | 26.52       | 500.0           | 9.000           | L1   | GND | 10.0       |
| 1.094           | ---              | 20.86           | 46.00        | 25.14       | 500.0           | 9.000           | L1   | GND | 10.1       |
| 1.094           | 30.69            | ---             | 56.00        | 25.31       | 500.0           | 9.000           | L1   | GND | 10.1       |
| 1.722           | 30.26            | ---             | 56.00        | 25.74       | 500.0           | 9.000           | N    | GND | 10.1       |
| 1.722           | ---              | 20.35           | 46.00        | 25.65       | 500.0           | 9.000           | N    | GND | 10.1       |
| 20.211          | 36.24            | ---             | 60.00        | 23.76       | 500.0           | 9.000           | L1   | GND | 10.3       |
| 20.211          | ---              | 25.95           | 50.00        | 24.05       | 500.0           | 9.000           | L1   | GND | 10.3       |



Preview Result 1-PK+  
Final\_Result QPK

EN 55032 Voltage on Mains QP  
Final\_Result CAV

EN 55032 Voltage on Mains A

## 9 Test setup photos

Setup photos are included in supporting file name: "EMC\_LENXX\_007\_21001\_FCC\_ISED\_Setup\_Photos.pdf"

## 10 Test Equipment And Ancillaries Used For Testing

| Equipment Type        | Manufacturer    | Model                    | Serial #  | Calibration Cycle | Last Calibration Date |
|-----------------------|-----------------|--------------------------|-----------|-------------------|-----------------------|
| BILOG ANTENNA         | A.H. Systems    | BiLA2G                   | 569       | 2 YEARS           | 12/1/2020             |
| HORN ANTENNA          | EMCO            | 3115                     | 00035111  | 2 YEARS           | 9/30/2021             |
| HORN ANTENNA          | ETS LINDGREN    | 3117-PA                  | 00169547  | 2 YEARS           | 9/1/2020              |
| HORN ANTENNA          | ETS LINDGREN    | 3116                     | 00169535  | 2 YEARS           | 9/23/2020             |
| Digital Thermometer   | Control Company | 36934-164                | 191871986 | 2 YEARS           | 10/20/2021            |
| ESW.EMI TEST RECEIVER | R&S             | ESW44                    | 101715    | 2 YEARS           | 9/14/2021             |
| EMI RECEIVER          | R&S             | ESU40                    | 100251    | 2 YEARS           | 9/13/2021             |
| FCC LISN              | FCC             | LISN FCC-LISN-50-25-2-08 | 8014      | 2 YEARS           | 8/31/2021             |

**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      | Report Name                                   | Changes to report                                                                                                                                                                       | Report prepared by |
|-----------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 7/1/2022  | EMC_LENXX_007_21001_FCC_15.407_ISED_UNII      | Initial Version                                                                                                                                                                         | Ghanma, Issa       |
| 7/27/2022 | EMC_LENXX_007_21001_FCC_15.407_ISED_UNII_Rev1 | <ul style="list-style-type: none"><li>• Section 2.1: Responsible Project Leader.</li><li>• Section 2.2: Client address</li><li>• Section 3.3: Replace with same as applicant.</li></ul> | Ghanma, Issa       |

<<< The End >>>

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