

# RF TEST REPORT



**Report No.: FCC\_IC\_SL18121801-KLA-021-AF120-DTS\_Rev3.0**

**Supersede Report No.: FCC\_IC\_SL18121801-KLA-021-AF120-DTS Rev2.0**

|                                                                                                      |   |                                                                                     |
|------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------|
| Applicant                                                                                            | : | KLA Corporation                                                                     |
| Product Name                                                                                         | : | SensArray@Automation FOUP                                                           |
| Model No.                                                                                            | : | AF120                                                                               |
| Test Standard                                                                                        | : | 47 CFR 15.247<br>RSS 247 Iss 2: Feb 2017                                            |
| Test Method                                                                                          | : | ANSI C63.10: 2013<br>RSS Gen Iss 5: Apr 2018<br>558074 D01 DTS Meas Guidance v05r01 |
| FCC ID                                                                                               | : | QTA-AF120                                                                           |
| IC                                                                                                   | : | 10516A-AF120                                                                        |
| Dates of test                                                                                        | : | 03/01/2019 – 03/10/2019                                                             |
| Issue Date                                                                                           | : | 03/30/2020                                                                          |
| Test Result                                                                                          | : | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail              |
| Equipment complied with the specification [X]<br>Equipment did not comply with the specification [ ] |   |                                                                                     |

This Test Report is Issued Under the Authority of:

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| <b>Cipher</b>                                                                       | <b>Chen Ge</b>                                                                       |
| Test Engineer                                                                       | Engineer Reviewer                                                                    |

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| Country/Region | Accreditation Body     | Scope                             |
|----------------|------------------------|-----------------------------------|
| USA            | FCC, A2LA              | EMC, RF/Wireless, Telecom         |
| Canada         | IC, A2LA, NIST         | EMC, RF/Wireless, Telecom         |
| Taiwan         | BSMI, NCC, NIST        | EMC, RF, Telecom, Safety          |
| Hong Kong      | OFTA, NIST             | RF/Wireless, Telecom              |
| Australia      | NATA, NIST             | EMC, RF, Telecom, Safety          |
| Korea          | KCC/RRA, NIST          | EMI, EMS, RF, Telecom, Safety     |
| Japan          | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom         |
| Mexico         | NOM, COFETEL, Caniety  | Safety, EMC, RF/Wireless, Telecom |
| Europe         | A2LA, NIST             | EMC, RF, Telecom, Safety          |
| Israel         | MOC, NIST              | EMC, RF, Telecom, Safety          |

### Accreditations for Product Certifications

| Country   | Accreditation Body | Scope                 |
|-----------|--------------------|-----------------------|
| USA       | FCC TCB, NIST      | EMC, RF, Telecom      |
| Canada    | IC FCB, NIST       | EMC, RF, Telecom      |
| Singapore | iDA, NIST          | EMC, RF, Telecom      |
| EU        | NB                 | EMC & R&TTE Directive |
| Japan     | MIC (RCB 208)      | RF, Telecom           |
| Hong Kong | OFTA (US002)       | RF, Telecom           |

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## 1 Report Revision History

| Report No.                                 | Report Version | Description                    | Issue Date |
|--------------------------------------------|----------------|--------------------------------|------------|
| FCC_IC_SL18121801-KLA-021-AF120-DTS        | None           | Original                       | 03/28/2019 |
| FCC_IC_SL18121801-KLA-021-AF120-DTS_Rev1.0 | Rev1.0         | Add FCC Id and Changed Name    | 04/18/2019 |
| FCC_IC_SL18121801-KLA-021-AF120-DTS_Rev2.0 | Rev2.0         | Add IC Id                      | 08/07/2019 |
| FCC_IC_SL18121801-KLA-021-AF120-DTS_Rev3.0 | Rev3.0         | Add Conducted Emission section | 03/30/2020 |
|                                            |                |                                |            |

## 2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

|          |                           |
|----------|---------------------------|
| Company: | KLA Corporation           |
| Product: | SensArray@Automation FOUP |
| Model:   | AF120                     |

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1<sup>st</sup> page.

## 3 Customer information

|                      |   |                                          |
|----------------------|---|------------------------------------------|
| Applicant Name       | : | KLA Corporation                          |
| Applicant Address    | : | One Technology Drive, Milpitas, CA 95035 |
| Manufacturer Name    | : | KLA Corporation                          |
| Manufacturer Address | : | One Technology Drive, Milpitas, CA 95035 |

## 4 Test site information

|                      |                                             |
|----------------------|---------------------------------------------|
| Lab performing tests | SIEMIC Laboratories                         |
| Lab Address          | 775 Montague Expressway, Milpitas, CA 95035 |
| FCC Test Site No.    | 540430                                      |
| IC Test Site No.     | 4842D                                       |
| VCCI Test Site No.   | A0133                                       |

## 5 Modification

| Index | Item | Description | Note |
|-------|------|-------------|------|
| -     | -    | -           | -    |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |

## 6 EUT Information

### 6.1 EUT Description

|                           |                           |
|---------------------------|---------------------------|
| Product Name              | SensArray@Automation FOUP |
| Model No.                 | AF120                     |
| Trade Name                | KLA                       |
| Serial No.                | N/A                       |
| Input Power               | 5 VDC                     |
| Date of EUT received      | 03/18/2019                |
| Equipment Class/ Category | DTS                       |
| Port/Connectors           | I/O                       |

### 6.2 Radio Description

|                        |                          |
|------------------------|--------------------------|
| Radio Type             | 802.11b/g/n              |
| Operating Frequency    | 2412-2462MHz             |
| Modulation             | DSSS (CCK, DQPSK, DBPSK) |
| Channel Spacing        | 5MHz                     |
| Number of Channels     | 11                       |
| Antenna Type           | Chip Antenna             |
| Antenna Gain (Peak)    | 1.9 dBi                  |
| Antenna Connector Type | -                        |
| Note                   | -                        |

## 7 Supporting Equipment/Software and cabling Description

### 7.1 Supporting Equipment

| Item | Supporting Equipment Description | Model          | Serial Number | Manufacturer | Note |
|------|----------------------------------|----------------|---------------|--------------|------|
| 1    | Laptop                           | ThinkPad T420s | N/A           | Lenovo       | -    |
|      |                                  |                |               |              |      |
|      |                                  |                |               |              |      |

### 7.2 Cabling Description

| Name | Connection Start |                | Connection Stop |          | Length / shielding Info |            | Note |
|------|------------------|----------------|-----------------|----------|-------------------------|------------|------|
|      | From             | I/O Port       | To              | I/O Port | Length (m)              | Shielding  |      |
| USB  | EUT              | Micro-USB Port | Laptop          | USB      | 1                       | Unshielded | -    |
|      |                  |                |                 |          |                         |            |      |

### 7.3 Test Software Description

| Test Item  | Software  | Description                                                   |
|------------|-----------|---------------------------------------------------------------|
| RF Testing | Tera Term | Set the EUT to transmit continuously in different test modes. |
|            |           |                                                               |
|            |           |                                                               |

## 8 Test Summary

| Test Item                    | Test standard |              | Test Method/Procedure |                                     | Pass / Fail                              |
|------------------------------|---------------|--------------|-----------------------|-------------------------------------|------------------------------------------|
| Restricted Band of Operation | FCC           | 15.205       | FCC                   | ANSI C63.10:2013                    | <input checked="" type="checkbox"/> Pass |
|                              | IC            | RSS Gen 8.10 | IC                    | 558074 D01 DTS Meas Guidance v05r01 | <input type="checkbox"/> N/A             |
| AC Conducted Emissions       | FCC           | 15.207(a)    | FCC                   | ANSI C63.10:2013                    | <input checked="" type="checkbox"/> Pass |
|                              | IC            | RSS Gen 8.8  | IC                    | RSS Gen Issue 5: 2018               | <input type="checkbox"/> N/A             |

### DTS Band Requirement

| Test Item                                 | Test standard                                                                                                                                                                                                                                                                                                                                          |                | Test Method/Procedure |                                                         | Pass / Fail                                                              |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------|---------------------------------------------------------|--------------------------------------------------------------------------|
| 99% Occupied Bandwidth                    | -                                                                                                                                                                                                                                                                                                                                                      | -              | -                     | -                                                       | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | RSS Gen 6.7    | IC                    | RSS Gen Issue 5: 2018                                   | <input type="checkbox"/> N/A                                             |
| 6dB Bandwidth                             | FCC                                                                                                                                                                                                                                                                                                                                                    | 15.247(a)(2)   | FCC                   | 558074 D01 DTS Meas Guidance v05r01                     | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | RSS247 (5.2.a) | IC                    |                                                         | <input type="checkbox"/> N/A                                             |
| Band Edge and Radiated Spurious Emissions | FCC                                                                                                                                                                                                                                                                                                                                                    | 15.247(d)      | FCC                   | ANSI C63.10:2013<br>558074 D01 DTS Meas Guidance v05r01 | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | RSS247 (5.5)   | IC                    |                                                         | <input type="checkbox"/> N/A                                             |
| Output Power                              | FCC                                                                                                                                                                                                                                                                                                                                                    | 15.247(b)      | FCC                   | 558074 D01 DTS Meas Guidance v05r01                     | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | RSS247 (5.4.d) | IC                    |                                                         | <input type="checkbox"/> N/A                                             |
| Receiver Spurious Emissions               | IC                                                                                                                                                                                                                                                                                                                                                     | RSS Gen (7.3)  | IC                    | RSS Gen Issue 5: 2018                                   | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Antenna Gain > 6 dBi                      | FCC                                                                                                                                                                                                                                                                                                                                                    | 15.247(e)      | FCC                   | -                                                       | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | -              | IC                    | -                                                       | <input type="checkbox"/> N/A                                             |
| Power Spectral Density                    | FCC                                                                                                                                                                                                                                                                                                                                                    | 15.247(e)      | FCC                   | 558074 D01 DTS Meas Guidance v05r01                     | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | RSS247 (5.2.b) | IC                    |                                                         | <input type="checkbox"/> N/A                                             |
| RF Exposure requirement                   | FCC                                                                                                                                                                                                                                                                                                                                                    | 15.247(i)      | FCC                   | -                                                       | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                     | RSS Gen(3.4)   | IC                    | RSS Gen Issue 5: 2018                                   | <input type="checkbox"/> N/A                                             |
| Remark                                    | <ol style="list-style-type: none"> <li>All measurement uncertainties do not take into consideration for all presented test results.</li> <li>The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.</li> </ol> |                |                       |                                                         |                                                                          |

## 9 Measurement Uncertainty

### 9.1 Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| Antenna Factor                    | 0.65       | Normal                   | 2        | 1                       | 0.325                |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| Mismatch Filter - Receiver        | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| NSA Calibration                   | 4.0        | U-Shape                  | 1.414    | 1                       | 2.8288543            |
| Combined Standard Uncertainty     |            |                          |          |                         | 3.0059131            |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>6.0118262</b>     |

The total derived measurement uncertainty is +/- 6.00 dB.

### 9.2 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.0692840            |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.1050000            |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.1250000            |
| Antenna Factor                    | 0.65       | Normal                   | 2        | 1                       | 0.3250000            |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.8660508            |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.8660508            |
| Mismatch Filter - Receiver        | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| VSWR Calibration                  | 2.0        | U-Shape                  | 1.414    | 1                       | 1.4144272            |
| Combined Standard Uncertainty     |            |                          |          |                         | 4.2363               |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>8.4726</b>        |

The total derived measurement uncertainty is +/- 8.47 dB.

### 9.3 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Reference Level                   | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Attenuator                        | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| Mismatch                          | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| Combined Standard Uncertainty     |            |                          |          |                         | 0.476087             |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>0.952174</b>      |

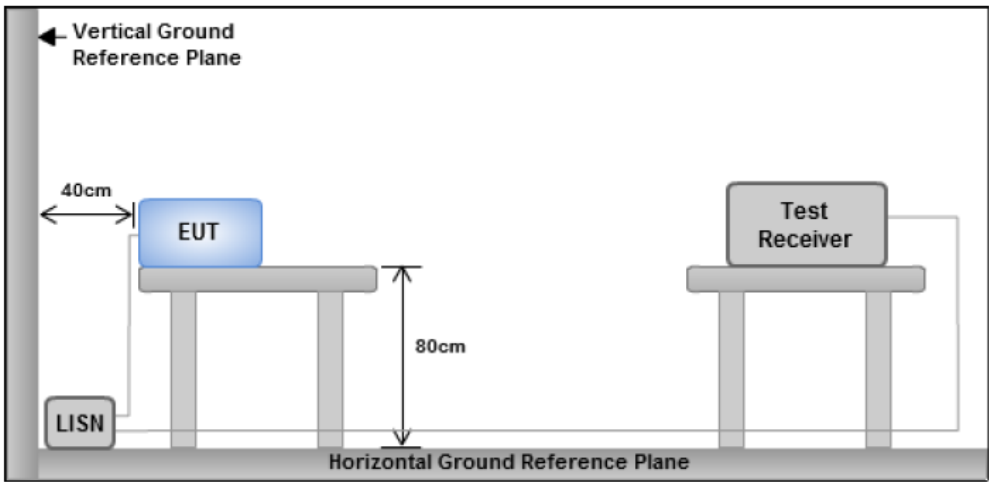
The total derived measurement uncertainty is +/- 0.95 dB.

## 10 Measurements, Examination and Derived Results

### 10.1 Conducted Emissions

#### Conducted Emission Limit

| Frequency ranges<br>(MHz) | Limit (dBuV) |         |
|---------------------------|--------------|---------|
|                           | QP           | Average |
| 0.15 ~ 0.5                | 66 – 56      | 56 – 46 |
| 0.5 ~ 5                   | 56           | 46      |
| 5 ~ 30                    | 60           | 50      |

| Spec             | Item | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Applicable                          |
|------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 47CFR§<br>15.207 | a)   | For Low-power radio-frequency devices 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, as measured using a 50 $\mu$ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.                                                                                                         | <input checked="" type="checkbox"/> |
| Test Setup       |      |  <p><b>Note: 1. Support units were connected to second LISN.</b><br/> <b>2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes</b></p>                                                                                                                                                                                                                                                                                                          |                                     |
| Procedure        |      | <ul style="list-style-type: none"> <li>- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.</li> <li>- The power supply for the EUT was fed through a 50<math>\Omega</math>/50<math>\mu</math>H EUT LISN, connected to filtered mains.</li> <li>- The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.</li> <li>- All other supporting equipment was powered separately from another main supply.</li> </ul> |                                     |
| Remark           |      | EUT was tested at 120VAC, 60Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                     |
| Result           |      | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                     |

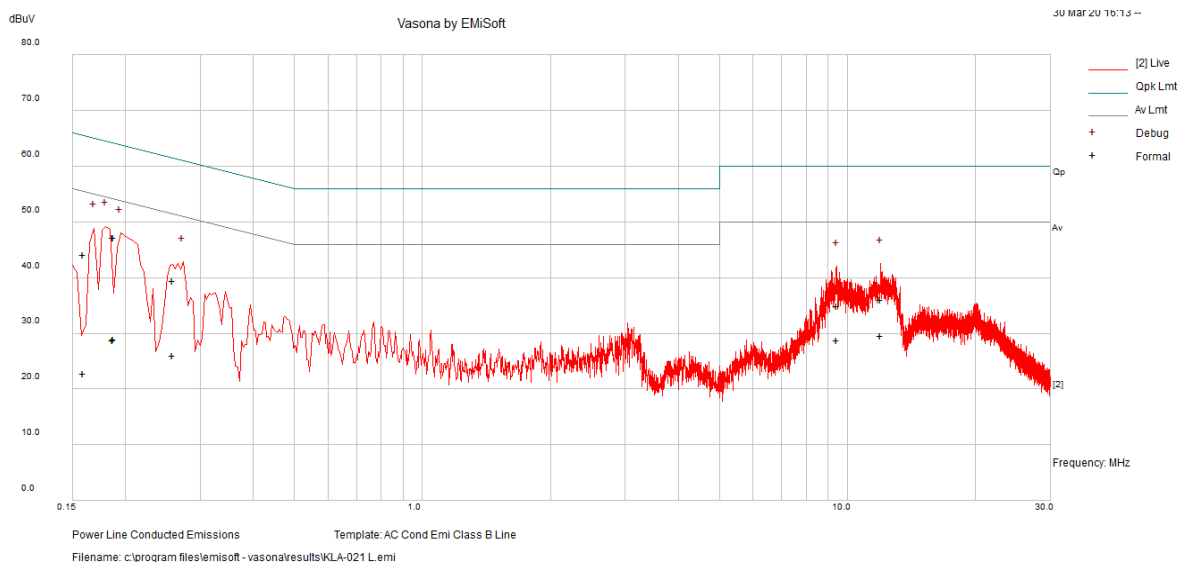
Test Data    ☒ Yes      ☐ N/A

Test Plot    ☒ Yes (See below)      ☐ N/A

Test was done by George Hsu at Conducted Emission test site.

## Conducted Emission Test Results

|                           |                     |      |         |                                                                                              |
|---------------------------|---------------------|------|---------|----------------------------------------------------------------------------------------------|
| Test specification:       | Conducted Emissions |      |         |                                                                                              |
| Environmental Conditions: | Temp(°C):           | 21   | Result: | <div><input checked="" type="checkbox"/> Pass</div> <div><input type="checkbox"/> Fail</div> |
|                           | Humidity (%):       | 42   |         |                                                                                              |
|                           | Atmospheric(mbar):  | 1021 |         |                                                                                              |
| Mains Power:              | 120Vac, 60Hz        |      |         |                                                                                              |
| Tested by:                | George Hsu          |      |         |                                                                                              |
| Test Date:                | 3/13/19             |      |         |                                                                                              |
| Remarks                   | Live                |      |         |                                                                                              |

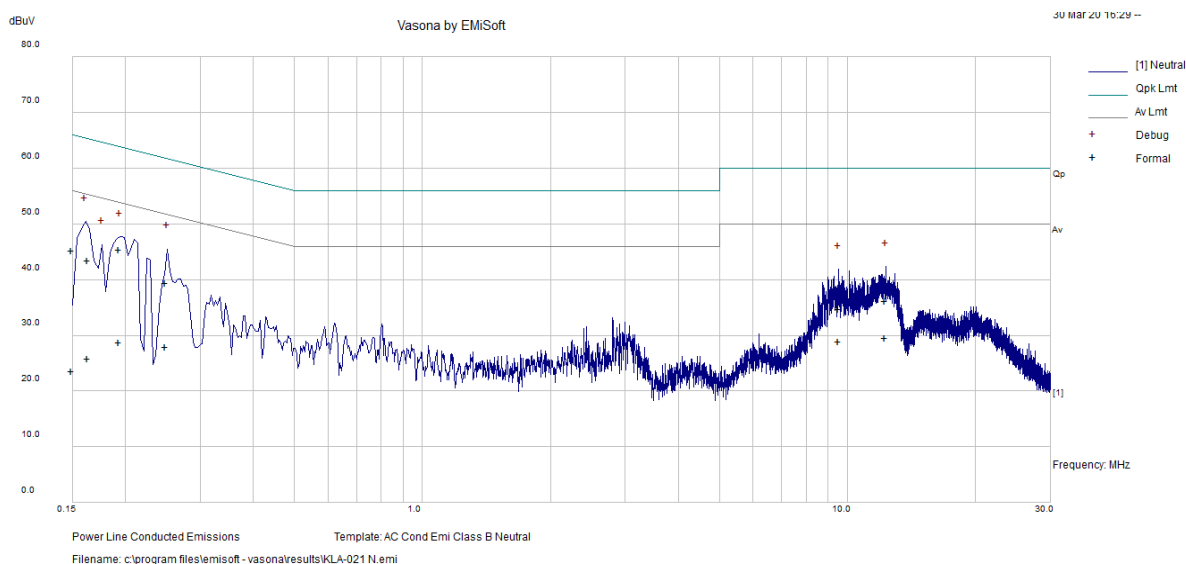


Live Plot at 120Vac, 60Hz

| Frequency (MHz) | Raw (dBuV) | Cable Loss (dB) | Factors (dB) | Level (dBuV) | Measurement Type | Line/Neutral | Limit (dBuV) | Margin (dB) | Pass /Fail |
|-----------------|------------|-----------------|--------------|--------------|------------------|--------------|--------------|-------------|------------|
| 0.187599        | 37.84      | 9.35            | 0.04         | 47.24        | Quasi Peak       | Live         | 64.14        | -16.9       | Pass       |
| 0.186686        | 37.86      | 9.35            | 0.04         | 47.26        | Quasi Peak       | Live         | 64.18        | -16.93      | Pass       |
| 0.159426        | 34.77      | 9.31            | 0.04         | 44.12        | Quasi Peak       | Live         | 65.49        | -21.38      | Pass       |
| 11.97671        | 26.06      | 9.67            | 0.27         | 36           | Quasi Peak       | Live         | 60           | -24         | Pass       |
| 9.448872        | 25         | 9.63            | 0.23         | 34.86        | Quasi Peak       | Live         | 60           | -25.14      | Pass       |
| 0.259155        | 29.94      | 9.43            | 0.04         | 39.41        | Quasi Peak       | Live         | 61.46        | -22.05      | Pass       |
| 0.187599        | 19.54      | 9.35            | 0.04         | 28.94        | Average          | Live         | 54.14        | -25.2       | Pass       |
| 0.186686        | 19.45      | 9.35            | 0.04         | 28.84        | Average          | Live         | 54.18        | -25.34      | Pass       |
| 0.159426        | 13.42      | 9.31            | 0.04         | 22.77        | Average          | Live         | 55.49        | -32.72      | Pass       |
| 11.97671        | 19.59      | 9.67            | 0.27         | 29.54        | Average          | Live         | 50           | -20.46      | Pass       |
| 9.448872        | 18.98      | 9.63            | 0.23         | 28.84        | Average          | Live         | 50           | -21.16      | Pass       |
| 0.259155        | 16.6       | 9.43            | 0.04         | 26.08        | Average          | Live         | 51.46        | -25.38      | Pass       |

## Conducted Emission Test Results

|                           |                     |      |         |                                                                                              |
|---------------------------|---------------------|------|---------|----------------------------------------------------------------------------------------------|
| Test specification:       | Conducted Emissions |      |         |                                                                                              |
| Environmental Conditions: | Temp(°C):           | 21   | Result: | <div><input checked="" type="checkbox"/> Pass</div> <div><input type="checkbox"/> Fail</div> |
|                           | Humidity (%):       | 42   |         |                                                                                              |
|                           | Atmospheric(mbar):  | 1021 |         |                                                                                              |
| Mains Power:              | 120Vac, 60Hz        |      |         |                                                                                              |
| Tested by:                | George Hsu          |      |         |                                                                                              |
| Test Date:                | 3/13/19             |      |         |                                                                                              |
| Remarks                   | Neutral             |      |         |                                                                                              |

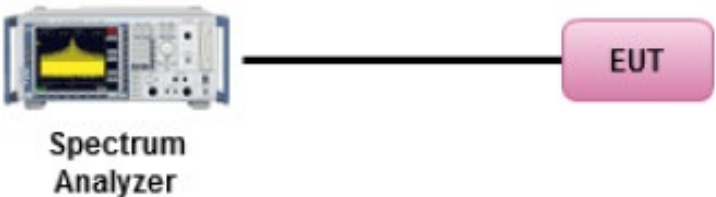


Neutral Plot at 120Vac, 60Hz

| Frequency (MHz) | Raw (dBuV) | Cable Loss (dB) | Factors (dB) | Level (dBuV) | Measurement Type | Line/Neutral | Limit (dBuV) | Margin (dB) | Pass /Fail |
|-----------------|------------|-----------------|--------------|--------------|------------------|--------------|--------------|-------------|------------|
| 0.15            | 36.04      | 9.29            | 0.03         | 45.36        | Quasi Peak       | Neutral      | 66           | -20.64      | Pass       |
| 0.193323        | 36.07      | 9.36            | 0.03         | 45.47        | Quasi Peak       | Neutral      | 63.89        | -18.43      | Pass       |
| 0.248766        | 29.98      | 9.43            | 0.03         | 39.44        | Quasi Peak       | Neutral      | 61.8         | -22.36      | Pass       |
| 12.32357        | 26.35      | 9.66            | 0.29         | 36.3         | Quasi Peak       | Neutral      | 60           | -23.7       | Pass       |
| 9.567904        | 24.87      | 9.63            | 0.23         | 34.73        | Quasi Peak       | Neutral      | 60           | -25.27      | Pass       |
| 0.163587        | 34.09      | 9.32            | 0.03         | 43.43        | Quasi Peak       | Neutral      | 65.28        | -21.85      | Pass       |
| 0.15            | 14.24      | 9.29            | 0.03         | 23.56        | Average          | Neutral      | 56           | -32.44      | Pass       |
| 0.193323        | 19.4       | 9.36            | 0.03         | 28.79        | Average          | Neutral      | 53.89        | -25.1       | Pass       |
| 0.248766        | 18.5       | 9.43            | 0.03         | 27.96        | Average          | Neutral      | 51.8         | -23.84      | Pass       |
| 12.32357        | 19.56      | 9.66            | 0.29         | 29.51        | Average          | Neutral      | 50           | -20.49      | Pass       |
| 9.567904        | 19.08      | 9.63            | 0.23         | 28.94        | Average          | Neutral      | 50           | -21.06      | Pass       |
| 0.163587        | 16.54      | 9.32            | 0.03         | 25.88        | Average          | Neutral      | 55.28        | -29.4       | Pass       |

## 10.2 6dB & 99% Bandwidth

### Requirement(s):

| Spec                       | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Applicable                                                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| § 15.247<br>RSS247 (5.2.1) | 6dB BW≥500KHz;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <input checked="" type="checkbox"/>                                                                   |
| RSS Gen 4.6.1              | The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth | <input checked="" type="checkbox"/>                                                                   |
| Test Setup                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                       |
| Test Procedure             | 558074 D01 DTS Meas Guidance v04, 8.1 DTS bandwidth<br><u>6dB Emission bandwidth measurement procedure</u> <ul style="list-style-type: none"> <li>- Set RBW = 100 kHz.</li> <li>- Set the video bandwidth (VBW) <math>\geq 3 \times</math> RBW.</li> <li>- Detector = Peak.</li> <li>- Trace mode = max hold.</li> <li>- Sweep = auto couple.</li> <li>- Allow the trace to stabilize.</li> <li>- 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.</li> </ul>                                                                                                                                                                                                                                                                                                                         |                                                                                                       |
| Test Date                  | 03/01/2019 – 03/10/2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Environmental condition<br>Temperature 23°C<br>Relative Humidity 42%<br>Atmospheric Pressure 1021mbar |
| Remark                     | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                       |
| Result                     | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                       |

Test Data    ☒ Yes      ☐ N/A

Test Plot    ☒ Yes      ☐ N/A

Test was done by CIPHER at RF test site.

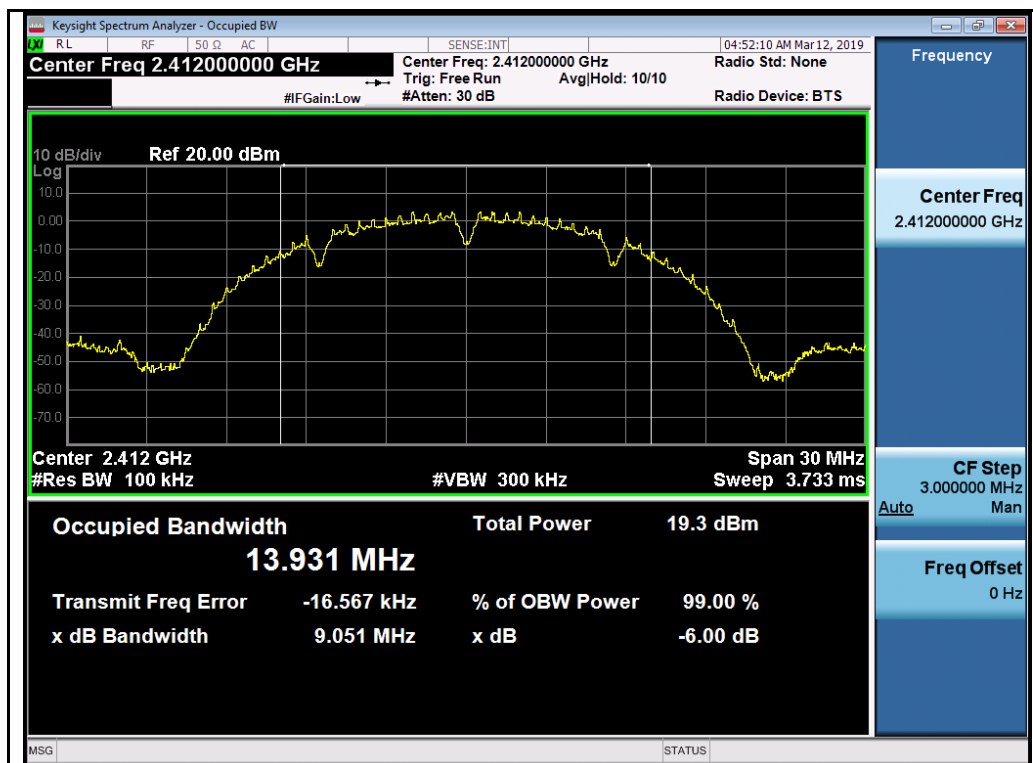
#### 6dB Bandwidth measurement result for 2.4GHz

| Type   | Test mode | Freq (MHz) | CH   | Result (MHz) | Limit (MHz) | Result |
|--------|-----------|------------|------|--------------|-------------|--------|
| 6dB BW | 802.11b   | 2412       | Low  | 9.051        | ≥0.5        | Pass   |
|        |           | 2437       | Mid  | 9.553        | ≥0.5        | Pass   |
|        |           | 2462       | High | 9.071        | ≥0.5        | Pass   |
|        | 802.11g   | 2412       | Low  | 15.041       | ≥0.5        | Pass   |
|        |           | 2437       | Mid  | 15.083       | ≥0.5        | Pass   |
|        |           | 2462       | High | 15.042       | ≥0.5        | Pass   |
|        | 802.11n20 | 2412       | Low  | 15.025       | ≥0.5        | Pass   |
|        |           | 2437       | Mid  | 13.184       | ≥0.5        | Pass   |
|        |           | 2462       | High | 15.106       | ≥0.5        | Pass   |

#### 99% OBW measurement result for 2.4GHz

| Type    | Test mode | Freq (MHz) | CH   | Result (MHz) |
|---------|-----------|------------|------|--------------|
| 99% OBW | 802.11b   | 2412       | Low  | 13.931       |
|         |           | 2437       | Mid  | 14.060       |
|         |           | 2462       | High | 14.019       |
|         | 802.11g   | 2412       | Low  | 16.291       |
|         |           | 2437       | Mid  | 16.654       |
|         |           | 2462       | High | 16.324       |
|         | 802.11n20 | 2412       | Low  | 17.470       |
|         |           | 2437       | Mid  | 17.673       |
|         |           | 2462       | High | 17.474       |

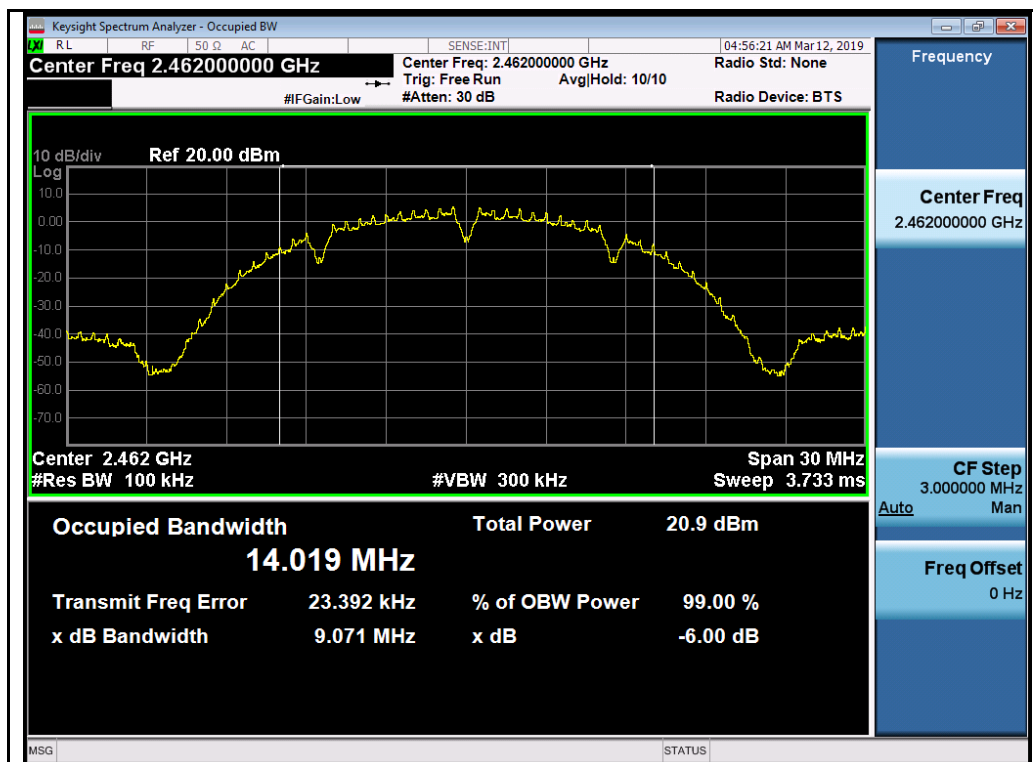
## 6dB & 99% Bandwidth Test Plots



802.11b-2412MHz



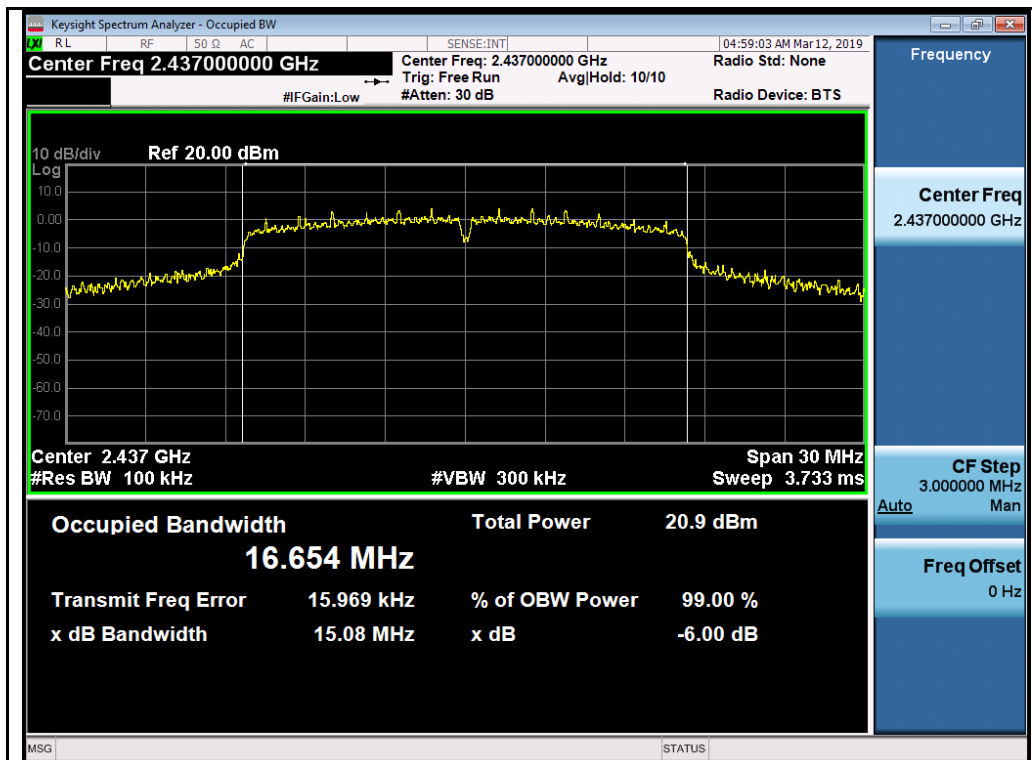
802.11b-2437MHz



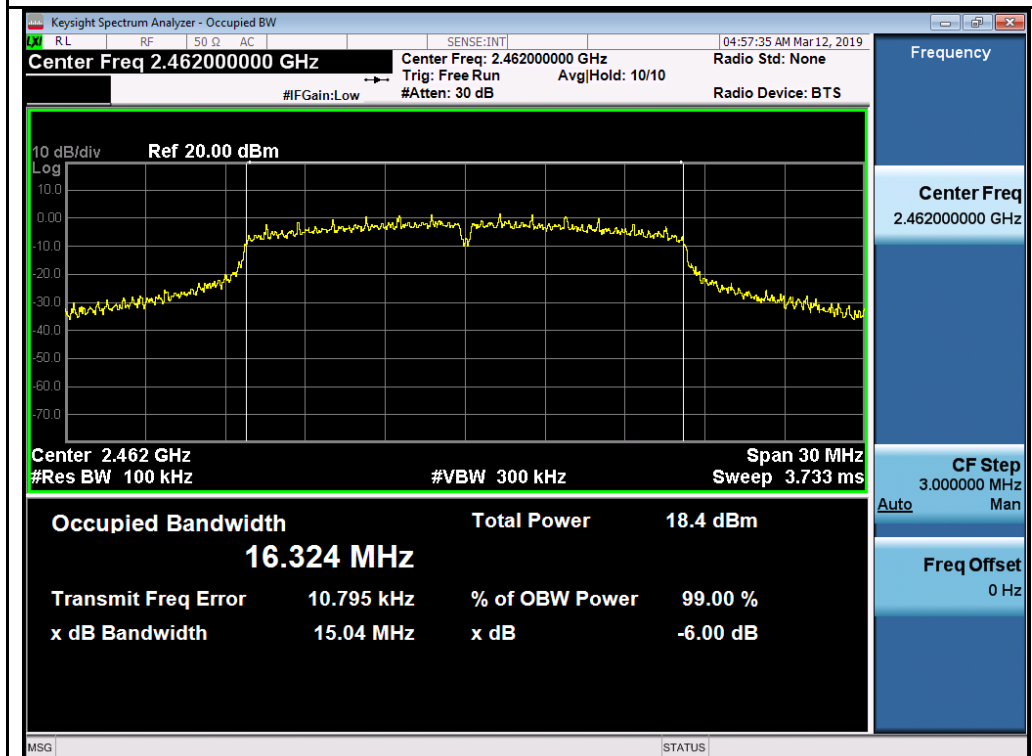
802.11b-2462MHz



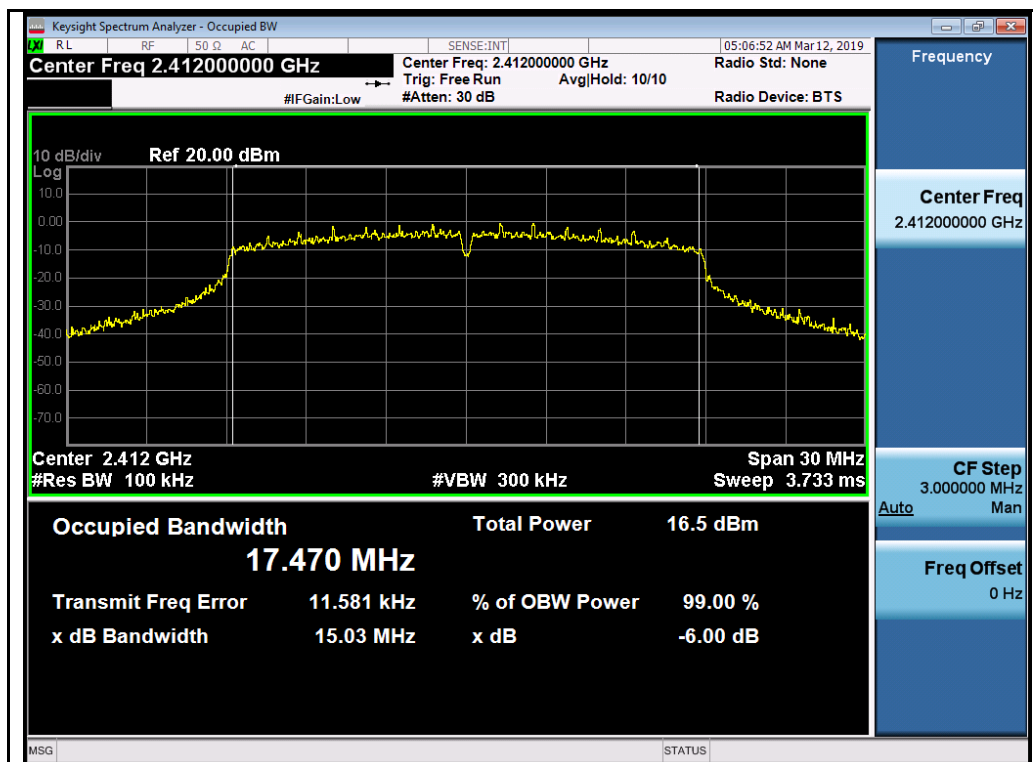
802.11g-2412MHz



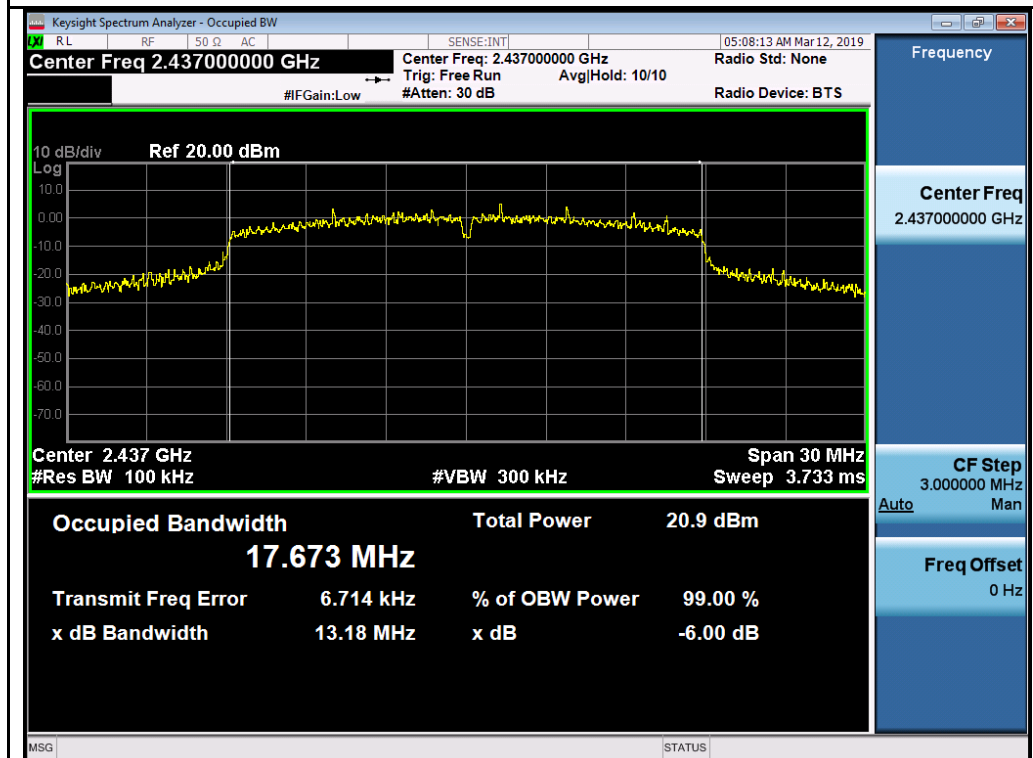
802.11g-2437MHz



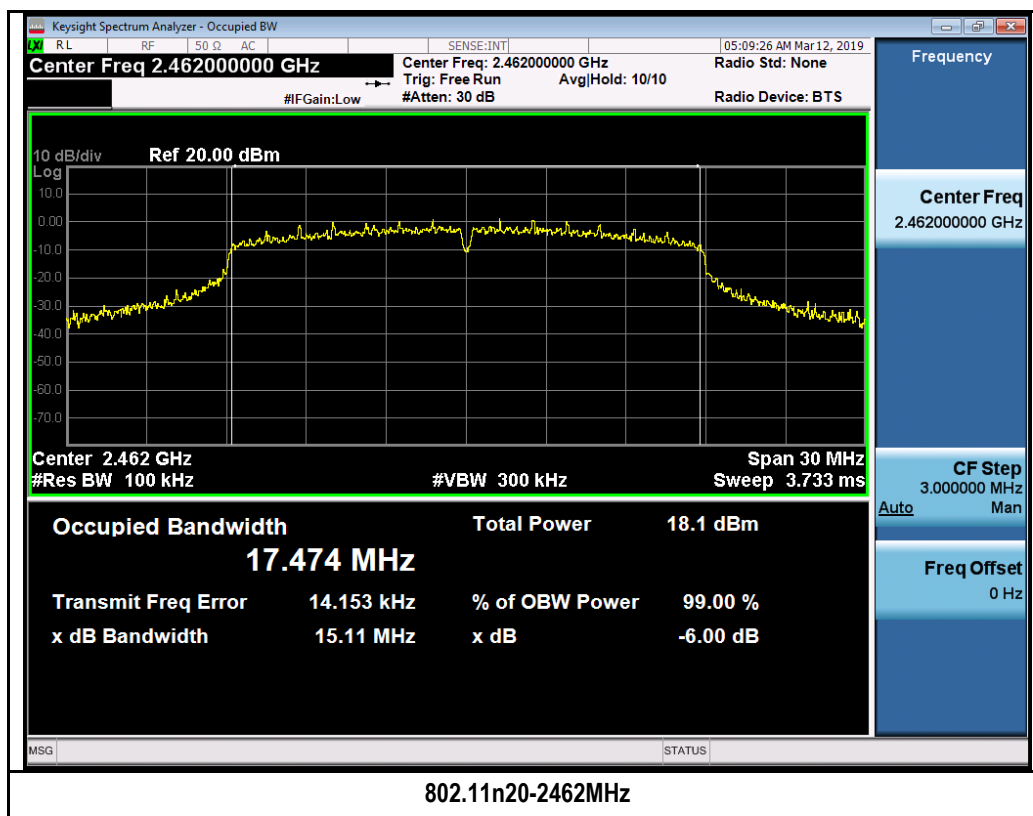
802.11g-2462MHz



802.11n20-2412MHz

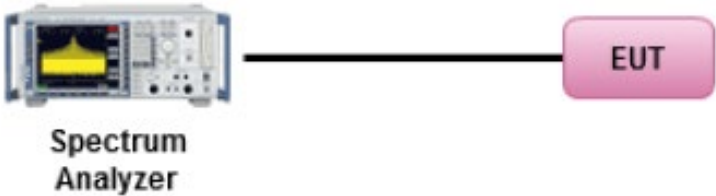


802.11n20-2437MHz



### 10.3 Output Power

#### Requirement(s):

| Spec                       | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement                                                                                                                                                                                                                                                       | Applicable                                                                 |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| § 15.247<br>RSS247 (5.4.4) | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. | <input checked="" type="checkbox"/>                                        |
| Test Setup                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                   |                                                                            |
| Test Procedure             | <p>558074 D01 DTS Meas Guidance v04, 9.2.2.2</p> <p><u>Measurement using a Spectrum Analyzer (SA)</u></p> <ul style="list-style-type: none"> <li>(a) Set span to at least 1.5 times the OBW</li> <li>(b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.</li> <li>(c) Set VBW <math>\geq 3 \times</math> RBW.</li> <li>(d) Number of points in sweep <math>\geq 2 \times \text{span} / \text{RBW}</math>. (This gives bin-to-bin spacing <math>\leq \text{RBW}/2</math>, so that narrowband signals are not lost between frequency bins.)</li> <li>(e) Sweep time = auto.</li> <li>(f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.</li> <li>(g) If transmit duty cycle &lt; 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle <math>\geq 98</math> %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".</li> <li>(h) Trace average at least 100 traces in power averaging (i.e., RMS) mode</li> <li>(i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.</li> </ul> |                                                                                                                                                                                                                                                                   |                                                                            |
| Test Date                  | 03/01/2019 – 03/10/2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Environmental condition                                                                                                                                                                                                                                           | Temperature 23°C<br>Relative Humidity 44%<br>Atmospheric Pressure 1021mbar |
| Remark                     | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                   |                                                                            |
| Result                     | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                   |                                                                            |

Test Data    ☒ Yes                      ☐ N/A

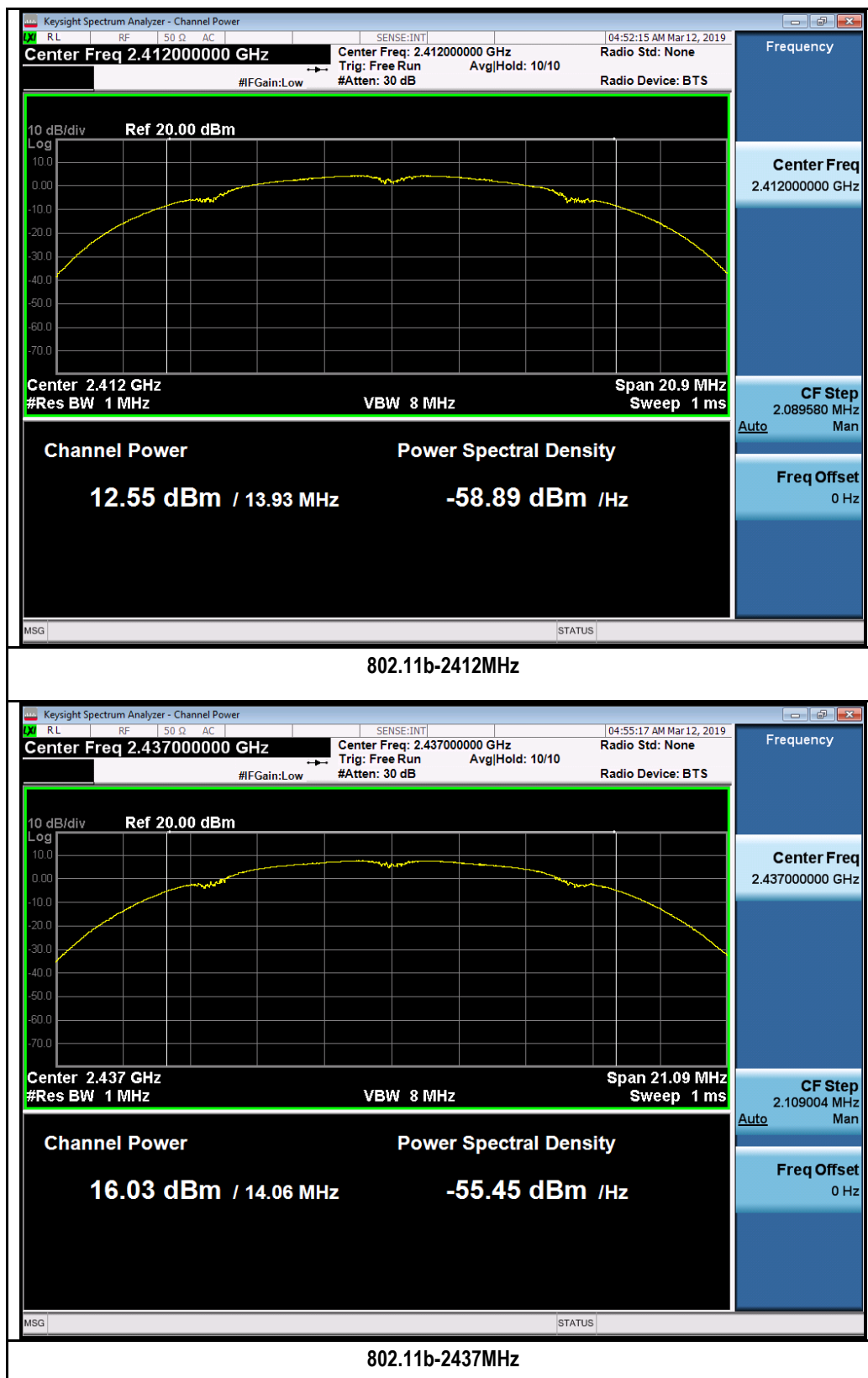
Test Plot    ☒ Yes (See below)              ☐ N/A

Test was done by Cipher at RF test site.

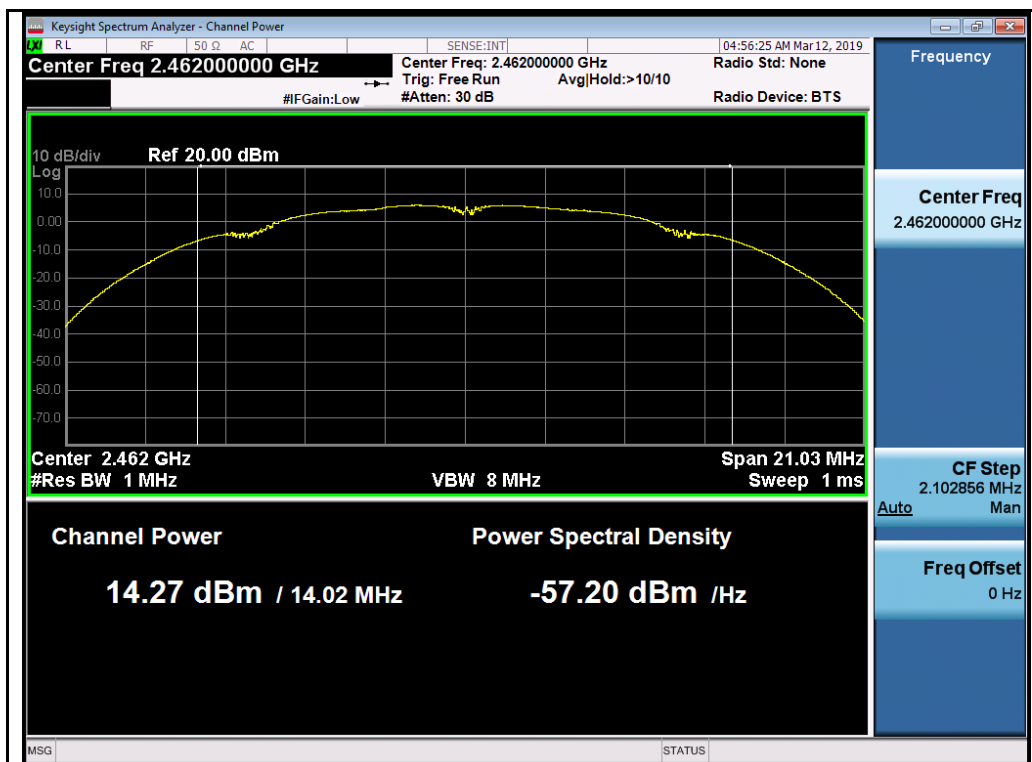
## Output Power measurement result

| Type         | Test mode | Freq (MHz) | CH   | Conducted Power (dBm) | Limit (dBm) | Result |
|--------------|-----------|------------|------|-----------------------|-------------|--------|
| Output Power | 802.11b   | 2412       | Low  | 12.555                | 30          | Pass   |
|              |           | 2437       | Mid  | 16.025                | 30          | Pass   |
|              |           | 2462       | High | 14.265                | 30          | Pass   |
|              | 802.11g   | 2412       | Low  | 9.793                 | 30          | Pass   |
|              |           | 2437       | Mid  | 14.156                | 30          | Pass   |
|              |           | 2462       | High | 12.186                | 30          | Pass   |
|              | 802.11n20 | 2412       | Low  | 10.349                | 30          | Pass   |
|              |           | 2437       | Mid  | 14.919                | 30          | Pass   |
|              |           | 2462       | High | 11.667                | 30          | Pass   |

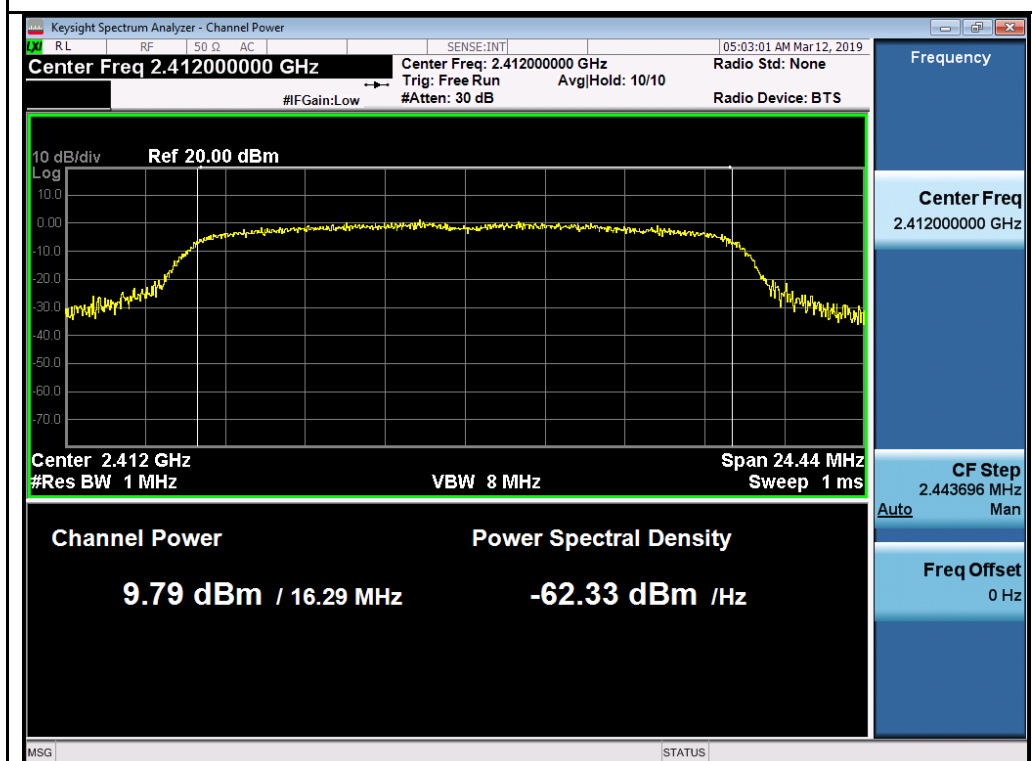
## Test Plots:



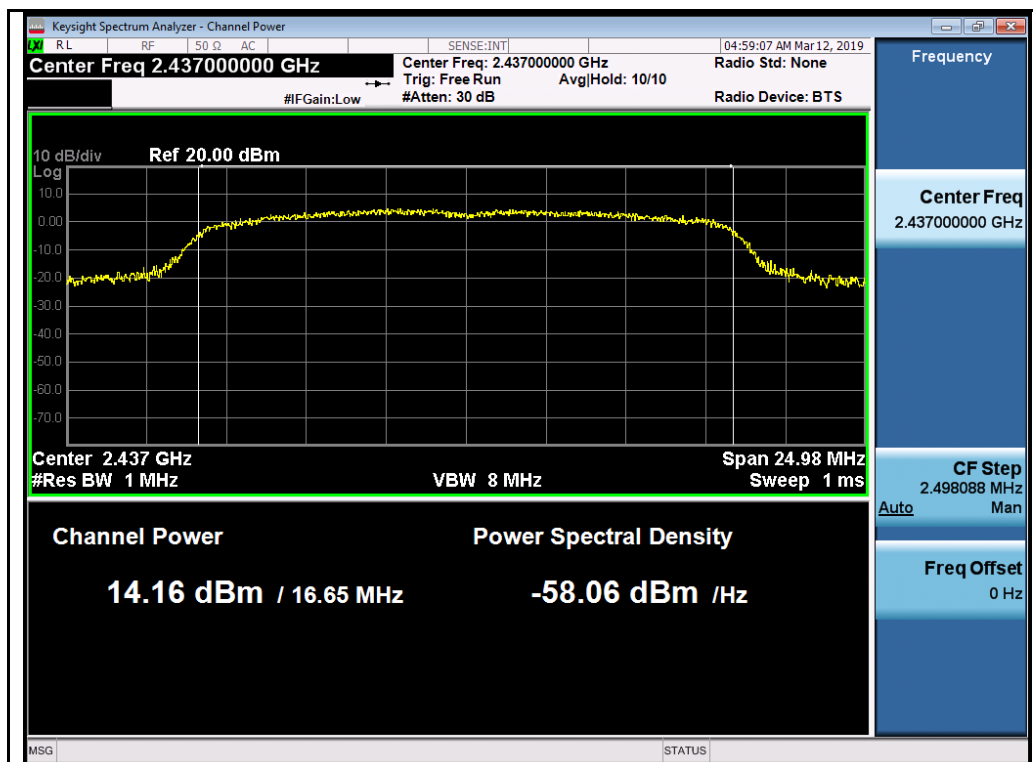




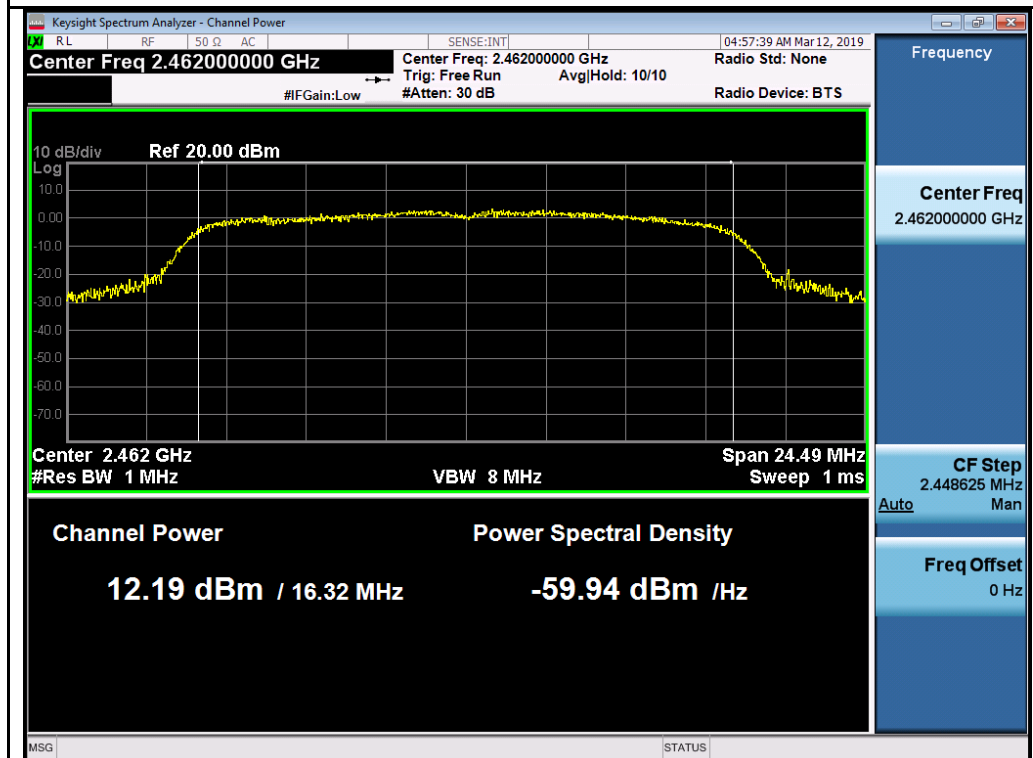
802.11b-2462MHz



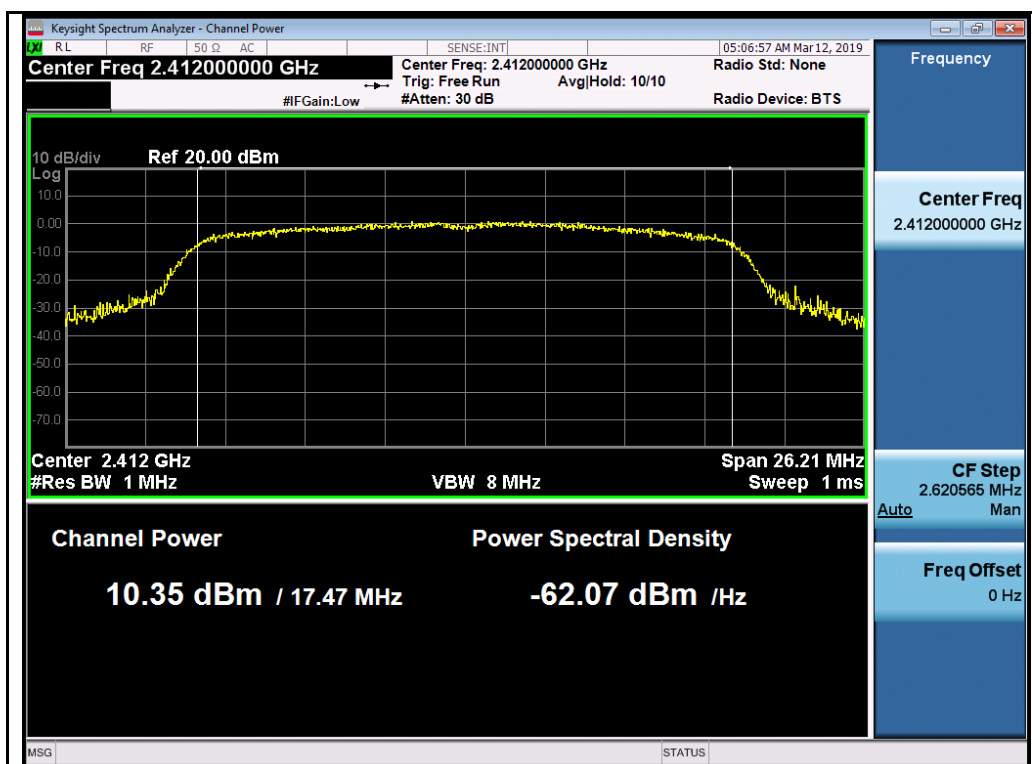
802.11g-2412MHz



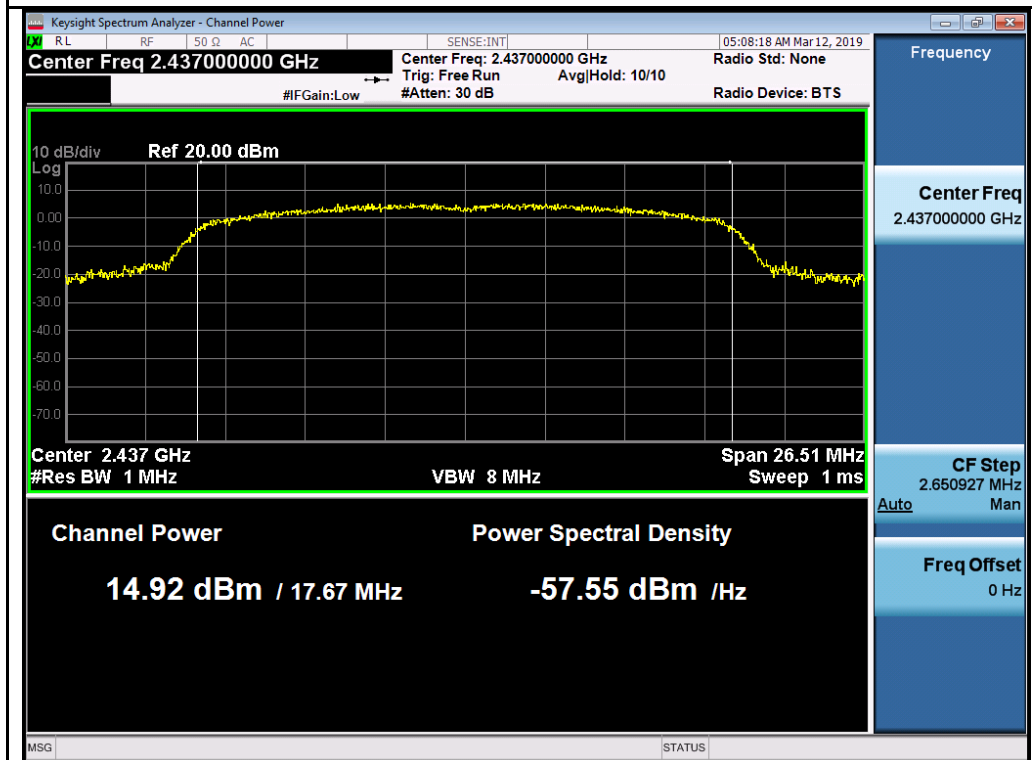
802.11g-2437MHz



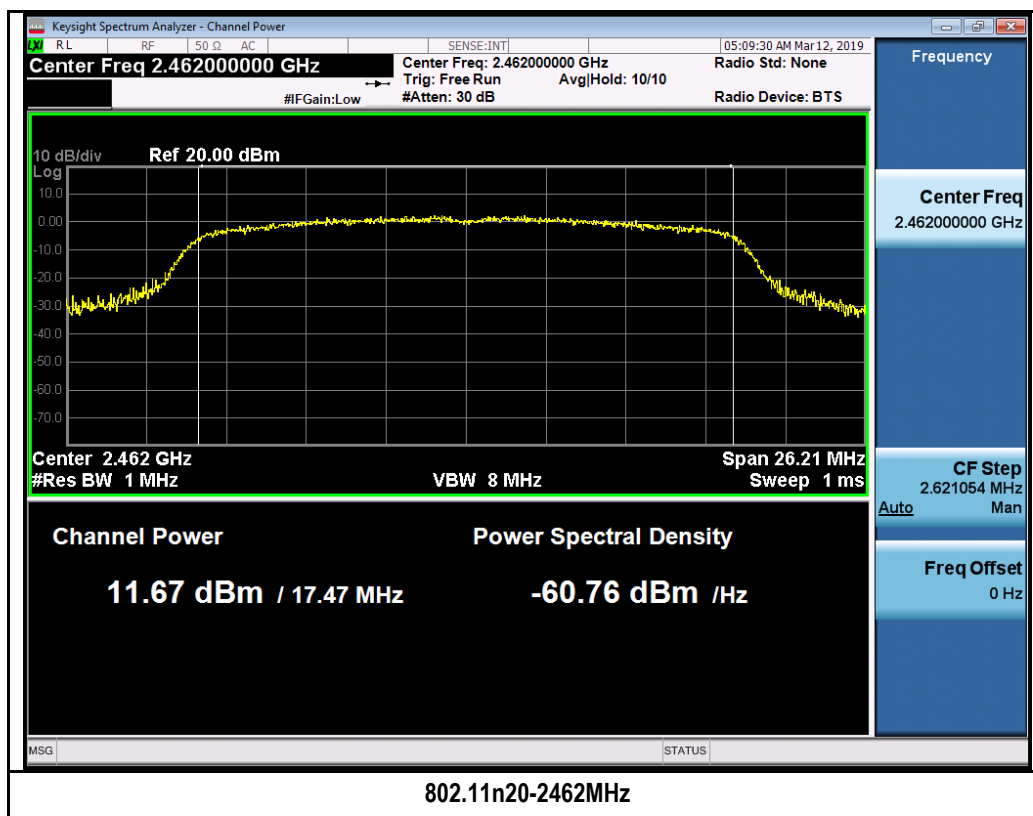
802.11g-2462MHz



802.11n20-2412MHz

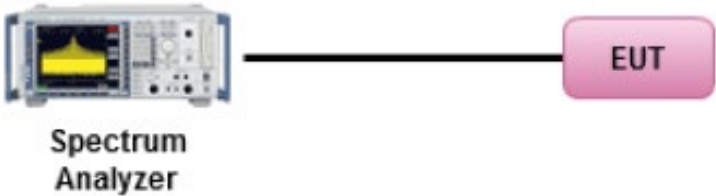


802.11n20-2437MHz



## 10.4 Band Edge

### Requirement(s):

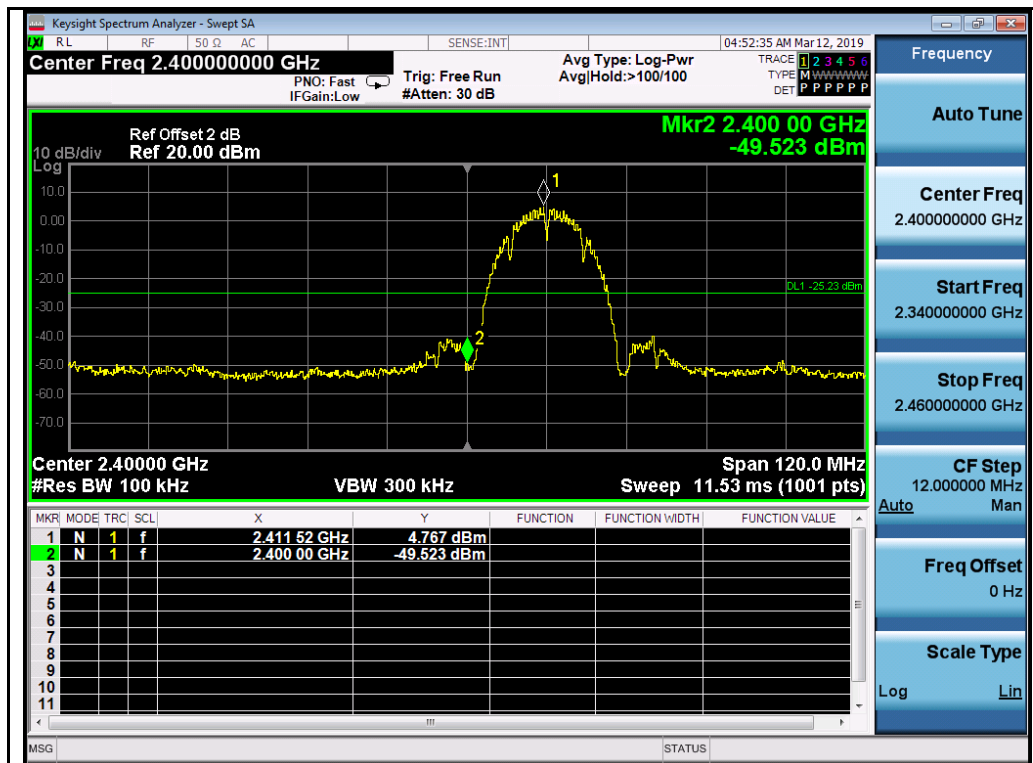
| Spec                    | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Applicable                                                                 |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| § 15.247<br>RSS247(5.5) | d)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209 (a) is not required<br><br><input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down | <input checked="" type="checkbox"/>                                        |
| Test Setup              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |
| Test Procedure          | <p>558074 D01 DTS Meas Guidance v04</p> <p><u>Band Edge measurement procedure</u></p> <ol style="list-style-type: none"> <li>1. Set the EUT to maximum power setting and enable the EUT transmit continuously.</li> <li>2. Band edge emissions must be at least 30 dB down from the highest emission level within the authorized band as a measured. The attenuation shall be 30 dB instead of 20 dB when Peak conducted output power procedure is used.</li> <li>3. Change modulation and channel bandwidth then repeat step 1 to 2.</li> <li>4. Measured and record the results in the test report.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |
| Test Date               | 03/01/2019 – 03/10/2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Environmental condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Temperature 22°C<br>Relative Humidity 46%<br>Atmospheric Pressure 1020mbar |
| Remark                  | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |
| Result                  | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |

Test Data    ☐ Yes      ☒ N/A

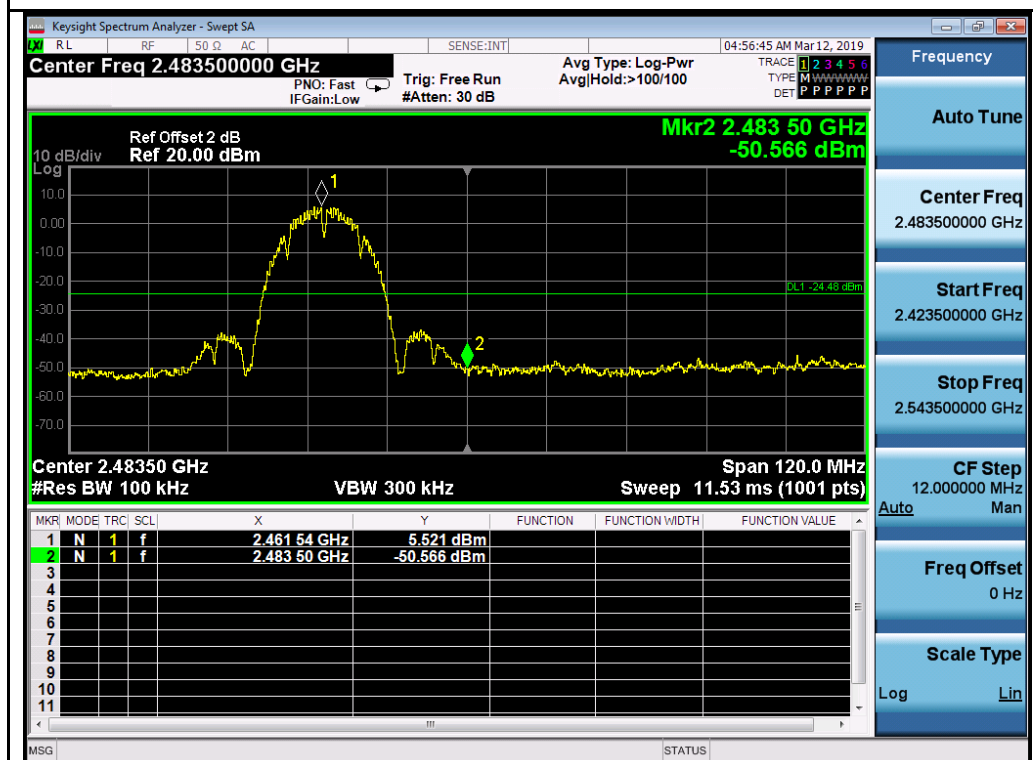
Test Plot    ☒ Yes (See below)      ☐ N/A

Test was done by Cipher at RF test site.

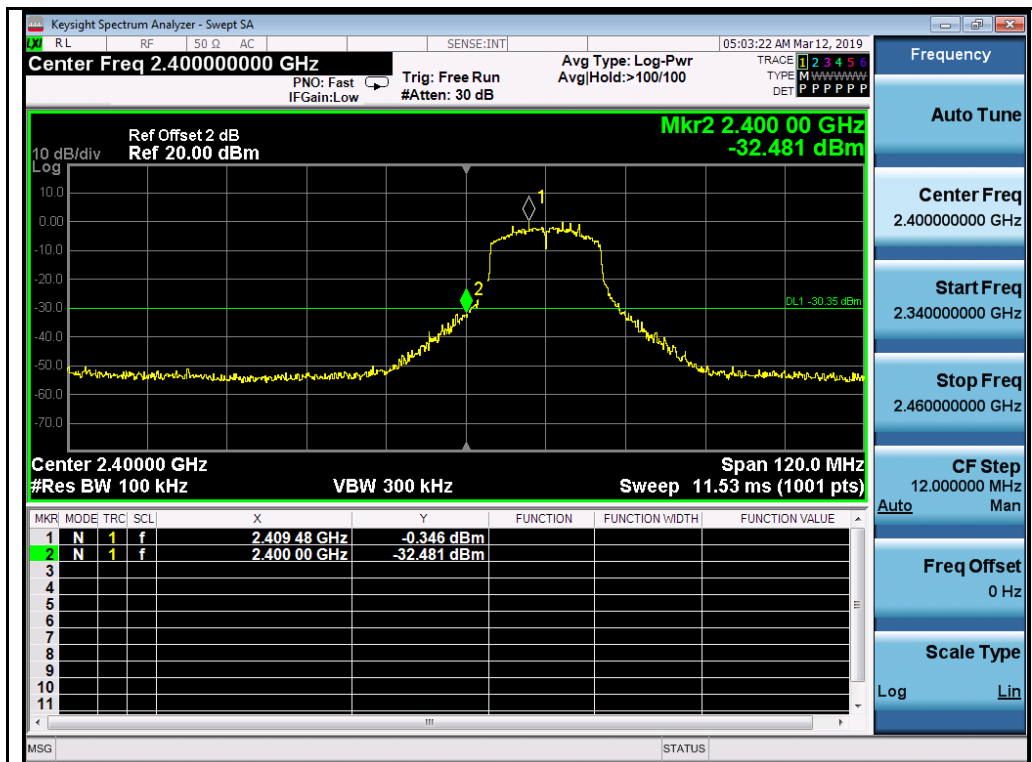
## Test Plots



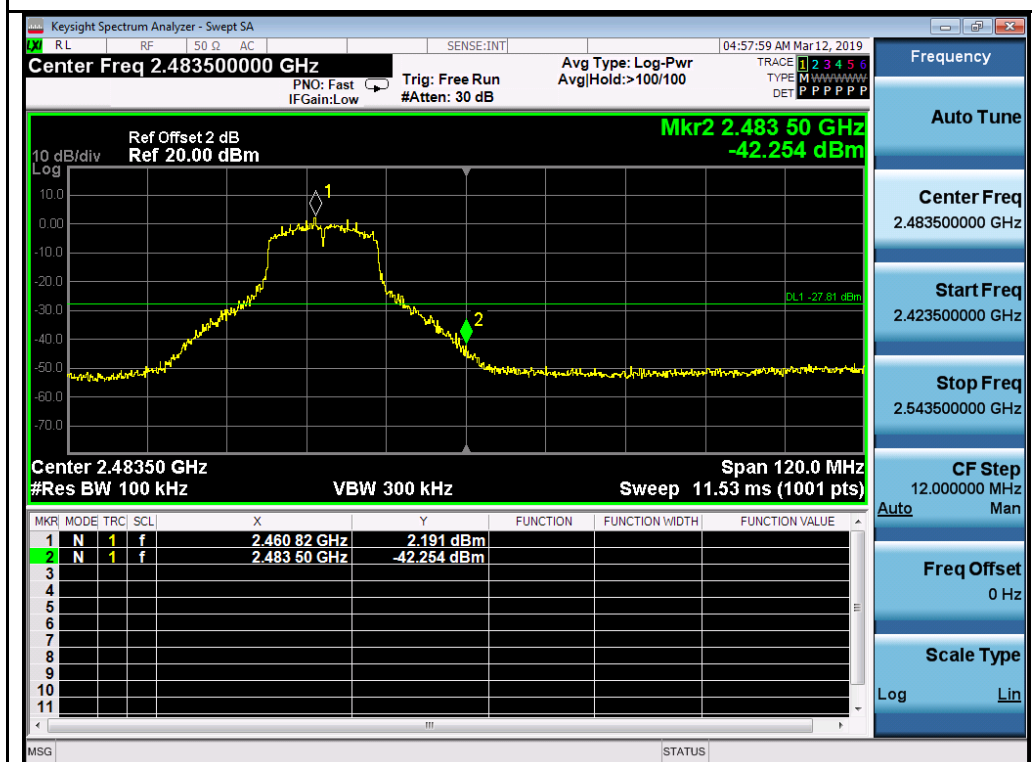
802.11b-2412MHz



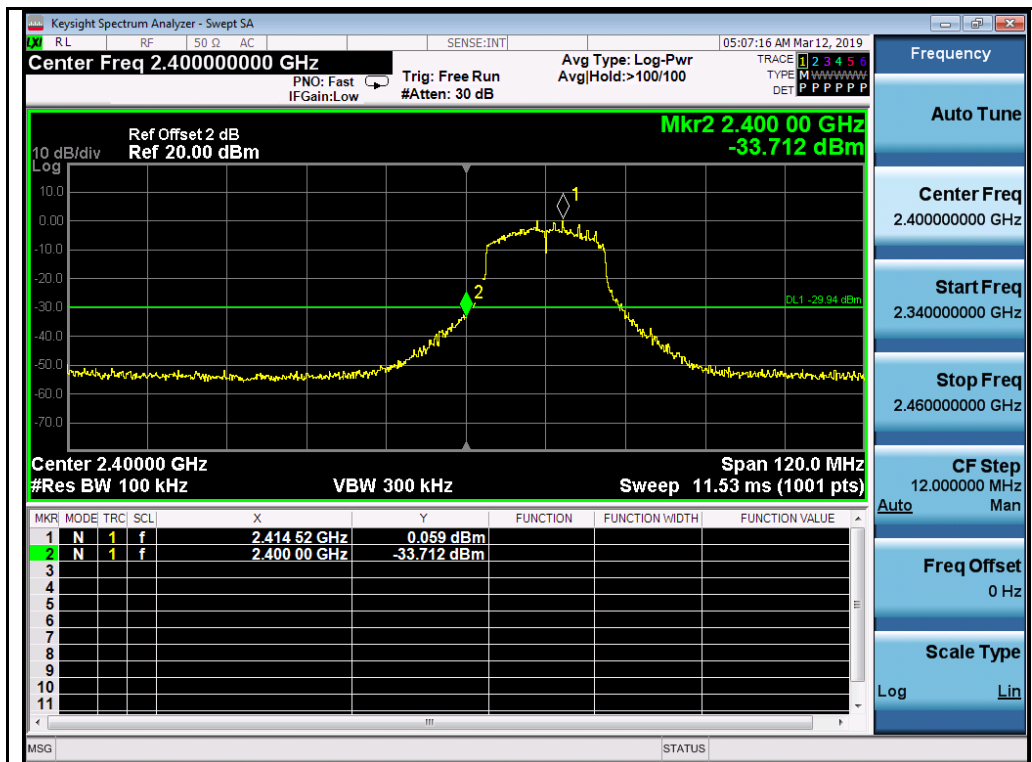
802.11b-2462MHz



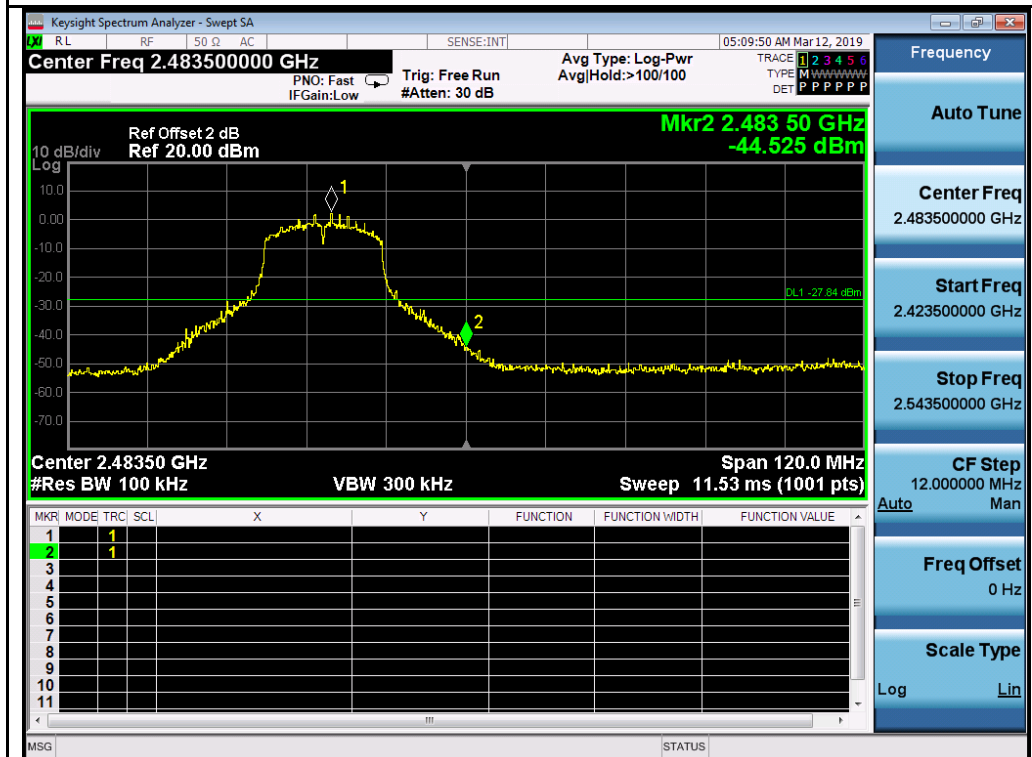
802.11g-2412MHz



802.11g-2462MHz



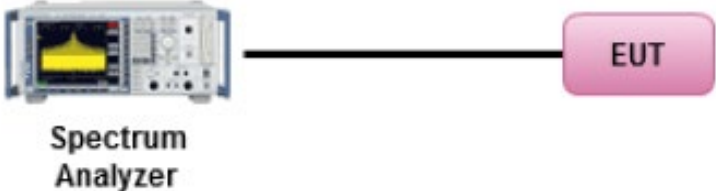
802.11n20-2412MHz



802.11n20-2462MHz

## 10.5 Peak Spectral Density

### Requirement(s):

| Spec                          | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Requirement                                                           | Applicable                                                                 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------|
| § 15.247(e)<br>RSS247 (5.2.2) | e)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DSSS: $\leq 8\text{dBm}/3\text{KHz}$                                  | <input checked="" type="checkbox"/>                                        |
|                               | f)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DSSS in hybrid sys with FH turned off: $\leq 8\text{dBm}/3\text{KHz}$ | <input type="checkbox"/>                                                   |
| Test Setup                    |  <p><b>Spectrum Analyzer</b> ——— <b>EUT</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                       |                                                                            |
| Test Procedure                | <p>558074 D01 DTS Meas Guidance v04, 10.2 Method PKPSD (peak PSD)</p> <p><u>Peak spectral density measurement procedure</u></p> <ul style="list-style-type: none"> <li>- Set analyzer center frequency to DTS channel center frequency.</li> <li>- Set the span to 1.5 times the DTS bandwidth.</li> <li>- Set the RBW to: <math>3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}</math>.</li> <li>- Set the VBW <math>\geq 3 \times \text{RBW}</math>.</li> <li>- Detector = Peak</li> <li>- Sweep time = auto couple.</li> <li>- Trace mode = Max Hold</li> <li>- Allow trace to fully stabilize.</li> <li>- Use the peak marker function to determine the maximum amplitude level within the RBW.</li> <li>- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.</li> </ul> |                                                                       |                                                                            |
| Test Date                     | 03/01/2019 – 03/10/2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Environmental condition                                               | Temperature 22°C<br>Relative Humidity 46%<br>Atmospheric Pressure 1020mbar |
| Remark                        | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                       |                                                                            |
| Result                        | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                       |                                                                            |

Test Data    ☒ Yes                      ☐ N/A

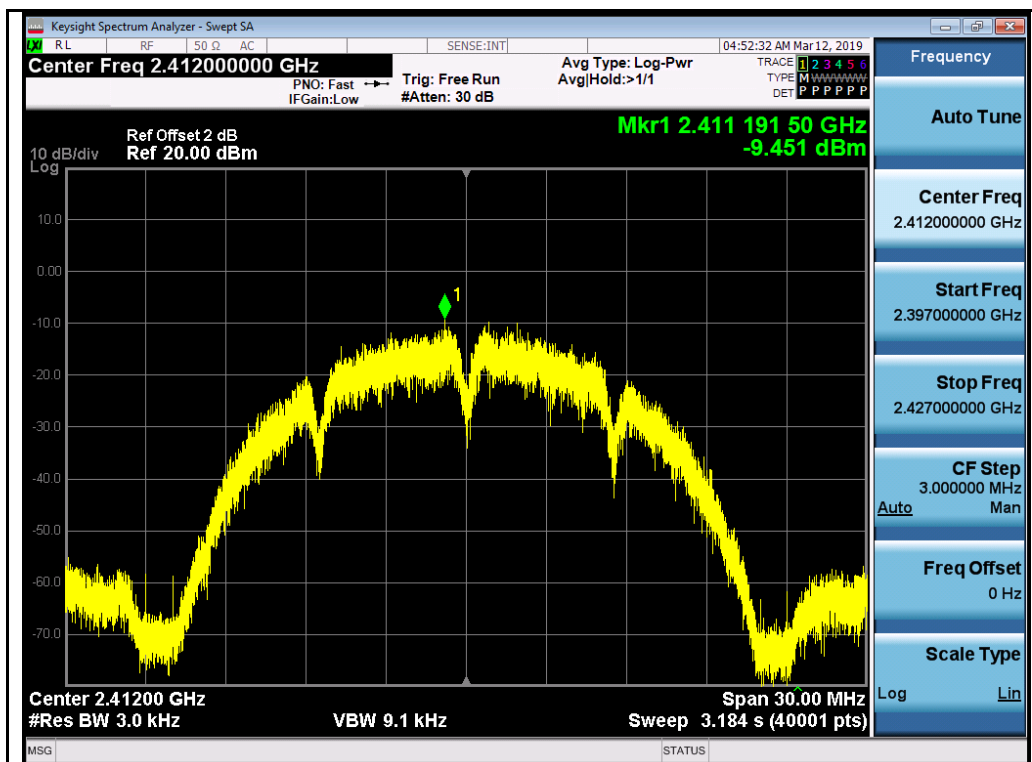
Test Plot    ☒ Yes (See below)            ☐ N/A

Test was done by Cipher at RF test site.

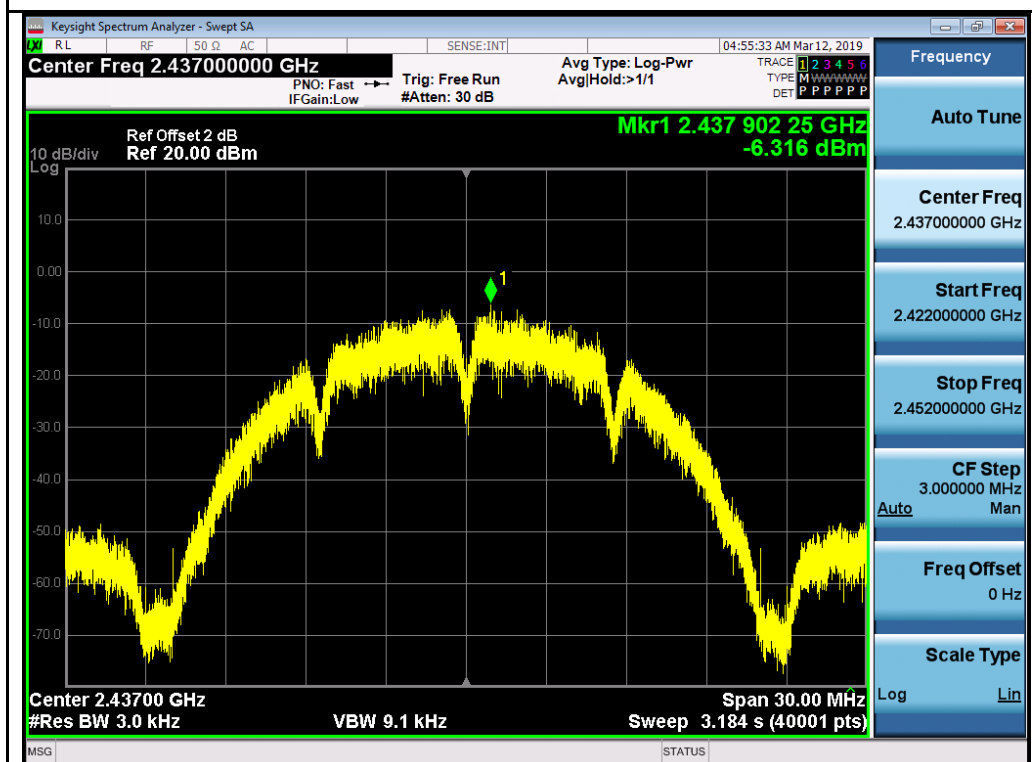
## PSD measurement results

| Type | Test mode | Freq (MHz) | CH   | Conducted PSD (dBm/3KHz) | Limit (dBm/3KHz) | Result |
|------|-----------|------------|------|--------------------------|------------------|--------|
| PSD  | 802.11b   | 2412       | Low  | -9.451                   | ≤8               | Pass   |
|      |           | 2437       | Mid  | -6.316                   | ≤8               | Pass   |
|      |           | 2462       | High | -9.011                   | ≤8               | Pass   |
|      | 802.11g   | 2412       | Low  | -12.767                  | ≤8               | Pass   |
|      |           | 2437       | Mid  | -9.243                   | ≤8               | Pass   |
|      |           | 2462       | High | -12.080                  | ≤8               | Pass   |
|      | 802.11n20 | 2412       | Low  | -14.298                  | ≤8               | Pass   |
|      |           | 2437       | Mid  | -8.841                   | ≤8               | Pass   |
|      |           | 2462       | High | -11.905                  | ≤8               | Pass   |

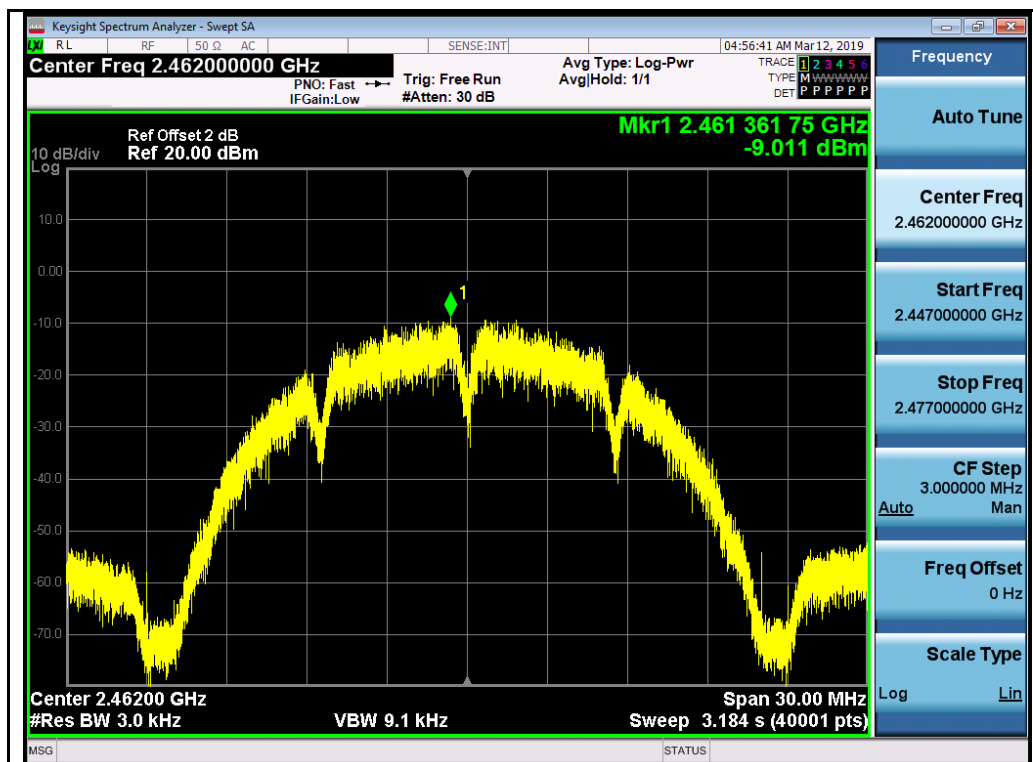
## Test Plots:



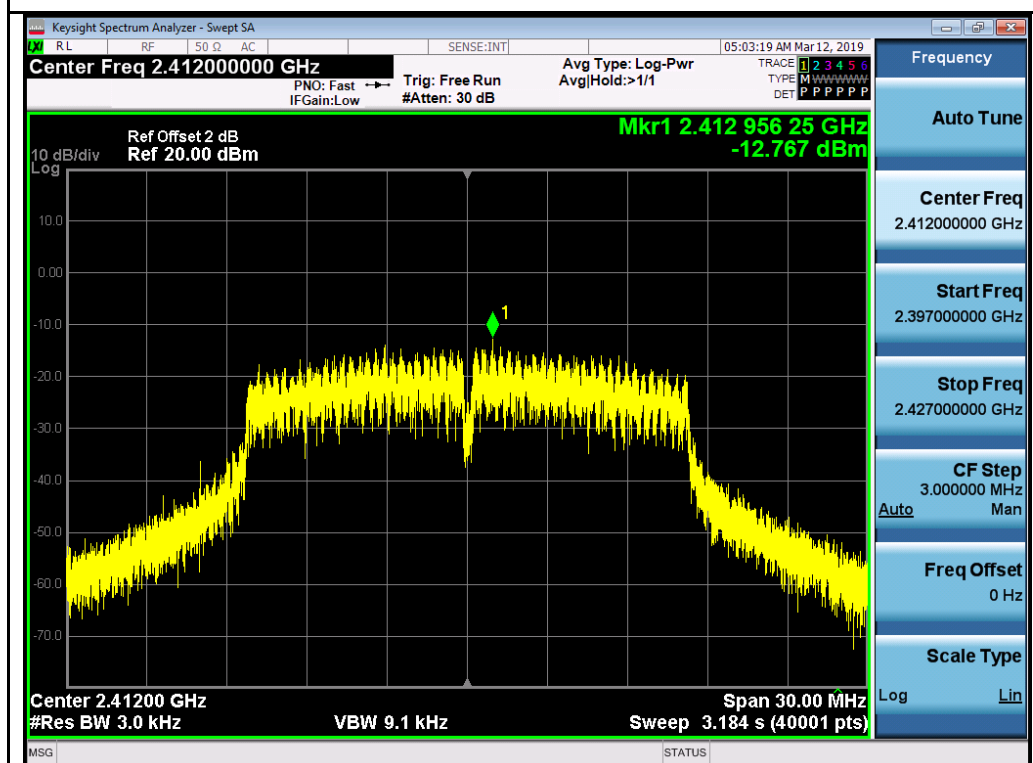
802.11b-2412MHz



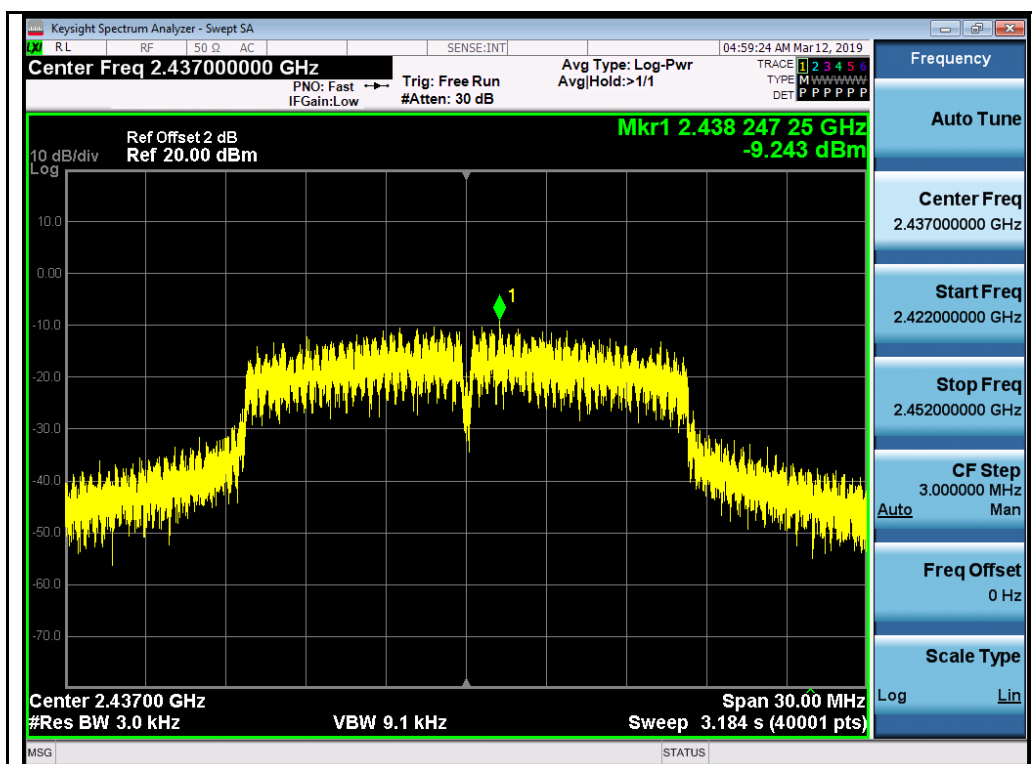
802.11b-2437MHz



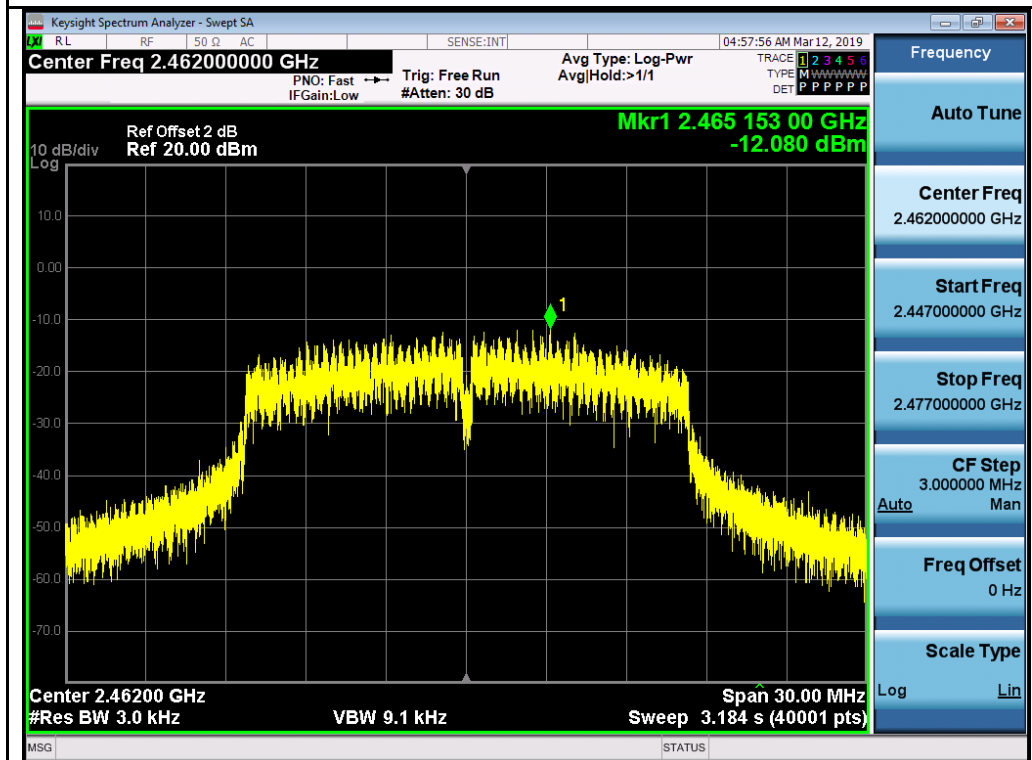
802.11b-2462MHz



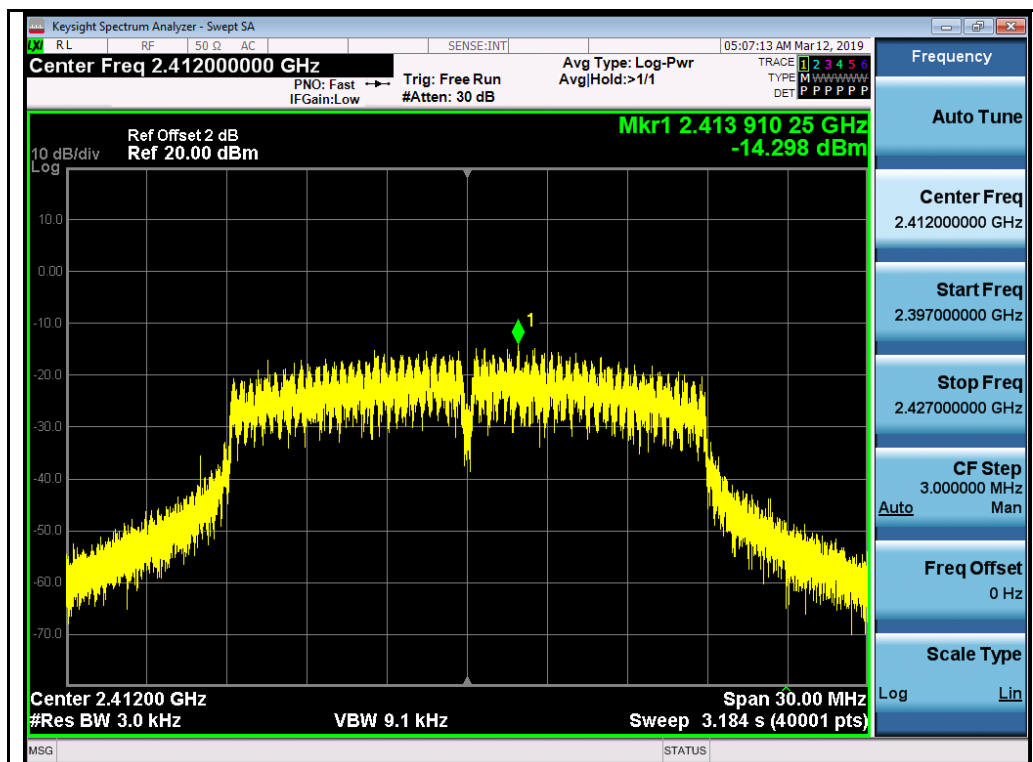
802.11g-2412MHz



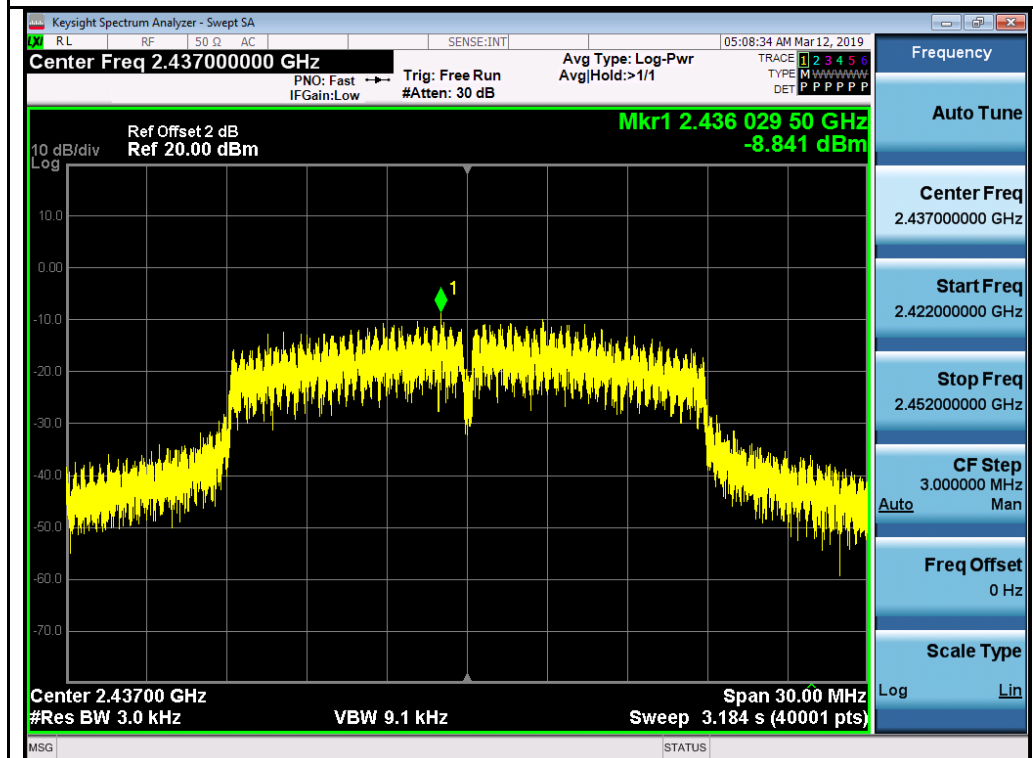
802.11g-2437MHz



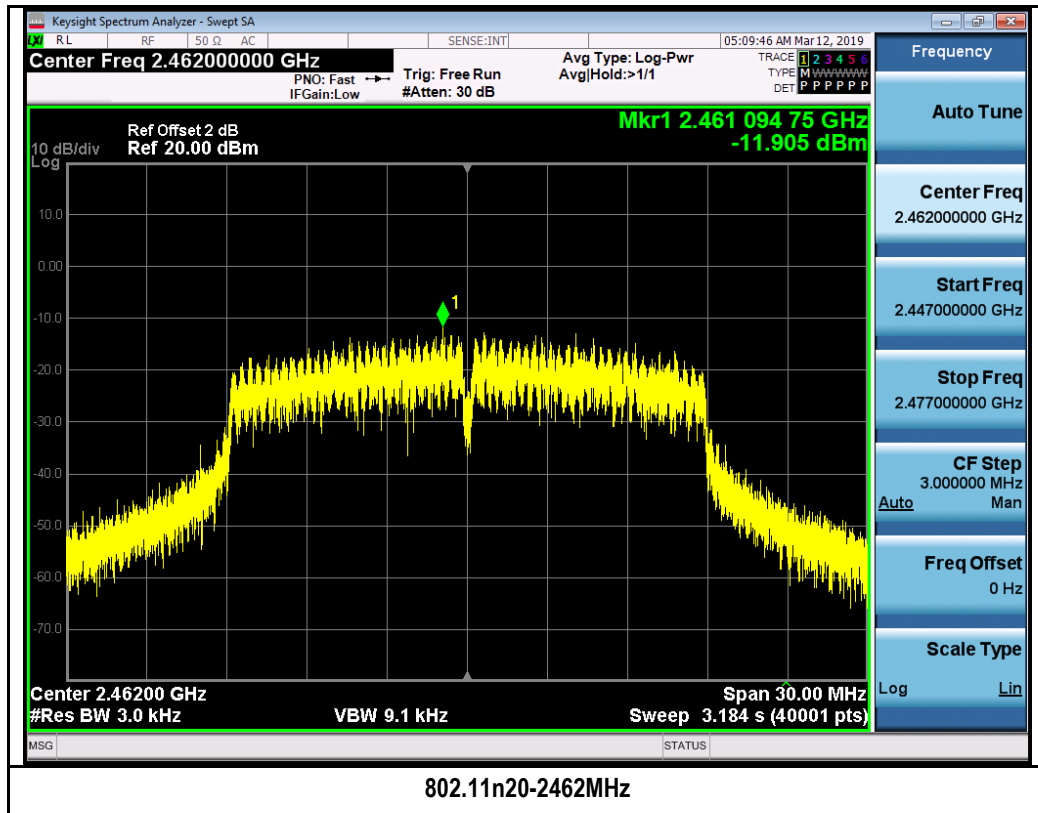
802.11g-2462MHz



802.11n20-2412MHz

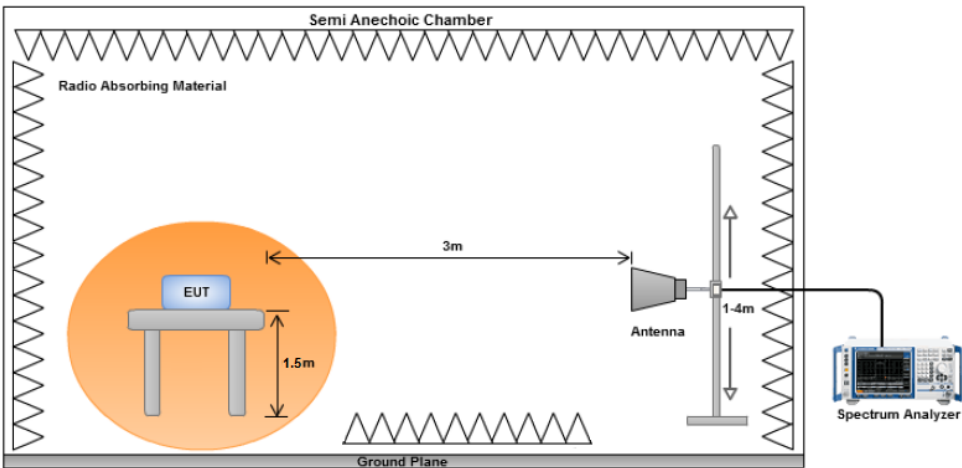


802.11n20-2437MHz



## 10.6 Radiated Spurious Emissions in restricted band

### Requirement(s):

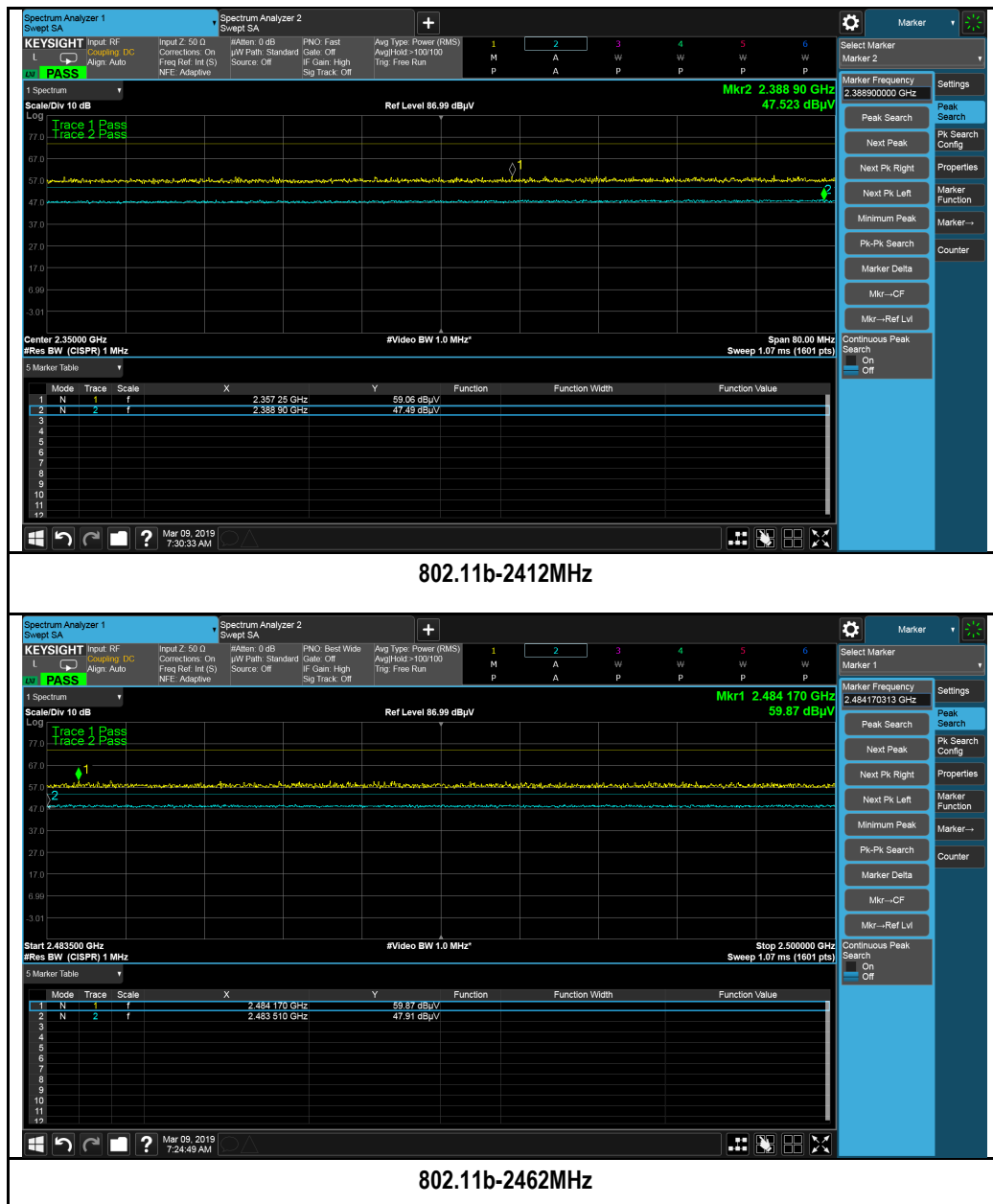
| Spec                             | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Applicable                          |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 47CFR§15.247(d),<br>RSS247(A8.5) | a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required<br><br><input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down | <input checked="" type="checkbox"/> |
|                                  | b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | or restricted band, emission must also comply with the radiated emission limits specified in 15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <input checked="" type="checkbox"/> |
| Test Setup                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Procedure                        | <ol style="list-style-type: none"> <li>The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> <li>Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>The EUT was then rotated to the direction that gave the maximum emission.</li> <li>Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>An average measurement was then made for that frequency point.</li> <li>Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Remark                           | The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Result                           | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |

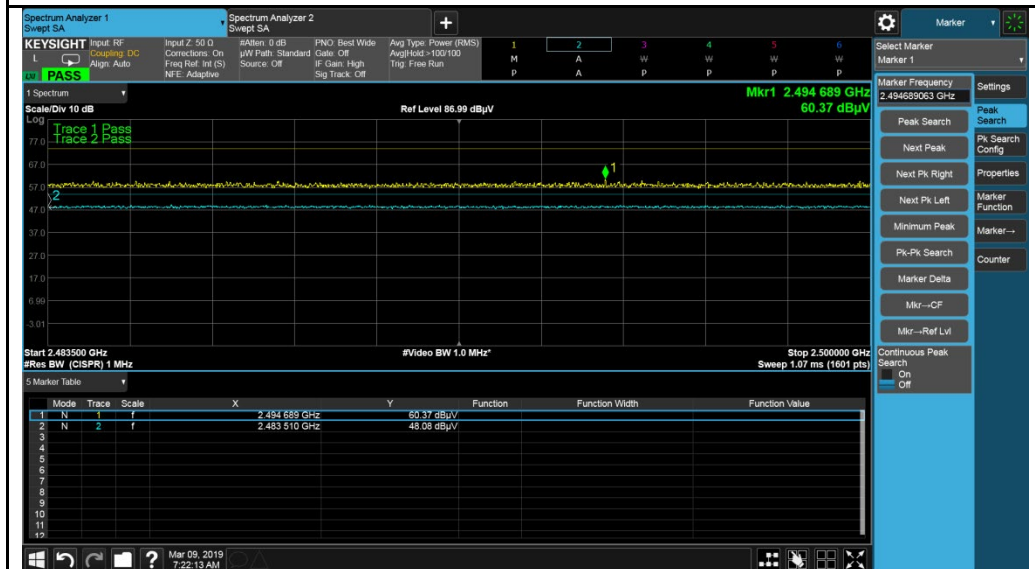
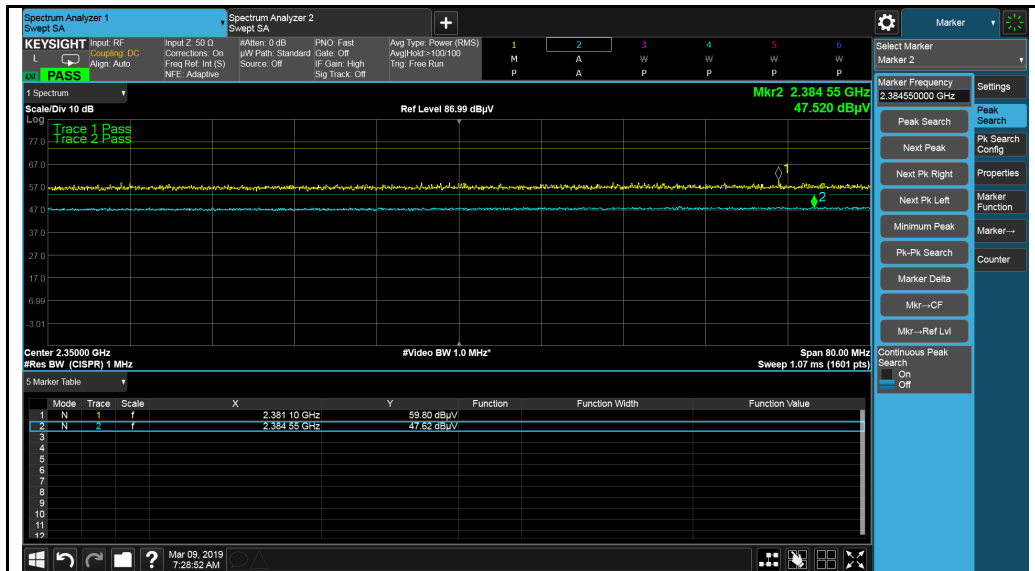
Test Data    ☐ Yes (See below)    ☒ N/A

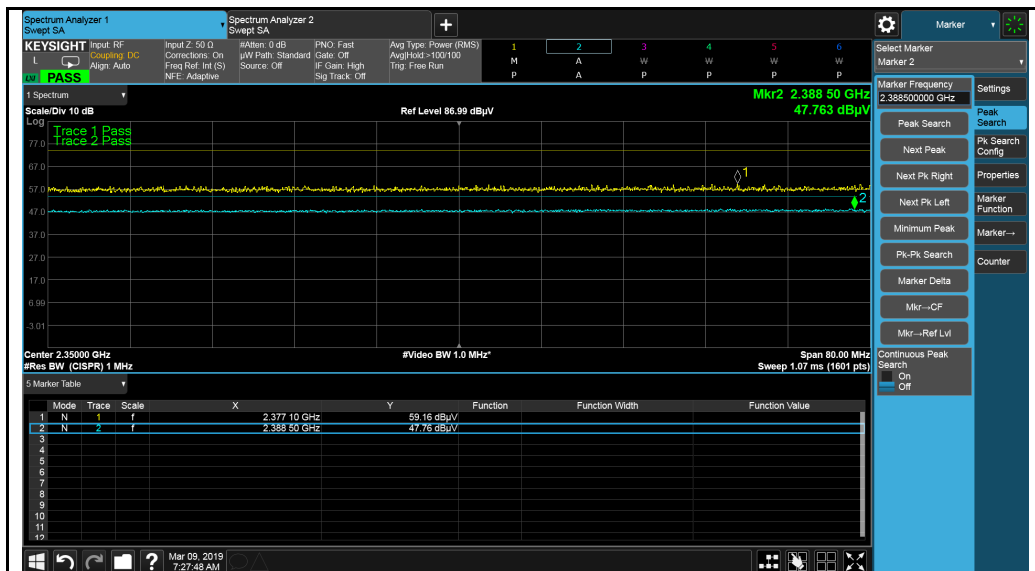
Test Plot    ☒ Yes (See below)    ☐ N/A

Test was done by Cipher at 10m chamber.

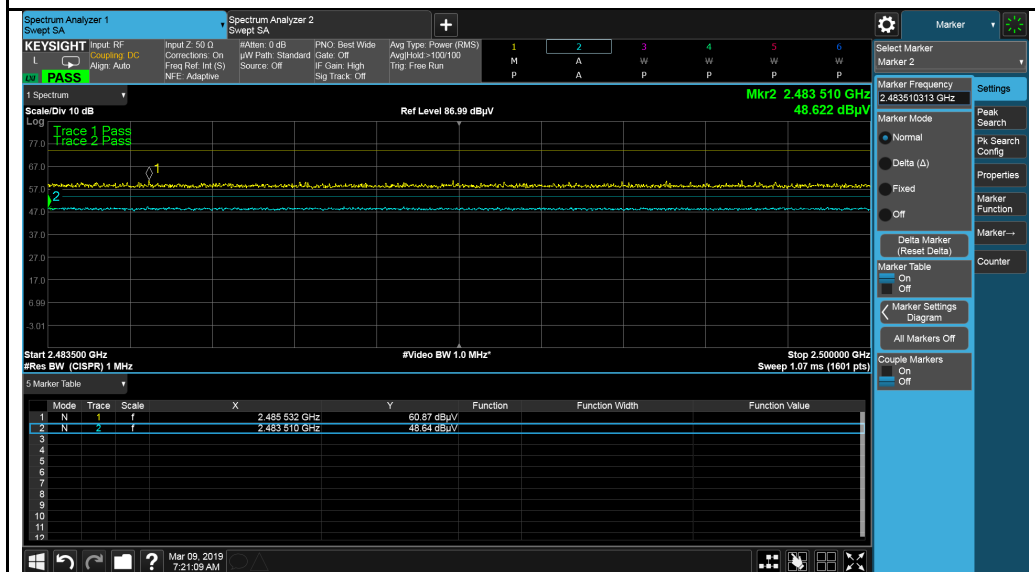
## Restricted Band Measurement Plots:







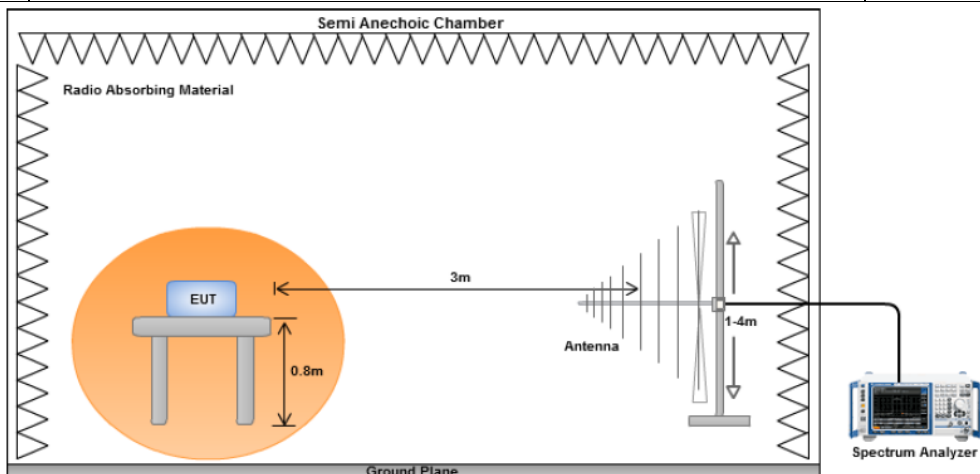
802.11n20-2412MHz



802.11n20-2462MHz

## 10.7 Radiated Spurious Emissions below 1GHz

### Requirement(s):

| Spec                            | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Applicable            |                       |         |     |          |     |         |     |           |     |                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------|-----|----------|-----|---------|-----|-----------|-----|------------------------------------------------|
| 47CFR§15.247(d)<br>RSS247 (5.5) | a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table><thead><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr></thead><tbody><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></tbody></table> | Frequency range (MHz) | Field Strength (uV/m) | 30 – 88 | 100 | 88 – 216 | 150 | 216 960 | 200 | Above 960 | 500 | <div><input checked="" type="checkbox"/></div> |
| Frequency range (MHz)           | Field Strength (uV/m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| 30 – 88                         | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| 88 – 216                        | 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| 216 960                         | 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Above 960                       | 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Test Setup                      | <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Procedure                       | <div><div><div>1.</div><div>2.</div><div>3.</div><div>4.</div></div><div><p>The EUT was switched on and allowed to warm up to its normal operating condition.</p><p>The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:</p><div><div>a.</div><div>b.</div><div>c.</div></div><p>Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</p><p>The EUT was then rotated to the direction that gave the maximum emission.</p><p>Finally, the antenna height was adjusted to the height that gave the maximum emission.</p><p>A Quasi-peak measurement was then made for that frequency point.</p><p>Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</p></div></div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Remark                          | <p>The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Result                          | <div><div><input checked="" type="checkbox"/> Pass</div><div><input type="checkbox"/> Fail</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |

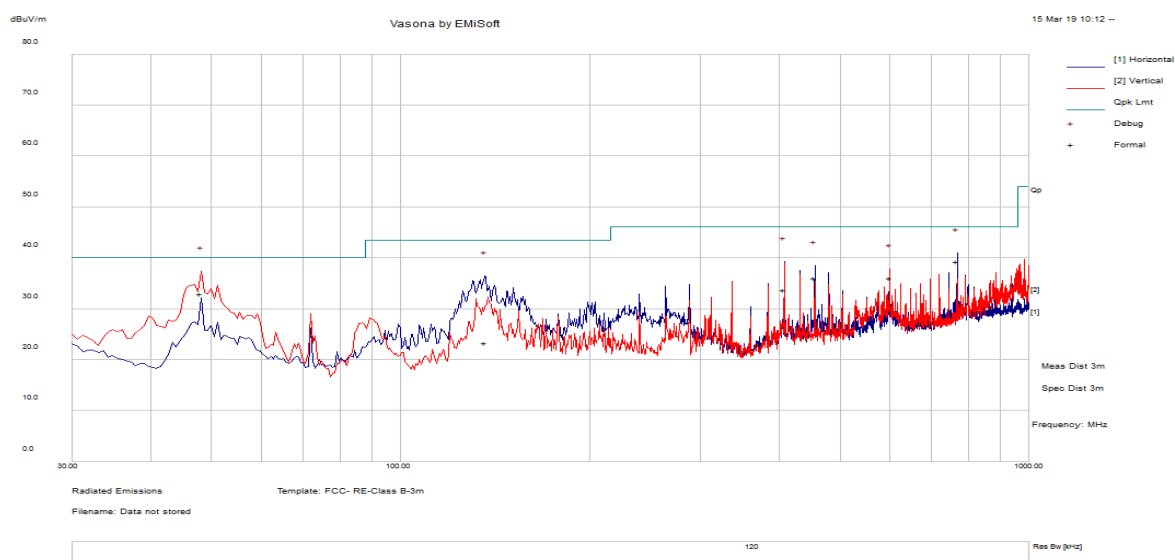
Test Data    ☒ Yes (See below)      ☐ N/A

Test Plot    ☒ Yes (See below)      ☐ N/A

Test was done by CIPHER at 10m chamber.

## Radiated Emission Test Results (Below 1GHz)

|                           |                         |      |  |  |        |      |
|---------------------------|-------------------------|------|--|--|--------|------|
| Test specification        | below 1GHz              |      |  |  | Result | Pass |
| Environmental Conditions: | Temp (°C):              | 26   |  |  |        |      |
|                           | Humidity (%)            | 47   |  |  |        |      |
|                           | Atmospheric (mbar):     | 1020 |  |  |        |      |
| Mains Power:              | 5 VDC                   |      |  |  |        |      |
| Tested by:                | Cipher                  |      |  |  |        |      |
| Test Date:                | 03/01/2019 – 03/10/2019 |      |  |  |        |      |
| Remarks:                  | 802.11b mid channel     |      |  |  |        |      |

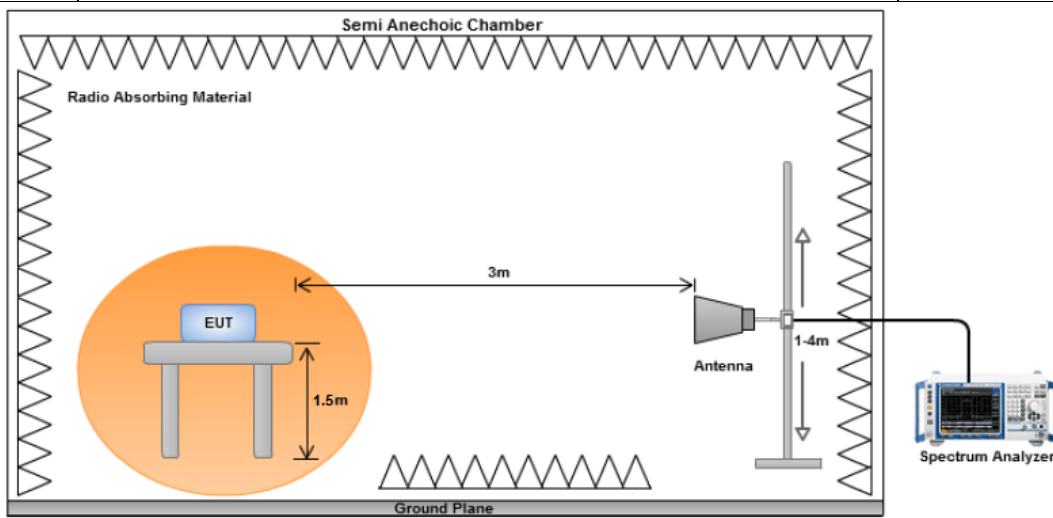


| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 47.99         | 46.98    | 11.43      | -25.41 | 33           | Quasi Max        | V   | 118    | 330     | 40           | -7        | Pass       |
| 768.00        | 38.32    | 15.43      | -14.42 | 39.32        | Quasi Max        | H   | 106    | 137     | 46           | -6.68     | Pass       |
| 407.94        | 40.14    | 13.85      | -20.15 | 33.84        | Quasi Max        | H   | 122    | 311     | 46           | -12.16    | Pass       |
| 136.34        | 34.26    | 12.19      | -23.12 | 23.32        | Quasi Max        | H   | 126    | 332     | 43.5         | -20.18    | Pass       |
| 455.99        | 40.98    | 14.08      | -18.98 | 36.08        | Quasi Max        | H   | 107    | 337     | 46           | -9.92     | Pass       |
| 599.98        | 38.03    | 14.69      | -16.53 | 36.19        | Quasi Max        | V   | 103    | 90      | 46           | -9.81     | Pass       |

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

## 10.8 Radiated Spurious Emissions between 1GHz – 25GHz

### Requirement(s):

| Spec                             | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Applicable                          |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 47CFR§15.247(d),<br>RSS247(A8.5) | a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required<br><br><input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down | <input checked="" type="checkbox"/> |
|                                  | b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | or restricted band, emission must also comply with the radiated emission limits specified in 15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <input checked="" type="checkbox"/> |
| Test Setup                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Procedure                        | <ol style="list-style-type: none"> <li>The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> <li>Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>The EUT was then rotated to the direction that gave the maximum emission.</li> <li>Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>An average measurement was then made for that frequency point.</li> <li>Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Remark                           | The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. There isn't outstanding emission found at the edge of restricted frequency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Result                           | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |

**Test Data**    ☒ Yes (See below)    ☐ N/A

**Test Plot**    ☐ Yes (See below)    ☒ N/A

**Test was done by CIPHER at 10m chamber.**

## Radiated Emission Test Results (Above 1GHz)

### Above 1GHz-25GHz – 802.11b – 2412MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3024.81       | 49.87    | 3.29       | -14.09 | 39.07        | Peak Max         | V   | 266    | 304     | 74           | -34.93    | Pass       |
| 4824.35       | 60.66    | 4.12       | -10.92 | 53.86        | Peak Max         | H   | 227    | 47      | 74           | -20.14    | Pass       |
| 8494.46       | 41.14    | 5.53       | -6.86  | 39.81        | Peak Max         | V   | 168    | 159     | 74           | -34.19    | Pass       |
| 3024.81       | 40.01    | 3.29       | -14.09 | 29.21        | Average Max      | H   | 266    | 304     | 54           | -24.79    | Pass       |
| 4824.35       | 51.58    | 4.12       | -10.92 | 44.78        | Average Max      | V   | 227    | 47      | 54           | -9.22     | Pass       |
| 8494.46       | 32.03    | 5.53       | -6.86  | 30.7         | Average Max      | V   | 168    | 159     | 54           | -23.3     | Pass       |

### Above 1GHz-25GHz- 802.11b - 2437MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3821.31       | 49.8     | 3.65       | -12.93 | 40.52        | Peak Max         | H   | 268    | 304     | 74           | -33.48    | Pass       |
| 4873.36       | 60.36    | 4.17       | -11.01 | 53.52        | Peak Max         | H   | 232    | 49      | 74           | -20.48    | Pass       |
| 8096.01       | 42.32    | 5.4        | -7.07  | 40.65        | Peak Max         | H   | 164    | 160     | 74           | -33.35    | Pass       |
| 3821.31       | 40.67    | 3.65       | -12.93 | 31.39        | Average Max      | V   | 268    | 304     | 54           | -22.61    | Pass       |
| 4873.36       | 51.33    | 4.17       | -11.01 | 44.49        | Average Max      | V   | 232    | 49      | 54           | -9.51     | Pass       |
| 8096.01       | 32.41    | 5.4        | -7.07  | 30.74        | Average Max      | H   | 164    | 160     | 54           | -23.26    | Pass       |

### Above 1GHz-25GHz – 802.11b – 2462MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3040.75       | 49.39    | 3.3        | -14.02 | 38.67        | Peak Max         | H   | 269    | 304     | 74           | -35.33    | Pass       |
| 4924.33       | 60.24    | 4.22       | -11.11 | 53.35        | Peak Max         | V   | 234    | 45      | 74           | -20.65    | Pass       |
| 8338.02       | 42.01    | 5.41       | -7.03  | 40.39        | Peak Max         | H   | 169    | 153     | 74           | -33.61    | Pass       |
| 3040.75       | 39.45    | 3.3        | -14.02 | 28.73        | Average Max      | V   | 269    | 304     | 54           | -25.27    | Pass       |
| 4924.33       | 51.11    | 4.22       | -11.11 | 44.22        | Average Max      | V   | 234    | 45      | 54           | -9.78     | Pass       |
| 8338.02       | 32.03    | 5.41       | -7.03  | 30.41        | Average Max      | V   | 169    | 153     | 54           | -23.59    | Pass       |

#### Above 1GHz-25GHz- 802.11g - 2412MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3154.74       | 49.74    | 3.39       | -13.81 | 39.32        | Peak Max         | V   | 265    | 295     | 74           | -34.68    | Pass       |
| 4825.00       | 48.6     | 4.12       | -10.92 | 41.8         | Peak Max         | H   | 225    | 49      | 74           | -32.2     | Pass       |
| 8617.57       | 43.32    | 5.58       | -6.67  | 42.23        | Peak Max         | H   | 169    | 159     | 74           | -31.77    | Pass       |
| 3154.74       | 39.85    | 3.39       | -13.81 | 29.43        | Average Max      | V   | 265    | 295     | 54           | -24.57    | Pass       |
| 4825.00       | 39.52    | 4.12       | -10.92 | 32.72        | Average Max      | H   | 225    | 49      | 54           | -21.28    | Pass       |
| 8617.57       | 33.97    | 5.58       | -6.67  | 32.88        | Average Max      | V   | 169    | 159     | 54           | -21.12    | Pass       |

#### Above 1GHz-25GHz – 802.11g – 2437MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3735.19       | 50.66    | 3.57       | -13.13 | 41.1         | Peak Max         | H   | 271    | 304     | 74           | -32.9     | Pass       |
| 4873.76       | 48.35    | 4.17       | -11.01 | 41.51        | Peak Max         | H   | 226    | 47      | 74           | -32.49    | Pass       |
| 8011.44       | 42.3     | 5.43       | -7.03  | 40.7         | Peak Max         | V   | 167    | 158     | 74           | -33.3     | Pass       |
| 3735.19       | 40.86    | 3.57       | -13.13 | 31.3         | Average Max      | V   | 271    | 304     | 54           | -22.7     | Pass       |
| 4873.76       | 39.08    | 4.17       | -11.01 | 32.24        | Average Max      | H   | 226    | 47      | 54           | -21.76    | Pass       |
| 8011.44       | 32.64    | 5.43       | -7.03  | 31.04        | Average Max      | V   | 167    | 158     | 54           | -22.96    | Pass       |

#### Above 1GHz-25GHz- 802.11g - 2462MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3091.64       | 49.8     | 3.34       | -13.87 | 39.27        | Peak Max         | H   | 269    | 302     | 74           | -34.73    | Pass       |
| 4924.08       | 48.27    | 4.22       | -11.11 | 41.38        | Peak Max         | H   | 233    | 43      | 74           | -32.62    | Pass       |
| 8371.97       | 42.28    | 5.44       | -6.99  | 40.73        | Peak Max         | H   | 168    | 160     | 74           | -33.27    | Pass       |
| 3091.64       | 40.61    | 3.34       | -13.87 | 30.08        | Average Max      | H   | 269    | 302     | 54           | -23.92    | Pass       |
| 4924.08       | 38.71    | 4.22       | -11.11 | 31.82        | Average Max      | H   | 233    | 43      | 54           | -22.18    | Pass       |
| 8371.97       | 32.88    | 5.44       | -6.99  | 31.33        | Average Max      | V   | 168    | 160     | 54           | -22.67    | Pass       |

#### Above 1GHz-25GHz- 802.11n20 - 2412MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3876.64       | 49.23    | 3.71       | -12.8  | 40.14        | Peak Max         | V   | 266    | 296     | 74           | -33.86    | Pass       |
| 4824.86       | 60.61    | 4.12       | -10.92 | 53.81        | Peak Max         | V   | 230    | 45      | 74           | -20.19    | Pass       |
| 8872.45       | 41.81    | 5.63       | -6.18  | 41.26        | Peak Max         | V   | 163    | 155     | 74           | -32.74    | Pass       |
| 3876.64       | 39.98    | 3.71       | -12.8  | 30.89        | Average Max      | H   | 266    | 296     | 54           | -23.11    | Pass       |
| 4824.86       | 50.7     | 4.12       | -10.92 | 43.9         | Average Max      | V   | 230    | 45      | 54           | -10.1     | Pass       |
| 8872.45       | 32.76    | 5.63       | -6.18  | 32.21        | Average Max      | V   | 163    | 155     | 54           | -21.79    | Pass       |

#### Above 1GHz-25GHz – 802.11n20 – 2437MHz

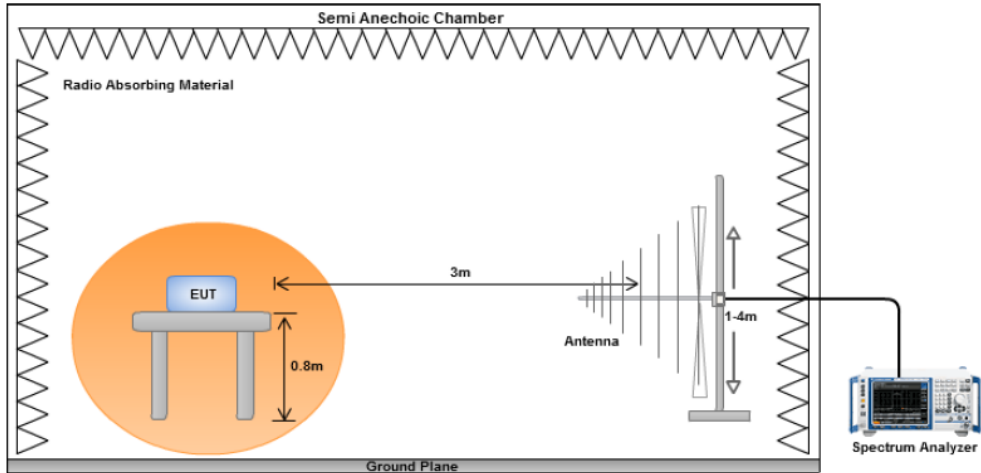
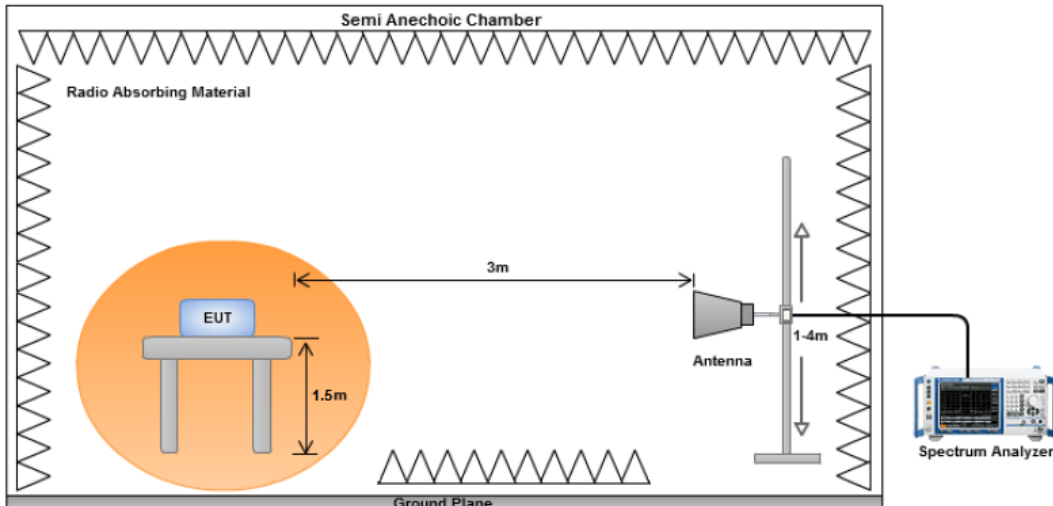
| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3423.88       | 49.58    | 3.55       | -13.73 | 39.4         | Peak Max         | H   | 269    | 297     | 74           | -34.6     | Pass       |
| 4873.81       | 60.35    | 4.17       | -11.01 | 53.51        | Peak Max         | V   | 230    | 43      | 74           | -20.49    | Pass       |
| 8918.49       | 41.4     | 5.62       | -6.11  | 40.91        | Peak Max         | H   | 168    | 160     | 74           | -33.09    | Pass       |
| 3423.88       | 39.99    | 3.55       | -13.73 | 29.81        | Average Max      | V   | 269    | 297     | 54           | -24.19    | Pass       |
| 4873.81       | 50.67    | 4.17       | -11.01 | 43.83        | Average Max      | H   | 230    | 43      | 54           | -10.17    | Pass       |
| 8918.49       | 31.52    | 5.62       | -6.11  | 31.03        | Average Max      | H   | 168    | 160     | 54           | -22.97    | Pass       |

#### Above 1GHz-25GHz- 802.11n20 - 2462MHz

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 3894.65       | 49.24    | 3.73       | -12.76 | 40.21        | Peak Max         | H   | 264    | 296     | 74           | -33.79    | Pass       |
| 4924.39       | 60.24    | 4.22       | -11.11 | 53.35        | Peak Max         | V   | 225    | 45      | 74           | -20.65    | Pass       |
| 8938.38       | 42.06    | 5.62       | -6.07  | 41.61        | Peak Max         | H   | 161    | 159     | 74           | -32.39    | Pass       |
| 3894.65       | 40.24    | 3.73       | -12.76 | 31.21        | Average Max      | H   | 264    | 296     | 54           | -22.79    | Pass       |
| 4924.39       | 50.3     | 4.22       | -11.11 | 43.41        | Average Max      | H   | 225    | 45      | 54           | -10.59    | Pass       |
| 8938.38       | 32.84    | 5.62       | -6.07  | 32.39        | Average Max      | H   | 161    | 159     | 54           | -21.61    | Pass       |

## 10.9 Receiver Spurious Emissions

### Requirement(s):

| Spec        | Item                                                                                 | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Applicable            |                       |         |     |          |     |         |     |           |     |              |
|-------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------|-----|----------|-----|---------|-----|-----------|-----|--------------|
| RSS GEN 7.3 | a)                                                                                   | <p>Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna ports. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least five times the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.</p> <p>Spurious emissions from receivers shall not exceed the radiated emissions limits shown in table 3</p> <table><thead><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr></thead><tbody><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></tbody></table> | Frequency range (MHz) | Field Strength (uV/m) | 30 – 88 | 100 | 88 – 216 | 150 | 216 960 | 200 | Above 960 | 500 | <div>☒</div> |
|             |                                                                                      | Frequency range (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Field Strength (uV/m) |                       |         |     |          |     |         |     |           |     |              |
|             |                                                                                      | 30 – 88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 100                   |                       |         |     |          |     |         |     |           |     |              |
| 88 – 216    | 150                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                       |         |     |          |     |         |     |           |     |              |
| 216 960     | 200                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                       |         |     |          |     |         |     |           |     |              |
| Above 960   | 500                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                       |         |     |          |     |         |     |           |     |              |
| Test Setup  |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                       |         |     |          |     |         |     |           |     |              |
| Test Setup  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                       |         |     |          |     |         |     |           |     |              |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Procedure | <ol style="list-style-type: none"> <li>1. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> <li>a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>b. The EUT was then rotated to the direction that gave the maximum emission.</li> <li>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>3. A Quasi-peak measurement was then made for that frequency point.</li> <li>4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol> |
| Remark    | The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Result    | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

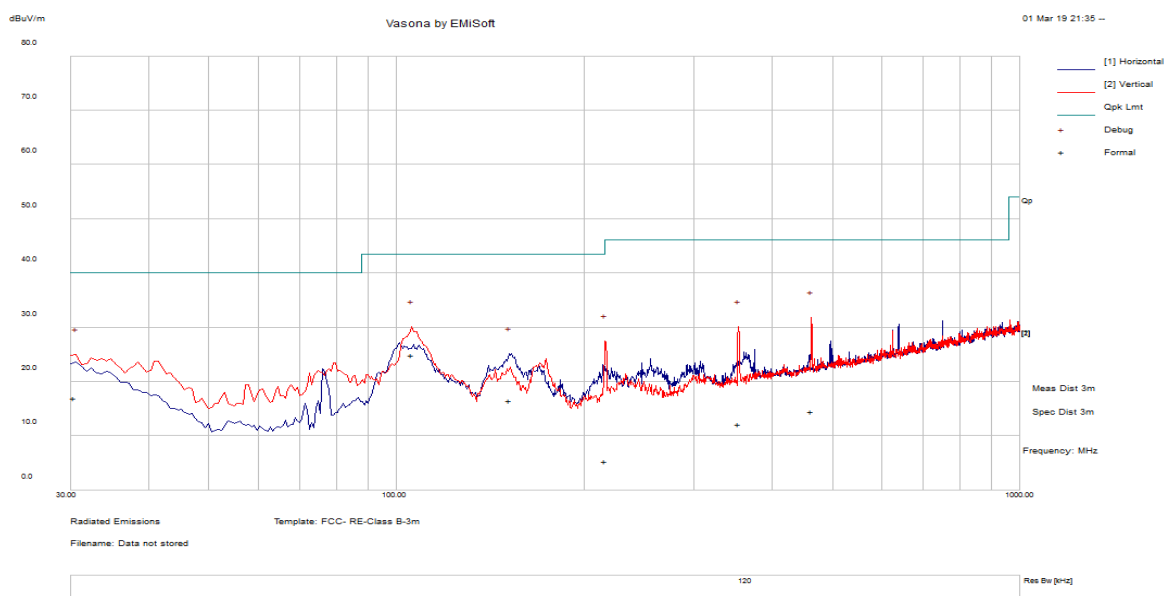
**Test Data**    ☒ Yes (See below)    ☐ N/A

**Test Plot**    ☒ Yes (See below)    ☐ N/A

**Test was done by Cipher at 10m chamber.**

## Radiated Emission Test Results (Below 1GHz)

| Accelerated Lifetime Test Results (Below 1GHz) |                         |      |        |      |  |
|------------------------------------------------|-------------------------|------|--------|------|--|
| Test specification                             | below 1GHz              |      |        |      |  |
| Environmental Conditions:                      | Temp (°C):              | 26   | Result | Pass |  |
|                                                | Humidity (%)            | 47   |        |      |  |
|                                                | Atmospheric (mbar):     | 1020 |        |      |  |
| Mains Power:                                   | 5 VDC                   |      |        |      |  |
| Tested by:                                     | Cipher                  |      |        |      |  |
| Test Date:                                     | 03/01/2019 – 03/10/2019 |      |        |      |  |
| Remarks:                                       | Receiver mode           |      |        |      |  |



| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 105.92        | 37.23    | 11.92      | -24.25 | 24.91        | Quasi Max        | V   | 110    | 219     | 43.5         | -18.59    | Pass       |
| 462.82        | 19.21    | 14.13      | -18.84 | 14.49        | Quasi Max        | V   | 249    | 137     | 46           | -31.51    | Pass       |
| 30.39         | 18.42    | 11.12      | -12.46 | 17.07        | Quasi Max        | V   | 101    | 112     | 40           | -22.93    | Pass       |
| 353.65        | 19.49    | 13.54      | -20.8  | 12.23        | Quasi Max        | V   | 121    | 173     | 46           | -33.78    | Pass       |
| 151.88        | 27.62    | 12.21      | -23.33 | 16.5         | Quasi Max        | H   | 133    | 253     | 43.5         | -27       | Pass       |
| 215.97        | 17.49    | 12.77      | -24.96 | 5.3          | Quasi Max        | V   | 130    | 91      | 43.5         | -38.2     | Pass       |

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

## Radiated Emission Test Results (Above 1GHz)

### Receiver mode

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 1595.52       | 46.58    | 2.43       | -6.03 | 42.98        | Peak Max         | H   | 190    | 305     | 74           | -31.02    | Pass       |
| 3189.59       | 44.46    | 3.42       | -1.49 | 46.39        | Peak Max         | V   | 180    | 178     | 74           | -27.62    | Pass       |
| 1064.40       | 57.56    | 1.94       | -7.85 | 51.65        | Peak Max         | V   | 120    | 201     | 74           | -22.35    | Pass       |
| 1944.44       | 48.18    | 2.7        | -2.76 | 48.12        | Peak Max         | V   | 102    | 208     | 74           | -25.88    | Pass       |
| 1595.52       | 29.75    | 2.43       | -6.03 | 26.16        | Average Max      | H   | 190    | 305     | 54           | -27.84    | Pass       |
| 3189.59       | 29.16    | 3.42       | -1.49 | 31.08        | Average Max      | V   | 180    | 178     | 54           | -22.92    | Pass       |
| 1064.40       | 32.88    | 1.94       | -7.85 | 26.97        | Average Max      | V   | 120    | 201     | 54           | -27.03    | Pass       |
| 1944.44       | 29.96    | 2.7        | -2.76 | 29.9         | Average Max      | V   | 102    | 208     | 54           | -24.1     | Pass       |

## Annex A. TEST INSTRUMENT

| Instrument                           | Model       | Serial #    | Cal Date   | Cal Cycle | Cal Due    | In use                              |
|--------------------------------------|-------------|-------------|------------|-----------|------------|-------------------------------------|
| <b>Radiated Emissions</b>            |             |             |            |           |            |                                     |
| Keysight EXA 44GHz Spectrum Analyzer | N9030B(PXA) | MY57140374  | 08/20/2018 | 1 Year    | 08/20/2019 | <input checked="" type="checkbox"/> |
| Bi-Log antenna (30MHz~6GHz)          | JB6         | A111717     | 08/12/2018 | 1 Year    | 08/12/2019 | <input checked="" type="checkbox"/> |
| Horn Antenna (1GHz~26GHz)            | 3115        | 100059      | 01/26/2019 | 1 Year    | 01/26/2020 | <input checked="" type="checkbox"/> |
| Horn Antenna (26GHz~40GHz)           | AH-840      | 101013      | 08/28/2018 | 1 Year    | 08/28/2019 | <input checked="" type="checkbox"/> |
| Pre-Amplifier(0.3MHz-6.5GHz)         | LPA-6-30    | 11170602    | 02/06/2019 | 1 Year    | 02/06/2020 | <input checked="" type="checkbox"/> |
| Pre-Amplifier (1-26.5GHz)            | 8449B       | 3008A00715  | 08/16/2018 | 1 Year    | 08/16/2019 | <input checked="" type="checkbox"/> |
| Pre-Amp (10MHz~50GHz)                | RAMP00M50GA | 17032300047 | 02/10/2019 | 1 Year    | 02/10/2020 | <input checked="" type="checkbox"/> |
| <b>Conducted Measurement</b>         |             |             |            |           |            |                                     |
| Spectrum Analyzer                    | N9010A      | 10SL0180    | 11/16/2018 | 1 Year    | 11/16/2019 | <input checked="" type="checkbox"/> |
| Keysight Signal Generator            | E8257D      | MY57280548  | 02/09/2018 | 2 Year    | 02/09/2020 | <input checked="" type="checkbox"/> |

## Annex B. SIEMIC Accreditation

| Accreditations                          | Document                                                                            | Scope / Remark                                                                                                                                                            |
|-----------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 17025 (A2LA)                        |    | Please see the documents for the detailed scope                                                                                                                           |
| ISO Guide 65 (A2LA)                     |    | Please see the documents for the detailed scope                                                                                                                           |
| TCB Designation                         |                                                                                     | <a href="#">A1</a> , <a href="#">A2</a> , <a href="#">A3</a> , <a href="#">A4</a> , <a href="#">B1</a> , <a href="#">B2</a> , <a href="#">B3</a> , <a href="#">B4</a> , C |
| FCC DoC Accreditation                   |    | FCC Declaration of Conformity Accreditation                                                                                                                               |
| FCC Site Registration                   |    | 3 meter site                                                                                                                                                              |
| FCC Site Registration                   |    | 10 meter site                                                                                                                                                             |
| IC Site Registration                    |    | 3 meter site                                                                                                                                                              |
| IC Site Registration                    |    | 10 meter site                                                                                                                                                             |
| EU NB                                   |    | <b>Radio &amp; Telecommunications Terminal Equipment:</b><br>EN45001 – EN ISO/IEC 17025                                                                                   |
|                                         |  | <b>Electromagnetic Compatibility:</b><br>EN45001 – EN ISO/IEC 17025                                                                                                       |
| Singapore iDA<br>CB(Certification Body) |  | <a href="#">Phase I</a> , <a href="#">Phase II</a>                                                                                                                        |
| Vietnam MIC<br>CAB Accreditation        |  | Please see the document for the detailed scope                                                                                                                            |
| Hong Kong OFCA                          |  | <b>(Phase II)</b> OFCA Foreign Certification Body for Radio and Telecom                                                                                                   |
|                                         |  | <b>(Phase I)</b> Conformity Assessment Body for Radio and Telecom                                                                                                         |
| Industry Canada CAB                     |  | <b>Radio:</b> Scope A – All Radio Standard Specification in Category I                                                                                                    |
|                                         |  | <b>Telecom:</b> CS-03 Part I, II, V, VI, VII, VIII                                                                                                                        |

|                                                    |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Japan Recognized Certification<br>Body Designation |    | <p><b>Radio:</b> A1. Terminal equipment for purpose of calling</p> <p><b>Telecom:</b> B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Korea CAB Accreditation                            |    | <p><b>EMI:</b> KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI<br/>KN22: Test Method for EMI</p> <p><b>EMS:</b> KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS<br/>KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS</p> <p><b>Radio:</b> RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68</p> <p><b>Telecom:</b> President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4</p> |
| Taiwan NCC CAB Recognition                         |    | LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Taiwan BSMI CAB Recognition                        |  | CNS 13438                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Japan VCCI                                         |  | <p>R-3083: Radiation 3 meter site</p> <p>C-3421: Main Ports Conducted Interference Measurement</p> <p>T-1597: Telecommunication Ports Conducted Interference Measurement</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Australia CAB Recognition                          |  | <p><b>EMC:</b> AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p> <p><b>Radio communications:</b> AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771</p> <p><b>Telecommunications:</b> AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06, AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1</p>                                                                                                             |
| Australia NATA Recognition                         |  | AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |