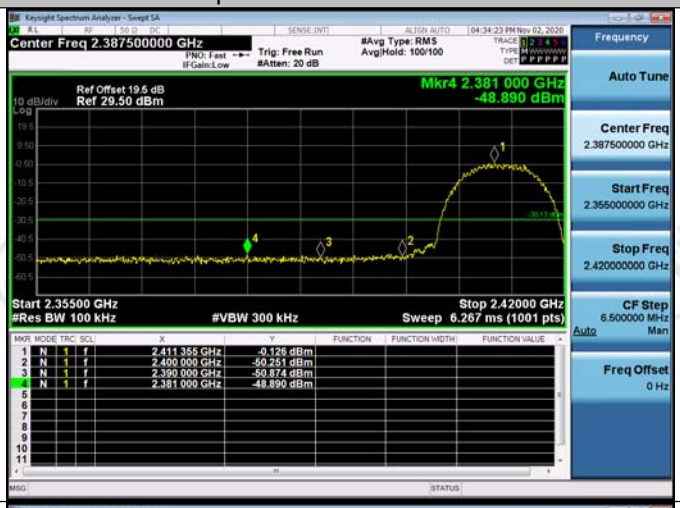
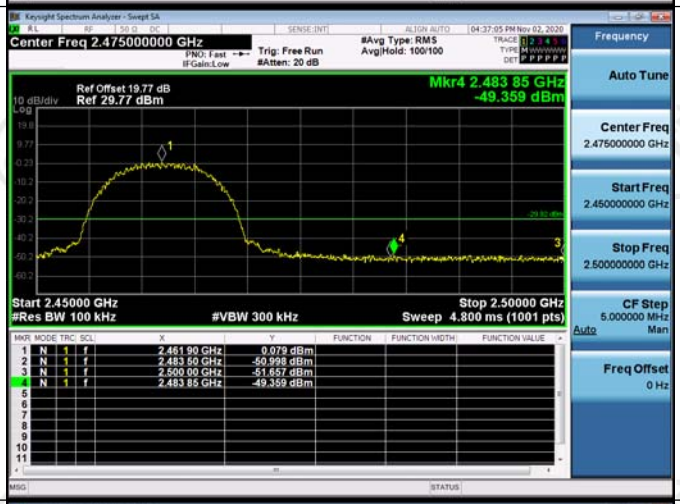
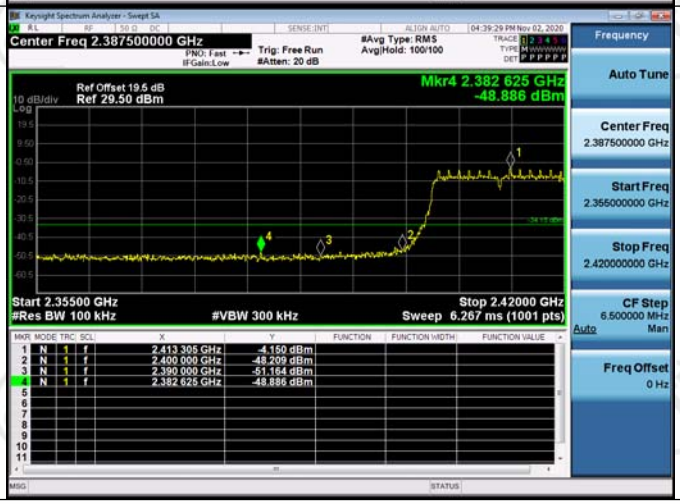
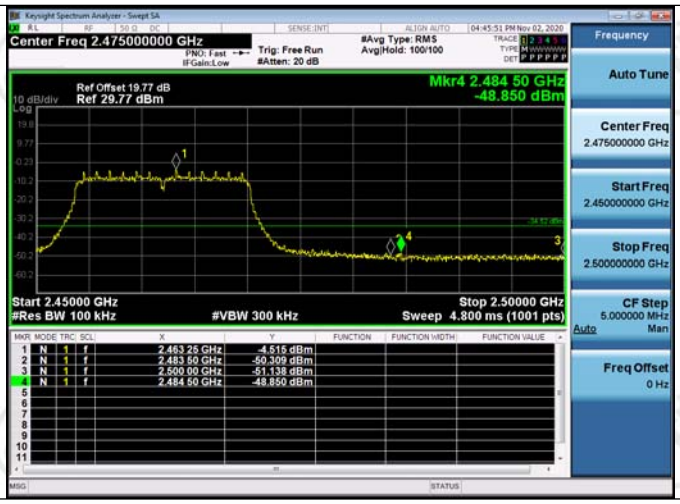
## Result Table

| Mode | Channel | Carrier Power[dBm] | Max.Spurious Level [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|
| 11B | LCH | -0.126 | -48.890 | -30.13 | PASS |
| 11B | HCH | 0.079 | -49.359 | -29.92 | PASS |
| 11G | LCH | -4.150 | -48.886 | -34.15 | PASS |
| 11G | HCH | -4.515 | -48.850 | -34.52 | PASS |

**Test Graph**

| Graphs | | | |
|---|---|---|---|
| 11B/LCH | |  | |
| 11B/HCH | |  | |
| 11G/LCH | |  | |

| | |
|---|---|
| 11G/HCH |  |

Center Freq 2.475000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 19.77 dB
10 dB/div
Ref 29.77 dBm
Mkr4 2.484 50 GHz
-48.850 dBm
Start 2.45000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 4.800 ms (1001 pts)
1 N 1 f 2.463 25 GHz -4.515 dBm
2 N 1 f 2.483 50 GHz -50.309 dBm
3 N 1 f 2.500 00 GHz -51.138 dBm
4 N 1 f 2.484 50 GHz -48.850 dBm
Frequency
Auto Tune
Center Freq
2.475000000 GHz
Start Freq
2.450000000 GHz
Stop Freq
2.500000000 GHz
CF Step
5.000000 MHz
Auto
Man
Freq Offset
0 Hz

# Appendix D): RF Conducted Spurious Emissions

**Test Limit**

According to §15.247(d),

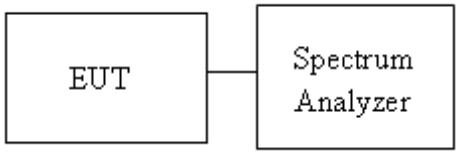
In any 100 kHz bandwidth outside the authorized frequency band,
Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

**Test Procedure**

Test method Refer as KDB 558074 D01.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. f the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

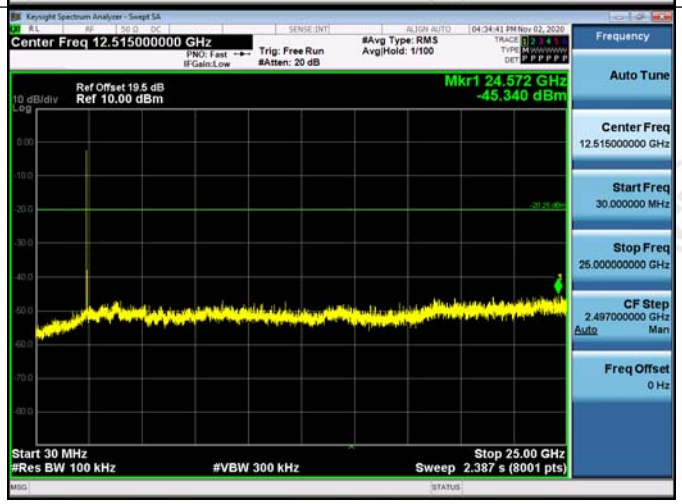
**Test Setup**

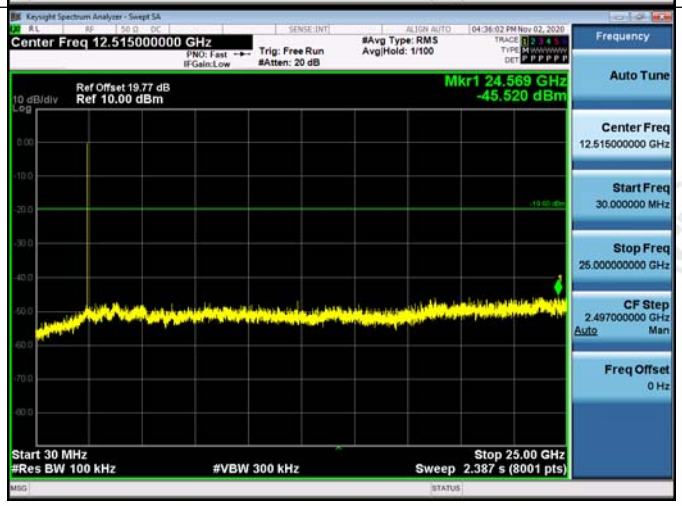


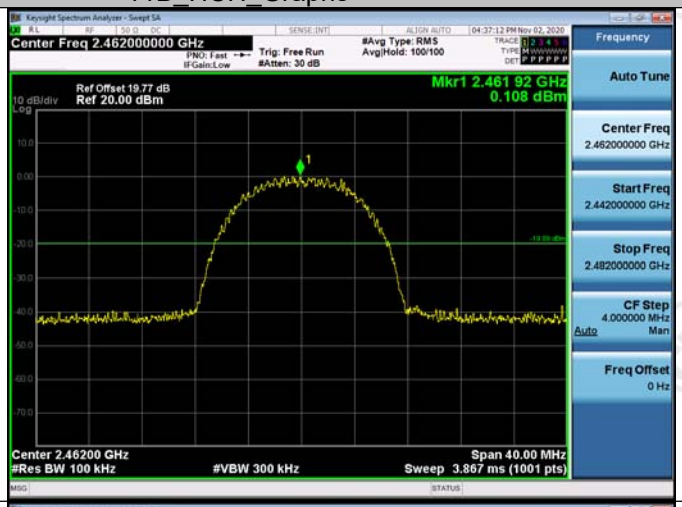
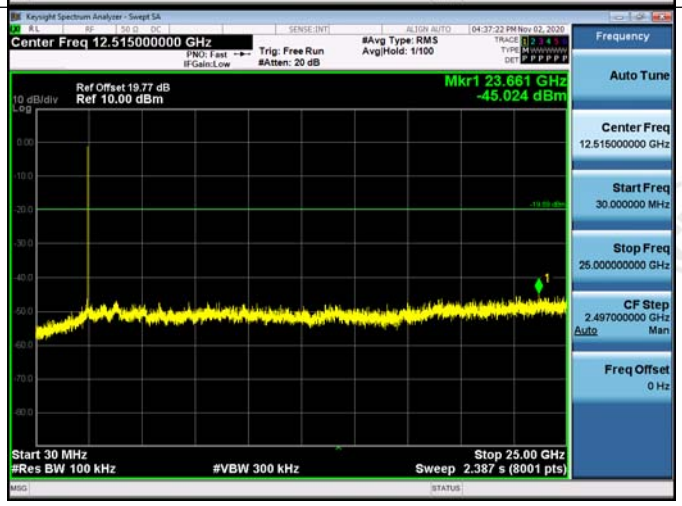
**Result Table**

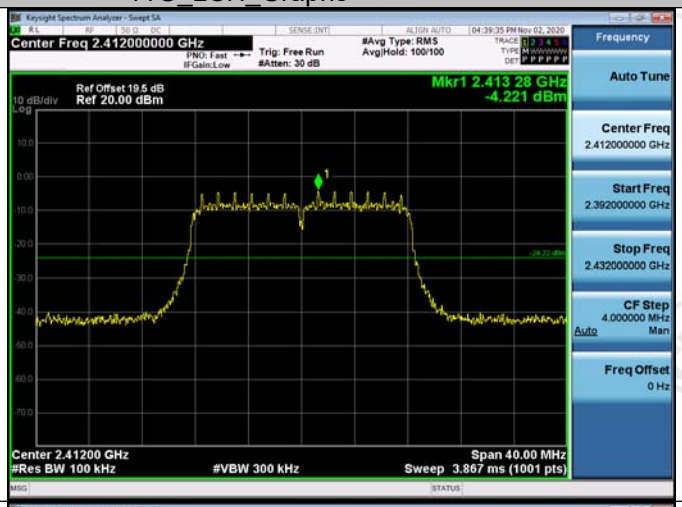
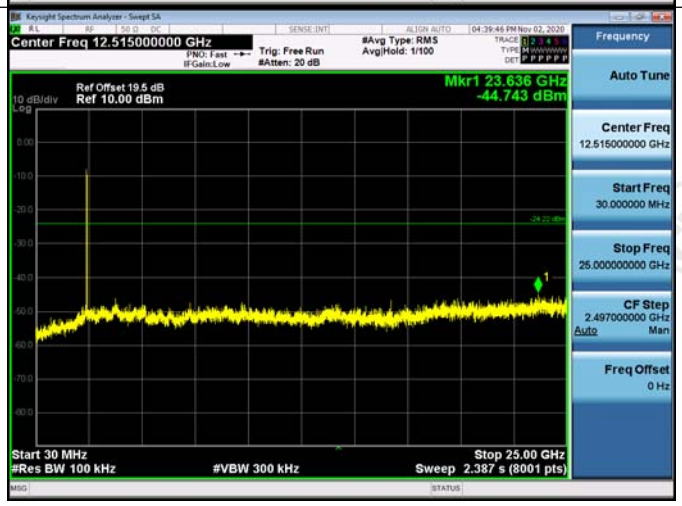
| Mode | Channel | Pref [dBm] | Puw[dBm] | Verdict |
|---|---|---|---|---|
| 11B | LCH | -0.245 | <Limit | PASS |
| 11B | MCH | 0.405 | <Limit | PASS |
| 11B | HCH | 0.108 | <Limit | PASS |
| 11G | LCH | -4.221 | <Limit | PASS |
| 11G | MCH | -3.541 | <Limit | PASS |
| 11G | HCH | -4.561 | <Limit | PASS |

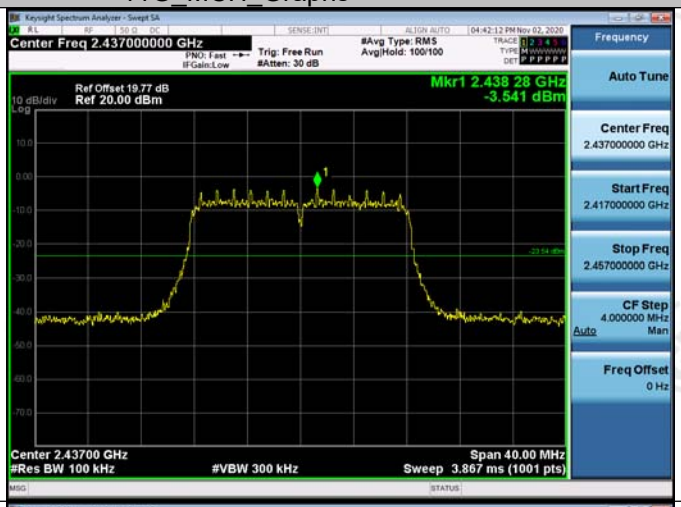
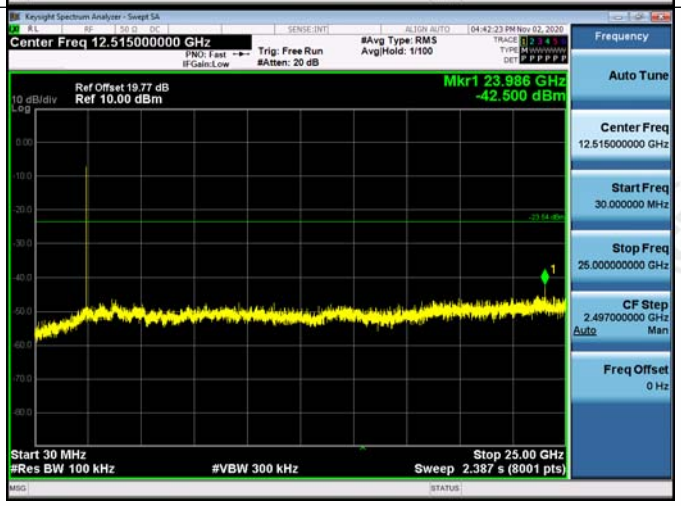
**Test Graph**

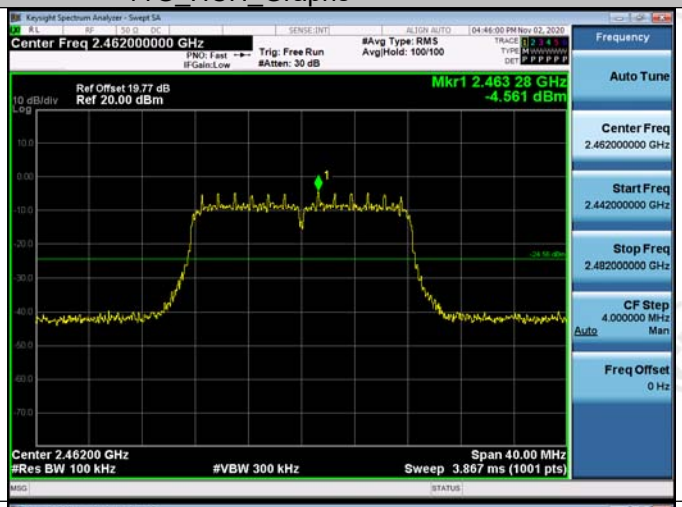
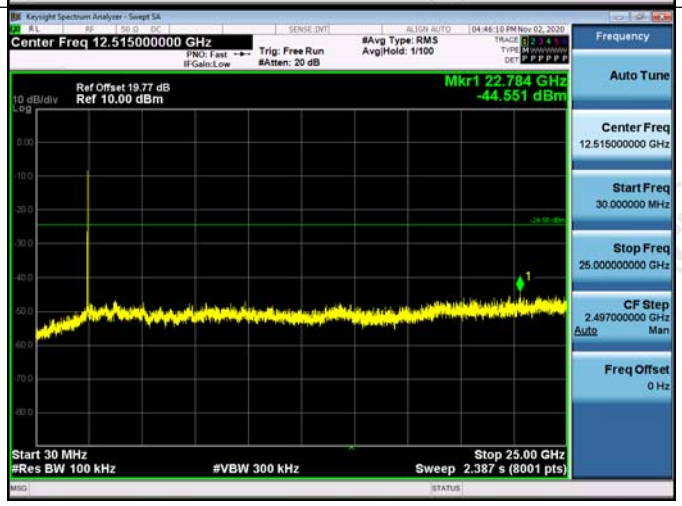
| 11B_LCH_Graphs | |
|---|---|
| Pref/11B/LCH |  |
| Puw/11B/LCH |  |

| 11B_MCH_Graphs | | |
|---|---|---|
| Pref/11B/MCH | |   |
| Puw/11B/MCH | |   |

| 11B_HCH_Graphs | | |
|---|---|---|
| Pref/11B/HCH | |   |
| Puw/11B/HCH | |   |

| 11G_LCH_Graphs | | |
|---|---|---|
| Pref/11G/LCH | |  |
| Puw/11G/LCH | |  |

| 11G_MCH_Graphs | | |
|---|---|---|
| Pref/11G/MCH | |   |
| Puw/11G/MCH | |   |

| 11G_HCH_Graphs | | |
|---|---|---|
| Pref/11G/HCH | |   |
| Puw/11G/HCH | |   |

# Appendix E): Power Spectral Density

**Test Limit**

According to §15.247(e),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

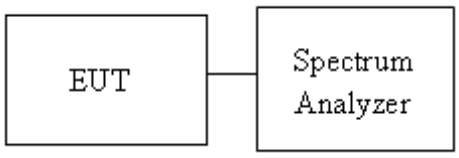
| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：8dBm<br>☐ Antenna with DG greater than 6 dBi：<br>[ Limit = 8 – (DG – 6) ]<br>☐ Point-to-point operation： |

**Test Procedure**

Test method Refer as KDB 558074 D01.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss was compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

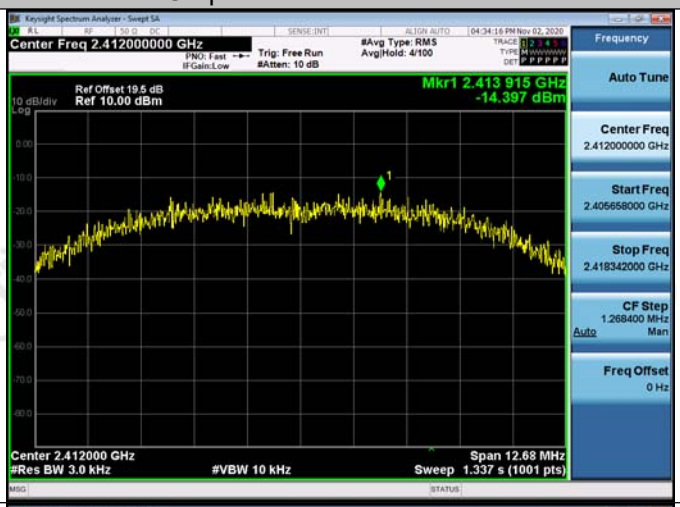
**Test Setup**

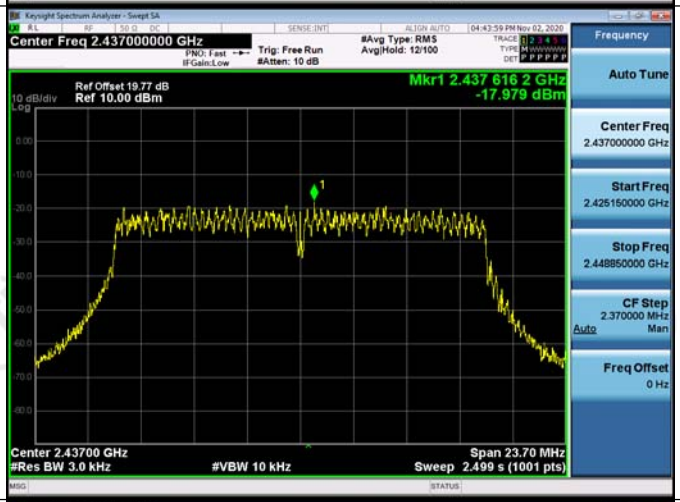
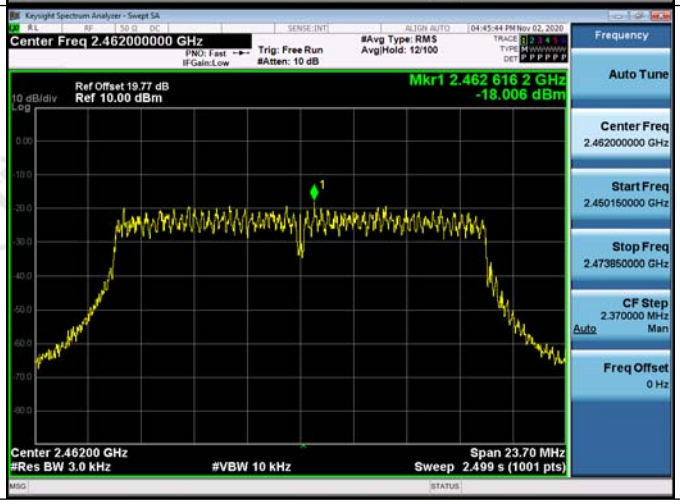


**Result Table**

| Mode | Channel | Power Spectral Density [dBm] | Verdict |
|---|---|---|---|
| 11B | LCH | -14.397 | PASS |
| 11B | MCH | -13.869 | PASS |
| 11B | HCH | -13.977 | PASS |
| 11G | LCH | -17.686 | PASS |
| 11G | MCH | -17.979 | PASS |
| 11G | HCH | -18.006 | PASS |

**Test Graph**

| Graphs | | | |
|---|---|---|---|
| 11B/LCH | |  | |
| 11B/MCH | |  | |
| 11B/HCH | |  | |

| | | | |
|---|---|---|---|
| 11G/LCH | |  | |
| 11G/MCH | |  | |
| 11G/HCH | |  | |

# Appendix F): Antenna Requirement

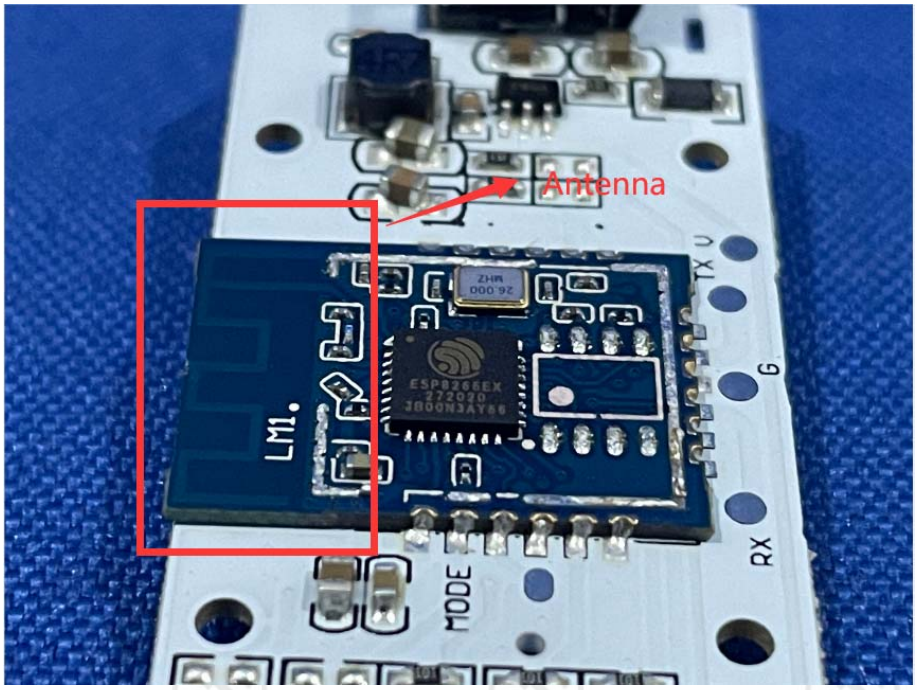
**15.203 requirement:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

**15.247(b) (4) requirement:**

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**EUT Antenna:**




The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.5 dBi.

# Appendix G): AC Power Line Conducted Emission

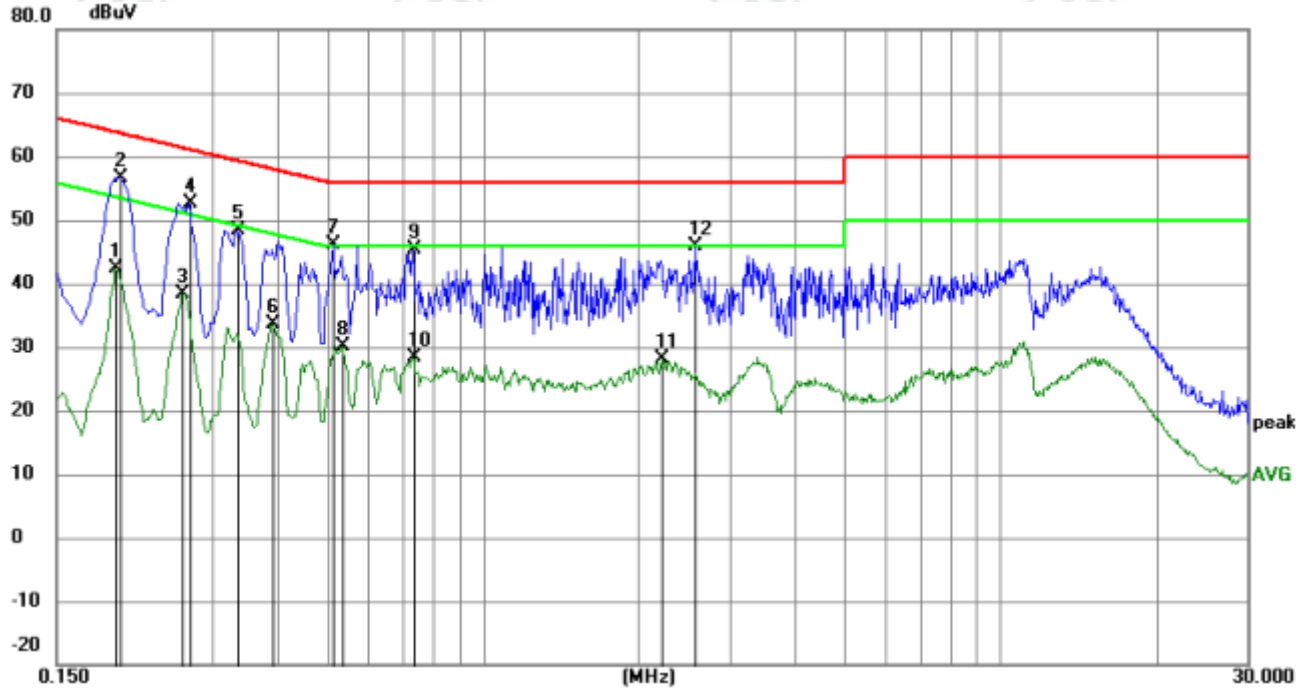
<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz<br>1) The mains terminal disturbance voltage test was conducted in a shielded room.<br>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.<br>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,<br>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.<br>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.<br>NOTE : The lower limit is applicable at the transition frequency</td></tr>
</table>

**Measurement Data**

An initial pre-scan was performed on the live and neutral lines with peak detector.

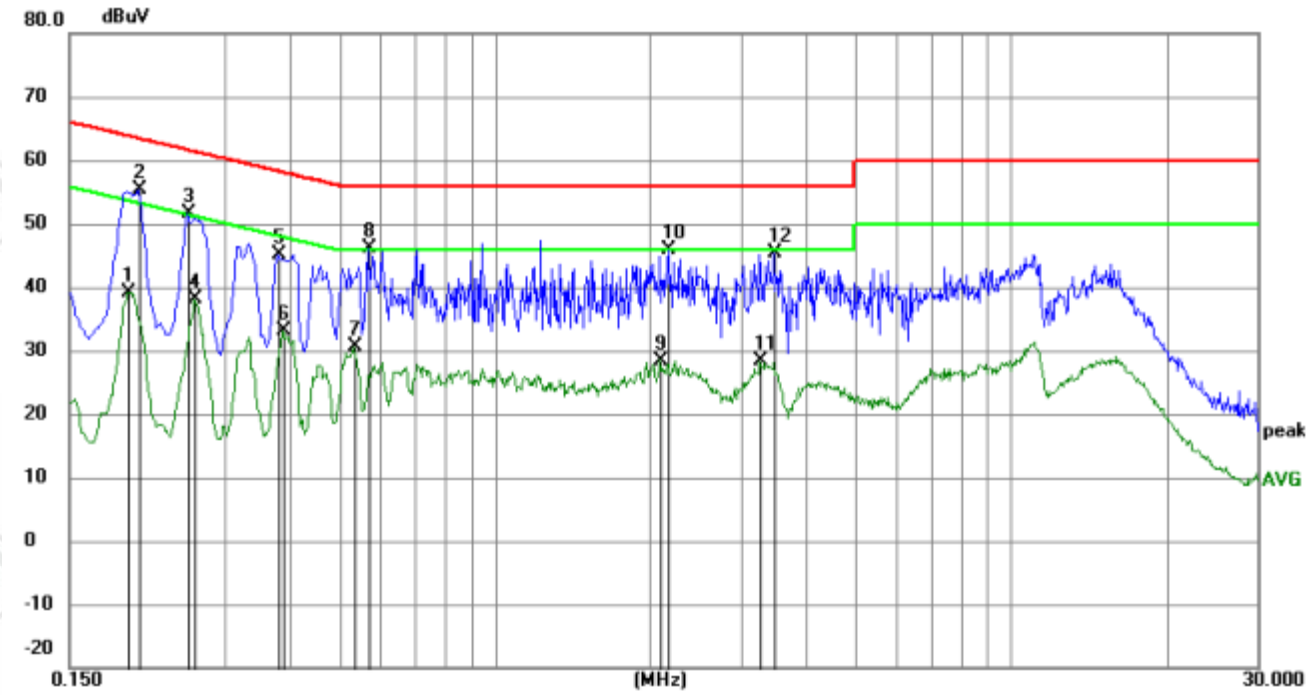
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1949 | 32.52 | 9.87 | 42.39 | 53.83 | -11.44 | AVG | |
| 2 | * | 0.1995 | 46.88 | 9.87 | 56.75 | 63.63 | -6.88 | QP | |
| 3 | | 0.2625 | 28.38 | 10.00 | 38.38 | 51.35 | -12.97 | AVG | |
| 4 | | 0.2714 | 42.53 | 10.01 | 52.54 | 61.07 | -8.53 | QP | |
| 5 | | 0.3345 | 38.35 | 10.04 | 48.39 | 59.34 | -10.95 | QP | |
| 6 | | 0.3930 | 23.73 | 9.98 | 33.71 | 48.00 | -14.29 | AVG | |
| 7 | | 0.5144 | 36.28 | 9.97 | 46.25 | 56.00 | -9.75 | QP | |
| 8 | | 0.5325 | 20.24 | 9.99 | 30.23 | 46.00 | -15.77 | AVG | |
| 9 | | 0.7350 | 35.55 | 9.87 | 45.42 | 56.00 | -10.58 | QP | |
| 10 | | 0.7350 | 18.44 | 9.87 | 28.31 | 46.00 | -17.69 | AVG | |
| 11 | | 2.2244 | 18.34 | 9.79 | 28.13 | 46.00 | -17.87 | AVG | |
| 12 | | 2.5710 | 36.12 | 9.79 | 45.91 | 56.00 | -10.09 | QP | |

Neutral line:




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1949 | 29.18 | 9.87 | 39.05 | 53.83 | -14.78 | AVG | |
| 2 | * | 0.2040 | 45.40 | 9.88 | 55.28 | 63.45 | -8.17 | QP | |
| 3 | | 0.2535 | 41.70 | 9.98 | 51.68 | 61.64 | -9.96 | QP | |
| 4 | | 0.2625 | 28.04 | 10.00 | 38.04 | 51.35 | -13.31 | AVG | |
| 5 | | 0.3795 | 35.13 | 9.99 | 45.12 | 58.29 | -13.17 | QP | |
| 6 | | 0.3885 | 23.17 | 9.98 | 33.15 | 48.10 | -14.95 | AVG | |
| 7 | | 0.5325 | 20.53 | 9.99 | 30.52 | 46.00 | -15.48 | AVG | |
| 8 | | 0.5685 | 36.06 | 10.03 | 46.09 | 56.00 | -9.91 | QP | |
| 9 | | 2.0940 | 18.71 | 9.79 | 28.50 | 46.00 | -17.50 | AVG | |
| 10 | | 2.1705 | 36.00 | 9.79 | 45.79 | 56.00 | -10.21 | QP | |
| 11 | | 3.2730 | 18.59 | 9.79 | 28.38 | 46.00 | -17.62 | AVG | |
| 12 | | 3.4755 | 35.60 | 9.78 | 45.38 | 56.00 | -10.62 | QP | |

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

# Appendix H): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 30MHz-1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | Peak | 1MHz | 10Hz | Average |

Test Procedure:

**Below 1GHz test procedure as below:**

Test method Refer as KDB 558074 D01

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

**Above 1GHz test procedure as below:**

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

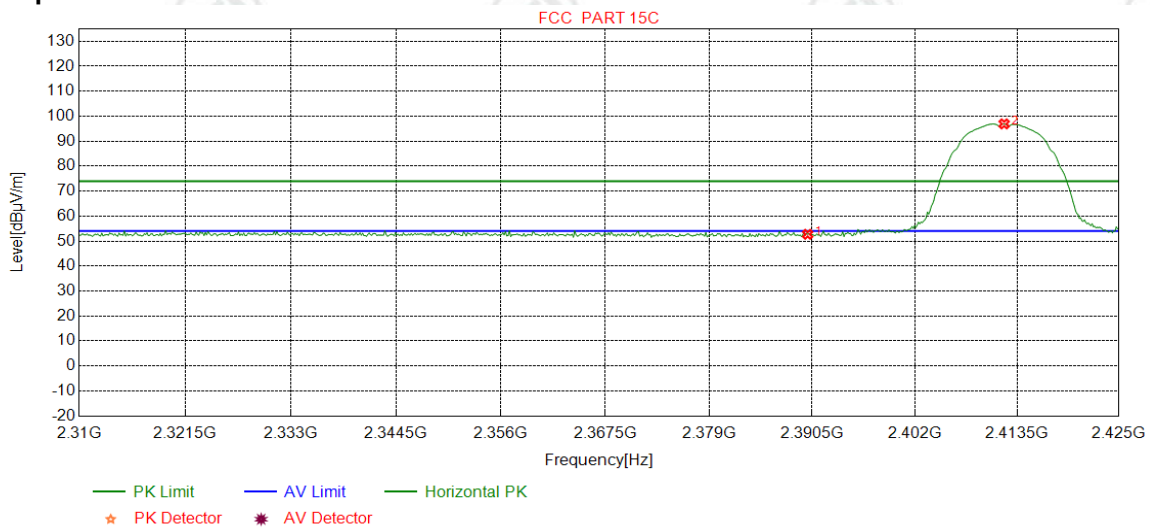
Limit:

| Frequency | Limit (dBμV/m @3m) | Remark |
|---|---|---|
| 30MHz-88MHz | 40.0 | Quasi-peak Value |
| 88MHz-216MHz | 43.5 | Quasi-peak Value |
| 216MHz-960MHz | 46.0 | Quasi-peak Value |
| 960MHz-1GHz | 54.0 | Quasi-peak Value |
| Above 1GHz | 54.0 | Average Value |
| | 74.0 | Peak Value |

**Test plot as follows:**

| Mode: | 802.11 b Transmitting | Channel: | 2412 |
|---|---|---|---|
| Remark: | PK | | |

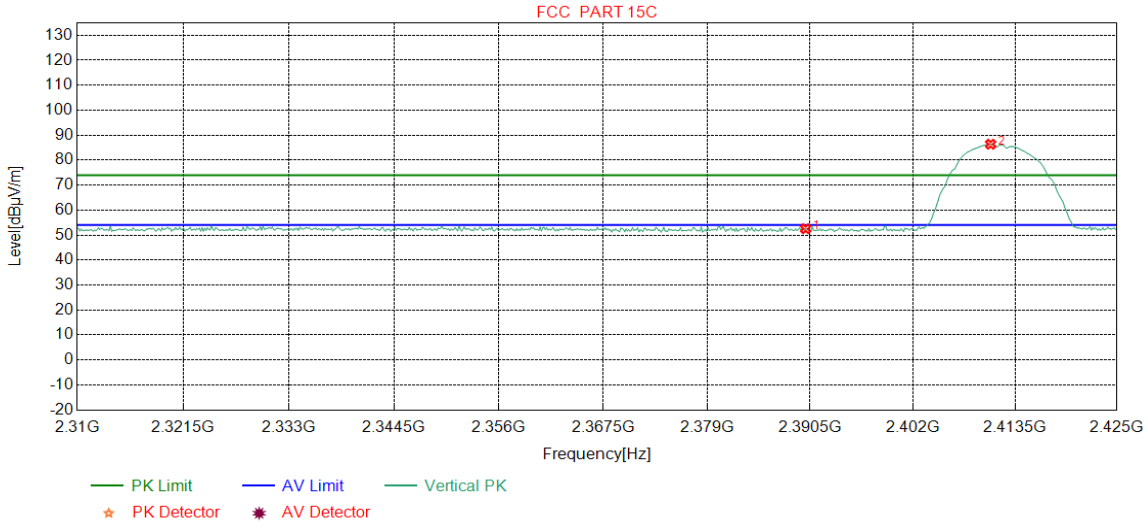
**Test Graph**




| NO | Freq. [MHz] | Ant Factor [dB] | Cable loss [dB] | Preamp gain [dB] | Reading [dBµV] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Result | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2390.0000 | 32.25 | 13.37 | -43.12 | 50.21 | 52.71 | 74.00 | 21.29 | Pass | Horizontal |
| 2 | 2412.0463 | 32.28 | 13.36 | -43.13 | 94.41 | 96.92 | 74.00 | -22.92 | Pass | Horizontal |

| Mode: | 802.11 b Transmitting | Channel: | 2412 |
|---|---|---|---|
| Remark: | PK | | |

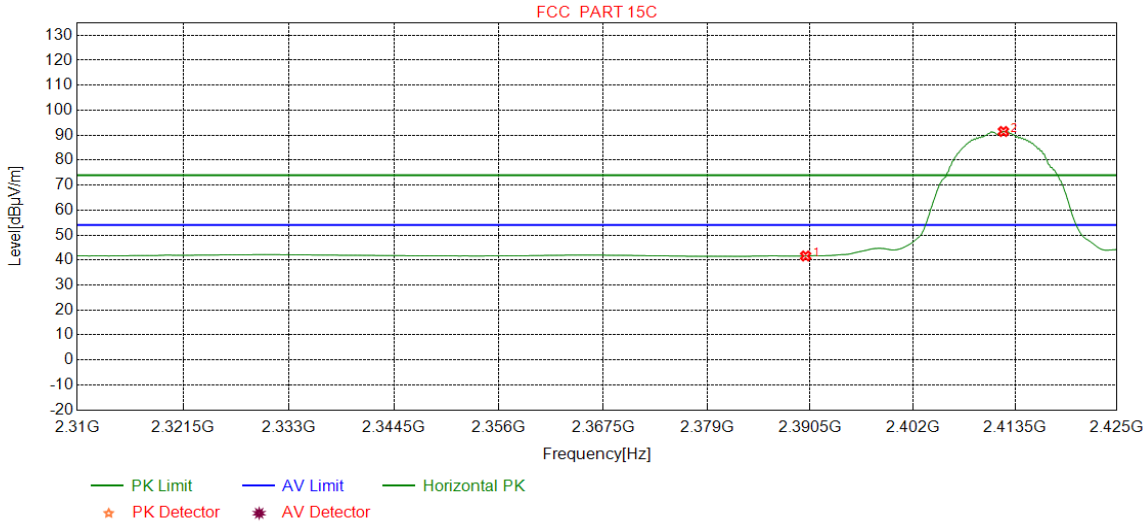
**Test Graph**




| NO | Freq. [MHz] | Ant Factor [dB] | Cable loss [dB] | Pream gain [dB] | Reading [dBµV] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Result | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2390.0000 | 32.25 | 13.37 | -43.12 | 50.04 | 52.54 | 74.00 | 21.46 | Pass | Vertical |
| 2 | 2410.7509 | 32.28 | 13.35 | -43.12 | 83.86 | 86.37 | 74.00 | -12.37 | Pass | Vertical |

| Mode: | 802.11 b Transmitting | Channel: | 2412 |
|---|---|---|---|
| Remark: | AV | | |

**Test Graph**




| NO | Freq. [MHz] | Ant Factor [dB] | Cable loss [dB] | Pream gain [dB] | Reading [dBµV] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Result | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2390.0000 | 32.25 | 13.37 | -43.12 | 39.12 | 41.62 | 54.00 | 12.38 | Pass | Horizontal |
| 2 | 2412.1902 | 32.28 | 13.36 | -43.12 | 88.96 | 91.48 | 54.00 | -37.48 | Pass | Horizontal |