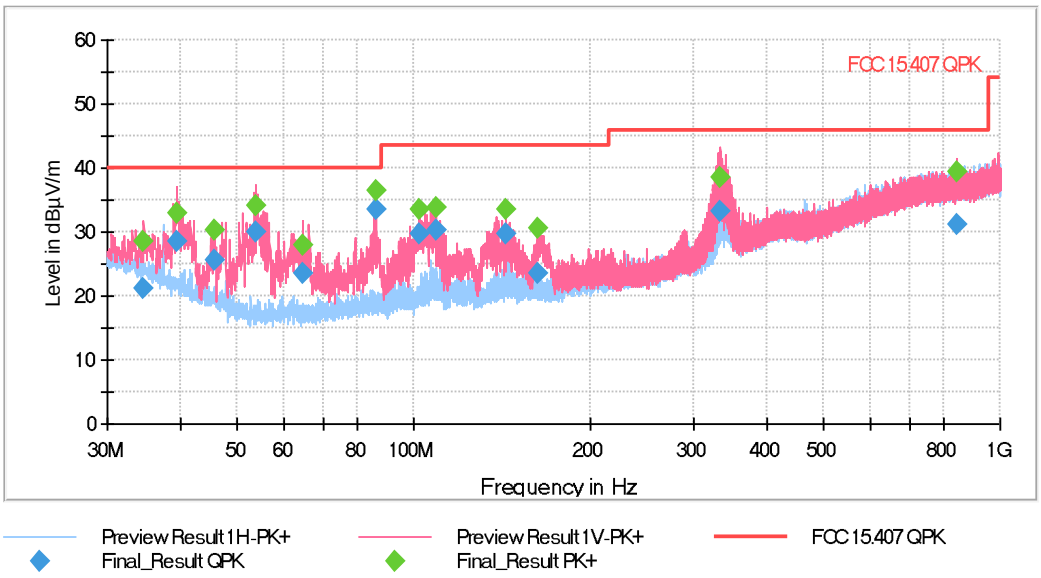
**SISO worst-case:**

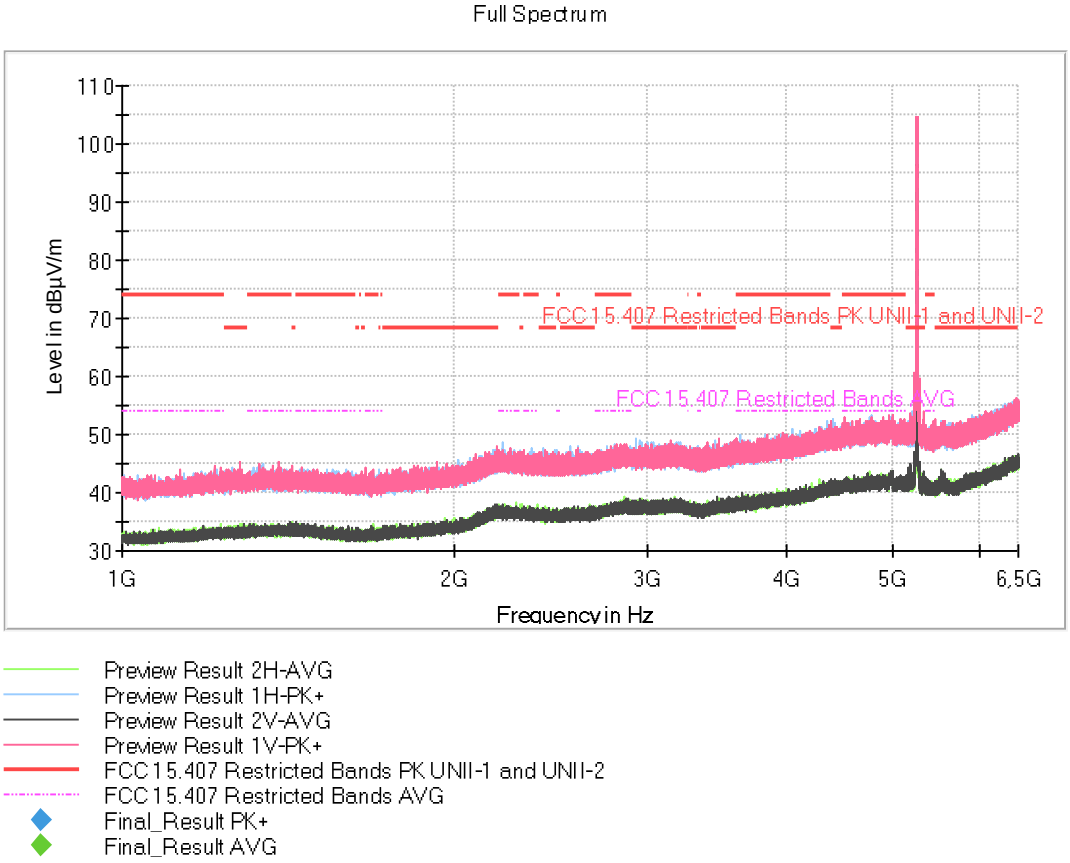
**FREQUENCY RANGE 30 MHz - 1 GHz (SISO worst-case):**

This plot is valid for the Low, Middle and High Channels and all the modulation modes.



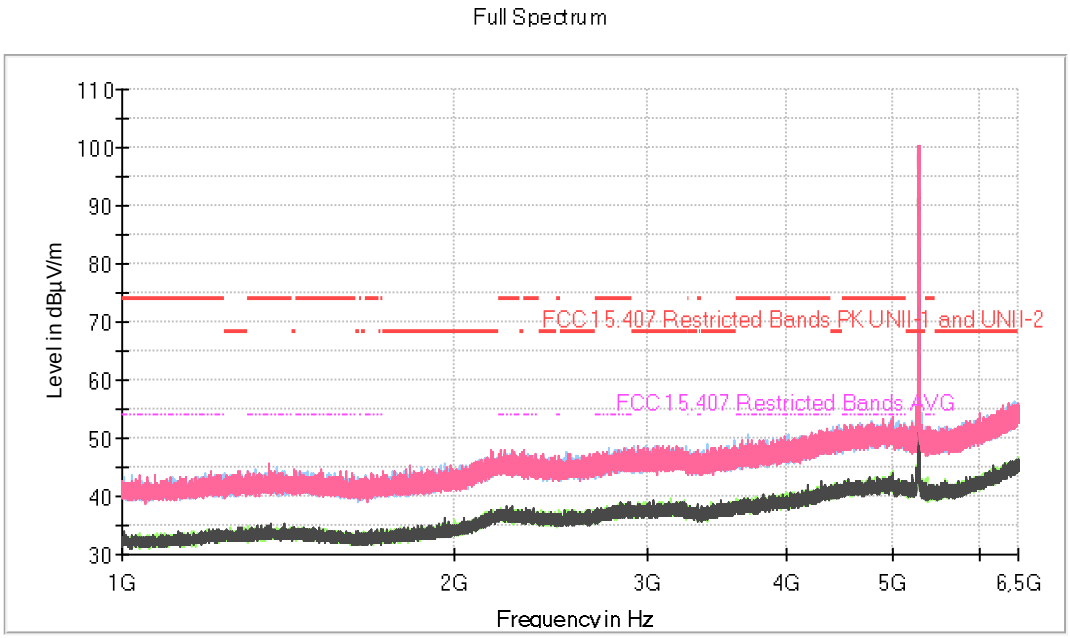
**FREQUENCY RANGE 1 – 6.5 GHz (SISO worst-case):**

- Low Channel:



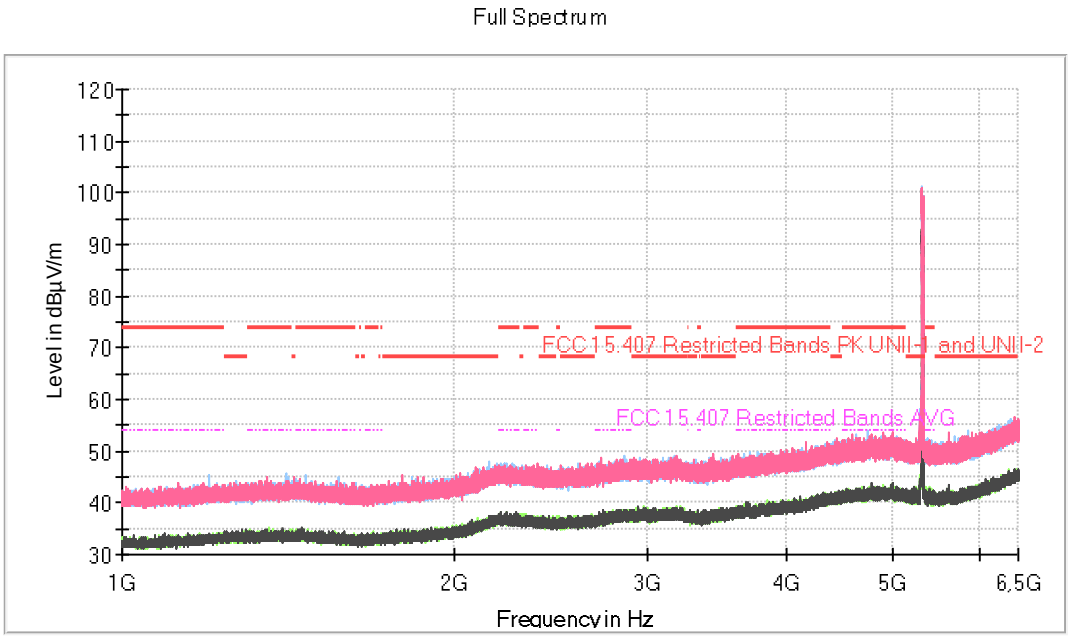

Note: The peak shown in the plot above the limit is the carrier frequency.

- Middle Channel:




Note: The peak shown in the plot above the limit is the carrier frequency.

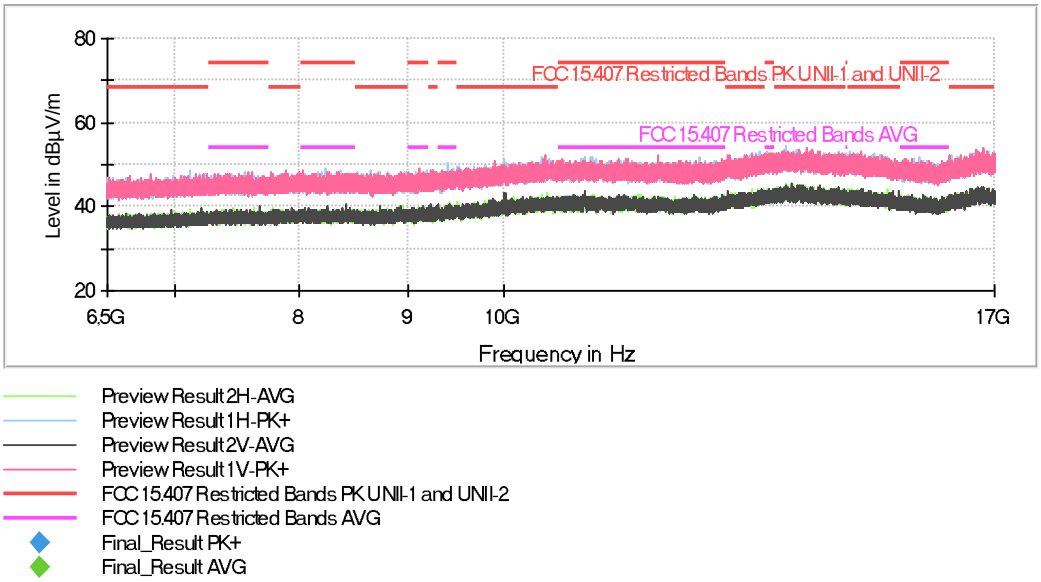
- High Channel:



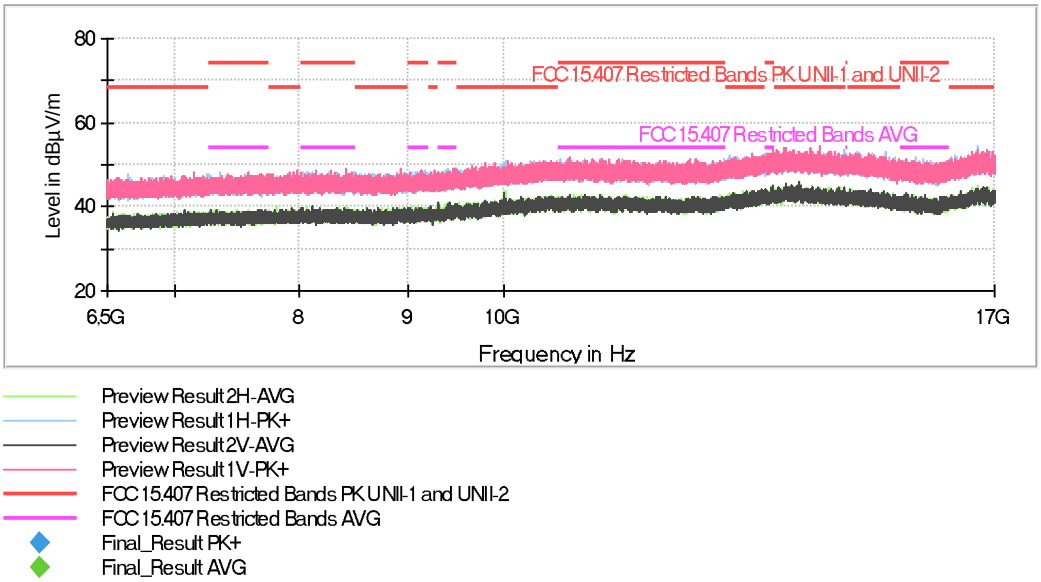

Note: The peak shown in the plot above the limit is the carrier frequency.

## FREQUENCY RANGE 6.5 - 17 GHz (SISO worst-case):

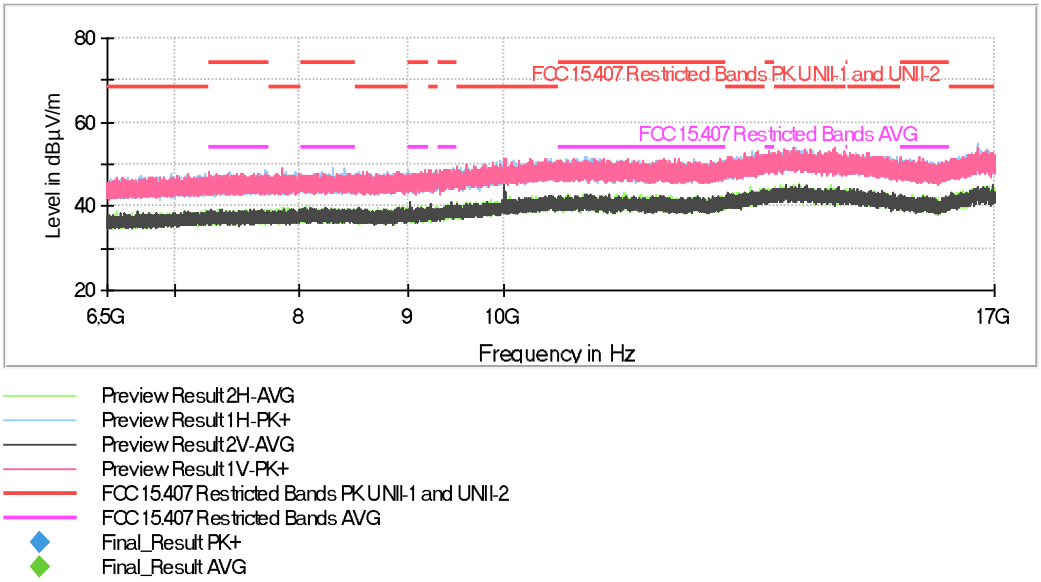
- Low Channel:




- Middle Channel:

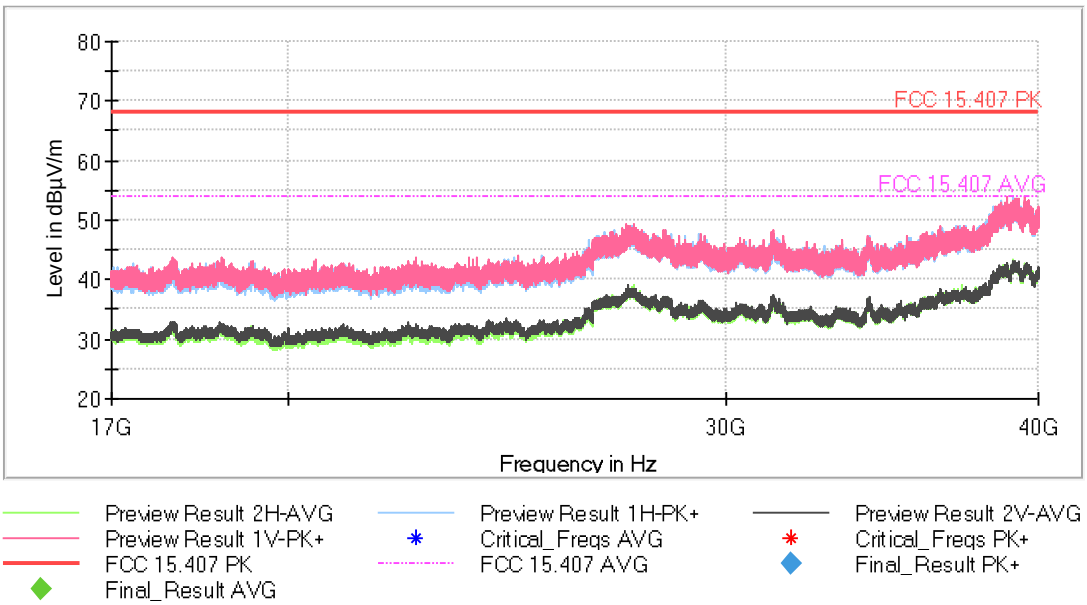


- High Channel:




**FREQUENCY RANGE 17 - 40 GHz (SISO worst-case):**

This plot is valid for all the Channels and all the modulation modes and bandwidths.



**MIMO worst-case:**

- Preliminary tests determined the MIMO worst-case: Chain 0+1.

  **Worst-case:** 802.11 a20

**Frequency range 30 MHz - 1 GHz (MIMO worst-case):**

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious frequencies detected at less than 20 dB below the limit:

| Spurious frequency (MHz) | Emission Level (dBµV/m) | Polarization | Detector |
|---|---|---|---|
| 34.487820 | 39.30 | V | Peak |
| | 35.02 | | QP |
| 39.247254 | 32.00 | V | Peak |
| | 29.29 | | QP |
| 45.722158 | 36.45 | V | Peak |
| | 32.58 | | QP |
| 53.253754 | 31.53 | V | Peak |
| | 30.08 | | QP |
| 64.504875 | 30.82 | V | Peak |
| | 27.80 | | QP |
| 86.840938 | 36.74 | V | Peak |
| | 32.77 | | QP |
| 101.720940 | 36.20 | V | Peak |
| | 32.75 | | QP |
| 108.186779 | 31.01 | V | Peak |
| | 25.10 | | QP |
| 142.978722 | 31.12 | V | Peak |
| | 25.60 | | QP |
| 162.024188 | 30.23 | V | Peak |
| | 21.90 | | QP |
| 333.007188 | 40.81 | V | Peak |
| | 37.31 | | QP |
| 841.995938 | 38.60 | V | Peak |
| | 30.80 | | QP |

**Frequency range 1 - 40 GHz (MIMO worst-case):**

The results in the next tables show the maximum measured levels in the 1-40 GHz frequency range.

The Low, Middle and High Channels were measured for out-of-band emissions for the worst mode.

Spurious frequencies with peak levels above the average limit (54 dBµV/m at 3 m) are measured with an average detector for checking compliance with the average limit.

- **MIMO 802.11 n20 (HT20) (MIMO worst-case):**

  No spurious frequencies detected at less than 20 dB below the limit.

Verdict: PASS

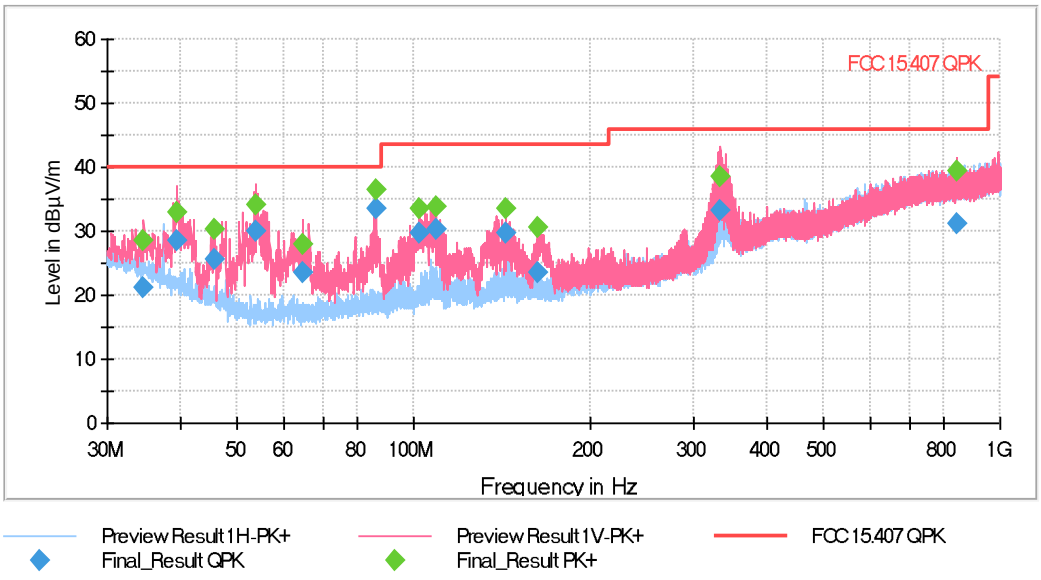
The measurement settings for each range of frequency is as follows:

| Subrange | Step Size | Detectors | Bandwidth | Sweep Time | Preamp |
|---|---|---|---|---|---|
| Receiver: [ESW 44] | | | | | |
| 30 MHz - 1 GHz | 30,312 kHz | PK+ | 100 kHz | 1 s | 30 dB |
| **Subrange** | **Step Size** | **Detectors** | **Bandwidth** | **Sweep Time** | **Preamp** |
| Receiver: [FSW 50] | | | | | |
| 1 GHz - 6,5 GHz | 100 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |
| **Subrange** | **Step Size** | **Detectors** | **Bandwidth** | **Sweep Time** | **Preamp** |
| Receiver: [ESW 44] | | | | | |
| 6,5 GHz - 17 GHz | 105 kHz | PK+ ; AVG | 1 MHz | 1 s | 30 dB |
| **Subrange** | **Step Size** | **Detectors** | **Bandwidth** | **Sweep Time** | **Preamp** |
| Receiver: [ESU 40] | | | | | |
| 17 GHz - 28,5 GHz | 383,333 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |
| 28,5 GHz - 40 GHz | 383,333 kHz | PK+ ; AVG | 1 MHz | 1 s | 0 dB |

**MIMO worst-case:**

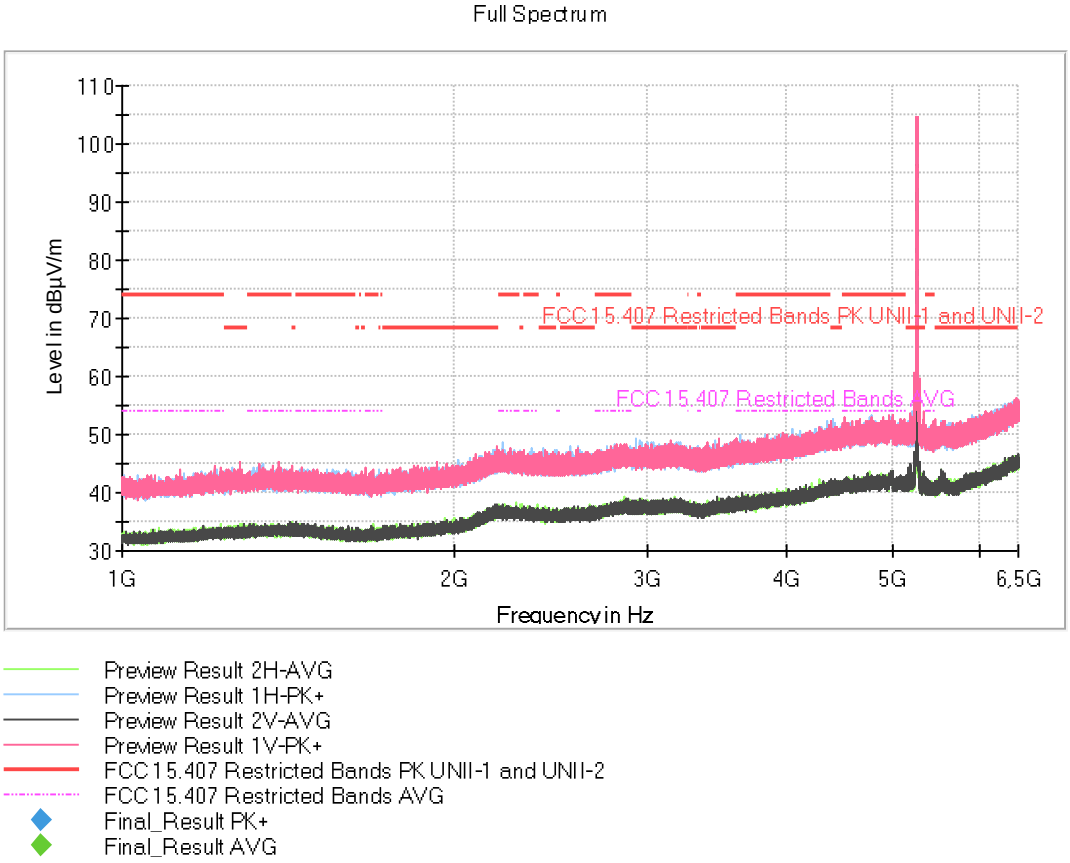
**FREQUENCY RANGE 30 MHz - 1 GHz (MIMO worst-case):**

This plot is valid for the Low, Middle and High Channels and all the modulation modes.



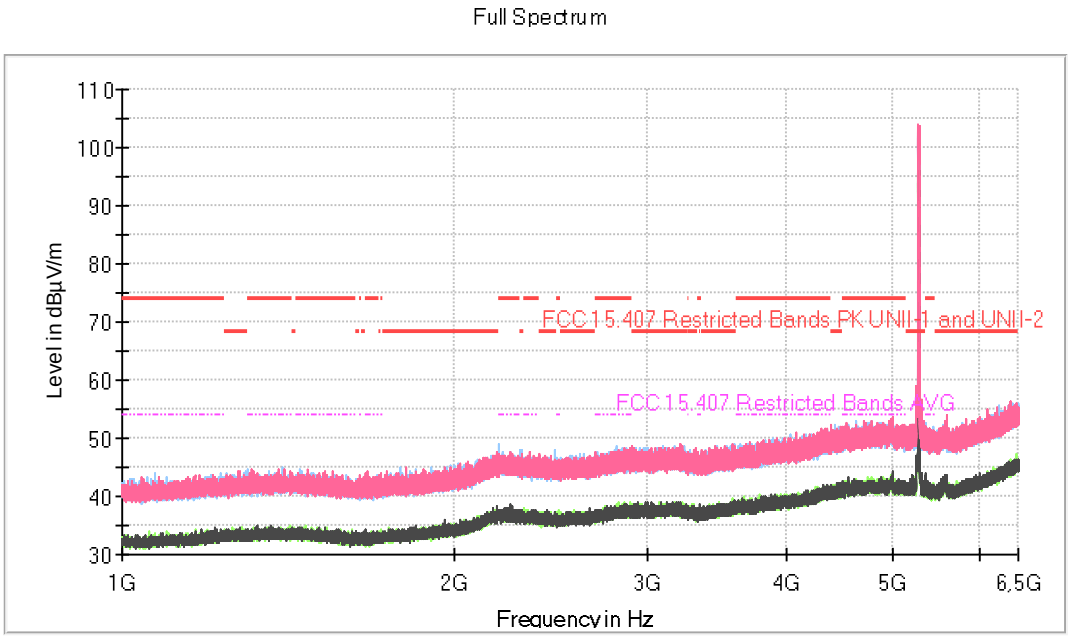
**FREQUENCY RANGE 1 – 6.5 GHz (MIMO worst-case):**

- Low Channel:



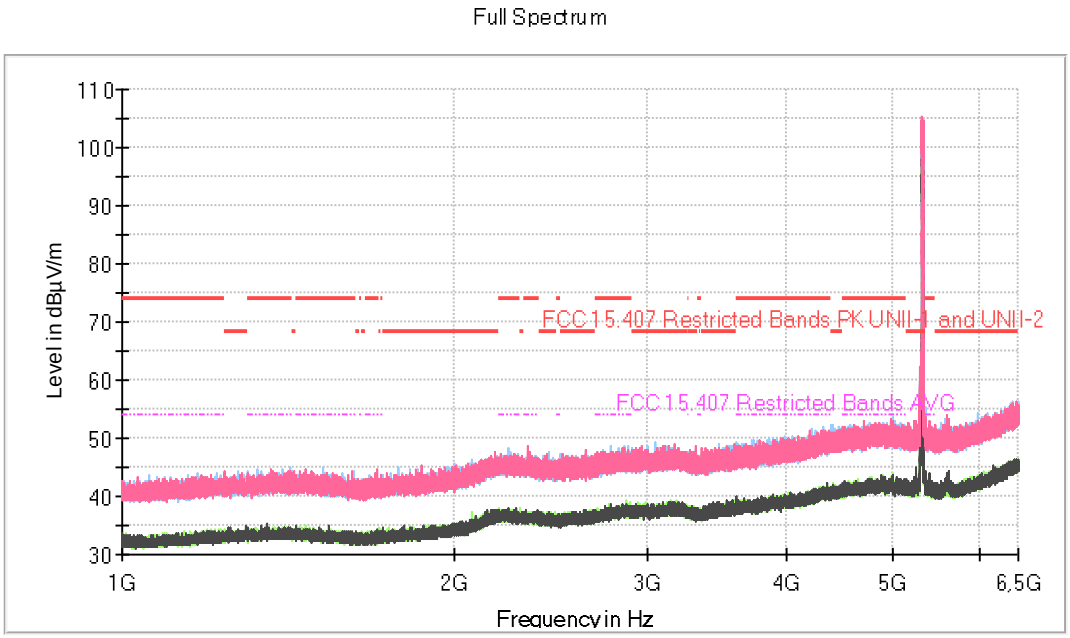

Note: The peak shown in the plot above the limit is the carrier frequency.

- Middle Channel:




Note: The peak shown in the plot above the limit is the carrier frequency.

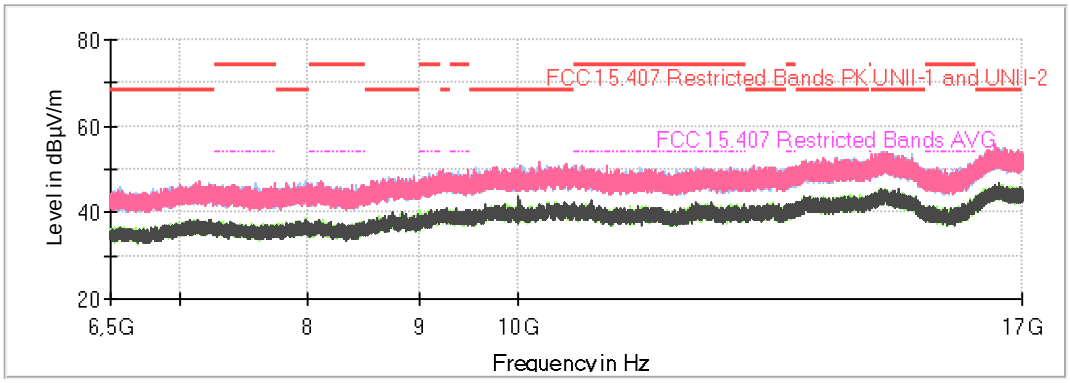
- High Channel:




Note: The peak shown in the plot above the limit is the carrier frequency.

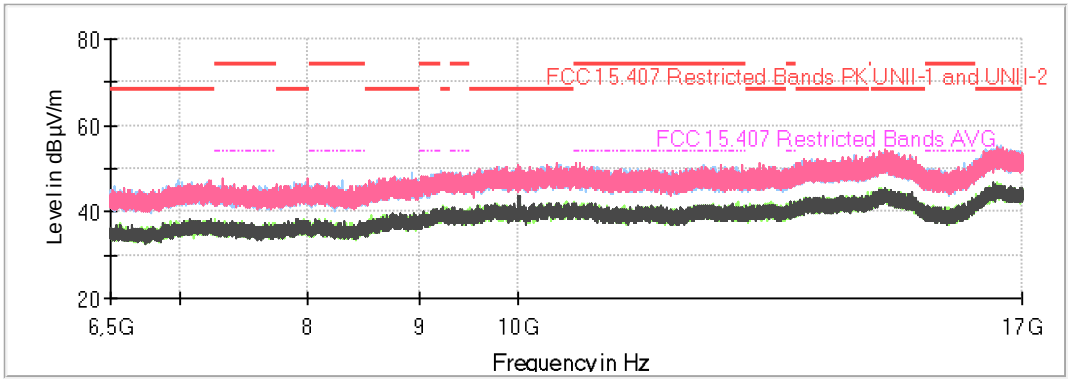
**FREQUENCY RANGE 6.5 - 17 GHz (MIMO worst-case):**

- Low Channel:



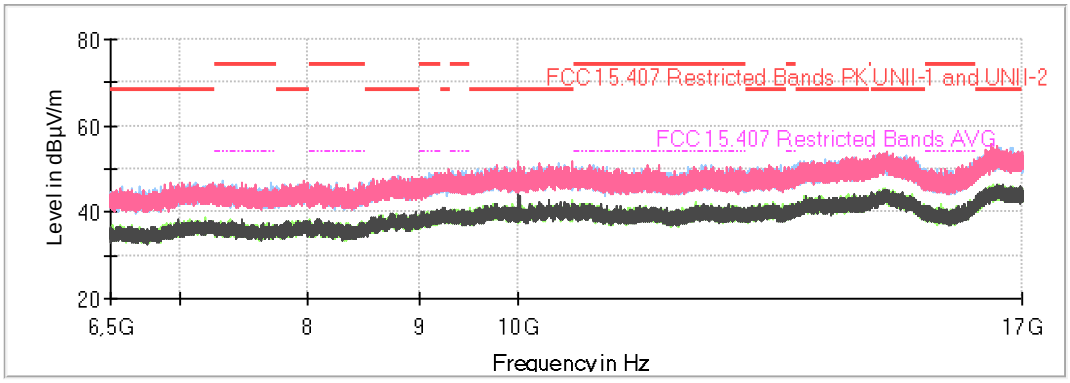

Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

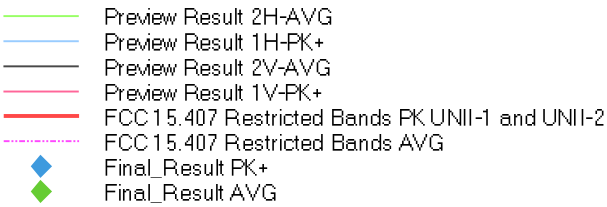
- Middle Channel:




Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

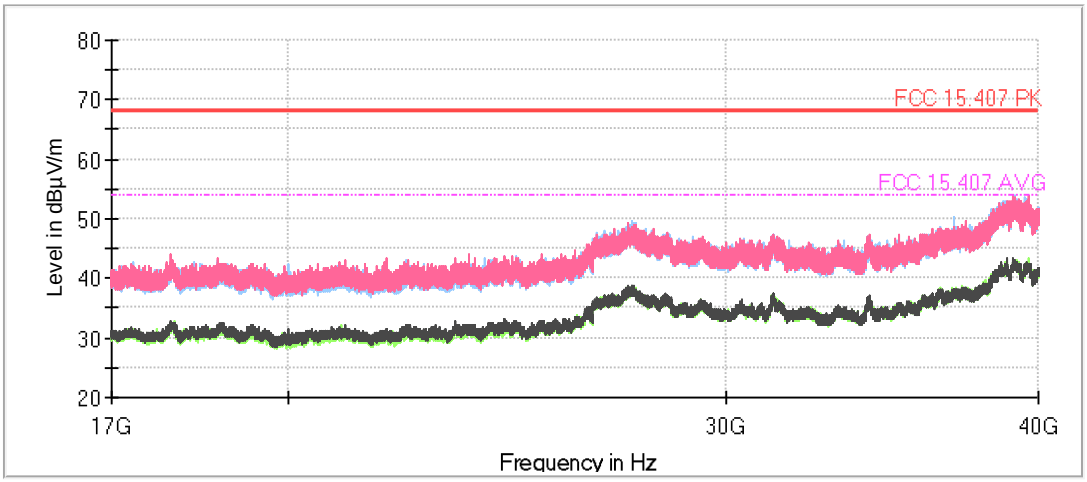
- High Channel:

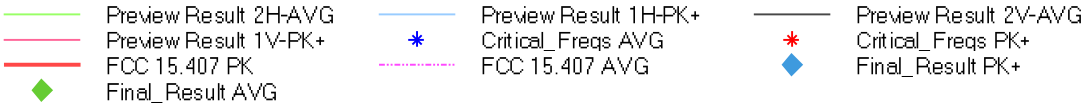



**FREQUENCY RANGE 17 - 40 GHz (MIMO worst-case):**

This plot is valid for all the Channels and all the modulation modes and bandwidths.



# FCC 15.407 (b)(1) / RSS-247 6.2.1.2. Band Edge Radiated Emissions

SPECIFICATION:

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.20 dBµV/m at 3 m distance).

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

| Frequency Range (MHz) | Field strength (µV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|---|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | - | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| 960 - 40000 | 500 | 54 | 3 |

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.
Measurements were made in both horizontal and vertical planes of polarization.
The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º to find the maximum radiated emission.

All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
There are restricted bands of operation below band edge at 4.50-5.15 GHz also above the upper band edge at 5.35-5.46 GHz therefore the provision of FCC Part 15.205 apply.

Field strength measurements using peak and average detector performed in the restricted bands below 5.15 GHz and above 5.35 GHz.

- Preliminary tests determined the SISO worst-case: Chain 1.
- Preliminary tests determined the MIMO worst-case: Chain 0+1.

Test performed on the following worst-cases modes in all relevant tests channels for both techniques:

- 802.11a: 6 Mbps SISO 1Tx on WLAN1.
- 802.11n HT20: MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11n HT40: MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ac VHT20: MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ac VHT40: MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.
- 802.11ac VHT80: MCS0 SISO 1Tx on WLAN1 / MIMO 2Tx on WLAN12.

**BAND EDGE EMISSIONS**: For U-NII-2A, band edge spurious emissions inside of the Restricted Bands 4.50-5.15 GHz and 5.35-5.46 GHz.

The Lower Band Edge of the Low Channel and the Upper Band Edge of the High Channel were tested for all modes.

**SISO worst-case:**

- **SISO 802.11 a20:**

- Lower Band Edge Channel 52 (5260 MHz). No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.

- Upper Band Edge Channel 64 (5320 MHz). No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **SISO 802.11 n20:**

- Lower Band Edge Channel 52 (5260 MHz). No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.

- Upper Band Edge Channel 64 (5320 MHz). No spurious emissions inside the Restricted Band 5.35-5.46 GHz.

- **SISO 802.11 ac20:**

- Lower Band Edge Channel 52 (5260 MHz). No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.

- Upper Band Edge Channel 64 (5320 MHz). No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **SISO 802.11 n40:**

- Lower Band Edge Channel 52 (5260 MHz). No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.

- Upper Band Edge Channel 64 (5320 MHz). No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **SISO 802.11 ac40:**

- Lower Band Edge Channel 52 (5260 MHz). No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.

- Upper Band Edge Channel 64 (5320 MHz). No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **SISO 802.11 ac80:**

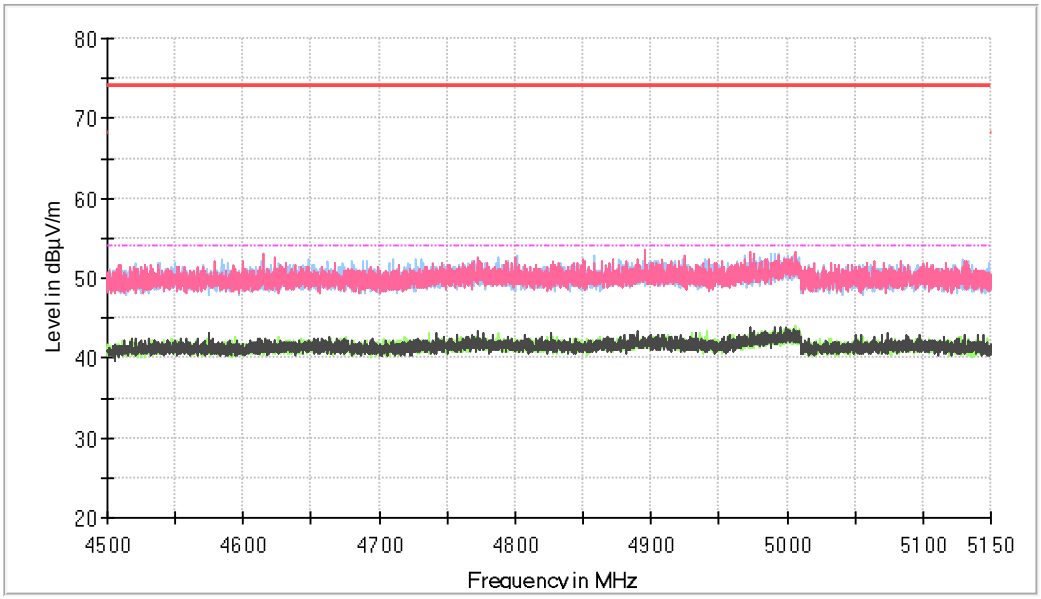
- Lower Band Edge Channel 52 (5260 MHz). No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.

- Upper Band Edge Channel 64 (5320 MHz). No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

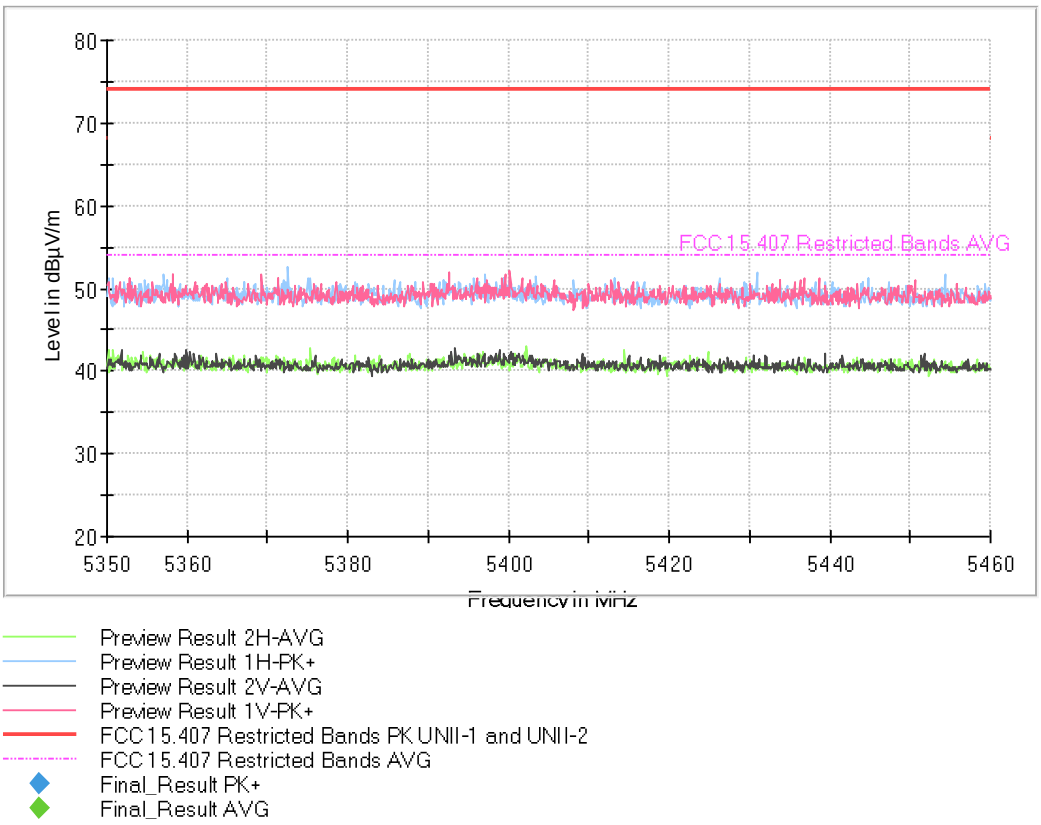
Verdict: PASS

- **SISO 802.11 a20:**

  - Lower Band Edge Channel 52 (Restricted Band 4.50-5.15 GHz)

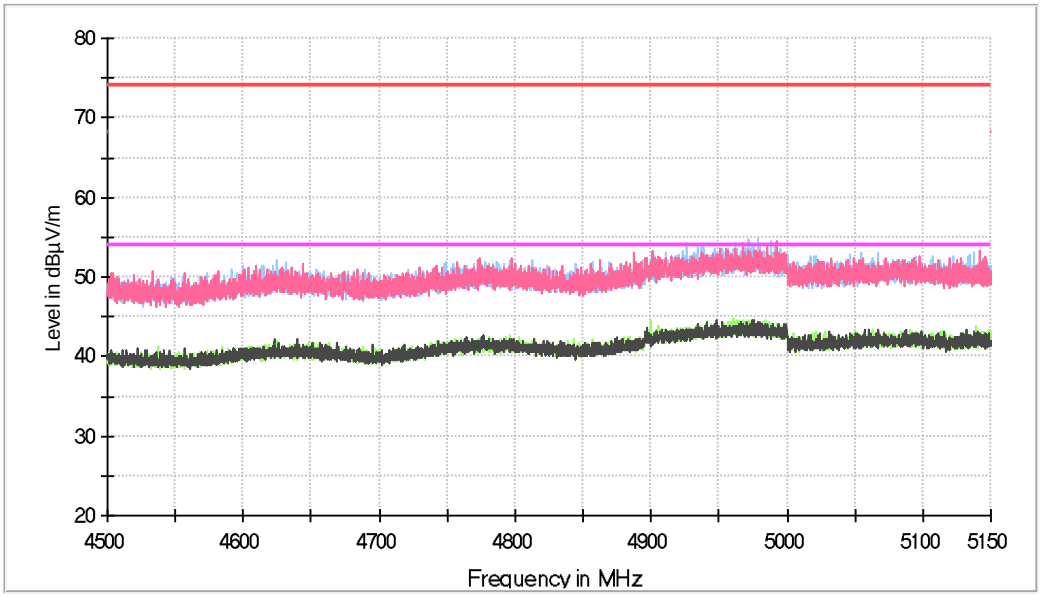


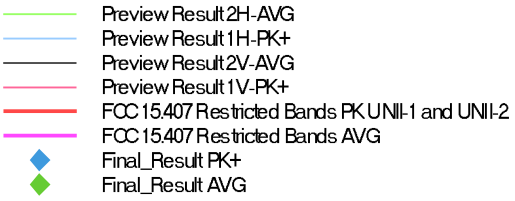
- Upper Band Edge Channel 64 (Restricted Band 5.35-5.46 GHz)



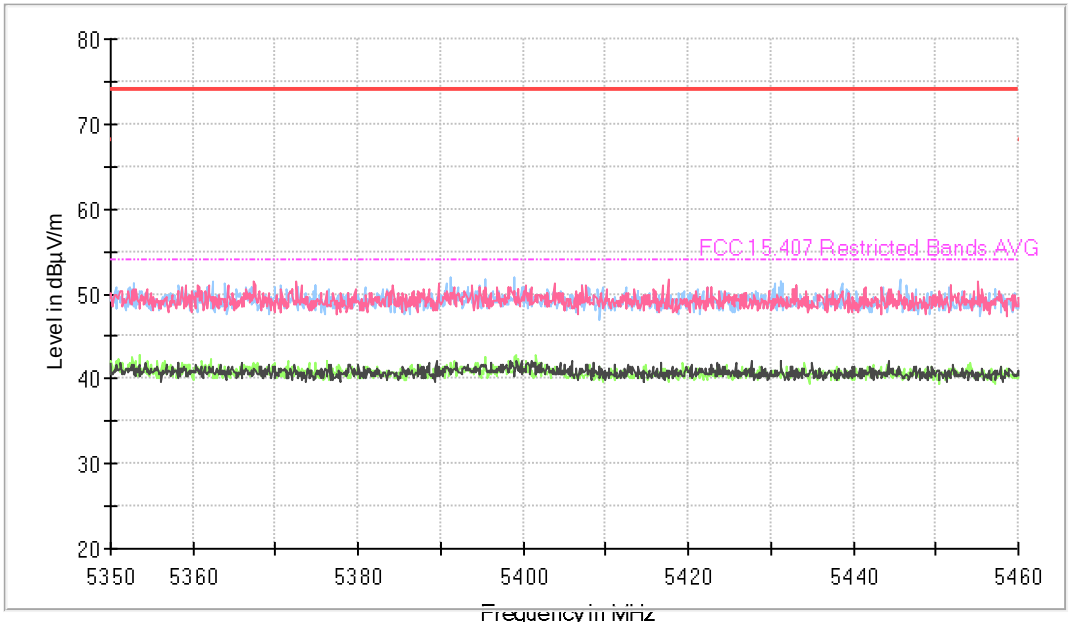
- **SISO 802.11 n20:**

  - Lower Band Edge Channel 52 (Restricted Band 4.50-5.15 GHz)



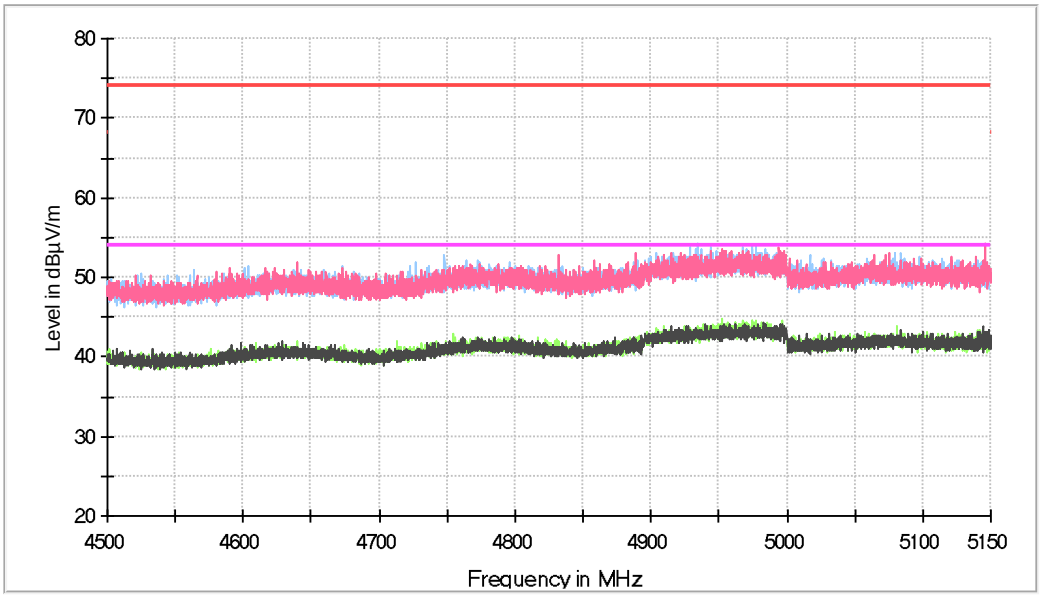
- Upper Band Edge Channel 64 (Restricted Band 5.35-5.46 GHz)




Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- **SISO 802.11 ac20:**

  - Lower Band Edge Channel 52 (Restricted Band 4.50-5.15 GHz)



- Upper Band Edge Channel 64 (Restricted Band 5.35-5.46 GHz)