



## **2.5 Spurious Radiated Emissions**

### **2.5.1 Specification Reference**

FCC 47 CFR Part 15E, Clause 15.407 (b) and 15.205  
Industry Canada RSS-247, Clause 6.2  
Industry Canada RSS-GEN, Clause 6.13

### **2.5.2 Equipment Under Test and Modification State**

A1932, S/N: C02X5003L3J0 - Modification State 0

### **2.5.3 Date of Test**

05-September-2018 to 28-September-2018

### **2.5.4 Test Method**

Testing was performed in accordance with ANSI C63.10 clause 6.3, 6.5 and 6.6.

Tests were performed in HT20 CDD in 2TX MIMO mode, with measurements undertaken from 30MHz to 40GHz, on channel 36 (5180MHz) and channel 165 (5825MHz). For the purpose of this testing, spurious emissions were limited to 1GHz to 26GHz on all other test channels.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 12.7.7.2 with max-hold trace to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (54/74 dBuV/m @ 3m and 64/84 dBuV/m @ 1m) when compared to -27 dBm/MHz EIRP outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBuV/m to uV/m:  
 $10^{(\text{Field Strength in dBuV/m}/20)}$

EIRP was converted to field strength at 3m using the following formula:  
 $\text{Field Strength (dBuV/m at 3m)} = \text{EIRP (dBm)} + 95.2 \text{ dB}$

### **2.5.5 Environmental Conditions**

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 21.8 - 23.5 °C |
| Relative Humidity   | 44.0 - 60.2 %  |



## 2.5.6 Test Results

### Main - 20 MHz Bandwidth

Testing was performed with the device operating at maximum output power, HT20 CDD MIMO 2TX, as this was deemed to be worst case.

| Frequency (MHz) | QP Level (dBuV/m) | QP Limit (dBuV/m) | QP Margin (dBuV/m) | Angle(Deg) | Height(m) | Polarity |
|-----------------|-------------------|-------------------|--------------------|------------|-----------|----------|
| *               |                   |                   |                    |            |           |          |

**Table 215 –30 MHz to 1 GHz – Radiated**

\*No emissions were detected within 10 dB of the limit

| Frequency (GHz) | Result (μV/m) |         | Limit (μV/m) |         | Margin (μV/m) |         |
|-----------------|---------------|---------|--------------|---------|---------------|---------|
|                 | Peak          | Average | Peak         | Average | Peak          | Average |
| *               |               |         |              |         |               |         |

**Table 216 - 1GHz to 40GHz - Emissions Results**

\*No emissions were detected within 10 dB of the limit.

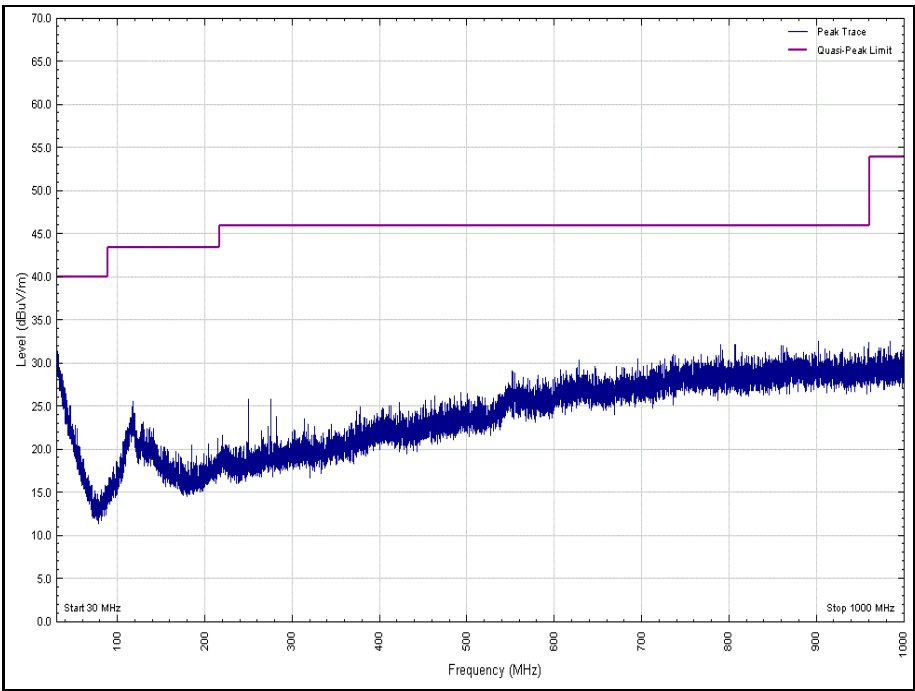


Figure 414 - U-NII 1 - 5180 MHz - 30 MHz to 1 GHz - Polarity: Horizontal

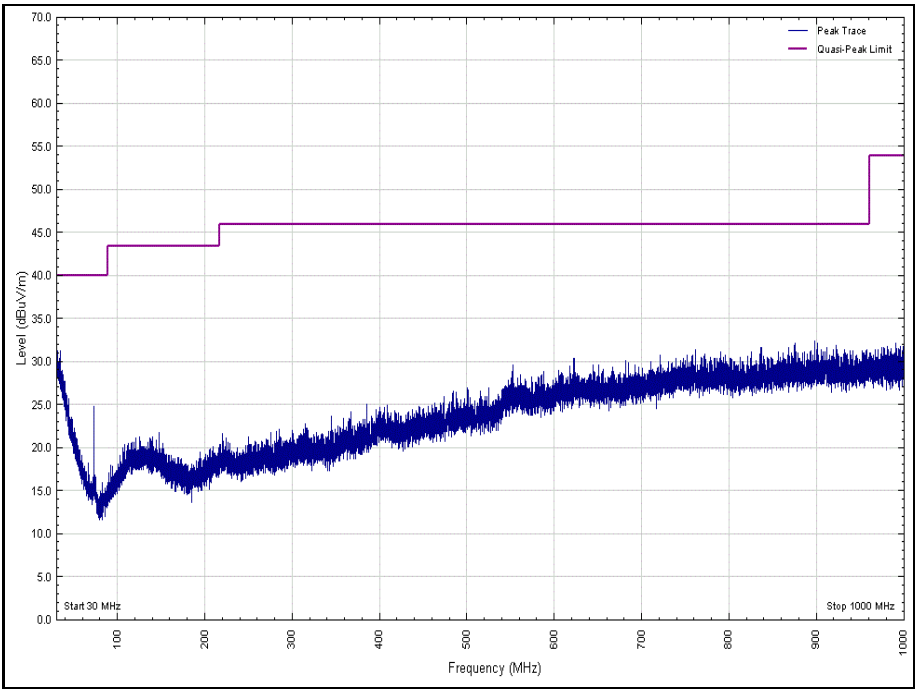


Figure 415 - U-NII 1 - 5180 MHz - 30 MHz to 1 GHz - Polarity: Vertical

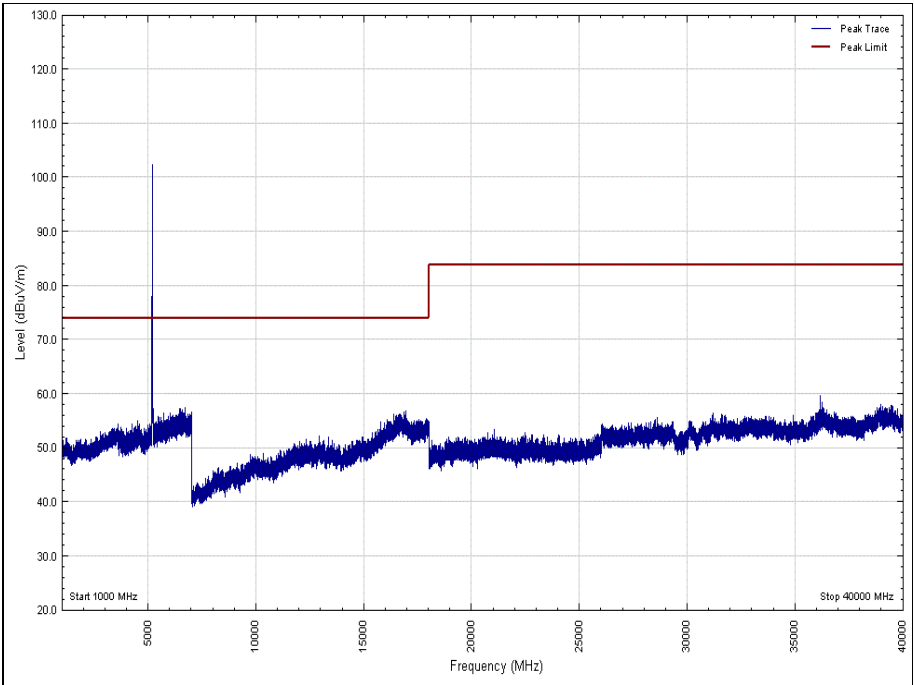


Figure 416 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

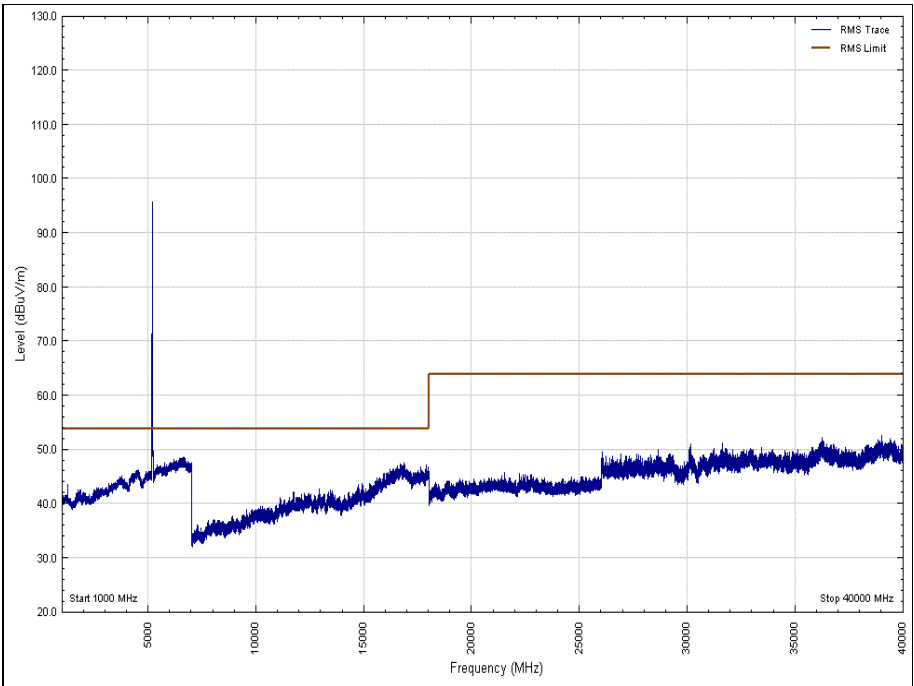


Figure 417 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

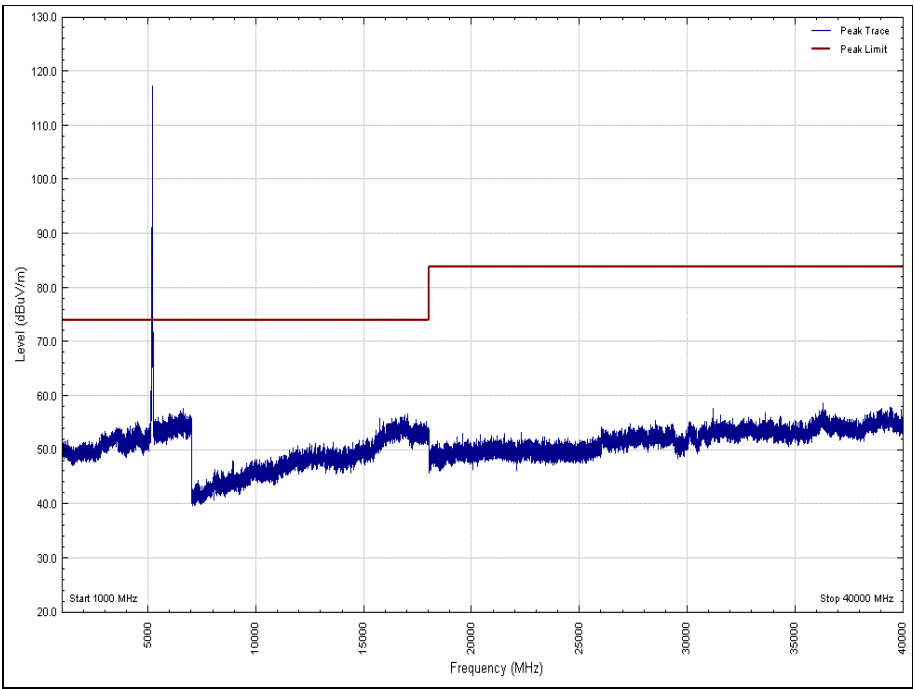


Figure 418 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

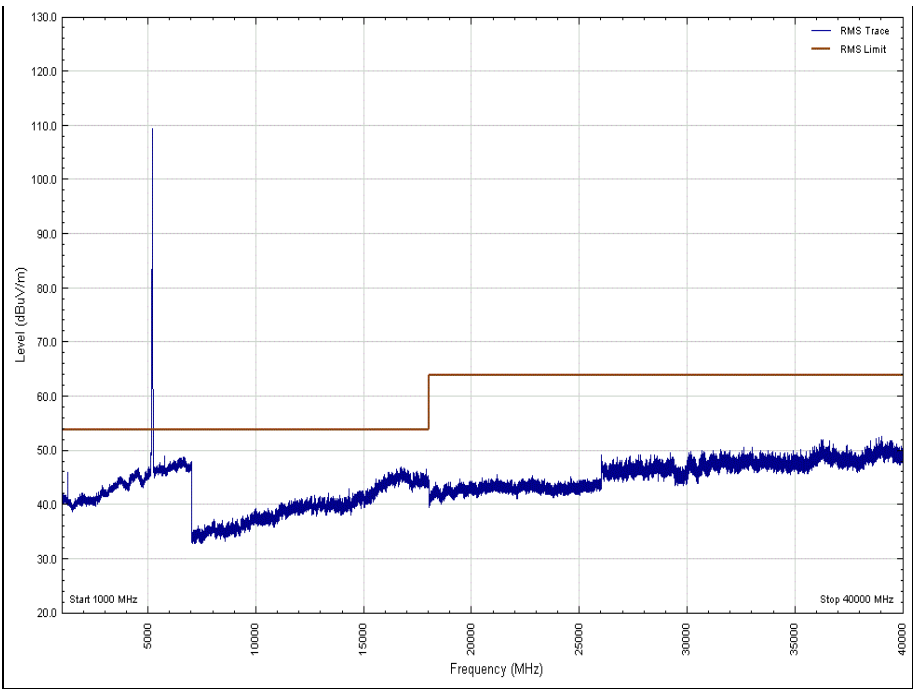


Figure 419 - U-NII 1 - 5180 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)

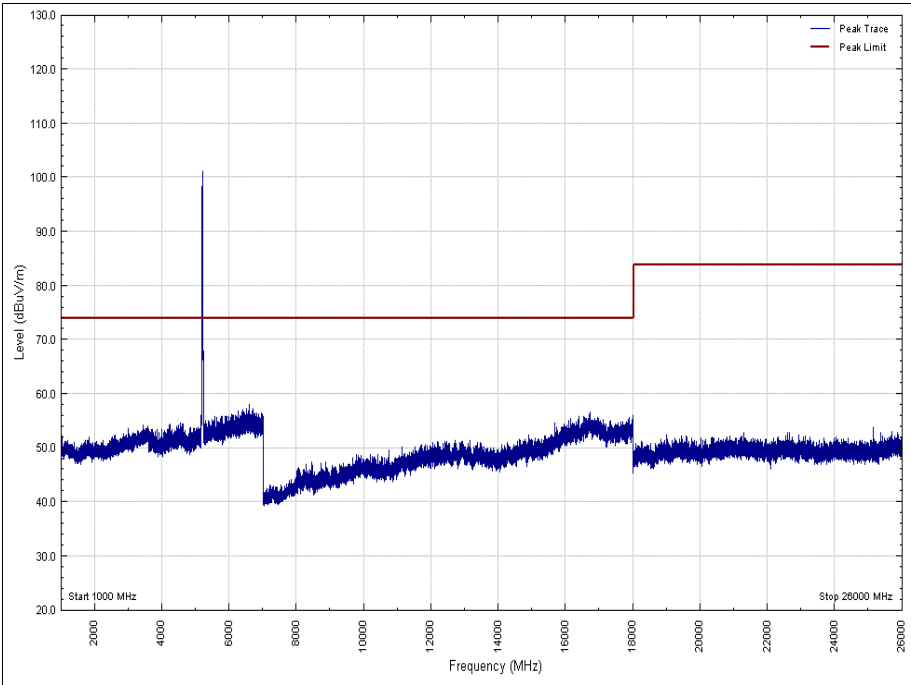


Figure 420 - U-NII 1 - 5240 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Peak)

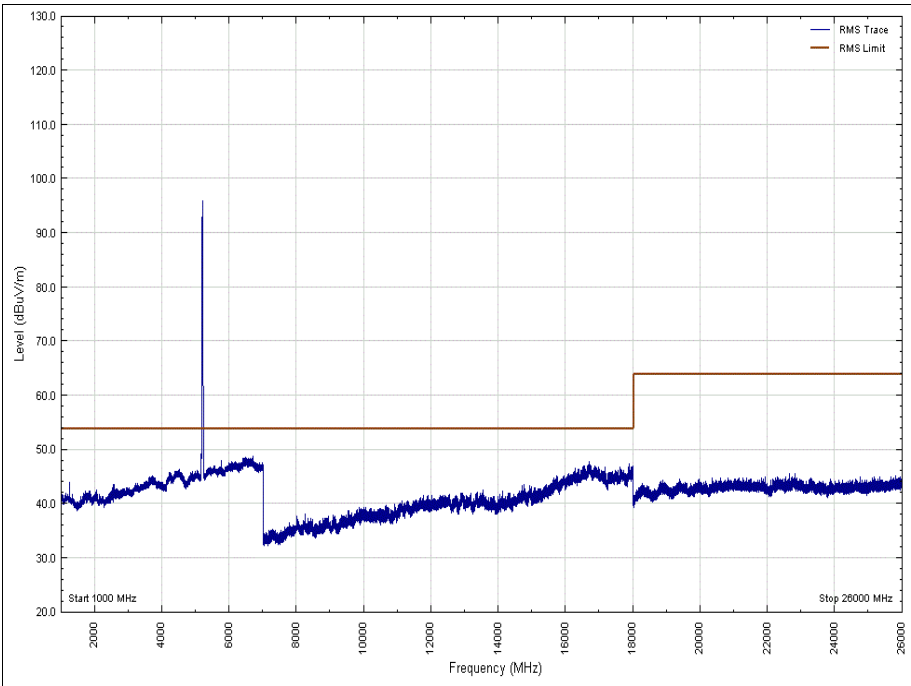


Figure 421 - U-NII 1 - 5240 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Average)

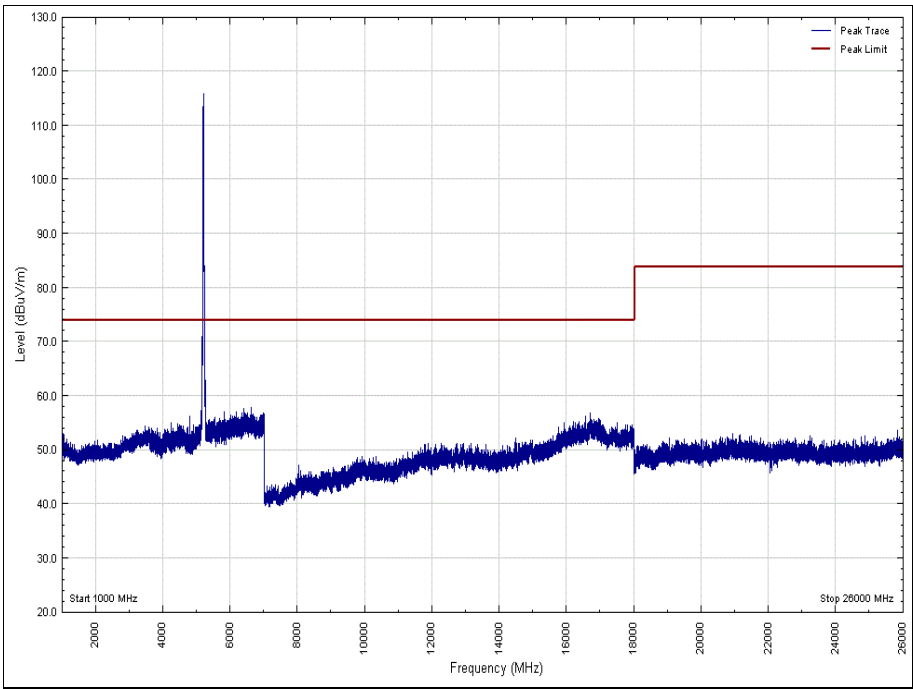


Figure 422 - U-NII 1 - 5240 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

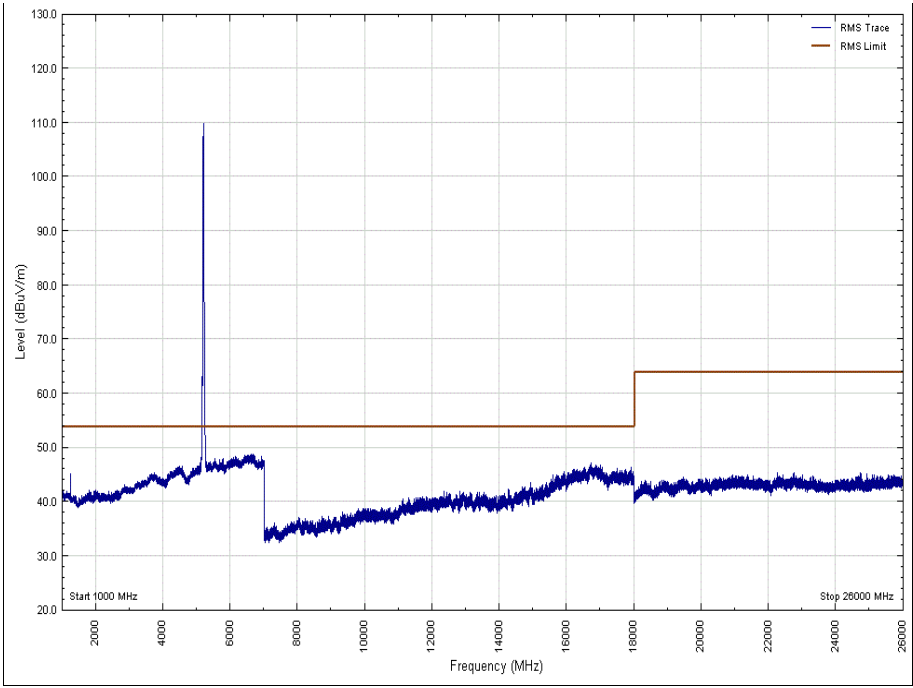


Figure 423 - U-NII 1 - 5240 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

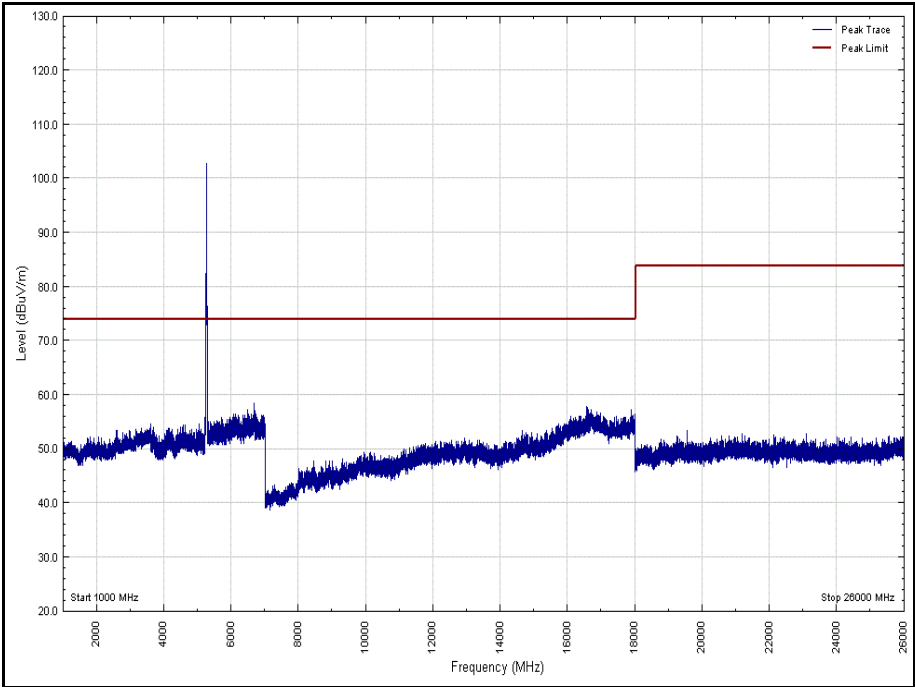


Figure 424 - U-NII 2a - 5260 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Peak)

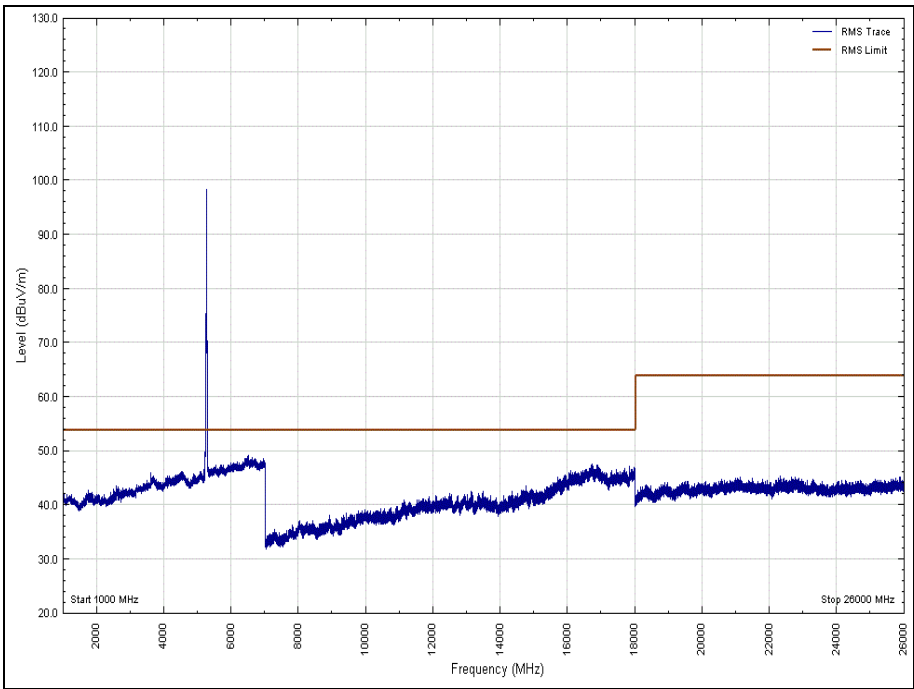


Figure 425 - U-NII 2a - 5260 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Average)



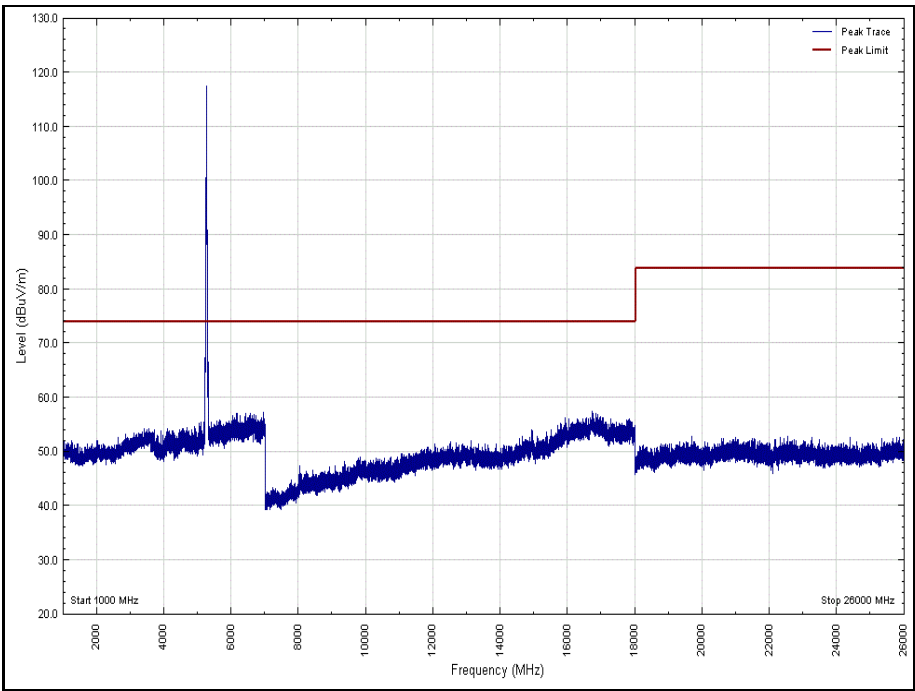


Figure 426 - U-NII 2a - 5260 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

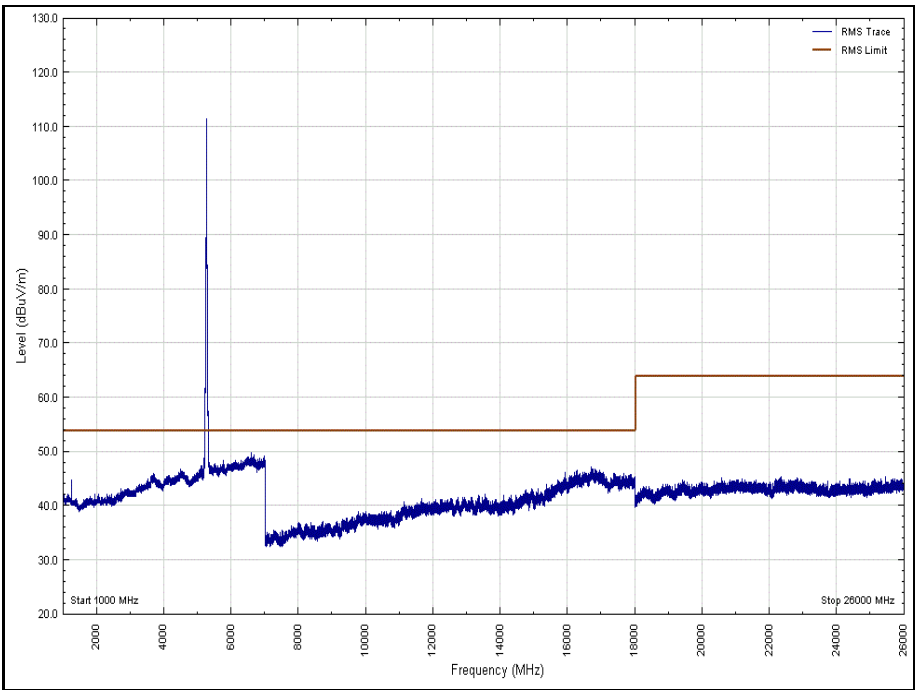


Figure 427 - U-NII 2a - 5260 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

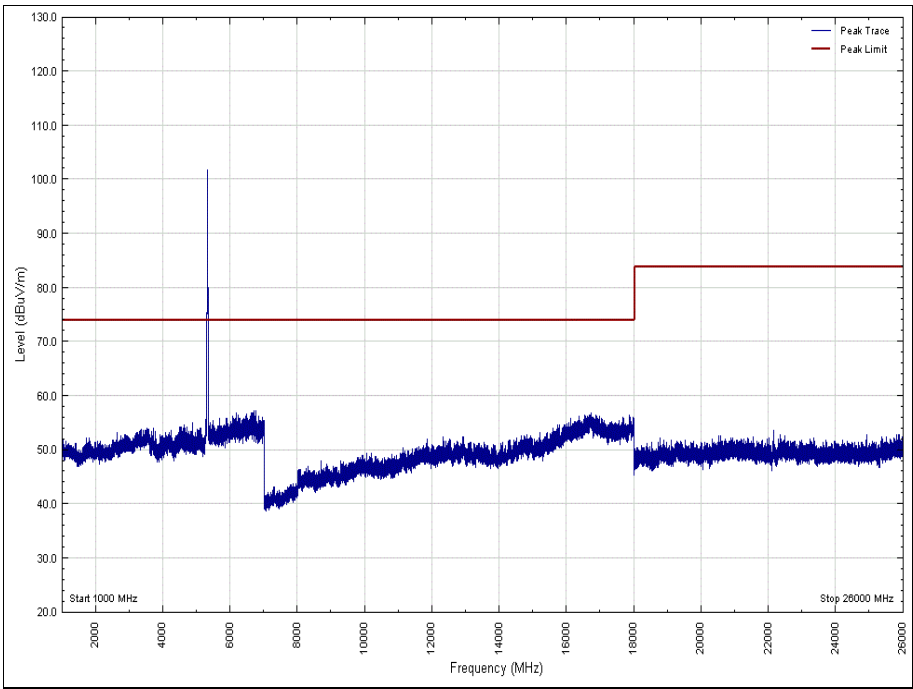


Figure 428 - U-NII 2a - 5320 MHz - 1 GHz to 26 GHz - Polarity: *Horizontal (Peak)*

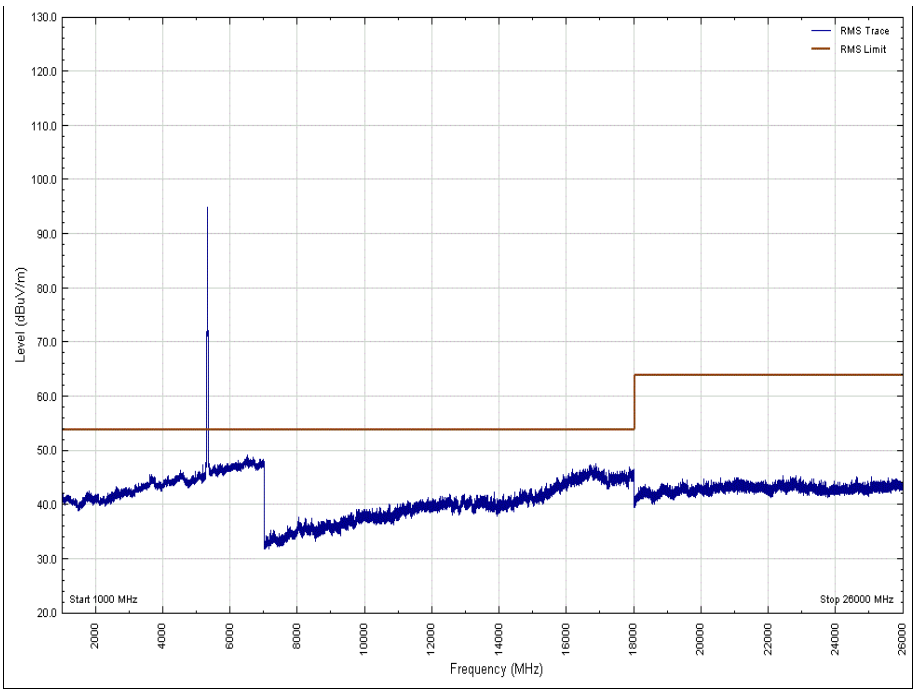


Figure 429 - U-NII 2a - 5320 MHz - 1 GHz to 26 GHz - Polarity: *Horizontal (Average)*

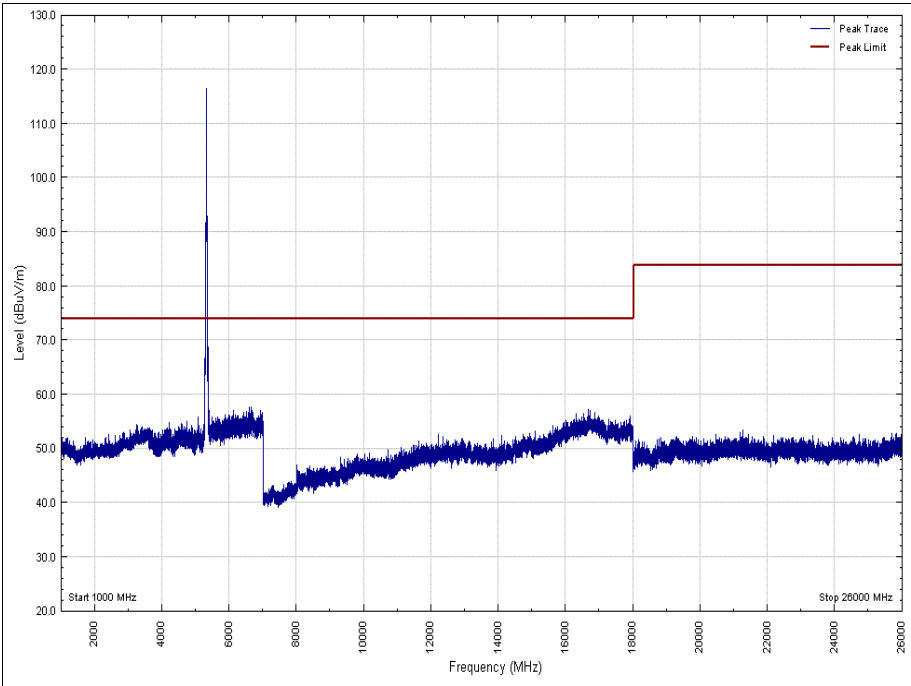


Figure 430 - U-NII 2a - 5320 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

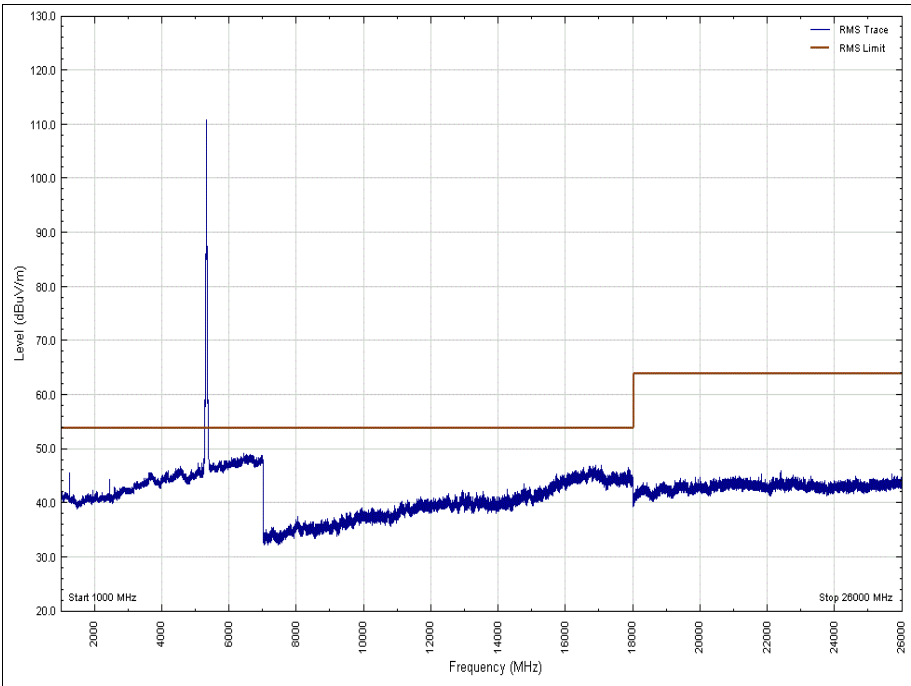


Figure 431 - U-NII 2a - 5320 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

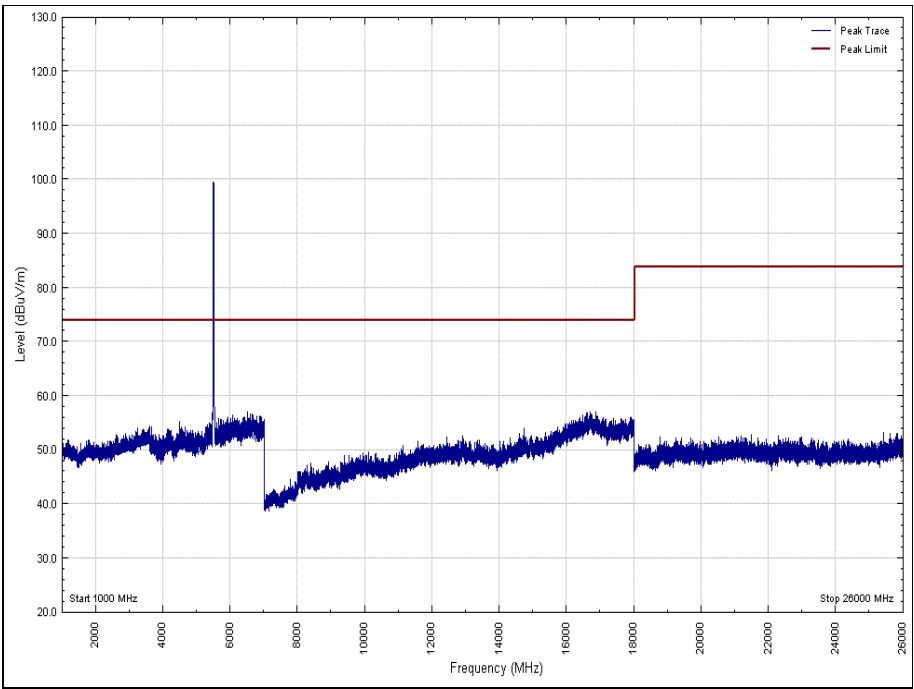


Figure 432 - U-NII 2c - 5500 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Peak)

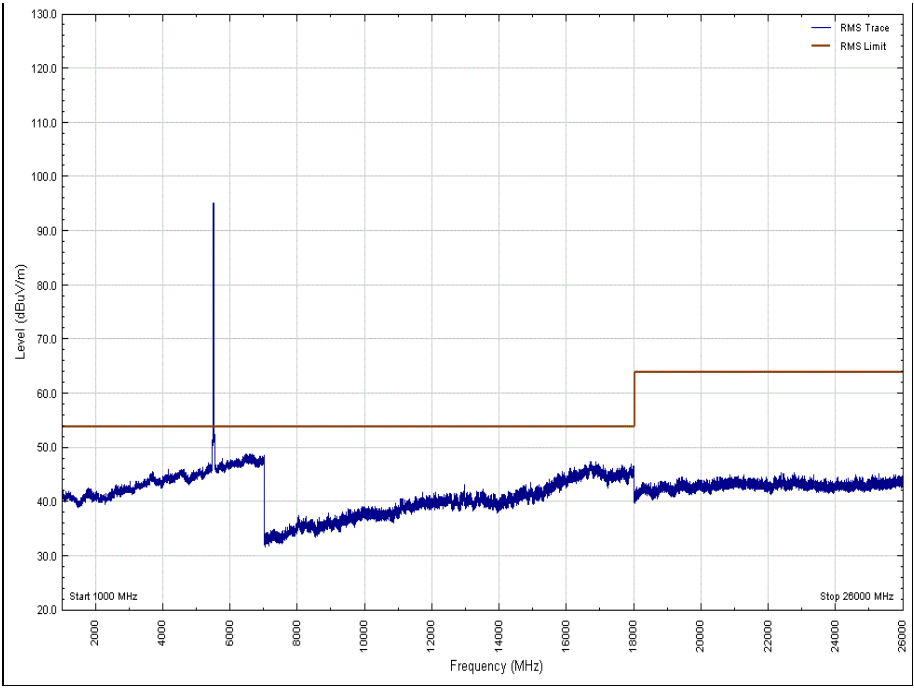


Figure 433 - U-NII 2c - 5500 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Average)

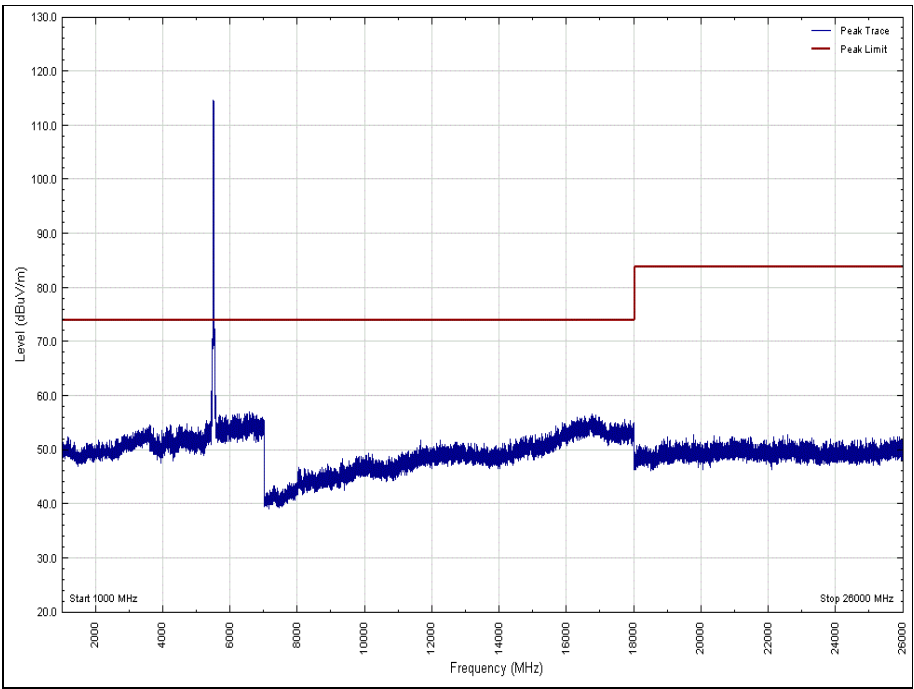


Figure 434 - U-NII 2c - 5500 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

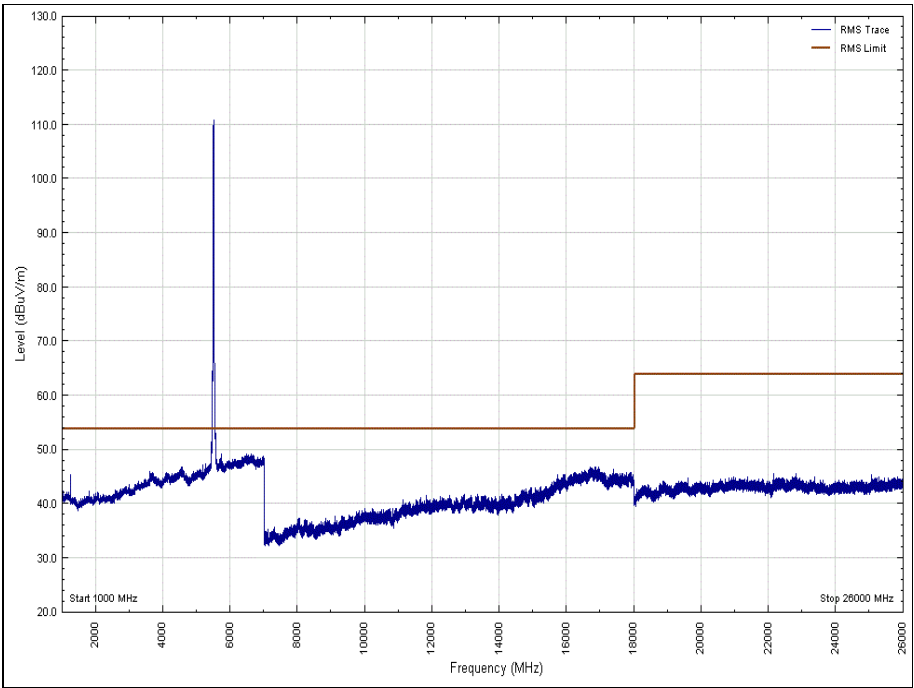


Figure 435 - U-NII 2c - 5500 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

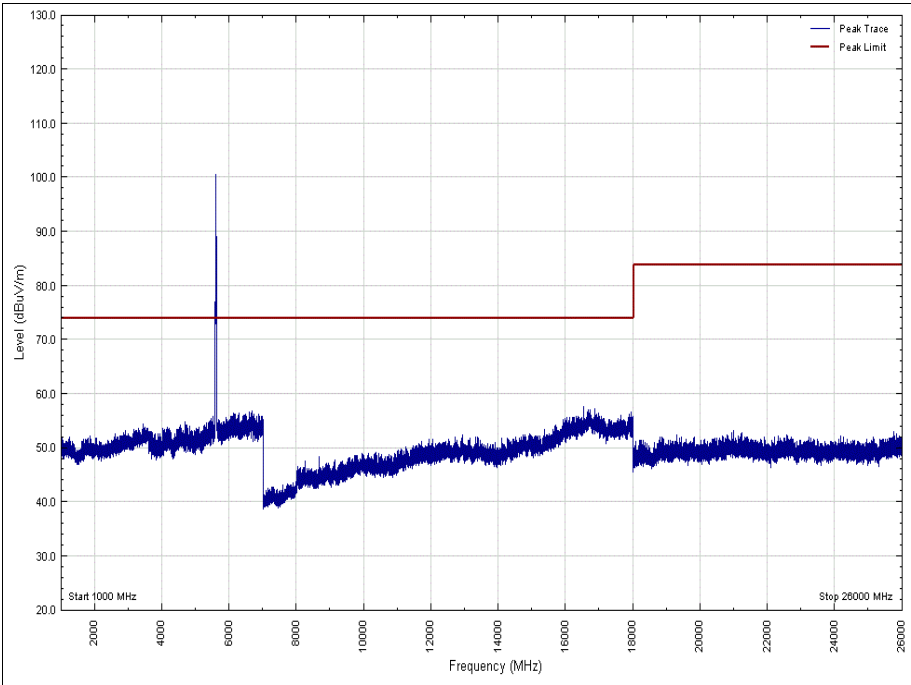


Figure 436 - U-NII 2c - 5600 MHz - 1 GHz to 26 GHz - Polarity: *Horizontal (Peak)*

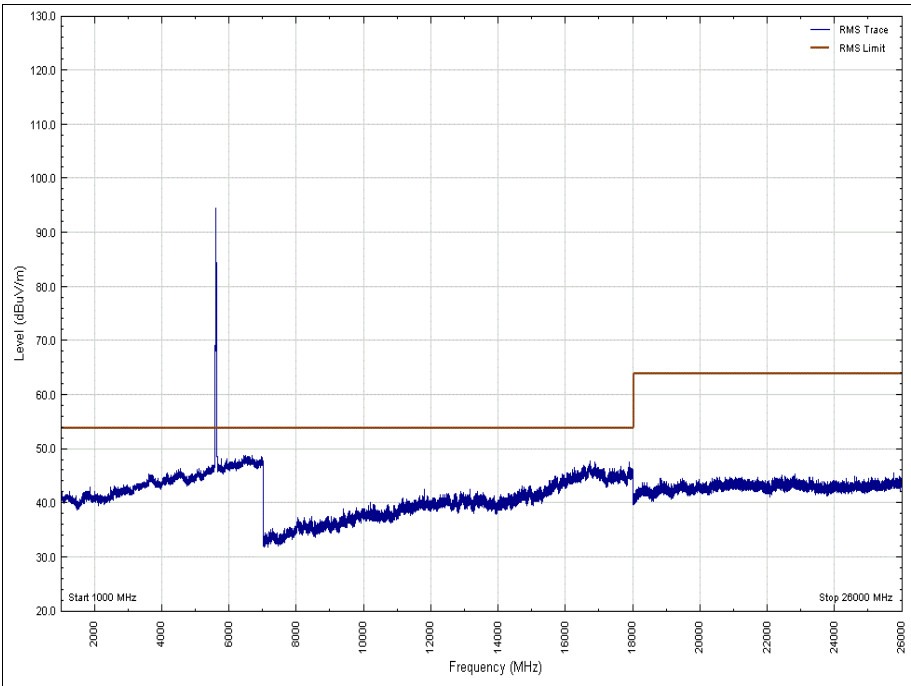


Figure 437 - U-NII 2c - 5600 MHz - 1 GHz to 26 GHz - Polarity: *Horizontal (Average)*

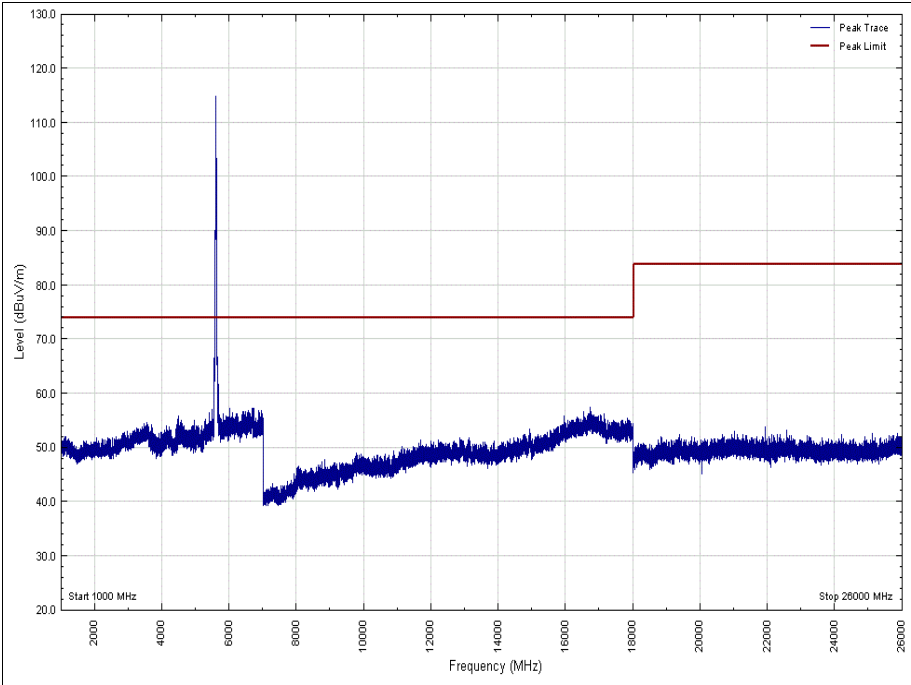


Figure 438 - U-NII 2c - 5600 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

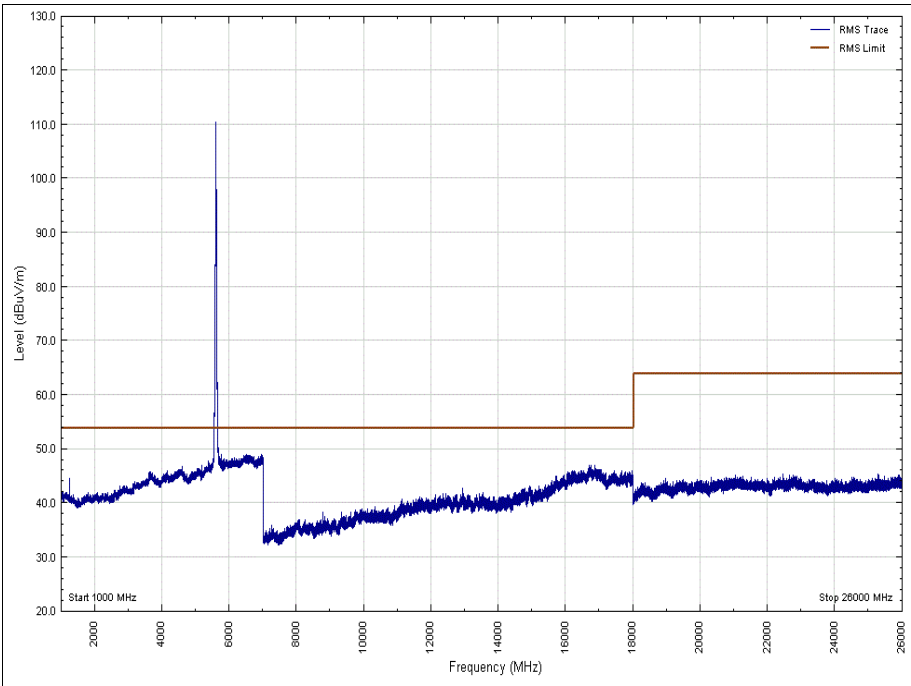


Figure 439 - U-NII 2c - 5600 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

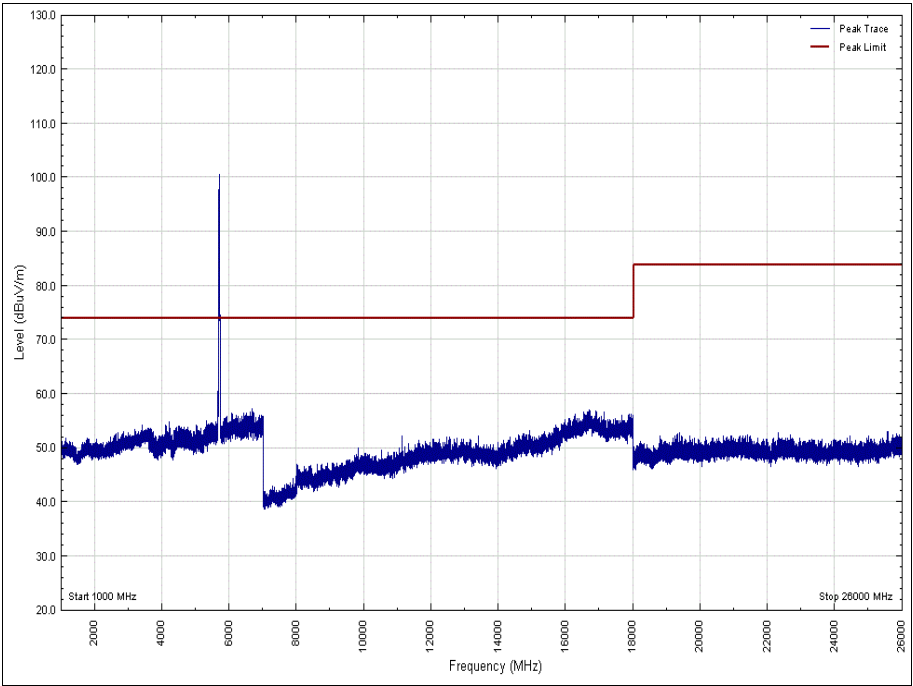


Figure 440 - U-NII 2c - 5700 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Peak)

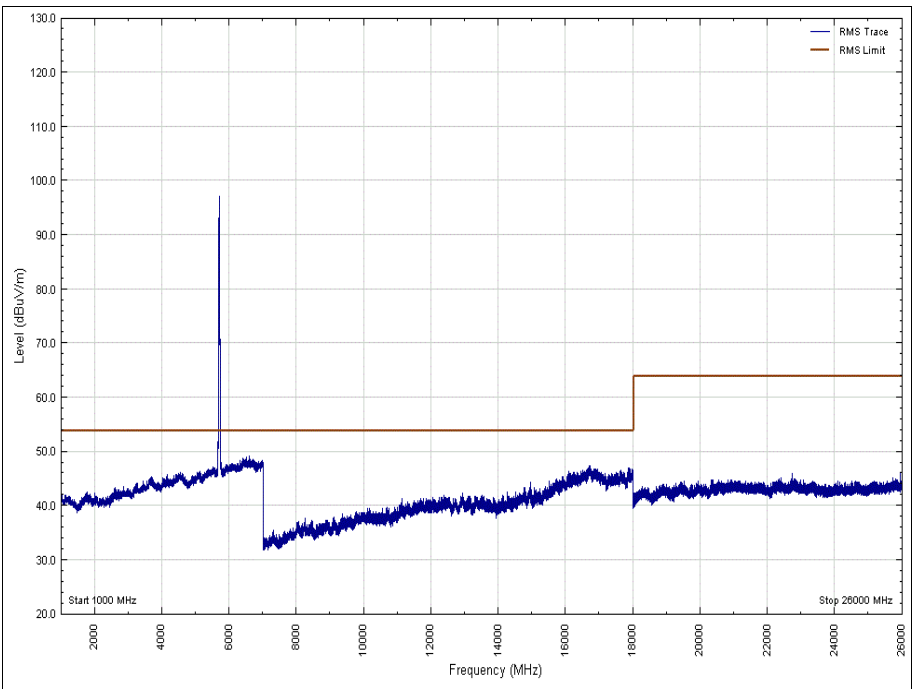


Figure 441 - U-NII 2c - 5700 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Average)



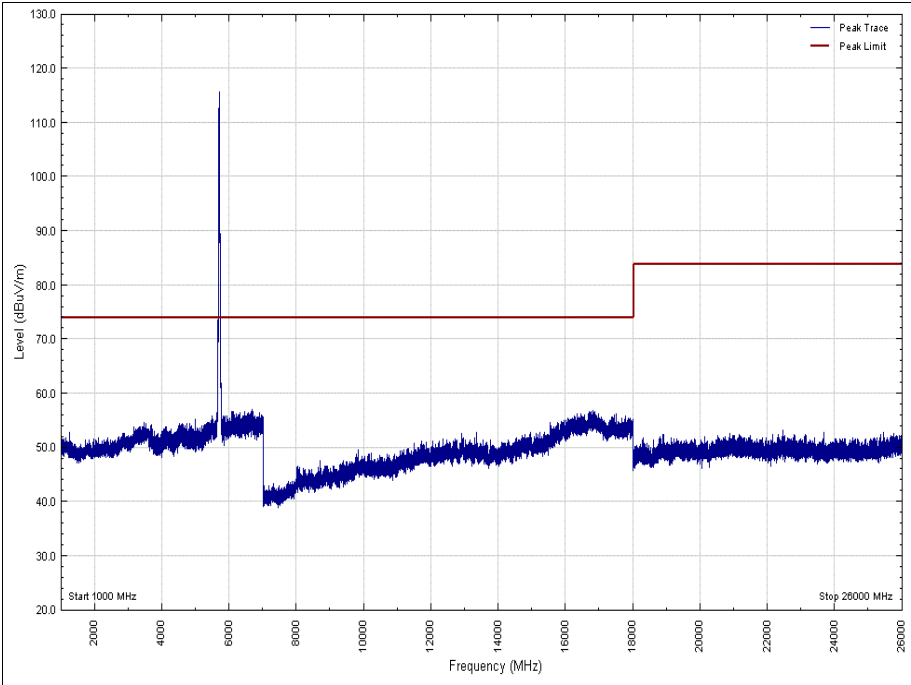


Figure 442 - U-NII 2c - 5700 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

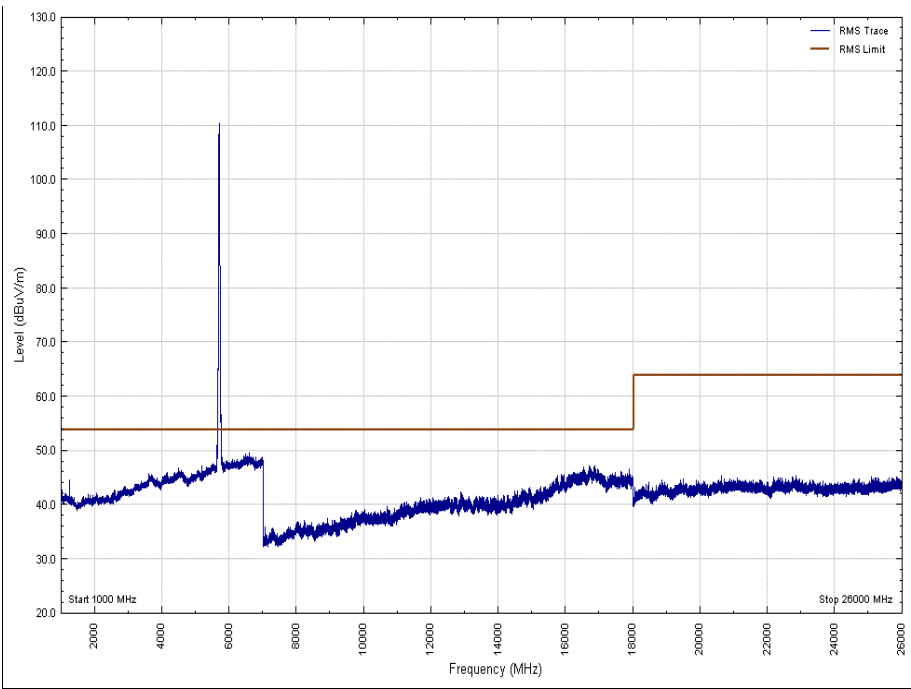


Figure 443 - U-NII 2c - 5700 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

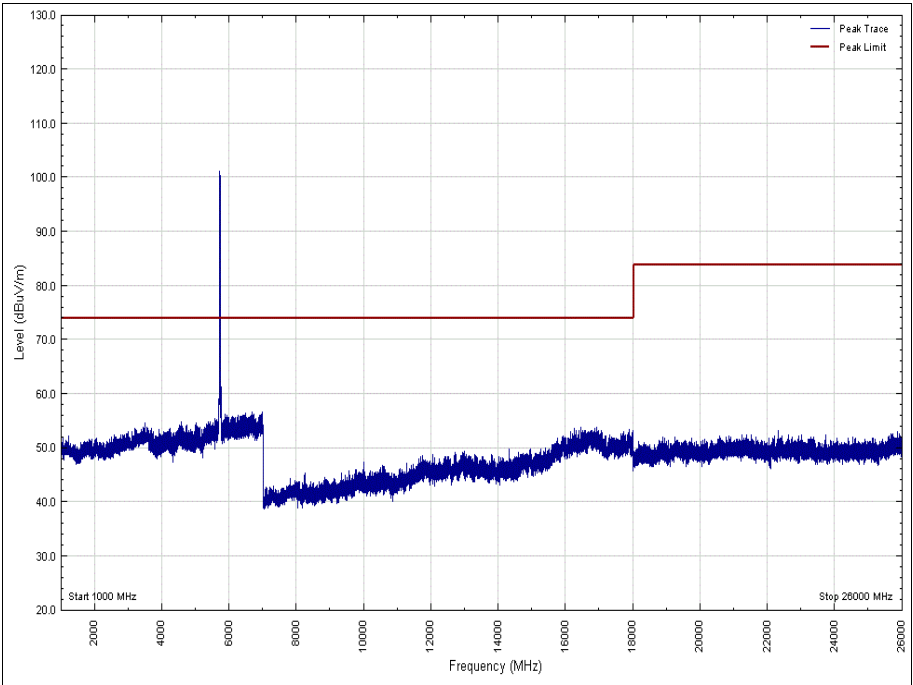


Figure 444 - U-NII 3 - 5745 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Peak)

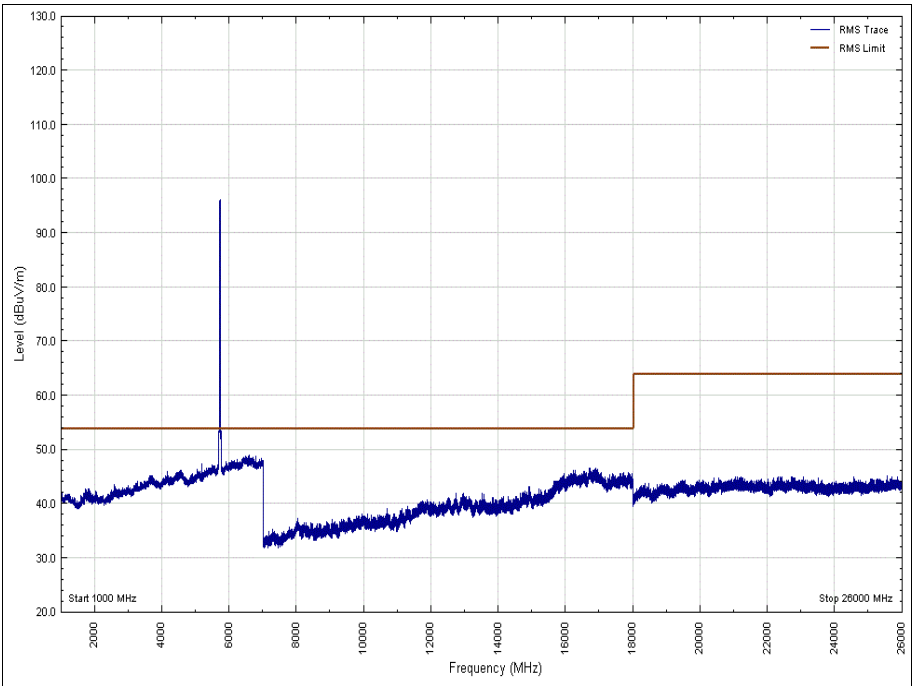


Figure 445 - U-NII 3 - 5745 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Average)

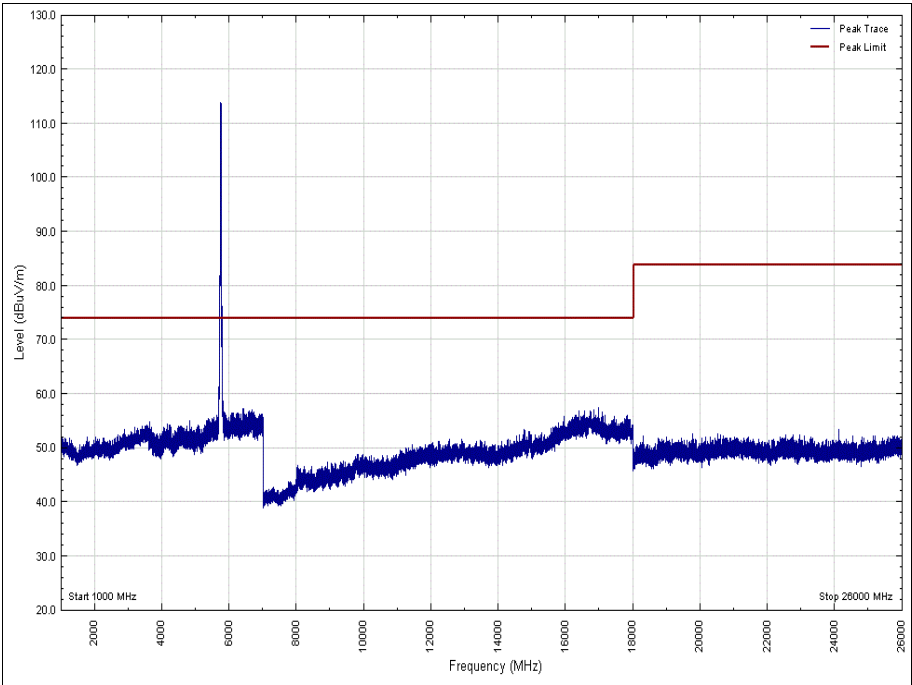


Figure 446 - U-NII 3 - 5745 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

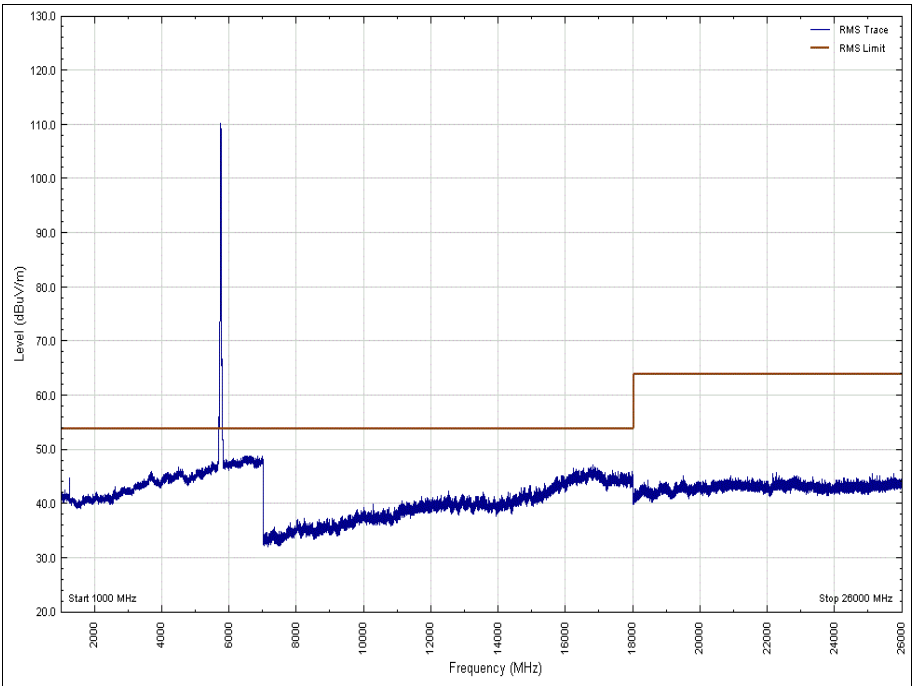


Figure 447 - U-NII 3 - 5745 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

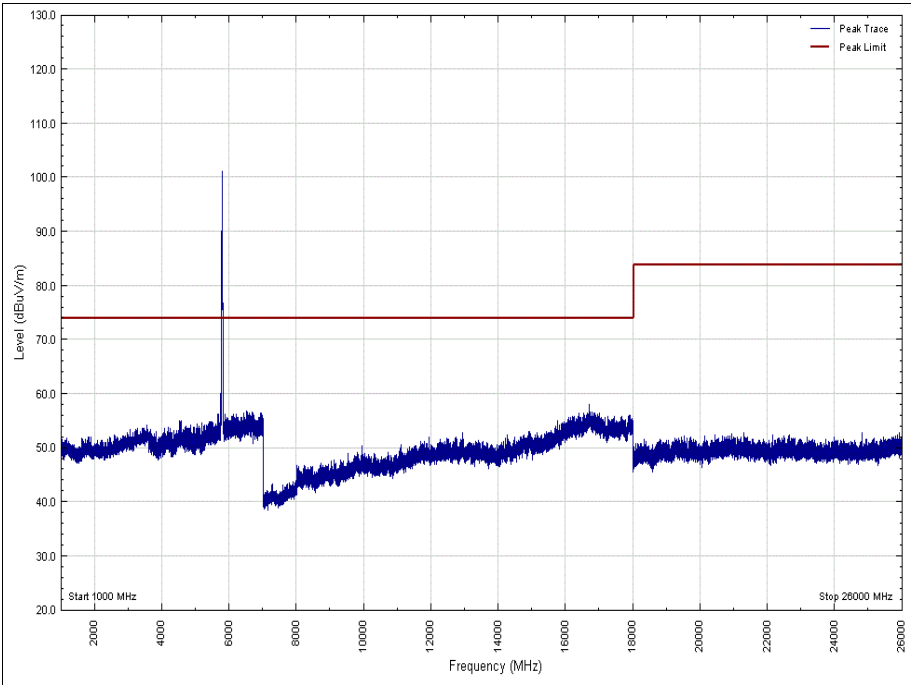


Figure 448 - U-NII 3 - 5785 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Peak)

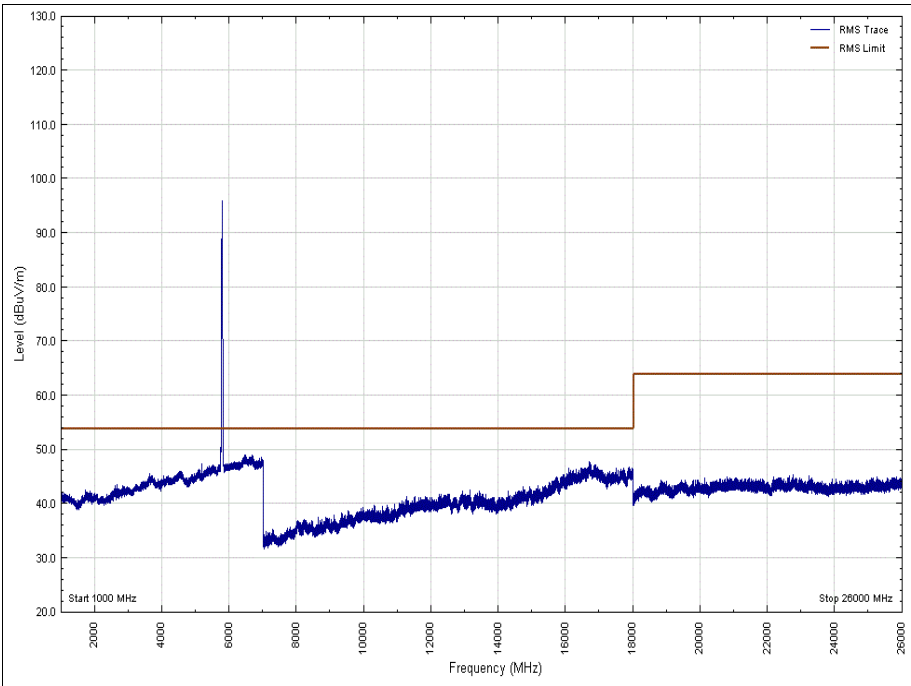


Figure 449 - U-NII 3 - 5785 MHz - 1 GHz to 26 GHz - Polarity: Horizontal (Average)

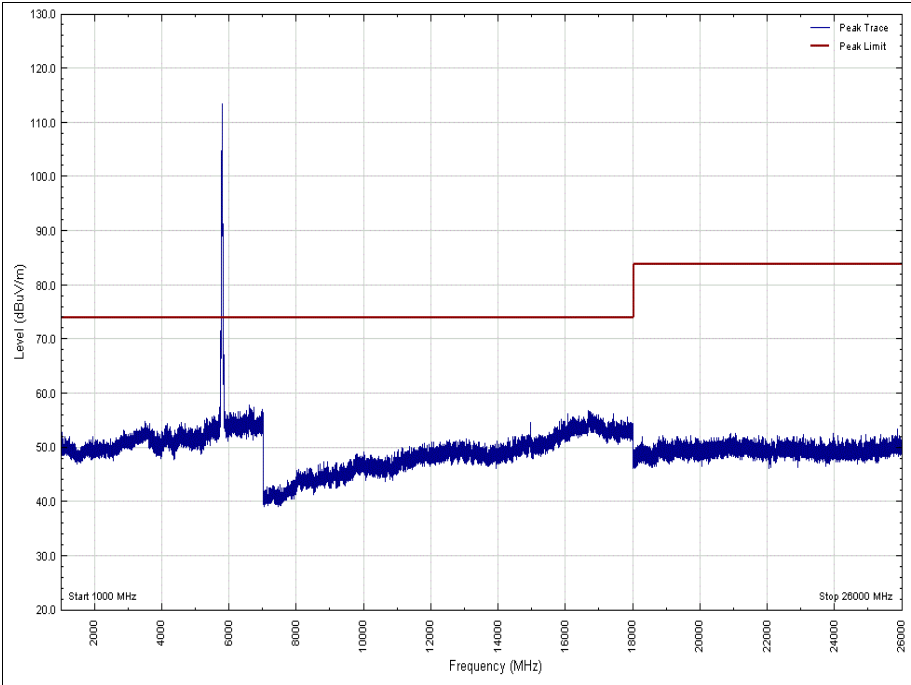


Figure 450 - U-NII 3 - 5785 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Peak)

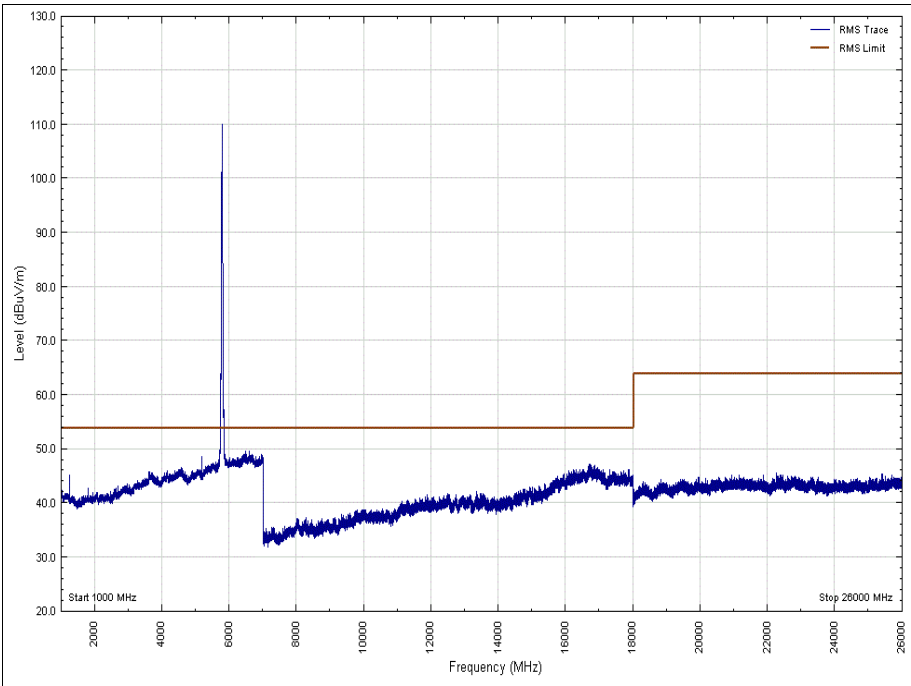


Figure 451 - U-NII 3 - 5785 MHz - 1 GHz to 26 GHz - Polarity: Vertical (Average)

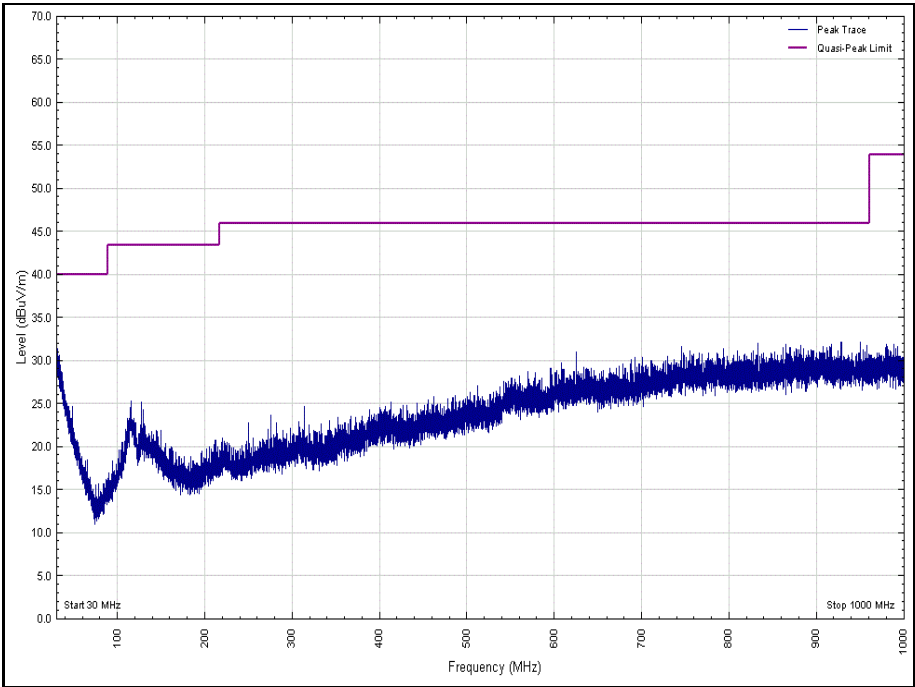


Figure 452 - U-NII 3 - 5825 MHz - 30 MHz to 1 GHz - Polarity: *Horizontal*

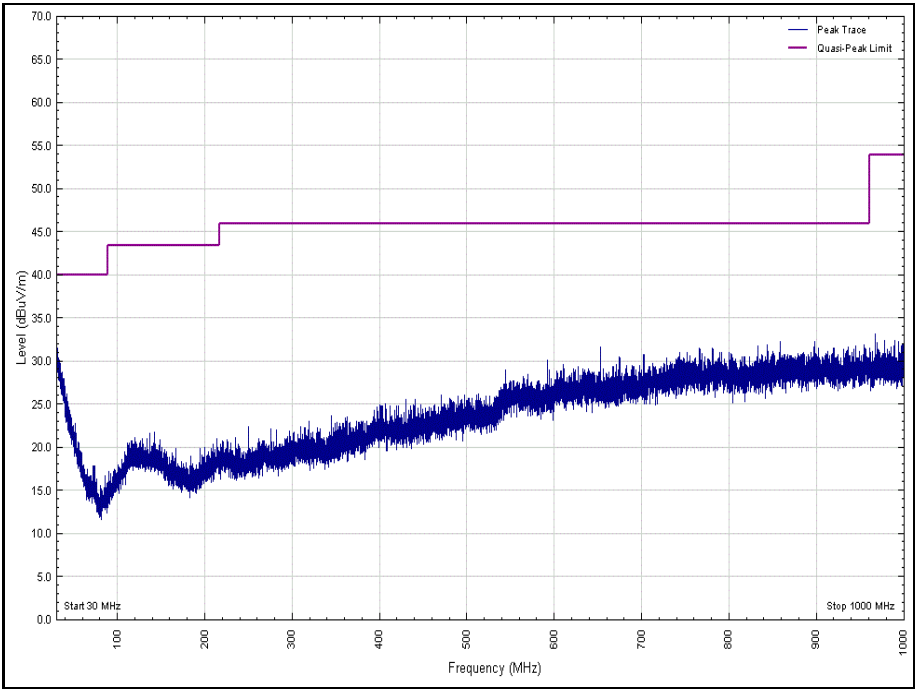


Figure 453 - U-NII 3 - 5825 MHz - 30 MHz to 1 GHz - Polarity: *Vertical*

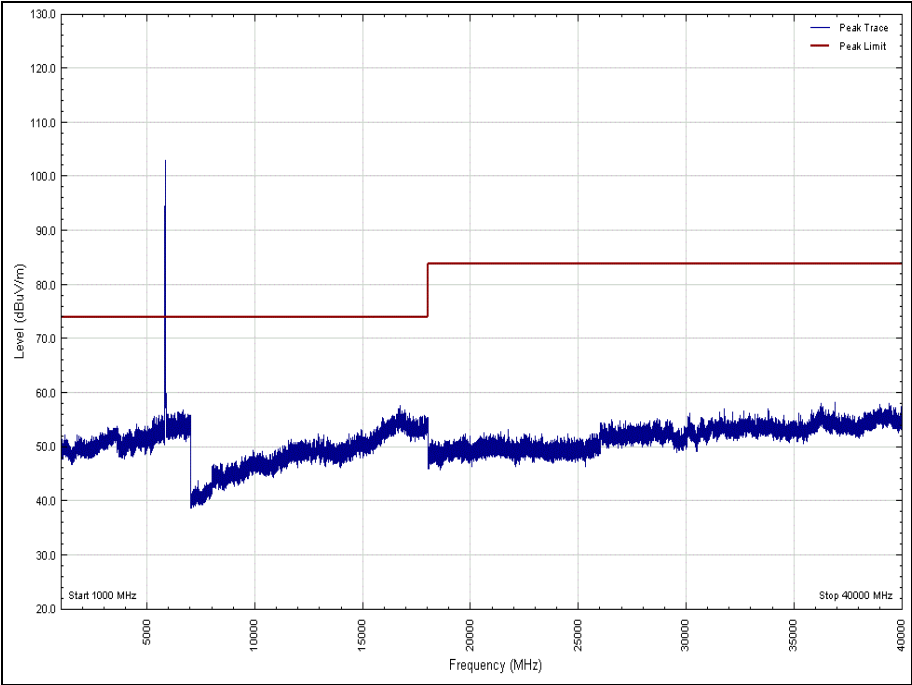


Figure 454 - U-NII 3 - 5825 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Peak)

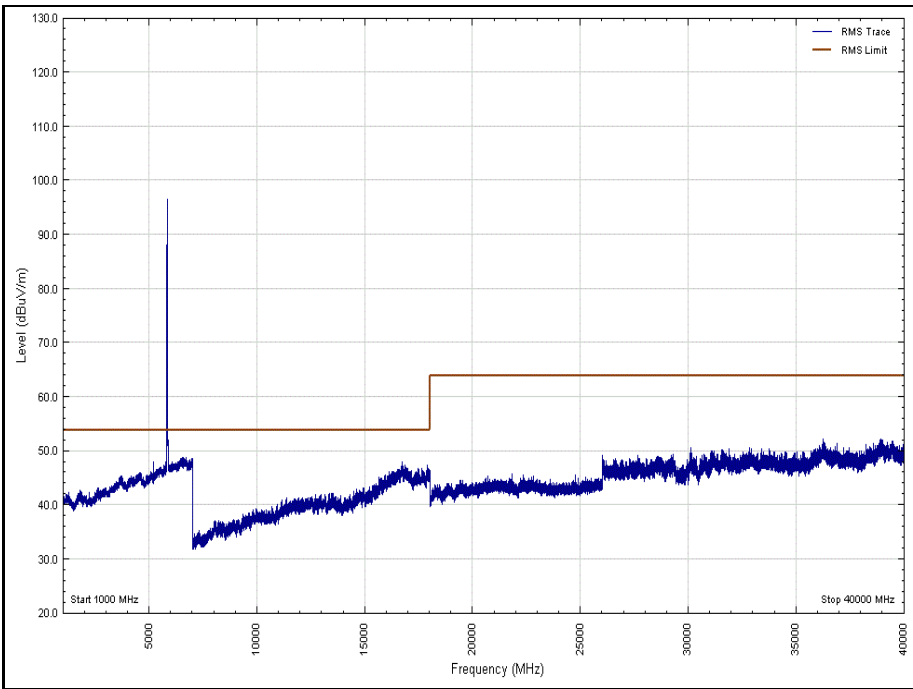


Figure 455 - U-NII 3 - 5825 MHz - 1 GHz to 40 GHz - Polarity: Horizontal (Average)

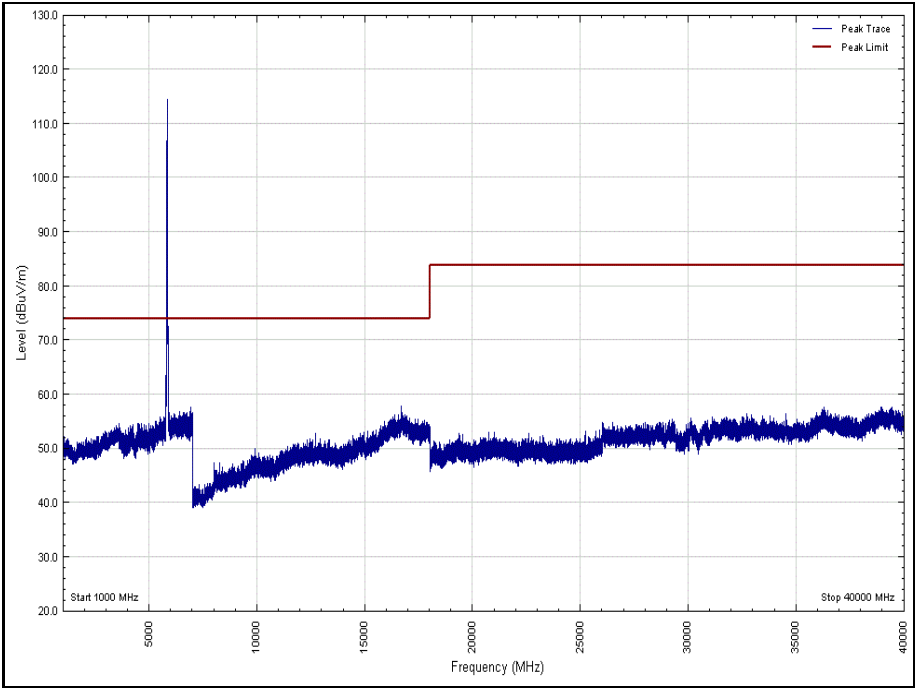


Figure 456 - U-NII 3 - 5825 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Peak)

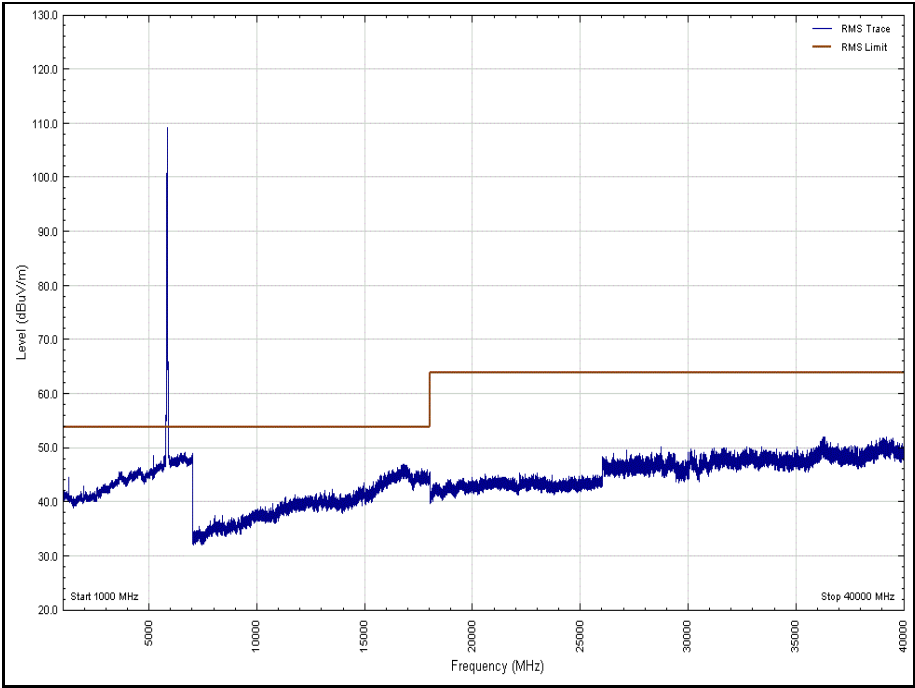


Figure 457 - U-NII 3 - 5825 MHz - 1 GHz to 40 GHz - Polarity: Vertical (Average)





FCC 47 CFR Part 15, Limit Clause 15.407(b)(1)(2)(3)(4)

Emissions not falling within the restricted bands listed in FCC 47 CFR Part 15.209:

For transmitters operating in the 5.15-5.25 GHz band:  $\leq -27$  dBm/MHz outside 5150-5350 MHz.

For transmitters operating in the 5.25-5.35 GHz band:  $\leq -27$  dBm/MHz outside 5150-5350 MHz.

For transmitters operating in the 5.47-5.725 GHz band:  $\leq -27$  dBm/MHz outside 5470-5725 MHz

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Emissions within the restricted bands listed in FCC 47 CFR Part 15.209:

| Frequency (MHz) | Field Strength ( $\mu\text{V}/\text{m}$ ) | Measurement Distance (m) |
|-----------------|---|--------------------------|
| 0.009 to 0.490  | $2400/F(\text{kHz})$                      | 300                      |
| 0.490 to 1.705  | $24000/F(\text{kHz})$                     | 30                       |
| 1.705 to 30     | 30  | 30                       |
| 30 to 88        | 100                                       | 3                        |
| 88 to 216       | 150                                       | 3                        |
| 216 to 960      | 200                                       | 3                        |
| Above 960       | 500                                       | 3                        |

**Table 217**



Industry Canada RSS-247, Limit Clause 6.2.1.2, 6.2.2.2, 6.2.3.2 and 6.2.4.2 and Industry Canada RSS-GEN, Limit Clause 8.9

Emissions not falling within the restricted bands listed in Industry Canada RSS-GEN, Clause 8.10:

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB.

For transmitters with operating frequencies in the bands 5250-5350 MHz and 5470-5725 MHz, all emissions outside the band 5250-5350 MHz and 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

- a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
- d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

Emissions not falling within the restricted bands listed in Industry Canada RSS-GEN, Clause 8.10:

| Frequency (MHz) | Field Strength ( $\mu\text{V}/\text{m}$ ) |
|-----------------|---|
| 0.009 to 0.490  | 2400/F(kHz)                               |
| 0.490 to 1.705  | 24000/F(kHz)                              |
| 1.705 to 30     | 30  |
| 30 to 88        | 100                                       |
| 88 to 216       | 150                                       |
| 216 to 960      | 200                                       |
| Above 960       | 500                                       |

**Table 218**



## 2.5.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

| Instrument                            | Manufacturer          | Type No             | TE No | Calibration Period (months) | Calibration Due |
|---------------------------------------|-----------------------|---------------------|-------|-----------------------------|-----------------|
| Multimeter                            | White Gold            | WG022               | 190   | 12                          | 24-Nov-2018     |
| Antenna 18-40GHz (Double Ridge Guide) | Link Microtek Ltd     | AM180HA-K-TU2       | 230   | 24                          | 02-May-2020     |
| Antenna (Bilog)                       | Schaffner             | CBL6143             | 287   | 24                          | 15-May-2020     |
| Dual Power Supply Unit                | Thurlby               | PL320               | 288   | -                           | TU              |
| Filter (High Pass)                    | Lorch                 | SHP7-7000-SR        | 566   | 12                          | 10-May-2019     |
| Pre-Amplifier                         | Phase One             | PS04-0086           | 1533  | 12                          | 12-Jan-2019     |
| 18GHz - 40GHz Pre-Amplifier           | Phase One             | PS04-0087           | 1534  | 12                          | 02-Feb-2019     |
| Screened Room (5)                     | Rainford              | Rainford            | 1545  | 36                          | 23-Jan-2021     |
| Turntable Controller                  | Inn-Co GmbH           | CO 1000             | 1606  | -                           | TU              |
| Antenna (Bilog)                       | Chase                 | CBL6143             | 2904  | 24                          | 08-Aug-2019     |
| Cable (N-N, 8m)                       | Rhophase              | NPS-2302-8000-NPS   | 3248  | -                           | O/P Mon         |
| EMI Test Receiver                     | Rohde & Schwarz       | ESU40               | 3506  | 12                          | 22-Nov-2018     |
| 1501A 4.0M Km Km Cable                | Rhophase              | KPS-1501A-4000-KPS  | 4301  | 12                          | 19-Feb-2019     |
| 1GHz to 8GHz Low Noise Amplifier      | Wright Technologies   | APS04-0085          | 4365  | 12                          | 18-Oct-2018     |
| Cable (Rx, Nm-Nm, 7m)                 | Scott Cables          | SLU18-NMNM-07.00M   | 4498  | -                           | O/P Mon         |
| EMI Receiver                          | Keysight Technologies | N9038A MXE          | 4628  | 12                          | 04-July-2019    |
| Double Ridged Waveguide Horn Antenna  | ETS-Lindgren          | 3117                | 4722  | 12                          | 01-Mar-2019     |
| Mast Controller                       | Maturo GmbH           | NCD                 | 4810  | -                           | TU              |
| Tilt Antenna Mast                     | Maturo GmbH           | TAM 4.0-P           | 4811  | -                           | TU              |
| 9m N type RF cable                    | Rosenberger           | 2303-0 9.0m PNm PNm | 4827  | 6                           | 04-Jan-2019     |
| Double Ridge Broadband Horn Antenna   | Schwarzbeck           | BBHA 9120 B         | 4848  | 12                          | 12-Feb-2019     |
| 4dB Attenuator                        | Pasternack            | PE7047-4            | 4935  | 12                          | 28-Nov-2018     |
| Hygrometer                            | Rotronic              | HP21                | 4989  | 12                          | 26-Apr-2019     |
| Cable (26.5GHz)                       | Rosenberger           | LU7-133-5000        | 5019  | -                           | O/P Mon         |
| Cable (40GHz)                         | Rosenberger           | LU1-001-2000        | 5020  | -                           | O/P Mon         |

**Table 219**



Product Service

TU – Traceability Unscheduled  
O/P Mon – Output Monitored



## **2.6 Restricted Band Edges**

### **2.6.1 Specification Reference**

FCC 47 CFR Part 15E, Clause 15.205  
Industry Canada RSS-GEN, Clause 8.10

### **2.6.2 Equipment Under Test and Modification State**

A1932, S/N: C02X5004L3FP - Modification State 0

### **2.6.3 Date of Test**

28-August-2018 to 12-September 2018

### **2.6.4 Test Method**

The test was performed in accordance with ANSI C63.10 clause 6.10.5.

Restricted band edge measurements were performed, with the device operating in SISO, MIMO and TxBF set-up's, across the various modes supported by the device.

The measurements displayed within this report, have been limited to those modes which have been shown to be worst case.

Further measurements are held on file by TÜV SÜD and are available if required.

### **2.6.5 Environmental Conditions**

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 22.7 - 23.7 °C |
| Relative Humidity   | 42.3 - 53.7 %  |



## 2.6.6 Test Results

### SISO - 20 MHz Bandwidth

| Mode    | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|---------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11a | 6Mbps         | 36                  | 5150.0                    | 61.40               | 51.13                  |
| 802.11a | 6Mbps         | 64                  | 5350.0                    | 66.84               | 51.40                  |
| 802.11a | 6Mbps         | 100                 | 5460.0                    | 59.29               | 47.74                  |

Table 220

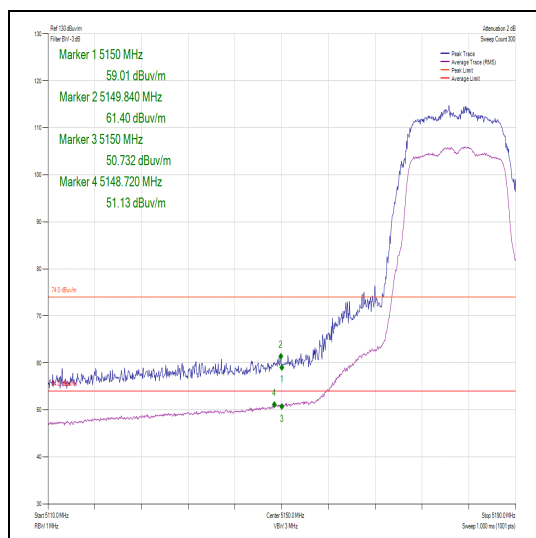


Figure 458 – Channel 36 – Restricted Band Edge

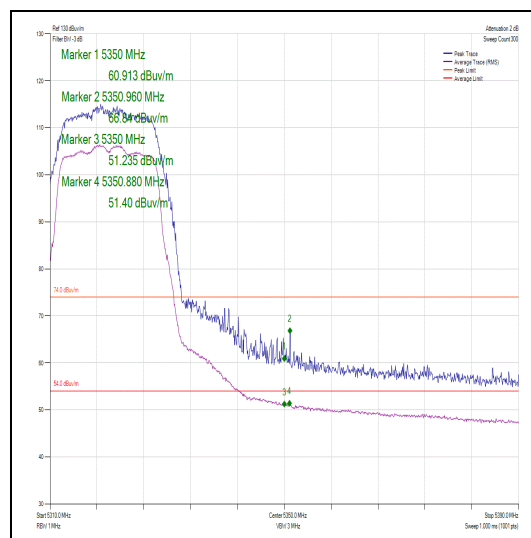


Figure 459 – Channel 64 - Restricted Band Edge

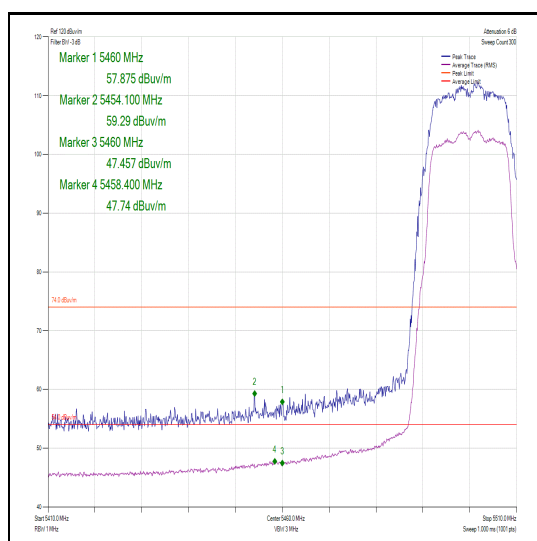


Figure 460 – Channel 100 - Restricted Band Edge



### SISO - 20 MHz Bandwidth

| Mode    | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|---------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11n | MCS0          | 36                  | 5150.0                    | 61.36               | 50.42                  |
| 802.11n | MCS0          | 64                  | 5350.0                    | 66.77               | 50.52                  |
| 802.11n | MCS0          | 100                 | 5460.0                    | 58.71               | 48.42                  |

Table 221

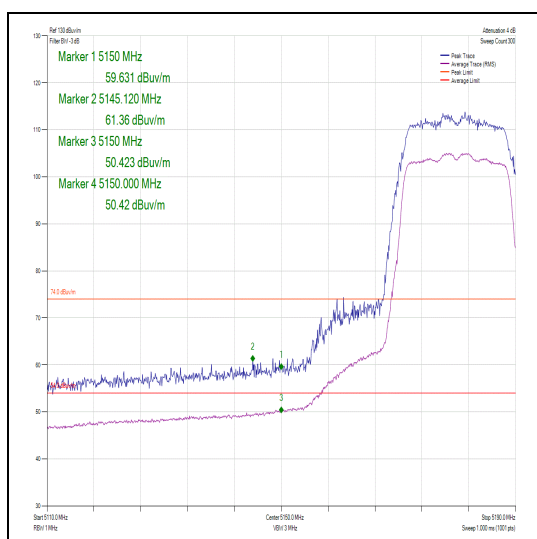


Figure 461 – Channel 36 – Restricted Band Edge

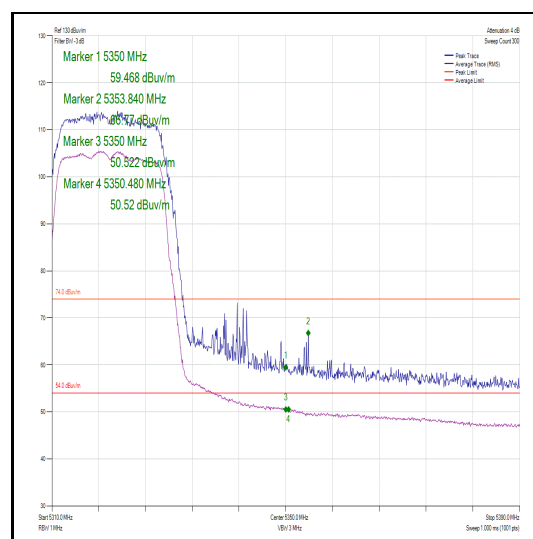


Figure 462 – Channel 64 - Restricted Band Edge

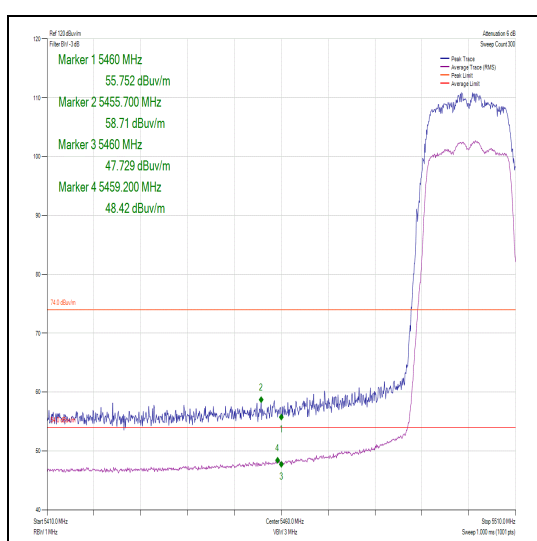


Figure 463 – Channel 100 – Restricted Band Edge



### MIMO 2TX - 20 MHz Bandwidth

| Mode    | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|---------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11n | MCS0          | 36                  | 5150.0                    | 60.17               | 50.45                  |
| 802.11n | MCS0          | 64                  | 5350.0                    | 63.65               | 50.47                  |
| 802.11n | MCS0          | 100                 | 5460.0                    | 59.12               | 47.87                  |

Table 222

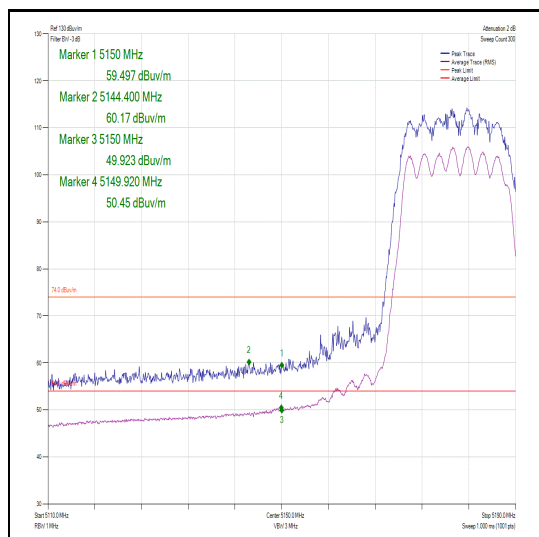


Figure 464 – Channel 36 – Restricted Band Edge

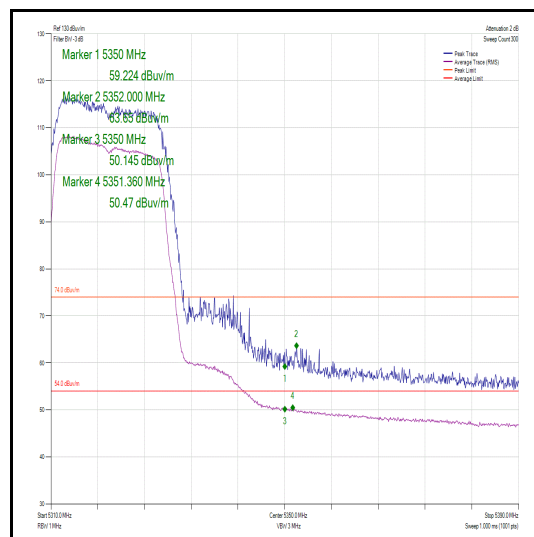


Figure 465 – Channel 64 - Restricted Band Edge

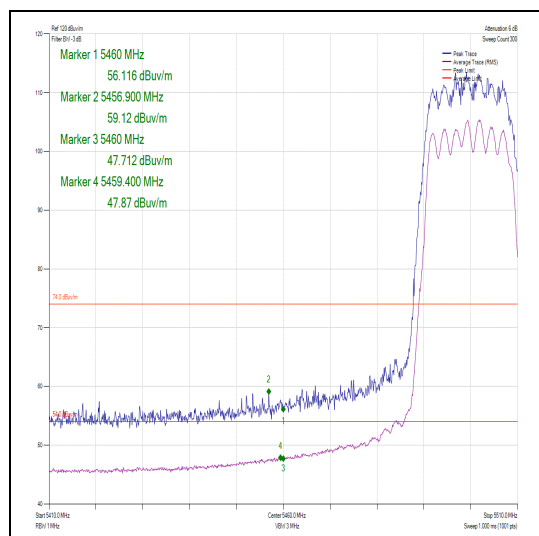


Figure 466 – Channel 100 – Restricted Band Edge



### SISO - 40 MHz Bandwidth

| Mode    | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|---------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11n | MCS0          | 38                  | 5150.0                    | 62.01               | 51.29                  |
| 802.11n | MCS0          | 62                  | 5350.0                    | 66.28               | 51.50                  |
| 802.11n | MCS0          | 102                 | 5460.0                    | 60.27               | 47.84                  |

Table 223

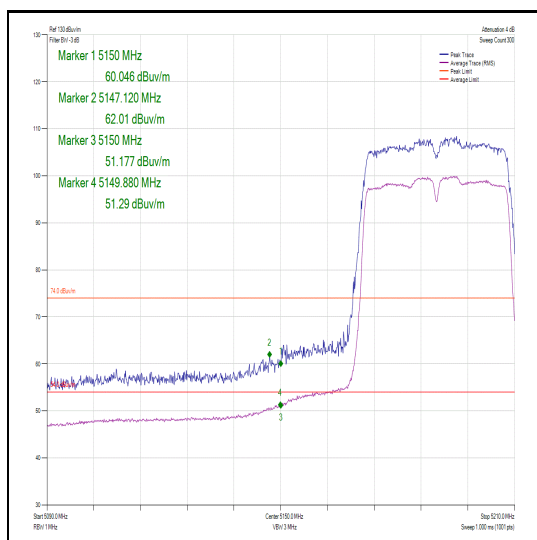


Figure 467 – Channel 38 – Restricted Band Edge

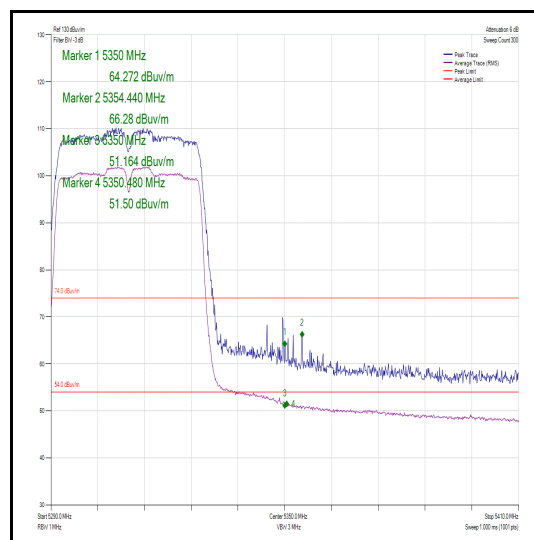


Figure 468 – Channel 62 - Restricted Band Edge

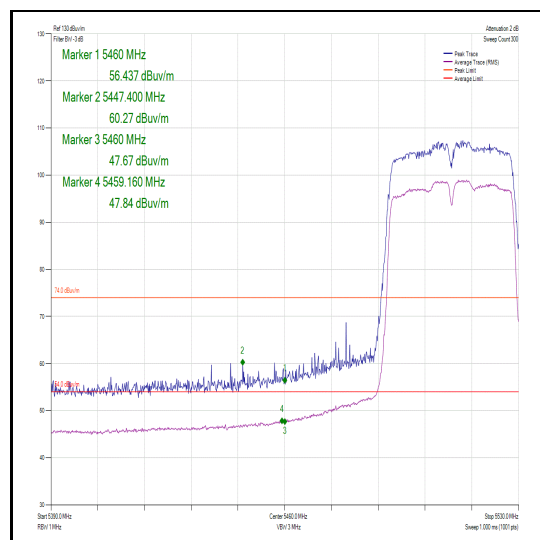


Figure 469 – Channel 102 – Restricted Band Edge



MIMO 2TX - 40 MHz Bandwidth

| MIMO    | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|---------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11n | MCS0          | 38                  | 5150.0                    | 65.84               | 51.77                  |
| 802.11n | MCS0          | 62                  | 5350.0                    | 70.97               | 51.56                  |
| 802.11n | MCS0          | 102                 | 5460.0                    | 60.29               | 49.02                  |

Table 224

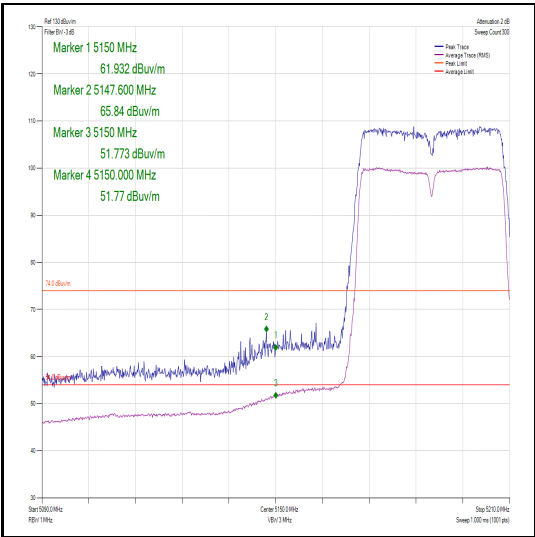


Figure 470 – Channel 38 – Restricted Band Edge

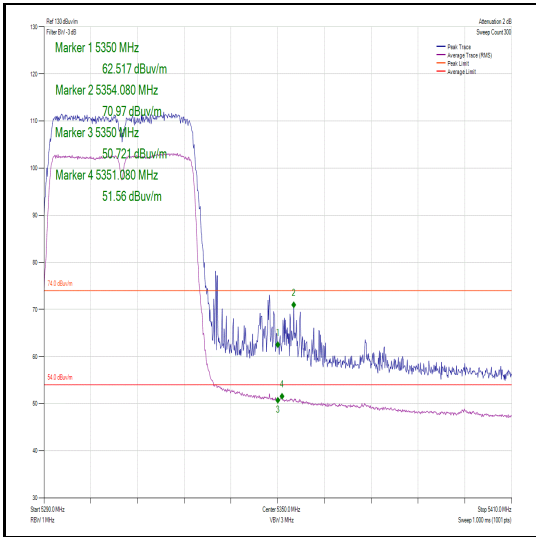


Figure 471 – Channel 62 - Restricted Band Edge

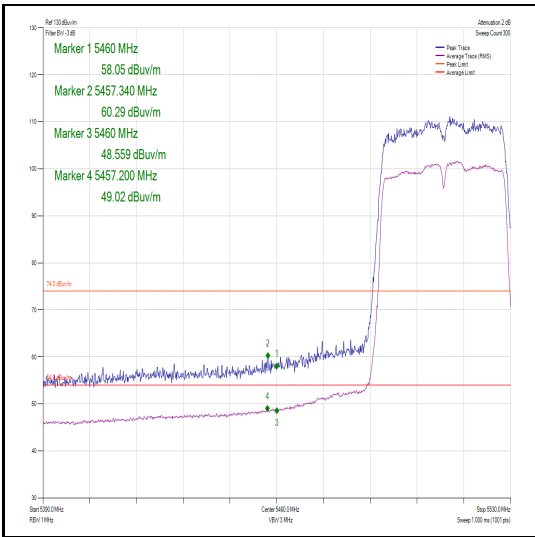


Figure 472 – Channel 102 – Restricted Band Edge



SISO - 80 MHz Bandwidth

| Measurement Configuration | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|---------------------------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11ac                  | MCS0          | 42                  | 5150.0                    | 62.09               | 50.81                  |
| 802.11ac                  | MCS0          | 58                  | 5350.0                    | 62.70               | 50.87                  |
| 802.11ac                  | MCS0          | 106                 | 5460.0                    | 60.58               | 49.28                  |

Table 225

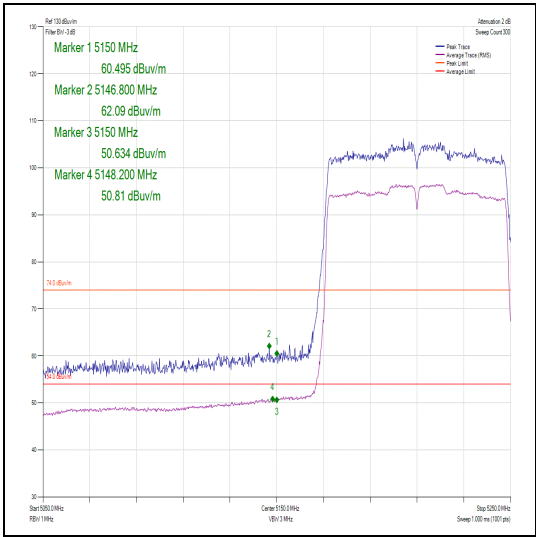


Figure 473 – Channel 42 – Restricted Band Edge

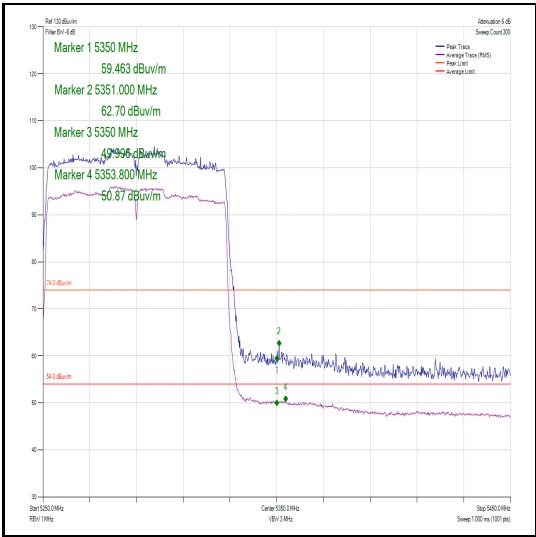


Figure 474 – Channel 58 - Restricted Band Edge

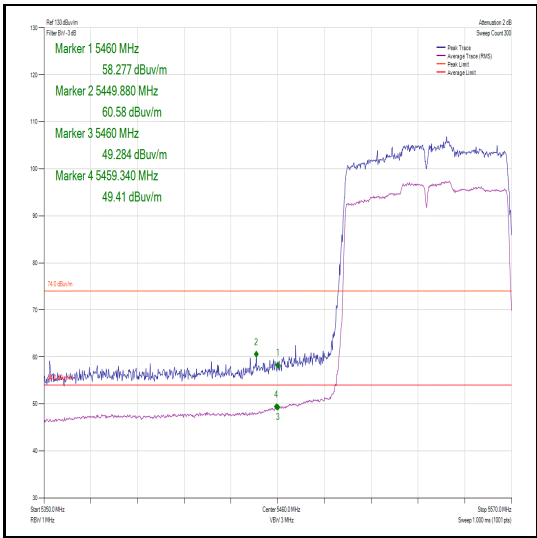


Figure 475 – Channel 106 – Restricted Band Edge



### MIMO 2TX - 80 MHz Bandwidth

| Mode     | Data Rate/MCS | Transmitter Channel | Band Edge Frequency (MHz) | Peak Level (dBuV/m) | Average Level (dBuV/m) |
|----------|---------------|---------------------|---------------------------|---------------------|------------------------|
| 802.11ac | MCS0          | 42                  | 5150.0                    | 62.90               | 51.53                  |
| 802.11ac | MCS0          | 58                  | 5350.0                    | 65.70               | 50.16                  |
| 802.11ac | MCS0          | 106                 | 5460.0                    | 61.05               | 49.76                  |

Table 226

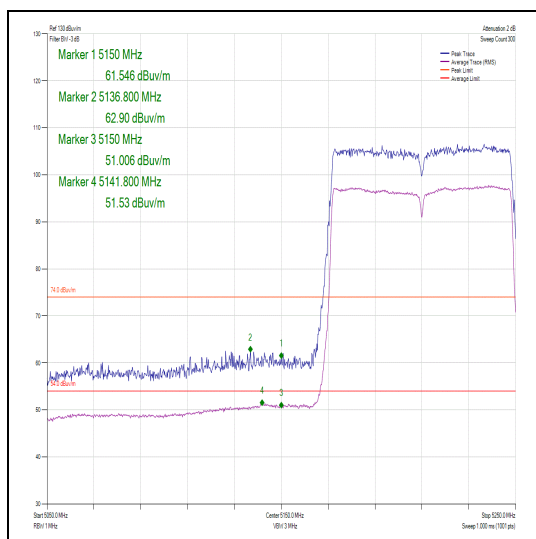


Figure 476 – Channel 42 – Restricted Band Edge

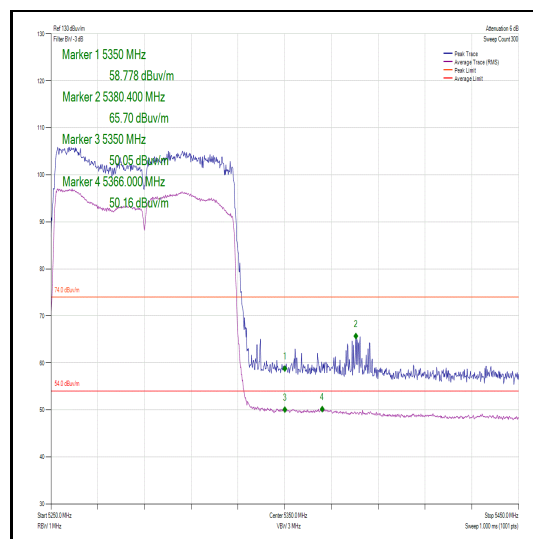


Figure 477 – Channel 58 - Restricted Band Edge

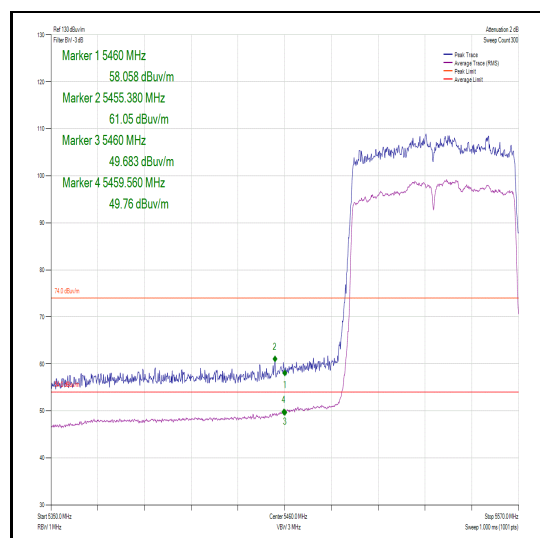


Figure 478 – Channel 106 – Restricted Band Edge



## 2.6.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

| Instrument                          | Manufacturer            | Type No             | TE No | Calibration Period (months) | Calibration Due |
|-------------------------------------|-------------------------|---------------------|-------|-----------------------------|-----------------|
| Cable (2m)                          | Rhophase                | KPS-1503-2000-KPS   | 3965  | 12                          | 12-Dec-2018     |
| Mains Voltage Monitor               | TUV SUD Product Service | MVM1                | 1378  | 12                          | 17-Apr-2019     |
| Turntable Controller                | Inn-Co GmbH             | CO 1000             | 1606  | -                           | TU              |
| EMI Test Receiver                   | Rohde & Schwarz         | ESU40               | 3506  | 12                          | 22-Nov-2018     |
| Pre-Amplifier                       | Agilent                 | 8449B (3008A0223)   | N/A   | -                           | O/P Mon         |
| Cable (40GHz)                       | Rosenberger             | LU1-001-2000        | 5020  | -                           | O/P Mon         |
| Cable (Rx, Nm-Nm, 7m)               | Scott Cables            | SLU18-NMNM-07.00M   | 4498  | -                           | O/P Mon         |
| EMI Receiver                        | Keysight Technologies   | N9038A MXE          | 4628  | 12                          | 04-Jul-2019     |
| Mast Controller                     | Maturo GmbH             | NCD                 | 4810  | -                           | TU              |
| Tilt Antenna Mast                   | Maturo GmbH             | TAM 4.0-P           | 4811  | -                           | TU              |
| 9m N type RF cable                  | Rosenberger             | 2303-0 9.0m PNm PNm | 4827  | 6                           | 04-Jan-2019     |
| Double Ridge Broadband Horn Antenna | Schwarzbeck             | BBHA 9120 B         | 4848  | 12                          | 12-Feb-2019     |
| Hygrometer                          | Rotronic                | HP21                | 4989  | 12                          | 26-Apr-2019     |

**Table 227**

TU – Traceability Unscheduled

O/P Mon – Output monitored using calibrated equipment.



## **2.7 Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period**

### **2.7.1 Specification Reference**

FCC 47 CFR Part 15E, Clause 15.407 (h)(2)(iii)(iv)  
Industry Canada RSS-247, Clause 6.3.2(c)(d)(e)

### **2.7.2 Equipment Under Test and Modification State**

A1932, - S/N: C02X5003JL93 Modification State 0

### **2.7.3 Date of Test**

04 October 2018 and 05 October 2018

### **2.7.4 Test Method**

This test was performed in accordance with FCC KDB 905462 D02, clause 7.8.3. The EUT and test equipment was configured as described in the calibration setup section below.

Radar Pulse Type 0 was transmitted and the spectrum monitored. The transmissions from the EUT were observed for a period of 12 seconds after the final injected Radar Pulse.

It was checked that all transmissions stopped within the 10 second period defined from the point of the end of the final Radar pulse + 10 seconds. In addition, the aggregate on time during the first 200ms and the following 9.8 seconds of the Channel Move Time was recorded.

The markers on the trace data correspond to the following time periods:

Red - End Of Radar Burst, (T0)  
Purple - End Of 200ms Period, (T0 + 200 ms)  
Orange - End Of Channel Move Time, (T0 + 10 seconds)

To verify the non-occupancy period, the PXI digitiser was replaced with a Spectrum Analyser. The external trigger from the Aeroflex DFS test system was used to trigger a 30 minute sweep from the moment the radar burst sequence was injected. It was verified that no transmissions occurred on the test channel during this time period.

### **2.7.5 Environmental Conditions**

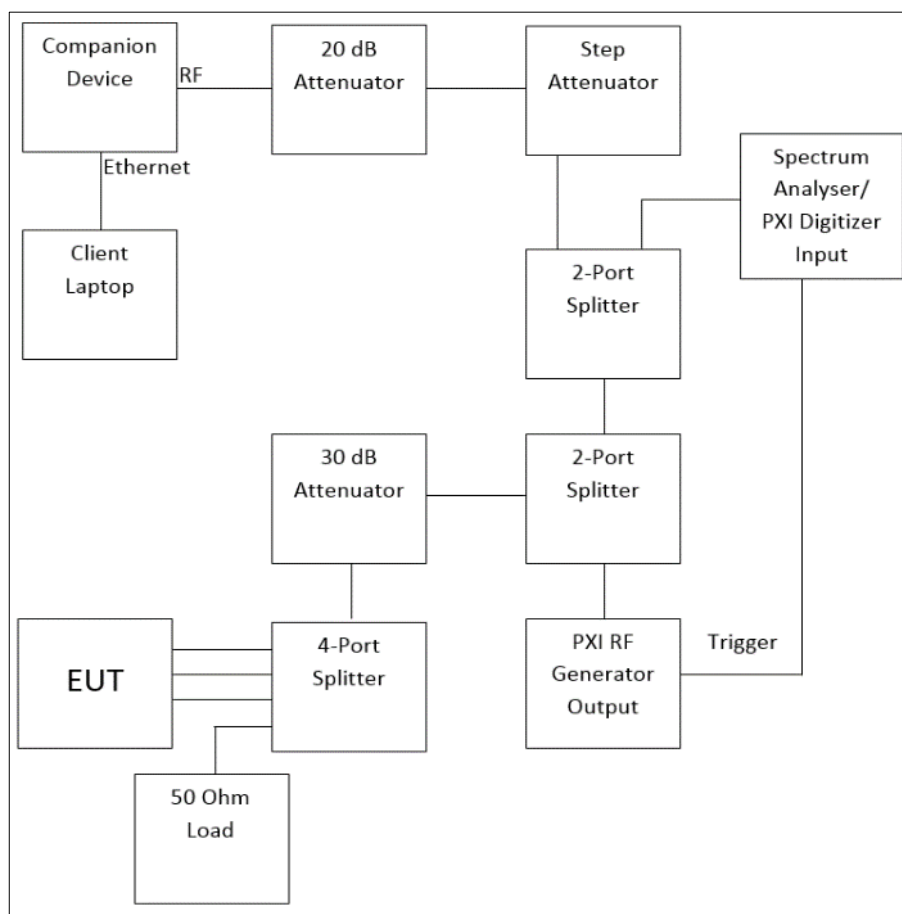
|                     |         |
|---------------------|---------|
| Ambient Temperature | 22.4 °C |
| Relative Humidity   | 57.4 %  |

## 2.7.6 Calibration of Radar Waveforms and EUT Channel Loading

### Main – 802.11a

The equipment was set up as shown in the diagram below. The EUT was configured to run iPerf, transmitting UDP to the client laptop. The channel loading was set to >17% by adjusting the bandwidth specified in the iPerf UDP transfer.

To calibrate the level of the radar at the input to the companion device, the companion device was replaced by the spectrum analyser and the output of the PXI RF generator adjusted to give -62 dBm.



**Figure 479 - Test Equipment Setup for Client Without Radar Detection with Injection at the Master**



| Radar Type | Pulse Width (µs) | PRI (µs) | Number of Pulses |
|------------|------------------|----------|------------------|
| 0          | 1                | 1428     | 18               |

Table 228 - Radar Pulse Type 0 Characteristics

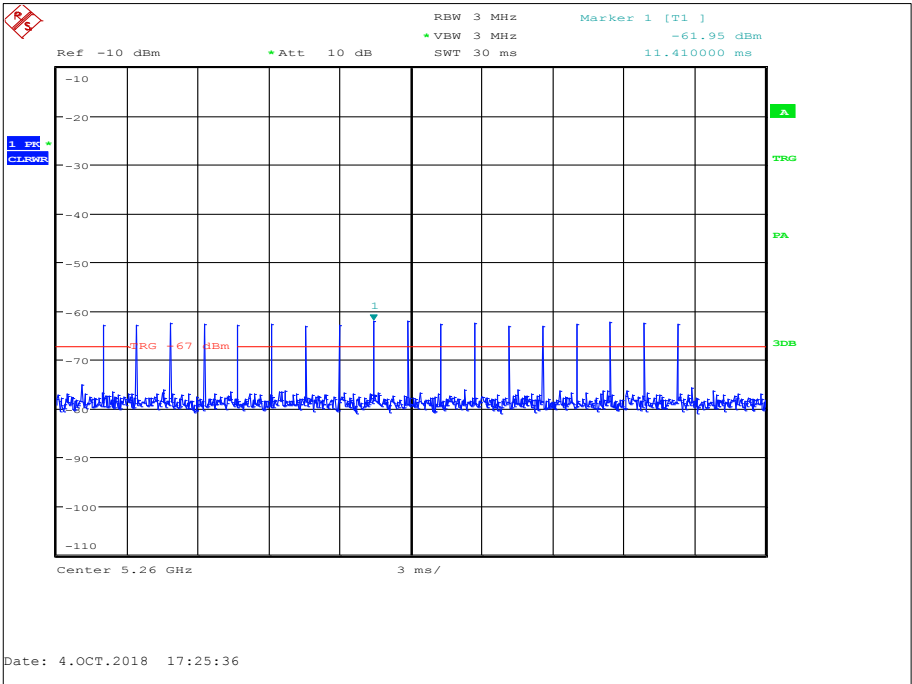


Figure 480 - Verification of Radar Type 0

| Maximum Transmit Power | Value (Notes 1 and 2) |
|------------------------|-----------------------|
| ≥ 200 milliwatt        | -64 dBm               |
| < 200 milliwatt        | -62 dBm               |

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Table 229 - DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection





Product Service

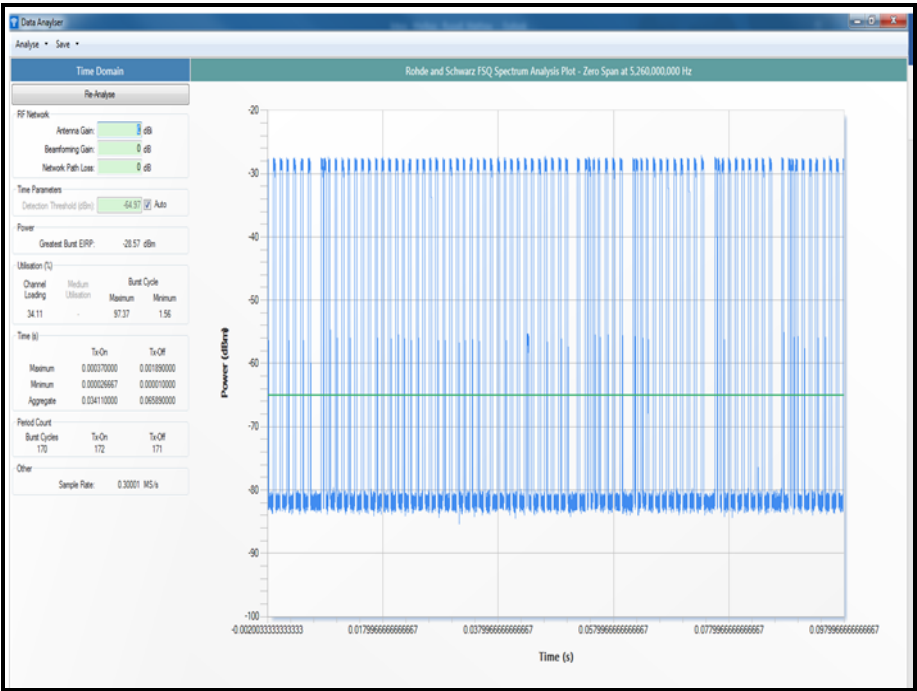


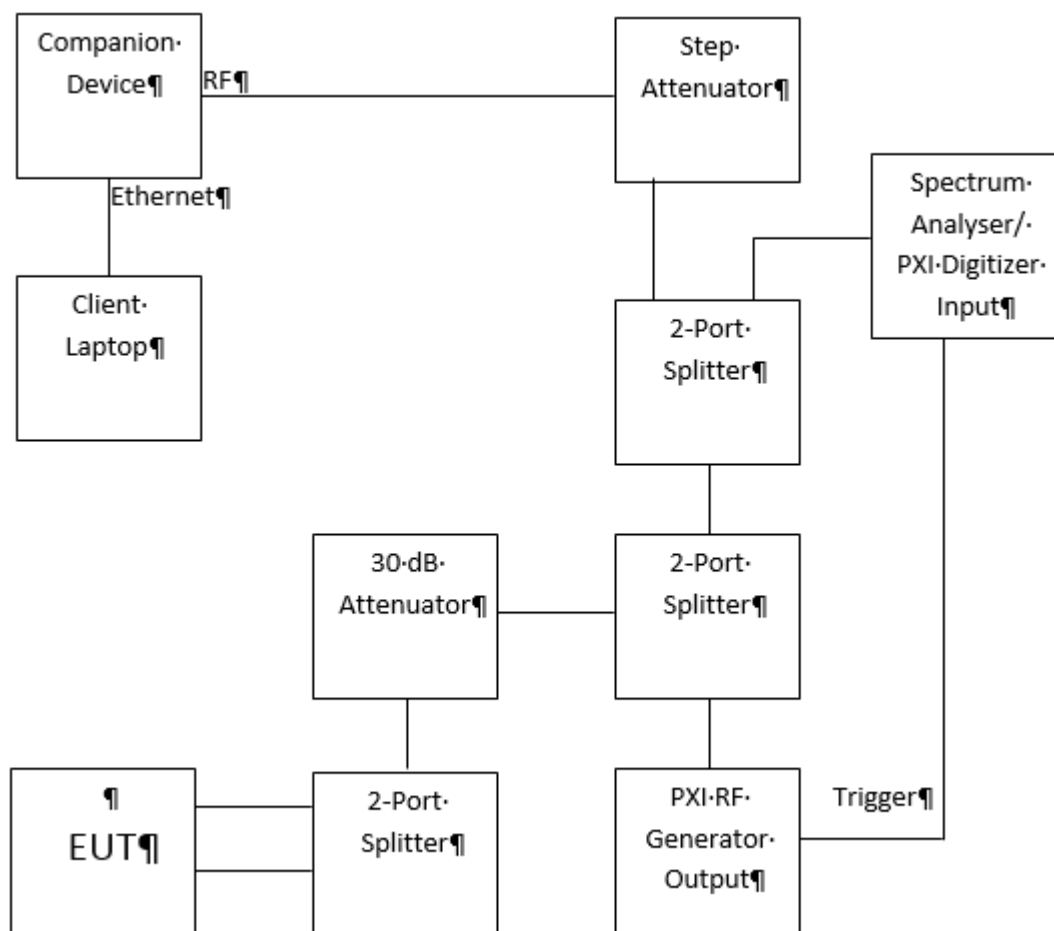
Figure 481 - Channel Loading

The channel loading was measured as 34.11%

### Main - VHT80

The equipment was set up as shown in the diagram below. The EUT was configured to run iPerf, transmitting UDP to the client laptop. The channel loading was set to >17% by adjusting the bandwidth specified in the iPerf UDP transfer.

To calibrate the level of the radar at the input to the companion device, the companion device was replaced by the spectrum analyser and the output of the PXI RF generator adjusted to give -62 dBm.



**Figure 482 - Test Equipment Setup for Client Without Radar Detection with Injection at the Master**



| Radar Type | Pulse Width (µs) | PRI (µs) | Number of Pulses |
|------------|------------------|----------|------------------|
| 0          | 1                | 1428     | 18               |

Table 230 - Radar Pulse Type 0 Characteristics

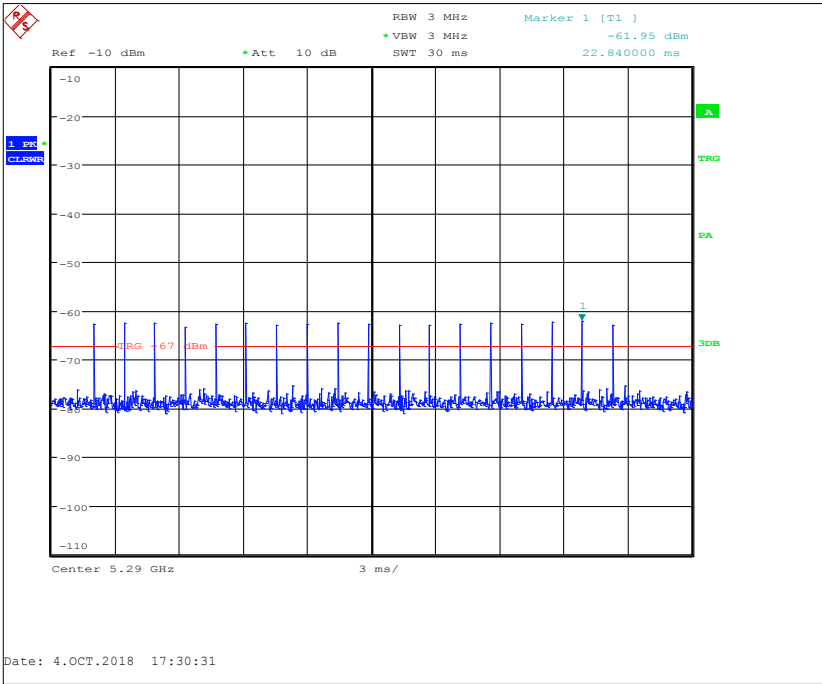


Figure 483 - Verification of Radar Type 0

| Maximum Transmit Power | Value (Notes 1 and 2) |
|------------------------|-----------------------|
| ≥ 200 milliwatt        | -64 dBm               |
| < 200 milliwatt        | -62 dBm               |

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Table 231 - DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection



Product Service

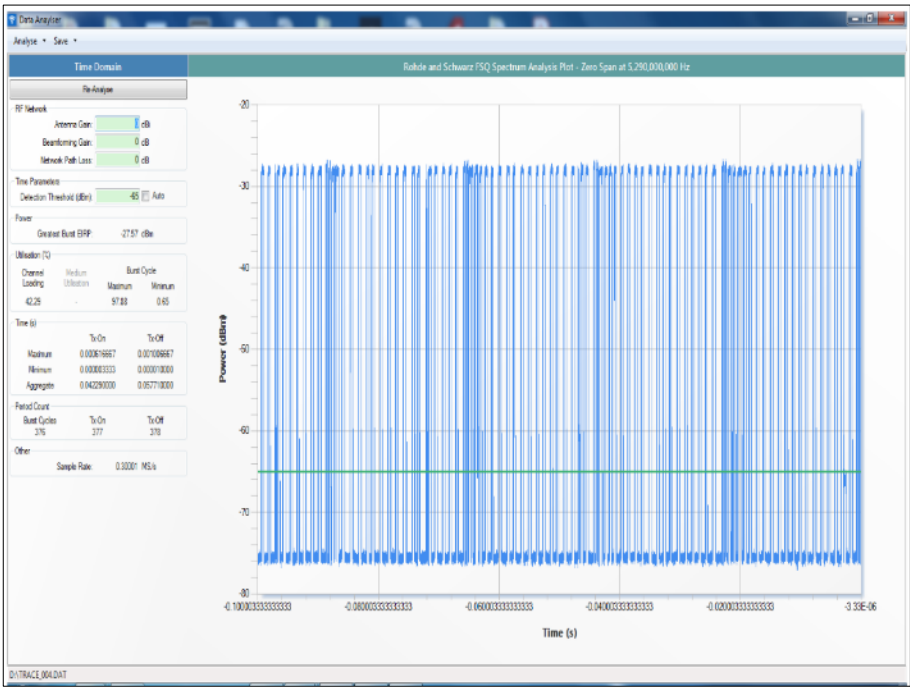


Figure 484 - Channel Loading

The channel loading was measured as 42.29%

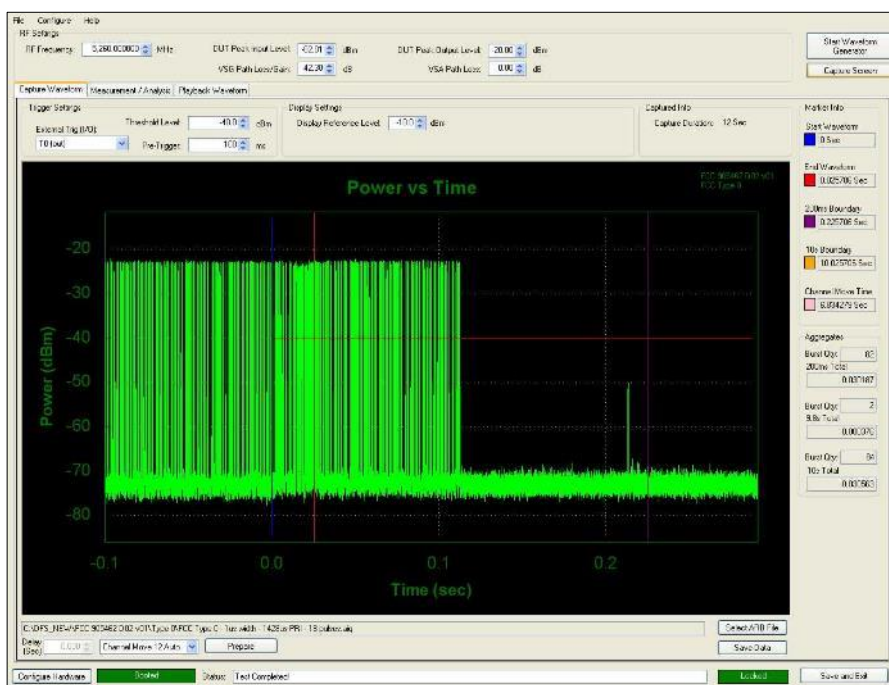


## 2.7.7 Test Results

### Main – 802.11a

| Test Parameter  | Result    |
|---|-----------|
| Channel Move Time   | 6.834 s   |
| Channel Closing Time (Aggregate Time During 200 ms)         | 30.187 ms |
| Channel Closing Time (Aggregate Time During 200 ms to 10 s) | 0.376 ms  |
| Channel Closing Time (Aggregate Time During 10 s)           | 30.563 ms |
| Transmission Observed During Non-Occupancy Period           | None      |

**Table 232 - In-Service Monitoring Test Results**



**Figure 485 - First 200 ms of Channel Shutdown Period**



Product Service

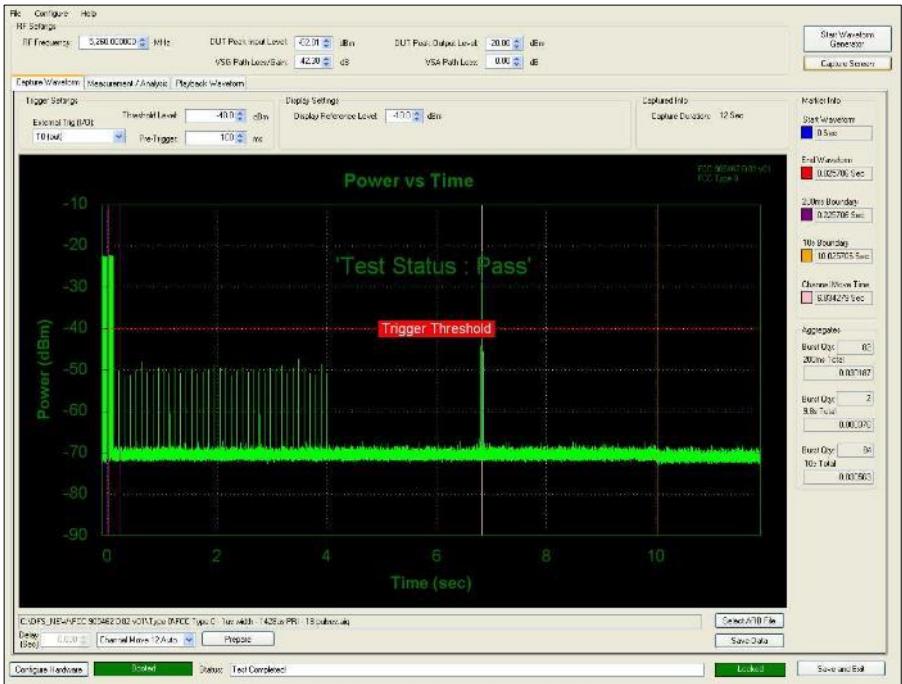


Figure 486 - 10 s Channel Shutdown

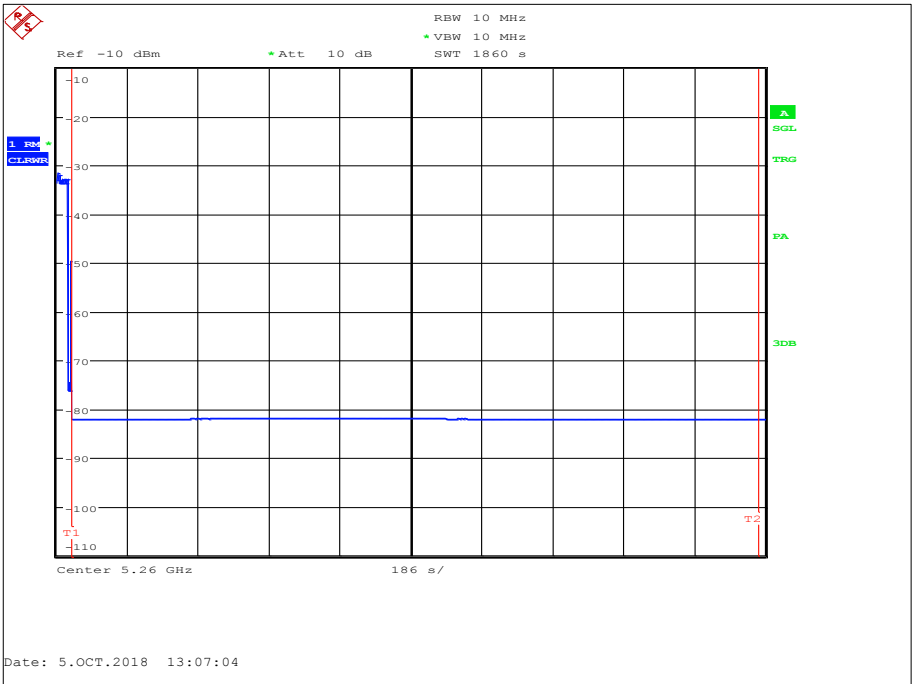


Figure 487 - Non - Occupancy Period



Product Service

FCC 47 CFR Part 15, Limit Clause 15.407 (h)(2)(iii) and Industry Canada RSS-247, Limit Clause 6.3.2(c)(d)

|   |             |
|---|-------------|
| Channel Move Time   | <10 seconds |
| Channel Closing Time<br>(Aggregate Time During 200ms)         | <200 ms     |
| Channel Closing Time<br>(Aggregate Time During +200ms to 10s) | <60 ms      |

**Table 233 - Channel Move Time and Channel Closing Transmission Time Limits**

FCC 47 CFR Part 15, Limit Clause 15.407 (h)(2)(iv) and Industry Canada RSS-247, Limit Clause 6.3.2(e)

|                      |              |
|----------------------|--------------|
| Non-occupancy Period | > 30 minutes |
|----------------------|--------------|

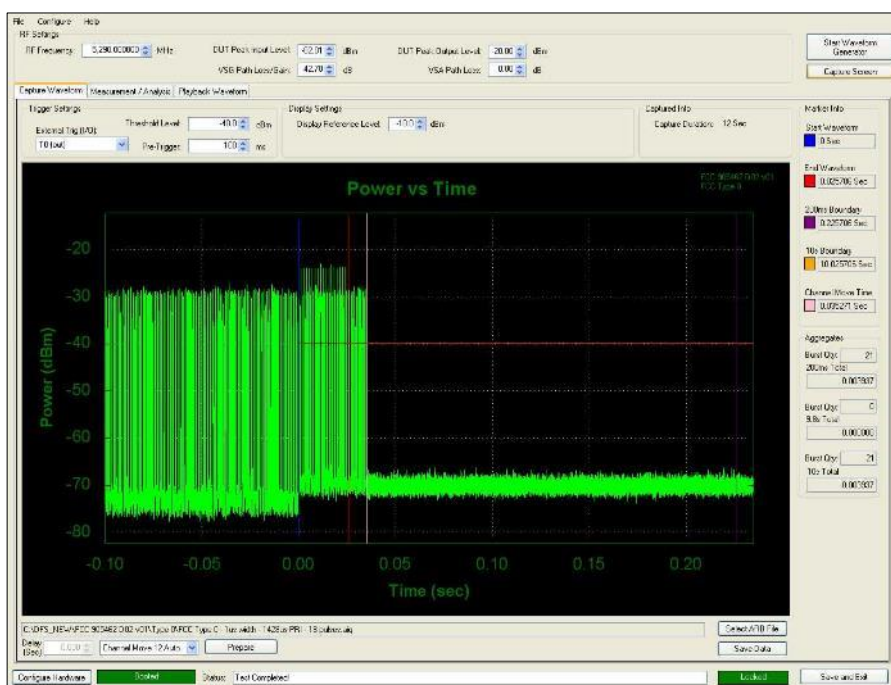
**Table 234 - Non-Occupancy Period Limit**



## Main - VHT80

| Test Parameter  | Result   |
|---|----------|
| Channel Move Time   | 0.035 s  |
| Channel Closing Time (Aggregate Time During 200 ms)         | 3.937 ms |
| Channel Closing Time (Aggregate Time During 200 ms to 10 s) | 0 ms     |
| Channel Closing Time (Aggregate Time During 10 s)           | 3.937 ms |
| Transmission Observed During Non-Occupancy Period           | None     |

**Table 235 - In-Service Monitoring Test Results**



**Figure 488 - First 200 ms of Channel Shutdown Period**



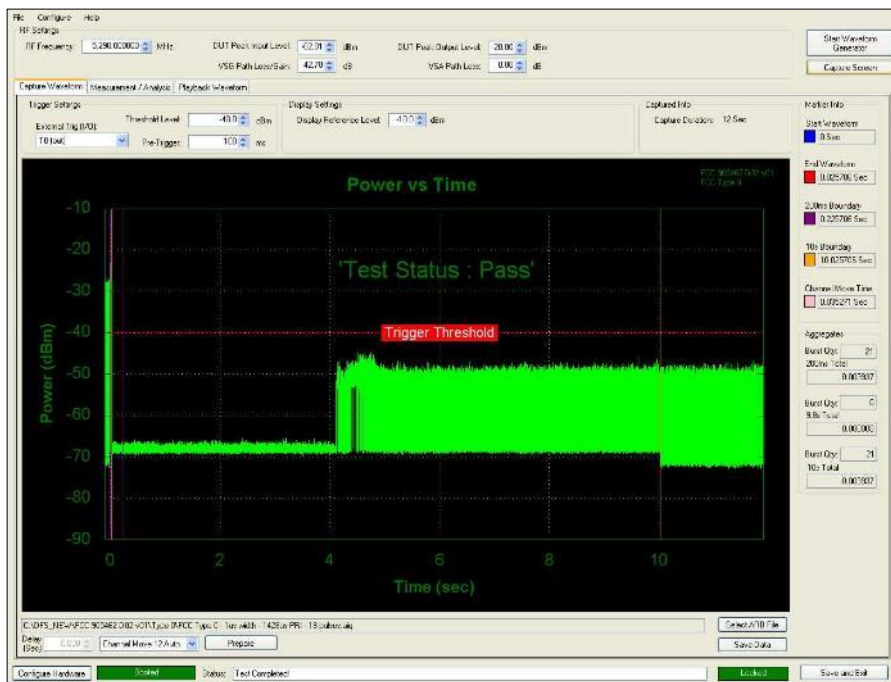


Figure 489 - 10 s Channel Shutdown

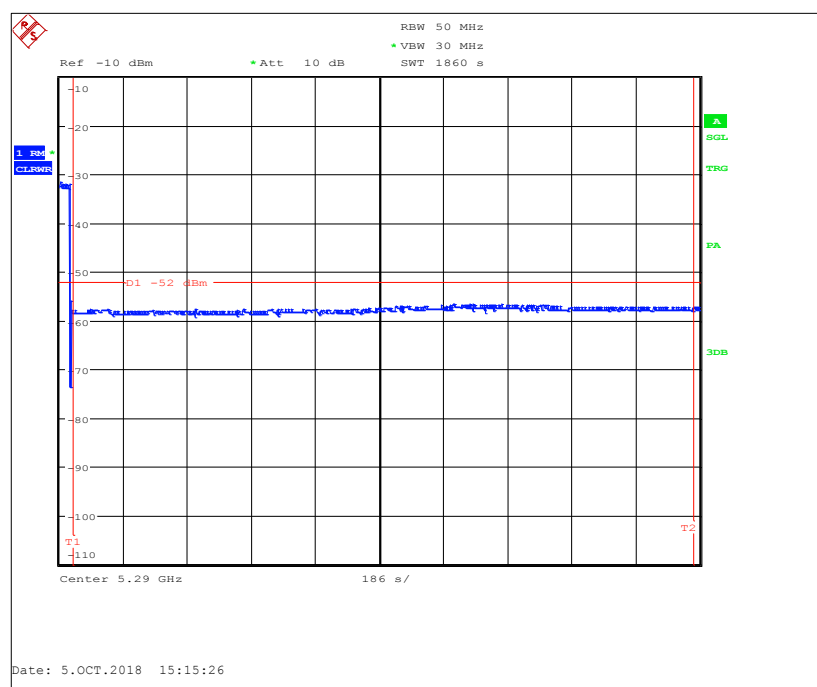


Figure 490 - Non - Occupancy Period

### Remarks

Note that it was confirmed that the channel transmissions had moved to channel 122 and leakage from these transmissions can be seen on the above plots but at a level below the threshold shown by the display lines.



Product Service

FCC 47 CFR Part 15, Limit Clause 15.407 (h)(2)(iii) and Industry Canada RSS-247, Limit Clause 6.3.2(c)(d)

|   |             |
|---|-------------|
| Channel Move Time   | <10 seconds |
| Channel Closing Time<br>(Aggregate Time During 200ms)         | <200 ms     |
| Channel Closing Time<br>(Aggregate Time During +200ms to 10s) | <60 ms      |

**Table 236 - Channel Move Time and Channel Closing Transmission Time Limits**

FCC 47 CFR Part 15, Limit Clause 15.407 (h)(2)(iv) and Industry Canada RSS-247, Limit Clause 6.3.2(e)

|                      |              |
|----------------------|--------------|
| Non-occupancy Period | > 30 minutes |
|----------------------|--------------|

**Table 237 - Non-Occupancy Period Limit**



## 2.7.8 Test Location and Test Equipment Used

This test was carried out in RF Chamber 10.

| Instrument   | Manufacturer    | Type No      | TE No | Calibration Period (months) | Calibration Due |
|--|-----------------|--------------|-------|-----------------------------|-----------------|
| Attenuator (10dB)                                  | Weinschel       | 47-10-34     | 481   | 12                          | 18-Jul-2019     |
| Step Attenuator                                    | Rohde & Schwarz | DPSP         | 1672  | -                           | O/P Mon         |
| Hygrometer   | Rotronic        | I-1000       | 3068  | 12                          | 21-Jun-2019     |
| Signal Analyser                                    | Rohde & Schwarz | FSQ 26       | 3545  | 12                          | 14-Mar-2019     |
| PXI RF Digitizer                                   | Aeroflex        | 3035         | 4012  | 24                          | 15-Mar-2020     |
| PXI RF Synthesizer                                 | Aeroflex        | 3010         | 4013  | 24                          | 15-Mar-2020     |
| PXI RF Synthesizer                                 | Aeroflex        | 3011         | 4014  | 24                          | 15-Mar-2020     |
| PXI Digital RF Signal Generator                    | Aeroflex        | 3025         | 4015  | 24                          | 15-Mar-2020     |
| 1800-6000 MHz Power Splitter                       | Mini-Circuits   | ZN2PD-63-S+  | 4055  | -                           | O/P Mon         |
| 1800-6000 MHz Power Splitter                       | Mini-Circuits   | ZN2PD-63-S+  | 4056  | -                           | O/P Mon         |
| Power splitter - 2 port                            | Mini-Circuits   | ZN2PD-63-S+  | 4743  | 12                          | 19-Sep-2019     |
| Power splitter - 4 port                            | Mini-Circuits   | ZN4PD1-63-S+ | 4744  | 12                          | 19-Sep-2019     |
| Wireless Cable & Fibre Router - AC 1900, Dual-band | Asus            | RT-AC68U     | 4881  | -                           | TU              |
| Cable (40GHz)                                      | Rosenberger     | LU1-001-1000 | 5023  | -                           | O/P Mon         |
| Cable (18GHz)                                      | Rosenberger     | LU7-036-1000 | 5033  | -                           | O/P Mon         |

**Table 238**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



### 3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

| Test Name                                | Measurement Uncertainty                                |
|--|--|
| Maximum Conducted Output Power           | ± 3.2 dB   |
| Maximum Conducted Power Spectral Density | ± 3.2 dB   |
| Emission Bandwidth                       | ± 2.028 MHz  |
| Authorised Band Edges                    | ± 6.3 dB   |
| Spurious Radiated Emissions              | 30 MHz to 1 GHz: ± 5.2 dB<br>1 GHz to 40 GHz: ± 6.3 dB |
| Restricted Band Edges                    | ± 6.3 dB   |

Table 239