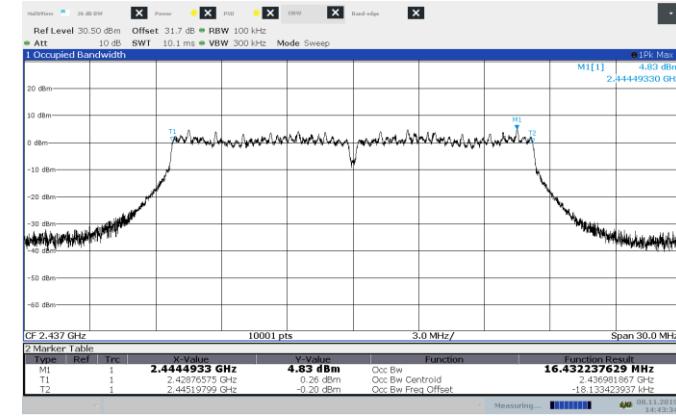
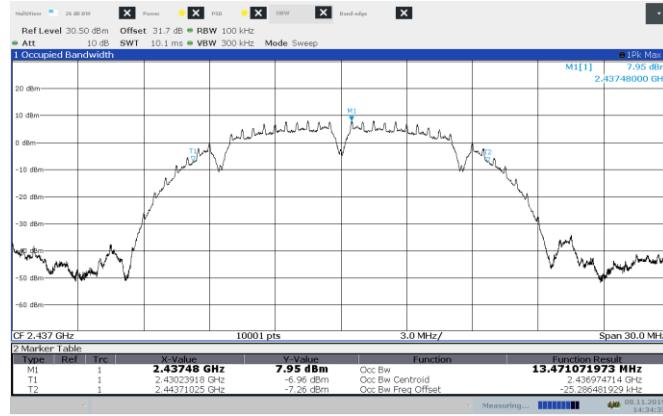
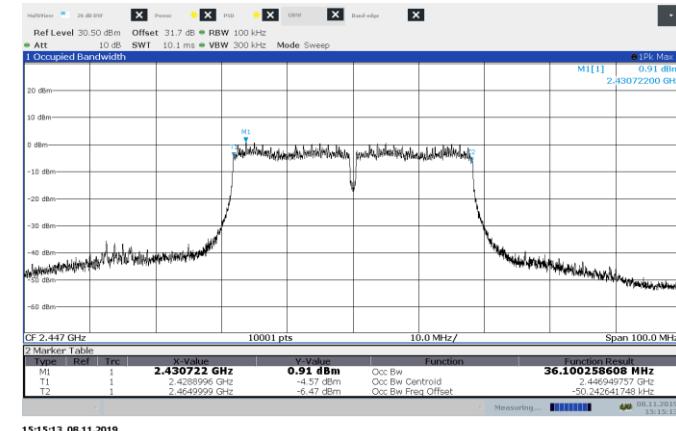
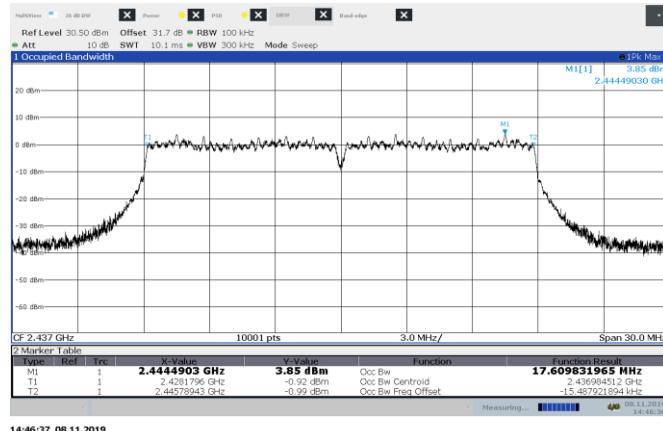


### 8.5.4 Test data, continued



14:34:34 08.11.2019

14:43:34 08.11.2019



14:46:37 08.11.2019

15:15:13 08.11.2019

## 8.6 FCC 15.247(b)(3)(4) Transmitter output power and e.i.r.p. requirements

### 8.6.1 Definitions and limits

#### FCC §15.247:

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(3) 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. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

(4) 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.

### 8.6.2 Test date

Start date      October 17, 2019

### 8.6.3 Observations, settings and special notes

- The test was performed as per KDB 558074, section 8.3 with reference to ANSI C63.10 subclause 11.9.2 (average power)
- The test was performed using method AVGSA-1 (trace averaging with the EUT transmitting at full power throughout each sweep).

Spectrum analyser settings:

|                      |  |
|----------------------|--|
| Resolution bandwidth | 1–5 % OBW  |
| Video bandwidth      | $\geq 3 \times$ RBW                                  |
| Frequency span       | 30 MHz for 20 MHz channel; 60 MHz for 40 MHz channel |
| Detector mode        | RMS  |
| Trace mode           | Average  |

8.6.4 Test data

Table 8.6-1: Output power measurements results - 802.11b modulation

| Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|----------------|-----------------------------|-------|------------|-------------------|-----------|-----------------|-----------------|
|                | Measured                    | Limit |            |                   |           |                 |                 |
| 2412           | 16.40                       | 30.00 | 13.60      | 3.96              | 20.36     | 36.00           | 15.64           |
| 2437           | 16.71                       | 30.00 | 13.29      | 3.96              | 20.67     | 36.00           | 15.33           |
| 2462           | 15.75                       | 30.00 | 14.25      | 3.96              | 19.71     | 36.00           | 16.29           |

Notes: EIRP = Output power + Antenna gain

Table 8.6-2: Output power measurements results - 802.11g modulation

| Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|----------------|-----------------------------|-------|------------|-------------------|-----------|-----------------|-----------------|
|                | Measured                    | Limit |            |                   |           |                 |                 |
| 2412           | 11.57                       | 30.00 | 18.43      | 3.96              | 15.53     | 36.00           | 20.47           |
| 2437           | 11.94                       | 30.00 | 18.06      | 3.96              | 15.90     | 36.00           | 20.10           |
| 2462           | 11.03                       | 30.00 | 18.97      | 3.96              | 14.99     | 36.00           | 21.01           |

Notes: EIRP = Output power + Antenna gain

Table 8.6-3: Output power measurements results - 802.11n HT20 modulation

| Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|----------------|-----------------------------|-------|------------|-------------------|-----------|-----------------|-----------------|
|                | Measured                    | Limit |            |                   |           |                 |                 |
| 2412           | 10.54                       | 30.00 | 19.46      | 3.96              | 14.50     | 36.00           | 21.50           |
| 2437           | 10.87                       | 30.00 | 19.13      | 3.96              | 14.83     | 36.00           | 21.17           |
| 2462           | 10.08                       | 30.00 | 19.92      | 3.96              | 14.04     | 36.00           | 21.96           |

Notes: EIRP = Output power + Antenna gain

Table 8.6-4: Output power measurements results - 802.11n HT40 modulation

| Frequency, MHz | Conducted output power, dBm |       | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|----------------|-----------------------------|-------|------------|-------------------|-----------|-----------------|-----------------|
|                | Measured                    | Limit |            |                   |           |                 |                 |
| 2422           | 8.20                        | 30.00 | 21.80      | 3.96              | 12.16     | 36.00           | 23.84           |
| 2447           | 8.12                        | 30.00 | 21.88      | 3.96              | 12.08     | 36.00           | 23.92           |
| 2452           | 7.87                        | 30.00 | 22.13      | 3.96              | 11.83     | 36.00           | 24.17           |

Notes: EIRP = Output power + Antenna gain

#### 8.6.4 Test data, continued

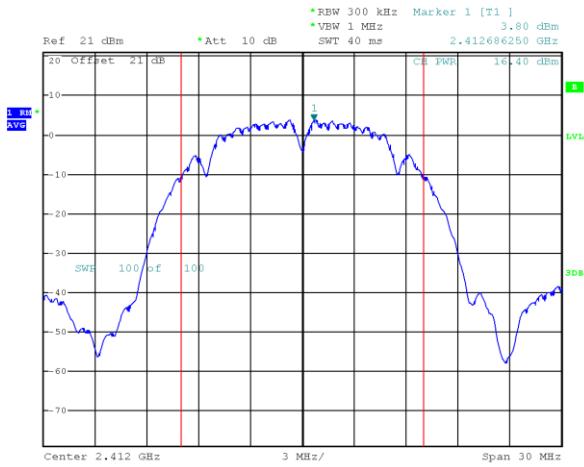


Figure 8.6-1: Conducted output power 802.11b, sample plot

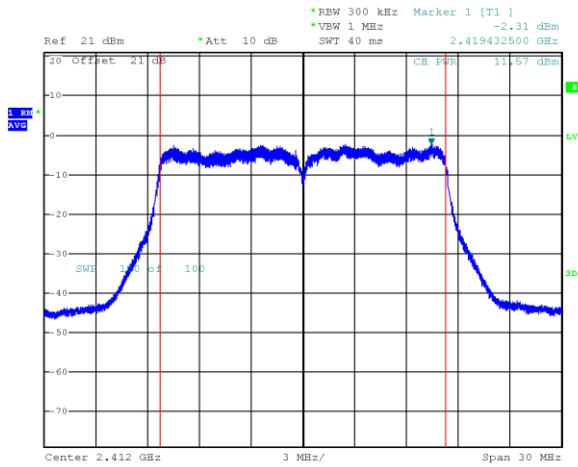


Figure 8.6-2: Conducted output power on 802.11g, sample plot

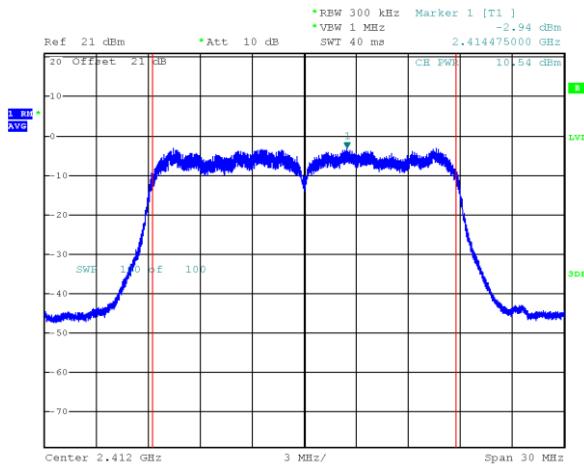


Figure 8.6-3: Conducted output power on 802.11n HT20, sample plot

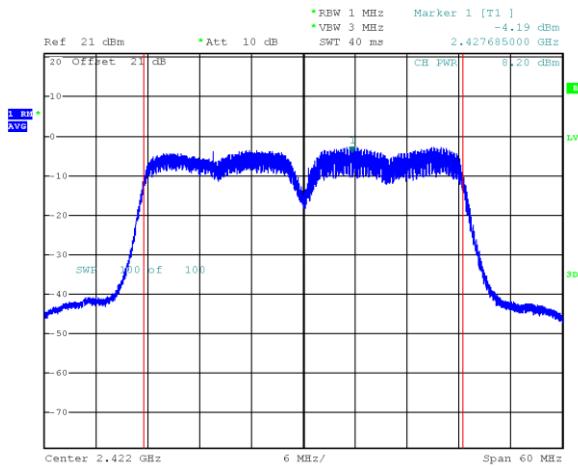


Figure 8.6-4: Conducted output power on 802.11n HT40, sample plot

## 8.7 FCC 15.247(d) Spurious (out-of-band) unwanted emissions

### 8.7.1 Definitions and limits

#### FCC §15.247 (d):

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 below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

**Table 8.7-1: FCC §15.209 – Radiated emission limits**

| Frequency,<br>MHz | Field strength of emissions<br>μV/m | Field strength of emissions<br>dBμV/m | Measurement distance,<br>m |
|-------------------|-------------------------------------|---------------------------------------|----------------------------|
| 0.009–0.490       | 2400/F                              | 67.6 – 20 × log <sub>10</sub> (F)     | 300                        |
| 0.490–1.705       | 24000/F                             | 87.6 – 20 × log <sub>10</sub> (F)     | 30                         |
| 1.705–30.0        | 30                                  | 29.5                                  | 30                         |
| 30–88             | 100                                 | 40.0                                  | 3                          |
| 88–216            | 150                                 | 43.5                                  | 3                          |
| 216–960           | 200                                 | 46.0                                  | 3                          |
| above 960         | 500                                 | 54.0                                  | 3                          |

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

**Table 8.7-2: FCC §15.205 – Restricted frequency bands**

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090–0.110       | 16.42–16.423        | 399.9–410     | 4.5–5.15    |
| 0.495–0.505       | 16.69475–16.69525   | 608–614       | 5.35–5.46   |
| 2.1735–2.1905     | 16.80425–16.80475   | 960–1240      | 7.25–7.75   |
| 4.125–4.128       | 25.5–25.67          | 1300–1427     | 8.025–8.5   |
| 4.17725–4.17775   | 37.5–38.25          | 1435–1626.5   | 9.0–9.2     |
| 4.20725–4.20775   | 73–74.6             | 1645.5–1646.5 | 9.3–9.5     |
| 6.215–6.218       | 74.8–75.2           | 1660–1710     | 10.6–12.7   |
| 6.26775–6.26825   | 108–121.94          | 1718.8–1722.2 | 13.25–13.4  |
| 6.31175–6.31225   | 123–138             | 2200–2300     | 14.47–14.5  |
| 8.291–8.294       | 149.9–150.05        | 2310–2390     | 15.35–16.2  |
| 8.362–8.366       | 156.52475–156.52525 | 2483.5–2500   | 17.7–21.4   |
| 8.37625–8.38675   | 156.7–156.9         | 2690–2900     | 22.01–23.12 |
| 8.41425–8.41475   | 162.0125–167.17     | 3260–3267     | 23.6–24.0   |
| 12.29–12.293      | 167.72–173.2        | 3332–3339     | 31.2–31.8   |
| 12.51975–12.52025 | 240–285             | 3345.8–3358   | 36.43–36.5  |
| 12.57675–12.57725 | 322–335.4           | 3600–4400     | Above 38.6  |
| 13.36–13.41       |                     |               |             |

Notes: None

#### 8.7.2 Test date

Start date October 16, 2019

#### 8.7.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.  
EUT was set to transmit with 100 % duty cycle.
- Radiated measurements from 1 – 18 GHz were performed at a distance of 3 m.
- Radiated measurements from 18 - 25 GHz were performed at a distance of 1 m.
- DTS emissions in non-restricted frequency bands test was performed as per KDB 558074, section 8.5 with reference to ANSI C63.10 subclause 11.11.
- Since fundamental power was tested using maximum conducted (average) output power procedure to demonstrate compliance, the spurious emissions limit is -30 dBc/100 kHz.
- DTS emissions in restricted frequency bands test was performed as per KDB 558074, section 8.6 with reference to ANSI C63.10 subclause 11.12.2.7.
- DTS band-edge emission measurements test was performed as per KDB 558074, section 8.7 with reference to ANSI C63.10 subclause 11.13.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

|                      |                    |
|----------------------|--------------------|
| Detector mode        | Peak or Quasi-Peak |
| Resolution bandwidth | 100 kHz or 120 kHz |
| Video bandwidth      | 300 kHz            |
| Trace mode           | Max Hold           |

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

|                      |          |
|----------------------|----------|
| Detector mode        | Peak     |
| Resolution bandwidth | 1 MHz    |
| Video bandwidth      | 3 MHz    |
| Trace mode           | Max Hold |

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

|                      |                      |
|----------------------|----------------------|
| Detector mode        | RMS                  |
| Resolution bandwidth | 1 MHz                |
| Video bandwidth      | 3 MHz                |
| Trace mode           | Average (100 Counts) |

Spectrum analyser settings for conducted spurious emissions measurements:

|                       |          |
|-----------------------|----------|
| Resolution bandwidth: | 100 kHz  |
| Video bandwidth:      | 300 kHz  |
| Detector mode:        | Peak     |
| Trace mode:           | Max Hold |

#### 8.7.4 Test data

**Table 8.7-3: Radiated field strength measurement results for 802.11b**

| Channel | Frequency,<br>MHz | Peak Field strength, dB $\mu$ V/m |       | Margin,<br>dB | Average Field strength, dB $\mu$ V/m |       | Margin,<br>dB |
|---------|-------------------|-----------------------------------|-------|---------------|--------------------------------------|-------|---------------|
|         |                   | Measured                          | Limit |               | Measured                             | Limit |               |
| Low     | 2390.0            | 67.38                             | 74.00 | 6.62          | 42.88                                | 54.00 | 11.12         |
| High    | 2483.5            | 66.60                             | 74.00 | 7.40          | 43.81                                | 54.00 | 10.19         |
| Low     | 4824.0            | 55.36                             | 74.00 | 18.64         | 50.83                                | 54.00 | 3.17          |
| Mid     | 7311.0            | 55.57                             | 74.00 | 18.43         | 48.20                                | 54.00 | 5.8           |

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

**Table 8.7-4: Radiated field strength measurement results for 802.11g**

| Channel | Frequency,<br>MHz | Peak Field strength, dB $\mu$ V/m |       | Margin,<br>dB | Average Field strength, dB $\mu$ V/m |       | Margin,<br>dB |
|---------|-------------------|-----------------------------------|-------|---------------|--------------------------------------|-------|---------------|
|         |                   | Measured                          | Limit |               | Measured                             | Limit |               |
| Low     | 2390.0            | 70.73                             | 74.00 | 3.27          | 48.51                                | 54.00 | 5.49          |
| High    | 2483.5            | 73.61                             | 74.00 | 0.39          | 46.97                                | 54.00 | 7.03          |
| Mid     | 7311.0            | 56.65                             | 74.00 | 17.35         | 43.32                                | 54.00 | 10.68         |

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

**Table 8.7-5: Radiated field strength measurement results for 802.11n HT20**

| Channel | Frequency,<br>MHz | Peak Field strength, dB $\mu$ V/m |       | Margin,<br>dB | Average Field strength, dB $\mu$ V/m |       | Margin,<br>dB |
|---------|-------------------|-----------------------------------|-------|---------------|--------------------------------------|-------|---------------|
|         |                   | Measured                          | Limit |               | Measured                             | Limit |               |
| Low     | 2390.0            | 73.25                             | 74.00 | 0.75          | 49.42                                | 54.00 | 4.58          |
| High    | 2483.5            | 72.75                             | 74.00 | 1.25          | 48.08                                | 54.00 | 5.92          |
| Mid     | 7311.0            | 57.80                             | 74.00 | 16.20         | 42.30                                | 54.00 | 11.70         |

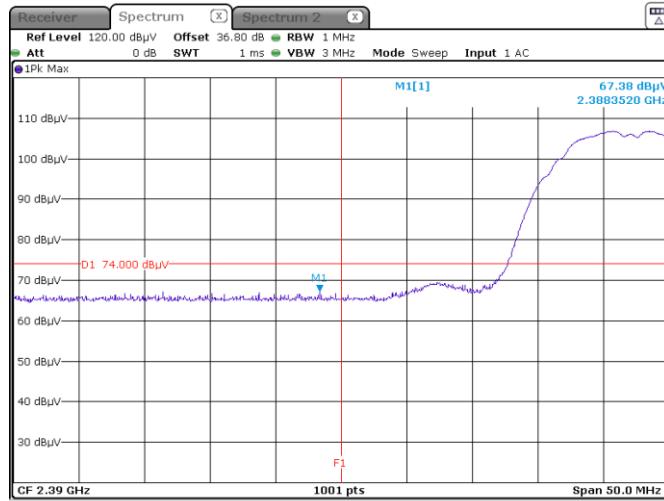
Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

**Table 8.7-6: Radiated field strength measurement results for 802.11n HT40**

| Channel | Frequency,<br>MHz | Peak Field strength, dB $\mu$ V/m |       | Margin,<br>dB | Average Field strength, dB $\mu$ V/m |       | Margin,<br>dB |
|---------|-------------------|-----------------------------------|-------|---------------|--------------------------------------|-------|---------------|
|         |                   | Measured                          | Limit |               | Measured                             | Limit |               |
| Low     | 2390.0            | 72.66                             | 74.00 | 1.34          | 51.38                                | 54.00 | 2.62          |
| High    | 2483.5            | 71.21                             | 74.00 | 2.79          | 51.97                                | 54.00 | 2.03          |
| Mid     | 7341.0            | 53.62                             | 74.00 | 20.38         | 39.97                                | 54.00 | 14.03         |

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

#### 8.7.4 Test data, continued



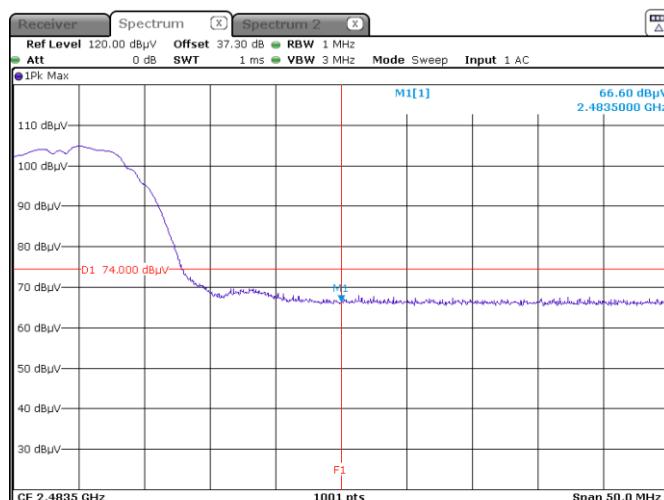
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Figure 8.7-1: Unwanted emissions in restricted band 2390 MHz  
802.11b, low channel, Peak



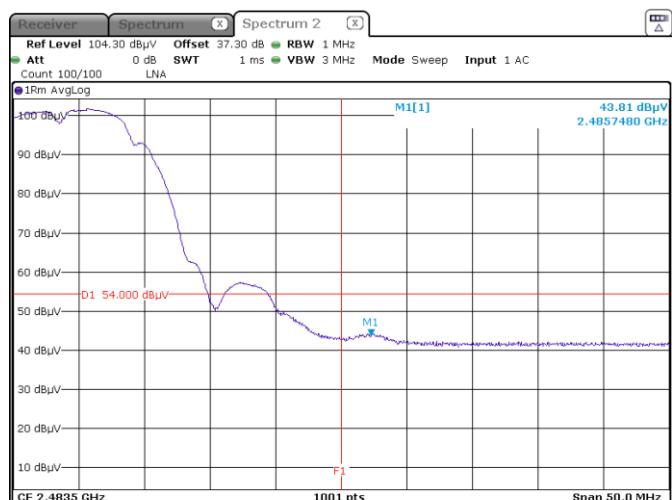
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Figure 8.7-2: Unwanted emissions in restricted band 2390 MHz  
802.11b, low channel, Average



Date: 16.OCT.2019 12:04:56

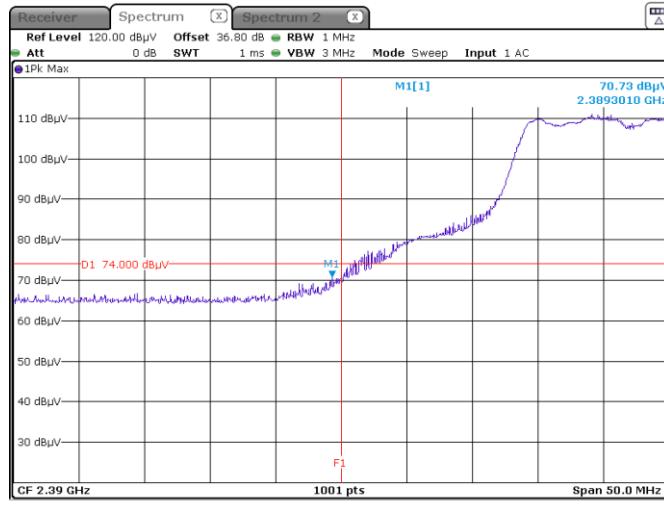
Figure 8.7-3: Unwanted emissions in restricted band 2483.5 MHz  
802.11b, high channel, Peak



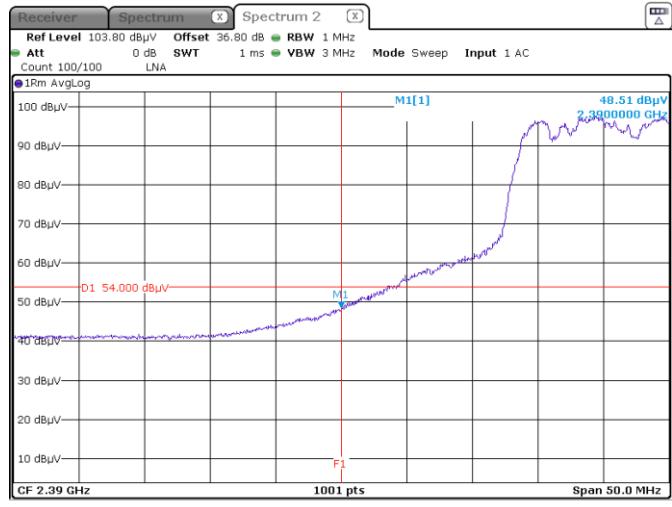
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Figure 8.7-4: Unwanted emissions in restricted band 2483.5 MHz  
802.11b, high channel, Average

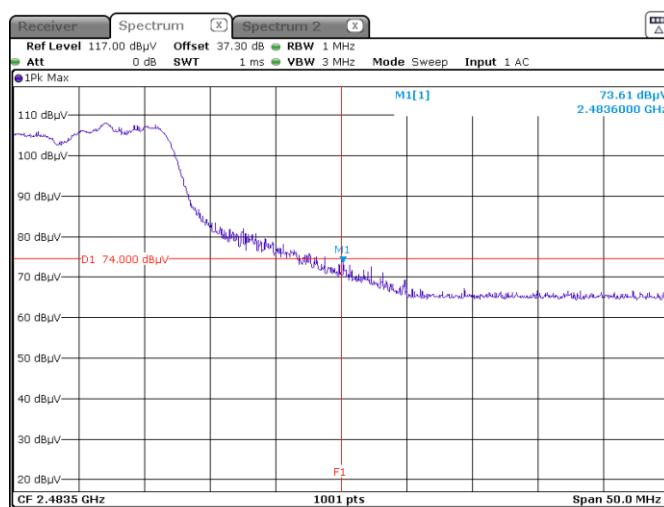
#### 8.7.4 Test data, continued



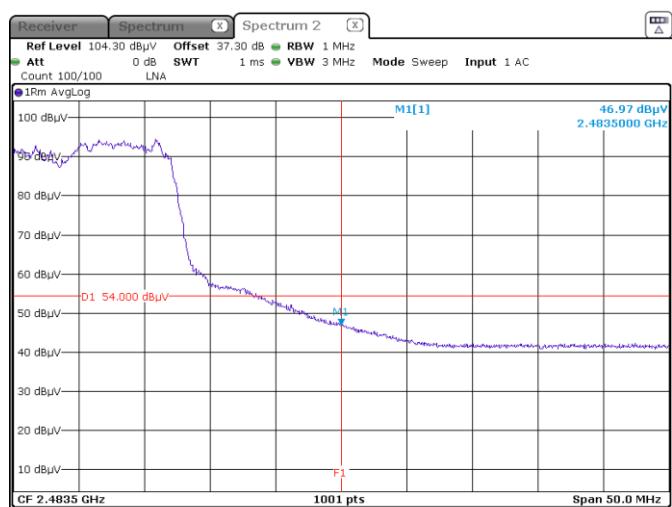
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Date: 16.OCT.2019 10:52:56

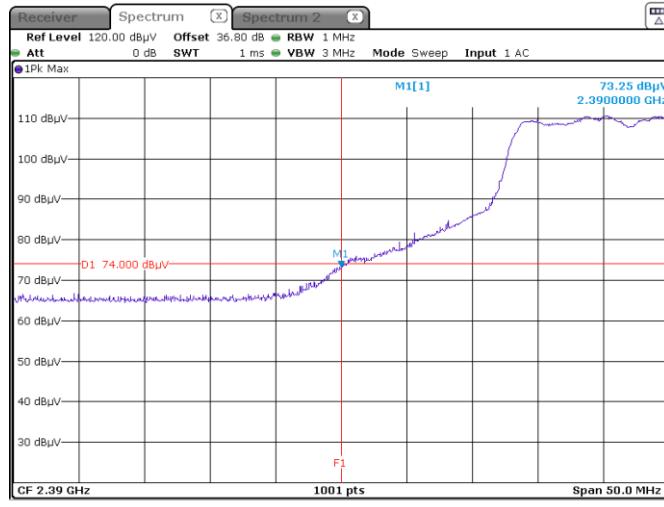


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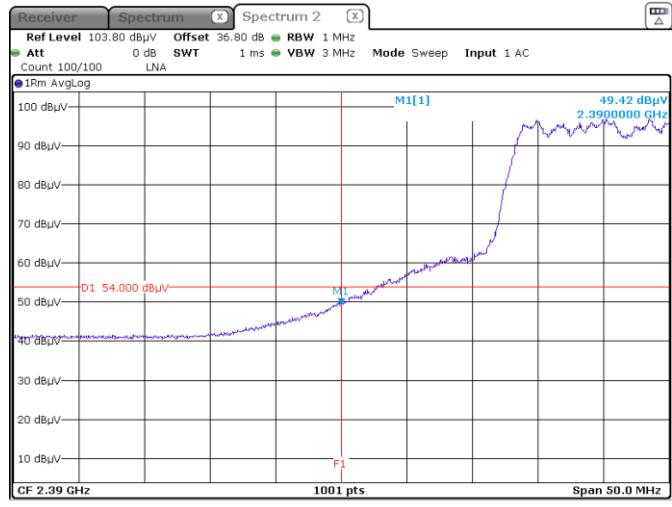


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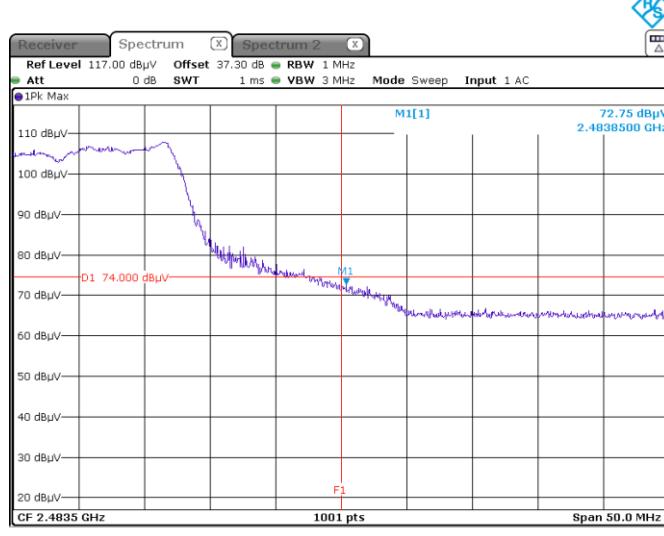
### 8.7.4 Test data, continued



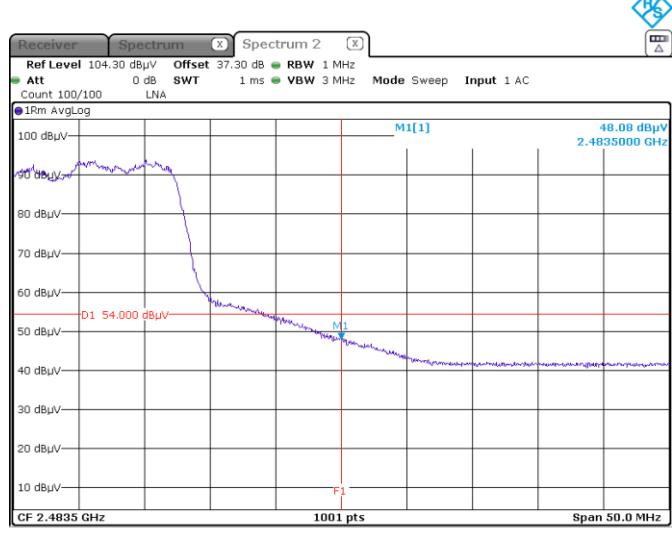
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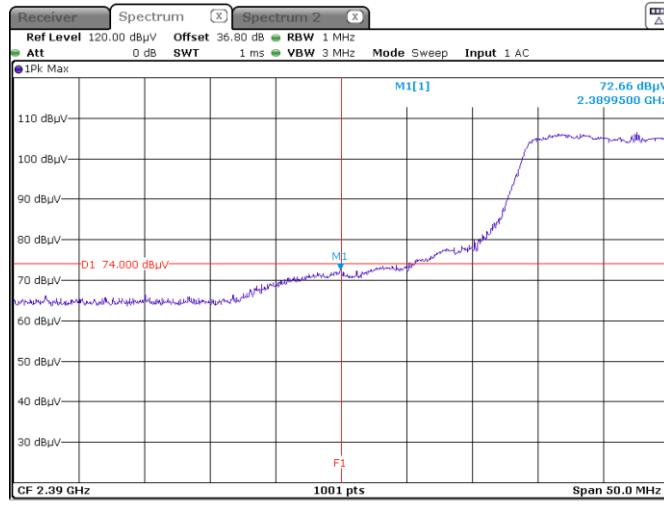


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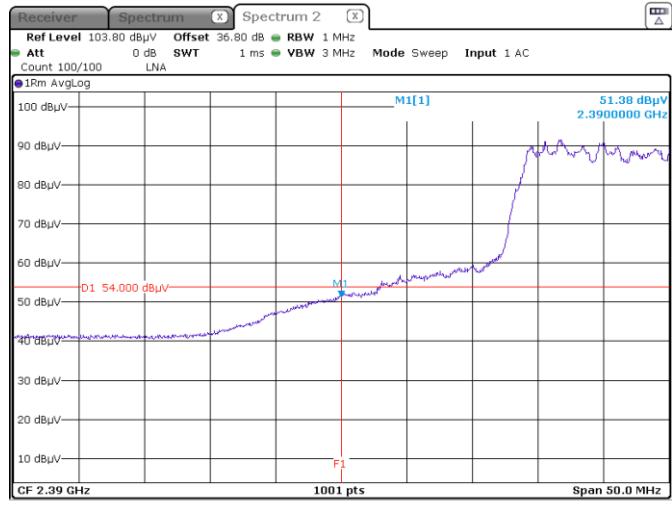


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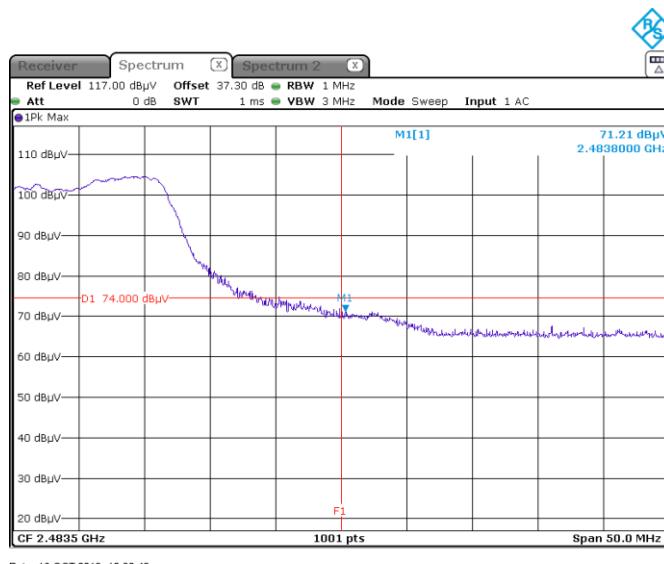
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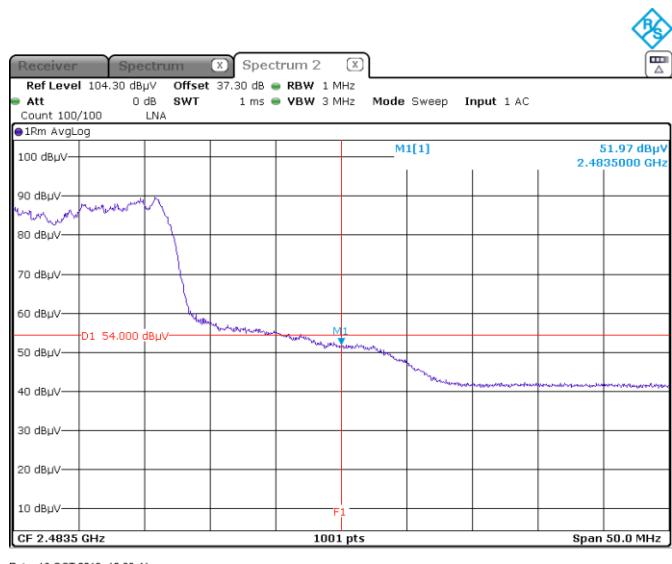
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Date: 16.OCT.2019 12:32:49



Date: 16.OCT.2019 12:33:41

#### 8.7.4 Test data, continued

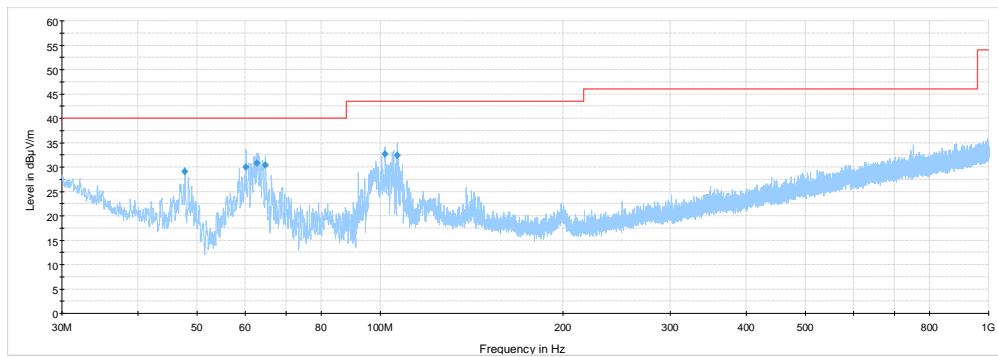


Figure 8.7-17: Radiated spurious emissions 30 MHz – 1 GHz for 802.11b, low channel

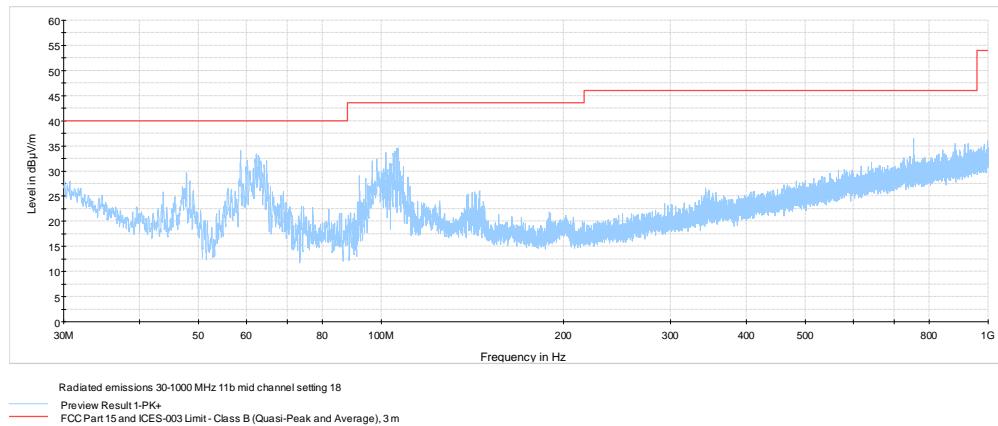
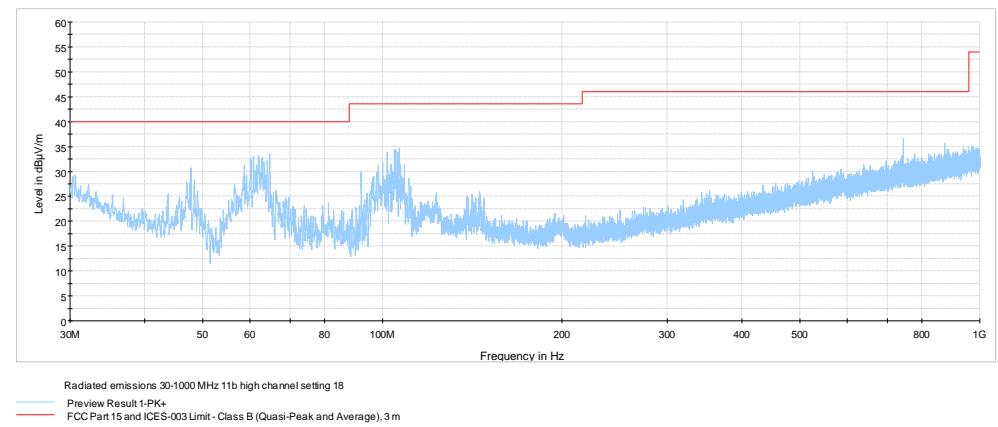


Figure 8.7-18: Radiated spurious emissions 30 MHz – 1 GHz for 802.11b, mid channel



#### 8.7.4 Test data, continued

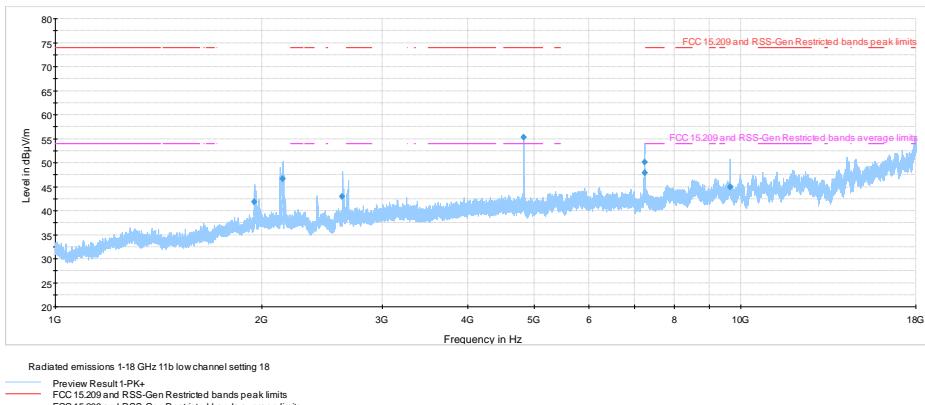


Figure 8.7-20: Radiated spurious emissions 1 - 18 GHz for 802.11b, low channel

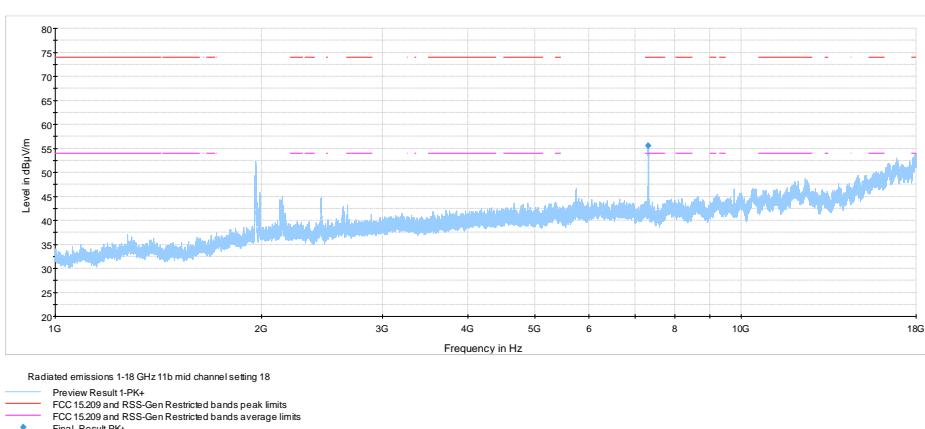


Figure 8.7-21: Radiated spurious emissions 1 - 18 GHz for 802.11b, mid channel

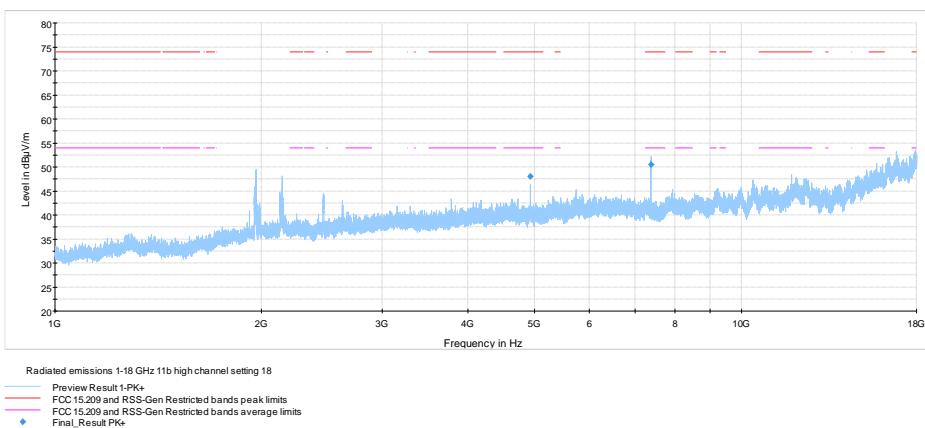


Figure 8.7-22: Radiated spurious emissions 1 - 18 GHz for 802.11b, high channel

#### 8.7.4 Test data, continued

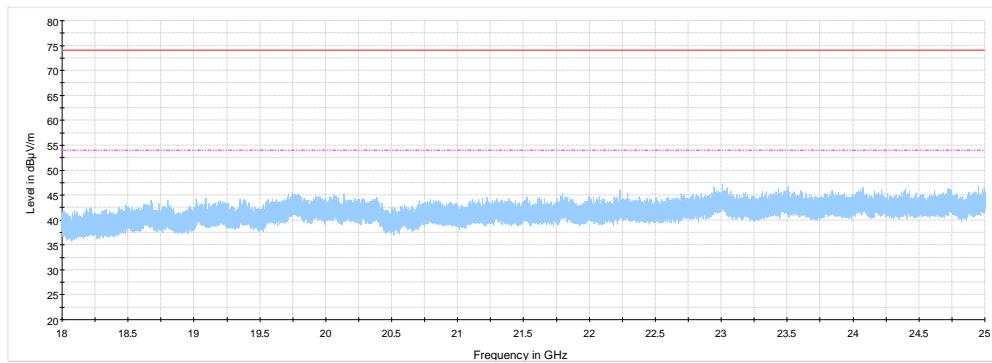


Figure 8.7-23: Radiated spurious emissions 18 - 25 GHz for 802.11b, low channel

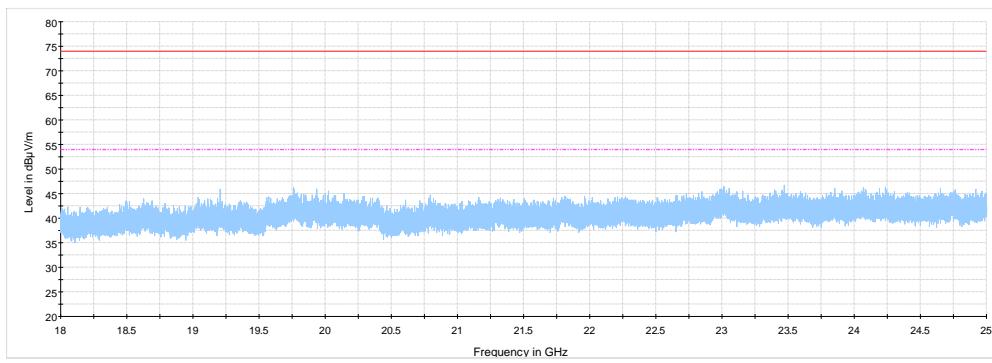


Figure 8.7-24: Radiated spurious emissions 18 - 25 GHz for 802.11b, mid channel

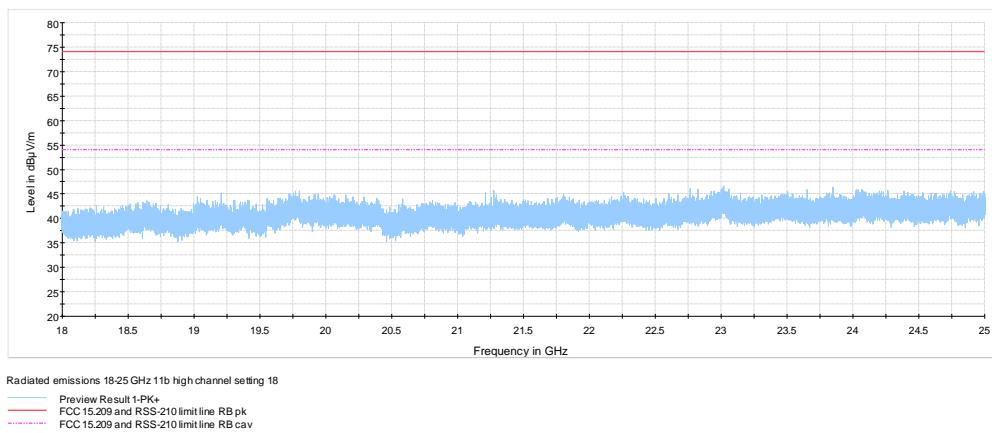


Figure 8.7-25: Radiated spurious emissions 18 - 25 GHz for 802.11b, high channel

#### 8.7.4 Test data, continued

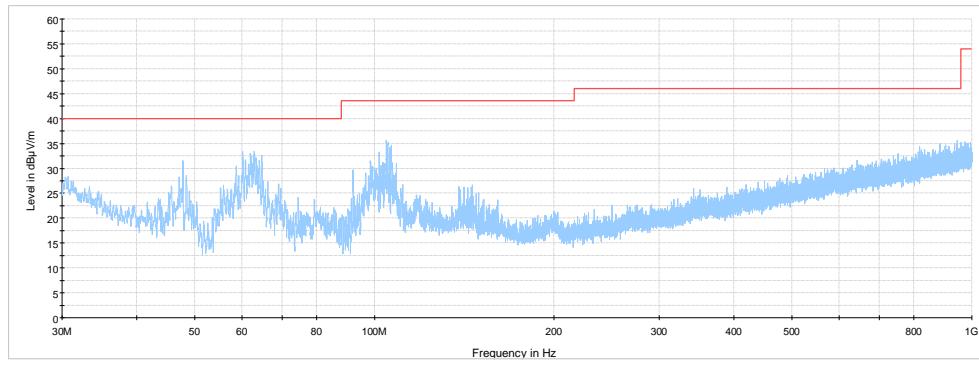


Figure 8.7-26: Radiated spurious emissions 30 MHz – 1 GHz for 802.11g, low channel

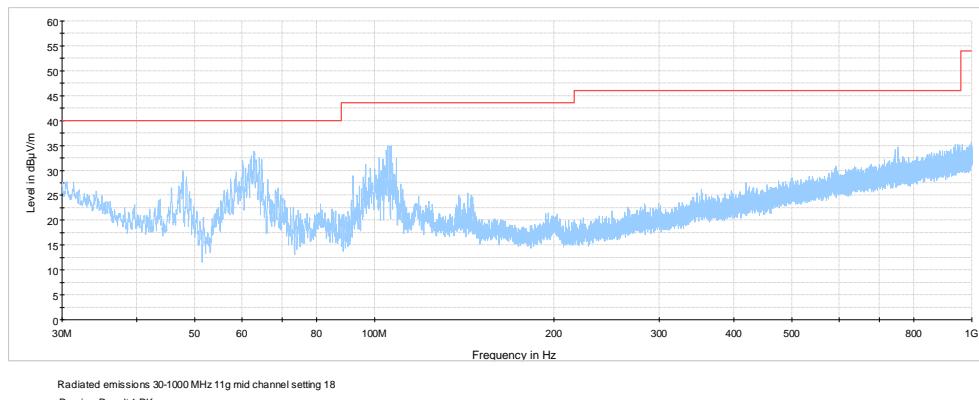


Figure 8.7-27: Radiated spurious emissions 30 MHz – 1 GHz for 802.11g, mid channel

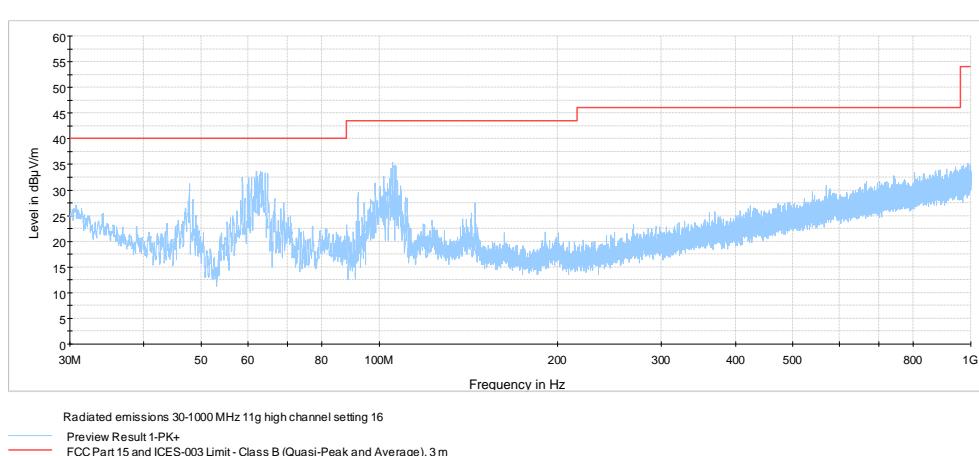


Figure 8.7-28: Radiated spurious emissions 30 MHz – 1 GHz for 802.11g, high channel

#### 8.7.4 Test data, continued

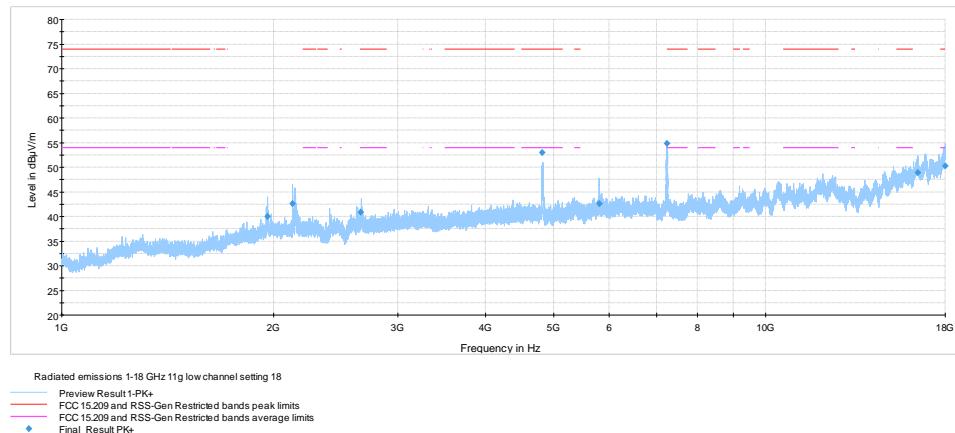


Figure 8.7-29: Radiated spurious emissions 1 - 18 GHz for 802.11g, low channel

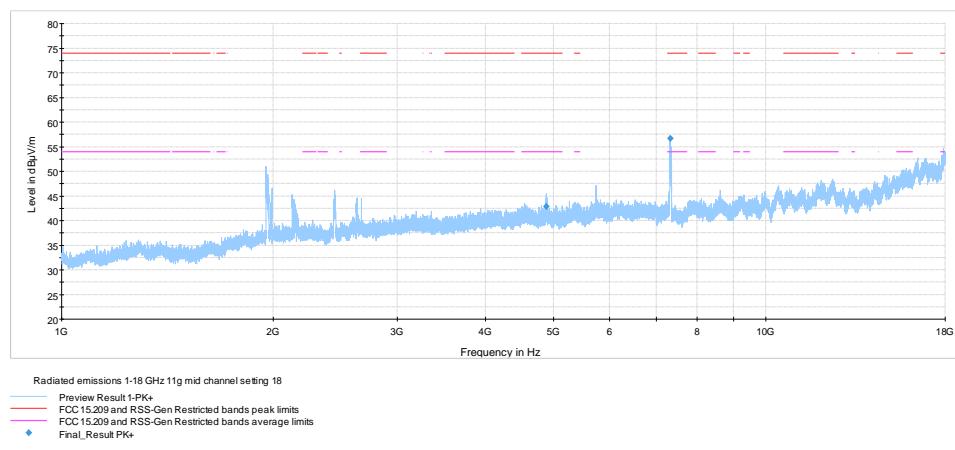


Figure 8.7-30: Radiated spurious emissions 1 - 18 GHz for 802.11g, mid channel

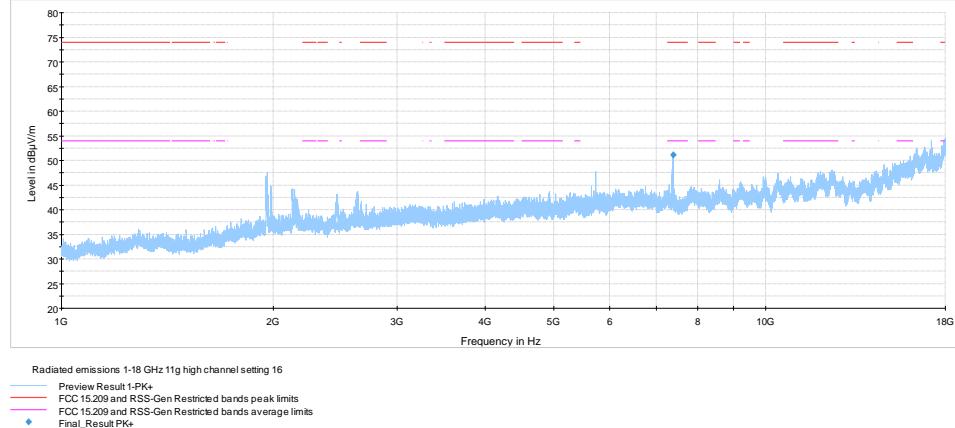
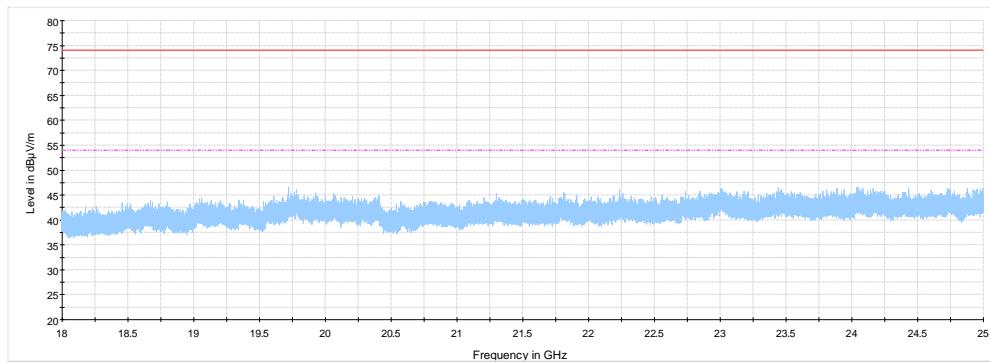


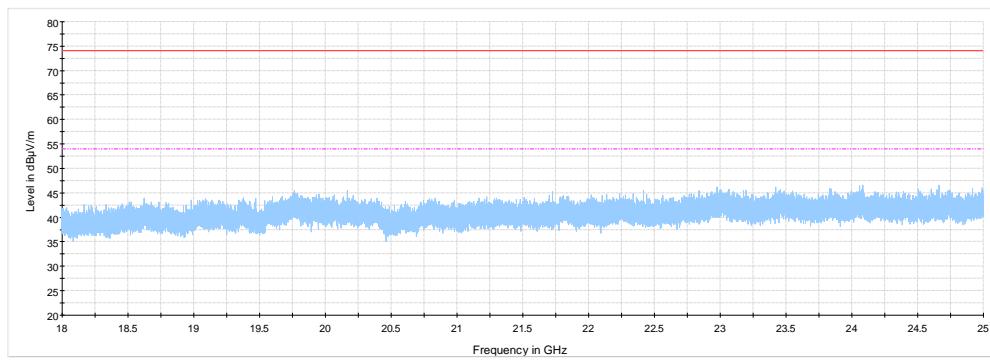
Figure 8.7-31: Radiated spurious emissions 1 - 18 GHz for 802.11g, high channel

#### 8.7.4 Test data, continued



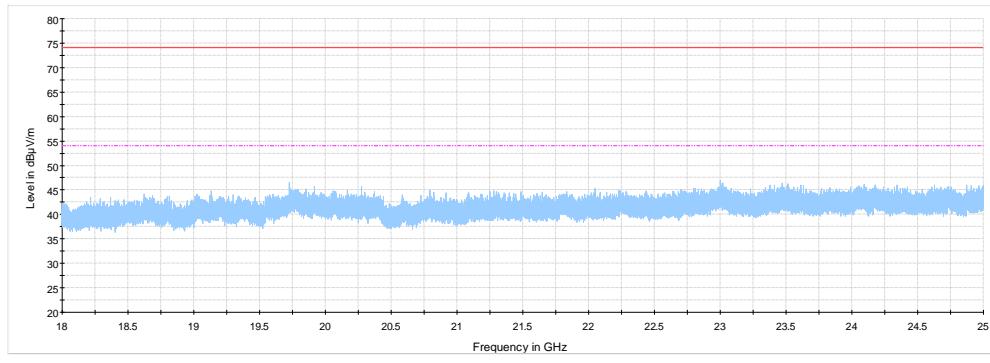
Radiated emissions 18-25 GHz 11g low channel setting 18  
— Preview Result 1-PK+  
— FCC 15.209 and RSS-210 limit line RB pk  
— FCC 15.209 and RSS-210 limit line RB cav

Figure 8.7-32: Radiated spurious emissions 18 - 25 GHz for 802.11g, low channel



Radiated emissions 18-25 GHz 11g mid channel setting 18  
— Preview Result 1-PK+  
— FCC 15.209 and RSS-210 limit line RB pk  
— FCC 15.209 and RSS-210 limit line RB cav

Figure 8.7-33: Radiated spurious emissions 18 - 25 GHz for 802.11g, mid channel



Radiated emissions 18-25 GHz 11g high channel setting 16  
— Preview Result 1-PK+  
— FCC 15.209 and RSS-210 limit line RB pk  
— FCC 15.209 and RSS-210 limit line RB cav

Figure 8.7-34: Radiated spurious emissions 18 - 25 GHz for 802.11g, high channel

#### 8.7.4 Test data, continued

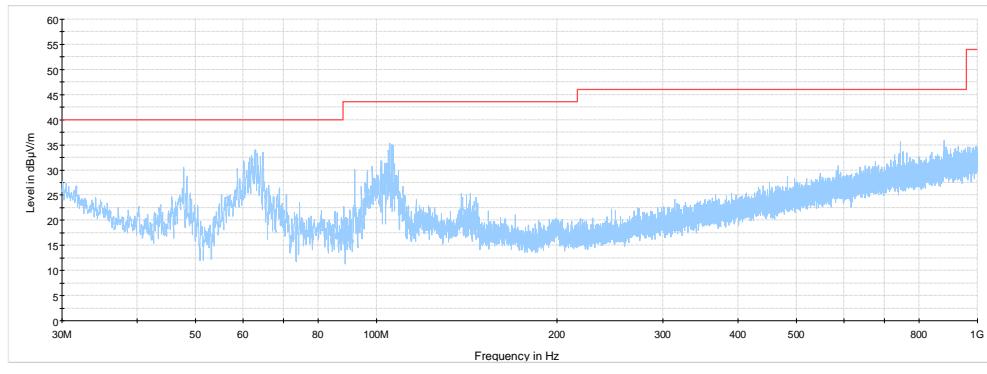


Figure 8.7-35: Radiated spurious emissions 30 MHz – 1 GHz for 802.11n HT20, low channel

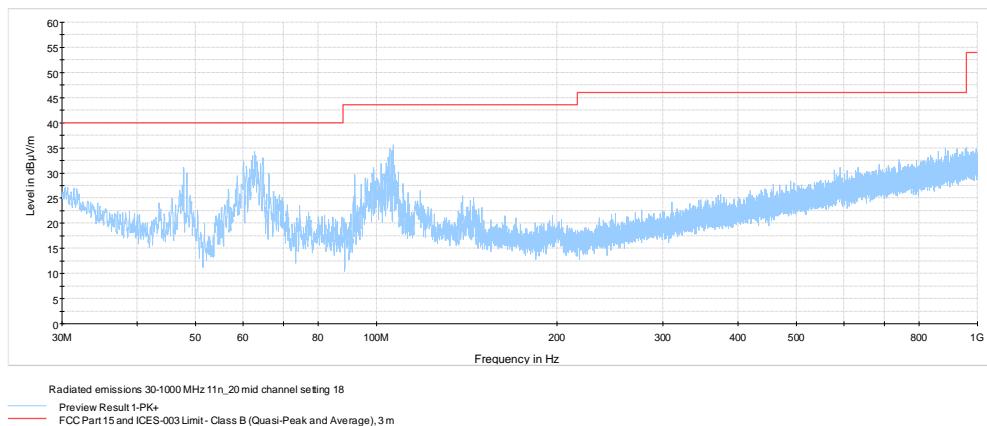


Figure 8.7-36: Radiated spurious emissions 30 MHz – 1 GHz for 802.11n HT20, mid channel

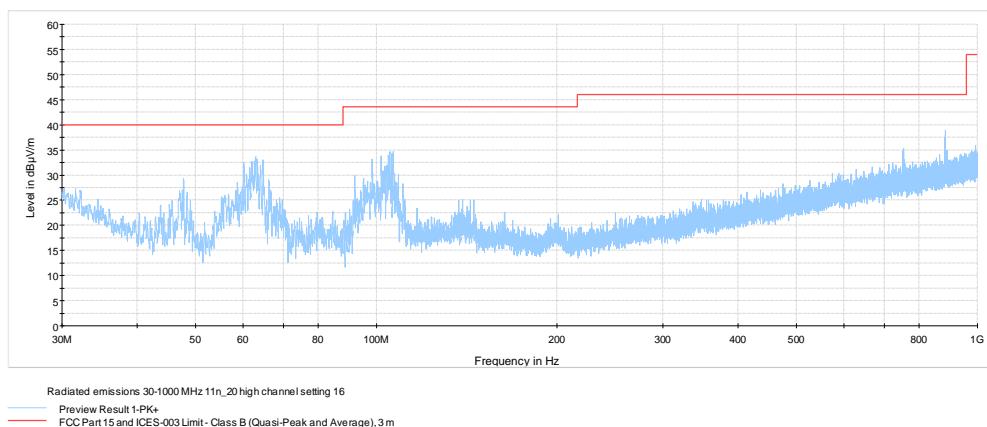


Figure 8.7-37: Radiated spurious emissions 30 MHz – 1 GHz for 802.11n HT20, high channel

#### 8.7.4 Test data, continued

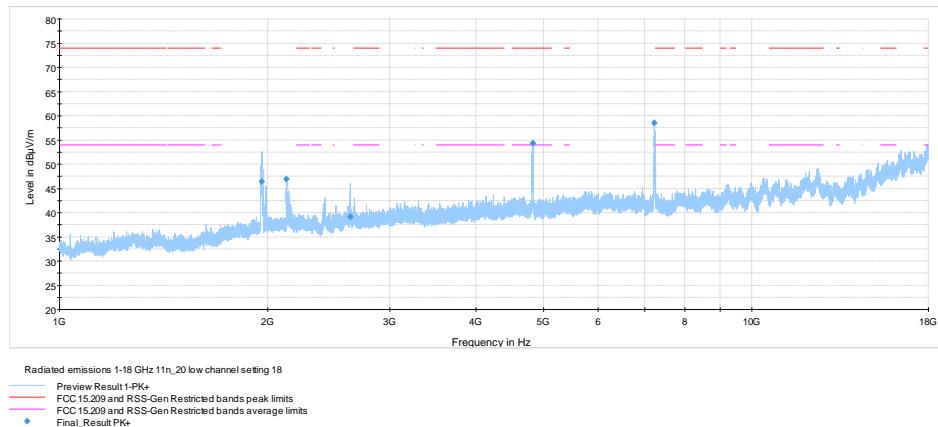


Figure 8.7-38: Radiated spurious emissions 1 - 18 GHz for 802.11n HT20, low channel

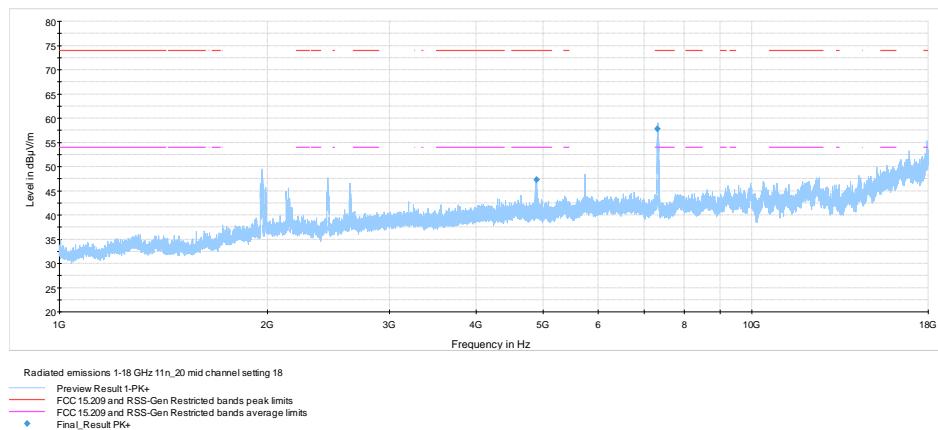


Figure 8.7-39: Radiated spurious emissions 1 - 18 GHz for 802.11n HT20, mid channel

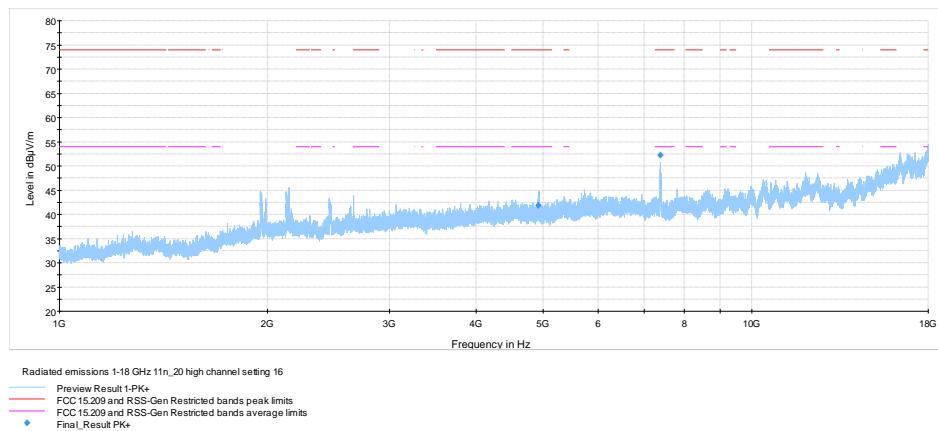


Figure 8.7-40: Radiated spurious emissions 1 - 18 GHz for 802.11n HT20, high channel

#### 8.7.4 Test data, continued

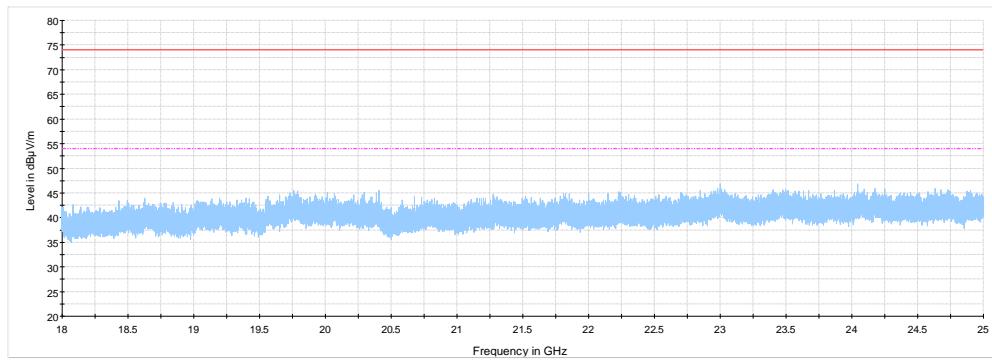


Figure 8.7-41: Radiated spurious emissions 18 - 25 GHz for 802.11n HT20, low channel

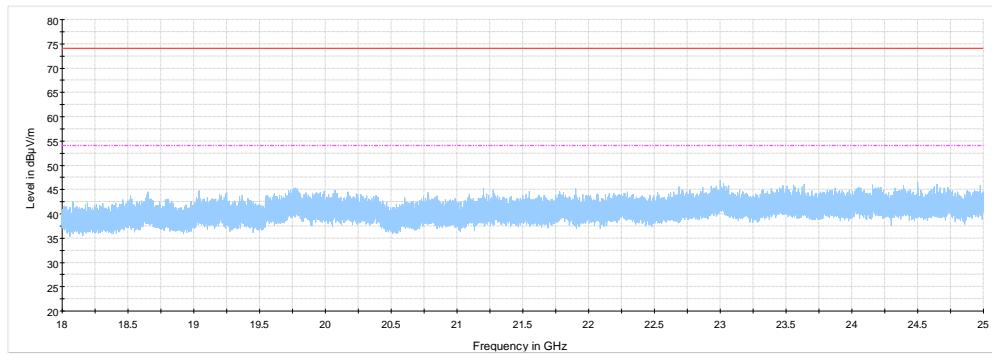


Figure 8.7-42: Radiated spurious emissions 18 - 25 GHz for 802.11n HT20, mid channel

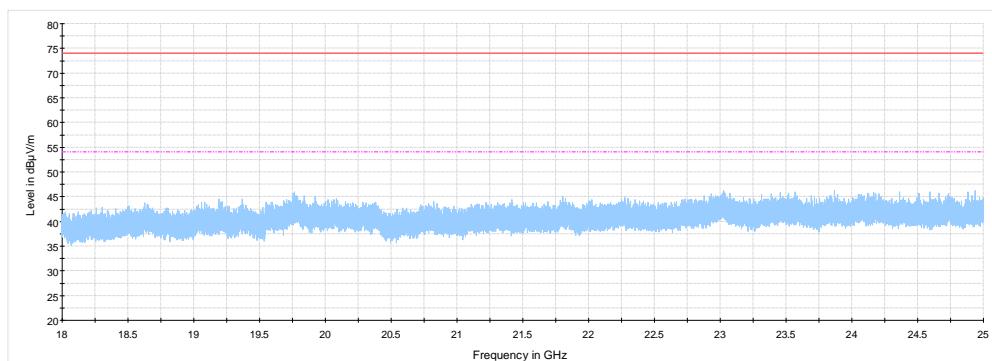


Figure 8.7-43: Radiated spurious emissions 18 - 25 GHz for 802.11n HT20, high channel