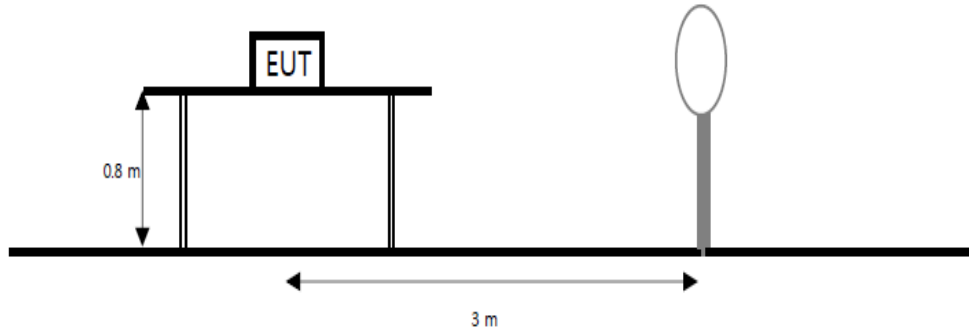


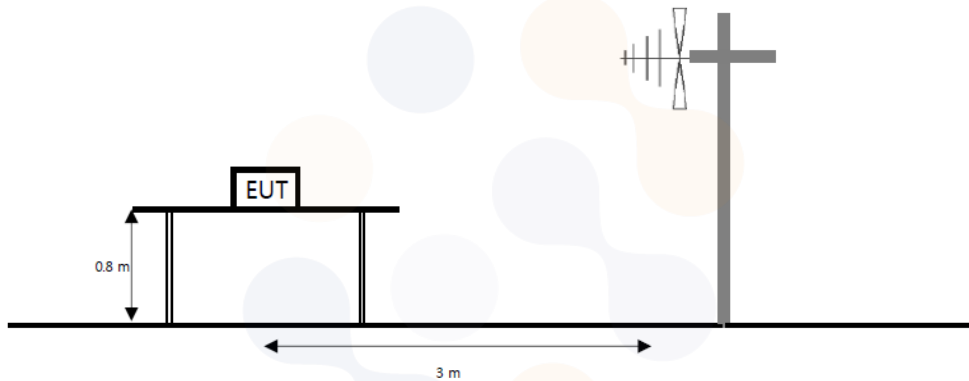
## 7.4. Spurious Emission, Band Edge and Restricted bands

### Test setup

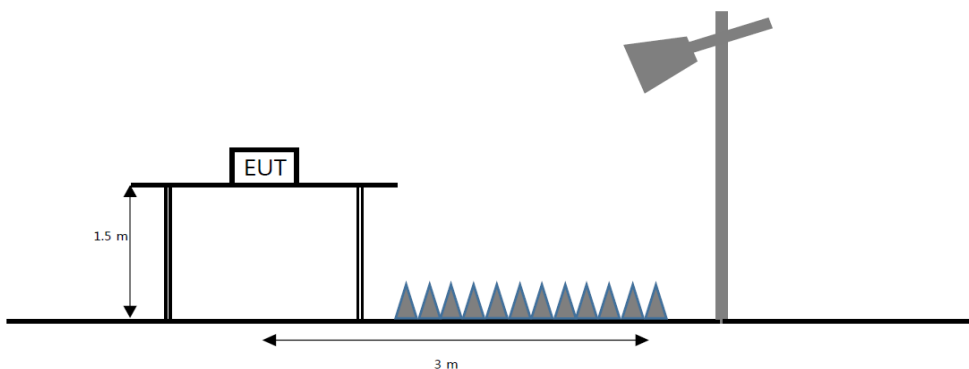
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



**Limit**

**FCC**

According to section 15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength ( $\mu V/m$ )	Measurement distance (m)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section 15.231 and 15.241.

According to section 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.386 75	25	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	156.7 - 156.9	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	162.012 5 - 167.17	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	167.72 - 173.2	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	240 - 285	3 600 - 4 400	Above 38.6
13.36 - 13.41	322 - 335.4		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

**IC**

According to RSS-247(5.5), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen(8.9), Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

**Table 5- General field strength limits at frequencies above 30 MHz**

Frequency(MHz)	Field strength (μV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

**Table 6- General field strength limits at frequencies below 30 MHz**

Frequency	Magnetic field strength (H-Field) ( μ A/m)	Measurement distance(m)
9 – 490 kHz <sup>1)</sup>	6.37/F (F in kHz)	300
490 – 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

**Note 1:** The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

According to RSS-Gen(8.10), Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

- (a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
- (b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
- (c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

**Table 7- Restricted frequency bands\***

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

\* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

## **Test procedure**

ANSI C63.10-2013

## **Test settings**

### **Peak field strength measurements**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW  $\geq$  (3 $\times$ RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

**Table. RBW as a function of frequency**

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz to 120 kHz
> 1 000 MHz	1 MHz

### **Average field strength measurements**

#### **Trace averaging with continuous EUT transmission at full power**

If the EUT can be configured or modified to transmit continuously ( $D \geq 98\%$ ), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1. RBW = 1 MHz (unless otherwise specified).
2. VBW  $\geq$  (3 $\times$ RBW).
3. Detector = RMS (power averaging), if  $[\text{span} / (\# \text{ of points in sweep})] \leq (\text{RBW} / 2)$ . Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
4. Averaging type = power (i.e., rms):
  - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
  - 2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

#### **Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction**

If continuous transmission of the EUT ( $D \geq 98\%$ ) cannot be achieved and the duty cycle is constant (duty cycle variations are less than  $\pm 2\%$ ), then the following procedure shall be used:

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 MHz (unless otherwise specified).
4. VBW  $\geq$  [3  $\times$  RBW].
5. Detector = RMS (power averaging), if  $[\text{span} / (\# \text{ of points in sweep})] \leq (\text{RBW} / 2)$ . Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
6. Averaging type = power (i.e., rms):

- 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
- 2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
  - 1) If power averaging (rms) mode was used in step f), then the applicable correction factor is  $[10 \log (1 / D)]$ , where D is the duty cycle.
  - 2) If linear voltage averaging mode was used in step f), then the applicable correction factor is  $[20 \log (1 / D)]$ , where D is the duty cycle.
  - 3) If a specific emission is demonstrated to be continuous ( $D \geq 98\%$ ) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

**Notes:**

1.  $f < 30$  MHz, extrapolation factor of 40 dB/decade of distance.  $F_d = 40 \log(D_m/D_s)$   
 $f \geq 30$  MHz, extrapolation factor of 20 dB/decade of distance.  $F_d = 20 \log(D_m/D_s)$   
Where:
  - $F_d$  = Distance factor in dB
  - $D_m$  = Measurement distance in meters
  - $D_s$  = Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or  $F_d$ (dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. <sup>1)</sup> means restricted band.
6. Below 30 MHz frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: "No spurious emissions were detected within 20 dB of the limit."
7. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBμV/m, which is equivalent to  $Y - 51.5 = Z$  dBμA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.
8. Measurement configuration for 11ax RU allocations
  - 1) For the radiated band-edge test, it was tested at 11ax RU allocations near the band edge.
  - 2) For the spurious emissions, it was tested at the RU allocations with actual highest power considering each bandwidth/channel.

**Test results (Above 1 000 MHz)**

**SISO ANT 2 Restricted Band edge (Lowest Channel)**

**802.11ax\_HE20 SU mode\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.97 <sup>1)</sup>	H	51.72	32.16	-28.00	-	55.88	74.00	18.12
<b>Average Data</b>								
2 389.97 <sup>1)</sup>	H	41.67	32.16	-28.00	0.38	46.21	54.00	7.79

**802.11ax\_HE20 RU mode (26T / RU offset 0)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.56 <sup>1)</sup>	H	58.10	32.16	-28.00	-	62.26	74.00	11.74
<b>Average Data</b>								
2 389.56 <sup>1)</sup>	H	38.26	32.16	-28.00	0.12	42.54	54.00	11.46

**802.11ax\_HE20 RU mode (52T / RU offset 37)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.91 <sup>1)</sup>	H	57.39	32.16	-28.00	-	61.55	74.00	12.45
<b>Average Data</b>								
2 389.91 <sup>1)</sup>	H	41.58	32.16	-28.00	0.12	45.86	54.00	8.14

**802.11ax\_HE20 RU mode (106T / RU offset 53)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.89 <sup>1)</sup>	H	50.56	32.16	-28.00	-	54.72	74.00	19.28
<b>Average Data</b>								
2 389.89 <sup>1)</sup>	H	45.67	32.16	-28.00	0.22	50.05	54.00	3.95

**802.11ax\_HE20 RU mode (242T / RU offset 61)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB( $\mu V$ ))	(dB)	(dB)	(dB)	(dB( $\mu V/m$ ))	(dB( $\mu V/m$ ))	(dB)
<b>Peak data</b>								
2 389.95 <sup>1)</sup>	V	57.09	32.16	-28.00	-	61.25	74.00	12.75
<b>Average Data</b>								
2 389.95 <sup>1)</sup>	V	44.86	32.16	-28.00	0.46	49.48	54.00	4.52





**MIMO Restricted Band edge (Lowest Channel)**

**802.11ax\_HE20 SU mode\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.88 <sup>1)</sup>	V	49.86	32.16	-28.00	-	54.02	74.00	19.98
<b>Average Data</b>								
2 389.88 <sup>1)</sup>	V	40.30	32.16	-28.00	0.38	44.84	54.00	9.16

**802.11ax\_HE20 RU mode (26T / RU offset 0)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 387.34 <sup>1)</sup>	V	59.24	32.15	-28.01	-	63.38	74.00	10.62
<b>Average Data</b>								
2 387.34 <sup>1)</sup>	V	41.23	32.15	-28.01	0.12	45.49	54.00	8.51

**802.11ax\_HE20 RU mode (52T / RU offset 37)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.96 <sup>1)</sup>	V	61.02	32.16	-28.00	-	65.18	74.00	8.82
<b>Average Data</b>								
2 389.96 <sup>1)</sup>	V	45.01	32.16	-28.00	0.12	49.29	54.00	4.71

**802.11ax\_HE20 RU mode (106T / RU offset 53)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.72 <sup>1)</sup>	V	61.57	32.16	-28.00	-	65.73	74.00	8.27
<b>Average Data</b>								
2 389.72 <sup>1)</sup>	V	45.62	32.16	-28.00	0.20	49.98	54.00	4.02

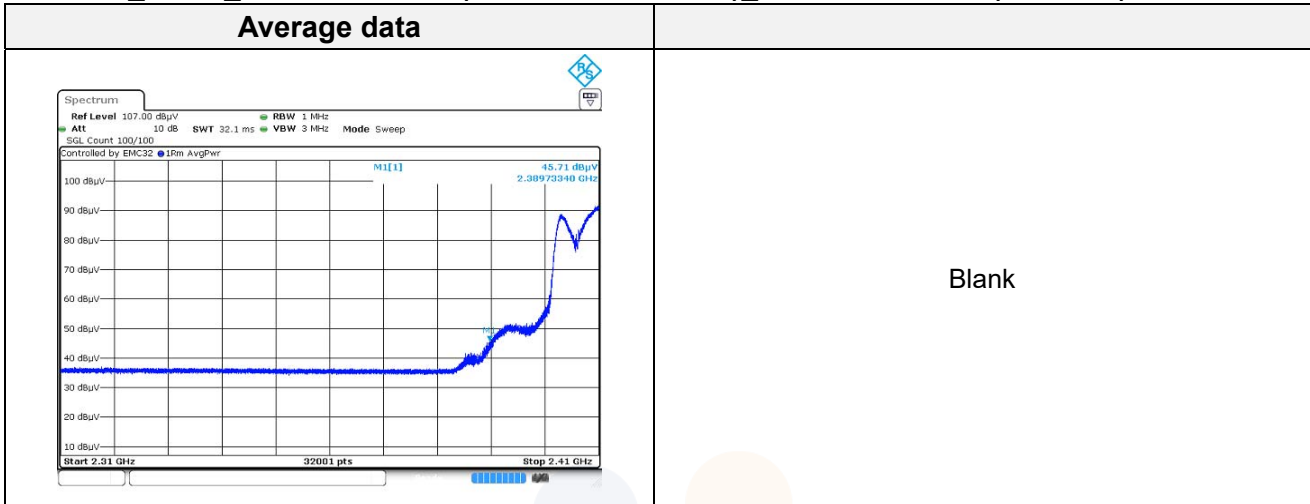
**802.11ax\_HE20 RU mode (242T / RU offset 61)\_Lowest Channel (2 412 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 389.73 <sup>1)</sup>	V	63.08	32.16	-28.00	-	67.24	74.00	6.76
<b>Average Data</b>								
2 389.73 <sup>1)</sup>	V	45.71	32.16	-28.00	0.42	50.29	54.00	3.71

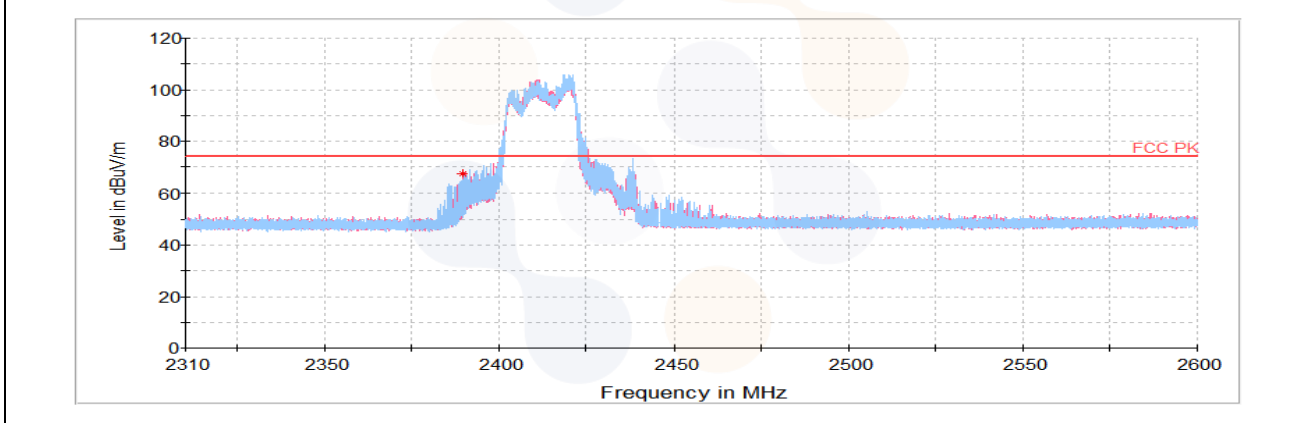
**Plot of Bandedge**

In order to simplify the report, attached plots were only the lowest margin condition

**802.11ax\_MIMO\_HE20 RU mode (242T / RU offset 61)\_Lowest Channel (2 412 MHz)**



**Horizontal/Vertical for Band-edge**



**SISO ANT 2 Restricted Band edge (11 Channel)**

**802.11ax\_HE20 SU mode\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.54 <sup>1)</sup>	H	51.86	32.36	-27.74	-	56.48	74.00	17.52
<b>Average Data</b>								
2 483.54 <sup>1)</sup>	H	41.83	32.36	-27.74	0.38	46.83	54.00	7.17

**802.11ax\_HE20 RU mode (26T / RU offset 8)\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.50 <sup>1)</sup>	H	55.08	32.36	-27.74	-	59.70	74.00	14.30
<b>Average Data</b>								
2 483.50 <sup>1)</sup>	H	39.36	32.36	-27.74	0.12	44.10	54.00	9.90

**802.11ax\_HE20 RU mode (52T / RU offset 40)\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.69 <sup>1)</sup>	H	58.75	32.36	-27.74	-	63.37	74.00	10.63
<b>Average Data</b>								
2 483.69 <sup>1)</sup>	H	43.94	32.36	-27.74	0.12	48.68	54.00	5.32

**802.11ax\_HE20 RU mode (106T / RU offset 54)\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.69 <sup>1)</sup>	H	59.19	32.36	-27.74	-	63.81	74.00	10.19
<b>Average Data</b>								
2 483.69 <sup>1)</sup>	H	46.99	32.36	-27.74	0.22	51.83	54.00	2.17

**802.11ax\_HE20 RU mode (242T / RU offset 61)\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.54 <sup>1)</sup>	H	56.21	32.36	-27.74	-	60.83	74.00	13.17
<b>Average Data</b>								
2 483.54 <sup>1)</sup>	H	45.17	32.36	-27.74	0.46	50.25	54.00	3.75

### MIMO Restricted Band edge (11 Channel)

#### 802.11ax\_HE20 SU mode\_11 Channel (2 462 Mhz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(Mhz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.51 <sup>1)</sup>	V	51.46	32.36	-27.74	-	56.08	74.00	17.92
<b>Average Data</b>								
2 483.51 <sup>1)</sup>	V	41.54	32.36	-27.74	0.38	46.54	54.00	7.46

#### 802.11ax\_HE20 RU mode (26T / RU offset 8)\_11 Channel (2 462 Mhz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(Mhz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 484.32 <sup>1)</sup>	V	63.47	32.37	-27.74	-	68.10	74.00	5.90
<b>Average Data</b>								
2 484.32 <sup>1)</sup>	V	40.06	32.37	-27.74	0.12	44.81	54.00	9.19

#### 802.11ax\_HE20 RU mode (52T / RU offset 40)\_11 Channel (2 462 Mhz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(Mhz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 485.01 <sup>1)</sup>	V	64.56	32.37	-27.73	-	69.20	74.00	4.80
<b>Average Data</b>								
2 485.01 <sup>1)</sup>	V	41.94	32.37	-27.73	0.12	46.70	54.00	7.30

#### 802.11ax\_HE20 RU mode (106T / RU offset 54)\_11 Channel (2 462 Mhz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(Mhz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.50 <sup>1)</sup>	V	59.18	32.36	-27.74	-	63.80	74.00	10.20
<b>Average Data</b>								
2 483.50 <sup>1)</sup>	V	41.64	32.36	-27.74	0.20	46.46	54.00	7.54

#### 802.11ax\_HE20 RU mode (242T / RU offset 61)\_11 Channel (2 462 Mhz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(Mhz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.54 <sup>1)</sup>	V	62.53	32.36	-27.74	-	67.15	74.00	6.85
<b>Average Data</b>								
2 483.54 <sup>1)</sup>	V	46.70	32.36	-27.74	0.42	51.74	54.00	2.26

### SISO ANT 2 Restricted Band edge (12 Channel)

#### **802.11ax\_HE20 SU mode\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 486.02 <sup>1)</sup>	H	39.60	32.37	-27.73	-	44.24	74.00	29.76
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

#### **802.11ax\_HE20 RU mode (26T / RU offset 8)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.52 <sup>1)</sup>	H	57.18	32.36	-27.74	-	61.80	74.00	12.20
<b>Average Data</b>								
2 483.52 <sup>1)</sup>	H	43.53	32.36	-27.74	0.12	48.27	54.00	5.73

#### **802.11ax\_HE20 RU mode (52T / RU offset 40)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 485.97 <sup>1)</sup>	H	61.67	32.37	-27.73	-	66.31	74.00	7.69
<b>Average Data</b>								
2 485.97 <sup>1)</sup>	H	43.40	32.37	-27.73	0.12	48.16	54.00	5.84

#### **802.11ax\_HE20 RU mode (106T / RU offset 54)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.53 <sup>1)</sup>	H	47.84	32.36	-27.74	-	52.46	74.00	21.54
<b>Average Data</b>								
2 483.53 <sup>1)</sup>	H	33.76	32.36	-27.74	0.22	38.60	54.00	15.40

#### **802.11ax\_HE20 RU mode (242T / RU offset 61)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.69 <sup>1)</sup>	V	51.09	32.36	-27.74	-	55.71	74.00	18.29
<b>Average Data</b>								
2 483.69 <sup>1)</sup>	V	35.56	32.36	-27.74	0.46	40.64	54.00	13.36

### MIMO Restricted Band edge (12 Channel)

#### **802.11ax\_HE20 SU mode\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.51 <sup>1)</sup>	V	47.52	32.36	-27.74	-	52.14	74.00	21.86
<b>Average Data</b>								
2 483.51 <sup>1)</sup>	V	37.42	32.36	-27.74	0.38	42.42	54.00	11.58

#### **802.11ax\_HE20 RU mode (26T / RU offset 8)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 487.72 <sup>1)</sup>	V	47.54	32.37	-27.73	-	52.18	74.00	21.82
<b>Average Data</b>								
2 487.72 <sup>1)</sup>	V	36.85	32.37	-27.73	0.12	41.61	54.00	12.39

#### **802.11ax\_HE20 RU mode (52T / RU offset 40)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 487.41 <sup>1)</sup>	V	46.93	32.37	-27.73	-	51.57	74.00	22.43
<b>Average Data</b>								
2 487.41 <sup>1)</sup>	V	36.99	32.37	-27.73	0.12	41.75	54.00	12.25

#### **802.11ax\_HE20 RU mode (106T / RU offset 54)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 485.27 <sup>1)</sup>	V	47.46	32.37	-27.73	-	52.10	74.00	21.90
<b>Average Data</b>								
2 485.27 <sup>1)</sup>	V	36.99	32.37	-27.73	0.20	41.83	54.00	12.17

#### **802.11ax\_HE20 RU mode (242T / RU offset 61)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 484.38 <sup>1)</sup>	V	56.53	32.37	-27.74	-	61.16	74.00	12.84
<b>Average Data</b>								
2 484.38 <sup>1)</sup>	V	42.68	32.37	-27.74	0.42	47.73	54.00	6.27

### SISO ANT 2 Restricted Band edge (Highest Channel)

#### **802.11ax\_HE20 SU mode\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.52 <sup>1)</sup>	V	51.38	32.36	-27.74	-	56.00	74.00	18.00
<b>Average Data</b>								
2 483.52 <sup>1)</sup>	V	40.11	32.36	-27.74	0.38	45.11	54.00	8.89

#### **802.11ax\_HE20 RU mode (26T / RU offset 8)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.56 <sup>1)</sup>	V	60.15	32.36	-27.74	-	64.77	74.00	9.23
<b>Average Data</b>								
2 483.56 <sup>1)</sup>	V	41.58	32.36	-27.74	0.12	46.32	54.00	7.68

#### **802.11ax\_HE20 RU mode (52T / RU offset 40)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.54 <sup>1)</sup>	V	63.59	32.36	-27.74	-	68.21	74.00	5.79
<b>Average Data</b>								
2 483.54 <sup>1)</sup>	V	46.91	32.36	-27.74	0.12	51.65	54.00	2.35

#### **802.11ax\_HE20 RU mode (106T / RU offset 54)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.69 <sup>1)</sup>	V	57.76	32.36	-27.74	-	62.38	74.00	11.62
<b>Average Data</b>								
2 483.69 <sup>1)</sup>	H	42.24	32.36	-27.74	0.22	47.08	54.00	6.92

#### **802.11ax\_HE20 RU mode (242T / RU offset 61)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.56 <sup>1)</sup>	V	58.79	32.36	-27.74	-	63.41	74.00	10.59
<b>Average Data</b>								
2 483.56 <sup>1)</sup>	V	41.97	32.36	-27.74	0.46	47.05	54.00	6.95

### MIMO Restricted Band edge (Highest Channel)

#### **802.11ax\_HE20 SU mode\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.57 <sup>1)</sup>	V	55.99	32.36	-27.74	-	60.61	74.00	13.39
<b>Average Data</b>								
2 483.57 <sup>1)</sup>	V	40.58	32.36	-27.74	0.38	45.58	54.00	8.42

#### **802.11ax\_HE20 RU mode (26T / RU offset 8)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.56 <sup>1)</sup>	V	61.30	32.36	-27.74	-	65.92	74.00	8.08
<b>Average Data</b>								
2 483.56 <sup>1)</sup>	V	44.59	32.36	-27.74	0.12	49.33	54.00	4.67

#### **802.11ax\_HE20 RU mode (52T / RU offset 40)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.65 <sup>1)</sup>	V	63.11	32.36	-27.74	-	67.73	74.00	6.27
<b>Average Data</b>								
2 483.65 <sup>1)</sup>	V	46.03	32.36	-27.74	0.12	50.77	54.00	3.23

#### **802.11ax\_HE20 RU mode (106T / RU offset 54)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.52 <sup>1)</sup>	V	61.43	32.36	-27.74	-	66.05	74.00	7.95
<b>Average Data</b>								
2 483.52 <sup>1)</sup>	V	46.62	32.36	-27.74	0.20	51.44	54.00	2.56

#### **802.11ax\_HE20 RU mode (242T / RU offset 61)\_Highest Channel (2 472 MHz)**

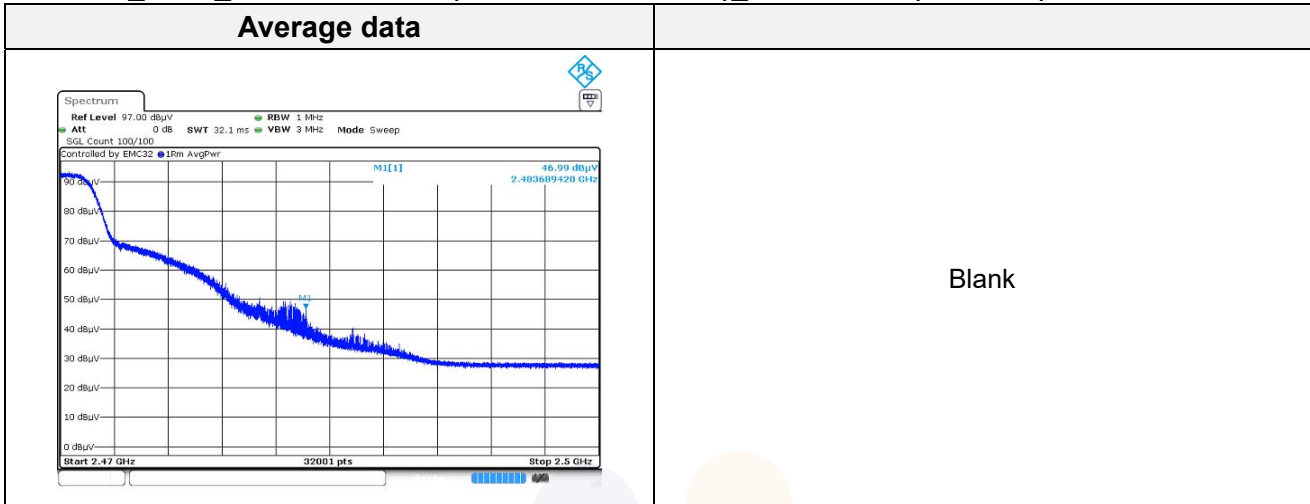
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.51 <sup>1)</sup>	V	63.36	32.36	-27.74	-	67.98	74.00	6.02
<b>Average Data</b>								
2 483.51 <sup>1)</sup>	V	45.44	32.36	-27.74	0.42	50.48	54.00	3.52



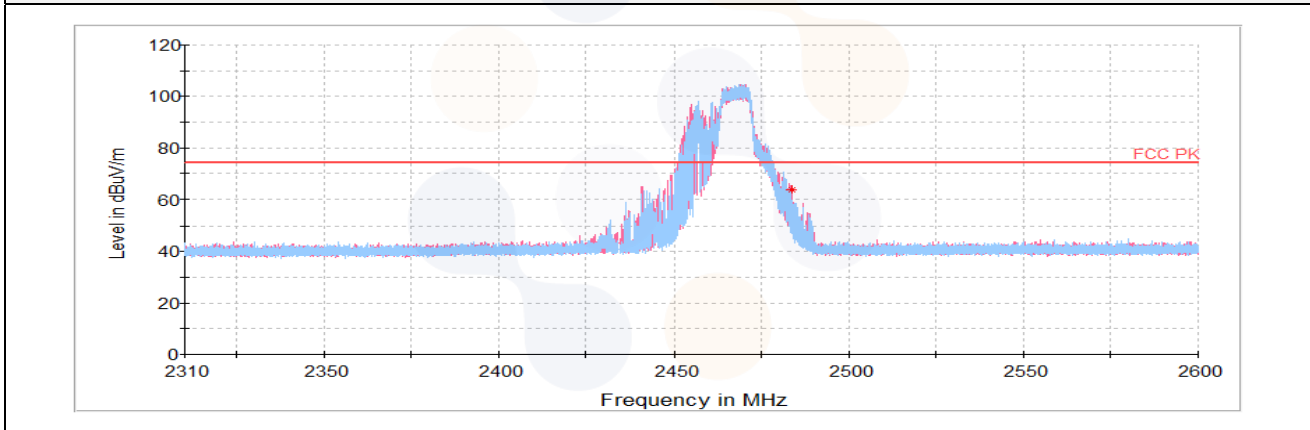
### Plot of Band edge

In order to simplify the report, attached plots were only the lowest margin condition

802.11ax\_SISO\_HE20 RU mode (106T / RU offset 54)\_11 Channel (2 462 MHz)



### Horizontal/Vertical for Band-edge



### SISO ANT 2 Harmonics and Spurious Emissions

#### 802.11ax\_HE20 SU mode\_Lowest Channel (2 412 MHz)

Frequency (MHz)	Pol. (V/H)	Reading (dB(μV))	Ant. Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB(μV/m))	Limit (dB(μV/m))	Margin (dB)
<b>Peak data</b>								
4 827.66 <sup>1)</sup>	V	65.48	33.70	-55.14	-	44.04	74.00	29.96
7 265.02 <sup>1)</sup>	H	63.19	35.15	-51.56	-	46.78	74.00	27.22
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

#### 802.11ax\_HE20 RU mode (52T / RU offset 40)\_Lowest Channel (2 412 MHz)

Frequency (MHz)	Pol. (V/H)	Reading (dB(μV))	Ant. Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB(μV/m))	Limit (dB(μV/m))	Margin (dB)
<b>Peak data</b>								
3 521.75	V	70.57	33.03	-56.57	-	47.03	74.00	26.97
4 827.66 <sup>1)</sup>	V	63.09	33.70	-55.14	-	41.65	74.00	32.35
7 215.63	H	61.33	35.14	-51.55	-	44.92	74.00	29.08
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

#### 802.11ax\_HE20 SU mode\_Middle Channel (2 437 MHz)

Frequency (MHz)	Pol. (V/H)	Reading (dB(μV))	Ant. Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB(μV/m))	Limit (dB(μV/m))	Margin (dB)
<b>Peak data</b>								
4 938.22 <sup>1)</sup>	H	66.67	33.70	-55.01	-	45.36	74.00	28.64
7 252.33 <sup>1)</sup>	V	63.64	35.15	-51.56	-	47.23	74.00	26.77
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

#### 802.11ax\_HE20 RU mode (52T / RU offset 37)\_Middle Channel (2 437 MHz)

Frequency (MHz)	Pol. (V/H)	Reading (dB(μV))	Ant. Factor (dB)	Amp. + Cable (dB)	DCF (dB)	Result (dB(μV/m))	Limit (dB(μV/m))	Margin (dB)
<b>Peak data</b>								
4 854.84 <sup>1)</sup>	V	63.51	33.70	-55.11	-	42.10	74.00	31.90
7 292.20 <sup>1)</sup>	V	60.22	35.16	-51.57	-	43.81	74.00	30.19
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

**802.11ax\_HE20 SU mode\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 922.36 <sup>1)</sup>	V	65.42	33.70	-55.03	-	44.09	74.00	29.91
7 368.33 <sup>1)</sup>	H	63.70	35.17	-51.59	-	47.28	74.00	26.72
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 RU mode (106T / RU offset 53)\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
3 594.25	V	68.87	33.11	-56.65	-	45.33	74.00	28.67
4 956.80 <sup>1)</sup>	H	64.27	33.70	-54.98	-	42.99	74.00	31.01
7 396.88 <sup>1)</sup>	H	60.59	35.18	-51.60	-	44.17	74.00	29.83
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 SU mode\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 940.03 <sup>1)</sup>	V	66.26	33.70	-55.01	-	44.95	74.00	29.05
7 427.23 <sup>1)</sup>	V	62.76	35.19	-51.61	-	46.34	74.00	27.66
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 RU mode (52T / RU offset 40)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 946.83 <sup>1)</sup>	V	64.43	33.70	-55.00	-	43.13	74.00	30.87
7 400.95 <sup>1)</sup>	H	61.75	35.18	-51.60	-	45.33	74.00	28.67
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 SU mode\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 982.17 <sup>1)</sup>	H	65.64	33.70	-54.95	-	44.39	74.00	29.61
7 426.33 <sup>1)</sup>	H	63.16	35.19	-51.61	-	46.74	74.00	27.26
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 RU mode (242T / RU offset 61)\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 933.69 <sup>1)</sup>	V	63.75	33.70	-55.02	-	42.43	74.00	31.57
7 390.53 <sup>1)</sup>	V	60.94	35.18	-51.60	-	44.52	74.00	29.48
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

### MIMO Harmonics and Spurious Emissions

#### 802.11ax\_HE20 SU mode\_Lowest Channel (2 412 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 815.42 <sup>1)</sup>	V	66.36	33.70	-55.15	-	44.91	74.00	29.09
7 298.55 <sup>1)</sup>	V	63.73	35.16	-51.57	-	47.32	74.00	26.68
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

#### 802.11ax\_HE20 RU mode (52T / RU offset 38)\_Lowest Channel (2 412 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 816.78 <sup>1)</sup>	V	63.91	33.70	-55.15	-	42.46	74.00	31.54
7 183.45 <sup>1)</sup>	V	62.65	35.14	-51.54	-	46.25	74.00	27.75
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

#### 802.11ax\_HE20 SU mode\_Middle Channel (2 437 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 895.17 <sup>1)</sup>	V	65.98	33.70	-55.07	-	44.61	74.00	29.39
7 241.45 <sup>1)</sup>	H	64.40	35.15	-51.56	-	47.99	74.00	26.01
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

#### 802.11ax\_HE20 RU mode (52T / RU offset 40)\_Middle Channel (2 437 MHz)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 894.72 <sup>1)</sup>	V	63.51	33.70	-55.07	-	42.14	74.00	31.86
7 301.27 <sup>1)</sup>	V	61.75	35.16	-51.57	-	45.34	74.00	28.66
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 SU mode\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 937.77 <sup>1)</sup>	V	65.19	33.70	-55.01	-	43.88	74.00	30.12
7 360.17 <sup>1)</sup>	H	64.18	35.17	-51.59	-	47.76	74.00	26.24
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 RU mode (52T / RU offset 37)\_11 Channel (2 462 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 907.86 <sup>1)</sup>	V	66.09	33.70	-55.06	-	44.73	74.00	29.27
7 369.23 <sup>1)</sup>	V	62.30	35.17	-51.59	-	45.88	74.00	28.12
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 SU mode\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 969.48 <sup>1)</sup>	H	66.52	33.70	-54.96	-	45.26	74.00	28.74
7 413.19 <sup>1)</sup>	V	63.17	35.18	-51.60	-	46.75	74.00	27.25
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 RU mode (52T / RU offset 38)\_12 Channel (2 467 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 949.09 <sup>1)</sup>	V	63.20	33.70	-54.99	-	41.91	74.00	32.09
7 417.72 <sup>1)</sup>	V	60.95	35.18	-51.61	-	44.52	74.00	29.48
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 SU mode\_Highest Channel (2 472 MHz)**

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 959.06 <sup>1)</sup>	V	65.37	33.70	-54.98	-	44.09	74.00	29.91
7 391.89 <sup>1)</sup>	H	63.11	35.18	-51.60	-	46.69	74.00	27.31
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

**802.11ax\_HE20 RU mode (242T / RU offset 61)\_Highest Channel (2 472 MHz)**

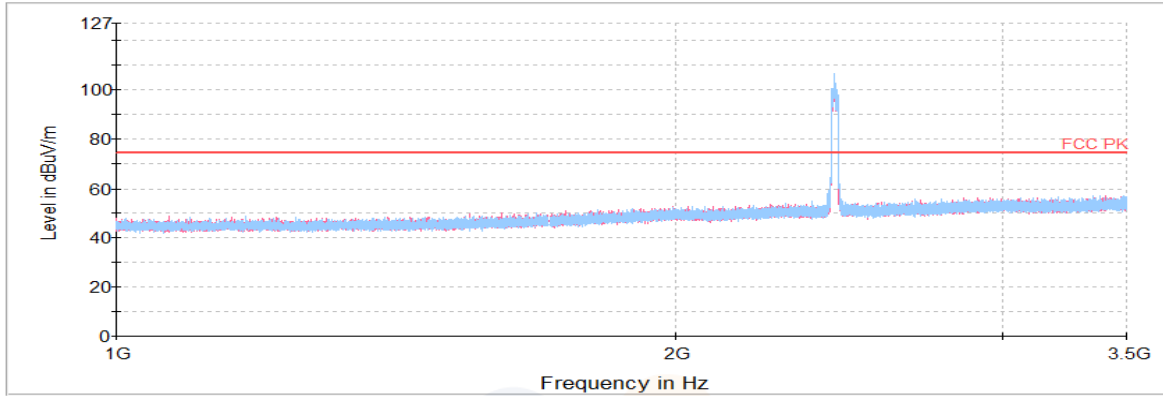
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
4 950.00 <sup>1)</sup>	V	63.25	33.70	-54.99	-	41.96	74.00	32.04
7 397.33 <sup>1)</sup>	V	60.70	35.18	-51.60	-	44.28	74.00	29.72
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit								

### Plot of Harmonics and Spurious Emissions

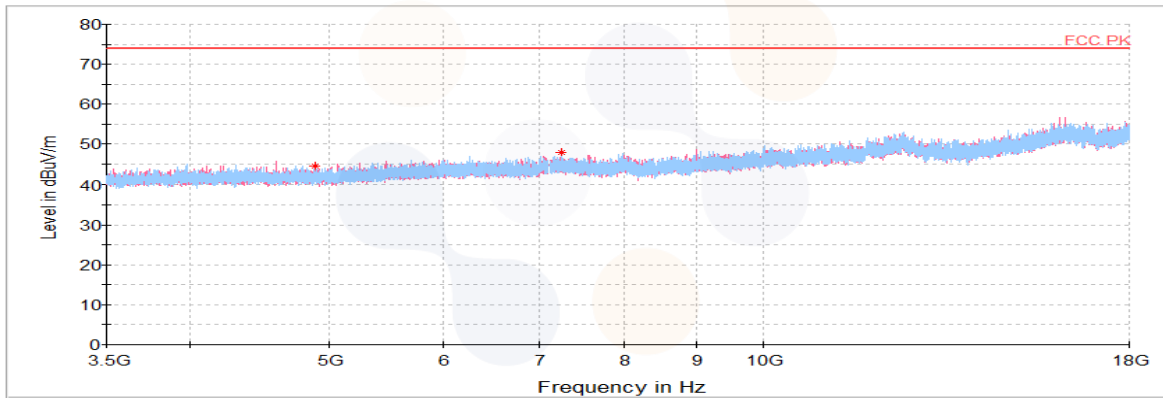
In order to simplify the report, attached plots were only the lowest margin condition

#### MIMO 802.11ax\_HE20 SU mode \_ Middle Channel (2 437 MHz)

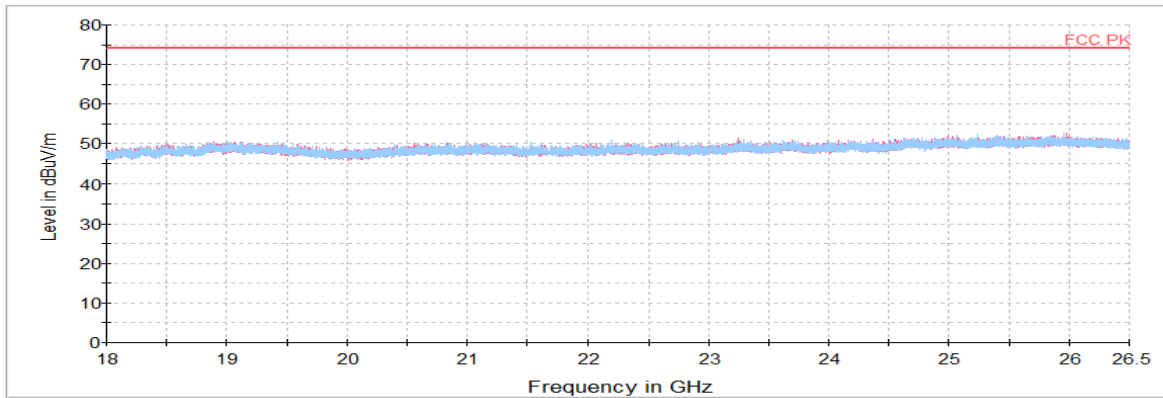
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz





**Spurious Emission for Simultaneous Tx Condition**

Case	Bluetooth	All antenna 2.4 GHz WLAN
Mode	BLE	Ax20
Channel	0	11
Frequency	2 402	2 462
Data Rate	2M Bits/s,37Packets	HE20
T.O	-	106T offset 54

**Notes.**

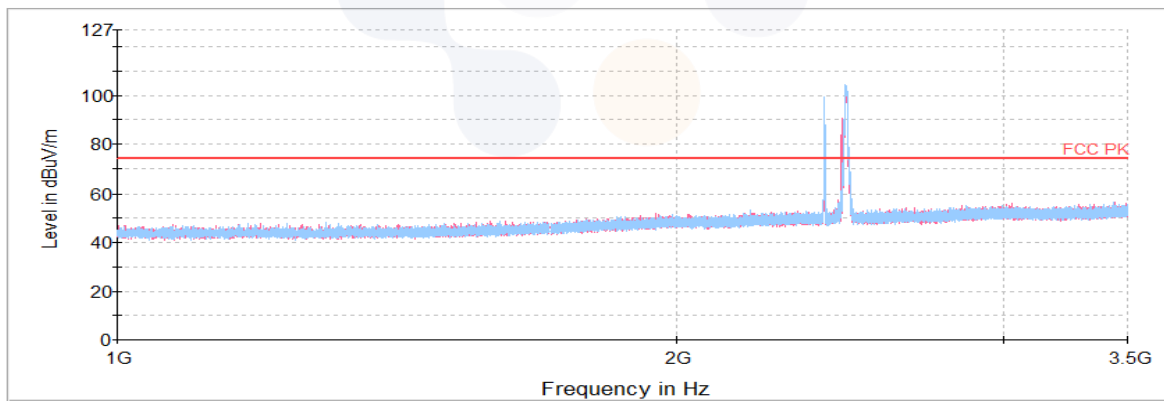
The lowest margin condition among the channels and modes were selected for test.

Frequency (MHz)	Pol. (V/H)	Reading (dB(μV))	Ant. Factor (dB)	Amp.+Cable (dB)	DCF (dB)	Result (dB(μV/m))	Limit (dB(μV/m))	Margin (dB)
<b>Peak data</b>								
4 640.97 <sup>1)</sup>	H	66.41	33.70	-55.57	-	44.54	74.00	29.46
4 765.13 <sup>1)</sup>	V	65.11	33.70	-55.24	-	43.57	74.00	30.43
5 022.50 <sup>1)</sup>	V	64.80	33.73	-54.93	-	43.60	74.00	30.40
7 199.77	V	61.43	35.14	-51.55	-	45.02	74.00	28.98
7 405.03 <sup>1)</sup>	H	61.95	35.18	-51.60	-	45.53	74.00	28.47

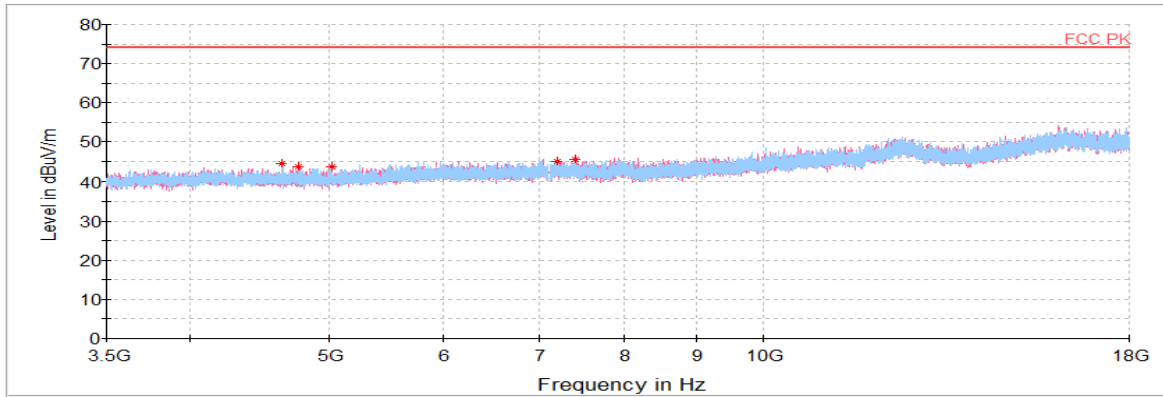
**Average Data**

No spurious emissions were detected within 20 dB of the limit.

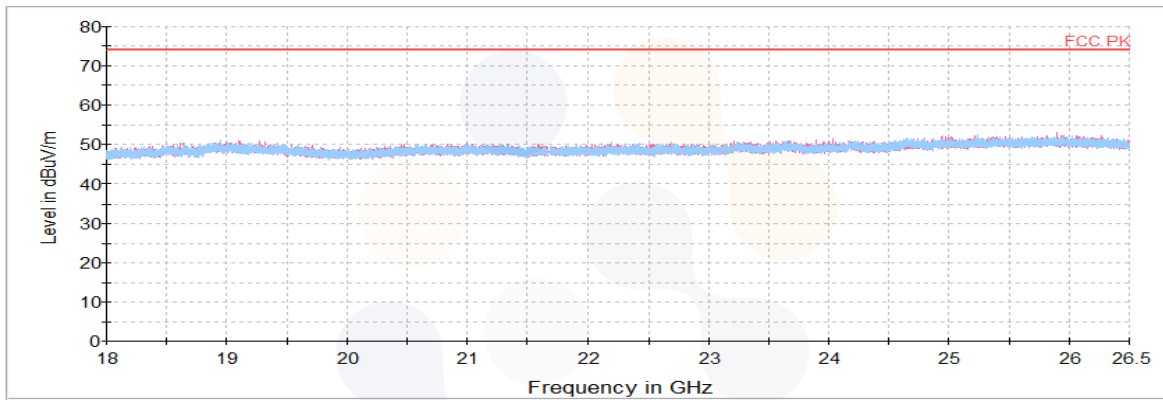
**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**

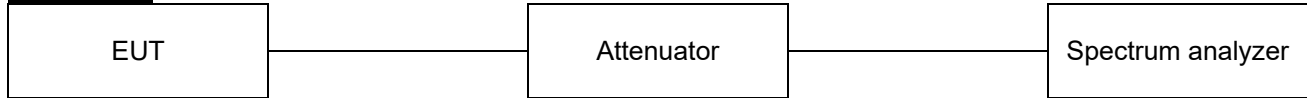


**Horizontal/Vertical for 18 GHz ~ 26.5 GHz**



## 7.5. Conducted Spurious Emission

### Test setup



### Limit

According to §15.247(d) and RSS-247(5.5), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operation, 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 averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation specified in §15.209(a) is not required. In addition, radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limit : 20 dBc

### Test procedure

ANSI C63.10 - Section 11.11.3, 14.3.3

KDB 558074 D01 v05 - Section 8.5

KDB 662911 D01 v02r01 – section (E)(3)(b)

### Test settings

Establish an emission level by using the following procedure:

- 1) Set the center frequency and span to encompass frequency range to be measured.
- 2) Set the RBW = 100 kHz
- 3) Set the VBW  $\geq$  [3 x RBW]
- 4) Detector = peak
- 5) Sweep time = auto couple
- 6) Trace mode = max hold
- 7) Allow trace to fully stabilize.
- 8) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

### Notes:

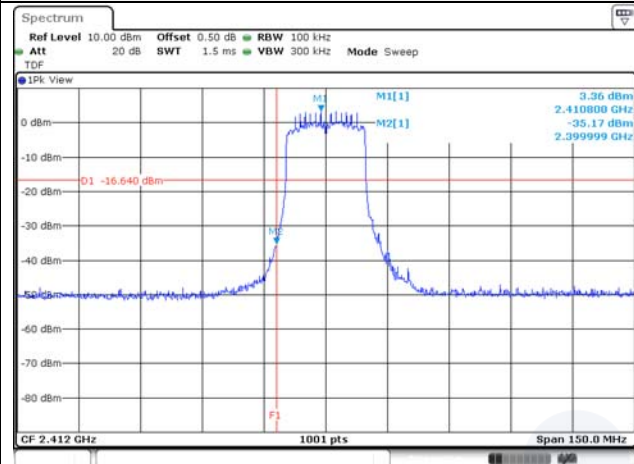
1. For the Conducted spurious, it was tested at the RU allocation with actual highest power and RU allocation with actual highest PSD for channel

**Test results**

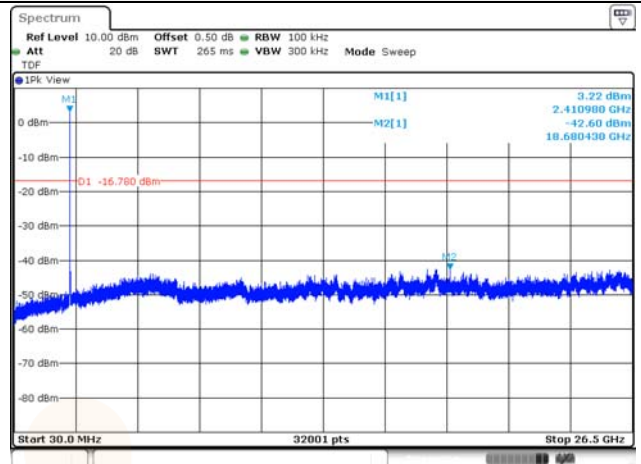
**SISO\_ANT2**

**SU**

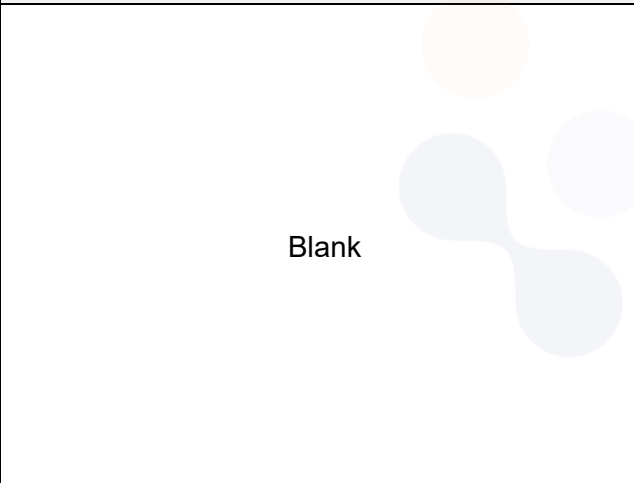
**Conducted band-edge / 2 412 MHz**



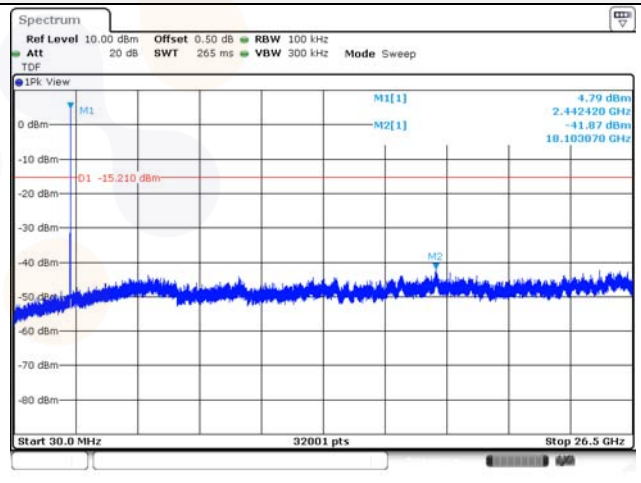
**Conducted spurious / 2 412 MHz**



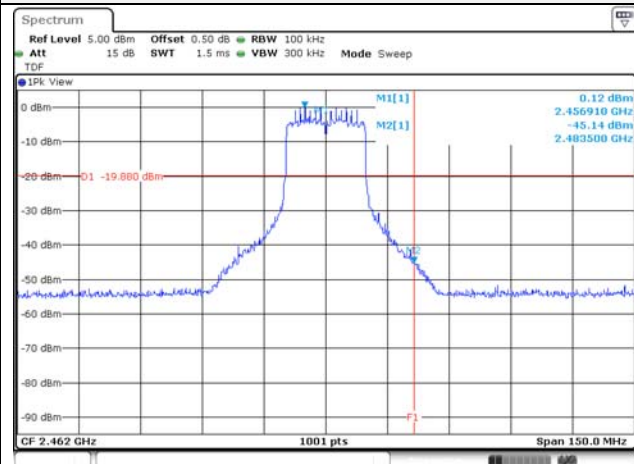
**Conducted band-edge / 2 437 MHz**



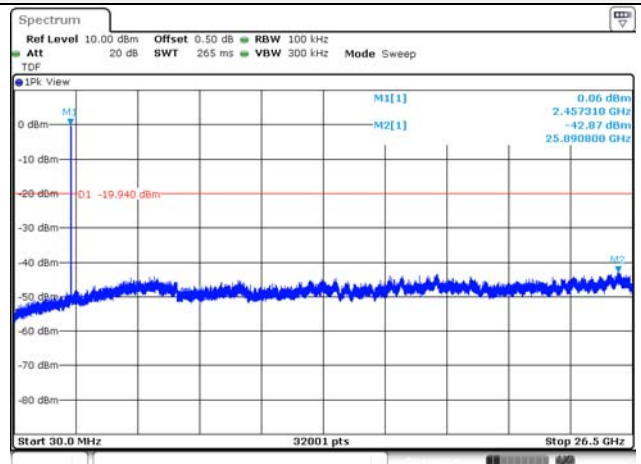
**Conducted spurious / 2 437 MHz**



**Conducted band-edge / 2 462 MHz**

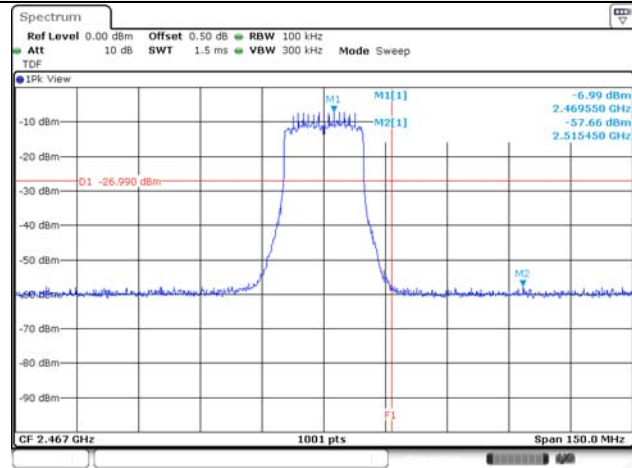


**Conducted spurious / 2 462 MHz**

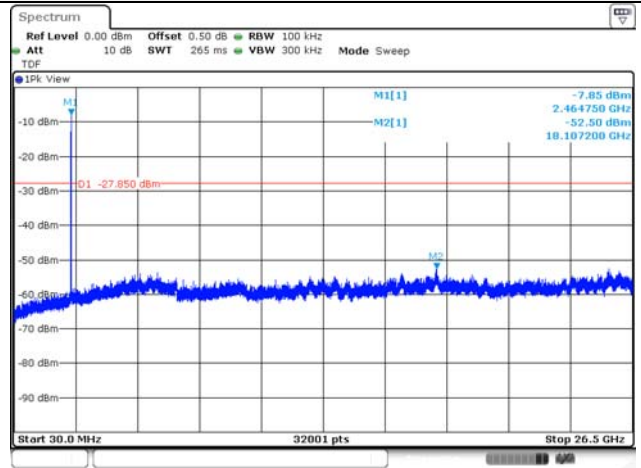


**SU**

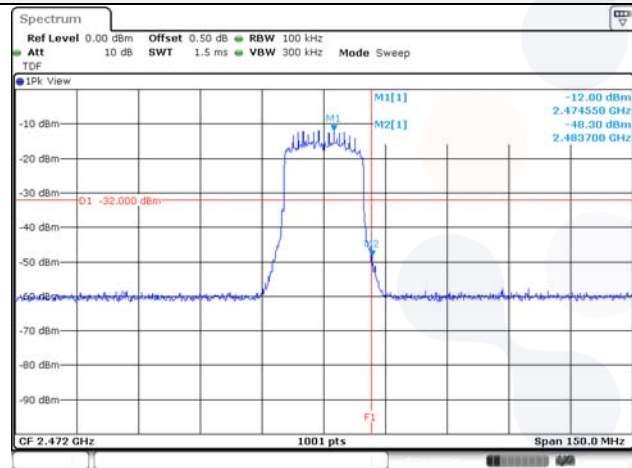
**Conducted band-edge / 2 467 MHz**



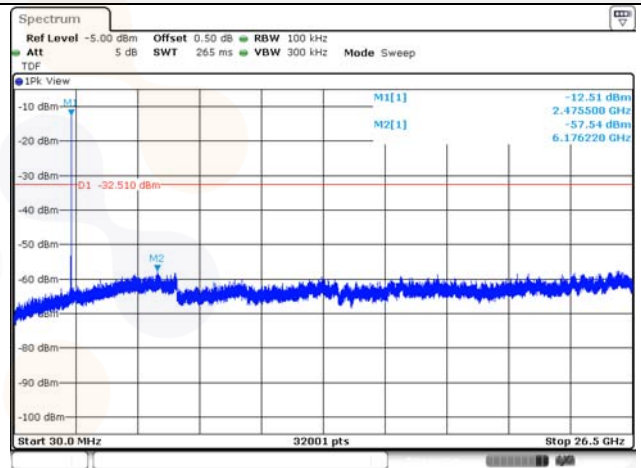
**Conducted spurious / 2 467 MHz**



**Conducted band-edge / 2 472 MHz**

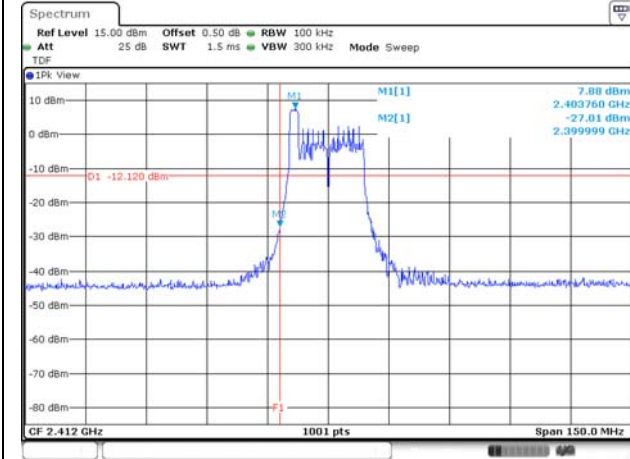


**Conducted spurious / 2 472 MHz**



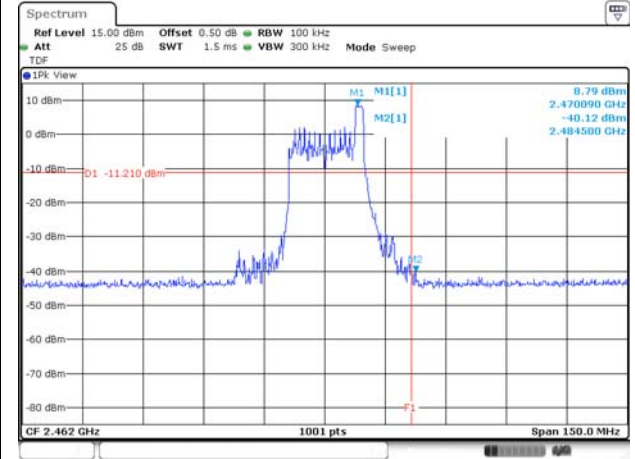
**26T / RU offset 0**

**Conducted band-edge / 2 412 MHz**



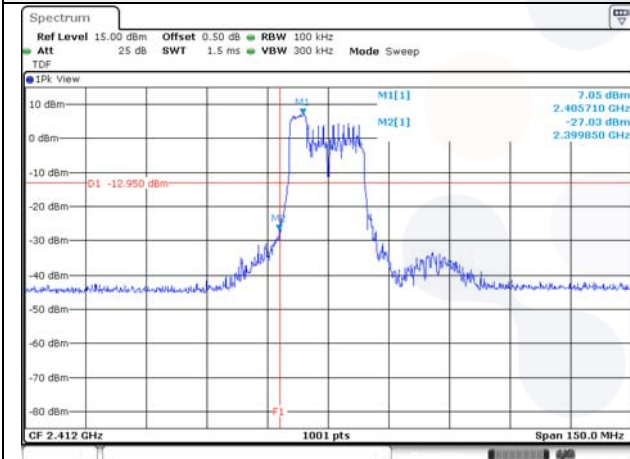
**26T / RU offset 8**

**Conducted band-edge / 2 462 MHz**



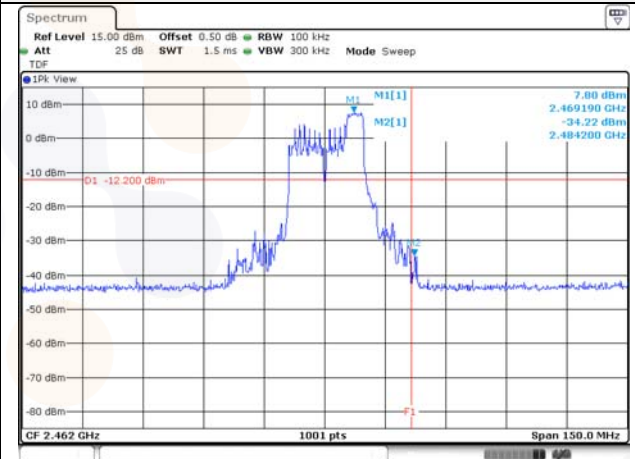
**52T / RU offset 37**

**Conducted band-edge / 2 412 MHz**



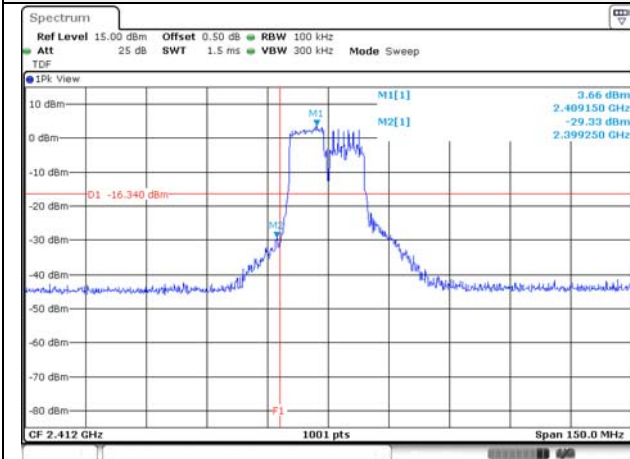
**52T / RU offset 40**

**Conducted band-edge / 2 462 MHz**



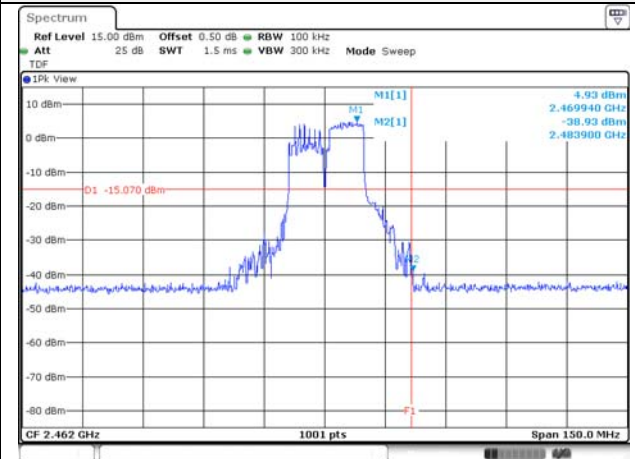
**106T / RU offset 53**

**Conducted band-edge / 2 412 MHz**



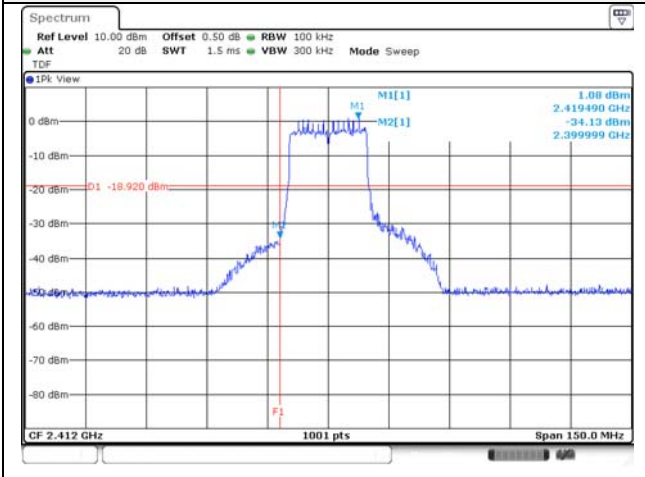
**106T / RU offset 54**

**Conducted band-edge / 2 462 MHz**

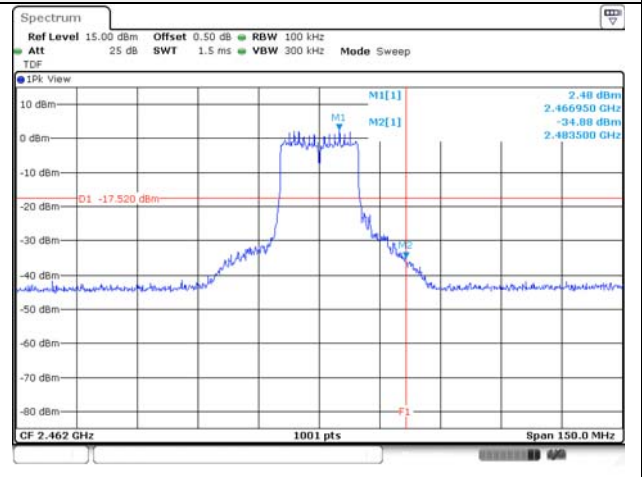


**242T / RU offset 61**

**Conducted band-edge / 2 412 MHz**



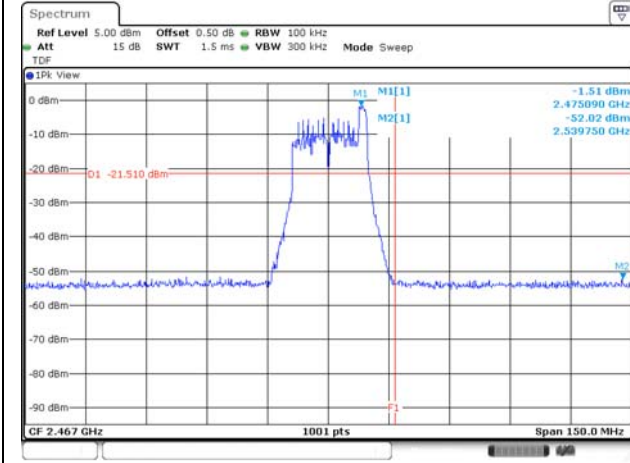
**Conducted band-edge / 2 462 MHz**



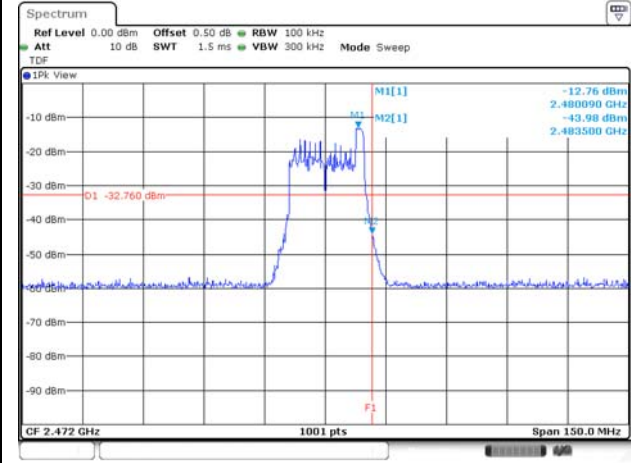


**26T / RU offset 8**

**Conducted band-edge / 2 467 MHz**

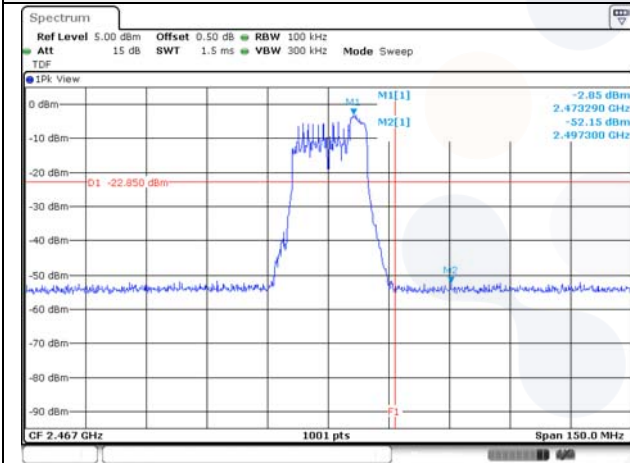


**Conducted band-edge / 2 472 MHz**

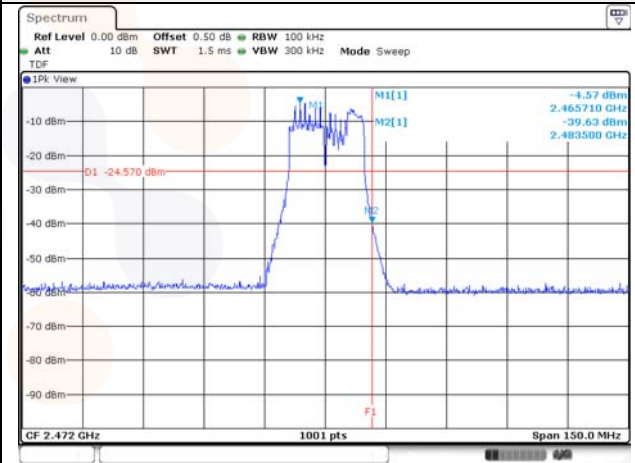


**52T / RU offset 40**

**Conducted band-edge / 2 467 MHz**

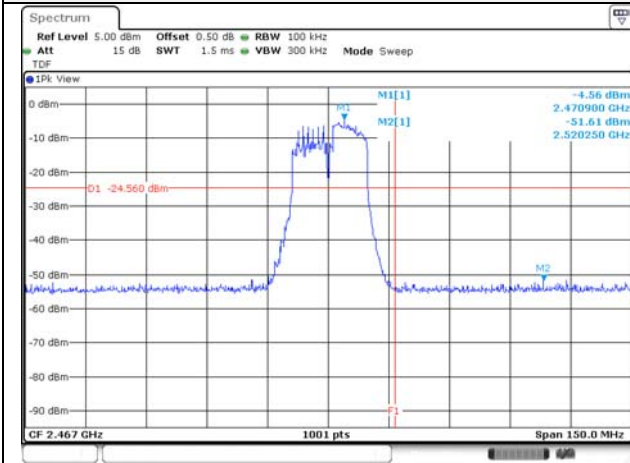


**Conducted band-edge / 2 472 MHz**

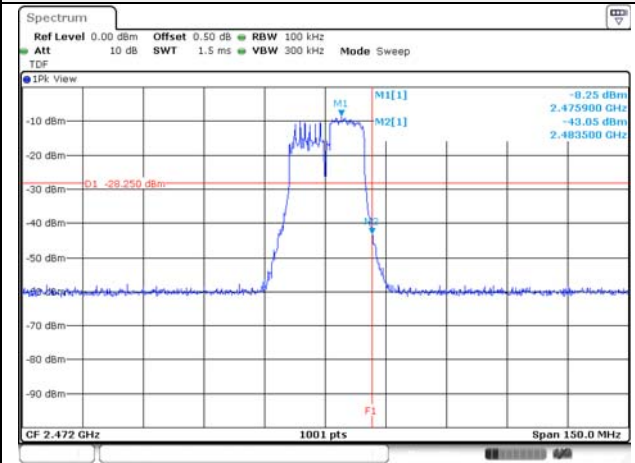


**106T / RU offset 54**

**Conducted band-edge / 2 467 MHz**



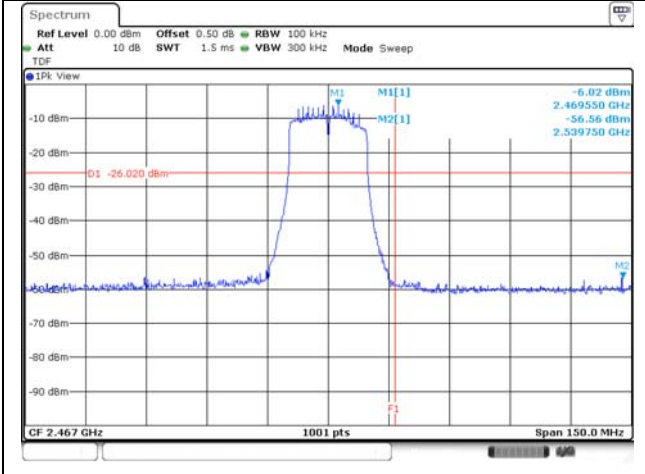
**Conducted band-edge / 2 472 MHz**



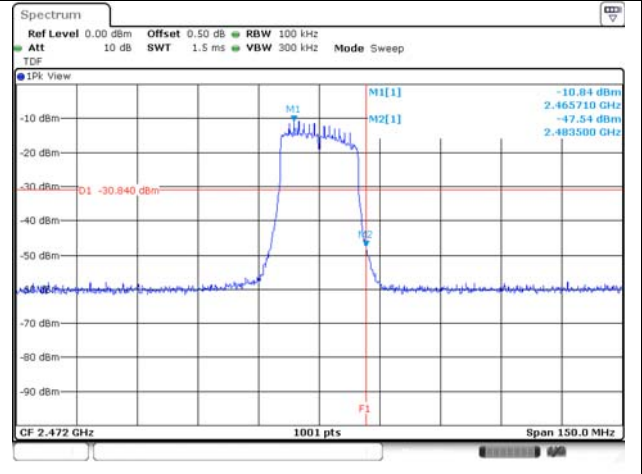


**242T / RU offset 61**

**Conducted band-edge / 2 467 MHz**

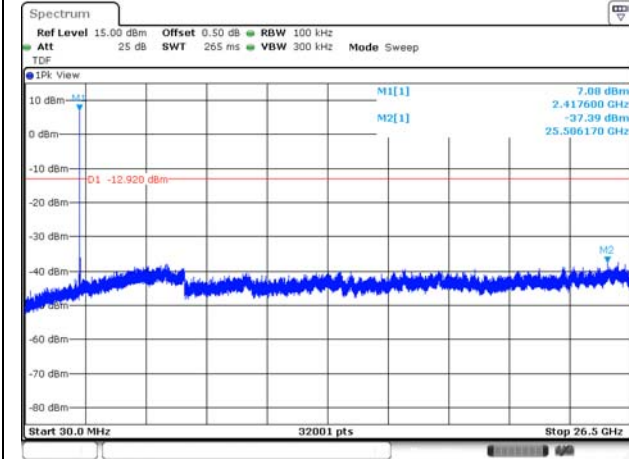


**Conducted band-edge / 2 472 MHz**



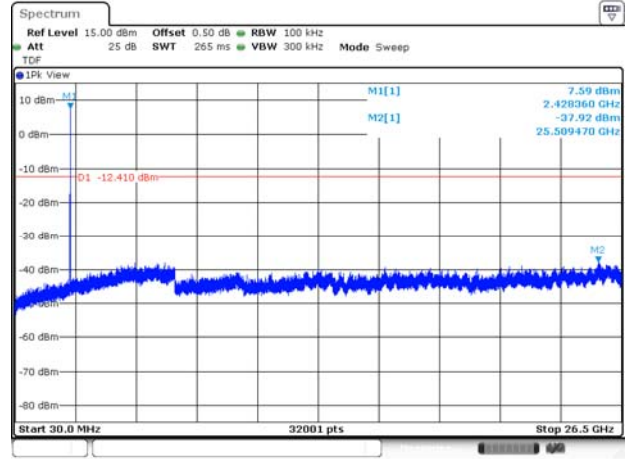
**52T / RU offset 40**

**Conducted spurious / 2 412 MHz**



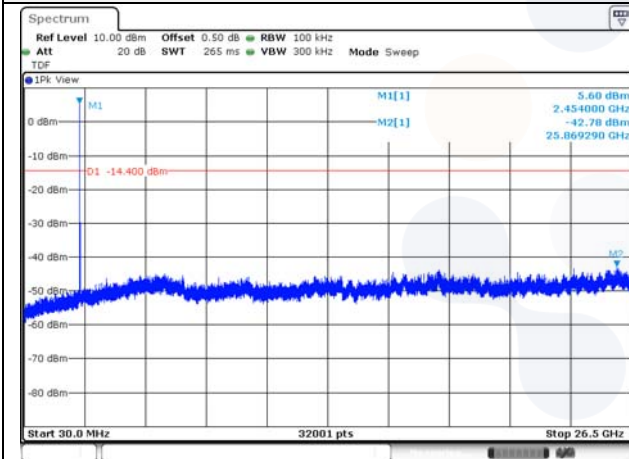
**26T / RU offset 0**

**Conducted spurious / 2 437 MHz**



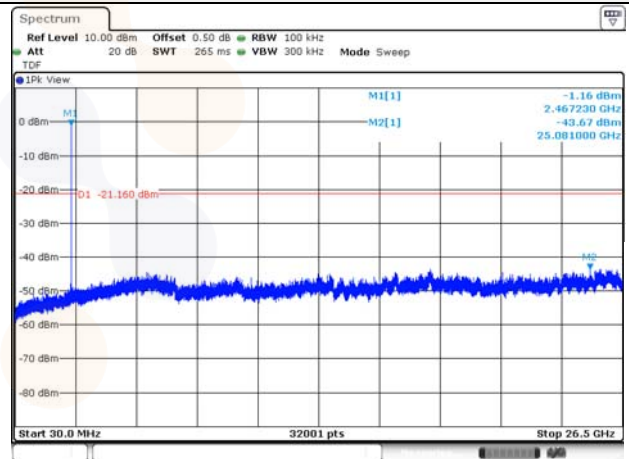
**52T / RU offset 37**

**Conducted spurious / 2 462 MHz**



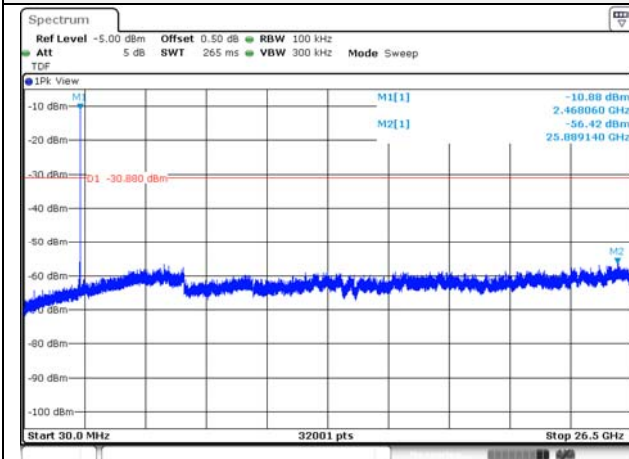
**26T / RU offset 4**

**Conducted spurious / 2 467 MHz**



**52T / RU offset 38**

**Conducted spurious / 2 472 MHz**



Blank

**MIMO\_ANT1+ANT2**

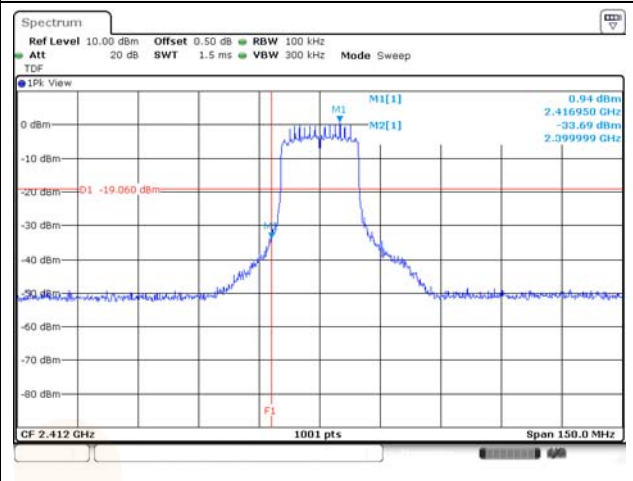
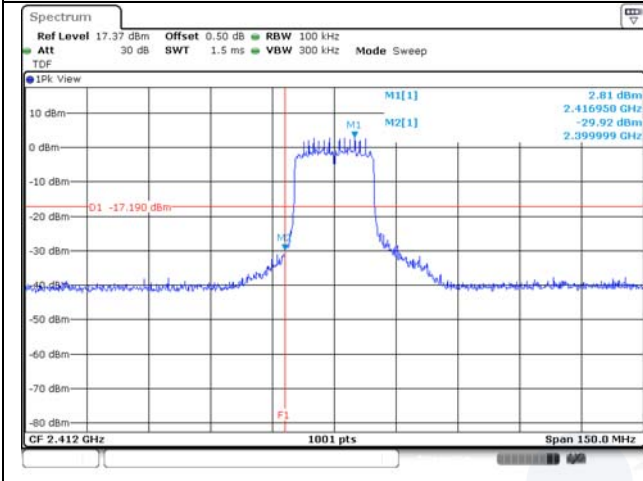
**SU**

**ANT 1**

**ANT 2**

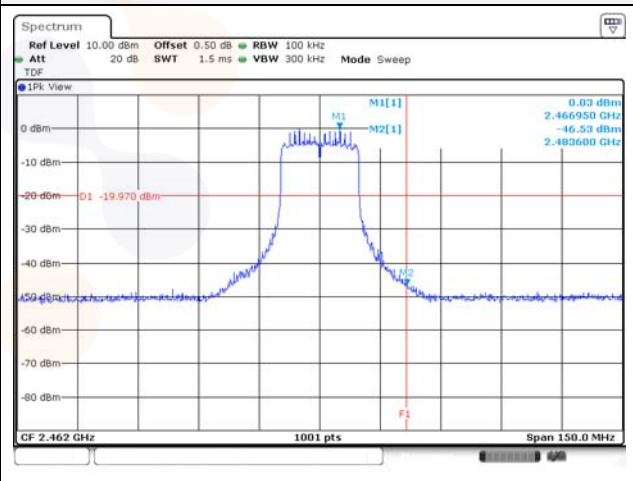
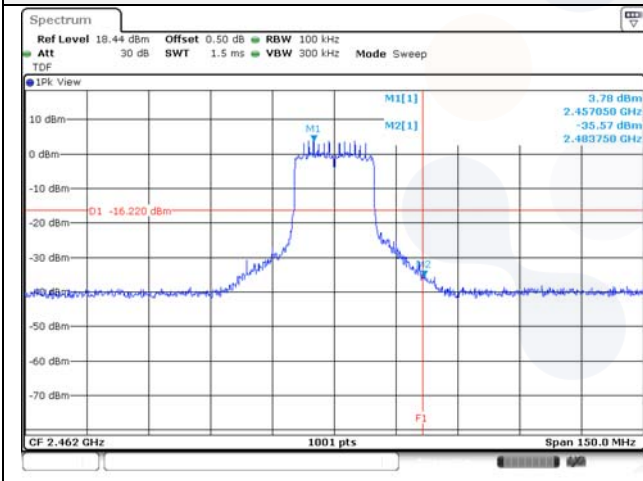
**Conducted band-edge / 2 412 MHz**

**Conducted band-edge / 2 412 MHz**



**Conducted band-edge / 2 462 MHz**

**Conducted band-edge / 2 462 MHz**



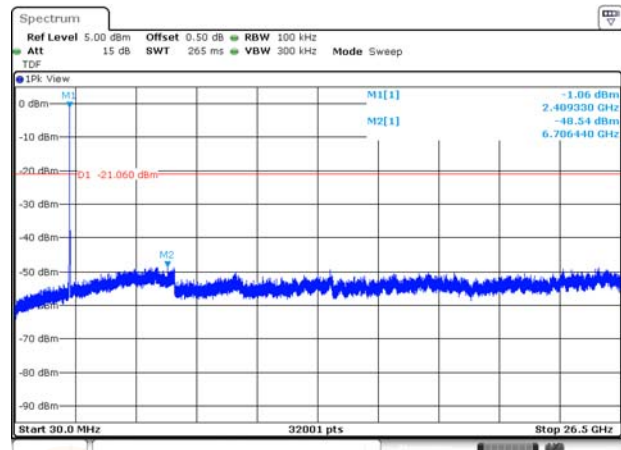
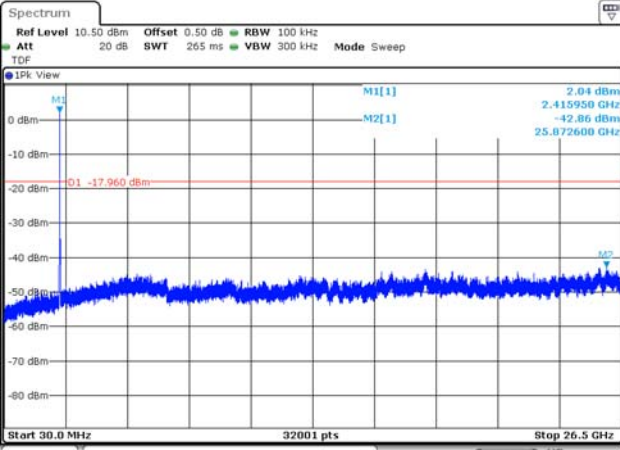
**SU**

**ANT 1**

**ANT 2**

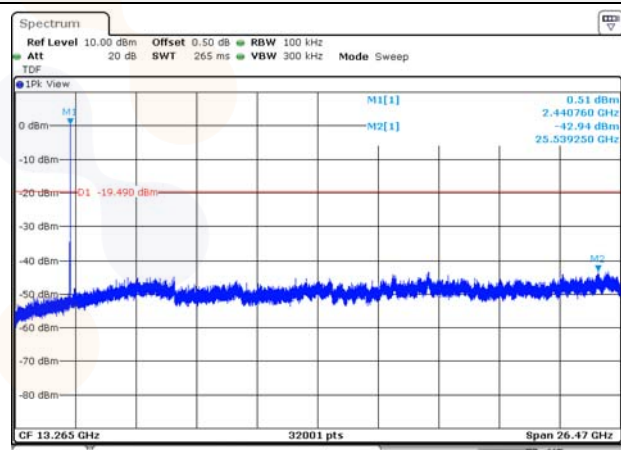
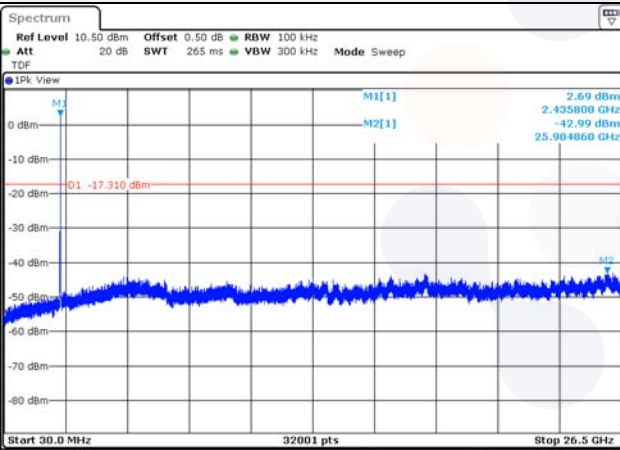
**Conducted spurious / 2 412 MHz**

**Conducted spurious / 2 412 MHz**



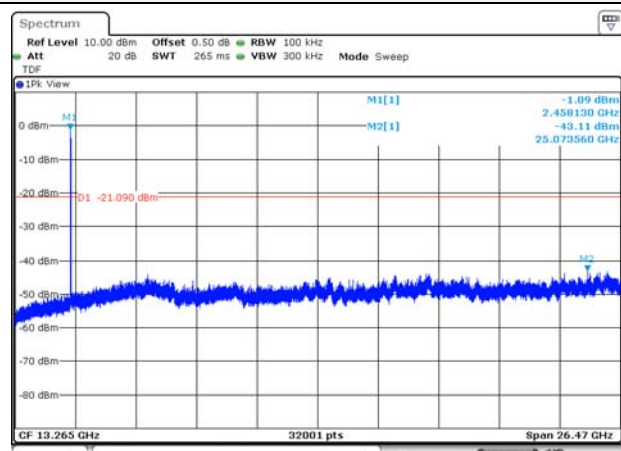
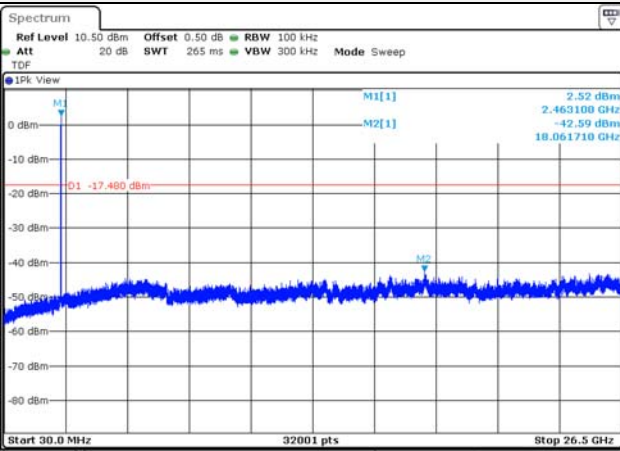
**Conducted spurious / 2 437 MHz**

**Conducted spurious / 2 437 MHz**



**Conducted spurious / 2 462 MHz**

**Conducted spurious / 2 462 MHz**



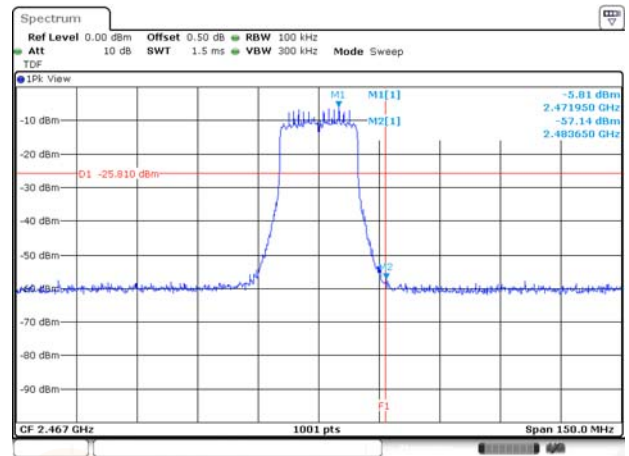
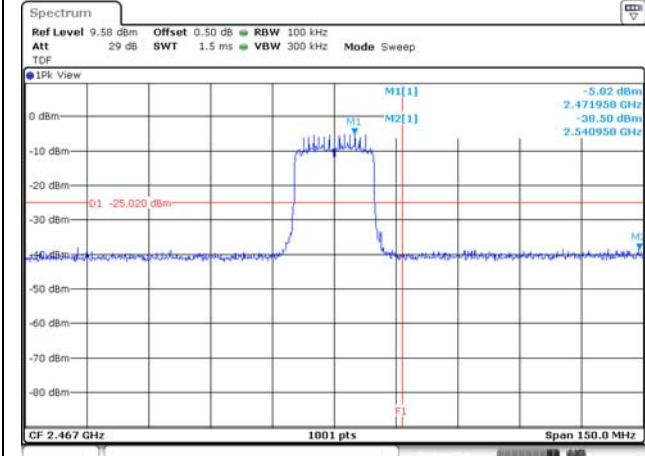
**SU**

**ANT 1**

**ANT 2**

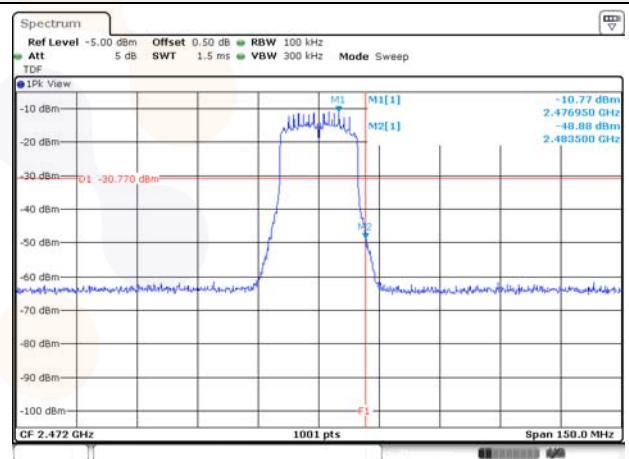
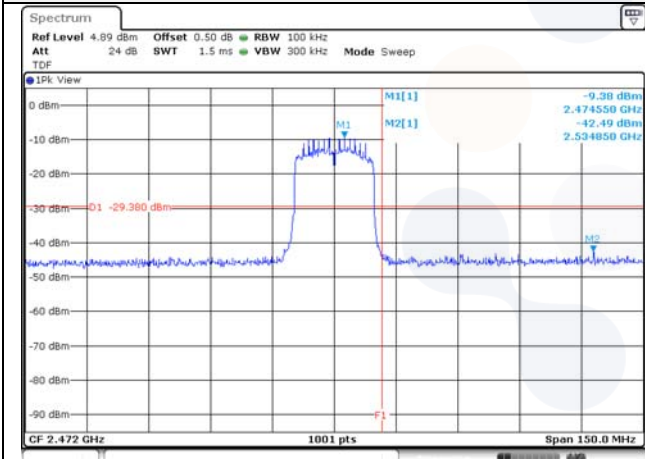
**Conducted band-edge / 2 467 MHz**

**Conducted band-edge / 2 467 MHz**



**Conducted band-edge / 2 472 MHz**

**Conducted band-edge / 2 472 MHz**





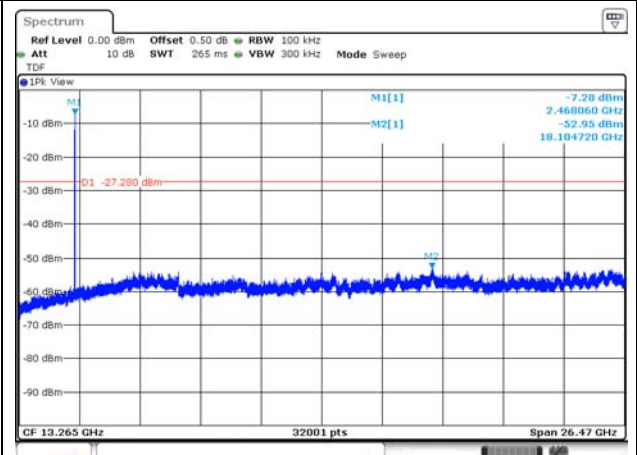
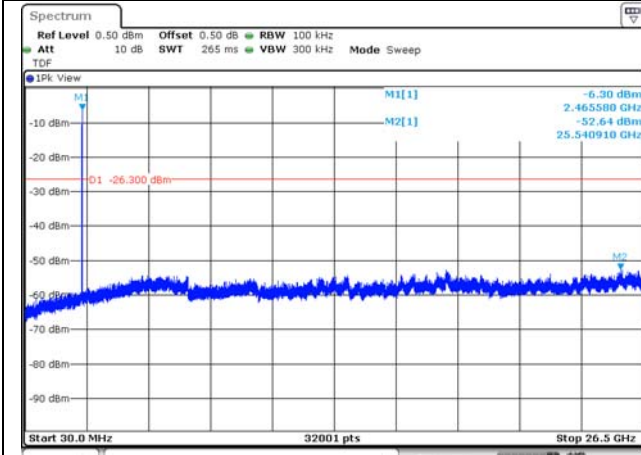
**SU**

**ANT 1**

**ANT 2**

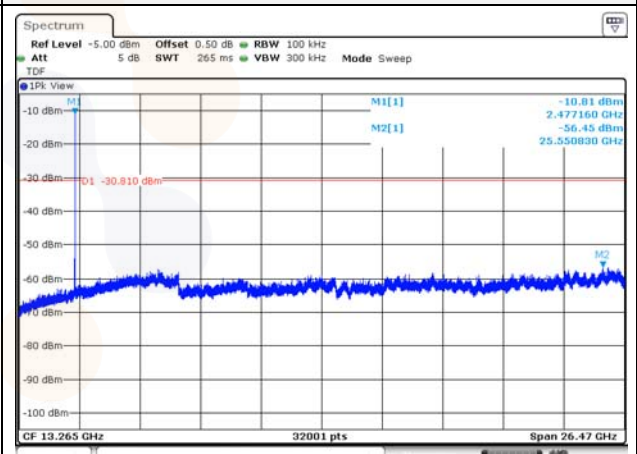
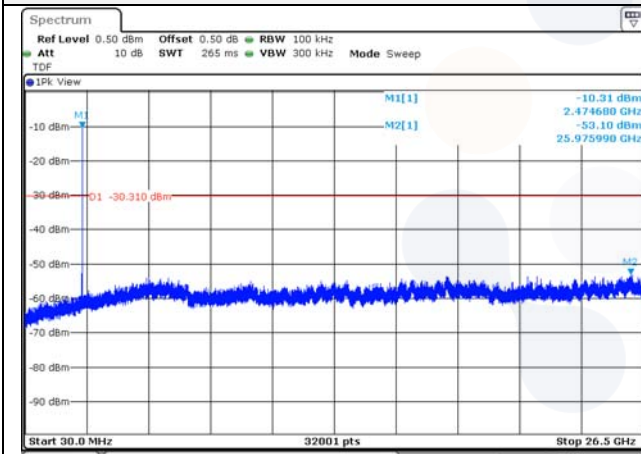
**Conducted spurious / 2 467 MHz**

**Conducted spurious / 2 467 MHz**



**Conducted spurious / 2 472 MHz**

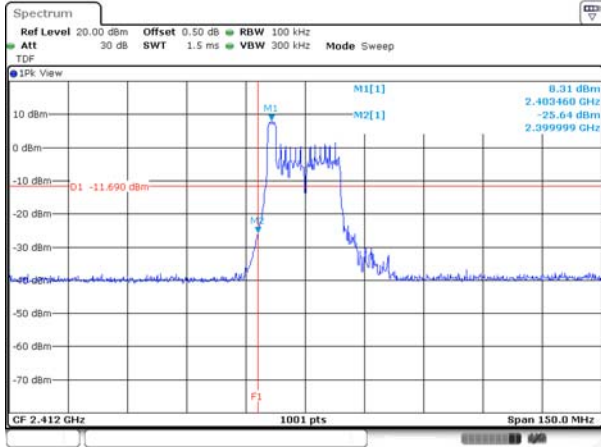
**Conducted spurious / 2 472 MHz**



**26T / RU offset 0**

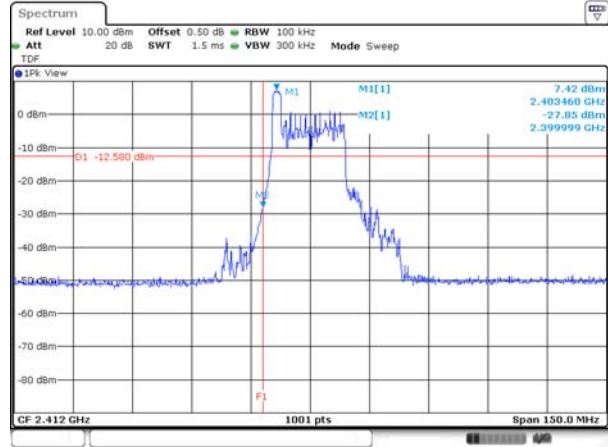
**ANT 1**

**Conducted band-edge / 2 412 MHz**



**ANT 2**

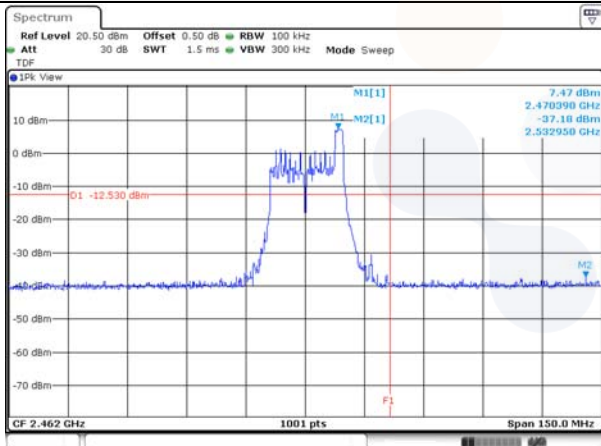
**Conducted band-edge / 2 412 MHz**



**26T / RU offset 8**

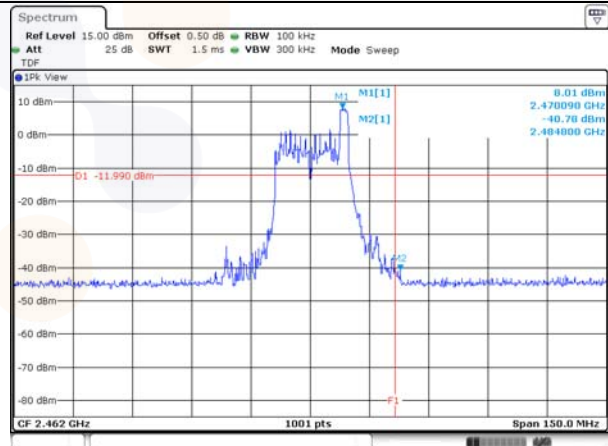
**ANT 1**

**Conducted band-edge / 2 462 MHz**



**ANT 2**

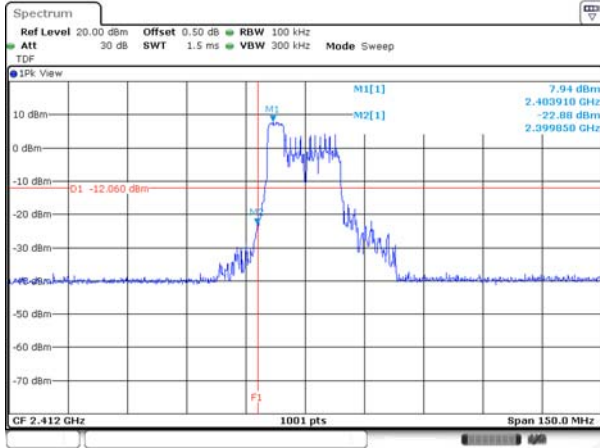
**Conducted band-edge / 2 462 MHz**



**52T / RU offset 37**

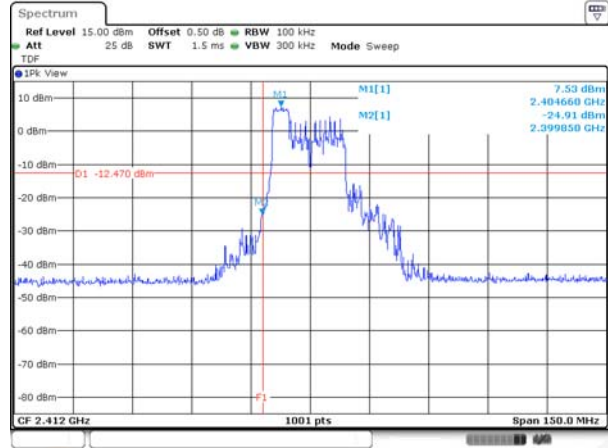
**ANT 1**

**Conducted band-edge / 2 412 MHz**



**ANT 2**

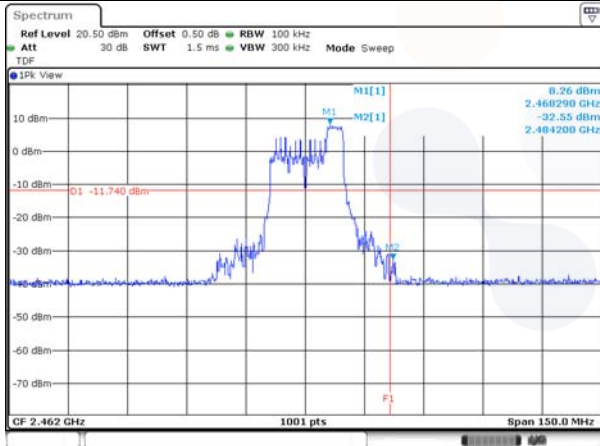
**Conducted band-edge / 2 412 MHz**



**52T / RU offset 40**

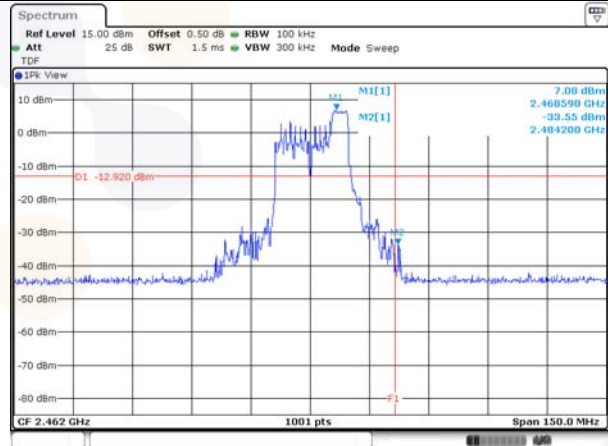
**ANT 1**

**Conducted band-edge / 2 462 MHz**



**ANT 2**

**Conducted band-edge / 2 462 MHz**

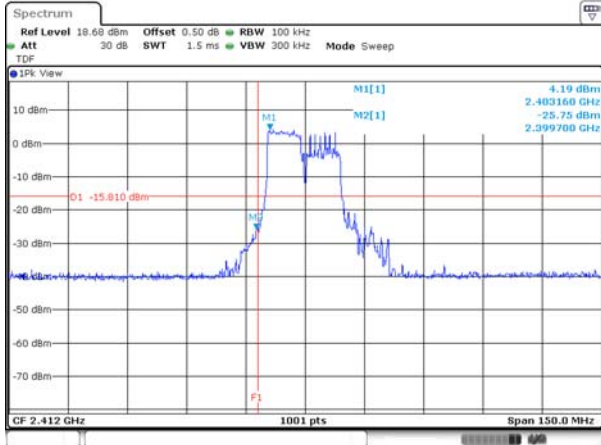




**106T / RU offset 53**

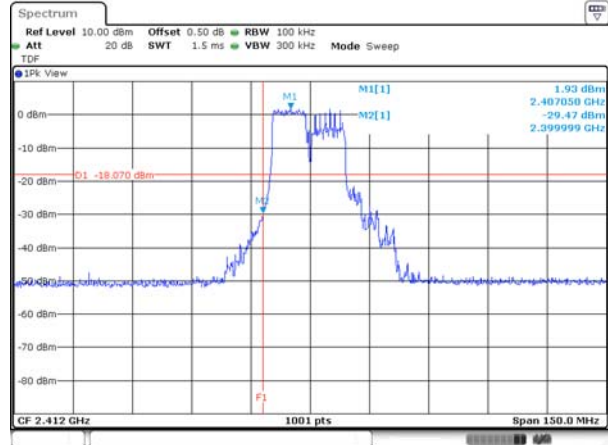
**ANT 1**

**Conducted band-edge / 2 412 MHz**



**ANT 2**

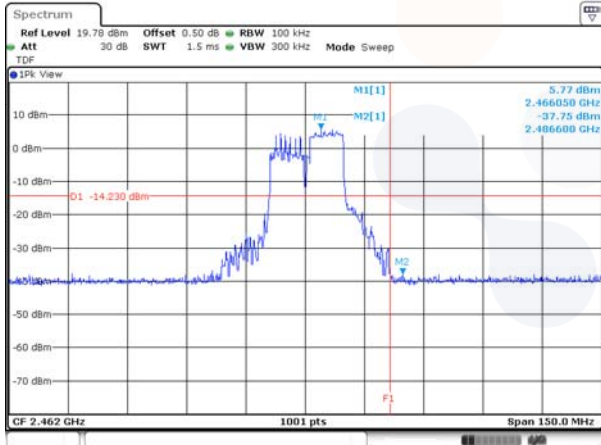
**Conducted band-edge / 2 412 MHz**



**106T / RU offset 54**

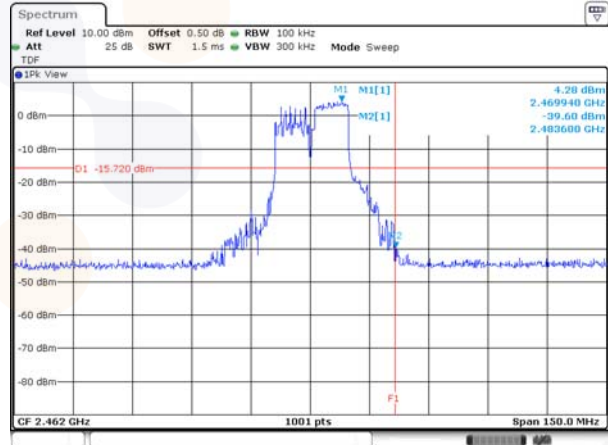
**ANT 1**

**Conducted band-edge / 2 462 MHz**



**ANT 2**

**Conducted band-edge / 2 462 MHz**



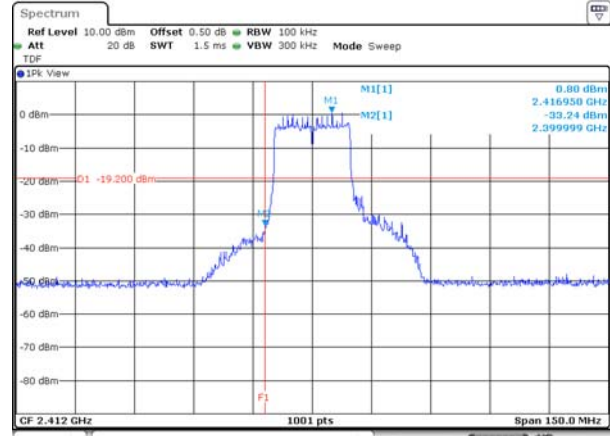
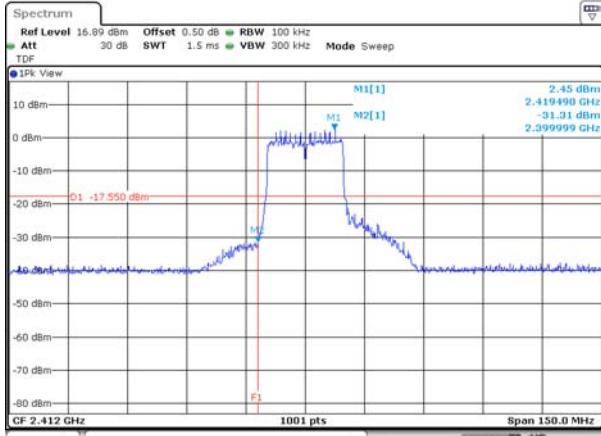
**242T / RU offset 61**

**ANT 1**

**ANT 2**

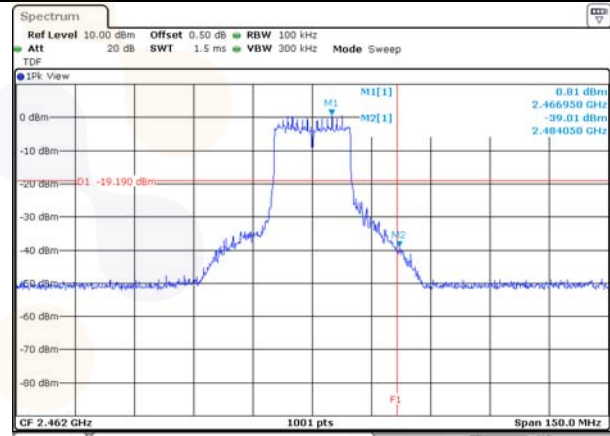
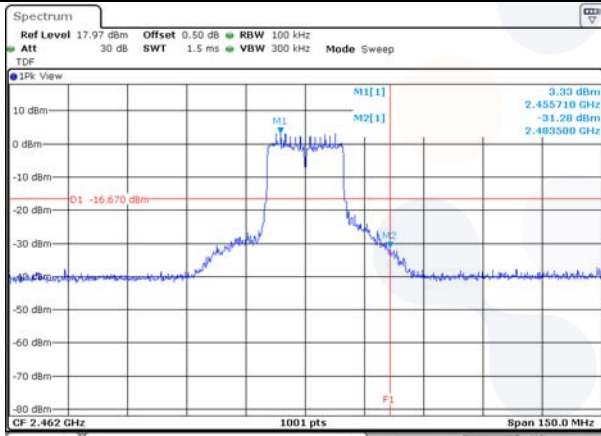
**Conducted band-edge / 2 412 MHz**

**Conducted band-edge / 2 412 MHz**



**Conducted band-edge / 2 462 MHz**

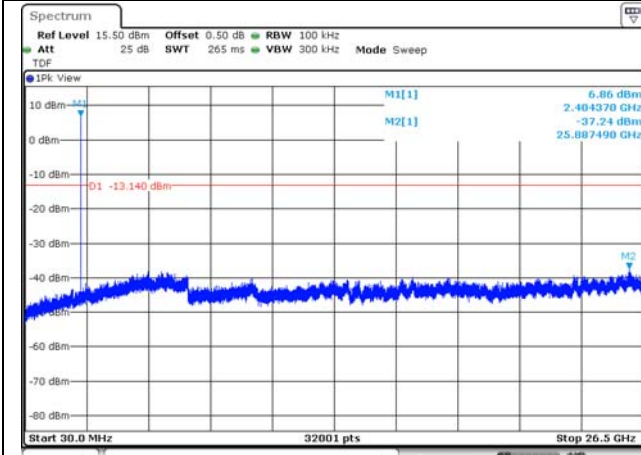
**Conducted band-edge / 2 462 MHz**



**52T / RU offset 38**

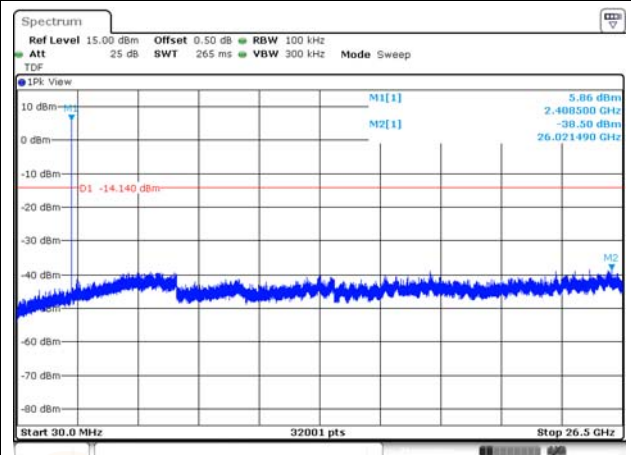
**ANT 1**

**Conducted spurious / 2 412 MHz**



**ANT 2**

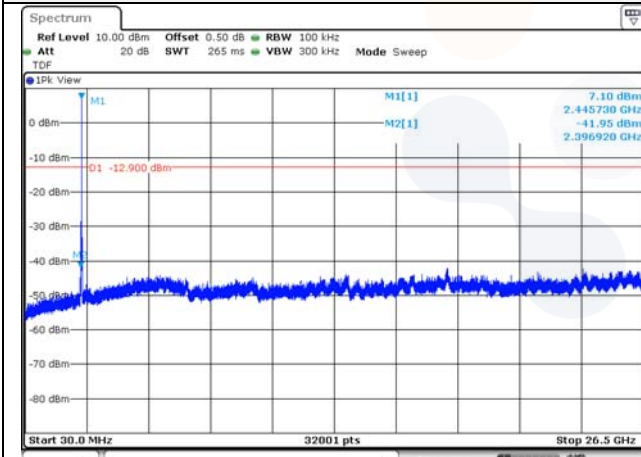
**Conducted spurious / 2 412 MHz**



**52T / RU offset 40**

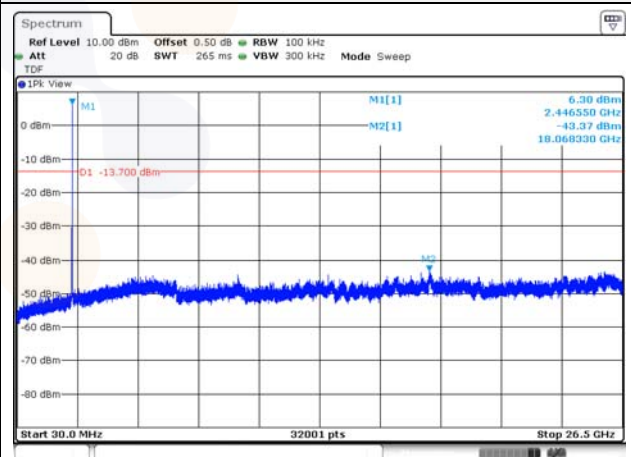
**ANT 1**

**Conducted spurious / 2 437 MHz**



**ANT 2**

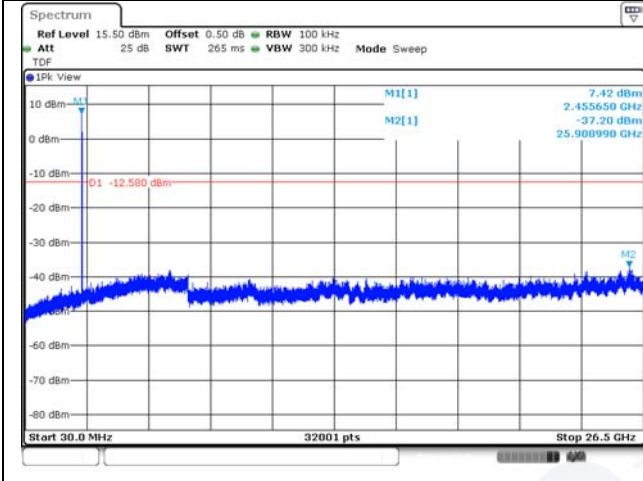
**Conducted spurious / 2 437 MHz**



**52T / RU offset 37**

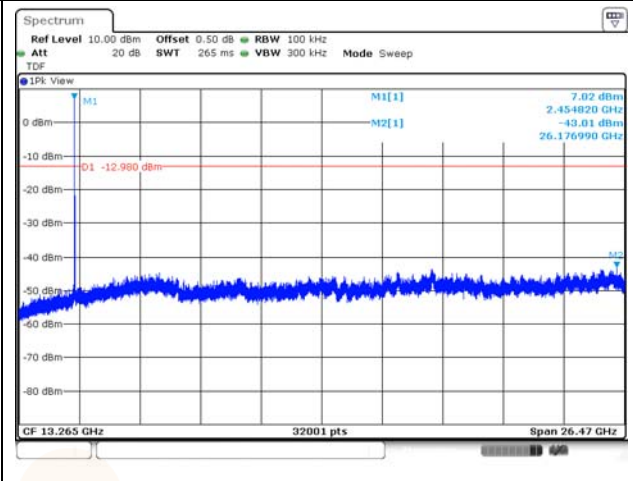
**ANT 1**

**Conducted spurious / 2 462 MHz**



**ANT 2**

**Conducted spurious / 2 462 MHz**



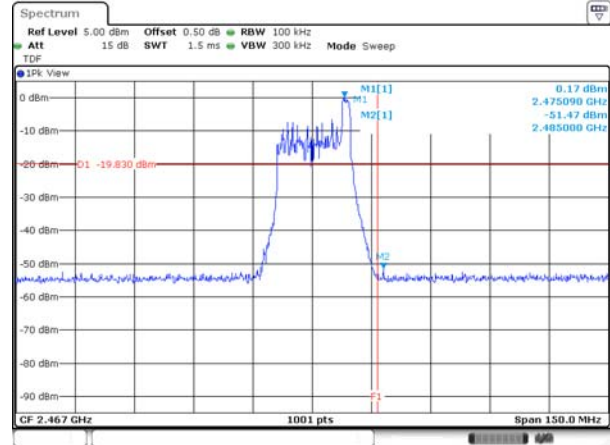
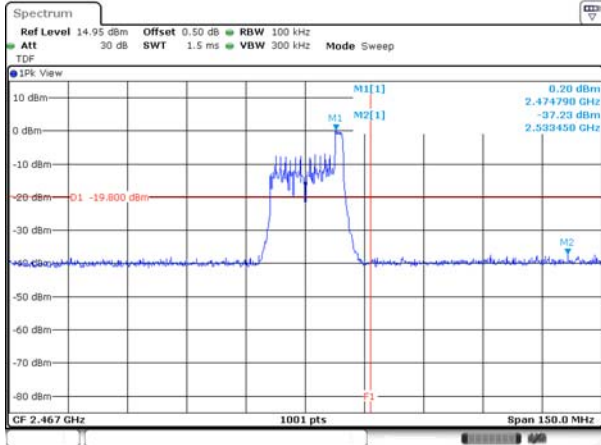
**26T / RU offset 8**

**ANT 1**

**ANT 2**

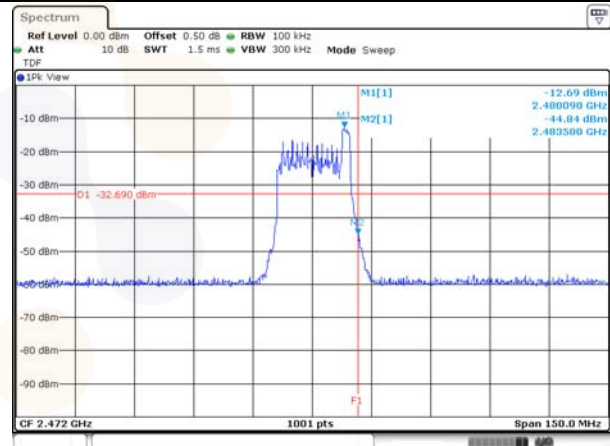
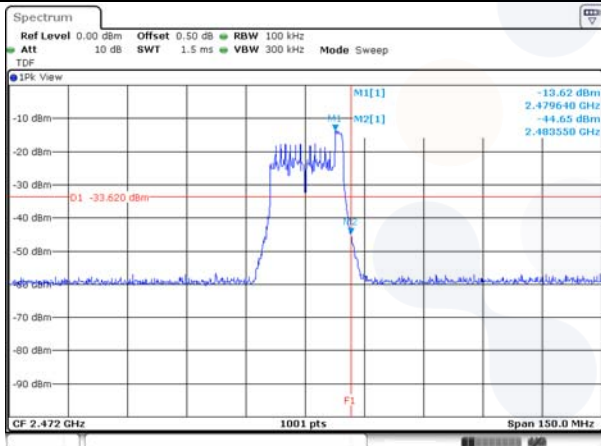
**Conducted band-edge / 2 467 MHz**

**Conducted band-edge / 2 467 MHz**



**Conducted band-edge / 2 472 MHz**

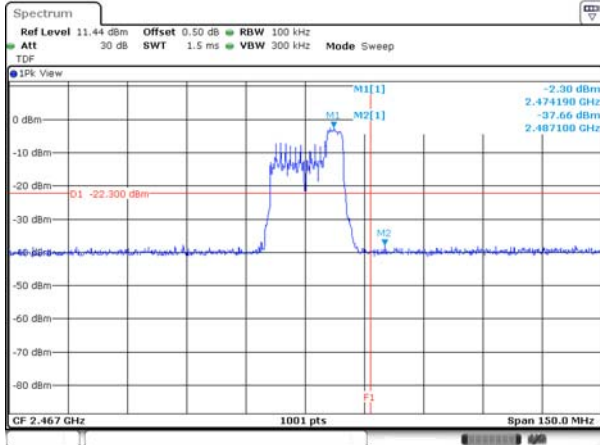
**Conducted band-edge / 2 472 MHz**



**52T / RU offset 40**

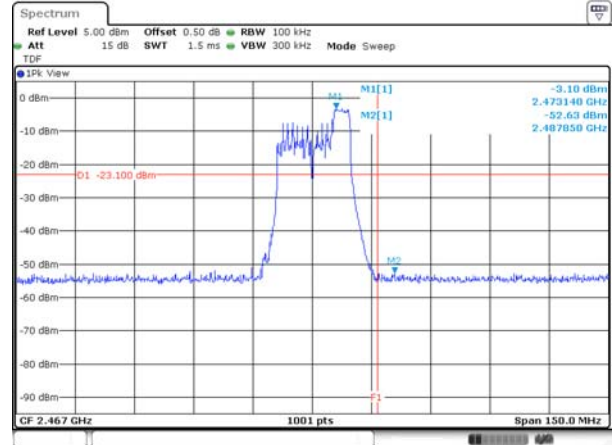
**ANT 1**

**Conducted band-edge / 2 467 MHz**

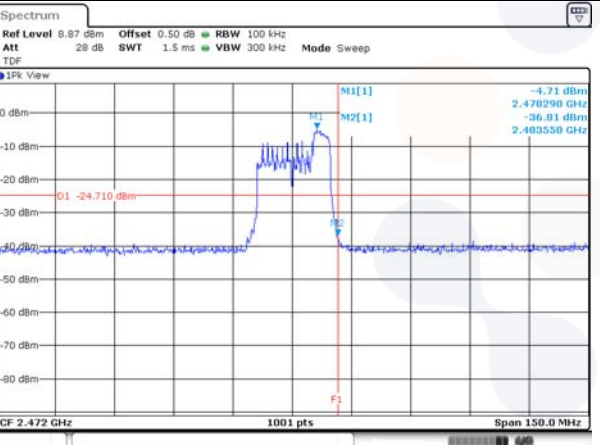


**ANT 2**

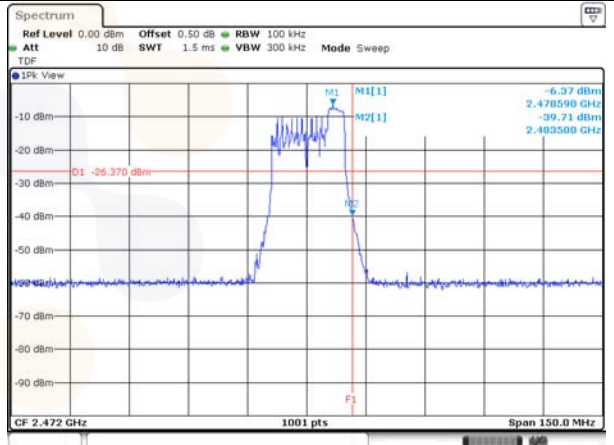
**Conducted band-edge / 2 467 MHz**



**Conducted band-edge / 2 472 MHz**



**Conducted band-edge / 2 472 MHz**





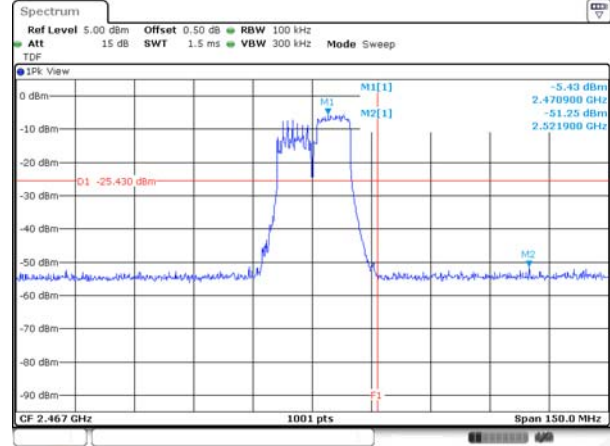
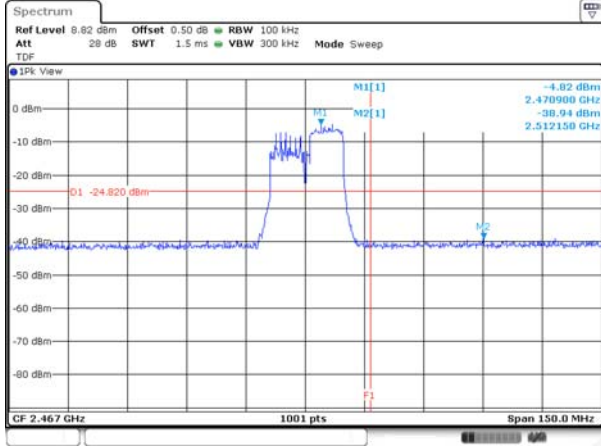
**106T / RU offset 54**

**ANT 1**

**ANT 2**

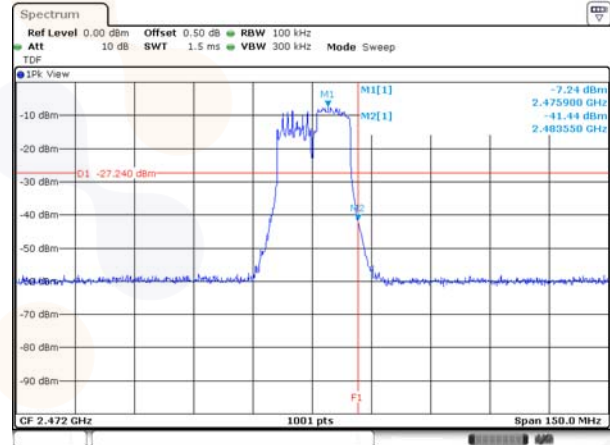
**Conducted band-edge / 2 467 MHz**

**Conducted band-edge / 2 467 MHz**



**Conducted band-edge / 2 472 MHz**

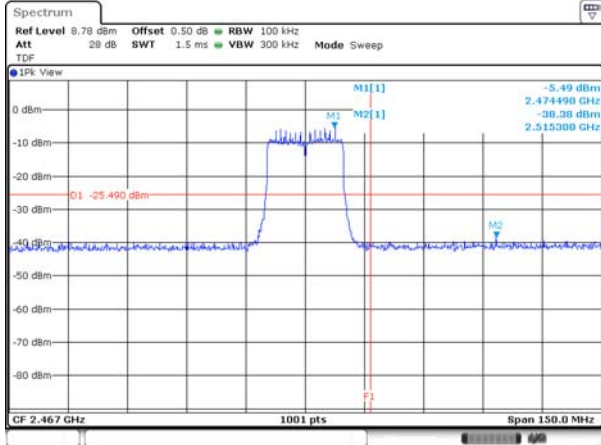
**Conducted band-edge / 2 472 MHz**



**242T / RU offset 61**

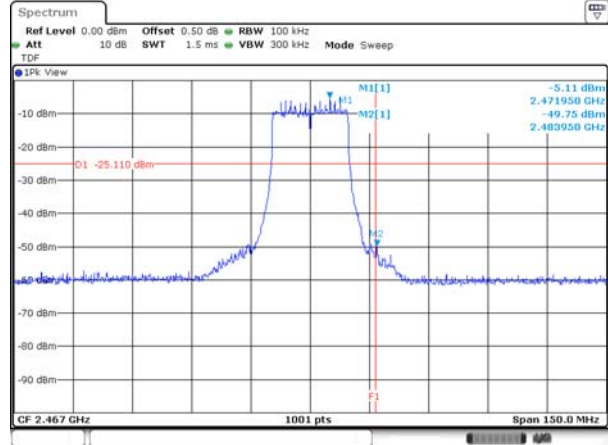
**ANT 1**

**Conducted band-edge / 2 467 MHz**

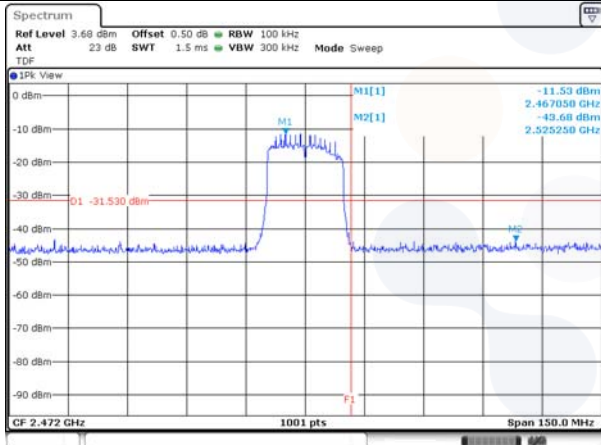


**ANT 2**

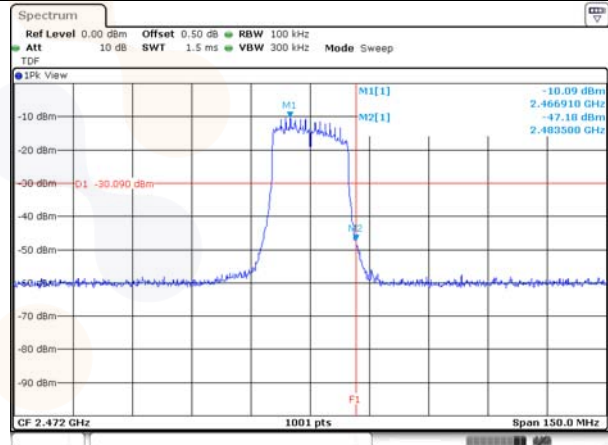
**Conducted band-edge / 2 467 MHz**



**Conducted band-edge / 2 472 MHz**



**Conducted band-edge / 2 472 MHz**

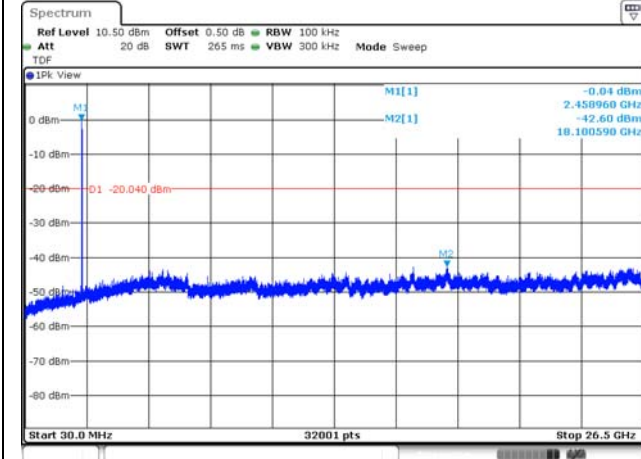




**26T / RU offset 0**

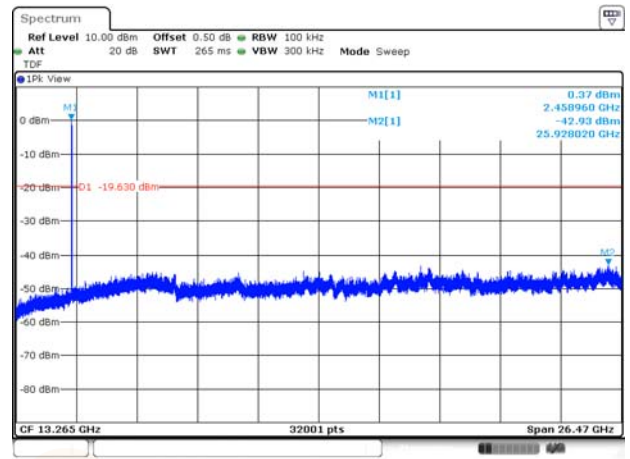
**ANT 1**

**Conducted spurious / 2 467 MHz**



**ANT 2**

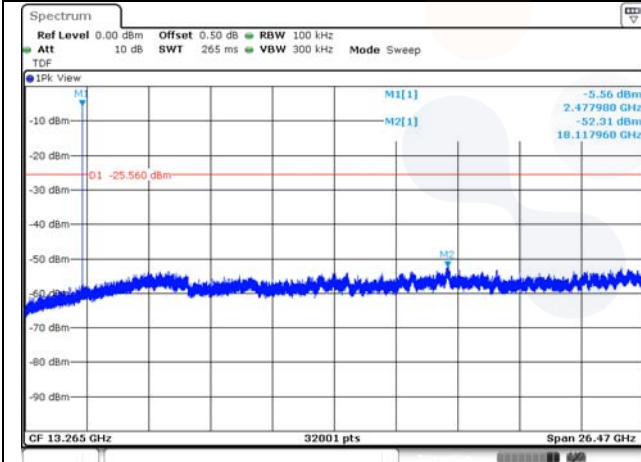
**Conducted spurious / 2 467 MHz**



**52T / RU offset 40**

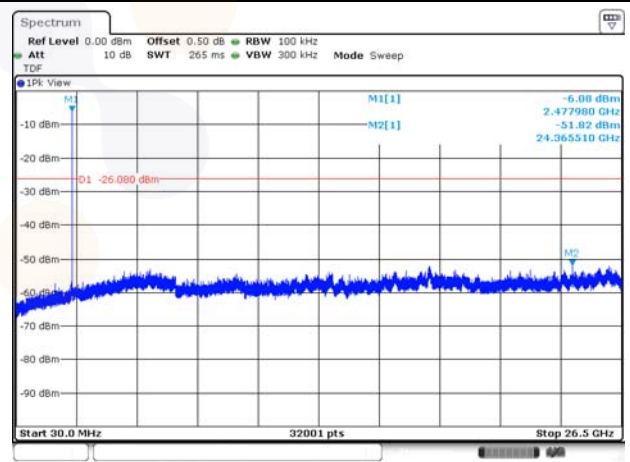
**ANT 1**

**Conducted spurious / 2 472 MHz**



**ANT 2**

**Conducted spurious / 2 472 MHz**



## 8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100807	23.07.12
Attenuator	API Inmet	40AH2W-10	16	23.05.03
Signal Generator	R&S	SMB100A	176206	23.01.19
Vector Signal Generator	R&S	SMBV100A	257566	23.07.04
Power Sensor	R&S	NRP-Z81	1137.9009.02-106224-tg	23.06.23
Attenuator	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	0001	23.05.02
DC Power Supply	AGILENT	E3632A	MY40016393	23.07.11
Spectrum Analyzer	R&S	FSV40	100989	23.10.14*
EMI TEST RECEIVER	R&S	ESC17	100732	23.01.19
Bi-Log Antenna	TESEQ	CBL 6112D	62438	24.08.24
Amplifier	SONOMA INSTRUMENT	310N	284608	23.08.18
ATTENUATOR	KEYSIGHT	8491B-6dB	MY39271060	24.04.27
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	23.03.28
Horn antenna	ETS.lindgren	3117	155787	23.09.29*
Horn antenna	ETS.lindgren	3116	00086632	23.01.25
Attenuator	API Inmet	40AH2W-10	12	23.05.03
AMPLIFIER	B&Z Technologies	BZRT-00504000-481055-382525	26299-27735	23.09.19*
AMPLIFIER	B&Z Technologies	BZR-0050400-551028-252525	27736	23.09.19*
LOOP Antenna	R&S	HFH2-Z2	100355	24.08.10
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Highpass Filter	WT	WT-A1698-HS	WT160411001	23.05.03
TWO-LINE V - NETWORK	R&S	ENV216	101358	23.09.29*
EMI TEST RECEIVER	R&S	ESC13	100001	23.08.18

\* Tests related to this equipment were progressed after the calibration was completed.

**End of test report**