

## **2.5 PEAK-AVERAGE RATIO**

### **2.5.1 Specification Reference**

FCC 47 CFR Part 27, Clause 27.50 (d)(5)  
RSS-139, Clause 6.5  
RSS-130, Clause 4.6.1  
RSS-195, Clause 5.5.1

### **2.5.2 Standard Applicable**

The peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

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

Serial No: 370920000139 (NU) and 371929000156 (CU) / Test Configuration A and B

### **2.5.4 Date of Test/Initial of test personnel who performed the test**

August 09 to 15, 2019/XYZ

### **2.5.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.5.6 Environmental Conditions**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 25.9 - 26.3°C  |
| Relative Humidity   | 49.5 - 52.3%   |
| ATM Pressure        | 98.8 - 99.0kPa |

#### 2.5.7 Additional Observations

- This is a conducted test.
- Test procedure is per FCC KDB 971168 D01 v03r01 clause 5.7, the PAPR was measured in accordance with ANSI C63.26 clause 5.2.3.4.
- Measurement was done using the Spectrum Analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile. The built-in function is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth (crest factor or peak-to-average ratio) A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth.
- RBW was set to maximum the SA can support.
- There are no measured PAR levels greater than 13dB.
- Low, Middle and High channels for all bandwidths were verified.
- Only test plots for middle channel were presented as the representative configuration.

## 2.5.8 Test Results

| LTE Band 4 Downlink |          |                 |          |
|---------------------|----------|-----------------|----------|
| Bandwidth (MHz)     | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz               | 1975     | 2112.5          | 10.54    |
|                     | 2175     | 2132.5          | 10.52    |
|                     | 2375     | 2152.5          | 9.91     |
| 10 MHz              | 2000     | 2115.0          | 9.49     |
|                     | 2175     | 2132.5          | 9.63     |
|                     | 2350     | 2150.0          | 9.02     |
| 15 MHz              | 2025     | 2117.5          | 11.30    |
|                     | 2175     | 2132.5          | 10.35    |
|                     | 2325     | 2147.5          | 11.25    |
| 20 MHz              | 2050     | 2120.0          | 10.44    |
|                     | 2175     | 2132.5          | 10.28    |
|                     | 2300     | 2145.0          | 9.37     |

| LTE Band 4 Uplink |          |                 |          |
|-------------------|----------|-----------------|----------|
| Bandwidth (MHz)   | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz             | 19975    | 1712.5          | 8.0      |
|                   | 20175    | 1732.5          | 8.99     |
|                   | 20375    | 1752.5          | 9.27     |
| 10 MHz            | 20000    | 1715.0          | 8.10     |
|                   | 20175    | 1732.5          | 8.88     |
|                   | 20350    | 1750.0          | 8.62     |
| 15 MHz            | 20025    | 1717.5          | 8.72     |
|                   | 20175    | 1732.5          | 9.53     |
|                   | 20325    | 1747.5          | 9.15     |
| 20 MHz            | 20050    | 1720.0          | 8.53     |
|                   | 20175    | 1732.5          | 9.24     |
|                   | 20300    | 1745.0          | 8.89     |

| LTE Band 12 Downlink |          |                 |          |
|----------------------|----------|-----------------|----------|
| Bandwidth (MHz)      | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz                | 5035     | 731.5           | 7.14     |
|                      | 5095     | 737.5           | 7.43     |
|                      | 5155     | 743.5           | 7.92     |
| 10 MHz               | 5060     | 734.0           | 8.90     |
|                      | 5095     | 737.5           | 8.84     |
|                      | 5130     | 741.0           | 9.47     |

| LTE Band 12 Uplink |          |                 |          |
|--------------------|----------|-----------------|----------|
| Bandwidth (MHz)    | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz              | 23035    | 701.5           | 11.24    |
|                    | 23095    | 707.5           | 10.27    |
|                    | 23155    | 713.5           | 10.58    |
| 10 MHz             | 23060    | 704.0           | 10.34    |
|                    | 23095    | 707.5           | 10.35    |
|                    | 23130    | 711.0           | 10.91    |

| LTE Band 13 Downlink |          |                 |          |
|----------------------|----------|-----------------|----------|
| Bandwidth (MHz)      | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz                | 5205     | 748.5           | 11.54    |
|                      | 5230     | 751.0           | 11.33    |
|                      | 5255     | 753.5           | 11.38    |
| 10 MHz               | -        | -               | -        |
|                      | 5230     | 751.0           | 11.23    |
|                      | -        | -               | -        |

| LTE Band 13 Uplink |          |                 |          |
|--------------------|----------|-----------------|----------|
| Bandwidth (MHz)    | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz              | 23205    | 779.5           | 11.17    |
|                    | 23230    | 782.0           | 10.88    |
|                    | 23255    | 784.5           | 11.05    |
| 10 MHz             | -        | -               | -        |
|                    | 23230    | 782.0           | 10.99    |
|                    | -        | -               | -        |

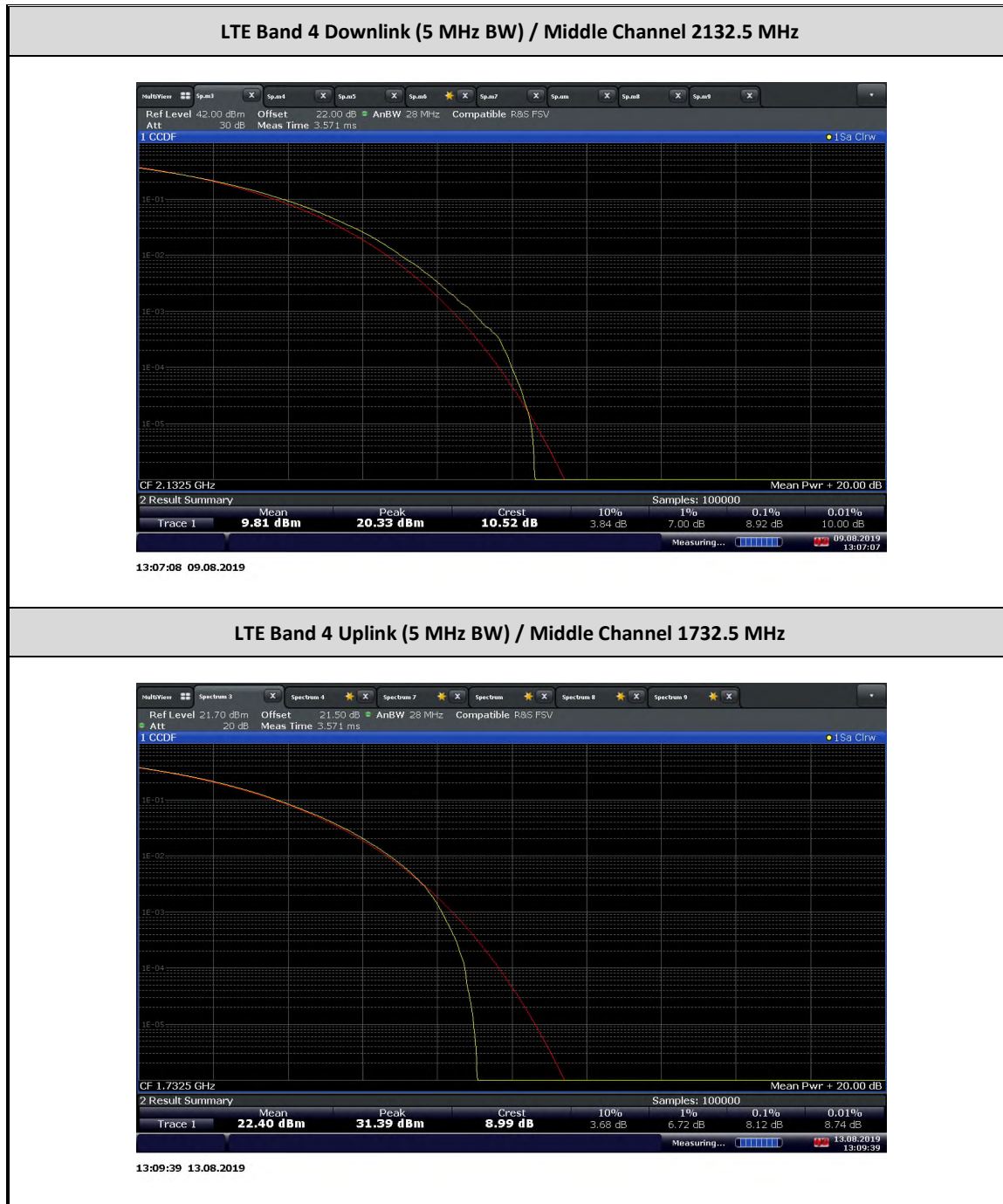
| LTE Band 30 Downlink |          |                 |          |
|----------------------|----------|-----------------|----------|
| Bandwidth (MHz)      | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz                | 9795     | 2352.5          | 7.87     |
|                      | 9820     | 2355.0          | 7.19     |
|                      | 9845     | 2357.5          | 7.93     |
| 10 MHz               | -        | -               | -        |
|                      | 9820     | 2355.0          | 7.91     |
|                      | -        | -               | -        |

| LTE Band 30 Uplink |          |                 |          |
|--------------------|----------|-----------------|----------|
| Bandwidth (MHz)    | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz              | 27685    | 2307.5          | 8.63     |
|                    | 27710    | 2310.0          | 8.81     |
|                    | 27735    | 2312.5          | 8.52     |
| 10 MHz             | -        | -               | -        |
|                    | 27710    | 2310.0          | 8.80     |
|                    | -        | -               | -        |

| LTE Band 71 Downlink |          |                 |          |
|----------------------|----------|-----------------|----------|
| Bandwidth (MHz)      | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz                | 68611    | 619.5           | 12.53    |
|                      | 68761    | 634.5           | 12.06    |
|                      | 68911    | 649.5           | 12.57    |
| 10 MHz               | 68636    | 622.0           | 11.55    |
|                      | 68761    | 634.5           | 11.87    |
|                      | 68886    | 647.0           | 12.22    |
| 15 MHz               | 68661    | 624.5           | 11.76    |
|                      | 68761    | 634.5           | 12.07    |
|                      | 68861    | 644.5           | 11.57    |
| 20 MHz               | 68686    | 627.0           | 11.86    |
|                      | 68761    | 634.5           | 12.12    |
|                      | 68836    | 642.0           | 12.26    |

| LTE Band 71 Uplink |          |                 |          |
|--------------------|----------|-----------------|----------|
| Bandwidth (MHz)    | Channels | Frequency (MHz) | PAR (dB) |
| 5 MHz              | 133147   | 665.5           | 11.64    |
|                    | 133297   | 680.5           | 11.36    |
|                    | 133447   | 695.5           | 12.17    |
| 10 MHz             | 133172   | 668.0           | 10.93    |
|                    | 133297   | 680.5           | 10.91    |
|                    | 133422   | 693.0           | 11.43    |
| 15 MHz             | 133197   | 670.5           | 11.16    |
|                    | 133297   | 680.5           | 11.21    |
|                    | 133397   | 690.5           | 11.27    |
| 20 MHz             | 133222   | 673.0           | 10.69    |
|                    | 133297   | 680.5           | 11.19    |
|                    | 133372   | 688.0           | 11.34    |

## 2.5.9 Sample Test Plot



### LTE Band 12 Downlink (5 MHz BW) / Middle Channel 737.5 MHz



### LTE Band 12 Uplink (5 MHz BW) / Middle Channel 707.5 MHz



### LTE Band 13 Downlink (5 MHz BW) / Middle Channel 751 MHz



### LTE Band 13 Uplink (5 MHz BW) / Middle Channel 782 MHz



### LTE Band 30 Downlink (5 MHz BW) / Middle Channel 2355 MHz



### LTE Band 30 Uplink (5 MHz BW) / Middle Channel 2310 MHz



### LTE Band 71 Downlink (5 MHz BW) / Middle Channel 634.5 MHz



### LTE Band 71 Uplink (5 MHz BW) / Middle Channel 680.5 MHz



## 2.6 BAND EDGE

### 2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051  
FCC 47 CFR Part 27, Clause 27.53(h)(1)(3)  
FCC 47 CFR Part 27, Clause 27.53(g)  
FCC 47 CFR Part 27, Clause 27.53(c)(1)(2)(5)  
FCC 47 CFR Part 27, Clause 27.53(a)(1)  
RSS-139, Clause 6.6  
RSS-130, Clause 4.7  
RSS-195, Clause 5.6.1

### 2.6.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.53:

(h) AWS emission limits – (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB.

(g) For operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(a) For operations in the 2305–2320 MHz band and the 2345–2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(1) For base and fixed stations' operations in the 2305–2320 MHz band and the 2345–2360 MHz band:

(i) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than  $75 + 10 \log(P)$  dB on all frequencies between 2320 and 2345 MHz;

(ii) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2300 and 2305 MHz,  $70 + 10 \log(P)$  dB on all frequencies between 2287.5 and 2300 MHz,  $72 + 10 \log(P)$  dB on all frequencies between 2285 and 2287.5 MHz, and  $75 + 10 \log(P)$  dB below 2285 MHz;

(iii) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2360 and 2362.5 MHz,  $55 + 10 \log(P)$  dB on all frequencies between 2362.5 and 2365 MHz,  $70 + 10 \log(P)$  dB on all frequencies between 2365 and 2367.5 MHz,  $72 + 10 \log(P)$  dB on all frequencies between 2367.5 and 2370 MHz, and  $75 + 10 \log(P)$  dB above 2370 MHz.

RSS-139, Clause 6.6:

(i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power  $P$  (dBW), by at least  $43 + 10 \log_{10} p$  (watts) dB.

RSS-130:

#### 4.7.1 General unwanted emissions limits

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $43 + 10 \log_{10} p$  (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-195, Clause 5.6.1:

The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power,  $P$  (dBW), by the amount indicated in Table 1 and graphically represented in Figure 1, where  $p$  is the transmitter output power measured in watts.

**Table 1 — Unwanted Emissions for Base Station, Fixed Station and High-Power Fixed Subscriber Equipment**

| Frequency (MHz) | Attenuation (dB)                       |
|-----------------|----------------------------------------|
| <2200           | $43 + 10 \log_{10}(p)$                 |
| 2200 - 2285     | $75 + 10 \log_{10}(p)$                 |
| 2285 - 2287.5   | $72 + 10 \log_{10}(p)$                 |
| 2287.5 - 2300   | $70 + 10 \log_{10}(p)$                 |
| 2300 - 2305     | $43 + 10 \log_{10}(p)$                 |
| 2305 - 2320     | $43 + 10 \log_{10}(p)$ <sup>Note</sup> |
| 2320 - 2345     | $75 + 10 \log_{10}(p)$                 |
| 2345 - 2360     | $43 + 10 \log_{10}(p)$ <sup>Note</sup> |
| 2360 - 2362.5   | $43 + 10 \log_{10}(p)$                 |
| 2362.5 - 2365   | $55 + 10 \log_{10}(p)$                 |
| 2365 - 2367.5   | $70 + 10 \log_{10}(p)$                 |
| 2367.5 - 2370   | $72 + 10 \log_{10}(p)$                 |
| 2370 - 2395     | $75 + 10 \log_{10}(p)$                 |
| >2395           | $43 + 10 \log_{10}(p)$                 |

**Note:** Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 5.2 for the permitted frequency ranges for the various equipment types.

### 2.6.3 Equipment Under Test and Modification State

Serial No: 370920000139 (NU) and 371929000156 (CU) / Test Configuration A and B

### 2.6.4 Date of Test/Initial of test personnel who performed the test

August 19 to 28, 2019/XYZ

### 2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 24.9 - 27.3°C  |
| Relative Humidity   | 41.7 - 49.6%   |
| ATM Pressure        | 98.5 – 99.0kPa |

### 2.6.7 Additional Observations

- This is a conducted test. Test guidance is per Section 6.1 of KDB971168 (D01 Power Meas License Digital Systems v03r01).
- The path loss was measured and entered as a level offset.
- For LTE Band 12, 13 and 71, RBW was set to 30 kHz and the limit for emissions 100 kHz outside of the low frequency edge and the high frequency edge of each frequency block range(s), was set to:

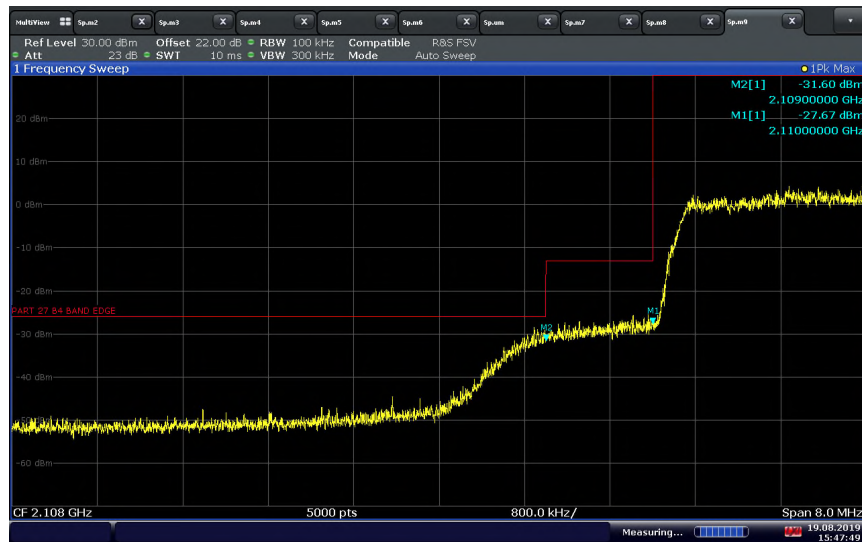
$$\text{Limit} = -13\text{dBm} + 10\lg(30/100) = -18.23 \text{ dBm}$$

- For LTE Band 4, RBW was set to at least 1% of the occupied bandwidth, and the limit for emissions 1MHz outside of the low frequency edge and the high frequency edge of each frequency block range(s), was set to:

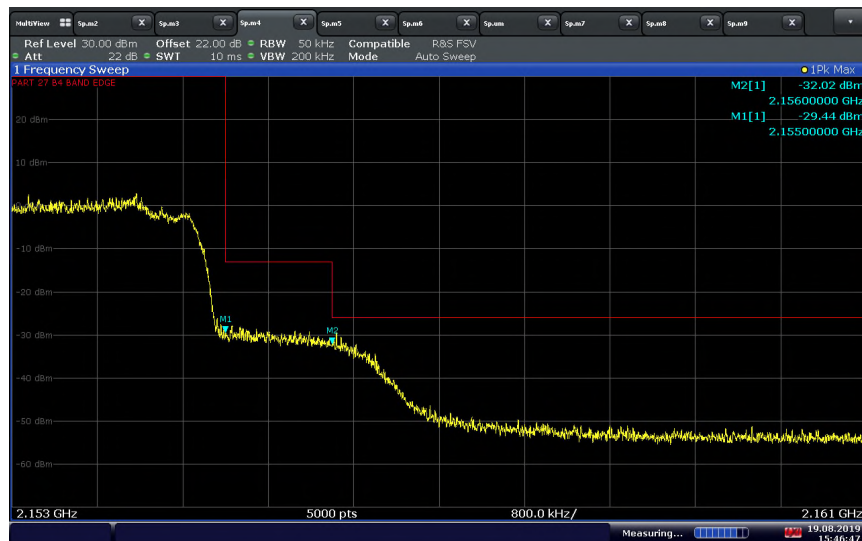
$$\text{Limit} = -13\text{dBm} + 10(\text{RBW}_{\text{used}}/1\text{MHz})$$

## 2.6.8 Test Results

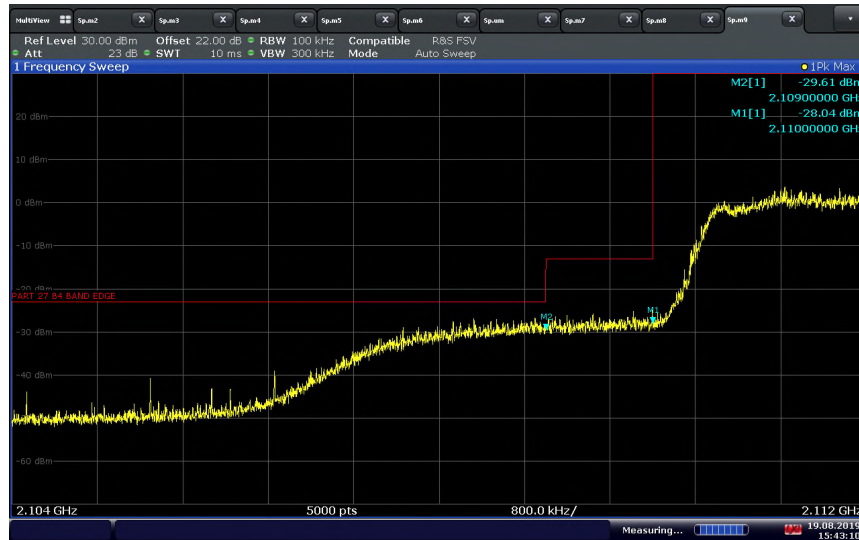
### LTE Band 4 Downlink 5MHz Bandwidth Low Channel Band Edge



### LTE Band 4 Downlink 5MHz Bandwidth High Channel Band Edge

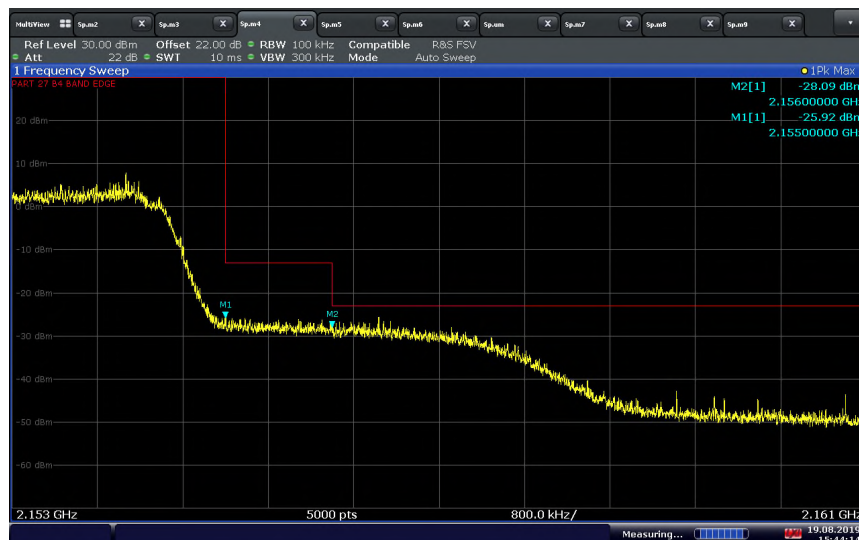


### LTE Band 4 Downlink 10MHz Bandwidth Low Channel Band Edge



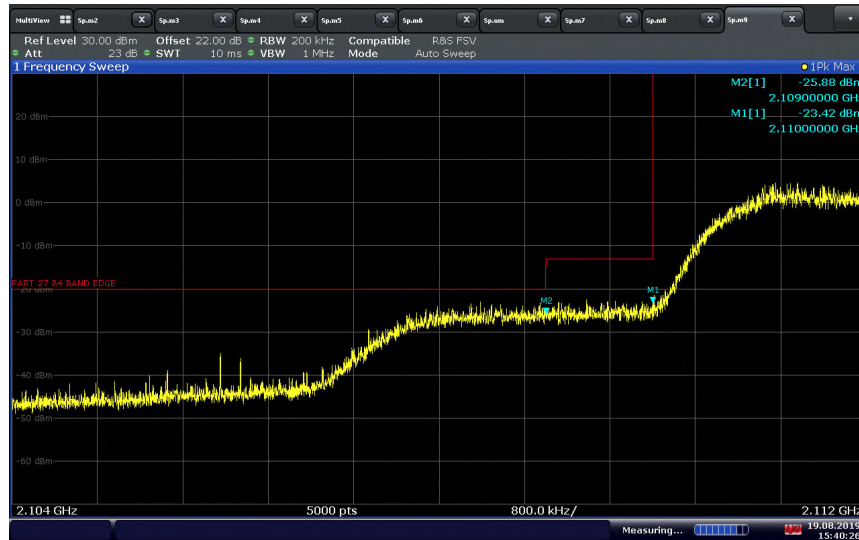
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### LTE Band 4 Downlink 10MHz Bandwidth High Channel Band Edge



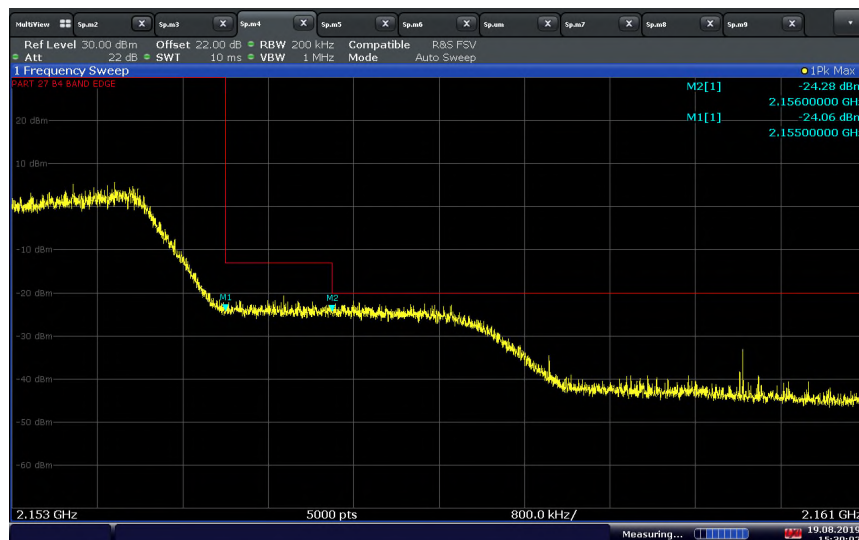
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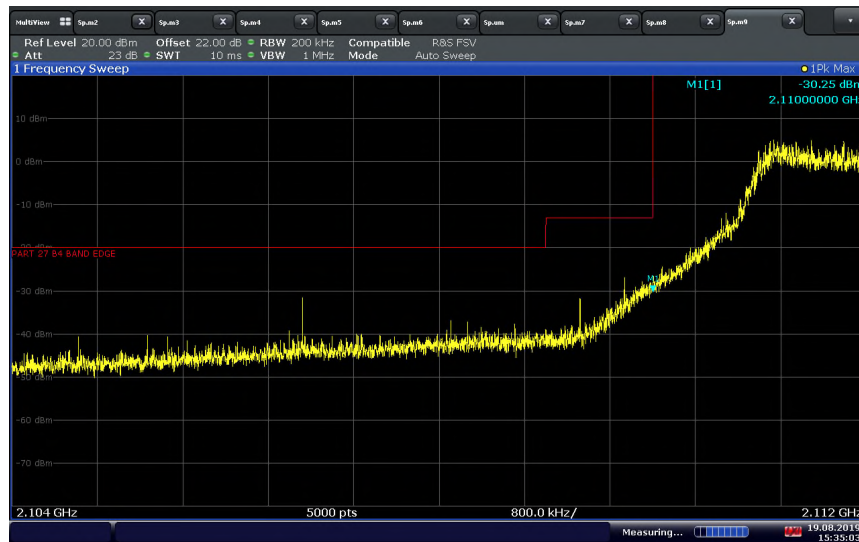
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### LTE Band 4 Downlink 15MHz Bandwidth High Channel Band Edge



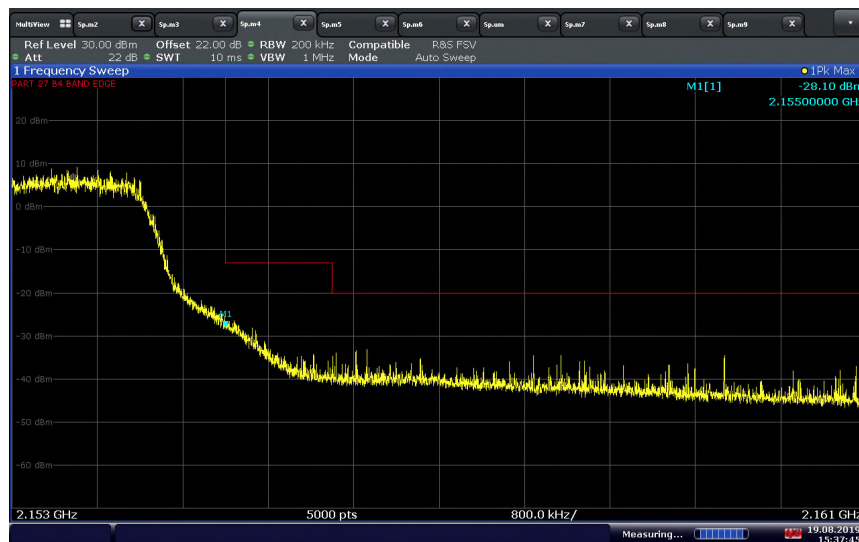
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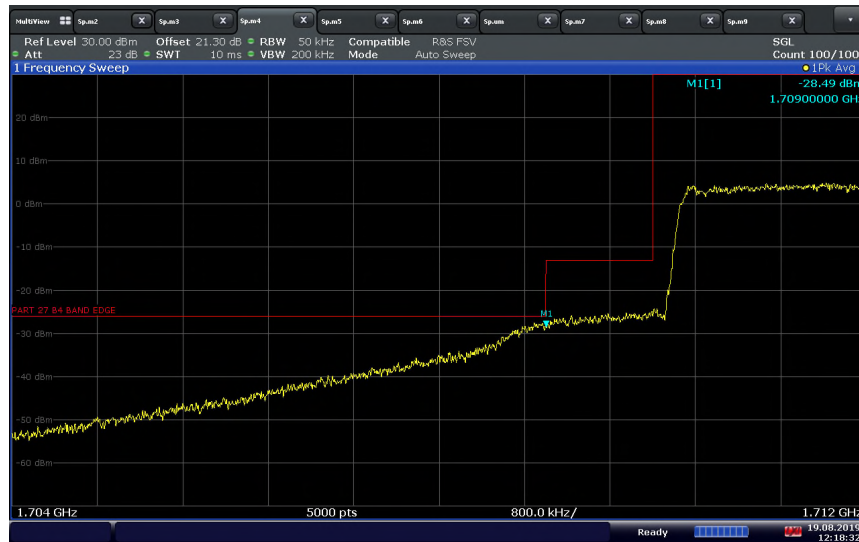
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### LTE Band 4 Downlink 20MHz Bandwidth High Channel Band Edge



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### LTE Band 4 Uplink 5MHz Bandwidth Low Channel Band Edge



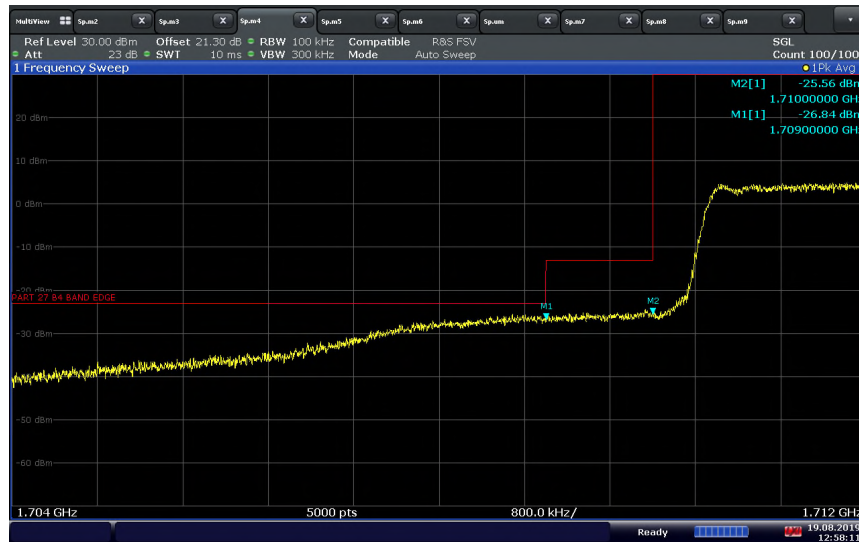
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### LTE Band 4 Uplink 5MHz Bandwidth High Channel Band Edge



12:27:33 19.08.2019

### LTE Band 4 Uplink 10MHz Bandwidth Low Channel Band Edge



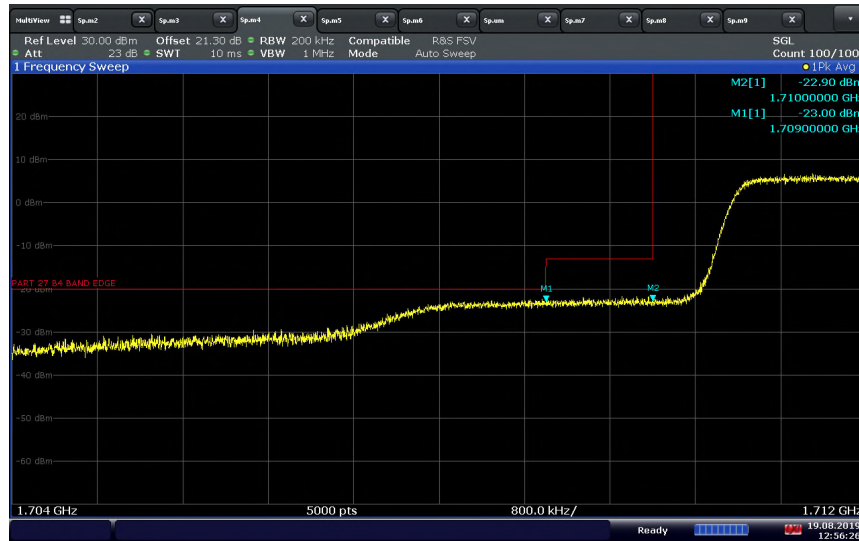
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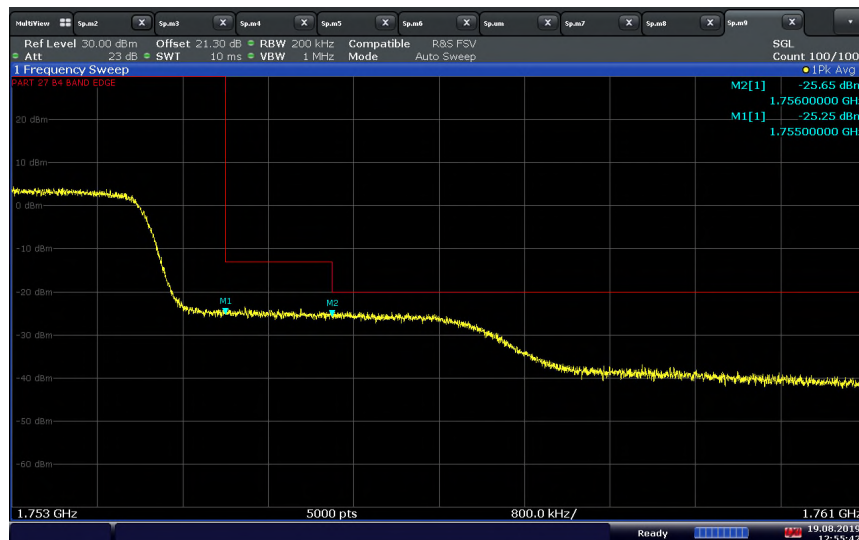
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### LTE Band 4 Uplink 15MHz Bandwidth Low Channel Band Edge



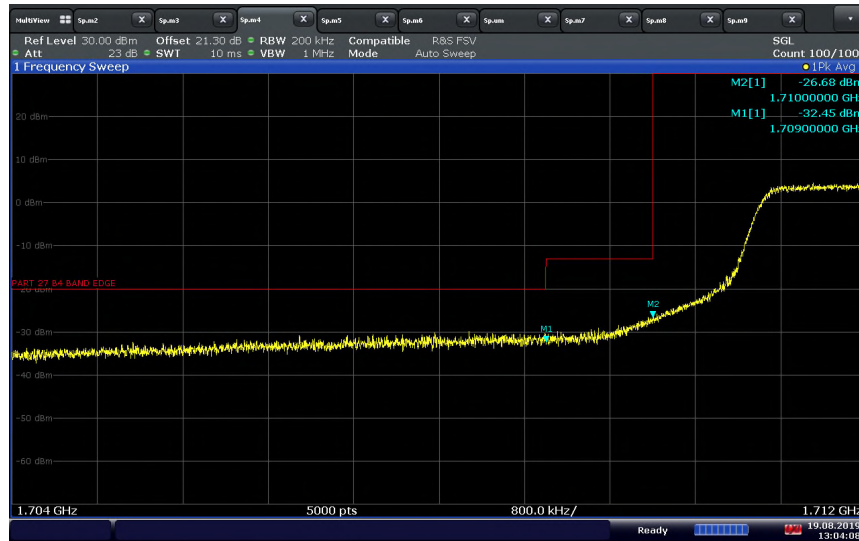
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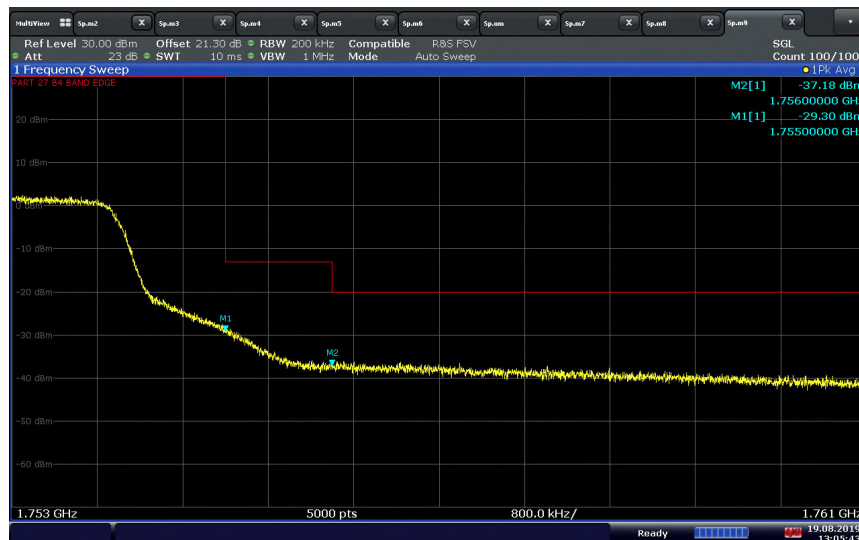
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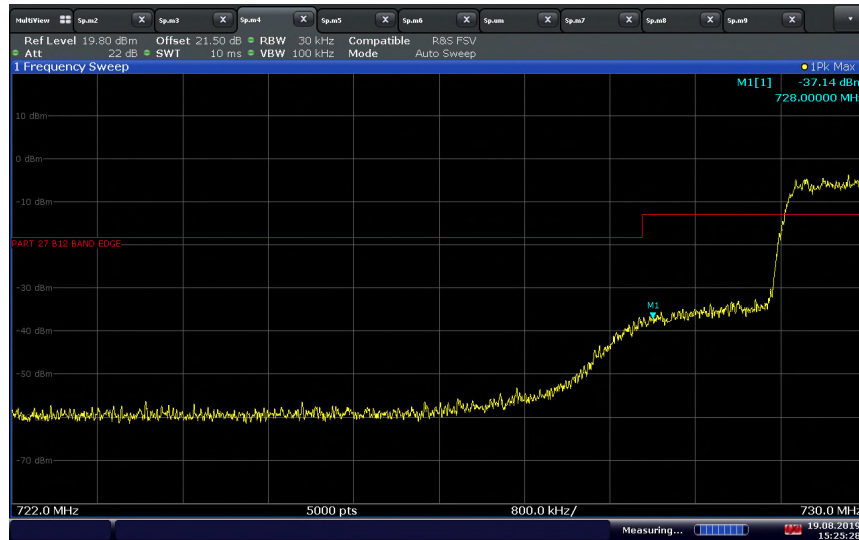
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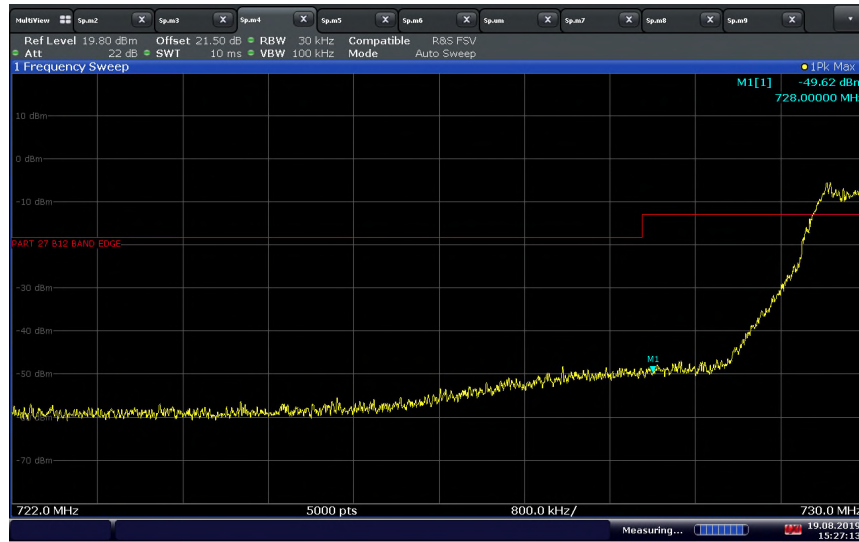
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### LTE Band 12 Downlink 5MHz Bandwidth High Channel Band Edge



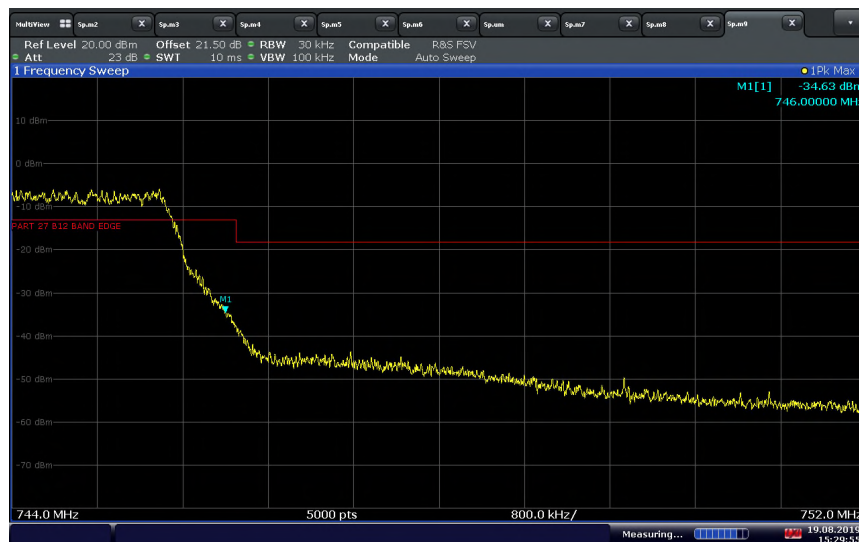
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### LTE Band 12 Downlink 10MHz Bandwidth Low Channel Band Edge



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### LTE Band 12 Downlink 10MHz Bandwidth High Channel Band Edge



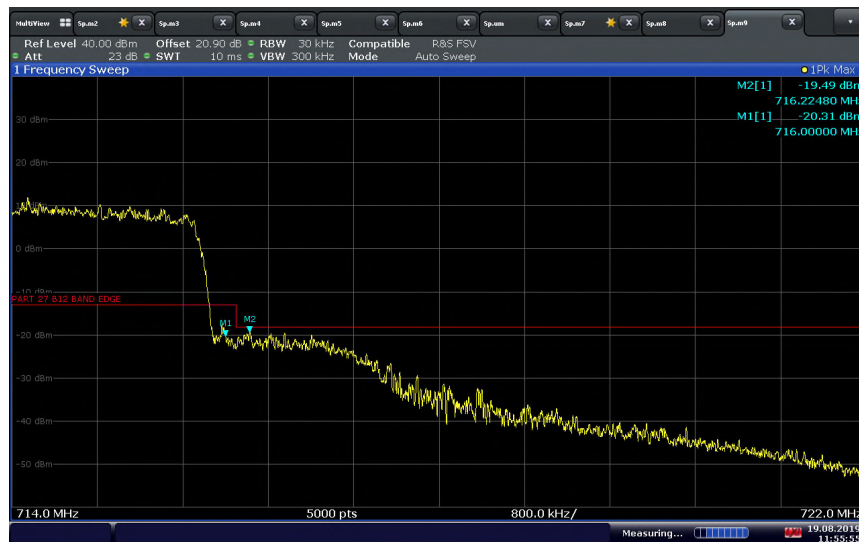
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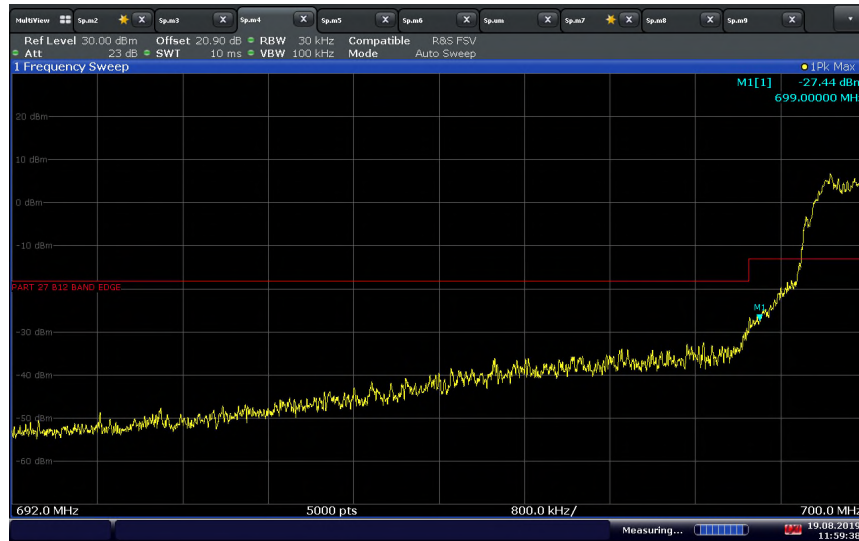
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### LTE Band 12 Uplink 5MHz Bandwidth High Channel Band Edge



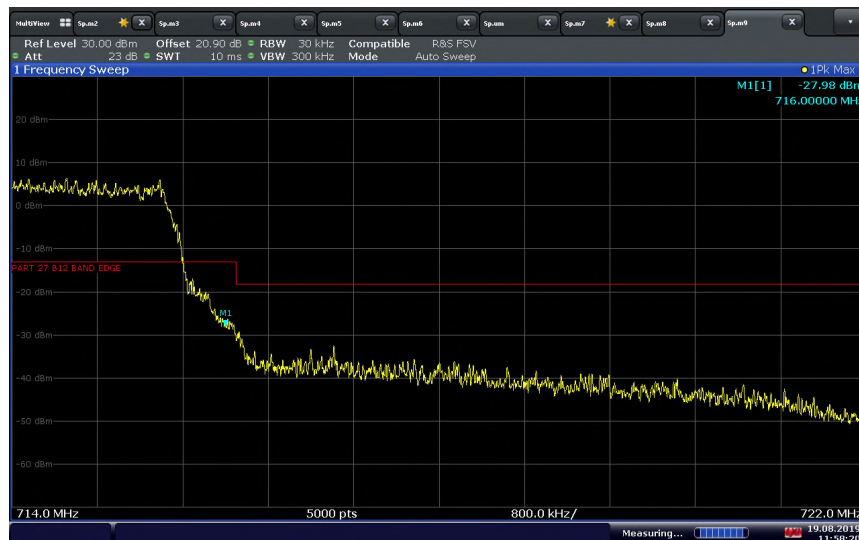
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### LTE Band 12 Uplink 10MHz Bandwidth Low Channel Band Edge



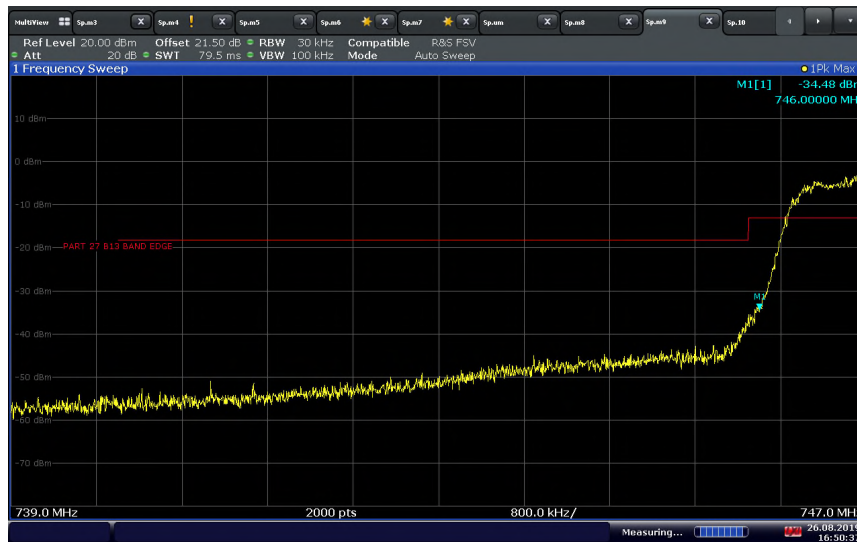
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### LTE Band 12 Uplink 10MHz Bandwidth High Channel Band Edge



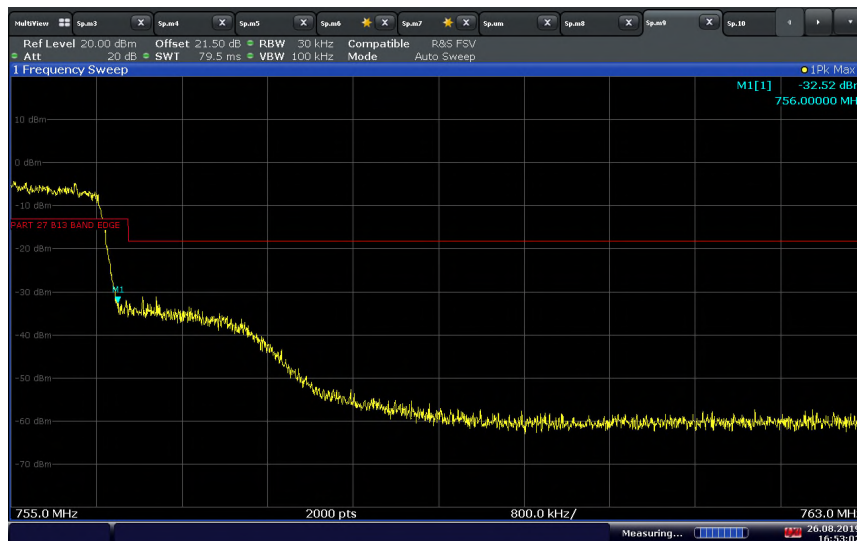
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### LTE Band 13 Downlink 5MHz Bandwidth Low Channel Band Edge



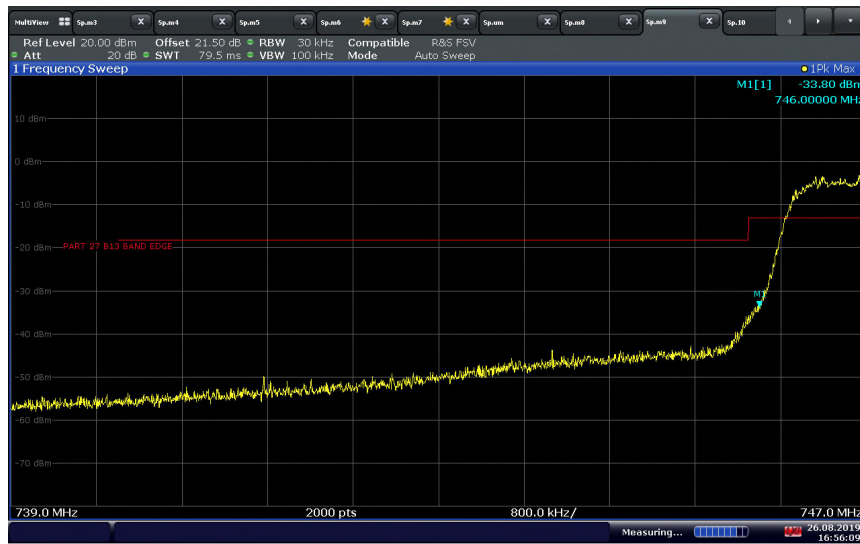
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### LTE Band 13 Downlink 5MHz Bandwidth High Channel Band Edge



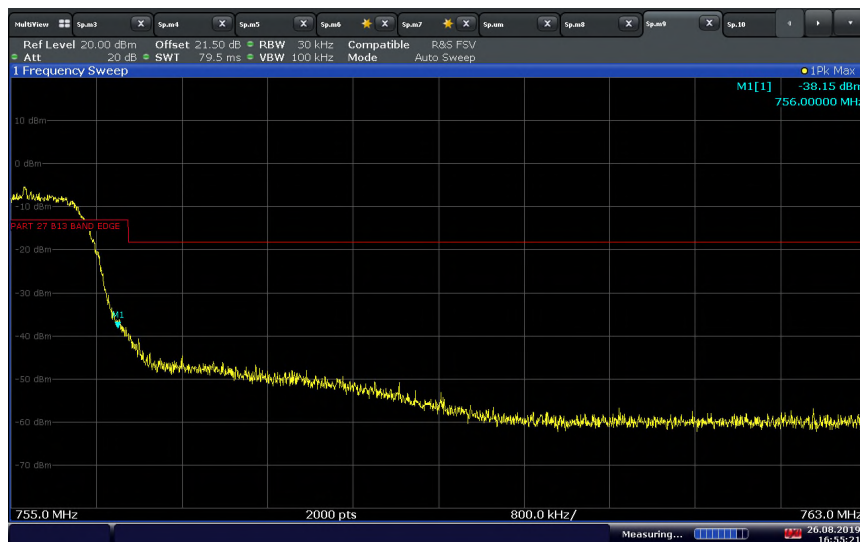
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### LTE Band 13 Downlink 10MHz Bandwidth Middle Channel Low Band Edge



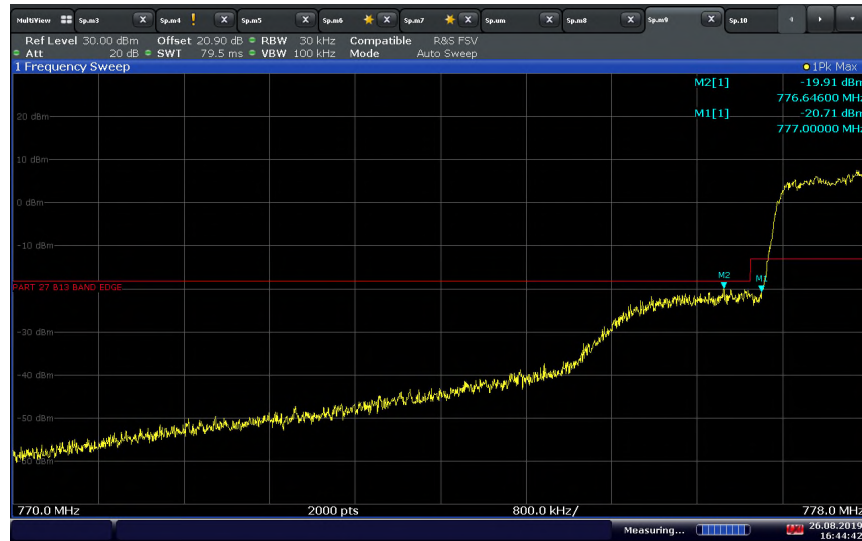
16:56:09 26.08.2019

### LTE Band 13 Downlink 10MHz Bandwidth Middle Channel High Band Edge



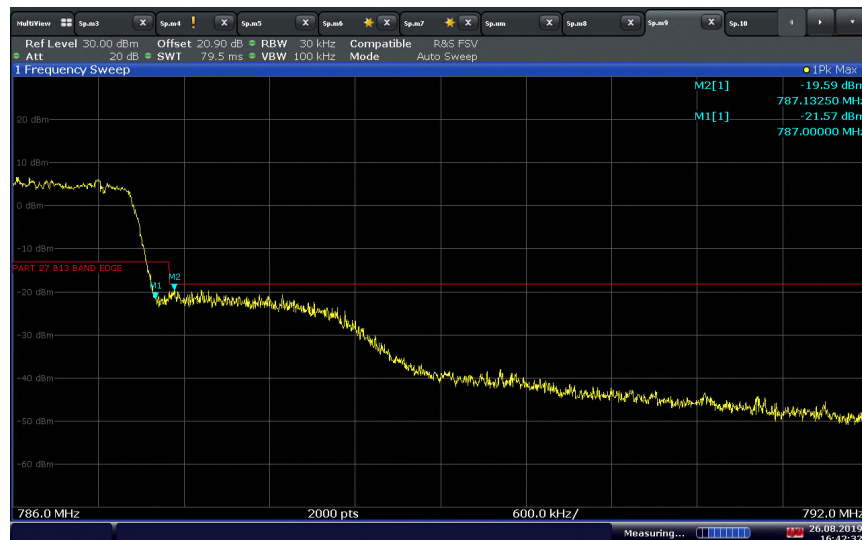
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### LTE Band 13 Uplink 5MHz Bandwidth Low Channel Band Edge



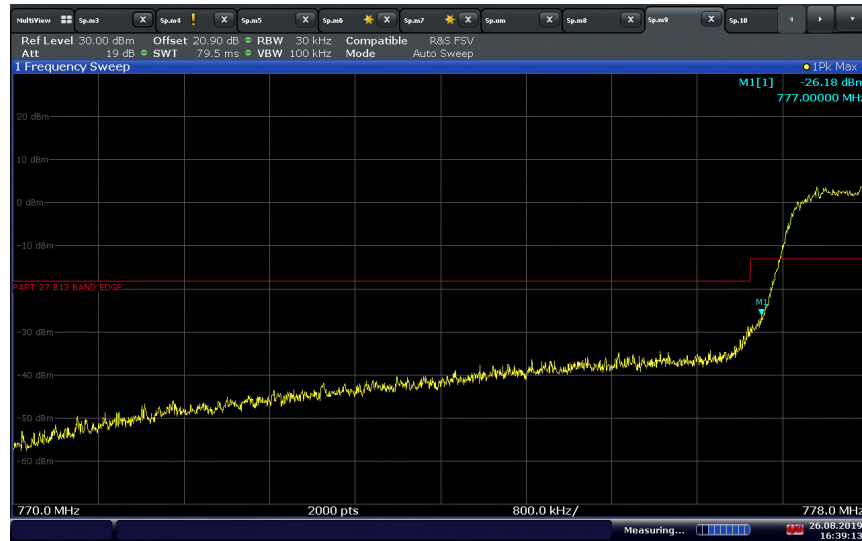
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### LTE Band 13 Uplink 5MHz Bandwidth High Channel Band Edge



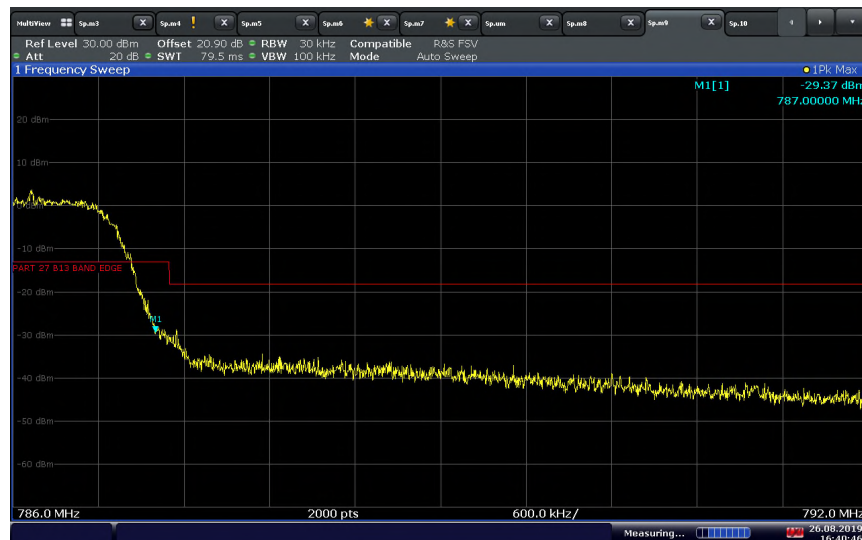
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### LTE Band 13 Uplink 10MHz Bandwidth Middle Channel Low Band Edge



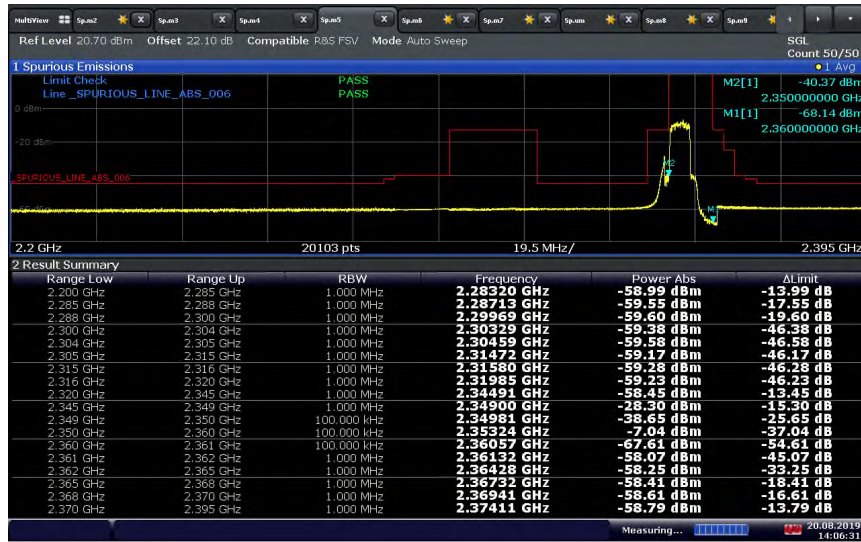
16:39:13 26.08.2019

### LTE Band 13 Uplink 10MHz Bandwidth Middle Channel High Band Edge



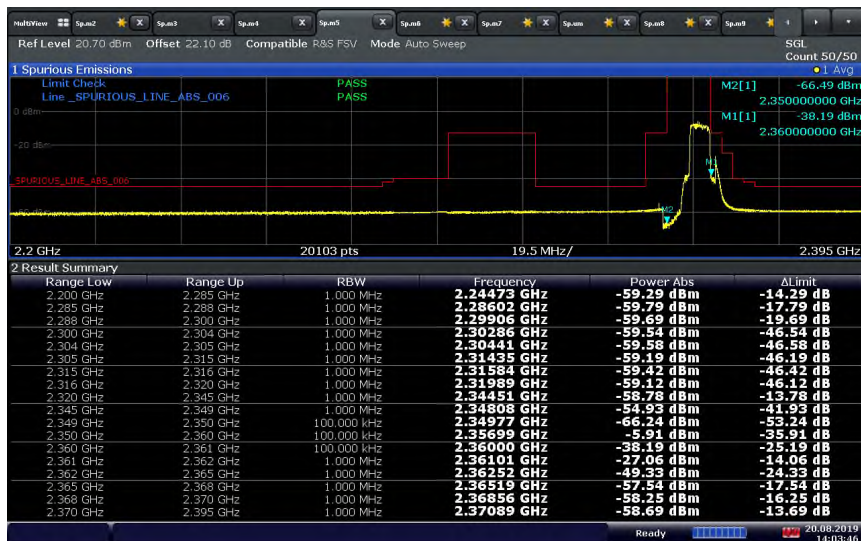
16:40:46 26.08.2019

### LTE Band 30 Downlink 5MHz Bandwidth Low Channel Band Edge



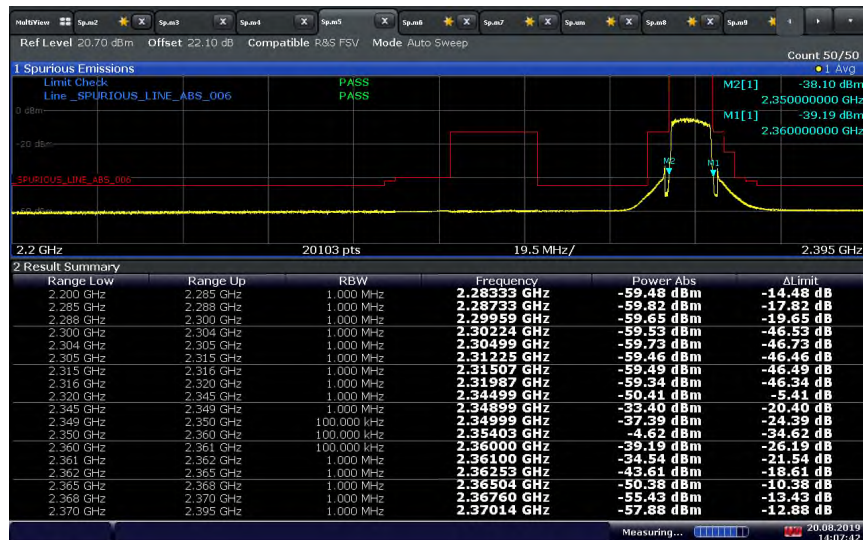
14:06:32 20.08.2019

### LTE Band 30 Downlink 5MHz Bandwidth High Channel Band Edge



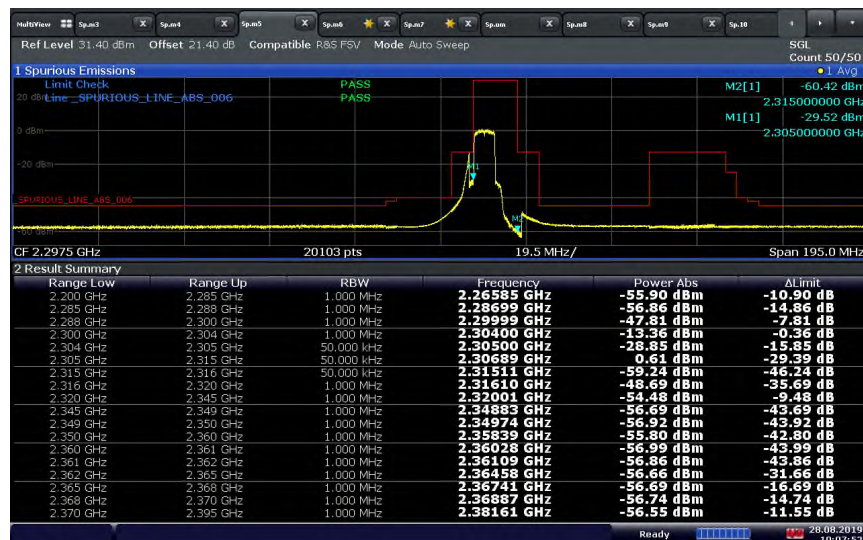
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### LTE Band 30 Downlink 10MHz Bandwidth Middle Channel Low and High Band Edge



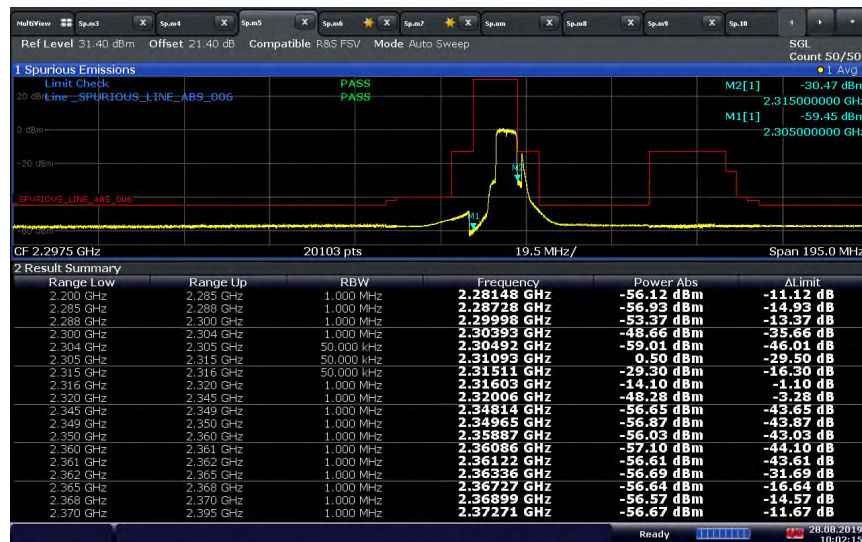
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### LTE Band 30 Uplink 5MHz Bandwidth Low Channel Band Edge



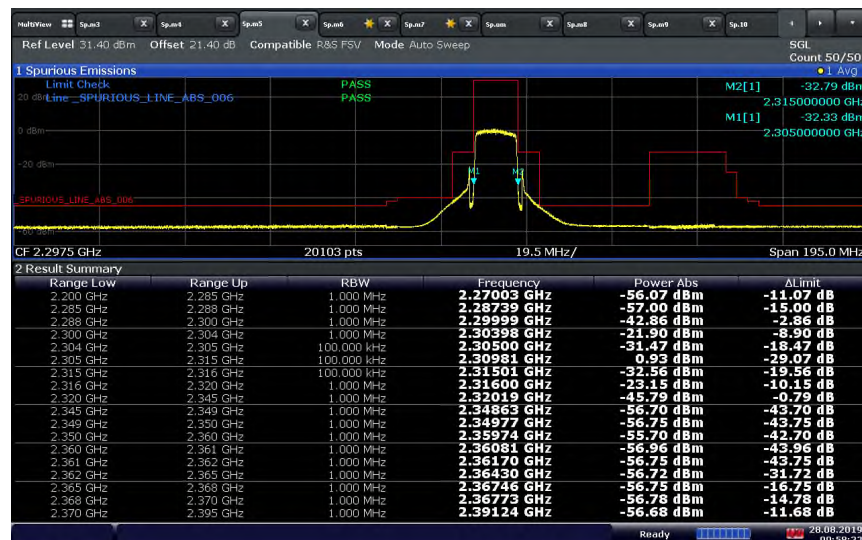
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### LTE Band 30 Uplink 5MHz Bandwidth High Channel Band Edge



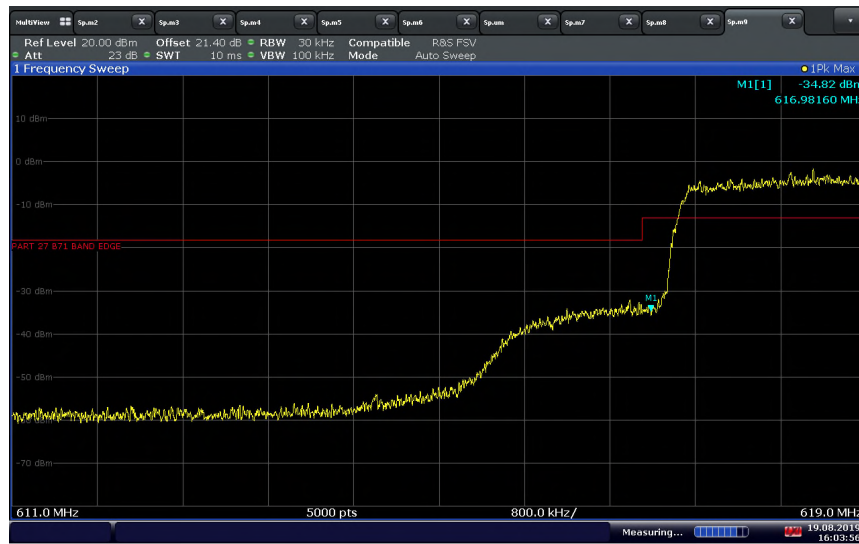
10:02:15 28.08.2019

### LTE Band 30 Uplink 10MHz Bandwidth Middle Channel Low and High Band Edge



09:58:23 28.08.2019

### LTE Band 71 Downlink 5MHz Bandwidth Low Channel Band Edge



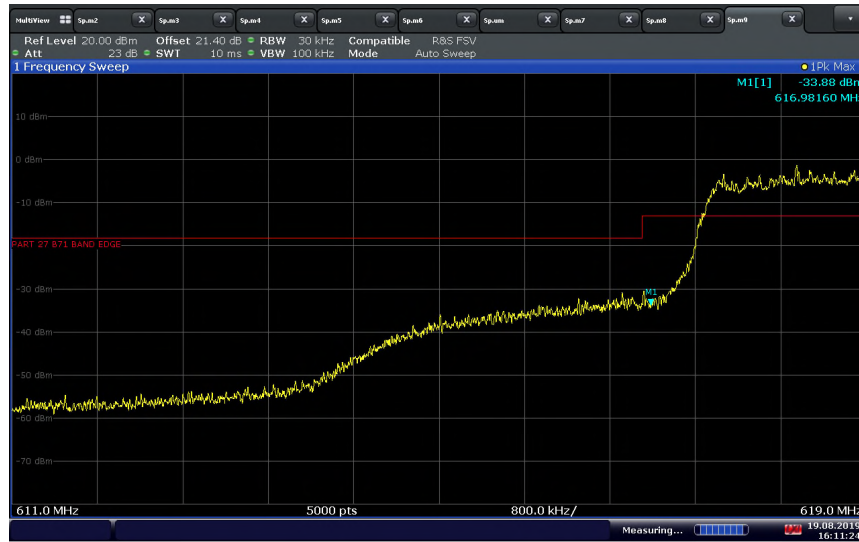
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### LTE Band 71 Downlink 5MHz Bandwidth High Channel Band Edge



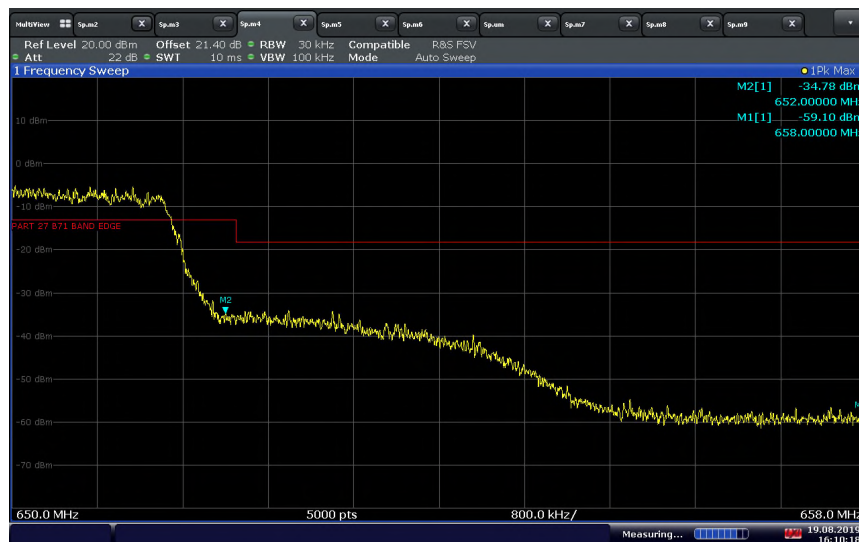
16:07:49 19.08.2019

### LTE Band 71 Downlink 10MHz Bandwidth Low Channel Band Edge



16:11:25 19.08.2019

### LTE Band 71 Downlink 10MHz Bandwidth High Channel Band Edge



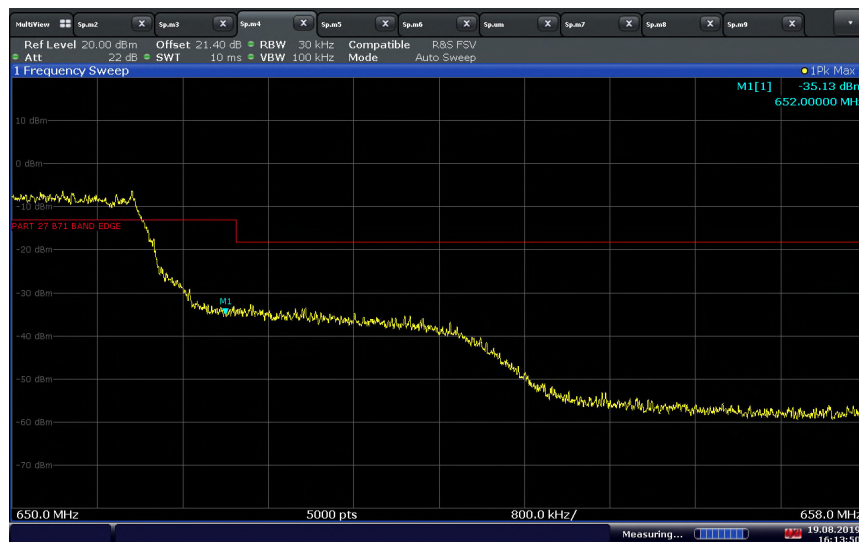
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### LTE Band 71 Downlink 15MHz Bandwidth Low Channel Band Edge



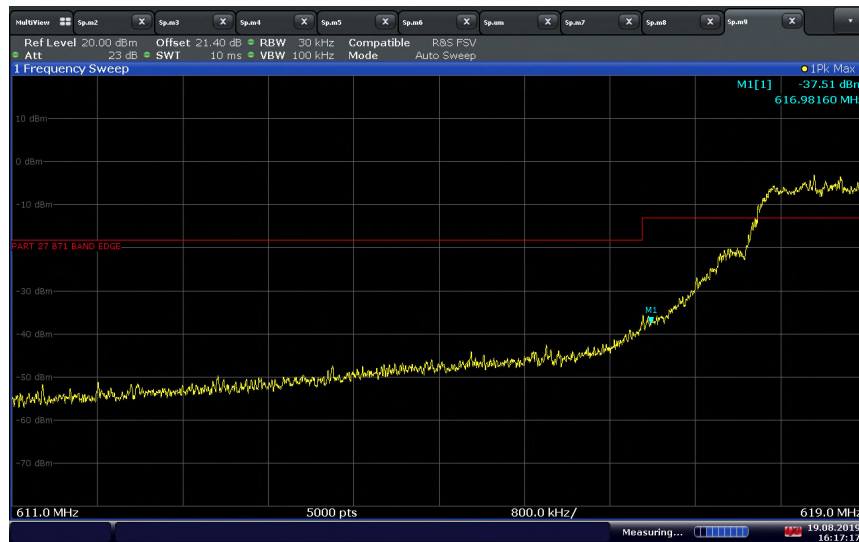
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### LTE Band 71 Downlink 15MHz Bandwidth High Channel Band Edge



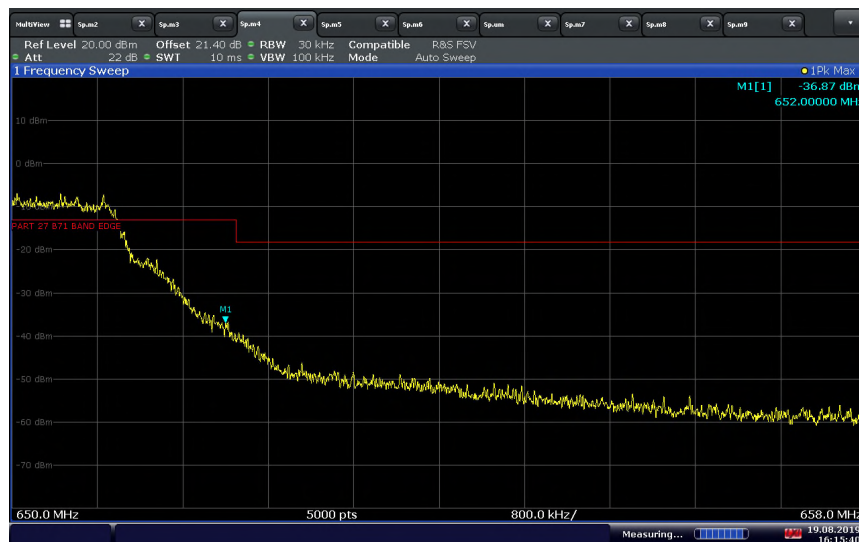
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### LTE Band 71 Downlink 20MHz Bandwidth Low Channel Band Edge



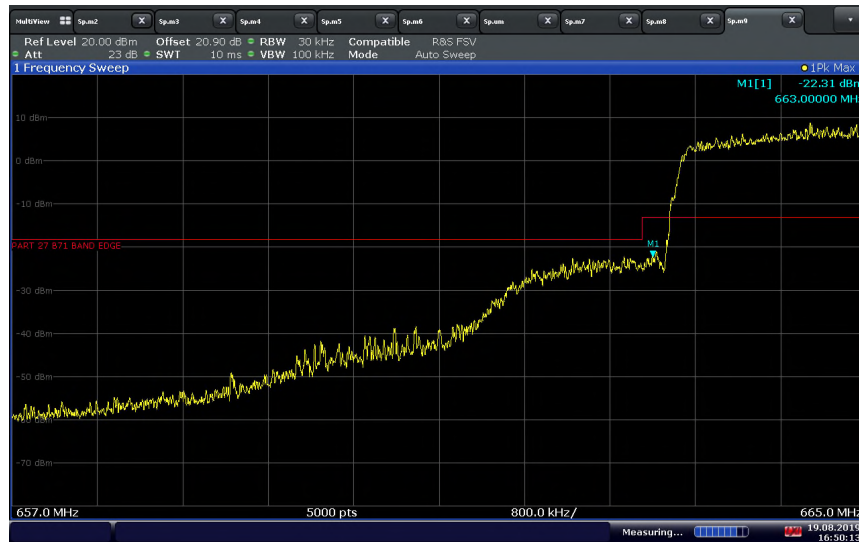
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### LTE Band 71 Downlink 20MHz Bandwidth High Channel Band Edge



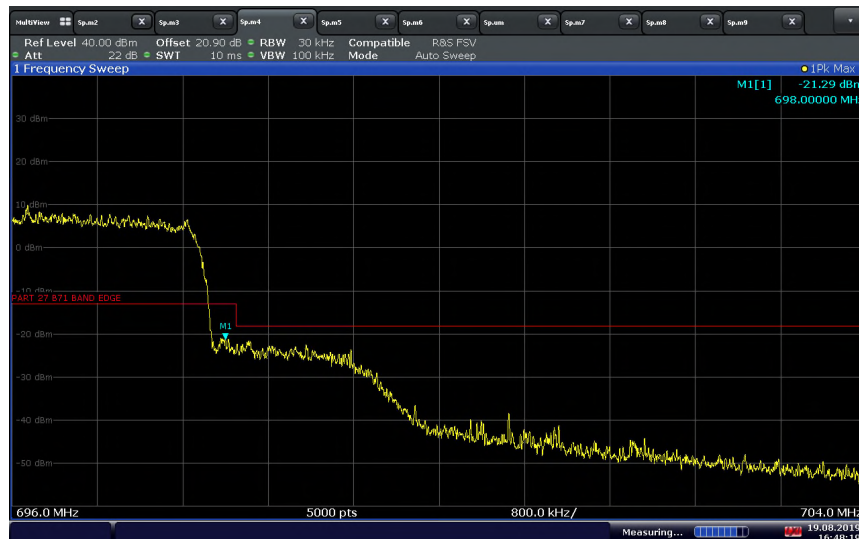
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### LTE Band 71 Uplink 5MHz Bandwidth Low Channel Band Edge



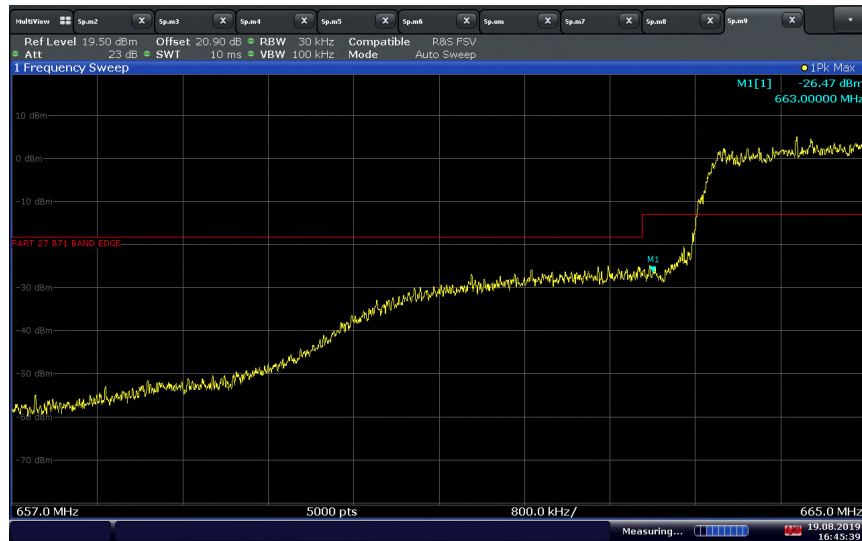
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### LTE Band 71 Uplink 5MHz Bandwidth High Channel Band Edge



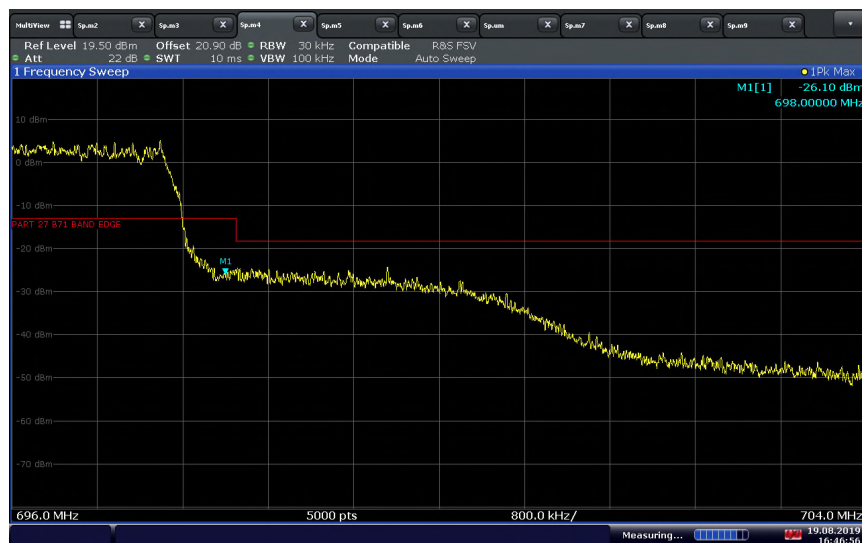
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### LTE Band 71 Uplink 10MHz Bandwidth Low Channel Band Edge



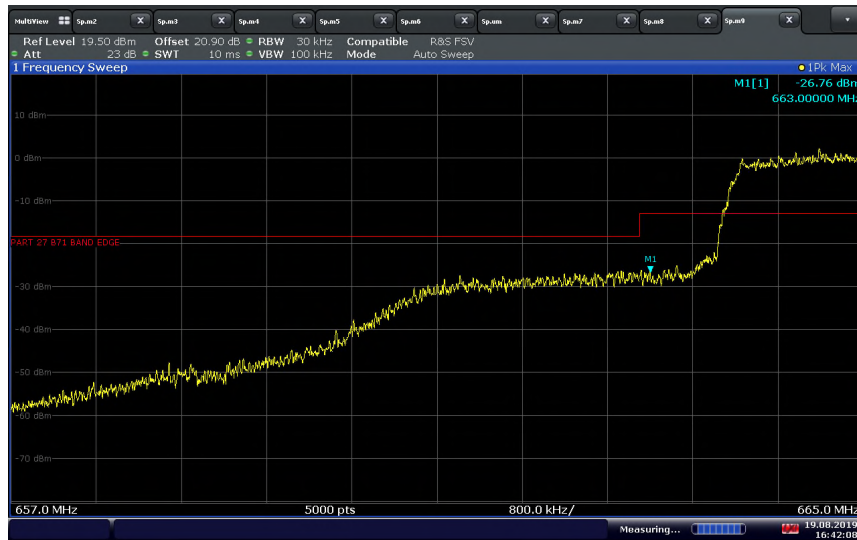
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### LTE Band 71 Uplink 10MHz Bandwidth High Channel Band Edge

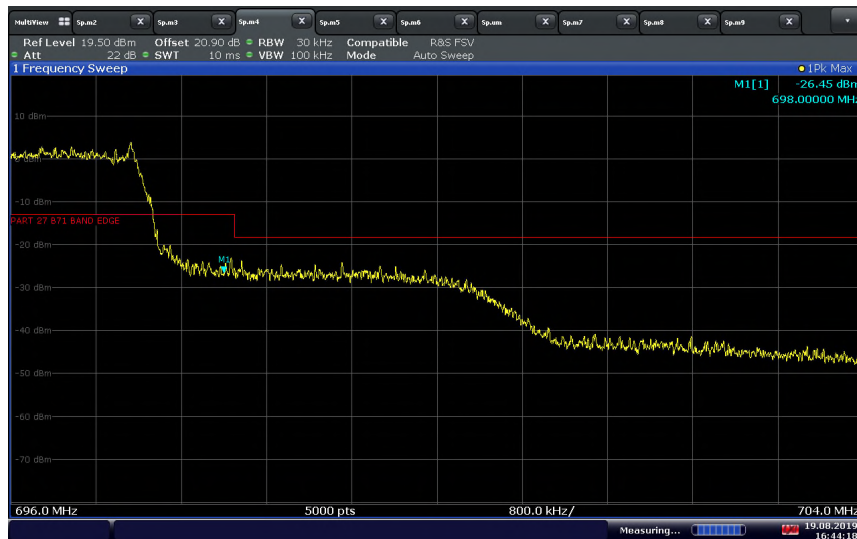


16:46:56 19.08.2019

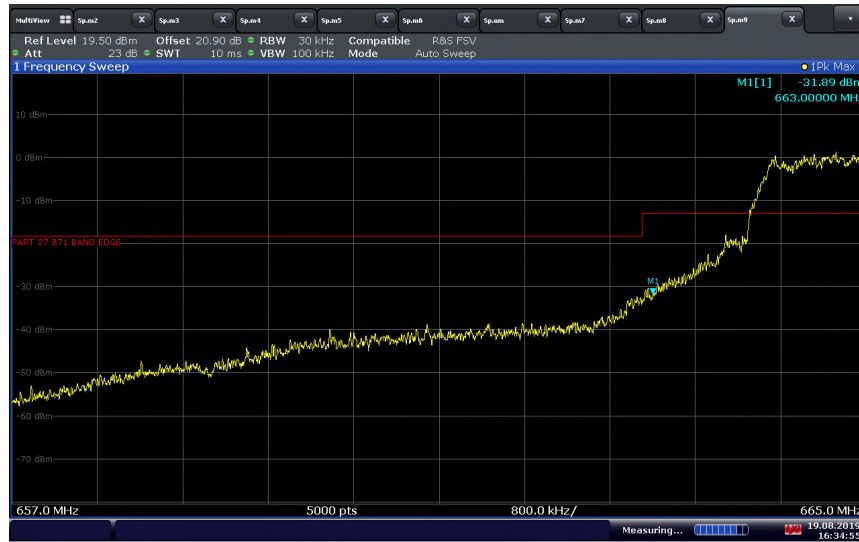
### LTE Band 71 Uplink 15MHz Bandwidth Low Channel Band Edge



### LTE Band 71 Uplink 15MHz Bandwidth High Channel Band Edge

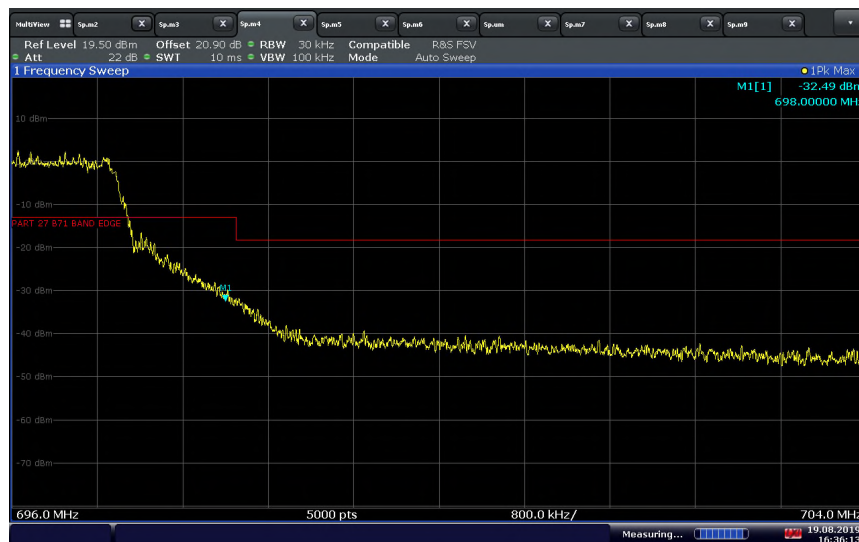


### LTE Band 71 Uplink 20MHz Bandwidth Low Channel Band Edge



16:34:56 19.08.2019

### LTE Band 71 Uplink 20MHz Bandwidth High Channel Band Edge



16:36:14 19.08.2019



## **2.7 CONDUCTED SPURIOUS EMISSIONS**

### **2.7.1 Specification Reference**

FCC 47 CFR Part 2, Clause 2.1051  
FCC 47 CFR Part 27, Clause 27.53(h)(1)(3)  
FCC 47 CFR Part 27, Clause 27.53(g)  
FCC 47 CFR Part 27, Clause 27.53(c)(1)(2)(3)(5)(6)(f)  
FCC 47 CFR Part 27, Clause 27.53(a)(1)  
RSS-139, Clause 6.6  
RSS-130, Clause 4.7  
RSS-195, Clause 5.6.1

### **2.7.2 Standard Applicable**

FCC 47 CFR Part 27, Clause 27.53:

(h) AWS emission limits – (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB.

(g) For operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $76 + 10 \log(P)$  dB in a 6.25 kHz band segment, for base and fixed stations;

(f) For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(a) For operations in the 2305–2320 MHz band and the 2345–2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

- (1) For base and fixed stations' operations in the 2305–2320 MHz band and the 2345–2360 MHz band:
- (i) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than  $75 + 10 \log(P)$  dB on all frequencies between 2320 and 2345 MHz;
  - (ii) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2300 and 2305 MHz,  $70 + 10 \log(P)$  dB on all frequencies between 2287.5 and 2300 MHz,  $72 + 10 \log(P)$  dB on all frequencies between 2285 and 2287.5 MHz, and  $75 + 10 \log(P)$  dB below 2285 MHz;
  - (iii) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2360 and 2362.5 MHz,  $55 + 10 \log(P)$  dB on all frequencies between 2362.5 and 2365 MHz,  $70 + 10 \log(P)$  dB on all frequencies between 2365 and 2367.5 MHz,  $72 + 10 \log(P)$  dB on all frequencies between 2367.5 and 2370 MHz, and  $75 + 10 \log(P)$  dB above 2370 MHz.

RSS-139, Clause 6.6:

- (i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power  $P$  (dBW), by at least  $43 + 10 \log_{10} p$  (watts) dB.

RSS-130:

#### 4.7.1 General unwanted emissions limits

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $43 + 10 \log_{10} p$  (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

#### 4.7.2 Additional unwanted emissions limits

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

- a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least:
  - (i)  $76 + 10 \log_{10} p$  (watts), dB, for base and fixed equipment, and
  - (ii)  $65 + 10 \log_{10} p$  (watts), dB, for mobile and portable equipment.
- b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

RSS-195, Clause 5.6.1:

The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power,  $P$ (dBW), by the amount indicated in Table 1 and graphically represented in Figure 1, where  $p$  is the transmitter output power measured in watts.

**Table 1 — Unwanted Emissions for Base Station, Fixed Station and High-Power Fixed Subscriber Equipment**

| Frequency (MHz) | Attenuation (dB)                       |
|-----------------|----------------------------------------|
| <2200           | $43 + 10 \log_{10}(p)$                 |
| 2200 - 2285     | $75 + 10 \log_{10}(p)$                 |
| 2285 - 2287.5   | $72 + 10 \log_{10}(p)$                 |
| 2287.5 - 2300   | $70 + 10 \log_{10}(p)$                 |
| 2300 - 2305     | $43 + 10 \log_{10}(p)$                 |
| 2305 - 2320     | $43 + 10 \log_{10}(p)$ <sup>Note</sup> |
| 2320 - 2345     | $75 + 10 \log_{10}(p)$                 |
| 2345 - 2360     | $43 + 10 \log_{10}(p)$ <sup>Note</sup> |
| 2360 - 2362.5   | $43 + 10 \log_{10}(p)$                 |
| 2362.5 - 2365   | $55 + 10 \log_{10}(p)$                 |
| 2365 - 2367.5   | $70 + 10 \log_{10}(p)$                 |
| 2367.5 - 2370   | $72 + 10 \log_{10}(p)$                 |
| 2370 - 2395     | $75 + 10 \log_{10}(p)$                 |
| >2395           | $43 + 10 \log_{10}(p)$                 |

**Note:** Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 5.2 for the permitted frequency ranges for the various equipment types.

### 2.7.3 Equipment Under Test and Modification State

Serial No: 370920000139 (NU) and 371929000156 (CU) / Test Configuration A and B

### 2.7.4 Date of Test/Initial of test personnel who performed the test

August 09 to 28 and November 21, 2019/XYZ

### 2.7.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.7.6 Environmental Conditions/ Test Location

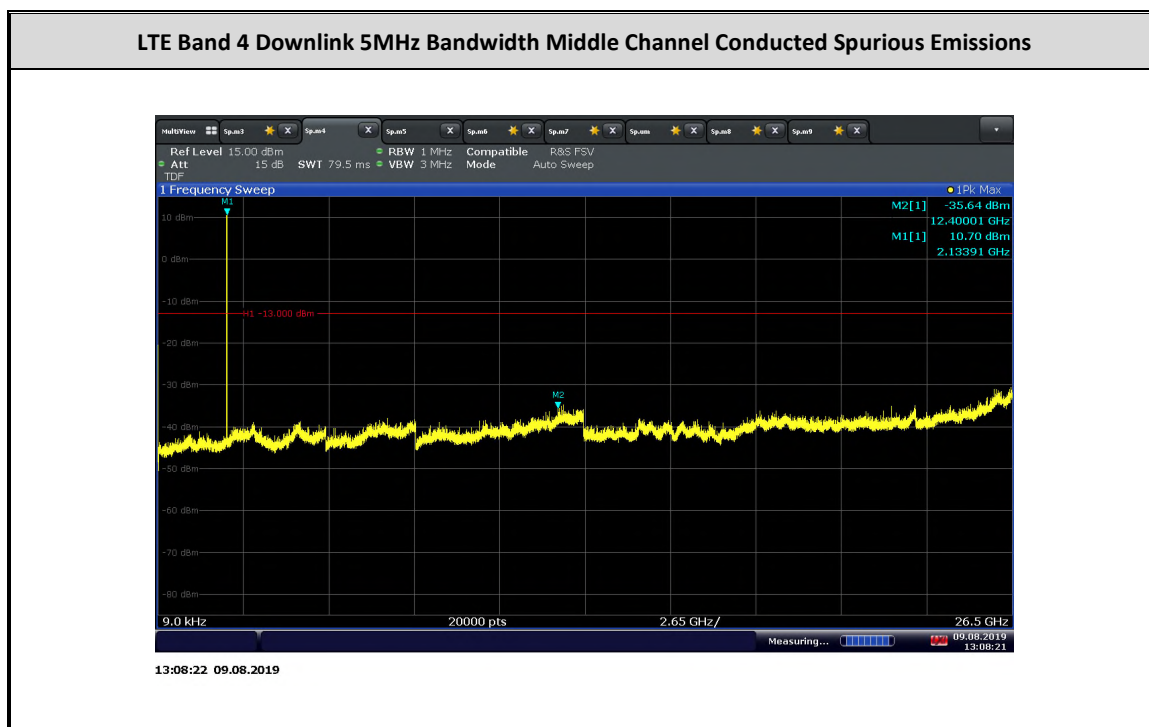
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                |
|---------------------|----------------|
| Ambient Temperature | 23.9 - 26.7°C  |
| Relative Humidity   | 42.3 - 53.3%   |
| ATM Pressure        | 98.7 - 99.0kPa |

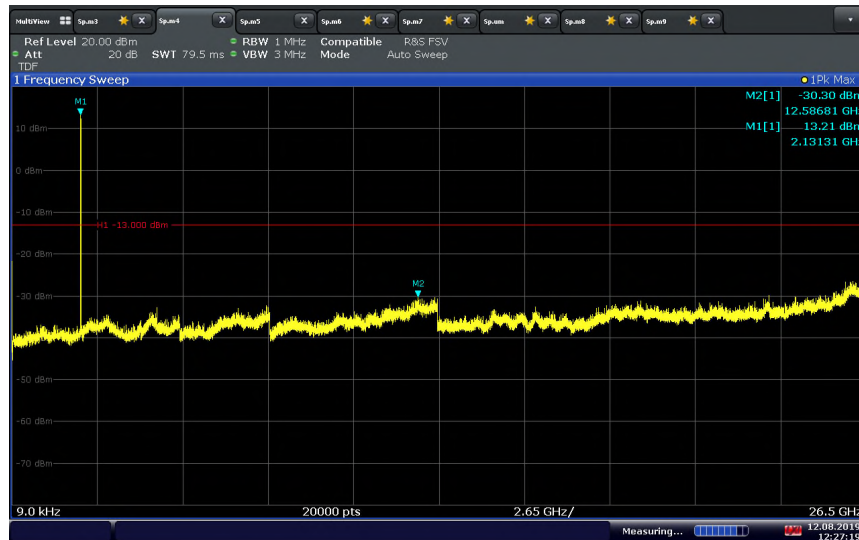
## 2.7.7 Additional Observations

- This is a conducted test. Test guidance is per Section 6.1 of KDB971168 (D01 Power Meas License Digital Systems v03r01).
- The transducer factor (TDF) used is from the external attenuators and cables used.
- Detector is peak and trace is set to max hold as the worst case setting.
- The spectrum was searched from 9 kHz to up to the 10<sup>th</sup> harmonic
- All low, middle and high channels for all bandwidths were verified and only middle channel presented in this test report as representative configuration.

## 2.7.8 Test Results

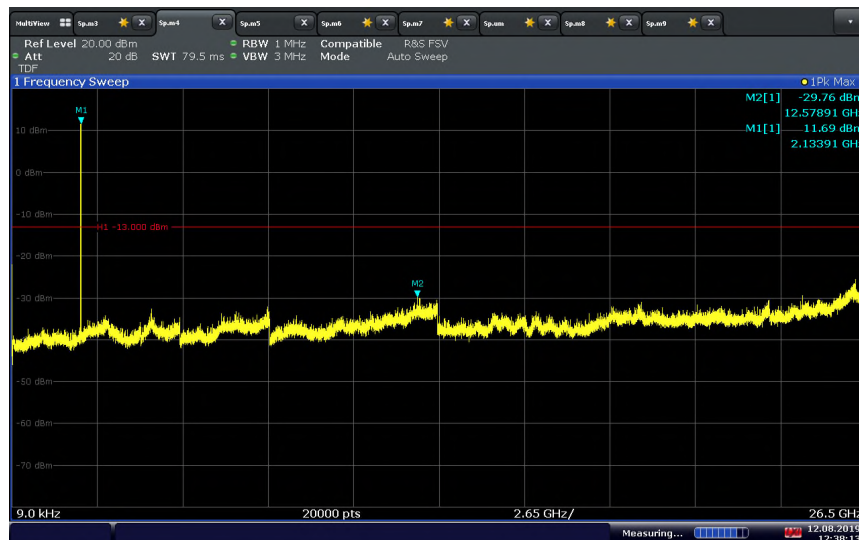


### LTE Band 4 Downlink 10MHz Bandwidth Middle Channel Conducted Spurious Emissions



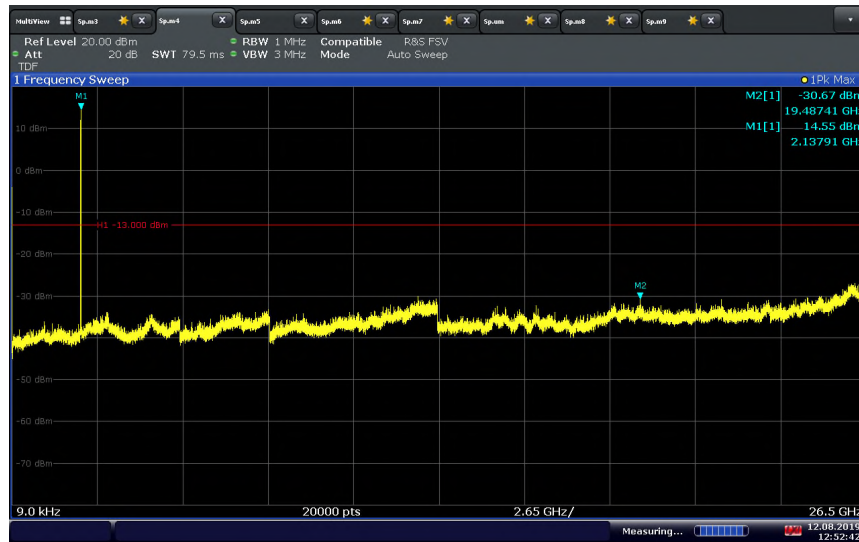
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### LTE Band 4 Downlink 15MHz Bandwidth Middle Channel Conducted Spurious Emissions



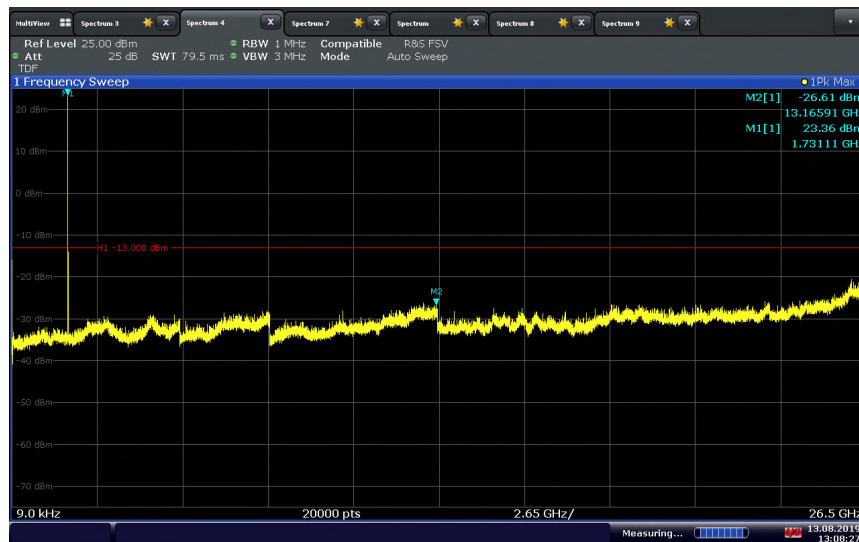
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### LTE Band 4 Downlink 20MHz Bandwidth Middle Channel Conducted Spurious Emissions



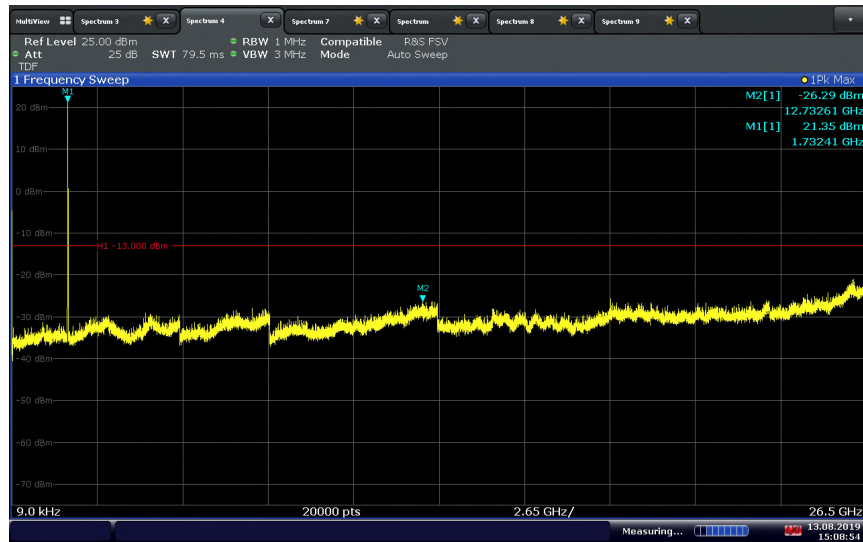
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### LTE Band 4 Uplink 5MHz Bandwidth Middle Channel Conducted Spurious Emissions



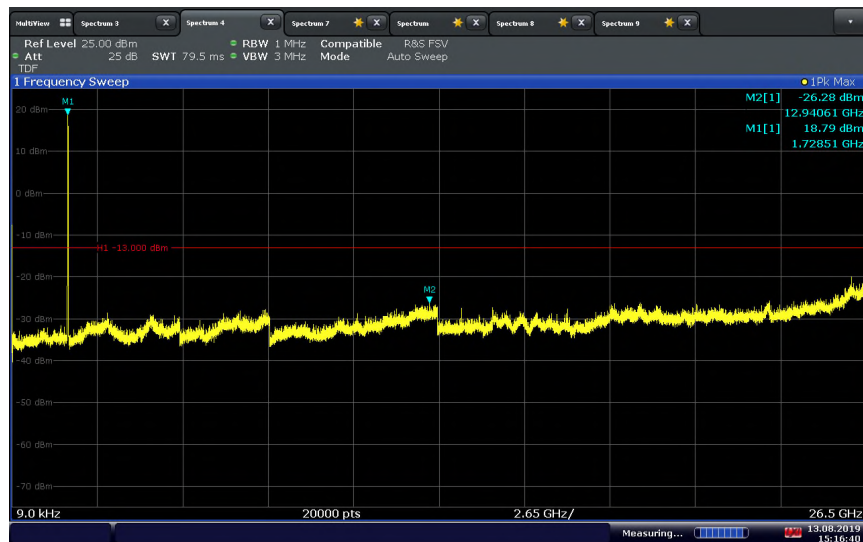
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### LTE Band 4 Uplink 10MHz Bandwidth Middle Channel Conducted Spurious Emissions



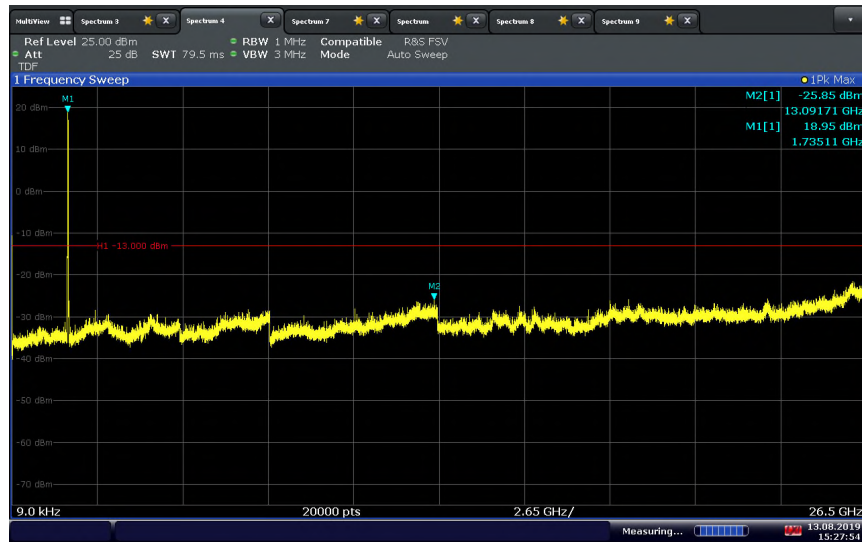
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### LTE Band 4 Uplink 15MHz Bandwidth Middle Channel Conducted Spurious Emissions



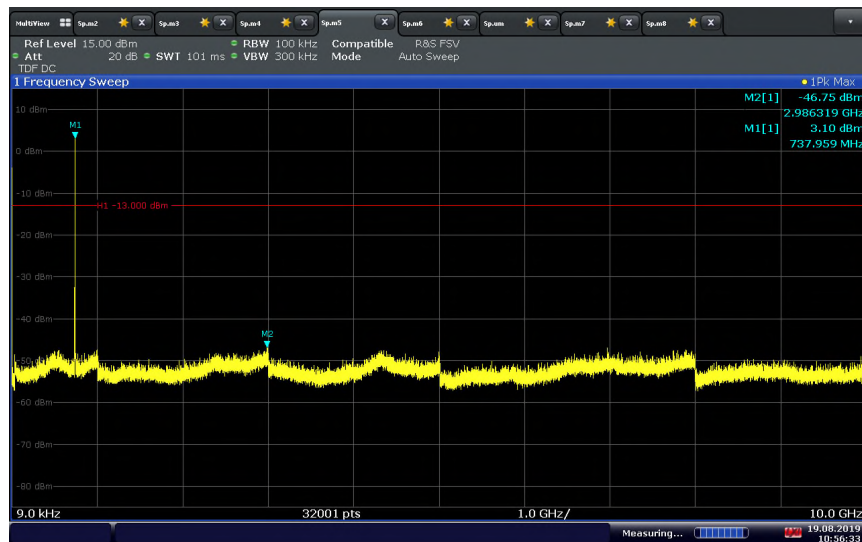
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### LTE Band 4 Uplink 20MHz Bandwidth Middle Channel Conducted Spurious Emissions



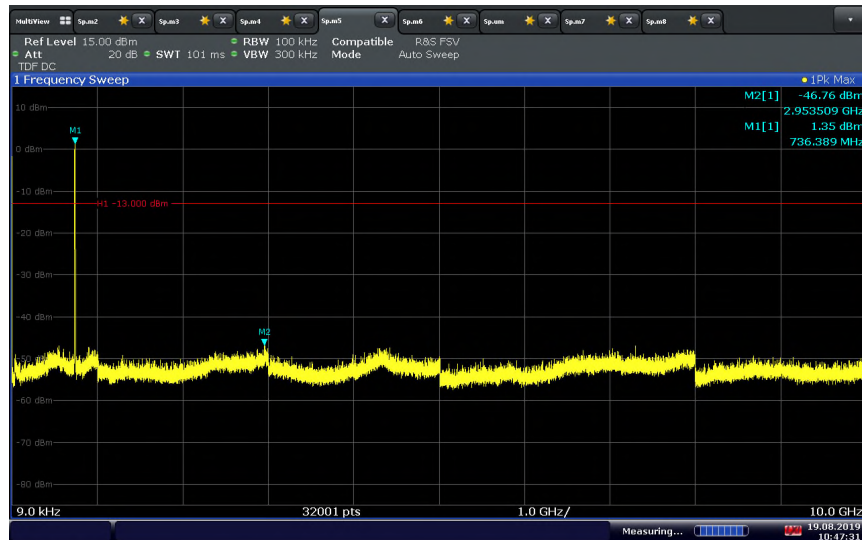
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### LTE Band 12 Downlink 5MHz Bandwidth Middle Channel Conducted Spurious Emissions



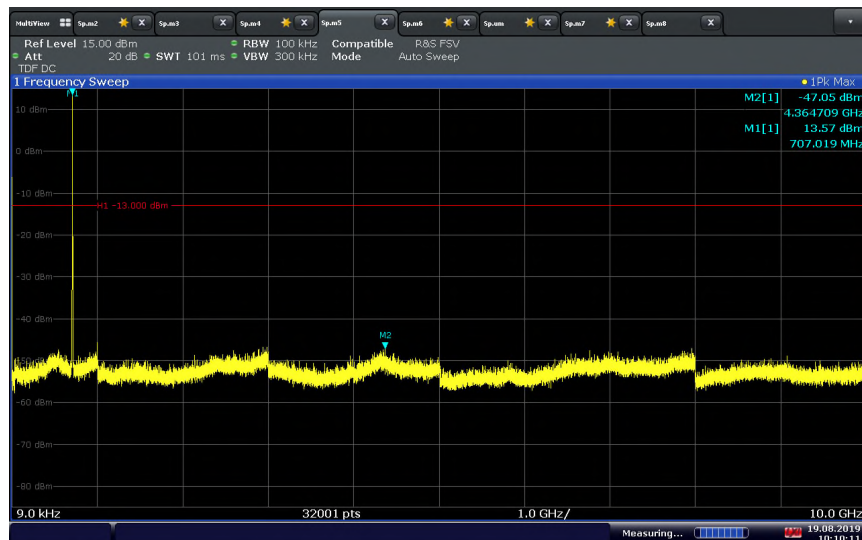
10:56:34 19.08.2019

### LTE Band 12 Downlink 10MHz Bandwidth Middle Channel Conducted Spurious Emissions



10:47:32 19.08.2019

### LTE Band 12 Uplink 5MHz Bandwidth High Channel Conducted Spurious Emissions



10:10:12 19.08.2019