

## **2.9 OSCILLATION DETECTION**

### **2.9.1 Specification Reference**

FCC 47 CFR Part 20. Clause 20.21(e)(9)(ii)(A)  
KDB935210 D04, Clause 7.11

### **2.9.2 Standard Applicable**

FCC 47 CFR Part 20. Clause 20.21(e)(9)(ii)(A) Anti-Oscillation:  
Consumer boosters must be able to detect and mitigate (i.e., by automatic gain reduction or shut down), any oscillations in uplink and downlink bands. Oscillation detection and mitigation must occur automatically within 0.3 seconds in the uplink band and within 1 second in the downlink band. In cases where oscillation is detected, the booster must continue mitigation for at least one minute before restarting. After five such restarts, the booster must not resume operation until manually reset.

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

Serial No: 370920000139 (NU) and 371929000156 (CU) / Test Configuration C and D

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

September 16, 23, 24 and October 31, 2019/XYZ

### **2.9.5 Test Equipment Used**

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

### **2.9.6 Environmental Conditions**

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

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 25.2 - 26.4 °C  |
| Relative Humidity   | 23.3 - 52.4 %   |
| ATM Pressure        | 98.8 - 98.9 kPa |

### **2.9.7 Additional Observations**

- This is conducted Test. Test procedure is per Section 7.11 of KDB935210 (D04 Provider Specific Booster Measurements v02r03). Appropriate offset (line losses) applied.
- The EUT operated in Normal Mode when testing Oscillation Mitigation Time. Setup the EUT according to Figure 10 and 11 of Section 7.11 of KDB935210 for Normal Mode.
- The EUT operated in Test Mode when testing Re-Try event. Setup the EUT according to Figure 12 of Section 7.11 of KDB935210 for Test Mode.
- Evaluations are conducted at CU and NU antenna ports.
- Signal: 5MHz WCDMA or LTE.

## 2.9.8 Test Results Summary

| Band                  | Signal Path       | Frequency (MHz) | Mitigation Time (Sec) | Limit (Sec) | Margin (Sec) |
|-----------------------|-------------------|-----------------|-----------------------|-------------|--------------|
| WCDMA Band 5 Downlink | CU with NU Port A | 881.6           | 0.043                 | 1           | 0.957        |
| WCDMA Band 5 Uplink   | NU Port A         | 836.6           | 0.033                 | 0.3         | 0.267        |
| LTE Band 4 Downlink   | CU with NU Port A | 2132.5          | 0.040                 | 1           | 0.960        |
| LTE Band 4 Uplink     | NU Port A         | 1732.5          | 0.035                 | 0.3         | 0.265        |
| LTE Band 4 Downlink   | CU with NU Port B | 2132.5          | 0.035                 | 1           | 0.965        |
| LTE Band 4 Uplink     | NU Port B         | 1732.5          | 0.028                 | 0.3         | 0.272        |
| LTE Band 4 Downlink   | CU with NU Port C | 2132.5          | 0.023                 | 1           | 0.977        |
| LTE Band 4 Uplink     | NU Port C         | 1732.5          | 0.025                 | 0.3         | 0.275        |
| LTE Band 5 Downlink   | CU with NU Port D | 881.5           | 0.066                 | 1           | 0.934        |
| LTE Band 5 Uplink     | NU Port D         | 836.5           | 0.035                 | 0.3         | 0.265        |
| LTE Band 12 Downlink  | CU with NU Port A | 737.5           | 0.025                 | 1           | 0.975        |
| LTE Band 12 Uplink    | NU Port A         | 707.5           | 0.025                 | 0.3         | 0.275        |
| LTE Band 12 Downlink  | CU with NU Port B | 737.5           | 0.040                 | 1           | 0.960        |
| LTE Band 12 Uplink    | NU Port B         | 707.5           | 0.023                 | 0.3         | 0.277        |
| LTE Band 13 Downlink  | CU with NU Port C | 751.0           | 0.028                 | 1           | 0.972        |
| LTE Band 13 Uplink    | NU Port C         | 782.0           | 0.028                 | 0.3         | 0.272        |
| LTE Band 25 Downlink  | CU with NU Port A | 1962.5          | 0.038                 | 1           | 0.962        |
| LTE Band 25 Uplink    | NU Port A         | 1882.5          | 0.033                 | 0.3         | 0.267        |
| LTE Band 25 Downlink  | CU with NU Port B | 1962.5          | 0.028                 | 1           | 0.972        |
| LTE Band 25 Uplink    | NU Port B         | 1882.5          | 0.040                 | 0.3         | 0.260        |
| LTE Band 25 Downlink  | CU with NU Port C | 1962.5          | 0.030                 | 1           | 0.970        |
| LTE Band 25 Uplink    | NU Port C         | 1882.5          | 0.020                 | 0.3         | 0.280        |
| LTE Band 25 Downlink  | CU with NU Port D | 1962.5          | 0.020                 | 1           | 0.980        |
| LTE Band 25 Uplink    | NU Port D         | 1882.5          | 0.022                 | 0.3         | 0.288        |
| LTE Band 30 Downlink  | CU with NU Port A | 2355.0          | 0.038                 | 1           | 0.962        |
| LTE Band 30 Uplink    | NU Port A         | 2310.0          | 0.033                 | 0.3         | 0.267        |
| LTE Band 71 Downlink  | CU with NU Port B | 634.5           | 0.028                 | 1           | 0.972        |
| LTE Band 71 Uplink    | NU Port B         | 680.5           | 0.023                 | 0.3         | 0.277        |



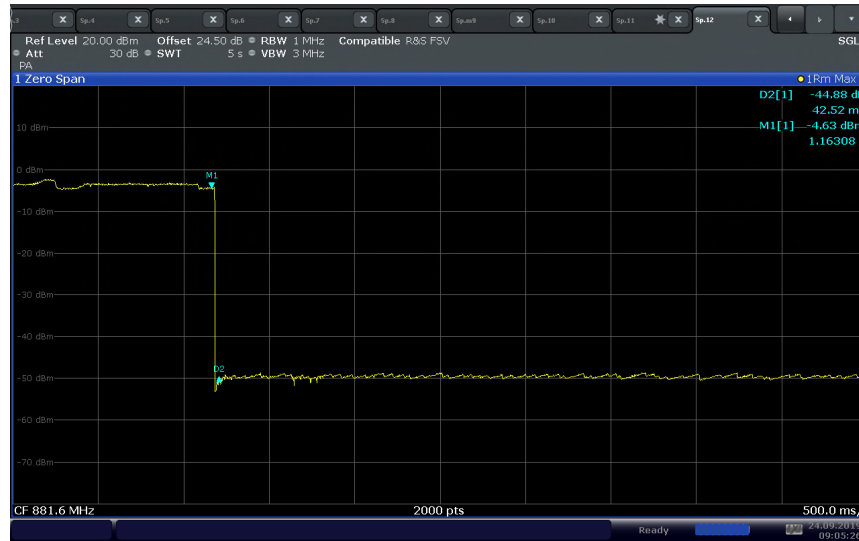
| Band                  | Signal Path       | Frequency (MHz) | Re-Try Event | Limit Event | Margin (dB) |
|-----------------------|-------------------|-----------------|--------------|-------------|-------------|
| WCDMA Band 5 Downlink | CU with NU Port A | 881.6           | 0            | 5           | 5           |
| WCDMA Band 5 Uplink   | NU Port A         | 836.6           | 0            | 5           | 5           |
| LTE Band 4 Downlink   | CU with NU Port A | 2132.5          | 0            | 5           | 5           |
| LTE Band 4 Uplink     | NU Port A         | 1732.5          | 0            | 5           | 5           |
| LTE Band 4 Downlink   | CU with NU Port B | 2132.5          | 0            | 5           | 5           |
| LTE Band 4 Uplink     | NU Port B         | 1732.5          | 0            | 5           | 5           |
| LTE Band 4 Downlink   | CU with NU Port C | 2132.5          | 0            | 5           | 5           |
| LTE Band 4 Uplink     | NU Port C         | 1732.5          | 0            | 5           | 5           |
| LTE Band 5 Downlink   | CU with NU Port D | 881.6           | 0            | 5           | 5           |
| LTE Band 5 Uplink     | NU Port D         | 836.6           | 0            | 5           | 5           |
| LTE Band 12 Downlink  | CU with NU Port A | 737.5           | 0            | 5           | 5           |
| LTE Band 12 Uplink    | NU Port A         | 707.5           | 0            | 5           | 5           |
| LTE Band 12 Downlink  | CU with NU Port B | 737.5           | 0            | 5           | 5           |
| LTE Band 12 Uplink    | NU Port B         | 707.5           | 0            | 5           | 5           |
| LTE Band 13 Downlink  | CU with NU Port B | 751.0           | 0            | 5           | 5           |
| LTE Band 13 Uplink    | NU Port B         | 782.0           | 0            | 5           | 5           |
| LTE Band 25 Downlink  | CU with NU Port A | 1962.5          | 0            | 5           | 5           |
| LTE Band 25 Uplink    | NU Port A         | 1882.5          | 0            | 5           | 5           |
| LTE Band 25 Downlink  | CU with NU Port B | 1962.5          | 0            | 5           | 5           |
| LTE Band 25 Uplink    | NU Port B         | 1882.5          | 0            | 5           | 5           |
| LTE Band 25 Downlink  | CU with NU Port C | 1962.5          | 0            | 5           | 5           |
| LTE Band 25 Uplink    | NU Port C         | 1882.5          | 0            | 5           | 5           |
| LTE Band 25 Downlink  | CU with NU Port D | 1962.5          | 0            | 5           | 5           |
| LTE Band 25 Uplink    | NU Port D         | 1882.5          | 0            | 5           | 5           |
| LTE Band 30 Downlink  | CU with NU Port A | 2355.0          | 0            | 5           | 5           |
| LTE Band 30 Uplink    | NU Port A         | 2310.0          | 0            | 5           | 5           |
| LTE Band 71 Downlink  | CU with NU Port B | 634.5           | 0            | 5           | 5           |
| LTE Band 71 Uplink    | NU Port B         | 680.5           | 0            | 5           | 5           |



| Band                  | Signal Path       | Frequency (MHz) | Level  | Peak Oscillation Level (dBm) | Limit (dBm) |
|-----------------------|-------------------|-----------------|--------|------------------------------|-------------|
| WCDMA Band 5 Downlink | CU with NU Port A | 869.27          | -71.75 | < 2dB                        | 12          |
| WCDMA Band 5 Uplink   | NU Port A         | 826.45          | -72.75 | < 2dB                        | 12          |
| LTE Band 4 Downlink   | CU with NU Port A | 2117.02         | -70.70 | < 2dB                        | 12          |
| LTE Band 4 Uplink     | NU Port A         | 1757.66         | -71.54 | < 2dB                        | 12          |
| LTE Band 4 Downlink   | CU with NU Port B | 2112.91         | -70.49 | < 2dB                        | 12          |
| LTE Band 4 Uplink     | NU Port B         | 1742.56         | -71.21 | < 2dB                        | 12          |
| LTE Band 4 Downlink   | CU with NU Port C | 2145.05         | -70.52 | < 2dB                        | 12          |
| LTE Band 4 Uplink     | NU Port C         | 1711.84         | -71.28 | < 2dB                        | 12          |
| LTE Band 5 Downlink   | CU with NU Port D | 869.27          | -71.75 | < 2dB                        | 12          |
| LTE Band 5 Uplink     | NU Port D         | 826.45          | -72.75 | < 2dB                        | 12          |
| LTE Band 12 Downlink  | CU with NU Port A | 746.38          | -72.05 | < 2dB                        | 12          |
| LTE Band 12 Uplink    | NU Port A         | 715.91          | -71.59 | < 2dB                        | 12          |
| LTE Band 12 Downlink  | CU with NU Port B | 745.08          | -72.21 | < 2dB                        | 12          |
| LTE Band 12 Uplink    | NU Port B         | 702.42          | -72.05 | < 2dB                        | 12          |
| LTE Band 13 Downlink  | CU with NU Port B | 746.02          | -71.98 | < 2dB                        | 12          |
| LTE Band 13 Uplink    | NU Port B         | 776.17          | -72.56 | < 2dB                        | 12          |
| LTE Band 25 Downlink  | CU with NU Port A | 1994.85         | -70.20 | < 2dB                        | 12          |
| LTE Band 25 Uplink    | NU Port A         | 1917.57         | -71.06 | < 2dB                        | 12          |
| LTE Band 25 Downlink  | CU with NU Port B | 1928.89         | -70.78 | < 2dB                        | 12          |
| LTE Band 25 Uplink    | NU Port B         | 1898.27         | -71.41 | < 2dB                        | 12          |
| LTE Band 25 Downlink  | CU with NU Port C | 1932.11         | -71.05 | < 2dB                        | 12          |
| LTE Band 25 Uplink    | NU Port C         | 1914.80         | -71.24 | < 2dB                        | 12          |
| LTE Band 25 Downlink  | CU with NU Port D | 1932.11         | -71.05 | < 2dB                        | 12          |
| LTE Band 25 Uplink    | NU Port D         | 1914.80         | -71.24 | < 2dB                        | 12          |
| LTE Band 30 Downlink  | CU with NU Port A | 2349.17         | -78.14 | < 2dB                        | 12          |
| LTE Band 30 Uplink    | NU Port A         | 2316.0          | -67.01 | < 2dB                        | 12          |
| LTE Band 71 Downlink  | CU with NU Port B | 648.09          | -72.50 | < 2dB                        | 12          |
| LTE Band 71 Uplink    | NU Port B         | 696.53          | -82.53 | < 2dB                        | 12          |

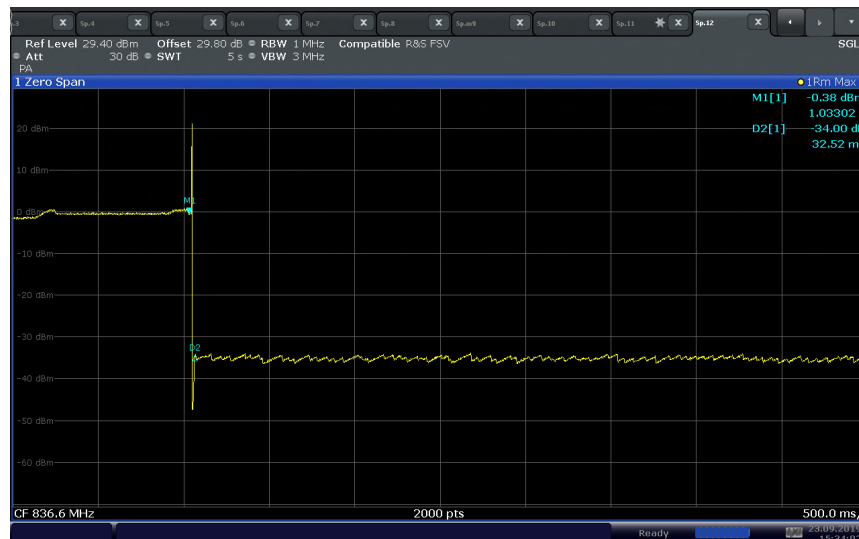
## 2.9.9 Test Plots

### Mitigation Time - WCDMA Band 5 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



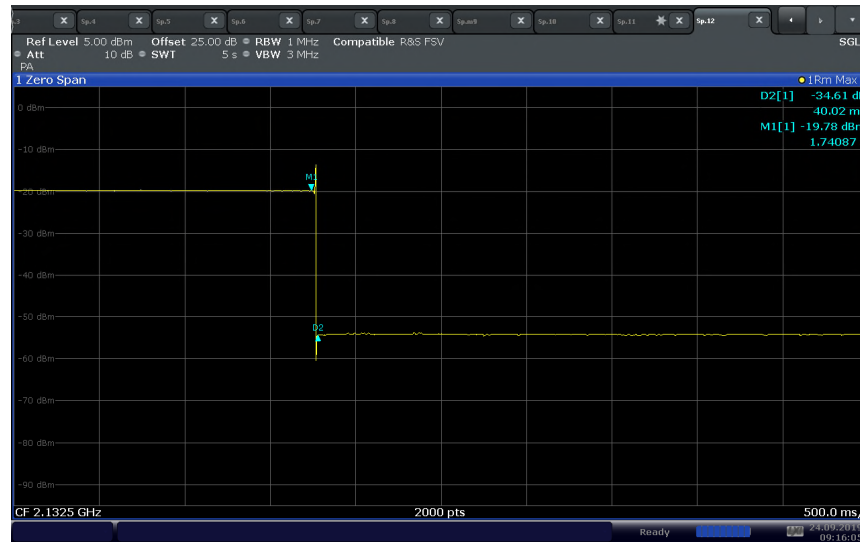
09:05:26 24.09.2019

### Mitigation Time - WCDMA Band 5 Uplink 5MHz Bandwidth Mid Channel - NU Port A



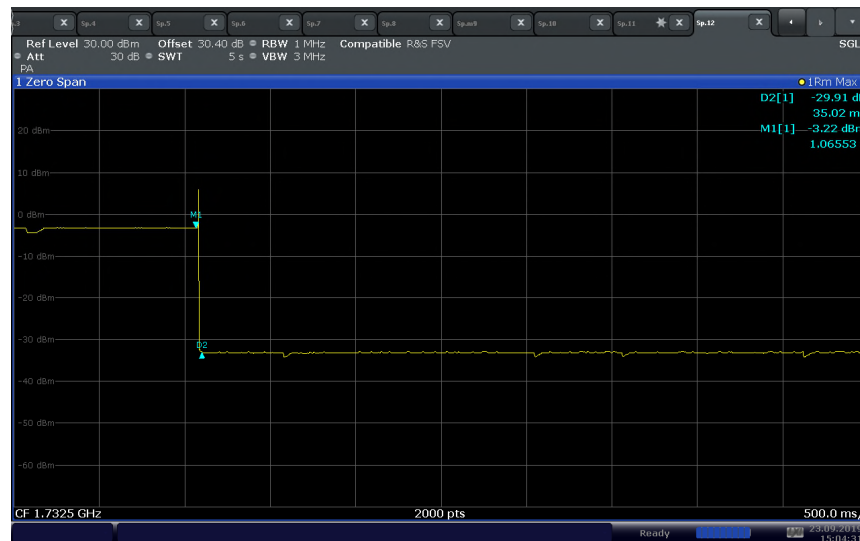
15:34:03 23.09.2019

### Mitigation Time - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



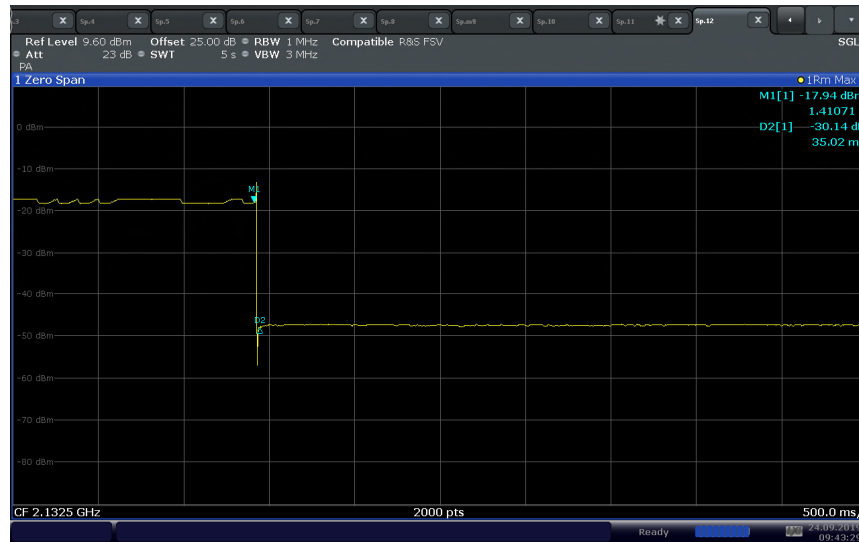
09:16:06 24.09.2019

### Mitigation Time - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel - NU Port A



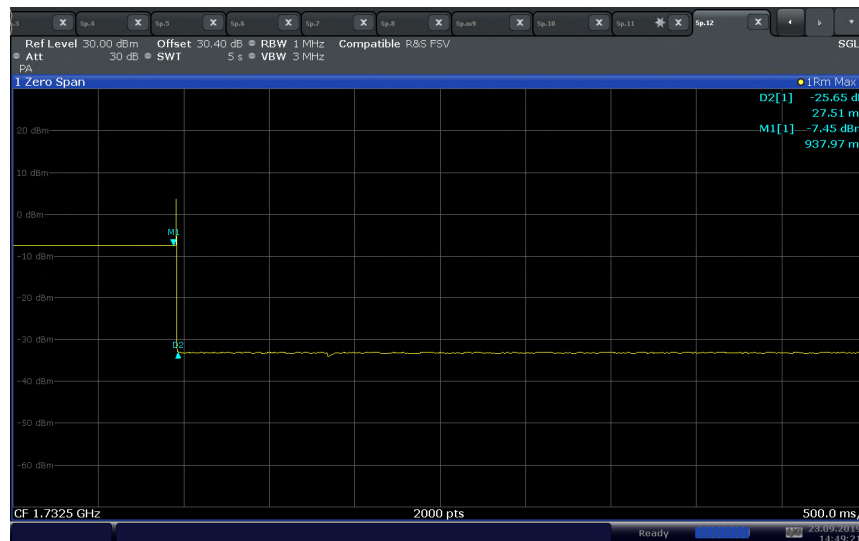
15:04:31 23.09.2019

### Mitigation Time - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



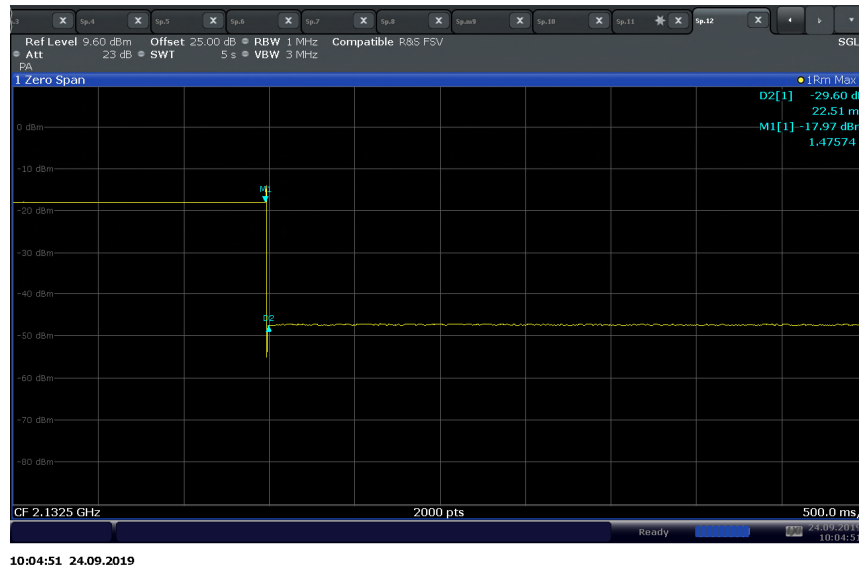
09:43:29 24.09.2019

### Mitigation Time - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel - NU Port B

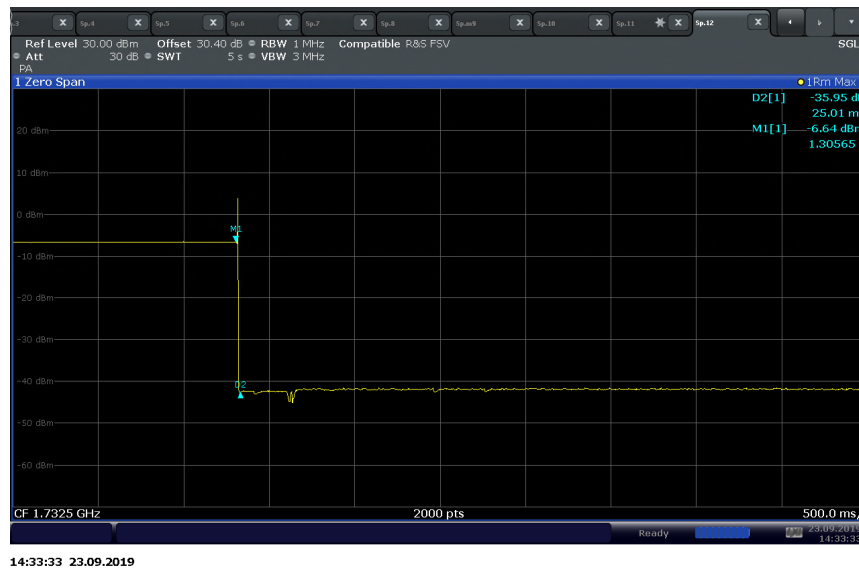


14:49:22 23.09.2019

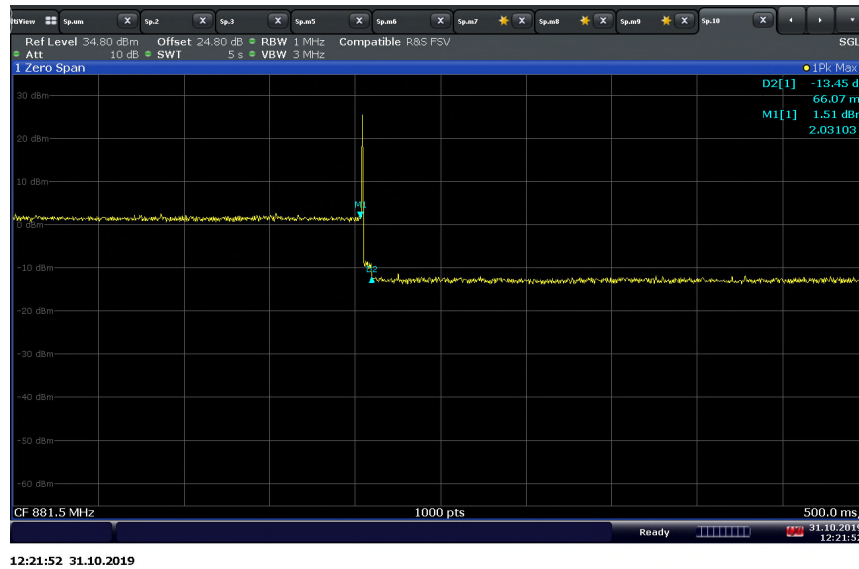
### Mitigation Time - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port C



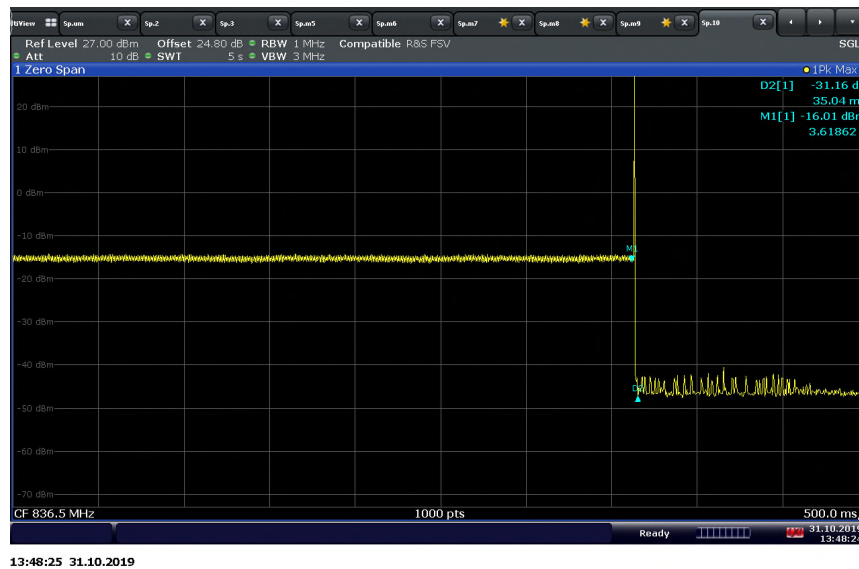
### Mitigation Time - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel - NU Port C



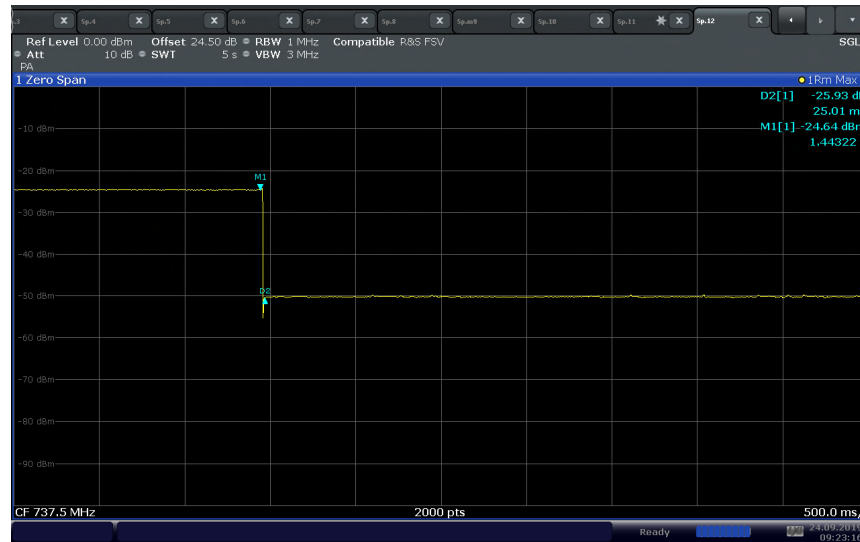
### Mitigation Time - LTE Band 5 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port D



### Mitigation Time - LTE Band 5 Uplink 5MHz Bandwidth Mid Channel - NU Port D



### Mitigation Time - LTE Band 12 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



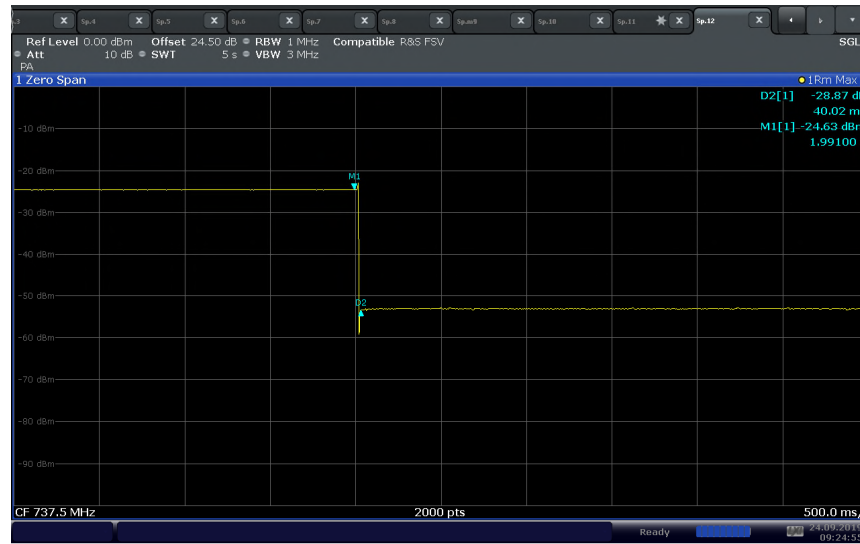
09:23:17 24.09.2019

### Mitigation Time - LTE Band 12 Uplink 5MHz Bandwidth Mid Channel - NU Port A



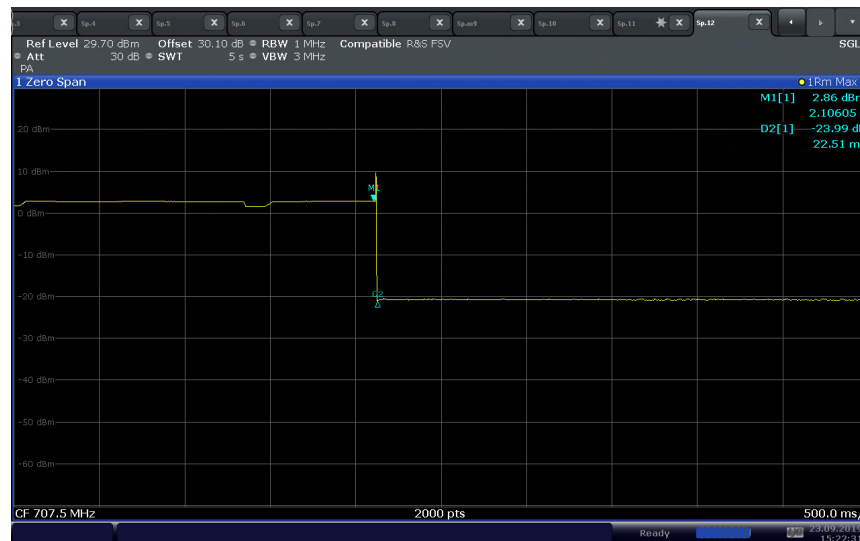
15:19:03 23.09.2019

### Mitigation Time - LTE Band 12 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



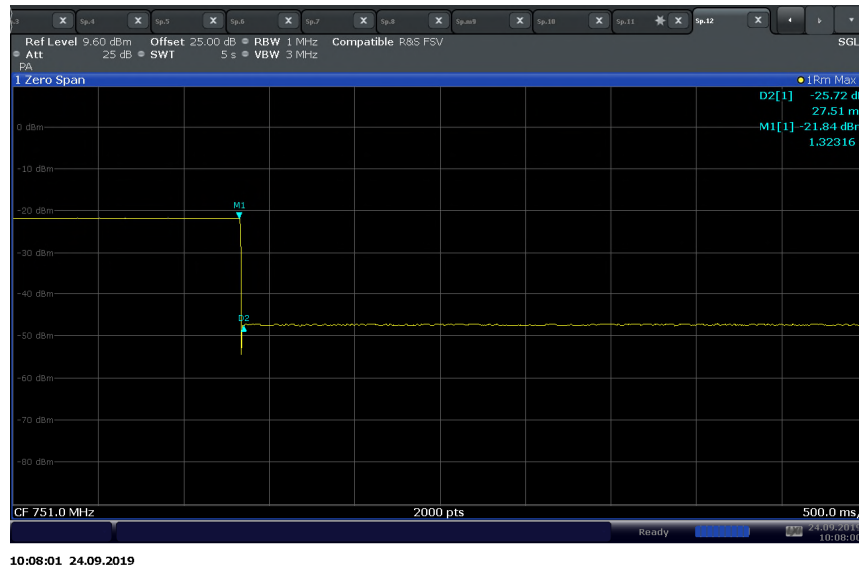
09:24:56 24.09.2019

### Mitigation Time - LTE Band 12 Uplink 5MHz Bandwidth Mid Channel - NU Port B



15:22:31 23.09.2019

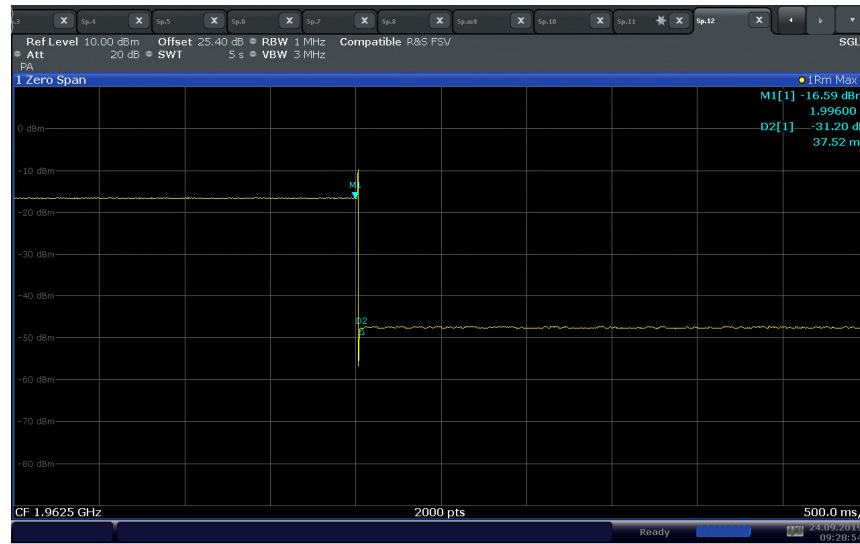
### Mitigation Time - LTE Band 13 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port C



### Mitigation Time - LTE Band 13 Uplink 5MHz Bandwidth Mid Channel - NU Port C

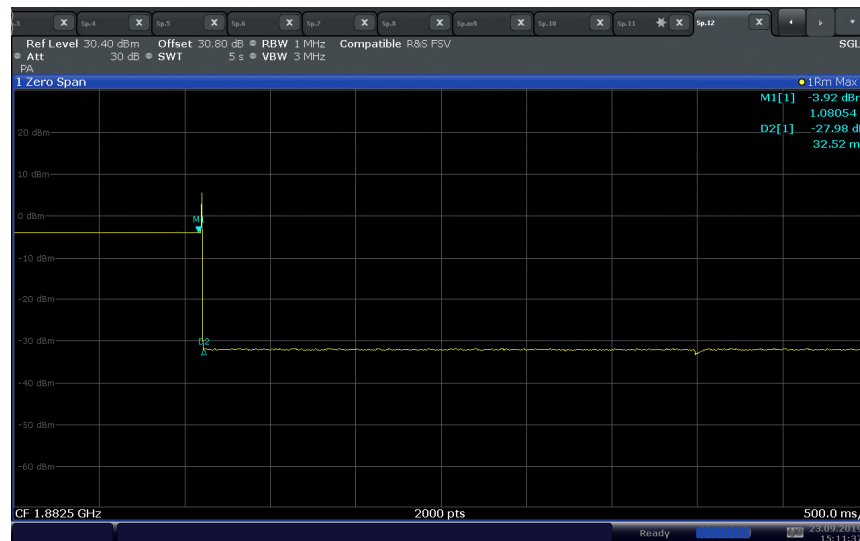


### Mitigation Time - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



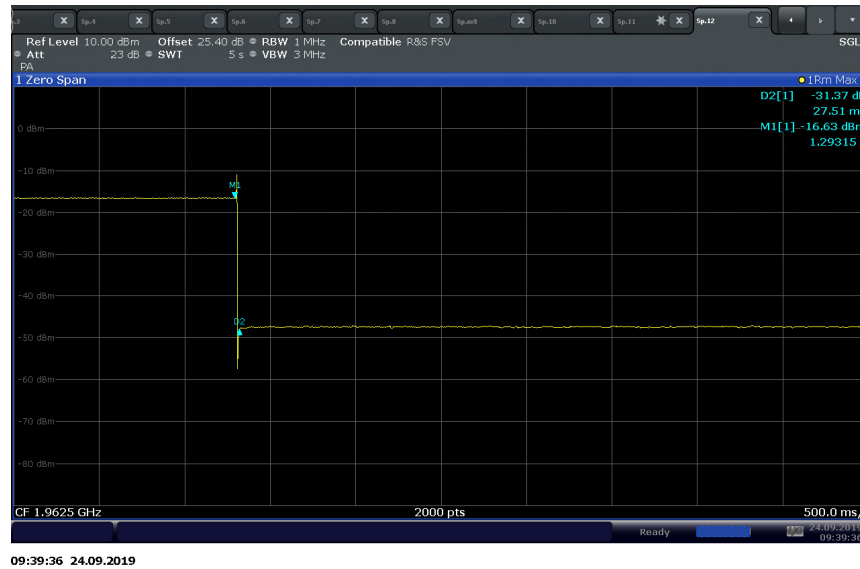
09:28:55 24.09.2019

### Mitigation Time - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port A

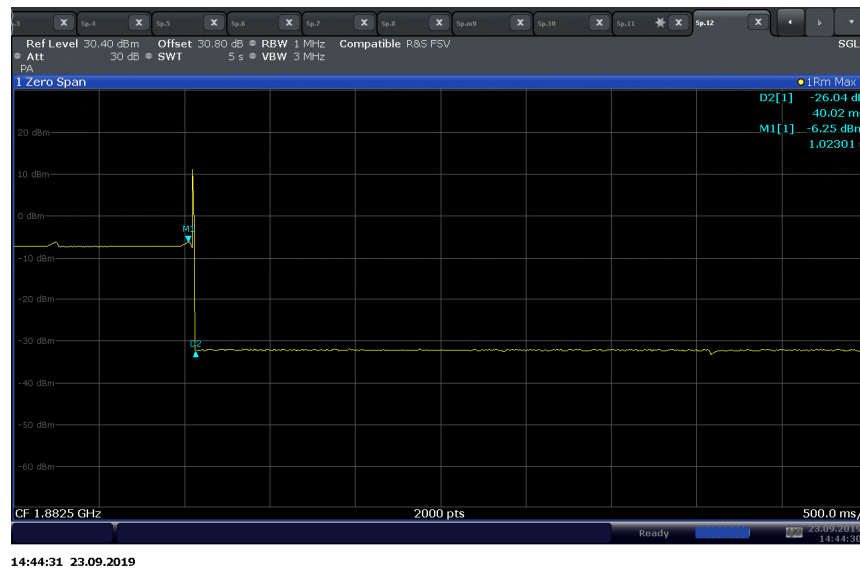


15:11:37 23.09.2019

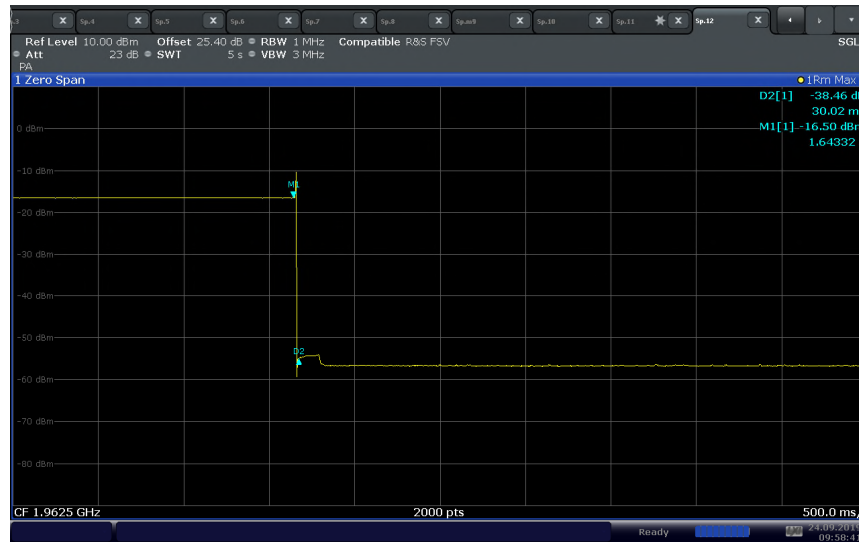
### Mitigation Time - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



### Mitigation Time - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port B

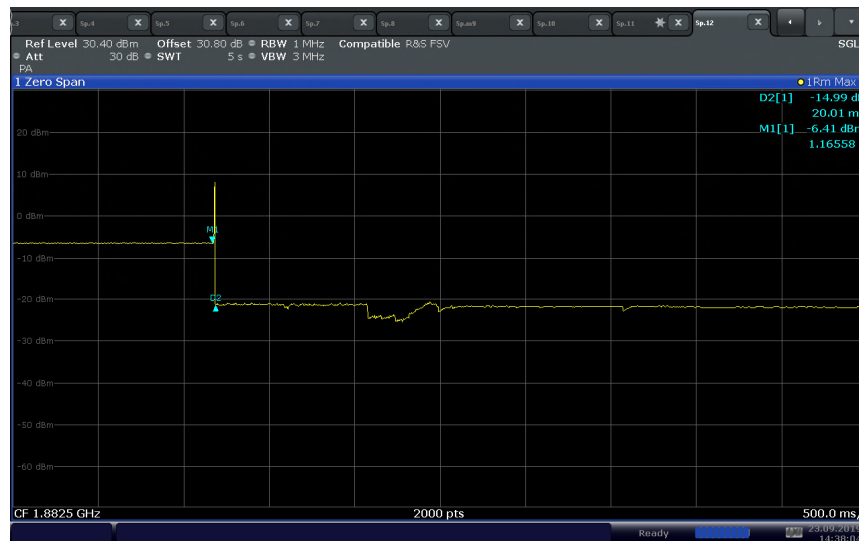


### Mitigation Time - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port C



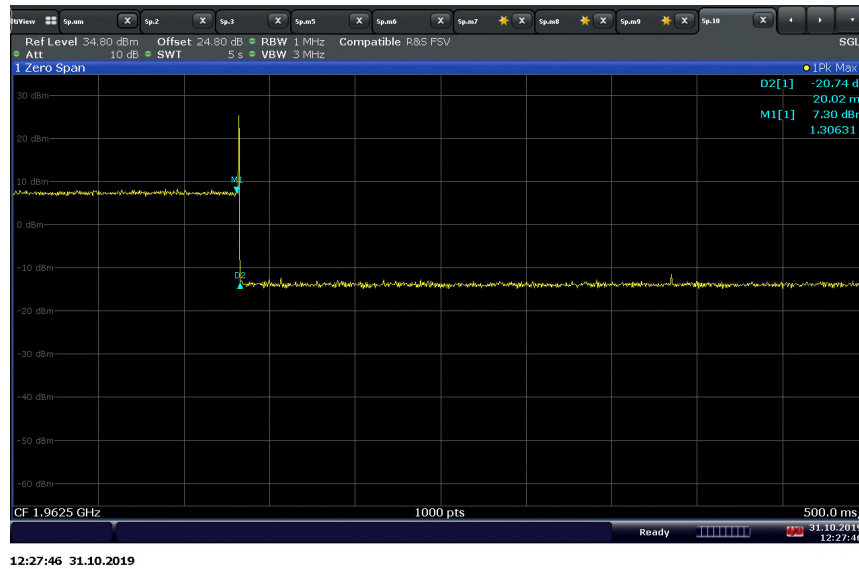
09:58:41 24.09.2019

### Mitigation Time - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port C

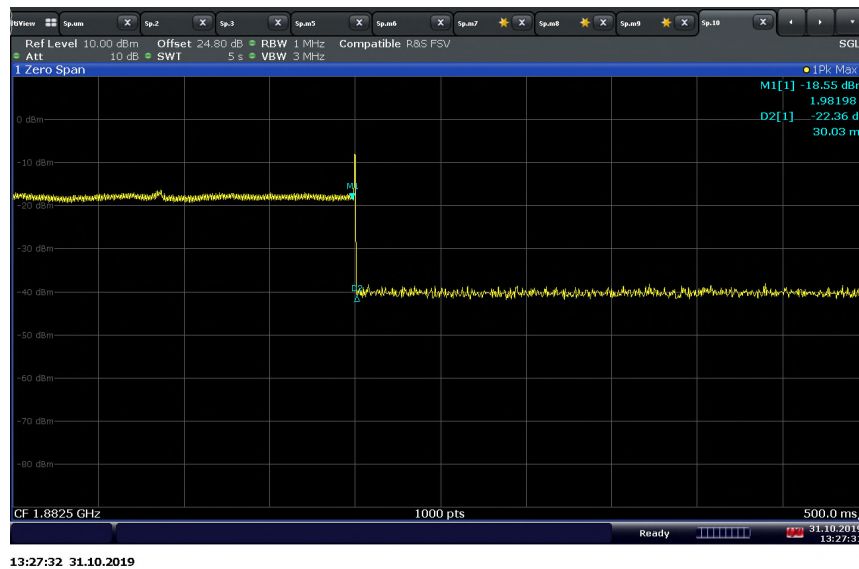


14:38:05 23.09.2019

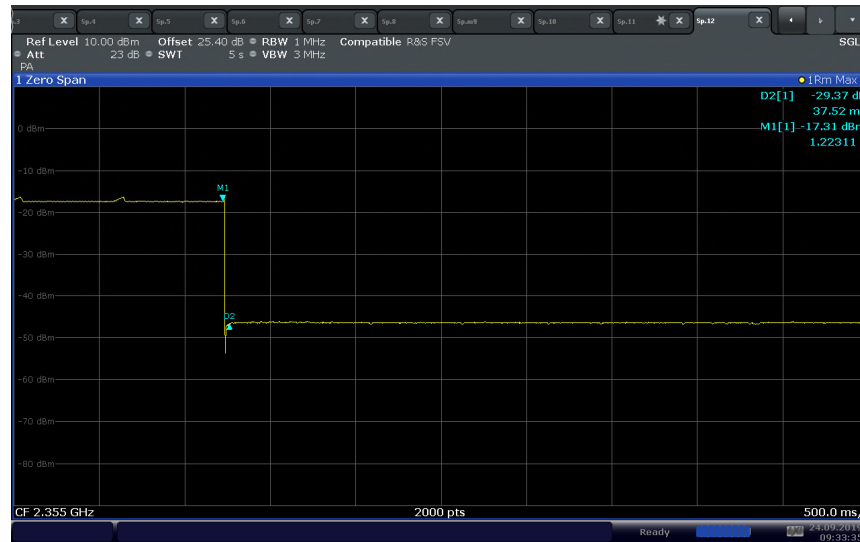
### Mitigation Time - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port D



### Mitigation Time - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port D

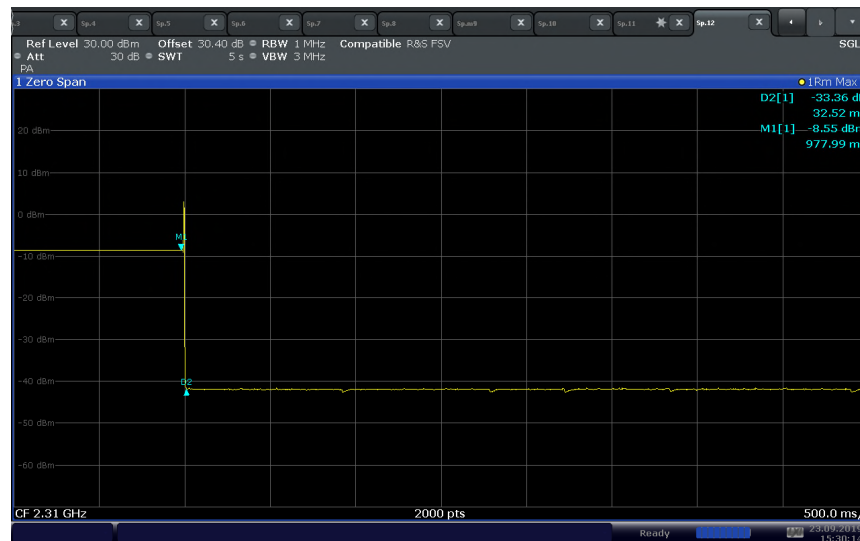


### Mitigation Time - LTE Band 30 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



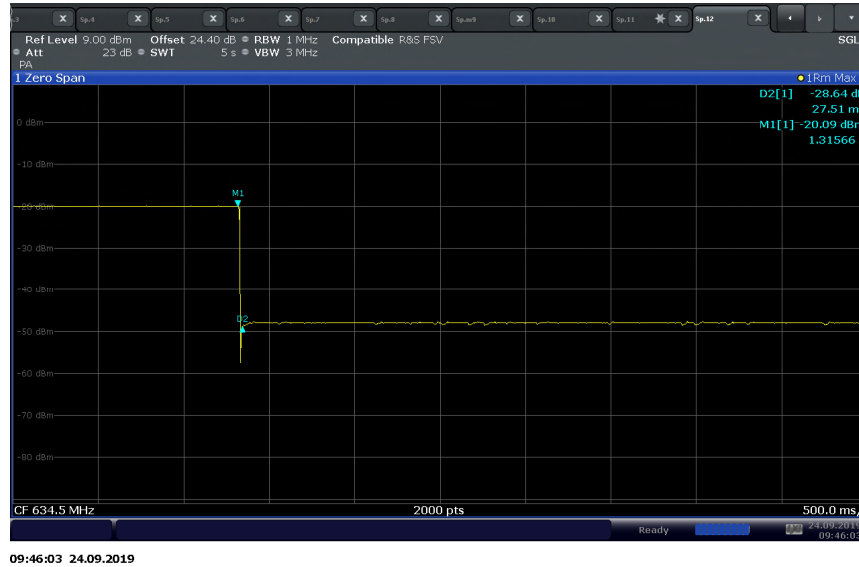
09:33:36 24.09.2019

### Mitigation Time - LTE Band 30 Uplink 5MHz Bandwidth Mid Channel - NU Port A

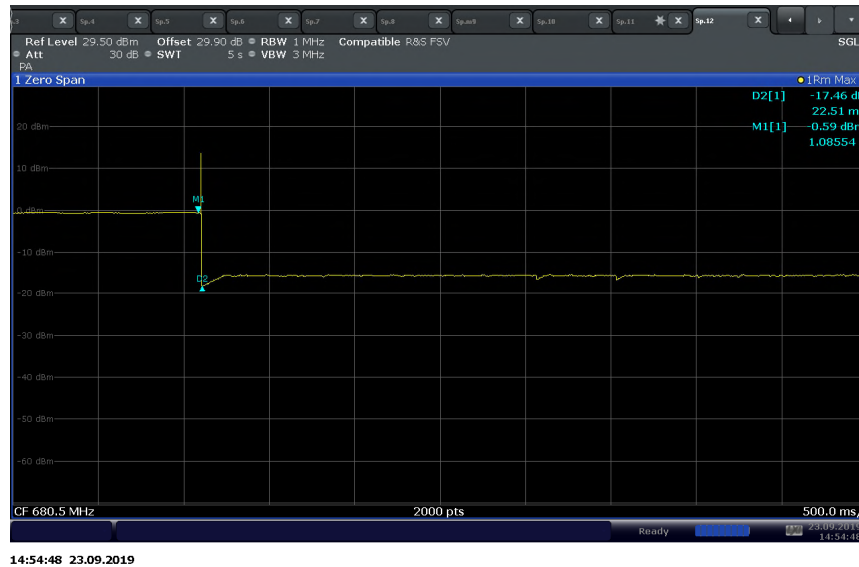


15:30:15 23.09.2019

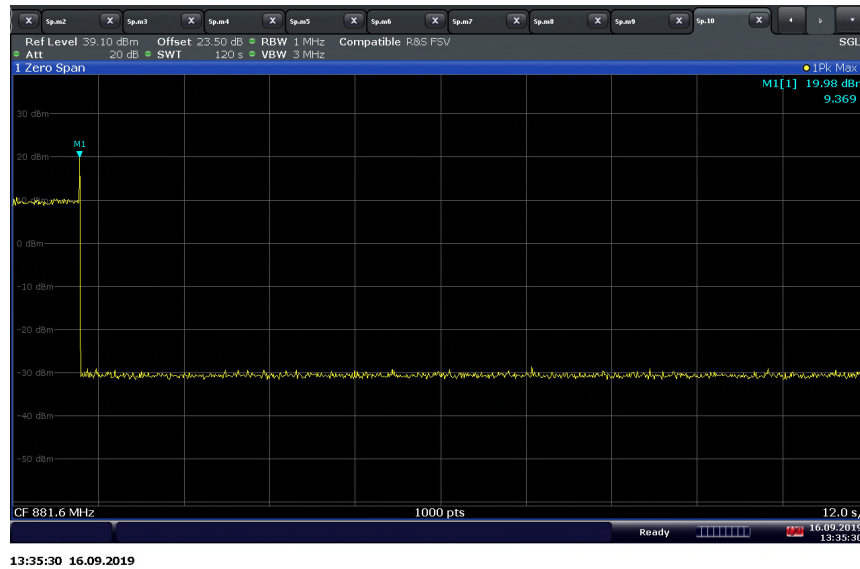
### Mitigation Time - LTE Band 71 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



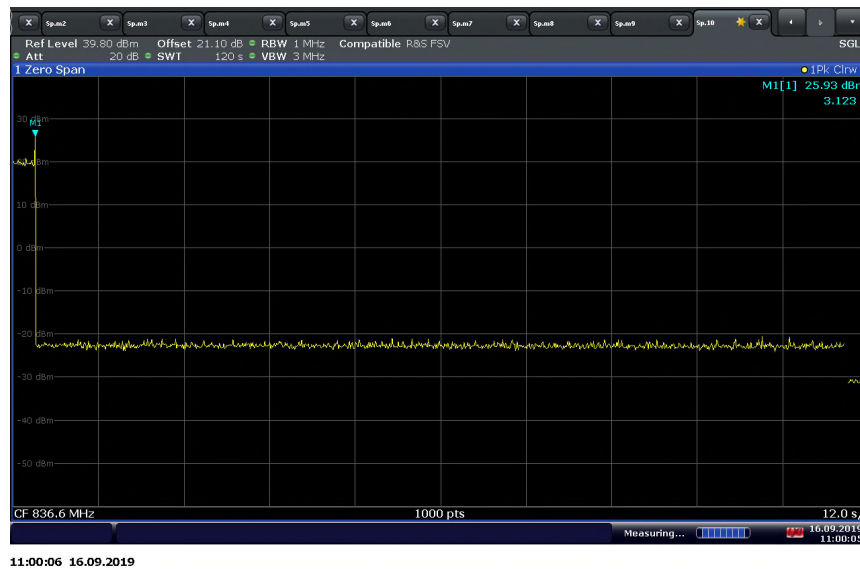
### Mitigation Time - LTE Band 71 Uplink 5MHz Bandwidth Mid Channel - NU Port B



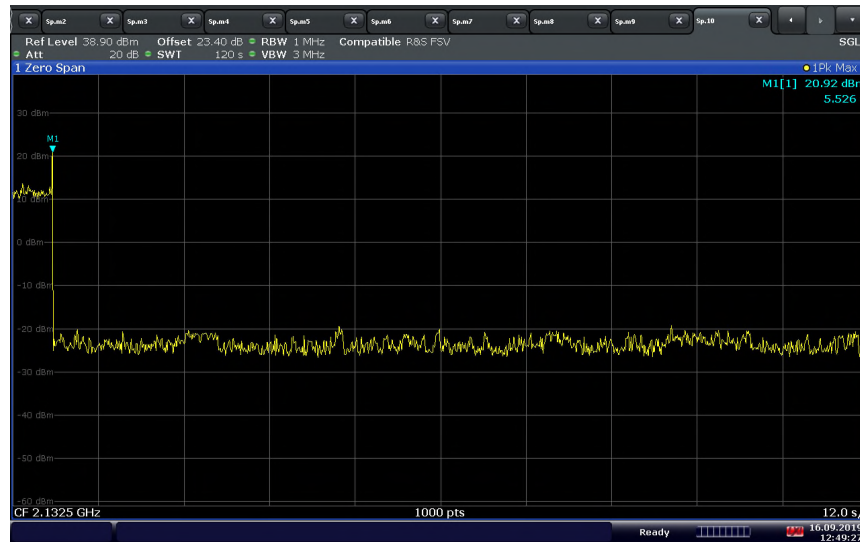
### Retry Event - WCDMA LTE Band 5 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



### Retry Event - WCDMA LTE Band 5 Uplink 5MHz Bandwidth Mid Channel - NU Port A

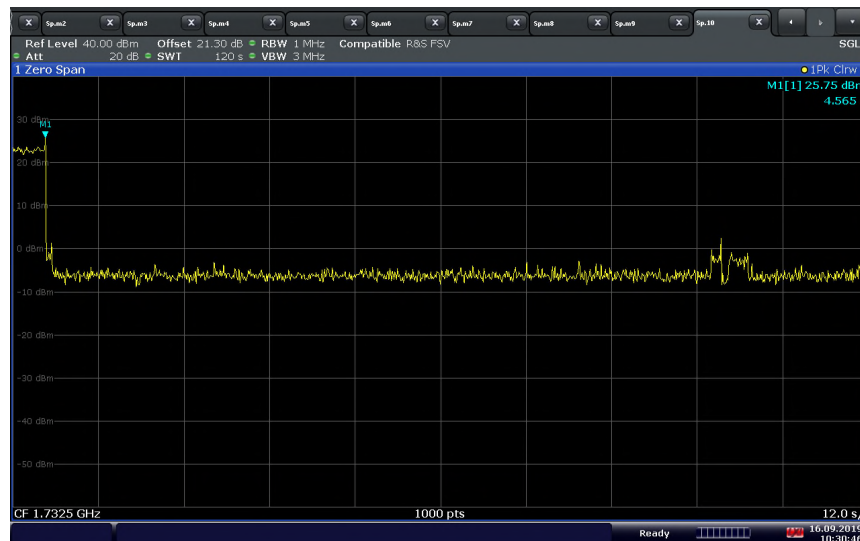


### Retry Event - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



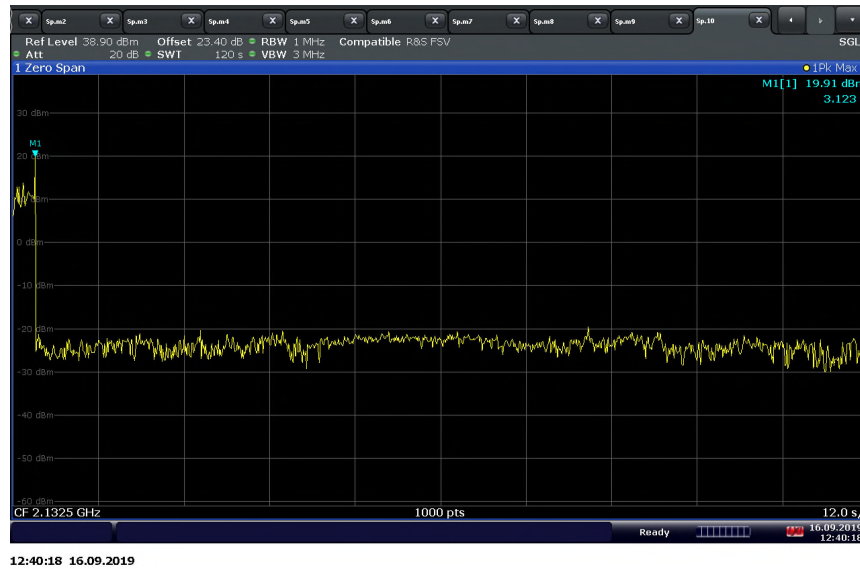
12:49:28 16.09.2019

### Retry Event - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel - NU Port A

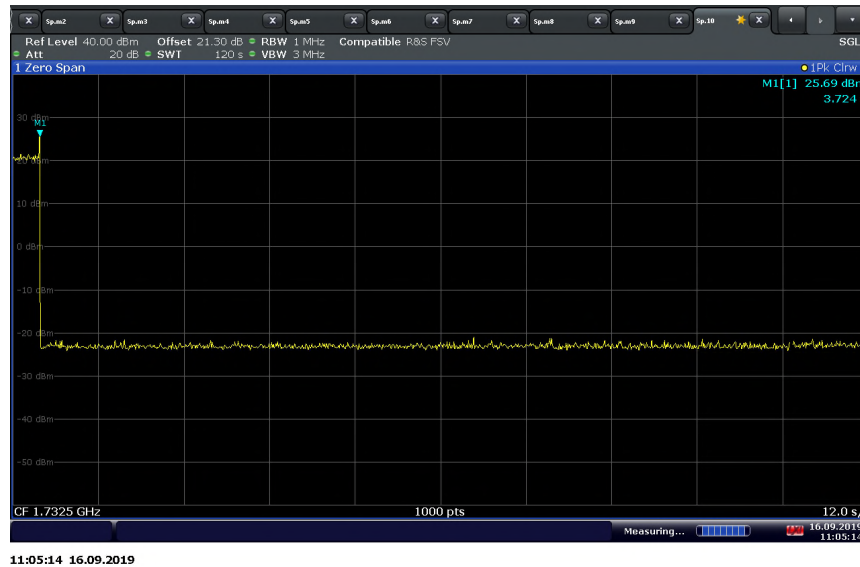


10:30:47 16.09.2019

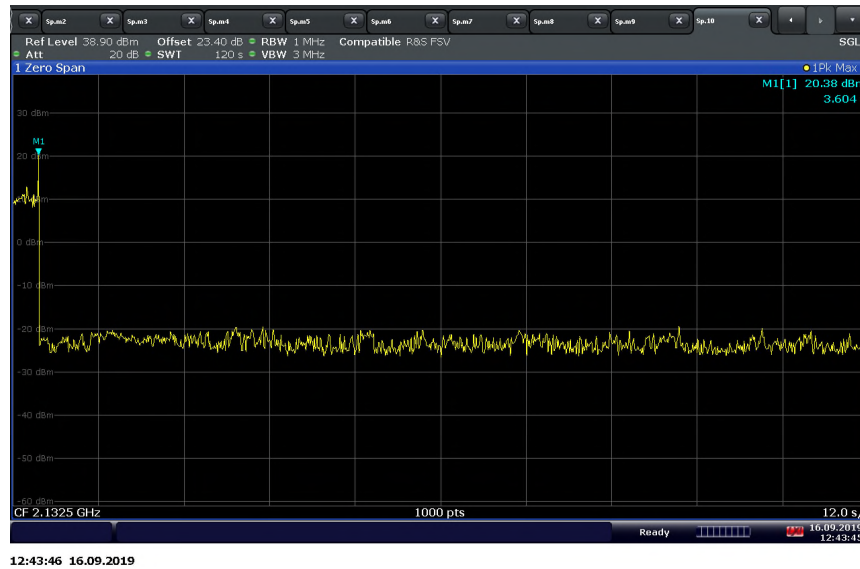
### Retry Event - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



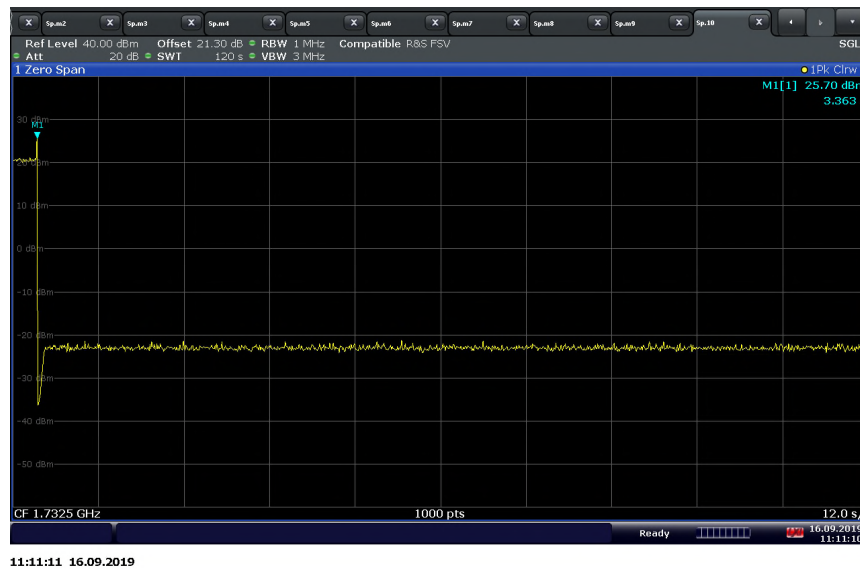
### Retry Event - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel - NU Port B



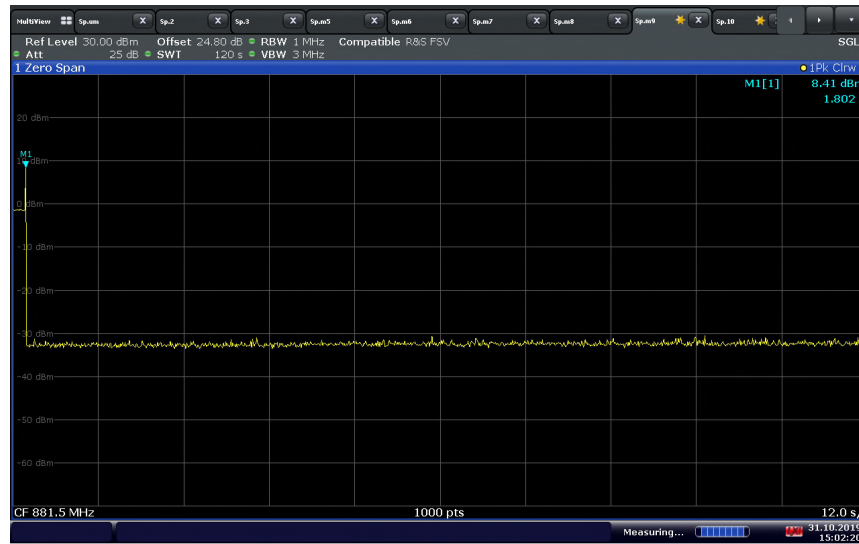
### Retry Event - LTE Band 4 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port C



### Retry Event - LTE Band 4 Uplink 5MHz Bandwidth Mid Channel - NU Port C

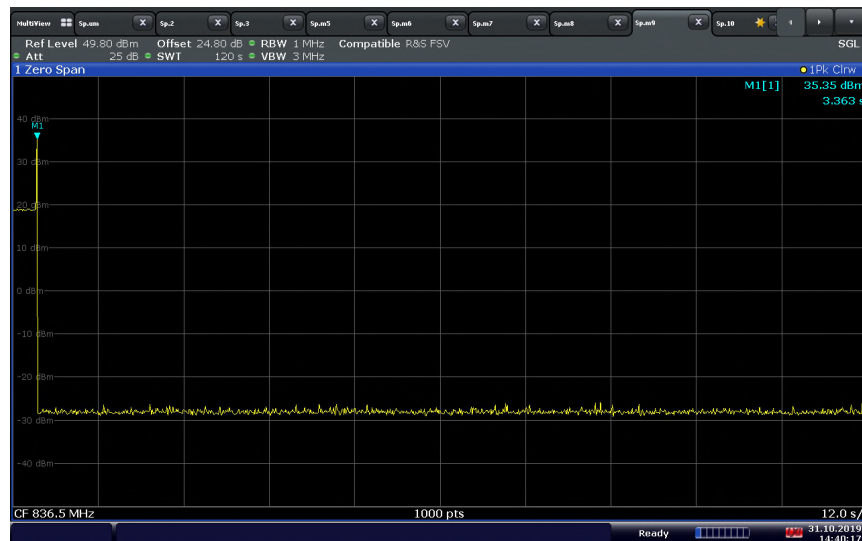


### Retry Event - LTE Band 5 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port D



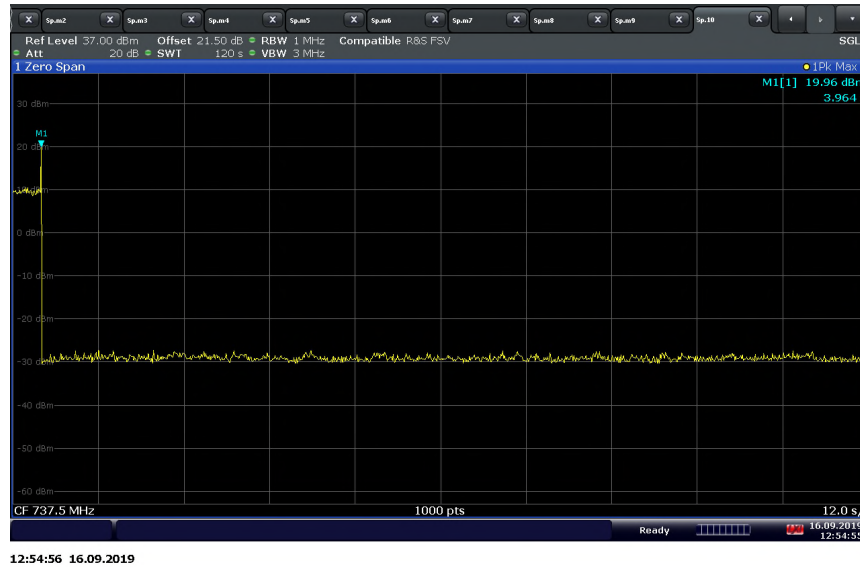
15:02:21 31.10.2019

### Retry Event - LTE Band 5 Uplink 5MHz Bandwidth Mid Channel - NU Port D

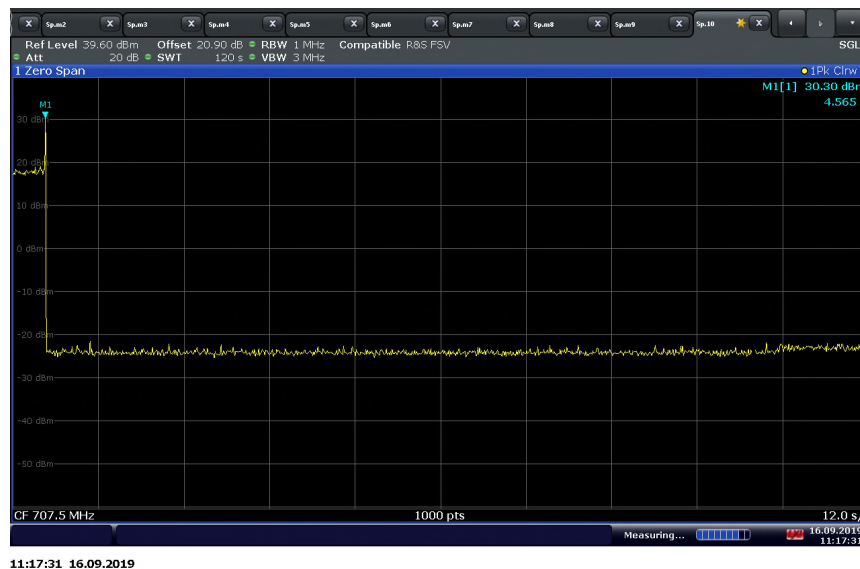


14:40:18 31.10.2019

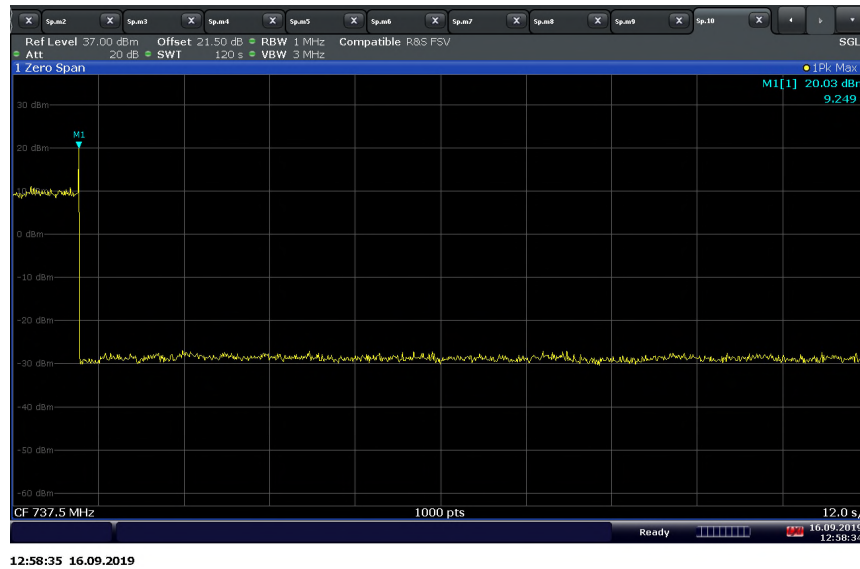
### Retry Event - LTE Band 12 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



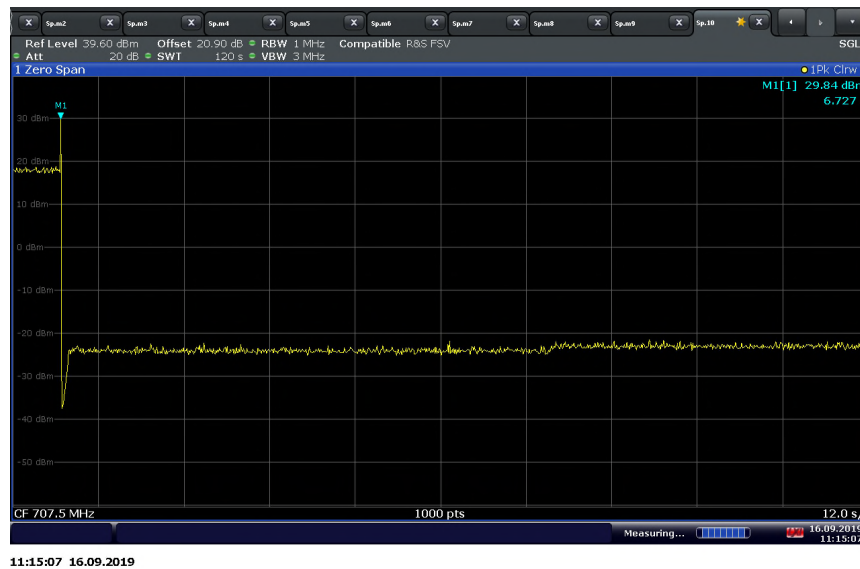
### Retry Event - LTE Band 12 Uplink 5MHz Bandwidth Mid Channel - NU Port A



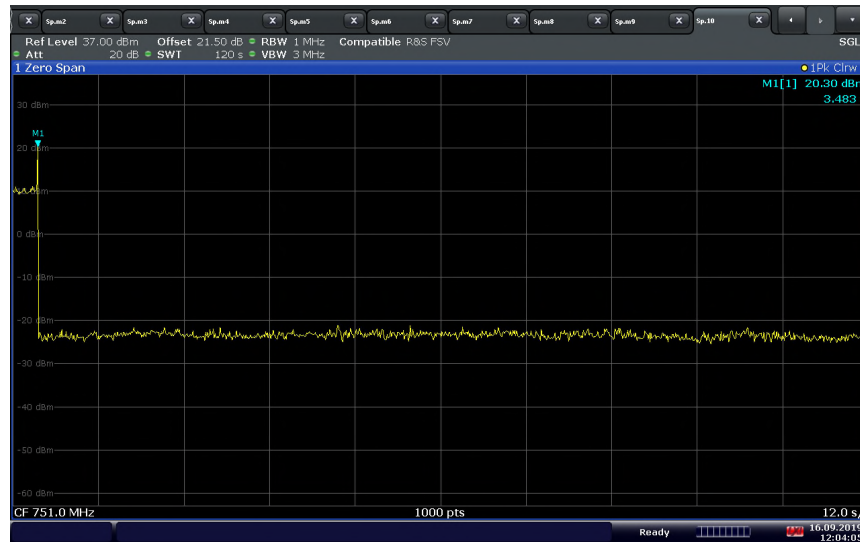
### Retry Event - LTE Band 12 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



### Retry Event - LTE Band 12 Uplink 5MHz Bandwidth Mid Channel - NU Port B

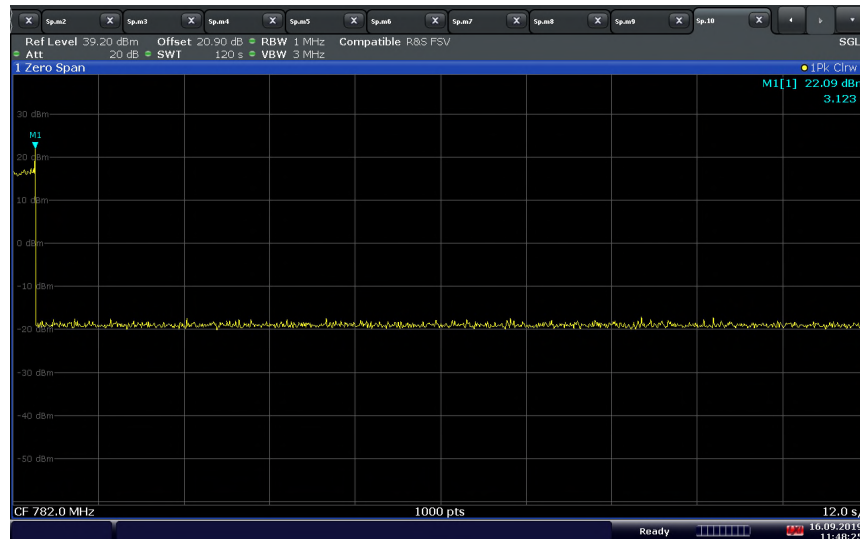


### Retry Event - LTE Band 13 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port C



12:04:06 16.09.2019

### Retry Event - LTE Band 13 Uplink 5MHz Bandwidth Mid Channel - NU Port C

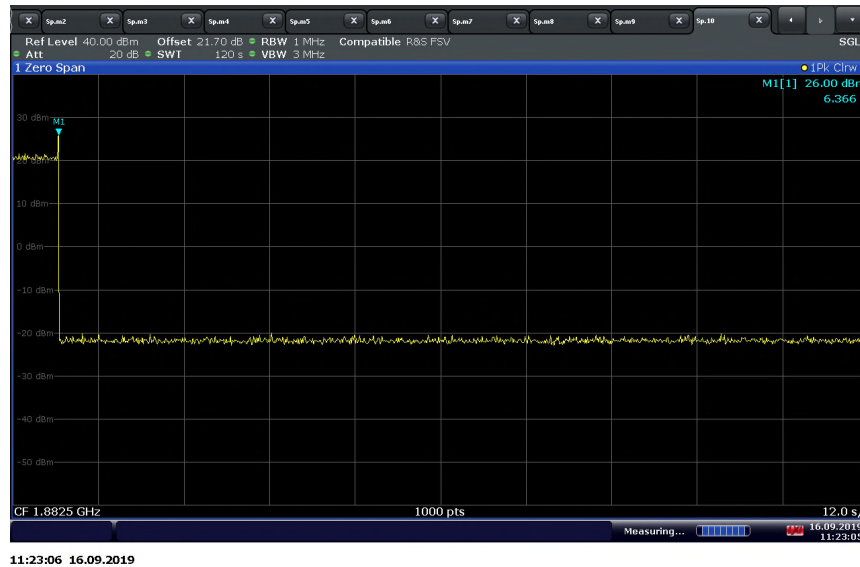


11:48:26 16.09.2019

### Retry Event - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



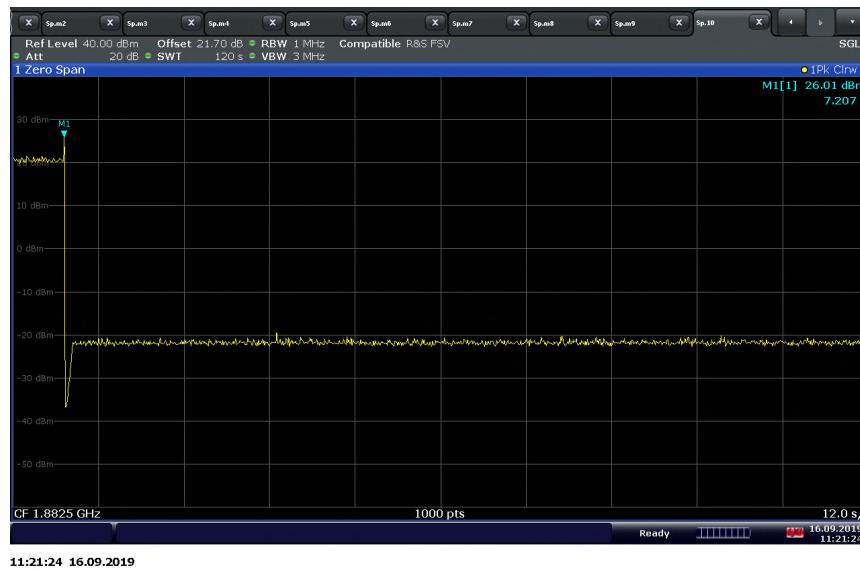
### Retry Event - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port A



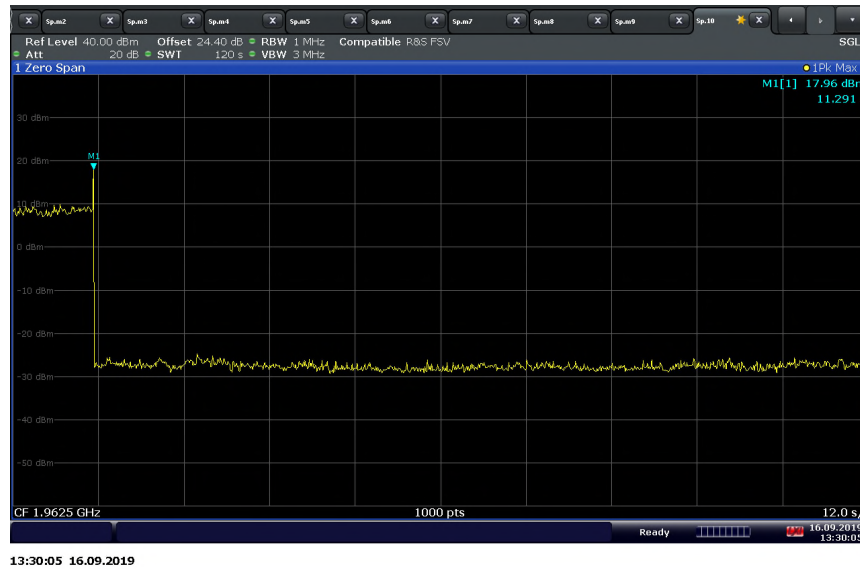
### Retry Event - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



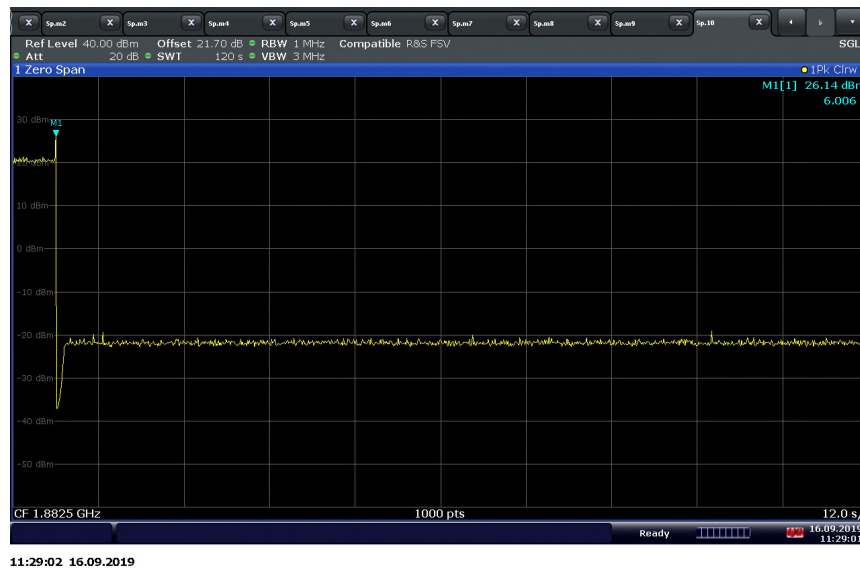
### Retry Event - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port B



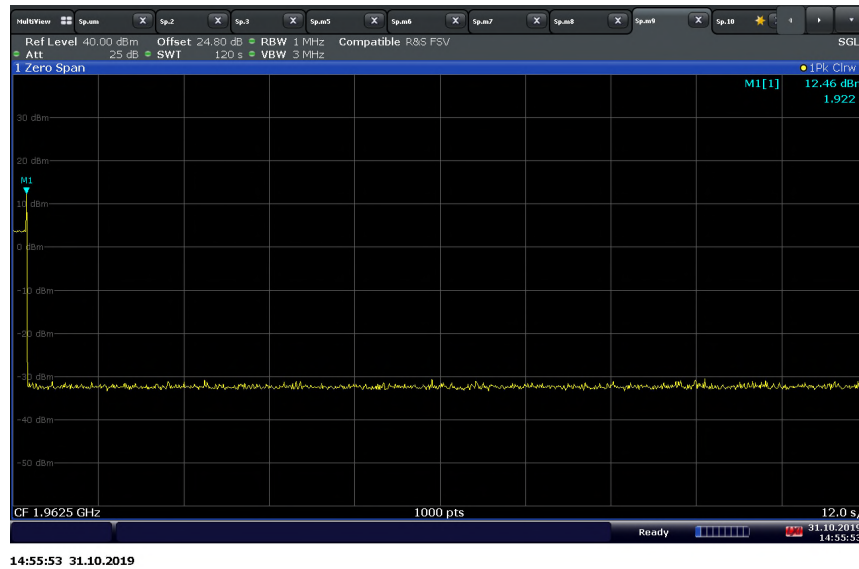
### Retry Event - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port C



### Retry Event - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port C



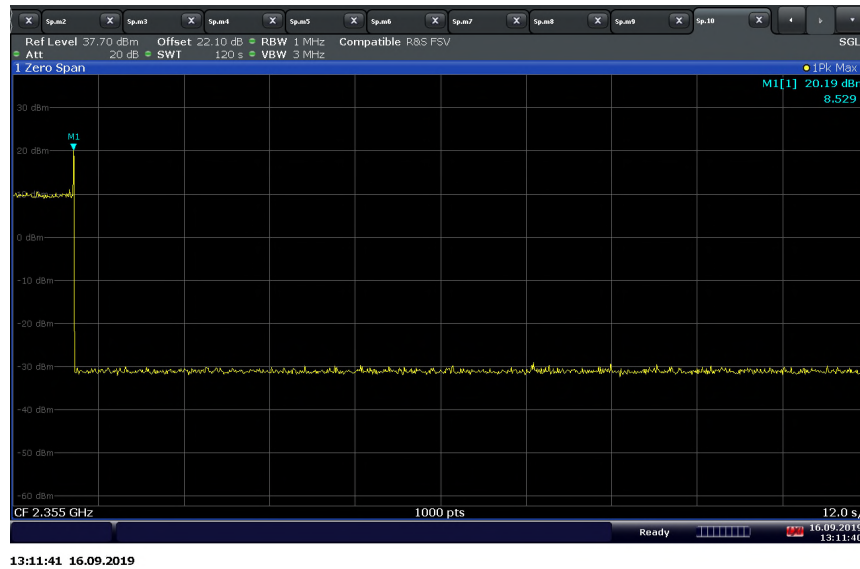
### Retry Event - LTE Band 25 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port D



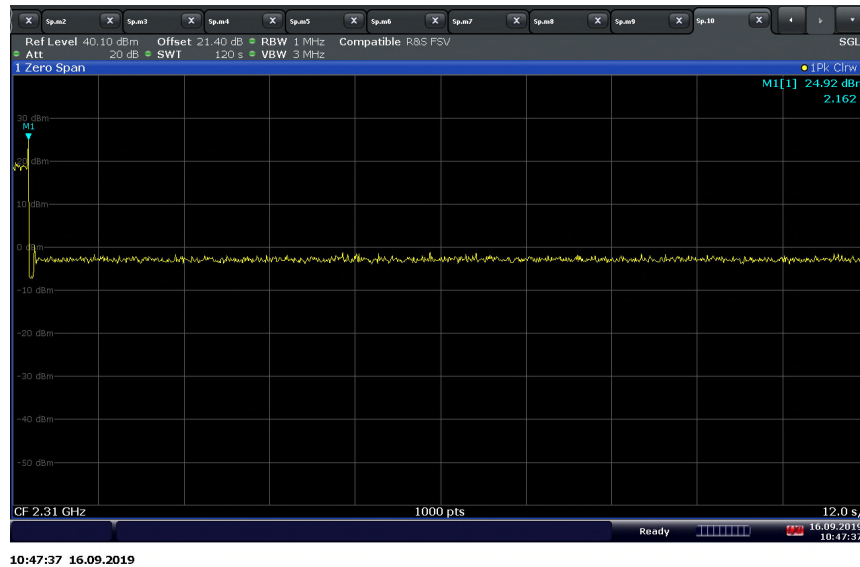
### Retry Event - LTE Band 25 Uplink 5MHz Bandwidth Mid Channel - NU Port D



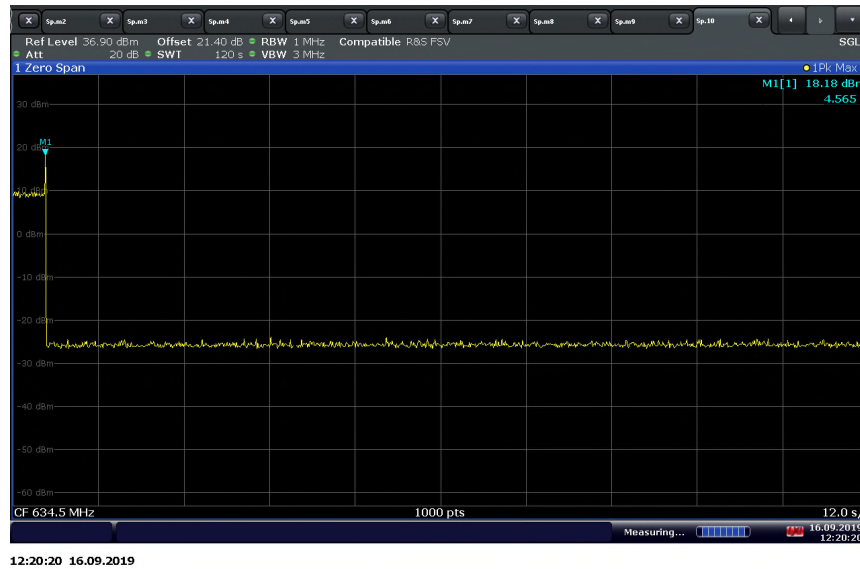
### Retry Event - LTE Band 30 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port A



### Retry Event - LTE Band 30 Uplink 5MHz Bandwidth Mid Channel - NU Port A



### Retry Event - LTE Band 71 Downlink 5MHz Bandwidth Mid Channel - CU with NU Port B



### Retry Event - LTE Band 71 Uplink 5MHz Bandwidth Mid Channel - NU Port B





## **2.10 OUT OF BAND GAIN LIMIT**

### **2.10.1 Specification Reference**

FCC 47 CFR Part 20. Clause 20.21(e)(9)(i)(E)  
KDB935210 D04, Clause 7.15

### **2.10.2 Standard Applicable**

FCC 47 CFR Part 20. Clause 20.21(e)(9)(i)(E) Out of Band Gain Limits.:

(1) A frequency selective booster shall have the following minimum attenuation referenced to the gain in the center of the pass band of the booster:

- (i) -20 dB at the band edge, where band edge is the end of the licensee's allocated spectrum,
- (ii) -30 dB at 1 MHz offset from band edge,
- (iii) -40 dB at 5 MHz offset from band edge.

(2) A frequency selective booster having maximum gain greater than 80 dB (referenced to the center of the pass band) shall limit the out of band gain to 60 dB at 0.2 MHz offset from the band edge, and 45 dB at 1 MHz offset from the band edge, where band edge is the end of the licensee's allocated spectrum.

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

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

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

September 09, 10, 11 and October 17, 2019 /XYZ

### **2.10.5 Test Equipment Used**

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

### **2.10.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

|                     |                 |
|---------------------|-----------------|
| Ambient Temperature | 25.5 - 26.2 °C  |
| Relative Humidity   | 47.9 - 49.9 %   |
| ATM Pressure        | 98.5 - 99.1 kPa |

#### **2.10.7 Additional Observations**

- This is conducted Test. Test procedure is per Section 7.15 of KDB935210 (D04 Provider Specific Booster Measurements v02r03). Appropriate offset (line losses) applied.
- Downlink was tested according to 7.15.1 of KDB935210. The signal generator was set to transmit a CW signal with output power level set to that as determined in clause 7.2.2 of KDB935210.
- Uplink which has narrowband protection function was tested according to 7.15.2 of KDB935210. One signal generator produced a band-limited AWGN signal with an OBW (99%) of 4.1 MHz with output power level set to that as determined in clause 7.2.2 of KDB935210. A second signal generator produced a band-limited AWGN signal with an OBW (99%) of 200 kHz with output power level set to a level that is 20 dB higher than the level determined from 7.2.2 of KDB935210.
- The EUT operated in Test Mode with the gain set to the maximum gain and a minimum bandwidth setting (5MHz).
- Setup the EUT according to Figure 2 or 3 of Section 6.3.3 of KDB935210 D04 as appropriate.
- Evaluations are conducted at CU and NU antenna ports.
- Operational uplink and downlink bands for WCDMA Band 5 and LTE Band 4, 5, 12, 13, 25, 30, 71 were tested.

## 2.10.8 Test Results

| Out of Band Gain Limit – WCDMA Band 5 Downlink (869 – 894 MHz) |                   |                    |           |                 |
|----------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                   | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                               | -82.16            | 10.45              | 92.61     | -               |
| 0 (Low Band Edge)                                              | -82.40            | -65.03             | 17.37     | 72.61           |
| -0.2                                                           | -82.52            | -64.58             | 17.94     | 60              |
| -1                                                             | -82.11            | -64.27             | 17.84     | 45              |
| -5                                                             | -82.25            | -62.98             | 19.27     | 52.61           |
| 0 (High Band Edge)                                             | -82.47            | -65.53             | 16.94     | 72.61           |
| +0.2                                                           | -82.04            | -64.68             | 17.36     | 60              |
| +1                                                             | -82.39            | -64.32             | 18.07     | 45              |
| +5                                                             | -82.17            | -65.48             | 16.69     | 52.61           |

| Out of Band Gain Limit - WCDMA Band 5 Uplink (824 – 849 MHz) |                   |                    |           |                 |
|--------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                 | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                             | -76.69            | 17.01              | 93.70     | -               |
| 0 (Low Band Edge)                                            | -72.16            | -64.02             | 8.14      | 73.70           |
| -0.2                                                         | -71.52            | -64.66             | 6.86      | 60              |
| -1                                                           | -70.76            | -66.21             | 4.55      | 45              |
| -5                                                           | -71.93            | -64.56             | 7.37      | 53.70           |
| 0 (High Band Edge)                                           | -70.62            | -65.73             | 4.89      | 73.70           |
| +0.2                                                         | -70.92            | -65.80             | 5.12      | 60              |
| +1                                                           | -70.59            | -65.04             | 5.55      | 45              |
| +5                                                           | -69.37            | -63.25             | 6.12      | 53.70           |

| Out of Band Gain Limit – LTE Band 4 Downlink (2110 – 2155 MHz) |                   |                    |           |                 |
|----------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                   | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                               | -85.30            | 10.87              | 96.17     | -               |
| 0 (Low Band Edge)                                              | -85.71            | -46.81             | 38.90     | 76.17           |
| -0.2                                                           | -84.72            | -72.23             | 12.49     | 60              |
| -1                                                             | -85.24            | -70.78             | 14.46     | 45              |
| -5                                                             | -85.74            | -70.71             | 15.03     | 56.17           |
| 0 (High Band Edge)                                             | -85.78            | -70.13             | 15.65     | 76.17           |
| +0.2                                                           | -85.62            | -71.91             | 13.71     | 60              |
| +1                                                             | -86.16            | -71.81             | 14.35     | 45              |
| +5                                                             | -85.39            | -71.15             | 14.24     | 56.17           |

| Out of Band Gain Limit - LTE Band 4 Uplink (1710 – 1755 MHz) |                   |                    |           |                 |
|--------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                 | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                             | -75.09            | 19.04              | 94.13     | -               |
| 0 (Low Band Edge)                                            | -69.63            | -65.17             | 4.46      | 74.13           |
| -0.2                                                         | -69.22            | -65.53             | 3.69      | 60              |
| -1                                                           | -69.88            | -63.44             | 6.44      | 45              |
| -5                                                           | -68.76            | -65.53             | 3.23      | 54.13           |
| 0 (High Band Edge)                                           | -69.24            | -64.95             | 4.29      | 74.13           |
| +0.2                                                         | -69.54            | -65.35             | 4.19      | 60              |
| +1                                                           | -69.23            | -64.61             | 4.62      | 45              |
| +5                                                           | -68.36            | -64.01             | 4.35      | 74.13           |

| Out of Band Gain Limit – LTE Band 5 Downlink (869 – 894 MHz) |                   |                    |           |                 |
|--------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                 | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                             | -83.02            | 8.84               | 91.86     | -               |
| 0 (Low Band Edge)                                            | -82.92            | -65.19             | 17.73     | 71.86           |
| -0.2                                                         | -82.90            | -65.30             | 17.60     | 60              |
| -1                                                           | -83.03            | -65.25             | 17.78     | 45              |
| -5                                                           | -83.24            | -65.39             | 17.85     | 51.86           |
| 0 (High Band Edge)                                           | -82.95            | -66.15             | 16.80     | 71.86           |
| +0.2                                                         | -82.92            | -66.22             | 16.70     | 60              |
| +1                                                           | -83.20            | -66.44             | 16.76     | 45              |
| +5                                                           | -82.60            | -67.63             | 14.97     | 51.86           |

| Out of Band Gain Limit - LTE Band 5 Uplink (824 – 849 MHz) |                   |                    |           |                 |
|------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                               | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                           | -73.71            | 17.64              | 91.35     | -               |
| 0 (Low Band Edge)                                          | -73.76            | -67.73             | 8.14      | 71.35           |
| -0.2                                                       | -73.75            | -67.71             | 6.86      | 60              |
| -1                                                         | -73.74            | -67.75             | 4.55      | 45              |
| -5                                                         | -73.68            | -68.08             | 7.37      | 51.35           |
| 0 (High Band Edge)                                         | -73.79            | -68.03             | 4.89      | 71.35           |
| +0.2                                                       | -73.85            | -68.08             | 5.12      | 60              |
| +1                                                         | -73.84            | -68.16             | 5.55      | 45              |
| +5                                                         | -73.81            | -68.65             | 6.12      | 51.35           |

| Out of Band Gain Limit – LTE Band 12 Downlink (729 – 746MHz) |                   |                    |           |                 |
|--------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                 | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                             | -82.47            | 7.56               | 90.03     | -               |
| 0 (Low Band Edge)                                            | -82.75            | -69.45             | 13.30     | 70.03           |
| -0.2                                                         | -82.27            | -68.46             | 13.81     | 60              |
| -1                                                           | -82.66            | -69.35             | 13.31     | 45              |
| -5                                                           | -83.26            | -69.58             | 13.68     | 50.03           |
| 0 (High Band Edge)                                           | -82.91            | -68.27             | 14.64     | 70.03           |
| +0.2                                                         | -83.22            | -69.79             | 13.43     | 60              |
| +1                                                           | -82.77            | -60.55             | 22.22     | 45              |
| +5                                                           | -82.66            | -60.34             | 22.32     | 50.03           |

| Out of Band Gain Limit - LTE Band 12 Uplink (699 – 716MHz) |                   |                    |           |                 |
|------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                               | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                           | -74.81            | 19.38              | 90.98     | -               |
| 0 (Low Band Edge)                                          | -72.37            | -70.58             | 7.2       | 70.98           |
| -0.2                                                       | -72.41            | -68.72             | 6.88      | 60              |
| -1                                                         | -72.15            | -70.25             | 8.71      | 45              |
| -5                                                         | -71.86            | -70.46             | 6.33      | 50.98           |
| 0 (High Band Edge)                                         | -72.89            | -70.23             | 7.94      | 70.98           |
| +0.2                                                       | -72.52            | -70.50             | 7.17      | 60              |
| +1                                                         | -72.10            | -70.36             | 7.49      | 45              |
| +5                                                         | -72.11            | -69.87             | 8.1       | 50.98           |

| Out of Band Gain Limit – LTE Band 13 Downlink (746 – 756MHz) |                   |                    |           |                 |
|--------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                 | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                             | -82.20            | 10.28              | 92.48     | -               |
| 0 (Low Band Edge)                                            | -82.47            | -55.59             | 26.88     | 72.48           |
| -0.2                                                         | -82.23            | -57.36             | 24.87     | 60              |
| -1                                                           | -82.19            | -60.32             | 21.87     | 45              |
| -5                                                           | -82.01            | -71.79             | 10.22     | 52.48           |
| 0 (High Band Edge)                                           | -81.95            | -59.67             | 22.28     | 72.48           |
| +0.2                                                         | -82.34            | -58.89             | 23.45     | 60              |
| +1                                                           | -82.78            | -62.81             | 19.97     | 45              |
| +5                                                           | -82.25            | -74.60             | 7.65      | 52.48           |

| Out of Band Gain Limit – LTE Band 13 Uplink (777 – 787 MHz) |                   |                    |           |                 |
|-------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                            | -73.65            | 13.61              | 87.26     | -               |
| 0 (Low Band Edge)                                           | -71.27            | -65.59             | 5.68      | 67.26           |
| -0.2                                                        | -69.64            | -64.42             | 5.22      | 60              |
| -1                                                          | -70.03            | -66.67             | 3.36      | 45              |
| -5                                                          | -71.08            | -65.53             | 5.55      | 47.26           |
| 0 (High Band Edge)                                          | -70.59            | -65.50             | 5.09      | 67.26           |
| +0.2                                                        | -69.89            | -64.72             | 5.17      | 60              |
| +1                                                          | -70.17            | -64.96             | 5.21      | 45              |
| +5                                                          | -70.95            | -65.12             | 5.83      | 47.26           |

| Out of Band Gain Limit – LTE Band 25 Downlink (1930 – 1995 MHz) |                   |                    |           |                 |
|-----------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                    | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                                | -86.59            | 7.62               | 94.21     | -               |
| 0 (Low Band Edge)                                               | -86.69            | -64.25             | 22.44     | 74.21           |
| -0.2                                                            | -86.48            | -63.40             | 23.08     | 60              |
| -1                                                              | -86.61            | -63.30             | 23.31     | 45              |
| -5                                                              | -86.65            | -64.52             | 22.13     | 54.21           |
| 0 (High Band Edge)                                              | -87.02            | -64.61             | 22.41     | 74.21           |
| +0.2                                                            | -86.96            | -62.46             | 24.50     | 60              |
| +1                                                              | -87.28            | -63.93             | 23.35     | 45              |
| +5                                                              | -87.06            | -64.18             | 22.88     | 54.21           |

| Out of Band Gain Limit - LTE Band 25 Uplink (1850 – 1915 MHz) |                   |                    |           |                 |
|---------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                  | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                              | -71.38            | 19.08              | 90.46     | -               |
| 0 (Low Band Edge)                                             | -69.36            | -65.33             | 4.03      | 70.46           |
| -0.2                                                          | -69.13            | -62.43             | 6.7       | 60              |
| -1                                                            | -69.89            | -63.39             | 6.5       | 45              |
| -5                                                            | -69.12            | -63.05             | 6.07      | 50.46           |
| 0 (High Band Edge)                                            | -69.22            | -65.58             | 3.64      | 70.46           |
| +0.2                                                          | -69.94            | -64.37             | 5.57      | 60              |
| +1                                                            | -70.15            | -65.32             | 4.83      | 45              |
| +5                                                            | -69.93            | -64.96             | 4.97      | 50.46           |

| Out of Band Gain Limit – LTE Band 30 Downlink (2350 – 2360 MHz) |                   |                    |           |                 |
|-----------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                    | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                                | -86.87            | 10.61              | 97.48     | -               |
| 0 (Low Band Edge)                                               | -86.71            | -62.60             | 24.11     | 77.48           |
| -0.2                                                            | -86.82            | -62.25             | 24.57     | 60              |
| -1                                                              | -86.30            | -62.63             | 23.67     | 45              |
| -5                                                              | -86.82            | -64.66             | 22.16     | 57.48           |
| 0 (High Band Edge)                                              | -86.33            | -62.35             | 23.98     | 77.48           |
| +0.2                                                            | -86.62            | -61.72             | 24.90     | 60              |
| +1                                                              | -86.79            | -63.26             | 23.53     | 45              |
| +5                                                              | -86.87            | -63.95             | 22.92     | 57.48           |

| Out of Band Gain Limit – LTE Band 30 Uplink (2305 – 2315 MHz) |                   |                    |           |                 |
|---------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                  | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                              | -76.8             | 16.17              | 92.97     | -               |
| 0 (Low Band Edge)                                             | -75.82            | -60.28             | 15.54     | 72.97           |
| -0.2                                                          | -76.38            | -61.09             | 15.29     | 60              |
| -1                                                            | -75.64            | -64.66             | 10.98     | 45              |
| -5                                                            | -75.90            | -61.62             | 14.28     | 52.97           |
| 0 (High Band Edge)                                            | -74.21            | -63.90             | 10.31     | 72.97           |
| +0.2                                                          | -75.36            | -63.53             | 11.83     | 60              |
| +1                                                            | -74.51            | -62.59             | 11.92     | 45              |
| +5                                                            | -75.25            | -62.53             | 12.72     | 52.97           |

| Out of Band Gain Limit – LTE Band 71 Downlink (617 – 652 MHz) |                   |                    |           |                 |
|---------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                  | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                              | -86.50            | 8.23               | 94.73     | -               |
| 0 (Low Band Edge)                                             | -86.79            | -65.30             | 21.49     | 74.73           |
| -0.2                                                          | -86.58            | -65.14             | 21.44     | 60              |
| -1                                                            | -86.48            | -63.50             | 22.98     | 45              |
| -5                                                            | -86.96            | -65.21             | 21.75     | 54.73           |
| 0 (High Band Edge)                                            | -86.69            | -64.47             | 22.22     | 74.73           |
| +0.2                                                          | -86.84            | -64.48             | 22.36     | 60              |
| +1                                                            | -86.95            | -63.71             | 23.24     | 45              |
| +5                                                            | -86.67            | -65.47             | 21.20     | 54.73           |

| Out of Band Gain Limit – LTE Band 71 Uplink (663 – 698 MHz) |                   |                    |           |                 |
|-------------------------------------------------------------|-------------------|--------------------|-----------|-----------------|
| Offset (MHz)                                                | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Gain Limit (dB) |
| Centre Frequency                                            | -78.53            | 19.41              | 97.94     | -               |
| 0 (Low Band Edge)                                           | -73.0             | -59.12             | 13.88     | 77.94           |
| -0.2                                                        | -74.42            | -64.32             | 10.10     | 60              |
| -1                                                          | -74.05            | -63.21             | 10.84     | 45              |
| -5                                                          | -73.72            | -68.45             | 5.27      | 57.94           |
| 0 (High Band Edge)                                          | -73.75            | -57.94             | 15.81     | 77.94           |
| +0.2                                                        | -73.88            | -60.83             | 13.05     | 60              |
| +1                                                          | -73.67            | -60.28             | 13.39     | 45              |
| +5                                                          | -72.23            | -62.67             | 9.56      | 57.94           |

FCC ID: NU: YETQ44-1234CNU  
CU: YETQ41-5ECU  
IC: NU: 9298A-Q441234CNU  
CU: 9298A-Q415ECU  
Report No. 72146075C



### **SECTION 3**

#### **TEST EQUIPMENT USED**

### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| ID Number<br>(SDGE/SDRB)     | Test Equipment                      | Type        | Serial Number       | Manufacturer    | Cal Date                  | Cal Due Date |
|------------------------------|-------------------------------------|-------------|---------------------|-----------------|---------------------------|--------------|
| Antenna Conducted Port Setup |                                     |             |                     |                 |                           |              |
| 7608                         | Vector Signal Generator             | SMBV100A    | 259021              | Rhode & Schwarz | 10/10/19                  | 10/10/21     |
| 7582                         | Signal/Spectrum Analyzer            | FSW26       | 101614              | Rhode & Schwarz | 01/07/19                  | 01/07/20     |
| 7562                         | Wideband Radio Communication Tester | CMW 500     | 1201.0002k50/103829 | Rhode & Schwarz | For Signalling            |              |
| 8825                         | 20dB Attenuator                     | 46-20-34    | BK5773              | Weinschel Corp. | Verified by 7608 and 7582 |              |
| -                            | 10dB Attenuator                     | VAT-10W2+2W | N/A                 | MCL             | Verified by 7608 and 7582 |              |
| Miscellaneous                |                                     |             |                     |                 |                           |              |
| 43003                        | True RMS Multimeter                 | 85 III      | 96880143            | Fluke           | 10/07/19                  | 10/07/20     |
| 7619                         | Temp & Humidity Sensor              | iBTHX-W     | 15050268            | Omega           | 06/18/19                  | 06/18/20     |

### 3.2 MEASUREMENT UNCERTAINTY

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

#### 3.2.1 Conducted Antenna Port Measurement

|                               | Input Quantity (Contribution) $X_i$ | Value   | Prob. Dist. | Divisor | $u_i(x)$ | $u_i(x)^2$ |
|-------------------------------|-------------------------------------|---------|-------------|---------|----------|------------|
| 1                             | Receiver reading                    | 0.10 dB | Normal, k=1 | 1.000   | 0.10     | 0.01       |
| 2                             | Cable attenuation                   | 1.00 dB | Normal, k=2 | 2.000   | 0.50     | 0.25       |
| 3                             | Receiver sinewave accuracy          | 0.08 dB | Normal, k=2 | 2.000   | 0.04     | 0.00       |
| 4                             | Receiver pulse amplitude            | 0.00 dB | Rectangular | 1.732   | 0.00     | 0.00       |
| 5                             | Receiver pulse repetition rate      | 0.00 dB | Rectangular | 1.732   | 0.00     | 0.00       |
| 6                             | Noise floor proximity               | 0.00 dB | Rectangular | 1.732   | 0.00     | 0.00       |
| 7                             | Frequency interpolation             | 0.10 dB | Rectangular | 1.732   | 0.06     | 0.00       |
| 8                             | Mismatch                            | 0.07 dB | U-shaped    | 1.414   | 0.05     | 0.00       |
|                               |                                     |         |             |         |          |            |
| Combined standard uncertainty |                                     |         | Normal      | 0.52    | dB       |            |
| Expanded uncertainty          |                                     |         | Normal, k=2 | 1.03    | dB       |            |

FCC ID: NU: YETQ44-1234CNU  
CU: YETQ41-5ECU  
IC: NU: 9298A-Q441234CNU  
CU: 9298A-Q415ECU  
Report No. 72146075C



## **SECTION 4**

### **DIAGRAM OF TEST SETUP**

FCC ID: NU: YETQ44-1234CNU  
CU: YETQ41-5ECU  
IC: NU: 9298A-Q441234CNU  
CU: 9298A-Q415ECU  
Report No. 72146075C



#### **4.1 TEST SETUP DIAGRAM**

**Notes:** All tests were done on the bench (conducted). Please refer to Section 1.4.4 of this test report for more details.

FCC ID: NU: YETQ44-1234CNU  
CU: YETQ41-5ECU  
IC: NU: 9298A-Q441234CNU  
CU: 9298A-Q415ECU  
Report No. 72146075C



## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and TÜV SÜD America, Inc., extracts from the test report shall not be reproduced, except in full without TÜV SÜD America, Inc.'s written approval.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

TÜV SÜD America, Inc. and its professional staff hold government and professional organization certifications for AAMI, ACIL, AEA, ANSI, IEEE, A2LA, NIST and VCCI.



A2LA Cert. No. 2955.13

