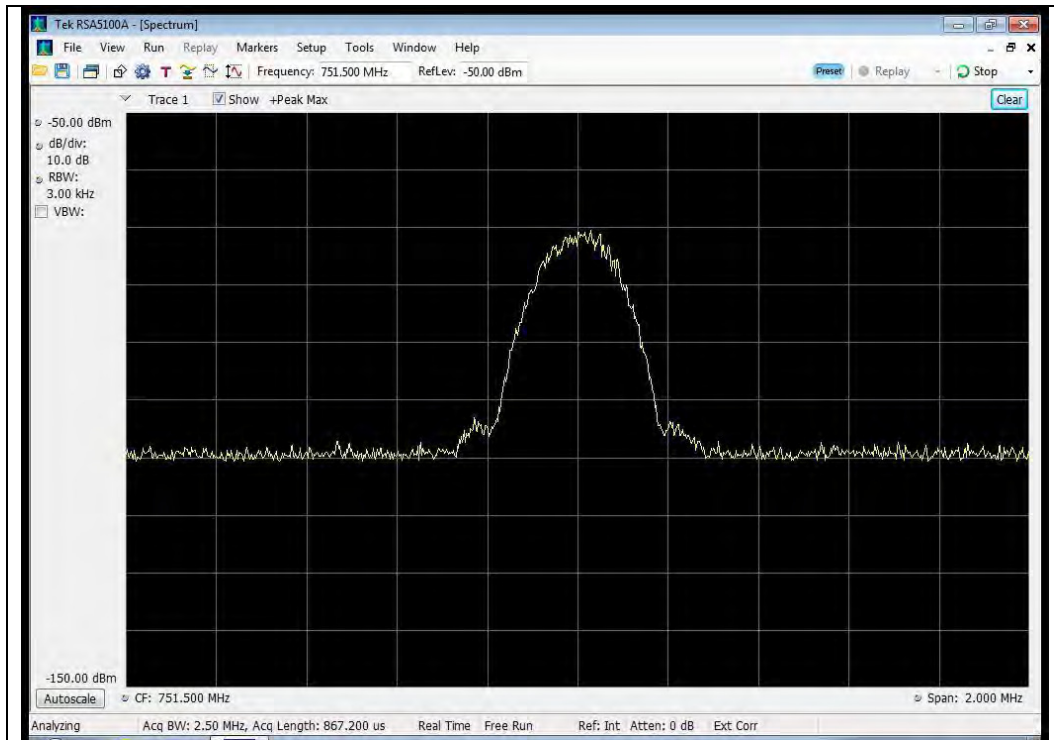
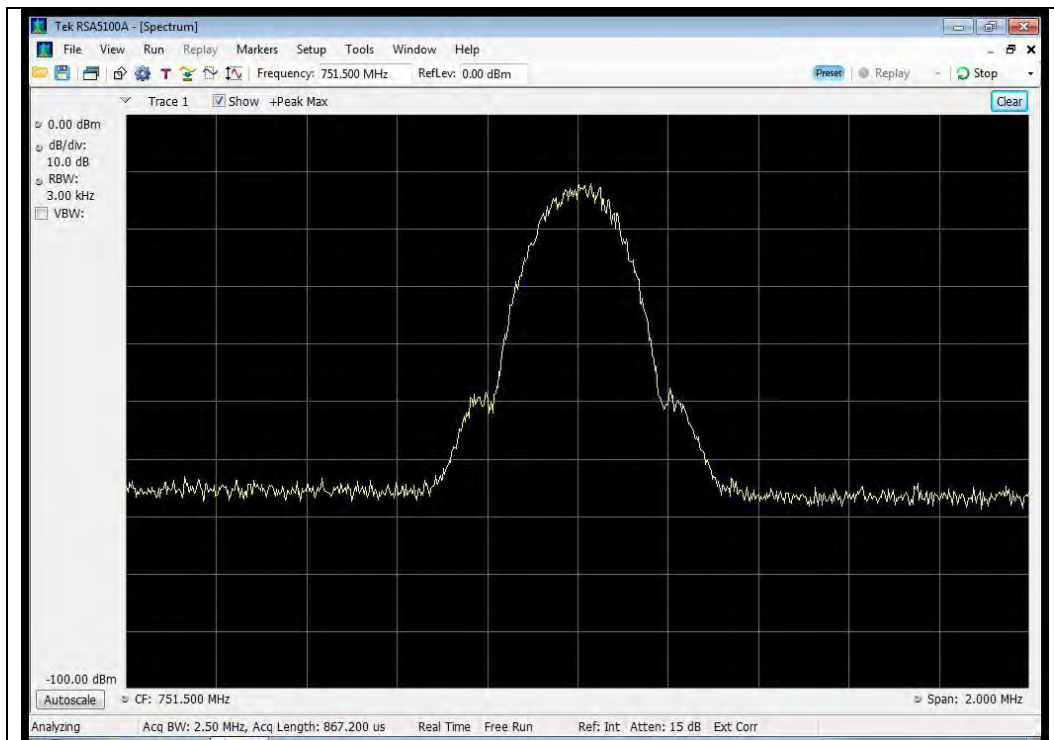


## 746 - 757 MHz Band

### Input

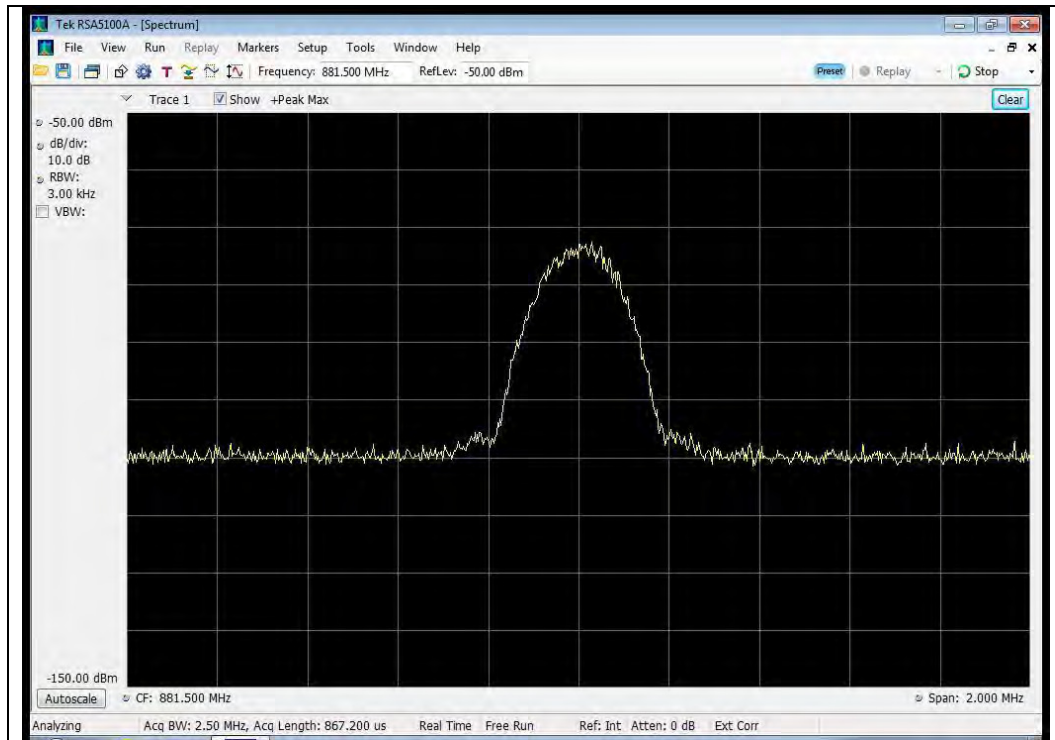


### Output

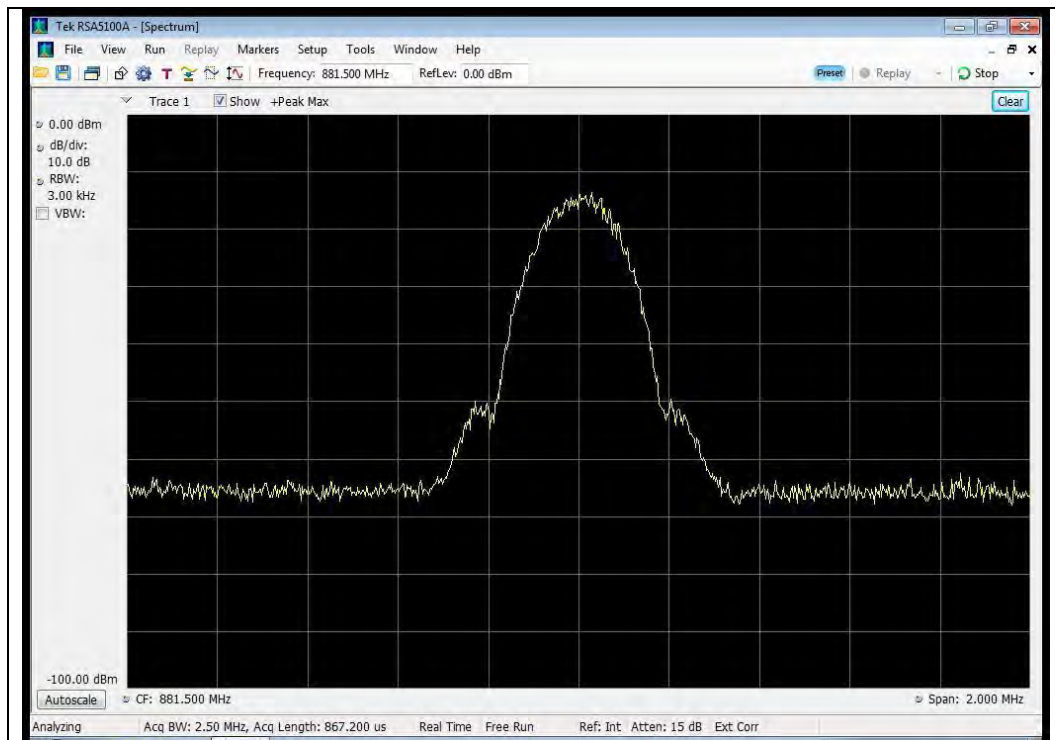


## 869 - 894 MHz Band

### Input

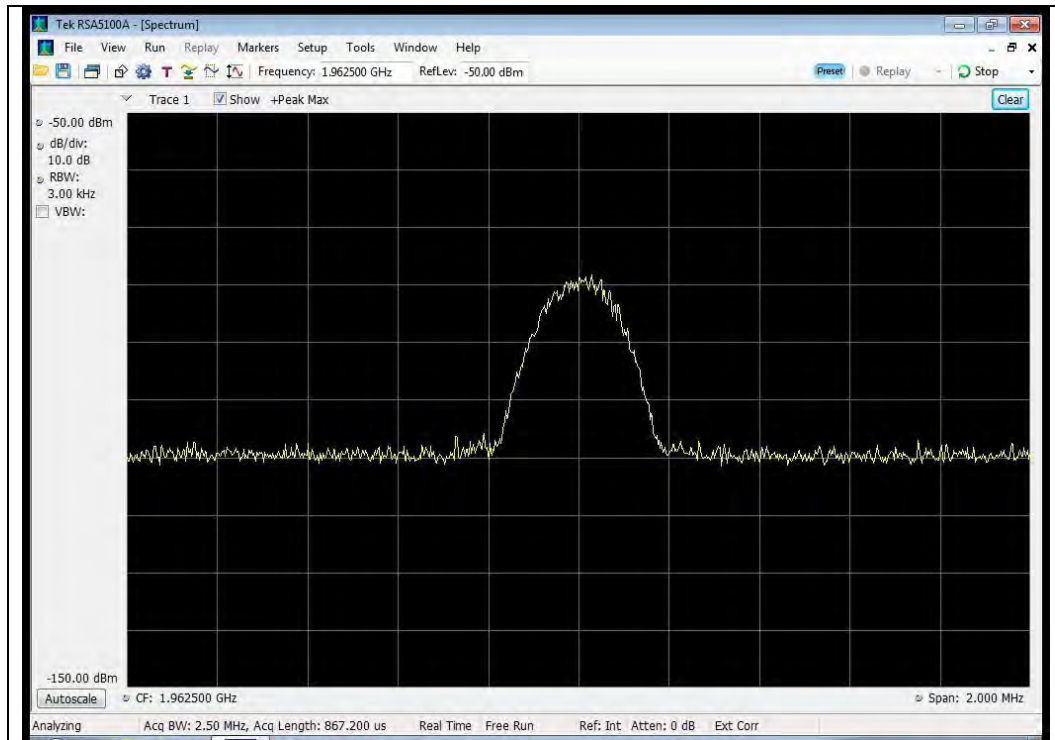


### Output

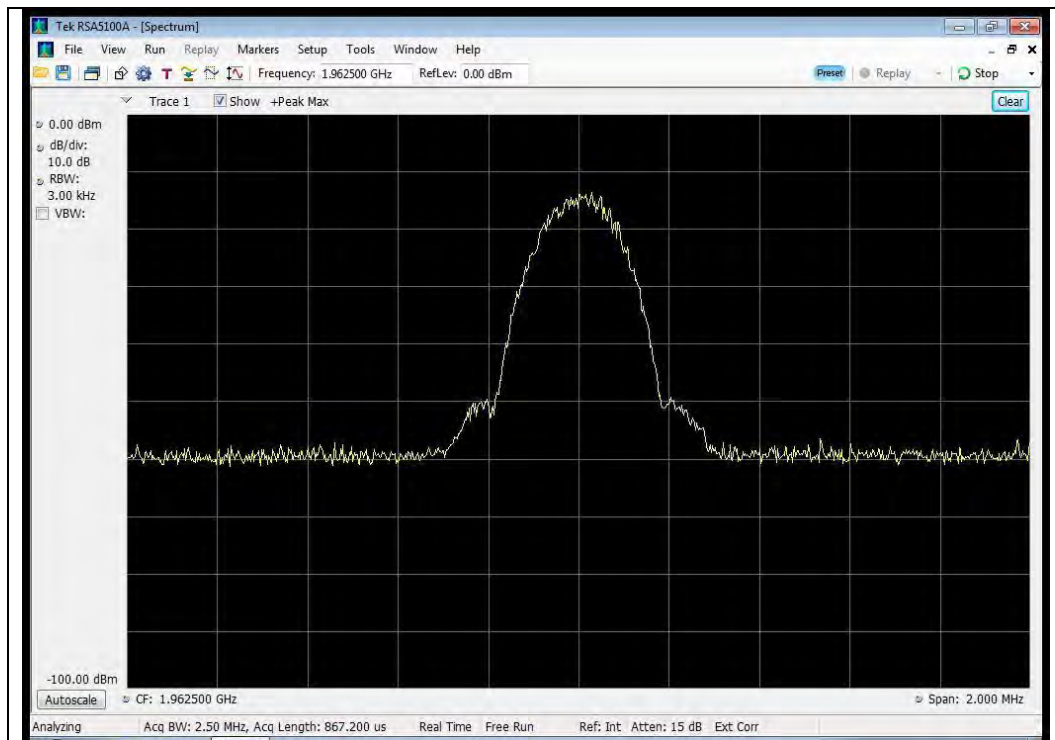


## 1930 - 1995 MHz Band

### Input

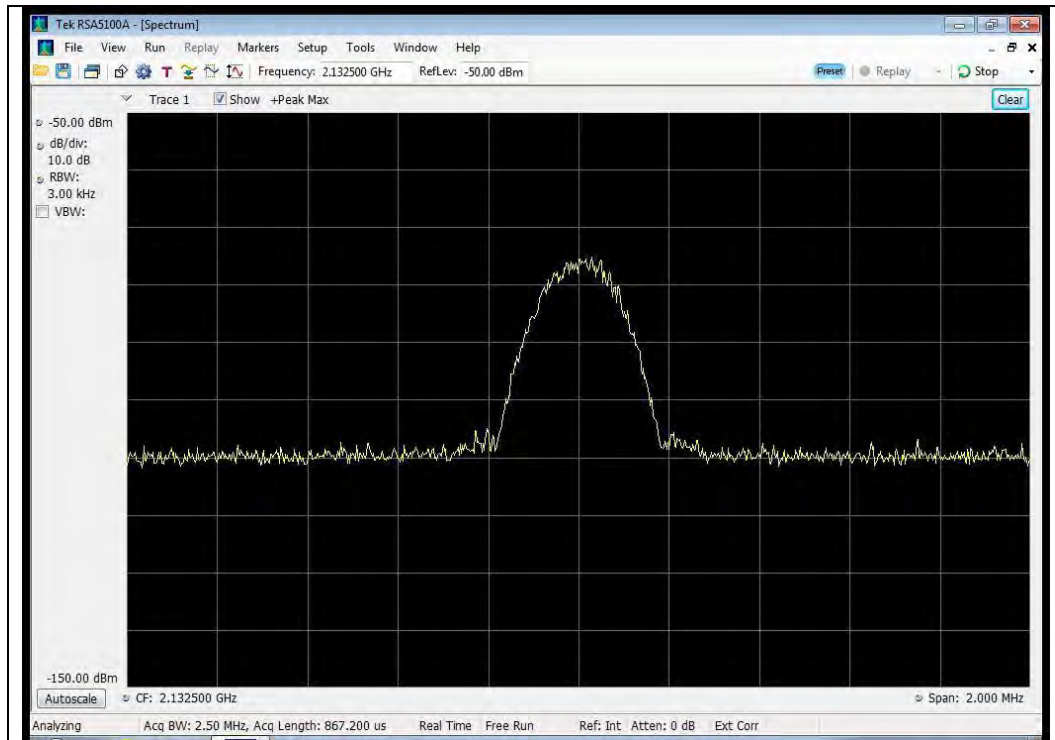


### Output

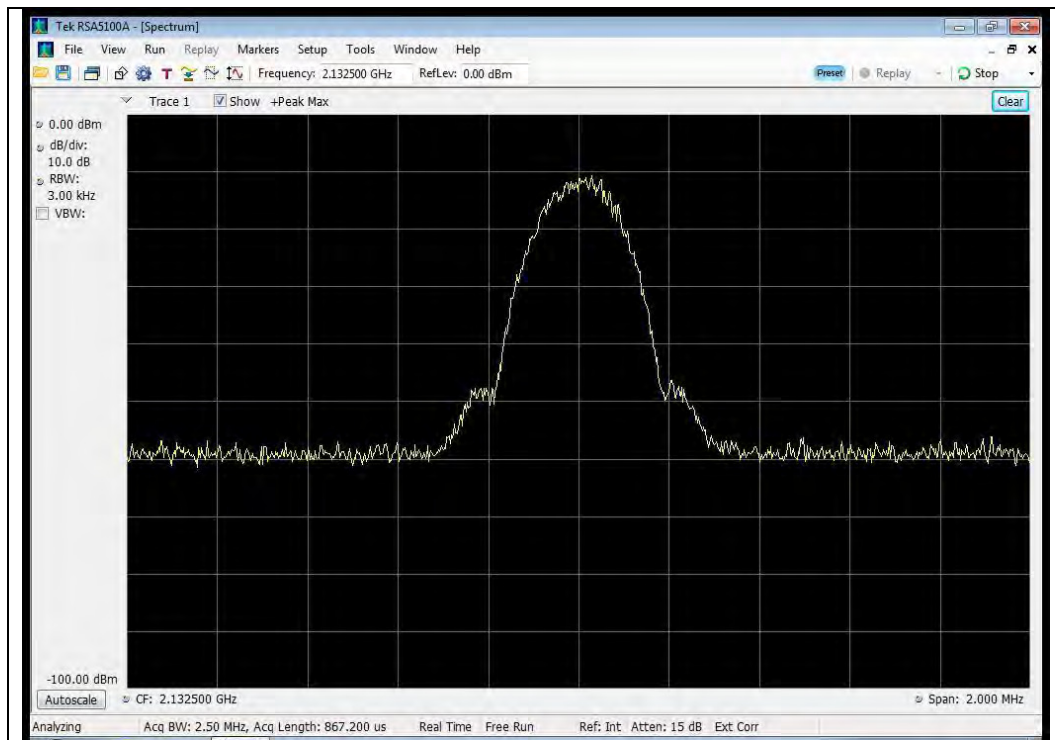


## 2110 - 2155 MHz Band

### Input



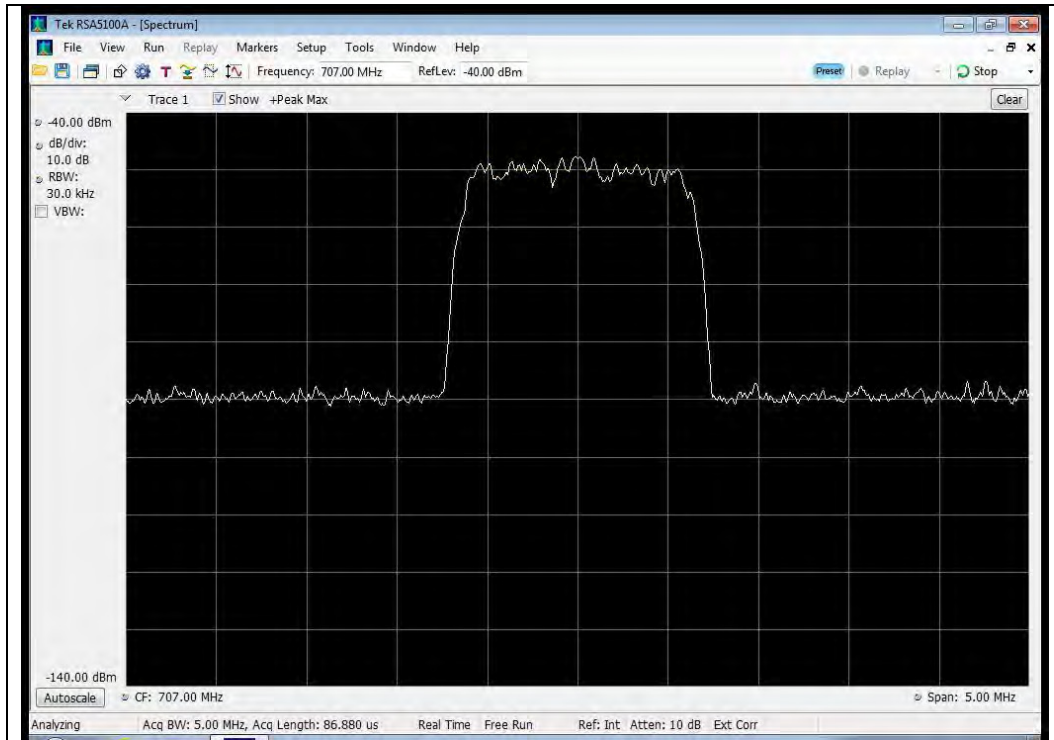
### Output



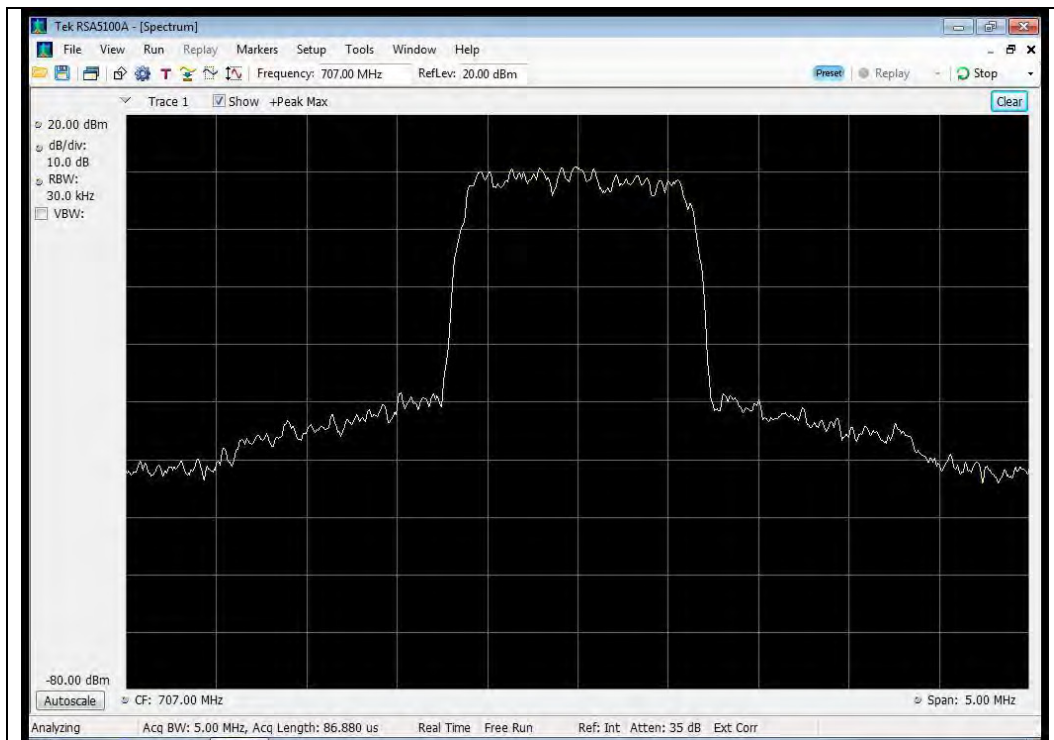
## CDMA Uplink Test Plots

698 - 716 MHz Band

Input

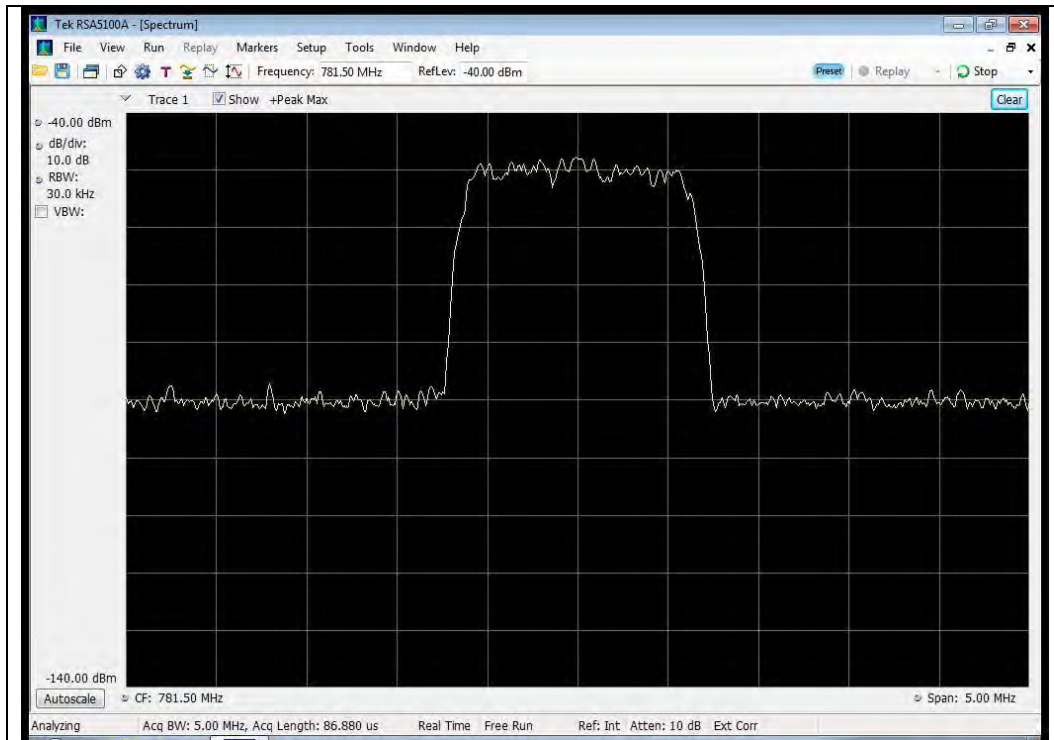


Output

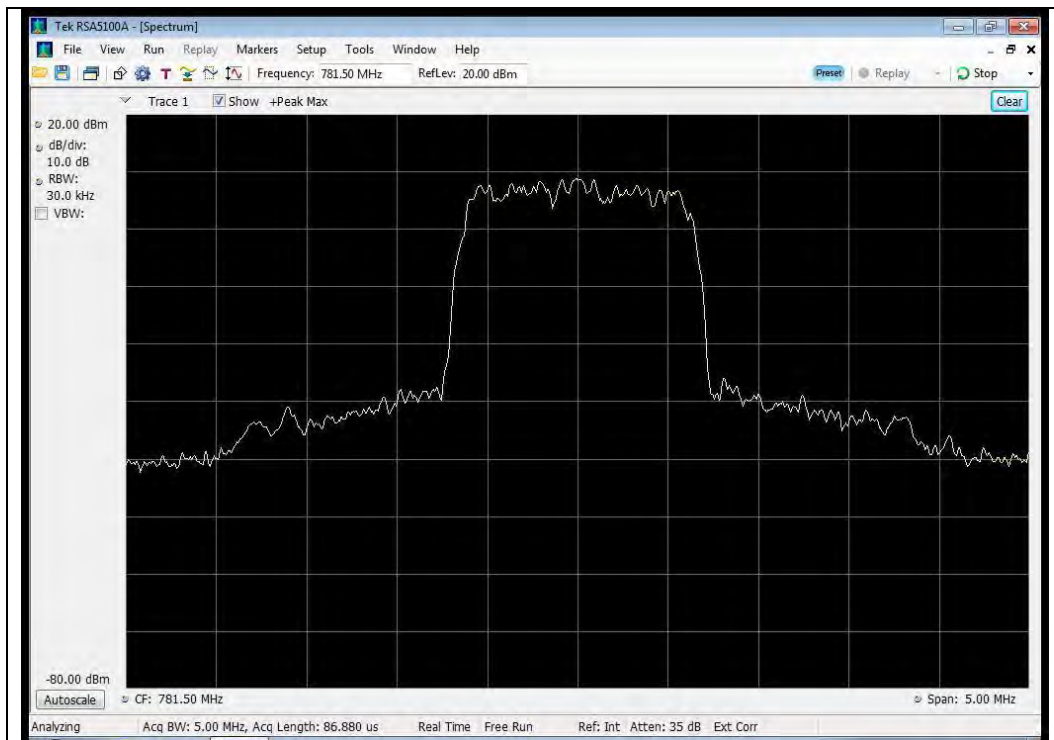


## 776 - 787 MHz Band

### Input

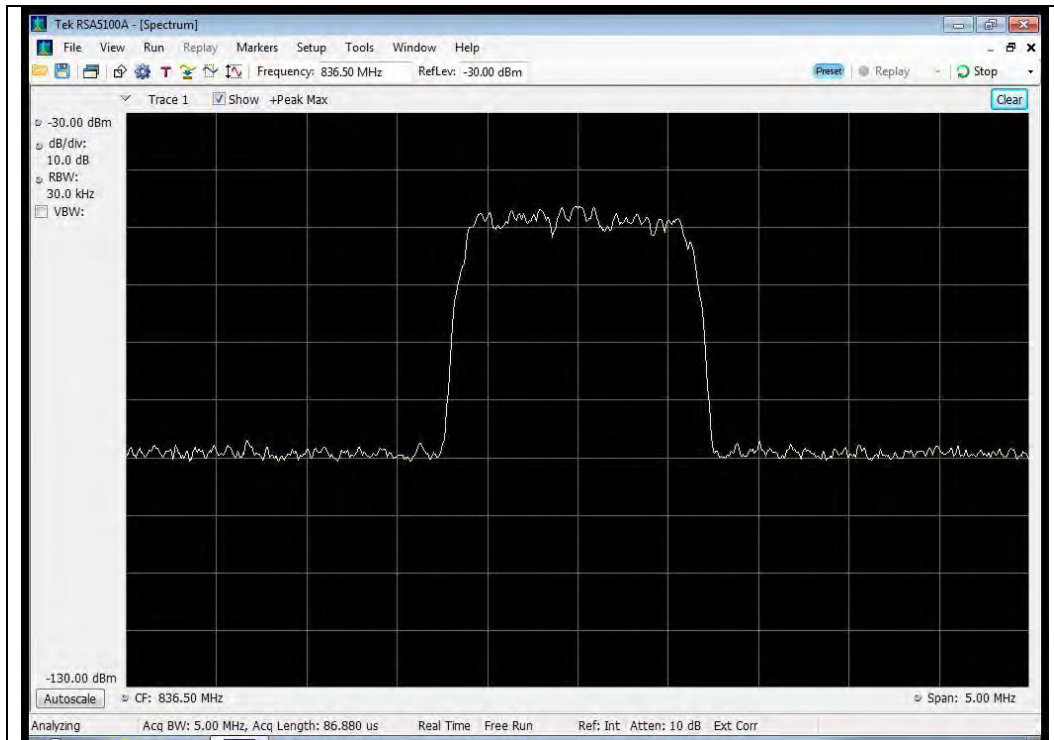


### Output

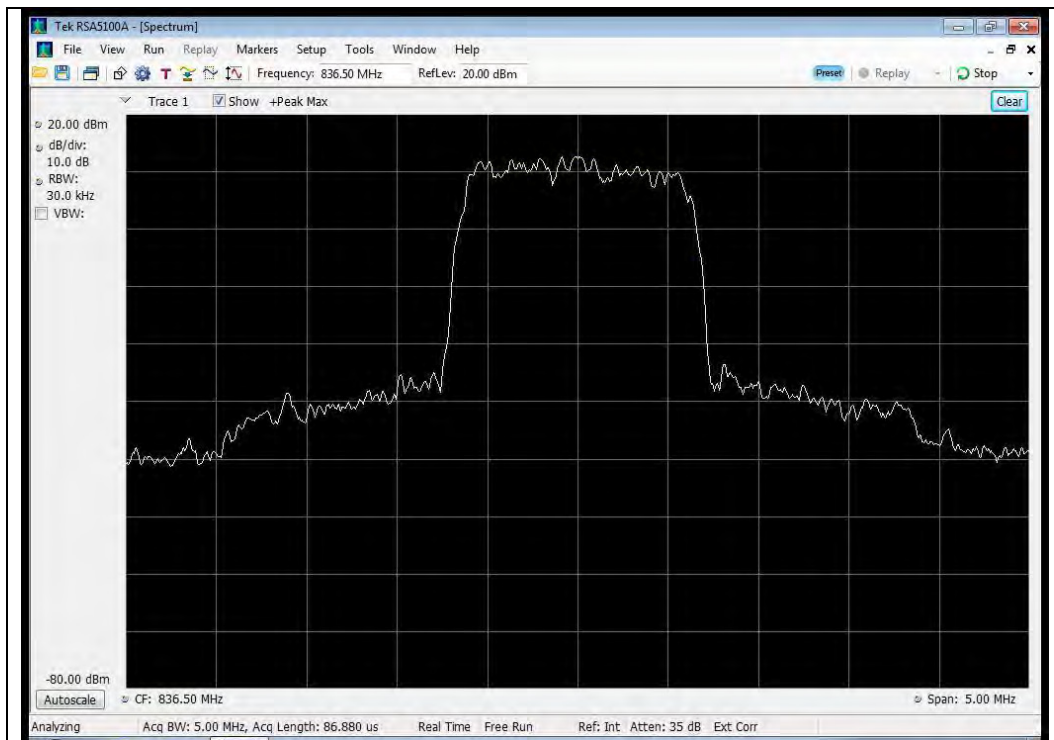


## 824 - 849 MHz Band

### Input

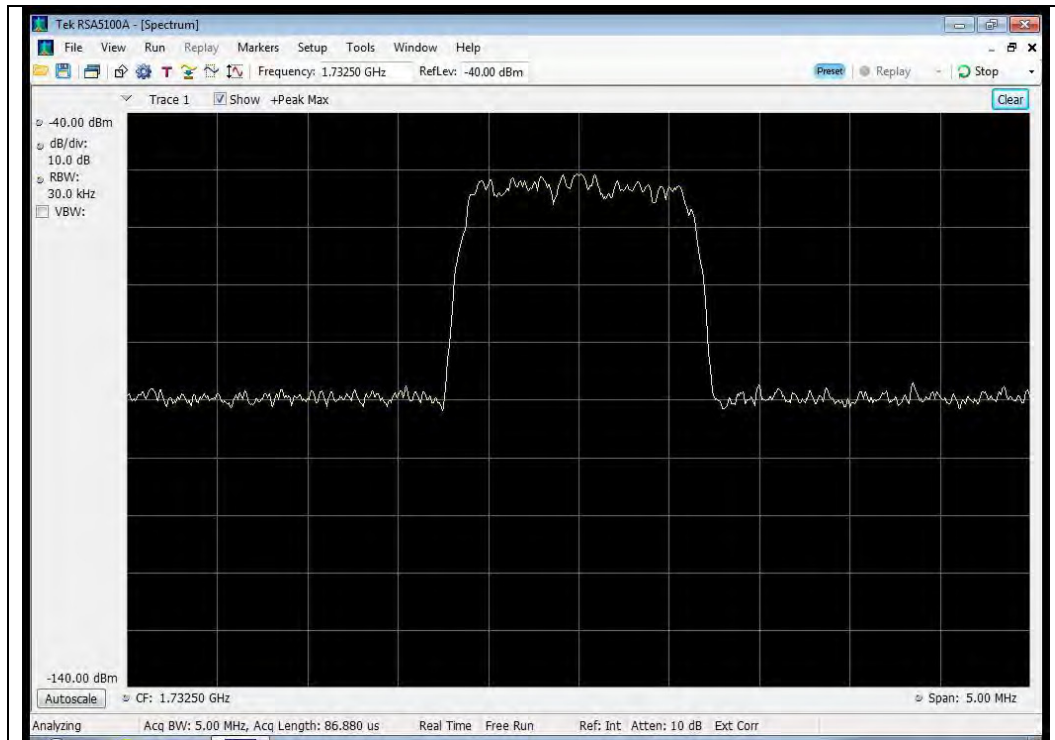


### Output

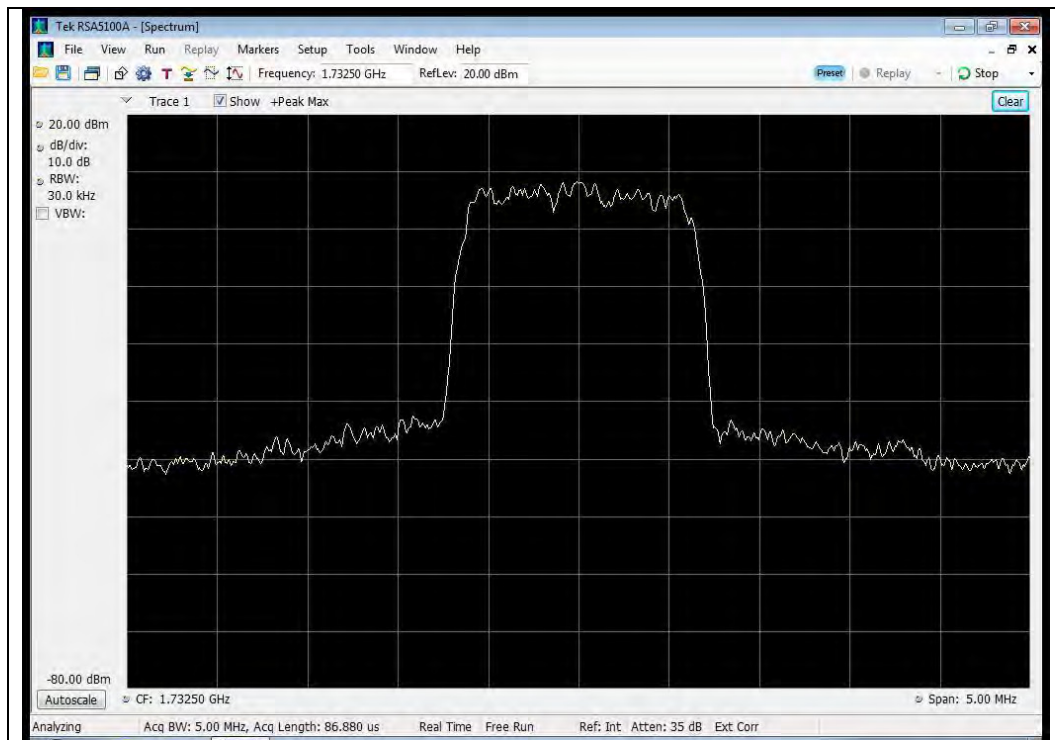


## 1710 - 1755 MHz Band

### Input

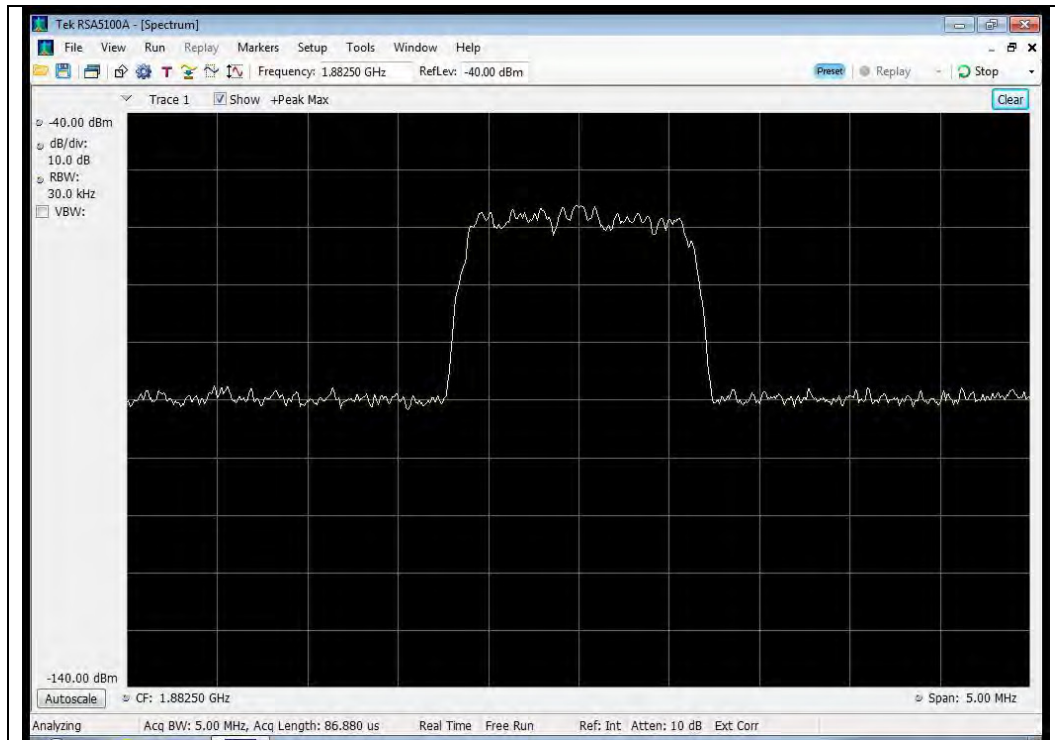


### Output

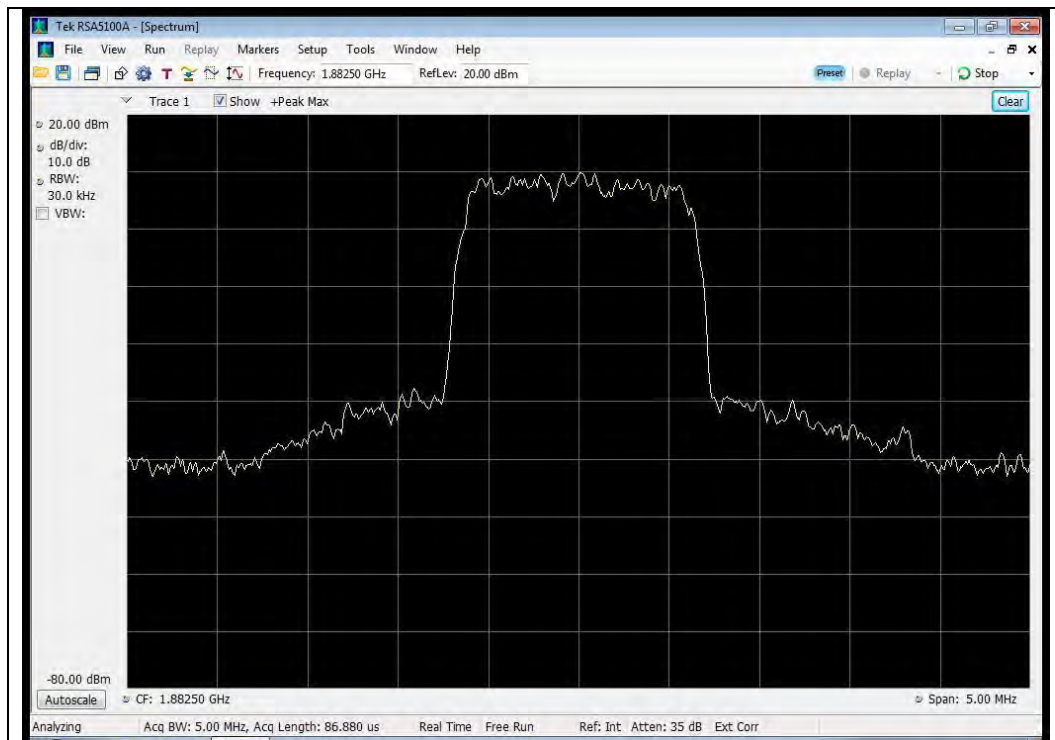


## 1850 - 1915 MHz Band

### Input



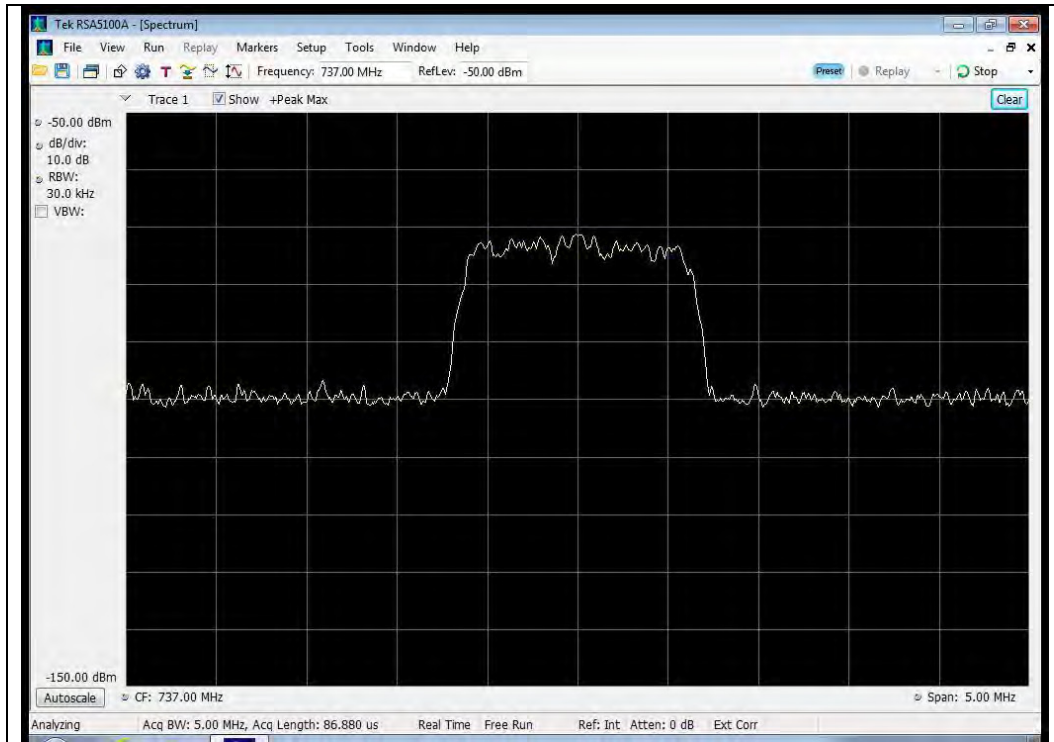
### Output



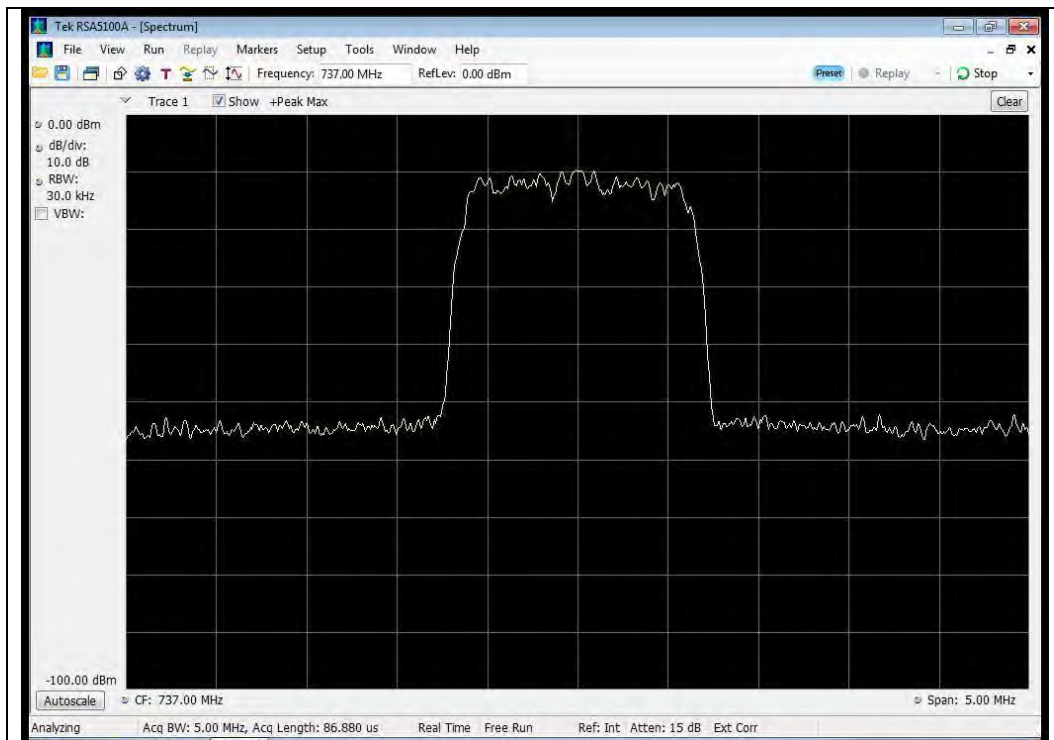
## CDMA Downlink Test Plots

728 - 746 MHz Band

Input

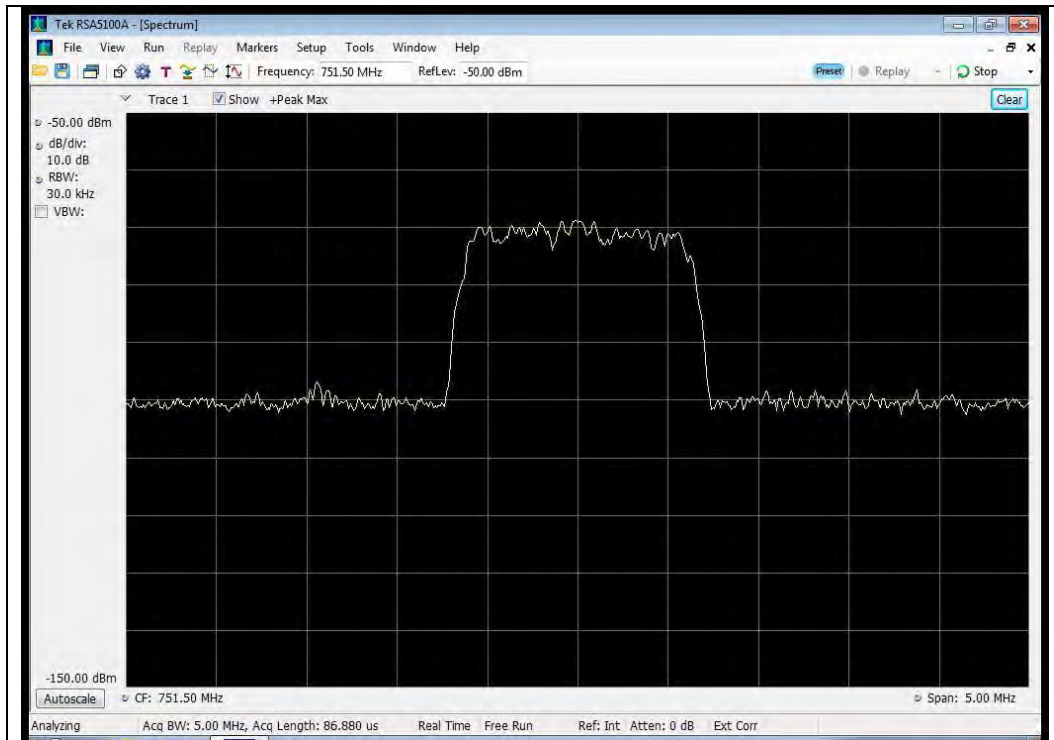


Output

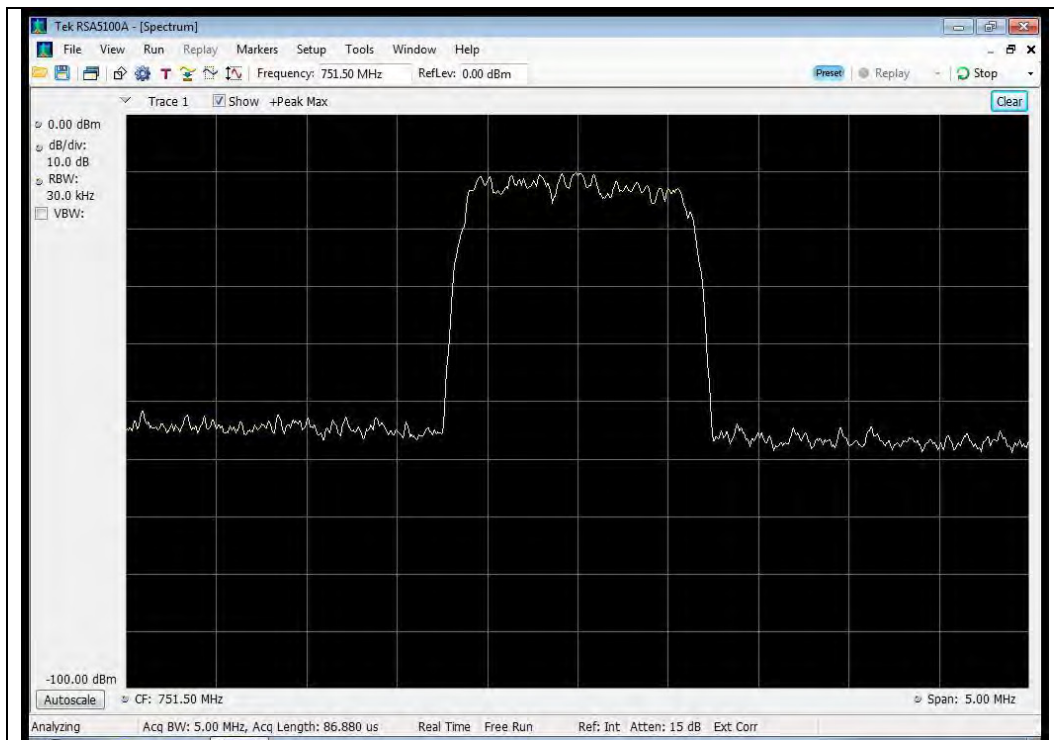


## 746 - 757 MHz Band

### Input

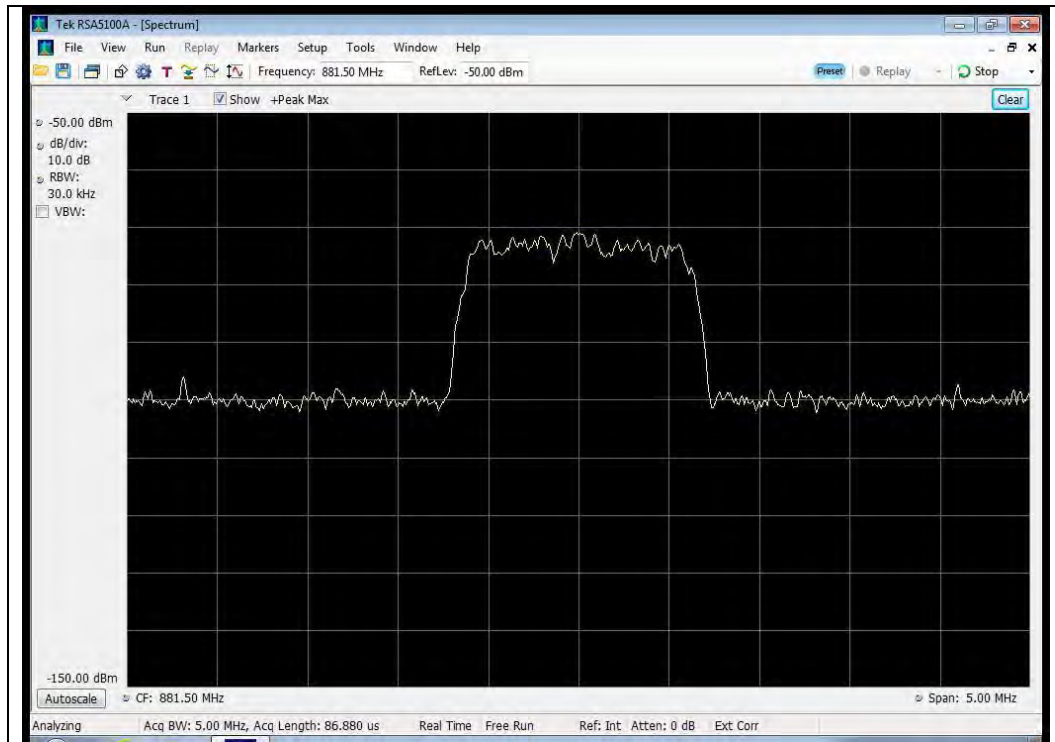


### Output

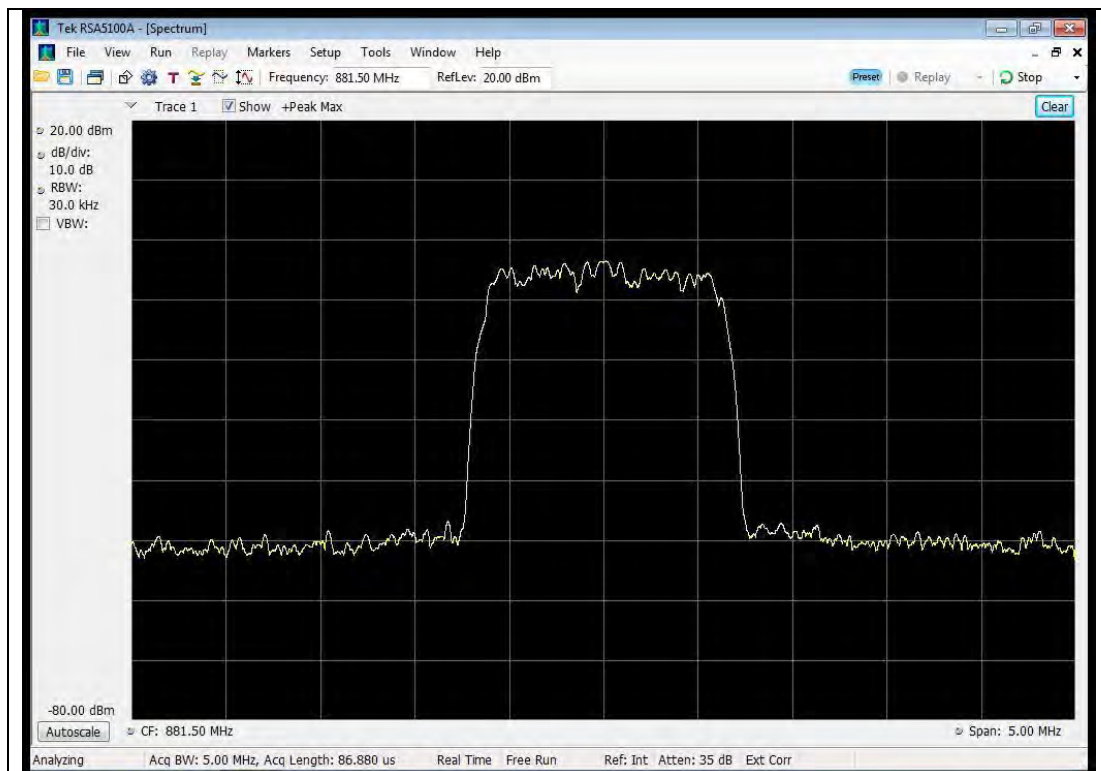


## 869 - 894 MHz Band

### Input

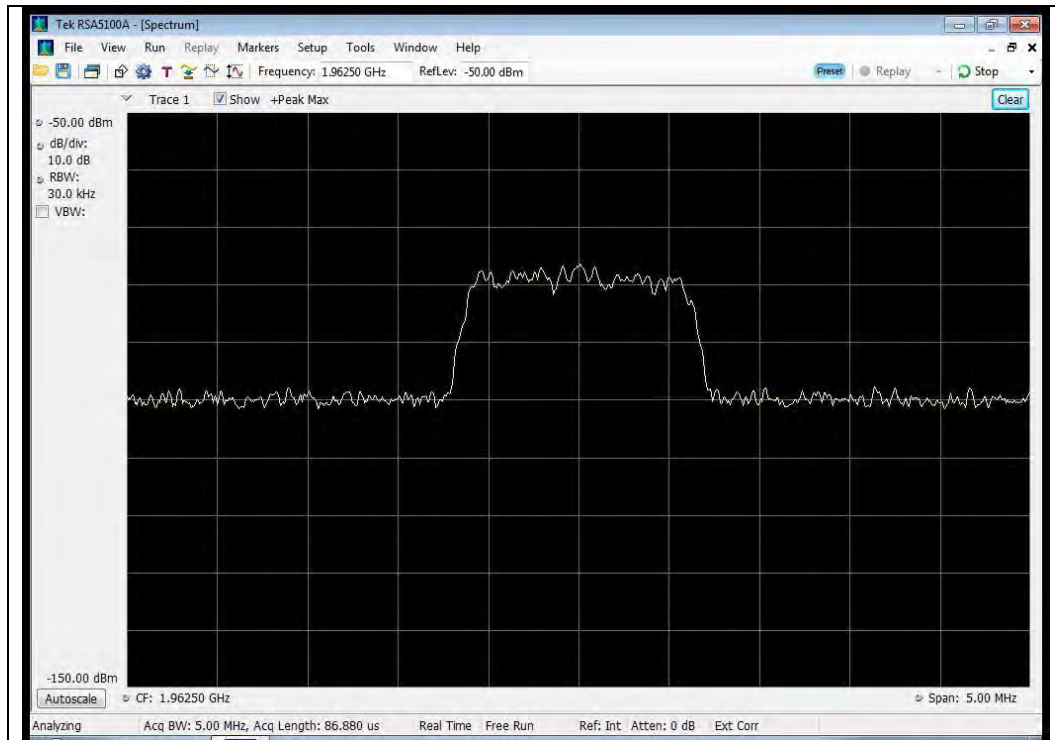


### Output

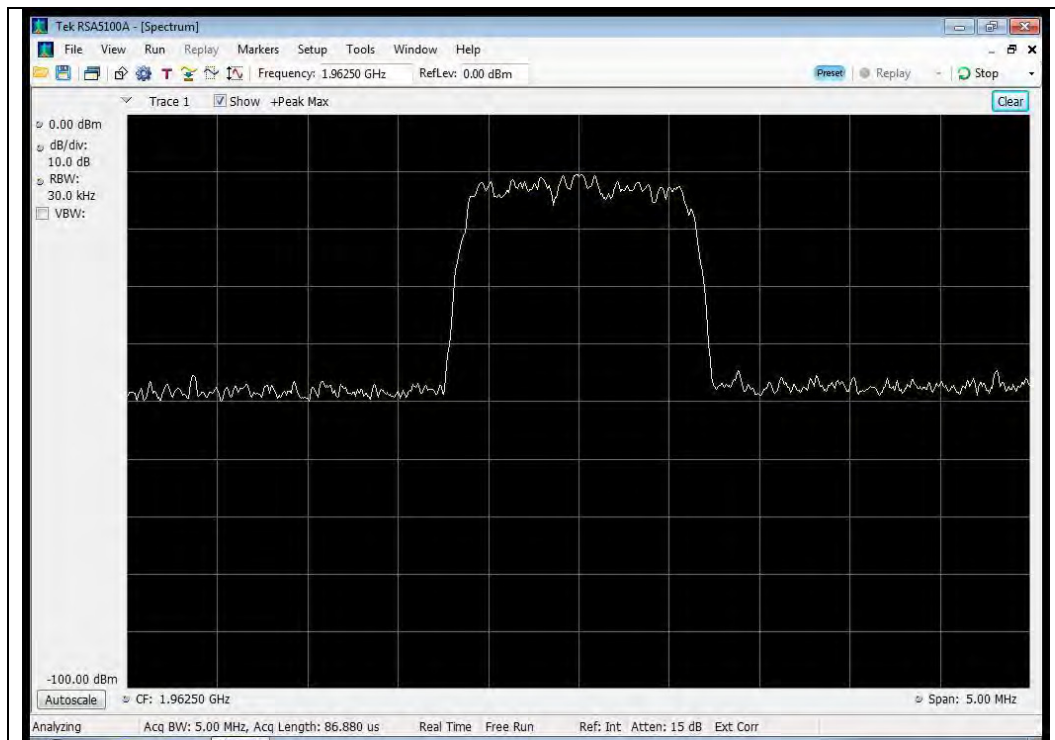


## 1930 - 1995 MHz Band

### Input

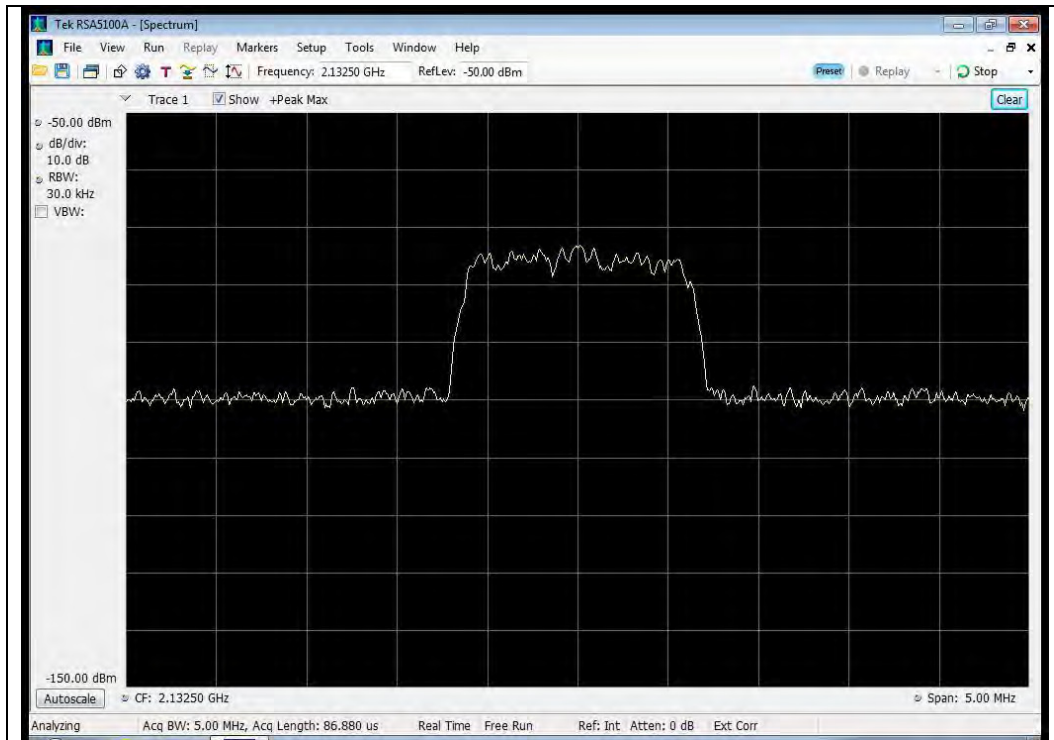


### Output

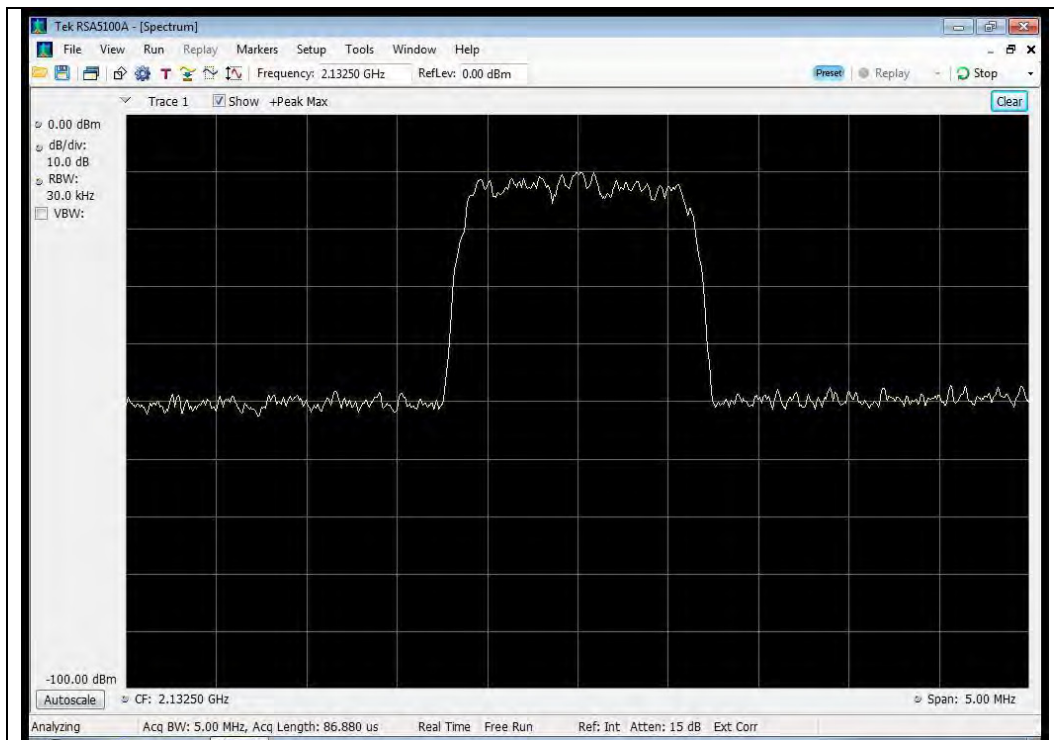


## 2110 - 2155 MHz Band

### Input



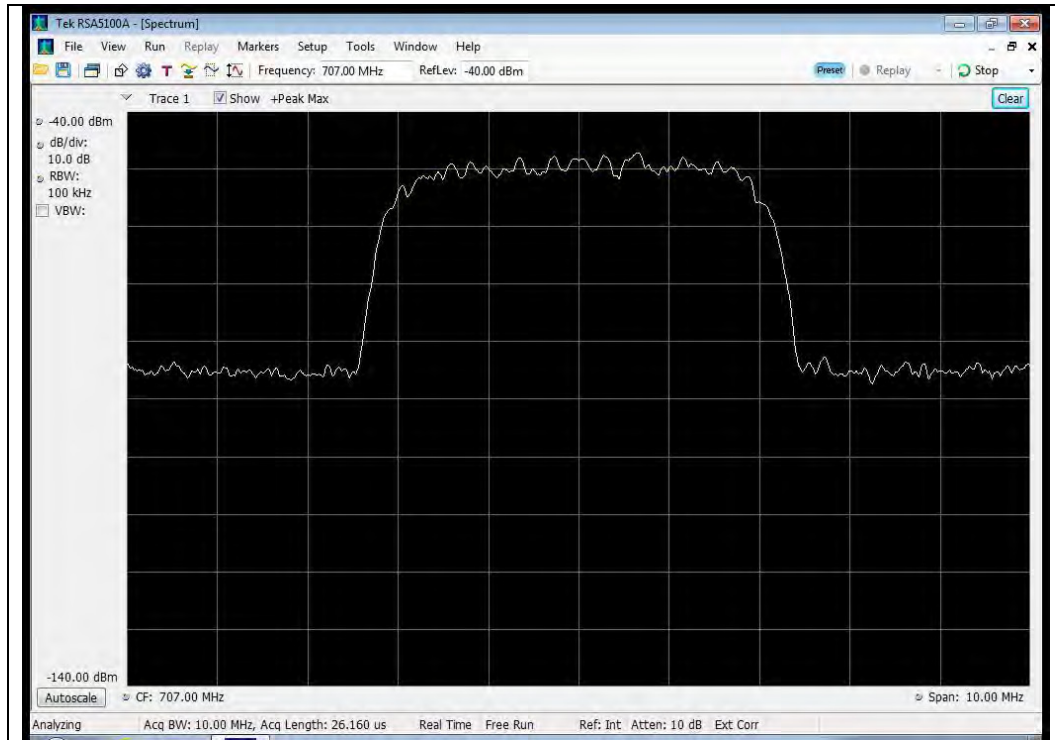
### Output



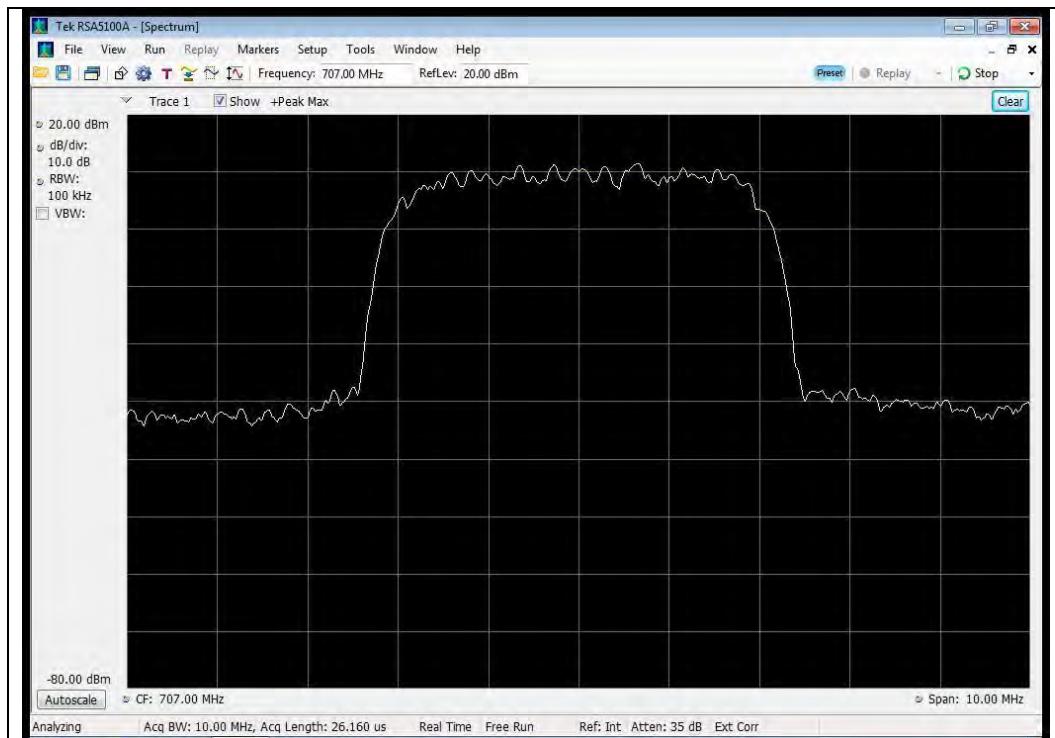
## WCDMA Uplink Test Plots

698 - 716 MHz Band

Input

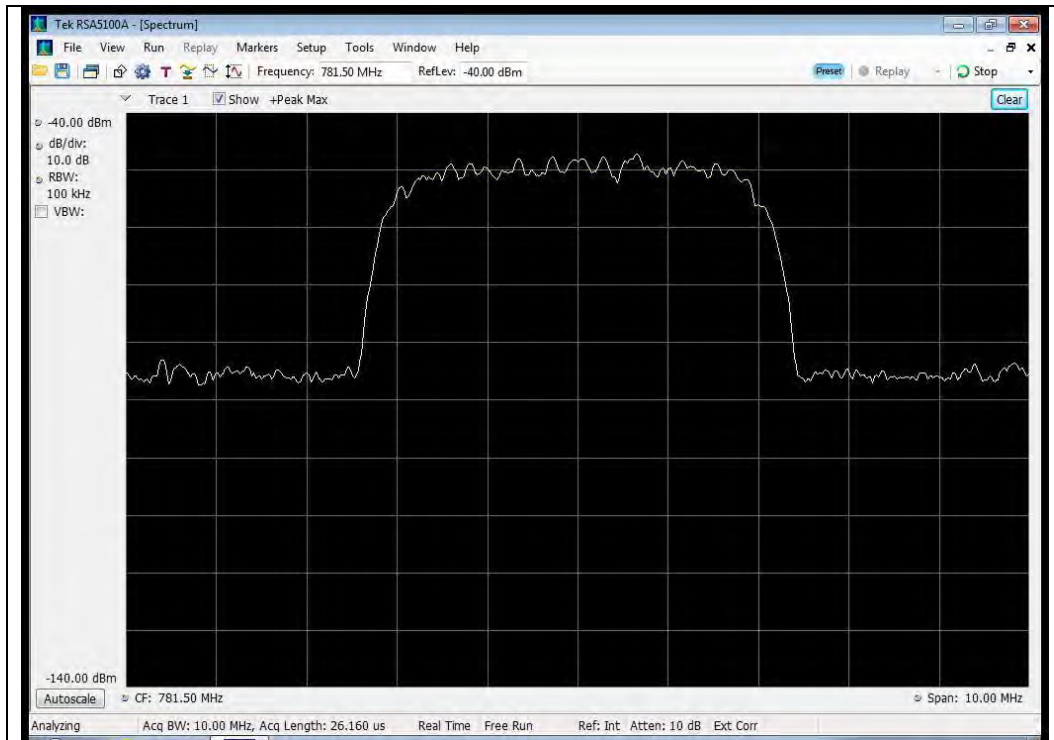


Output

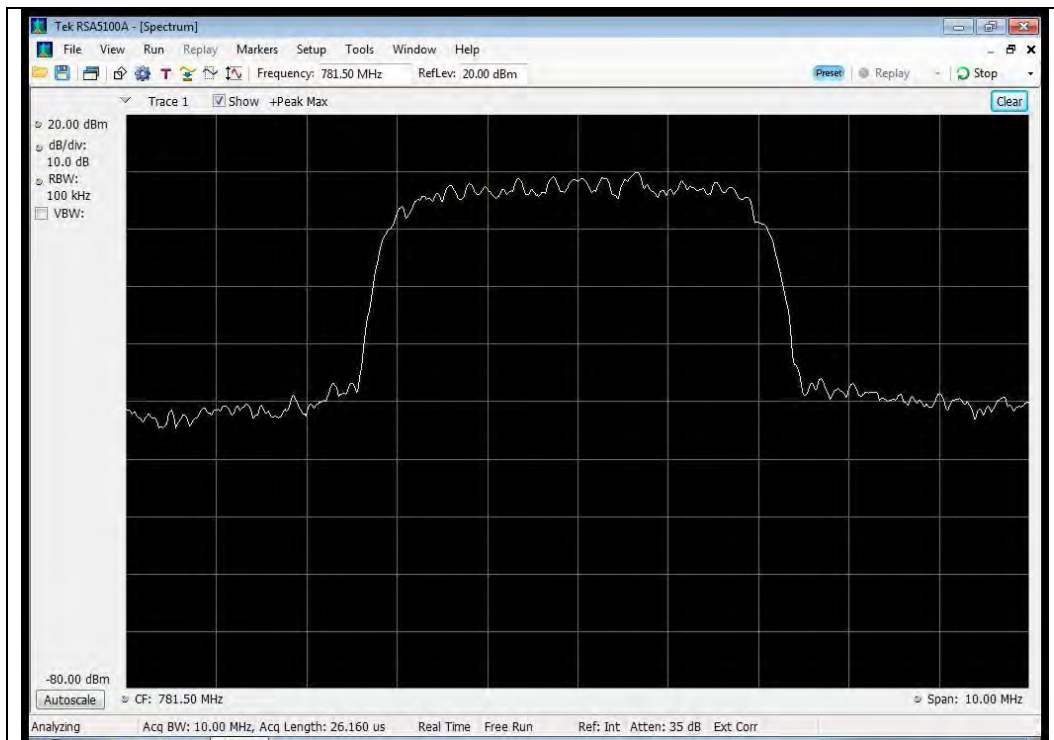


## 776 - 787 MHz Band

### Input

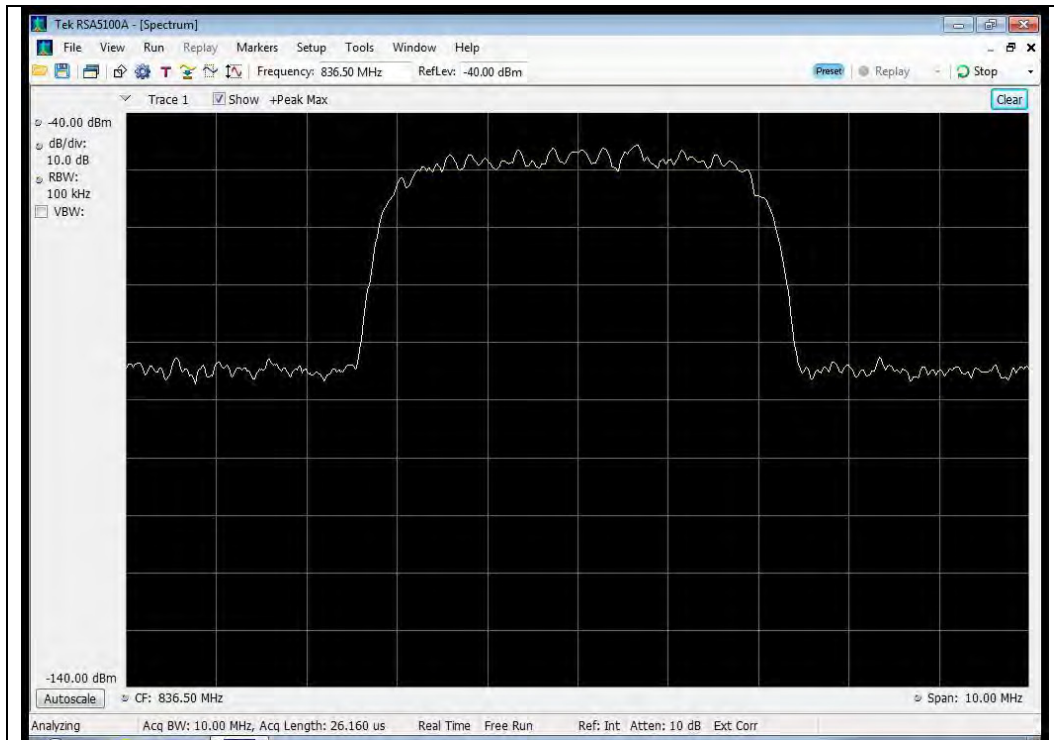


### Output

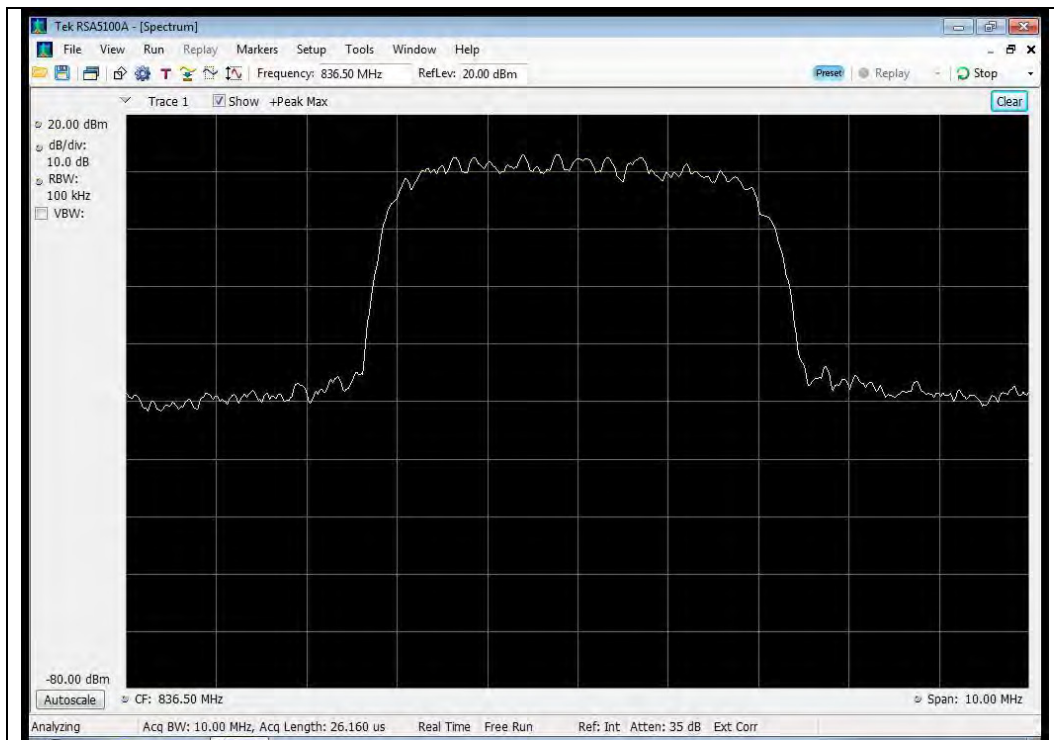


## 824 - 849 MHz Band

### Input

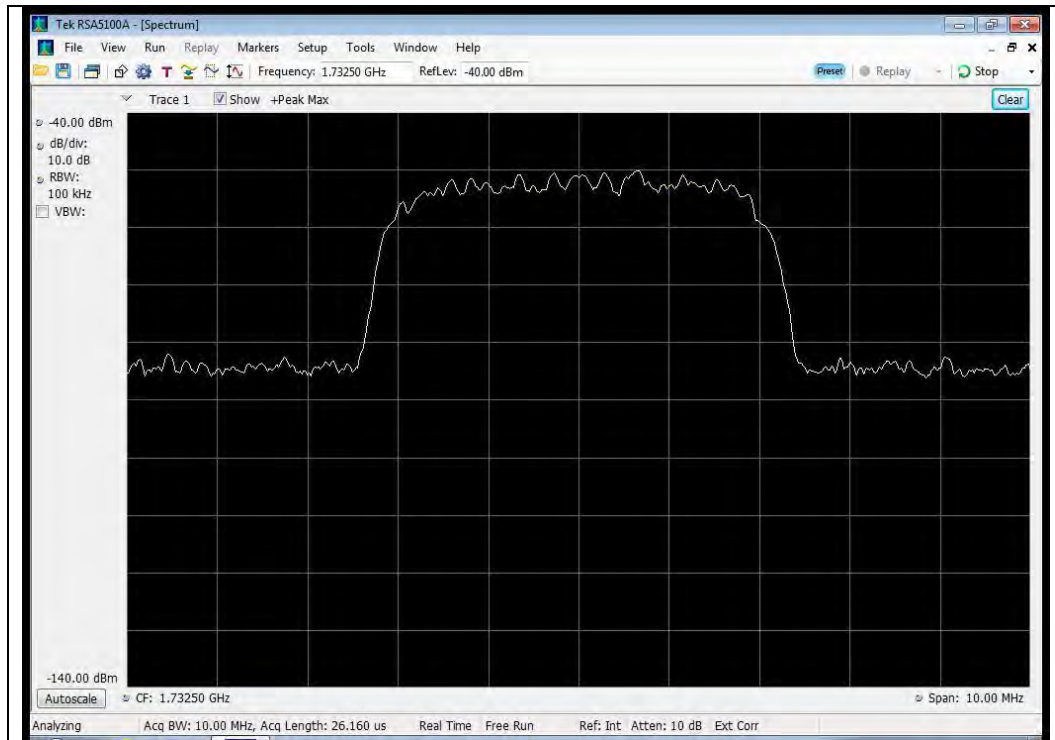


### Output

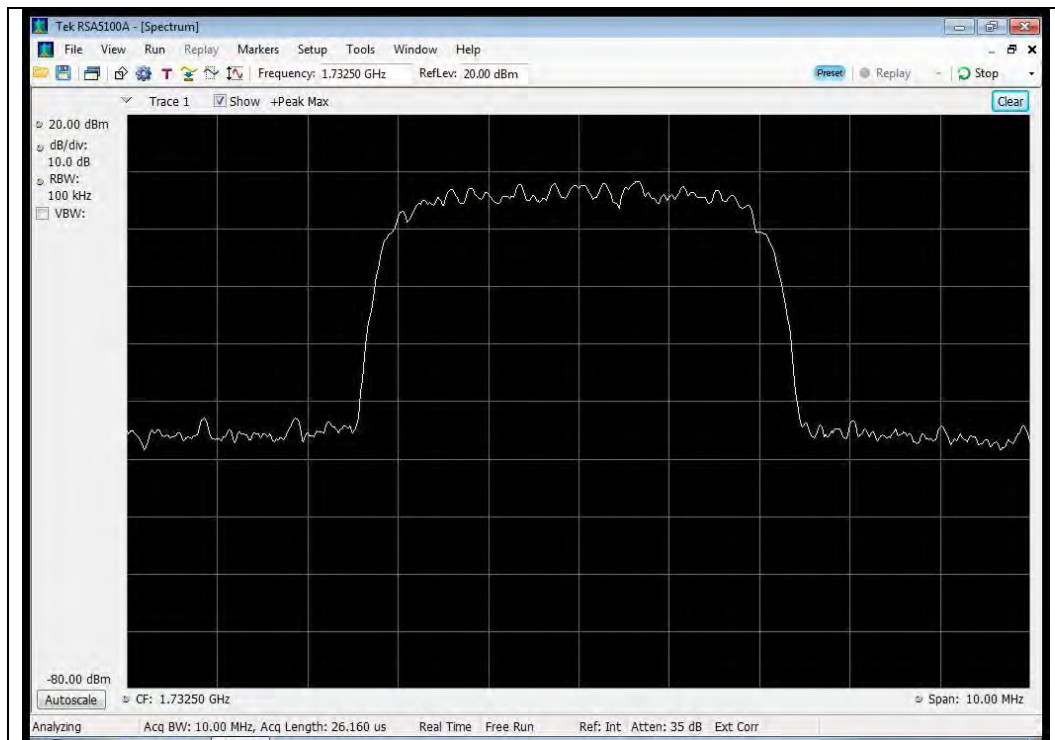


## 1710 - 1755 MHz Band

### Input

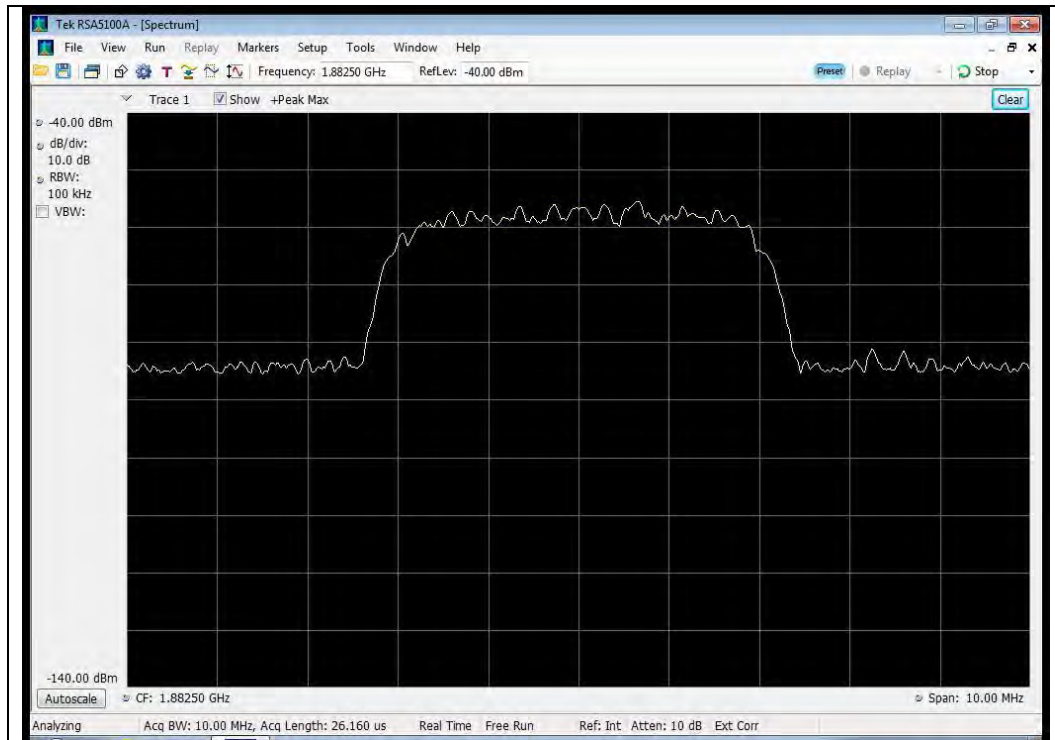


### Output

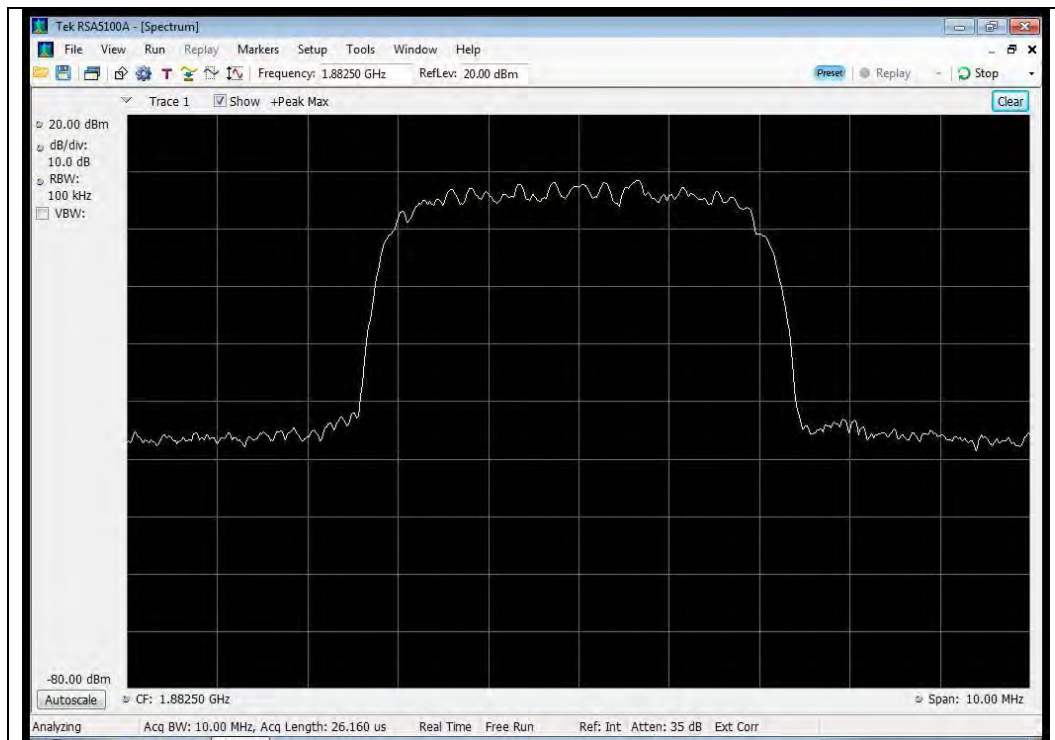


## 1850 - 1915 MHz Band

### Input



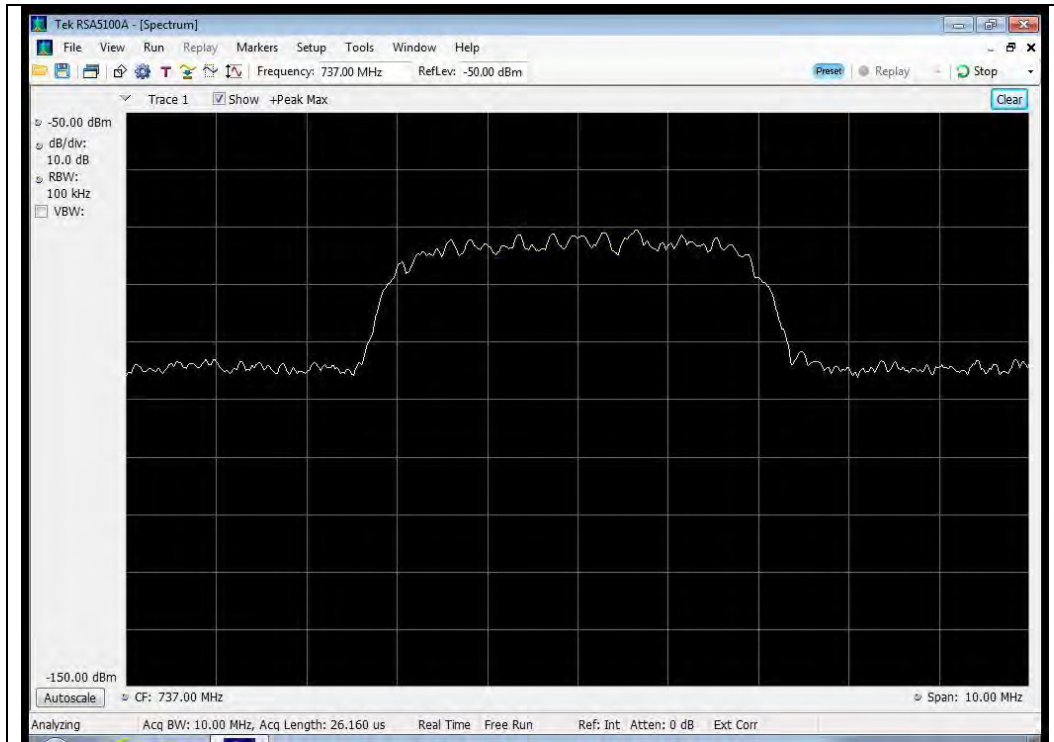
### Output



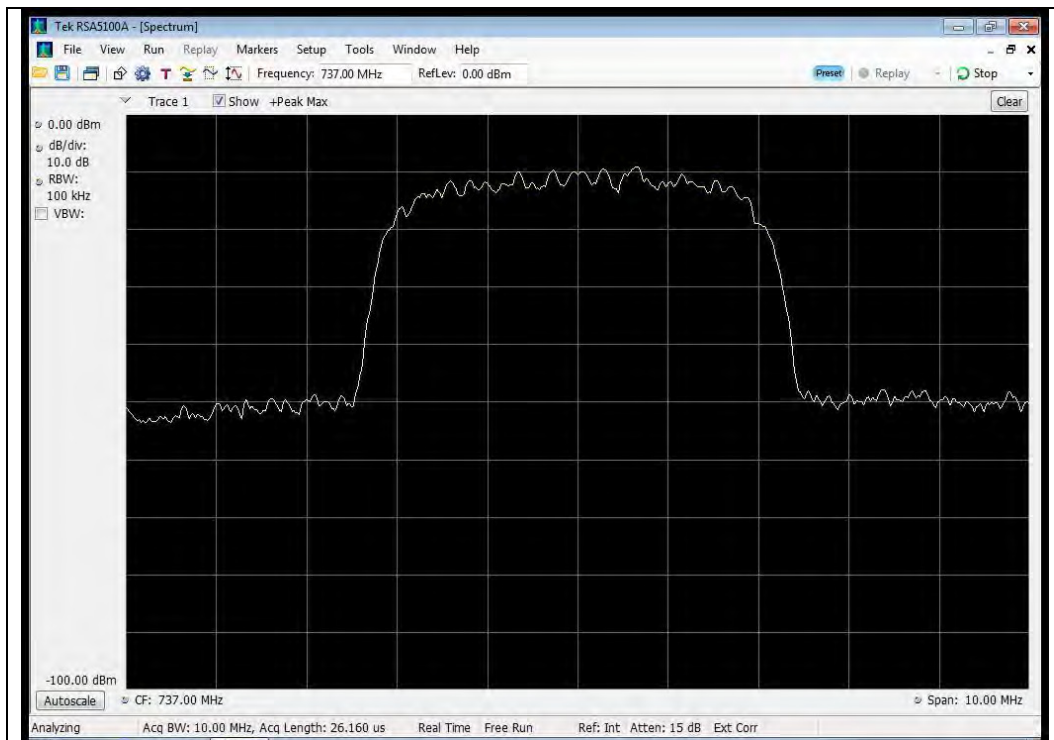
## WCDMA Downlink Test Plots

728 - 746 MHz Band

Input

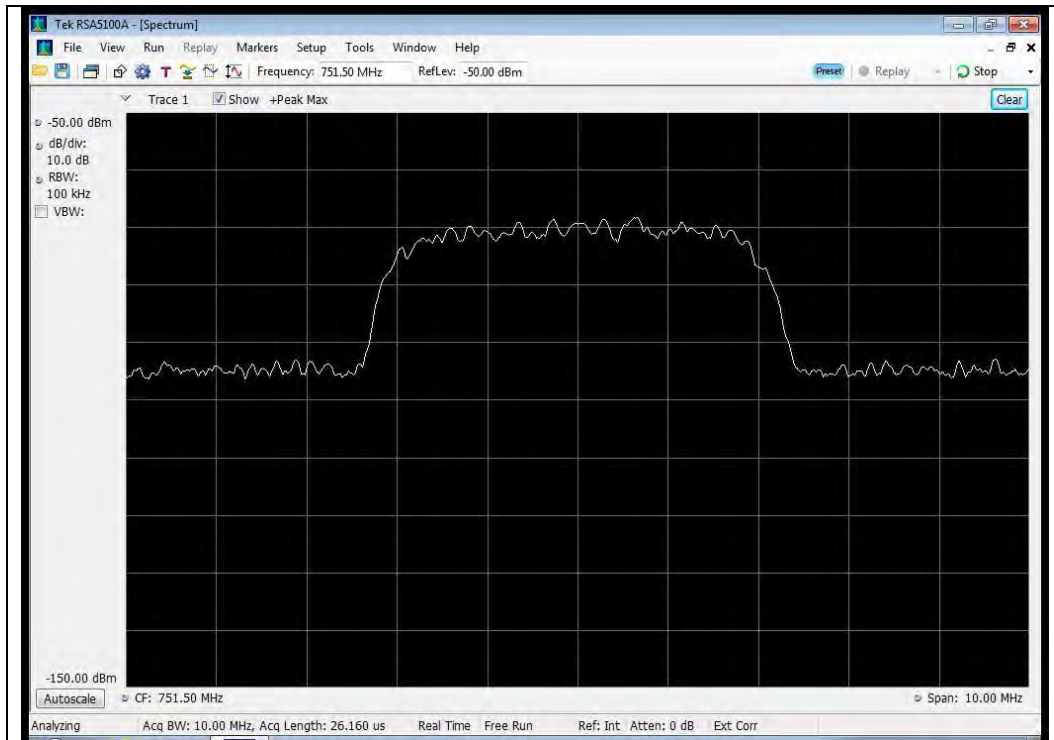


Output

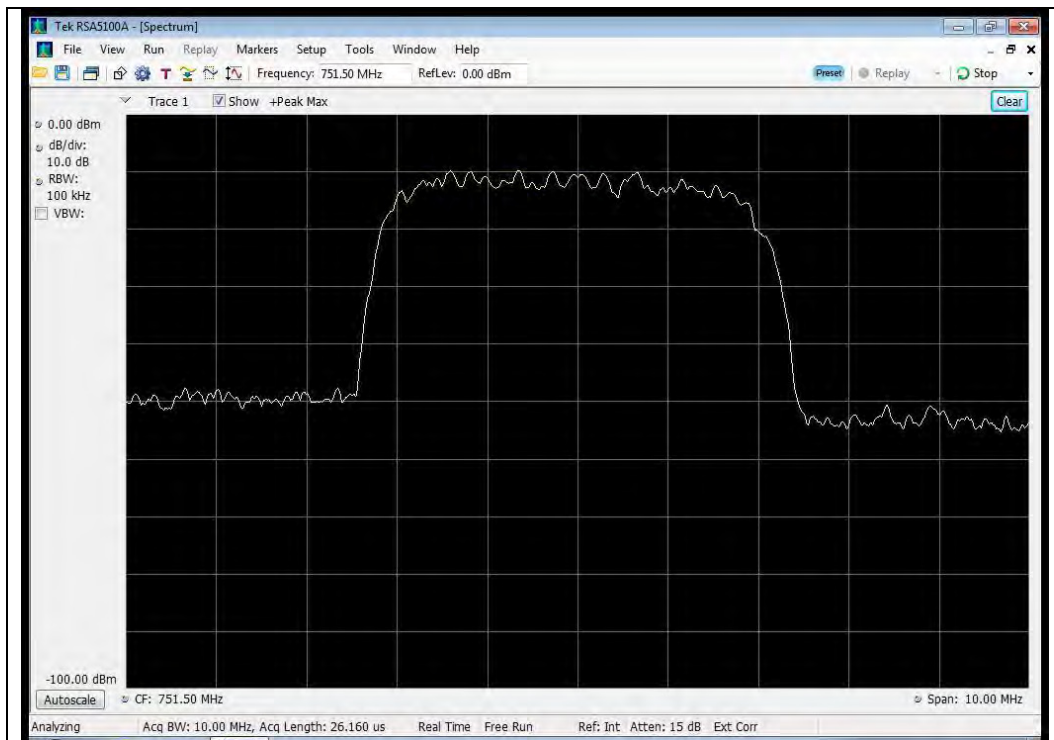


## 746 - 757 MHz Band

### Input

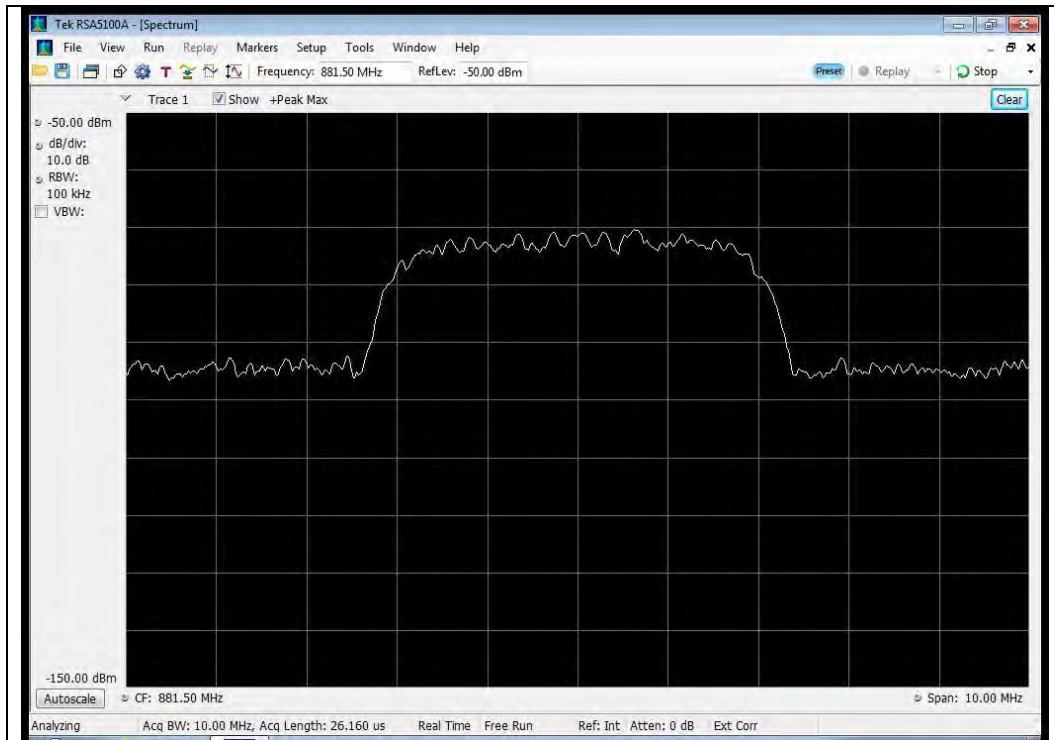


### Output

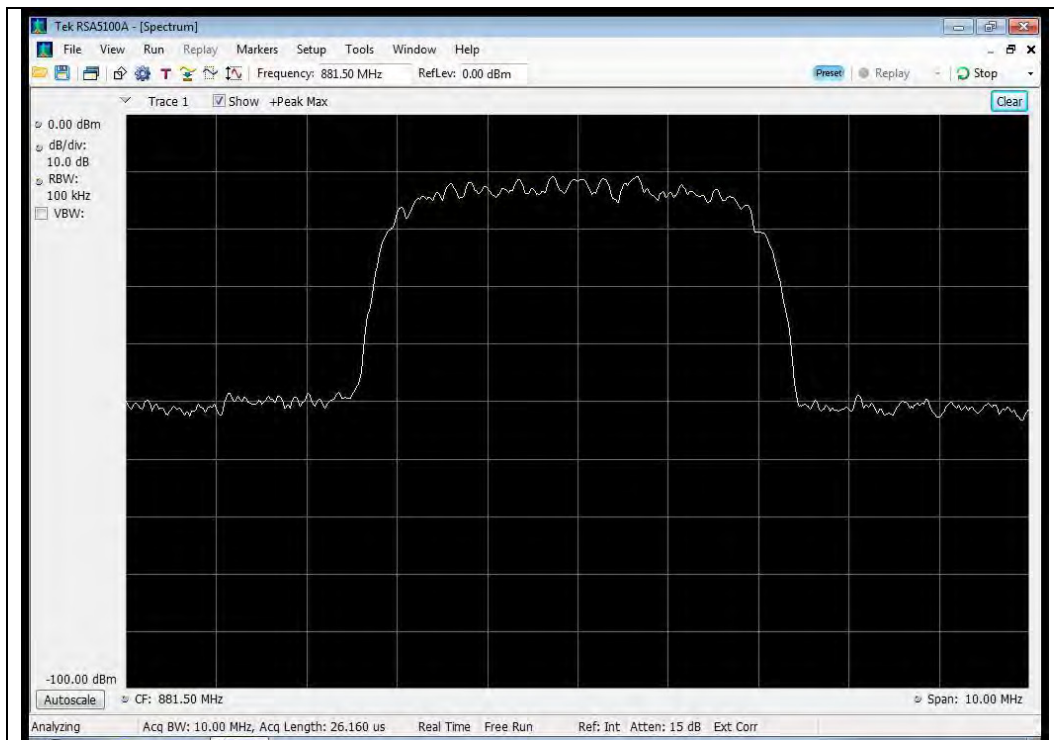


## 869 - 894 MHz Band

### Input

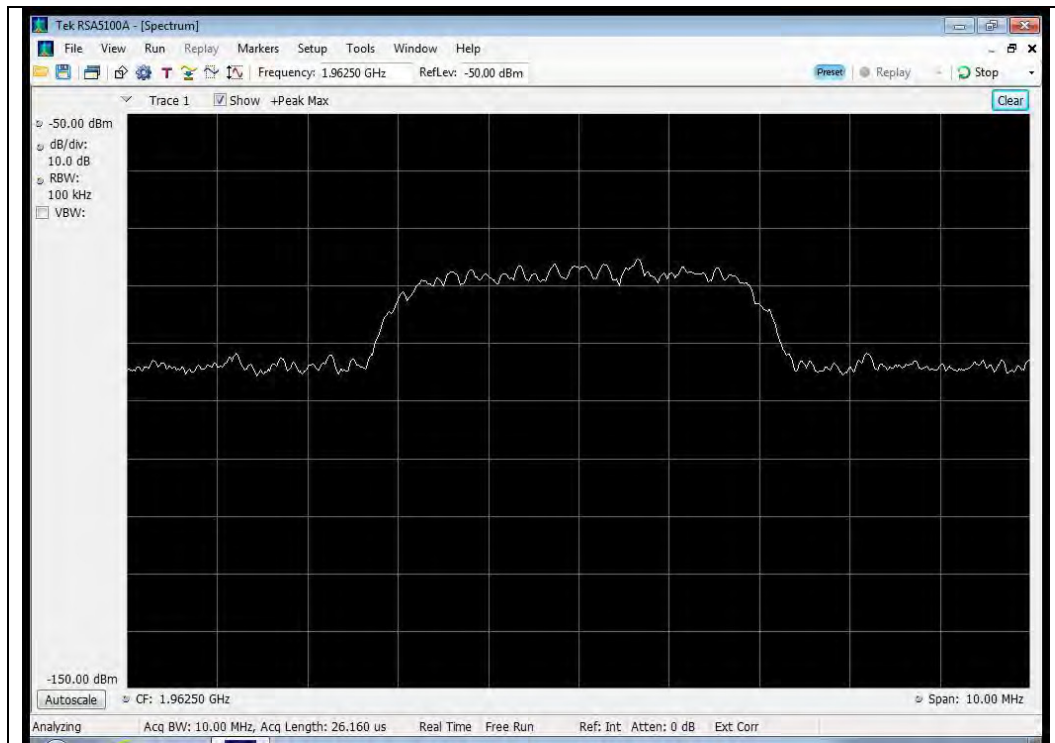


### Output

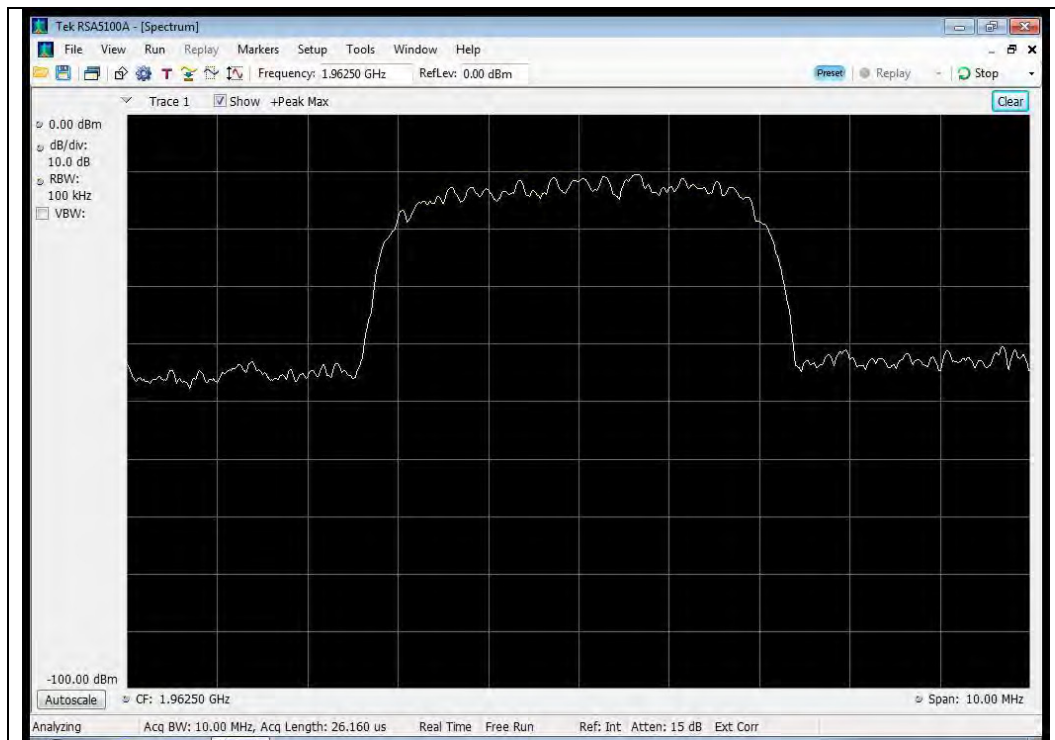


## 1930 - 1995 MHz Band

### Input

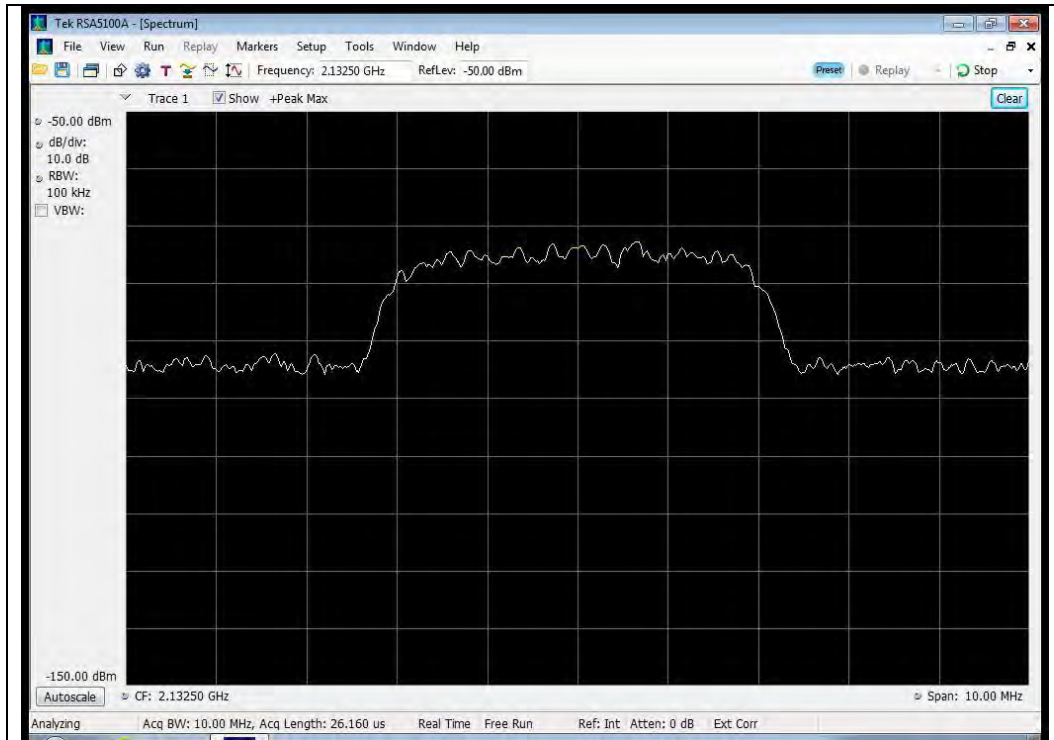


### Output

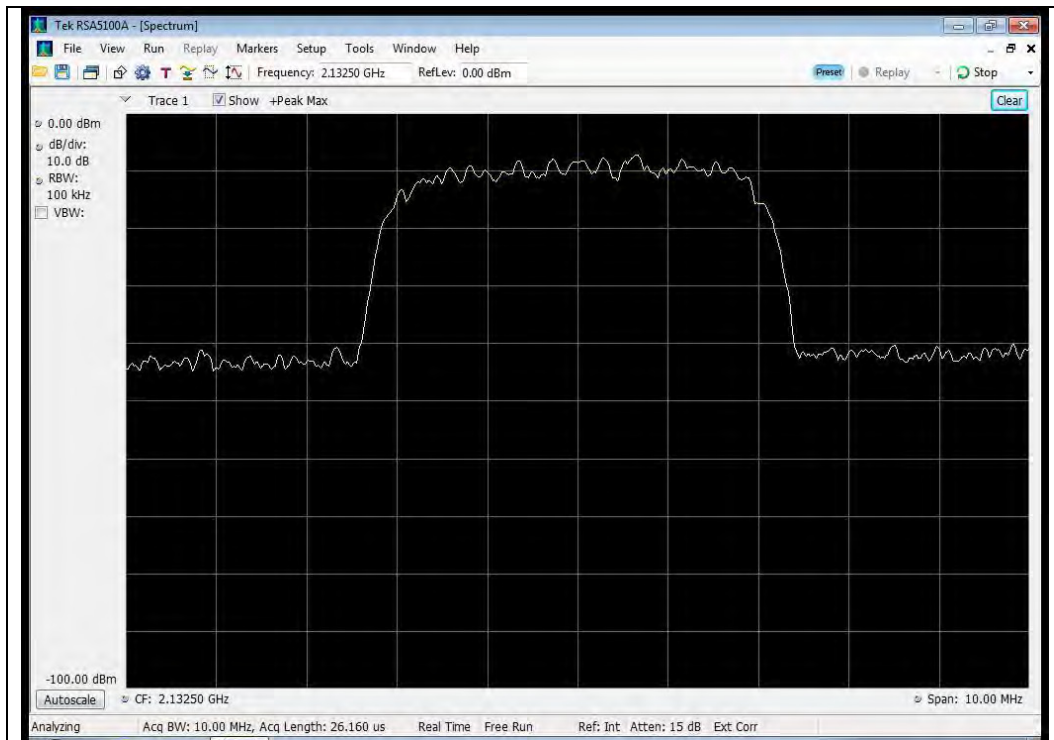


## 2110 - 2155 MHz Band

### Input



### Output



## Anti-Oscillation

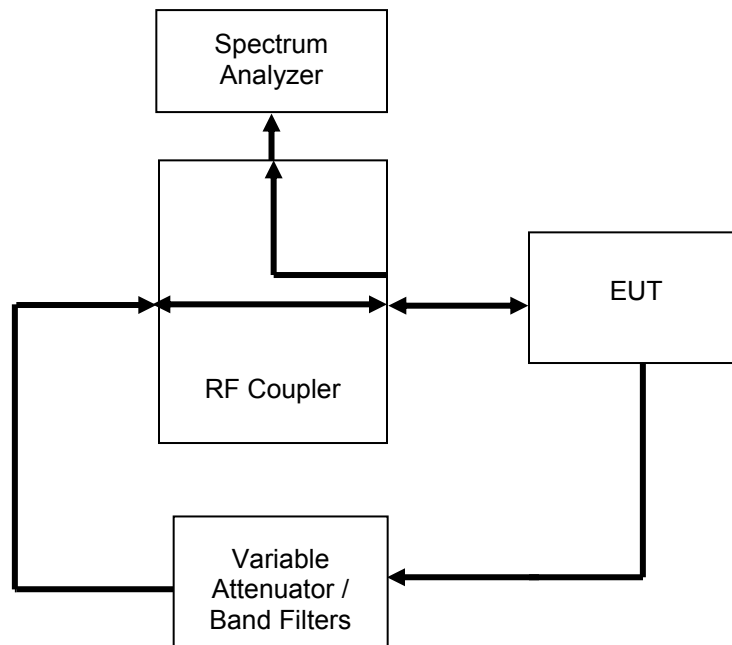
**Engineer:** Mike Graffeo

**Test Date:** 10/28/14

### Test Procedure

The EUT was connected to a spectrum analyzer set for 0 Hz operation. The EUT uplink and downlink were fed back upon each other through a selectable band pass filter and variable attenuator. The EUT uplink and downlink were tested to ensure that the presence of oscillation was detected and that the EUT output turned off within 300 mS for the Uplink and 1 second for the Downlink and remained off for 1 minute. A EUT with test software was utilized to ensure that the EUT only had a maximum of 5 attempts at restart from oscillation before permanently shutting off.

### Test Setup



### Uplink Detection Time Test Results

| Frequency Band (MHz) | Measured Time (mS) | Limit (mS) | Result |
|----------------------|--------------------|------------|--------|
| 698 - 716            | 118.30             | 300        | Pass   |
| 776 - 787            | 52.25              | 300        | Pass   |
| 824 - 849            | 55.00              | 300        | Pass   |
| 1710 - 1755          | 22.00              | 300        | Pass   |
| 1850 - 1915          | 156.80             | 300        | Pass   |

### Downlink Detection Time Test Results

| Frequency Band (MHz) | Measured Time (mS) | Limit (mS) | Result |
|----------------------|--------------------|------------|--------|
| 728 - 746            | 74.25              | 1000       | Pass   |
| 746 - 757            | 22.00              | 1000       | Pass   |
| 869 - 894            | 195.30             | 1000       | Pass   |
| 1930 - 1995          | 22.00              | 1000       | Pass   |
| 2110 - 2155          | 93.50              | 1000       | Pass   |

### Uplink Restart Time Test Results

| Frequency Band (MHz) | Measured Time (S) | Limit (S) | Result |
|----------------------|-------------------|-----------|--------|
| 698 - 716            | device shut down  | ≥60       | Pass   |
| 776 - 787            | device shut down  | ≥60       | Pass   |
| 824 - 849            | device shut down  | ≥60       | Pass   |
| 1710 - 1755          | device shut down  | ≥60       | Pass   |
| 1850 - 1915          | 69.97             | ≥60       | Pass   |

### Downlink Restart Time Test Results

| Frequency Band (MHz) | Measured Time (S) | Limit (S) | Result |
|----------------------|-------------------|-----------|--------|
| 728 - 746            | device shut down  | ≥60       | Pass   |
| 746 - 757            | device shut down  | ≥60       | Pass   |
| 869 - 894            | device shut down  | ≥60       | Pass   |
| 1930 - 1995          | 69.52             | ≥60       | Pass   |
| 2110 - 2155          | 70.2              | ≥60       | Pass   |

### Uplink Restart Count Test Results

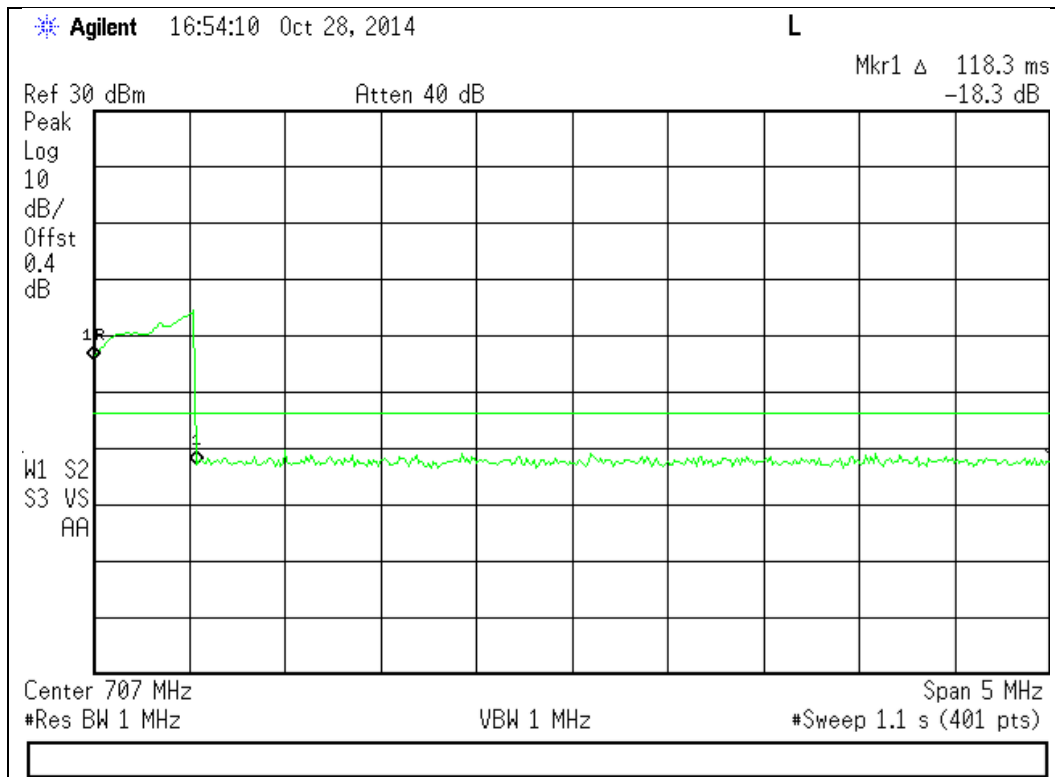
| Frequency Band (MHz) | Restarts | Limit | Result |
|----------------------|----------|-------|--------|
| 698 - 716            | 0        | ≤5    | Pass   |
| 776 - 787            | 0        | ≤5    | Pass   |
| 824 - 849            | 0        | ≤5    | Pass   |
| 1710 - 1755          | 0        | ≤5    | Pass   |
| 1850 - 1915          | 3        | ≤5    | Pass   |

### Downlink Restart Count Test Results

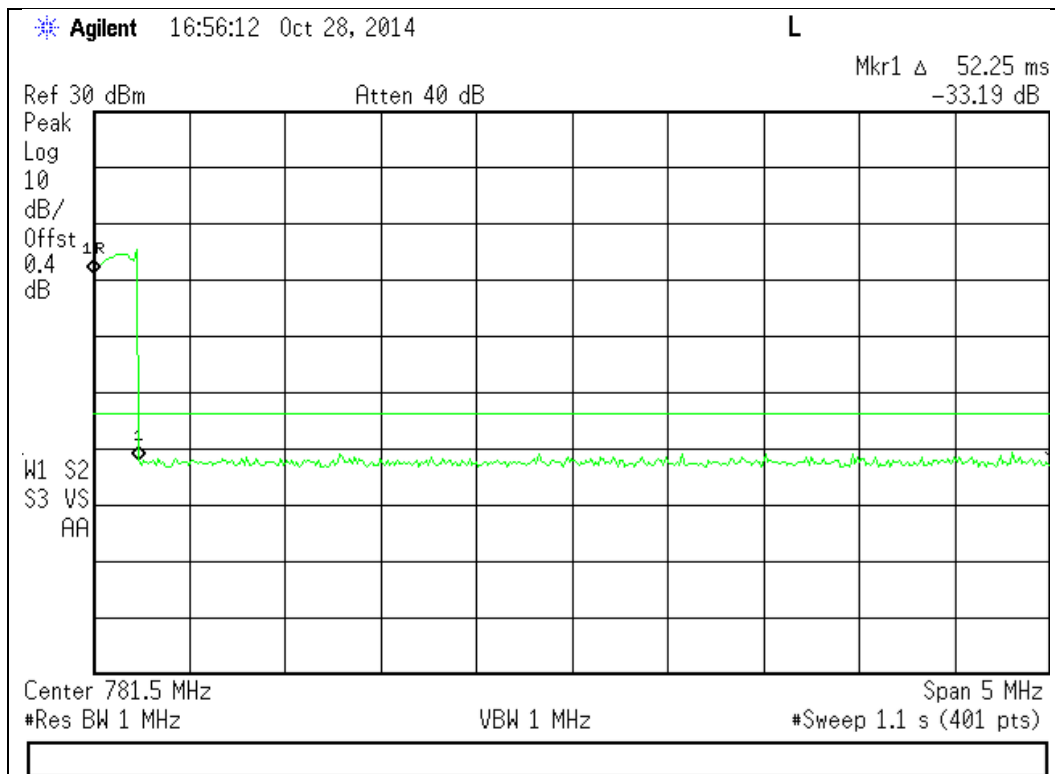
| Frequency Band (MHz) | Restarts | Limit | Result |
|----------------------|----------|-------|--------|
| 728 - 746            | 0        | ≤5    | Pass   |
| 746 - 757            | 0        | ≤5    | Pass   |
| 869 - 894            | 0        | ≤5    | Pass   |
| 1930 - 1995          | 4        | ≤5    | Pass   |
| 2110 - 2155          | 4        | ≤5    | Pass   |

## Uplink Detection Time Test Results

### 698 - 716 MHz Band

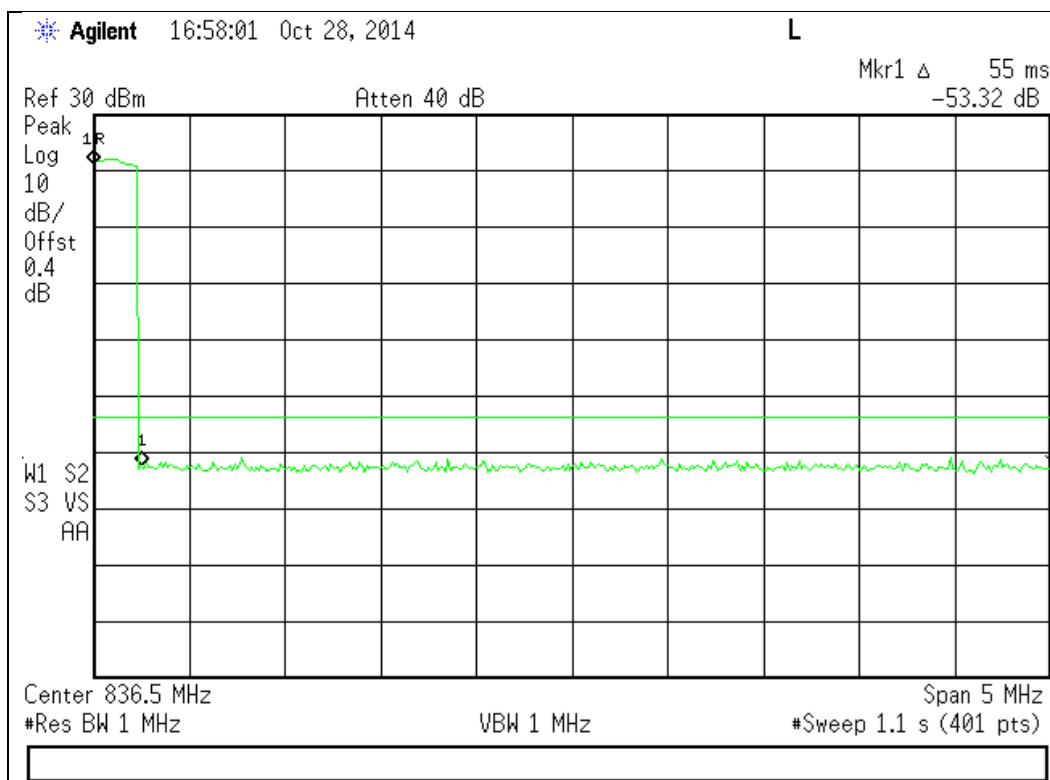


### 776 - 787 MHz Band

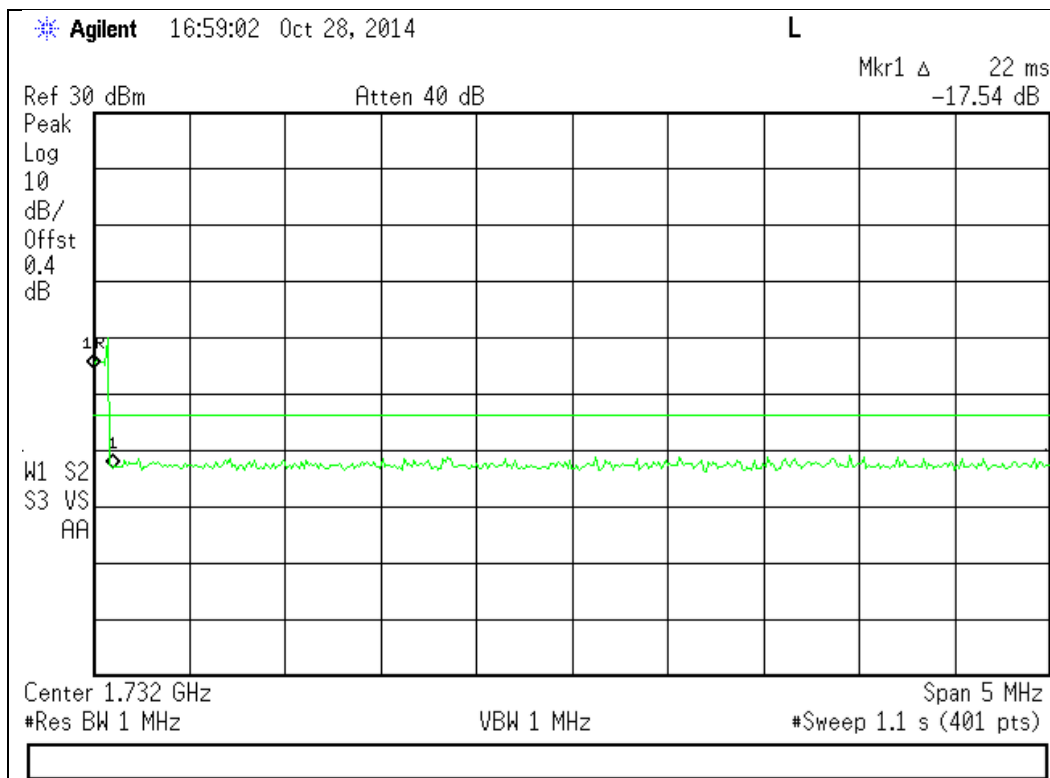




### 824 - 849 MHz Band

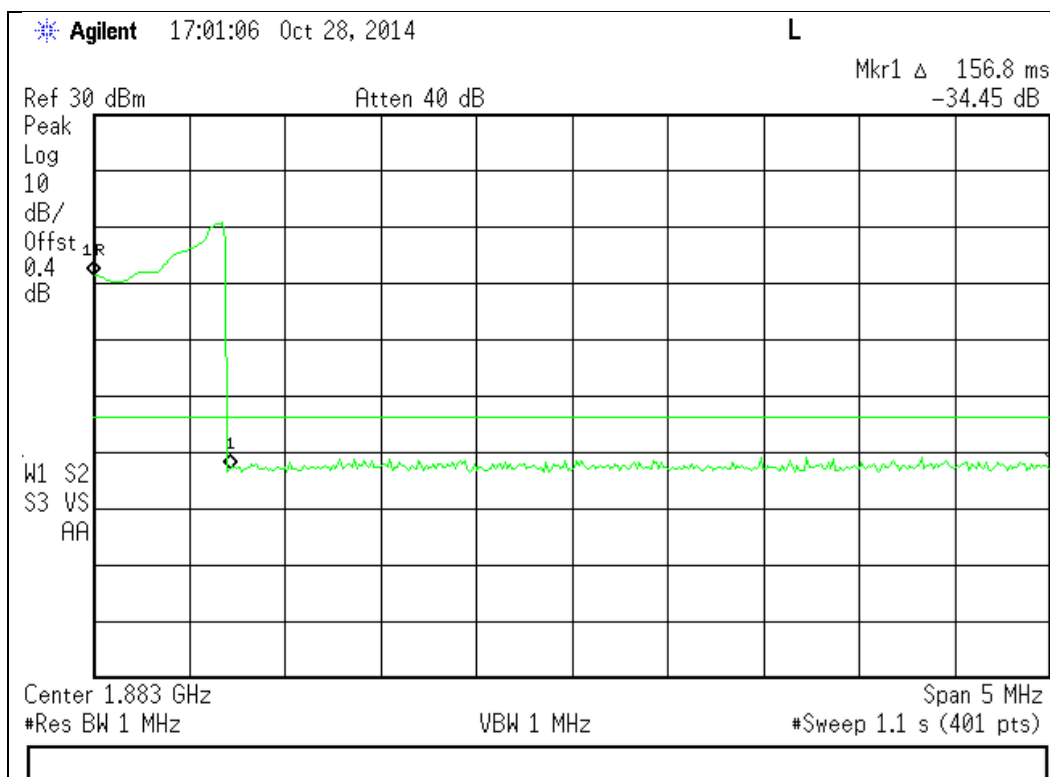


### 1710 - 1755 MHz Band



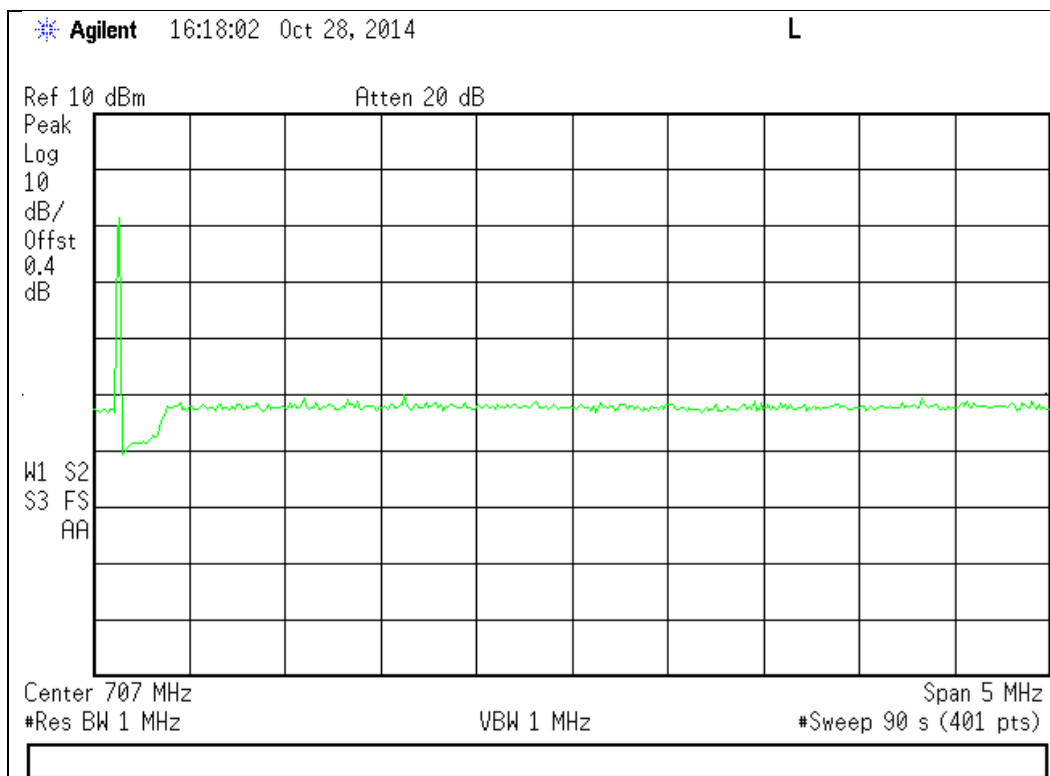


### 1850 - 1915 MHz Band



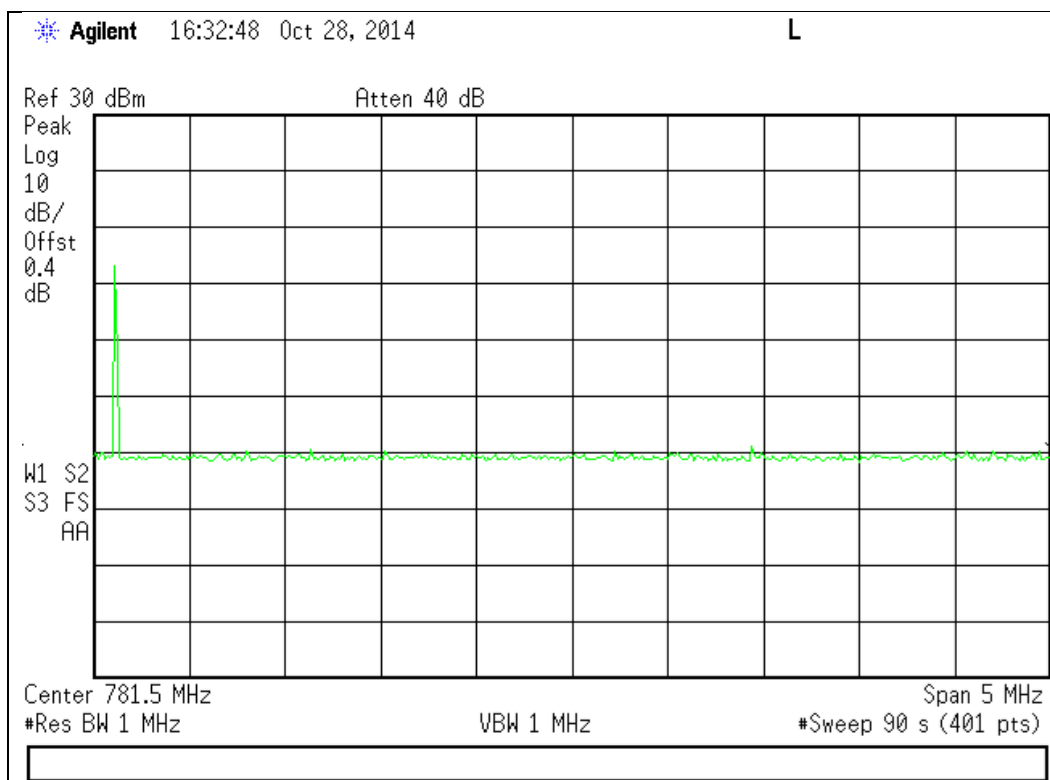
### Uplink Restart Time Test Results

### 698 - 716 MHz Band

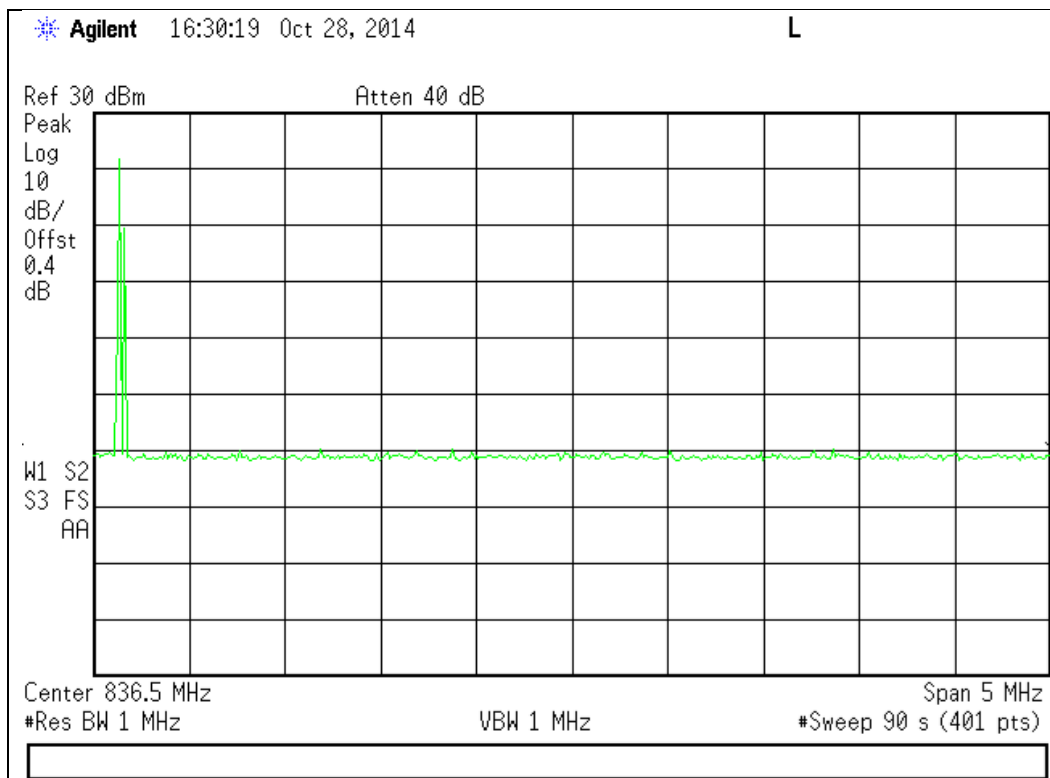




### 776 - 787 MHz Band

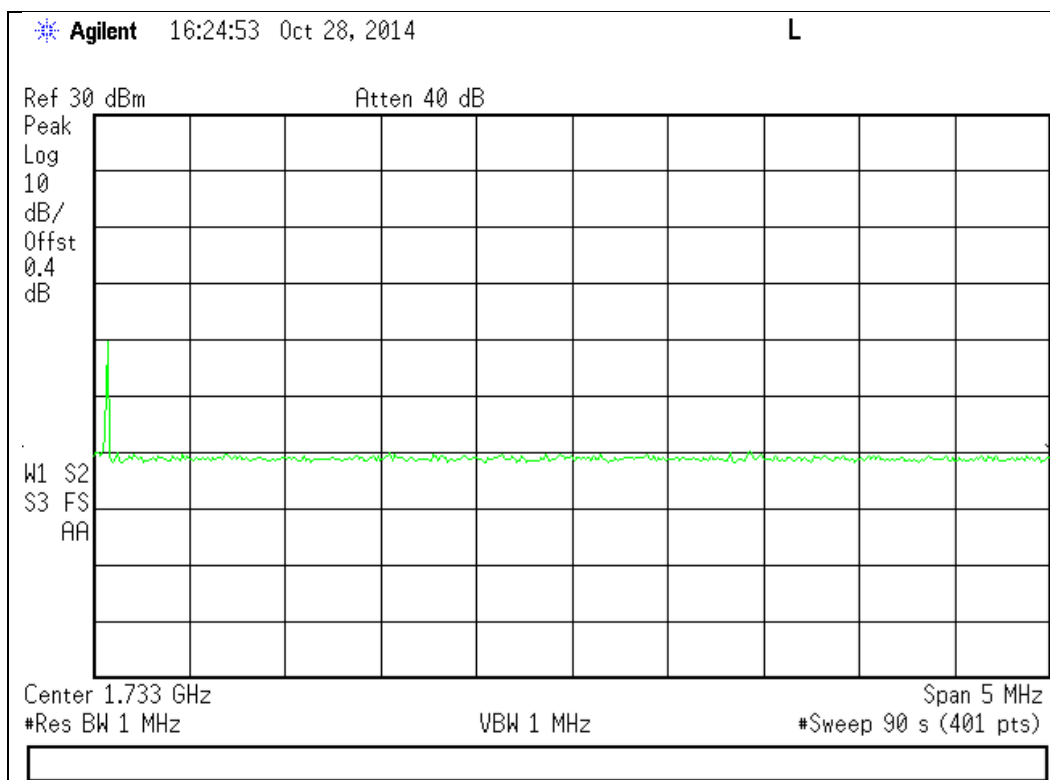


### 824 - 849 MHz Band

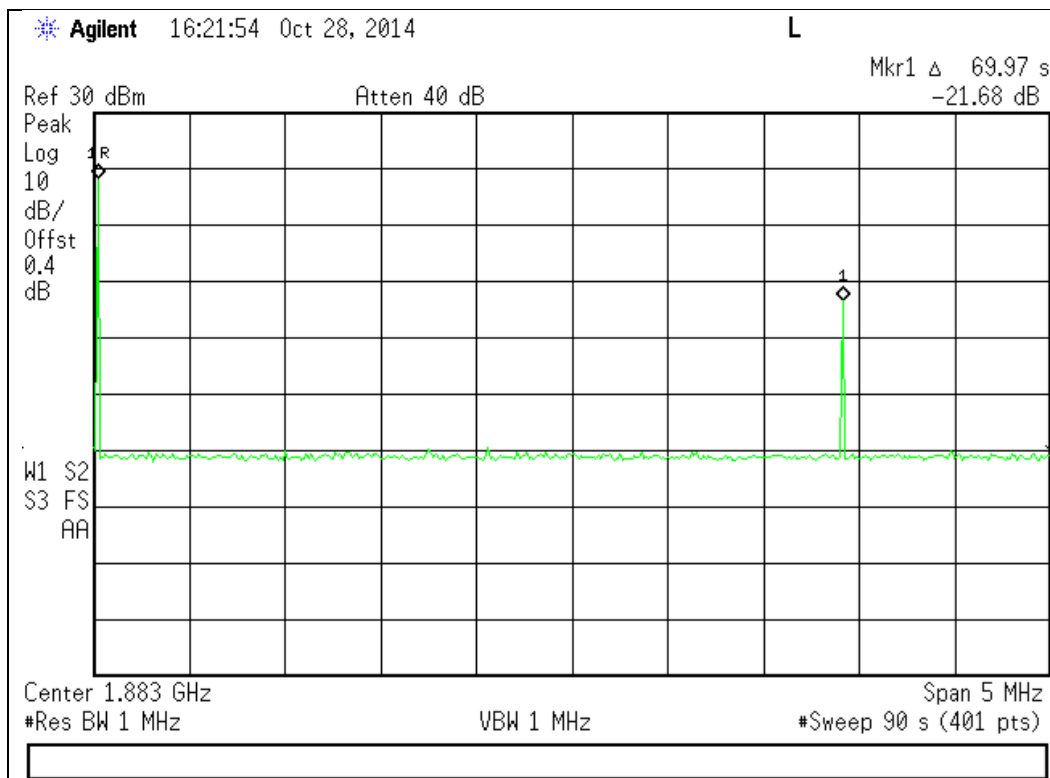




### 1710 - 1755 MHz Band

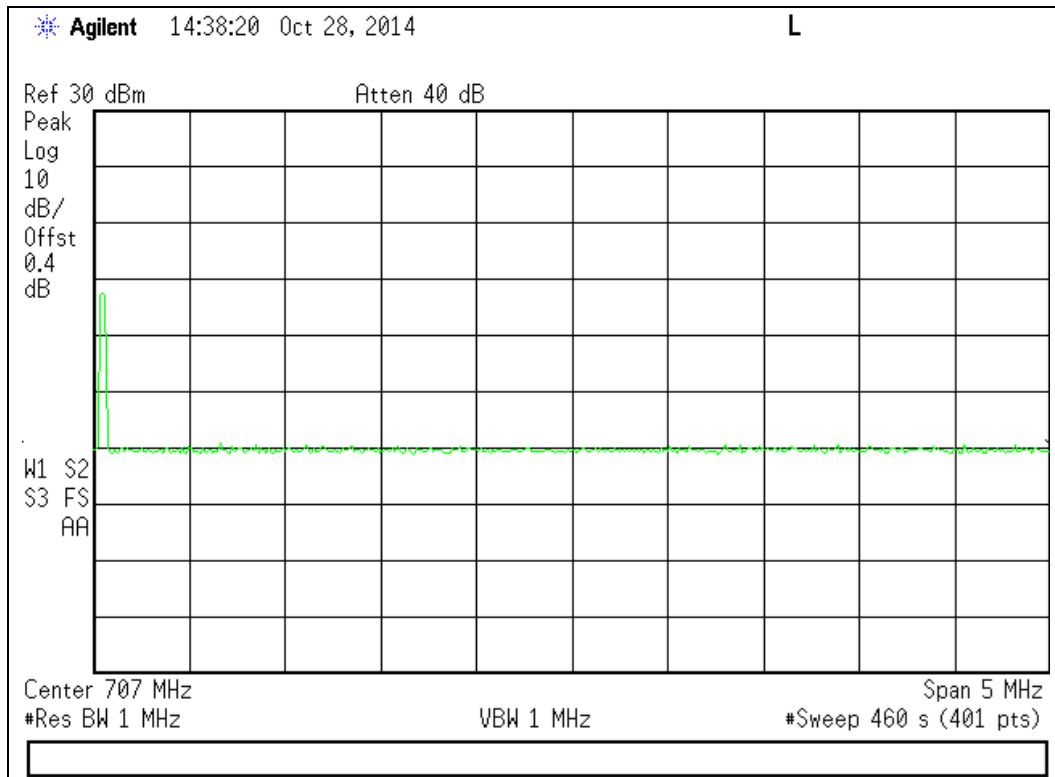


### 1850 - 1915 MHz Band

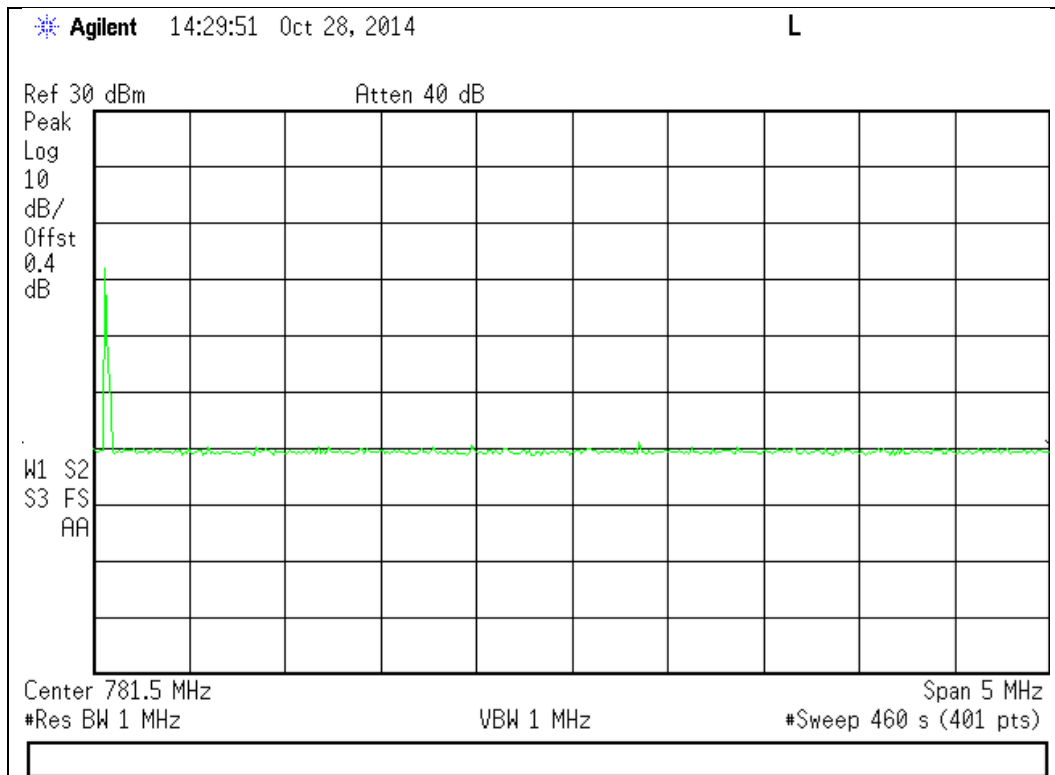


## Uplink Restart Count Test Results

### 698 - 716 MHz Band

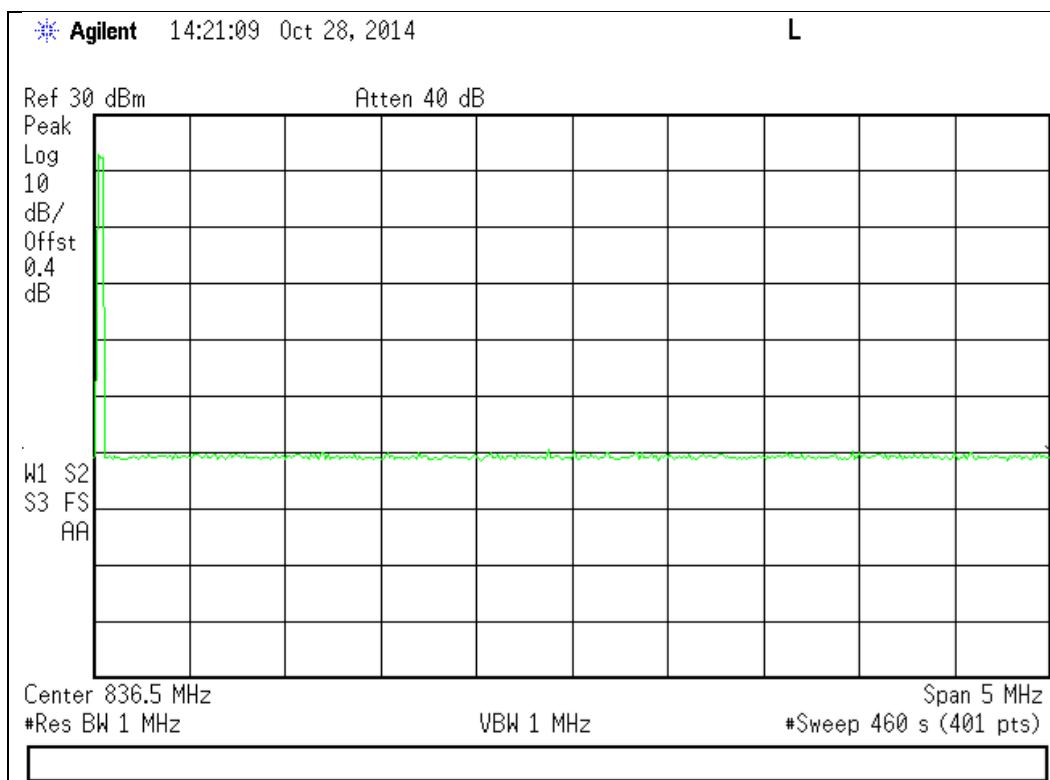


### 776 - 787 MHz Band

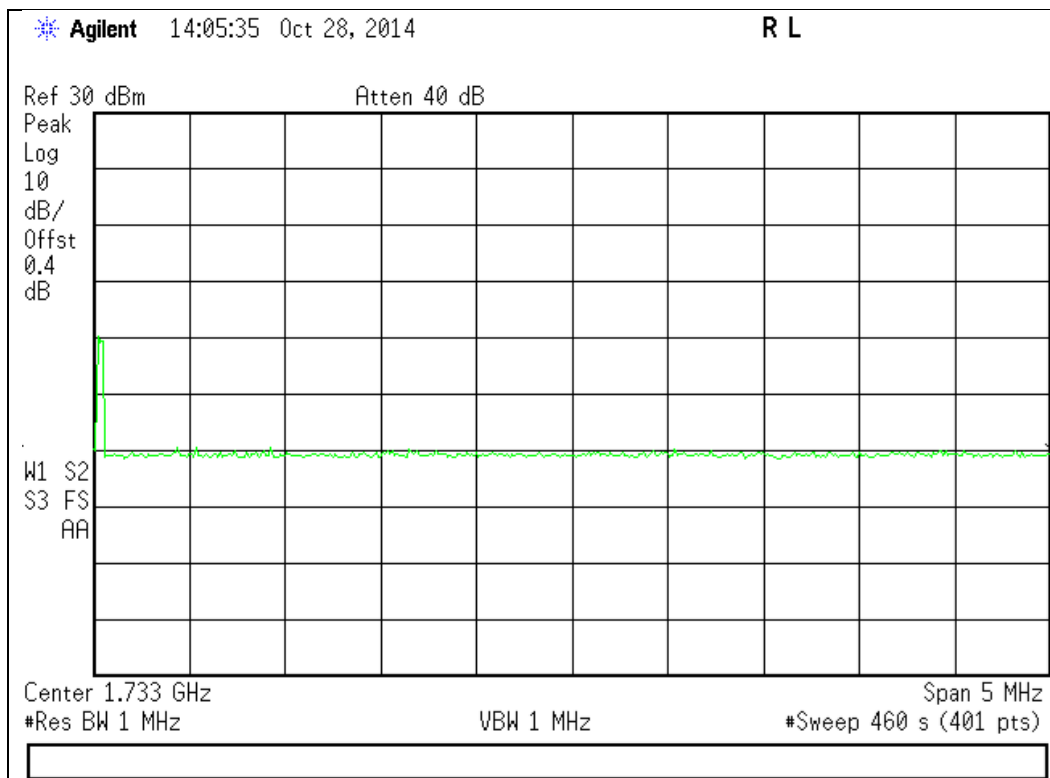




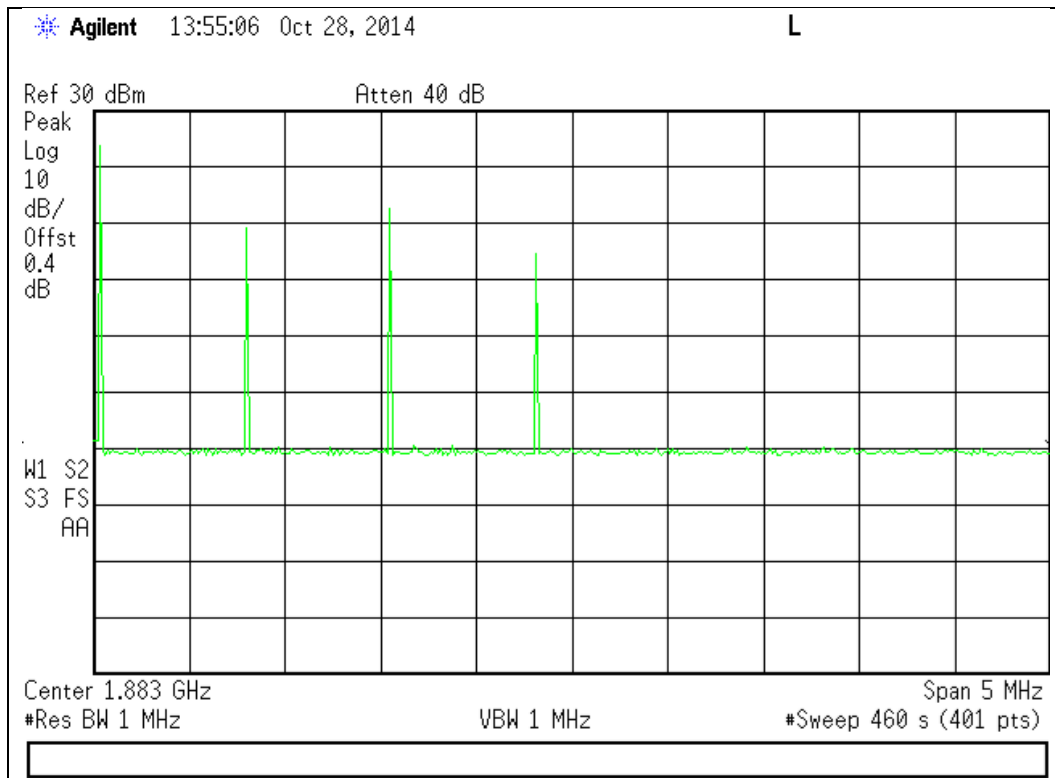
### 824 - 849 MHz Band



### 1710 - 1755 MHz Band

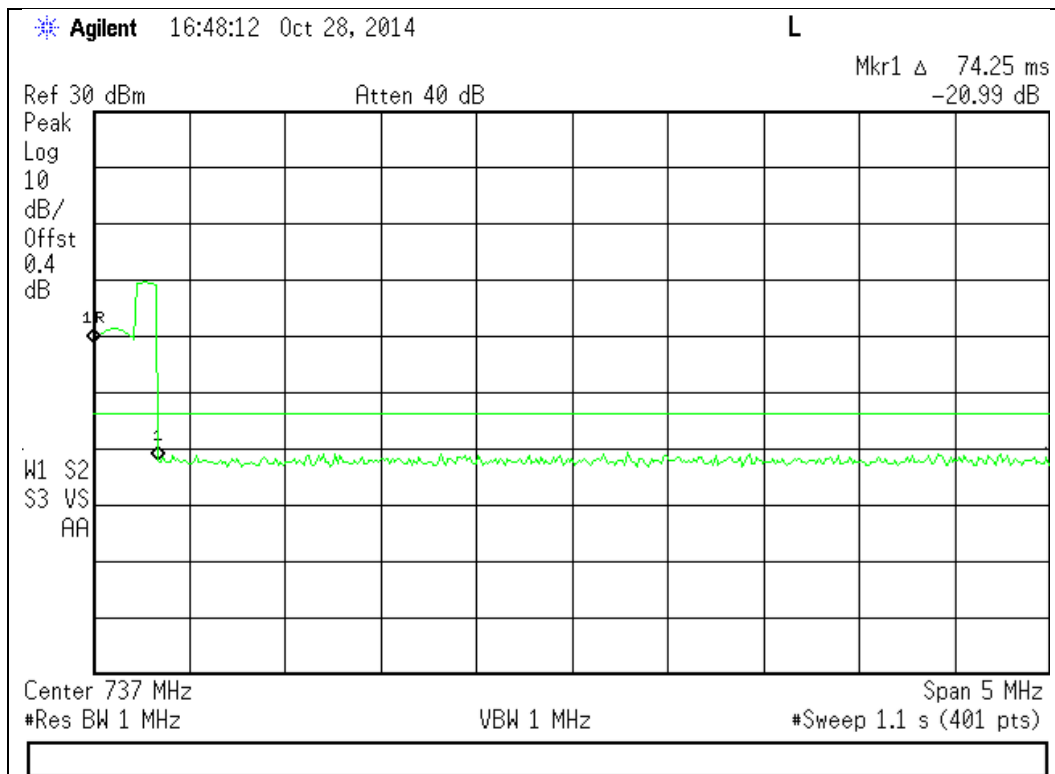


### 1850 - 1915 MHz Band



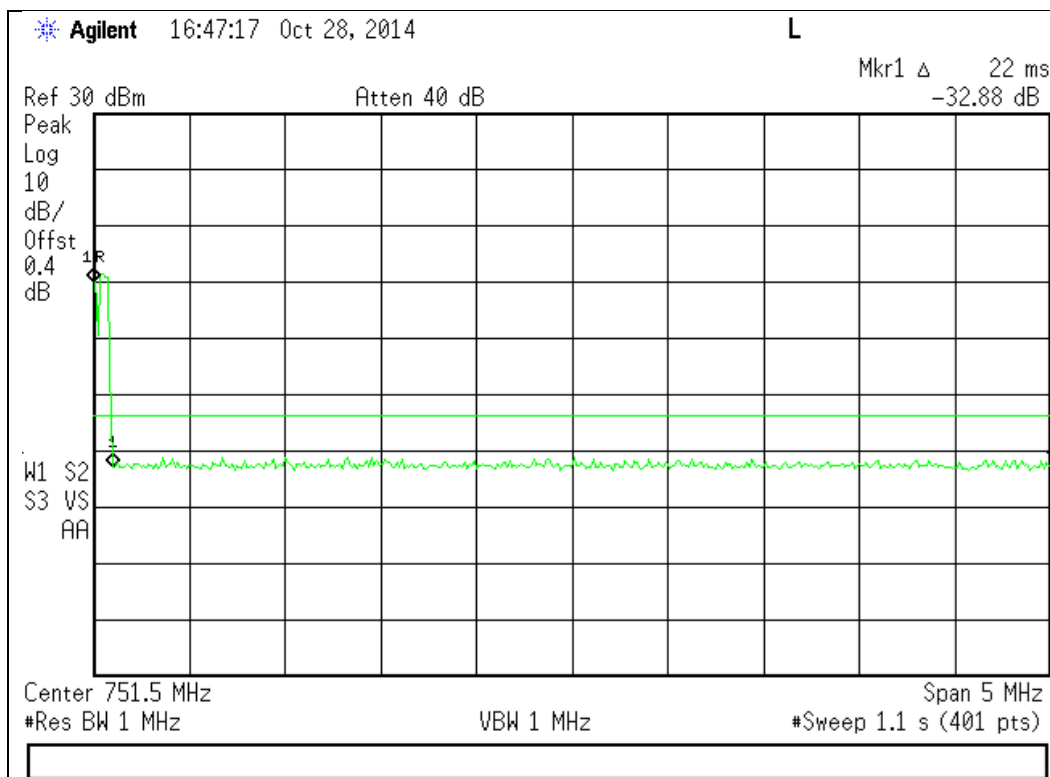
### Downlink Detection Time Test Results

### 728 - 746 MHz Band

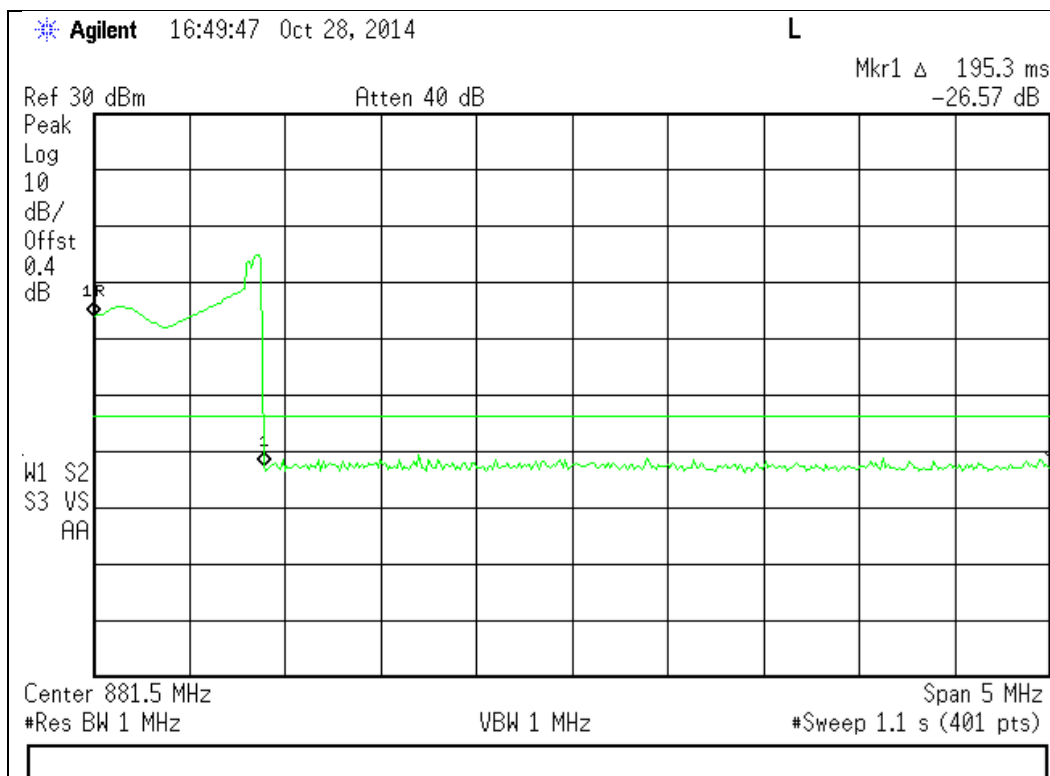




### 746 - 757 MHz Band

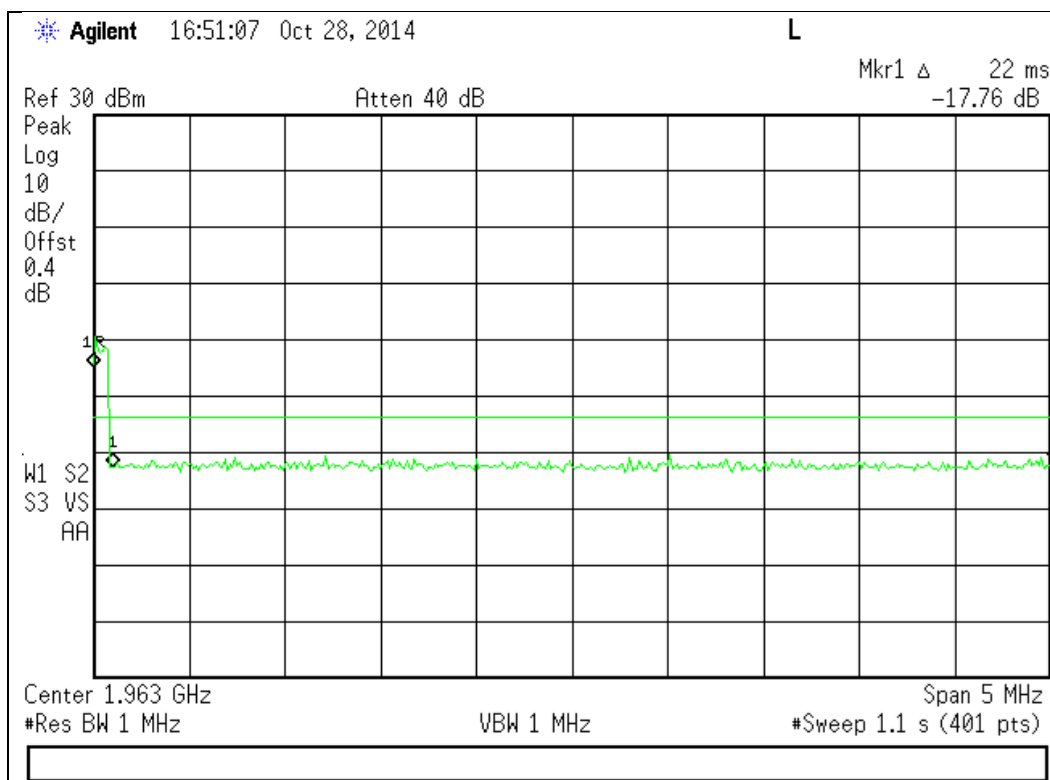


### 869 - 894 MHz Band

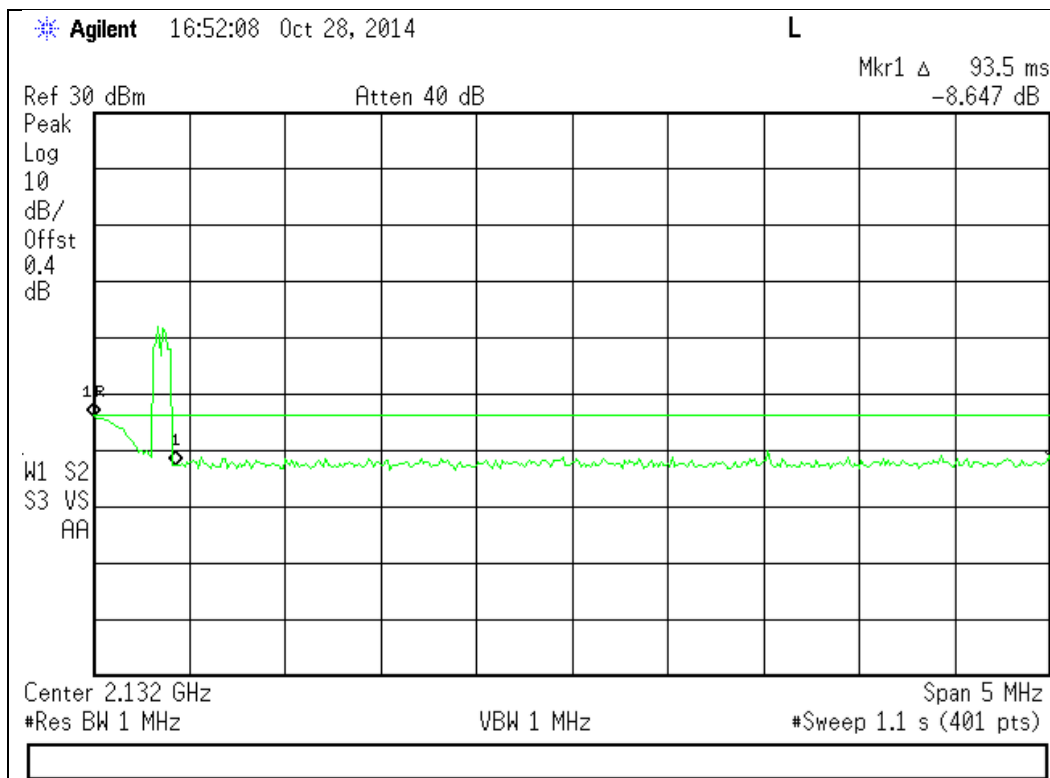




### 1930 - 1995 MHz Band

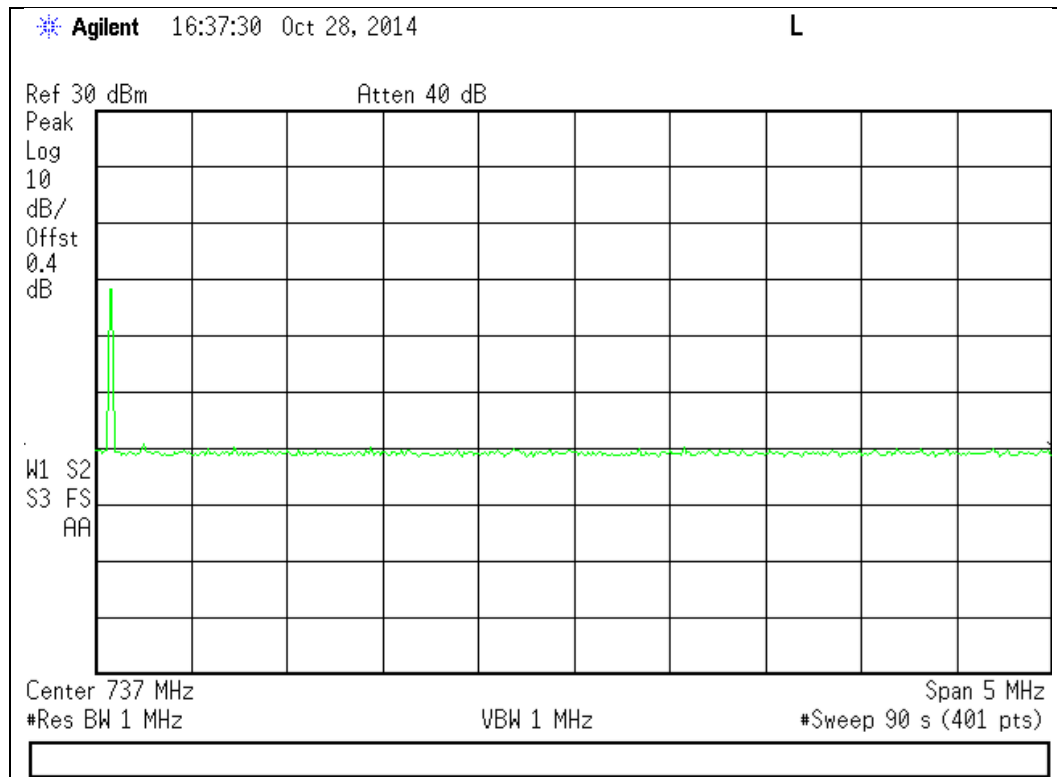


### 2110 - 2155 MHz Band

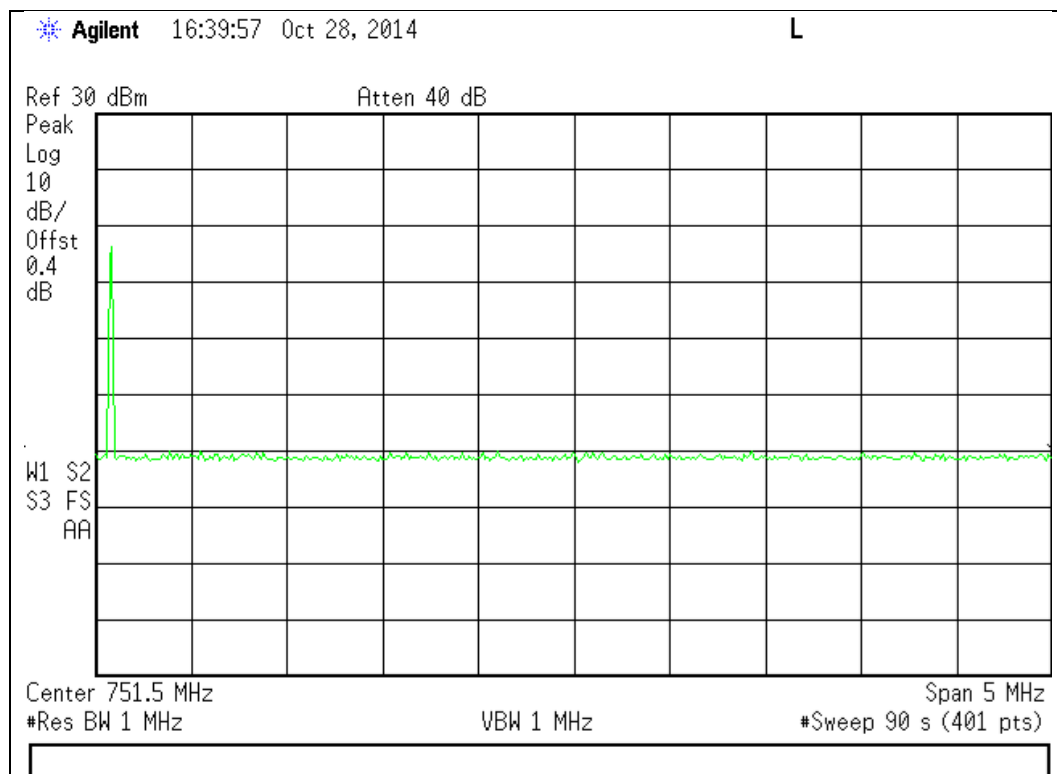


## Downlink Restart Time Test Results

### 728 - 746 MHz Band

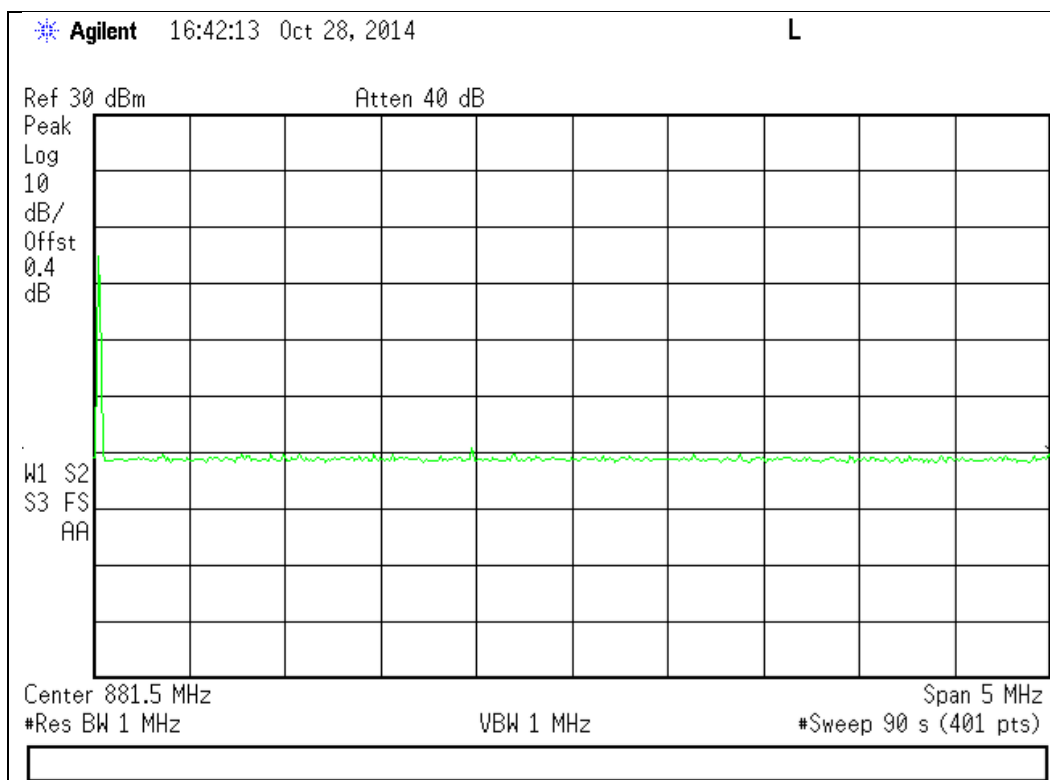


### 746 - 757 MHz Band

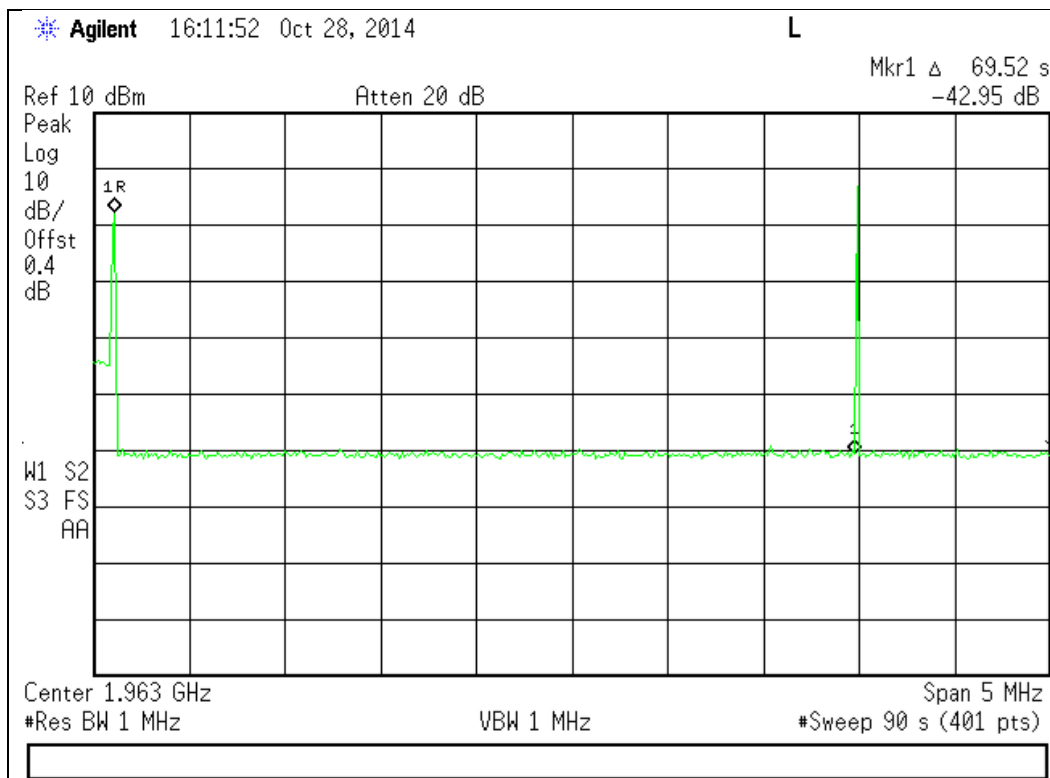




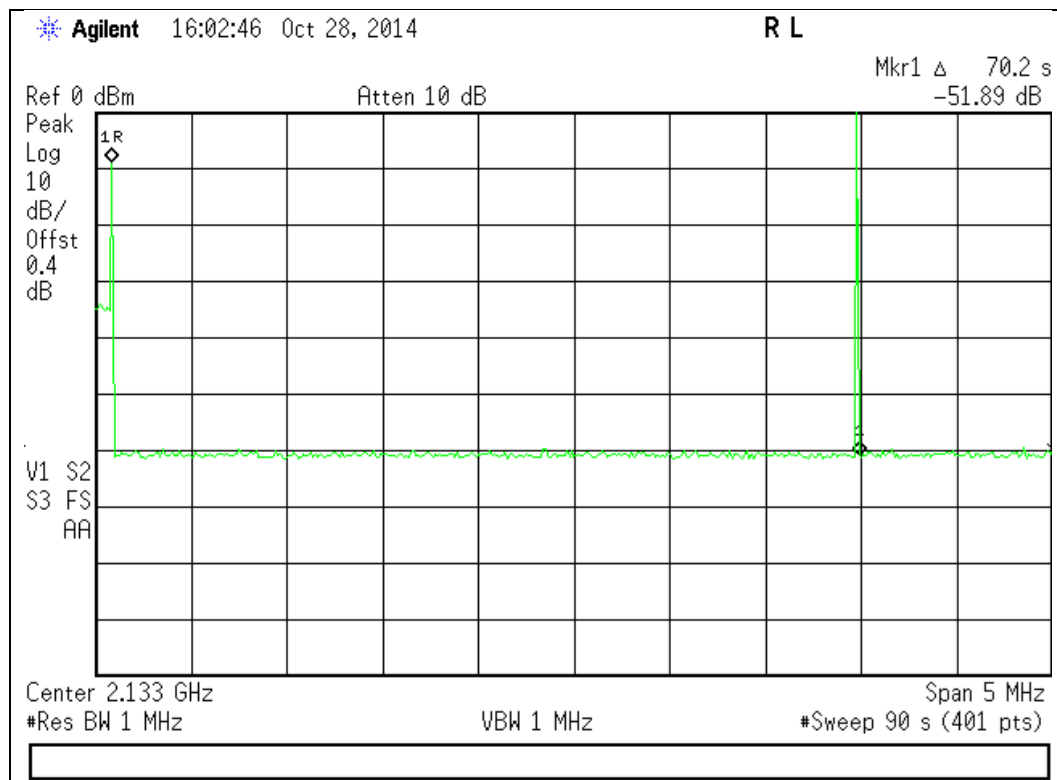
### 869 - 894 MHz Band



### 1930 - 1995 MHz Band

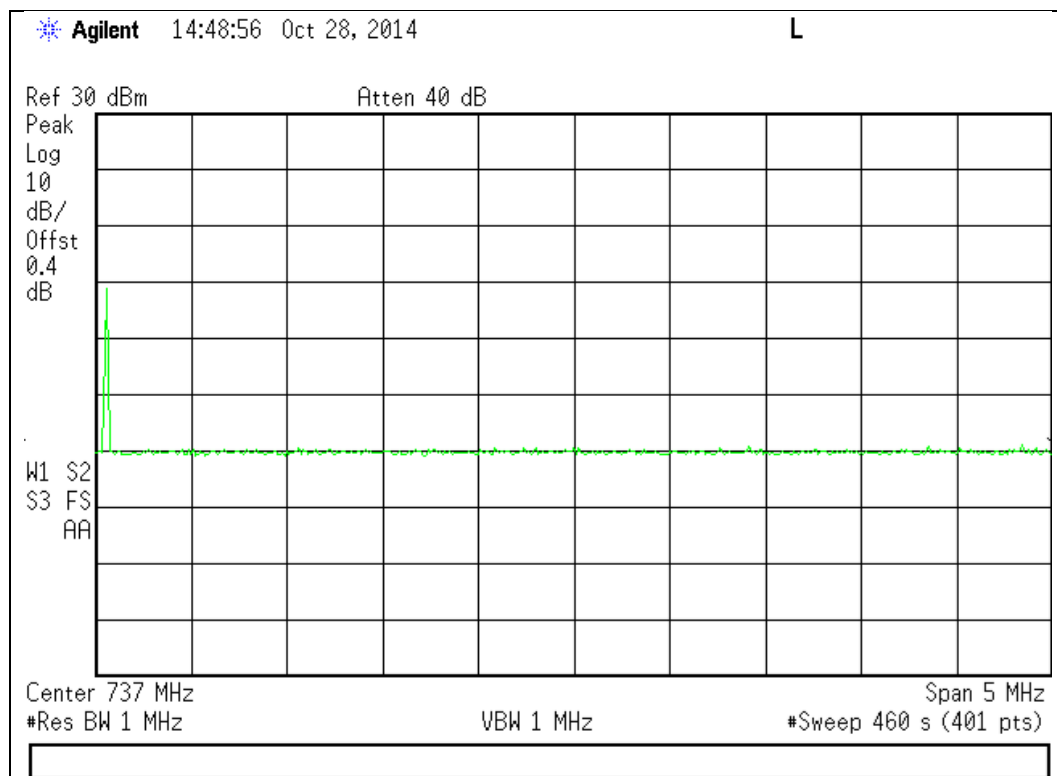


## 2110 - 2155 MHz Band



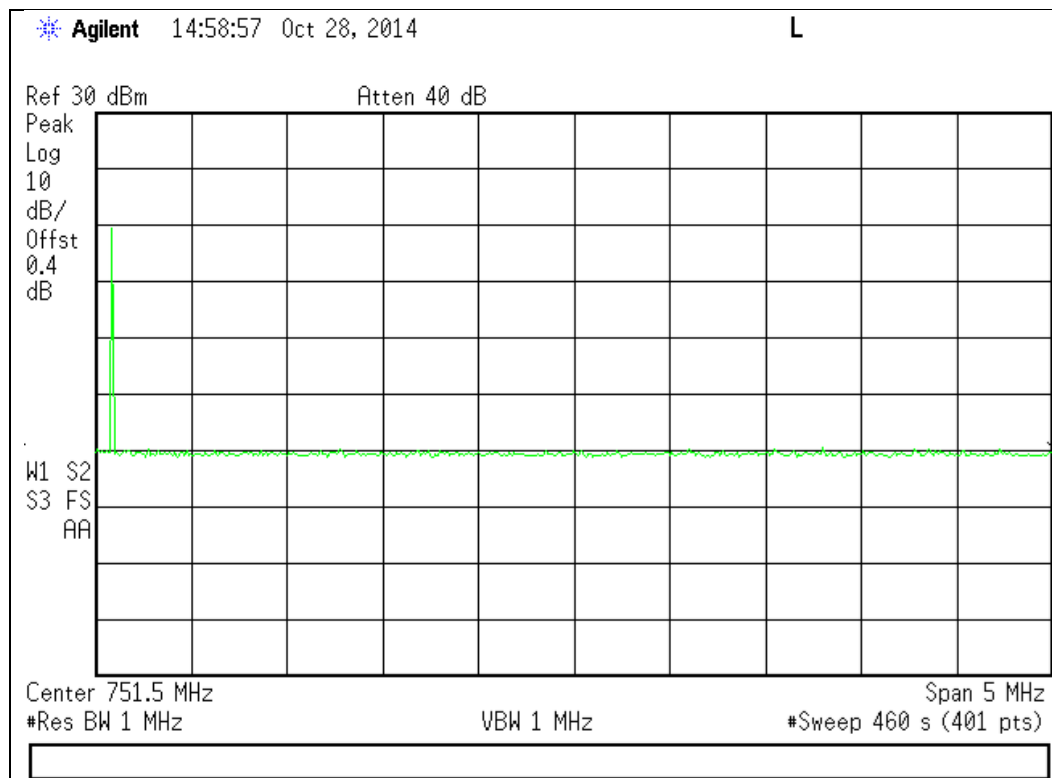
## Downlink Restart Count Test Results

## 728 - 746 MHz Band

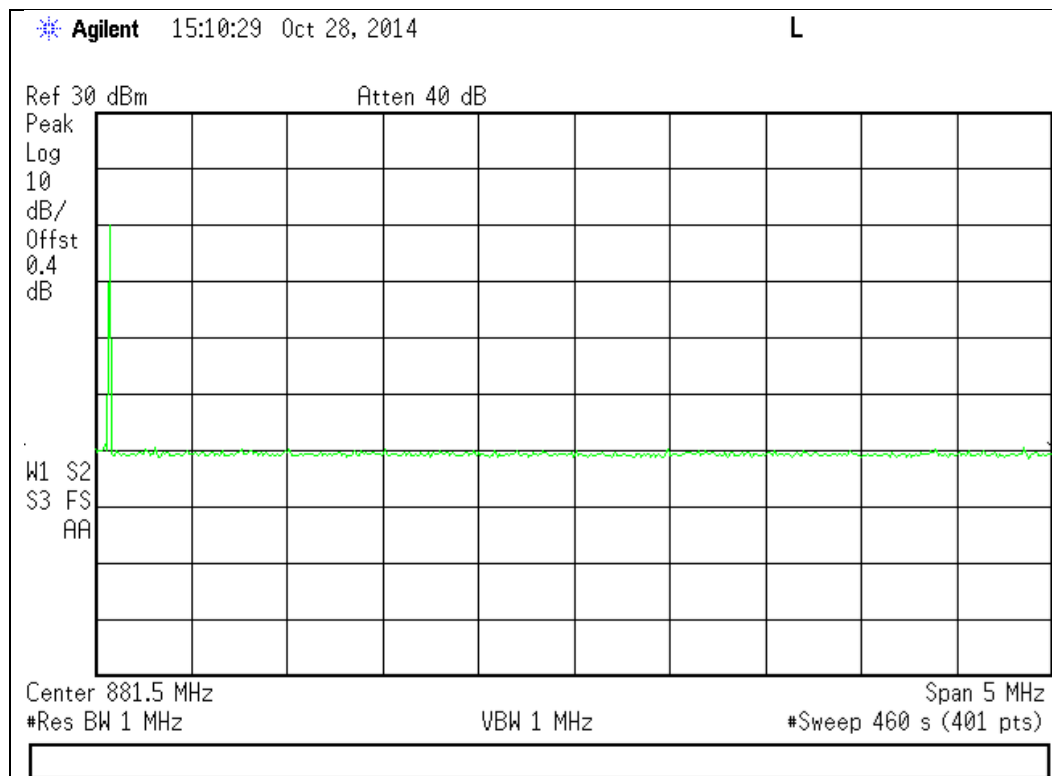




### 746 - 757 MHz Band

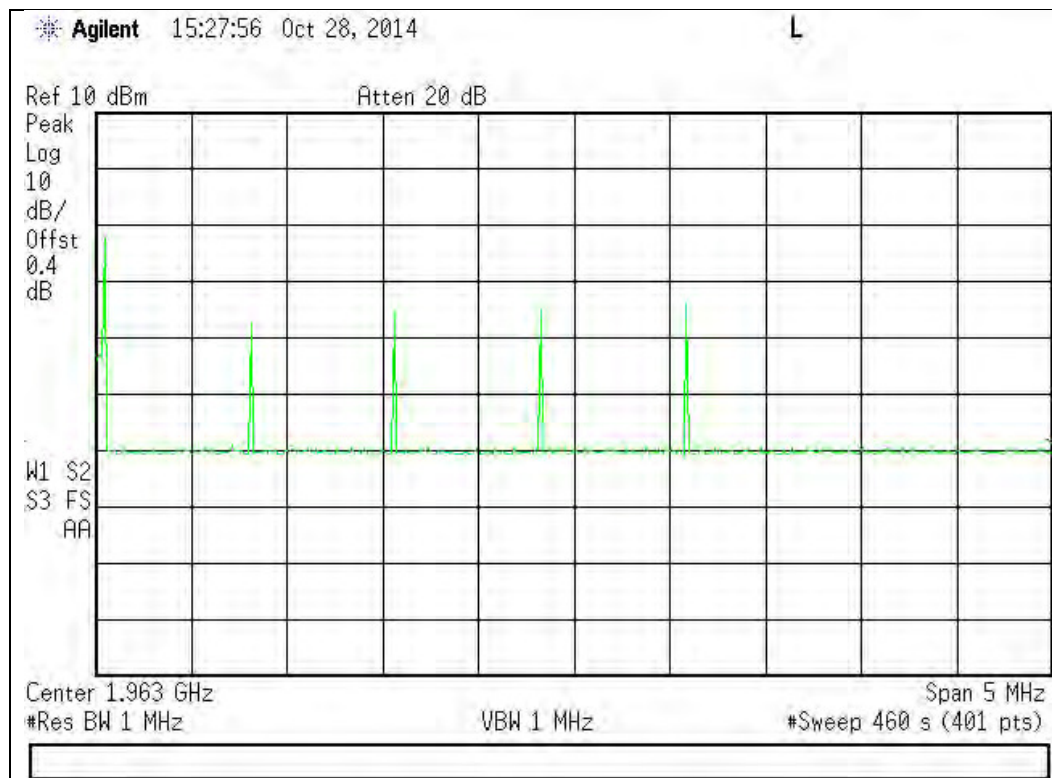


### 869 - 894 MHz Band

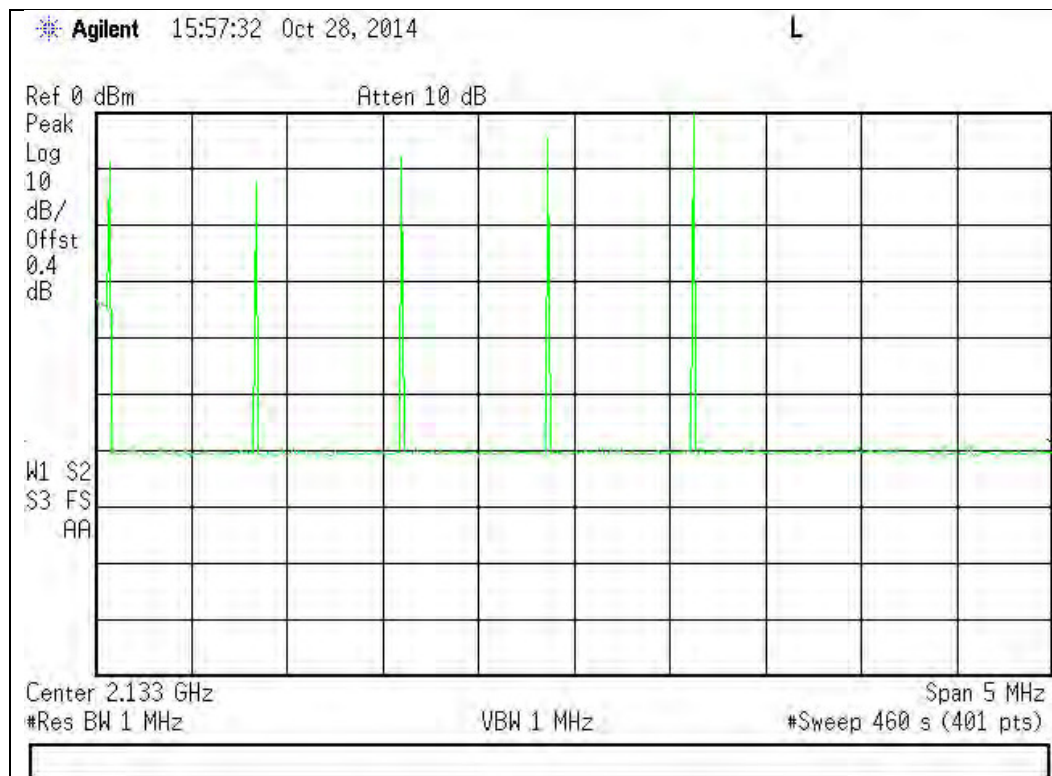




### 1930 - 1995 MHz Band



### 2110 - 2155 MHz Band



## Oscillation Mitigation

Engineer: Greg Corbin

Test Date: 11/23/2015

### Test Procedure

The EUT was connected as shown per KDB 935210 D03 v03. The EUT was verified to shut down in the presence of an oscillation.

The total attenuation from output to input was set +5 dB higher than the gain for the band being tested.

For EUT's that do not shutdown, the peak oscillation was measured and the variable attenuator was reduced in 1 dB increments until the booster shuts off.

The frequency and amplitude of the lowest level within the span and the frequency and amplitude of the oscillation were recorded as required.

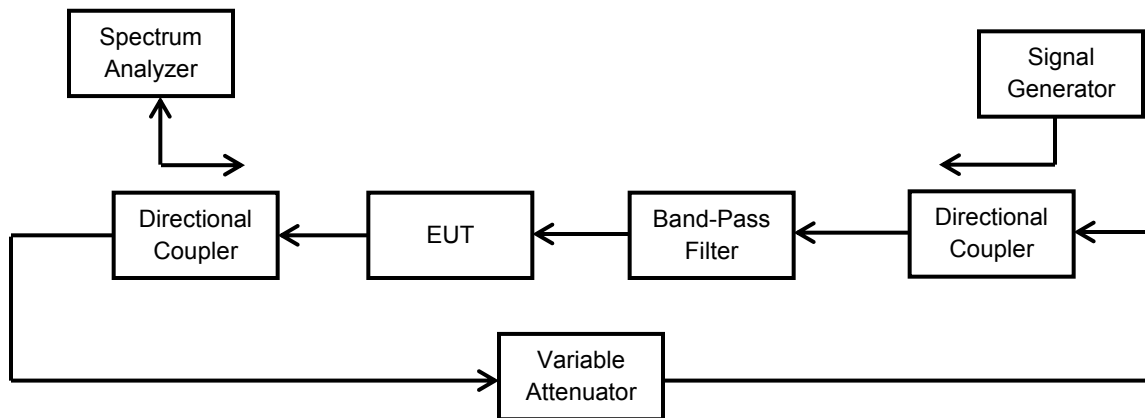
The frequency and amplitude of the highest oscillation and the lowest level in the valley next to the oscillation was recorded for each 1 dB step as required per the KDB.

For oscillations that exceeded the 12 dB limit, the time required for the booster to mitigate the oscillation to less than 12 dB was recorded.

If the booster mitigated the oscillation within the 300 second time limit, the time required to mitigate the oscillation was recorded along with the final level of the oscillation after mitigation.

**Note:** In all cases the booster mitigated the oscillation to less than 12 dB before the 300 second limit.

### Test Setup



### Uplink Oscillation Mitigation Test Data

| Oscillation Mitigation - Uplink |               |       |                           |       |        |       |                              |                       |             |
|---------------------------------|---------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                            | 698 – 716 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                | CDMA          |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting     | Oscillations  |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                 | Freq.         | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                              | MHz           | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                              | 702.63        | -60   | 700.5                     | -67.7 | 7.7    | <12   | Not required                 | < 300                 | Pass        |
| +4                              | 702.63        | -59.6 | 700.5                     | -68.4 | 8.8    | <12   | Not required                 | < 300                 | Pass        |
| +3                              | 702.63        | -59.8 | 700.5                     | -68.1 | 8.3    | <12   | Not required                 | < 300                 | Pass        |
| 2                               | 702.63        | -57.5 | 700.5                     | -68.3 | 10.8   | <12   | Not required                 | < 300                 | Pass        |
| +1                              | 702.63        | -61.2 | 700.5                     | -69.6 | 8.4    | <12   | <20                          | < 300                 | Pass        |
| +0                              | 702.63        | -60   | 700.5                     | -70   | 10     | <12   | Not required                 | < 300                 | Pass        |
| -1                              | 702.63        | -58.6 | 700.5                     | -69.6 | 11     | <12   | Not required                 | < 300                 | Pass        |
| -2                              | 702.63        | -62.8 | 700.5                     | -72   | 9.2    | <12   | Not required                 | < 300                 | Pass        |
| -3                              | 702.63        | -61.4 | 700.5                     | -72.1 | 10.7   | <12   | <8                           | < 300                 | Pass        |
| -4                              | 702.63        | -63.9 | 700.5                     | -73.7 | 9.8    | <12   | <21                          | < 300                 | Pass        |
| -5                              | 702.63        | -62.9 | 700.5                     | -73.4 | 10.5   | <12   | Not required                 | < 300                 | Pass        |

| Oscillation Mitigation - Uplink |               |       |                           |       |        |       |                              |                       |             |
|---------------------------------|---------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                            | 776 – 787 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                | CDMA          |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting     | Oscillations  |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                 | Freq.         | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                              | MHz           | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                              | 784           | -60.5 | 782.3                     | -67.4 | 6.9    | <12   | Not required                 | < 300                 | Pass        |
| +4                              | 784           | -60.1 | 782.3                     | -67.7 | 7.6    | <12   | Not required                 | < 300                 | Pass        |
| +3                              | 784           | -58.6 | 782.3                     | -68.5 | 9.9    | <12   | Not required                 | < 300                 | Pass        |
| 2                               | 784           | -57.3 | 782.3                     | -68.6 | 11.3   | <12   | Not required                 | < 300                 | Pass        |
| +1                              | 784           | -60.8 | 782.3                     | -70.1 | 9.3    | <12   | <29                          | < 300                 | Pass        |
| +0                              | 784           | -59.2 | 782.3                     | -70.1 | 10.9   | <12   | Not required                 | < 300                 | Pass        |
| -1                              | 784           | -62.7 | 782.3                     | -71.6 | 8.9    | <12   | <45                          | < 300                 | Pass        |
| -2                              | 784           | -61.7 | 782.3                     | -71.9 | 10.2   | <12   | Not required                 | < 300                 | Pass        |
| -3                              | 784           | -64.8 | 782.3                     | -73.1 | 8.3    | <12   | <30                          | < 300                 | Pass        |
| -4                              | 784           | -64   | 782.3                     | -73.3 | 9.3    | <12   | Not required                 | < 300                 | Pass        |
| -5                              | 784           | -66.8 | 782.3                     | -74.8 | 8      | <12   | <23                          | < 300                 | Pass        |

| Oscillation Mitigation - Uplink |               |       |                           |       |        |       |                              |                       |             |
|---------------------------------|---------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                            | 824 - 849 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                | CDMA          |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting     | Oscillations  |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                 | Freq.         | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                              | MHz           | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                              | 836.1         | -58.6 | 838.1                     | -67.5 | 8.9    | <12   | Not required                 | < 300                 | Pass        |
| +4                              | 836.1         | -58.3 | 838.1                     | -67.8 | 9.5    | <12   | Not required                 | < 300                 | Pass        |
| +3                              | 836.1         | -57.2 | 838.1                     | -68.3 | 11.1   | <12   | Not required                 | < 300                 | Pass        |
| 2                               | 836.1         | -59.6 | 838.1                     | -69.4 | 9.8    | <12   | <30                          | < 300                 | Pass        |
| +1                              | 836.1         | -58.4 | 838.1                     | -70   | 11.6   | <12   | Not required                 | < 300                 | Pass        |
| +0                              | 836.1         | -62.3 | 838.1                     | -71.3 | 9      | <12   | <21                          | < 300                 | Pass        |
| -1                              | 836.1         | -65.3 | 838.1                     | -72.5 | 7.2    | <12   | <25                          | < 300                 | Pass        |
| -2                              | 836.1         | -64.1 | 838.1                     | -72.8 | 8.7    | <12   | Not required                 | < 300                 | Pass        |
| -3                              | 836.1         | -65.6 | 838.1                     | -74.2 | 8.6    | <12   | Not required                 | < 300                 | Pass        |
| -4                              | 836.1         | -65.6 | 838.1                     | -74.4 | 8.8    | <12   | Not required                 | < 300                 | Pass        |
| -5                              | 836.1         | -67.5 | 838.1                     | -74.9 | 7.4    | <12   | <35                          | < 300                 | Pass        |

| Oscillation Mitigation - Uplink |                 |       |                           |       |        |       |                              |                       |             |
|---------------------------------|-----------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                            | 1710 - 1755 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                | CDMA            |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting     | Oscillations    |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                 | Freq.           | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                              | MHz             | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                              | 1730.25         | -56.6 | 1736.65                   | -66.4 | 9.8    | <12   | Not required                 | < 300                 | Pass        |
| +4                              | 1730.25         | -55   | 1736.65                   | -66.4 | 11.4   | <12   | Not required                 | < 300                 | Pass        |
| +3                              | 1730.25         | -56.1 | 1736.65                   | -62.7 | 6.6    | <12   | <40                          | < 300                 | Pass        |
| 2                               | 1730.25         | -60.1 | 1736.65                   | -64.6 | 4.5    | <12   | Not required                 | < 300                 | Pass        |
| +1                              | 1730.25         | -60.2 | 1736.65                   | -64.1 | 3.9    | <12   | Not required                 | < 300                 | Pass        |
| +0                              | 1730.25         | -58.9 | 1736.65                   | -65.2 | 6.3    | <12   | Not required                 | < 300                 | Pass        |
| -1                              | 1730.25         | -57.5 | 1736.65                   | -64.7 | 7.2    | <12   | Not required                 | < 300                 | Pass        |
| -2                              | 1730.25         | -63.4 | 1736.65                   | -65.7 | 2.3    | <12   | Not required                 | < 300                 | Pass        |
| -3                              | 1730.25         | -64.3 | 1736.65                   | -65.3 | 1      | <12   | Not required                 | < 300                 | Pass        |
| -4                              | 1730.25         | -64.2 | 1736.65                   | -65.1 | 0.9    | <12   | Not required                 | < 300                 | Pass        |
| -5                              | 1730.25         | -63.4 | 1736.65                   | -65.3 | 1.9    | <12   | Not required                 | < 300                 | Pass        |

| Oscillation Mitigation - Uplink |                 |       |                           |       |        |       |                              |                       |             |
|---------------------------------|-----------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                            | 1850 - 1915 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                | CDMA            |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting     | Oscillations    |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                 | Freq.           | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                              | MHz             | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                              | 1876.08         | -57.5 | 1880.78                   | -64.8 | 7.3    | <12   | Not required                 | < 300                 | Pass        |
| +4                              | 1876.08         | -56.6 | 1880.78                   | -64.8 | 8.2    | <12   | Not required                 | < 300                 | Pass        |
| +3                              | 1876.08         | -56.5 | 1880.78                   | -64.9 | 8.4    | <12   | Not required                 | < 300                 | Pass        |
| 2                               | 1876.08         | -55.7 | 1880.78                   | -65.1 | 9.4    | <12   | Not required                 | < 300                 | Pass        |
| +1                              | 1876.08         | -60.1 | 1880.78                   | -67.6 | 7.5    | <12   | <15                          | < 300                 | Pass        |
| +0                              | 1876.08         | -59.9 | 1880.78                   | -67.5 | 7.6    | <12   | Not required                 | < 300                 | Pass        |
| -1                              | 1876.08         | -58.8 | 1880.78                   | -68.2 | 9.4    | <12   | Not required                 | < 300                 | Pass        |
| -2                              | 1876.08         | -62.7 | 1880.78                   | -69   | 6.3    | <12   | Not required                 | < 300                 | Pass        |
| -3                              | 1876.08         | -61   | 1880.78                   | -68.9 | 7.9    | <12   | Not required                 | < 300                 | Pass        |
| -4                              | 1876.08         | -63.8 | 1880.78                   | -69.3 | 5.5    | <12   | Not required                 | < 300                 | Pass        |
| -5                              | 1876.08         | -64.2 | 1880.78                   | -70.2 | 6      | <12   | Not required                 | < 300                 | Pass        |

### Downlink Oscillation Mitigation Test Data

| Oscillation Mitigation - Downlink |               |       |                           |       |        |       |                              |                       |             |
|-----------------------------------|---------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                              | 728 - 746 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                  | CDMA          |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting       | Oscillations  |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                   | Freq.         | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                                | MHz           | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                                | 738           | -64.5 | 740.7                     | -70.5 | 6      | <12   | Not required                 | < 300                 | Pass        |
| +4                                | 738           | -64.6 | 740.7                     | -70.4 | 5.8    | <12   | Not required                 | < 300                 | Pass        |
| +3                                | 738           | -63.1 | 740.7                     | -70.6 | 7.5    | <12   | Not required                 | < 300                 | Pass        |
| 2                                 | 738           | -63.3 | 740.7                     | -70.5 | 7.2    | <12   | Not required                 | < 300                 | Pass        |
| +1                                | 738           | -62.1 | 740.7                     | -71.1 | 9      | <12   | Not required                 | < 300                 | Pass        |
| +0                                | 738           | -65.6 | 740.7                     | -72.6 | 7      | <12   | Not required                 | < 300                 | Pass        |
| -1                                | 738           | -67.6 | 740.7                     | -73.9 | 6.3    | <12   | Not required                 | < 300                 | Pass        |
| -2                                | 738           | -66.9 | 740.7                     | -74.4 | 7.5    | <12   | Not required                 | < 300                 | Pass        |
| -3                                | 738           | -66.1 | 740.7                     | -74.3 | 8.2    | <12   | Not required                 | < 300                 | Pass        |
| -4                                | 738           | -67.7 | 740.7                     | -75.4 | 7.7    | <12   | Not required                 | < 300                 | Pass        |
| -5                                | 738           | -67.5 | 740.7                     | -75.6 | 8.1    | <12   | Not required                 | < 300                 | Pass        |

| Oscillation Mitigation - Downlink |               |       |                           |       |        |       |                              |                       |             |
|-----------------------------------|---------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                              | 746 - 757 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                  | CDMA          |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting       | Oscillations  |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                   | Freq.         | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                                | MHz           | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                                | 748.96        | -64.7 | 751.44                    | -68   | 3.3    | <12   | Not required                 | < 300                 | Pass        |
| +4                                | 748.96        | -64.5 | 751.44                    | -69   | 4.5    | <12   | Not required                 | < 300                 | Pass        |
| +3                                | 748.96        | -64.7 | 751.44                    | -69.2 | 4.5    | <12   | Not required                 | < 300                 | Pass        |
| 2                                 | 748.96        | -63.9 | 751.44                    | -68.9 | 5      | <12   | Not required                 | < 300                 | Pass        |
| +1                                | 748.96        | -63.3 | 751.44                    | -68.6 | 5.3    | <12   | Not required                 | < 300                 | Pass        |
| +0                                | 748.96        | -62.9 | 751.44                    | -69   | 6.1    | <12   | Not required                 | < 300                 | Pass        |
| -1                                | 748.96        | -62.3 | 751.44                    | -68.8 | 6.5    | <12   | Not required                 | < 300                 | Pass        |
| -2                                | 748.96        | -61.8 | 751.44                    | -69   | 7.2    | <12   | Not required                 | < 300                 | Pass        |
| -3                                | 748.96        | -66.5 | 751.44                    | -70.2 | 3.7    | <12   | Not required                 | < 300                 | Pass        |
| -4                                | 748.96        | -66   | 751.44                    | -70.1 | 4.1    | <12   | Not required                 | < 300                 | Pass        |
| -5                                | 748.96        | -67.8 | 751.44                    | -70   | 2.2    | <12   | Not required                 | < 300                 | Pass        |

| Oscillation Mitigation – Downlink |               |       |                           |       |        |       |                              |                       |             |
|-----------------------------------|---------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                              | 869 - 894 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                  | CDMA          |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting       | Oscillations  |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                   | Freq.         | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                                | MHz           | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                                | 877.79        | -60.7 | 879.64                    | -64.8 | 4.1    | <12   | Not required                 | < 300                 | Pass        |
| +4                                | 877.79        | -60.3 | 879.64                    | -65.9 | 5.6    | <12   | Not required                 | < 300                 | Pass        |
| +3                                | 877.79        | -59.6 | 879.64                    | -65.8 | 6.2    | <12   | Not required                 | < 300                 | Pass        |
| 2                                 | 877.79        | -58.6 | 879.64                    | -65.8 | 7.2    | <12   | Not required                 | < 300                 | Pass        |
| +1                                | 877.79        | -58.2 | 879.64                    | -66.5 | 8.3    | <12   | Not required                 | < 300                 | Pass        |
| +0                                | 877.79        | -57.3 | 879.64                    | -66.5 | 9.2    | <12   | Not required                 | < 300                 | Pass        |
| -1                                | 877.79        | -55.5 | 879.64                    | -66.5 | 11     | <12   | Not required                 | < 300                 | Pass        |
| -2                                | 877.79        | -59.4 | 879.64                    | -67.6 | 8.2    | <12   | <25                          | < 300                 | Pass        |
| -3                                | 877.79        | -57.6 | 879.64                    | -67.8 | 10.2   | <12   | Not required                 | < 300                 | Pass        |
| -4                                | 877.79        | -60.8 | 879.64                    | -68.8 | 8      | <12   | <20                          | < 300                 | Pass        |
| -5                                | 877.79        | -59.7 | 879.64                    | -64.3 | 4.6    | <12   | Not required                 | < 300                 | Pass        |

| Oscillation Mitigation - Downlink |                 |       |                           |       |        |       |                              |                       |             |
|-----------------------------------|-----------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                              | 1930 - 1995 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                  | CDMA            |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting       | Oscillations    |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                   | Freq.           | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                                | MHz             | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                                | 1977.4          | -50.1 | 1973.6                    | -60.1 | 10     | <12   | Not required                 | < 300                 | Pass        |
| +4                                | 1977.4          | -49.4 | 1973.6                    | -59.7 | 10.3   | <12   | Not required                 | < 300                 | Pass        |
| +3                                | 1977.4          | -48.5 | 1973.6                    | -60.3 | 11.8   | <12   | Not required                 | < 300                 | Pass        |
| 2                                 | 1977.4          | -52   | 1973.6                    | -61.9 | 9.9    | <12   | <20                          | < 300                 | Pass        |
| +1                                | 1977.4          | -50.6 | 1973.6                    | -62.2 | 11.6   | <12   | Not required                 | < 300                 | Pass        |
| +0                                | 1977.4          | -53.5 | 1973.6                    | -63.4 | 9.9    | <12   | Not required                 | < 300                 | Pass        |
| -1                                | 1977.4          | -56.4 | 1973.6                    | -64.7 | 8.3    | <12   | <20                          | < 300                 | Pass        |
| -2                                | 1977.4          | -56   | 1973.6                    | -65.4 | 9.4    | <12   | Not required                 | < 300                 | Pass        |
| -3                                | 1977.4          | -58.6 | 1973.6                    | -67.2 | 8.6    | <12   | <20                          | < 300                 | Pass        |
| -4                                | 1977.4          | -58.3 | 1973.6                    | -67   | 8.7    | <12   | Not required                 | < 300                 | Pass        |
| -5                                | 1977.4          | -56.6 | 1973.6                    | -66.8 | 10.2   | <12   | Not required                 | < 300                 | Pass        |

| Oscillation Mitigation - Uplink |                 |       |                           |       |        |       |                              |                       |             |
|---------------------------------|-----------------|-------|---------------------------|-------|--------|-------|------------------------------|-----------------------|-------------|
| Band                            | 2110 - 2155 MHz |       |                           |       |        |       |                              |                       |             |
| Test Signal Type                | CDMA            |       |                           |       |        |       |                              |                       |             |
| Variable Attenuator Setting     | Oscillations    |       | Lowest Output Power Level |       | Margin | Limit | Time to Mitigate Oscillation | Mitigation Time Limit | Pass / Fail |
|                                 | Freq.           | Level | Freq.                     | Level |        |       |                              |                       |             |
| dB                              | MHz             | dBm   | MHz                       | dBm   | dB     | dB    | sec                          | sec                   |             |
| +5                              | 2145.6          | -52.5 | 2140.5                    | -60.7 | 8.2    | <12   | Not required                 | < 300                 | Pass        |
| +4                              | 2145.6          | -51.5 | 2140.5                    | -60.8 | 9.3    | <12   | Not required                 | < 300                 | Pass        |
| +3                              | 2145.6          | -50.5 | 2140.5                    | -61.4 | 10.9   | <12   | Not required                 | < 300                 | Pass        |
| 2                               | 2145.6          | -53.9 | 2140.5                    | -63.5 | 9.6    | <12   | <25                          | < 300                 | Pass        |
| +1                              | 2145.6          | -52.8 | 2140.5                    | -63.1 | 10.3   | <12   | Not required                 | < 300                 | Pass        |
| +0                              | 2145.6          | -55.8 | 2140.5                    | -64.5 | 8.7    | <12   | <50                          | < 300                 | Pass        |
| -1                              | 2145.6          | -54.3 | 2140.5                    | -64.9 | 10.6   | <12   | Not required                 | < 300                 | Pass        |
| -2                              | 2145.6          | -57.6 | 2140.5                    | -66.3 | 8.7    | <12   | <20                          | < 300                 | Pass        |
| -3                              | 2145.6          | -56.6 | 2140.5                    | -66   | 9.4    | <12   | Not required                 | < 300                 | Pass        |
| -4                              | 2145.6          | -61.9 | 2140.5                    | -68.8 | 6.9    | <12   | <20                          | < 300                 | Pass        |
| -5                              | 2145.6          | -57.8 | 2140.5                    | -67.8 | 10     | <12   | Not required                 | < 300                 | Pass        |

## Radiated Spurious

**Engineer:** Greg Corbin

**Test Date:** 1/5/2017

### Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm. A signal generator was used to provide a CW signal centered in each operational uplink and downlink band. The EUT output was terminated into a 50 Ohm non-radiating load.

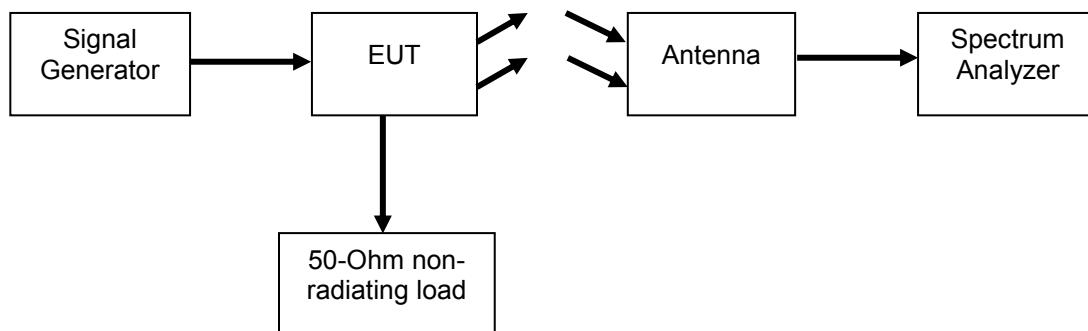
The following formula was used for calculating the limits:

Radiated Spurious Emissions Limit =  $P1 - (43 + 10\log(P2)) = -13\text{dBm}$

P1 = power in dBm

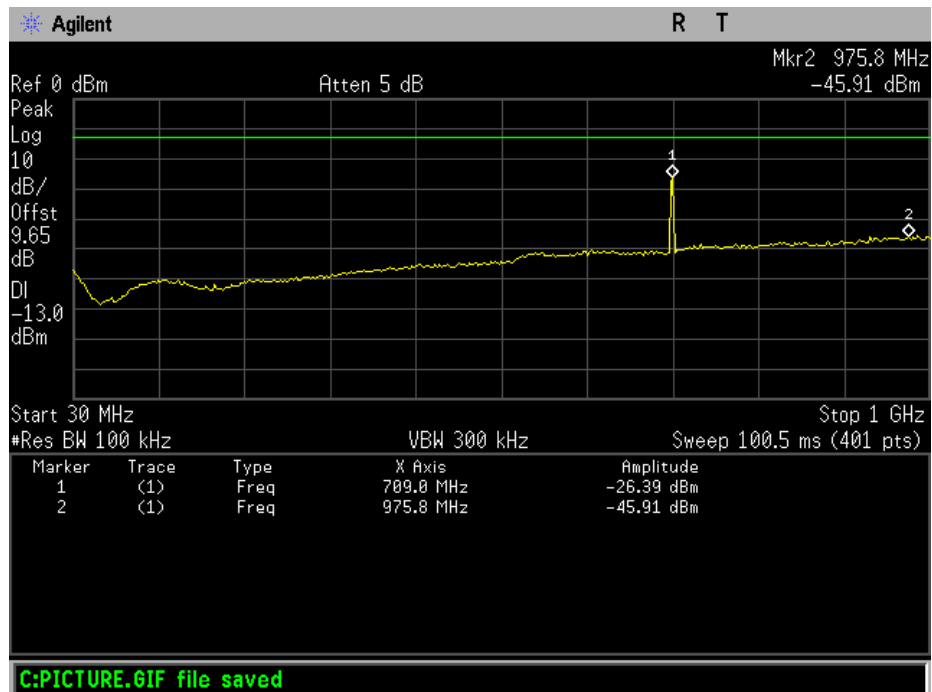
P2 = power in Watts

### Test Setup

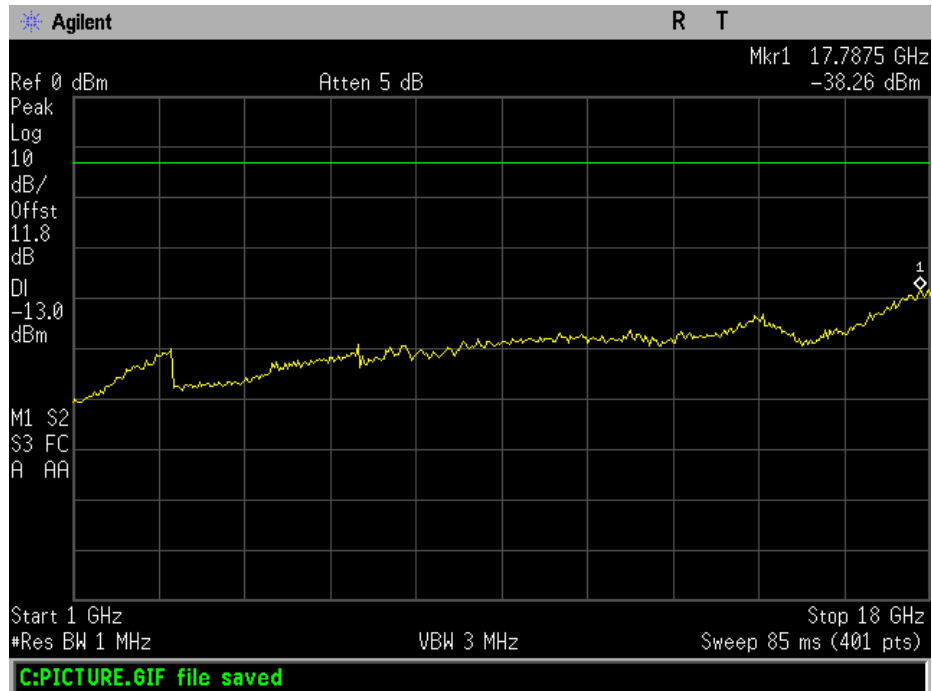


## Uplink Test Results

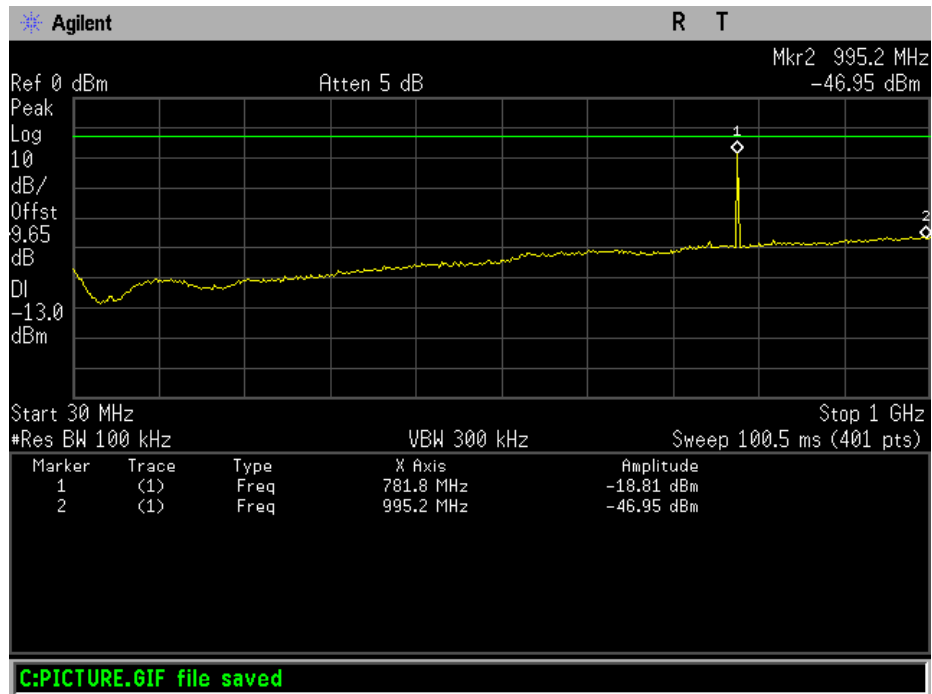
698 - 716 MHz Band  
30 - 1000 MHz



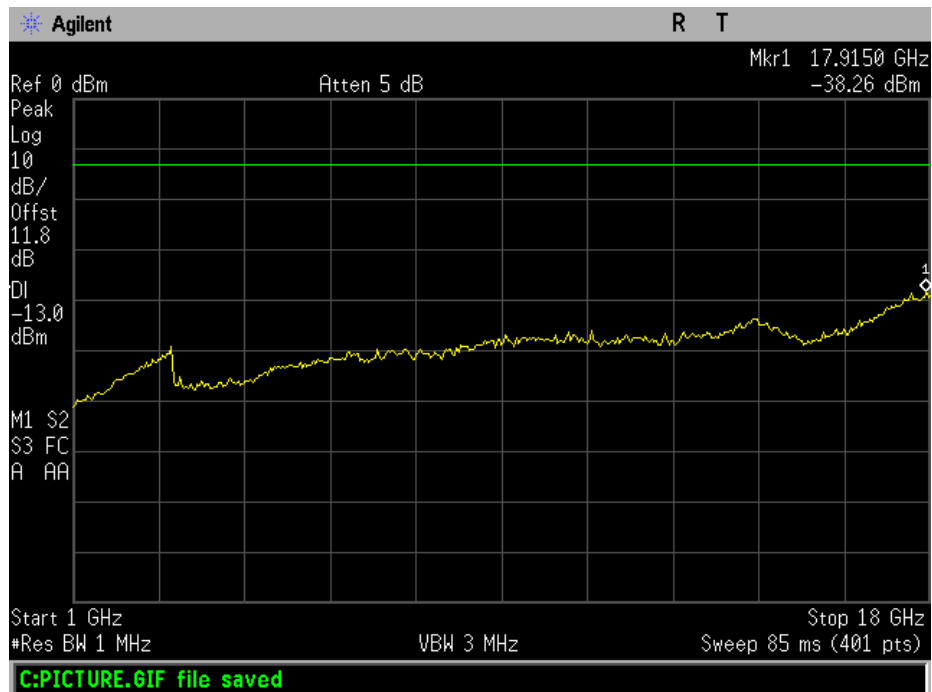
1 - 18 GHz



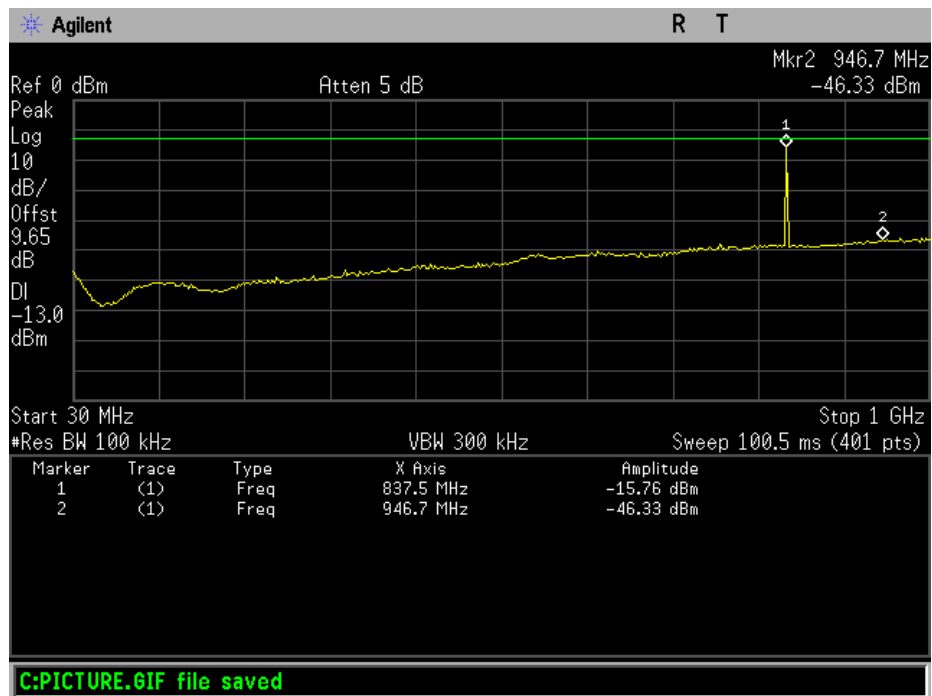
776 - 787 MHz Band  
30 – 1000 MHz



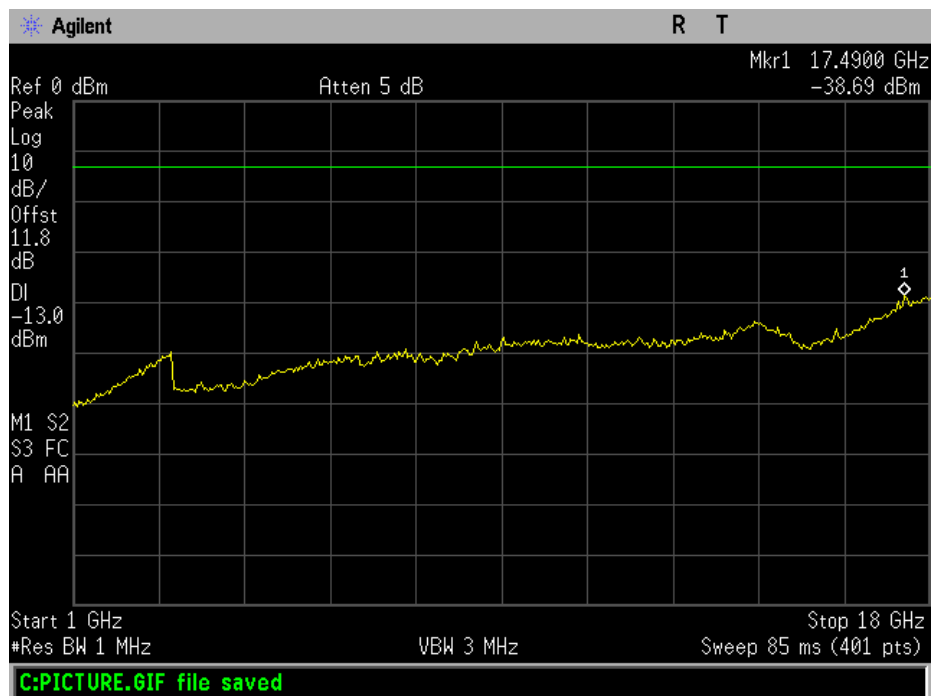
1 – 18 GHz



824 - 849 MHz Band  
30 – 1000 MHz

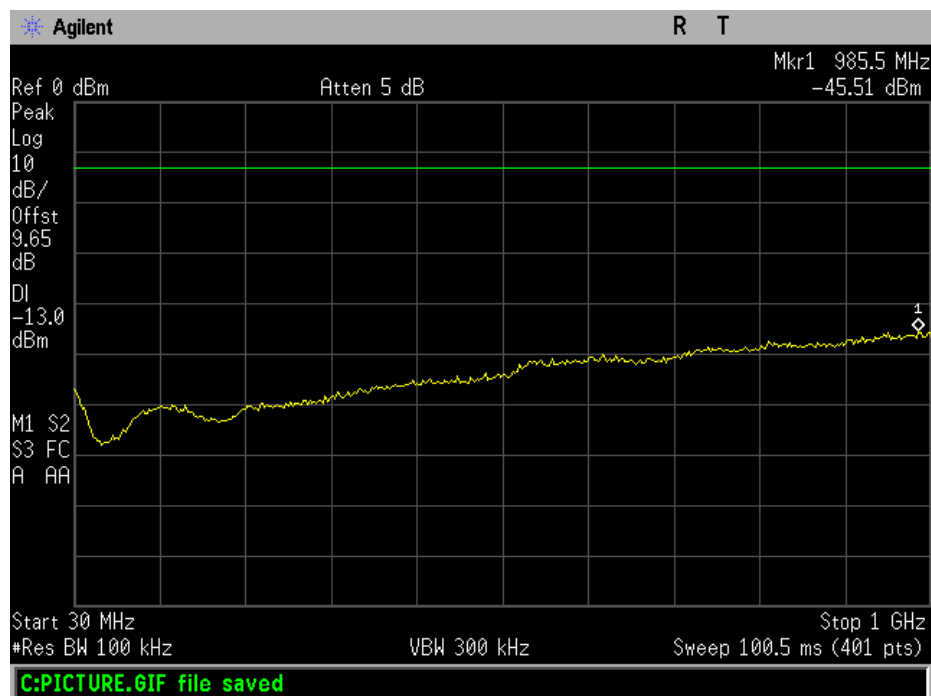


1 – 18 GHz

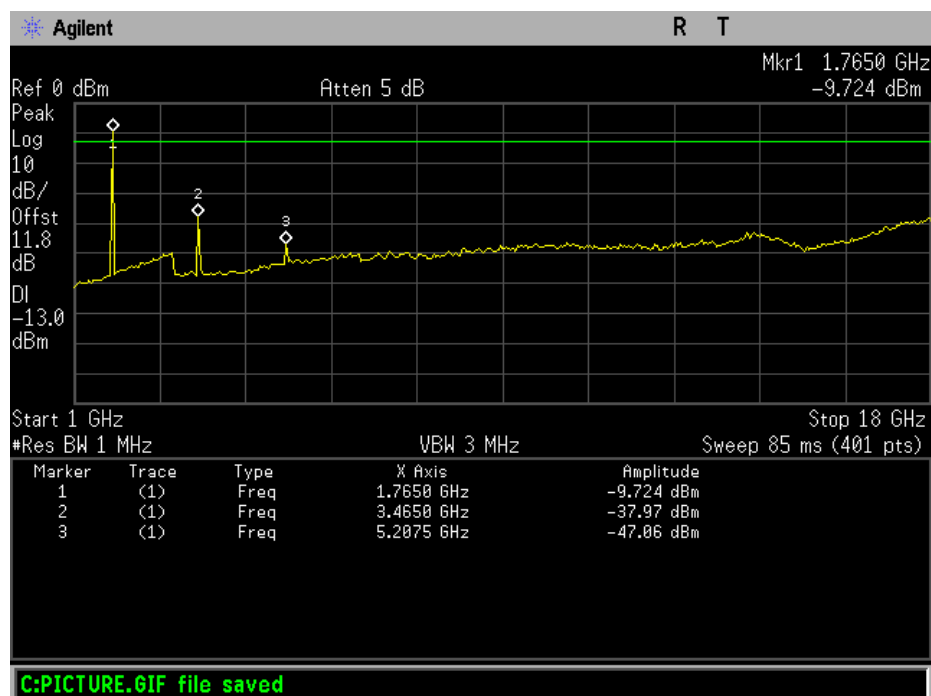




1710 - 1755 MHz Band  
30 - 1000 MHz

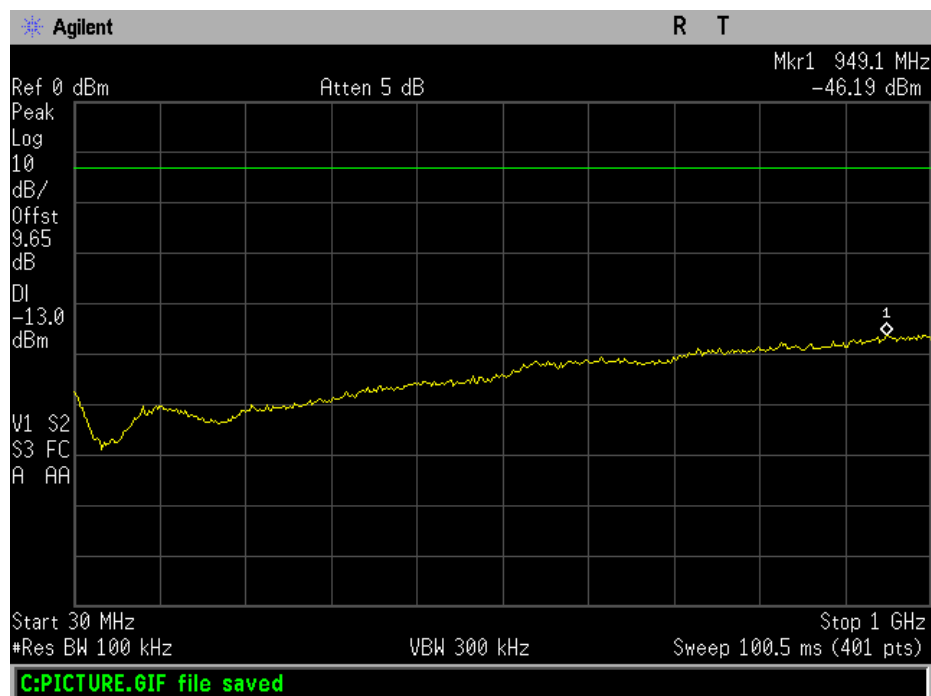


1 - 18 GHz

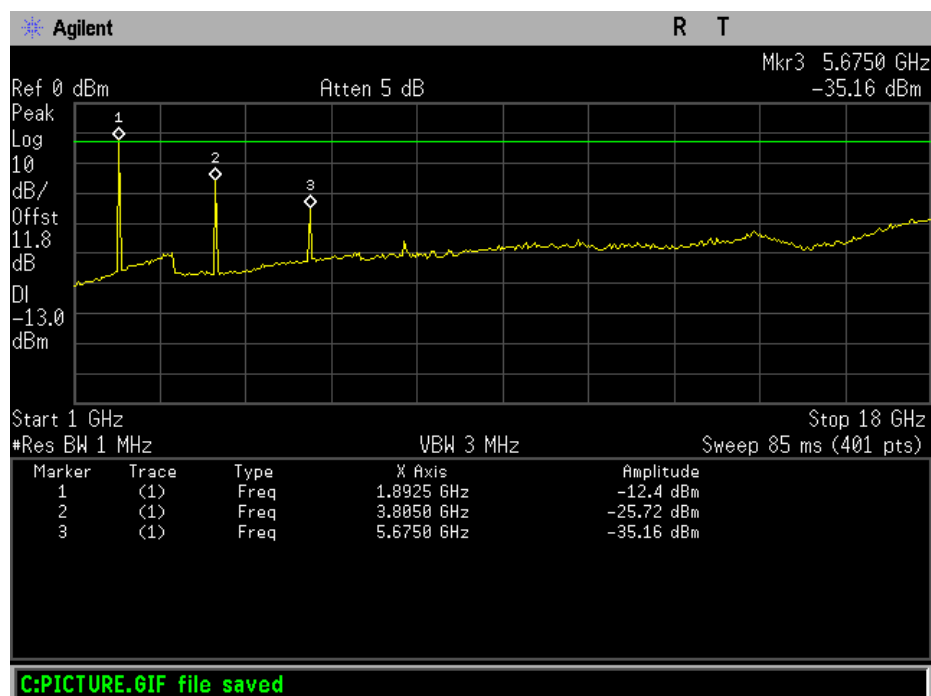




1850 - 1915 MHz Band  
30 - 1000 MHz



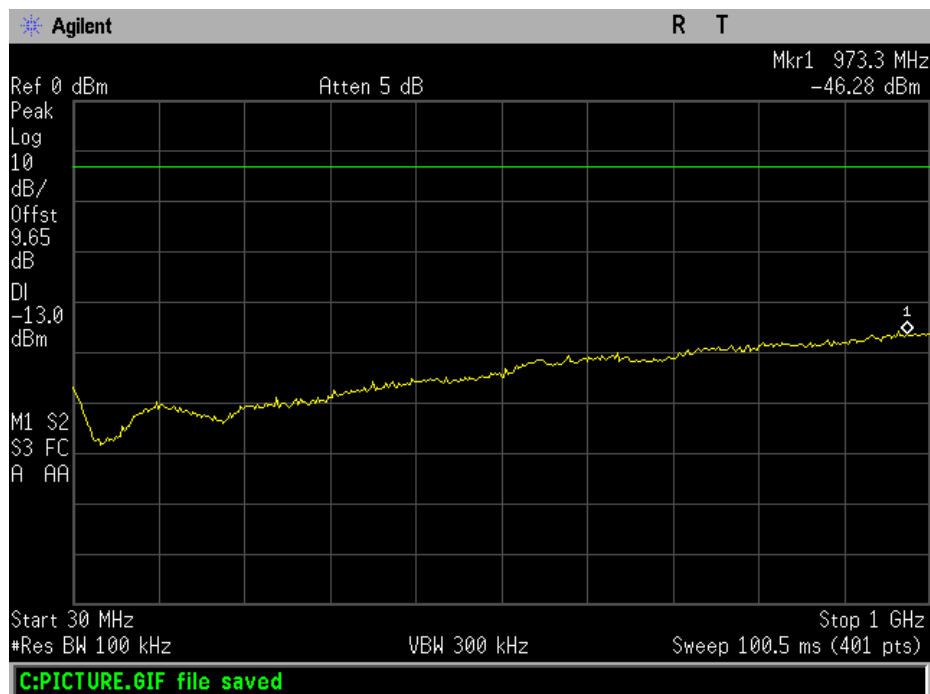
1 - 18 GHz



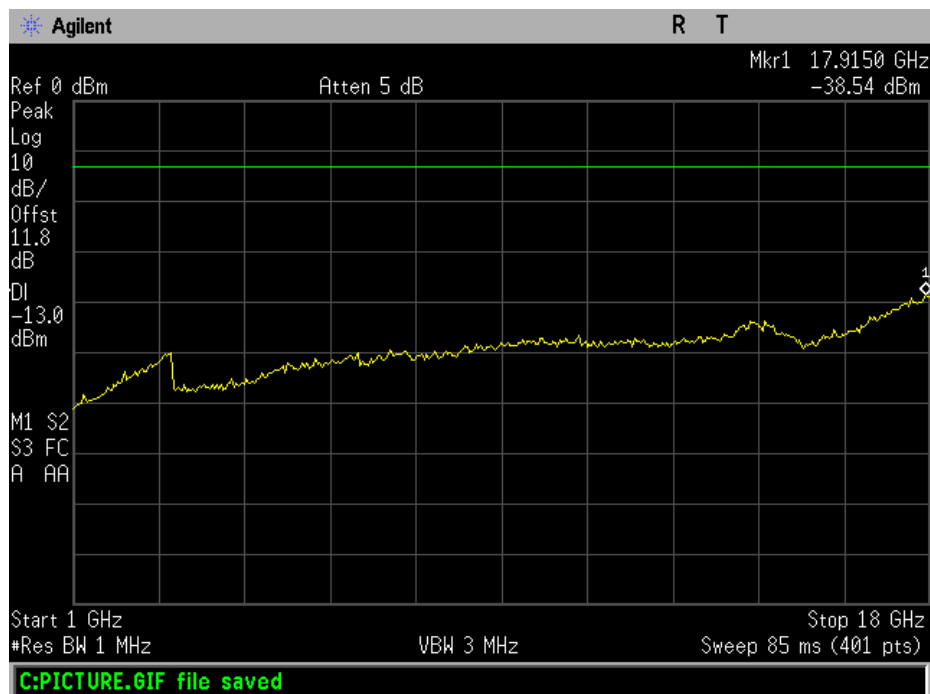


## Downlink Test Results

728 - 746 MHz Band  
30 - 1000 MHz

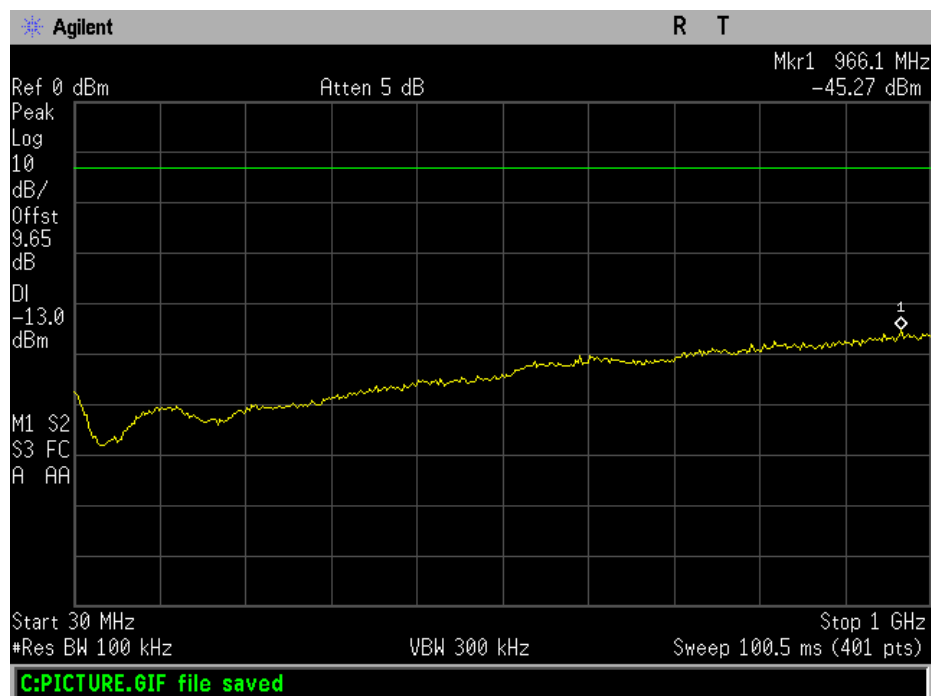


1 - 18 GHz

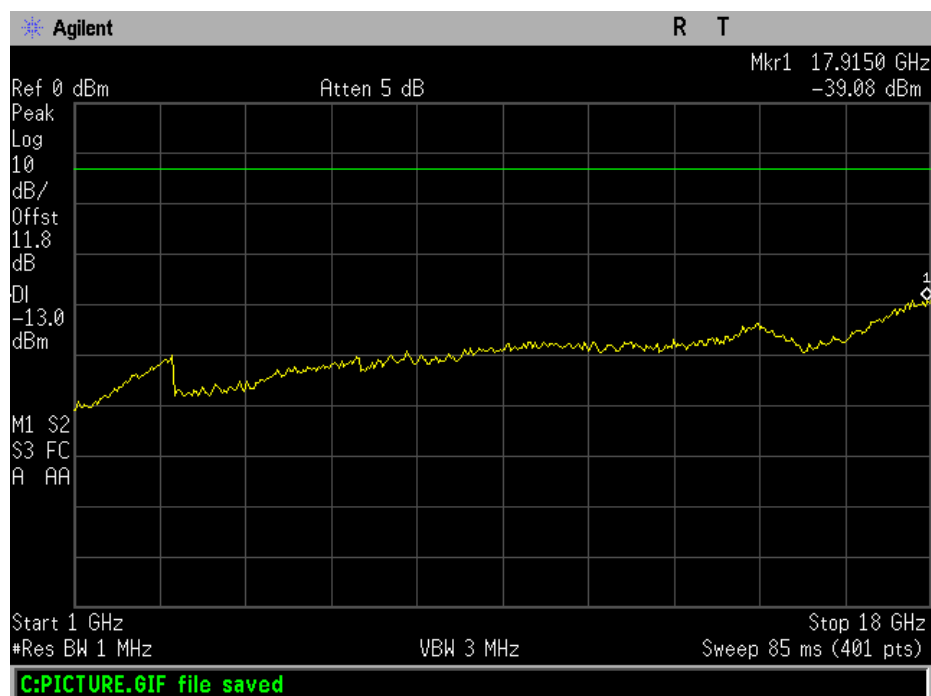




746 - 757 MHz Band  
30 – 1000 MHz

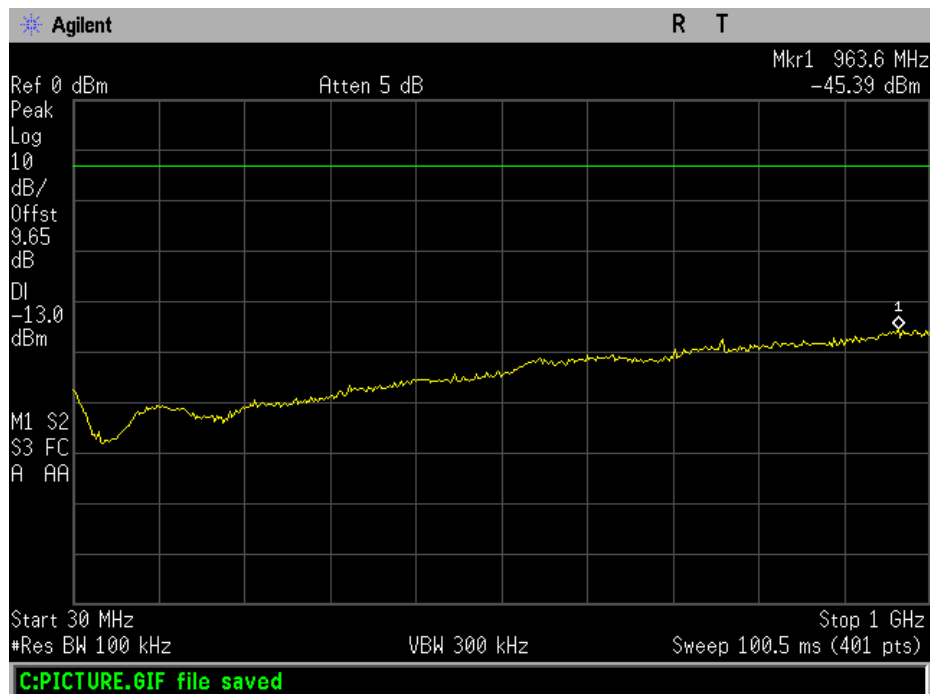


1 – 18 GHz

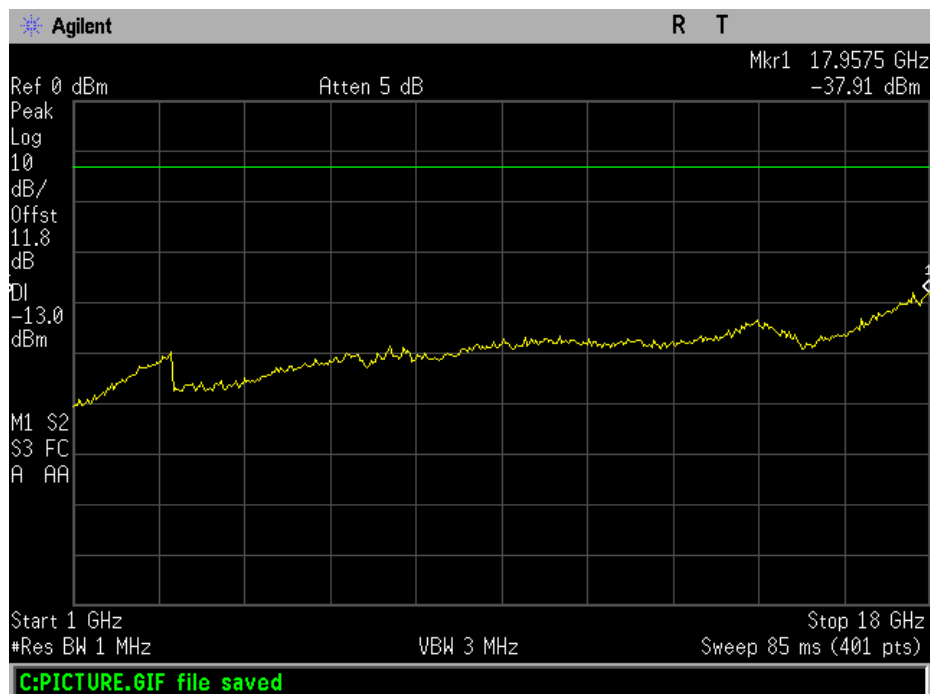




869 - 894 MHz Band  
30 - 1000 MHz

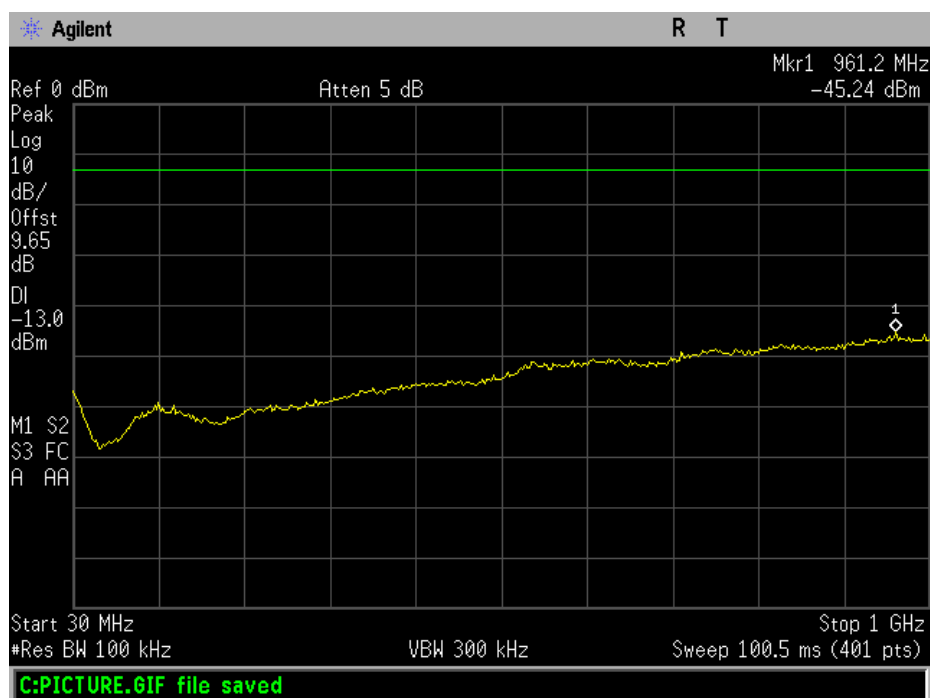


1 - 18 GHz

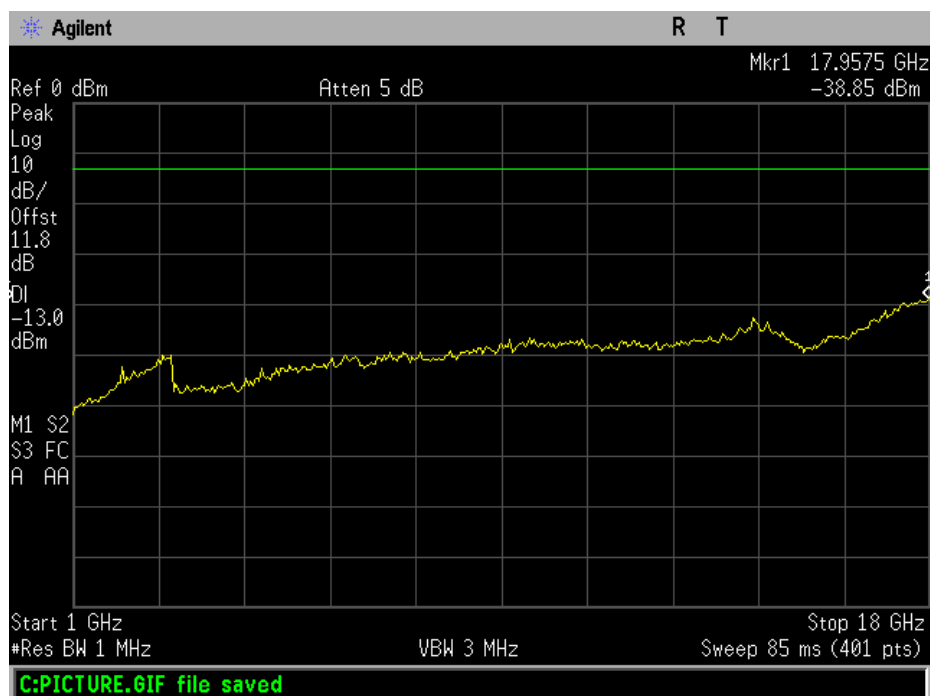




1930 - 1995 MHz Band  
30 - 1000 MHz

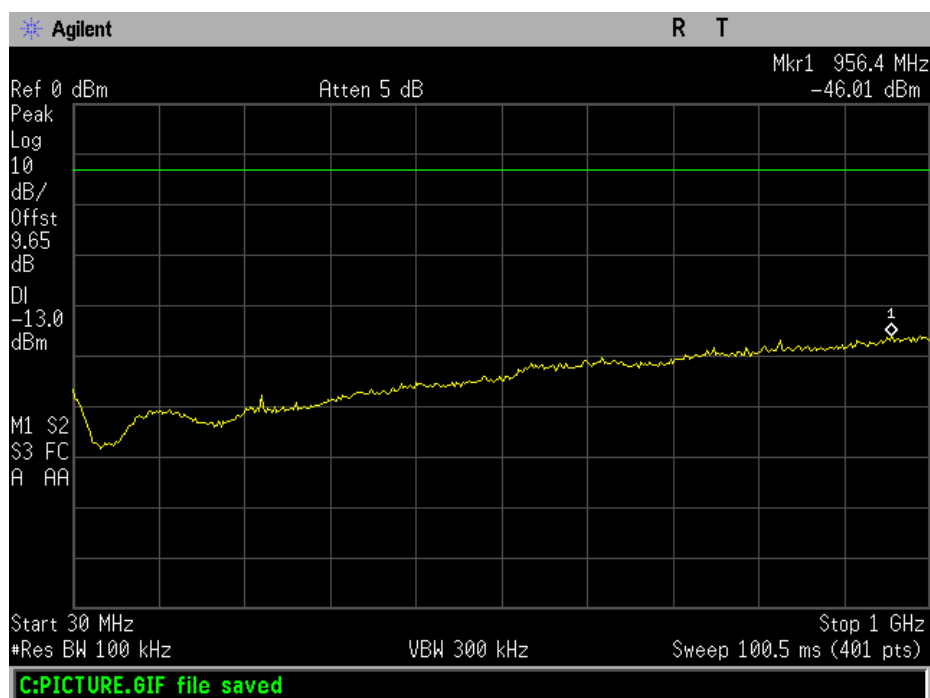


1 - 18 GHz

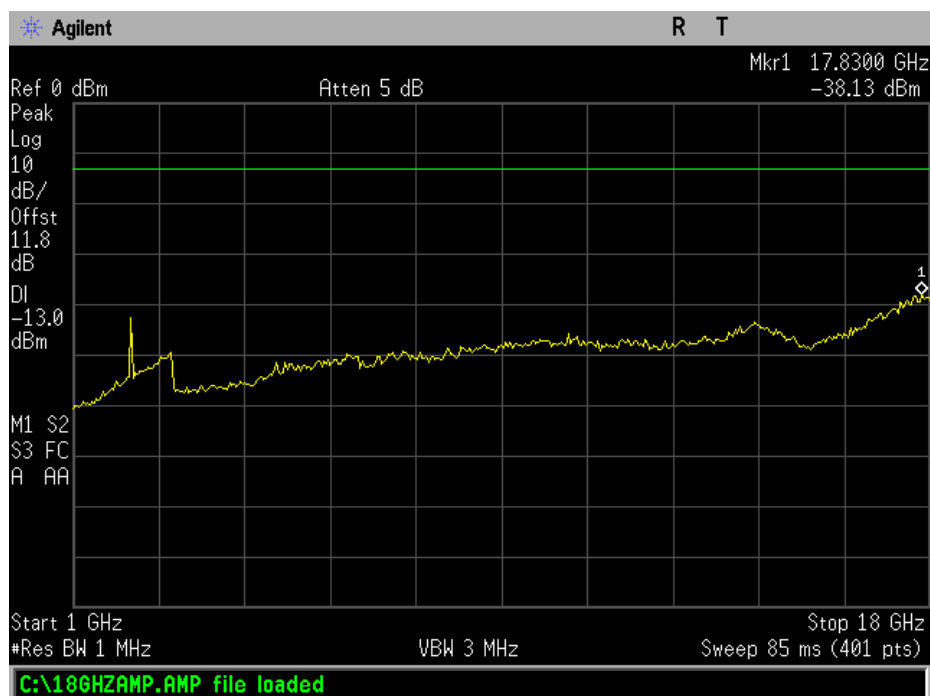




2110 - 2155 MHz Band  
30 – 1000 MHz



1 – 18 GHz



**Note:** Any emissions over the -13 dBm limit line were the fundamental signal and exempt from the -13 dBm limit.

No other emissions were detected. All emissions were lower than -13 dBm.

## Test Equipment Utilized

| Description                   | Manufacturer    | Model #                       | CT Asset # | Last Cal Date | Cal Due Date |
|-------------------------------|-----------------|-------------------------------|------------|---------------|--------------|
| Horn Antenna                  | ARA             | DRG-118/A                     | i00271     | 6/16/16       | 6/16/18      |
| Humidity / Temp Meter         | Newport         | IBTHX-W-5                     | i00282     | 5/26/16       | 5/26/17      |
| Bi-Log Antenna                | Schaffner       | CBL 6111D                     | i00349     | 8/3/16        | 8/3/18       |
| EMI Analyzer                  | Agilent         | E7405A                        | i00379     | 2/11/16       | 2/11/17      |
| Signal Generator              | Rohde & Schwarz | SMU200A                       | i00405     | 1/22/16       | 1/22/17      |
| Spectrum Analyzer             | Textronix       | RSA5126A                      | i00424     | 3/28/16       | 3/28/17      |
| 3 Meter Semi-Anechoic Chamber | Panashield      | 3 Meter Semi-Anechoic Chamber | i00428     | 8/15/16       | 8/15/19      |
| Preamplifier                  | Miteq           | AFS44 00101 400 23-10P-44     | i00509     | N/A           | N/A          |

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT