**Compliance Testing, LLC**
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

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# Test Report

**Prepared for: Cellphone-Mate Inc.**

**Model: TriFlex-V**

**Description: 3-Band Cellphone Signal Booster**

**FCC ID: RSNTRIFLEX-V**

**To**

**FCC Part 20**

**Date of Issue: December 12, 2013**

| | |
|---|---|
| **On the behalf of the applicant:** | **Cellphone-Mate Inc.**<br>**43116 Christy St.**<br>**Fremont, CA 94538** |
| **To the attention of:** | **Hongtao Zhan, CEO**<br>**Ph: (510) 770-0469**<br>**Email: hzhan@cellphone-mate.com** |

**Prepared By**
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**Project No: p1370009**

**Greg Corbin**
**Project Test Engineer**

**Test Report Revision History**

| Revision | Date | Revised By | Reason for Revision |
|---|---|---|---|
| 1.0 | December 12, 2013 | Greg Corbin | Original Document |
| 2.0 | January 6, 2014 | Greg Corbin | Revised test report on page 61, with new MSCL values supplied by the manufacturer |
| 3.0 | January 28, 2014 | Greg Corbin | Corrected rule sections in the test summary table for conducted spurious, Noise Limits, and Uplink Inactivity on page 7. |
| 4.0 | February 7, 2014 | Amanda Reed | Updated Model & FCC ID |

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**ILAC / A2LA**

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

**FCC Site Reg, #349717**

**IC Site Reg. #2044A-2**

**Non-accredited tests contained in this report:**

**N/A**

**Test and Measurement Data**
Subpart
2.1033(c)(14):

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Part 2, Subpart J and the following individual Parts: 20.21 in conjunction with latest version of KDB 935210.

**Standard Test Conditions and Engineering Practices**

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI/C63.4-2009, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F), unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

| Environmental Conditions | | |
|---|---|---|
| **Temp (ºC)** | **Humidity (%)** | **Pressure (mbar)** |
| 15.8 – 20.6 | 29.3 – 36.8 | 969.6 – 981.2 |

Measurement results, unless otherwise noted, are worst-case measurements.

**EUT Description**

**Model:** TriFlex-V

**Description:** 3-Band Cellphone Signal Booster

**Firmware:** N/A

**Software:** Revision 2.0

**Additional Information:**
The EUT is an **In Building** bi-directional amplifier for the boosting of cellular phone signals and data communication devices.

| Frequency Band (MHz) | | | |
|---|---|---|---|
| **Uplink** | 776 - 787 | 824 - 849 | 1850 - 1910 |
| **Downlink** | 746 - 757 | 869 - 894 | 1930 - 1990 |
| **Modulation Type** | LTE | GSM, CDMA, EDGE, HSPA. EVDO, LTE | CDMA, HSPA, LTE, EDGE, EVDO |

| Emission Designators | | | | | |
|---|---|---|---|---|---|
| **CDMA** | **HSPA** | **LTE** | **EVDO** | **EDGE** | **GSM** |
| F9W | F9W | G7D | F9W | G7W | GXW |

The modulation types and emission designators listed in the tables represent the modulations that the cell phone providers use for each frequency band. GSM, CDMA, and WCDMA represent all the modulation types (phase and amplitude or a combination thereof) utilized within the industry. EDGE, HSPA, LTE etc. are all protocols or multiplexing techniques using the base modulations.

**EUT Operation during Tests**
The EUT was in a normal operating condition.

**Accessories:**

| Qty | Description | Mfg | Model | S/N |
|---|---|---|---|---|
| 1 | I.T.E. Power Supply | Surecall | GFP451DA-0945-1 | N/A |

**Test Result Summary**

| Specification | Test Name | Pass, Fail, N/A | Comments |
|---|---|---|---|
| 20.21(e)(3) | Authorized Frequency Band | Pass | |
| 20.21(e)(8)(i)(B)<br>20.21(e)(8)(i)(C)<br>20.21(e)(8)(i)(D) | Maximum Power and Gain | Pass | |
| 20.21(e)(8)(i)(F) | Intermodulation | Pass | |
| 20.21(e)(8)(i)(E) | Out-of-Band Emissions | Pass | |
| 2.1051<br>22.917(a)<br>24.238((a)<br>27.53(e) | Conducted Spurious Emissions | Pass | |
| 20.21(e)(8)(i)(A) | Noise Limits | Pass | |
| 20.21(e)(8)(i)(I) | Uplink Inactivity | Pass | |
| 21(e)(8)(i)(C) | Variable Gain | Pass | |
| 2.1049 | Occupied Bandwidth | Pass | |
| 20.21(e)(8)(ii)(A) | Oscillation Detection | Pass | |
| 2.1053 | Radiated Spurious | Pass | |
| 20.21(e)(8)(i)(B) | Spectrum Block Filtering | N/A | This only applies to devices utilizing spectrum block filtering |

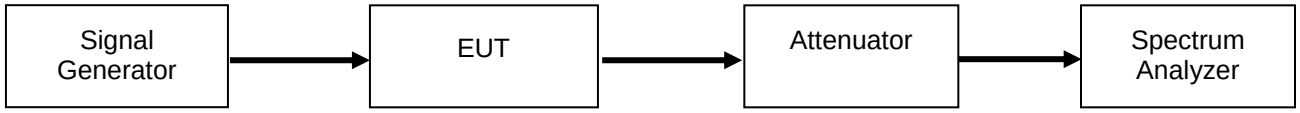
**Authorized Frequency Band**

| | | |
|---|---|---|
| **Name of Test:** | Authorized Frequency Band | **Engineer:** Greg Corbin |
| **Test Equipment Utilized:** | i00424, SMU 200A - S/N:101369 | **Test Date:** 12/6/13 |

**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as needed to ensure accurate readings. A signal generator was utilized to produce a CW input signal tuned to the center channel of the operational band. The RF input level was increased to a point just prior to the AGC being in control of the power. The Signal generator was set to sweep across 2X the operational band of the EUT while the spectrum analyzer was set to MAX HOLD. Two markers were placed at the edges of the operational band and a third marker was placed at the highest point within the band no closer than 2.5 MHz from the band edge.

**Test Setup**

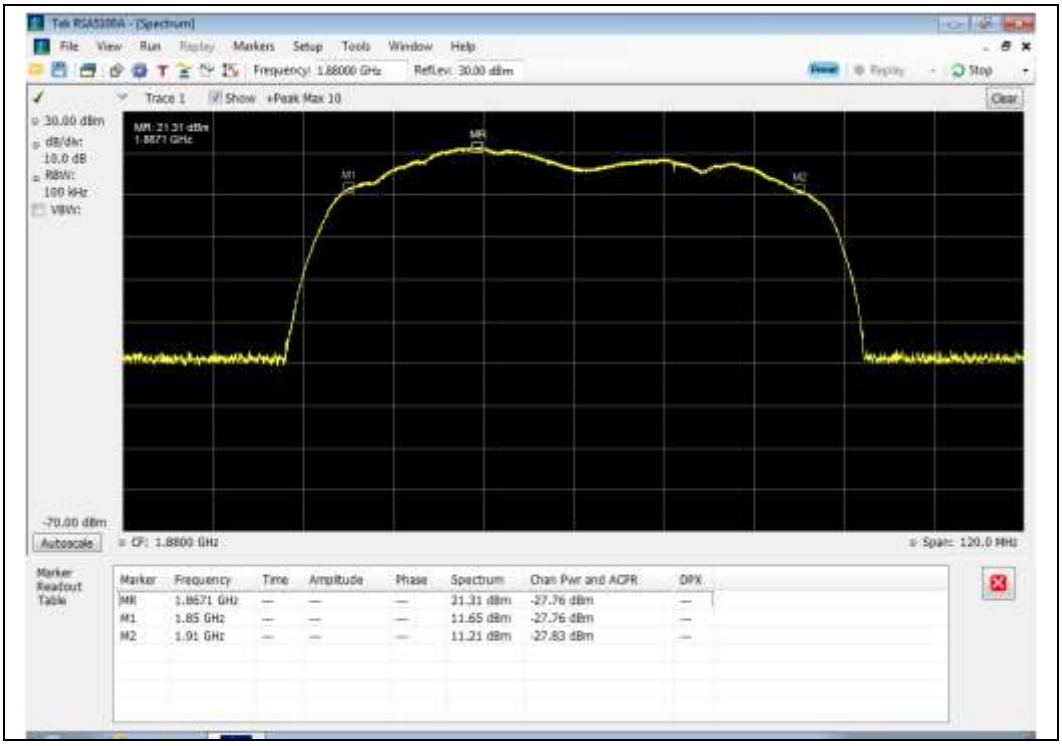


## Uplink Test Results

### 776 - 787 MHz Band

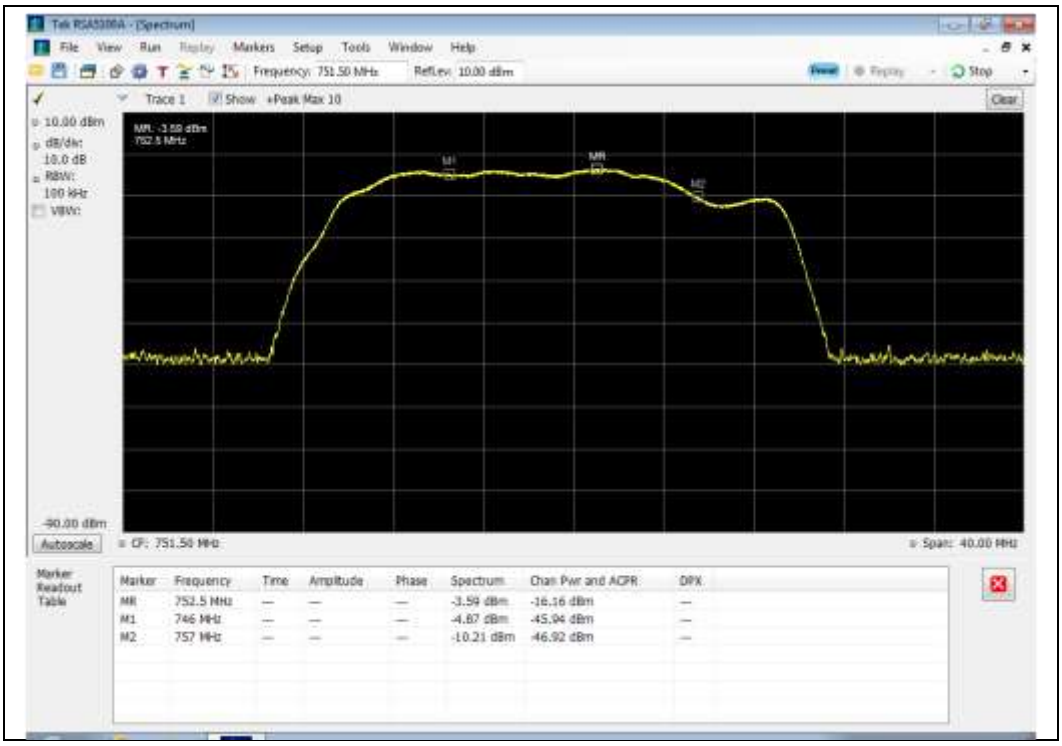

### 824 - 849 MHz Band

**1850 - 1910 MHz Band**

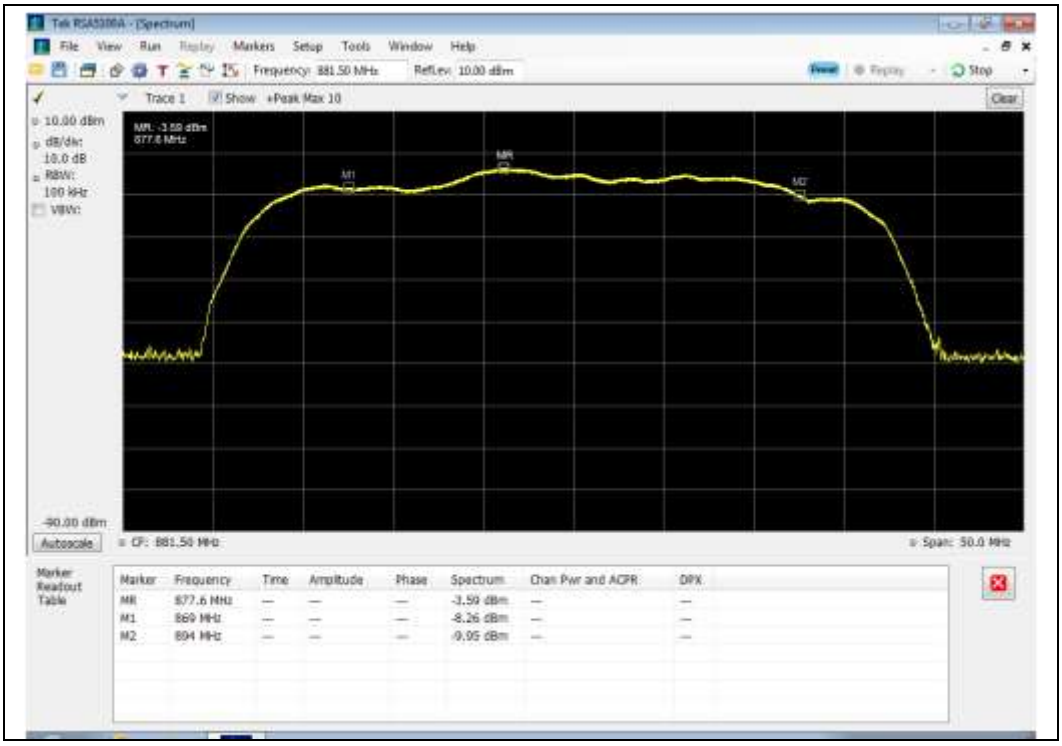



**Downlink Test Results**

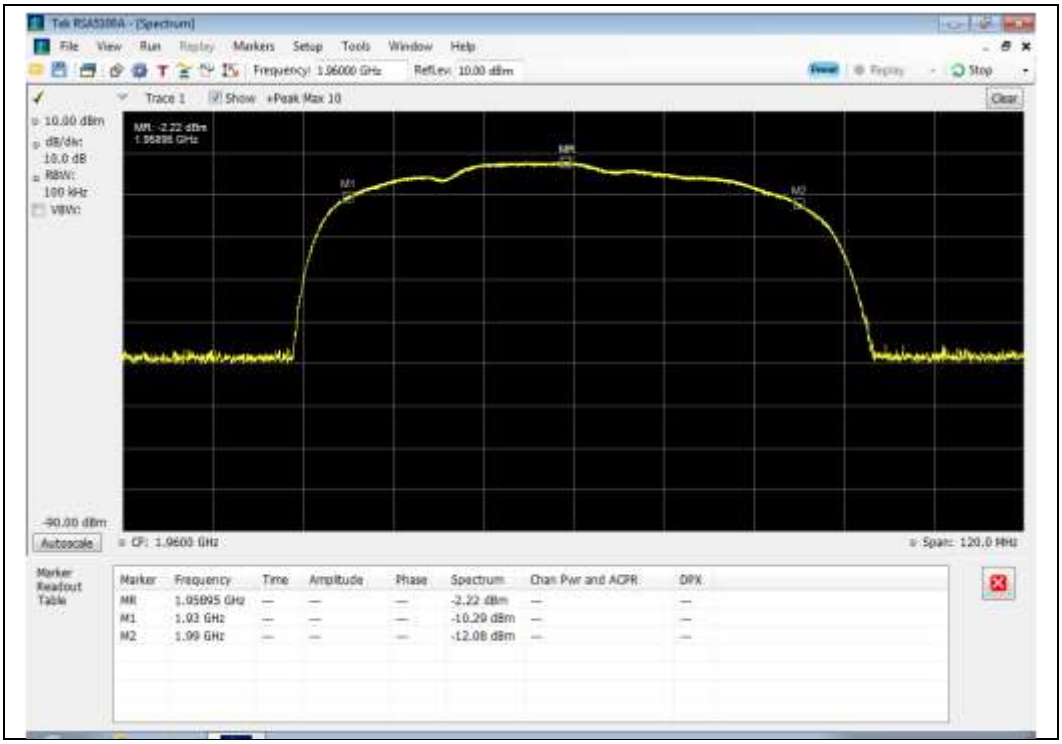
**746 - 757 MHz Band**



**869 - 894 MHz Band**




**1930 - 1990 MHz Band**



**Maximum Power and Gain**

| | | |
|---|---|---|
| **Name of Test:** | Maximum Power and Gain | **Engineer:** Greg Corbin |
| **Test Equipment Utilized:** | i00424, SMU 200A - S/N:101369 | **Test Date:** 12/6/2013 |

**Test Procedure**

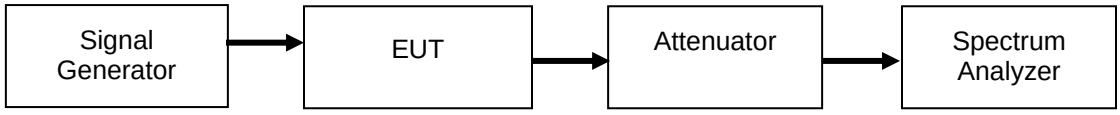
The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as needed to ensure accurate readings. The spectrum analyzer and signal generator were tuned to the frequency with the highest power level in the band, as determined by the Authorized Frequency Band test. The RF input level was increased to a point just prior to the AGC being in control of the power for both pulsed single time slot GSM modulation and 4.1 MHz AWGN modulation. The maximum power was measured and verified to meet the minimum and maximum levels allowed, with the maximum gain being computed from these values. The uplink and downlink gain under each condition were verified to be within 9 dB of each other.

The following formula was used for calculating the gain limits.

Gain Limit (dB) = 6.5 dB + 20Log($F_{MHz}$)

$F_{MHz}$ is the uplink mid-band frequency with the downlink gain limit being equivalent to the paired Uplink band gain limit.

**Test Setup**




**Uplink Power Test Results**

| Frequency Band (MHz) | Input Level (dBm) | Output Power (dBm) | Lower Limit (dBm) | Upper Limit (dBm) | Result |
|---|---|---|---|---|---|
| 776 - 787 MHz Pulsed GSM | -39.3 | 21.3 | 17 | 30 | Pass |
| 776 - 787 MHz AWGN | -42.2 | 18.5 | 17 | 30 | Pass |
| 824 - 849 MHz Pulsed GSM | -39.7 | 19.8 | 17 | 30 | Pass |
| 824 - 849 MHz AWGN | -42.7 | 18.1 | 17 | 30 | Pass |
| 1850 - 1910 MHz Pulsed GSM | -44.2 | 21.4 | 17 | 30 | Pass |
| 1850 - 1910 MHz AWGN | -47.3 | 19.7 | 17 | 30 | Pass |

**Downlink Power Test Results**

| Frequency Band (MHz) | Input Level (dBm) | Output Power (dBm) | Upper Limit (dBm) | Result |
|---|---|---|---|---|
| 746 - 757 MHz Pulsed GSM | -61.2 | -2.3 | 17 | Pass |
| 746 - 757 MHz AWGN | -65.7 | -5.7 | 17 | Pass |
| 869 - 894 MHz Pulsed GSM | -63.6 | -3.3 | 17 | Pass |
| 869 - 894 MHz AWGN | -67.5 | -6.0 | 17 | Pass |
| 1930 - 1990 MHz Pulsed GSM | -67.1 | -1.8 | 17 | Pass |
| 1930 - 1990 MHz AWGN | -72.0 | -5.2 | 17 | Pass |

**Uplink and Downlink Gain Test Results**

| Modulation | Uplink Frequency (MHz) | Downlink Frequency (MHz) | Uplink Gain (dB) | Uplink Limit (dB) | Downlink Gain (dB) | Downlink Limit (dB) | Delta (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| Pulsed GSM | 784.9 | 752.5 | 60.6 | 64.4 | 58.9 | 64.4 | 1.7 | 9 | -7.3 |
| AWGN | 784.9 | 752.5 | 60.7 | 64.4 | 60.0 | 64.4 | 0.7 | 9 | -8.3 |
| Pulsed GSM | 829.05 | 877.6 | 59.5 | 64.9 | 60.3 | 64.9 | 0.8 | 9 | -8.2 |
| AWGN | 829.05 | 877.6 | 60.8 | 64.9 | 61.5 | 64.9 | 0.7 | 9 | -8.3 |
| Pulsed GSM | 1867.1 | 1958.95 | 65.6 | 72 | 65.3 | 72 | 0.3 | 9 | -8.7 |
| AWGN | 1867.1 | 1958.95 | 67.0 | 72 | 66.8 | 72 | 0.2 | 9 | -8.8 |

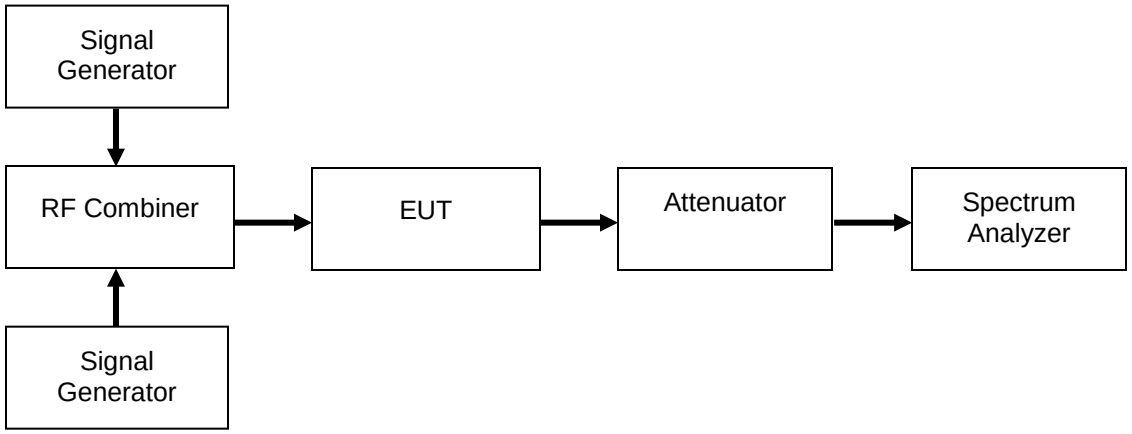
**Intermodulation**

| | | | |
|---|---|---|---|
| **Name of Test:** | Intermodulation | **Engineer:** | Greg Corbin |
| **Test Equipment Utilized:** | i00424, SMU 200A - S/N:101369 | **Test Date:** | 12/11/13 |

**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator. Two signal generators were utilized to produce two CW signals 600 kHz apart and centered in the operational band. Attenuator and cable insertion loss correction factors were input to either the signal generator or the spectrum analyzer as required to ensure that accurate measurements were recorded. The input power was set at the maximum allowable power and the RMS intermodulation products were measured to ensure they were less than -19 dBm in a 3 kHz RBW. The uplink and downlink intermodulation products were plotted, with the levels being listed in the summary tables.

**Test Setup**




**Uplink Test Results**

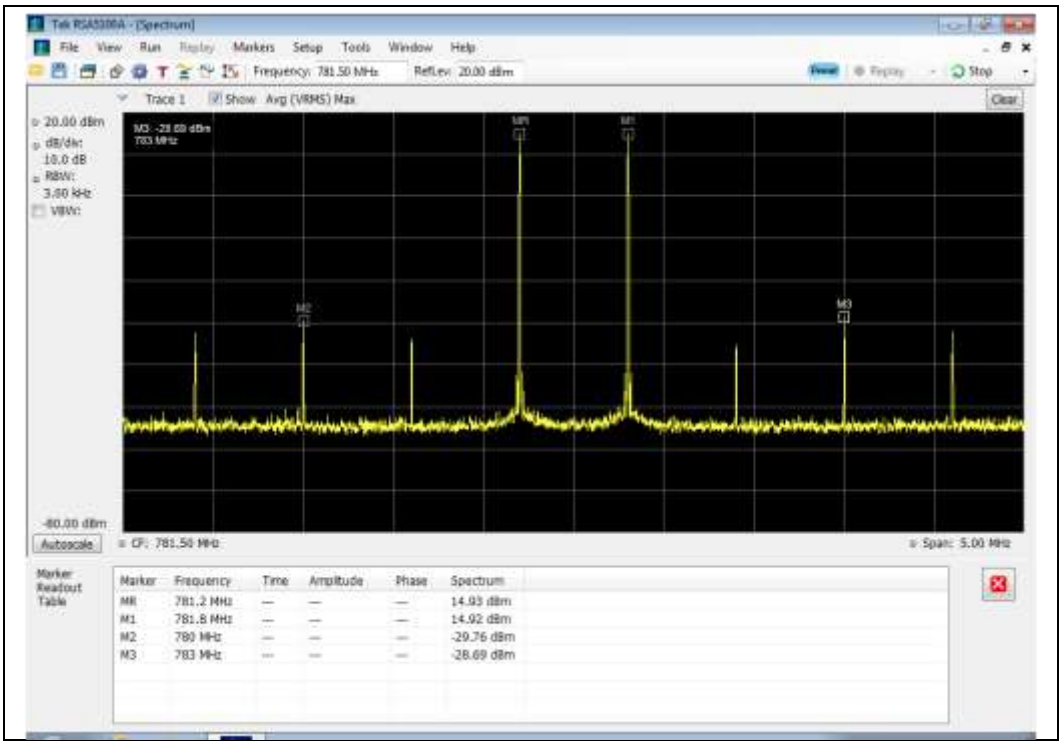
| Frequency Band (MHz) | Intermodulation Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 776 - 787 MHz | -28.7 | -19 | Pass |
| 824 - 849 MHz | -27.2 | -19 | Pass |
| 1850 - 1910 MHz | -32.1 | -19 | Pass |

**Downlink Test Results**

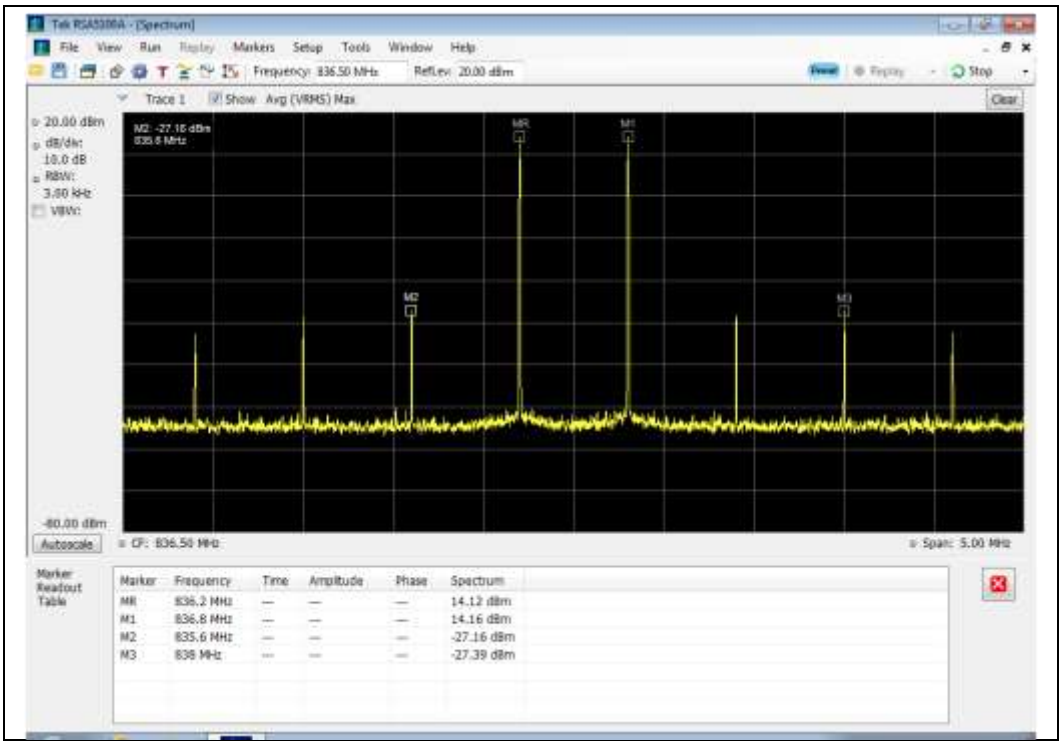
| Frequency Band (MHz) | Intermodulation Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 746 - 757 MHz | -56.2 | -19 | Pass |
| 869 - 894 MHz | -56.2 | -19 | Pass |
| 1930 - 1990 MHz | -55.5 | -19 | Pass |

## Uplink Test Results

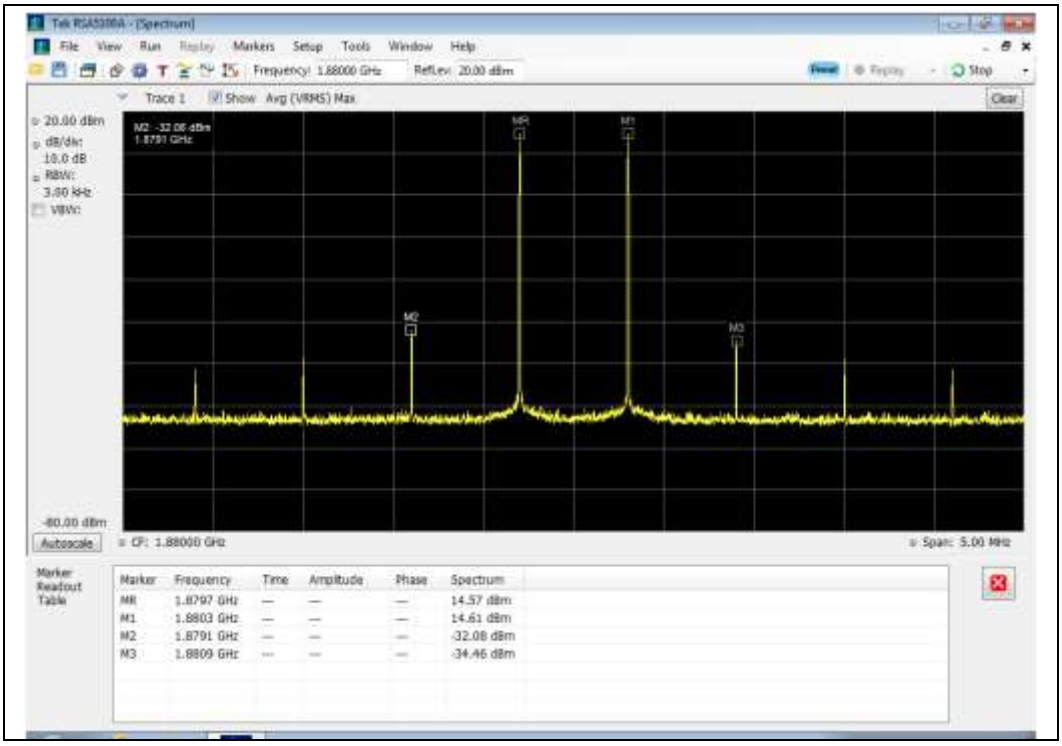
### 776 - 787 MHz Band




### 824 - 849 MHz Band

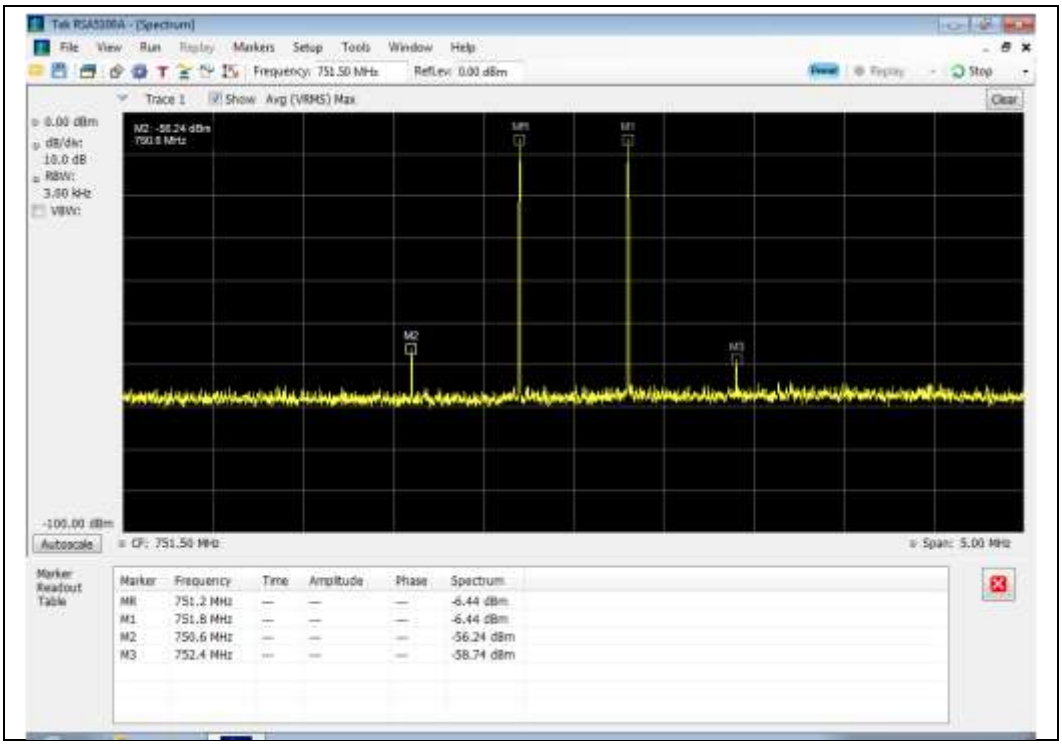


**1850 - 1910 MHz Band**

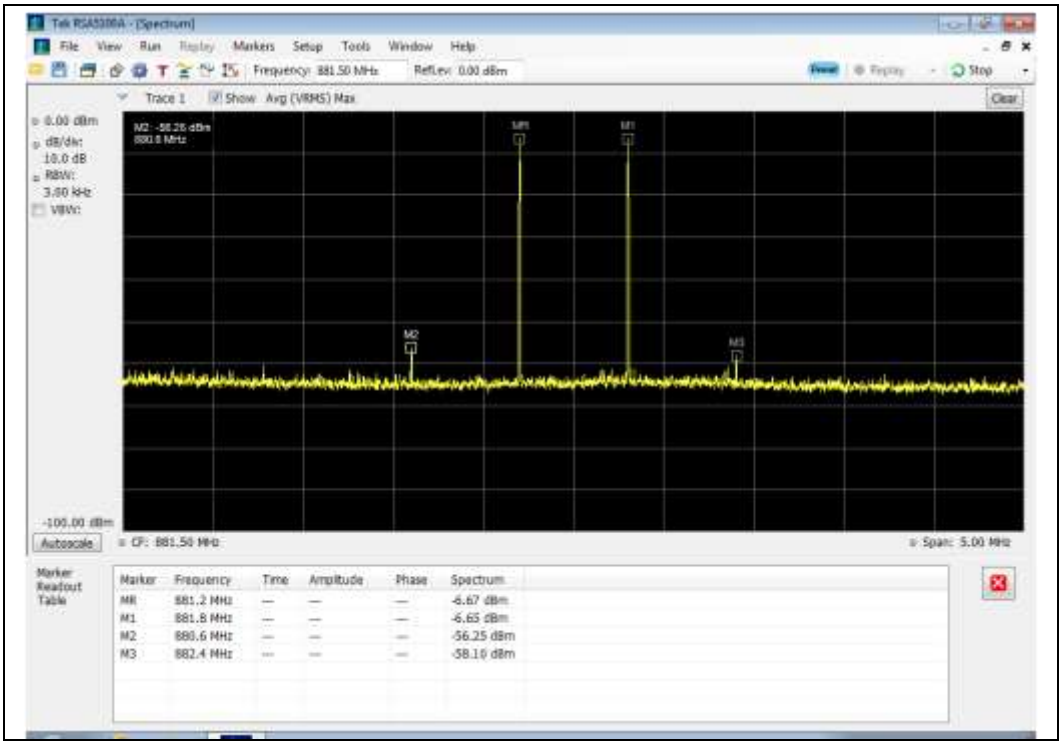



**Downlink Test Results**

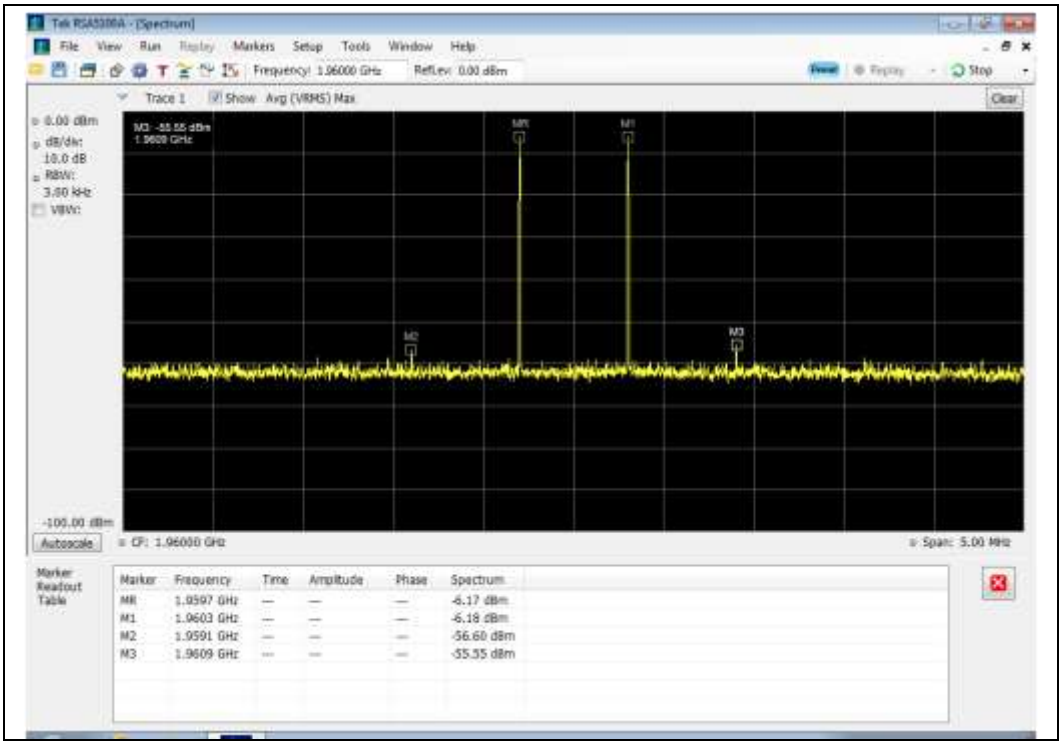
**746 - 757 MHz Band**



**869 - 894 MHz Band**




**1930 - 1990 MHz Band**



**Out-of-Band Emissions**

| | | |
|---|---|---|
| **Name of Test:** | Out-of-Band Emissions | **Engineer:** Greg Corbin |
| **Test Equipment Utilized:** | i00424, SMU 200A - S/N:101369 | **Test Date:** 12/11/13 |

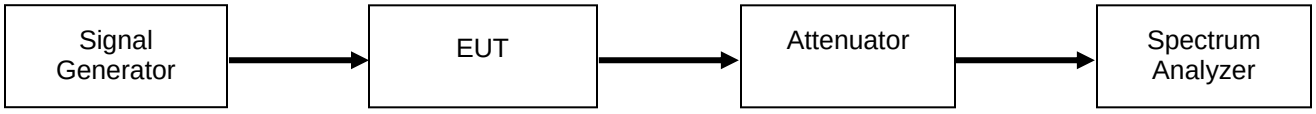
**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor in order to ensure accurate readings. A signal generator was utilized to produce the following signals: GSM, CDMA, and WCDMA. The signal generator was tuned to the lowest allowable upper and lower channel within the EUT operational band for each respective modulation type. The RF input level was increased to a point just prior to the AGC being in control of the power. For each modulation type the Out of Band Emissions were measured to ensure they met the limits.

The following formula was used for calculating the limits:

Limit = P1 - 6 - (43+ 10Log(P2)) = -19dBm
P1 = power in dBm
P2 = power in Watts

**Test Setup**



**GSM Uplink Test Results**

| Frequency Band (MHz) | Band Edge | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 776 - 787 | Lower | -35.5 | -19 | Pass |
| 776 - 787 | Upper | -29.7 | -19 | Pass |
| 824 - 849 | Lower | -46.0 | -19 | Pass |
| 824 - 849 | Upper | -45.5 | -19 | Pass |
| 1850 - 1910 | Lower | -50.3 | -19 | Pass |
| 1850 - 1910 | Upper | -79.8 | -19 | Pass |

**CDMA Uplink Test Results**

| Frequency Band (MHz) | Band Edge | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 776 - 787 | Lower | -46.2 | -19 | Pass |
| 776 - 787 | Upper | -42.7 | -19 | Pass |
| 824 - 849 | Lower | -46.4 | -19 | Pass |
| 824 - 849 | Upper | -42.0 | -19 | Pass |
| 1850 - 1910 | Lower | -62.1 | -19 | Pass |
| 1850 - 1910 | Upper | -70.2 | -19 | Pass |

**WCDMA Uplink Test Results**

| Frequency Band (MHz) | Band Edge | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 776 - 787 | Lower | -44.8 | -19 | Pass |
| 776 - 787 | Upper | -47.4 | -19 | Pass |
| 824 - 849 | Lower | -44.7 | -19 | Pass |
| 824 - 849 | Upper | -44.4 | -19 | Pass |
| 1850 - 1910 | Lower | -57.5 | -19 | Pass |
| 1850 - 1910 | Upper | -64.8 | -19 | Pass |

**GSM Downlink Test Results**

| Frequency Band (MHz) | Band Edge | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 746 - 757 | Lower | -55.9 | -19 | Pass |
| 746 - 757 | Upper | -58.8 | -19 | Pass |
| 869 - 894 | Lower | -67.1 | -19 | Pass |
| 869 - 894 | Upper | -67.3 | -19 | Pass |
| 1930 - 1990 | Lower | -69.3 | -19 | Pass |
| 1930 - 1990 | Upper | -81.4 | -19 | Pass |

**CDMA Downlink Test Results**

| Frequency Band (MHz) | Band Edge | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 746 - 757 | Lower | -65.5 | -19 | Pass |
| 746 - 757 | Upper | -69.9 | -19 | Pass |
| 869 - 894 | Lower | -65.7 | -19 | Pass |
| 869 - 894 | Upper | -66.9 | -19 | Pass |
| 1930 - 1990 | Lower | -64.5 | -19 | Pass |
| 1930 - 1990 | Upper | -71.6 | -19 | Pass |

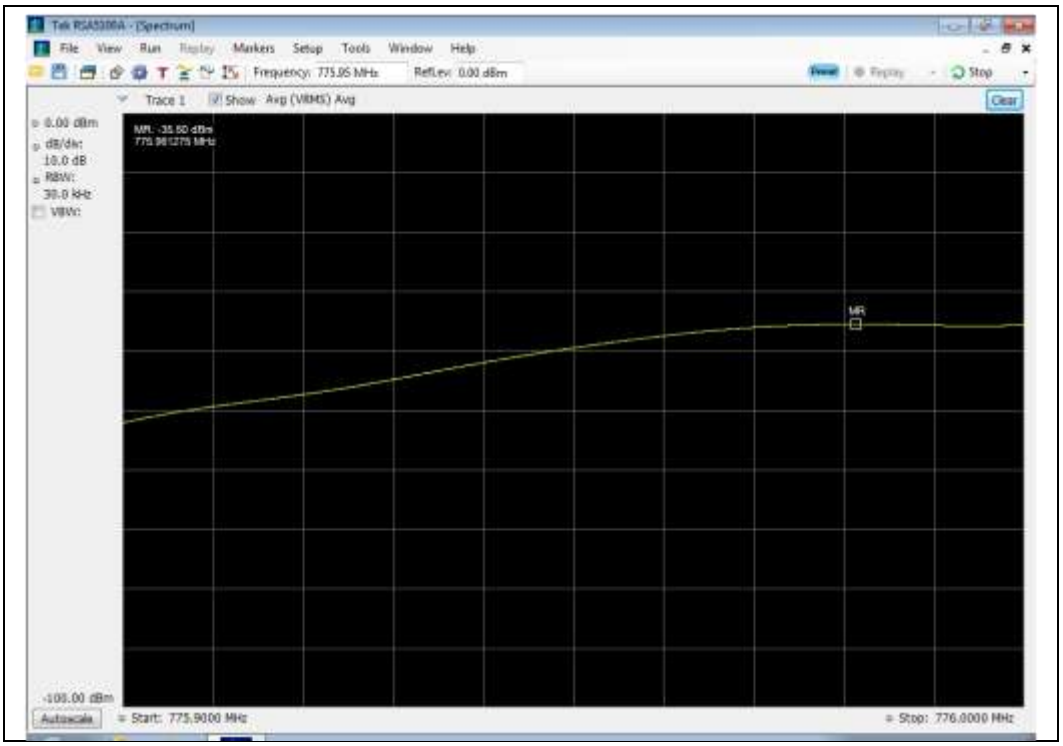
**WCDMA Downlink Test Results**

| Frequency Band (MHz) | Band Edge | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 746 - 757 | Lower | -64.9 | -19 | Pass |
| 746 - 757 | Upper | -68.9 | -19 | Pass |
| 869 - 894 | Lower | -60.5 | -19 | Pass |
| 869 - 894 | Upper | -61.3 | -19 | Pass |
| 1930 - 1990 | Lower | -59.5 | -19 | Pass |
| 1930 - 1990 | Upper | -66.6 | -19 | Pass |

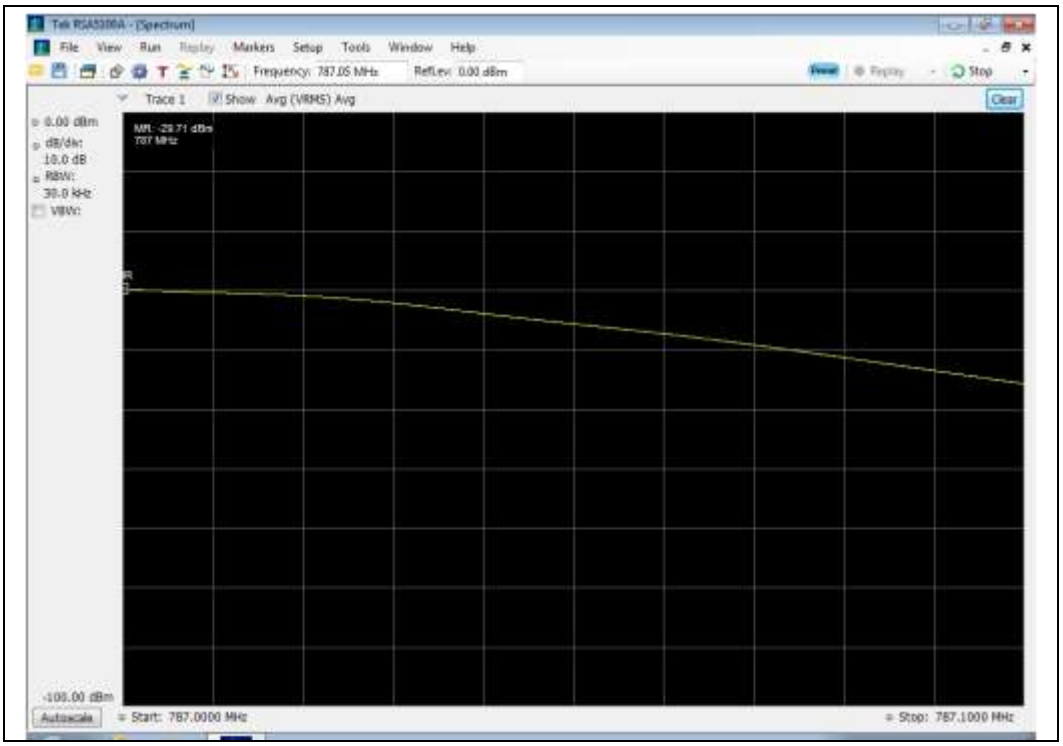
## GSM Uplink Test Plots

### 776 - 787 MHz Band

**Lower Band Edge**

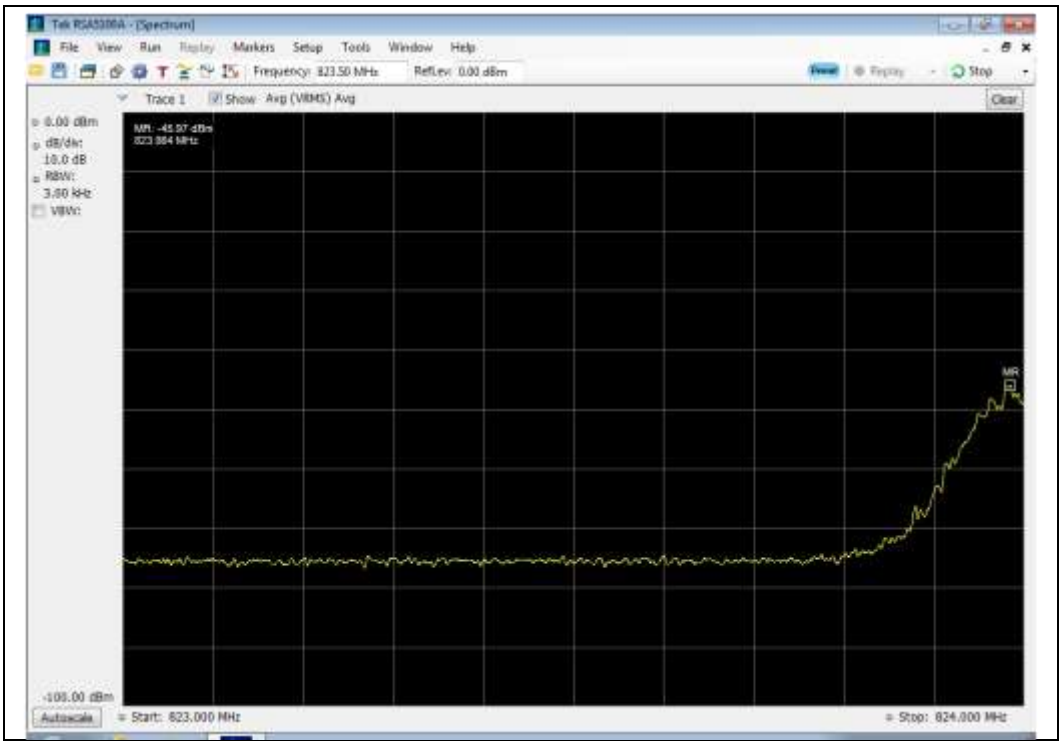



**Upper Band Edge**

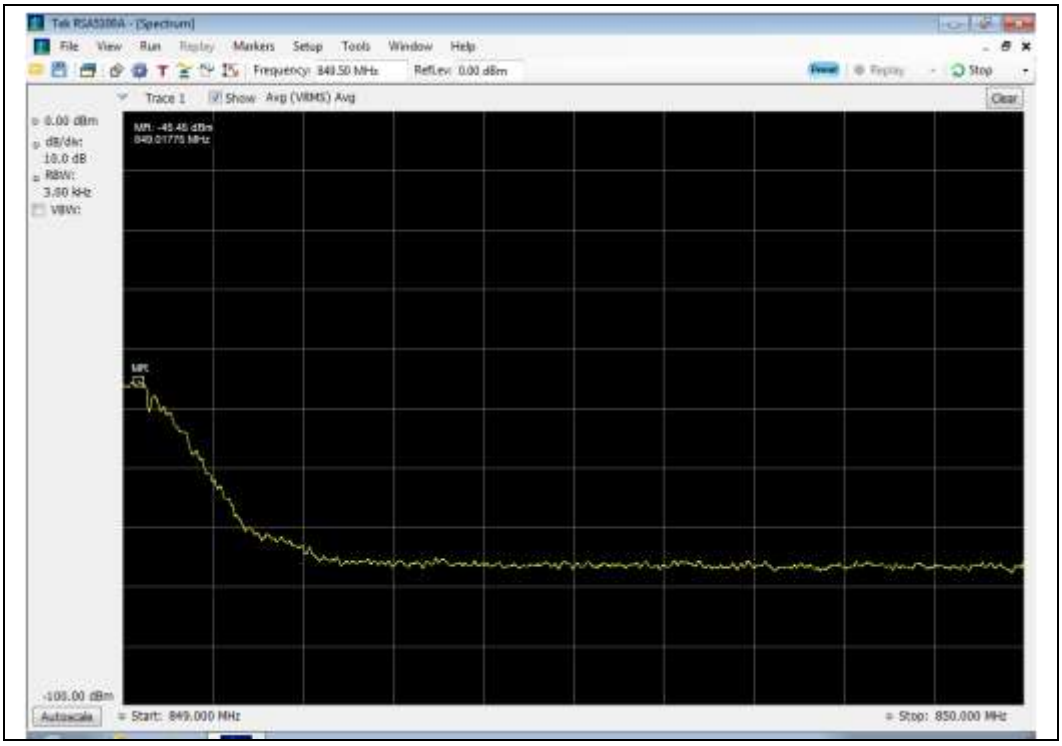


## 824 - 849 MHz Band

### Lower Band Edge

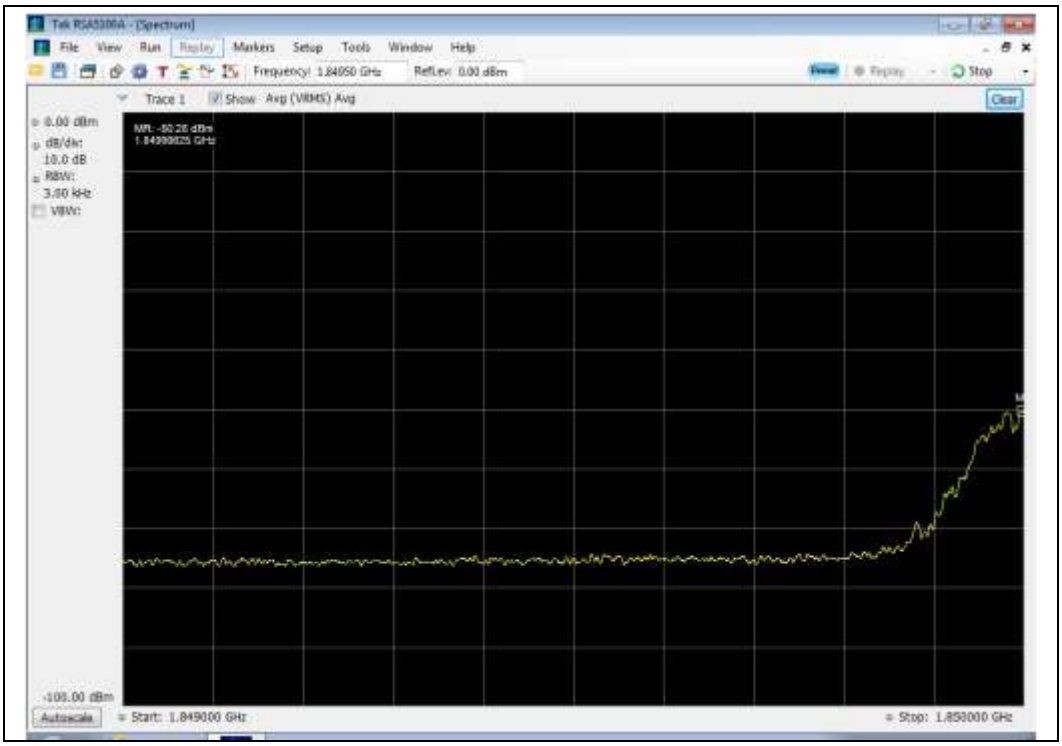



### Upper Band Edge

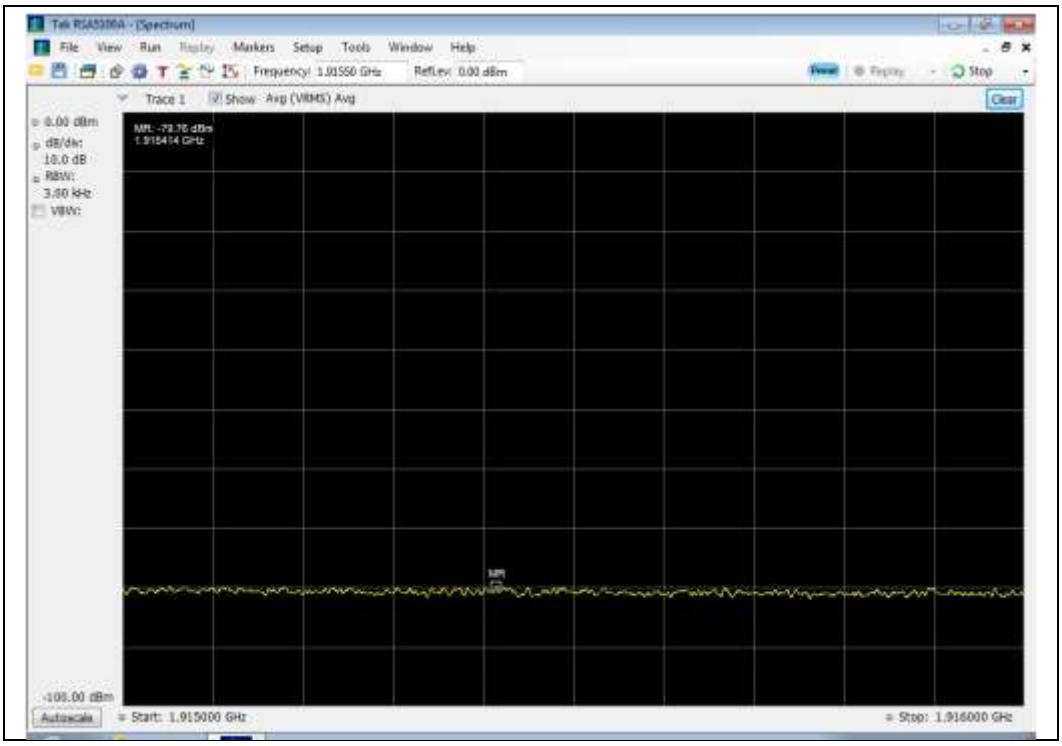


**1850 - 1910 MHz Band**

**Lower Band Edge**



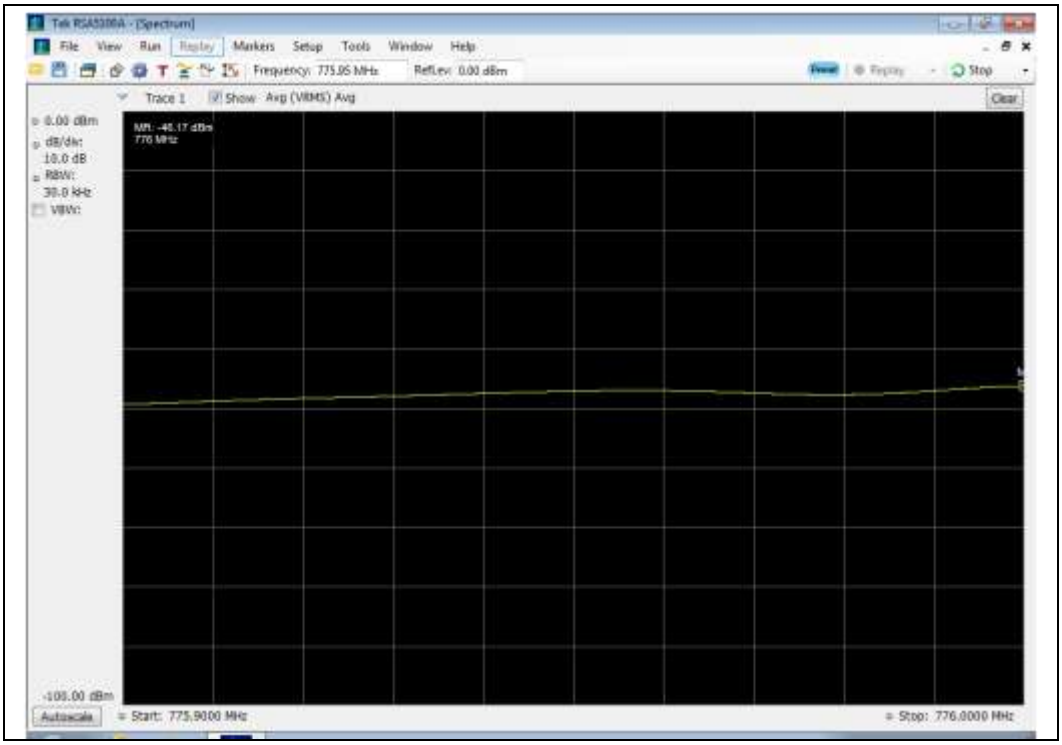

**Upper Band Edge**



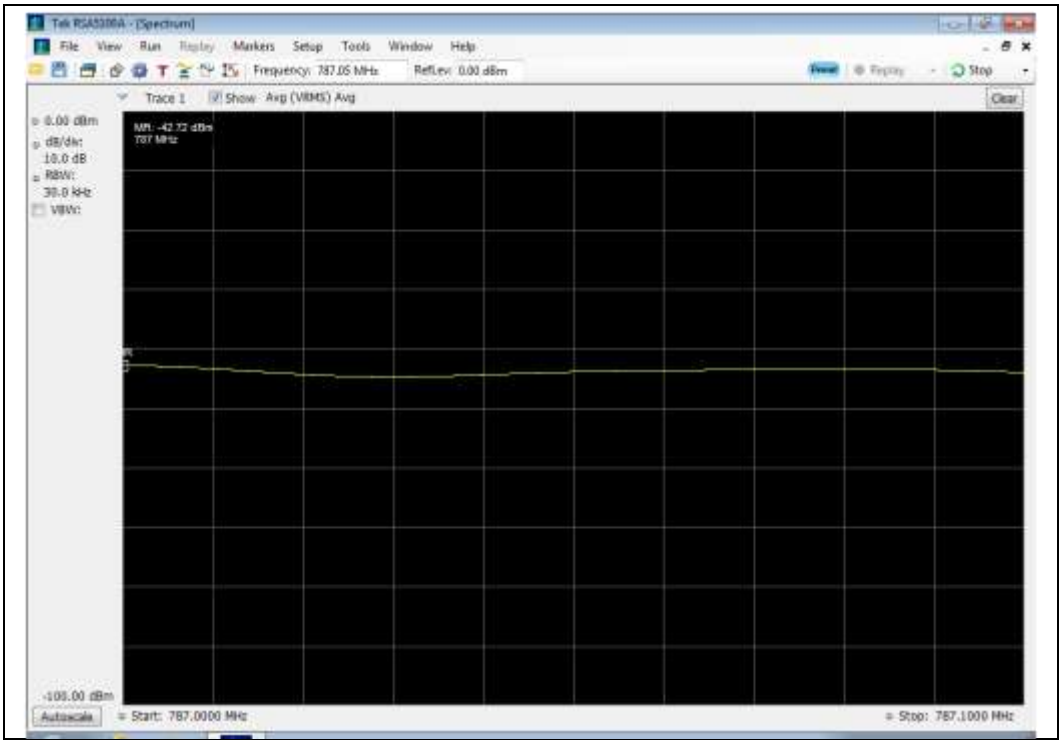
## CDMA Uplink Test Plots

### 776 - 787 MHz Band

### Lower Band Edge

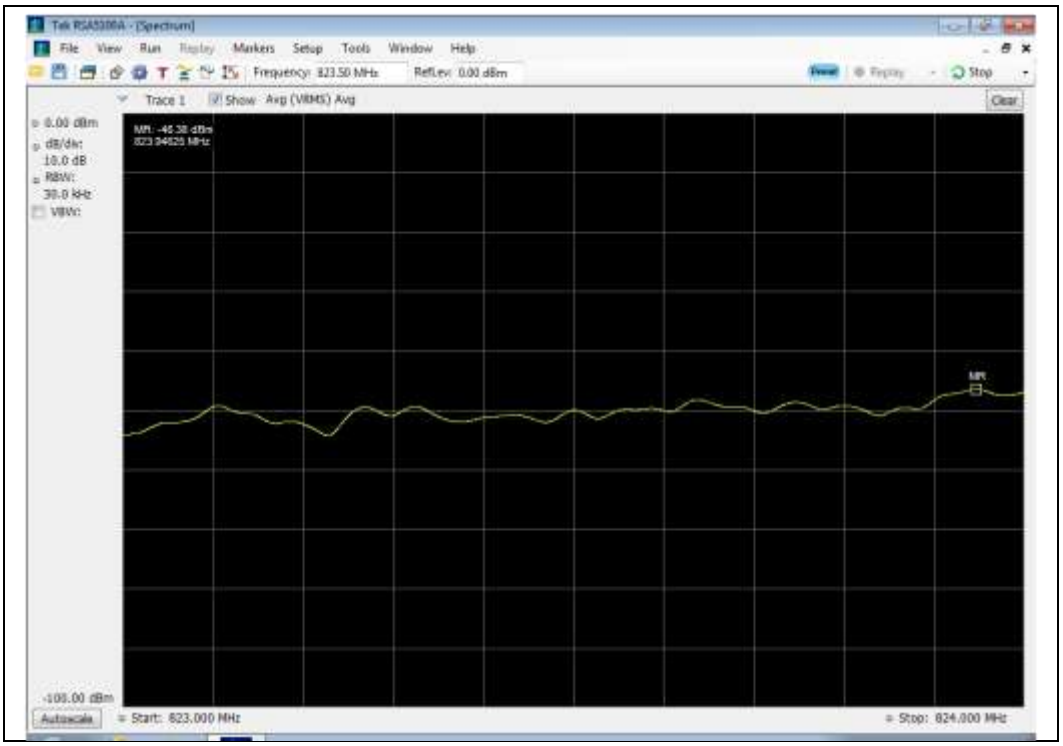



### Upper Band Edge

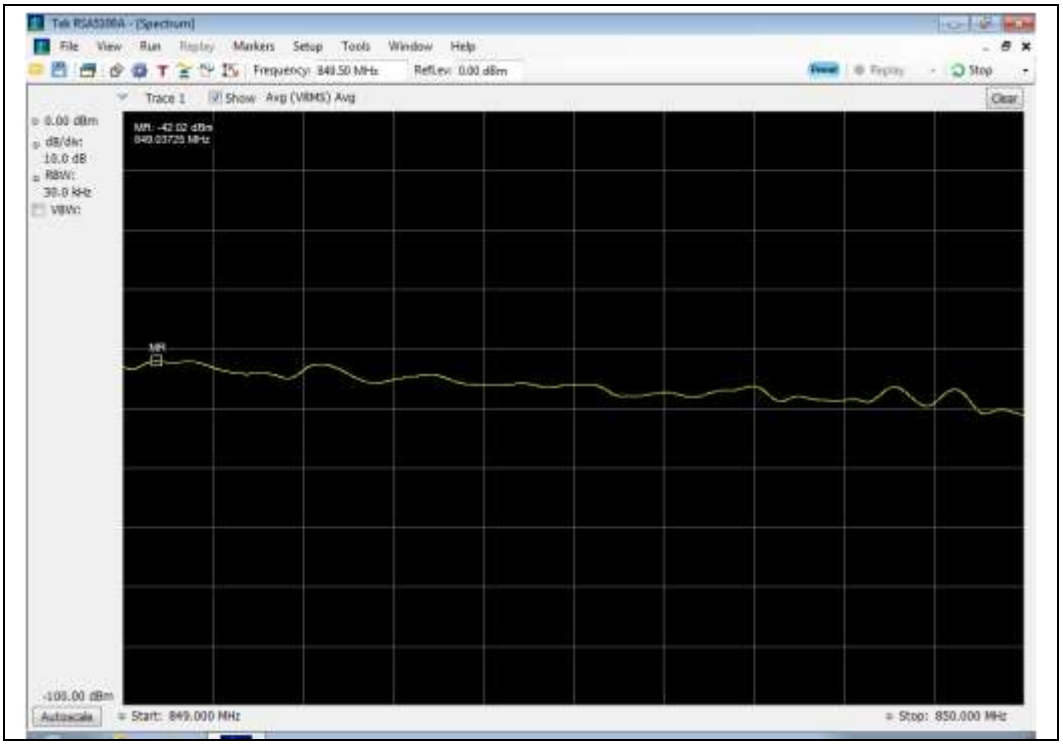


**824 - 849 MHz Band**

**Lower Band Edge**

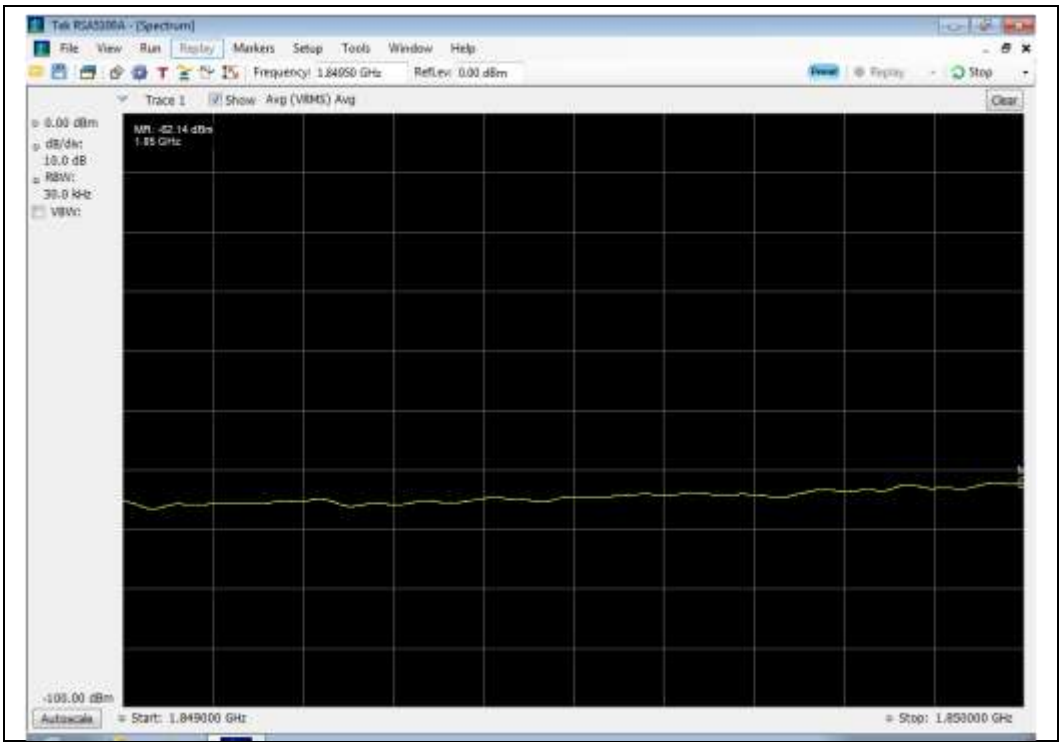



**Upper Band Edge**

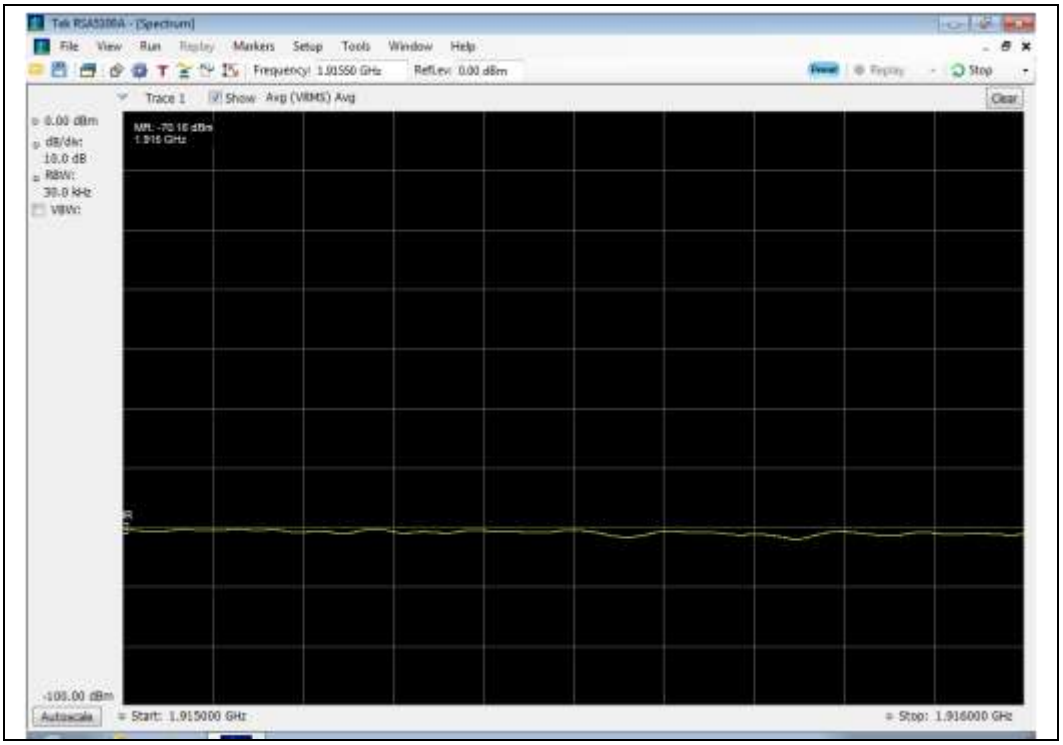


**1850 - 1910 MHz Band**

**Lower Band Edge**



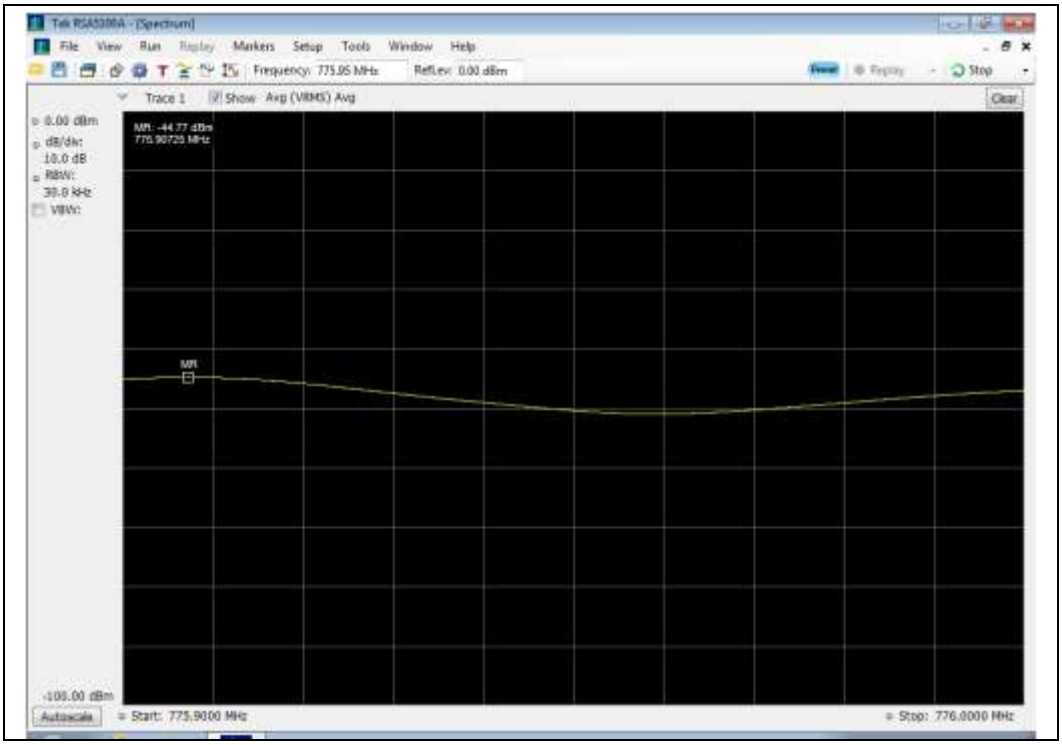

**Upper Band Edge**



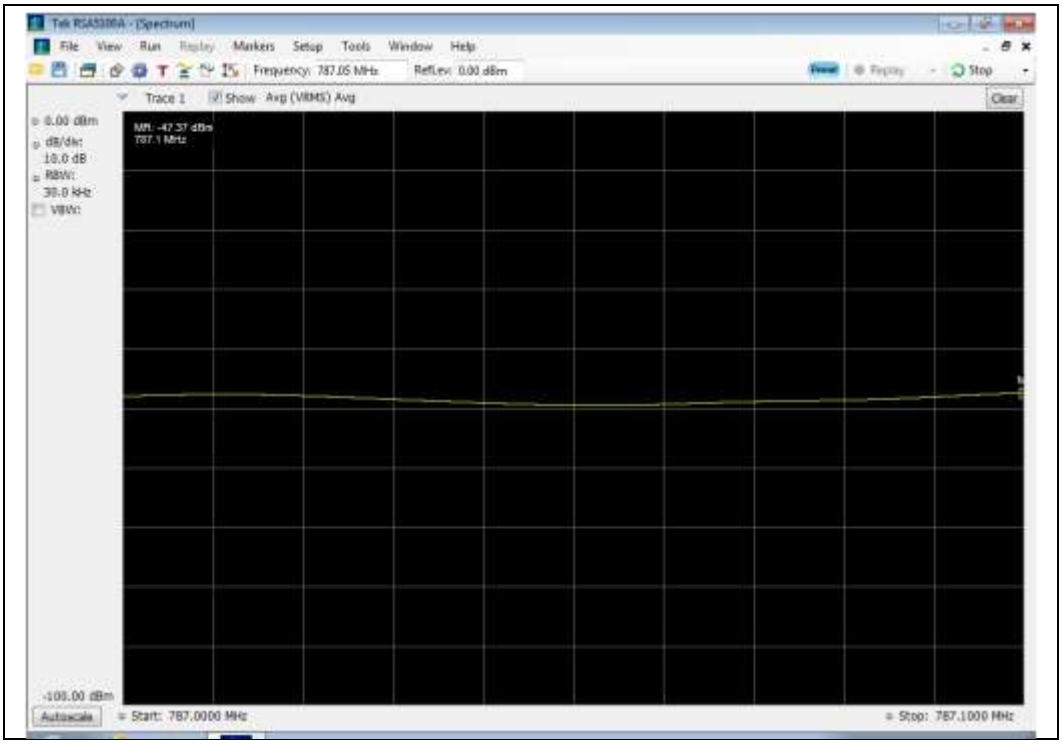
**WCDMA Uplink Test Plots**

**776 - 787 MHz Band**

**Lower Band Edge**

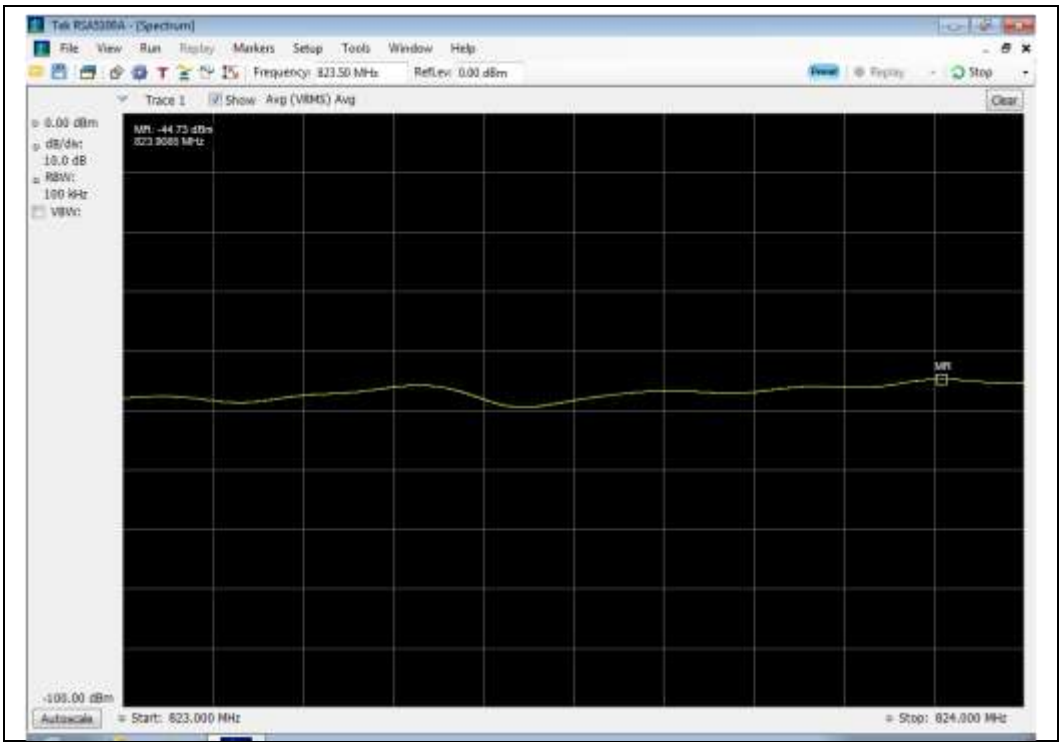



**Upper Band Edge**

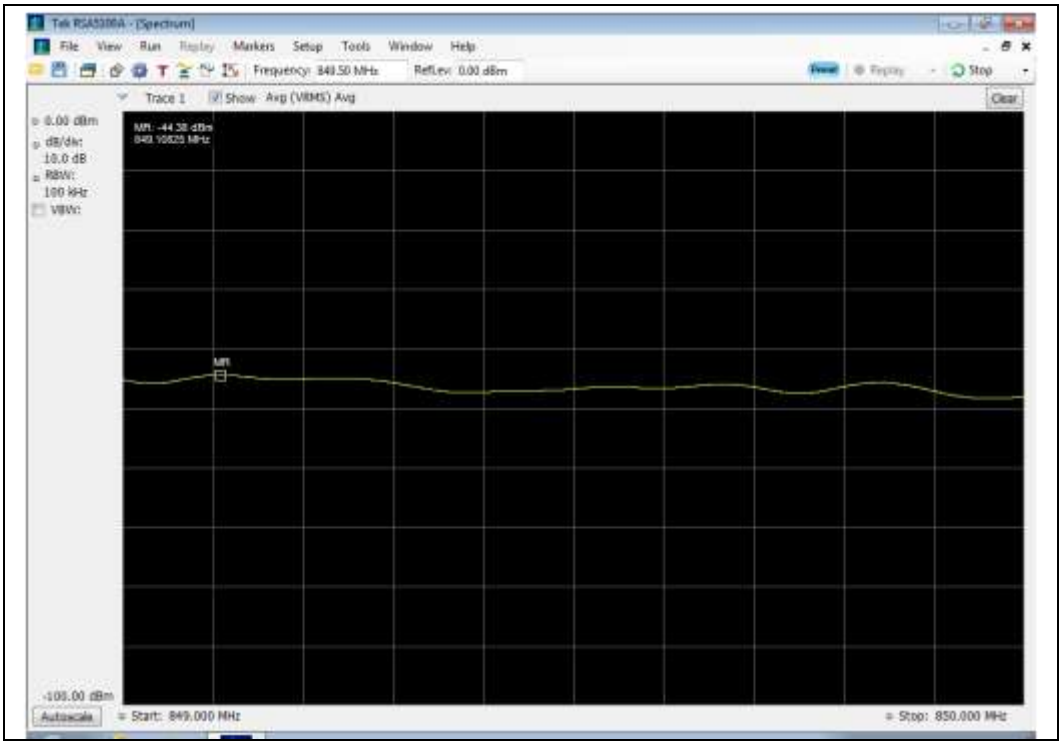


**824 - 849 MHz Band**

**Lower Band Edge**

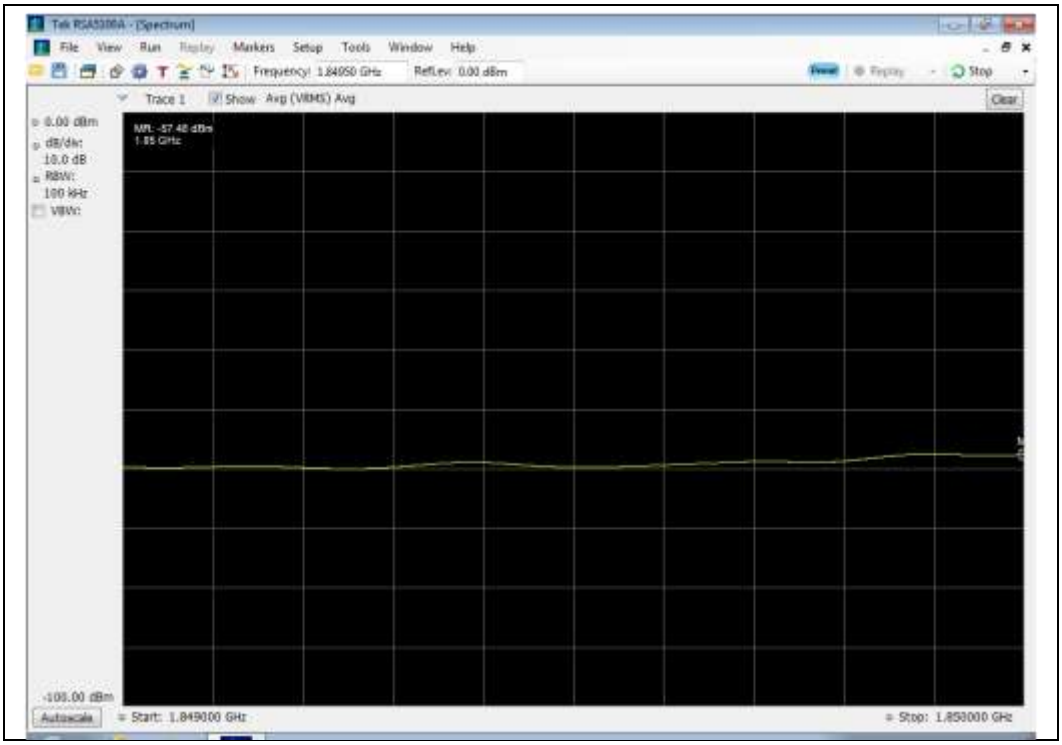



**Upper Band Edge**

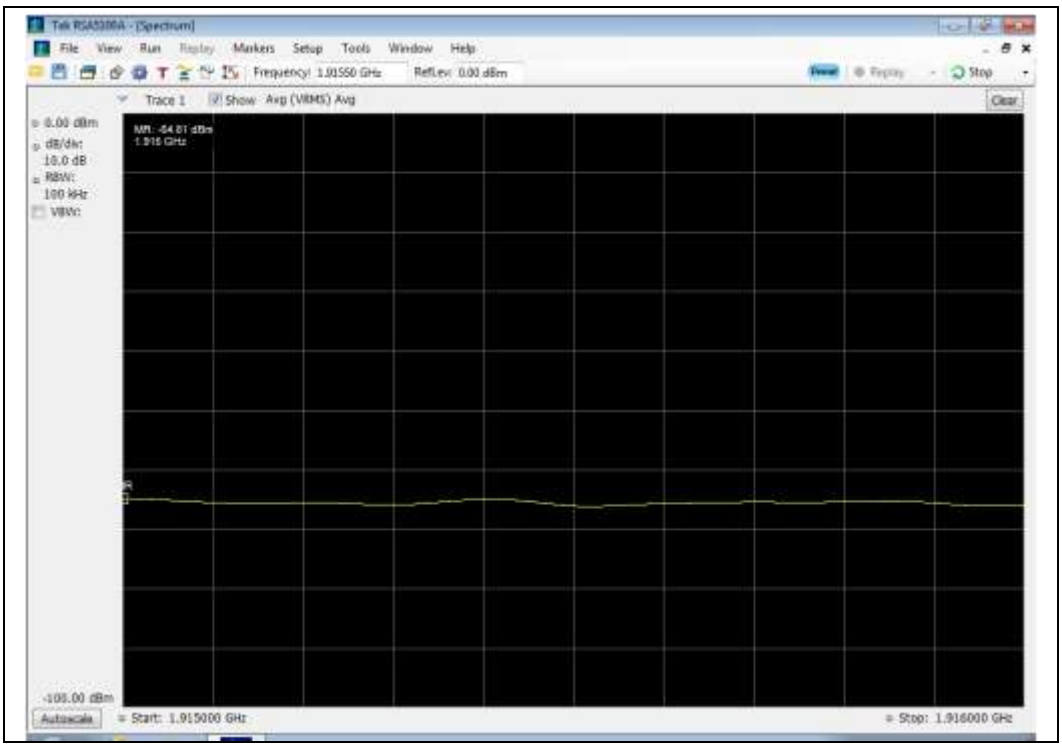


**1850 - 1910 MHz Band**

**Lower Band Edge**



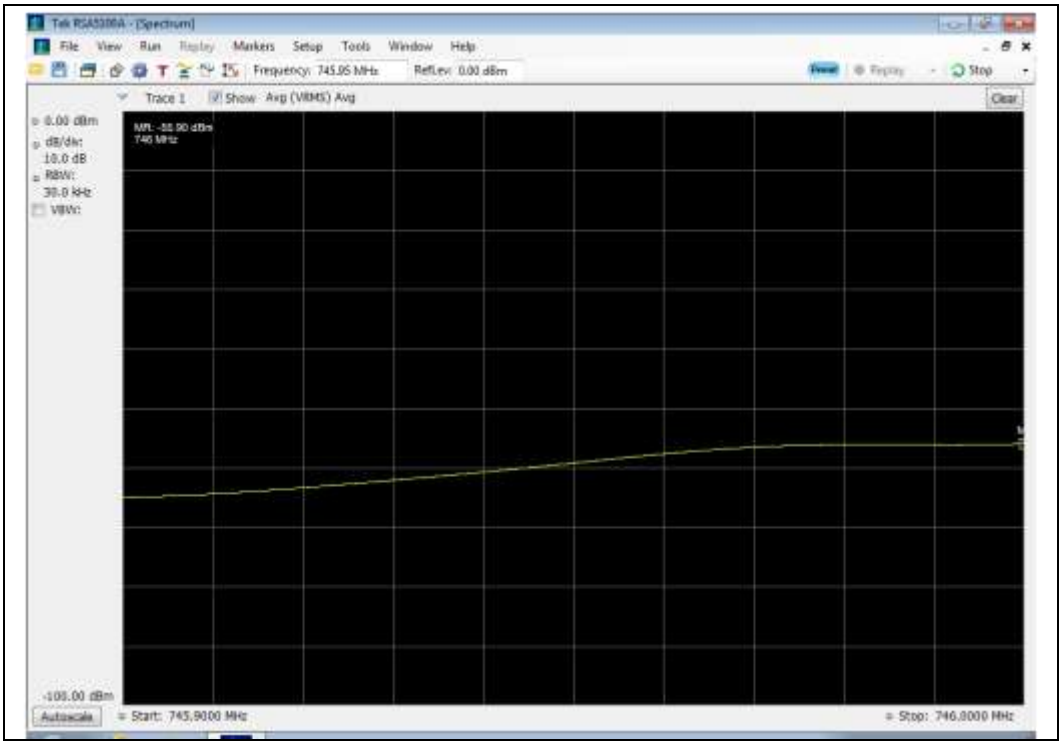

**Upper Band Edge**



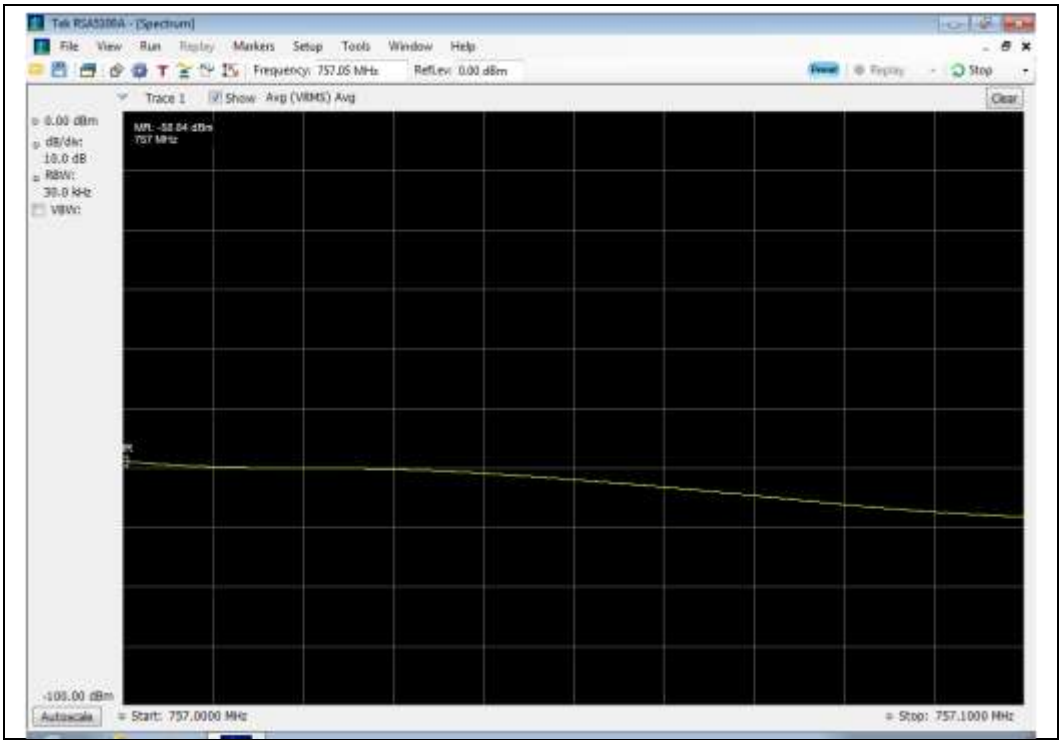
**GSM Downlink Test Plots**

**746 - 757 MHz Band**

**Lower Band Edge**

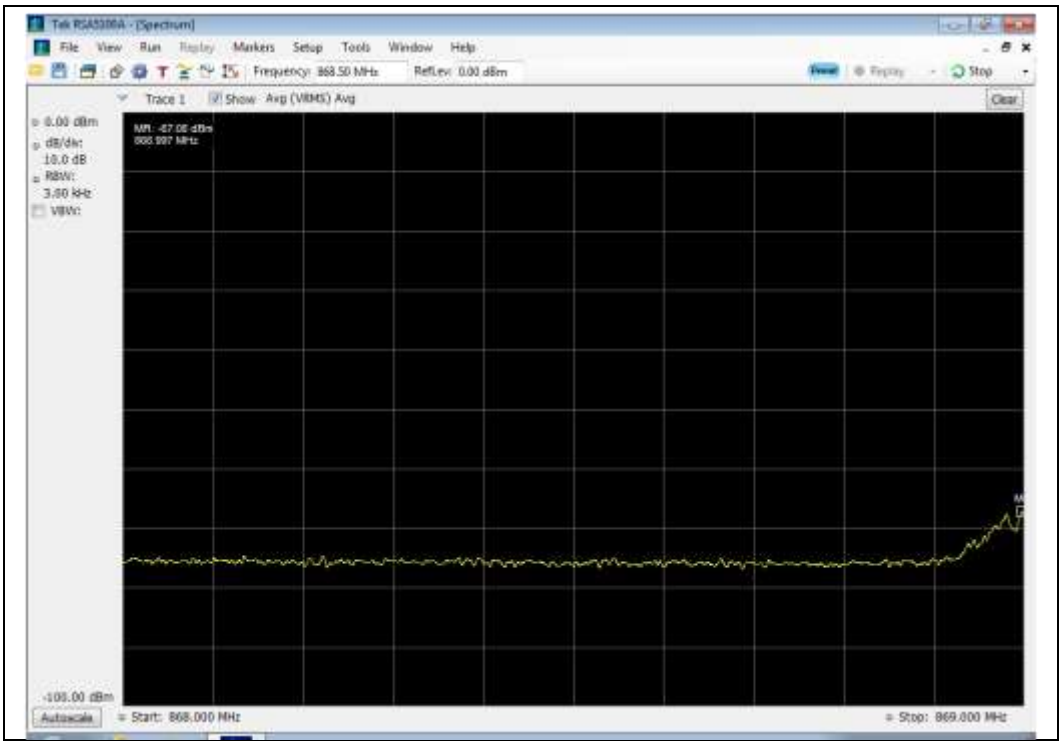



**Upper Band Edge**

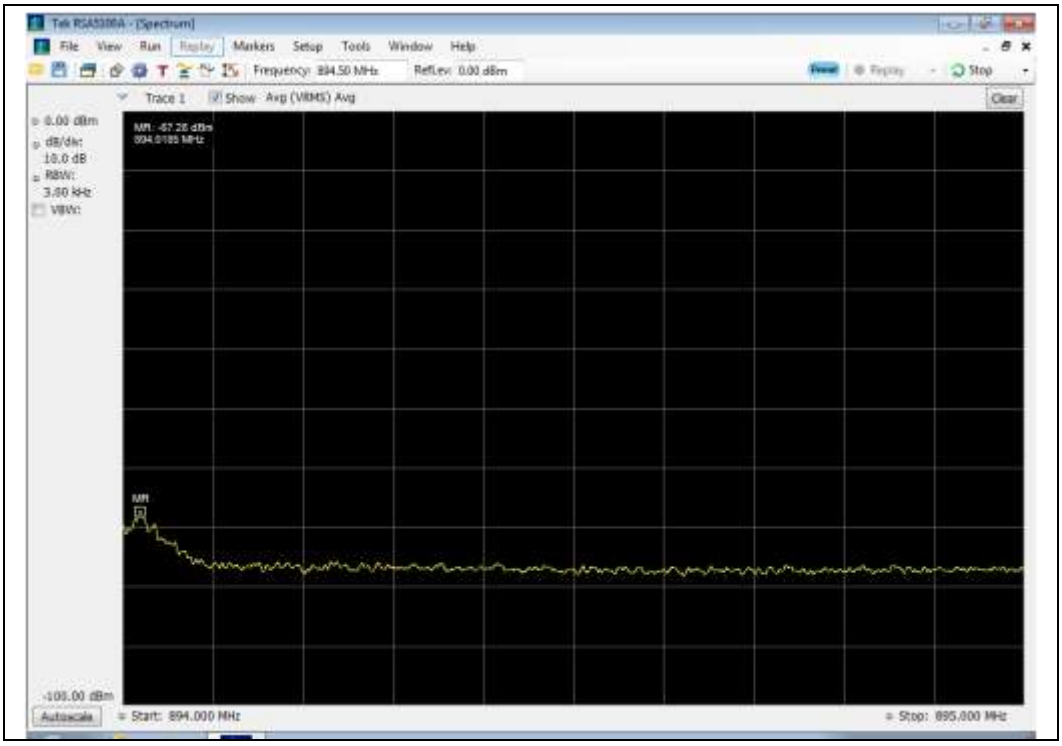


**869 - 894 MHz Band**

**Lower Band Edge**

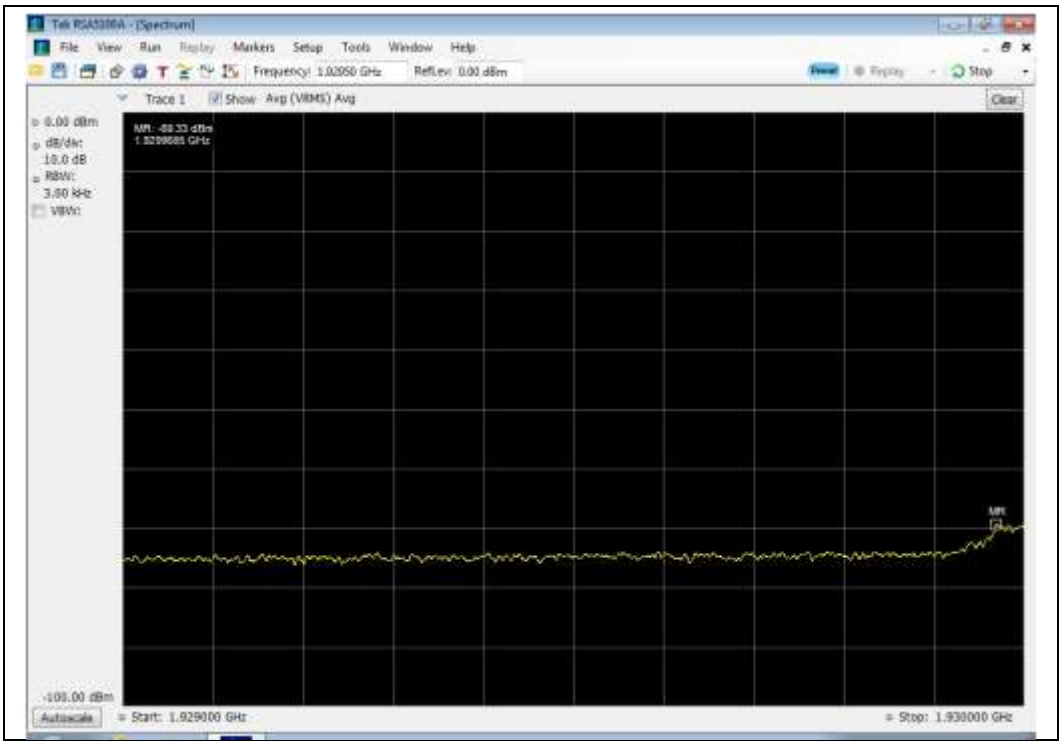



**Upper Band Edge**

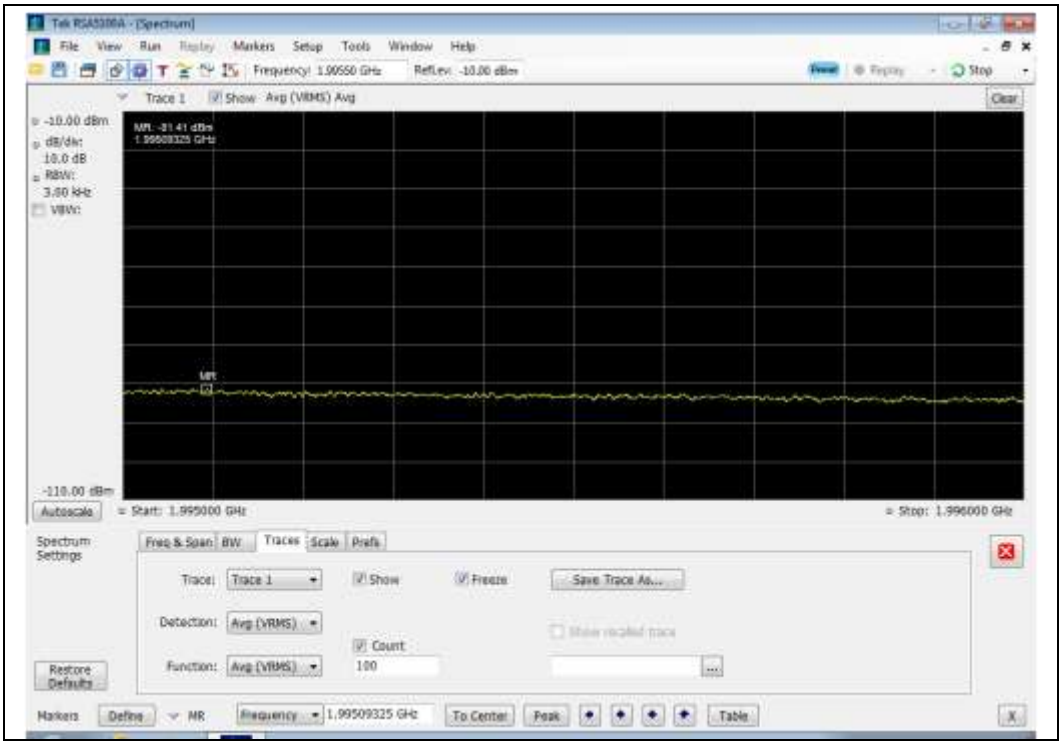


**1930 - 1990 MHz Band**

**Lower Band Edge**



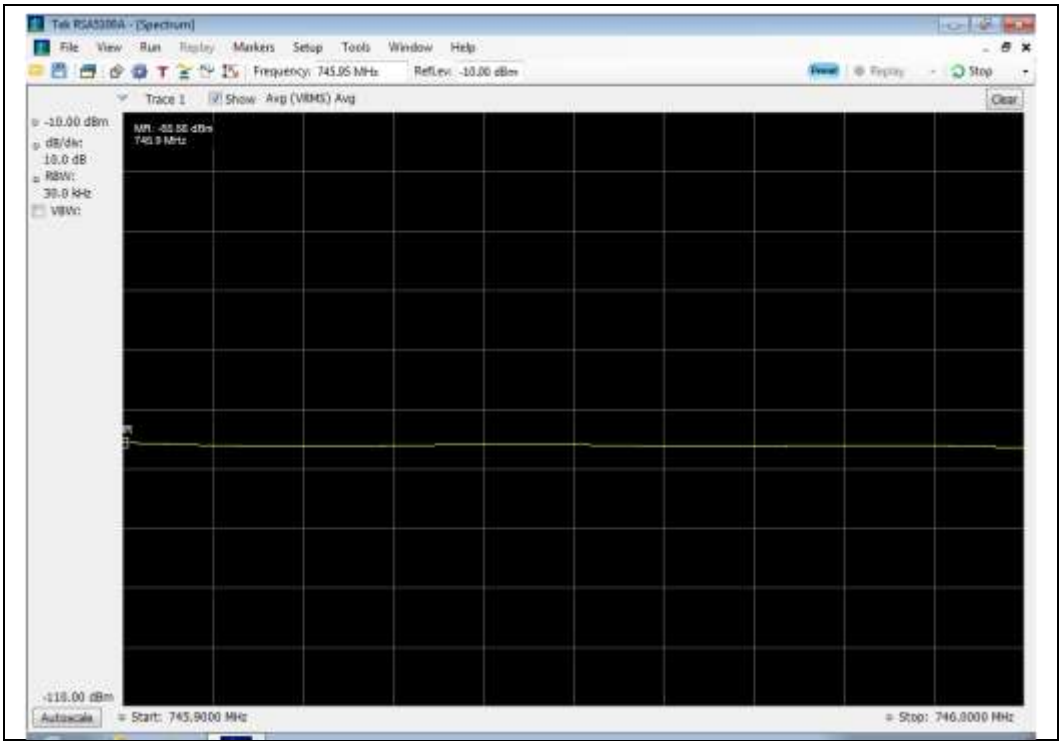

**Upper Band Edge**



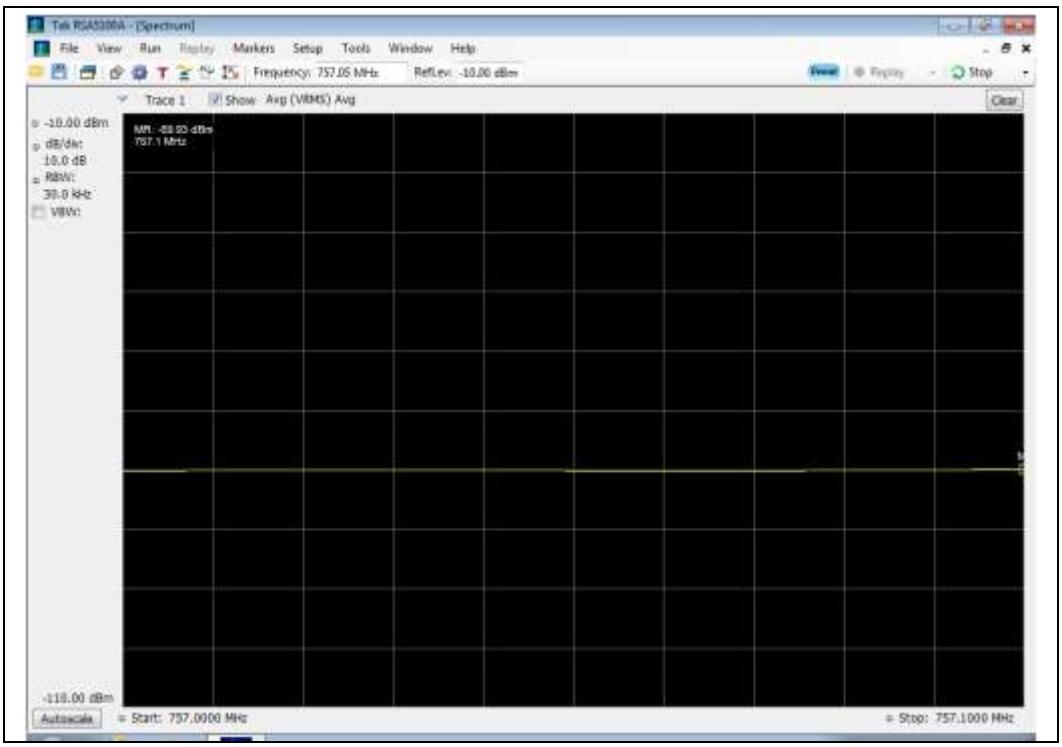
## CDMA Downlink Test Plots

### 746 - 757 MHz Band

### Lower Band Edge

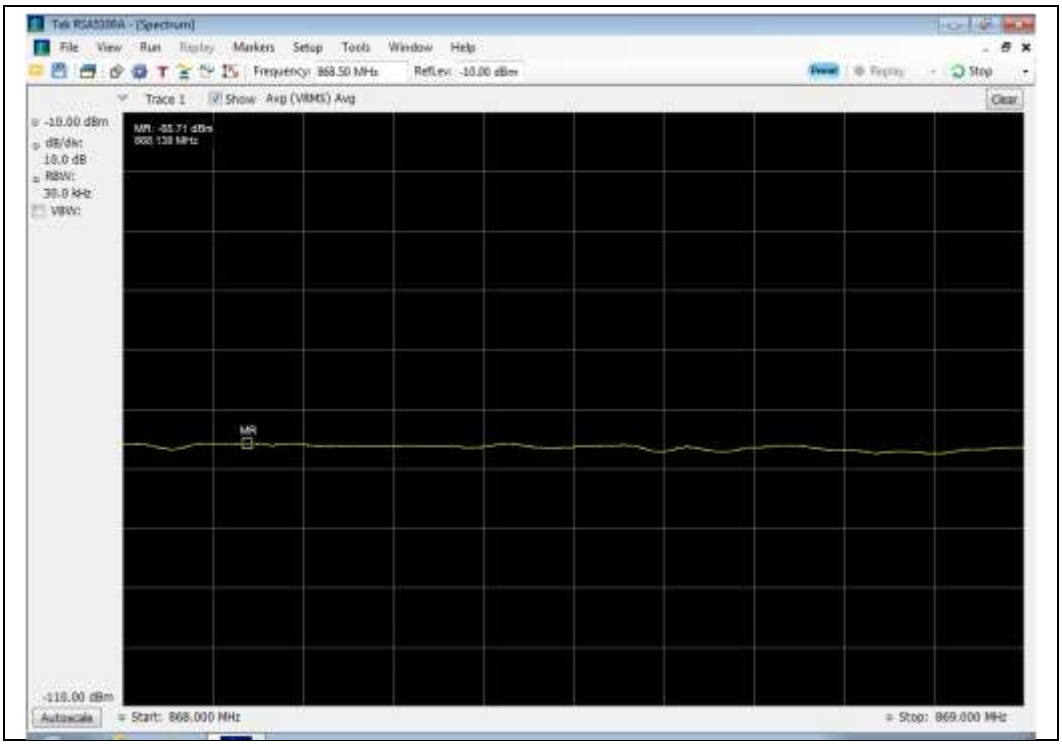



### Upper Band Edge

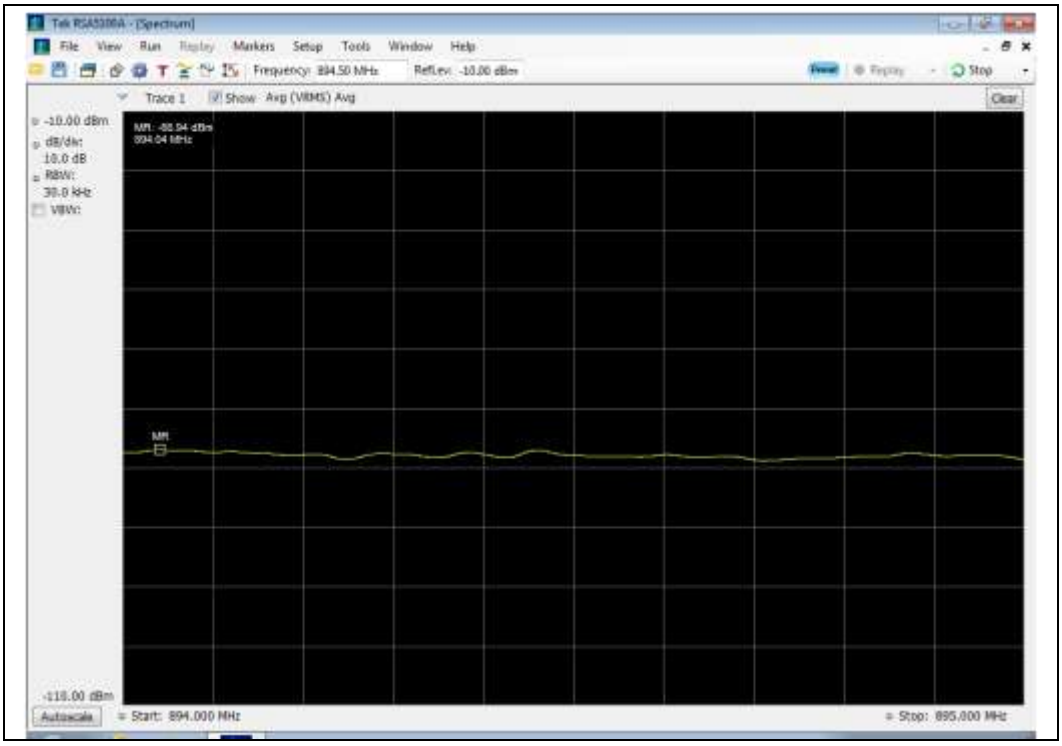


**869 - 894 MHz Band**

**Lower Band Edge**

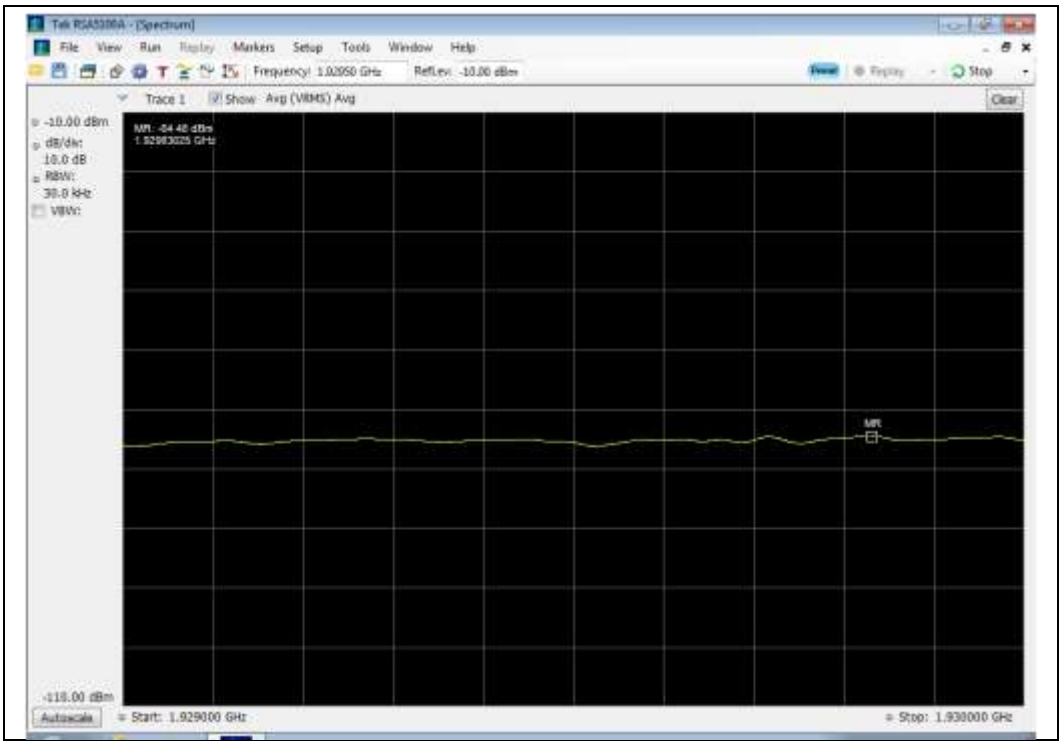



**Upper Band Edge**

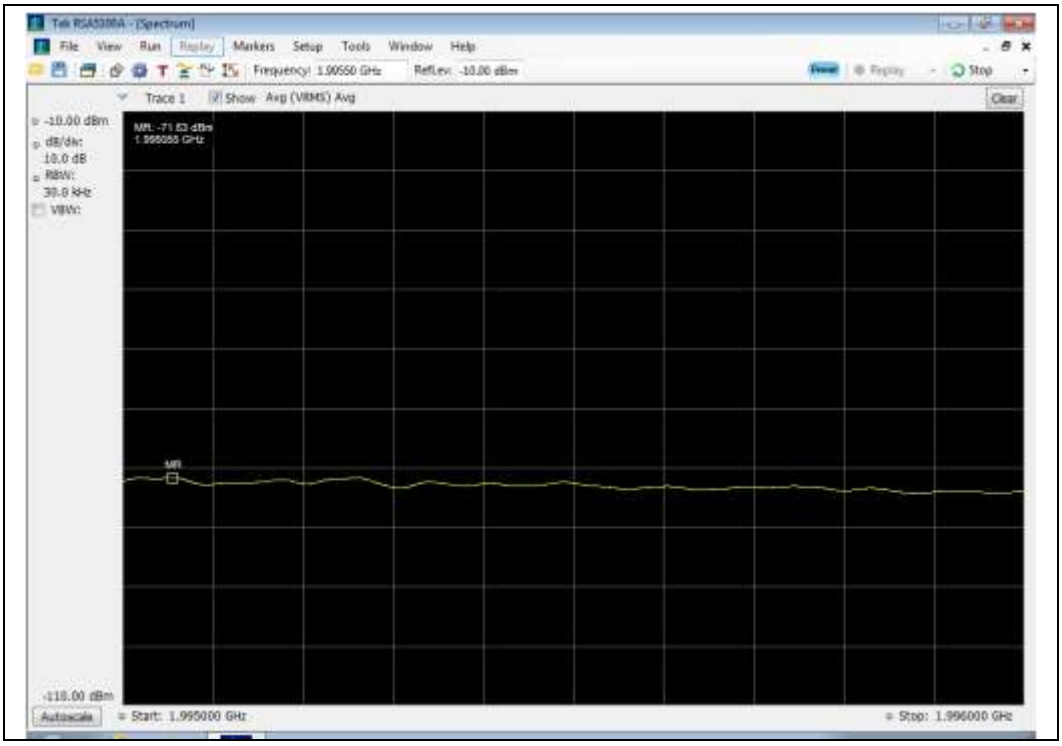


**1930 - 1990 MHz Band**

**Lower Band Edge**



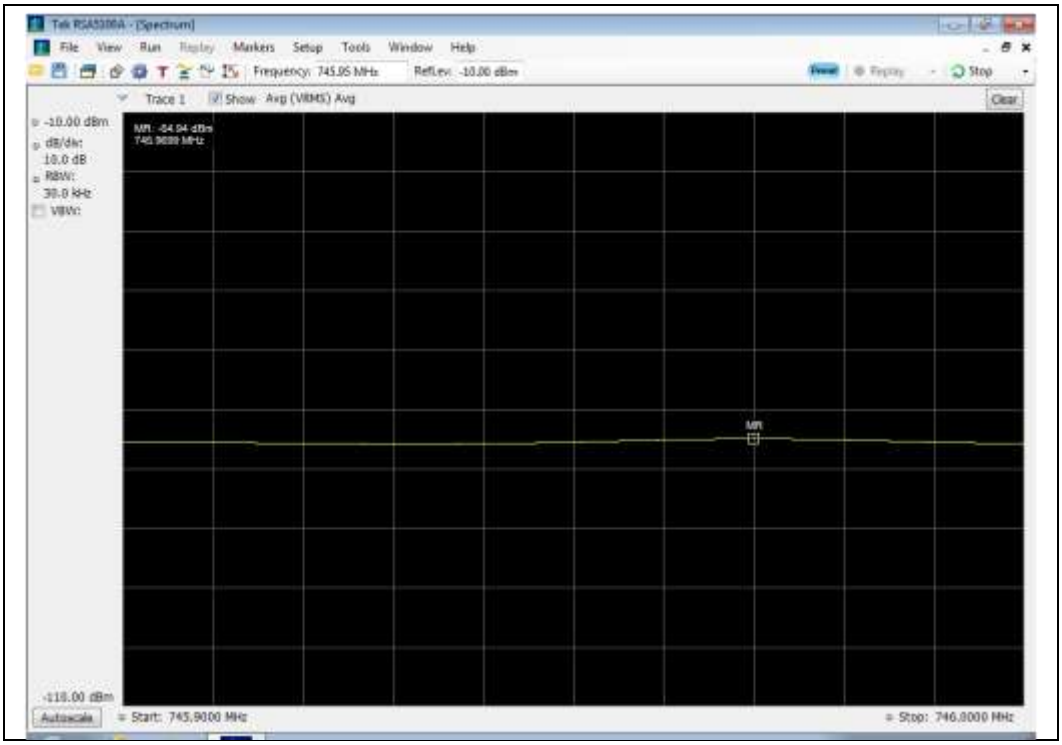

**Upper Band Edge**



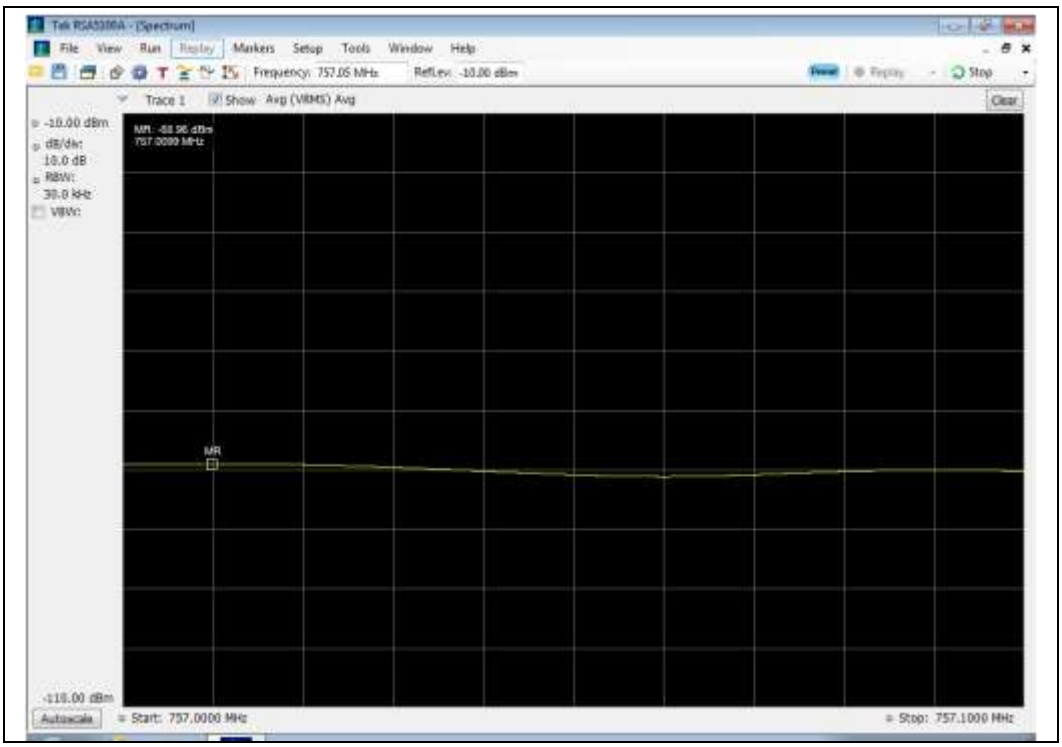
## WCDMA Downlink Test Plots

### 746 - 757 MHz Band

### Lower Band Edge

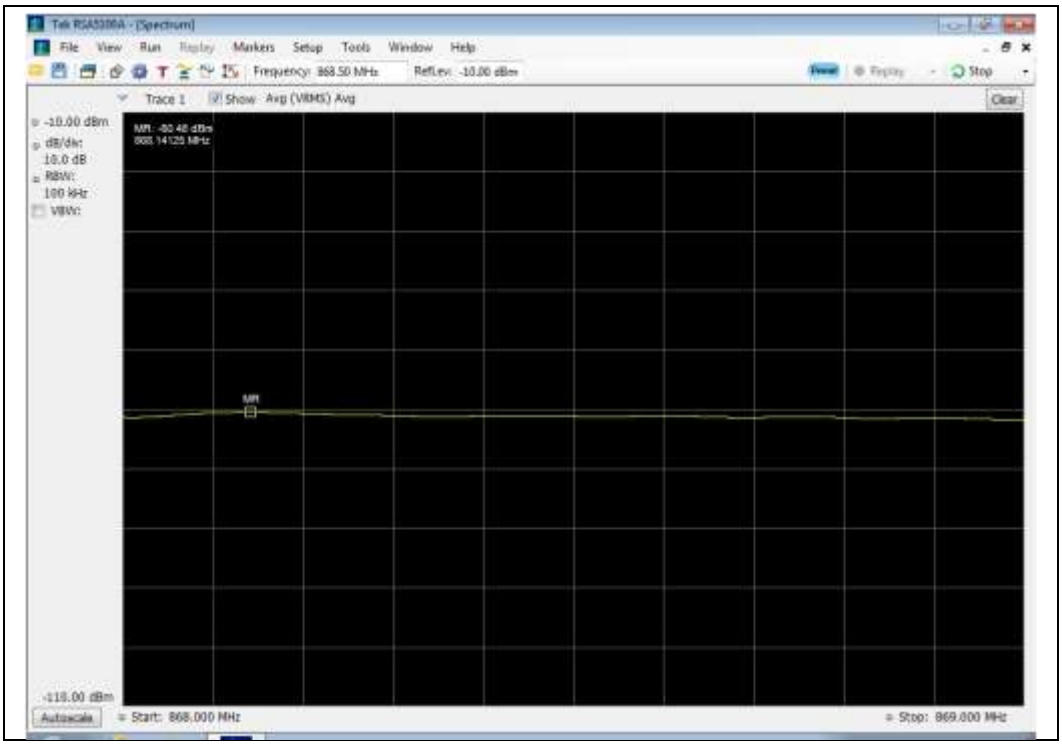



### Upper Band Edge

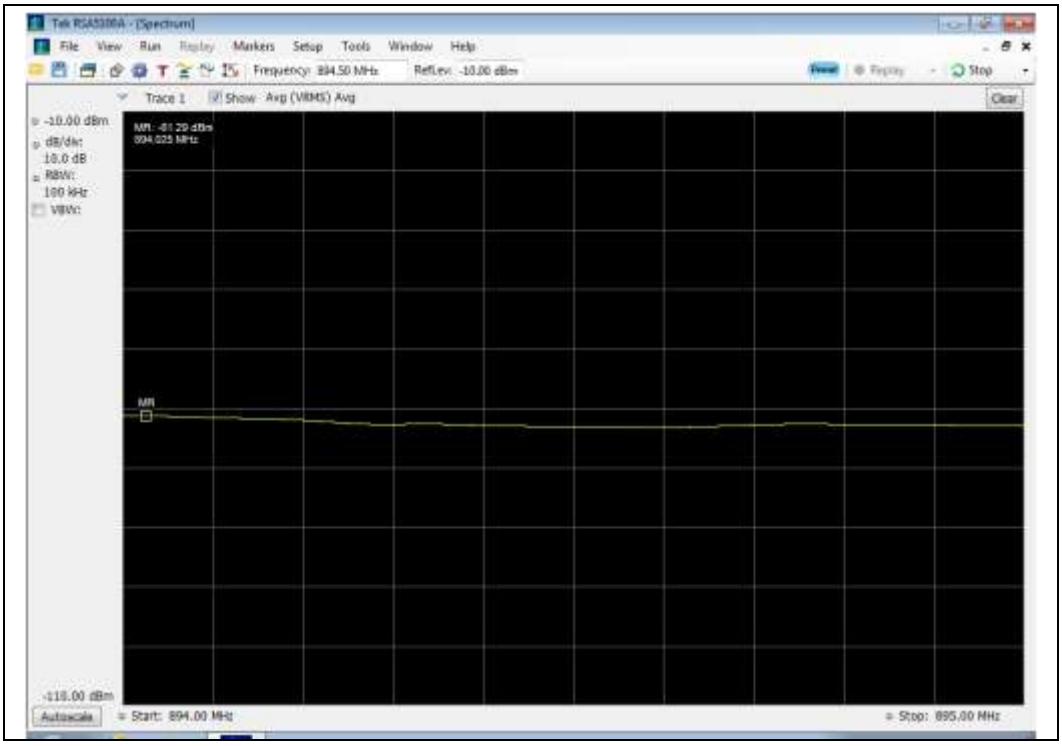


**869 - 894 MHz Band**

**Lower Band Edge**

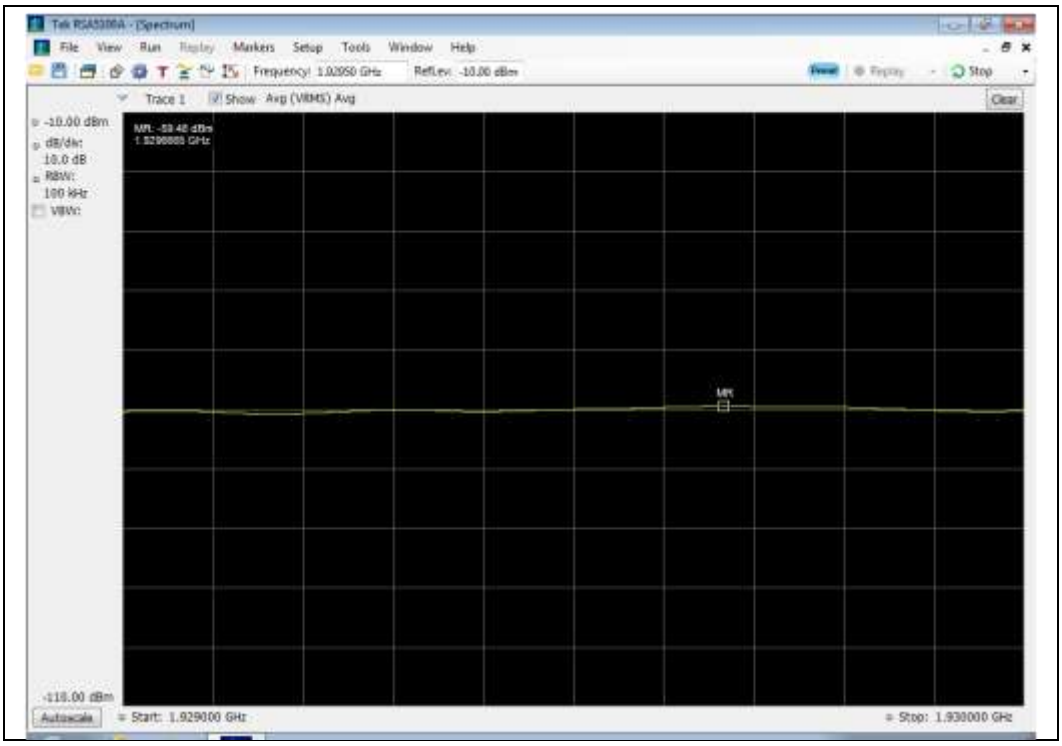



**Upper Band Edge**

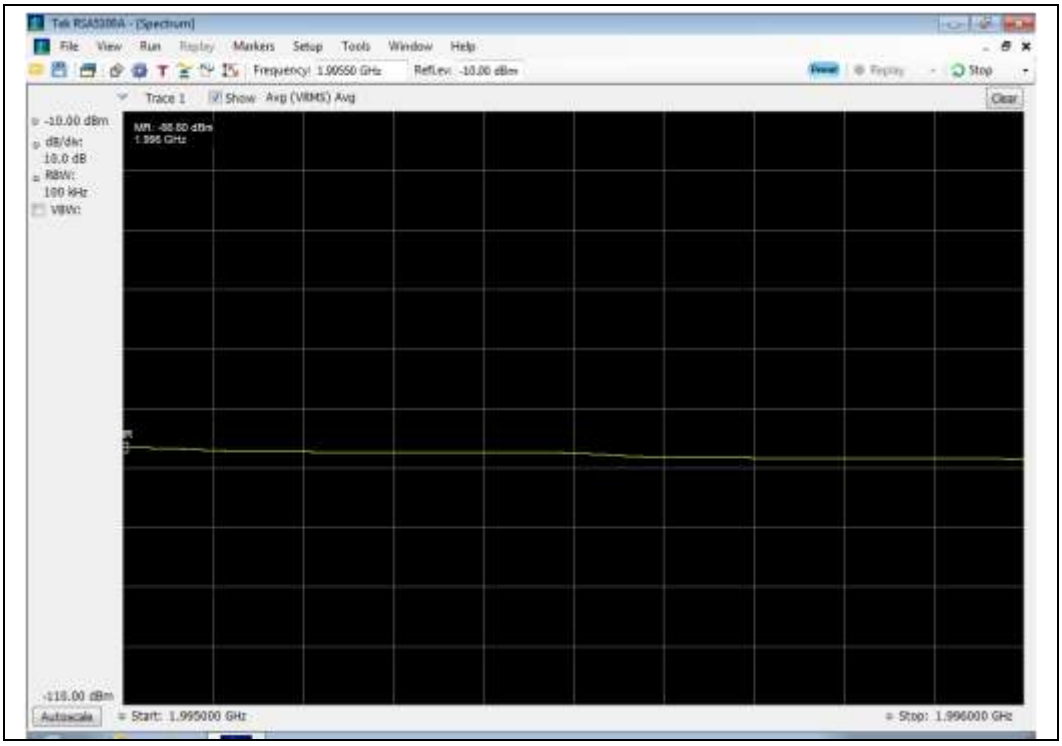


**1930 - 1990 MHz Band**

**Lower Band Edge**




**Upper Band Edge**



**Conducted Spurious Emissions**

**Name of Test:** Conducted Spurious Emissions **Engineer:** Greg Corbin
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369 **Test Date:** 12/11/2013

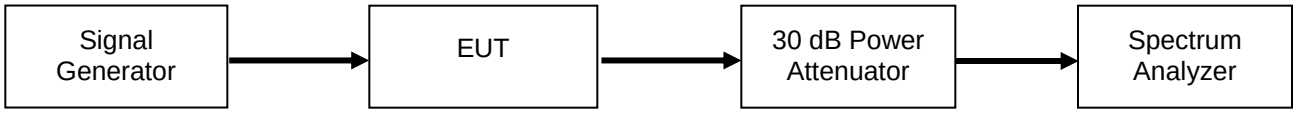
**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator, with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as needed to ensure accurate readings. A signal generator was utilized to produce a 4.1 MHz AWGN signal operating at the maximum allowable power. The conducted spurious emissions from 9 kHz to 10 times the highest tunable frequency for each operational band were measured (excluding the band defined by the Out of band emissions test). The emissions were plotted and the highest level was recorded in the summary table.

The following formulas are used for calculating the limits.

Conducted Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13 dBm
P1 = power in dBm
P2 = power in Watts

**Test Setup**




**Uplink Test Results**

| Frequency Band (MHz) | Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 776 - 787 | 775.9 | -24 | -13 | Pass |
| 824 - 849 | 1864.21 | -36.8 | -13 | Pass |
| 1850 - 1910 | 3760.97 | -33.6 | -13 | Pass |

**Downlink Test Results**

| Frequency Band (MHz) | Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| 746 - 757 | 1957.873 | -38.4 | -13 | Pass |
| 869 - 894 | 1952.9175 | -36 | -13 | Pass |
| 1930 - 1990 | 754.244 | -40 | -13 | Pass |

**For the 746 – 758 downlink and 776 – 788 Uplink bands of operation, the following additional spurious emissions requirements apply.**

**FCC 27.53(c)**
*For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:*

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

The test is performed using a 10 kHz RBW. Since the limit is referenced to a 6.25 kHz BW, the following correction factor is applied to the measured data.

BW correction Factor = 10Log B1/B2
BW correction Factor =10Log 6.25 / 10 = - 2.0 dB

Final Value (dBm) = conducted measurement +BW correction factor

**777 – 787 MHz Uplink Band**

| Spurious Frequency Range (MHz) | Measured Frequency (MHz) | Measured Value (dB) | Bandwidth Correction Factor (dB) | Final Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 763 – 775 | 775 | -53.1 | -2.0 | -55.14 | -46 | -9.14 |
| 793 – 805 | 793.258 | -64.9 | -2.0 | -66.94 | -46 | -20.94 |

**746 - 756 MHz Downlink Band**

| Spurious Frequency Range (MHz) | Measured Frequency (MHz) | Measured Value (dB) | Bandwidth Correction Factor (dB) | Final Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 763 – 775 | 765.199 | -76.2 | -2.0 | -78.2 | -46 | -32.2 |
| 793 – 805 | 793.051 | -76.0 | -2.0 | -78.0 | -46 | -32.0 |

**FCC 27.53(e)**
For operations in the 746-763 MHz, 775-793 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Since the limit is referenced to EIRP, the final data is computed using the Conducted Spurious Emission data and adding the BW correction factor and the final gain/loss data from the antenna kitting information supplied by the manufacturer.

For the Narrowband measurement, the test is performed using a 10 kHz RBW. Since the limit is referenced to a 700 Hz BW, the following correction factor is applied to the measured data.

BW correction Factor = 10Log B1/B2
BW correction Factor =10Log 700 / 10000 = -11.55 dB

Final Value (dBm) = conducted measurement +BW correction factor + final gain/loss from Antenna Kitting document

The Limit for (narrowband) emissions is -80dBW (-50 dBm) in 700 MHz BW.
The Limit for (wideband) emissions is -70 dBW (-40 dBm) in a 1 MHz BW

**777 – 787 MHz Uplink Band**

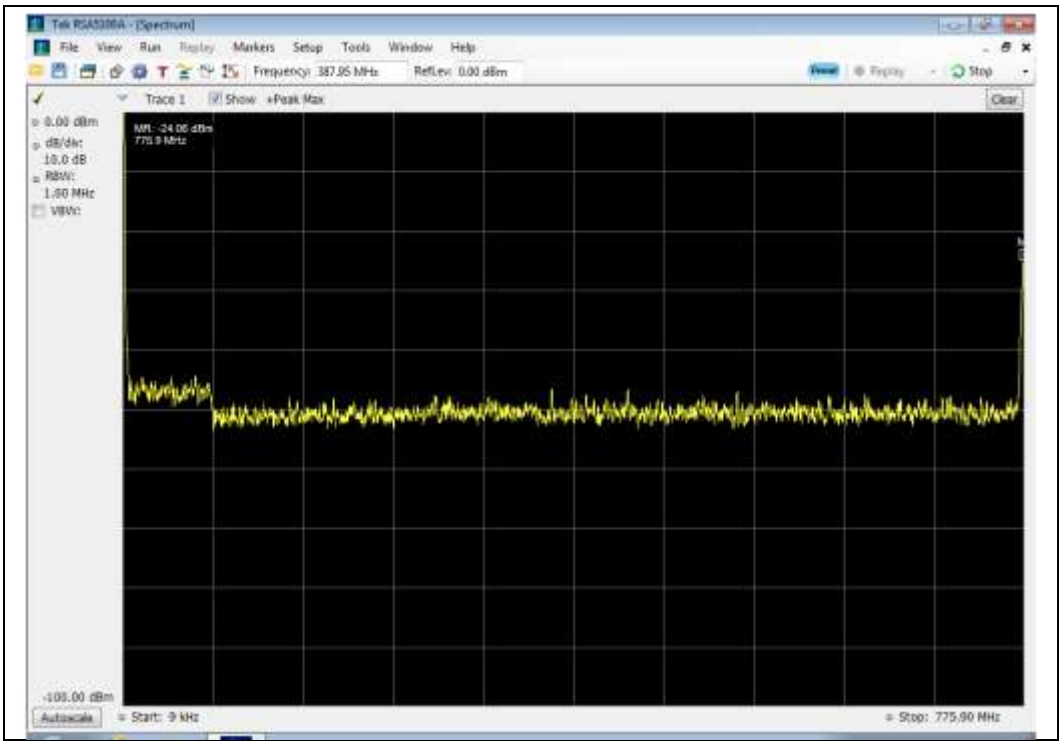
| Spurious Frequency Range (MHz) | Measured Frequency (MHz) | Measured Value (dBm) | Bandwidth Correction Factor (dB) | Gain/Loss from Antenna Kitting Information (dB) | Final Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 1559 – 1610 (Wideband) | 1584.5 | -62.5 | 0 | 6.48 | -56.02 | -40 | -16.02 |
| 1559 – 1610 (Narrowband) | 1609.133 | -82.5 | -11.55 | 6.48 | -87.57 | -50 | -37.57 |

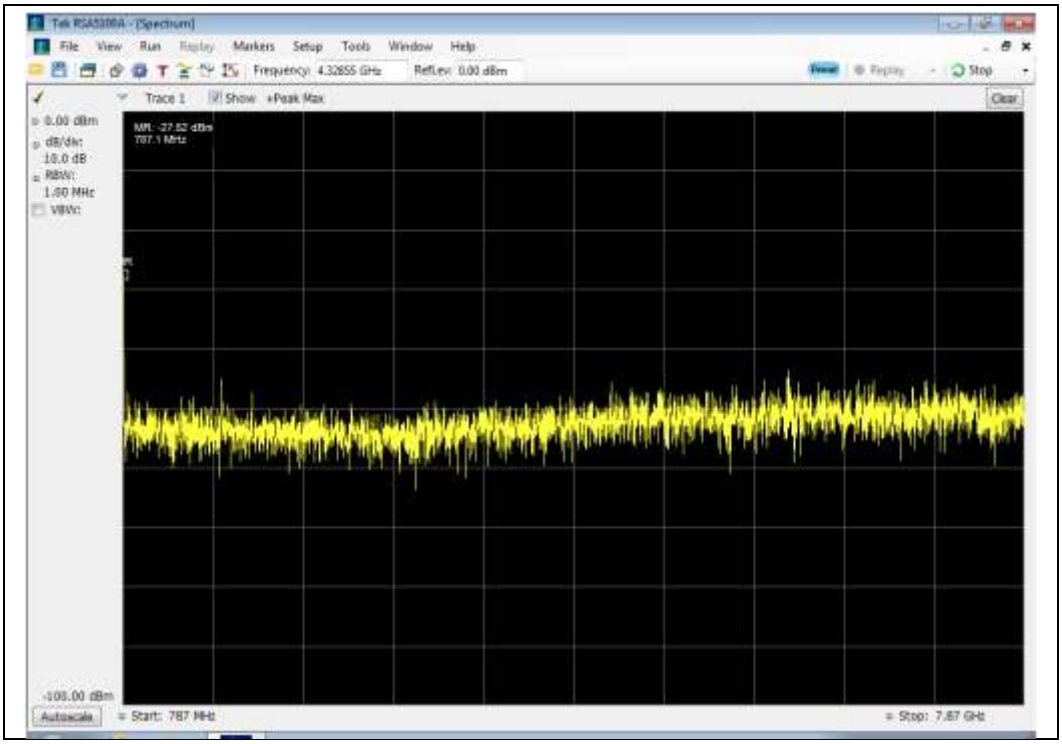
**746 - 756 MHz Downlink Band**

| Spurious Frequency Range (MHz) | Measured Frequency (MHz) | Measured Value (dBm) | Bandwidth Correction Factor (dB) | Gain/Loss from Antenna Kitting Information (dB) | Final Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 1559 – 1610 (Wideband) | 1608.712 | -56 | 0 | 4.95 | -51.05 | -40 | -11.05 |
| 1559 – 1610 (Narrowband) | 1609.439 | -82.3 | -11.55 | 4.95 | -88.90 | -50 | -38.90 |

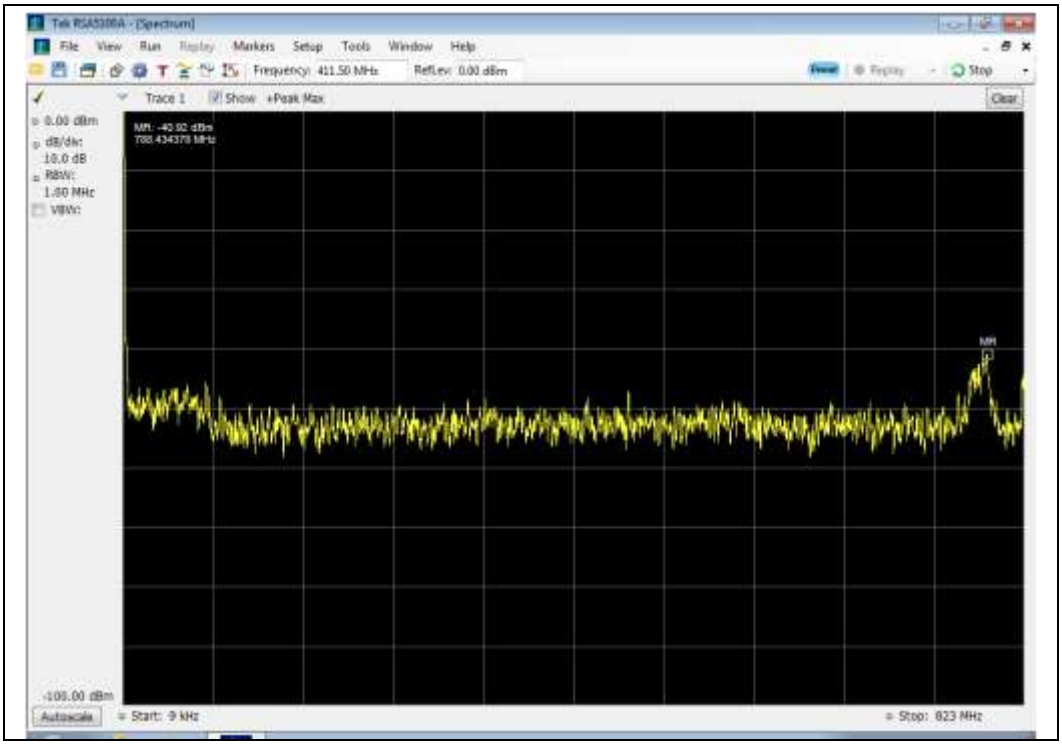
## Uplink Test Plots

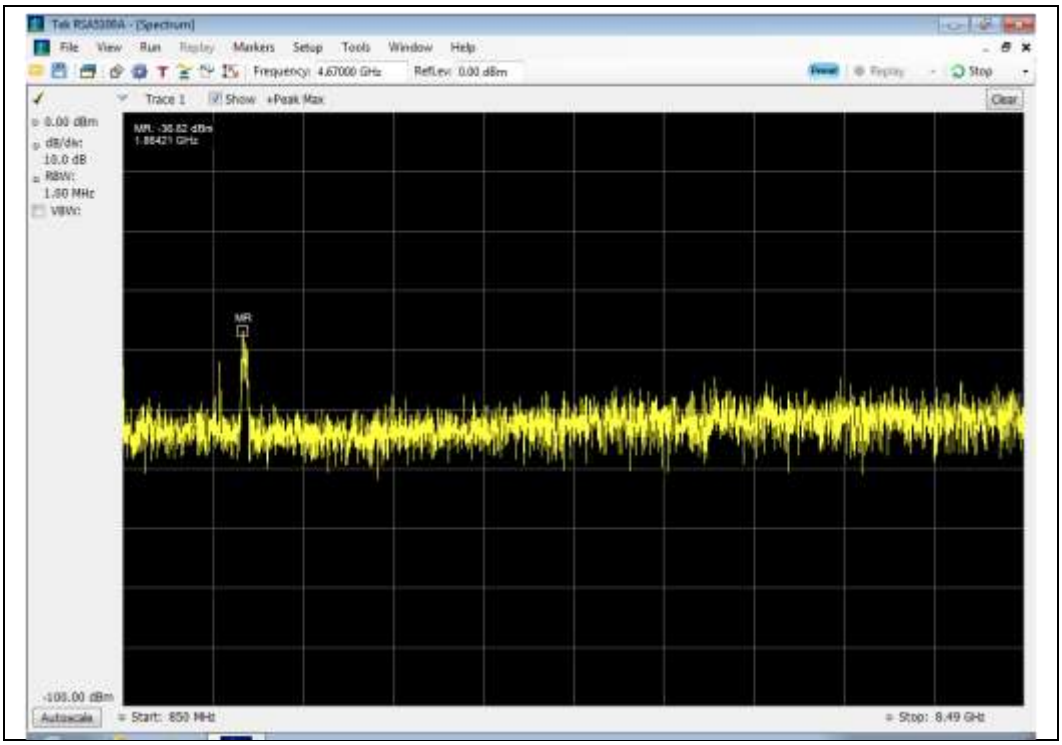
### 776 - 787 MHz Band



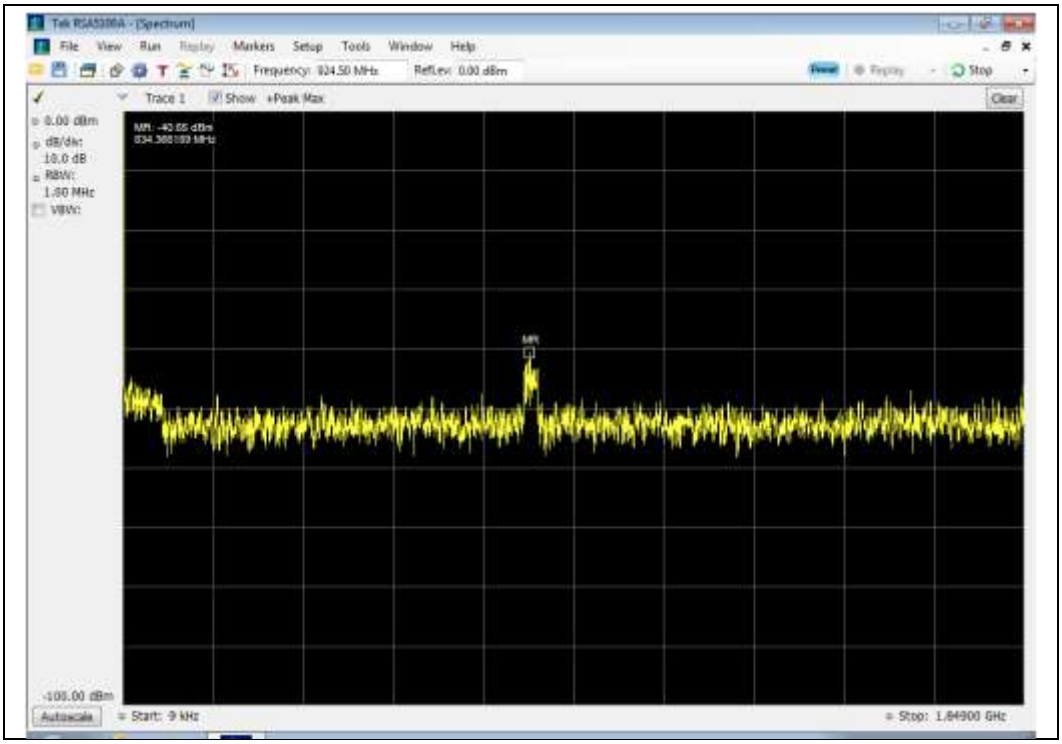



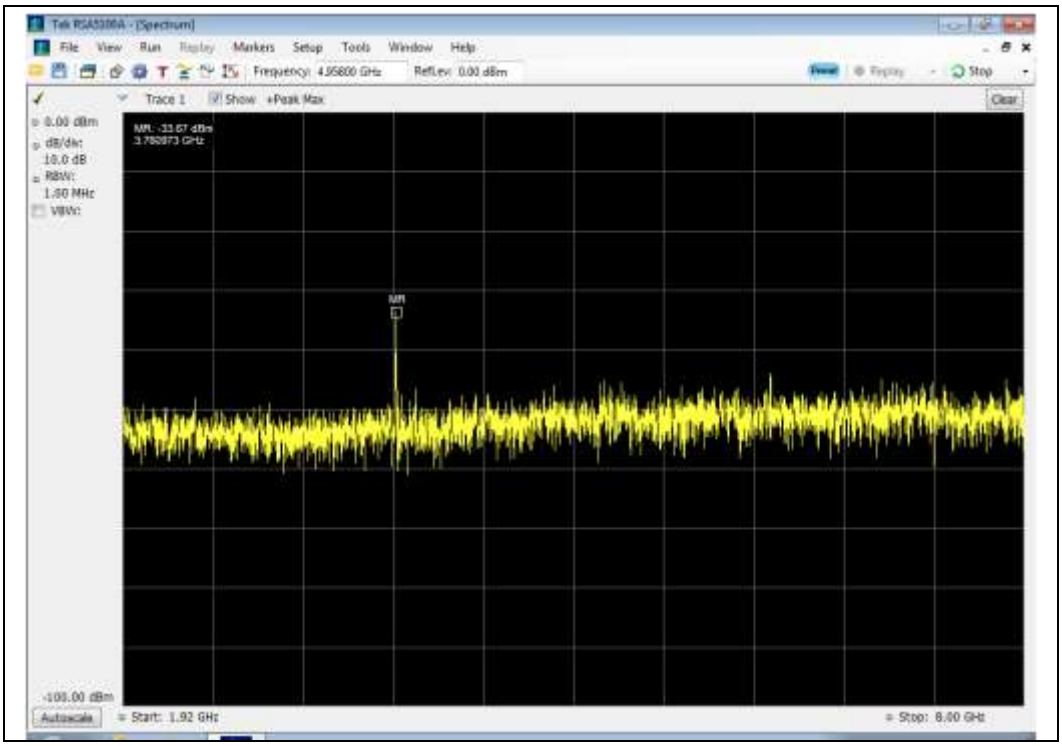
**824 - 849 MHz Band**

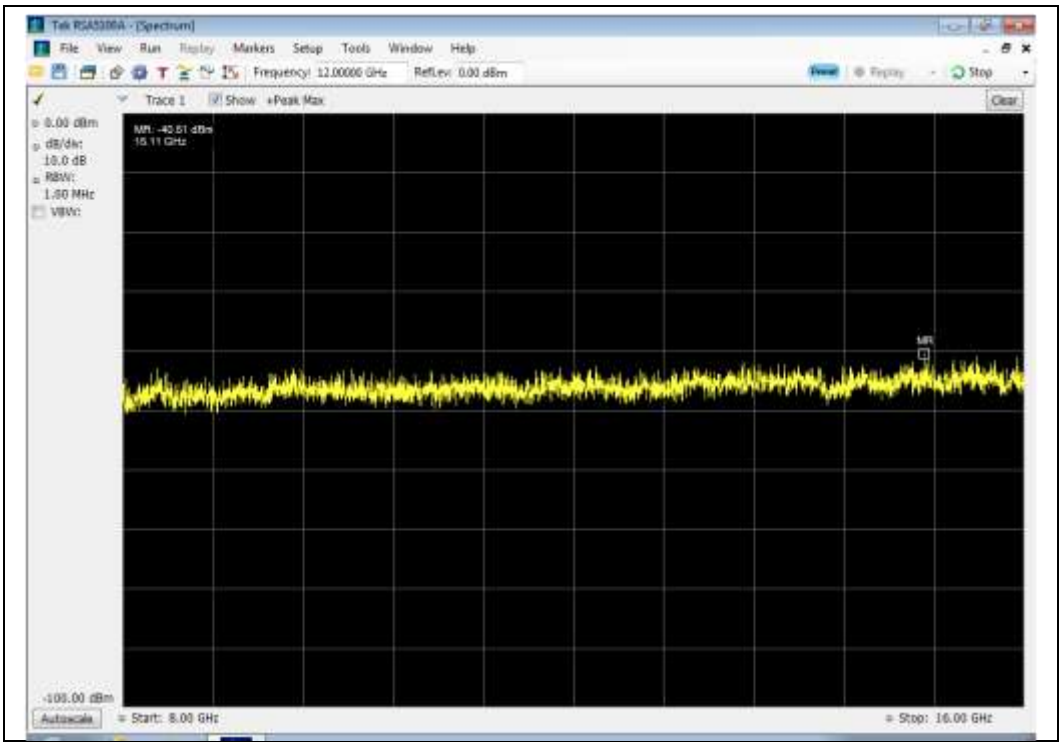


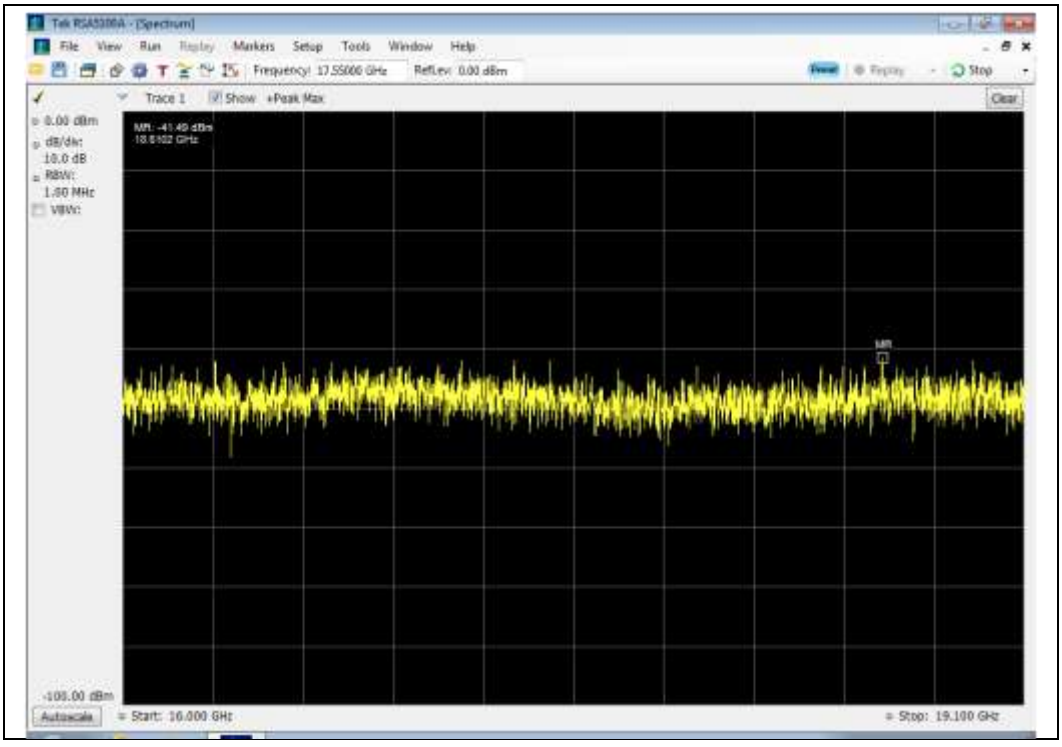



**1850 - 1910 MHz Band**



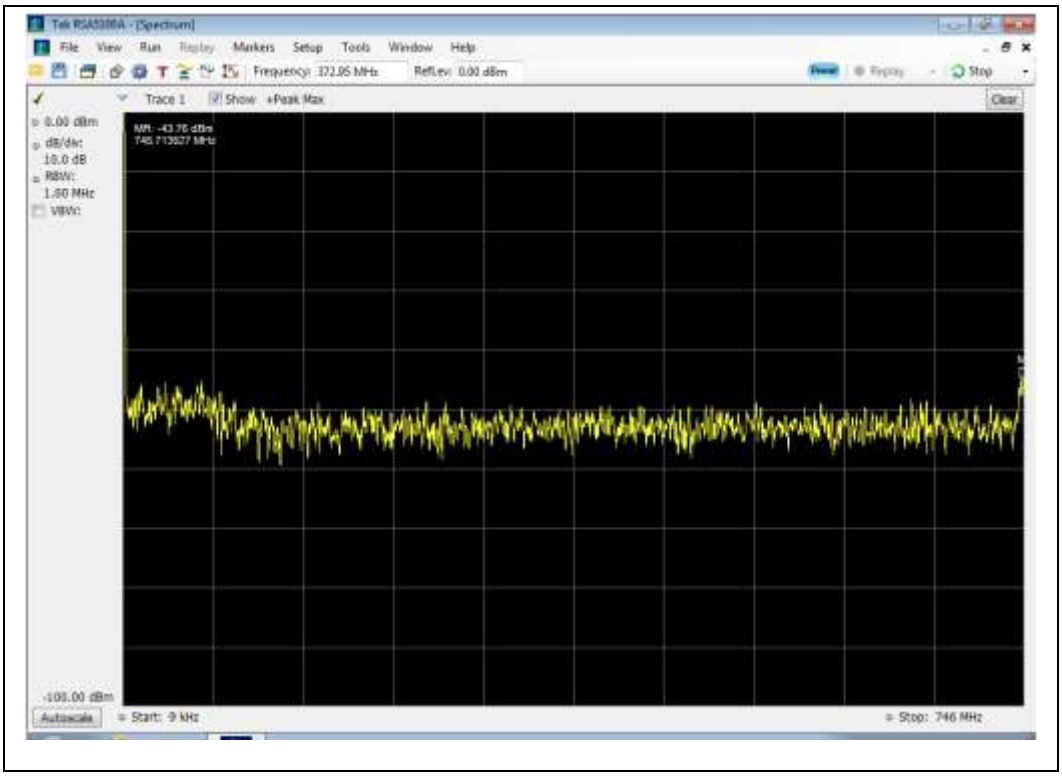



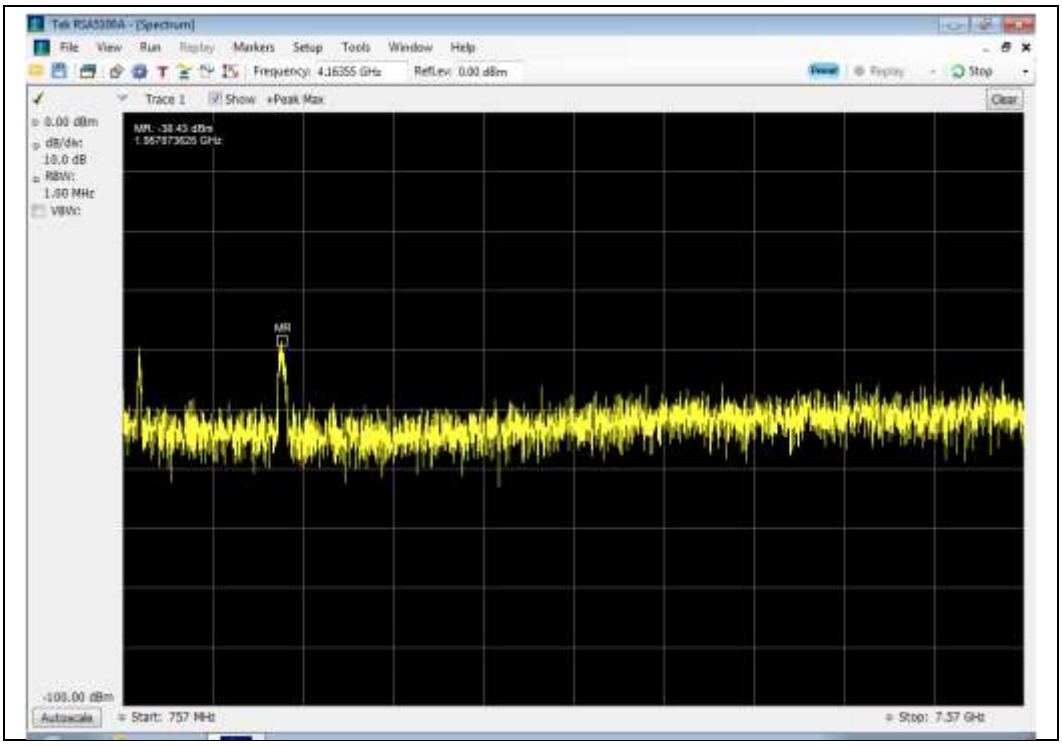

Tek RSA5106A - [Spectrum]
File View Run Replay Markers Setup Tools Window Help
Frequency 12.00000 GHz
RefLev 0.00 dBm
Stop
Trace 1
Show +Peak Max
Clear
0.00 dBm
dB/div
10.0 dB
RBW
1.00 MHz
VBW
MR: -42.51 dBm
15.11 GHz
MR
-100.00 dBm
Autoscale
Start: 8.00 GHz
Stop: 16.00 GHz


Tek RSA5106A - [Spectrum]
File View Run Replay Markers Setup Tools Window Help
Frequency 17.55000 GHz
RefLev 0.00 dBm
Stop
Trace 1
Show +Peak Max
Clear
0.00 dBm
dB/div
10.0 dB
RBW
1.00 MHz
VBW
MR
-100.00 dBm
Autoscale
Start: 16.000 GHz
Stop: 19.100 GHz

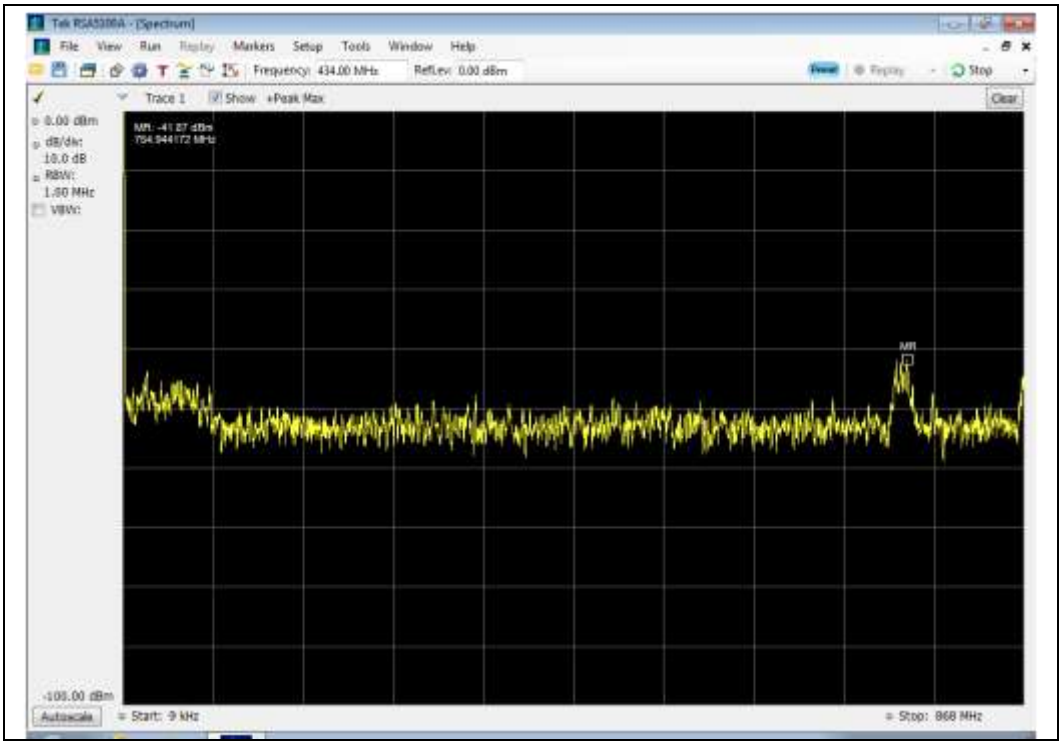
## Downlink Test Plots

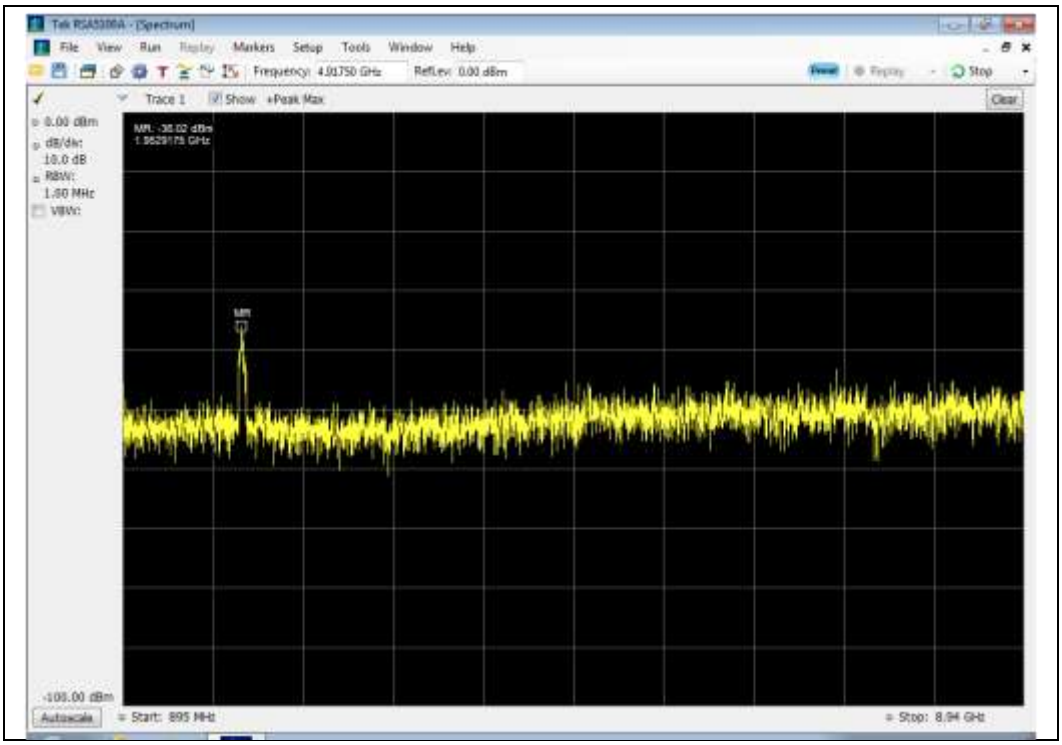
### 746 - 757 MHz Band



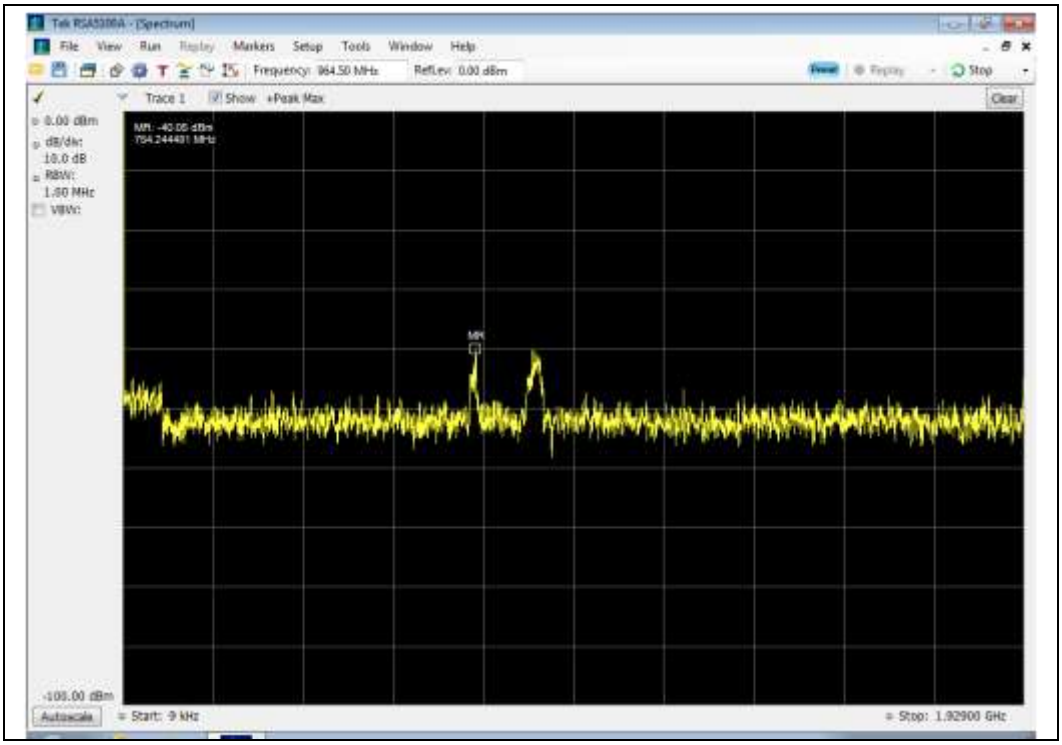



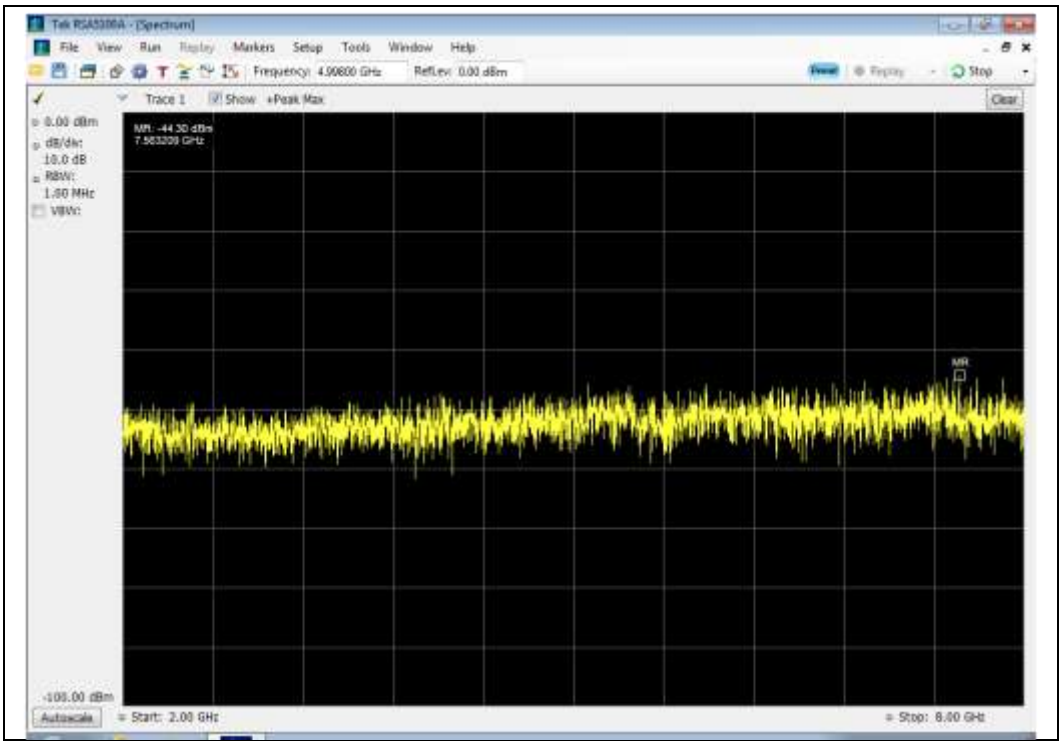
**869 - 894 MHz Band**

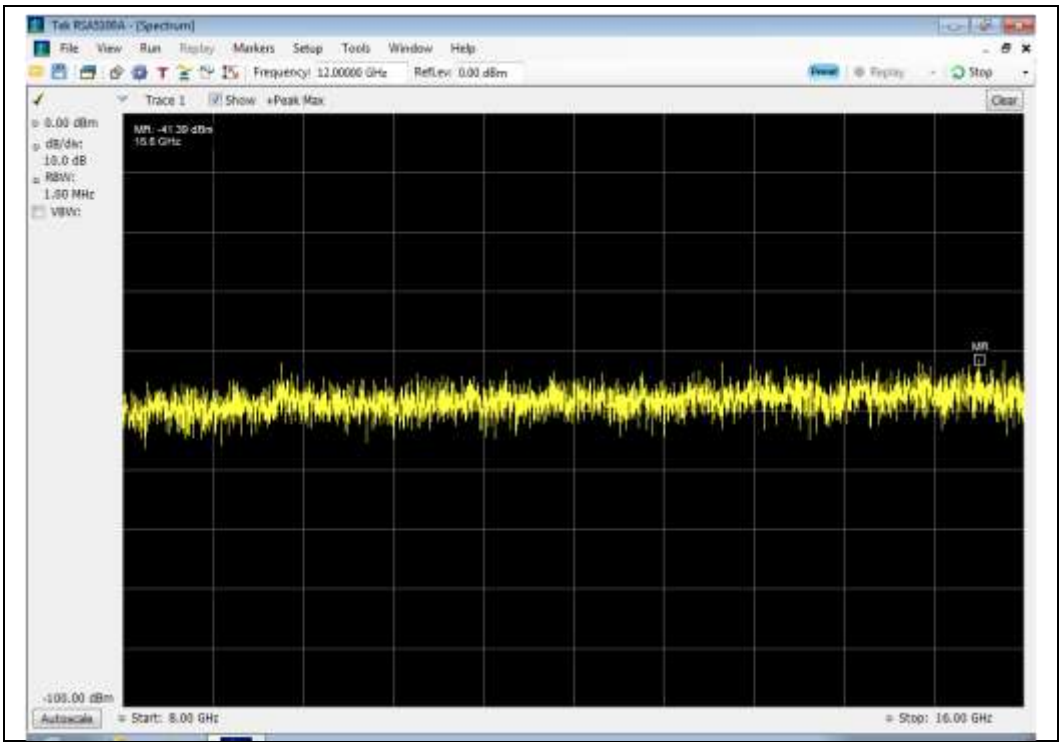


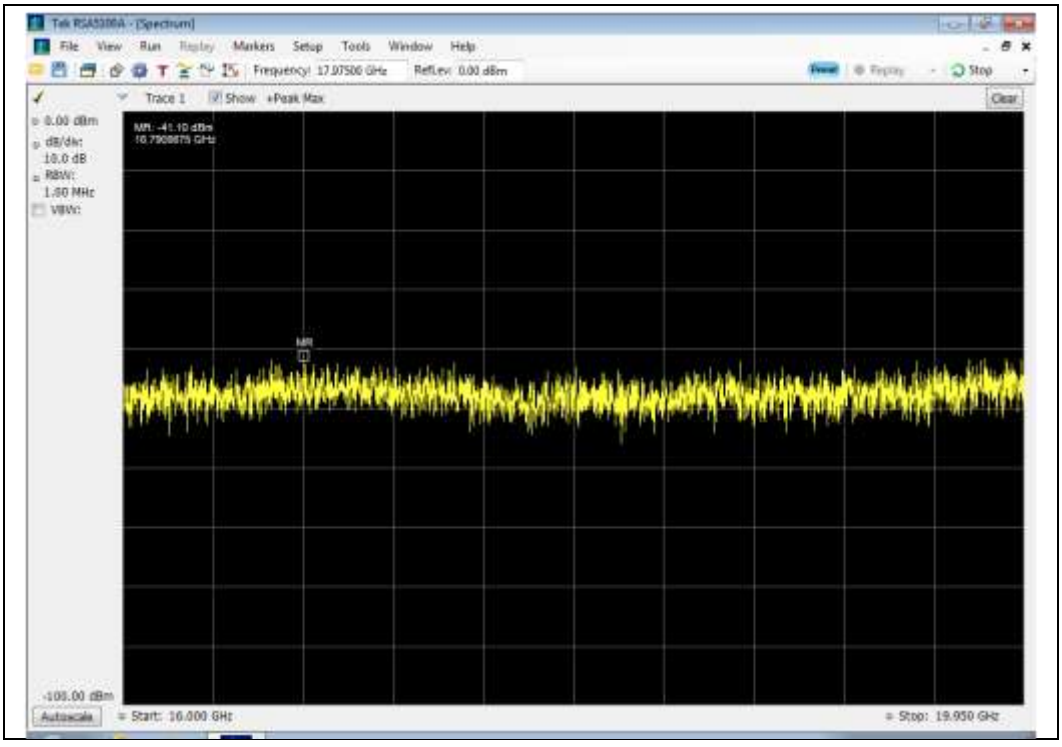



**1930 - 1990 MHz Band**



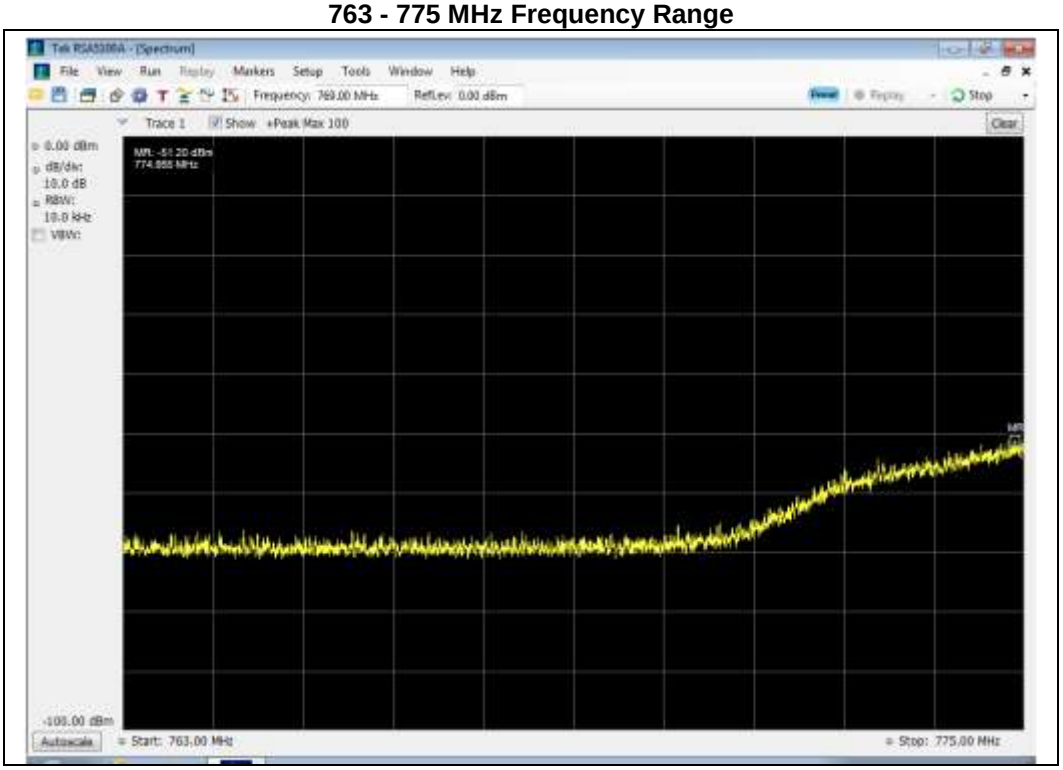




Tek RSA5106A - [Spectrum]
File View Run Replay Markers Setup Tools Window Help
Frequency 12.00000 GHz
RefLev 0.00 dBm
Stop
Trace 1
Show +Peak Max
Clear
0.00 dBm
dB/div
10.0 dB
RBW
1.00 MHz
VBW
MR
-100.00 dBm
Autoscale
Start: 8.00 GHz
Stop: 16.00 GHz

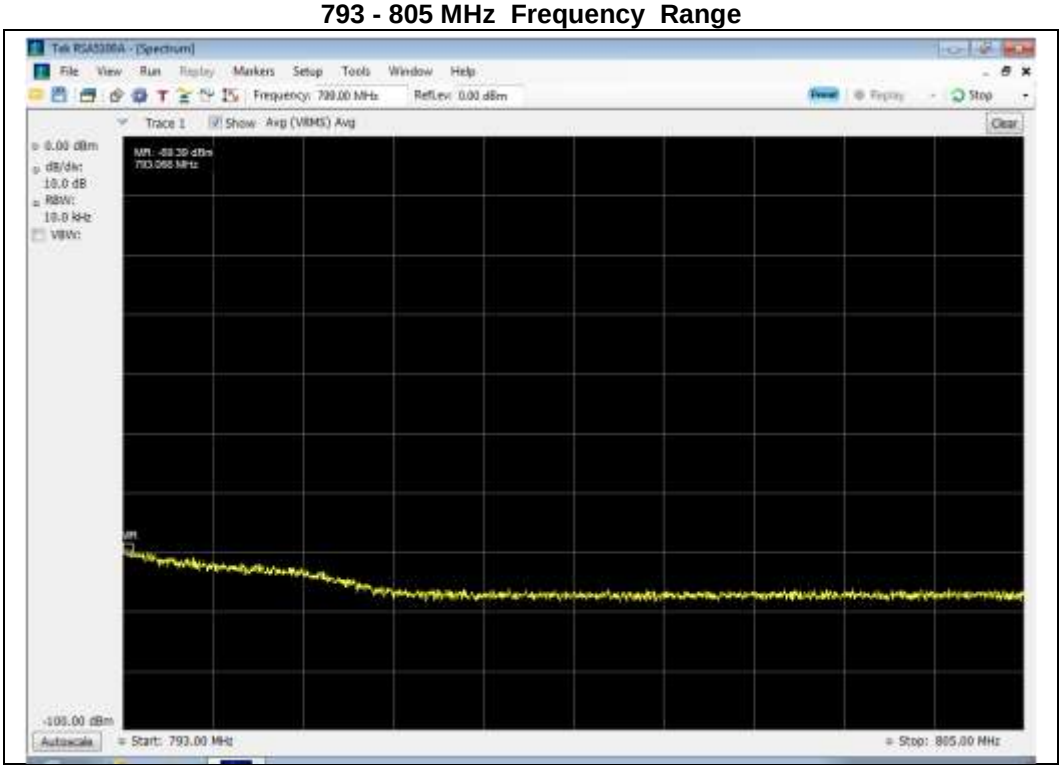

Tek RSA5106A - [Spectrum]
File View Run Replay Markers Setup Tools Window Help
Frequency 17.07500 GHz
RefLev 0.00 dBm
Stop
Trace 1
Show +Peak Max
Clear
0.00 dBm
dB/div
10.0 dB
RBW
1.00 MHz
VBW
MR
-100.00 dBm
Autoscale
Start: 16.000 GHz
Stop: 19.950 GHz

**777 – 787 MHz Uplink Test Plots for the**

**763 - 775 MHz Frequency Range**

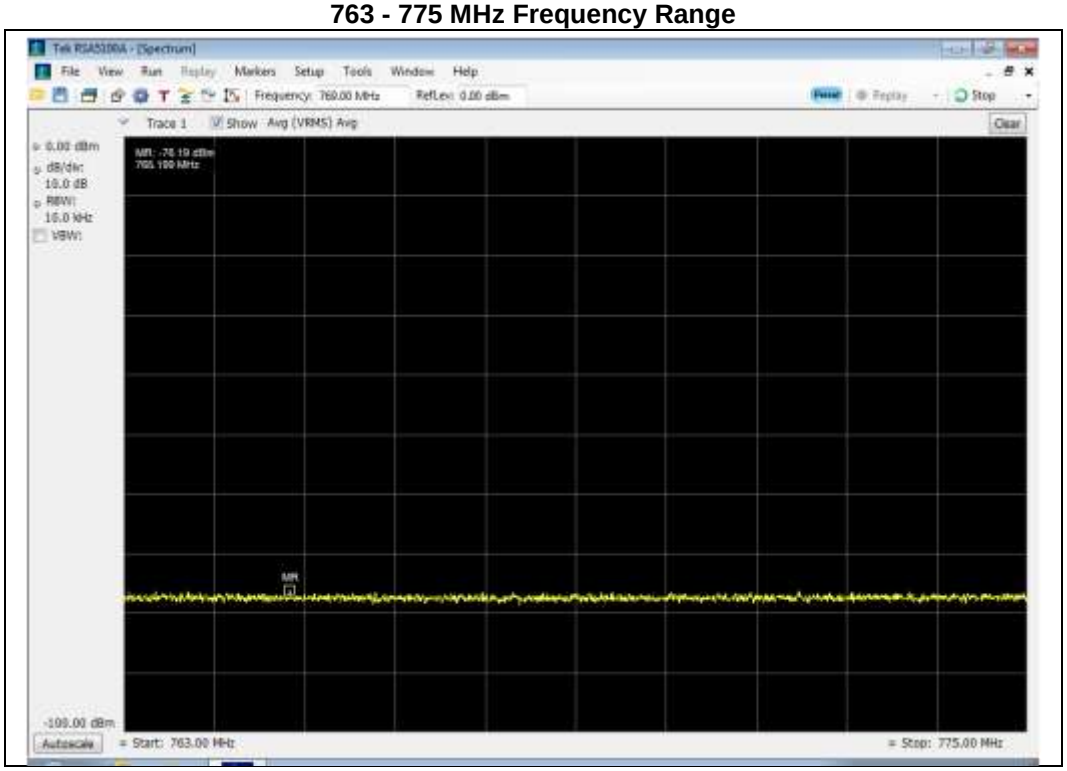



**793 - 805 MHz  Frequency  Range**

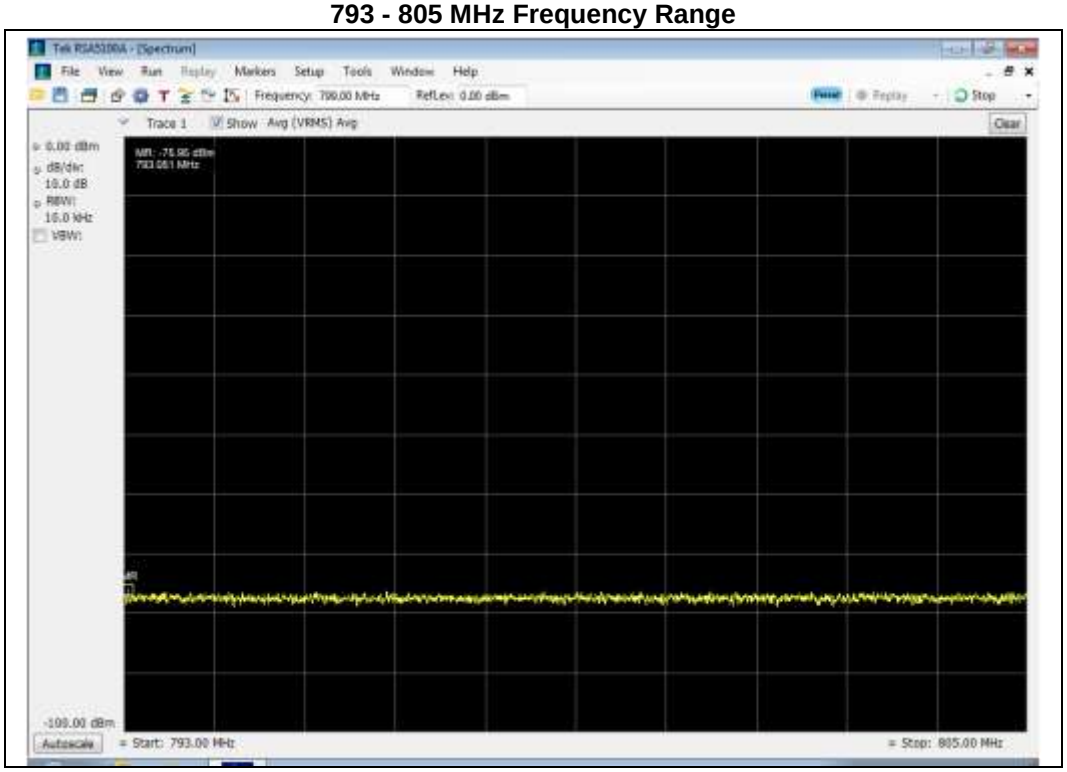


**746 – 756 MHz Downlink Test Plots for the**

**763 - 775 MHz Frequency Range**

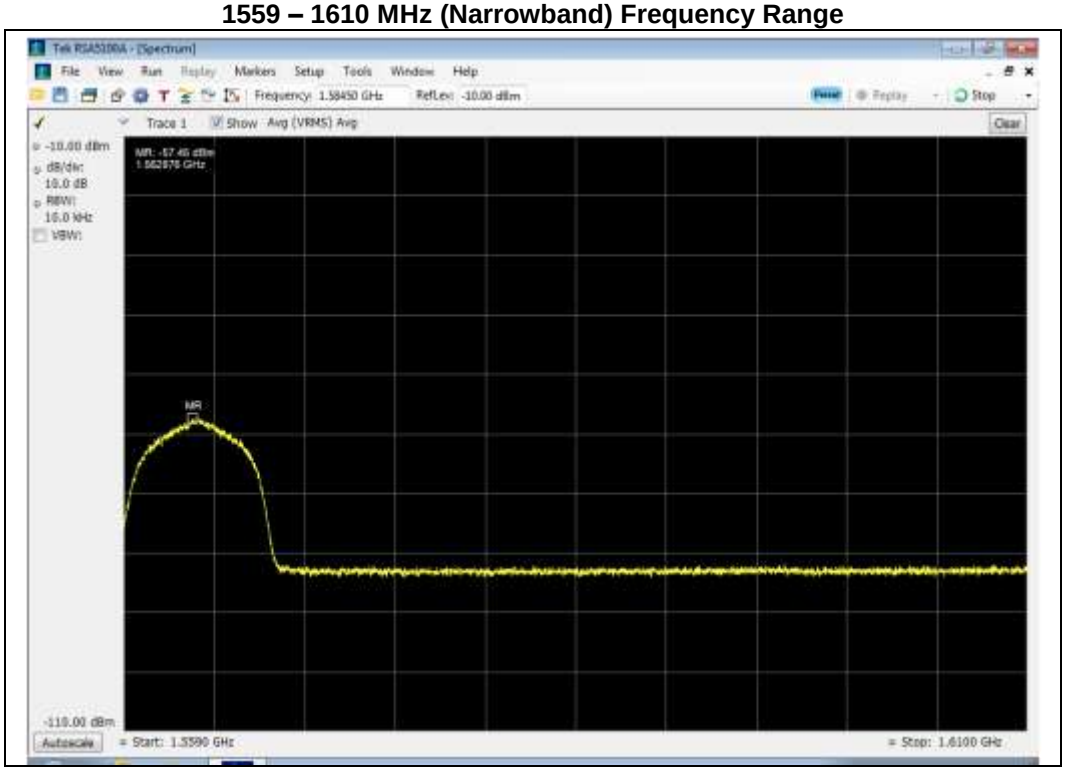



**793 - 805 MHz Frequency Range**

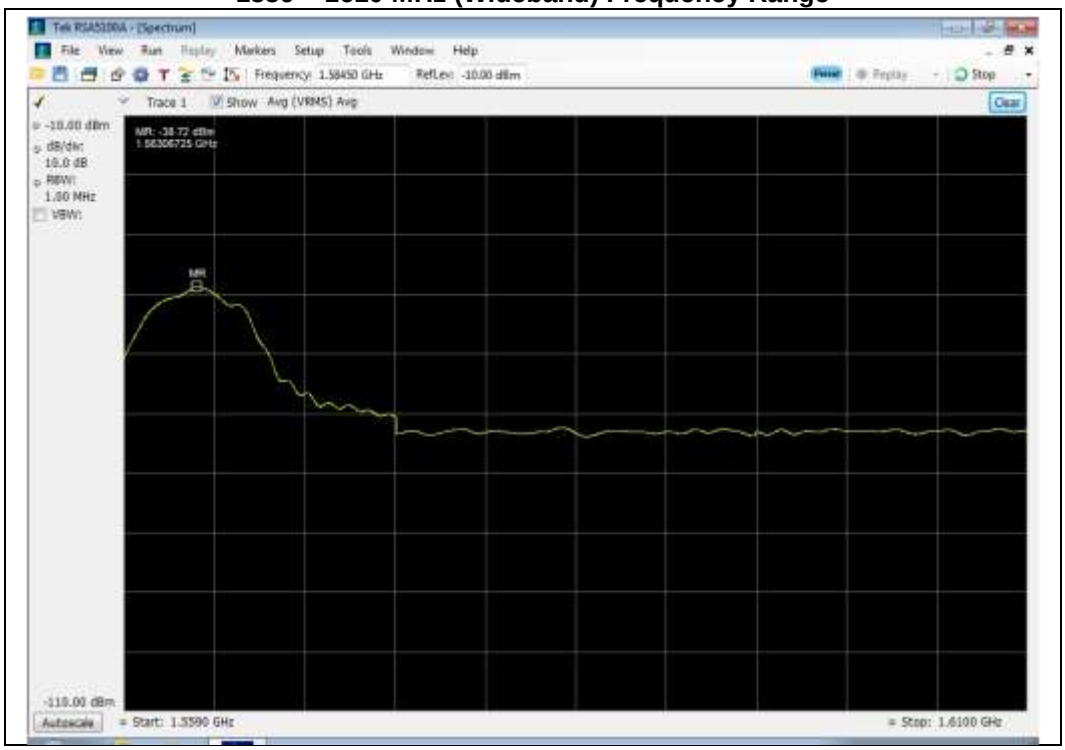


**777 – 787 MHz Uplink Test Plots for the**

**1559 – 1610 MHz (Narrowband) Frequency Range**

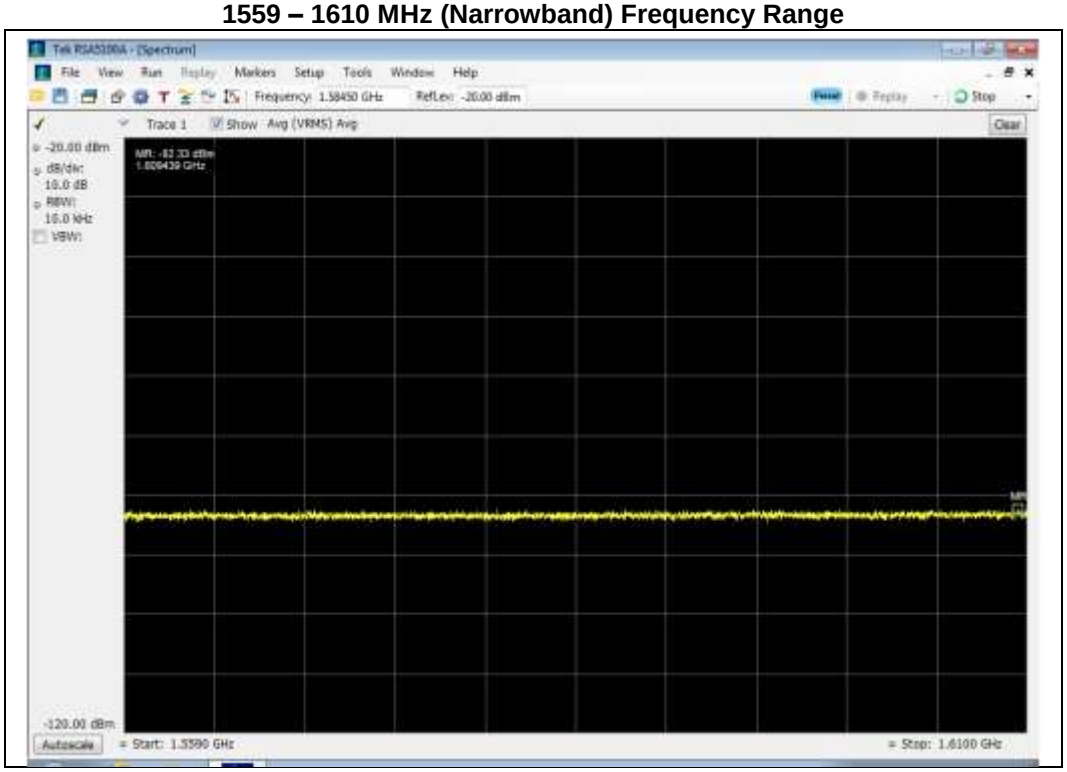



**1559 – 1610 MHz (Wideband) Frequency Range**

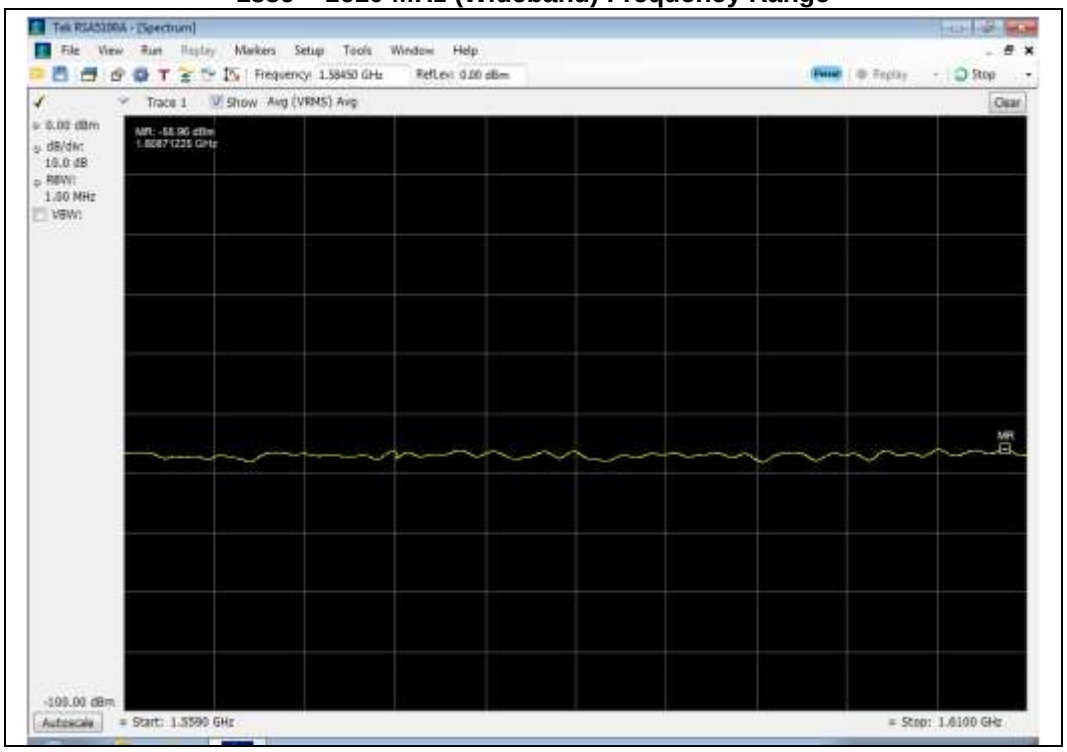


**746 – 756 MHz Downlink Test Plots for the**

**1559 – 1610 MHz (Narrowband) Frequency Range**




**1559 – 1610 MHz (Wideband) Frequency Range**



**Noise Limits**

| | | | |
|---|---|---|---|
| **Name of Test:** | Noise Limits | **Engineer:** | Greg Corbin |
| **Test Equipment Utilized:** | i00413, i00424<br>SMU 200A - S/N:101369 | **Test Date:** | 12/9/2013 |

**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as necessary to ensure that accurate readings were obtained. A series of three tests were performed: the maximum uplink and downlink noise, the variable noise for the uplink and downlink in the presence of a downlink signal, and the variable uplink noise timing. The detailed procedures from KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516c were followed.

For the Uplink Noise Timing plots, the first marker (MR) is the reference marker where the Downlink signal level was increased and marker (M1) is the time it took the booster to react to the increase in the Downlink signal level per KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516c.

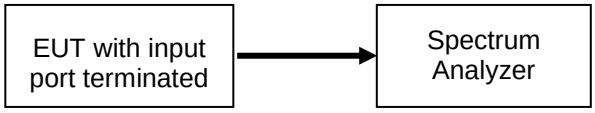
The following formulas are used for calculating the limits. Note – Downlink noise power limit is calculated with the CF of the associated uplink band.

Noise Power =-102.5+LOG10(Band Center Frequency)*20

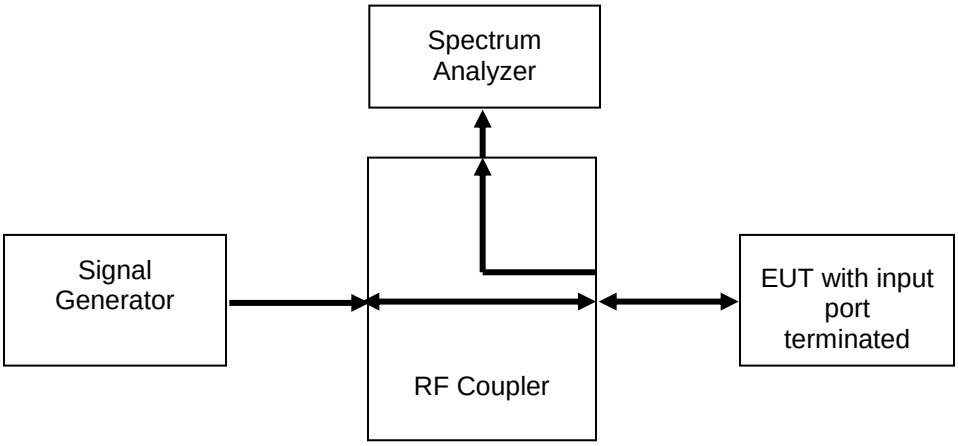
Variable Noise =-103 dBm/MHz-RSSI

**Test Setup**

**Maximum Noise Power**




**Variable Uplink Noise Power and Timing**




**Variable Downlink Noise Power and Timing**

**Maximum Uplink Noise Test Results**

| Frequency Band (MHz) | Measured Noise (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 776 - 787 | -49.2 | -44.6 | -4.6 | Pass |
| 824 - 849 | -47.2 | -44.1 | -3.1 | Pass |
| 1850 - 1910 | -42.6 | -37.0 | -5.6 | Pass |

**Maximum Downlink Noise Test Results**

| Frequency Band (MHz) | Measured Noise (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 746 - 757 | -49.4 | -44.6 | -4.8 | Pass |
| 869 - 894 | -46.8 | -44.1 | -2.7 | Pass |
| 1930 - 1990 | -41.6 | -37.0 | -4.6 | Pass |

**Uplink Noise Timing Test Results**

| Frequency Band (MHz) | Measured Timing (Seconds) | Limit (Seconds) | Result |
|---|---|---|---|
| 776 - 787 | 0.73 | 3.0 | Pass |
| 824 - 849 | 0.94 | 3.0 | Pass |
| 1850 - 1910 | 1.23 | 3.0 | Pass |

## Variable Uplink Noise Limit Test Results

**776 - 787 MHz**

| RSSI (dBm) | Noise Limit (dBm) | Measured Noise (dBm) | Margin (dB) |
|---|---|---|---|
| -70.0 | -44.6 | -54.4 | -9.8 |
| -71.0 | -44.6 | -54.5 | -9.9 |
| -72.0 | -44.6 | -54.5 | -9.9 |
| -73.0 | -44.6 | -54.5 | -9.9 |
| -47.0 | -56.0 | -71.6 | -15.6 |
| -48.0 | -55.0 | -71.4 | -16.4 |

**824 - 849 MHz**

| RSSI (dBm) | Noise Limit (dBm) | Measured Noise (dBm) | Margin (dB) |
|---|---|---|---|
| -81.0 | -44.0 | -53.4 | -9.4 |
| -82.0 | -44.0 | -53.4 | -9.4 |
| -83.0 | -44.0 | -53.4 | -9.4 |
| -68.0 | -44.0 | -53.4 | -9.4 |
| -49.0 | -54.0 | -69.4 | -15.4 |
| -47.0 | -56.0 | -71.5 | -15.5 |

**1850 - 1910 MHz**

| RSSI (dBm) | Noise Limit (dBm) | Measured Noise (dBm) | Margin (dB) |
|---|---|---|---|
| -74.0 | -37.0 | -49.1 | -12.1 |
| -72.0 | -37.0 | -49.2 | -12.2 |
| -73.0 | -37.0 | -49.2 | -12.2 |
| -76.0 | -37.0 | -49.3 | -12.3 |
| -53.0 | -50.0 | -66.4 | -16.4 |
| -56.0 | -47.0 | -63.4 | -16.4 |

## Variable Downlink Noise Limit Test Results

**746 - 757 MHz**

| RSSI (dBm) | Noise Limit (dBm) | Measured Noise (dBm) | Margin (dB) |
|---|---|---|---|
| -70.0 | -44.6 | -50.6 | -6.0 |
| -71.0 | -44.6 | -50.6 | -6.0 |
| -72.0 | -44.6 | -50.6 | -6.0 |
| -73.0 | -44.6 | -50.6 | -6.0 |
| -56.0 | -47.0 | -61.2 | -14.2 |
| -57.0 | -46.0 | -60.3 | -14.3 |

**869 - 894 MHz**

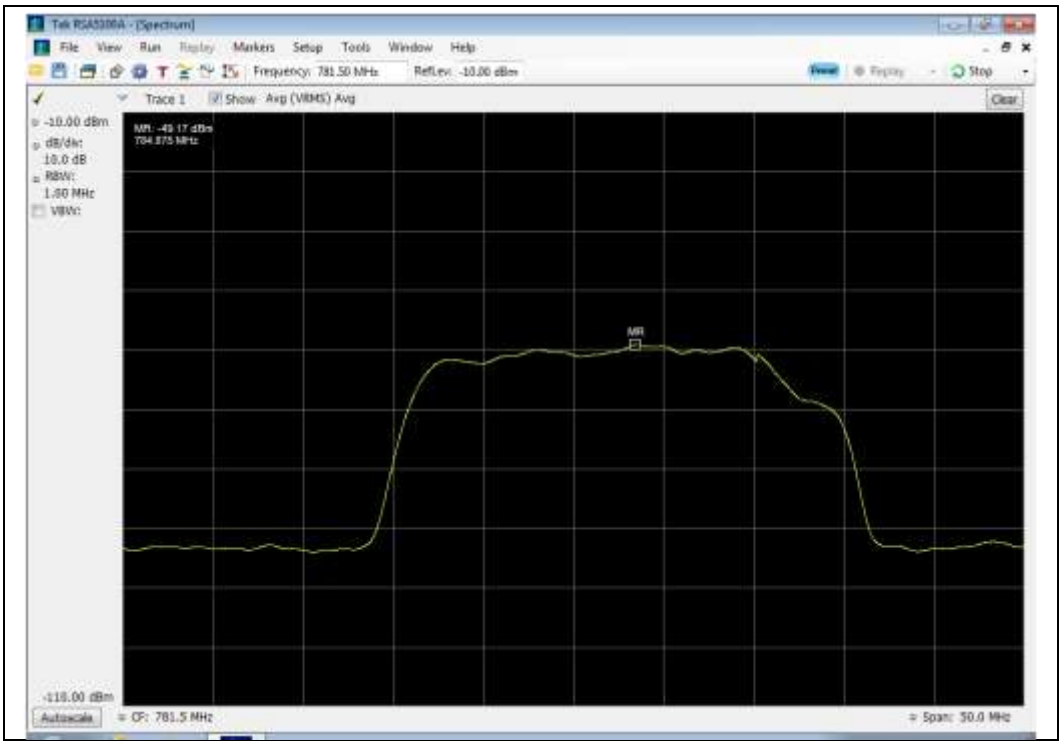
| RSSI (dBm) | Noise Limit (dBm) | Measured Noise (dBm) | Margin (dB) |
|---|---|---|---|
| -69.0 | -44.0 | -47.6 | -3.6 |
| -68.0 | -44.0 | -47.8 | -3.8 |
| -71.0 | -44.0 | -48.0 | -4.0 |
| -72.0 | -44.0 | -48.0 | -4.0 |
| -54.0 | -49.0 | -59.6 | -10.6 |
| -57.0 | -46.0 | -57.1 | -11.1 |

**1930 - 1990 MHz**

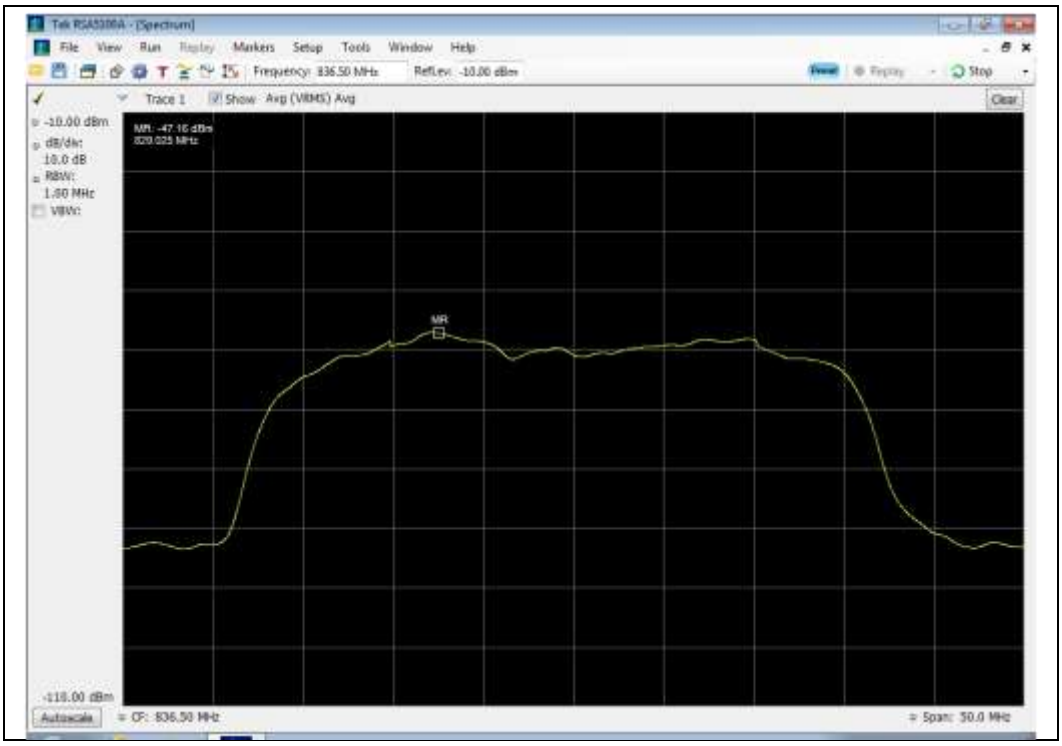
| RSSI (dBm) | Noise Limit (dBm) | Measured Noise (dBm) | Margin (dB) |
|---|---|---|---|
| -76.0 | -37.0 | -42.4 | -5.4 |
| -77.0 | -37.0 | -42.4 | -5.4 |
| -78.0 | -37.0 | -42.4 | -5.4 |
| -79.0 | -37.0 | -42.4 | -5.4 |
| -50.0 | -53.0 | -61.1 | -8.1 |
| -51.0 | -52.0 | -60.1 | -8.1 |

## Maximum Uplink Noise Test Plots

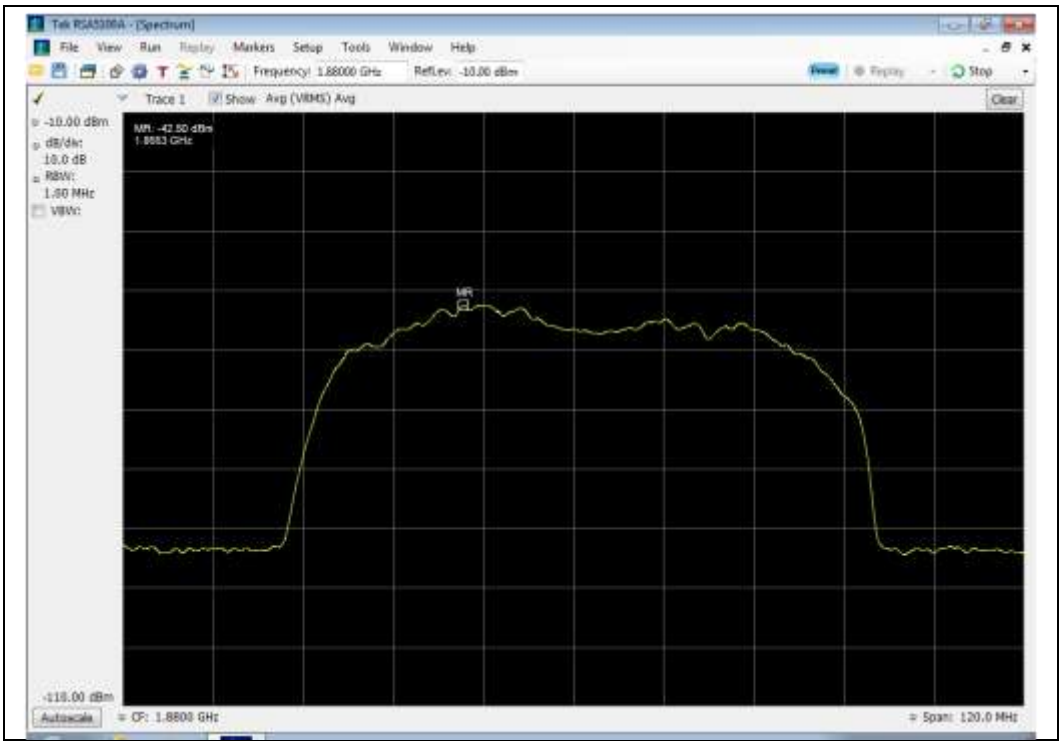
### 776 - 787 MHz Band




### 824 - 849 MHz Band

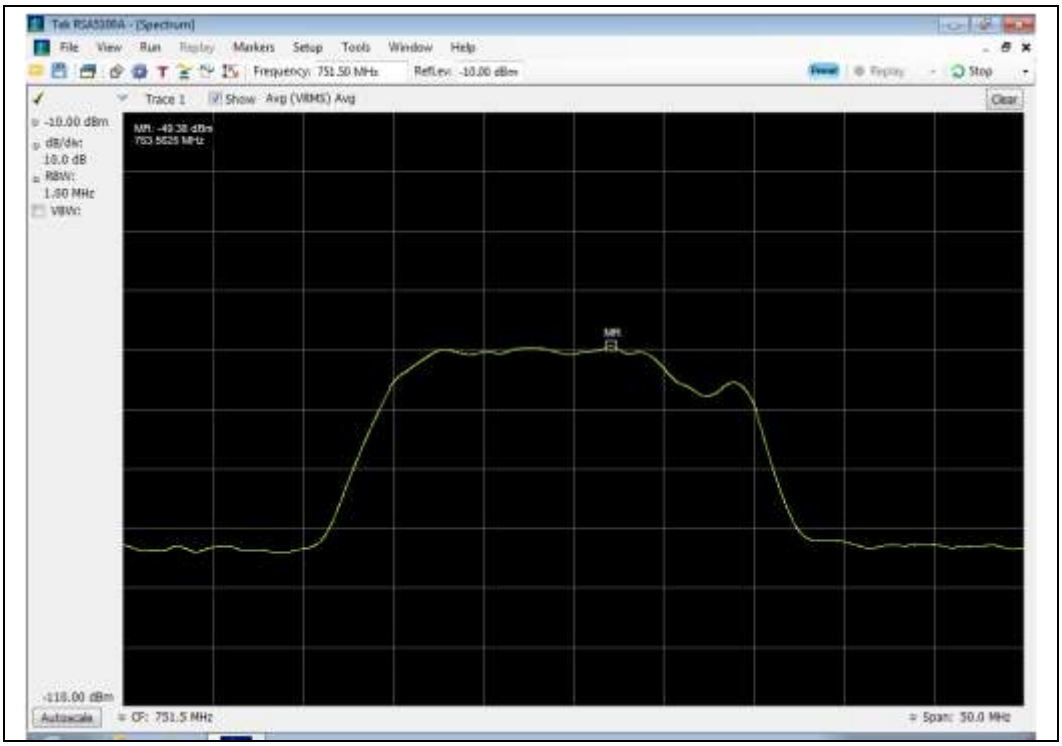


**1850 - 1910 MHz Band**

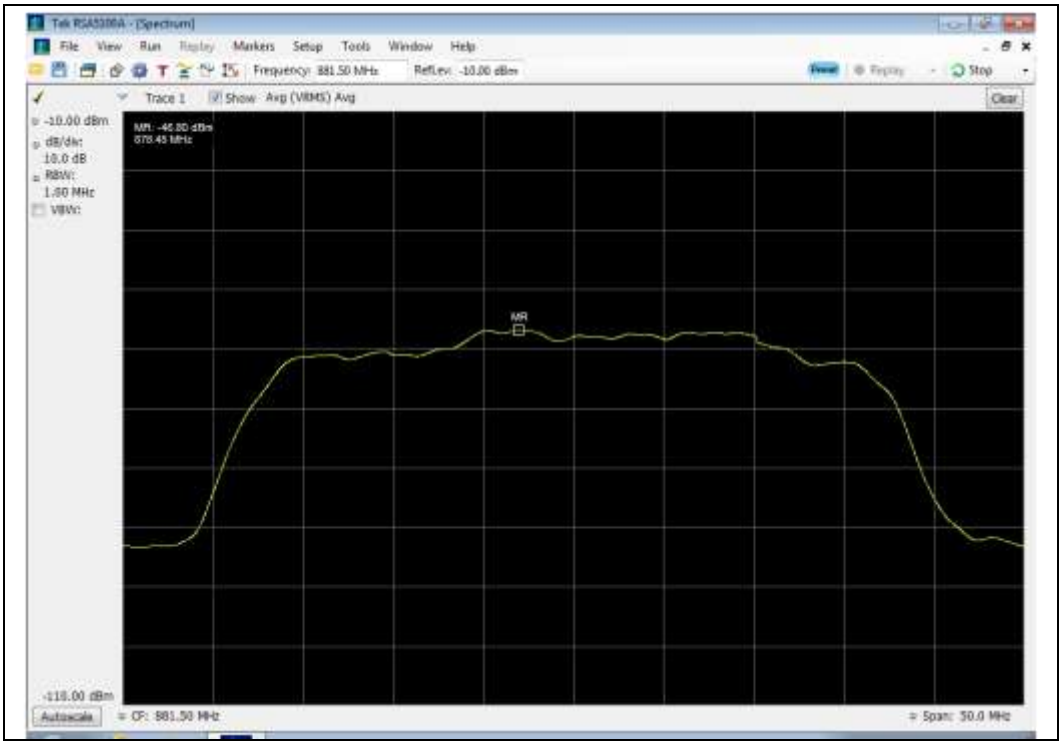



**Maximum Downlink Noise Test Plots**

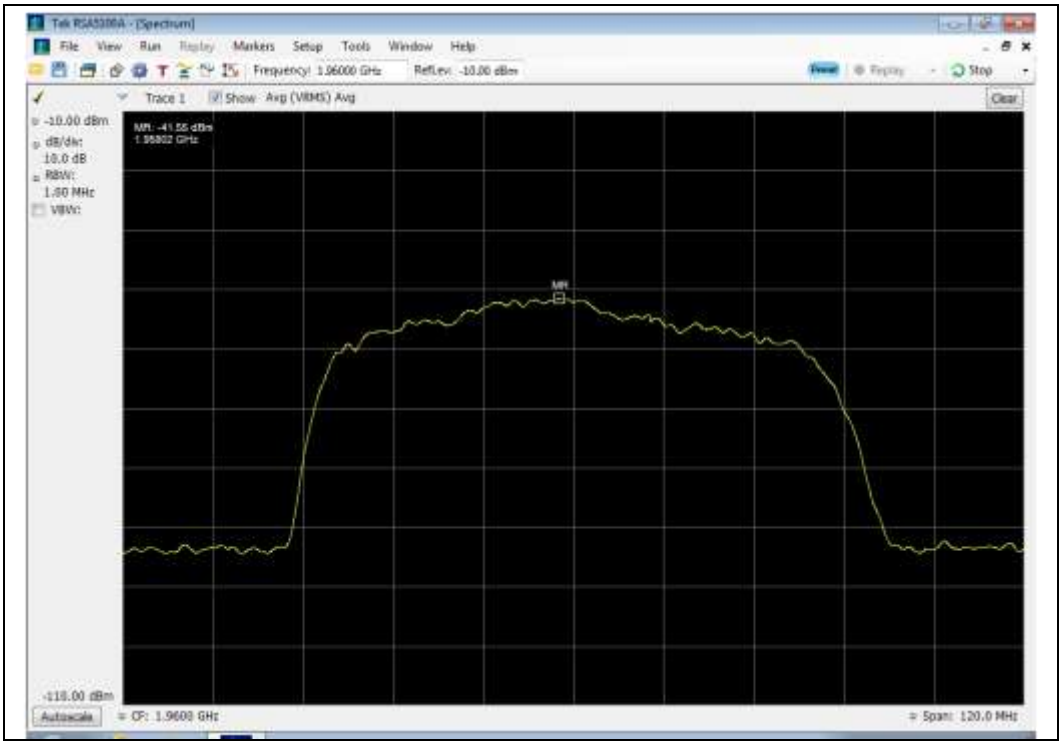
**746 - 757 MHz Band**



**869 - 894 MHz Band**

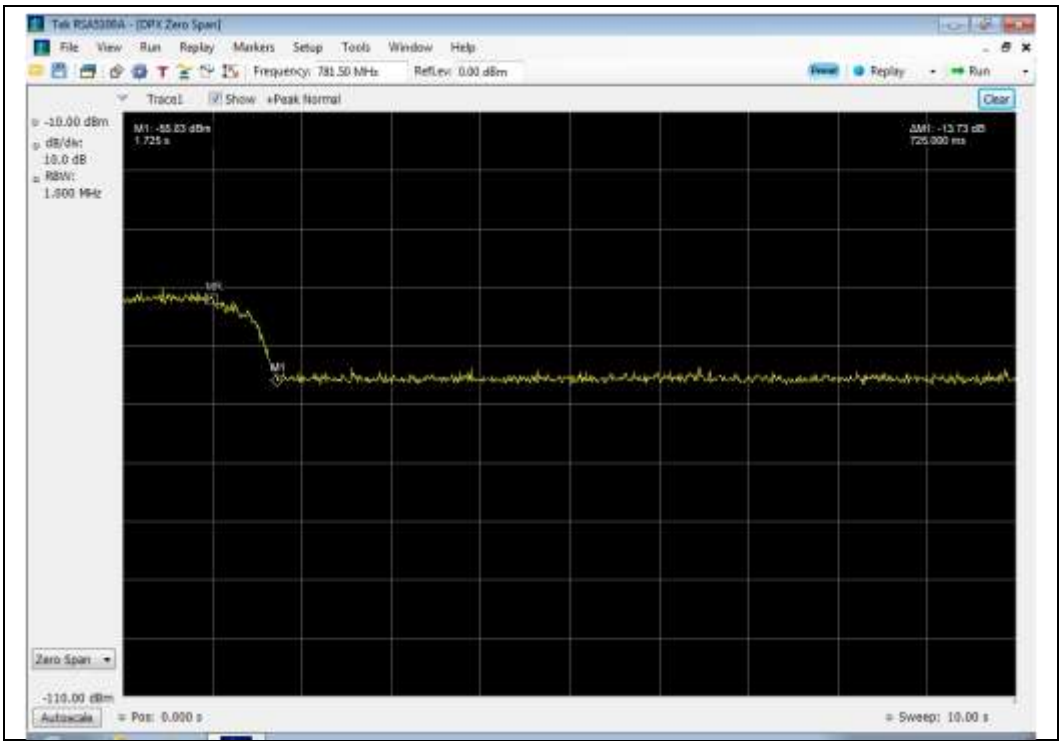



**1930 - 1990 MHz Band**

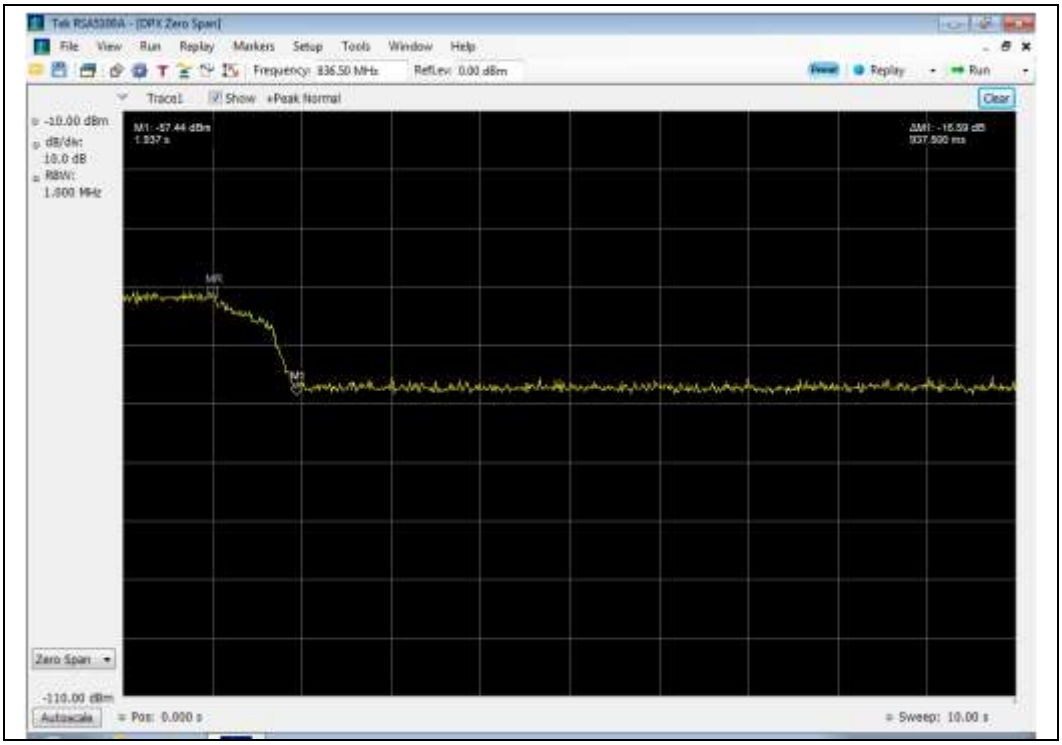


## Uplink Noise Timing Test Plots

### 776 - 787 MHz Band




### 824 - 849 MHz Band



**1850 - 1910 MHz Band**

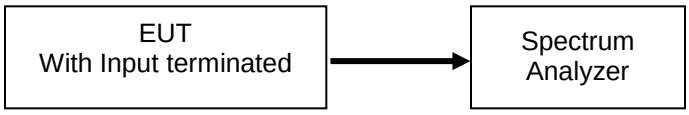
**Uplink Inactivity**

**Name of Test:** Uplink Inactivity
**Engineer:** Greg Corbin
**Test Equipment Utilized:** i00424
**Test Date:** 12/10/2013

## Test Procedure

The EUT was connected directly to a spectrum analyzer set to operate in the center of the EUT operational uplink and downlink bands. The span was set to 0 Hz with a sweep time of 330 seconds and MAX HOLD operation. The EUT was powered on and the time for the uplink to return to an inactive state was measured using the DELTA MARKER method to ensure that it was less than 300 seconds. The noise level after the return to an inactive state was less than -70 dBm/MHz.

## Test Setup

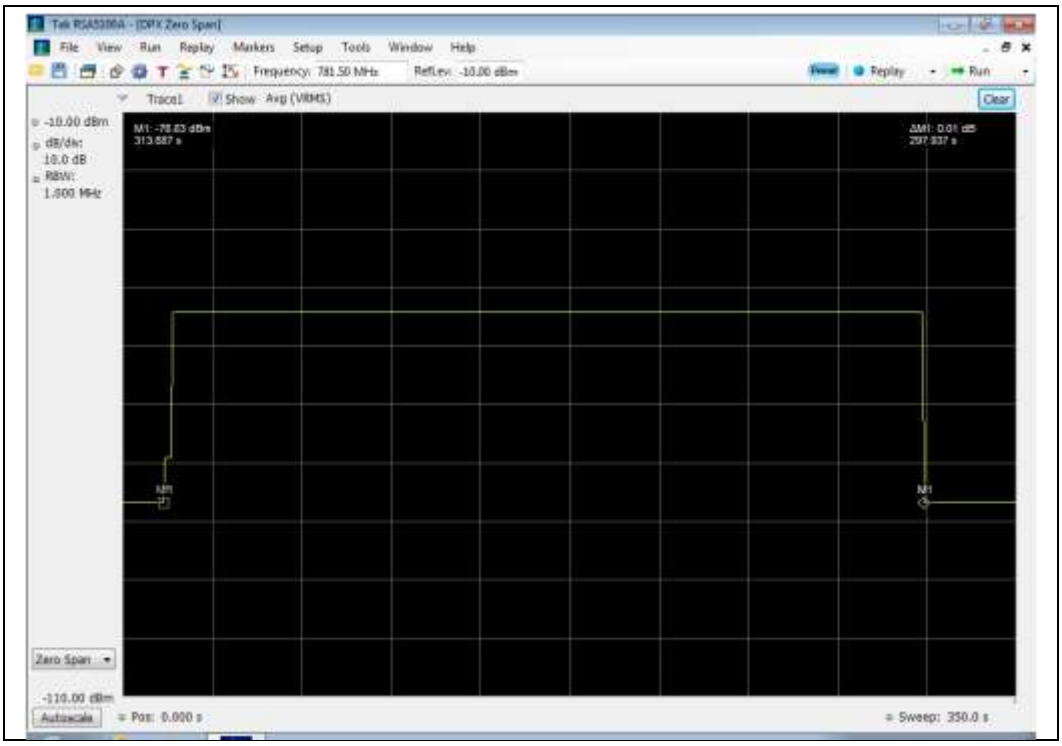



## Uplink Test Results

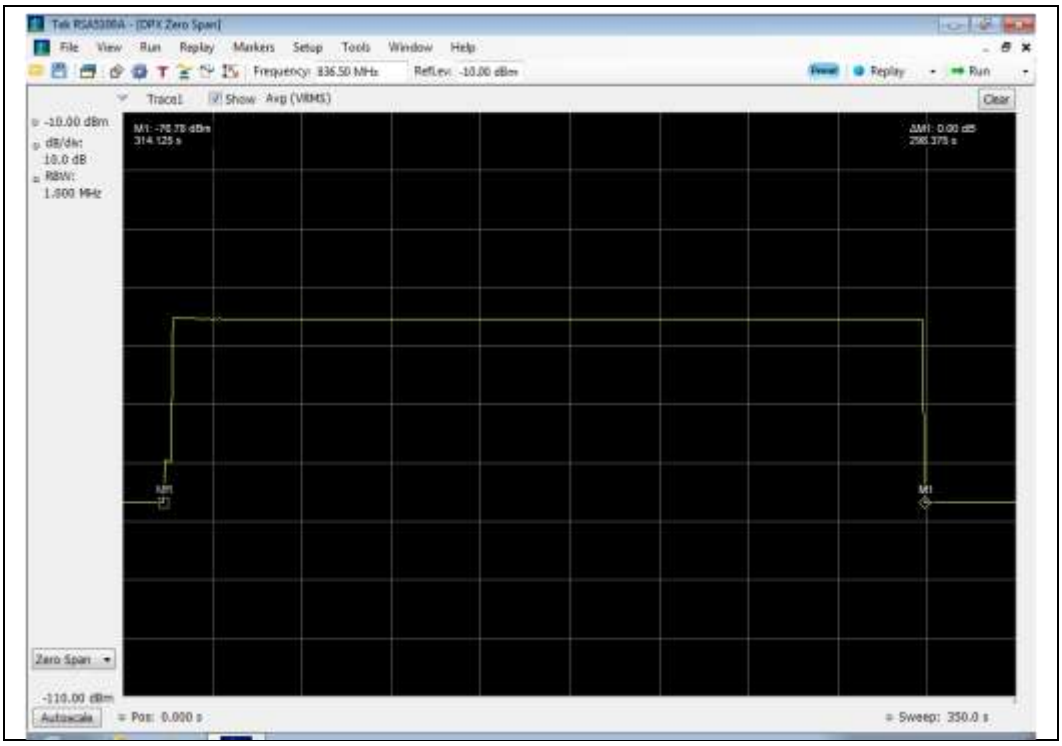
| Frequency Band (MHz) | Measured Time (Seconds) | Limit (Seconds) | Result |
|---|---|---|---|
| 776 - 787 | 297.937 | 300 | Pass |
| 824 - 849 | 298.375 | 300 | Pass |
| 1850 - 1910 | 295.312 | 300 | Pass |

## Uplink Inactivity Test Results

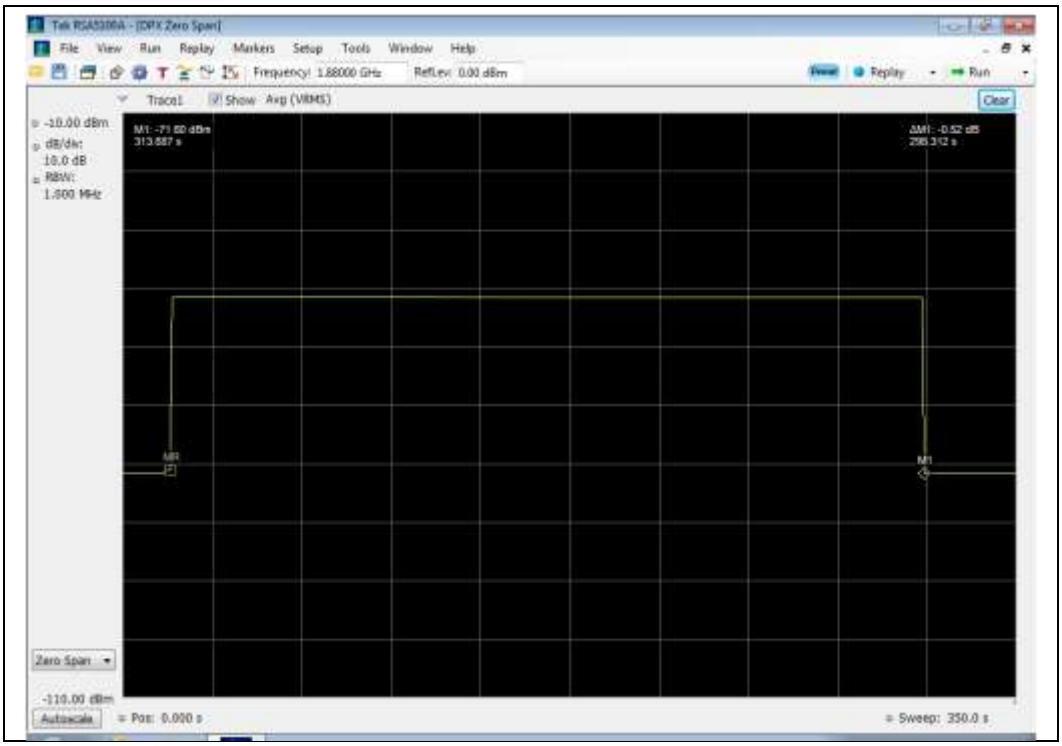
### 776 - 787 MHz




### 824 - 849 MHz



**1850 - 1910 MHz**



**Variable Gain**

| | | | |
|---|---|---|---|
| **Name of Test:** | Variable Gain | **Engineer:** | Greg Corbin |
| **Test Equipment Utilized:** | i00413, i00424<br>SMU 200A - S/N:101369 | **Test Date:** | 12/10/2013 |

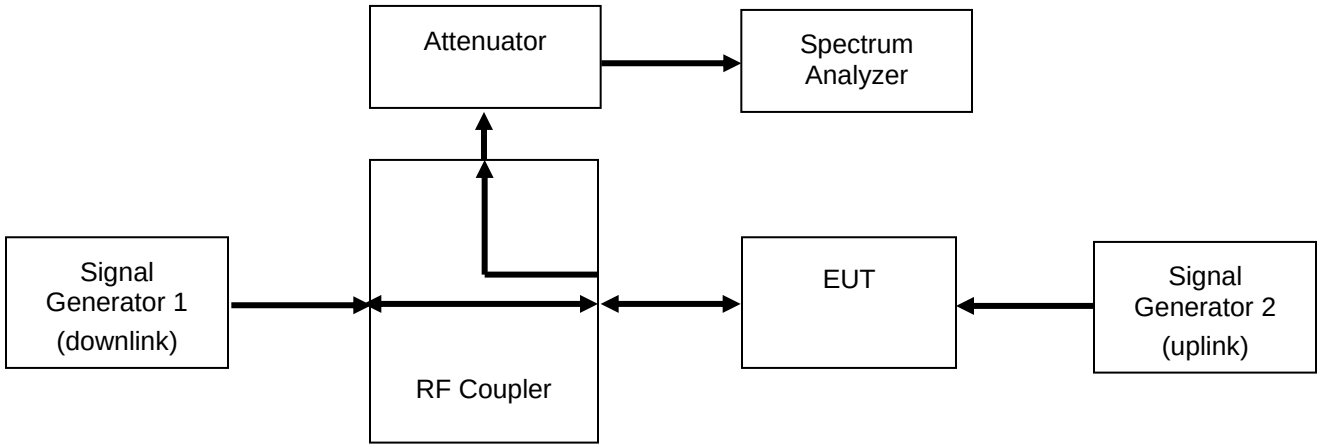
**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor in order to ensure accurate readings were obtained. The uplink gain in the presence of a downlink signal was measured for each operational uplink band using the detailed procedures from KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516.

The following formula is used for calculating the limits:

Variable Gain = -34 dB - RSSI +MSCL

**Test Setup**



## Uplink Test Results

**776 - 787 MHz**

| RSSI (dBm) | MSCL (dB) | Gain Limit (dBm) | P(in) (dBm) | P(out) (dBm) | Gain (dB) | Margin (dB) |
|---|---|---|---|---|---|---|
| -47 | 29.0 | 42.0 | -47.2 | -6.6 | 40.6 | -1.4 |
| -48 | 29.0 | 43.0 | -47.2 | -5.7 | 41.5 | -1.5 |
| -59 | 29.0 | 54.0 | -47.2 | 4.6 | 51.8 | -2.2 |
| -54 | 29.0 | 49.0 | -47.2 | -0.5 | 46.7 | -2.3 |
| -55 | 29.0 | 50.0 | -47.2 | 0.4 | 47.6 | -2.4 |
| -56 | 29.0 | 51.0 | -47.2 | 1.4 | 48.6 | -2.4 |

**824 - 849 MHz**

| RSSI (dBm) | MSCL (dB) | Gain Limit (dBm) | P(in) (dBm) | P(out) (dBm) | Gain (dB) | Margin (dB) |
|---|---|---|---|---|---|---|
| -47 | 28.0 | 41.0 | -47.7 | -8.8 | 38.9 | -2.1 |
| -46 | 28.0 | 40.0 | -47.7 | -9.9 | 37.8 | -2.2 |
| -48 | 28.0 | 42.0 | -47.7 | -7.9 | 39.8 | -2.2 |
| -49 | 28.0 | 43.0 | -47.7 | -7.0 | 40.7 | -2.3 |
| -50 | 28.0 | 44.0 | -47.7 | -6.0 | 41.7 | -2.3 |
| -51 | 28.0 | 45.0 | -47.7 | -5.0 | 42.7 | -2.3 |

**1850 - 1910 MHz**

| RSSI (dBm) | MSCL (dB) | Gain Limit (dBm) | P(in) (dBm) | P(out) (dBm) | Gain (dB) | Margin (dB) |
|---|---|---|---|---|---|---|
| -51 | 25.0 | 42.0 | -52.3 | -10.6 | 41.7 | -0.3 |
| -48 | 25.0 | 39.0 | -52.3 | -13.7 | 38.6 | -0.4 |
| -49 | 25.0 | 40.0 | -52.3 | -12.7 | 39.6 | -0.4 |
| -52 | 25.0 | 43.0 | -52.3 | -9.7 | 42.6 | -0.4 |
| -56 | 25.0 | 47.0 | -52.3 | -5.7 | 46.6 | -0.4 |
| -57 | 25.0 | 48.0 | -52.3 | -4.7 | 47.6 | -0.4 |

## Uplink Gain Timing Test Results

| Frequency Band (MHz) | Measured Timing (Seconds) | Limit (Seconds) | Result |
|---|---|---|---|
| 777 - 78 | 0.96 | 3.0 | Pass |
| 824 - 849 | 1.19 | 3.0 | Pass |
| 1850 - 1910 | 1.85 | 3.0 | Pass |

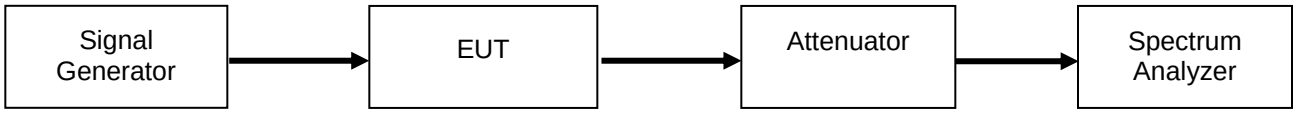
**Occupied Bandwidth**

| | | |
|---|---|---|
| **Name of Test:** | Occupied Bandwidth | **Engineer:** Greg Corbin |
| **Test Equipment Utilized:** | 0103,i00334, i00379, SMU 200A - S/N:101369 | **Test Date:** 12/12/2013 |

**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as required to ensure that accurate readings were obtained. A signal generator was utilized to produce the following signals: GSM, CDMA, and WCDMA. The signal generator was tuned to the center channel of each of the EUT operational uplink and downlink bands with the RF level set at a point just prior to the AGC being in control of the power. For each modulation type, the input and output signal was measured and plotted to ensure that the signals were similar.

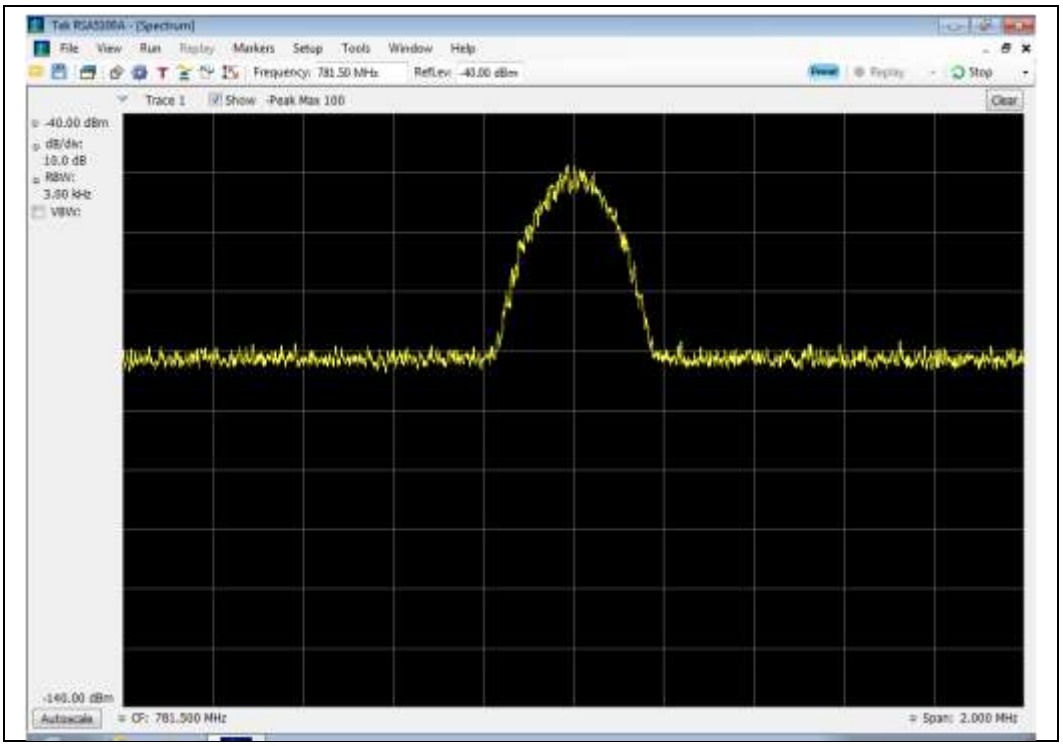
**Test Setup**



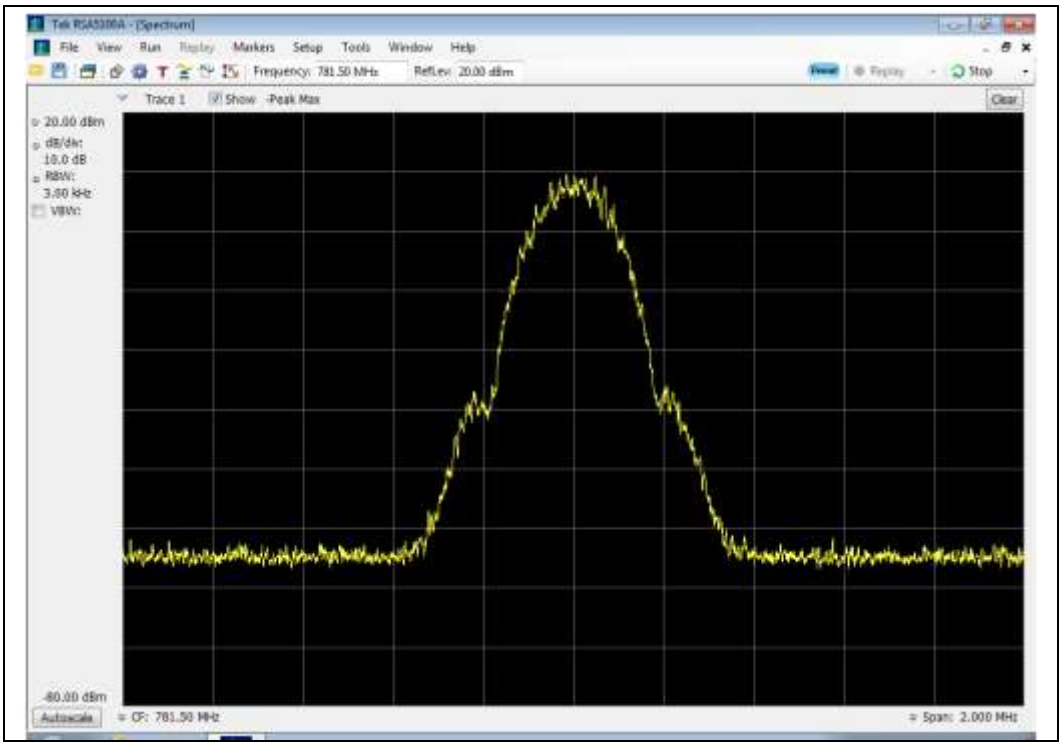
## GSM Uplink Test Plots

### 776 - 787 MHz Band

**Input**

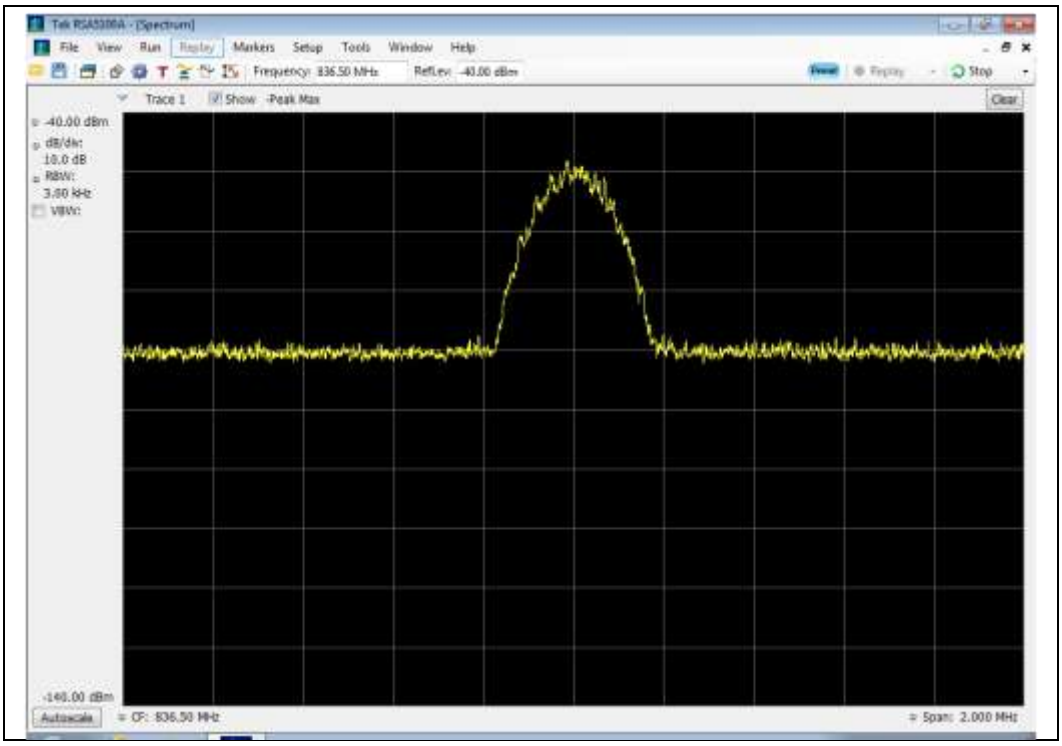



**Output**

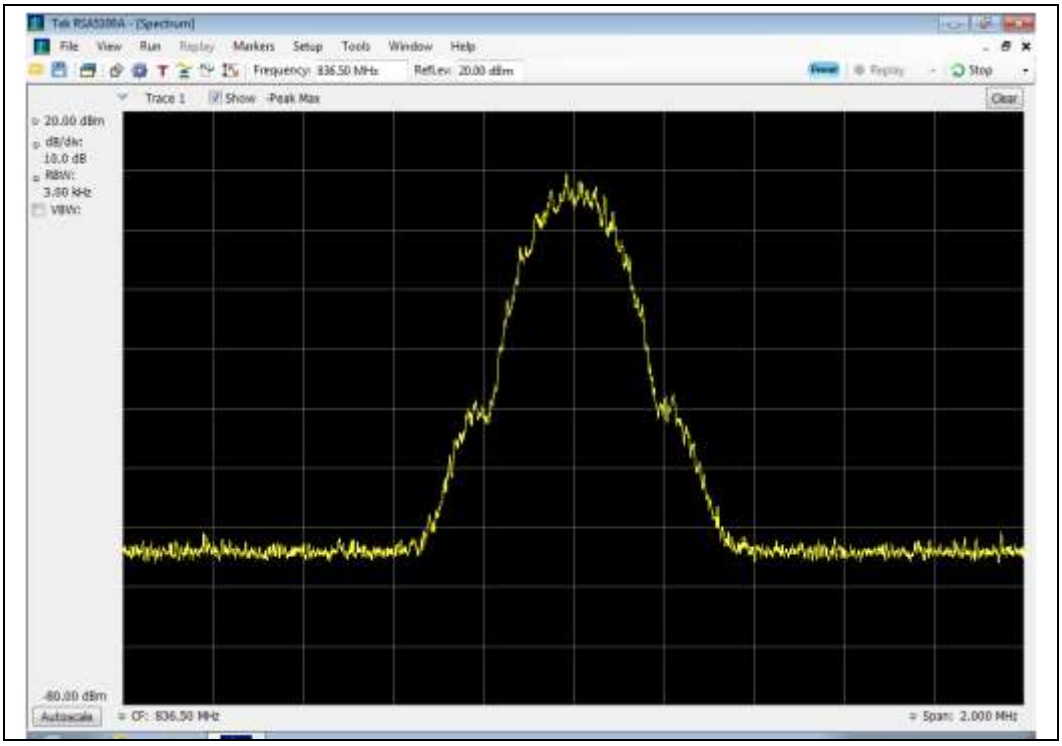


**824 - 849 MHz Band**

**Input**

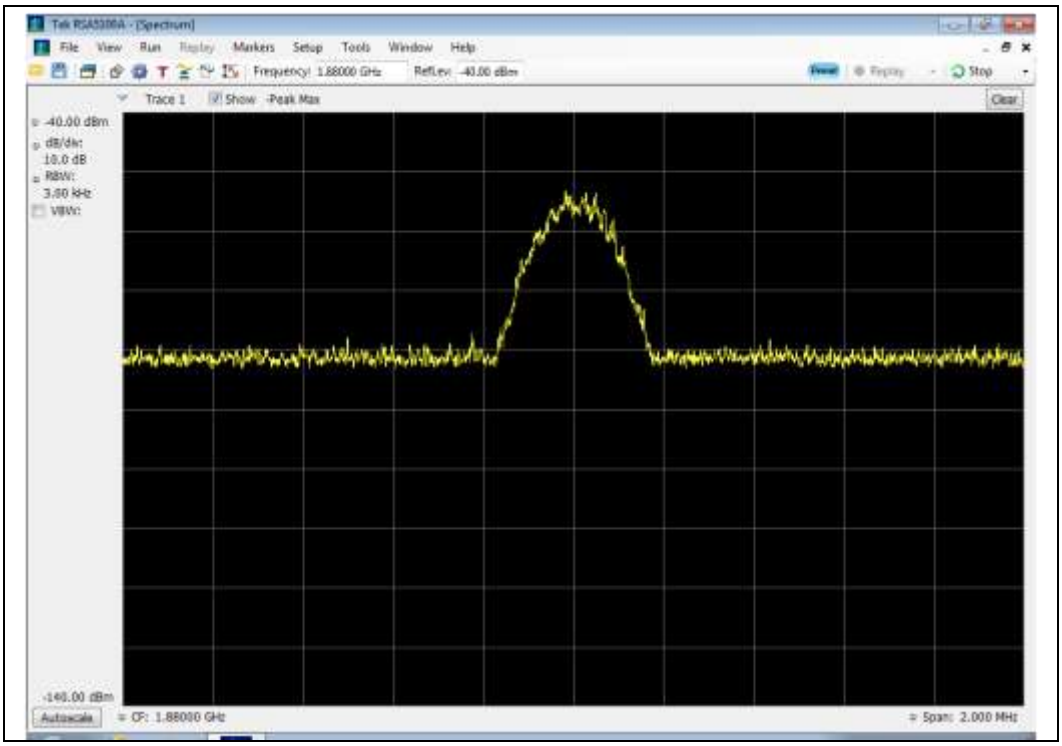



**Output**

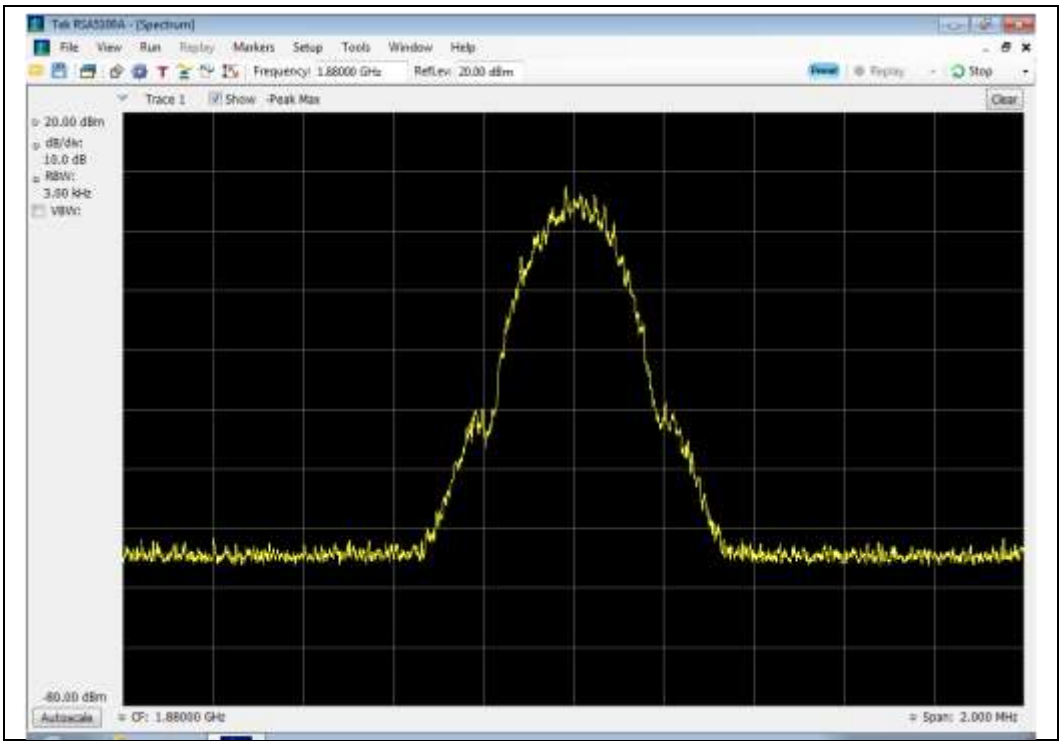


**1850 - 1910 MHz Band**

**Input**



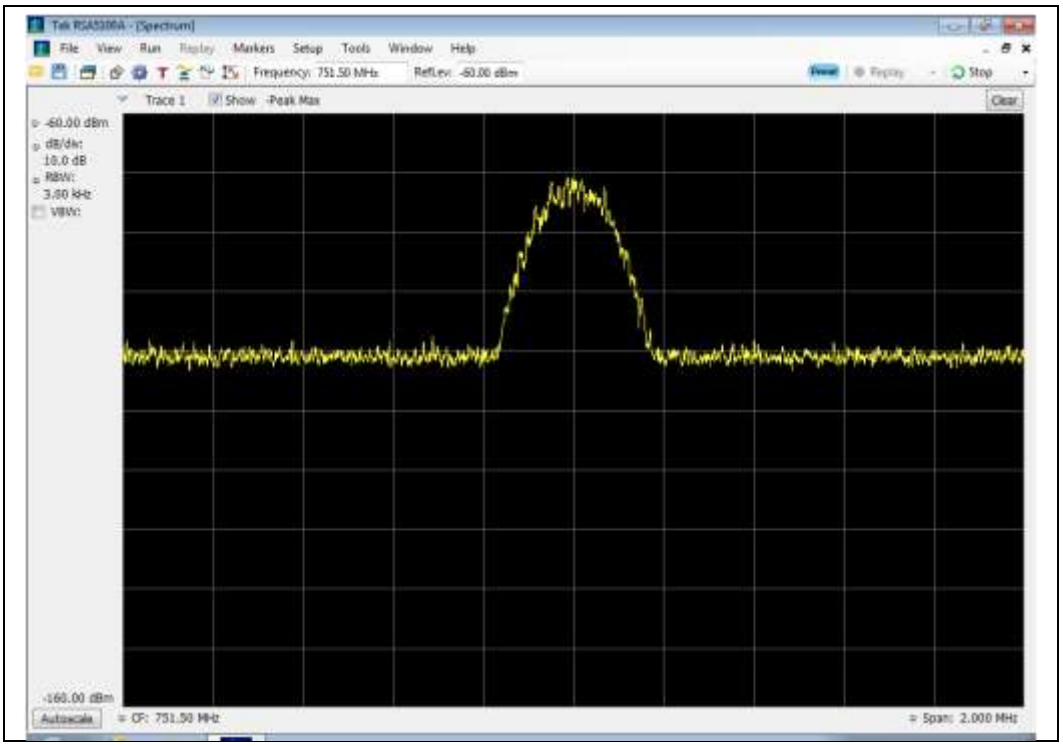

**Output**



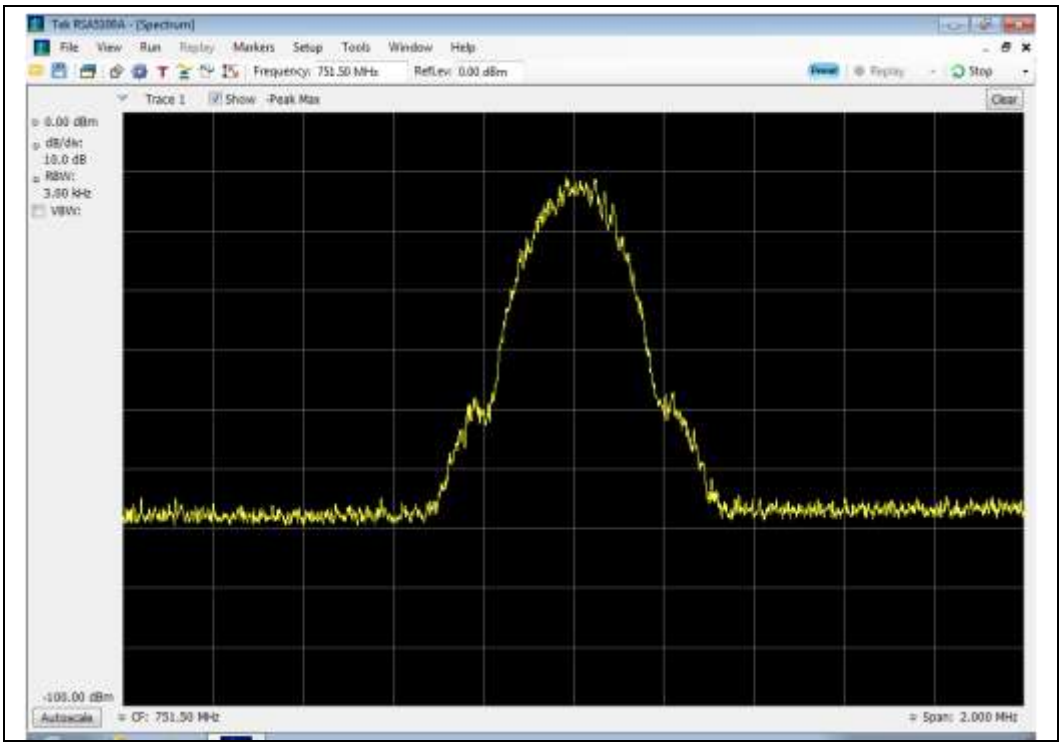
## GSM Downlink Test Plots

### 746 - 757 MHz Band

**Input**

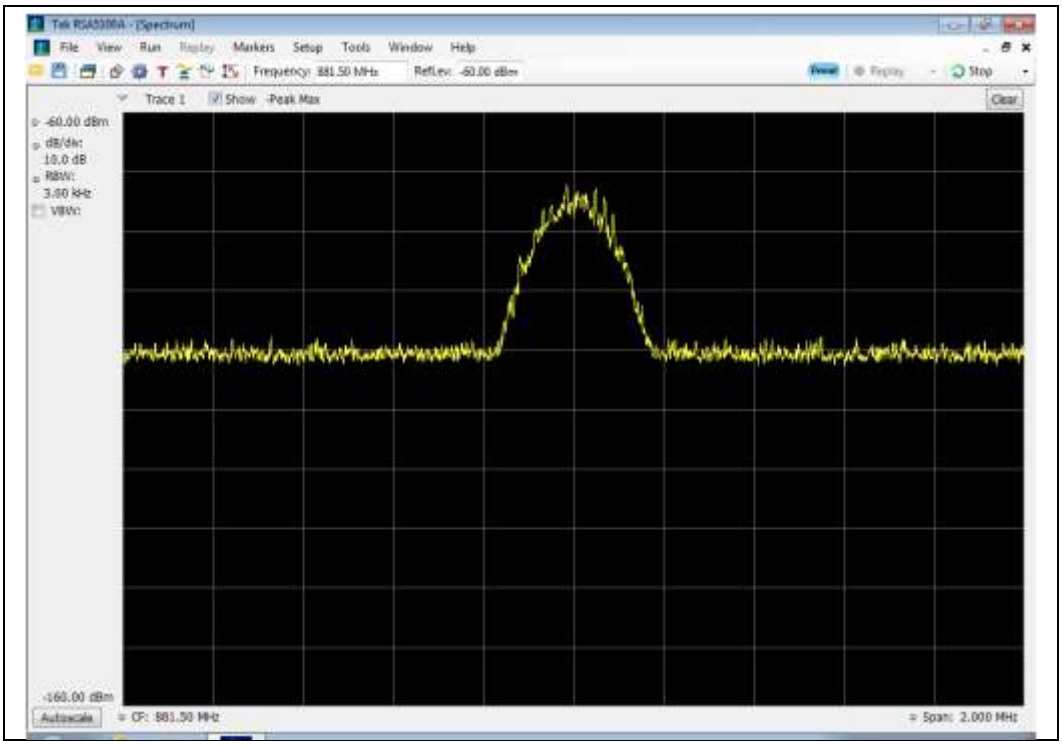



**Output**

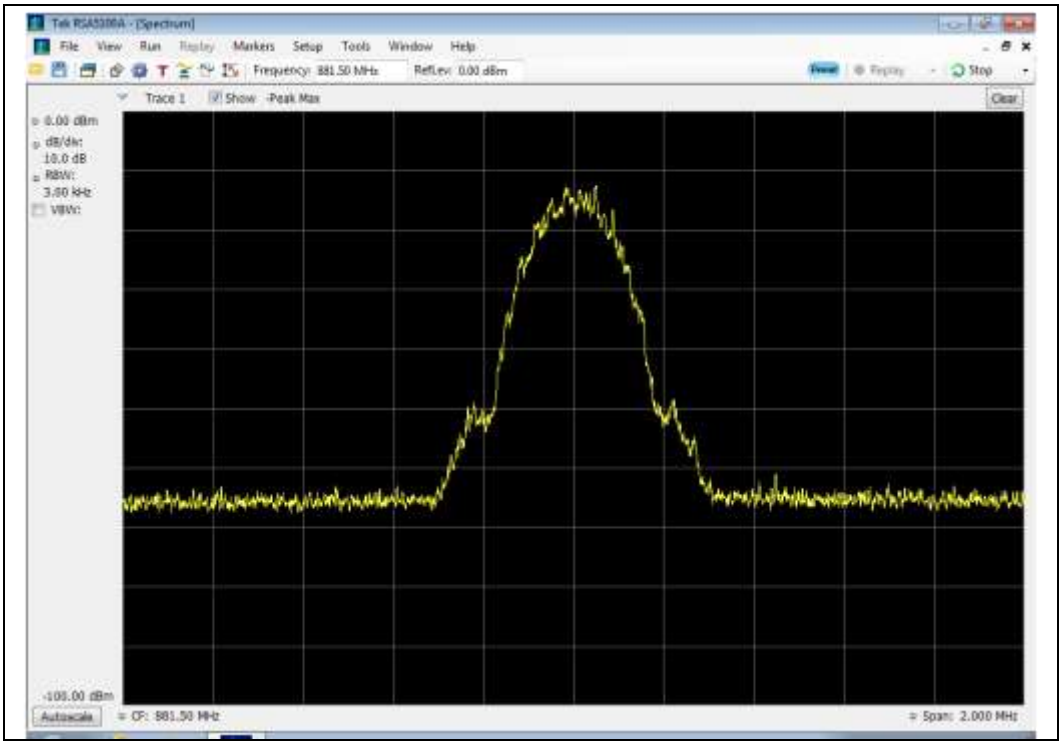


**869 - 894 MHz Band**

**Input**

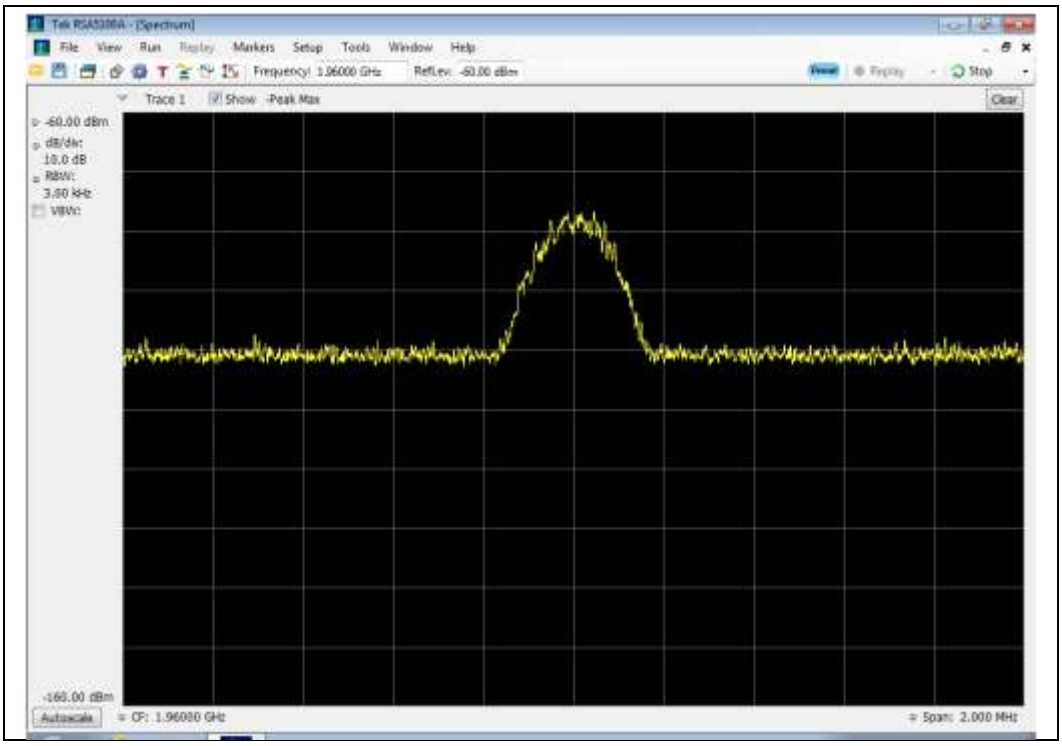



**Output**

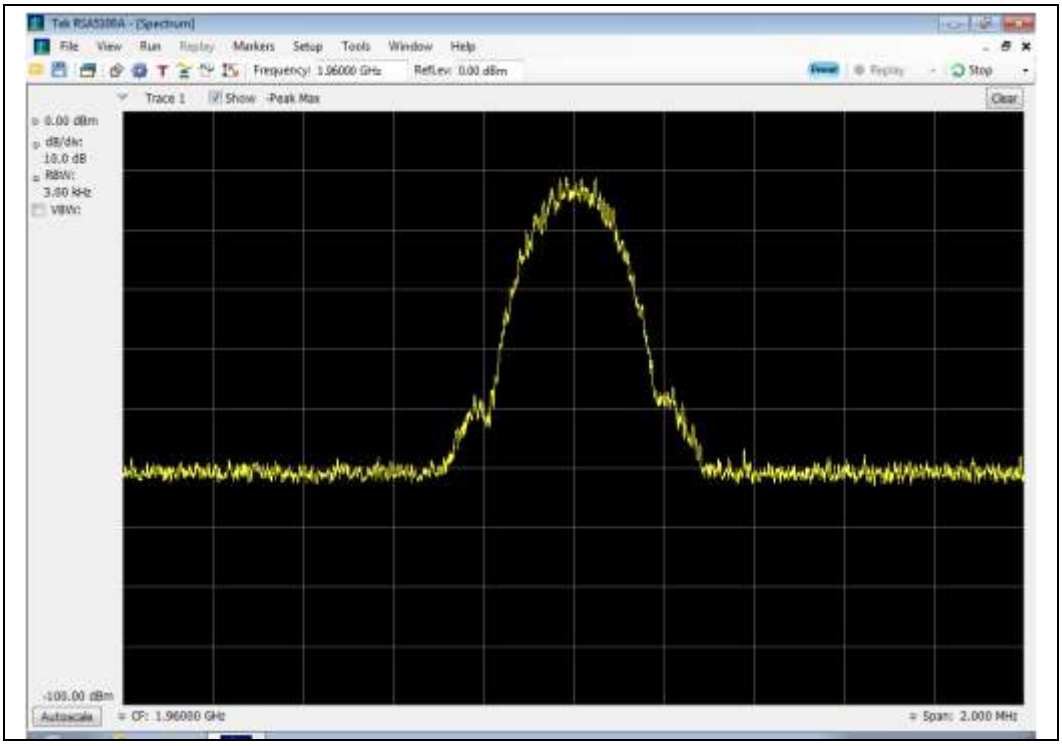


**1930 - 1990 MHz Band**

**Input**



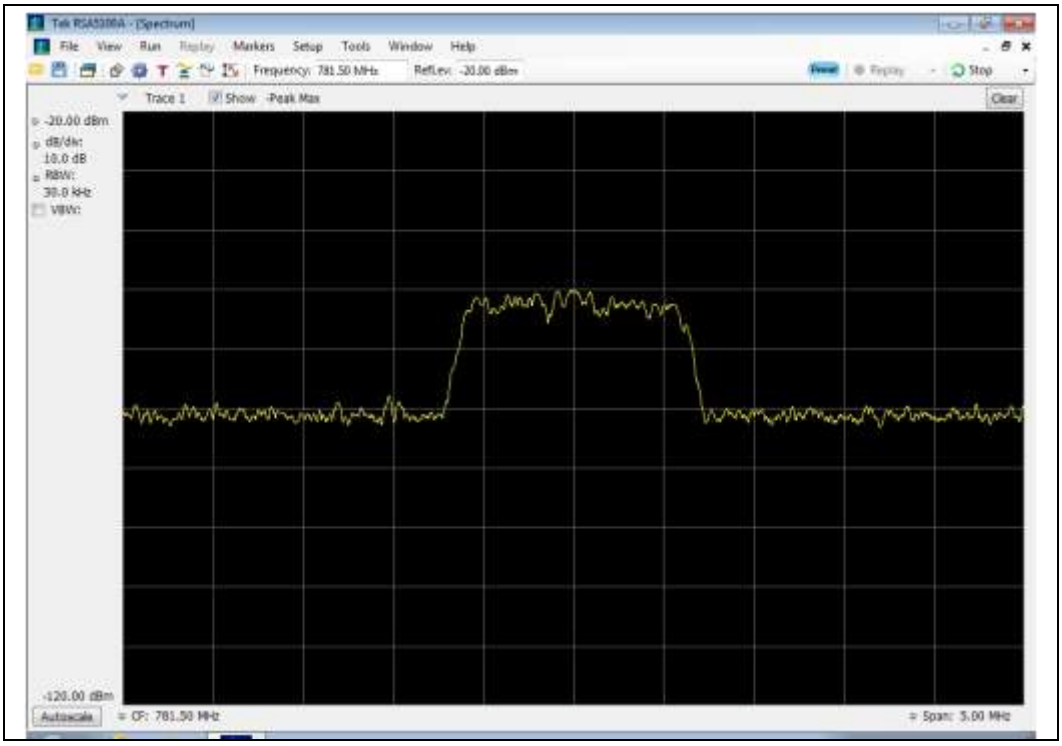

**Output**



## CDMA Uplink Test Plots

### 776 - 787 MHz Band

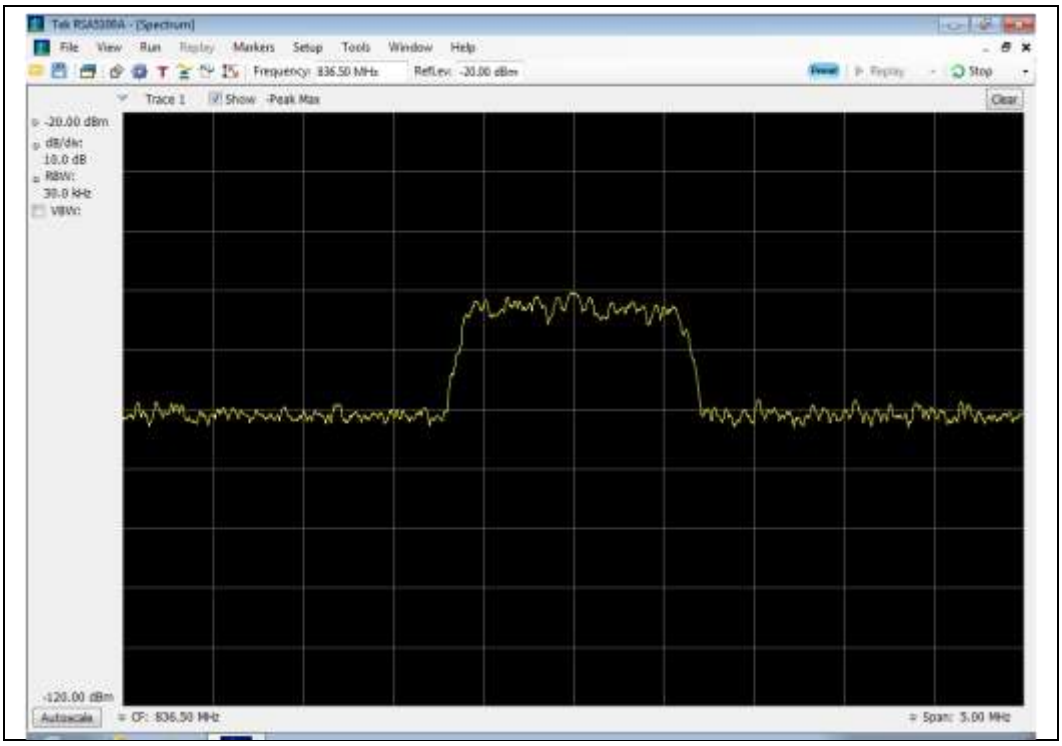
**Input**



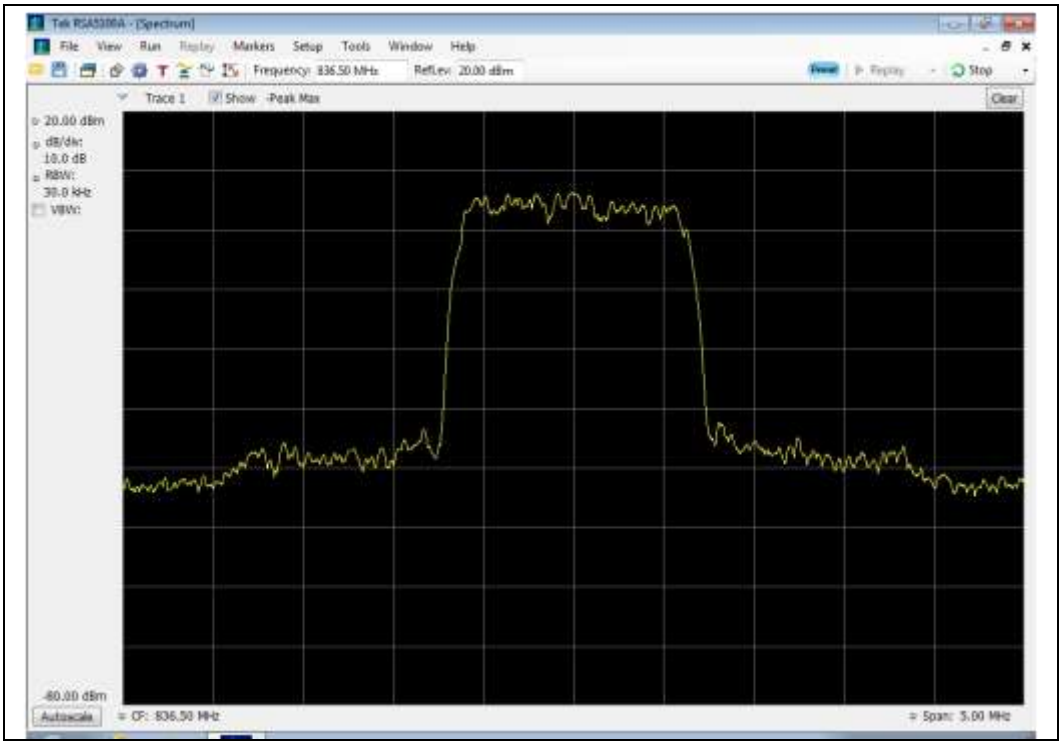

**Output**

**824 - 849 MHz Band**

**Input**

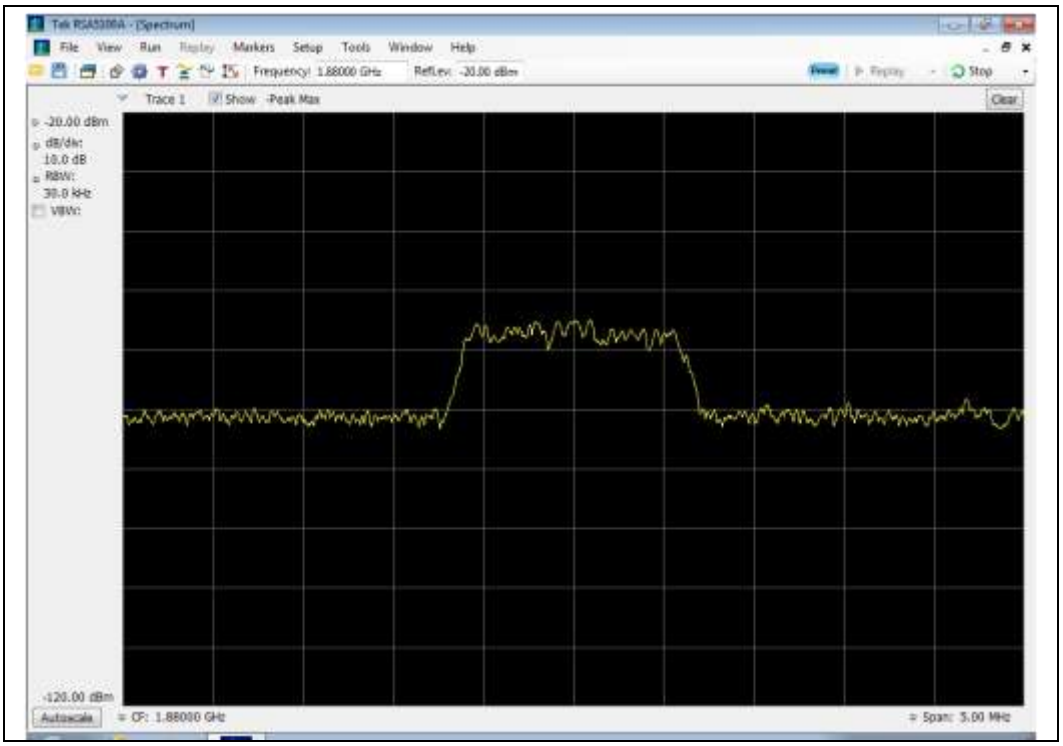



**Output**

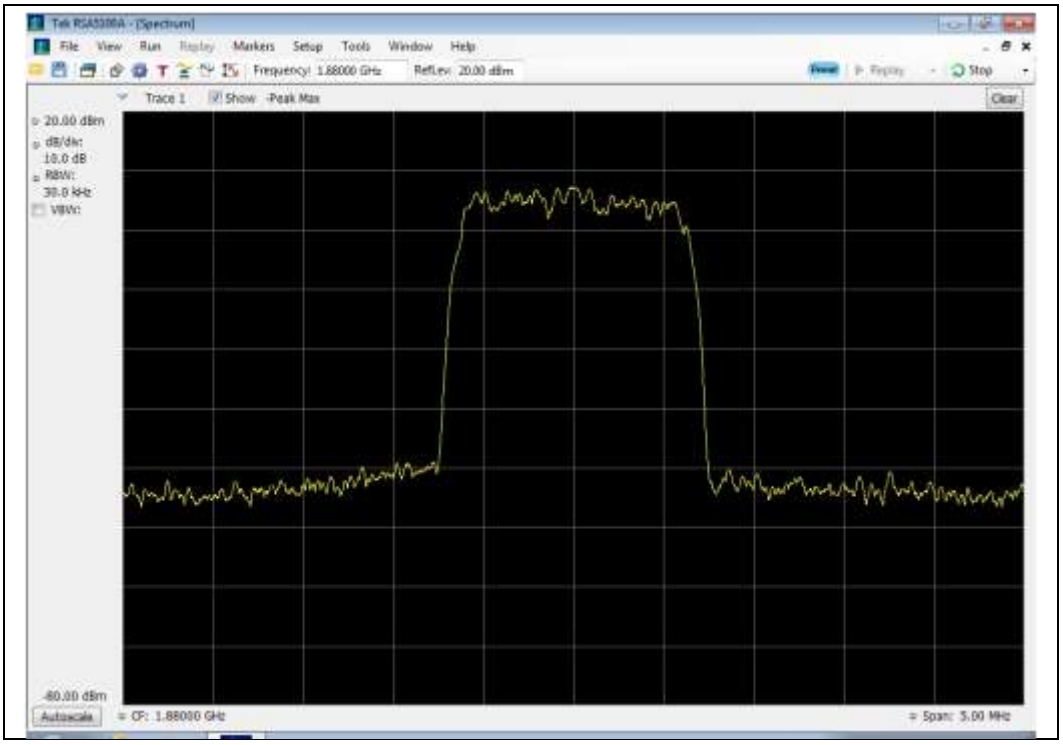


**1850 - 1910 MHz Band**

**Input**



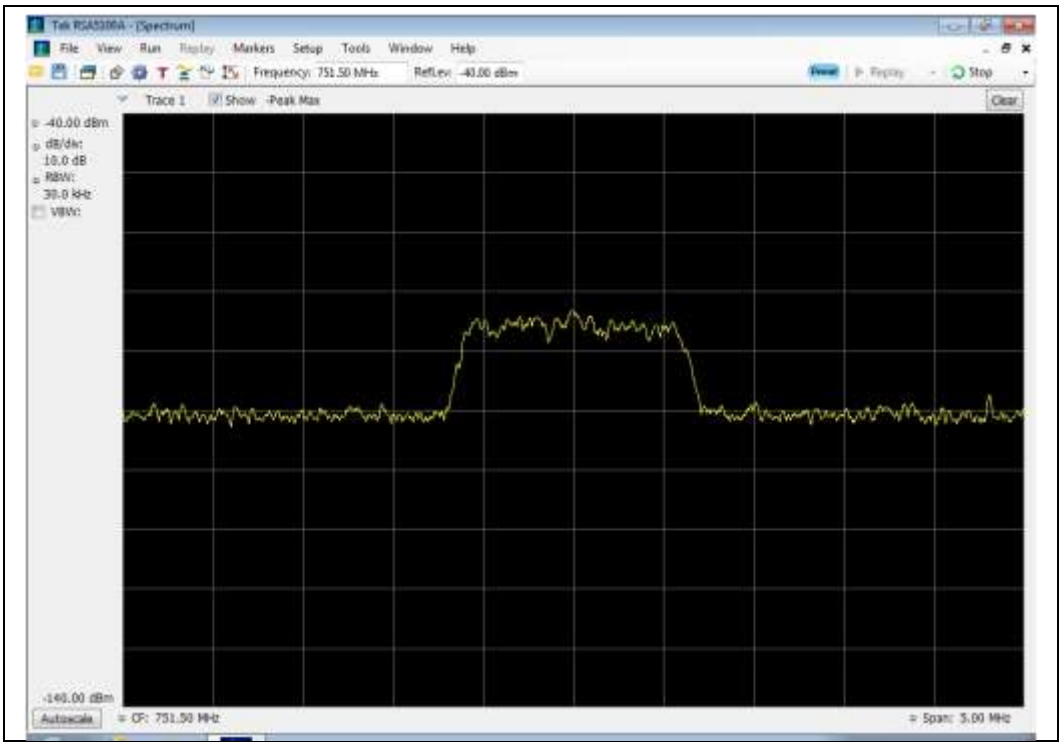

**Output**



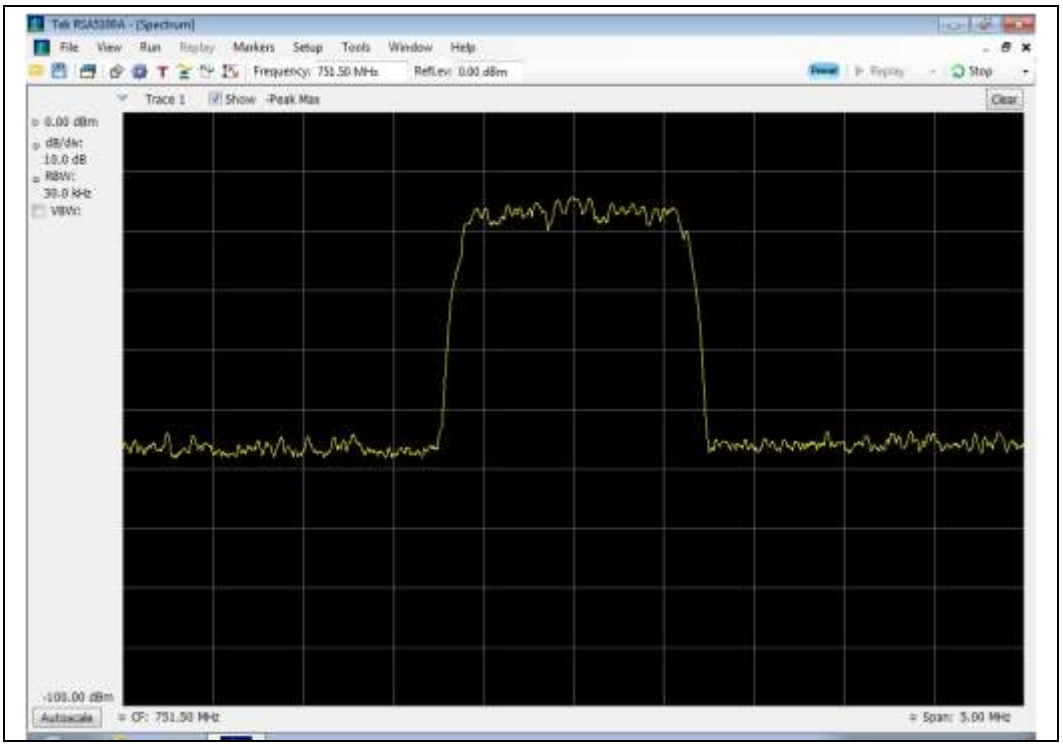
## CDMA Downlink Test Plots

### 746 - 757 MHz Band

**Input**

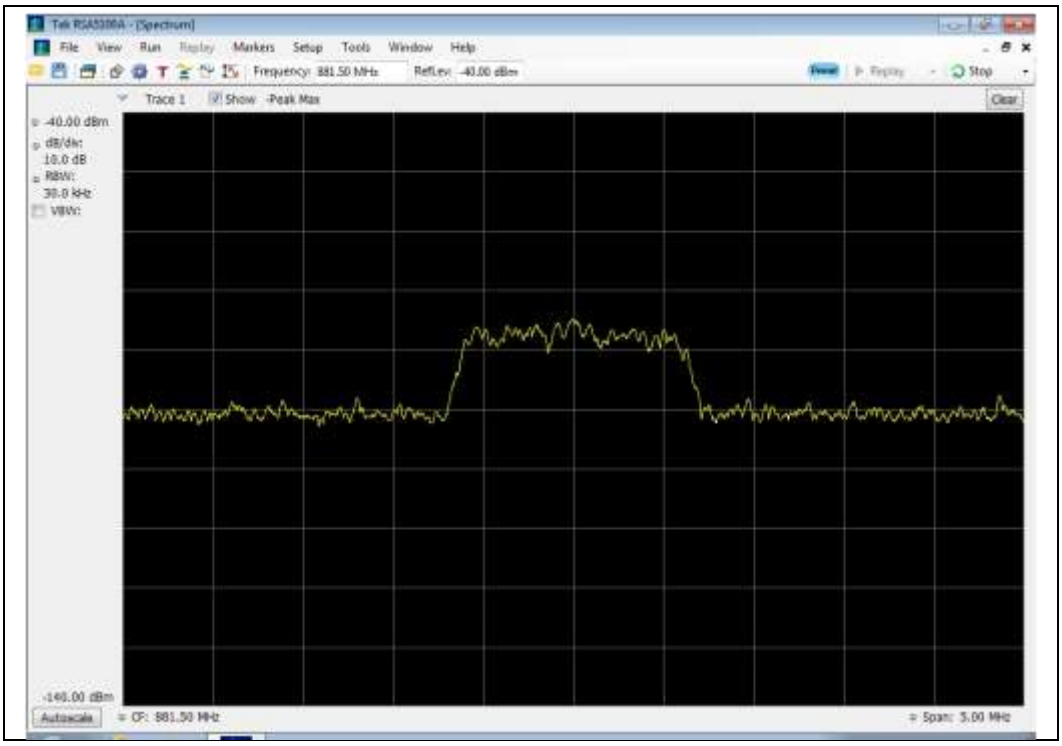



**Output**

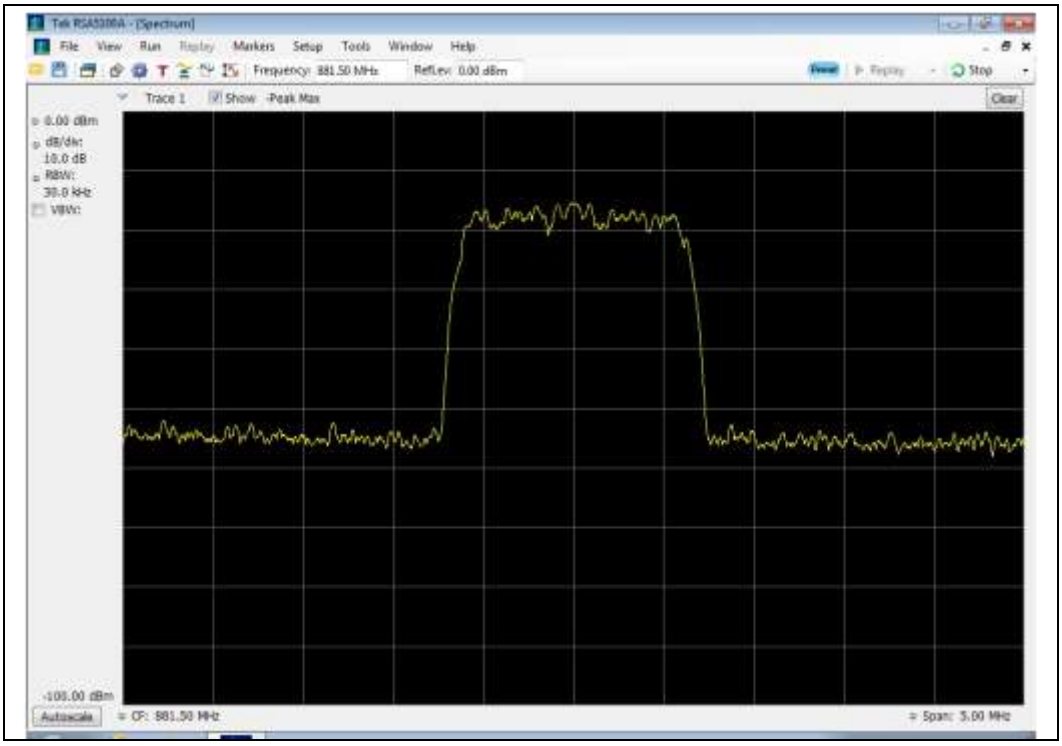


**869 - 894 MHz Band**

**Input**

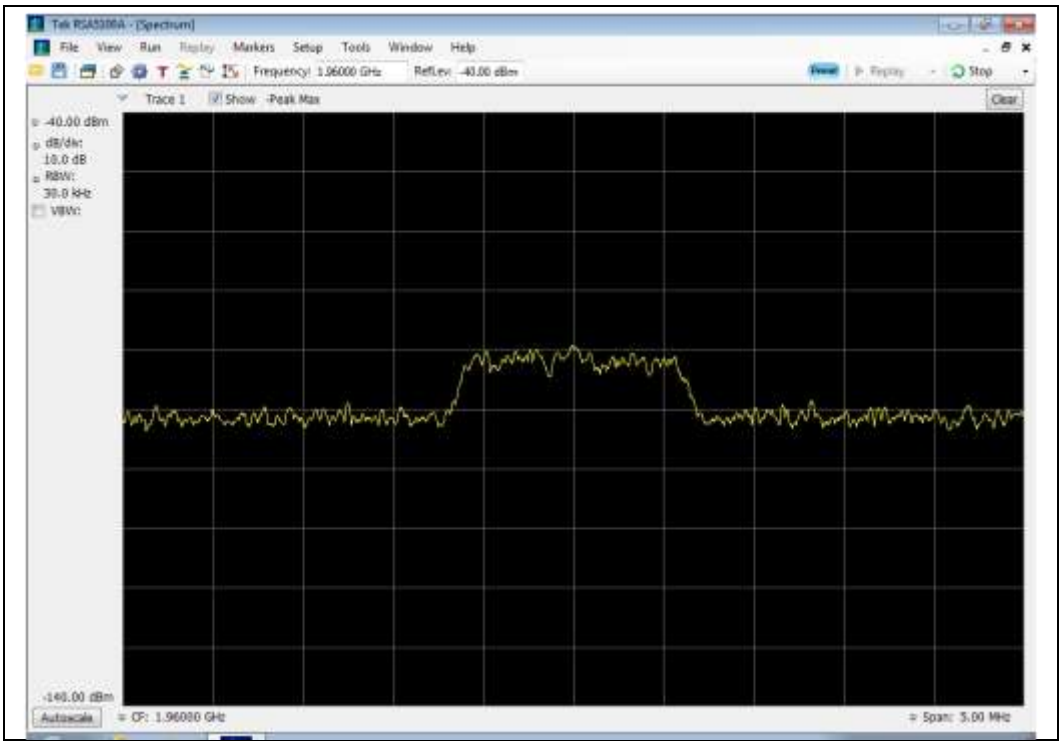



**Output**

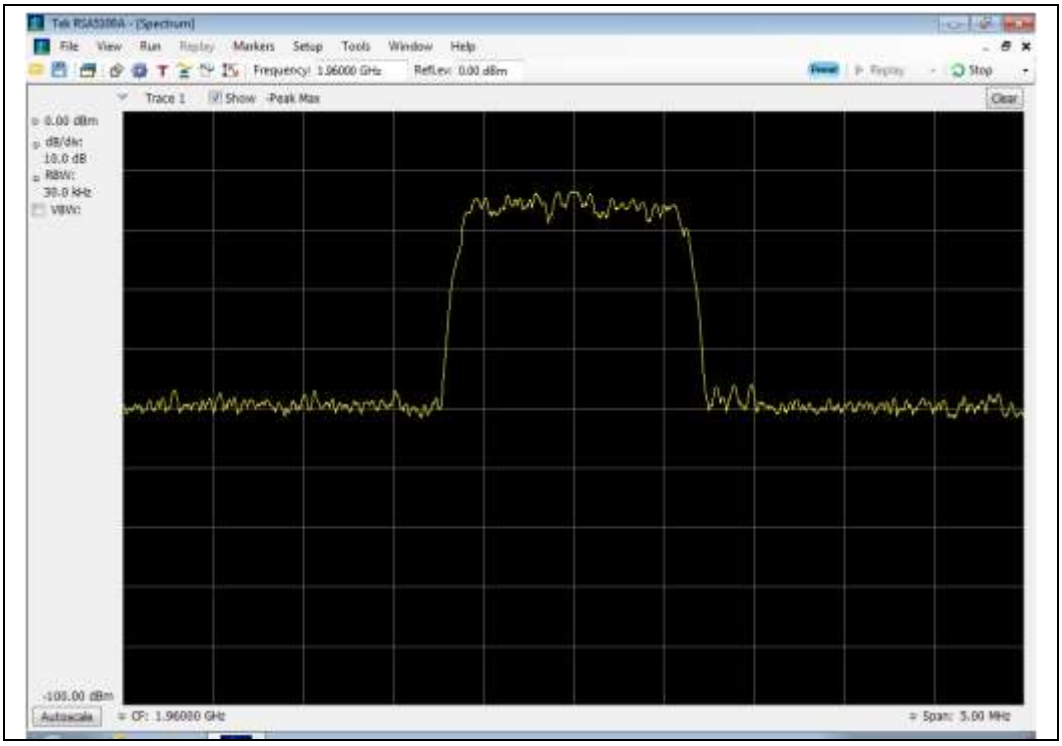


**1930 - 1990 MHz Band**

**Input**



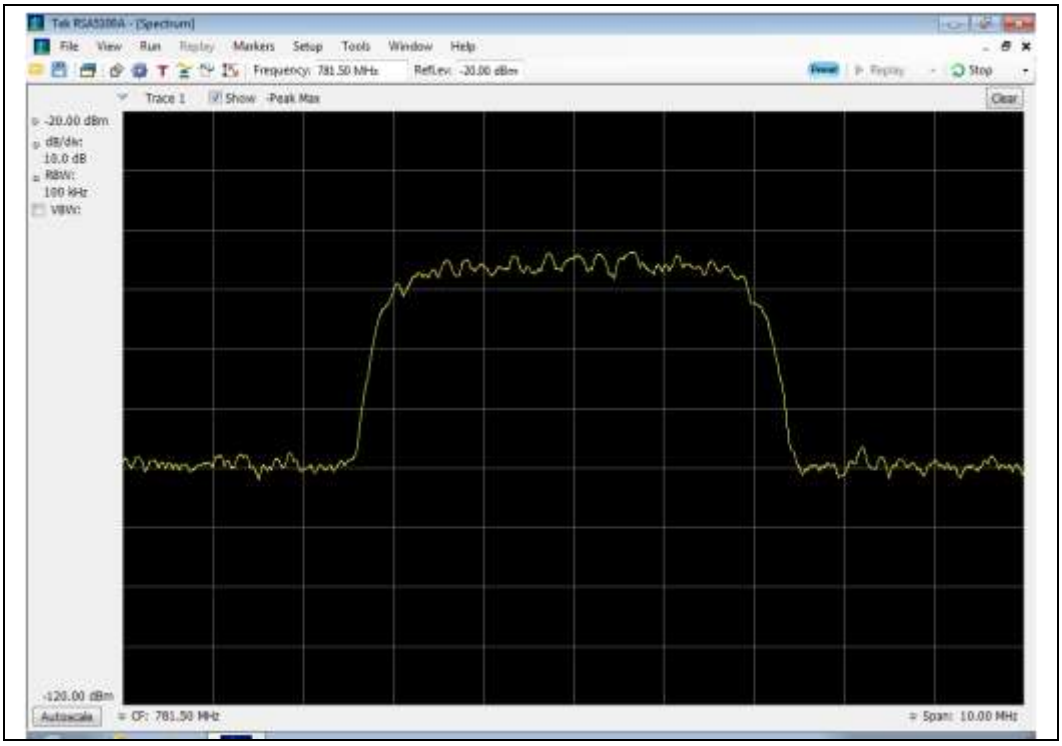

**Output**



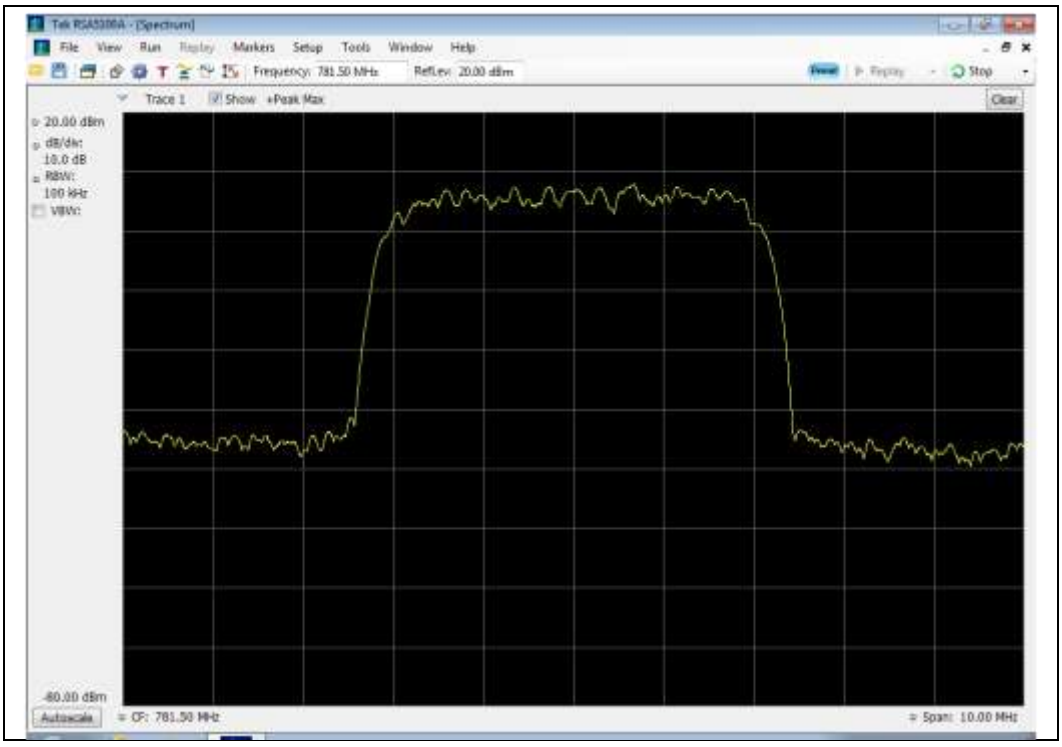
## WCDMA Uplink Test Plots

### 776 - 787 MHz Band

**Input**

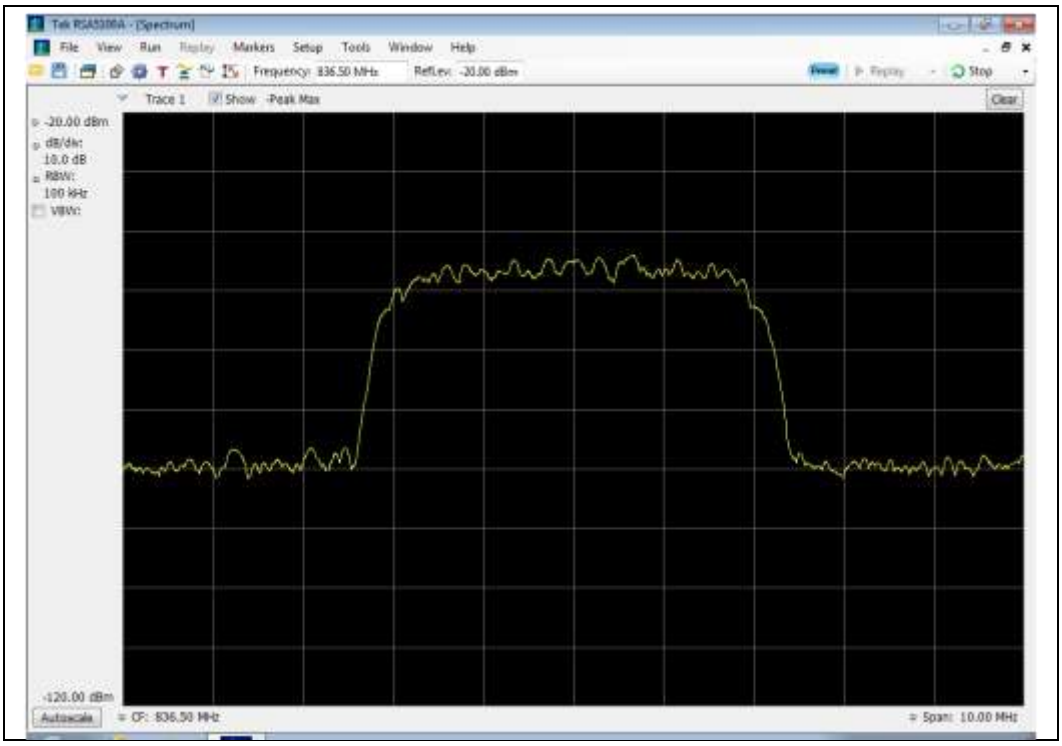



**Output**

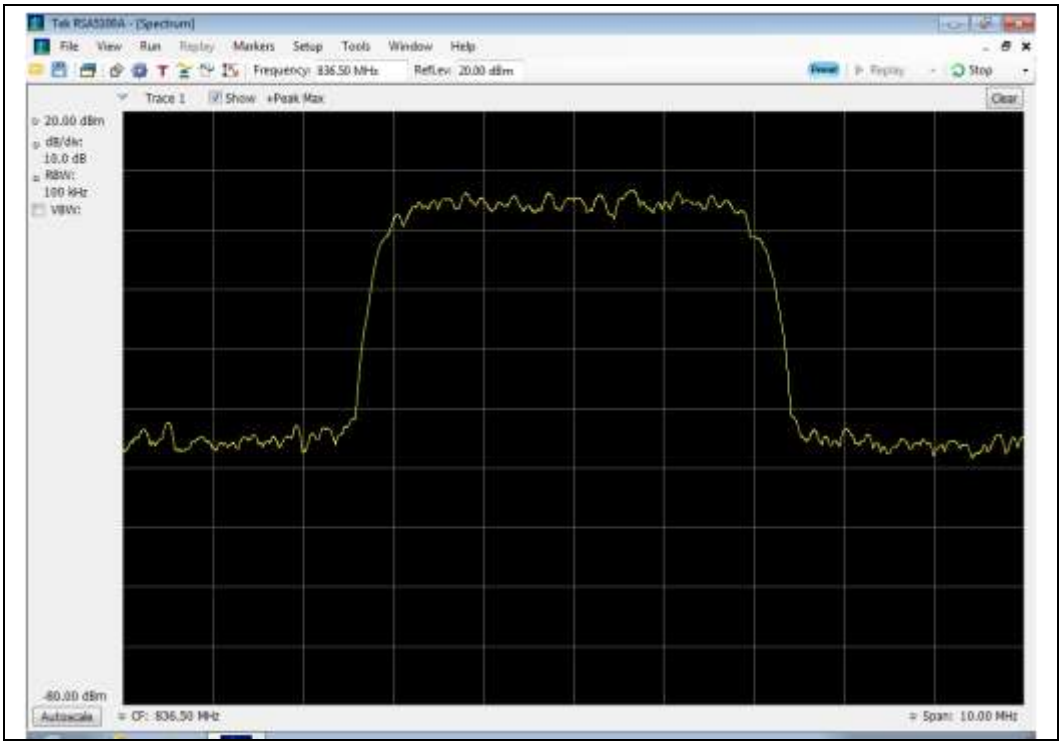


**824 - 849 MHz Band**

**Input**

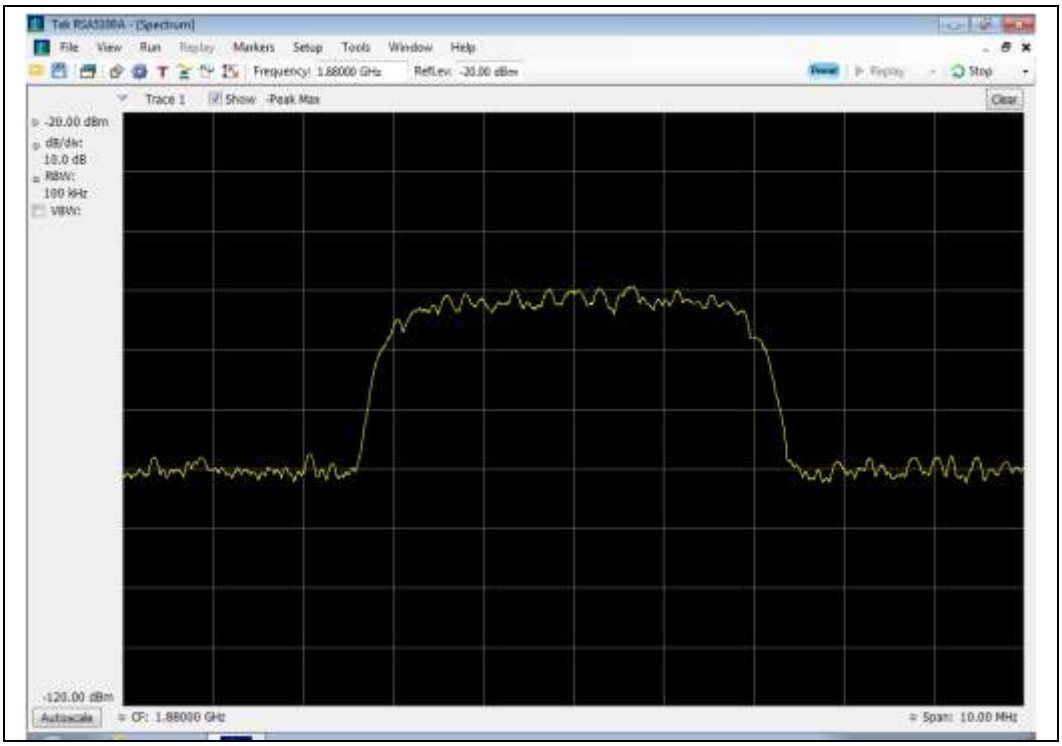



**Output**

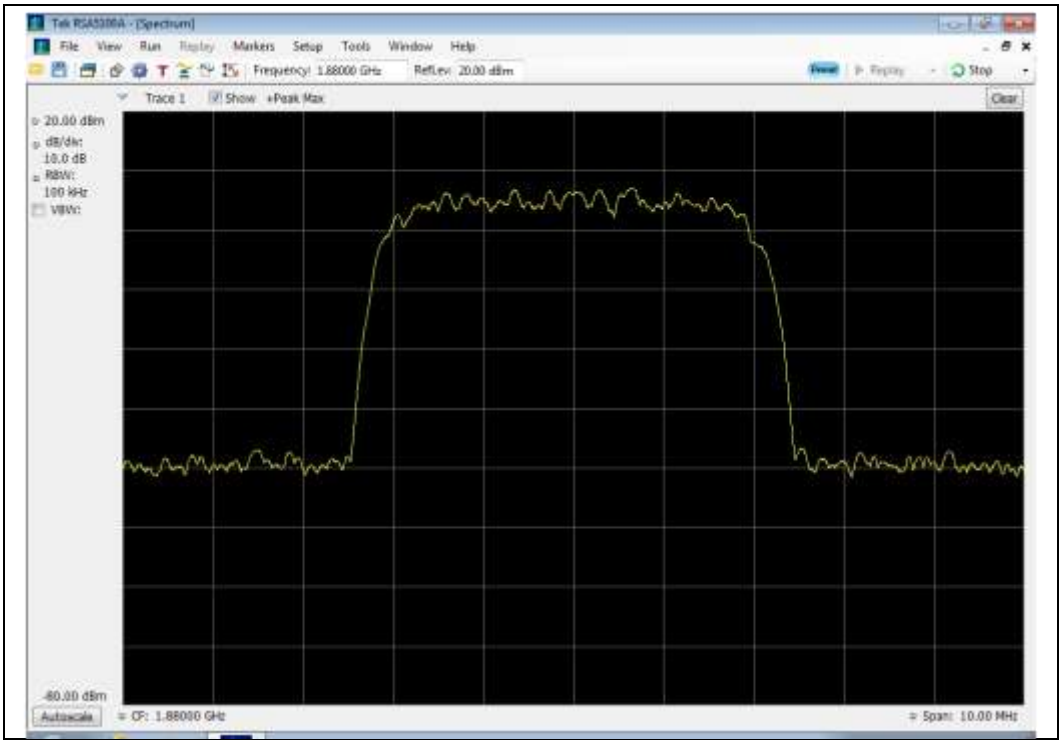


**1850 - 1910 MHz Band**

**Input**



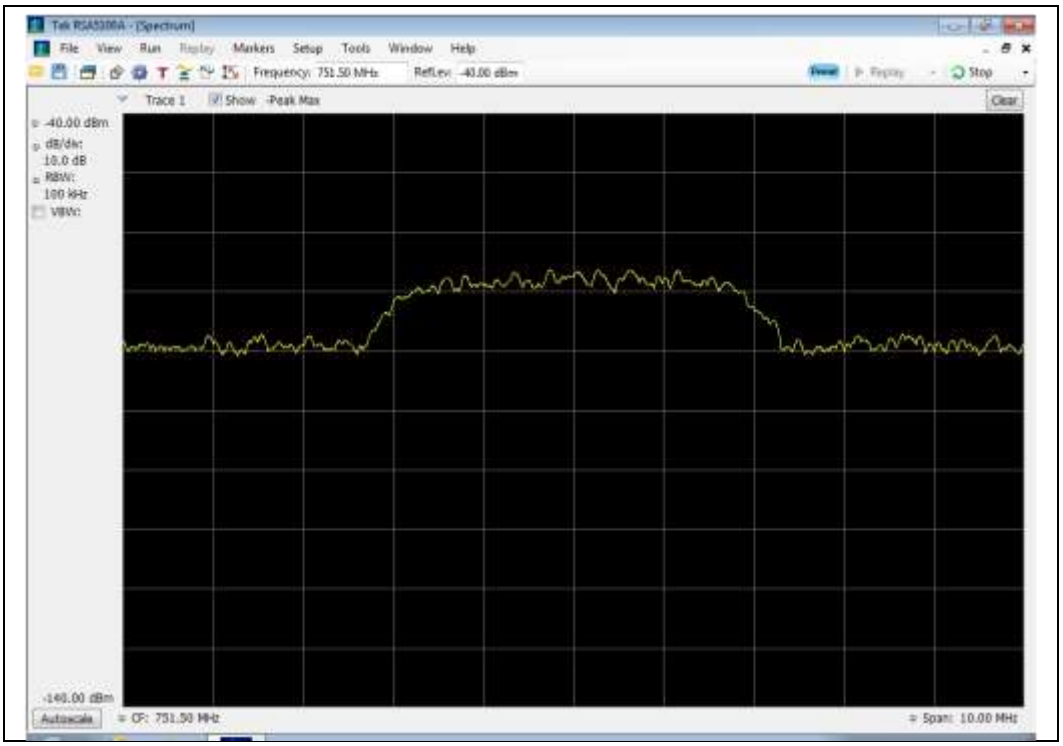

**Output**



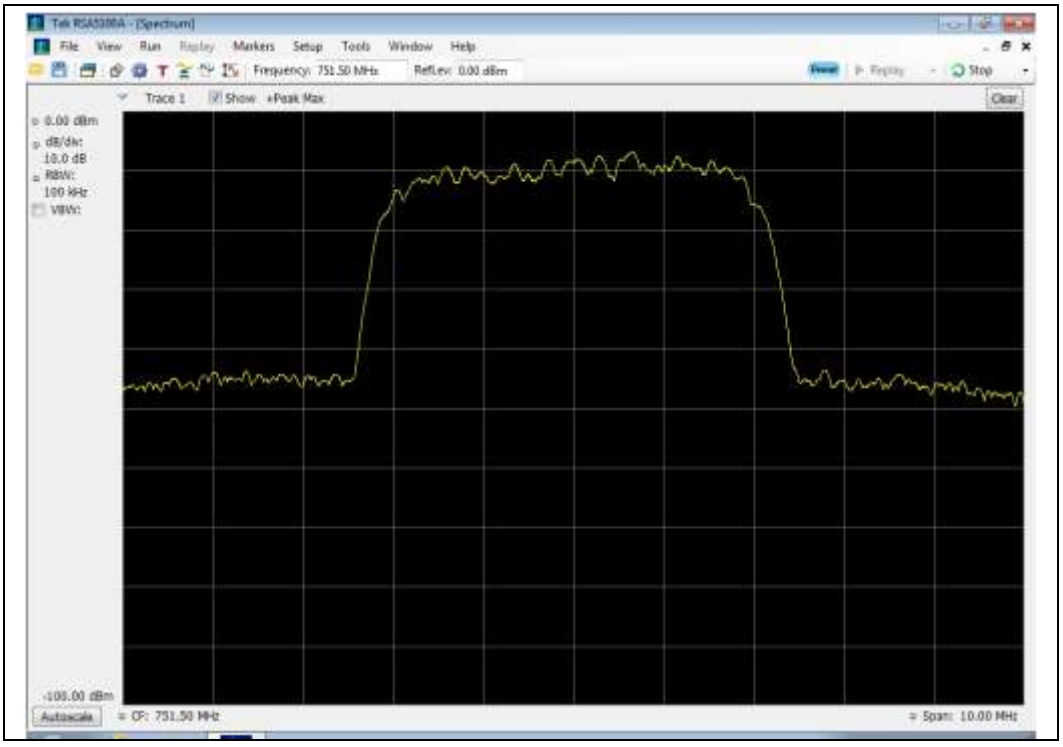
## WCDMA Downlink Test Plots

### 746 - 757 MHz Band

**Input**

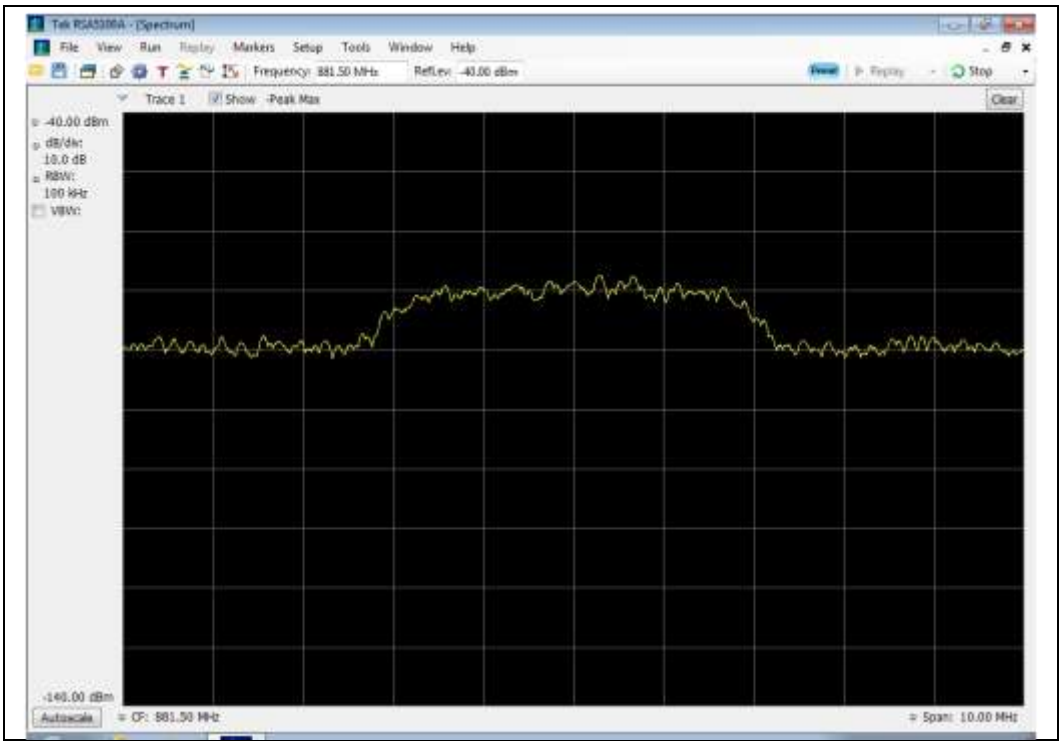



**Output**

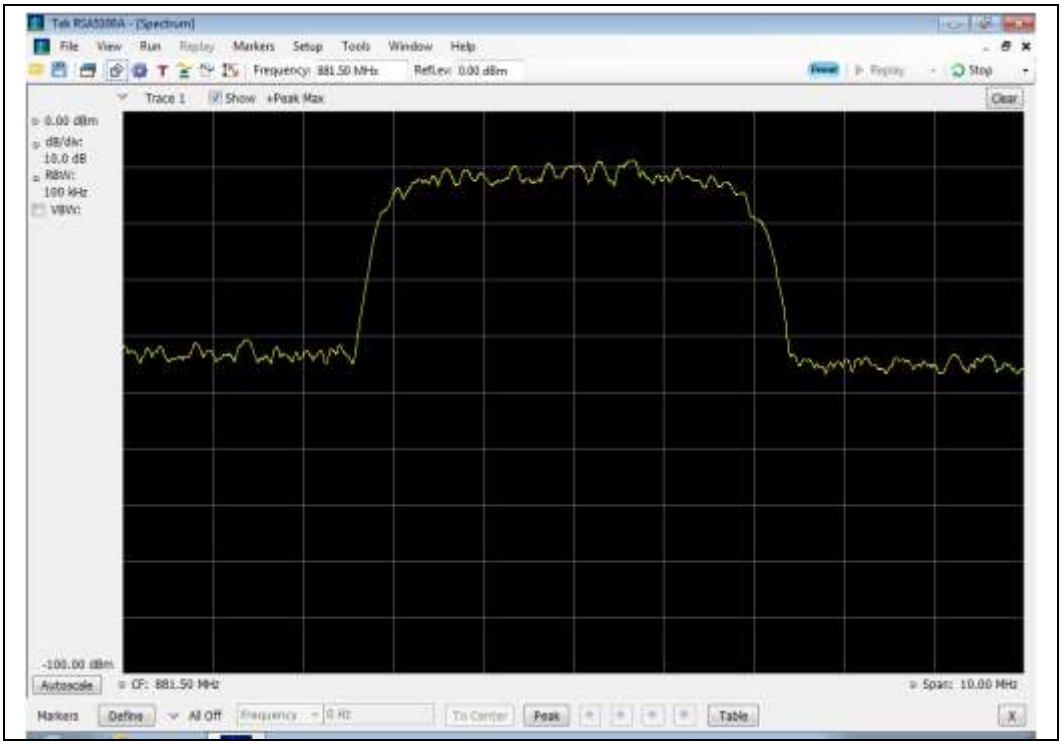


**869 - 894 MHz Band**

**Input**

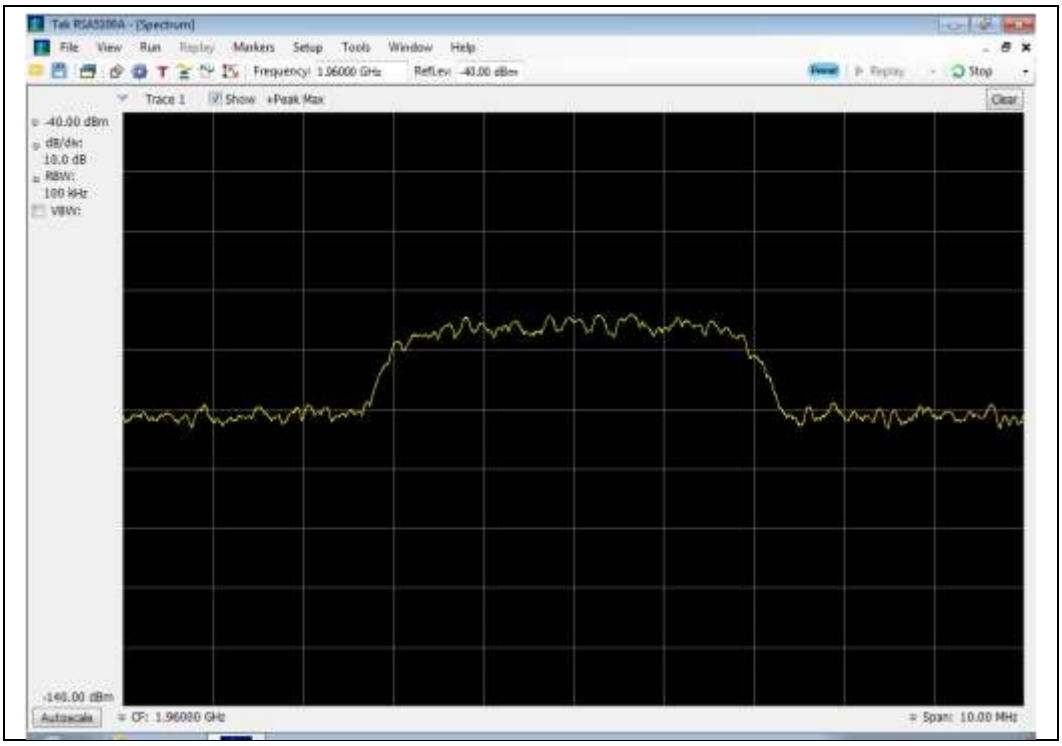



**Output**

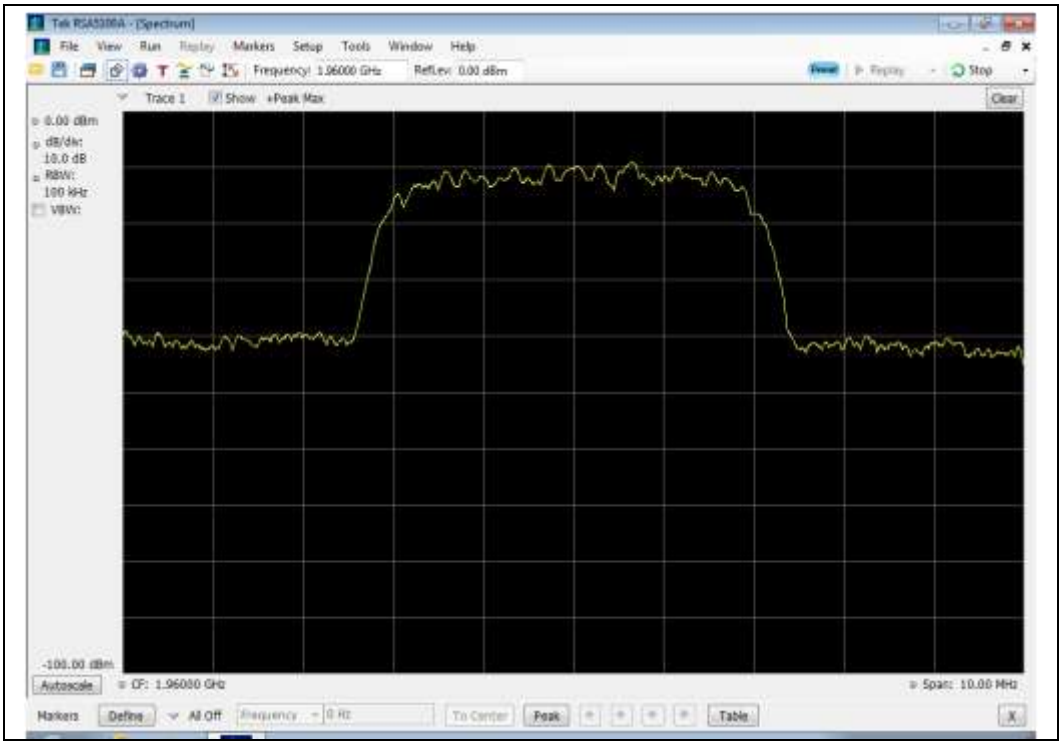


**1930 - 1990 MHz Band**

**Input**




**Output**



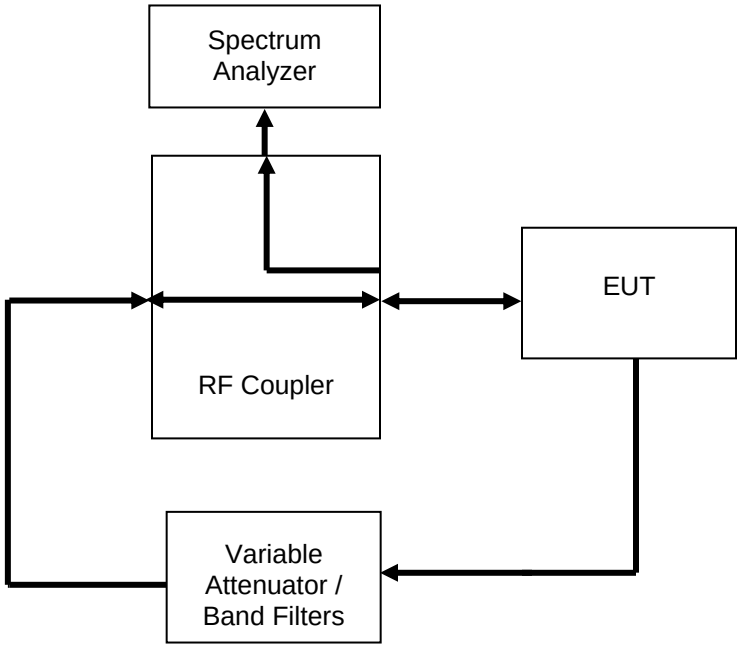
**Oscillation Detection**

| | | | |
|---|---|---|---|
| **Name of Test:** | Oscillation Detection | **Engineer:** | Greg Corbin |
| **Test Equipment Utilized:** | i00411, i00413, i00424 | **Test Date:** | 12/10/2013 |

**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 |
|---|---|---|---|
| 776 - 787 | 88.75 | 300 | Pass |
| 824 - 849 | 103.75 | 300 | Pass |
| 1850 - 1910 | 106.25 | 300 | Pass |

**Downlink Detection Time Test Results**

| Frequency Band (MHz) | Measured Time (mS) | Limit (mS) | Result |
|---|---|---|---|
| 746 - 757 | 20 | 1000 | Pass |
| 869 - 894 | 18.75 | 1000 | Pass |
| 1930 - 1990 | 17.5 | 1000 | Pass |

**Uplink Restart Time Test Results**

| Frequency Band (MHz) | Measured Time (S) | Limit (S) | Result |
|---|---|---|---|
| 776 - 787 | 68.5 | ≥60 | Pass |
| 824 - 849 | 68.5 | ≥60 | Pass |
| 1850 - 1910 | 68.875 | ≥60 | Pass |

**Downlink Restart Time Test Results**

| Frequency Band (MHz) | Measured Time (S) | Limit (S) | Result |
|---|---|---|---|
| 746 - 757 | 69 | ≥60 | Pass |
| 869 - 894 | 68.875 | ≥60 | Pass |
| 1930 - 1990 | 68.25 | ≥60 | Pass |

**Uplink Restart Count Test Results**

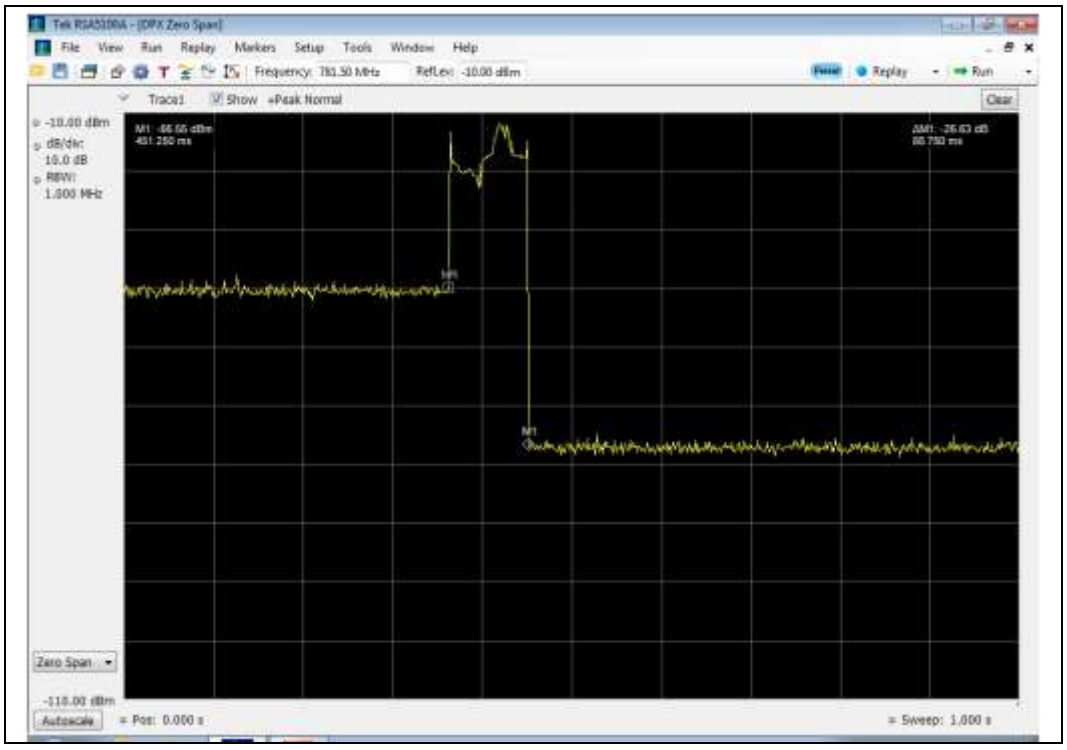
| Frequency Band (MHz) | Restarts | Limit | Result |
|---|---|---|---|
| 776 - 787 | 5 | ≤5 | Pass |
| 824 - 849 | 5 | ≤5 | Pass |
| 1850 - 1910 | 5 | ≤5 | Pass |

**Downlink Restart Count Test Results**

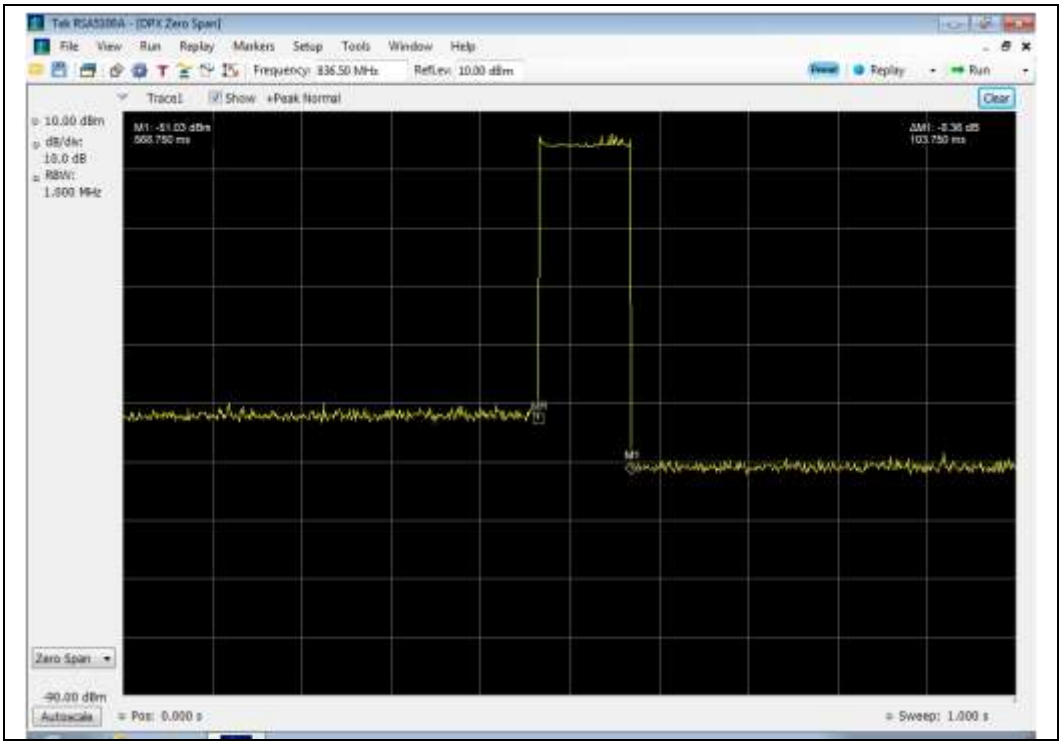
| Frequency Band (MHz) | Restarts | Limit | Result |
|---|---|---|---|
| 746 - 757 | 5 | ≤5 | Pass |
| 869 - 894 | 5 | ≤5 | Pass |
| 1930 - 1990 | 5 | ≤5 | Pass |

## Uplink Detection Time Test Results

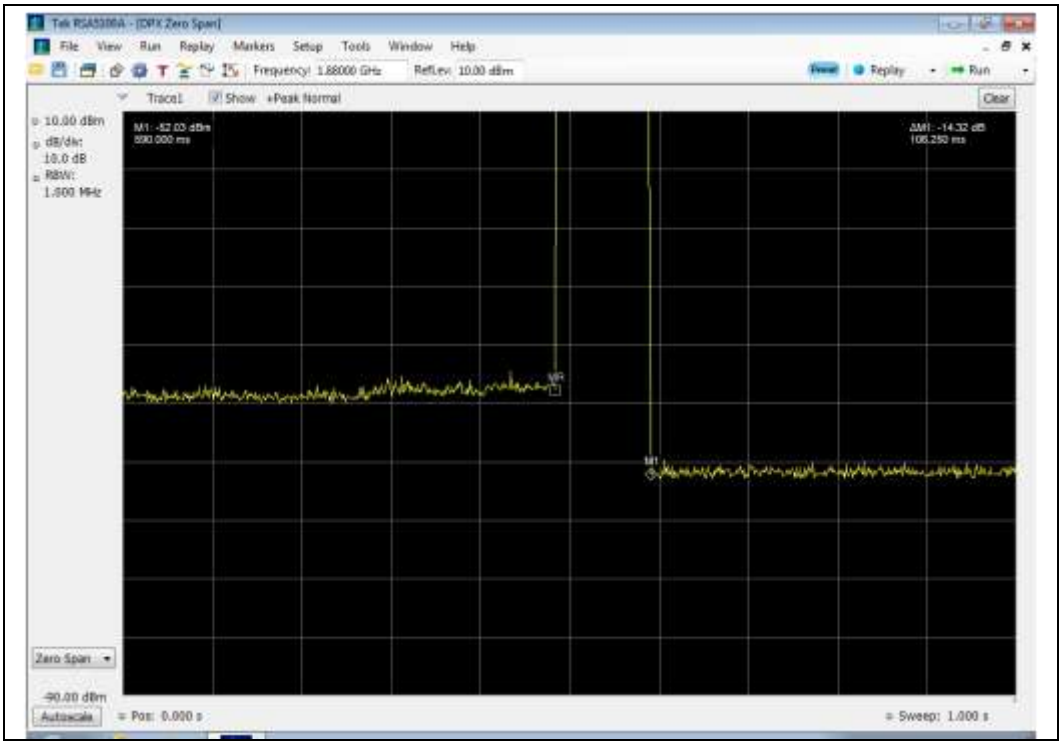
### 776 - 787 MHz Band




### 824 - 849 MHz Band

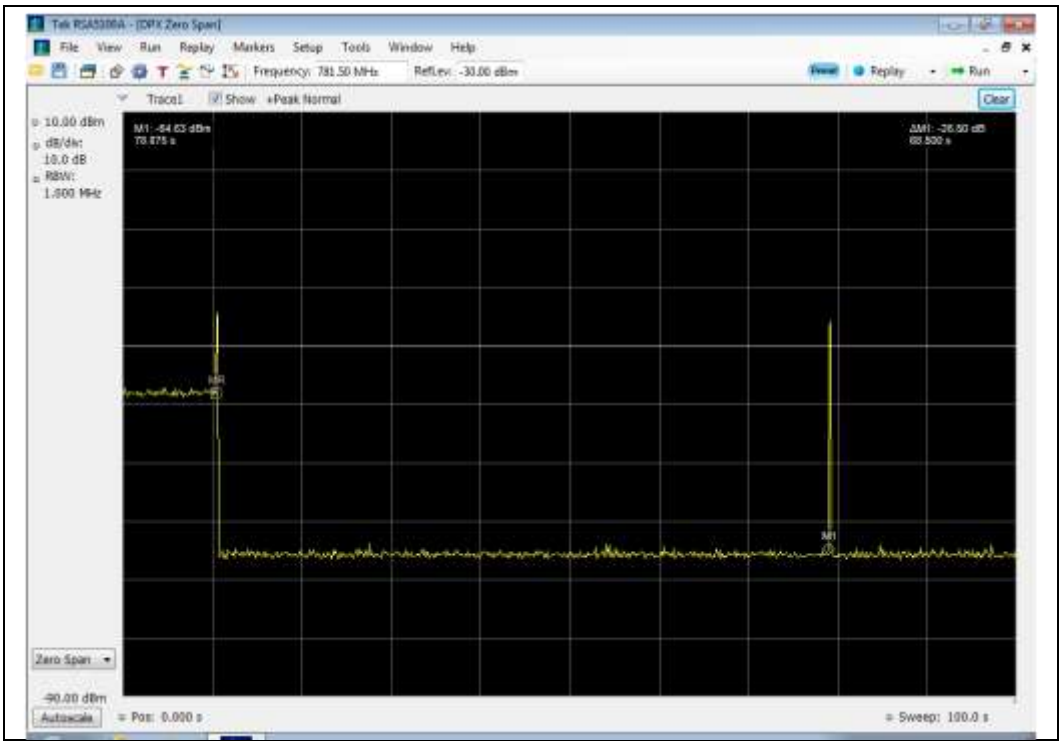


**1850 - 1910 MHz Band**

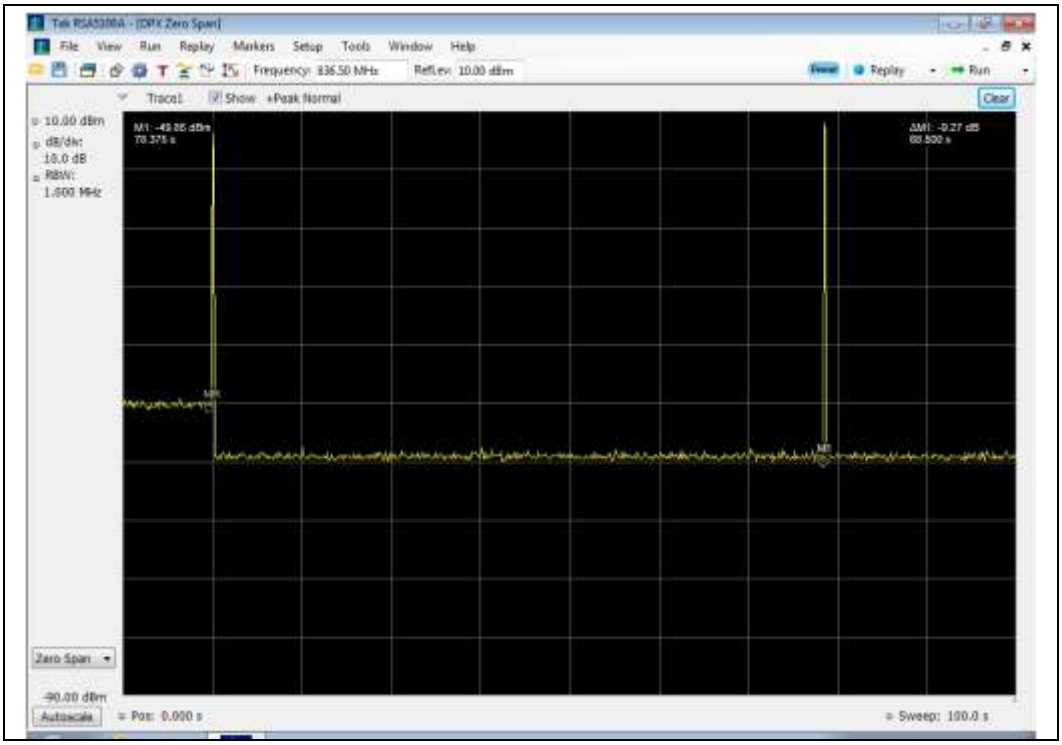



**Uplink Restart Time Test Results**

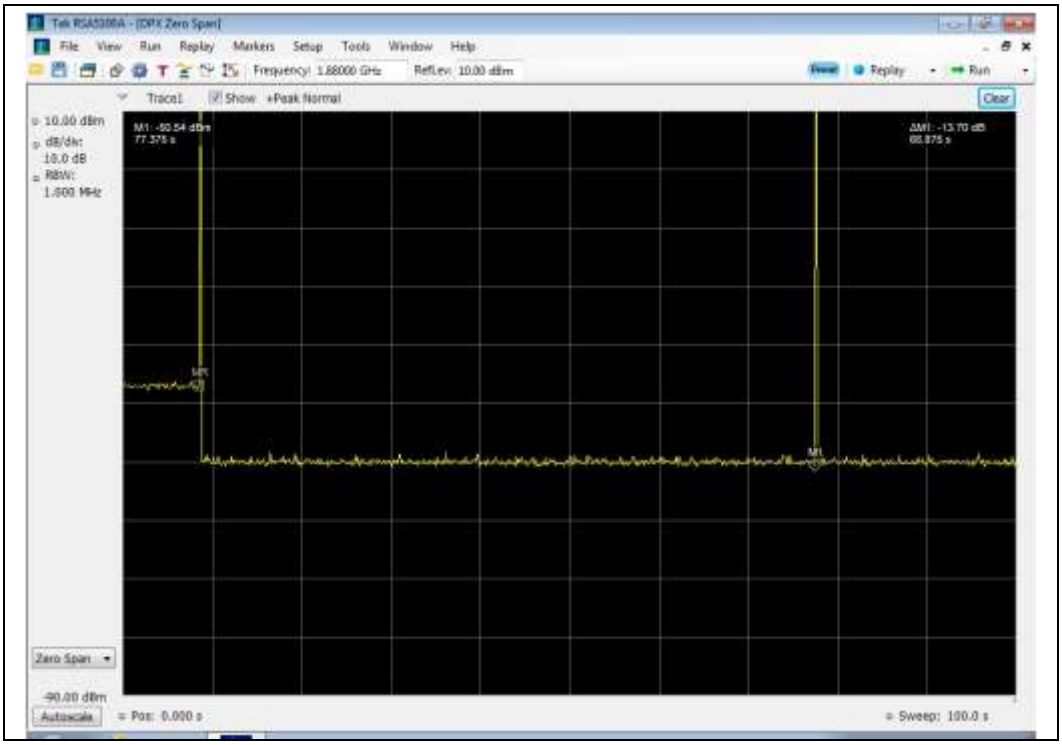
**776 - 787 MHz Band**



**824 - 849 MHz Band**

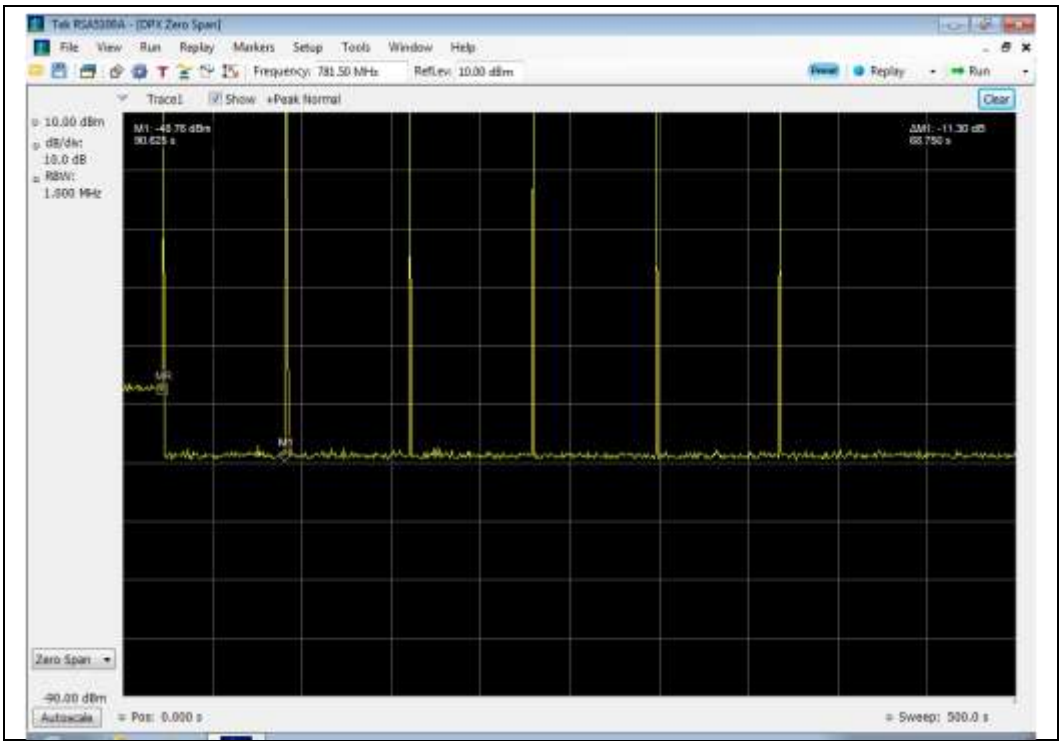



**1850 - 1910 MHz Band**

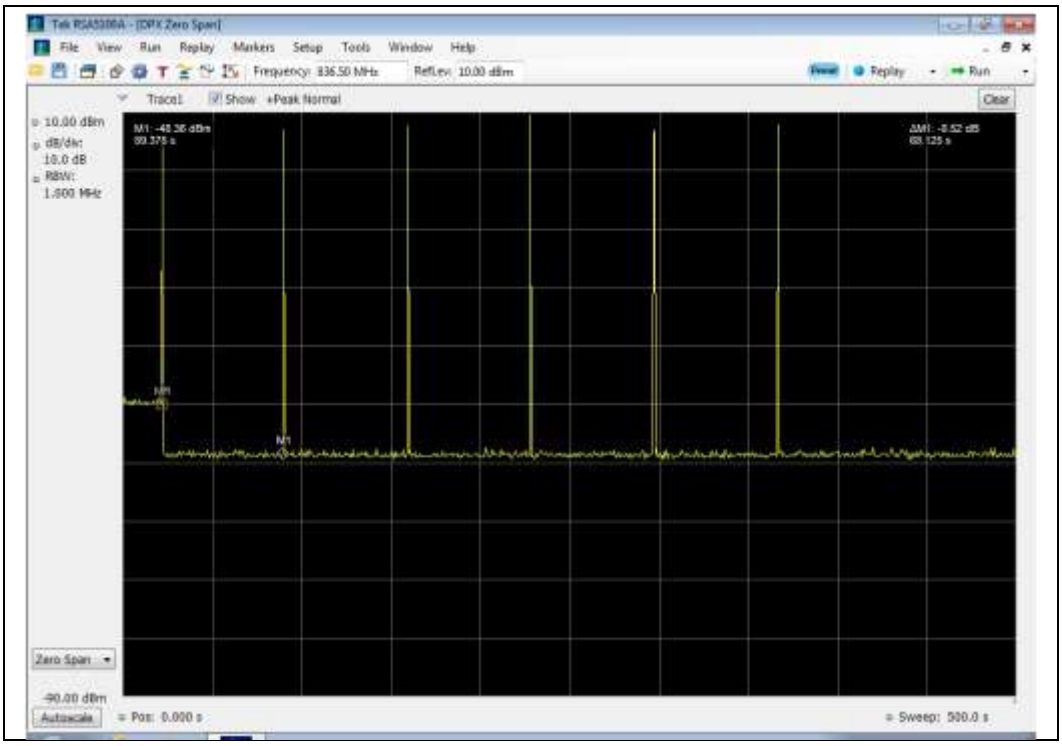


## Uplink Restart Count Test Results

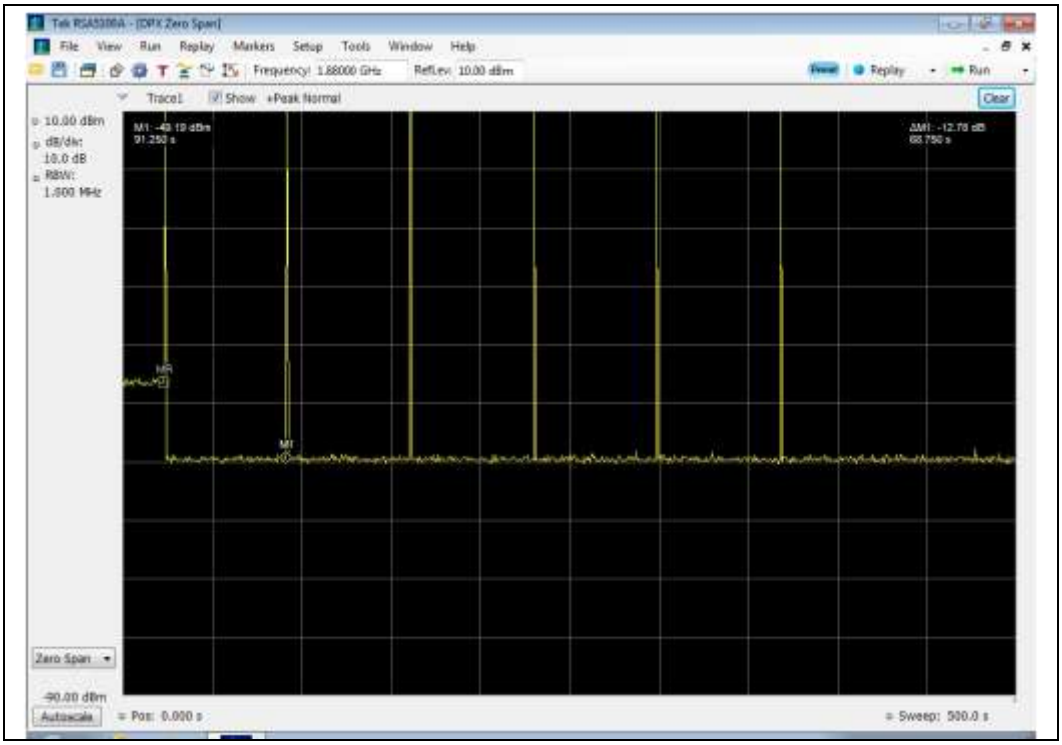
### 776 - 787 MHz Band




### 824 - 849 MHz Band

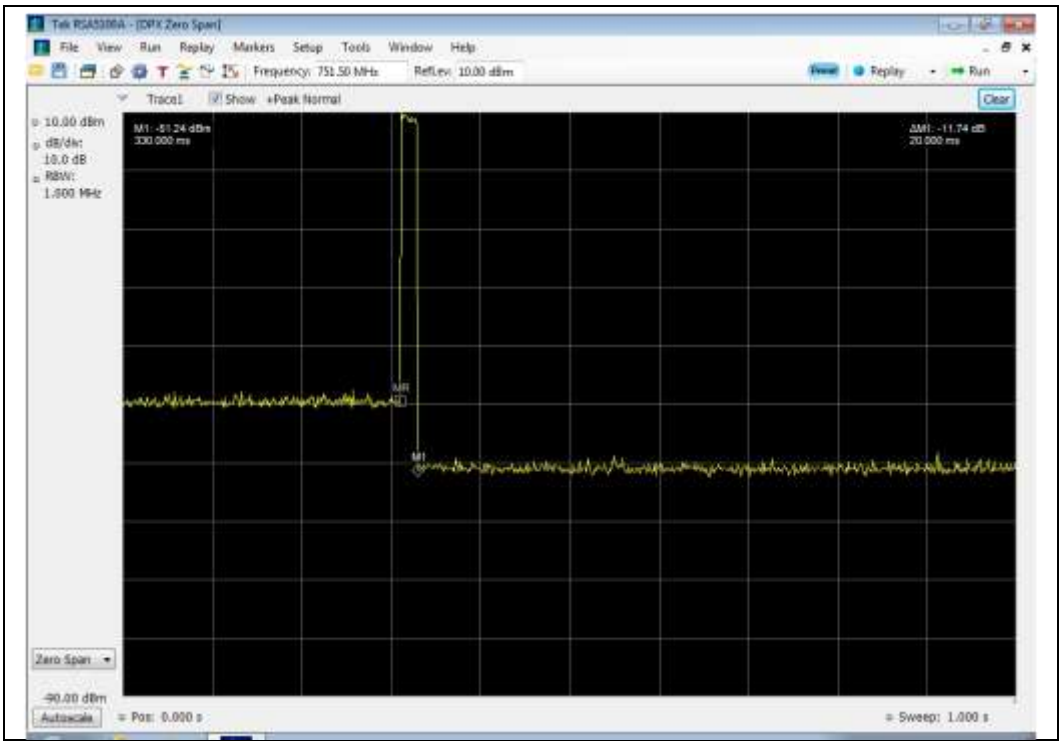


**1850 - 1910 MHz Band**

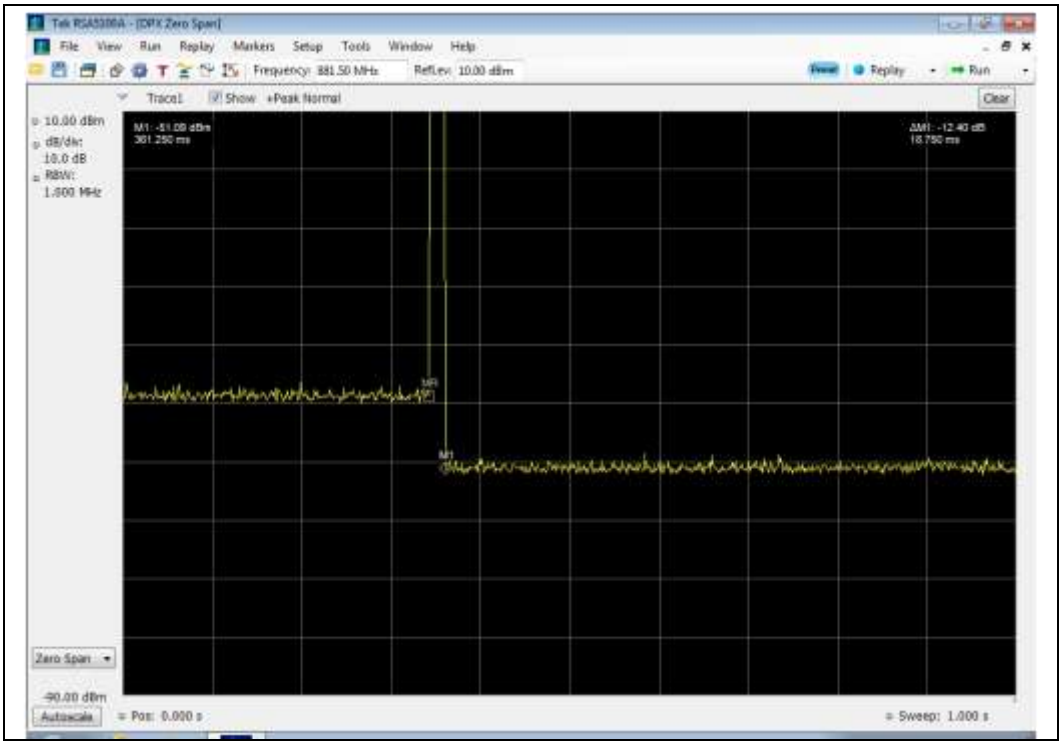



**Downlink Detection Time Test Results**

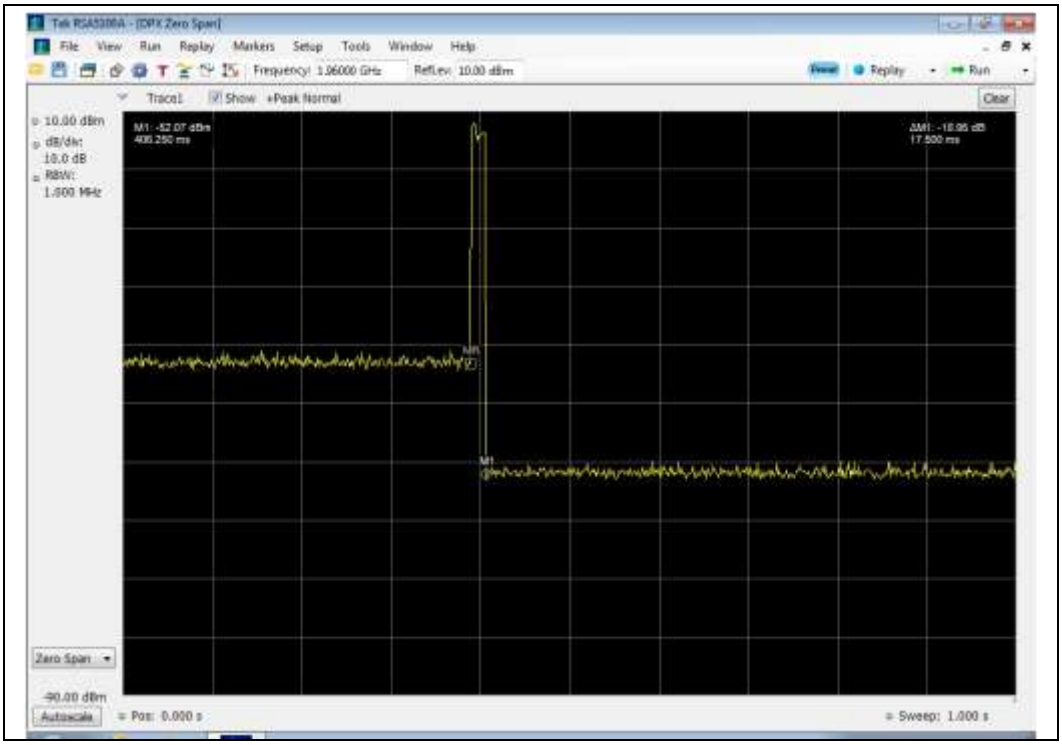
**746 - 757 MHz Band**



**869 - 894 MHz Band**

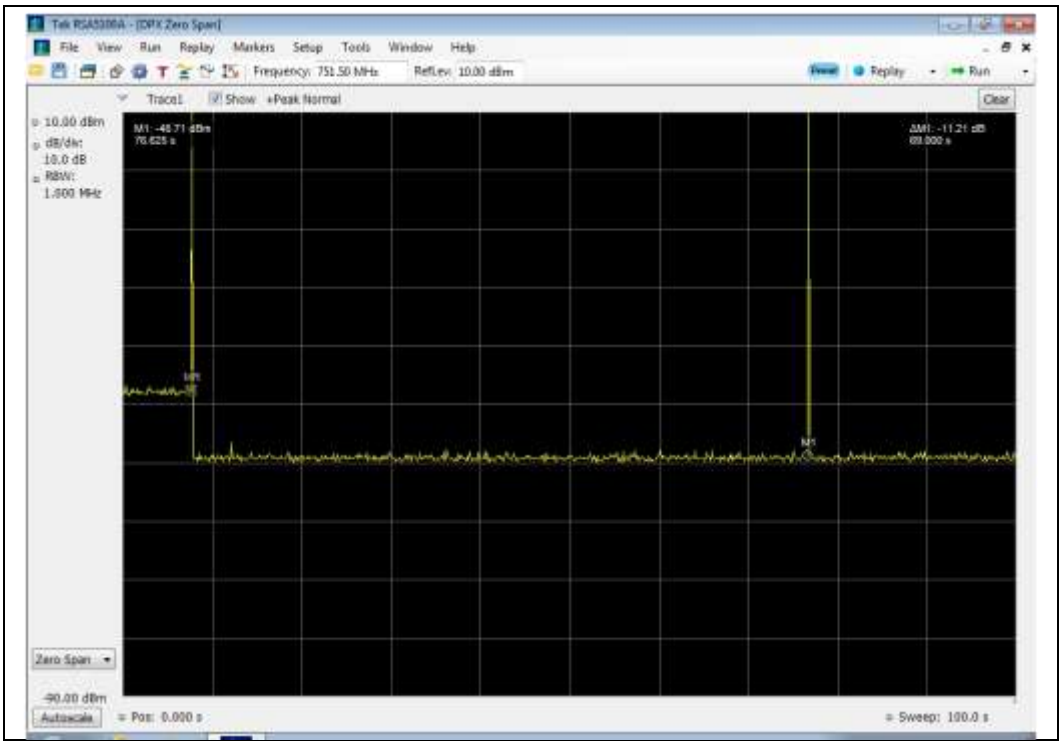



**1930 - 1990 MHz Band**

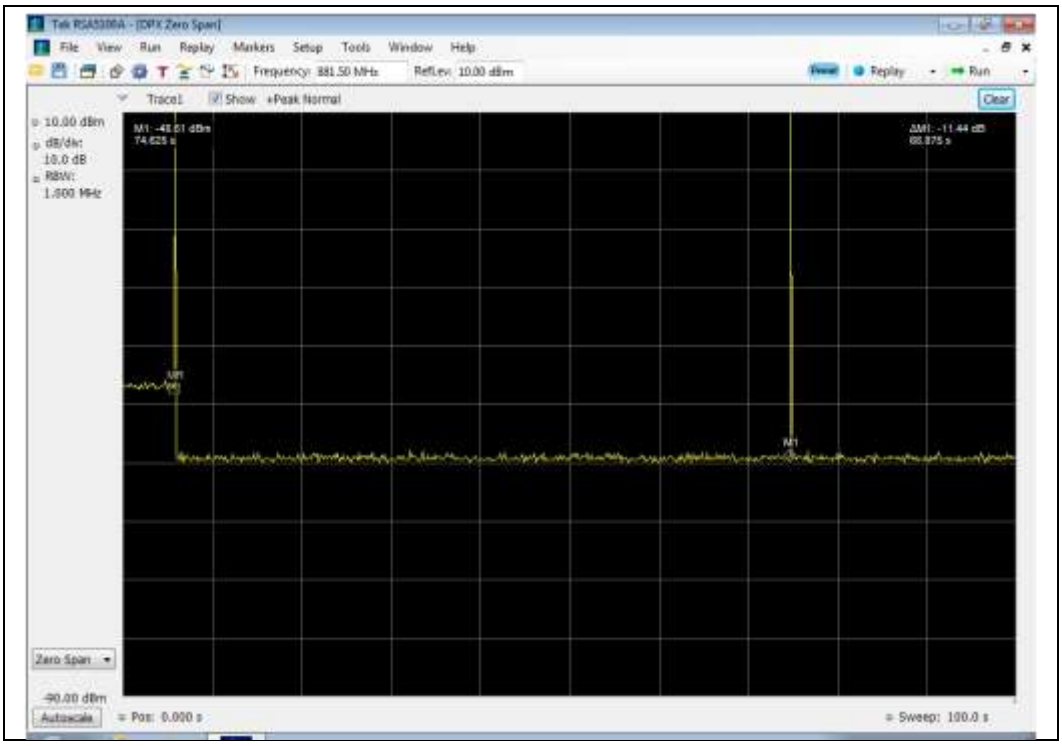


## Downlink Restart Time Test Results

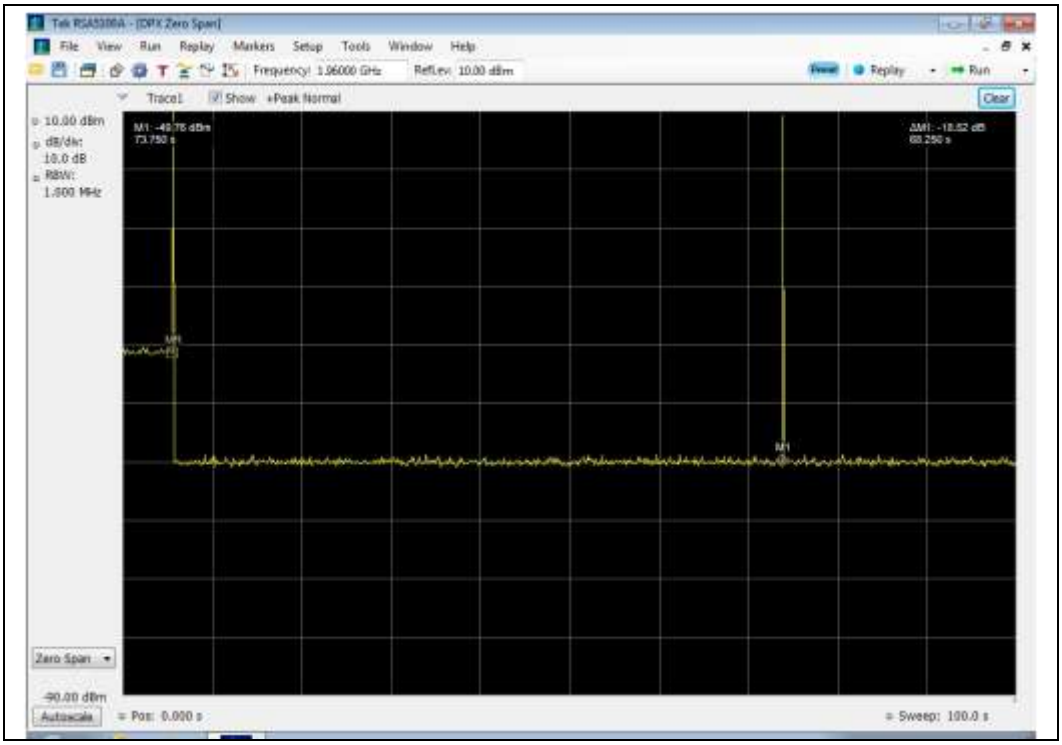
### 746 - 757 MHz Band




### 869 - 894 MHz Band

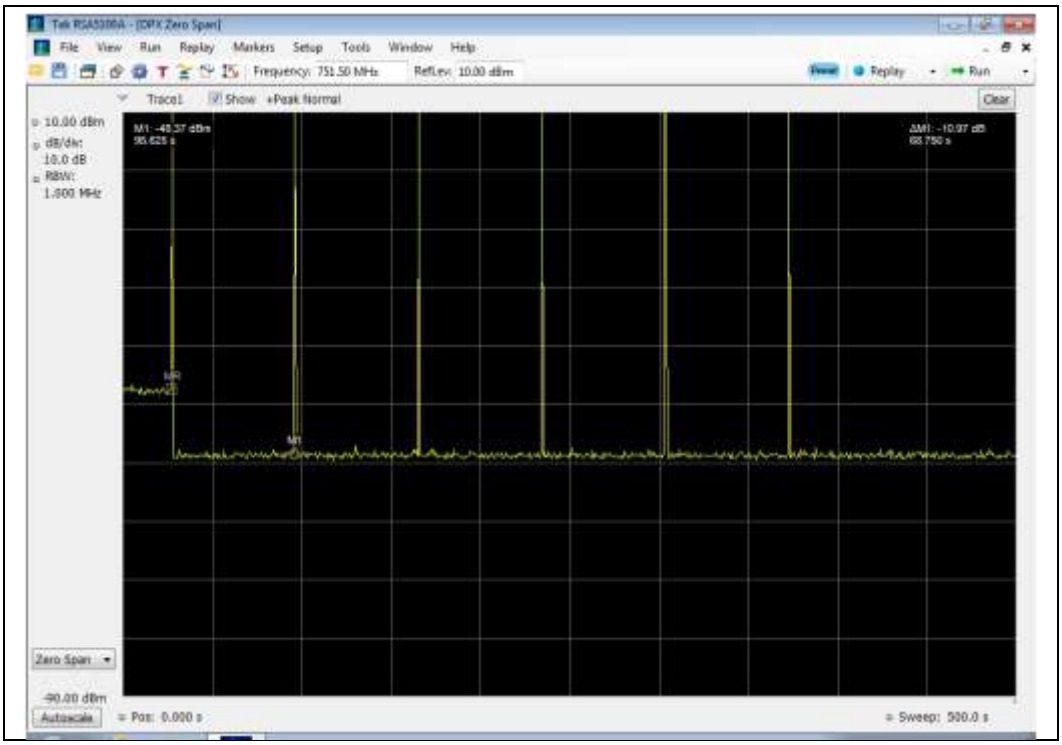


**1930 - 1990 MHz Band**

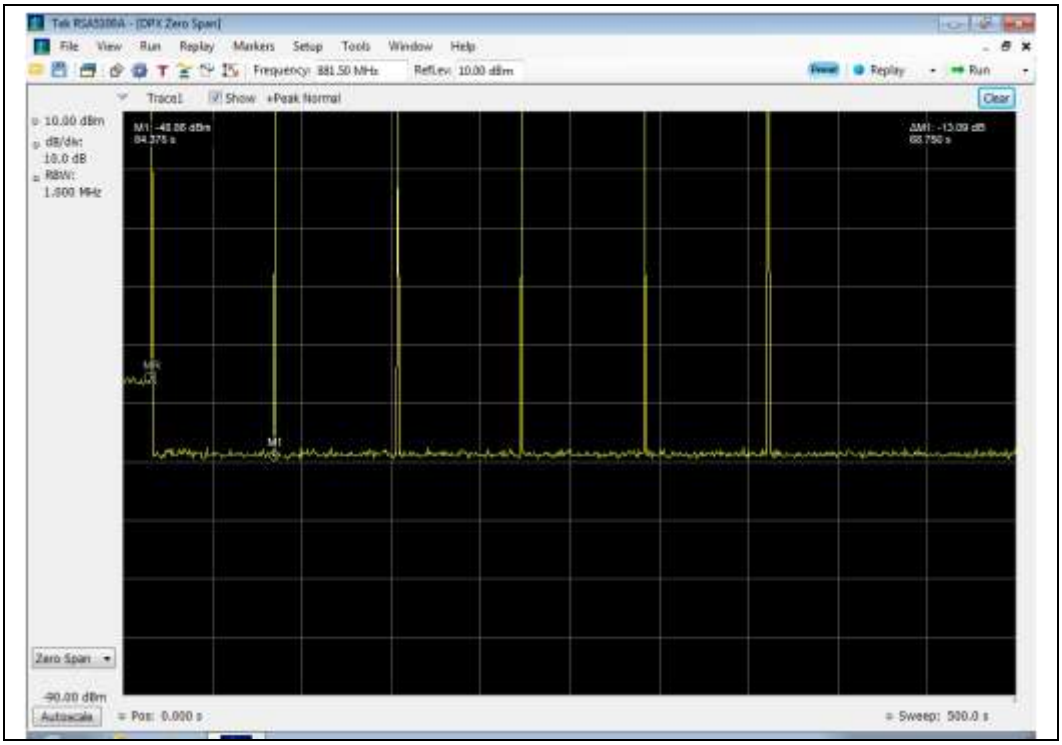



**Downlink Restart Count Test Results**

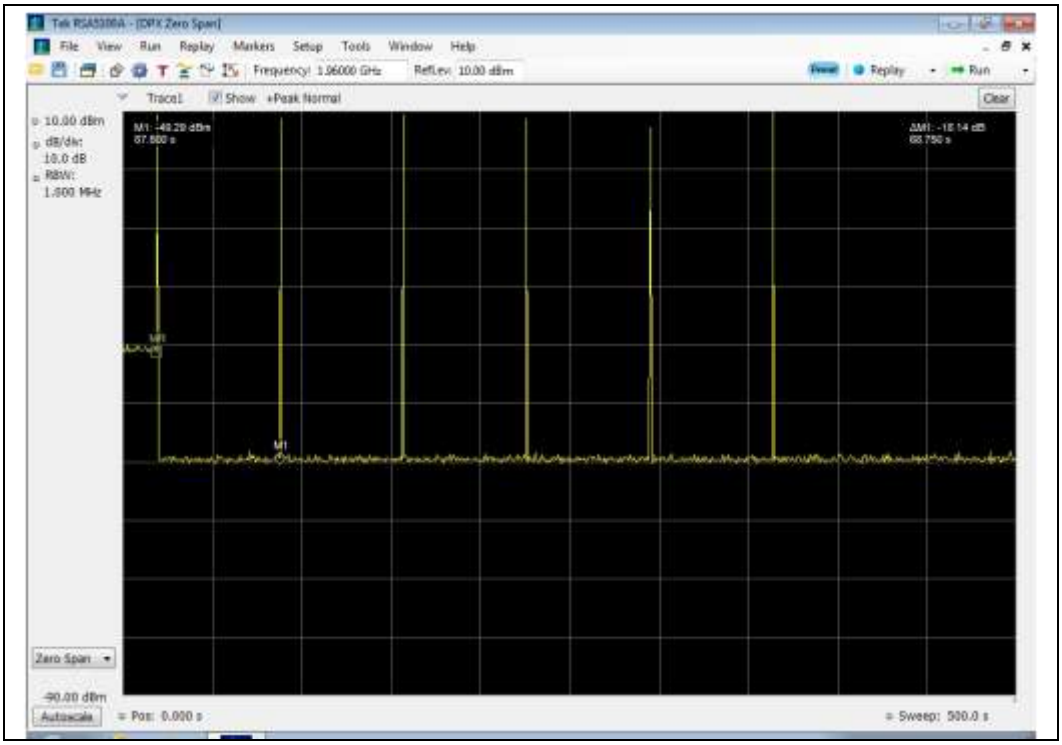
**746 - 757 MHz Band**



**869 - 894 MHz Band**




**1930 - 1990 MHz Band**



**Radiated Spurious**

| | | |
|---|---|---|
| **Name of Test:** | Radiated Spurious | **Engineer:** Greg Corbin |
| **Test Equipment Utilized:** | i00103,i00334, i00379, SMU 200A - S/N:101369 | **Test Date:** 12/13/2013 |

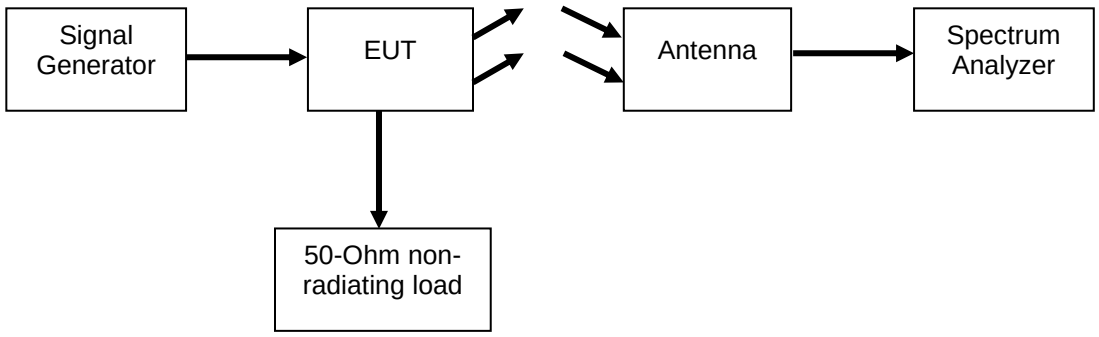
**Test Procedure**

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+ 10Log(P2)) = -13dBm
P1 = power in dBm
P2 = power in Watts

**Test Setup**



## Uplink Test Results

### 776 - 787 MHz Band 781.5 MHz Tuned Frequency

| Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 1563 | -46.5 | -13 | Pass |
| 2344.5 | -42.1 | -13 | Pass |
| 3126 | -37.7 | -13 | Pass |

### 824 - 849 MHz Band 836.5 MHz Tuned Frequency

| Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 1673 | -44.5 | -13 | Pass |
| 2509.5 | -40.3 | -13 | Pass |
| 3346 | -35.5 | -13 | Pass |

### 1850 - 1910 MHz Band 1880 MHz Tuned Frequency

| Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 3760 | -36.7 | -13 | Pass |
| 5640 | -30.9 | -13 | Pass |
| 7520 | -24.6 | -13 | Pass |

**Downlink Test Results**

**746 - 757 MHz Band 751.5 MHz Tuned Frequency**

| Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 1503 | -45.2 | -13 | Pass |
| 2254.5 | -43.3 | -13 | Pass |
| 3006 | -35.9 | -13 | Pass |

**869 - 894 MHz Band 881.5 MHz Tuned Frequency**

| Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 1763 | -45.2 | -13 | Pass |
| 2644.5 | -40.0 | -13 | Pass |
| 3526 | -35.5 | -13 | Pass |

**1930 - 1990 MHz Band 1960 MHz Tuned Frequency**

| Measured Frequency (MHz) | Measured Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|
| 3920 | -34.8 | -13 | Pass |
| 5880 | -32.3 | -13 | Pass |
| 7840 | -24.9 | -13 | Pass |

No other emissions were detected. All emissions were lower than –13 dBm.
All emissions were system noise floor.

**Test Equipment Utilized**

| Description | Manufacturer | Model # | CT Asset # | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| Horn Antenna | EMCO | 3115 | i00103 | 12/11/12 | 12/11/14 |
| Humidity / Temp Meter | Newport | IBTHX-W-5 | i00282 | 12/4/12 | 12/4/13** |
| Voltmeter | Fluke | 75III | i00320 | 2/1/13 | 2/1/14 |
| Non-radiating load | Termaline | 8201 | i00334 | Verified on: 12/13/13 | |
| EMI Analyzer | Agilent | E7405A | i00379 | 11/21/12 | 11/21/13** |
| Tunable Band Pass Filter | Wilson Electronics | Variable Attenuator / Bandpass Filter Switch Assembly | i00411 | Verified on: 12/10/13 | |
| RF Directional Coupler | Meca | CS06-1.500V | i00413 | Verified on: 12/10/13 | |
| Signal Generator | Rohde & Schwarz | SMU200A | S/N:101369 | 6/24/13 | 6/24/16 |
| Spectrum Analyzer | Textronix | RSA5126A | i00424 | 9/22/13 | 9/22/14 |

**30-day cal extension by lab manager

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