



# Compliance Testing, LLC

Previously Flom Test Lab

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## Test Report

Prepared for: Wilson Electronics, Inc.

Model: 460008

Description: Quint Band Mobile Signal Booster

FCC ID: PWO460008

To

FCC Part 20

Date of Issue: January 20, 2014

On the behalf of the applicant:

Wilson Electronics, Inc.  
3301 E Deseret Drive  
St. George, UT 84790

To the attention of:

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Project No: p1350021

**Greg Corbin**  
Project Test Engineer

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All results contained herein relate only to the sample tested



### Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	October 26, 2013	Greg Corbin	Original Document
2.0	November 27, 2013	Greg Corbin	Corrected typo in gain chart on page 83
3.0	January 6, 2014	Greg Corbin	Added additional spurious emissions data on pages 56, 57, 68, 69, 70, 71
4.0	January 9, 2014	Greg Corbin	Updated Conducted Emissions rule sections in the test summary table on page 6 and 57 to match the eCFR rule sections dated January 7, 2014.
5.0	January 20, 2014	Greg Corbin	Added test details to test procedure on page 20 for the Uplink Noise Timing plots. Added MSCL values to the tables on pages 88 and 89.
6.0	January 28, 2014	Greg Corbin	Corrected rule sections in the test summary table for Noise Limits and Uplink Inactivity on page 6.



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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 OATS Reg, #933597**

**IC Reg. #2044A-1**

**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 Draft KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516.

**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 (°C)	Humidity (%)	Pressure (mbar)
23.6 – 28.4	25.4 – 43.9	958.1 – 974.8

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

**EUT Description**

**Model:** 460008

**Description:** Quint Band Mobile Signal Booster

**Firmware:** A460008A

**Software:** 460008A

**Additional Information:**

The EUT is a **mobile** bi-directional amplifier for the boosting of cellular phone signals and data communication devices. The frequency bands listed in the table below are the bands used by the EUT.

The modulation types and emission designators listed in the tables below represent the modulations that the cell phone providers use for each frequency band. GSK, 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.

Frequency Band (MHz)					
<b>Uplink</b>	704 - 716	776 - 787	824 - 849	1850 - 1915	1710 – 1755
<b>Downlink</b>	734 - 746	746 - 757	869 - 894	1930 - 1995	2110 - 2155
<b>Modulation Type</b>	LTE		GSM, CDMA, EDGE, HSPA, EVDO, LTE		CDMA, HSPA, LTE, EDGE, EVDO

Emission Designators					
<b>CDMA</b>	<b>HSPA</b>	<b>LTE</b>	<b>EVDO</b>	<b>EDGE</b>	<b>GSM</b>
F9W	F9W	G7D	F9W	G7W	GXW

**EUT Operation during Tests**

The EUT was in a normal operating condition.



## 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) 20.21(e)(8)(i)(C) 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 22.917(a) 24.238((a) 27.53(c) 27.53(e) 27.53(f) 27.53(g)	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 device does not use spectrum block filtering



**Authorized Frequency Band**

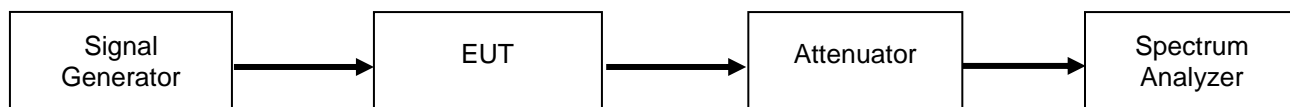
**Name of Test:** Authorized Frequency Band  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 9/23/13

**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 necessary to ensure accurate readings were obtained. 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.

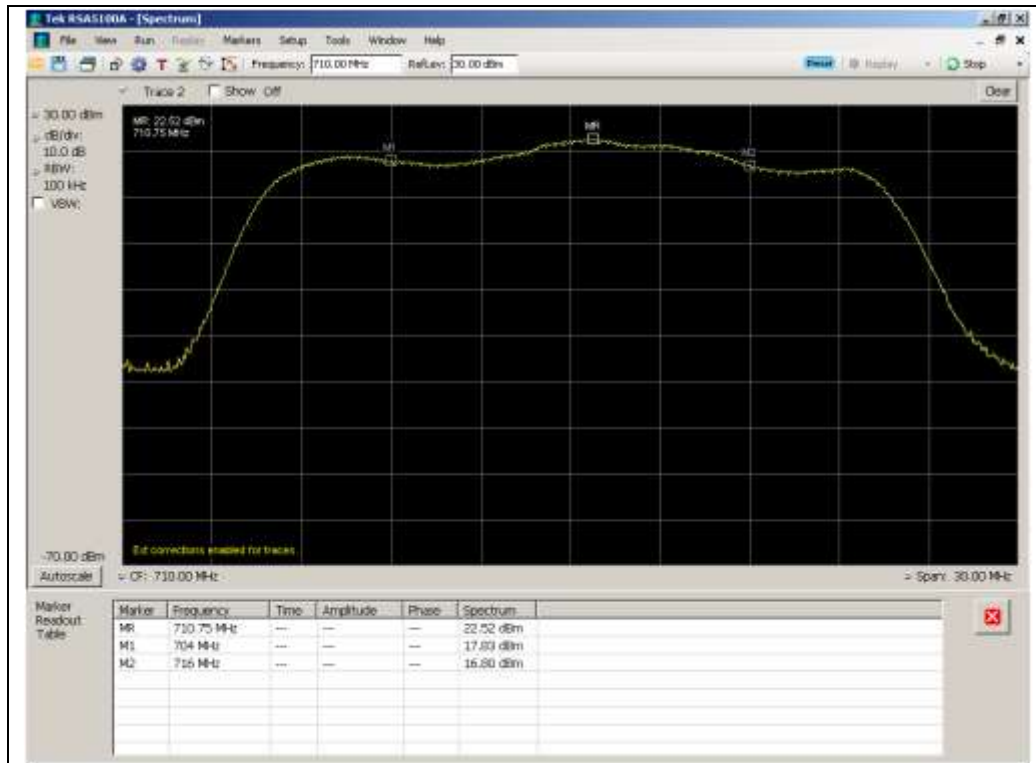
**Test Setup**



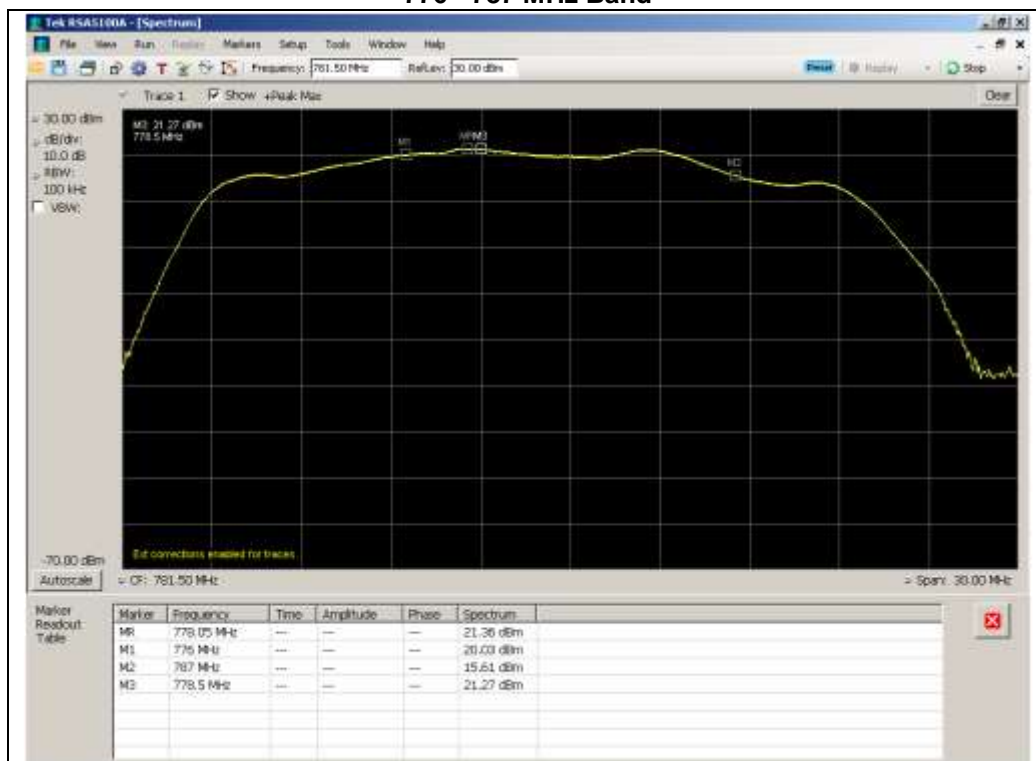


## Uplink Test Results

### 704 - 716 MHz Band



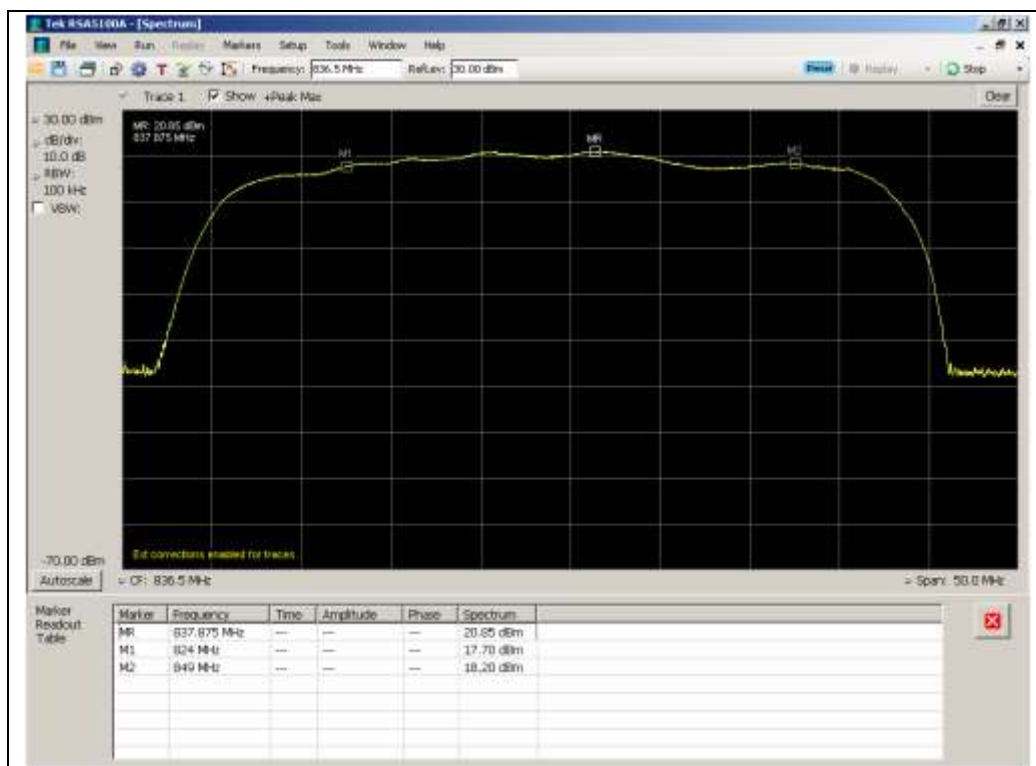
### 776 - 787 MHz Band



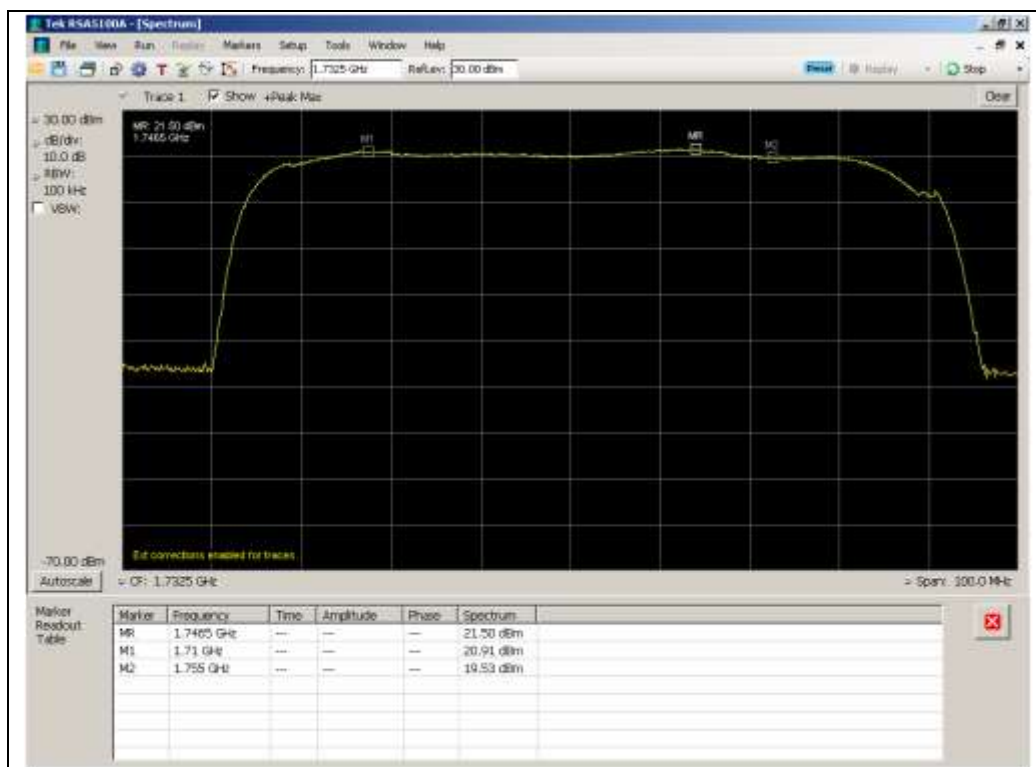




### 824 - 849 MHz Band

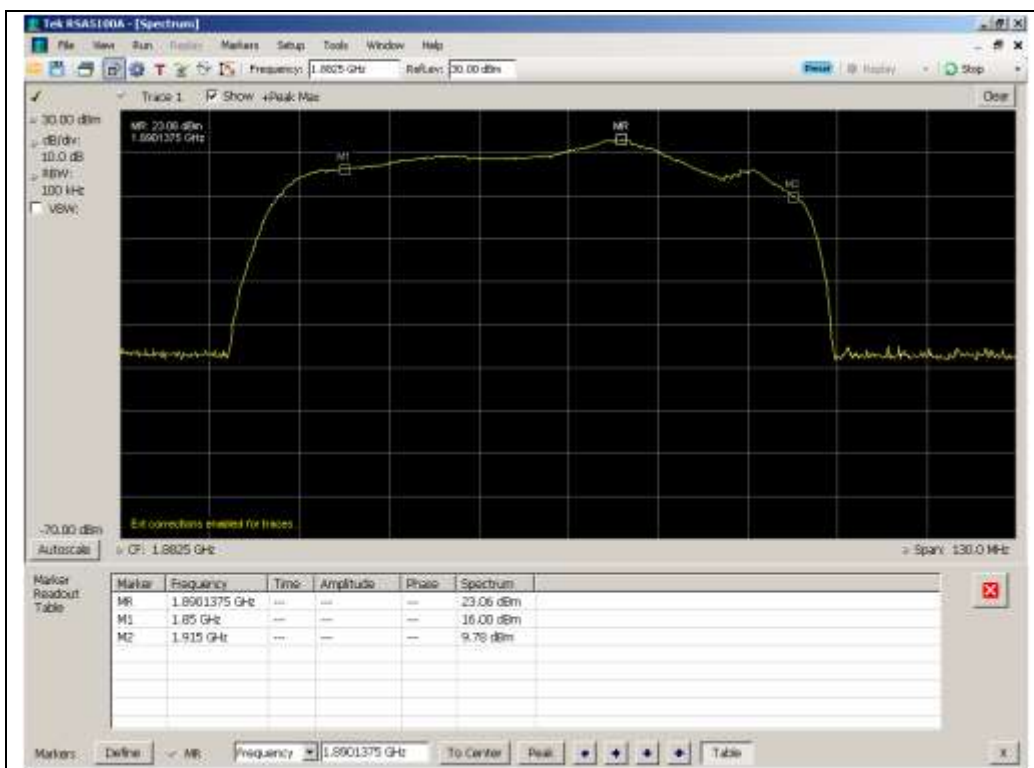


### 1710 - 1755 MHz Band



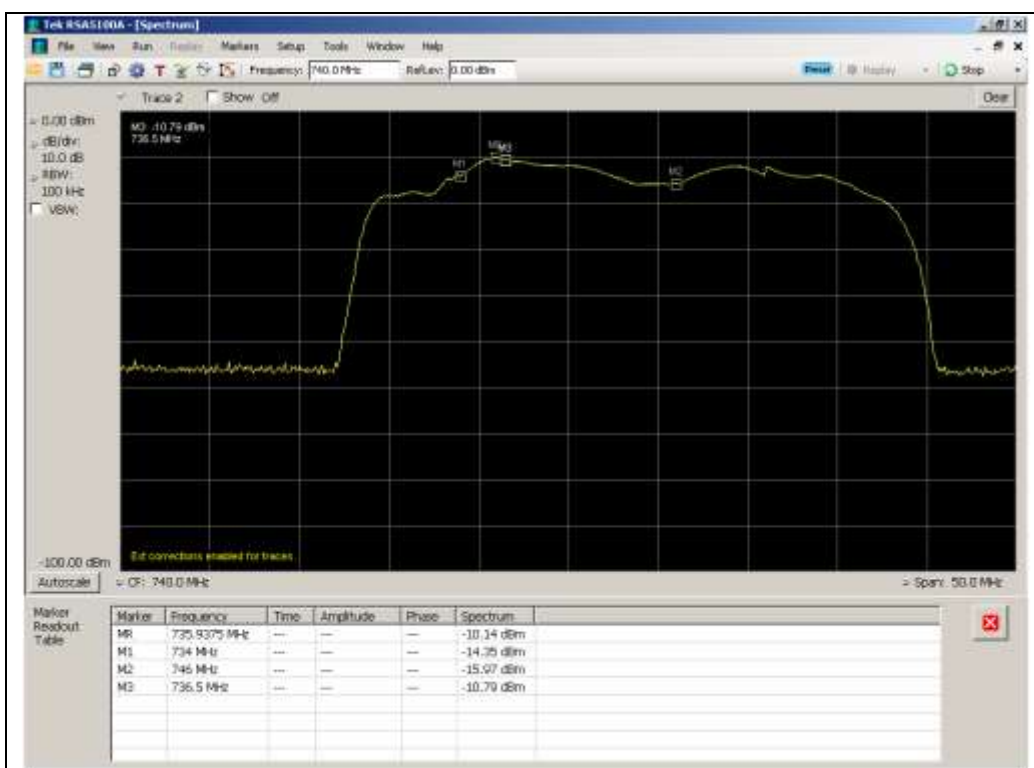


### 1850 - 1915 MHz Band



### Downlink Test Results

### 734 - 746 MHz Band

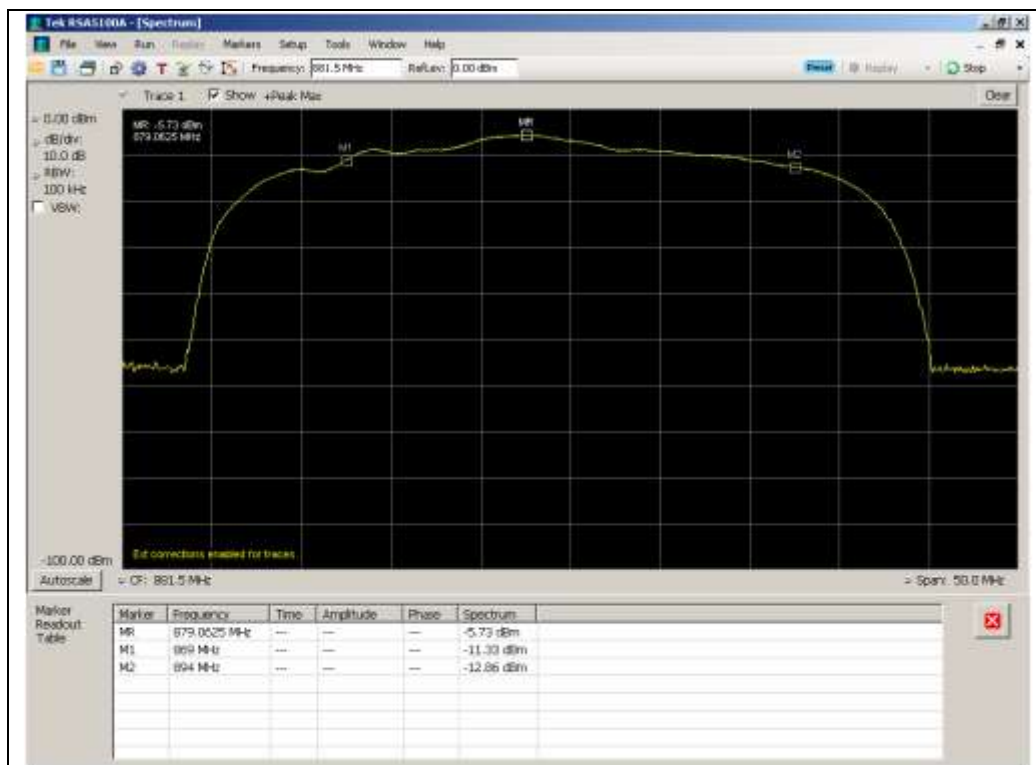




### 746 - 757 MHz Band

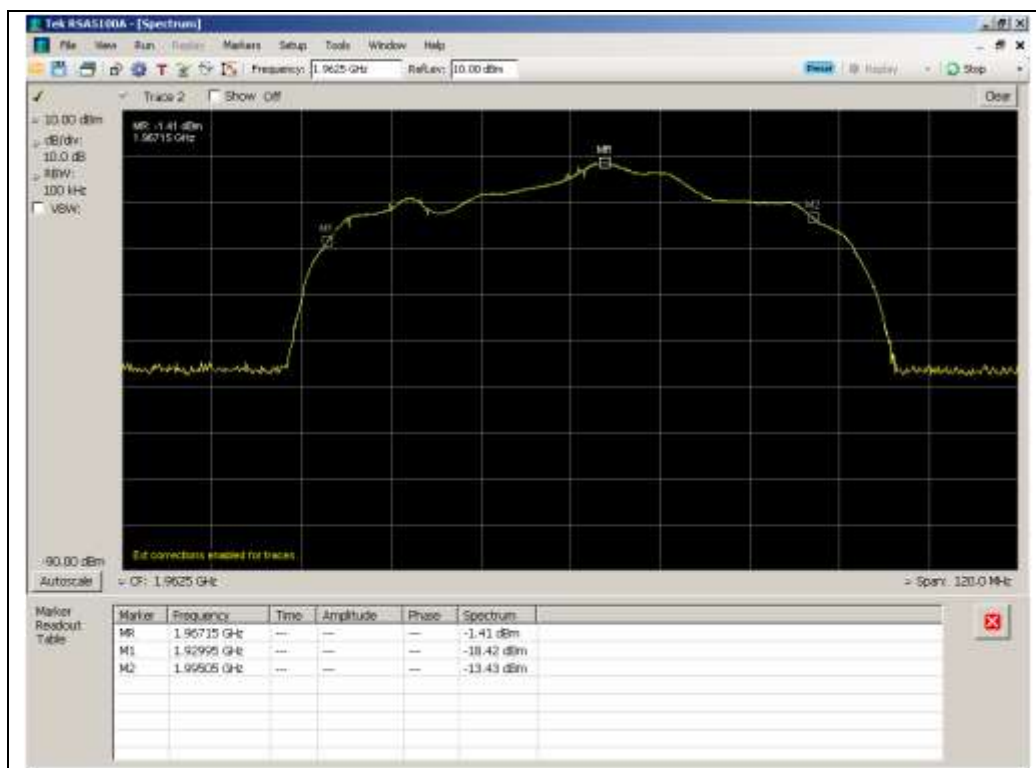


### 869 - 894 MHz Band

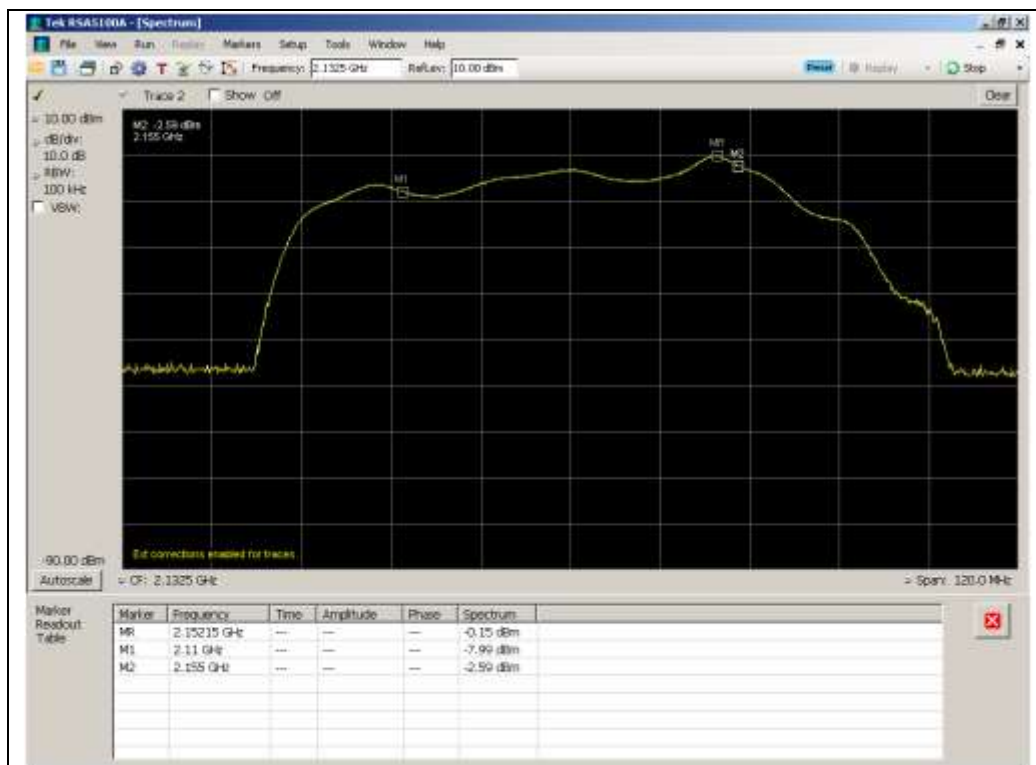




### 1930 - 1995 MHz Band



### 2110 - 2155 MHz Band





**Maximum Power and Gain**

**Name of Test:** Maximum Power and Gain  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 10/22/2013

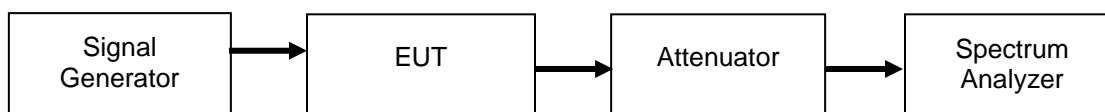
**Test Procedure**

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 accurate readings were obtained. The spectrum analyzer and signal generator were tuned to the frequency with the maximum gain 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 with both a pulsed single time slot GSM 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.

This is a mobile device with the maximum gain limit fixed at 50 dB for all bands.

The uplink and downlink gain under each condition was verified to be within 9 dB of each other.

**Test Setup**



**Uplink Power Test Results**

Frequency Band (MHz)	Input Level (dBm)	Output Power (dBm)	Lower Limit (dBm)	Upper Limit (dBm)	Result
704 - 716 MHz Pulsed GSM	-23.0	25.7	17	30	Pass
704 - 716 MHz AWGN	-30.5	18.9	17	30	Pass
776 - 787 MHz Pulsed GSM	-24.0	24.4	17	30	Pass
776 - 787 MHz AWGN	-30.7	18.2	17	30	Pass
824 - 849 MHz Pulsed GSM	-21.8	25.1	17	30	Pass
824 - 849 MHz AWGN	-30.5	18.1	17	30	Pass
1710 - 1755 MHz Pulsed GSM	-20.5	23.8	17	30	Pass
1710 - 1755 MHz AWGN	-27.0	18.8	17	30	Pass
1850 - 1915 MHz Pulsed GSM	-22.5	25.2	17	30	Pass
1850 - 1915 MHz AWGN	-29.5	19.6	17	30	Pass



**Downlink Power Test Results**

Frequency Band (MHz)	Input Level (dBm)	Output Power (dBm)	Upper Limit (dBm)	Result
734 - 746 MHz Pulsed GSM	-53.0	-4.3	17	Pass
734 - 746 MHz AWGN	-61.8	-12.1	17	Pass
746 - 757 MHz Pulsed GSM	-51.6	-4.1	17	Pass
746 - 757 MHz AWGN	-60.0	-11.9	17	Pass
869 - 894 MHz Pulsed GSM	-49.9	-1.2	17	Pass
869 - 894 MHz AWGN	-57.3	-7.7	17	Pass
1930 - 1995 MHz Pulsed GSM	-44.7	4.0	17	Pass
1930 - 1995 MHz AWGN	-53.0	-3.2	17	Pass
2110 - 2155 MHz Pulsed GSM	-39.8	5.6	17	Pass
2110 - 2155 MHz AWGN	-47.5	-1.1	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	710.75	736.5	48.7	50	48.7	50	0	9	-9
AWGN	710.75	736.5	49.4	50	49.7	50	0.3	9	-8.7
Pulsed GSM	778.5	749.1875	48.4	50	47.5	50	0.9	9	-8.1
AWGN	778.5	749.1875	48.9	50	48.1	50	0.8	9	-8.2
Pulsed GSM	837.875	879.0625	46.9	50	48.7	50	1.8	9	-7.2
AWGN	837.875	879.0625	48.6	50	49.6	50	1	9	-8
Pulsed GSM	1746.5	2152.15	44.3	50	45.4	50	1.1	9	-7.9
AWGN	1746.5	2152.15	45.8	50	46.4	50	0.6	9	-8.4
Pulsed GSM	1890.1375	1967.15	47.7	50	48.7	50	1	9	-8
AWGN	1890.1375	1967.15	49.1	50	49.8	50	0.7	9	-8.3



**Intermodulation**

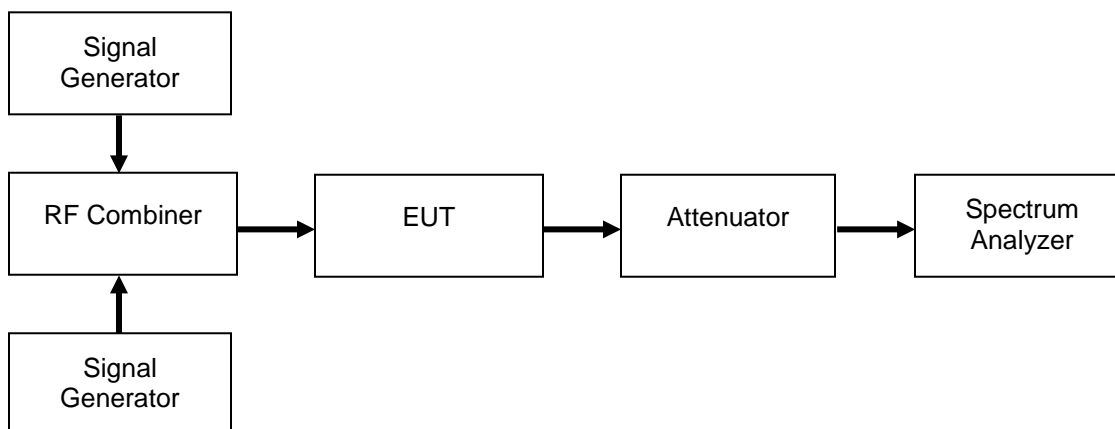
**Name of Test:** Intermodulation  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 9/24/2013

**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 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
704 - 716 MHz	-23.5	-19	Pass
776 - 787 MHz	-24.7	-19	Pass
824 - 849 MHz	-25.2	-19	Pass
1710 - 1755 MHz	-21.5	-19	Pass
1850 - 1915 MHz	-22.6	-19	Pass

**Downlink Test Results**

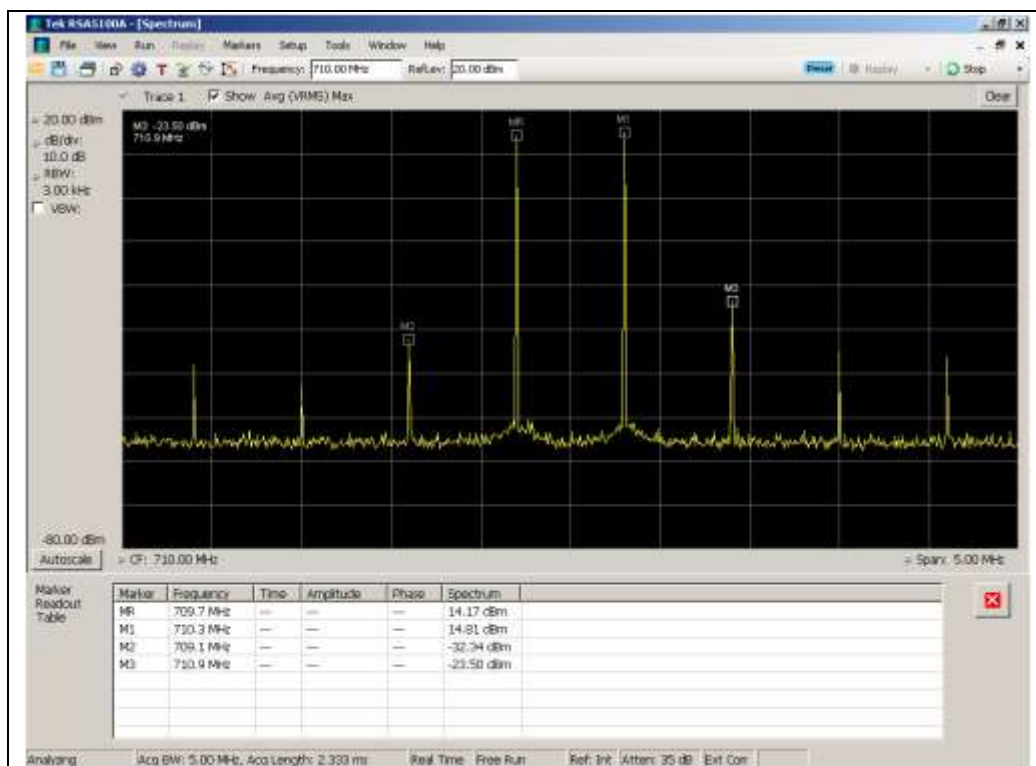
Frequency Band (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Result
734 - 746 MHz	-70.2	-19	Pass
746 - 757 MHz	-70.8	-19	Pass
869 - 894 MHz	-70.7	-19	Pass
1930 - 1995 MHz	-69.8	-19	Pass
2110 - 2155 MHz	-64.8	-19	Pass



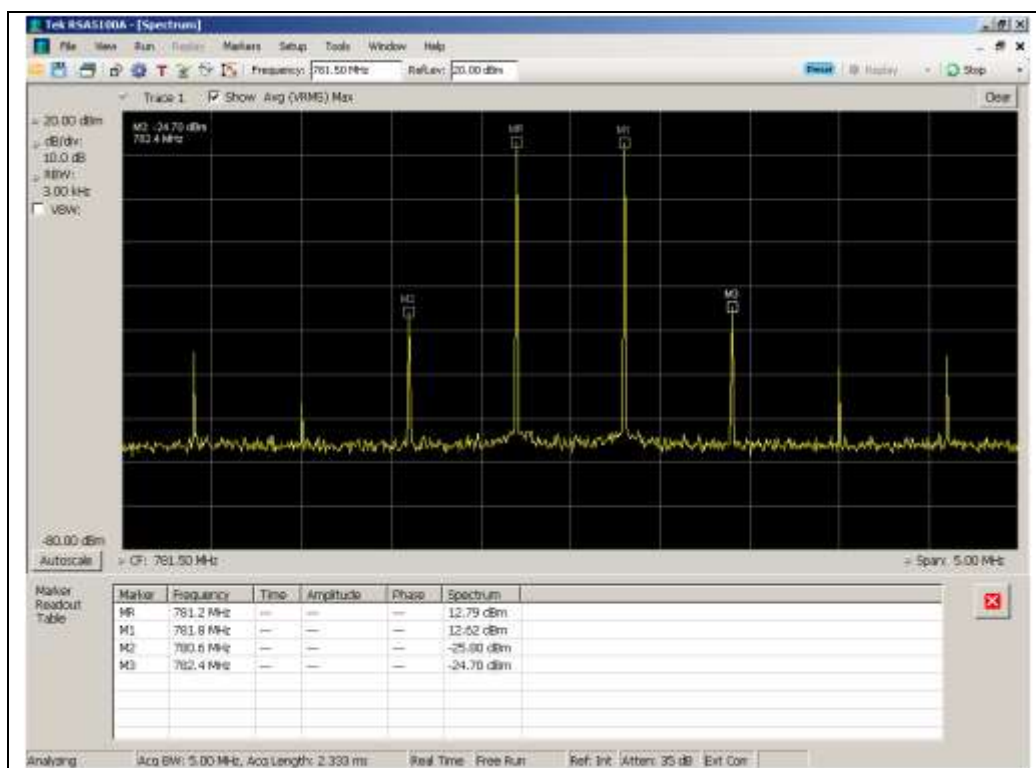


## Uplink Test Results

### 704 - 716 MHz Band



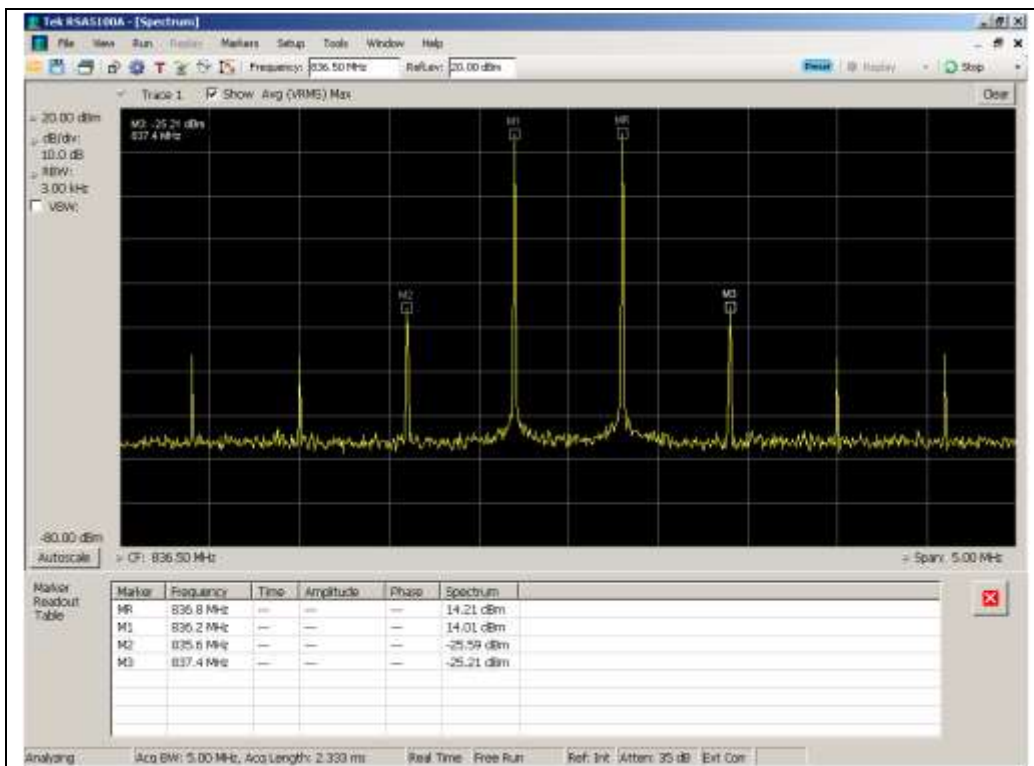
### 776 - 787 MHz Band



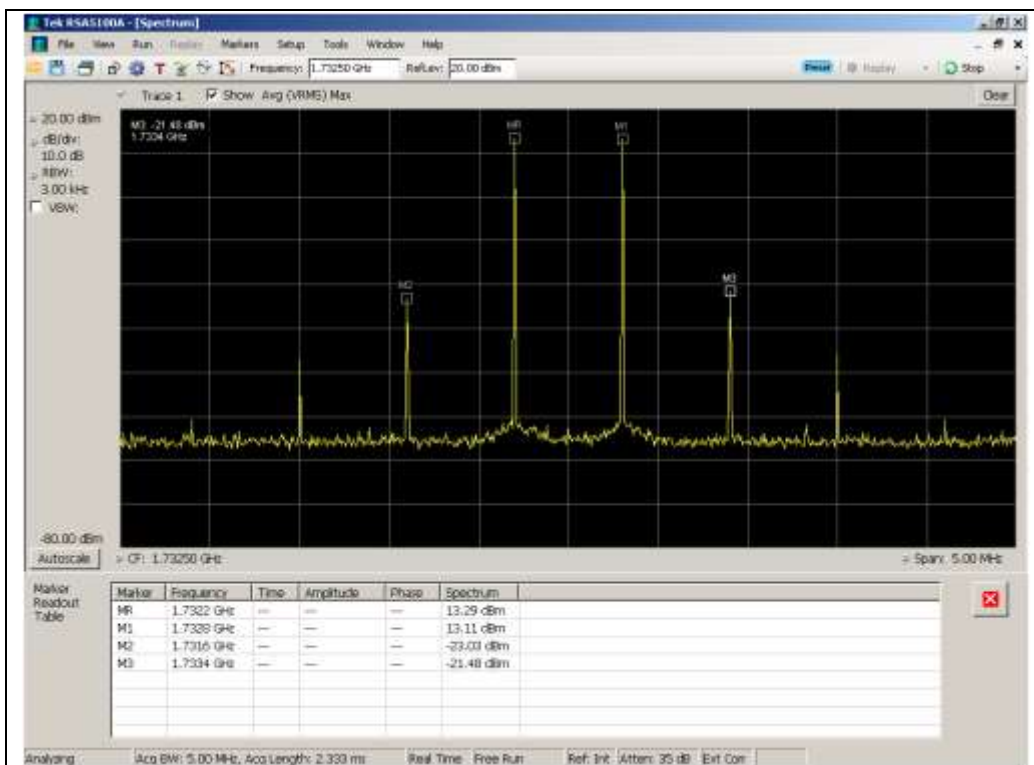




### 824 - 849 MHz Band

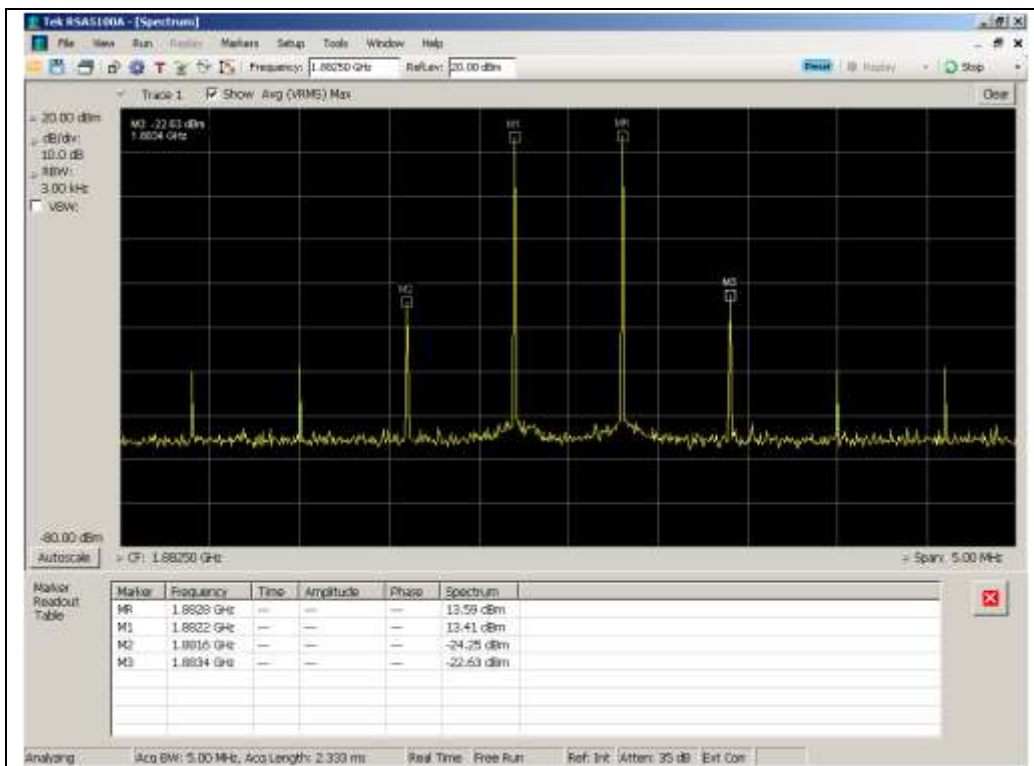


### 1710 - 1755 MHz Band



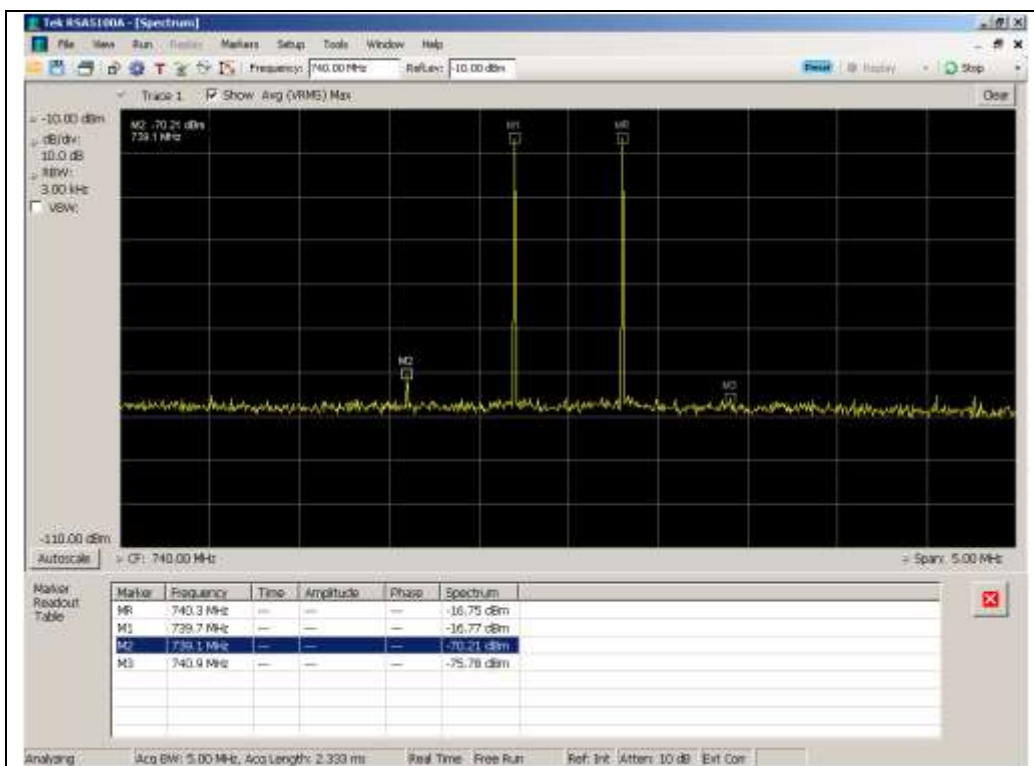


### 1850 - 1915 MHz Band



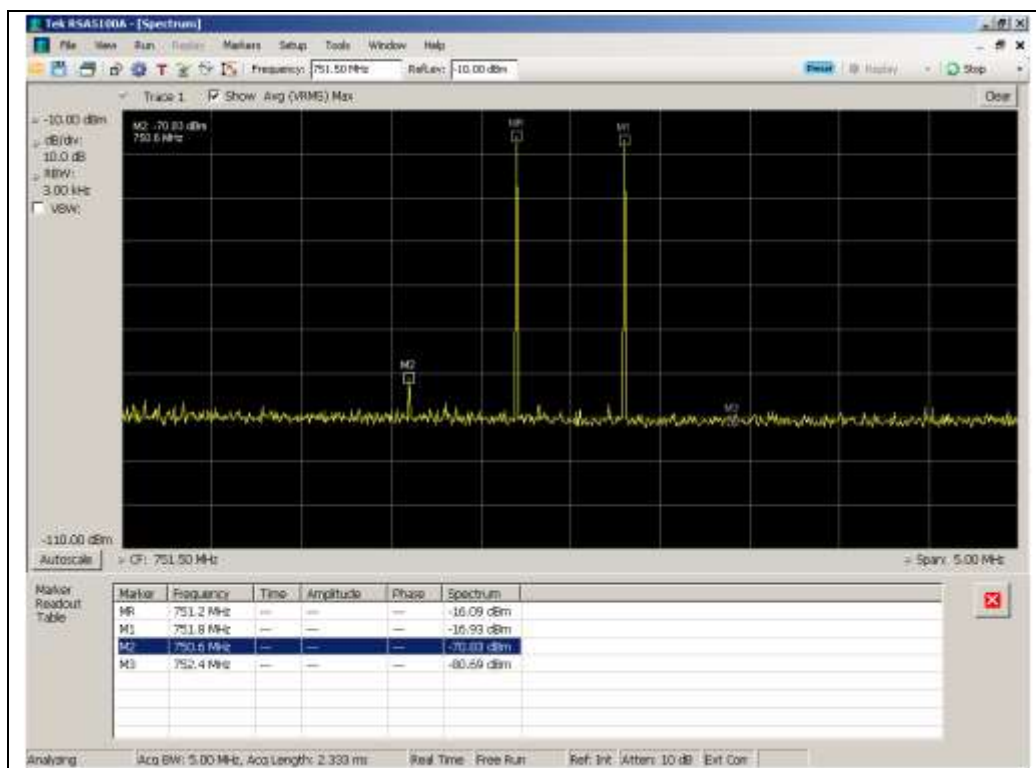
### Downlink Test Results

### 734 - 746 MHz Band

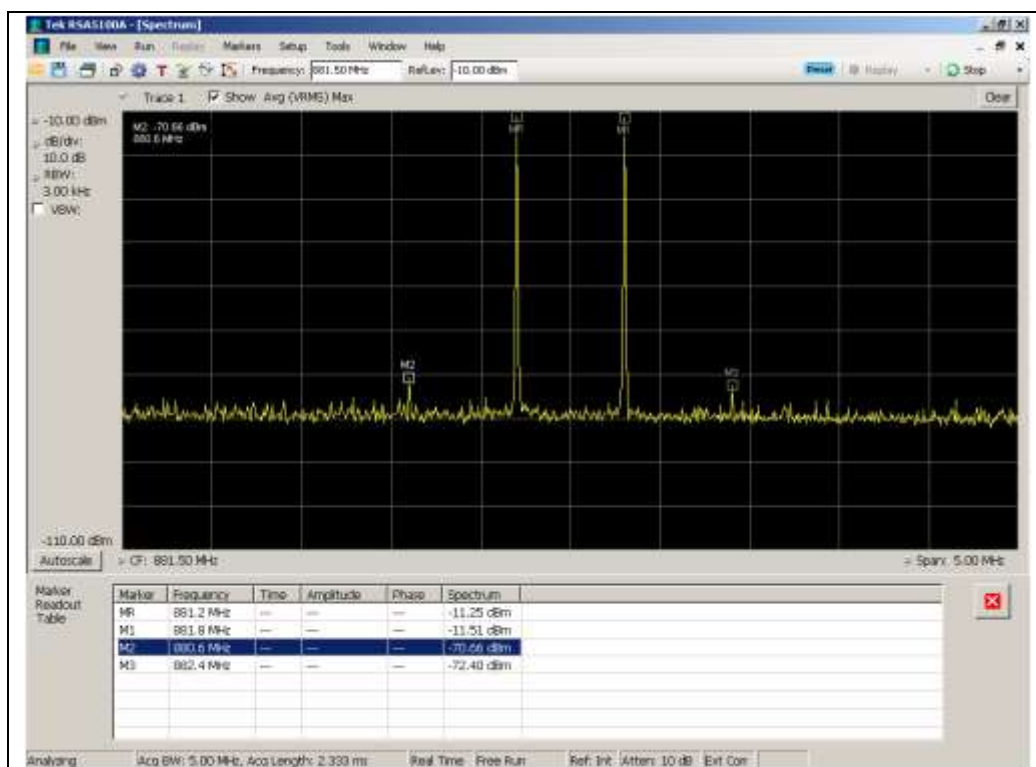




### 746 - 757 MHz Band

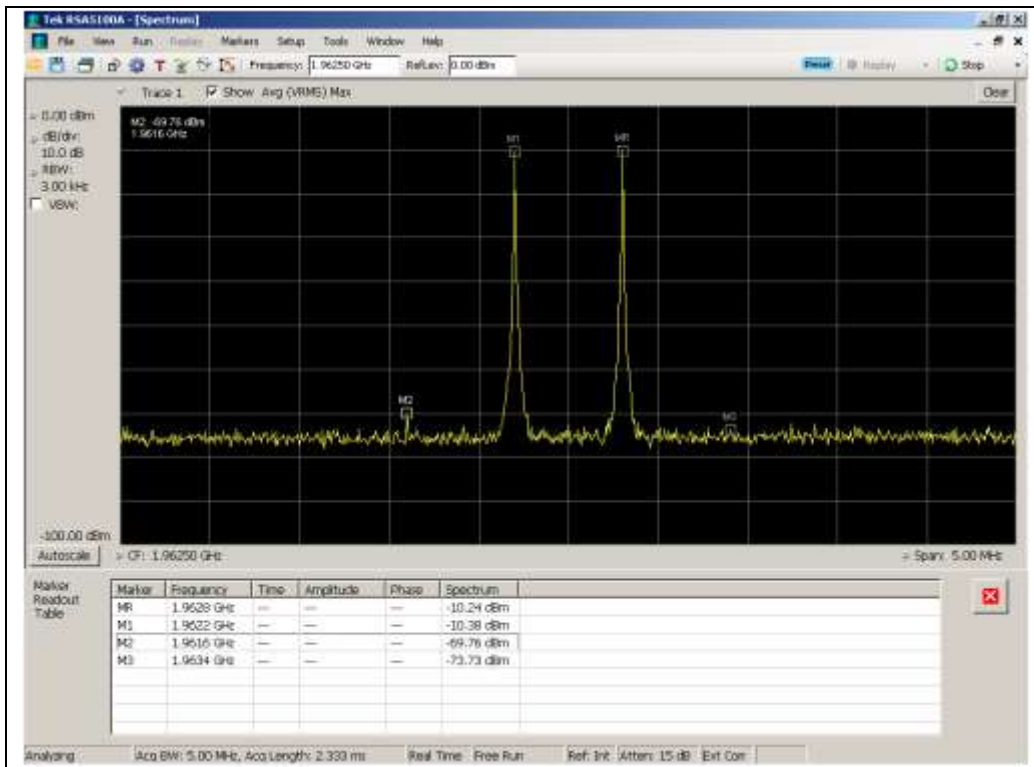


### 869 - 894 MHz Band

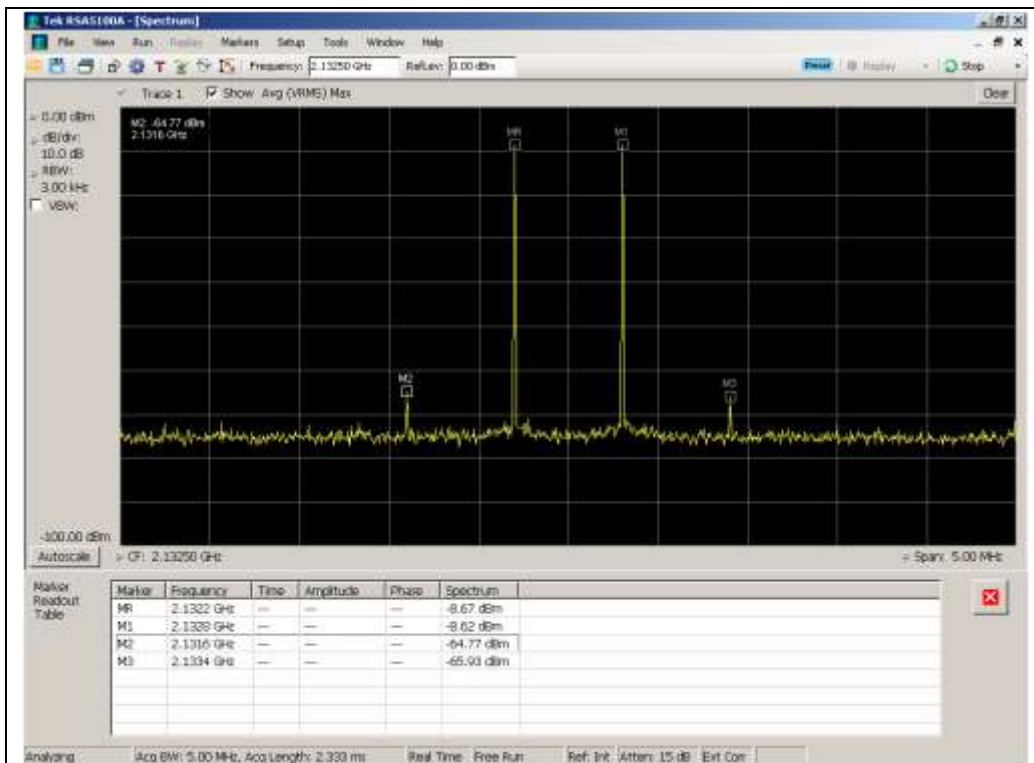




### 1930 - 1995 MHz Band



### 2110 - 2155 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:** 9/30/13

### 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 necessary to ensure accurate readings were obtained. A signal generator was utilized to produce the following signals; GSM, CDMA, and WCDMA 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 was measured ensuring the meet the requirements.

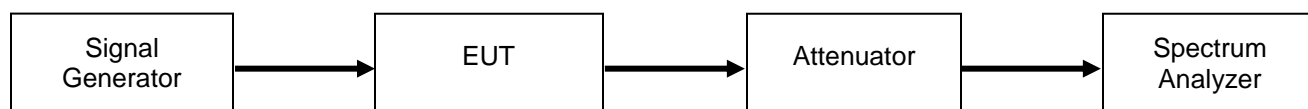
The following formula is used for calculating the limits.

$$\text{Limit (dBm)} = -6 + (P2 - (43 + 10 \cdot \log P1))$$

P1 = Output Power in watts

P2 = Output Power in dBm

### Test Setup





### GSM Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	Lower	-70.8	-19	Pass
704 - 716	Upper	-30.9	-19	Pass
776 - 787	Lower	-31.9	-19	Pass
776 - 787	Upper	-30.4	-19	Pass
824 - 849	Lower	-34.7	-19	Pass
824 - 849	Upper	-33.1	-19	Pass
1710 - 1755	Lower	-33	-19	Pass
1710 - 1755	Upper	-34.2	-19	Pass
1850 - 1915	Lower	-32.2	-19	Pass
1850 - 1915	Upper	-38.8	-19	Pass

### CDMA Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	Lower	-71.4	-19	Pass
704 - 716	Upper	-41.3	-19	Pass
776 - 787	Lower	-39.9	-19	Pass
776 - 787	Upper	-39.7	-19	Pass
824 - 849	Lower	-48.4	-19	Pass
824 - 849	Upper	-42.5	-19	Pass
1710 - 1755	Lower	-37.3	-19	Pass
1710 - 1755	Upper	-39.2	-19	Pass
1850 - 1915	Lower	-40.1	-19	Pass
1850 - 1915	Upper	-50.9	-19	Pass



### WCDMA Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	Lower	-70.5	-19	Pass
704 - 716	Upper	-41.7	-19	Pass
776 - 787	Lower	-41.2	-19	Pass
776 - 787	Upper	-40.9	-19	Pass
824 - 849	Lower	-48.8	-19	Pass
824 - 849	Upper	-35.3	-19	Pass
1710 - 1755	Lower	-35.4	-19	Pass
1710 - 1755	Upper	-35.9	-19	Pass
1850 - 1915	Lower	-36.9	-19	Pass
1850 - 1915	Upper	-48.8	-19	Pass

### GSM Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-78.4	-19	Pass
734 - 746	Upper	-55.8	-19	Pass
746 - 757	Lower	-57.5	-19	Pass
746 - 757	Upper	-58.2	-19	Pass
869 - 894	Lower	-63	-19	Pass
869 - 894	Upper	-62.3	-19	Pass
1930 - 1995	Lower	-63.2	-19	Pass
1930 - 1995	Upper	-55.7	-19	Pass
2110 - 2155	Lower	-54.2	-19	Pass
2110 - 2155	Upper	-52.7	-19	Pass



### CDMA Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-78.3	-19	Pass
734 - 746	Upper	-70.9	-19	Pass
746 - 757	Lower	-76.7	-19	Pass
746 - 757	Upper	-78	-19	Pass
869 - 894	Lower	-76	-19	Pass
869 - 894	Upper	-76.7	-19	Pass
1930 - 1995	Lower	-78.5	-19	Pass
1930 - 1995	Upper	-77.5	-19	Pass
2110 - 2155	Lower	-77.3	-19	Pass
2110 - 2155	Upper	-76.5	-19	Pass

### WCDMA Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-78.5	-19	Pass
734 - 746	Upper	-71.6	-19	Pass
746 - 757	Lower	-77.3	-19	Pass
746 - 757	Upper	-78.1	-19	Pass
869 - 894	Lower	-71.6	-19	Pass
869 - 894	Upper	-71.7	-19	Pass
1930 - 1995	Lower	-73.1	-19	Pass
1930 - 1995	Upper	-77.1	-19	Pass
2110 - 2155	Lower	-77	-19	Pass
2110 - 2155	Upper	-72.1	-19	Pass

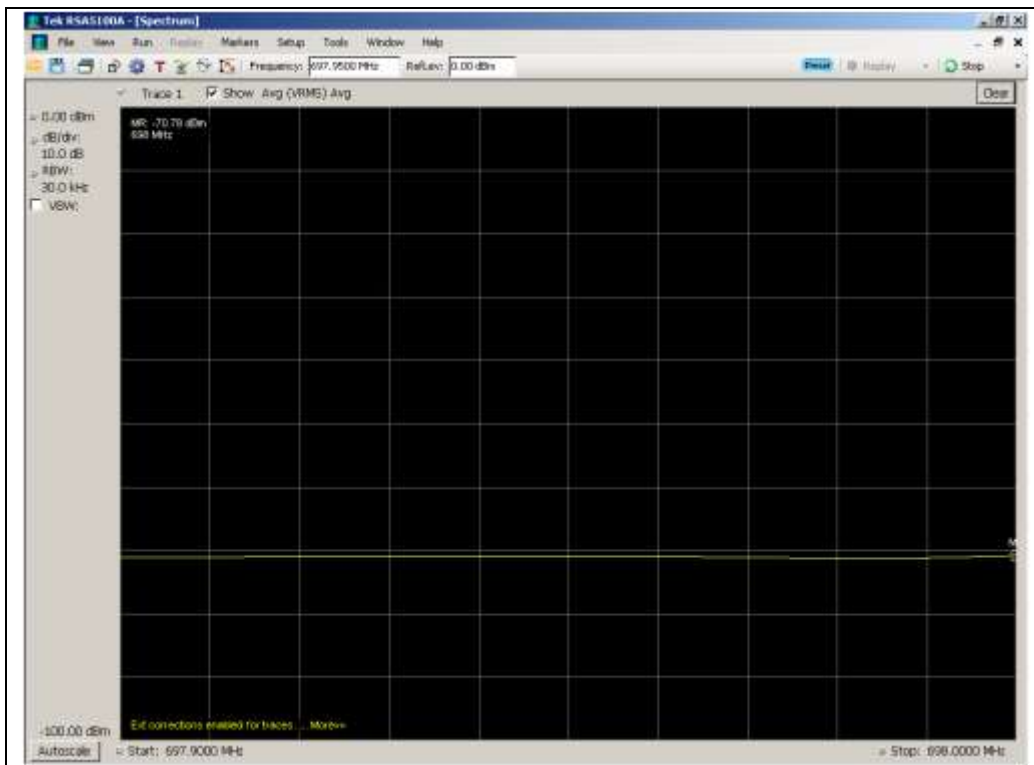




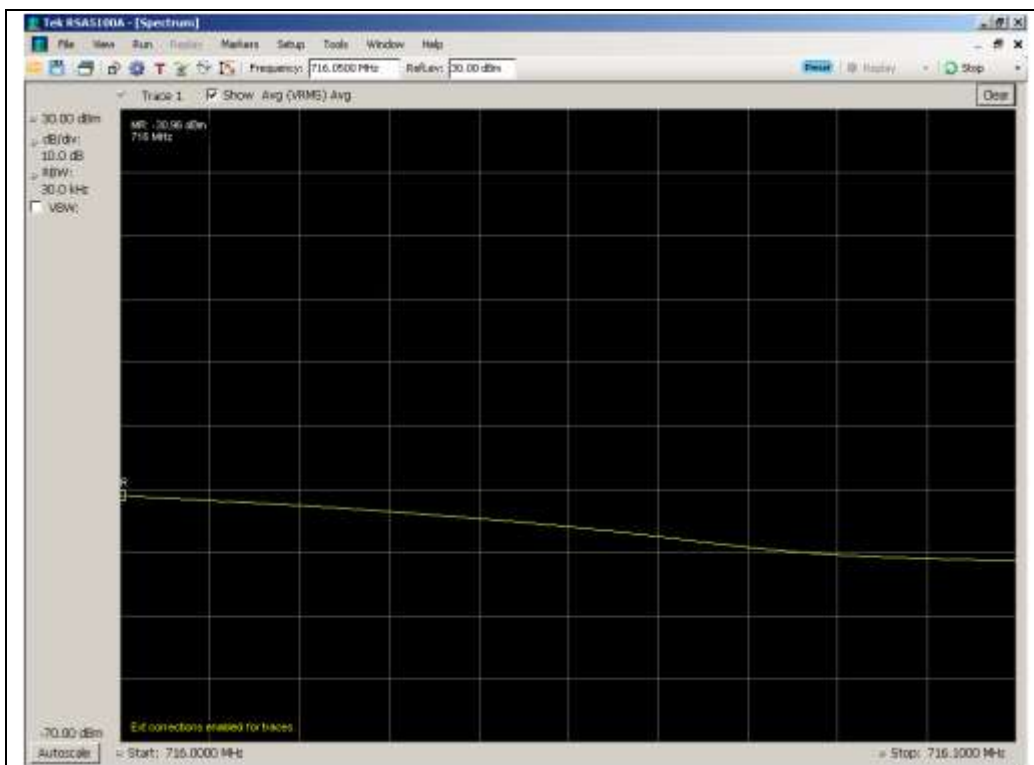
## GSM Uplink Test Plots

704 - 716 MHz Band

Lower Band Edge



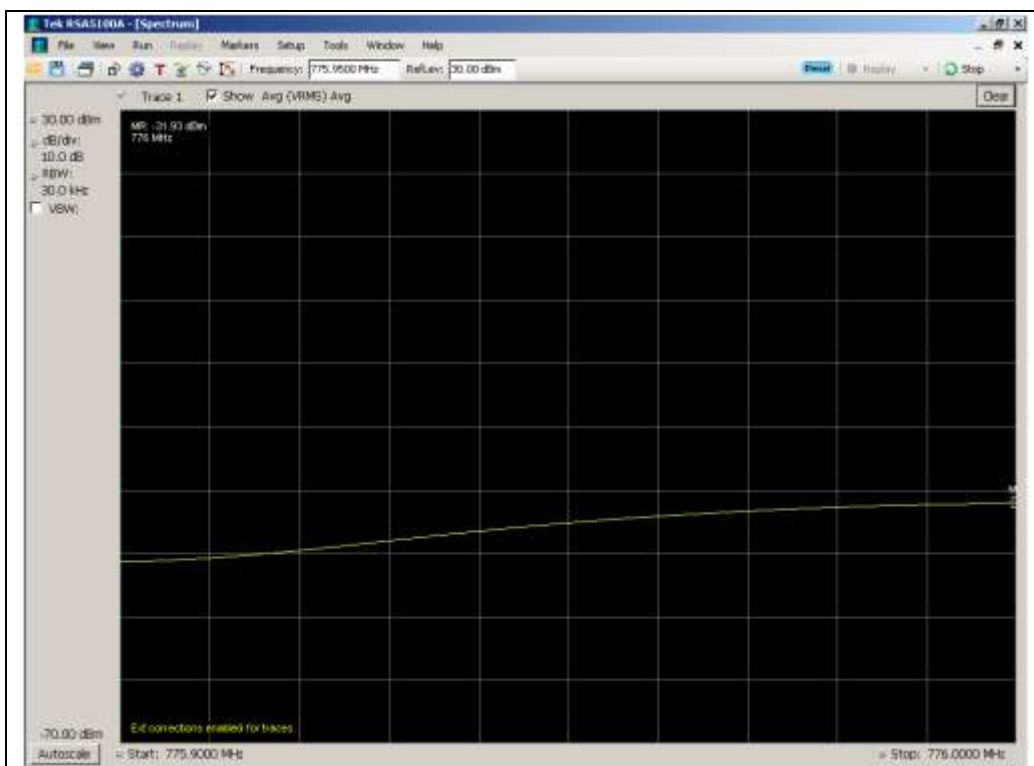
Upper Band Edge



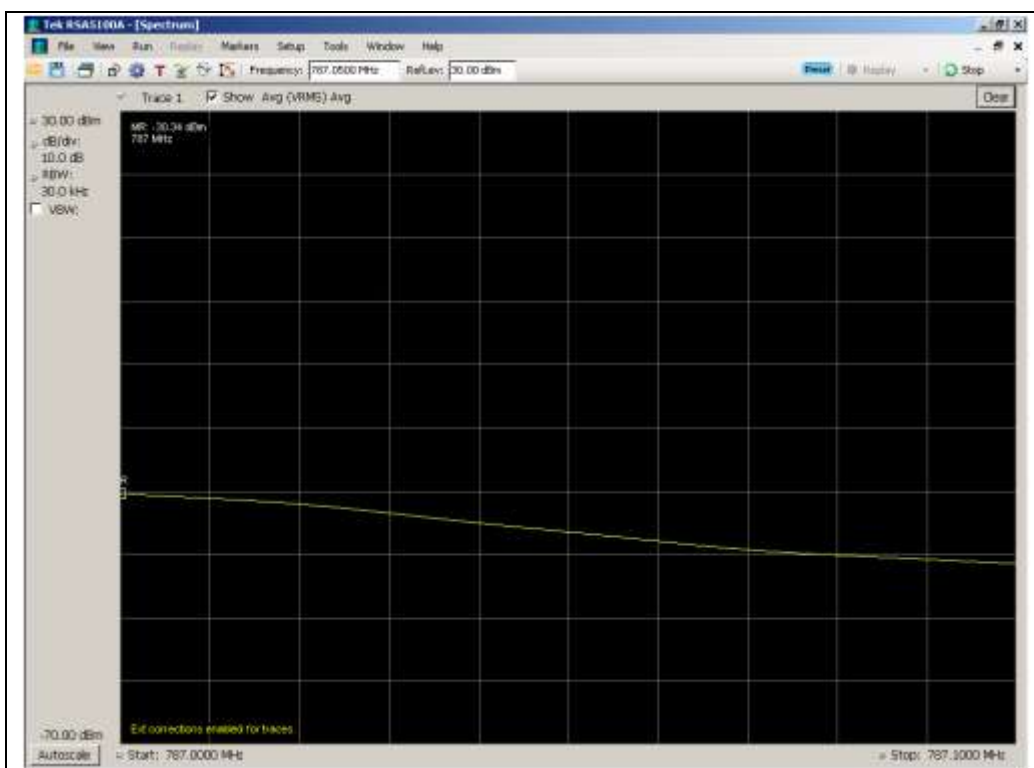


### 776 - 787 MHz Band

#### Lower Band Edge



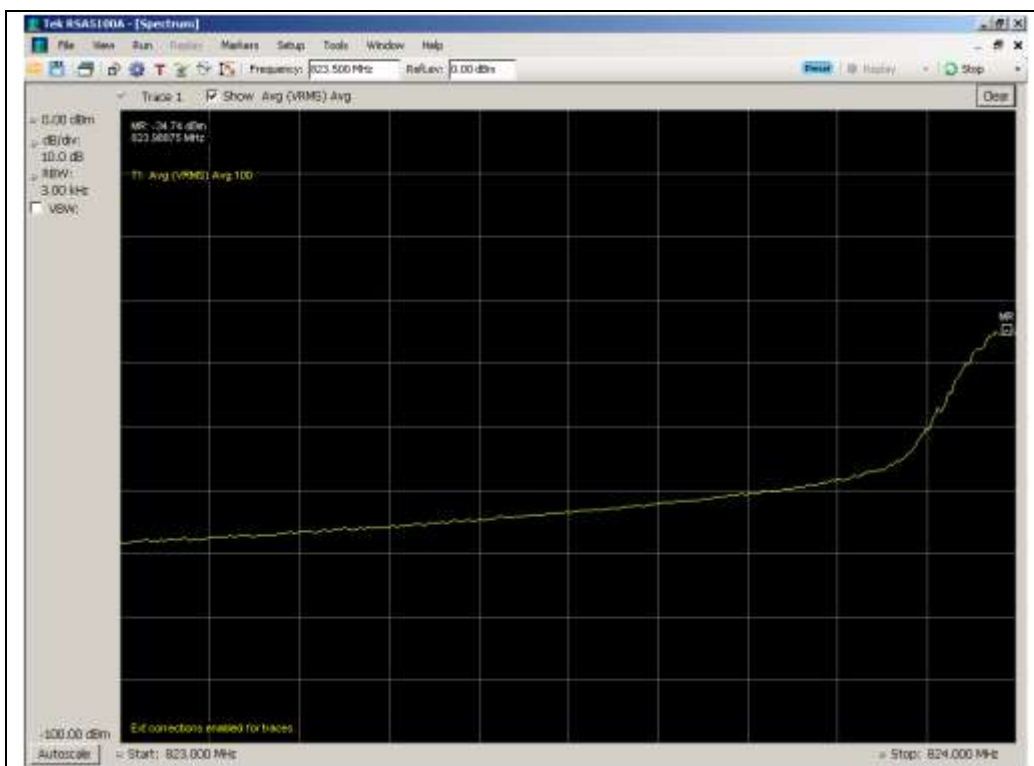
#### Upper Band Edge



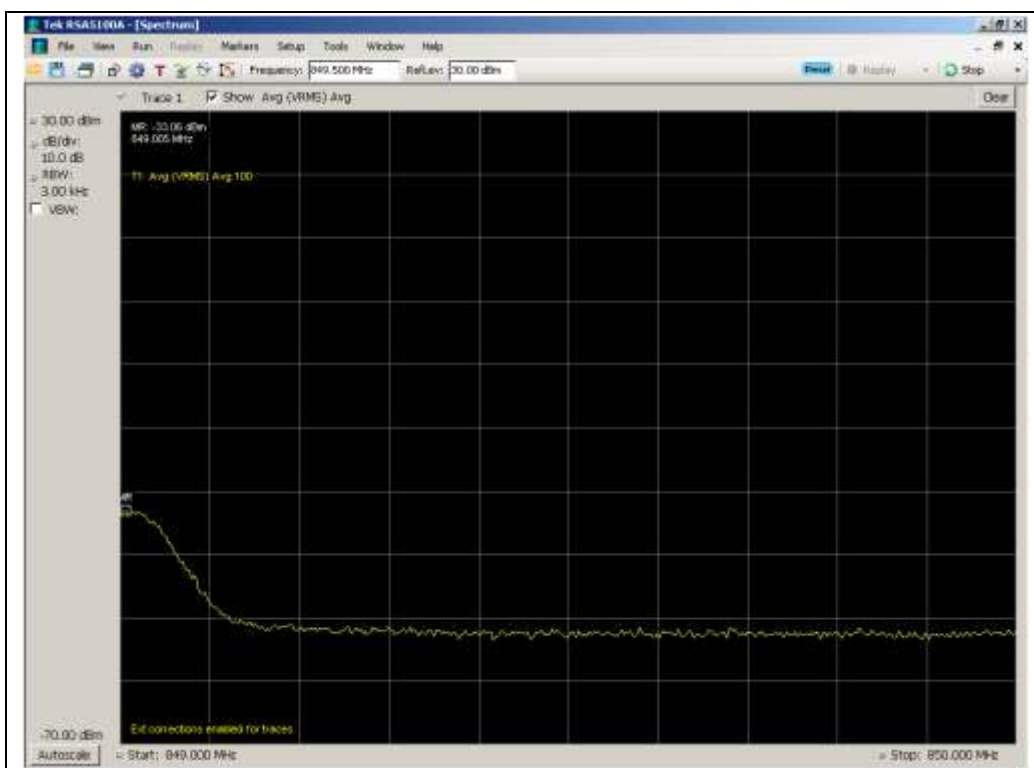


### 824 - 849 MHz Band

#### Lower Band Edge



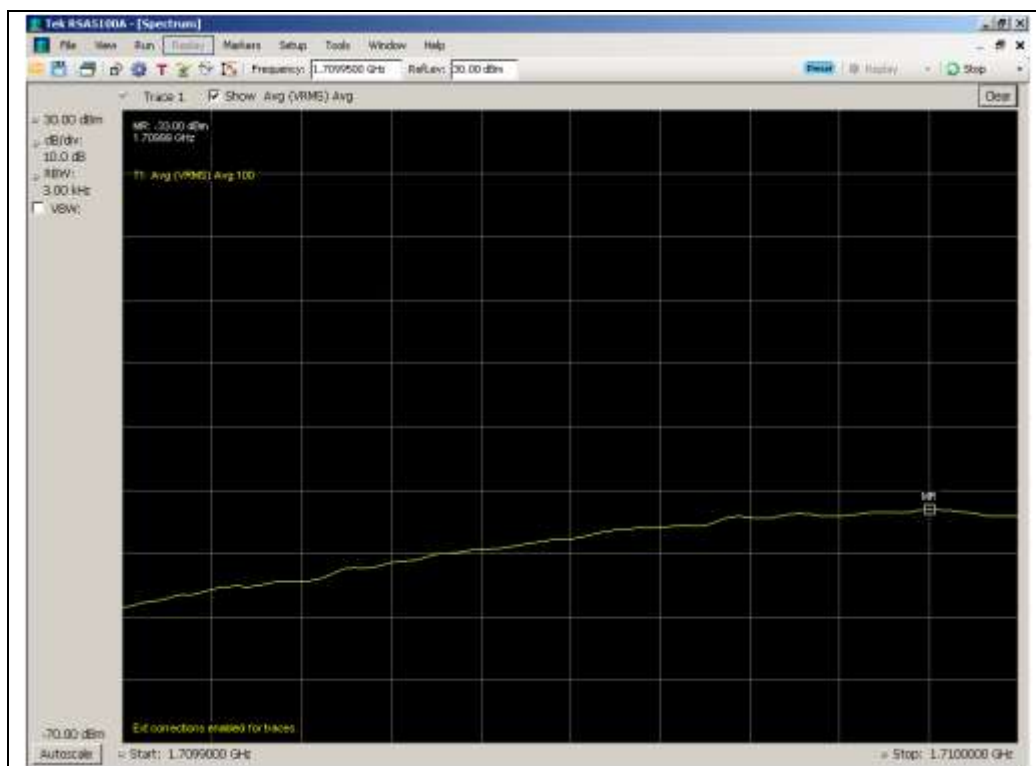
#### Upper Band Edge



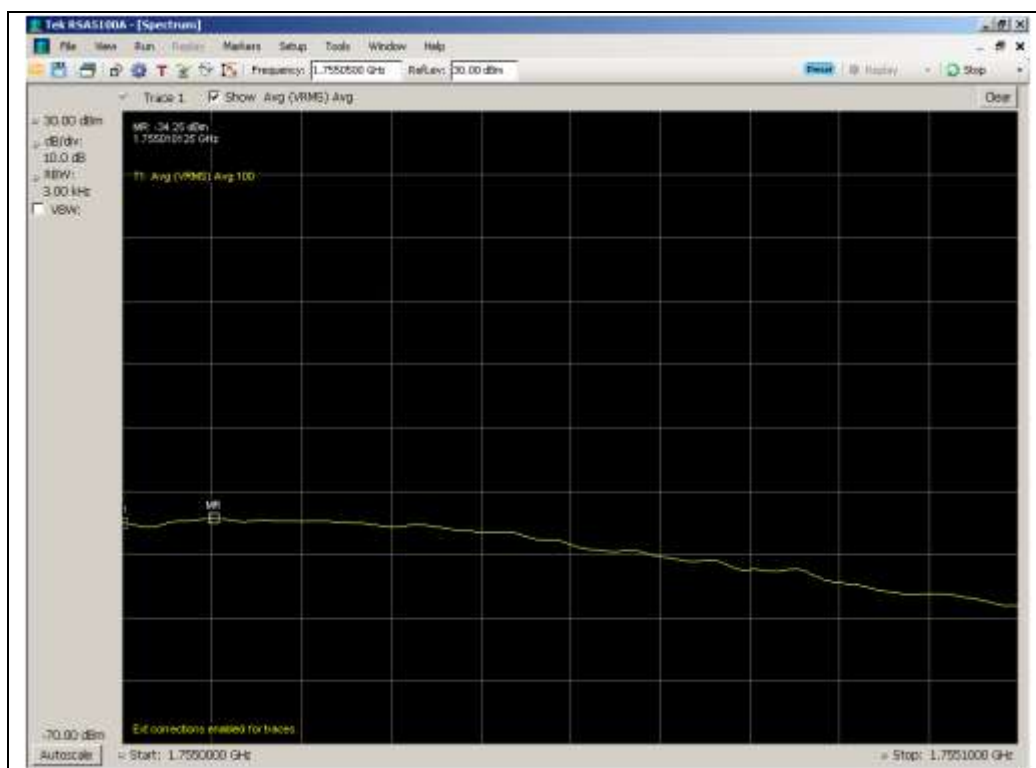


### 1710 - 1755 MHz Band

#### Lower Band Edge



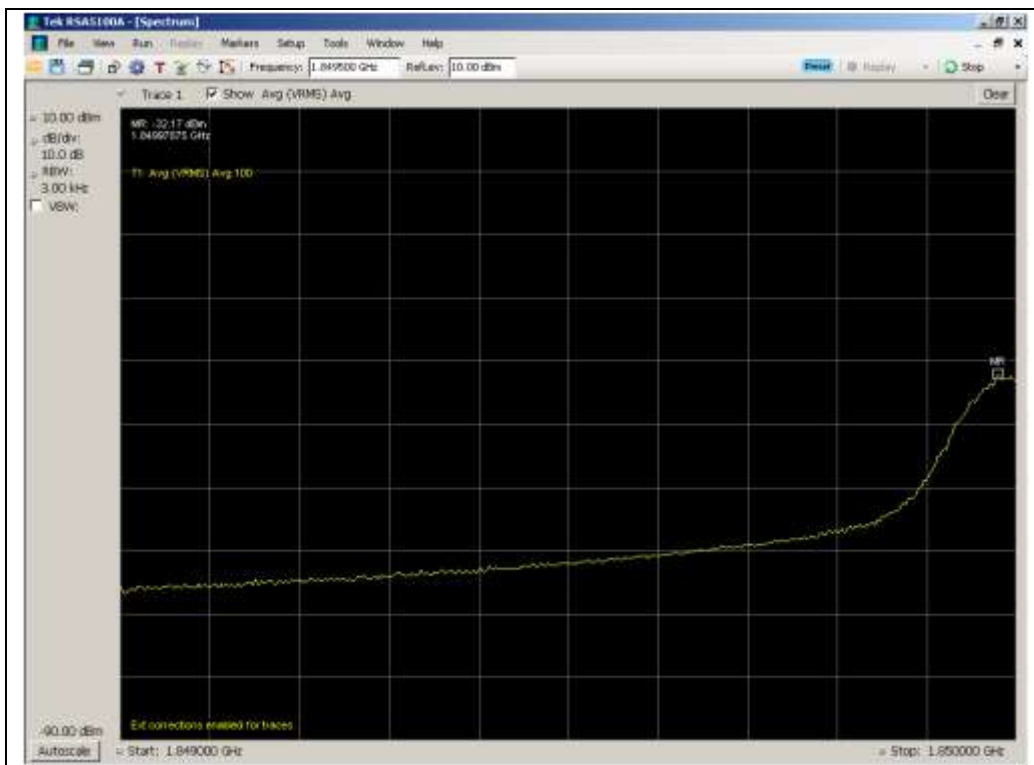
#### Upper Band Edge



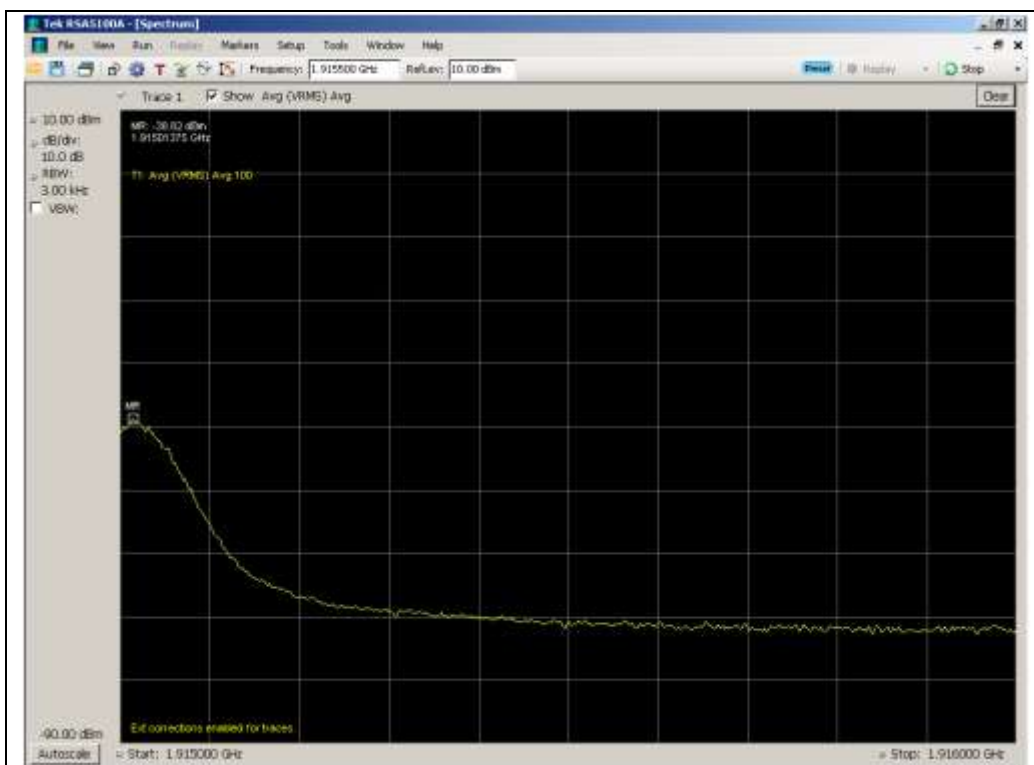


### 1850 - 1915 MHz Band

#### Lower Band Edge



#### Upper Band Edge

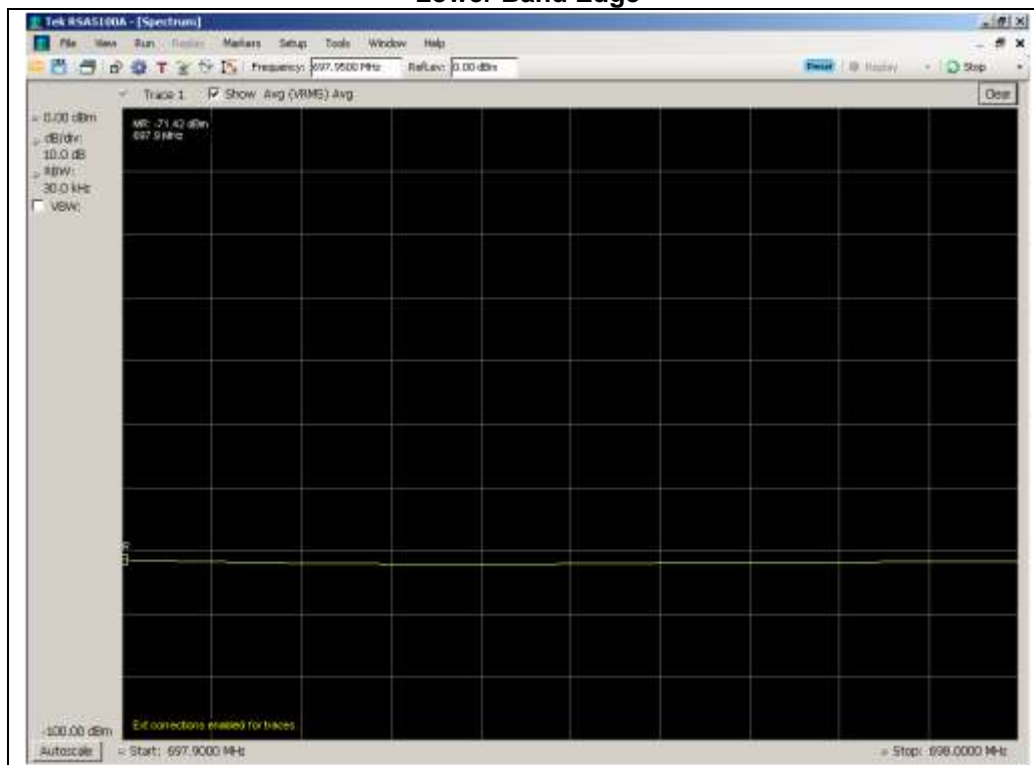




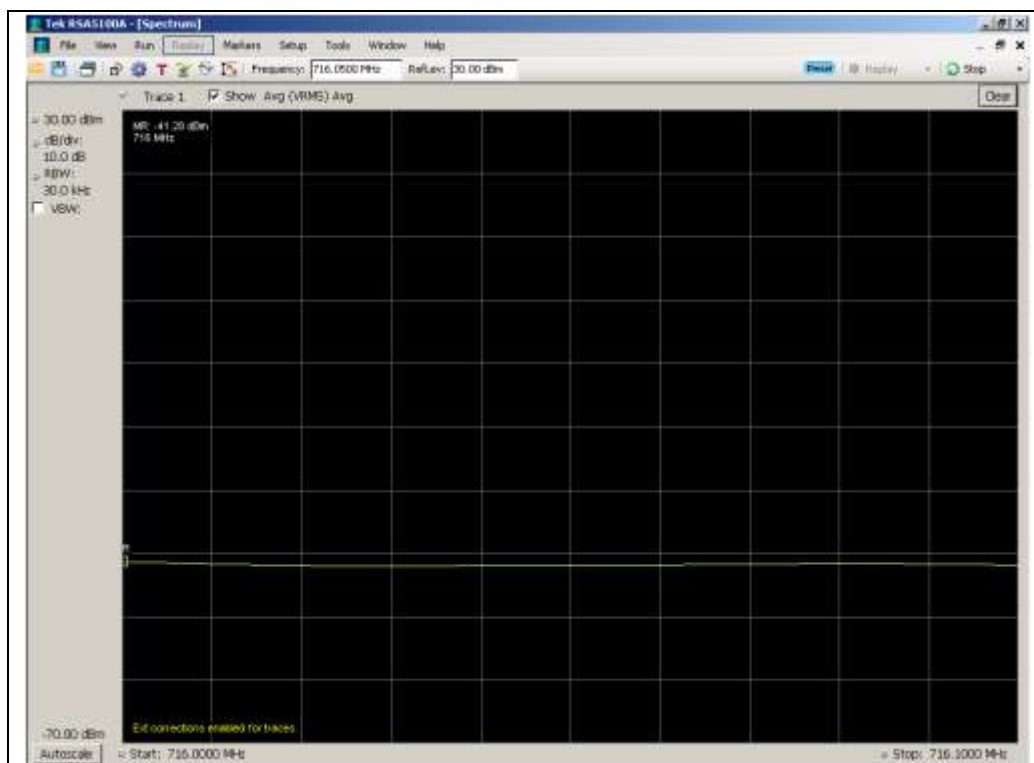
## CDMA Uplink Test Plots

704 - 716 MHz Band

Lower Band Edge

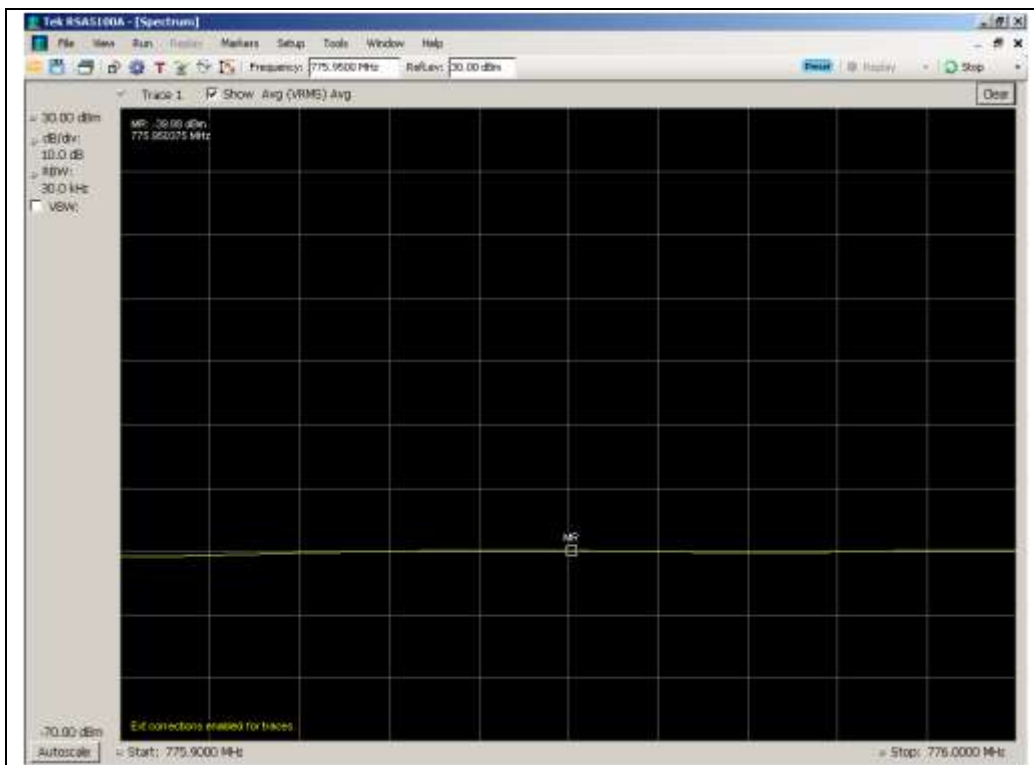


Upper Band Edge

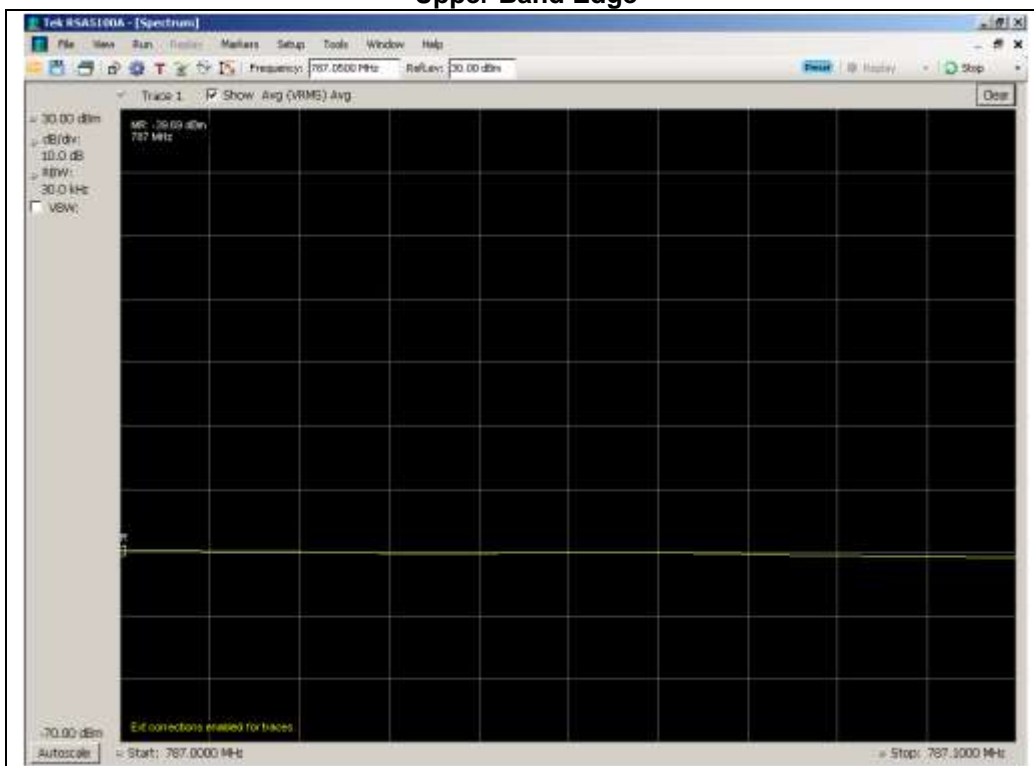




### 776 - 787 MHz Band Lower Band Edge



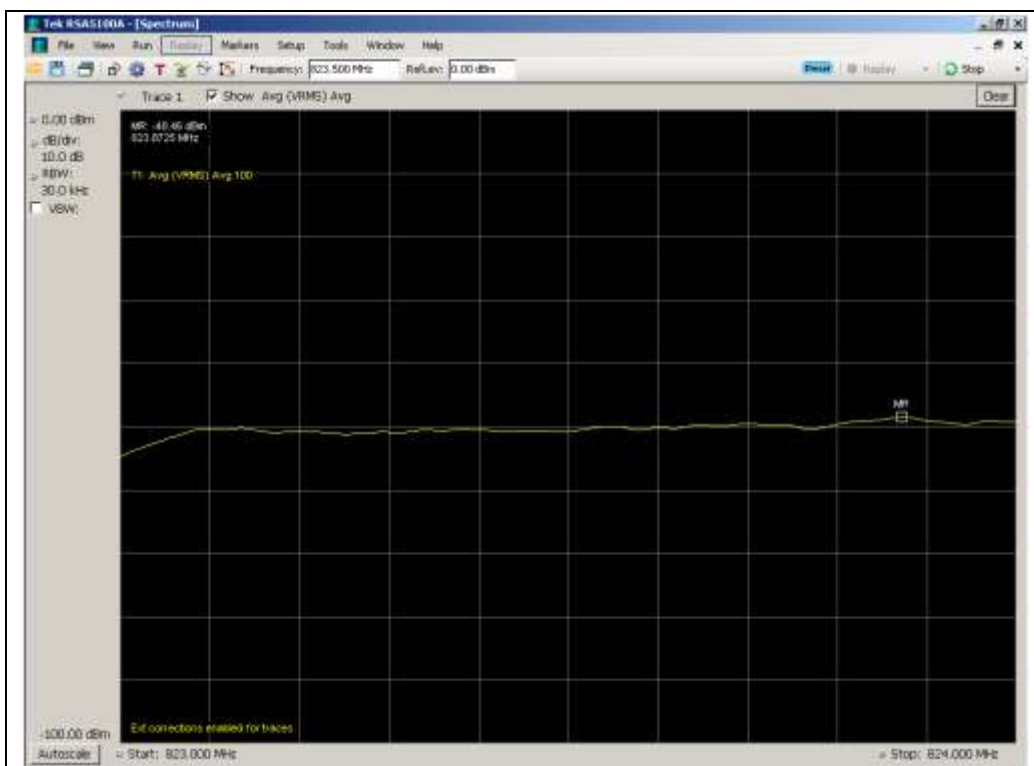
Upper Band Edge



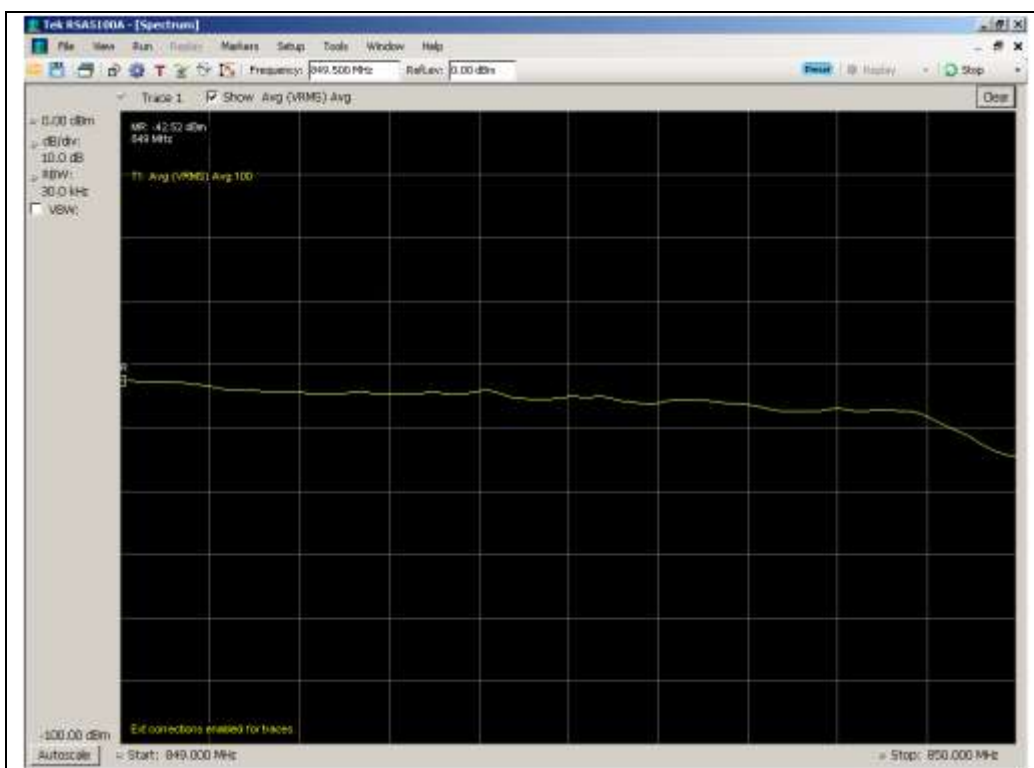


### 824 - 849 MHz Band

#### Lower Band Edge



#### Upper Band Edge

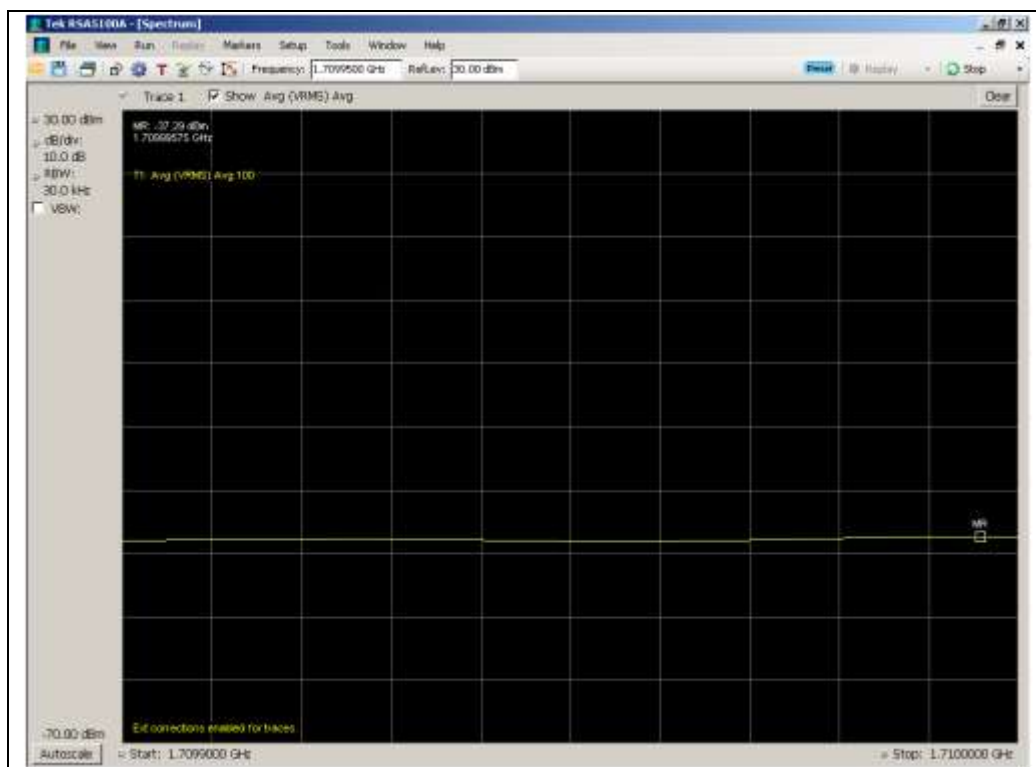




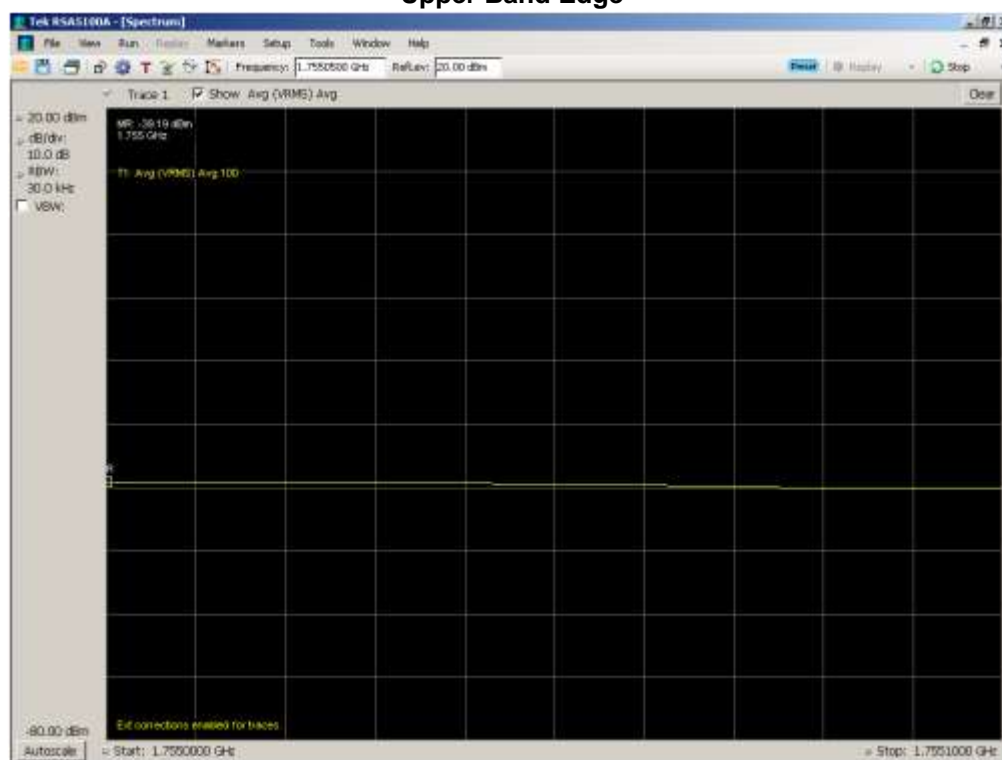


### 1710 - 1755 MHz Band

#### Lower Band Edge



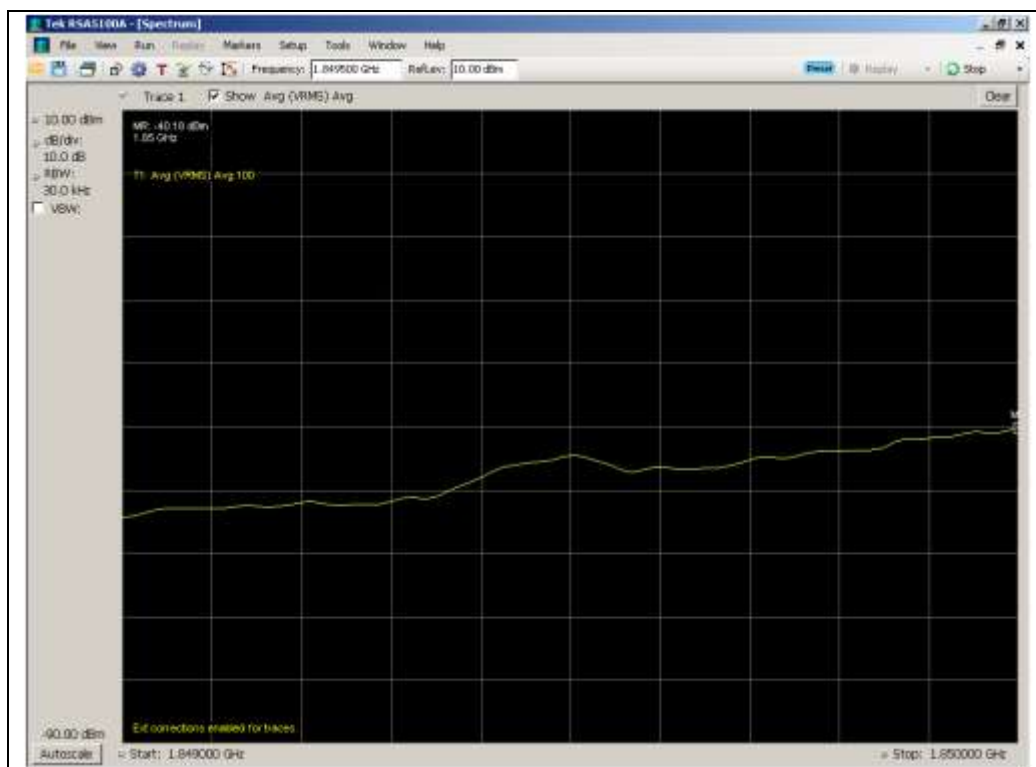
#### Upper Band Edge



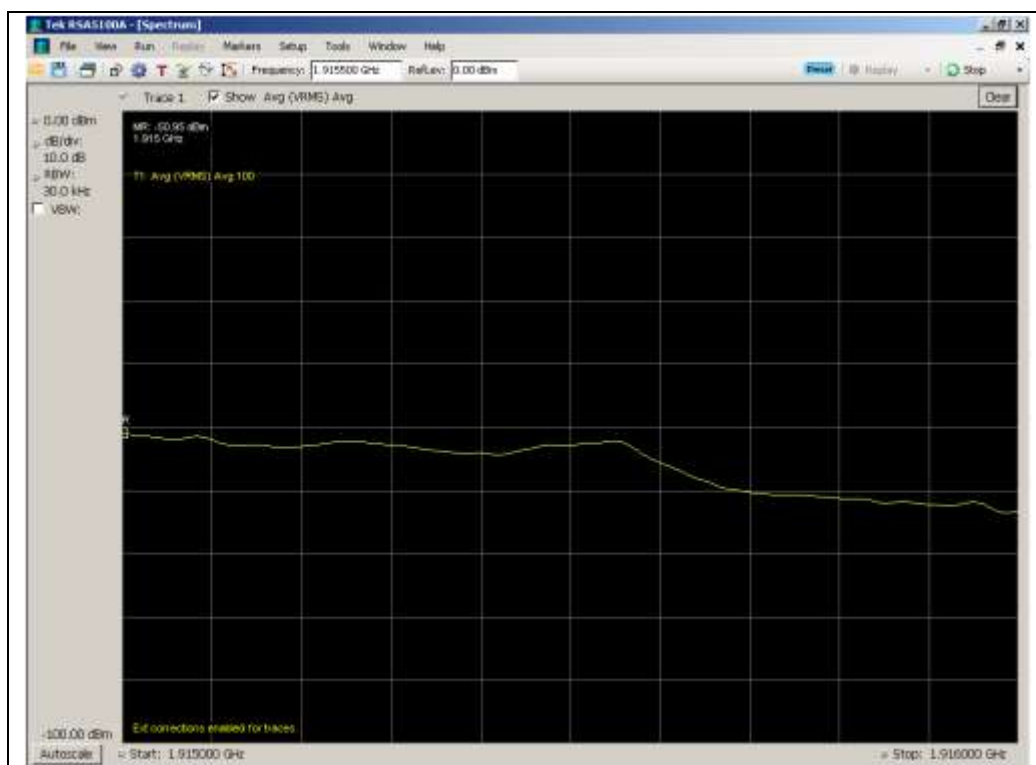


### 1850 - 1915 MHz Band

#### Lower Band Edge

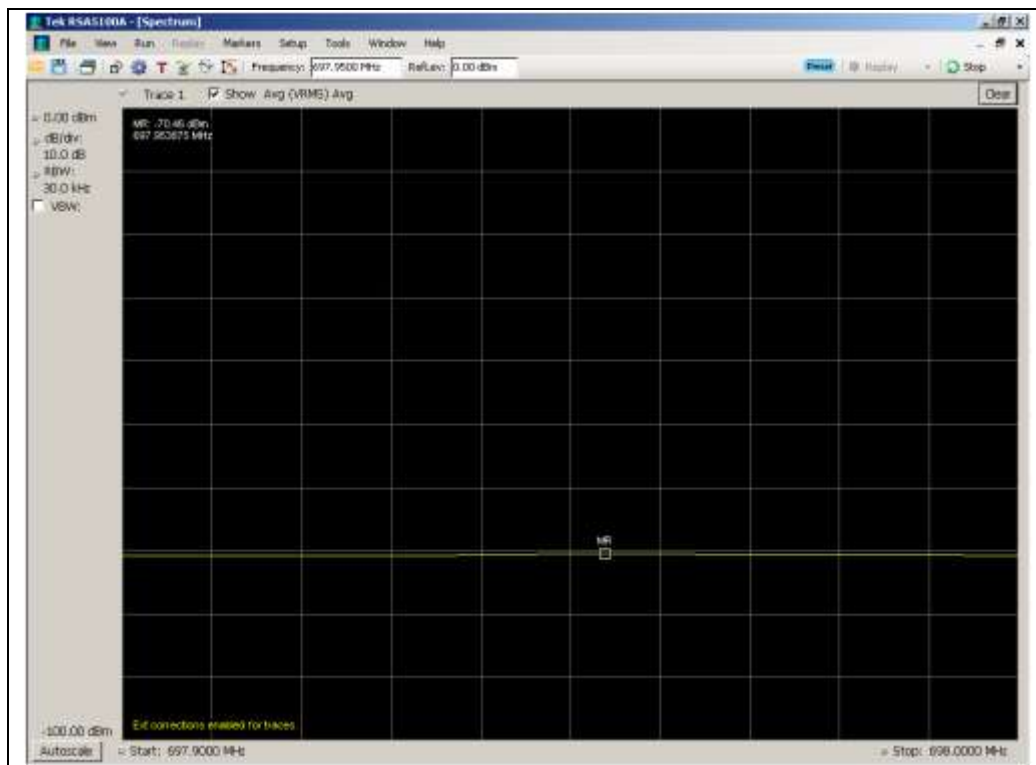


#### Upper Band Edge

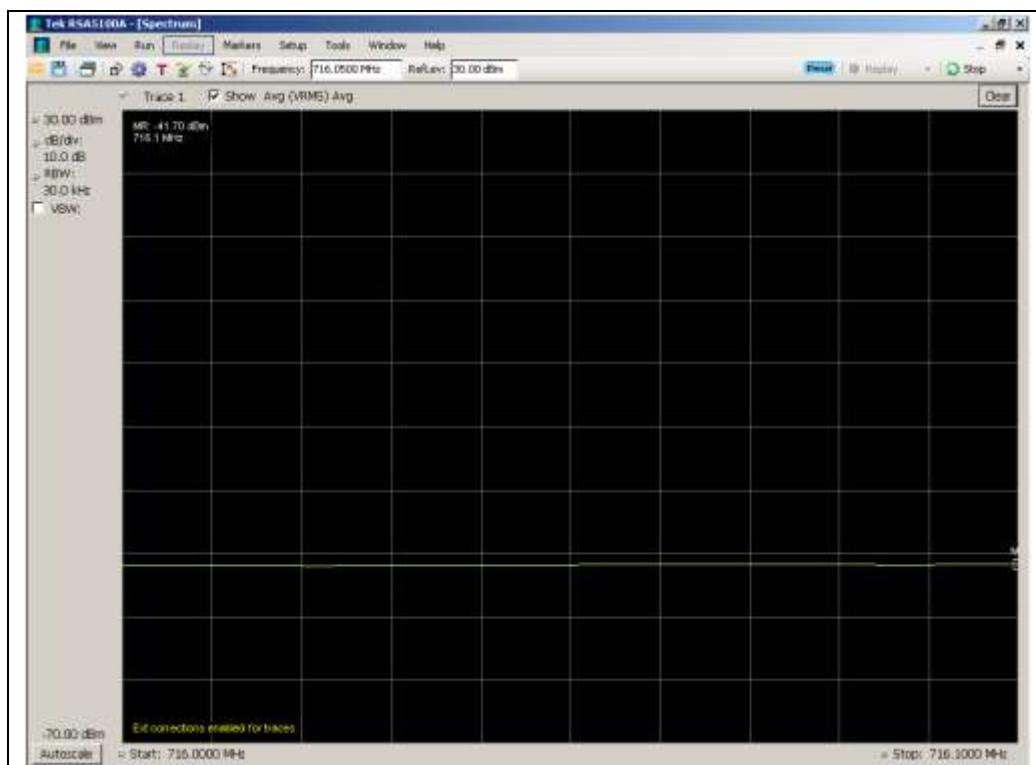




### WCDMA Uplink Test Plots 704 - 716 MHz Band Lower Band Edge



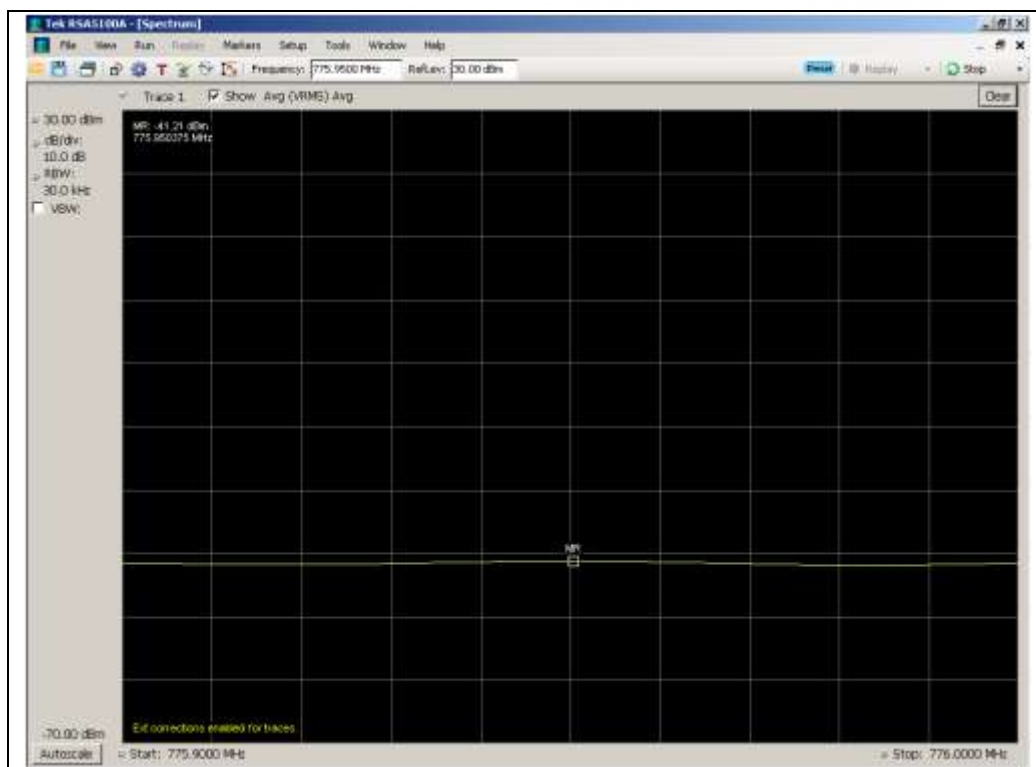
### Upper Band Edge



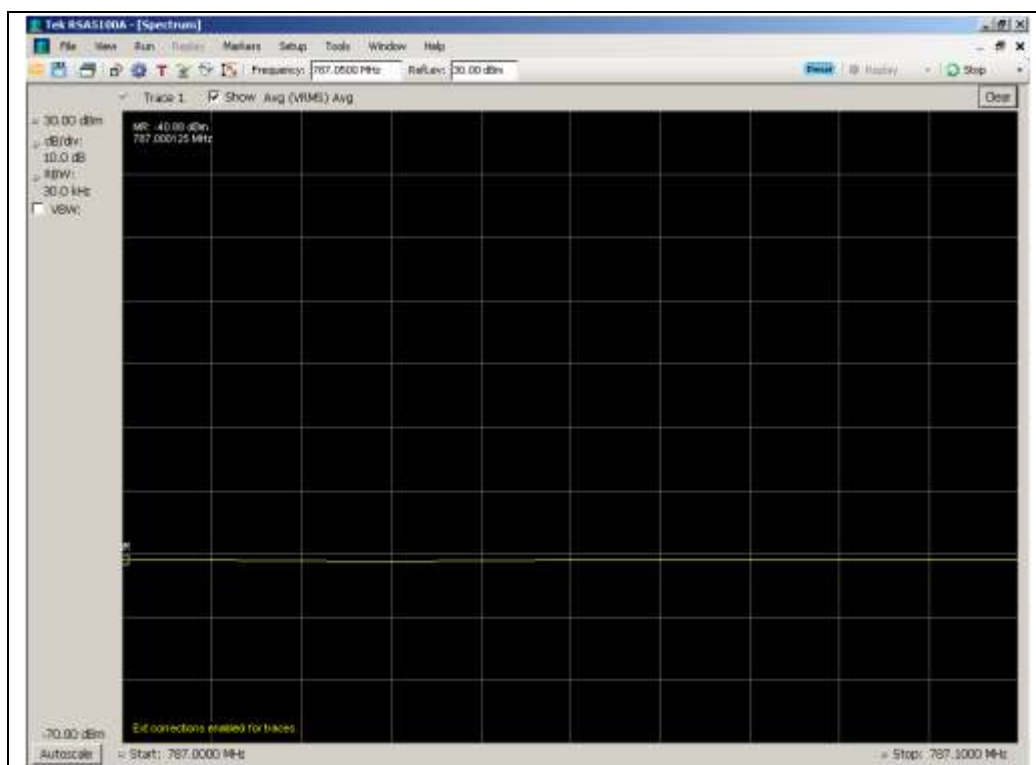


### 776 - 787 MHz Band

#### Lower Band Edge



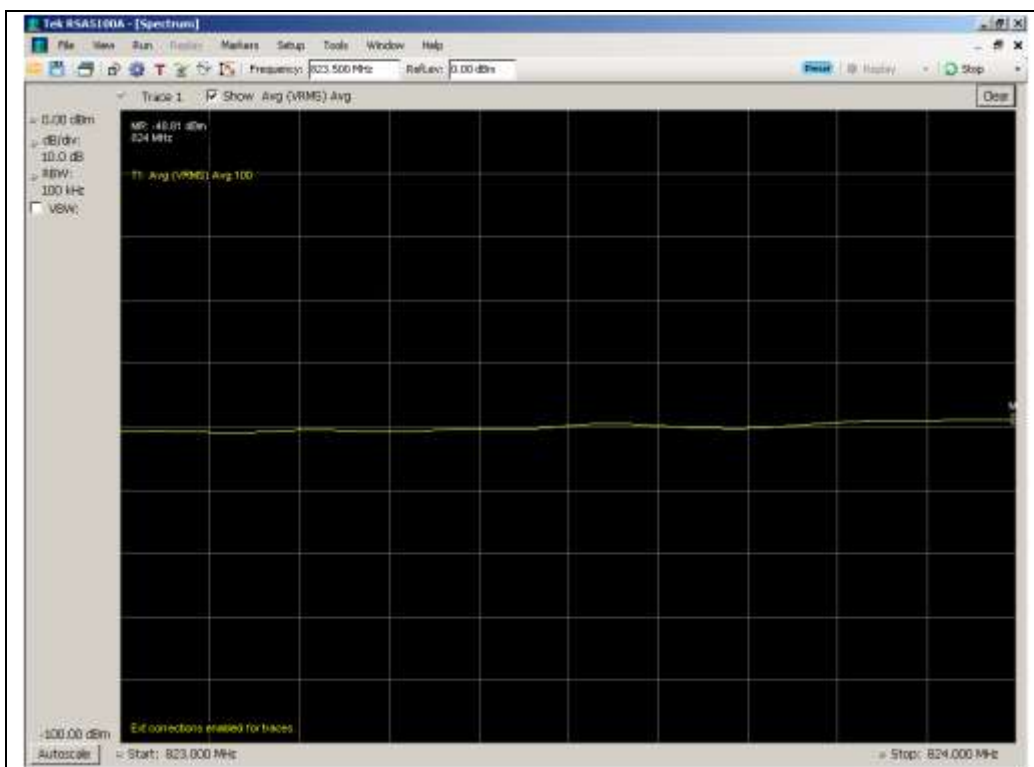
#### Upper Band Edge



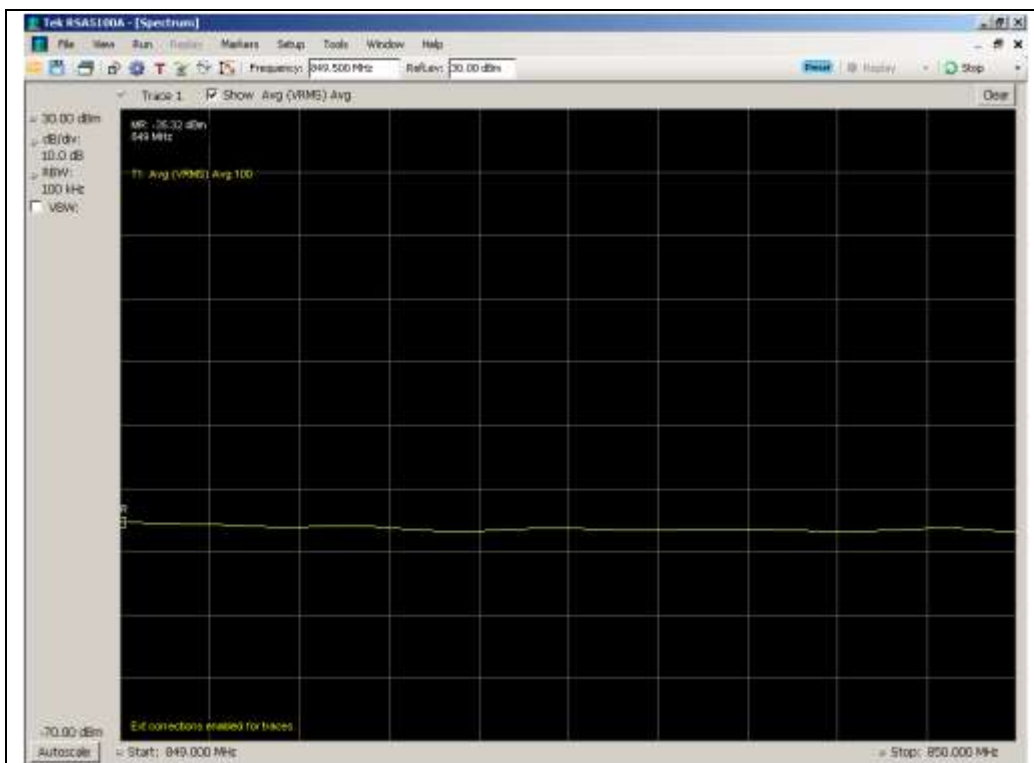


### 824 - 849 MHz Band

#### Lower Band Edge



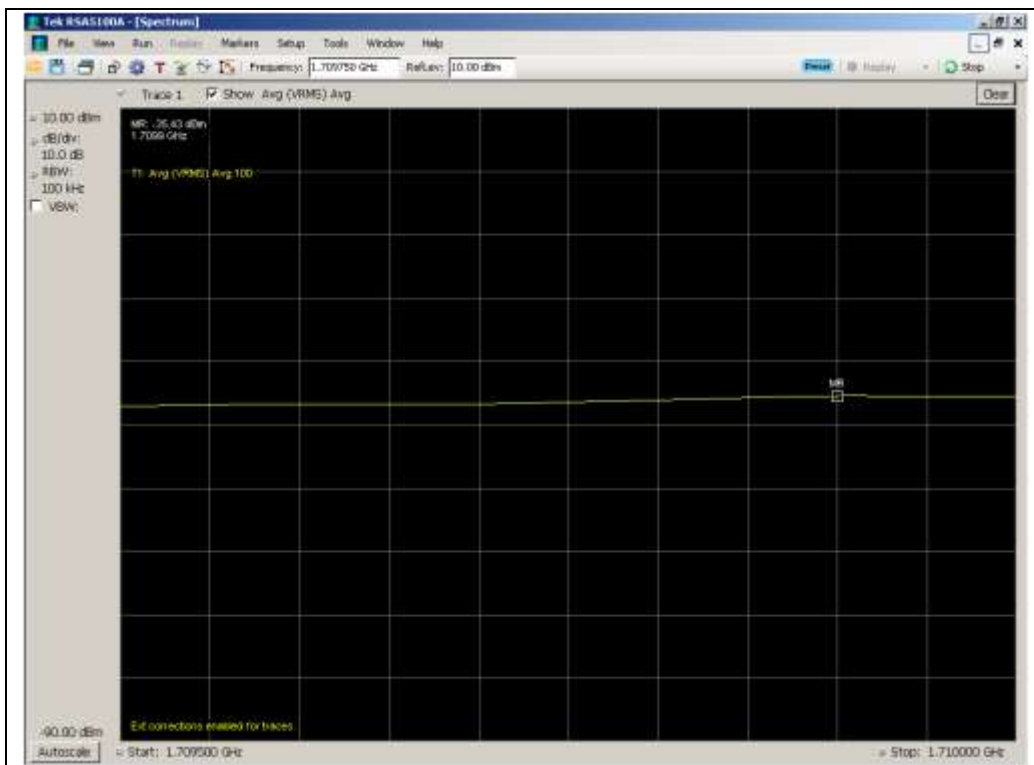
#### Upper Band Edge



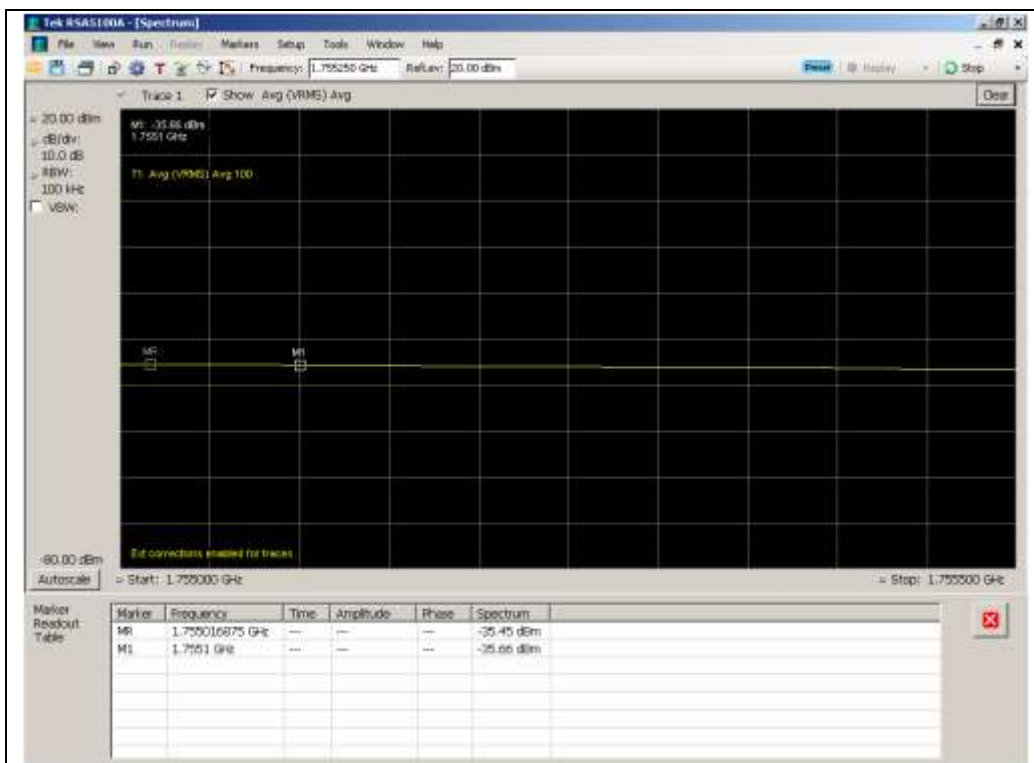


### 1710 - 1755 MHz Band

### Lower Band Edge



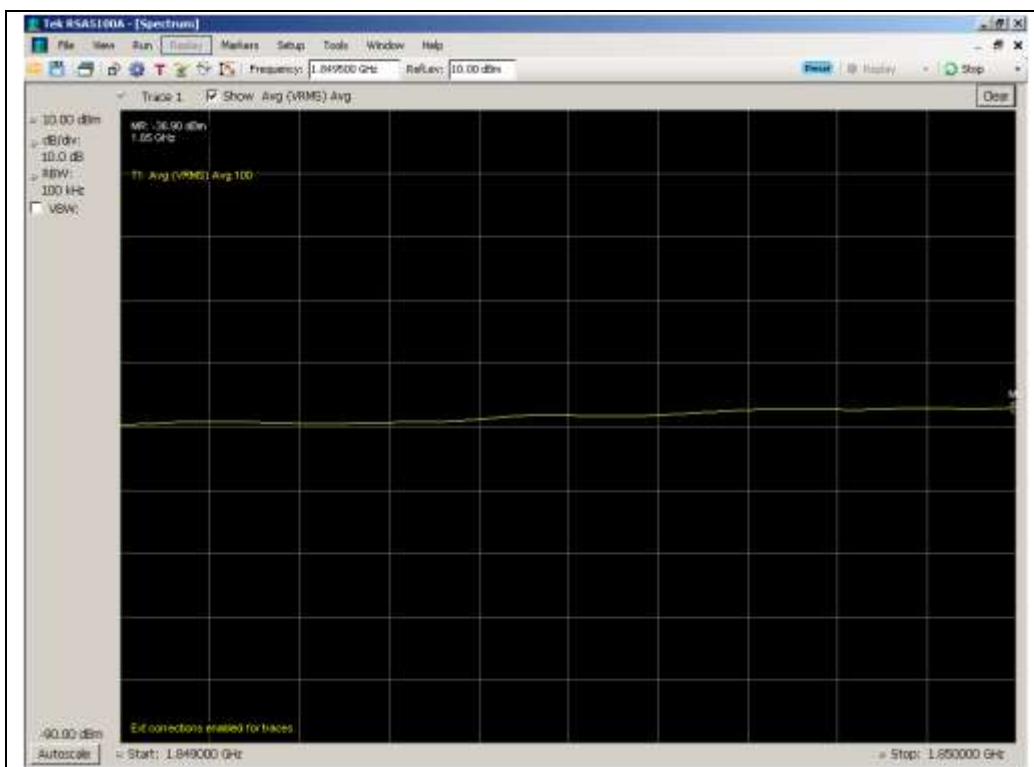
### Upper Band Edge



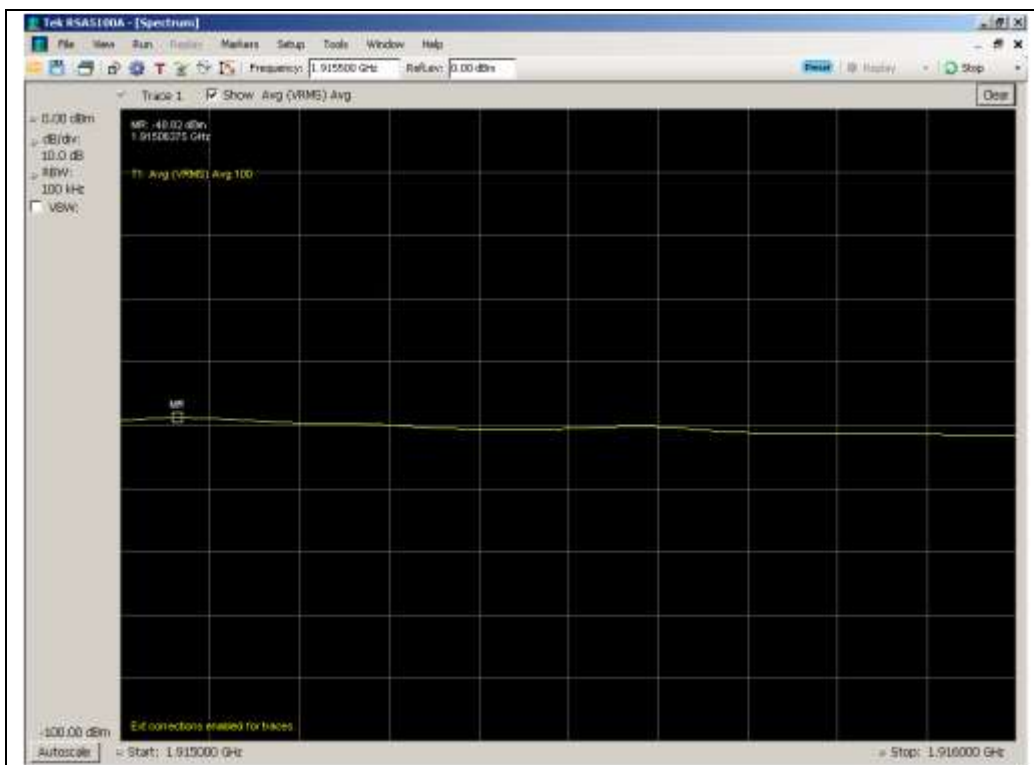


### 1850 - 1915 MHz Band

#### Lower Band Edge

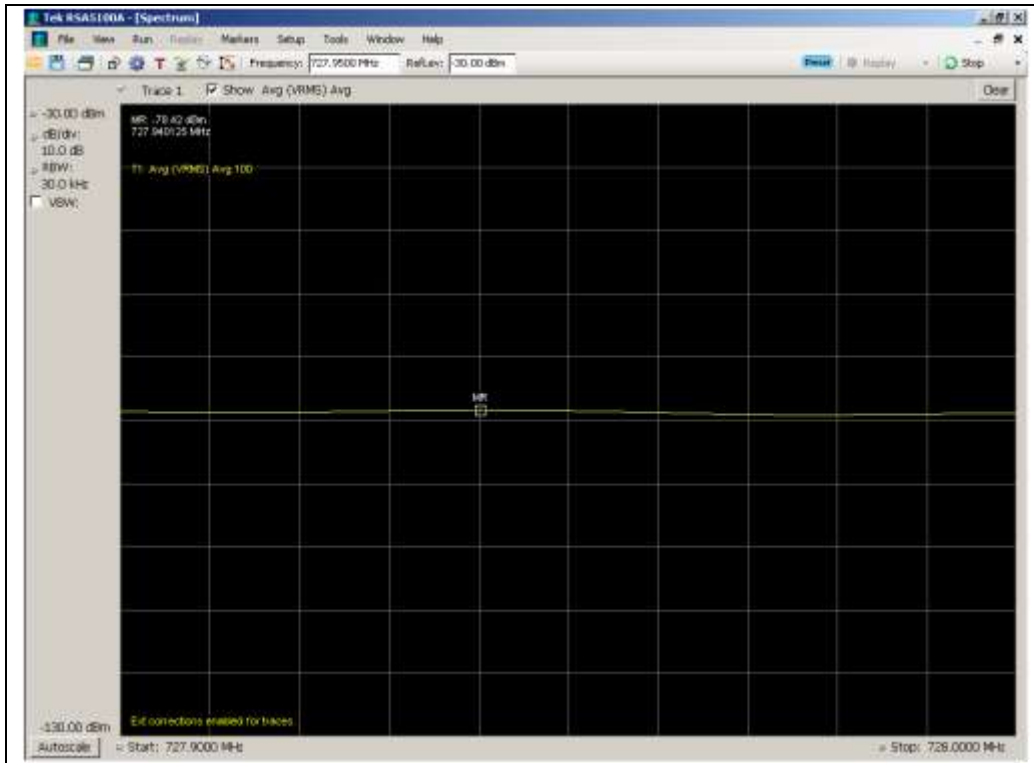


#### Upper Band Edge

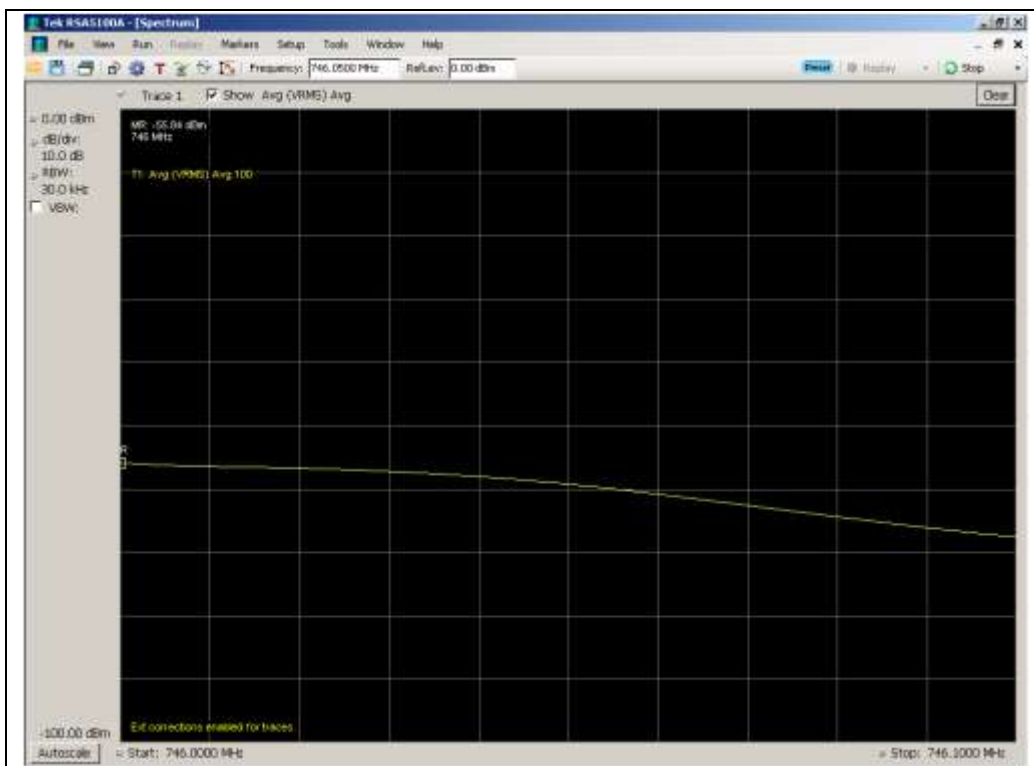




### GSM Downlink Test Plots 734 - 746 MHz Band Lower Band Edge



Upper Band Edge

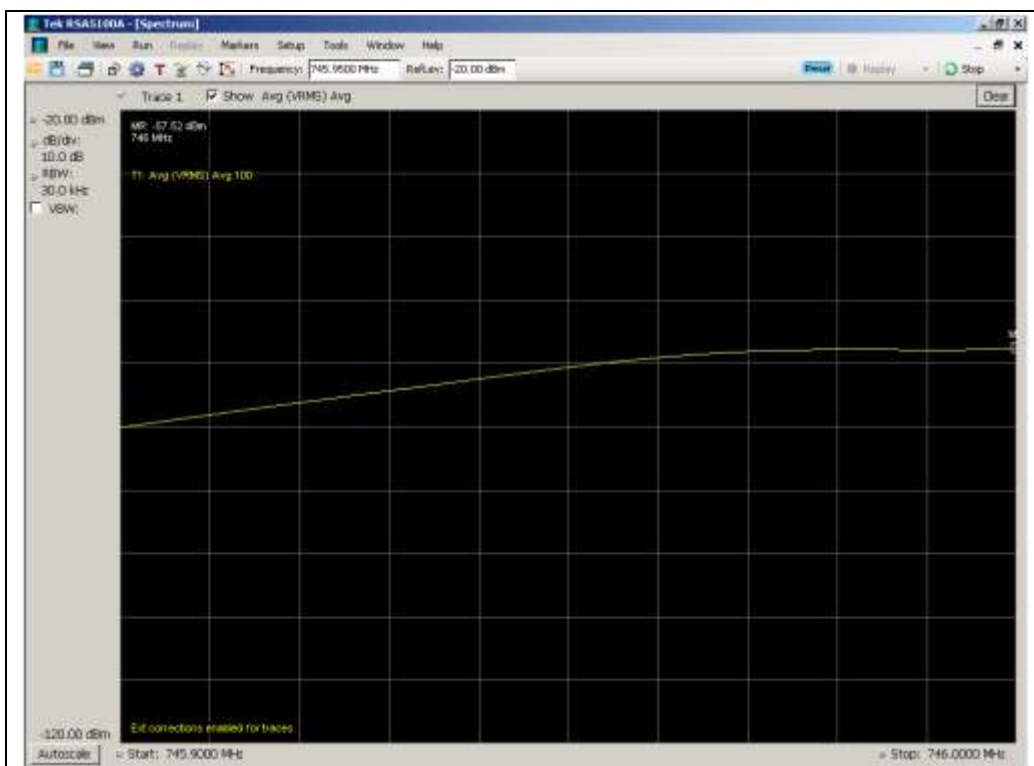




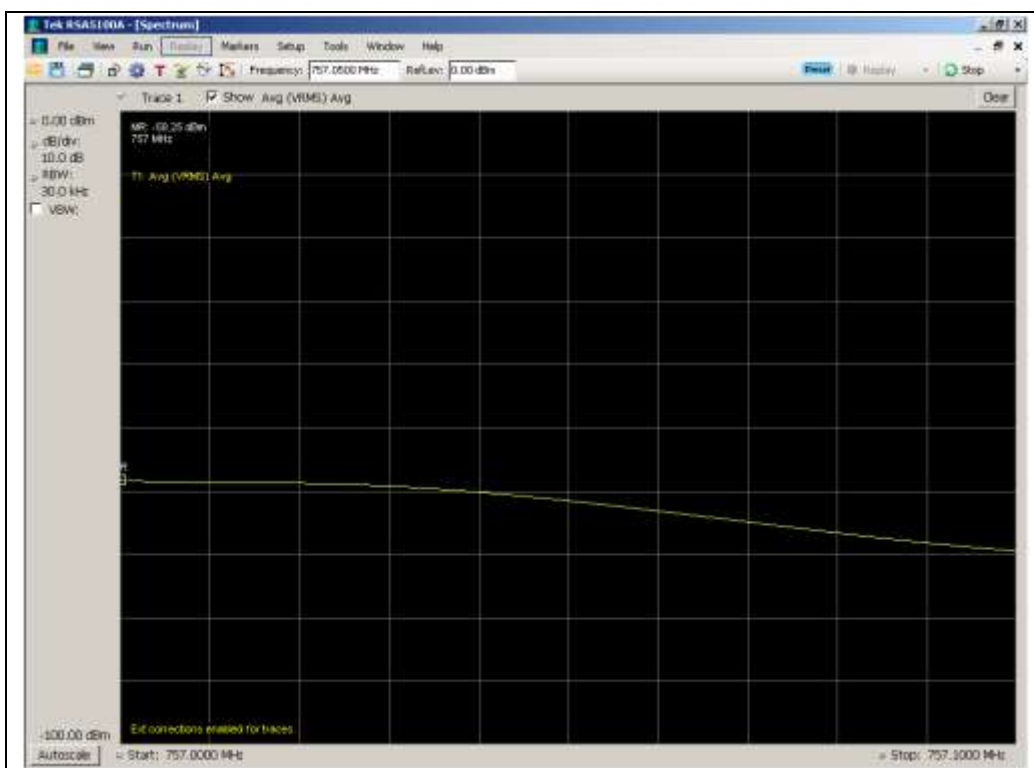


### 746 - 757 MHz Band

#### Lower Band Edge



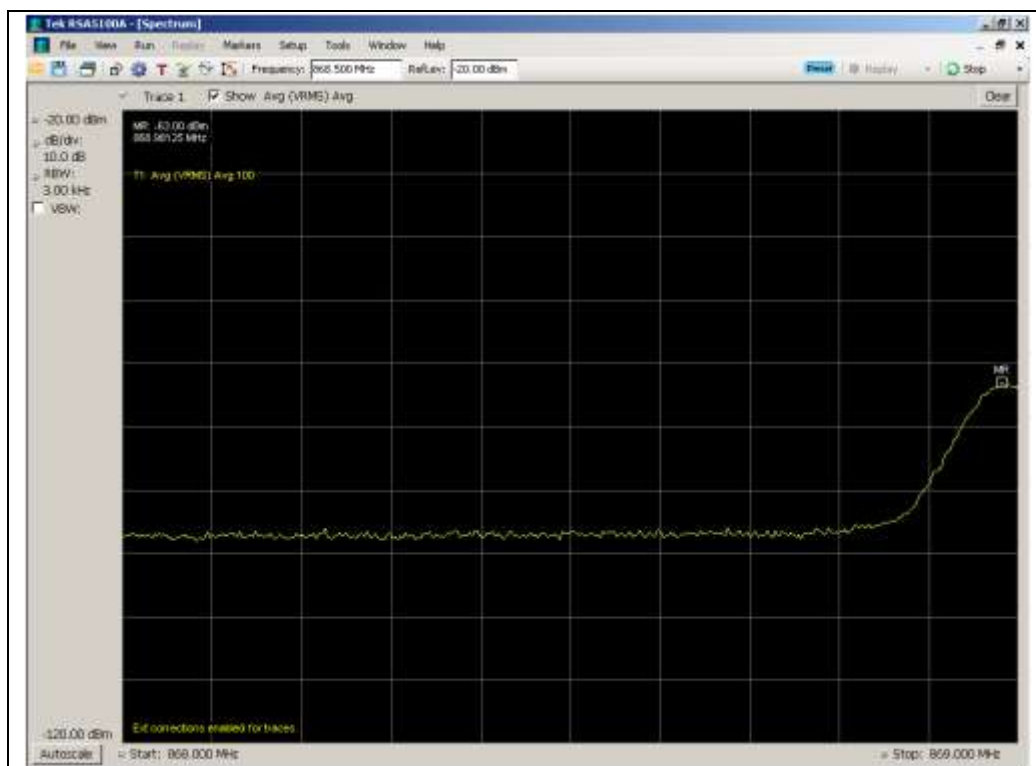
#### Upper Band Edge



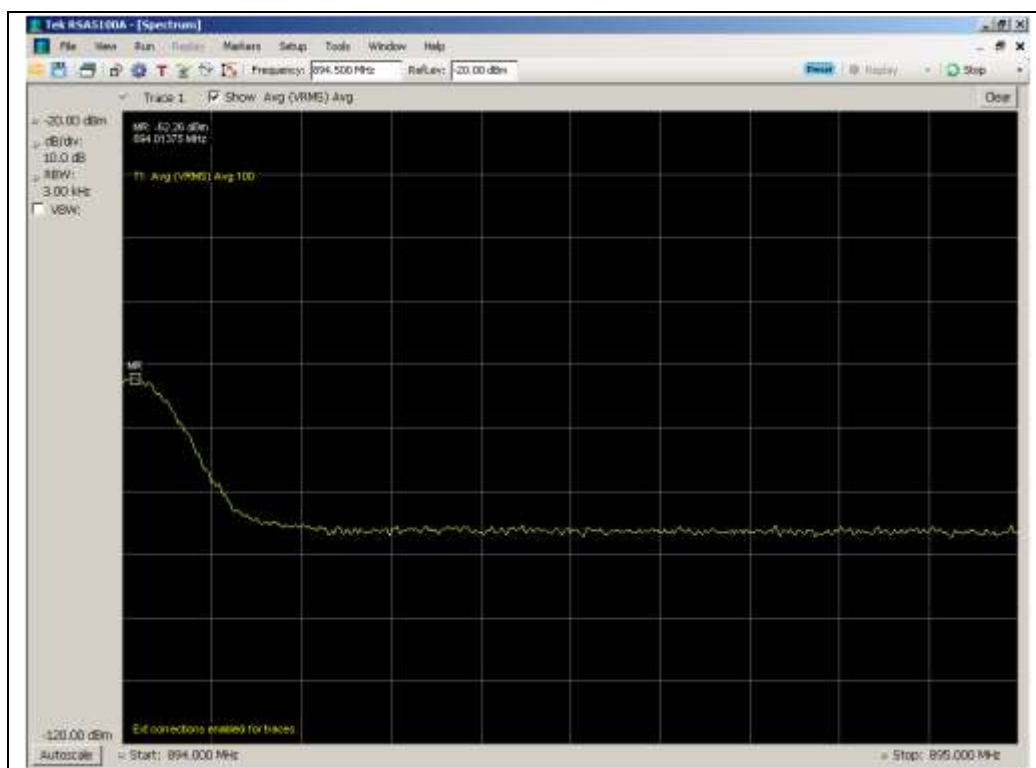


### 869 - 894 MHz Band

#### Lower Band Edge



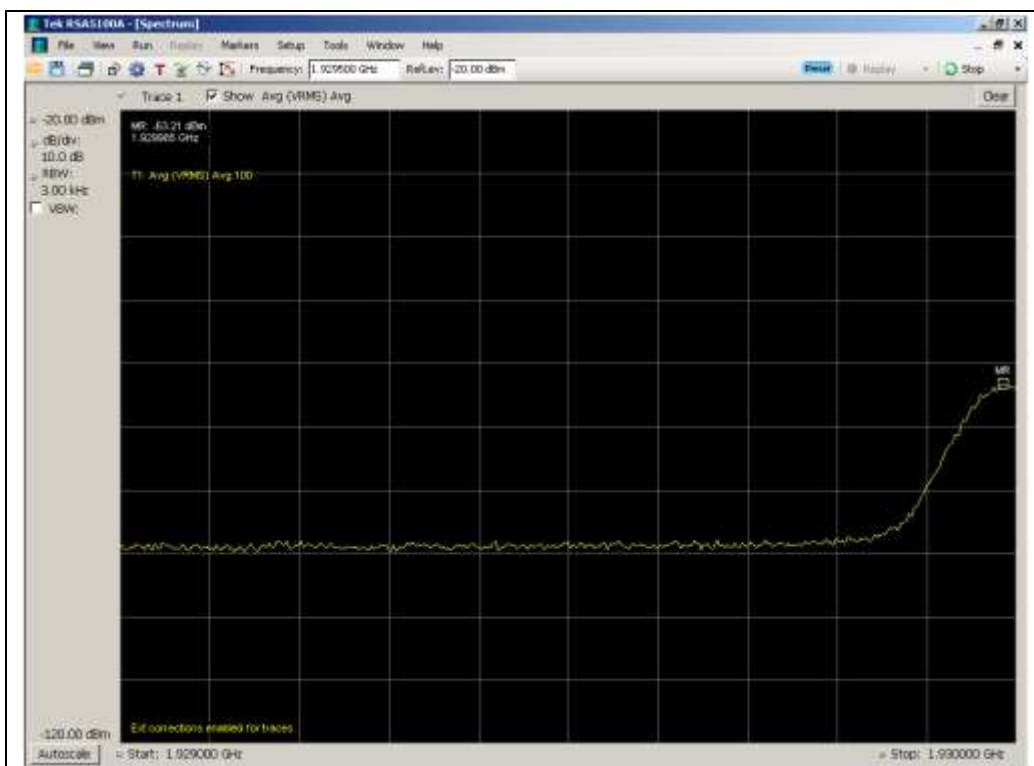
#### Upper Band Edge



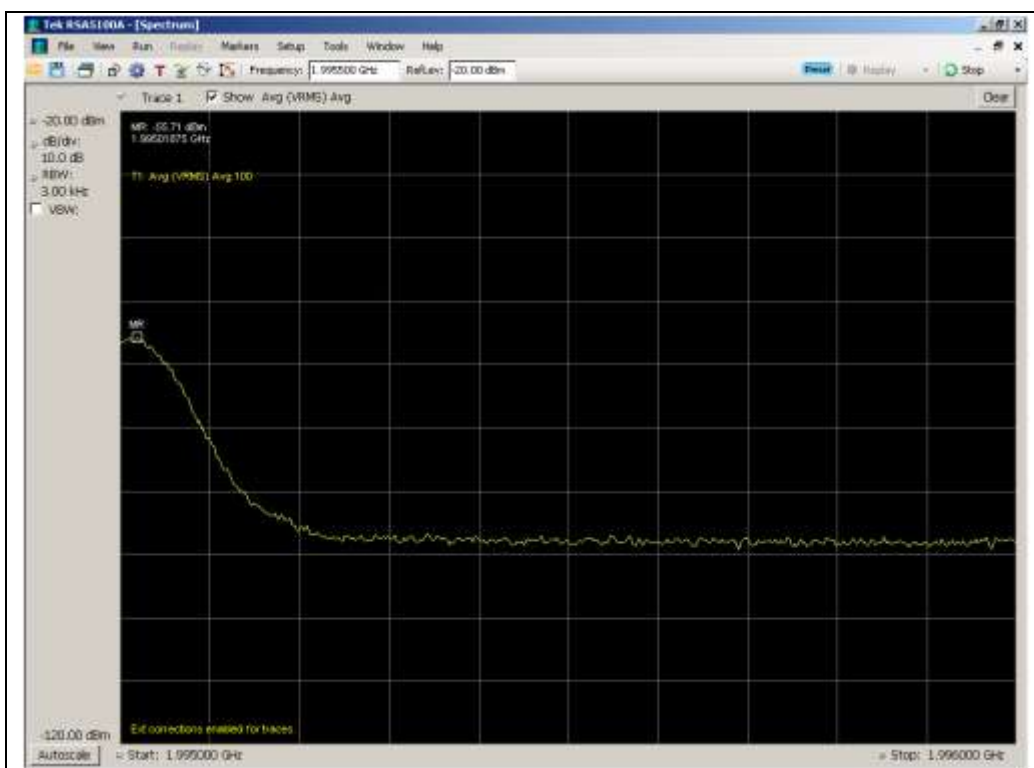


### 1930 - 1995 MHz Band

#### Lower Band Edge



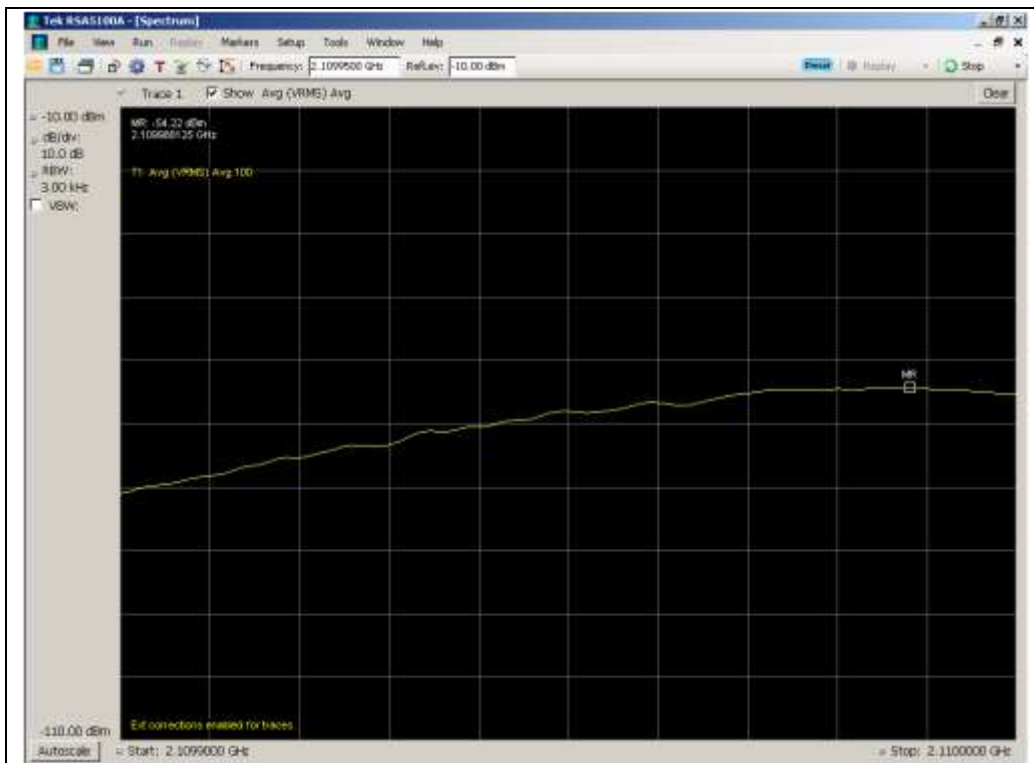
#### Upper Band Edge



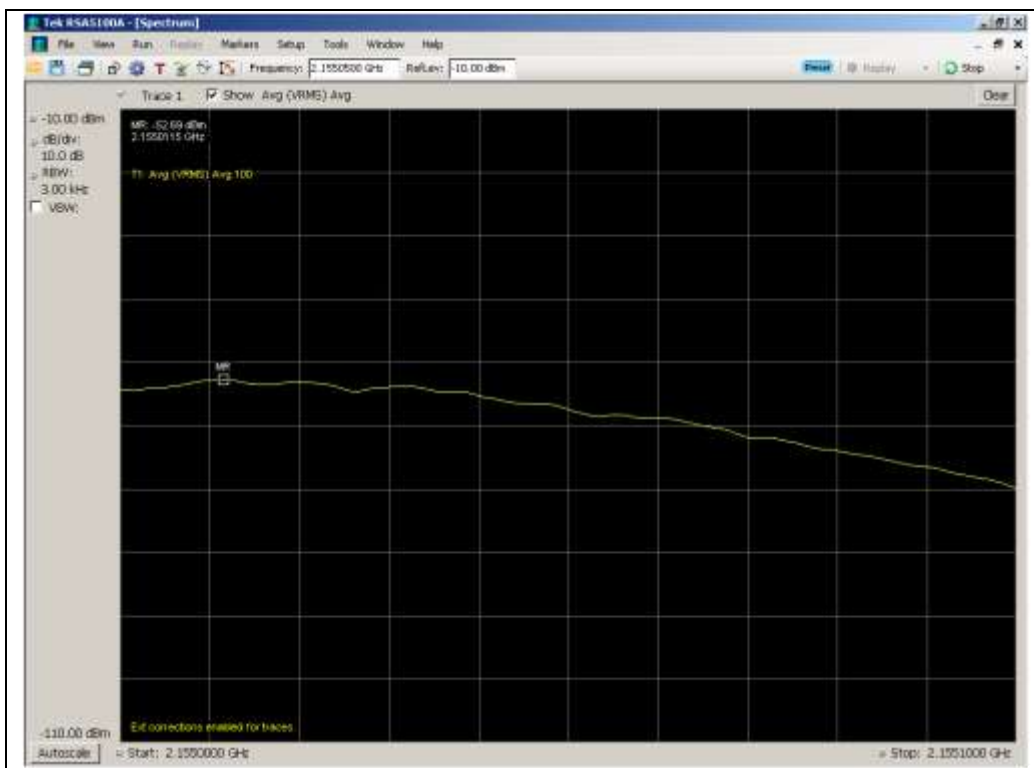


## 2110 - 2155 MHz Band

### Lower Band Edge



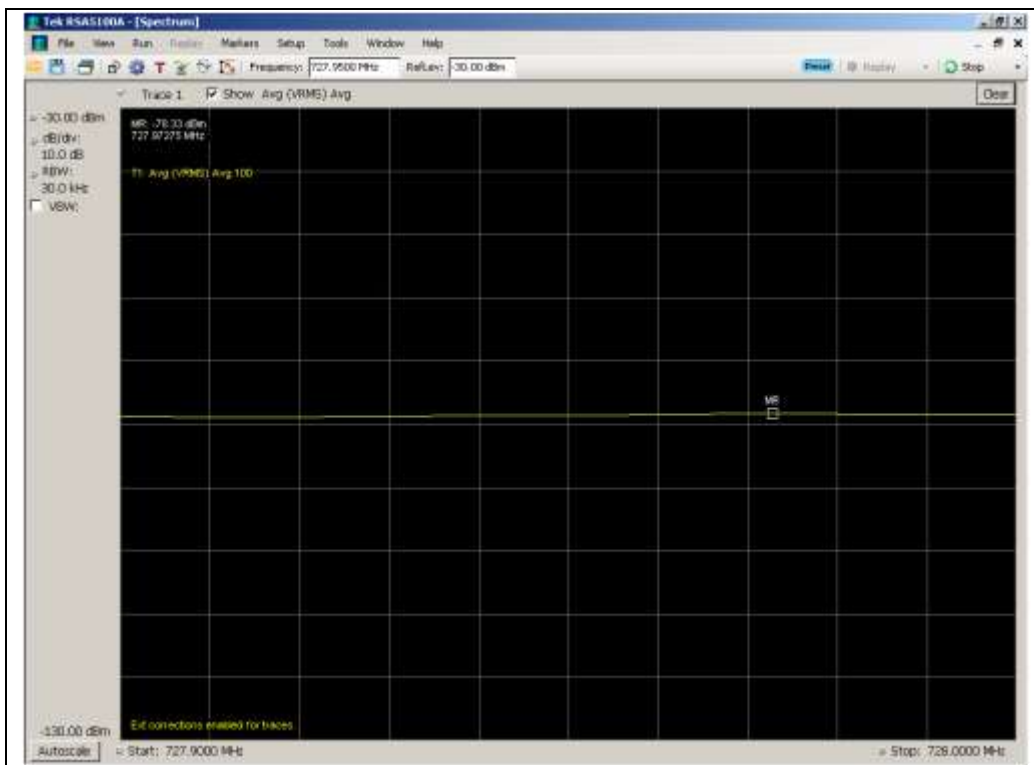
### Upper Band Edge



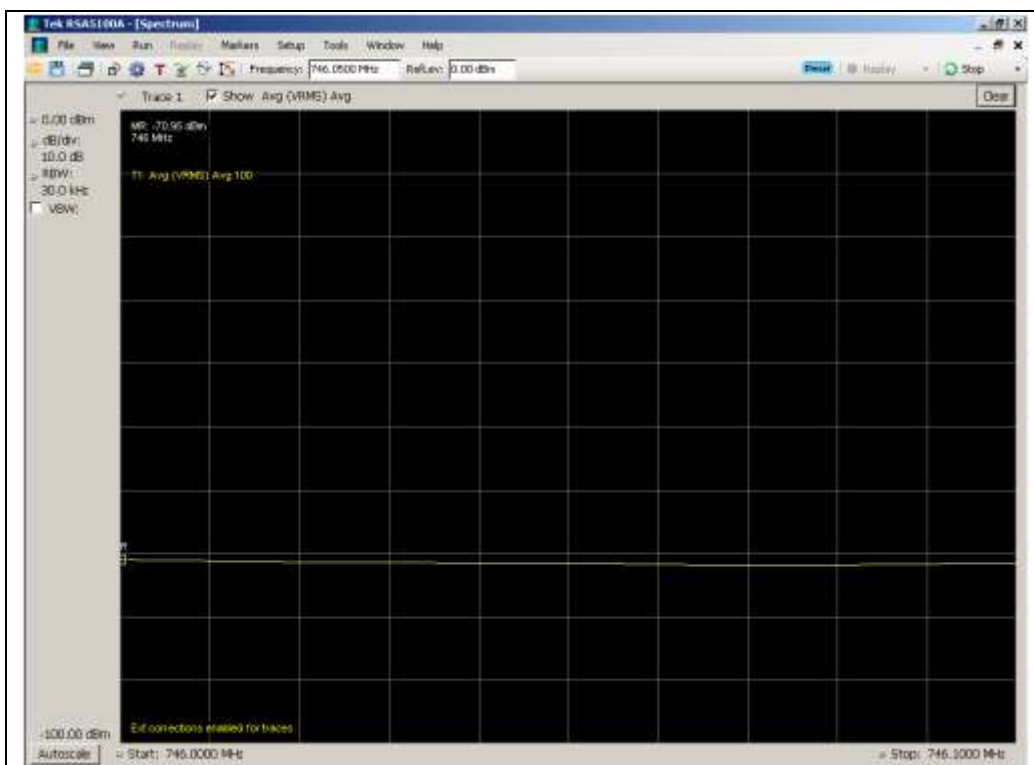


## CDMA Downlink Test Plots

### 734 - 746 MHz Band Lower Band Edge



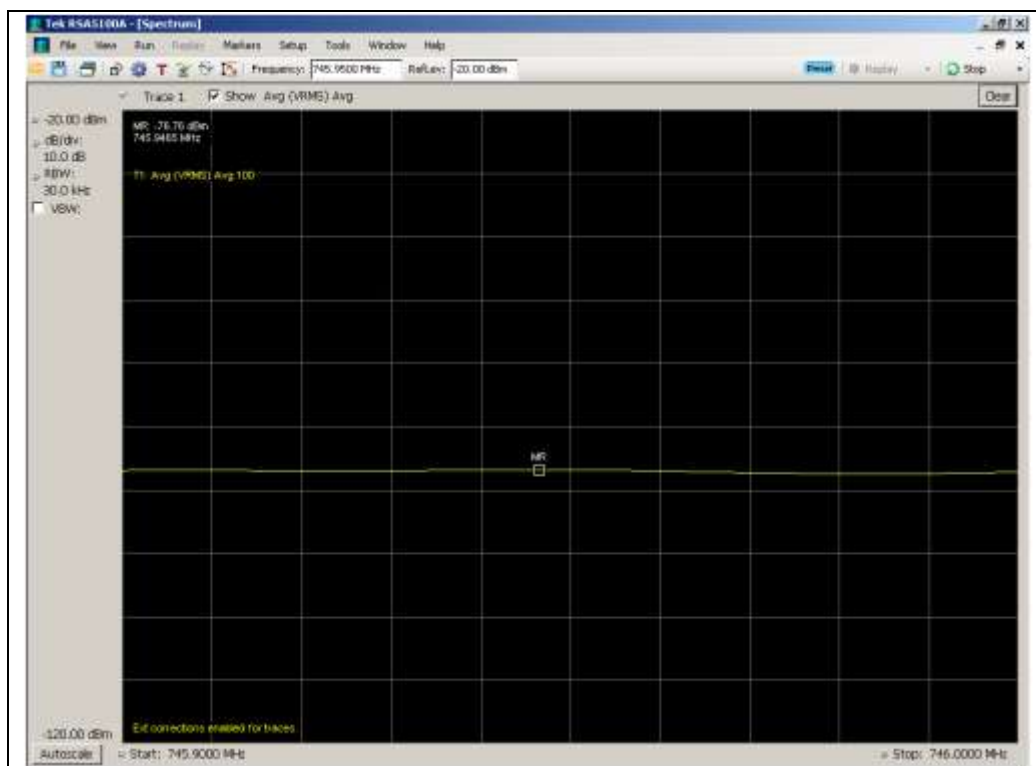
### Upper Band Edge



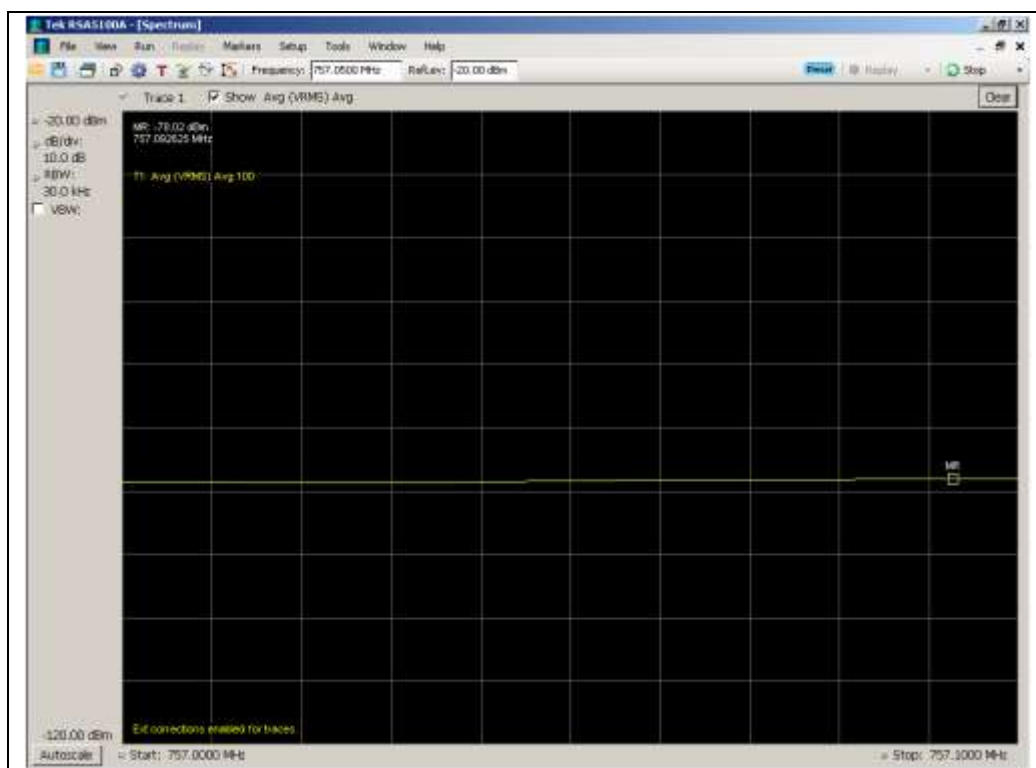


### 746 - 757 MHz Band

#### Lower Band Edge



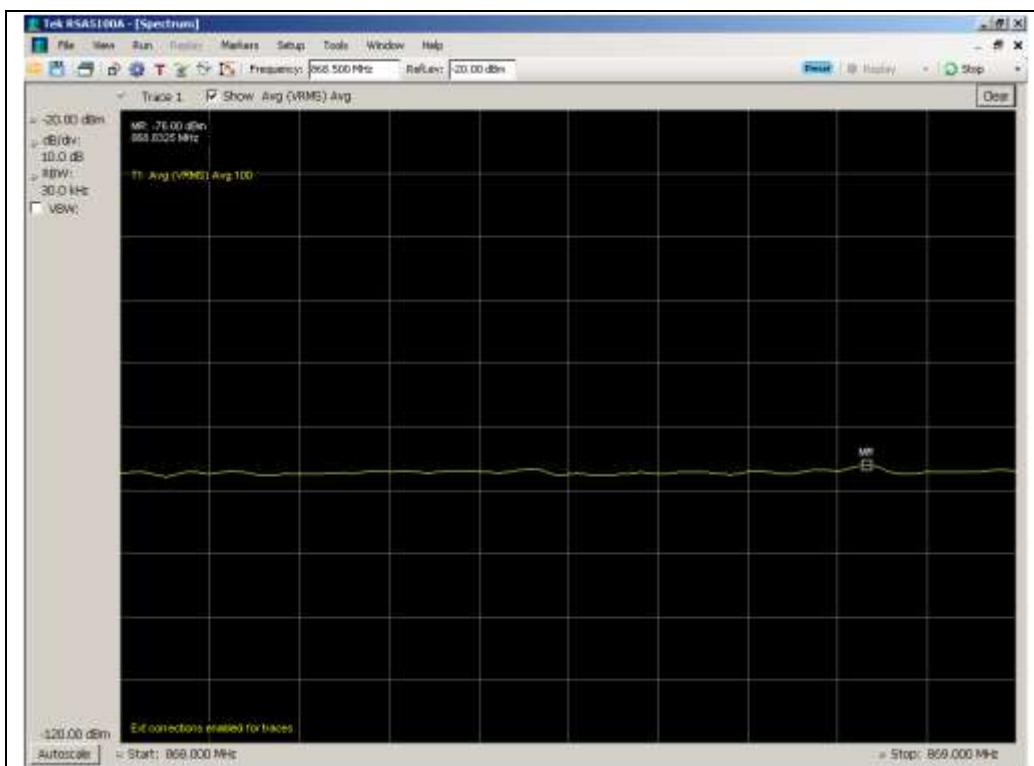
#### Upper Band Edge



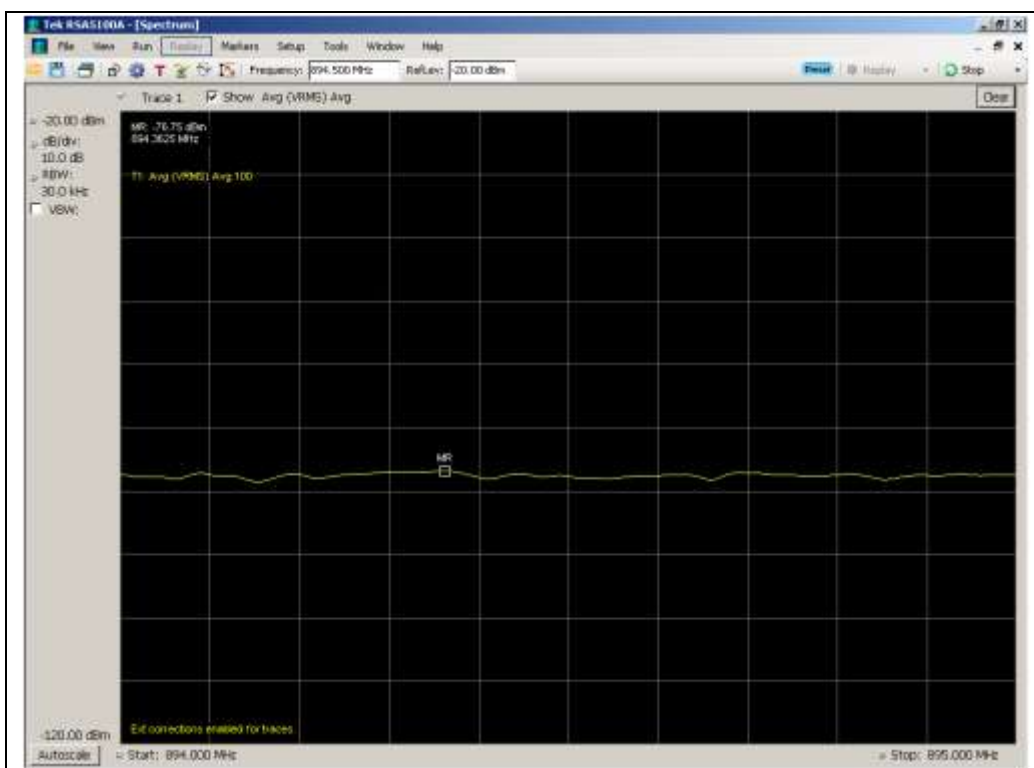


### 869 - 894 MHz Band

#### Lower Band Edge



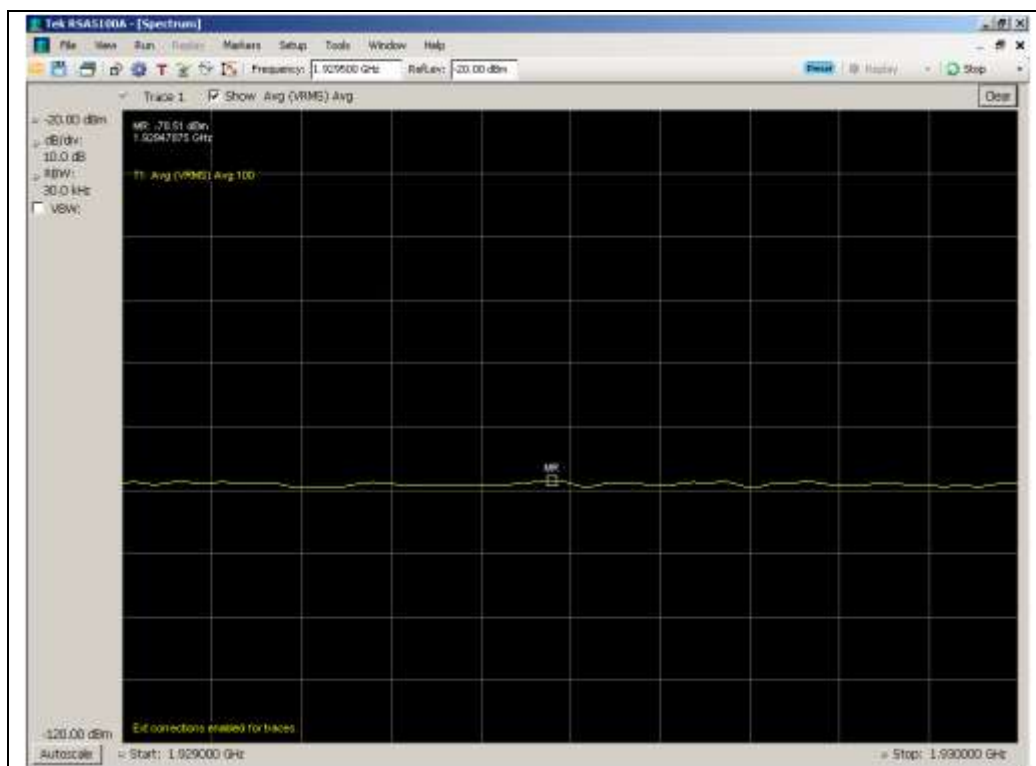
#### Upper Band Edge



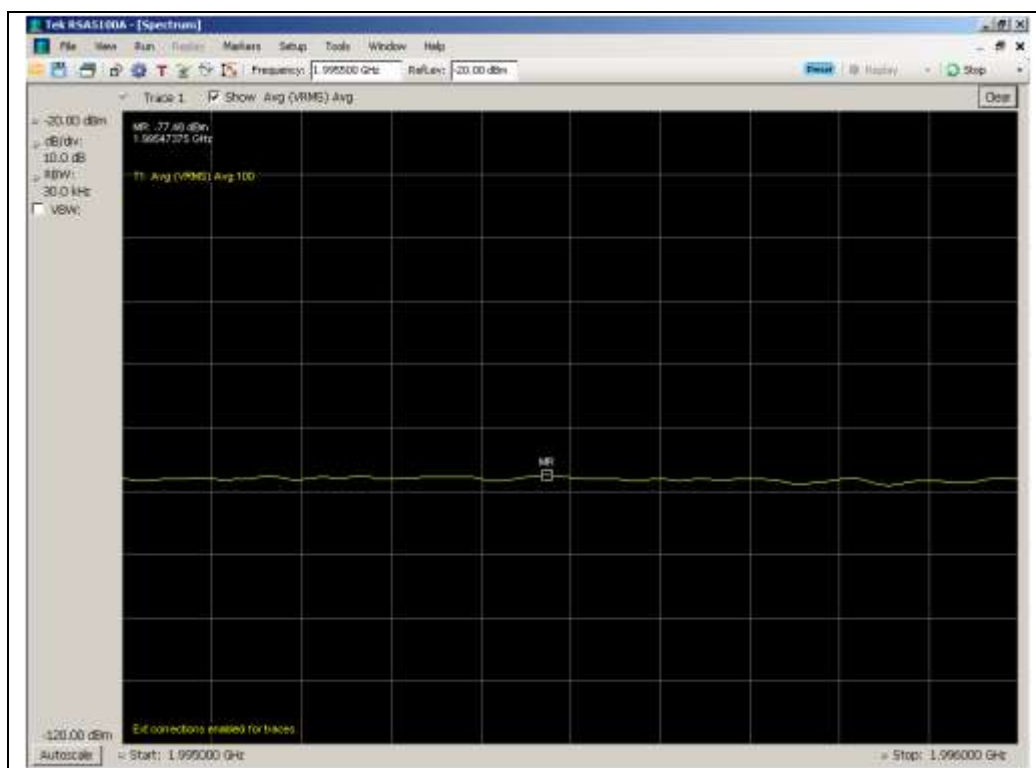


### 1930 - 1995 MHz Band

#### Lower Band Edge



#### Upper Band Edge

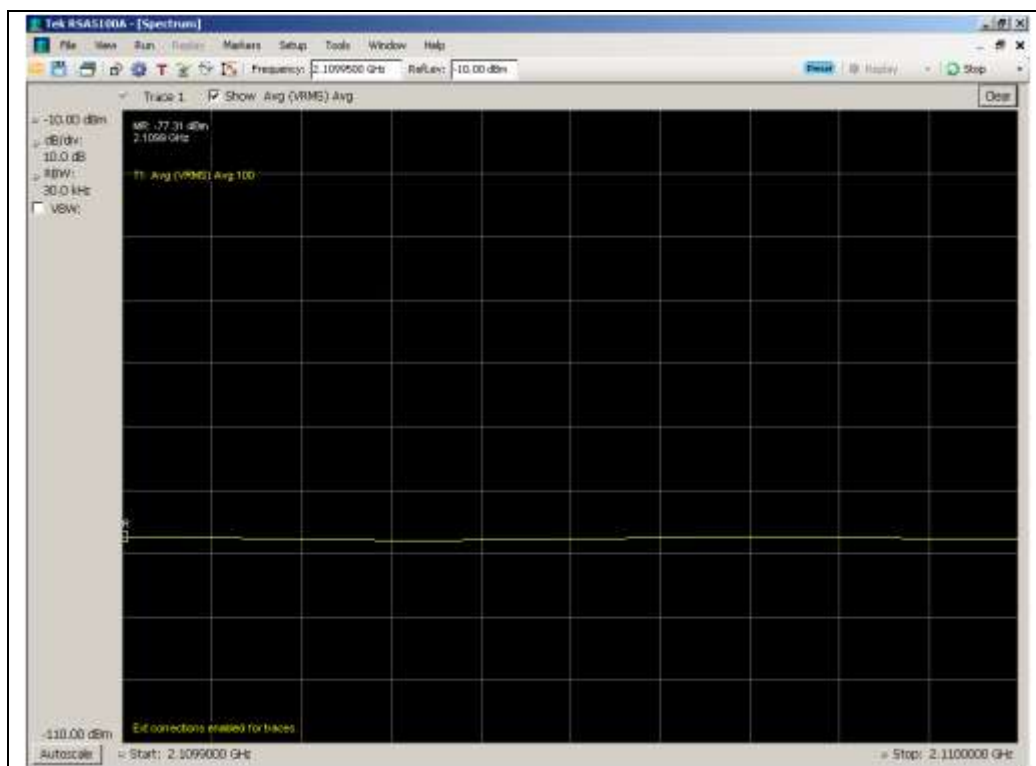




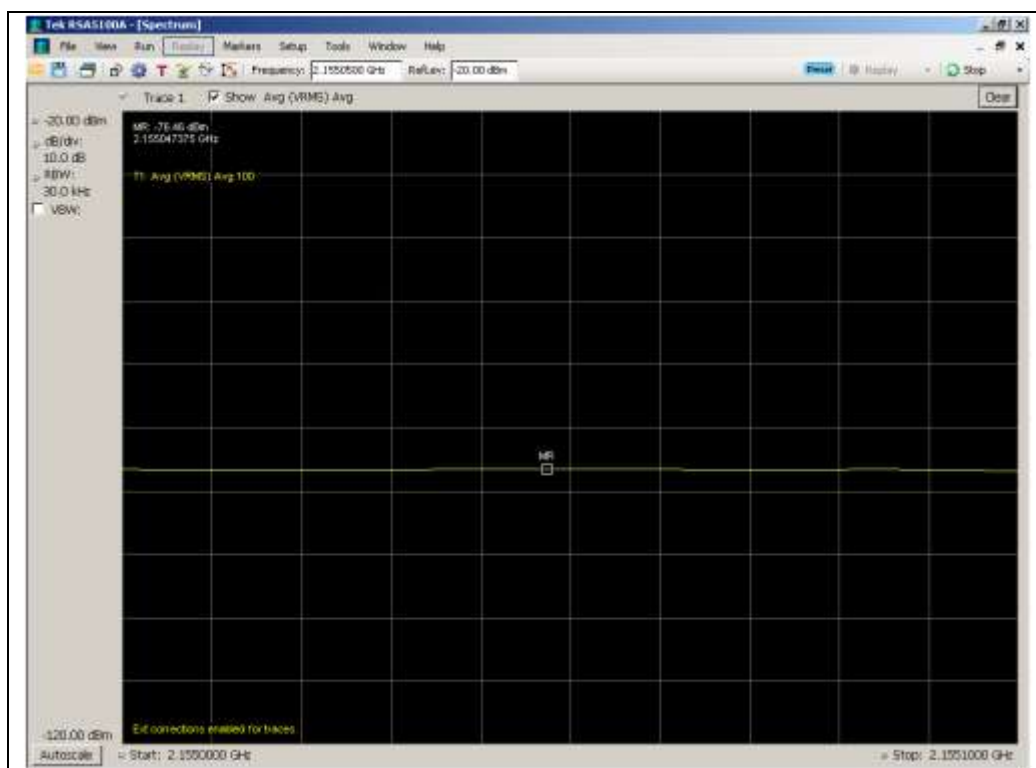


## 2110 - 2155 MHz Band

### Lower Band Edge



### Upper Band Edge

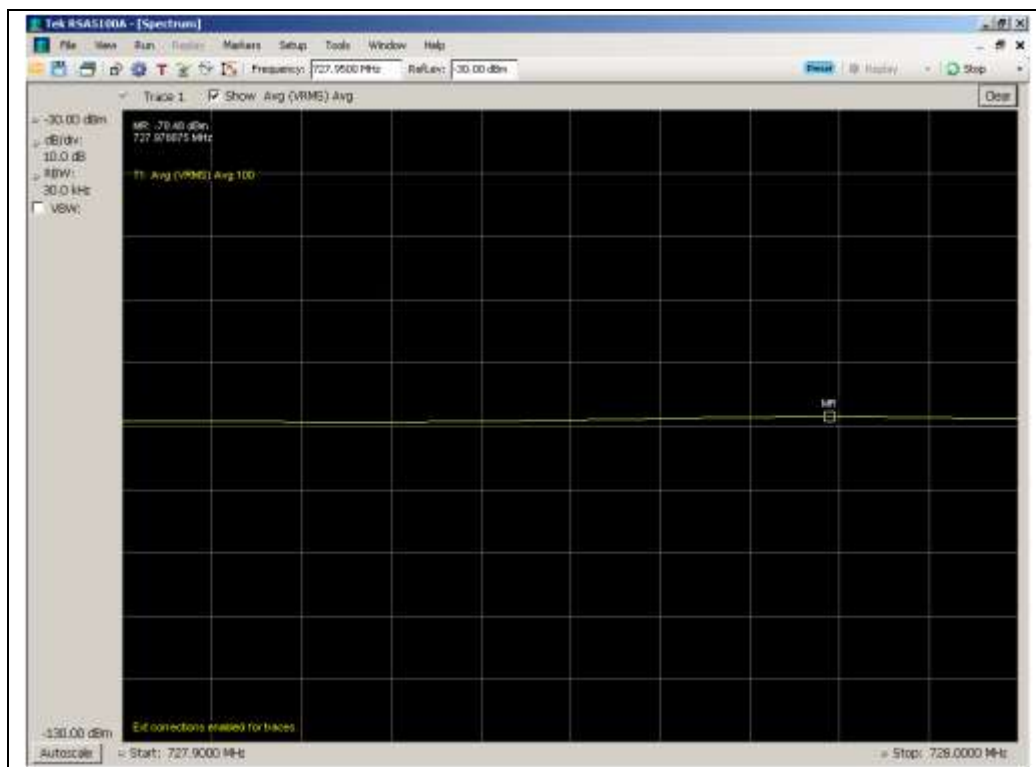




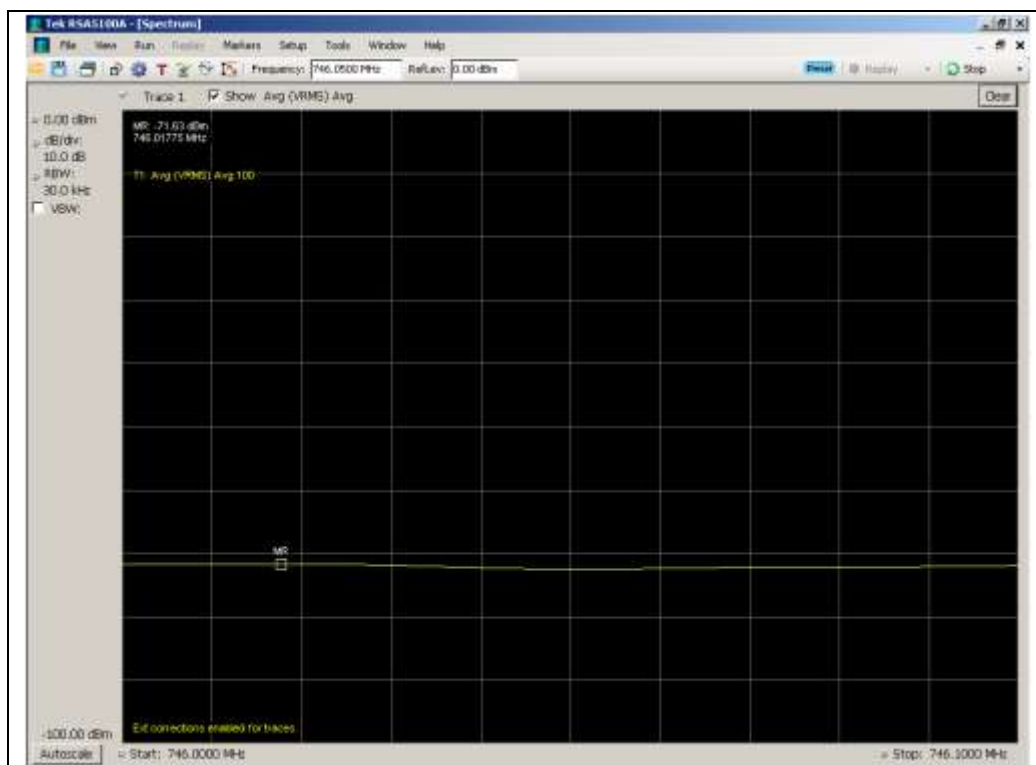
## WCDMA Downlink Test Plots

734 - 746 MHz Band

Lower Band Edge



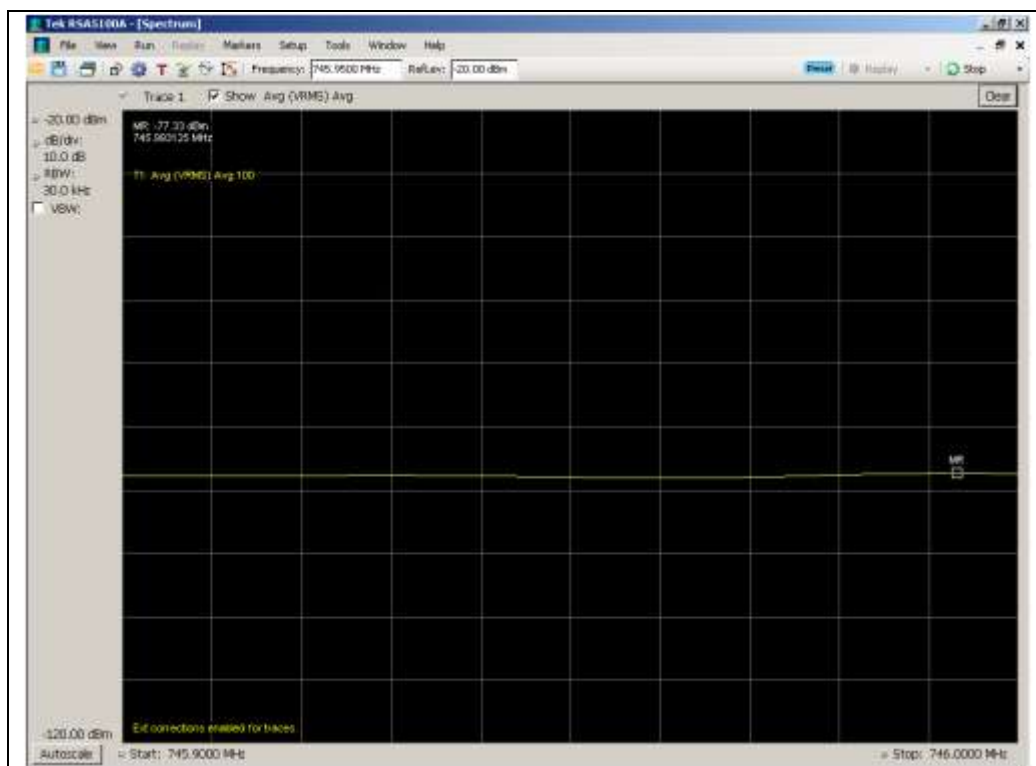
Upper Band Edge



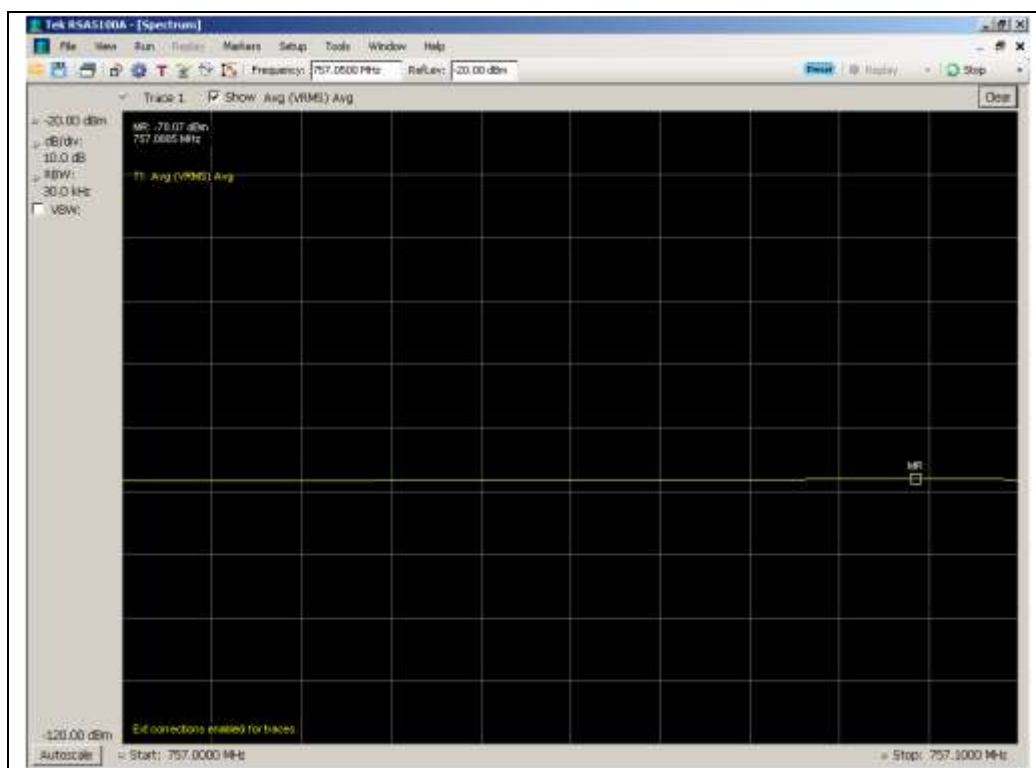


### 746 - 757 MHz Band

#### Lower Band Edge



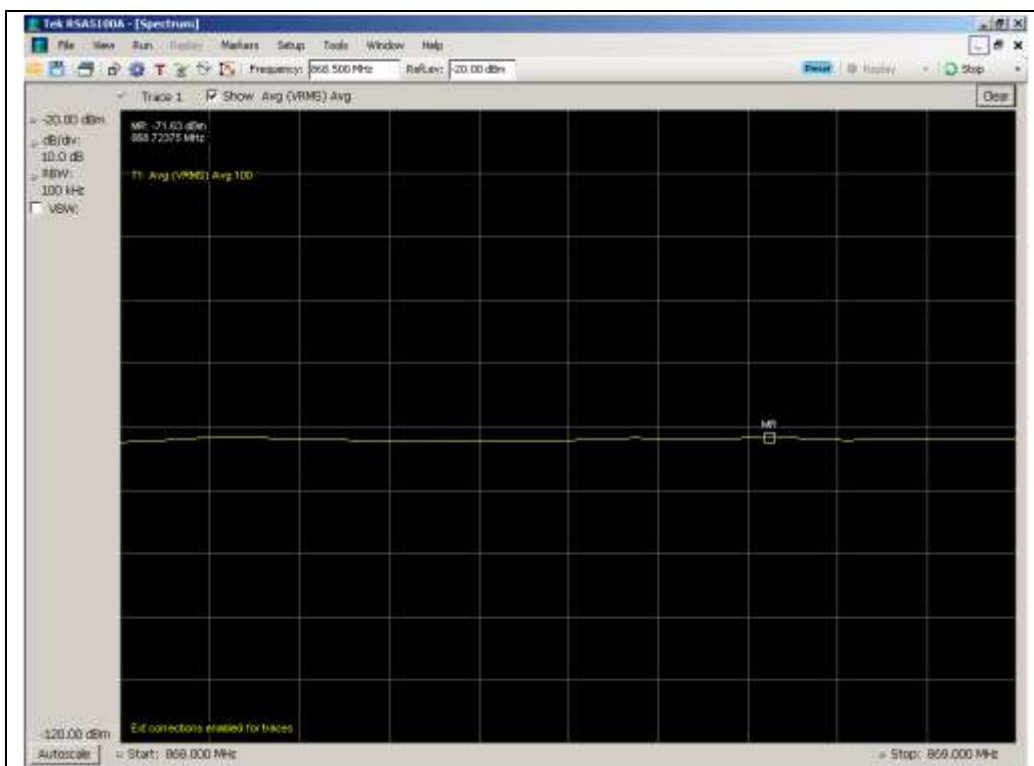
#### Upper Band Edge



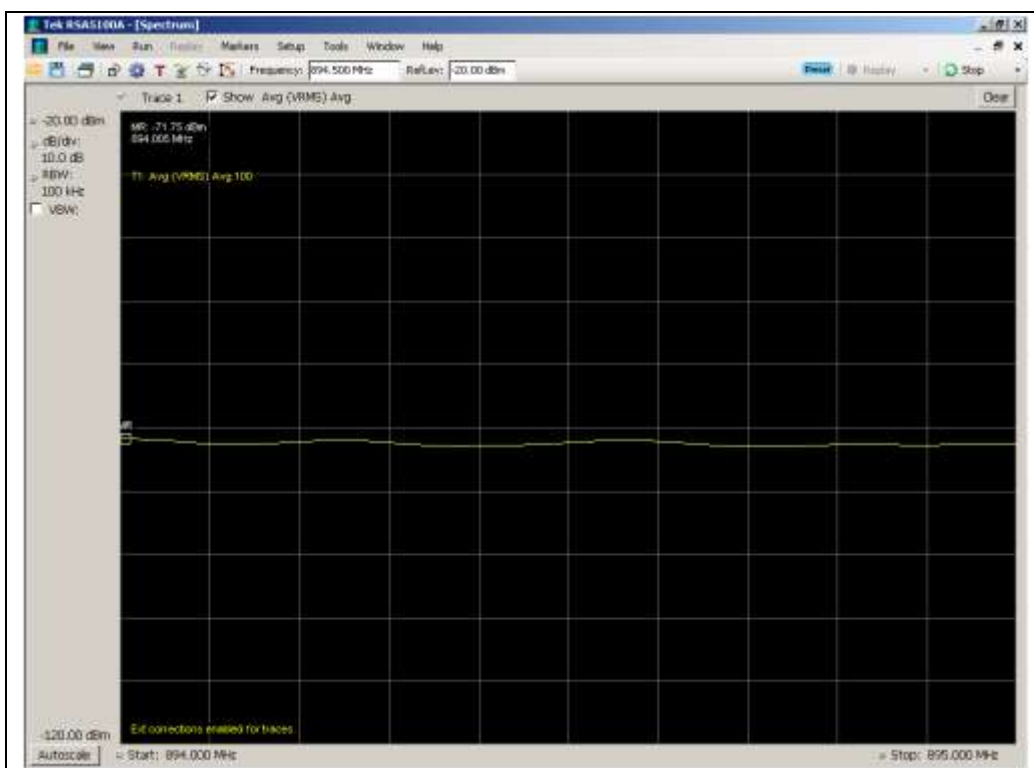


### 869 - 894 MHz Band

#### Lower Band Edge



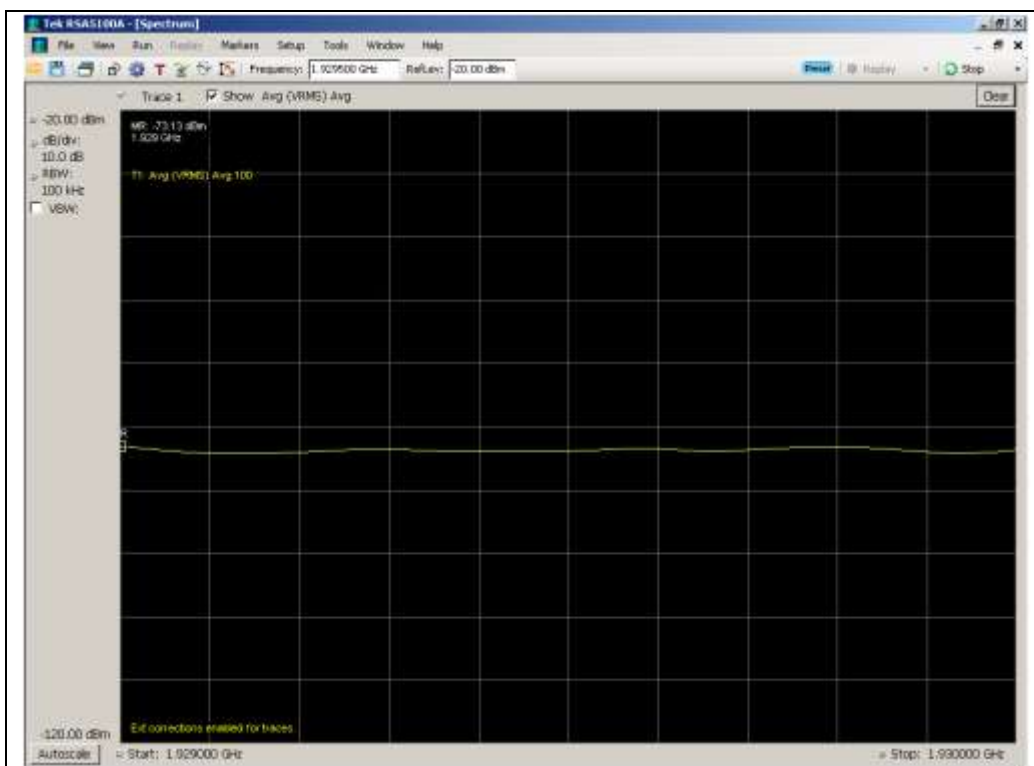
#### Upper Band Edge



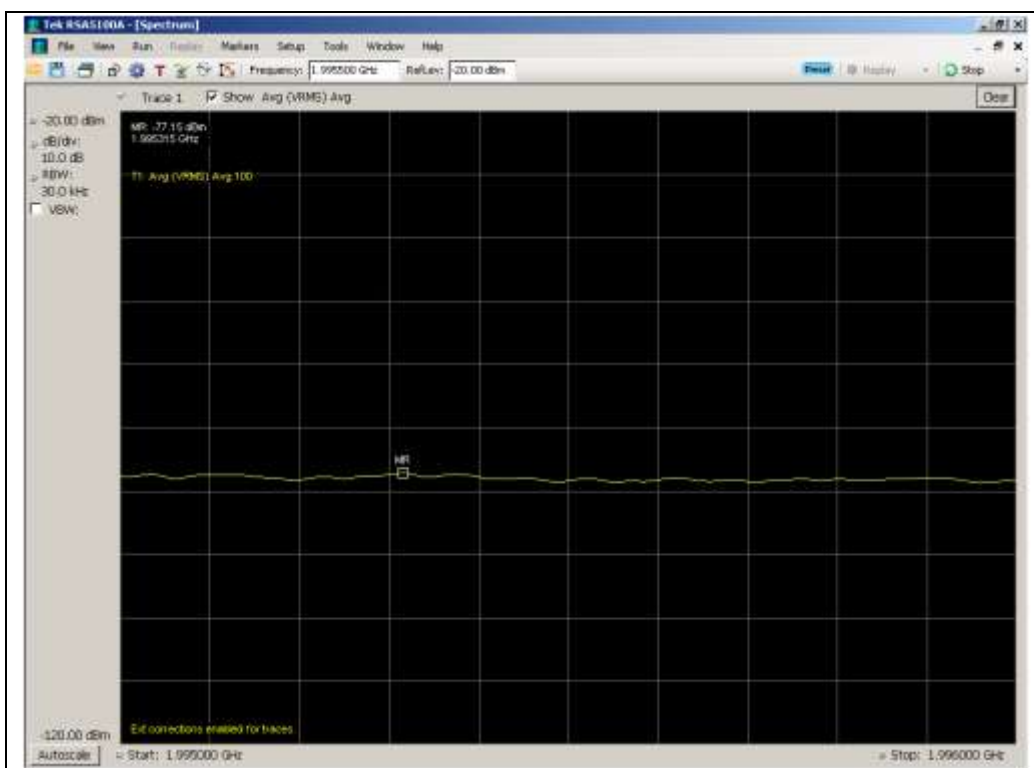


### 1930 - 1995 MHz Band

#### Lower Band Edge



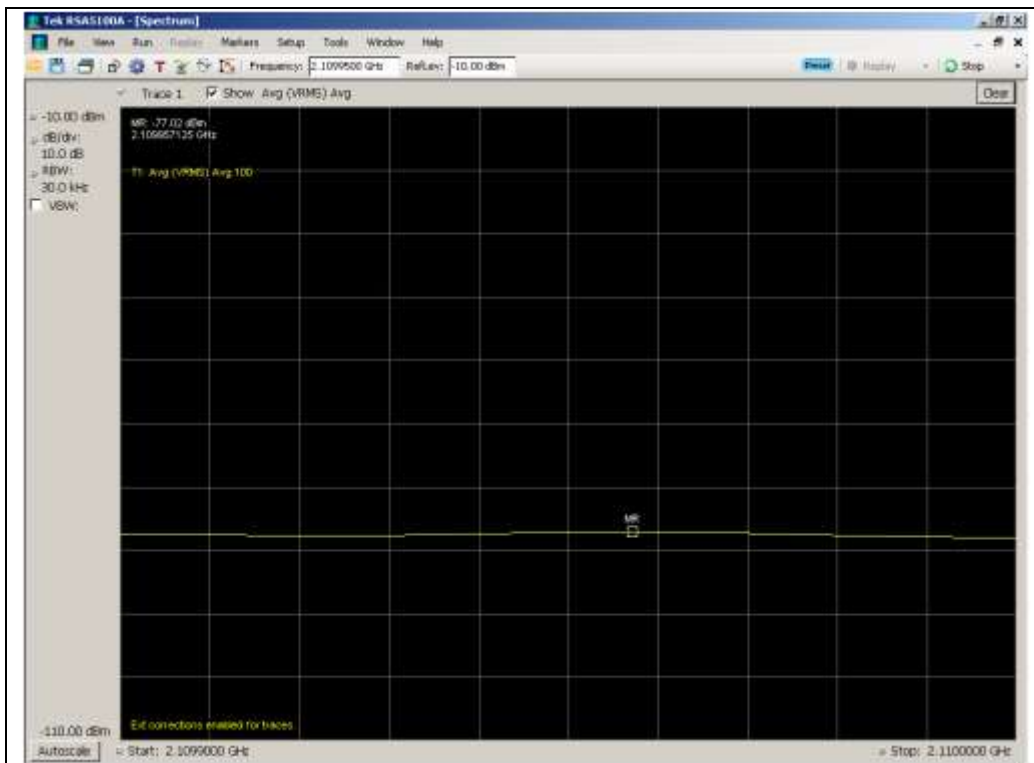
#### Upper Band Edge



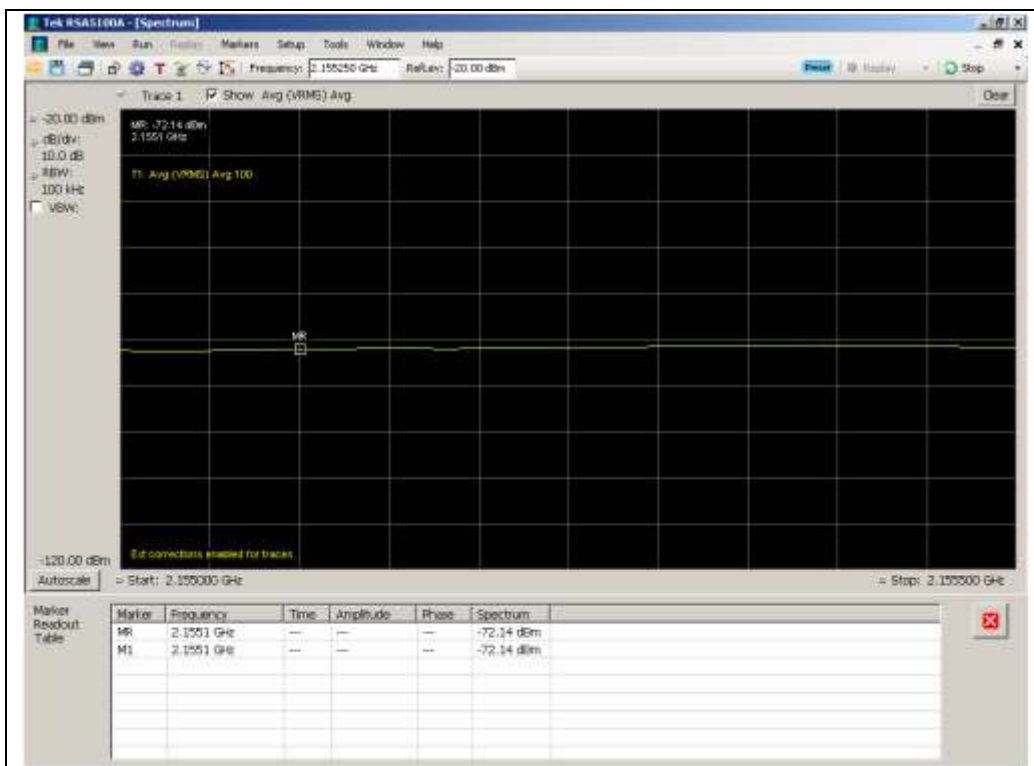


## 2110 - 2155 MHz Band

### Lower Band Edge



### Upper Band Edge





**Conducted Spurious Emissions**

**Name of Test:** Conducted Spurious Emissions  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 10/1/2013

**Test Procedure**

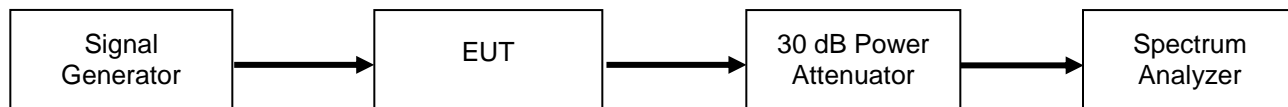
The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as necessary to ensure accurate readings were obtained. A signal generator was utilized to produce a 4.1 MHz AWGN signal operating at the maximum allowable power. The conducted spurious emissions from 30 MHz to 10 times the highest tunable frequency for each operational band was 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.

$$\text{Conducted Spurious Emissions Limit (dBm)} = P2 - (43 + 10 \cdot \text{Log}P1)$$

P1 = Output Power in watts  
P2 = Output Power in dBm

**Test Setup**



**Uplink Test Results**

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	716.1	-22.9	-13	Pass
776 - 787	775.9	-26.2	-13	Pass
824 - 849	59.88	-32.2	-13	Pass
1710 - 1755	13802.6	-31.1	-13	Pass
1850 - 1915	14927.6	-29.6	-13	Pass

**Downlink Test Results**

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	39.58	-32.3	-13	Pass
746 - 757	41.59	-32.1	-13	Pass
869 - 894	32.01	-32	-13	Pass
1930 - 1995	19875.9	-30	-13	Pass
2110 - 2155	21048.1	-30	-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:*

- (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable 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 =  $10\log B1/B2$

BW correction Factor =  $10\log 6.25 / 10 = - 2.0$  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	774.979	-56.3	-2.0	-58.34	-35	-22.34
793 – 805	798.859	-72.5	-2.0	-74.54	-35	-38.54

**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	771.379	-72.4	-2.0	-74.44	-35	-38.44
793 – 805	799.75	-71.9	-2.0	-73.94	-35	-37.94





**FCC 27.53(e)**

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

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 =  $10\log B1/B2$

BW correction Factor =  $10\log 700 / 10000 = -11.55 \text{ dB}$

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

The Limit for discrete (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)	1560.109	-50.5	0	-0.3	-50.80	-40	-10.80
1559 – 1610 (Narrowband)	1561.69	-70	-11.55	-0.3	-81.85	-50	-31.85

**746 - 756 MHz Downlink Band**

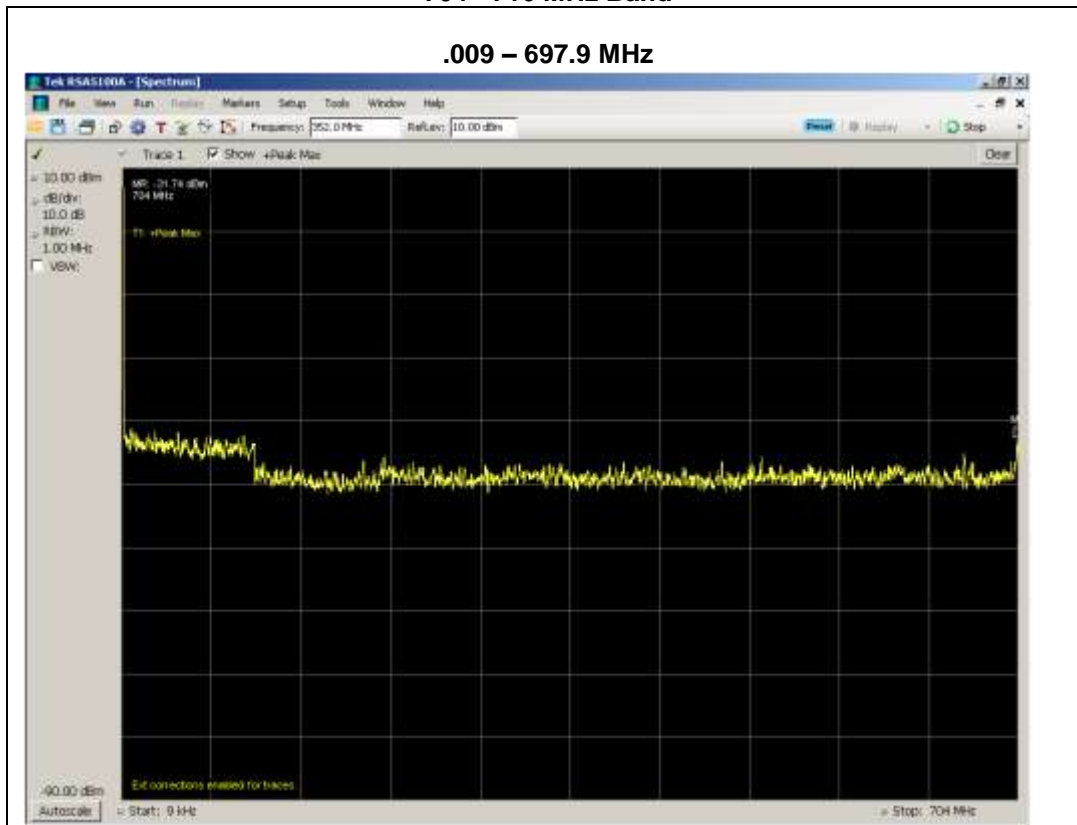
Spurious Frequency Range (MHz)	Measured Frequency (MHz)	Measured Value (dBm)	Bandwidth Correction Factor (dB)	Gain/Loss from Antenna Kitting information (dB)	Final Value (dBm)	Limit (dBm)	Margin (dB)
1559 – 1610 (Wideband)	1562.85	-52	0	-0.3	-52.30	-40	-12.30
1559 – 1610 (Narrowband)	1588.401	-71.7	-11.55	-0.3	-83.55	-50	-33.55



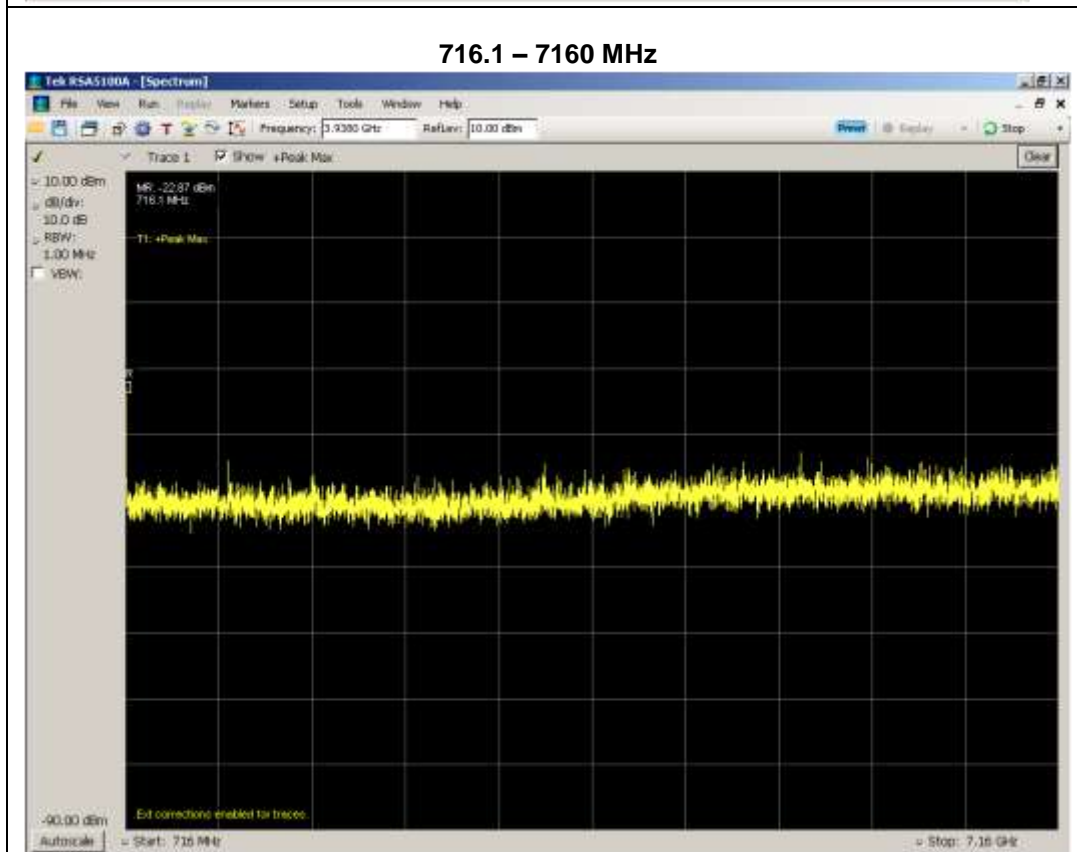
### Uplink Test Plots

#### 704 - 716 MHz Band

.009 – 697.9 MHz

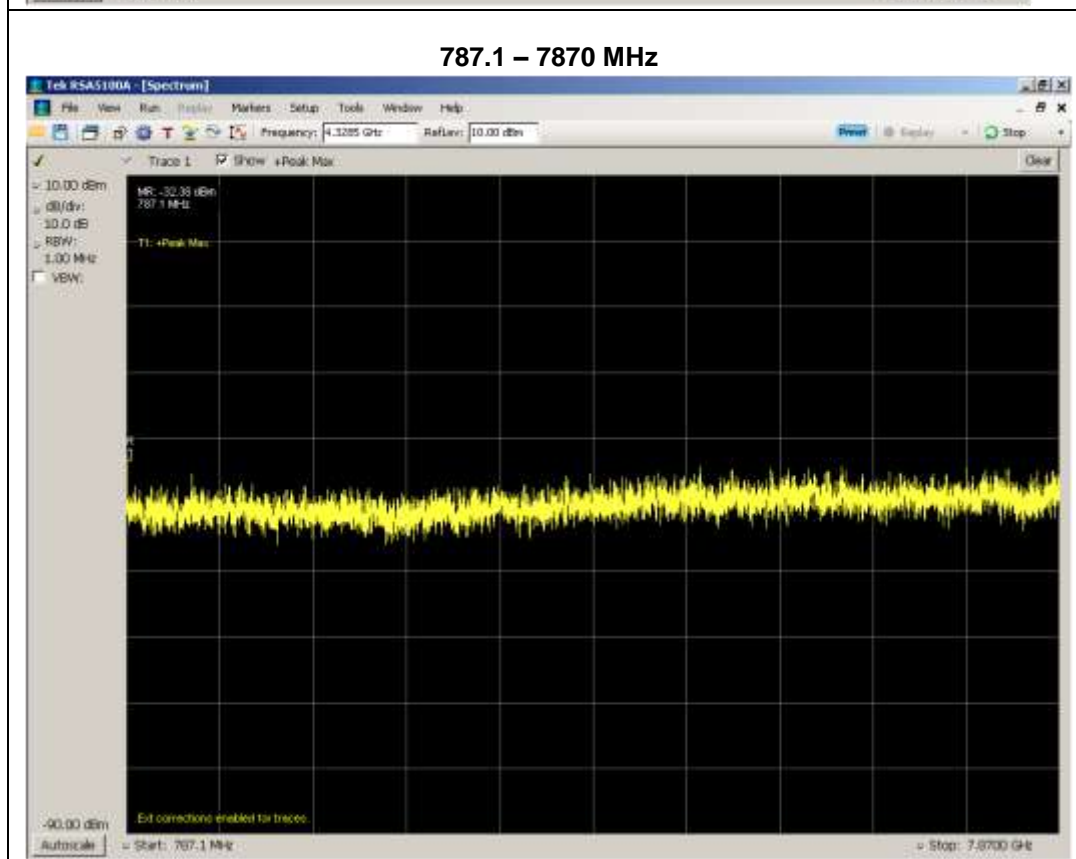
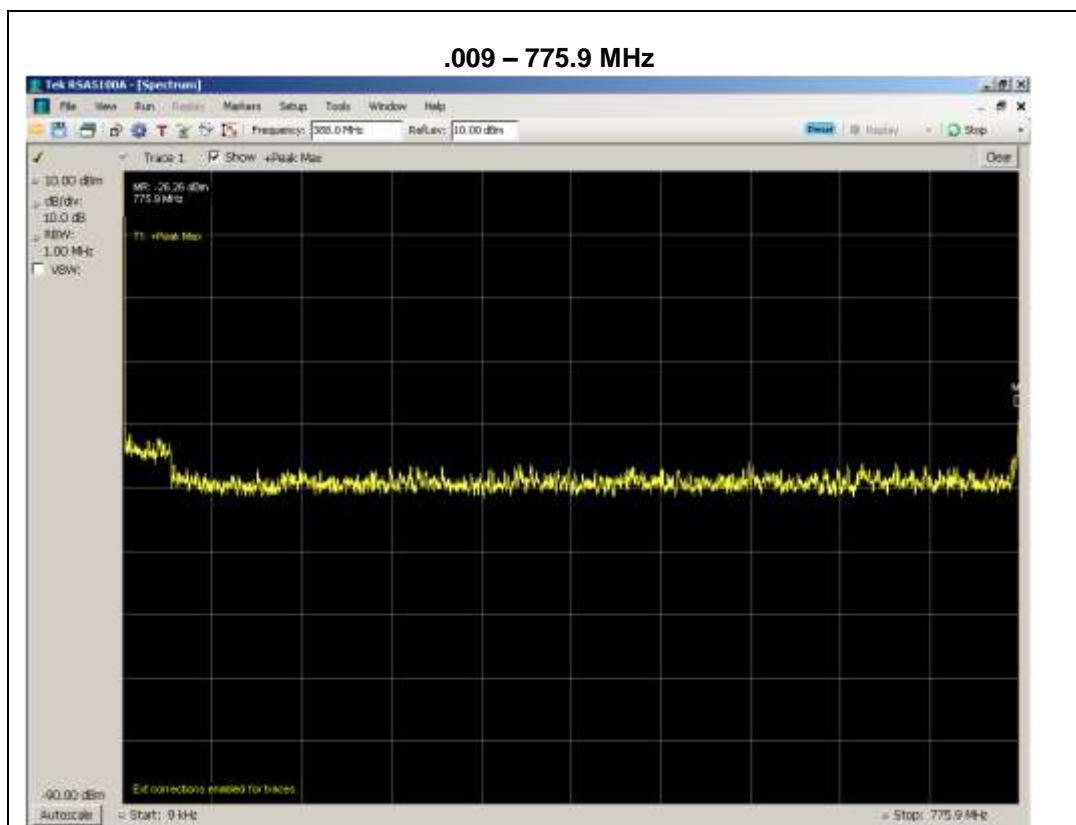


#### 716.1 – 7160 MHz



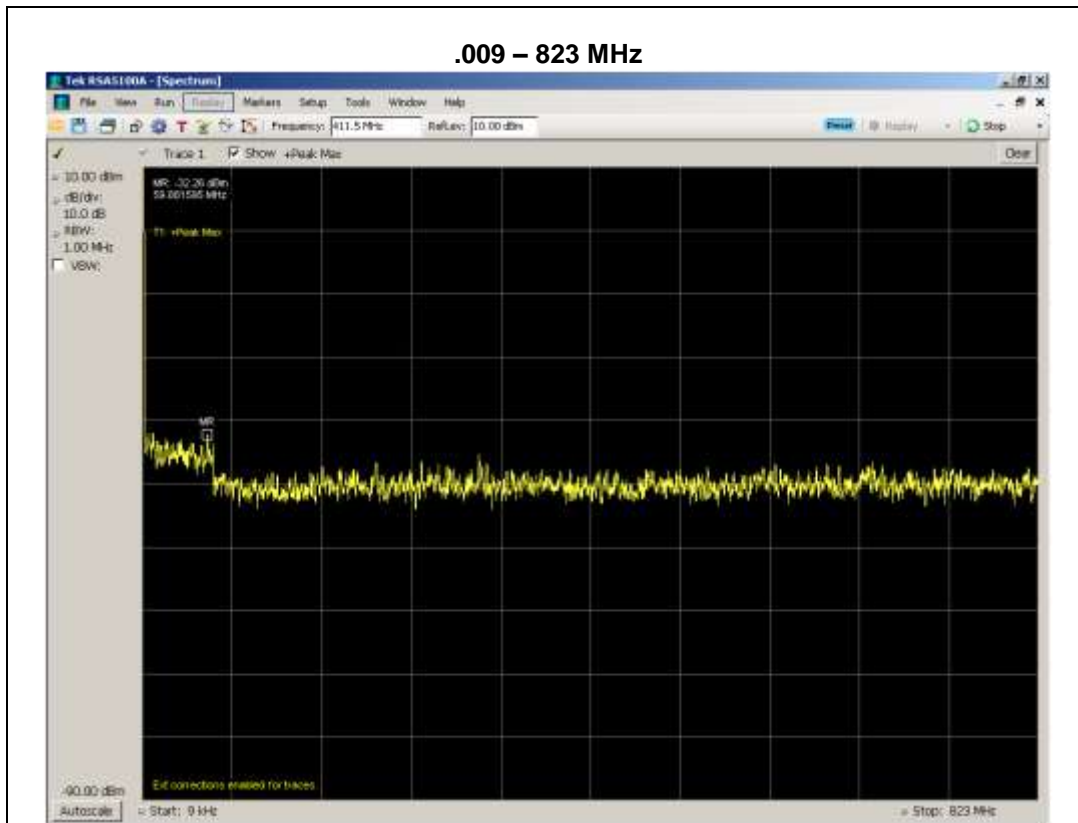


### 776 - 787 MHz Band

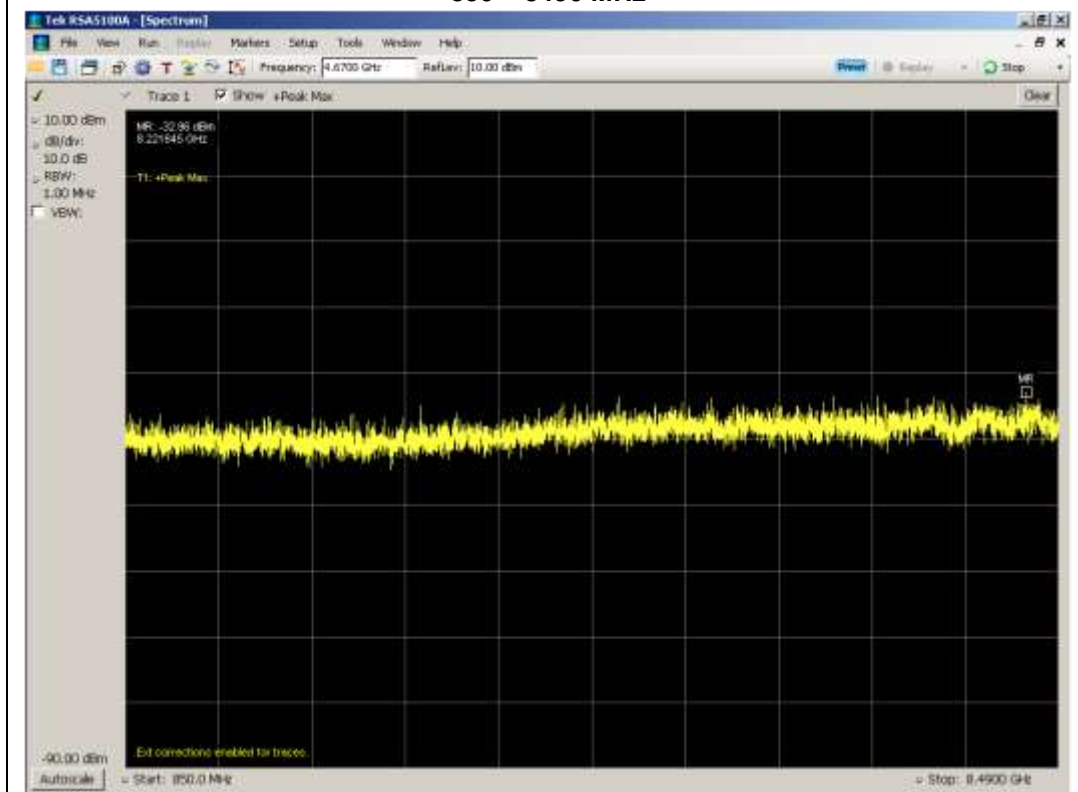




### 824 - 849 MHz Band

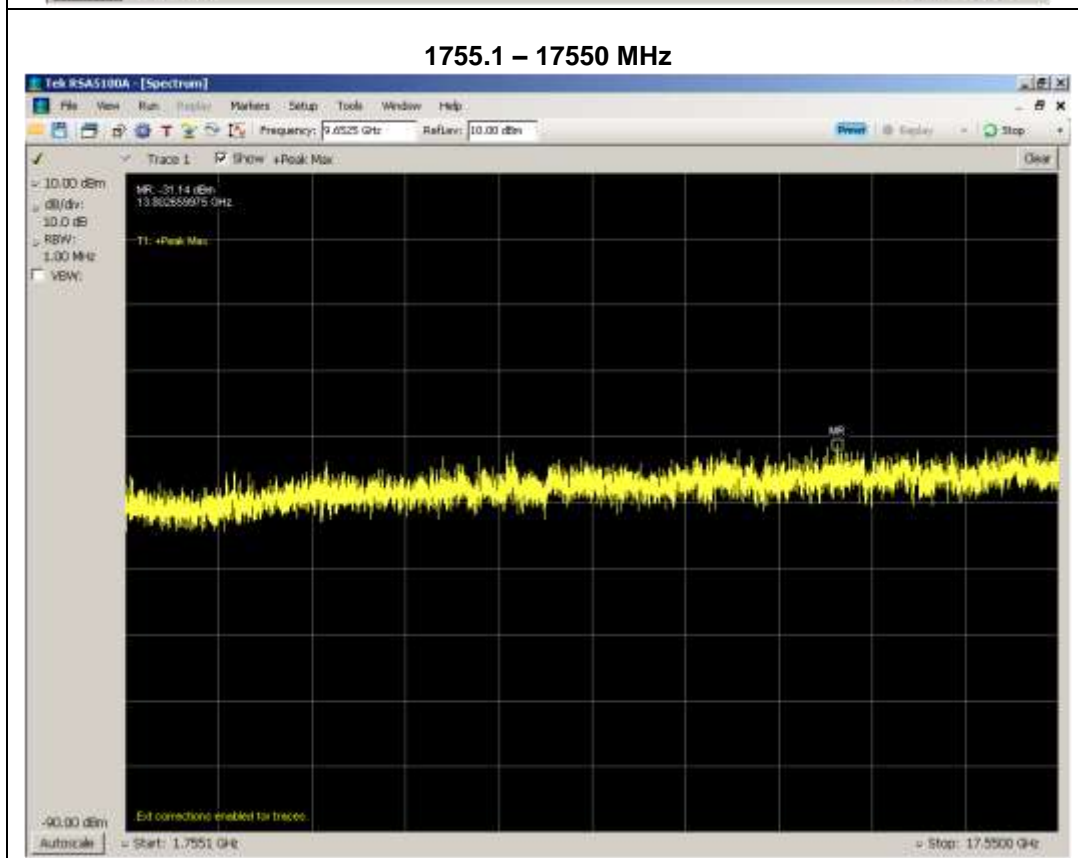
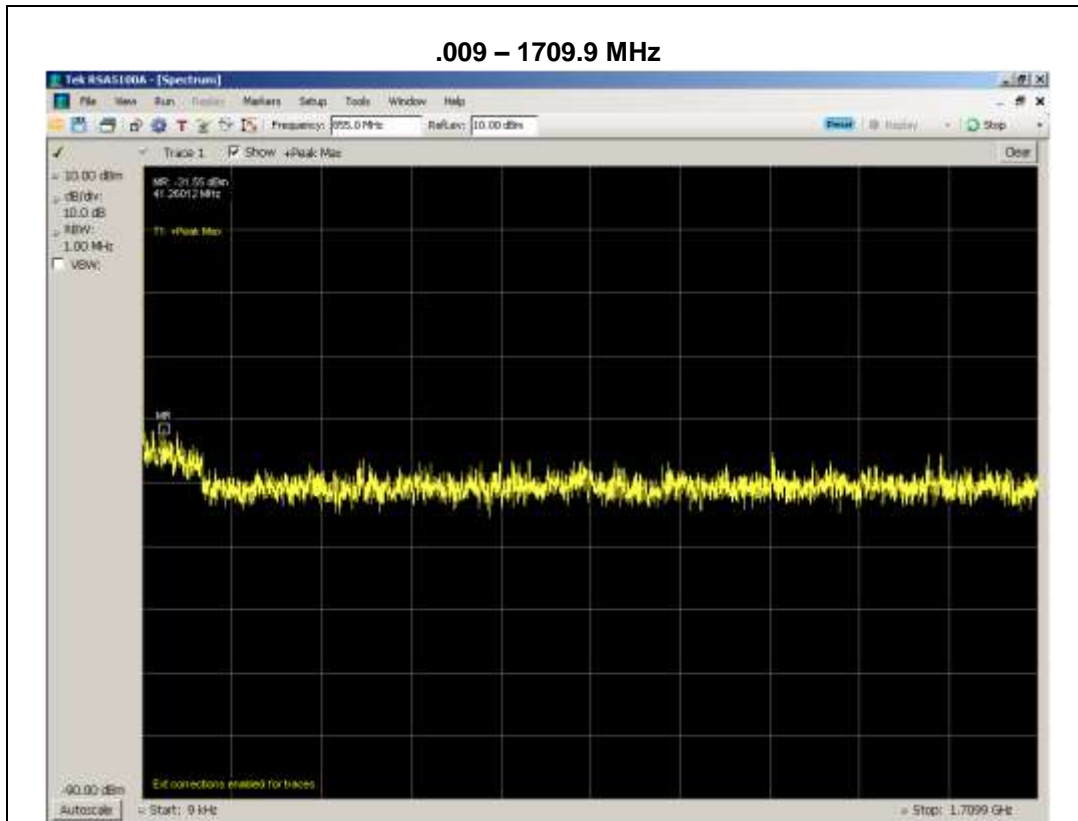


### 850 – 8490 MHz



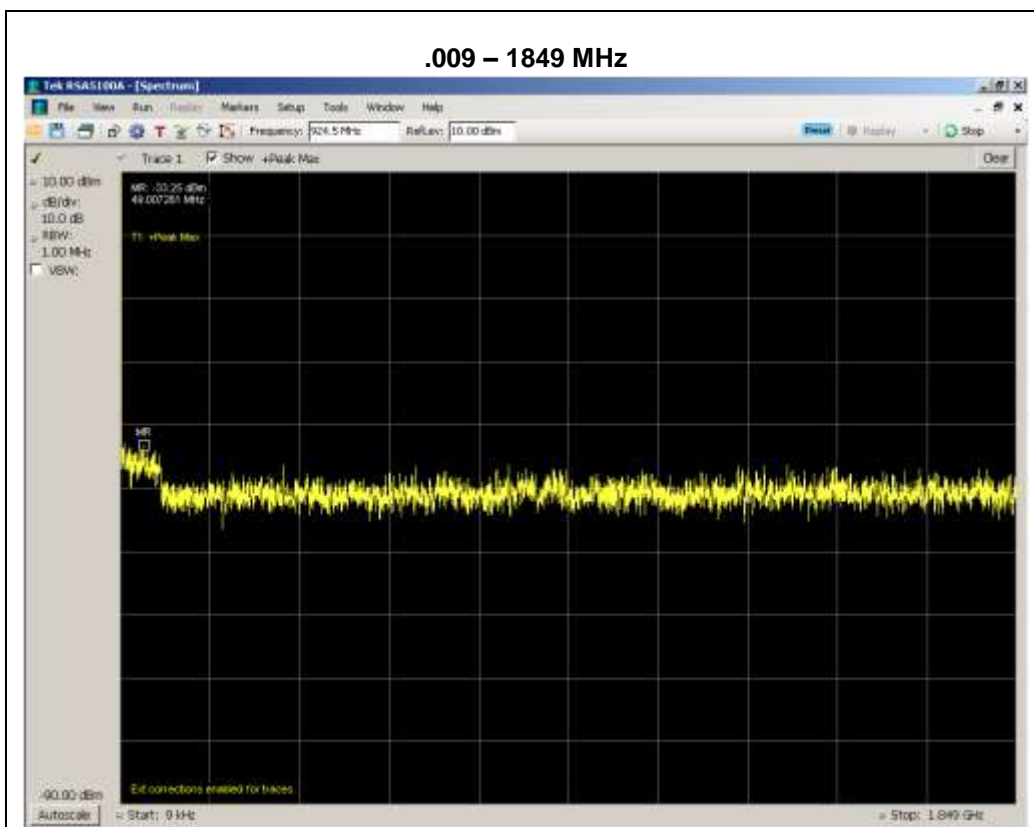


### 1710 - 1755 MHz Band

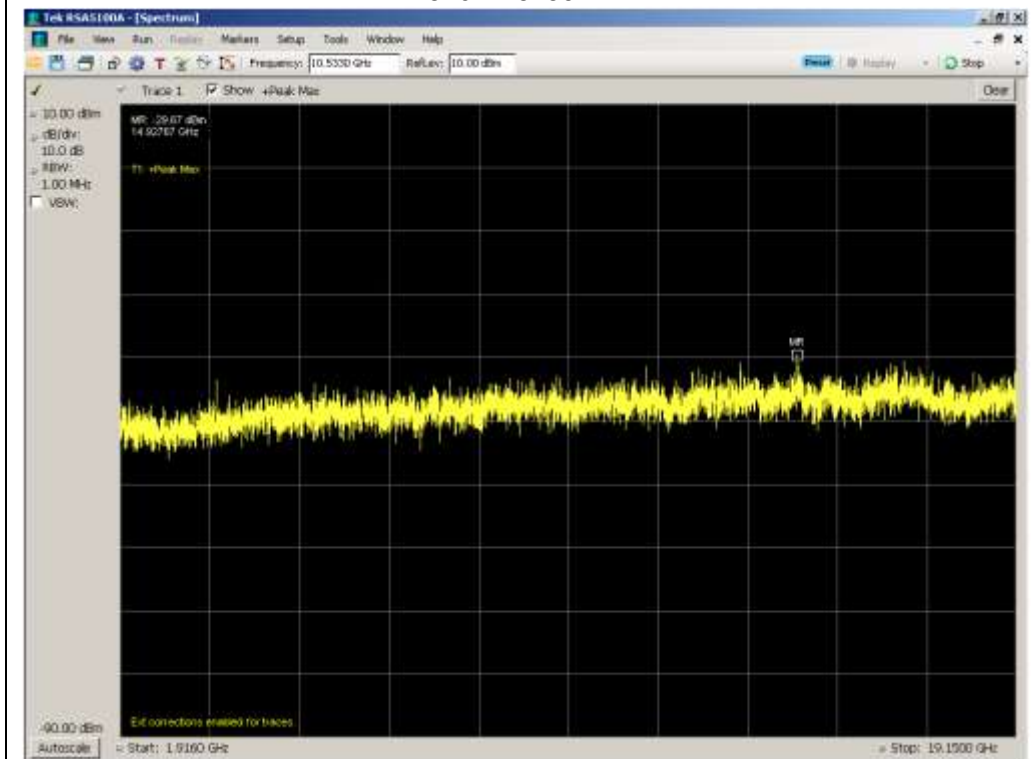




### 1850 - 1915 MHz Band



### 1916 – 19150 MHz

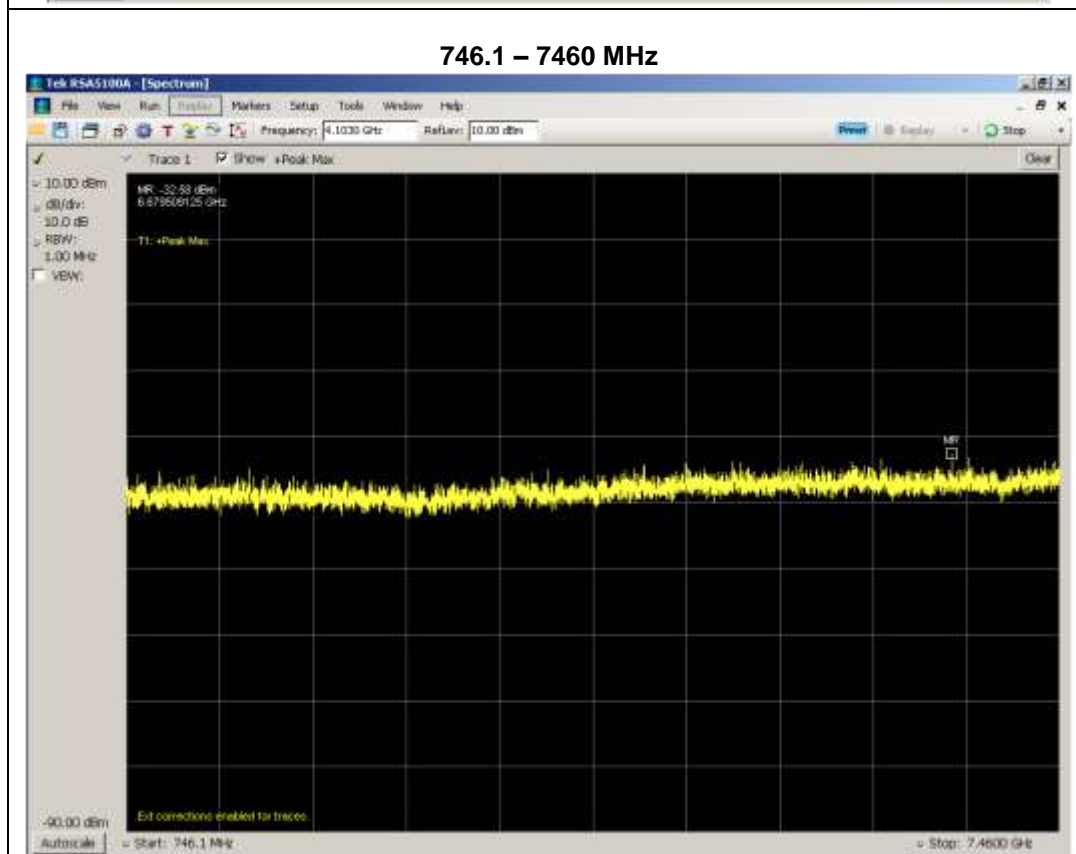
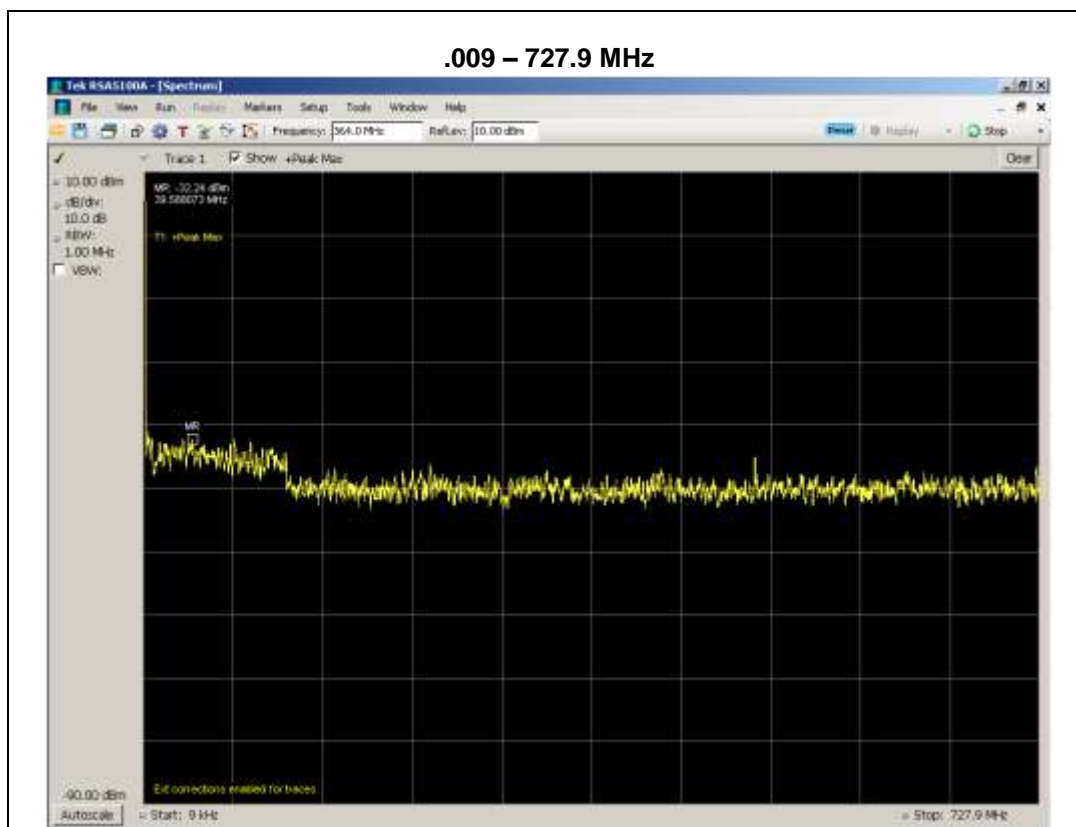






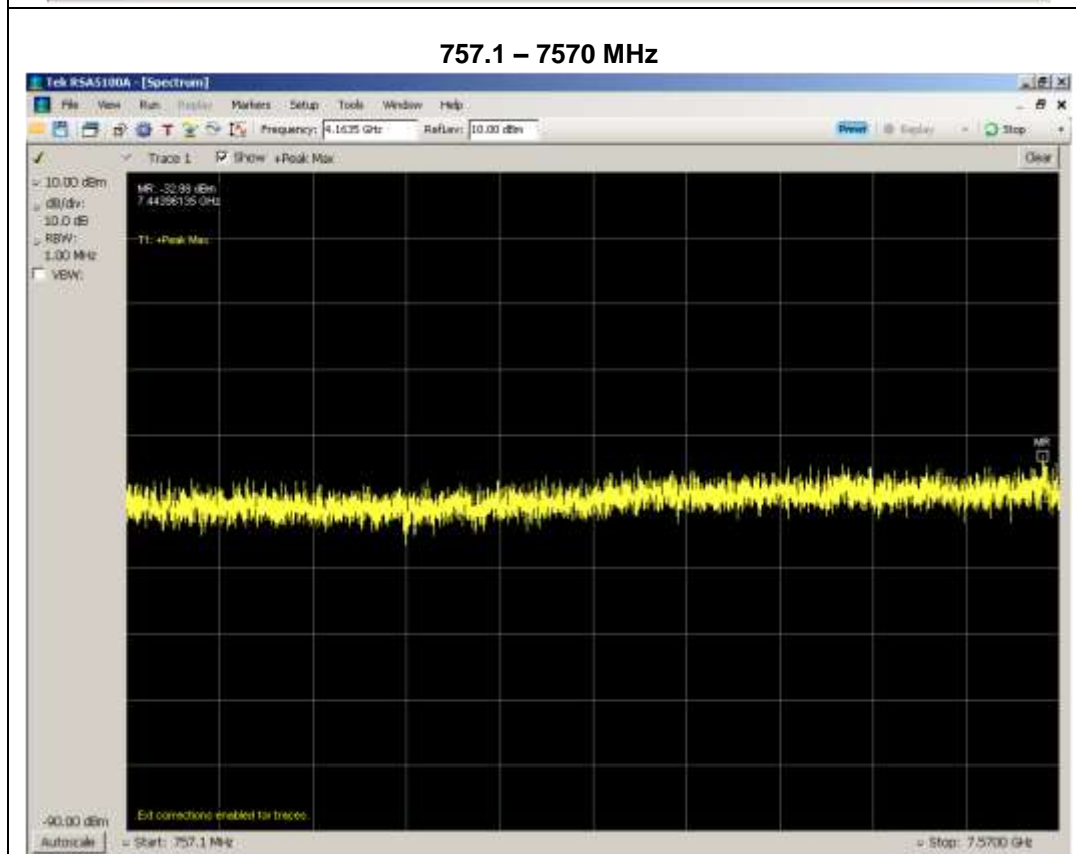
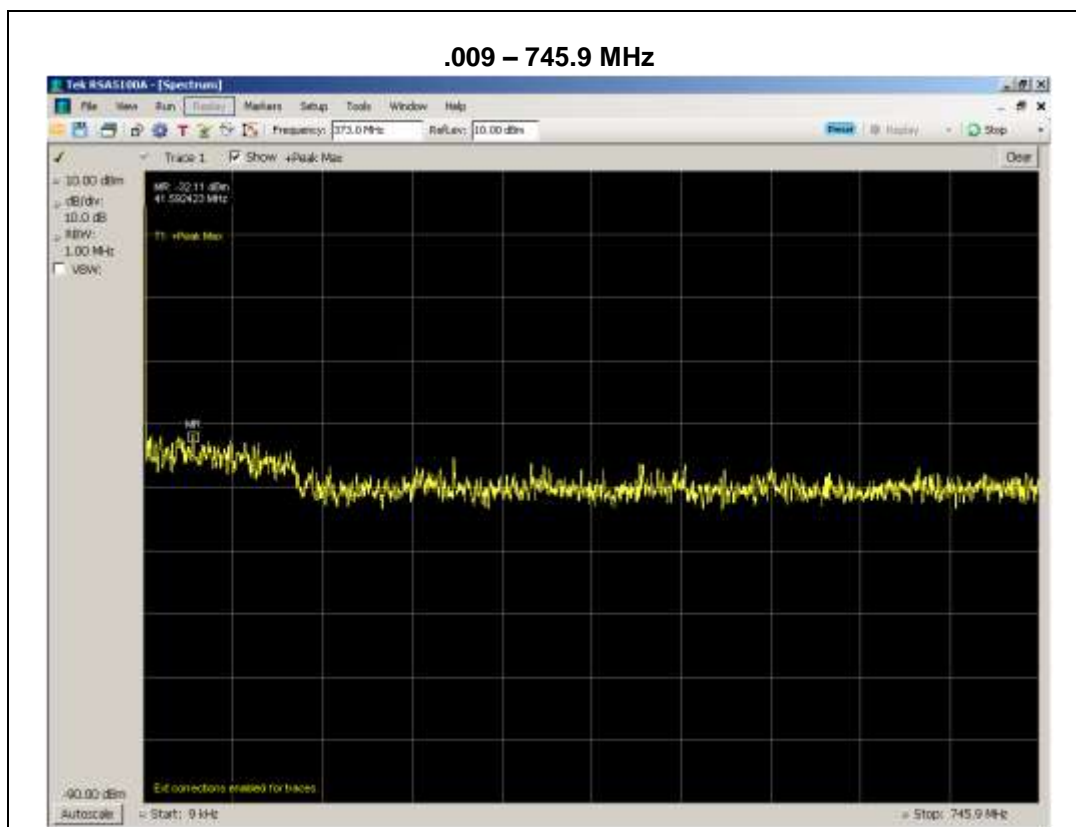
## Downlink Test Plots

### 734 - 746 MHz Band





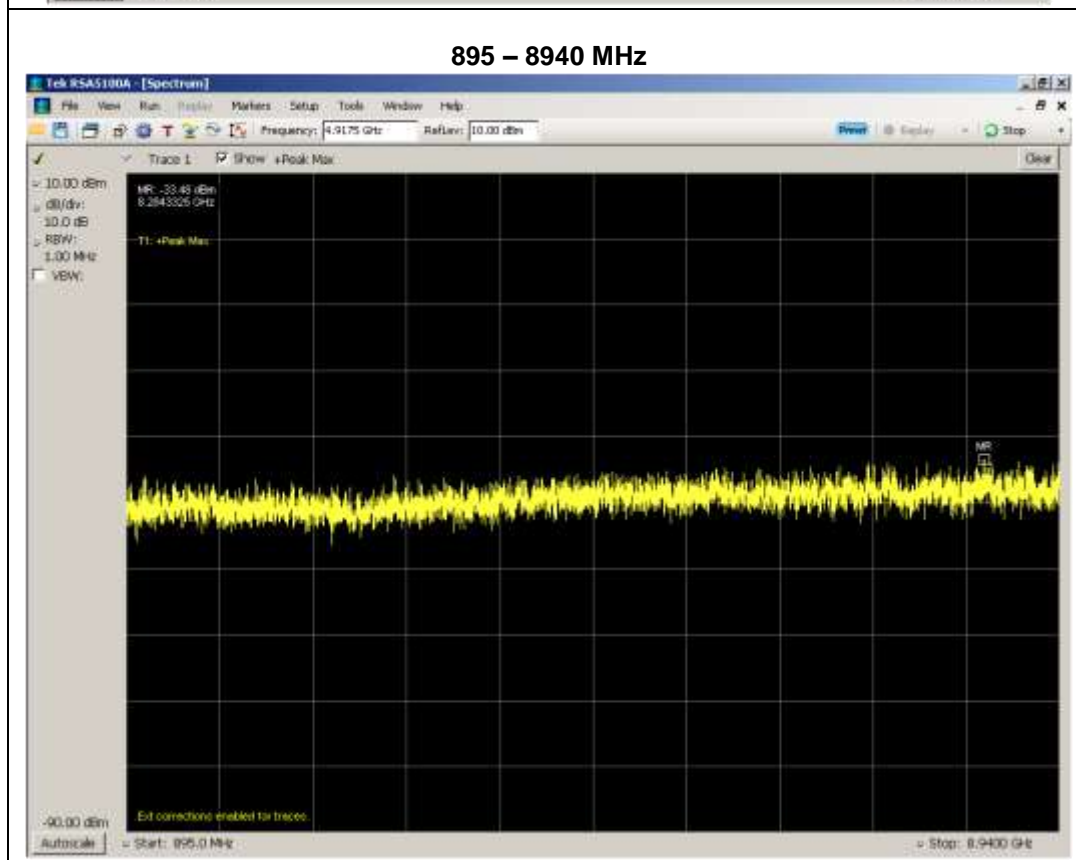
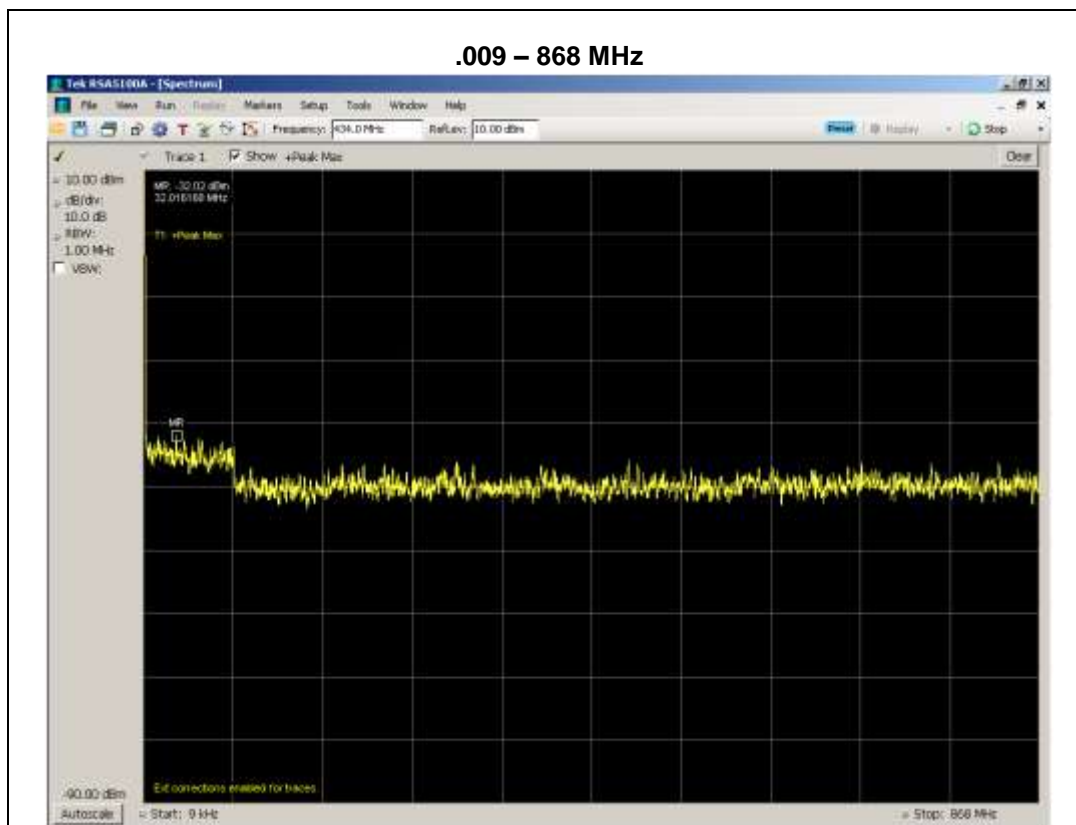
### 746 - 757 MHz Band





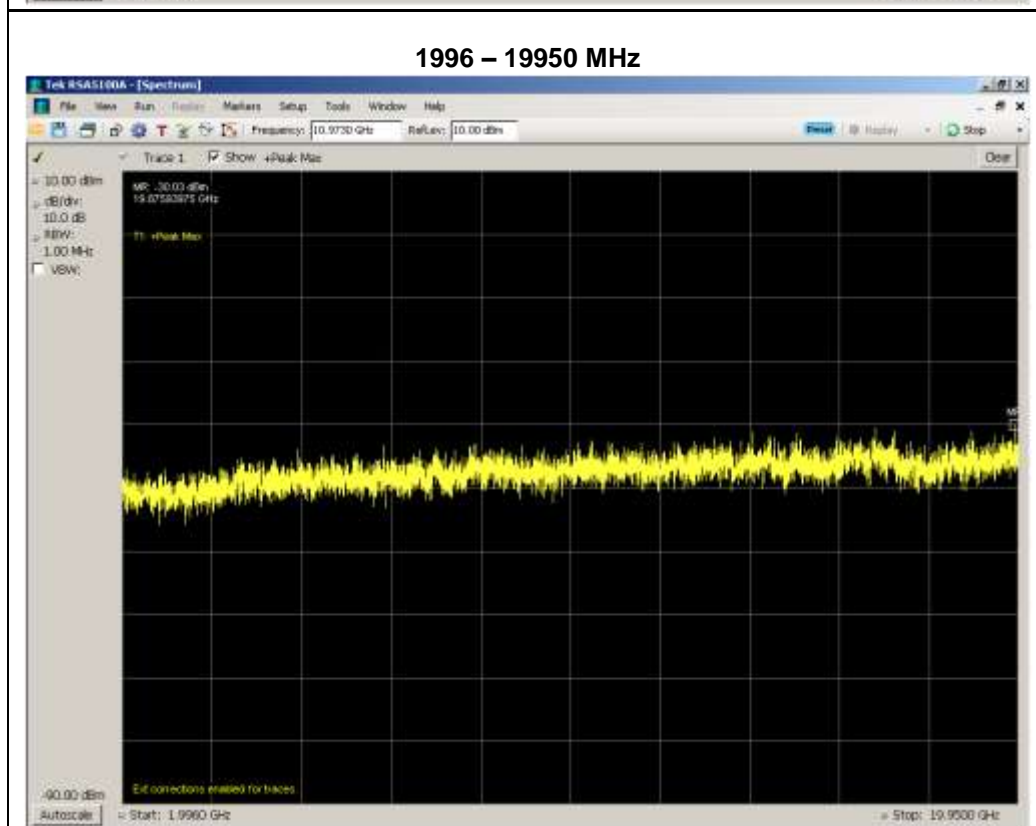
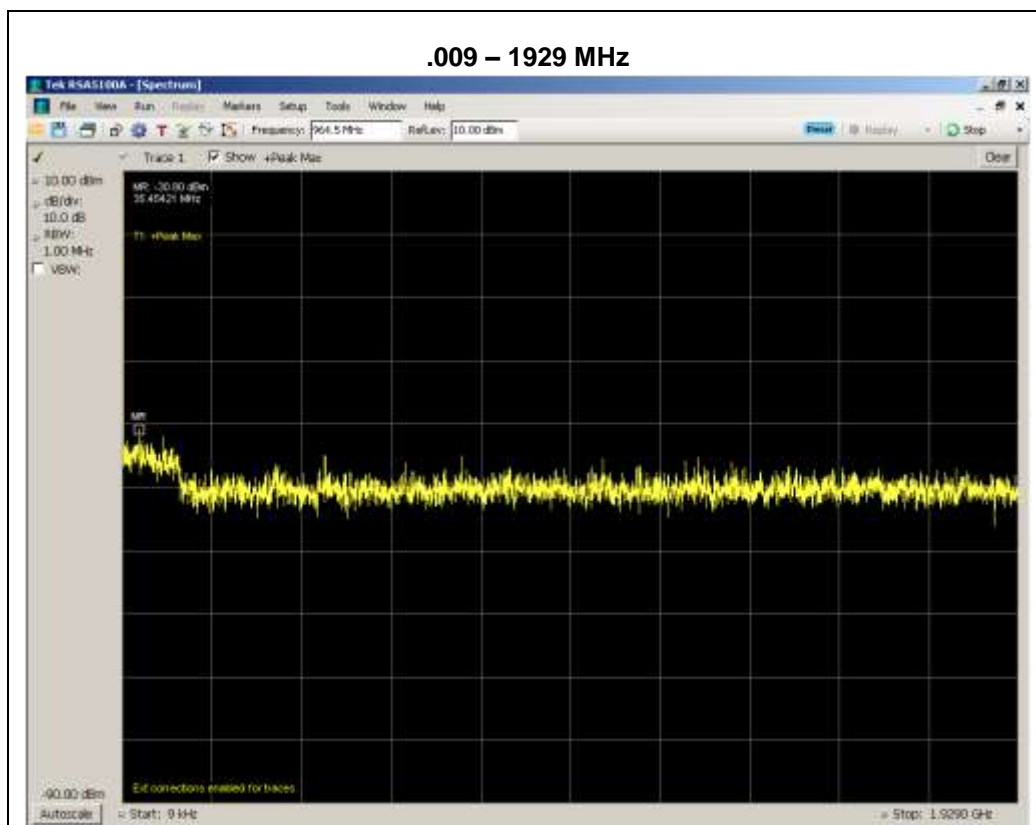


### 869 - 894 MHz Band



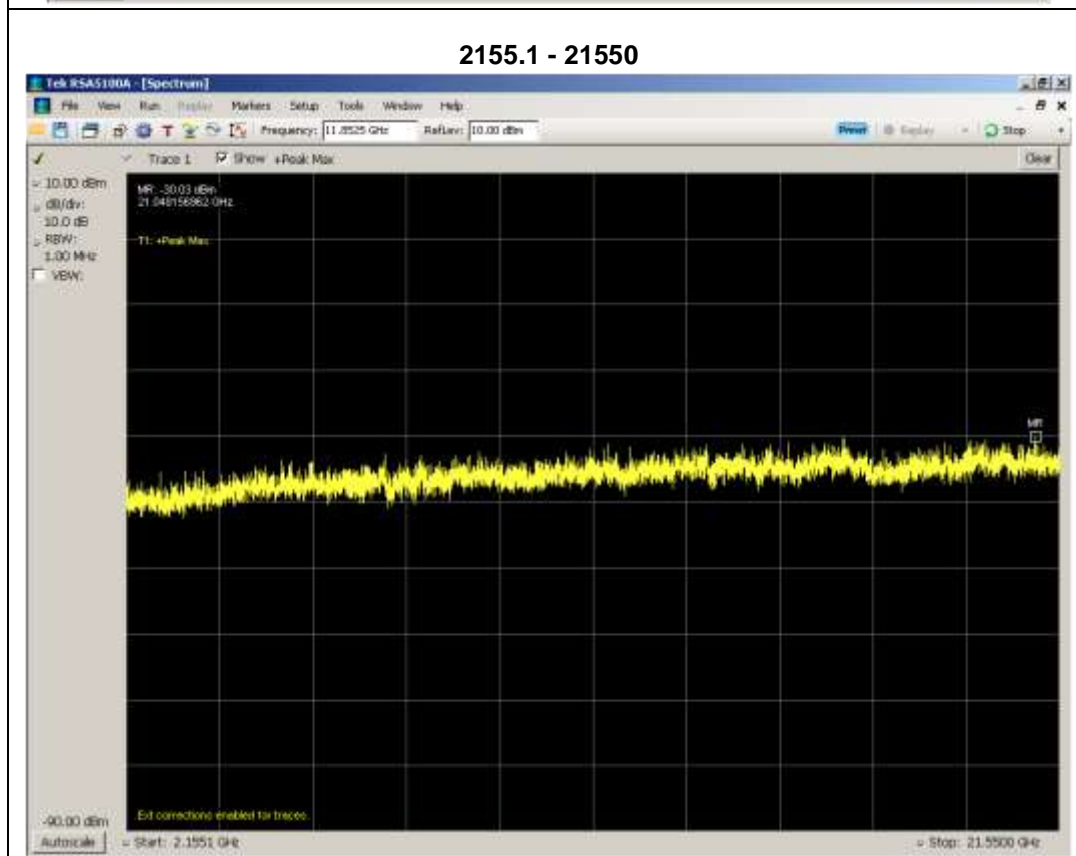
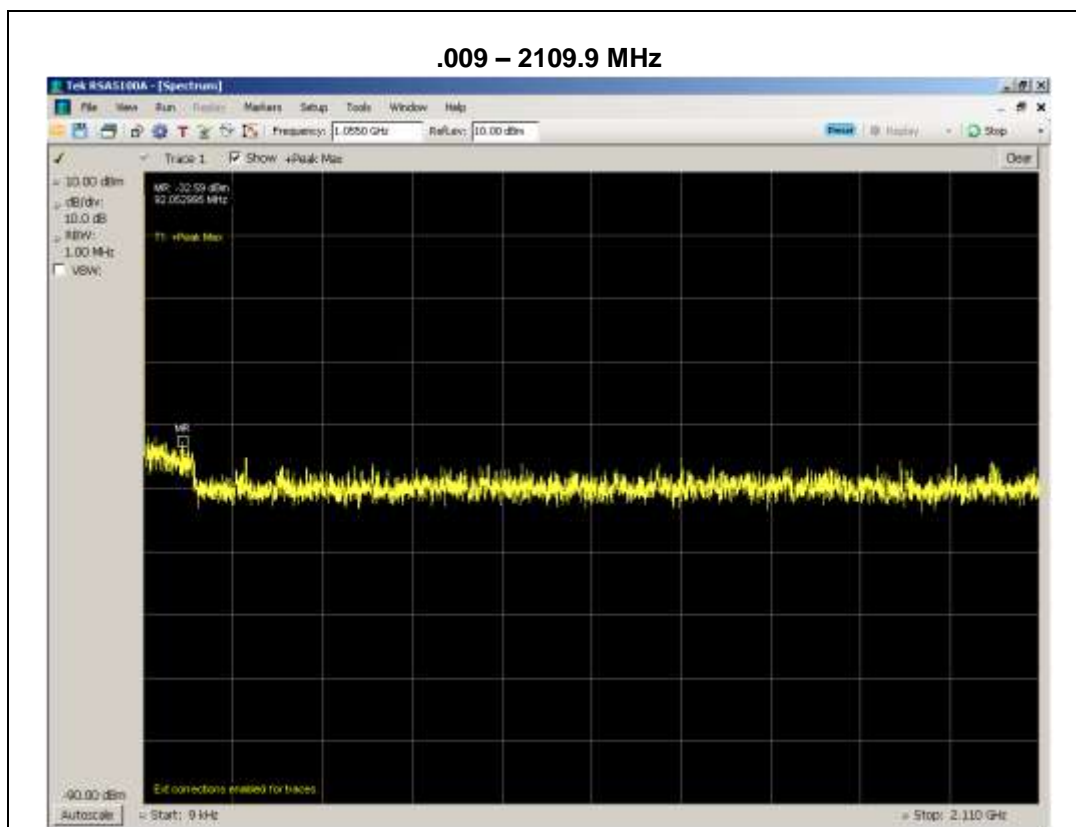


### 1930 - 1995 MHz Band





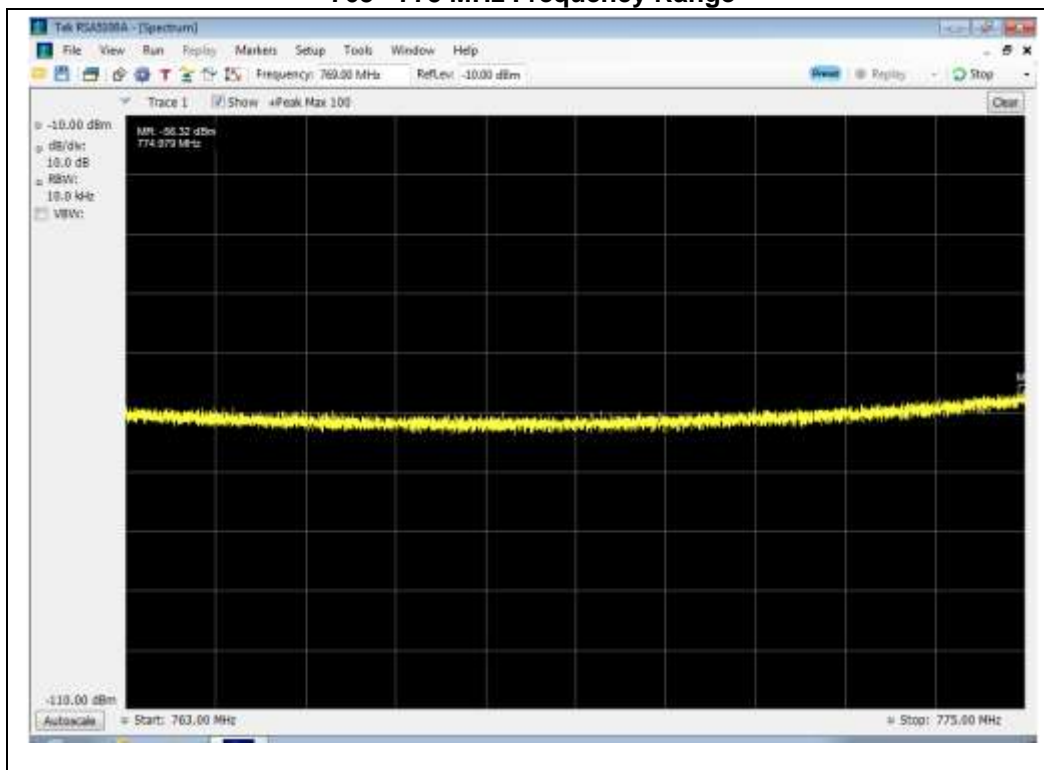
### 2110 - 2155 MHz Band



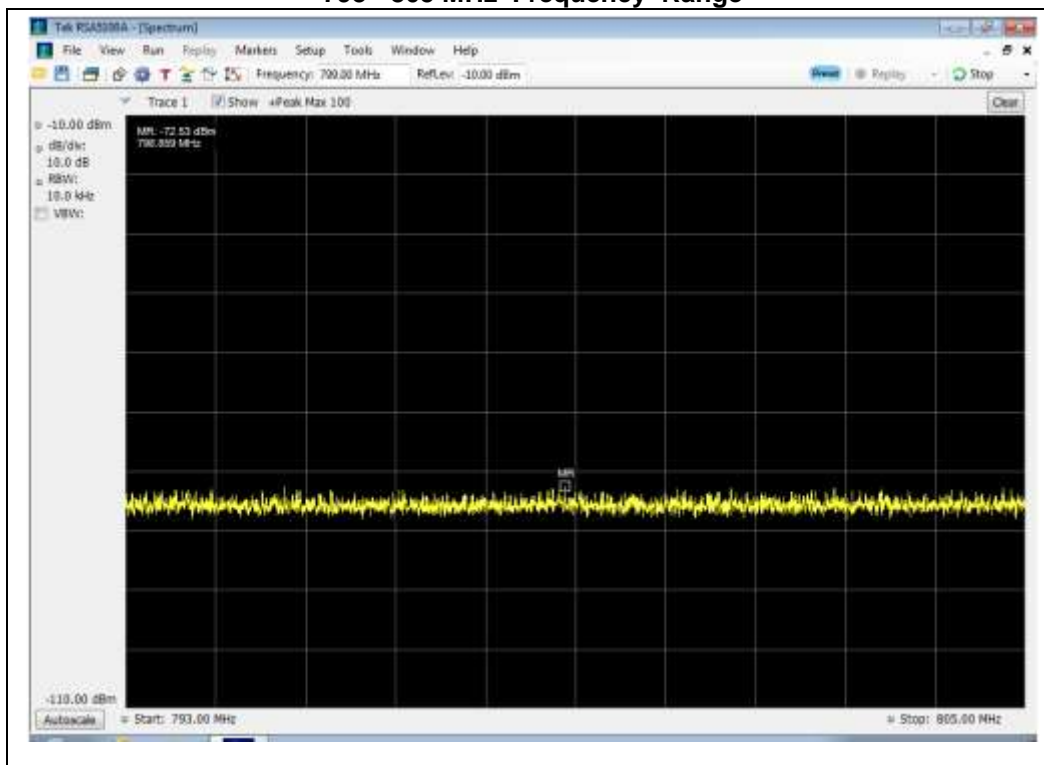


### 777 – 787 MHz Uplink Test Plots for the

#### 763 - 775 MHz Frequency Range



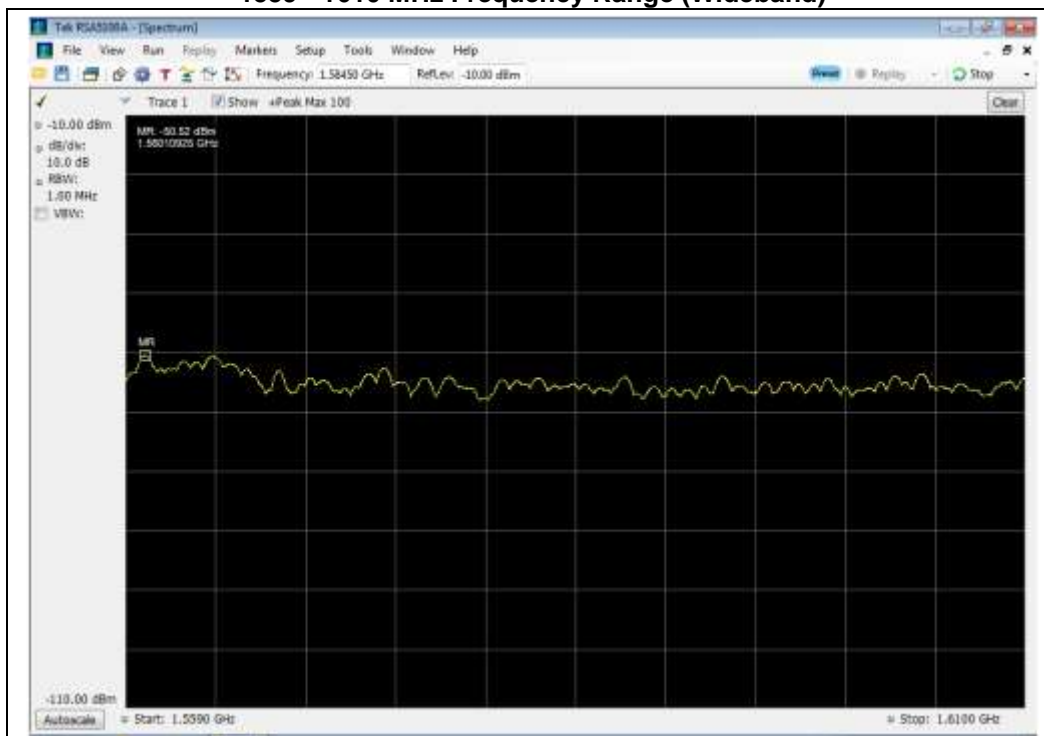
#### 793 - 805 MHz Frequency Range



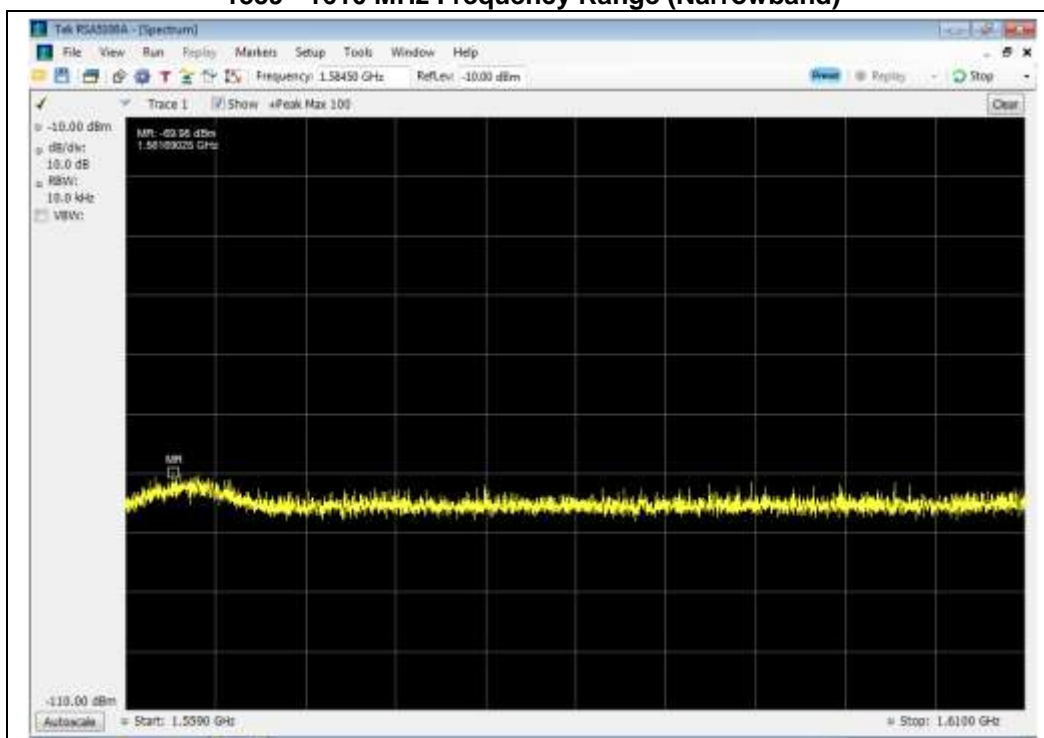


### 777 – 787 MHz Uplink Test Plots for the

### 1559 - 1610 MHz Frequency Range (Wideband)



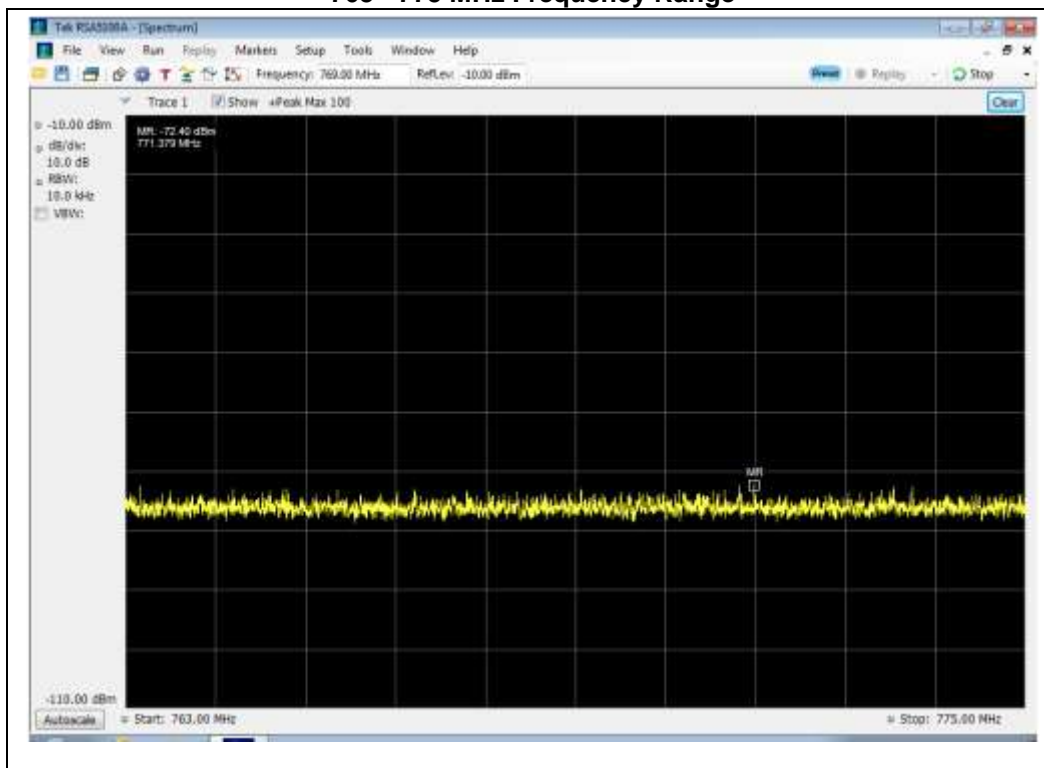
### 1559 - 1610 MHz Frequency Range (Narrowband)



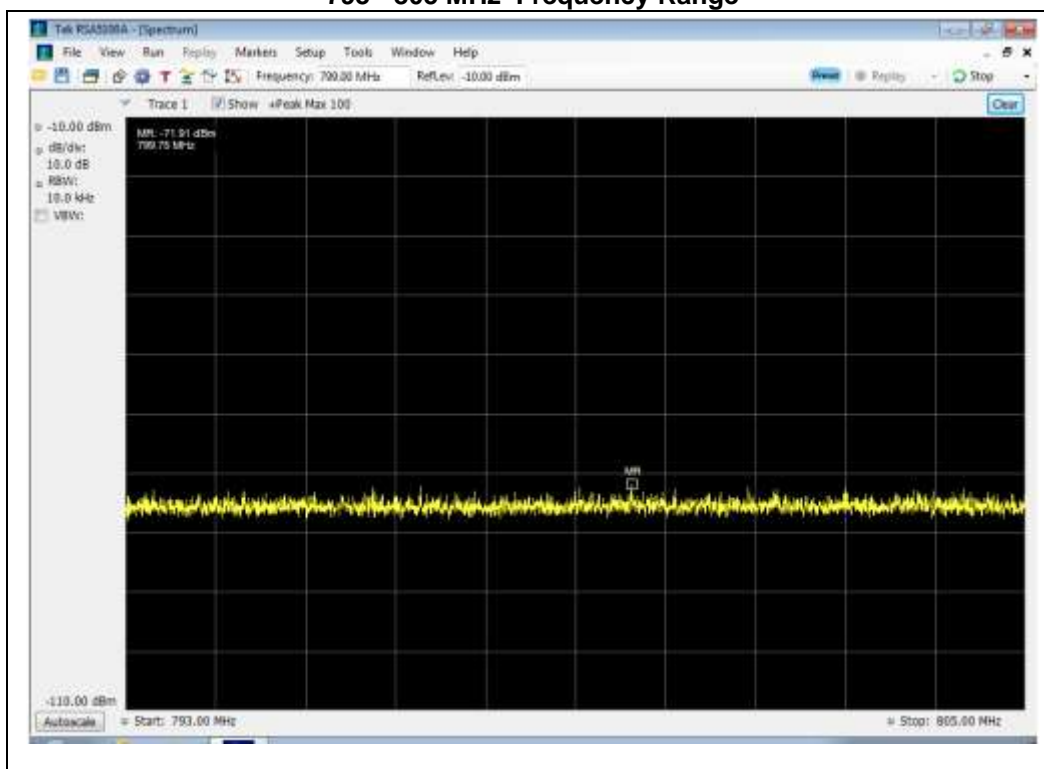


### 746 – 756 MHz Downlink Test Plots for the

#### 763 - 775 MHz Frequency Range



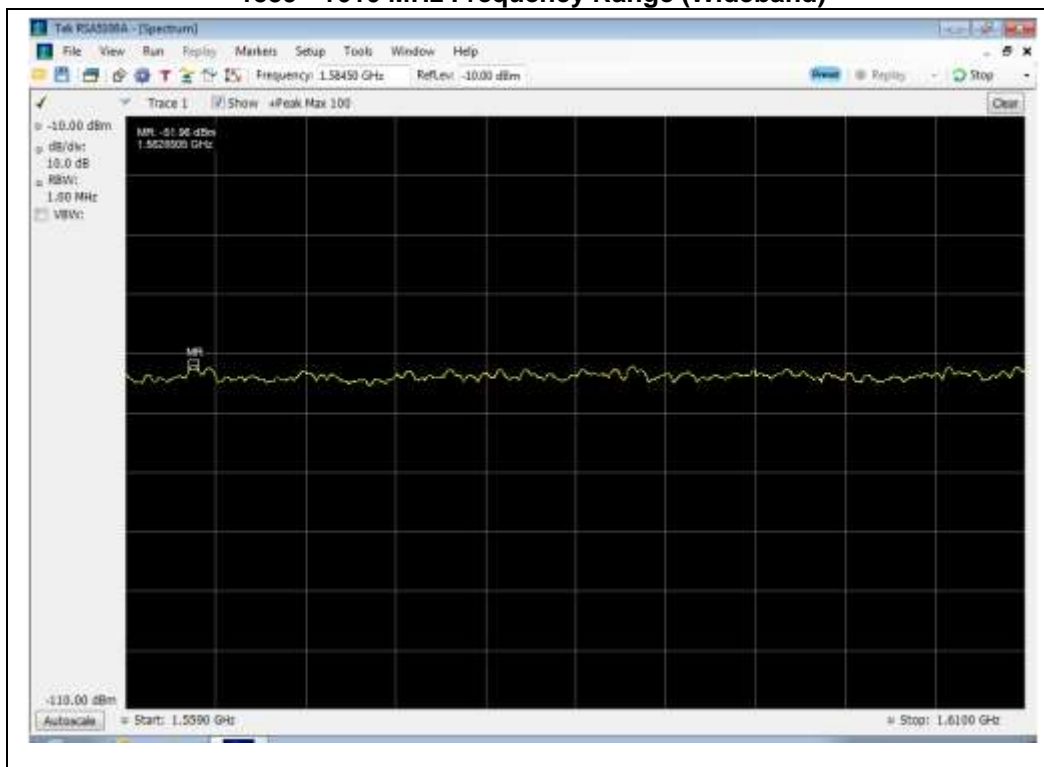
#### 793 - 805 MHz Frequency Range



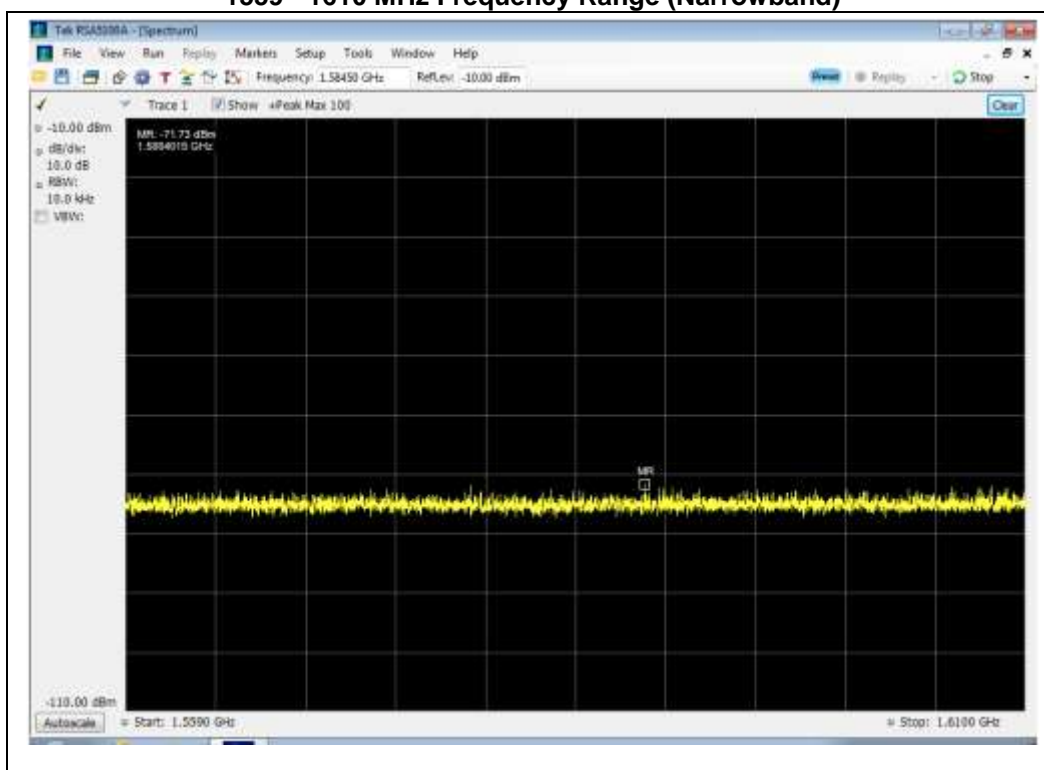


### 746 – 756 MHz Downlink Test Plots for the

### 1559 - 1610 MHz Frequency Range (Wideband)



### 1559 - 1610 MHz Frequency Range (Narrowband)







### Noise Limits

**Name of Test:**

Noise Limits

**Engineer:** Greg Corbin

**Test Equipment Utilized:**

i00424, SMU 200A - S/N:101369

**Test Date:** 11/8/2013

### 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 accurate readings were obtained. A series of three tests are performed to measure the maximum uplink and downlink noise and the variable noise for the uplink and downlink in the presence of a downlink signal. 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 EUT is a mobile booster.

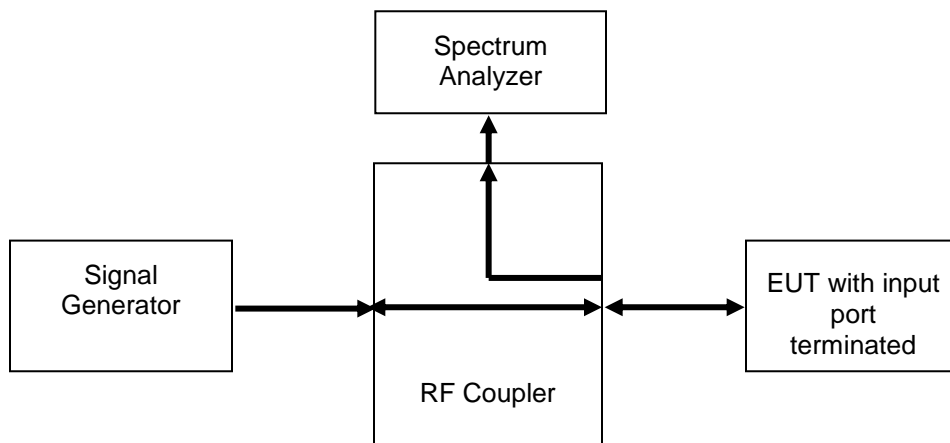
The noise power limit is fixed at -59 dBm for mobile boosters.

### Test Setup

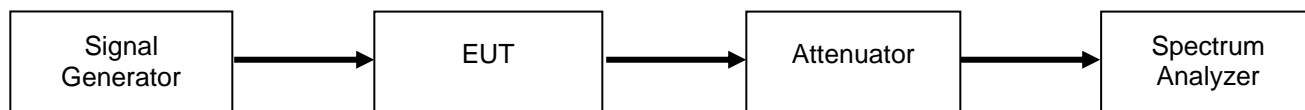
#### Maximum Noise Power



#### 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
704 - 716	-60.3	-59.0	-1.3	Pass
776 - 787	-59.2	-59.0	-0.2	Pass
824 - 849	-60.3	-59.0	-1.3	Pass
1710 - 1755	-60.3	-59.0	-1.3	Pass
1850 - 1915	-59.4	-59.0	-0.4	Pass

### Maximum Downlink Noise Test Results

Frequency Band (MHz)	Measured Noise (dBm)	Limit (dBm)	Margin (dB)	Result
734 - 746	-61.4	-59.0	-2.4	Pass
746 - 757	-67.2	-59.0	-8.2	Pass
869 - 894	-64.7	-59.0	-5.7	Pass
1930 - 1995	-61.9	-59.0	-2.9	Pass
2110 - 2155	-62.2	-59.0	-3.2	Pass

### Uplink Noise Timing Test Results

Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Result
704 - 716	0.800	1.0	Pass
776 - 787	0.663	1.0	Pass
824 - 849	0.313	1.0	Pass
1710 - 1755	0.525	1.0	Pass
1850 - 1915	0.538	1.0	Pass



### Variable Uplink Noise Limit Test Results

#### 704 - 716 MHz

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-69.0	-59.0	-59.5	-0.5
-68.0	-59.0	-59.5	-0.5
-67.0	-59.0	-59.5	-0.5
-66.0	-59.0	-59.5	-0.5
-58.0	-59.0	-60.5	-1.5
-57.0	-59.0	-60.9	-1.9

#### 776 - 787 MHz

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-62.0	-59.0	-61.8	-2.8
-59.0	-59.0	-61.8	-2.8
-58.0	-59.0	-62	-3.0
-56.0	-59.0	-61.9	-2.9
-51.0	-59.0	-63.5	-4.5
-50.0	-59.0	-64.2	-5.2

#### 824 - 849 MHz

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-59.0	-59.0	-59.8	-0.8
-58.0	-59.0	-59.8	-0.8
-57.0	-59.0	-59.8	-0.8
-56.0	-59.0	-59.8	-0.8
-54.0	-59.0	-61	-2.0
-53.0	-59.0	-62.8	-3.8

#### 1710 - 1755 MHz

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-84.0	-59.0	-59.7	-0.7
-83.0	-59.0	-59.7	-0.7
-82.0	-59.0	-59.7	-0.7
-81.0	-59.0	-59.7	-0.7
-35.0	-68.0	-69.3	-1.3
-32.0	-71.0	-71.4	-1.4

#### 1850 - 1915 MHz

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-36.0	-67.0	-67.2	-0.2
-33.0	-70.0	-70.4	-0.4
-37.0	-66.0	-66.5	-0.5
-34.0	-69.0	-69.5	-0.5
-52.0	-59.0	-59.5	-0.5
-51.0	-59.0	-59.5	-0.5



**Variable Downlink Noise Limit Test Results**

**734 - 746 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-69.0	-59.0	-59.8	-0.8
-68.0	-59.0	-59.8	-0.8
-67.0	-59.0	-59.8	-0.8
-66.0	-59.0	-59.8	-0.8
-60.0	-59.0	-60.7	-1.7
-59.0	-59.0	-60.8	-1.8

**746 - 757 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-60.0	-59.0	-60.3	-1.3
-59.0	-59.0	-60.5	-1.5
-58.0	-59.0	-60.5	-1.5
-81.0	-59.0	-60.9	-1.9
-56.0	-59.0	-62.8	-3.8
-55.0	-59.0	-63.4	-4.4

**869 - 894 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-84.0	-59.0	-59.1	-0.1
-83.0	-59.0	-59.1	-0.1
-82.0	-59.0	-59.1	-0.1
-81.0	-59.0	-59.1	-0.1
-55.0	-59.0	-60.1	-1.1
-54.0	-59.0	-60.2	-1.2

**1930 - 1995 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-51.0	-59.0	-61.0	-2.0
-55.0	-59.0	-61.4	-2.4
-67.0	-59.0	-61.5	-2.5
-66.0	-59.0	-61.5	-2.5
-36.0	-67.0	-69.7	-2.7
-39.0	-64.0	-67.1	-3.1

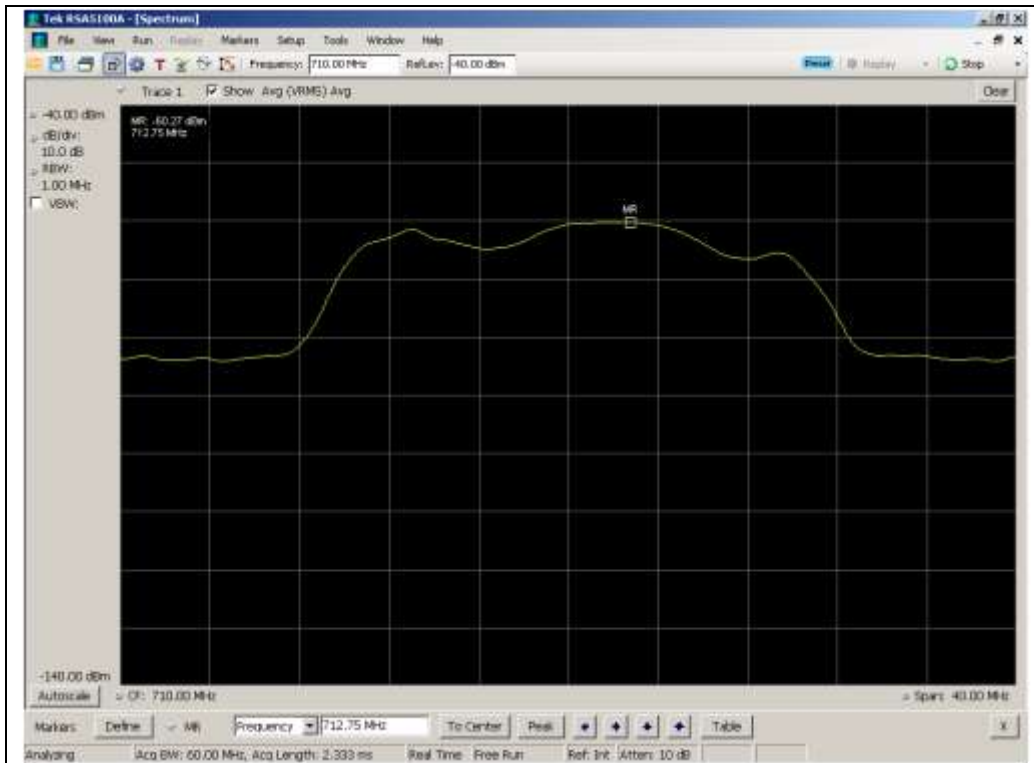
**2110 - 2155 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-33.0	-70.0	-71.8	-1.8
-32.0	-70.0	-72.2	-2.2
-30.0	-70.0	-72.9	-2.9
-41.0	-62.0	-64.9	-2.9
-31.0	-70.0	-73.0	-3.0
-39.0	-64.0	-67.4	-3.4

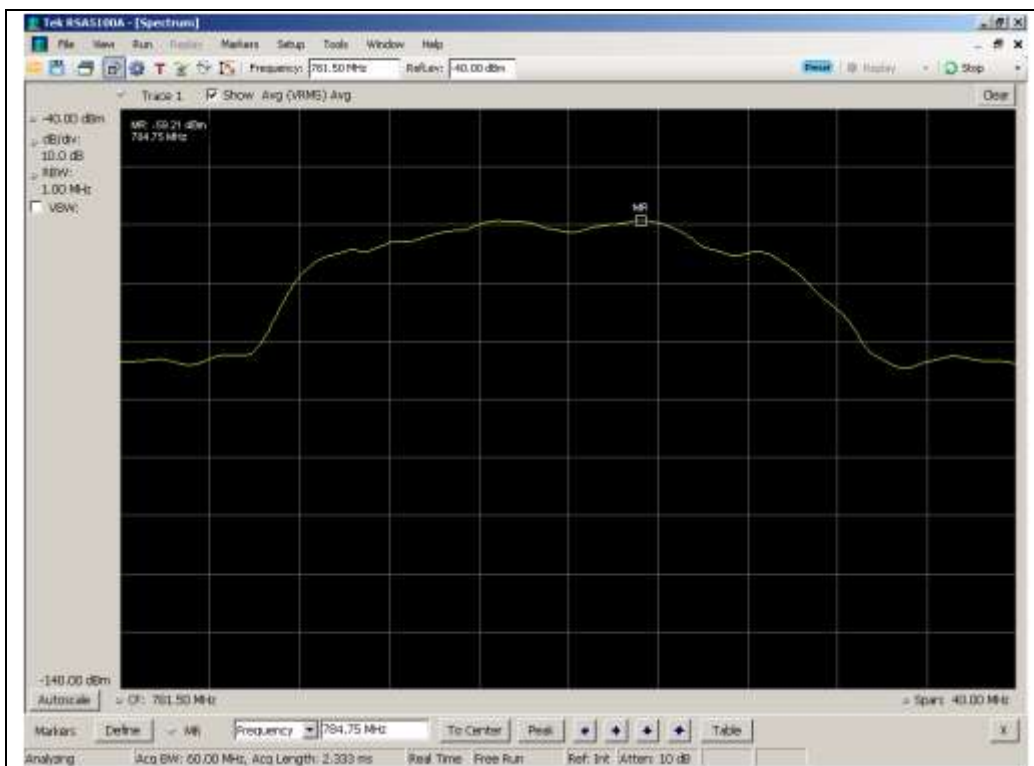


### Maximum Uplink Noise Test Plots

#### 704 - 716 MHz Band

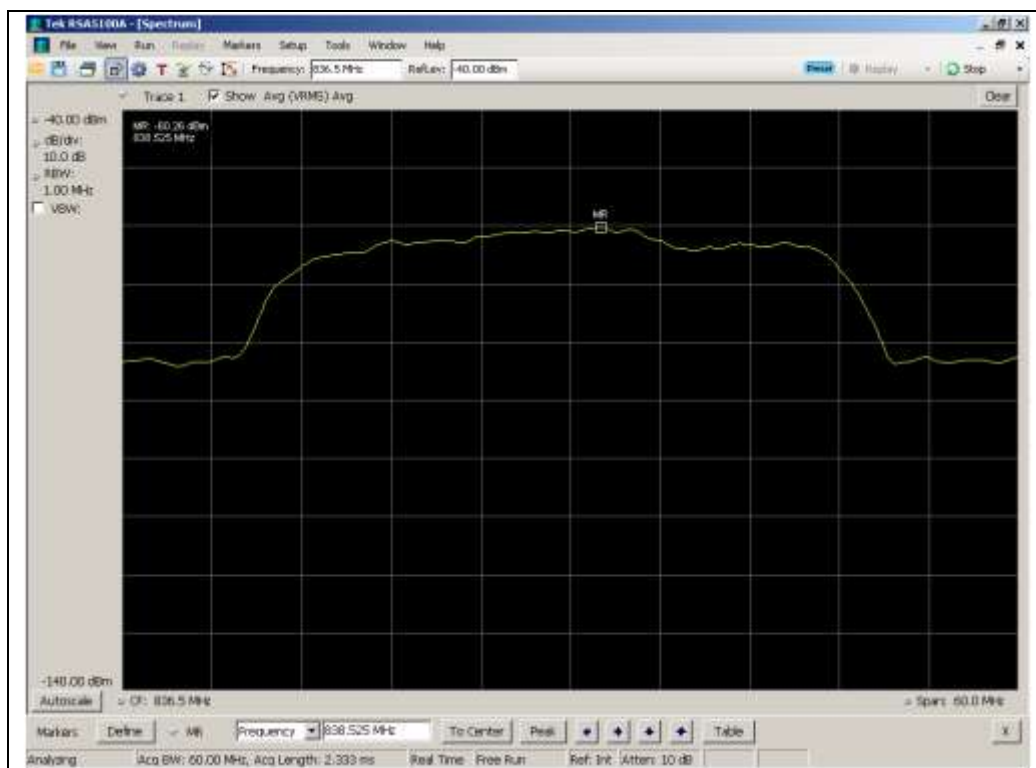


#### 776 - 787 MHz Band

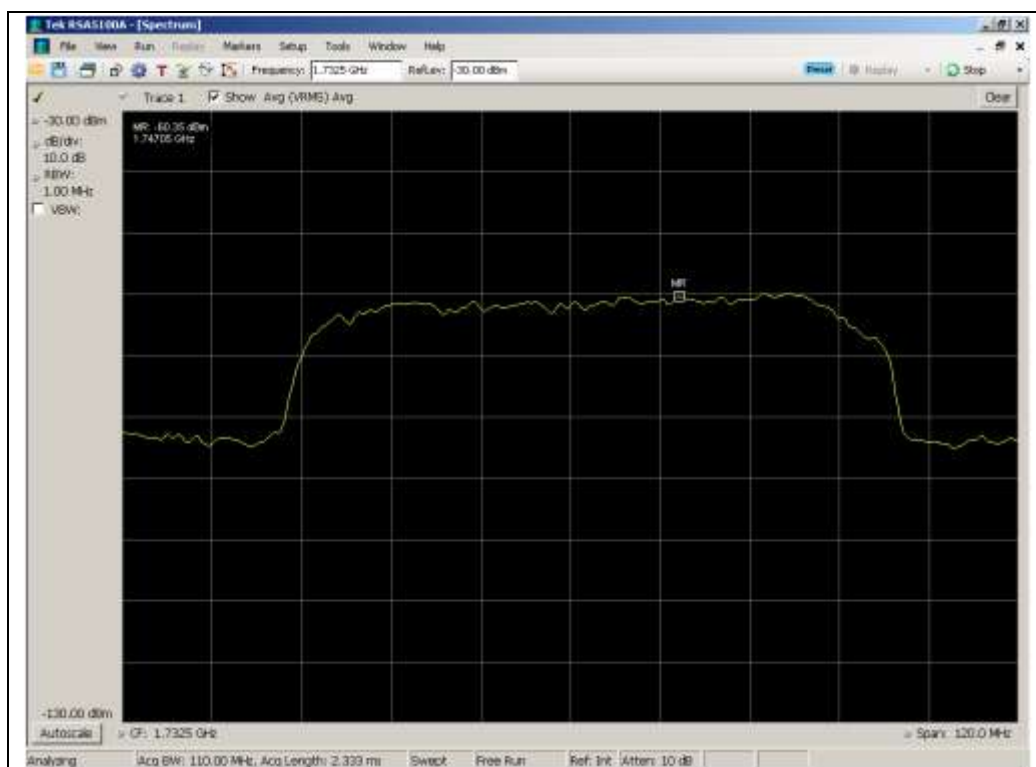




### 824 - 849 MHz Band

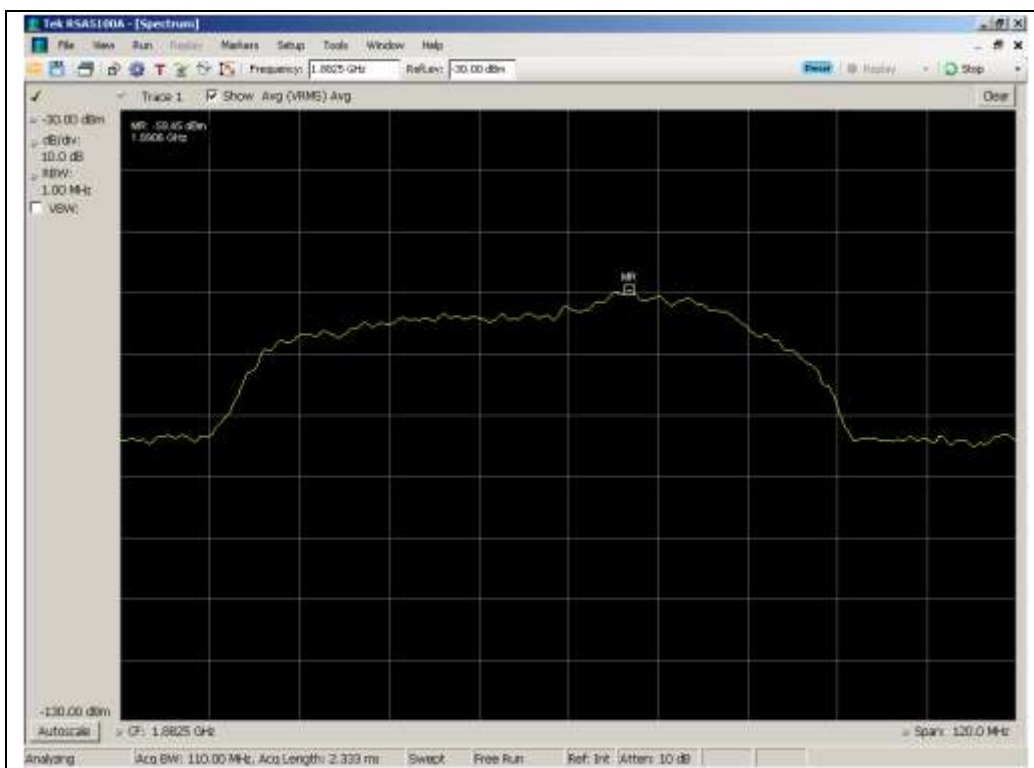


### 1710 - 1755 MHz Band



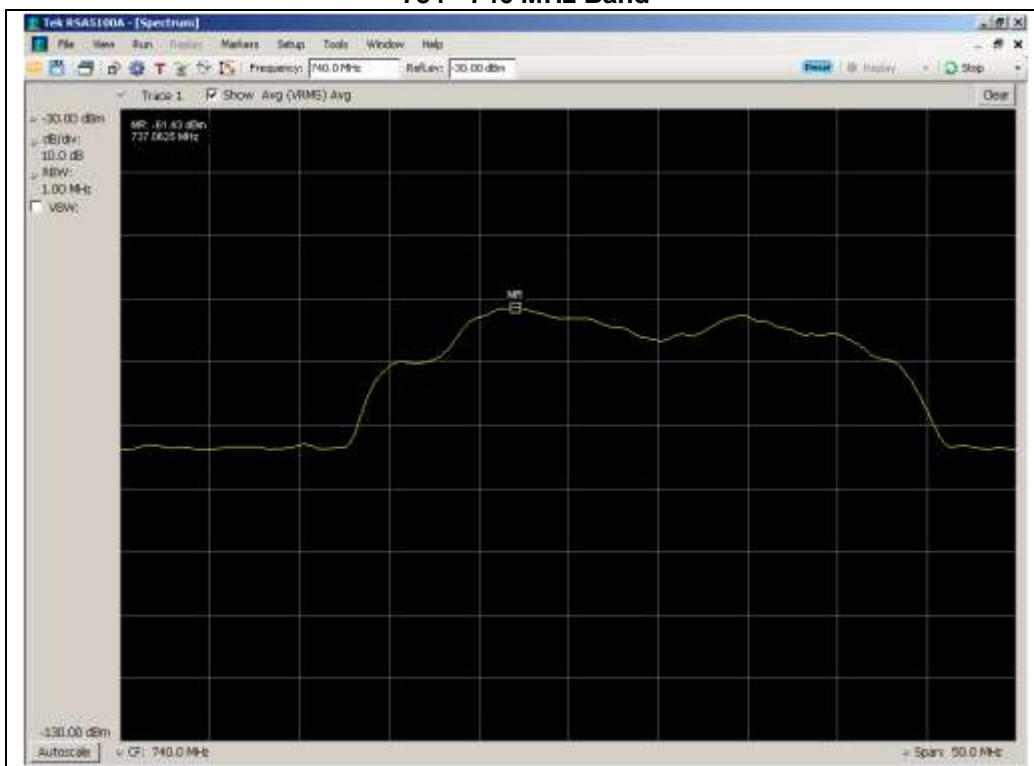


### 1850 - 1915 MHz Band



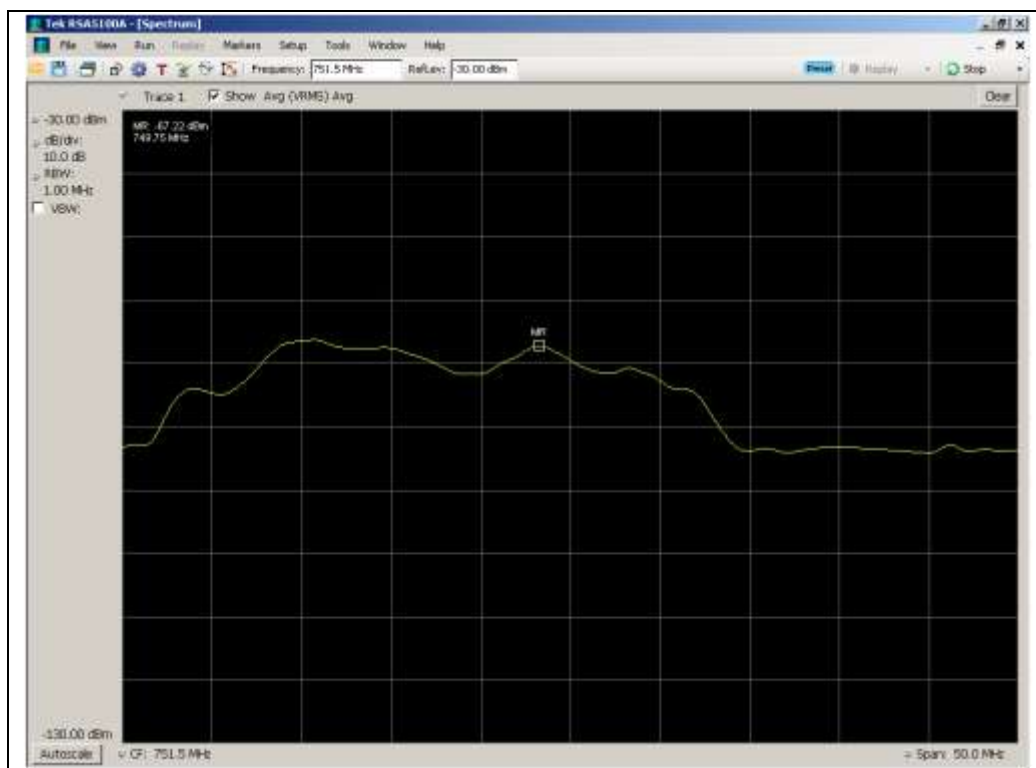
### Maximum Downlink Noise Test Plots

### 734 - 746 MHz Band

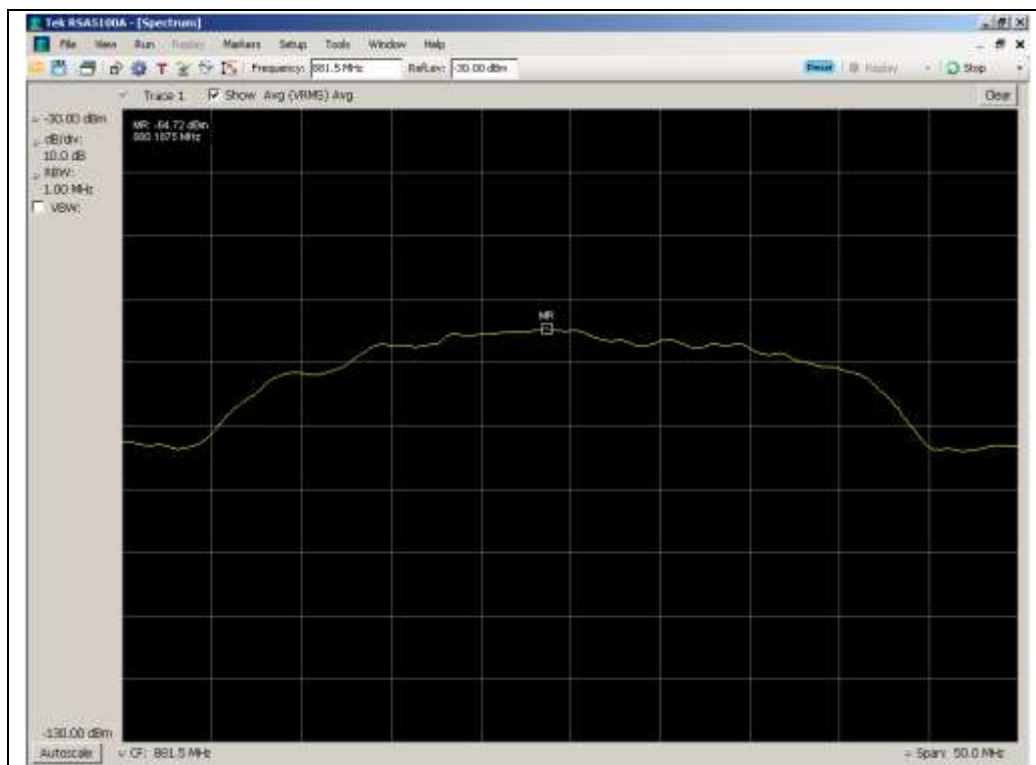




### 746 - 757 MHz Band

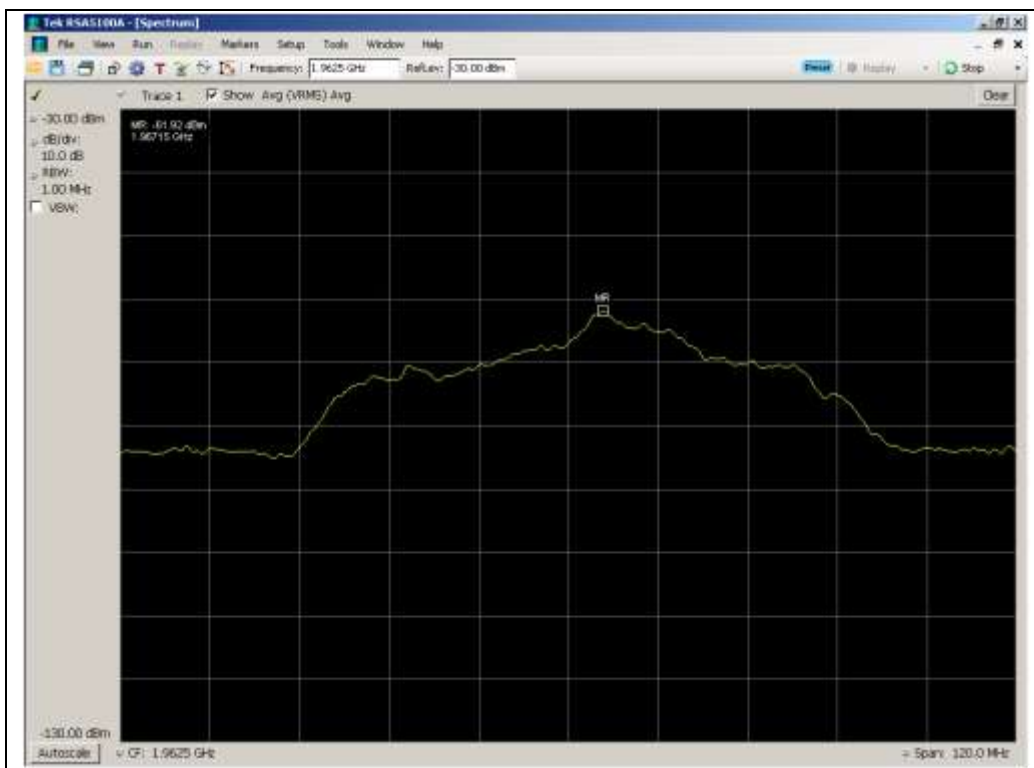


### 869 - 894 MHz Band

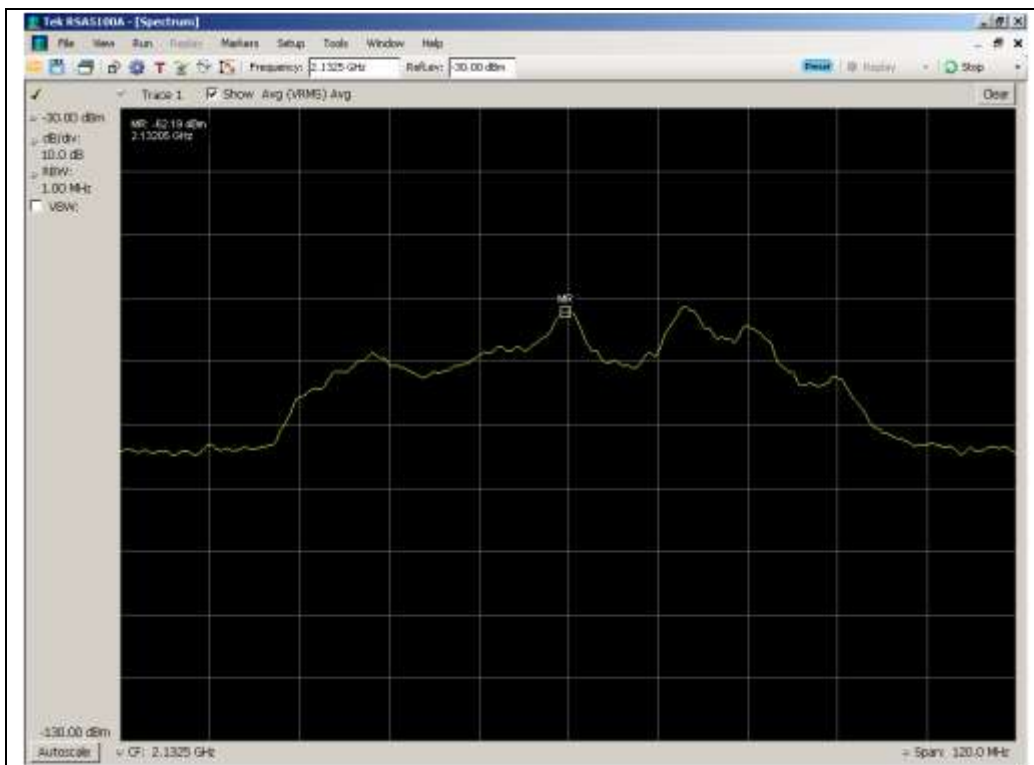




### 1930 - 1995 MHz Band



### 2110 - 2155 MHz Band

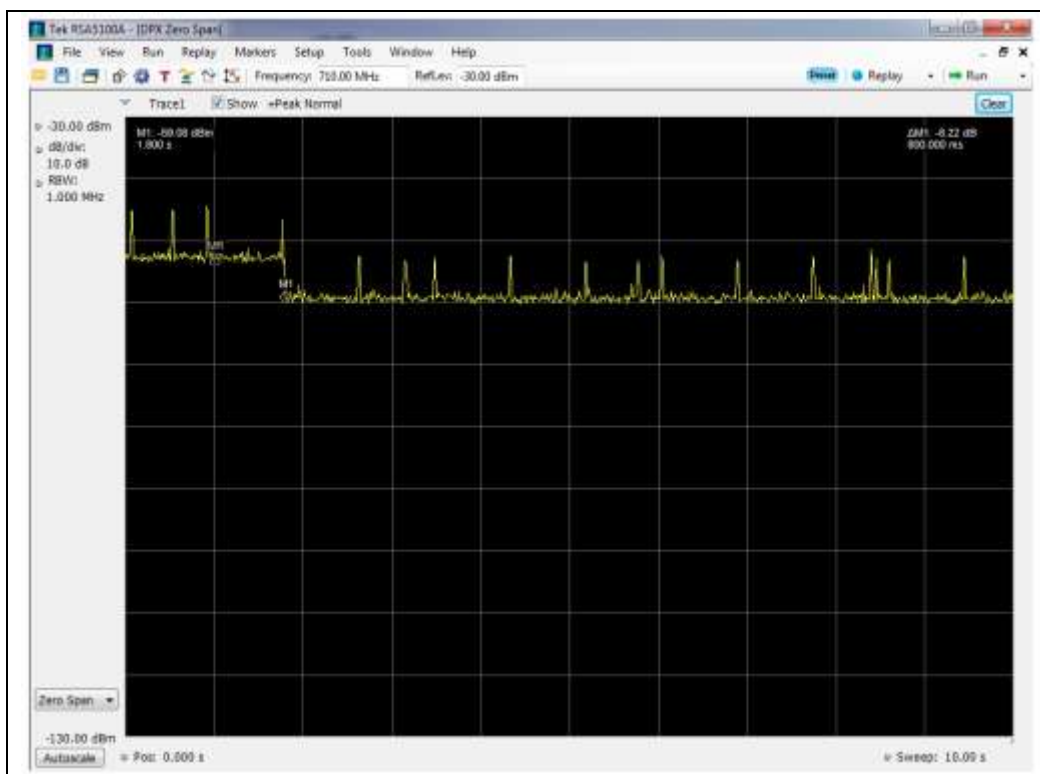




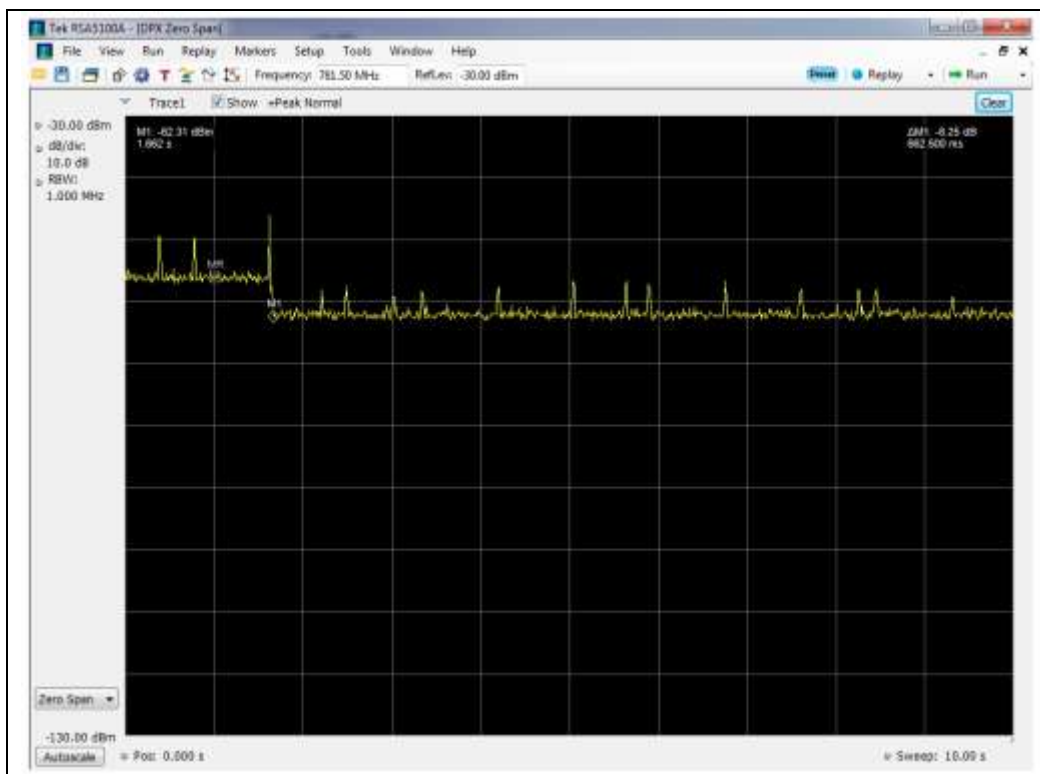


## Uplink Noise Timing Test Plots

### 704 - 716 MHz Band

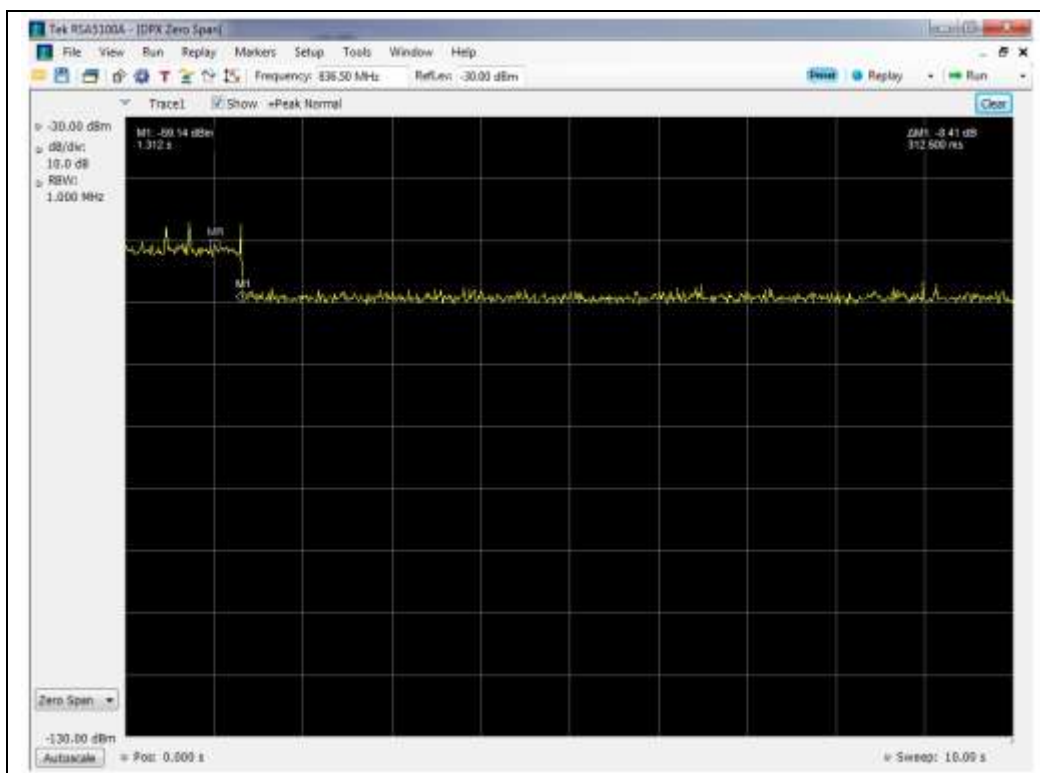


### 776 - 787 MHz Band

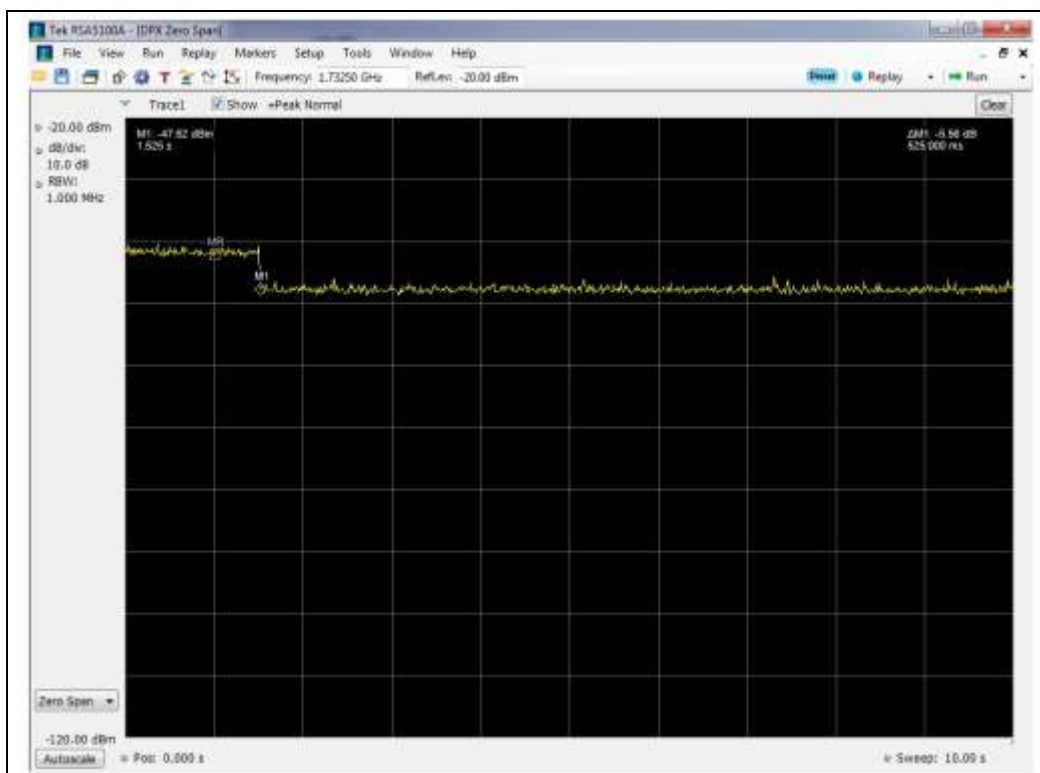




### 824 - 849 MHz Band

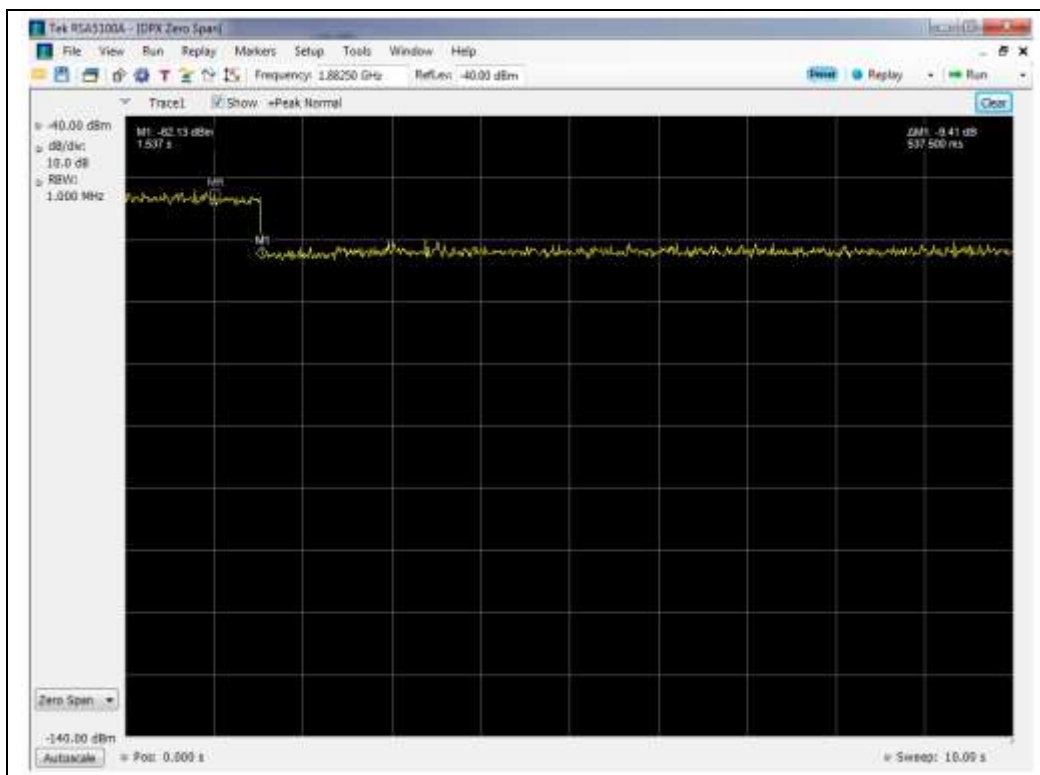


### 1710 - 1755 MHz Band





### 1850 - 1915 MHz Band





## Uplink Inactivity

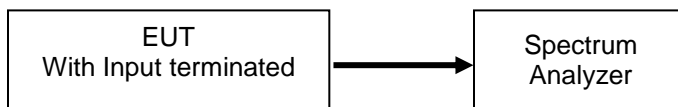
**Name of Test:** Uplink Inactivity  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 9/27/2013

### 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 which was utilized to ensure it was less than 300 seconds. The noise level after the return to an inactive state was less than -70 dBm/MHz.

### Test Setup



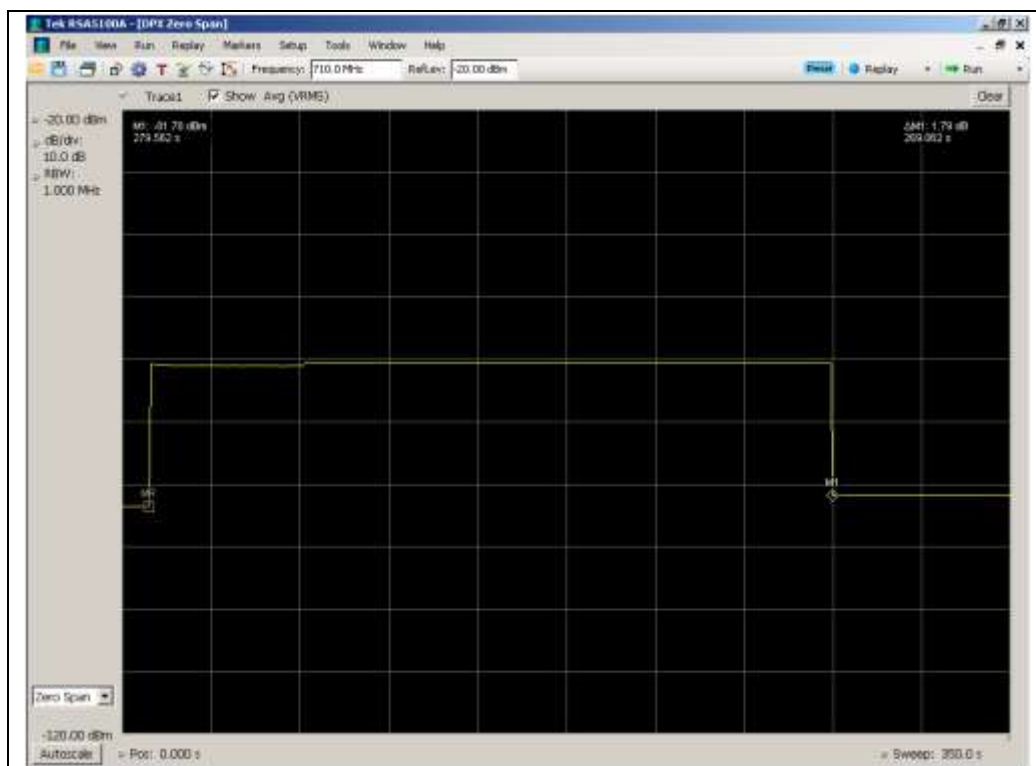
### Uplink Test Results

Frequency Band (MHz)	Measured Time (Seconds)	Limit (Seconds)	Result
704 - 716	269	300	Pass
776 - 787	269	300	Pass
824 - 849	269	300	Pass
1710 - 1755	269.5	300	Pass
1850 - 1915	269	300	Pass

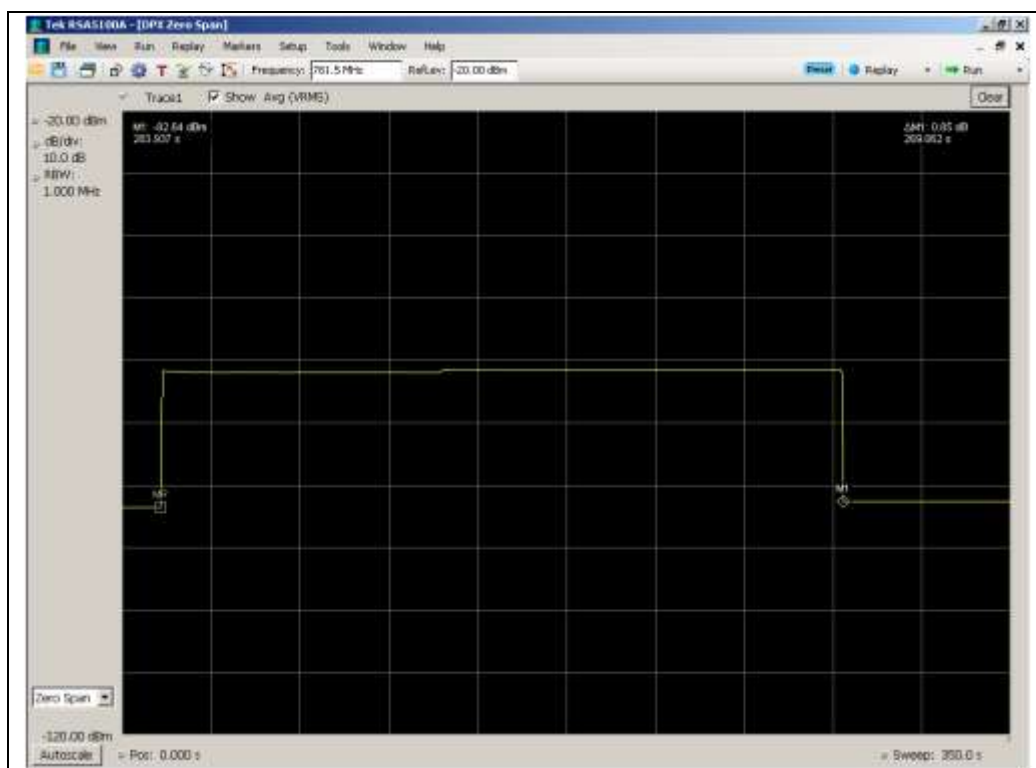


## Uplink Inactivity Test Results

704 - 716 MHz

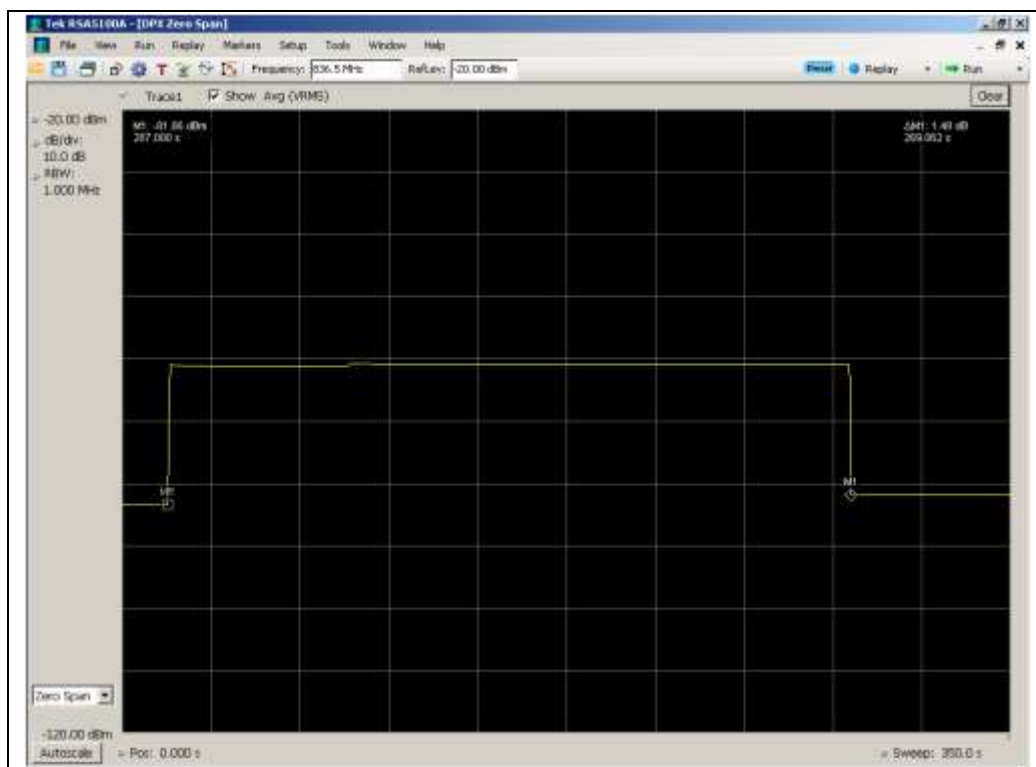


776 - 787 MHz

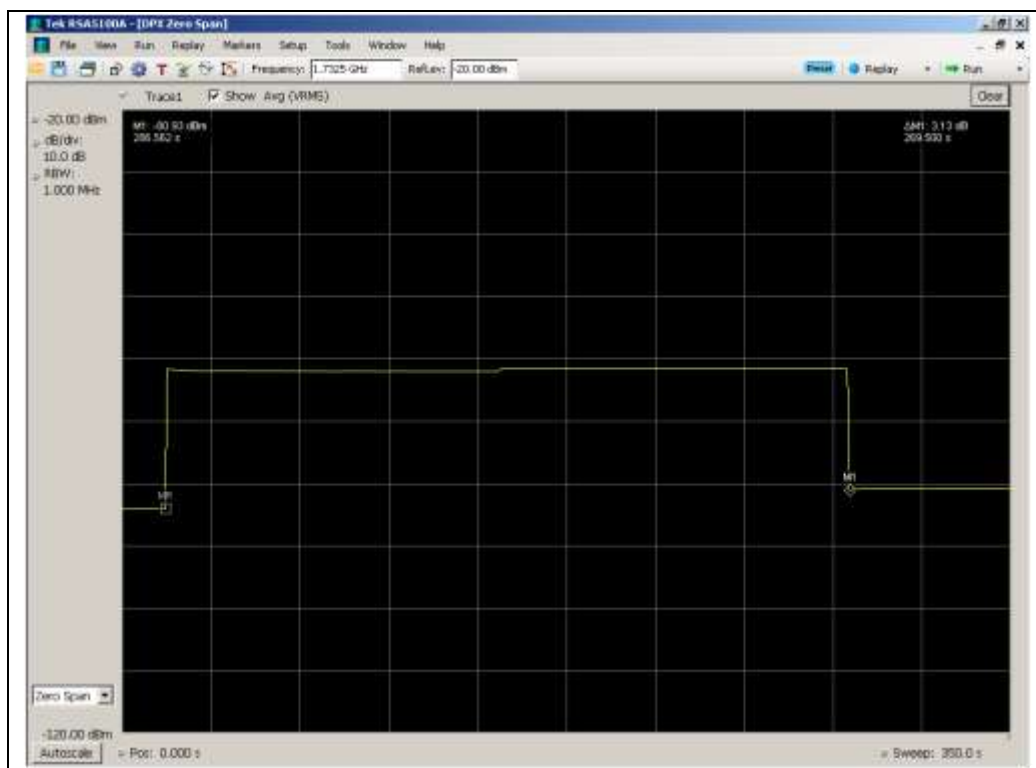




### 824 - 849 MHz

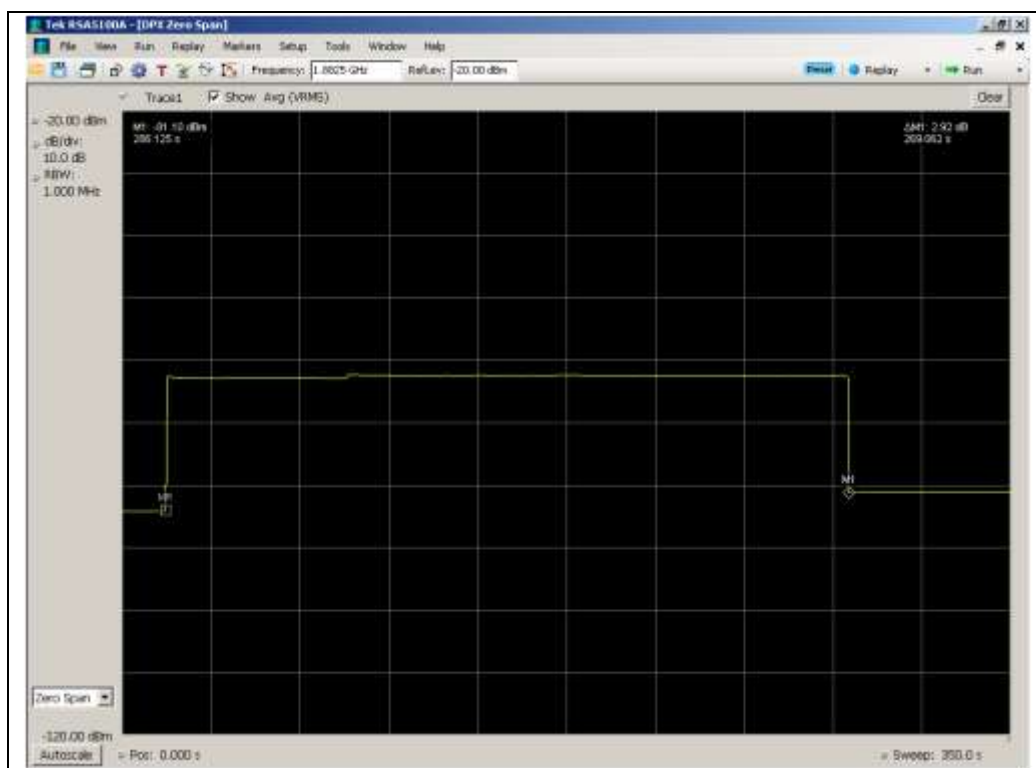


### 1710 - 1755 MHz





### 1850 - 1915 MHz





**Variable Gain**

**Name of Test:** Variable Gain  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 10/26/2013

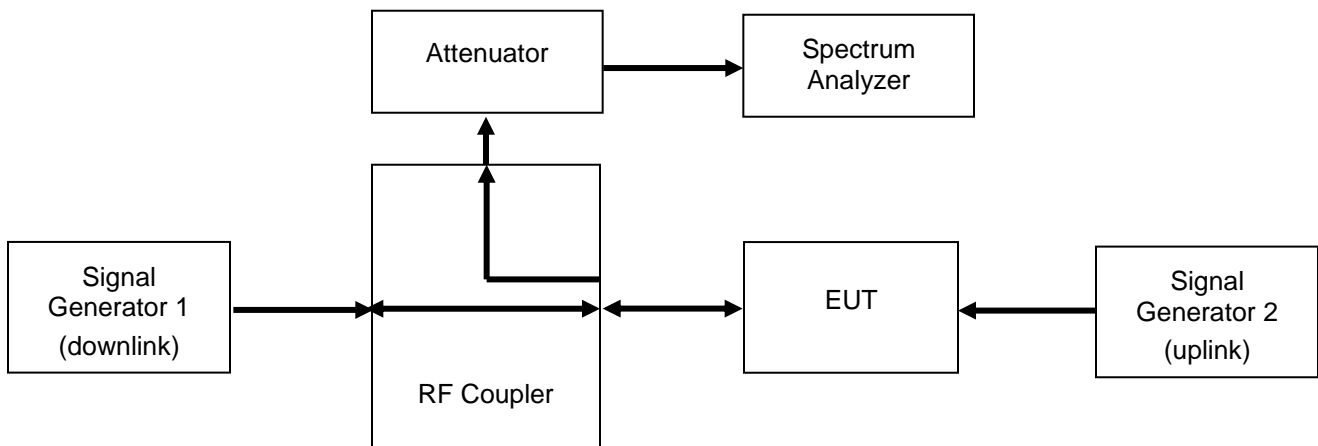
**Test Procedure**

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 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.

$$\text{Variable Gain} = -34 \text{ dB} - \text{RSSI} + \text{MSCL}$$

**Test Setup**



**Uplink Test Results**

**704 - 716 MHz**

RSSI (dBm)	MSCL (dB)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-66.0	25.5	50.0	-35.5	13.9	49.4	-0.6
-65.0	25.5	50.0	-35.5	13.9	49.4	-0.6
-64.0	25.5	50.0	-35.5	13.9	49.4	-0.6
-63.0	25.5	50.0	-35.5	13.9	49.4	-0.6
-56.0	25.5	47.5	-35.5	10.4	45.9	-1.6
-54.0	25.5	45.5	-35.5	8.4	43.9	-1.6

**776 - 787 MHz**

RSSI (dBm)	MSCL (dB)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-43.0	26.5	35.5	-35.7	-0.5	35.2	-0.3
-40.0	26.5	32.5	-35.7	-3.6	32.1	-0.4
-55.0	26.5	47.5	-35.7	11.4	47.1	-0.4
-42.0	26.5	34.5	-35.7	-1.7	34.0	-0.5
-41.0	26.5	33.5	-35.7	-2.7	33.0	-0.5
-39.0	26.5	31.5	-35.7	-4.7	31.0	-0.5





**824 - 849 MHz**

RSSI (dBm)	MSCL (dB)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-41.0	29.1	36.1	-35.5	-0.6	34.9	-1.2
-40.0	29.1	35.1	-35.5	-1.6	33.9	-1.2
-32.0	29.1	27.1	-35.5	-9.6	25.9	-1.2
-30.0	29.1	25.1	-35.5	-11.7	23.8	-1.3
-27.0	29.1	22.1	-35.5	-15.2	20.3	-1.8
-48.0	29.1	43.1	-35.5	5.7	41.2	-1.9

29.1

**1710 - 1755 MHz**

RSSI (dBm)	MSCL (dB)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-41.0	37.1	44.1	-32.0	10.5	42.5	-1.6
-34.0	37.1	37.1	-32.0	2.7	34.7	-2.4
-38.0	37.1	41.1	-32.0	6.6	38.6	-2.5
-31.0	37.1	34.1	-32.0	-0.4	31.6	-2.5
-30.0	37.1	33.1	-32.0	-1.4	30.6	-2.5
-29.0	37.1	32.1	-32.0	-2.6	29.4	-2.7

**1850 - 1915 MHz**

RSSI (dBm)	MSCL (dB)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-31.0	36.3	33.3	-34.5	-2.0	32.5	-0.8
-24.0	36.3	26.3	-34.5	-9.1	25.4	-0.9
-22.0	36.3	24.3	-34.5	-11.6	22.9	-1.4
-38.0	36.3	40.3	-34.5	4.2	38.7	-1.6
-40.0	36.3	42.3	-34.5	6.1	40.6	-1.7
-39.0	36.3	41.3	-34.5	5.1	39.6	-1.7

**Uplink Gain Timing Test Results**

Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Result
704 - 716	0.80	1.0	Pass
777 - 78	0.25	1.0	Pass
824 - 849	0.83	1.0	Pass
1710 - 1755	0.25	1.0	Pass
1850 - 1915	0.80	1.0	Pass



### Occupied Bandwidth

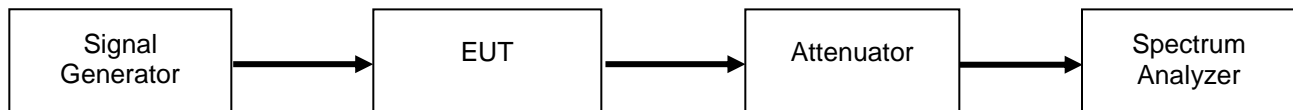
**Name of Test:** Occupied Bandwidth  
**Test Equipment Utilized:** i00424, SMU 200A - S/N:101369

**Engineer:** Greg Corbin  
**Test Date:** 9/26/2013

### 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 accurate readings were obtained. A signal generator was utilized to produce the following signals: GSM, CDMA, and WCDMA tuned to the center channel of each of the EUT's operational uplink and downlink band with the RF level set to 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

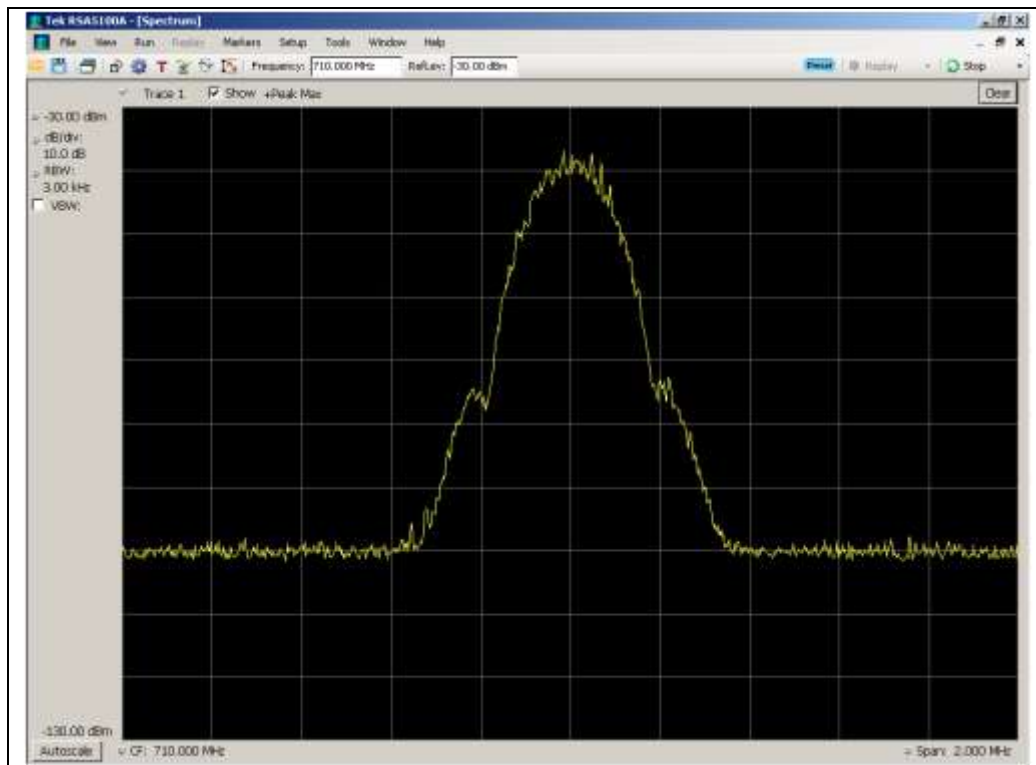




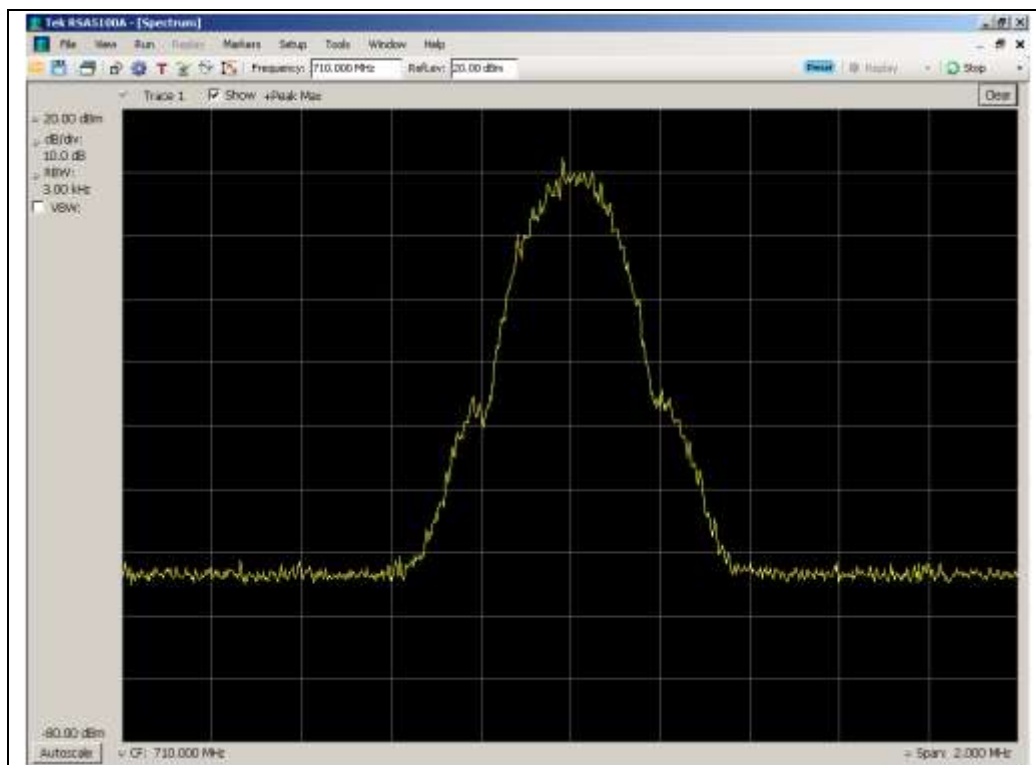
## GSM Uplink Test Plots

704 - 716 MHz Band

Input



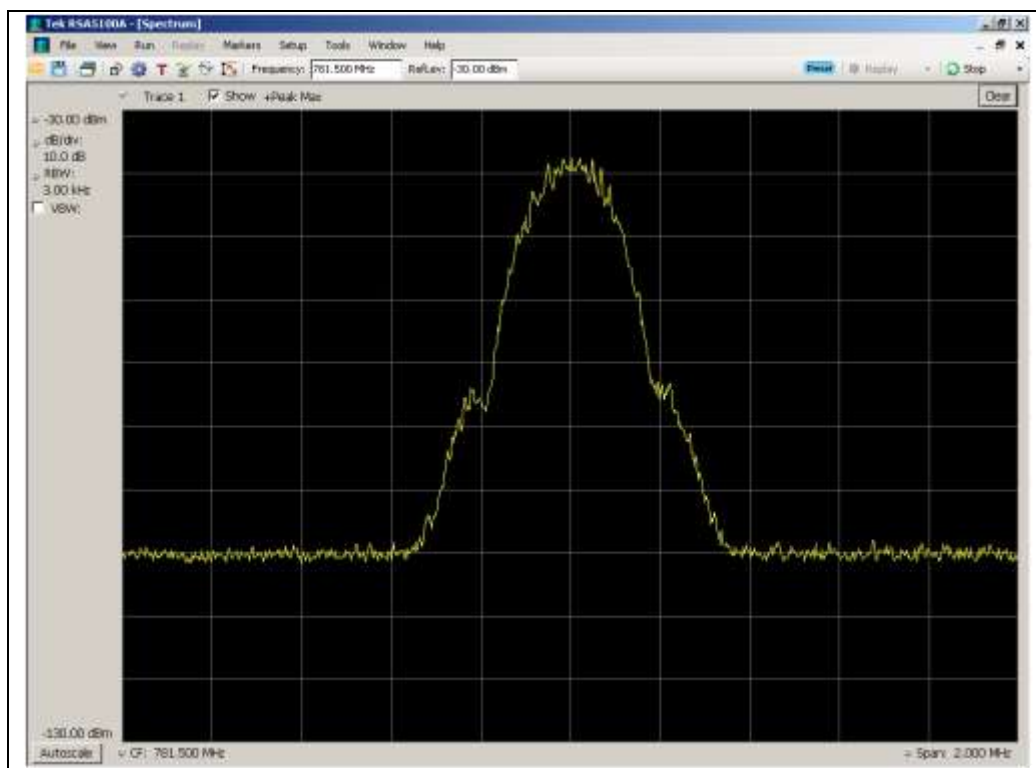
Output



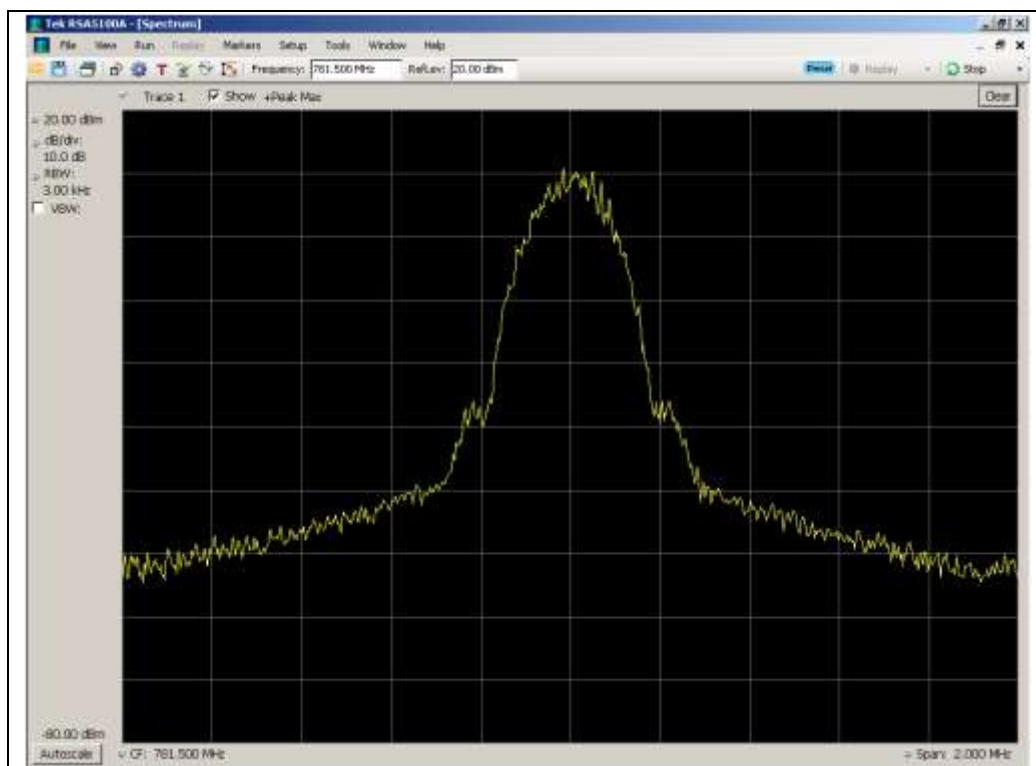


## 776 - 787 MHz Band

### Input



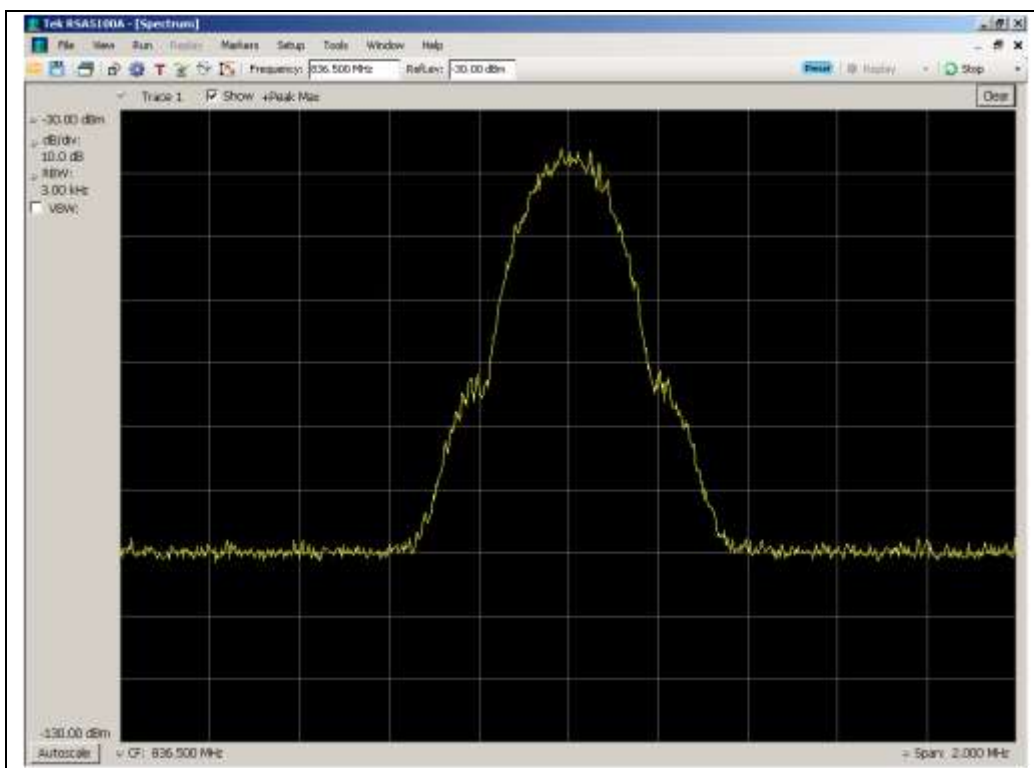
### Output



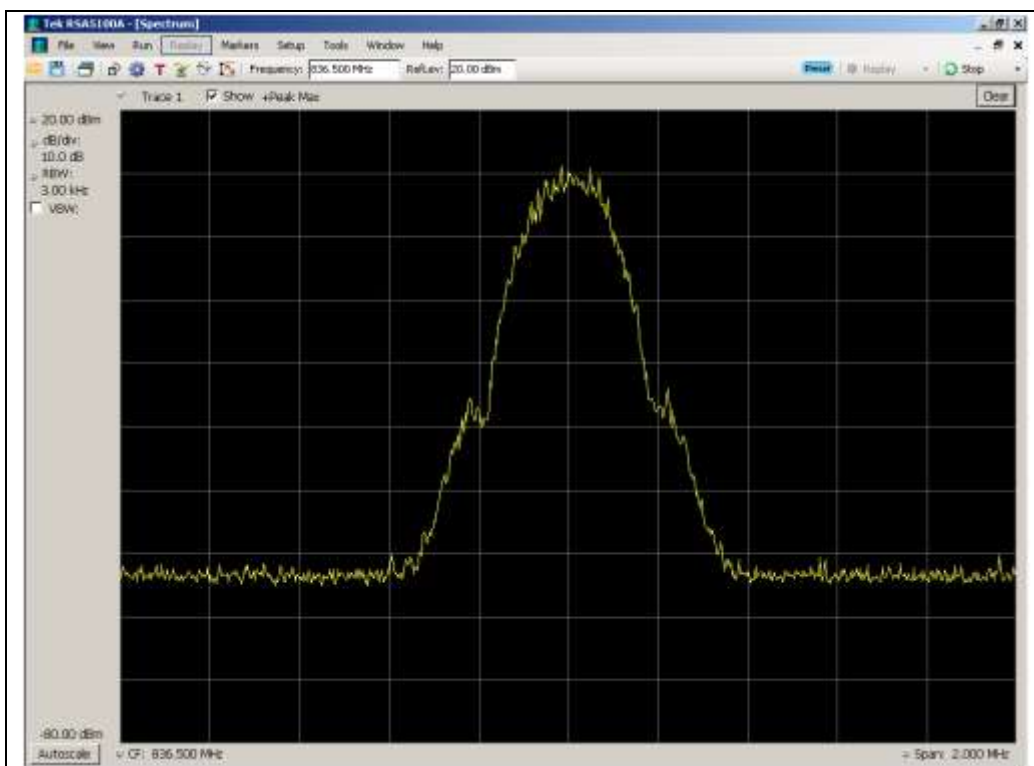


## 824 - 849 MHz Band

### Input



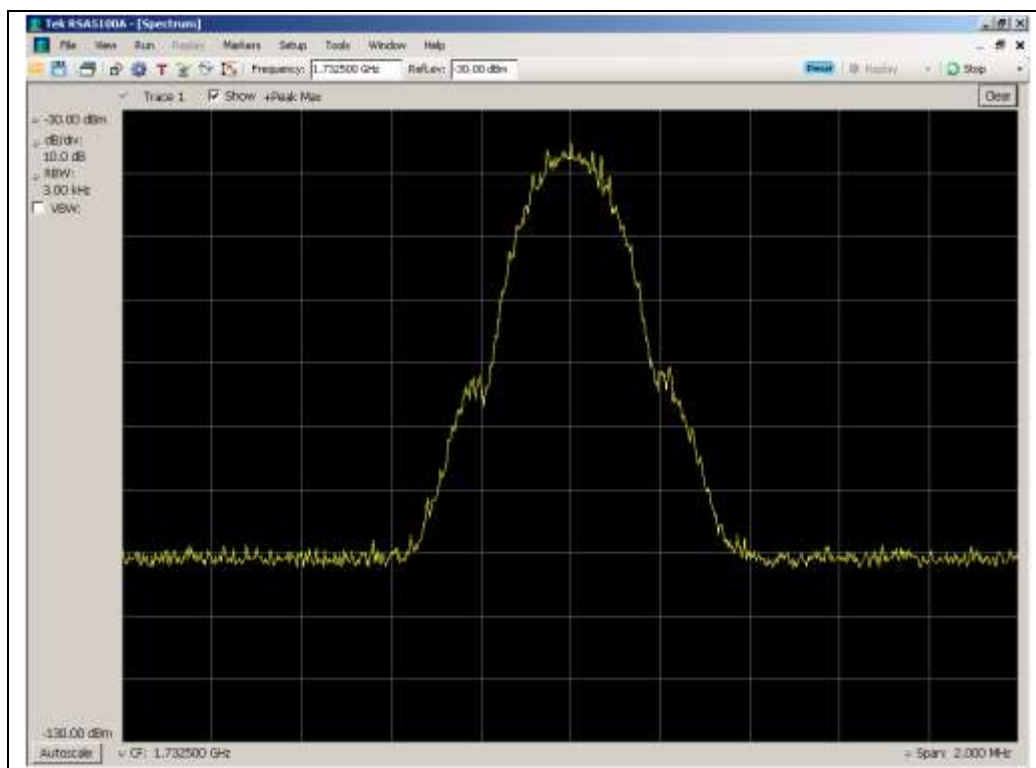
### Output



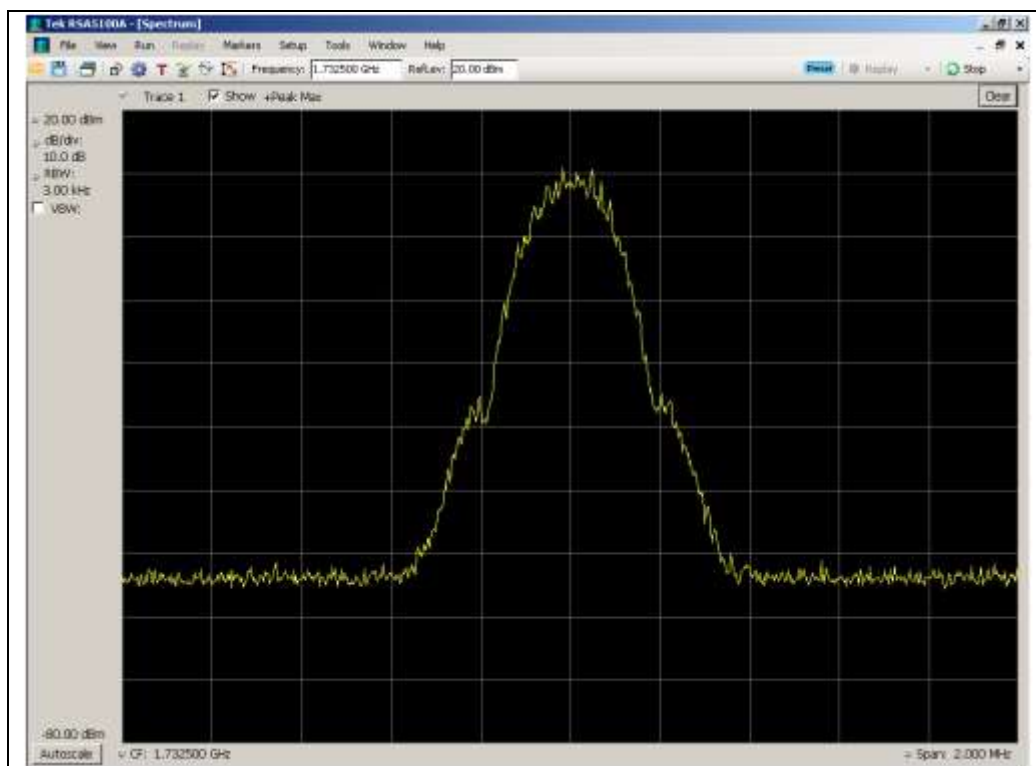


## 1710 - 1755 MHz Band

### Input



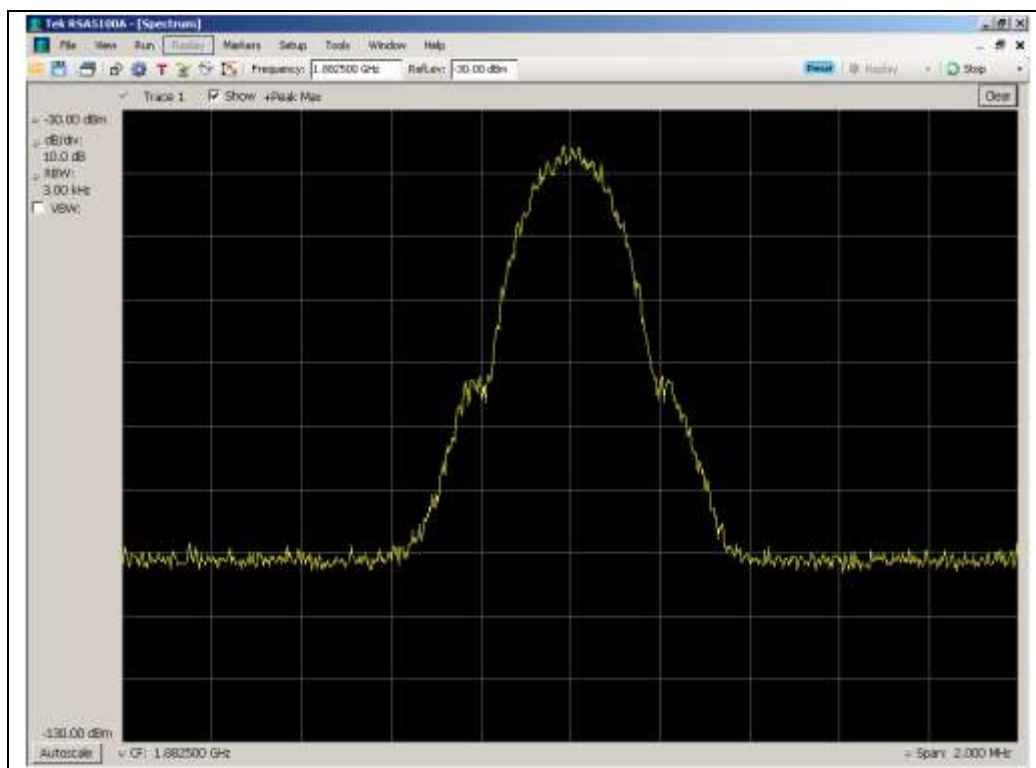
### Output



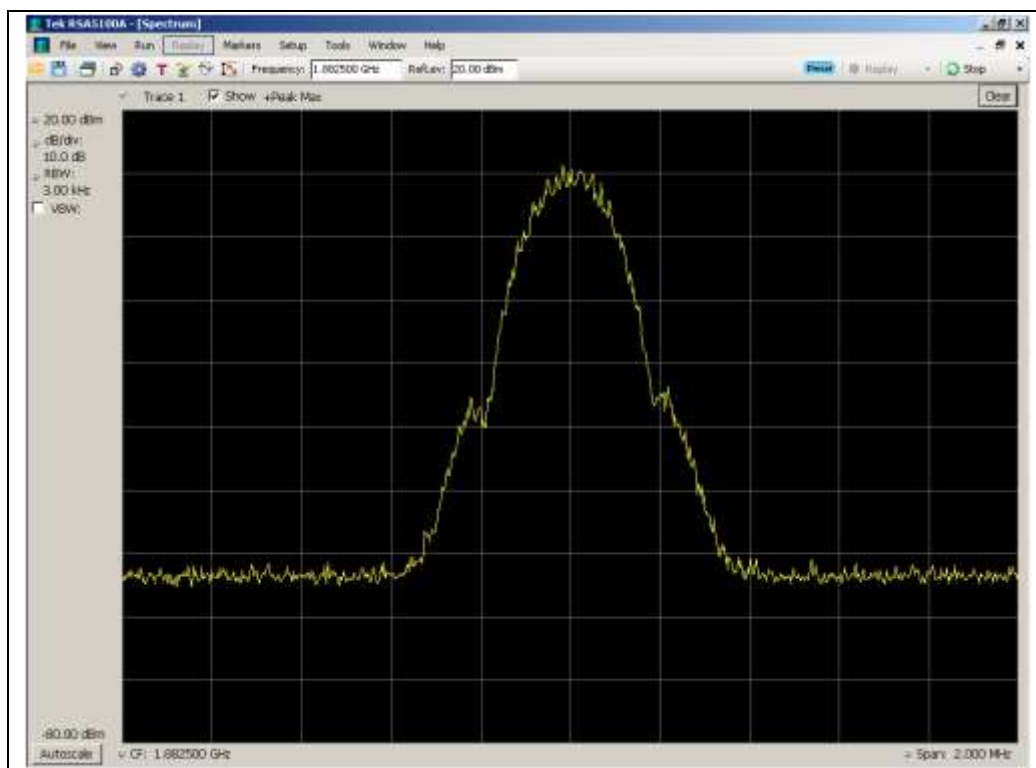


### 1850 - 1915 MHz Band

### Input



### Output

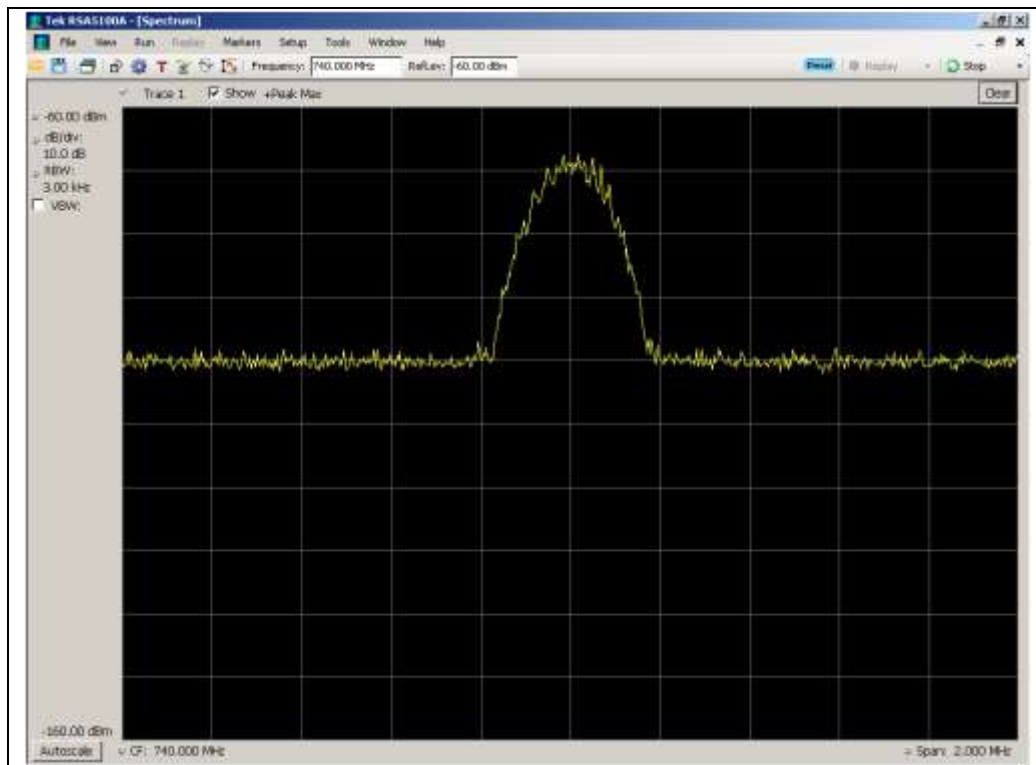




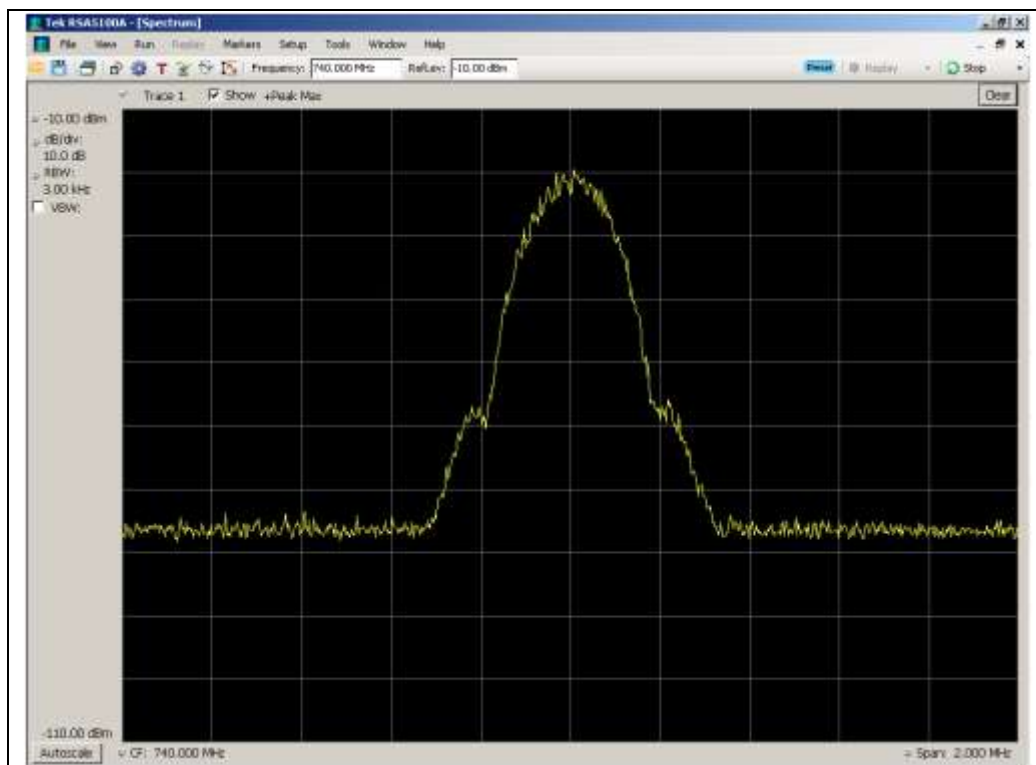
## GSM Downlink Test Plots

### 734 - 746 MHz Band

#### Input



#### Output

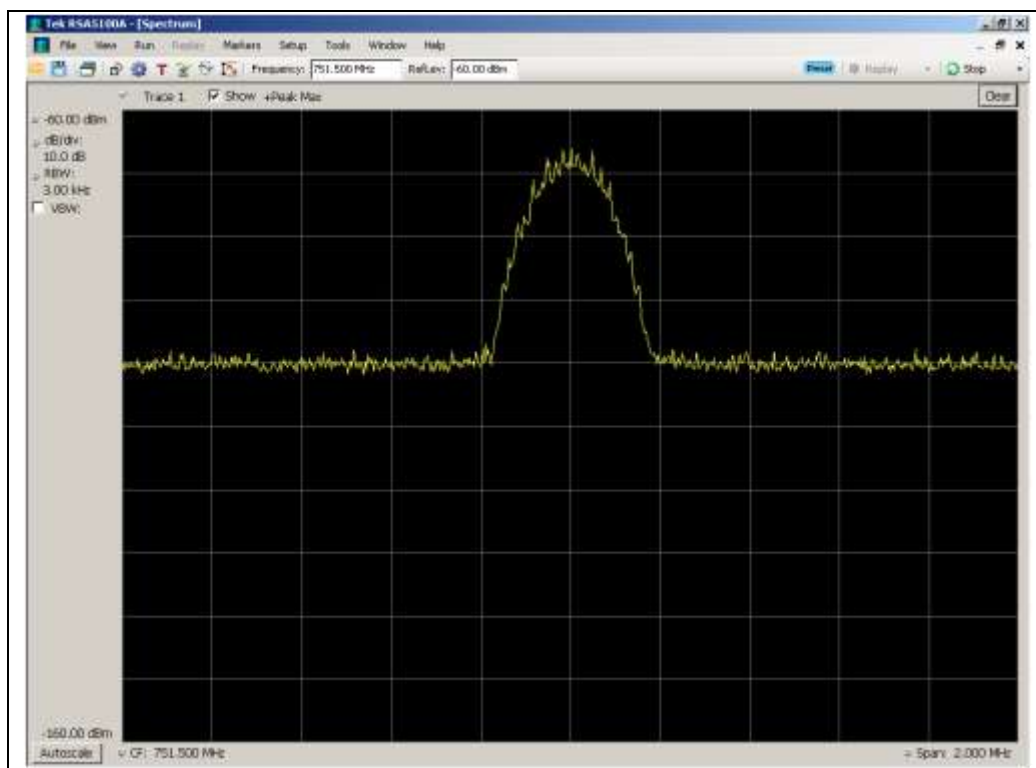




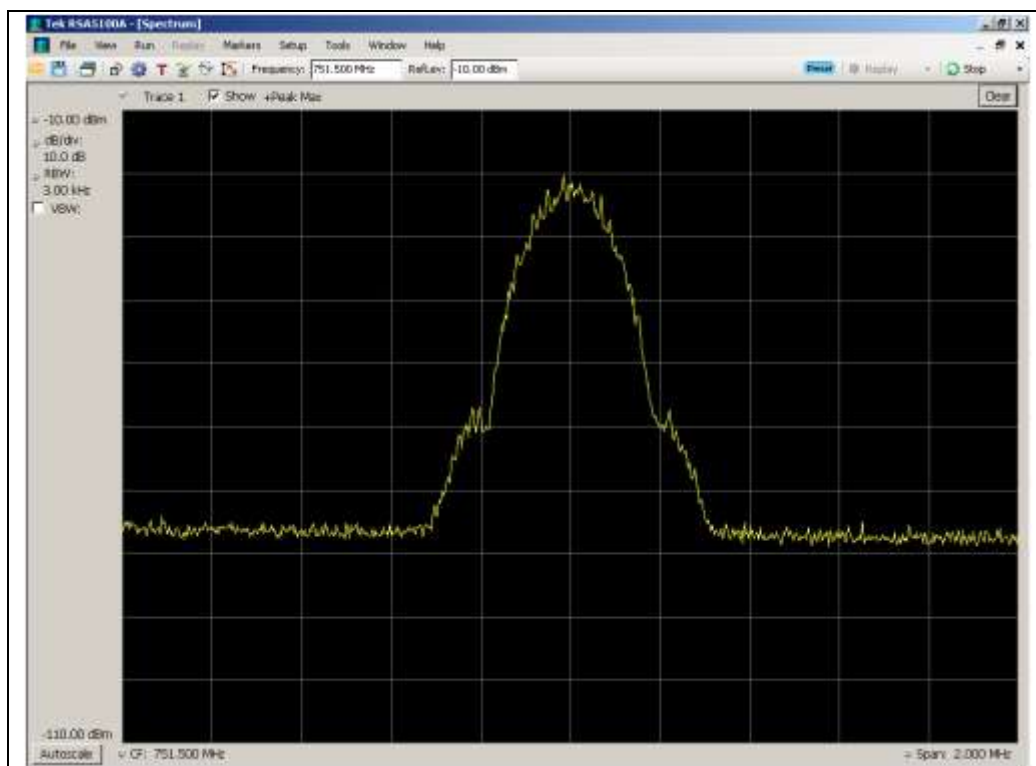


## 746 - 757 MHz Band

### Input



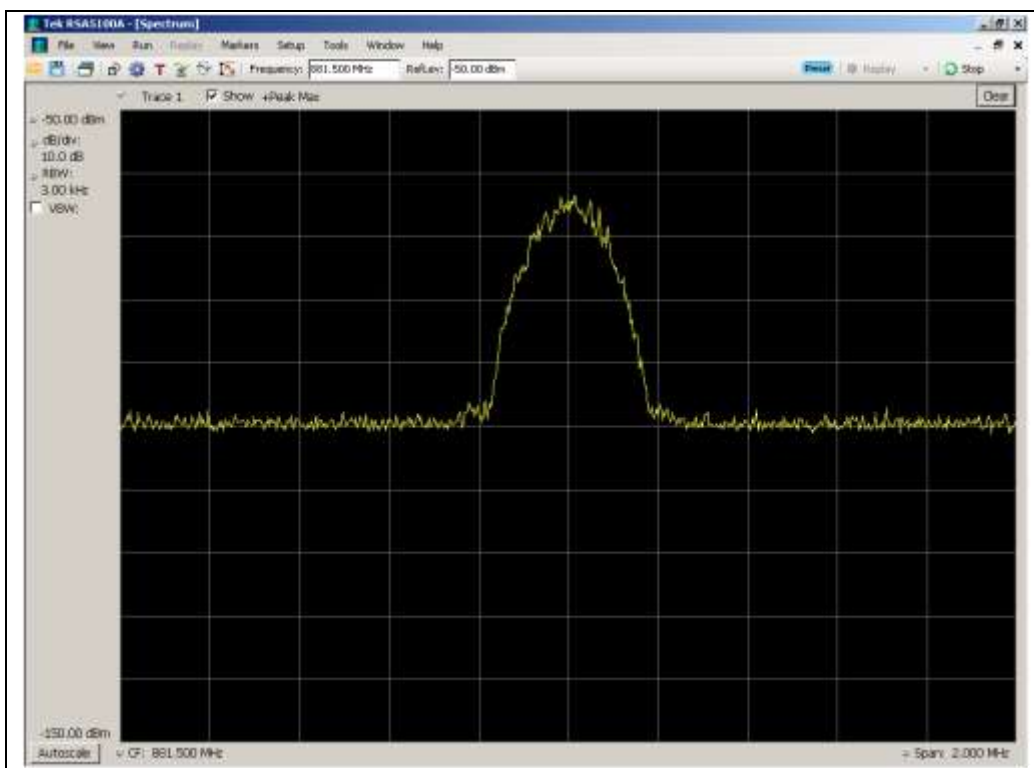
### Output



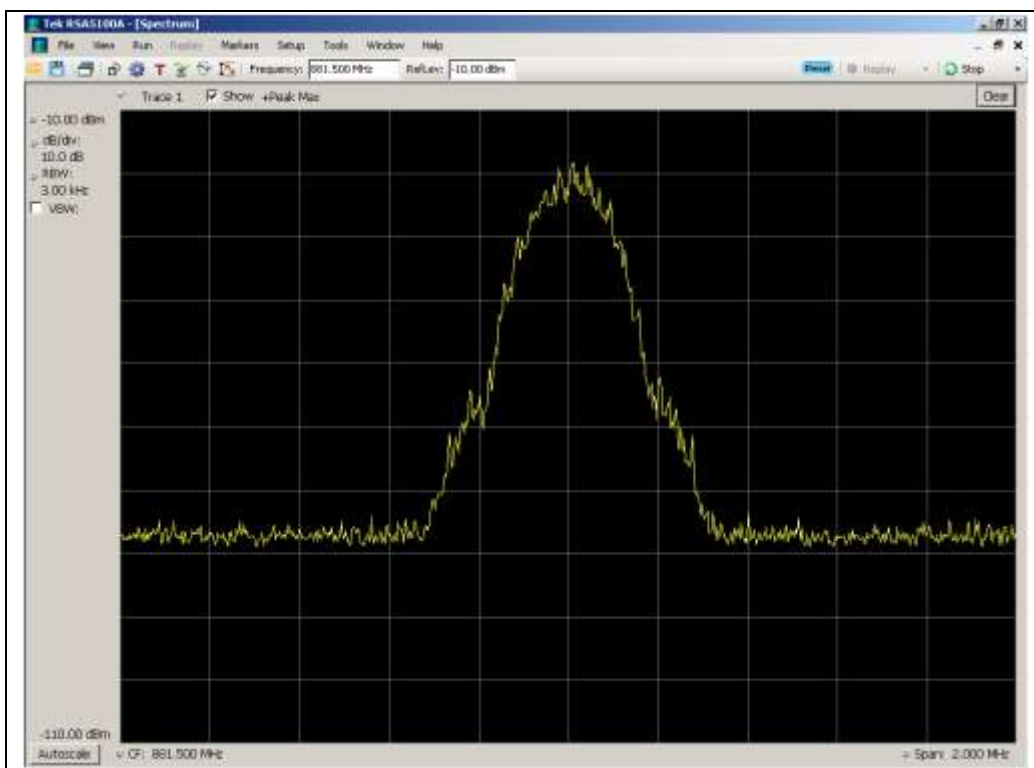


### 869 - 894 MHz Band

### Input



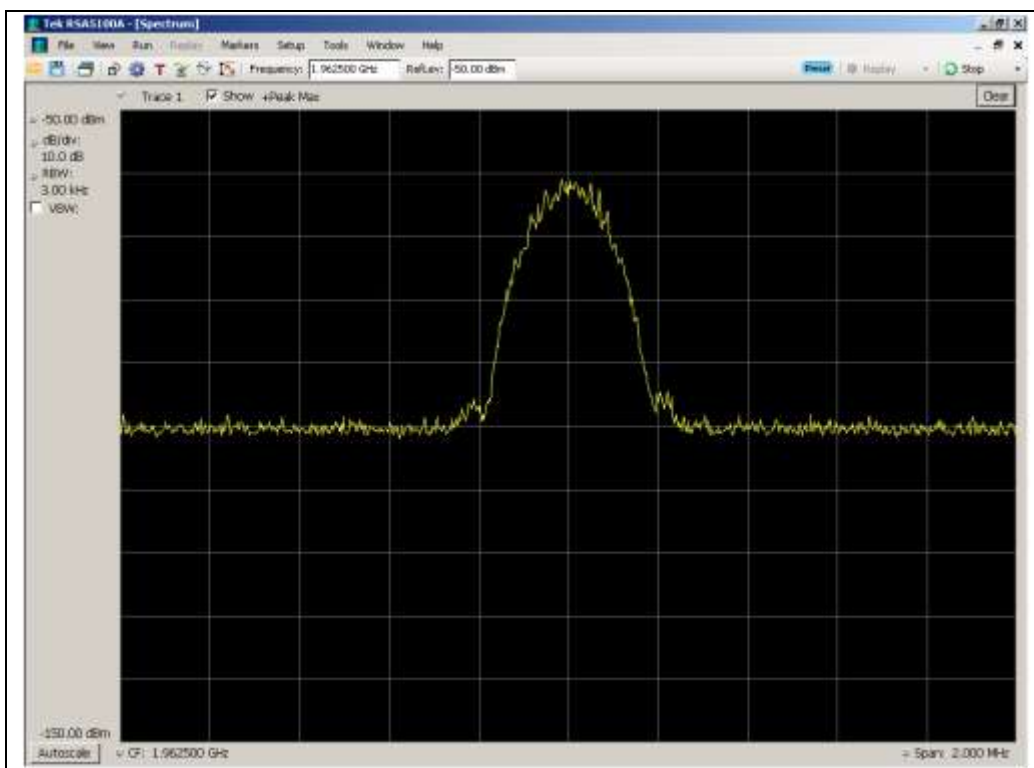
### Output



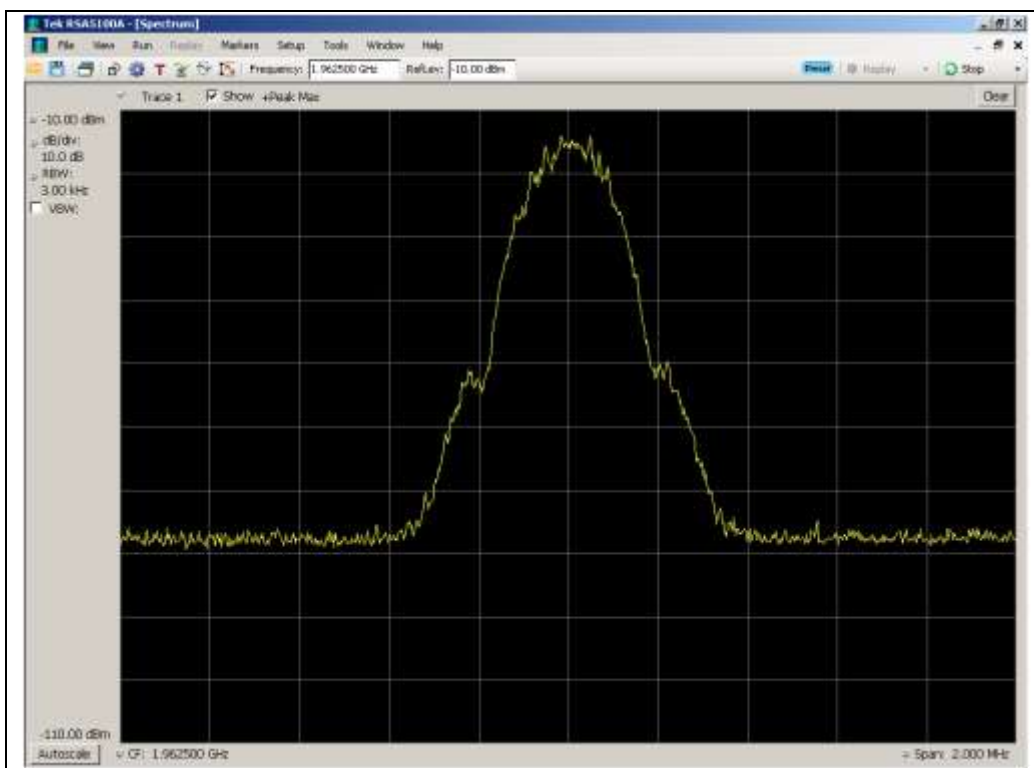


### 1930 - 1995 MHz Band

### Input



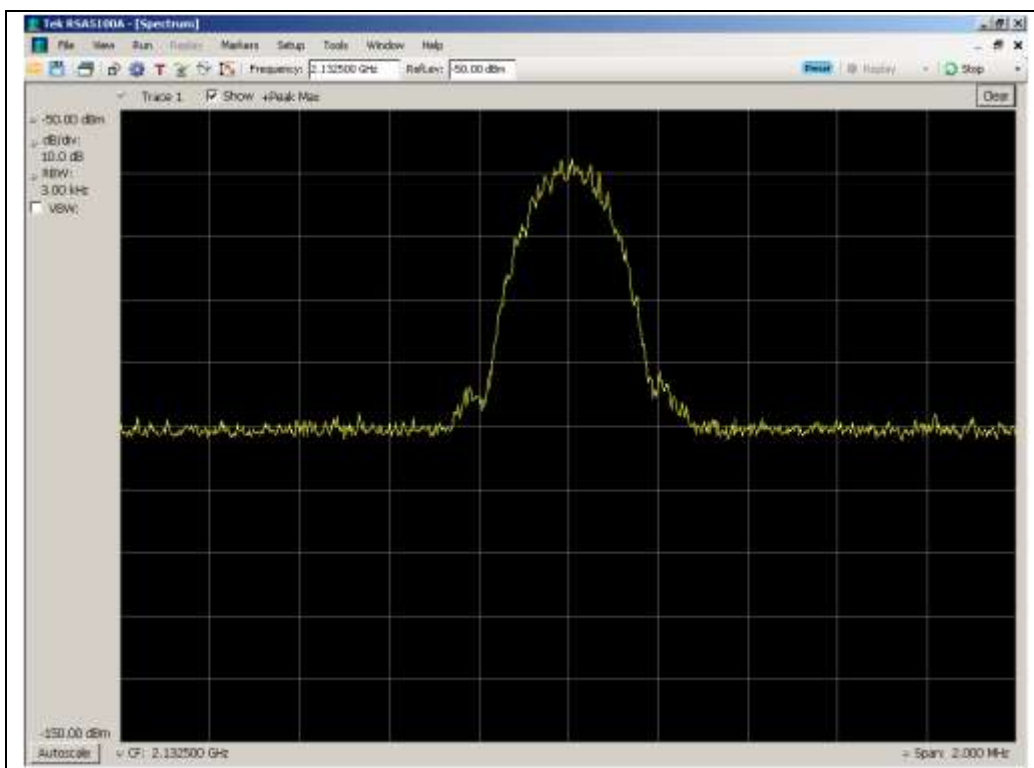
### Output



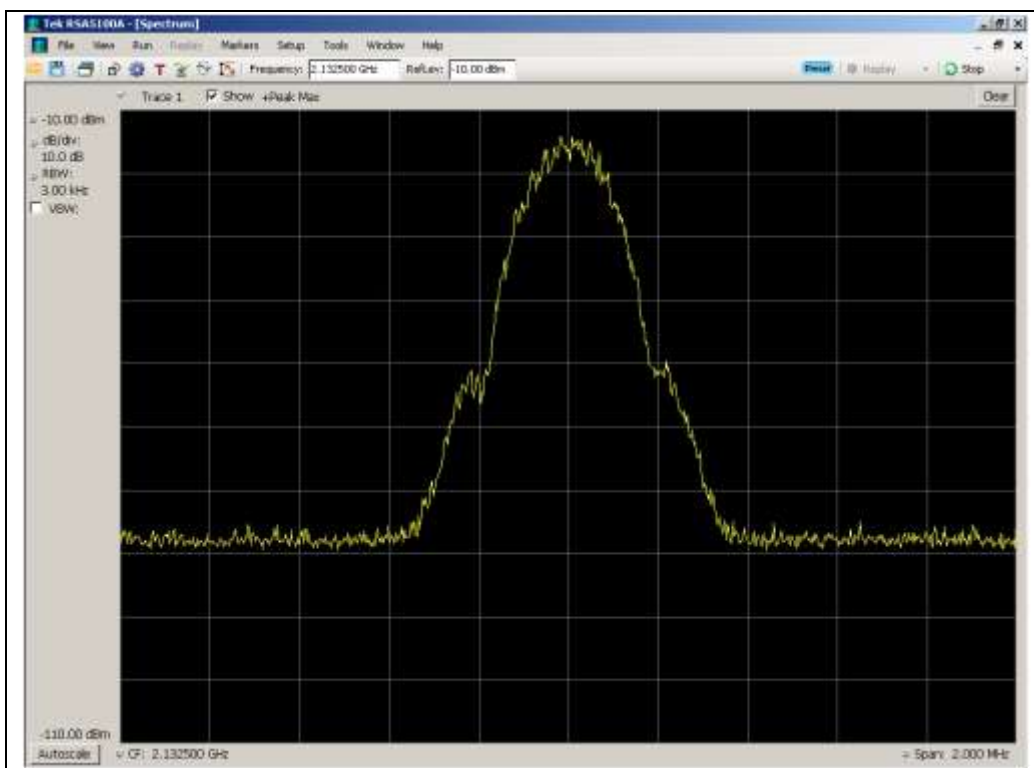


## 2110 - 2155 MHz Band

### Input



### Output

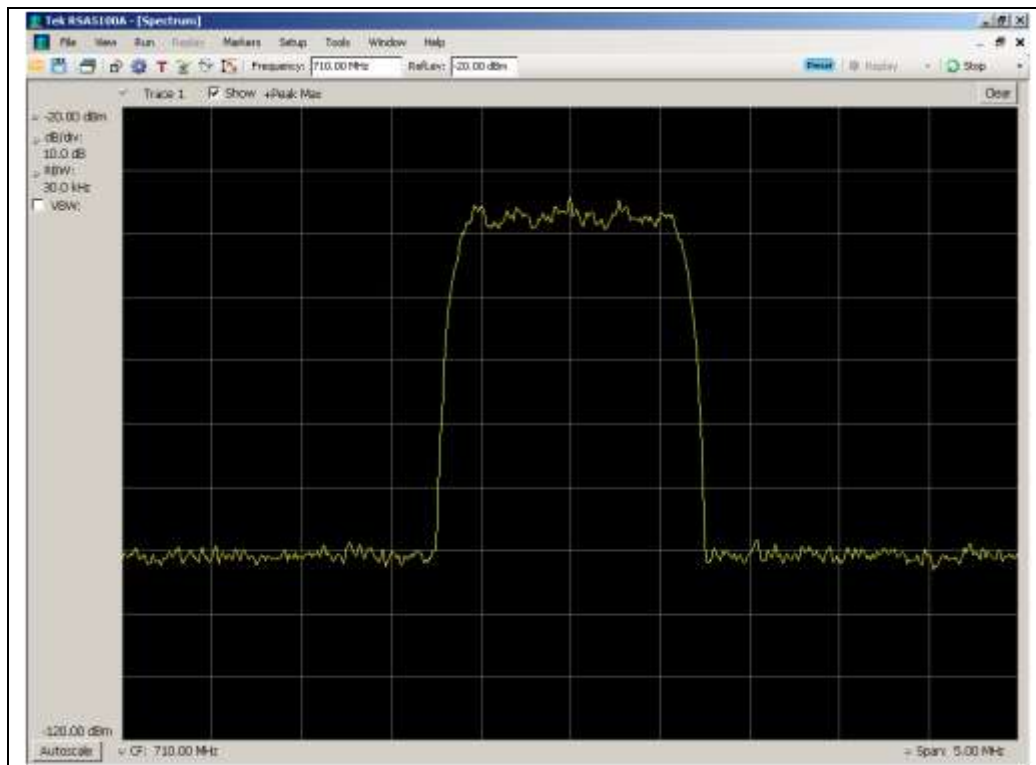




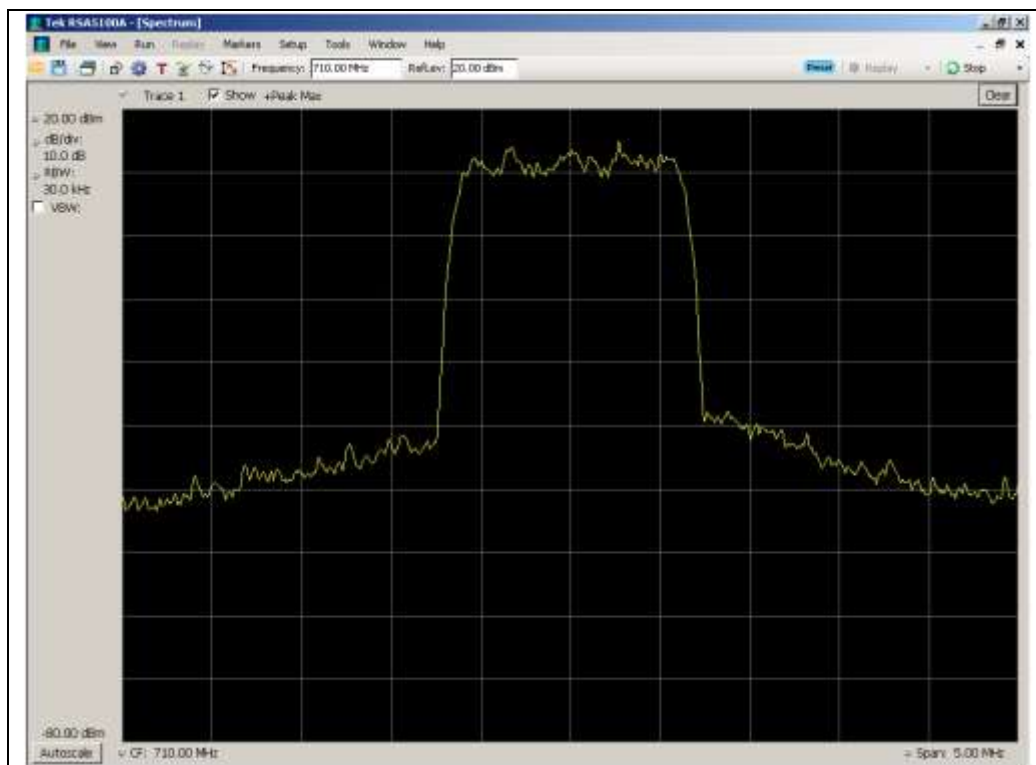
## CDMA Uplink Test Plots

704 - 716 MHz Band

Input



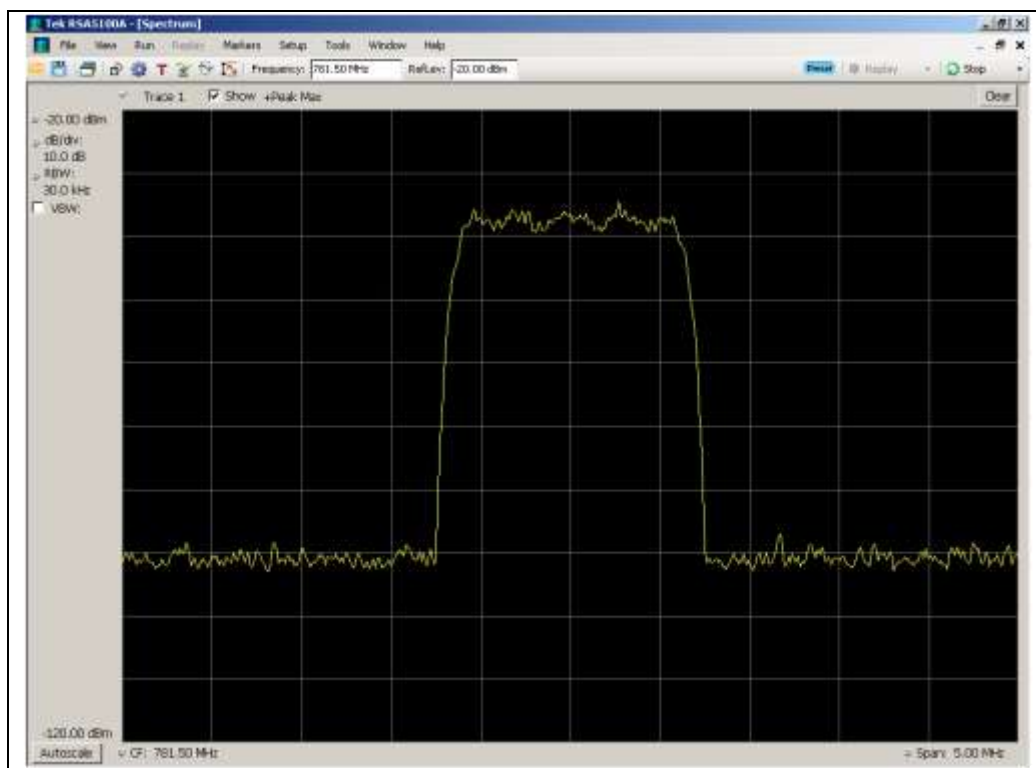
Output



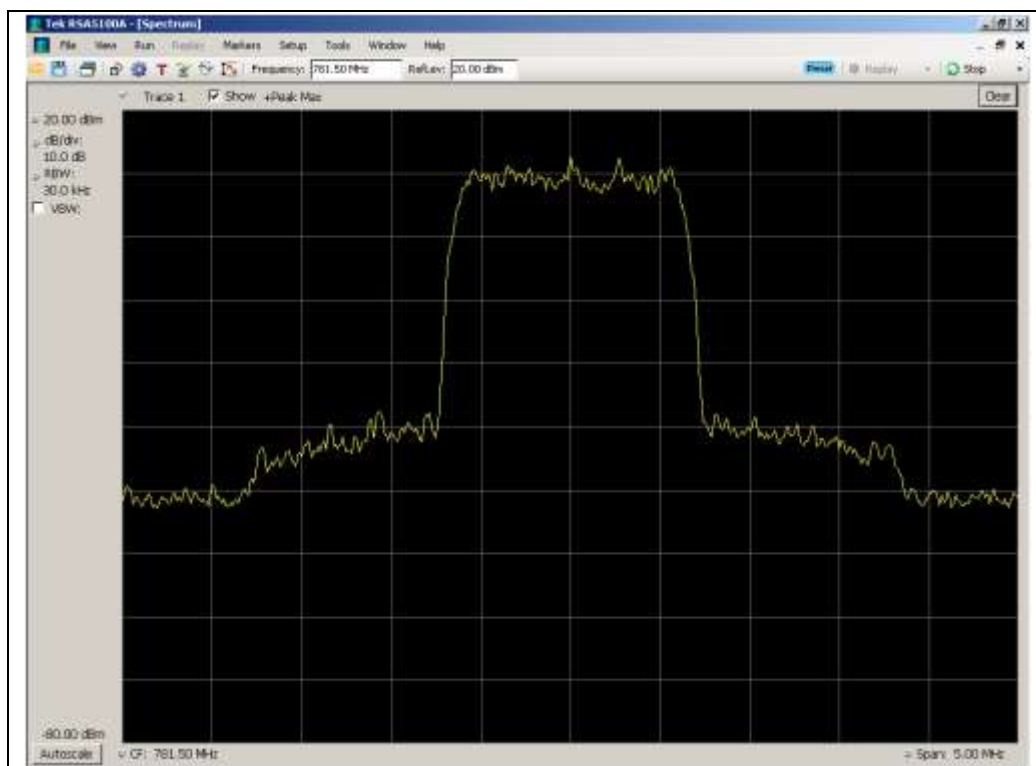


## 776 - 787 MHz Band

### Input



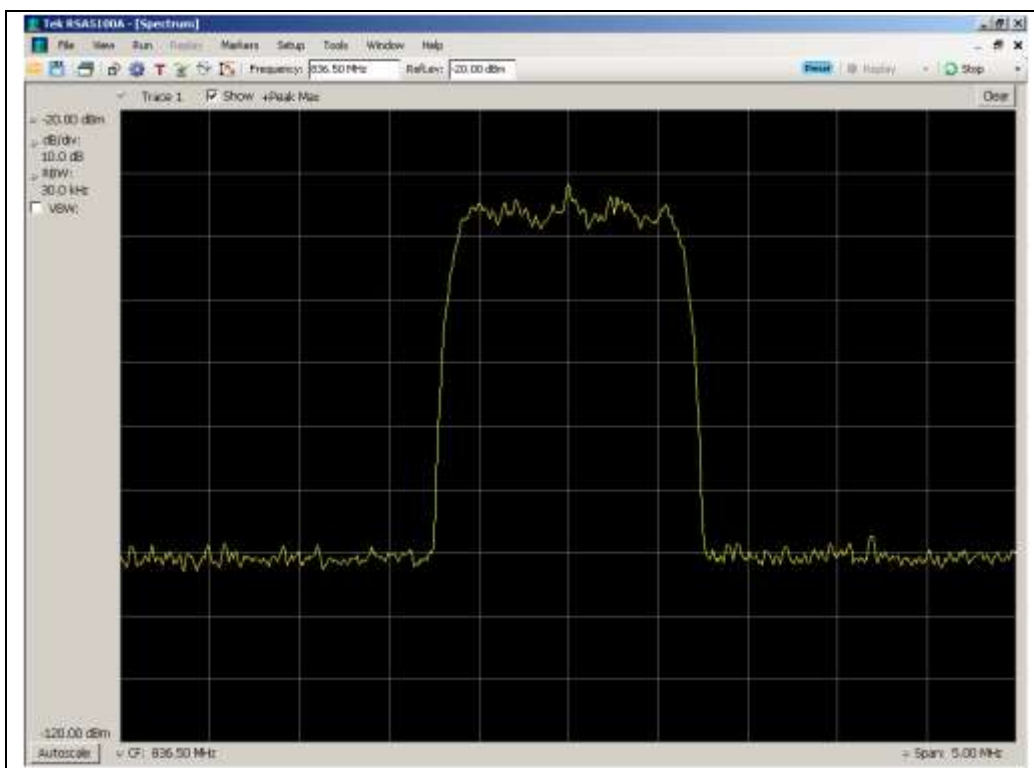
### Output



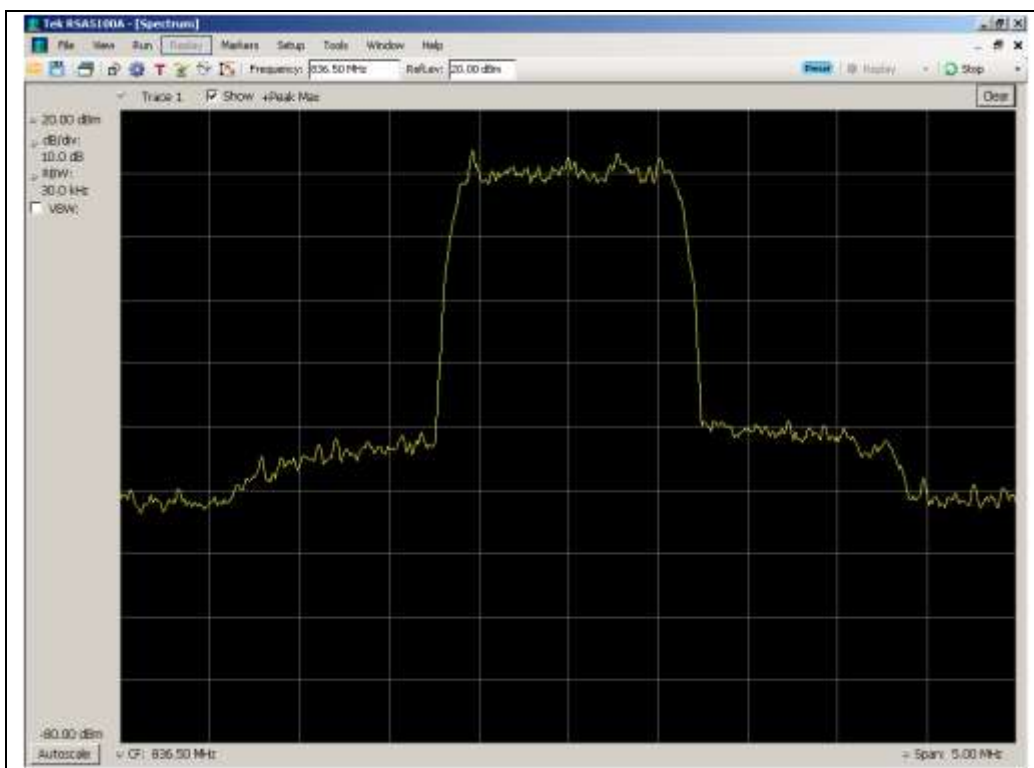


## 824 - 849 MHz Band

### Input



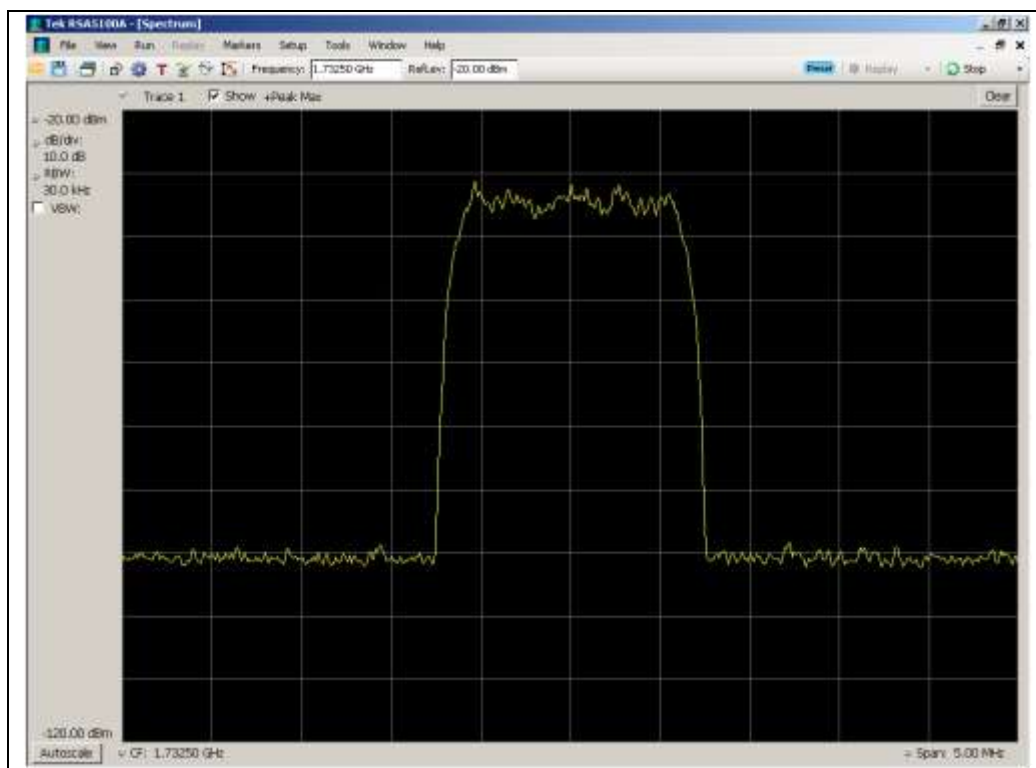
### Output



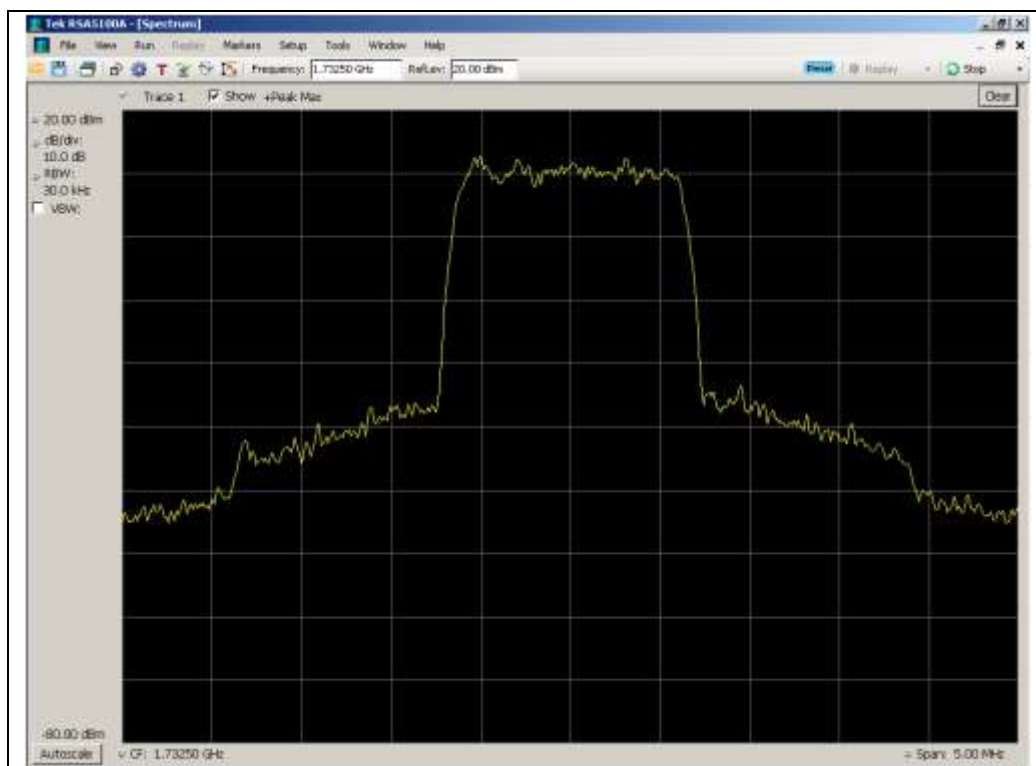


### 1710 - 1755 MHz Band

### Input



### Output

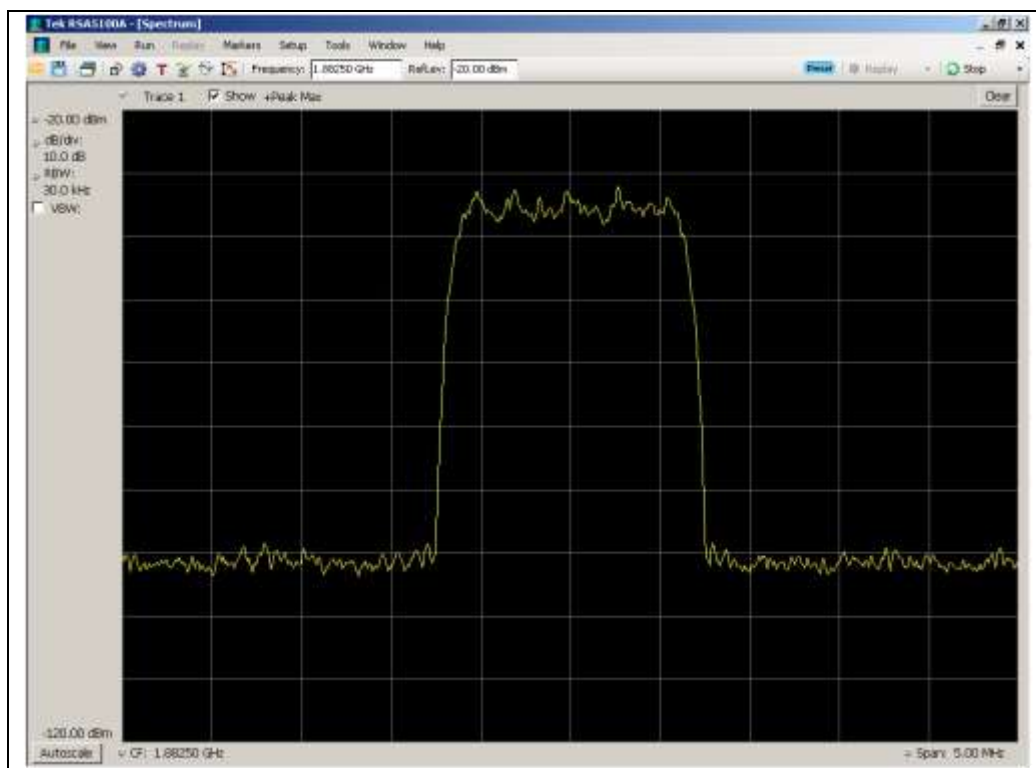




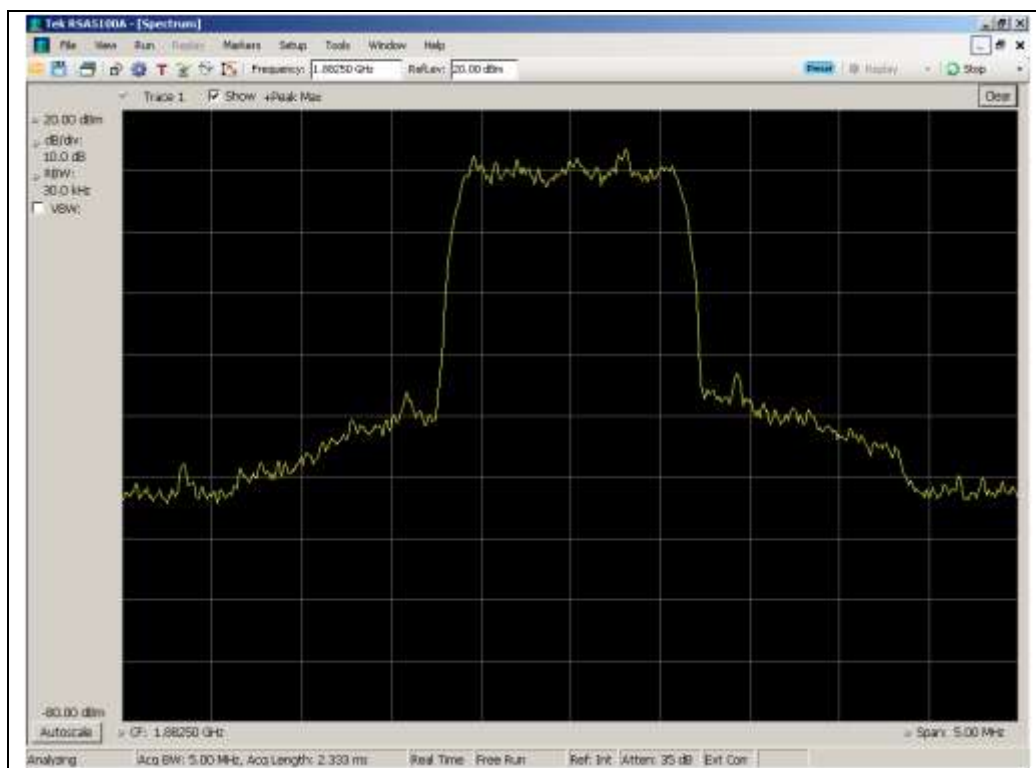


## 1850 - 1915 MHz Band

### Input



### Output

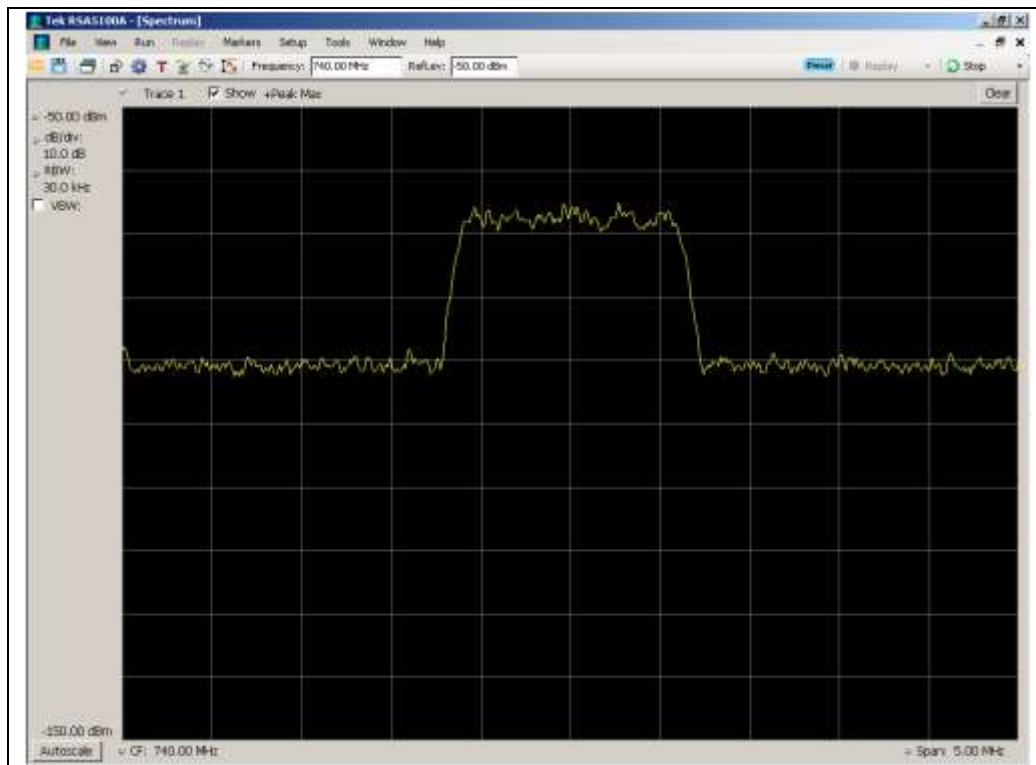




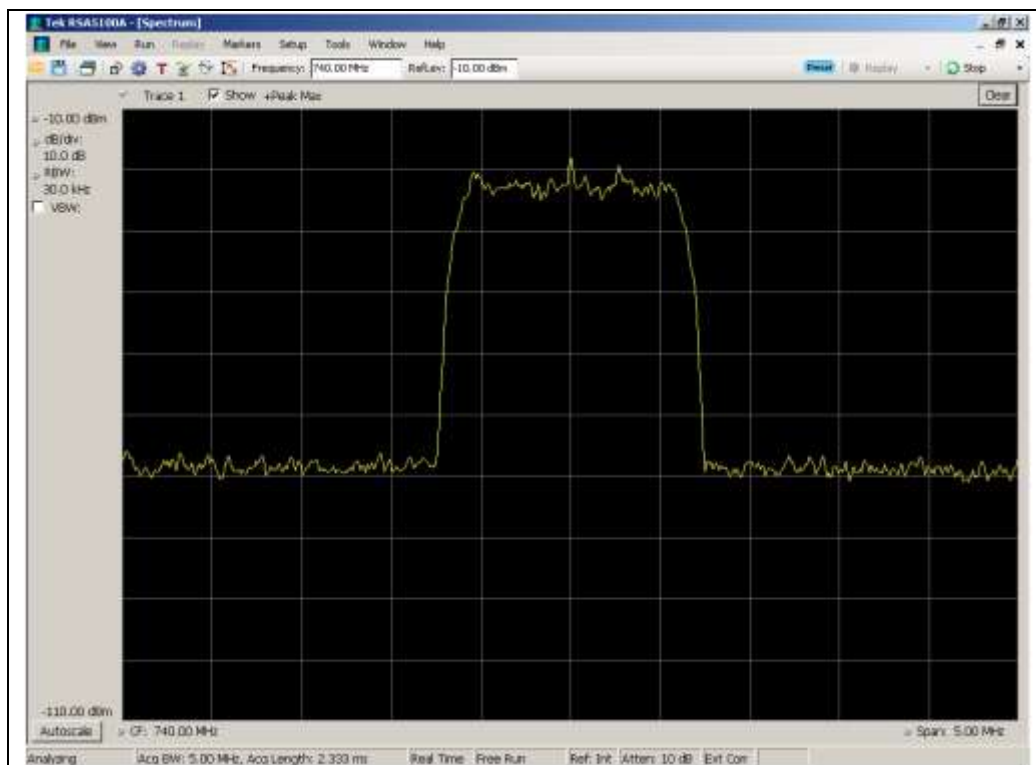
## CDMA Downlink Test Plots

### 734 - 746 MHz Band

#### Input



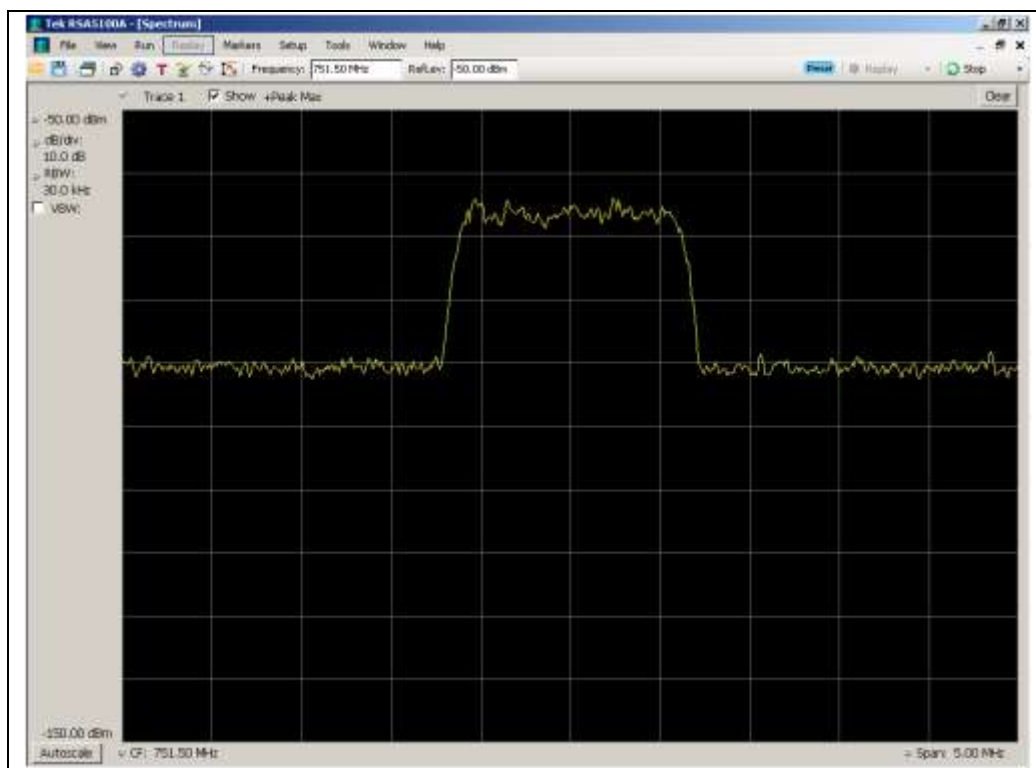
#### Output



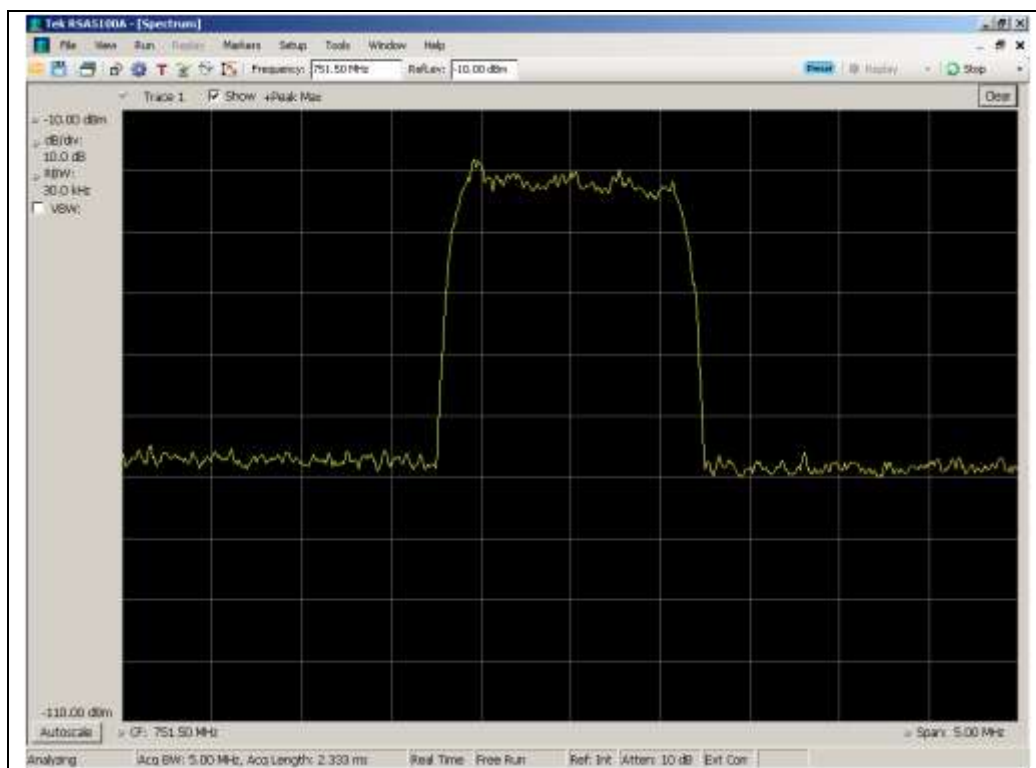


## 746 - 757 MHz Band

### Input



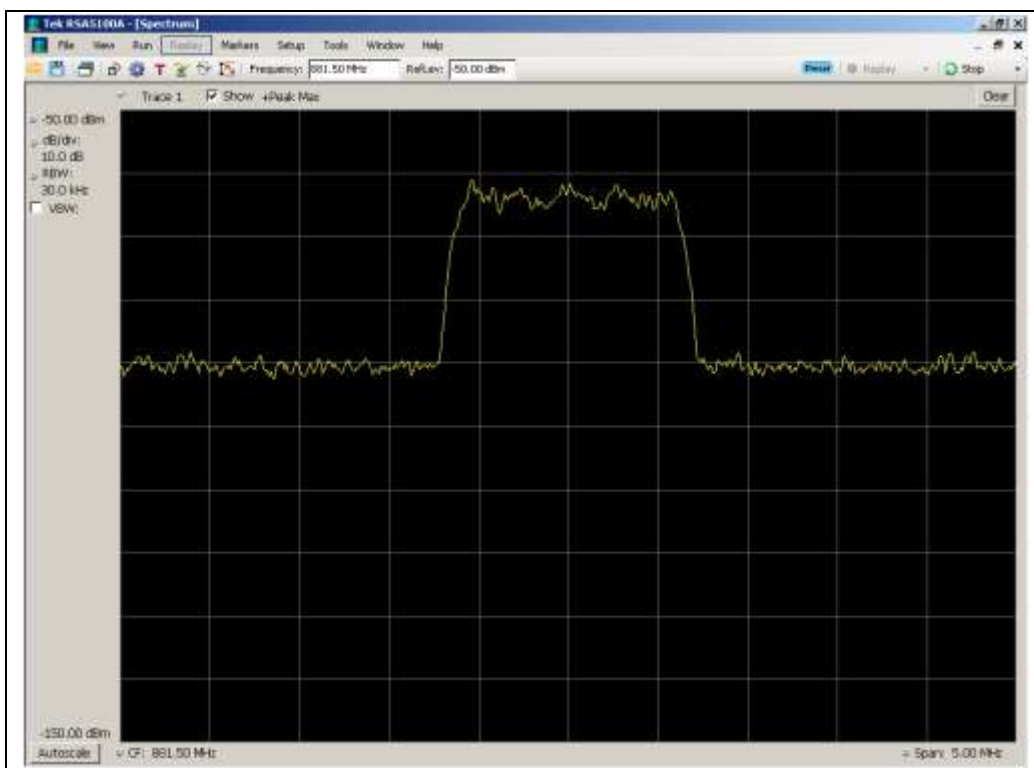
### Output



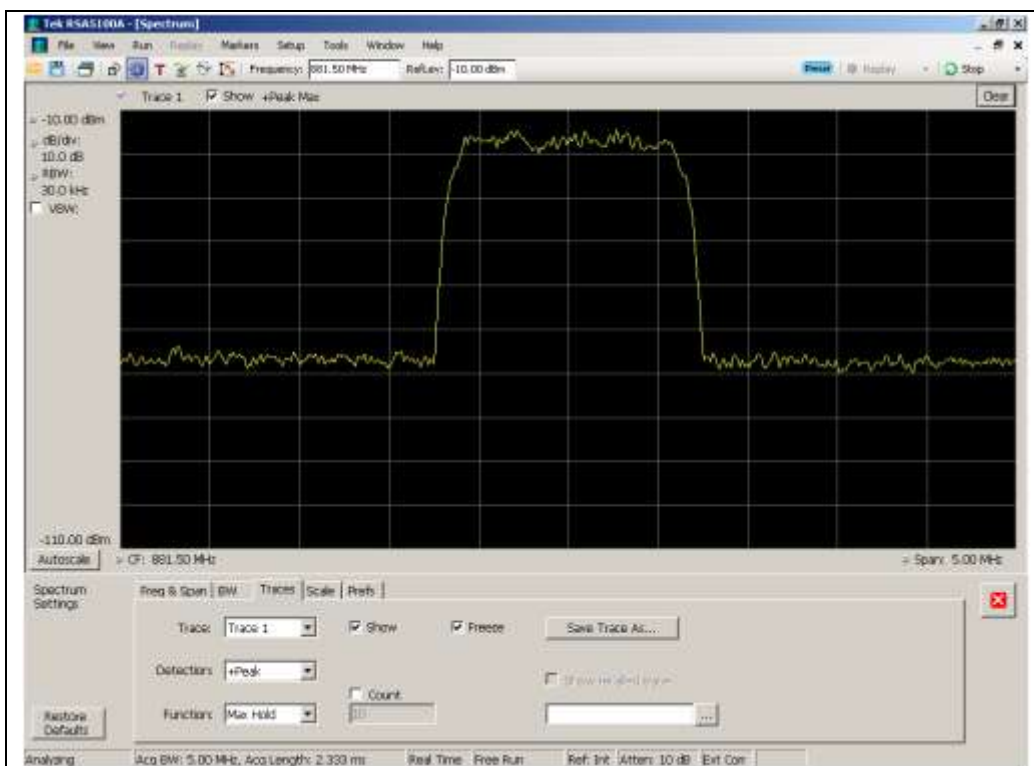


## 869 - 894 MHz Band

### Input



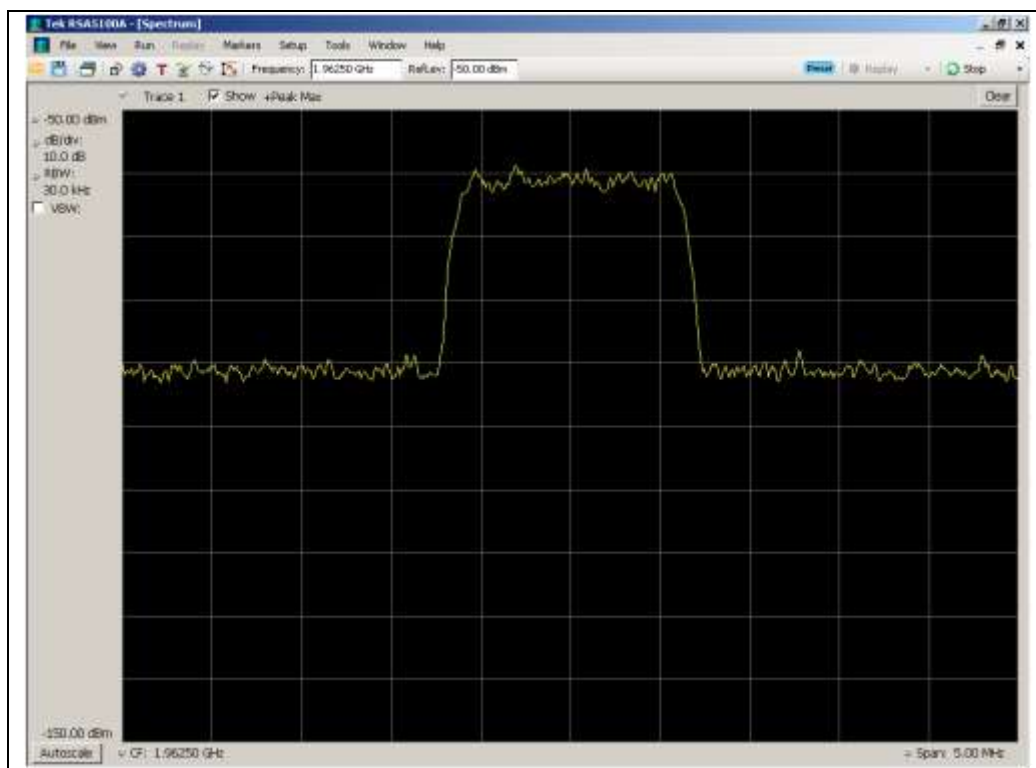
### Output



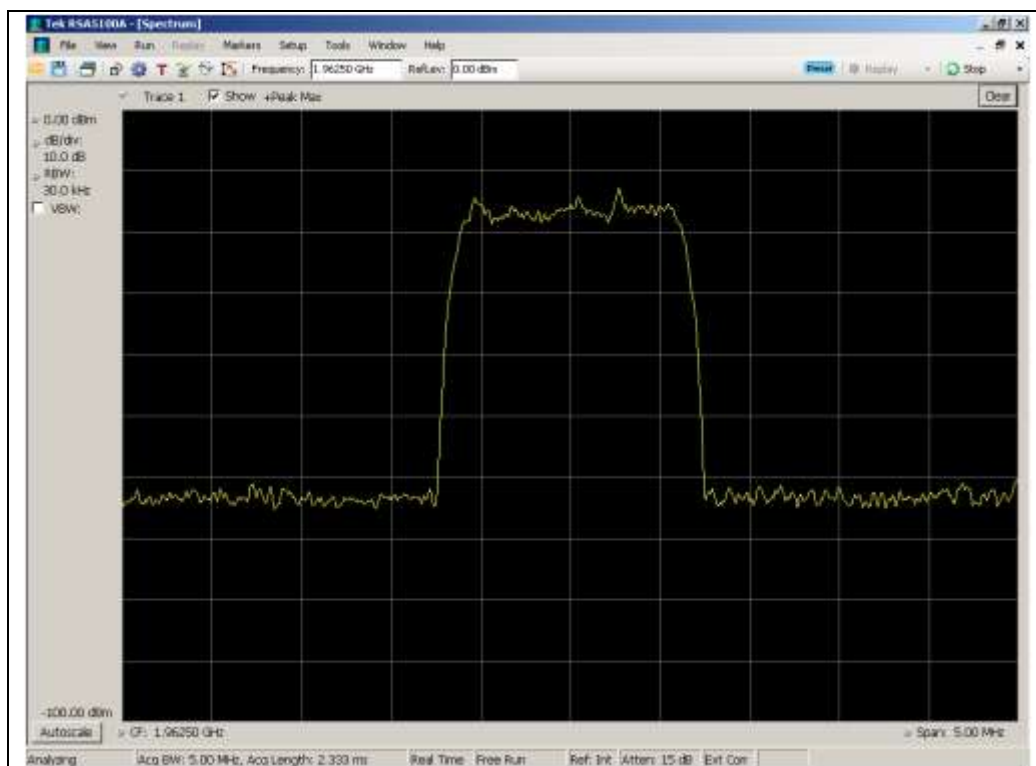


### 1930 - 1995 MHz Band

### Input



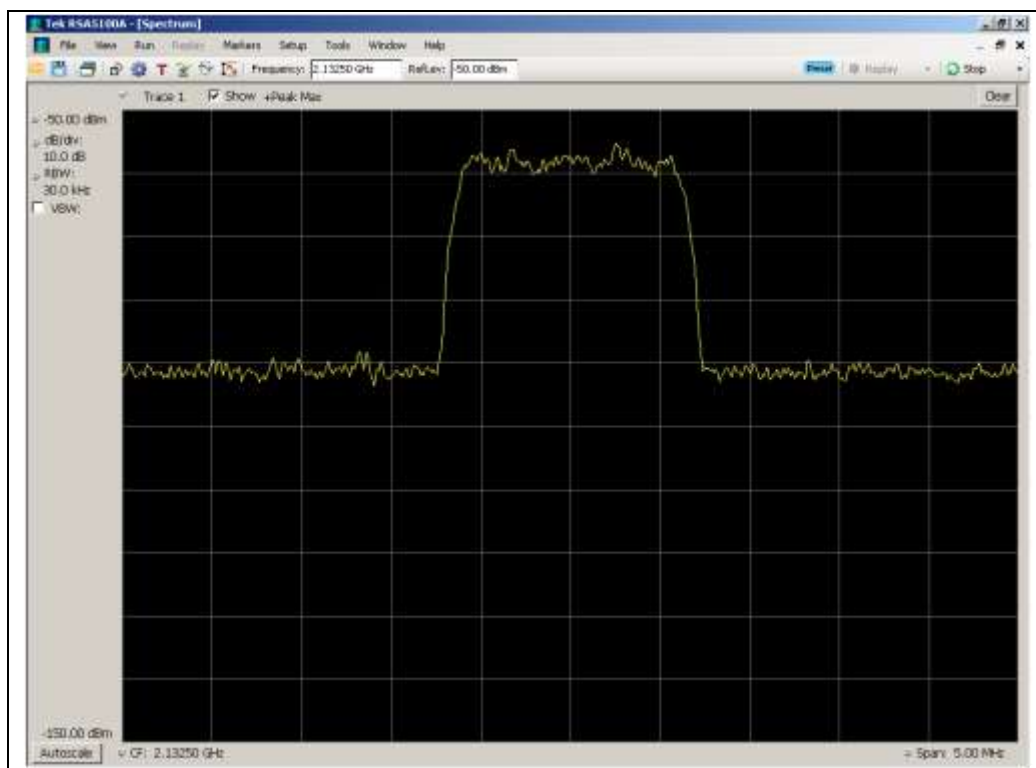
### Output



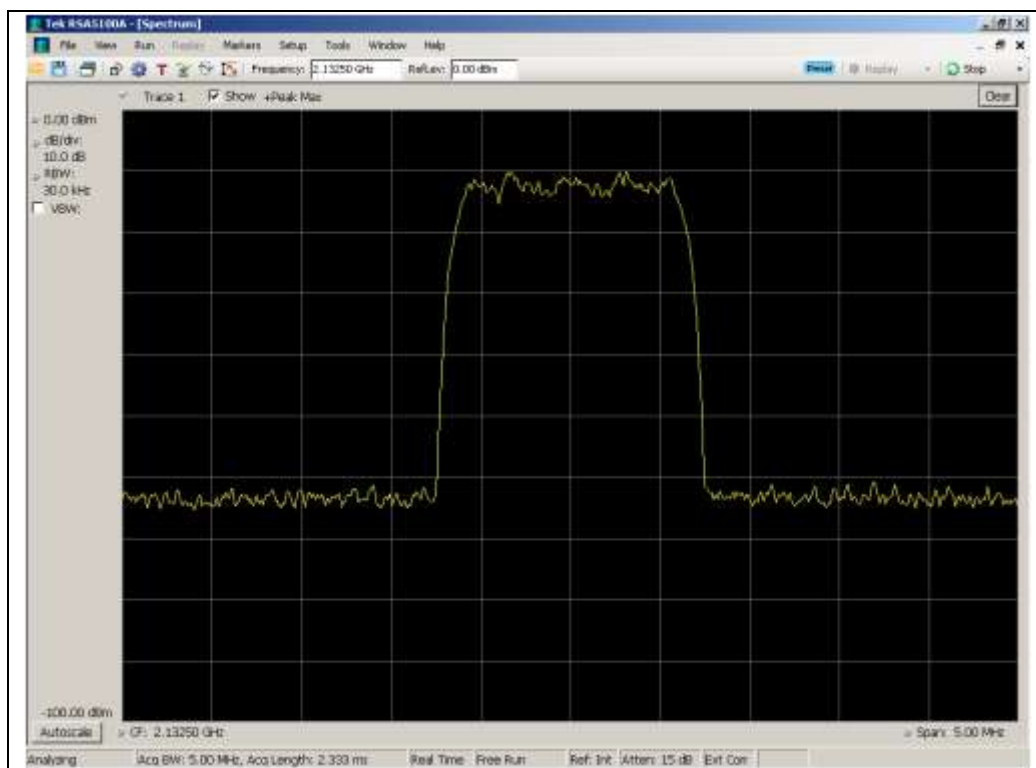


## 2110 - 2155 MHz Band

### Input



### Output

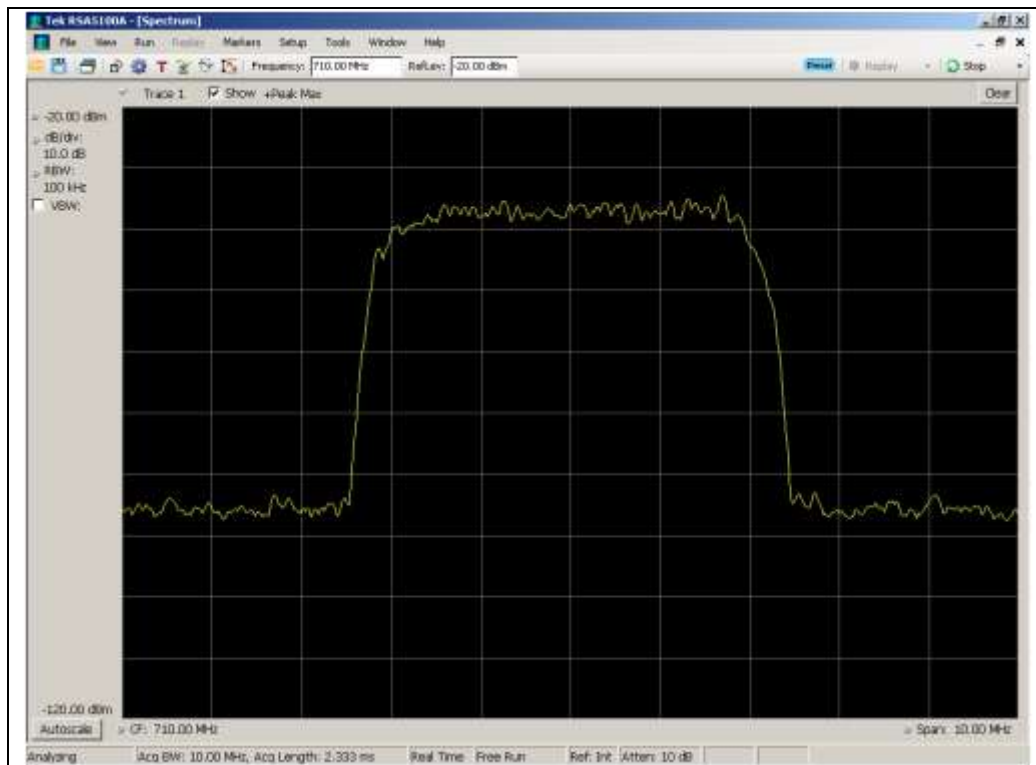




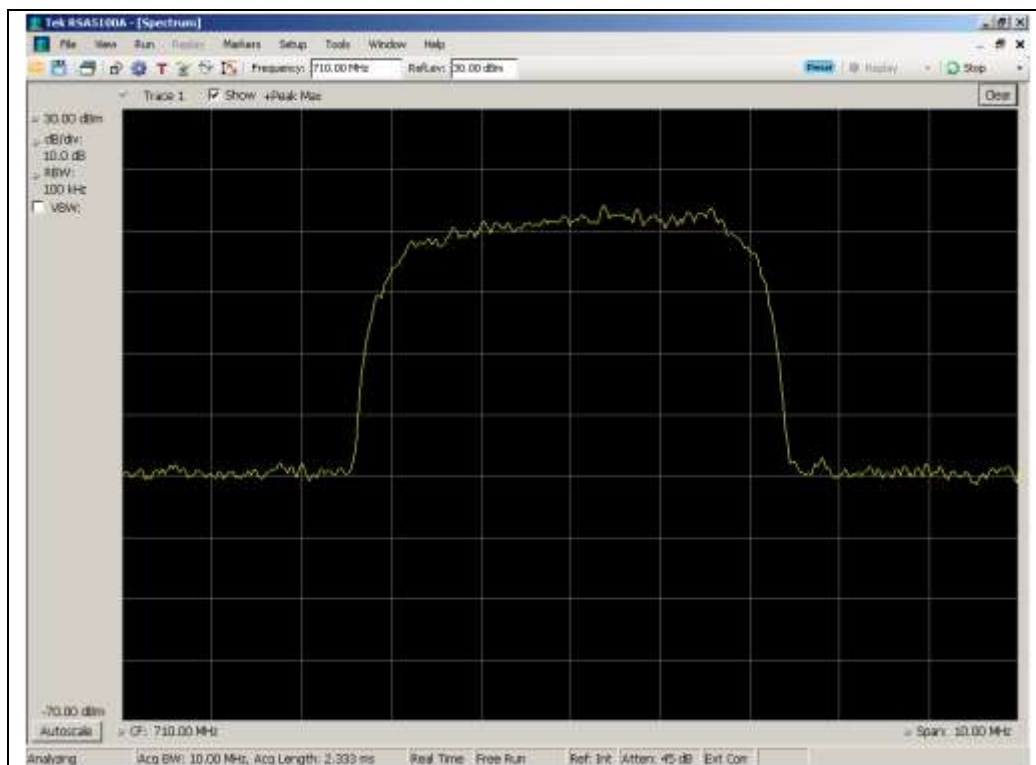
## WCDMA Uplink Test Plots

704 - 716 MHz Band

Input



Output

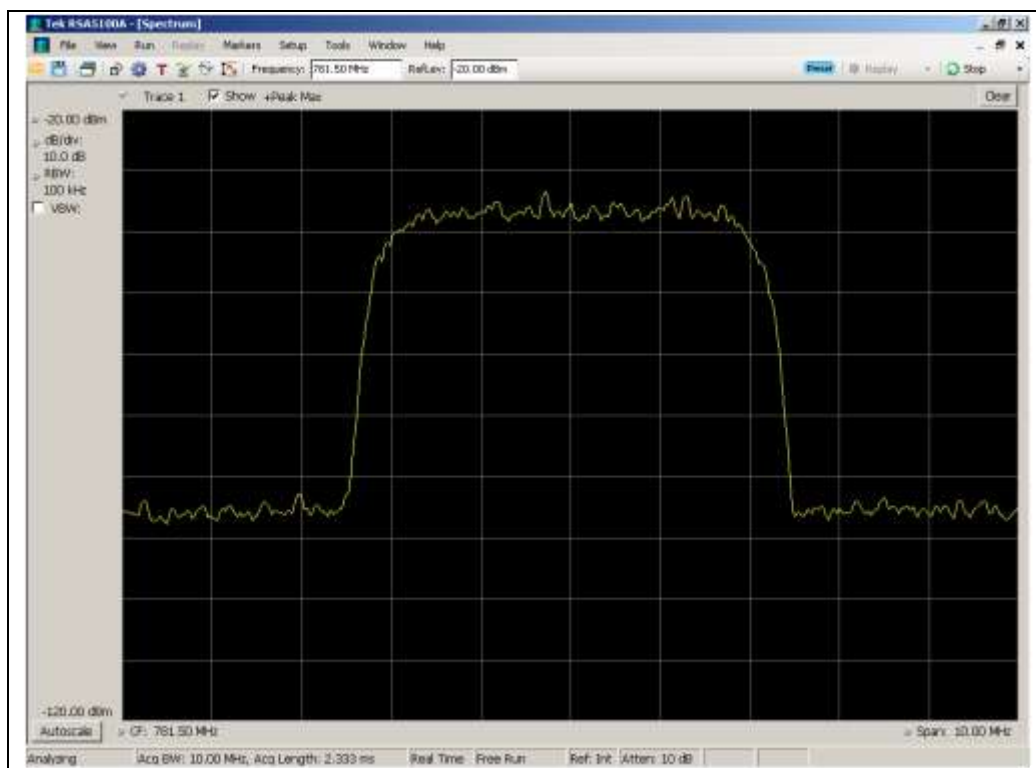




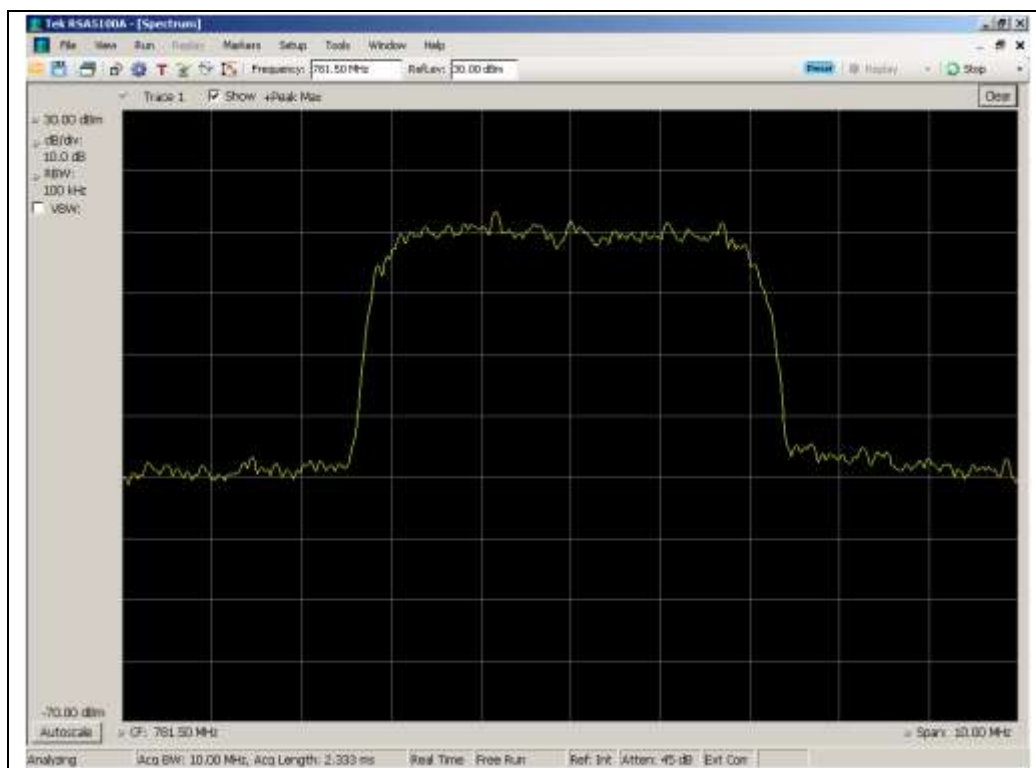


## 776 - 787 MHz Band

### Input



### Output

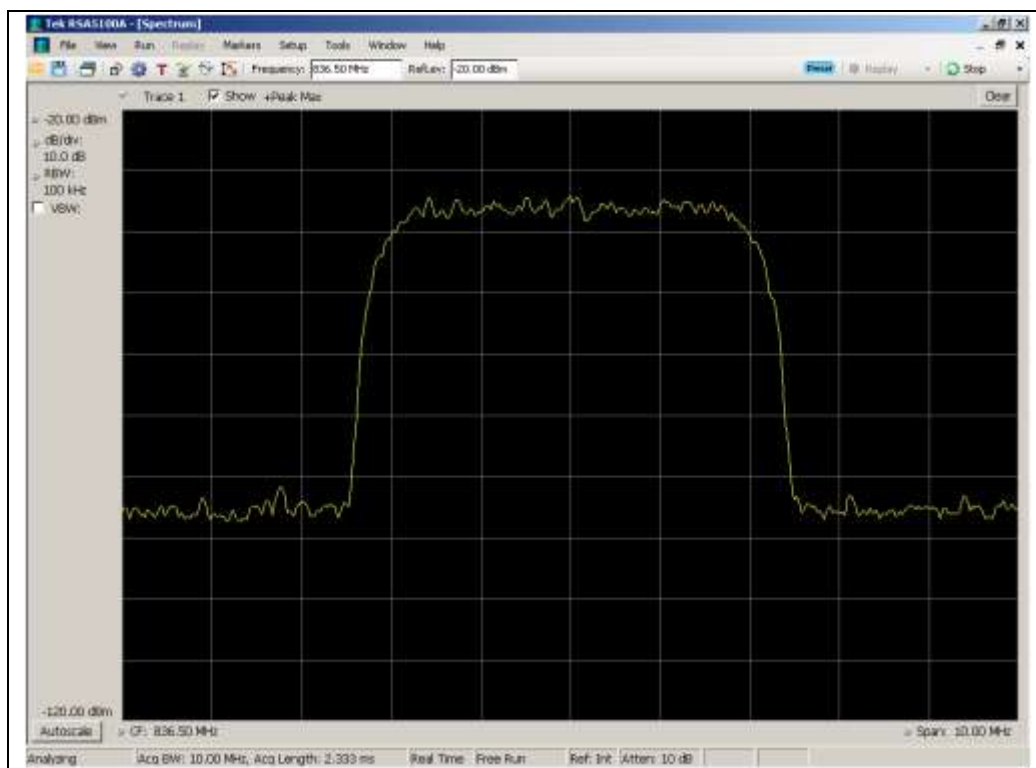




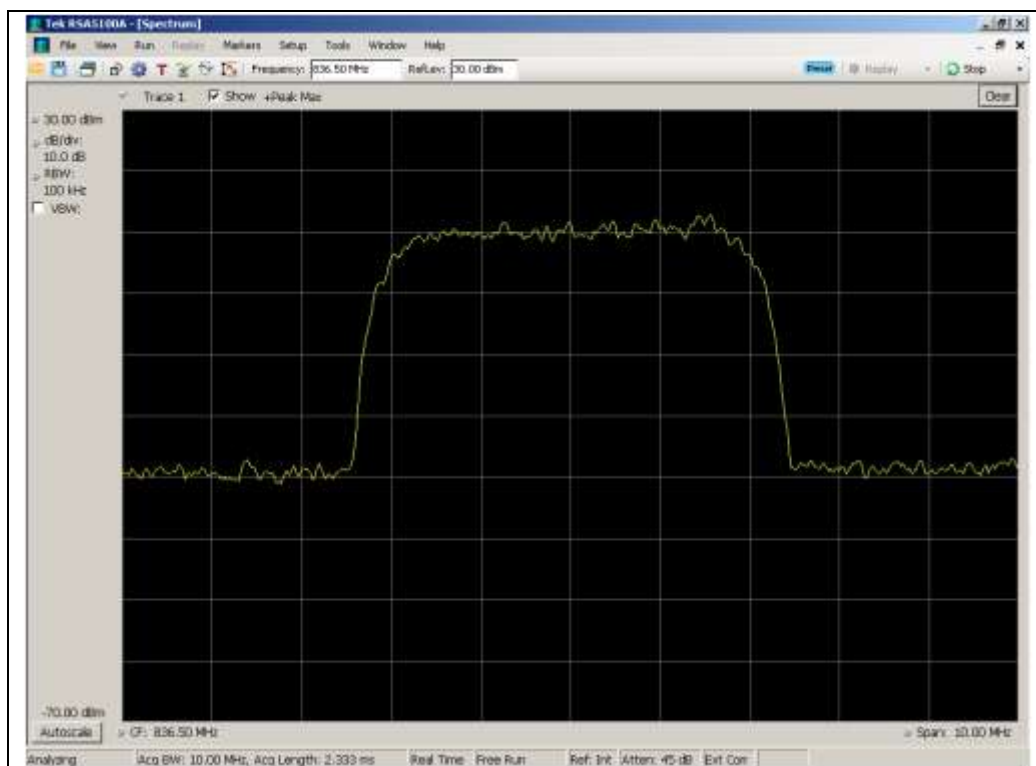


## 824 - 849 MHz Band

### Input



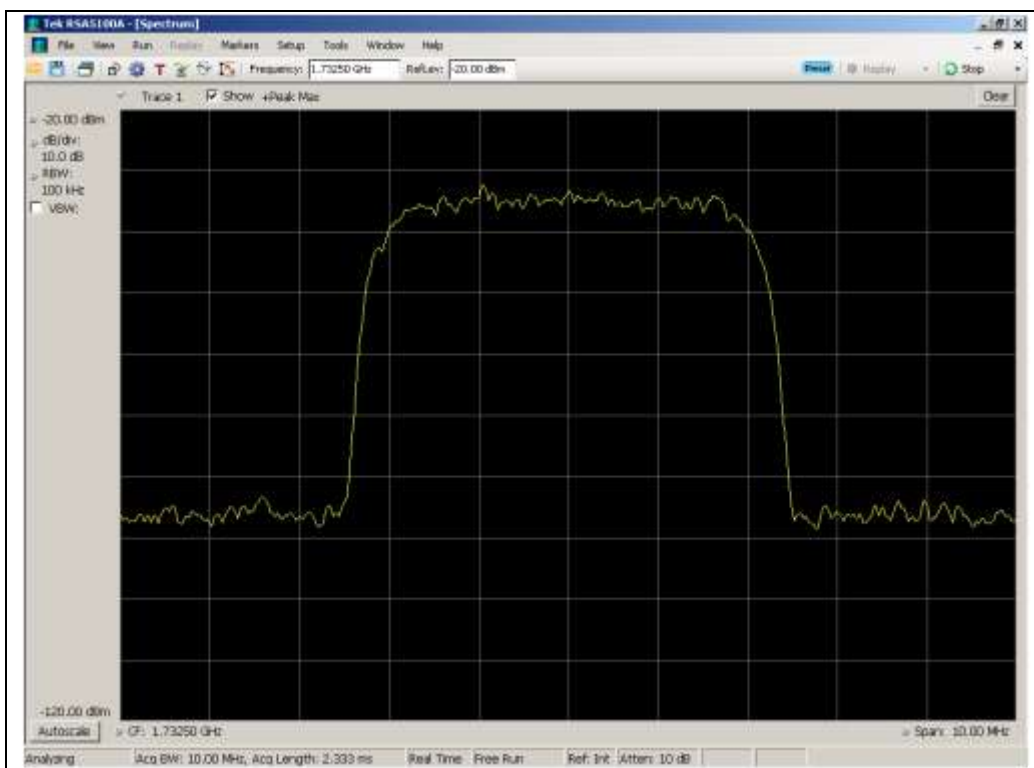
### Output



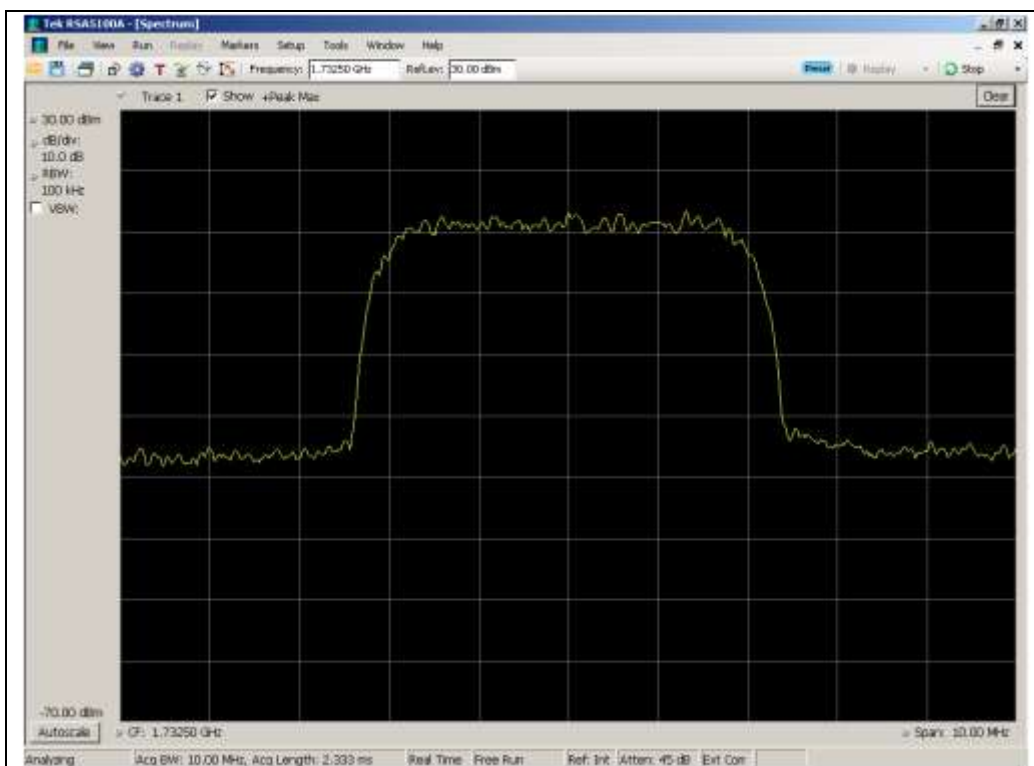


## 1710 - 1755 MHz Band

### Input



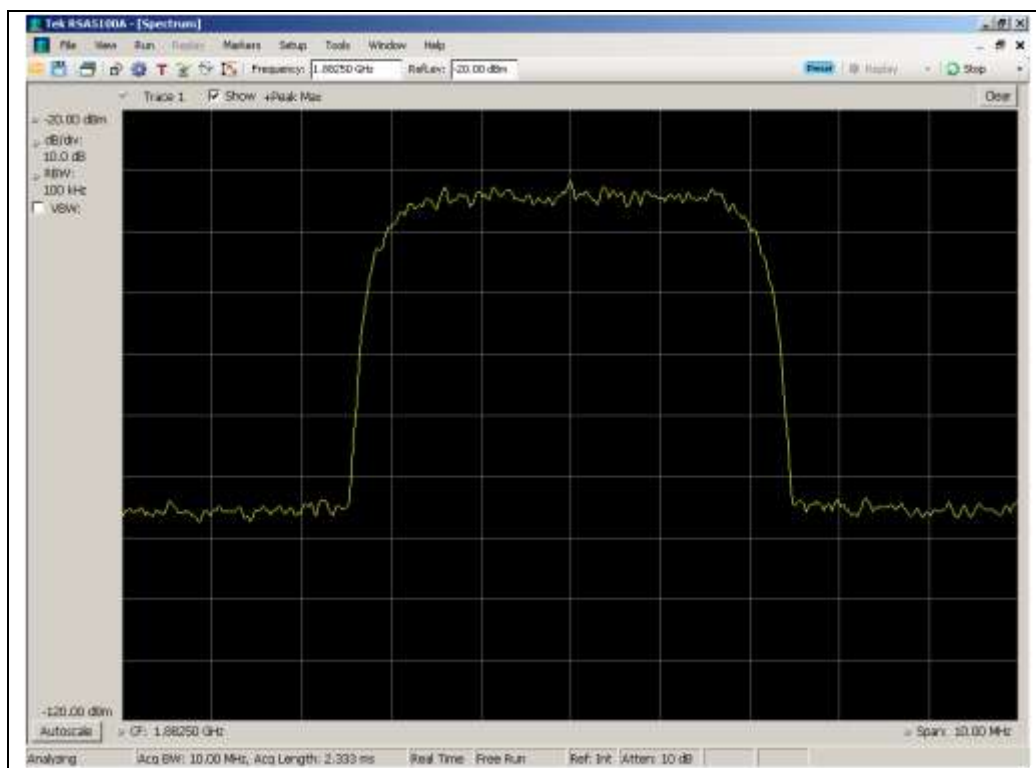
### Output



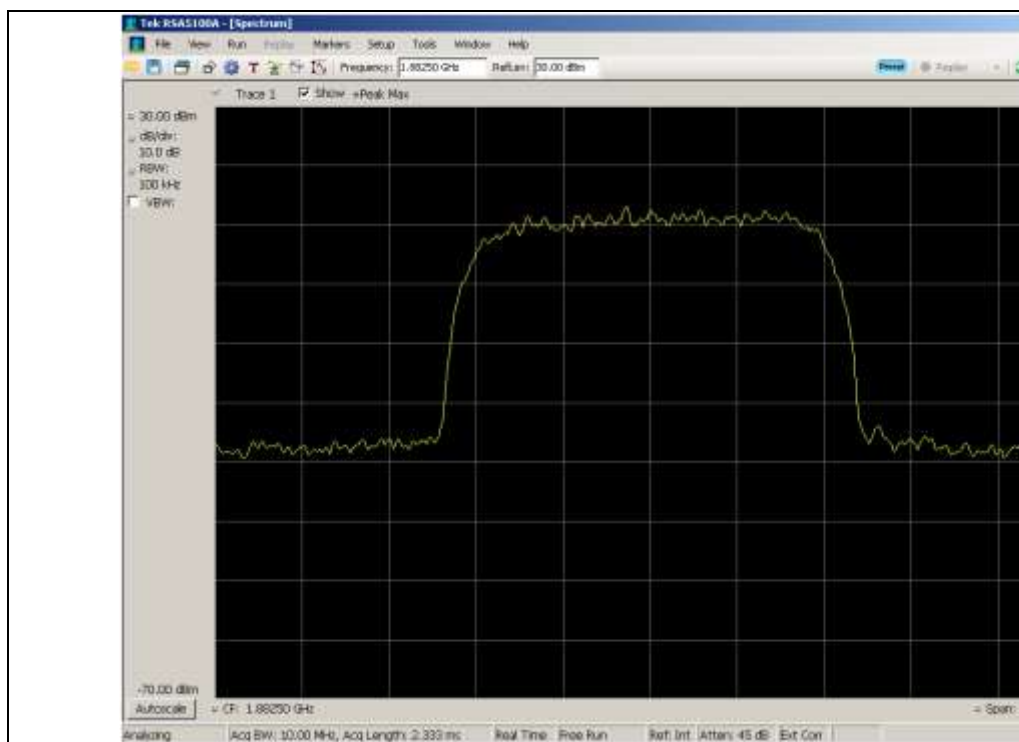


## 1850 - 1915 MHz Band

### Input



### Output

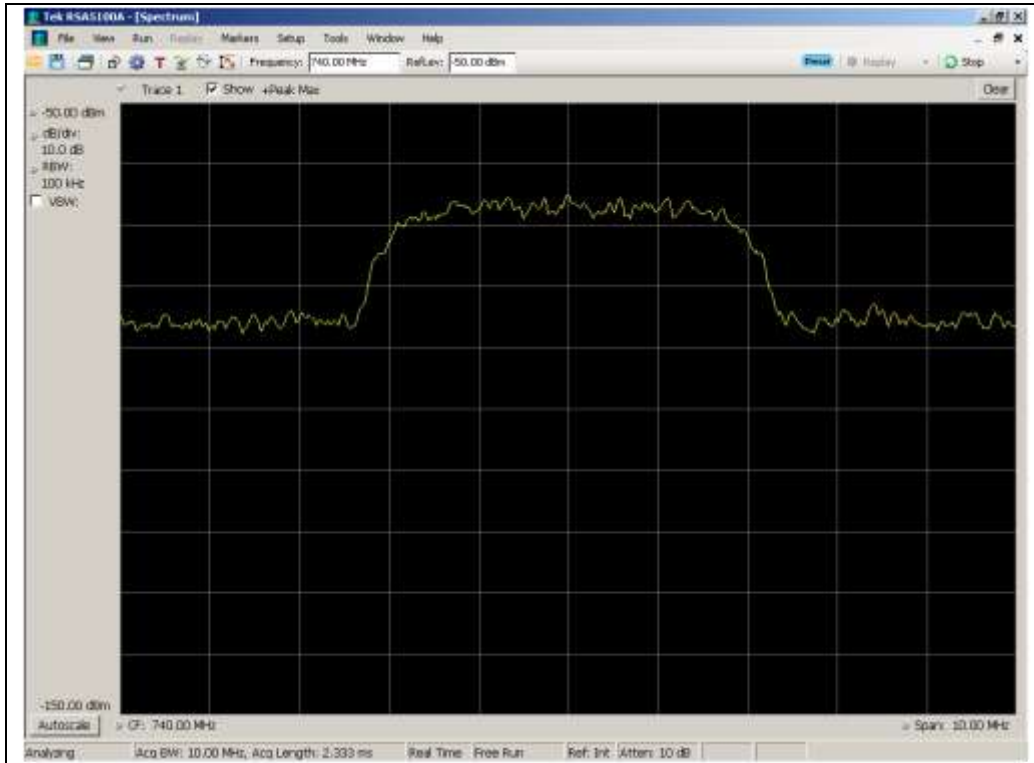




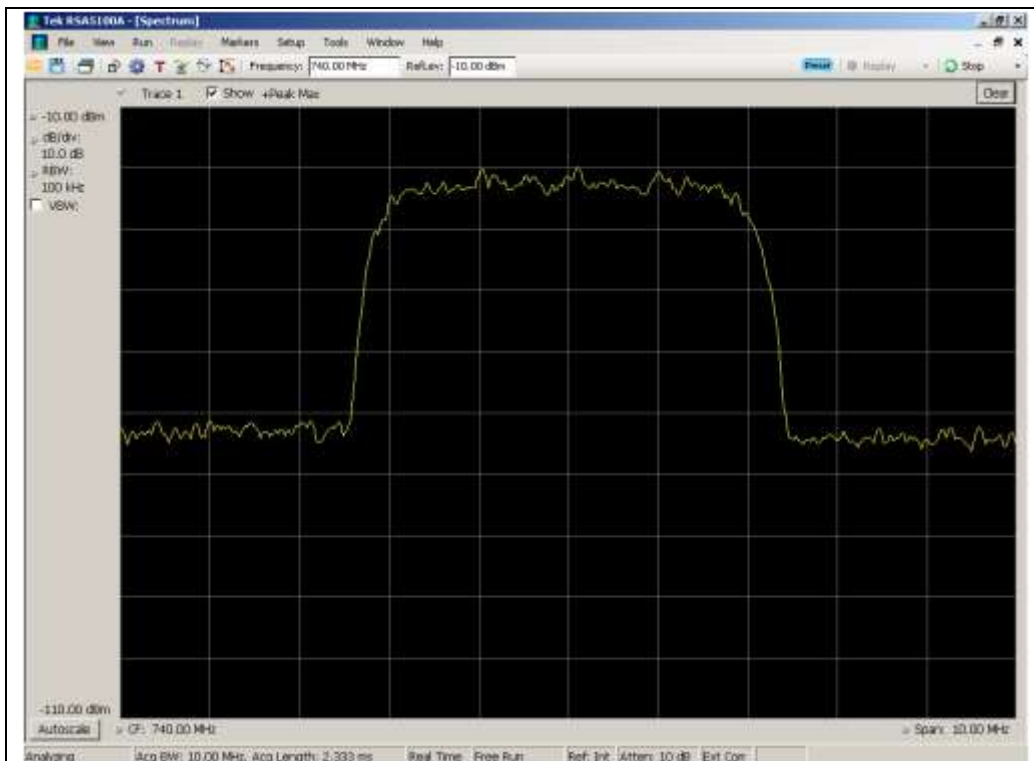
## WCDMA Downlink Test Plots

### 734 - 746 MHz Band

#### Input



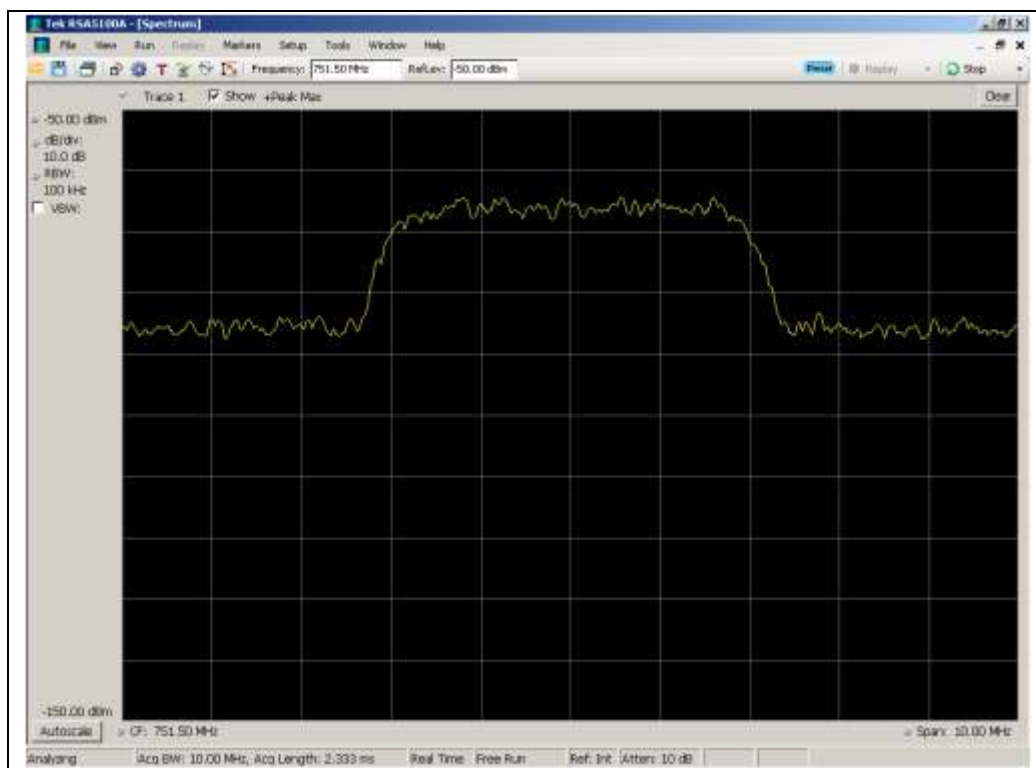
#### Output



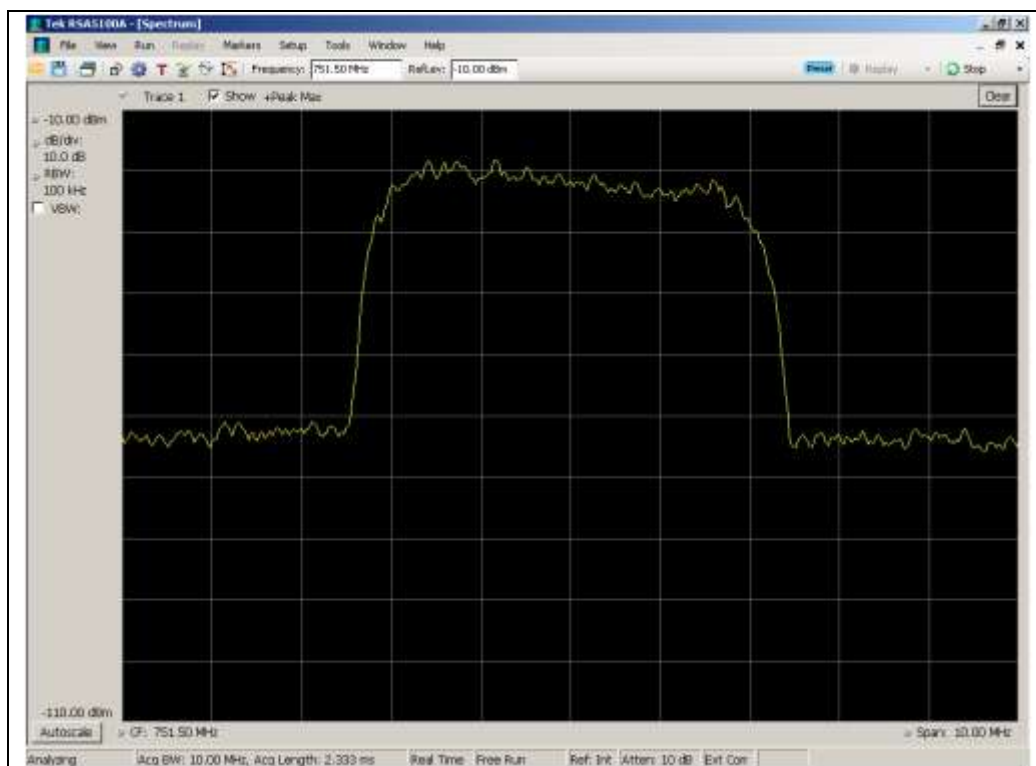


## 746 - 757 MHz Band

### Input



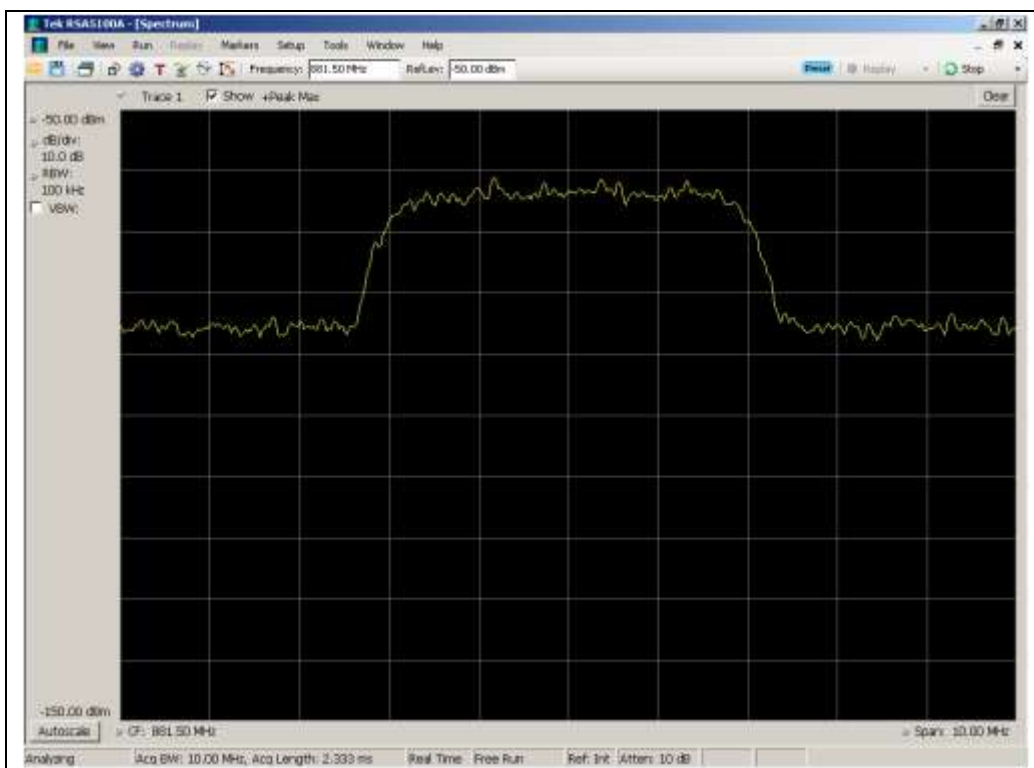
### Output



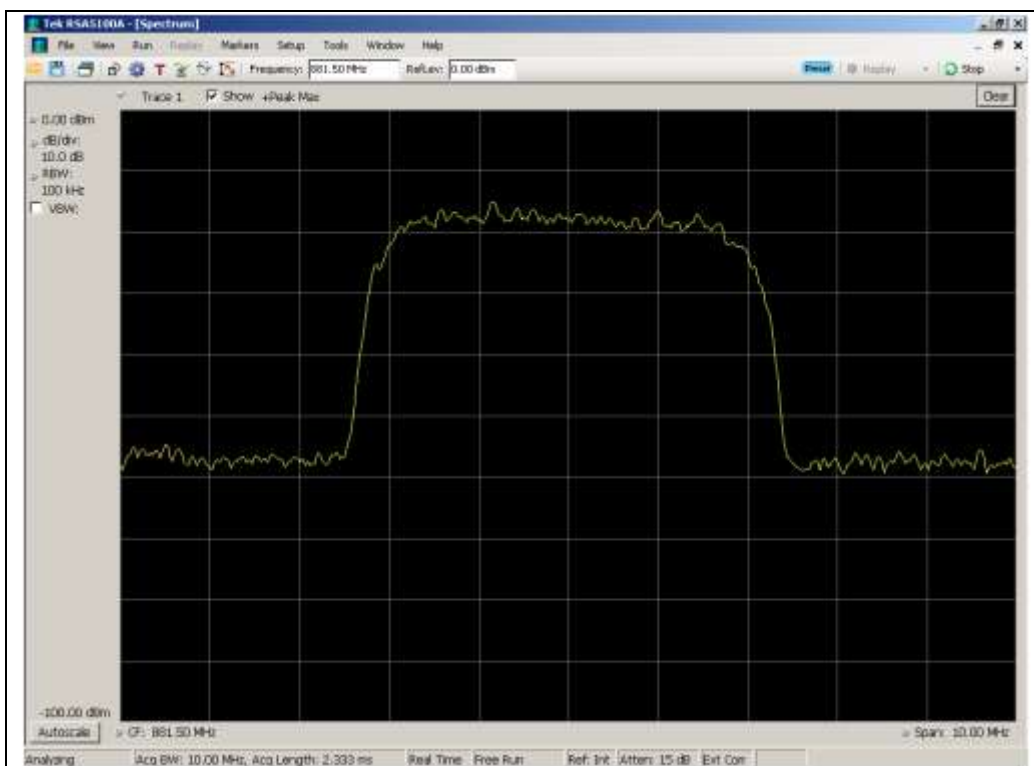


## 869 - 894 MHz Band

### Input



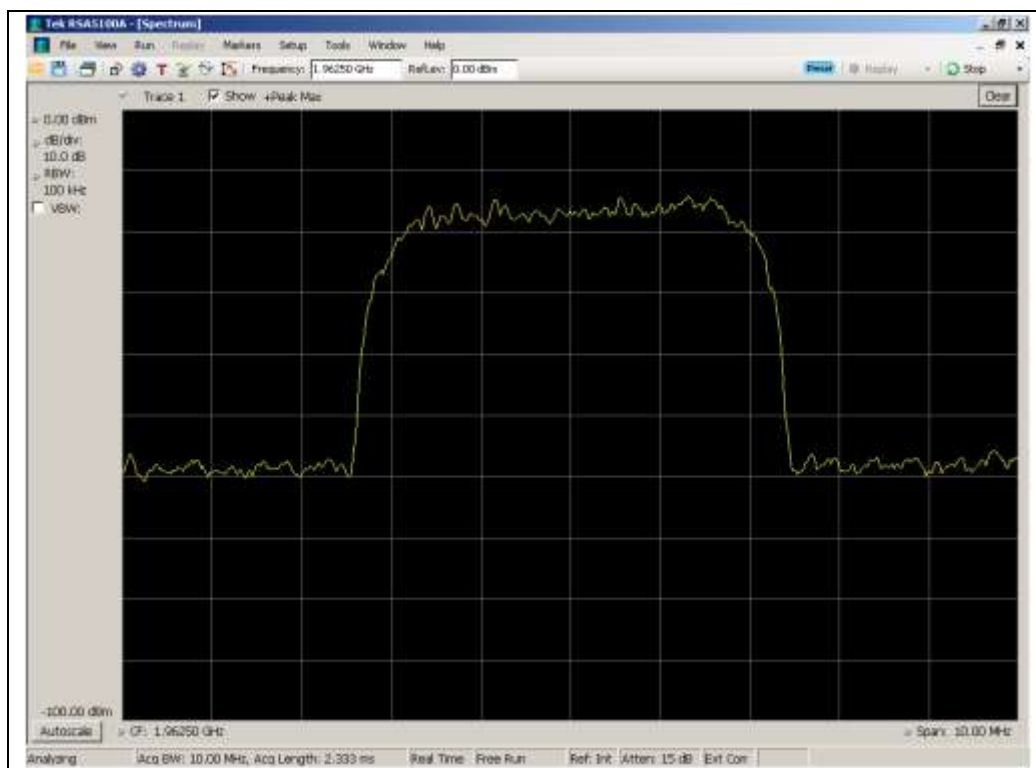
### Output



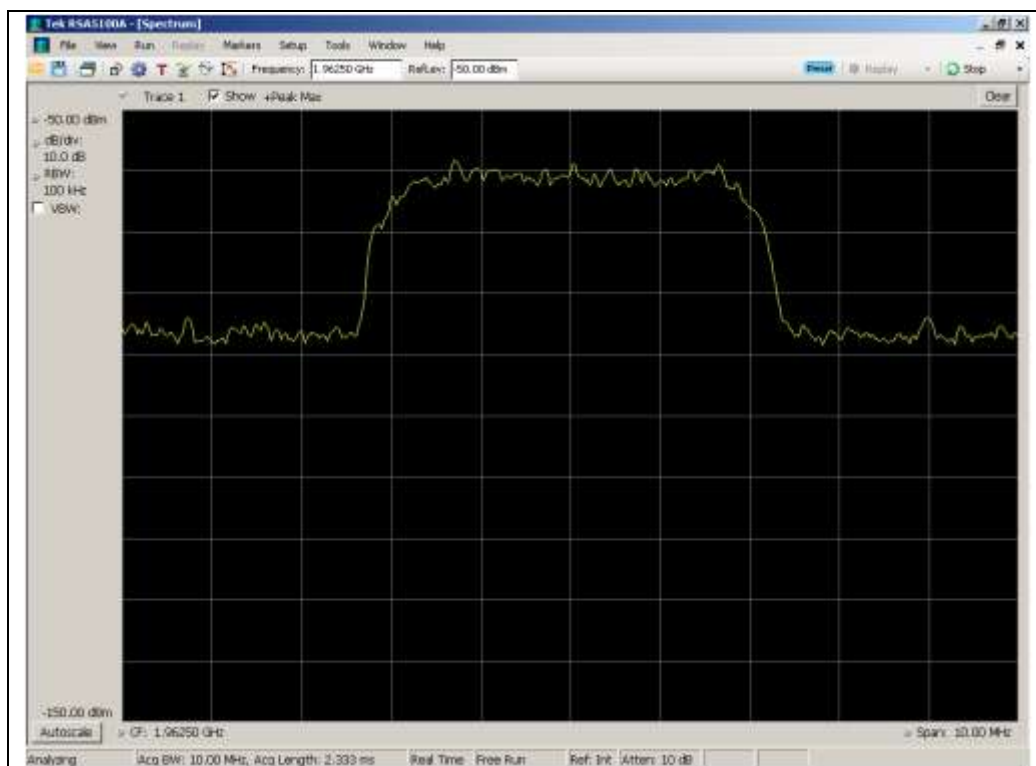


## 1930 - 1995 MHz Band

### Input



### Output

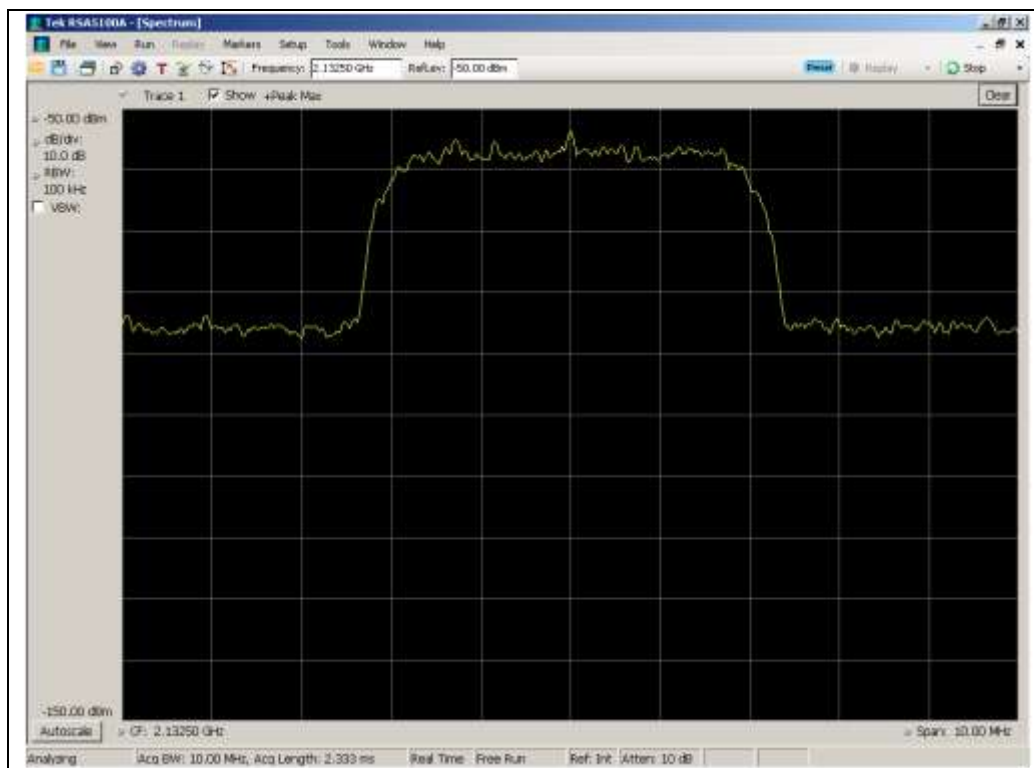




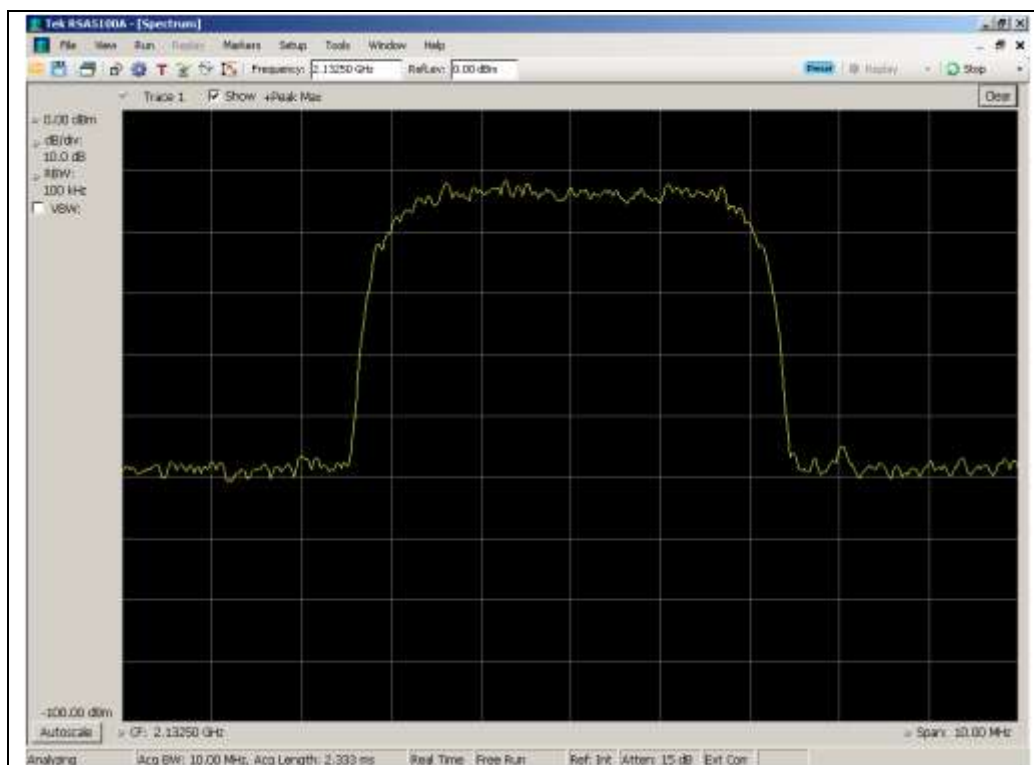


## 2110 - 2155 MHz Band

### Input



### Output







**Oscillation Detection**

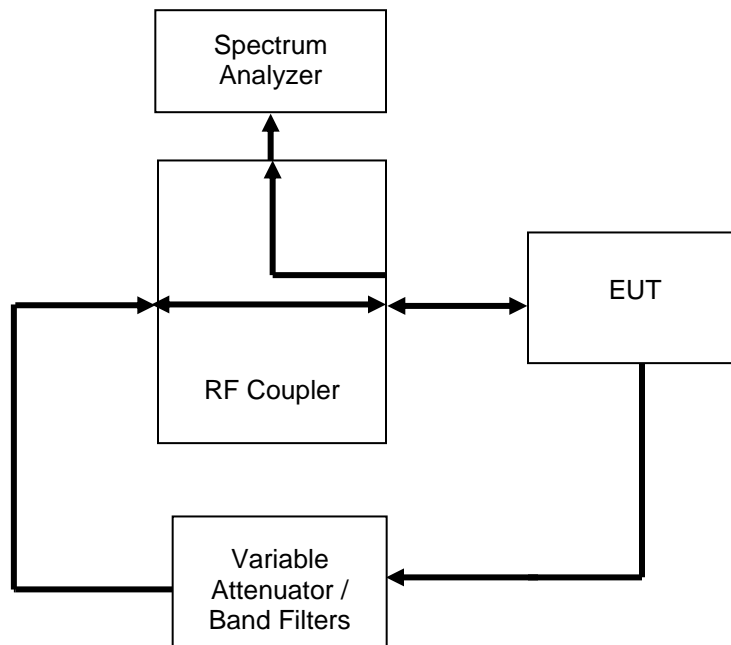
**Name of Test:** Oscillation Detection  
**Test Equipment Utilized:** i00411, i00413, i00424

**Engineer:** Greg Corbin  
**Test Date:** 9/29/2013

**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. An 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
704 - 716	17.5	300	Pass
776 - 787	108.75	300	Pass
824 - 849	193.75	300	Pass
1710 - 1755	130	300	Pass
1850 - 1915	130	300	Pass

**Downlink Detection Time Test Results**

Frequency Band (MHz)	Measured Time (mS)	Limit (S)	Result
734 - 746	223.75	1	Pass
746 - 757	140	1	Pass
869 - 894	266.25	1	Pass
1930 - 1995	51.25	1	Pass
2110 - 2155	56.25	1	Pass



### Uplink Restart Time Test Results

Frequency Band (MHz)	Measured Time (S)	Limit (S)	Result
704 - 716	65.75	≥60	Pass
776 - 787	65.63	≥60	Pass
824 - 849	65.75	≥60	Pass
1710 - 1755	65.63	≥60	Pass
1850 - 1915	65.5	≥60	Pass

### Downlink Restart Time Test Results

Frequency Band (MHz)	Measured Time (mS)	Limit (mS)	Result
734 - 746	65.75	≥60	Pass
746 - 757	65.75	≥60	Pass
869 - 894	65.75	≥60	Pass
1930 - 1995	65.75	≥60	Pass
2110 - 2155	65.75	≥60	Pass

### Uplink Restart Count Test Results

Frequency Band (MHz)	Restarts	Limit	Result
704 - 716	5	≤5	Pass
776 - 787	5	≤5	Pass
824 - 849	5	≤5	Pass
1710 - 1755	5	≤5	Pass
1850 - 1915	5	≤5	Pass

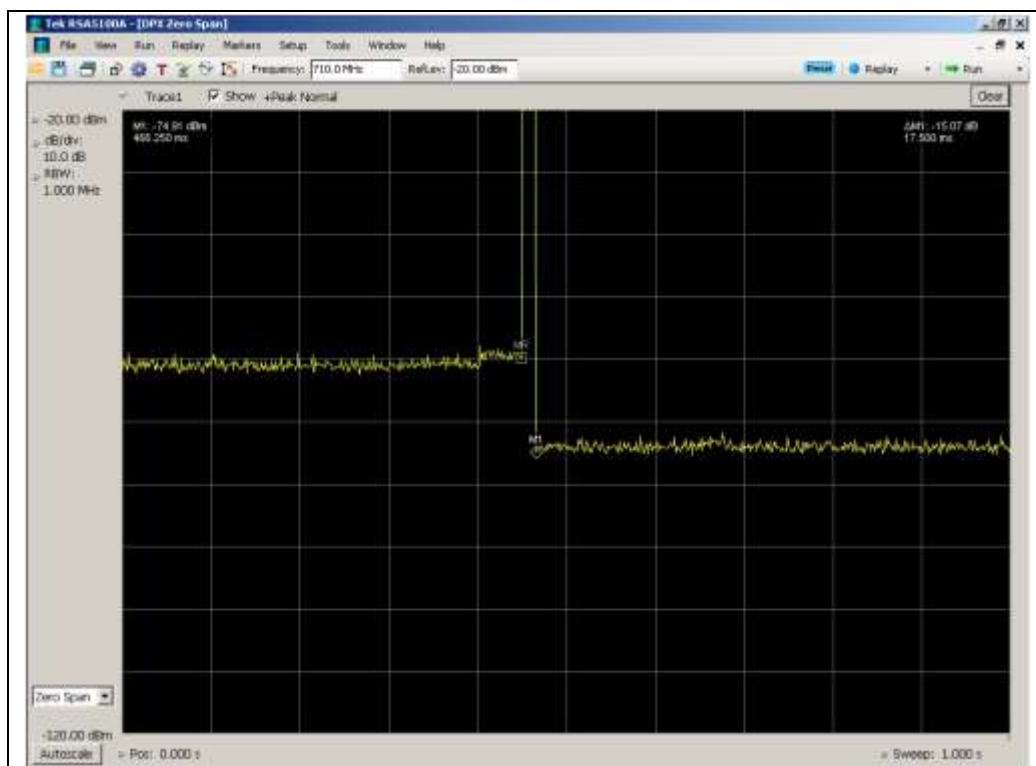
### Downlink Restart Count Test Results

Frequency Band (MHz)	Restarts	Limit	Result
734 - 746	5	≤5	Pass
746 - 757	5	≤5	Pass
869 - 894	5	≤5	Pass
1930 - 1995	5	≤5	Pass
2110 - 2155	5	≤5	Pass

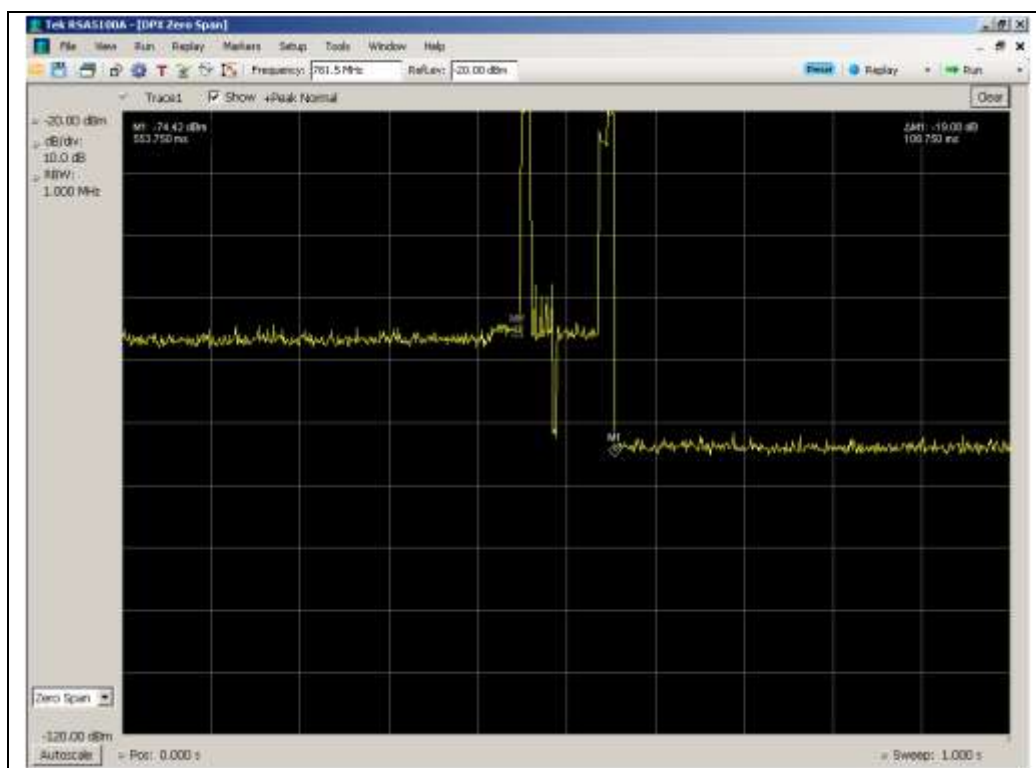


## Uplink Detection Time Test Results

### 704 - 716 MHz Band

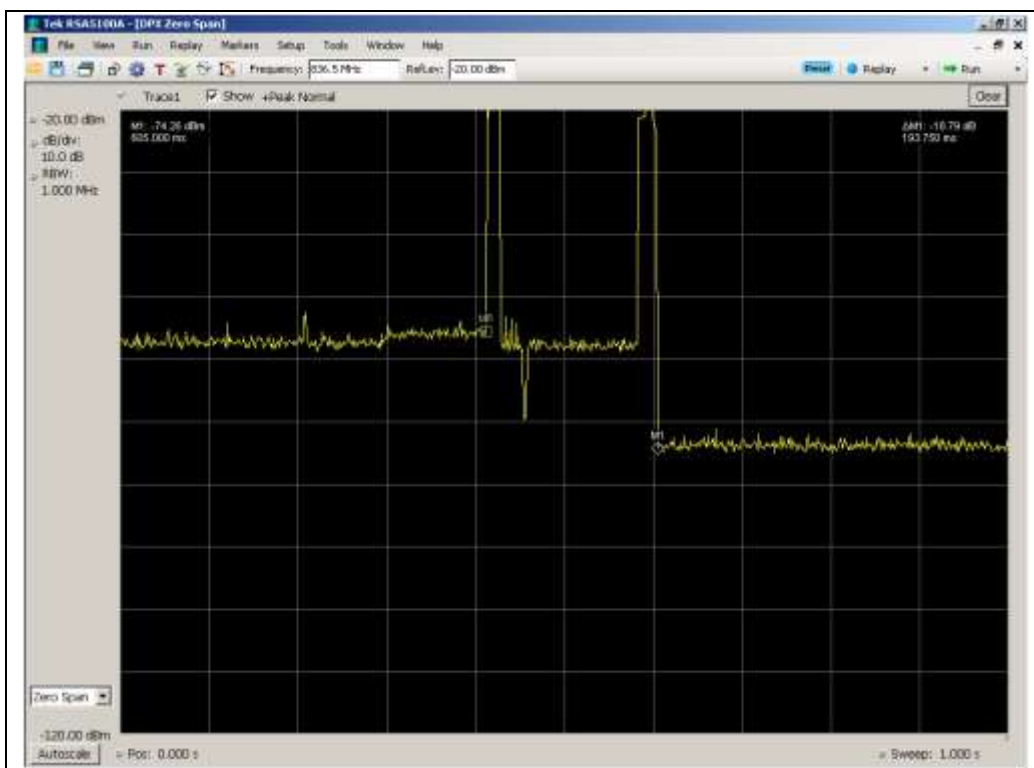


### 776 - 787 MHz Band

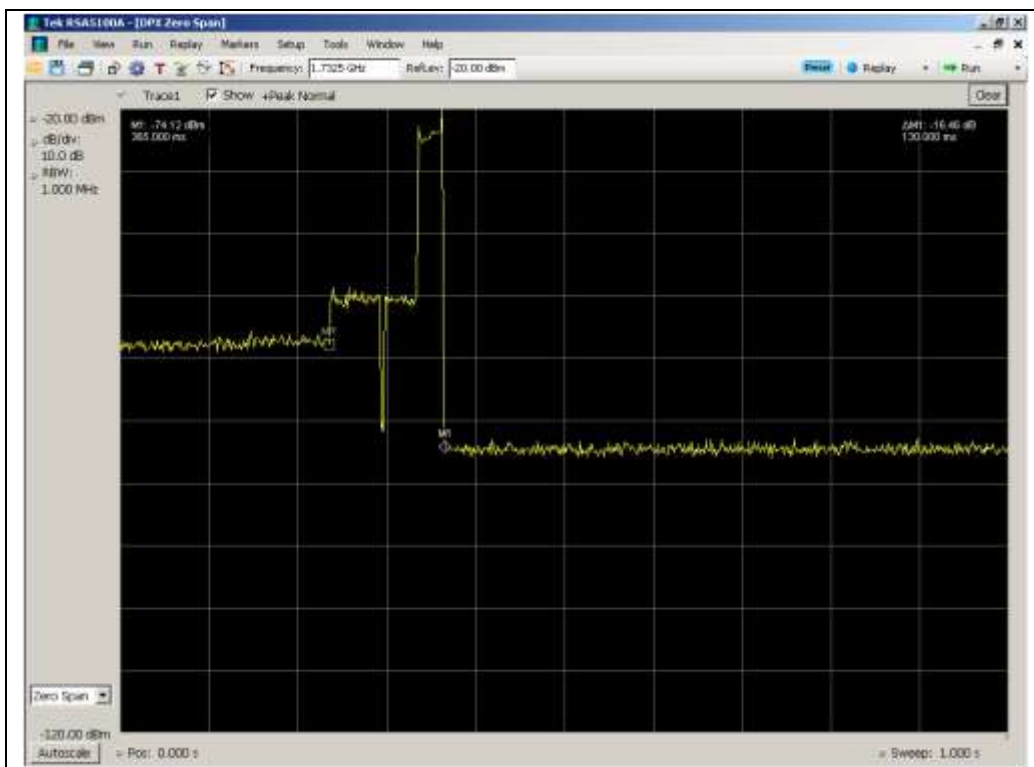




### 824 - 849 MHz Band

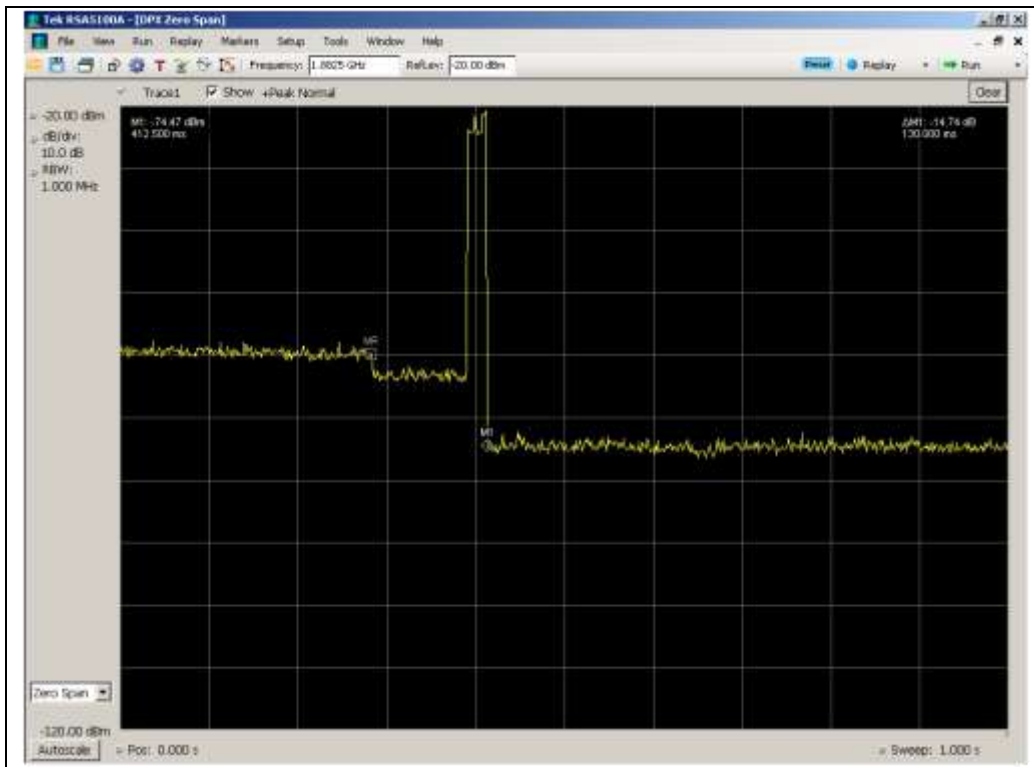


### 1710 - 1755 MHz Band



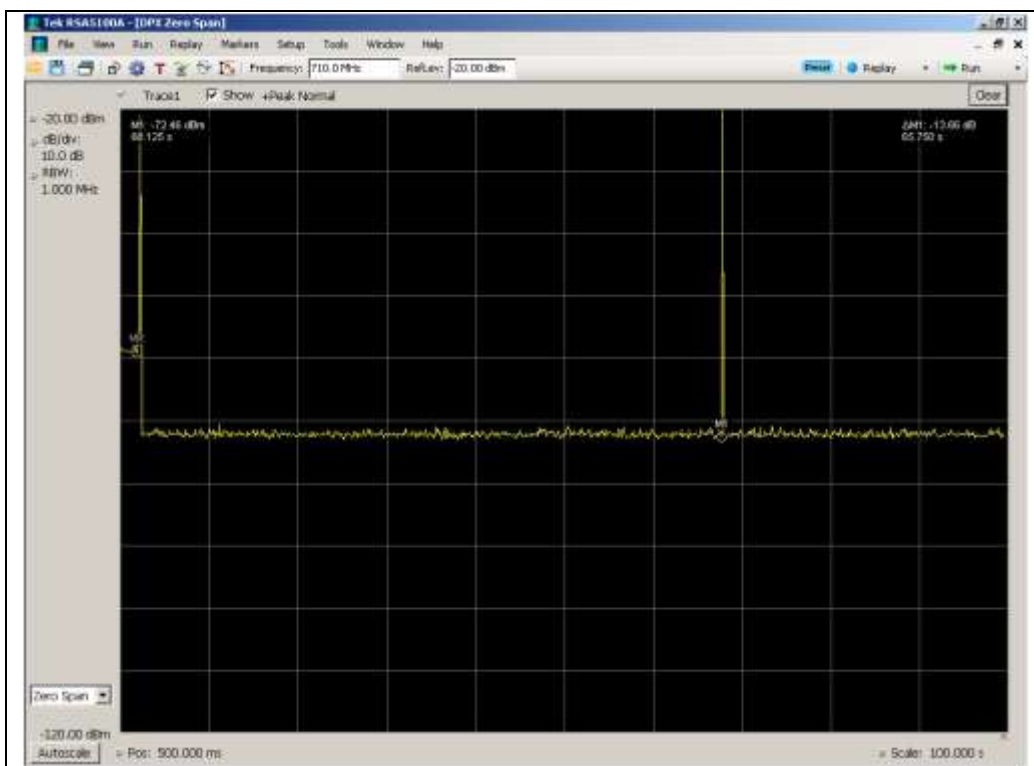


### 1850 - 1915 MHz Band



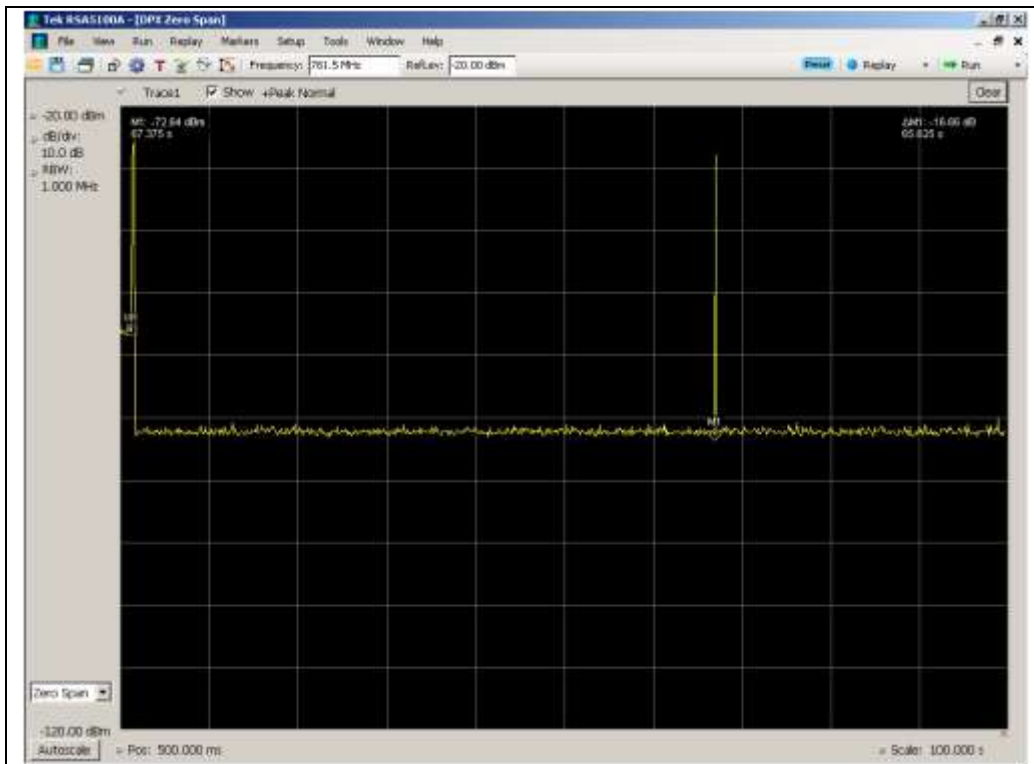
### Uplink Restart Time Test Results

### 704 - 716 MHz Band

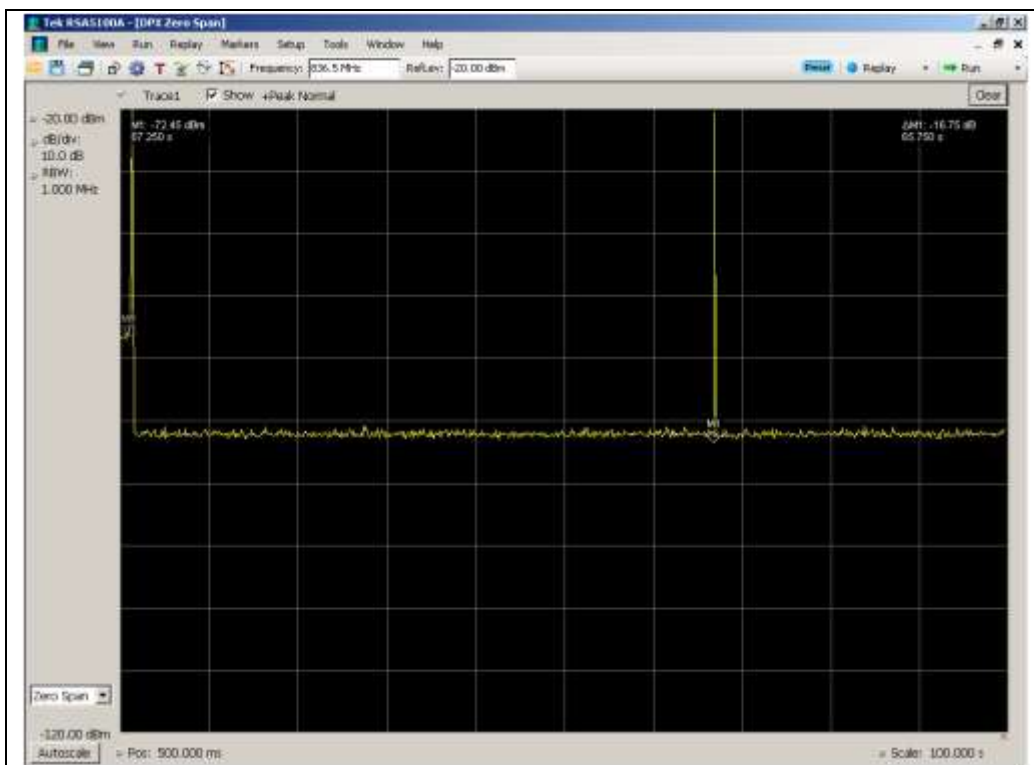




### 776 - 787 MHz Band

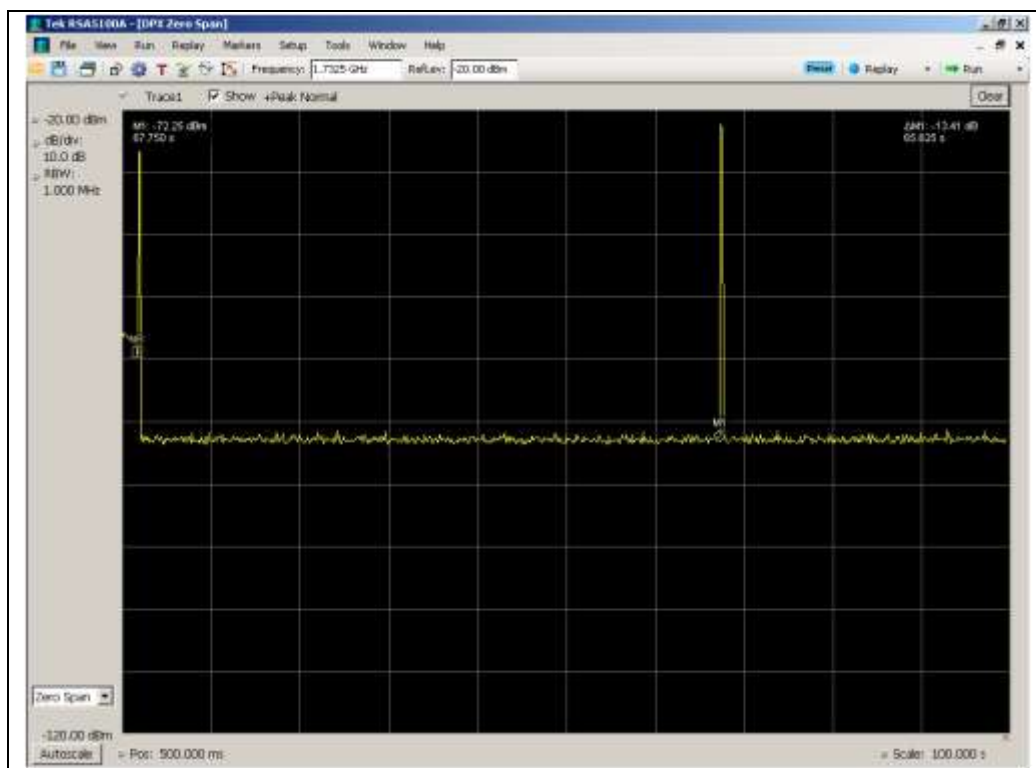


### 824 - 849 MHz Band

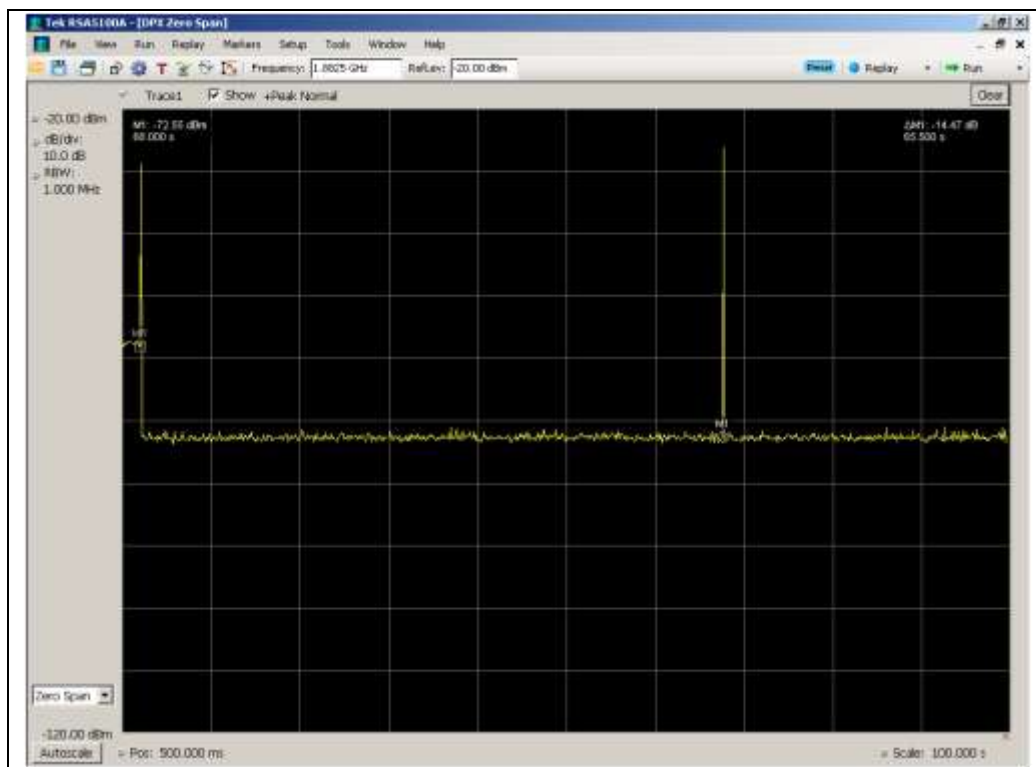




### 1710 - 1755 MHz Band



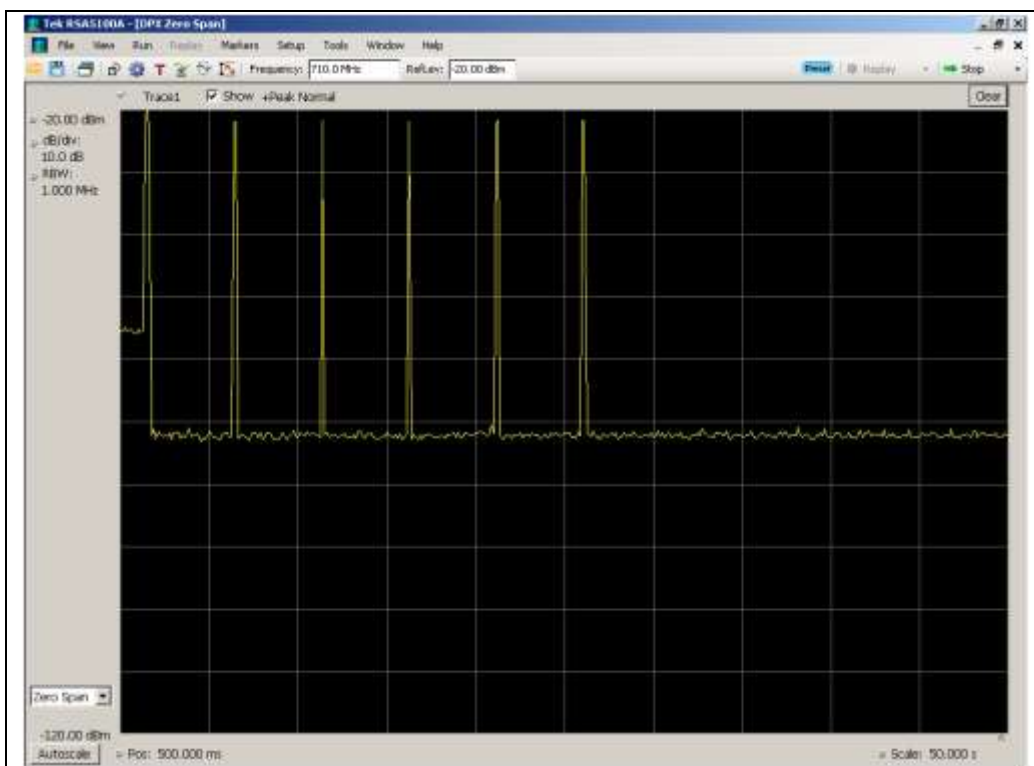
### 1850 - 1915 MHz Band



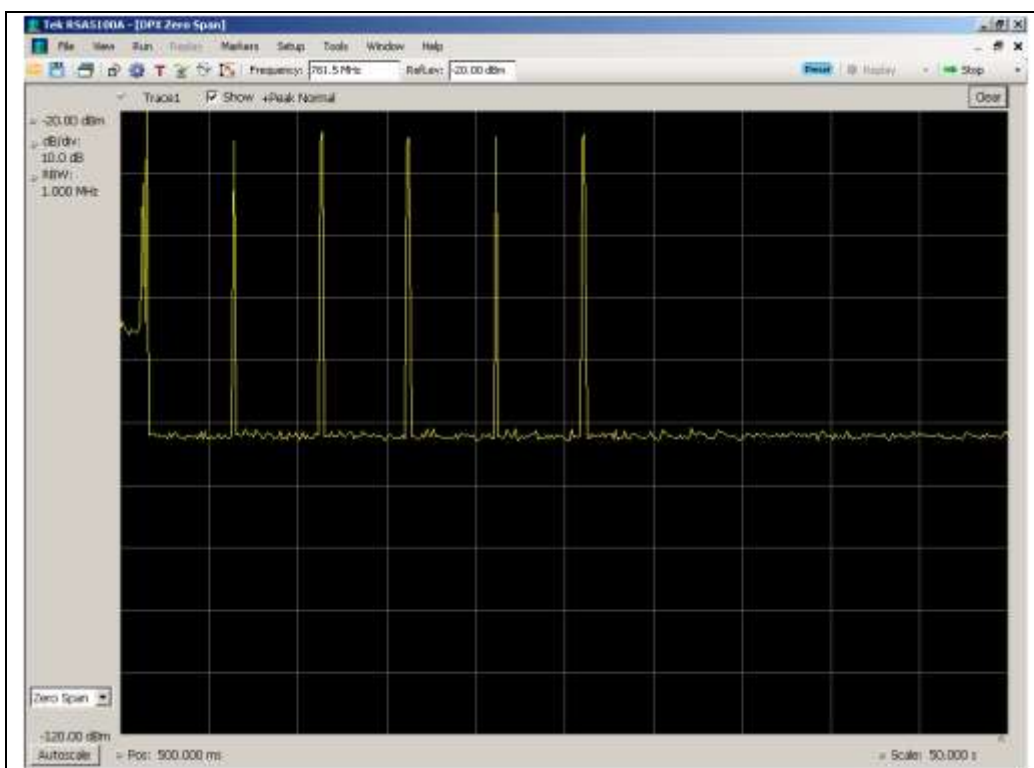


## Uplink Restart Count Test Results

### 704 - 716 MHz Band



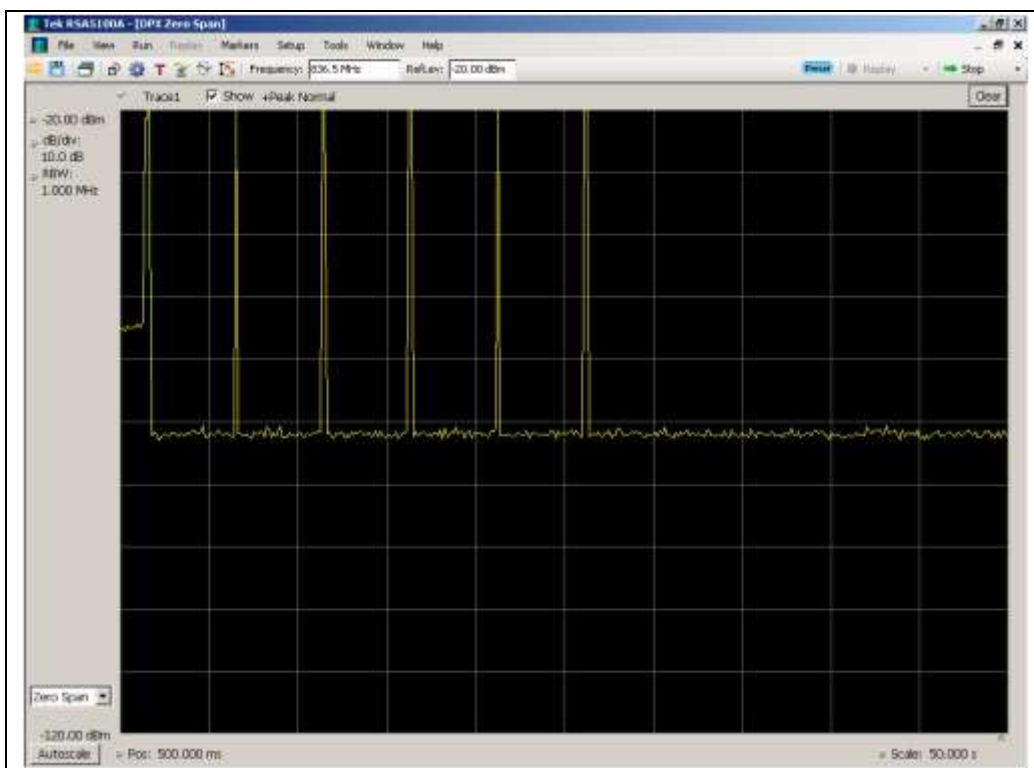
### 776 - 787 MHz Band



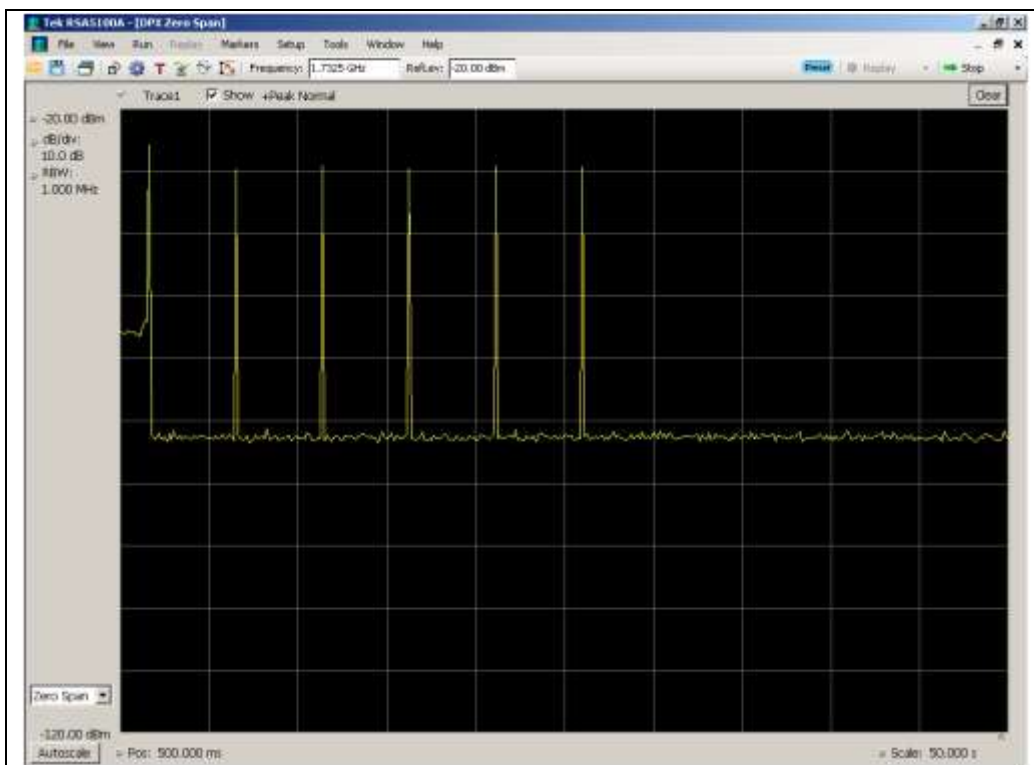




### 824 - 849 MHz Band

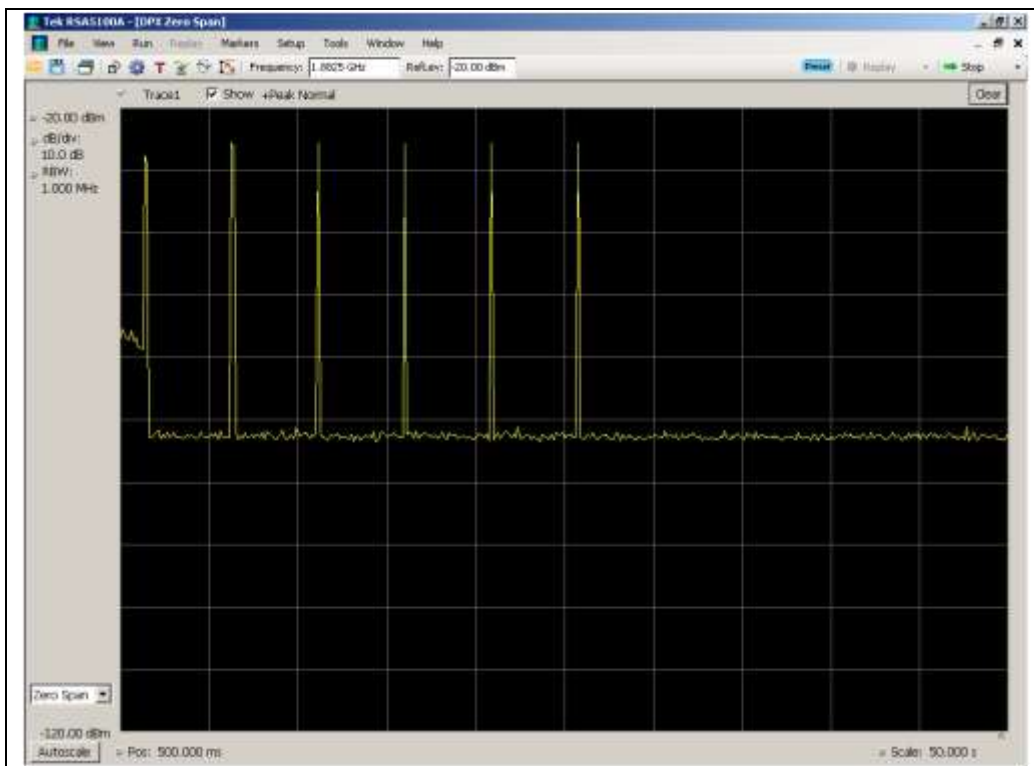


### 1710 - 1755 MHz Band



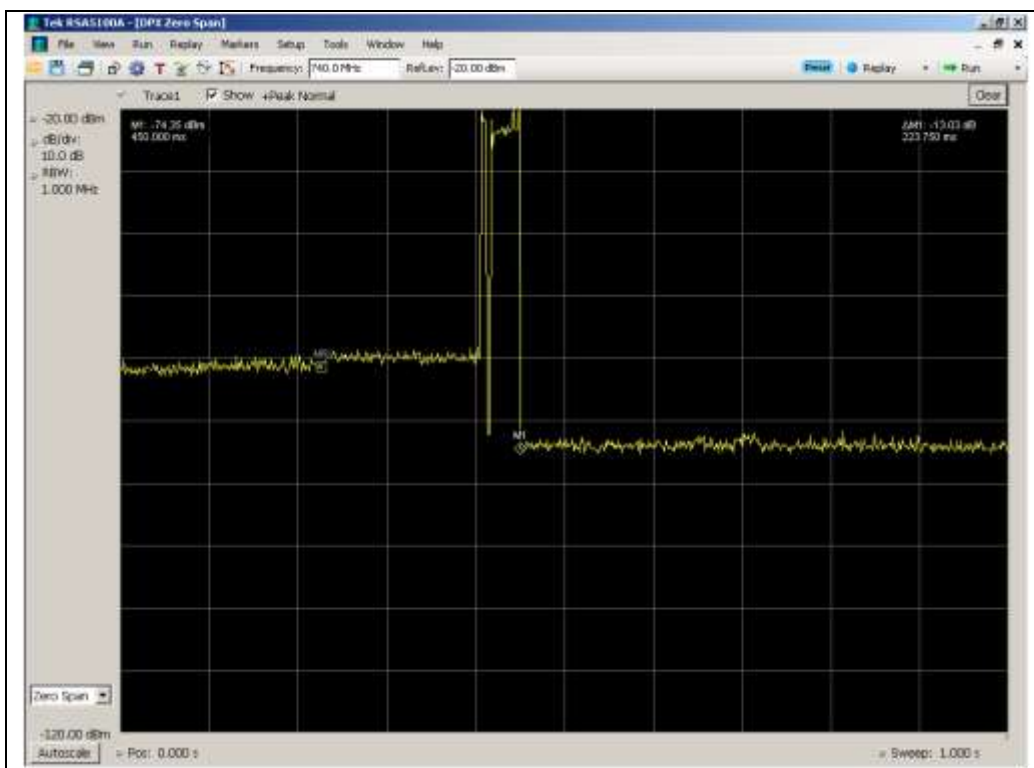


### 1850 - 1915 MHz Band



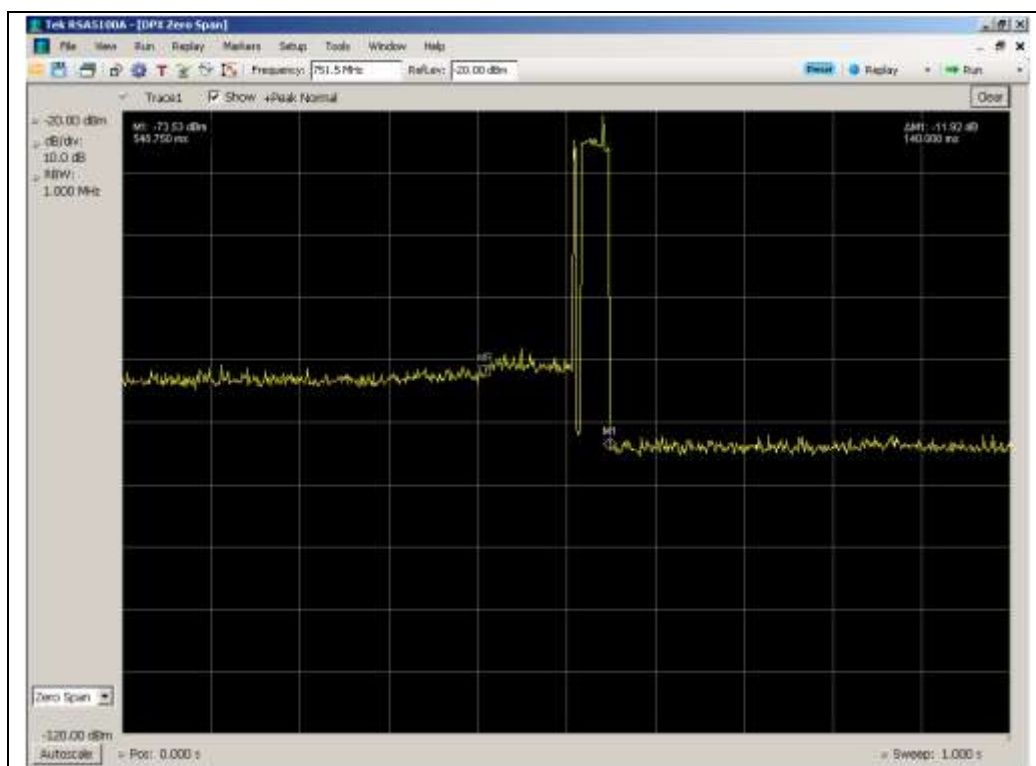
### Downlink Detection Time Test Results

### 734 - 746 MHz Band

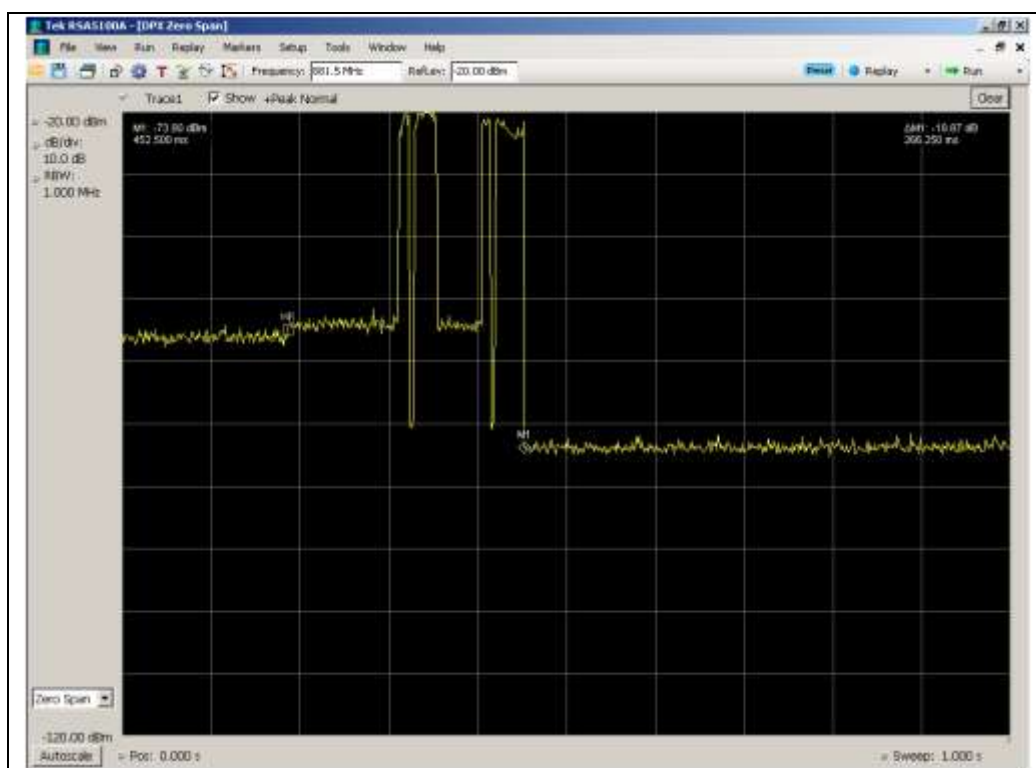




### 746 - 757 MHz Band

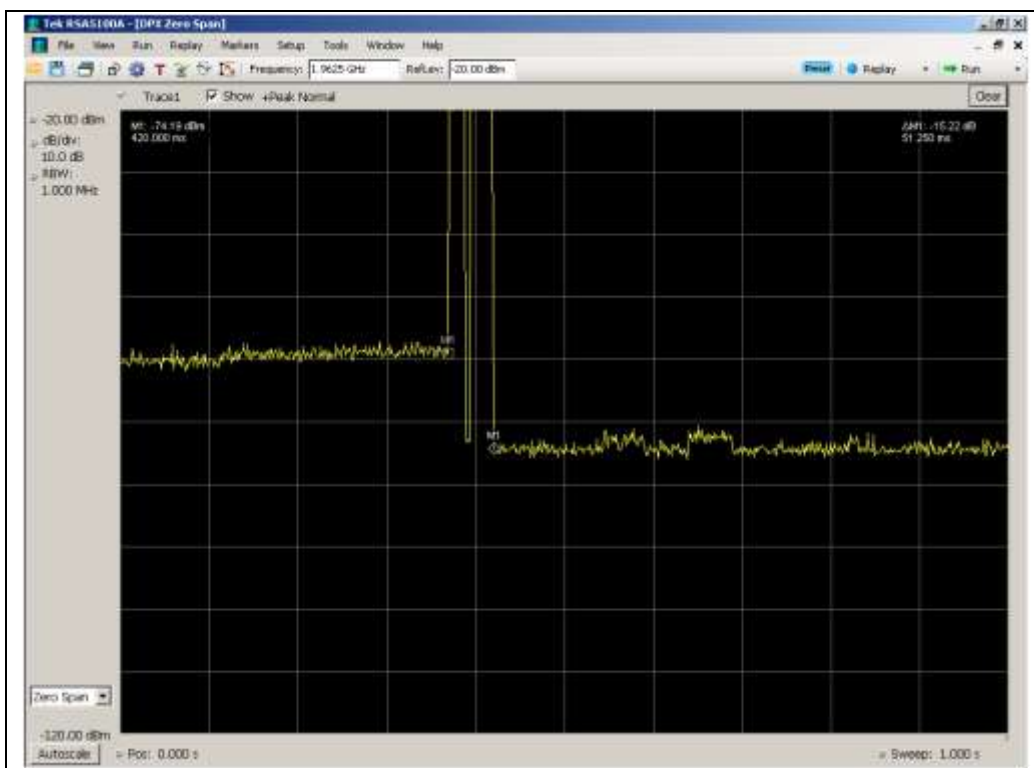


### 869 - 894 MHz Band

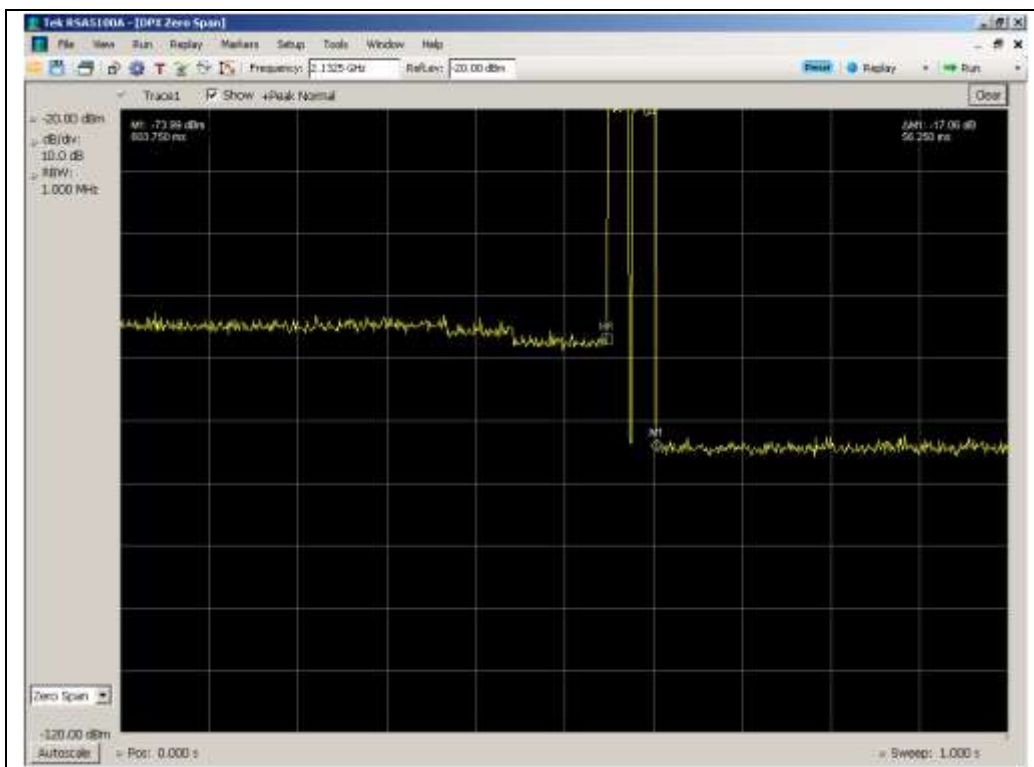




### 1930 - 1995 MHz Band



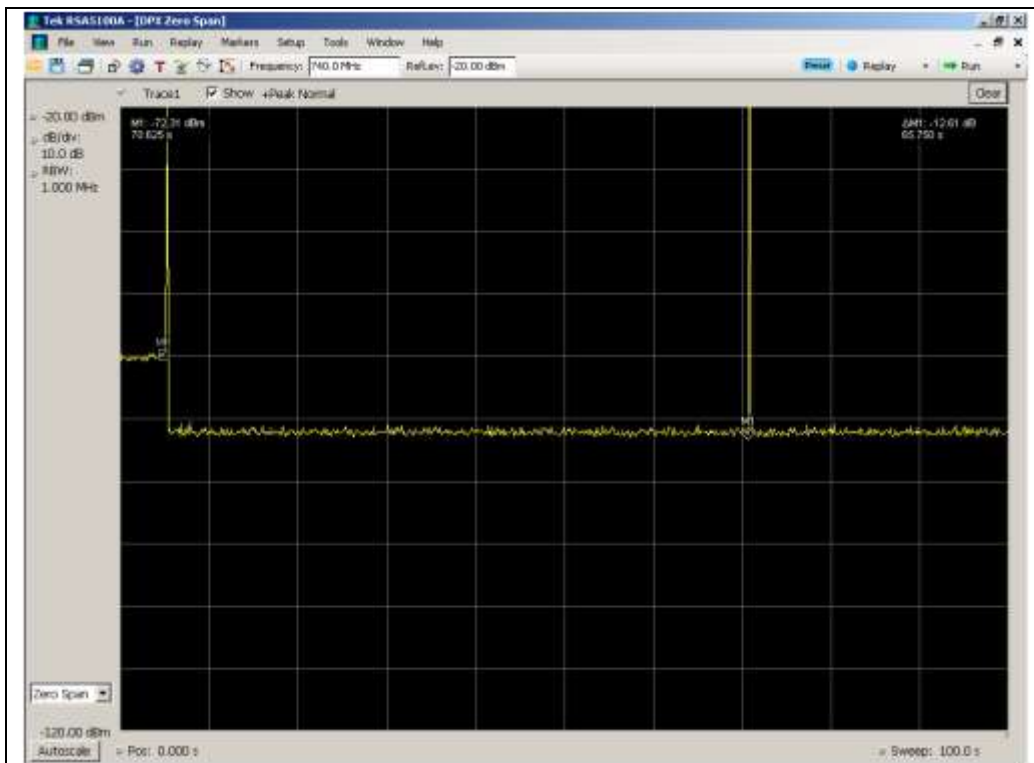
### 2110 - 2155 MHz Band



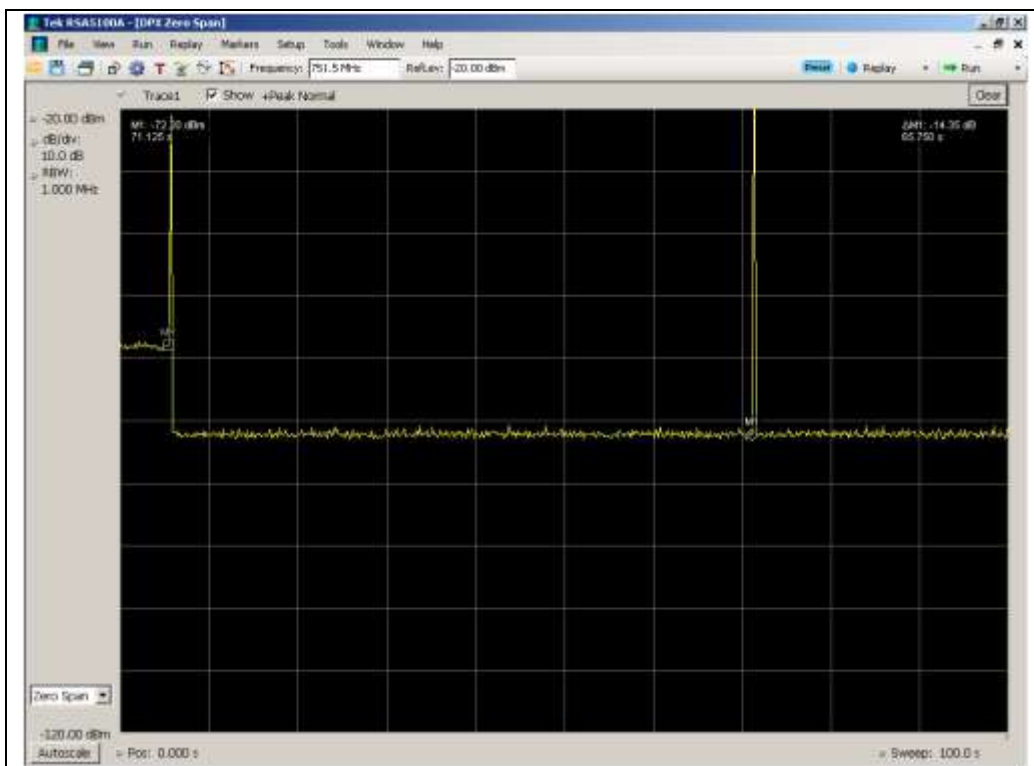


## Downlink Restart Time Test Results

### 734 - 746 MHz Band

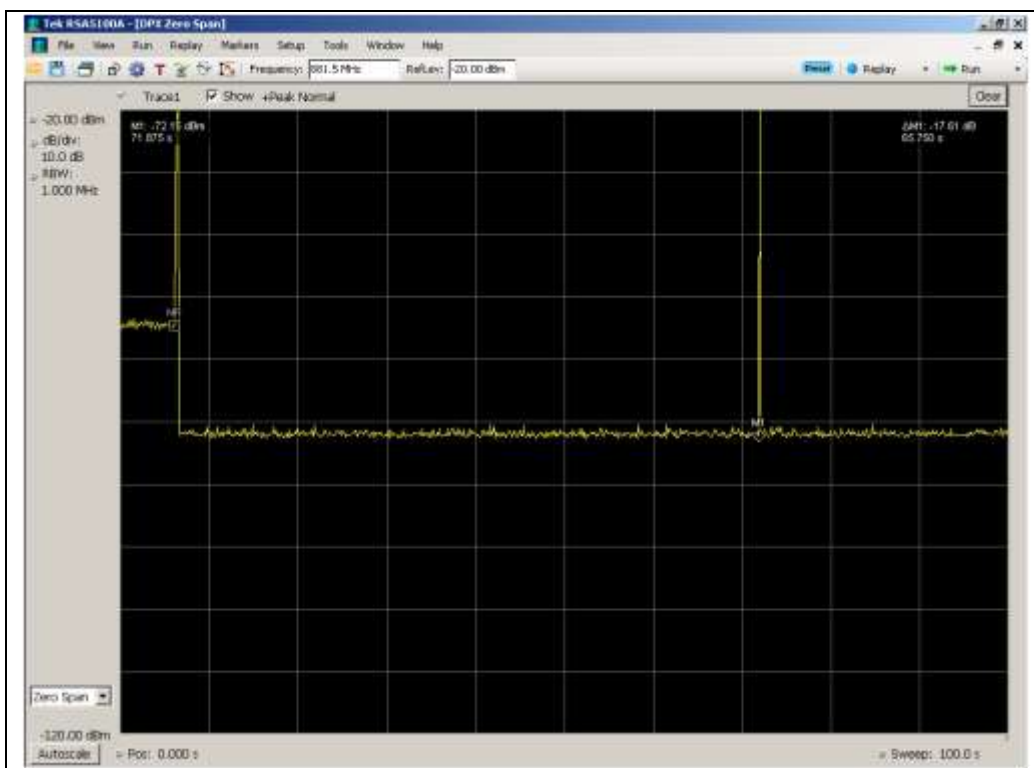


### 746 - 757 MHz Band

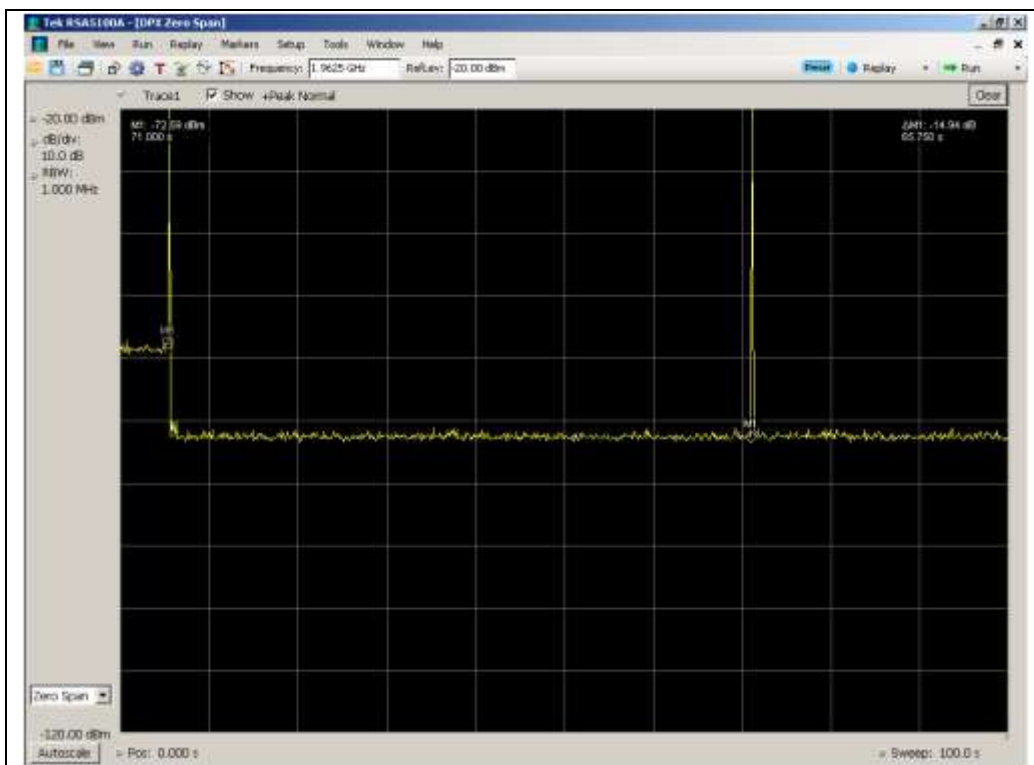




### 869 - 894 MHz Band

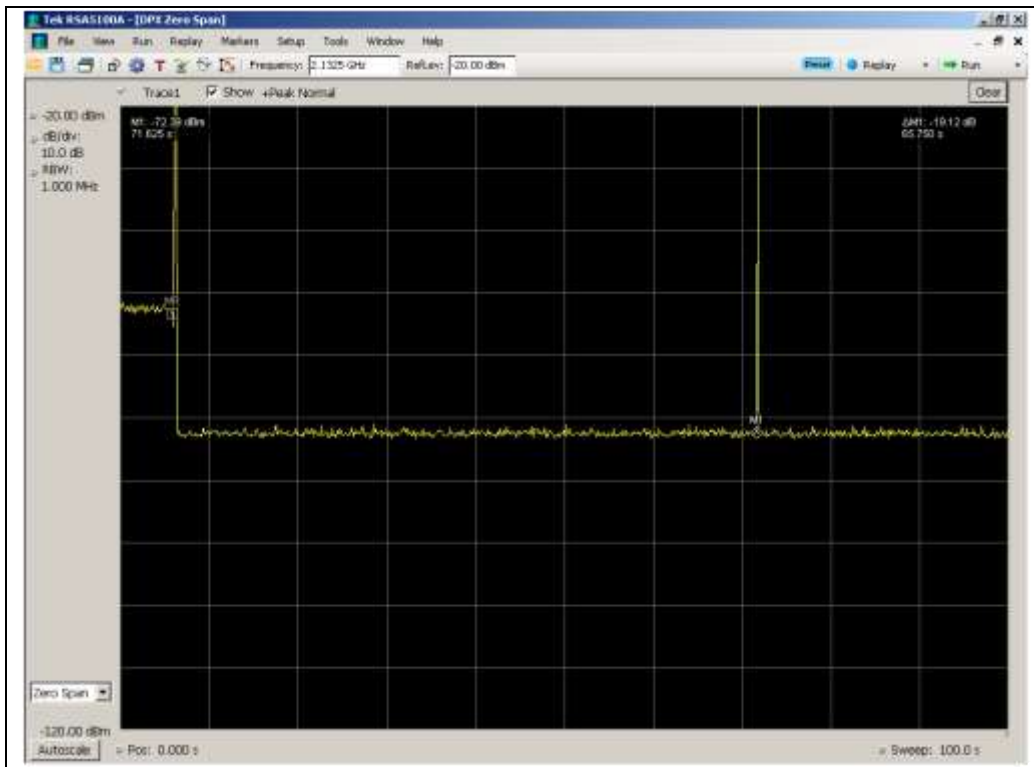


### 1930 - 1995 MHz Band



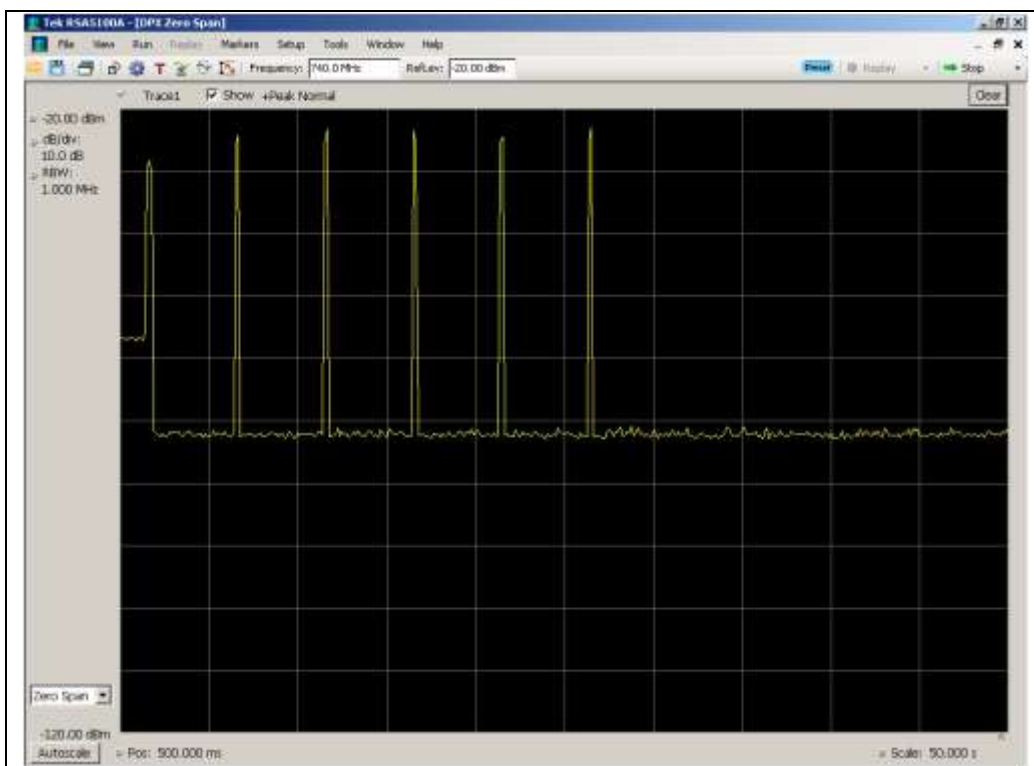


### 2110 - 2155 MHz Band



### Downlink Restart Count Test Results

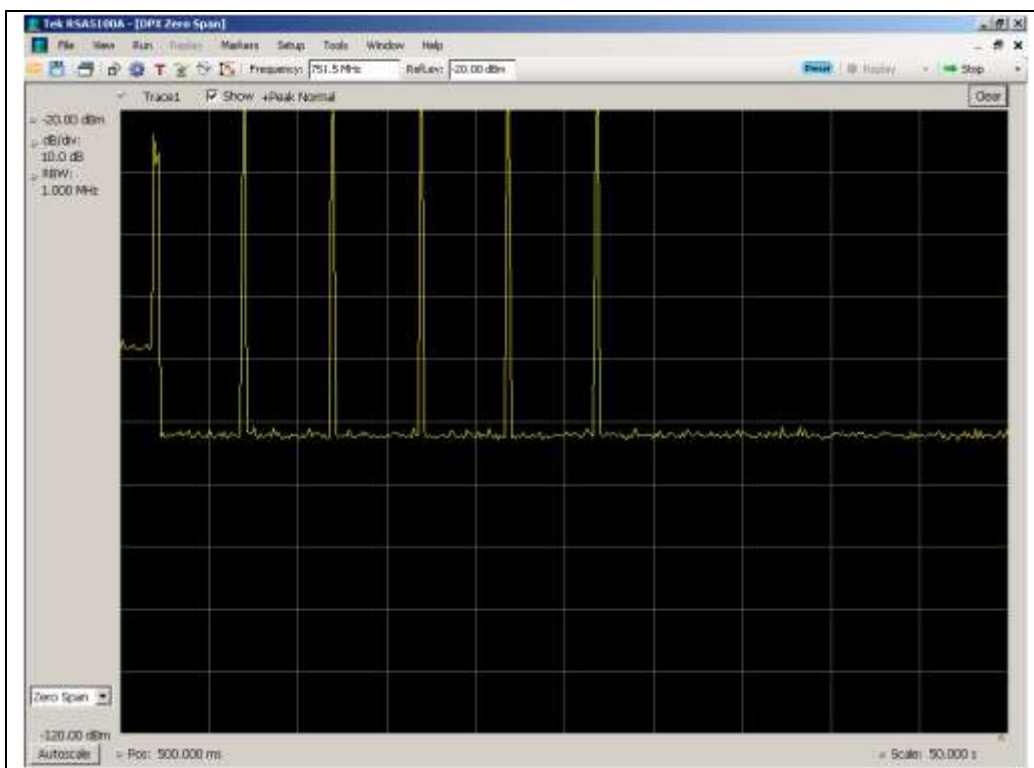
### 734 - 746 MHz Band



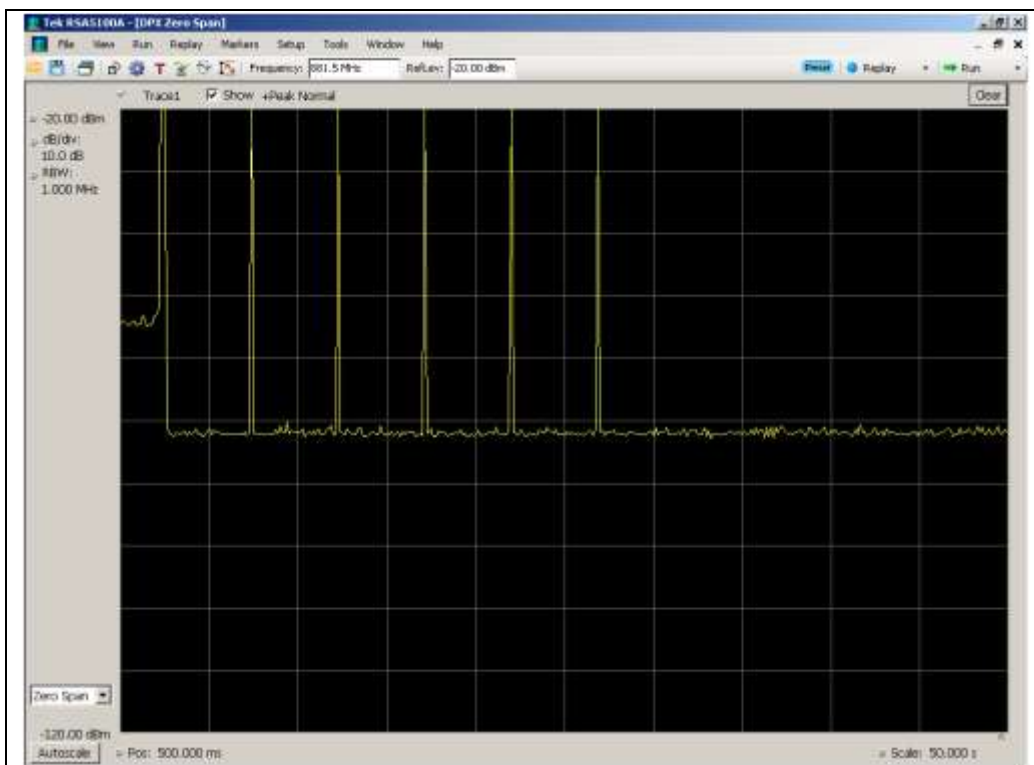




### 746 - 757 MHz Band



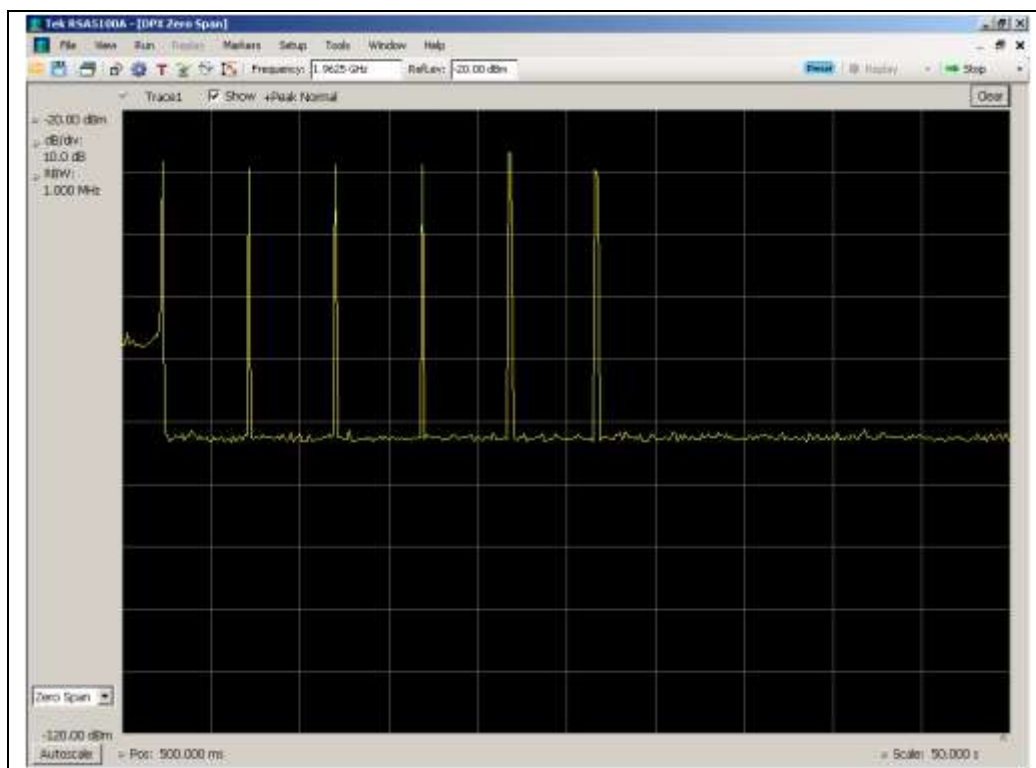
### 869 - 894 MHz Band



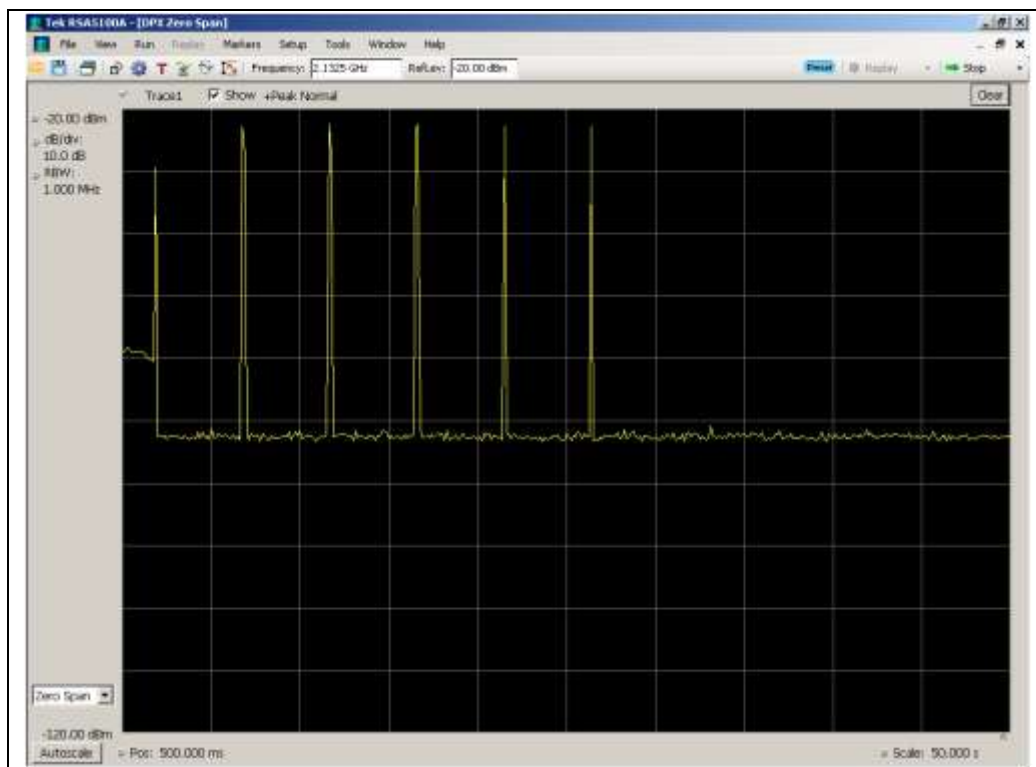




### 1930 - 1995 MHz Band



### 2110 - 2155 MHz Band





## Radiated Spurious

**Name of Test:** Radiated Spurious  
**Test Equipment Utilized:** i00103, i00334, i00379,  
SMU 200A - S/N:101369

**Engineer:** Greg Corbin

**Test Date:** 11/6/2013

### Test Procedure

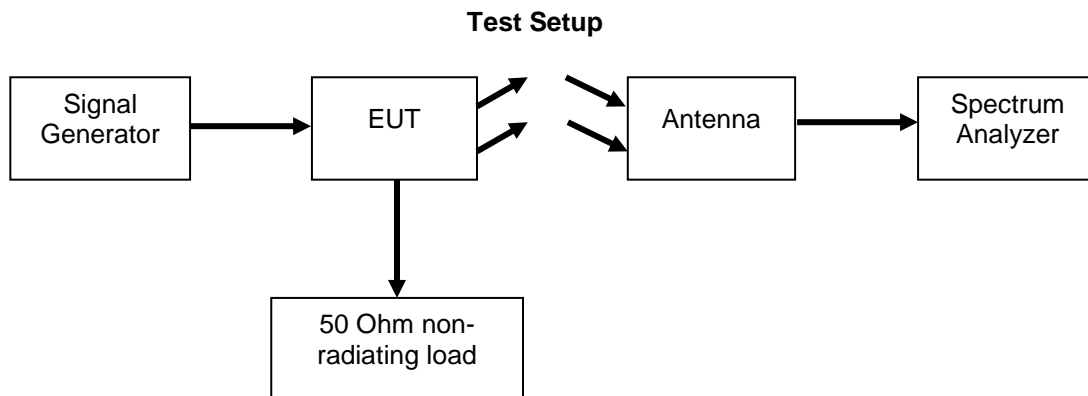
The EUT was tested in an Open Area Test Site (OATS) set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antennas in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure 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 tuned to the frequency of maximum gain as measured in the Maximum Power and Gain section of this test report for each operational uplink and downlink band. The EUT output was terminated into a 50 Ohm non-radiating load.

The following formulas are used for calculating the limits.

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

P1 = Output Power in watts

P2 = Output Power in dBm





### Uplink Test Results

#### 704 - 716 MHz Band\_710.75 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1421.5	-47.7	-13	Pass
2132.25	-39.7	-13	Pass
2843	-37.7	-13	Pass

#### 776 - 787 MHz Band\_778.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1557	-45.2	-13	Pass
2335.5	-41.6	-13	Pass
3114	-35.6	-13	Pass

#### 824 - 849 MHz Band\_837.875 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1675.75	-45.1	-13	Pass
2513.625	-39.7	-13	Pass
3351.5	-37.2	-13	Pass

#### 1710 - 1755 MHz Band\_1746.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3493	-36.7	-13	Pass
5239.5	-35.2	-13	Pass
6986	-34.2	-13	Pass

#### 1850 - 1915 MHz Band\_1890.1375 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3780.275	-37.0	-13	Pass
5670.4125	-33.7	-13	Pass
7560.55	-33.6	-13	Pass



### Downlink Test Results

#### 734 - 746 MHz Band 736.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1473	-49.6	-13	Pass
2209.5	-44.7	-13	Pass
2946	-42.3	-13	Pass

#### 746 - 757 MHz Band 749.1875 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1498.375	-50.8	-13	Pass
2247.5625	-44.1	-13	Pass
2996.75	-39.7	-13	Pass

#### 869 - 894 MHz Band 879.0625 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1758.125	-49.0	-13	Pass
2637.1875	-42.9	-13	Pass
3516.25	-39.8	-13	Pass

#### 1930 - 1995 MHz Band 1967.15 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3934.3	-40.9	-13	Pass
5901.45	-37.0	-13	Pass
7868.6	-28.4	-13	Pass

#### 2110 - 2155 MHz Band 2152.15 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
4304.3	-39.6	-13	Pass
6456.45	-36.3	-13	Pass
8608.6	-27.1	-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 Number	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3115	i00103	12/11/2012	12/11/2014
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	N/A	
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: 9/24/2013	
RF Directional Coupler	Meca	CS06-1.500V	i00413	Verified on: 9/24/13	
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

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