



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:

Pat Cook, Sr. Electrical Engineer
Ph: (435) 673-5021
Email: pcook@infowest.com

Prepared By
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Project No: p1350021

Greg Corbin
Project Test Engineer

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

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

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

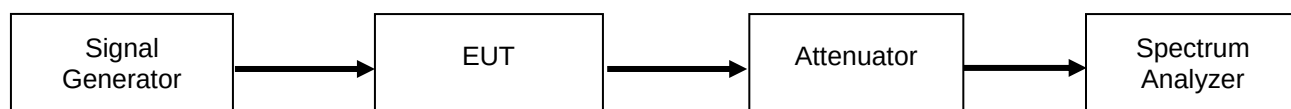
Name of Test: Authorized Frequency Band
Test Equipment Utilized: i00424, SMU 200A - S/N:101369

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.

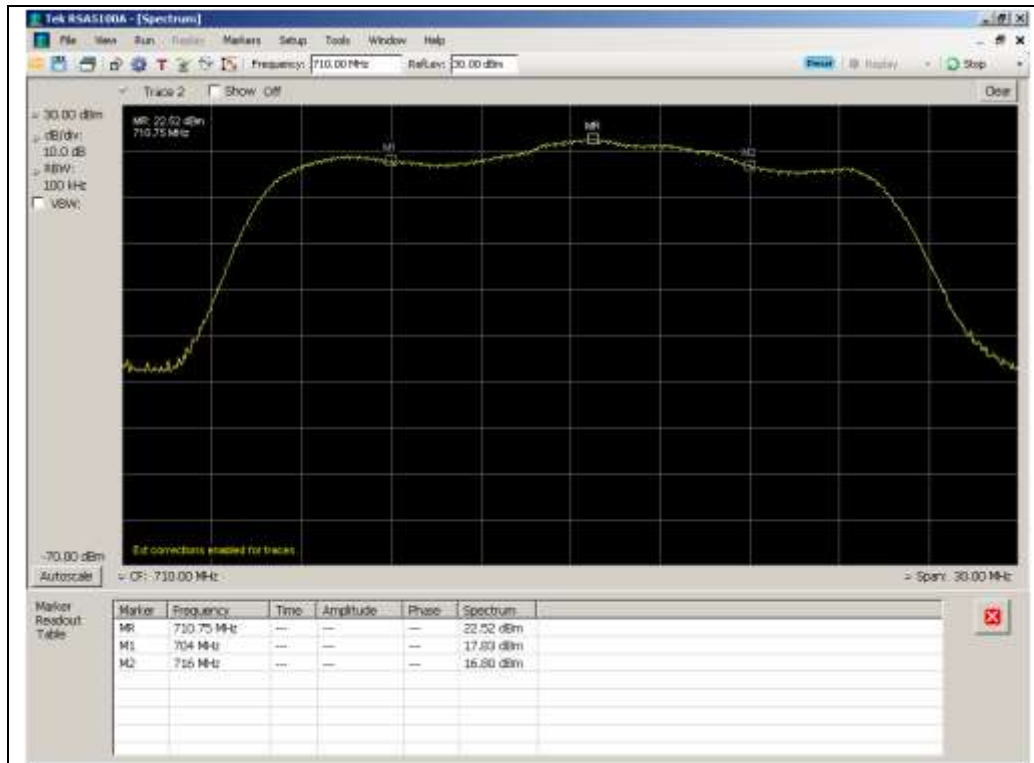
Test Setup



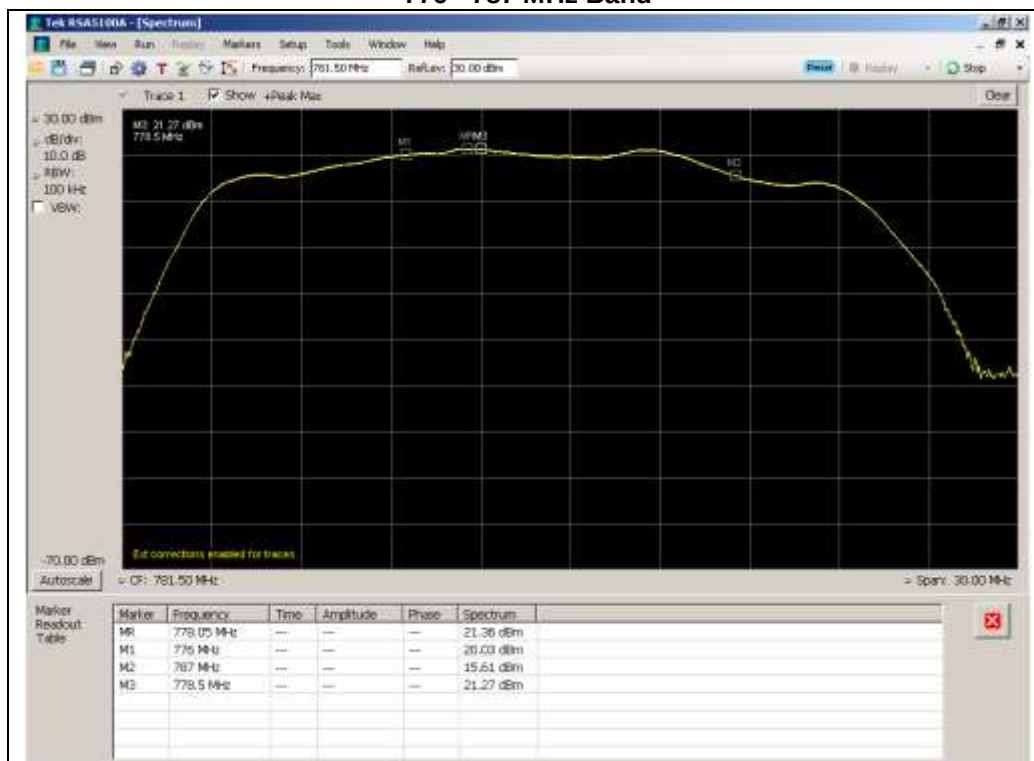


Uplink Test Results

704 - 716 MHz Band

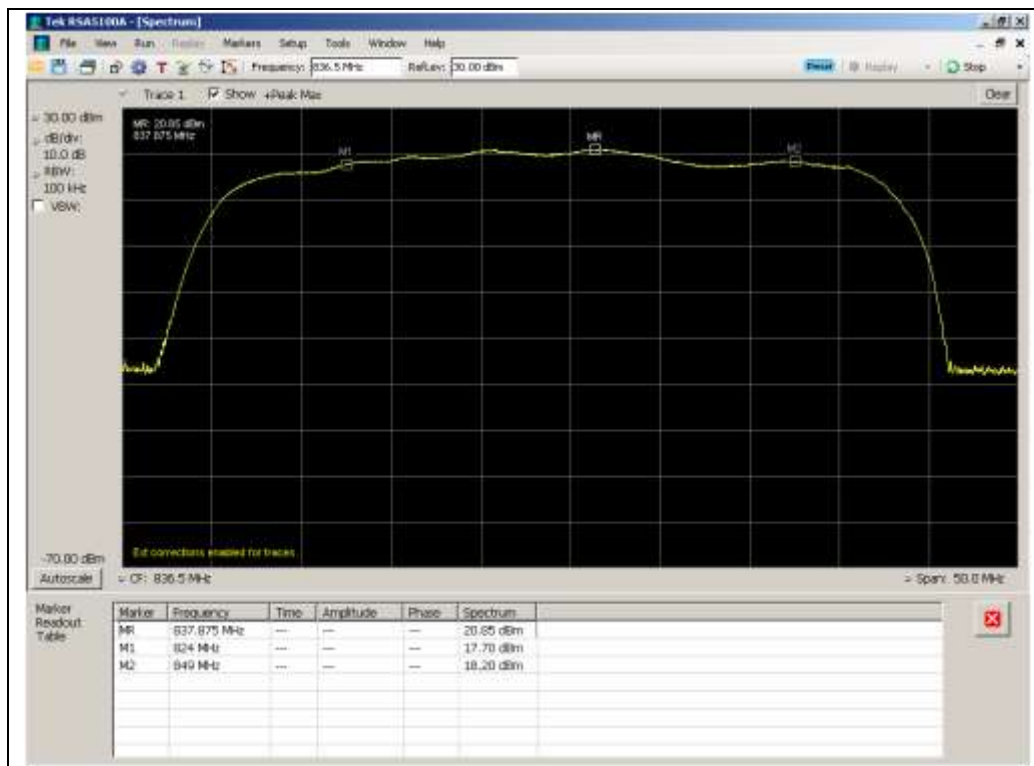


776 - 787 MHz Band

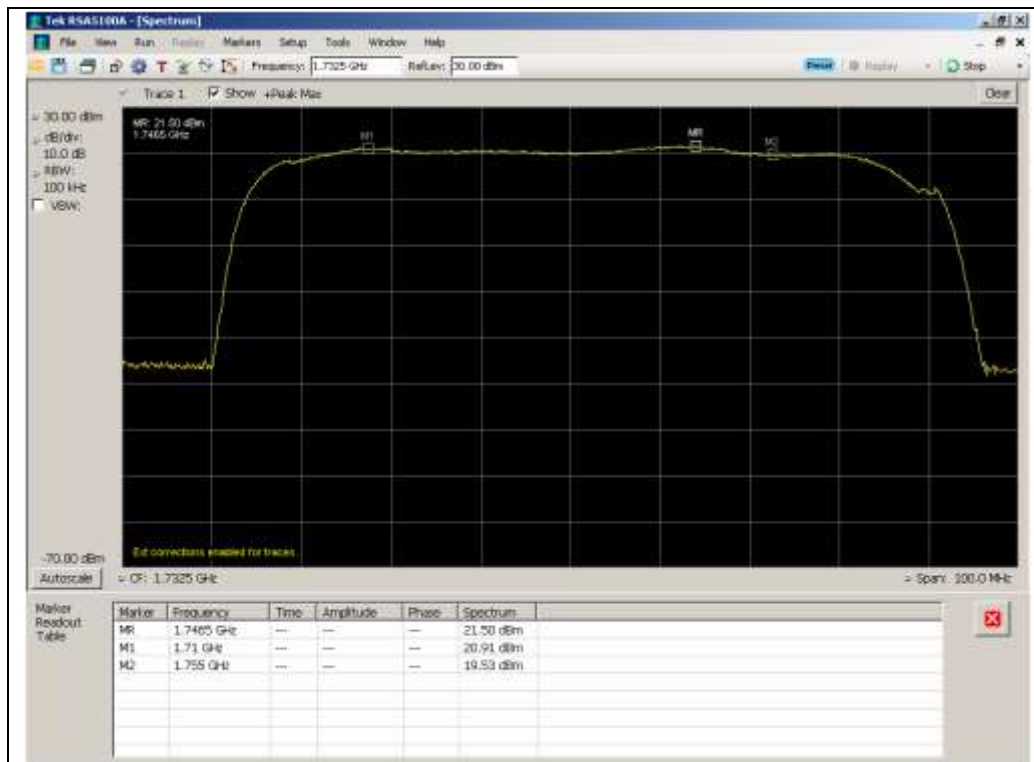




824 - 849 MHz Band

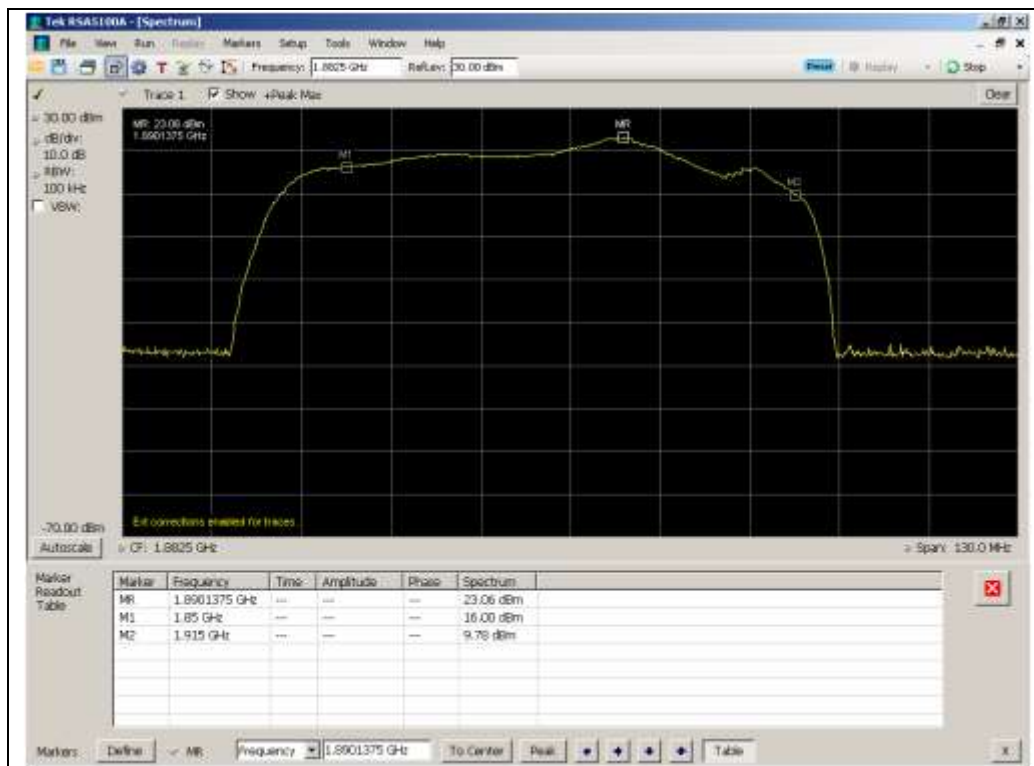


1710 - 1755 MHz Band



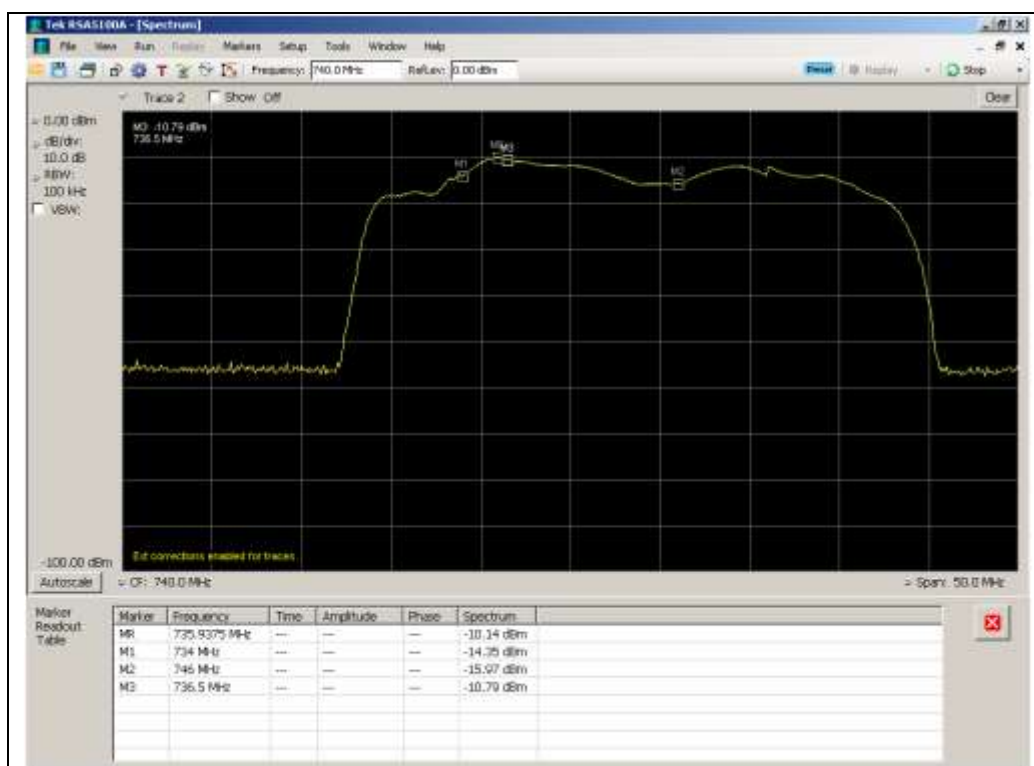


1850 - 1915 MHz Band



Downlink Test Results

734 - 746 MHz Band

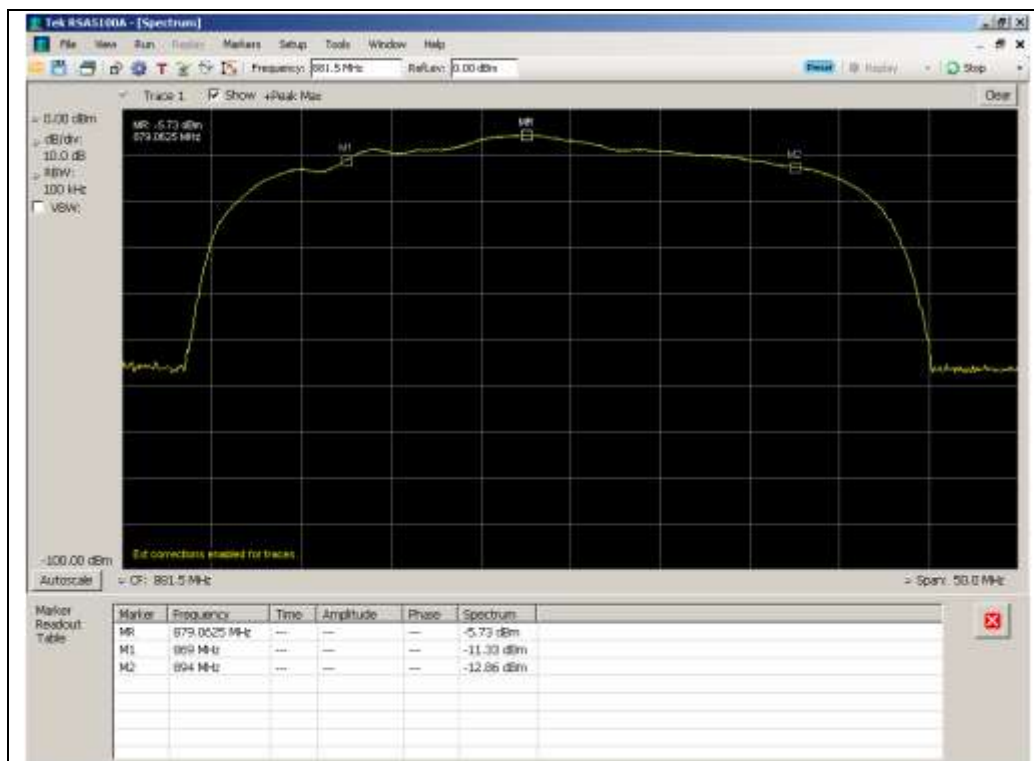




746 - 757 MHz Band

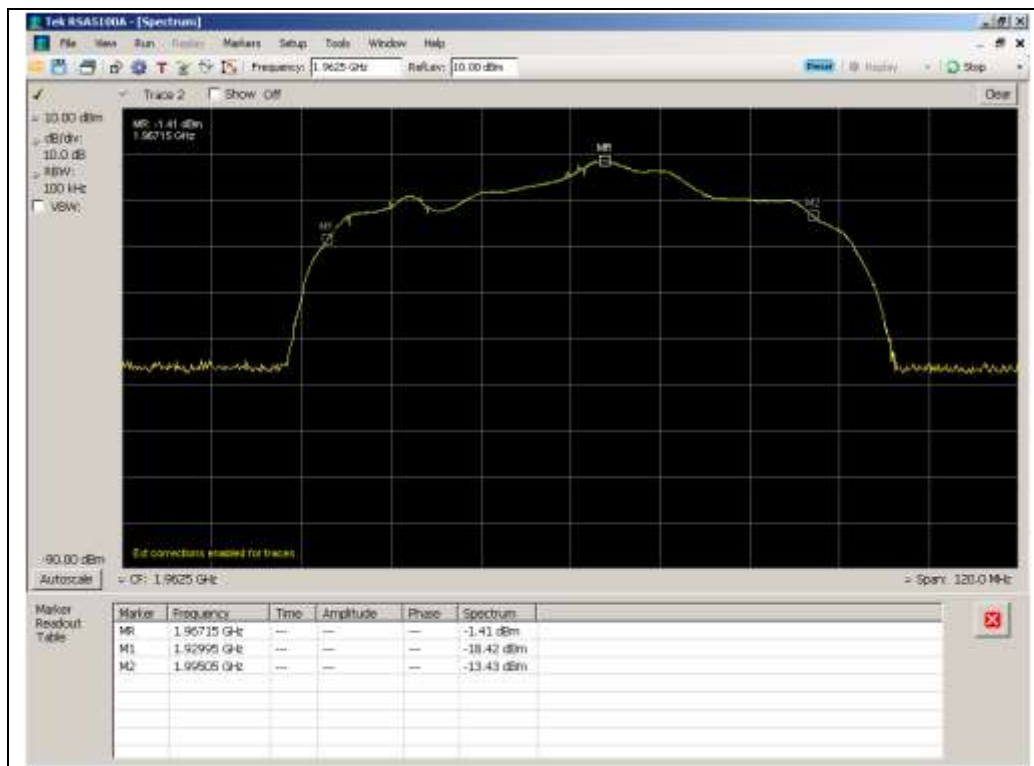


869 - 894 MHz Band

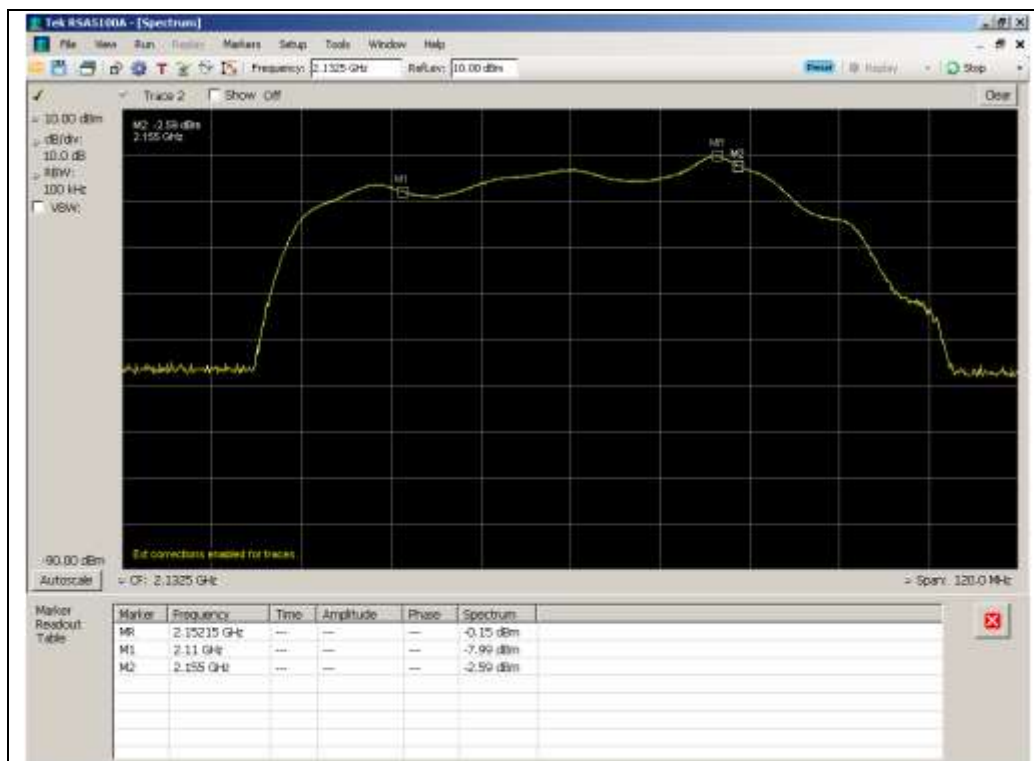




1930 - 1995 MHz Band



2110 - 2155 MHz Band





Maximum Power and Gain

Name of Test:

Maximum Power and Gain

Engineer: Greg Corbin

Test Equipment Utilized:

i00424, SMU 200A - S/N:101369

Test Date: 10/22/2013

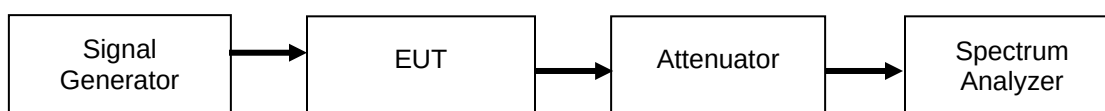
Test Procedure

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

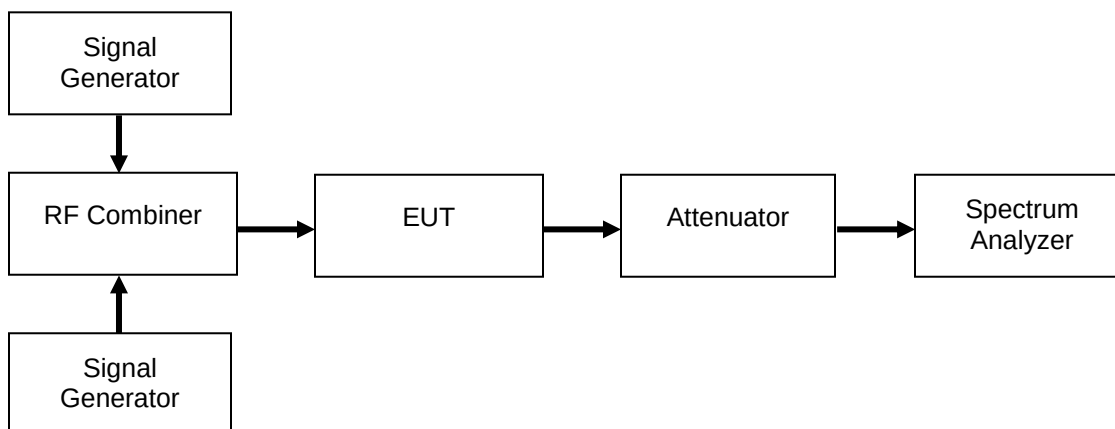
Name of Test: Intermodulation
Test Equipment Utilized: i00424, SMU 200A - S/N:101369

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

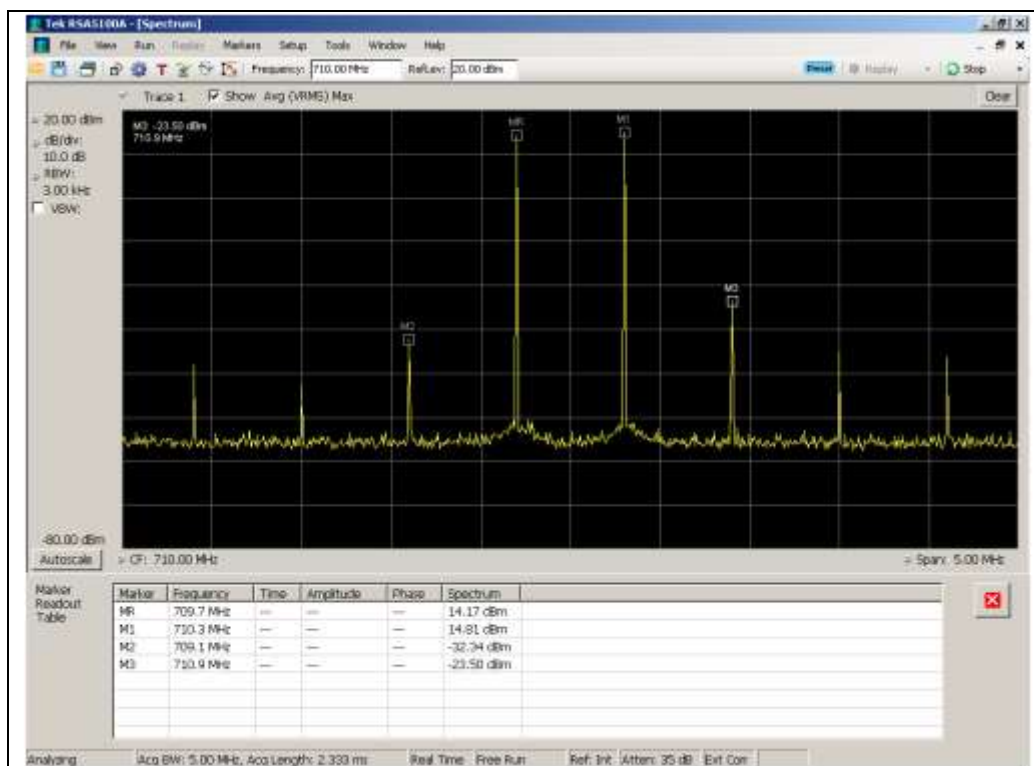
Downlink Test Results

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

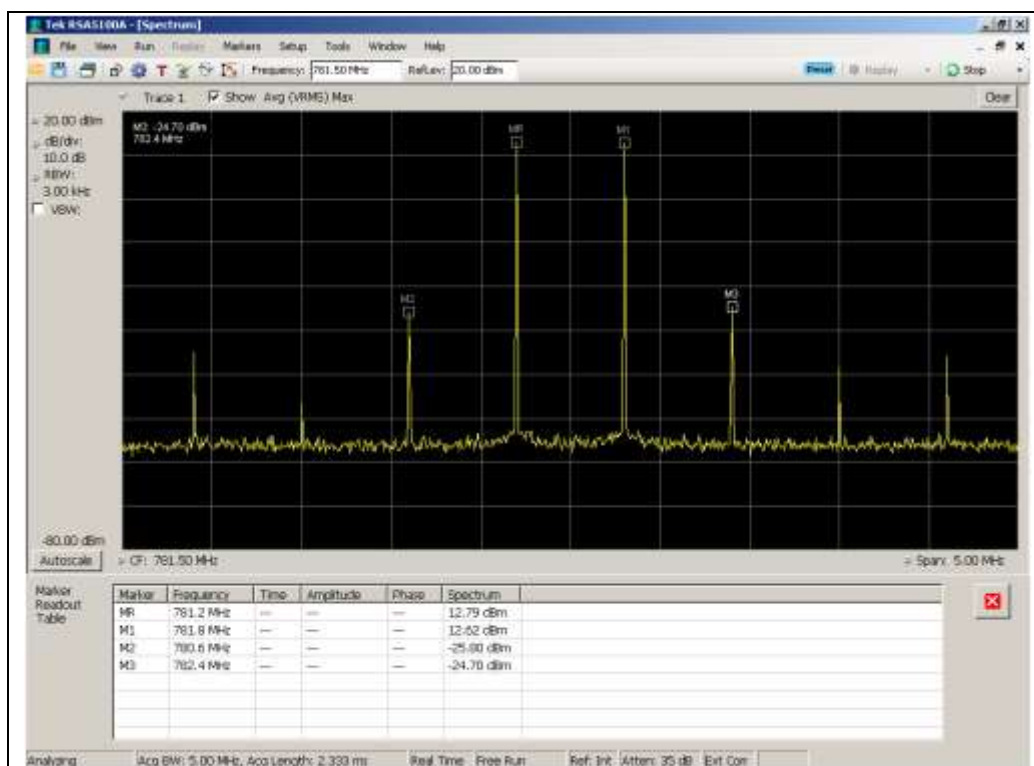


Uplink Test Results

704 - 716 MHz Band

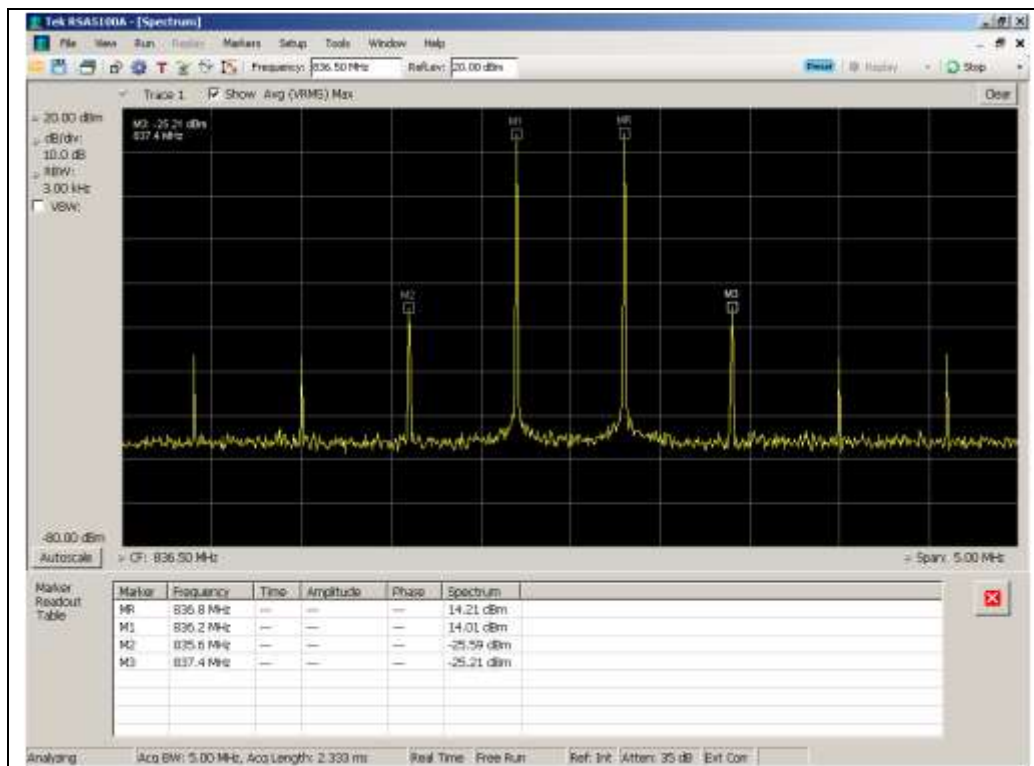


776 - 787 MHz Band

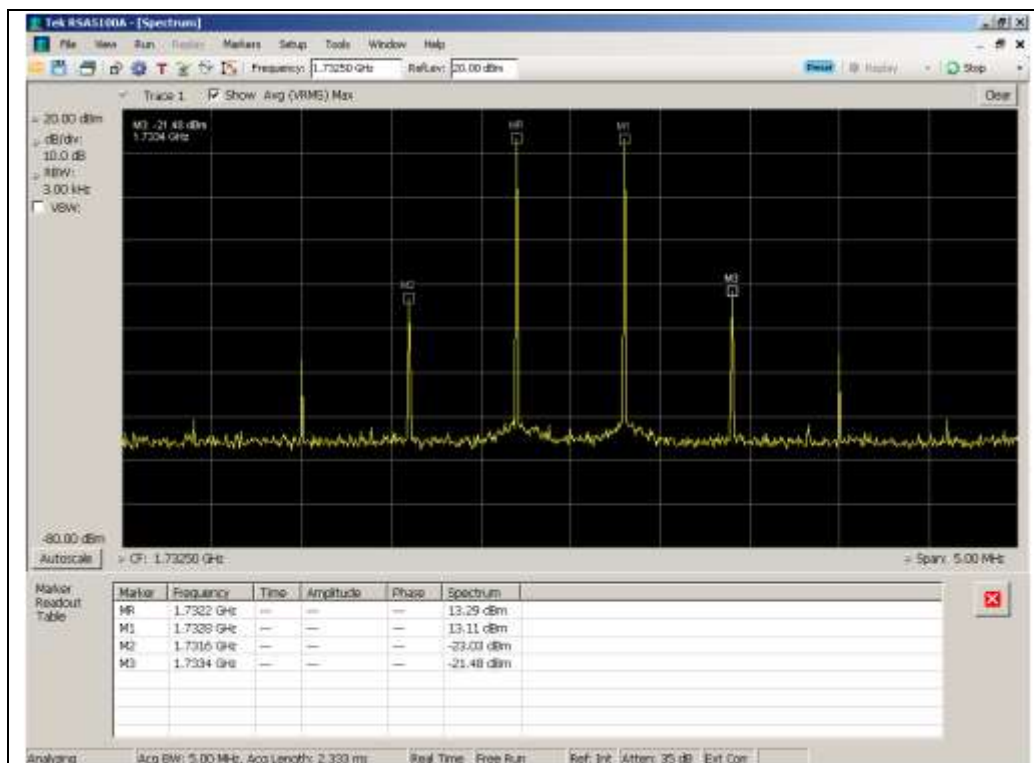




824 - 849 MHz Band

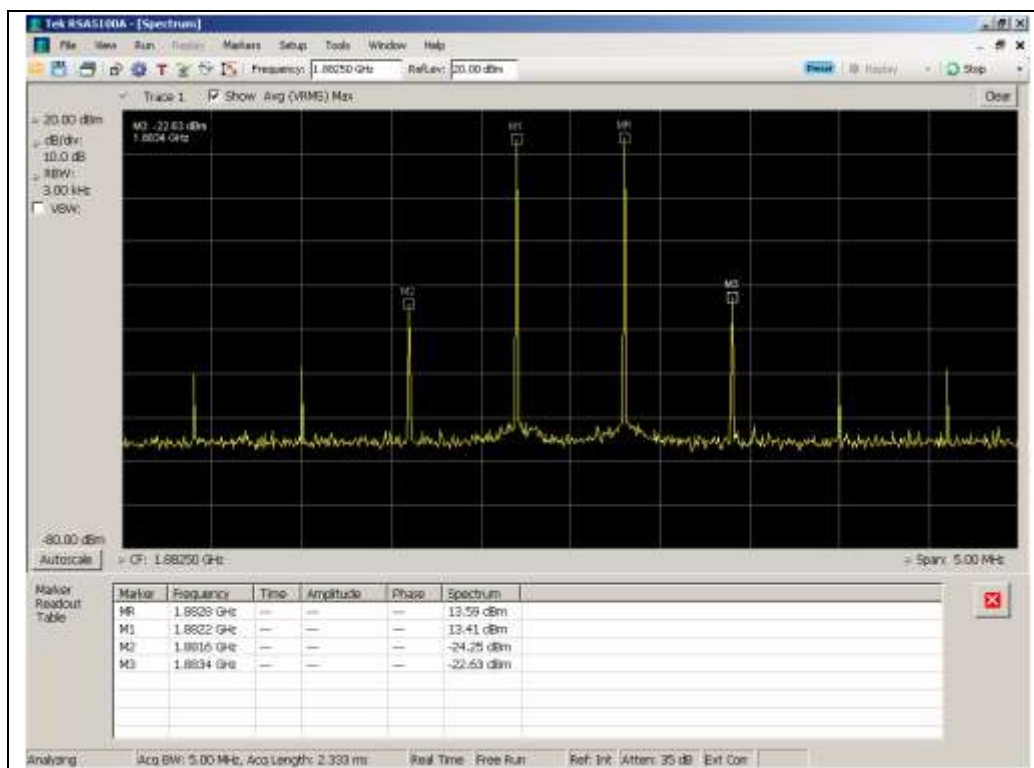


1710 - 1755 MHz Band



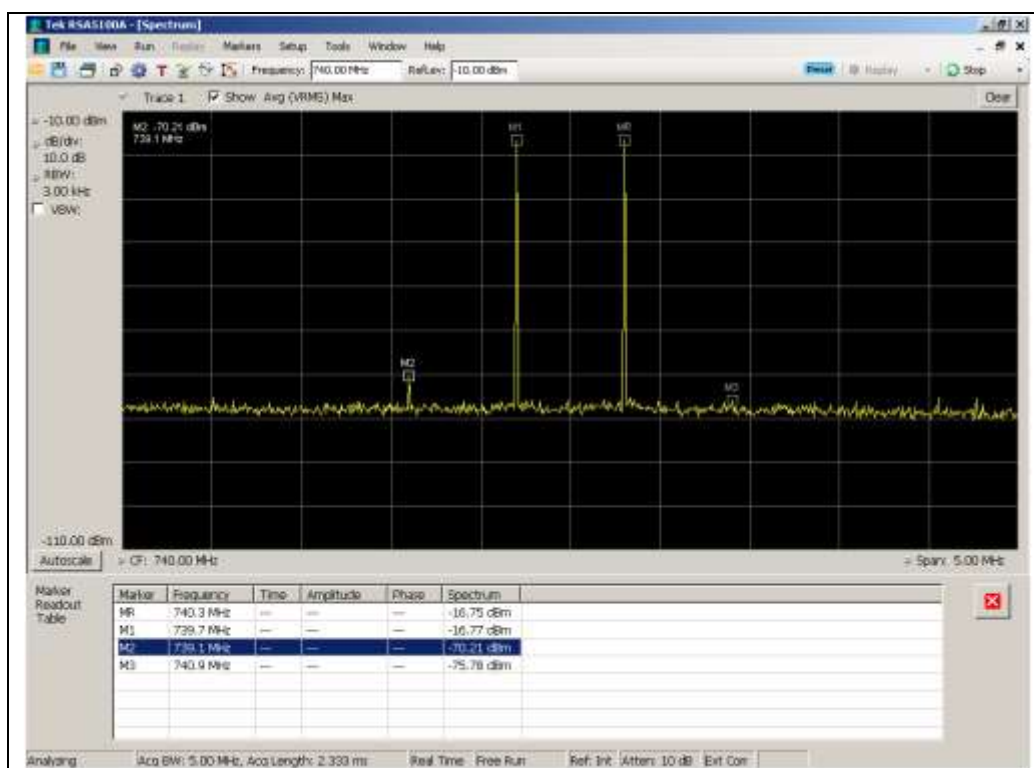


1850 - 1915 MHz Band



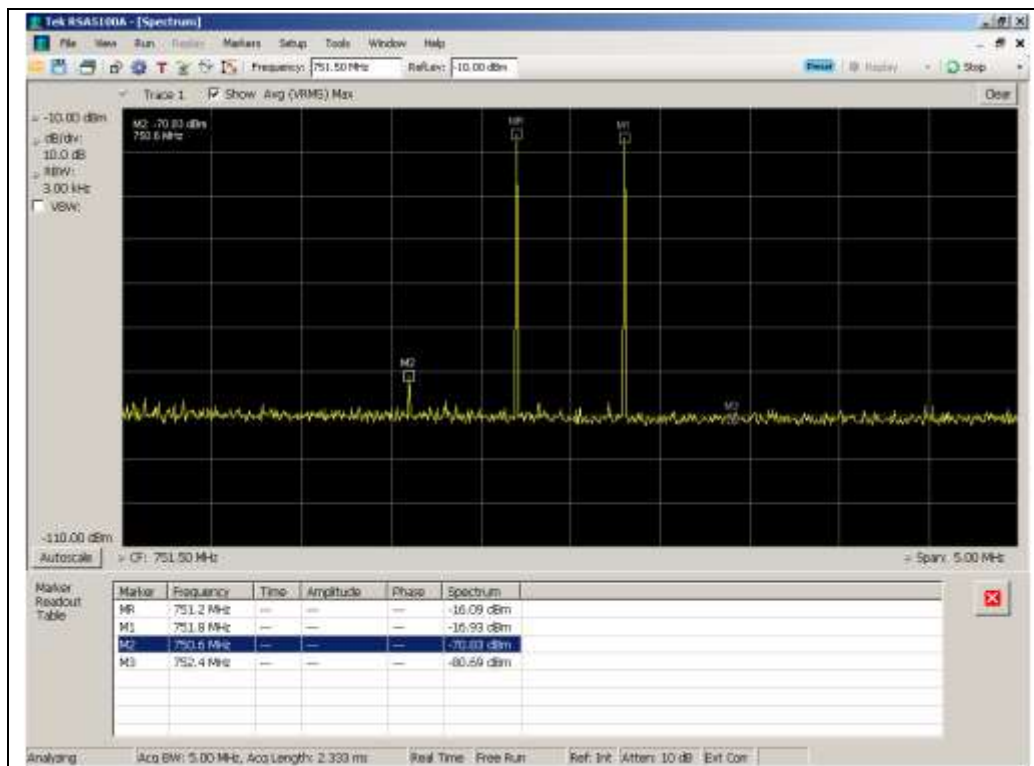
Downlink Test Results

734 - 746 MHz Band

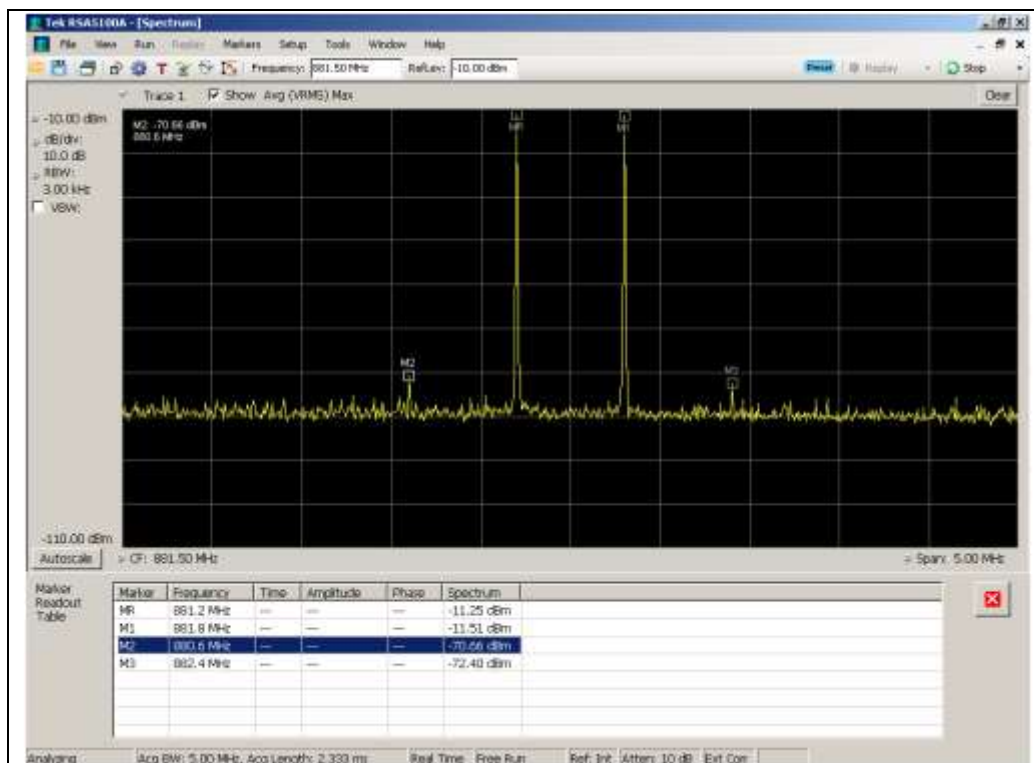




746 - 757 MHz Band

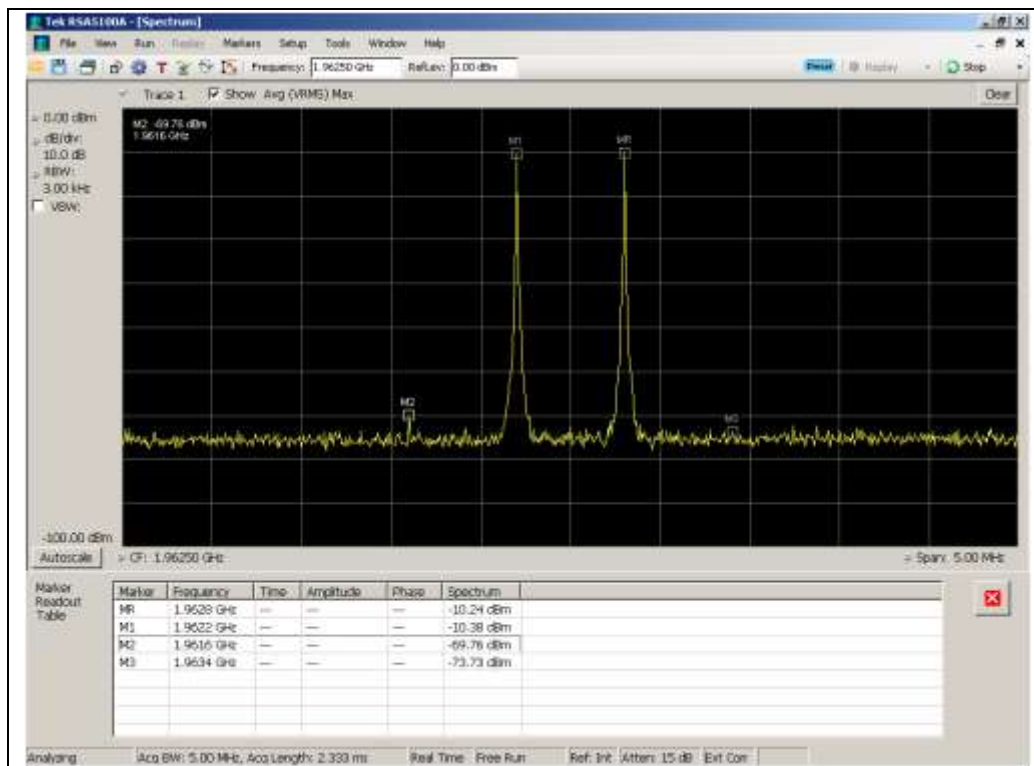


869 - 894 MHz Band

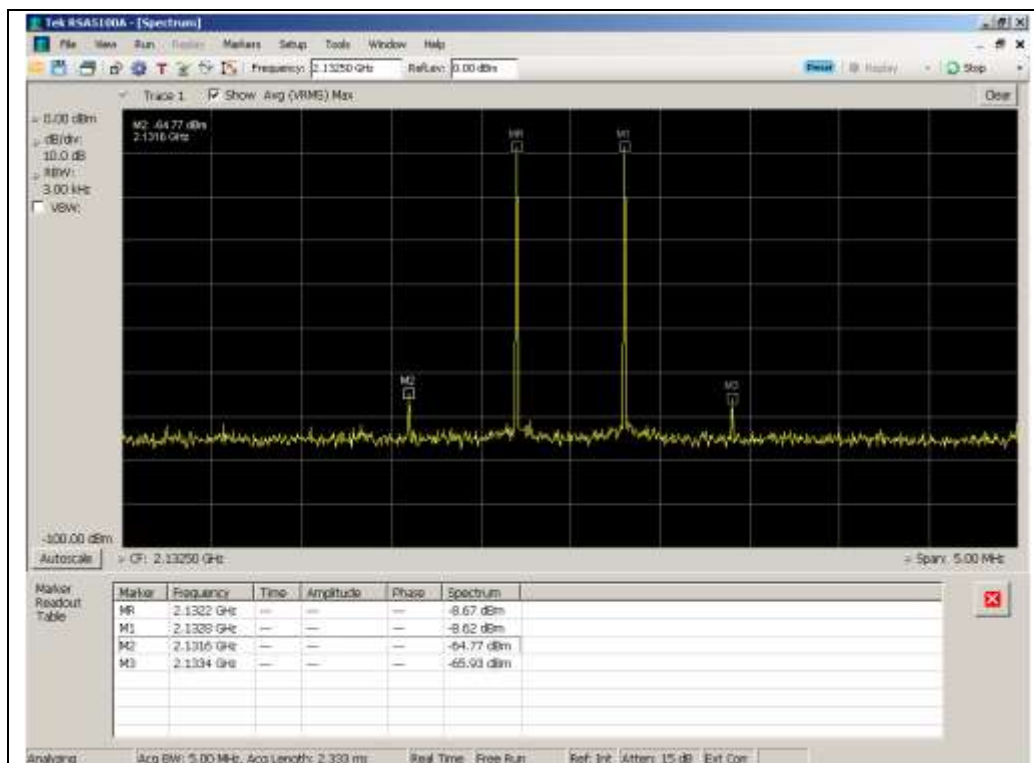




1930 - 1995 MHz Band



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.

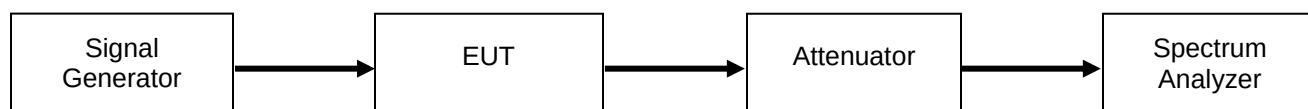
The following formula is used for calculating the limits.

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

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

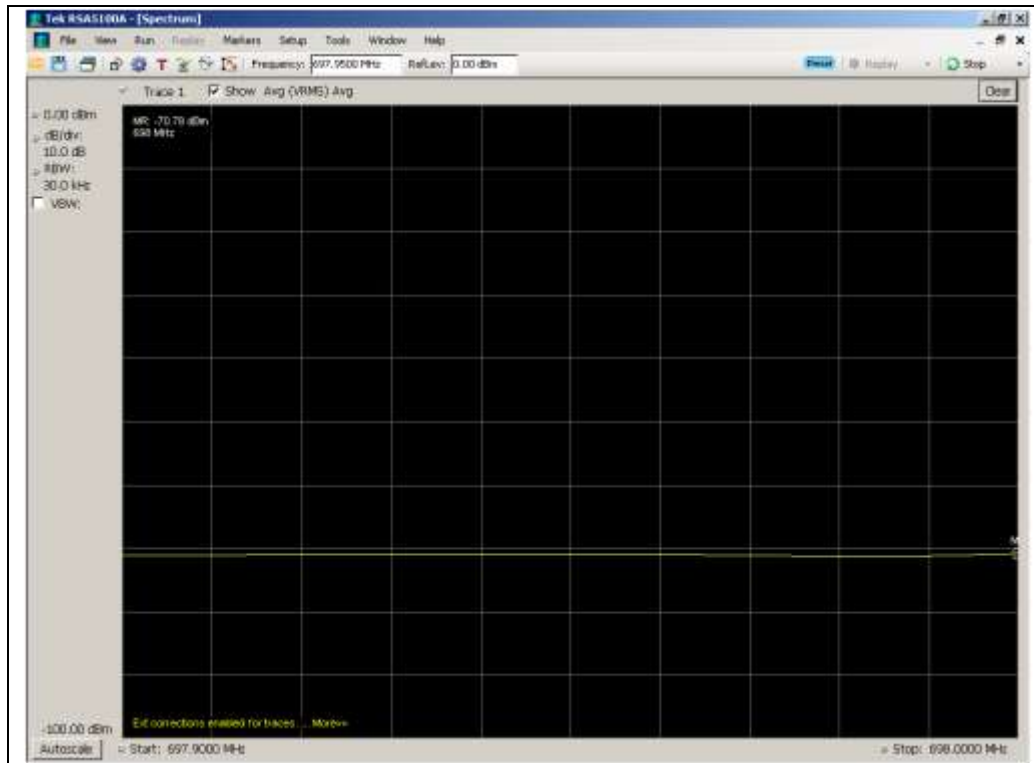
Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-78.5	-19	Pass
734 - 746	Upper	-71.6	-19	Pass
746 - 757	Lower	-77.3	-19	Pass
746 - 757	Upper	-78.1	-19	Pass
869 - 894	Lower	-71.6	-19	Pass
869 - 894	Upper	-71.7	-19	Pass
1930 - 1995	Lower	-73.1	-19	Pass
1930 - 1995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



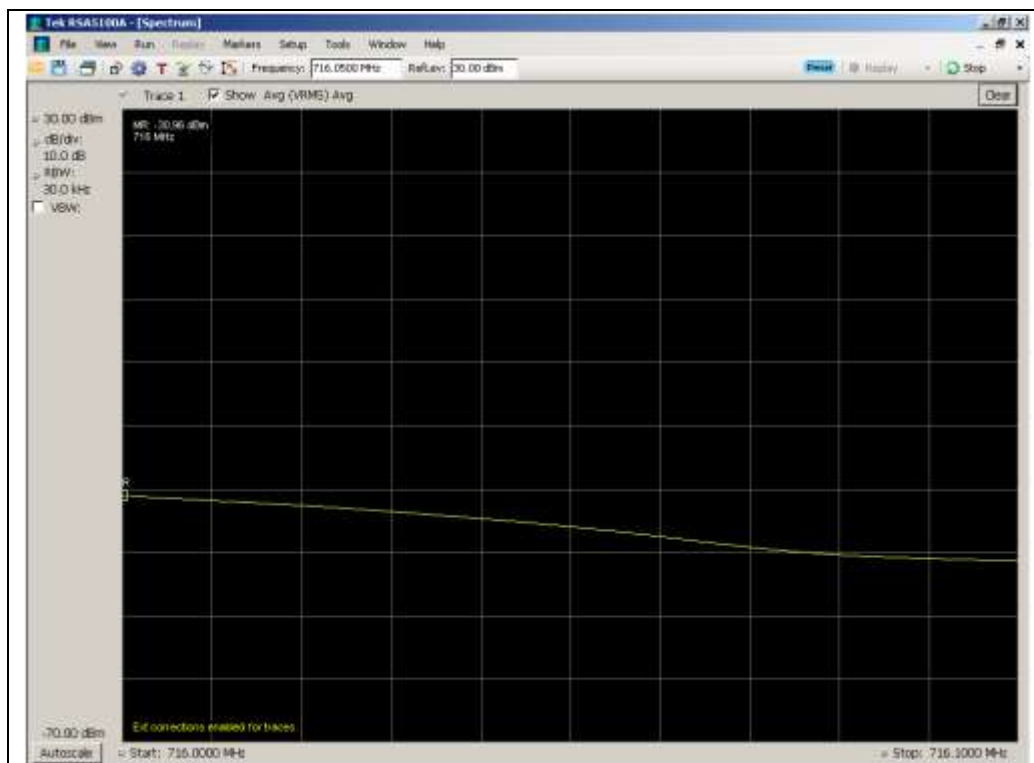
GSM Uplink Test Plots

704 - 716 MHz Band

Lower Band Edge



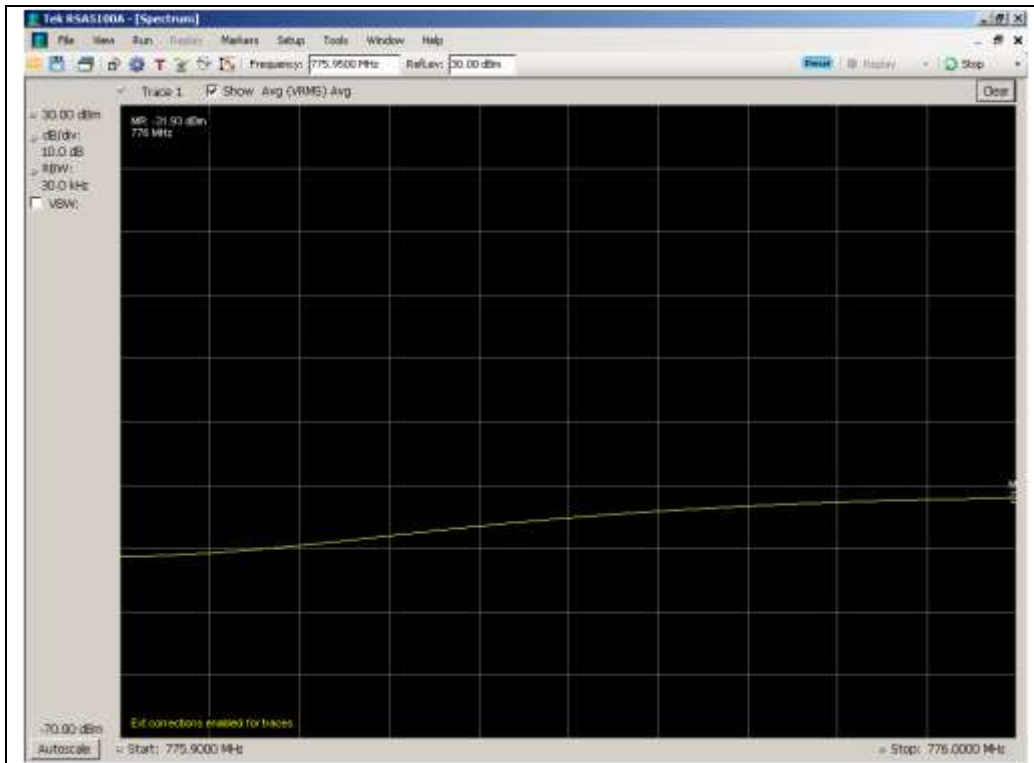
Upper Band Edge



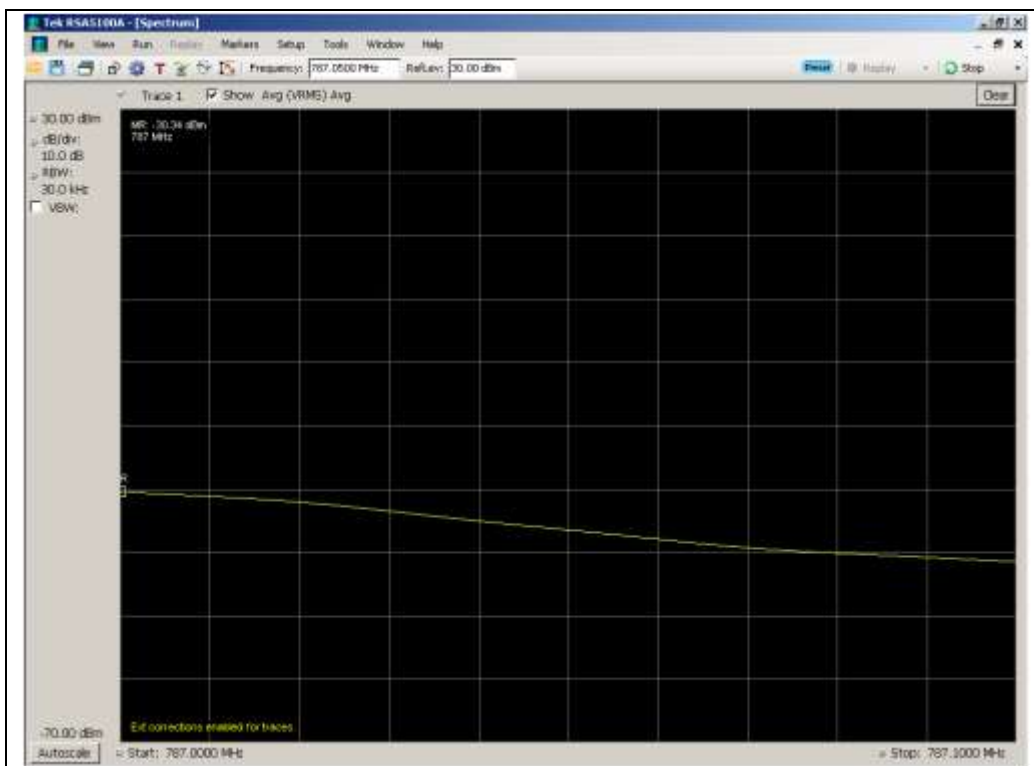


776 - 787 MHz Band

Lower Band Edge



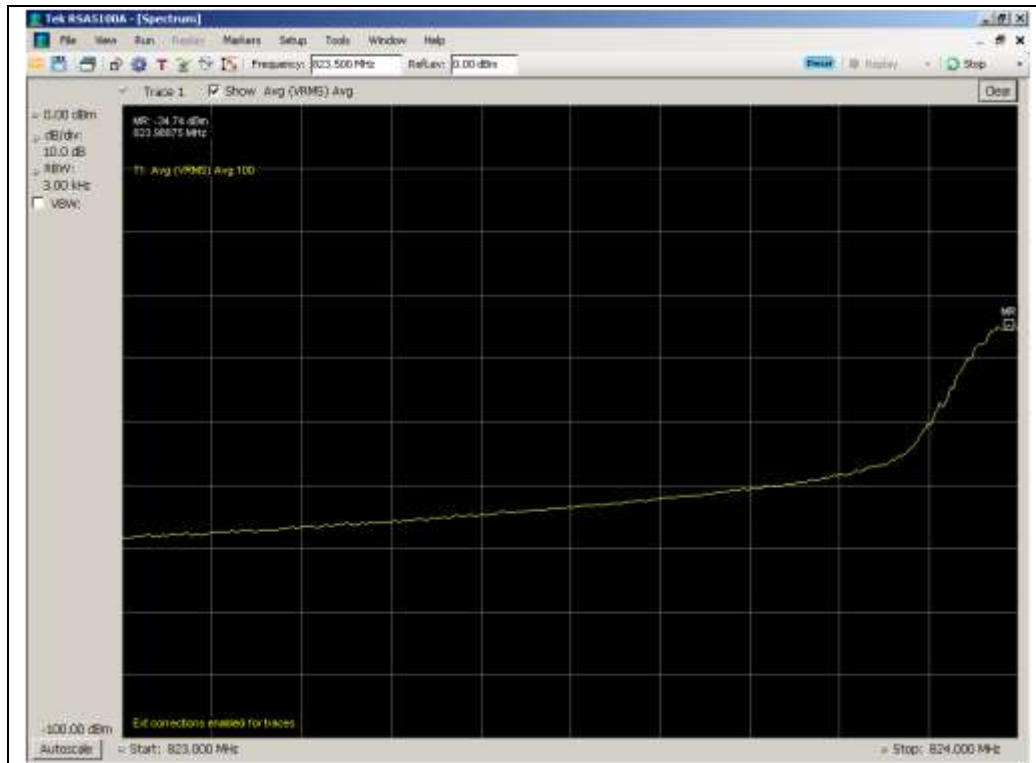
Upper Band Edge



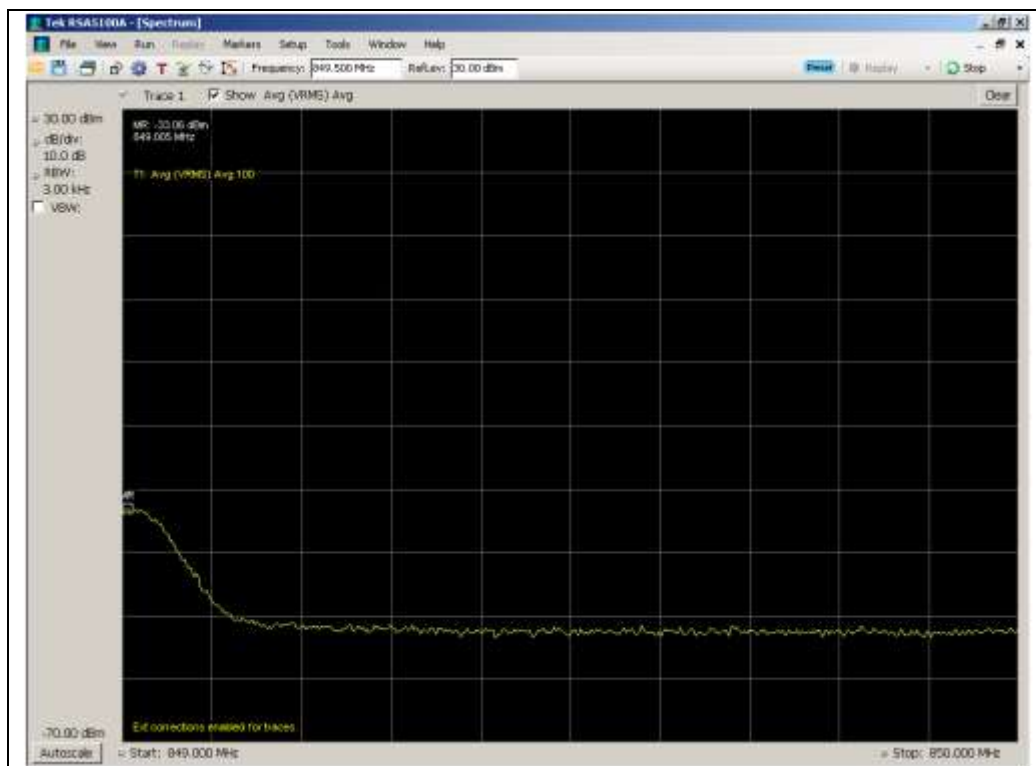


824 - 849 MHz Band

Lower Band Edge



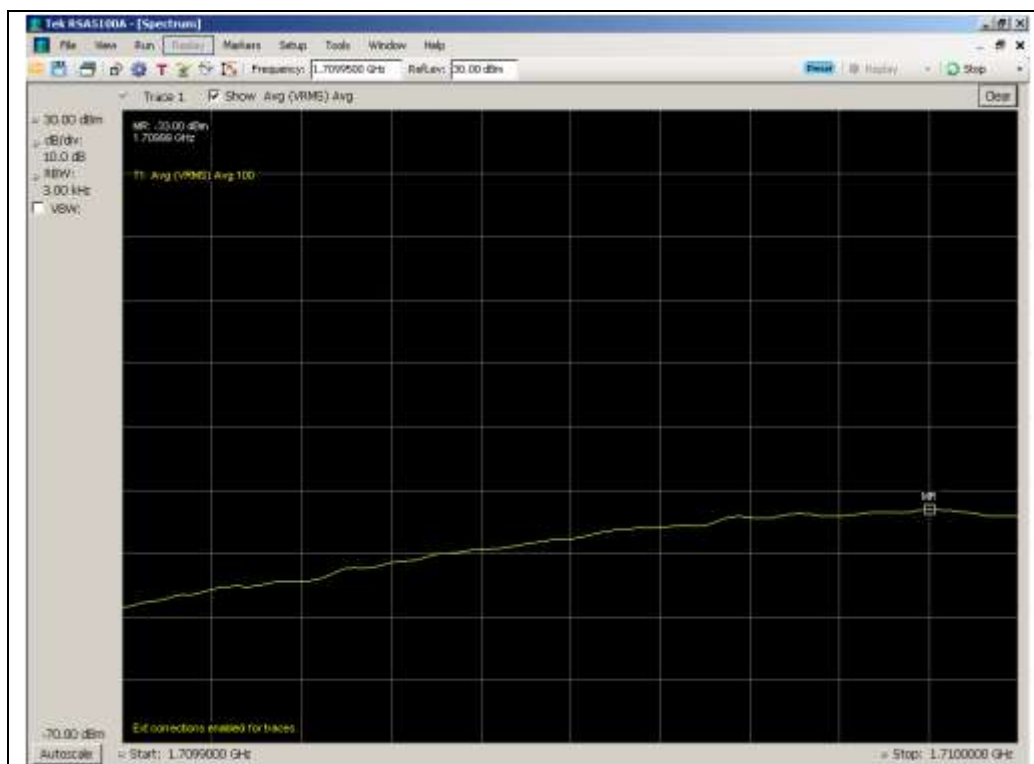
Upper Band Edge



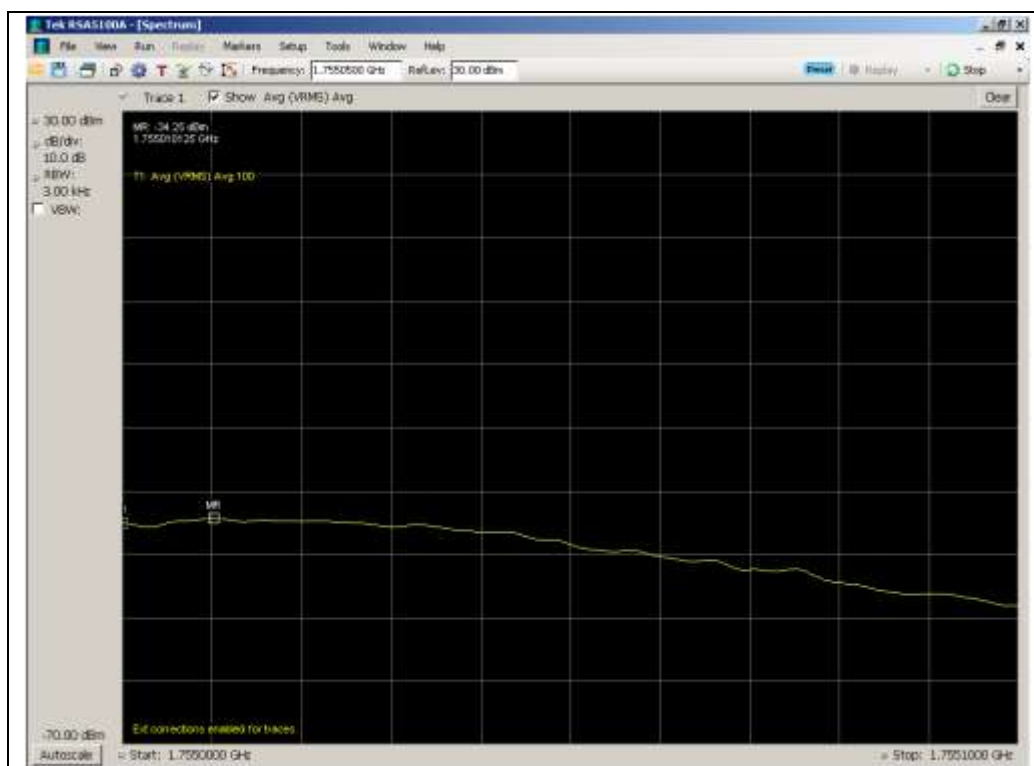


1710 - 1755 MHz Band

Lower Band Edge



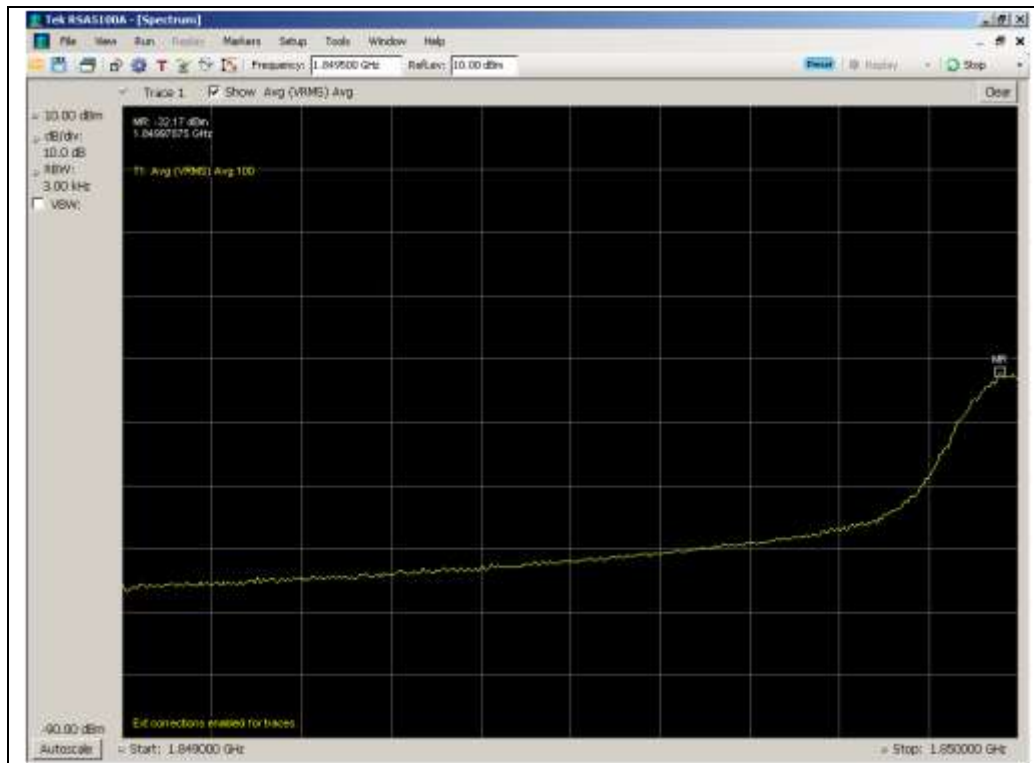
Upper Band Edge



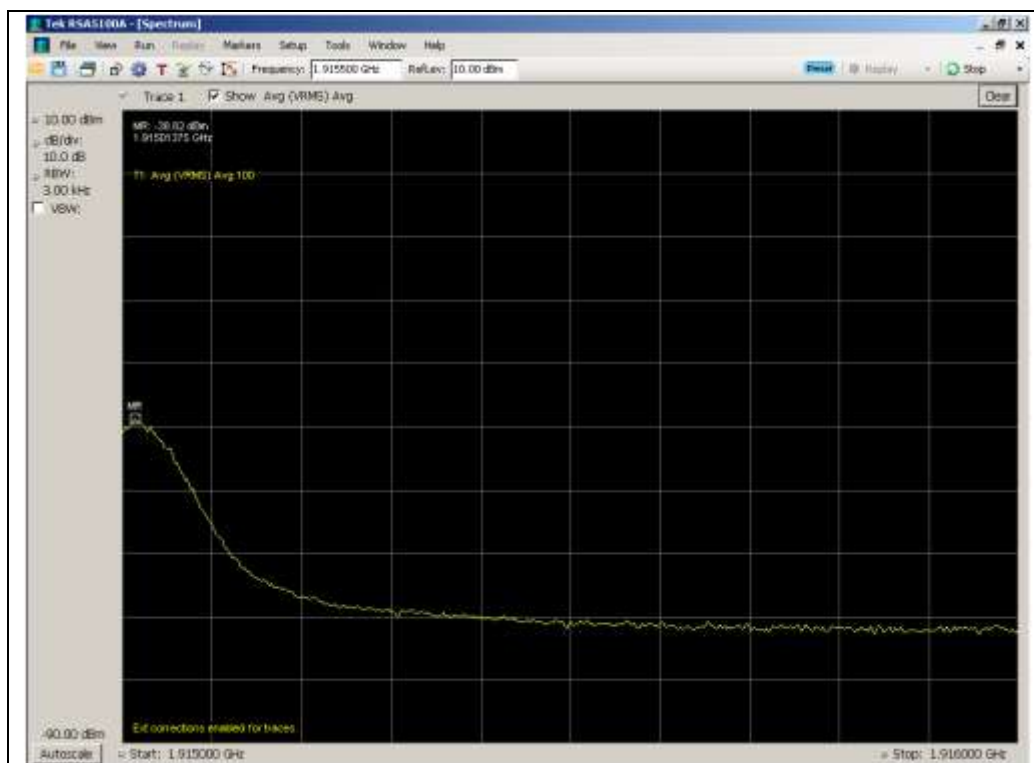


1850 - 1915 MHz Band

Lower Band Edge



Upper Band Edge

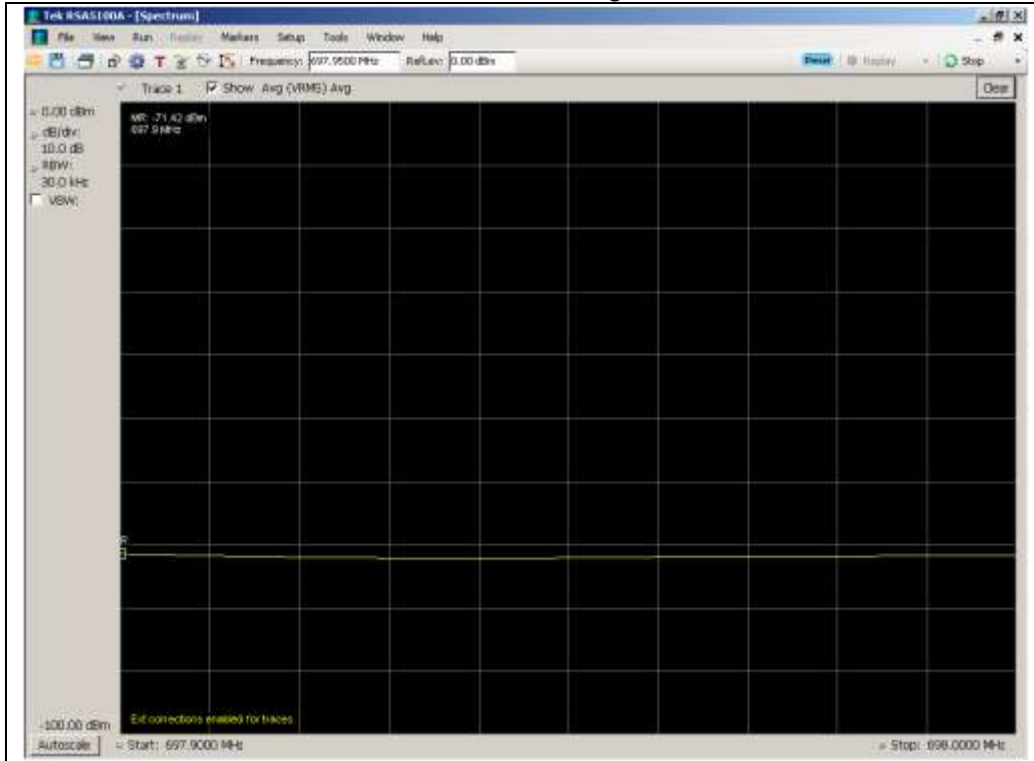




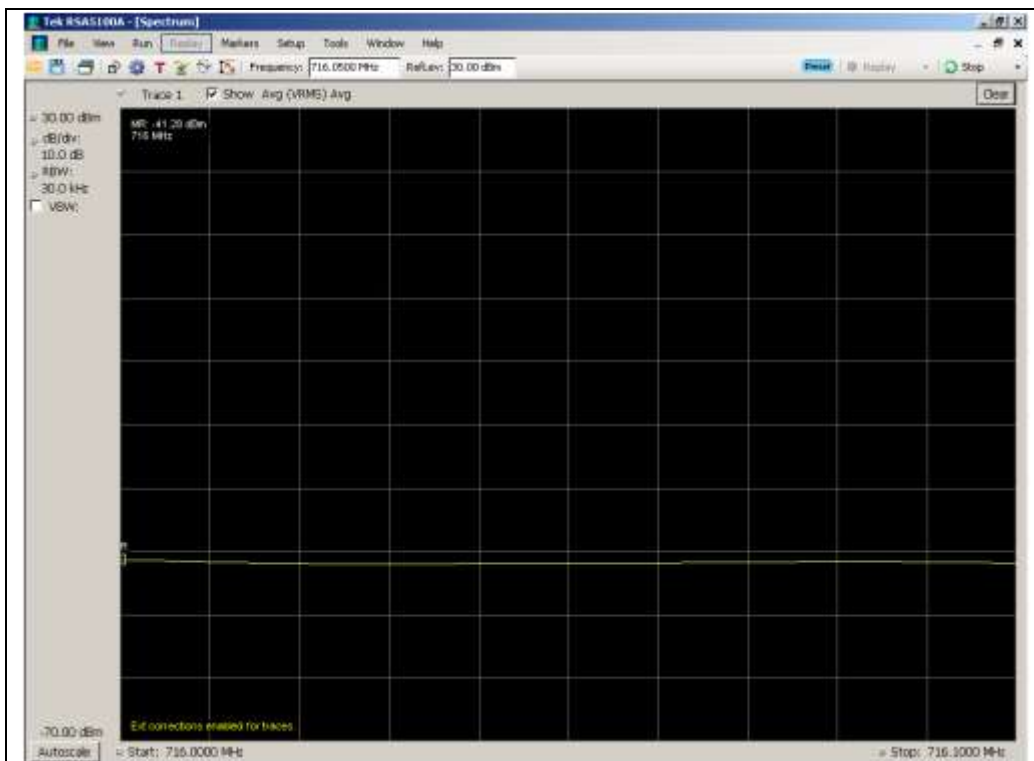
CDMA Uplink Test Plots

704 - 716 MHz Band

Lower Band Edge

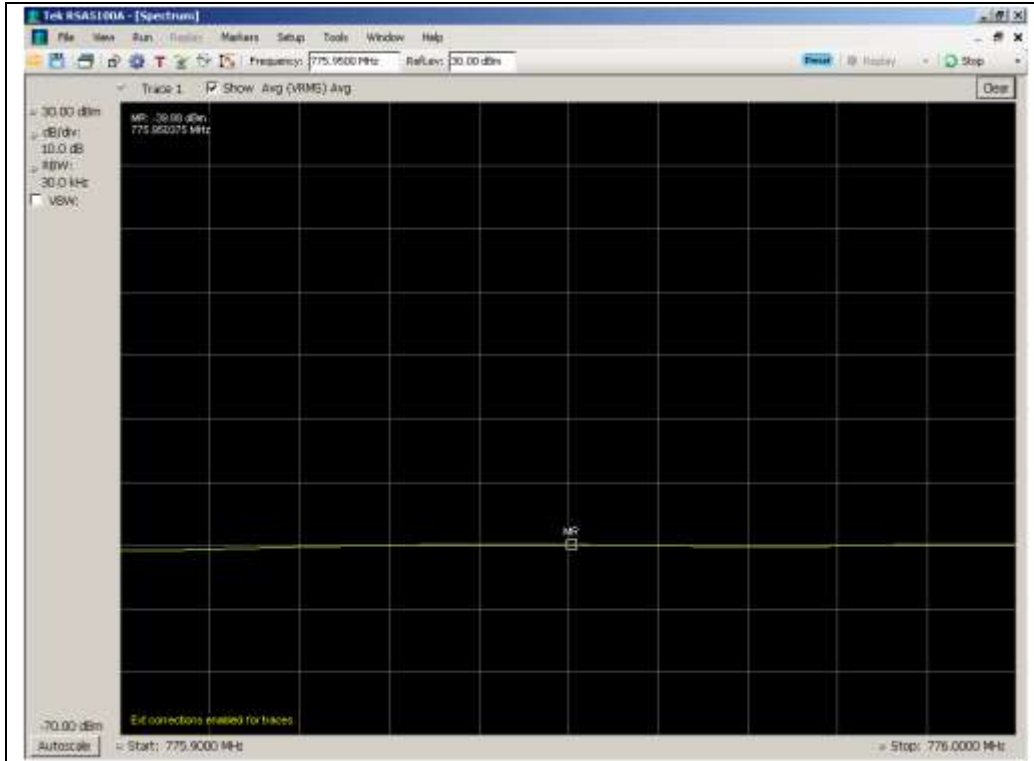


Upper Band Edge

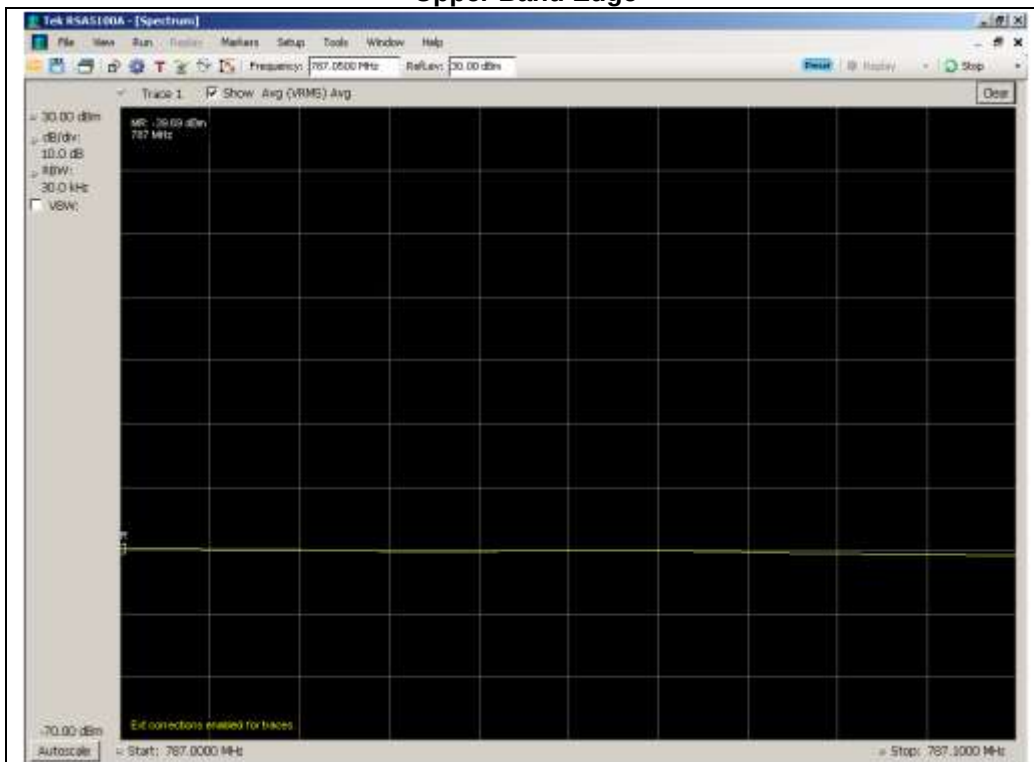




776 - 787 MHz Band Lower Band Edge



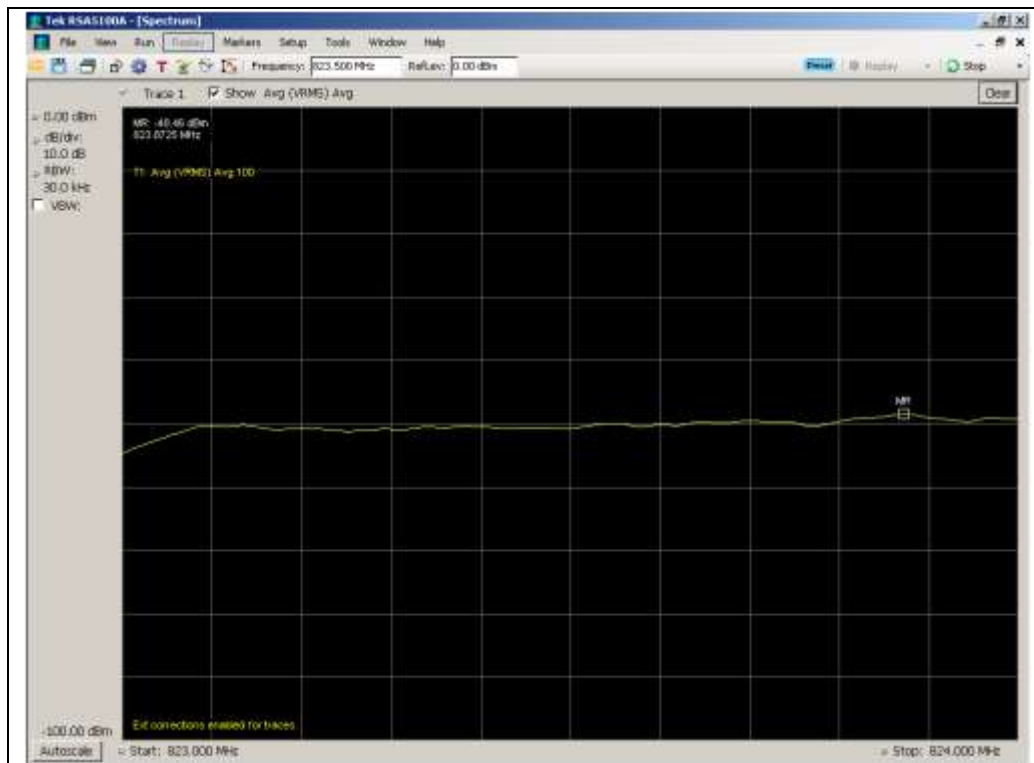
Upper Band Edge



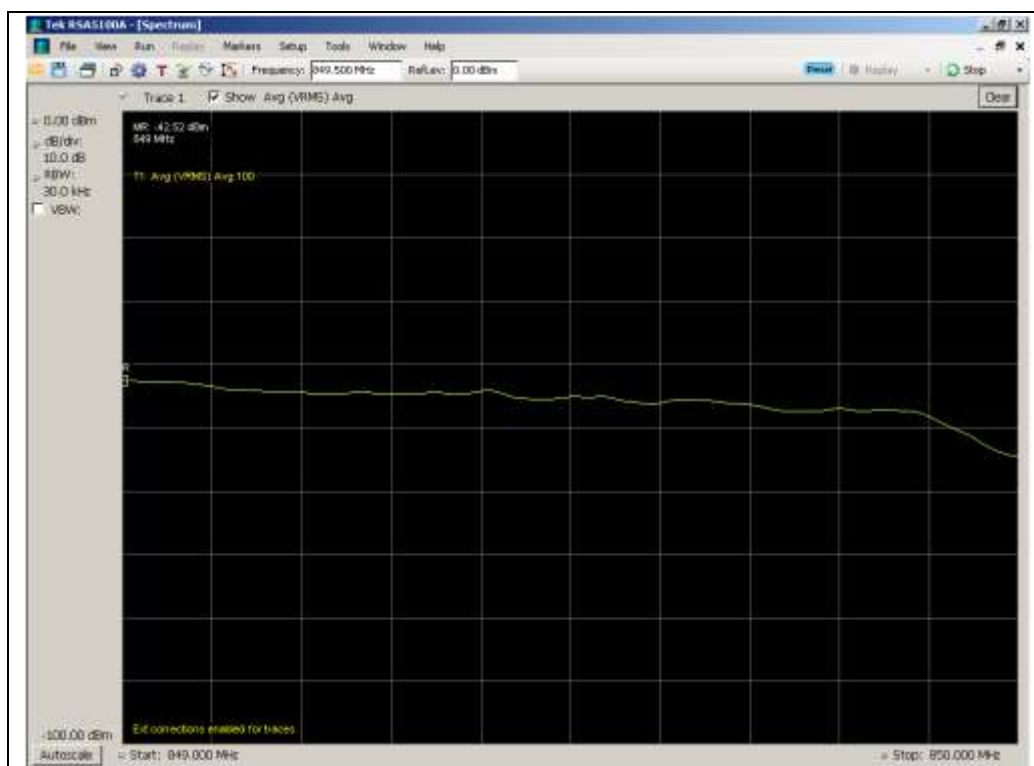


824 - 849 MHz Band

Lower Band Edge



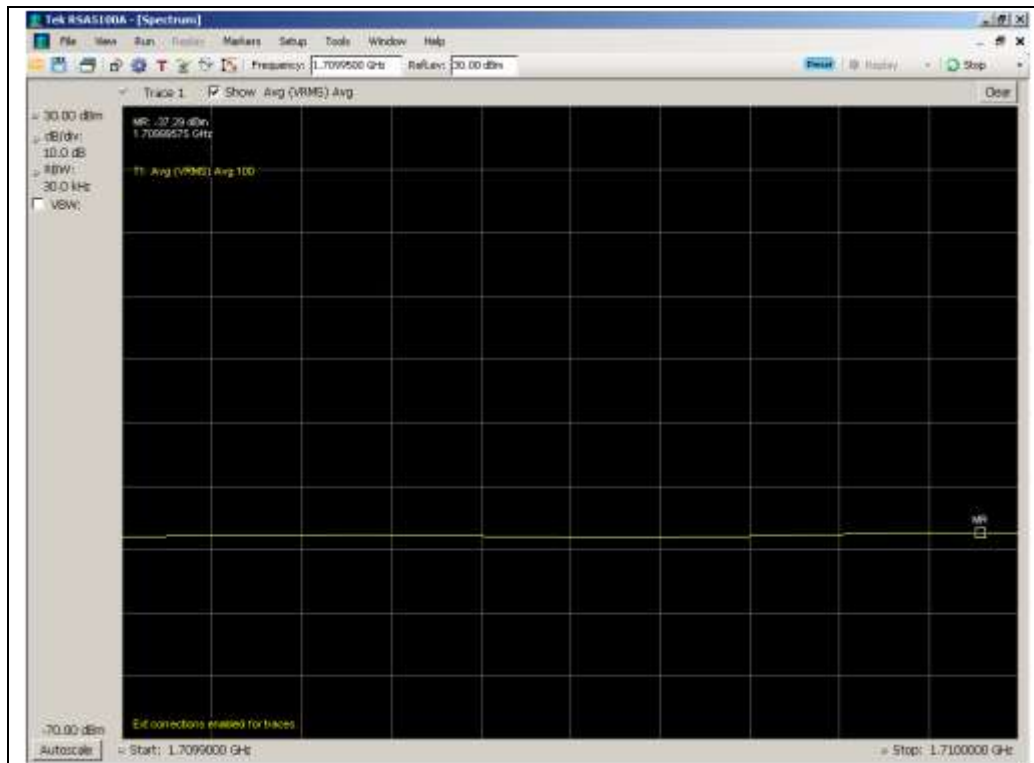
Upper Band Edge



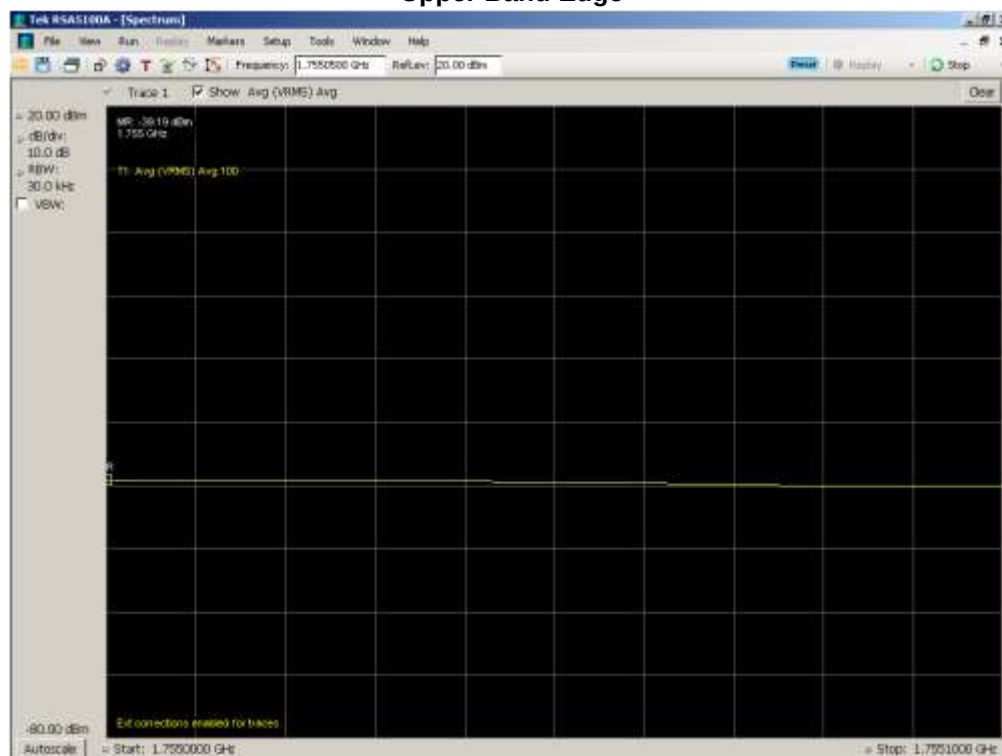


1710 - 1755 MHz Band

Lower Band Edge



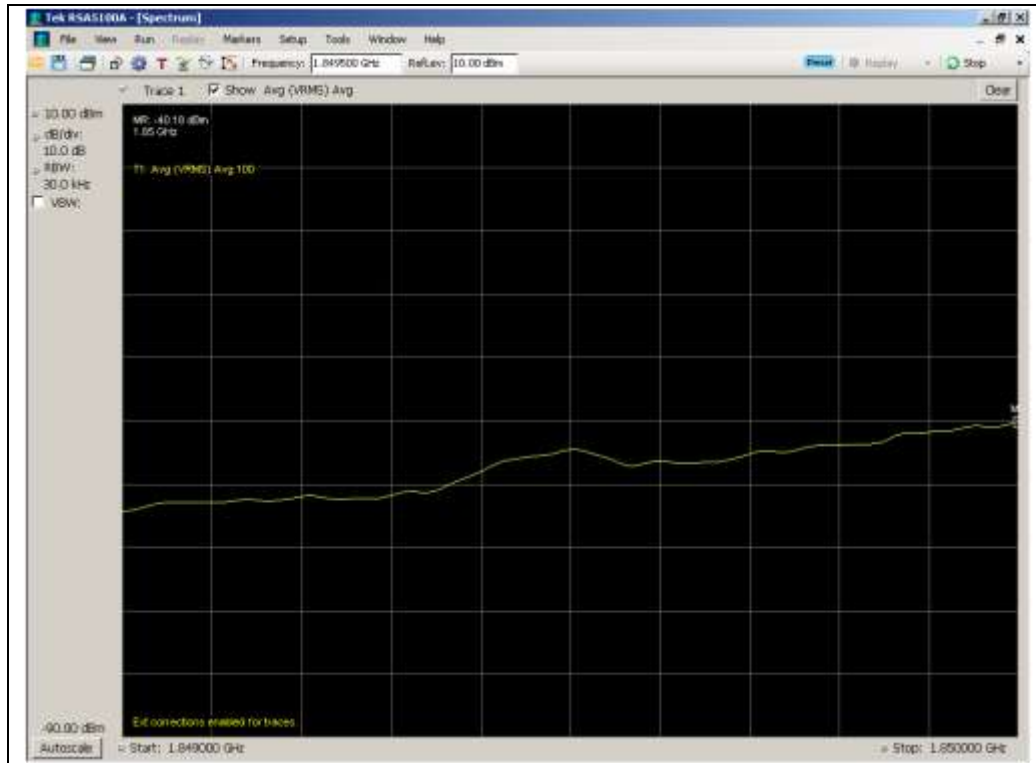
Upper Band Edge



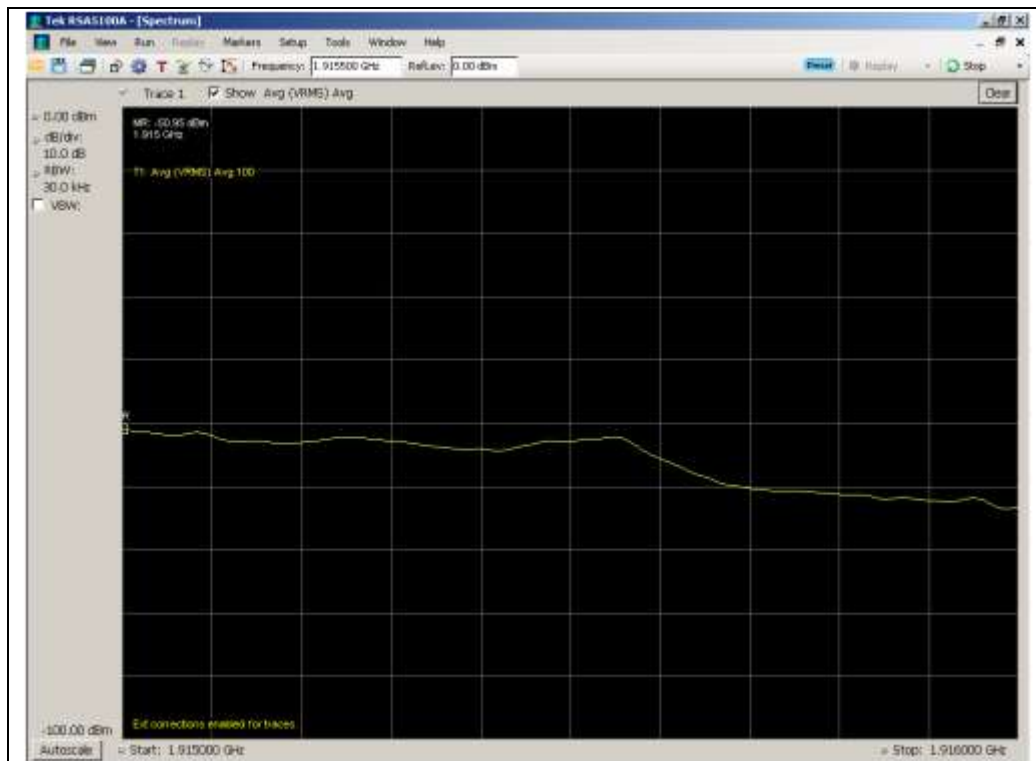


1850 - 1915 MHz Band

Lower Band Edge

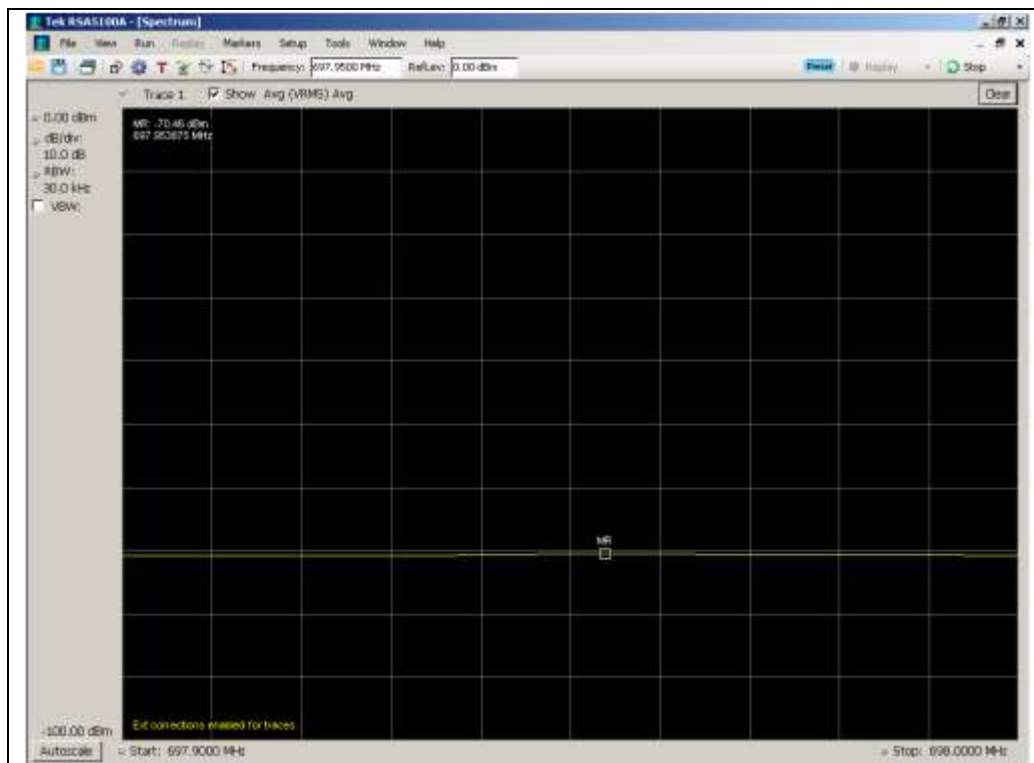


Upper Band Edge

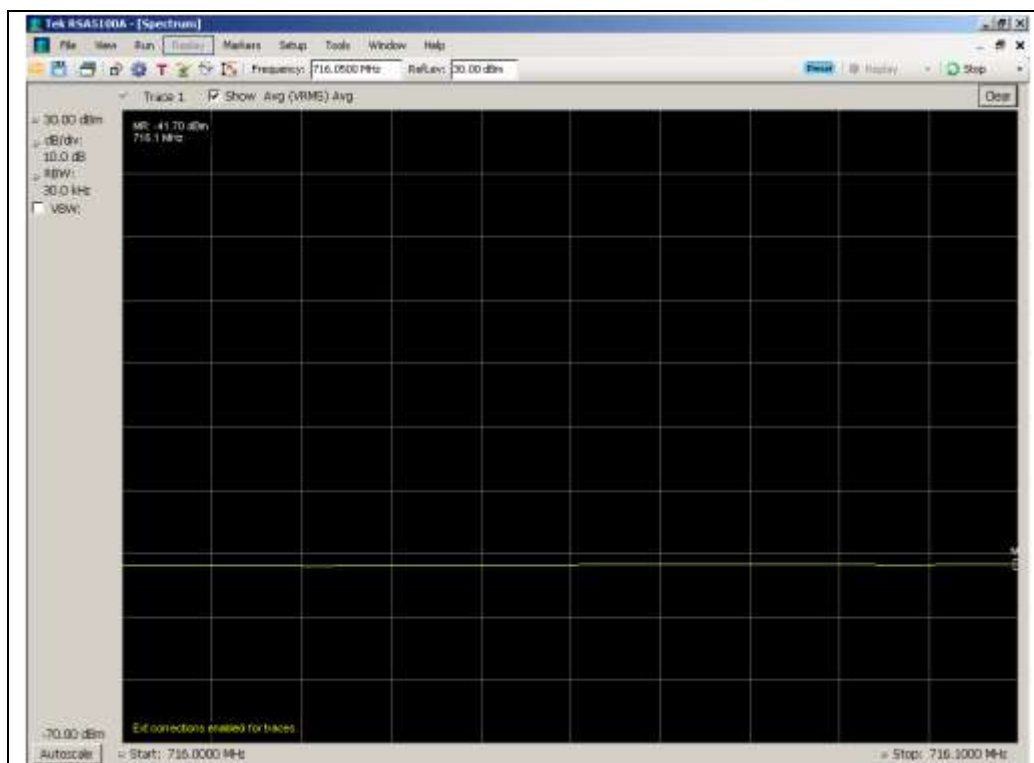




WCDMA Uplink Test Plots 704 - 716 MHz Band Lower Band Edge



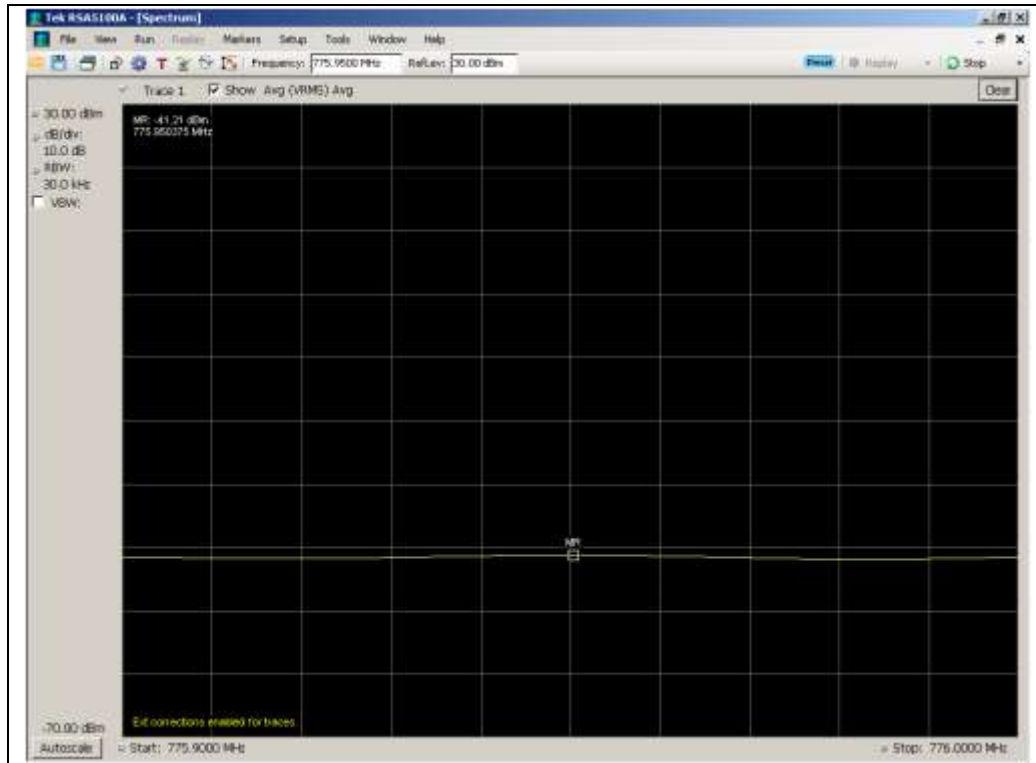
Upper Band Edge



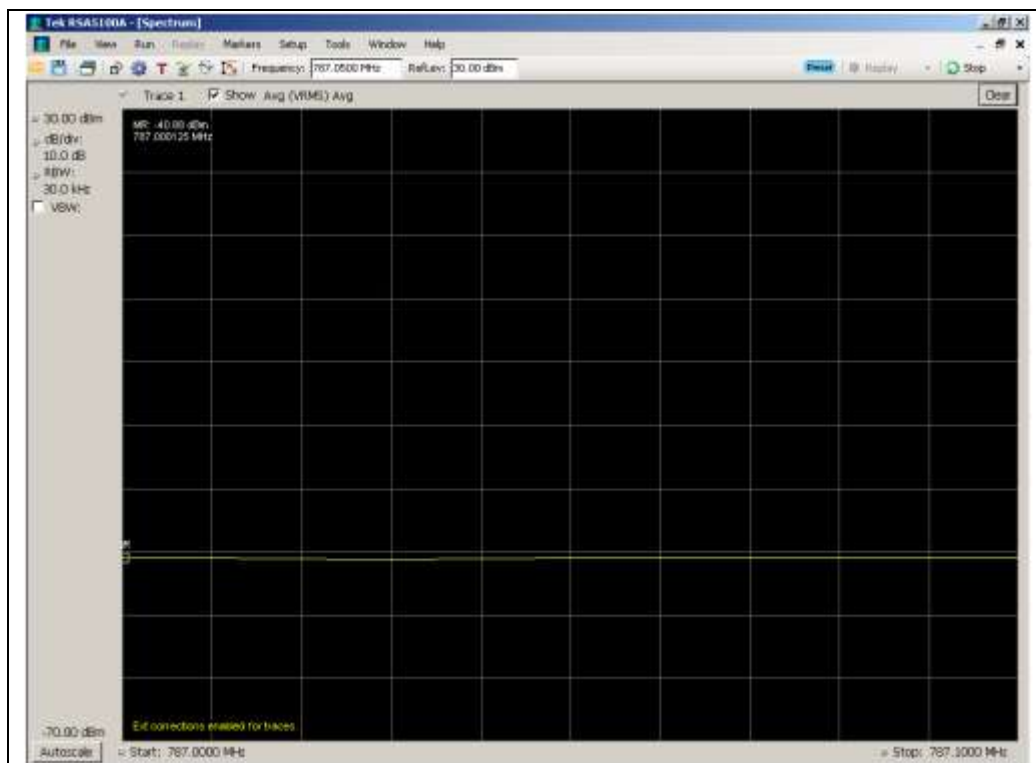


776 - 787 MHz Band

Lower Band Edge



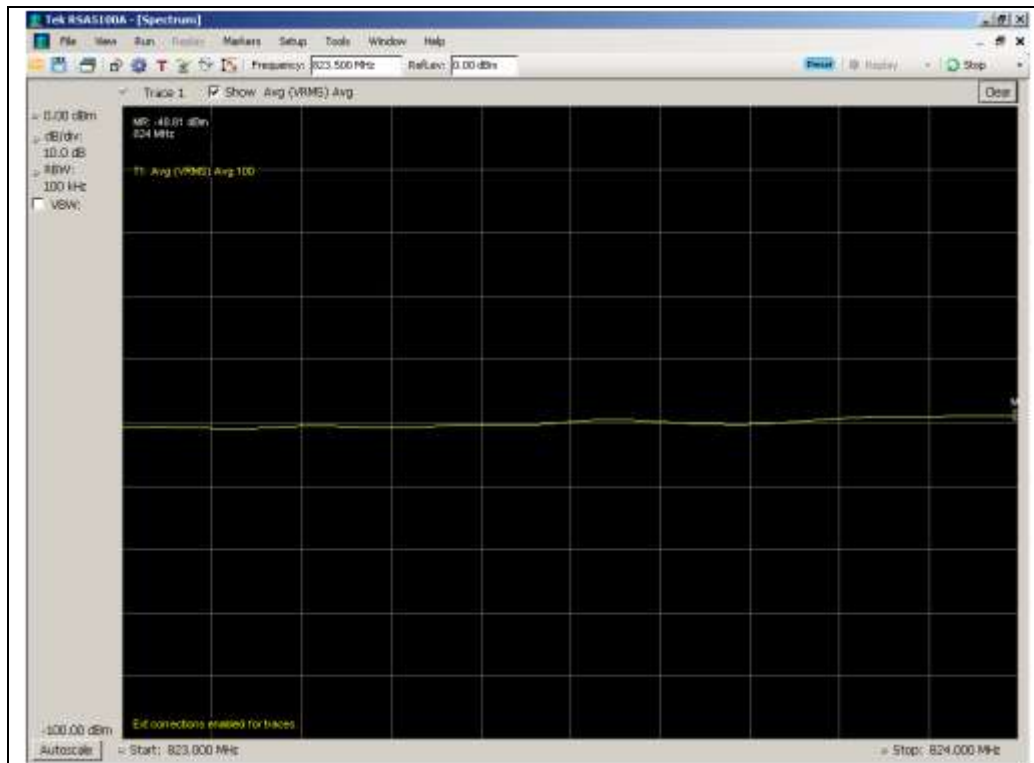
Upper Band Edge



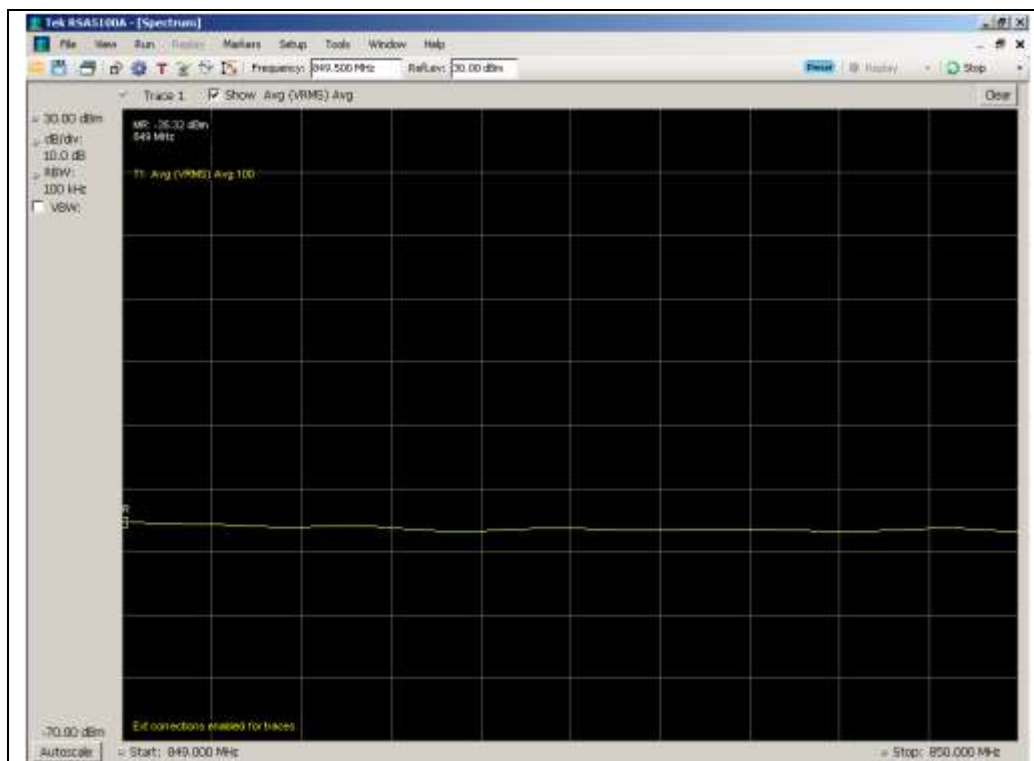


824 - 849 MHz Band

Lower Band Edge



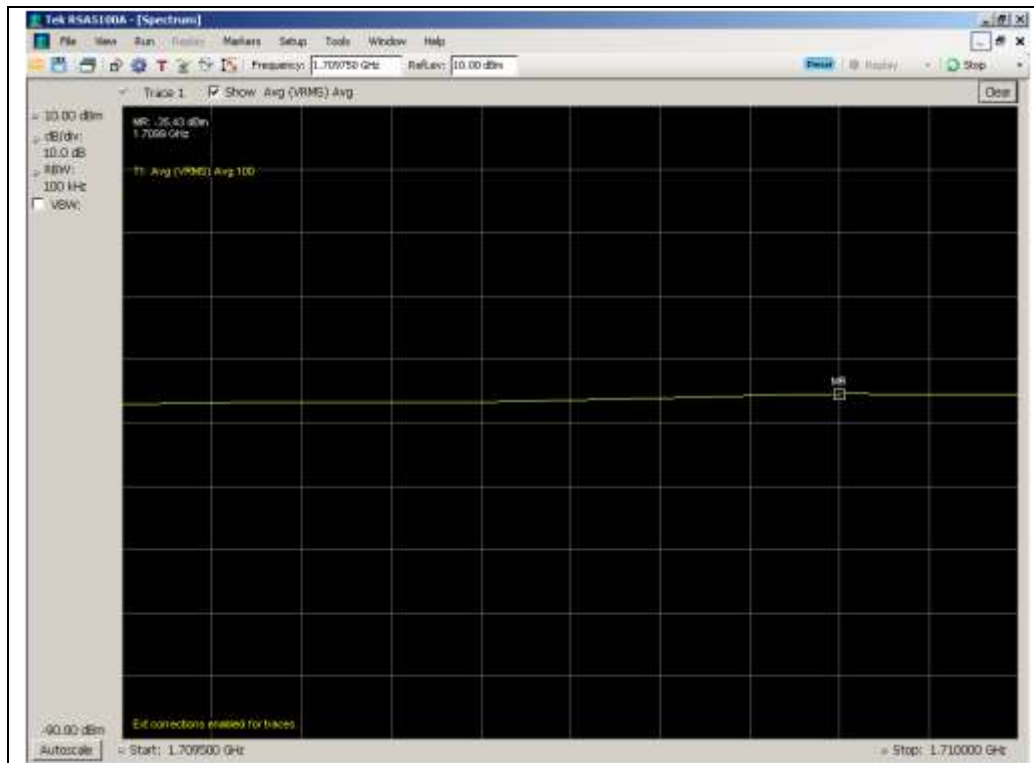
Upper Band Edge



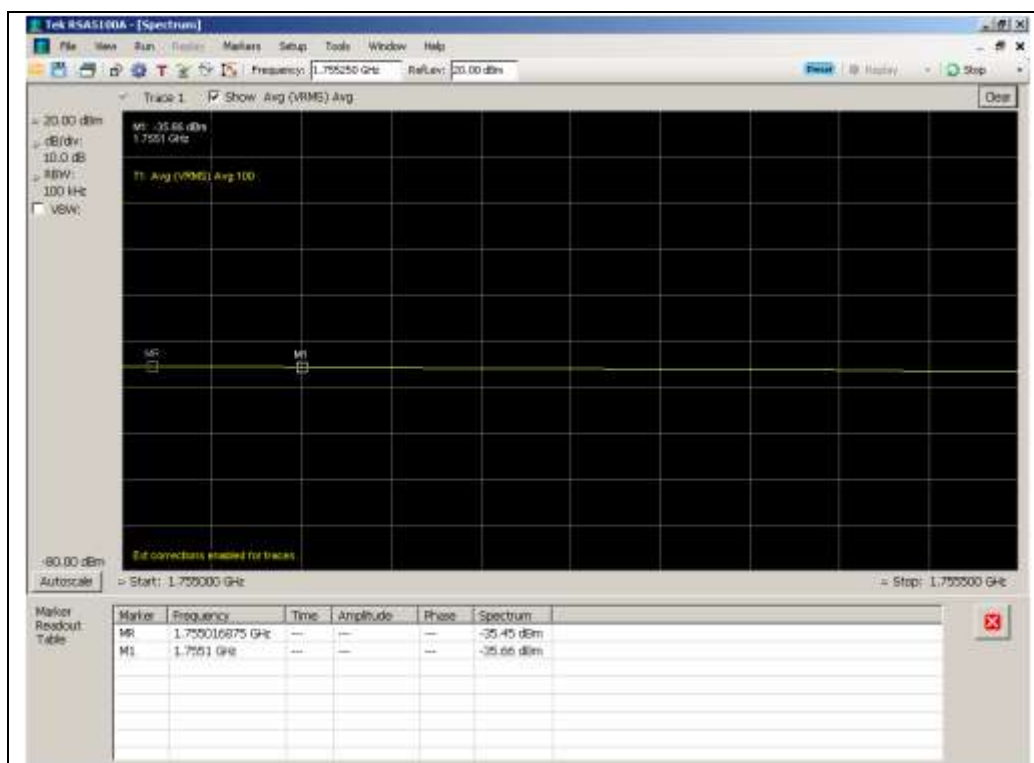


1710 - 1755 MHz Band

Lower Band Edge



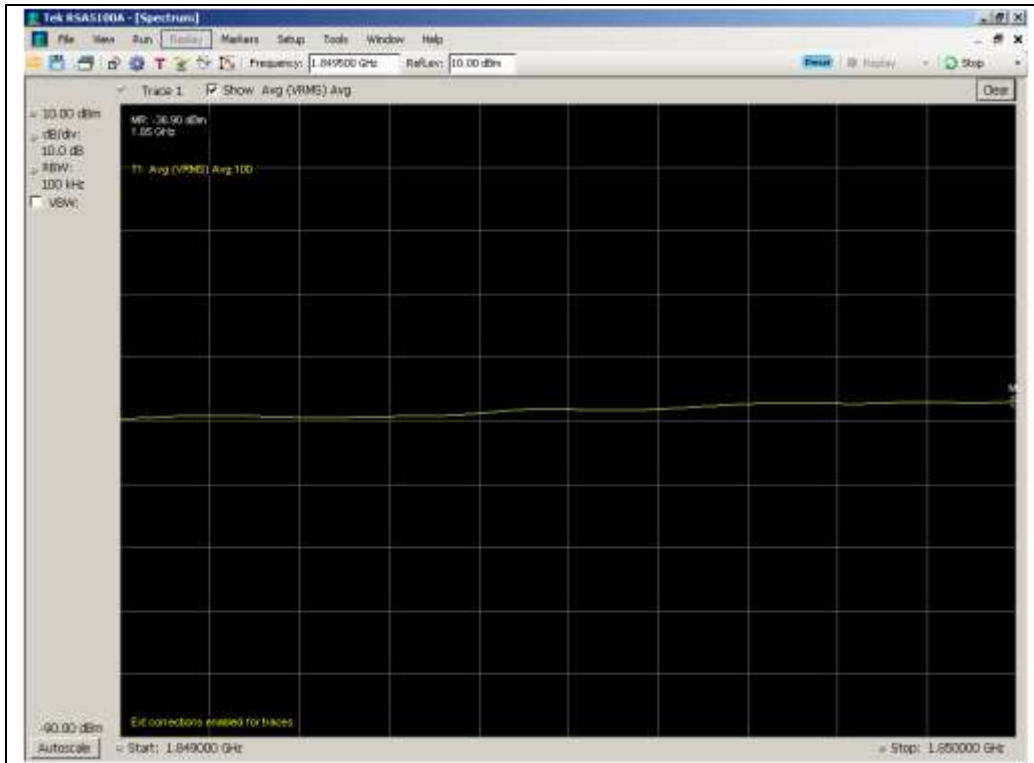
Upper Band Edge



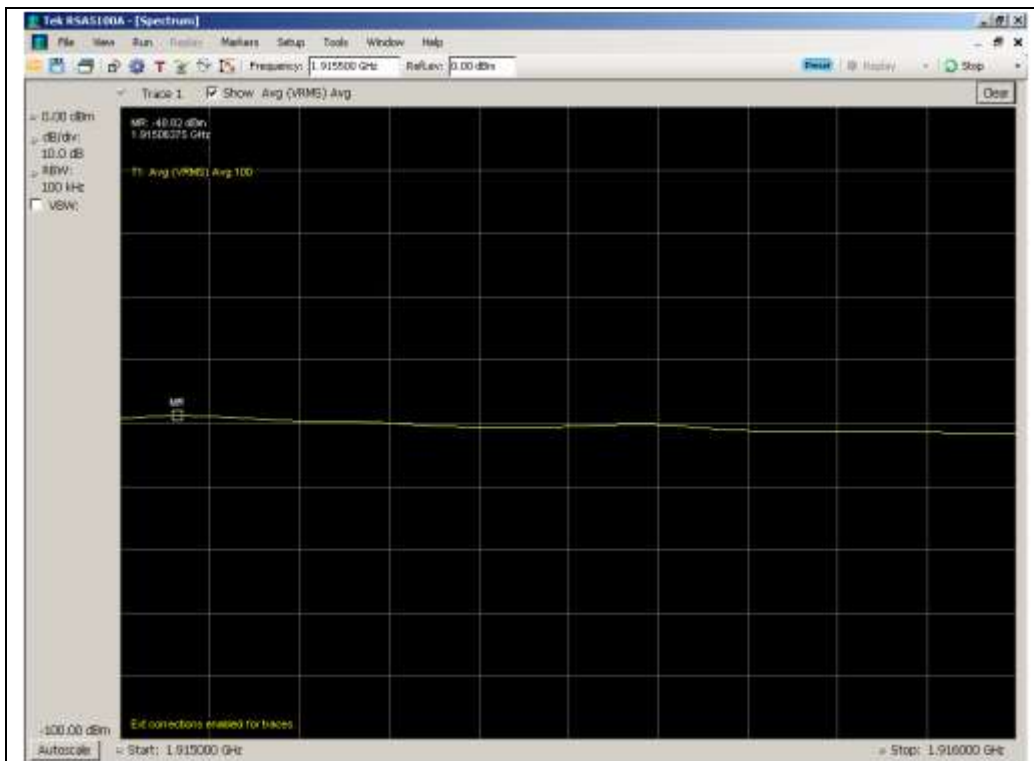


1850 - 1915 MHz Band

Lower Band Edge

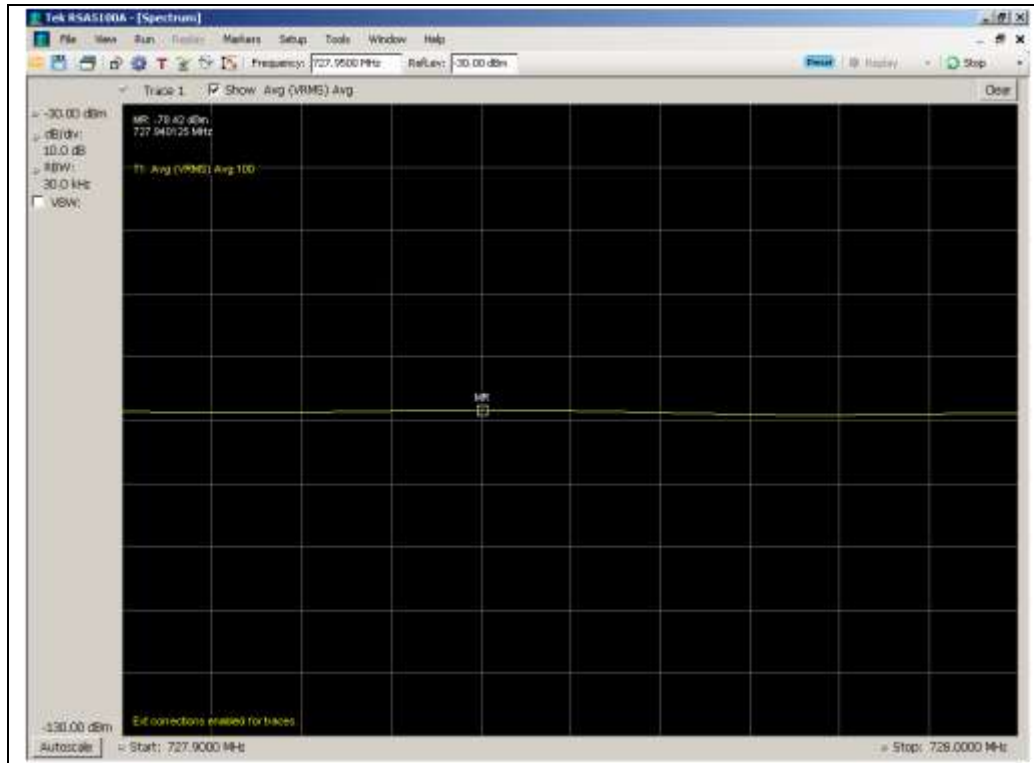


Upper Band Edge

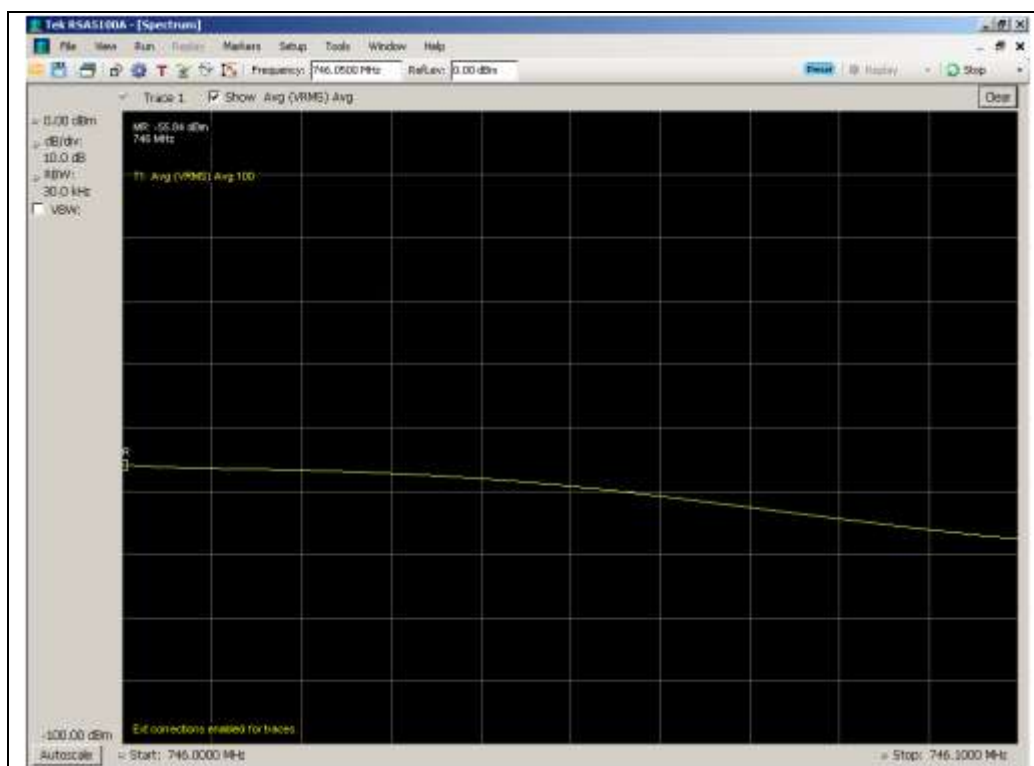




GSM Downlink Test Plots 734 - 746 MHz Band Lower Band Edge



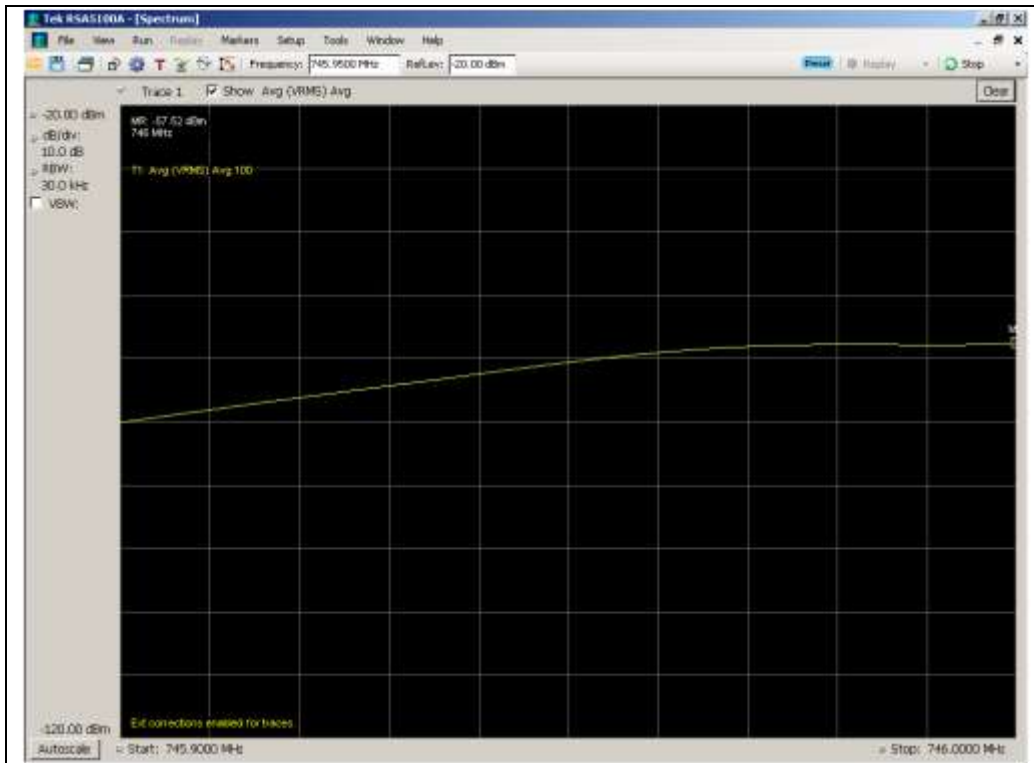
Upper Band Edge



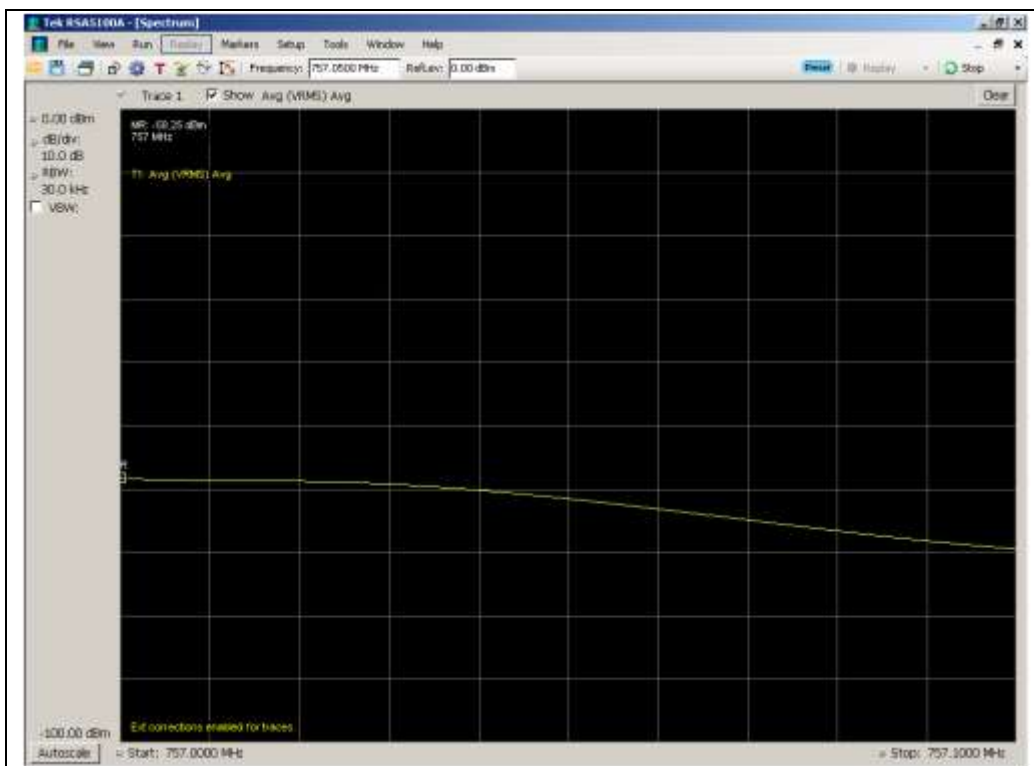


746 - 757 MHz Band

Lower Band Edge



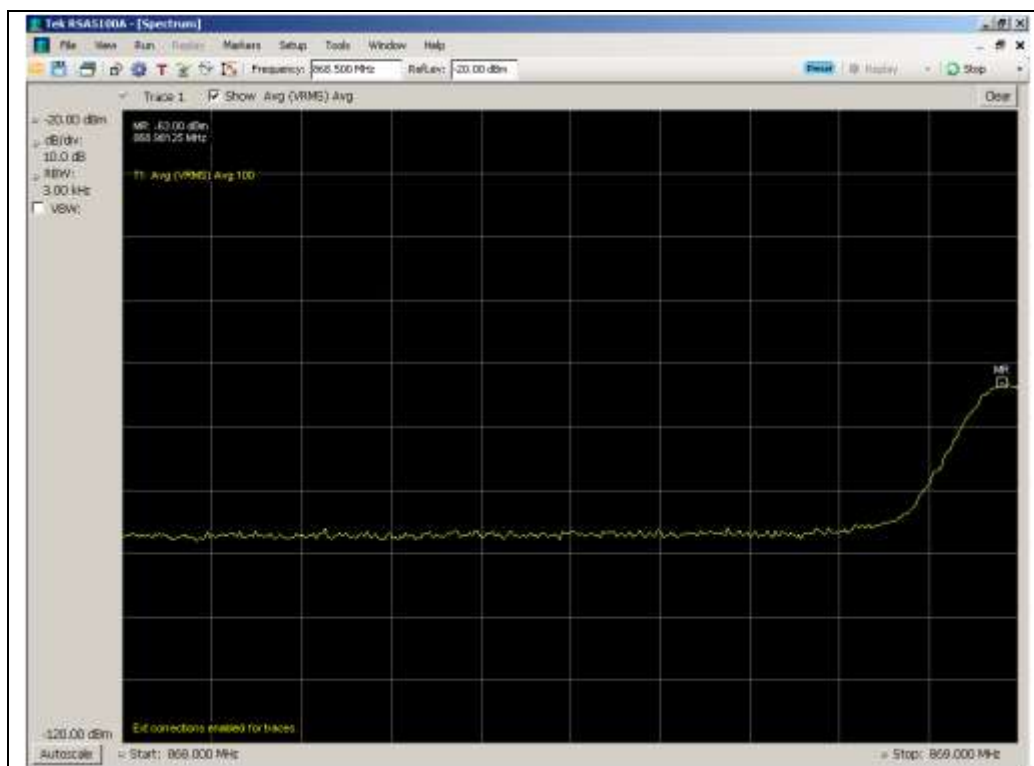
Upper Band Edge



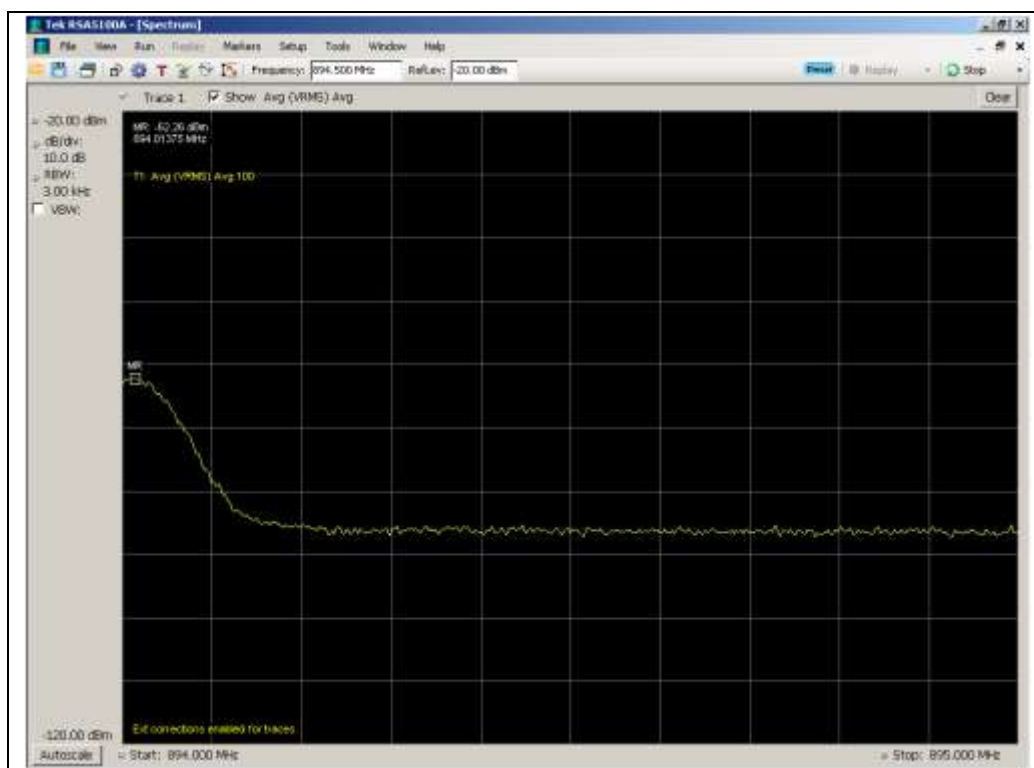


869 - 894 MHz Band

Lower Band Edge



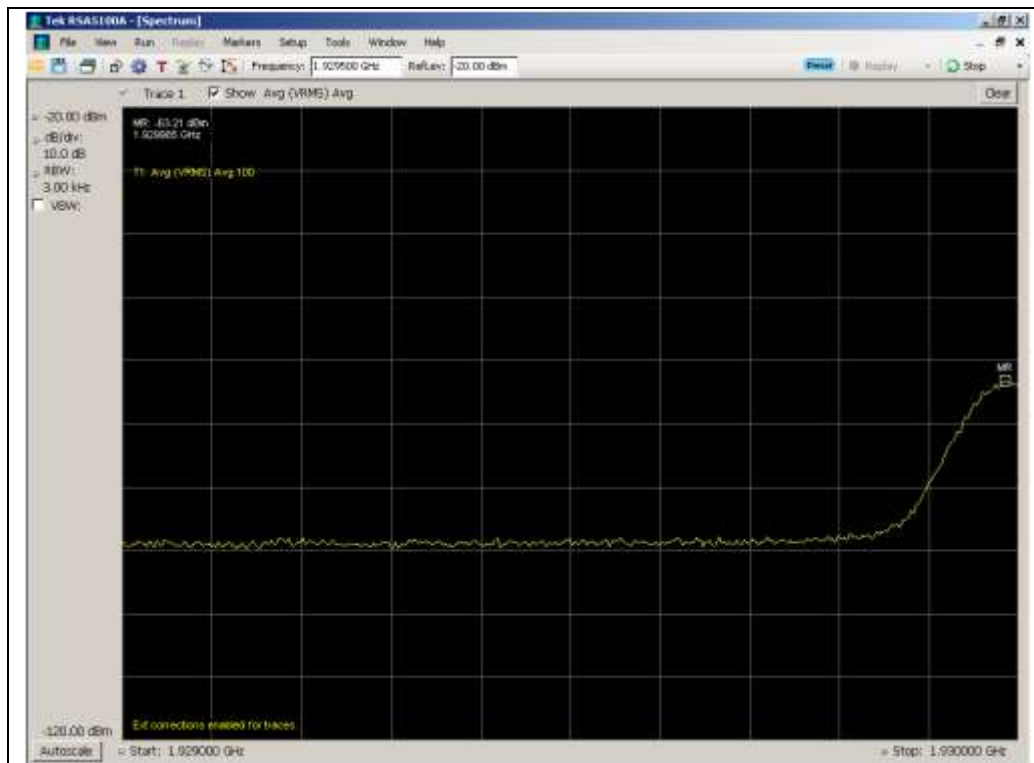
Upper Band Edge



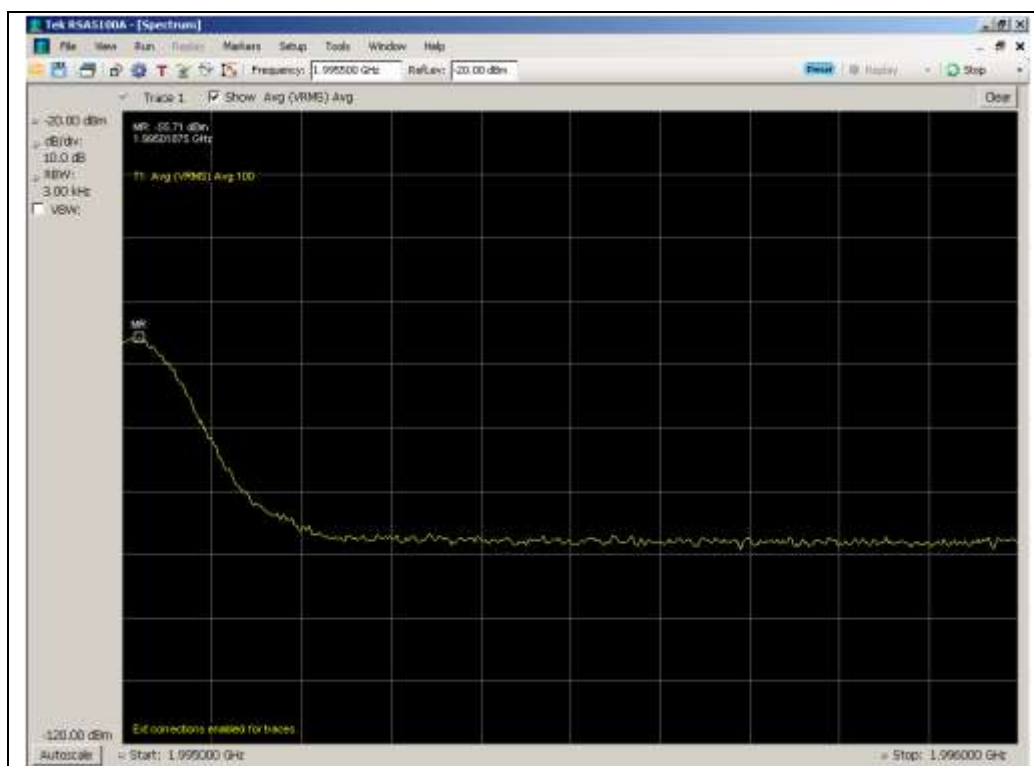


1930 - 1995 MHz Band

Lower Band Edge



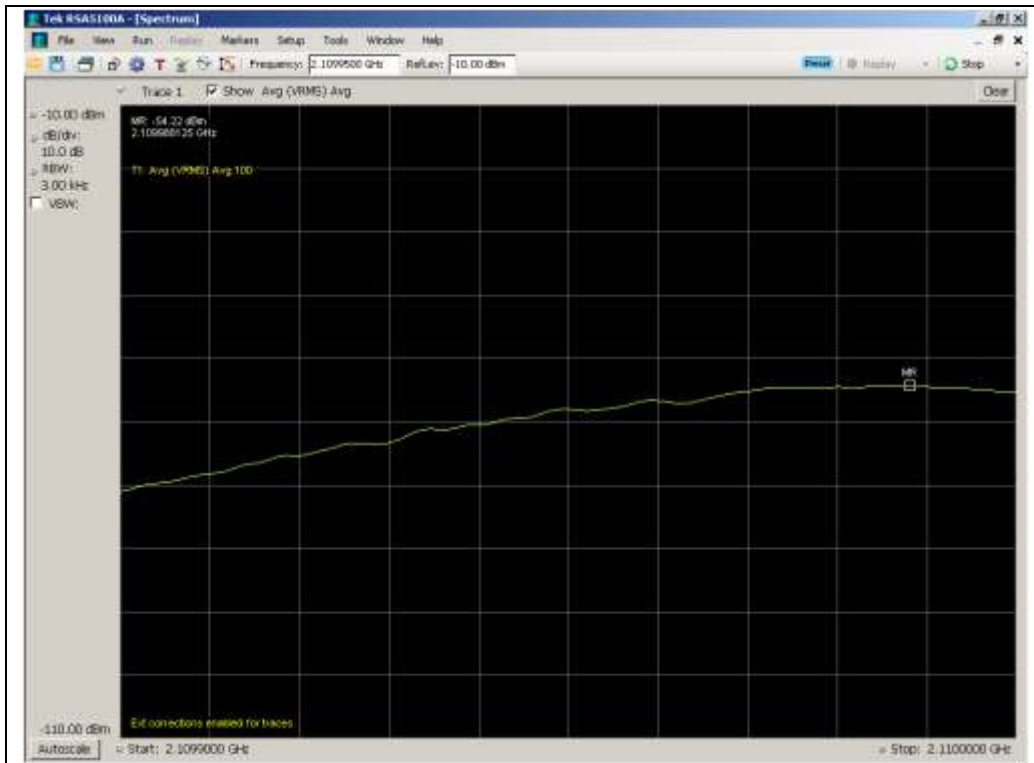
Upper Band Edge



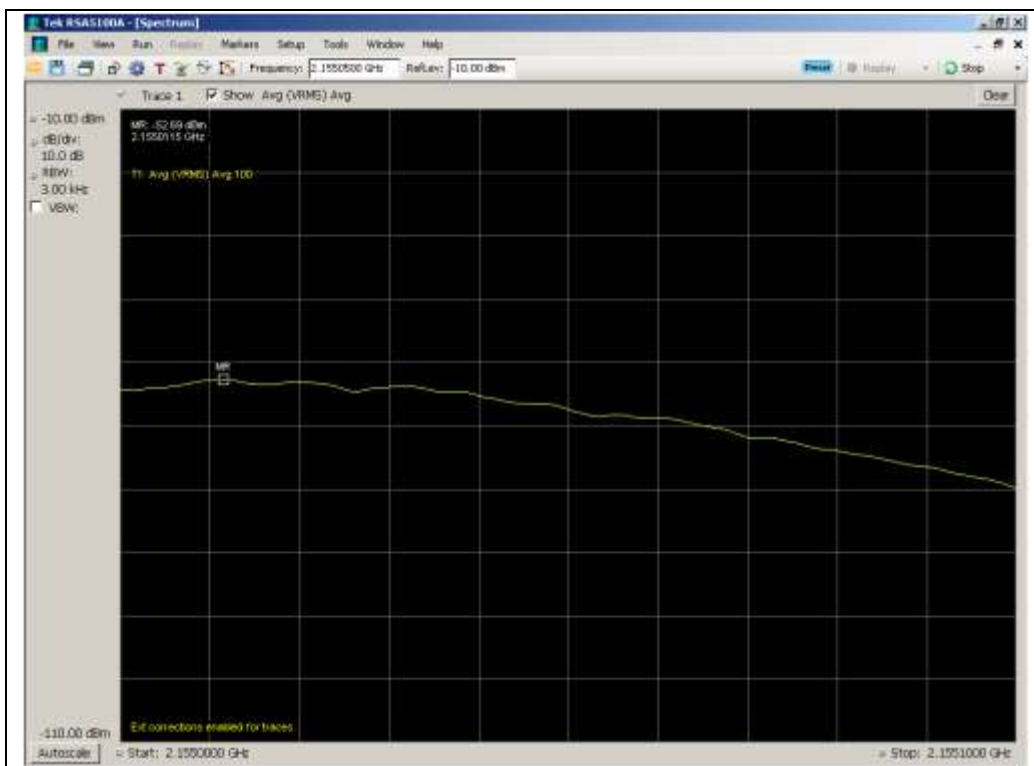


2110 - 2155 MHz Band

Lower Band Edge



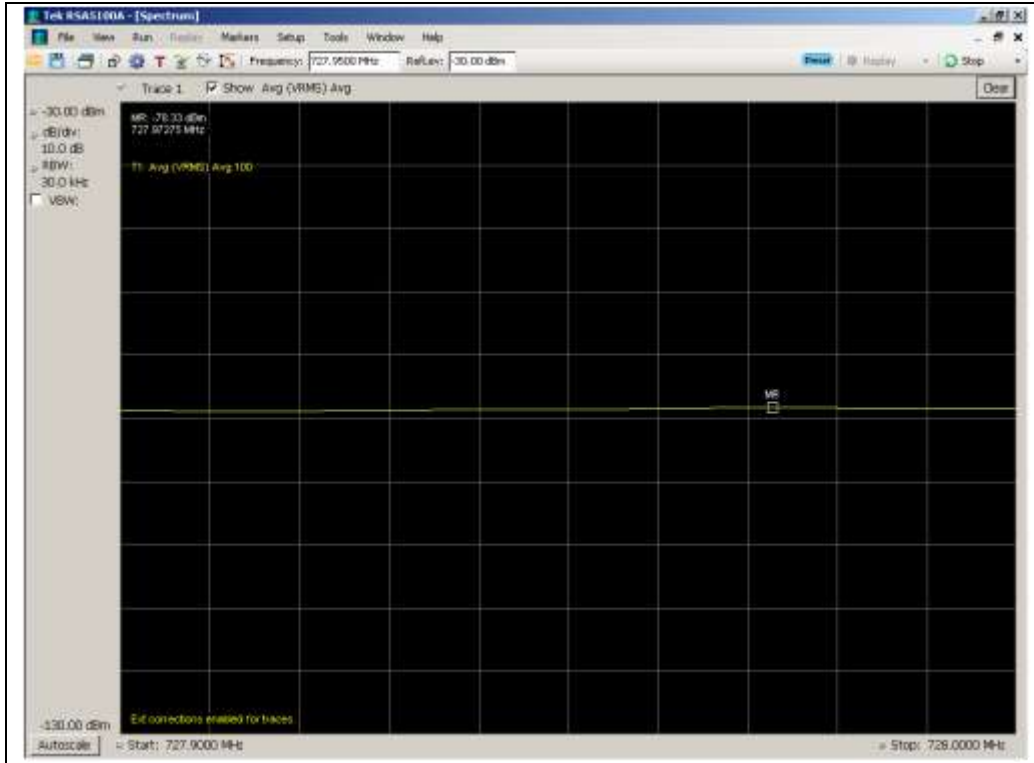
Upper Band Edge



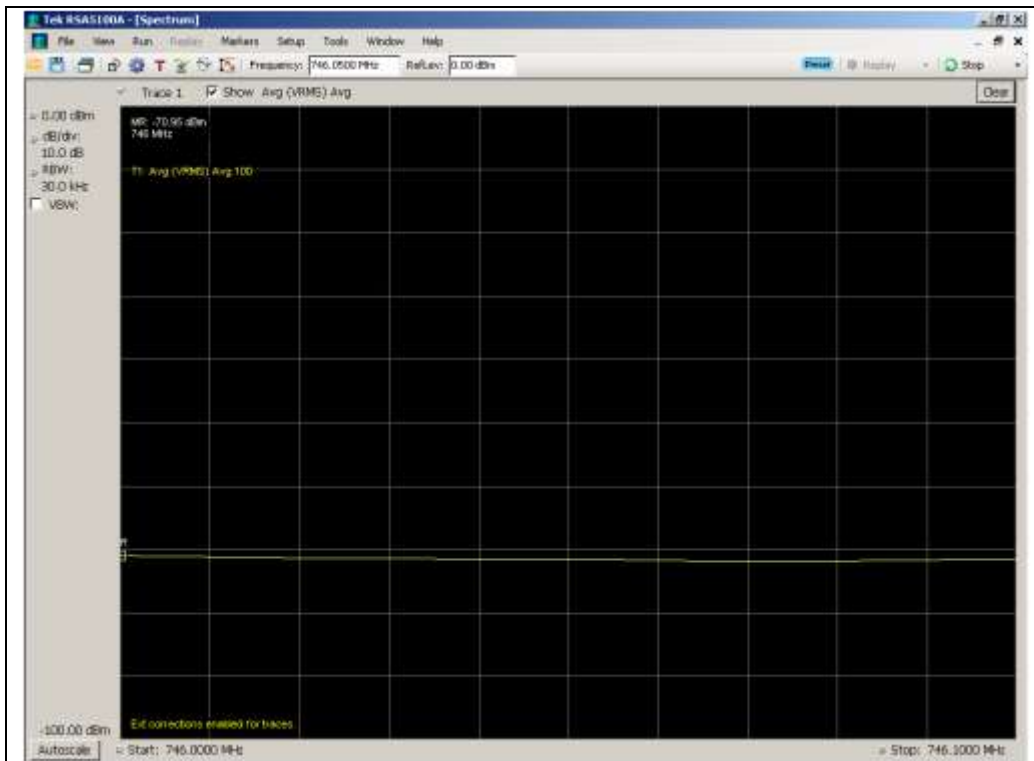


CDMA Downlink Test Plots

734 - 746 MHz Band Lower Band Edge



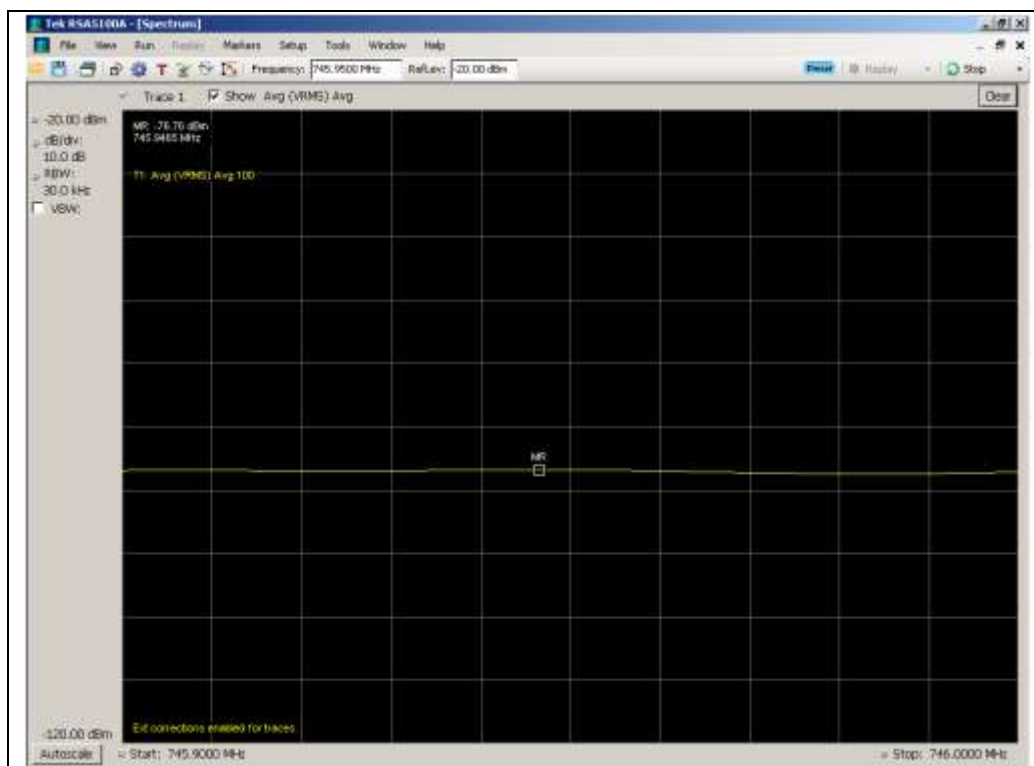
Upper Band Edge



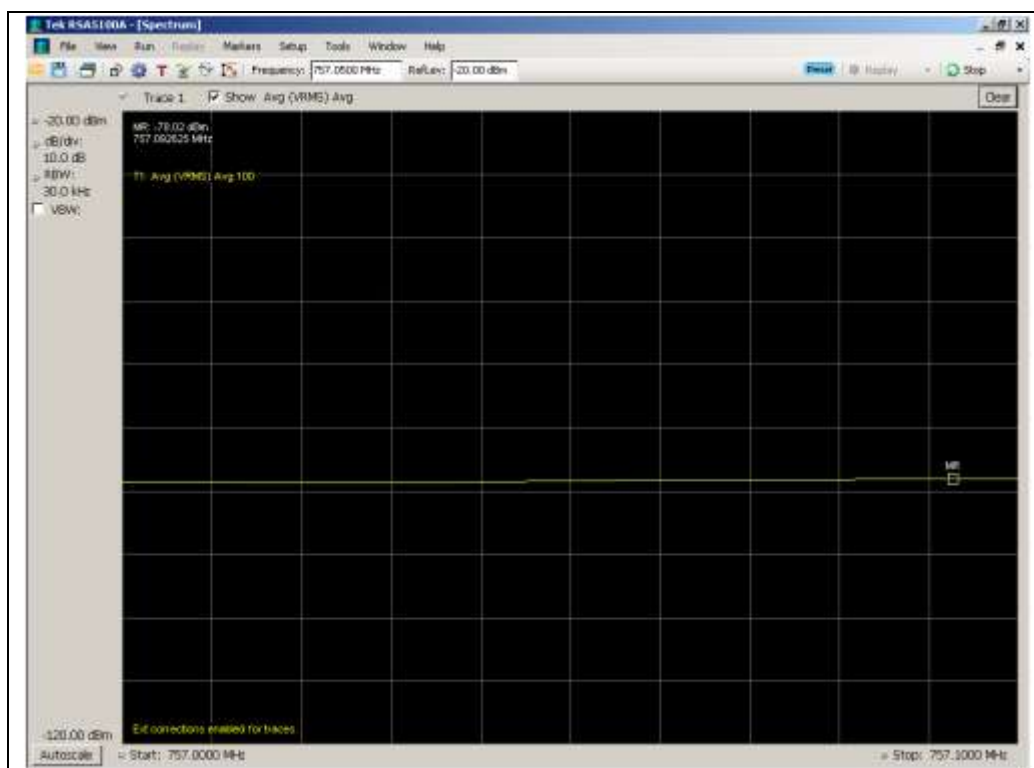


746 - 757 MHz Band

Lower Band Edge



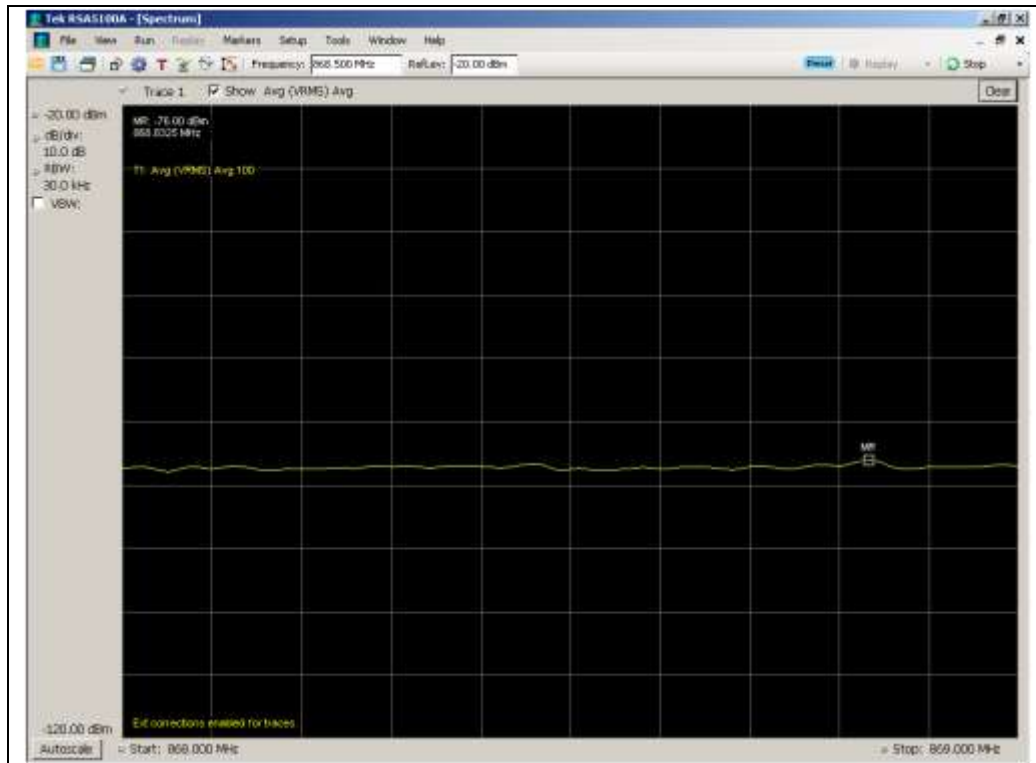
Upper Band Edge



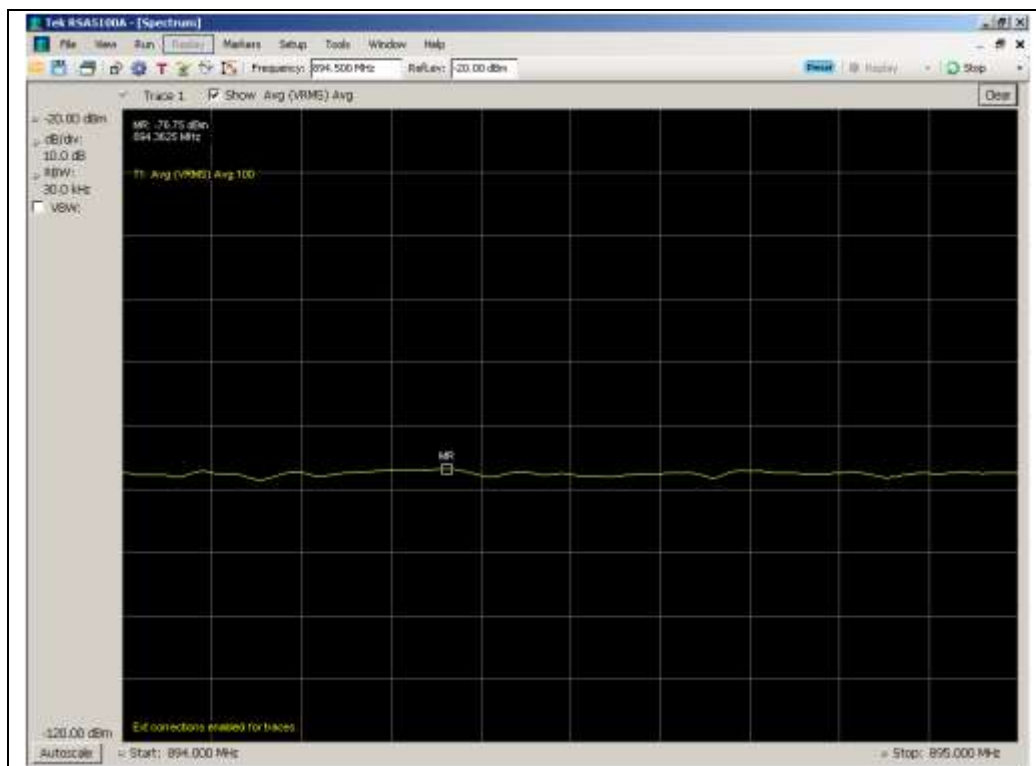


869 - 894 MHz Band

Lower Band Edge



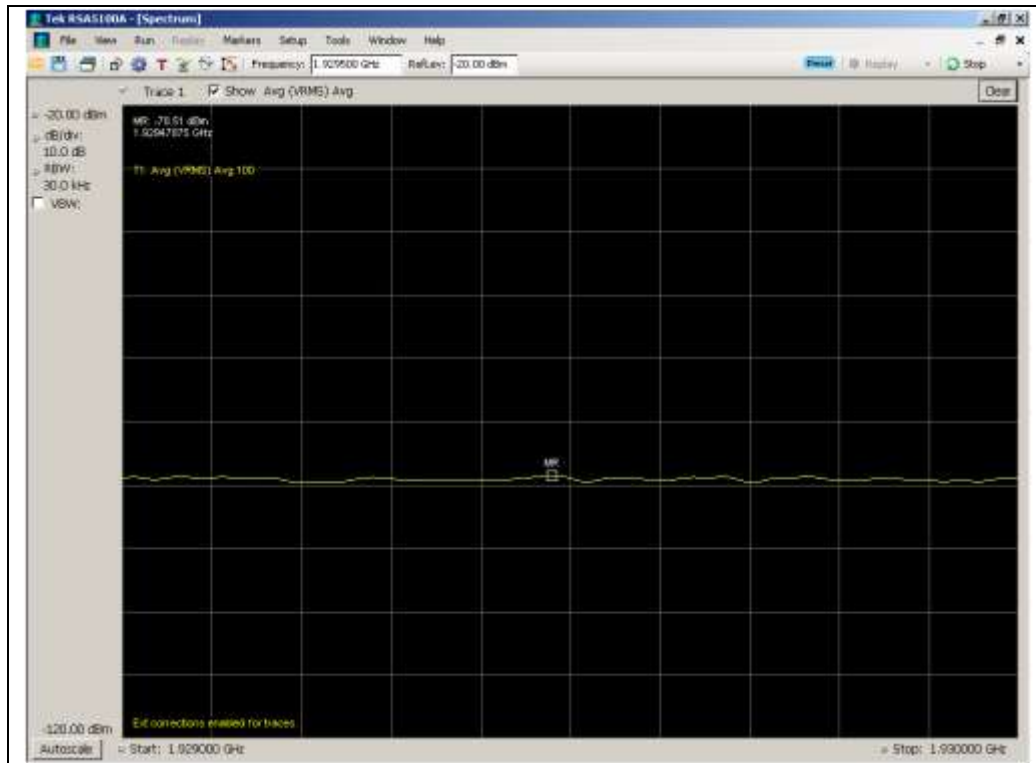
Upper Band Edge



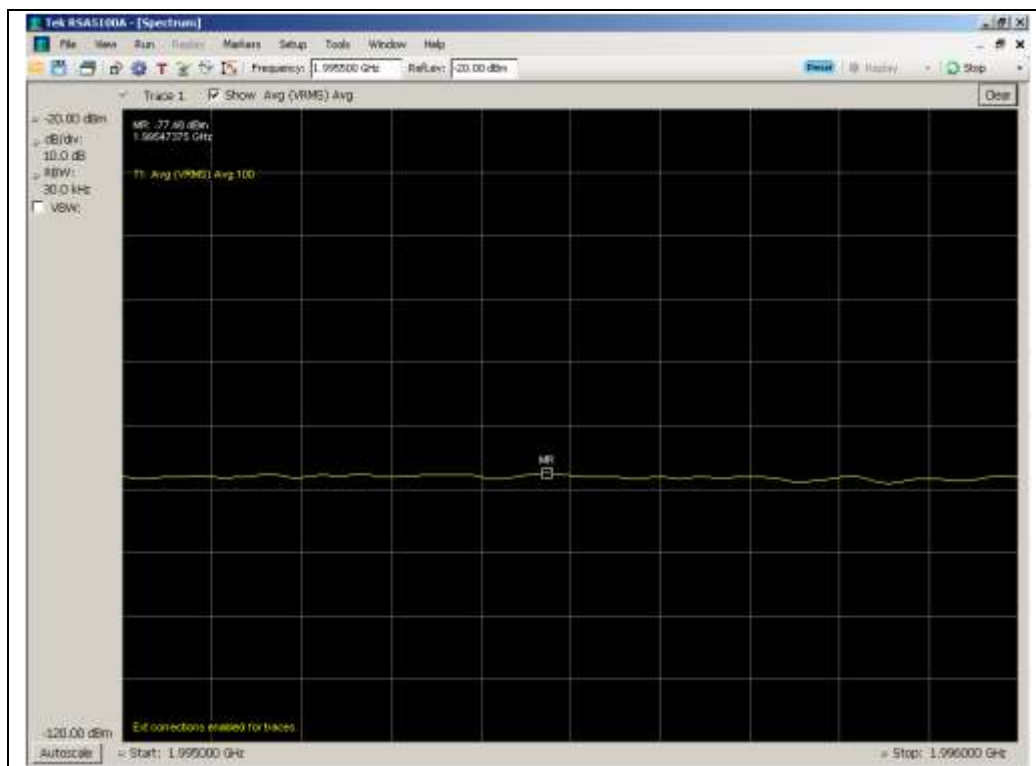


1930 - 1995 MHz Band

Lower Band Edge



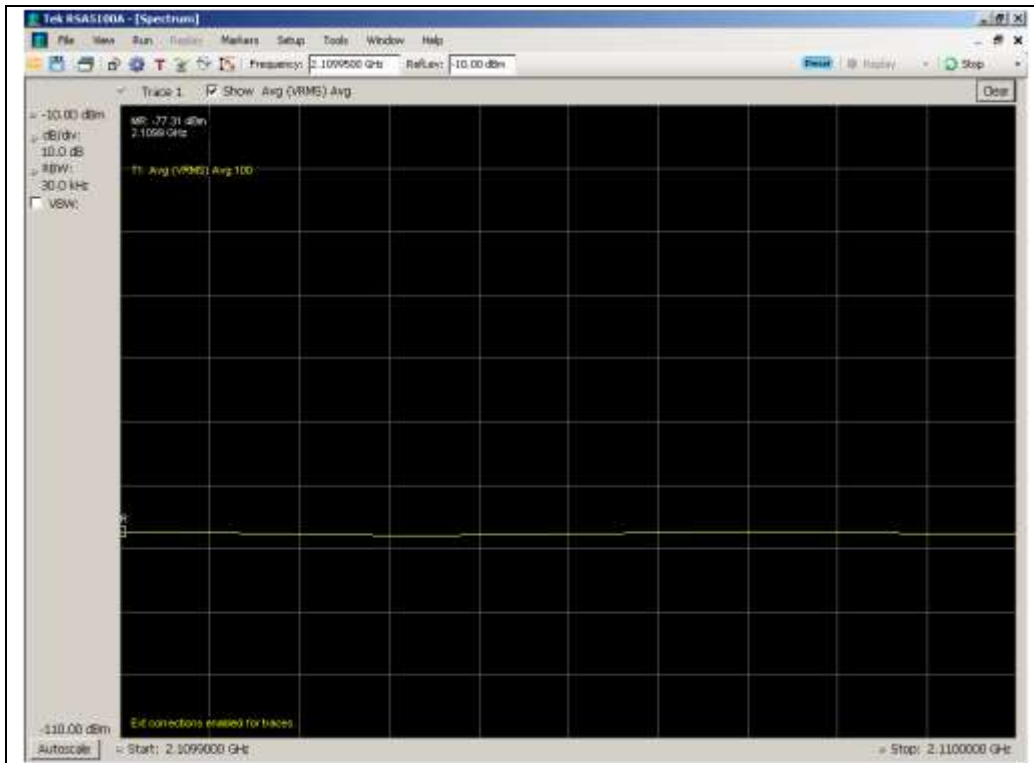
Upper Band Edge



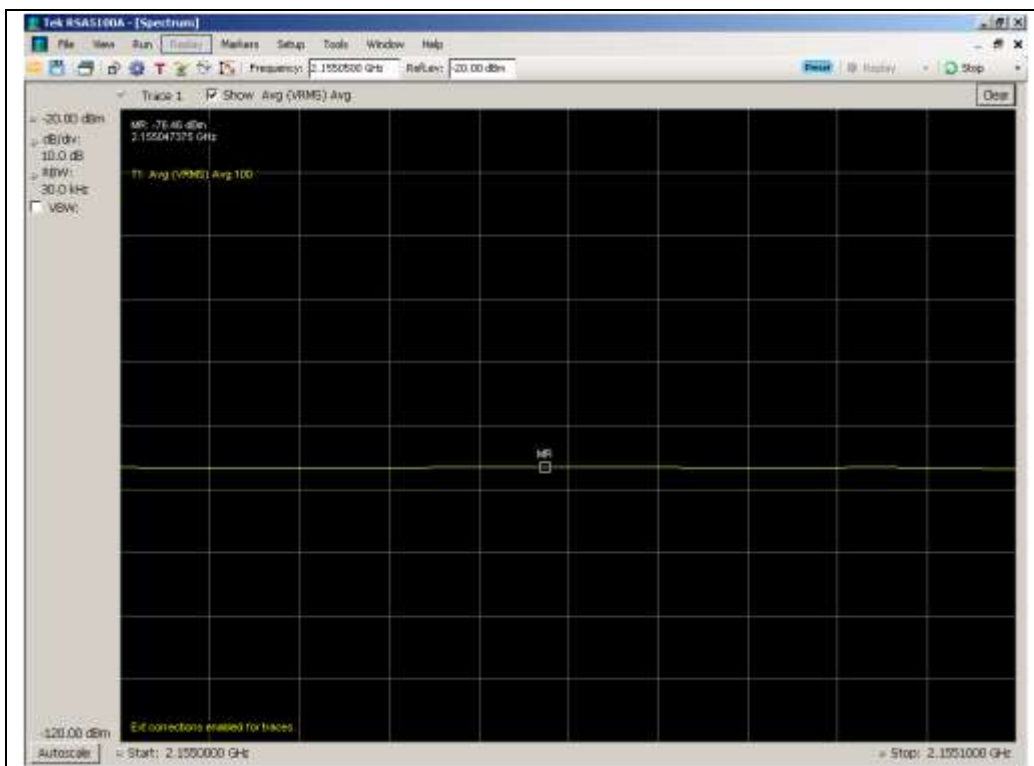


2110 - 2155 MHz Band

Lower Band Edge



Upper Band Edge

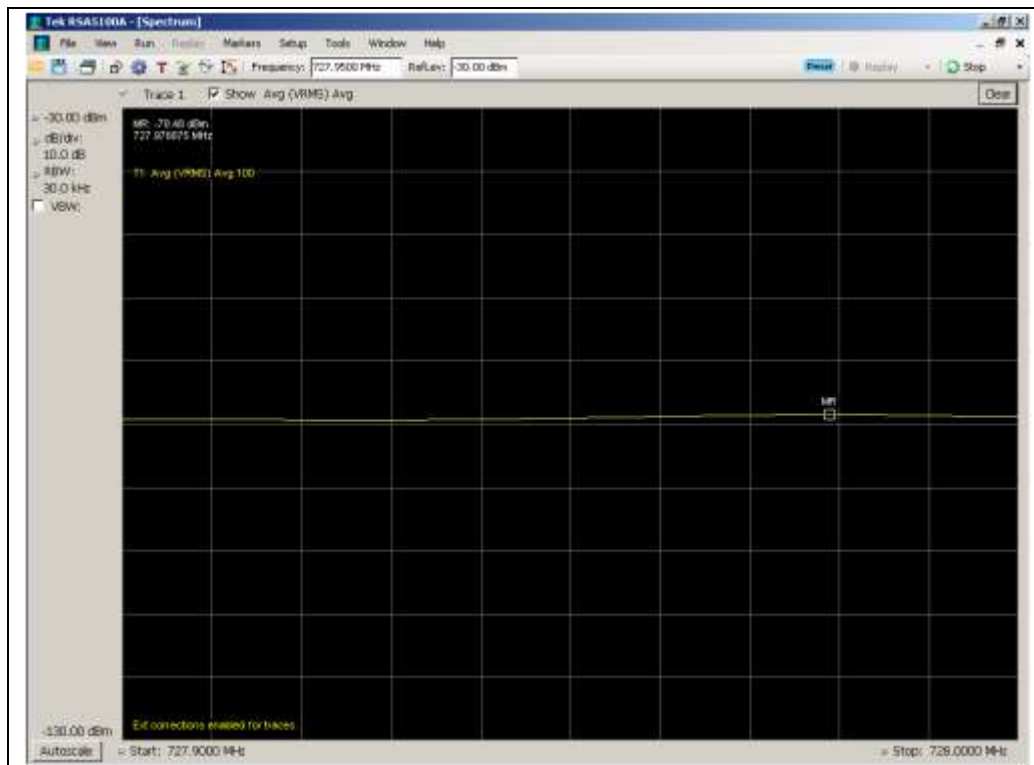




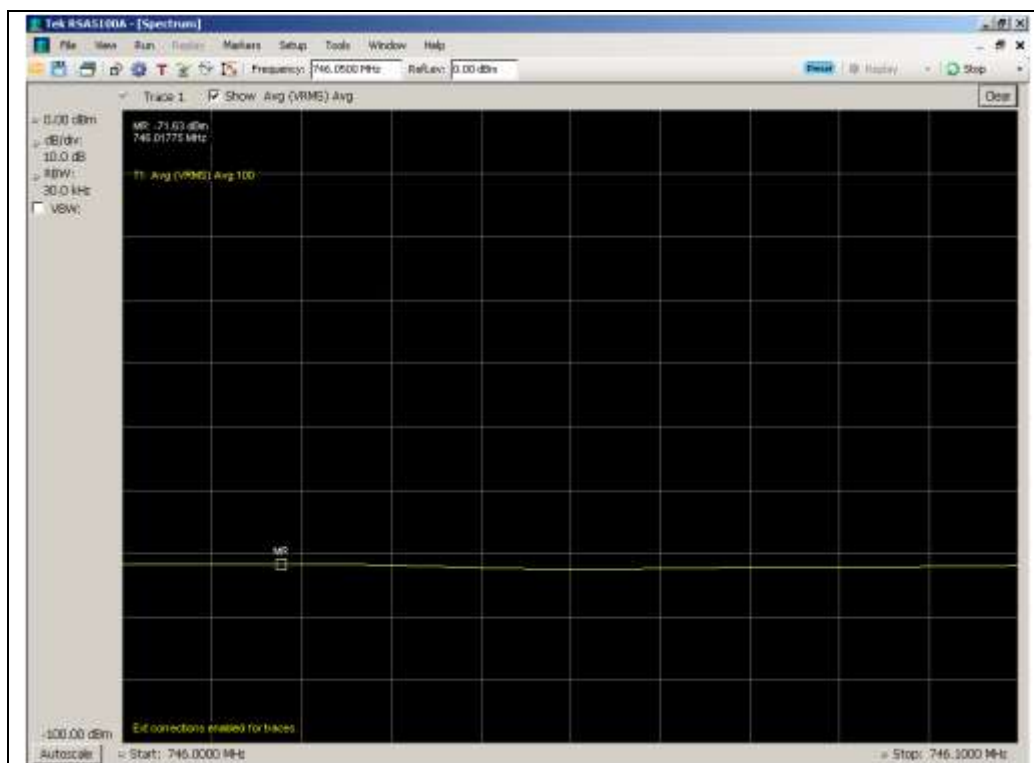
WCDMA Downlink Test Plots

734 - 746 MHz Band

Lower Band Edge



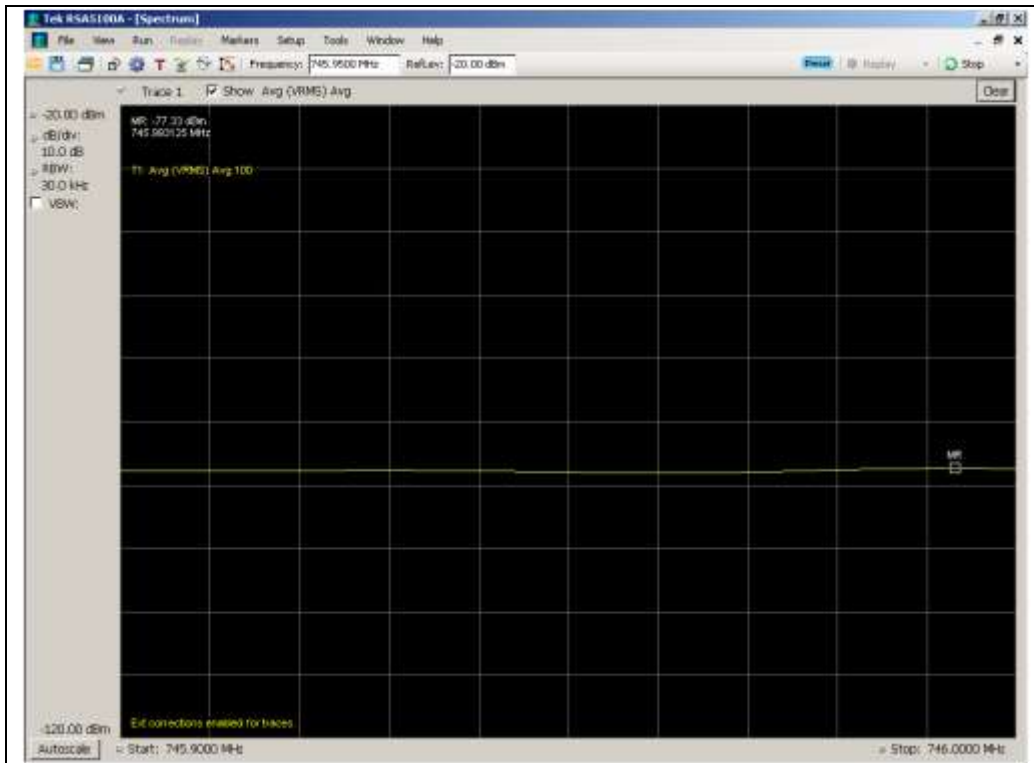
Upper Band Edge



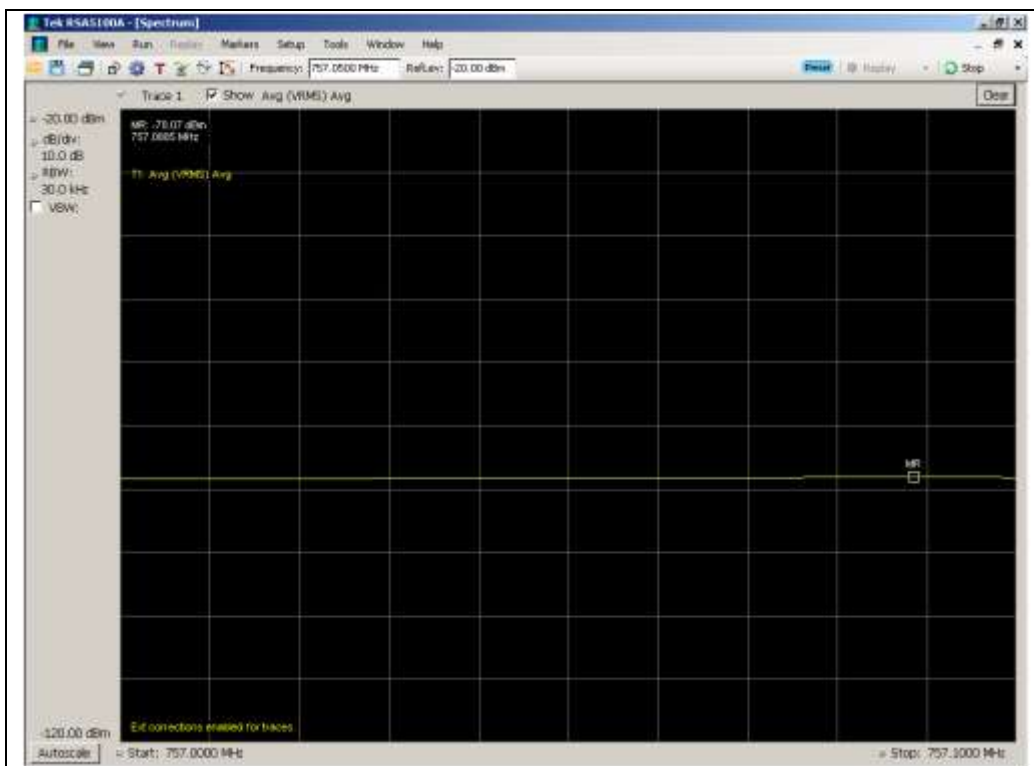


746 - 757 MHz Band

Lower Band Edge



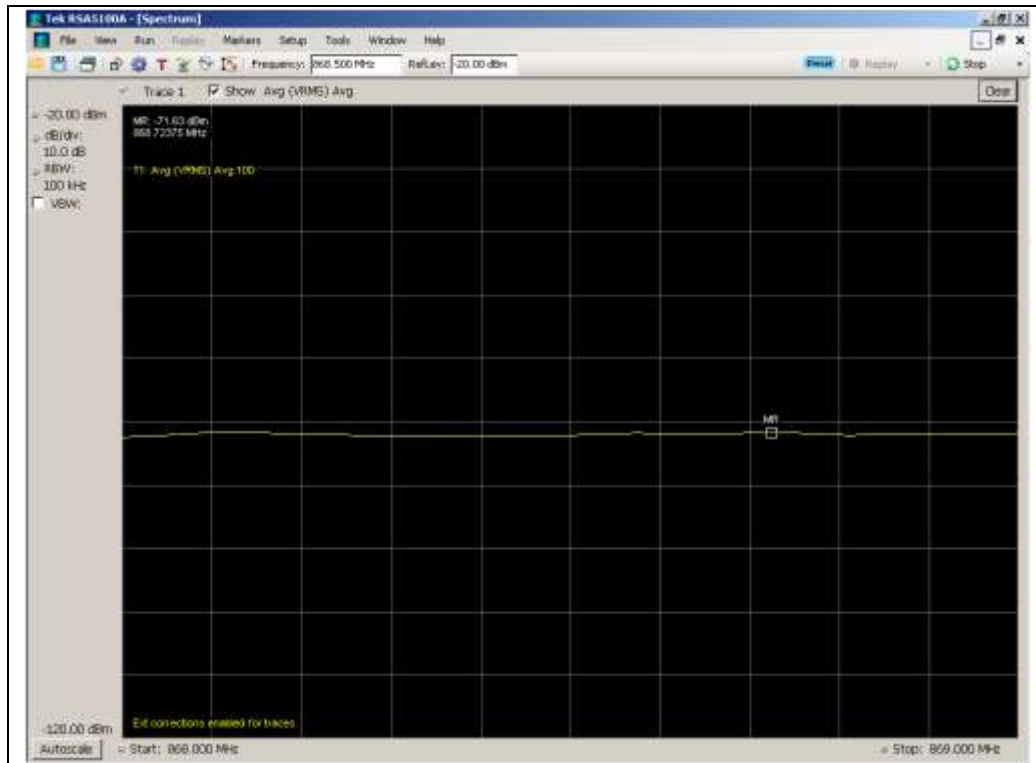
Upper Band Edge



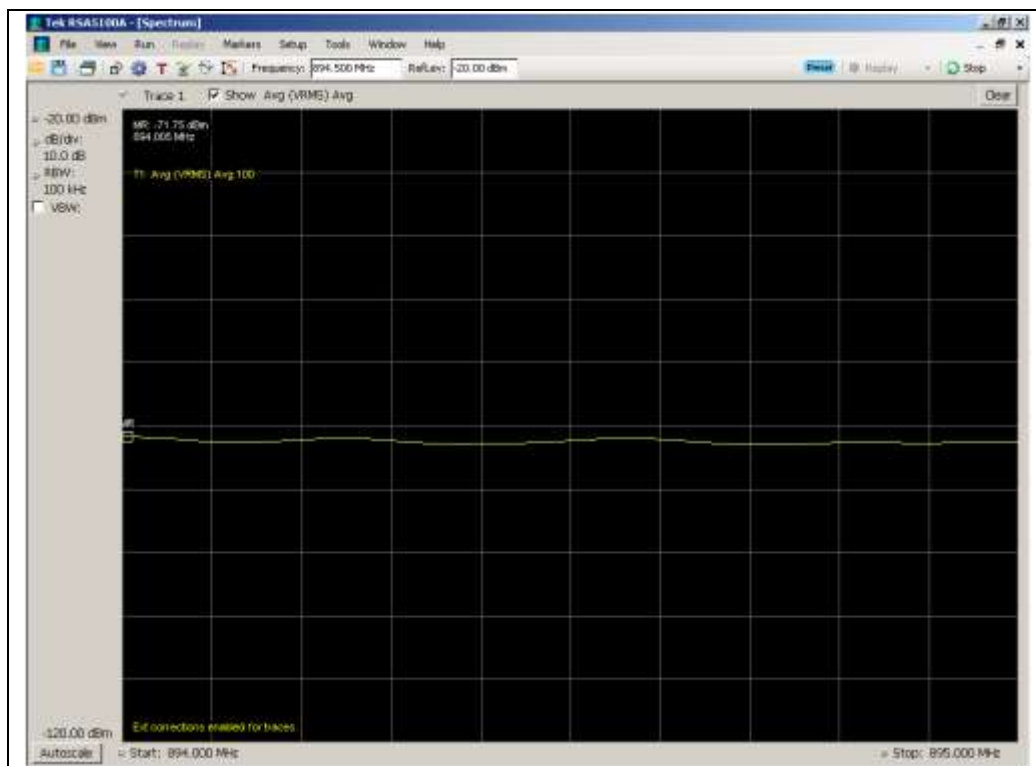


869 - 894 MHz Band

Lower Band Edge



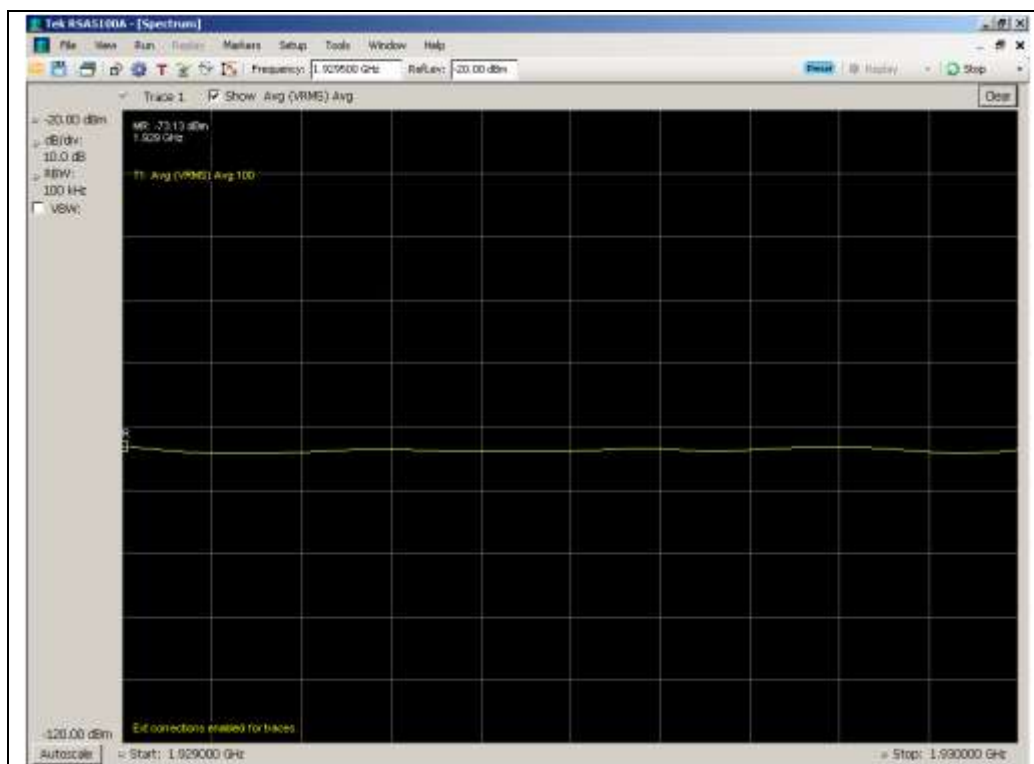
Upper Band Edge



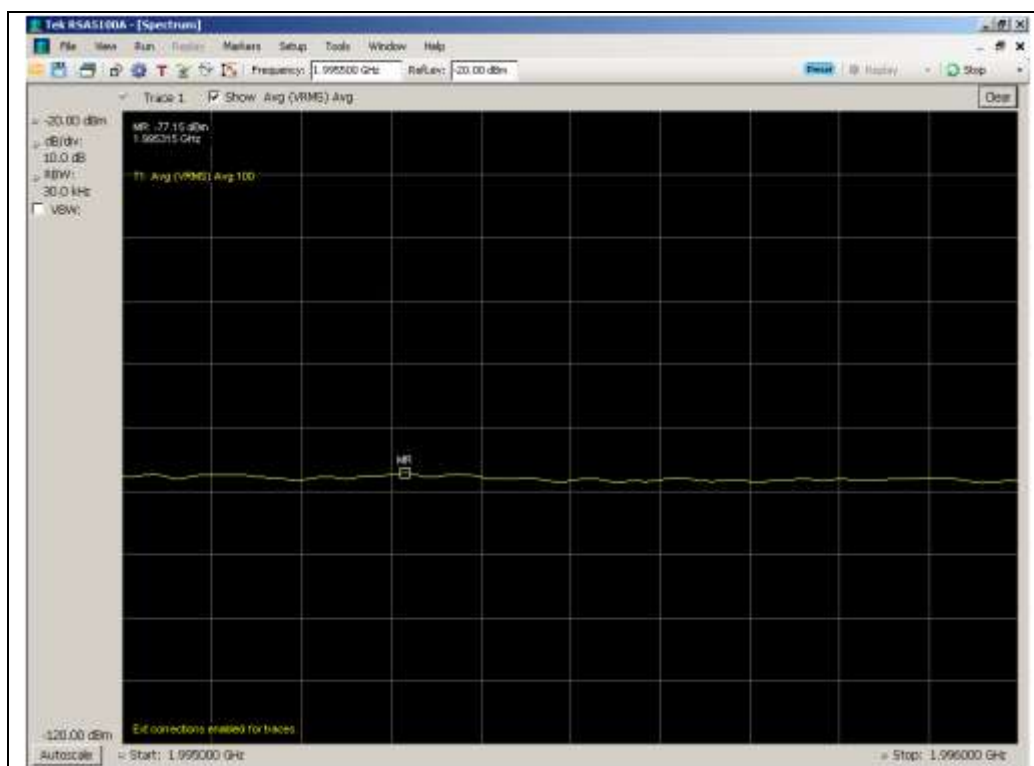


1930 - 1995 MHz Band

Lower Band Edge



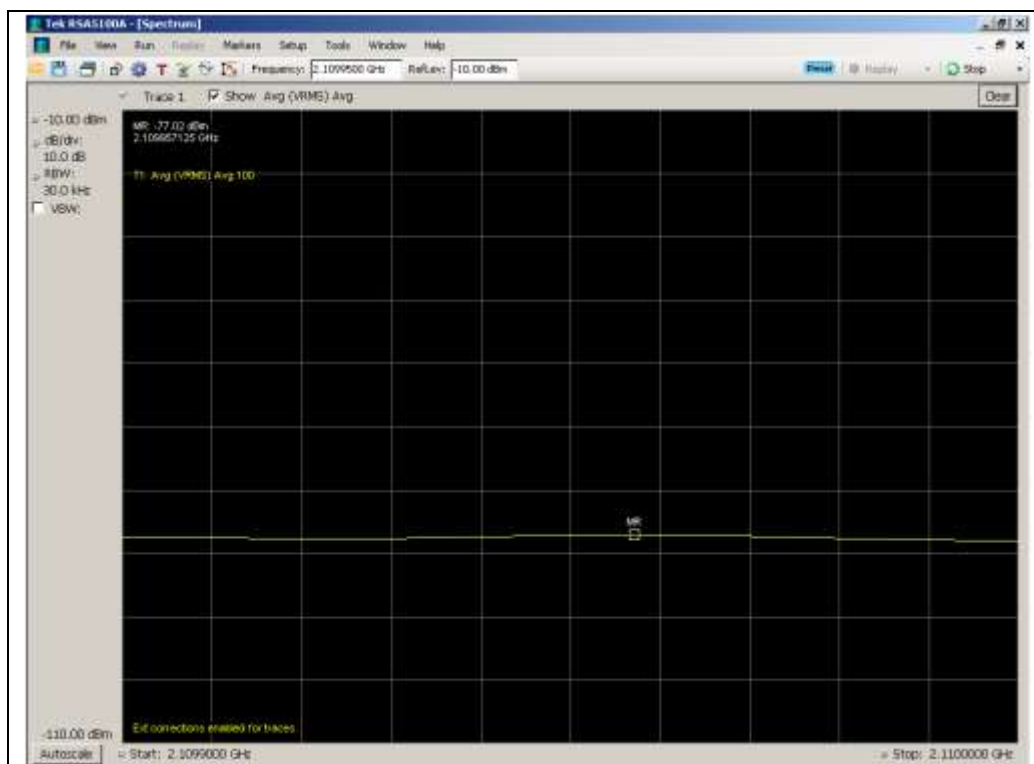
Upper Band Edge



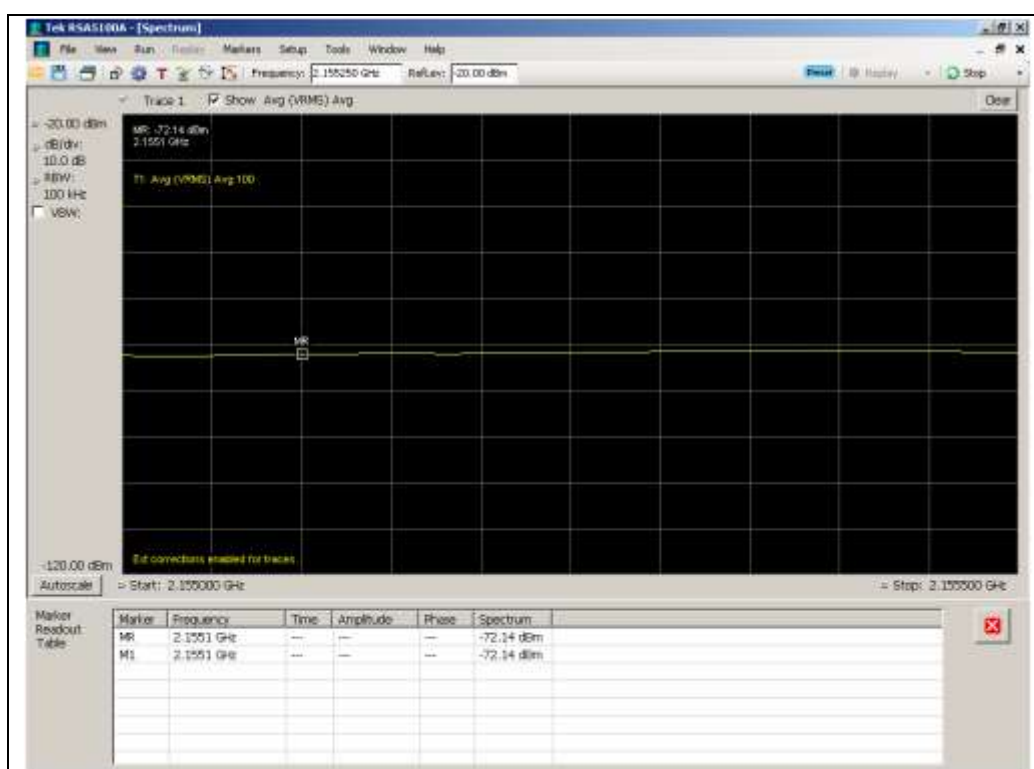


2110 - 2155 MHz Band

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.

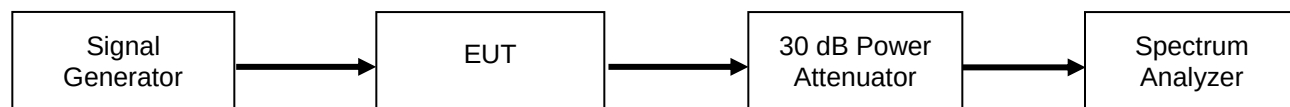
The following formulas are used for calculating the limits.

Conducted Spurious Emissions Limit (dBm) = $P_2 - (43 + 10 \cdot \log P_1)$

P_1 = Output Power in watts

P_2 = 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.

$$\text{BW correction Factor} = 10\log B1/B2$$

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

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

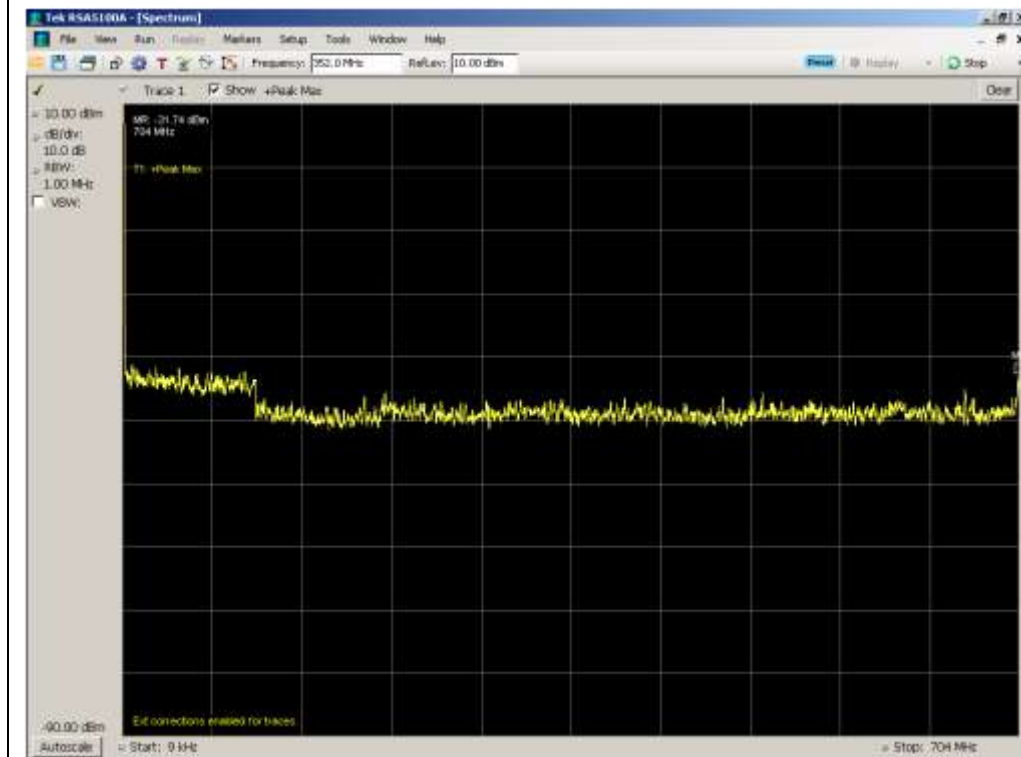
Spurious Frequency Range (MHz)	Measured Frequency (MHz)	Measured Value (dBm)	Bandwidth Correction Factor (dB)	Gain/Loss from Antenna Kitting information (dB)	Final Value (dBm)	Limit (dBm)	Margin (dB)
1559 – 1610 (Wideband)	1562.85	-52	0	-0.3	-52.30	-40	-12.30
1559 – 1610 (Narrowband)	1588.401	-71.7	-11.55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



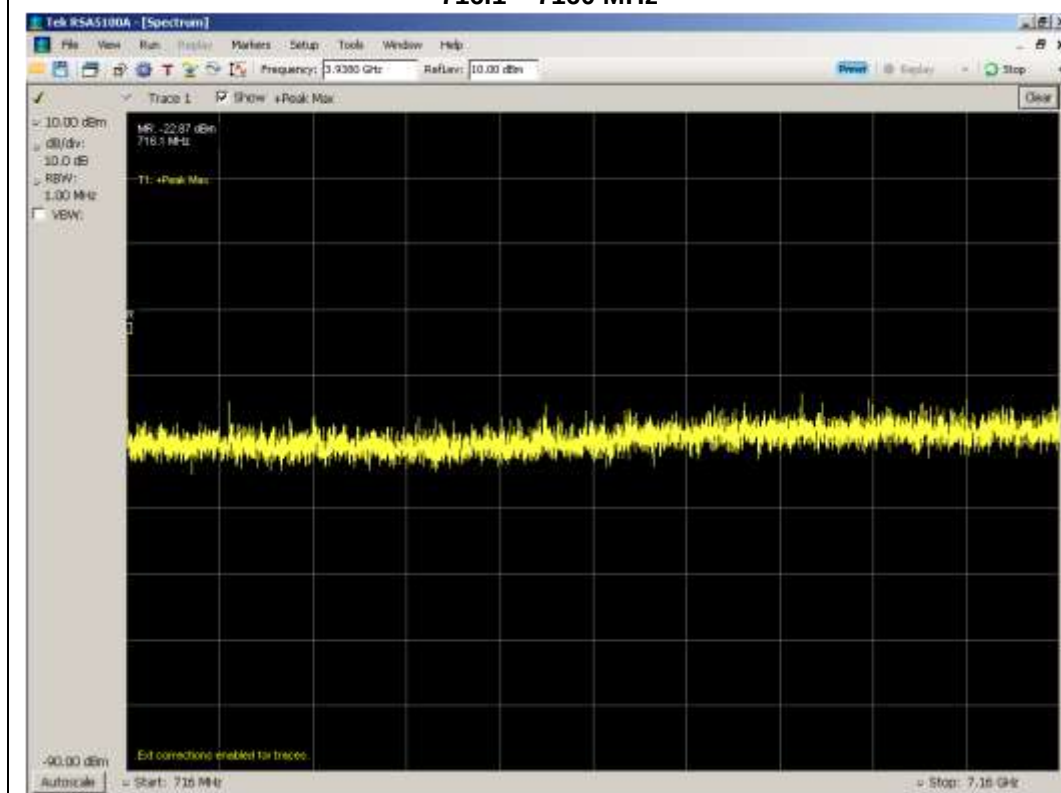
Uplink Test Plots

704 - 716 MHz Band

.009 – 697.9 MHz

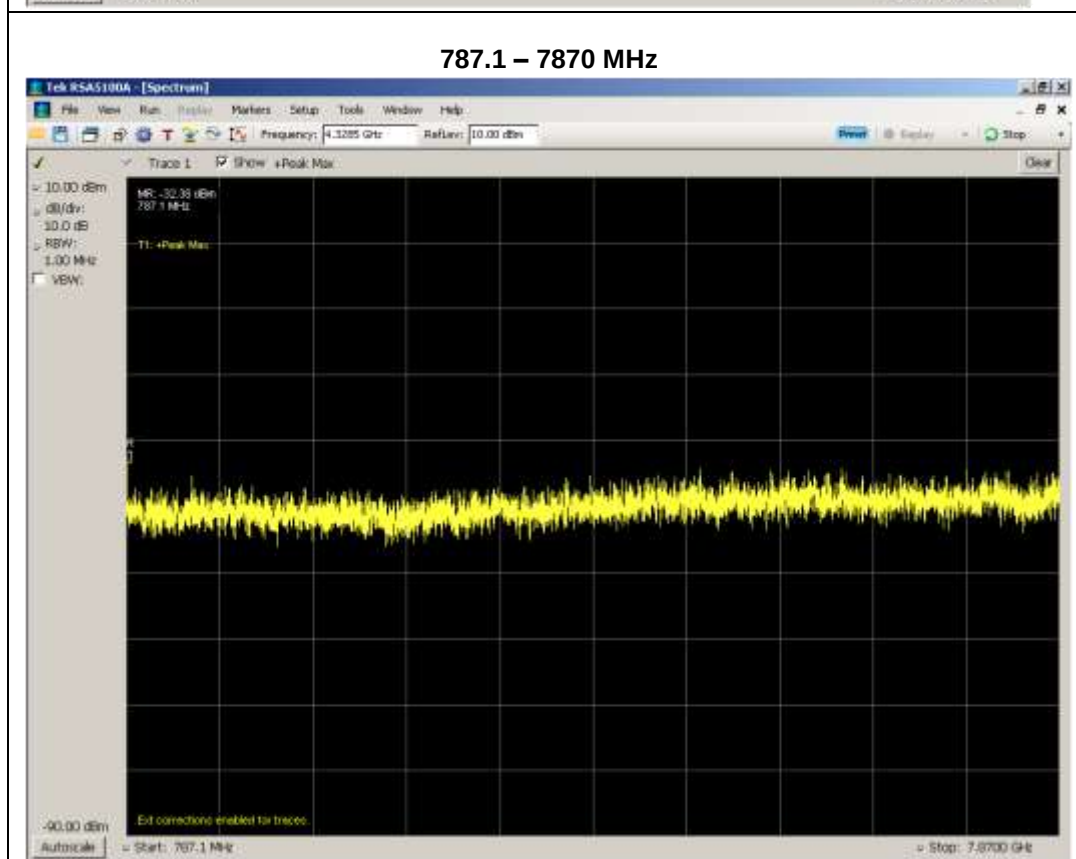
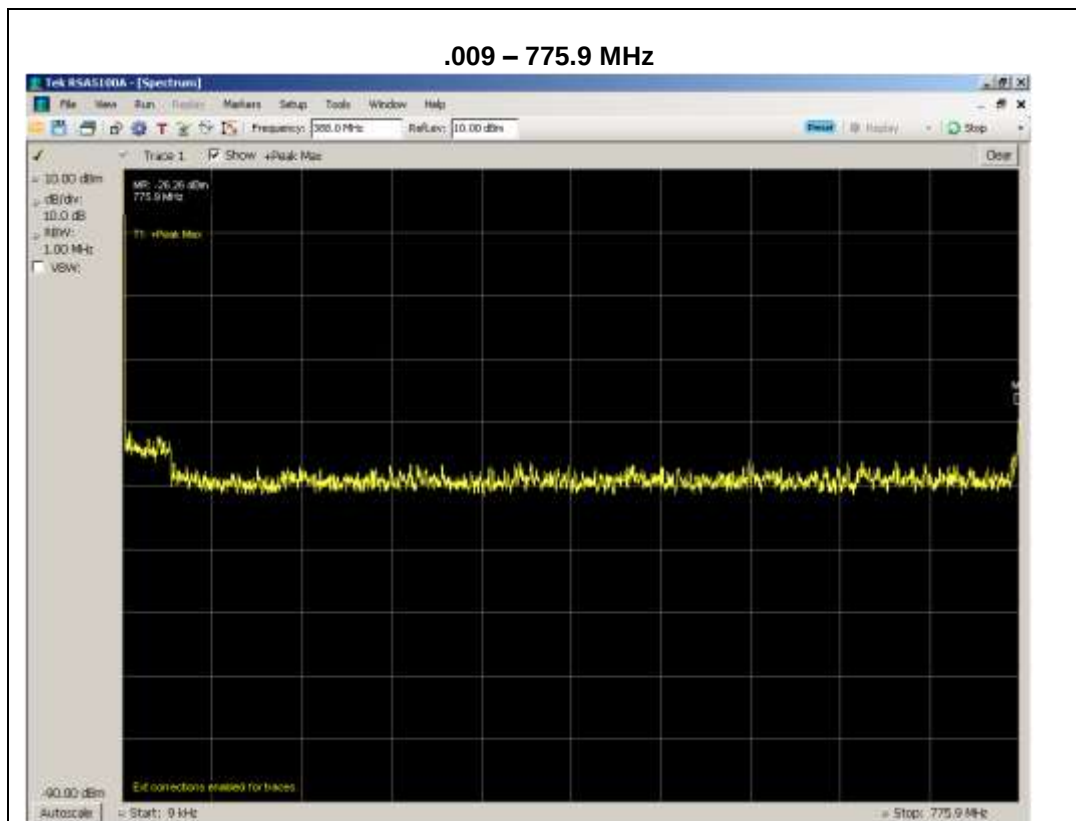


716.1 – 7160 MHz





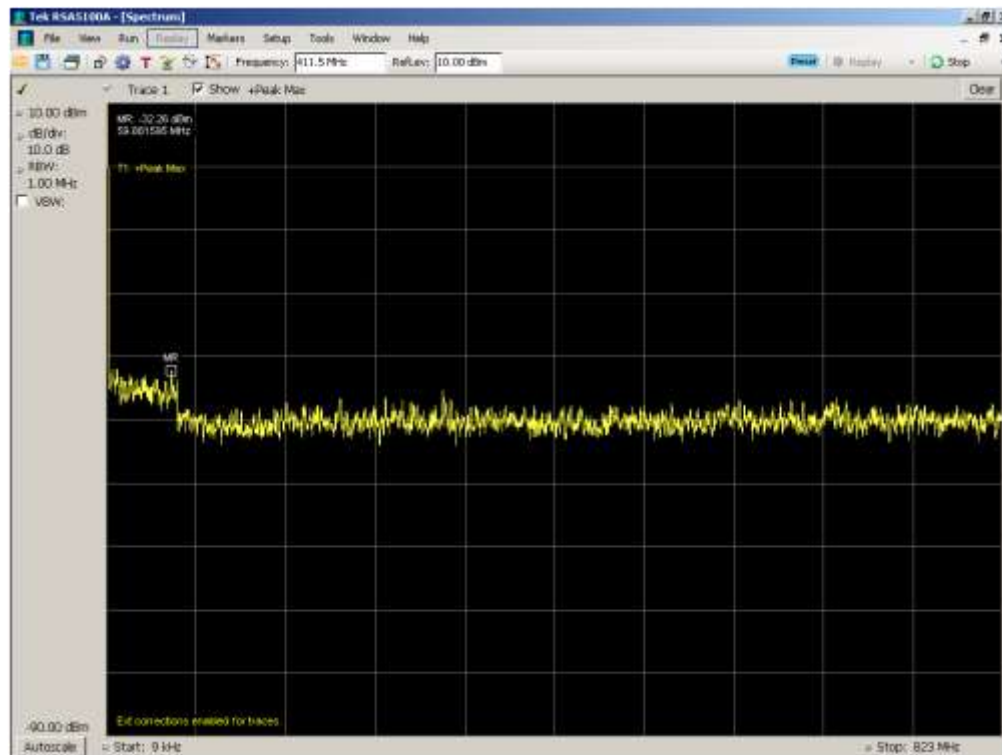
776 - 787 MHz Band



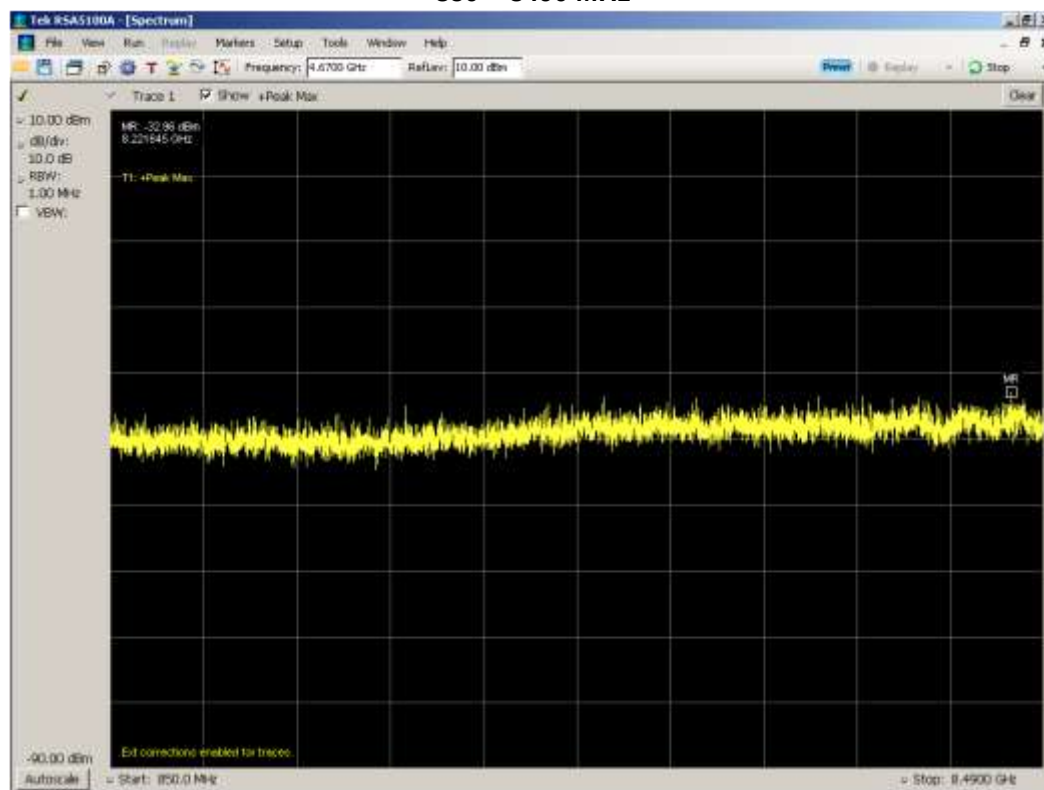


824 - 849 MHz Band

.009 – 823 MHz



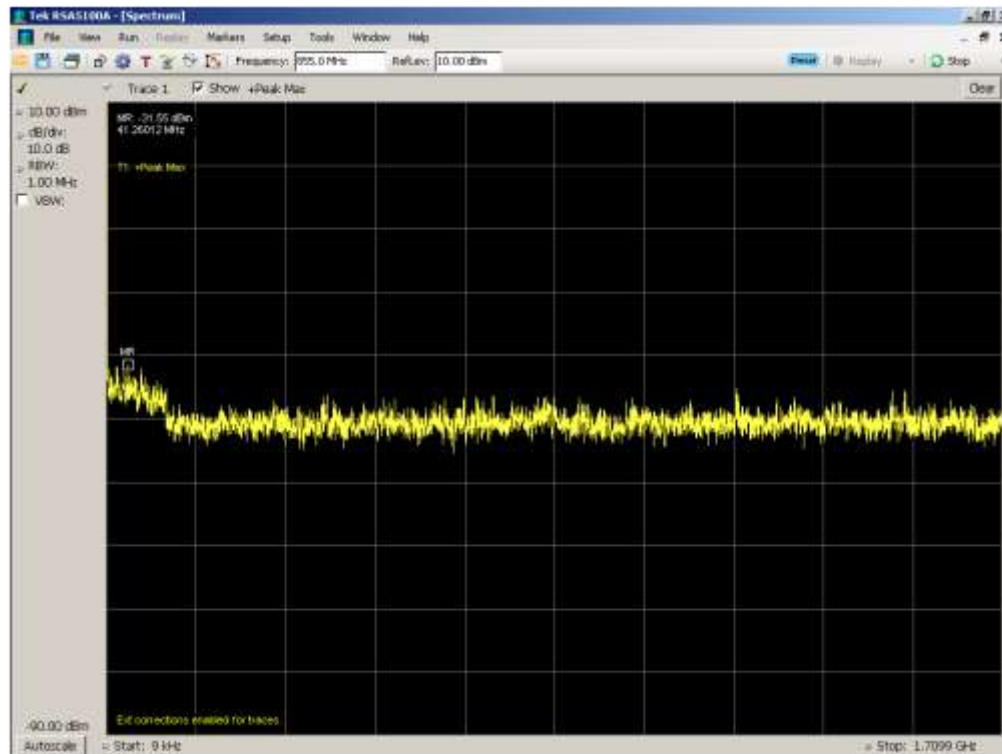
850 – 8490 MHz



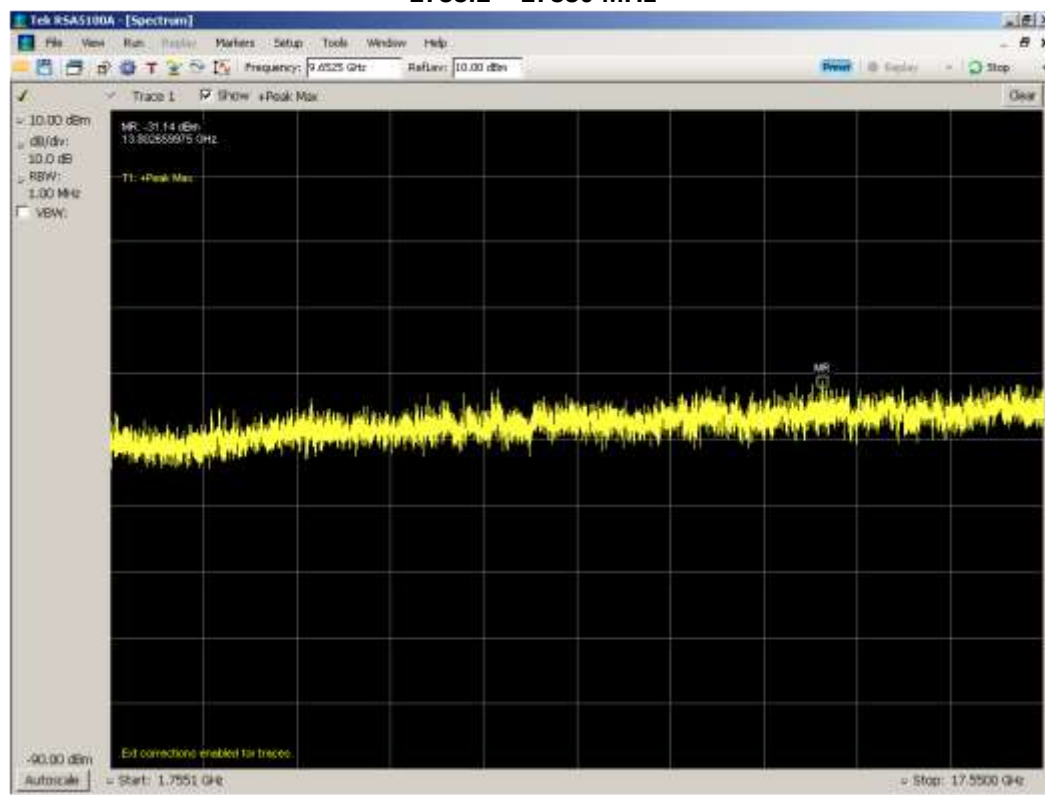


1710 - 1755 MHz Band

.009 – 1709.9 MHz



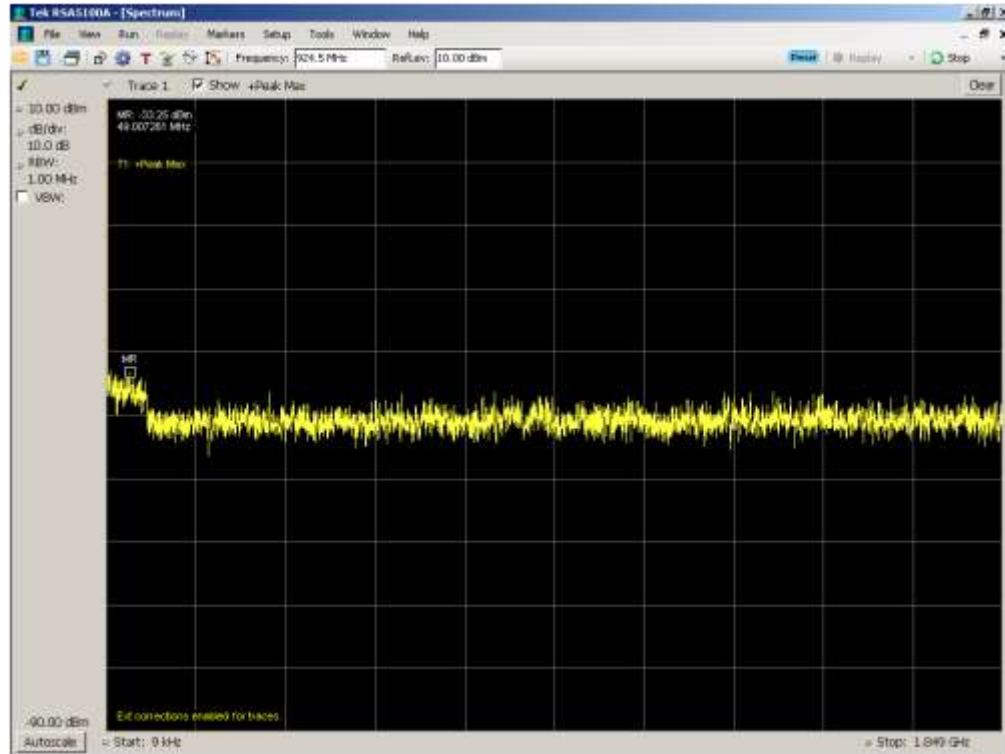
1755.1 – 17550 MHz



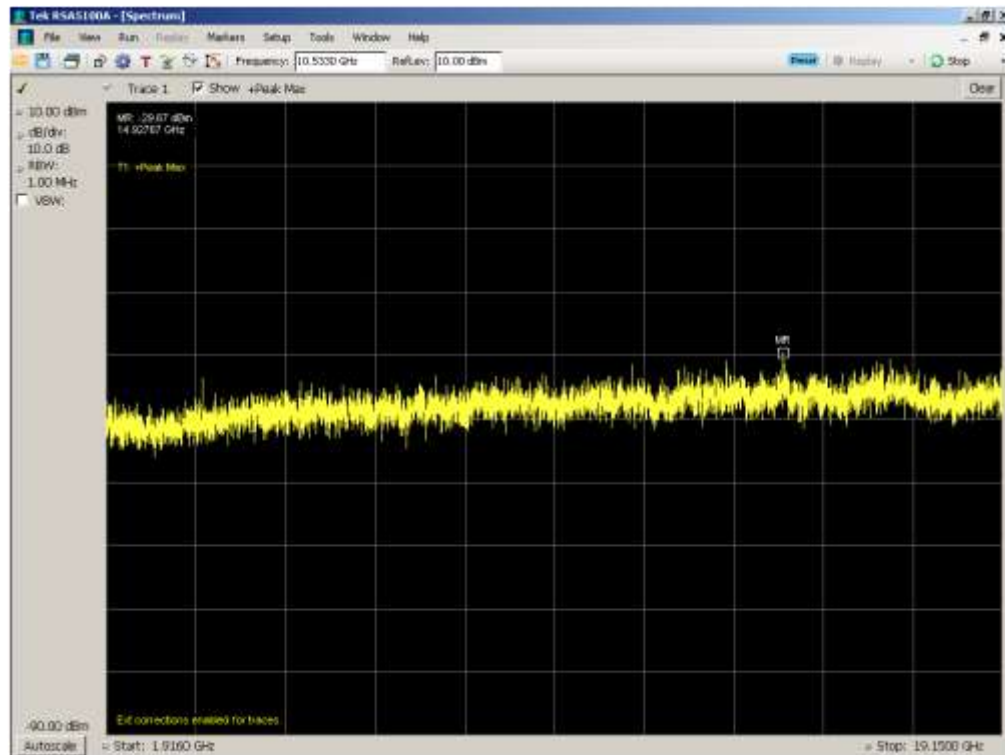


1850 - 1915 MHz Band

.009 – 1849 MHz



1916 – 19150 MHz

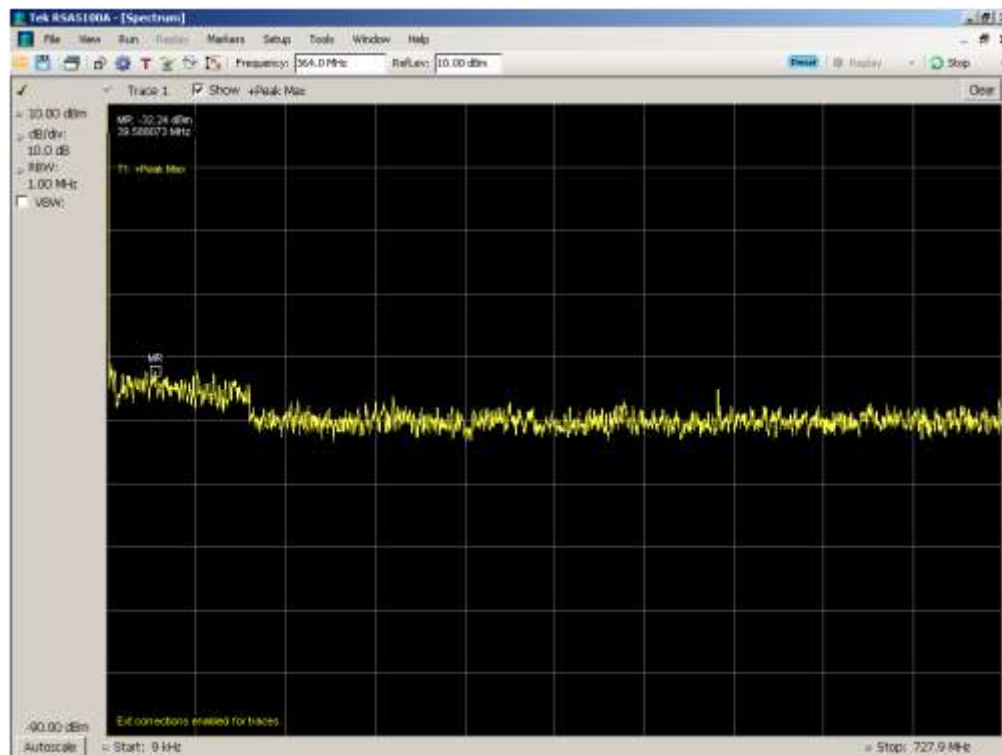




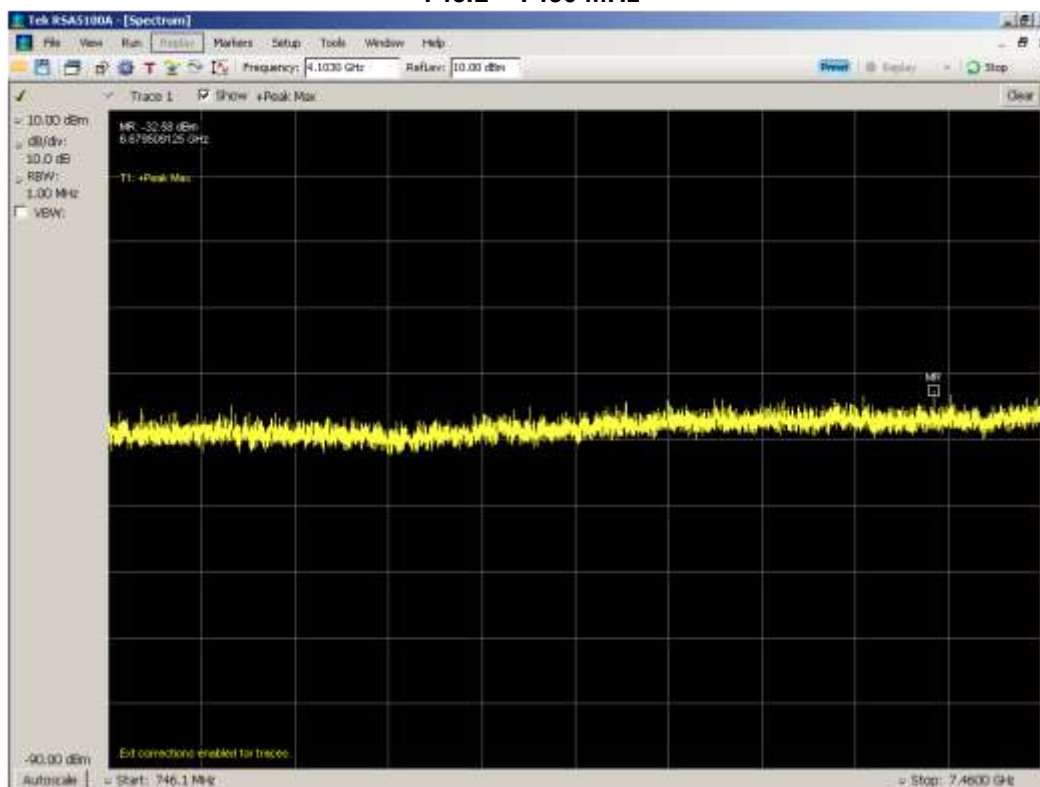
Downlink Test Plots

734 - 746 MHz Band

.009 – 727.9 MHz



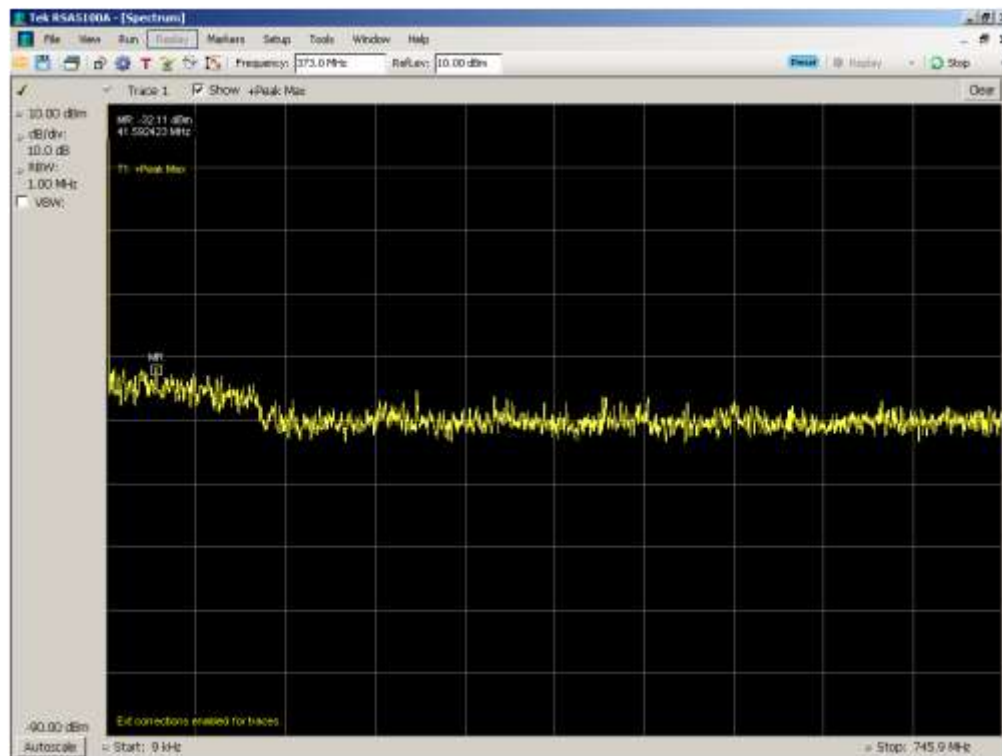
746.1 – 7460 MHz



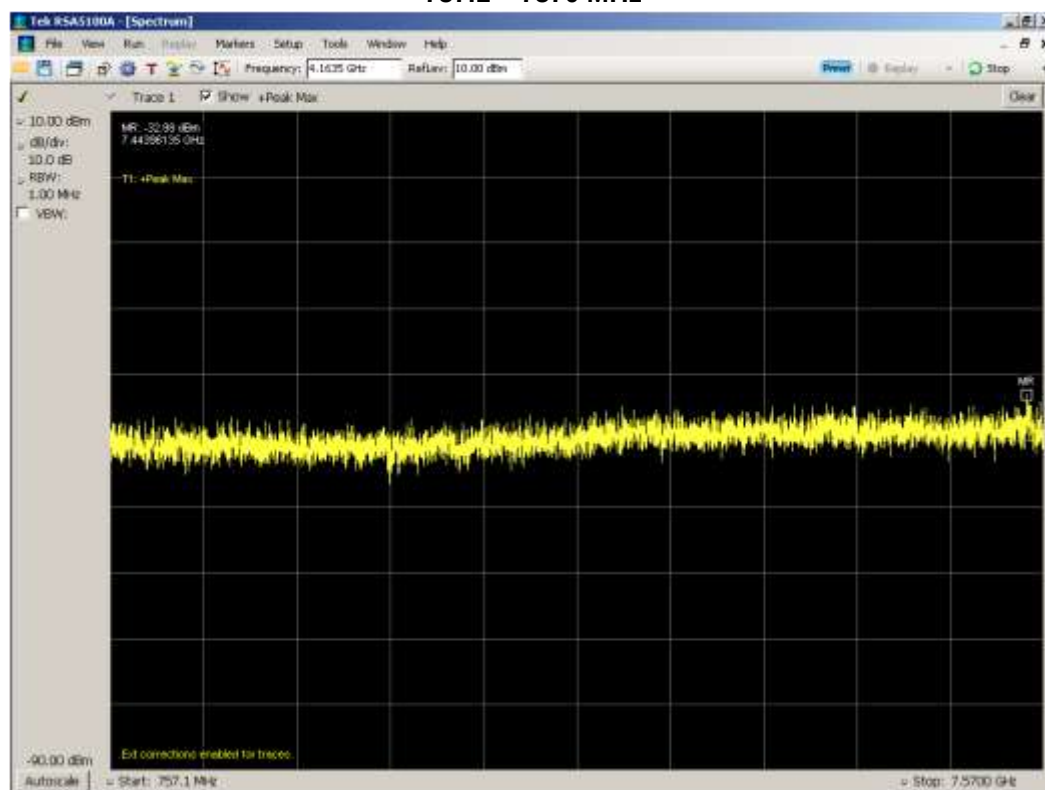


746 - 757 MHz Band

.009 – 745.9 MHz



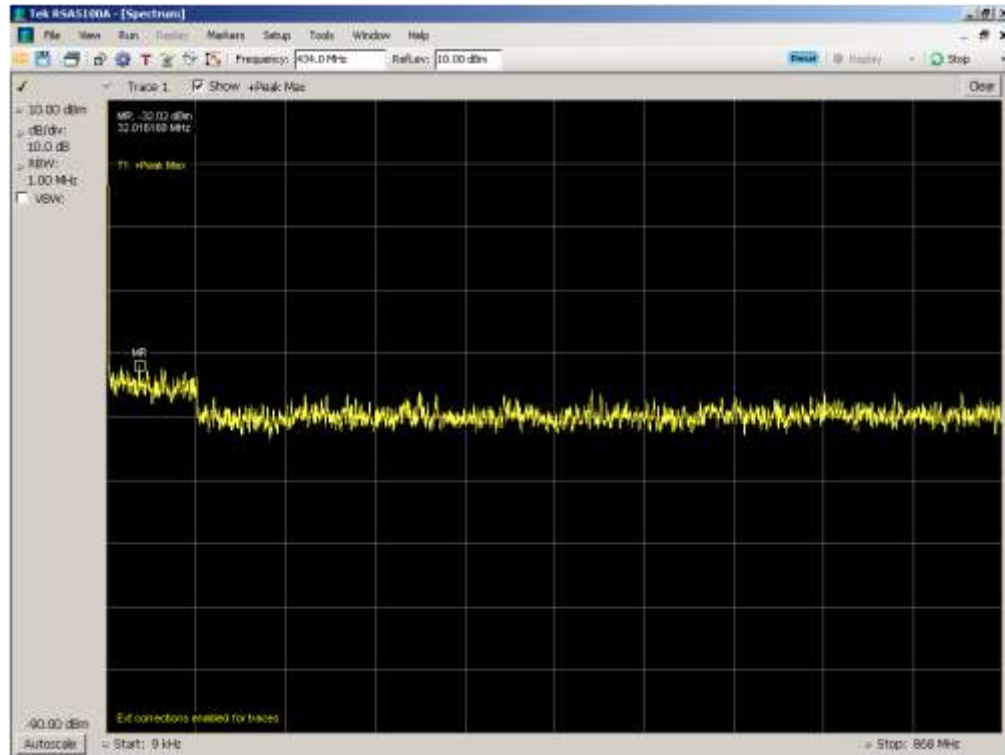
757.1 – 7570 MHz



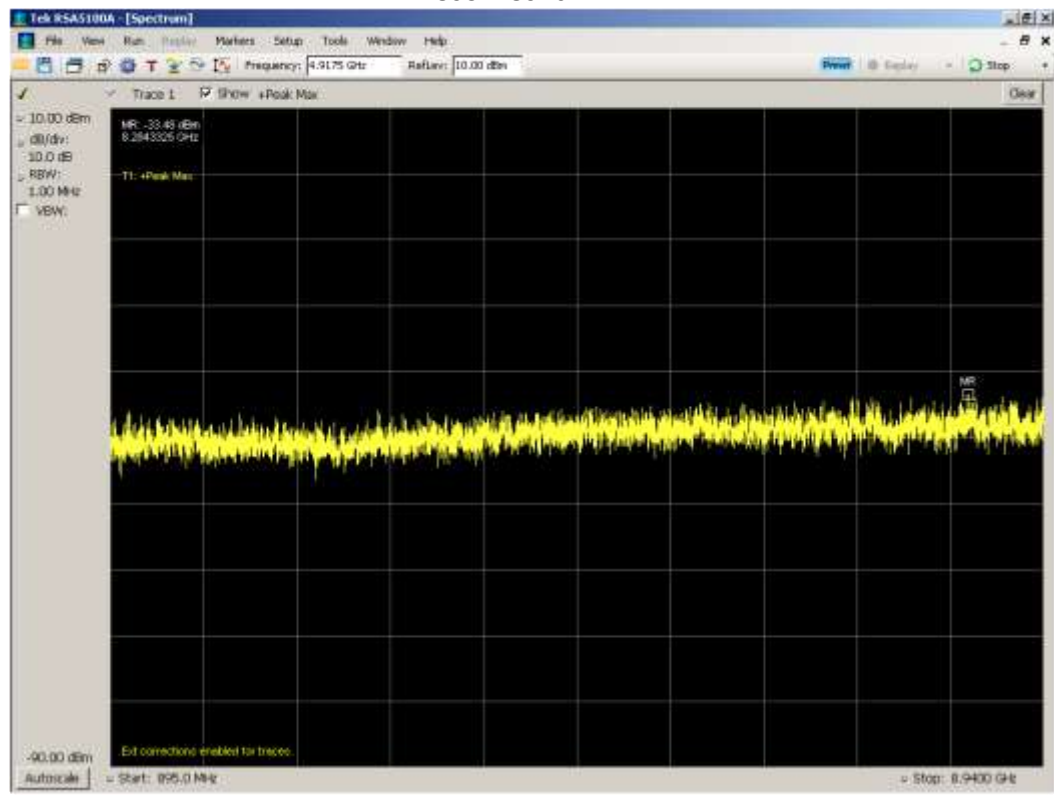


869 - 894 MHz Band

.009 – 868 MHz

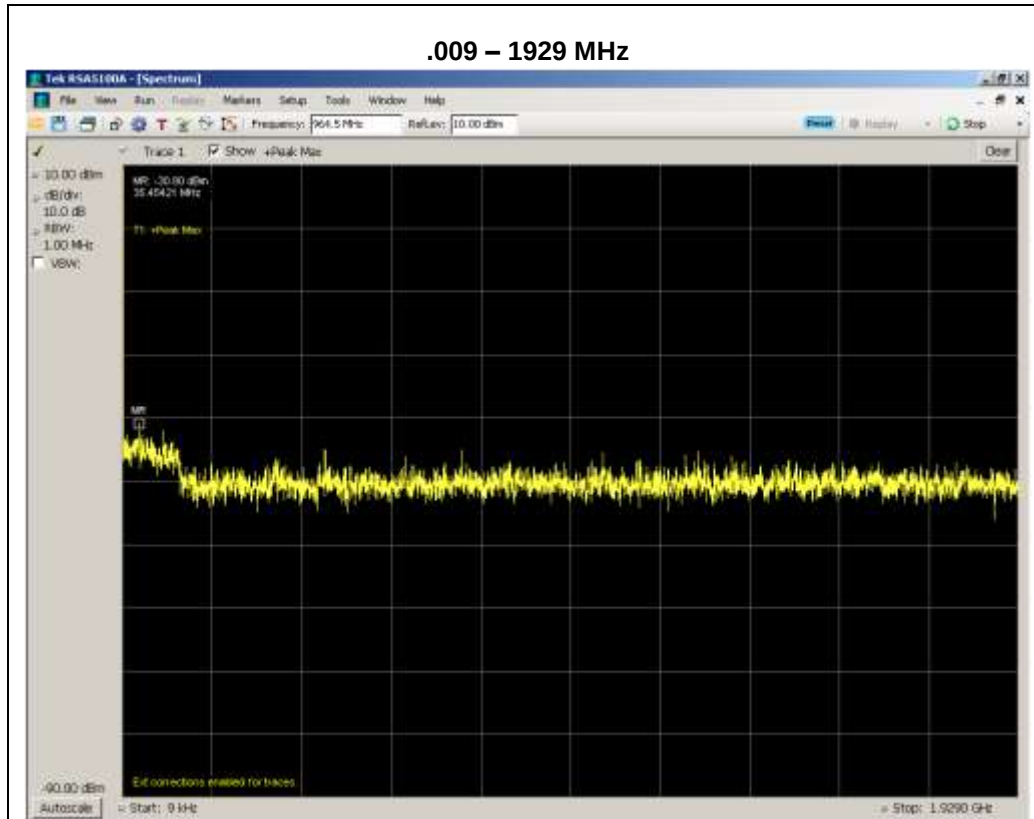


895 – 8940 MHz

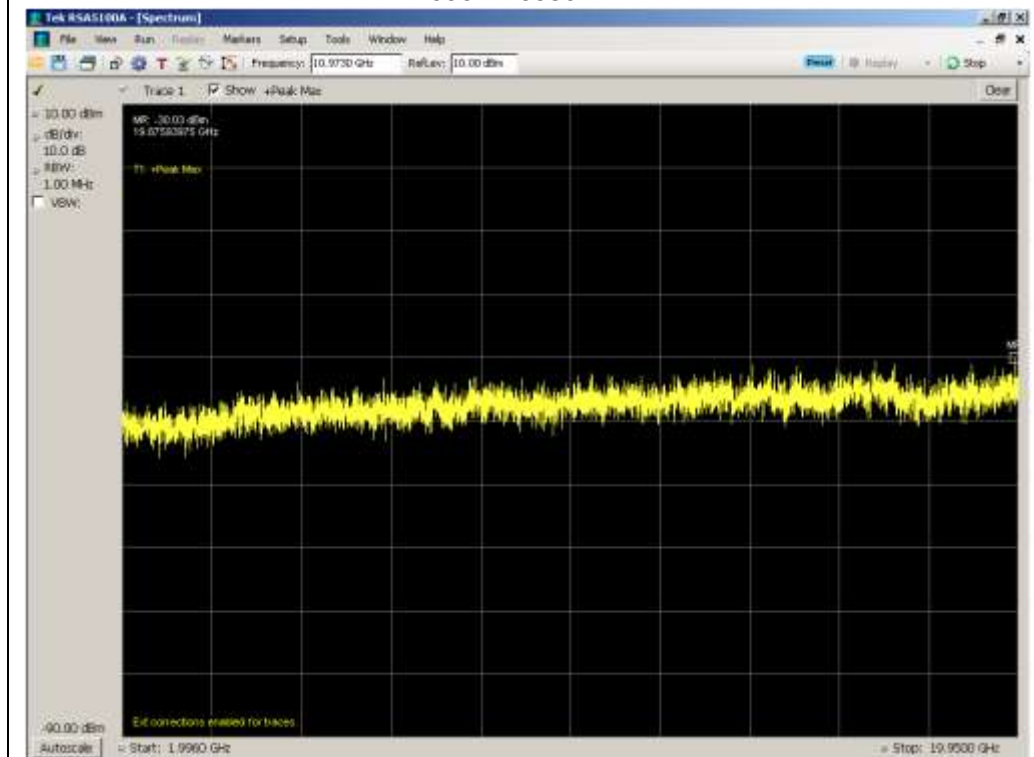




1930 - 1995 MHz Band

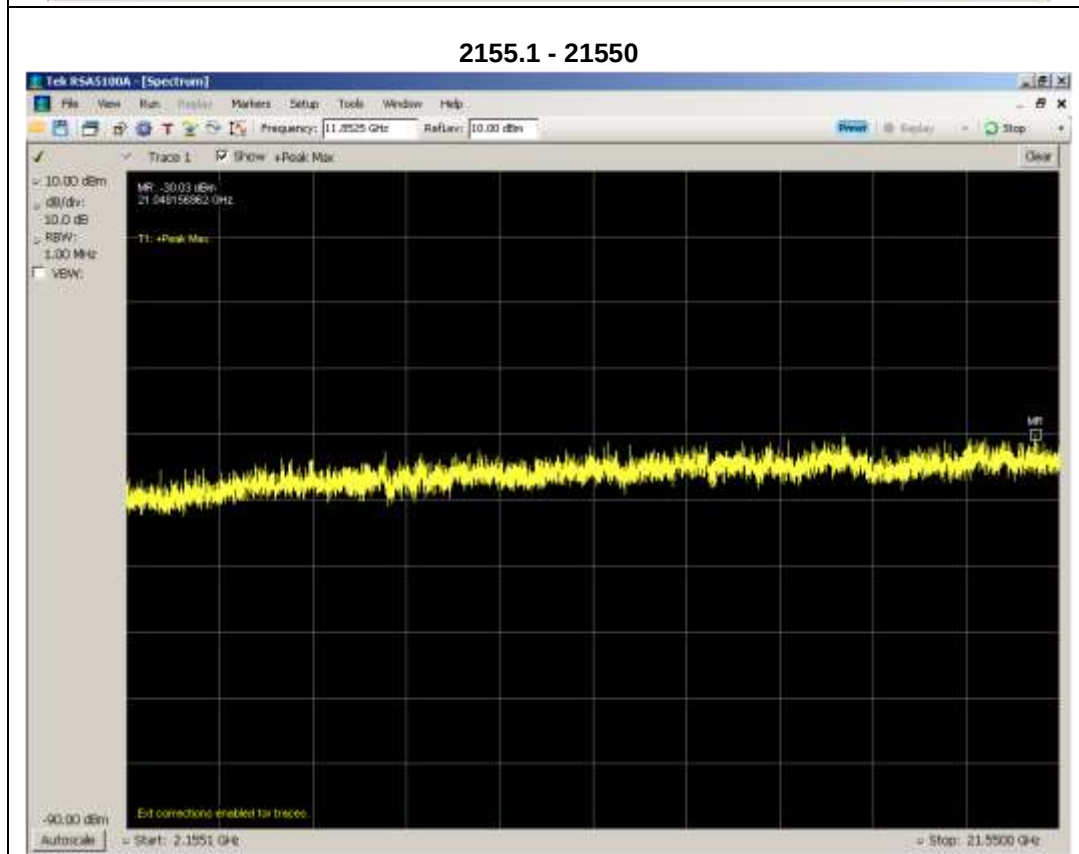
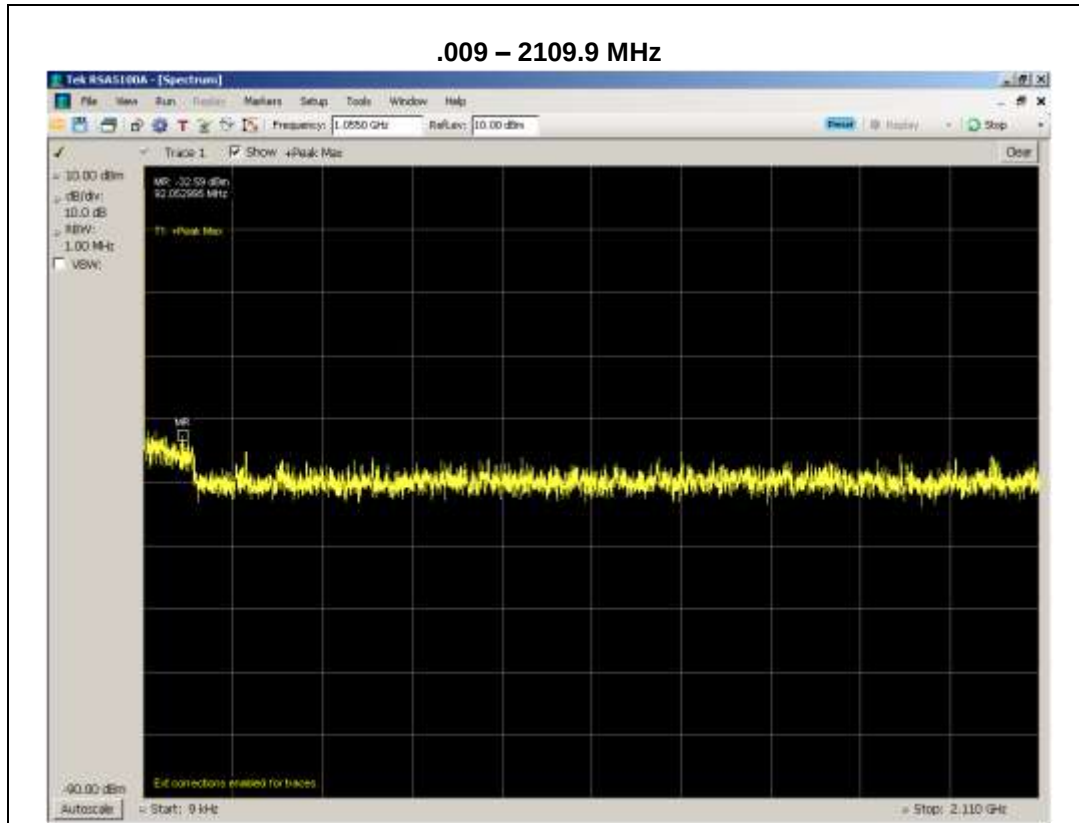


1996 – 19950 MHz





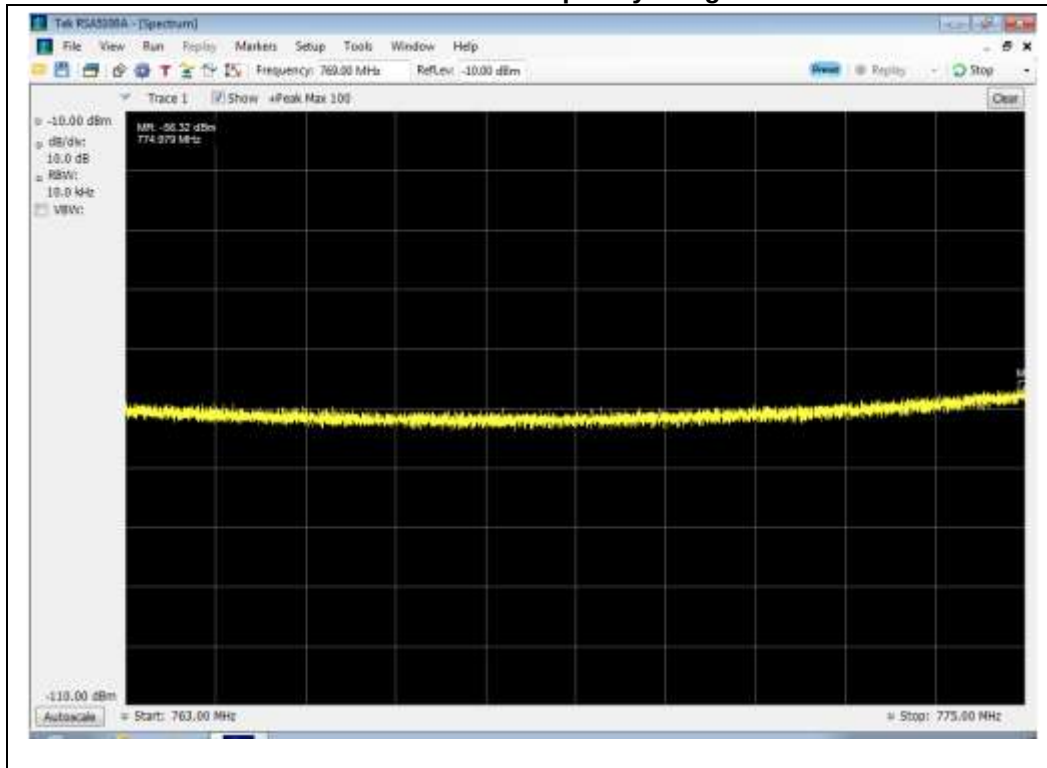
2110 - 2155 MHz Band



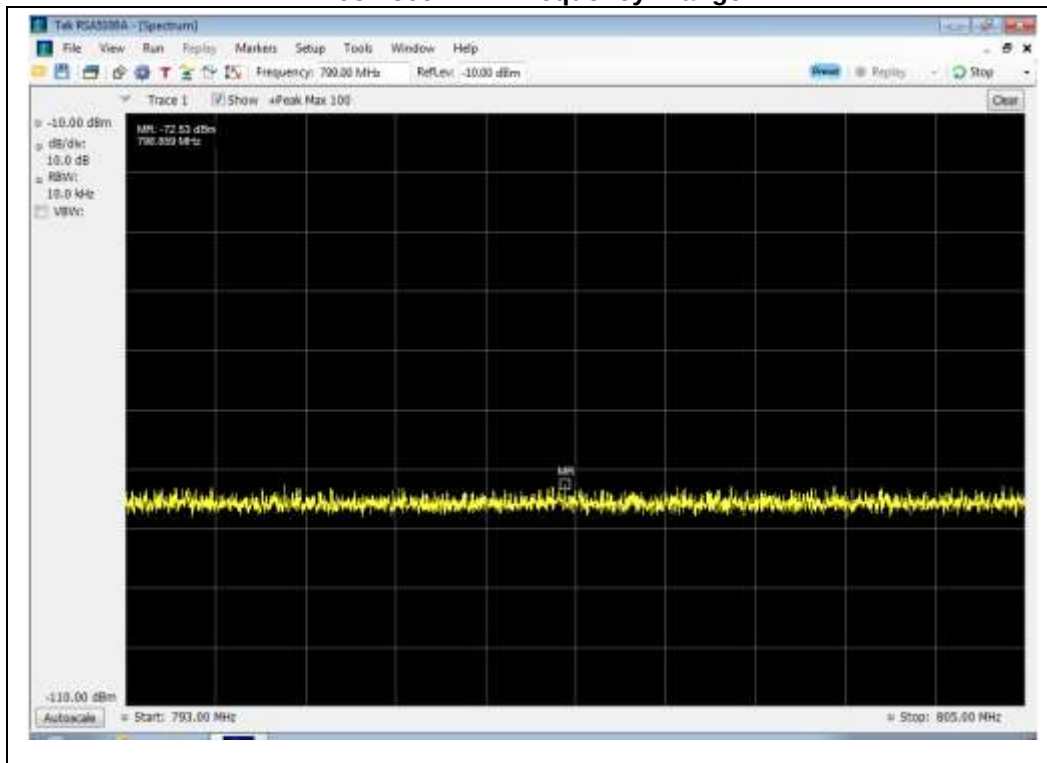


777 – 787 MHz Uplink Test Plots for the

763 - 775 MHz Frequency Range



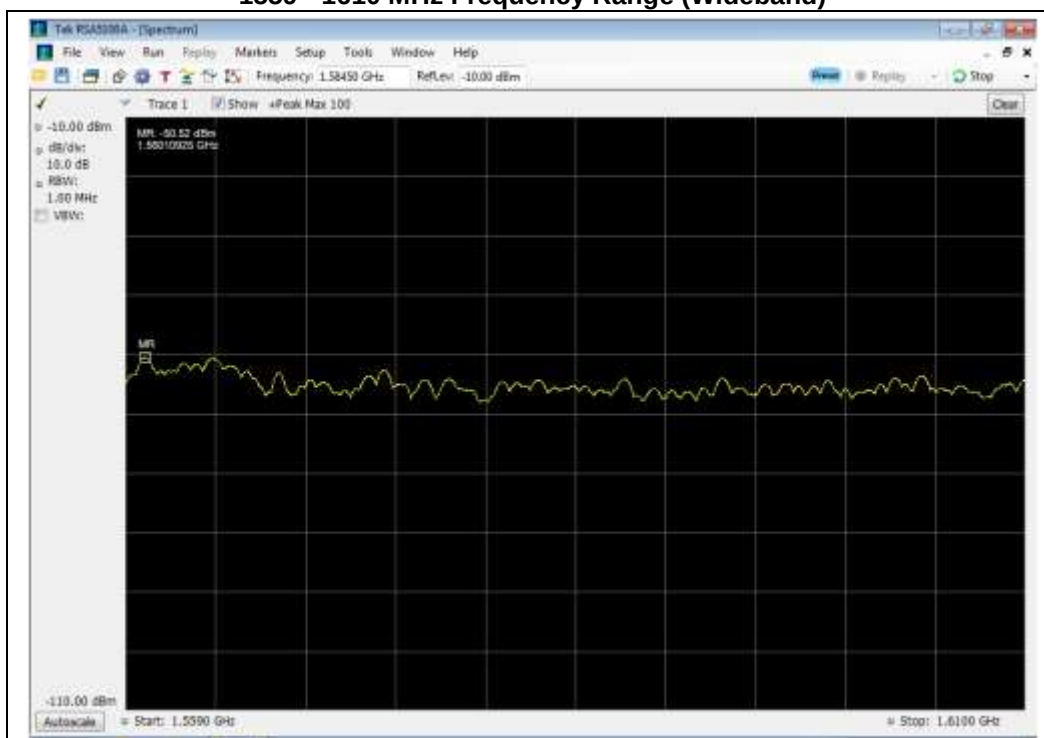
793 - 805 MHz Frequency Range



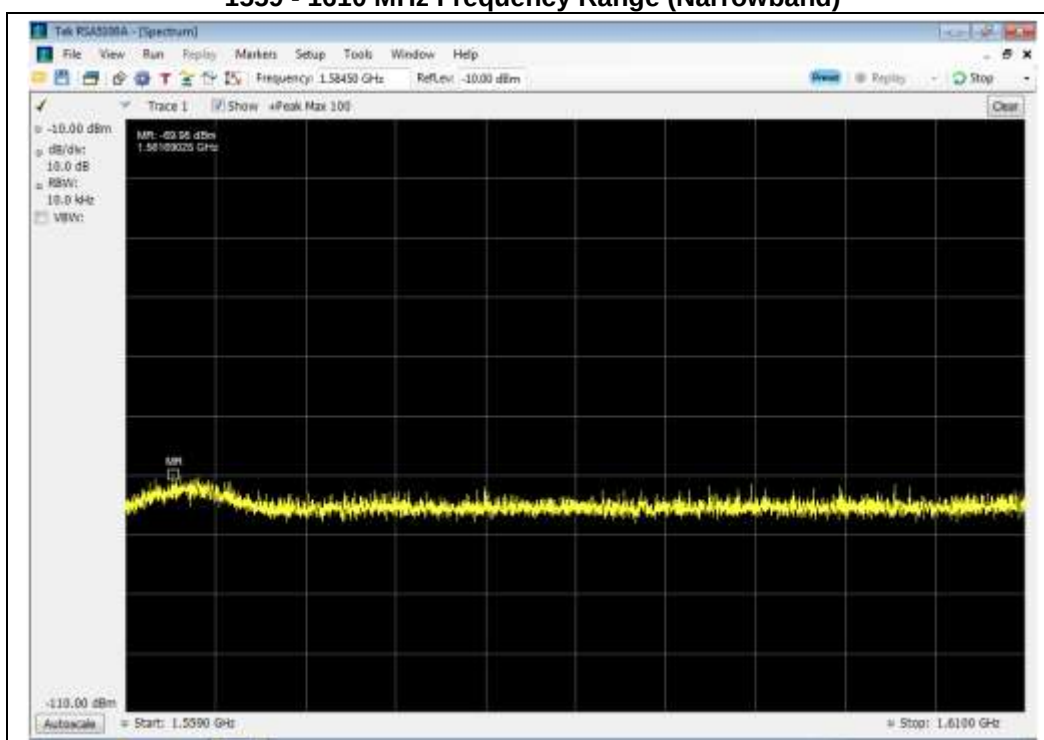


777 – 787 MHz Uplink Test Plots for the

1559 - 1610 MHz Frequency Range (Wideband)



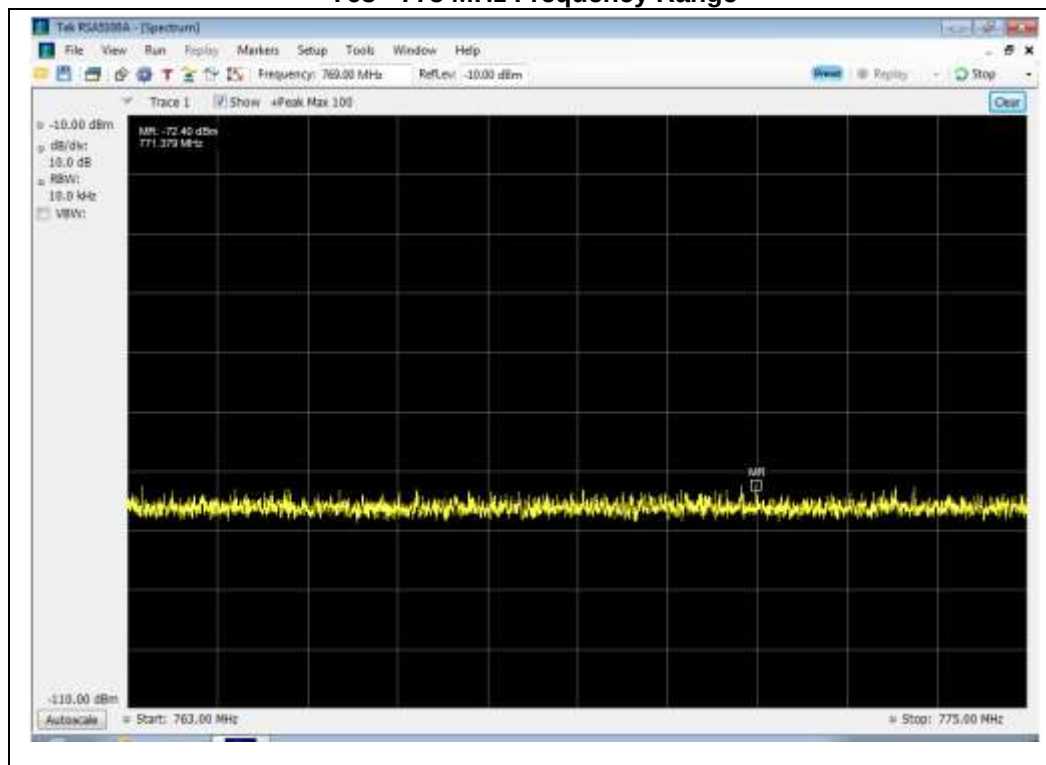
1559 - 1610 MHz Frequency Range (Narrowband)



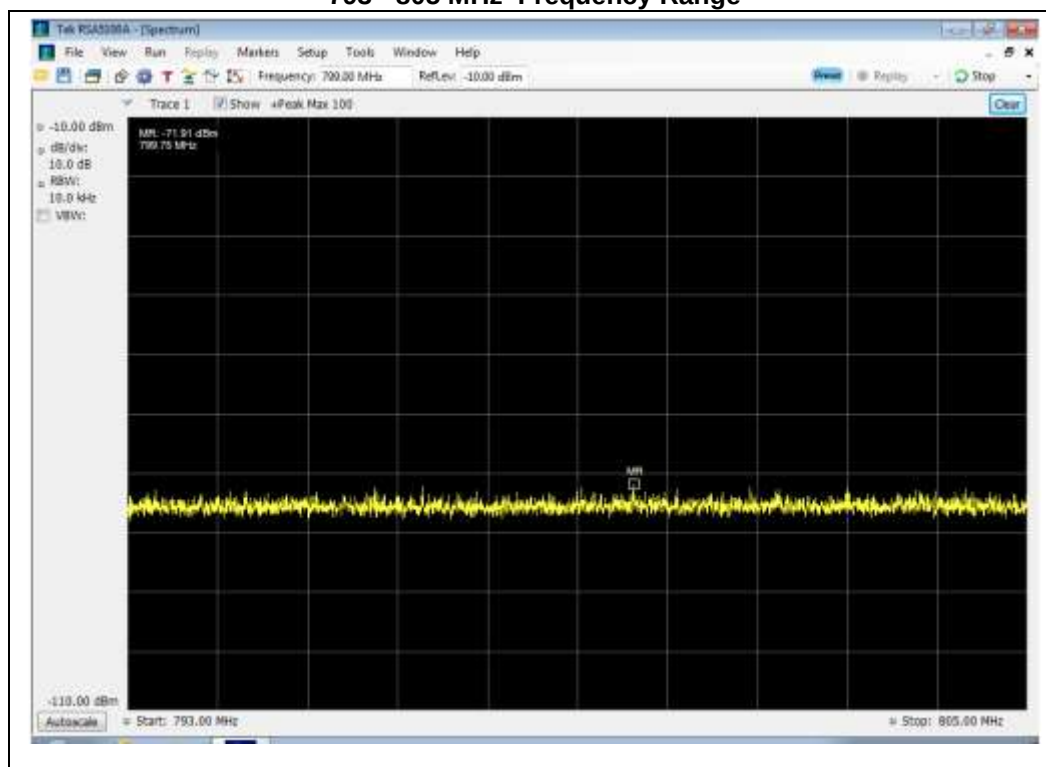


746 – 756 MHz Downlink Test Plots for the

763 - 775 MHz Frequency Range

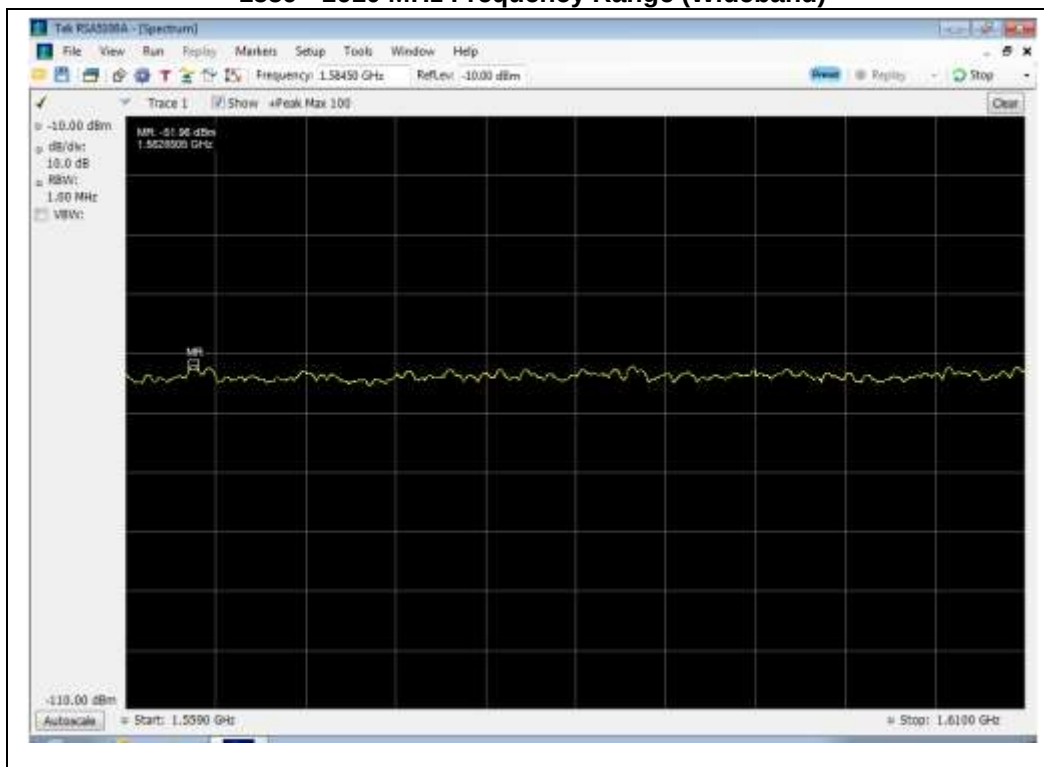


793 - 805 MHz Frequency Range

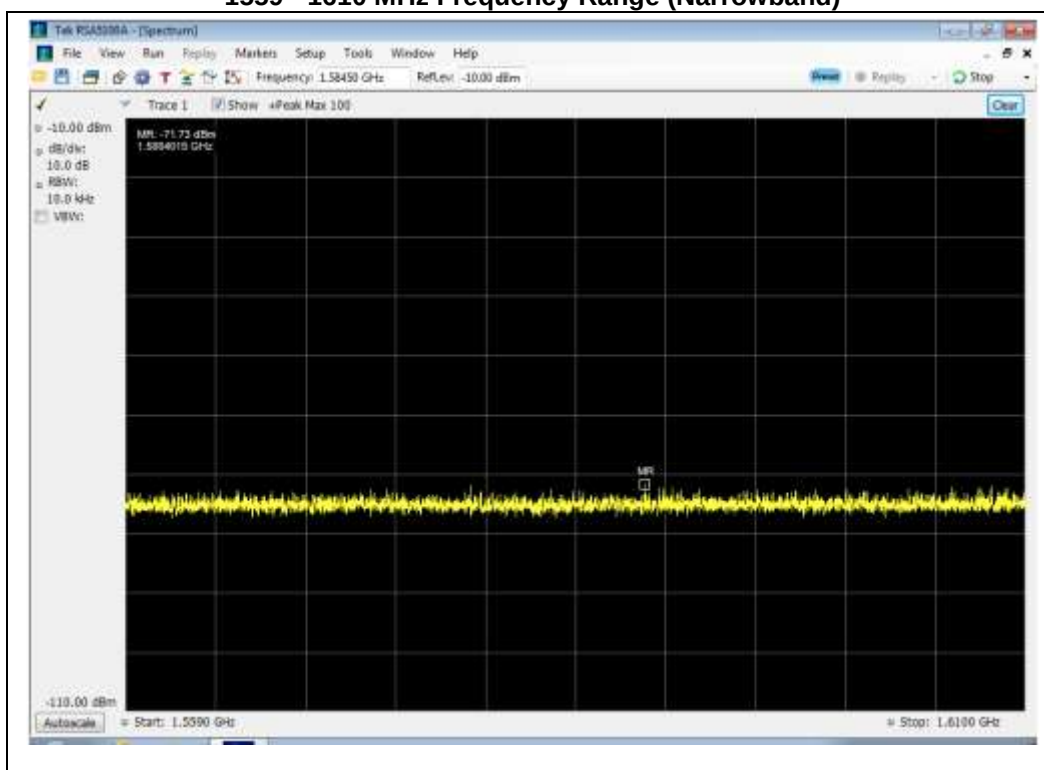




746 – 756 MHz Downlink Test Plots for the
1559 - 1610 MHz Frequency Range (Wideband)



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.

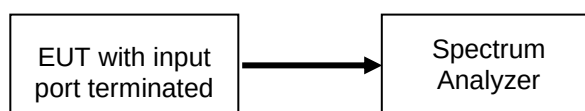
For the Uplink Noise Timing plots, the first marker (MR) is the reference marker where the Downlink signal level was increased and marker (M1) is the time it took the booster to react to the increase in the Downlink signal level per KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance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

The EUT is a mobile booster.

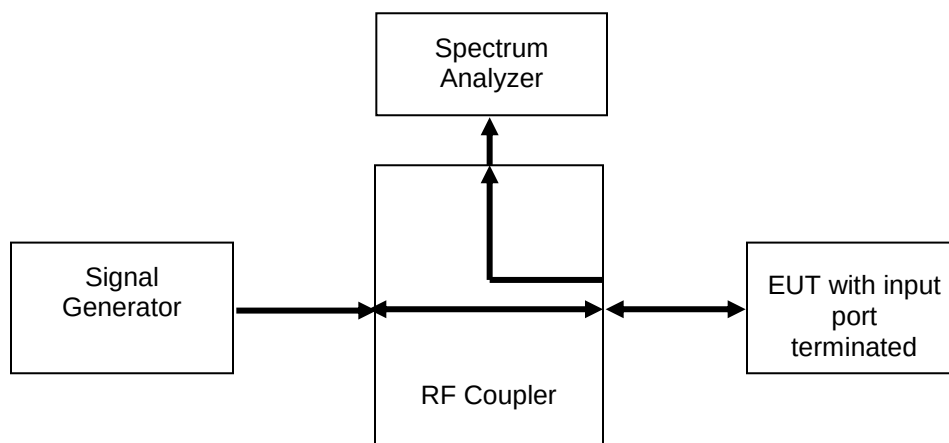
The noise power limit is fixed at -59 dBm for mobile boosters.

Test Setup

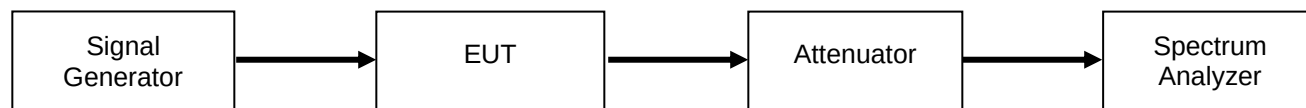
Maximum Noise Power



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

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-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

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-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

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-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

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-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

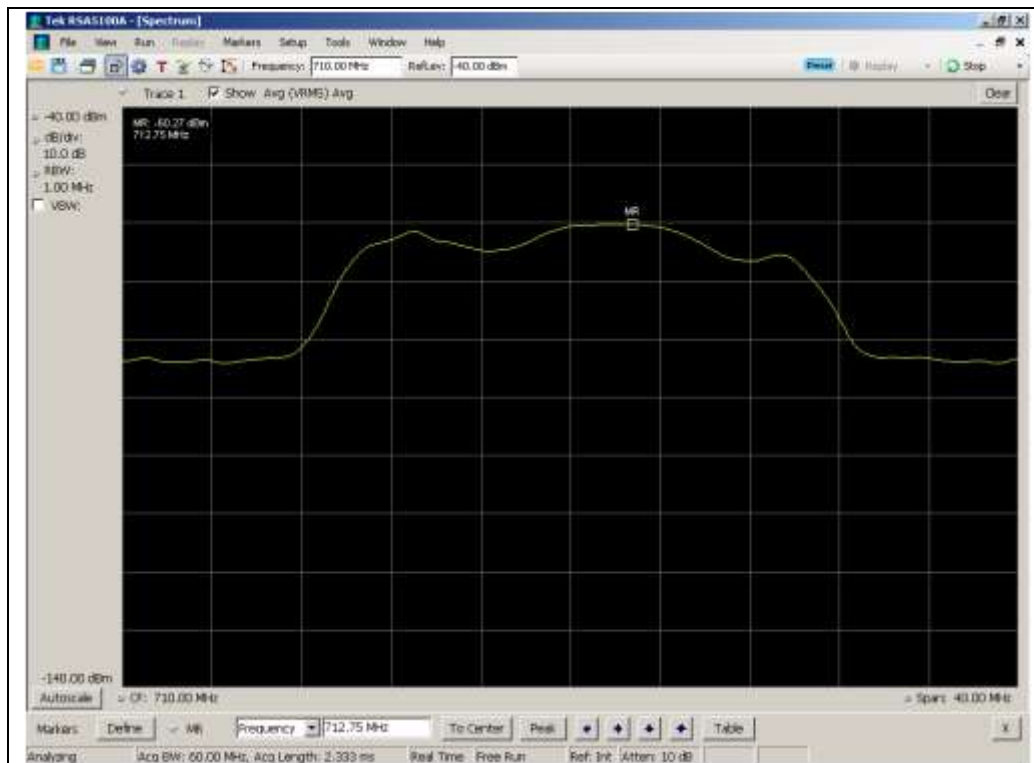
2110 - 2155 MHz

RSSI (dBm)	Noise Limit (dBm)	Measured Noise (dBm)	Margin (dB)
-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

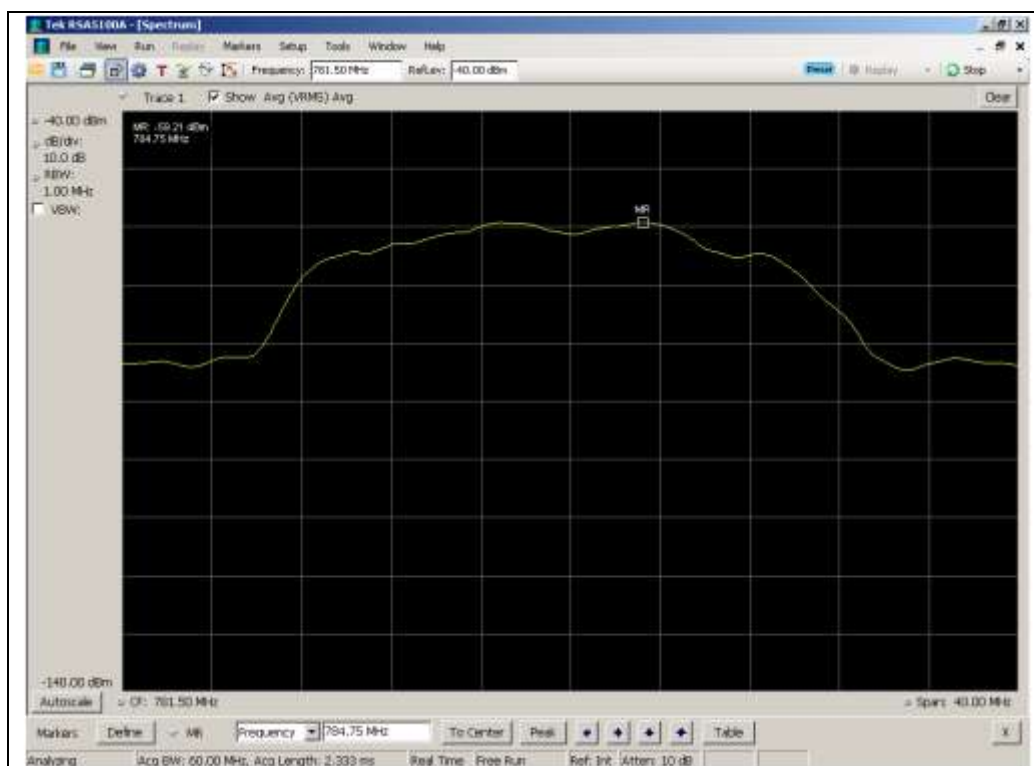


Maximum Uplink Noise Test Plots

704 - 716 MHz Band

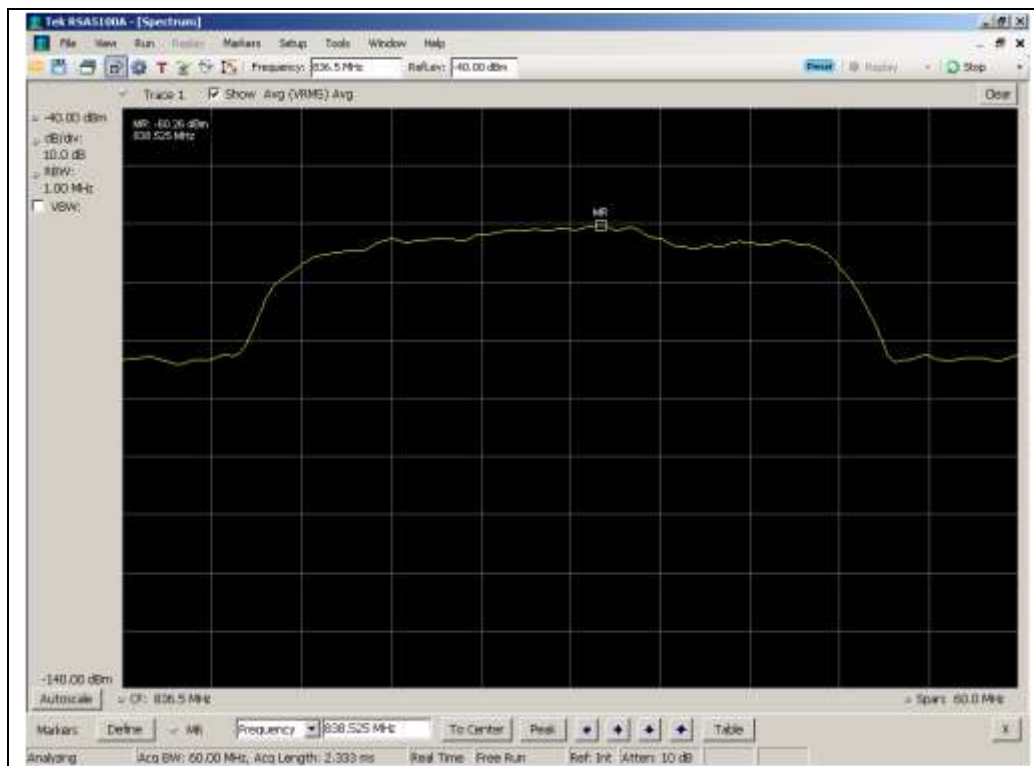


776 - 787 MHz Band

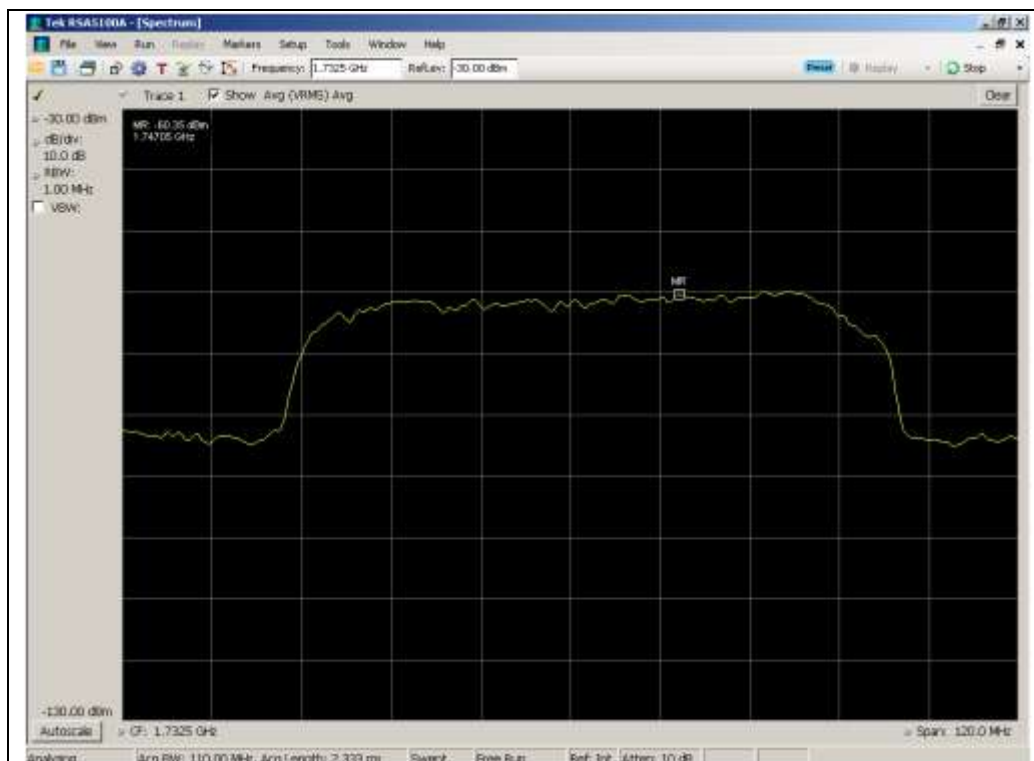




824 - 849 MHz Band



1710 - 1755 MHz Band



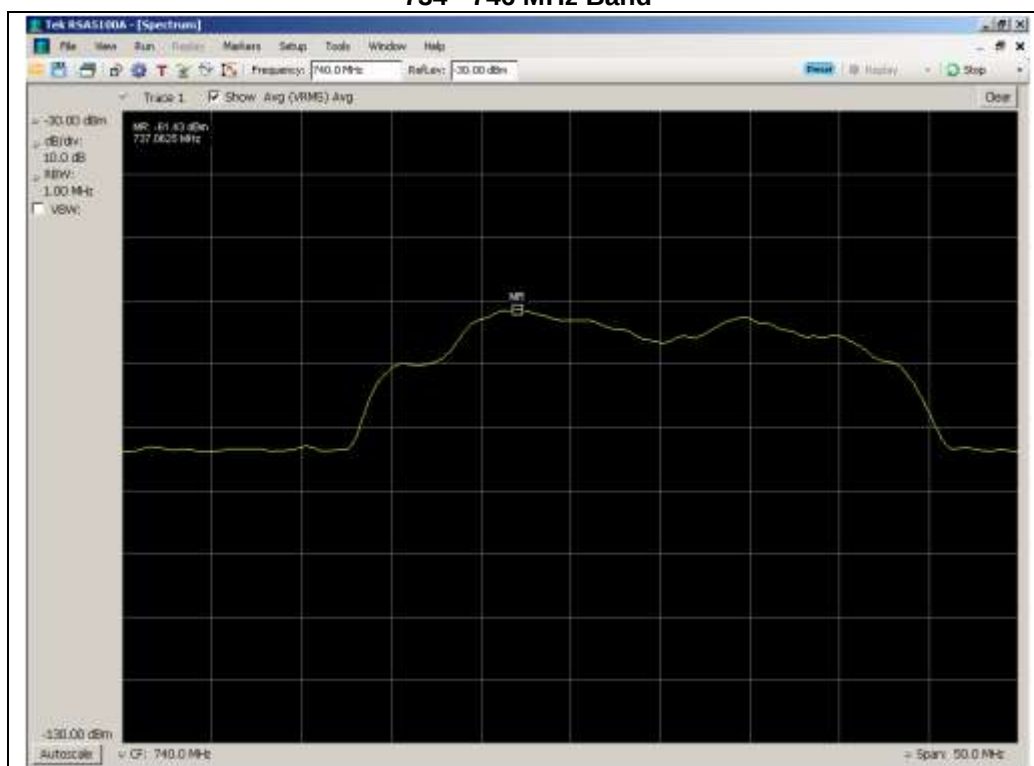


1850 - 1915 MHz Band



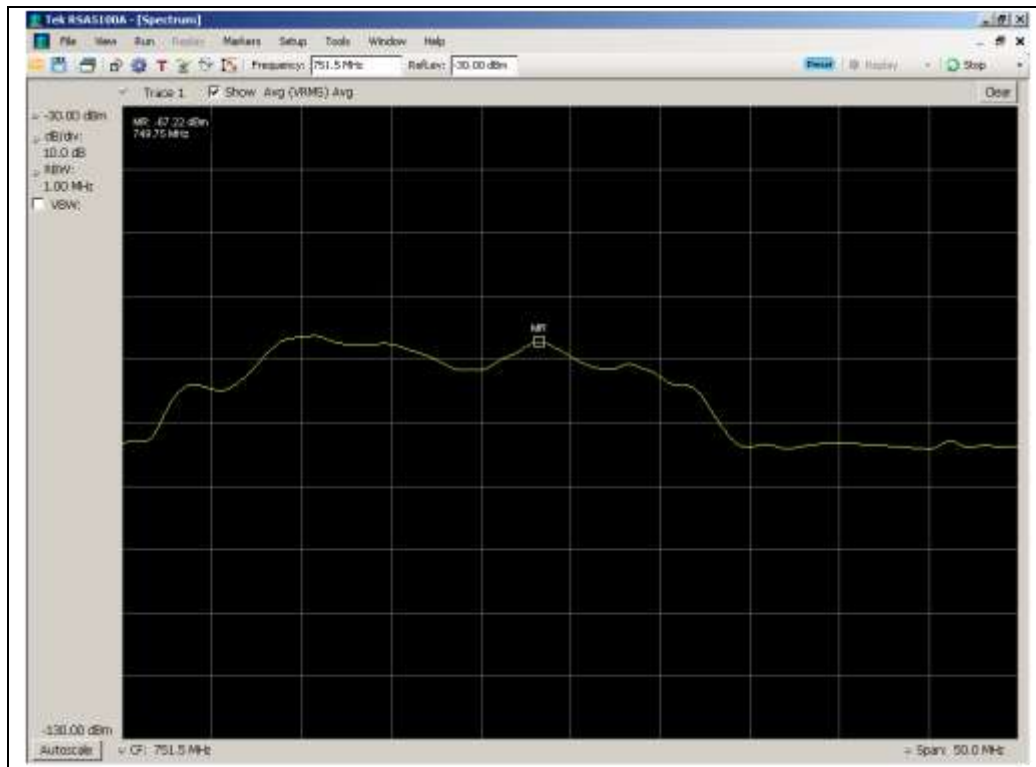
Maximum Downlink Noise Test Plots

734 - 746 MHz Band

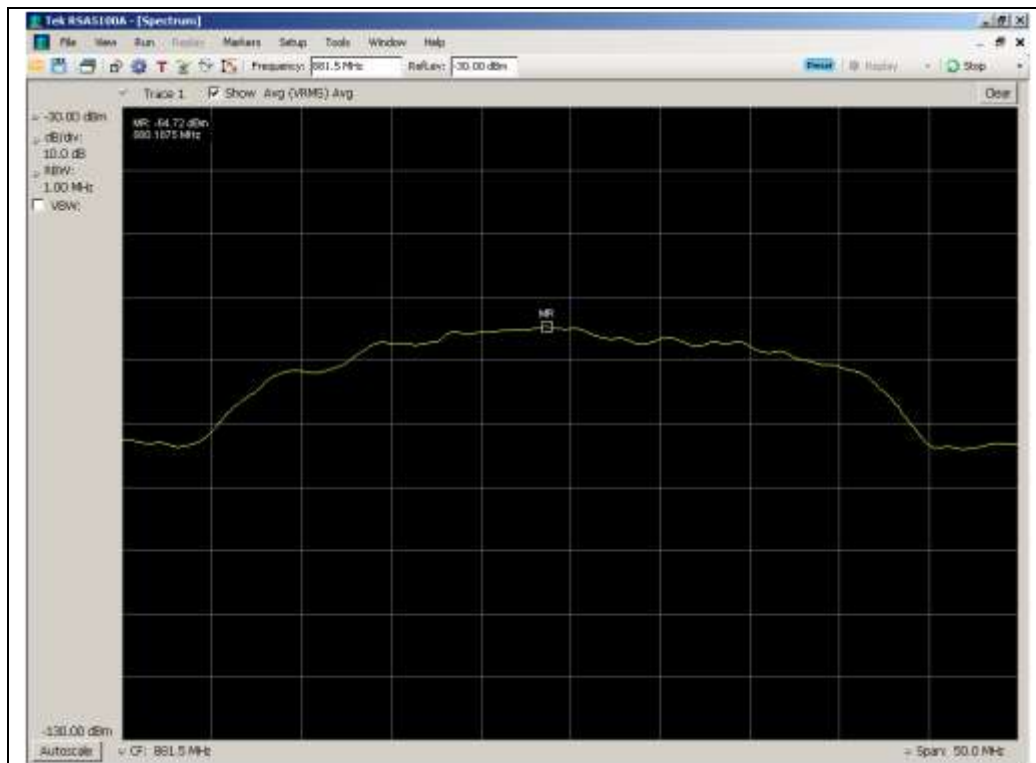




746 - 757 MHz Band

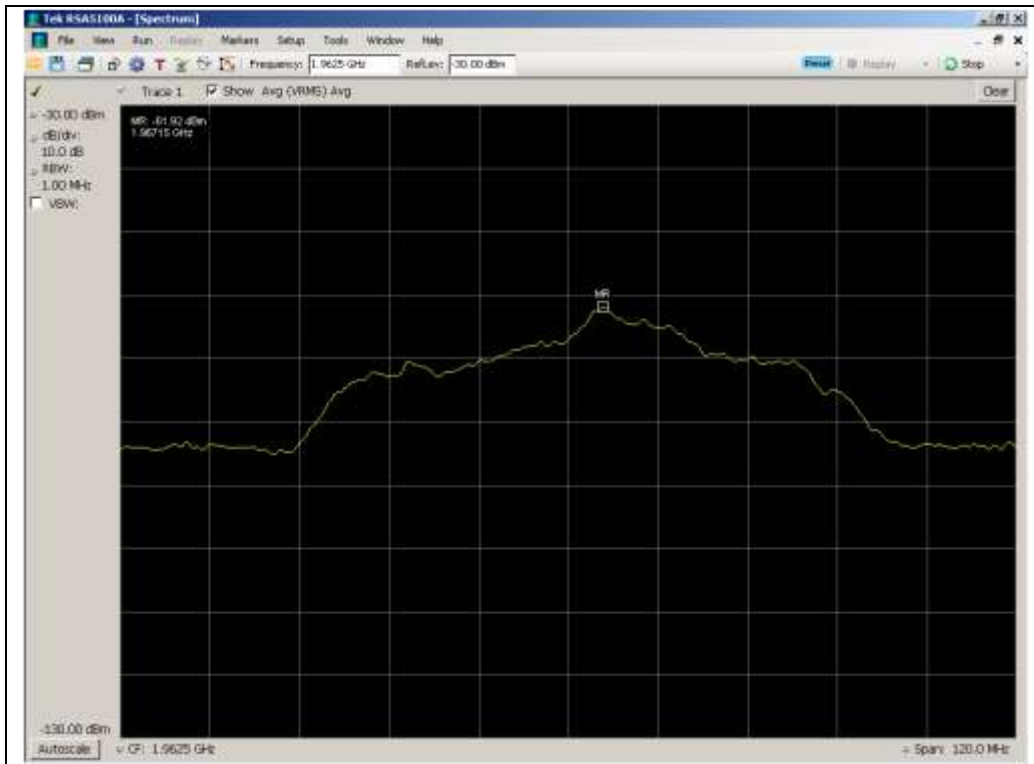


869 - 894 MHz Band

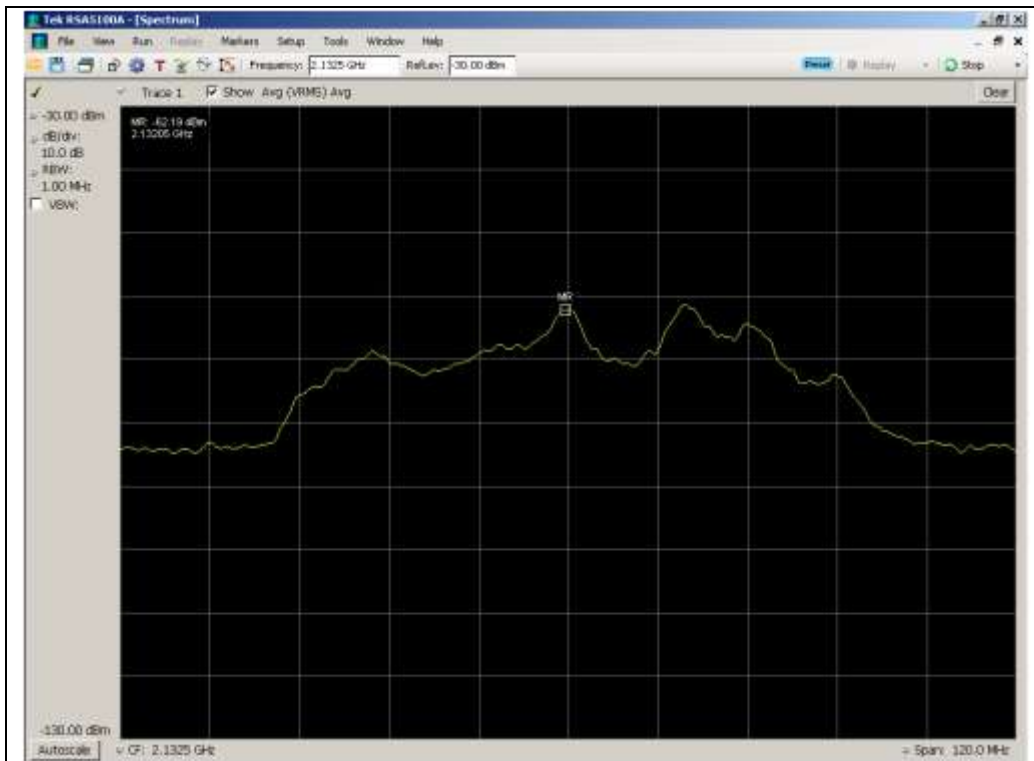




1930 - 1995 MHz Band



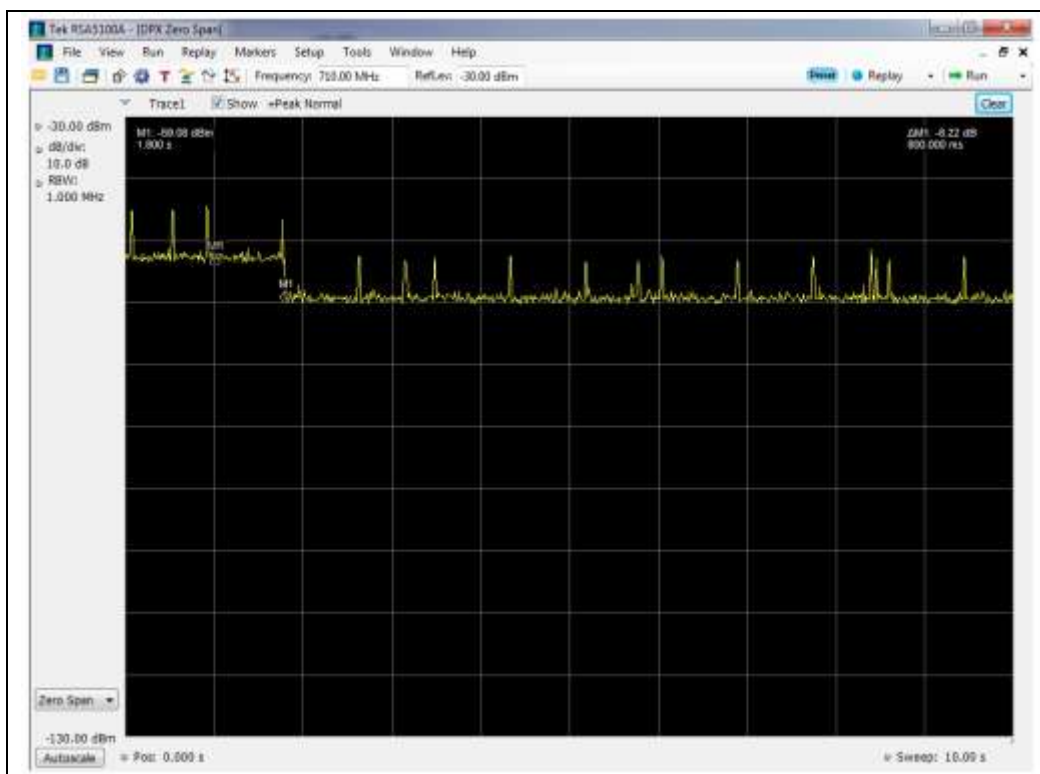
2110 - 2155 MHz Band



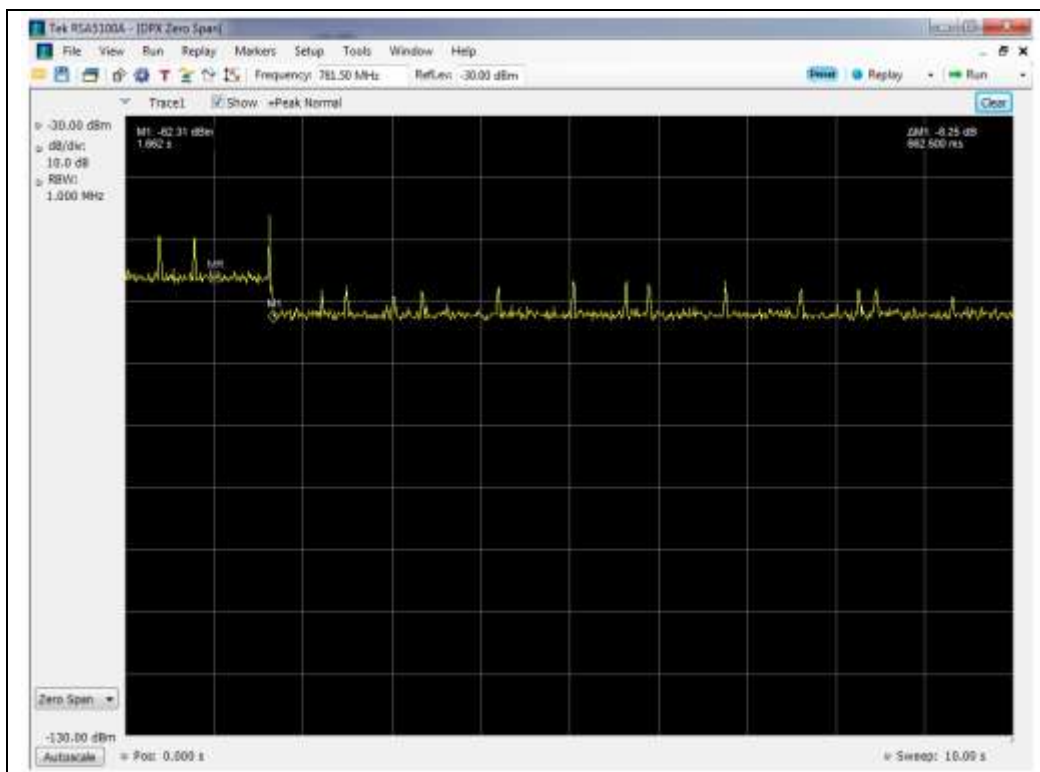


Uplink Noise Timing Test Plots

704 - 716 MHz Band

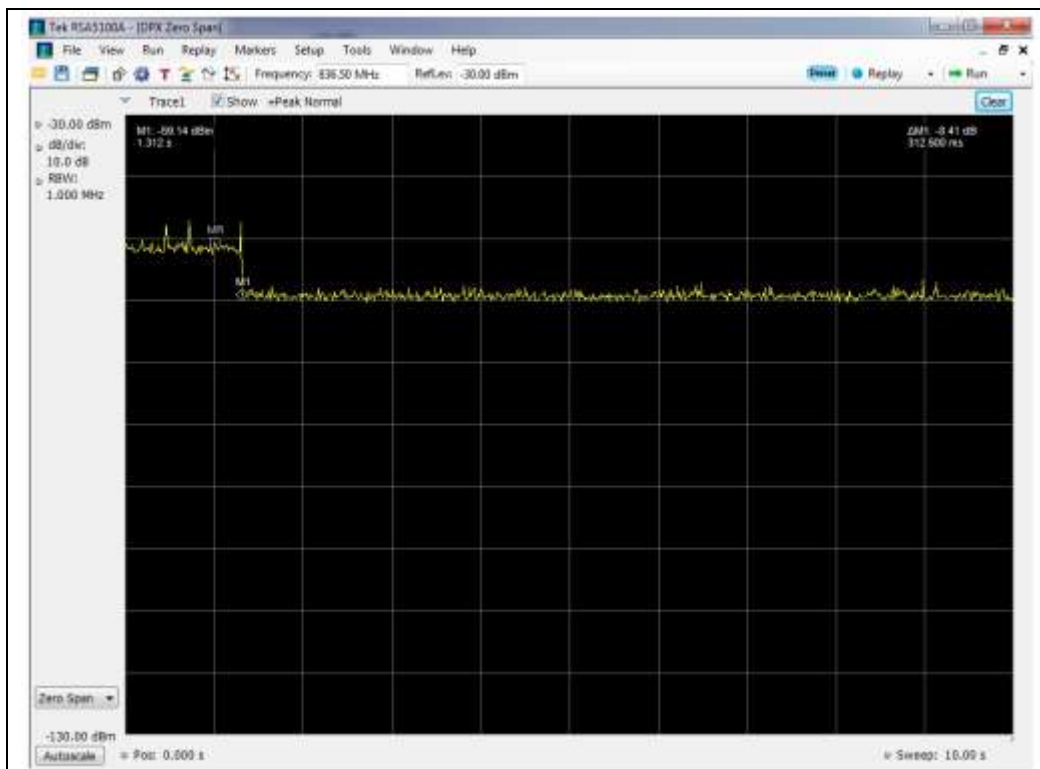


776 - 787 MHz Band

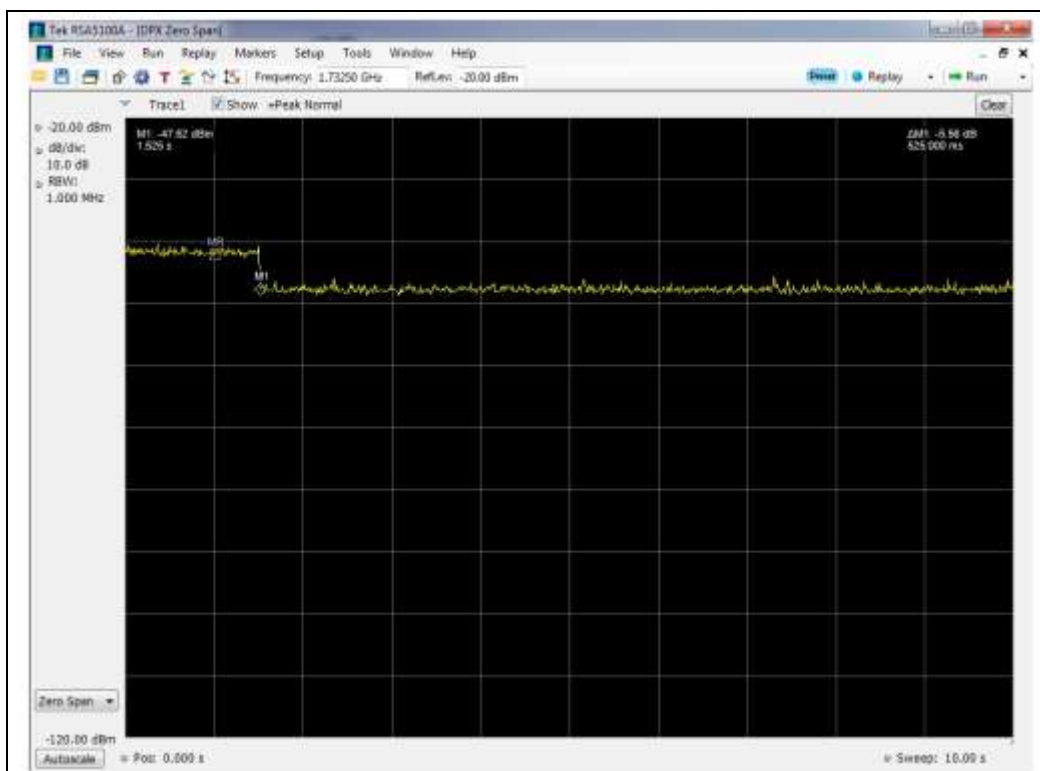




824 - 849 MHz Band

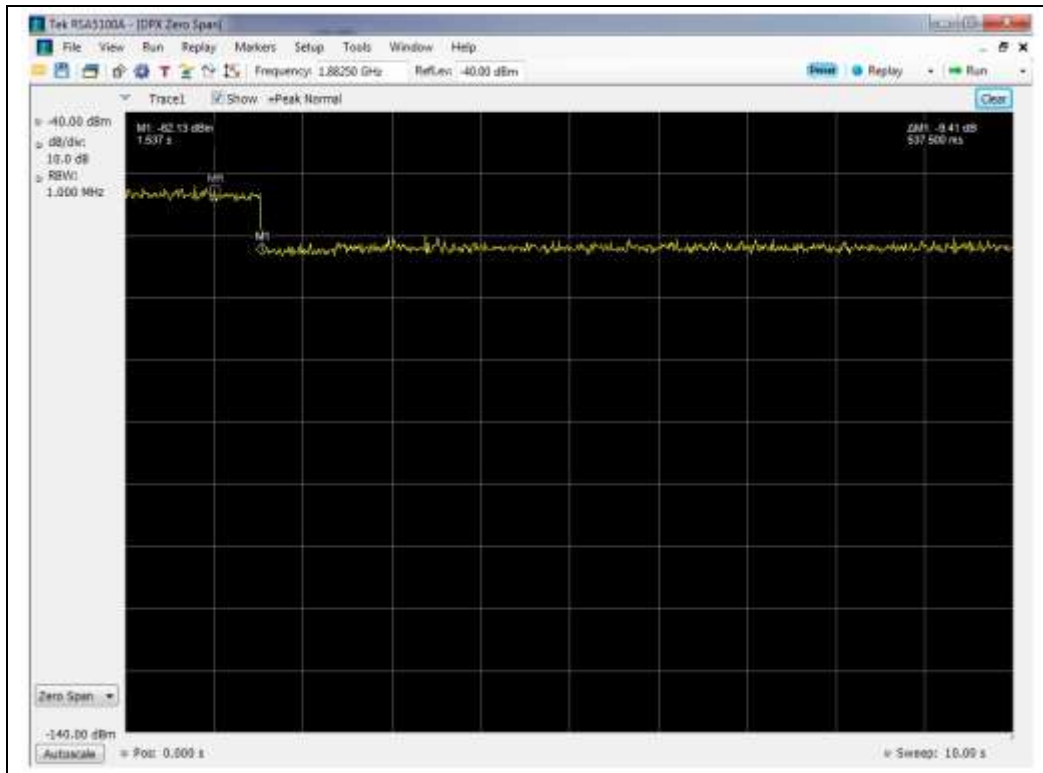


1710 - 1755 MHz Band





1850 - 1915 MHz Band





Uplink Inactivity

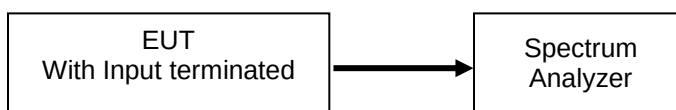
Name of Test: Uplink Inactivity
Test Equipment Utilized: i00424, SMU 200A - S/N:101369

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



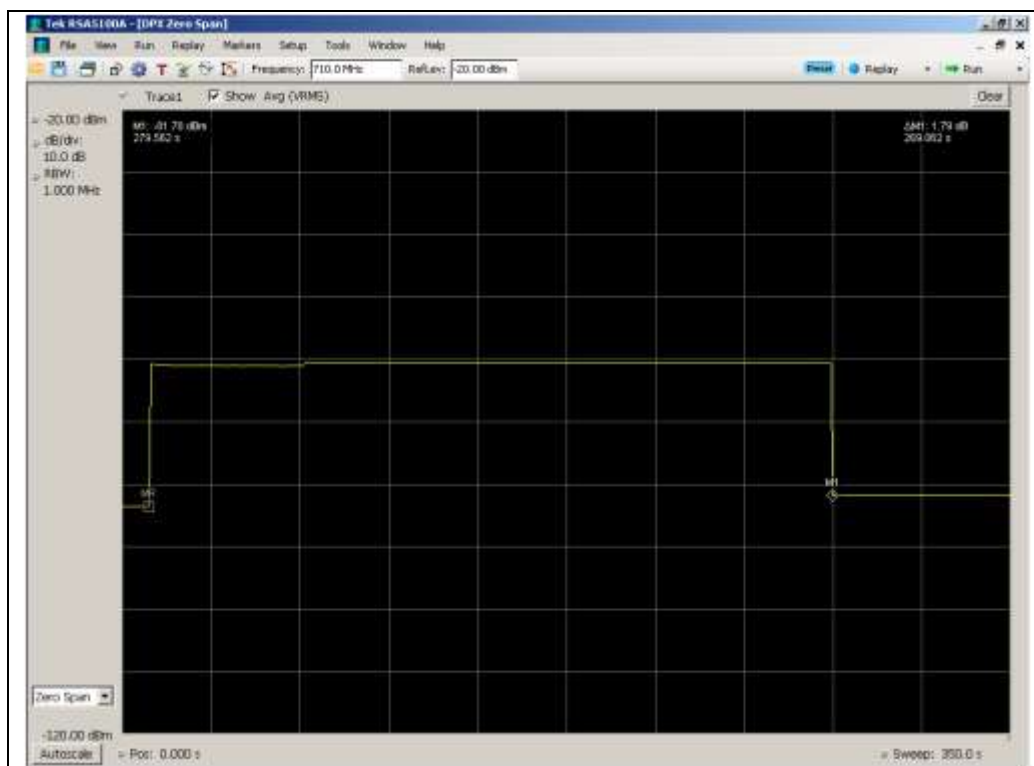
Uplink Test Results

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

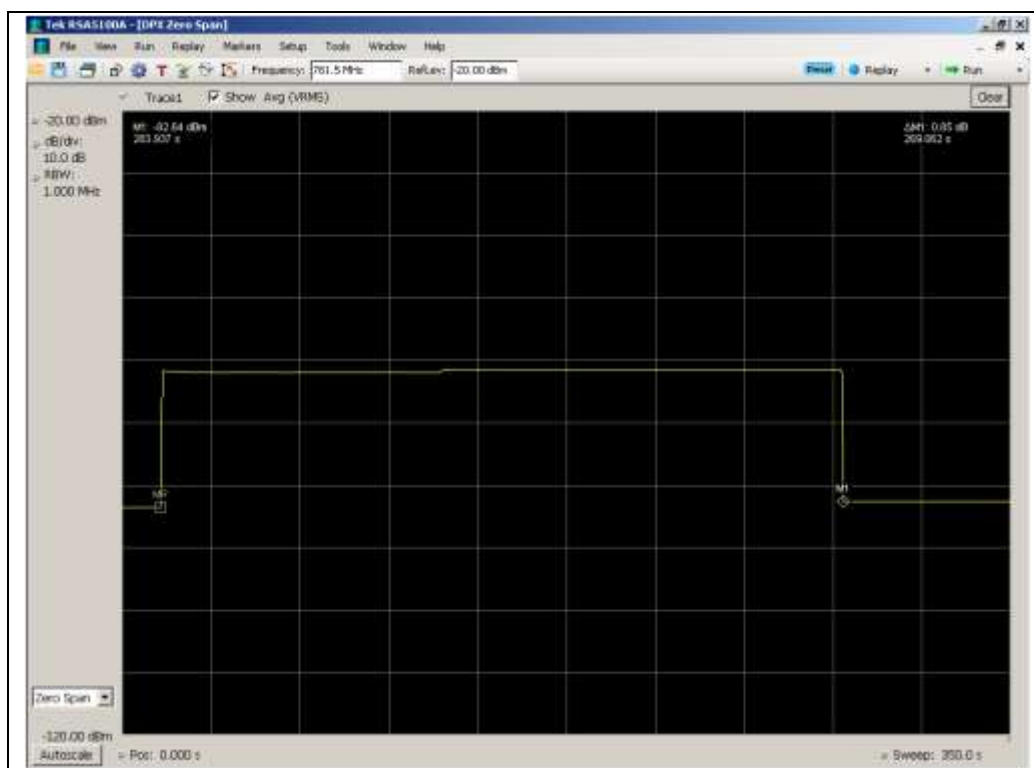


Uplink Inactivity Test Results

704 - 716 MHz

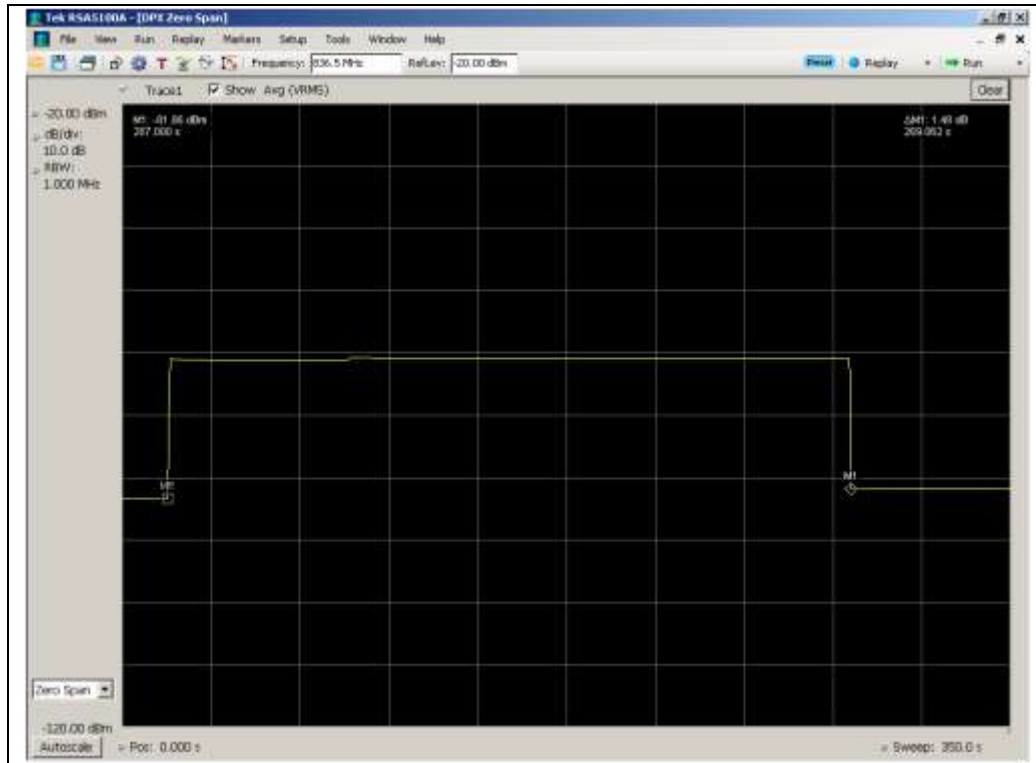


776 - 787 MHz

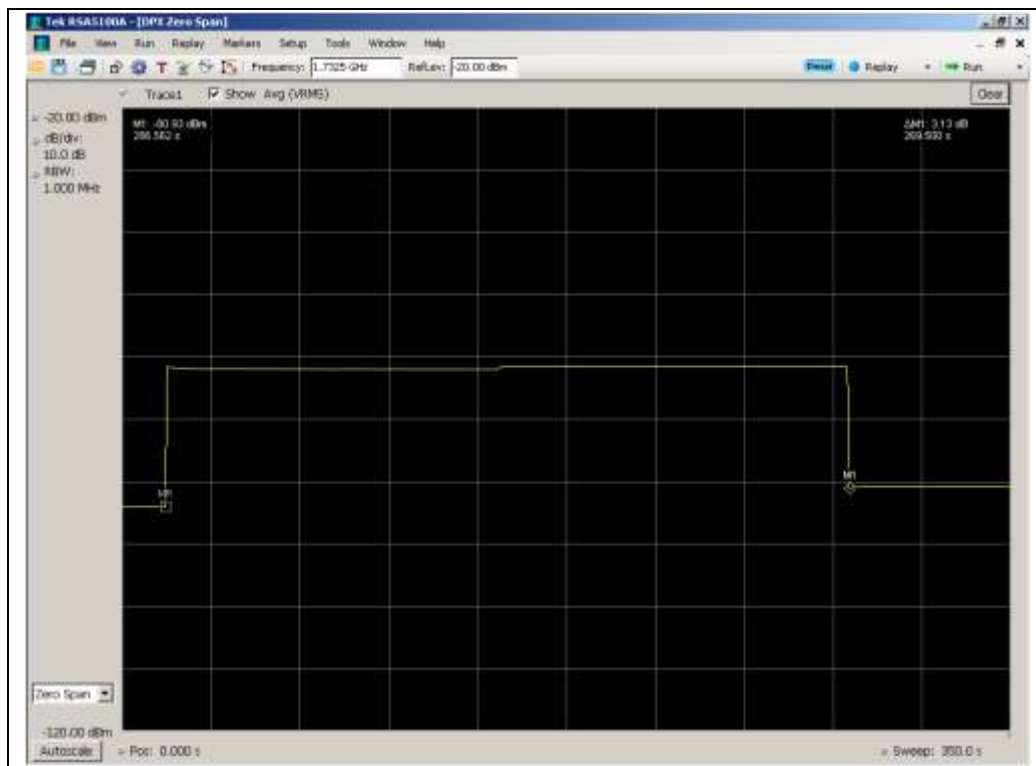




824 - 849 MHz

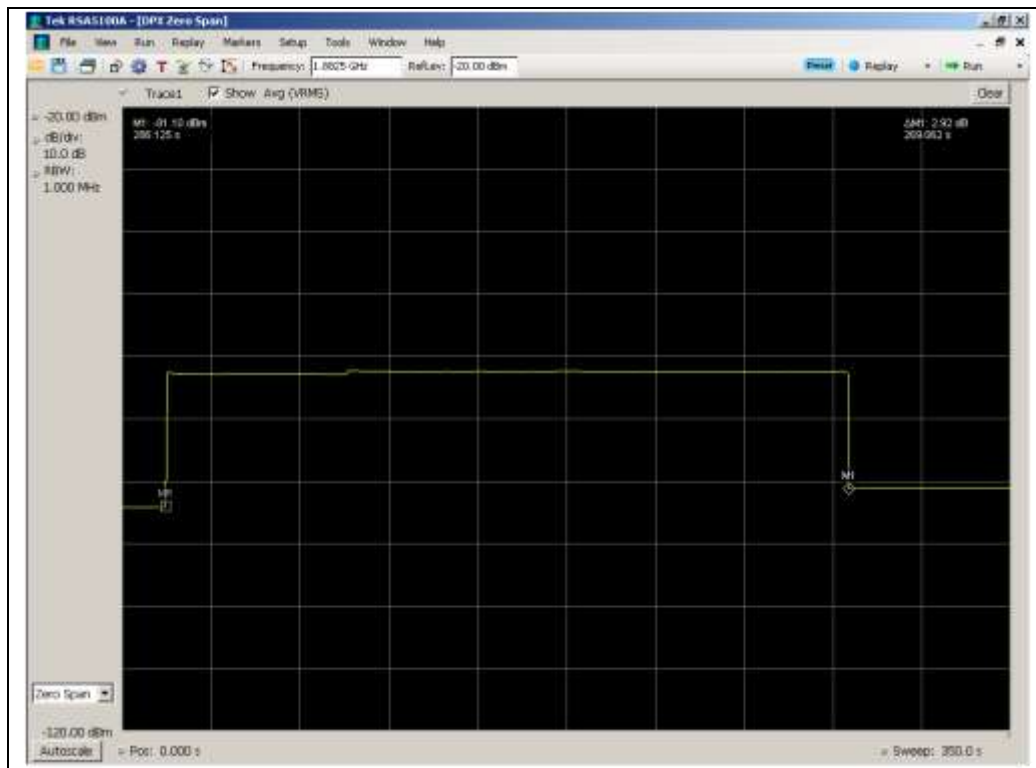


1710 - 1755 MHz





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

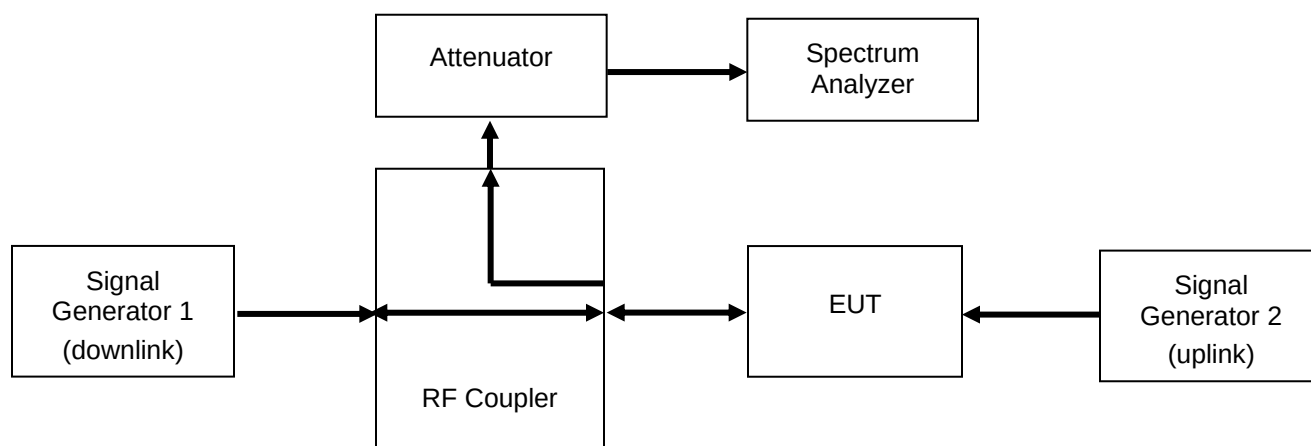
Test Procedure

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

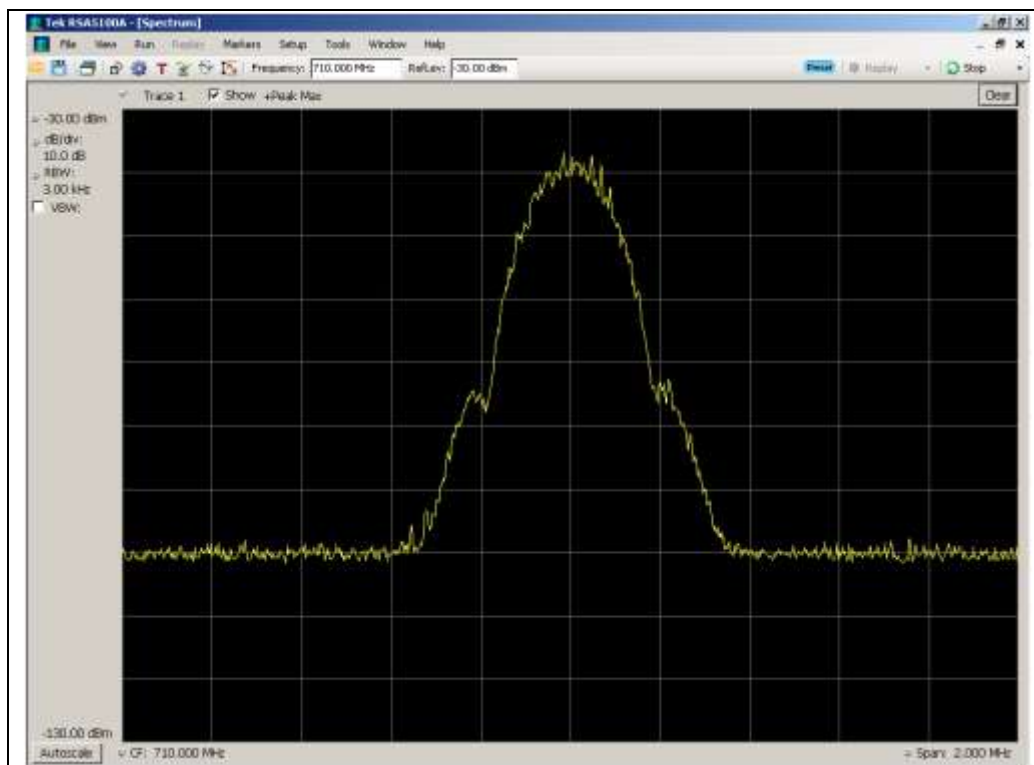




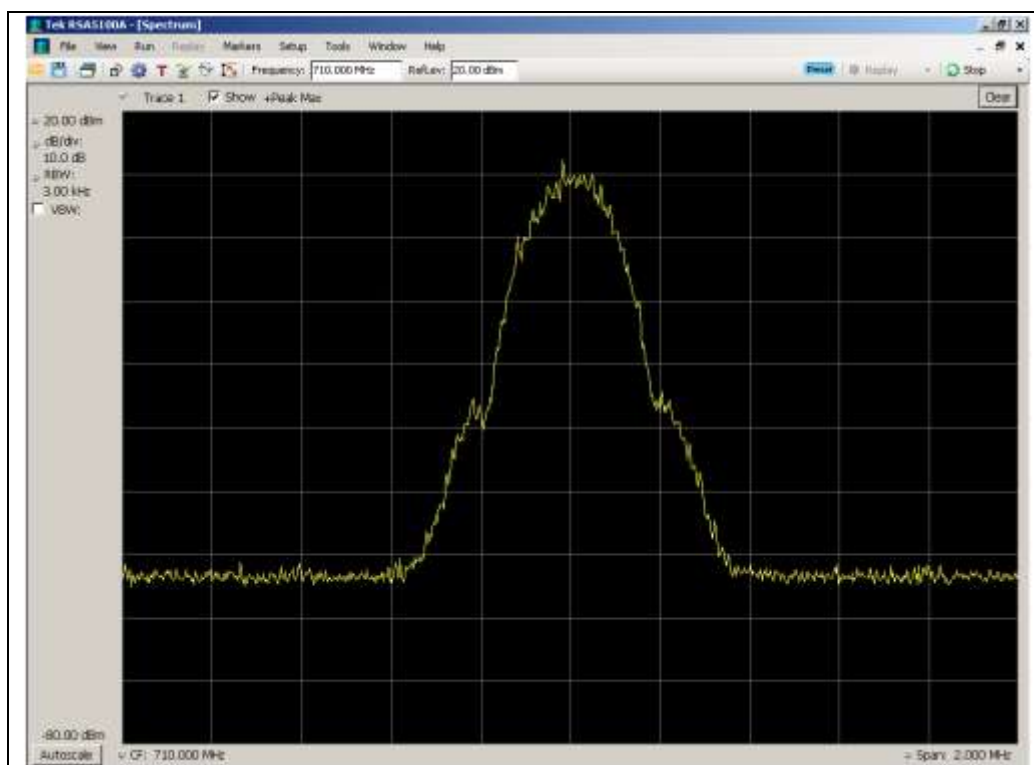
GSM Uplink Test Plots

704 - 716 MHz Band

Input



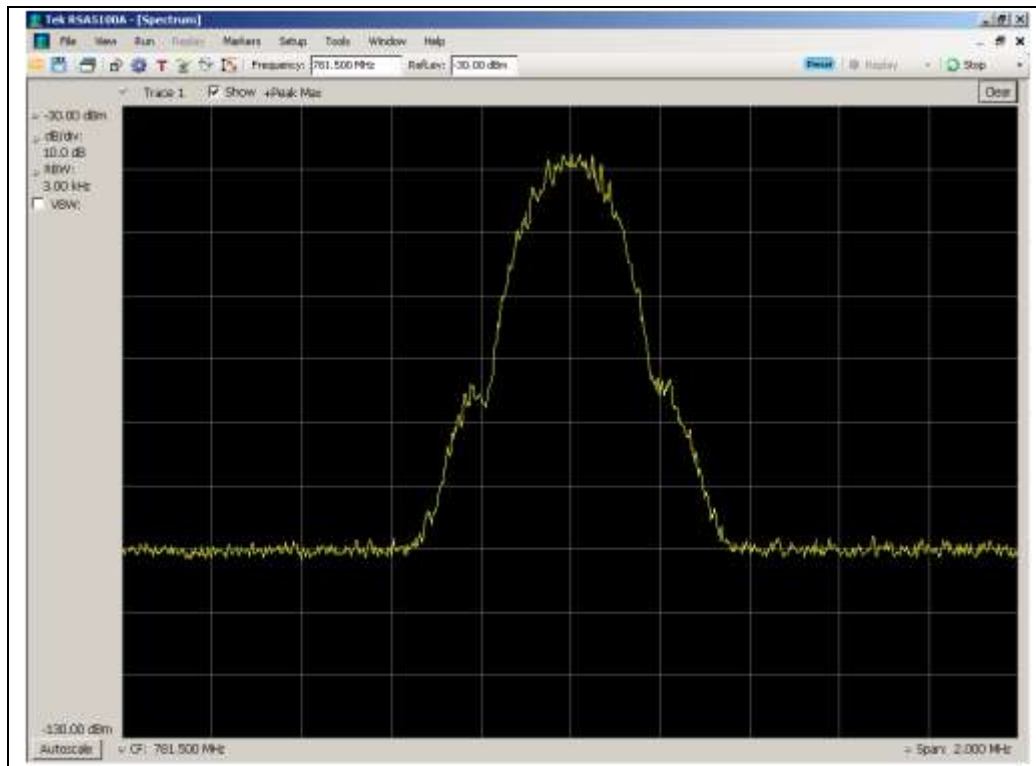
Output



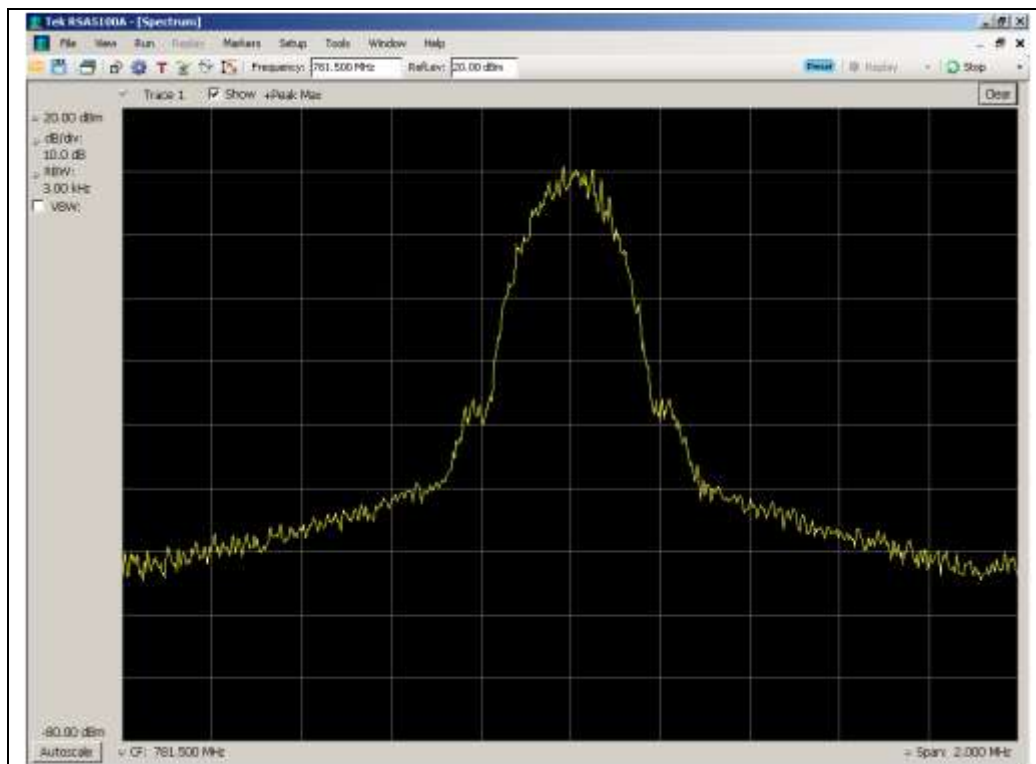


776 - 787 MHz Band

Input



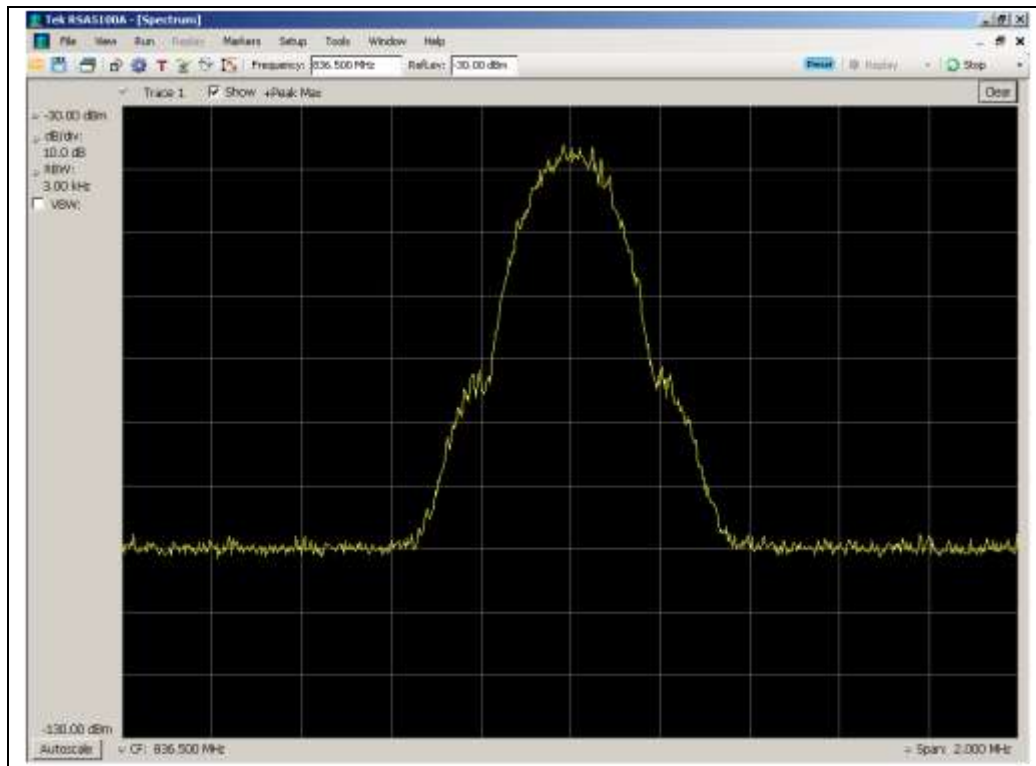
Output



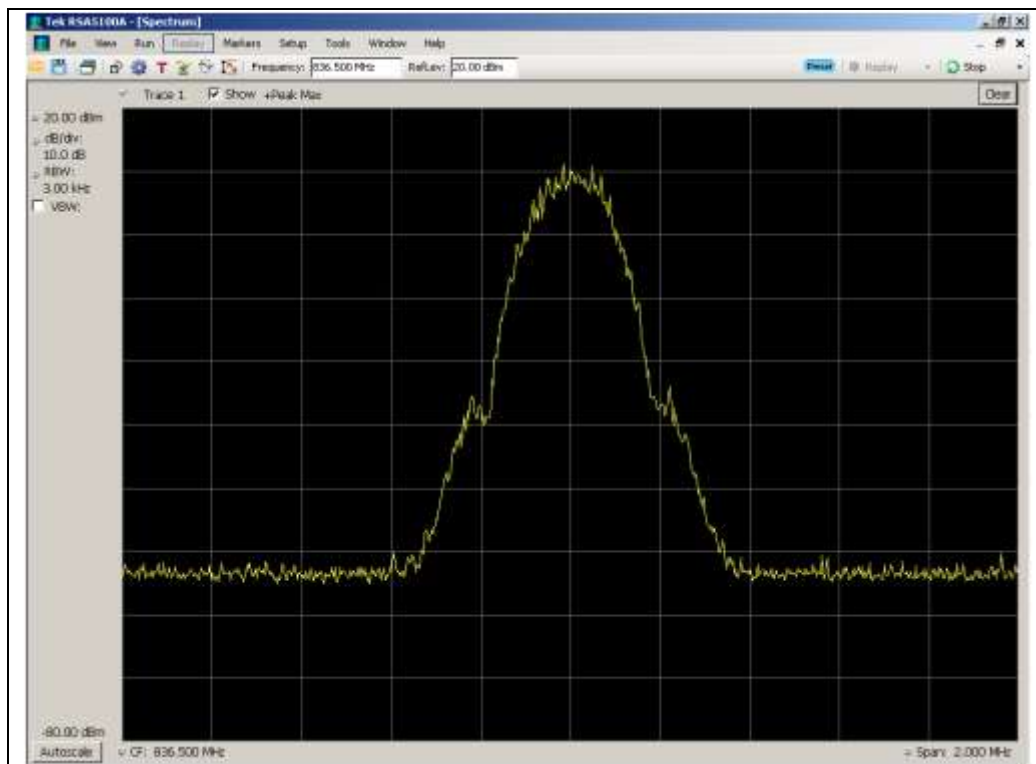


824 - 849 MHz Band

Input



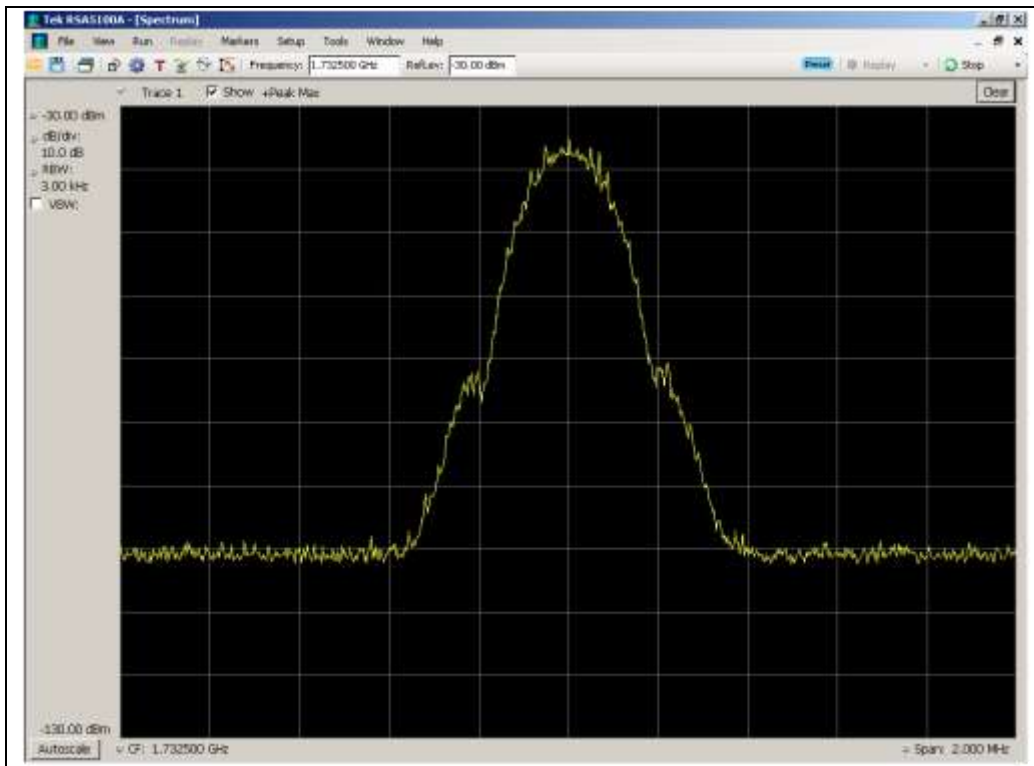
Output



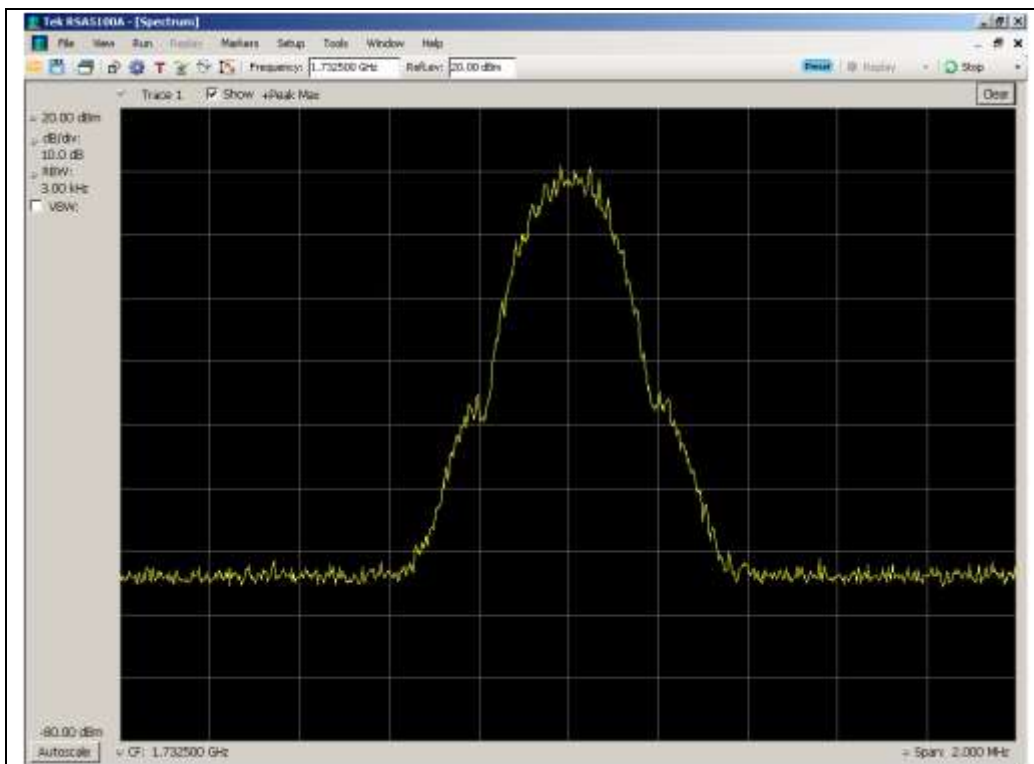


1710 - 1755 MHz Band

Input



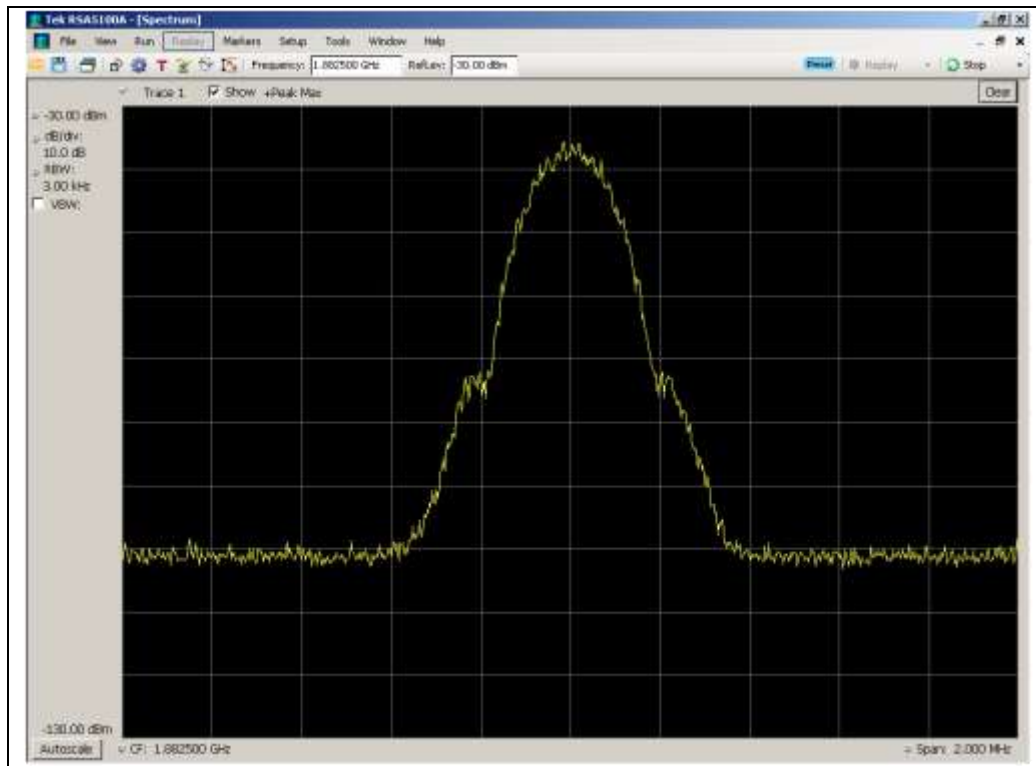
Output



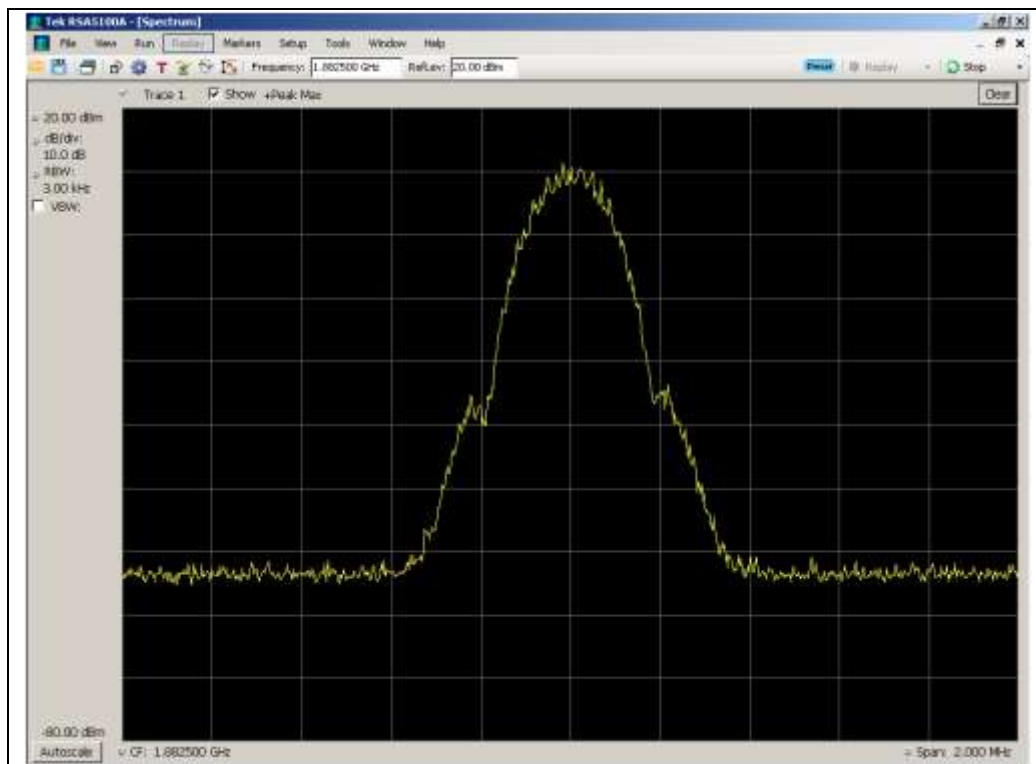


1850 - 1915 MHz Band

Input



Output

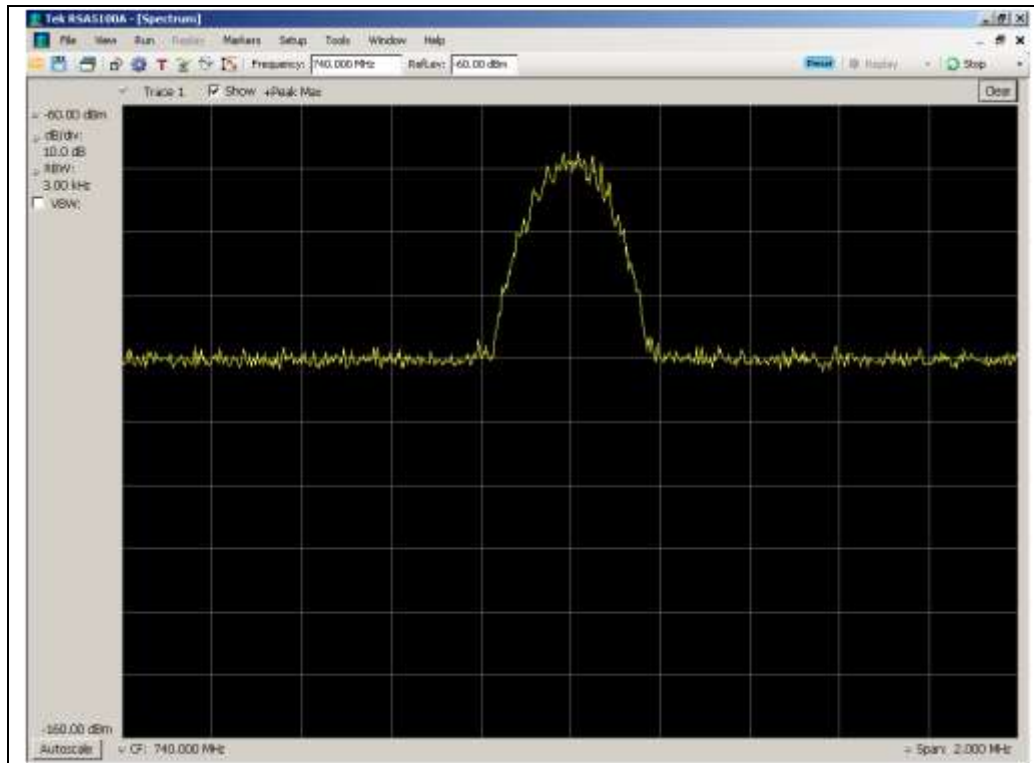




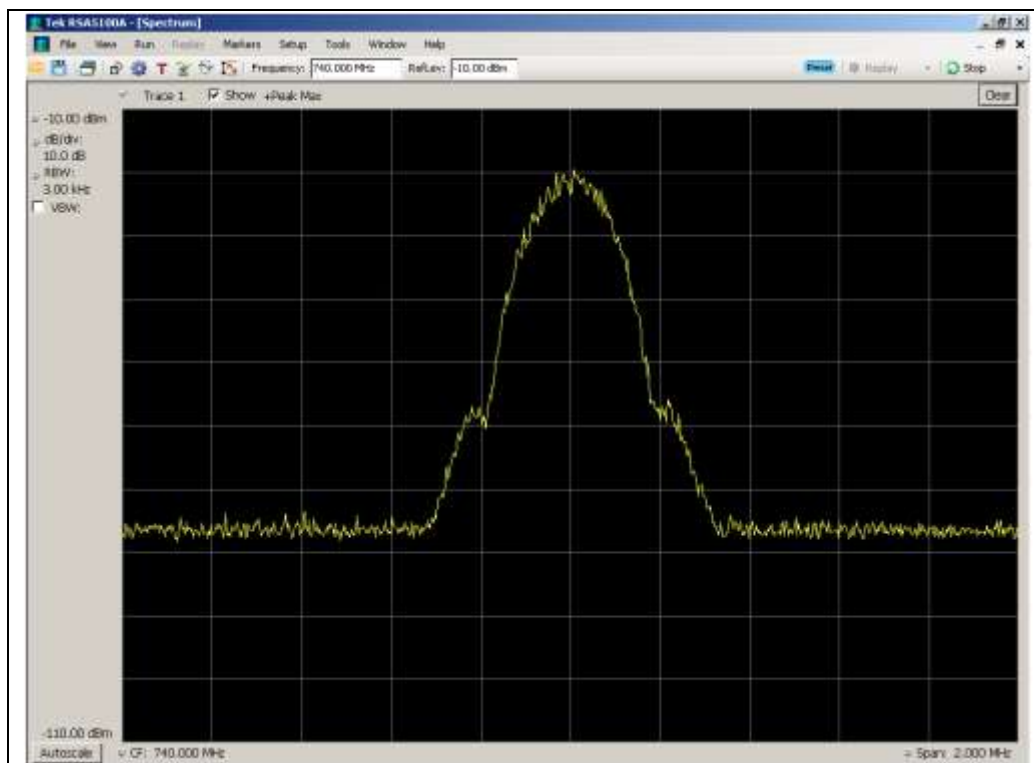
GSM Downlink Test Plots

734 - 746 MHz Band

Input



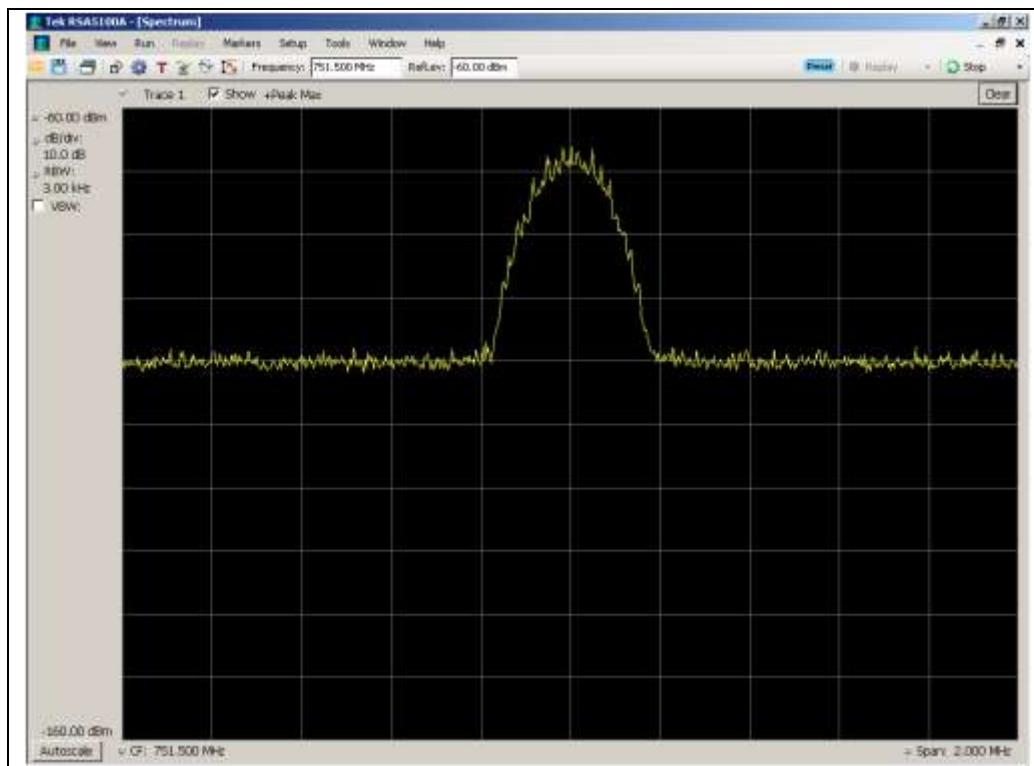
Output



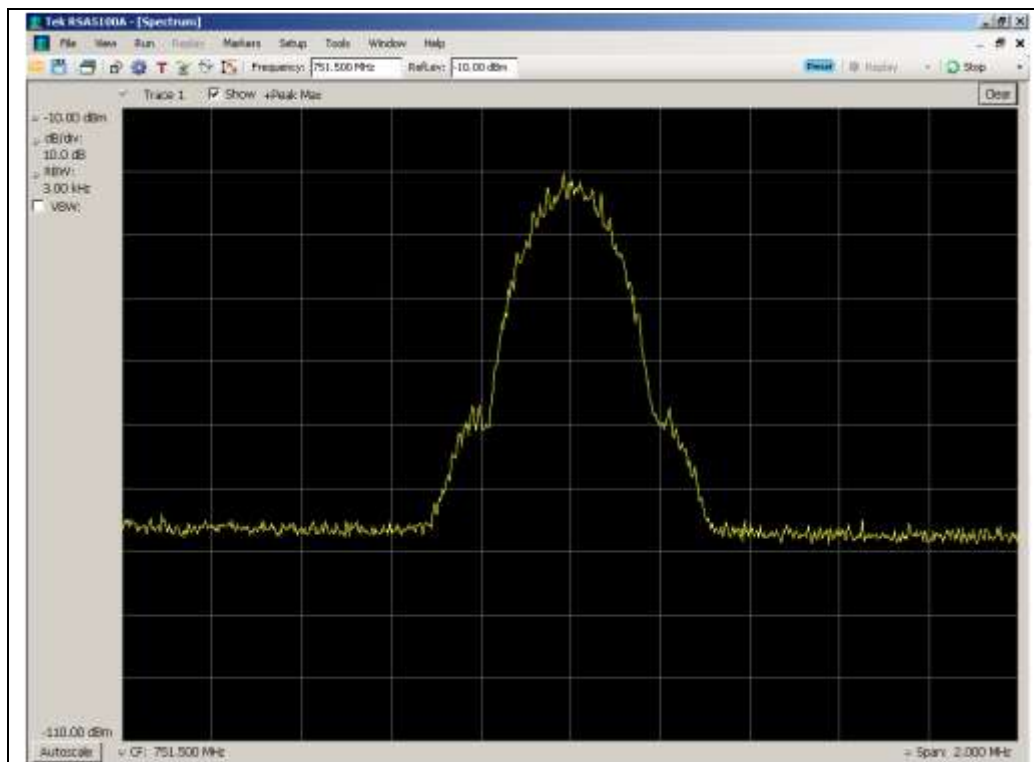


746 - 757 MHz Band

Input



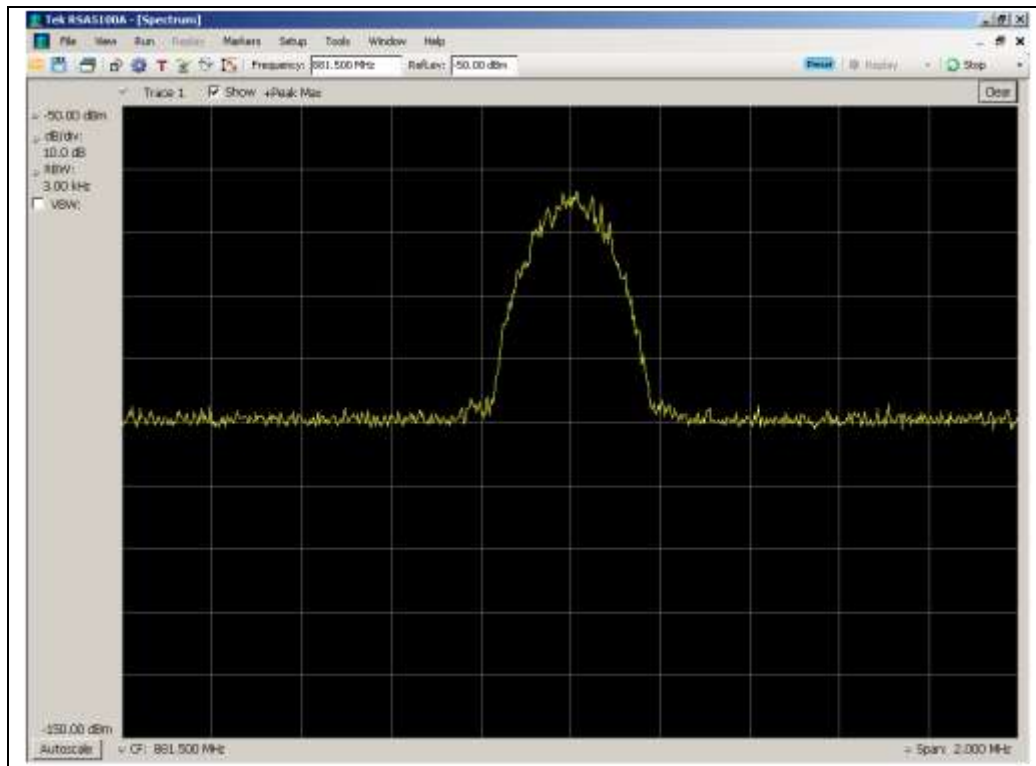
Output



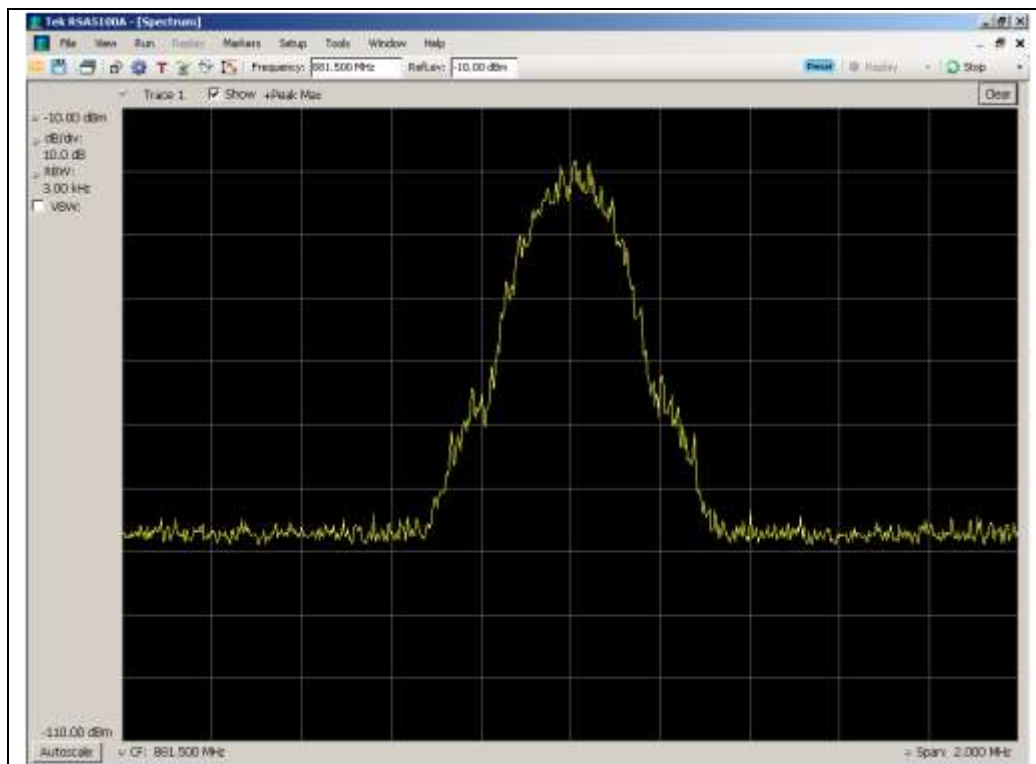


869 - 894 MHz Band

Input



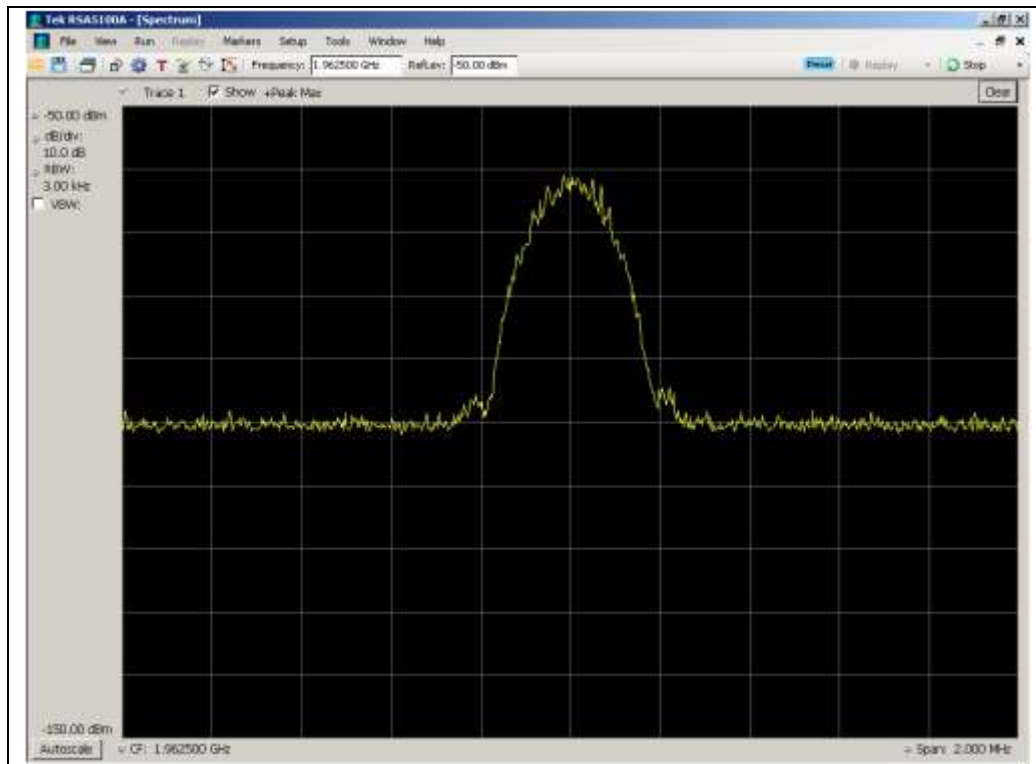
Output



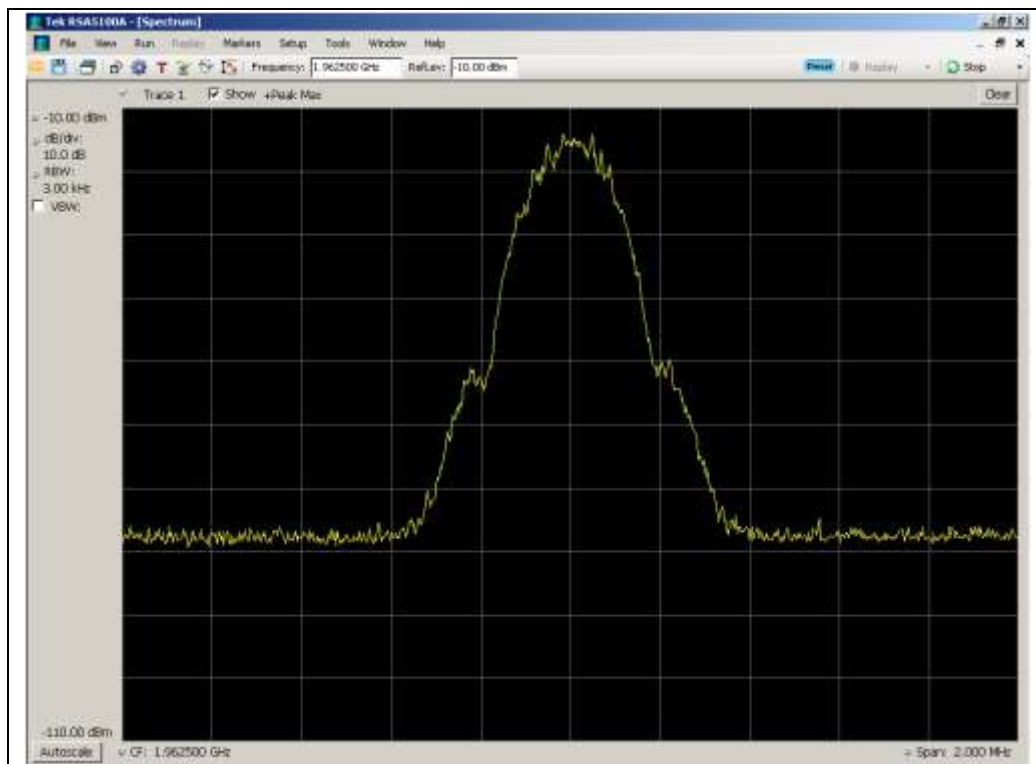


1930 - 1995 MHz Band

Input



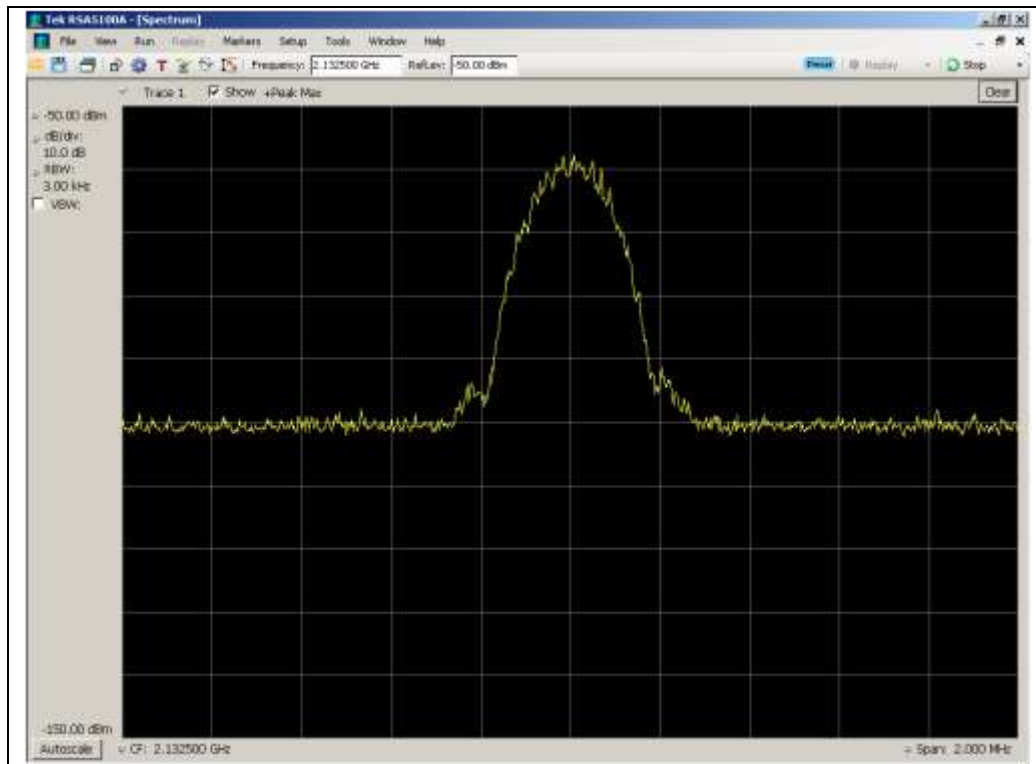
Output



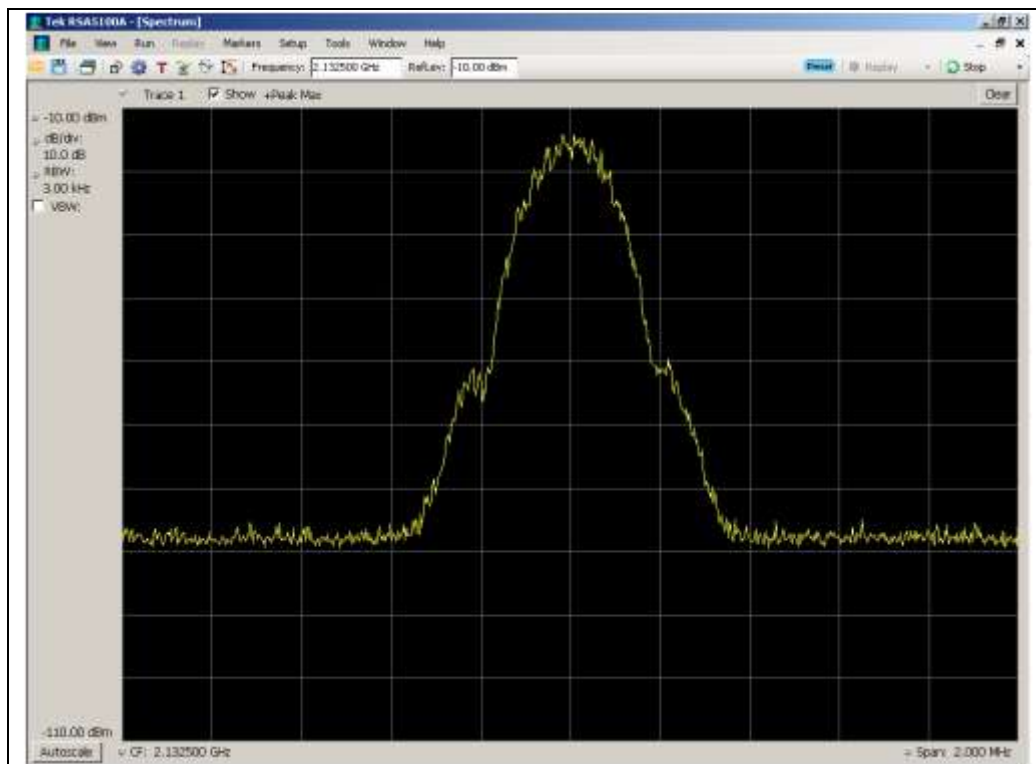


2110 - 2155 MHz Band

Input



Output

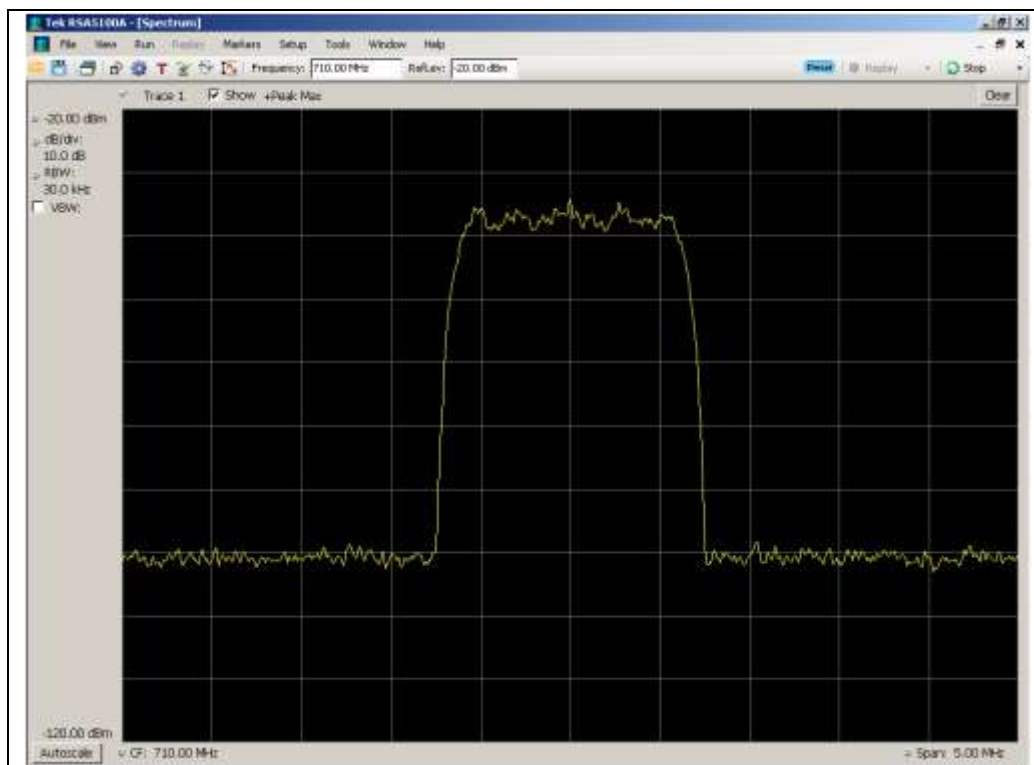




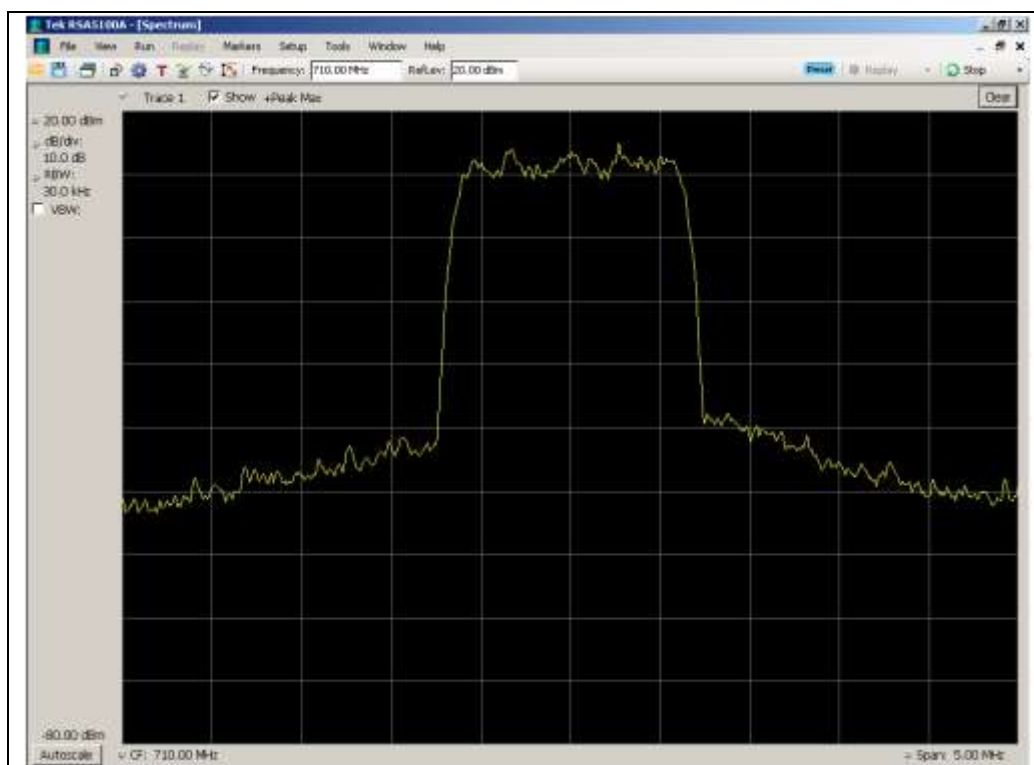
CDMA Uplink Test Plots

704 - 716 MHz Band

Input



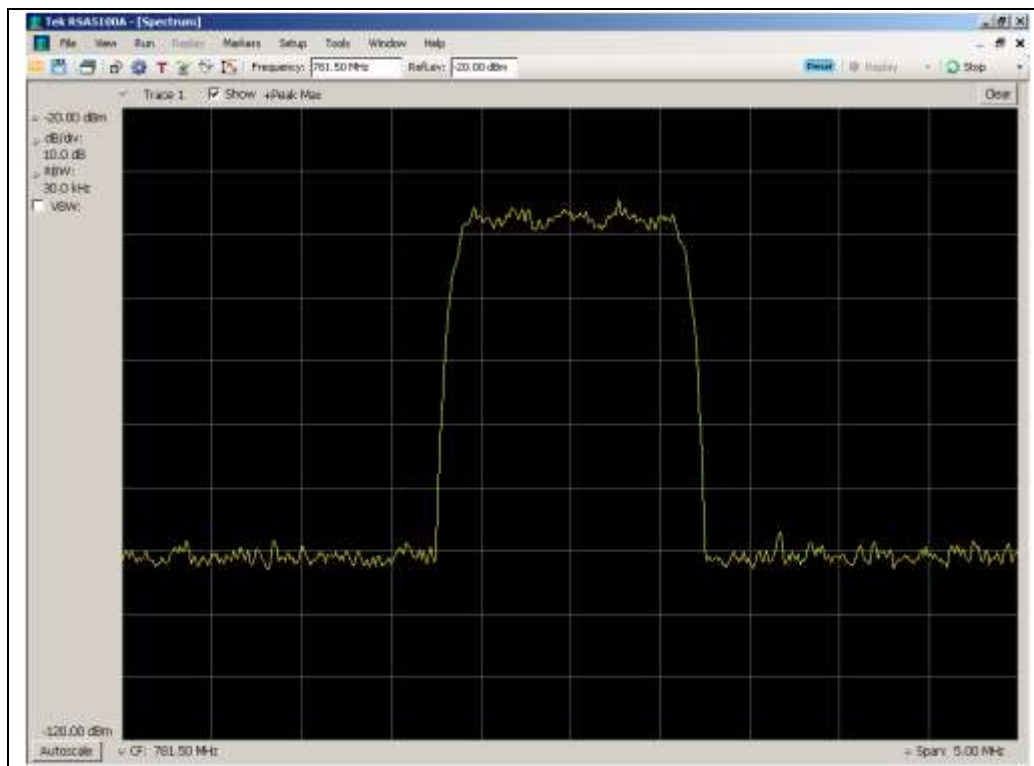
Output



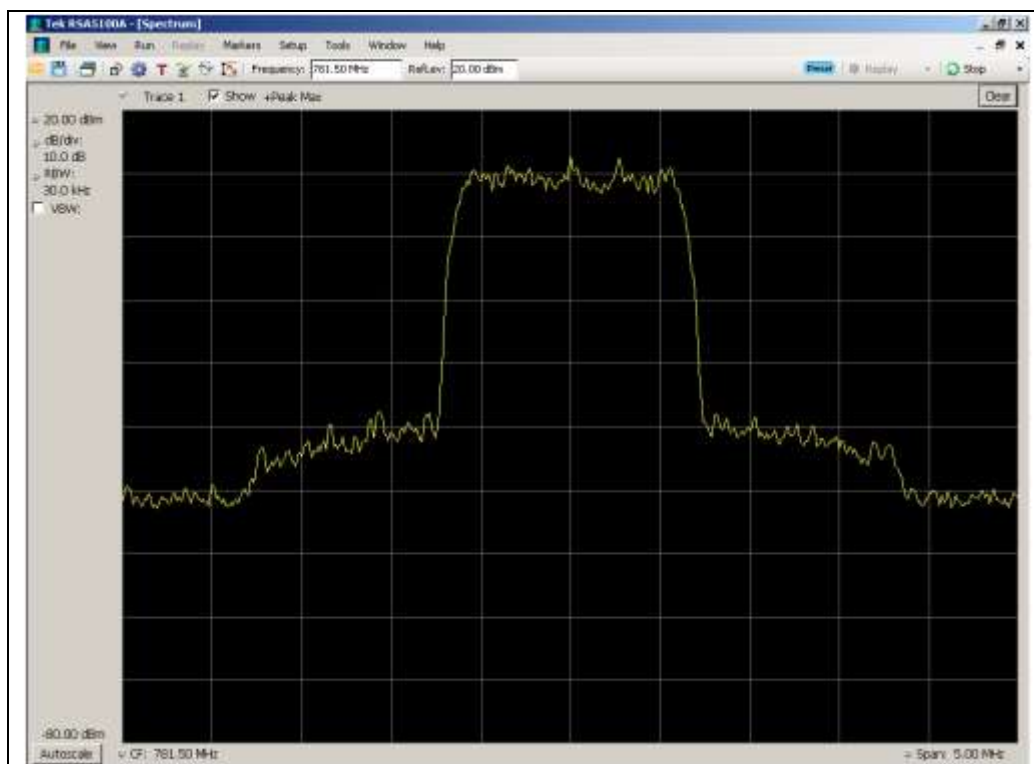


776 - 787 MHz Band

Input



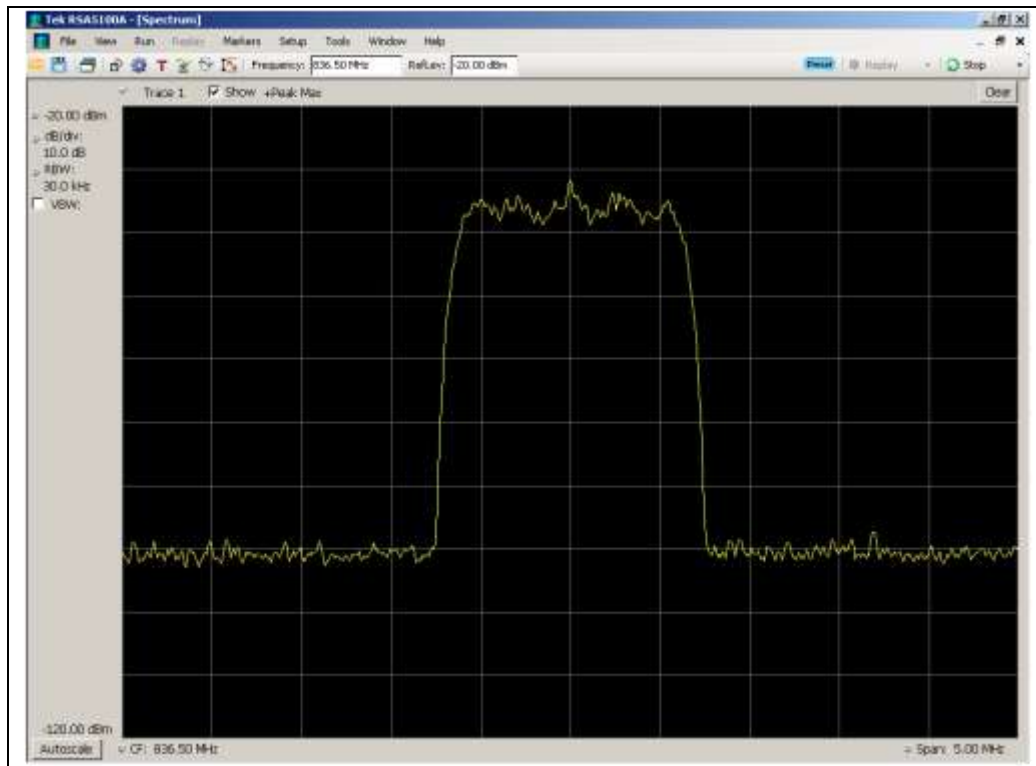
Output



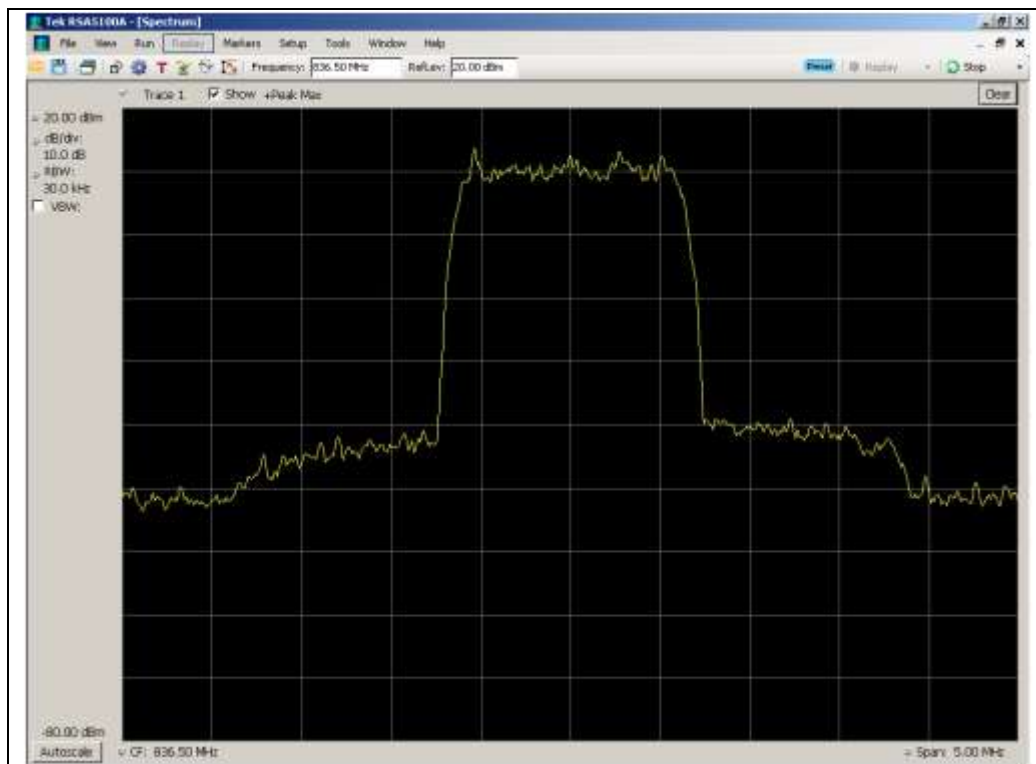


824 - 849 MHz Band

Input



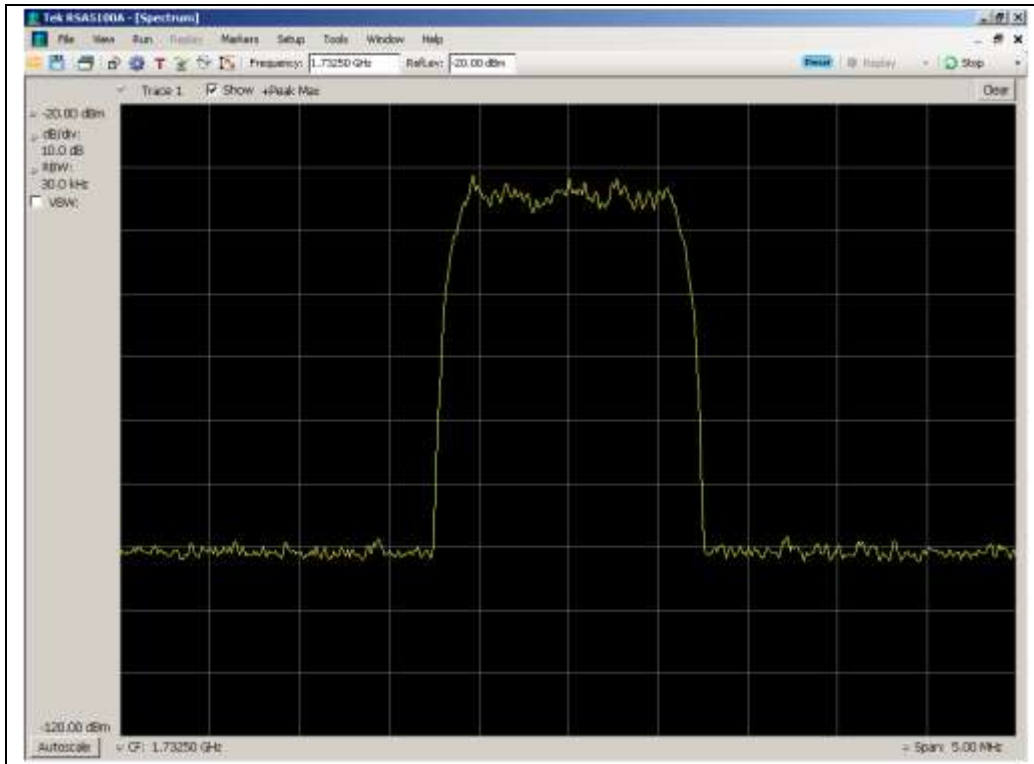
Output



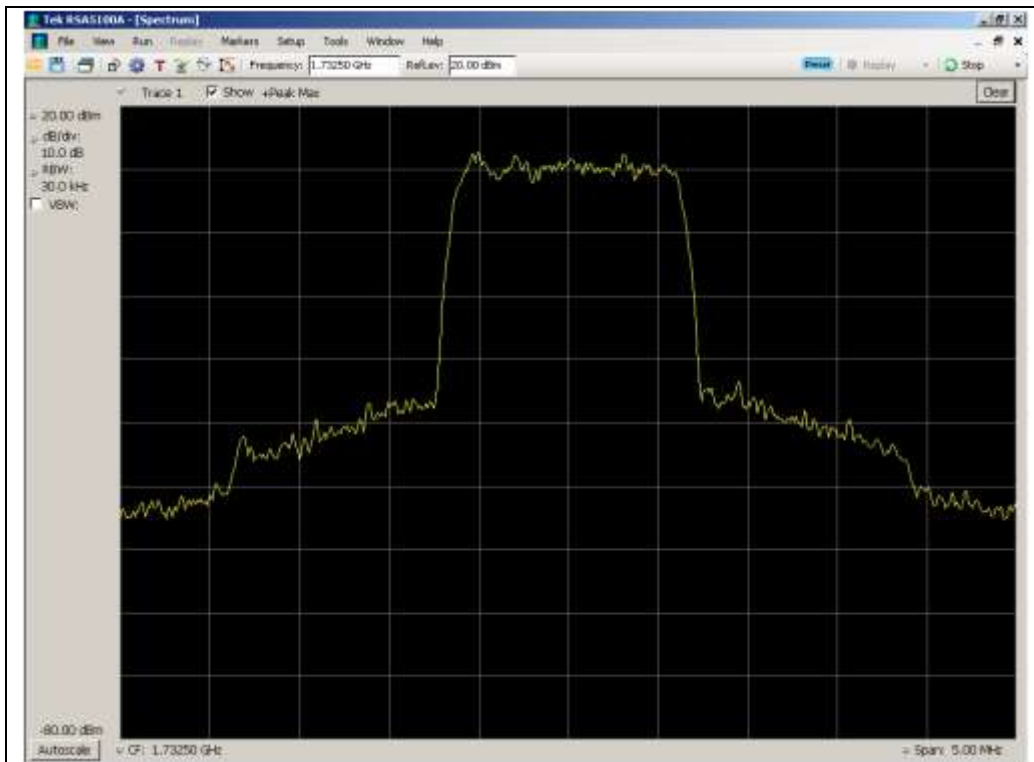


1710 - 1755 MHz Band

Input



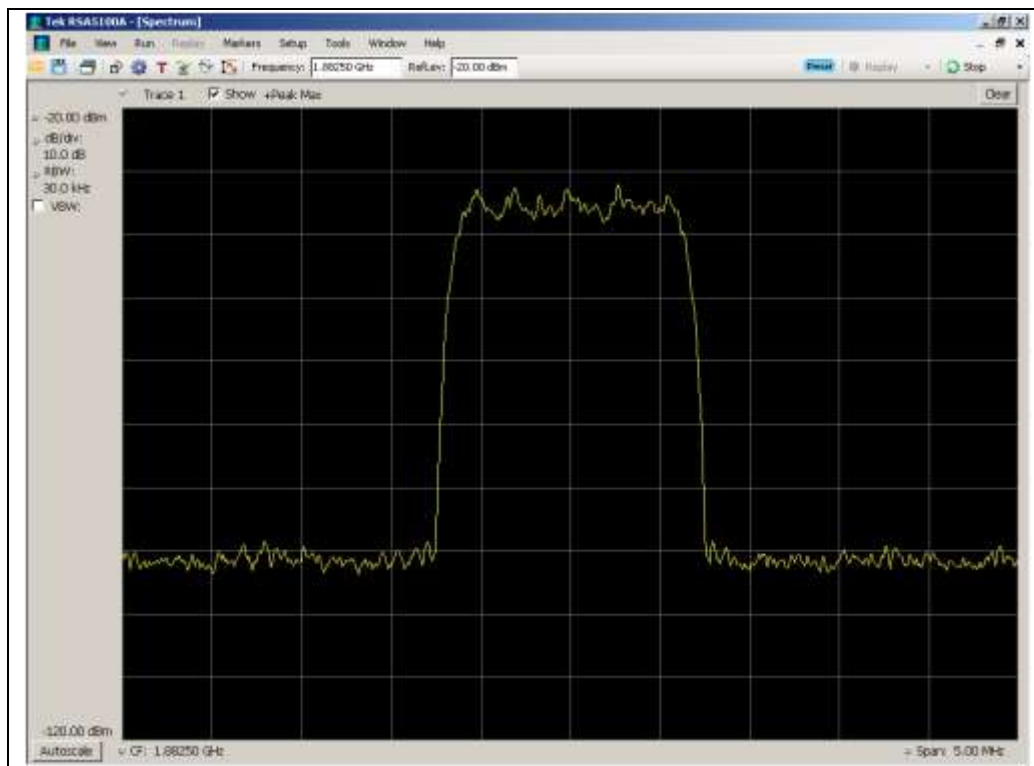
Output



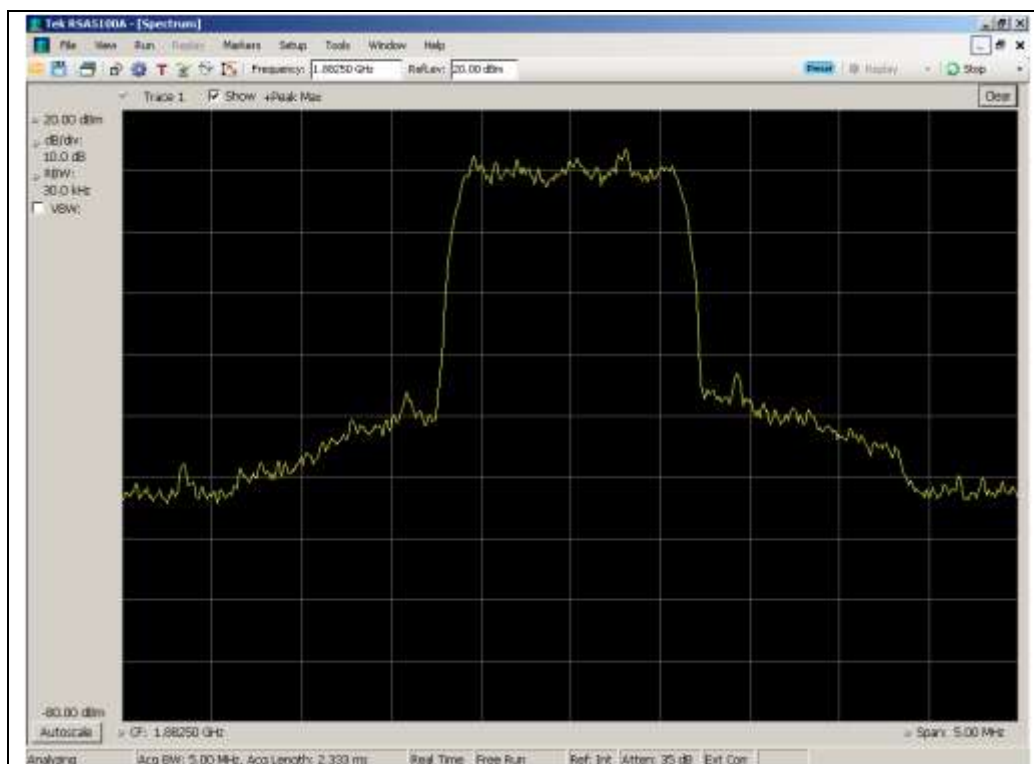


1850 - 1915 MHz Band

Input



Output

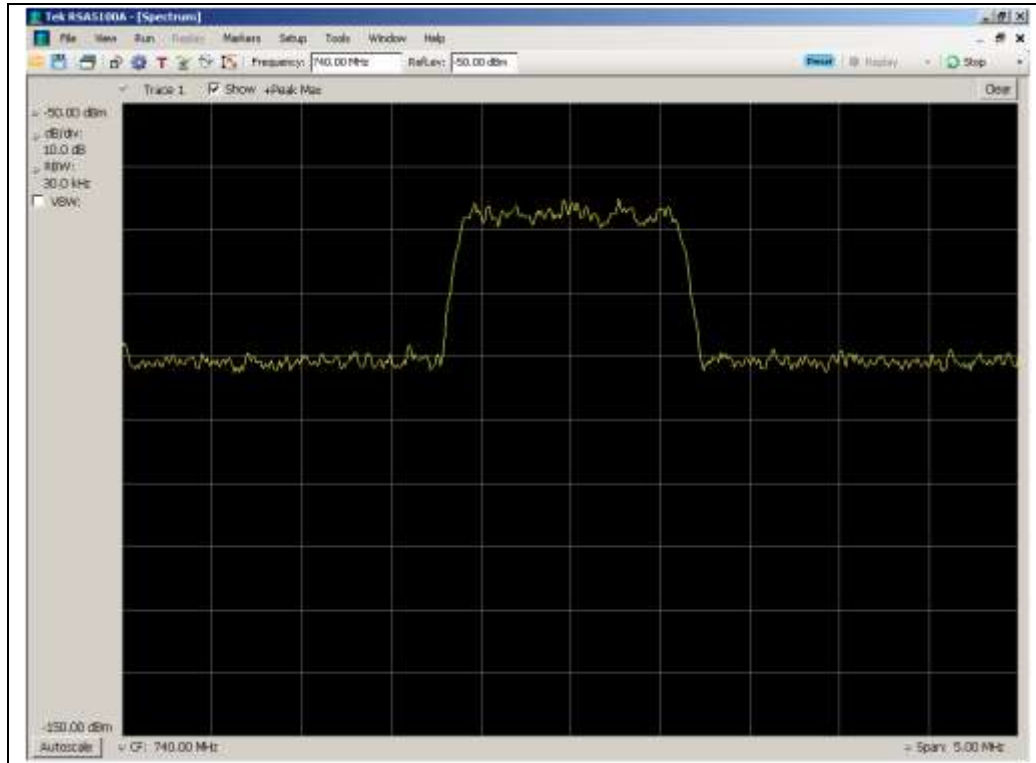




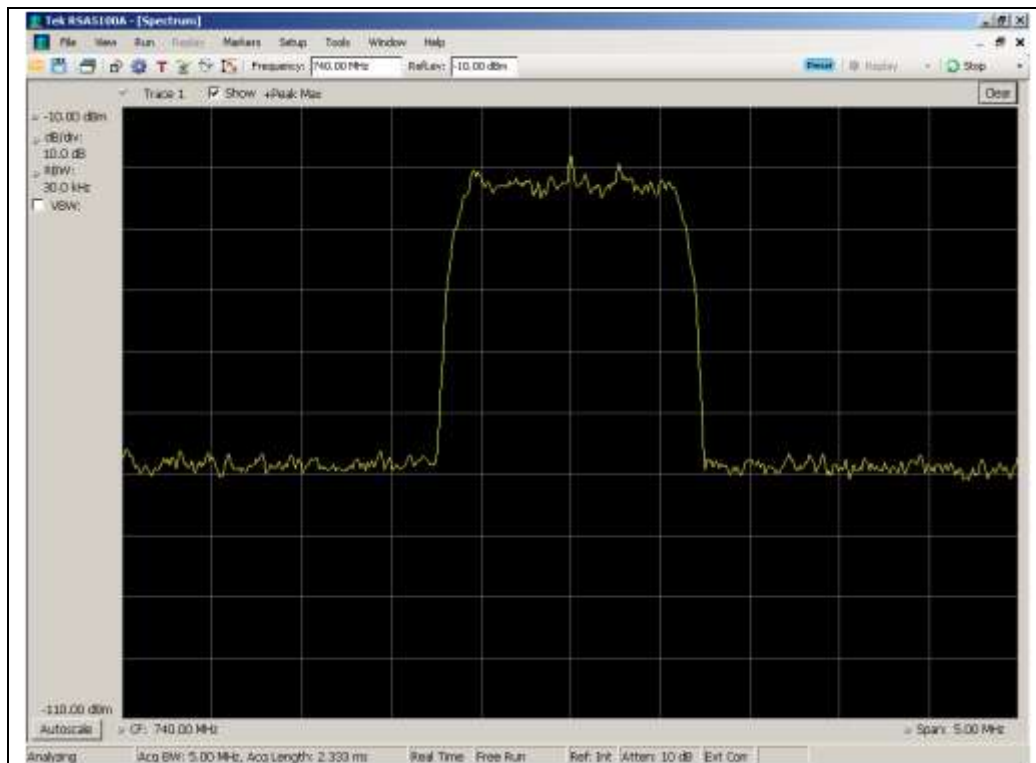
CDMA Downlink Test Plots

734 - 746 MHz Band

Input



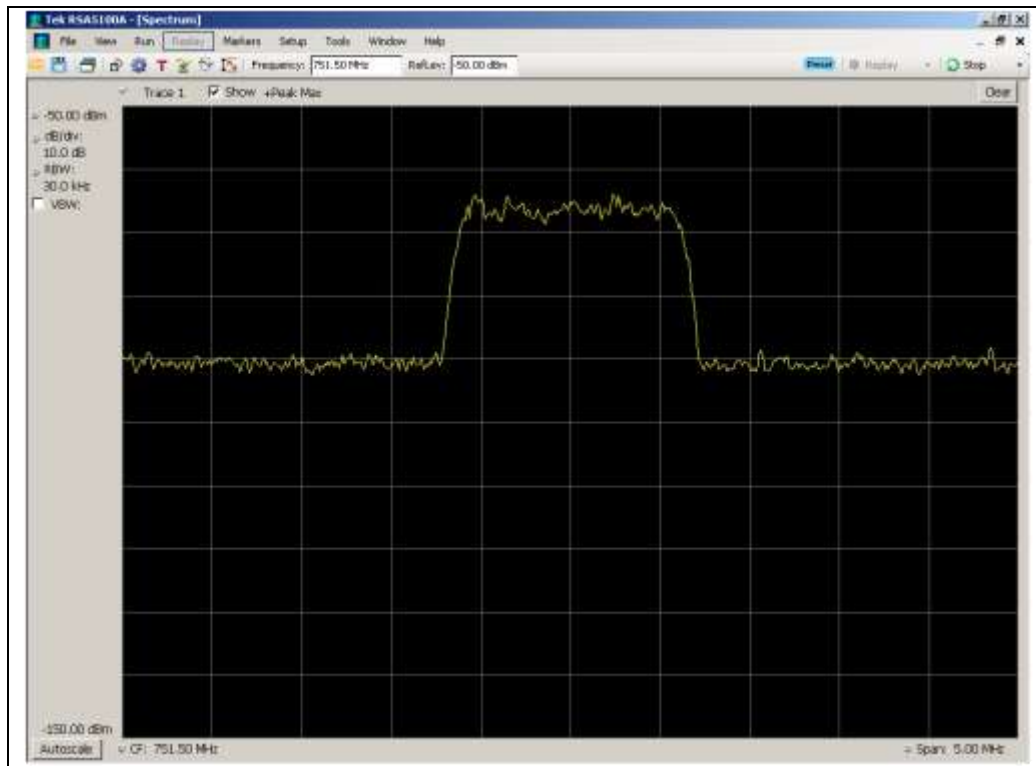
Output



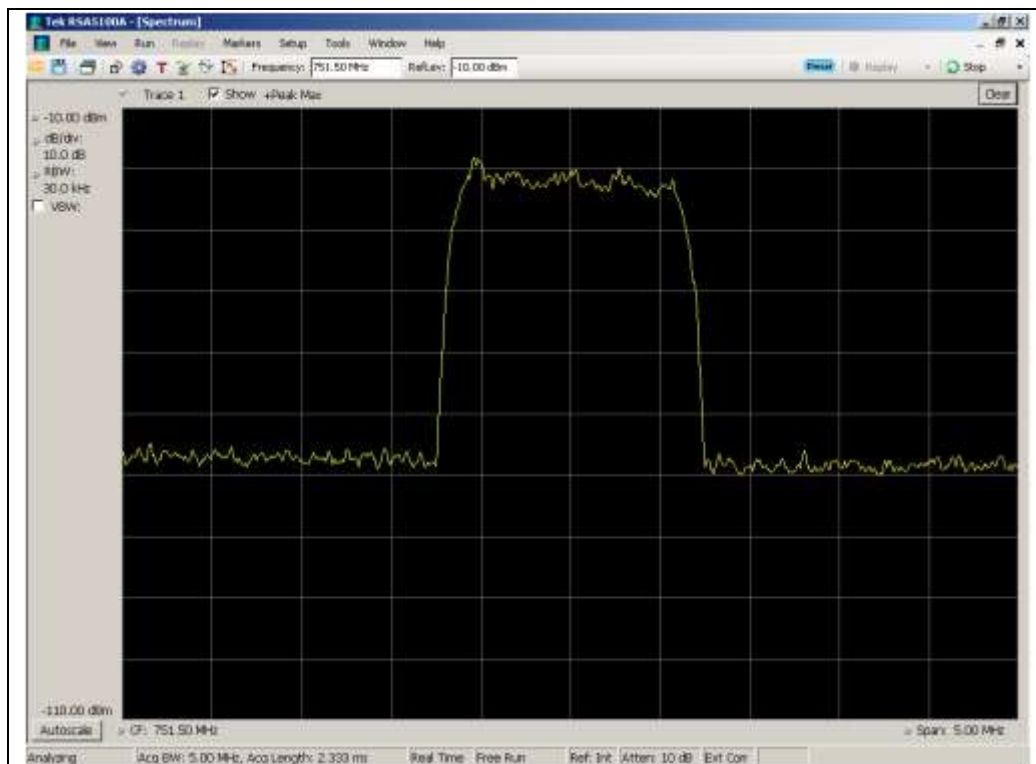


746 - 757 MHz Band

Input



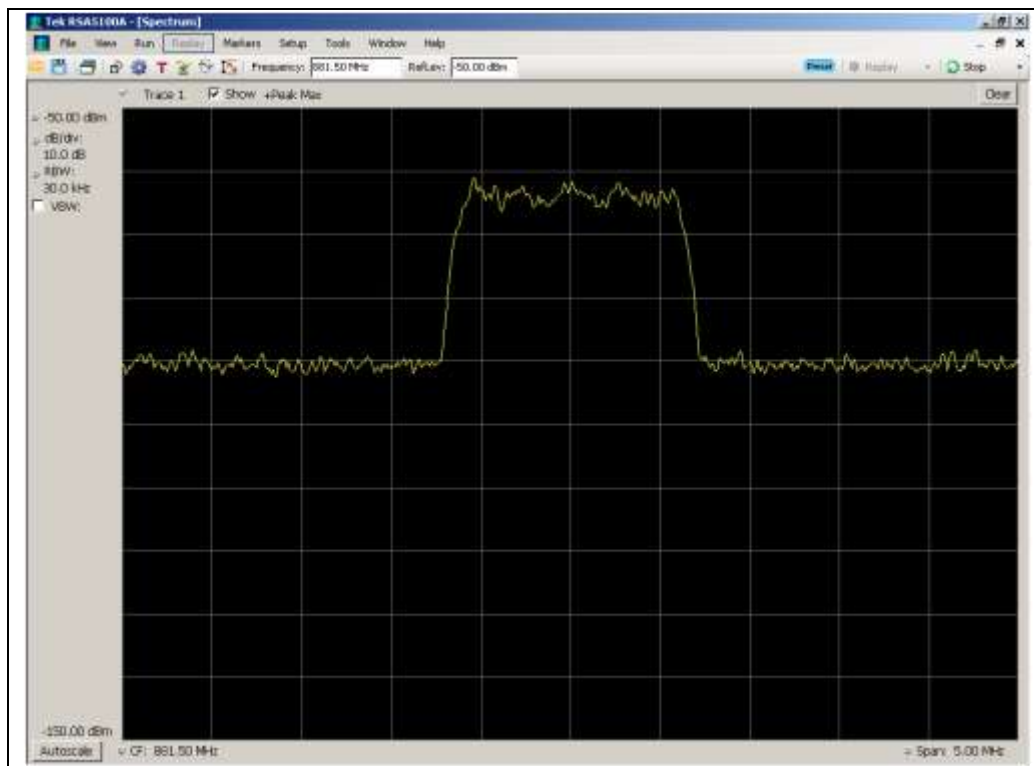
Output



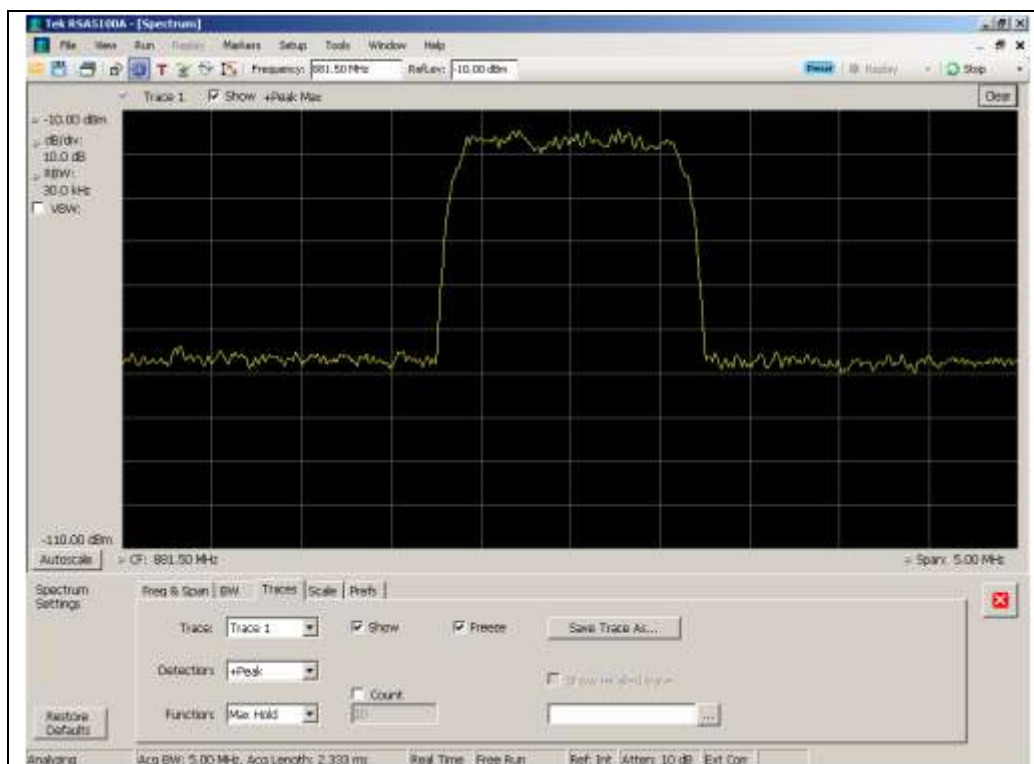


869 - 894 MHz Band

Input



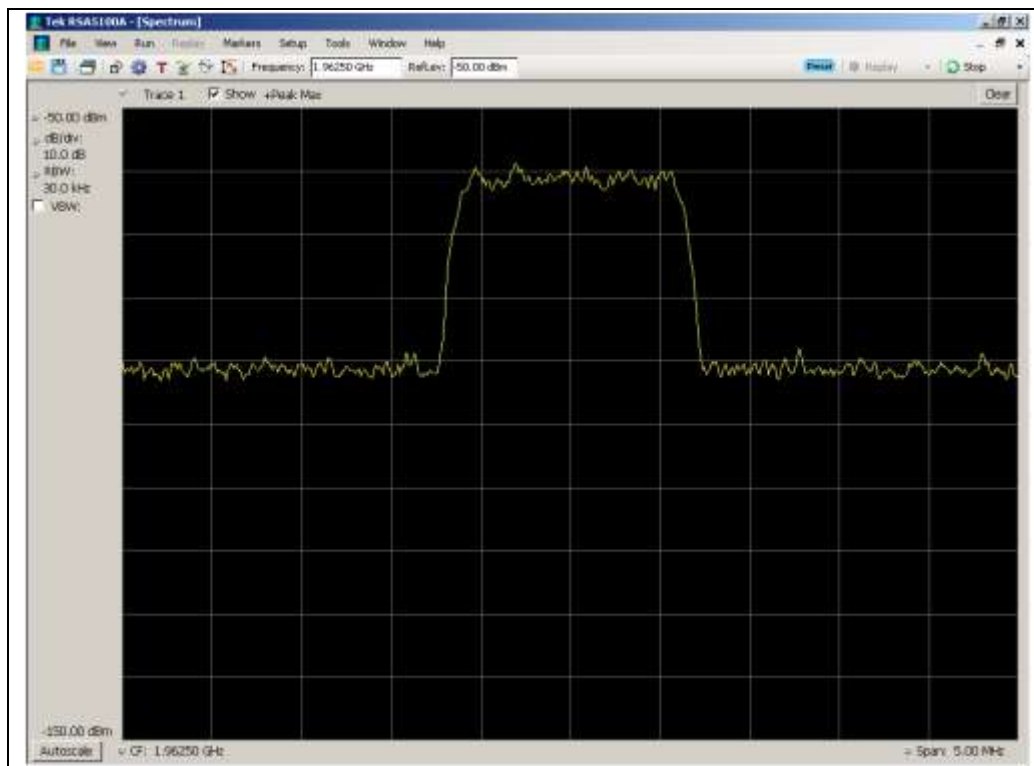
Output



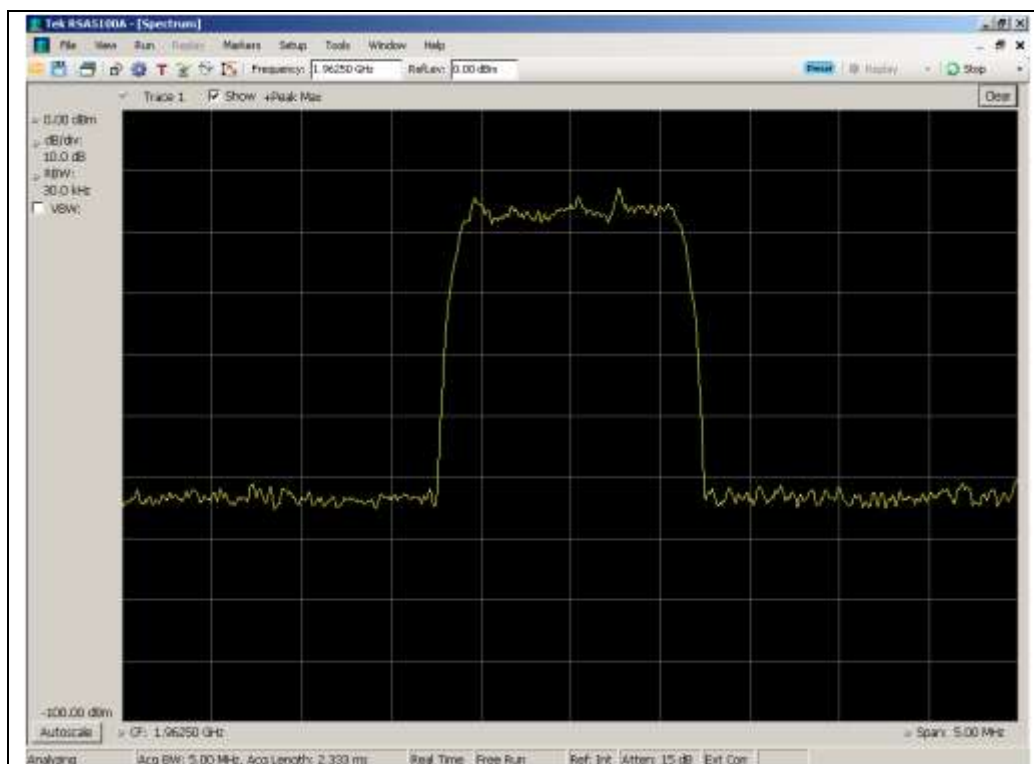


1930 - 1995 MHz Band

Input



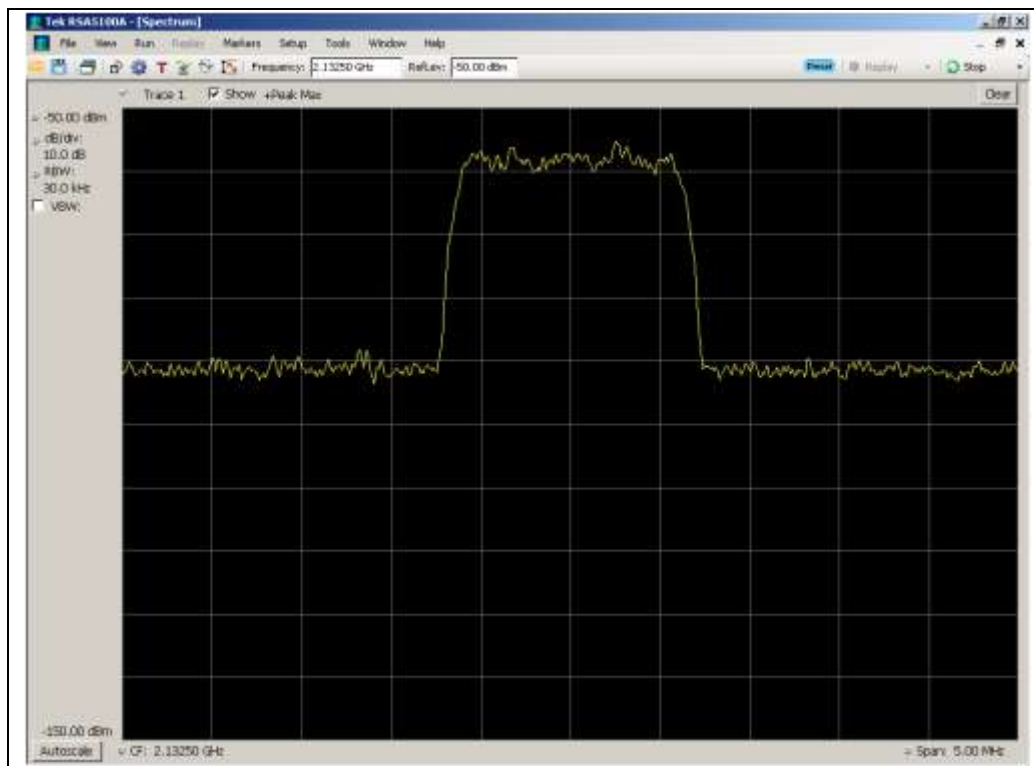
Output



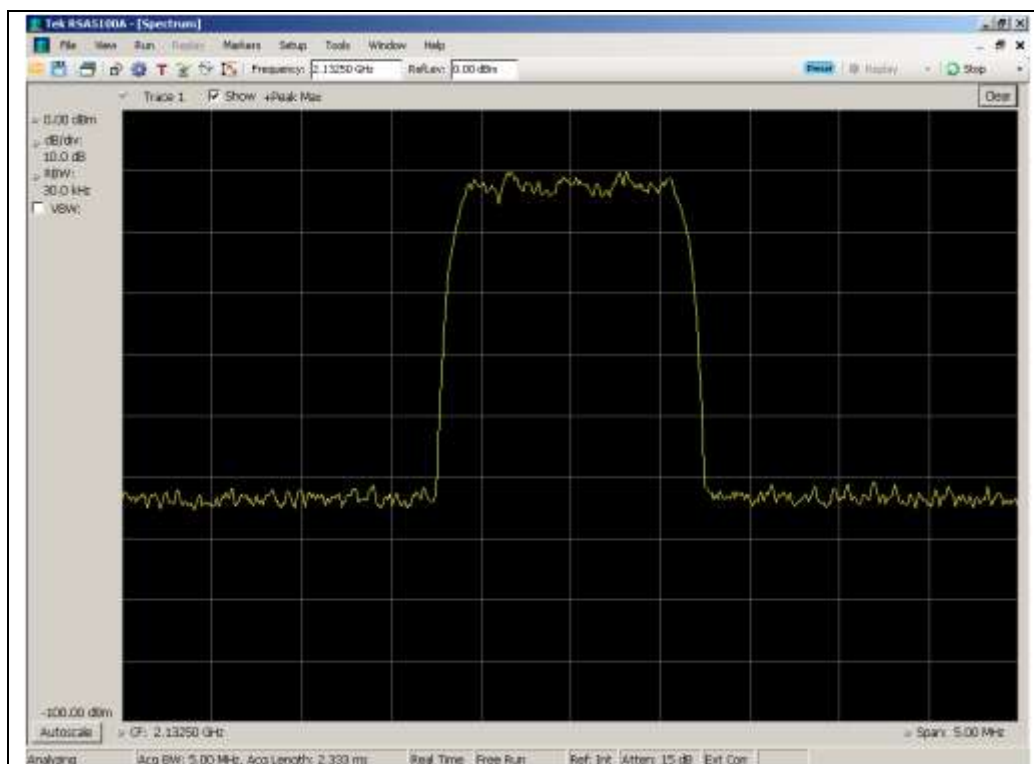


2110 - 2155 MHz Band

Input



Output

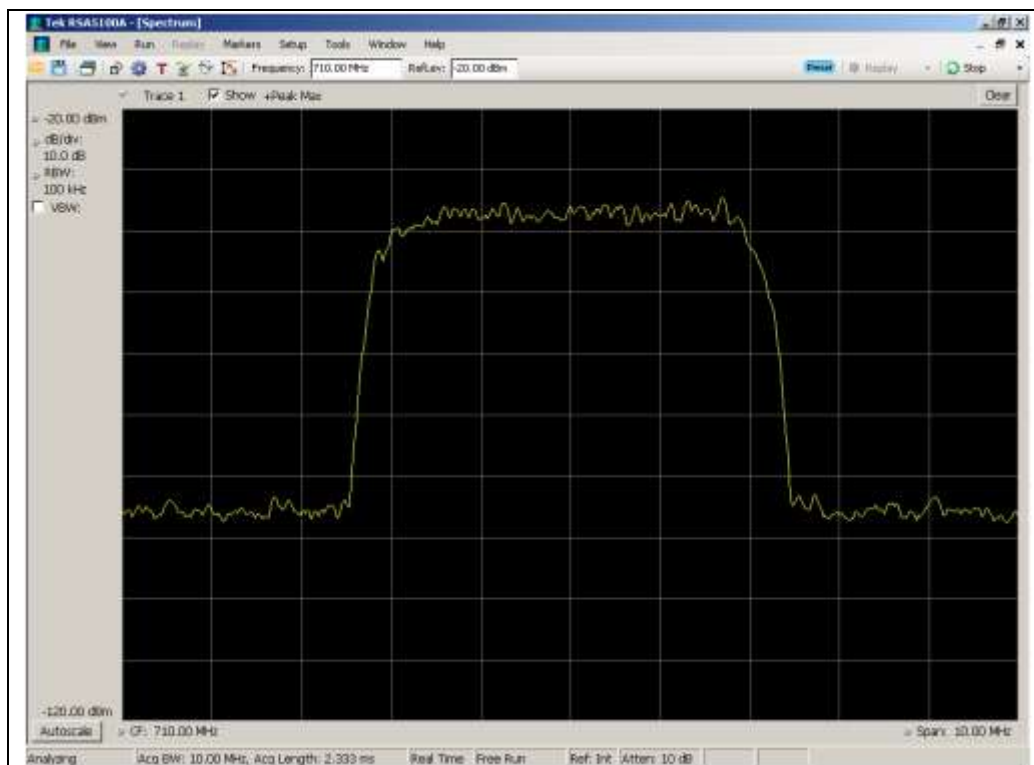




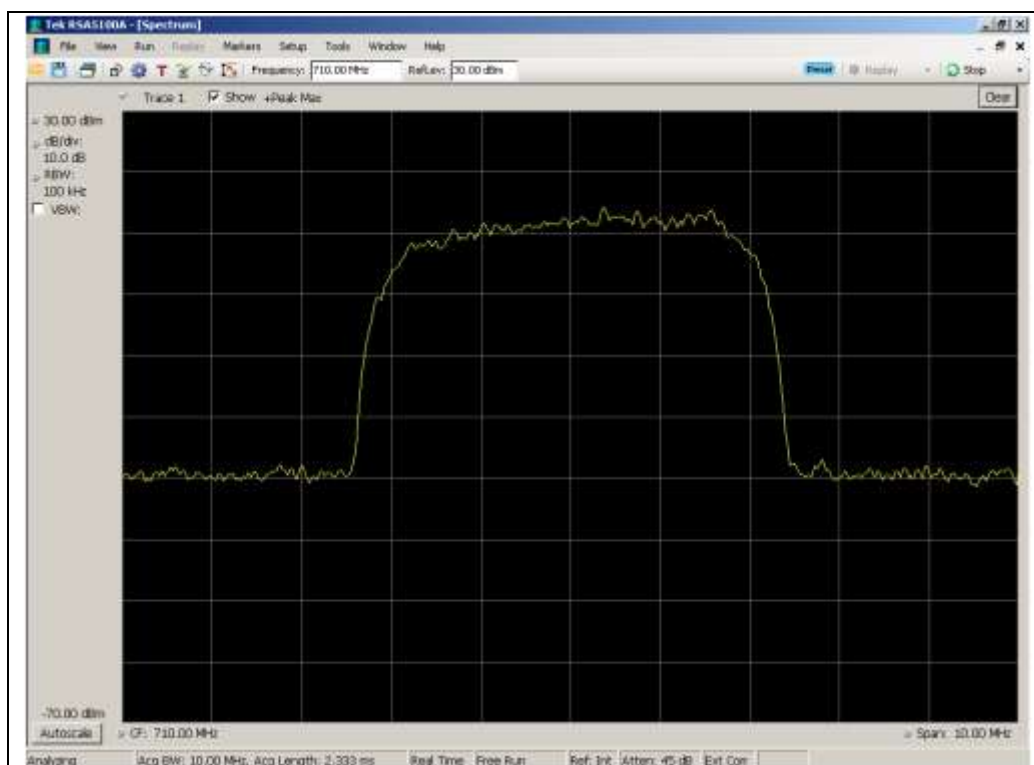
WCDMA Uplink Test Plots

704 - 716 MHz Band

Input



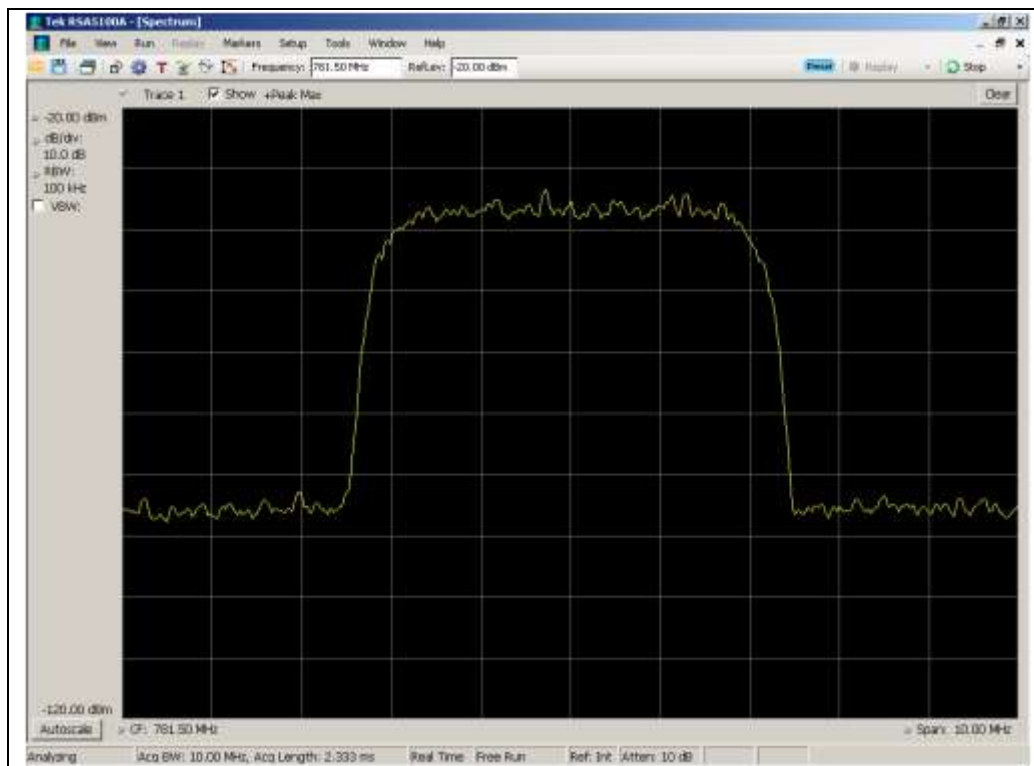
Output





776 - 787 MHz Band

Input



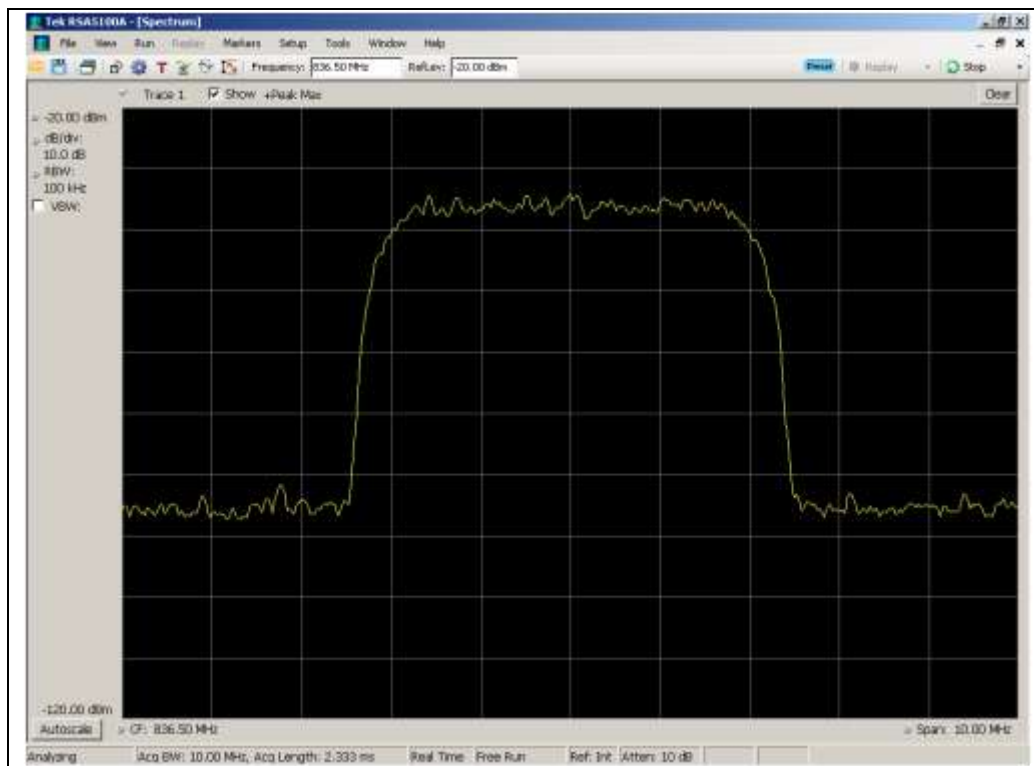
Output



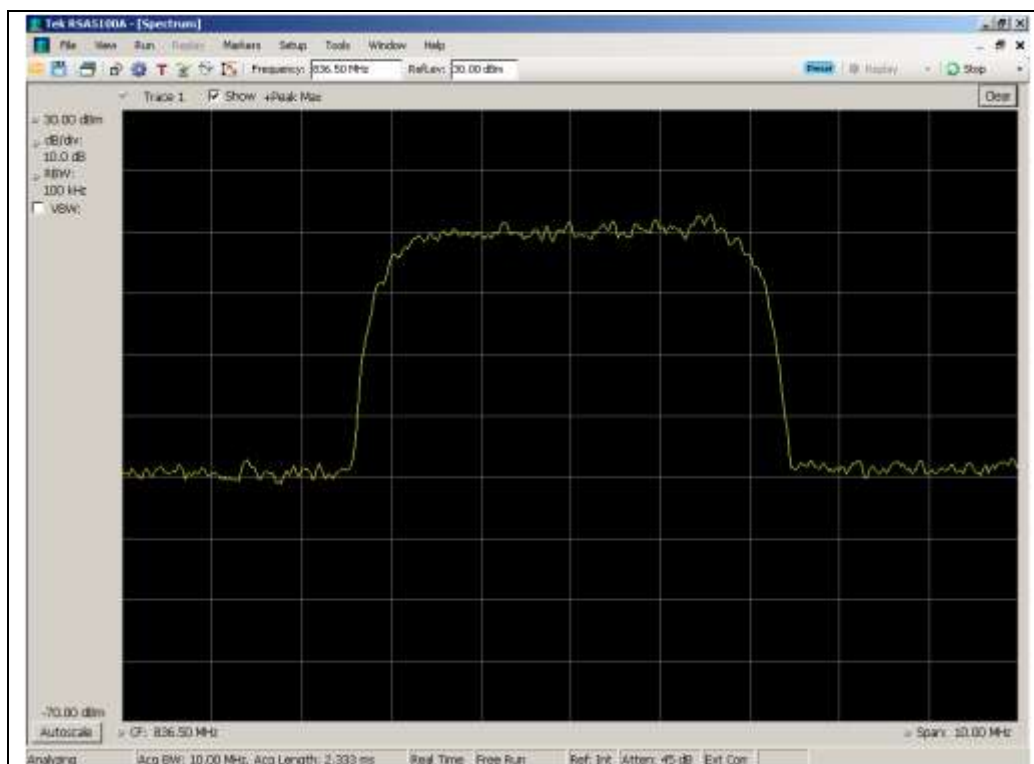


824 - 849 MHz Band

Input



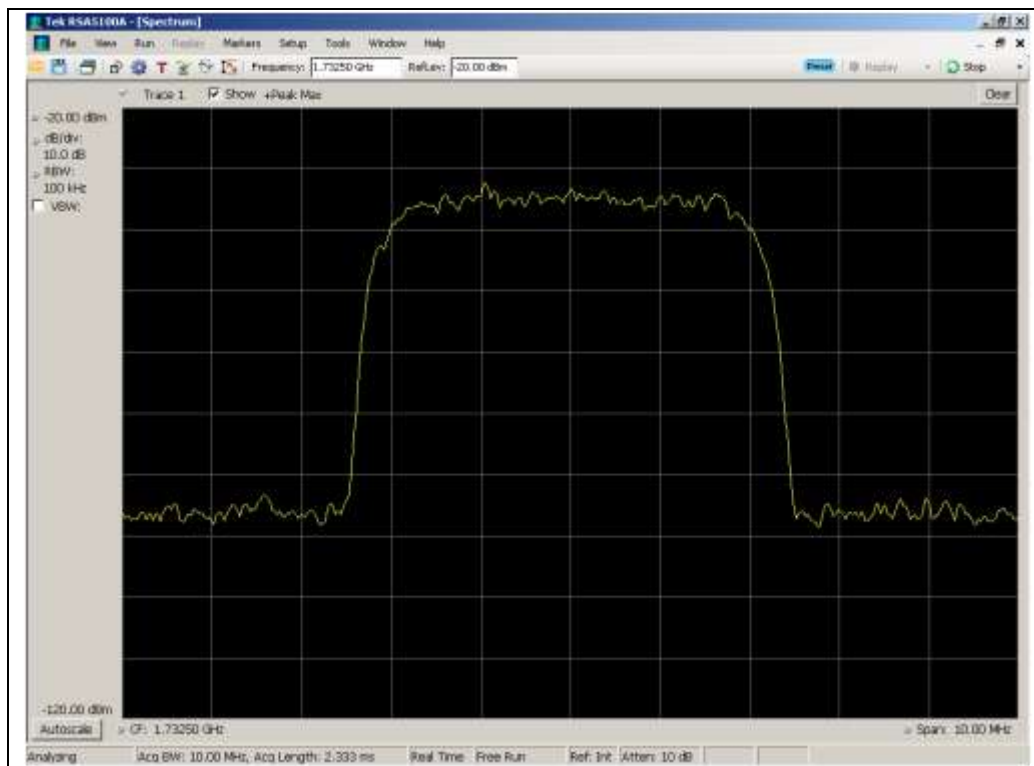
Output



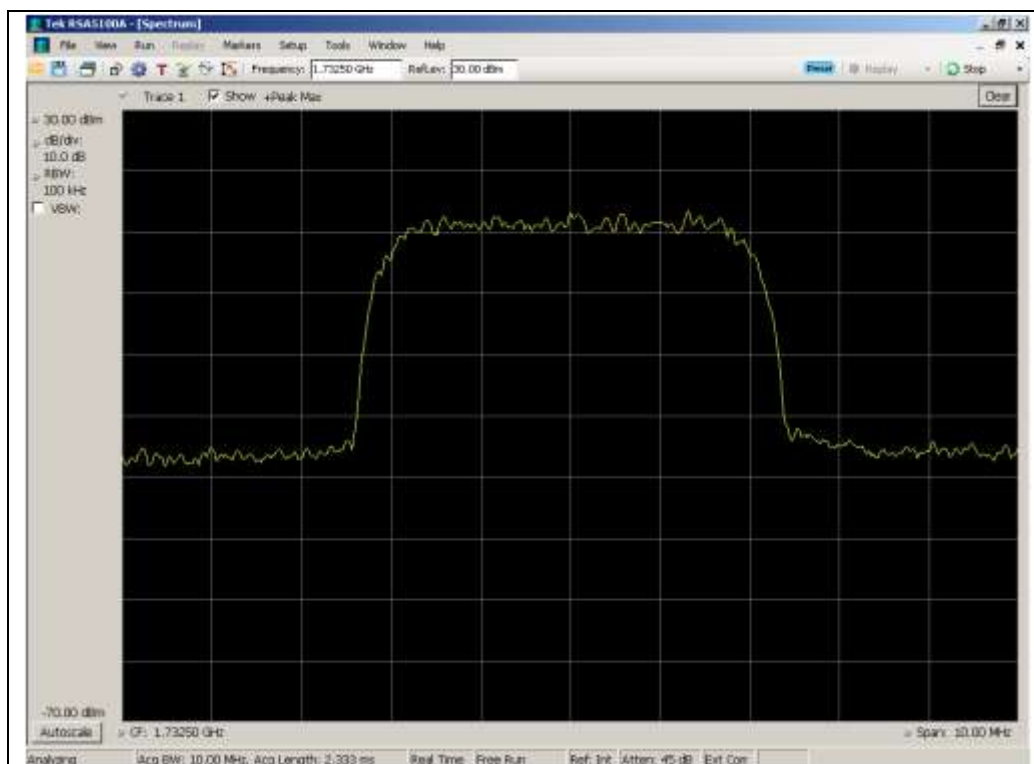


1710 - 1755 MHz Band

Input



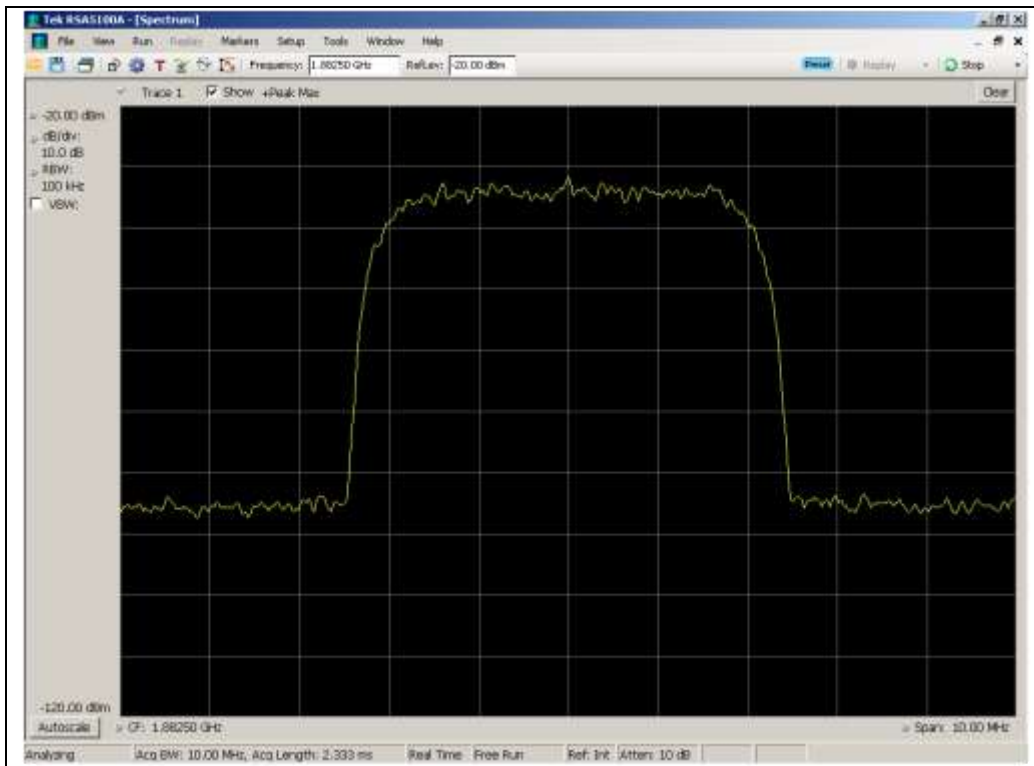
Output



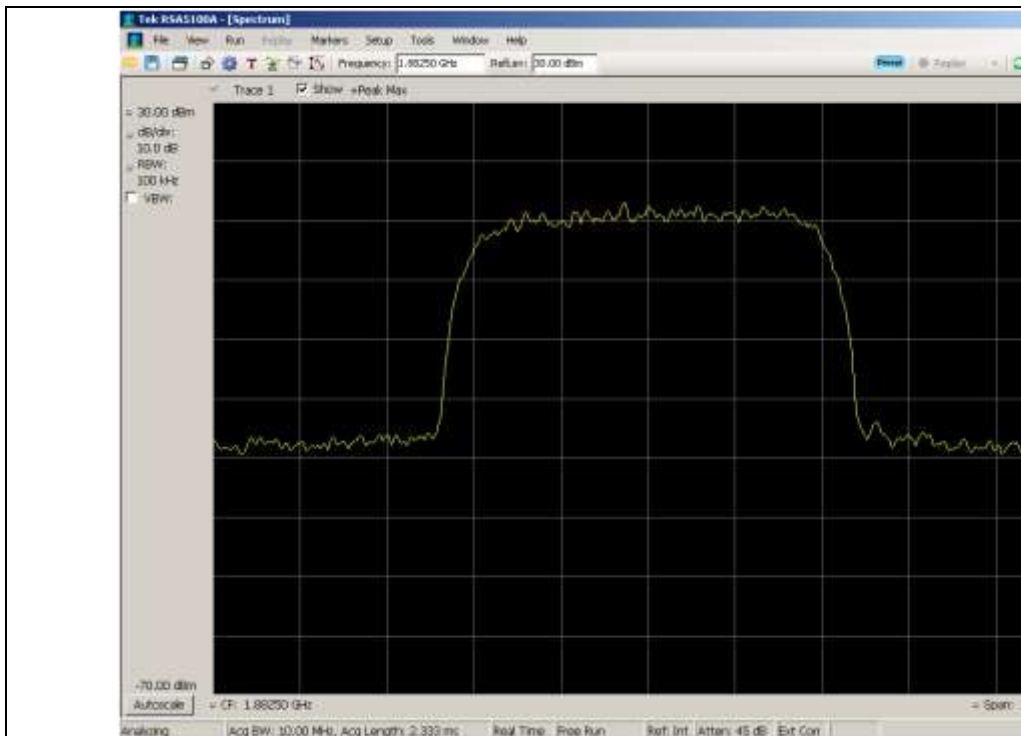


1850 - 1915 MHz Band

Input



Output

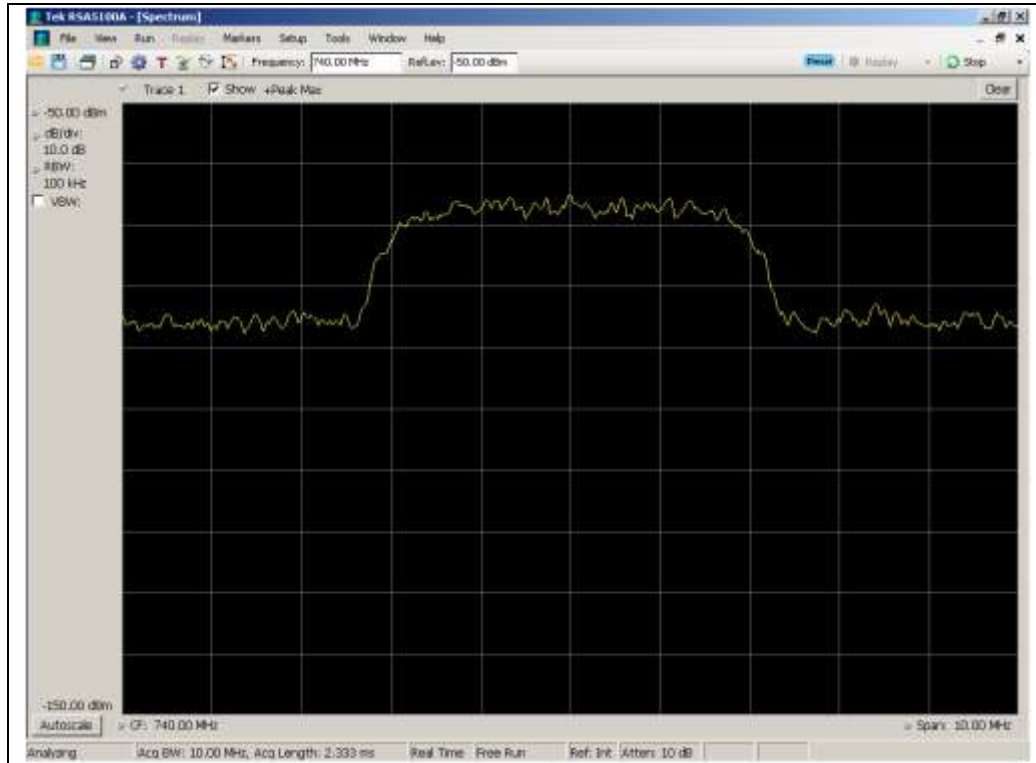




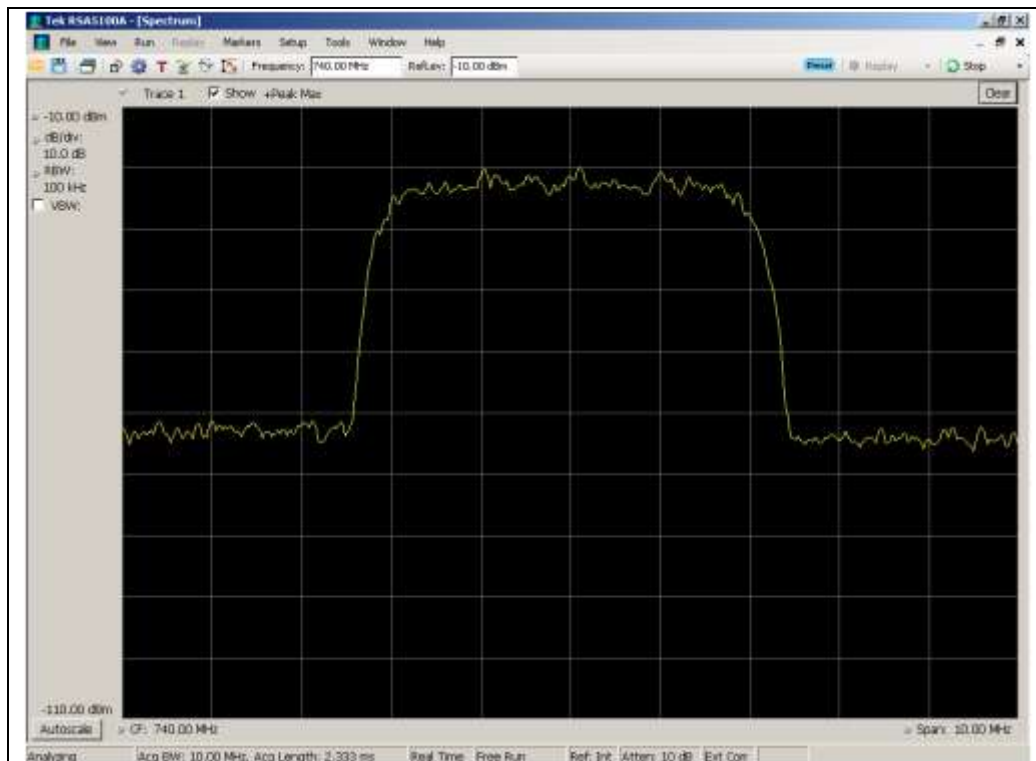
WCDMA Downlink Test Plots

734 - 746 MHz Band

Input



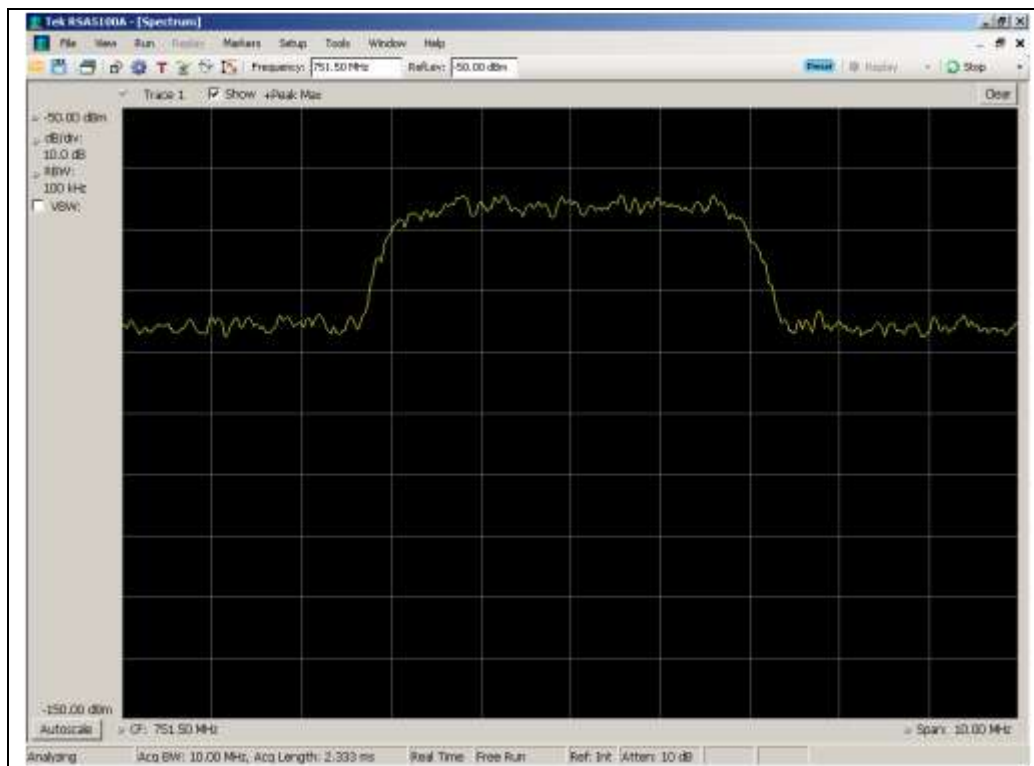
Output



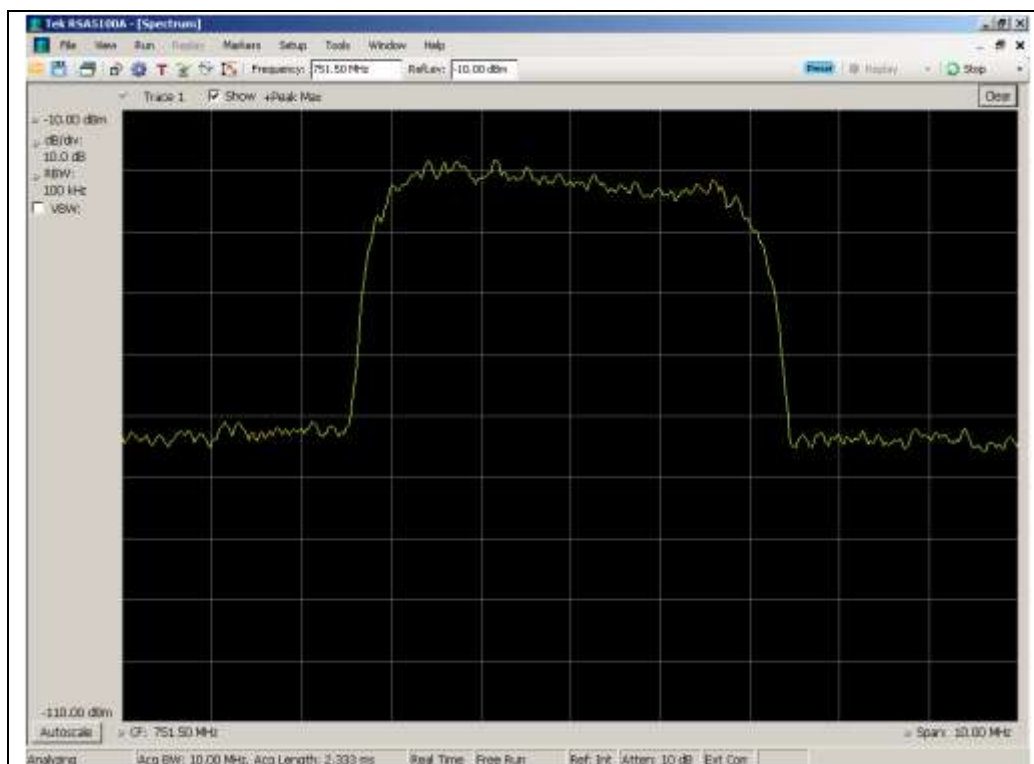


746 - 757 MHz Band

Input



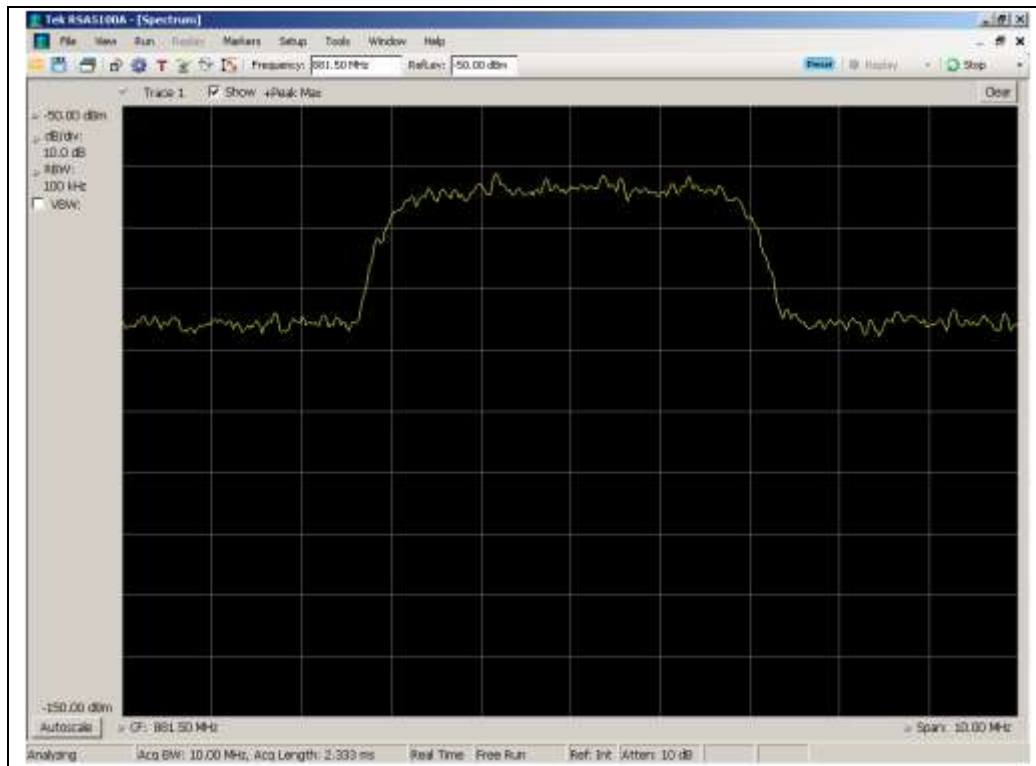
Output



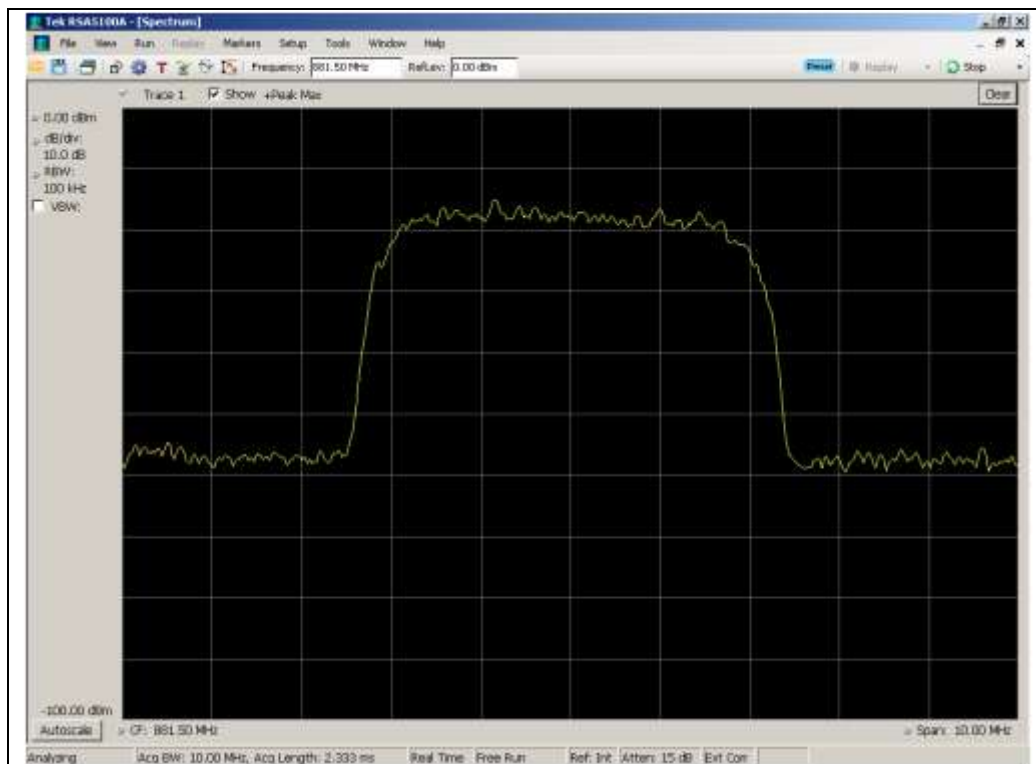


869 - 894 MHz Band

Input



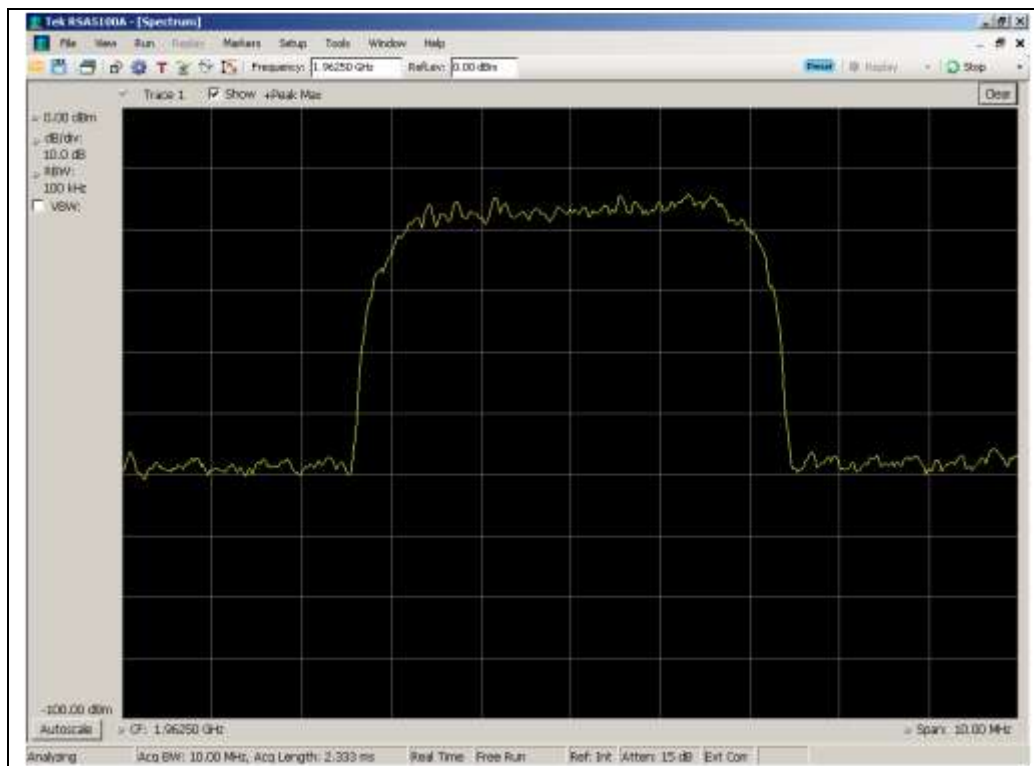
Output





1930 - 1995 MHz Band

Input



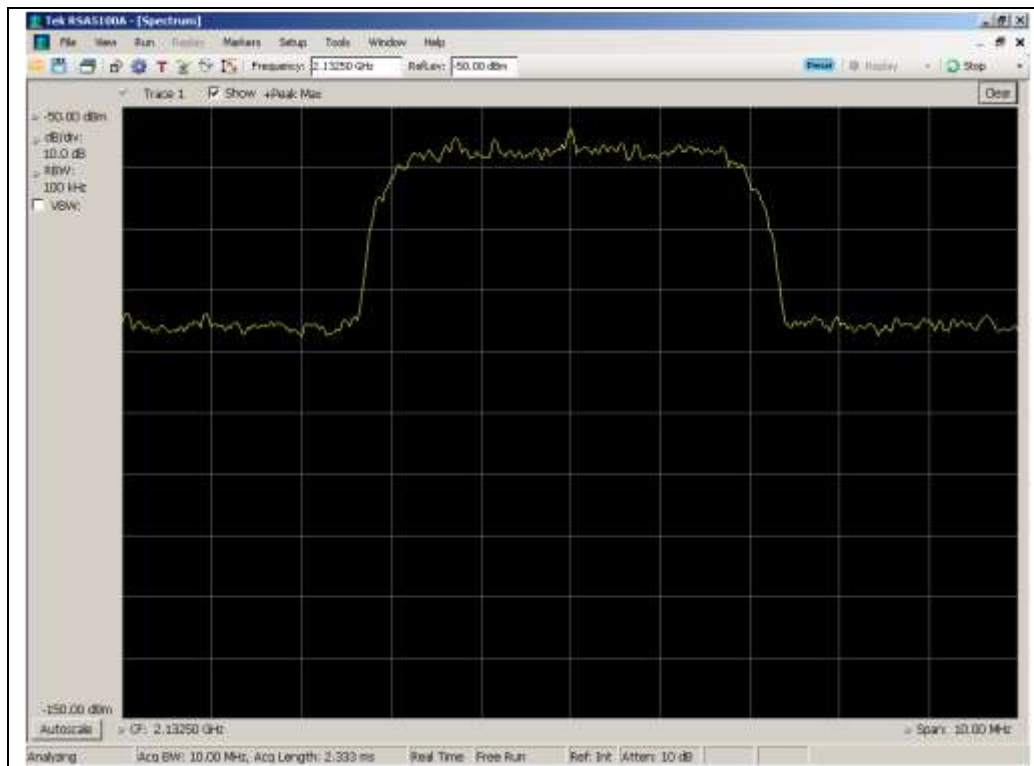
Output



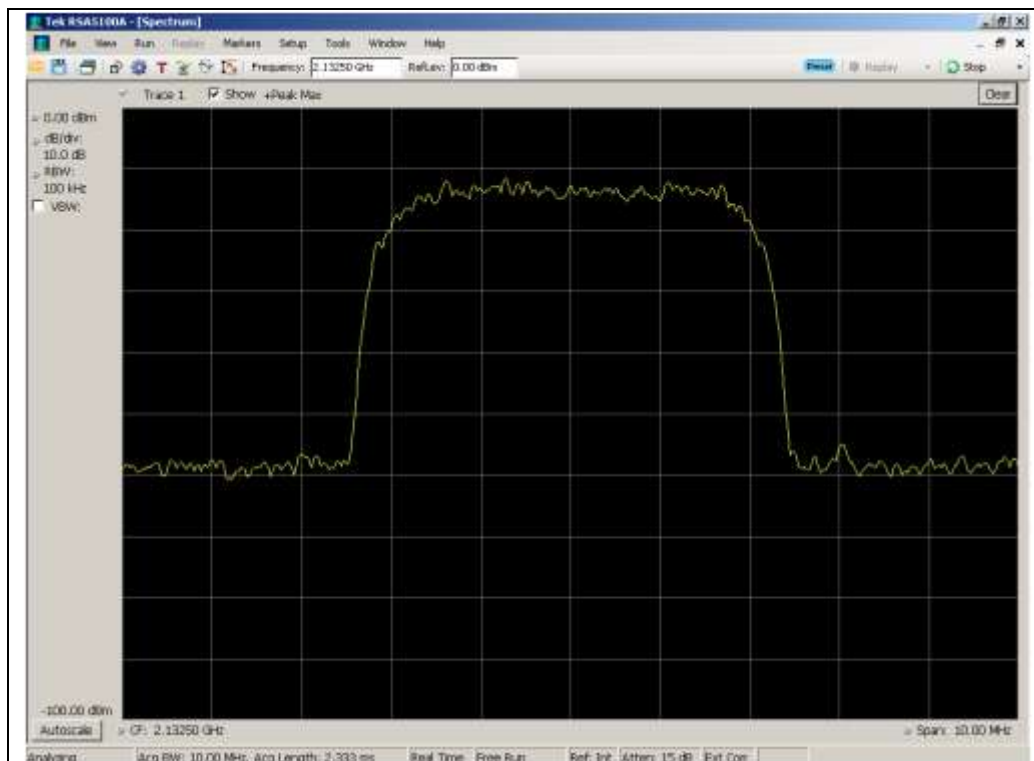


2110 - 2155 MHz Band

Input



Output





Oscillation Detection

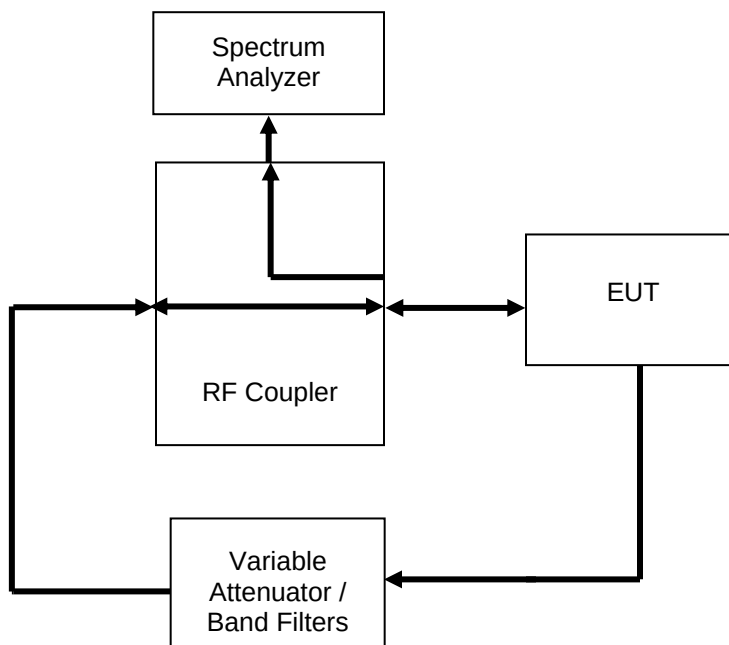
Name of Test: Oscillation Detection
Test Equipment Utilized: i00411, i00413, i00424

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

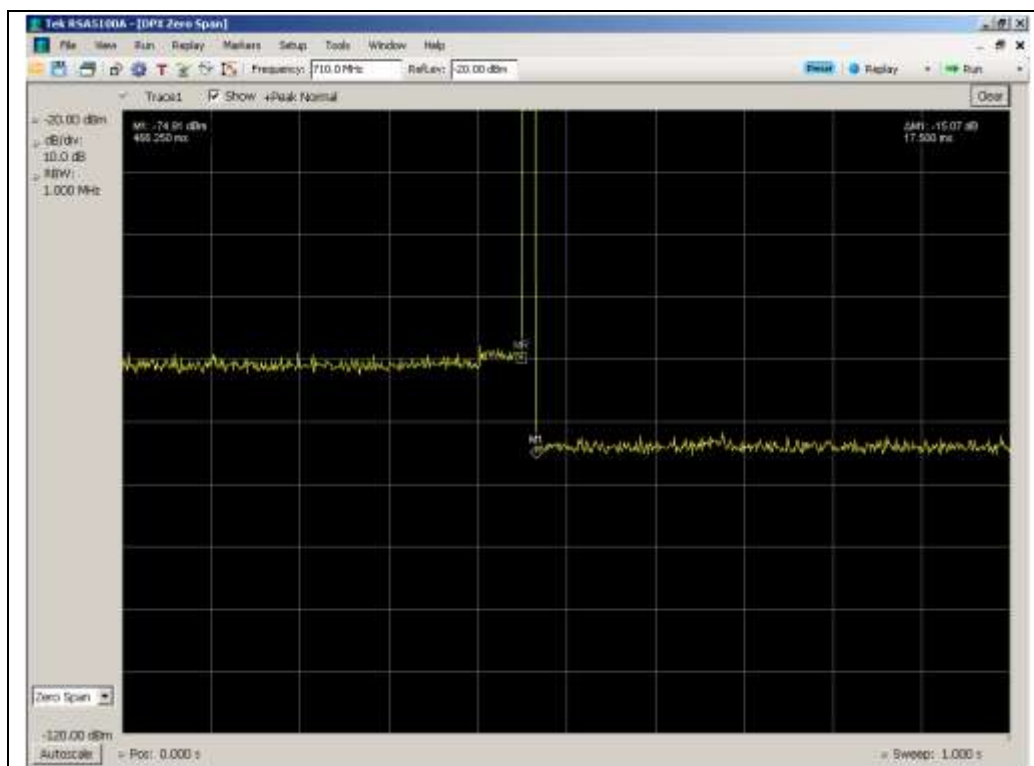
Downlink Restart Count Test Results

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

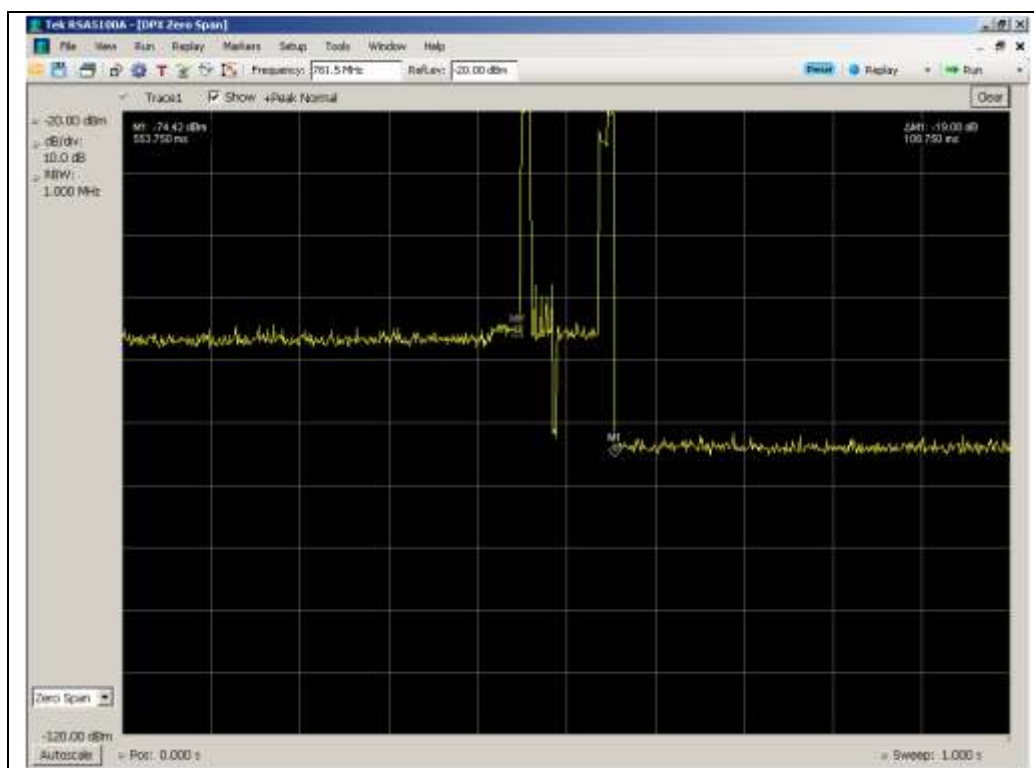


Uplink Detection Time Test Results

704 - 716 MHz Band

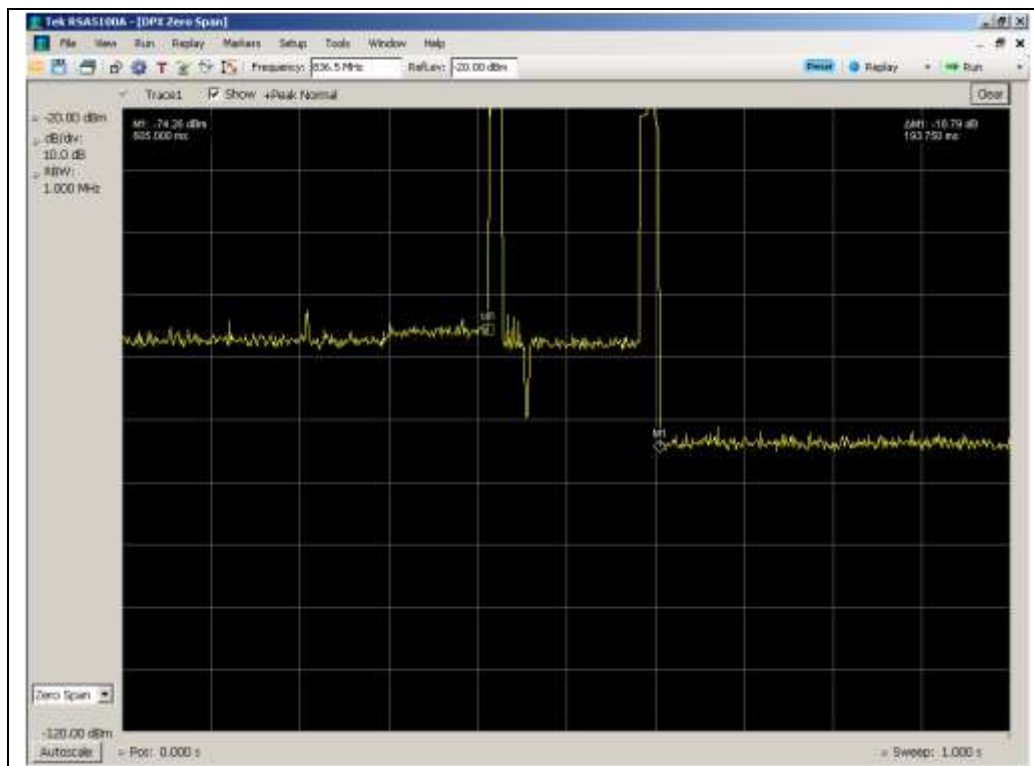


776 - 787 MHz Band

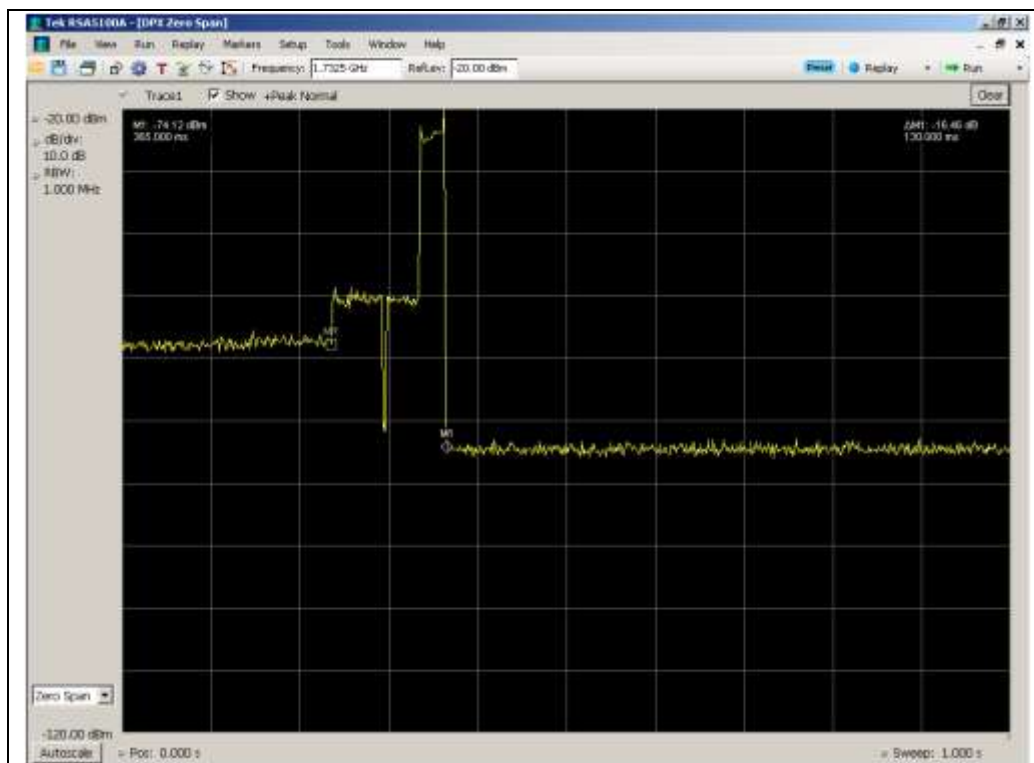




824 - 849 MHz Band

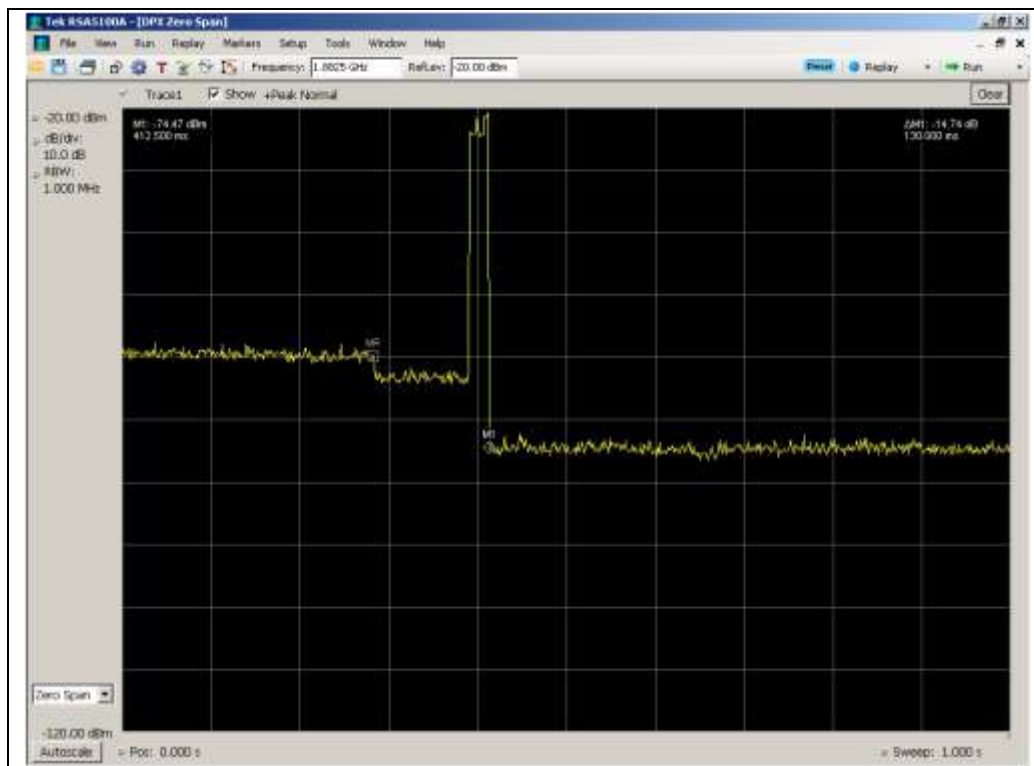


1710 - 1755 MHz Band



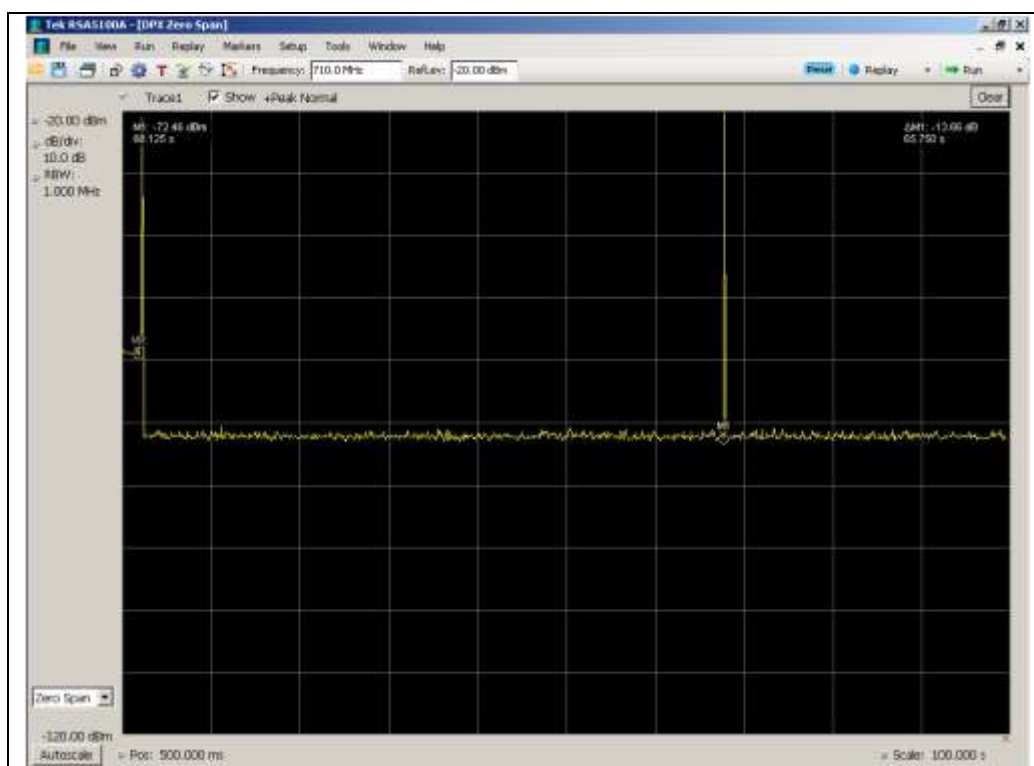


1850 - 1915 MHz Band



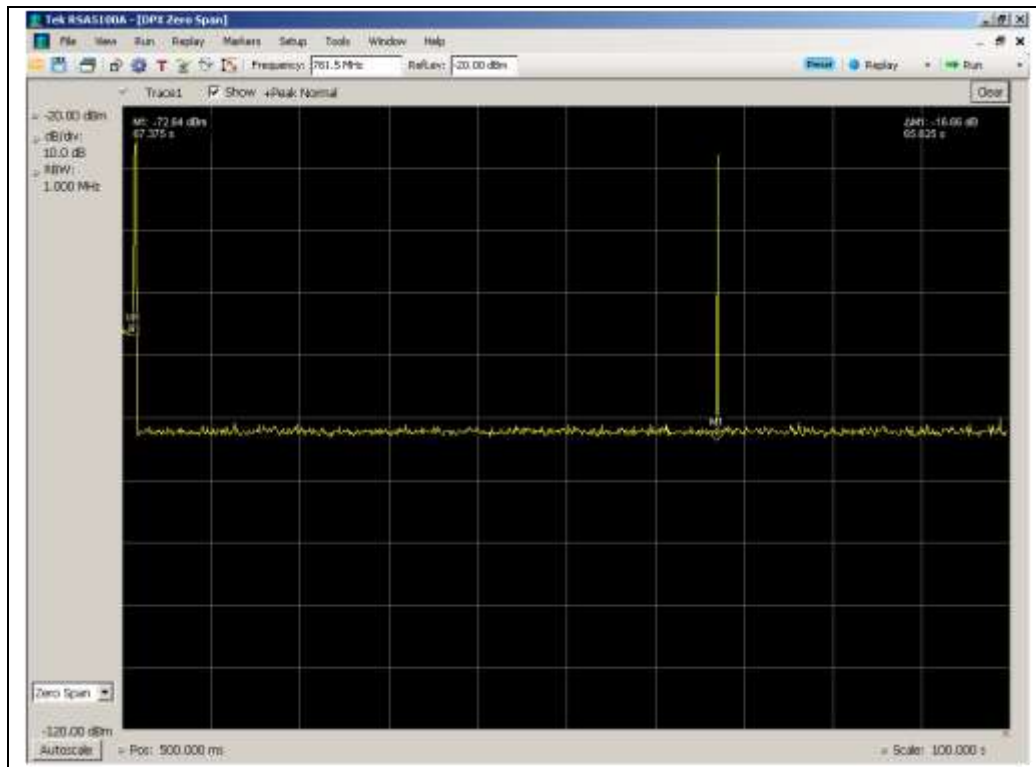
Uplink Restart Time Test Results

704 - 716 MHz Band

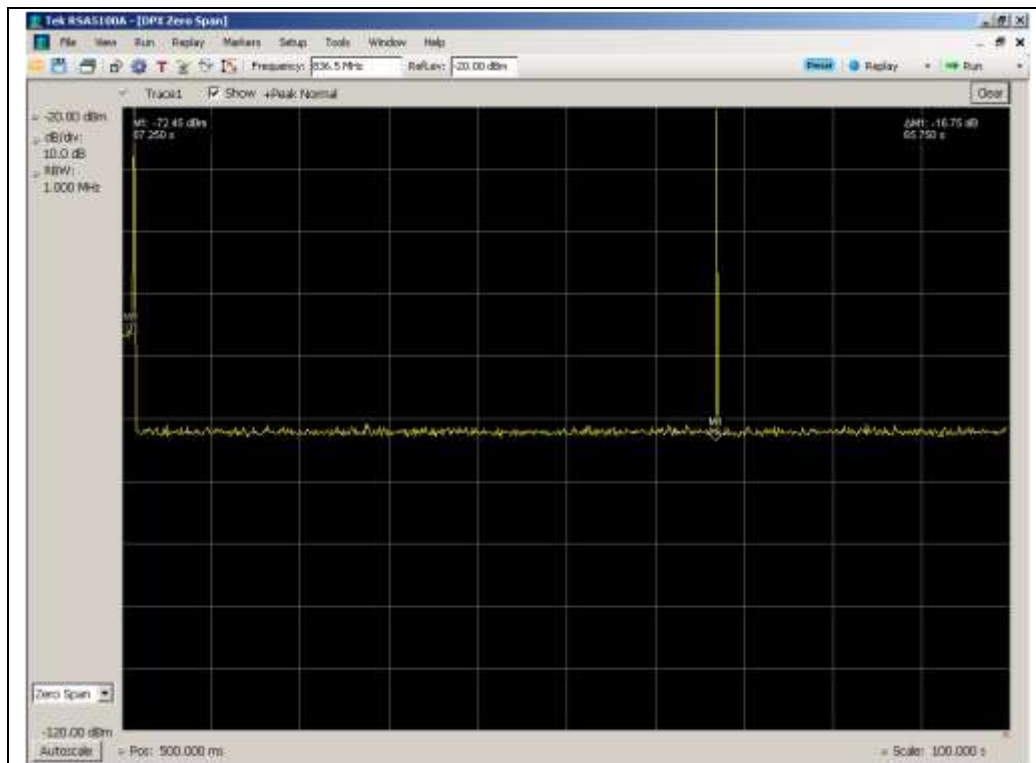




776 - 787 MHz Band

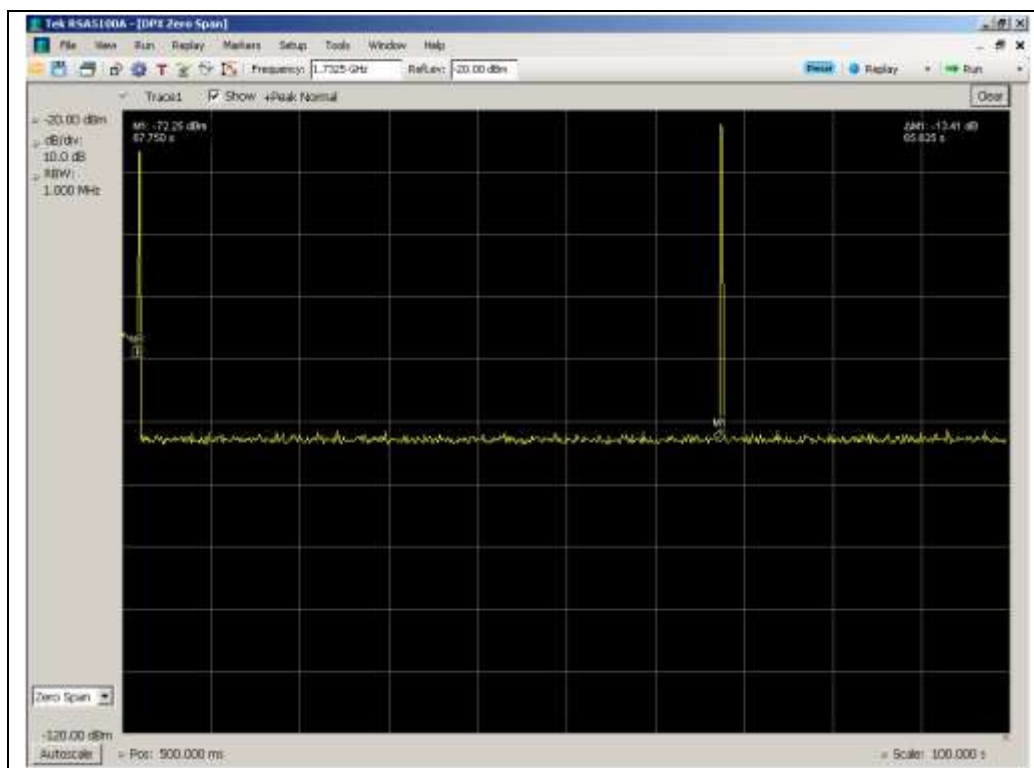


824 - 849 MHz Band

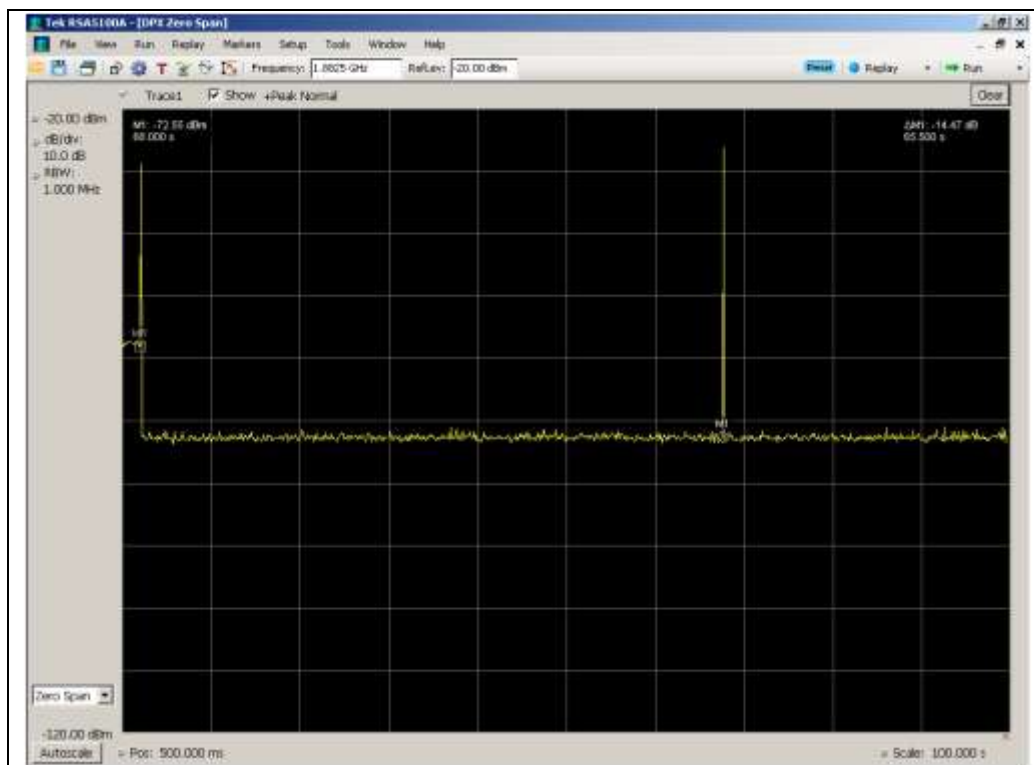




1710 - 1755 MHz Band



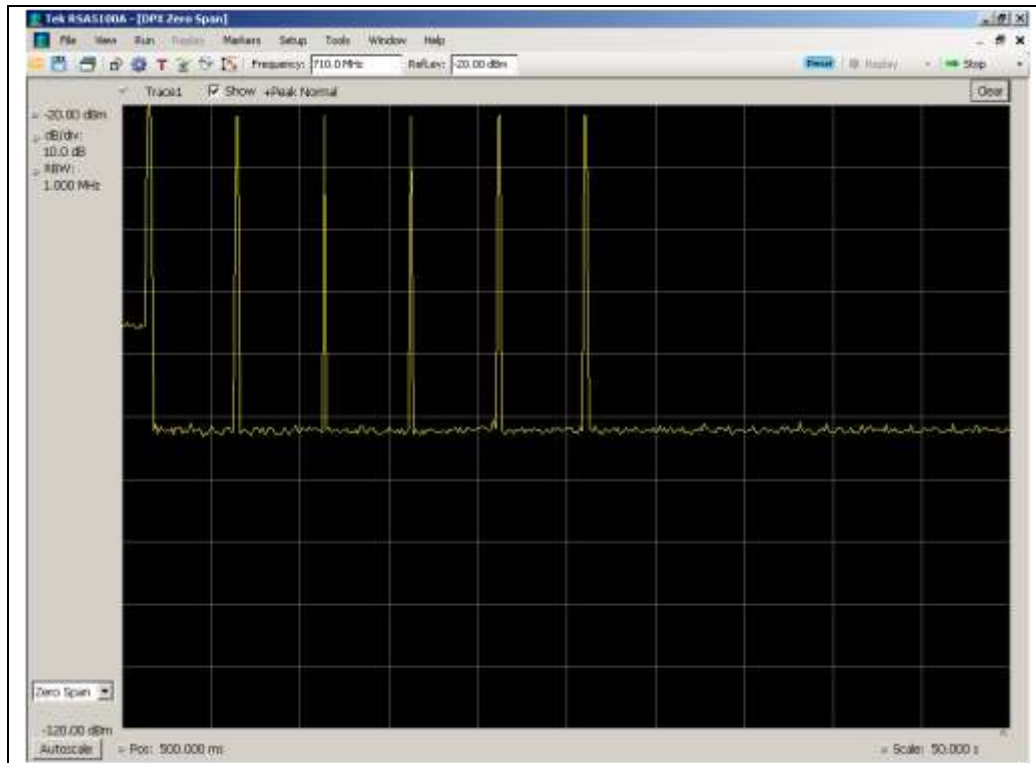
1850 - 1915 MHz Band



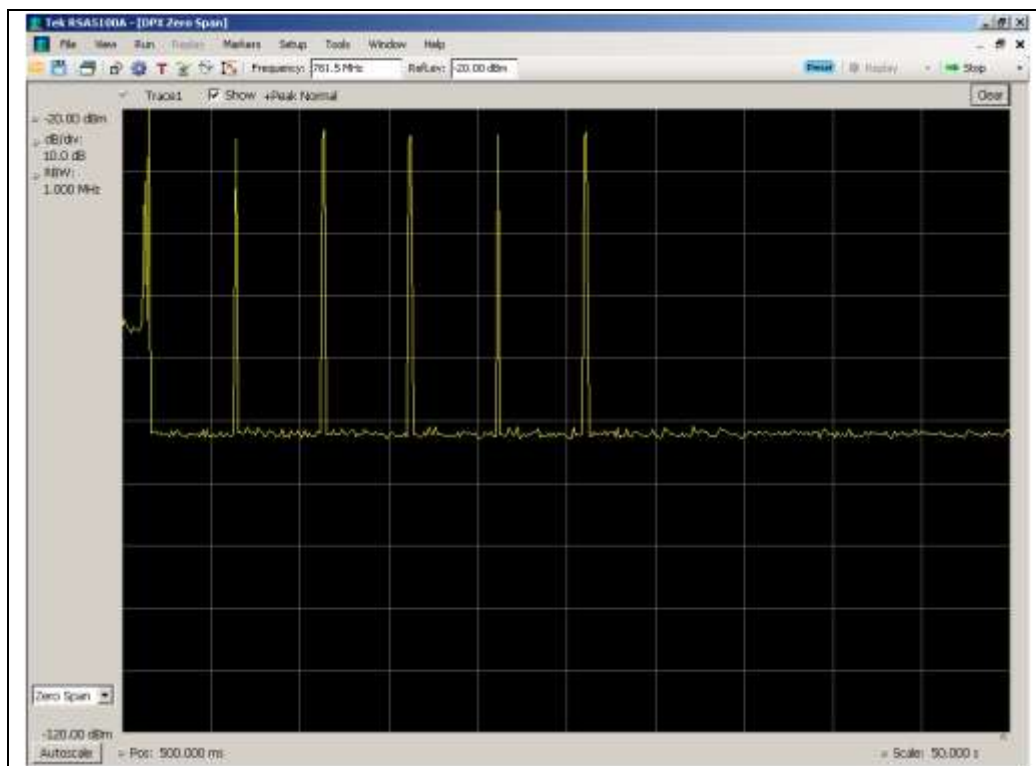


Uplink Restart Count Test Results

704 - 716 MHz Band

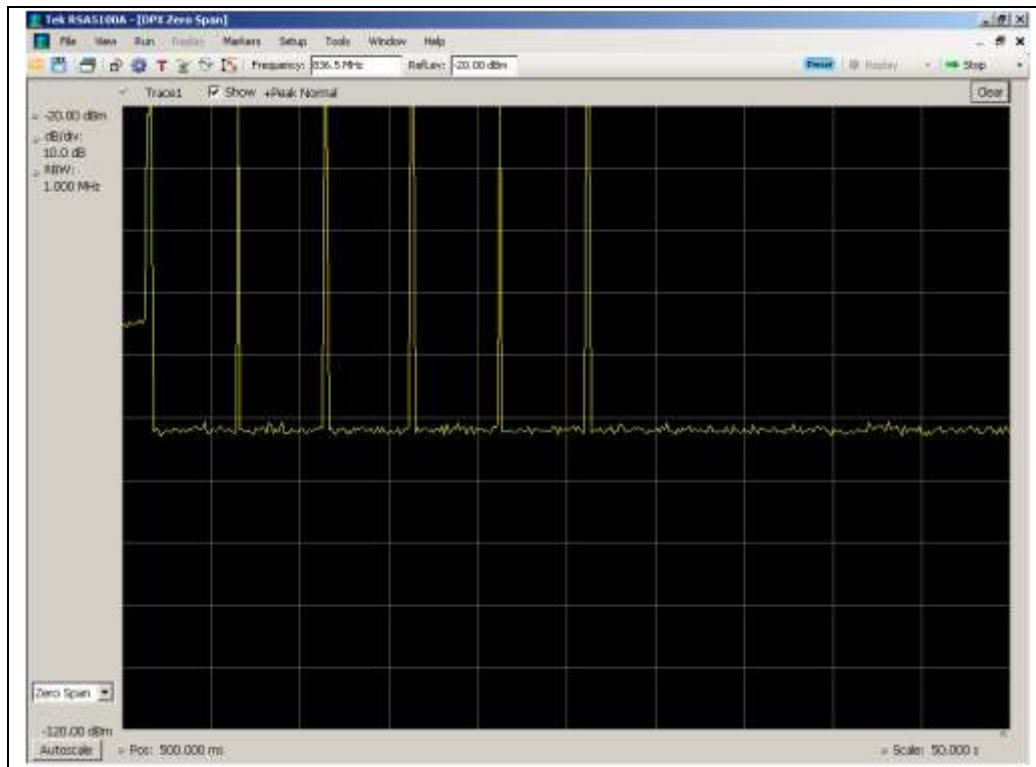


776 - 787 MHz Band

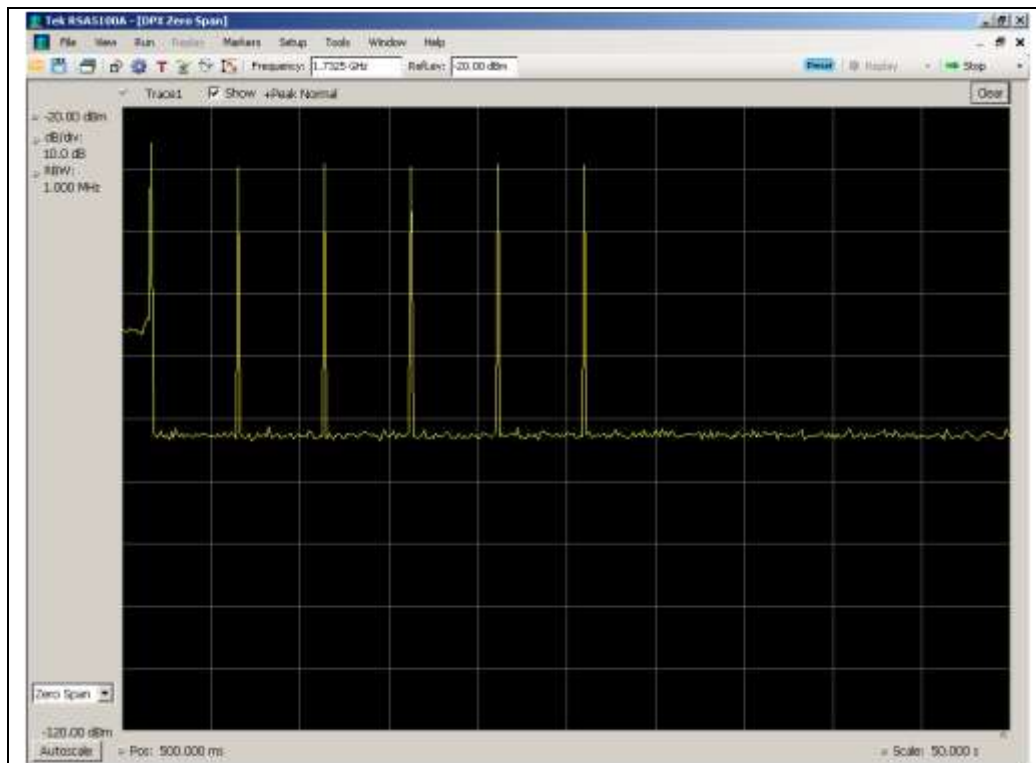




824 - 849 MHz Band

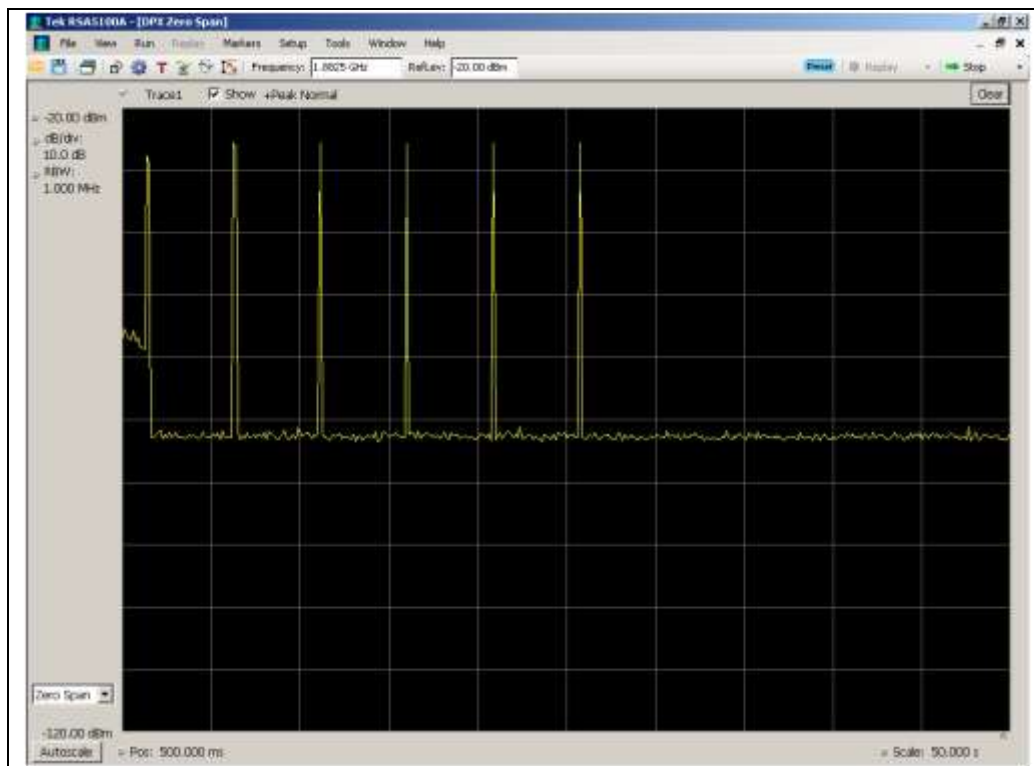


1710 - 1755 MHz Band



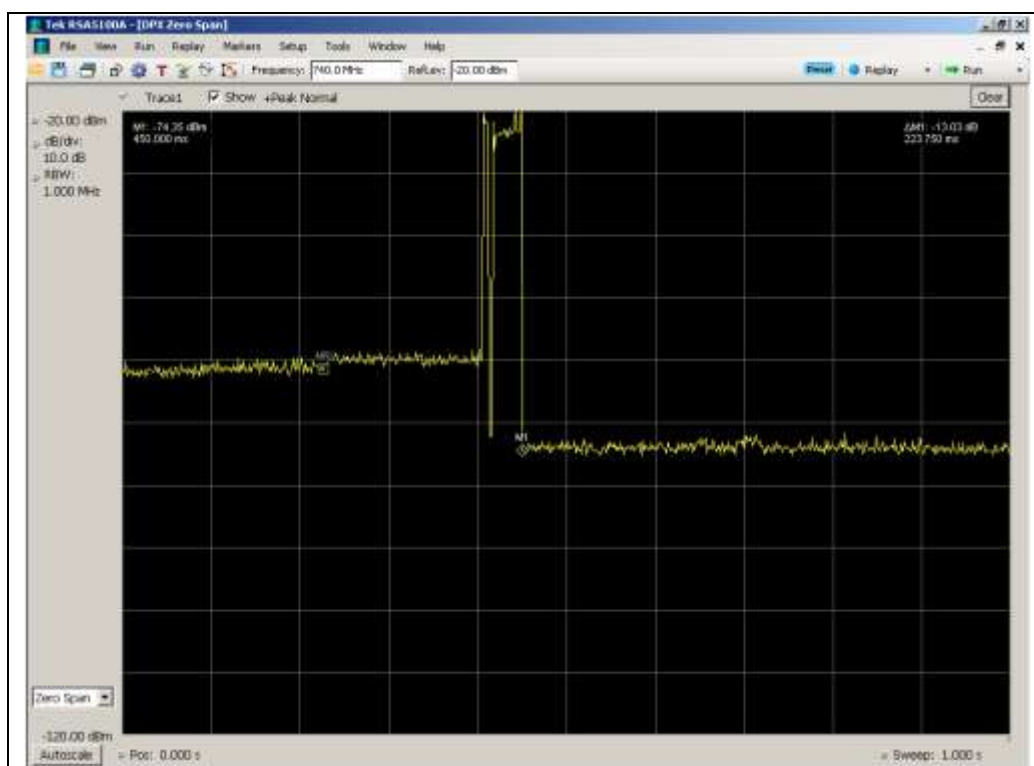


1850 - 1915 MHz Band



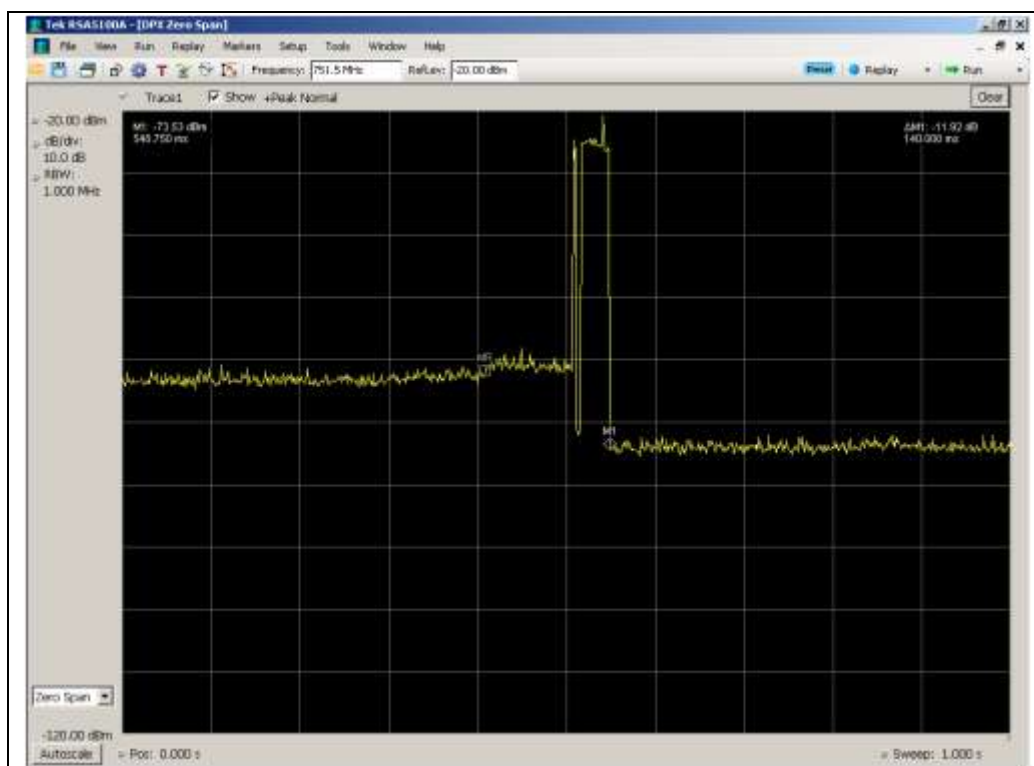
Downlink Detection Time Test Results

734 - 746 MHz Band

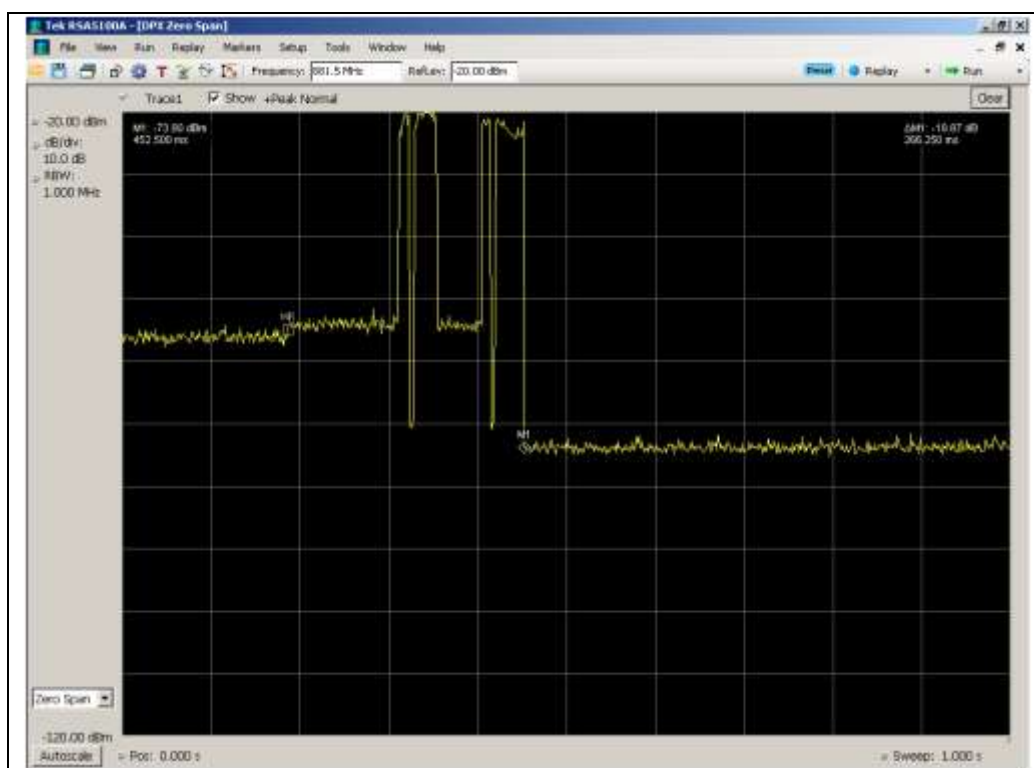




746 - 757 MHz Band

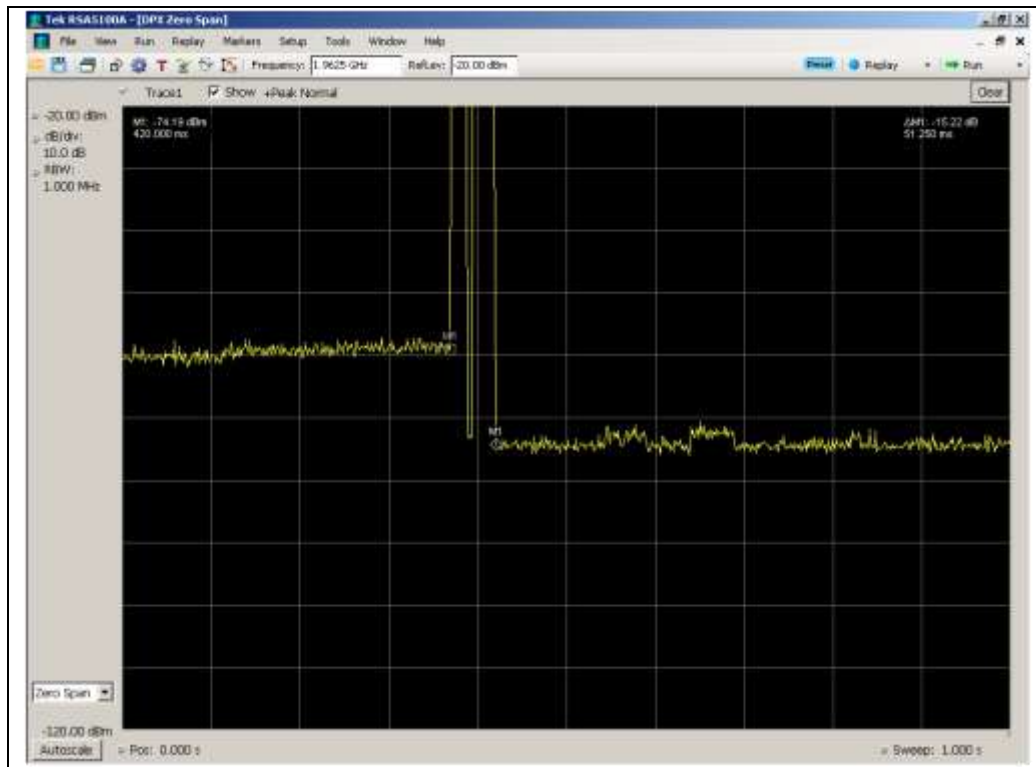


869 - 894 MHz Band

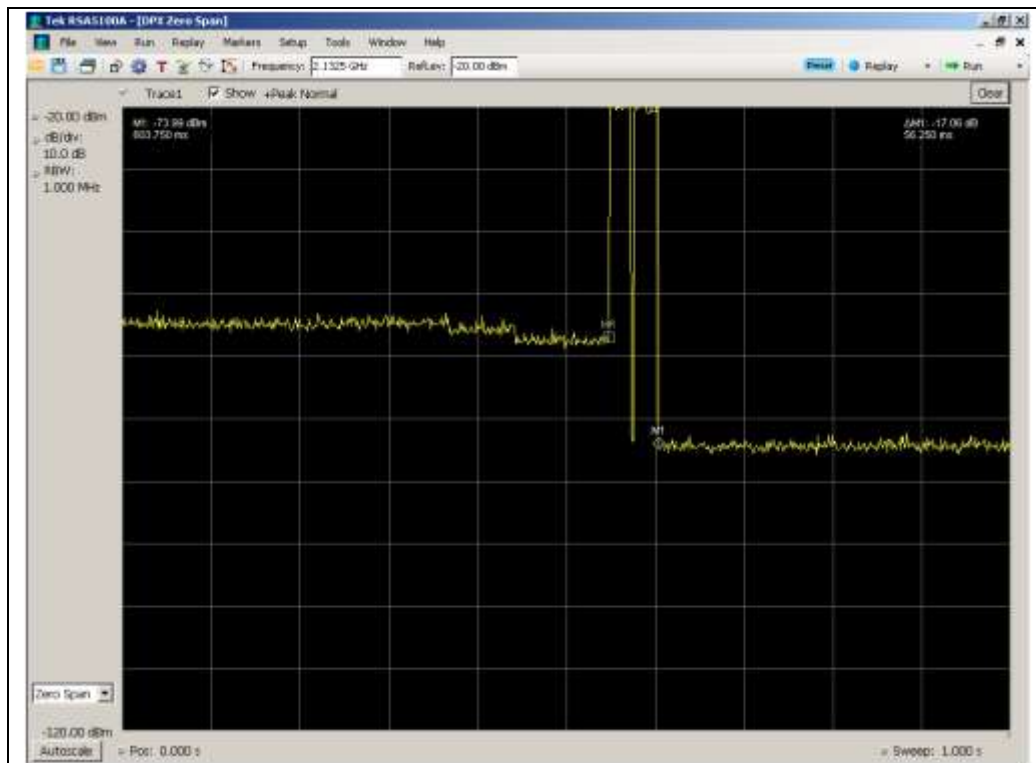




1930 - 1995 MHz Band



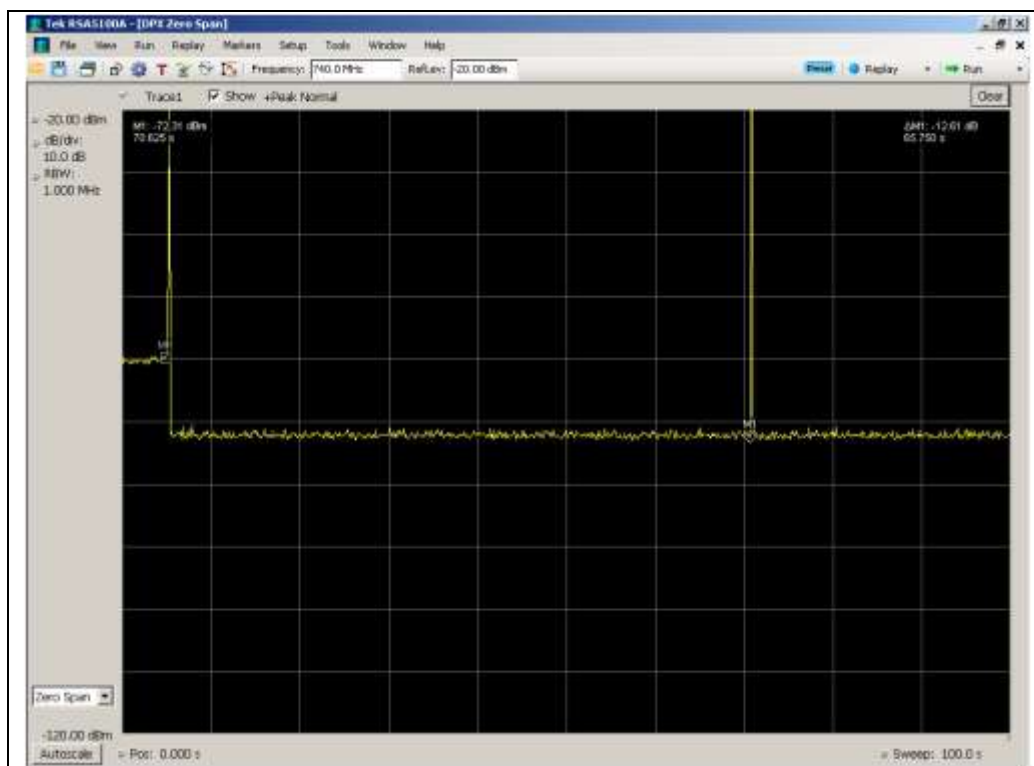
2110 - 2155 MHz Band



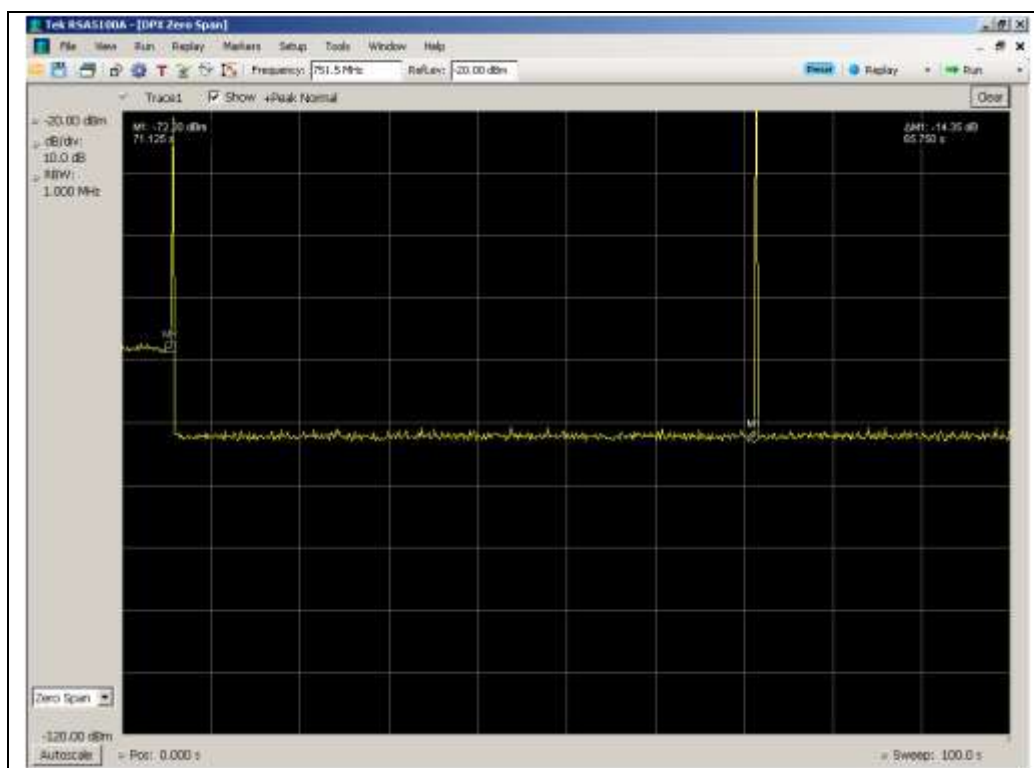


Downlink Restart Time Test Results

734 - 746 MHz Band

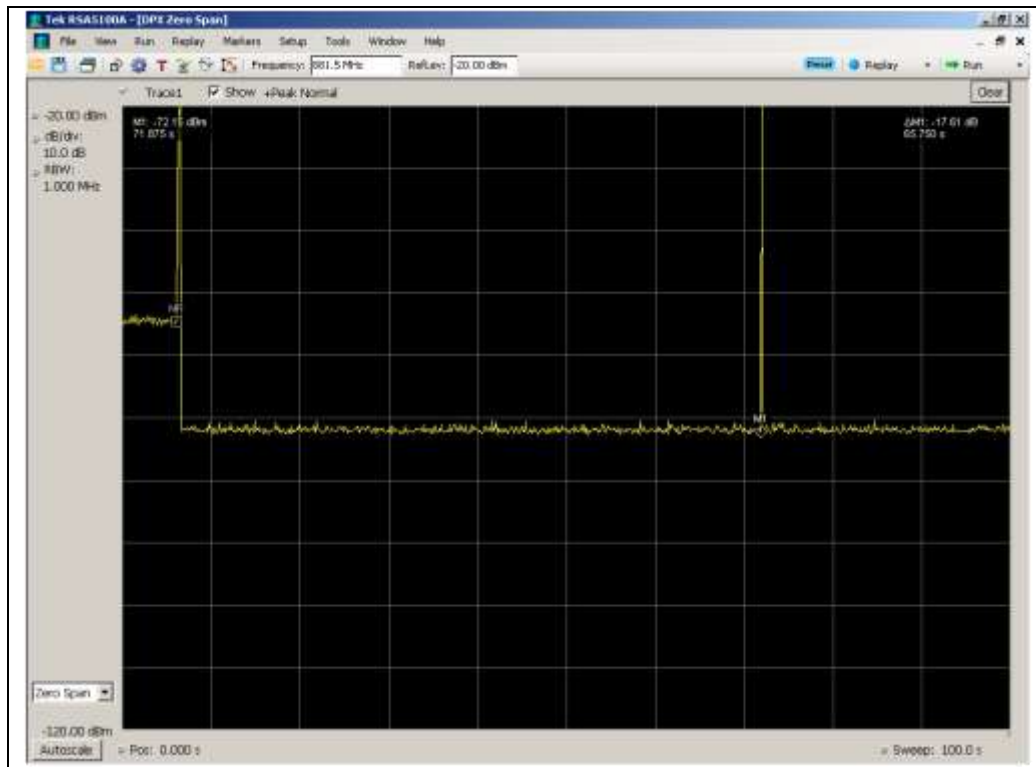


746 - 757 MHz Band

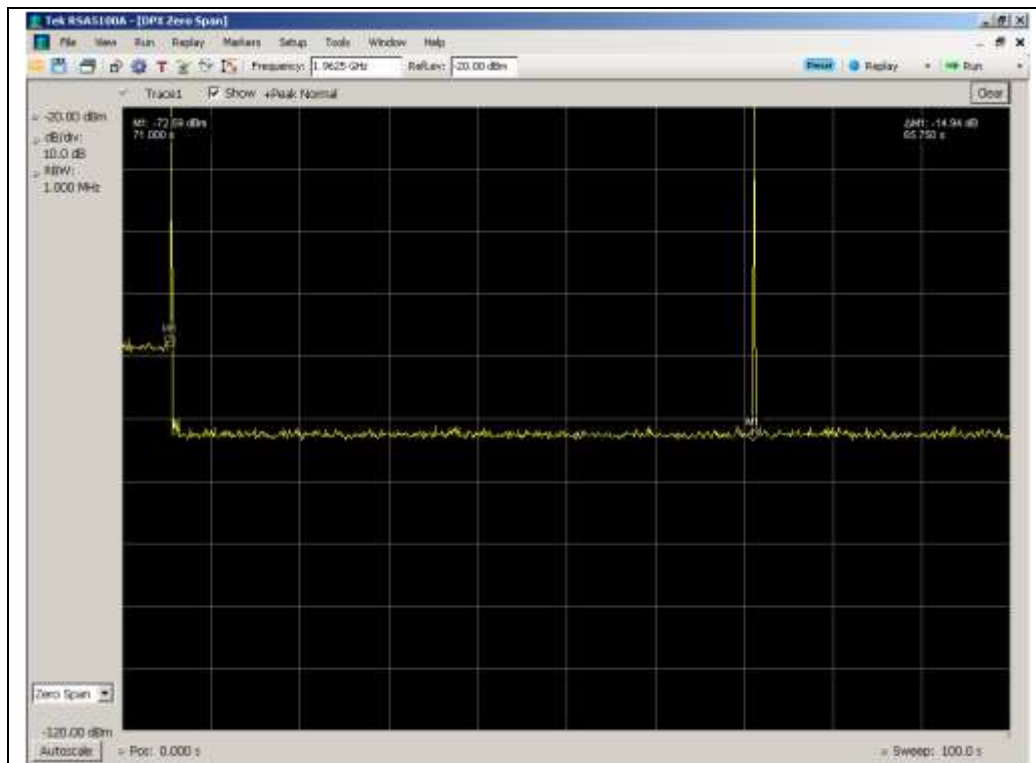




869 - 894 MHz Band

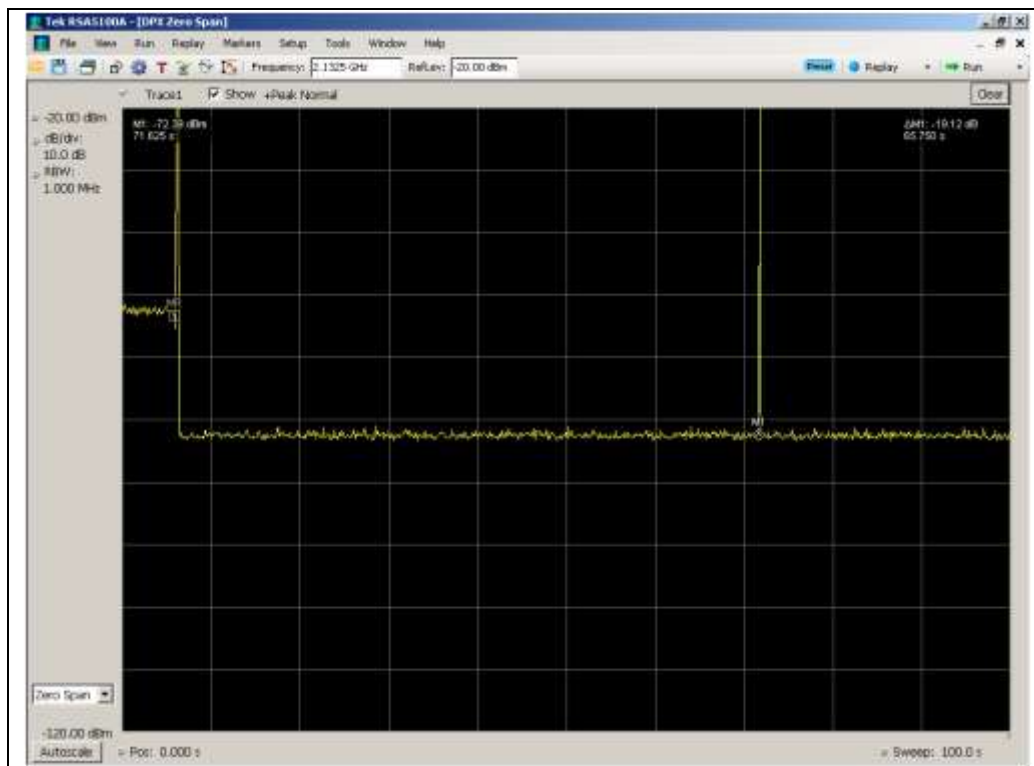


1930 - 1995 MHz Band



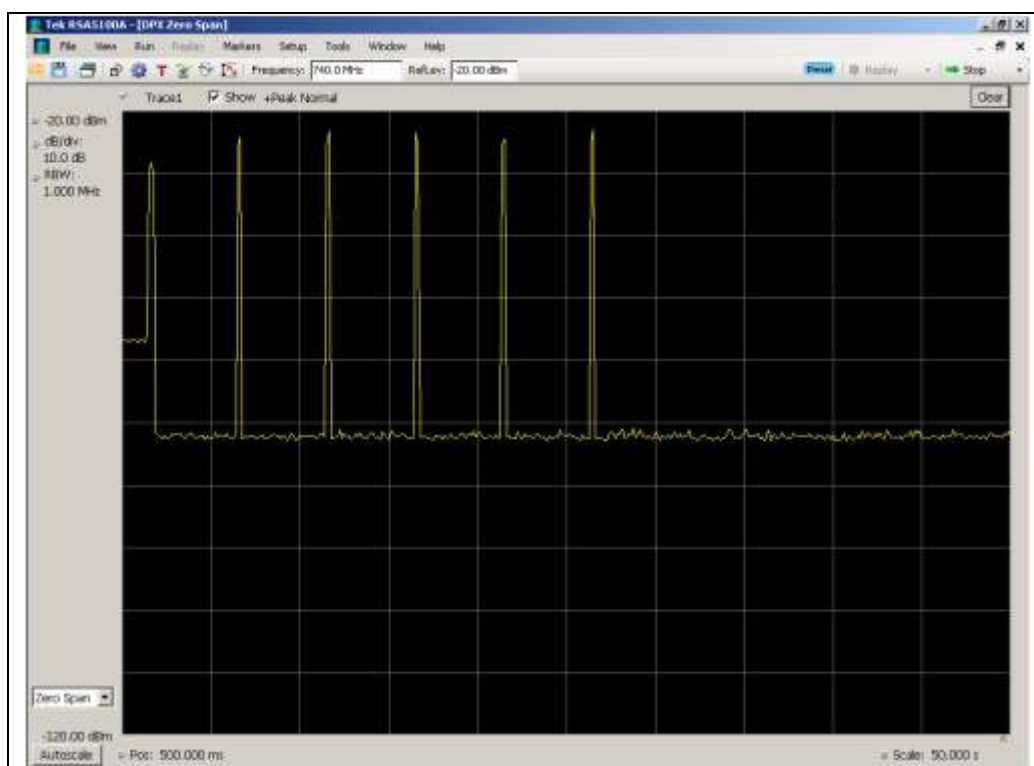


2110 - 2155 MHz Band



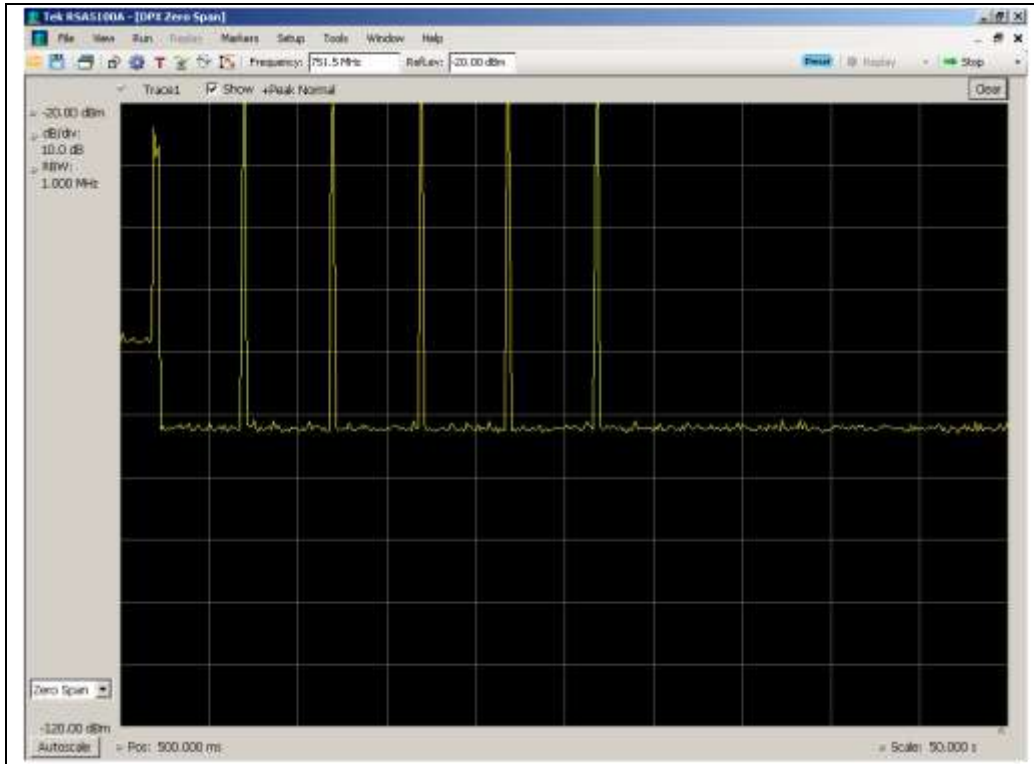
Downlink Restart Count Test Results

734 - 746 MHz Band

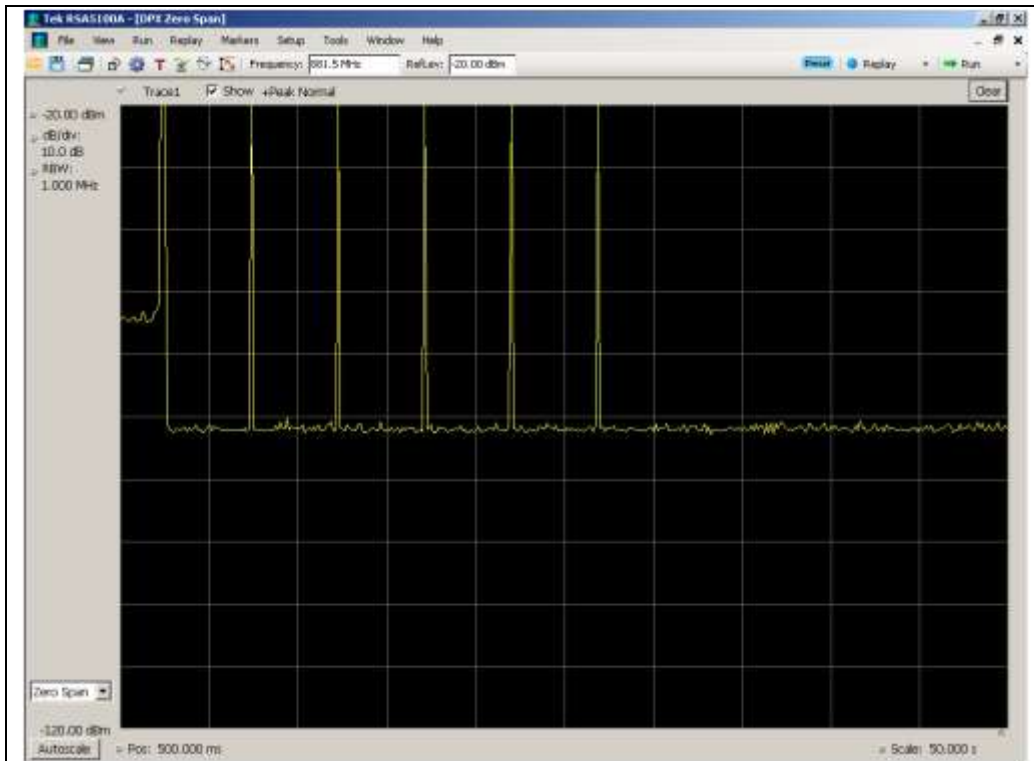




746 - 757 MHz Band

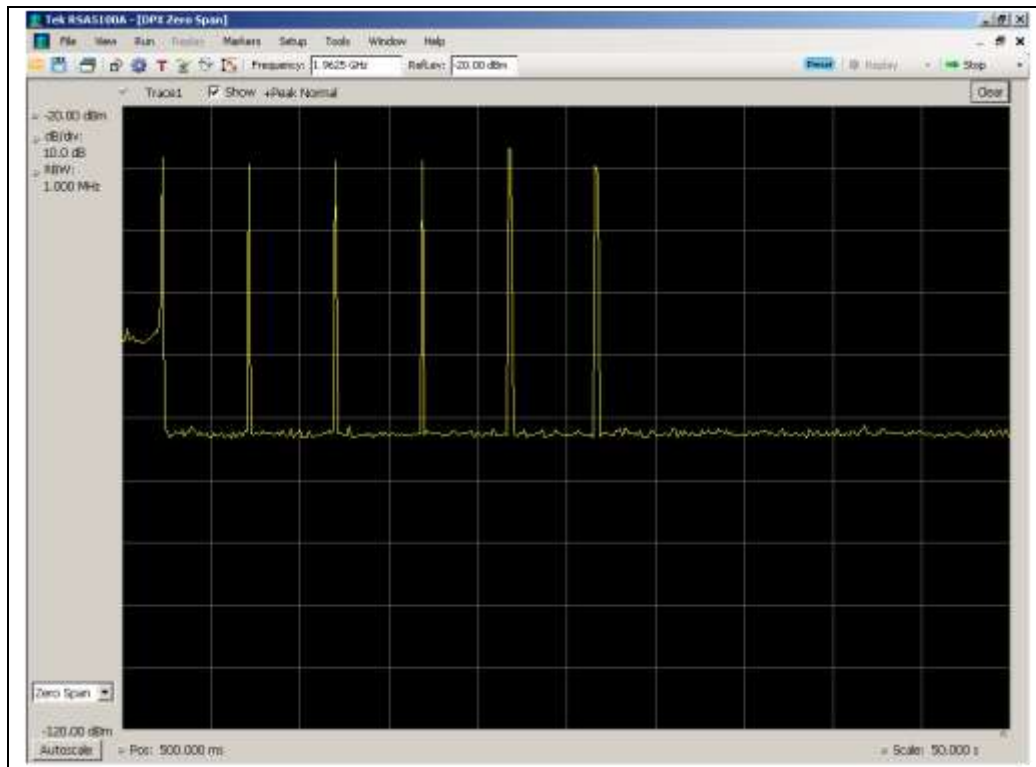


869 - 894 MHz Band

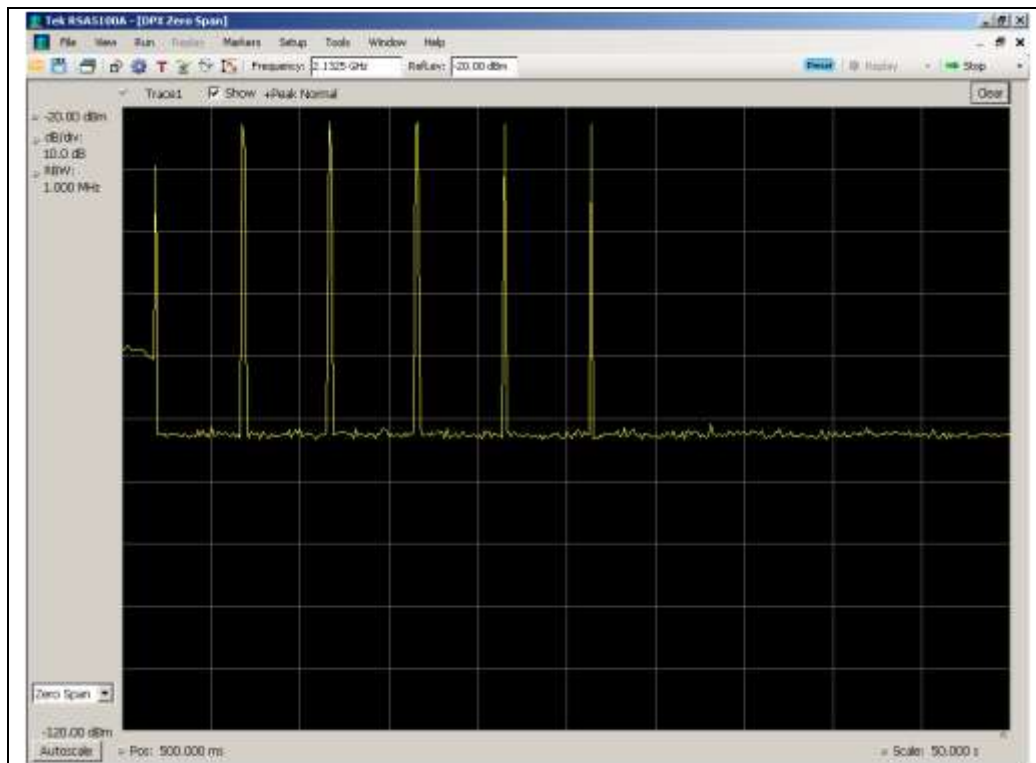




1930 - 1995 MHz Band



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.

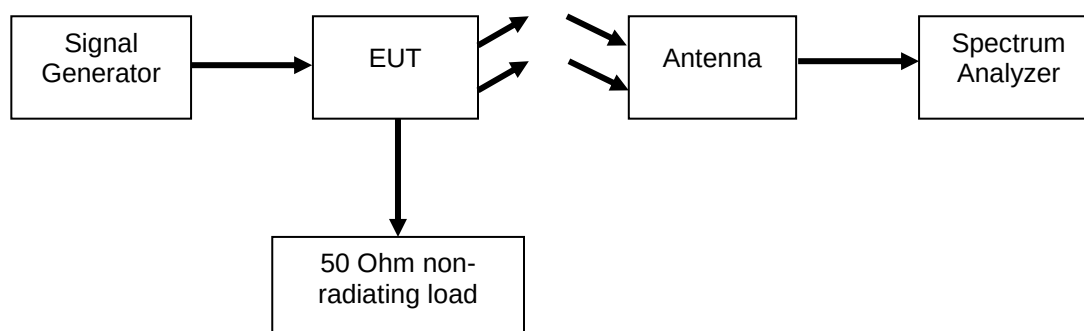
The following formulas are used for calculating the limits.

Radiated Spurious Emissions Limit (dBm) = $P2 - (43 + 10 \cdot \log P1)$

P1 = Output Power in watts

P2 = Output Power in dBm

Test Setup





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