



# Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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## Test Report

Prepared for: Wilson Electronics, Inc

Model: 460003

Description: Quint Band In-Building Wireless Signal Booster

FCC ID: PWO460003

To

FCC Part 20

Date of Issue: October 2, 2013

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  
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Prepared By  
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Project No: p1350022

**Mike Graffeo**  
**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 2, 2013	Mike Graffeo	Original Document
2.0	January 13, 2014	Mike Graffeo	Added additional spurious emissions data on pages 56, 57 and plots on pages 72-75 for compliance to rule part 27.53c and 27.53f.
3.0	January 27, 2014	Mike Graffeo	Updated Conducted Emissions rule sections in the test summary table on page 6 and 57 to match the new eCFR rule sections dated January 7, 2014.
4.0	February 6, 2014	Amanda Reed	Updated FCC Rule part on page 57 to 27.53(f)



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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 KDB 935210.

**Standard Test Conditions and Engineering Practices**

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

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

Environmental Conditions		
Temp (°C)	Humidity (%)	Pressure (mbar)
24.9 – 31.0	33.5 – 63.0	985.5 - 943.0

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

**EUT Description**

**Model:** 460003

**Description:** Quint Band In-Building Wireless Signal Booster

**Firmware:** A460003A

**Software:** 460003A

**Additional Information:**

The EUT is a bi-directional amplifier for the boosting of cellular phone signals and data communication devices. The following frequency bands and emission types are utilized.

Frequency Band (MHz)					
<b>Uplink</b>	704 - 716	777 - 787	824 - 849	1850 - 1915	1710 – 1755
<b>Downlink</b>	734 - 746	746 - 756	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 only applies to devices utilizing spectrum block filtering



**Authorized Frequency Band**

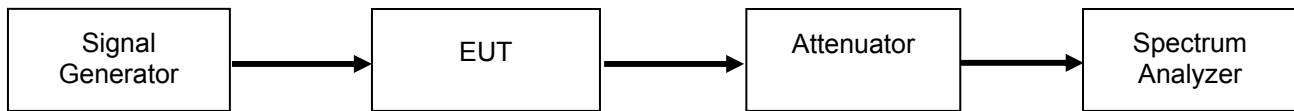
**Name of Test:** Authorized Frequency Band  
**Test Equipment Utilized:** i00331 and i00405

**Engineer:** Mike Graffeo  
**Test Date:** 9/11/13

**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor 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.

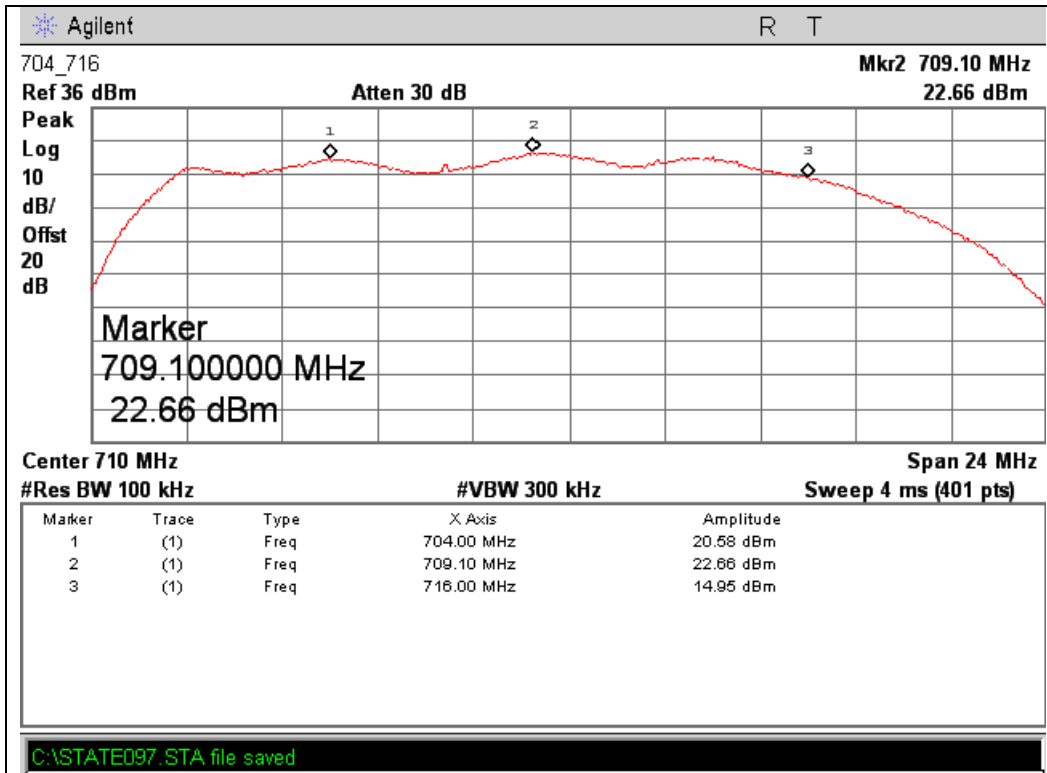
**Test Setup**



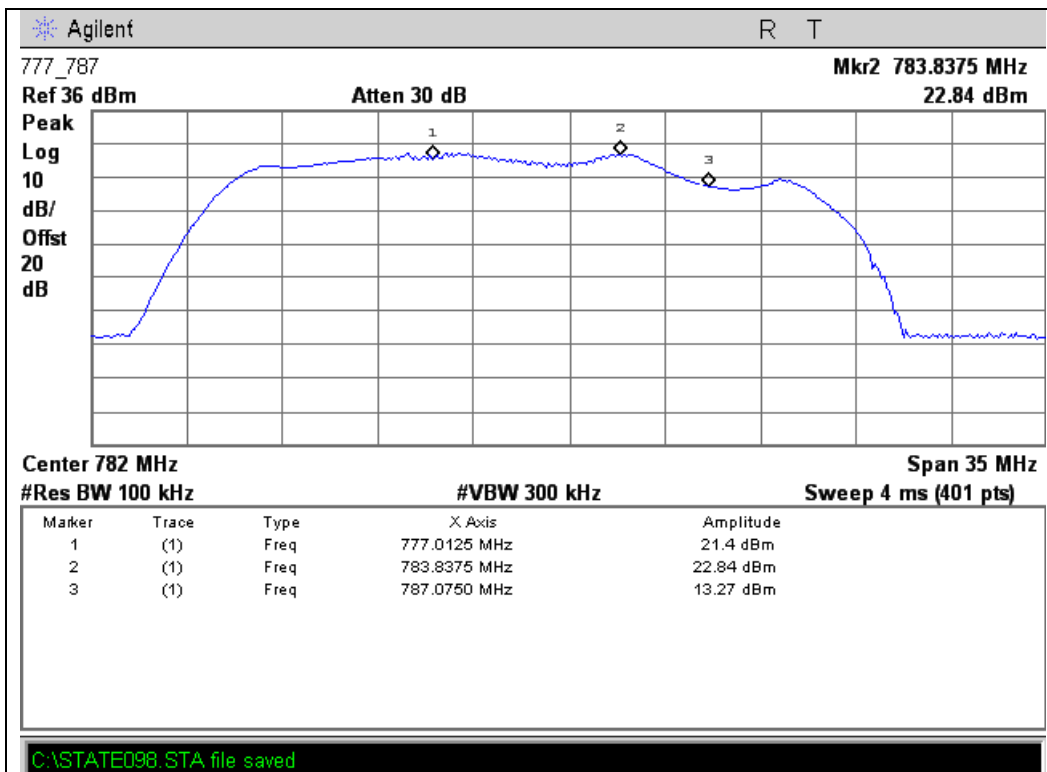


### Uplink Test Results

#### 704 - 716 MHz Band



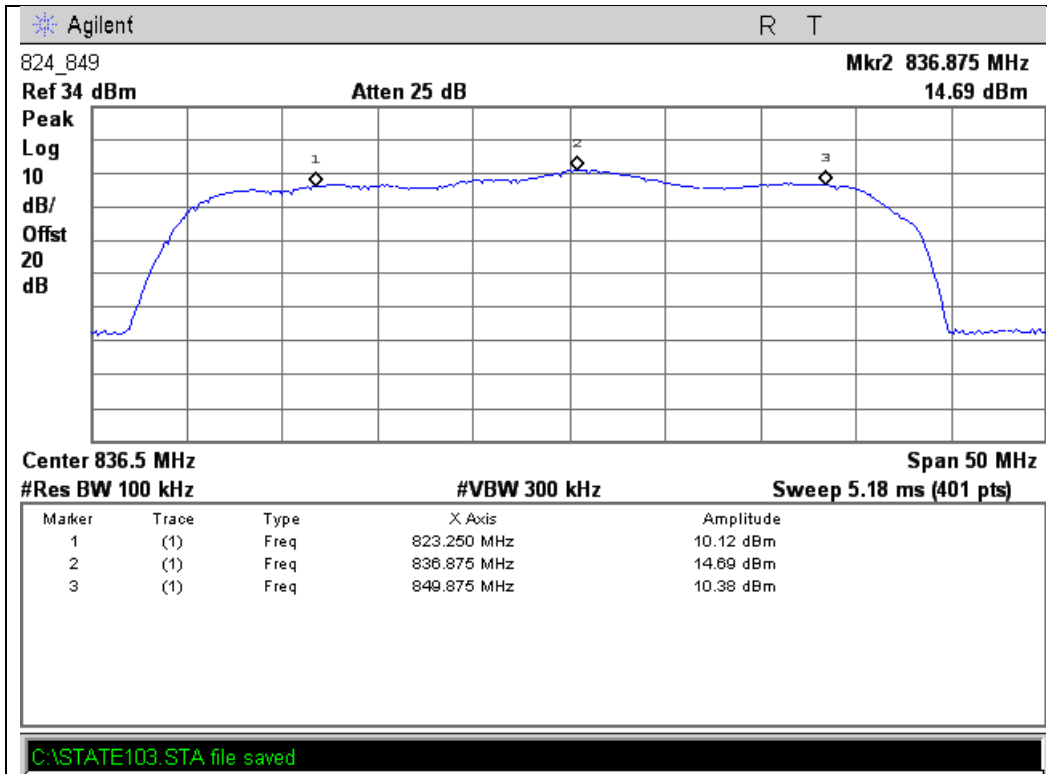
#### 777 - 787 MHz Band



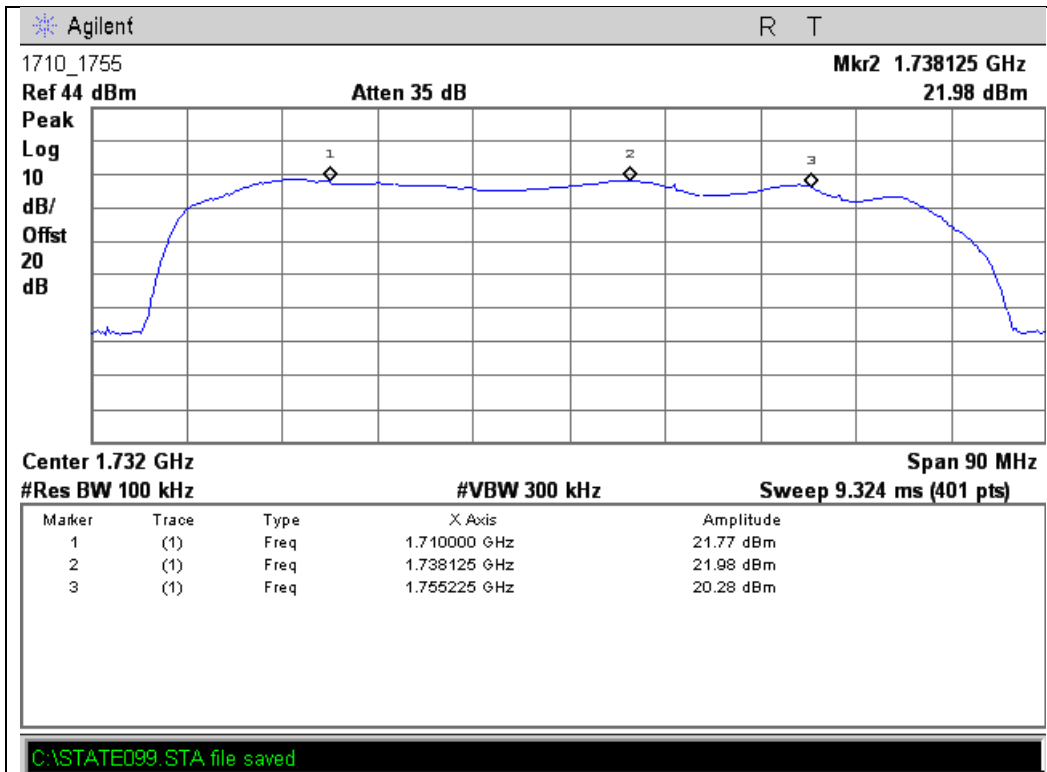




### 824 - 849 MHz Band

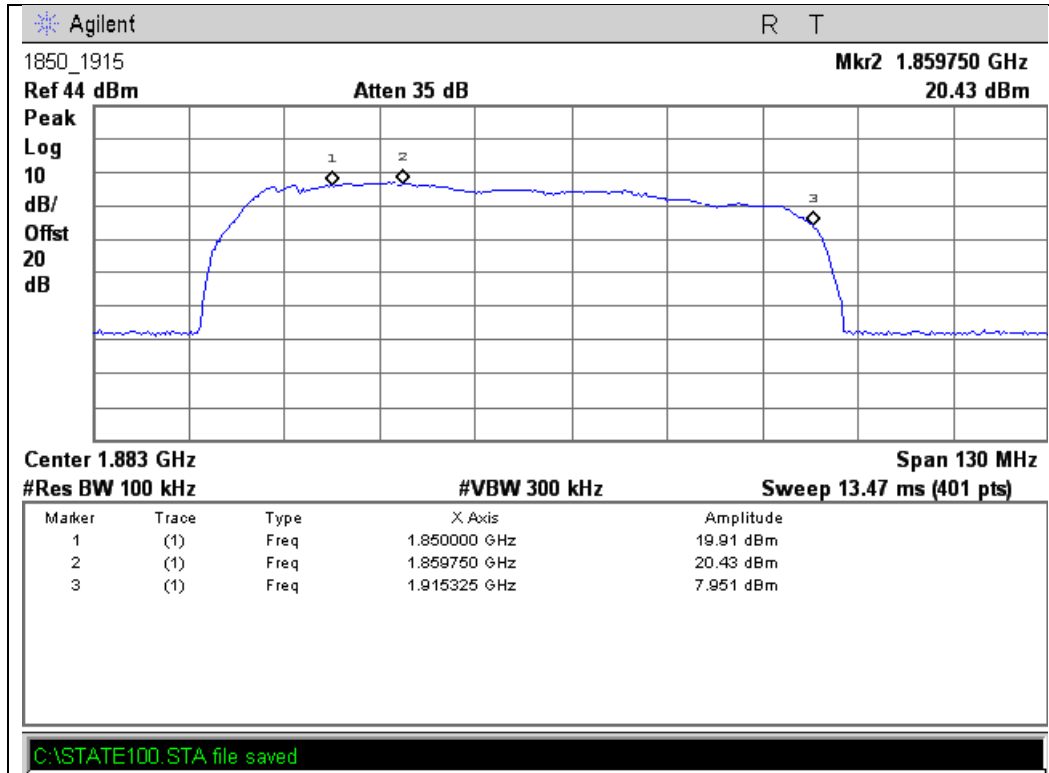


### 1710 - 1755 MHz Band



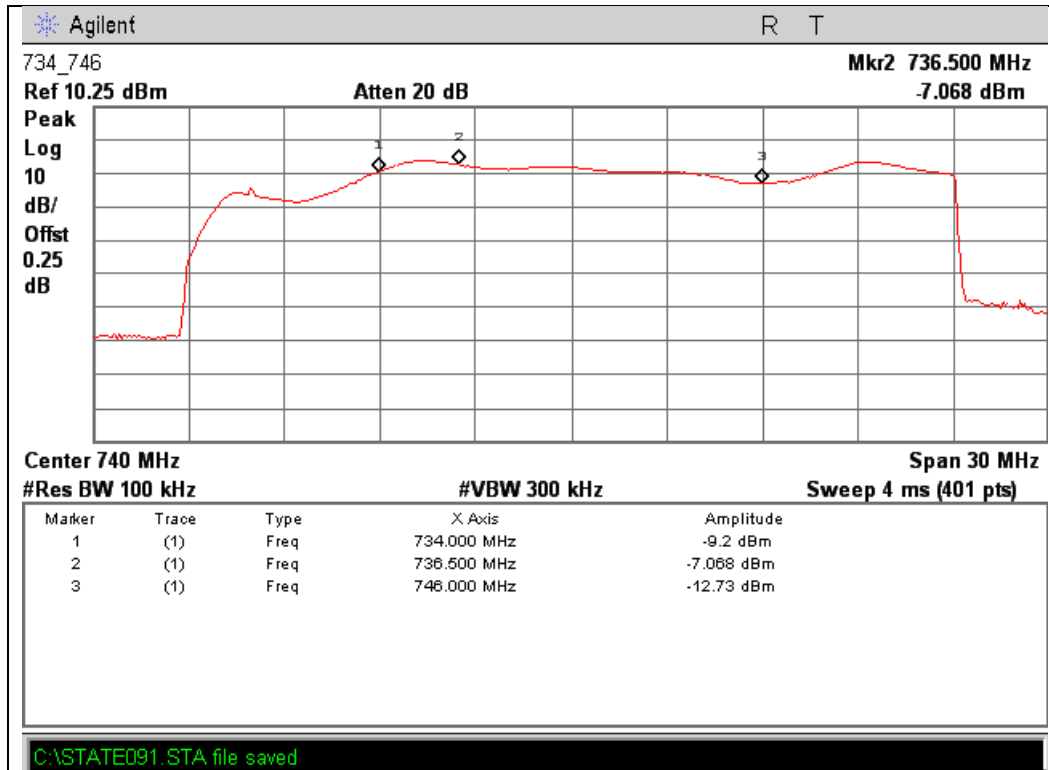


**1850 - 1915 MHz Band**



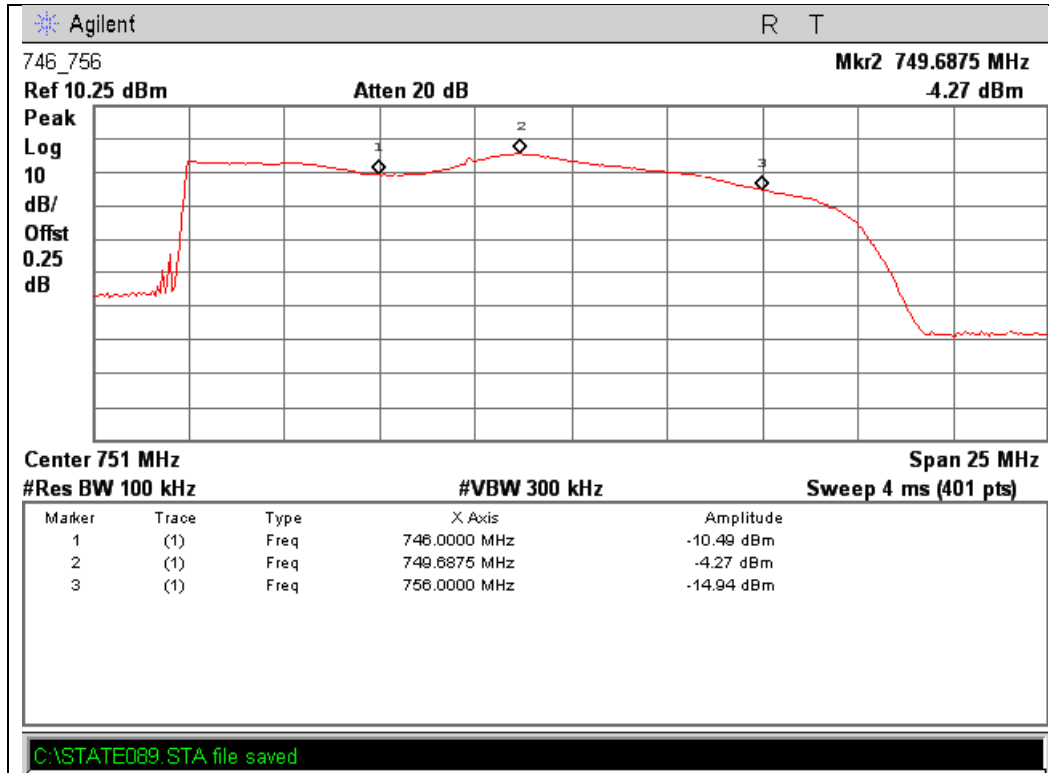
**Downlink Test Results**

**734 - 746 MHz Band**

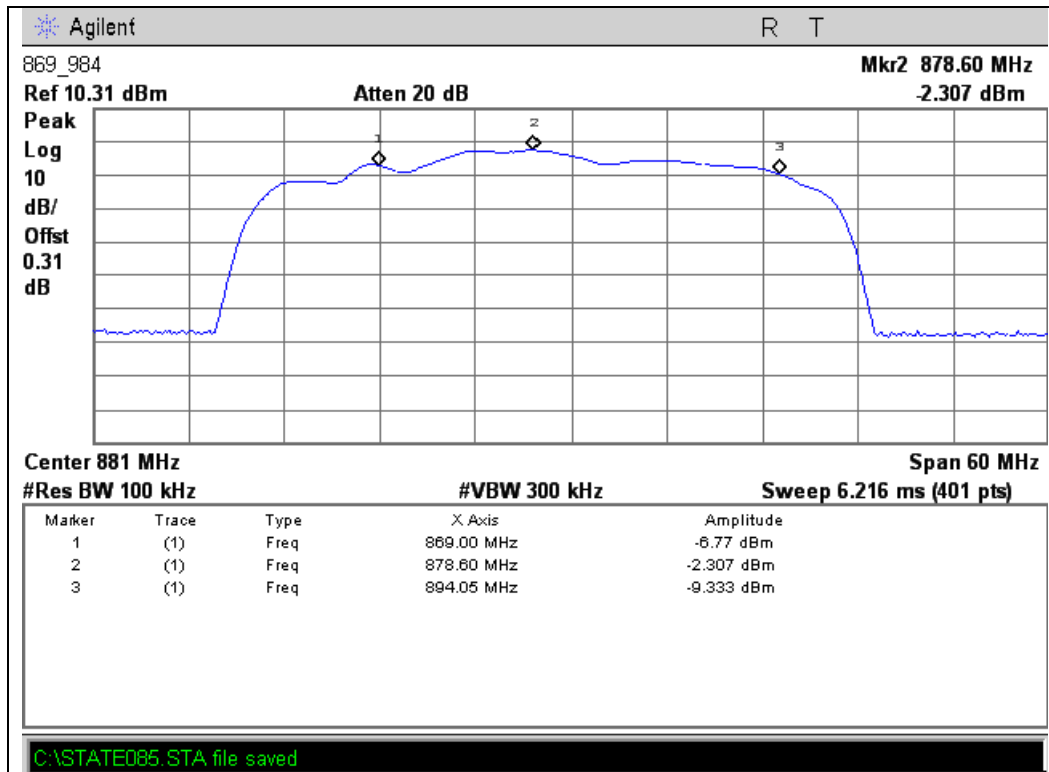




**746 - 756 MHz Band**

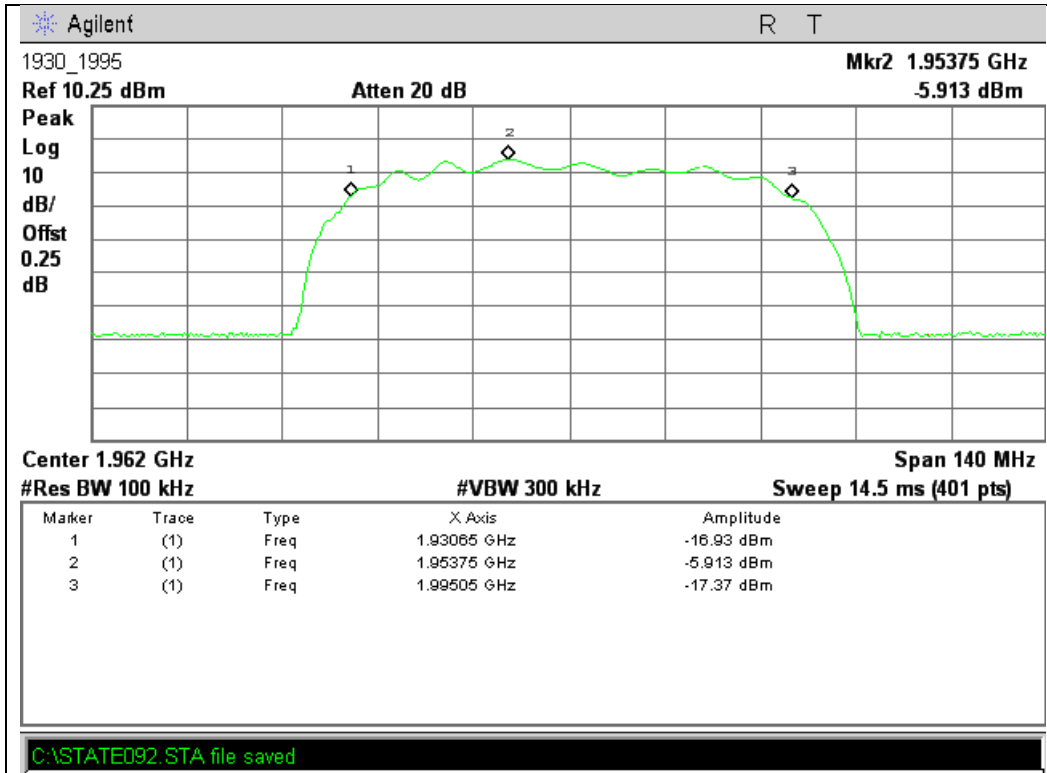


**869 - 894 MHz Band**

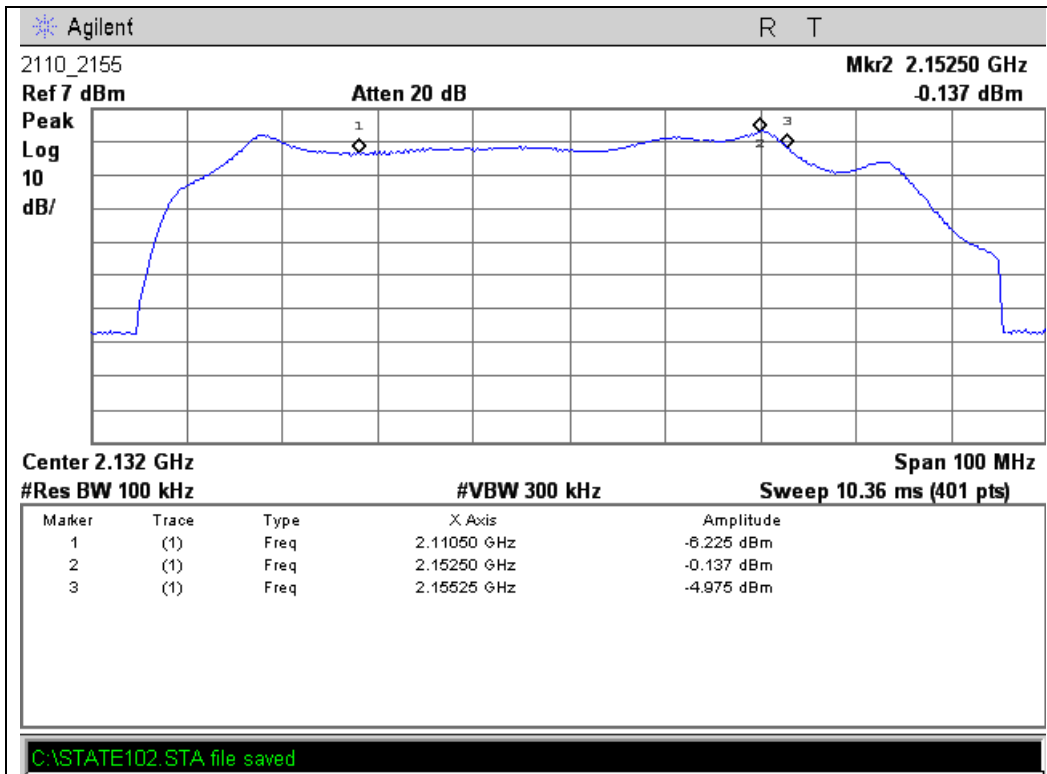




**1930 - 1995 MHz Band**



**2110 - 2155 MHz Band**





**Maximum Power and Gain**

**Name of Test:** Maximum Power and Gain  
**Test Equipment Utilized:** i00331, i00405, i00412

**Engineer:** Mike Graffeo  
**Test Date:** 9/12/13

**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. The spectrum analyzer and signal generator were tuned to the frequency with the highest power level in the band as determined by the Authorized Frequency Band test. The RF input level was increased to a point just prior to the AGC being in control of the power with both a 570 μS 12.5% duty-cycle pulsed CW and 4.1 MHz AWGN modulation. The maximum power was measured and verified to meet the minimum and maximum levels allowed and the maximum gain was computed from these values. The uplink and downlink gain under each condition was verified to be within 9 dB of each other.

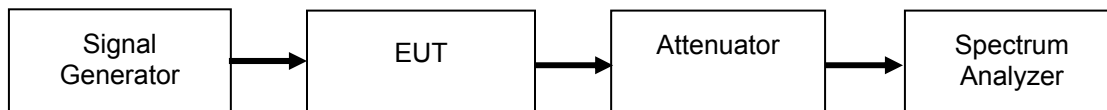
The following formulas are used for calculating the limits.

Note – The Downlink gain is calculated based on the paired Uplink center frequency.

$$\text{Maximum Gain Limit (dB)} = 6.5 \text{ dB} + 20\text{Log}(\text{Frequency})$$

Note - Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

**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 CW	-38.4	22.5	17	30	Pass
704 - 716 MHz AWGN	-40.0	18.2	17	30	Pass
777 - 787 MHz Pulsed CW	-37.3	24.2	17	30	Pass
777 - 787 MHz AWGN	-39.6	18.8	17	30	Pass
824 - 849 MHz Pulsed CW	-39.5	24.4	17	30	Pass
824 - 849 MHz AWGN	-37.6	20.5	17	30	Pass
1710 - 1755 MHz Pulsed CW	-36.0	24.1	17	30	Pass
1710 - 1755 MHz AWGN	-44.0	22.2	17	30	Pass
1850 - 1915 MHz Pulsed CW	-38.8	22.6	17	30	Pass
1850 - 1915 MHz AWGN	-40.0	21.0	17	30	Pass



**Downlink Power Test Results**

Frequency Band (MHz)	Input Level (dBm)	Output Power (dBm)	Upper Limit (dBm)	Result
734 - 746 MHz Pulsed CW	-58.6	4.7	17	Pass
734 - 746 MHz AWGN	-67.0	-4.2	17	Pass
746 - 756 MHz Pulsed CW	-58.6	4.5	17	Pass
746 - 756 MHz AWGN	-65.0	-2.0	17	Pass
869 - 894 MHz Pulsed CW	-57.5	6.9	17	Pass
869 - 894 MHz AWGN	-63.0	-3.0	17	Pass
1930 - 1995 MHz Pulsed CW	-56.7	10.4	17	Pass
1930 - 1995 MHz AWGN	-66.7	2.0	17	Pass
2110 - 2155 MHz Pulsed CW	-58.4	2.4	17	Pass
2110 - 2155 MHz AWGN	-68.0	-0.6	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 CW	709.22	736.5	60.9	63.5	63.3	63.5	2.42	9	-6.58
AWGN	709.22	736.5	58.2	63.5	62.8	63.5	4.6	9	-4.4
Pulsed CW	783.84	749.69	61.5	64	63.1	64	1.61	9	-7.39
AWGN	783.84	749.69	58.4	64	63.0	64	4.6	9	-4.4
Pulsed CW	836.87	878.75	63.9	65	64.4	65	0.49	9	-8.51
AWGN	836.87	878.75	58.1	65	60.0	65	1.94	9	-7.06
Pulsed CW	1738.12	2151.5	60.1	71	60.8	72	0.7	9	-8.3
AWGN	1738.12	2151.5	66.2	71	67.4	72	1.24	9	-7.76
Pulsed CW	1859.76	1953.75	61.4	72	67.1	71	5.71	9	-3.29
AWGN	1859.76	1953.75	61.0	72	68.7	71	7.7	9	-1.3



**Intermodulation**

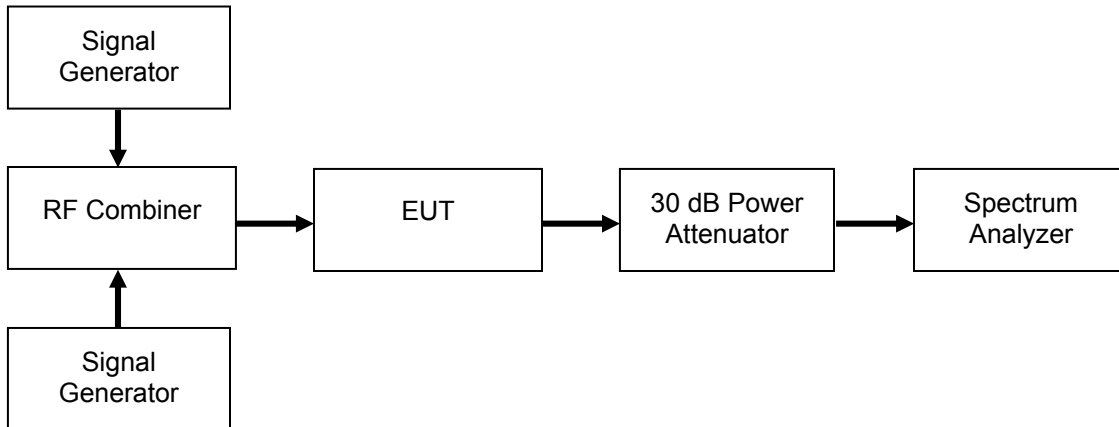
**Name of Test:** Intermodulation  
**Test Equipment Utilized:** i00331, i00405, i00412

**Engineer:** Mike Graffeo  
**Test Date:** 9/12/13

**Test Procedure**

The EUT was connected to a spectrum analyzer through an attenuator. Two signal generators were utilized to produce two CW signals 600 kHz apart and centered in the operational band. Attenuator and cable insertion loss correction factors were input to either the signal generator or the spectrum analyzer as required to ensure accurate measurements were recorded. The input power was set at the maximum allowable power and the 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	-27.91	-19	Pass
777 - 787 MHz	-28.45	-19	Pass
824 - 849 MHz	-25.95	-19	Pass
1710 - 1755 MHz	-23.19	-19	Pass
1850 - 1915 MHz	-31.88	-19	Pass

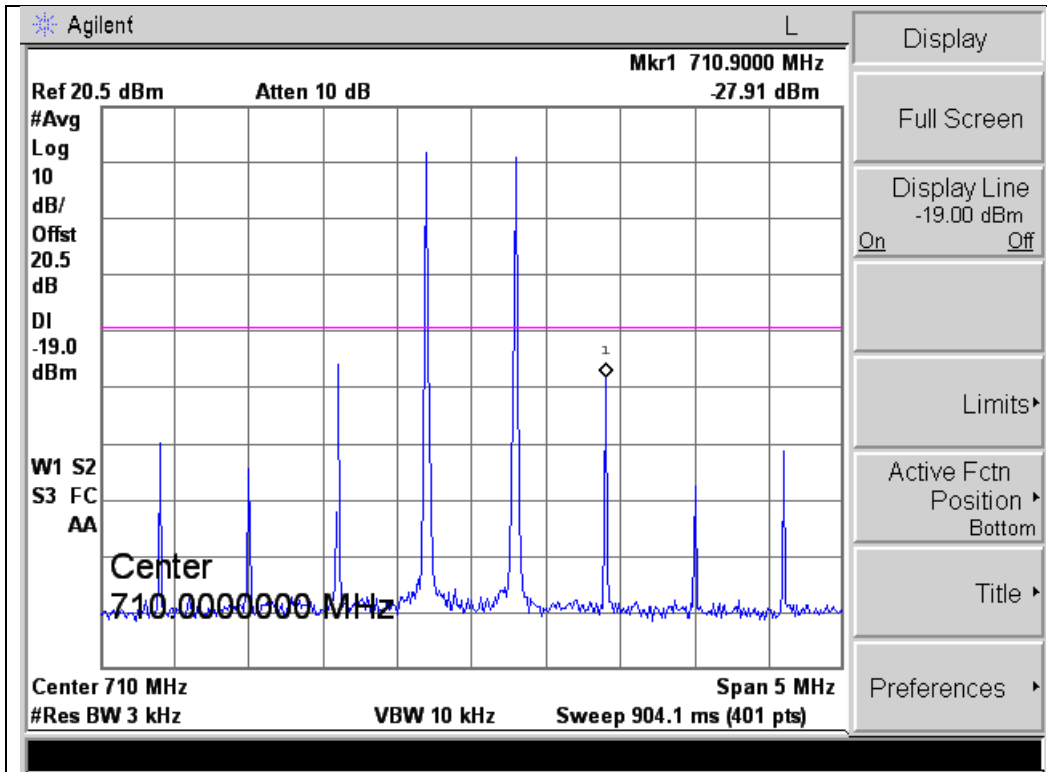
**Downlink Test Results**

Frequency Band (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Result
734 - 746 MHz	-34.28	-19	Pass
746 - 756 MHz	-49.33	-19	Pass
869 - 894 MHz	-42.98	-19	Pass
1930 - 1995 MHz	-38.01	-19	Pass
2110 - 2155 MHz	-26.18	-19	Pass

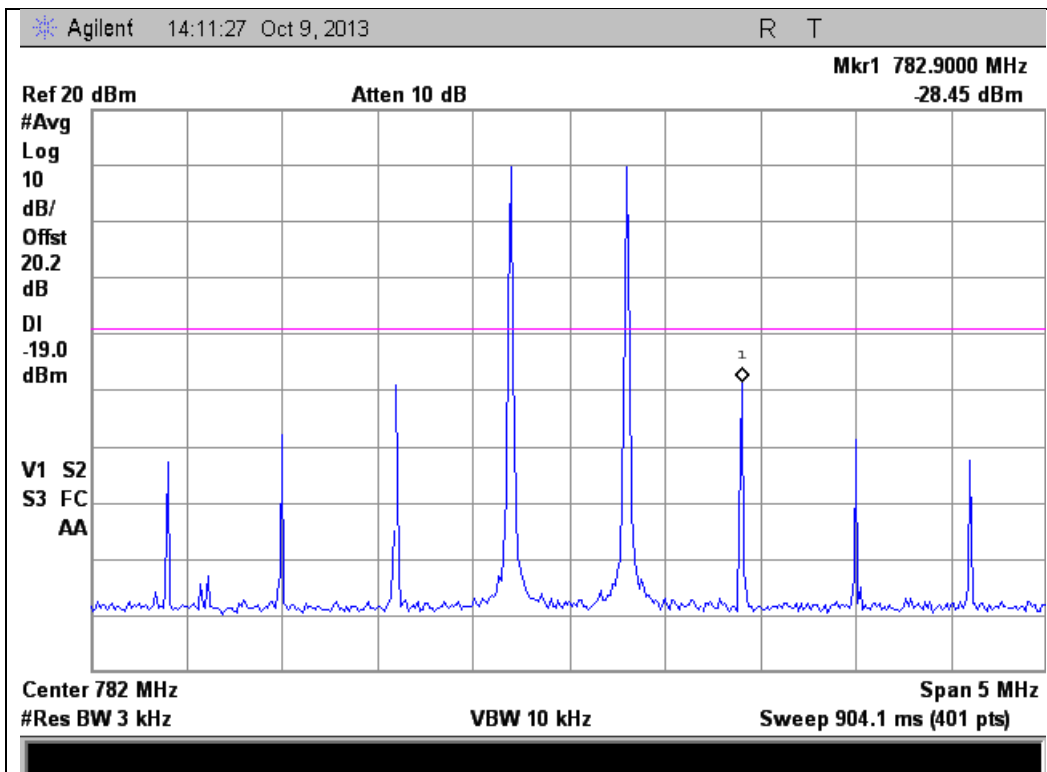


### Uplink Test Results

### 704 - 716 MHz Band



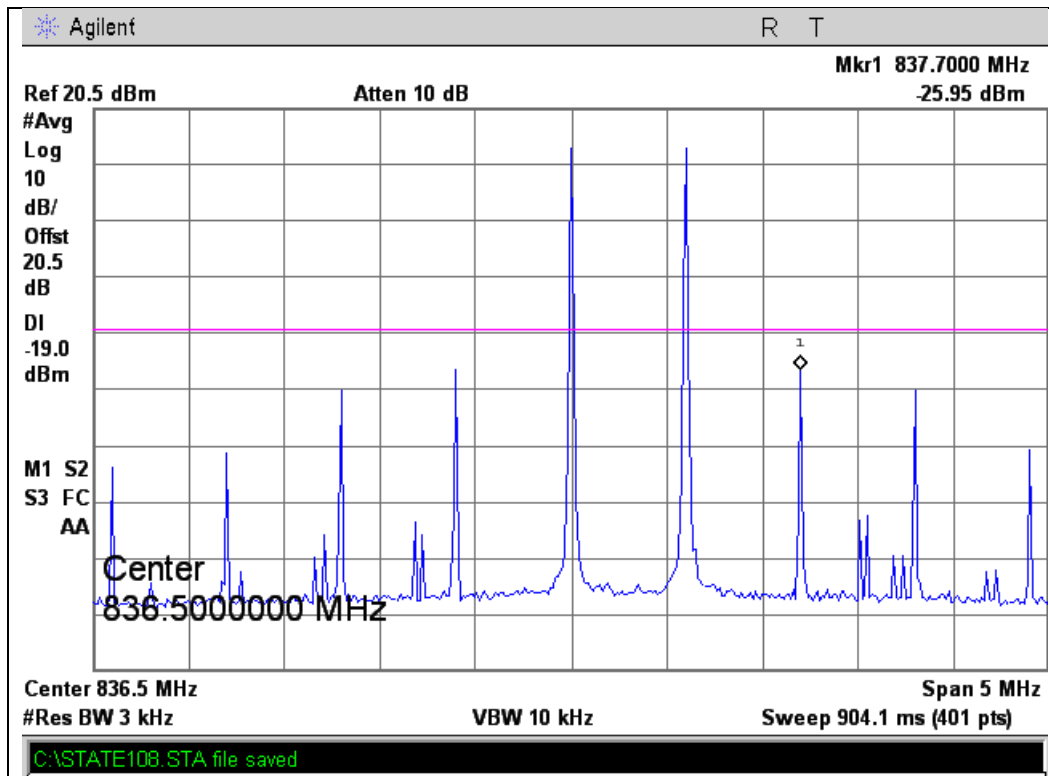
### 777 - 787 MHz Band



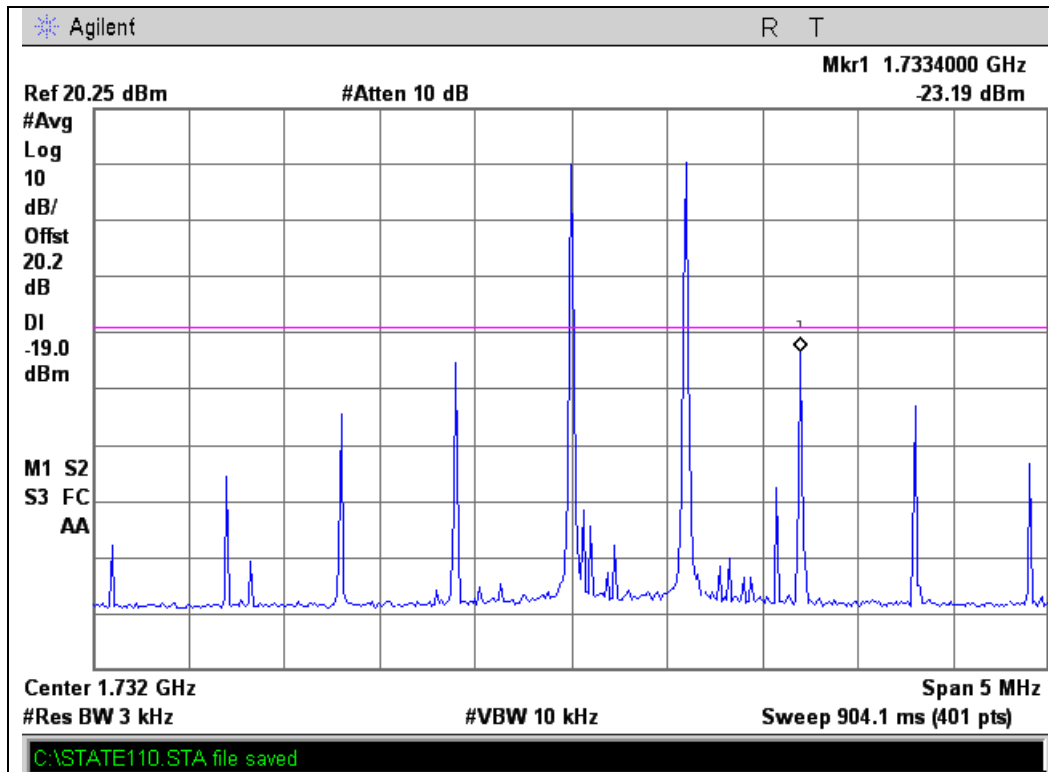




### 824 - 849 MHz Band

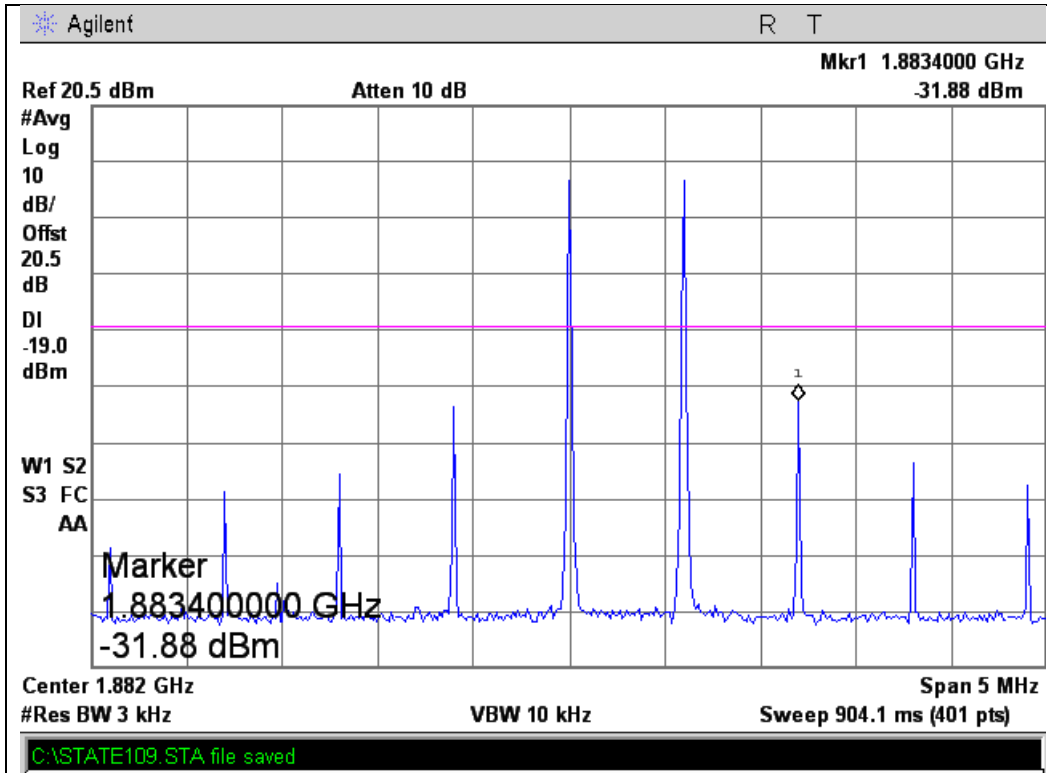


### 1710 - 1755 MHz Band



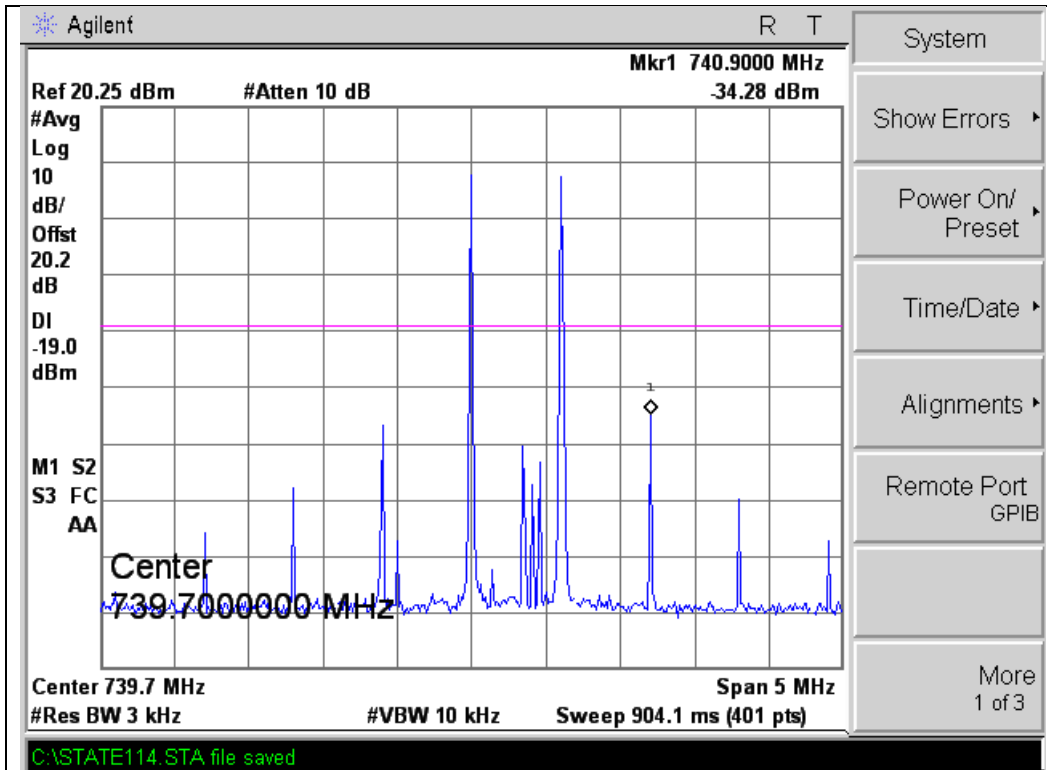


### 1850 - 1915 MHz Band



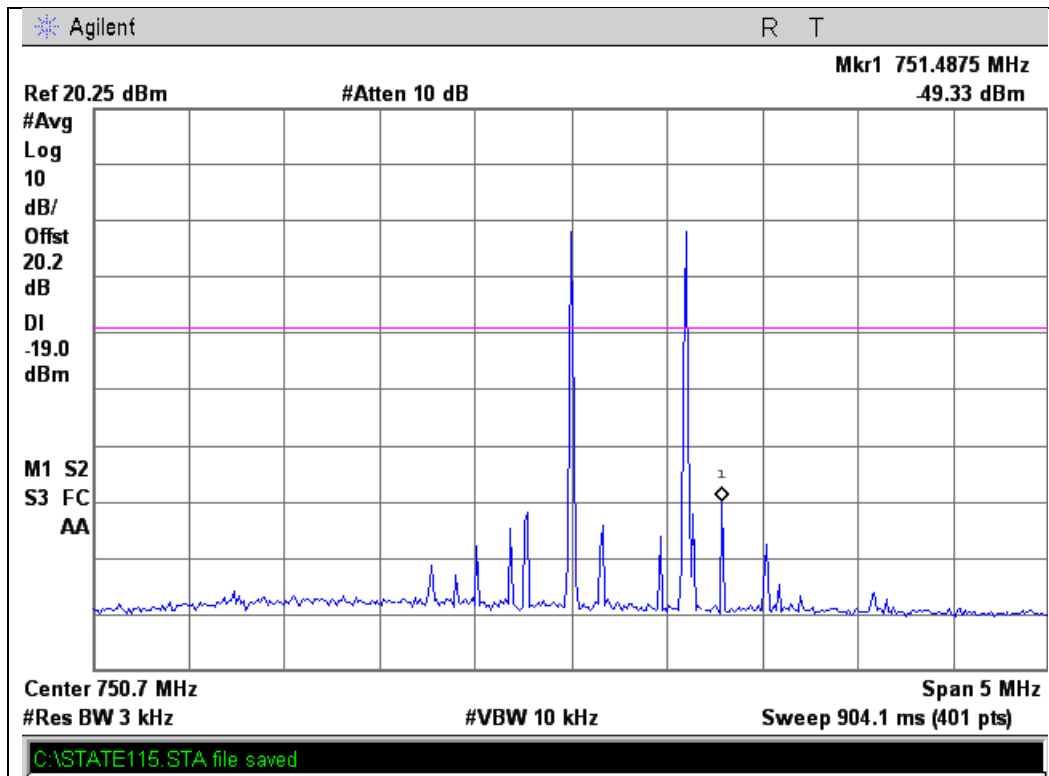
### Downlink Test Results

### 734 - 746 MHz Band

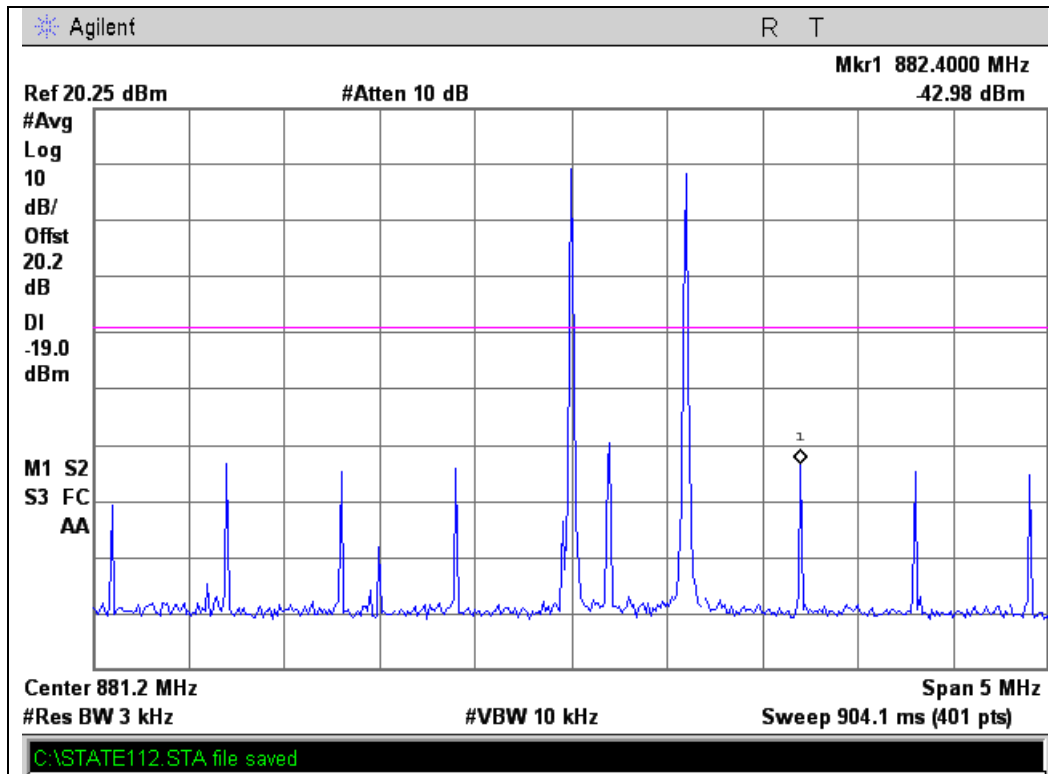




### 746 - 756 MHz Band

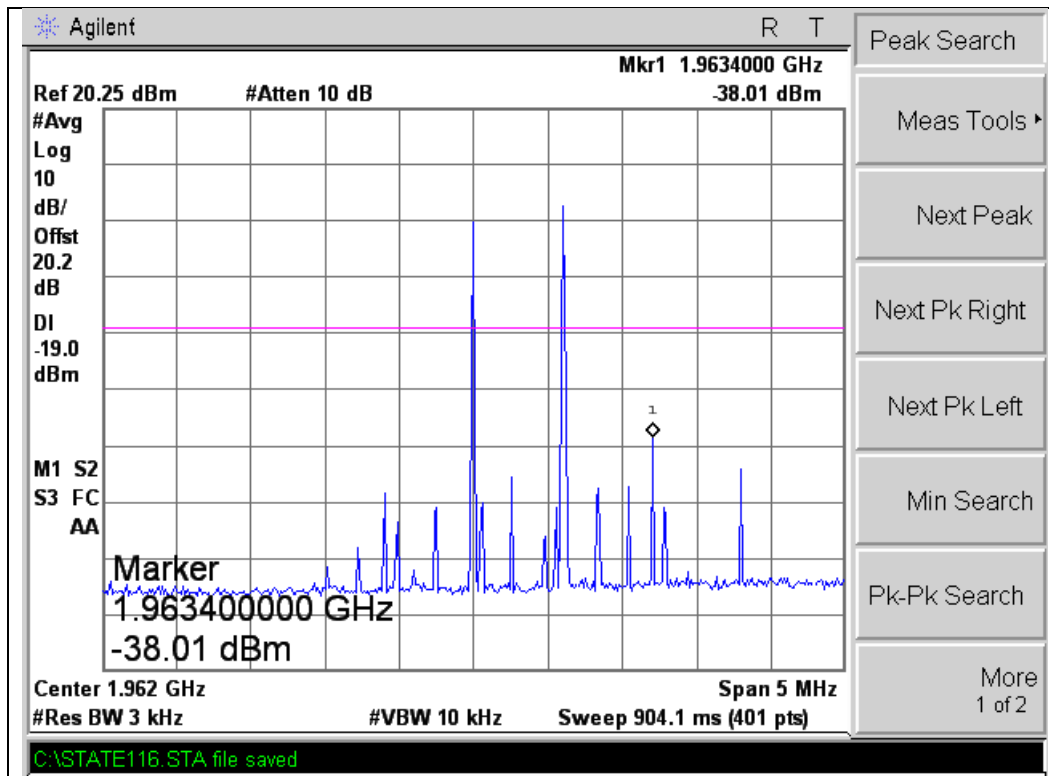


### 869 - 894 MHz Band

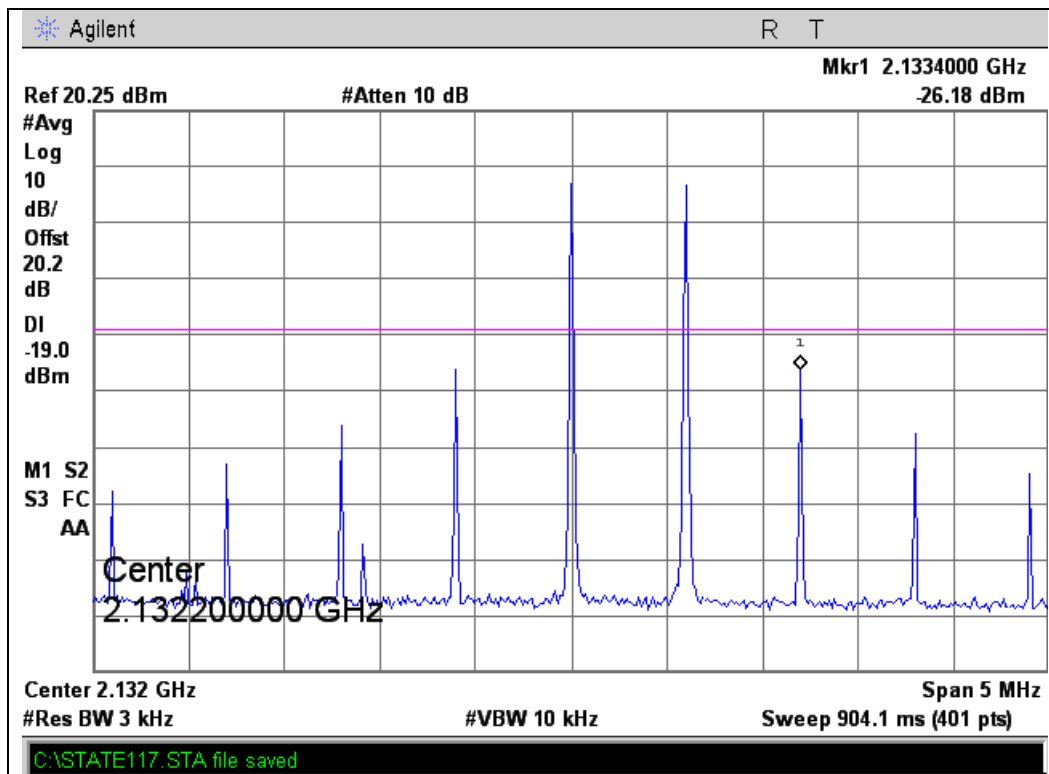




### 1930 - 1995 MHz Band



### 2110 - 2155 MHz Band





## Out-of-Band Emissions

**Name of Test:** Out-of-Band Emissions  
**Test Equipment Utilized:** i00331 and i00405

**Engineer:** Mike Graffeo  
**Test Date:** 9/13/13

### 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 they met the requirements.

The following formulas are used for calculating the limits.

Out-of-Band Emissions Limit =  $6 + (43 + 10\log P)$

### Test Setup





### GSM Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	Lower	-63.18	-19	Pass
704 - 716	Upper	-26.63	-19	Pass
777 - 787	Lower	-57.91	-19	Pass
777 - 787	Upper	-28.84	-19	Pass
824 - 849	Lower	-70.73	-19	Pass
824 - 849	Upper	-69.77	-19	Pass
1710 - 1755	Lower	-32.84	-19	Pass
1710 - 1755	Upper	-33.20	-19	Pass
1850 - 1915	Lower	-36.16	-19	Pass
1850 - 1915	Upper	-43.43	-19	Pass

### CDMA Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	Lower	-63.71	-19	Pass
704 - 716	Upper	-47.22	-19	Pass
777 - 787	Lower	-47.49	-19	Pass
777 - 787	Upper	-47.63	-19	Pass
824 - 849	Lower	-39.33	-19	Pass
824 - 849	Upper	-40.84	-19	Pass
1710 - 1755	Lower	-39.25	-19	Pass
1710 - 1755	Upper	-34.50	-19	Pass
1850 - 1915	Lower	-46.01	-19	Pass
1850 - 1915	Upper	-59.23	-19	Pass



### WCDMA Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	Lower	-63.42	-19	Pass
704 - 716	Upper	-51.09	-19	Pass
777 - 787	Lower	-44.94	-19	Pass
777 - 787	Upper	-47.03	-19	Pass
824 - 849	Lower	-40.63	-19	Pass
824 - 849	Upper	-48.82	-19	Pass
1710 - 1755	Lower	-34.23	-19	Pass
1710 - 1755	Upper	-34.69	-19	Pass
1850 - 1915	Lower	-30.41	-19	Pass
1850 - 1915	Upper	-40.88	-19	Pass

### GSM Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-65.31	-19	Pass
734 - 746	Upper	-55.66	-19	Pass
746 - 756	Lower	-52.31	-19	Pass
746 - 756	Upper	-65.73	-19	Pass
869 - 894	Lower	-57.28	-19	Pass
869 - 894	Upper	-58.85	-19	Pass
1930 - 1995	Lower	-67.84	-19	Pass
1930 - 1995	Upper	-74.73	-19	Pass
2110 - 2155	Lower	-74.26	-19	Pass
2110 - 2155	Upper	-74.61	-19	Pass



### CDMA Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-63.22	-19	Pass
734 - 746	Upper	-63.45	-19	Pass
746 - 756	Lower	-63.41	-19	Pass
746 - 756	Upper	-64.78	-19	Pass
869 - 894	Lower	-42.29	-19	Pass
869 - 894	Upper	-64.52	-19	Pass
1930 - 1995	Lower	-64.14	-19	Pass
1930 - 1995	Upper	-54.19	-19	Pass
2110 - 2155	Lower	-64.16	-19	Pass
2110 - 2155	Upper	-63.32	-19	Pass

### WCDMA Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	Lower	-63.89	-19	Pass
734 - 746	Upper	-63.88	-19	Pass
746 - 756	Lower	-64.08	-19	Pass
746 - 756	Upper	-64.80	-19	Pass
869 - 894	Lower	-57.70	-19	Pass
869 - 894	Upper	-57.55	-19	Pass
1930 - 1995	Lower	-56.79	-19	Pass
1930 - 1995	Upper	-57.28	-19	Pass
2110 - 2155	Lower	-56.74	-19	Pass
2110 - 2155	Upper	-57.91	-19	Pass

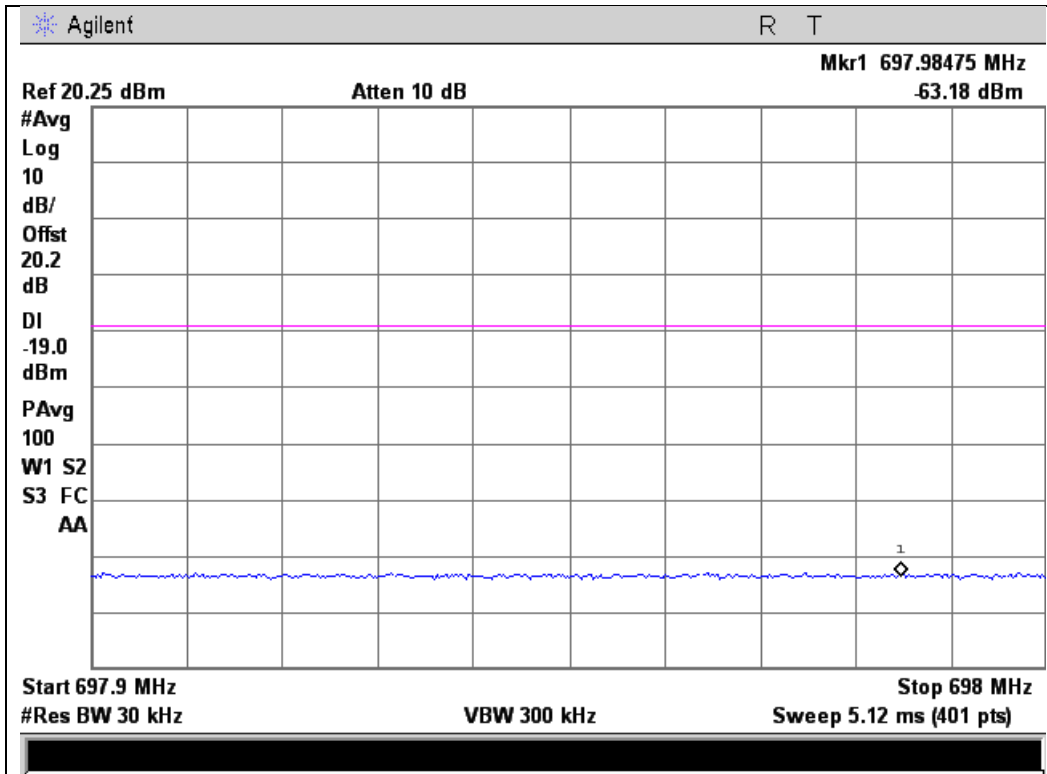




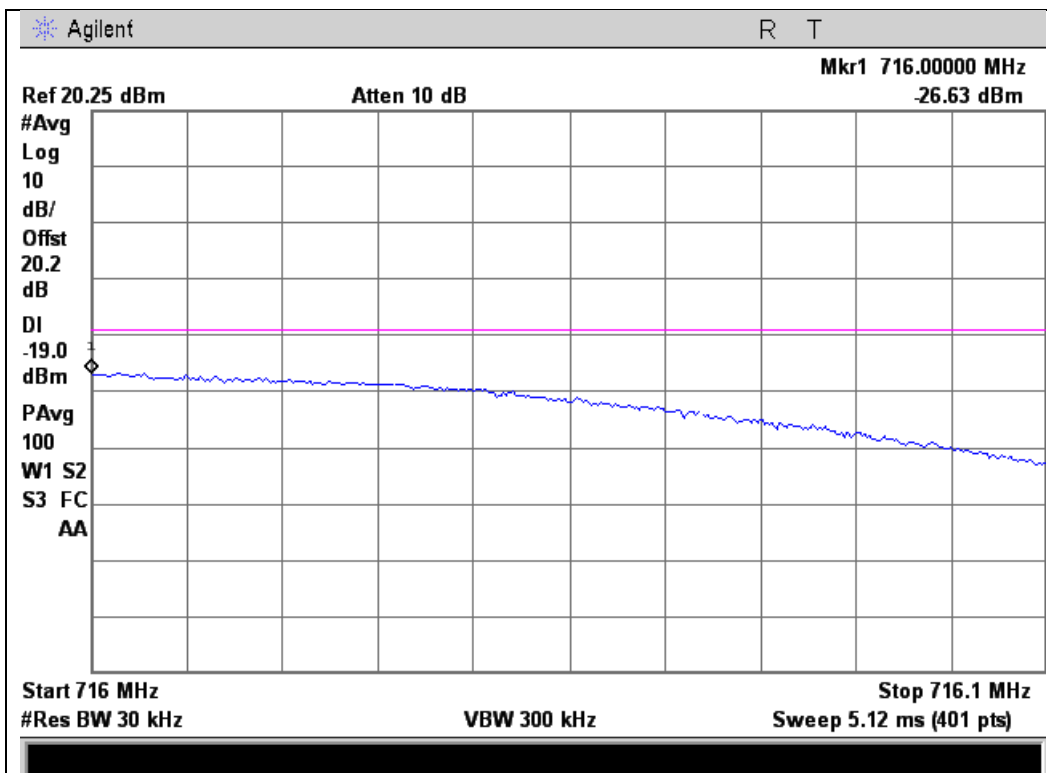
### GSM Uplink Test Plots

704 - 716 MHz Band

Lower Band Edge



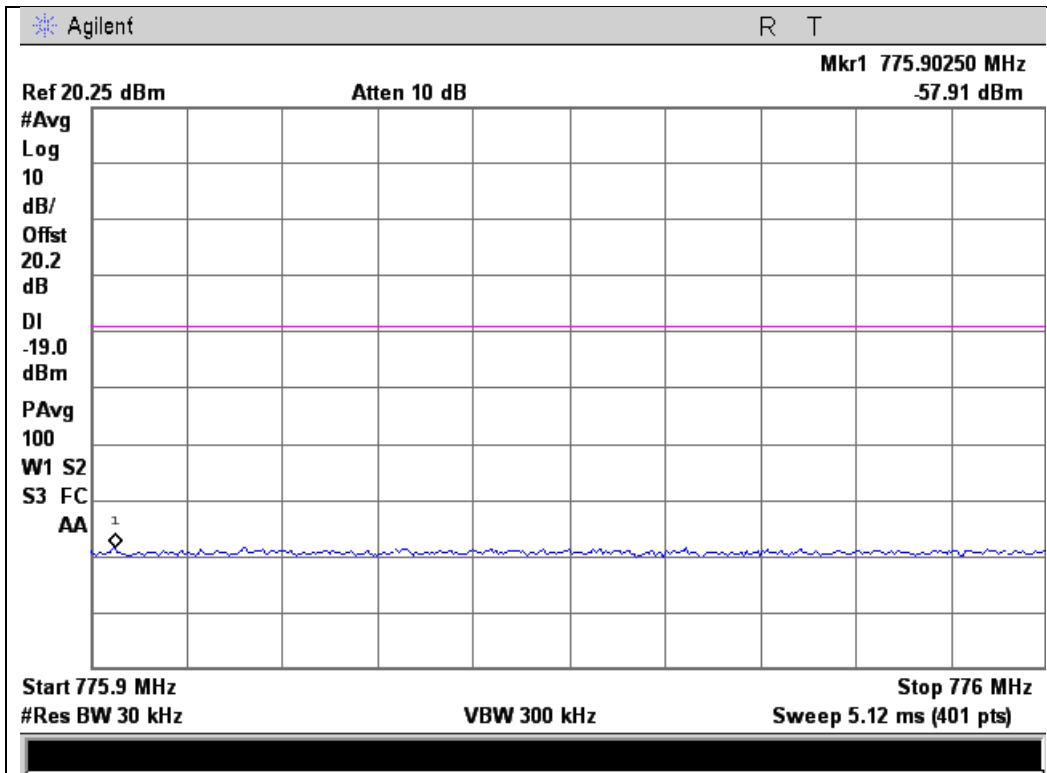
Upper Band Edge



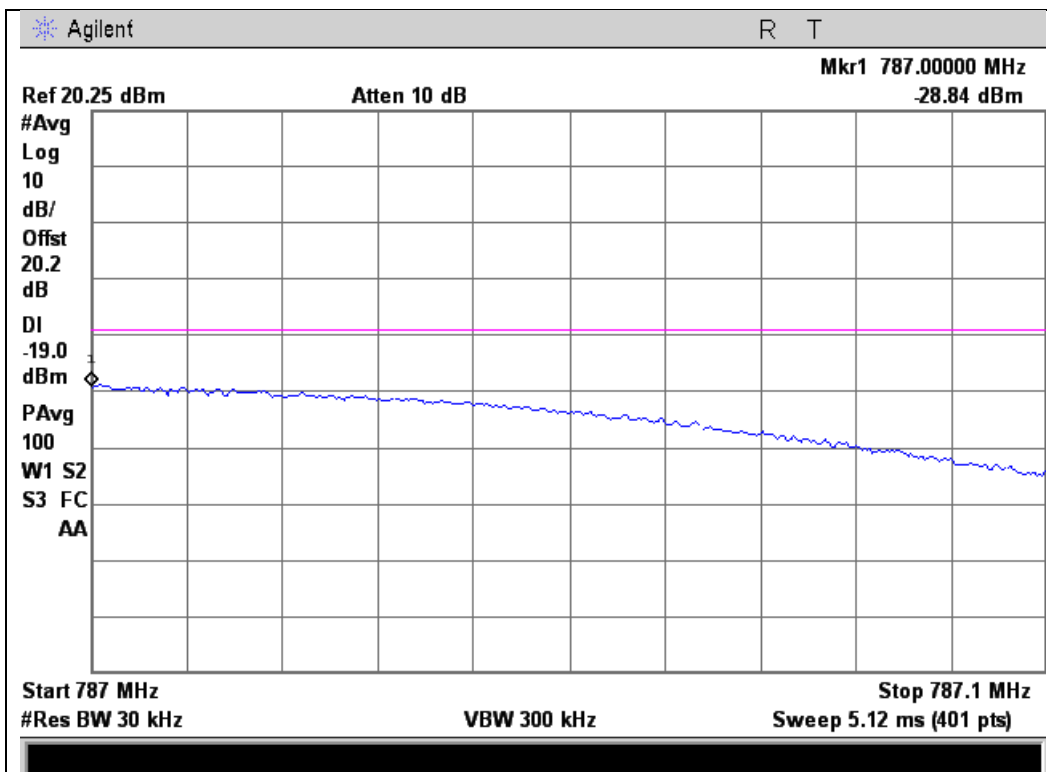


### 777 - 787 MHz Band

#### Lower Band Edge



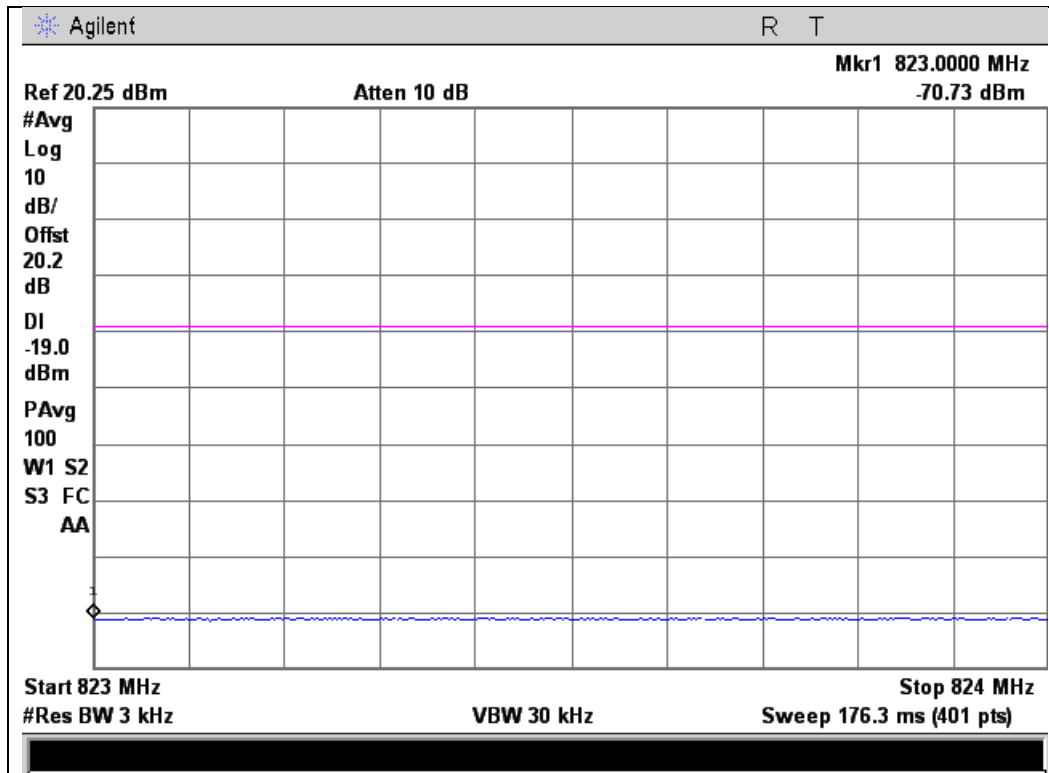
#### Upper Band Edge



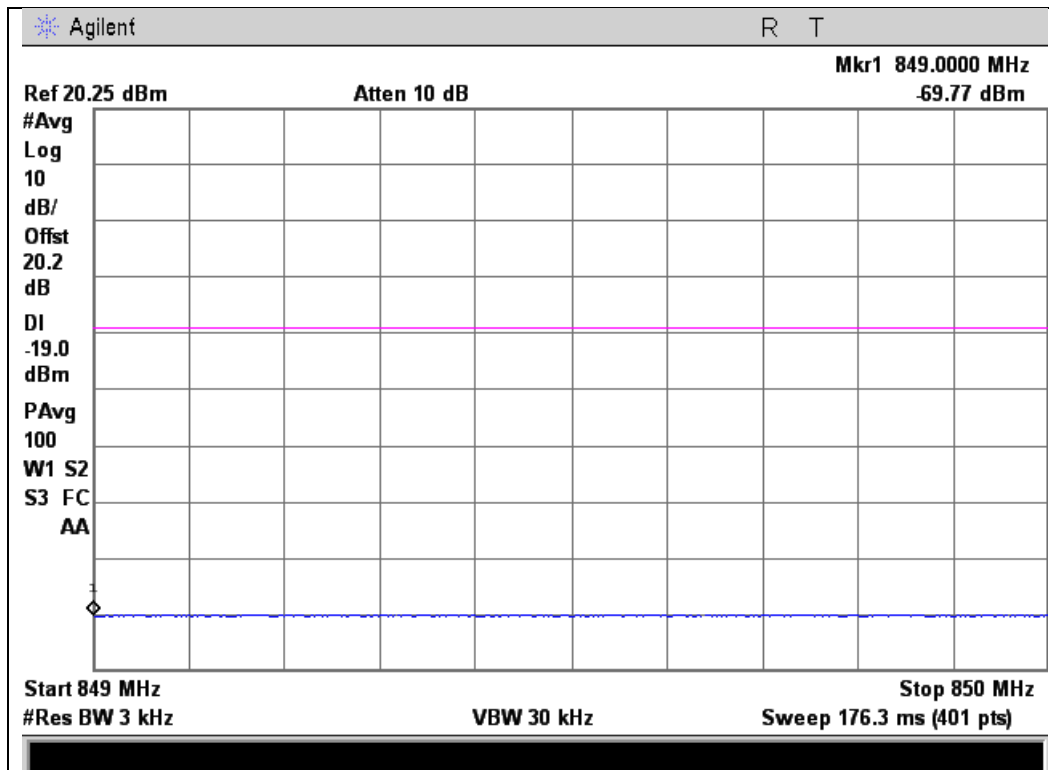


### 824 - 849 MHz Band

#### Lower Band Edge



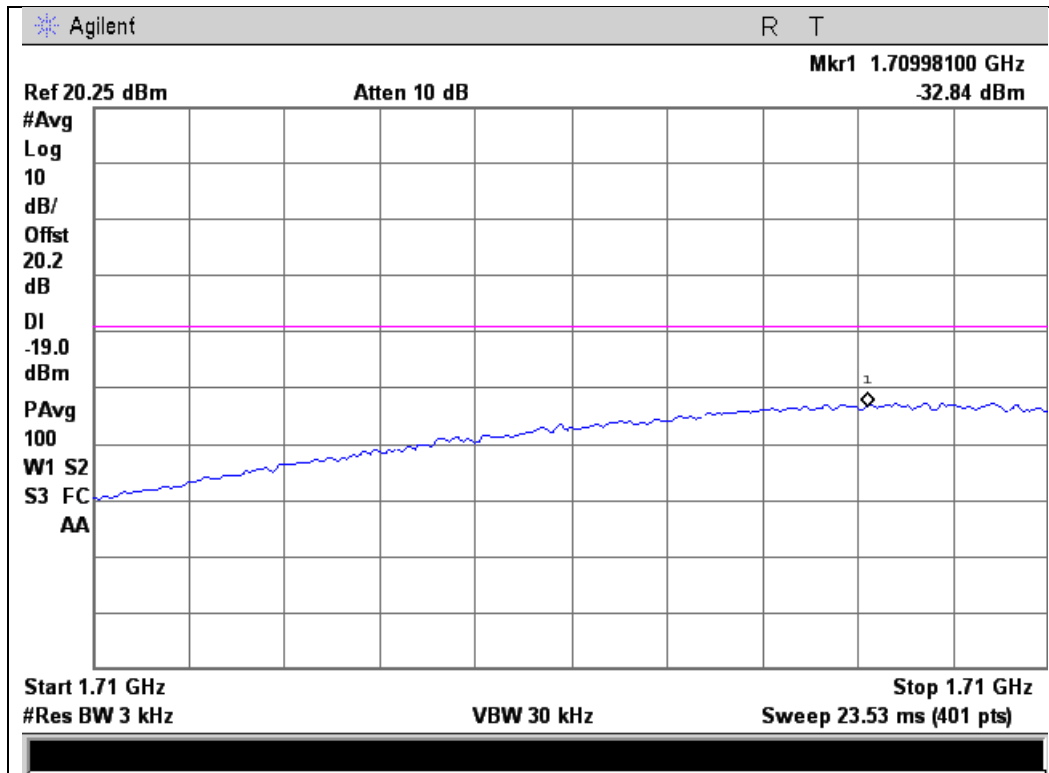
#### Upper Band Edge



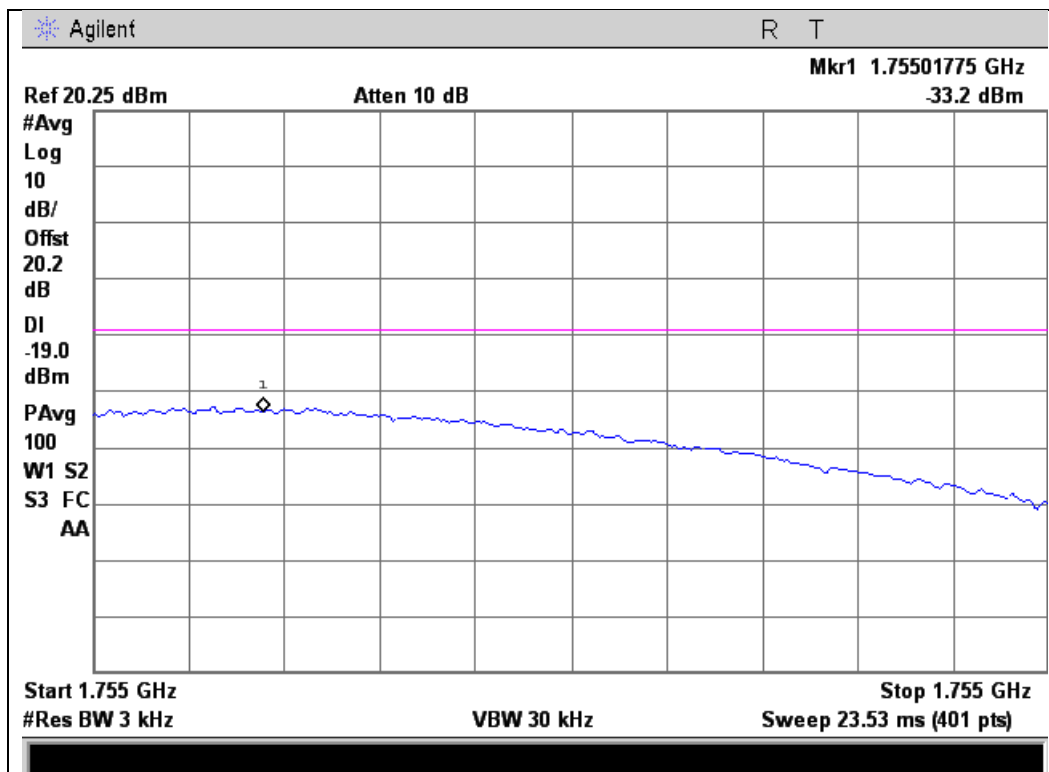


### 1710 - 1755 MHz Band

#### Lower Band Edge



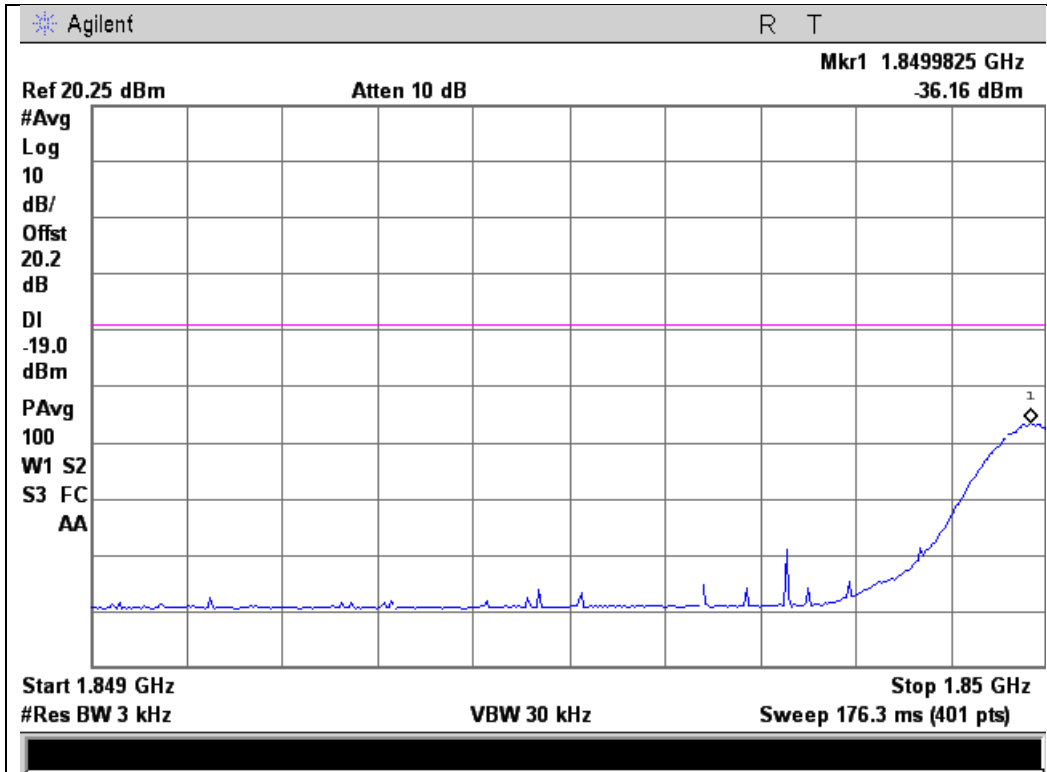
#### Upper Band Edge



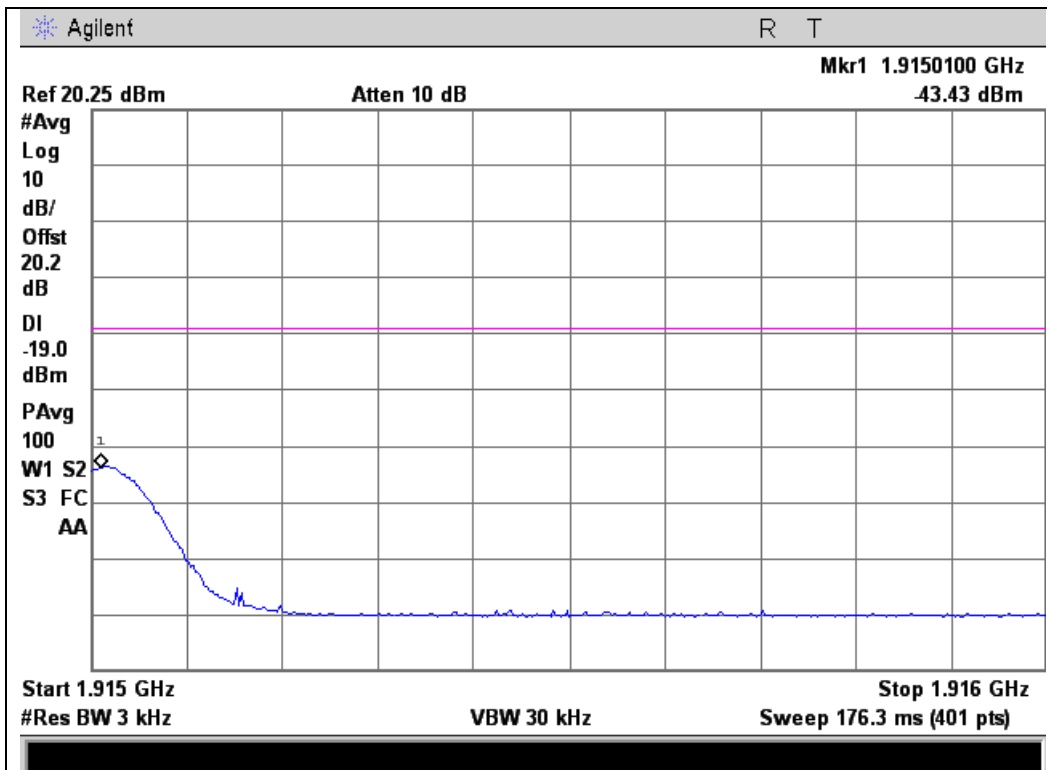


### 1850 - 1915 MHz Band

#### Lower Band Edge



#### Upper Band Edge

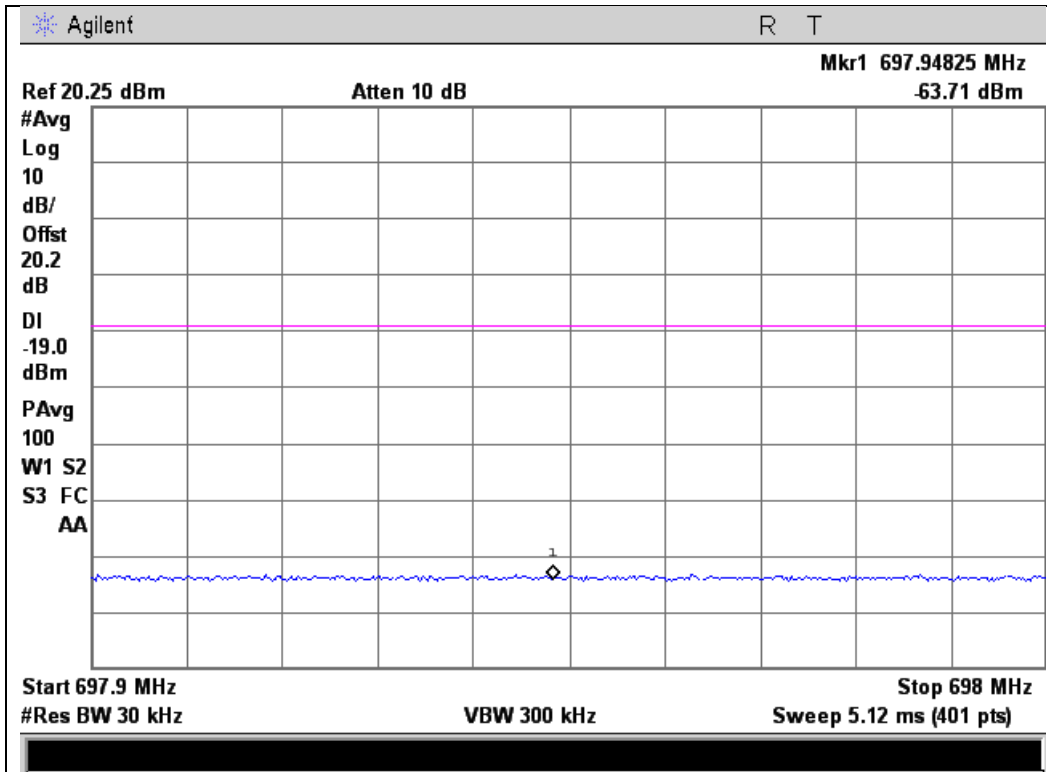




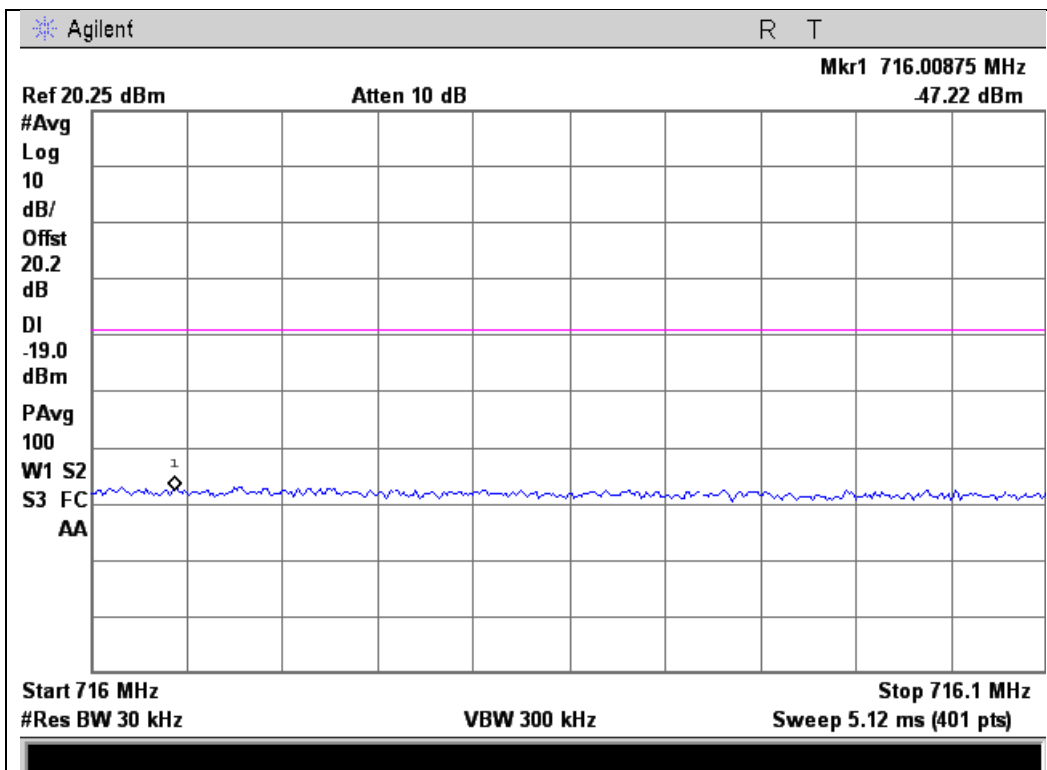
### CDMA Uplink Test Plots

704 - 716 MHz Band

Lower Band Edge



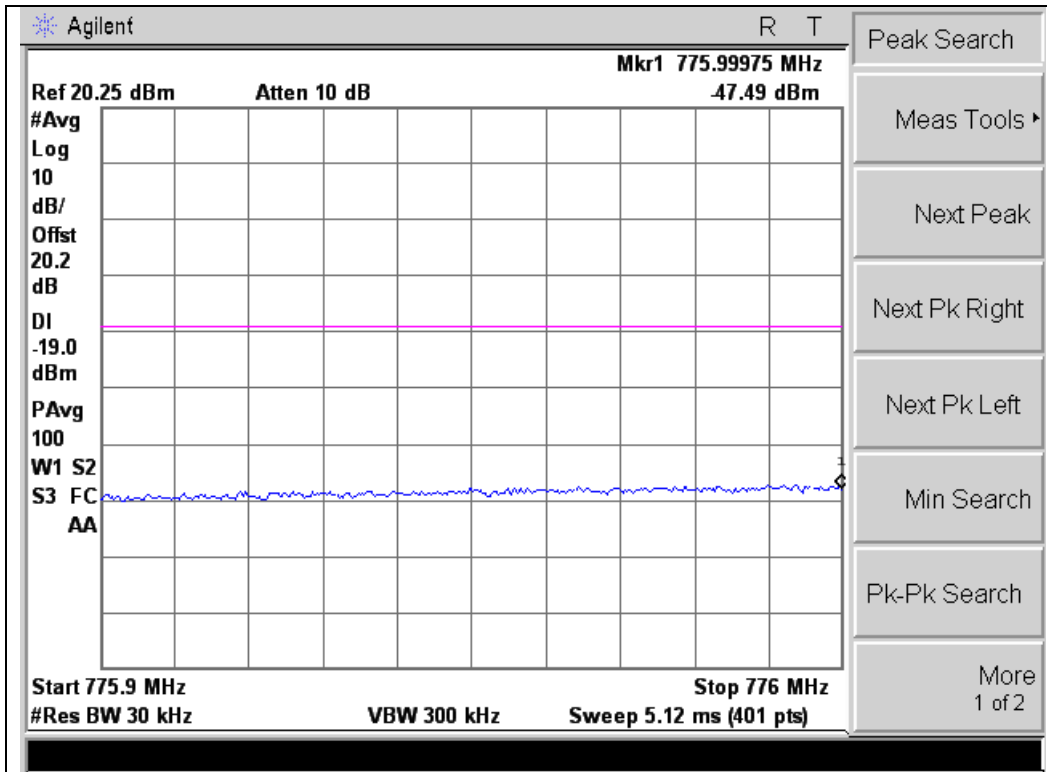
Upper Band Edge



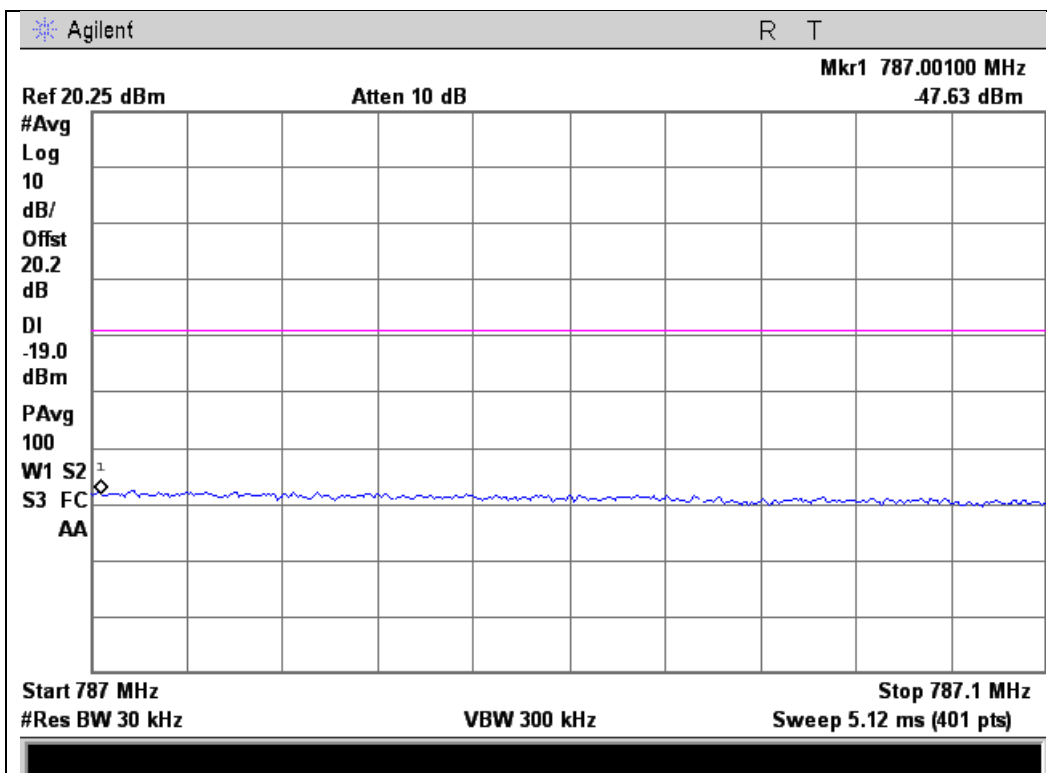


### 777 - 787 MHz Band

#### Lower Band Edge



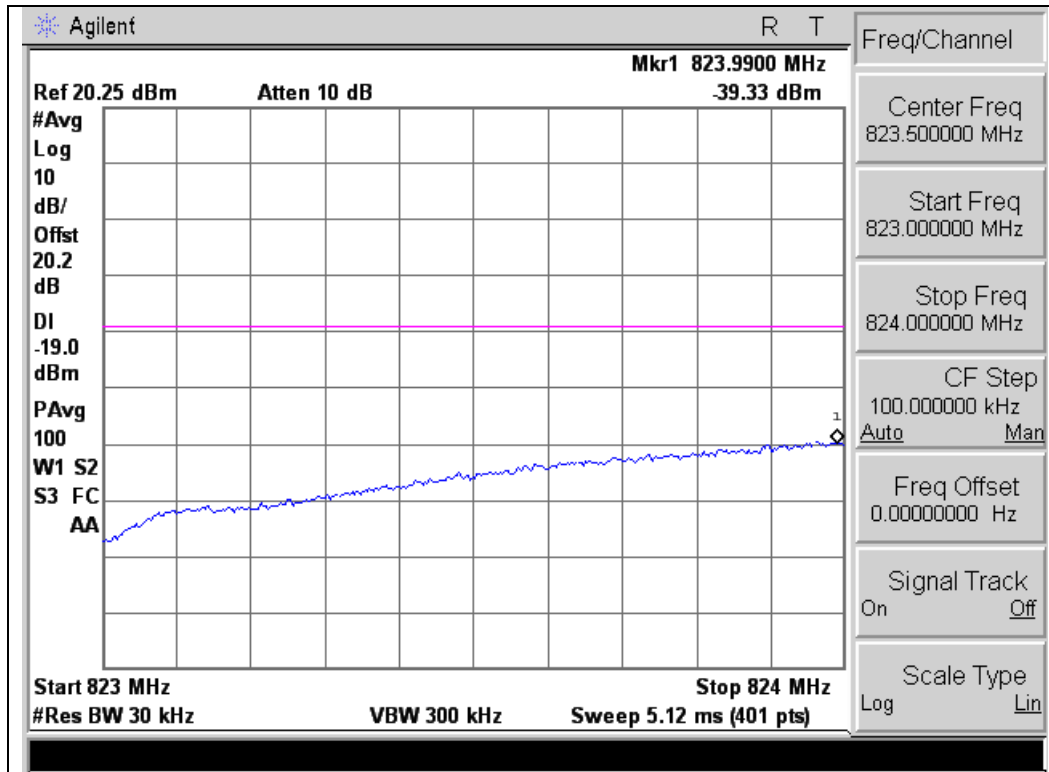
#### Upper Band Edge



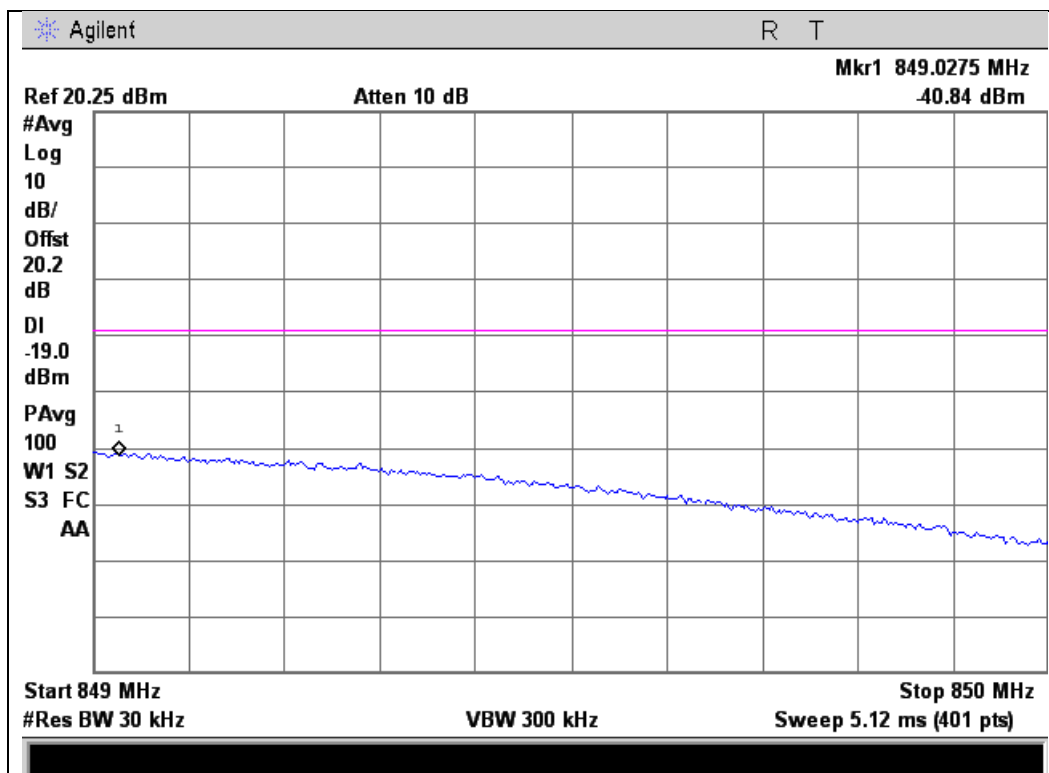


### 824 - 849 MHz Band

#### Lower Band Edge



#### Upper Band Edge

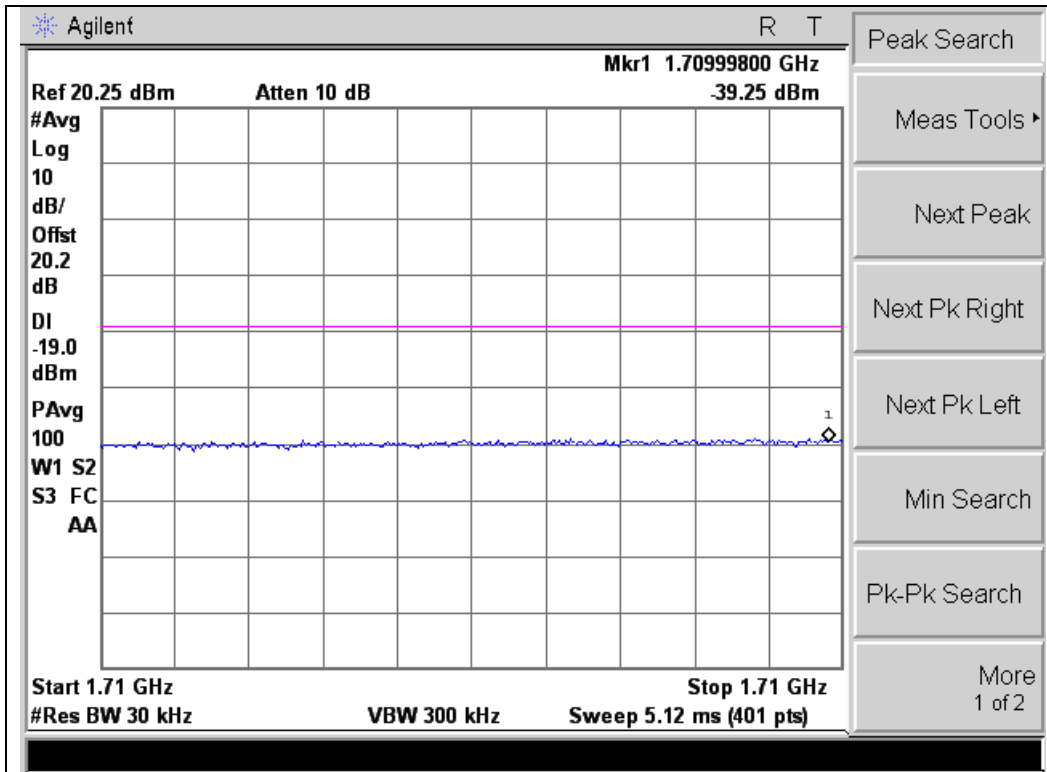




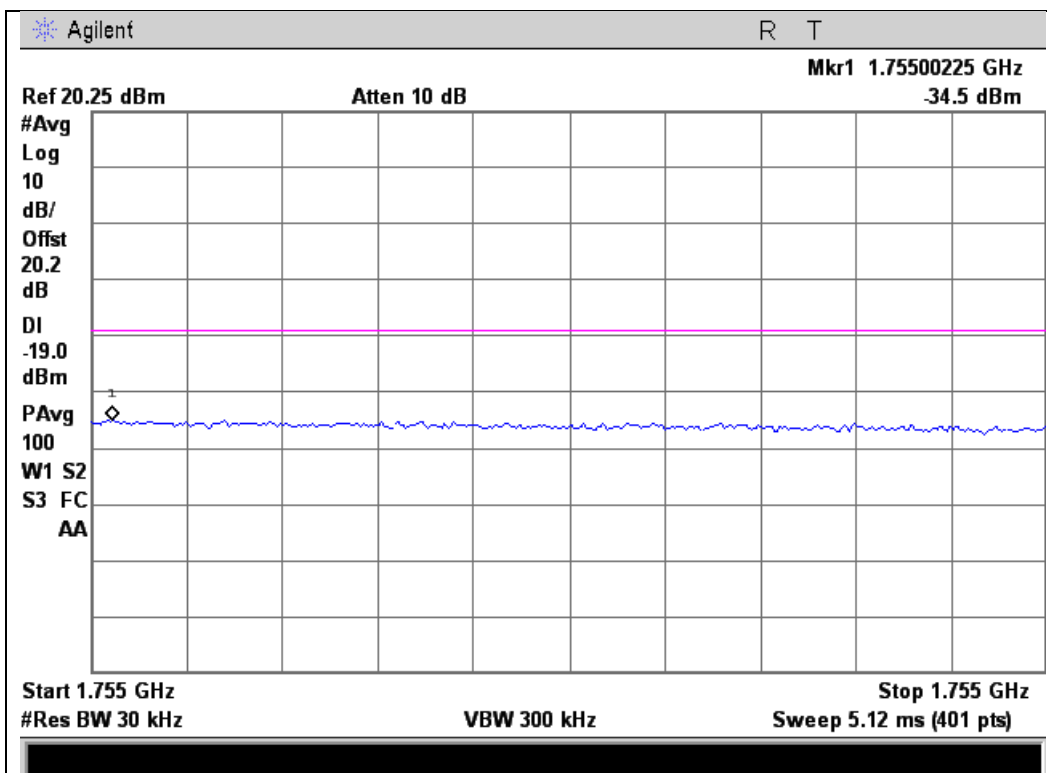


### 1710 - 1755 MHz Band

#### Lower Band Edge



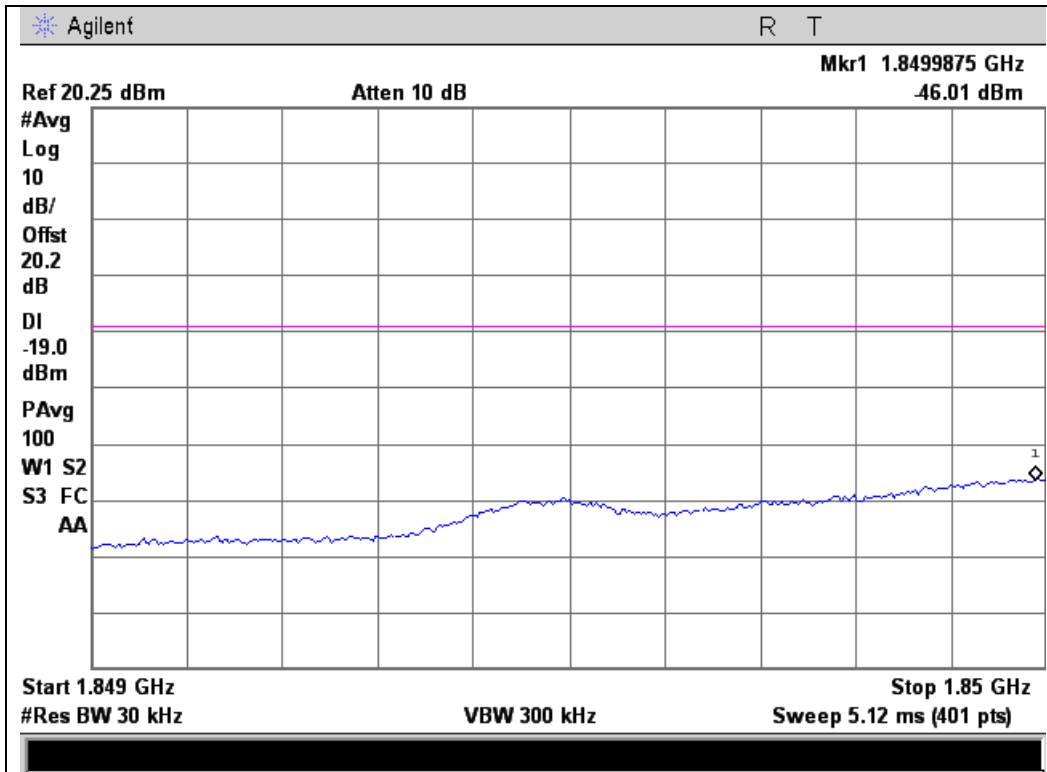
#### Upper Band Edge



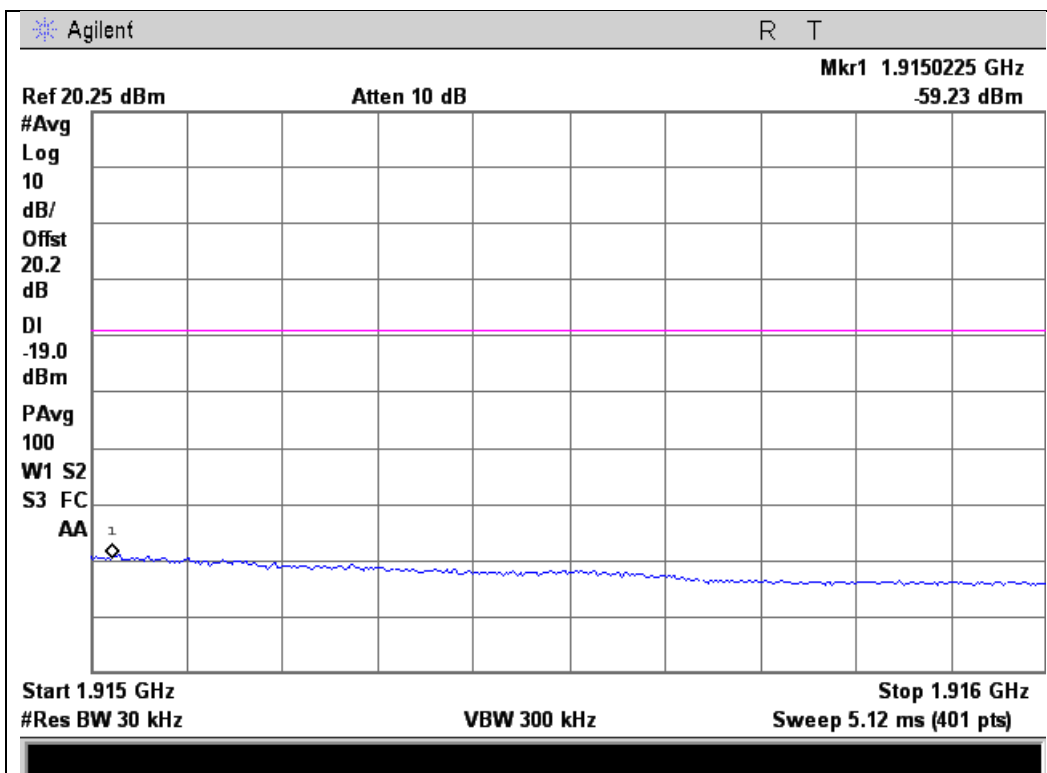


### 1850 - 1915 MHz Band

#### Lower Band Edge

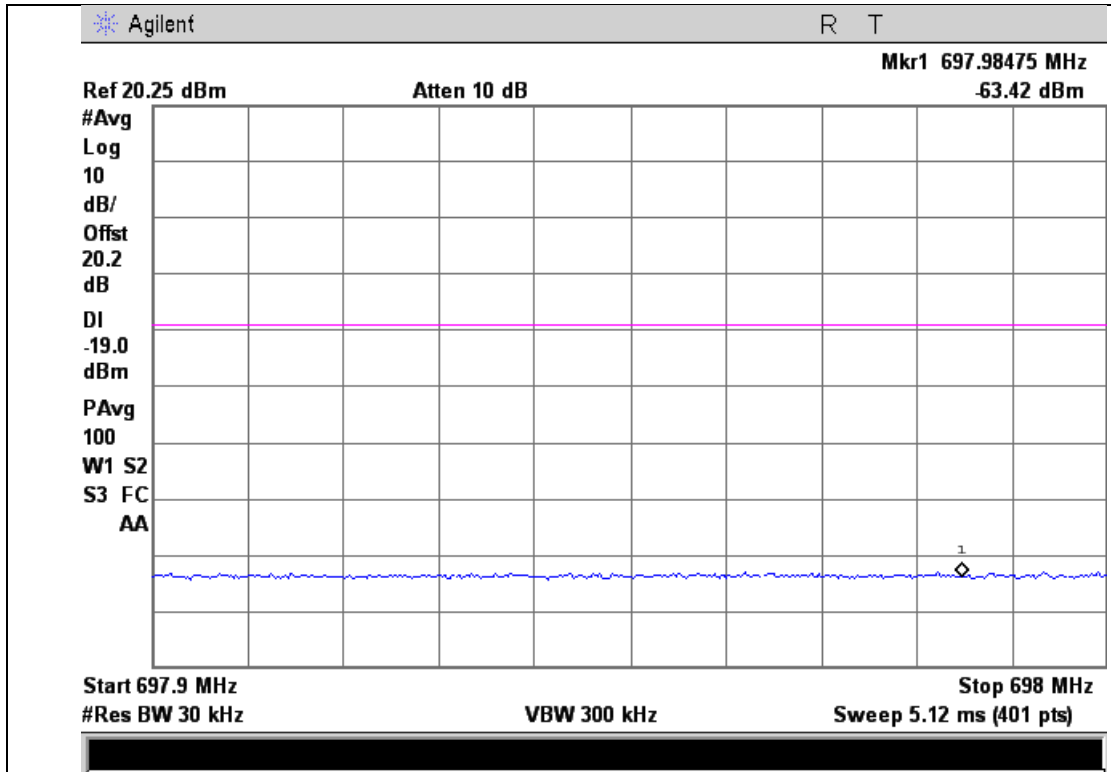


#### Upper Band Edge

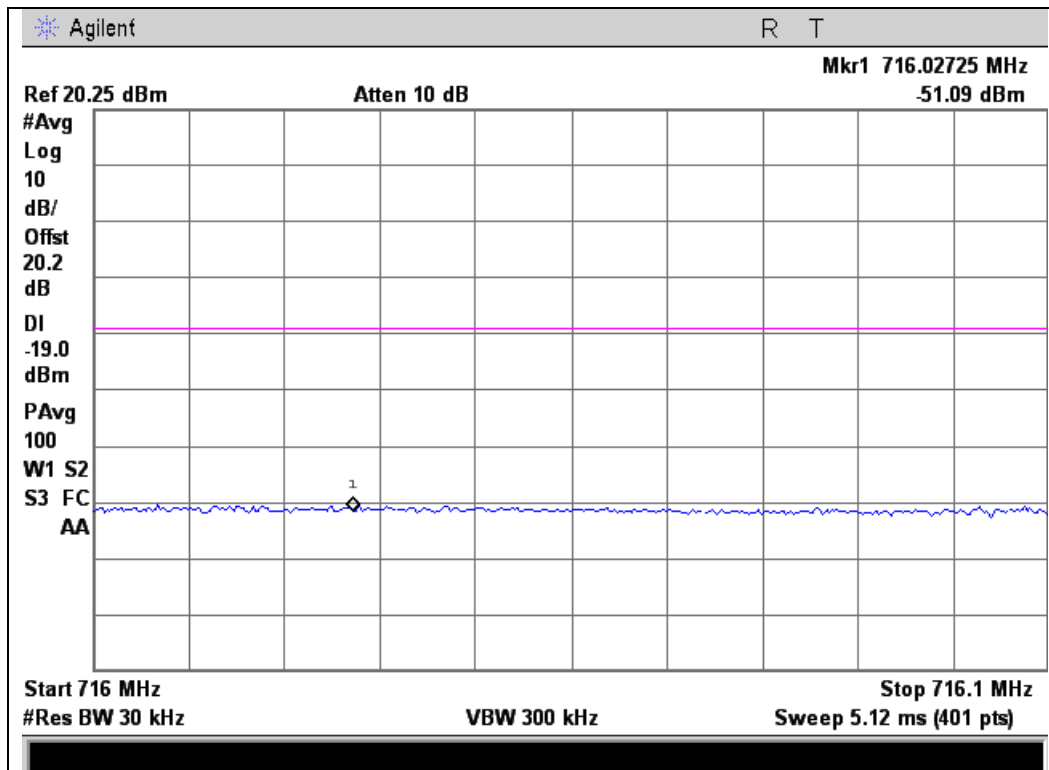




### WCDMA Uplink Test Plots 704 - 716 MHz Band Lower Band Edge



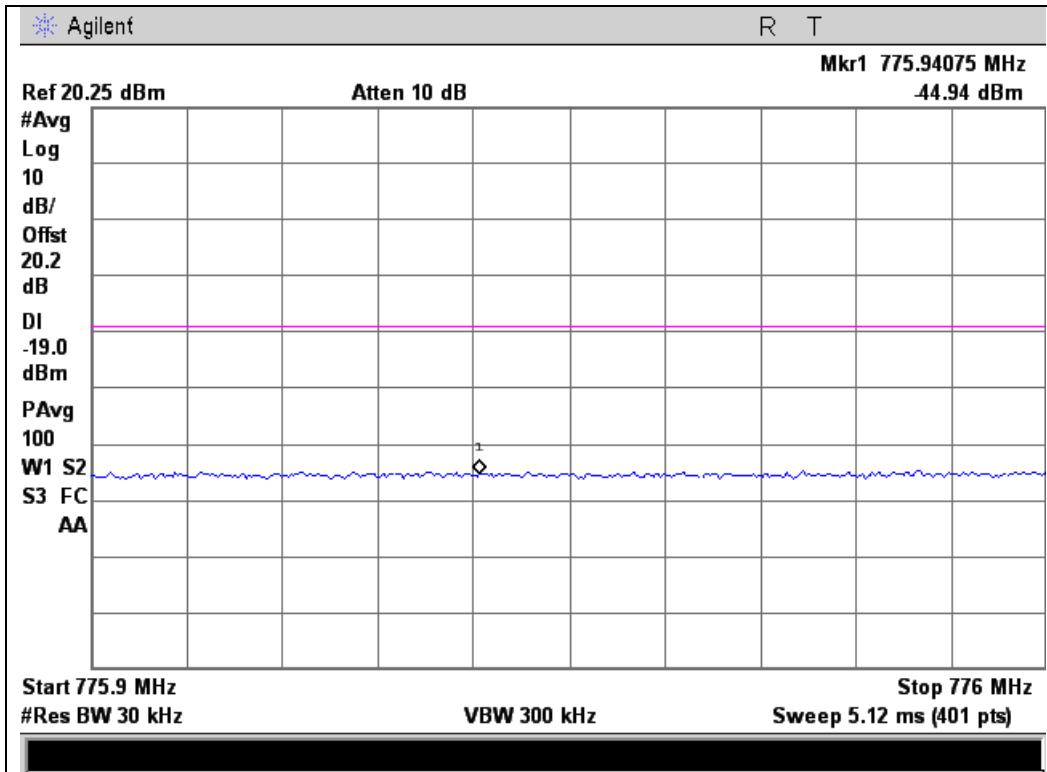
### Upper Band Edge



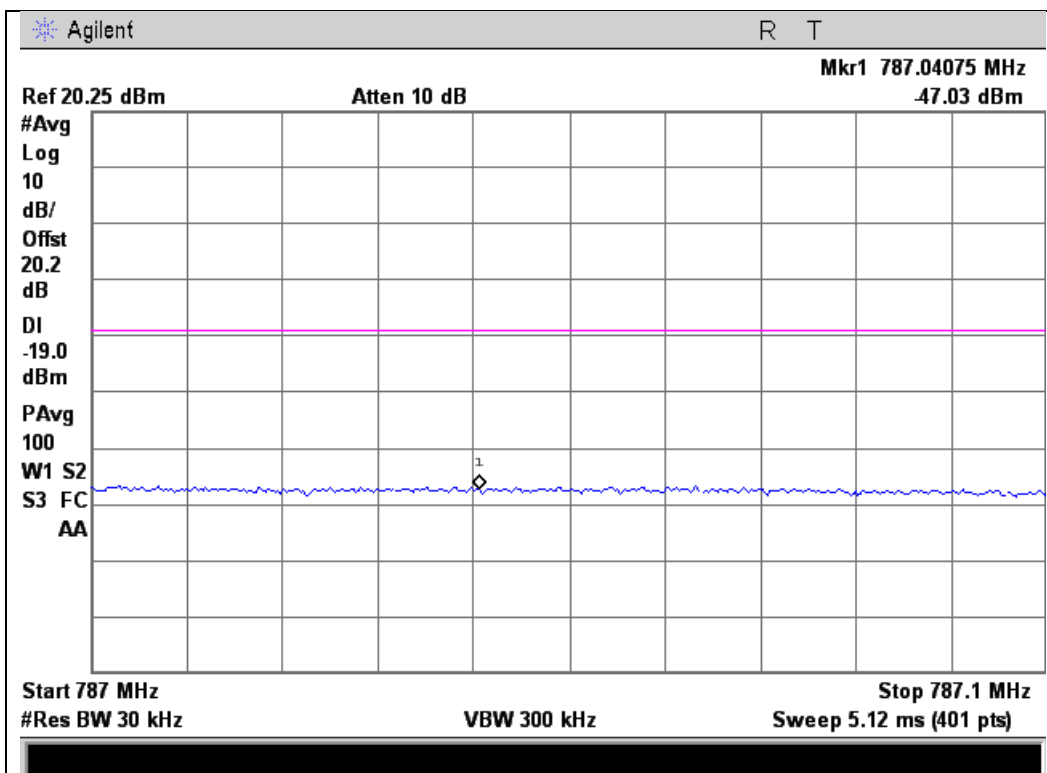


### 777 - 787 MHz Band

#### Lower Band Edge



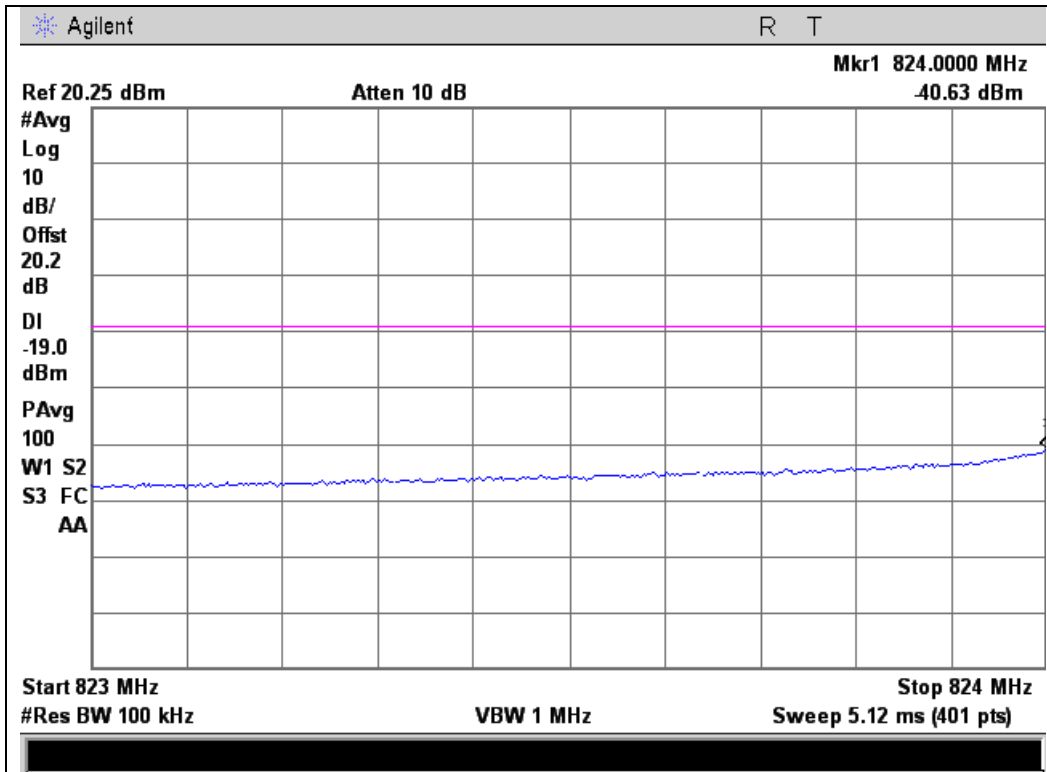
#### Upper Band Edge



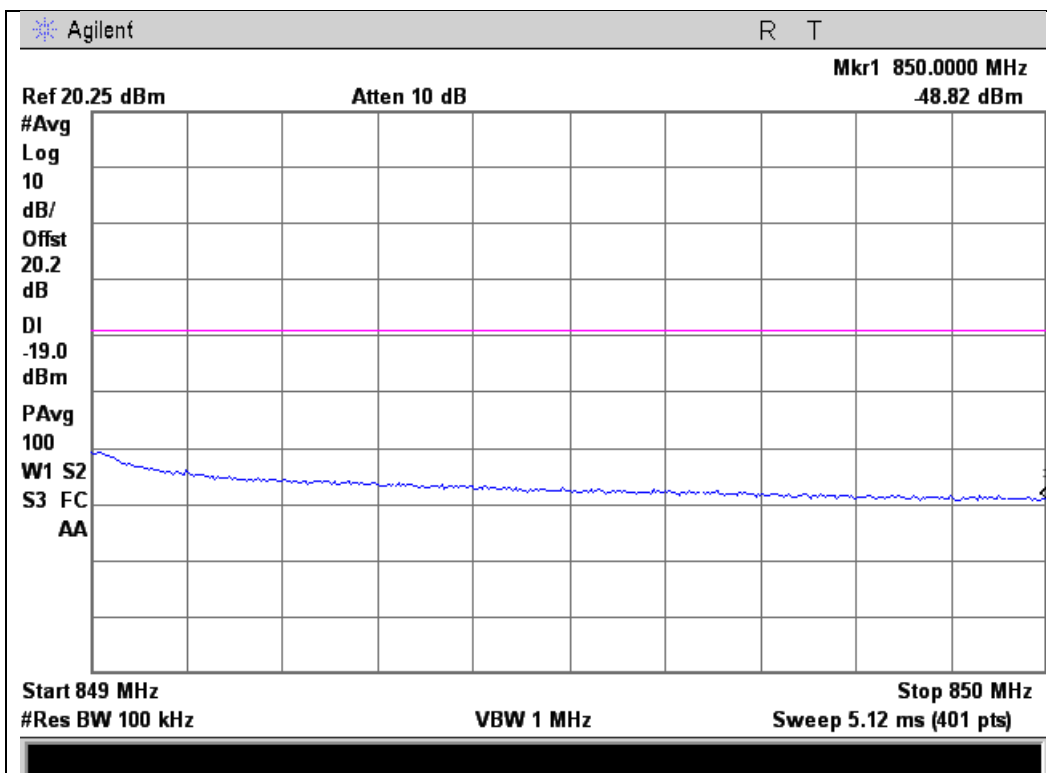


### 824 - 849 MHz Band

#### Lower Band Edge



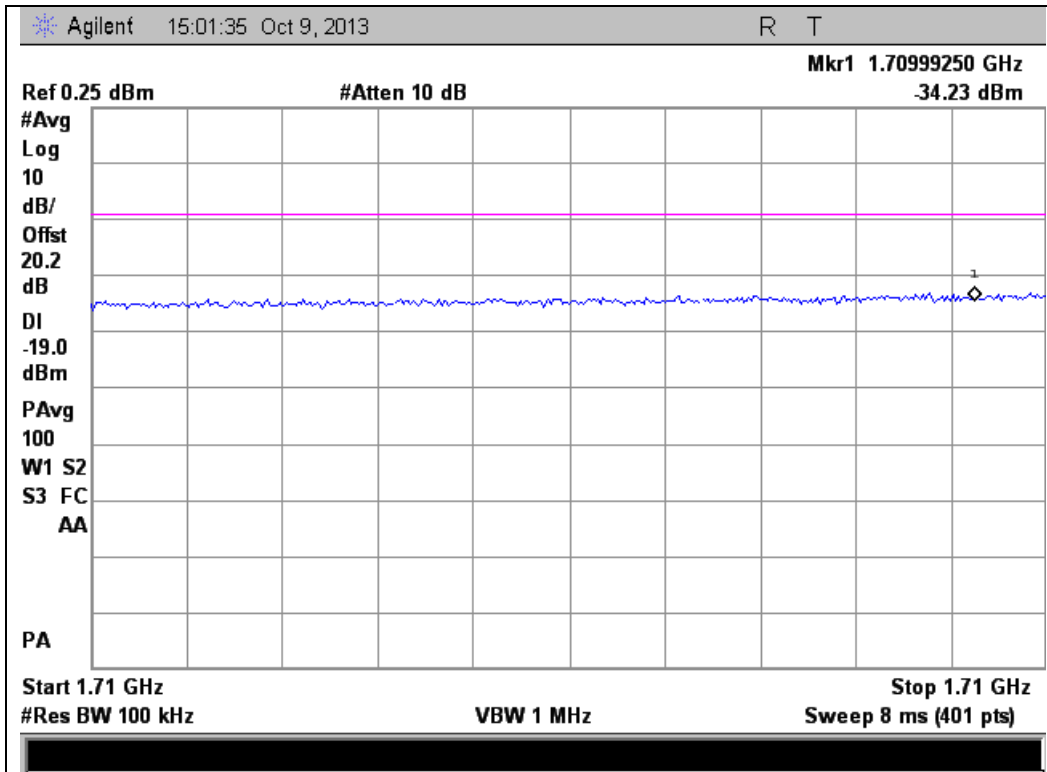
#### Upper Band Edge



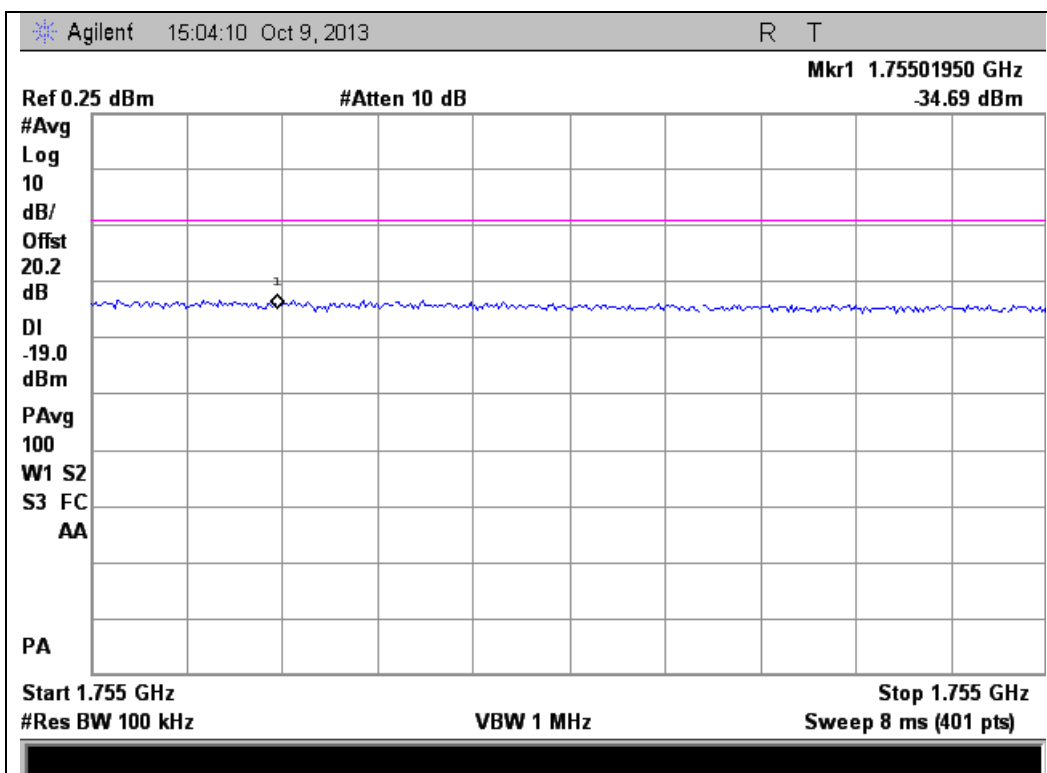


### 1710 - 1755 MHz Band

#### Lower Band Edge



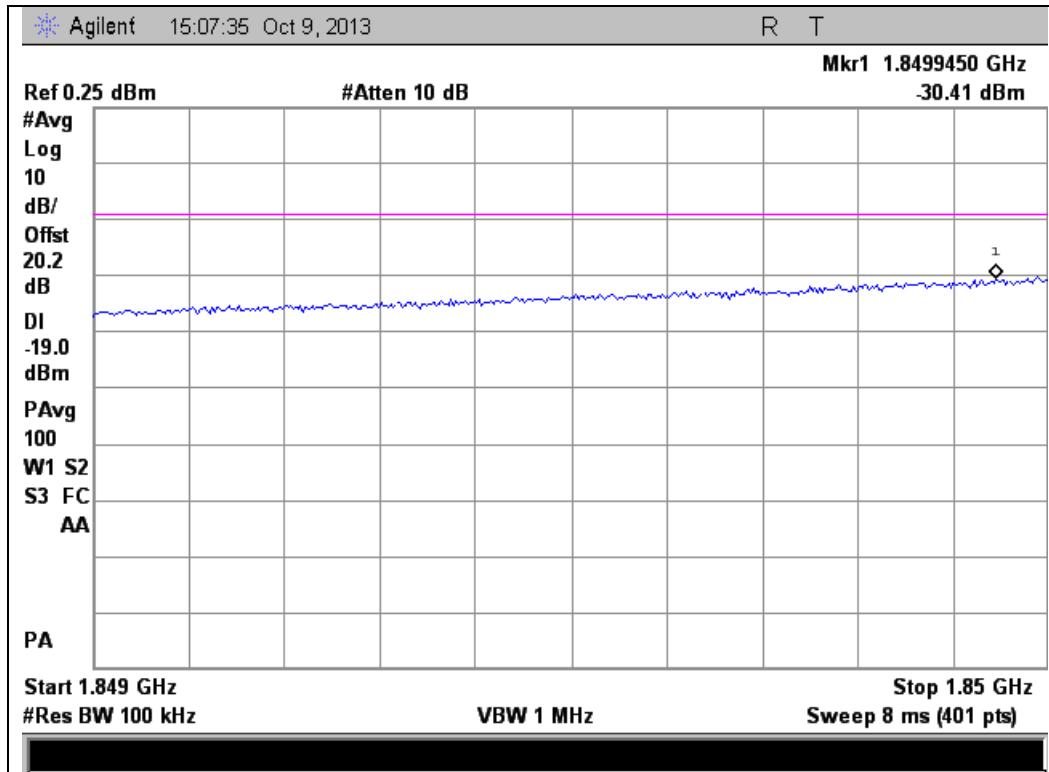
#### Upper Band Edge



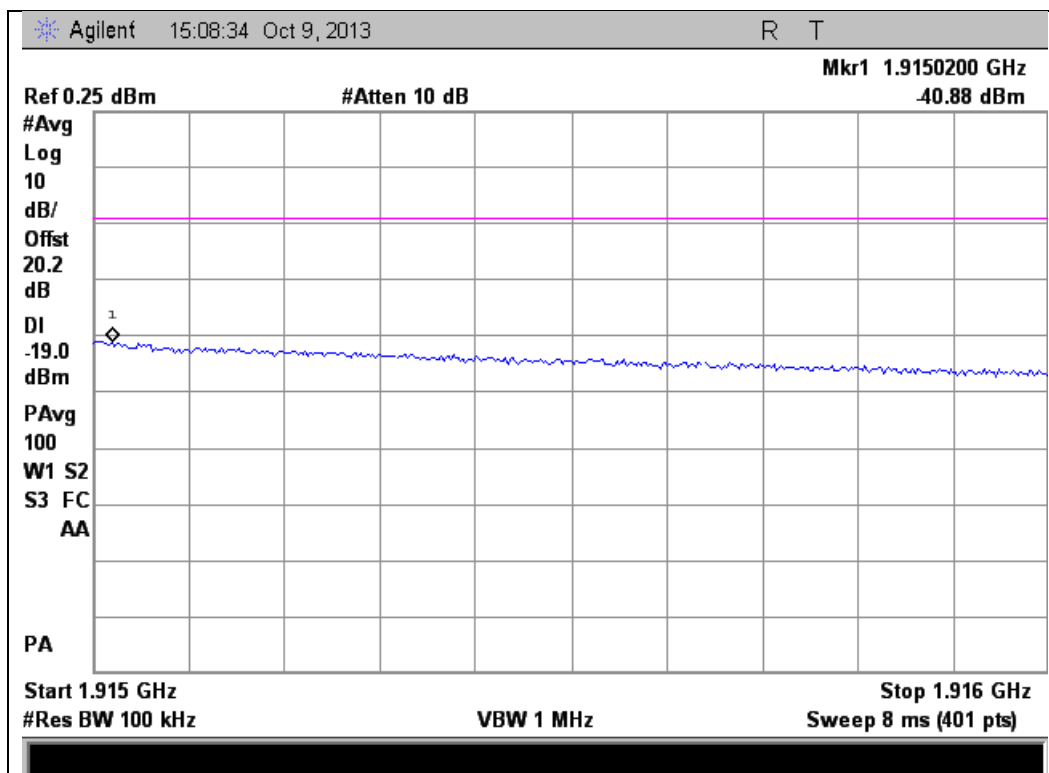


### 1850 - 1915 MHz Band

#### Lower Band Edge

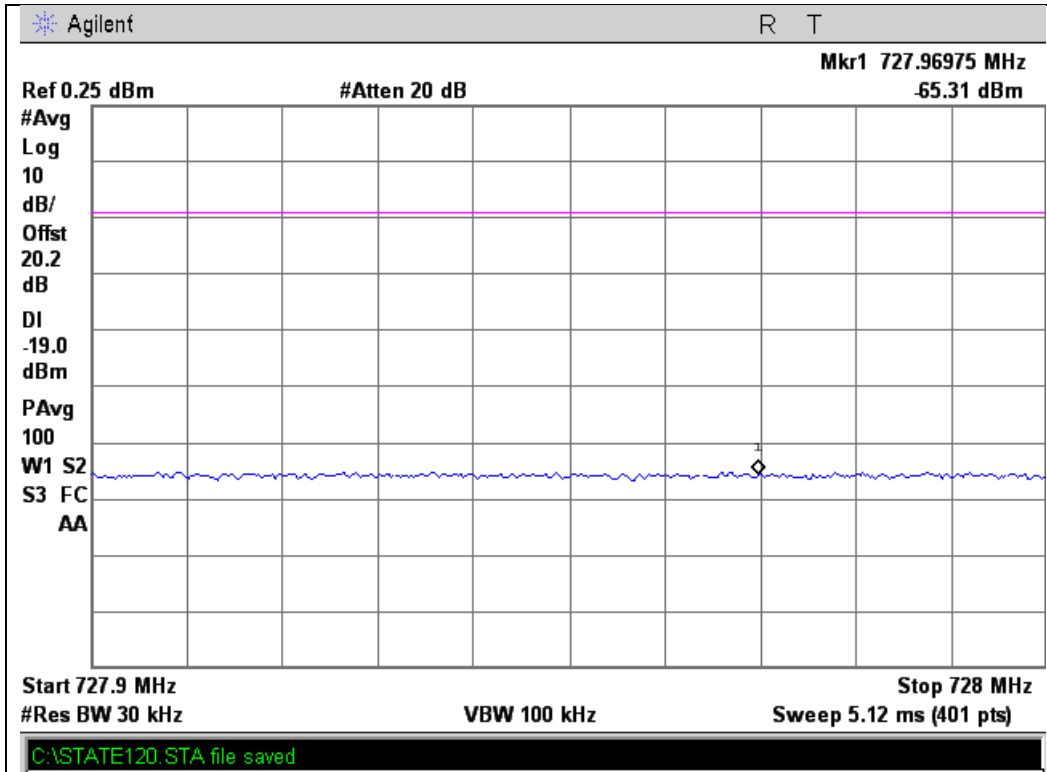


#### Upper Band Edge

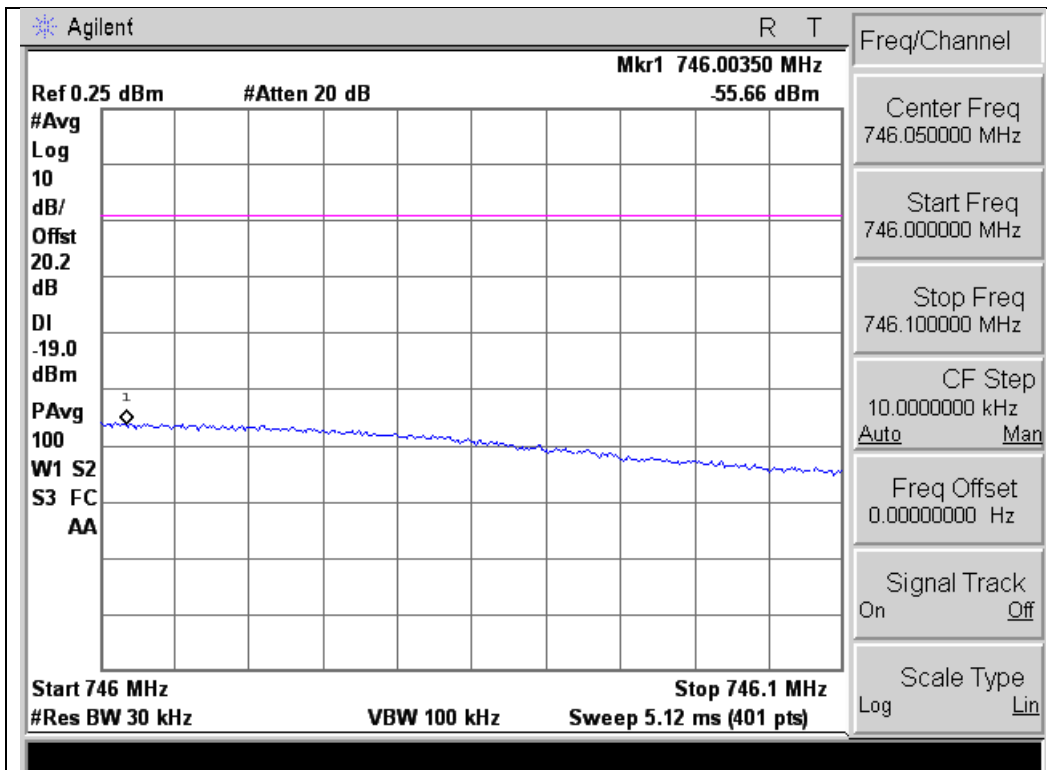




**GSM Downlink Test Plots  
734 - 746 MHz Band  
Lower Band Edge**



**Upper Band Edge**

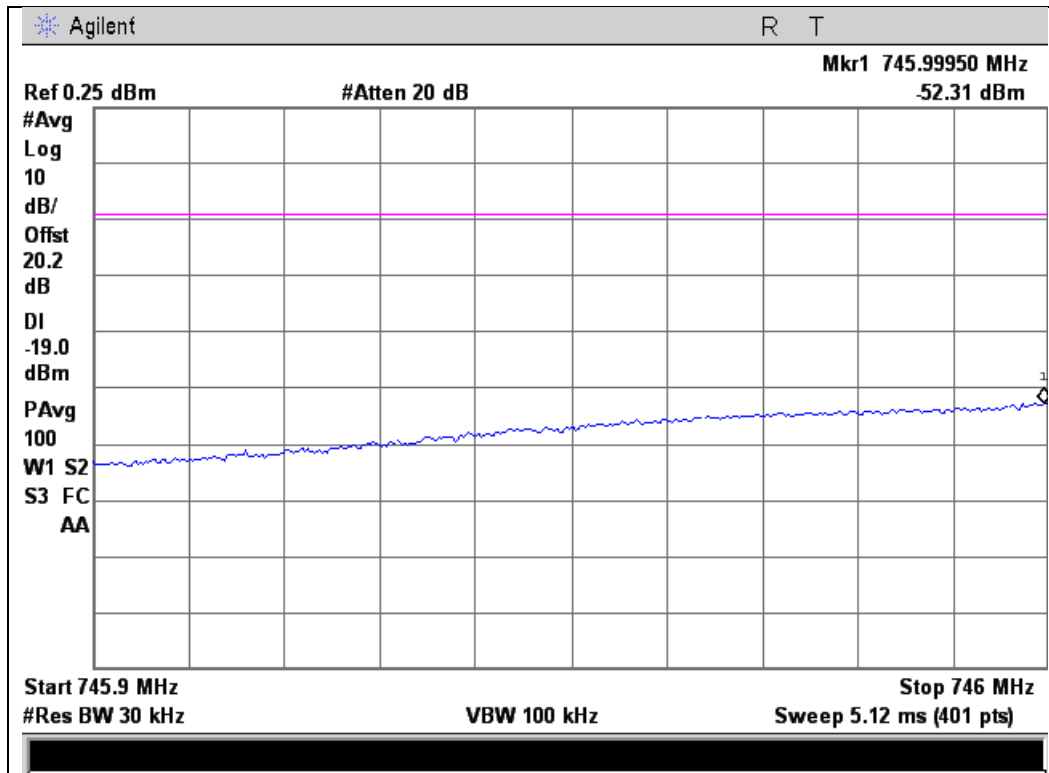




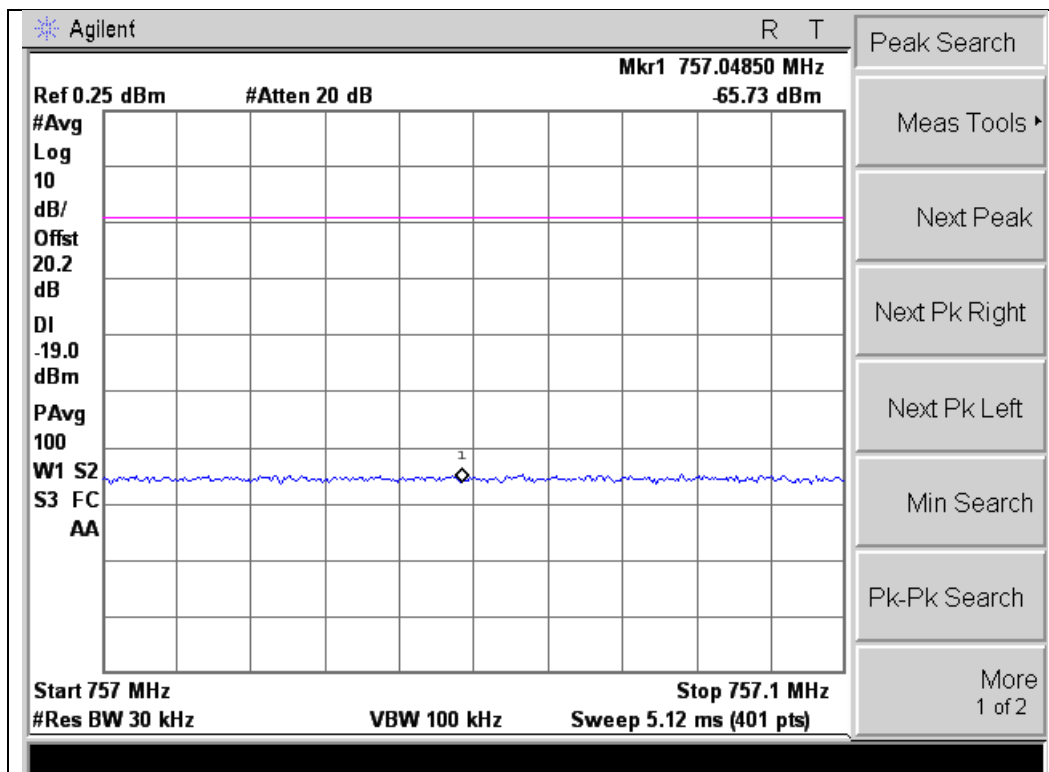


### 746 - 756 MHz Band

#### Lower Band Edge



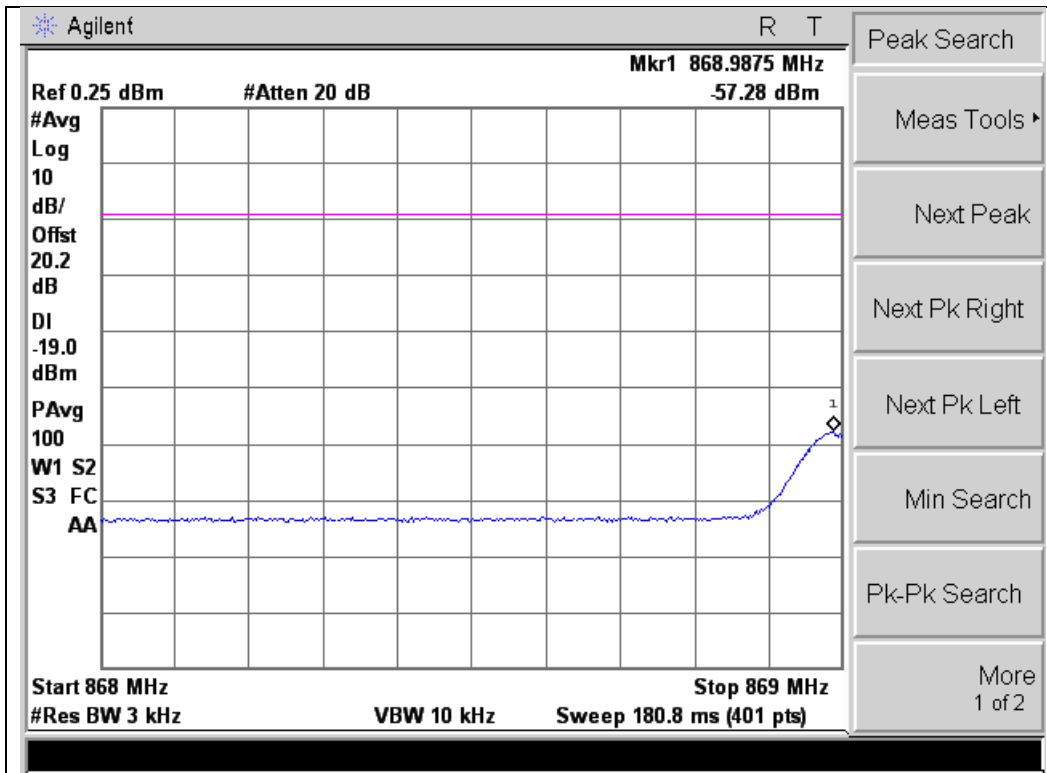
#### Upper Band Edge



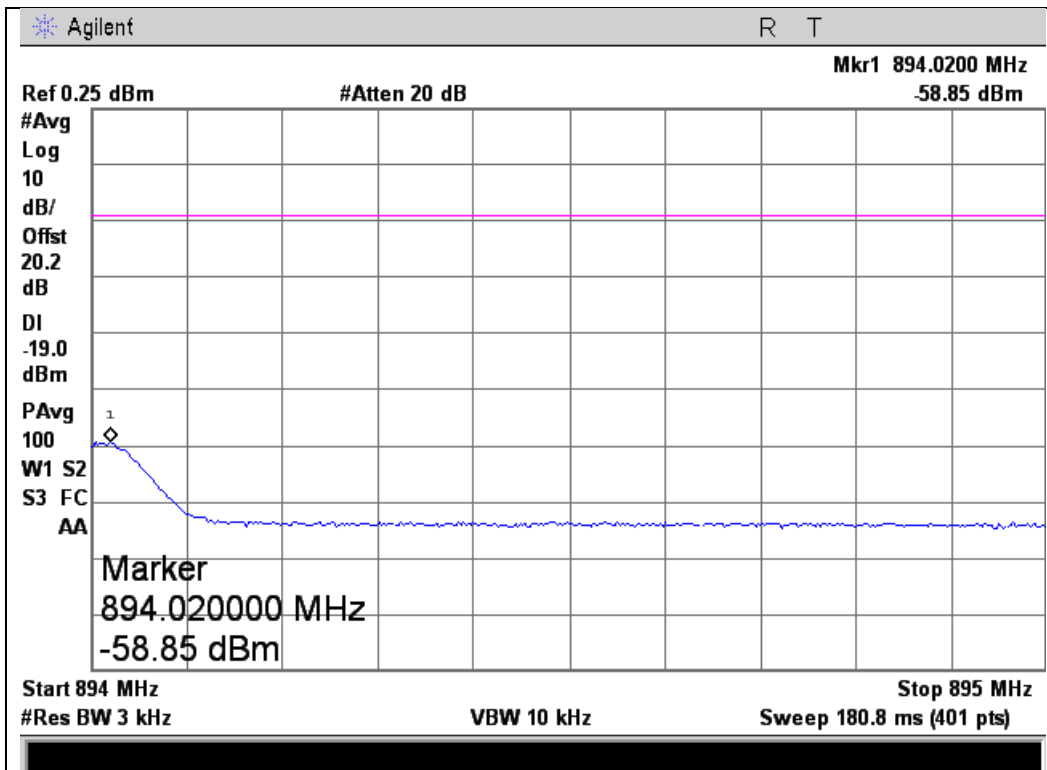


### 869 - 894 MHz Band

#### Lower Band Edge

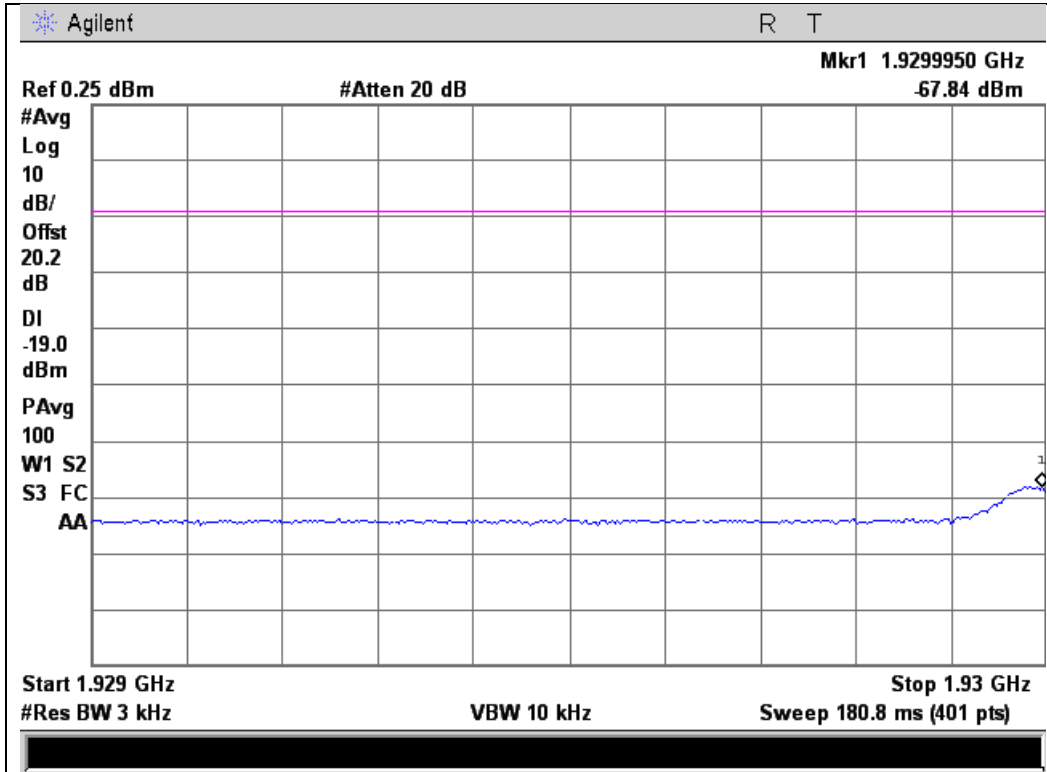


#### Upper Band Edge

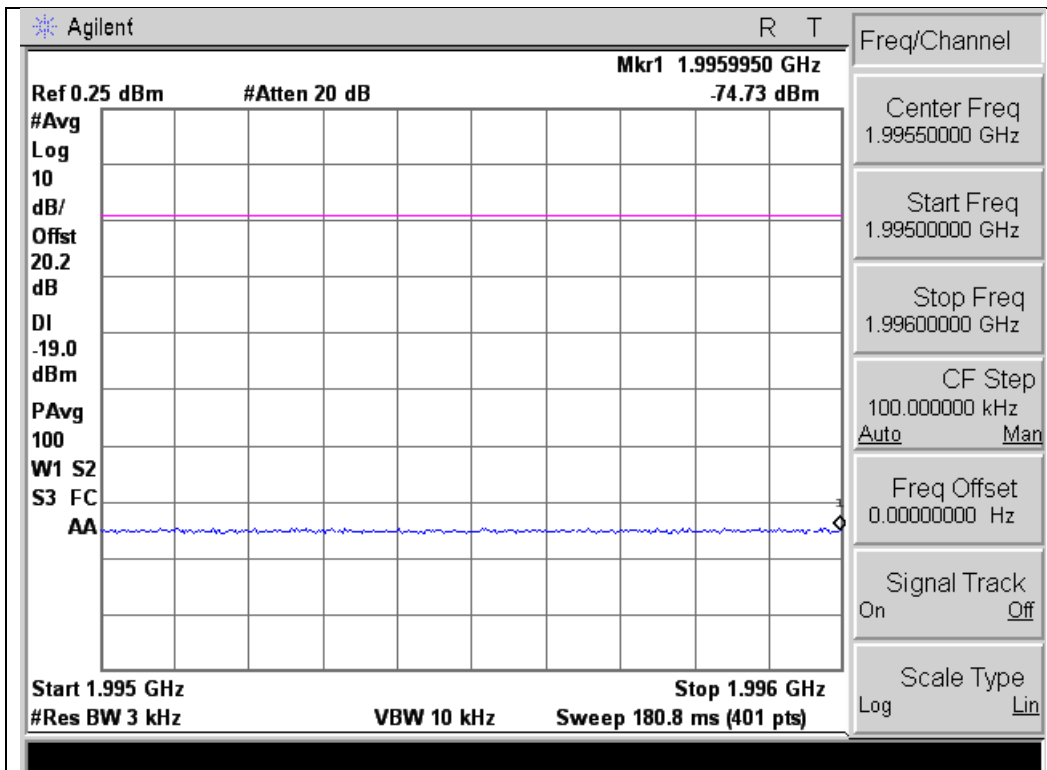




**1930 - 1995 MHz Band**  
**Lower Band Edge**



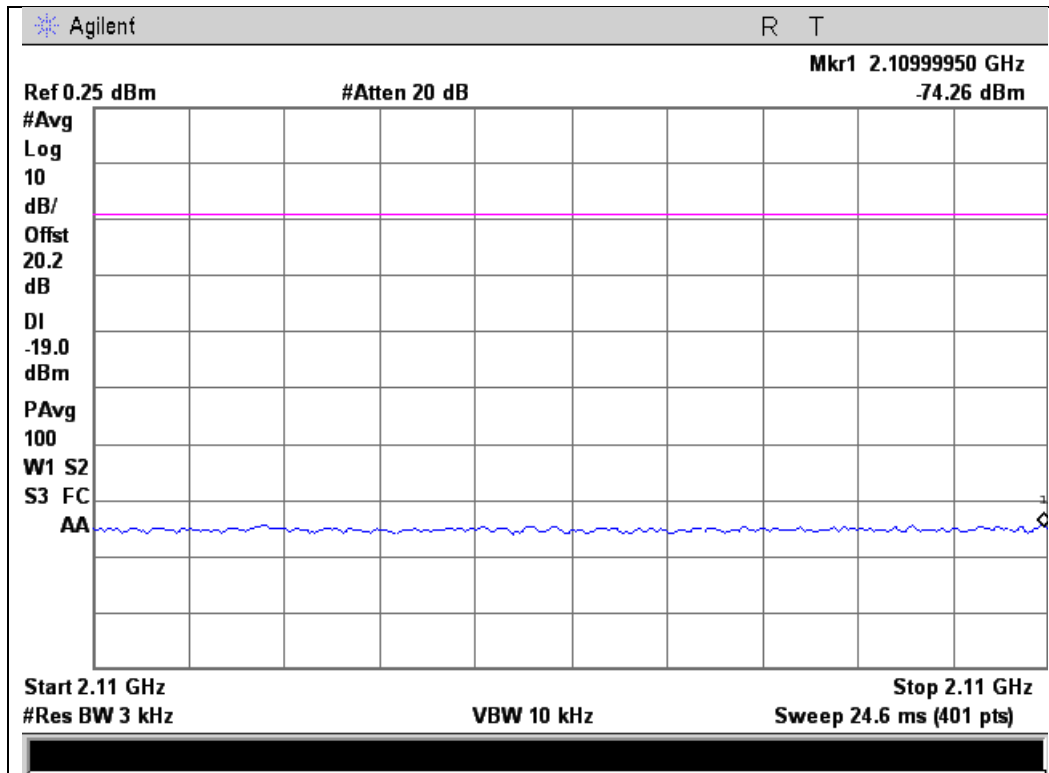
**Upper Band Edge**



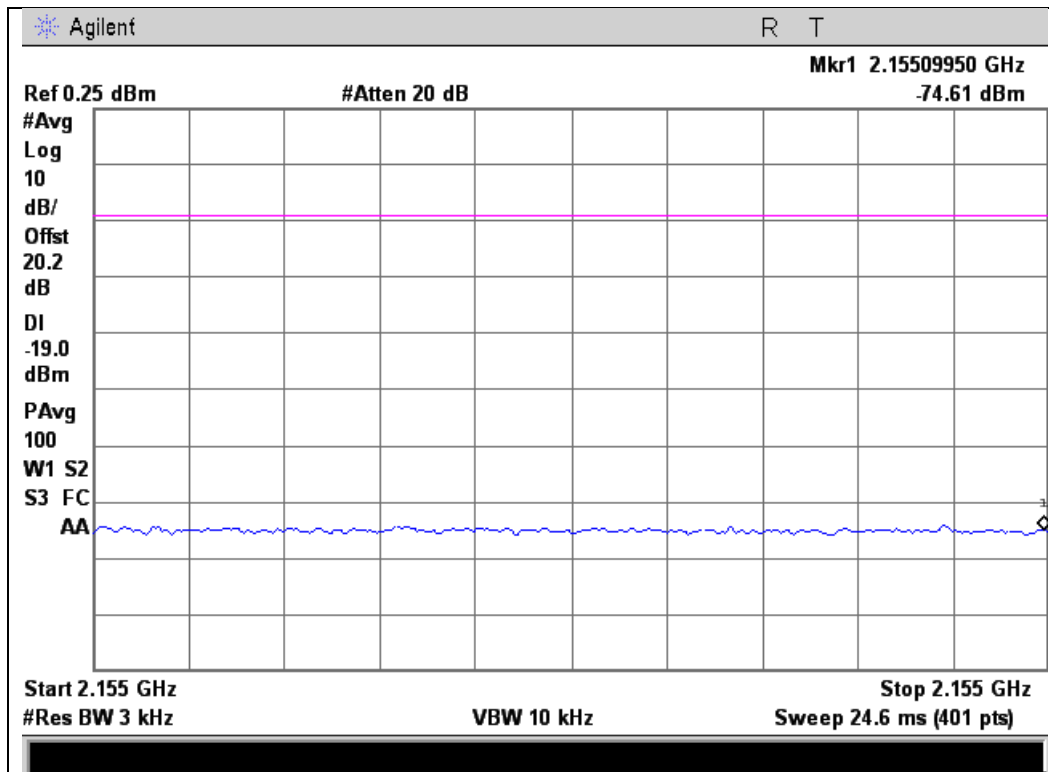


### 2110 - 2155 MHz Band

#### Lower Band Edge



#### Upper Band Edge

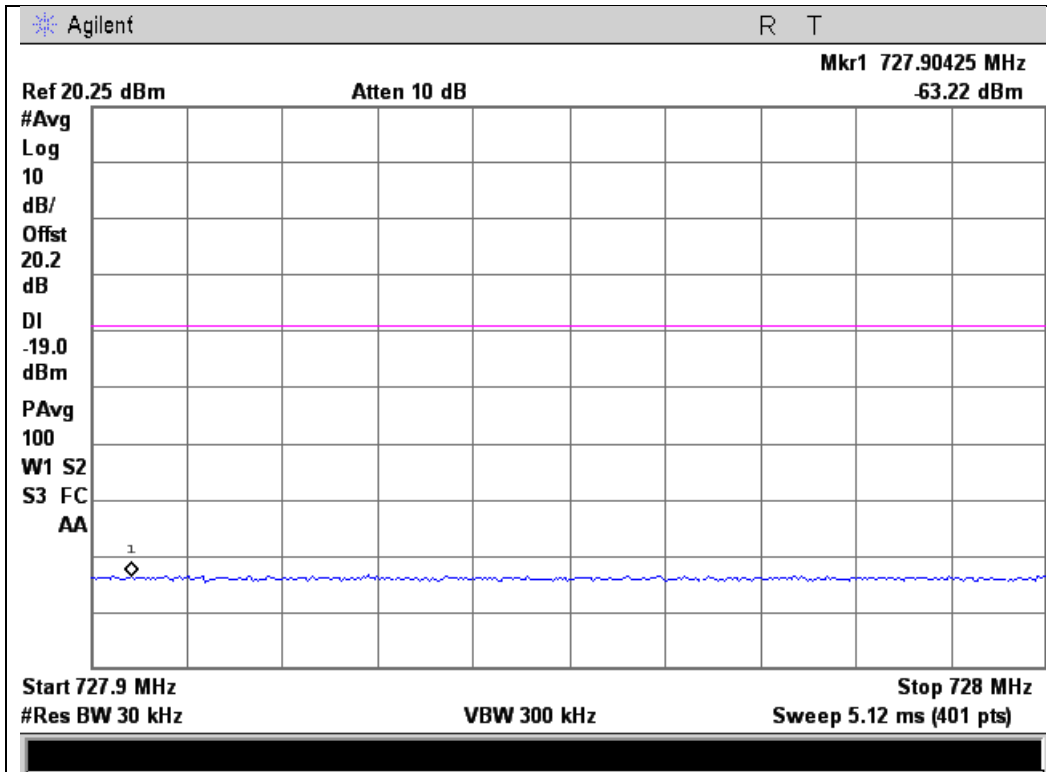




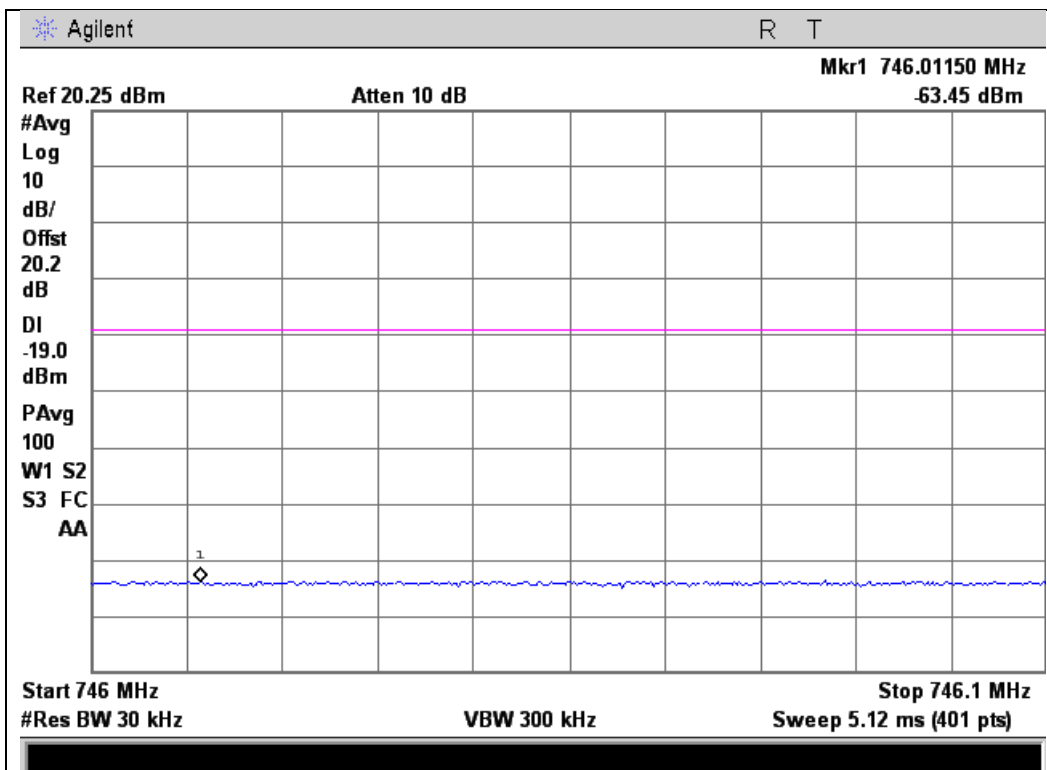
### CDMA Downlink Test Plots

734 - 746 MHz Band

Lower Band Edge



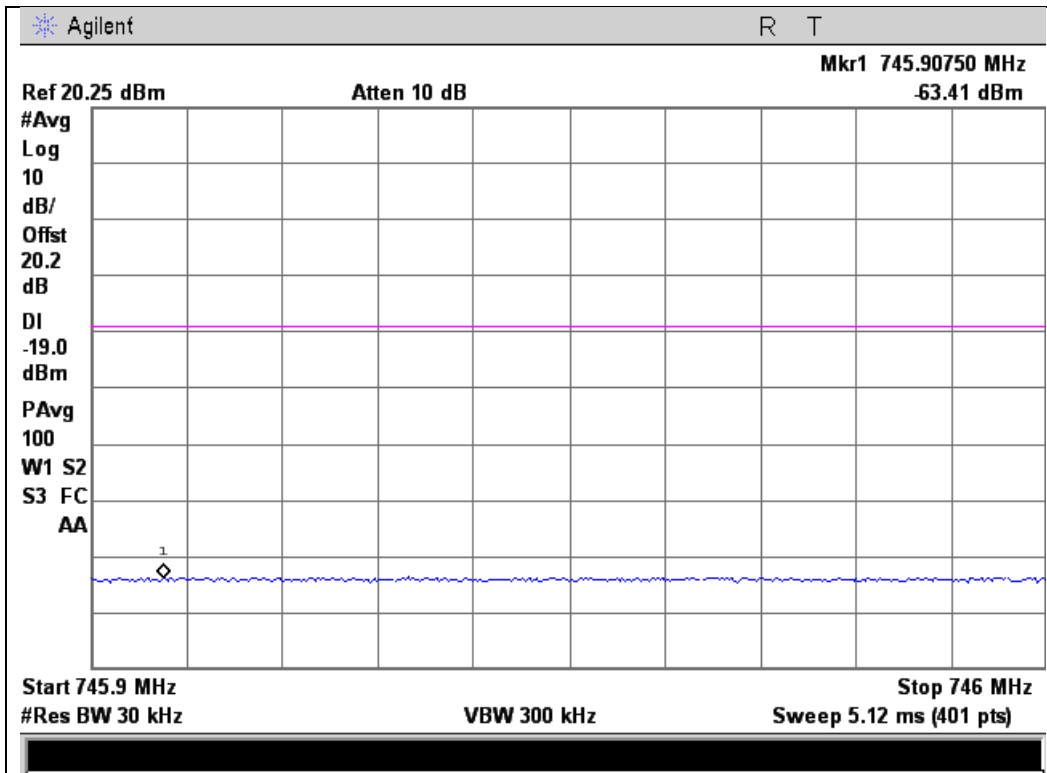
Upper Band Edge



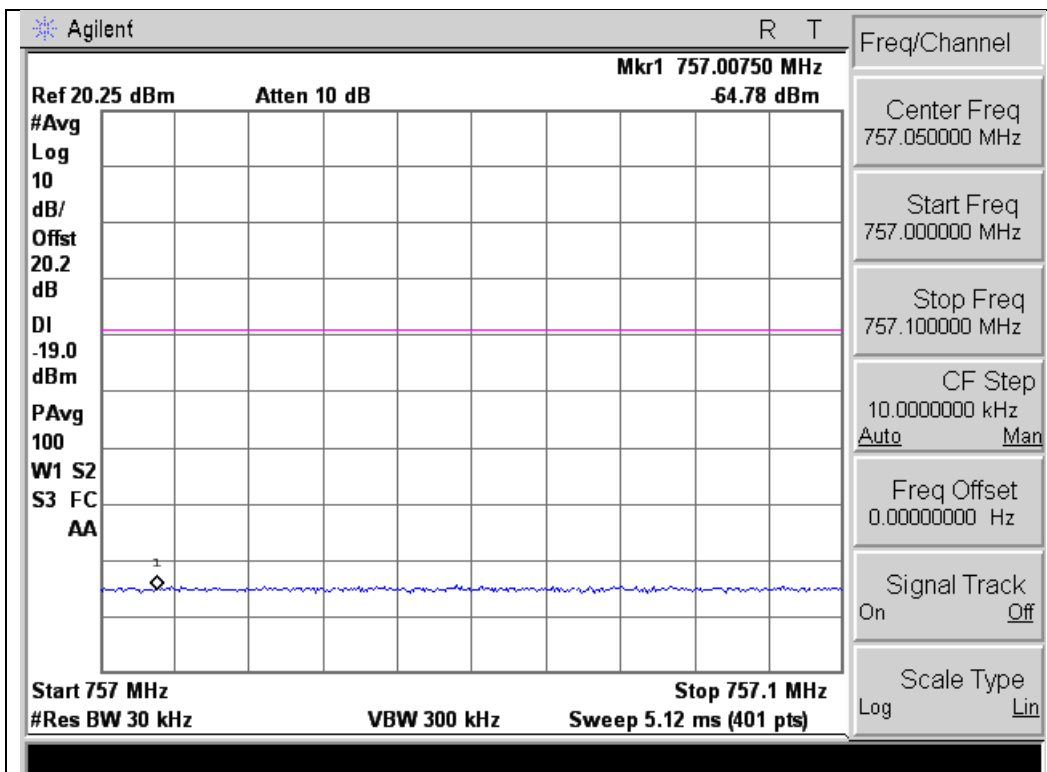


**746 - 756 MHz Band**

**Lower Band Edge**



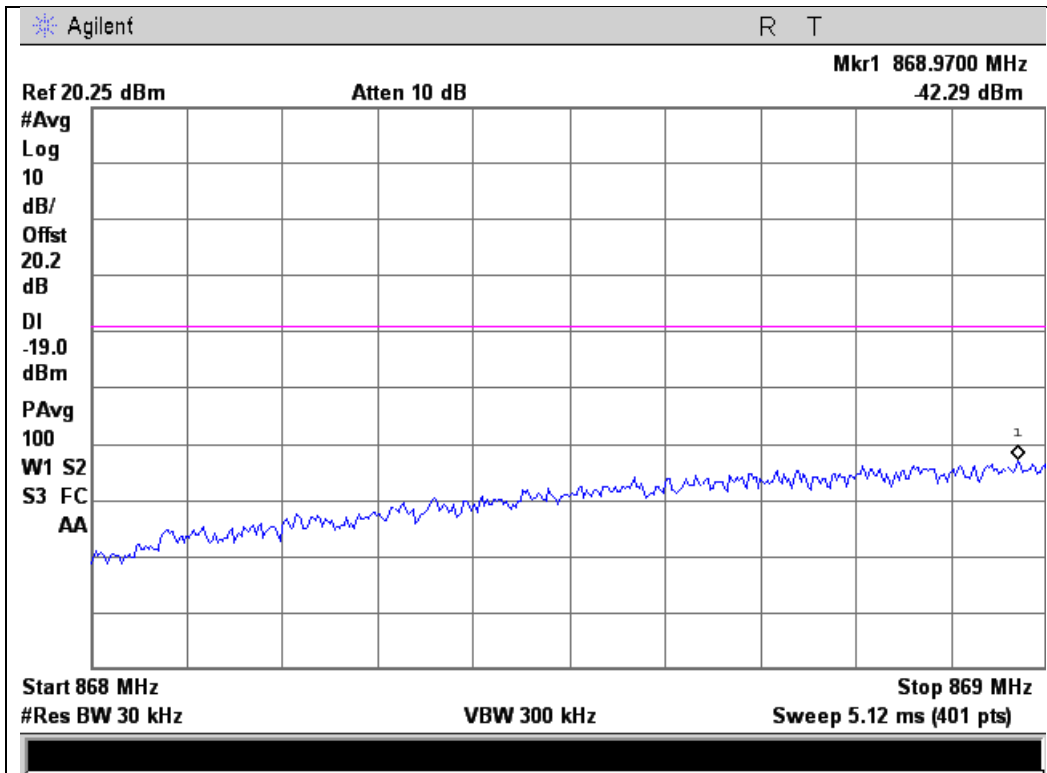
**Upper Band Edge**



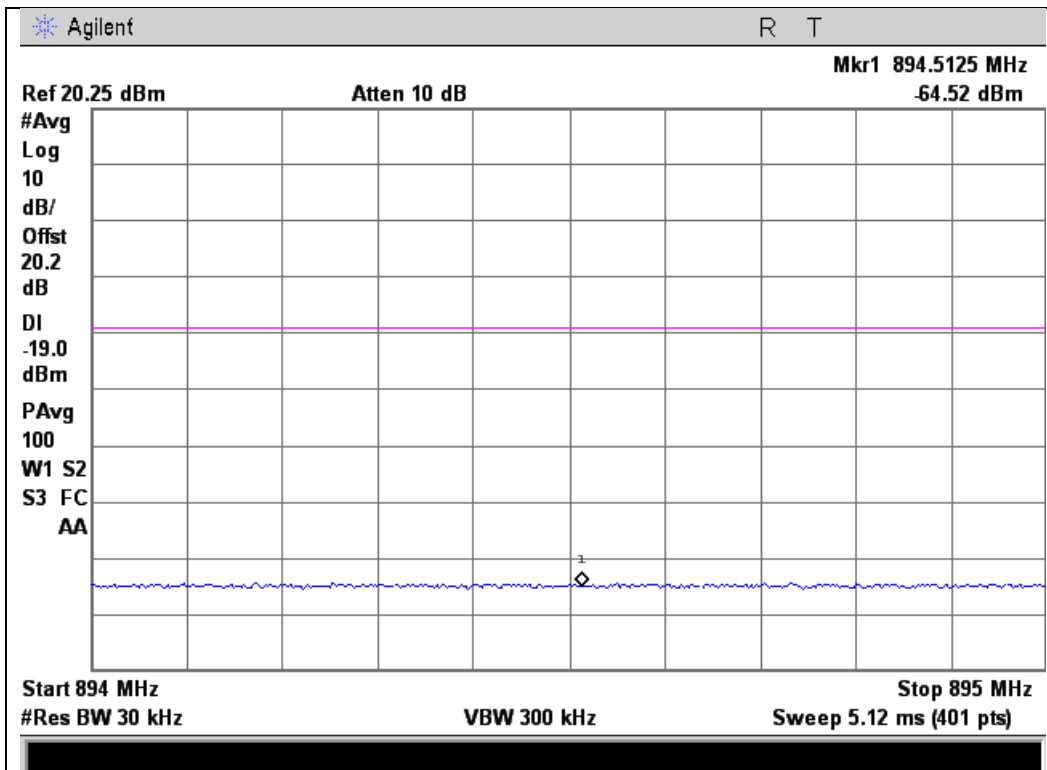


### 869 - 894 MHz Band

#### Lower Band Edge



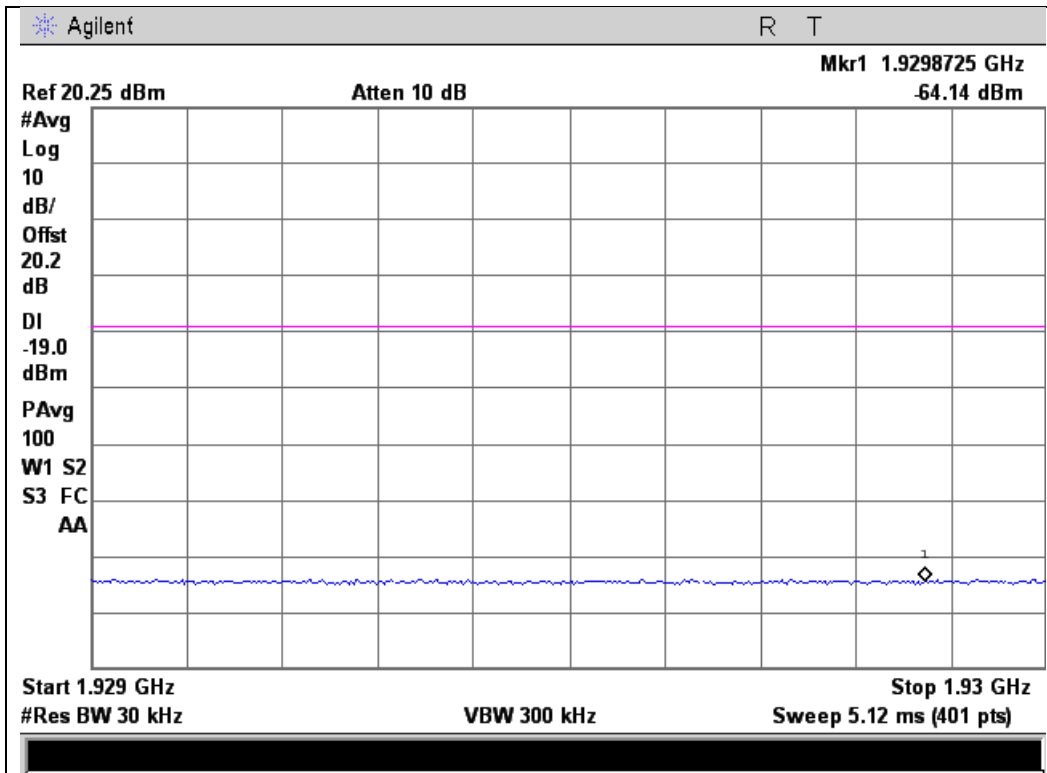
#### Upper Band Edge



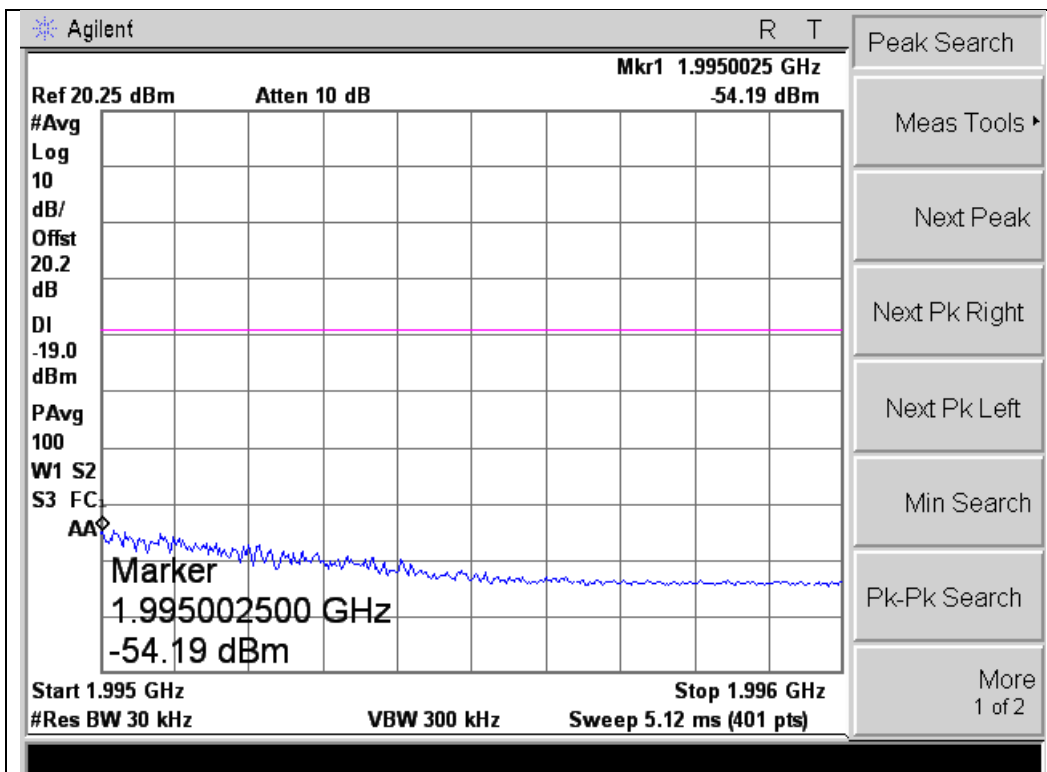


### 1930 - 1995 MHz Band

#### Lower Band Edge



#### Upper Band Edge

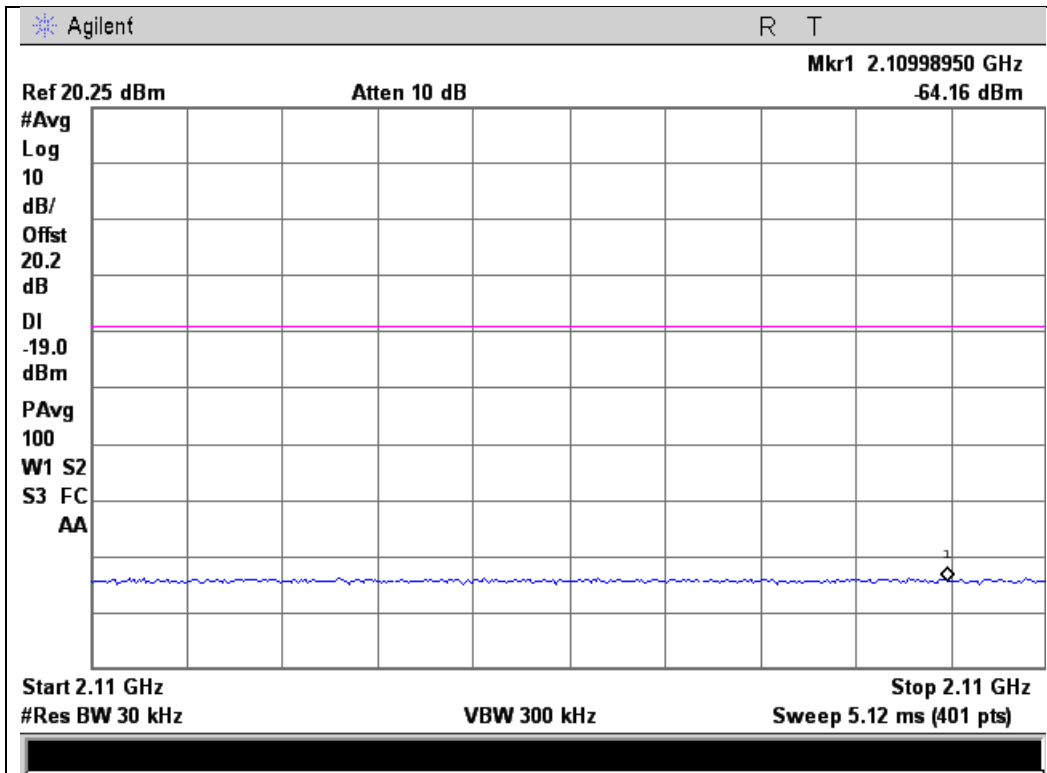




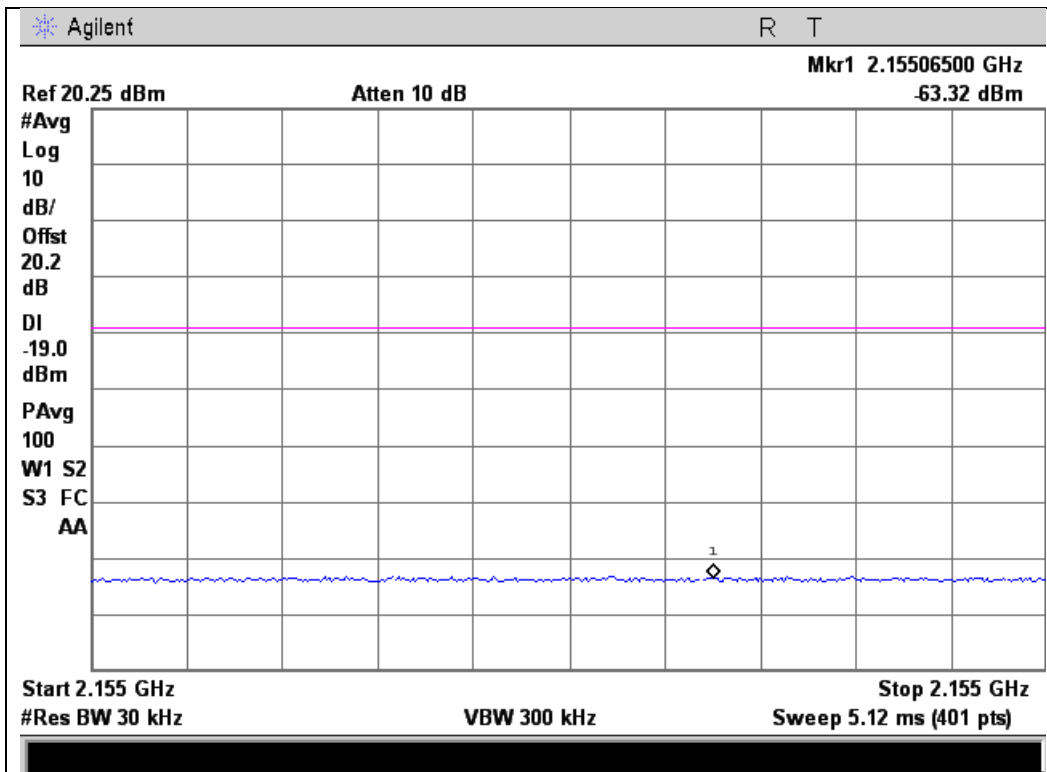


### 2110 - 2155 MHz Band

#### Lower Band Edge



#### Upper Band Edge

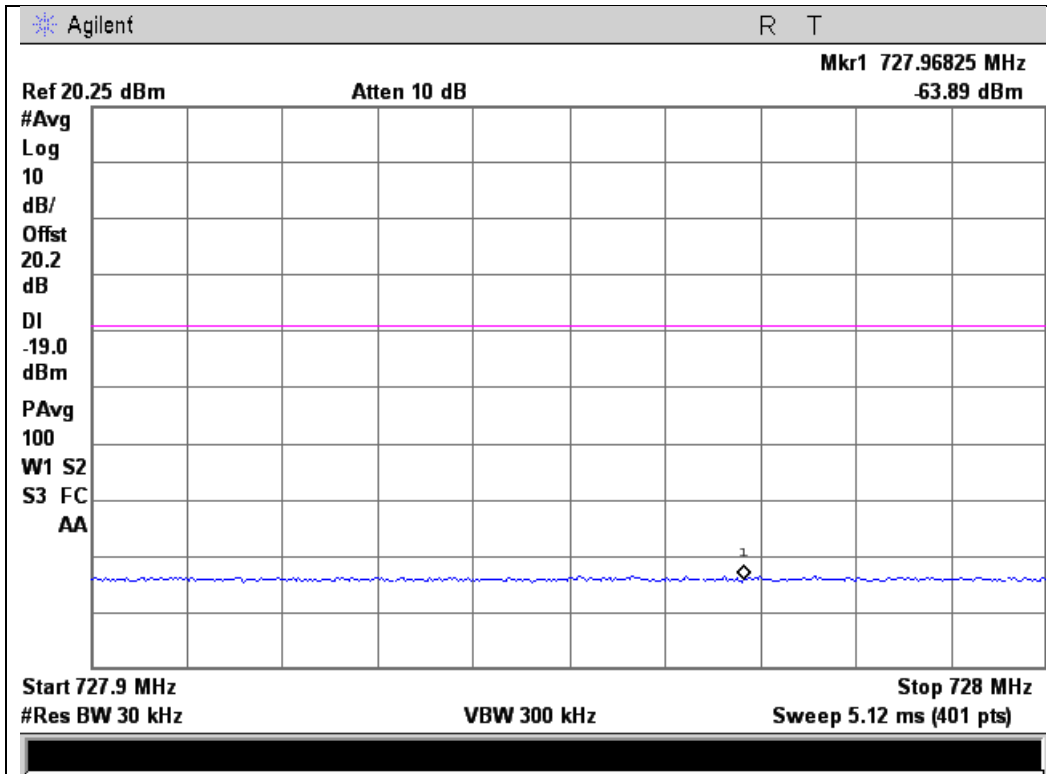




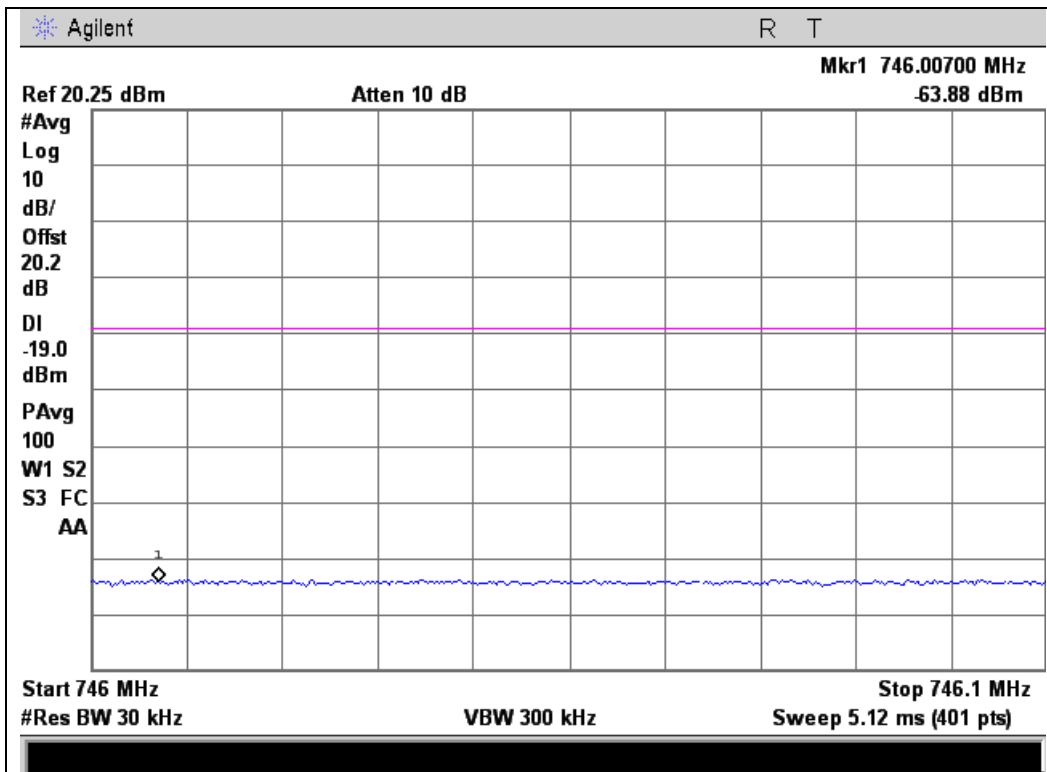
### WCDMA Downlink Test Plots

734 - 746 MHz Band

Lower Band Edge



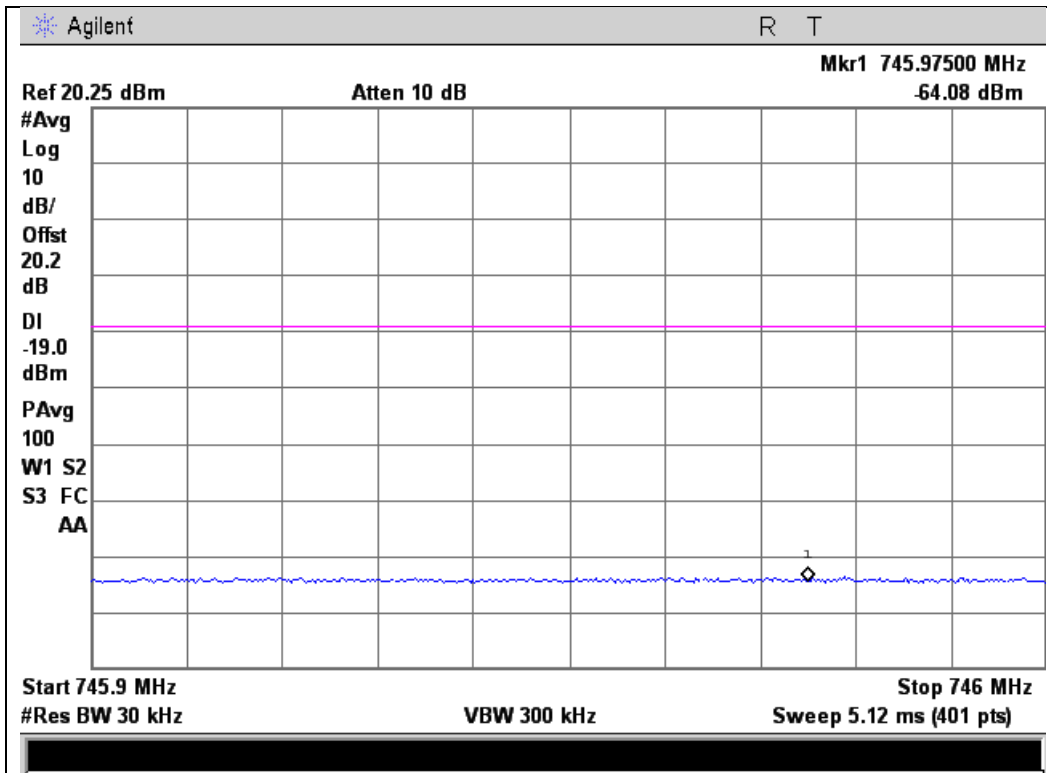
Upper Band Edge



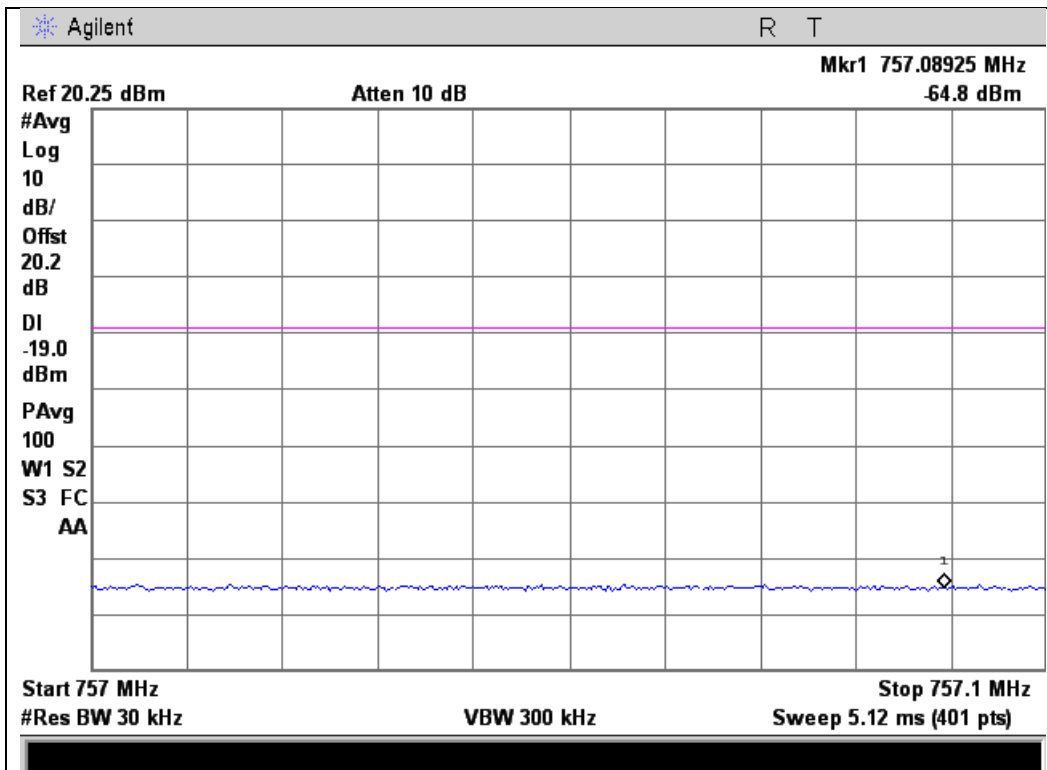


### 746 - 756 MHz Band

#### Lower Band Edge



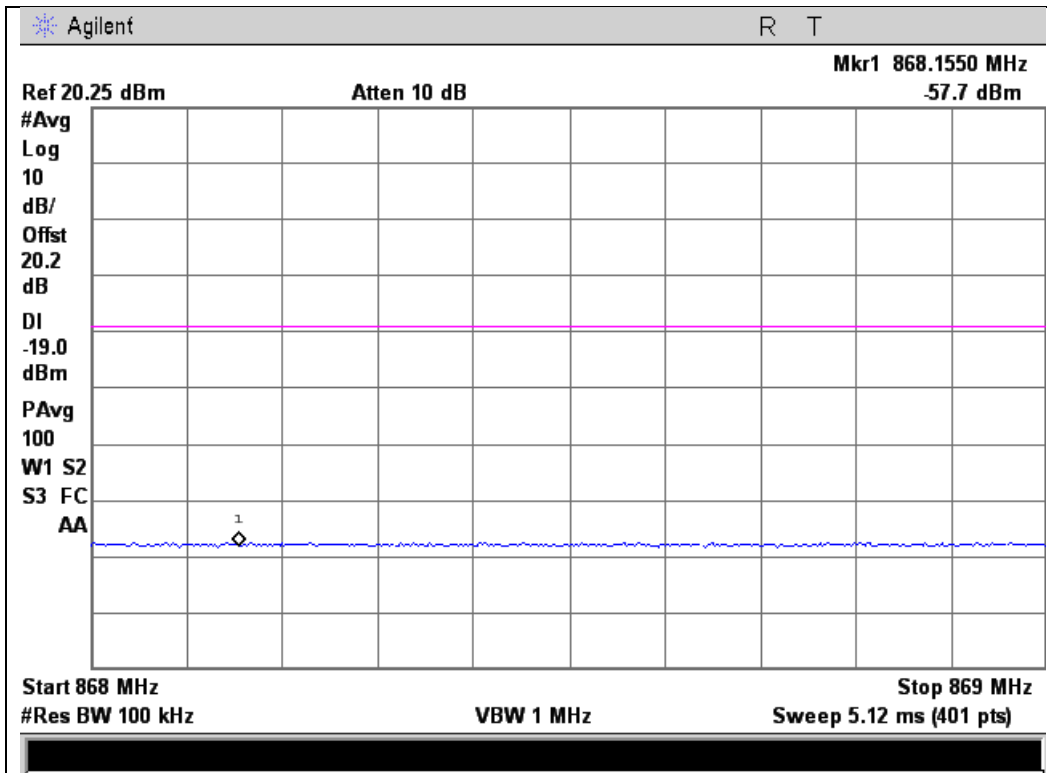
#### Upper Band Edge



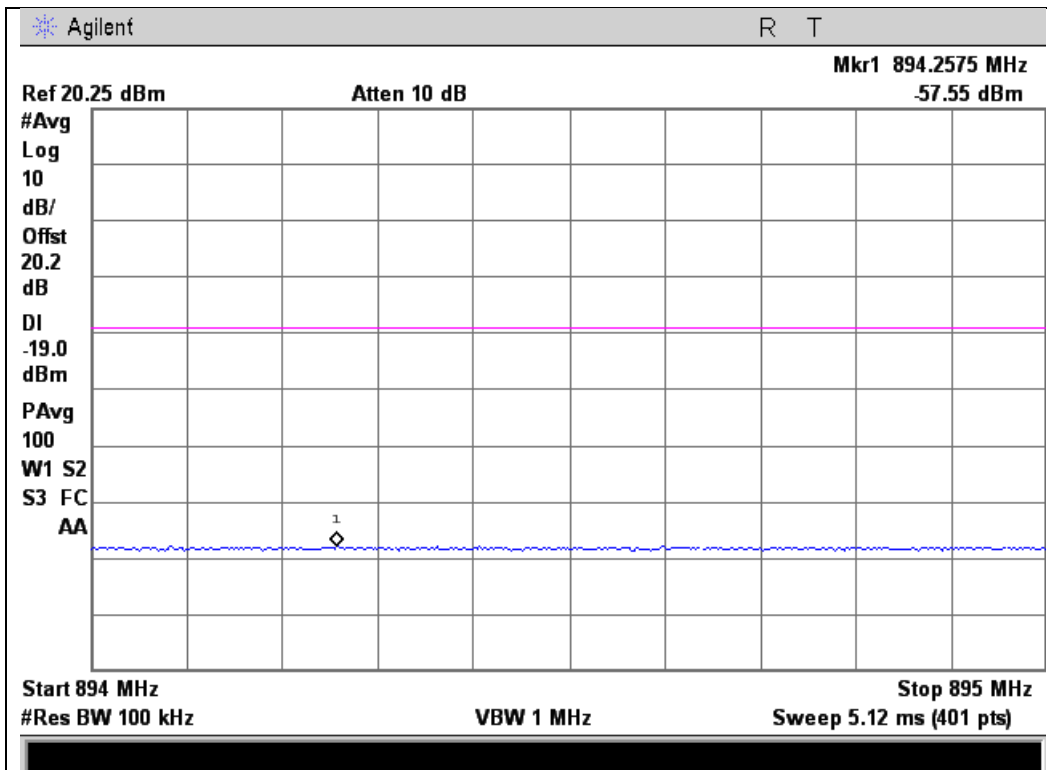


### 869 - 894 MHz Band

#### Lower Band Edge



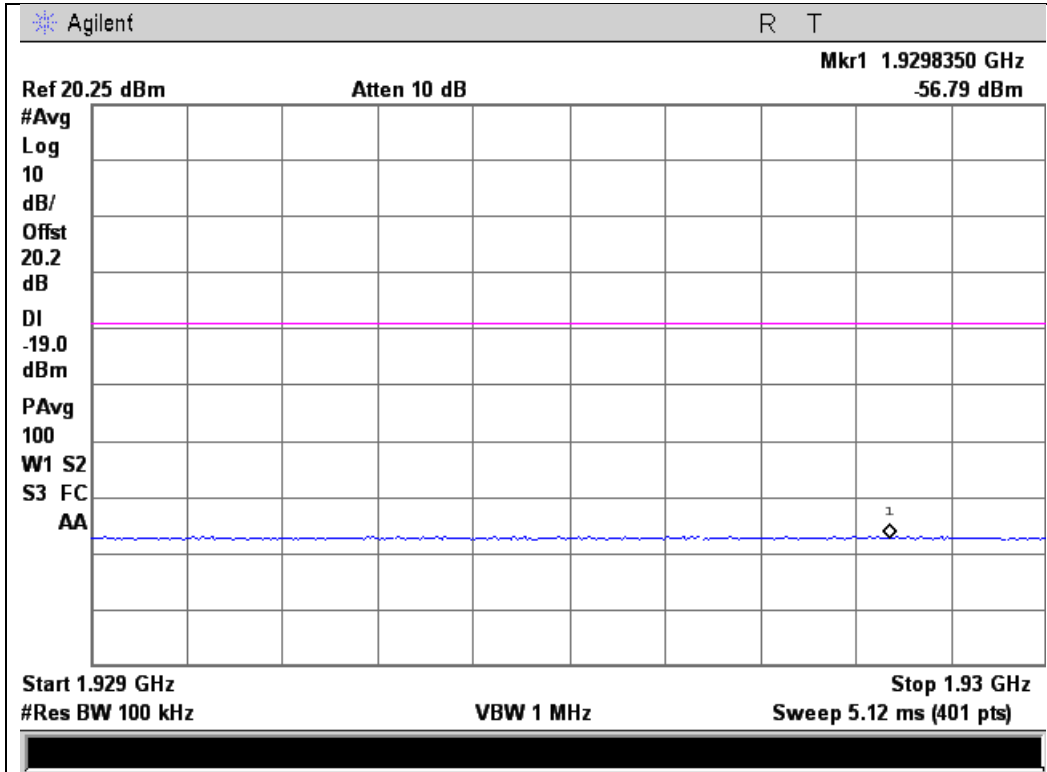
#### Upper Band Edge



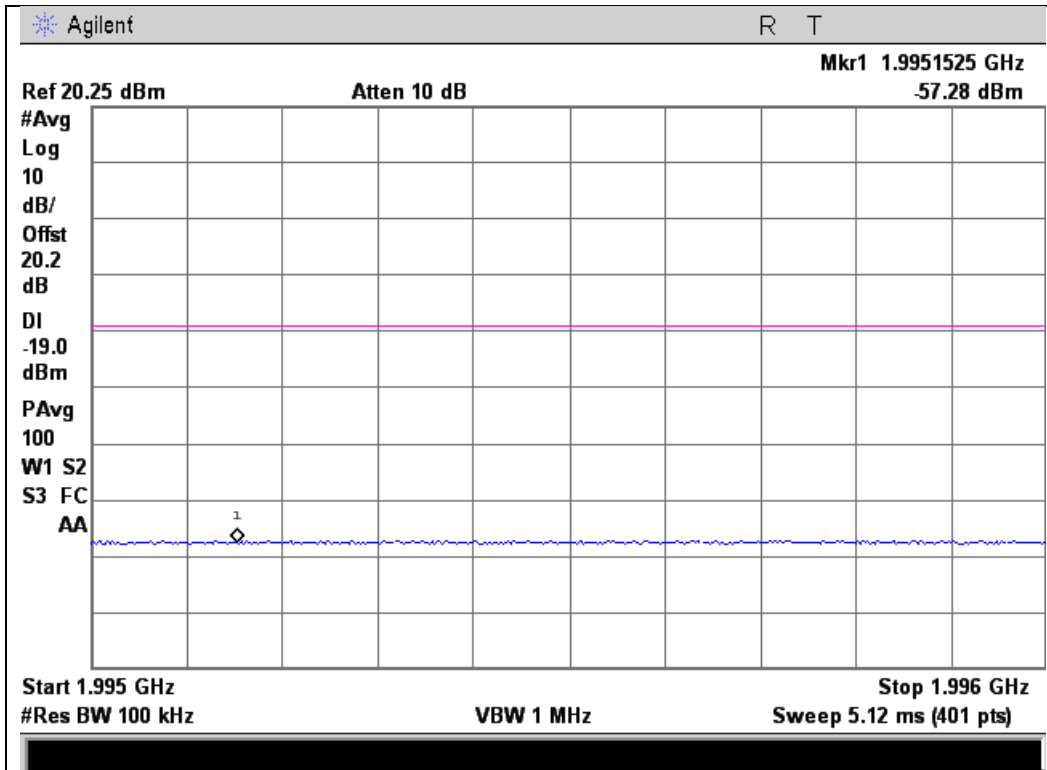


### 1930 - 1995 MHz Band

#### Lower Band Edge



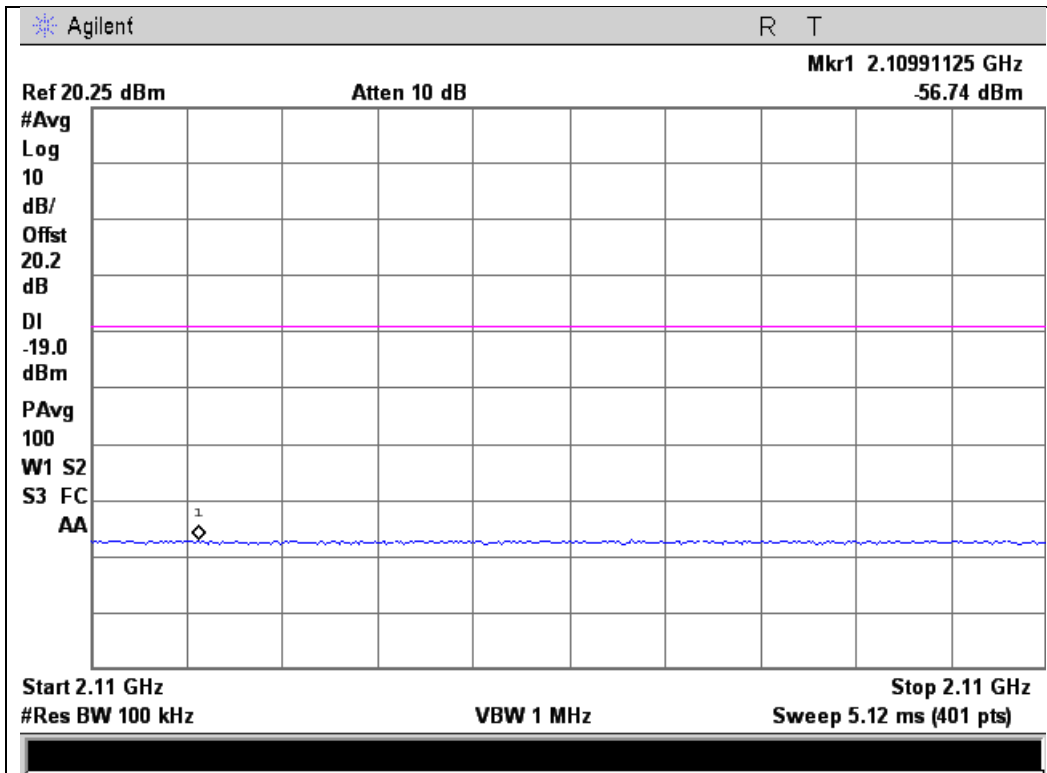
#### Upper Band Edge



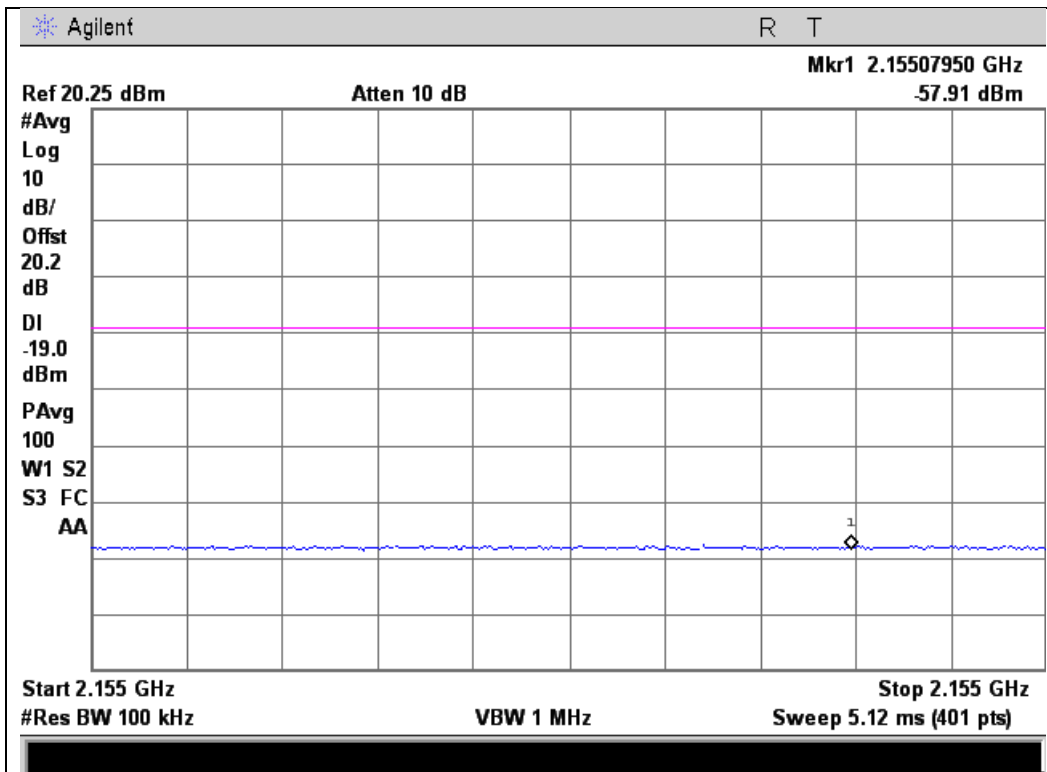


### 2110 - 2155 MHz Band

#### Lower Band Edge



#### Upper Band Edge





**Conducted Spurious Emissions**

**Name of Test:** Conducted Spurious Emissions

**Engineer:** Mike Graffeo

**Test Equipment Utilized:** i00331 and i00405

**Test Date:** 9/16/13, 1/9/14

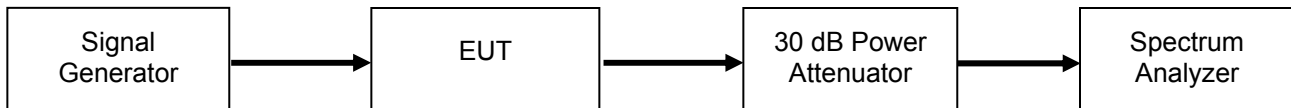
**Test Procedure**

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 =  $43 + 10\log(P)$  dB

**Test Setup**



**Uplink Test Results**

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
704 - 716	1738	-45.03	-13	Pass
777 - 787	1741	-45.64	-13	Pass
824 - 849	779	-52.47	-13	Pass
1710 - 1755	1862	-37.89	-13	Pass
1850 - 1915	1739	-34.92	-13	Pass

**Downlink Test Results**

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
734 - 746	2154	-47.98	-13	Pass
746 - 756	2152	-54.82	-13	Pass
869 - 894	2154	-42.67	-13	Pass
1930 - 1995	2152	-34.49	-13	Pass
2110 - 2155	1954	-33.75	-13	Pass



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

**FCC 27.53(c)**

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

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

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

BW correction Factor =  $10\log B1/B2$

BW correction Factor =  $10\log 6.25 / 10 = - 2.04$  dB

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

**776-787 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	774.80	-57.28	-2.04	-59.32	-46	-13.32
793 – 805	793.16	-75.99	-2.04	-78.03	-46	-32.03

**746 – 757 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	771.30	-83.62	-2.04	-85.66	-46	-39.66
793 – 805	794.14	-84.13	-2.04	-86.17	-46	-40.17





**FCC 27.53(f)**

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

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

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

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

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

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

The Limit for discreet (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

**776-787 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)	1564.04	-54.01	0.00	2.41	-51.60	-40	-11.60
1559 – 1610 (Narrowband)	1564.37	-73.12	-11.55	2.41	-82.26	-50	-32.26

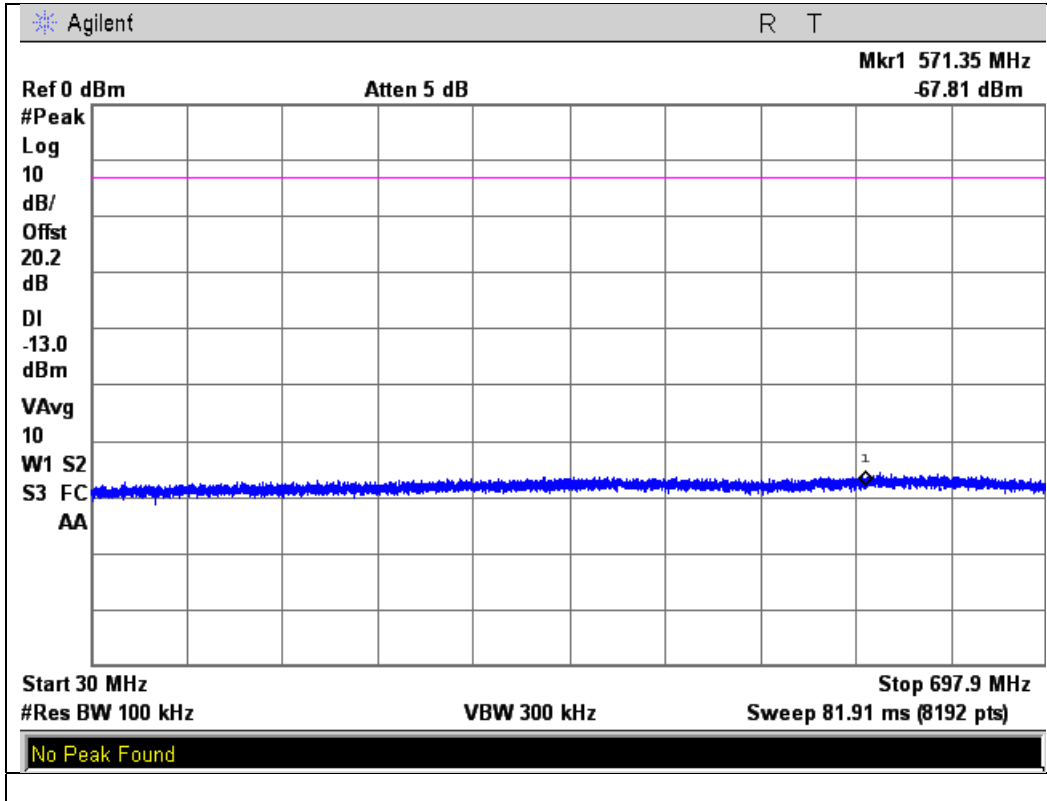
**746 – 757 MHz Downlink Band**

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)	1565.21	-62.81	0	1.21	-61.60	-40	-21.60
1559 – 1610 (Narrowband)	1596.66	-82.68	-11.55	1.21	-93.02	-50	-43.02

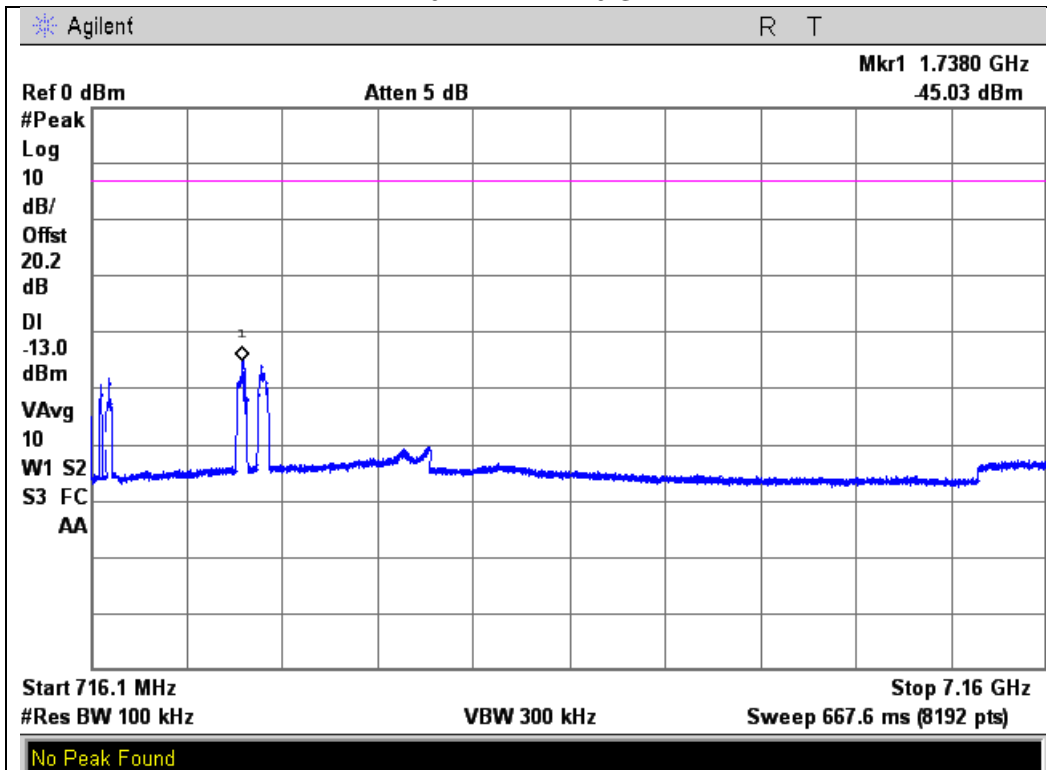


### Uplink Test Plots

704 - 716 MHz Band  
30MHz – 697.9 MHz

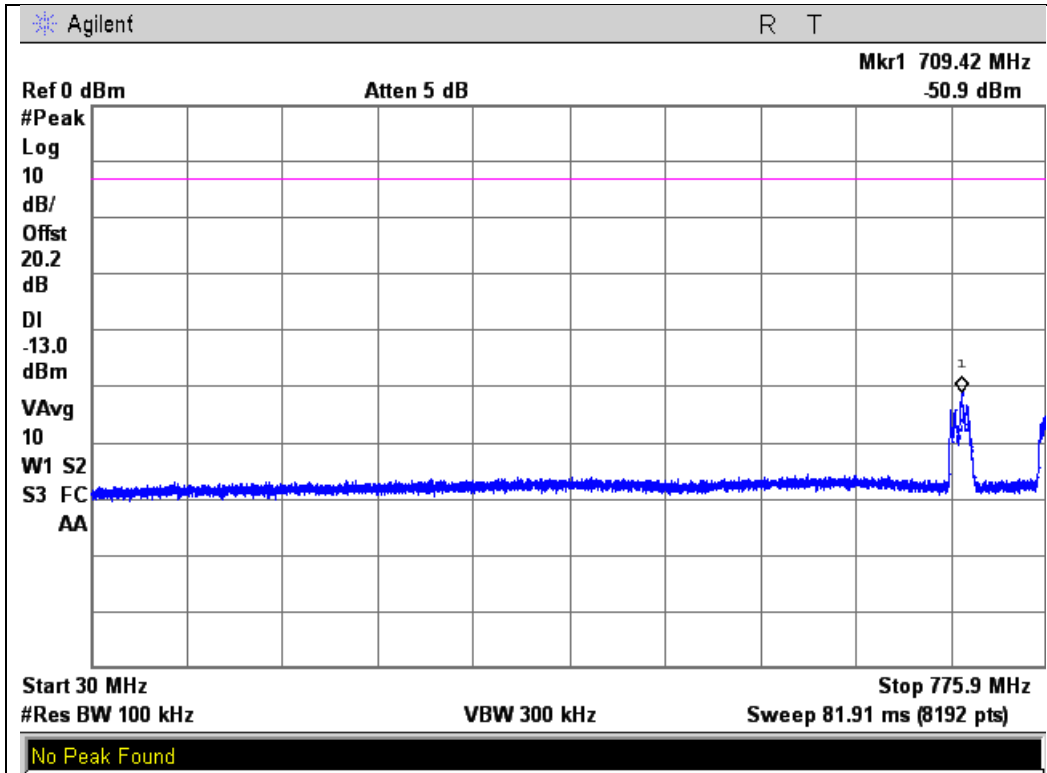


704 - 716 MHz Band  
716.1 MHz – 7.16 GHz

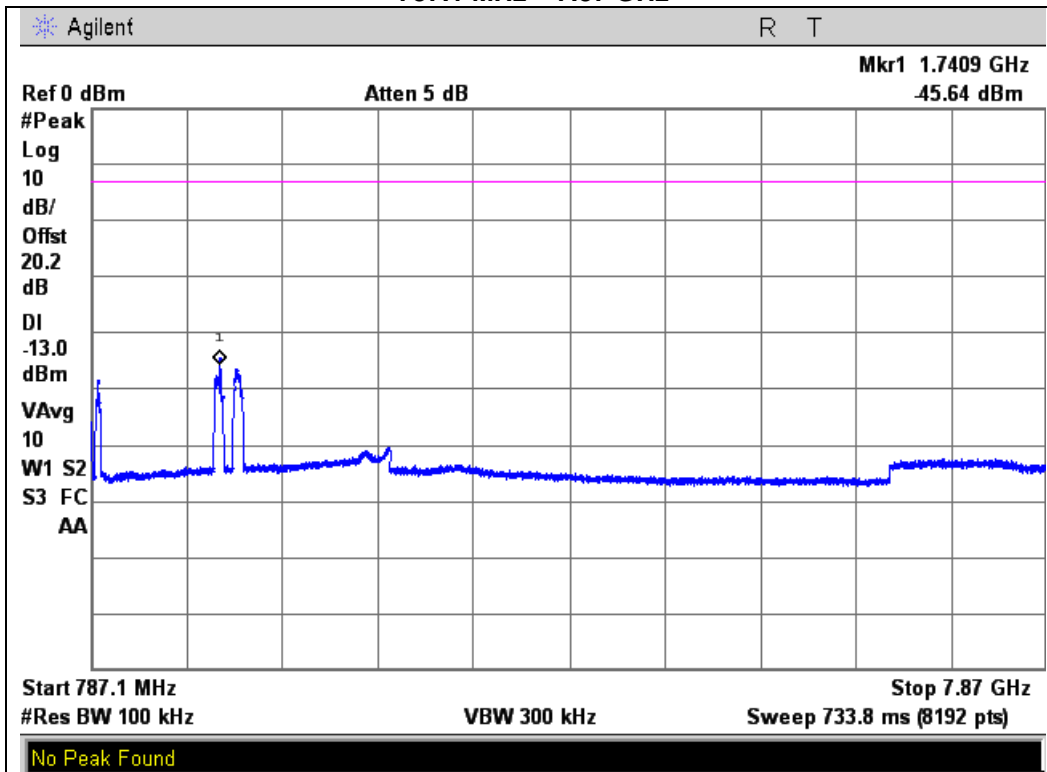




777 - 787 MHz Band  
30MHz - 775.9 MHz

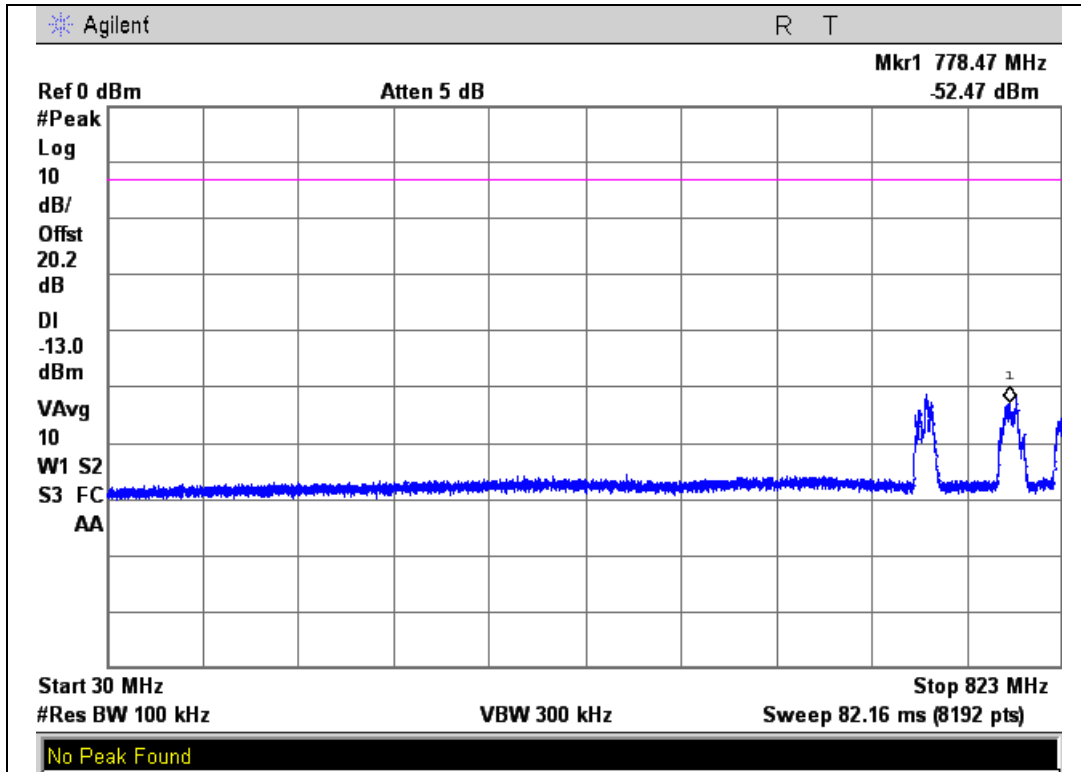


777 - 787 MHz Band  
787.1 MHz - 7.87 GHz

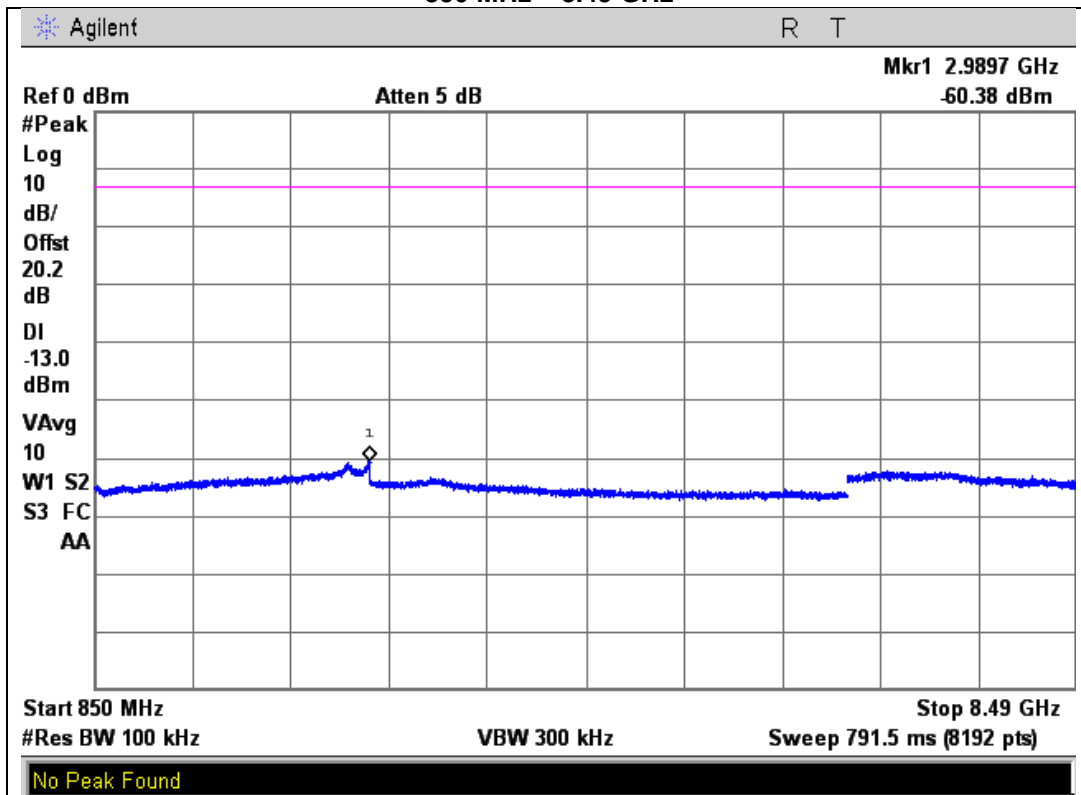




824 - 849 MHz Band  
30MHz – 823 MHz

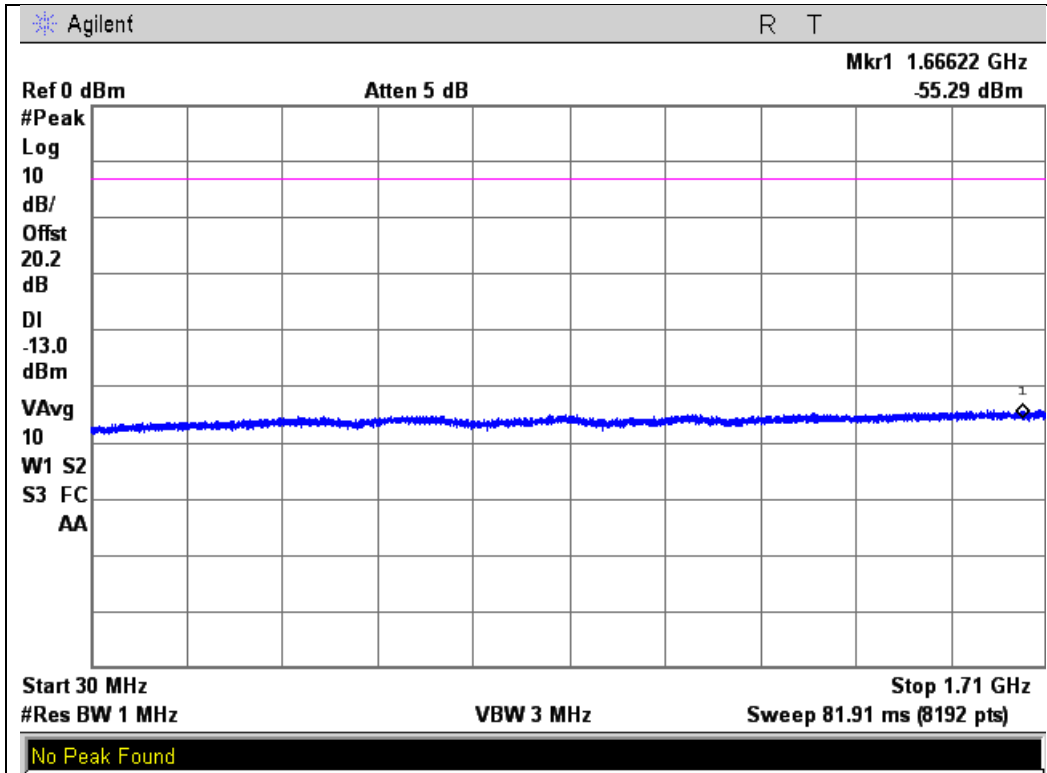


824 - 849 MHz Band  
850 MHz – 8.49 GHz

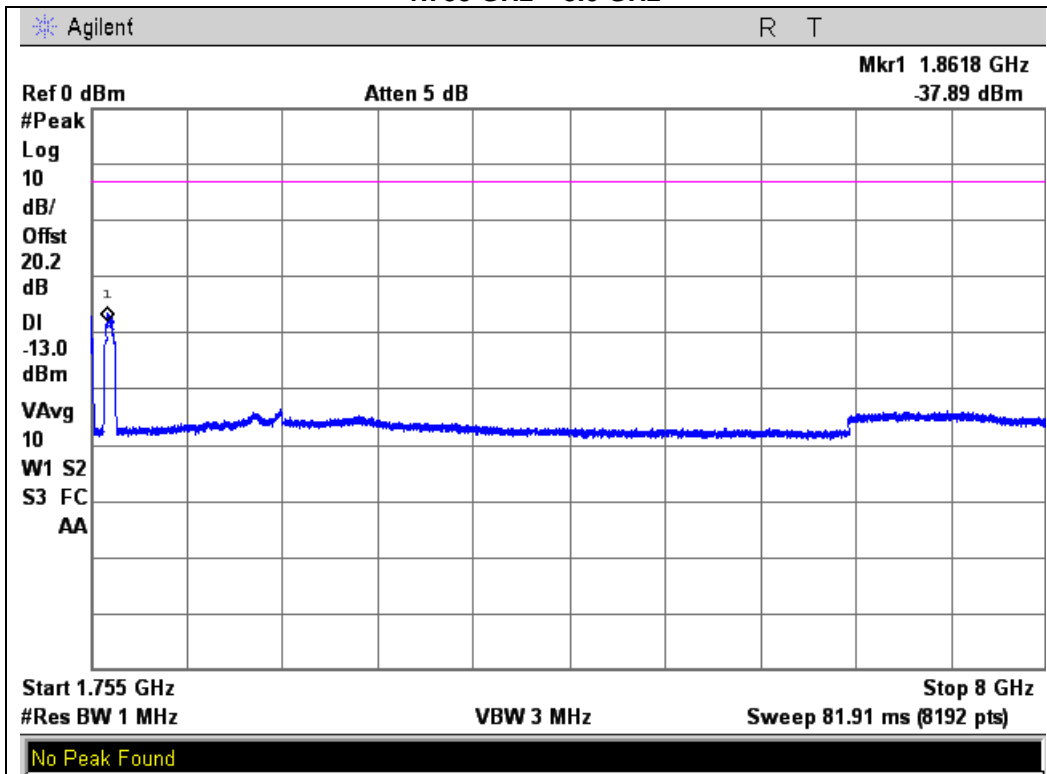




### 1710 - 1755 MHz Band 30MHz – 1.71 GHz

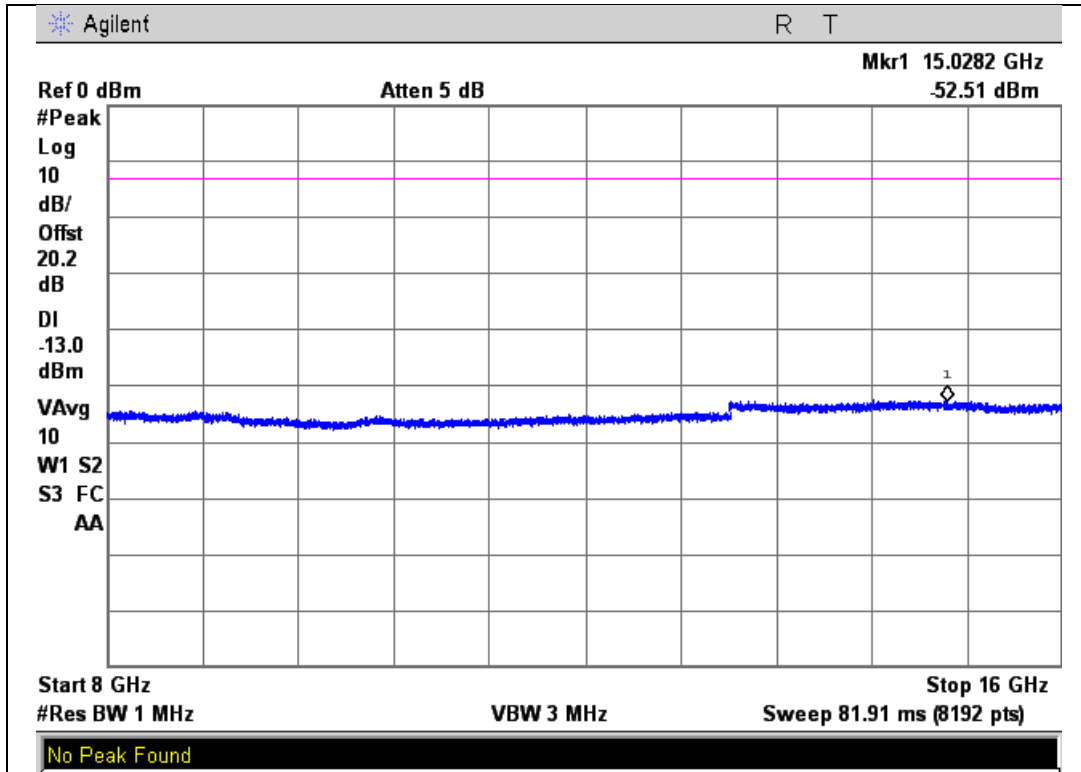


### 1710 - 1755 MHz Band 1.755 GHz – 8.0 GHz

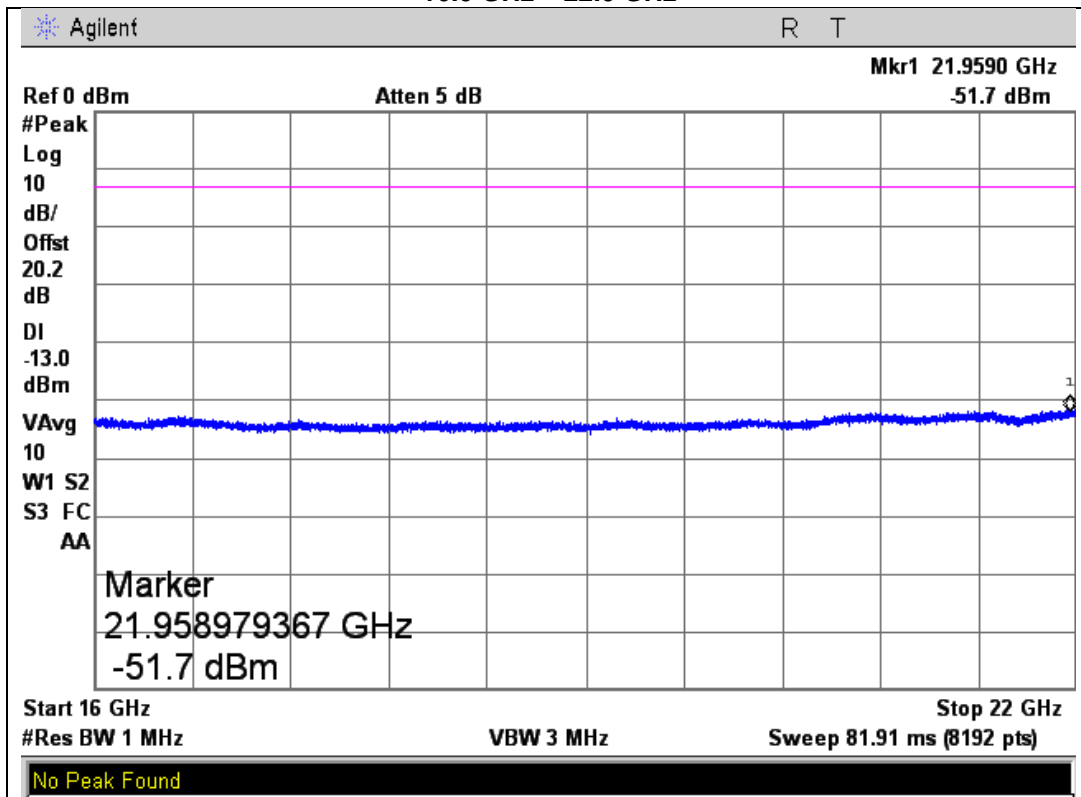




1710 - 1755 MHz Band  
8.0 GHz – 16.0 GHz

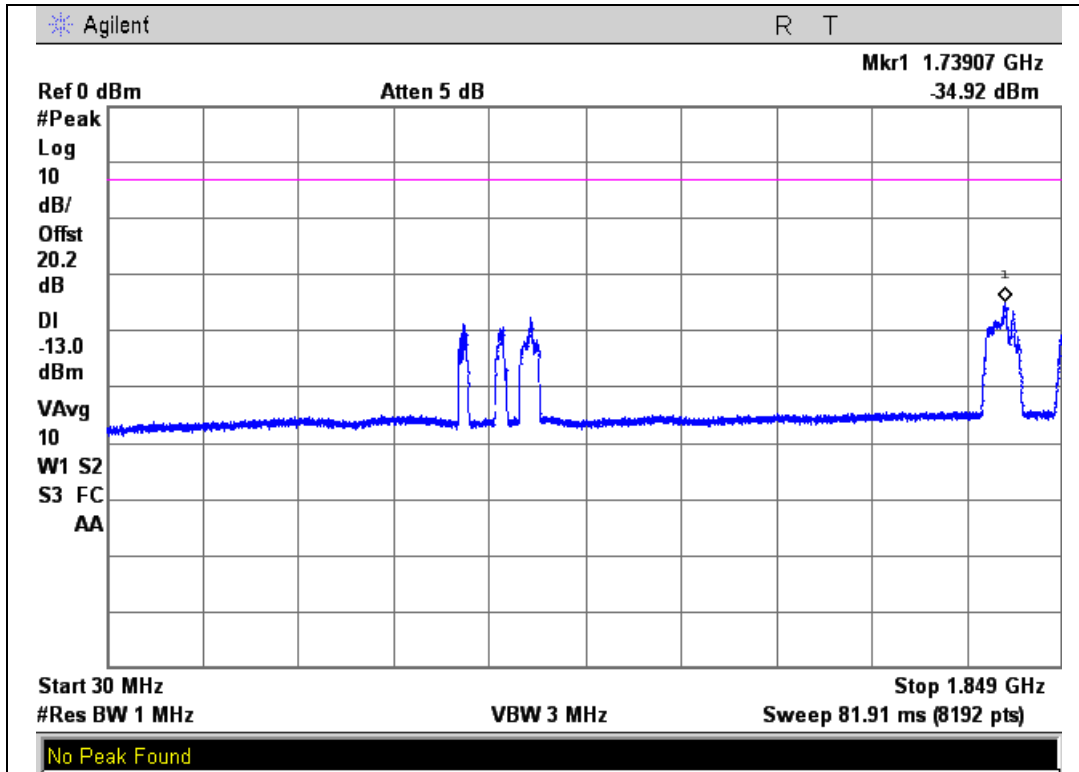


1710 - 1755 MHz Band  
16.0 GHz – 22.0 GHz

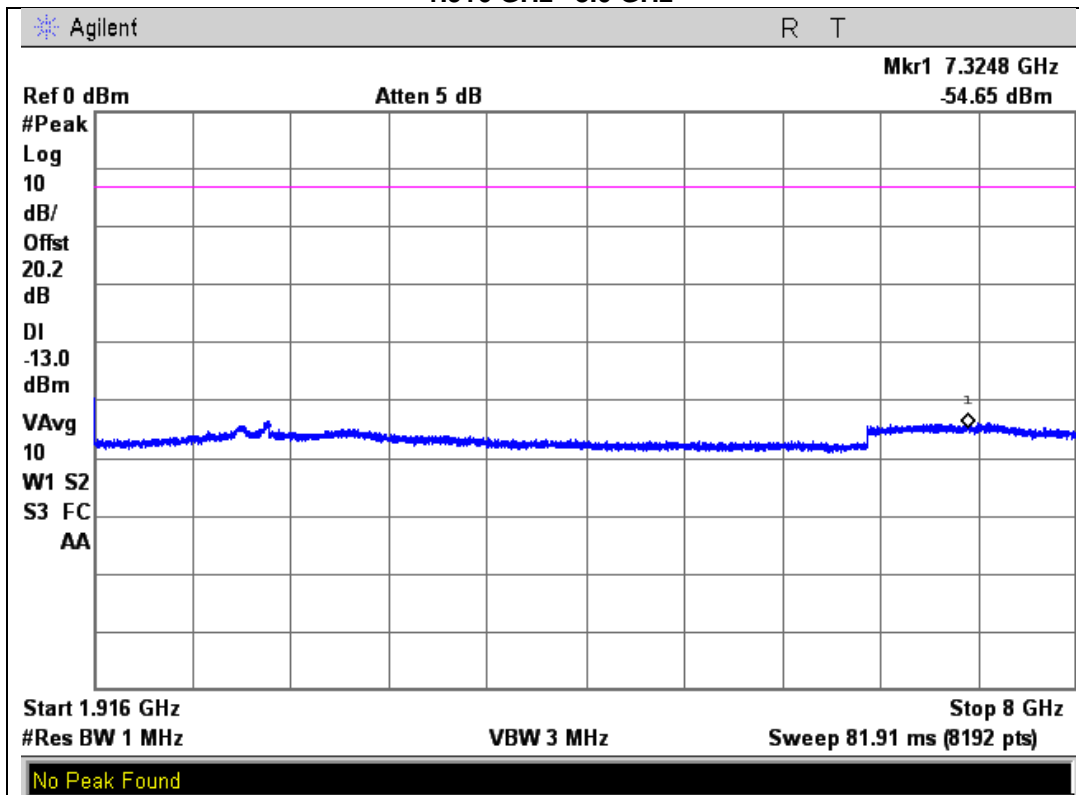




1850 – 1915 MHz Band  
30MHz – 1.849 GHz

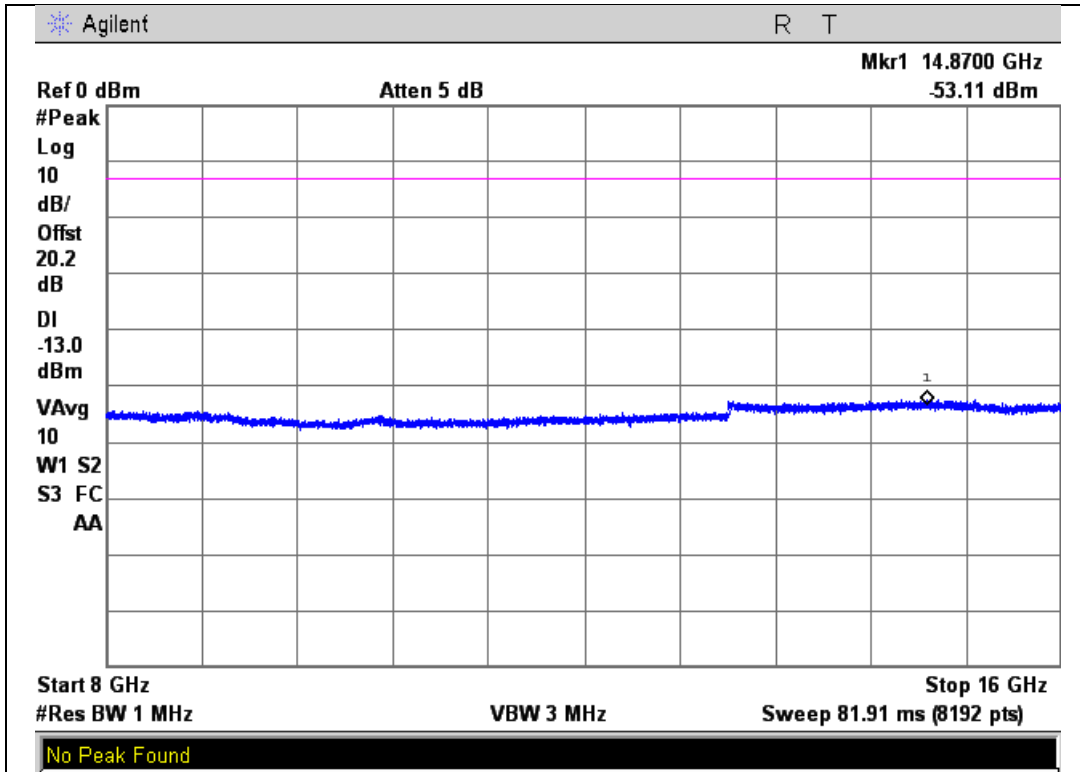


1850 – 1915 MHz Band  
1.916 GHz – 8.0 GHz

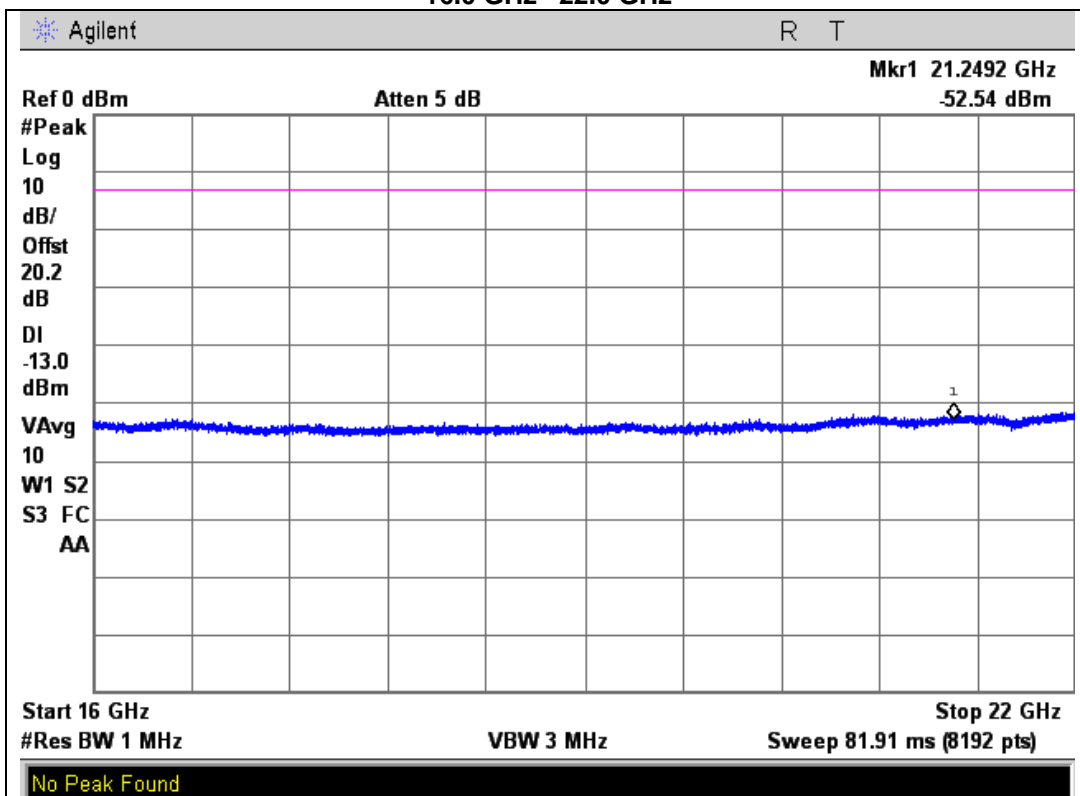




1850 – 1915 MHz Band  
8.0 GHz –16.0 GHz



1850 – 1915 MHz Band  
16.0 GHz –22.0 GHz

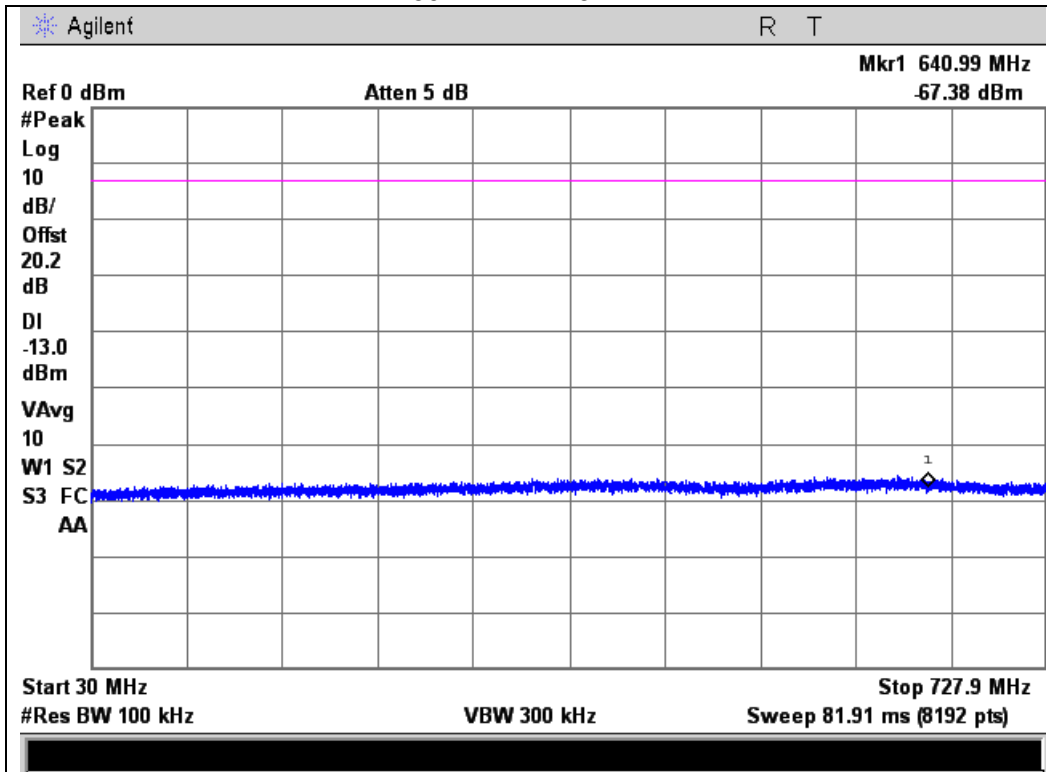




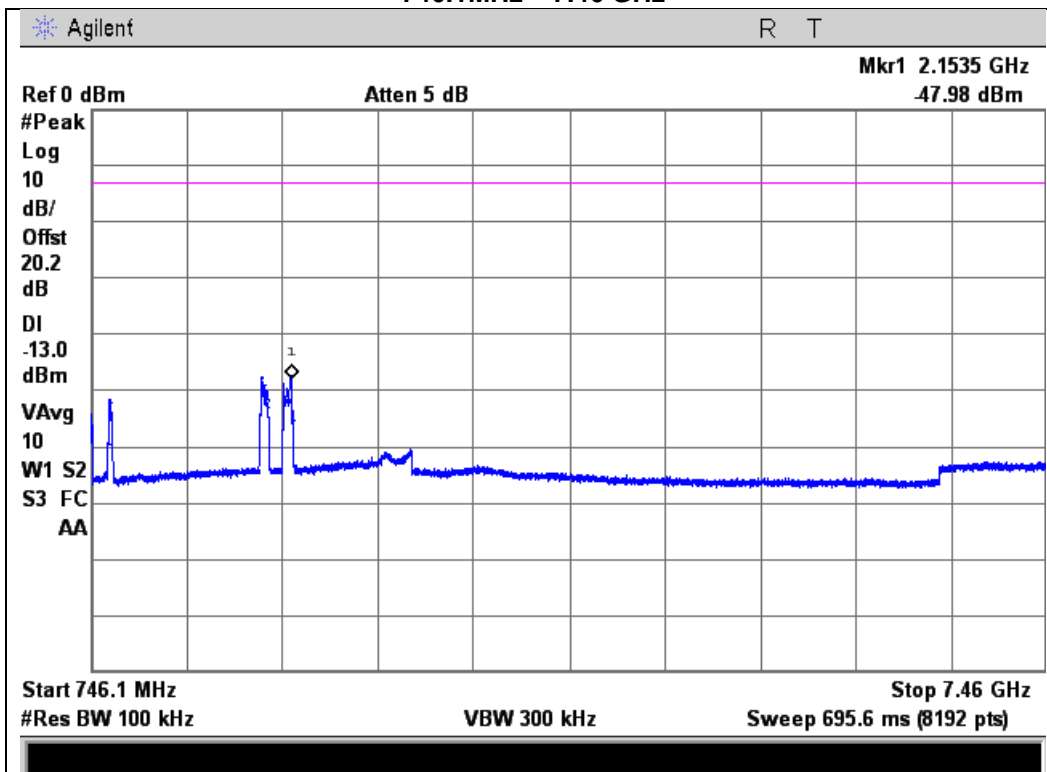


### Downlink Test Plots

734 - 746 MHz Band  
30MHz - 727.9 MHz

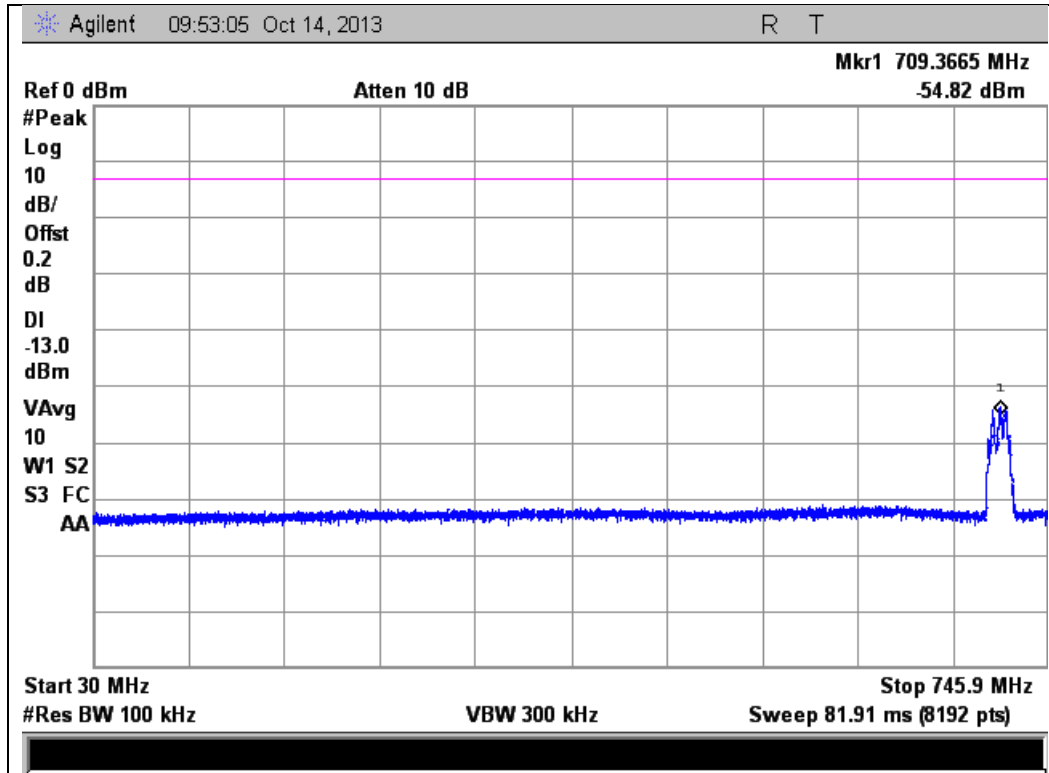


734 - 746 MHz Band  
746.1MHz - 7.46 GHz

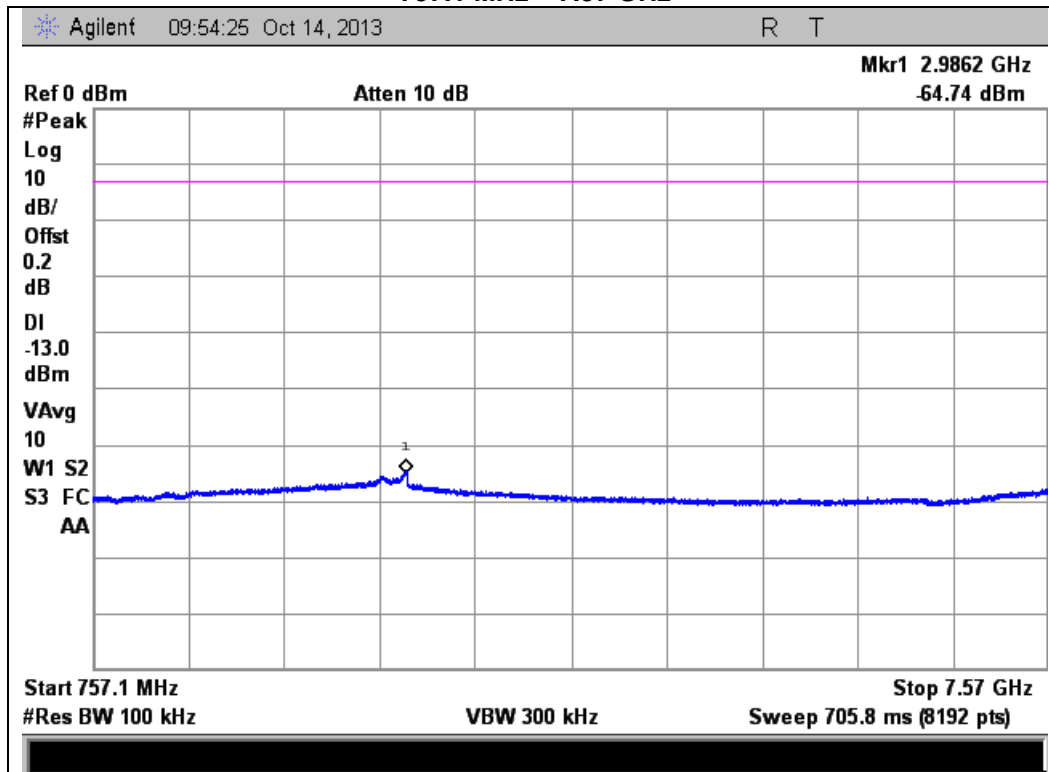




### 746 - 756 MHz Band 30MHz - 745.9 MHz

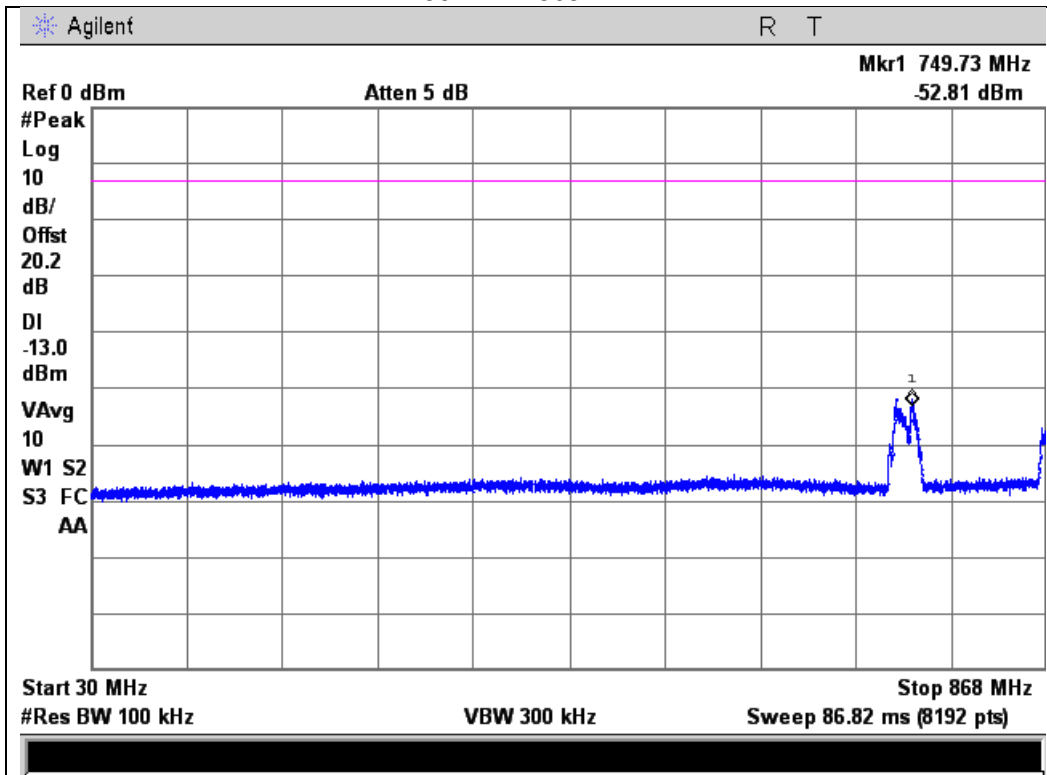


### 746 - 756 MHz Band 757.1 MHz - 7.57 GHz

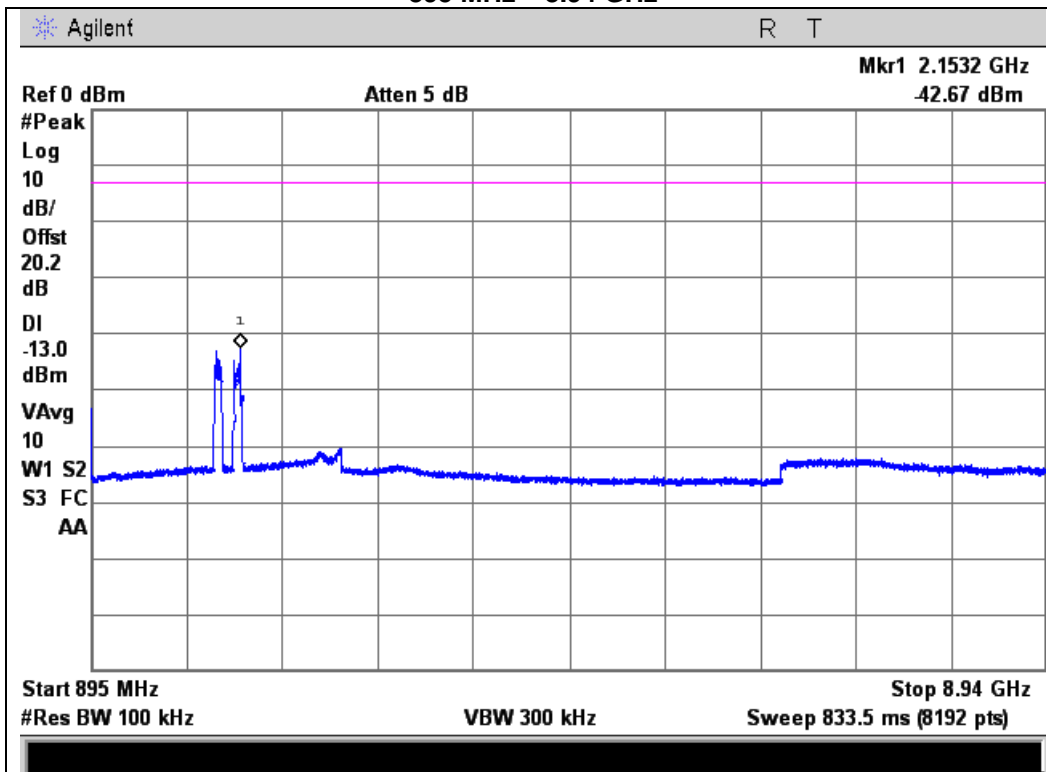




869 - 894 MHz Band  
30MHz - 868 MHz

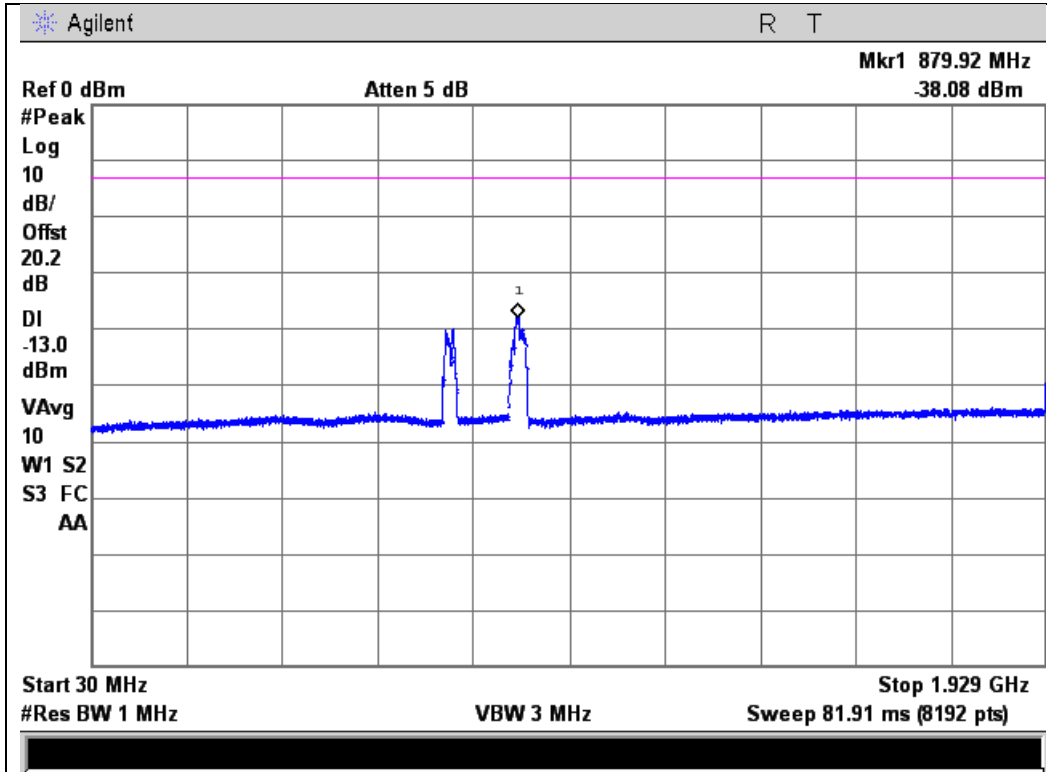


869 - 894 MHz Band  
895 MHz - 8.94 GHz

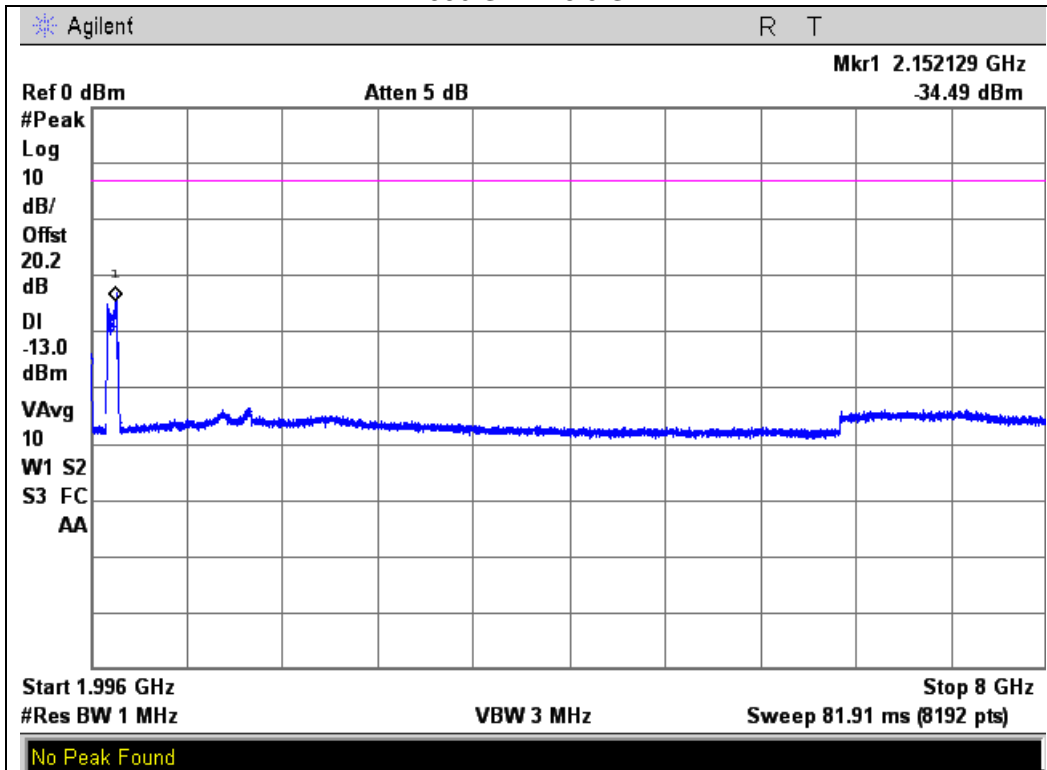




1930 - 1995 MHz Band  
30MHz – 1.929 GHz

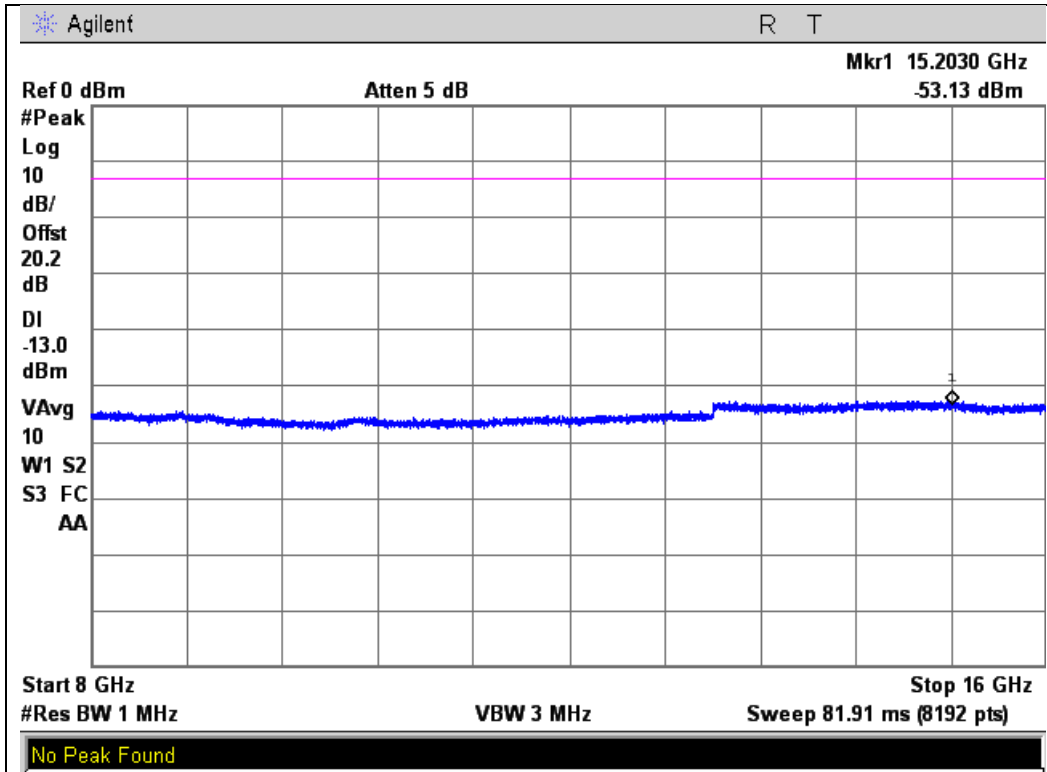


1930 - 1995 MHz Band  
1.996 GHz – 8.0 GHz

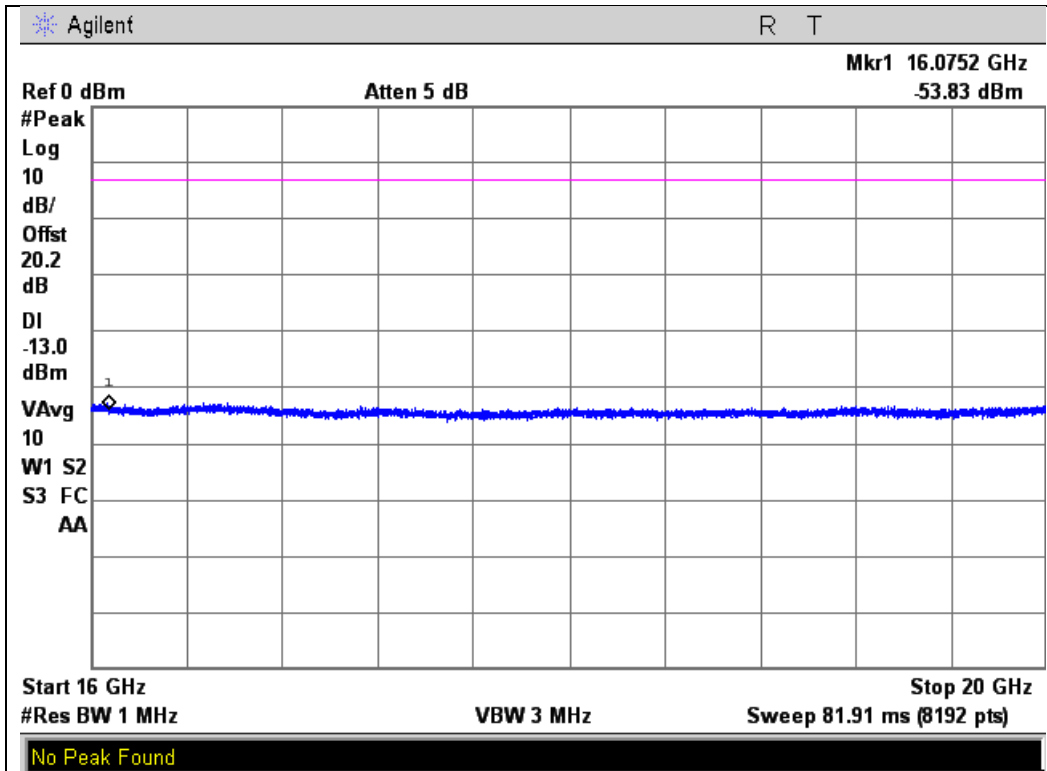




1930 - 1995 MHz Band  
8.0 GHz – 16.0 GHz

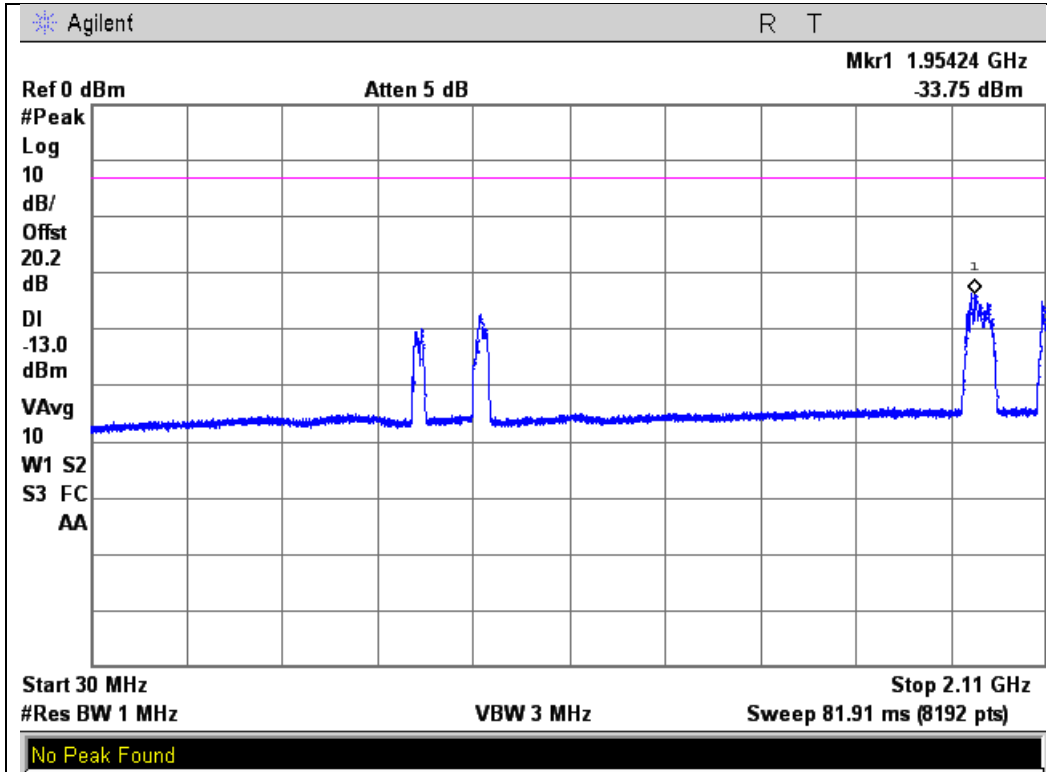


1930 - 1995 MHz Band  
16.0 GHz – 20.0 GHz

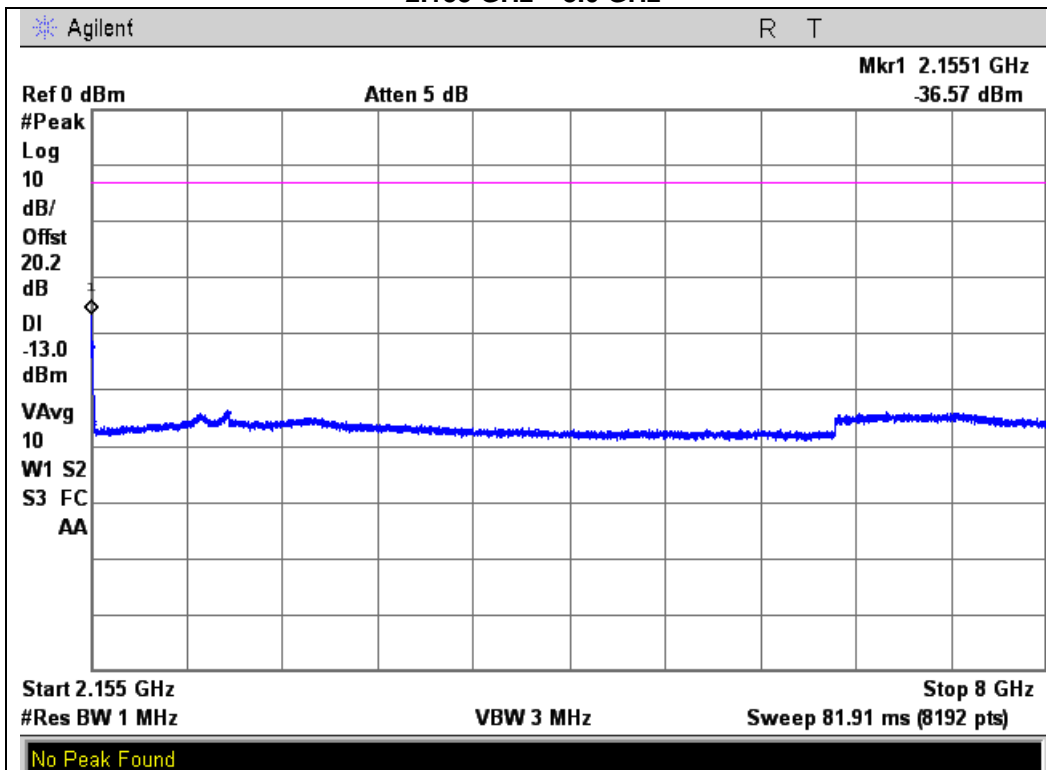




### 2110 - 2155 MHz Band 30MHz – 2.11 GHz

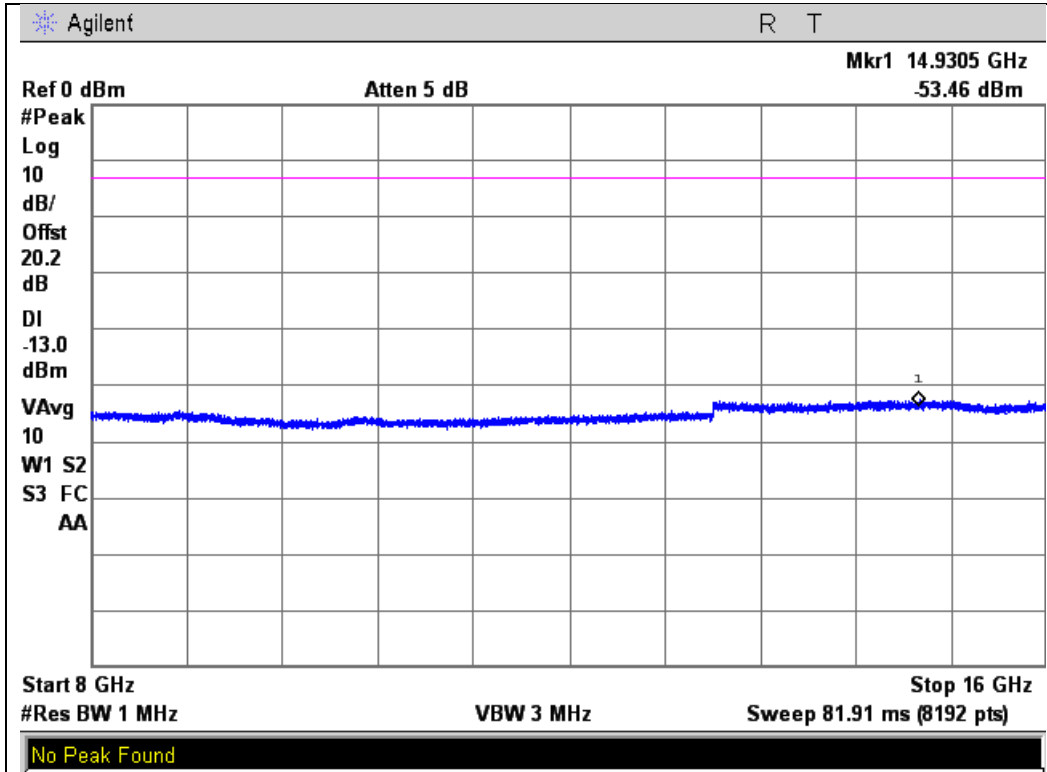


### 2110 - 2155 MHz Band 2.155 GHz – 8.0 GHz

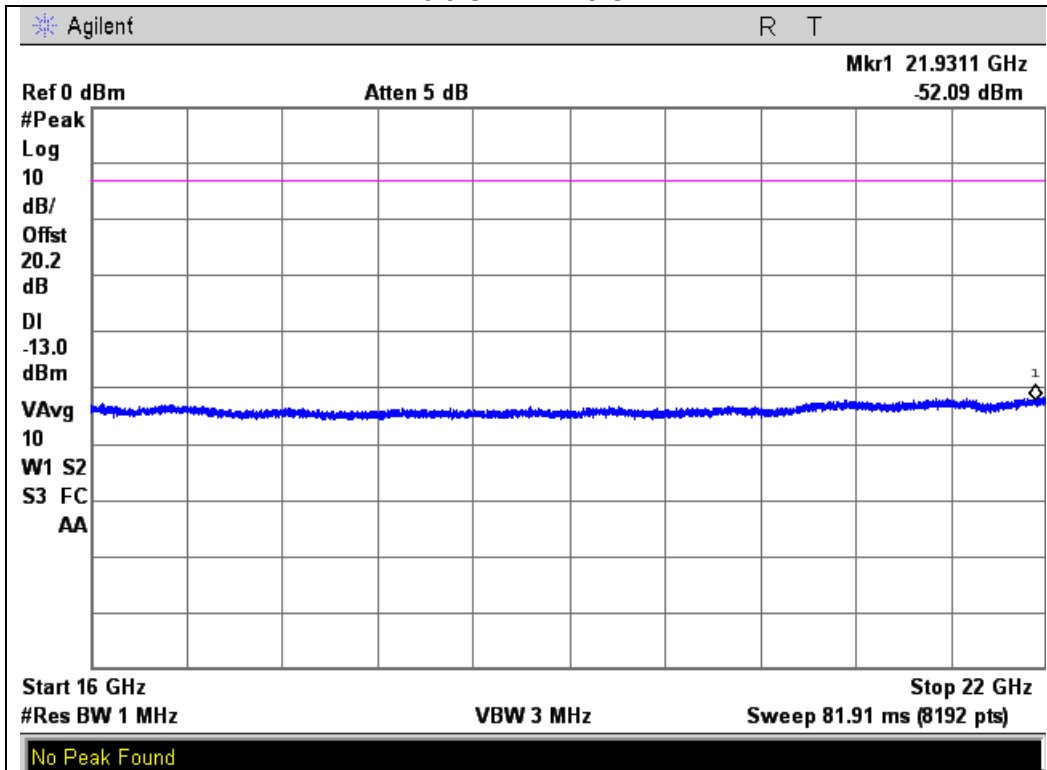




2110 - 2155 MHz Band  
8.0 GHz – 16.0 GHz



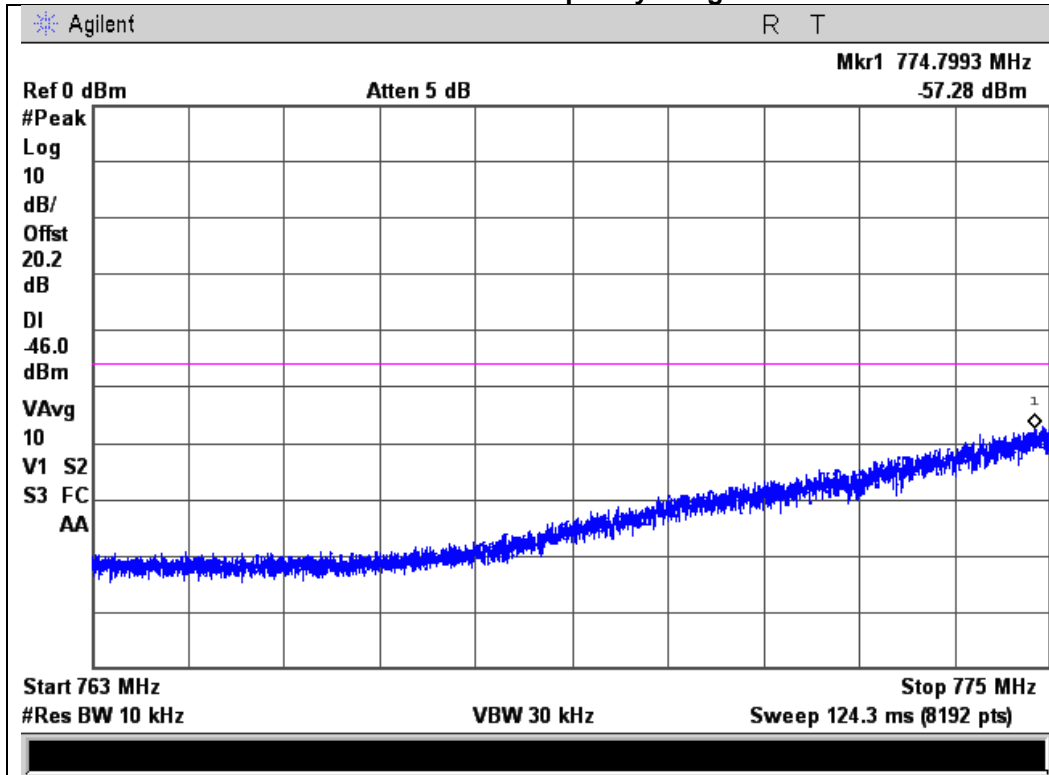
2110 - 2155 MHz Band  
16.0 GHz – 22.0 GHz



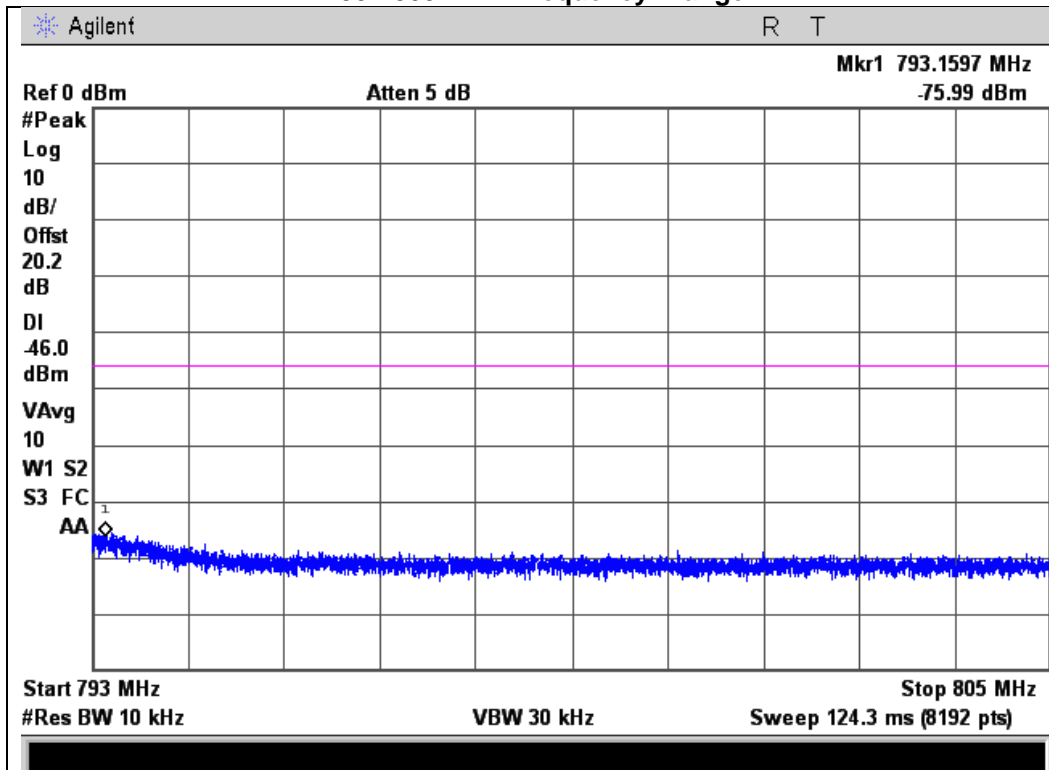


776 – 787 MHz Uplink Test Plots for the

763 - 775 MHz Frequency Range



793 - 805 MHz Frequency Range

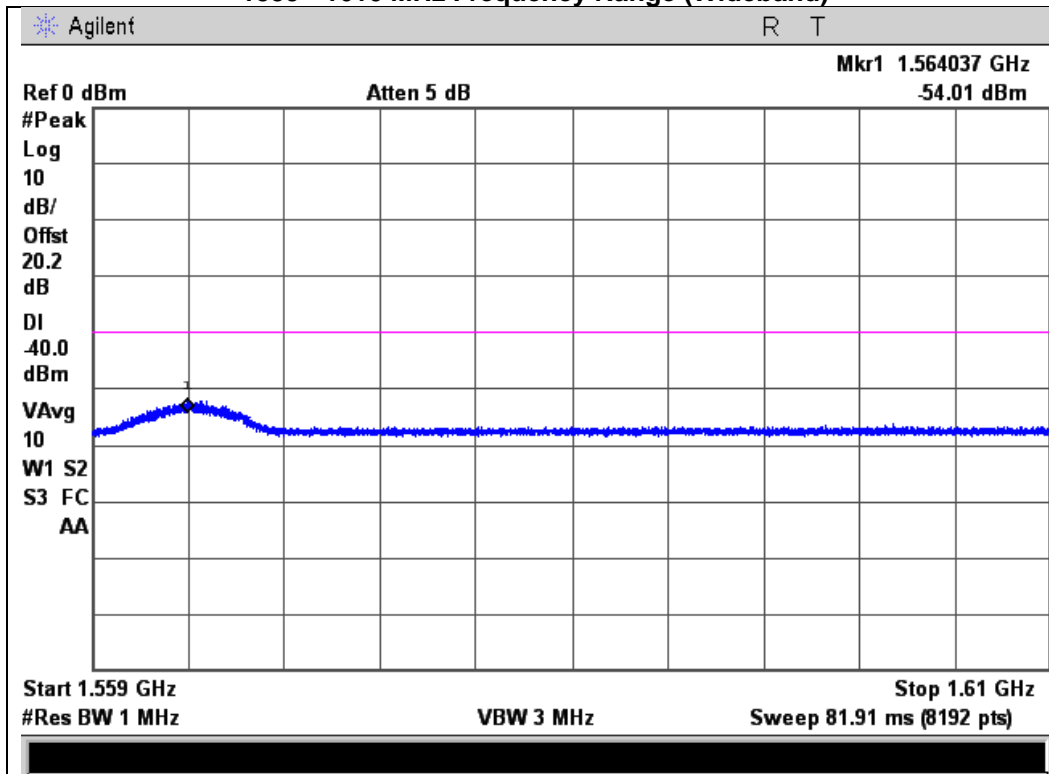




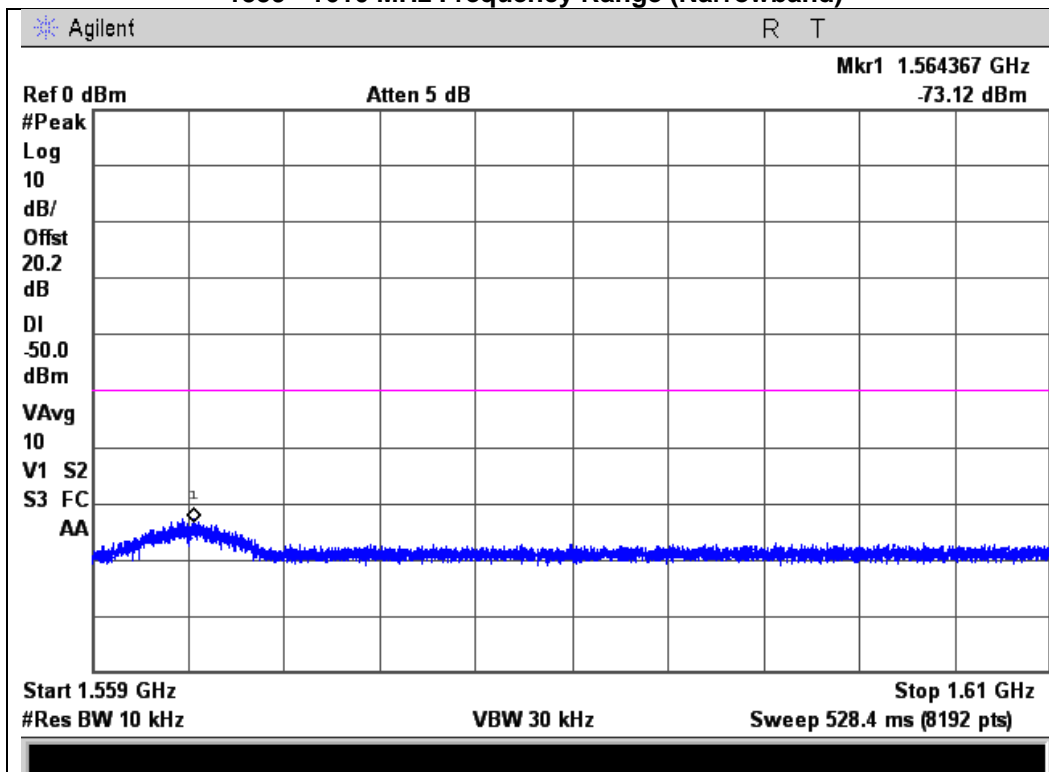


### 776 – 787 MHz Uplink Test Plots for the

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



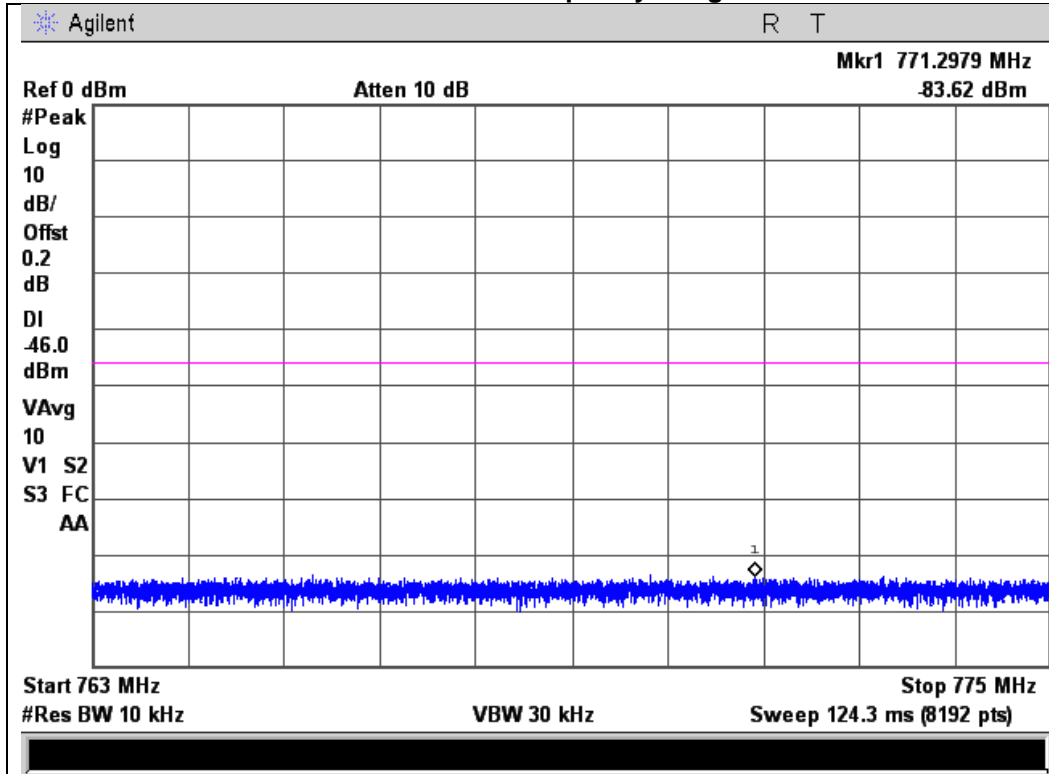
#### 1559 - 1610 MHz Frequency Range (Narrowband)



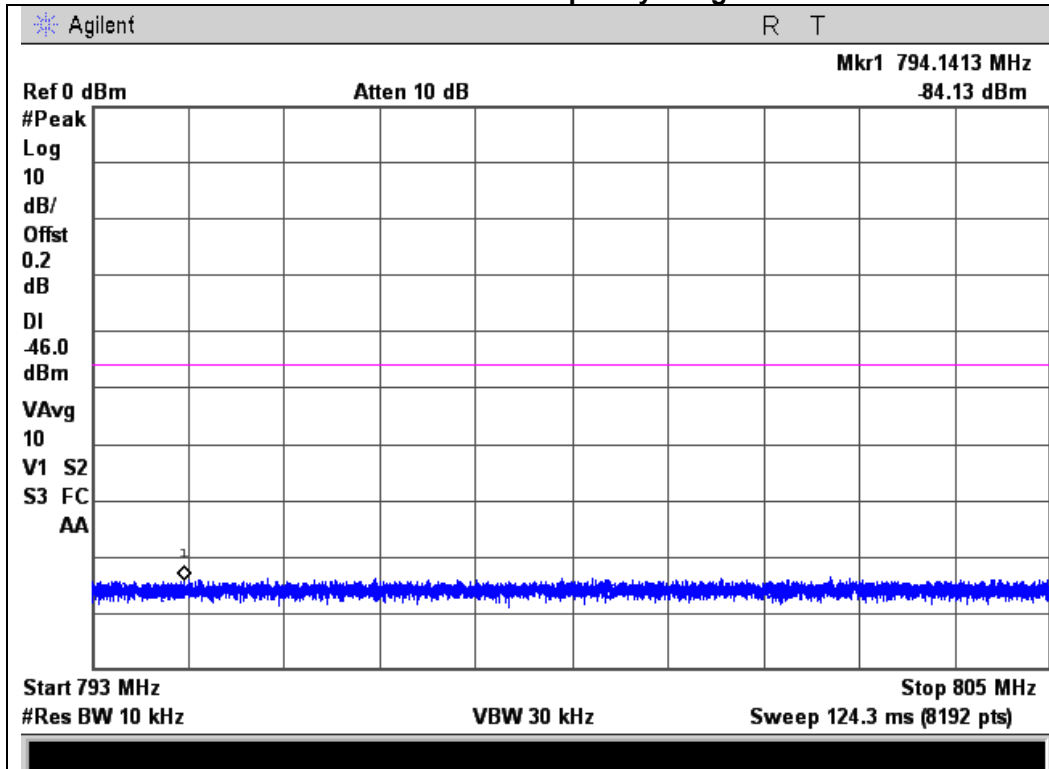


### 746 – 757 MHz Downlink Test Plots for the

#### 763 - 775 MHz Frequency Range



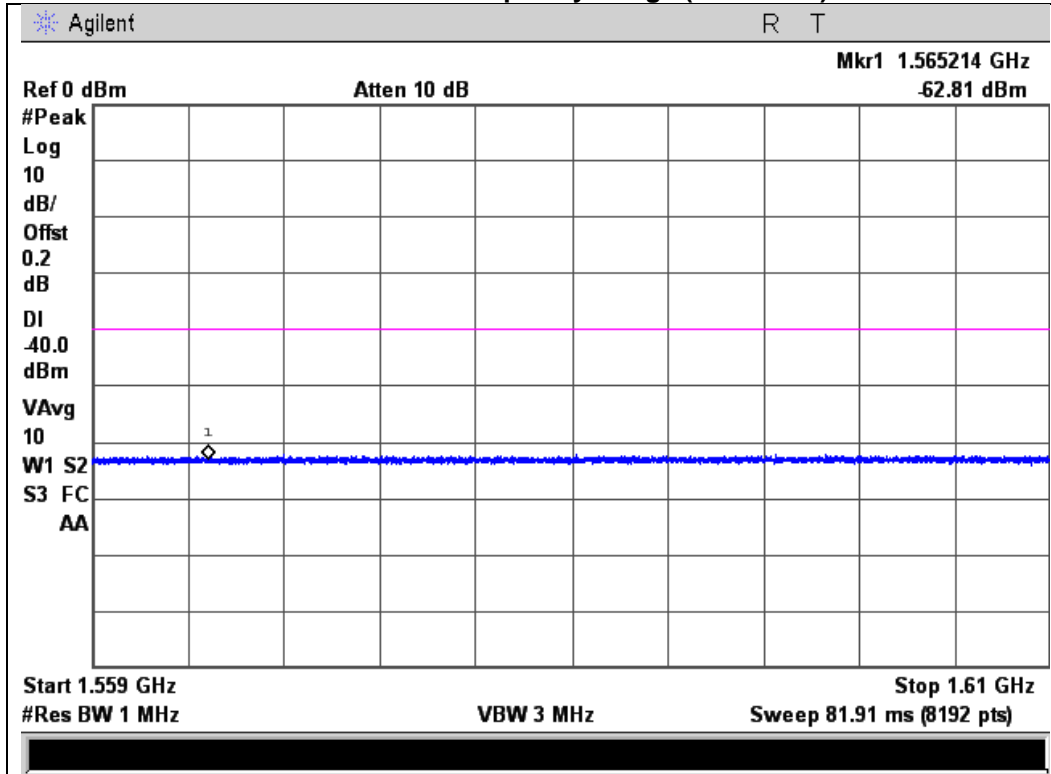
#### 793 - 805 MHz Frequency Range



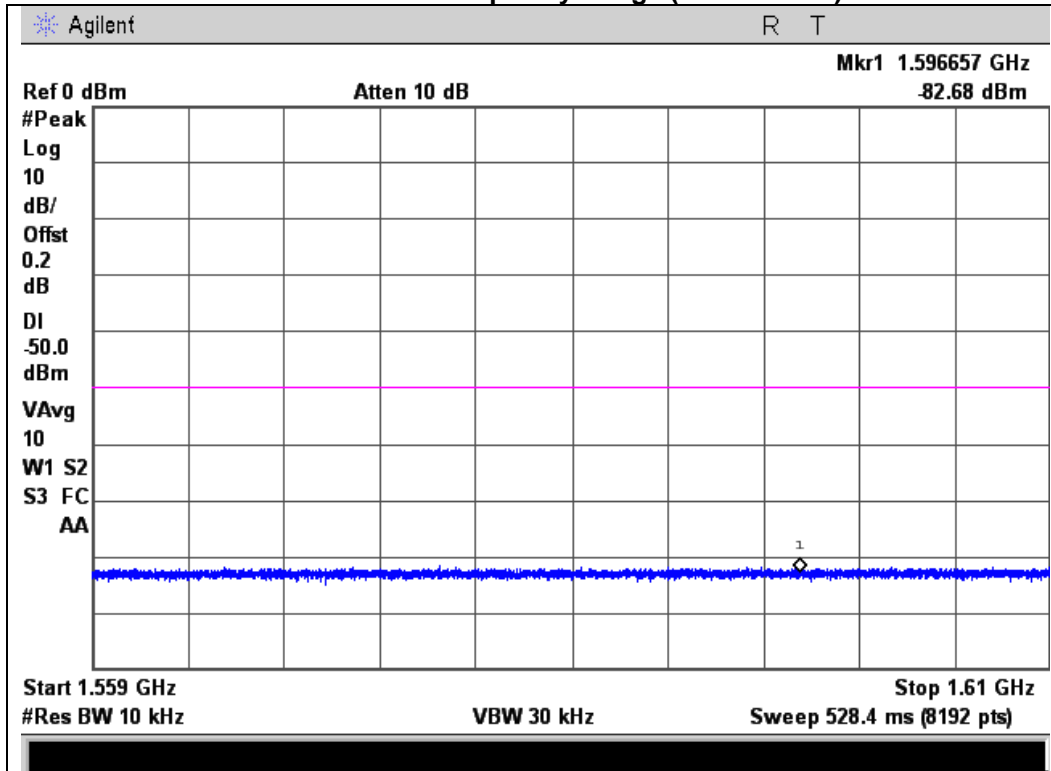


746 – 757 MHz Downlink Test Plots for the

1559 - 1610 MHz Frequency Range (Wideband)



1559 - 1610 MHz Frequency Range (Narrowband)





### Noise Limits

**Name of Test:** Noise Limits  
**Test Equipment Utilized:** i00331, i00405, i00412

**Engineer:** Mike Graffeo  
**Test Date:** 9/27/13

### 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 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.

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

$$\text{Noise Power} = -102.5 + \text{LOG}_{10}(\text{Band Center Frequency}) * 20$$

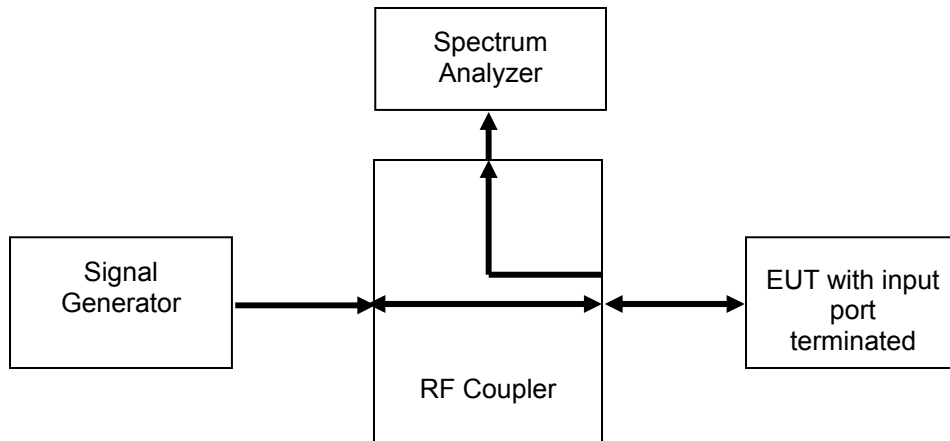
$$\text{Variable Noise} = -103 \text{ dBm/MHz-RSSI}$$

### Test Setup

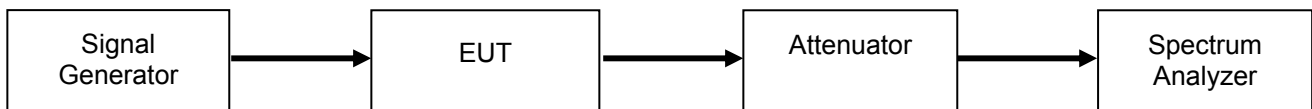
#### Maximum Noise Limit



#### Variable Uplink Noise Power and Timing



#### Variable Downlink Noise Power





### Maximum Uplink Noise Limit Test Results

Frequency Band (MHz)	Measured Noise (dBm)	Limit (dBm)	Margin (dB)	Result
704 - 716	-45.86	-45.5	-0.4	Pass
777 - 787	-46.22	-44.6	-1.6	Pass
824 - 849	-45.73	-44.1	-1.7	Pass
1710 - 1755	-42.23	-37.7	-4.5	Pass
1850 - 1915	-41.97	-37.0	-5.0	Pass

### Maximum Downlink Noise Limit Test Results

Frequency Band (MHz)	Measured Noise (dBm)	Limit (dBm)	Margin (dB)	Result
734 - 746	-46.17	-45.5	-0.7	Pass
746 - 756	-50.92	-44.6	-6.3	Pass
869 - 894	-48.59	-44.1	-4.5	Pass
1930 - 1995	-39.75	-37.0	-2.7	Pass
2110 - 2155	-40.49	-37.7	-2.8	Pass

### Uplink Noise Timing Test Results

Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Result
704 - 716	1.10	3.0	Pass
777 - 787	0.81	3.0	Pass
824 - 849	1.82	3.0	Pass
1710 - 1755	1.94	3.0	Pass
1850 - 1915	2.02	3.0	Pass



**Variable Uplink Noise Power Test Results**  
**704 - 716 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-47.0	-56.0	-60.3	-4.3
-40.0	-63.0	-67.2	-4.2
-34.0	-69.0	-73.1	-4.1
-39.0	-64.0	-67.9	-3.9
-59.0	-45.5	-49.0	-3.5
-60.0	-45.5	-46.3	-0.8

**777 - 787 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-53.0	-50.0	-66.1	-16.1
-44.0	-59.0	-72.6	-13.6
-35.0	-68.0	-79.3	-11.3
-34.0	-69.0	-79.3	-10.3
-33.0	-70.0	-79.3	-9.3
-60.0	-44.6	-52.3	-7.7

**824 - 849 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-56.0	-47.0	-59.2	-12.2
-49.0	-54.0	-66.1	-12.1
-35.0	-68.0	-79.9	-11.9
-34.0	-69.0	-79.9	-10.9
-20.0	-70.0	-79.9	-9.9
-60.0	-44.0	-51.7	-7.7



**1710 - 1755 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-58.0	-45.0	-54.3	-9.3
-51.0	-52.0	-61.3	-9.3
-34.0	-69.0	-78.3	-9.3
-47.0	-56.0	-65.2	-9.2
-59.0	-44.0	-47.3	-3.3
-60.0	-43.0	-46.1	-3.1

**1850 - 1915 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-61.0	-42.0	-56.3	-14.3
-49.0	-54.0	-68.3	-14.3
-39.0	-64.0	-78.3	-14.3
-48.0	-55.0	-69.2	-14.2
-50.0	-53.0	-66.8	-13.8
-66.0	-37.0	-40.8	-3.8



**Variable Downlink Noise Power Test Results**  
**734 - 746 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-58.0	-45.5	-48.2	-2.7
-59.0	-45.5	-48.1	-2.6
-55.0	-48.0	-50.1	-2.1
-56.0	-47.0	-49.0	-2.0
-57.0	-46.0	-47.9	-1.9
-60.0	-45.5	-47.1	-1.6

**746 - 756 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-59.0	-44.6	-53.7	-9.1
-58.0	-45.0	-53.8	-8.8
-53.0	-50.0	-58.3	-8.3
-45.0	-58.0	-66.2	-8.2
-46.0	-57.0	-65.1	-8.1
-70.0	-44.6	-46.3	-1.7

**869 - 894 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-39.0	-64.0	-64.7	-0.7
-80.0	-44.0	-44.6	-0.6
-70.0	-44.0	-44.6	-0.6
-51.0	-52.0	-52.6	-0.6
-90.0	-44.0	-44.3	-0.3
-45.0	-58.0	-58.1	-0.1





**1930 - 1995 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-48.0	-55.0	-69.7	-14.7
-45.0	-58.0	-72.6	-14.6
-43.0	-60.0	-74.3	-14.3
-39.0	-64.0	-78.3	-14.3
-46.0	-57.0	-71.0	-14.0
-60.0	-43.0	-47.3	-4.3

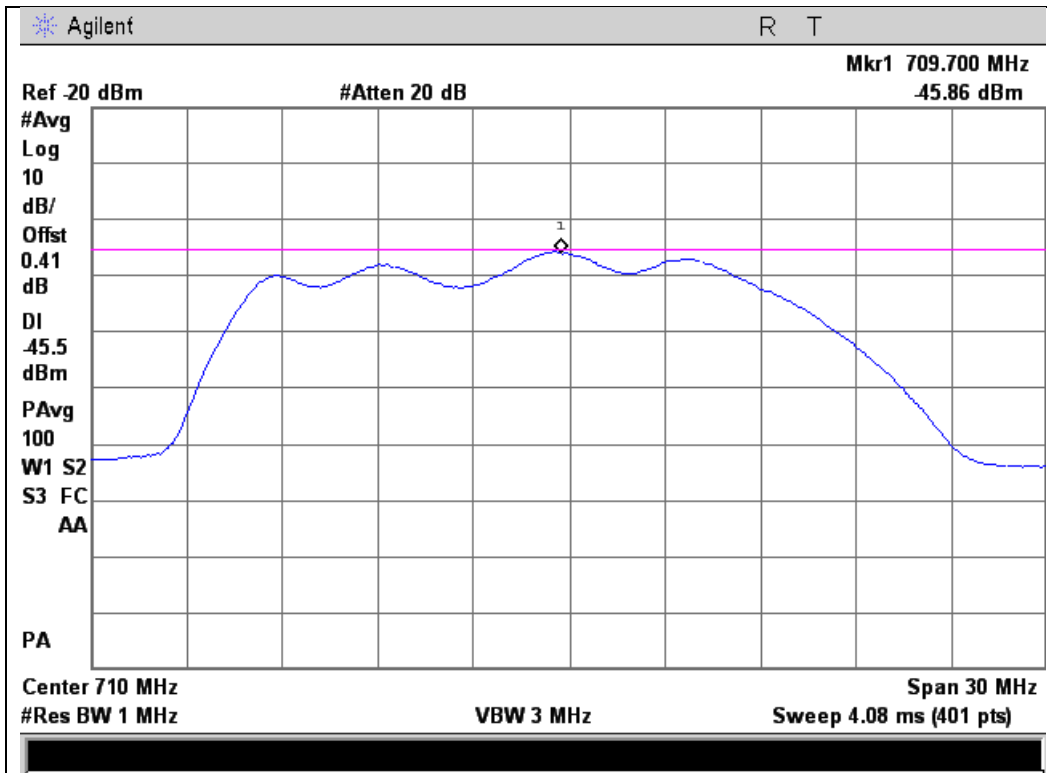
**2110 - 2155 MHz**

<b>RSSI (dBm)</b>	<b>Noise Limit (dBm)</b>	<b>Measured Noise (dBm)</b>	<b>Margin (dB)</b>
-58.0	-45.0	-53.6	-8.6
-56.0	-47.0	-55.6	-8.6
-57.0	-46.0	-54.1	-8.1
-53.0	-50.0	-57.3	-7.3
-52.0	-51.0	-58.3	-7.3
-51.0	-52.0	-59.3	-7.3

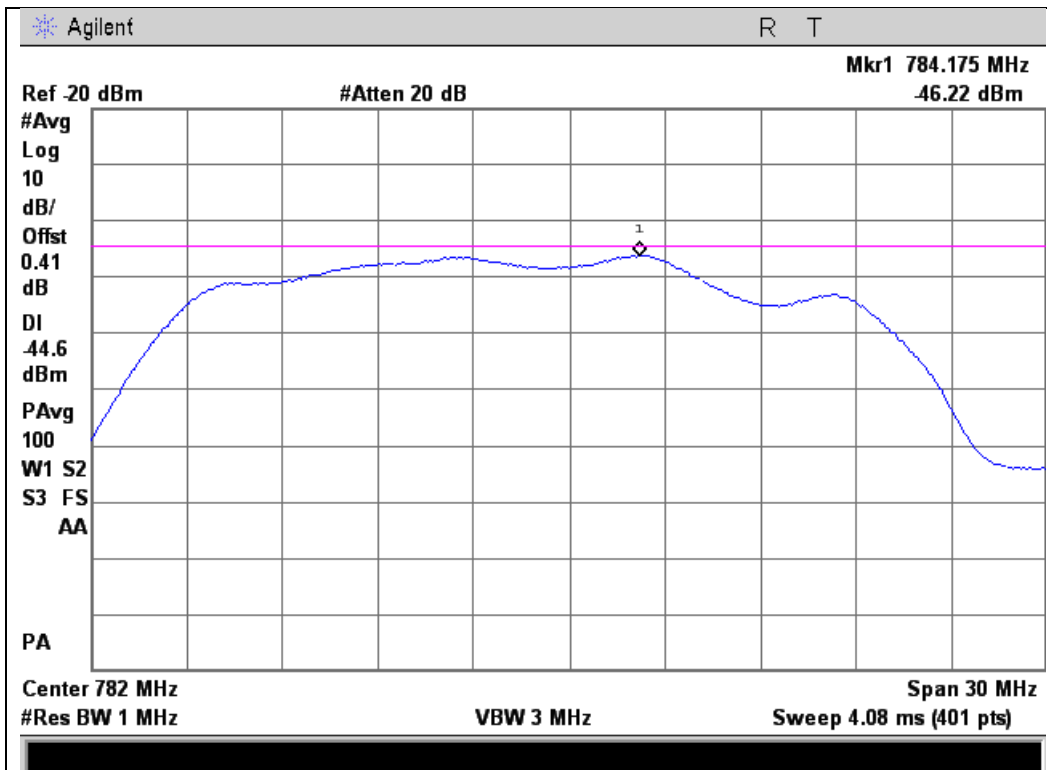


### Maximum Uplink Noise Test Plots

#### 704 - 716 MHz Band

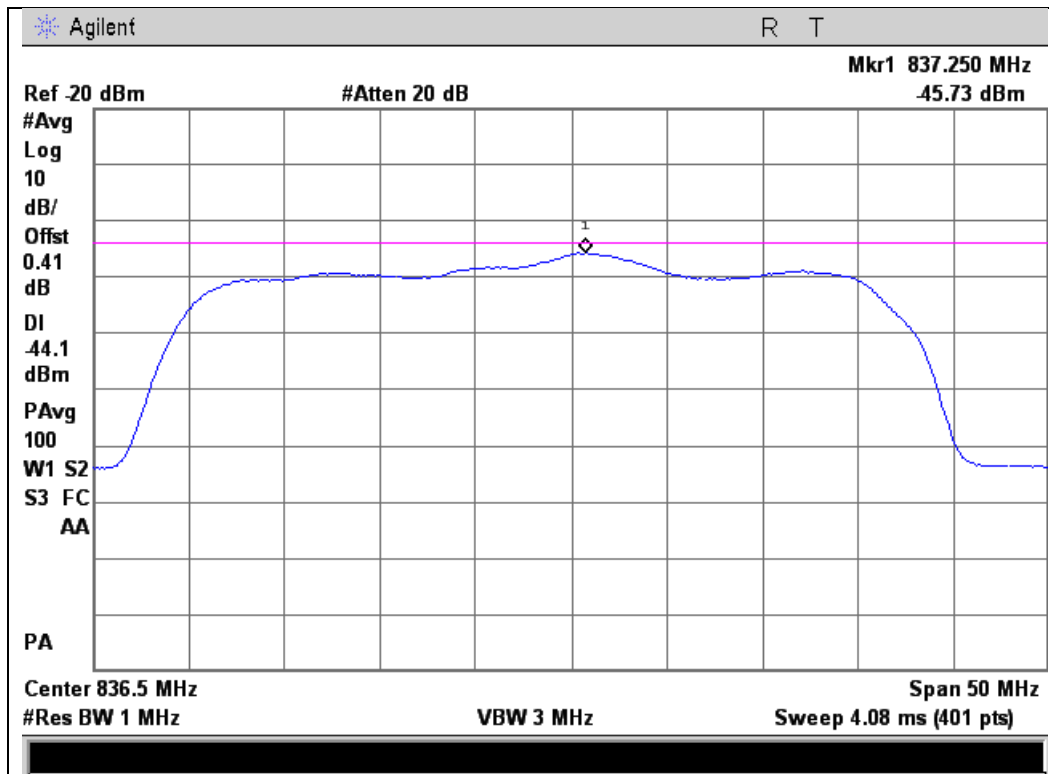


#### 777 - 787 MHz Band

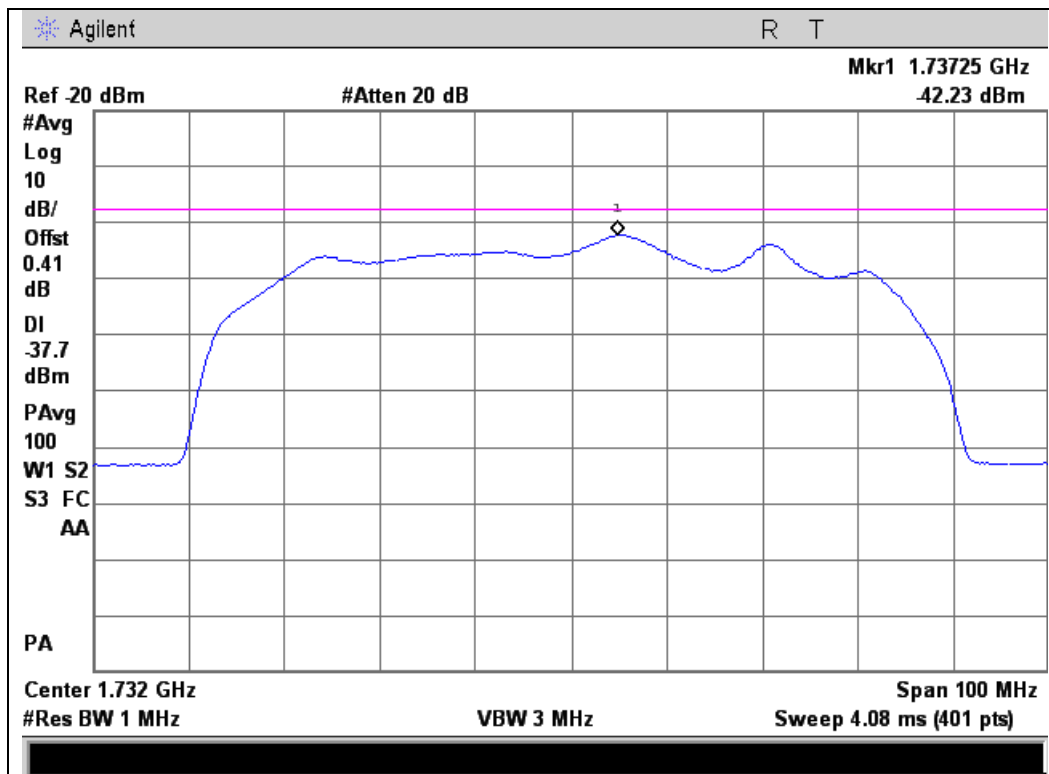




### 824 - 849 MHz Band

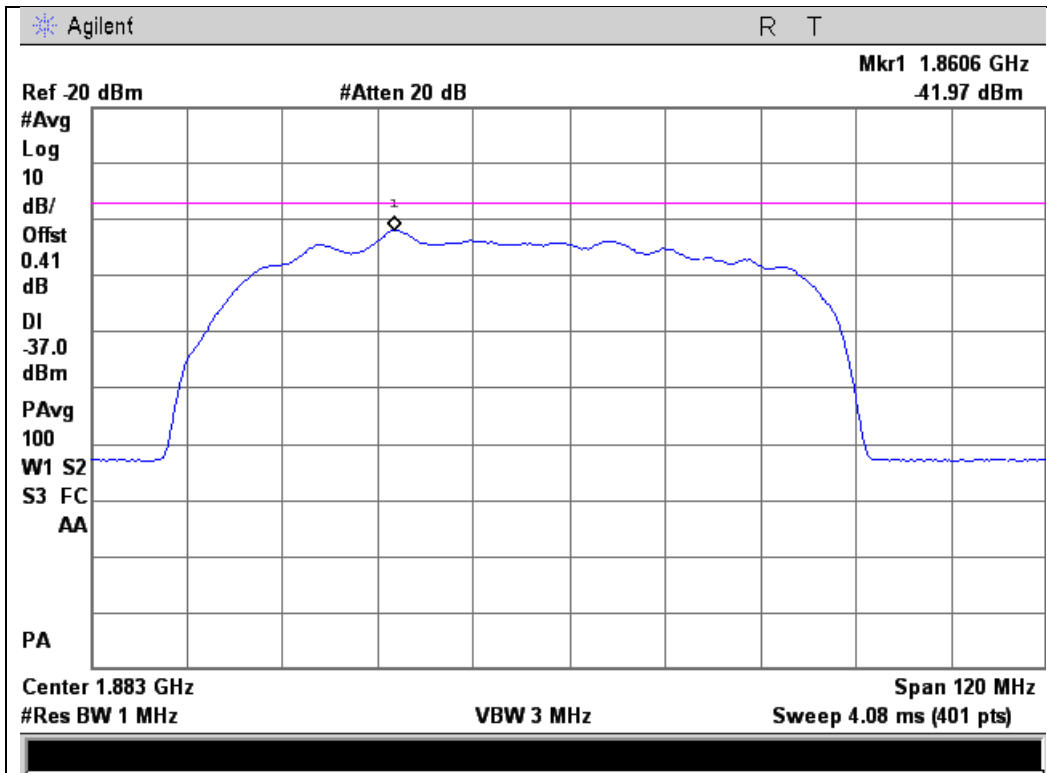


### 1710 - 1755 MHz Band



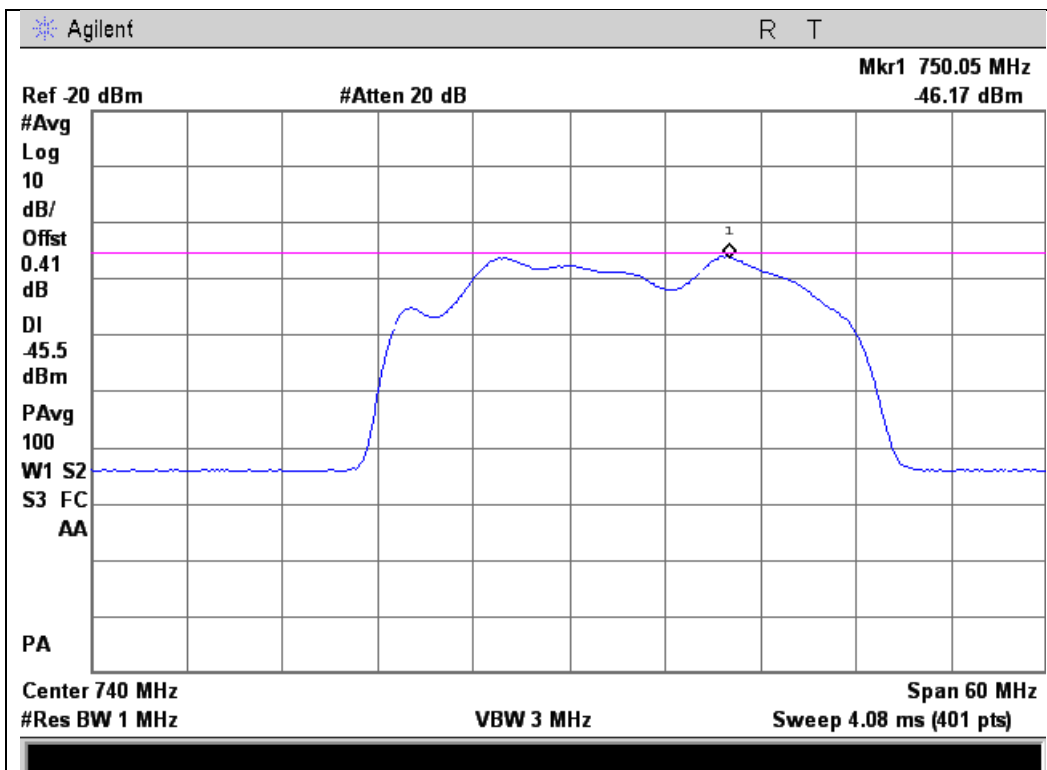


### 1850 - 1915 MHz Band



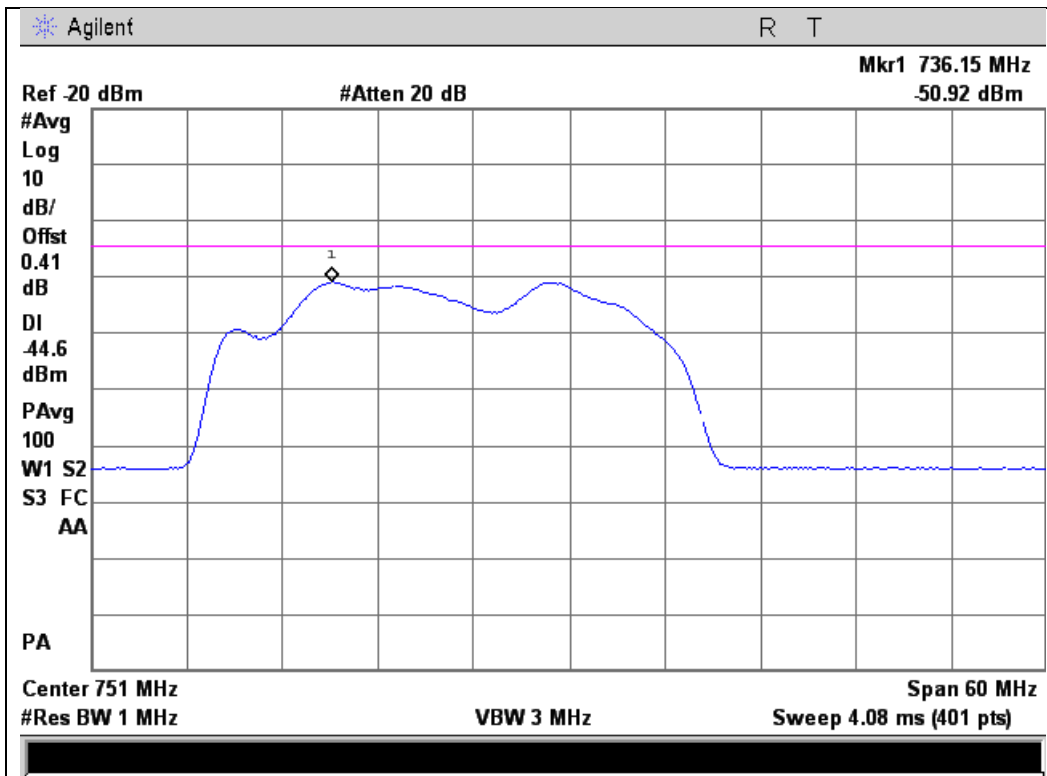
### Maximum Downlink Noise Test Plots

### 734 - 746 MHz Band

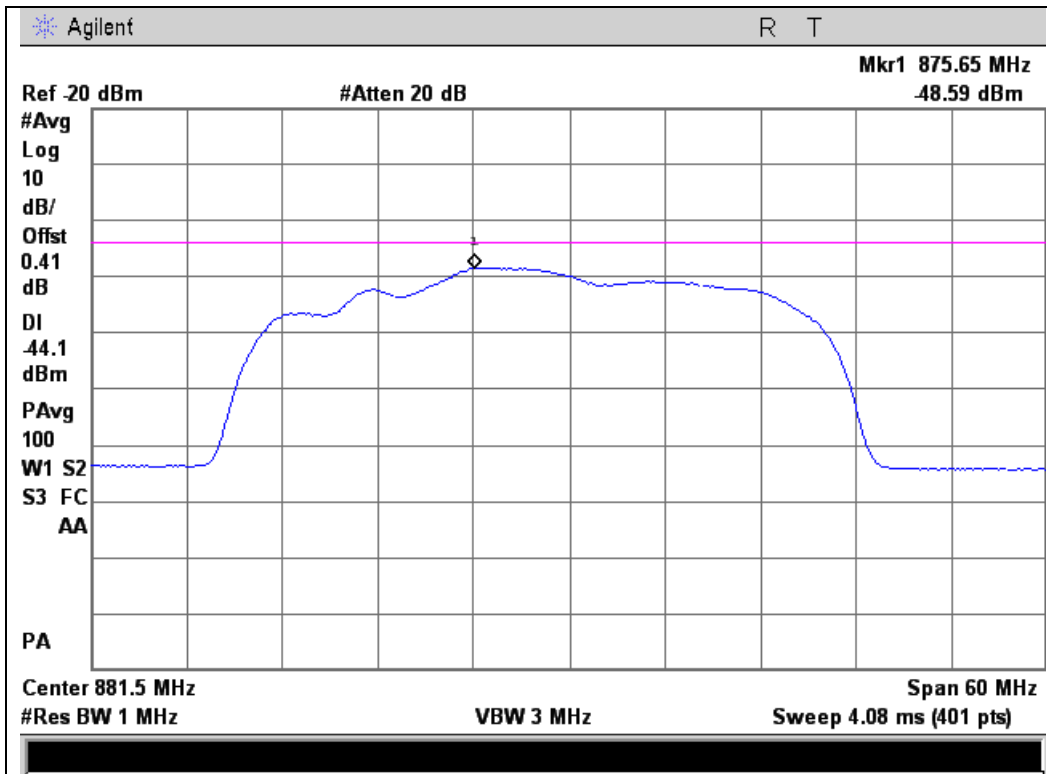




### 746 - 756 MHz Band

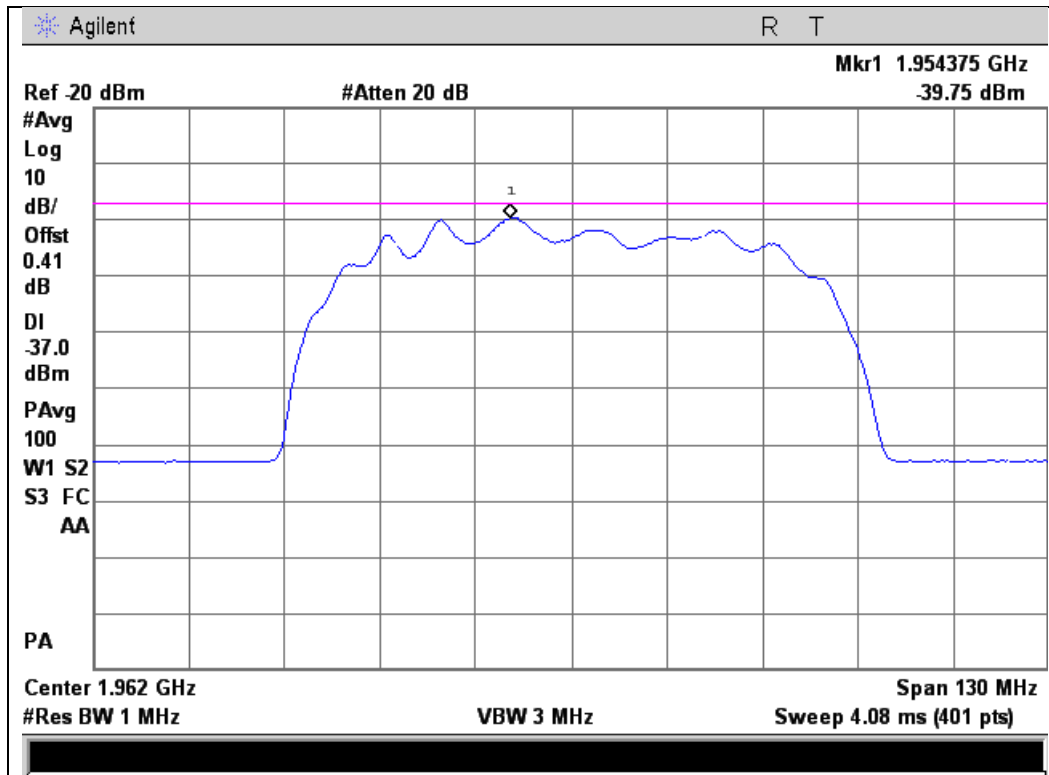


### 869 - 894 MHz Band

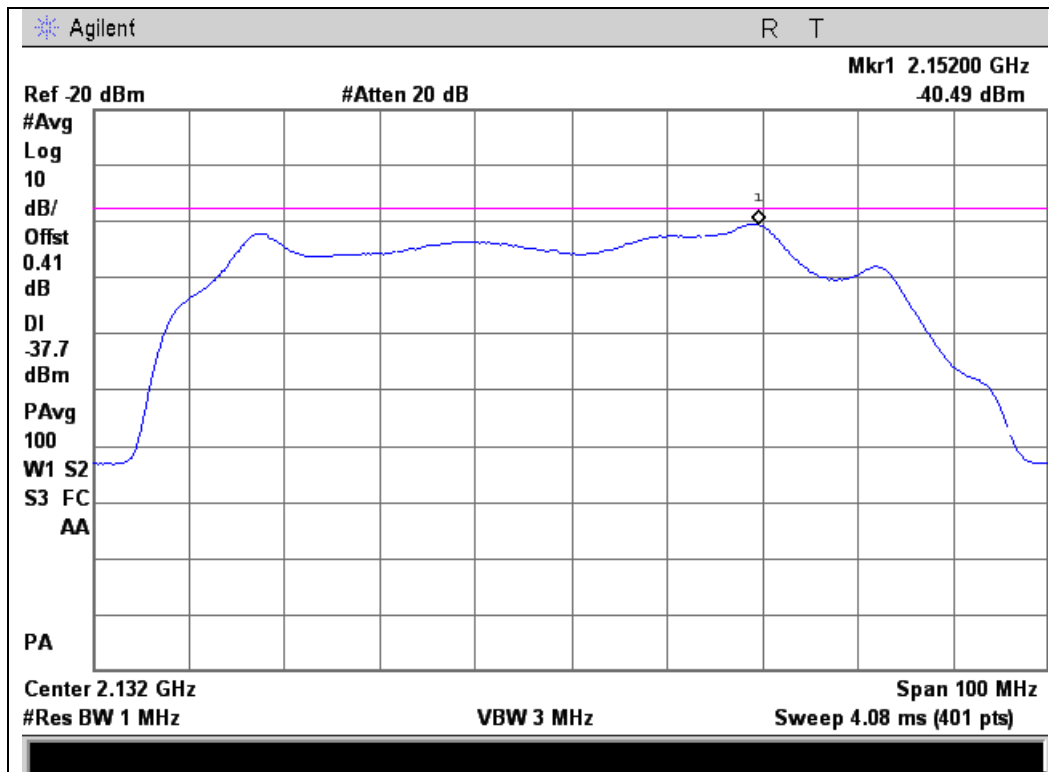




### 1930 - 1995 MHz Band



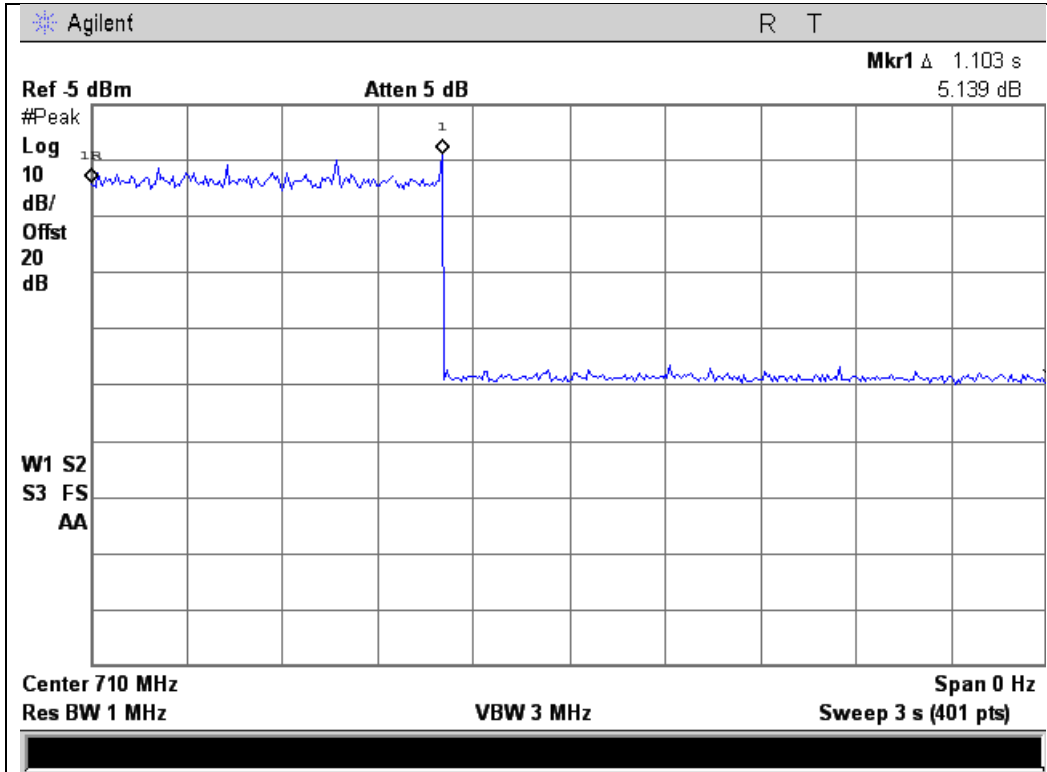
### 2110 - 2155 MHz Band



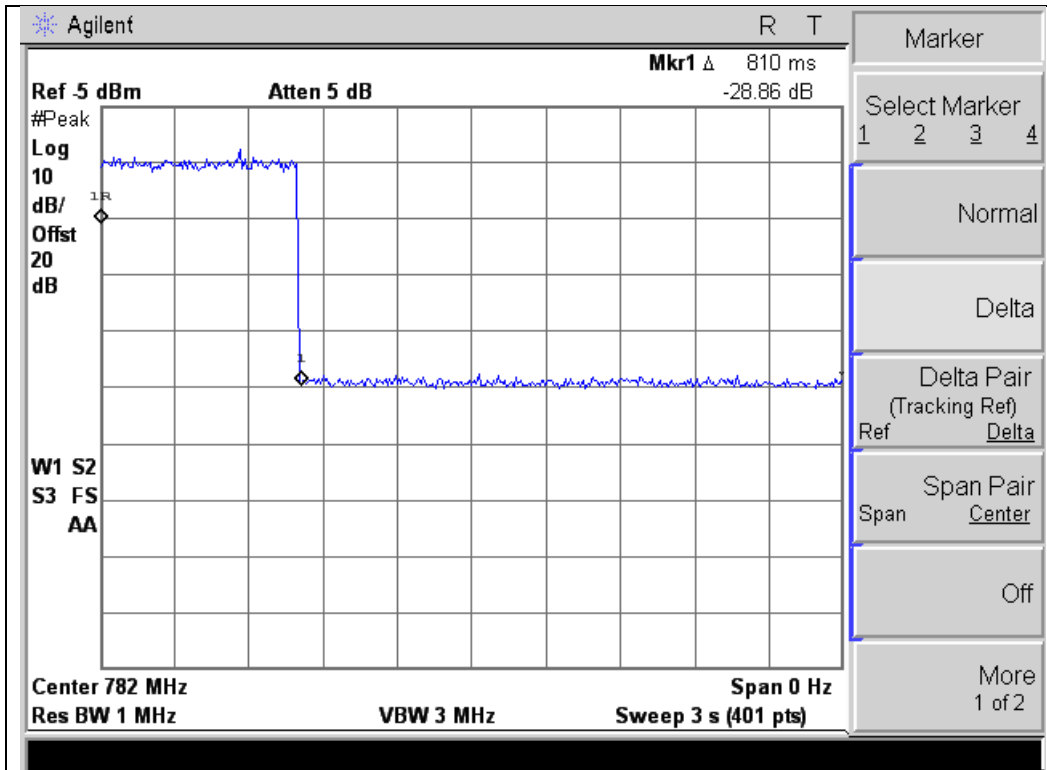


### Uplink Noise Timing Test Plots

#### 704 - 716 MHz Band

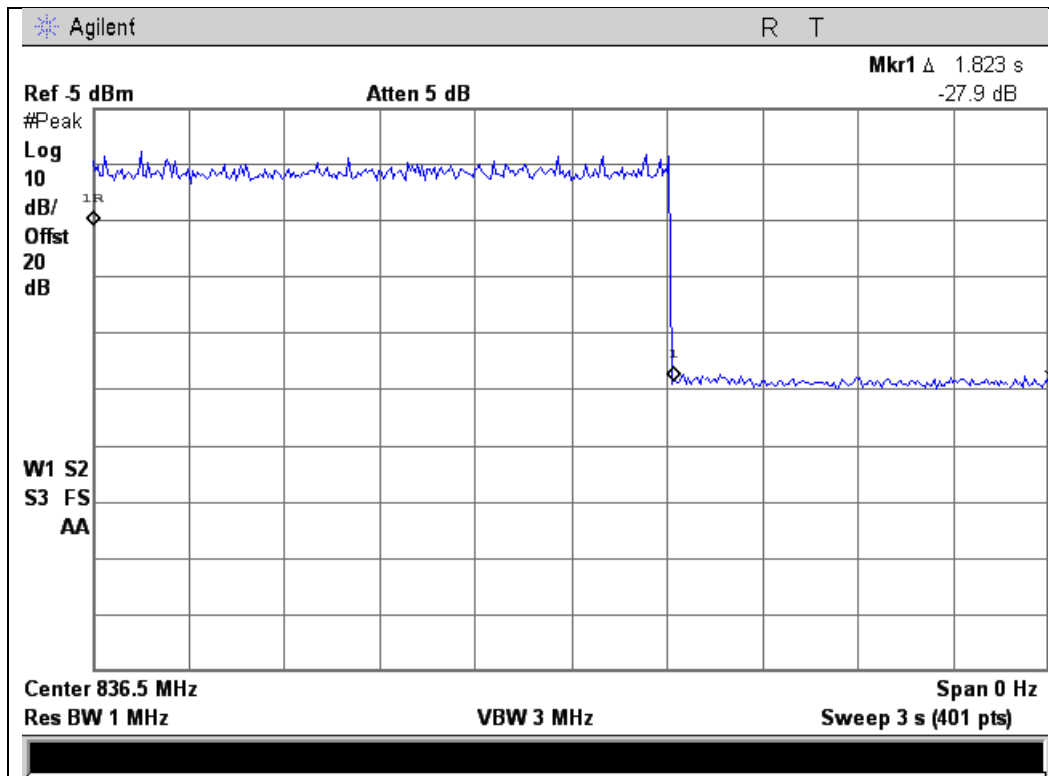


#### 777 - 787 MHz Band

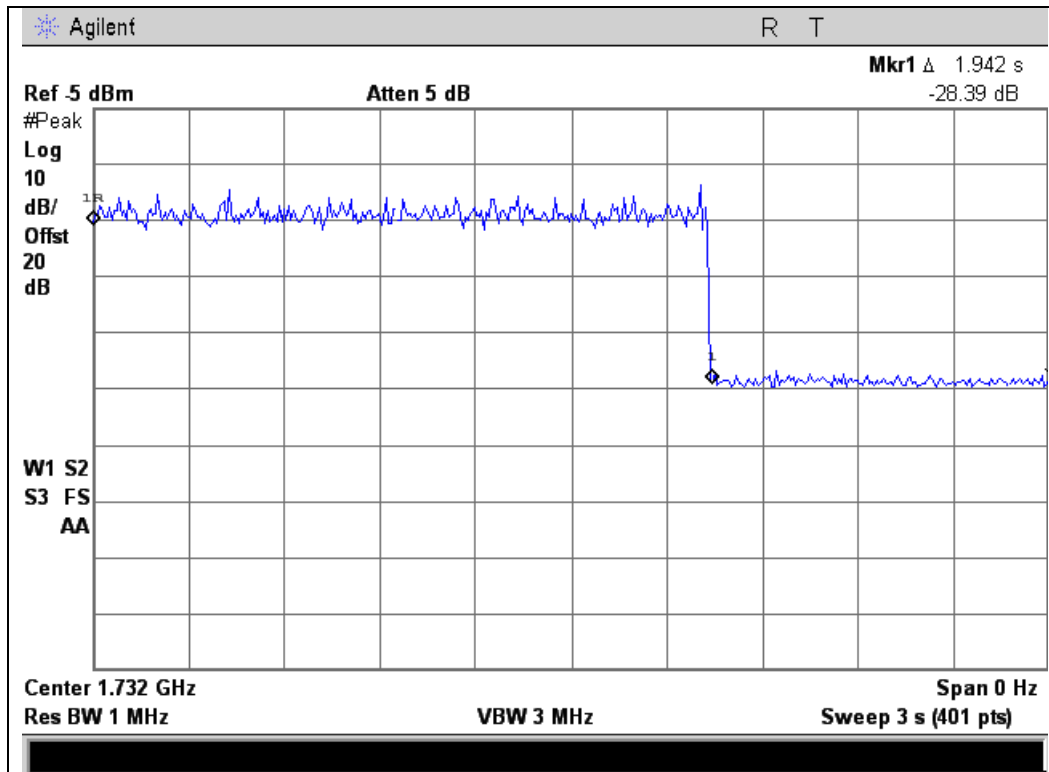




### 824 - 849 MHz Band



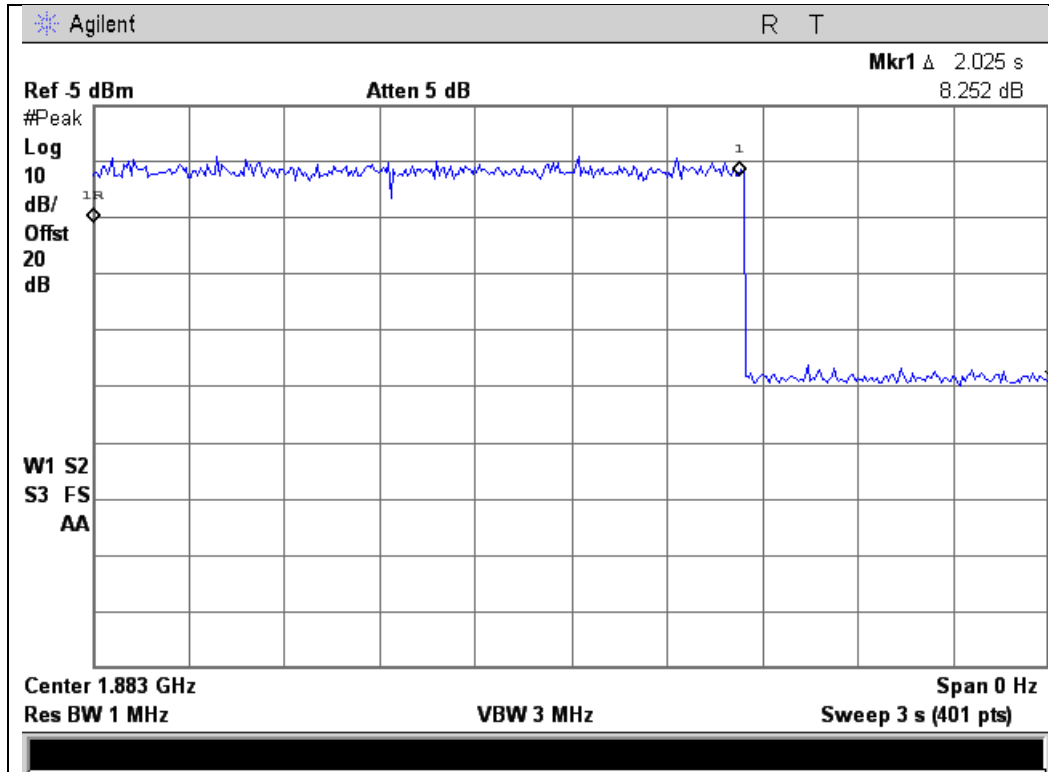
### 1710 - 1755 MHz Band







### 1850 - 1915 MHz Band





### Uplink Inactivity

**Name of Test:** Uplink Inactivity

**Engineer:** Mike Graffeo

**Test Equipment Utilized:** i00331

**Test Date:** 9/17/13

### Test Procedure

The EUT was connected directly to a spectrum analyzer set to operate in the center of the EUT operational uplink band. 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 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



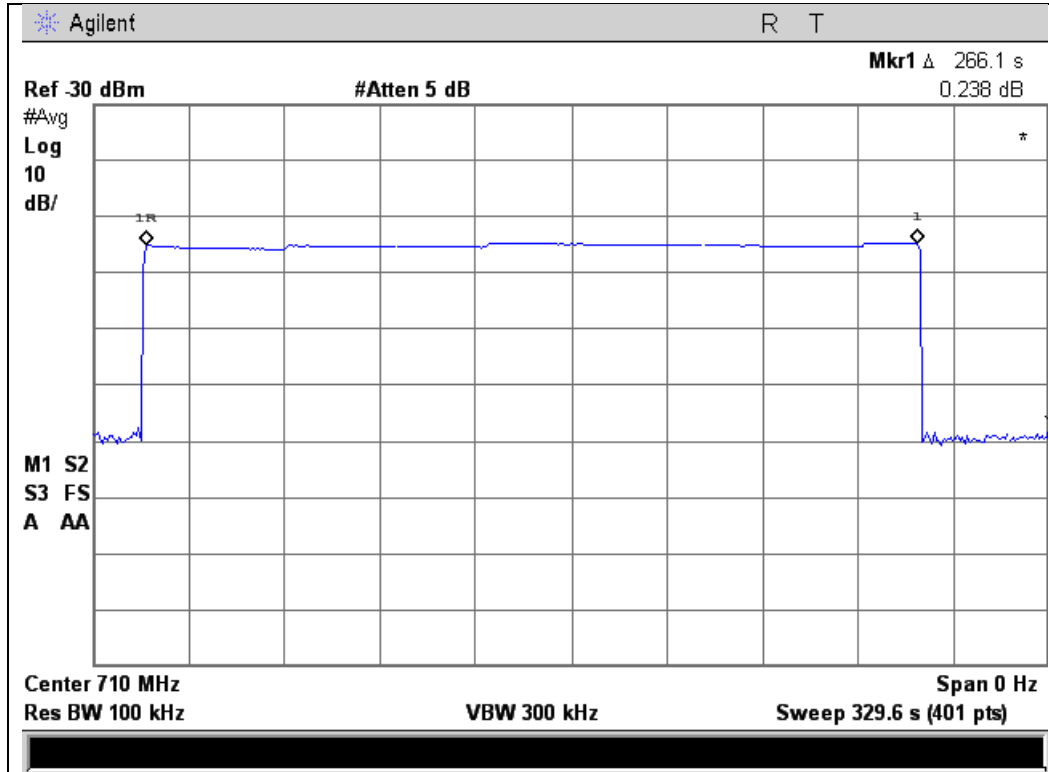
### Uplink Test Results

Frequency Band (MHz)	Measured Time (Seconds)	Limit (Seconds)	Result
704 - 716	266.1	300	Pass
777 - 787	266.5	300	Pass
824 - 849	266.5	300	Pass
1710 - 1755	267.3	300	Pass
1850 - 1915	266.5	300	Pass

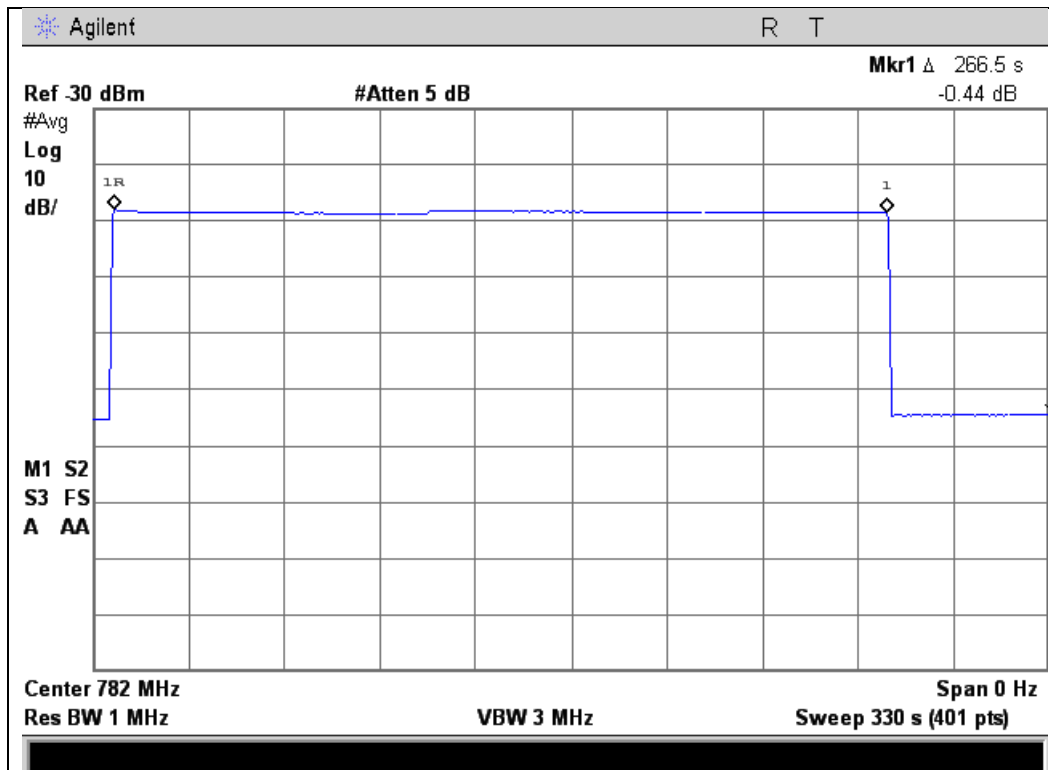


### Uplink Inactivity Test Results

704 - 716 MHz

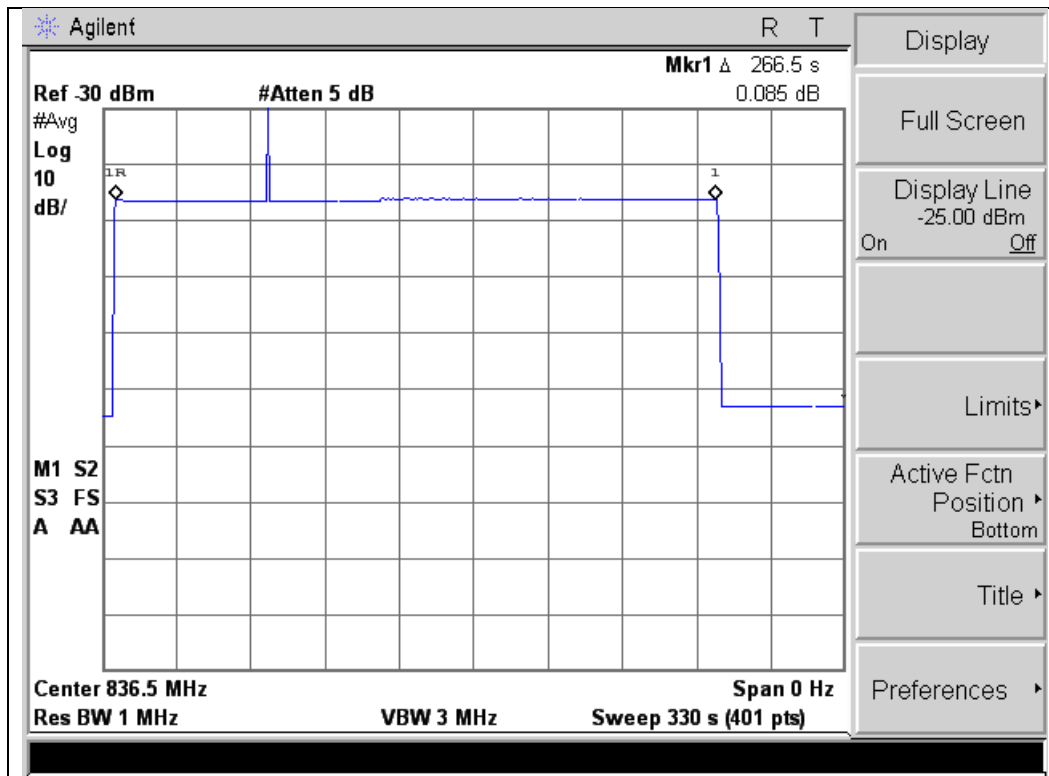


777 - 787 MHz

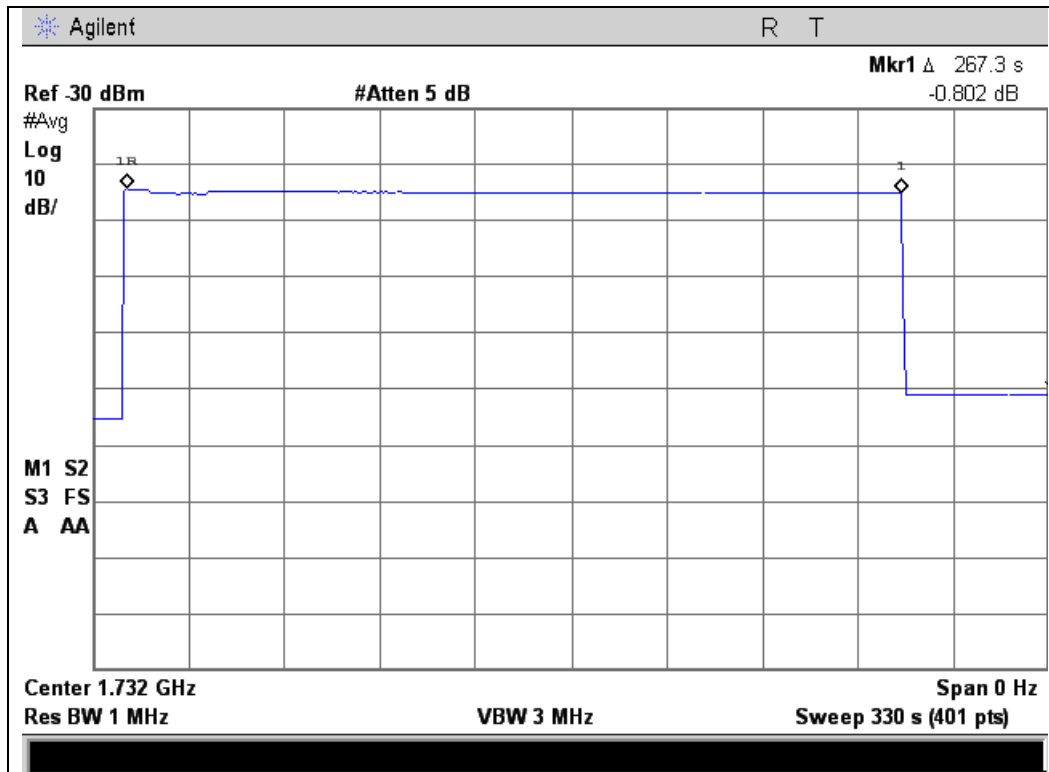




### 824 - 849 MHz

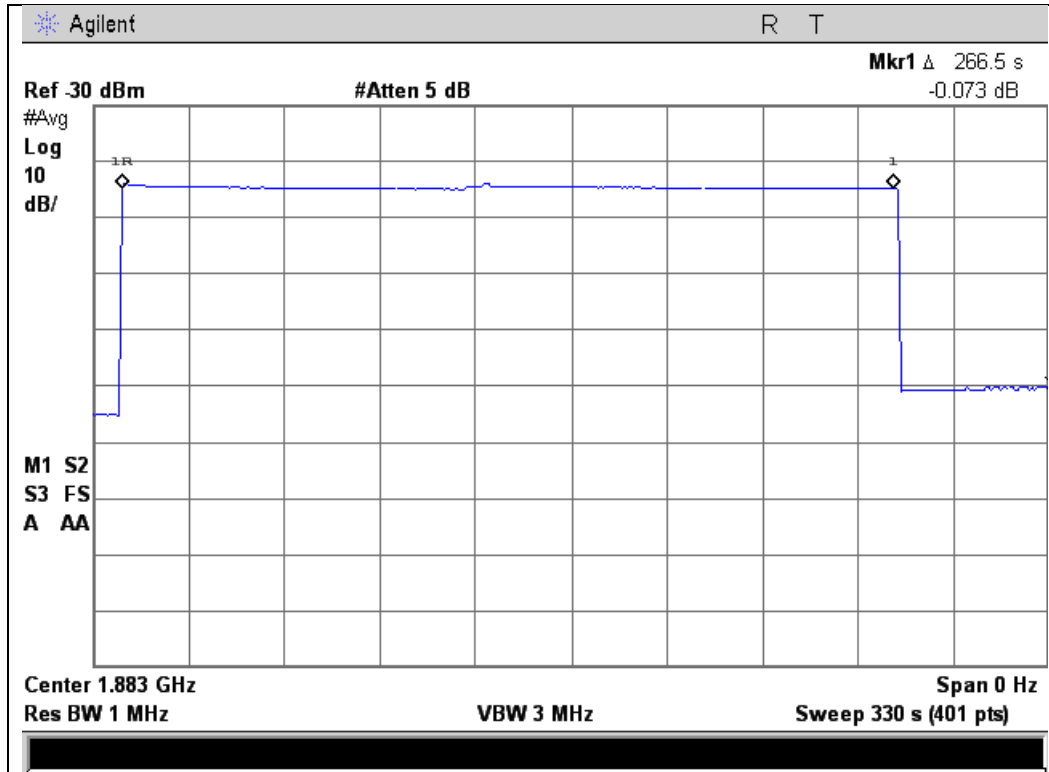


### 1710 - 1755 MHz





1850 - 1915 MHz





### Variable Gain

**Name of Test:** Variable Gain  
**Test Equipment Utilized:** i00331, i00405, i00412

**Engineer:** Mike Graffeo  
**Test Date:** 9/27/13

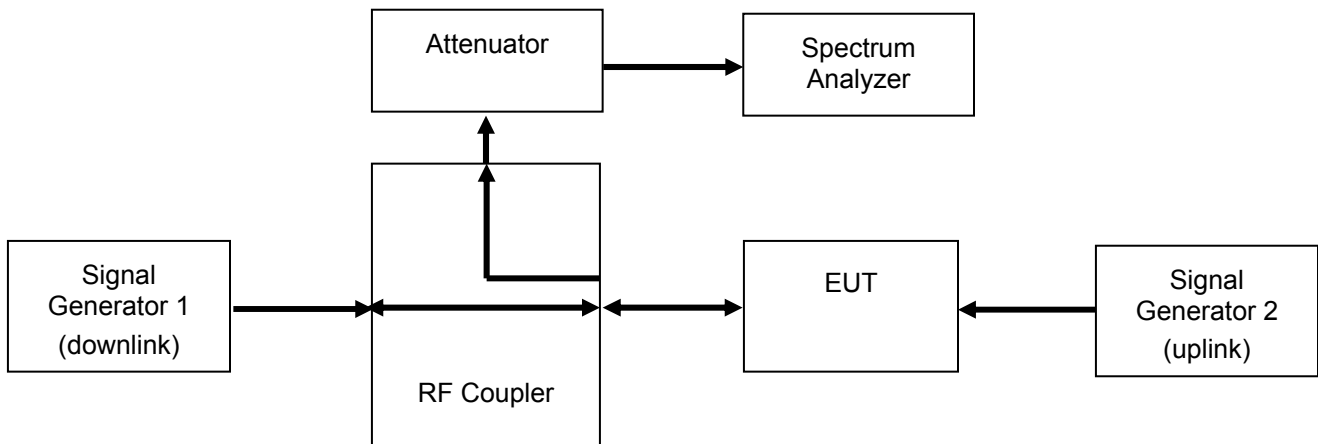
### Test Procedure

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. The uplink gain in the presence of a downlink signal was measured for each operational uplink band using the detailed procedures from KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516.

The following formula is used for calculating the limits.  
Variable Gain = -34 dB - RSSI +MSCL

Gain timing was verified by decreasing to a specific level and verifying the EUT responded with in 1sec.

### Test Setup





**Uplink Test Results**  
**704 - 716 MHz**

<b>RSSI (dBm)</b>	<b>Gain Limit (dBm)</b>	<b>P(in) (dBm)</b>	<b>P(out) (dBm)</b>	<b>Gain (dB)</b>	<b>Margin (dB)</b>
-45.0	45.9	-43.4	-2.4	41.0	-4.9
-44.0	44.9	-43.4	-3.3	40.1	-4.8
-43.0	43.9	-43.4	-4.4	39.0	-4.9
-42.0	42.9	-43.4	-2.0	41.4	-1.5
-41.0	41.9	-43.4	-2.0	41.4	-0.5
-38.0	38.9	-43.4	-5.0	38.4	-0.5

**777 - 787 MHz**

<b>RSSI (dBm)</b>	<b>Gain Limit (dBm)</b>	<b>P(in) (dBm)</b>	<b>P(out) (dBm)</b>	<b>Gain (dB)</b>	<b>Margin (dB)</b>
-61	62.8	-42.3	10.3	52.6	-10.2
-54.0	55.8	-42.3	5.1	47.4	-8.4
-55.0	56.8	-42.3	6.2	48.5	-8.3
-57.0	58.8	-42.3	8.8	51.1	-7.7
-66.0	64.0	-42.3	17.2	59.5	-4.5
-70.0	64.0	-42.3	17.5	59.8	-4.2

**824 - 849 MHz**

<b>RSSI (dBm)</b>	<b>Gain Limit (dBm)</b>	<b>P(in) (dBm)</b>	<b>P(out) (dBm)</b>	<b>Gain (dB)</b>	<b>Margin (dB)</b>
-54.0	56.3	-44.5	9.6	54.1	-2.2
-41.0	43.3	-44.5	-2.8	41.7	-1.6
-65.0	65.0	-44.5	19.9	64.4	-0.6
-64.0	65.0	-44.5	19.9	64.4	-0.6
-67.0	65.0	-44.5	20.1	64.6	-0.4
-66.0	65.0	-44.5	20.1	64.6	-0.4



**1710 - 1755 MHz**

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-49.0	55.5	-41.0	5.2	46.2	-9.3
-50.0	56.5	-41.0	7.1	48.1	-8.4
-48.0	54.5	-41.0	5.2	46.2	-8.3
-56.0	62.5	-41.0	13.3	54.3	-8.2
-55.0	61.5	-41.0	12.3	53.3	-8.2
-47.0	53.5	-41.0	4.3	45.3	-8.2

**1850 - 1915 MHz**

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-54.0	61.2	-43.8	5.3	49.1	-12.1
-51.0	58.2	-43.8	2.4	46.2	-12.0
-50.0	57.2	-43.8	0.4	44.2	-13.0
-49.0	56.2	-43.8	0.6	44.4	-11.8
-48.0	55.2	-43.8	-0.5	43.3	-11.9
-47.0	54.2	-43.8	-1.4	42.4	-11.8

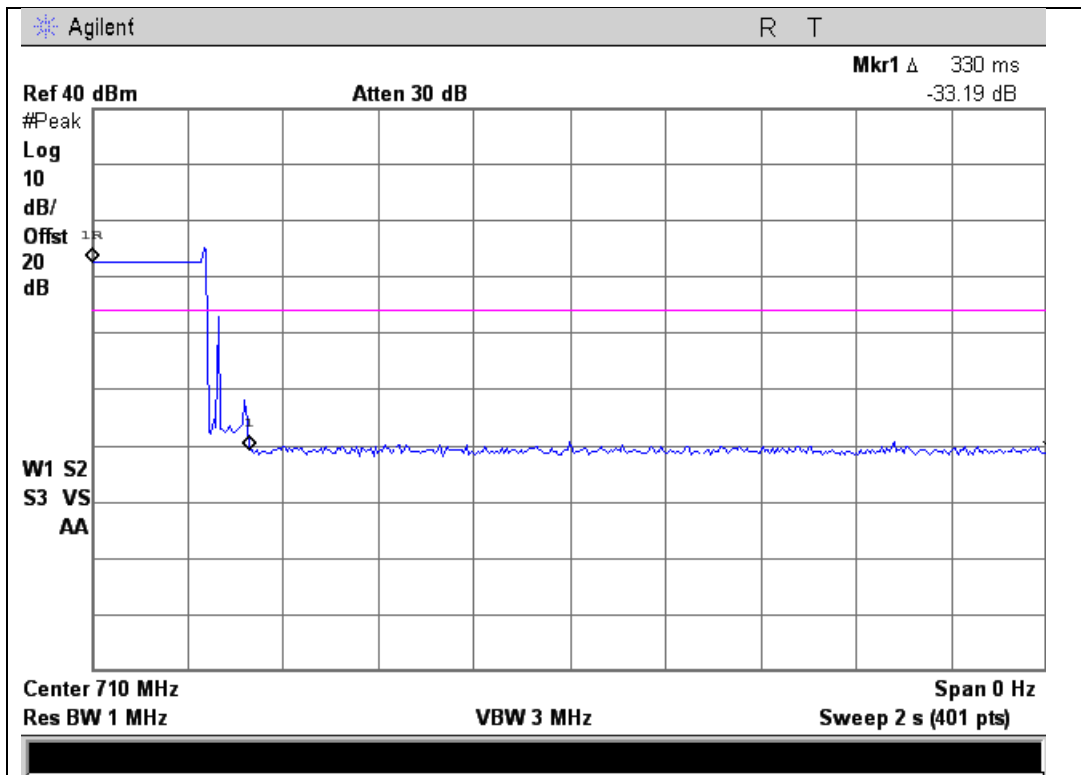
**Variable Uplink Gain Timing Test Results**

Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Result
704 - 716	0.330	1.0	Pass
777 - 787	0.330	1.0	Pass
824 - 849	0.595	1.0	Pass
1710 - 1755	0.760	1.0	Pass
1850 - 1915	0.795	1.0	Pass

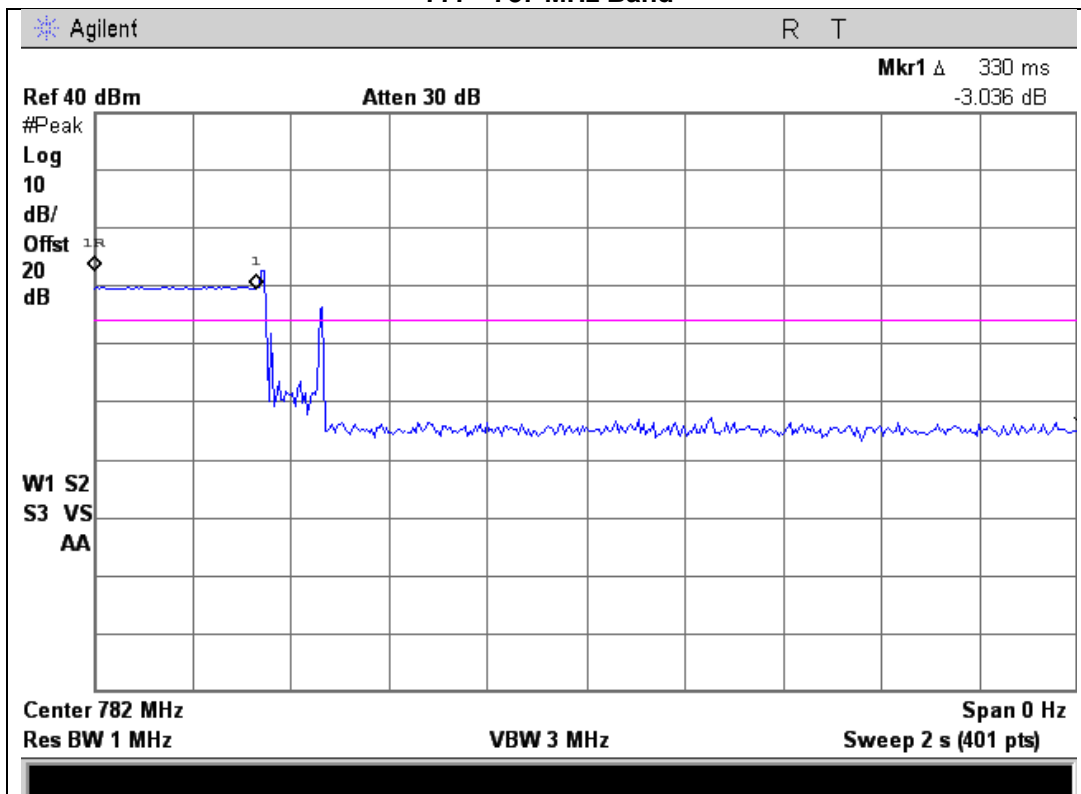




### Variable Uplink Gain Timing 704 - 716 MHz Band

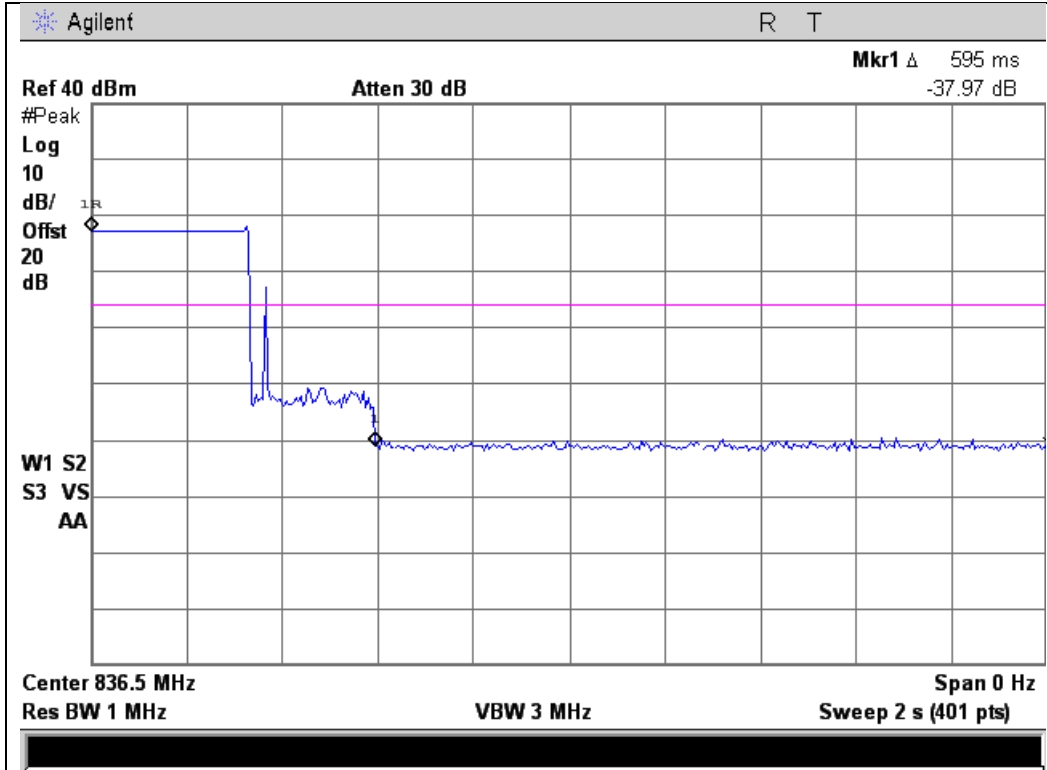


### 777 - 787 MHz Band





### 824 - 849 MHz Band

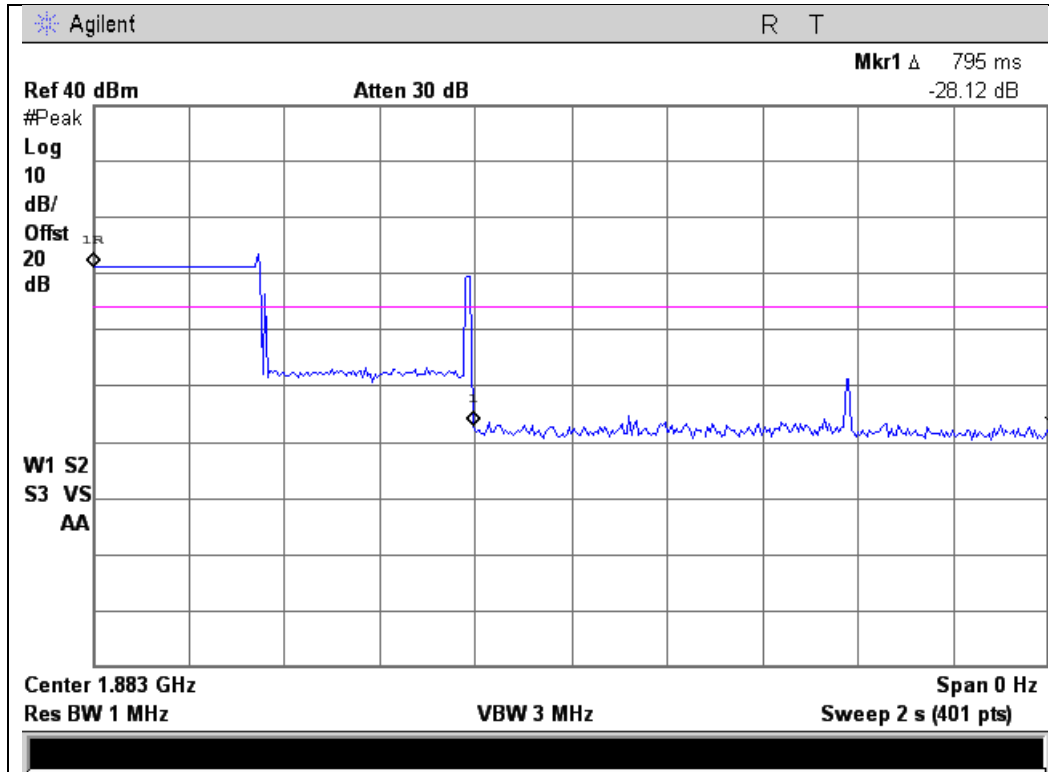


### 1710-1755 MHz Band





### 1850-1915 MHz Band





### Occupied Bandwidth

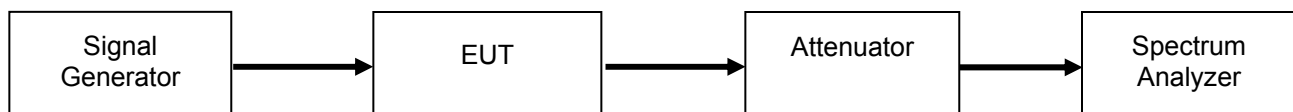
**Name of Test:** Occupied Bandwidth  
**Test Equipment Utilized:** i00331 and i00405

**Engineer:** Mike Graffeo  
**Test Date:** 9/16/13

### 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 center channel of each the EUT operational uplink and downlink band with the RF level set 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

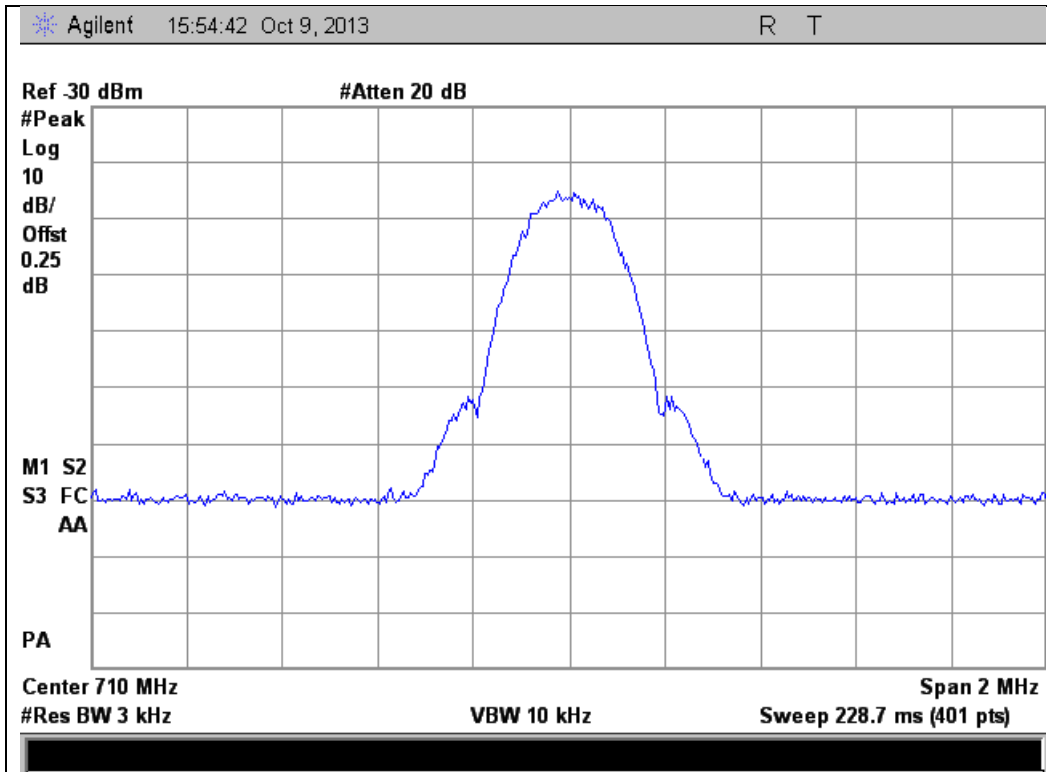




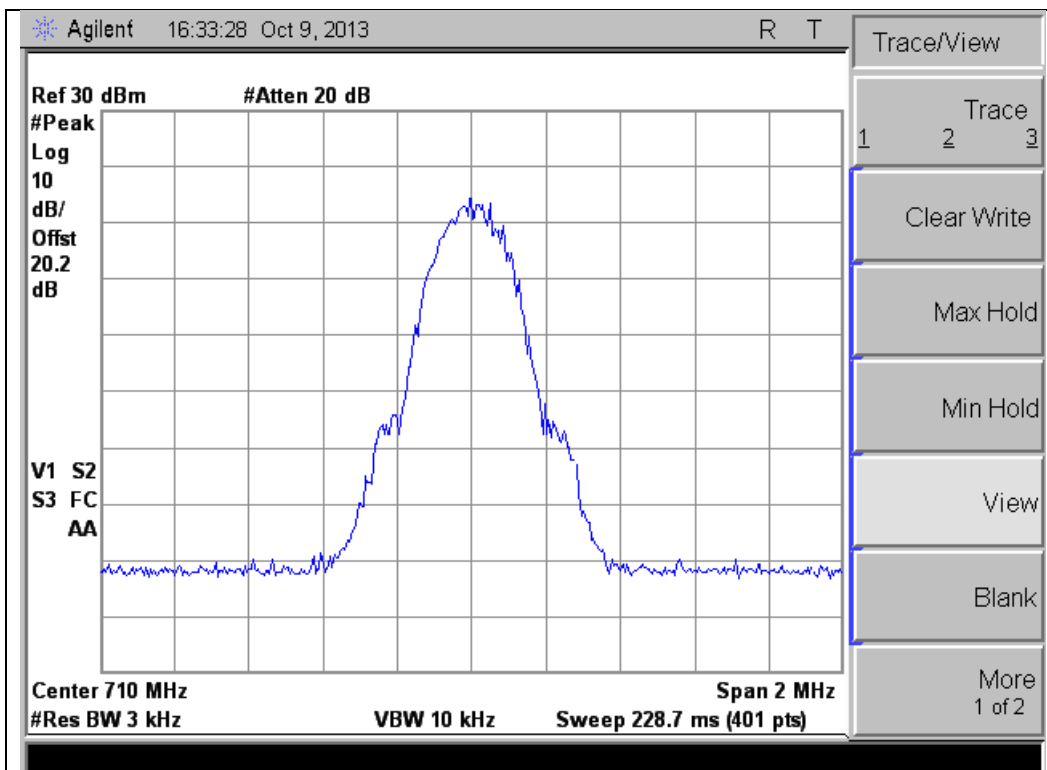
### GSM Uplink Test Plots

704 - 716 MHz Band

Input



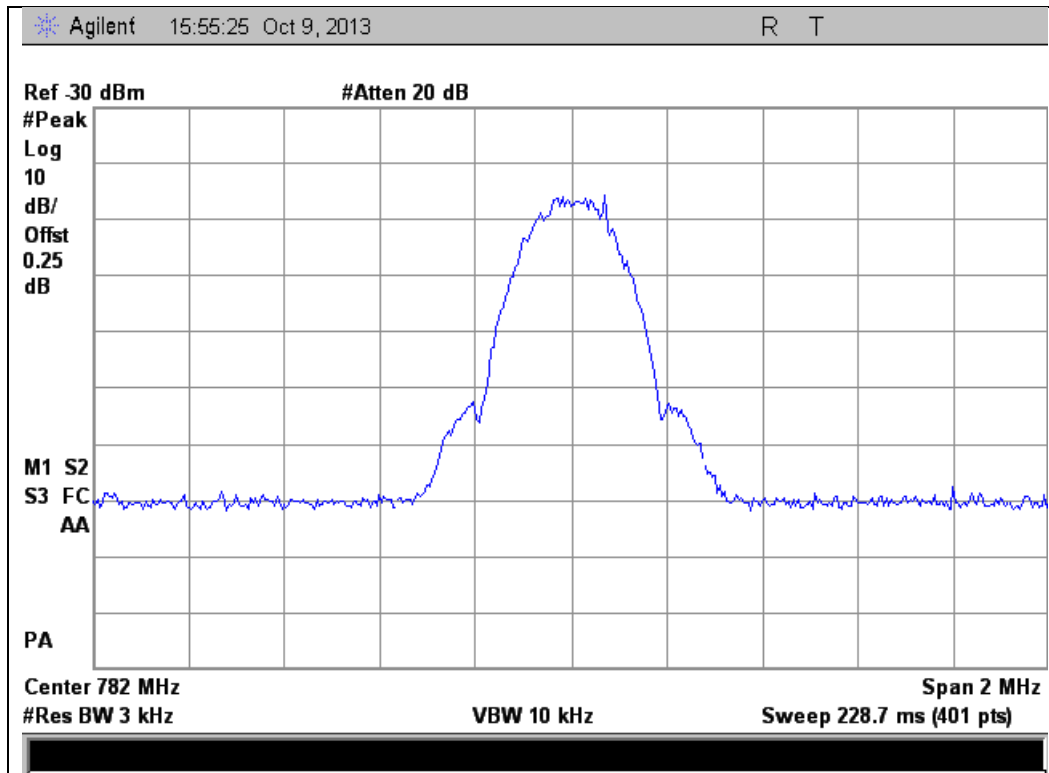
Output



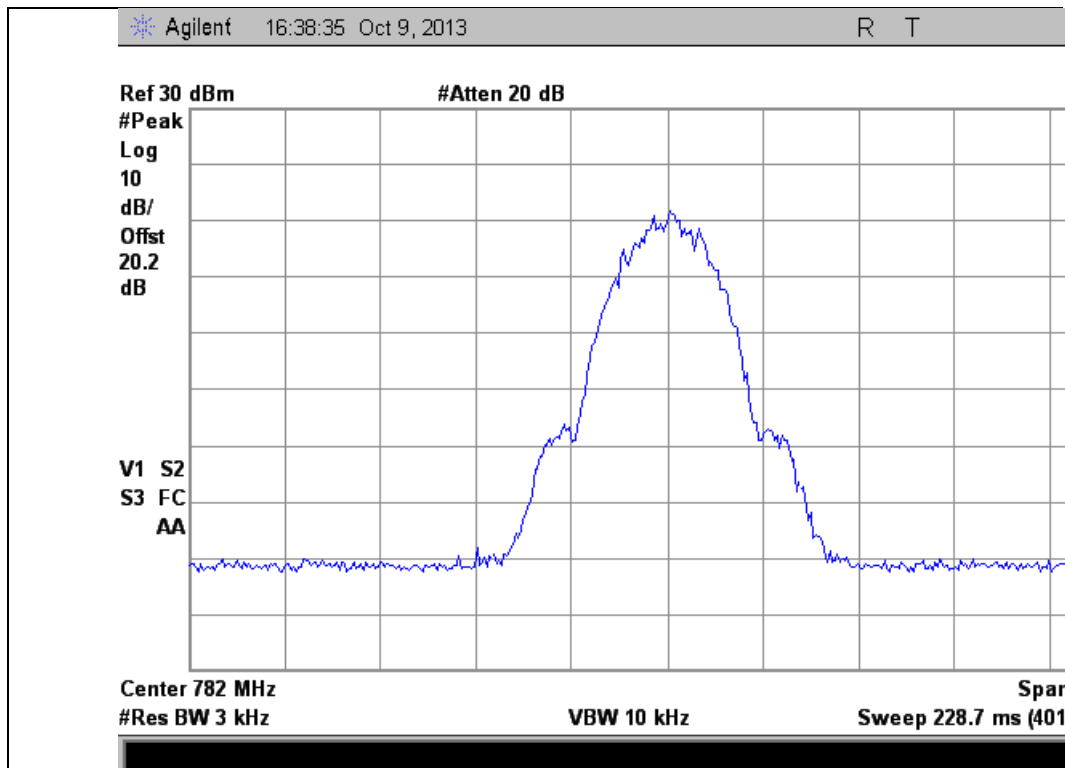


### 777 - 787 MHz Band

#### Input



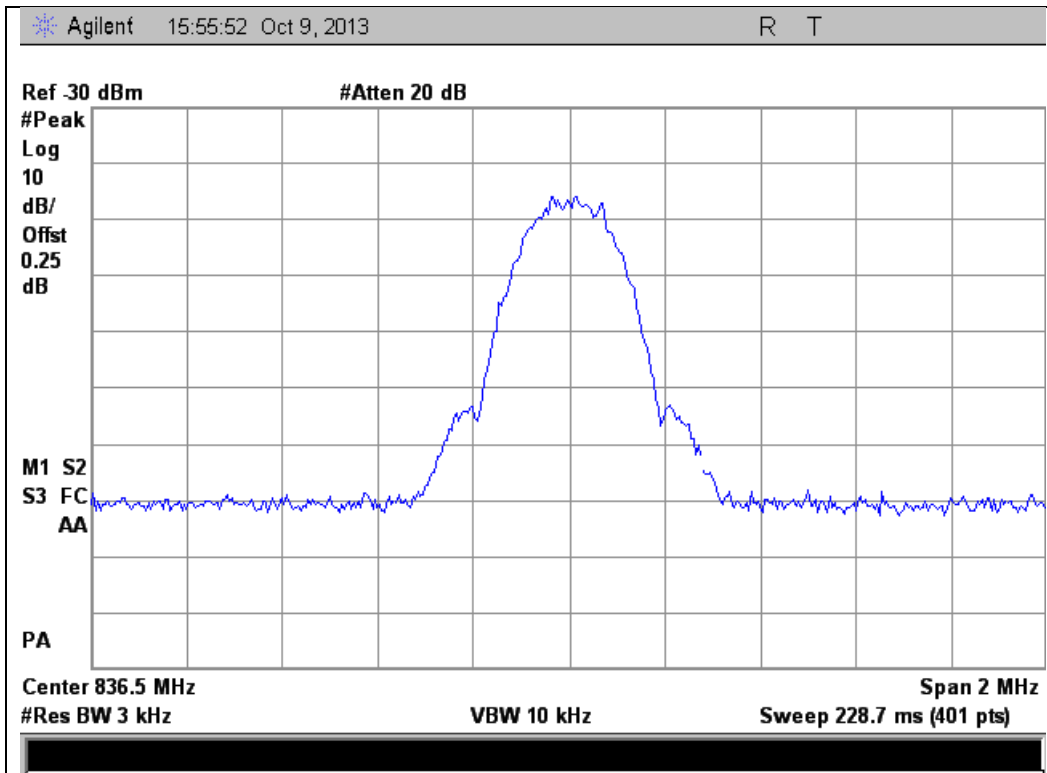
#### Output



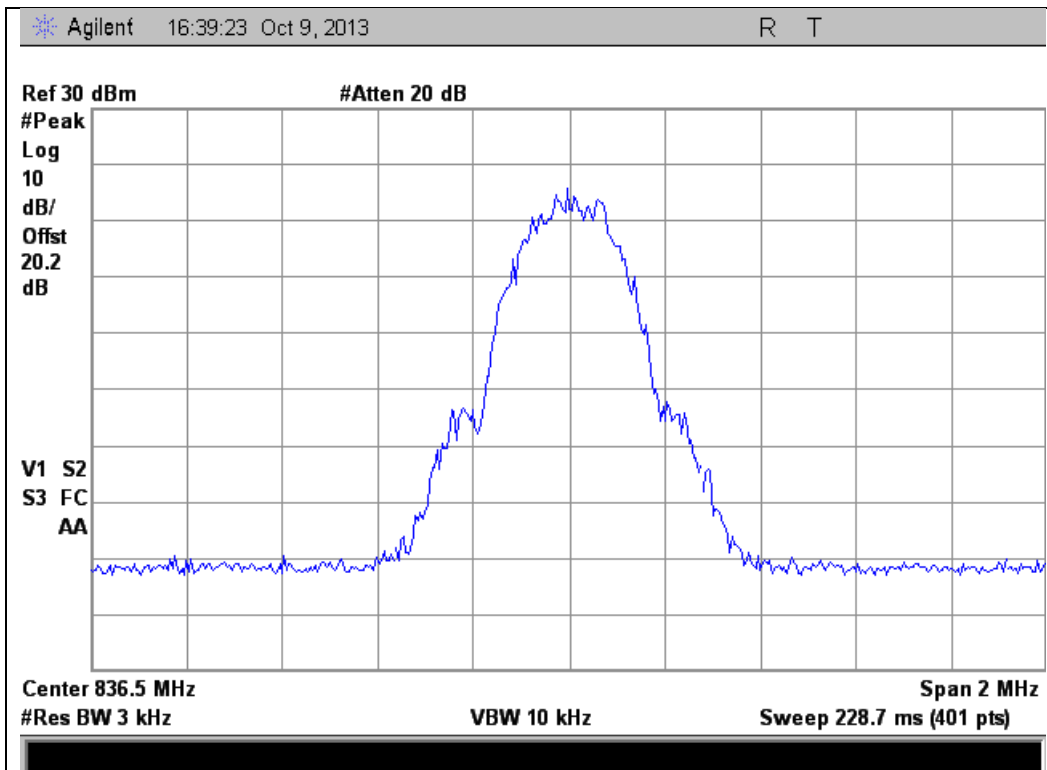


### 824 - 849 MHz Band

#### Input



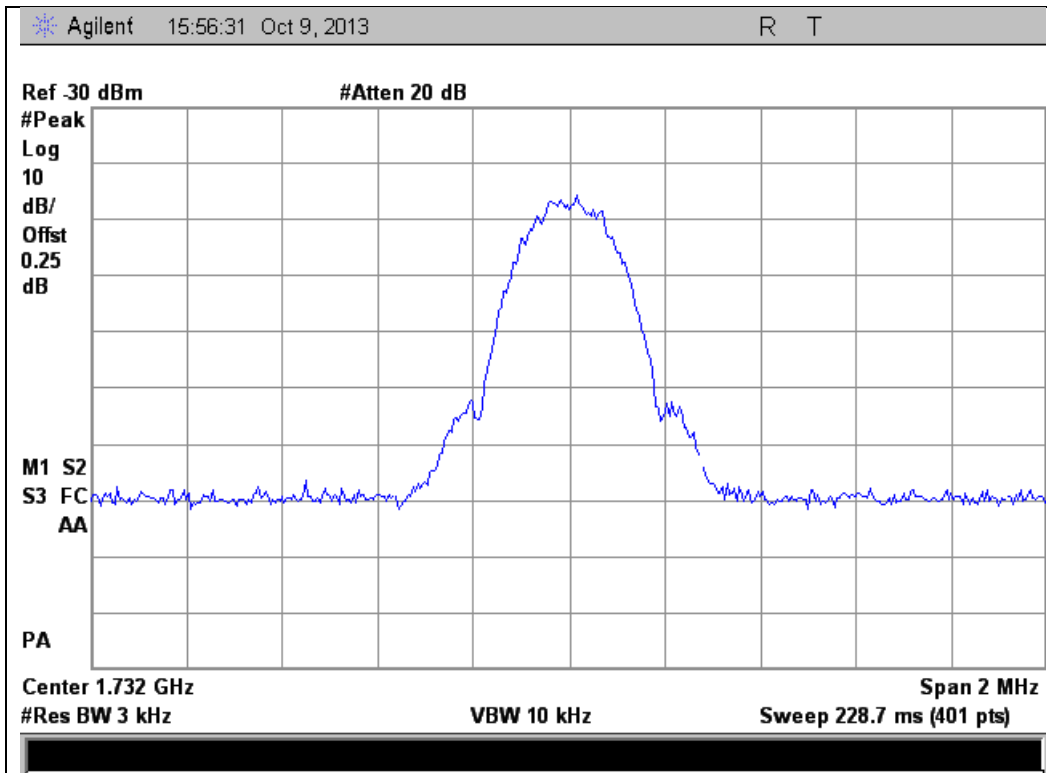
#### Output



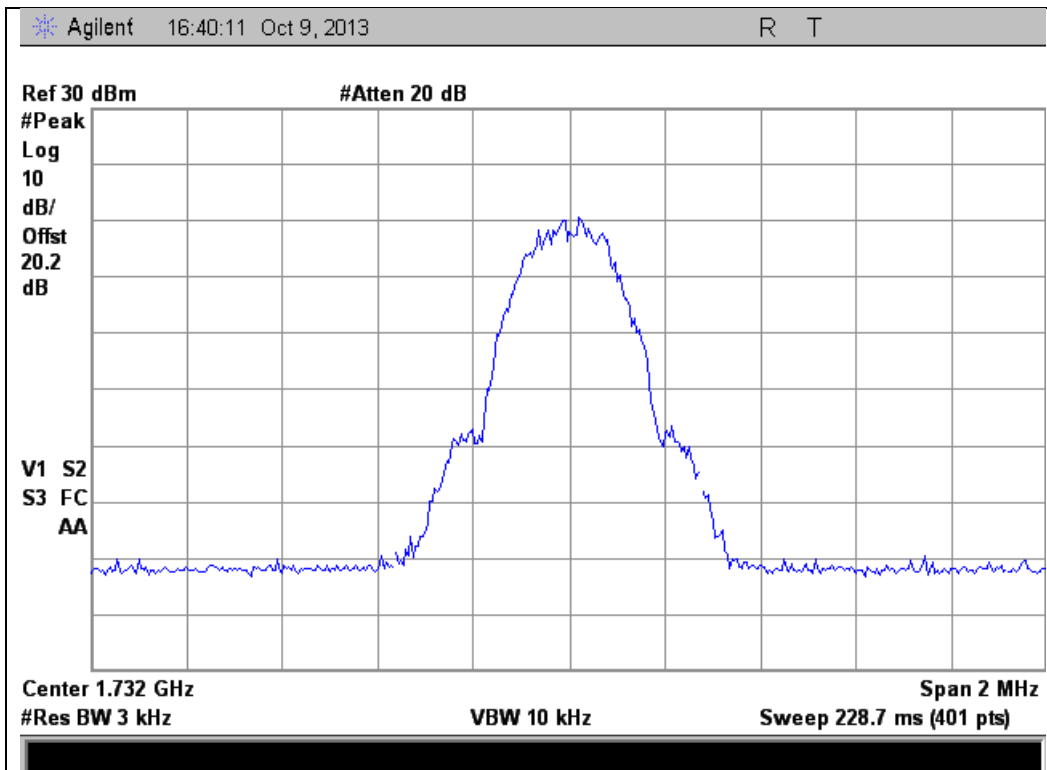


### 1710 - 1755 MHz Band

#### Input



#### Output

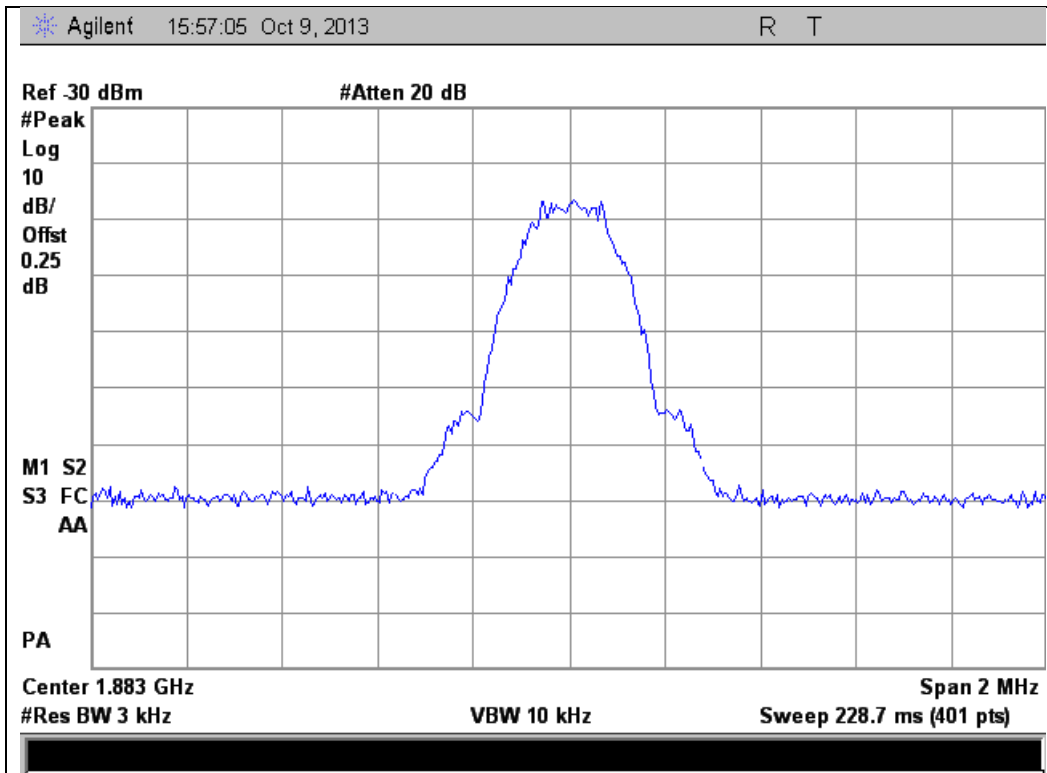




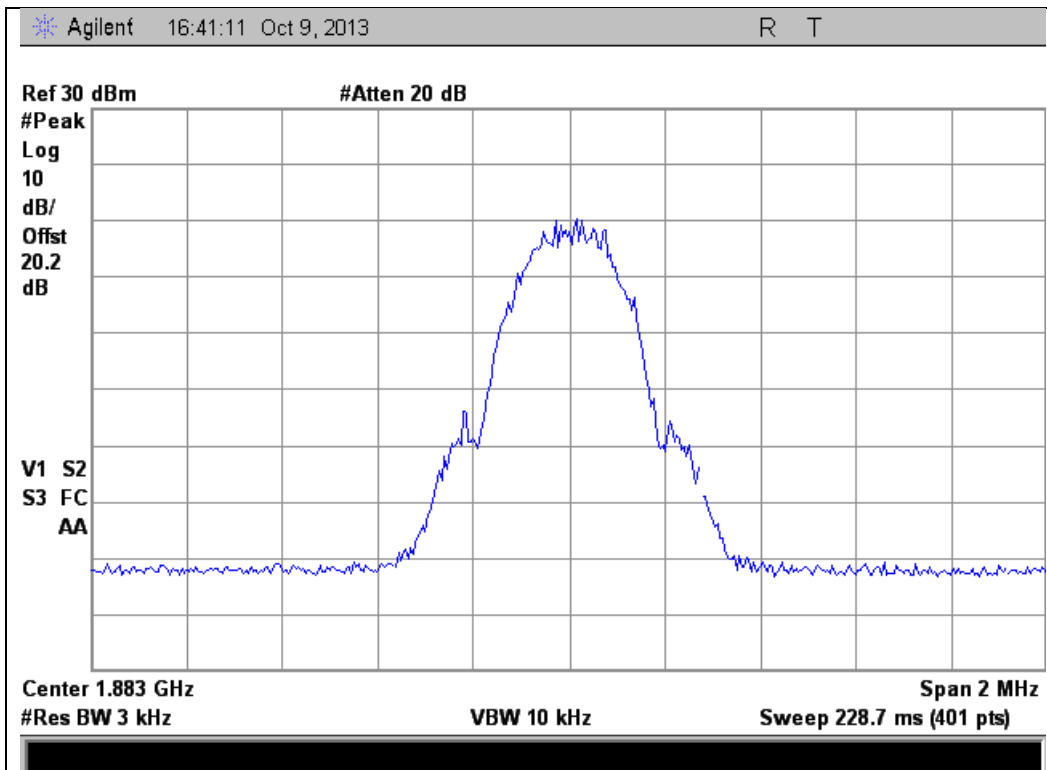


### 1850 - 1915 MHz Band

#### Input



#### Output

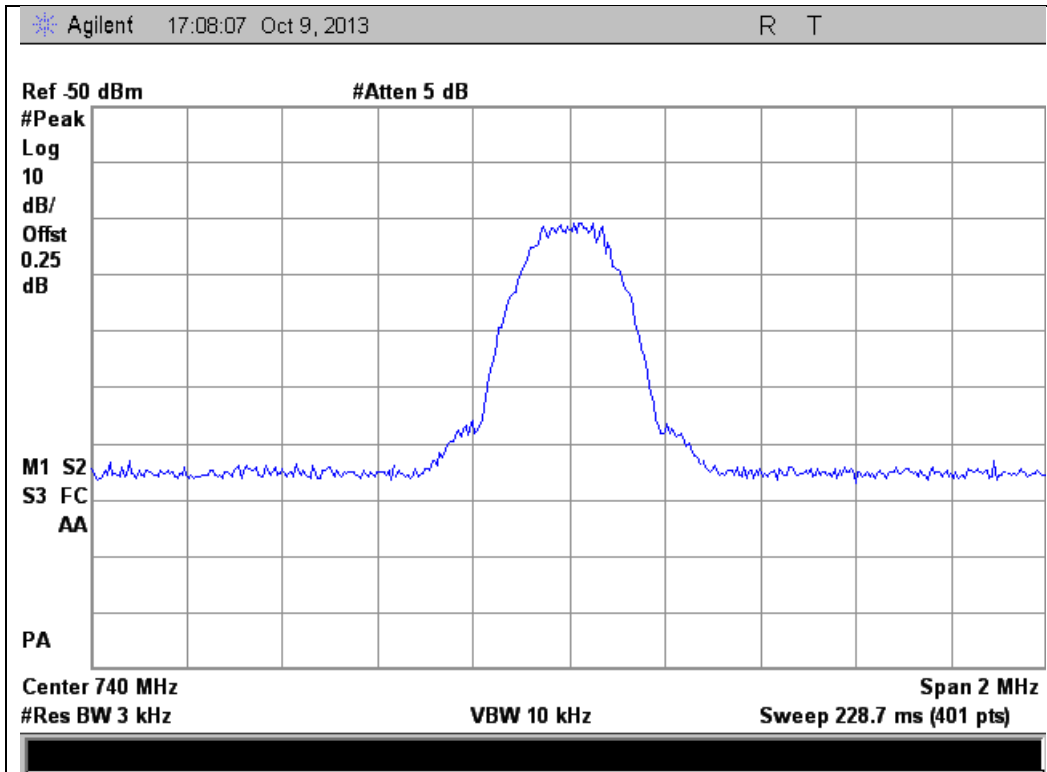




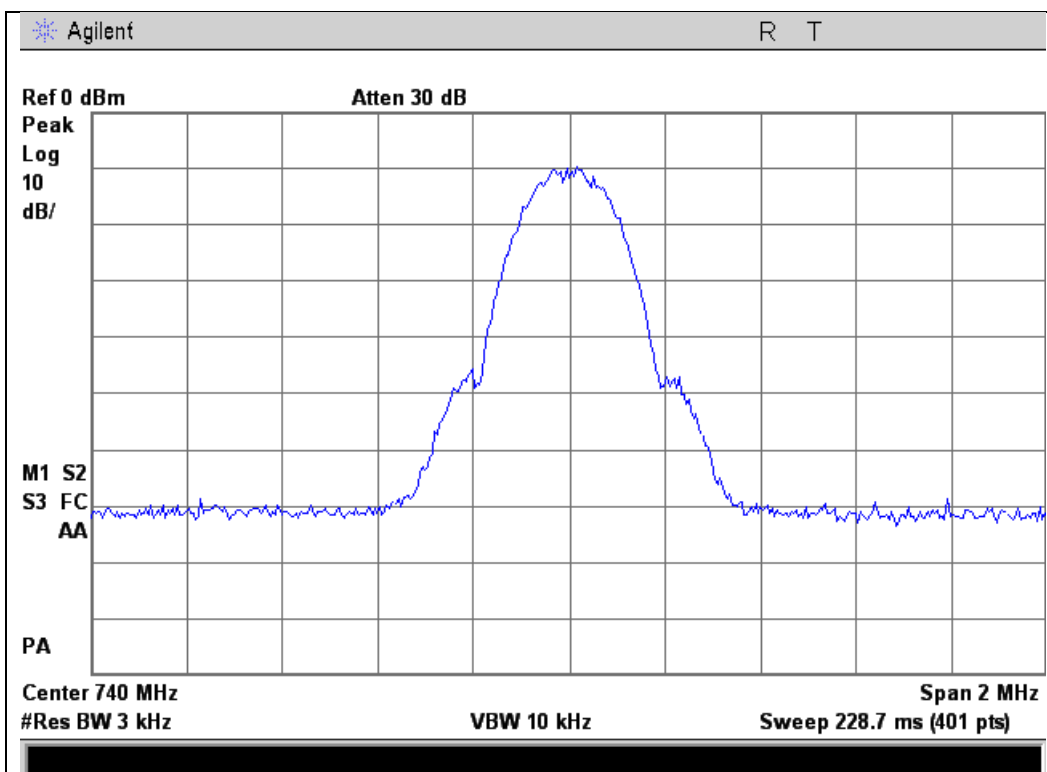
### GSM Downlink Test Plots

734 - 746 MHz Band

Input



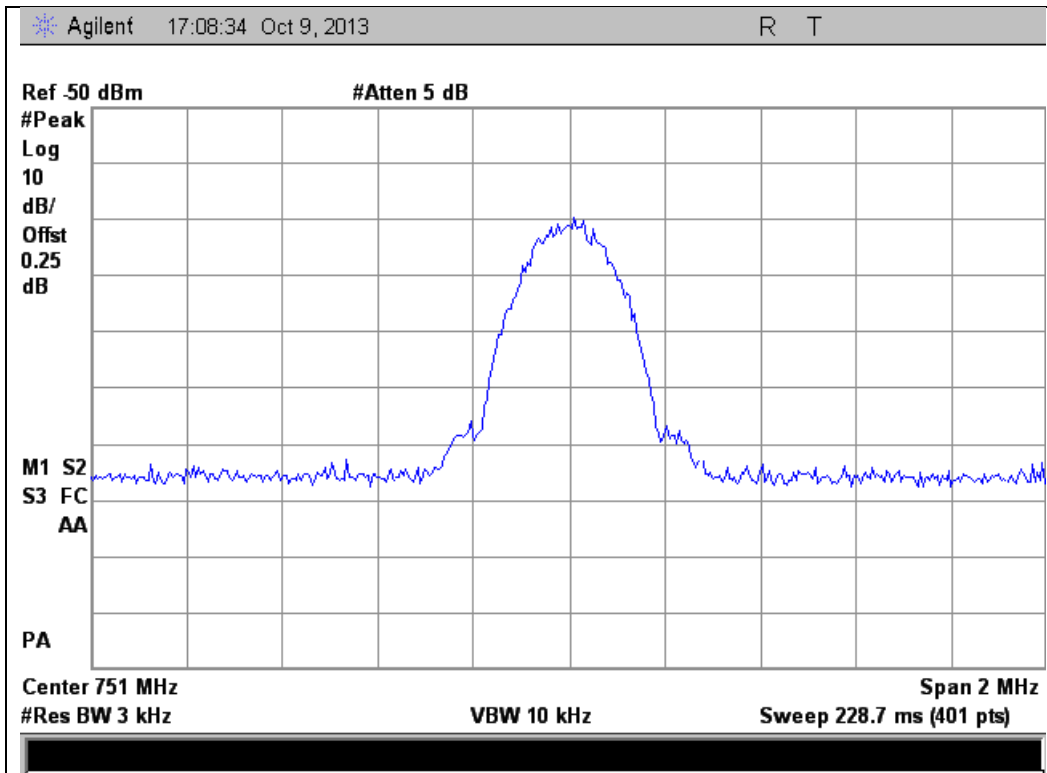
Output



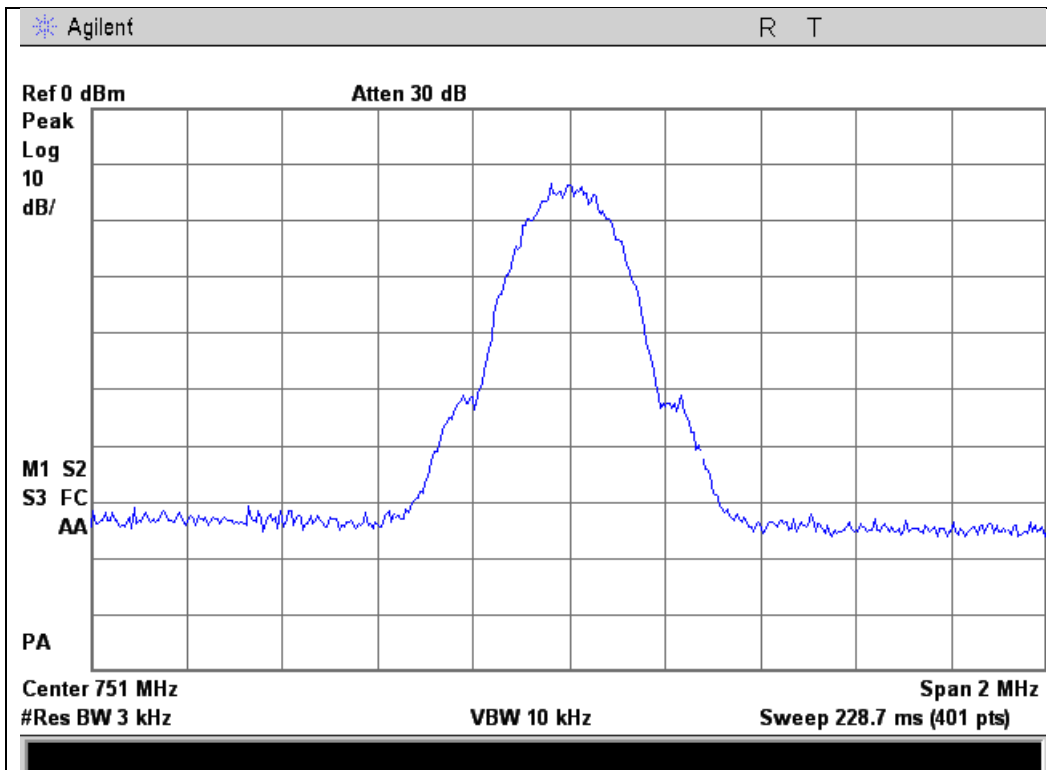


### 746 - 756 MHz Band

#### Input



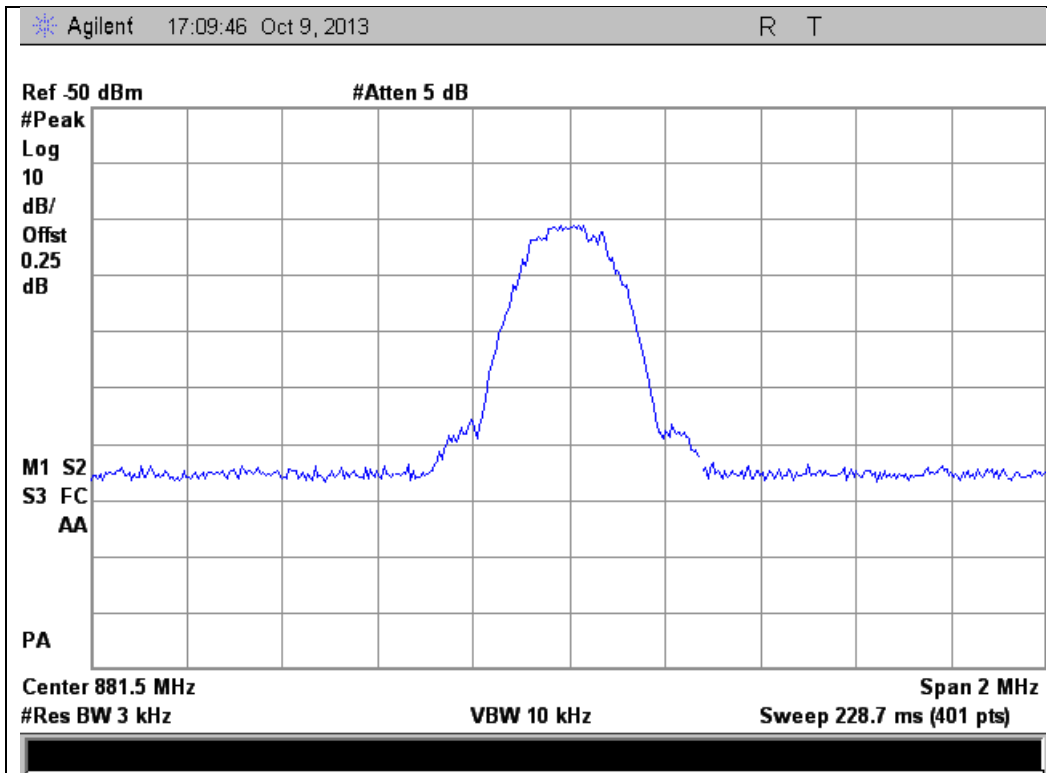
#### Output



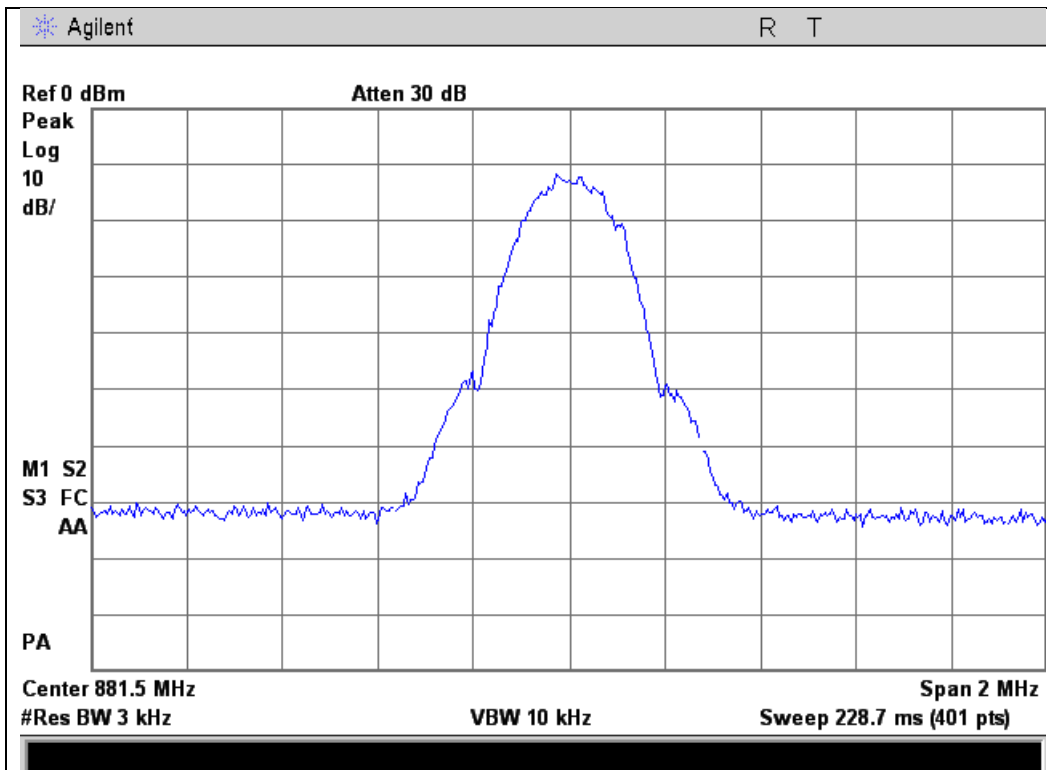


### 869 - 894 MHz Band

#### Input



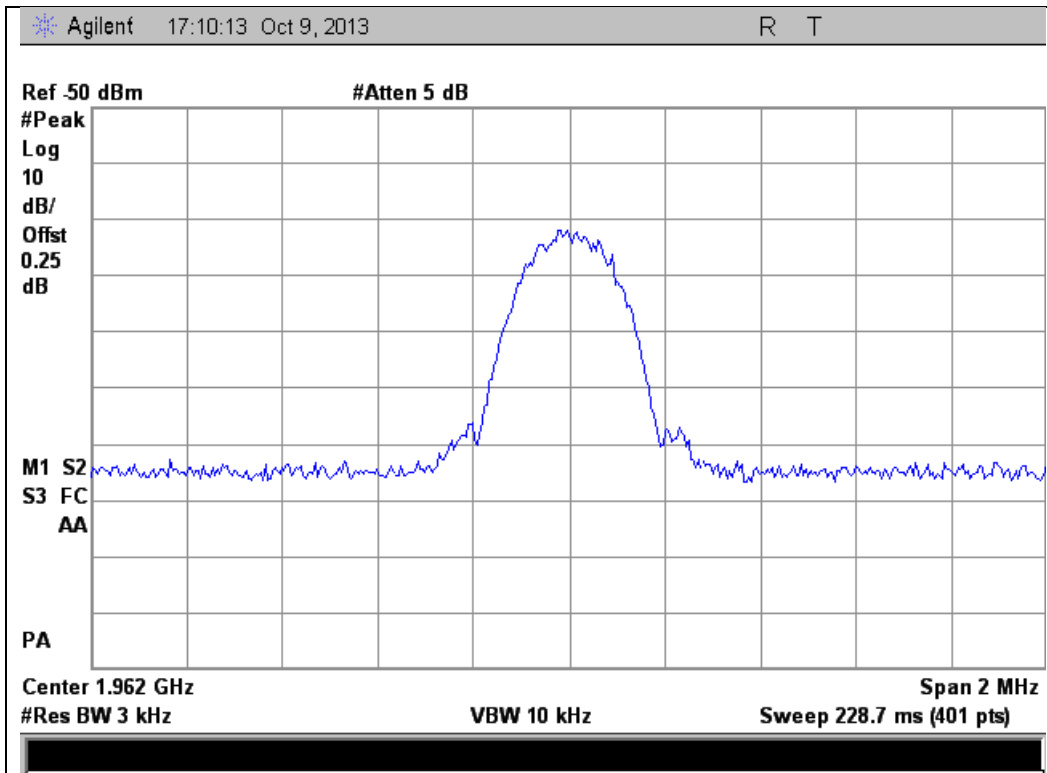
#### Output



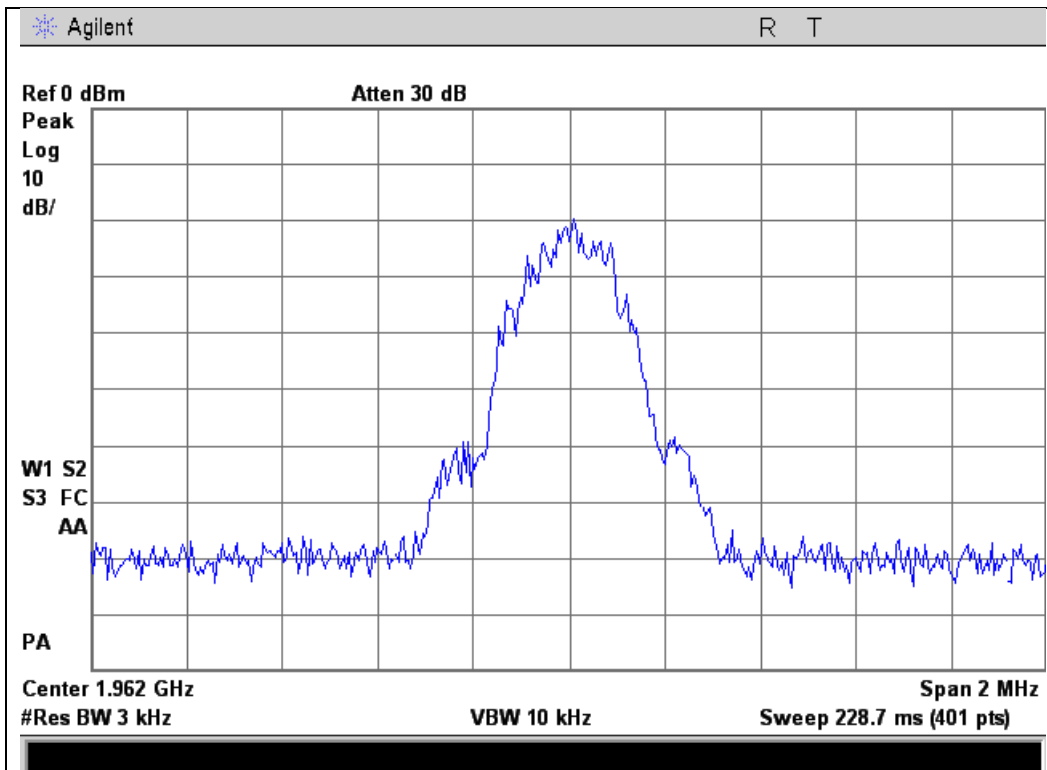


### 1930 - 1995 MHz Band

#### Input



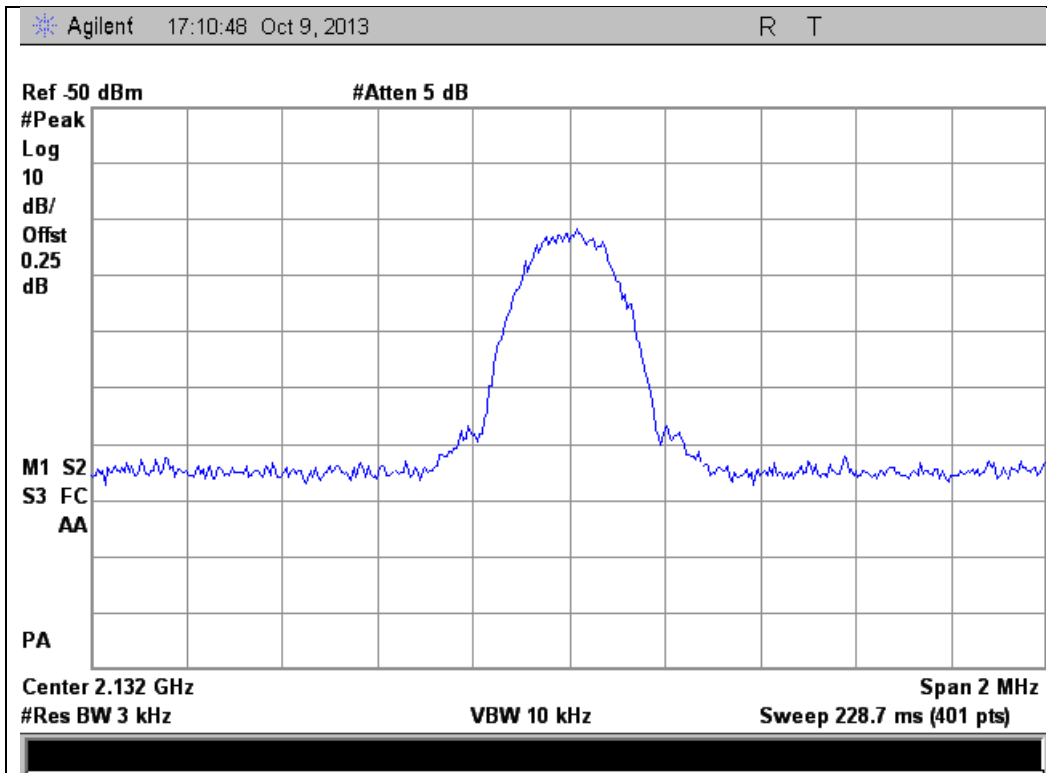
#### Output



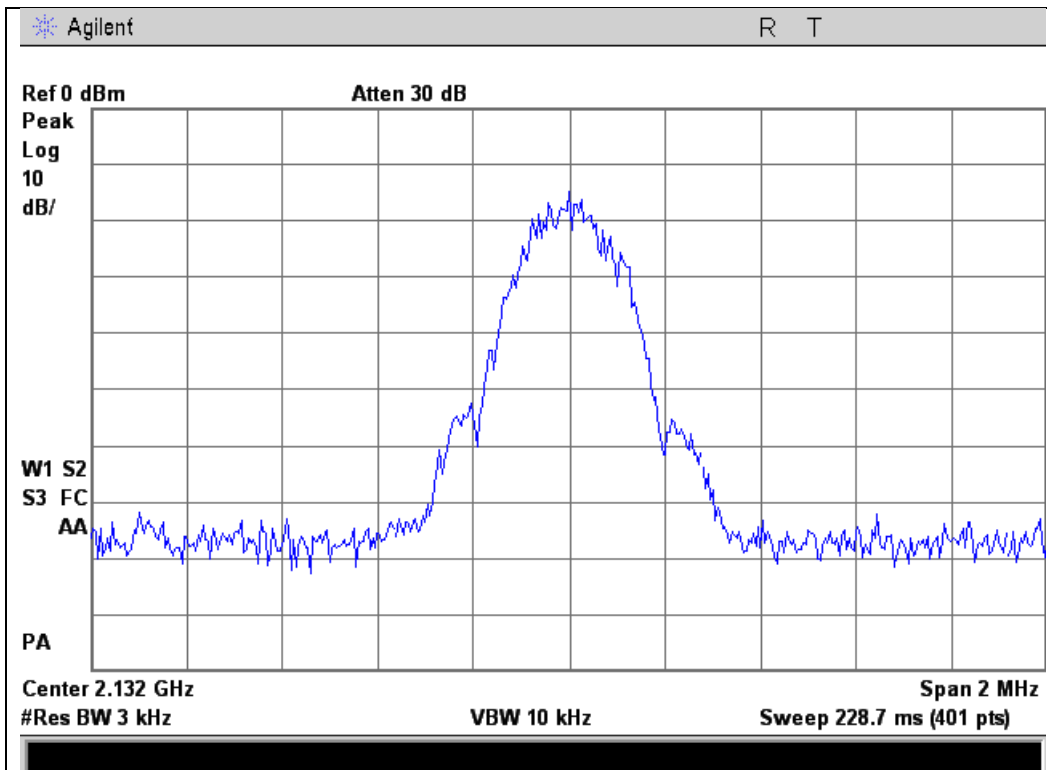


### 2110 - 2155 MHz Band

#### Input



#### Output

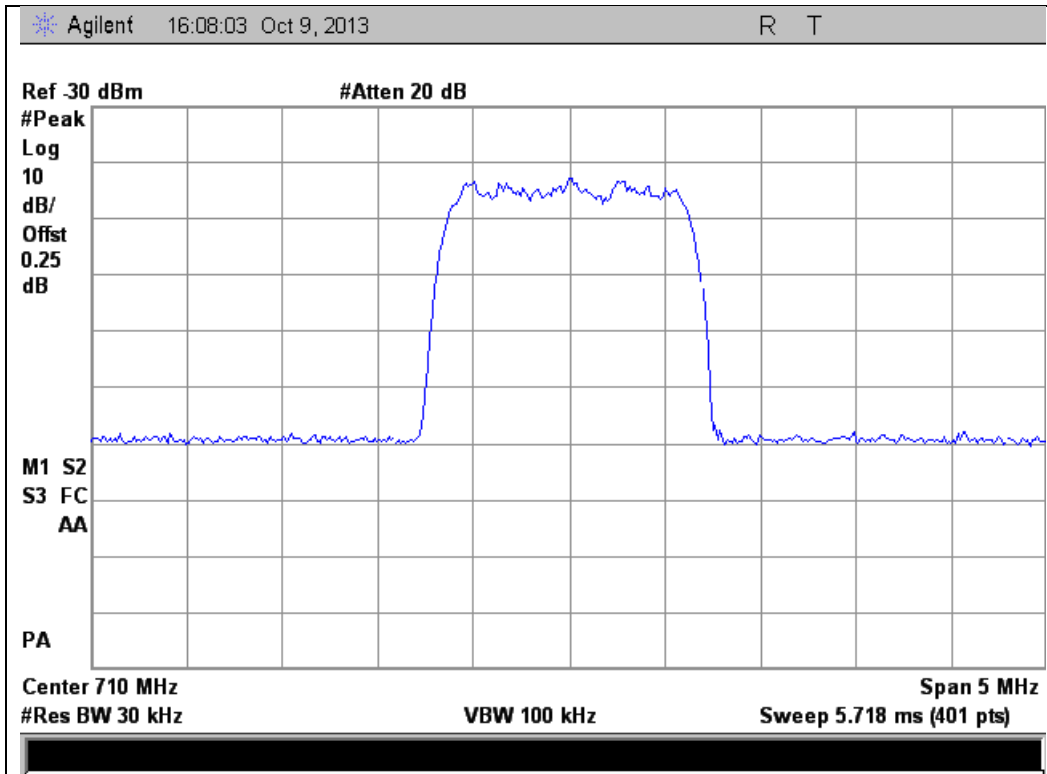




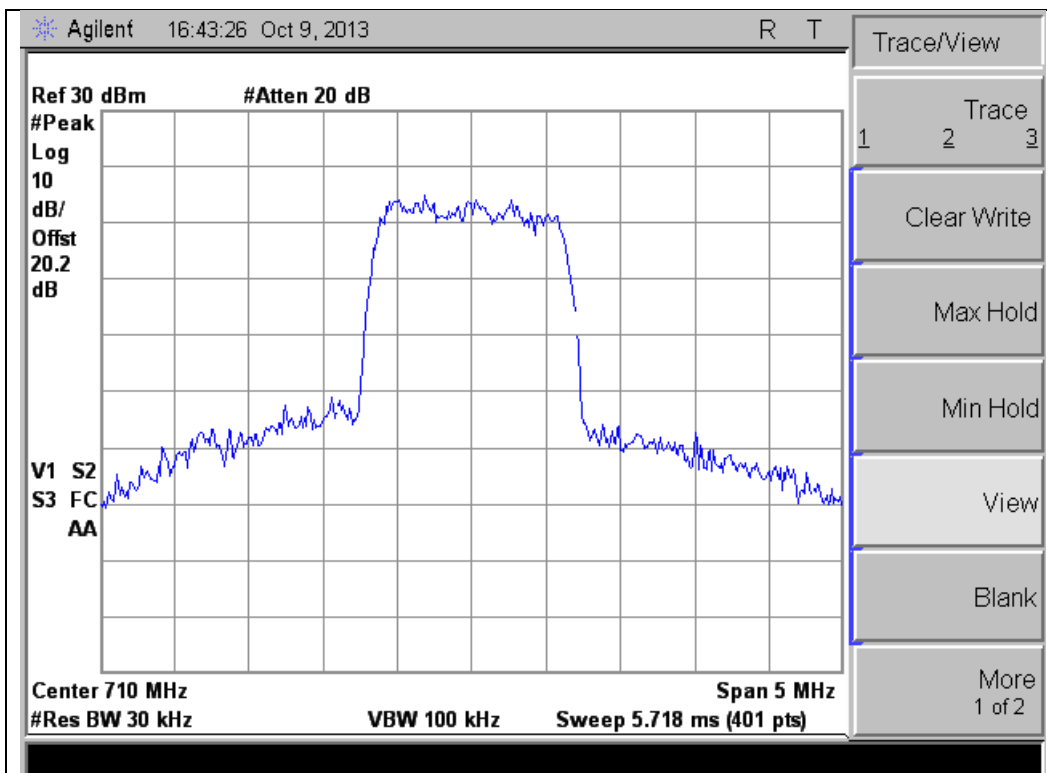
### CDMA Uplink Test Plots

704 - 716 MHz Band

Input



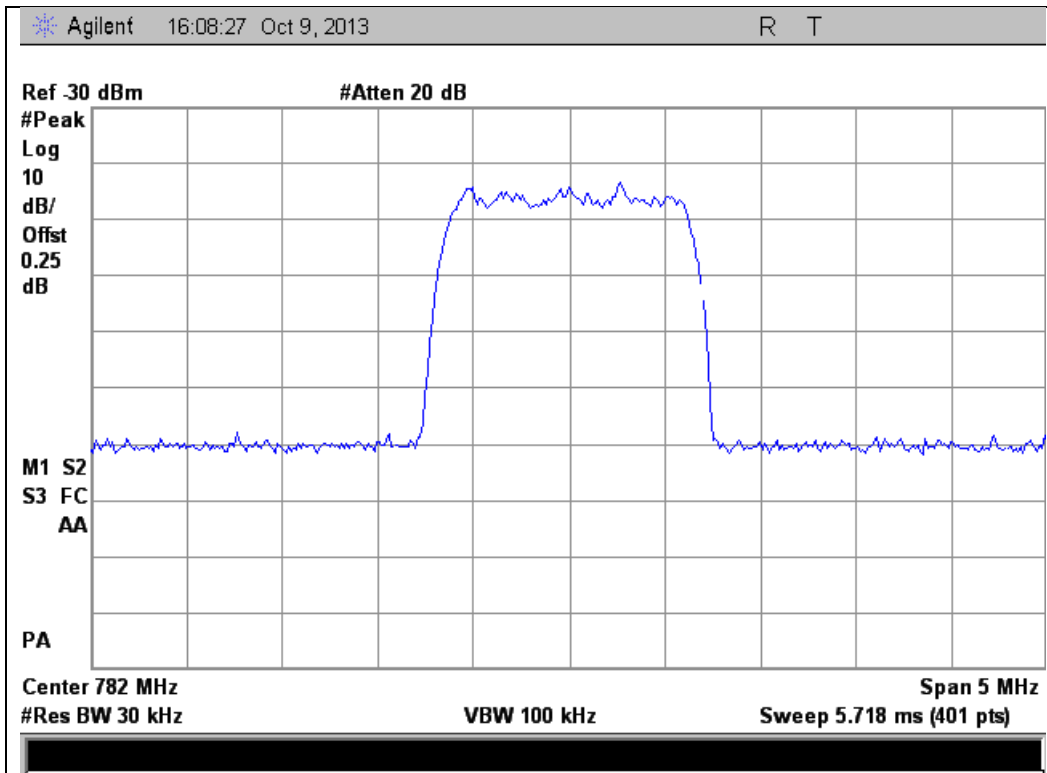
Output



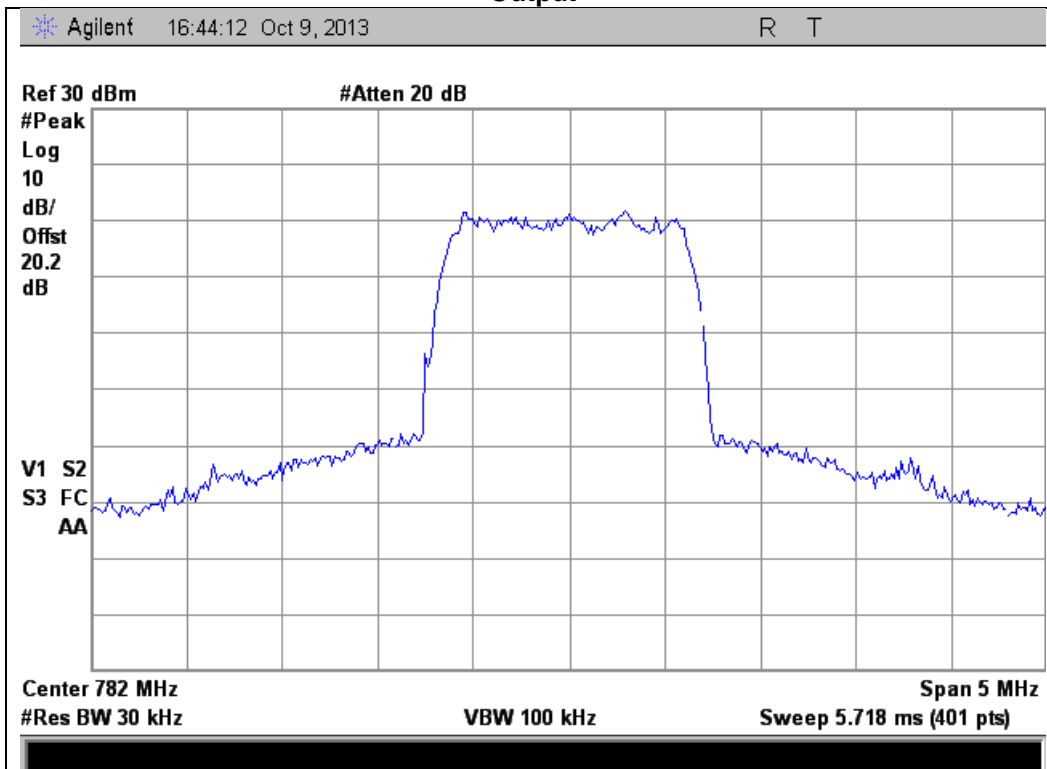


### 777 - 787 MHz Band

#### Input



#### Output

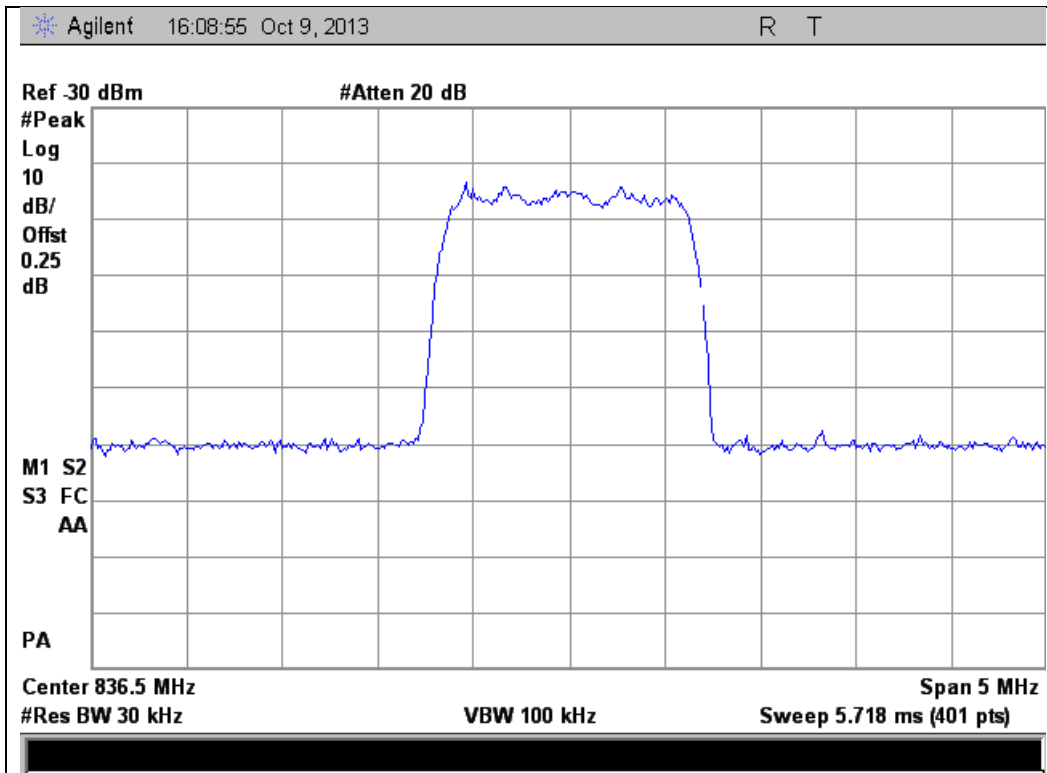




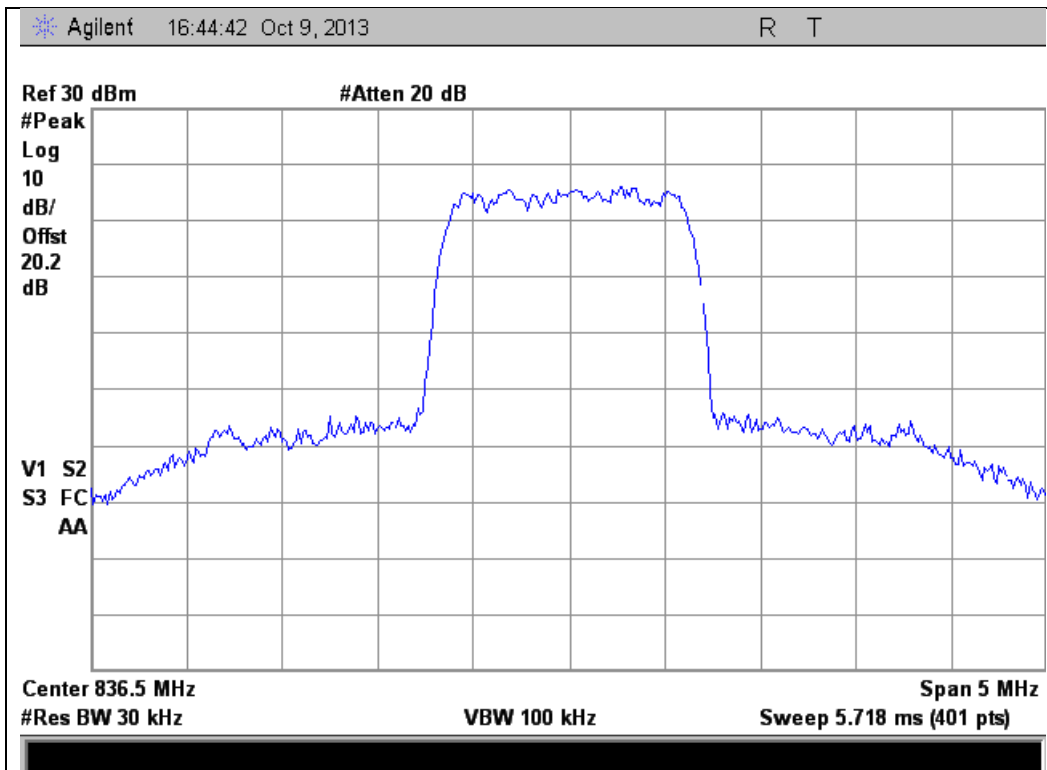


### 824 - 849 MHz Band

#### Input



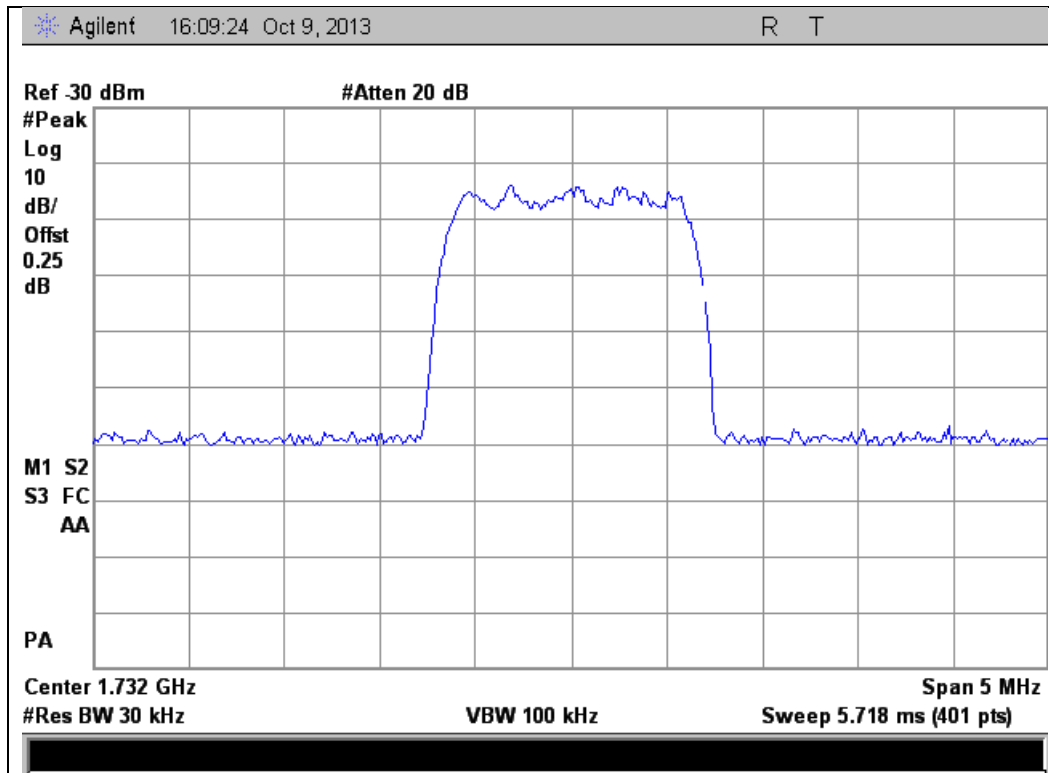
#### Output



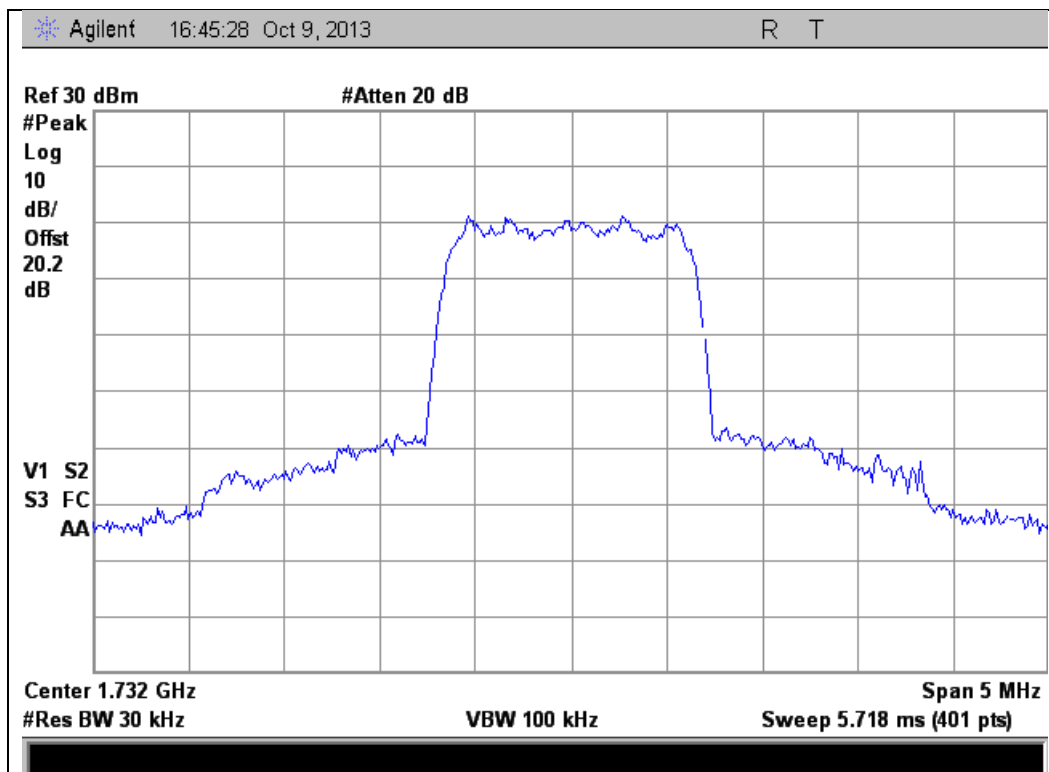


### 1710 - 1755 MHz Band

#### Input



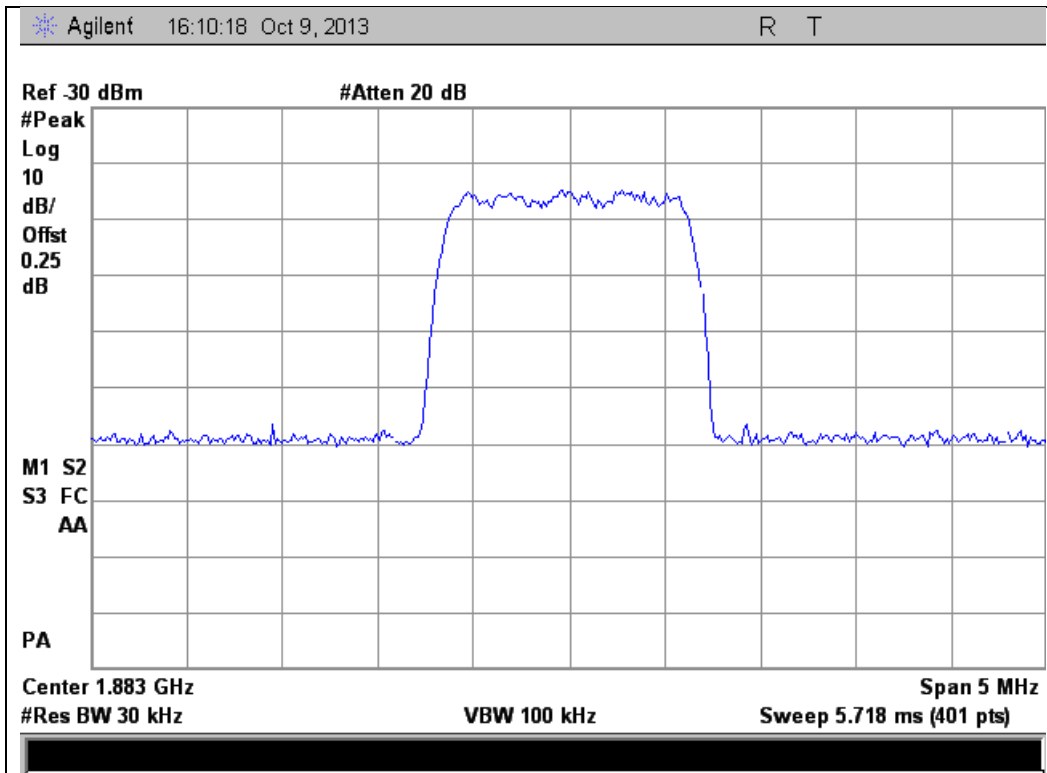
#### Output



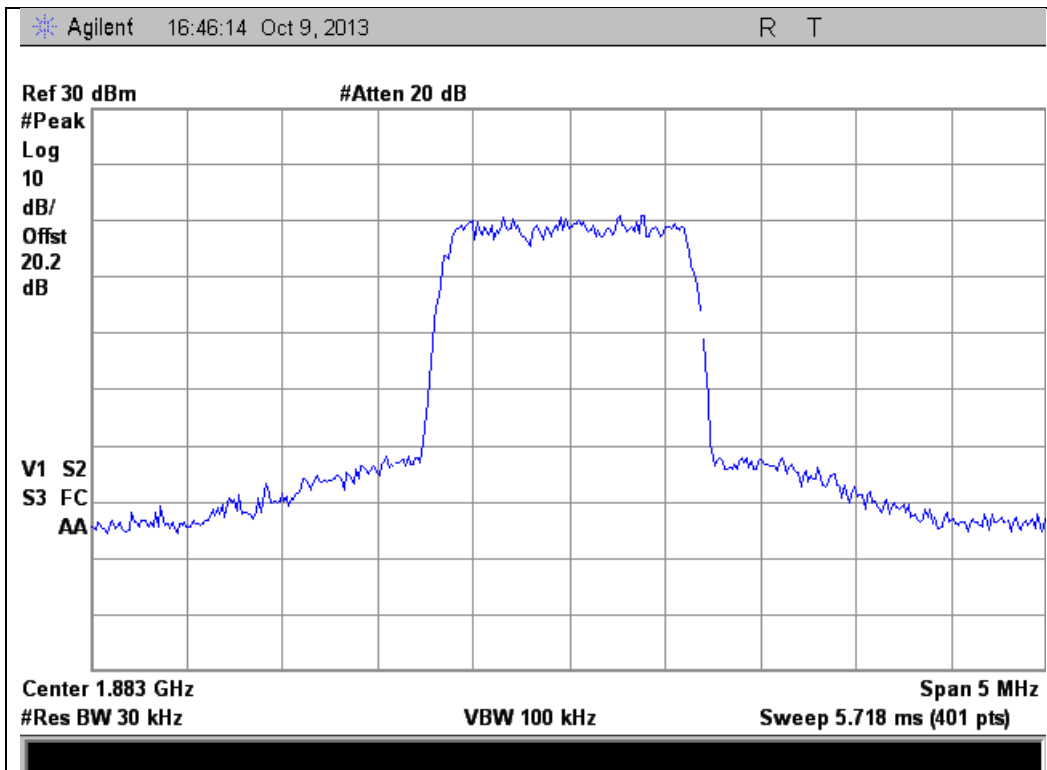


### 1850 - 1915 MHz Band

#### Input



#### Output

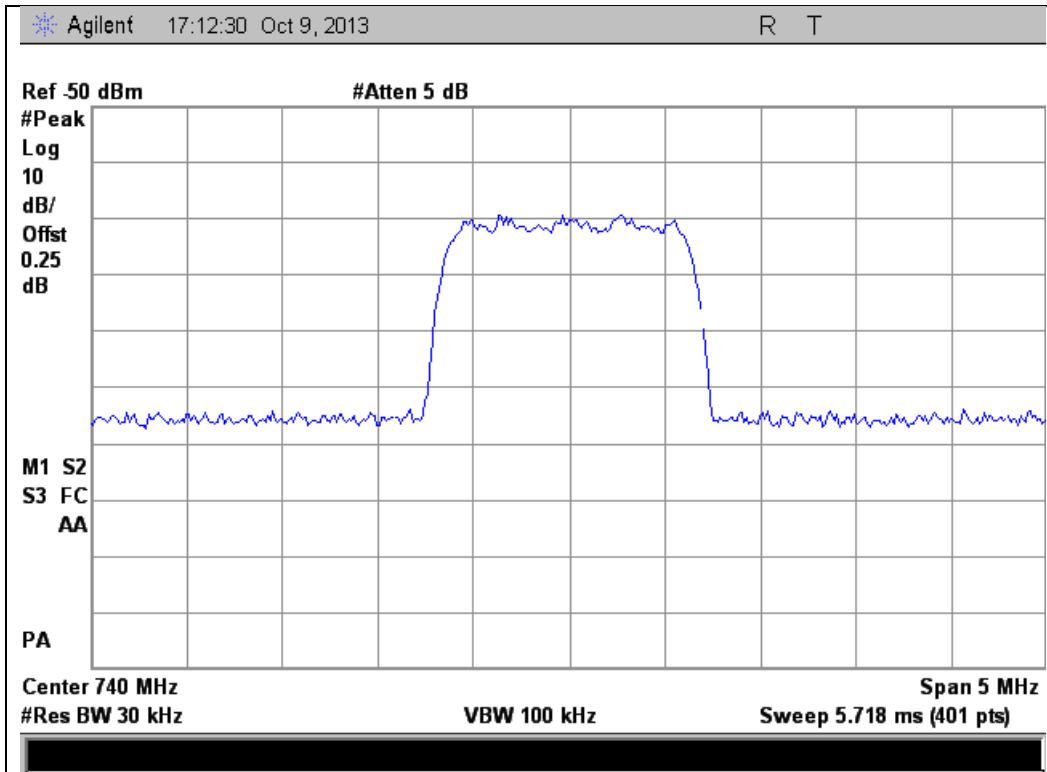




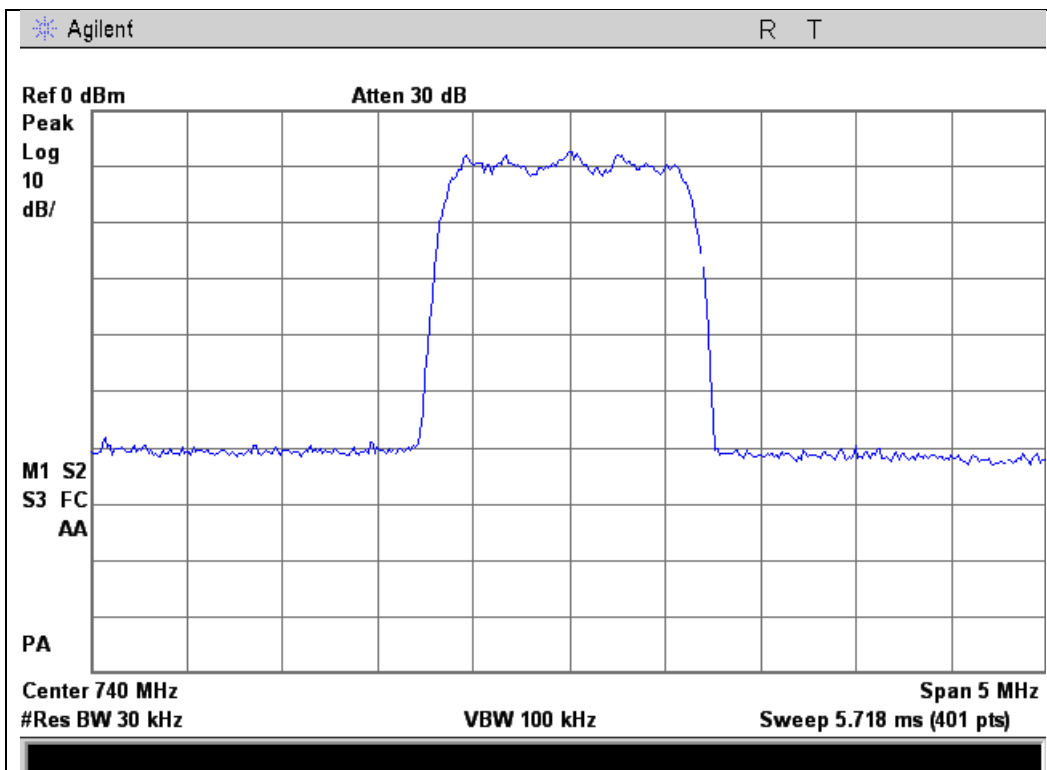
### CDMA Downlink Test Plots

734 - 746 MHz Band

Input



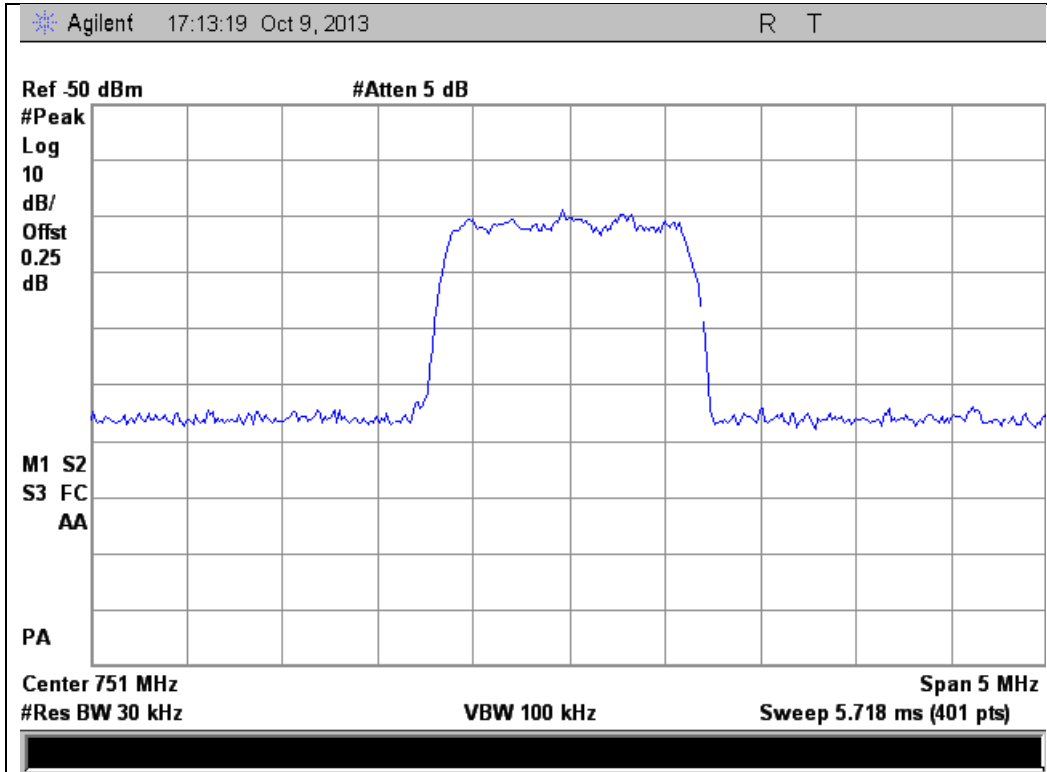
Output



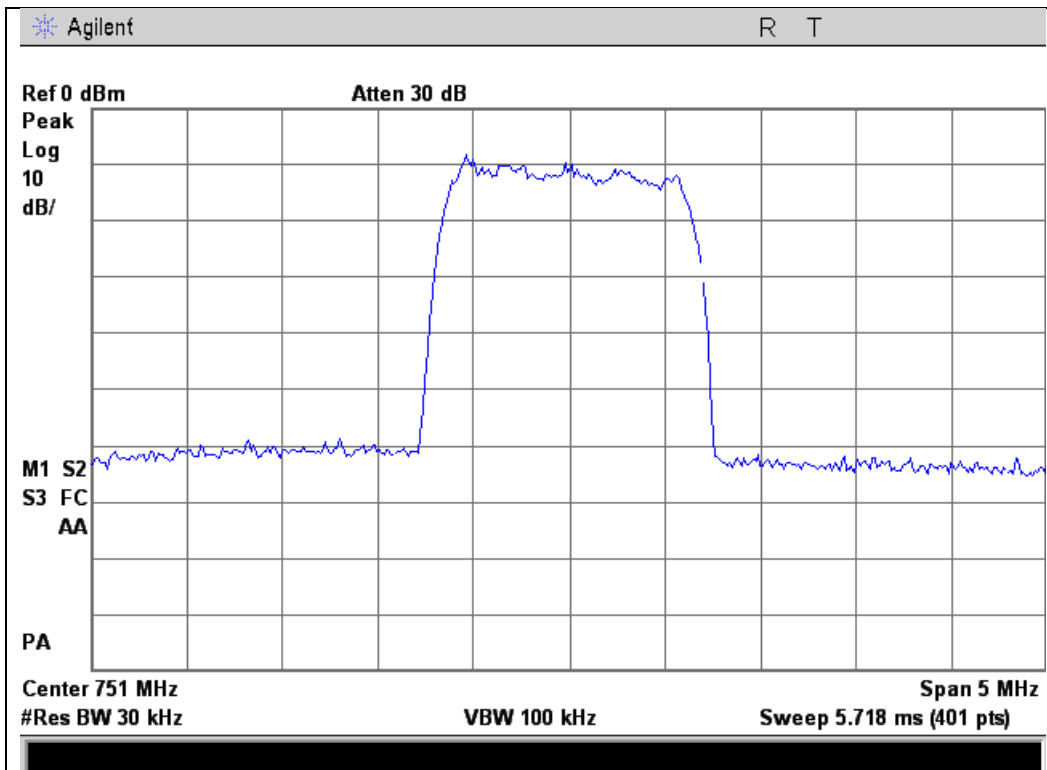


### 746 - 756 MHz Band

#### Input



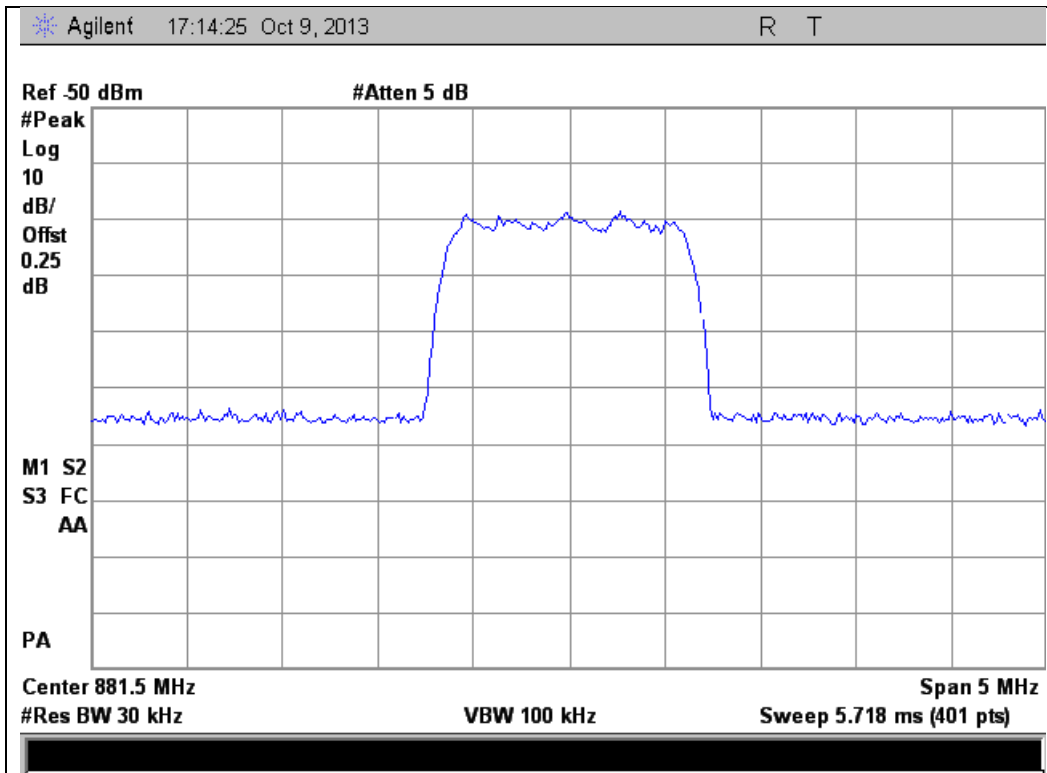
#### Output



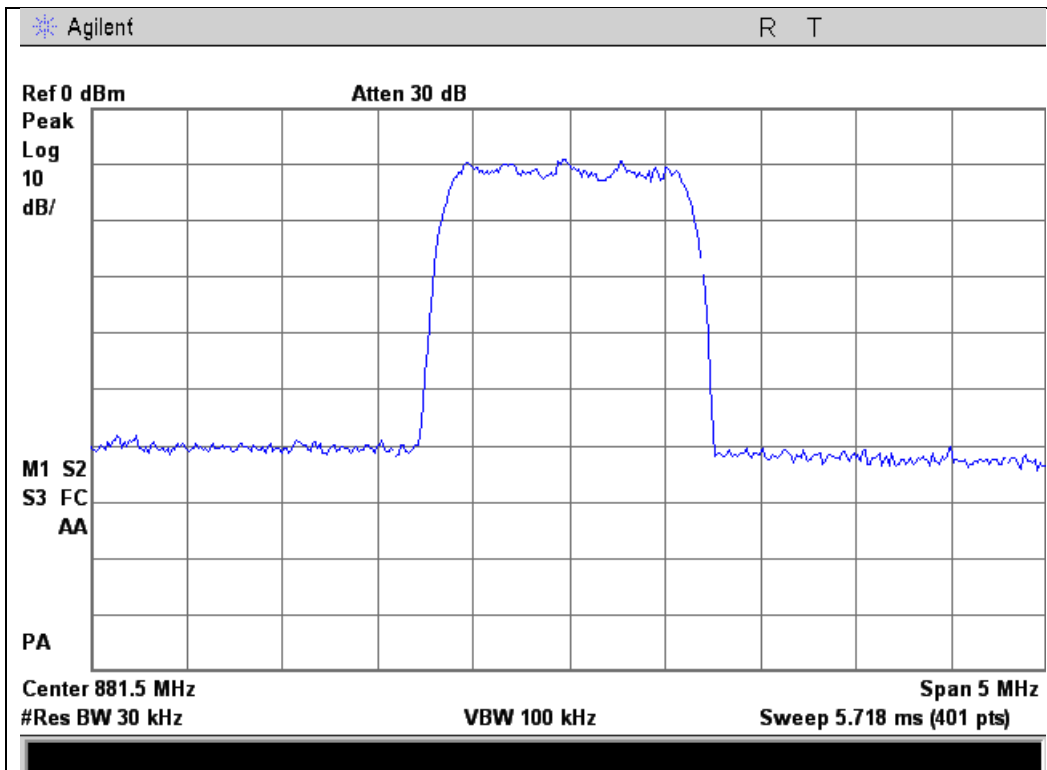


### 869 - 894 MHz Band

#### Input



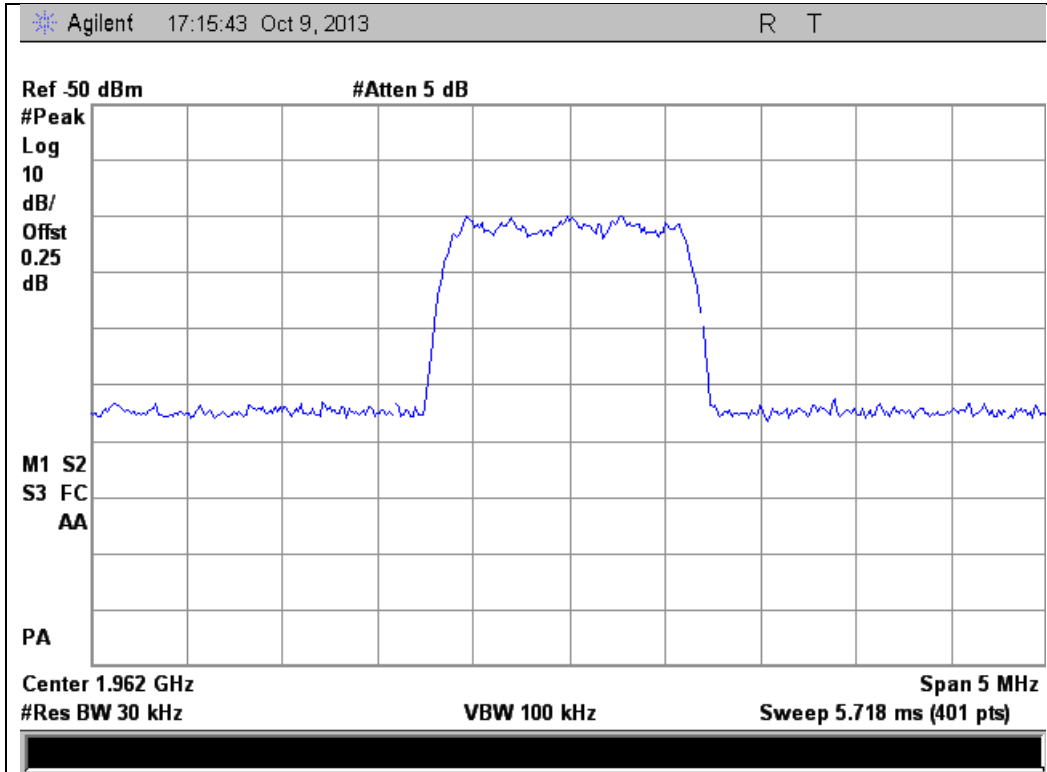
#### Output



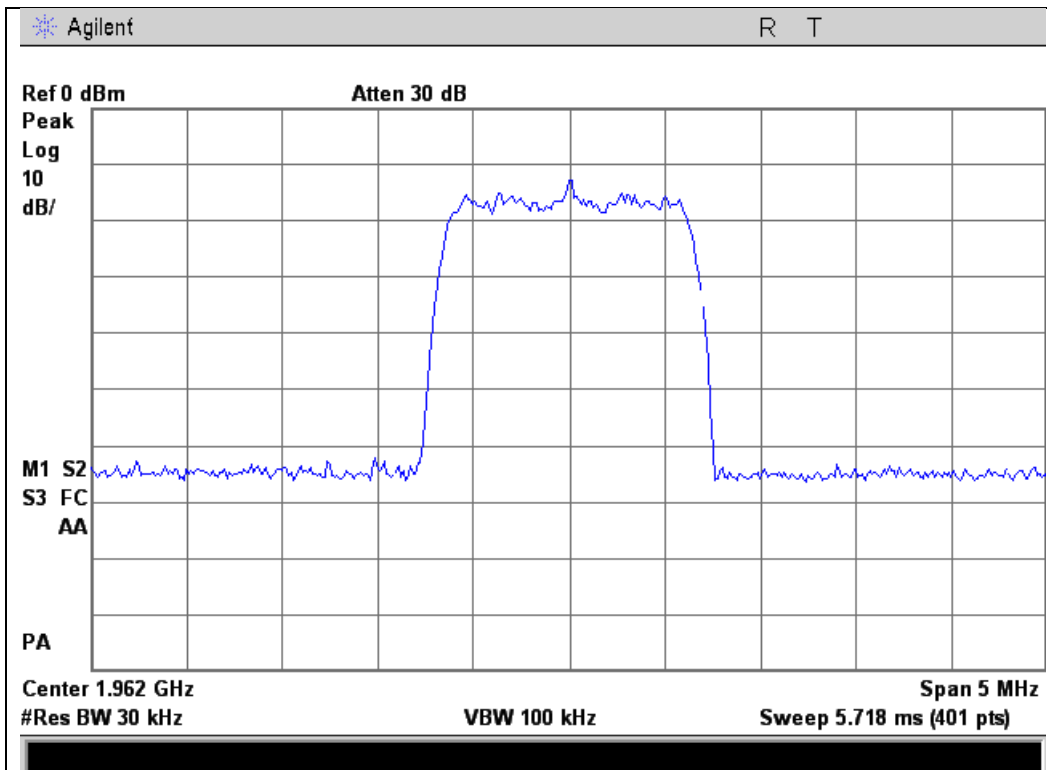


### 1930 - 1995 MHz Band

#### Input



#### Output





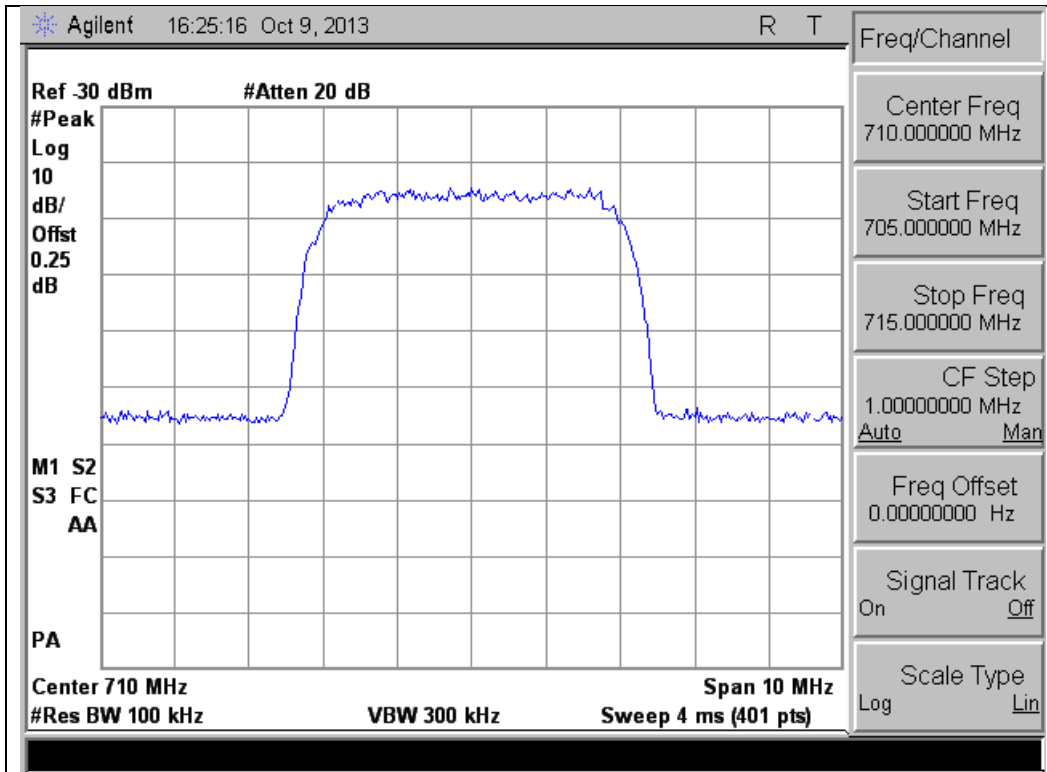




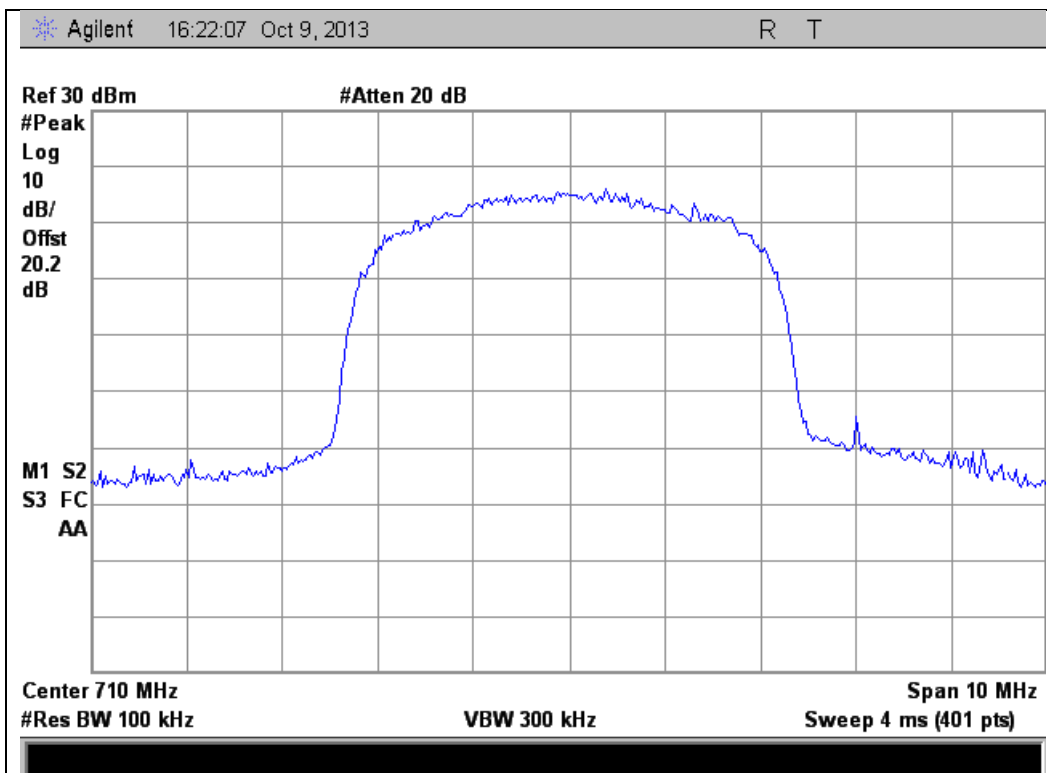
### WCDMA Uplink Test Plots

704 - 716 MHz Band

Input



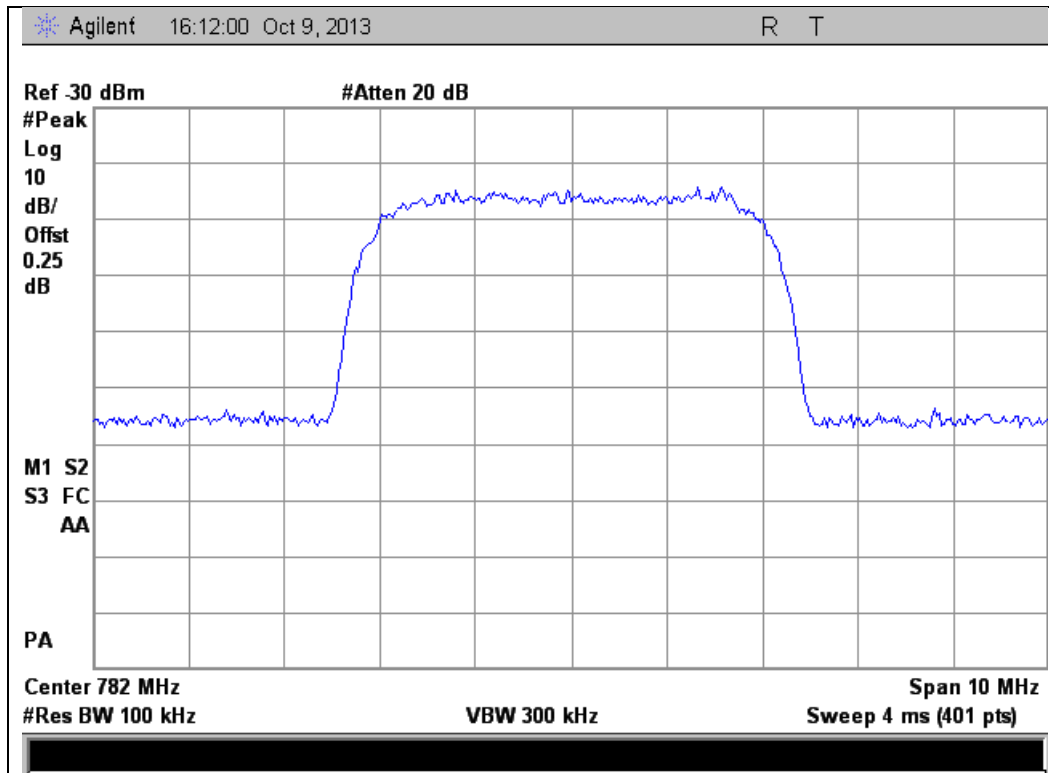
Output



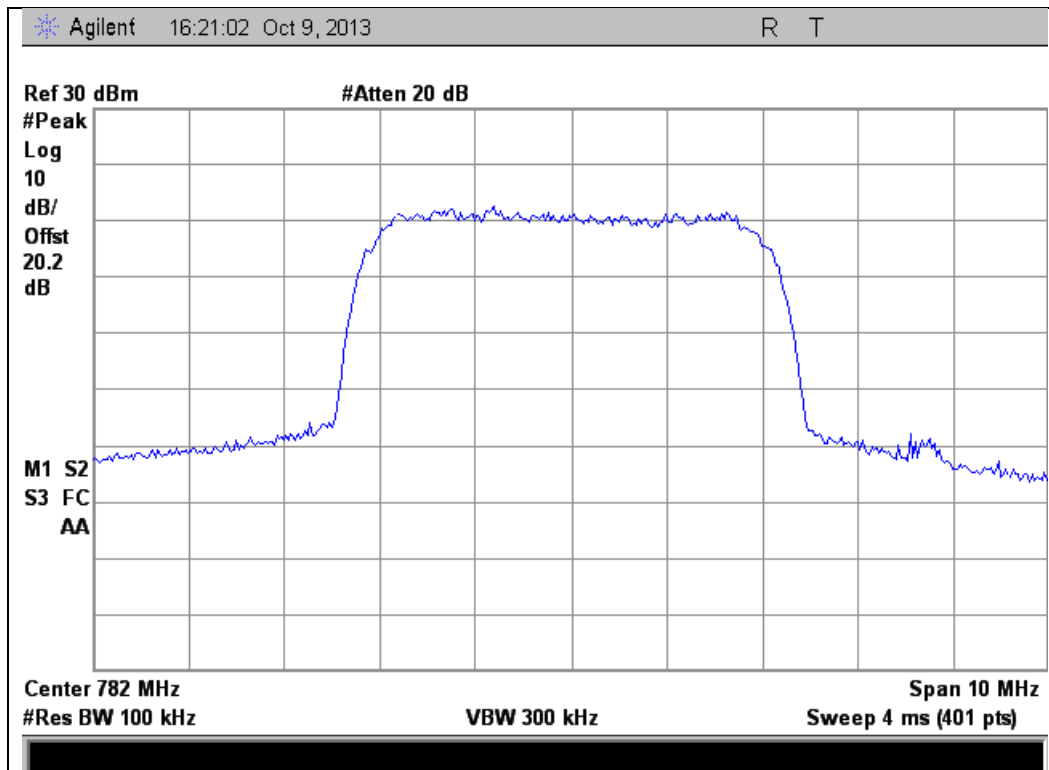


### 777 - 787 MHz Band

#### Input



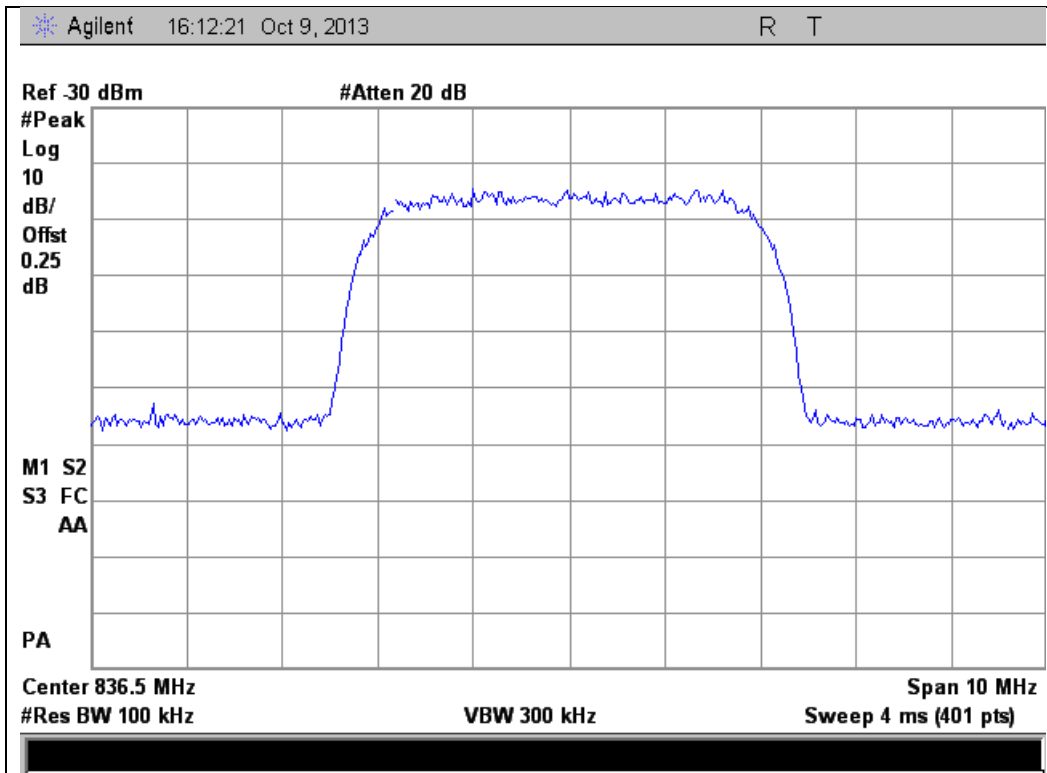
#### Output



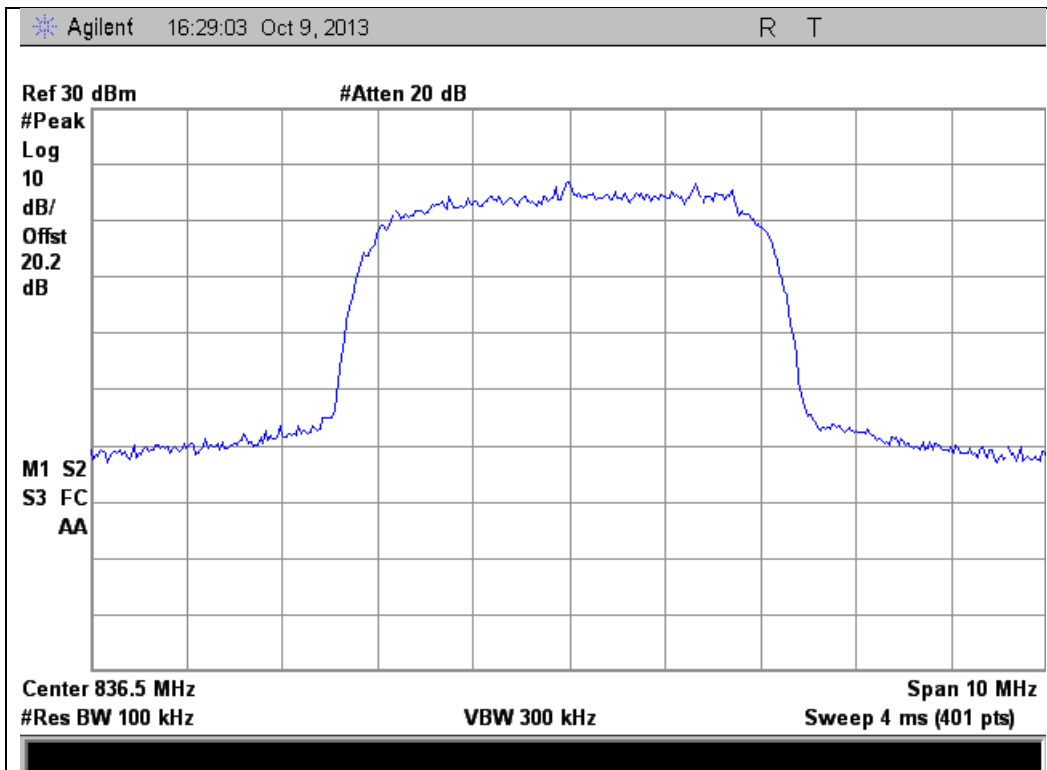


### 824 - 849 MHz Band

#### Input



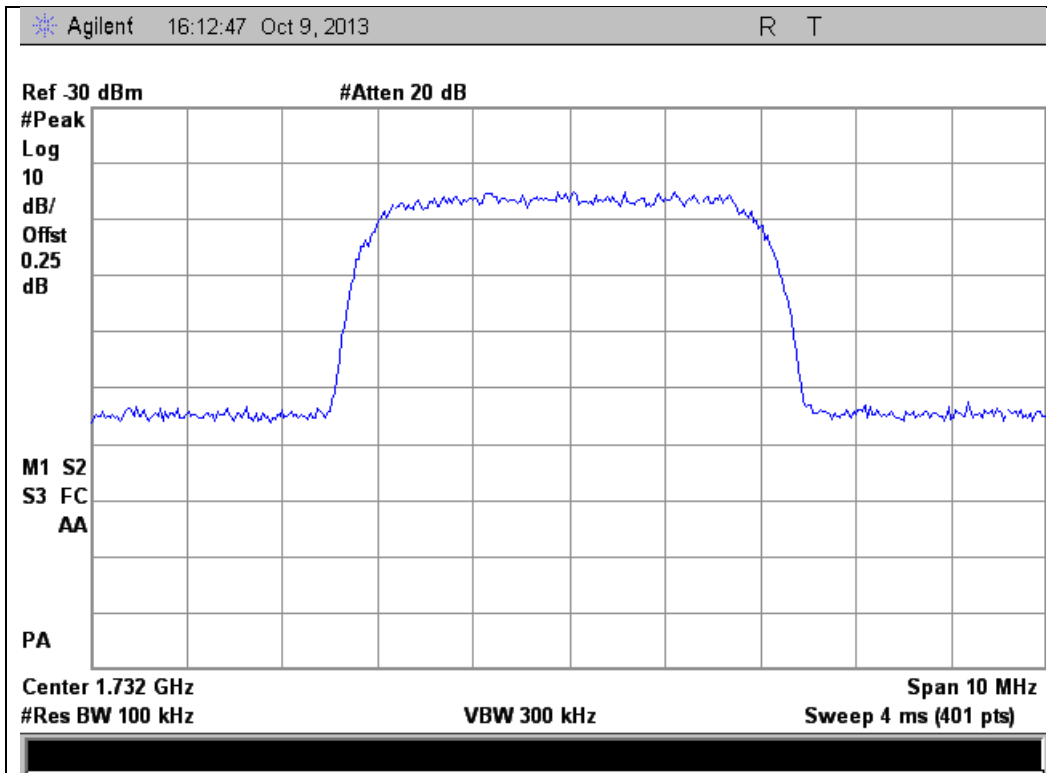
#### Output



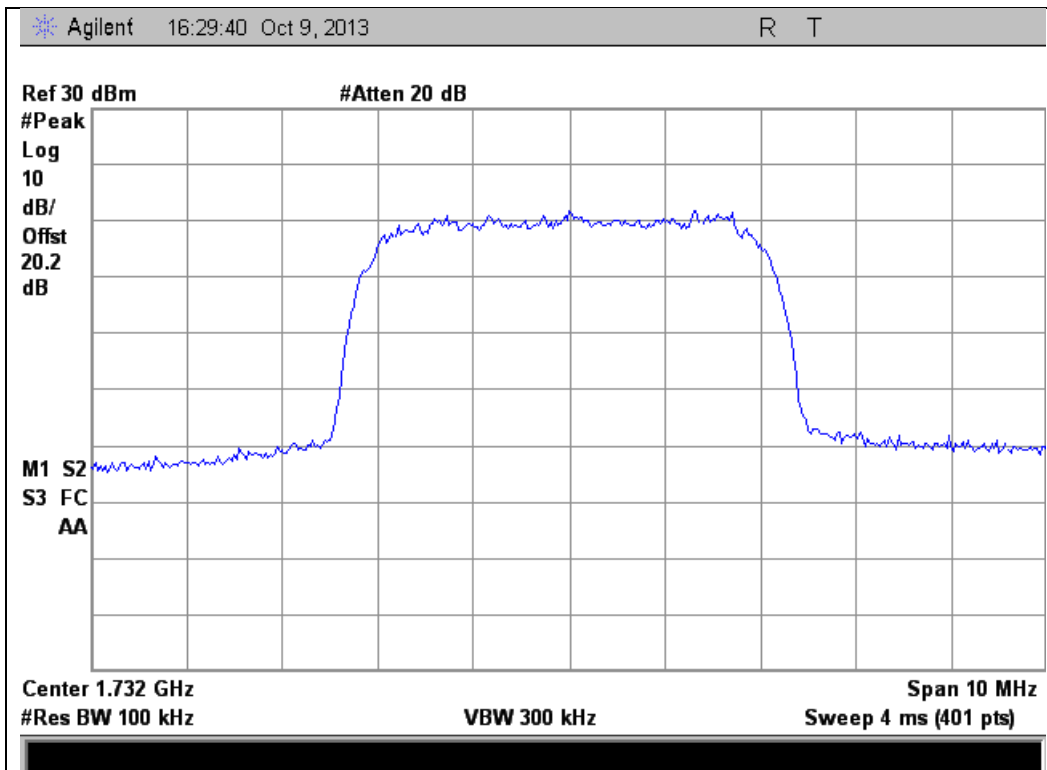


### 1710 - 1755 MHz Band

#### Input



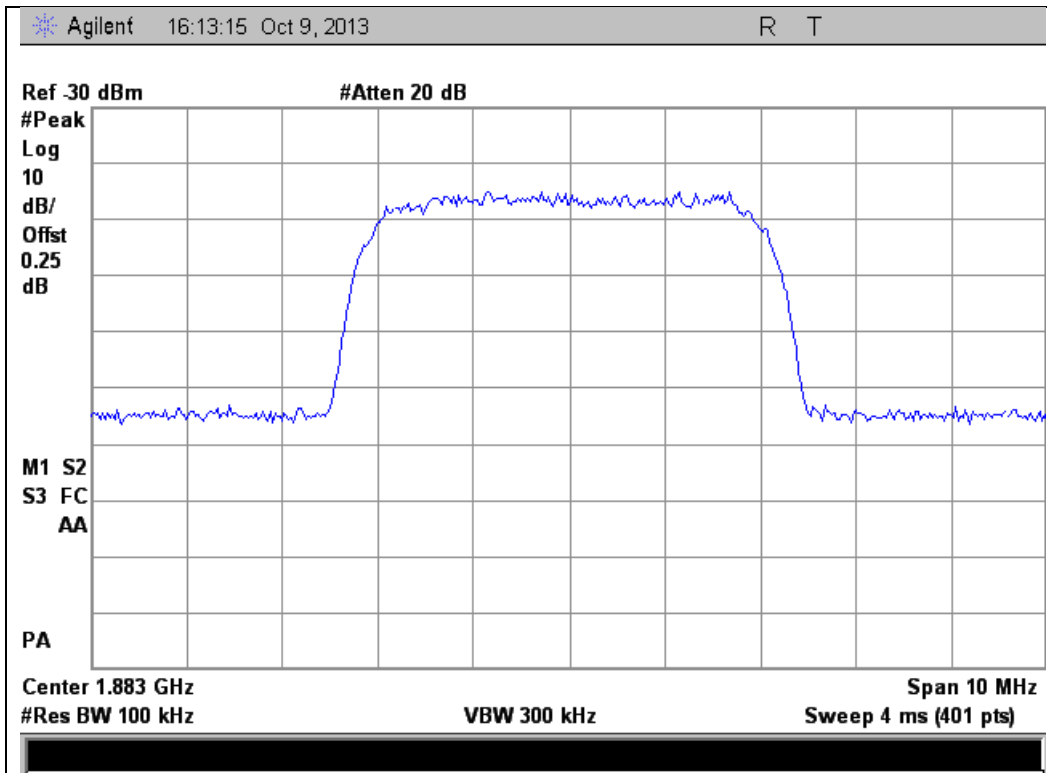
#### Output



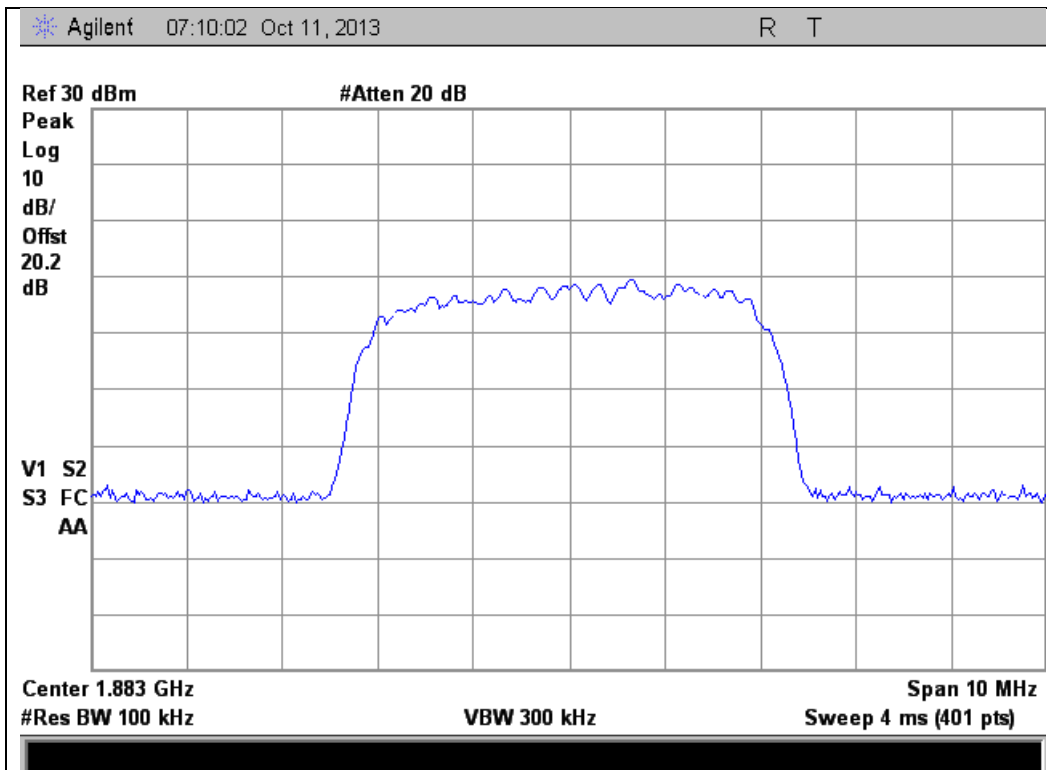


### 1850 - 1915 MHz Band

#### Input



#### Output

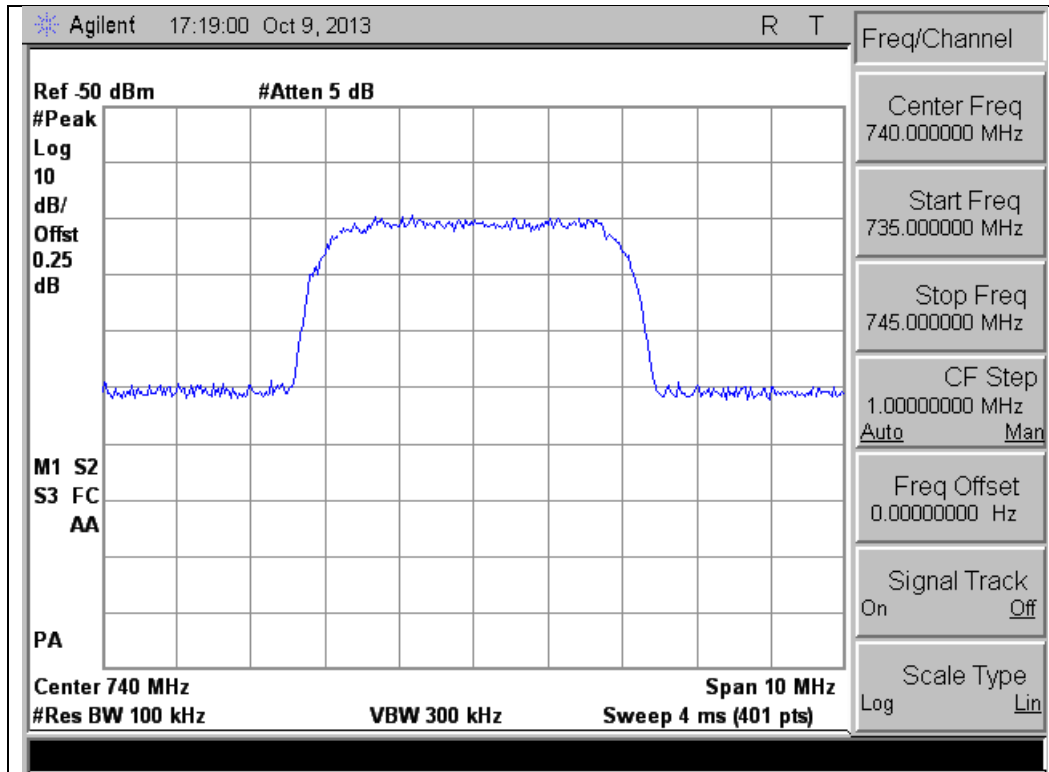




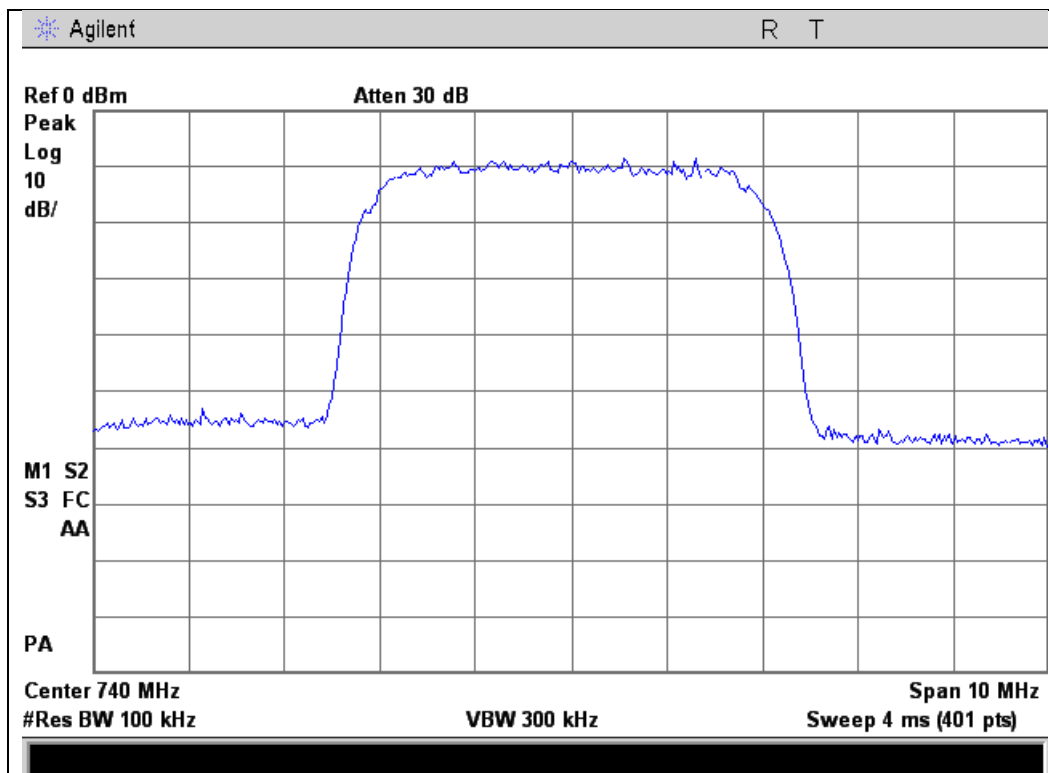
### WCDMA Downlink Test Plots

734 - 746 MHz Band

Input



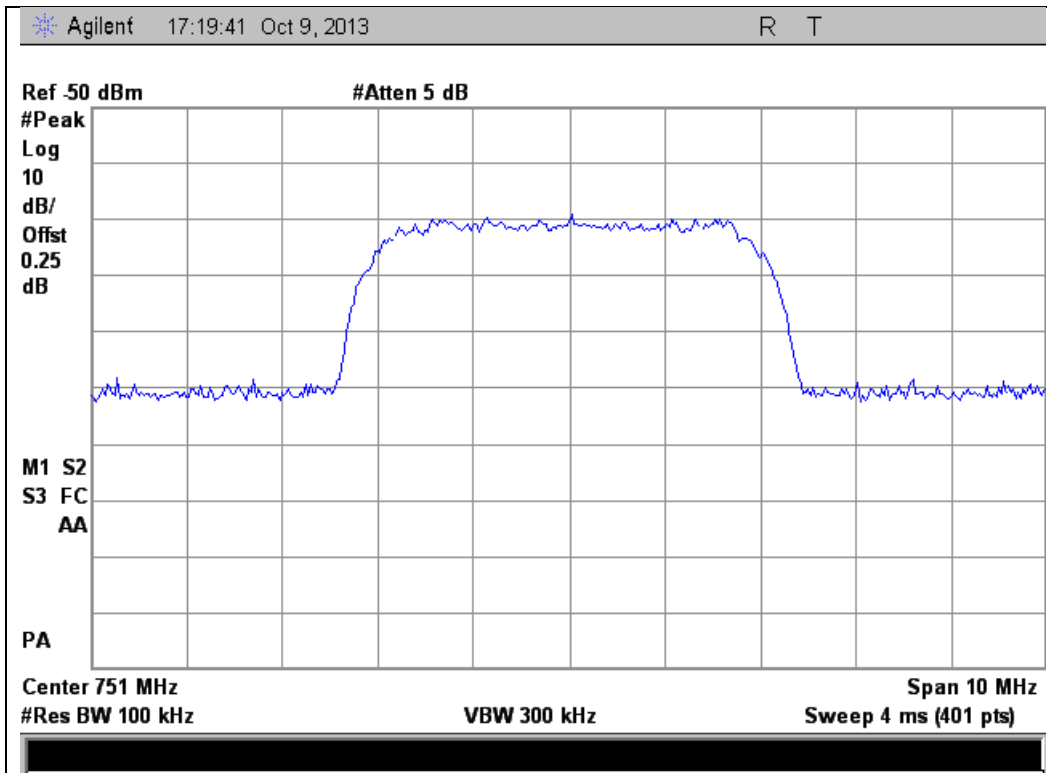
Output



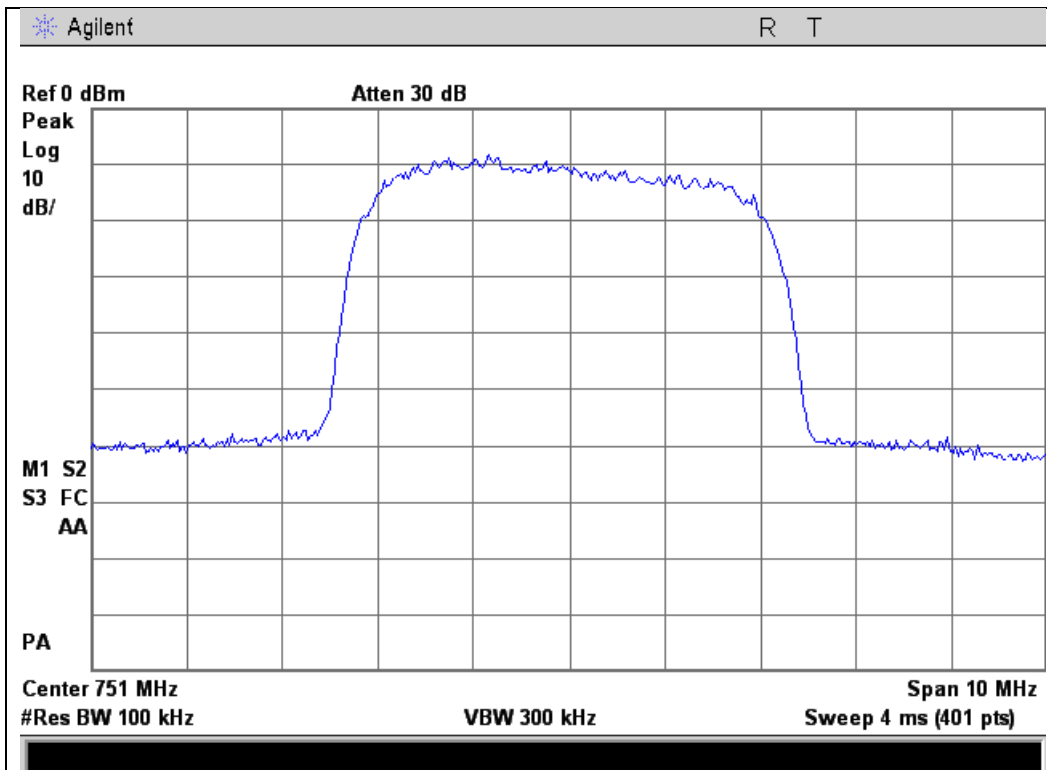


### 746 - 756 MHz Band

#### Input



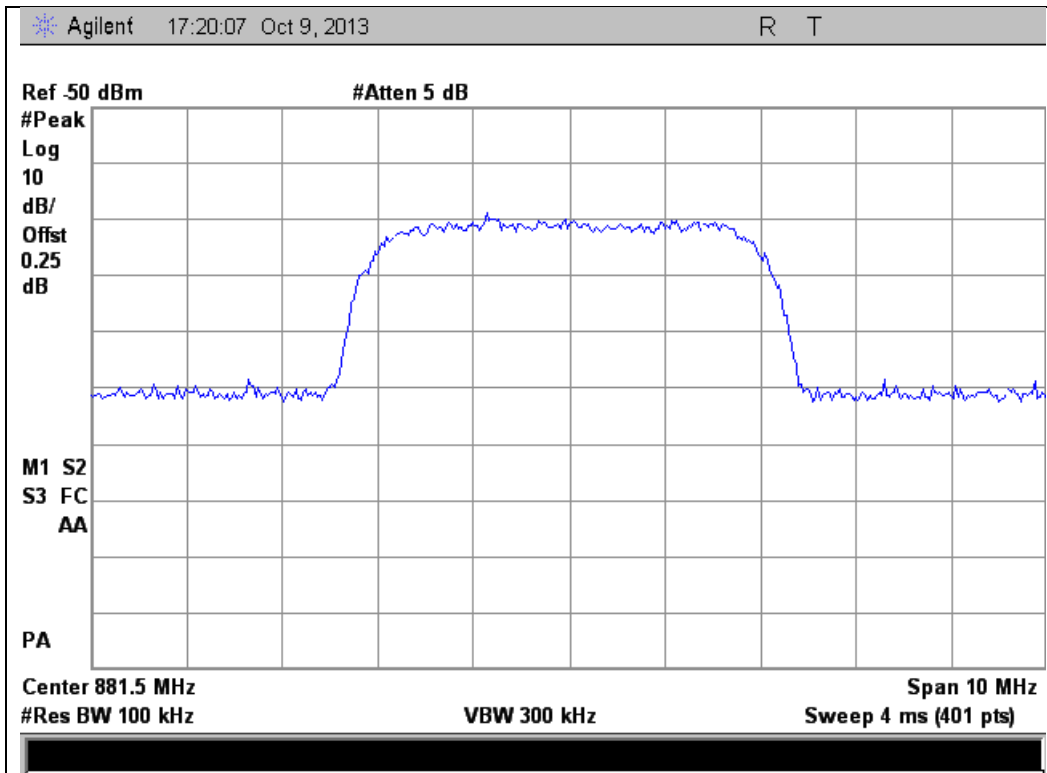
#### Output



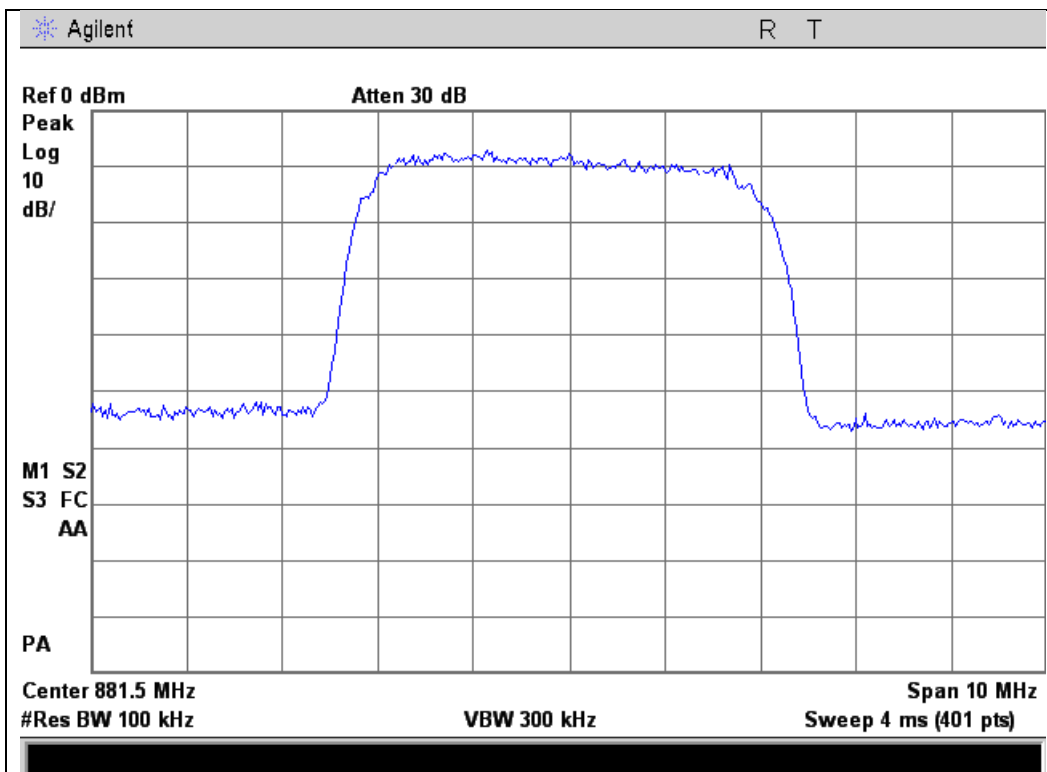


### 869 - 894 MHz Band

### Input



### Output

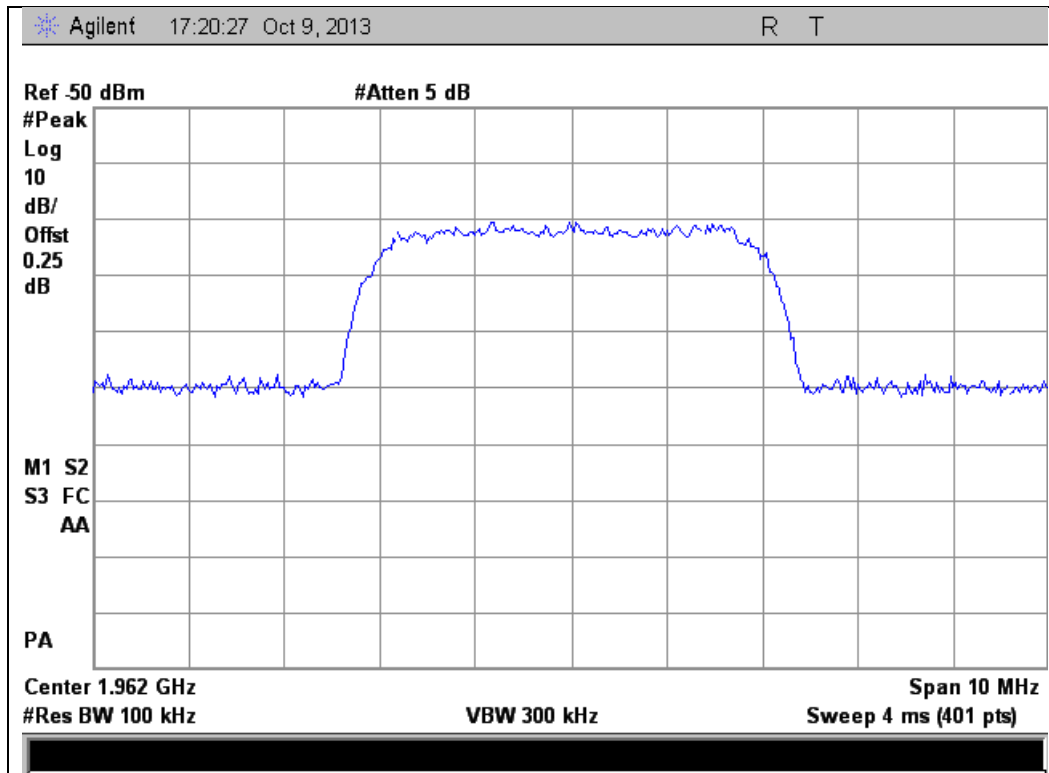




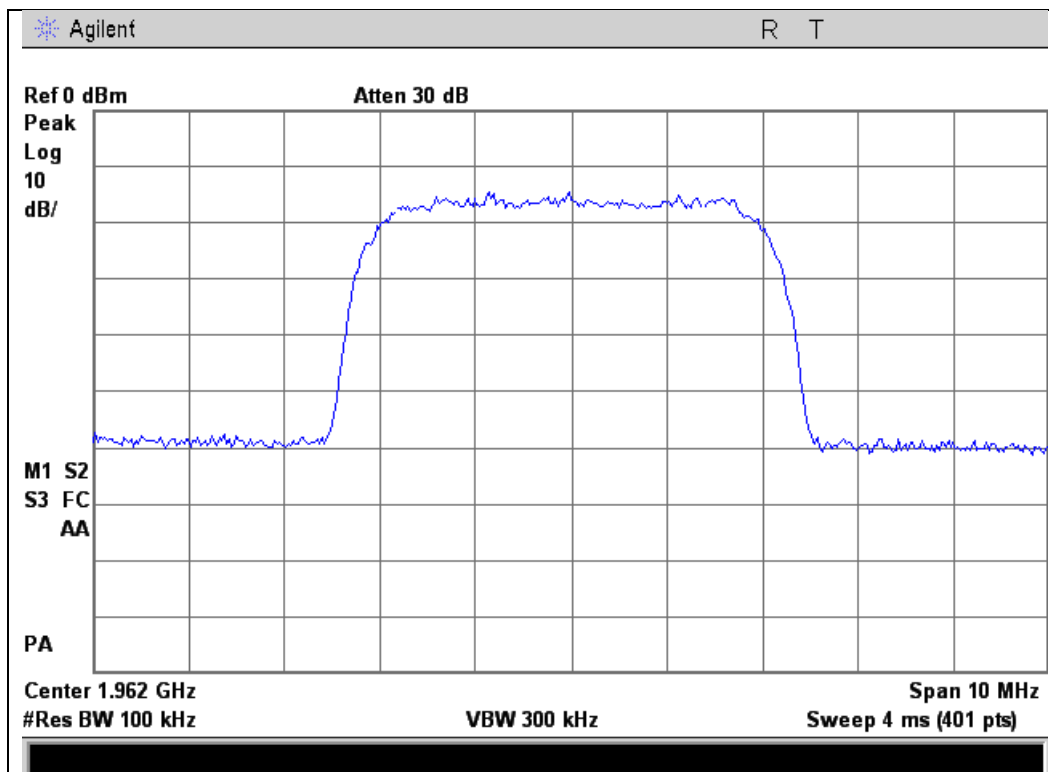


### 1930 - 1995 MHz Band

#### Input



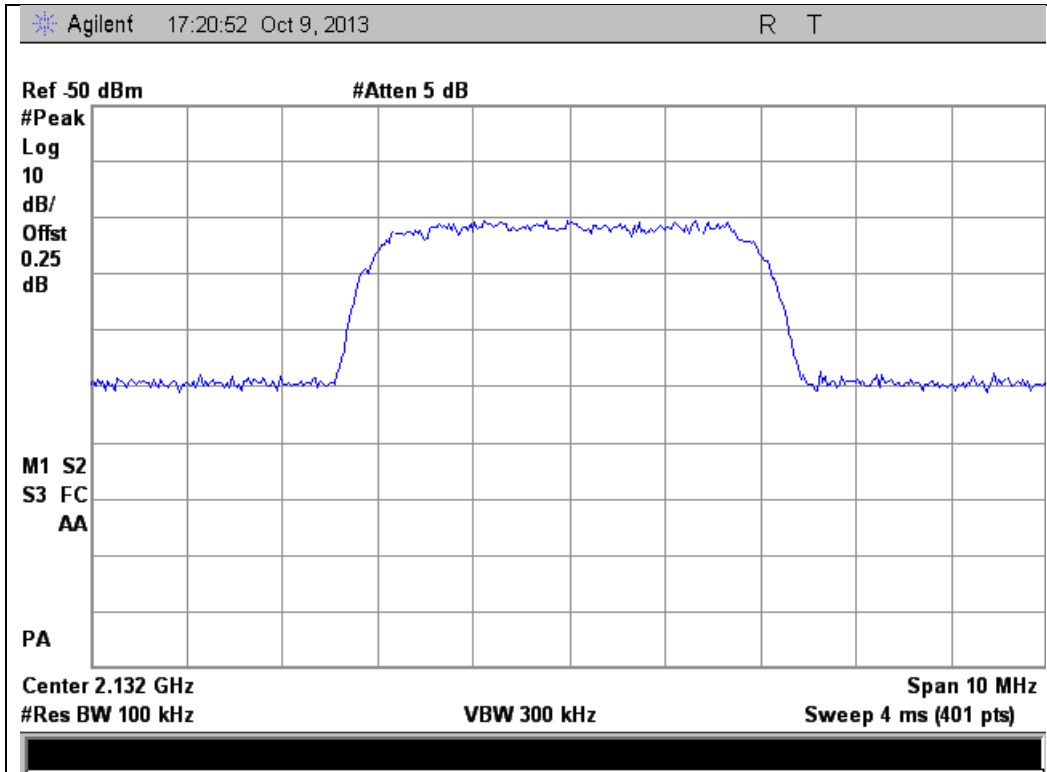
#### Output



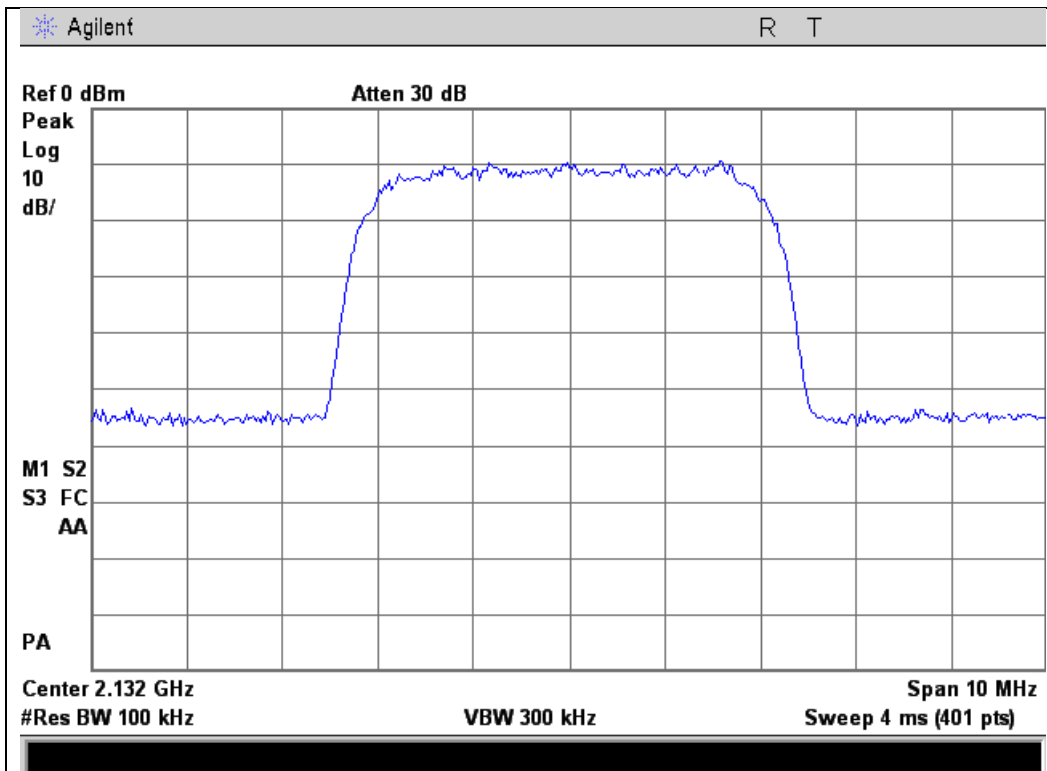


### 2110 - 2155 MHz Band

### Input



### Output





### Oscillation Detection

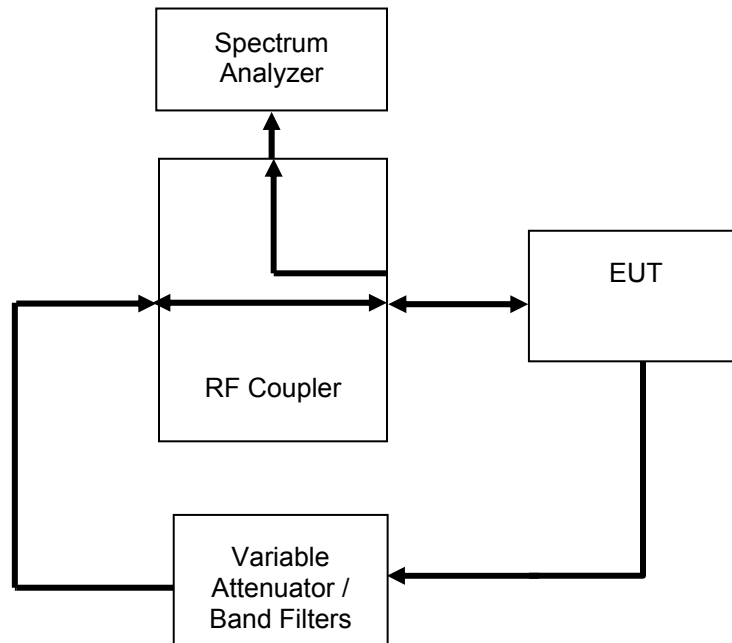
**Name of Test:** Oscillation Detection  
**Test Equipment Utilized:** i00331, i00405, i00412

**Engineer:** Mike Graffeo  
**Test Date:** 9/26/13

### Test Procedure

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

### Test Setup





### Uplink Detection Time Test Results

Frequency Band (MHz)	Measured Time (mS)	Limit (mS)	Result
704 - 716	144.4	300	Pass
777 - 787	126.2	300	Pass
824 - 849	145.2	300	Pass
1710 - 1755	142.7	300	Pass
1850 - 1915	160.9	300	Pass

### Downlink Detection Time Test Results

Frequency Band (MHz)	Measured Time (mS)	Limit (S)	Result
734 - 746	21.5	1	Pass
746 - 756	22.5	1	Pass
869 - 894	144.5	1	Pass
1930 - 1995	143.5	1	Pass
2110 - 2155	143.0	1	Pass

### Uplink Restart Time Test Results

Frequency Band (MHz)	Measured Time (S)	Limit (S)	Result
704 - 716	65.8	≥60	Pass
777 - 787	65.4	≥60	Pass
824 - 849	65.8	≥60	Pass
1710 - 1755	65.8	≥60	Pass
1850 - 1915	66.4	≥60	Pass



### Downlink Restart Time Test Results

Frequency Band (MHz)	Measured Time (mS)	Limit (mS)	Result
734 - 746	65.6	≥60	Pass
746 - 756	65.6	≥60	Pass
869 - 894	65.8	≥60	Pass
1930 - 1995	65.8	≥60	Pass
2110 - 2155	65.6	≥60	Pass

### Uplink Restart Count Test Results

Frequency Band (MHz)	Restarts	Limit	Result
704 - 716	2	≤5	Pass
777 - 787	2	≤5	Pass
824 - 849	1	≤5	Pass
1710 - 1755	1	≤5	Pass
1850 - 1915	1	≤5	Pass

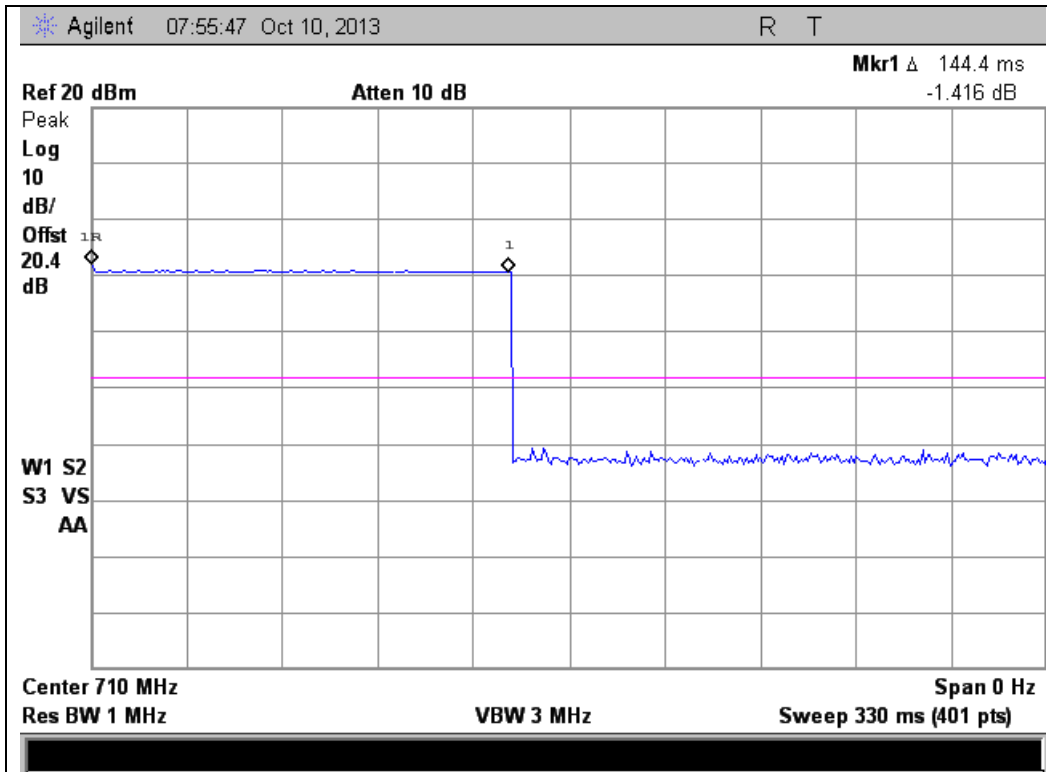
### Downlink Restart Count Test Results

Frequency Band (MHz)	Restarts	Limit	Result
734 - 746	3	≤5	Pass
746 - 756	2	≤5	Pass
869 - 894	1	≤5	Pass
1930 - 1995	5	≤5	Pass
2110 - 2155	5	≤5	Pass

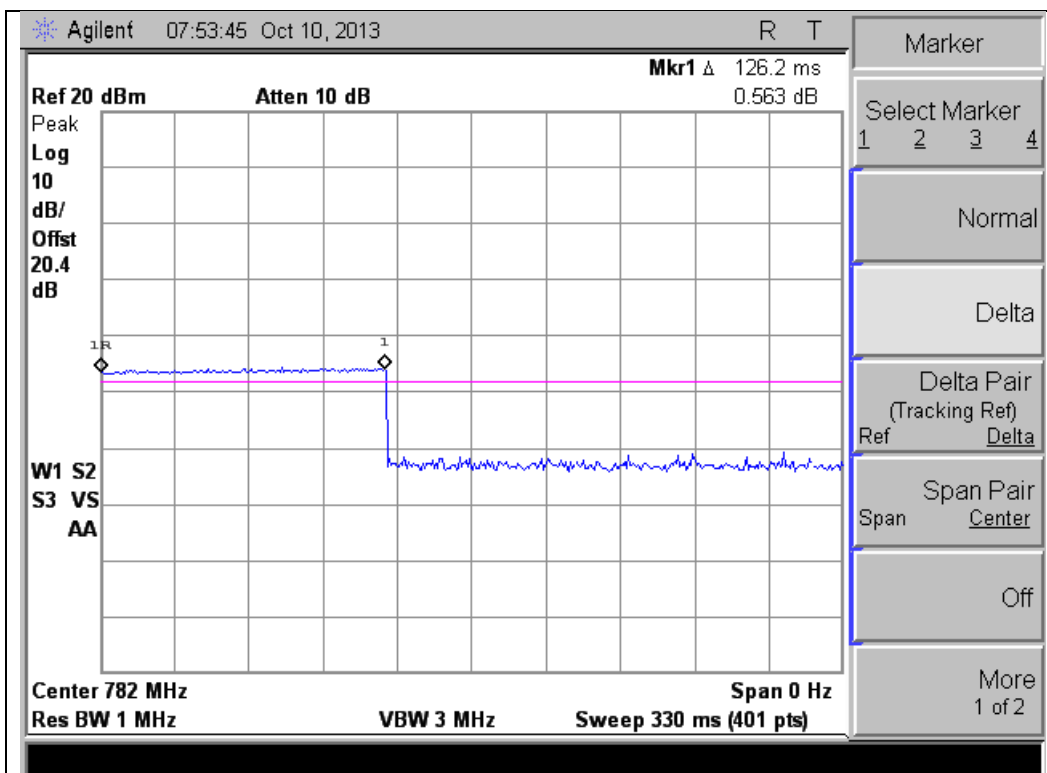


### Uplink Detection Time Test Results

#### 704 - 716 MHz Band

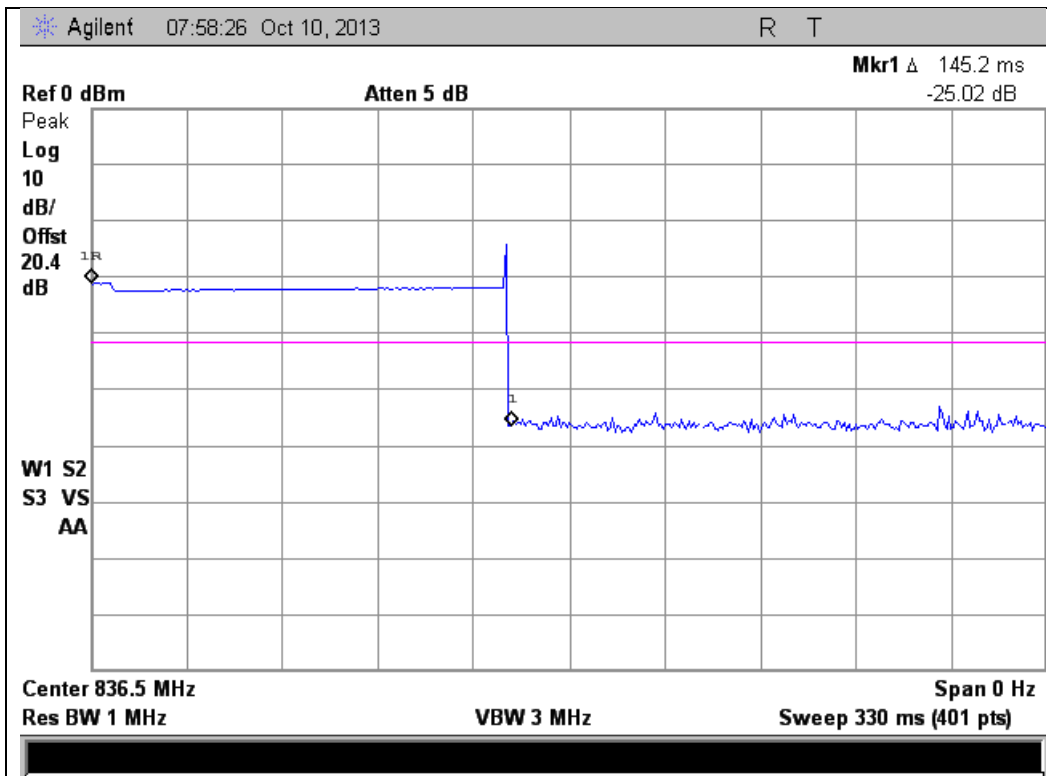


#### 777 - 787 MHz Band

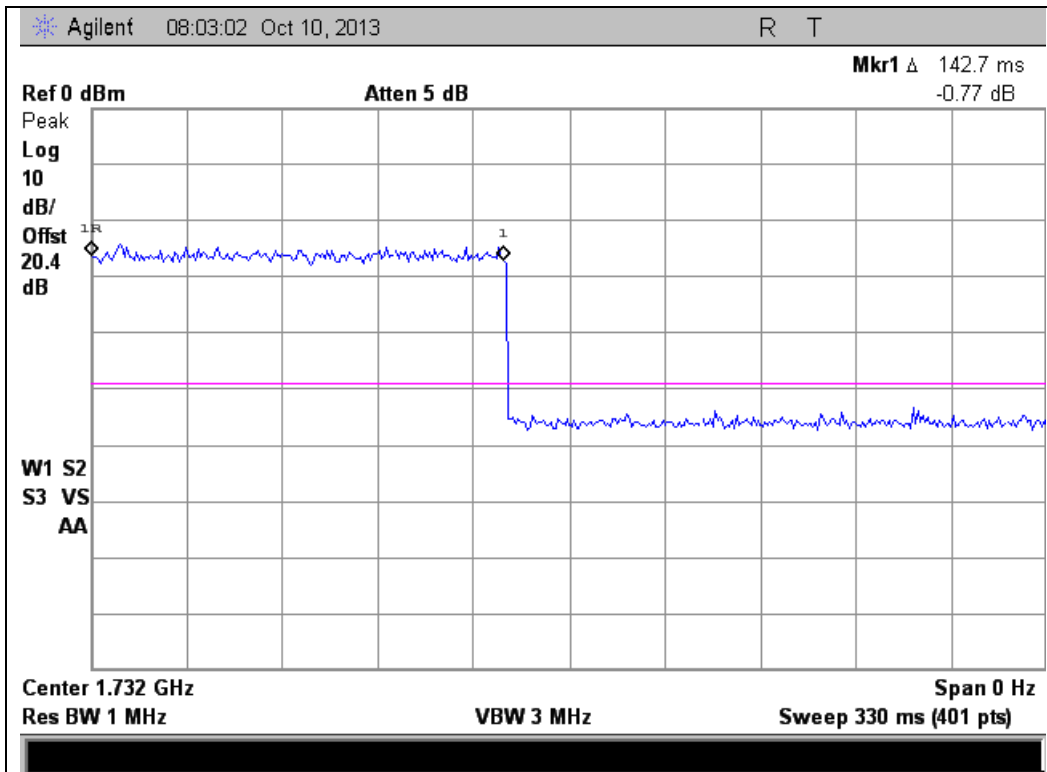




### 824 - 849 MHz Band

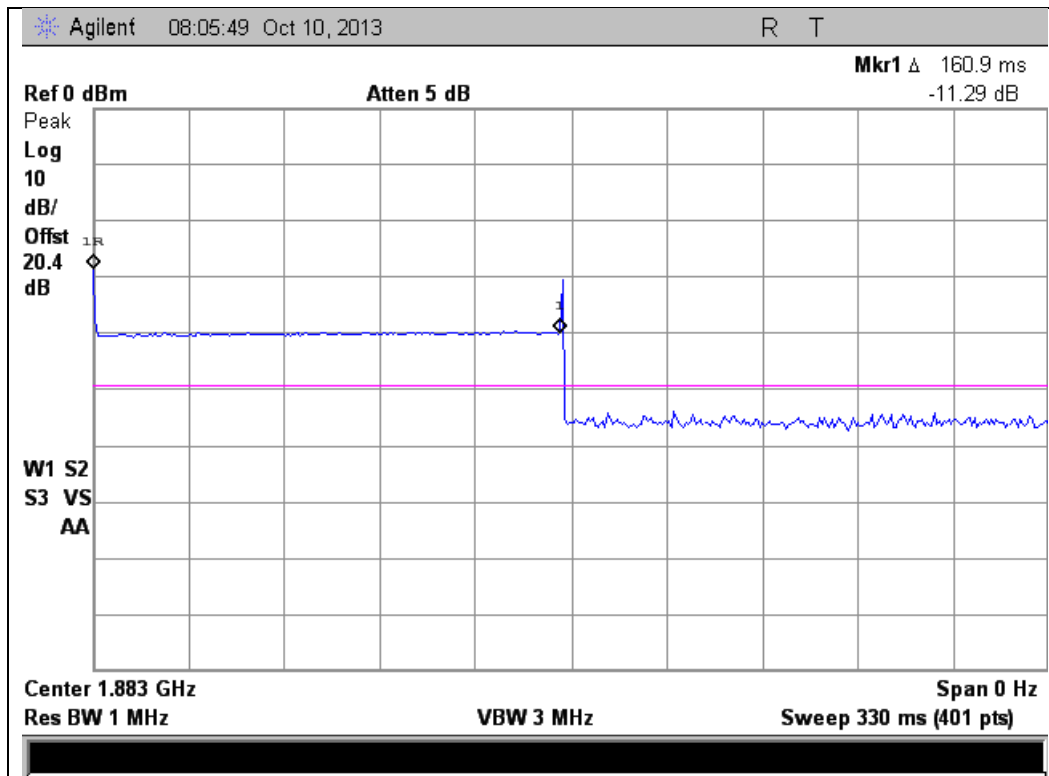


### 1710 - 1755 MHz Band



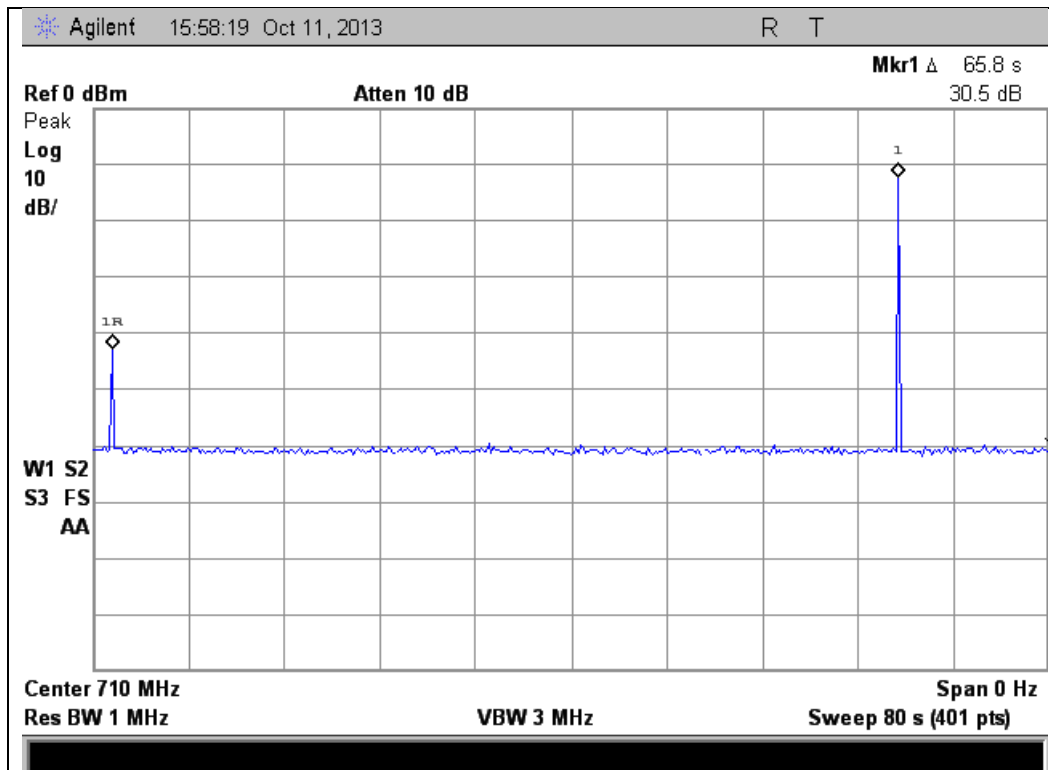


### 1850 - 1915 MHz Band



### Uplink Restart Time Test Results

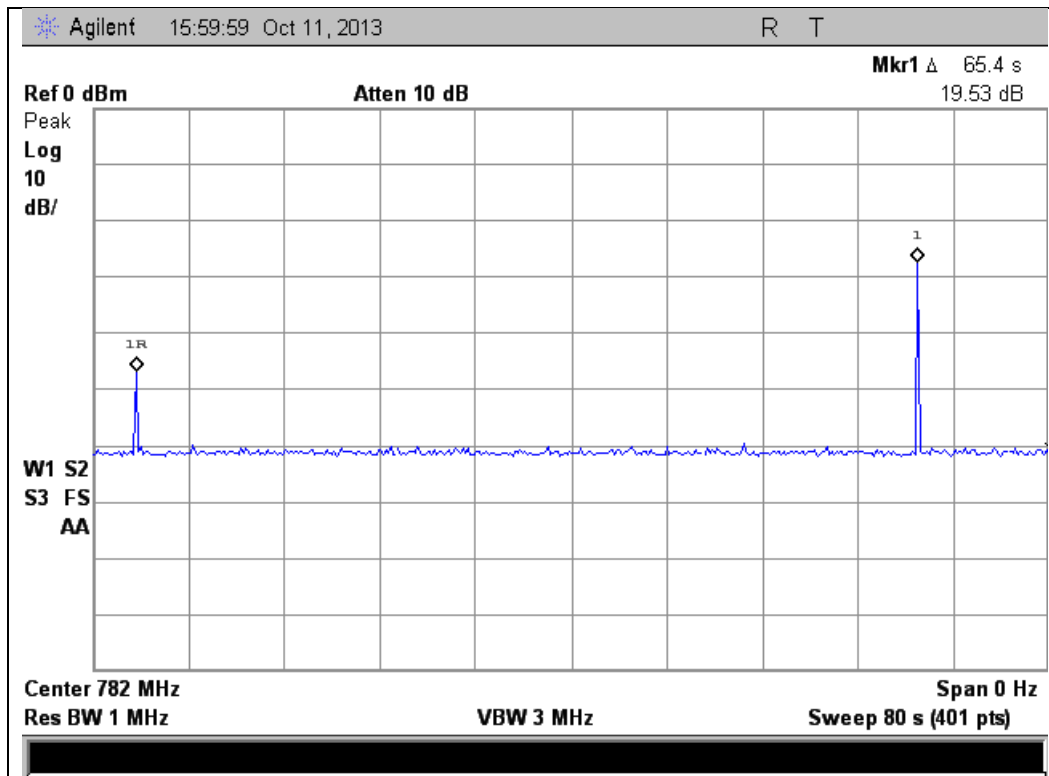
### 704 - 716 MHz Band



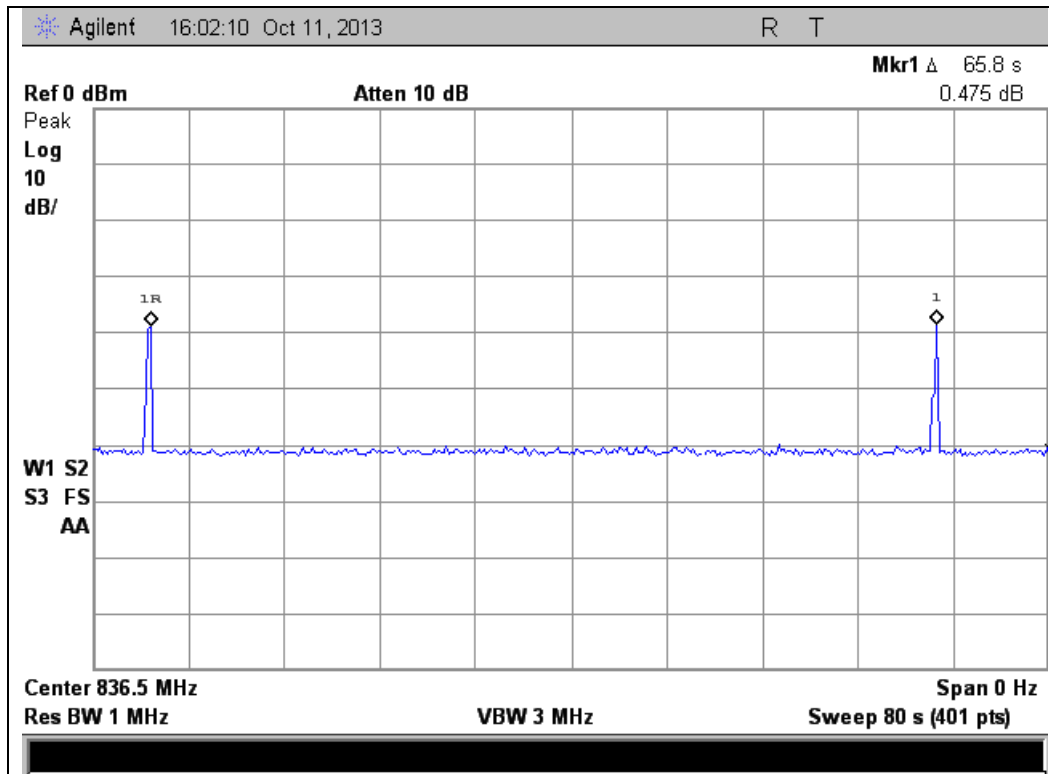




### 777 - 787 MHz Band

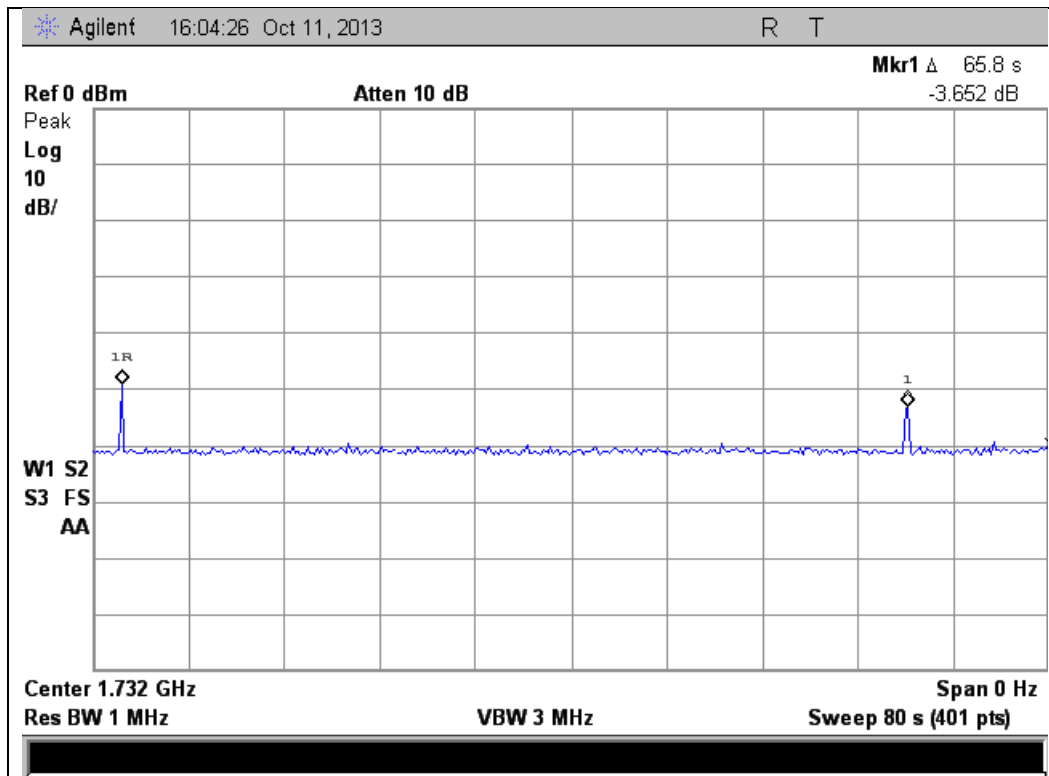


### 824 - 849 MHz Band

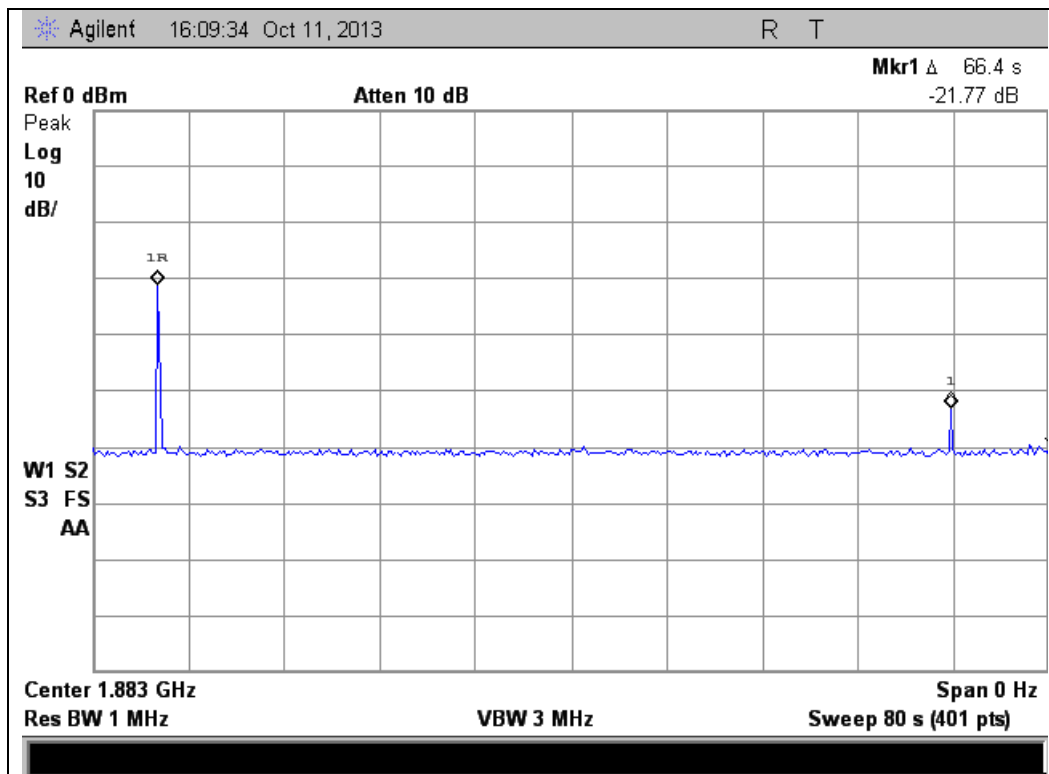




### 1710 - 1755 MHz Band



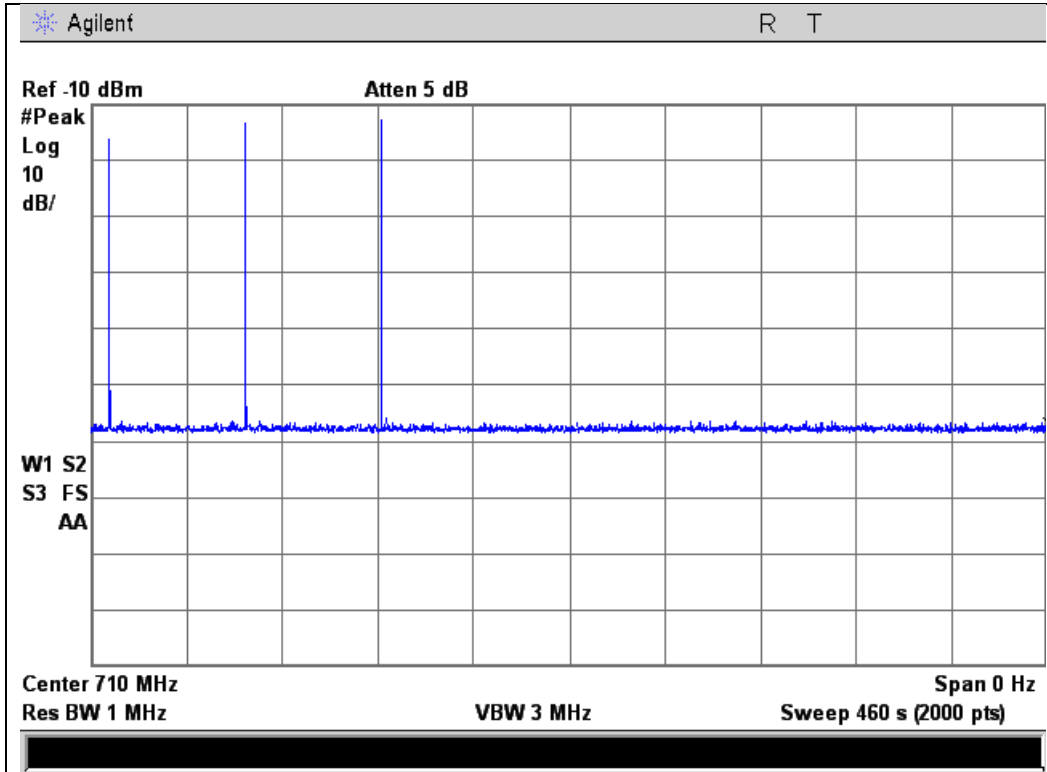
### 1850 - 1915 MHz Band



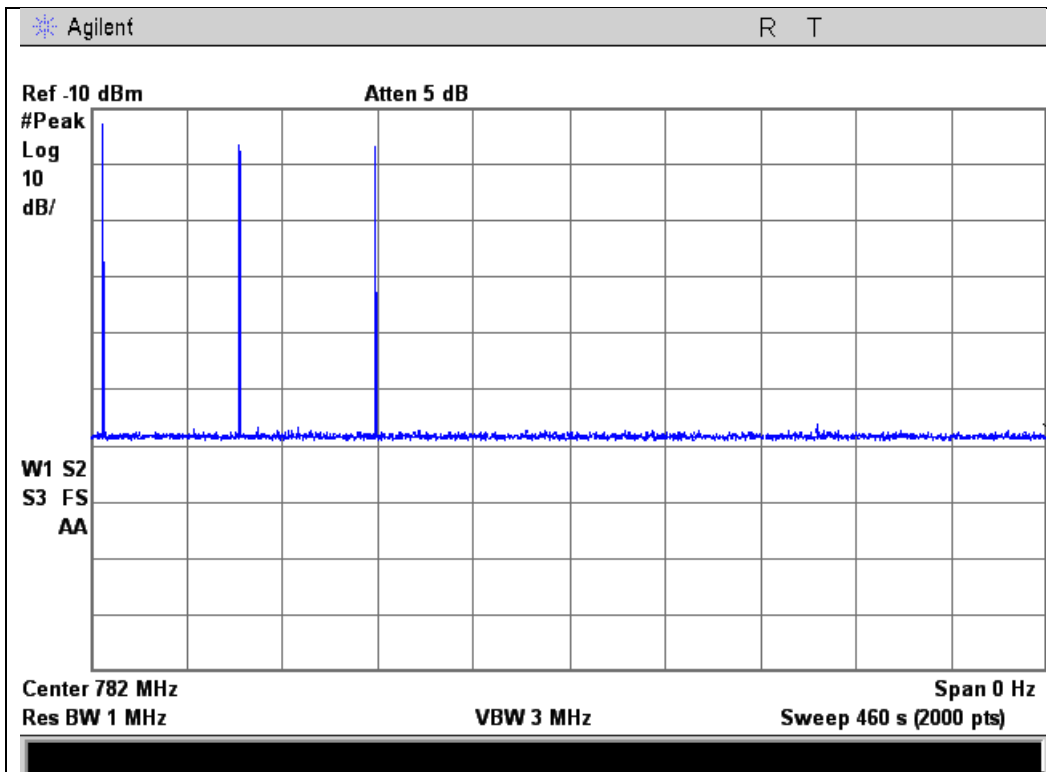


### Uplink Restart Count Test Results

#### 704 - 716 MHz Band

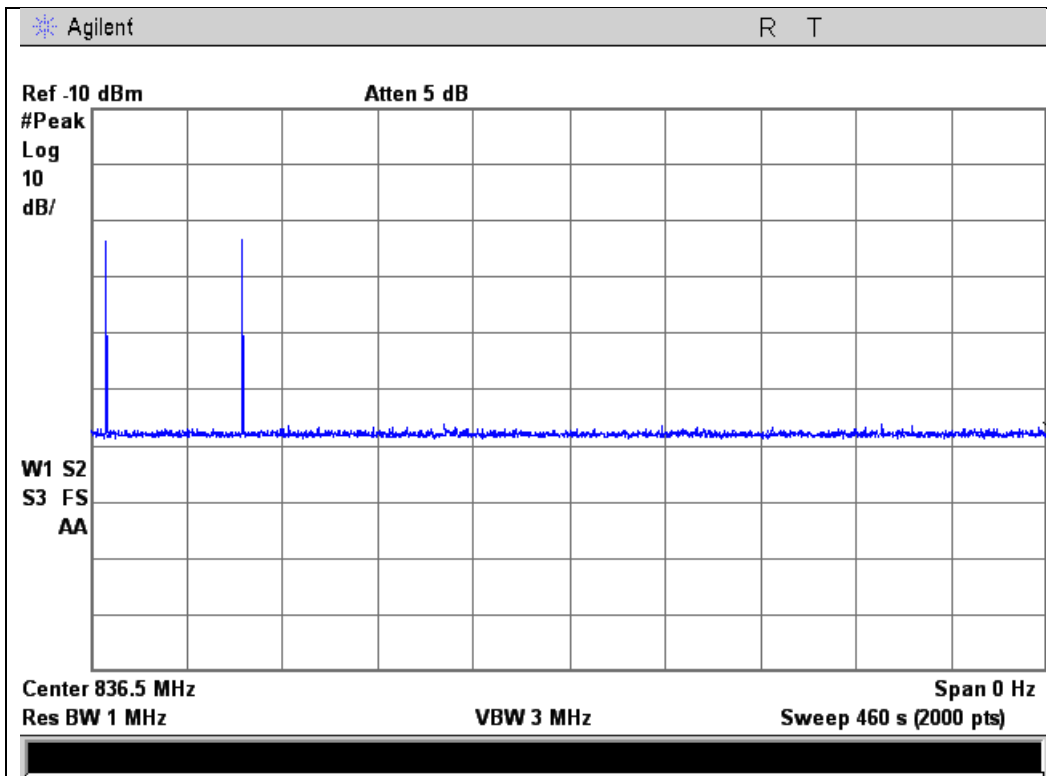


#### 777 - 787 MHz Band

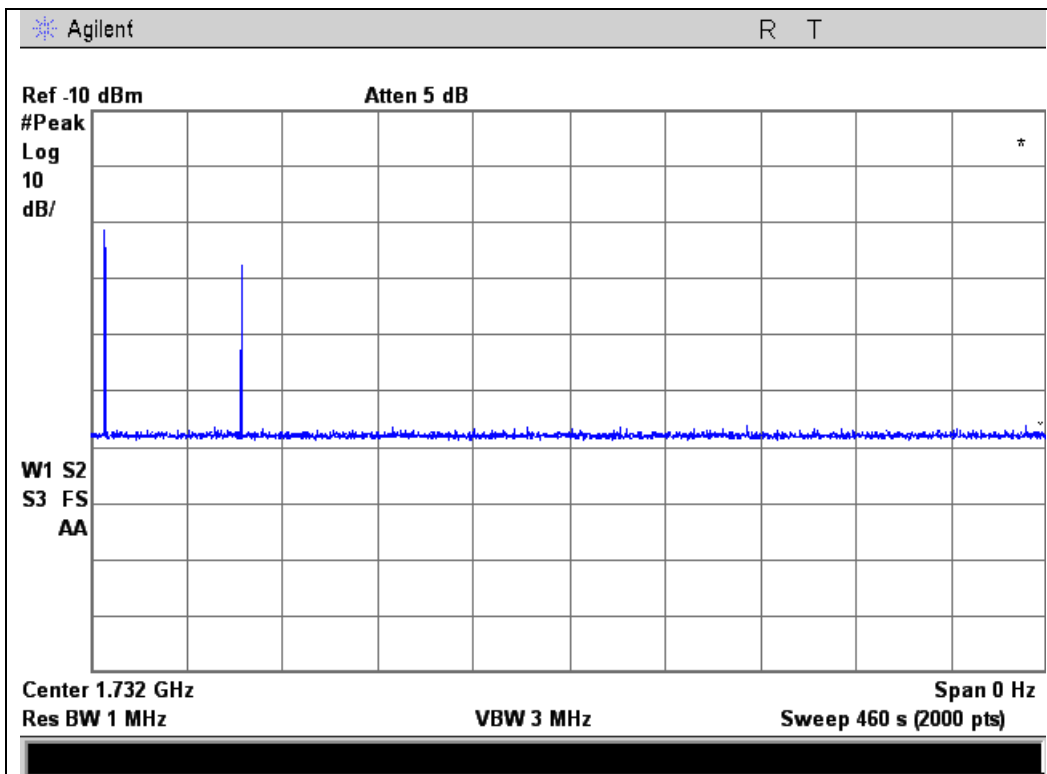




### 824 - 849 MHz Band

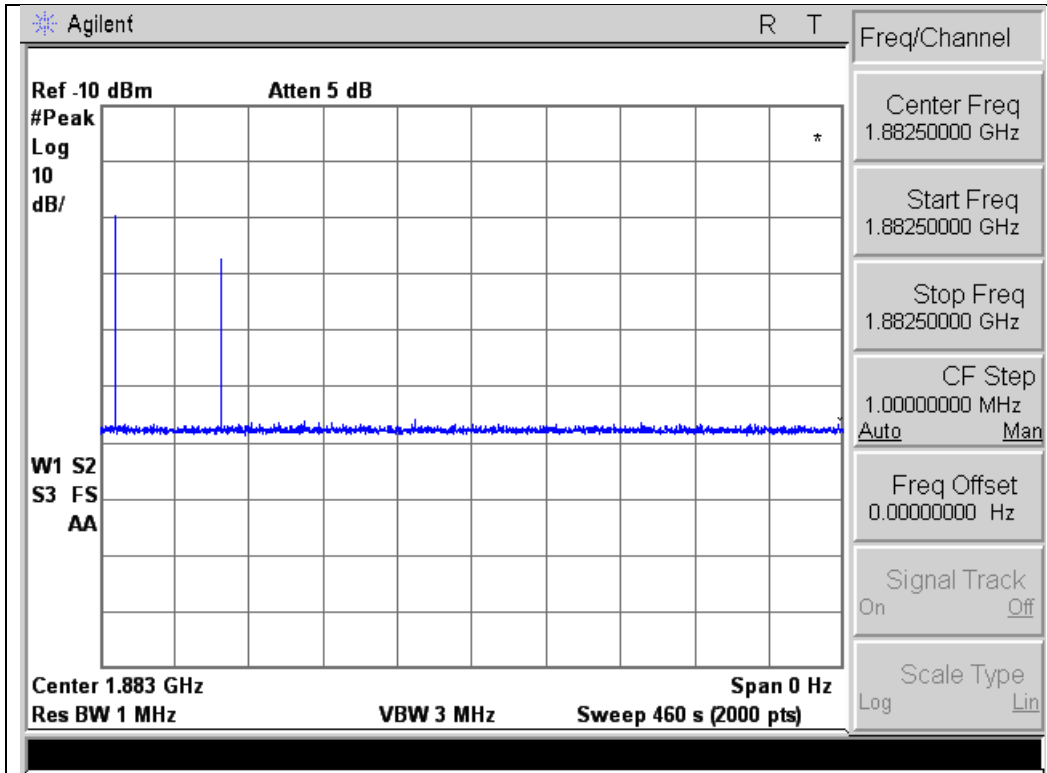


### 1710 - 1755 MHz Band



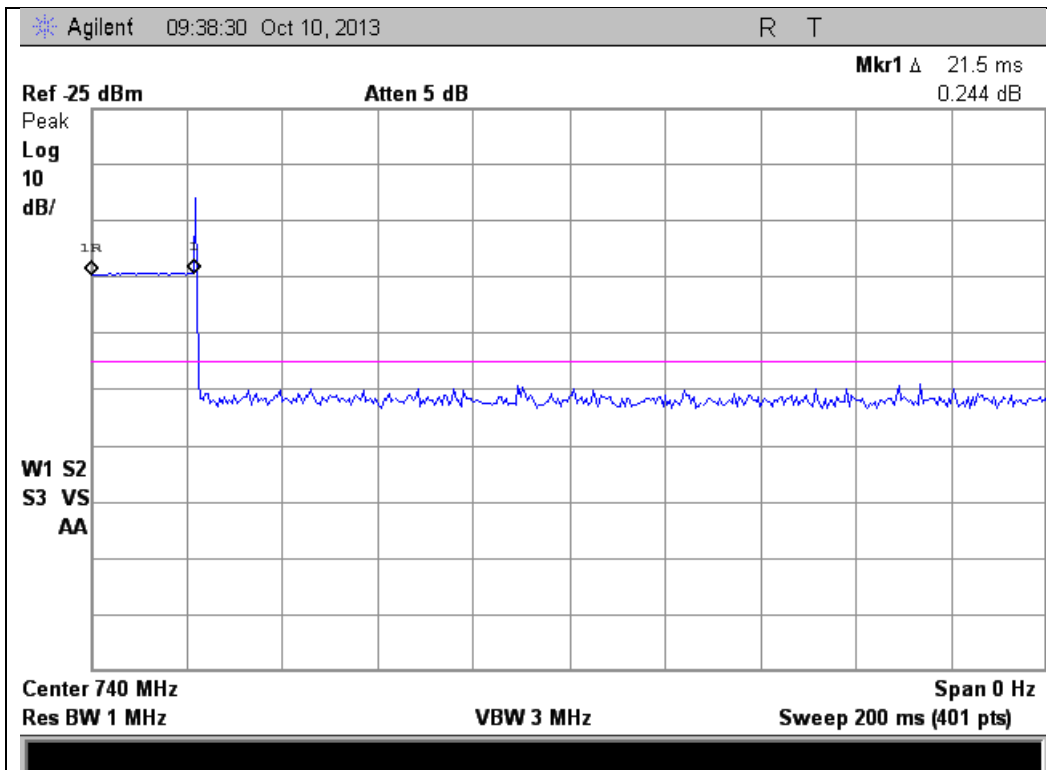


### 1850 - 1915 MHz Band



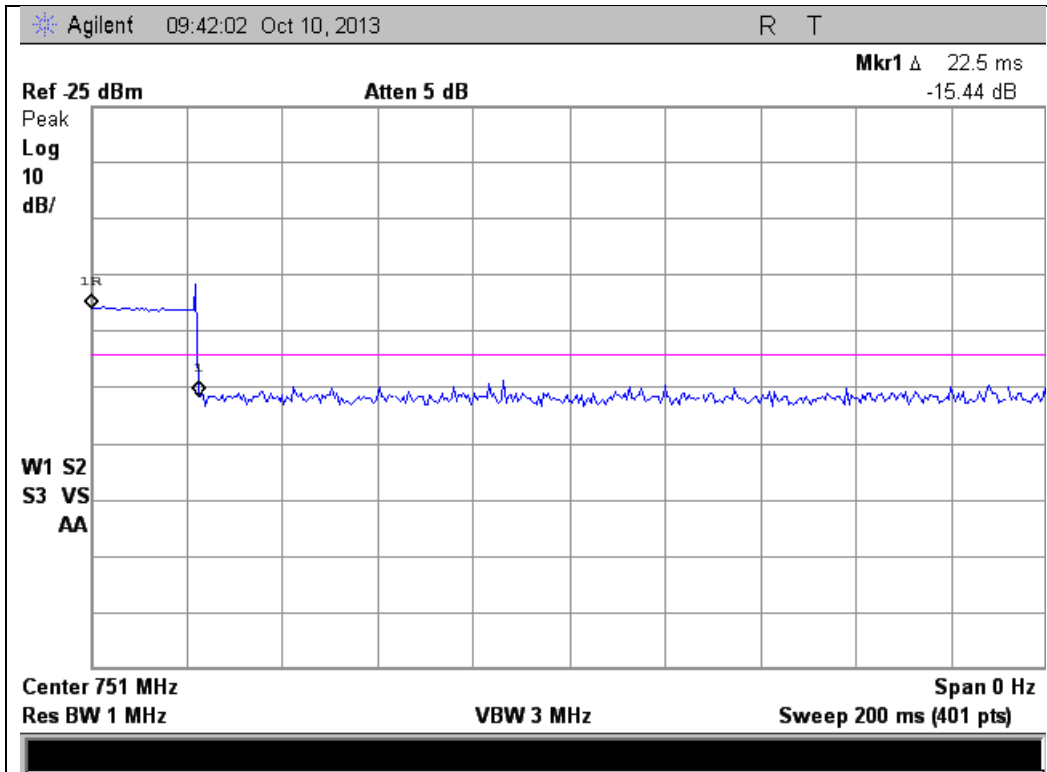
### Downlink Detection Time Test Results

### 734 - 746 MHz Band

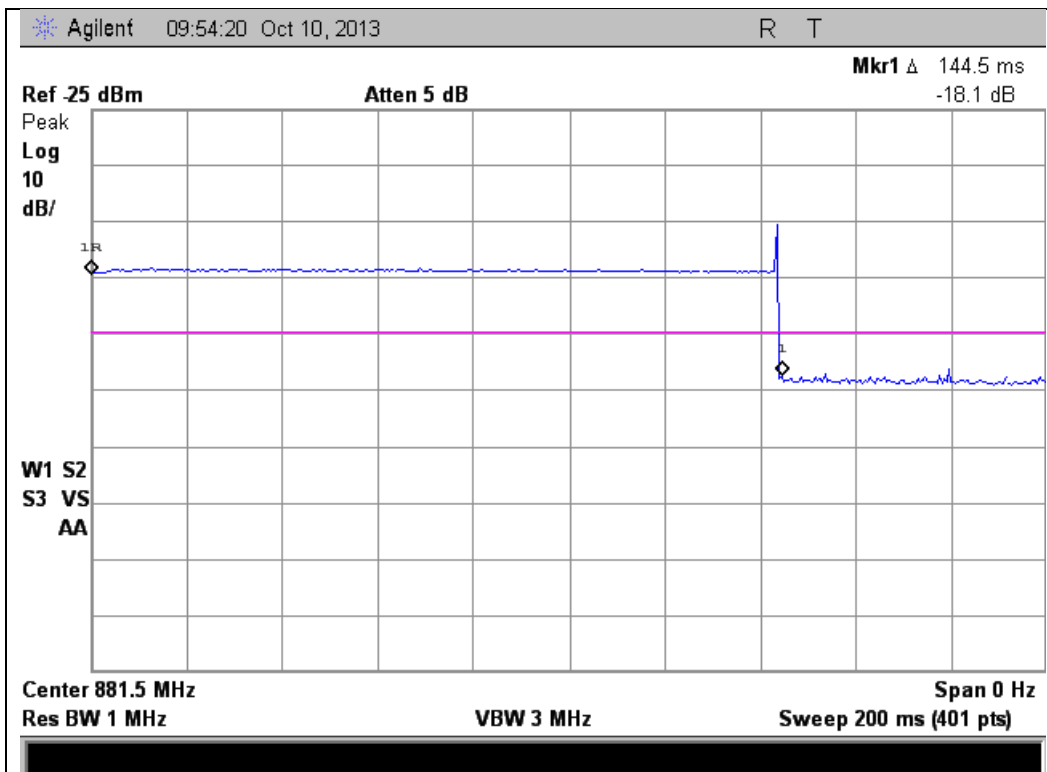




### 746 - 756 MHz Band

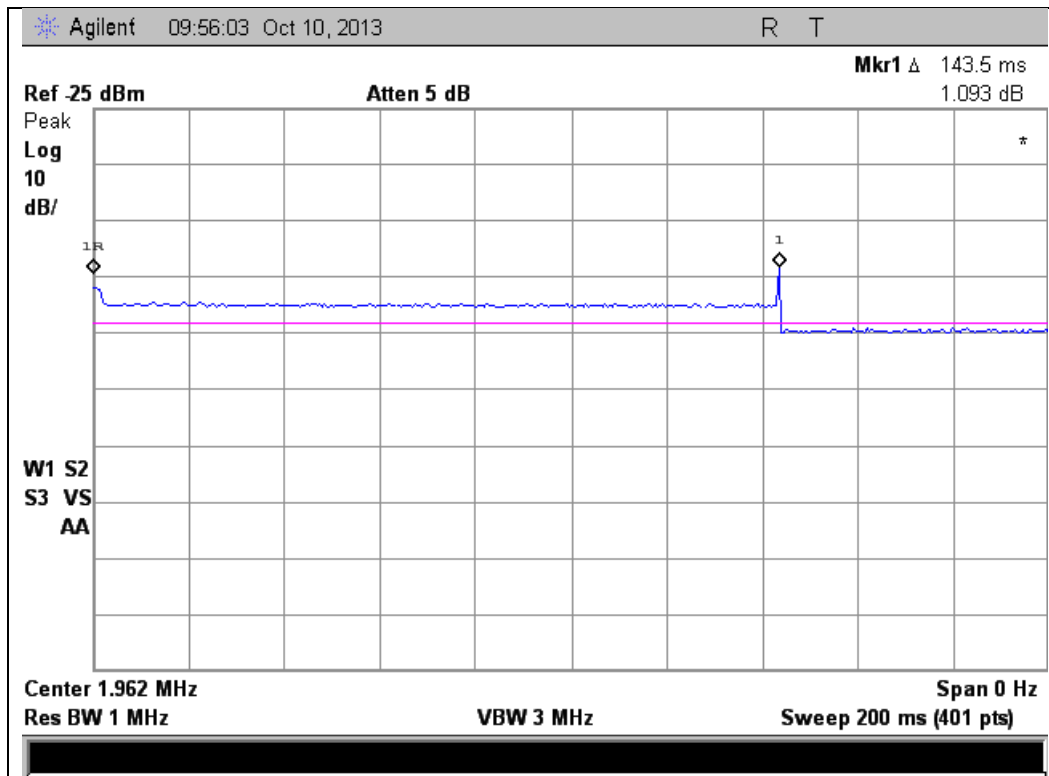


### 869 - 894 MHz Band

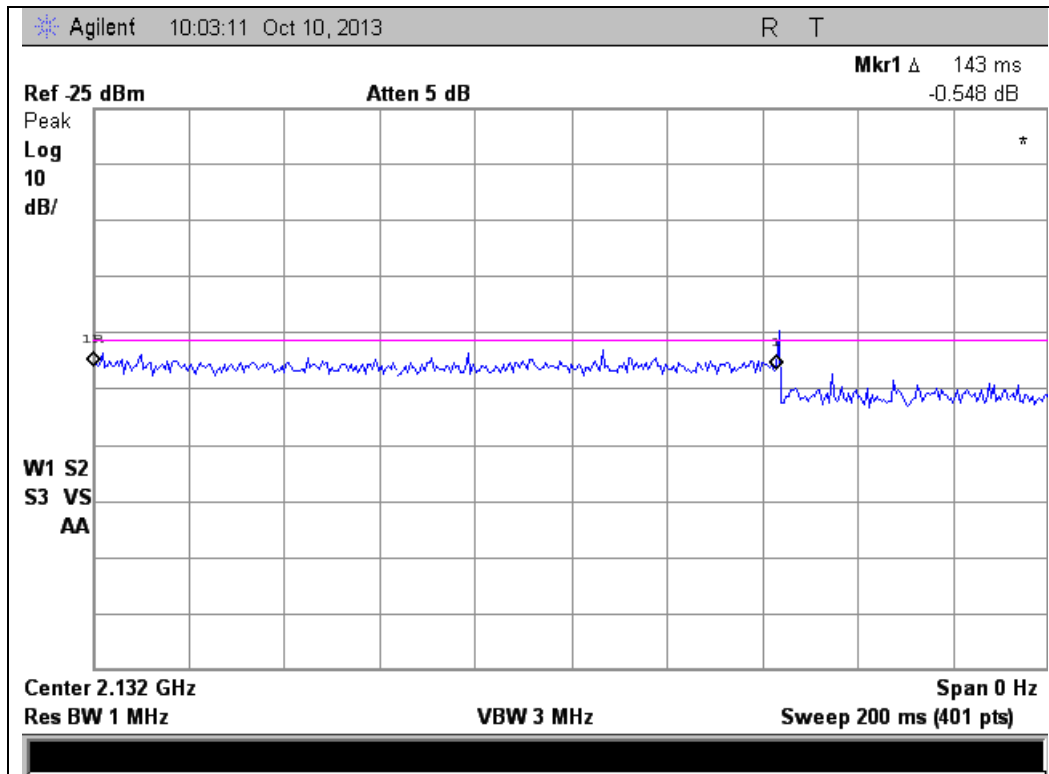




### 1930 - 1995 MHz Band



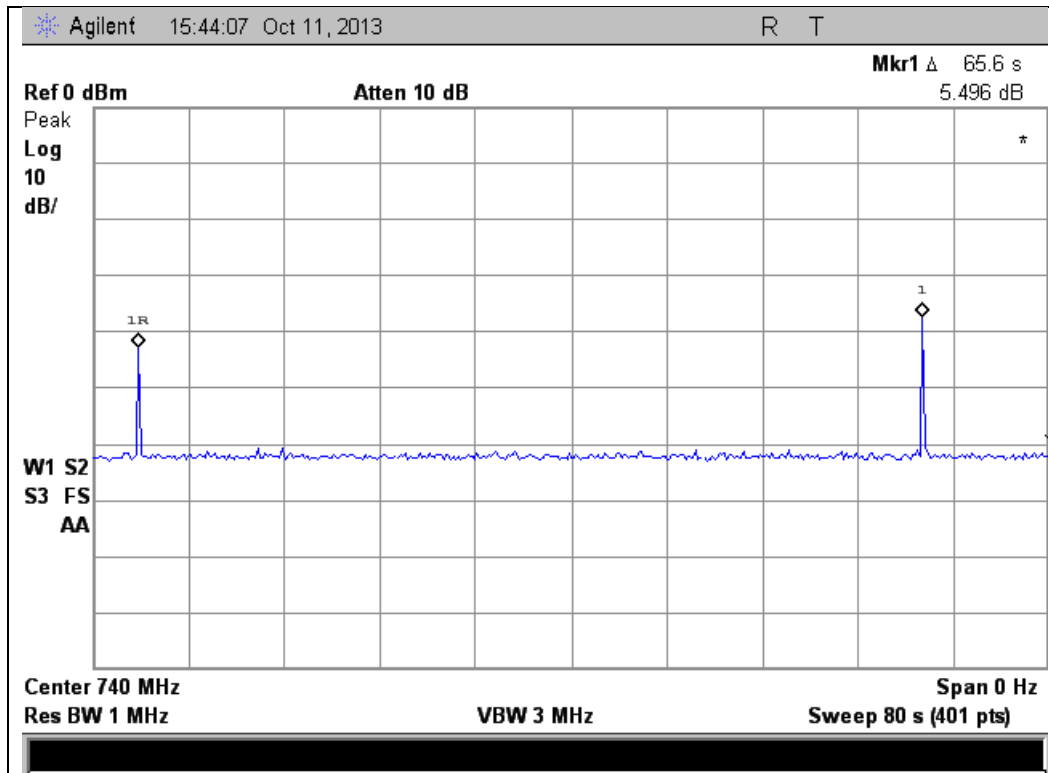
### 2110 - 2155 MHz Band



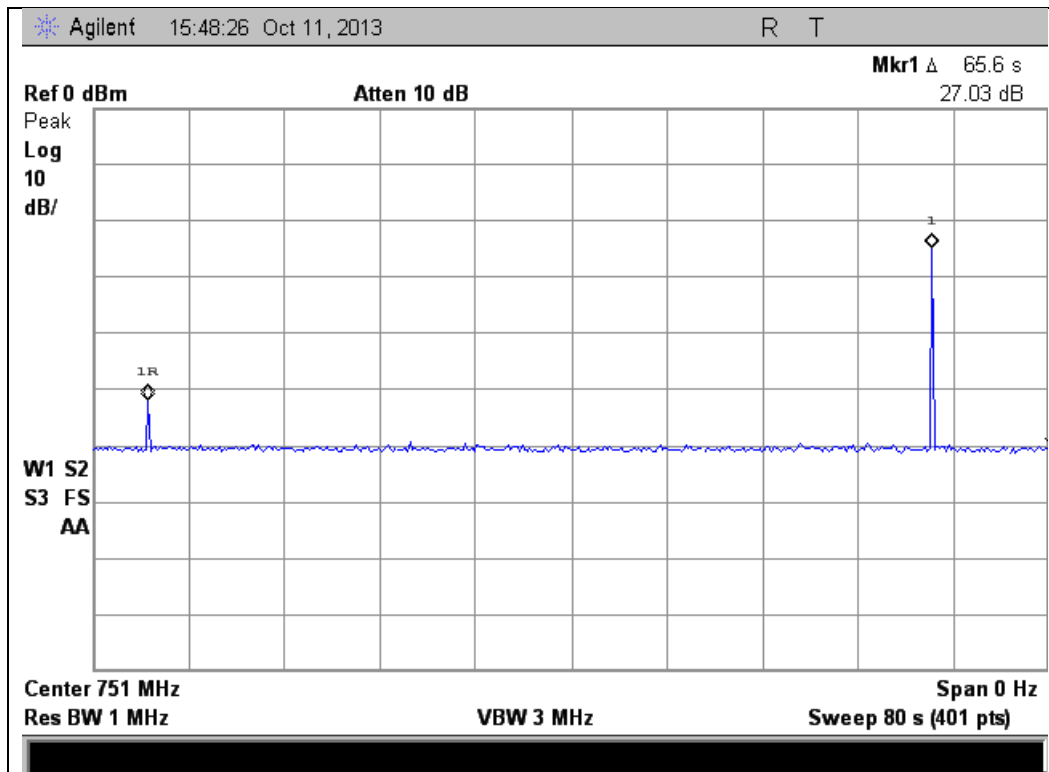


### Downlink Restart Time Test Results

#### 734 - 746 MHz Band



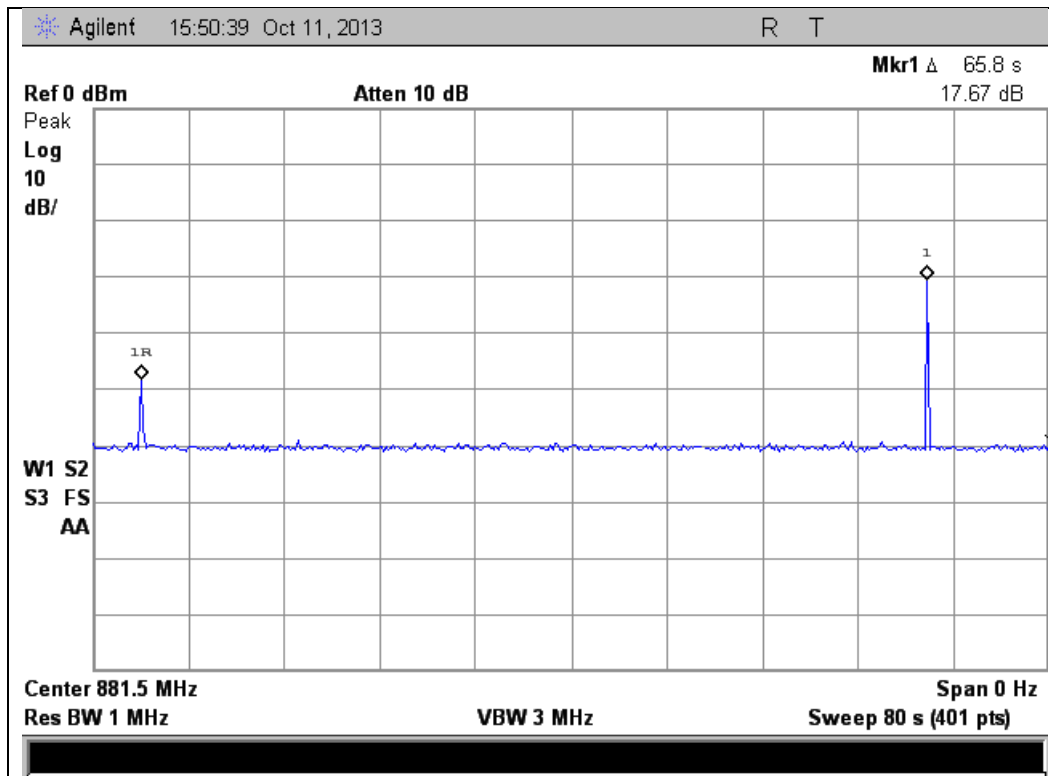
#### 746 - 756 MHz Band



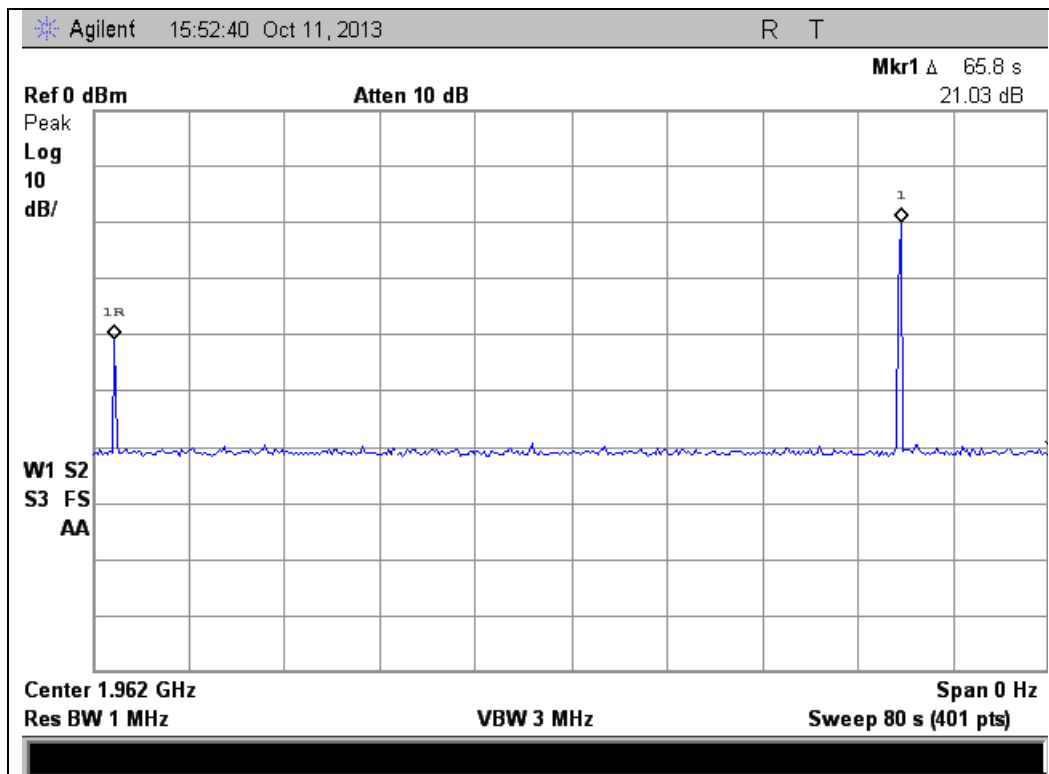




### 869 - 894 MHz Band

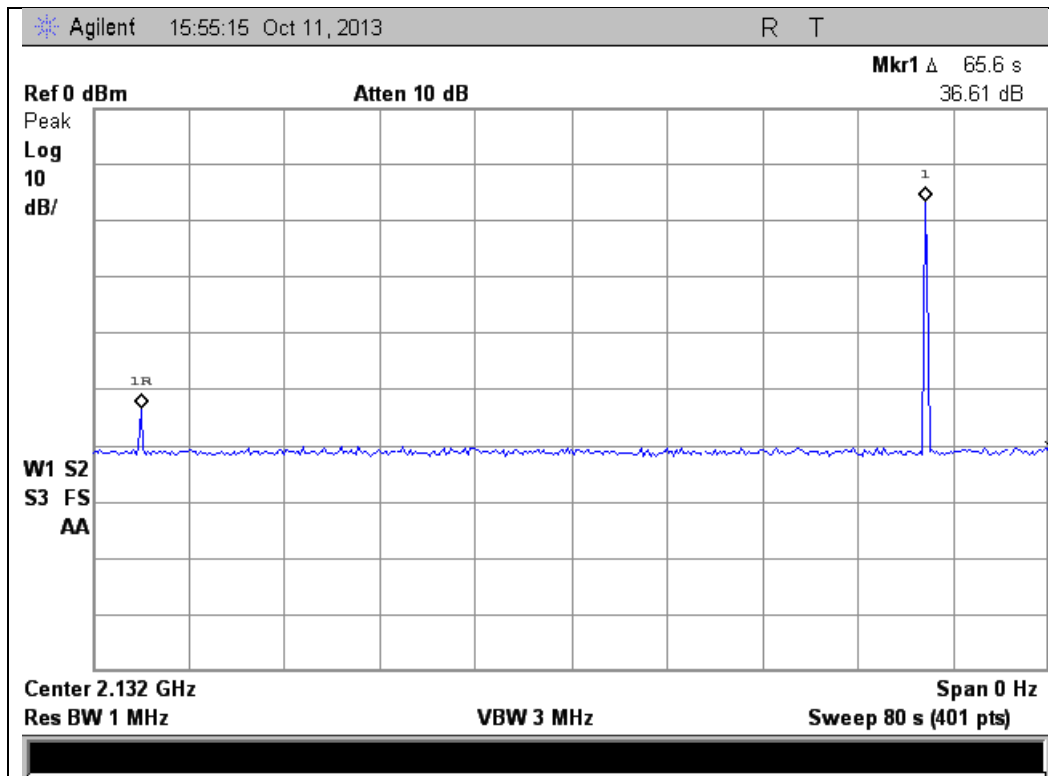


### 1930 - 1995 MHz Band



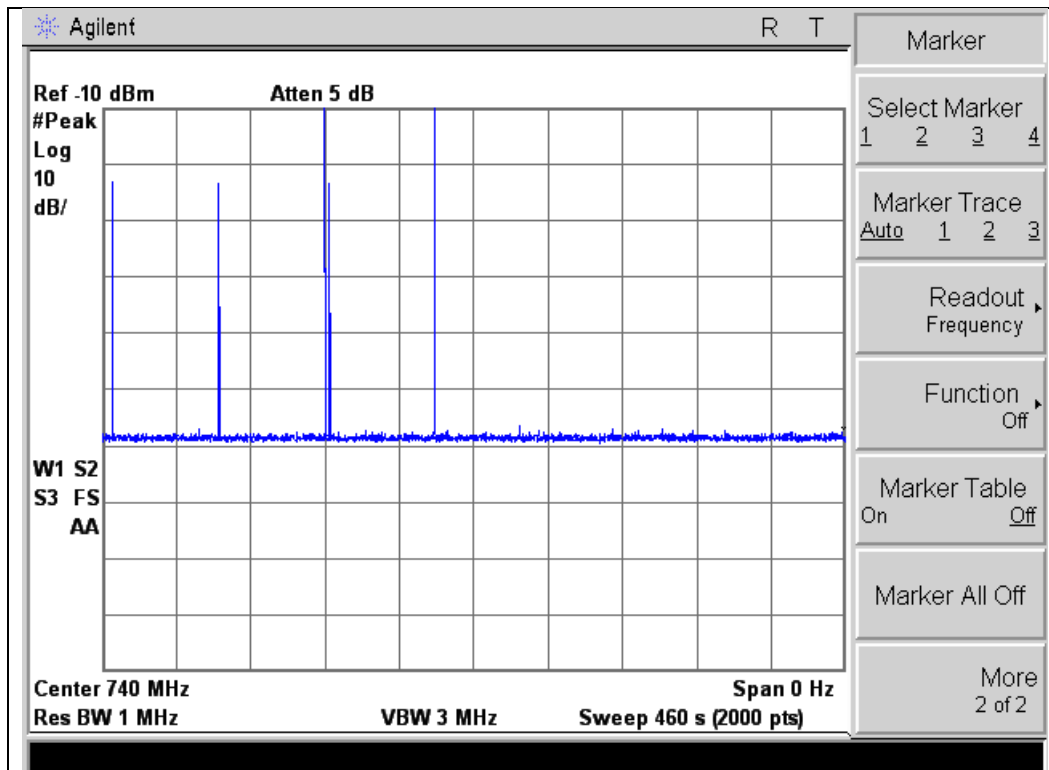


**2110 - 2155 MHz Band**



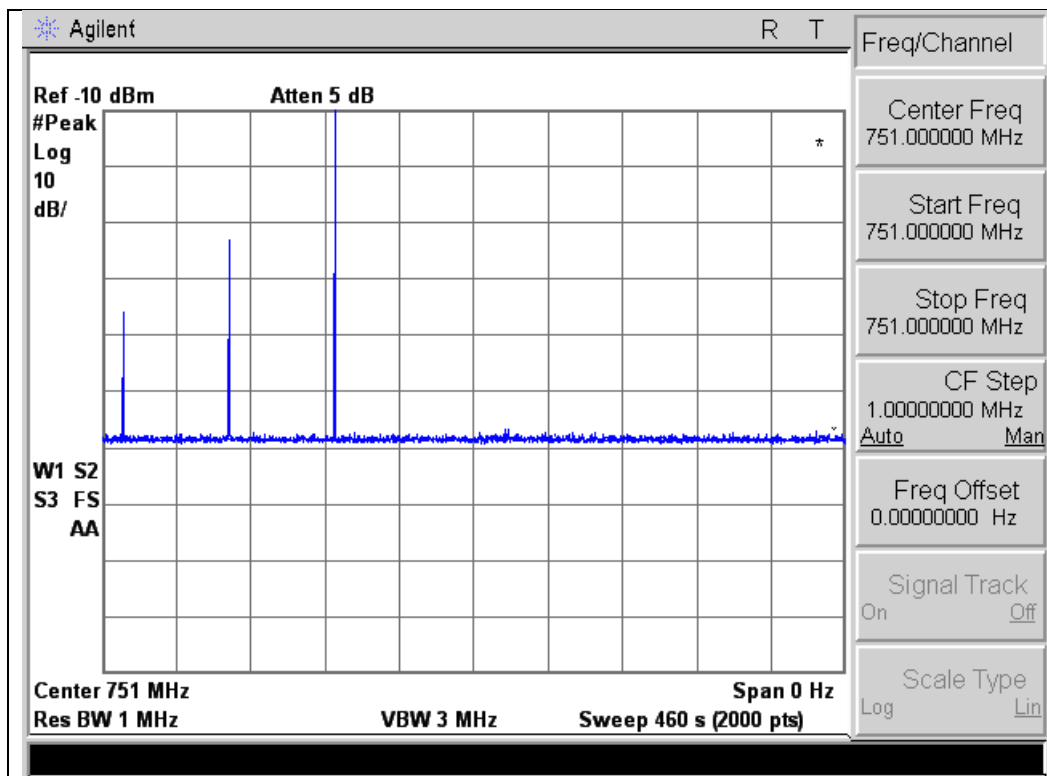
**Downlink Restart Count Test Results**

**734 - 746 MHz Band**

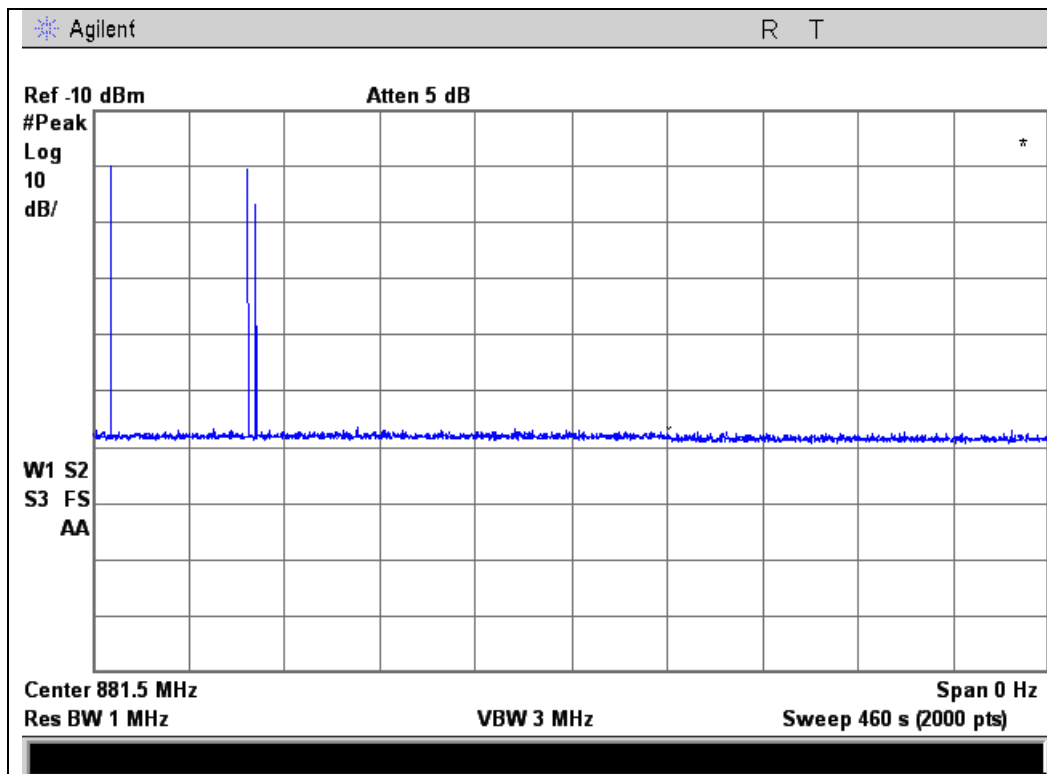




### 746 - 756 MHz Band

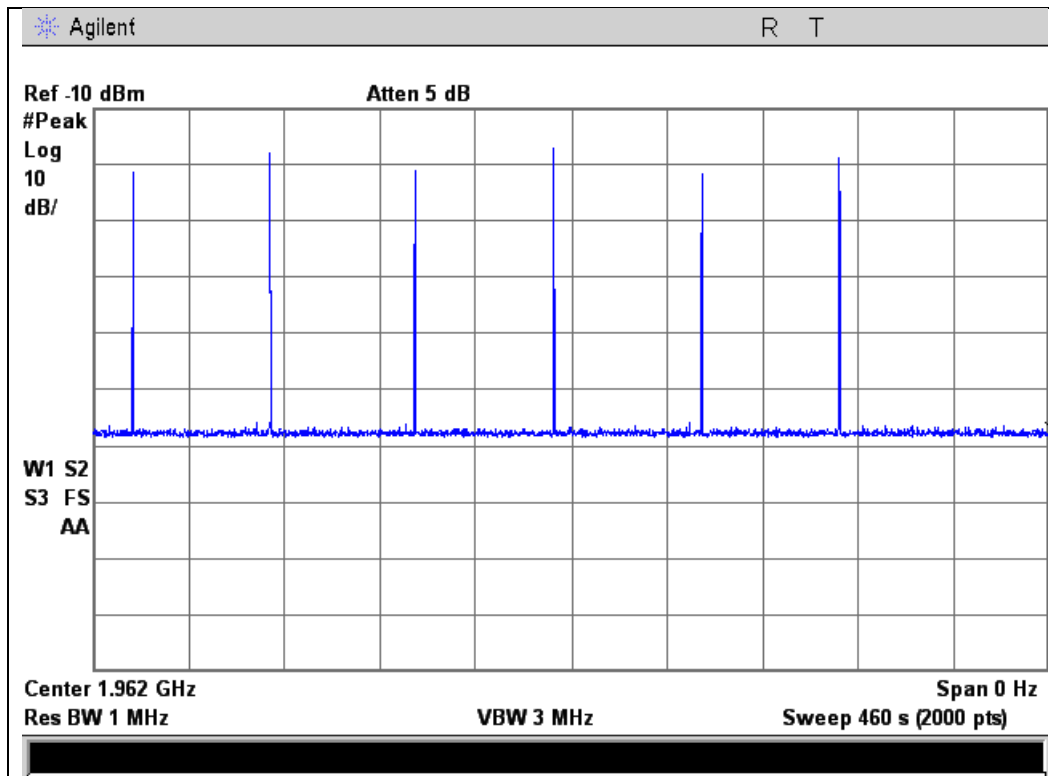


### 869 - 894 MHz Band

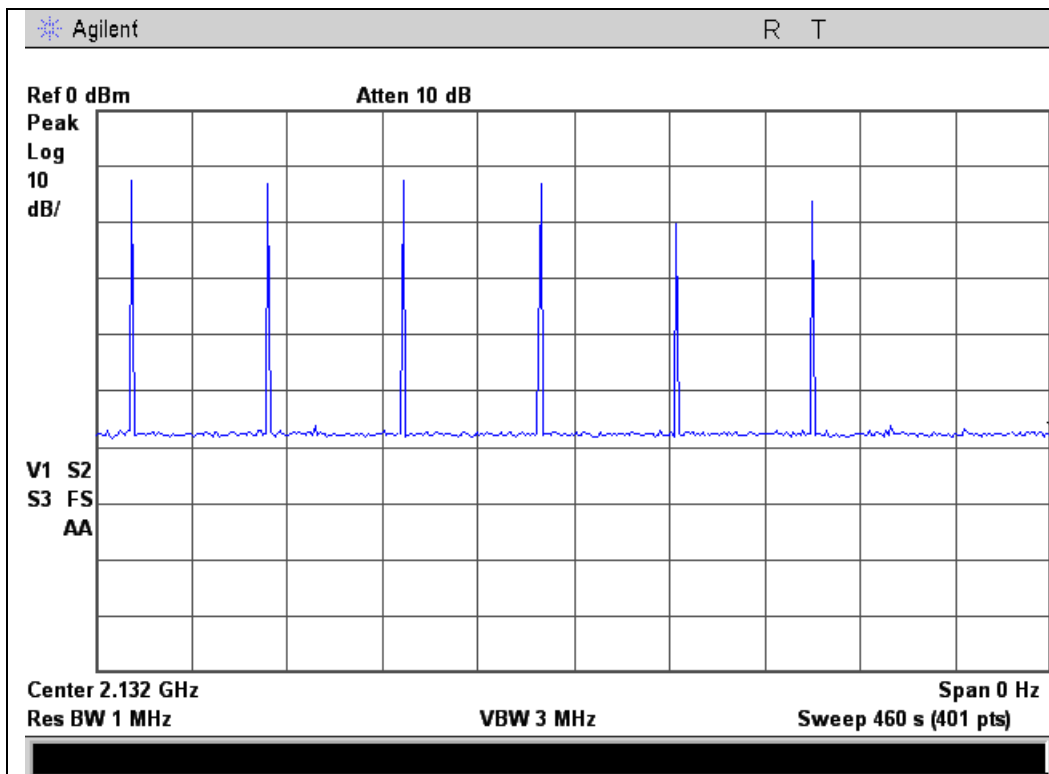




### 1930 - 1995 MHz Band



### 2110 - 2155 MHz Band





## Radiated Spurious

**Name of Test:** Radiated Spurious      **Engineer:** Mike Graffeo  
**Test Equipment Utilized:** i00405, i00334, i00271, i00331      **Test Date:** 10/1/13

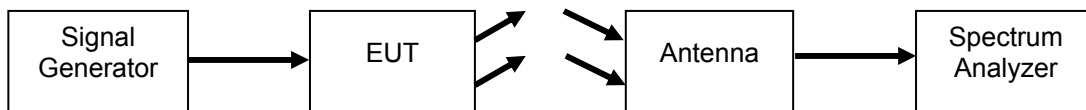
### Test Procedure

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 centered in 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 =  $43 + 10\log(P)$  dB

### Test Setup





### Uplink Test Results

#### 704 - 716 MHz Band 710 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1420	-74.96	-13	Pass
2130	-60.99	-13	Pass
2840	-65.46	-13	Pass

#### 777 - 787 MHz Band 782 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1564	-71.72	-13	Pass
2346	-67.27	-13	Pass
3128	-49.35	-13	Pass

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

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1673	-66.28	-13	Pass
2509.5	-67.99	-13	Pass
3346	-52.66	-13	Pass

#### 1710 - 1755 MHz Band 1732.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3465	-50.54	-13	Pass
5197.5	-50.23	-13	Pass
6930	-44.20	-13	Pass

#### 1850 - 1915 MHz Band 1882.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3765	-47.96	-13	Pass
5647.5	-46.48	-13	Pass
7530	-37.93	-13	Pass



### Downlink Test Results

#### 734 - 746 MHz Band 740 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1480	-71.56	-13	Pass
2220	-66.40	-13	Pass
2960	-61.78	-13	Pass

#### 746 - 756 MHz Band 751 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1502	-71.81	-13	Pass
2253	-68.27	-13	Pass
3004	-49.22	-13	Pass

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

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1763	-69.88	-13	Pass
2644.5	-62.89	-13	Pass
3526	-51.90	-13	Pass

#### 1930 - 1995 MHz Band 1962.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3925	-49.87	-13	Pass
5887.5	-46.62	-13	Pass
7850	-39.52	-13	Pass

#### 2110 - 2155 MHz Band 2132.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
4265	-48.63	-13	Pass
6397.5	-46.10	-13	Pass
8530	-38.28	-13	Pass

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



## Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3115	i00103	12/11/12	12/11/14
* Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	12/4/12	12/4/13
Voltmeter	Fluke	75III	i00320	2/1/13	2/1/14
Spectrum Analyzer	Agilent	E4407B	i00331	4/23/13	4/23/14
Non-radiating load	Termaline	8201	i00334	Verified on: 8/2/13	
Power Supply (for EUT)	HP	6654A	i00350	Verified on: 9/15/13	
Vector Signal Generator	Agilent	E4438C	i00348	1/4/13	1/4/14
Spectrum Analyzer	Agilent	E4407B	i00331	4/23/13	4/23/14
Signal Generator	Rohde & Schwarz	SMU200A	i00405	10/26/12	10/26/13
** Signal Generator	Rohde & Schwarz	SMU200A	i00405	12/11/13	12/11/14
RF Directional Coupler	Meca	CS06-1.500V	i00412	Verified on: 8/1/13	

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.

\* Note a 60 day calibration extension was issued for the equipment by the Lab Manager

\*\* This equipment was calibrated in Dec 2013 prior to the addition testing performed in January 2014

END OF TEST REPORT