Compliance Testing, LLC
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Test Report

Prepared for: Wilson Electronics, Inc

Model: 460007

Description: Quint Band Direct Connect Signal Booster

FCC ID: PWO460007

To

FCC Part 20

Date of Issue: November 18, 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** **Ph: (435)673-5021** **Email: pcook@infowest.com**

Prepared By
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Project No: p13a0013

Mike Graffeo
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	November 18, 2013	Mike Graffeo	Original Document
2.0	December 3, 2013	Mike Graffeo	Re-measured 824 - 849 MHz Pulsed GSM power page 14 and updated gain data on page 15
3.0	January 7, 2014	Mike Graffeo	1) Pages 1 & 5 corrected EUT description. 2) Page 5 corrected software/firmware versions. 3) Pages 55, 61, 62, 71, 82, 115, 116, corrected 1850 – 1915 MHz Band ranges. 4) Pages 55, 71, 116, corrected 746 - 756 MHz Band ranges.
4.0	January 9, 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.
5.0	January 27, 2014	Mike Graffeo	1) Updated Conducted Emissions rule sections in the test summary table on page 6 and 57 to match the new CFR rule sections dated January 7, 2014. 2) Updated report for response to RT dated 1-27-14

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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
Sub-part
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 KDB 935210 (dated Aug 7, 2013).

Standard Test Conditions and Engineering Practices

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

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

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

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

EUT Description
Model: 460007
Description: Quint Band Direct Connect Signal Booster
Firmware: A460007A
Software: 460007A
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)					
Uplink	698 - 716	776 - 787	824 - 849	1850 - 1910	1710 – 1755
Downlink	728 - 746	746 - 757	869 - 894	1930 - 1990	2110 - 2155
Modulation Type	LTE		GSM, CDMA, EDGE, HSPA. EVDO, LTE		CDMA, HSPA, LTE, EDGE, EVDO

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

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

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
20.21(e)(3)	Authorized Frequency Band	Pass	
20.21(e)(8)(i)(B) 20.21(e)(8)(i)(C) 20.21(e)(8)(i)(D)	Maximum Power and Gain	Pass	
20.21(e)(8)(i)(F)	Intermodulation	Pass	
20.21(e)(8)(i)(E)	Out-of-Band Emissions	Pass	
2.1051 22.917(a) 24.238((a) 27.53(c) 27.53(e) 27.53(f) 27.53(g)	Conducted Spurious Emissions	Pass	
20.21(e)(8)(i)(A)	Noise Limits	Pass	per rule 20.21e... if noise is less than -70dBm/MHz ("Transmit Power OFF Mode") then EUT will not shut off, therefore the following tests will not be performed: 1) Variable Uplink Noise Power Tests, 2) Variable Downlink Noise Power Tests, 3) Noise timing test
20.21(e)(8)(i)(I)	Uplink Inactivity	Pass	per rule 20.21e... if noise is less than -70dBm/MHz ("Transmit Power OFF Mode") then EUT will not shut off, therefore this test will not be performed
21(e)(8)(i)(C)	Variable Gain	Pass	
2.1049	Occupied Bandwidth	Pass	
20.21(e)(8)(ii)(A)	Oscillation Detection	Pass	
2.1053	Radiated Spurious	Pass	
20.21(e)(8)(i)(B)	Spectrum Block Filtering	N/A	This only applies to devices utilizing spectrum block filtering

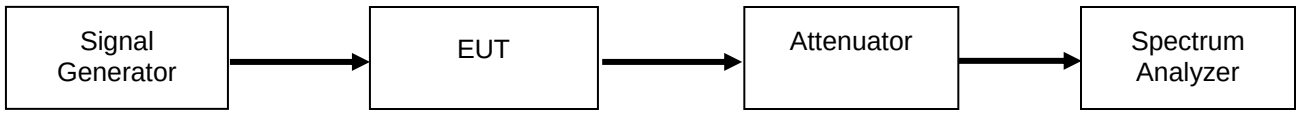
Authorized Frequency Band

Name of Test:	Authorized Frequency Band	**Engineer:** Mike Graffeo
Test Equipment Utilized:	i00331 and i00405	**Test Date**: 11/19/13

Test Procedure

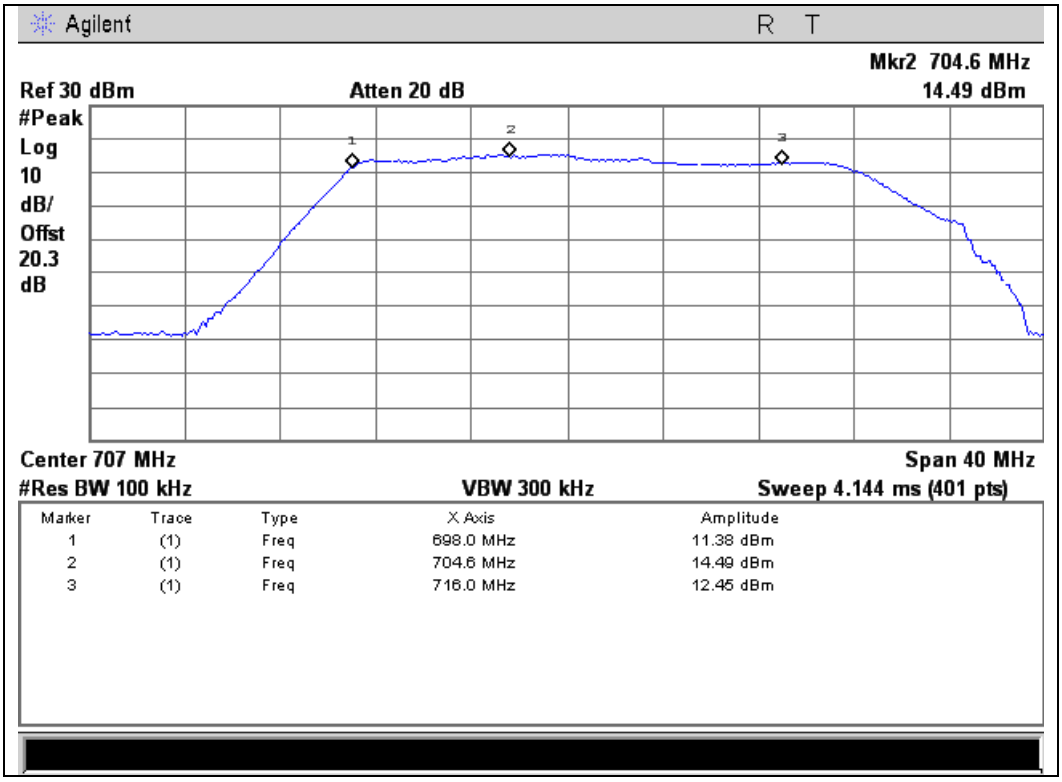
The EUT was connected to a spectrum analyzer through an attenuator with the losses being input into the spectrum analyzer as a combination of reference level offset and correction factor as necessary to ensure accurate readings were obtained. A signal generator was utilized to produce a CW input signal 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

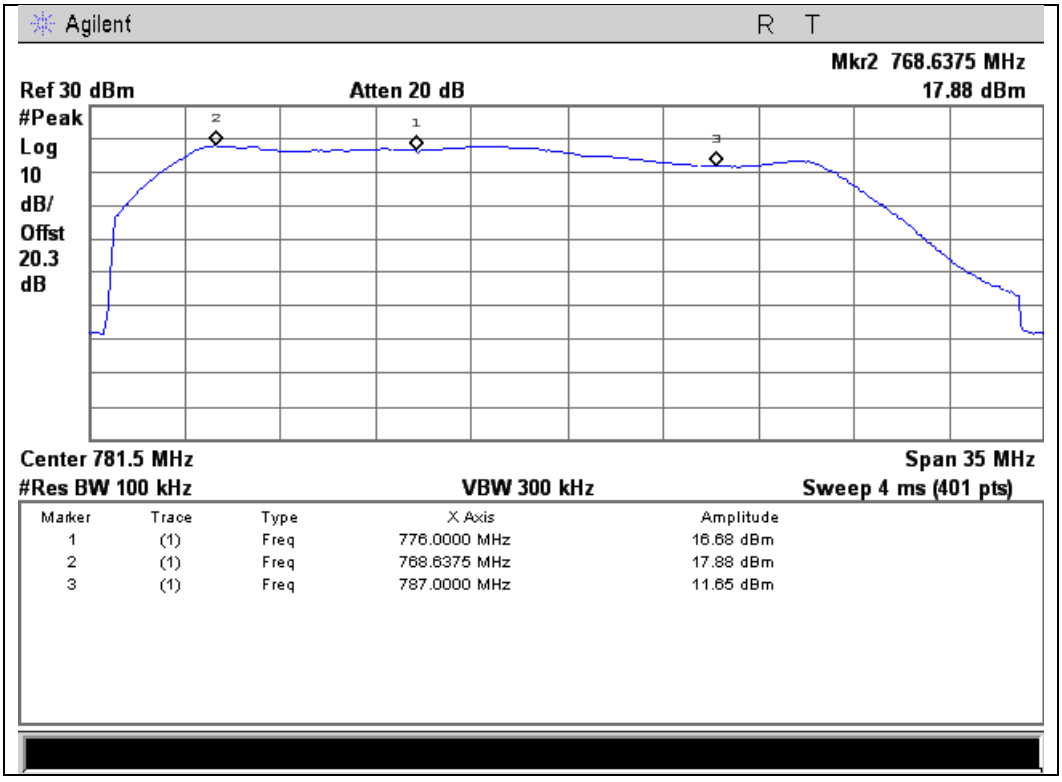


Uplink Test Results

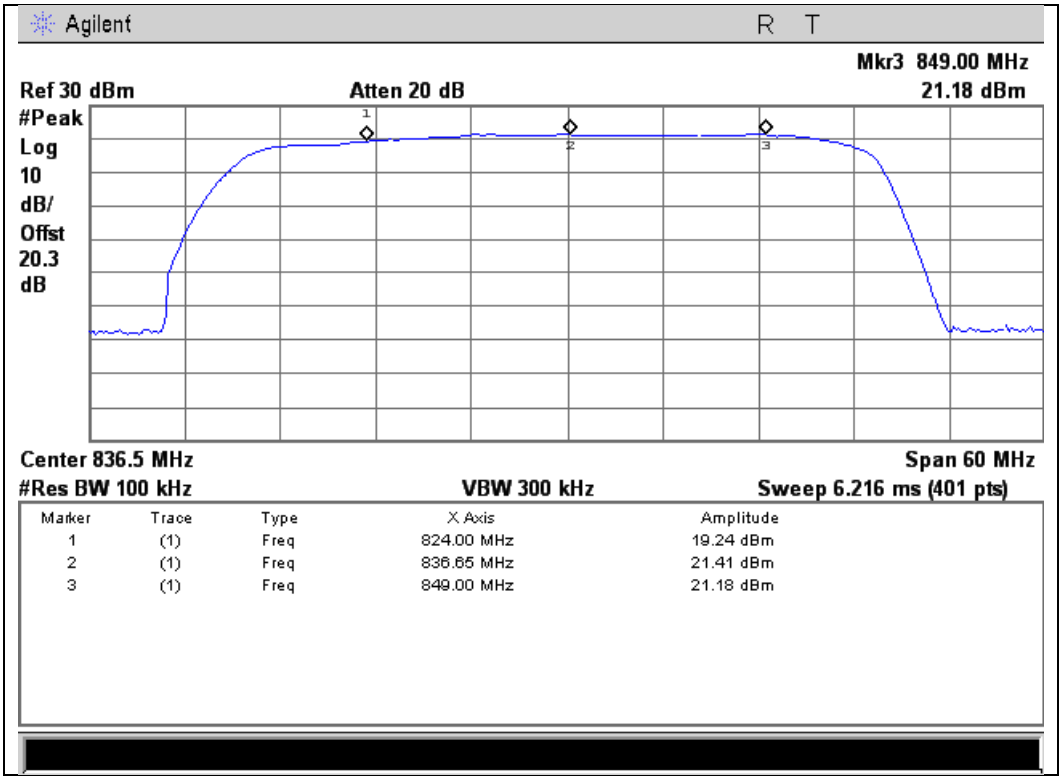
698 - 716MHz Band



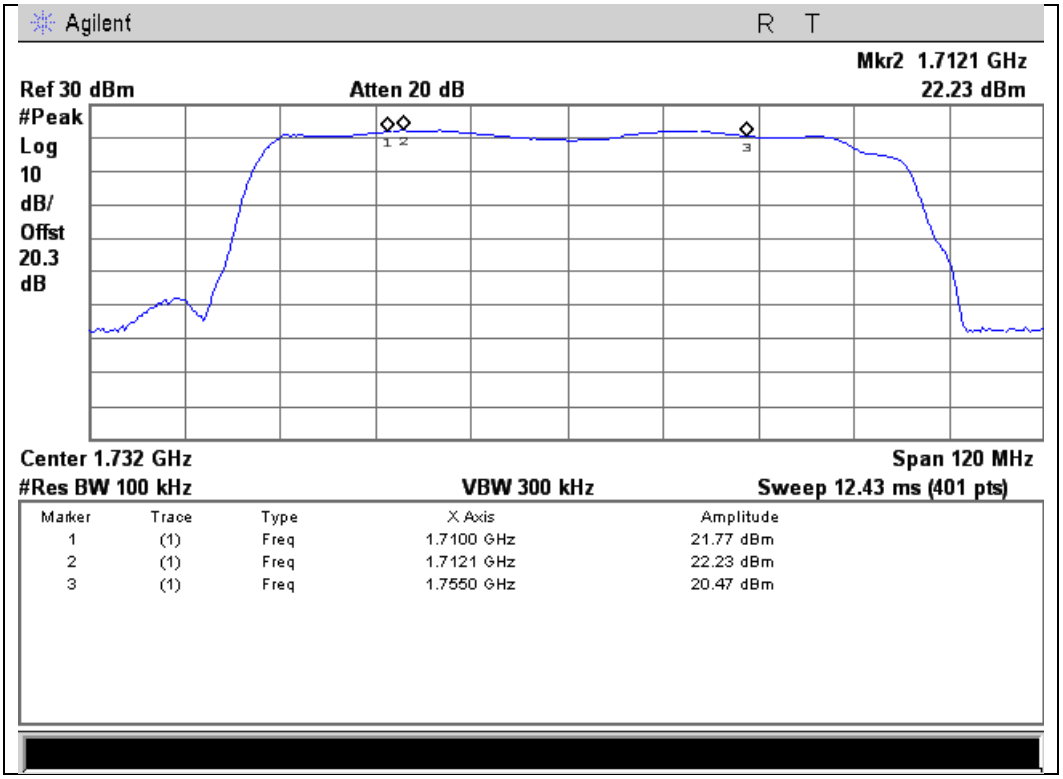
776 - 787MHz Band



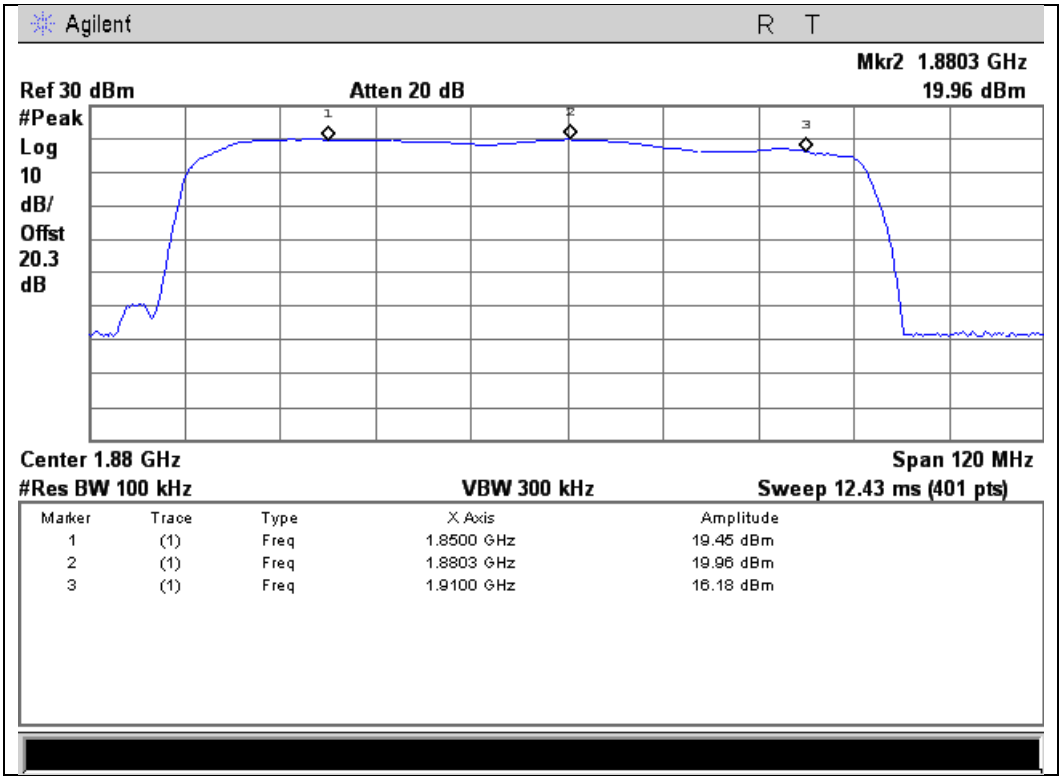
824 - 849 MHz Band



1710 - 1755 MHz Band

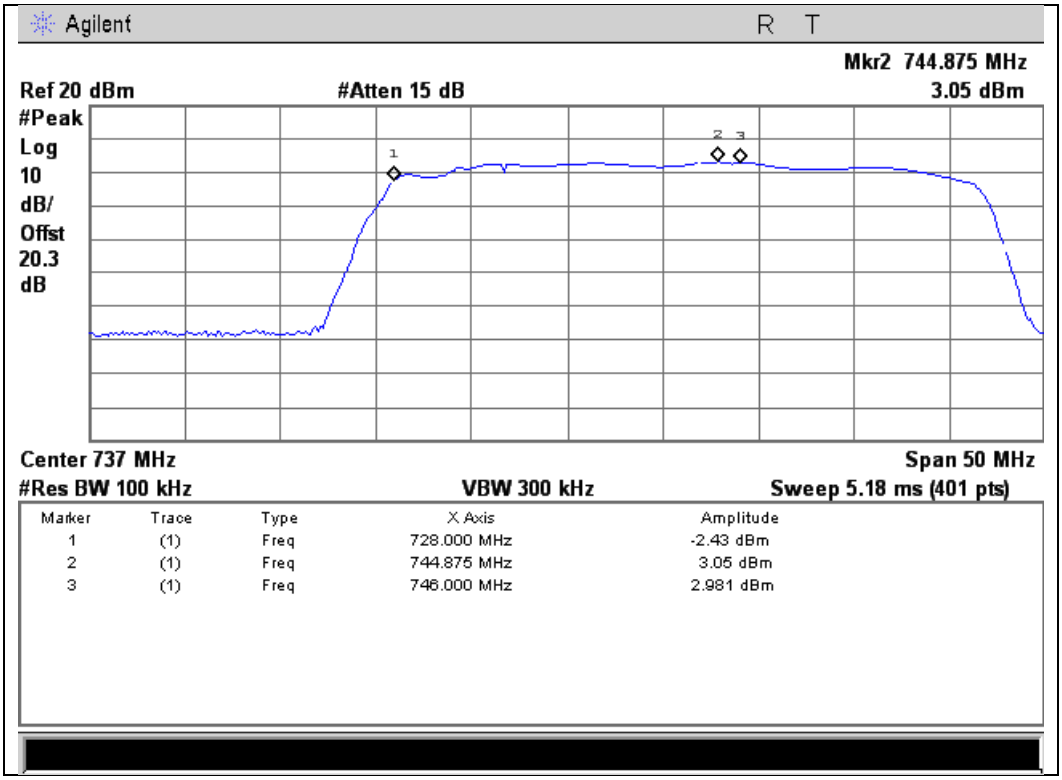


1850 - 1910 MHz Band

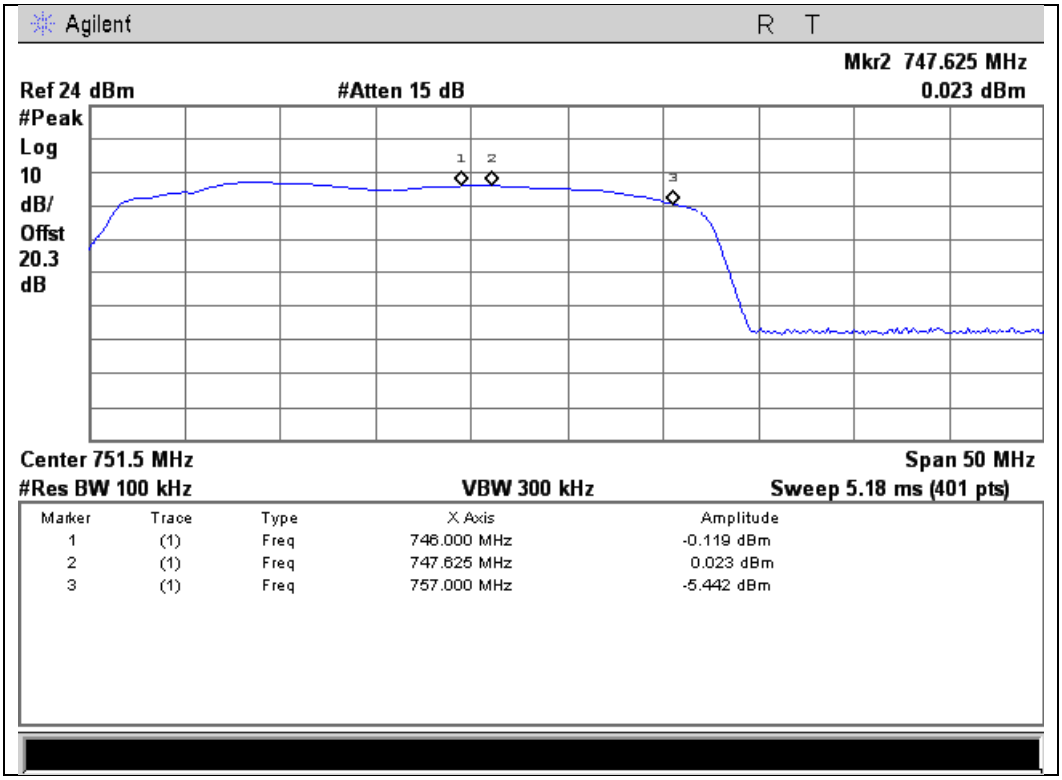


Downlink Test Results

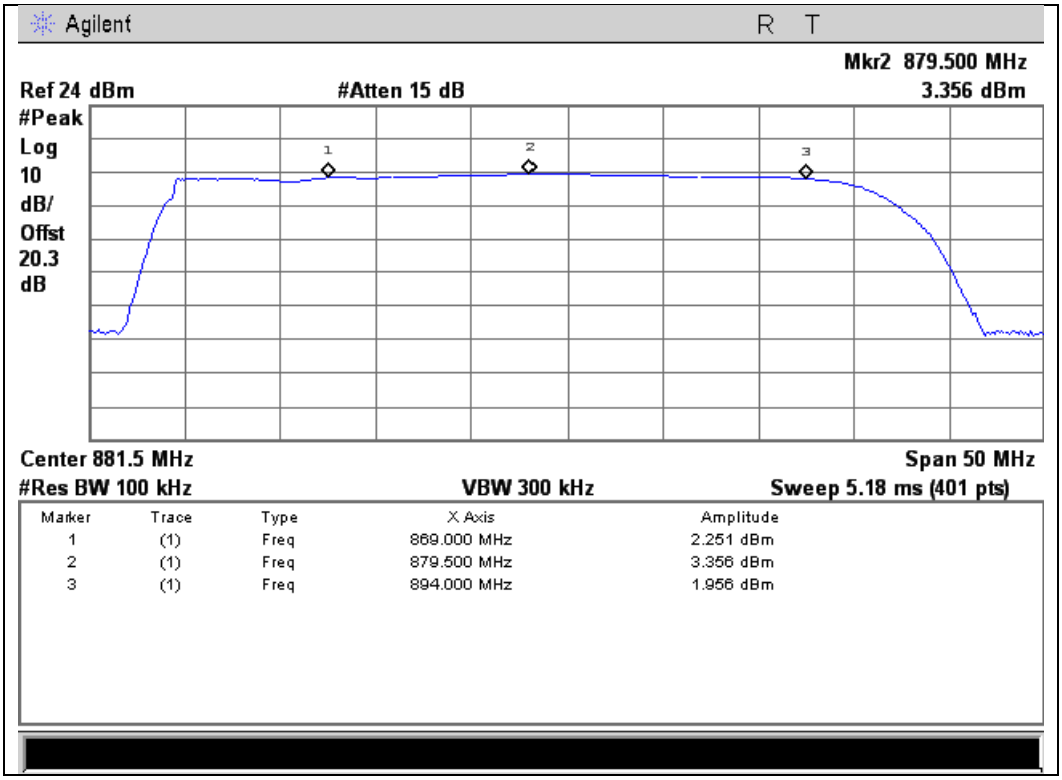
728 - 746 MHz Band



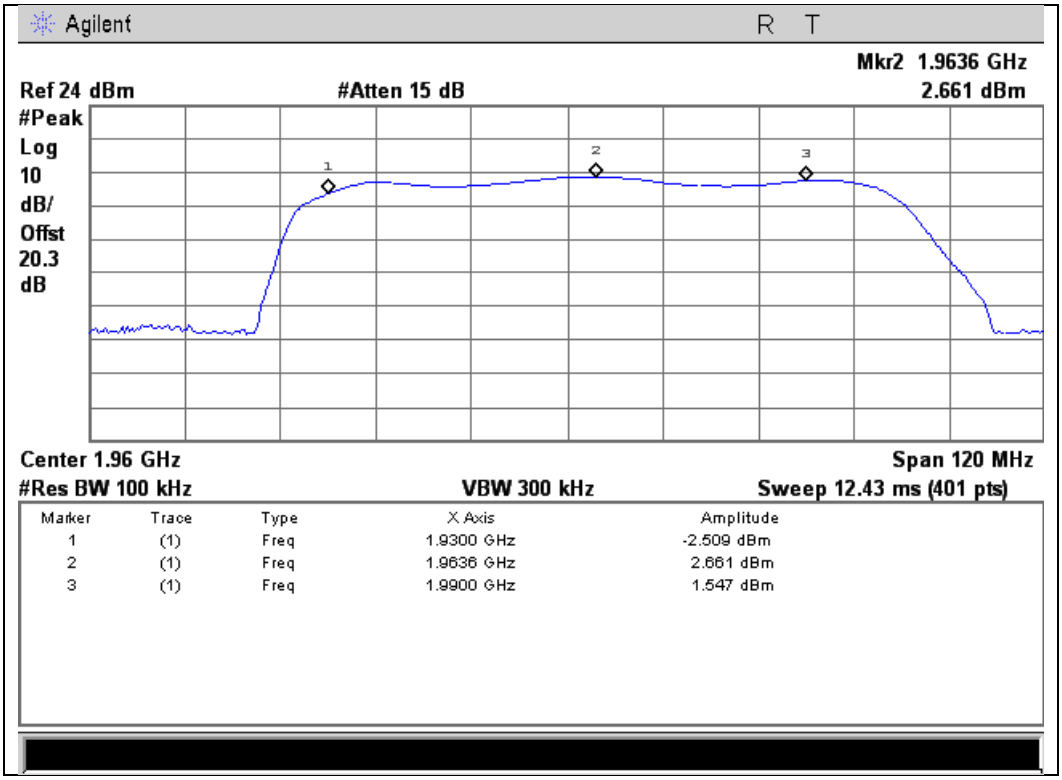
746 - 757MHz Band



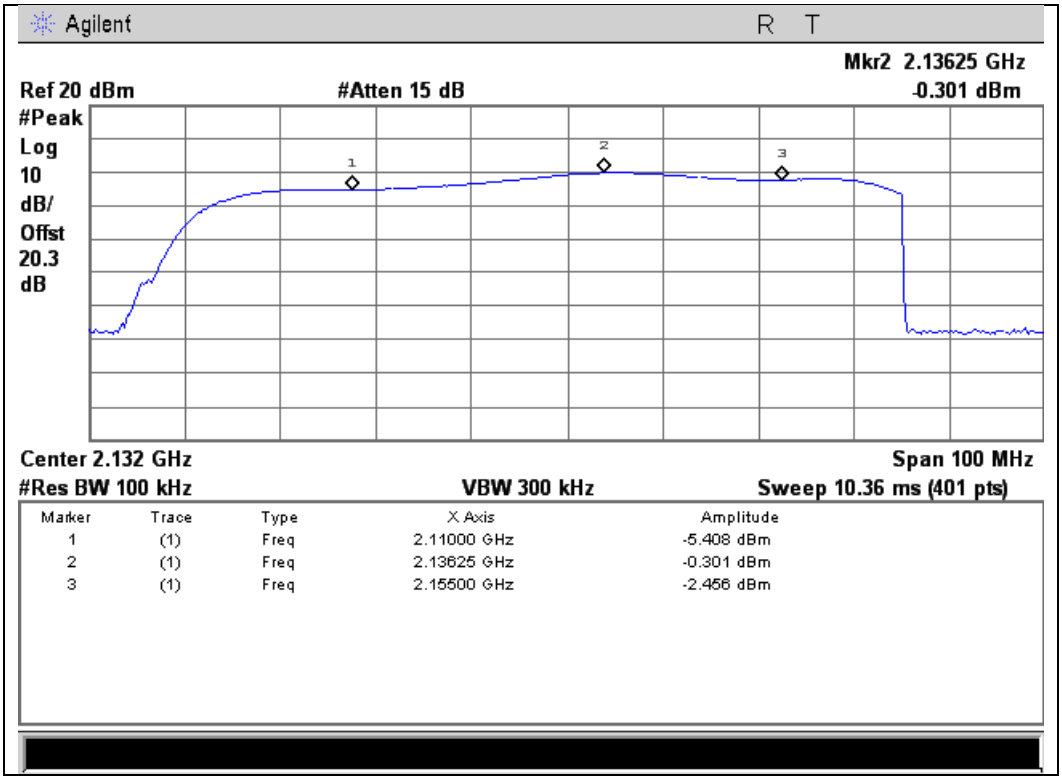
869 - 894 MHz Band



1930 - 1990MHz Band



2110 - 2155 MHz Band



Maximum Power and Gain

Name of Test:	Maximum Power and Gain	**Engineer:** Mike Graffeo
Test Equipment Utilized:	i00331, i00405,	**Test Date:** 11/20/13

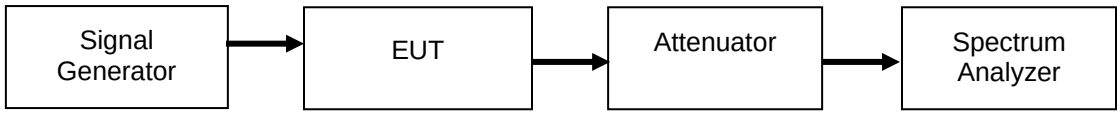
Test Procedure

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.

Maximum Gain Limit (dB) = 23 for mobile devices

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
698 - 716MHz Pulsed CW	3.2	24.35	17	30	Pass
698 - 716MHz AWGN	-3.1	17.78	17	30	Pass
776 - 787MHz Pulsed CW	5.8	23.09	17	30	Pass
776 - 787MHz AWGN	0.1	19.11	17	30	Pass
824 - 849 MHz Pulsed CW	5.4	24.90	17	30	Pass
824 - 849 MHz AWGN	2.0	21.50	17	30	Pass
1710 - 1755 MHz Pulsed CW	3.9	22.00	17	30	Pass
1710 - 1755 MHz AWGN	1.7	21.07	17	30	Pass
1850 - 1910 MHz Pulsed CW	6.1	22.69	17	30	Pass
1850 - 1910 MHz AWGN	1.0	20.42	17	30	Pass

Downlink Power Test Results

Frequency Band (MHz)	Input Level (dBm)	Output Power (dBm)	Upper Limit (dBm)	Result
728 - 746 MHz Pulsed CW	-46.8	-27.64	17	Pass
728 - 746 MHz AWGN	-47.8	-25.99	17	Pass
746 - 757MHz Pulsed CW	-48.6	-27.76	17	Pass
746 - 757MHz AWGN	-49.3	-27.82	17	Pass
869 - 894 MHz Pulsed CW	-48.0	-27.27	17	Pass
869 - 894 MHz AWGN	-52.8	-30.60	17	Pass
1930 - 1990MHz Pulsed CW	-45.7	-27.17	17	Pass
1930 - 1990MHz AWGN	-48.0	-26.82	17	Pass
2110 - 2155 MHz Pulsed CW	-49.7	-28.60	17	Pass
2110 - 2155 MHz AWGN	-52.2	-29.40	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	704.60	744.88	21.15	23	19.20	23	1.99	9	-7.01
AWGN	704.60	744.88	20.88	23	21.80	23	0.93	9	-8.07
Pulsed CW	779.40	747.63	17.29	23	20.80	23	3.55	9	-5.45
AWGN	779.40	747.63	19.01	23	21.50	23	2.47	9	-6.53
Pulsed CW	836.65	879.50	19.50	23	20.70	23	1.23	9	-7.77
AWGN	836.65	879.50	19.50	23	22.20	23	2.70	9	-6.3
Pulsed CW	1712.10	2136.25	18.10	23	21.10	23	3.00	9	-6
AWGN	1712.10	2136.25	19.37	23	22.80	23	3.43	9	-5.57
Pulsed CW	1880.30	1963.60	16.59	23	18.50	23	1.94	9	-7.06
AWGN	1880.30	1963.60	19.42	23	21.20	23	1.76	9	-7.24

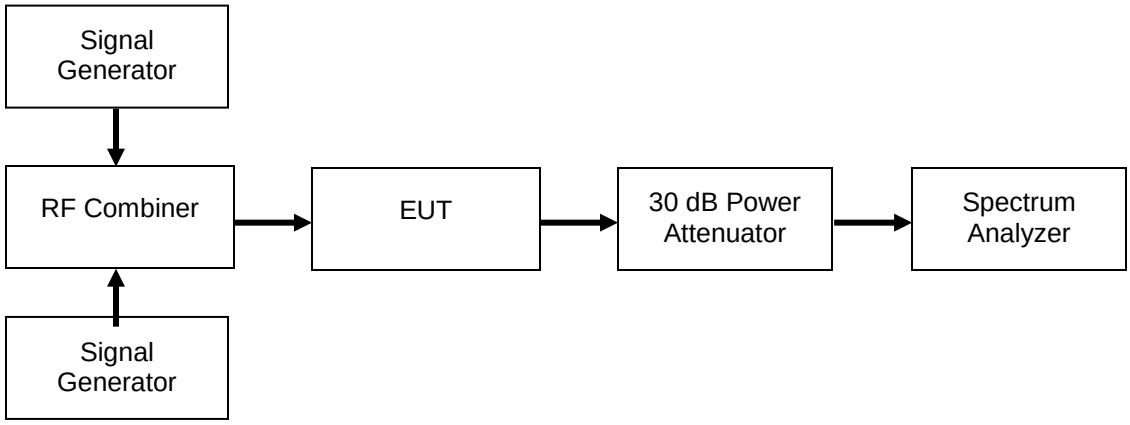
Intermodulation

Name of Test:	Intermodulation	**Engineer:**	Mike Graffeo
Test Equipment Utilized:	i00331, i00405, i00412	**Test Date:**	11/20/13

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

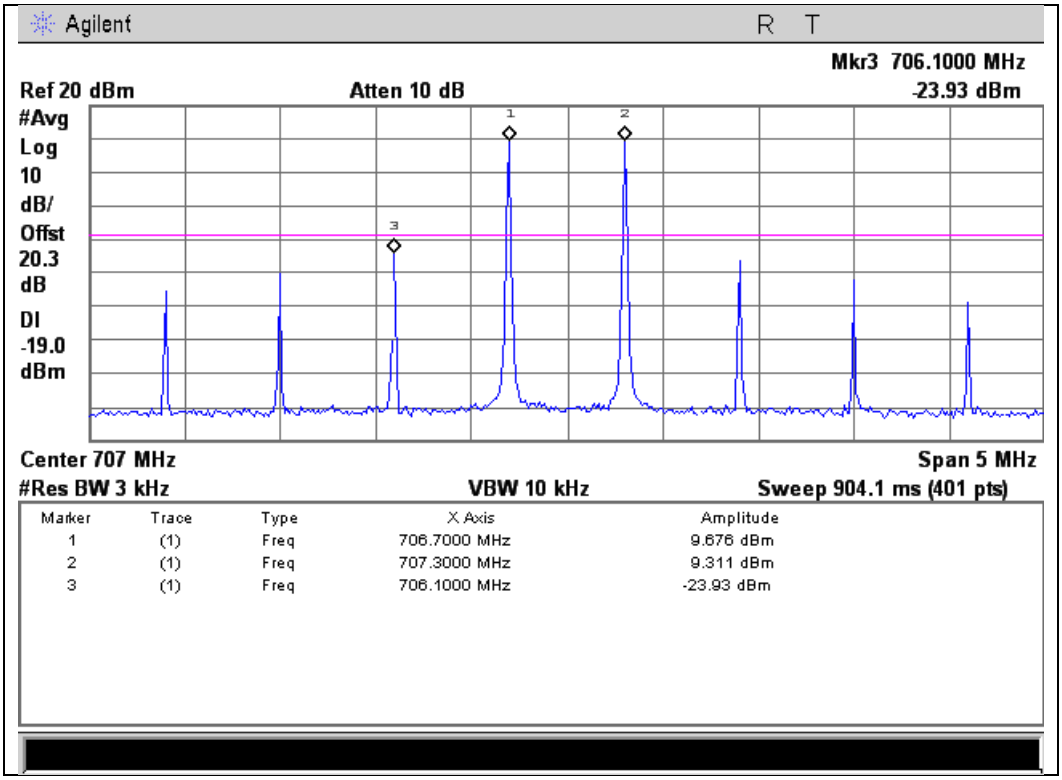
Frequency Band (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Result
698 - 716MHz	-23.93	-19	Pass
776 - 787MHz	-23.19	-19	Pass
824 - 849 MHz	-26.03	-19	Pass
1710 - 1755 MHz	-24.63	-19	Pass
1850 - 1910 MHz	-31.94	-19	Pass

Downlink Test Results

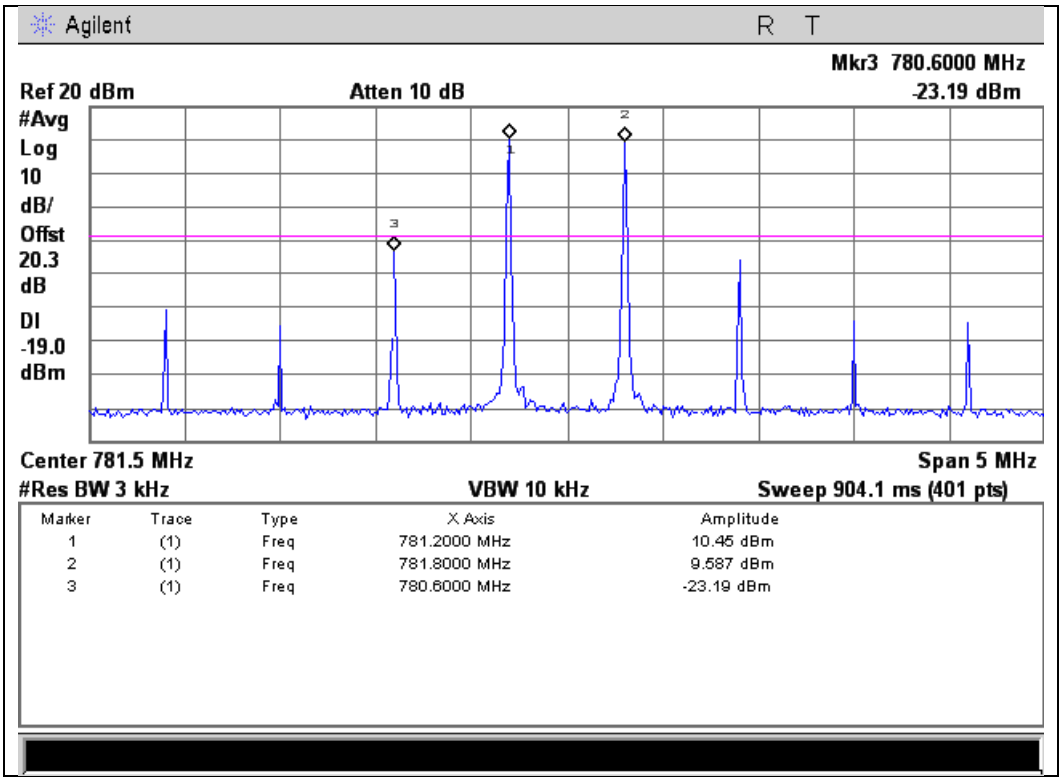
Frequency Band (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Result
728 - 746 MHz	-33.68	-19	Pass
746 - 757MHz	-30.34	-19	Pass
869 - 894 MHz	-26.62	-19	Pass
1930 - 1990MHz	-35.24	-19	Pass
2110 - 2155 MHz	-30.03	-19	Pass

Uplink Test Results

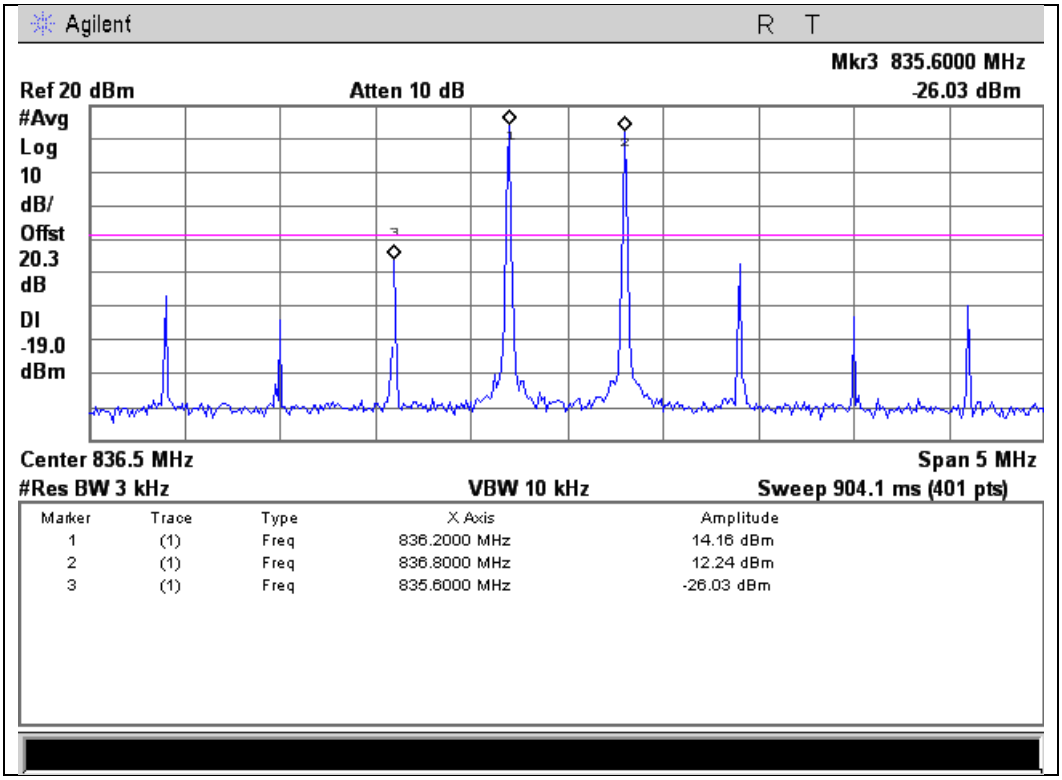
698 - 716MHz Band



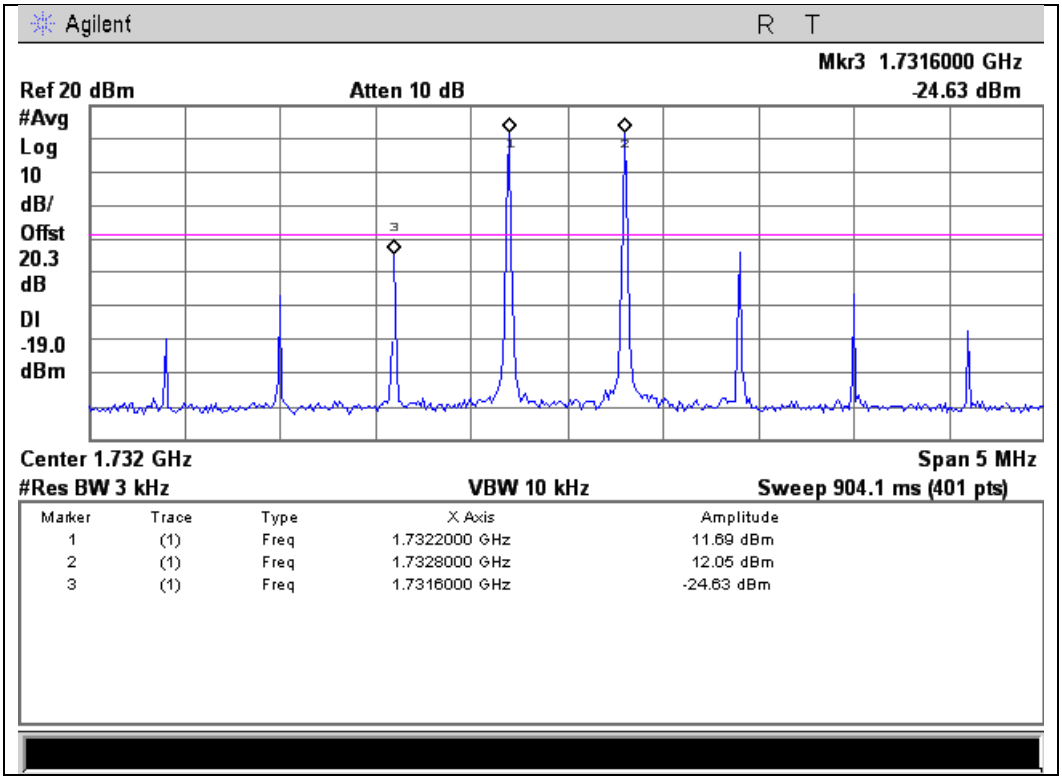
776 - 787MHz Band



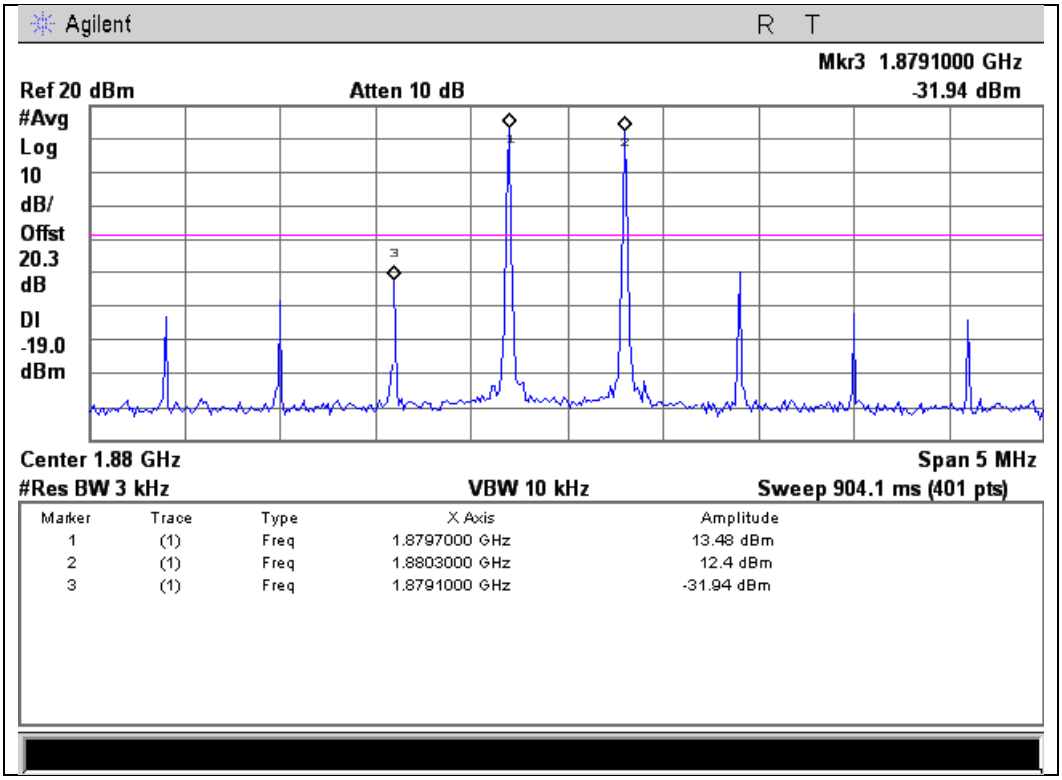
824 - 849 MHz Band



1710 - 1755 MHz Band

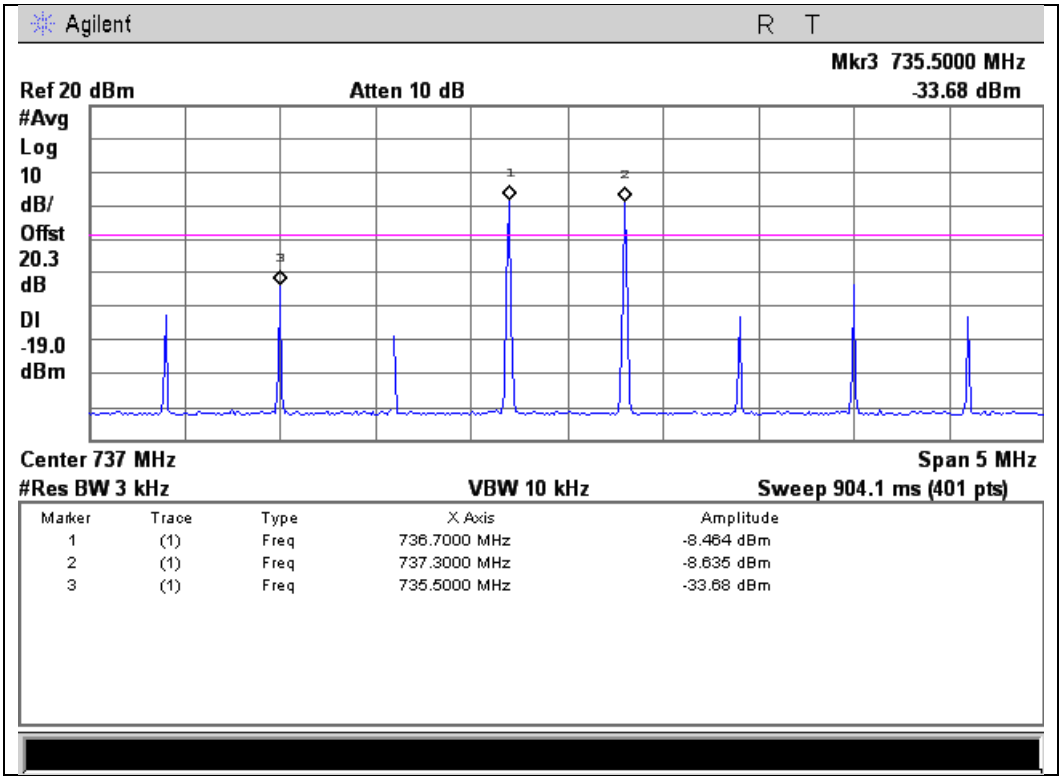


1850 - 1910 MHz Band

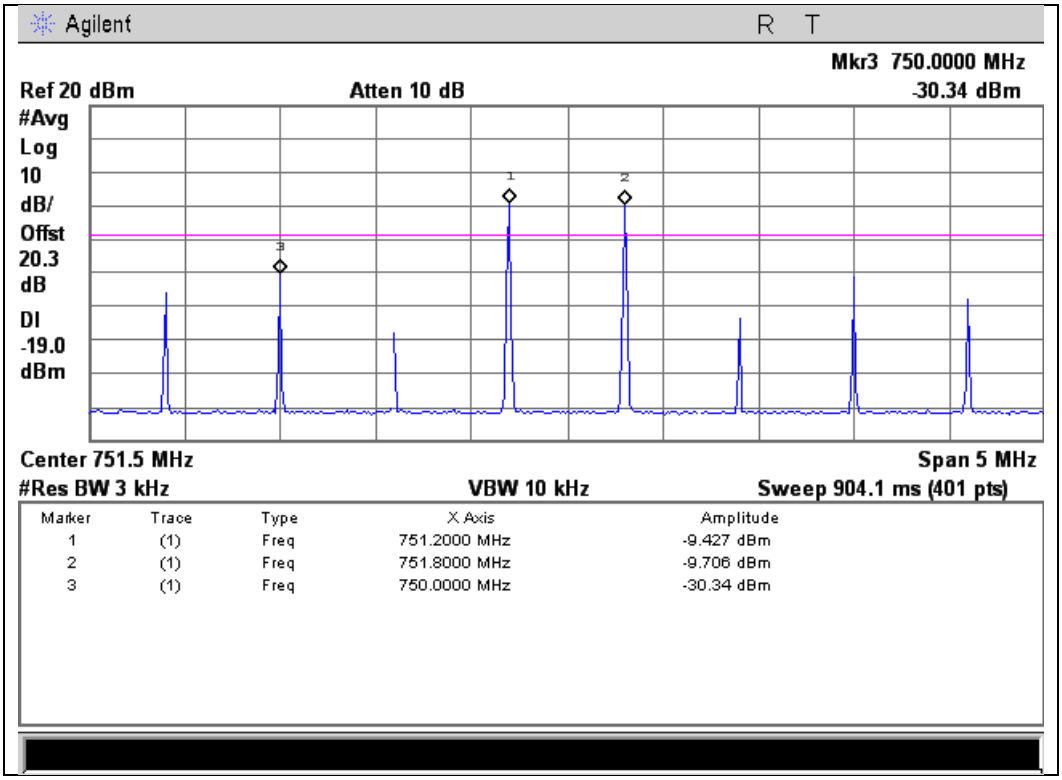


Downlink Test Results

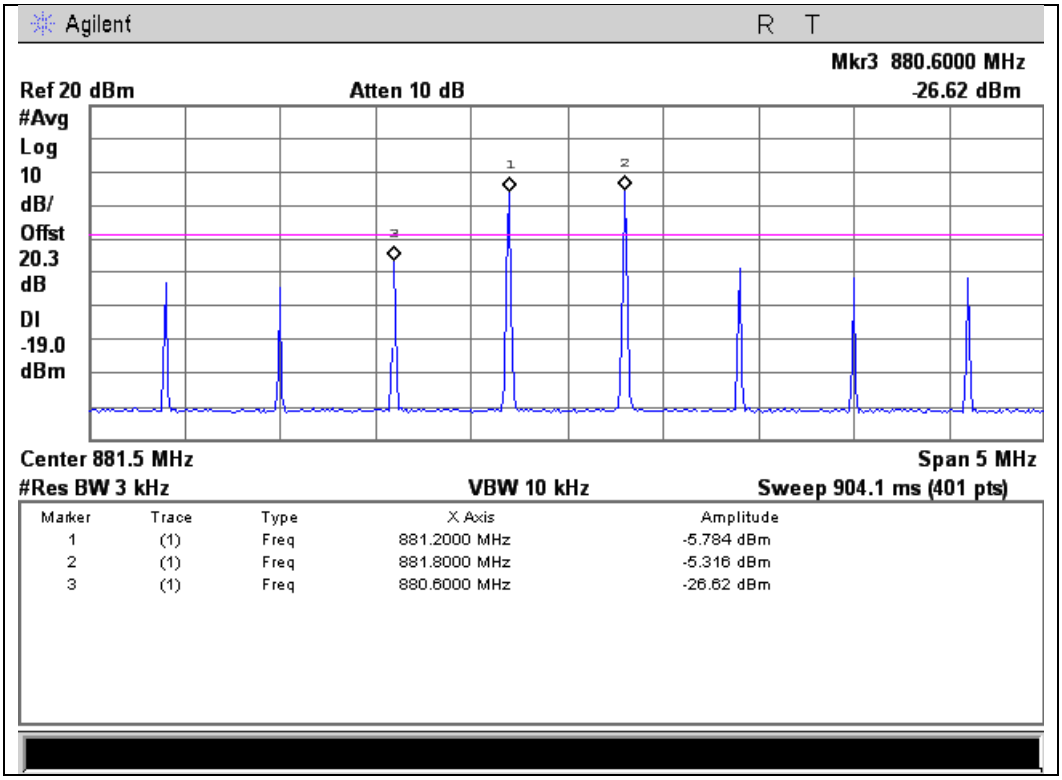
728 - 746 MHz Band



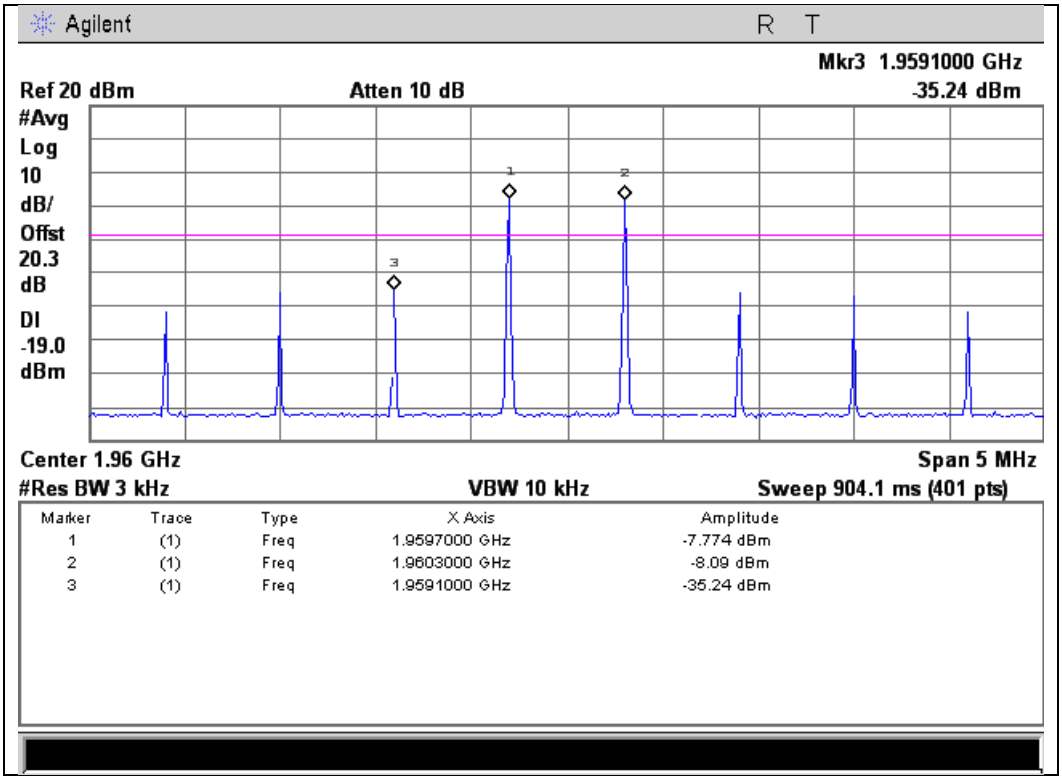
746 - 757MHz Band



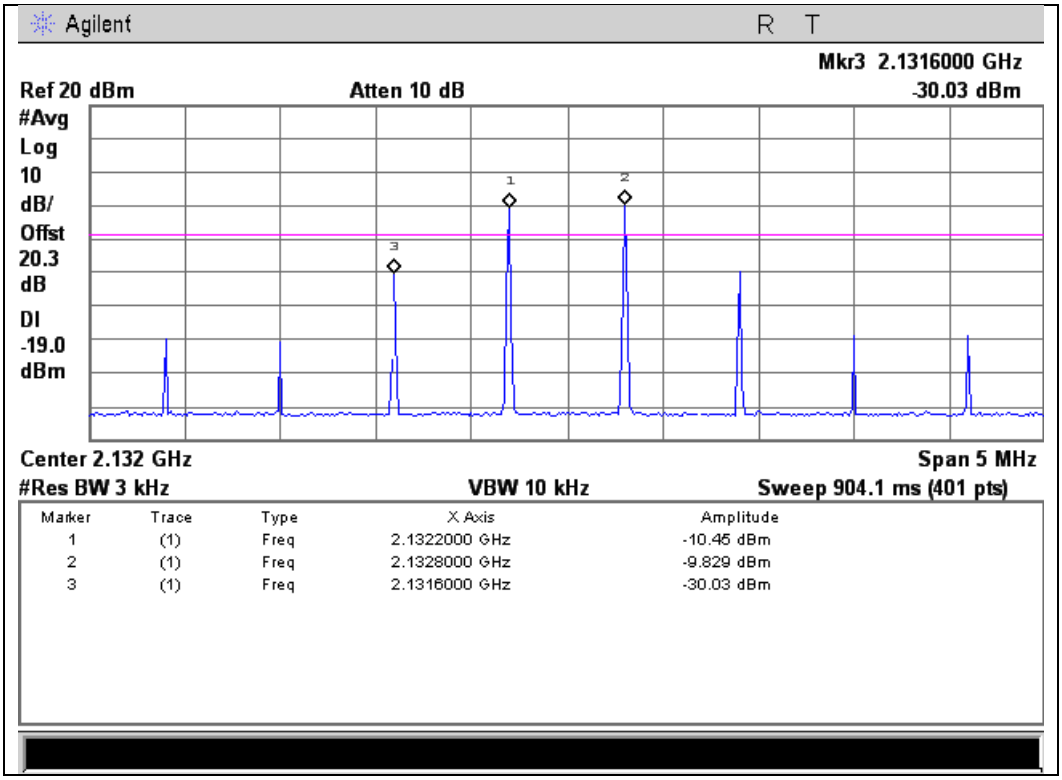
869 - 894 MHz Band



1930 - 1990MHz Band



2110 - 2155 MHz Band



Out-of-Band Emissions

Name of Test:	Out-of-Band Emissions	**Engineer:** Mike Graffeo
Test Equipment Utilized:	i00331 and i00405	**Test Date:** 11/20/13

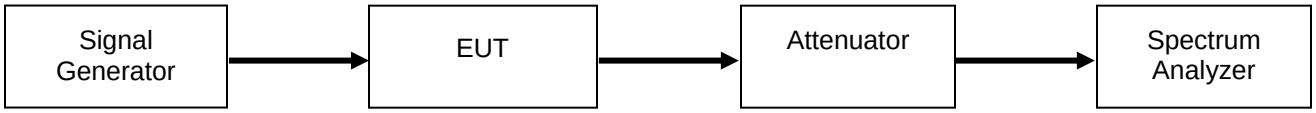
Test Procedure

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 =P1 -6 –(43 + 10Log(P2)) = -19dBm
where P1=power in dBm, and P2=power in Watts

Test Setup



GSM Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
698 - 716	Lower	-32.17	-19	Pass
698 - 716	Upper	-28.44	-19	Pass
776 - 787	Lower	-26.43	-19	Pass
776 - 787	Upper	-30.66	-19	Pass
824 - 849	Lower	-33.58	-19	Pass
824 - 849	Upper	-31.24	-19	Pass
1710 - 1755	Lower	-33.75	-19	Pass
1710 - 1755	Upper	-34.50	-19	Pass
1850 - 1910	Lower	-34.89	-19	Pass
1850 - 1910	Upper	-72.94	-19	Pass

CDMA Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
698 - 716	Lower	-44.92	-19	Pass
698 - 716	Upper	-59.1	-19	Pass
776 - 787	Lower	-56.99	-19	Pass
776 - 787	Upper	-79.70	-19	Pass
824 - 849	Lower	-36.38	-19	Pass
824 - 849	Upper	-26.31	-19	Pass
1710 - 1755	Lower	-41.11	-19	Pass
1710 - 1755	Upper	-31.35	-19	Pass
1850 - 1910	Lower	-43.45	-19	Pass
1850 - 1910	Upper	-67.10	-19	Pass

WCDMA Uplink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
698 - 716	Lower	-44.92	-19	Pass
698 - 716	Upper	-44.16	-19	Pass
776 - 787	Lower	-78.42	-19	Pass
776 - 787	Upper	-56.15	-19	Pass
824 - 849	Lower	-37.54	-19	Pass
824 - 849	Upper	-29.01	-19	Pass
1710 - 1755	Lower	-73.77	-19	Pass
1710 - 1755	Upper	-33.99	-19	Pass
1850 - 1910	Lower	-73.56	-19	Pass
1850 - 1910	Upper	-73.51	-19	Pass

GSM Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
728 - 746	Lower	-78.53	-19	Pass
728 - 746	Upper	-79.21	-19	Pass
746 - 757	Lower	-78.27	-19	Pass
746 - 757	Upper	-88.38	-19	Pass
869 - 894	Lower	-87.23	-19	Pass
869 - 894	Upper	-88.56	-19	Pass
1930 - 1990	Lower	-87.37	-19	Pass
1930 - 1990	Upper	-87.06	-19	Pass
2110 - 2155	Lower	-50.15	-19	Pass
2110 - 2155	Upper	-50.31	-19	Pass

CDMA Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
728 - 746	Lower	-30.01	-19	Pass
728 - 746	Upper	-27.03	-19	Pass
746 - 757	Lower	-27.93	-19	Pass
746 - 757	Upper	-30.82	-19	Pass
869 - 894	Lower	-24.83	-19	Pass
869 - 894	Upper	-24.89	-19	Pass
1930 - 1990	Lower	-32.16	-19	Pass
1930 - 1990	Upper	-54.12	-19	Pass
2110 - 2155	Lower	-30.71	-19	Pass
2110 - 2155	Upper	-30.51	-19	Pass

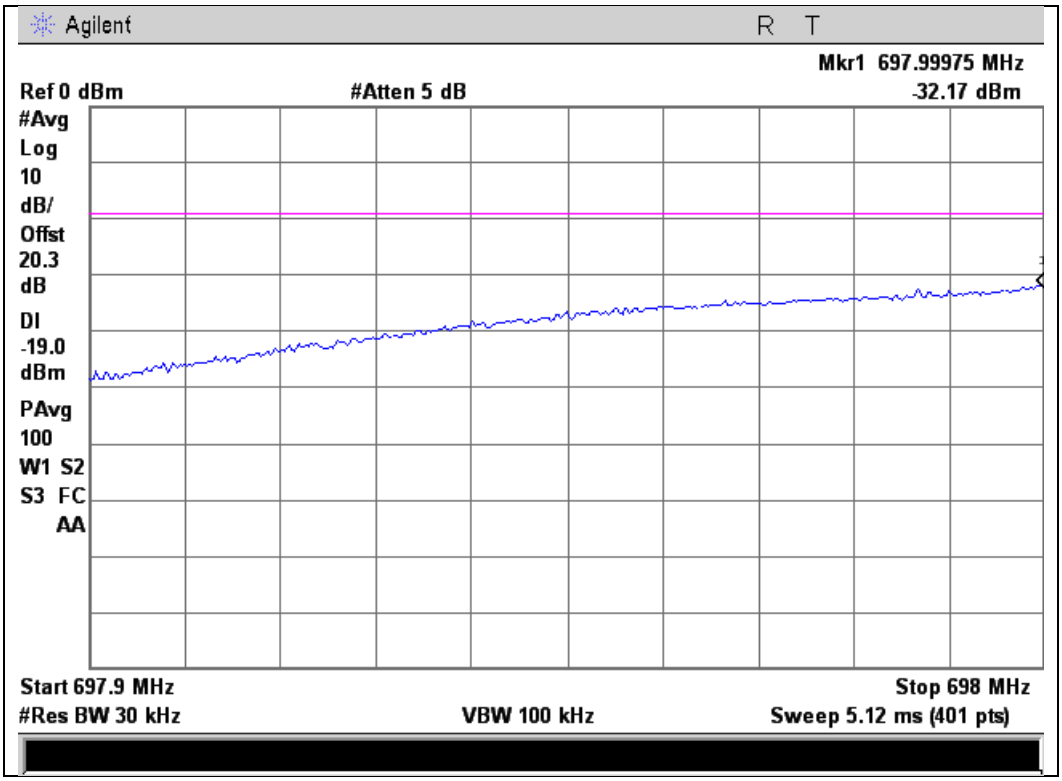
WCDMA Downlink Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)	Result
728 - 746	Lower	-33.72	-19	Pass
728 - 746	Upper	-30.5	-19	Pass
746 - 757	Lower	-31.06	-19	Pass
746 - 757	Upper	-33.60	-19	Pass
869 - 894	Lower	-25.49	-19	Pass
869 - 894	Upper	-25.26	-19	Pass
1930 - 1990	Lower	-29.61	-19	Pass
1930 - 1990	Upper	-40.00	-19	Pass
2110 - 2155	Lower	-27.35	-19	Pass
2110 - 2155	Upper	-28.11	-19	Pass

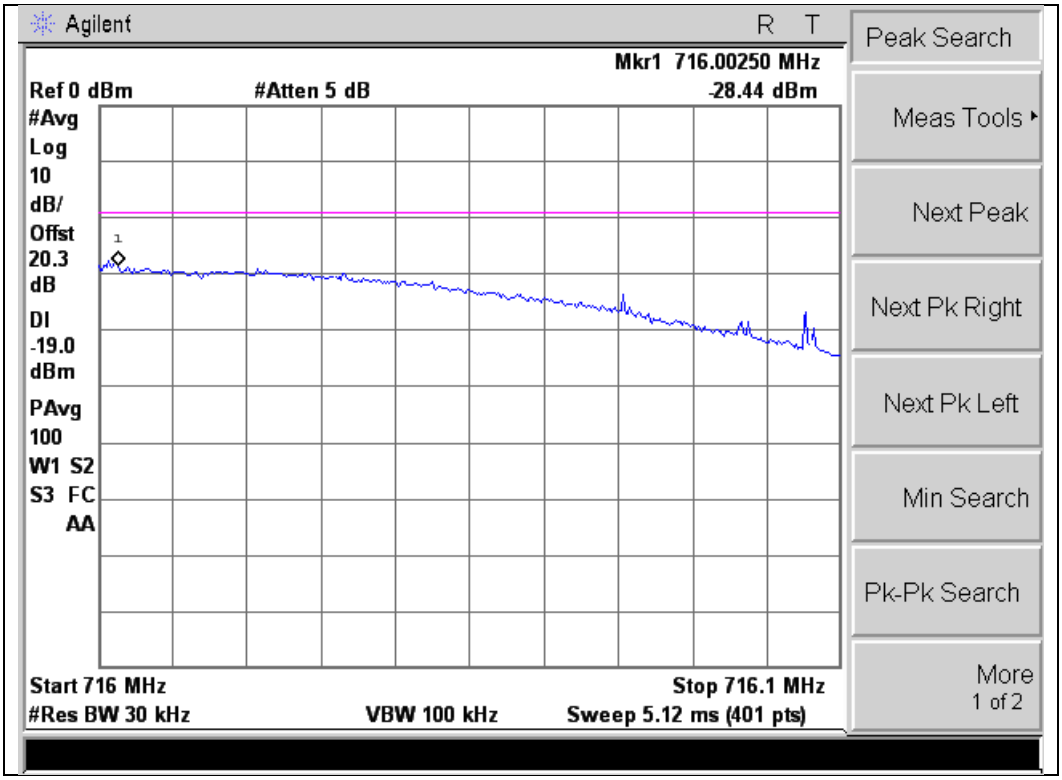
GSM Uplink Test Plots

698 - 716MHz Band

Lower Band Edge

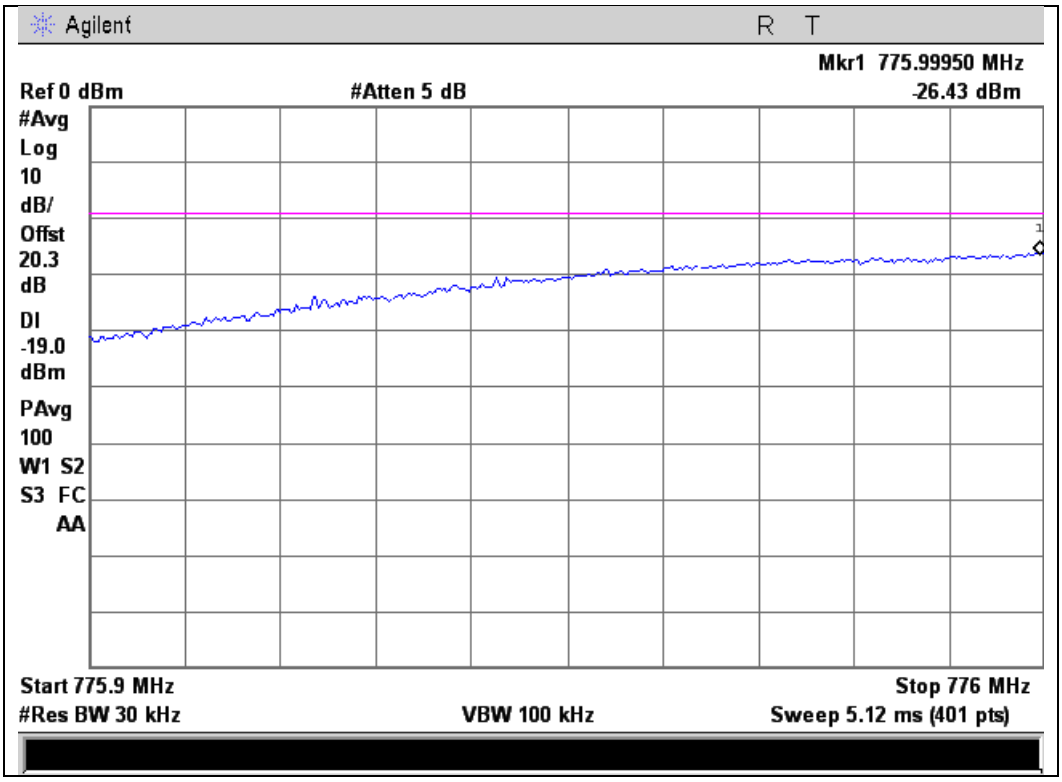


Upper Band Edge

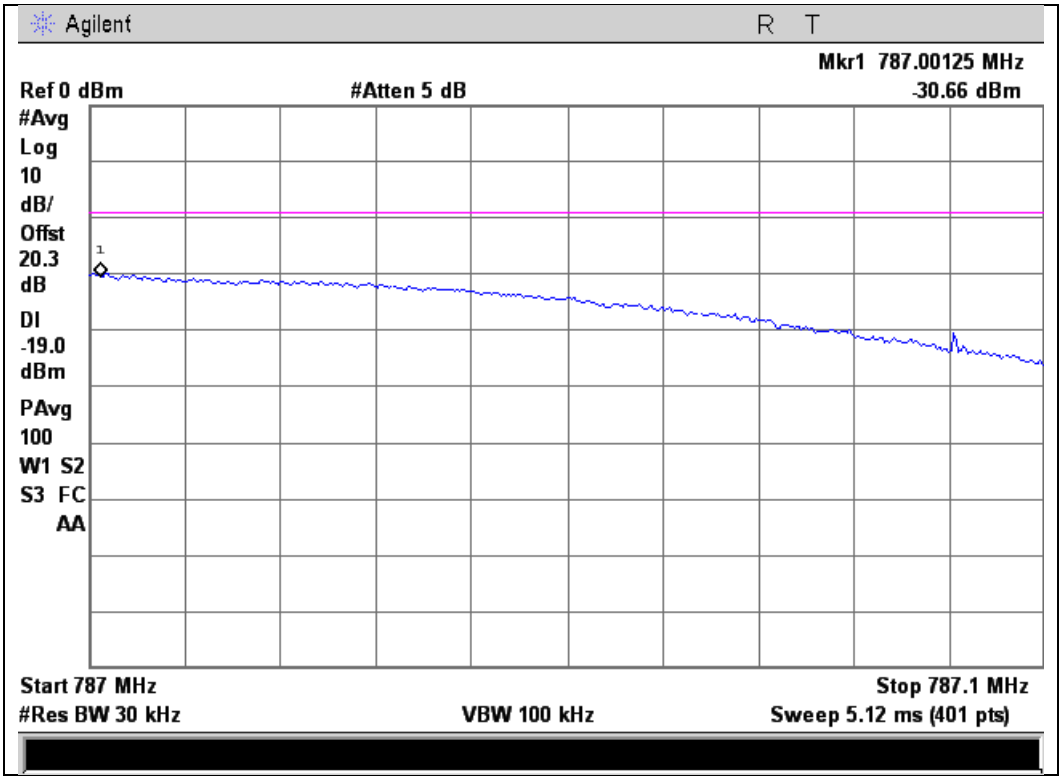


776 - 787MHz Band

Lower Band Edge

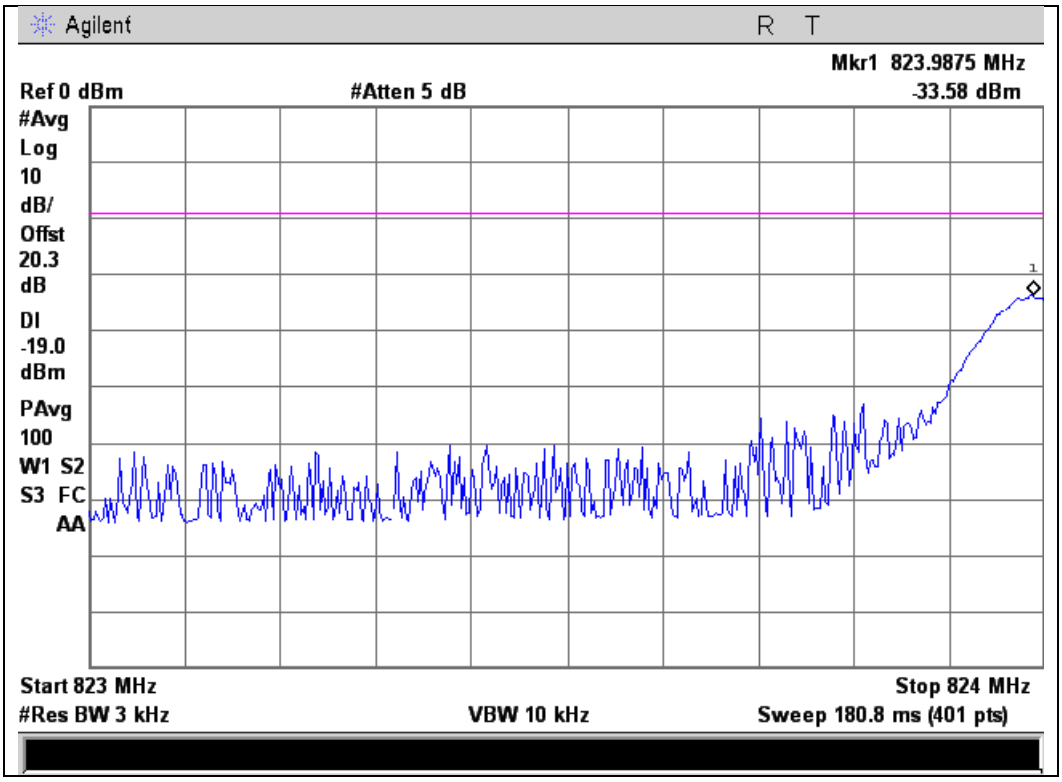


Upper Band Edge

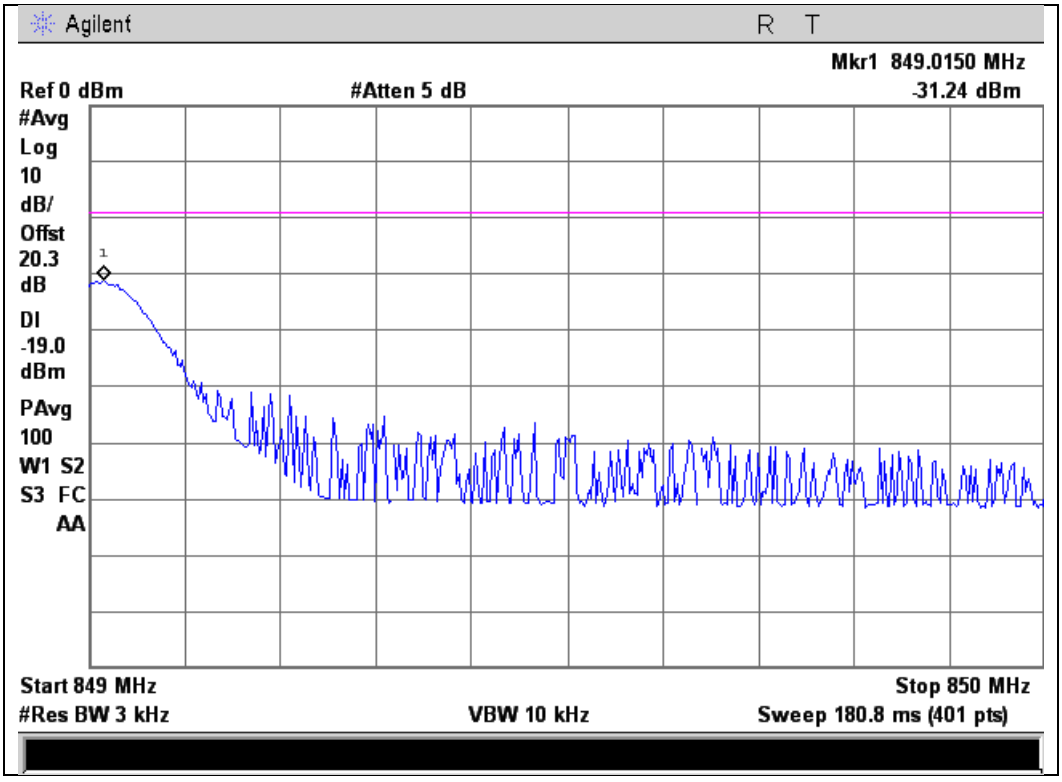


824 - 849 MHz Band

Lower Band Edge

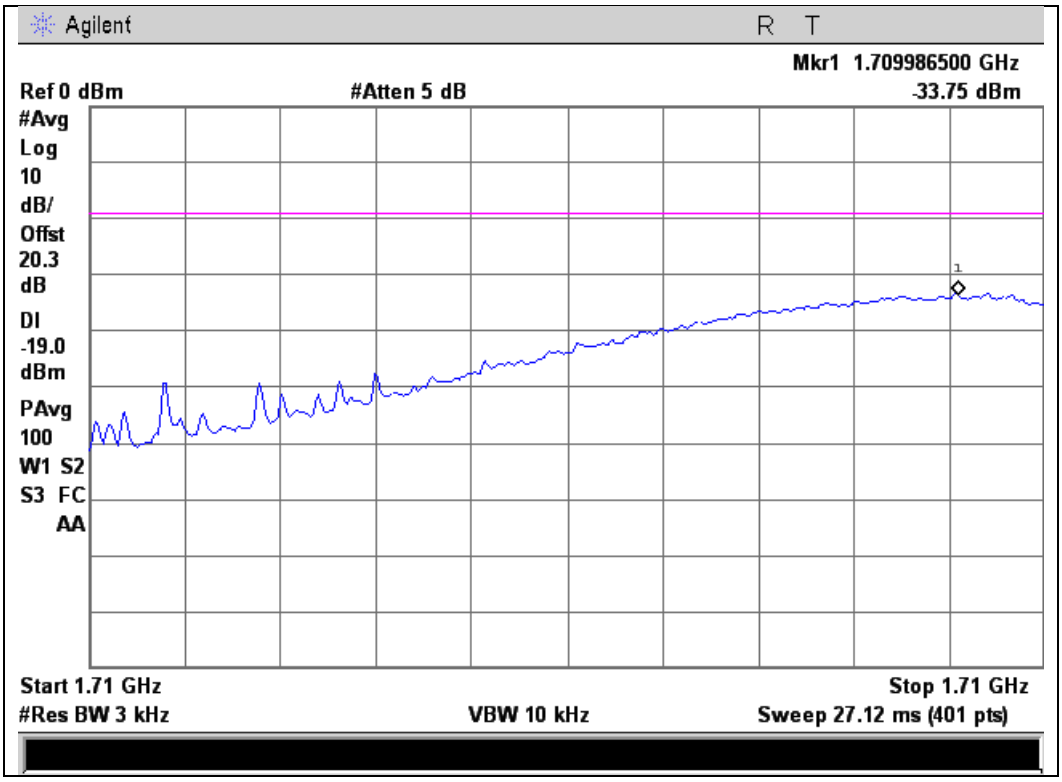


Upper Band Edge

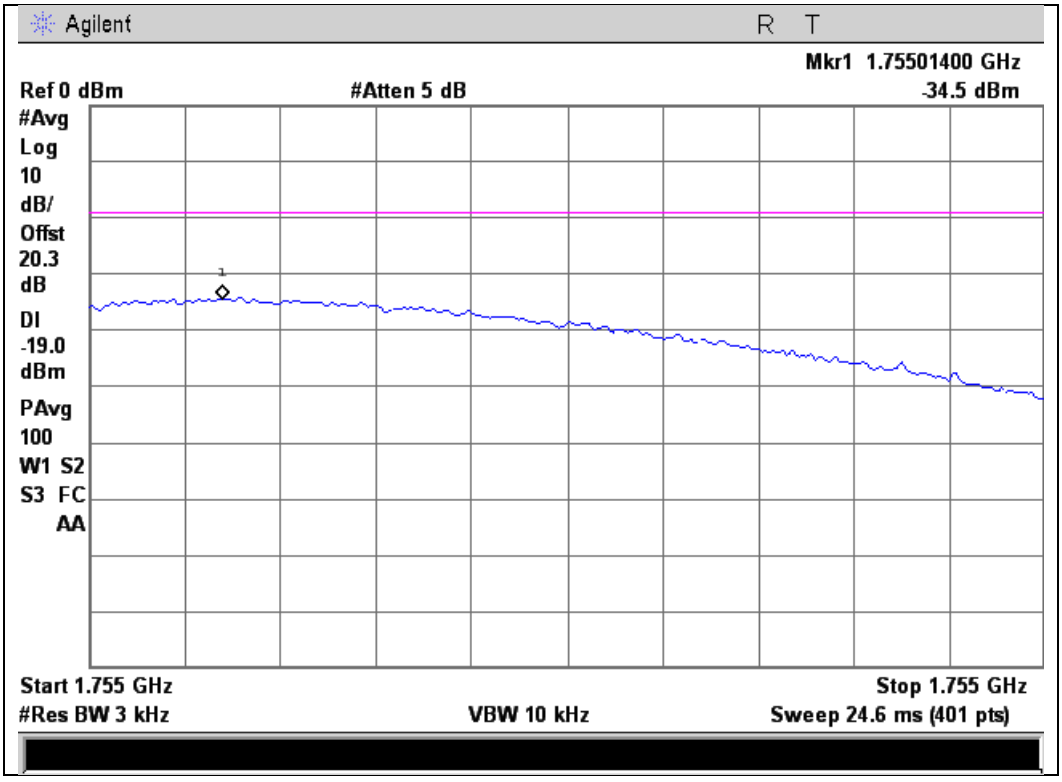


1710 - 1755 MHz Band

Lower Band Edge

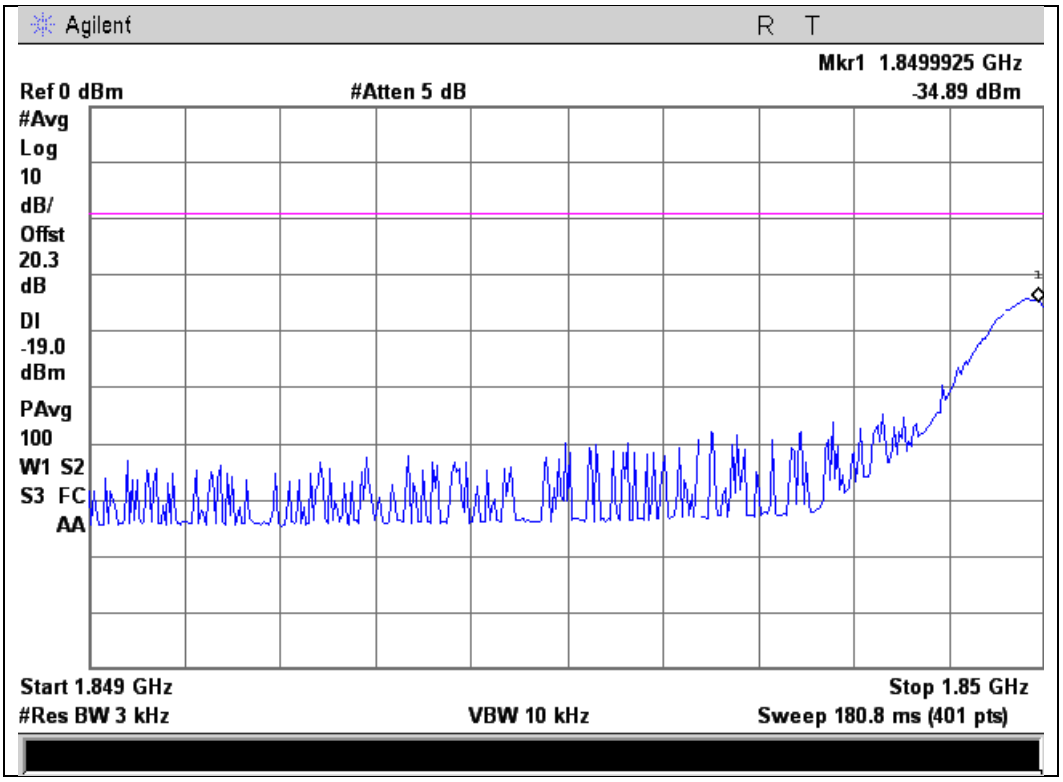


Upper Band Edge

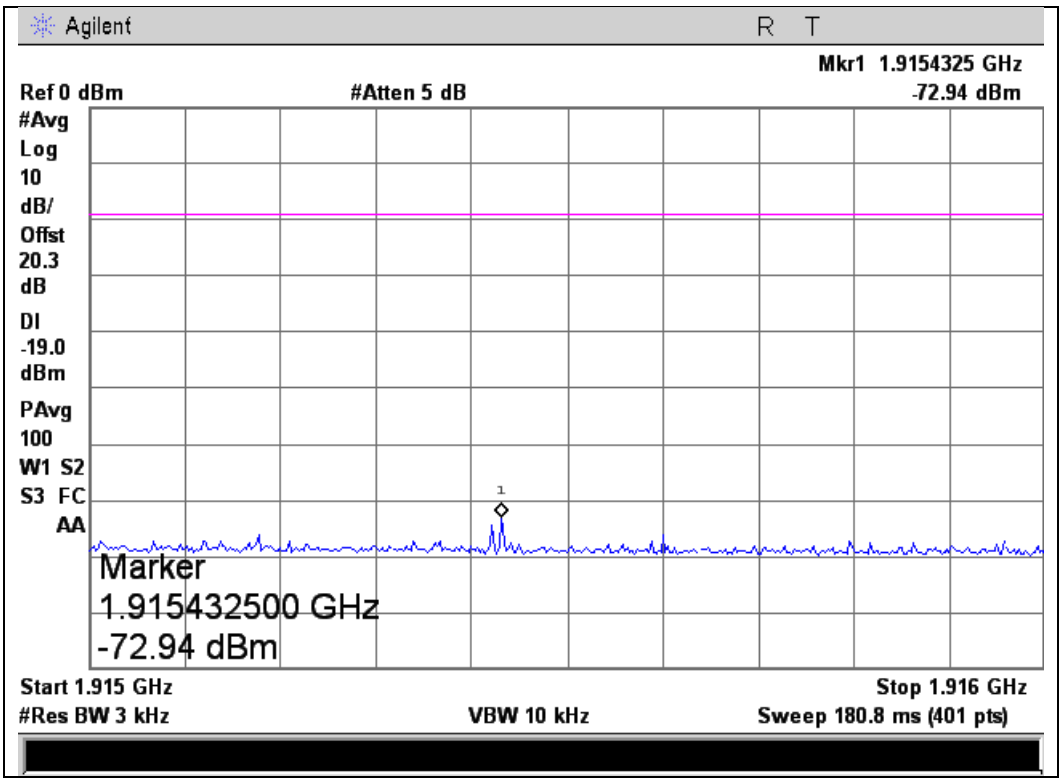


1850 - 1910 MHz Band

Lower Band Edge



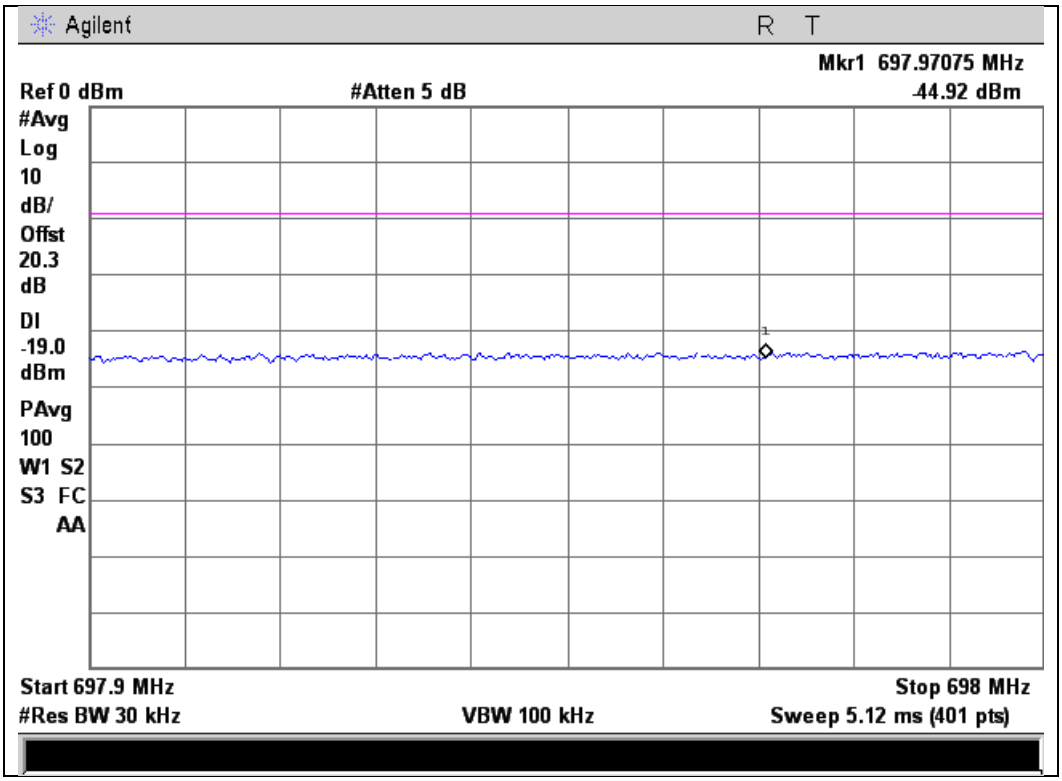
Upper Band Edge



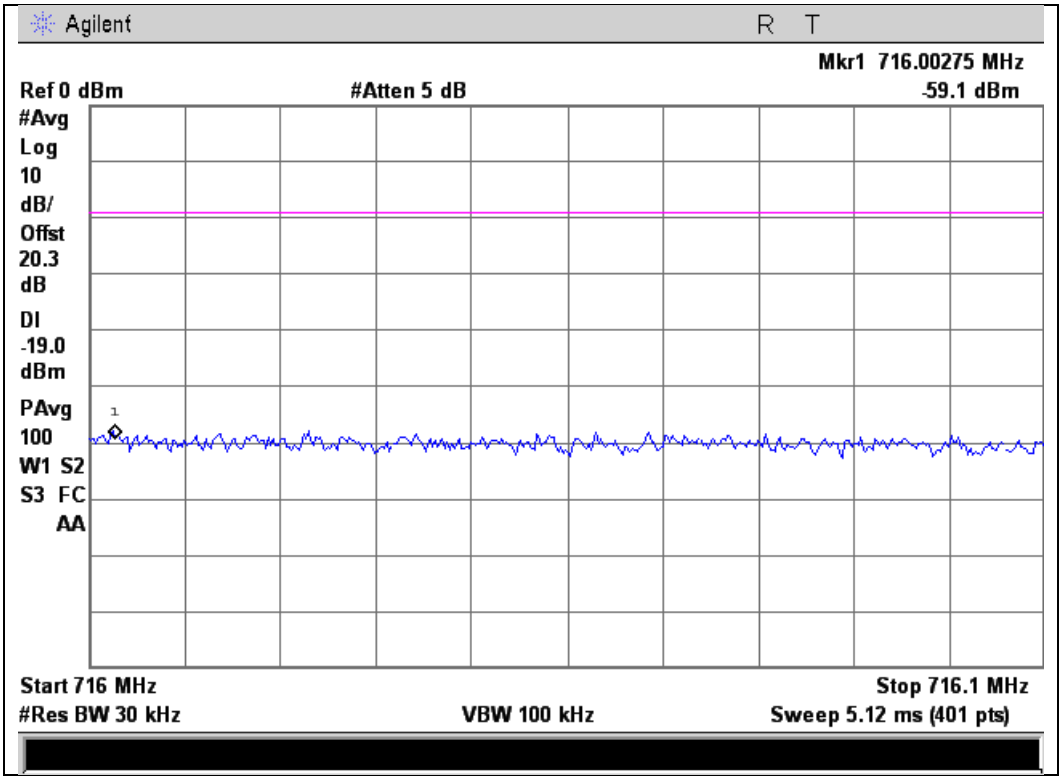
CDMA Uplink Test Plots

698 - 716MHz Band

Lower Band Edge

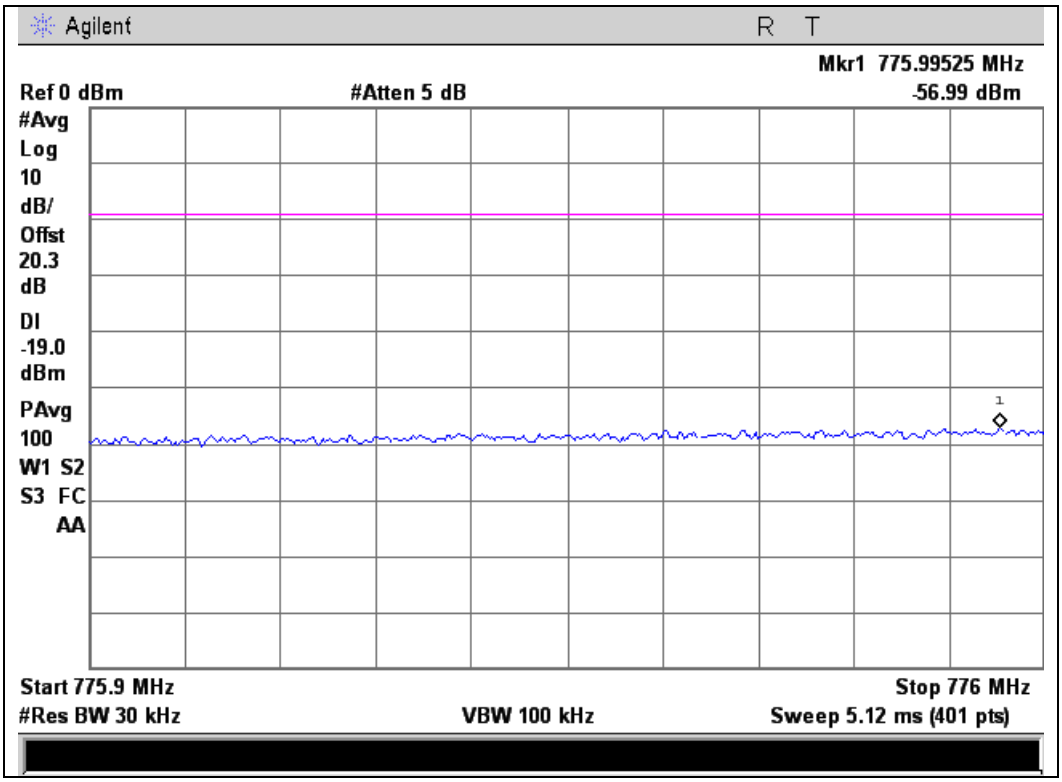


Upper Band Edge

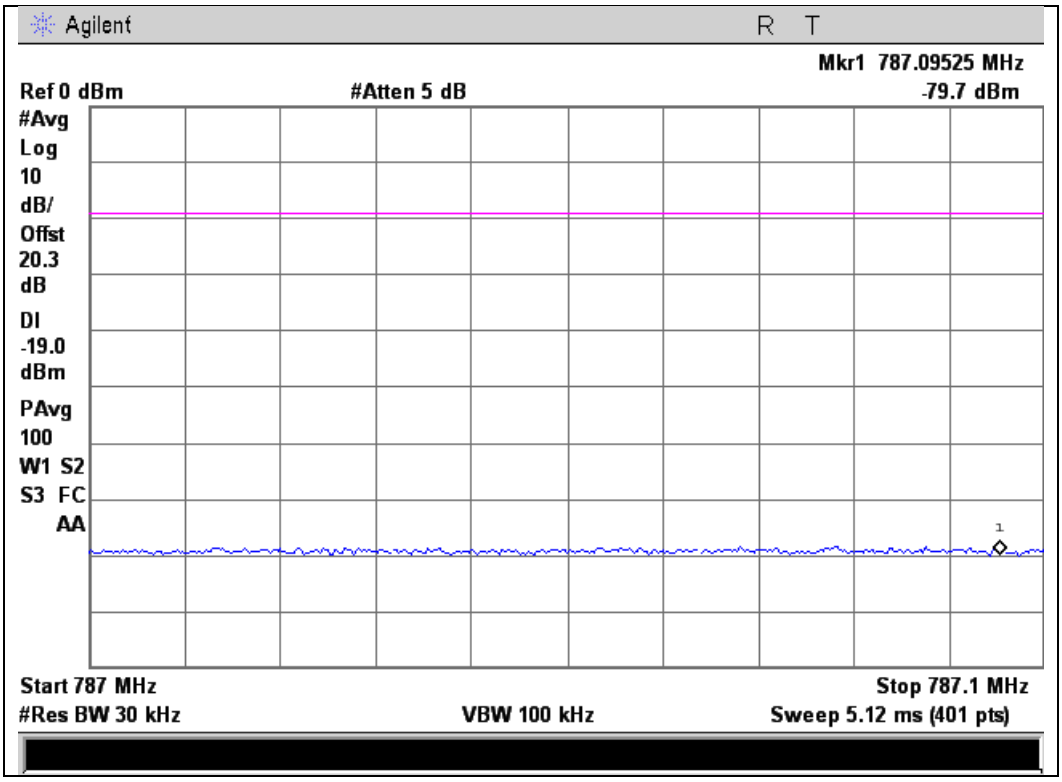


776 - 787MHz Band

Lower Band Edge

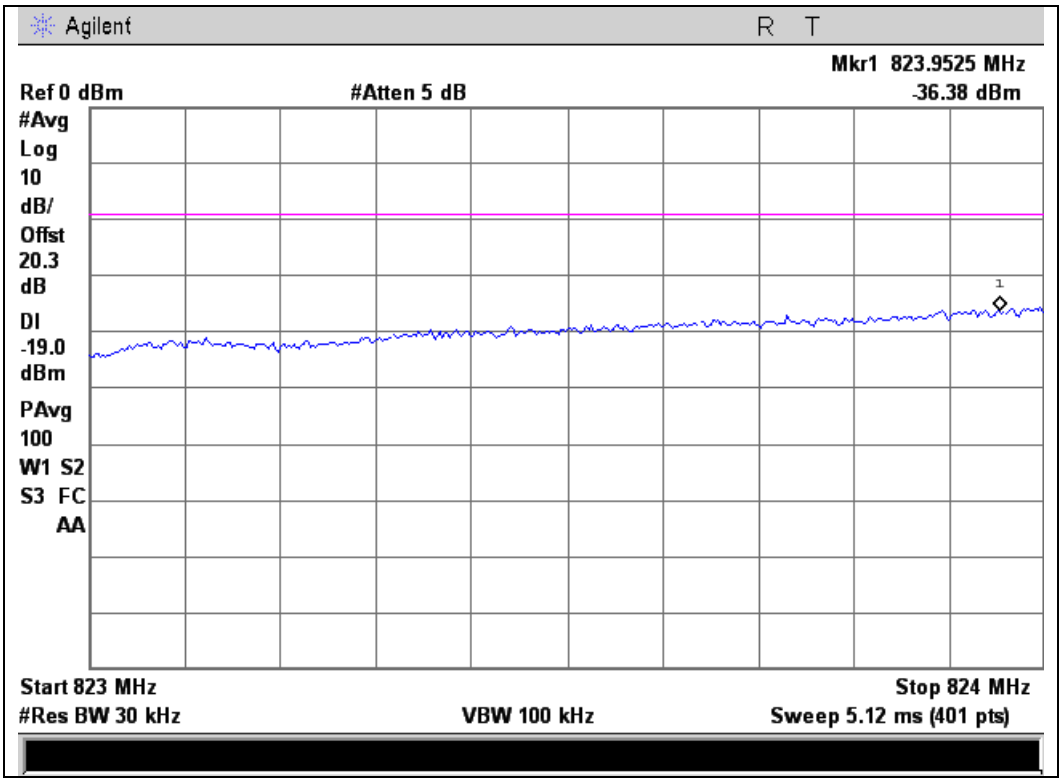


Upper Band Edge

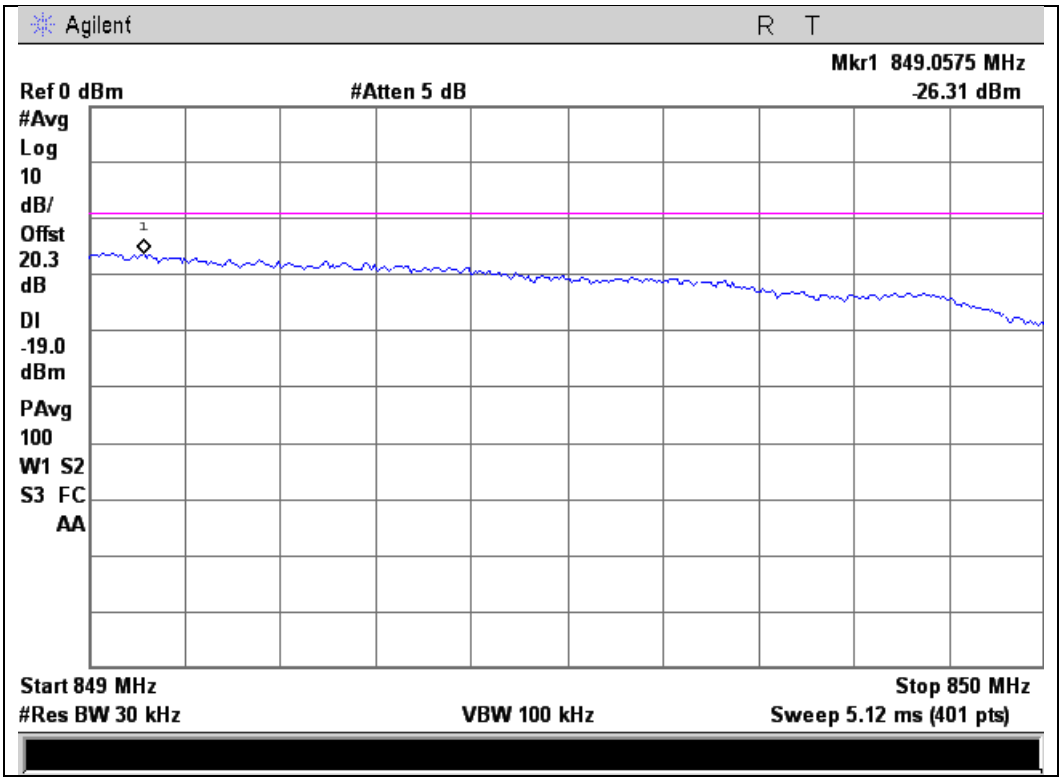


824 - 849 MHz Band

Lower Band Edge

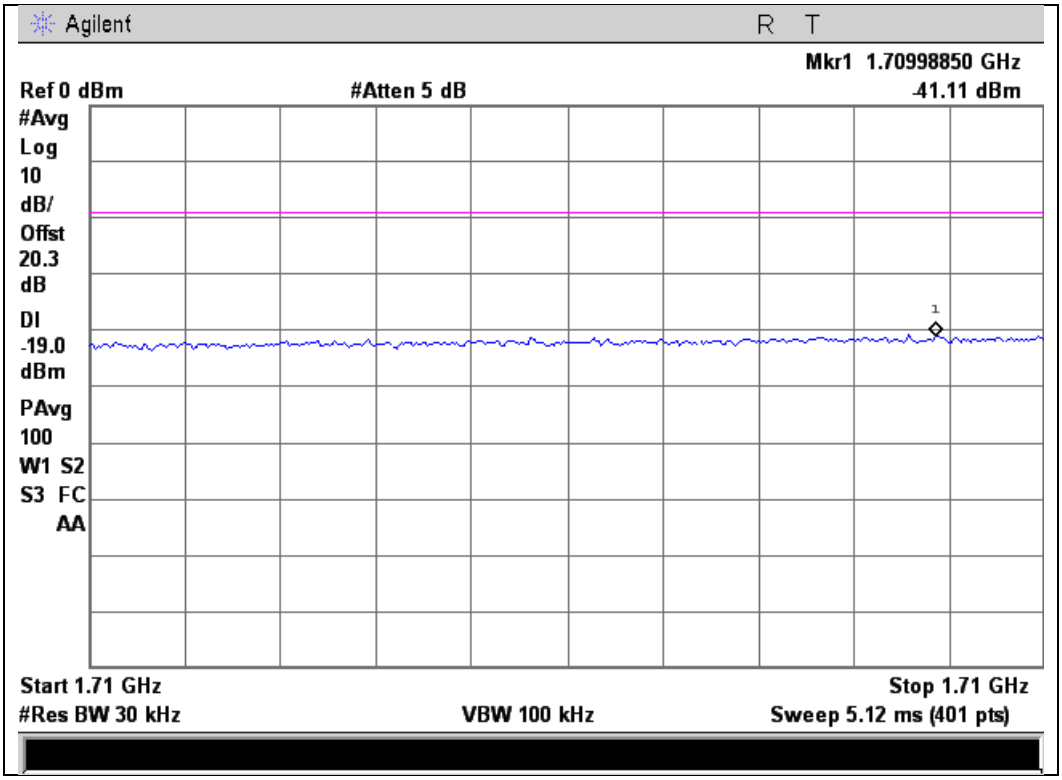


Upper Band Edge

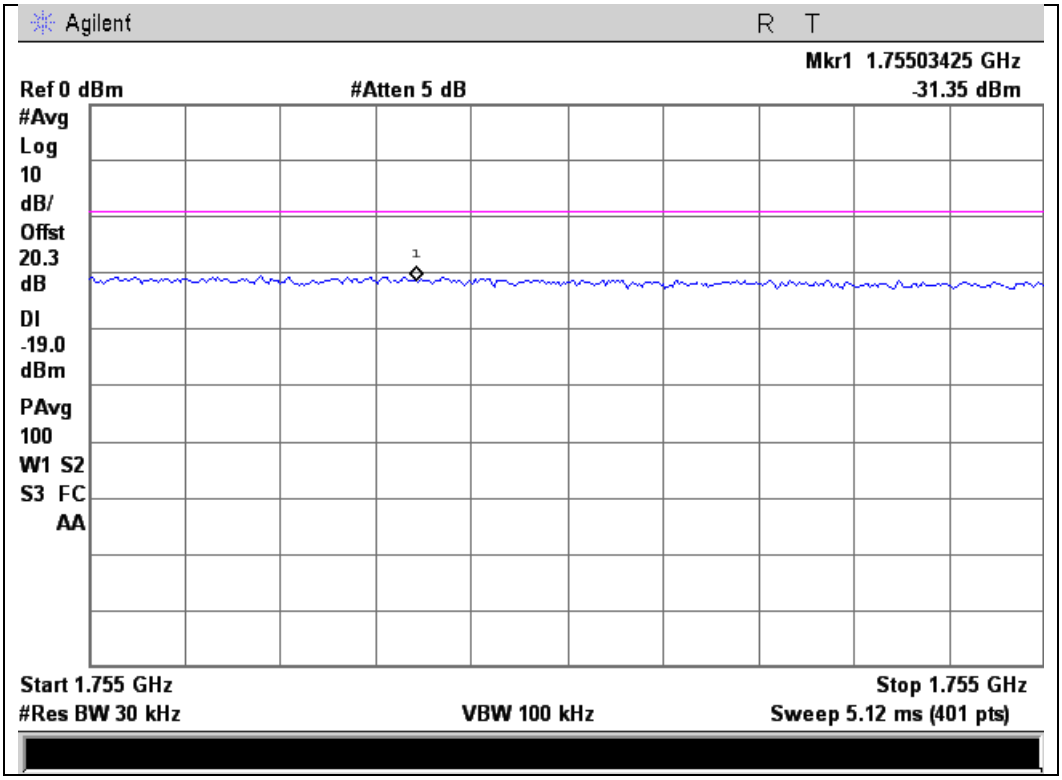


1710 - 1755 MHz Band

Lower Band Edge

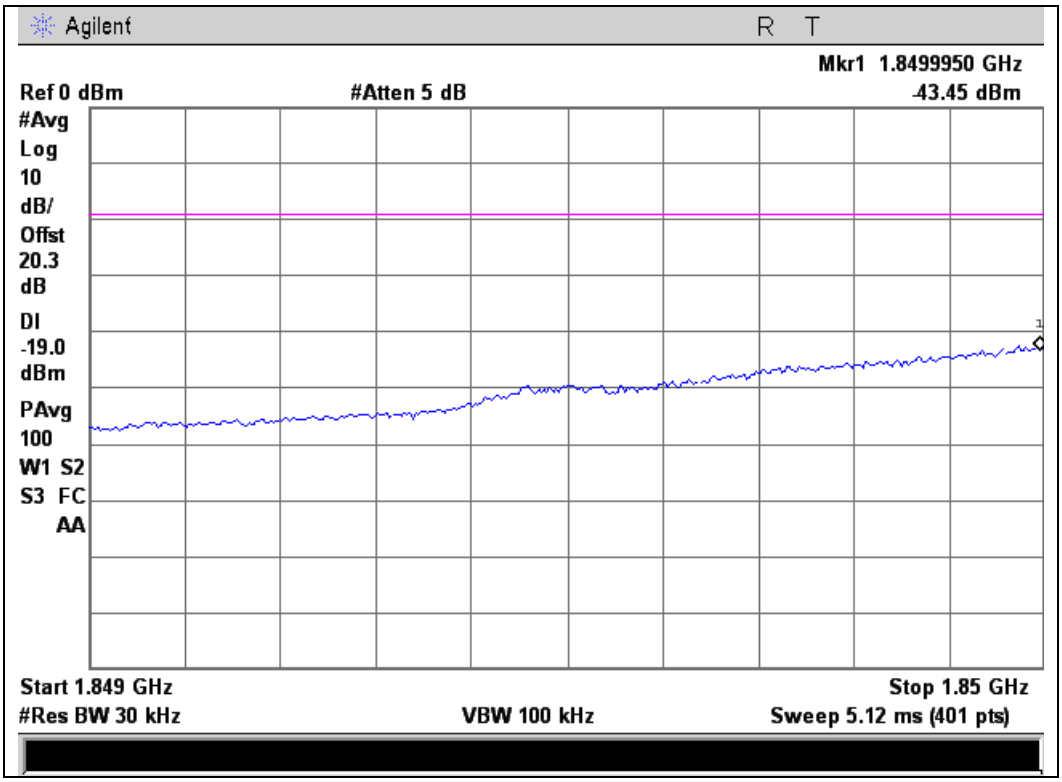


Upper Band Edge

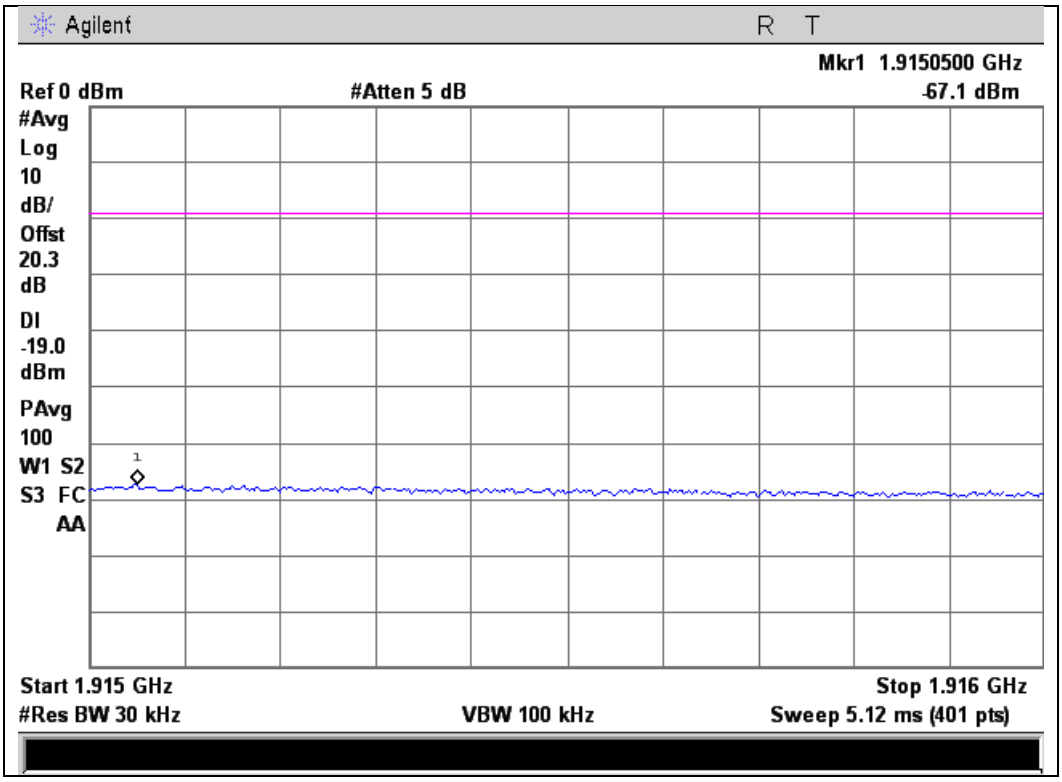


1850 - 1910 MHz Band

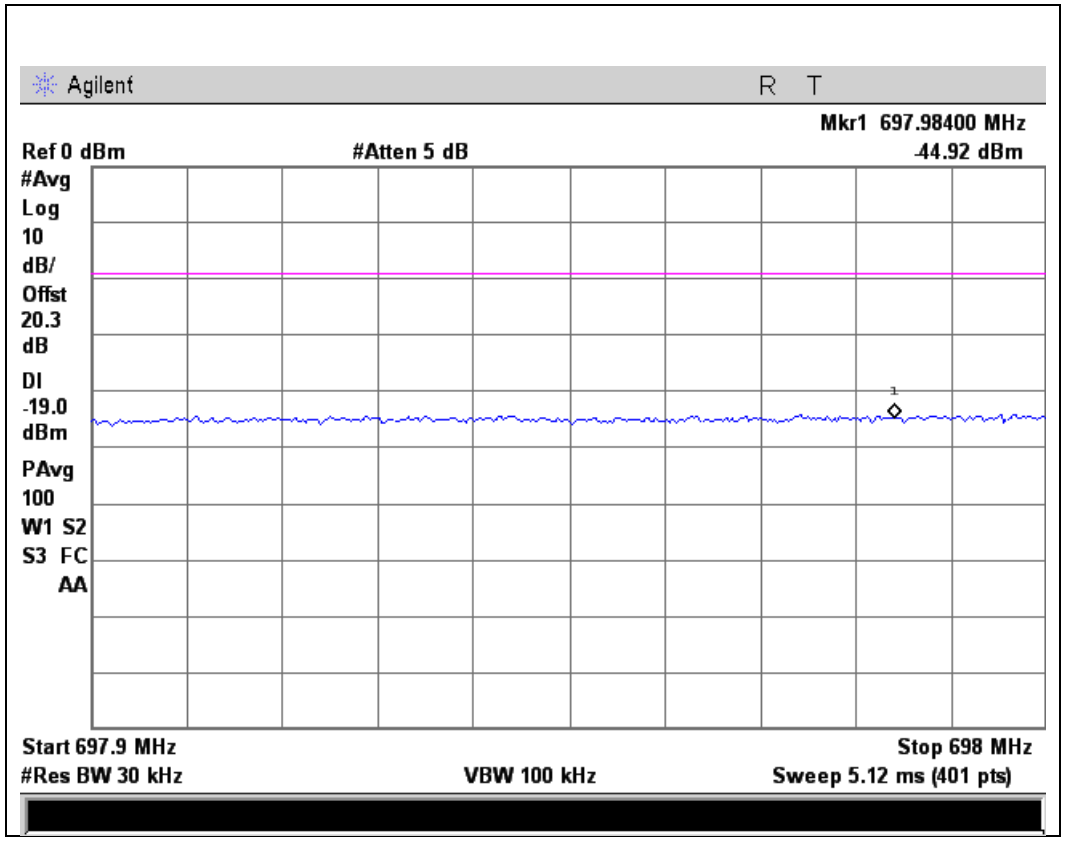
Lower Band Edge



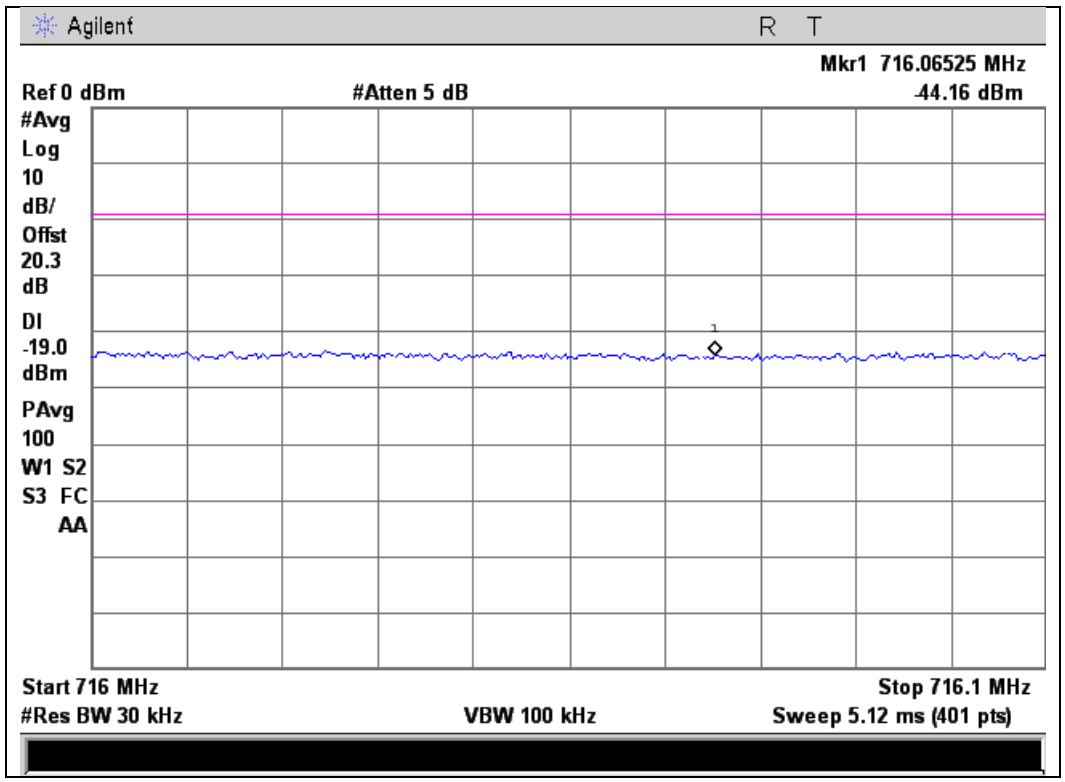
Upper Band Edge



WCDMA Uplink Test Plots
698 - 716MHz Band
Lower Band Edge

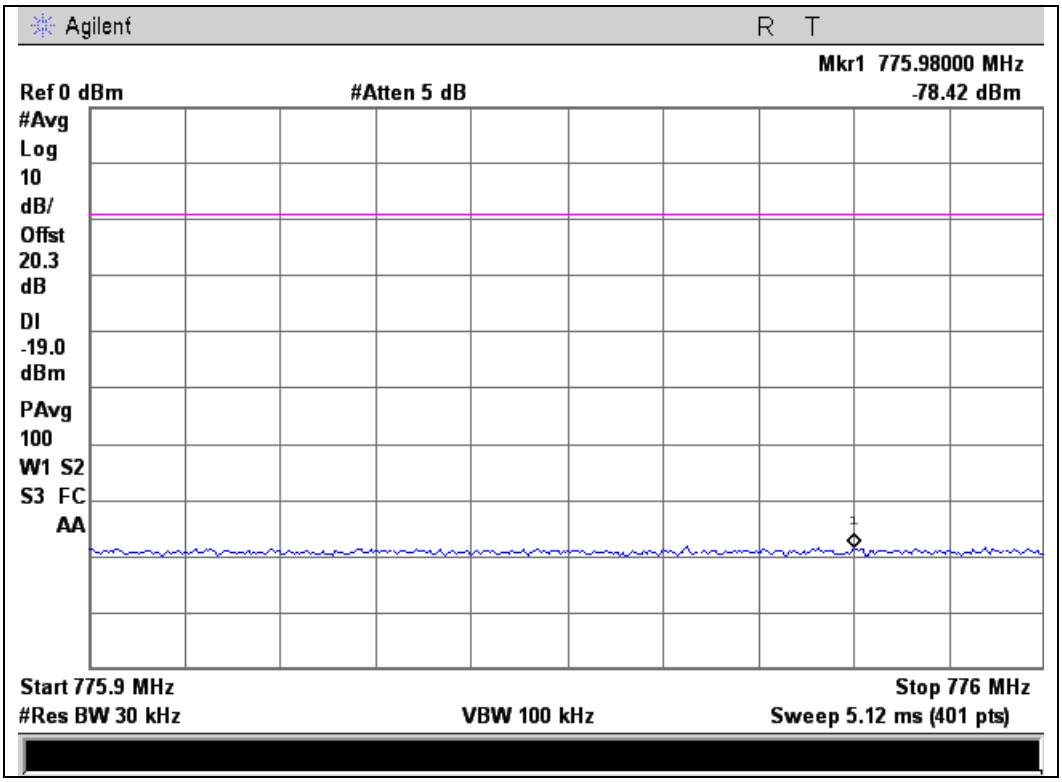


Upper Band Edge

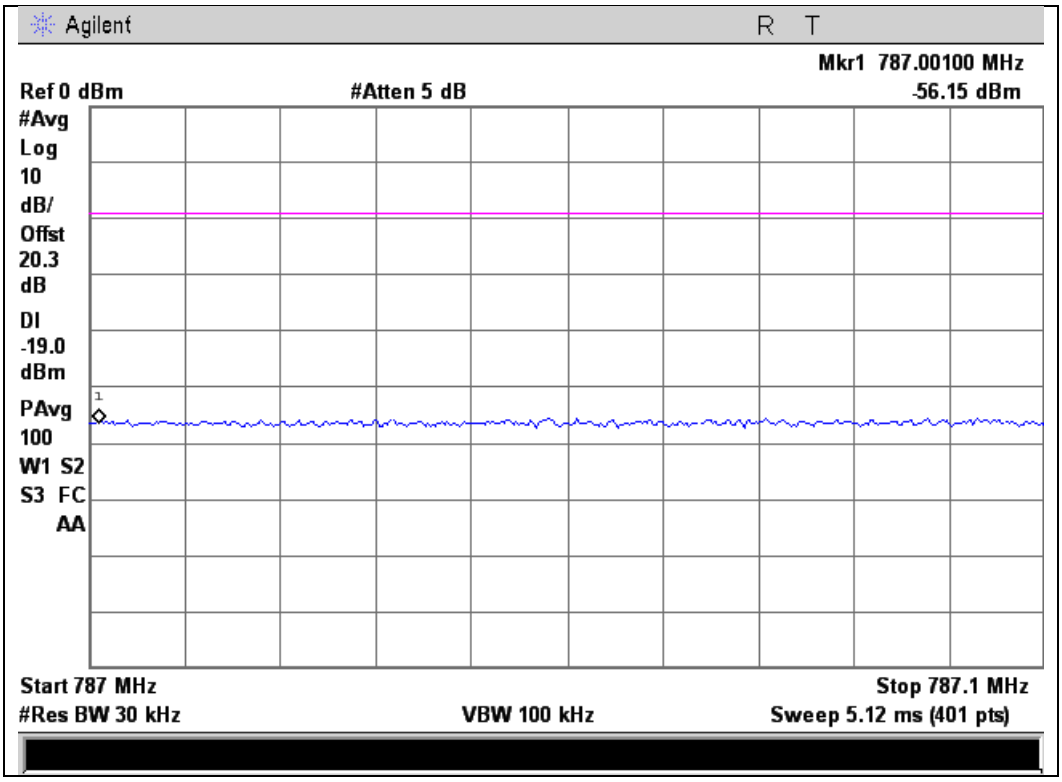


776 - 787MHz Band

Lower Band Edge

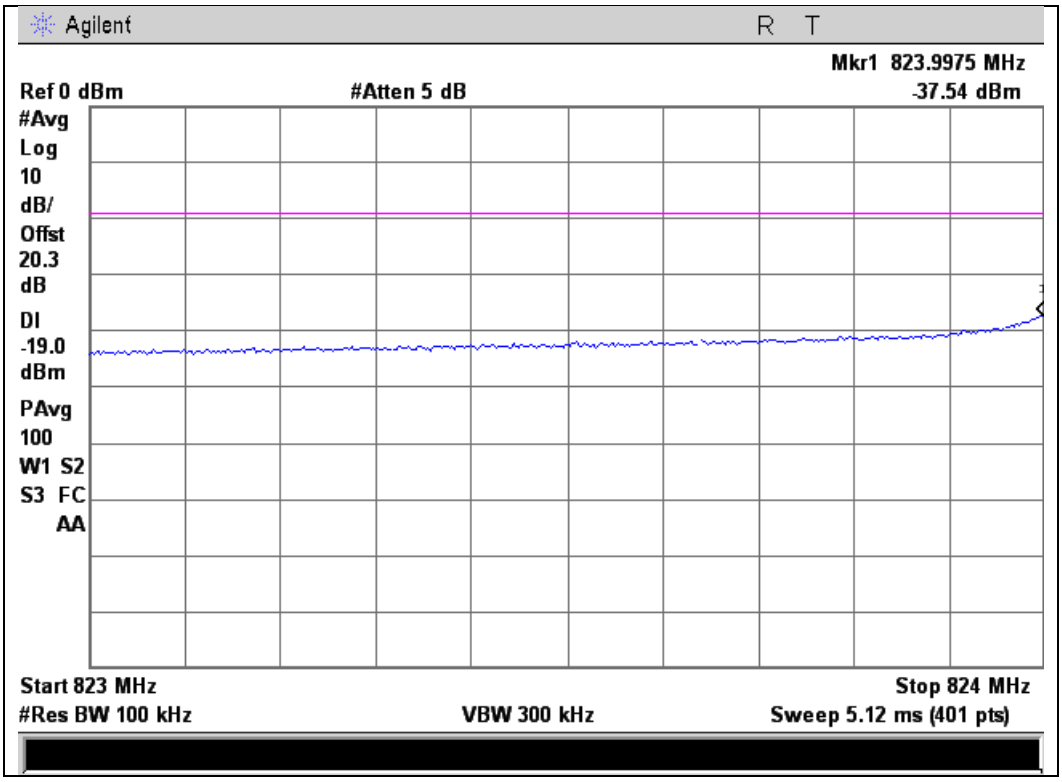


Upper Band Edge

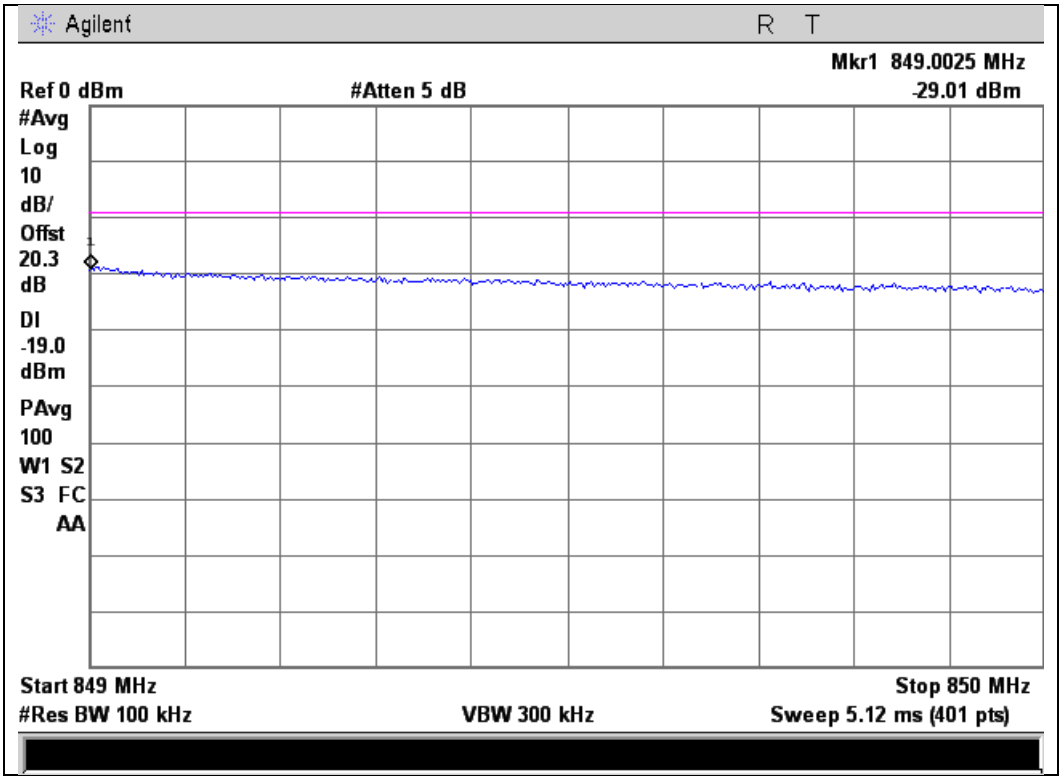


824 - 849 MHz Band

Lower Band Edge

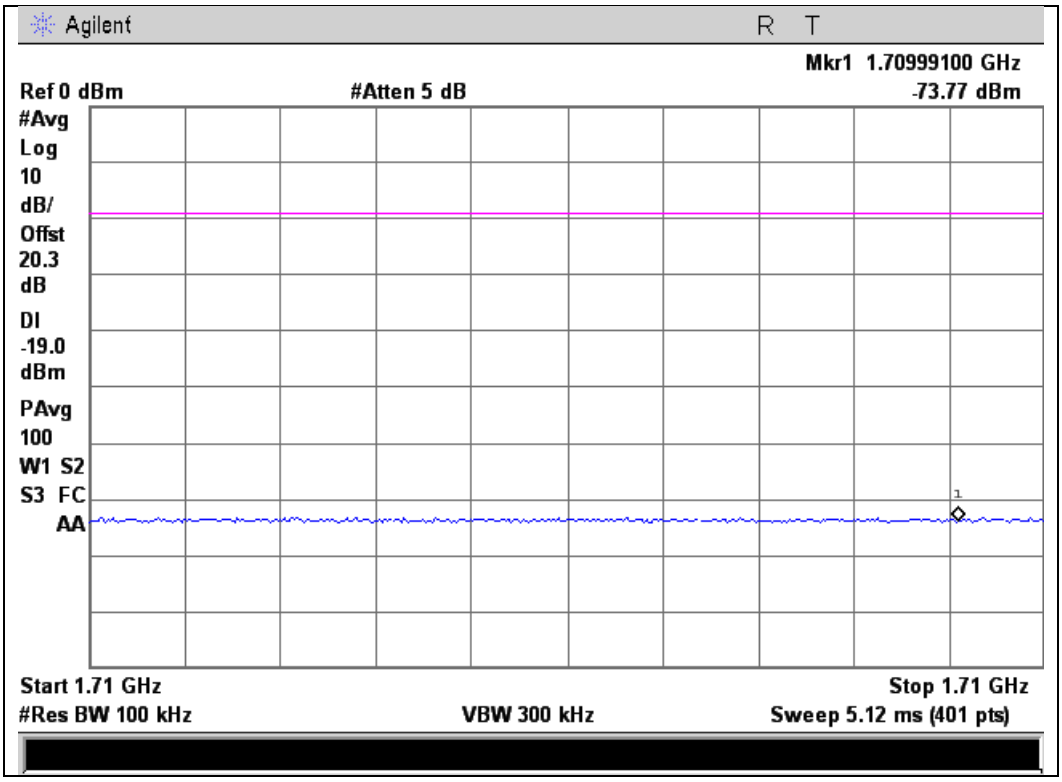


Upper Band Edge

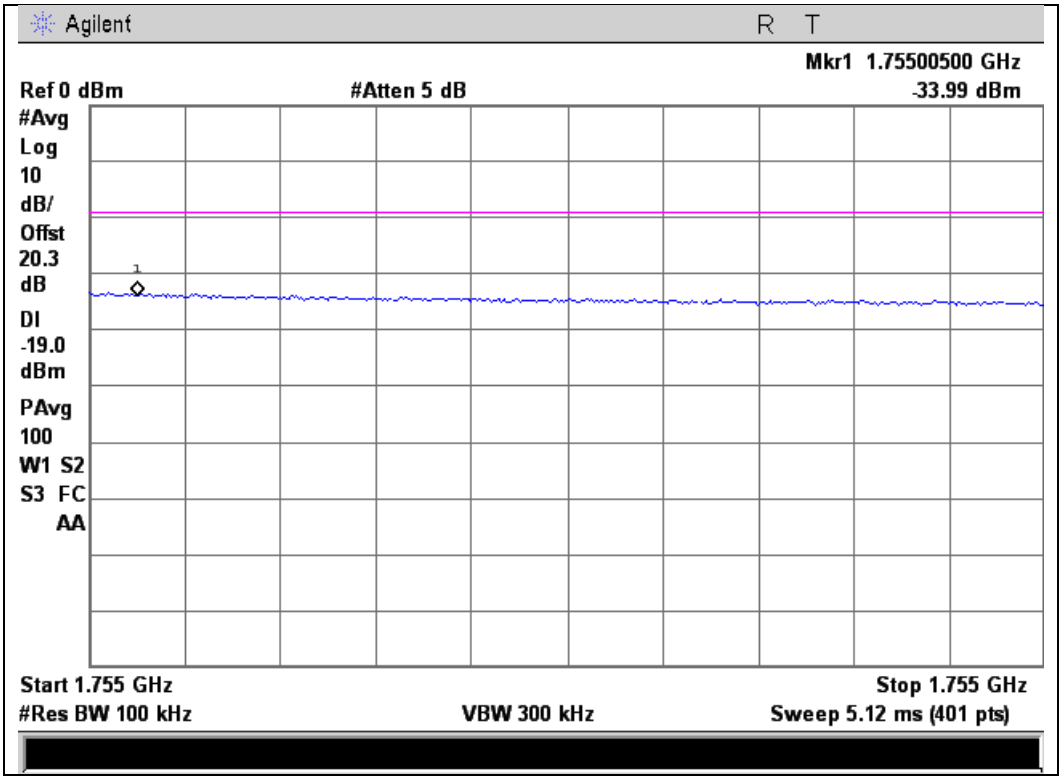


1710 - 1755 MHz Band

Lower Band Edge

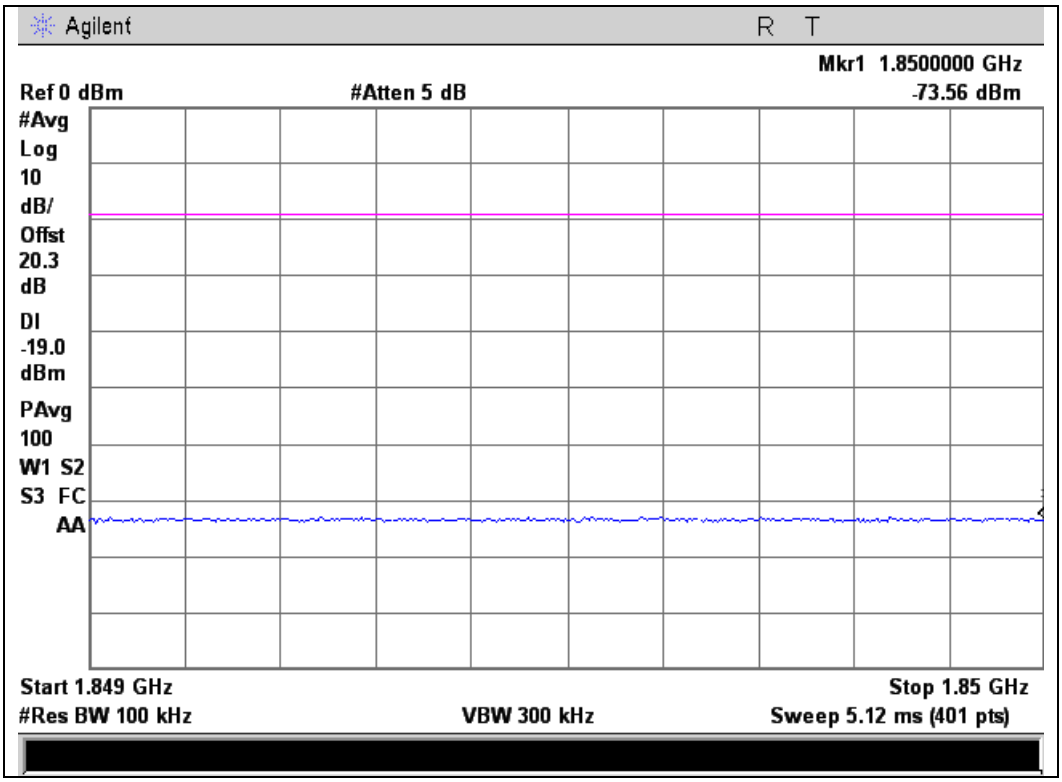


Upper Band Edge

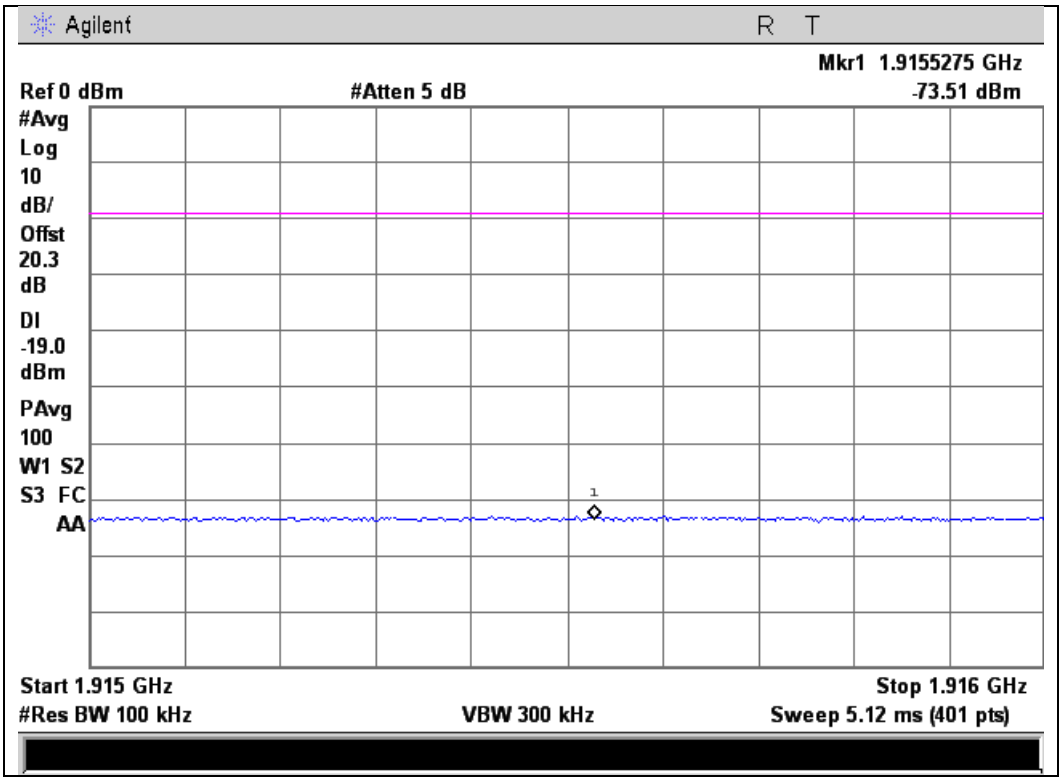


1850 - 1910 MHz Band

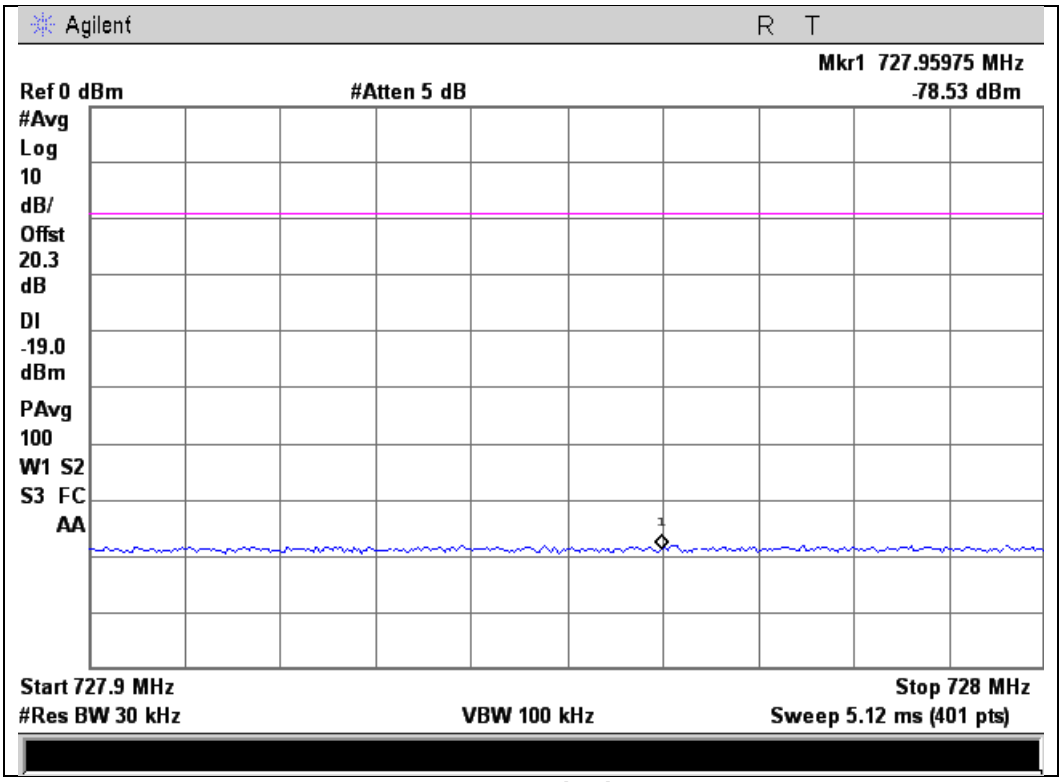
Lower Band Edge



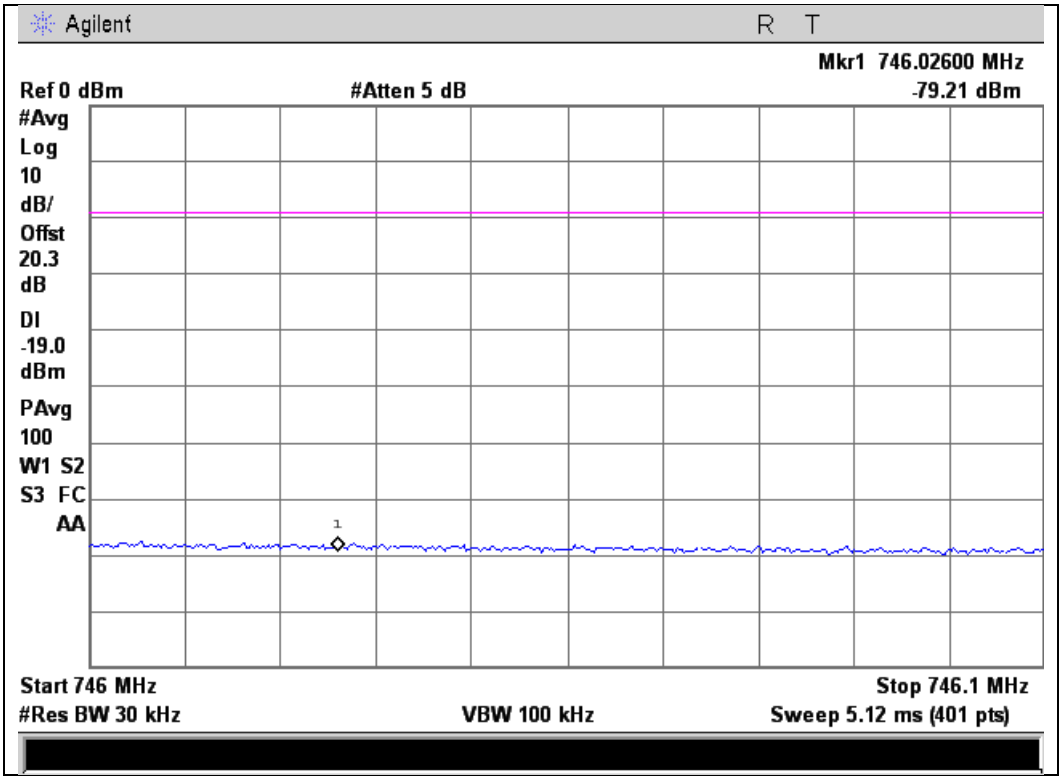
Upper Band Edge



GSM Downlink Test Plots
728 - 746 MHz Band
Lower Band Edge

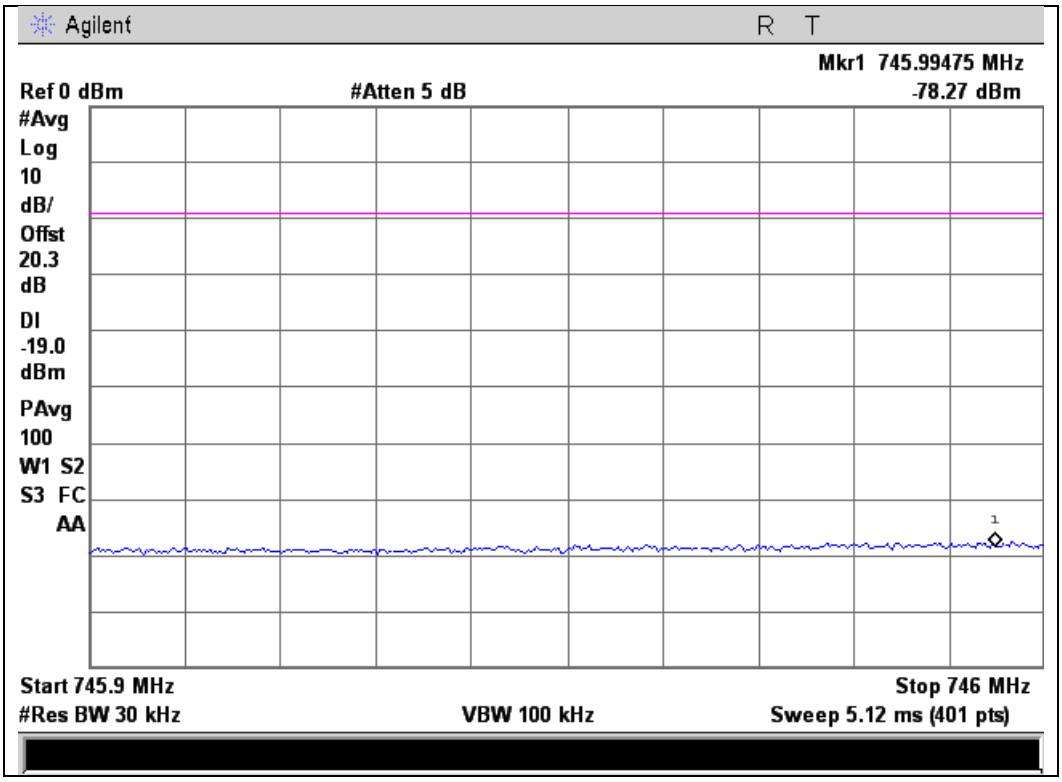


Upper Band Edge

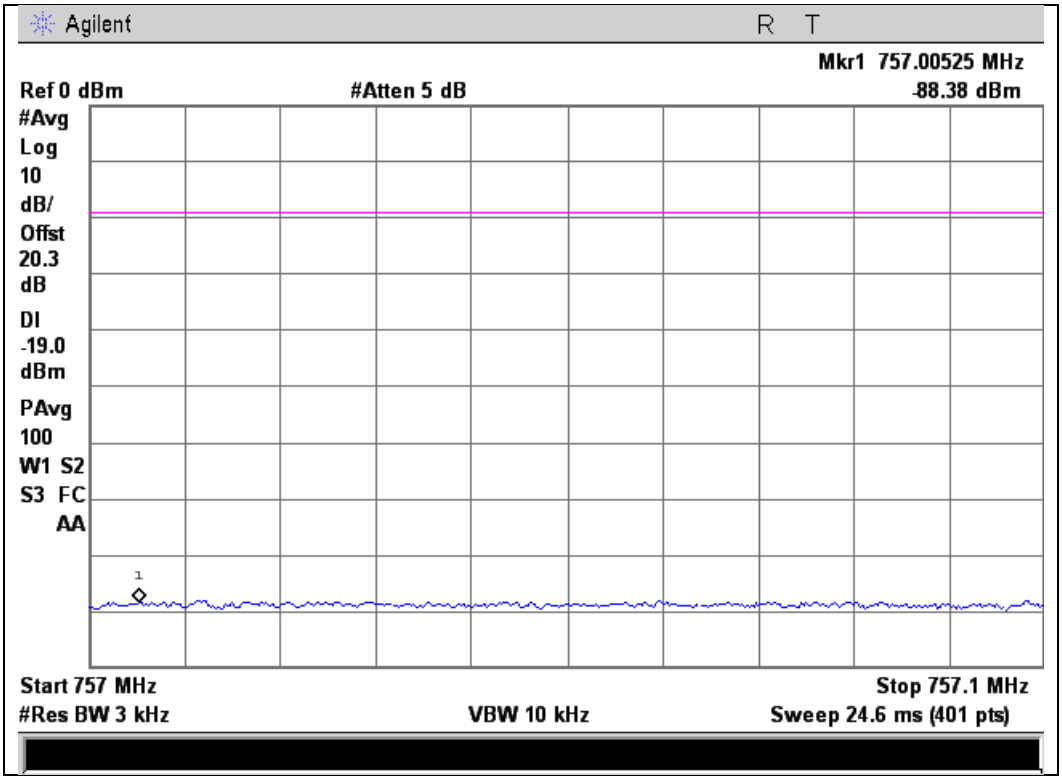


746 - 757MHz Band

Lower Band Edge

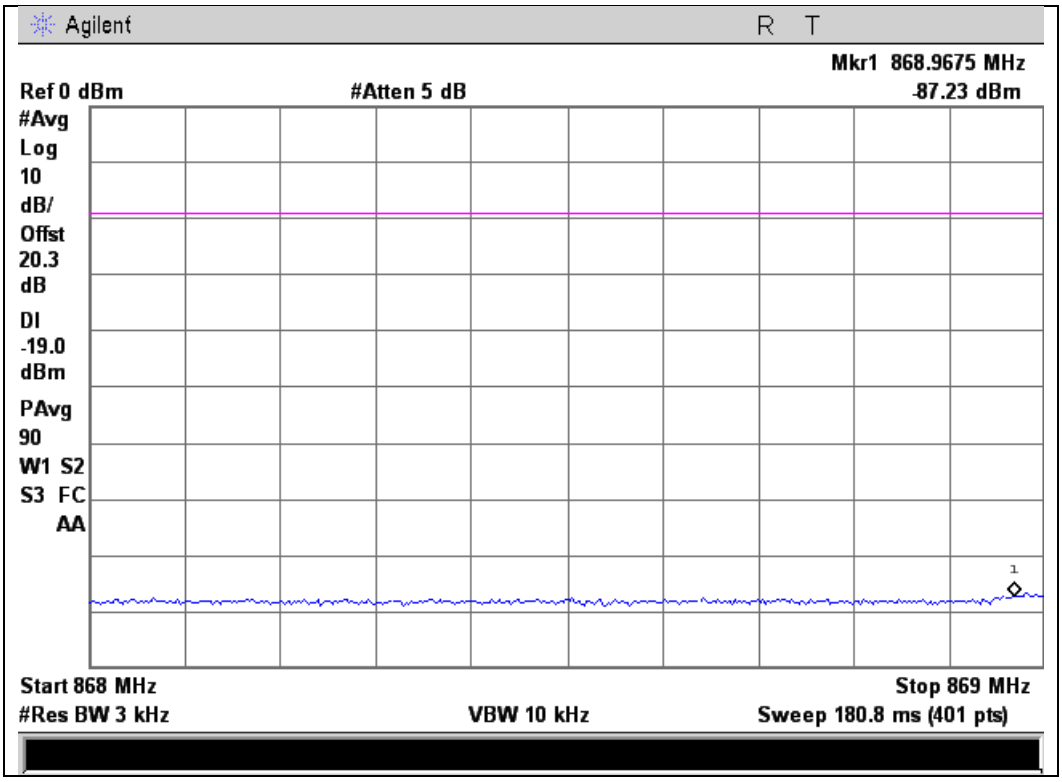


Upper Band Edge

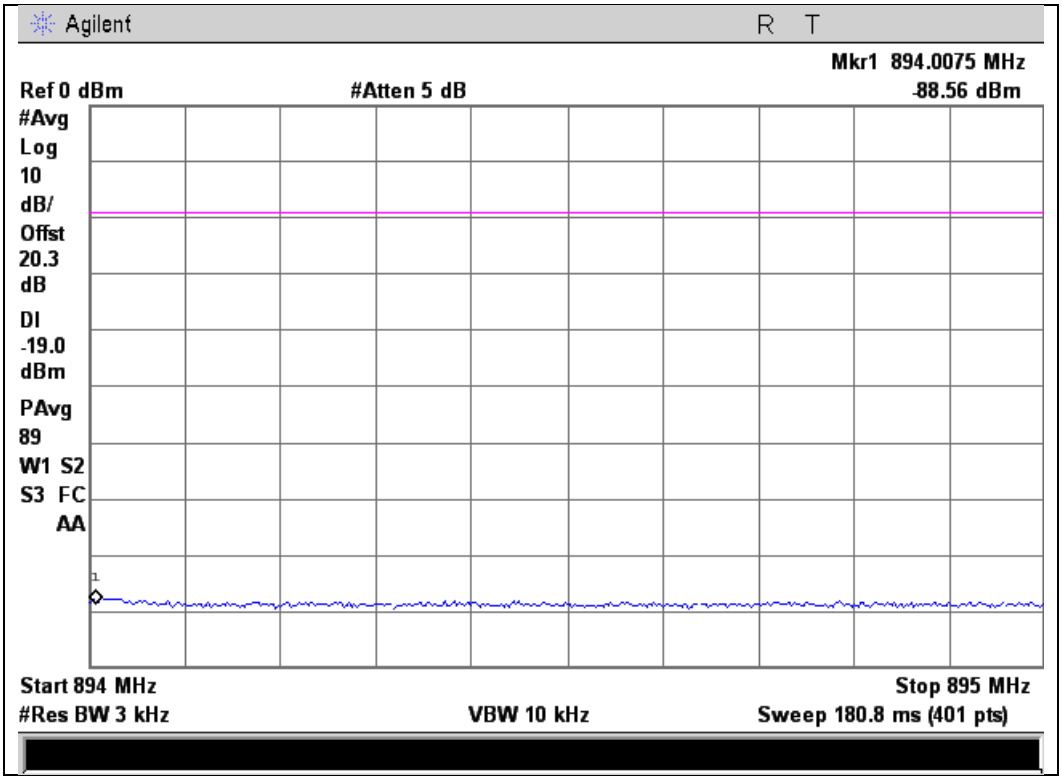


869 - 894 MHz Band

Lower Band Edge

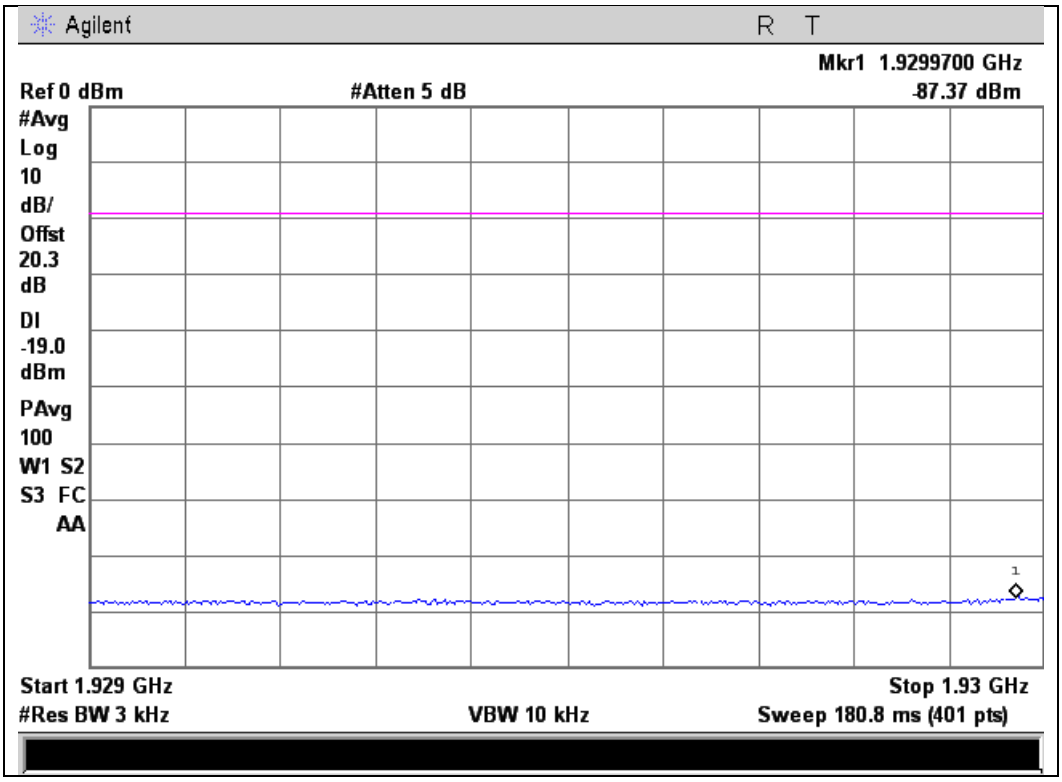


Upper Band Edge

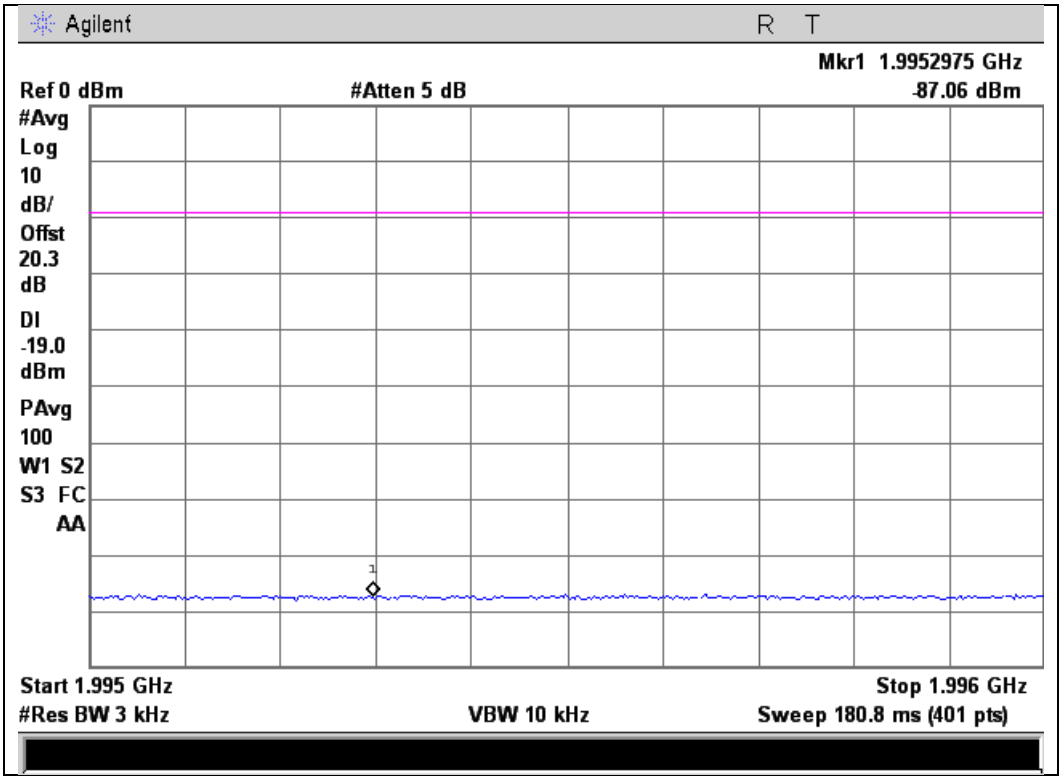


1930 - 1990MHz Band

Lower Band Edge

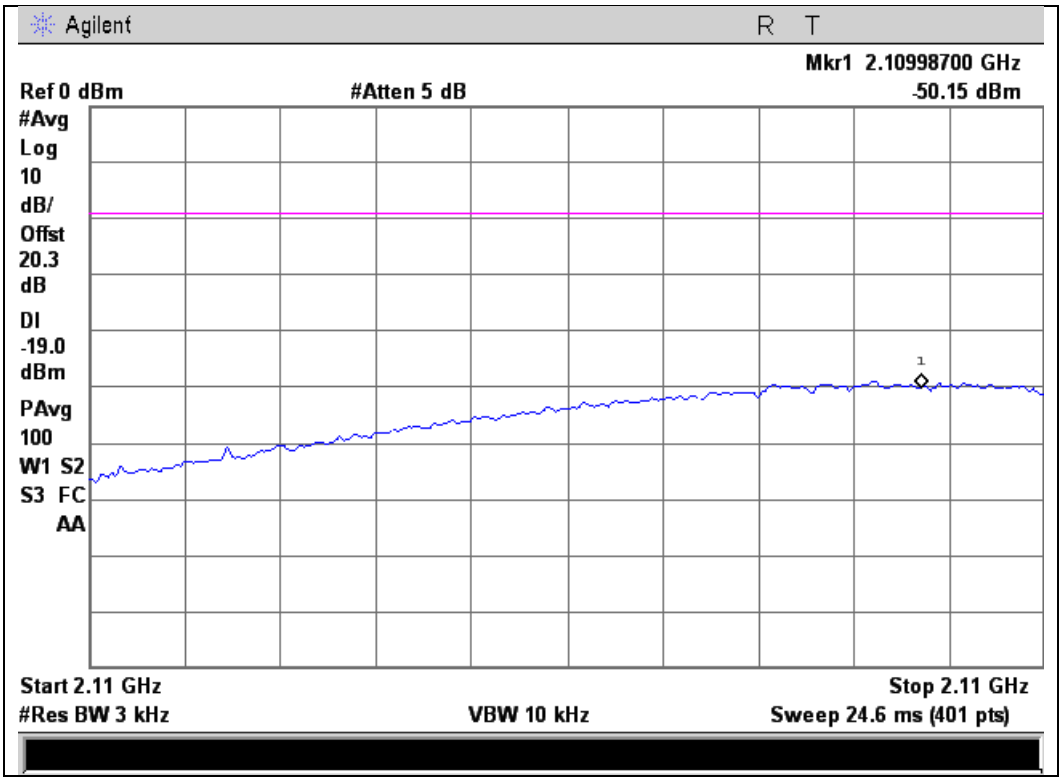


Upper Band Edge

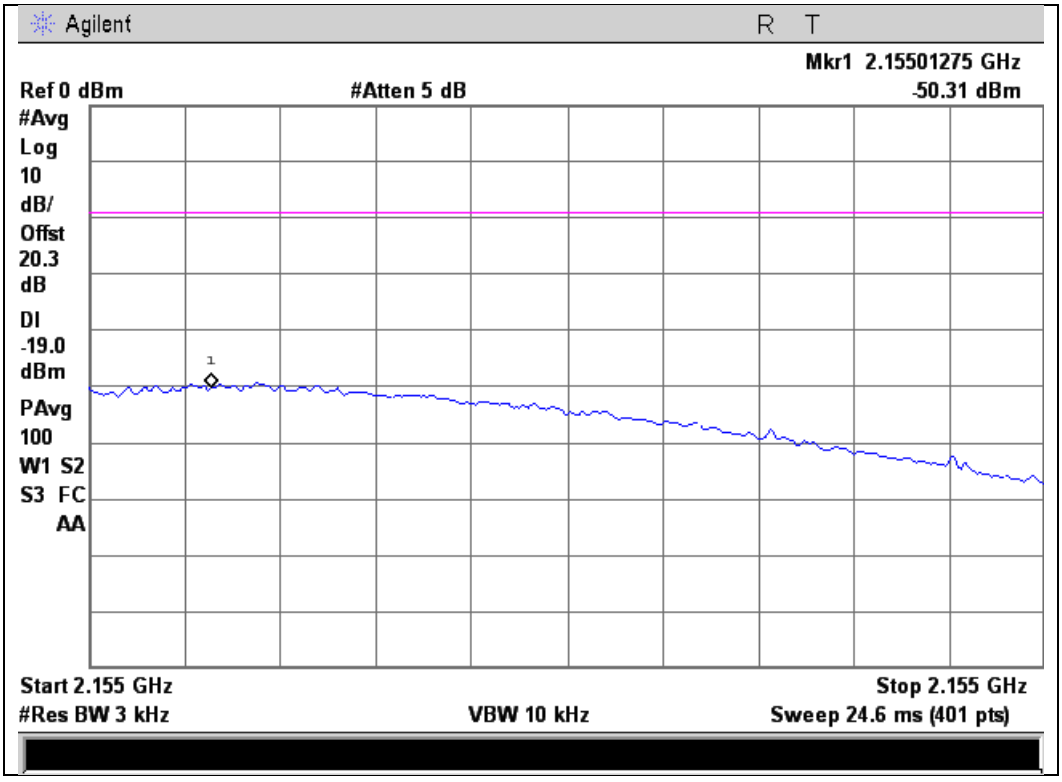


2110 - 2155 MHz Band

Lower Band Edge



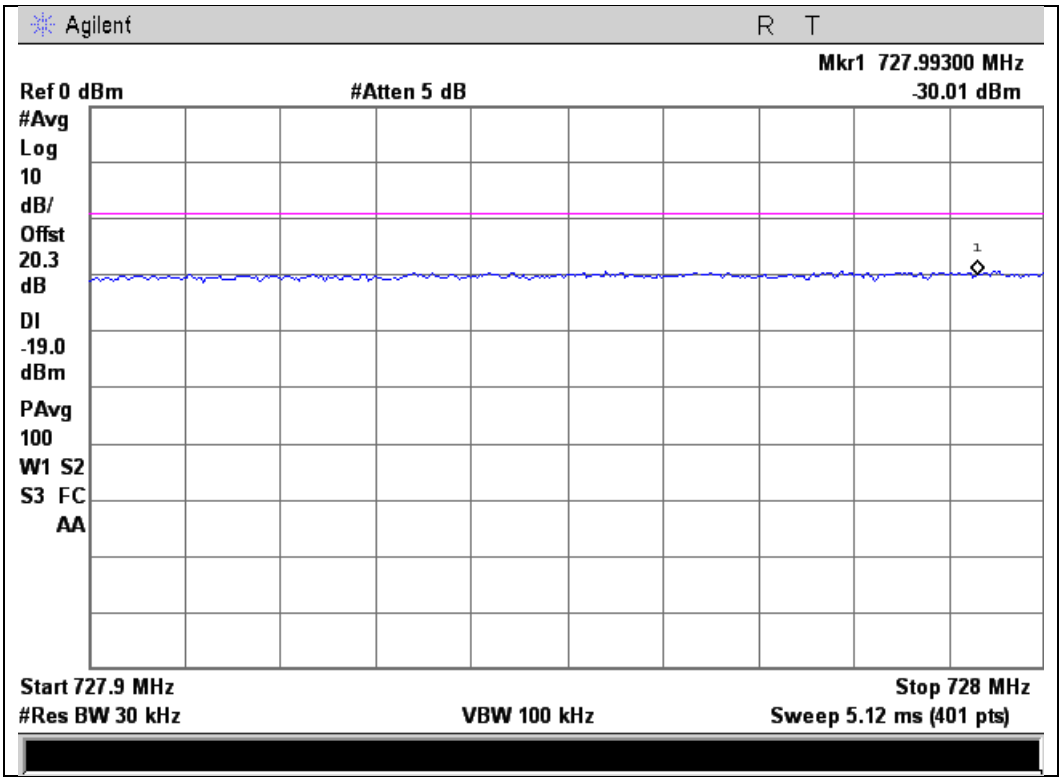
Upper Band Edge



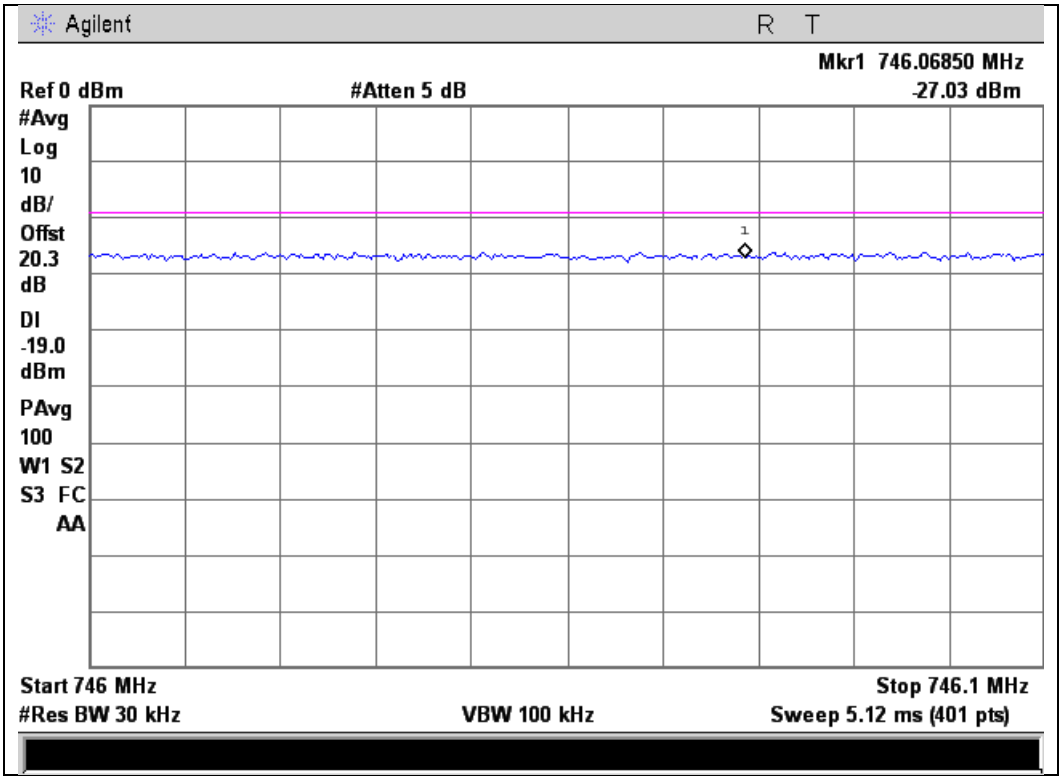
CDMA Downlink Test Plots

728 - 746 MHz Band

Lower Band Edge

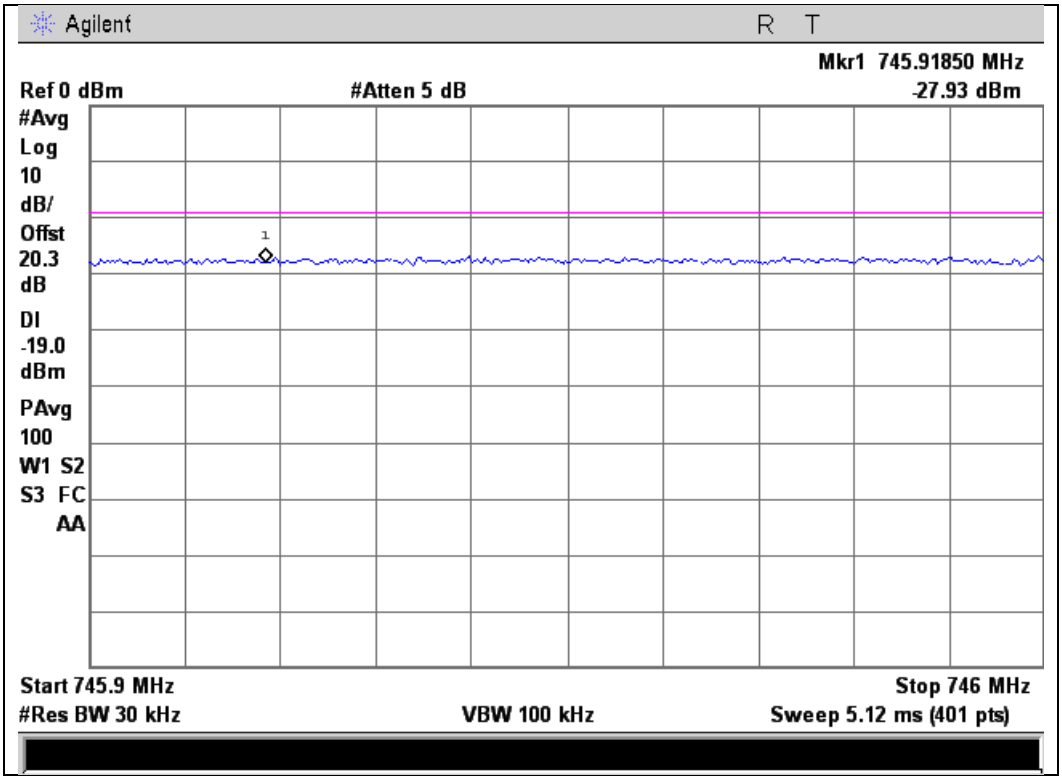


Upper Band Edge

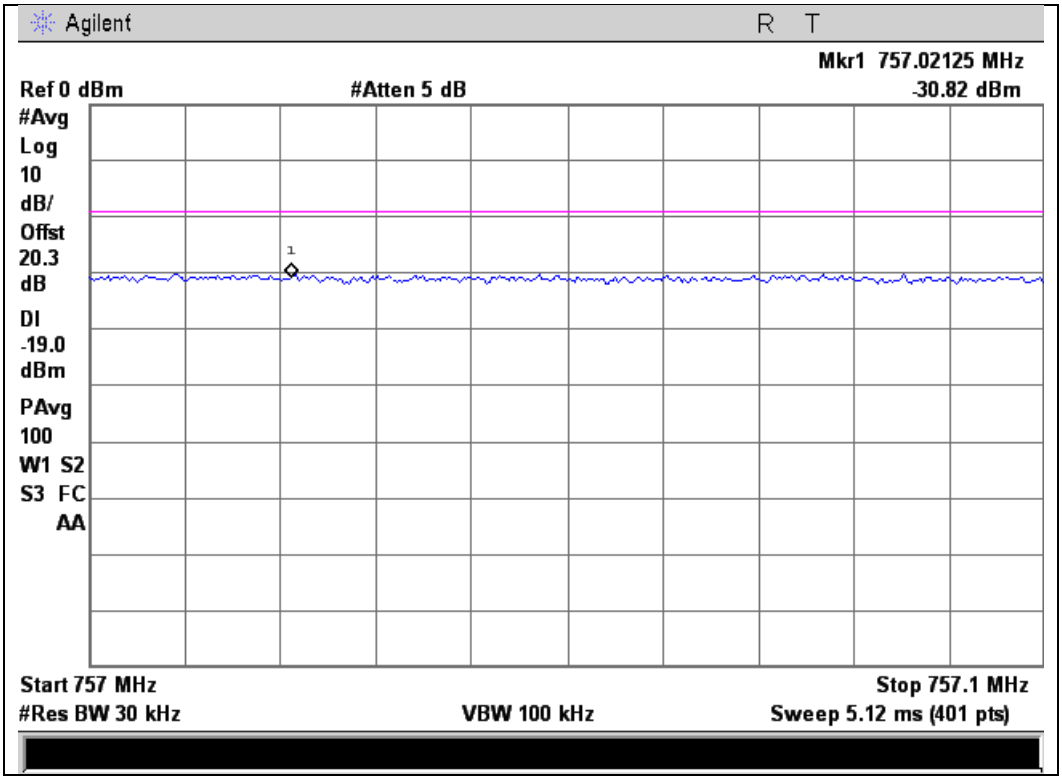


746 - 757MHz Band

Lower Band Edge

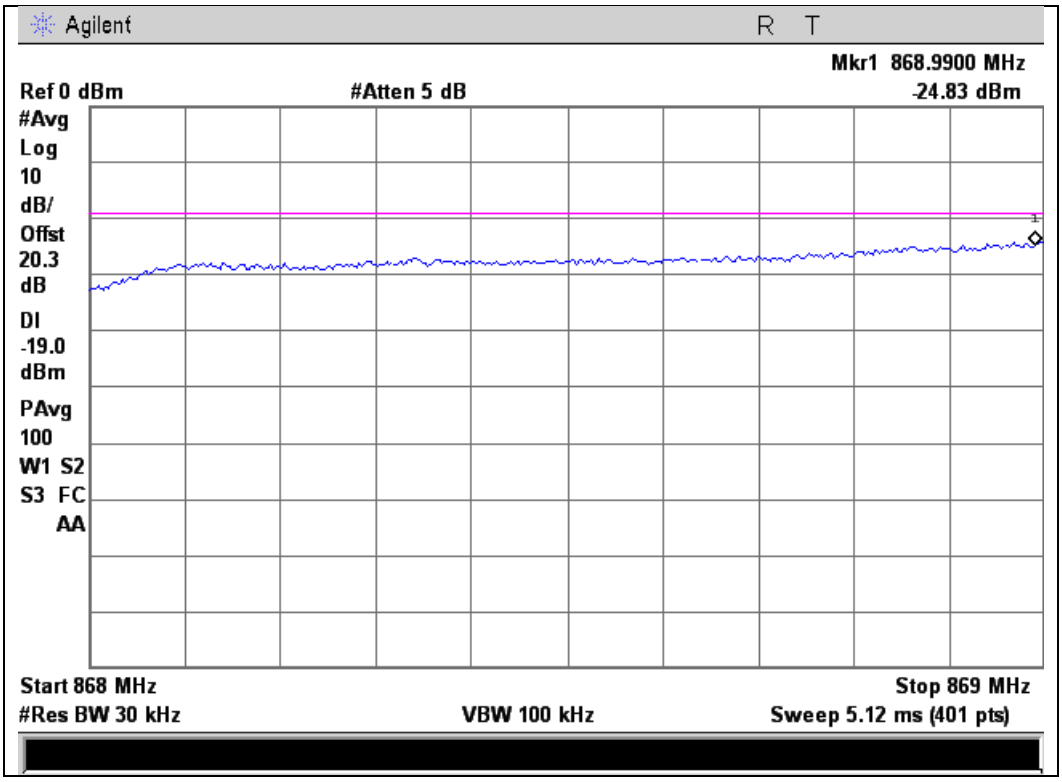


Upper Band Edge

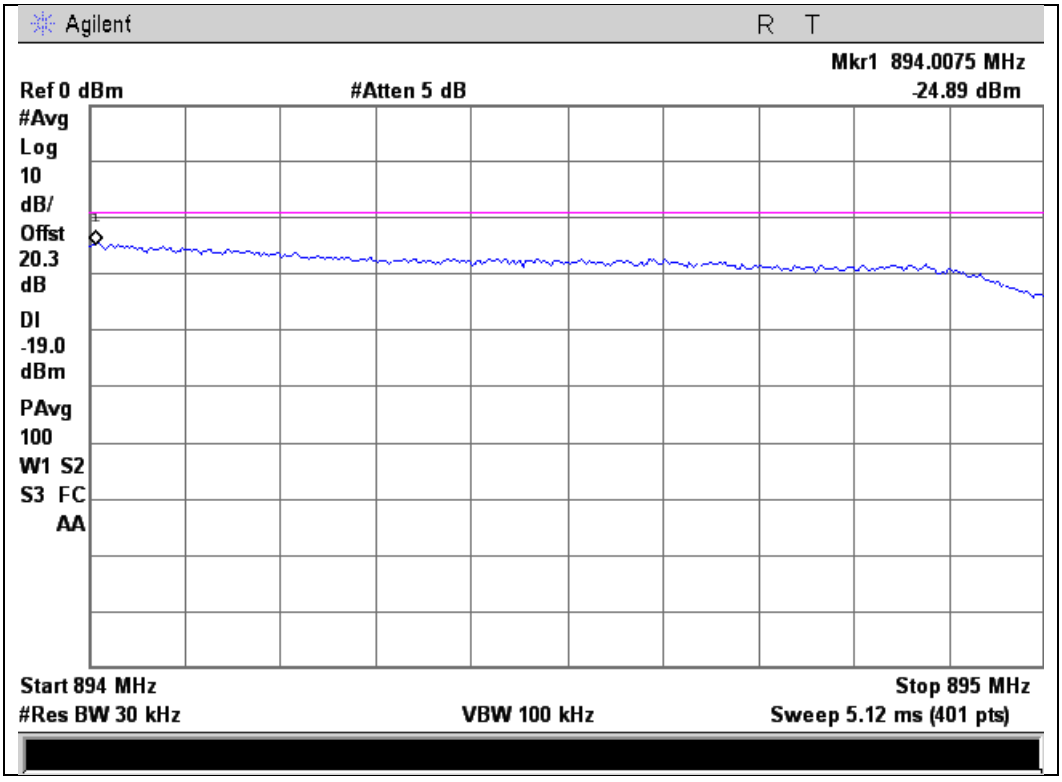


869 - 894 MHz Band

Lower Band Edge

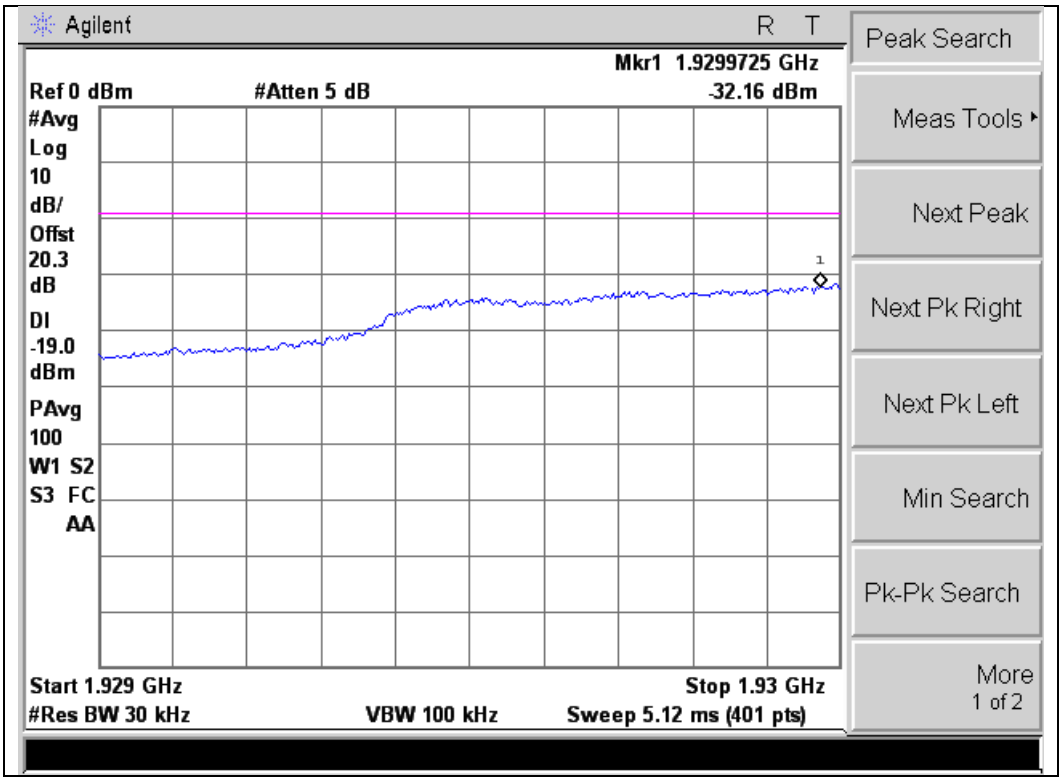


Upper Band Edge

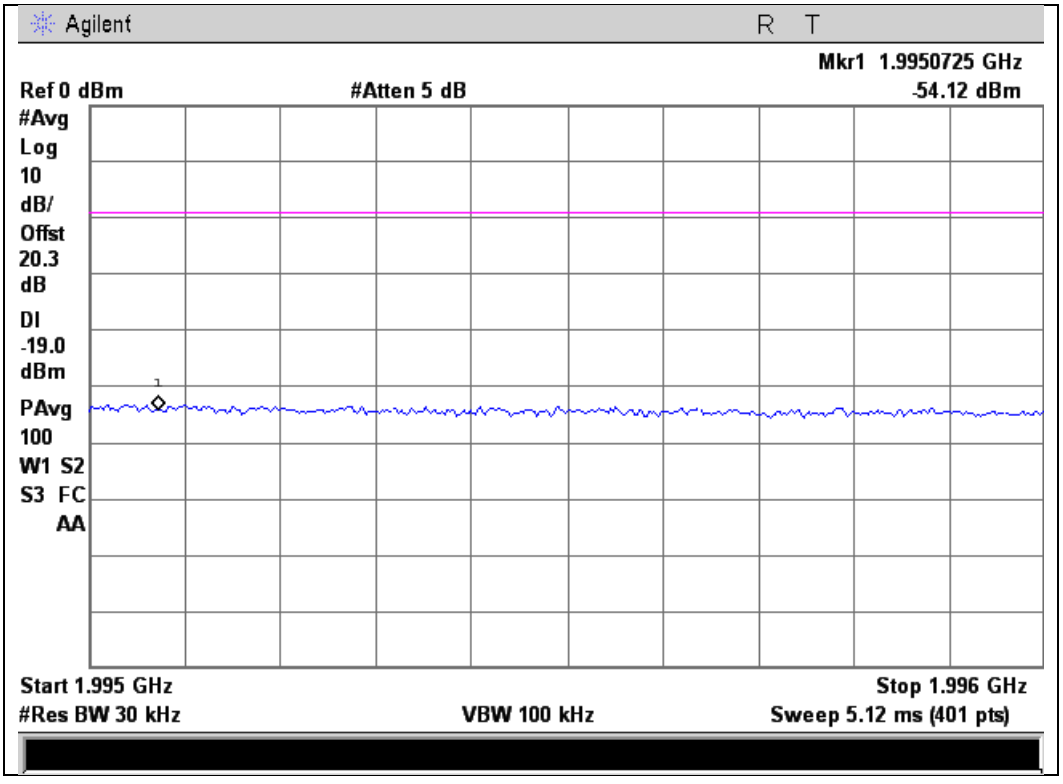


1930 - 1990MHz Band

Lower Band Edge

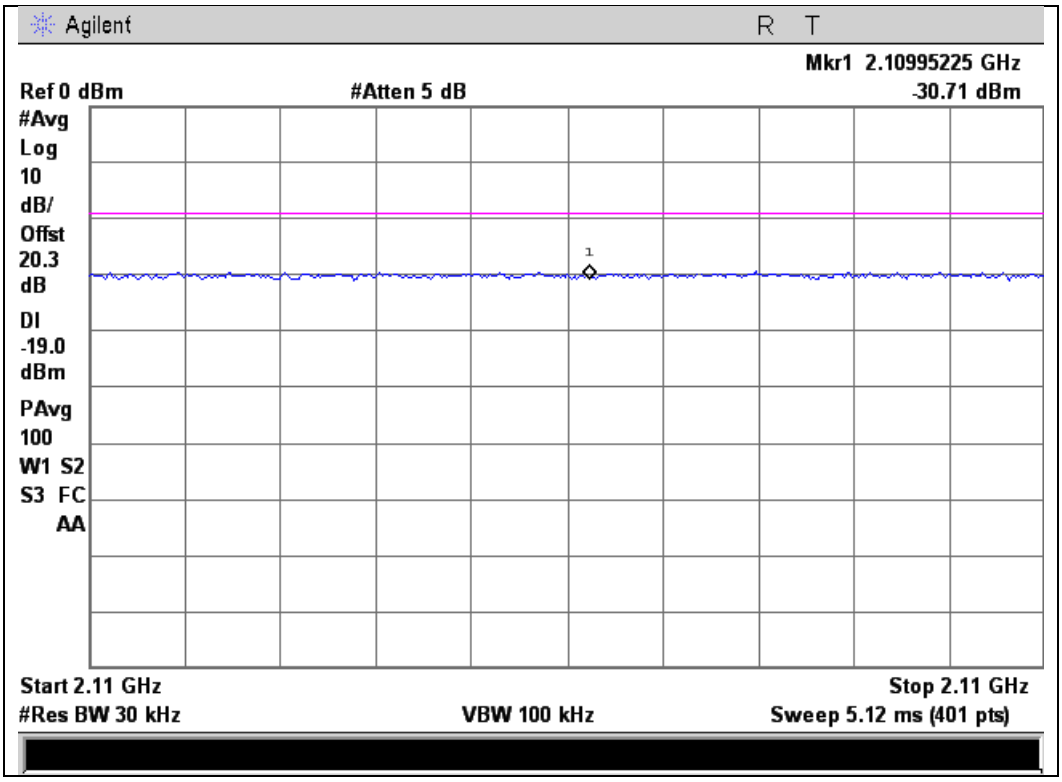


Upper Band Edge

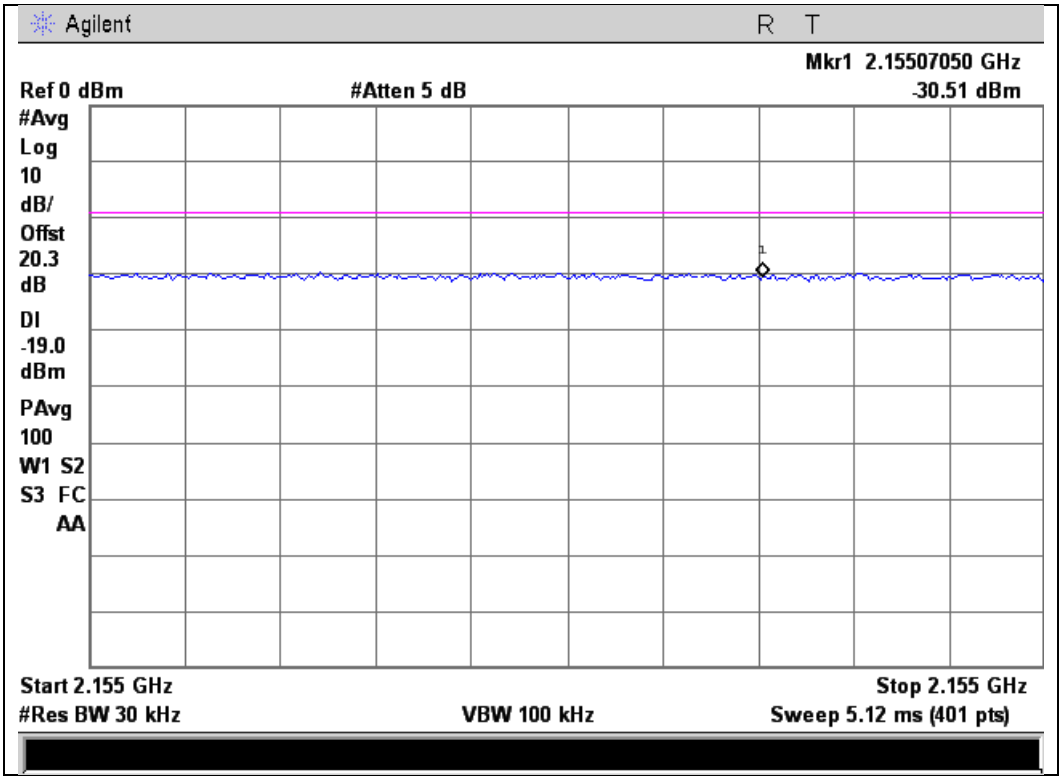


2110 - 2155 MHz Band

Lower Band Edge



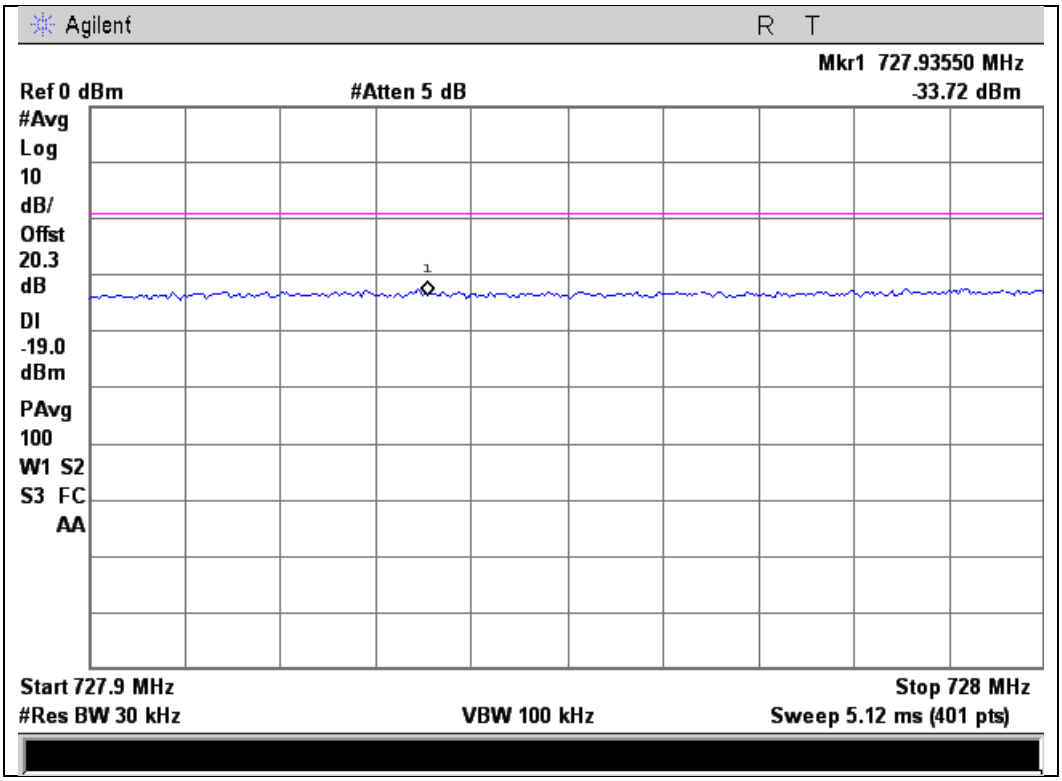
Upper Band Edge



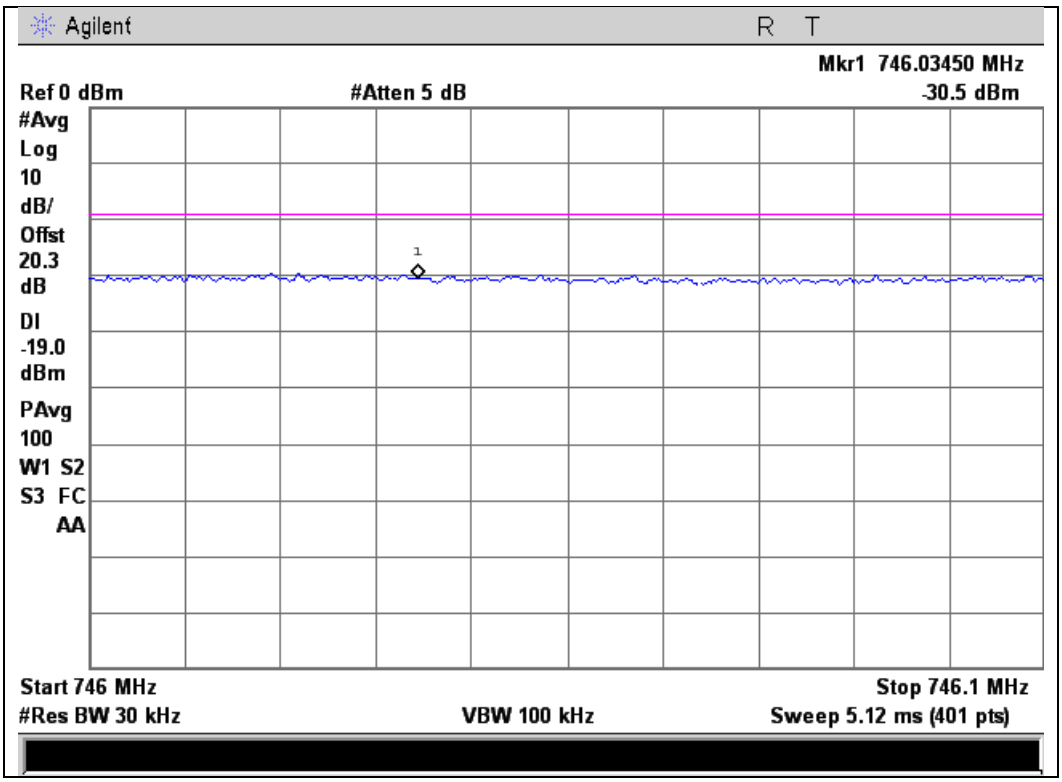
WCDMA Downlink Test Plots

728 - 746 MHz Band

Lower Band Edge

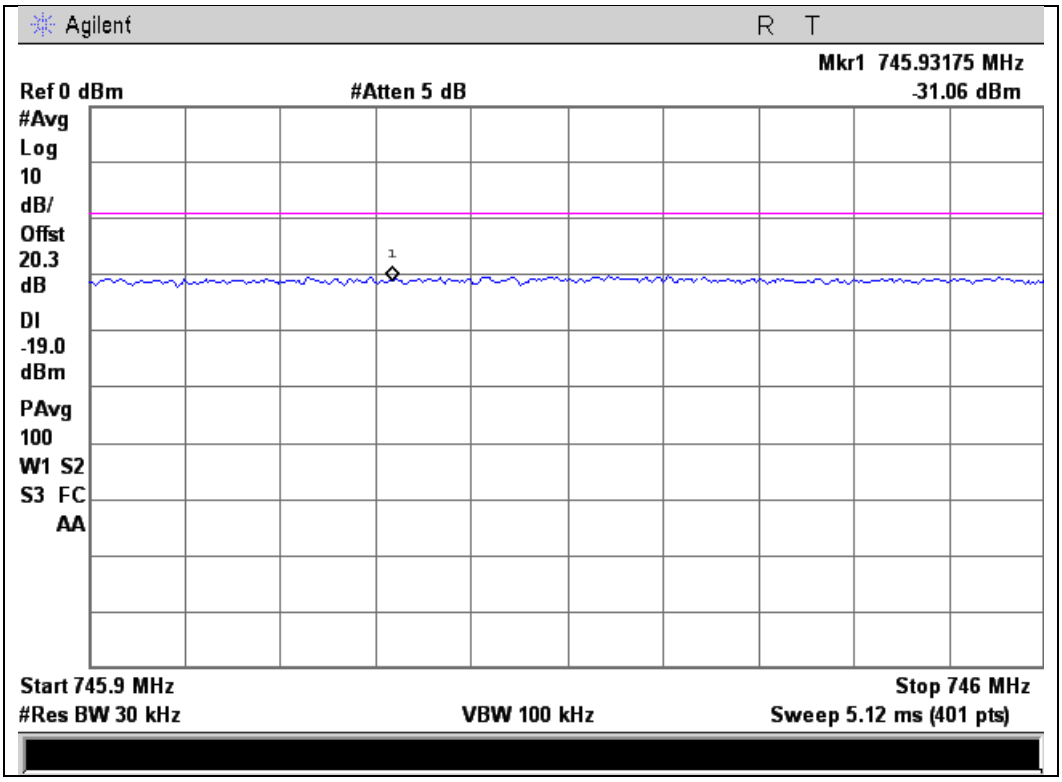


Upper Band Edge

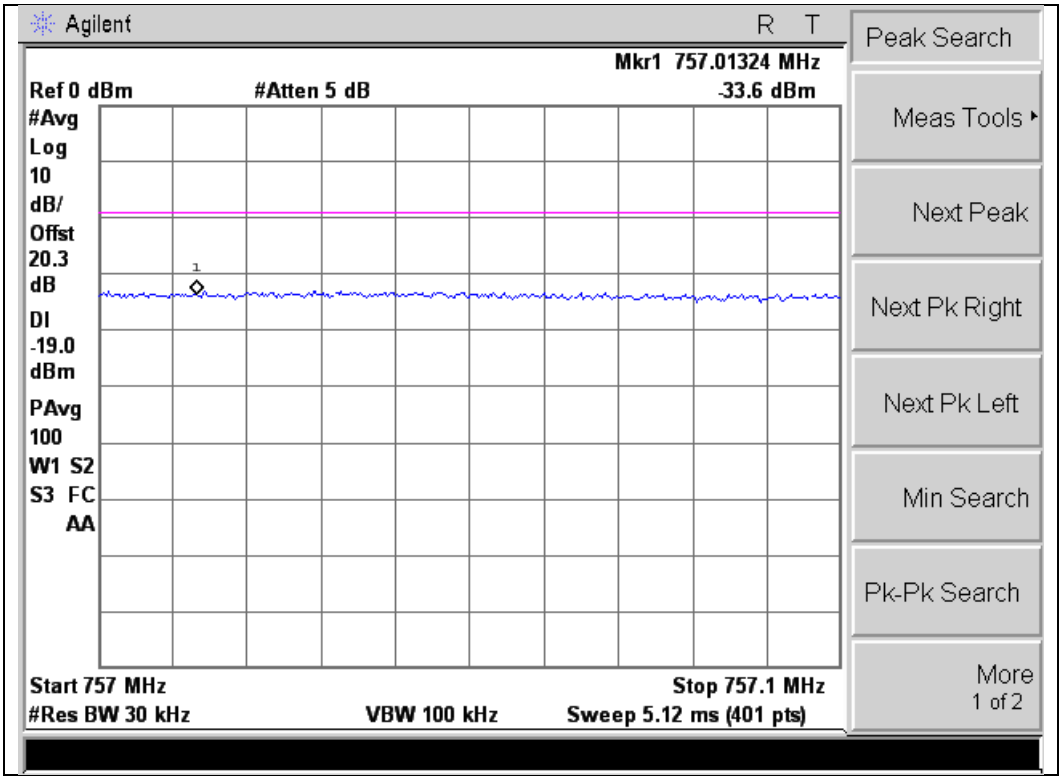


746 - 757MHz Band

Lower Band Edge

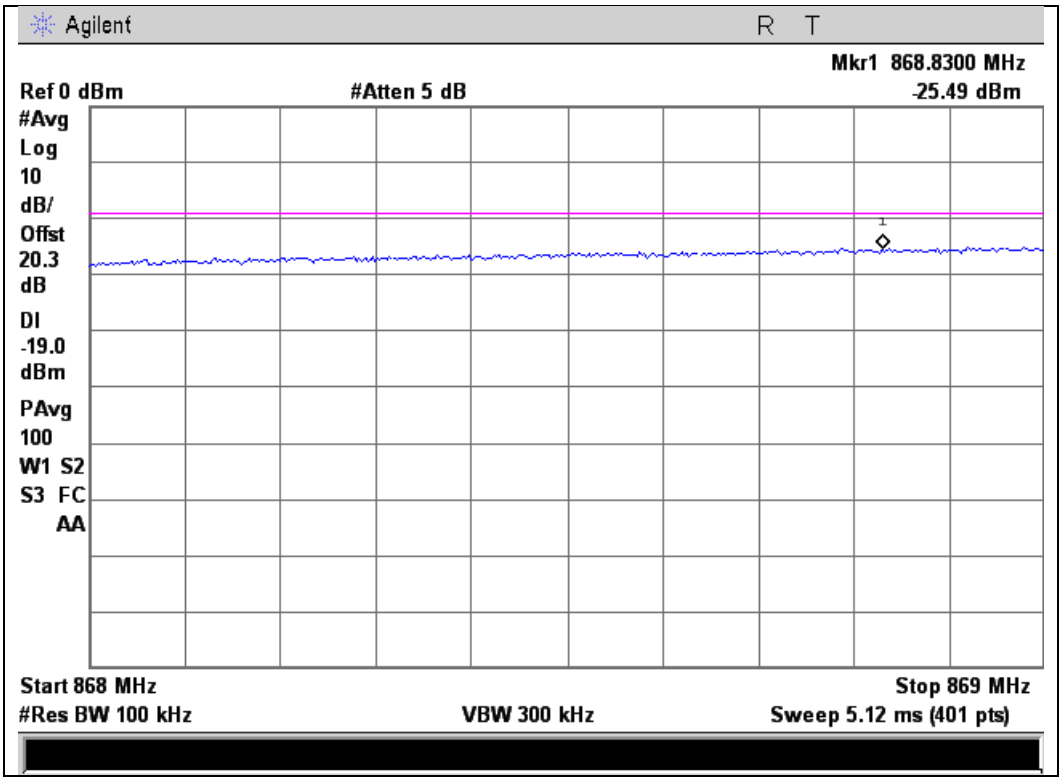


Upper Band Edge

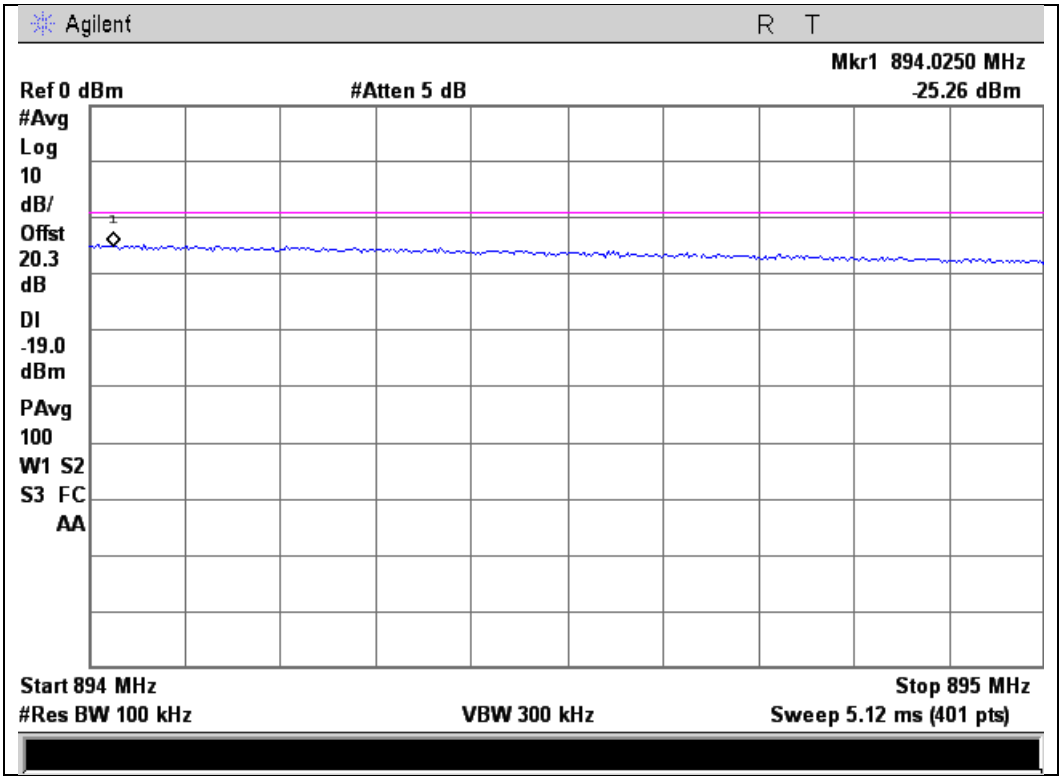


869 - 894 MHz Band

Lower Band Edge

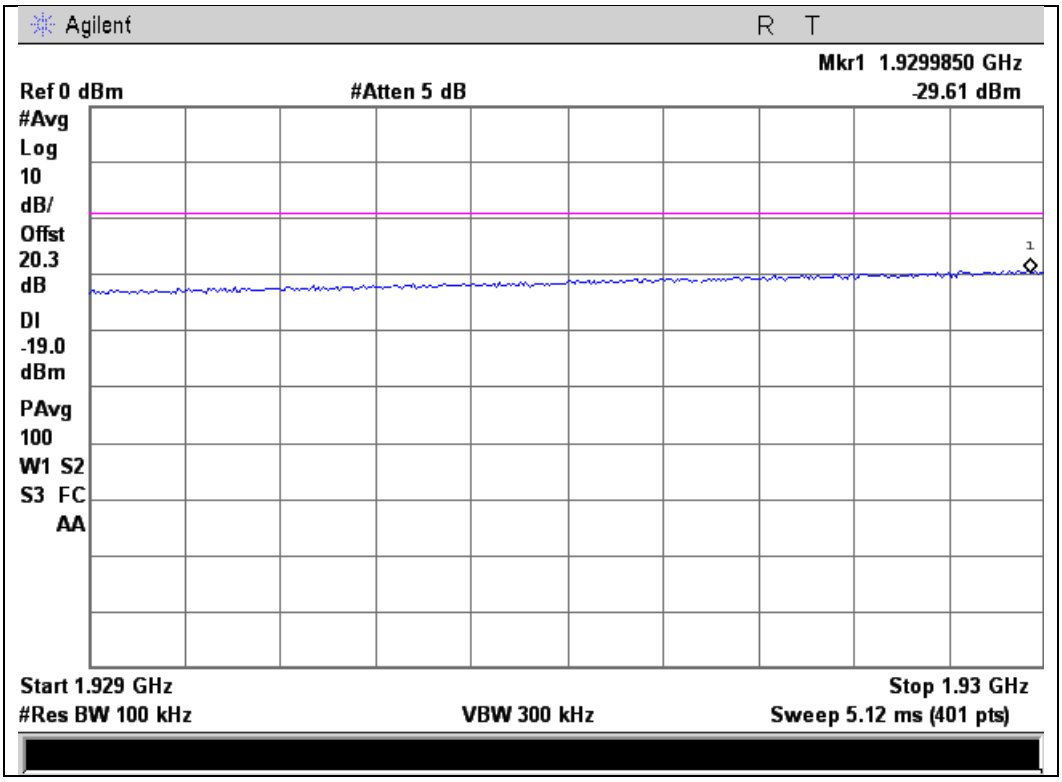


Upper Band Edge

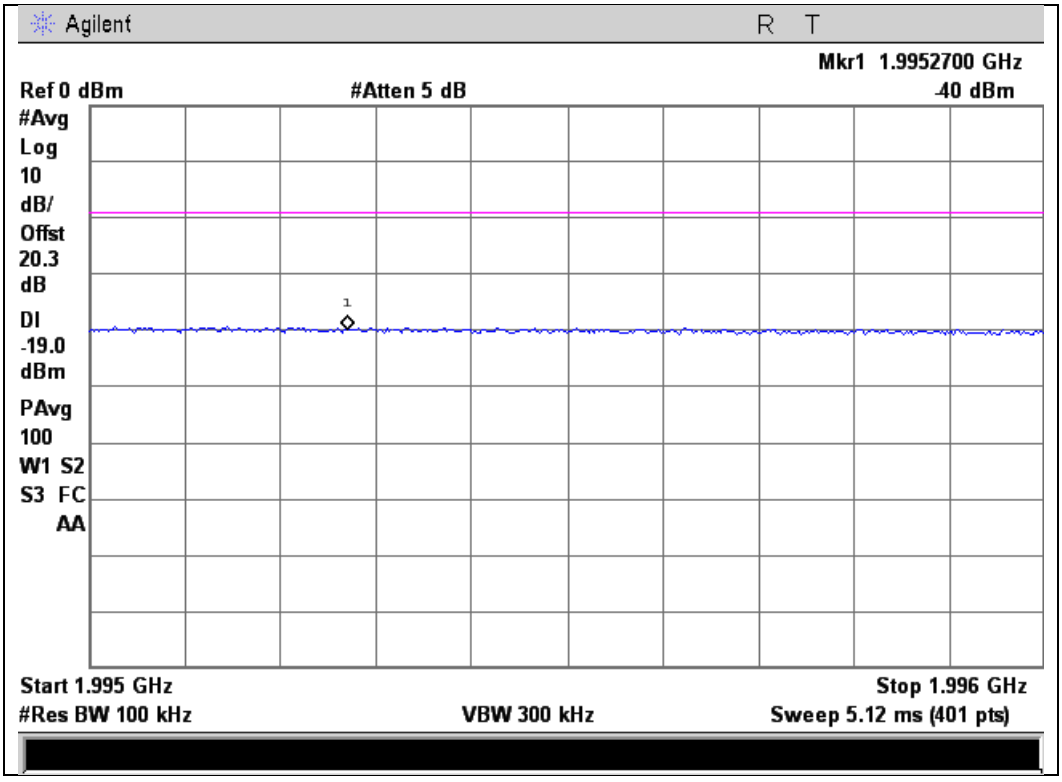


1930 - 1990MHz Band

Lower Band Edge

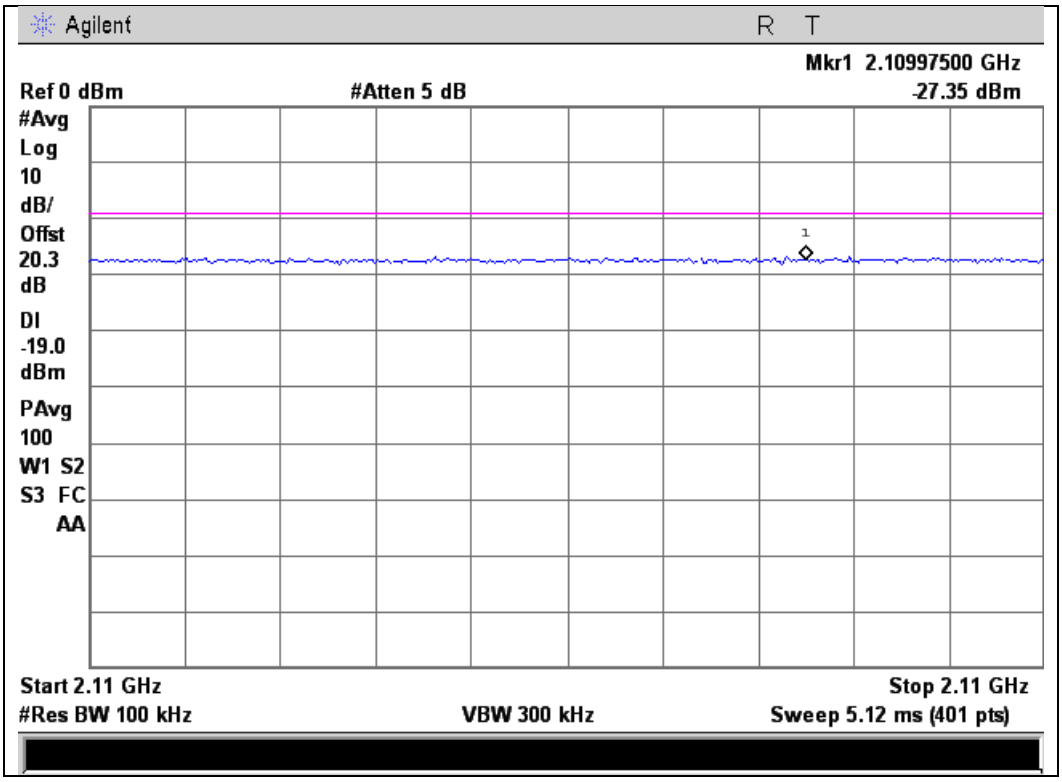


Upper Band Edge

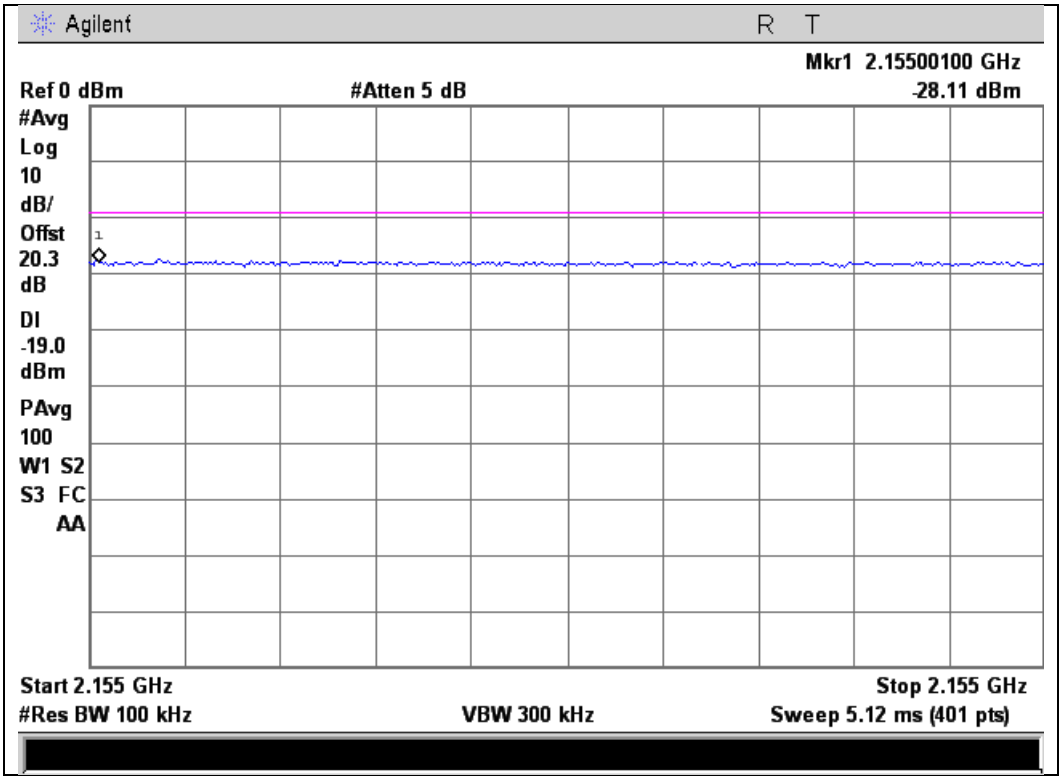


2110 - 2155 MHz Band

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:** 11/20/13, 1/9/14

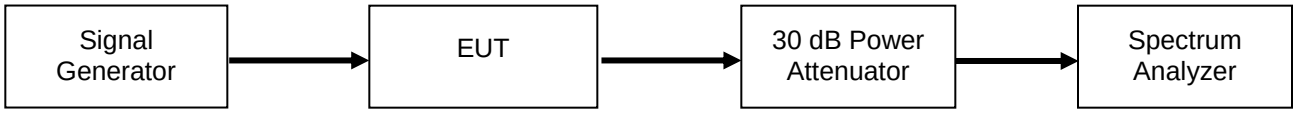
Test Procedure

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 = P1 – (43 + 10Log(P2)) = -13dBm
where P1= power in dBm, and P2=power in Watts

Test Setup



Uplink Test Results

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
698 - 716	716.10	-32.40	-13	Pass
776 - 787	775.33	-19.12	-13	Pass
824 - 849	823.00	-37.15	-13	Pass
1710 - 1755	3465.00	-30.63	-13	Pass
1850 - 1910	847.42	-43.45	-13	Pass

Downlink Test Results

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
728 - 746	746.10	-34.37	-13	Pass
746 - 757	745.90	-31.03	-13	Pass
869 - 894	867.89	-41.70	-13	Pass
1930 - 1990	878.43	-53.60	-13	Pass
2110 - 2155	2199.00	-54.73	-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)(4)
For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

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

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

BW correction Factor = 10Log B1/B2
BW correction Factor =10Log 6.25 / 10 = - 2.04 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	774.97	-47.65	-2.04	-49.69	-46	-3.69
793 – 805	793.35	-77.99	-2.04	-80.03	-46	-34.03

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	772.52	-81.07	-2.04	-83.11	-46	-37.11
793 – 805	801.5	-83.04	-2.04	-85.08	-46	-39.08

FCC 27.53(e)
For operations in the 746-763 MHz, 775-793 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.
Since the limit is referenced to EIRP, the final data is computed using the Conducted Spurious Emission data and adding the BW correction factor and the final gain/loss data from the antenna kitting information supplied by the manufacturer.

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

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

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

The Limit for 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

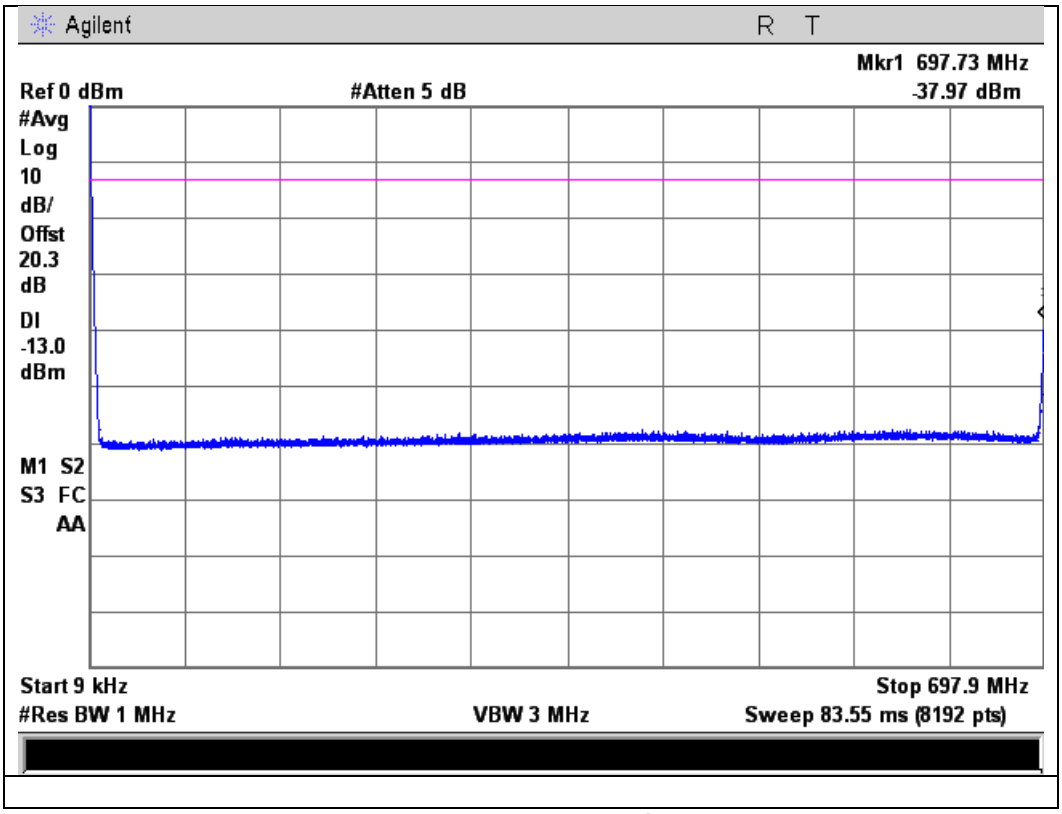
Spurious Frequency Range (MHz)	Measured Frequency (MHz)	Measured Value (dBm)	Bandwidth Correction Factor (dB)	Gain/Loss from Antenna Kitting Information (dB)	Final Value (dBm)	Limit (dBm)	Margin (dB)
1559 – 1610 (Wideband)	1562.34	-56.14	0.00	4.2	-51.94	-40	-11.94
1559 – 1610 (Narrowband)	1562.92	-74.57	-11.55	4.2	-81.92	-50	-31.92

746 - 757 MHz Downlink Band

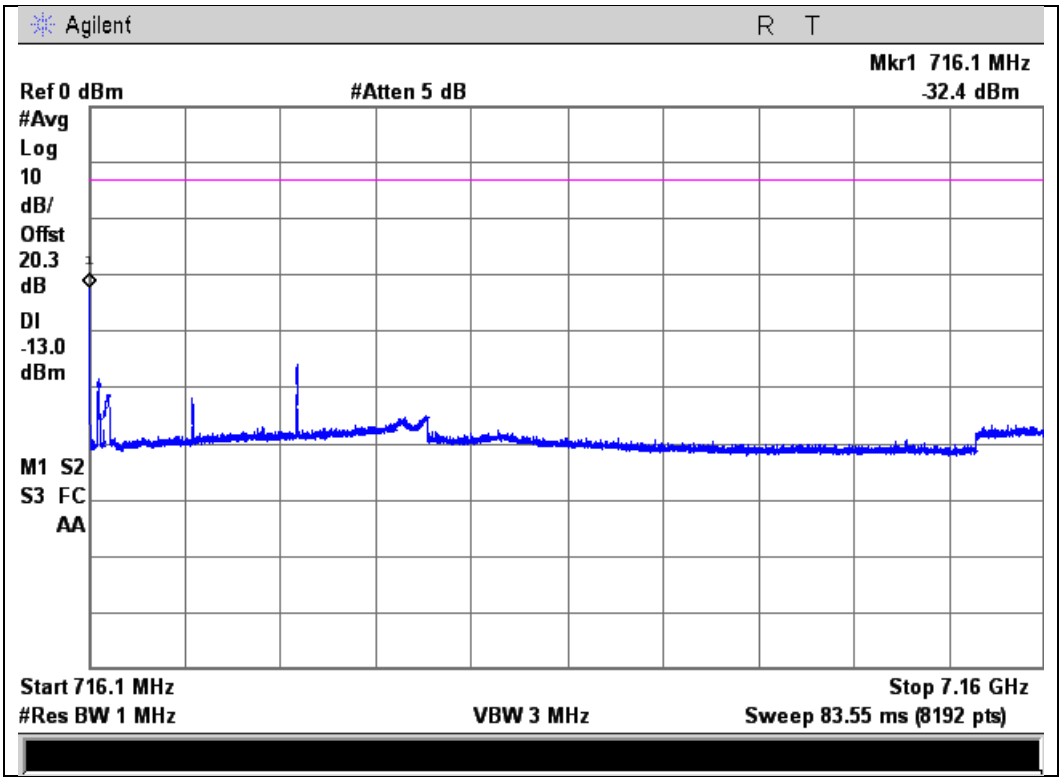
Spurious Frequency Range (MHz)	Measured Frequency (MHz)	Measured Value (dBm)	Bandwidth Correction Factor (dB)	Gain/Loss from Antenna Kitting information (dB)	Final Value (dBm)	Limit (dBm)	Margin (dB)
1559 – 1610 (Wideband)	1600.15	-62.64	0	0	-62.64	-40	-22.64
1559 – 1610 (Narrowband)	1599.45	-81.07	-11.55	0	-92.62	-50	-42.62

Uplink Test Plots

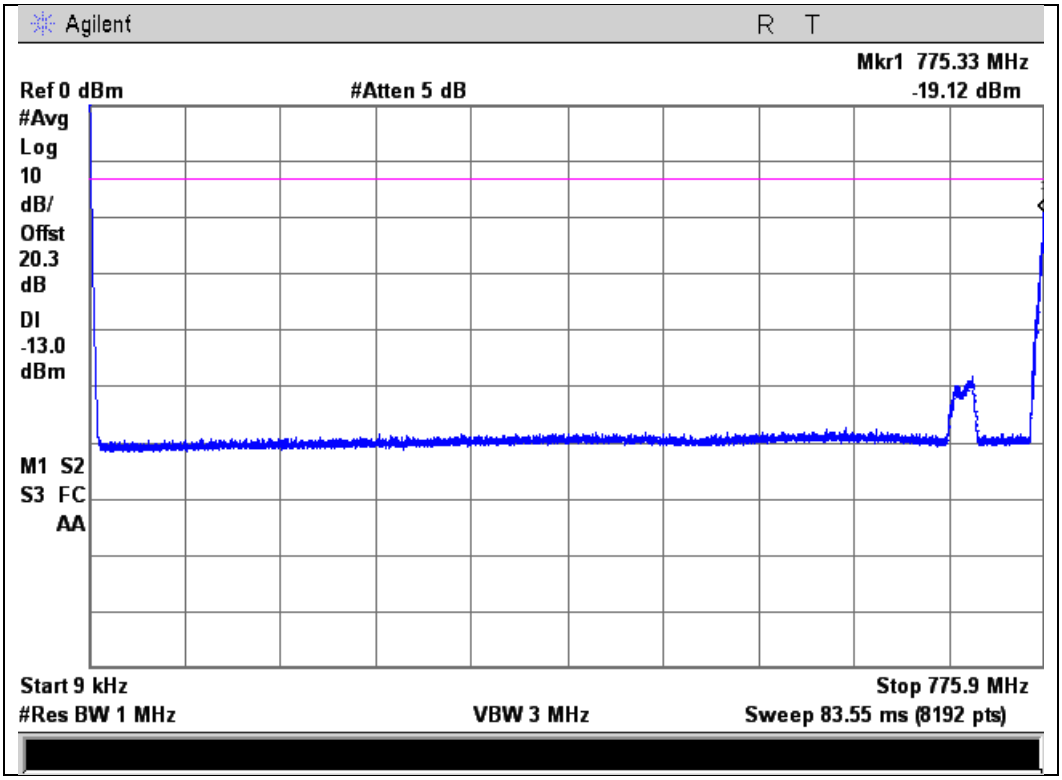
698 - 716MHz Band
9kHz – 697.9 MHz



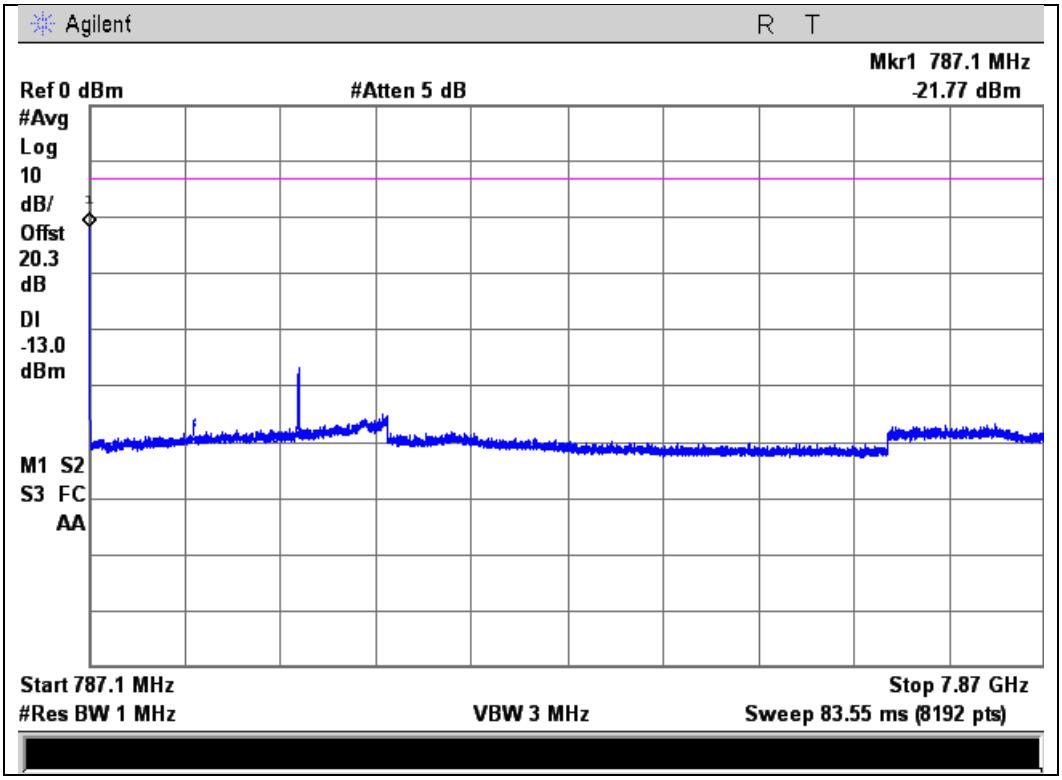
698 - 716MHz Band
716.1 MHz – 7.16 GHz



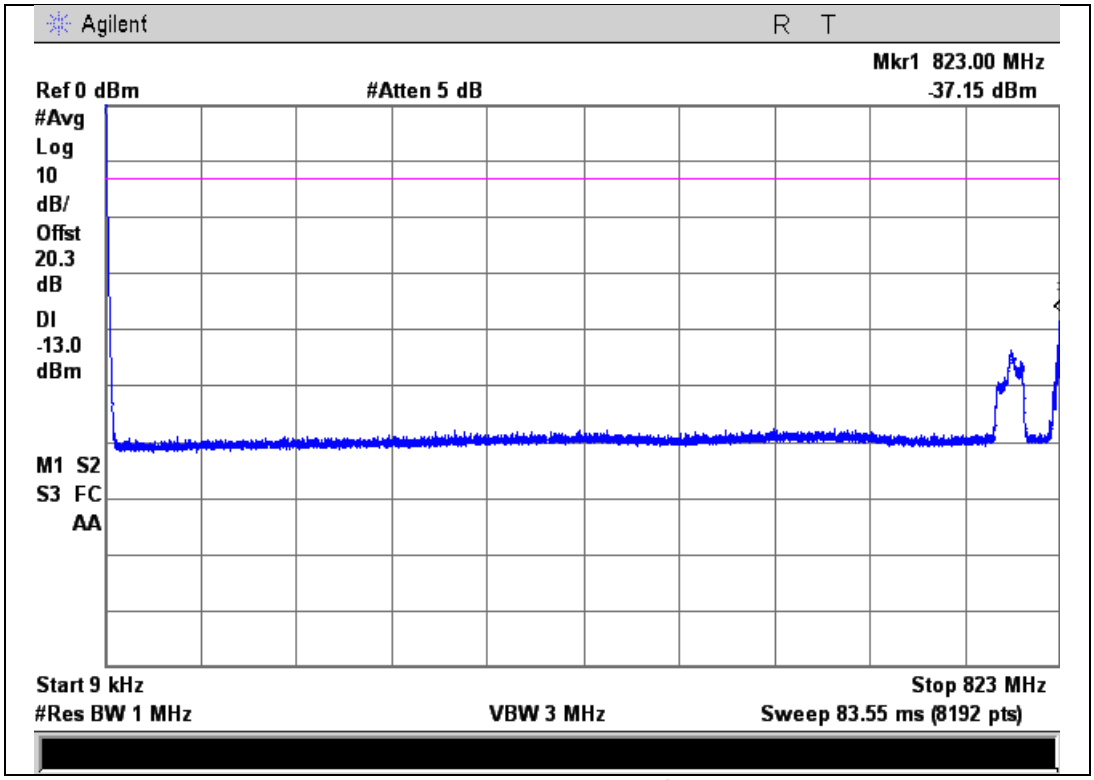
776 - 787MHz Band
9kHz – 775.9 MHz



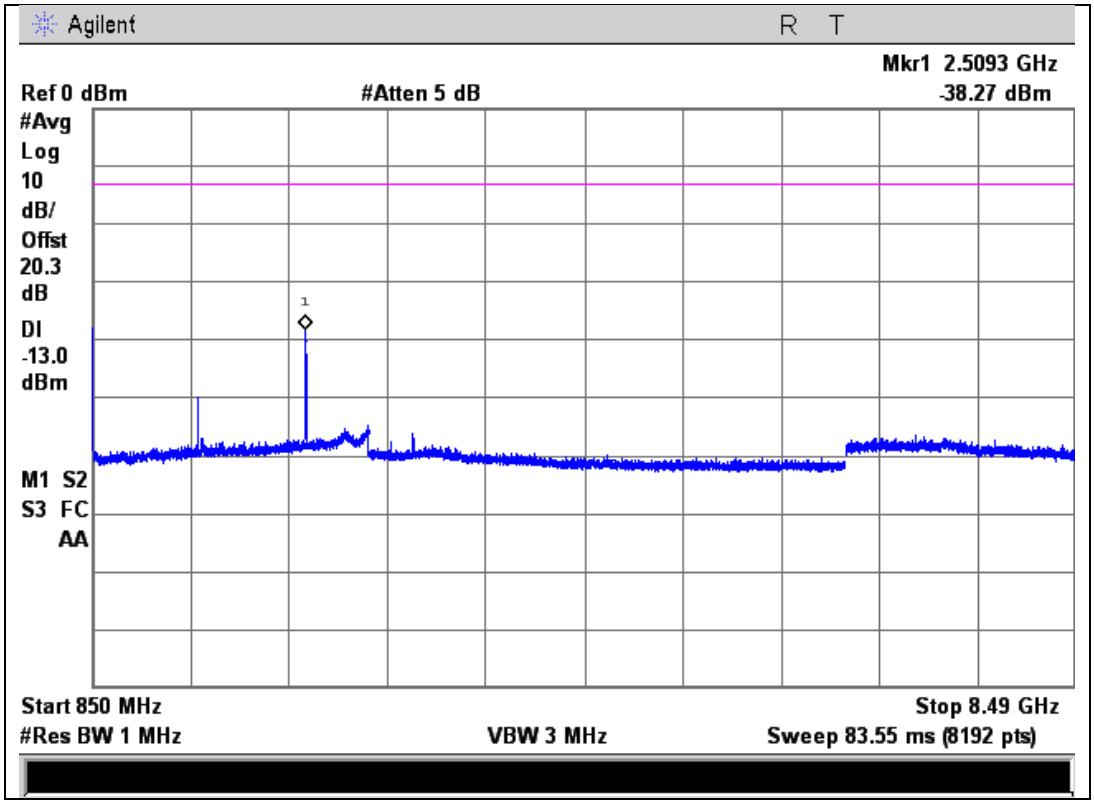
776 - 787MHz Band
787.1 MHz – 7.87 GHz



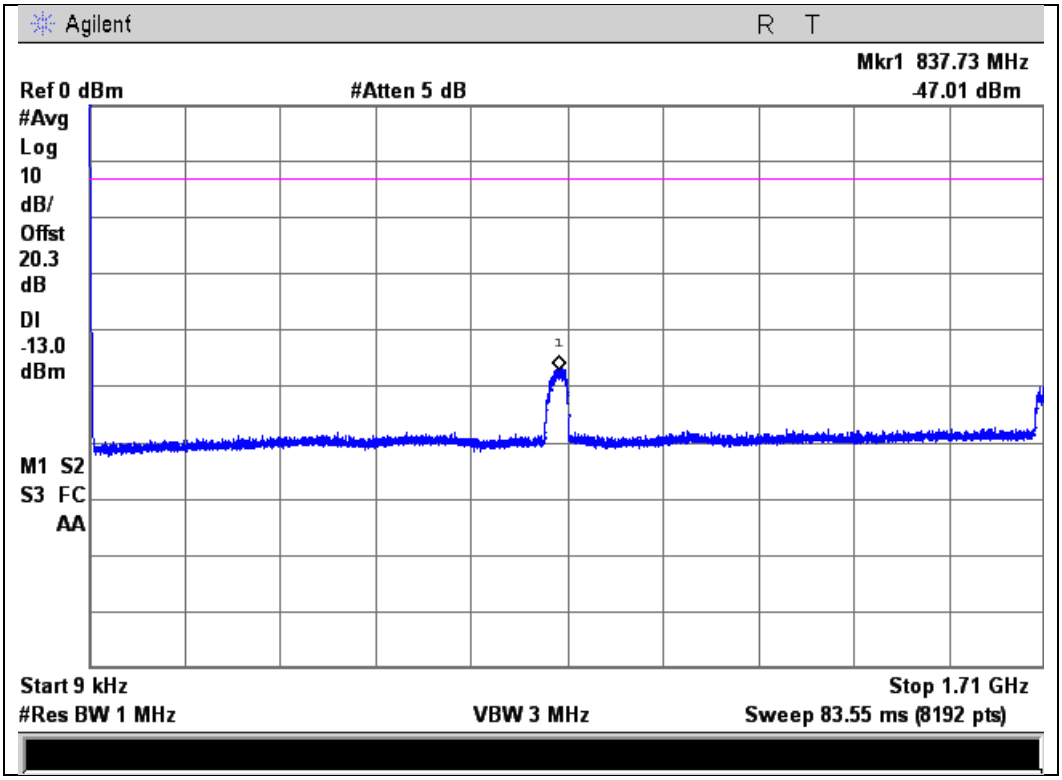
824 - 849 MHz Band
9kHz – 823 MHz



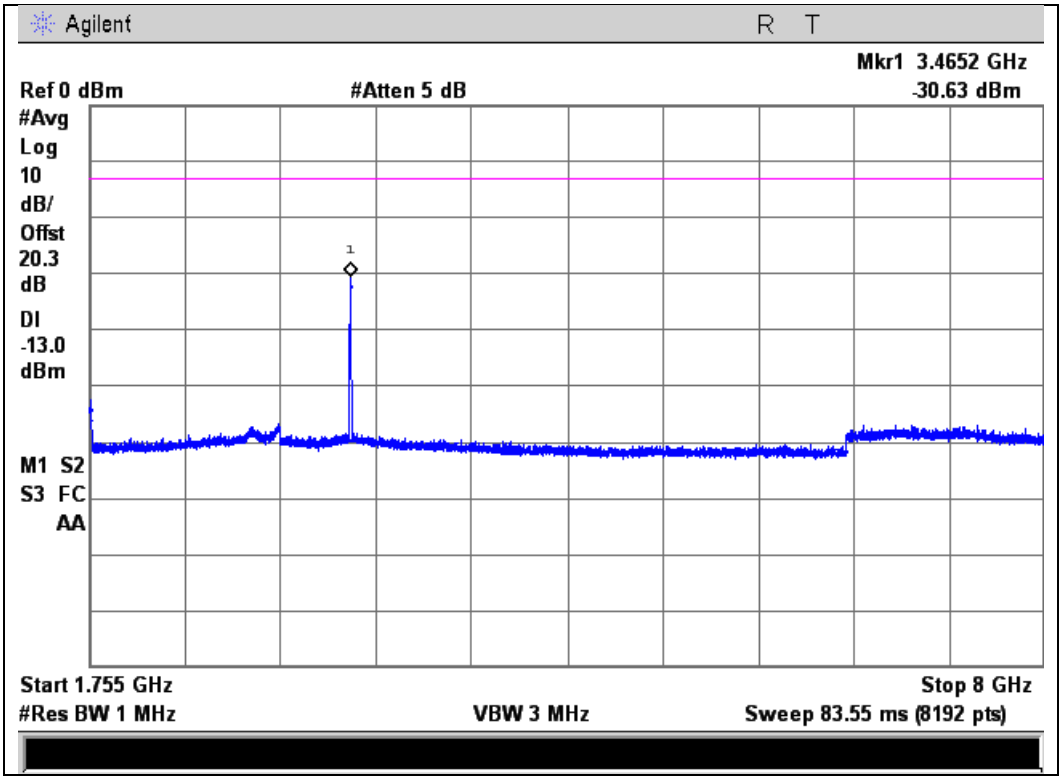
824 - 849 MHz Band
850 MHz – 8.49 GHz



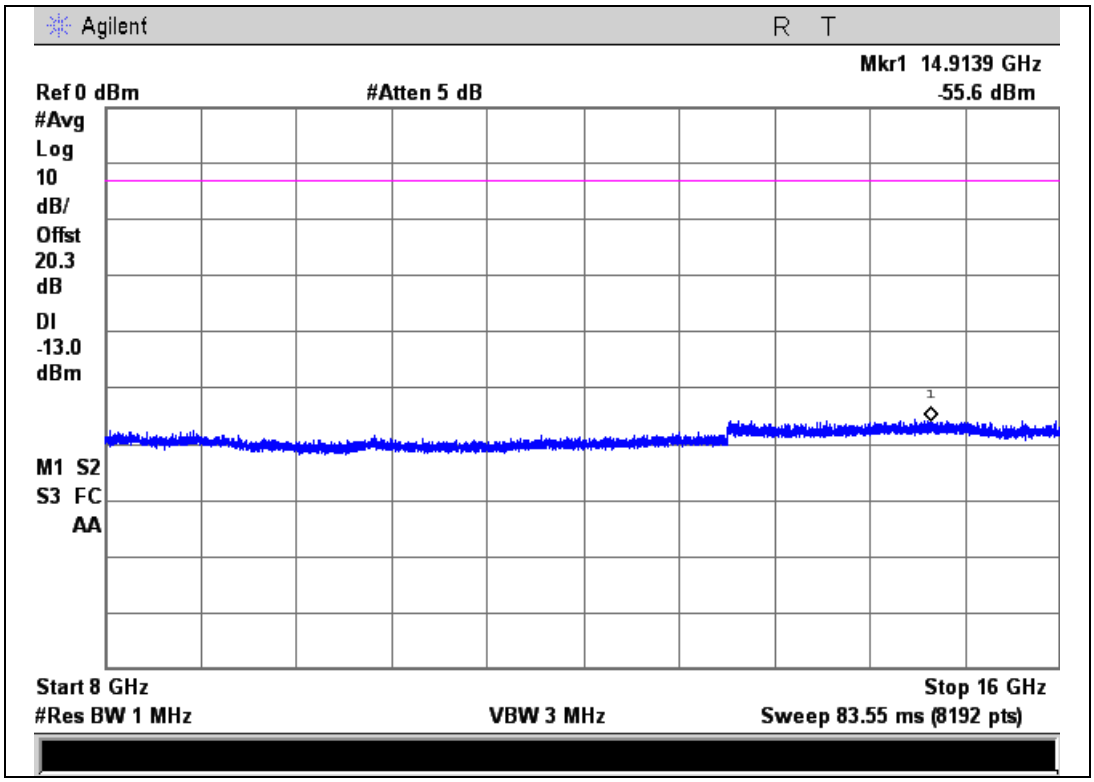
1710 - 1755 MHz Band
9kHz – 1.71 GHz



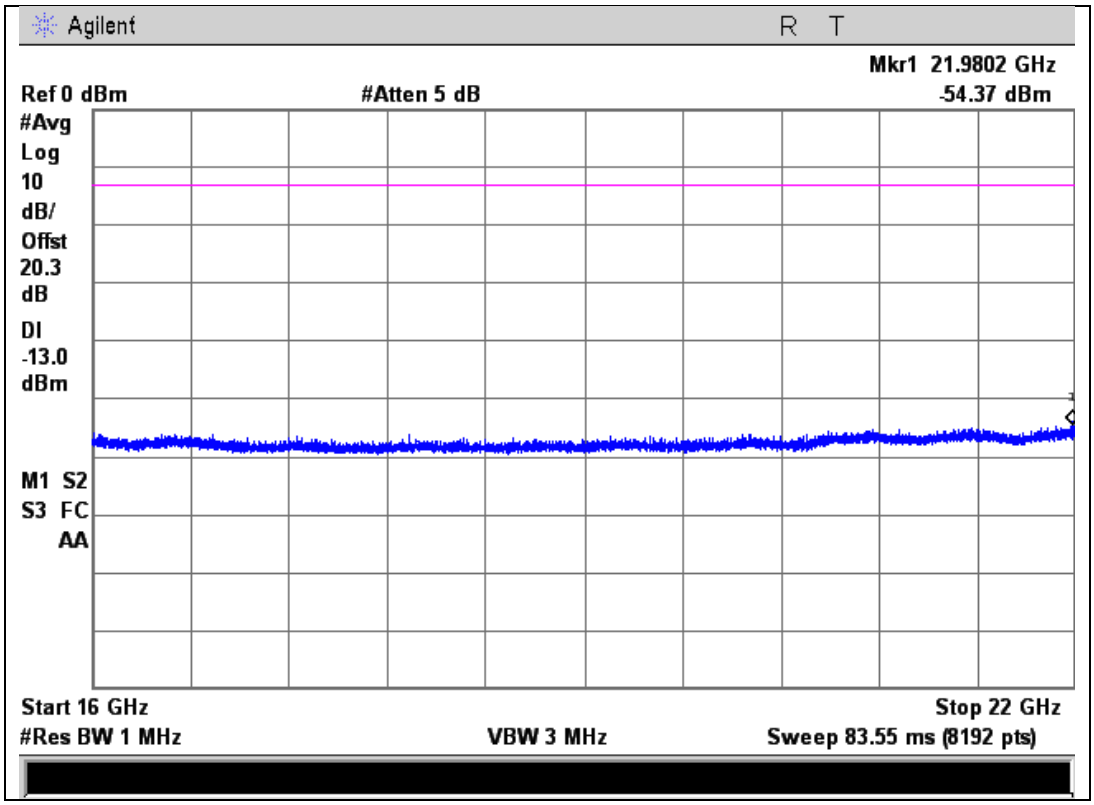
1710 - 1755 MHz Band
1.755 GHz – 8.0 GHz



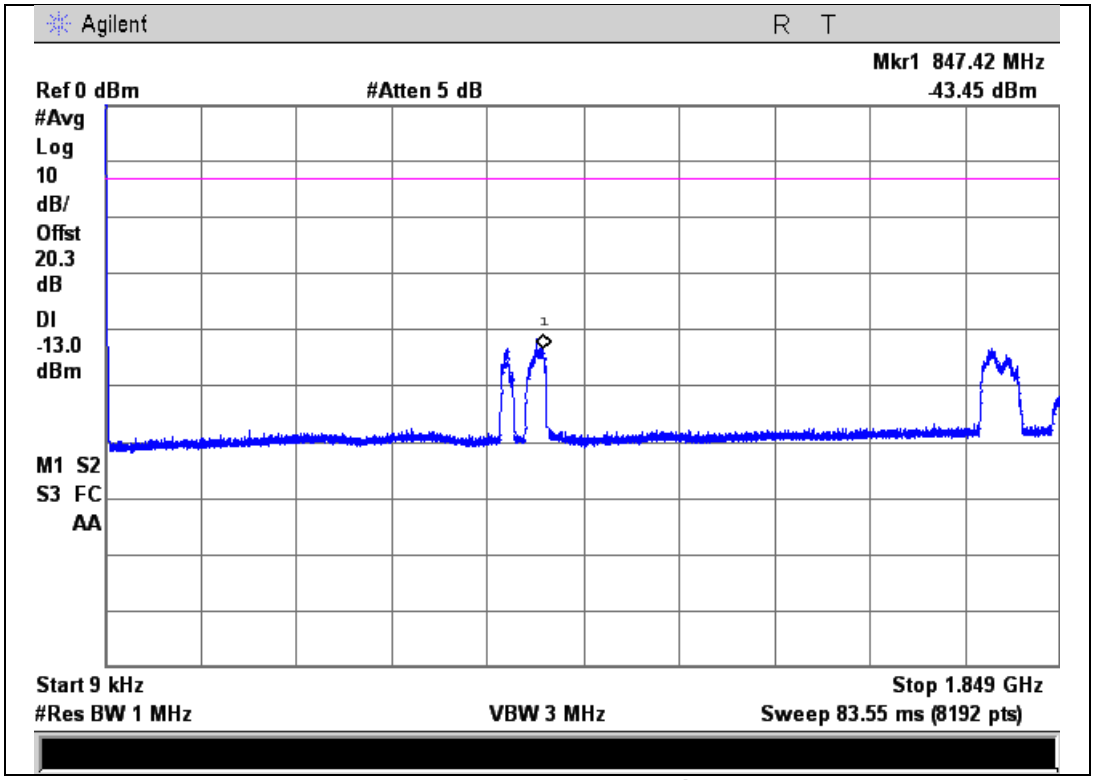
1710 - 1755 MHz Band
8.0 GHz – 16.0 GHz



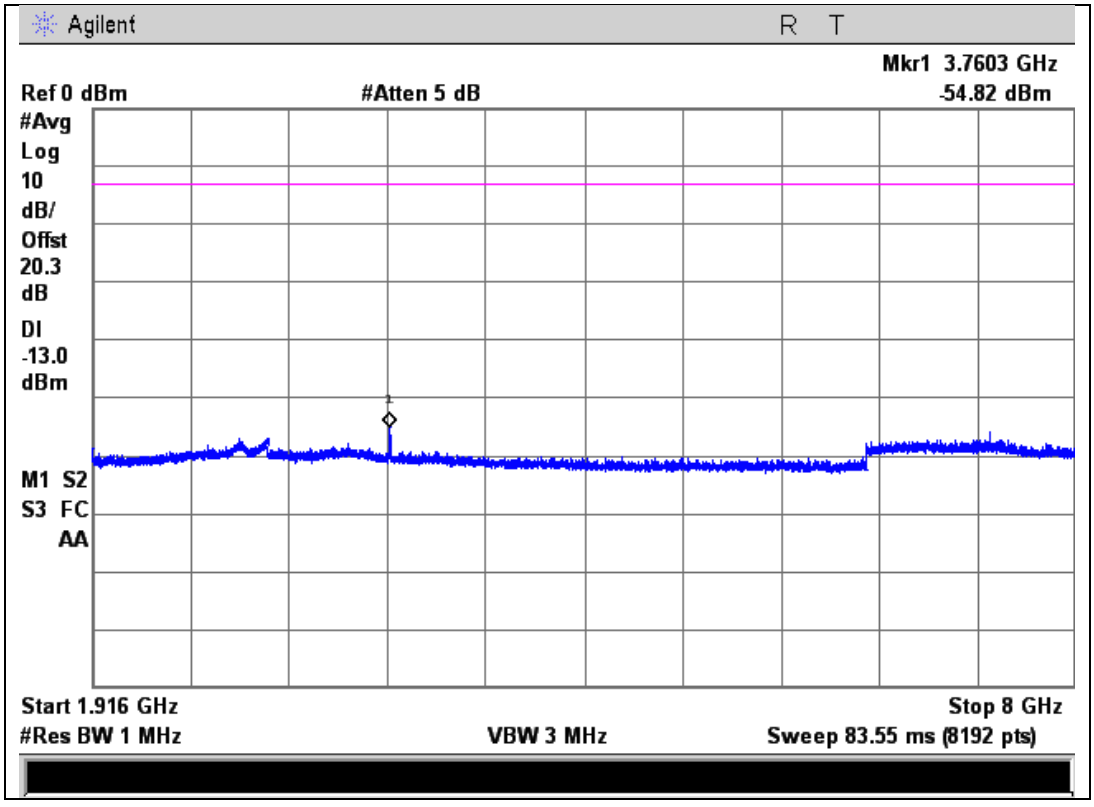
1710 - 1755 MHz Band
16.0 GHz – 22.0 GHz



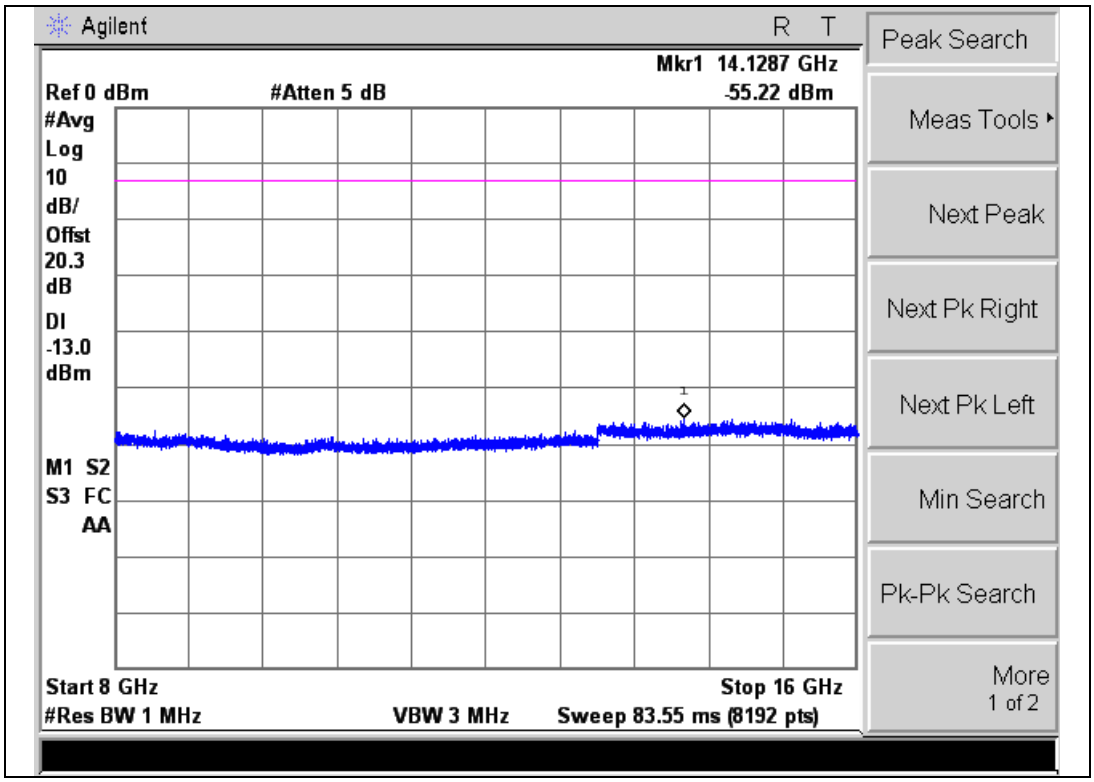
1850 – 1910 MHz Band
9kHz – 1.849 GHz



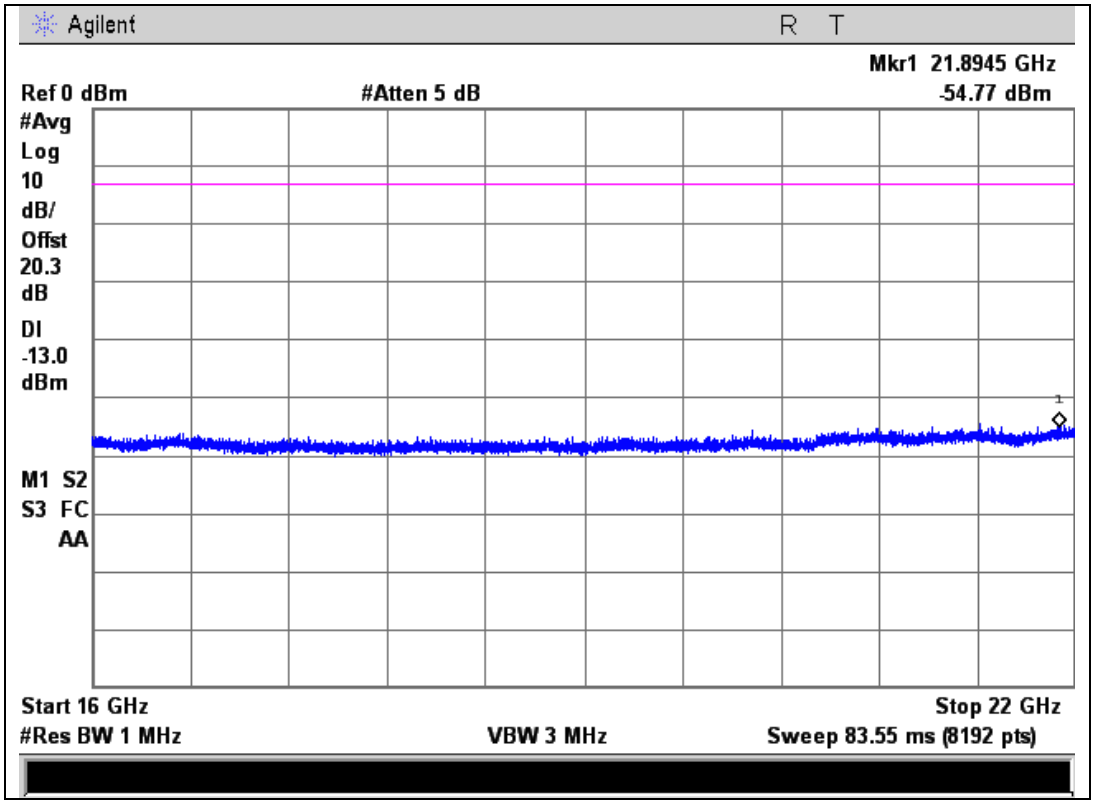
1850 – 1910 MHz Band
1.916 GHz –8.0 GHz



1850 – 1910 MHz Band
8.0 GHz –16.0 GHz

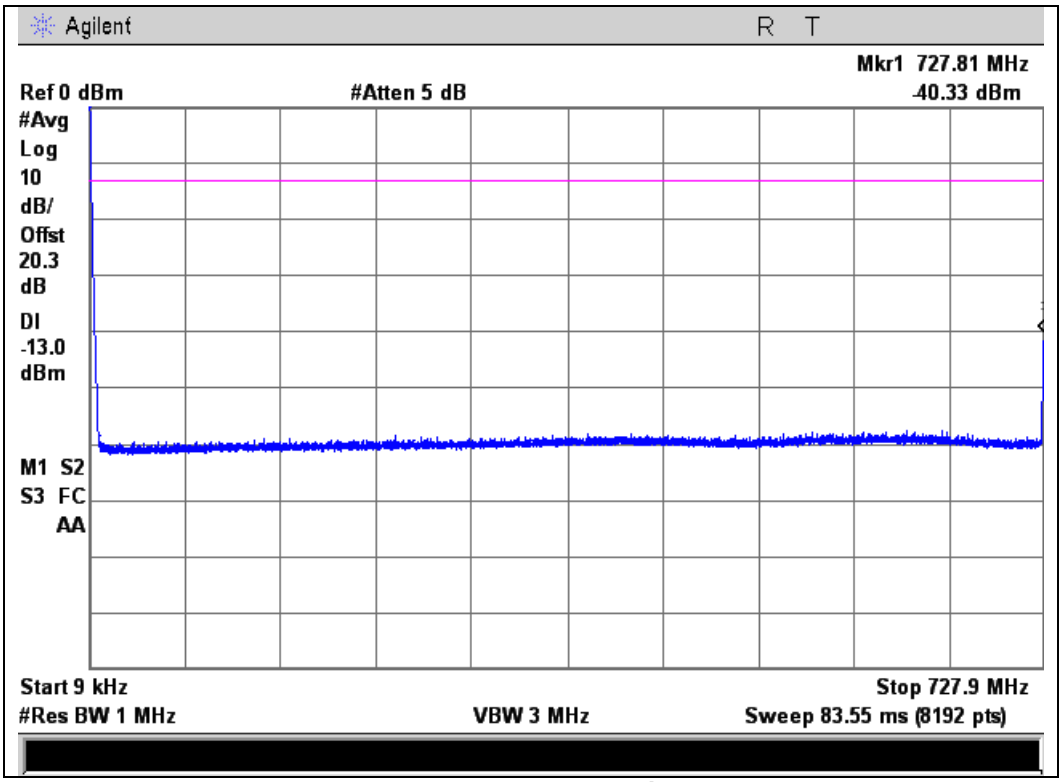


1850 – 1910 MHz Band
16.0 GHz –22.0 GHz

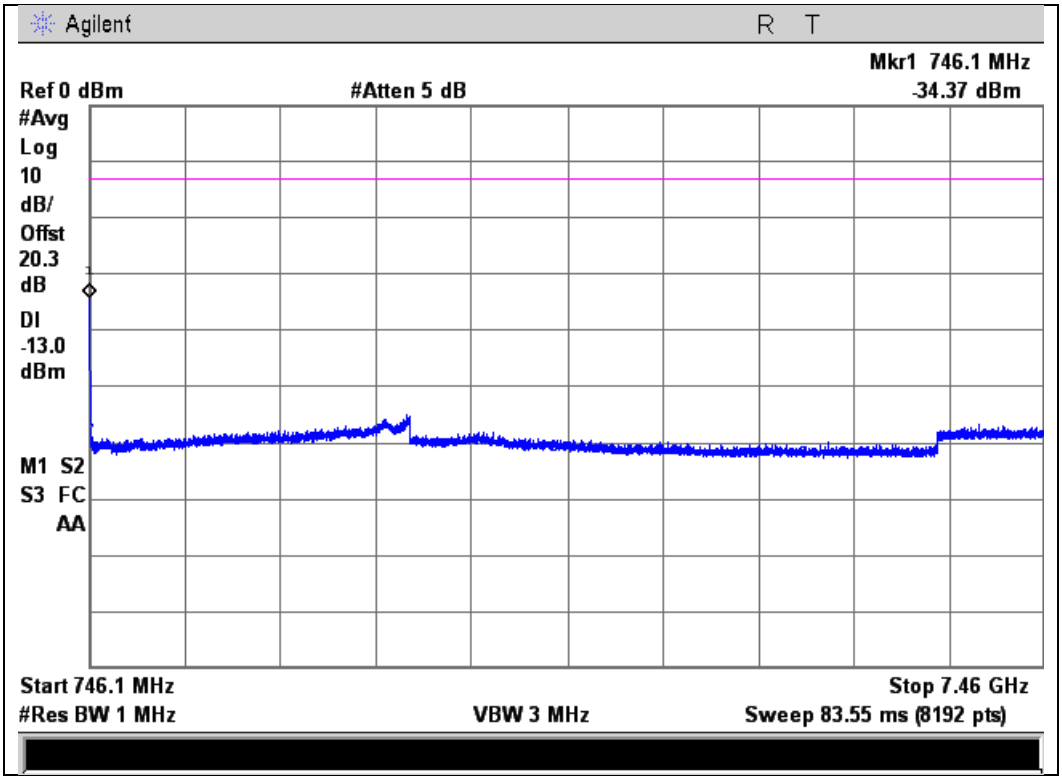


Downlink Test Plots

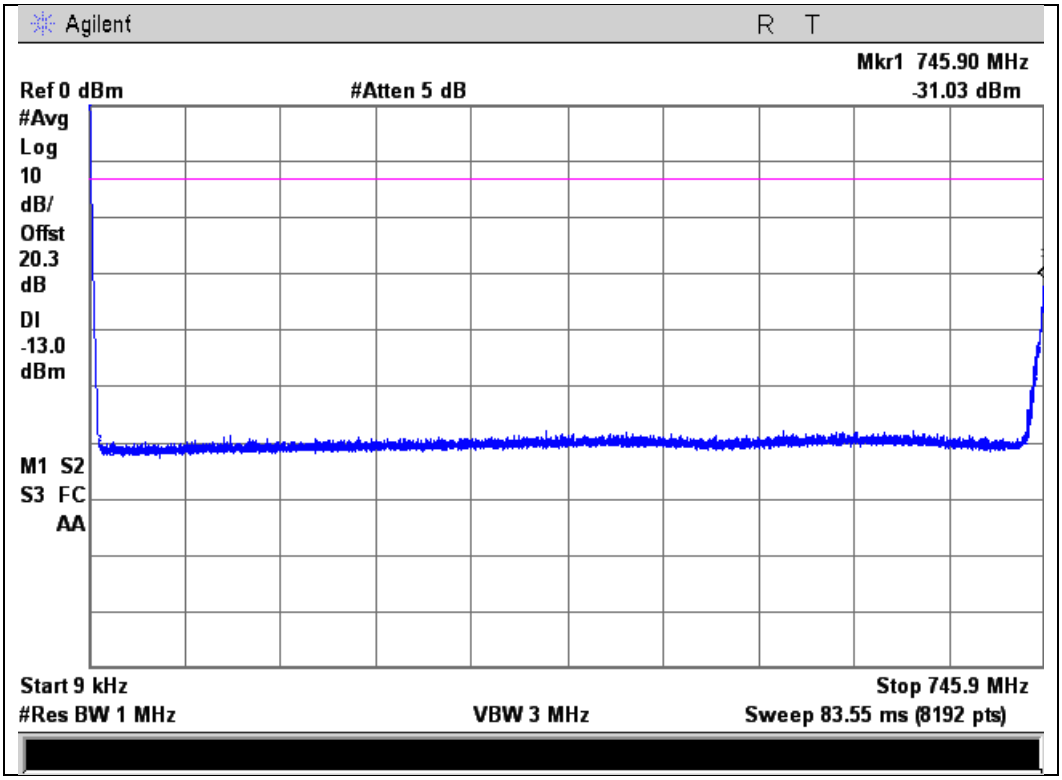
728 - 746 MHz Band
9kHz – 727.9 MHz



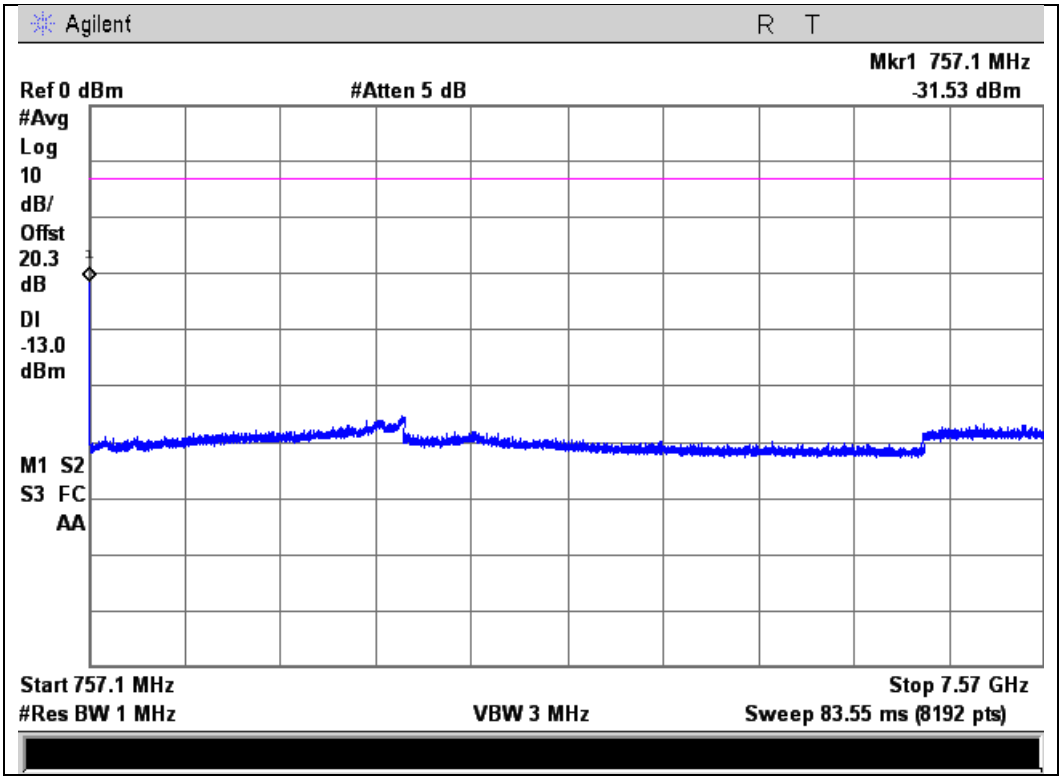
728 - 746 MHz Band
746.1MHz – 7.46 GHz



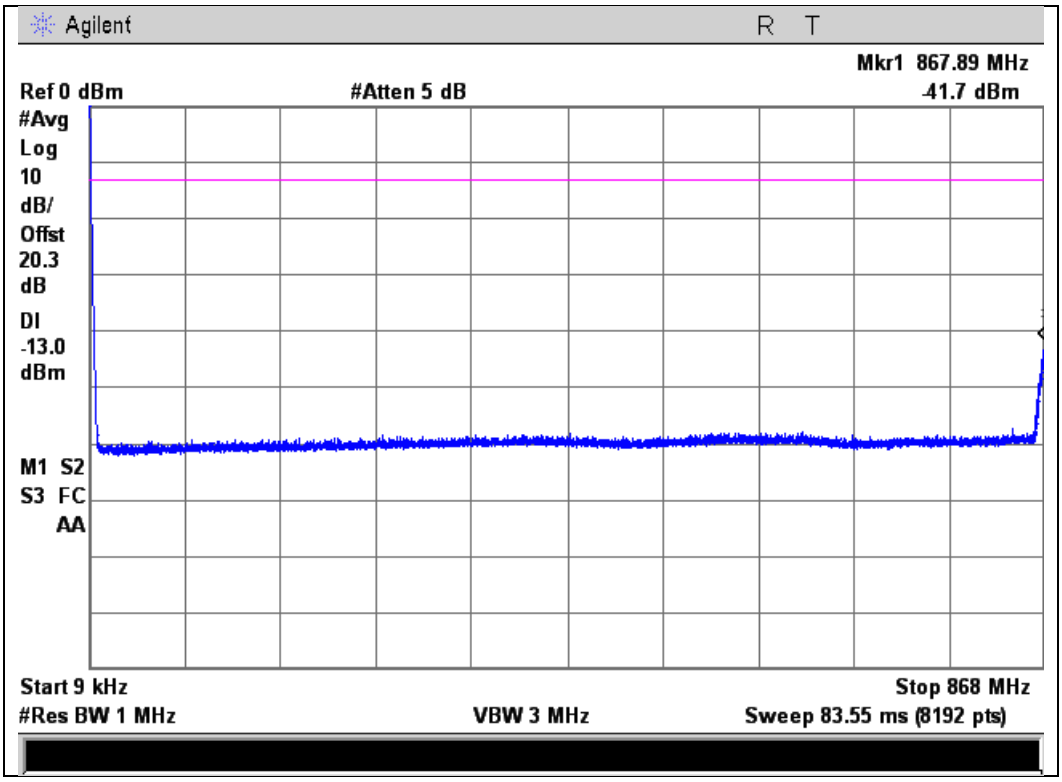
746 – 757 MHz Band
9kHz – 745.9 MHz



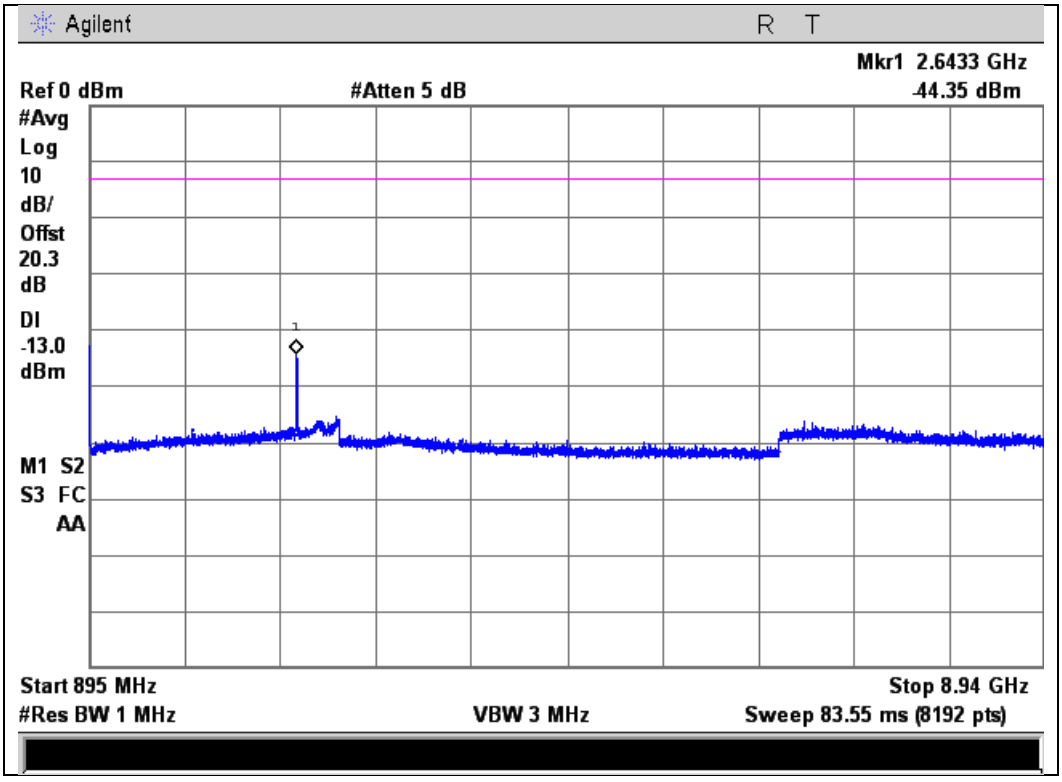
746 – 757 MHz Band
757.1 MHz – 7.57 GHz



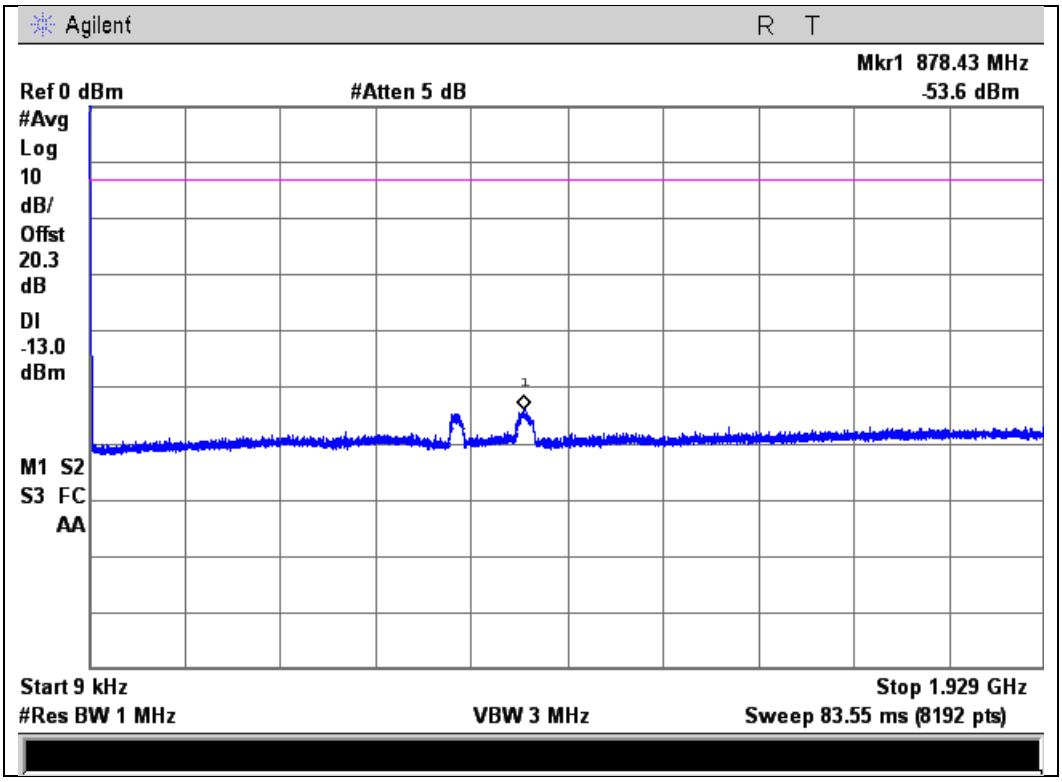
869 - 894 MHz Band
9kHz – 868 MHz



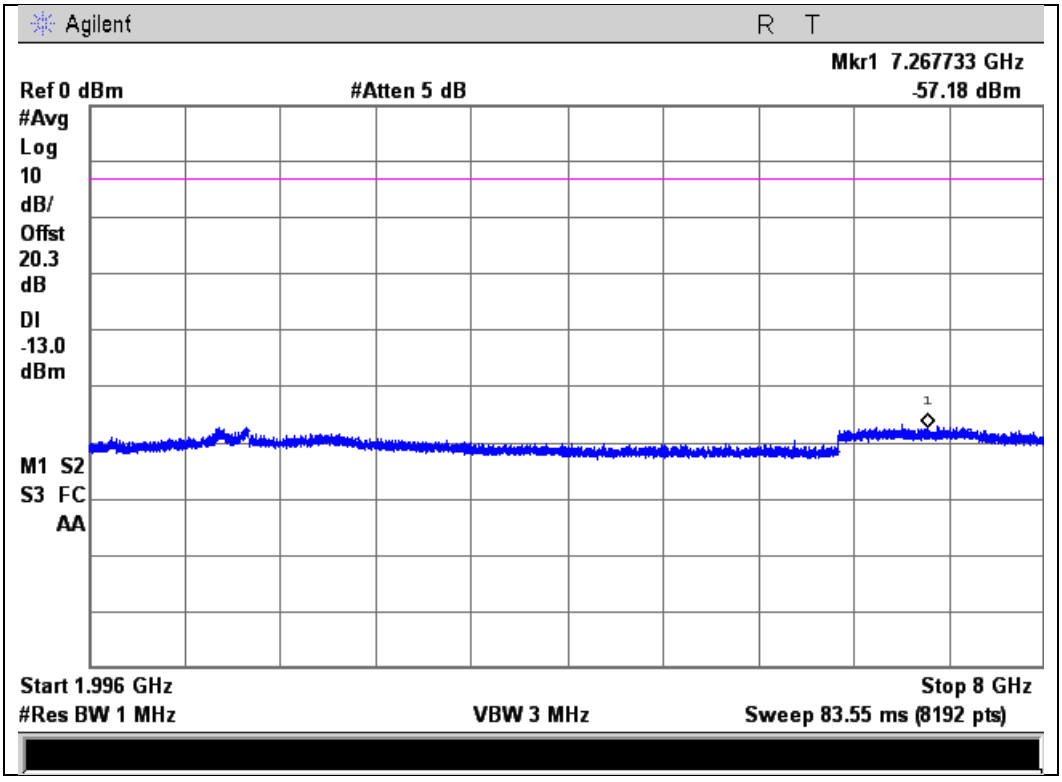
869 - 894 MHz Band
895 MHz – 8.94 GHz



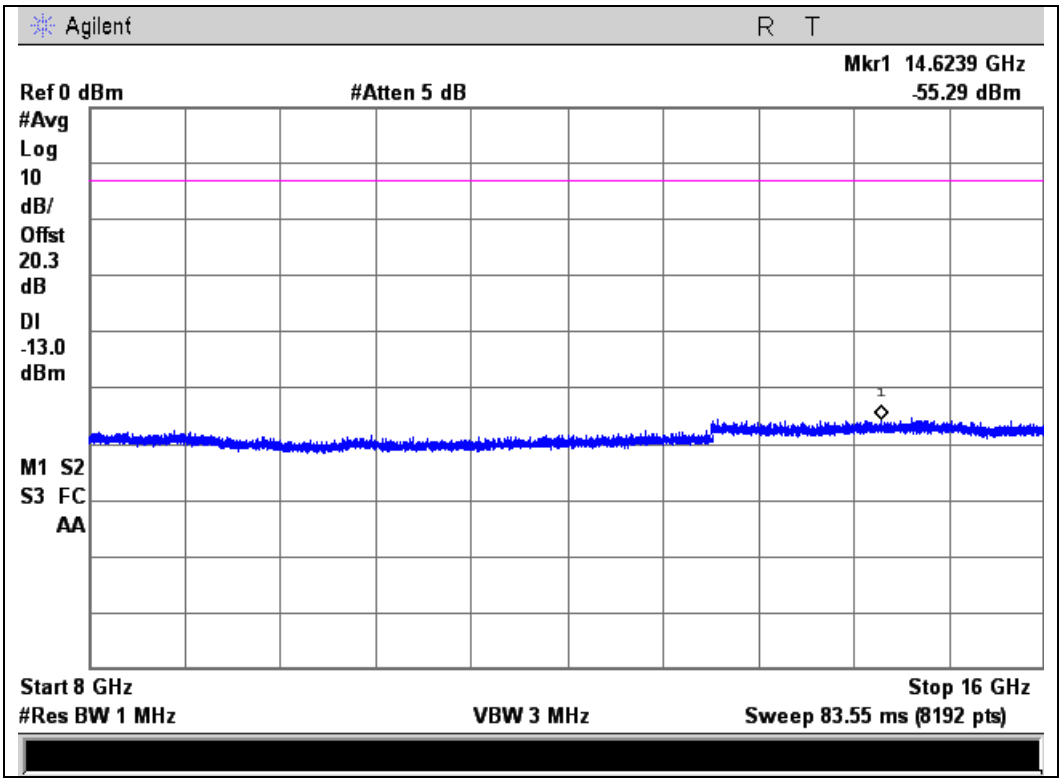
1930 – 1990 MHz Band
9kHz – 1.929 GHz



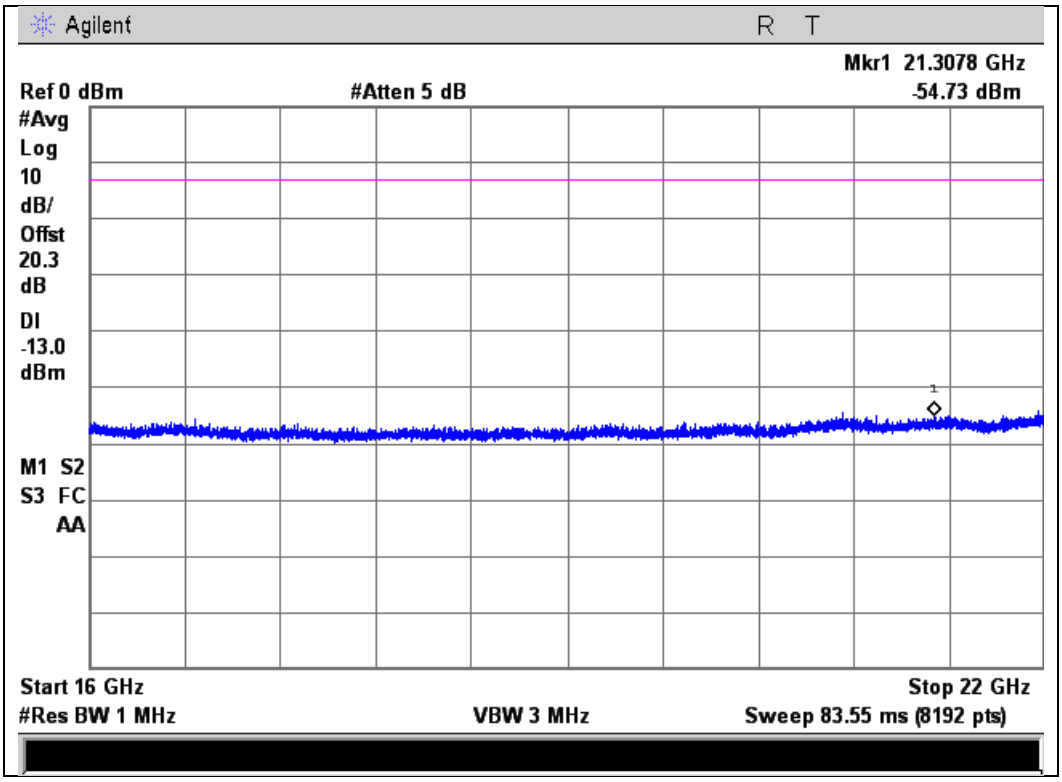
1930 – 1990 MHz Band
1.996 GHz – 8.0 GHz



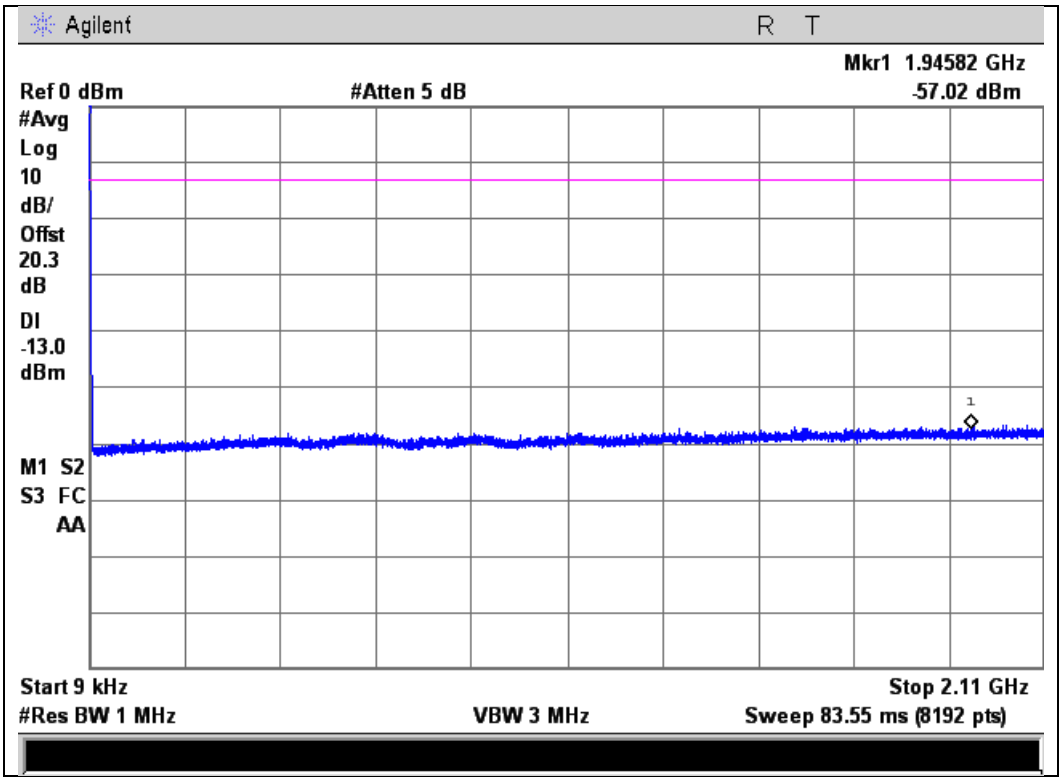
1930 – 1990 MHz Band
8.0 GHz – 16.0 GHz



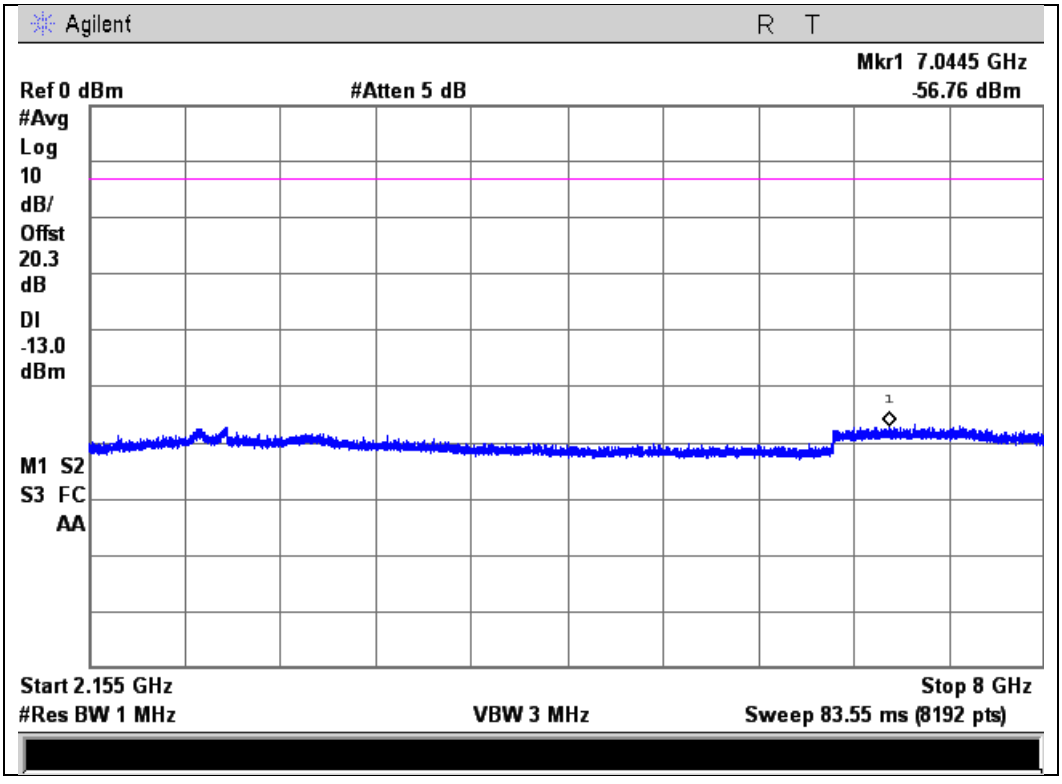
1930 – 1990 MHz Band
16.0 GHz – 22.0 GHz



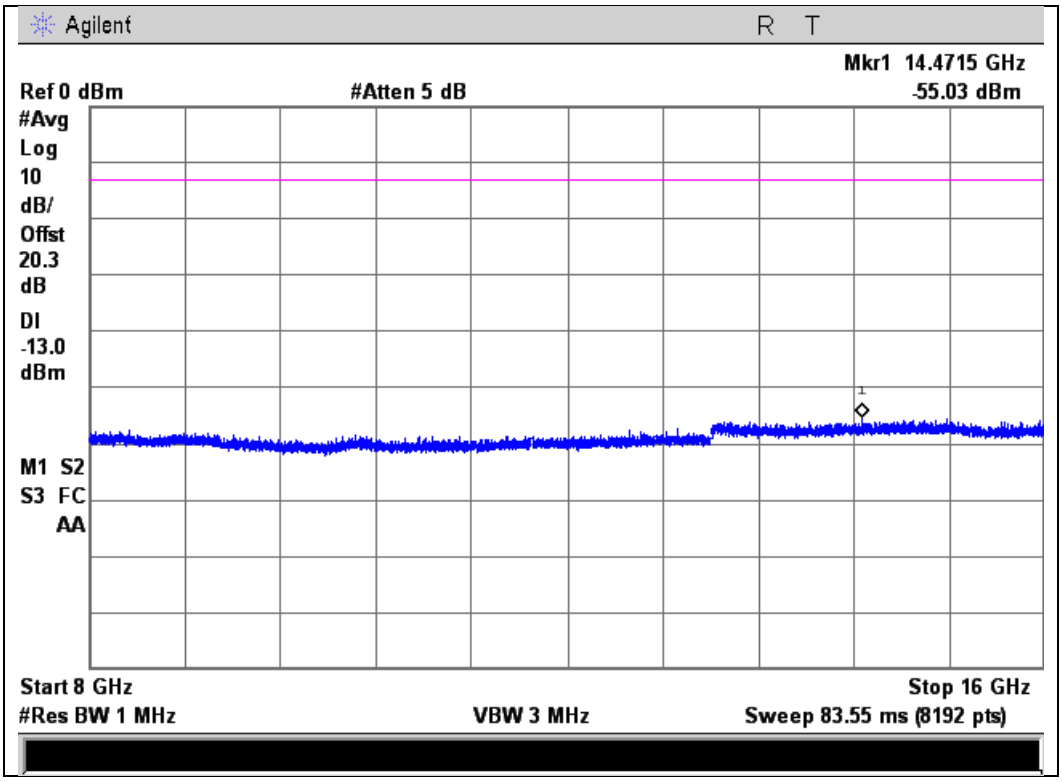
2110 - 2155 MHz Band
9kHz – 2.11 GHz



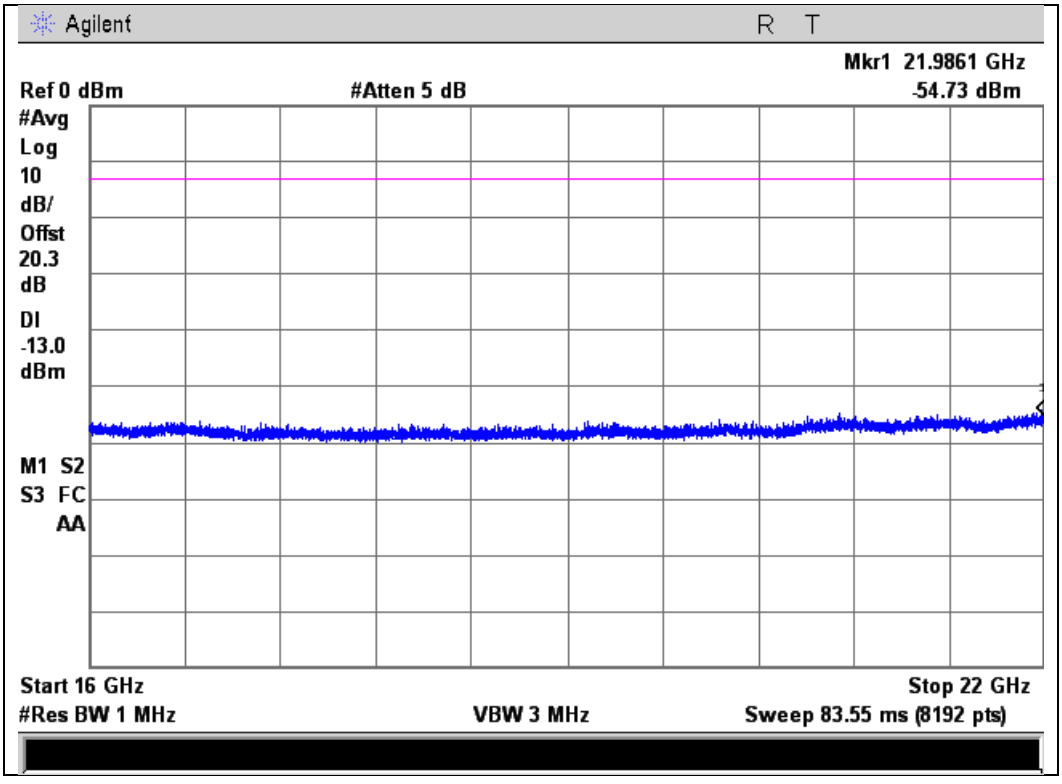
2110 - 2155 MHz Band
2.155 GHz – 8.0 GHz



2110 - 2155 MHz Band
8.0 GHz – 16.0 GHz

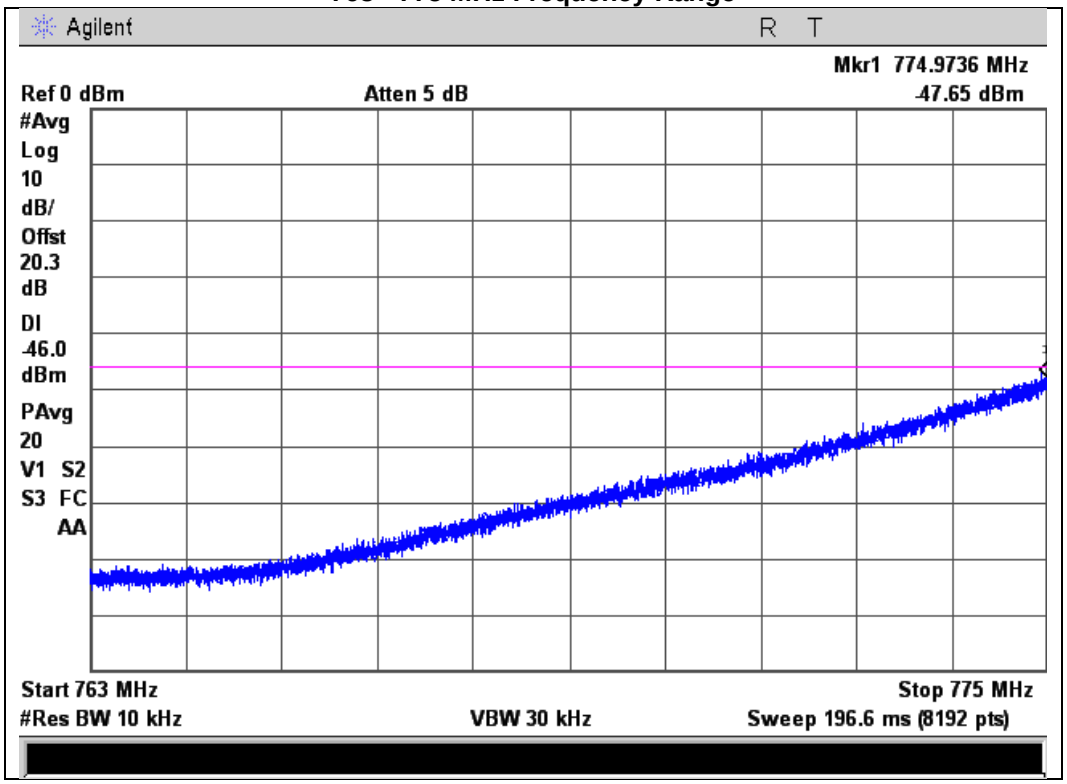


2110 - 2155 MHz Band
16.0 GHz – 22.0 GHz

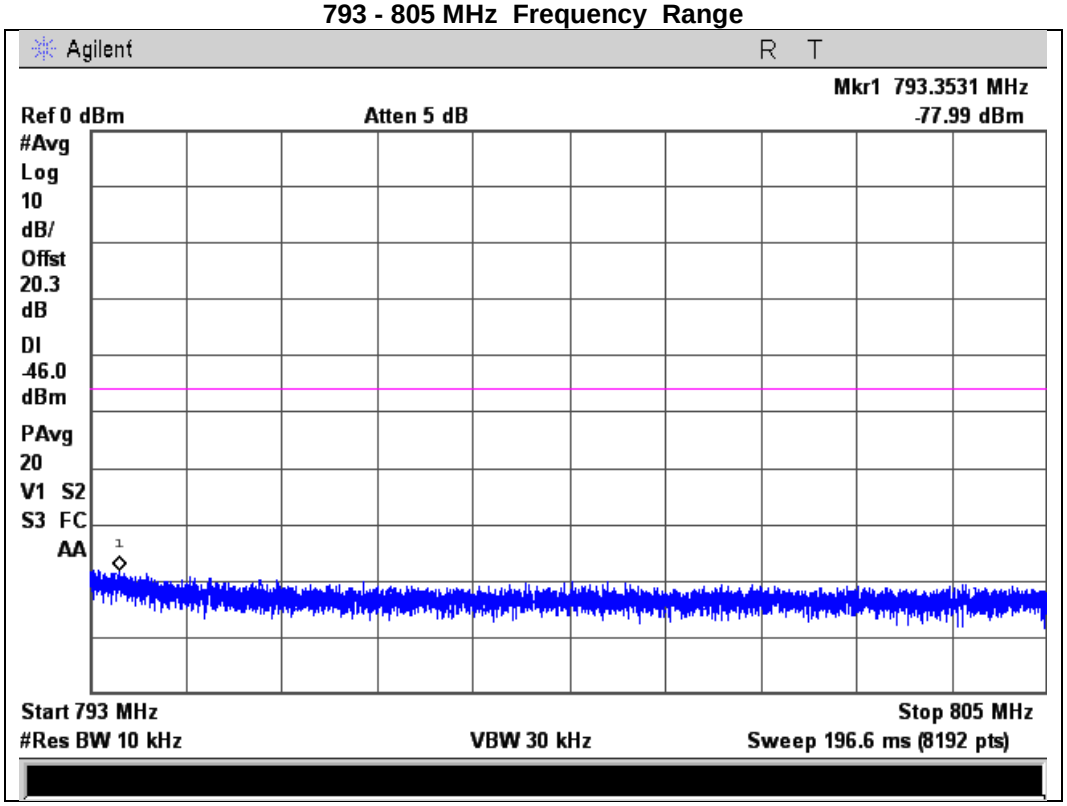


776 – 787 MHz Uplink Test Plots for the

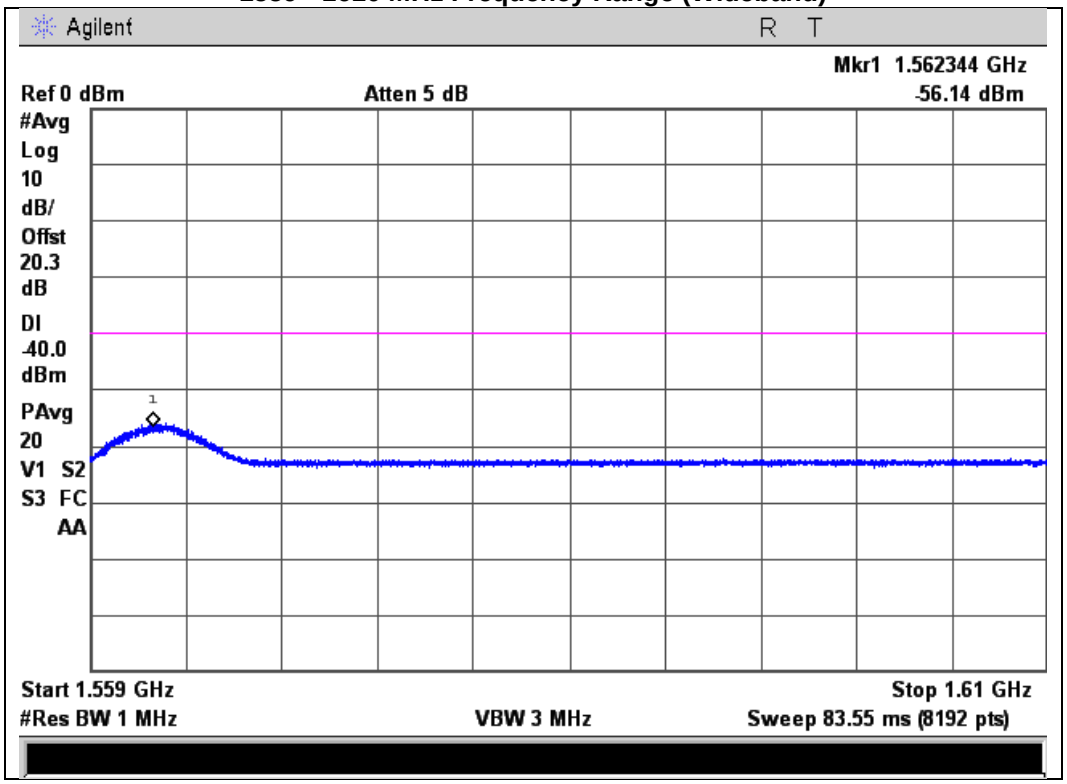
763 - 775 MHz Frequency Range



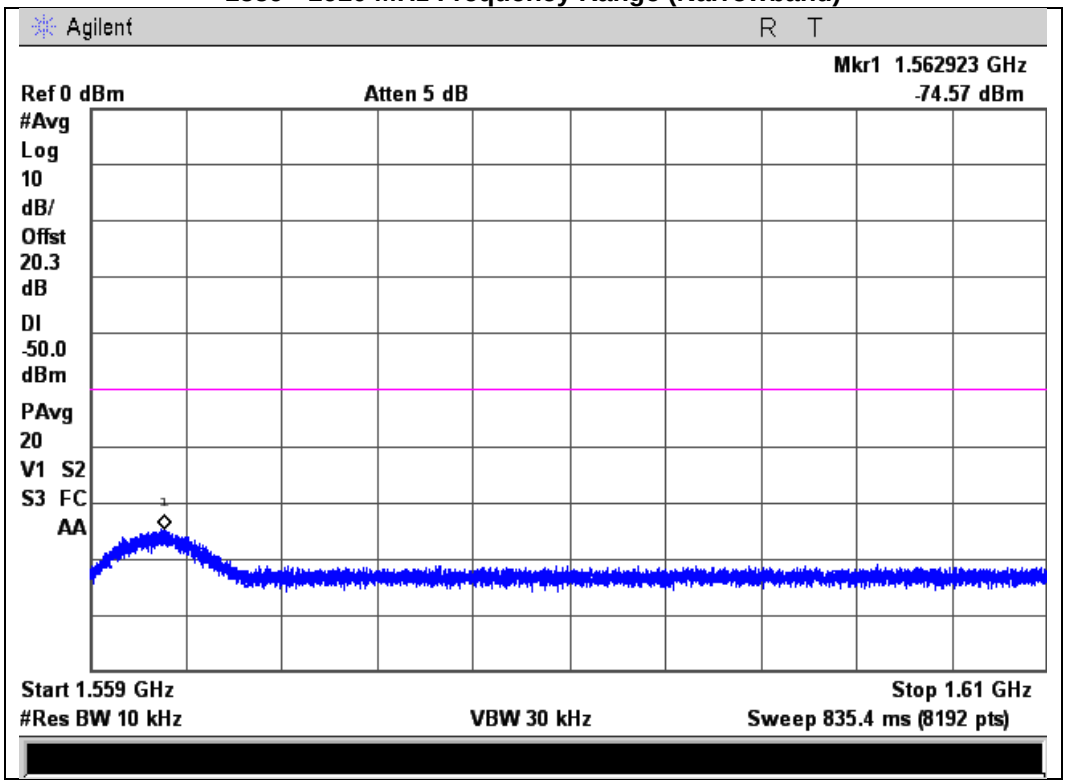
793 - 805 MHz Frequency Range



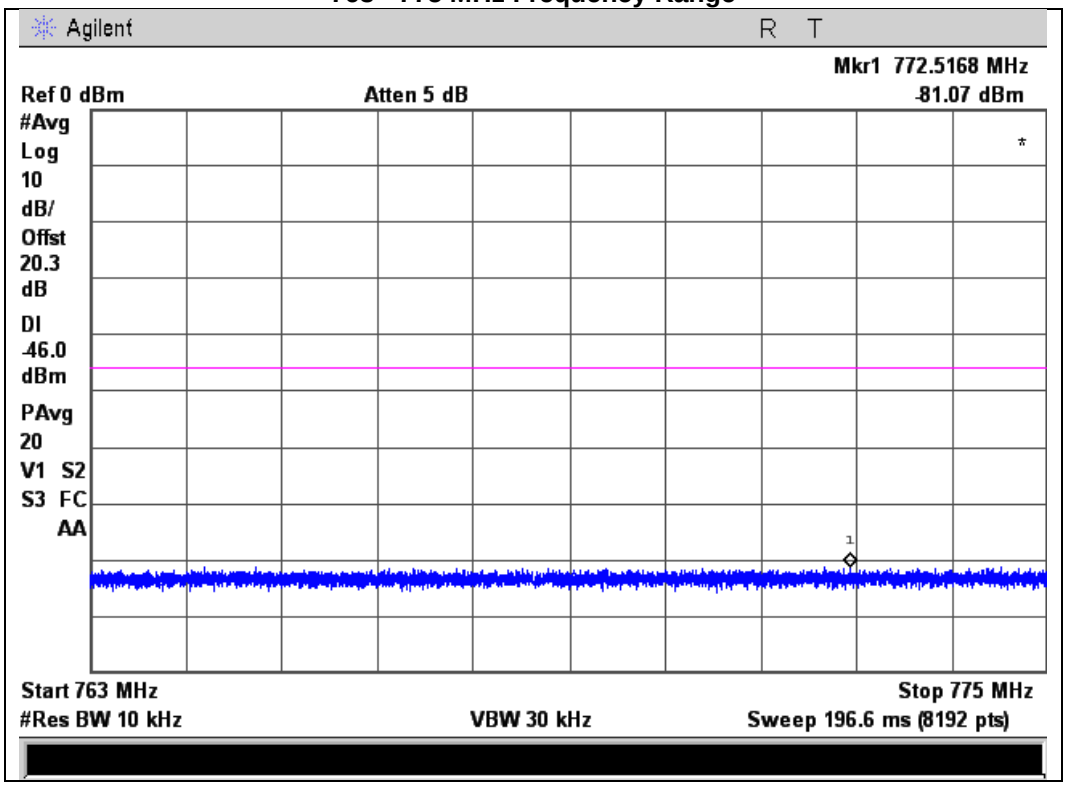
776 – 787 MHz Uplink Test Plots for the
1559 - 1610 MHz Frequency Range (Wideband)



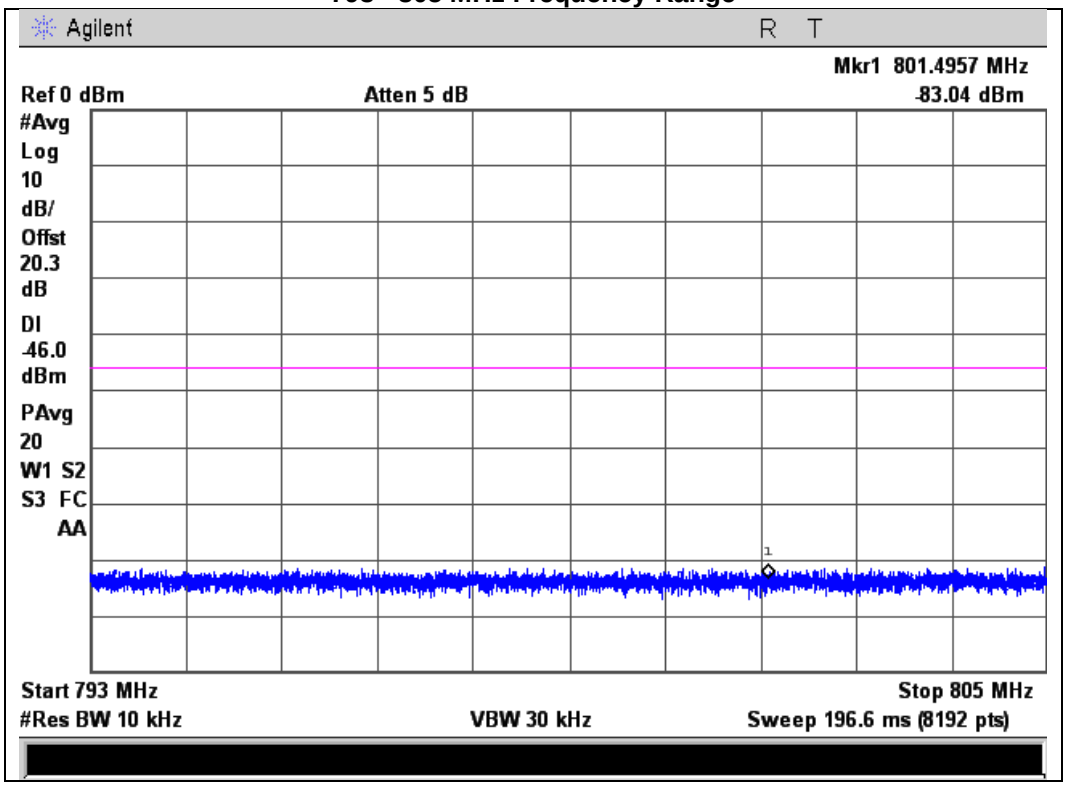
1559 - 1610 MHz Frequency Range (Narrowband)



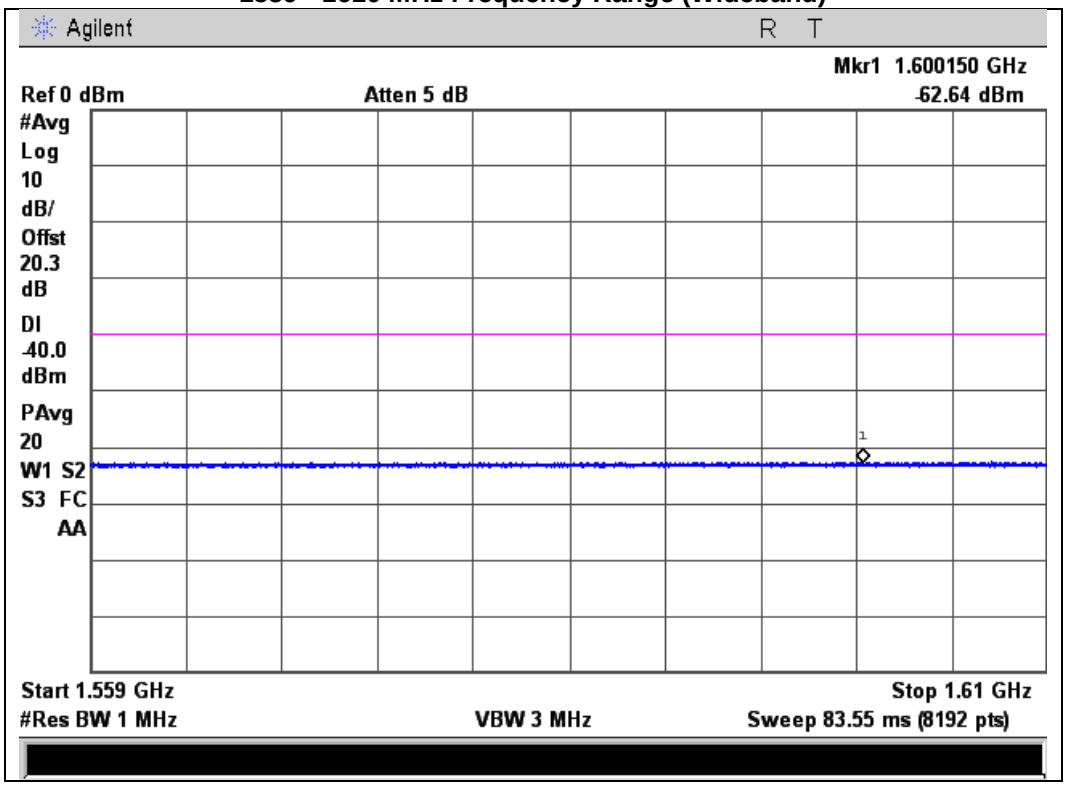
746 – 757 MHz Downlink Test Plots for the
763 - 775 MHz Frequency Range



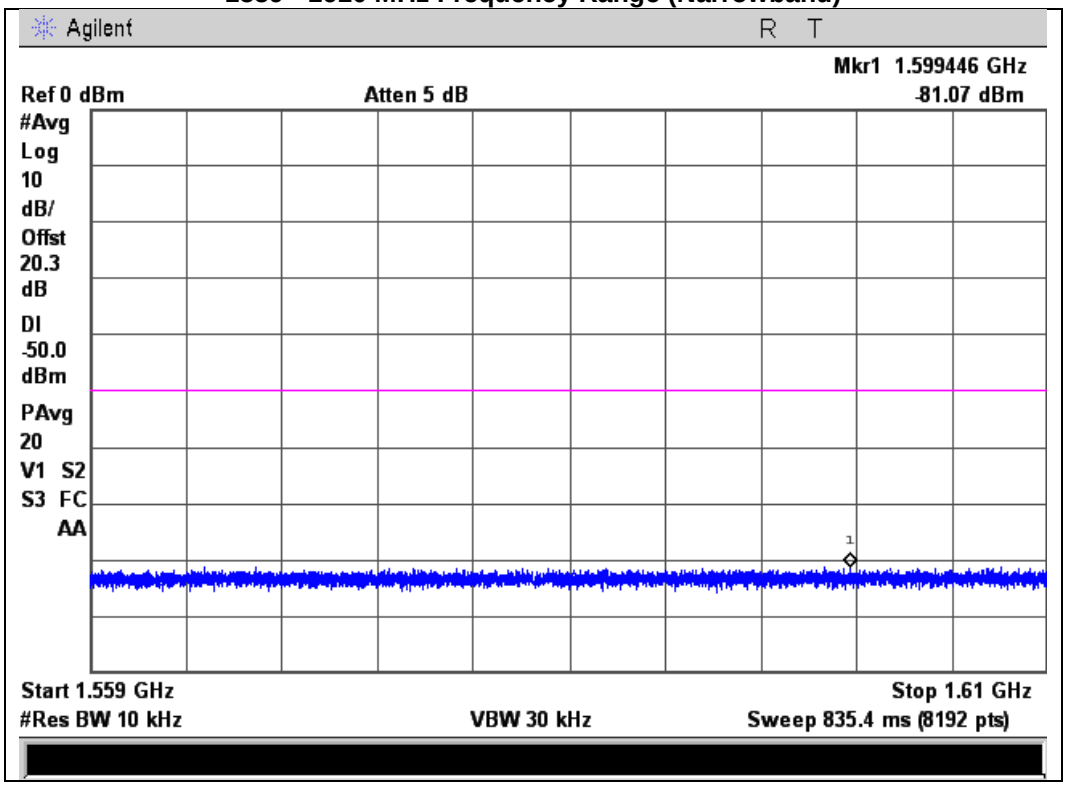
793 - 805 MHz Frequency Range



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	**Engineer:** Mike Graffeo
Test Equipment Utilized:	i00331, i00405, i00412	**Test Date**: 11/20/13

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. Tests are performed to measure the maximum uplink and downlink noise. The detailed procedures from KDB 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516c were followed.

Note – Downlink noise is calculated with the CF of the associated uplink band.

Noise Power limit =-59 dBm/MHz for Mobile devices

Test Setup

Maximum Noise Limit

Maximum Uplink Noise Limit Test Results

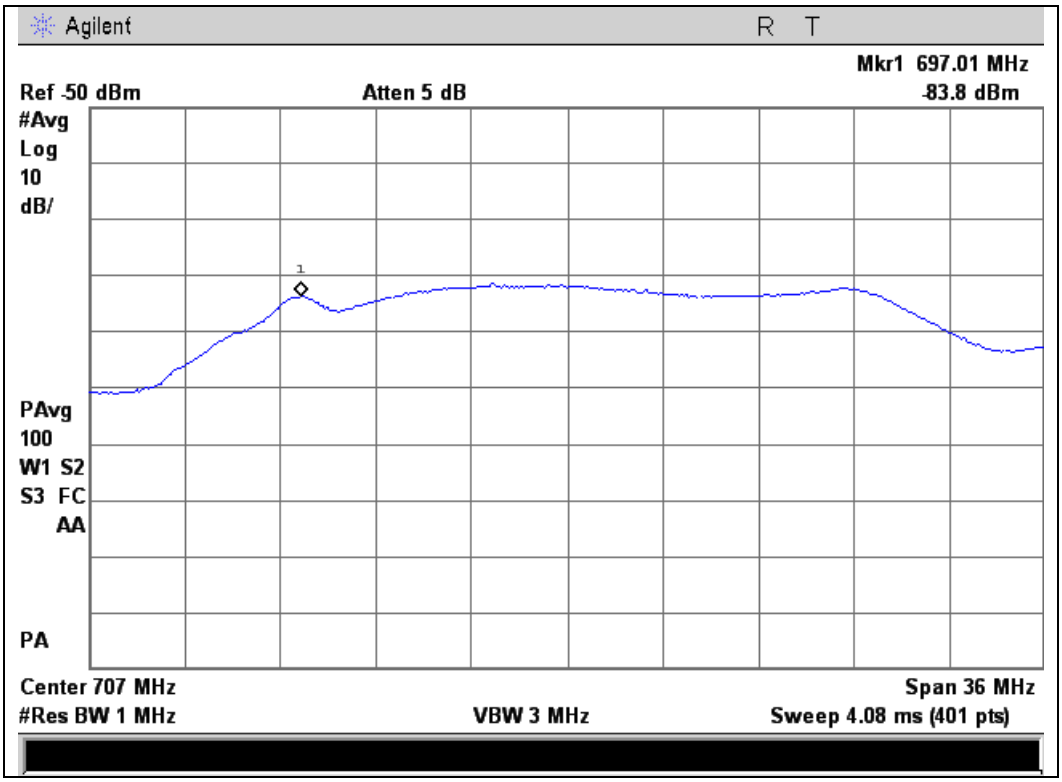
Frequency Band (MHz)	Measured Noise (dBm)	Limit (dBm)	Margin (dB)	Result
698 - 716	-83.80	-59.0	-24.8	Pass
776 - 787	-84.05	-59.0	-25.1	Pass
824 - 849	-81.22	-59.0	-22.2	Pass
1710 - 1755	-82.15	-59.0	-23.2	Pass
1850 - 1910	-83.89	-59.0	-24.9	Pass

Maximum Downlink Noise Limit Test Results

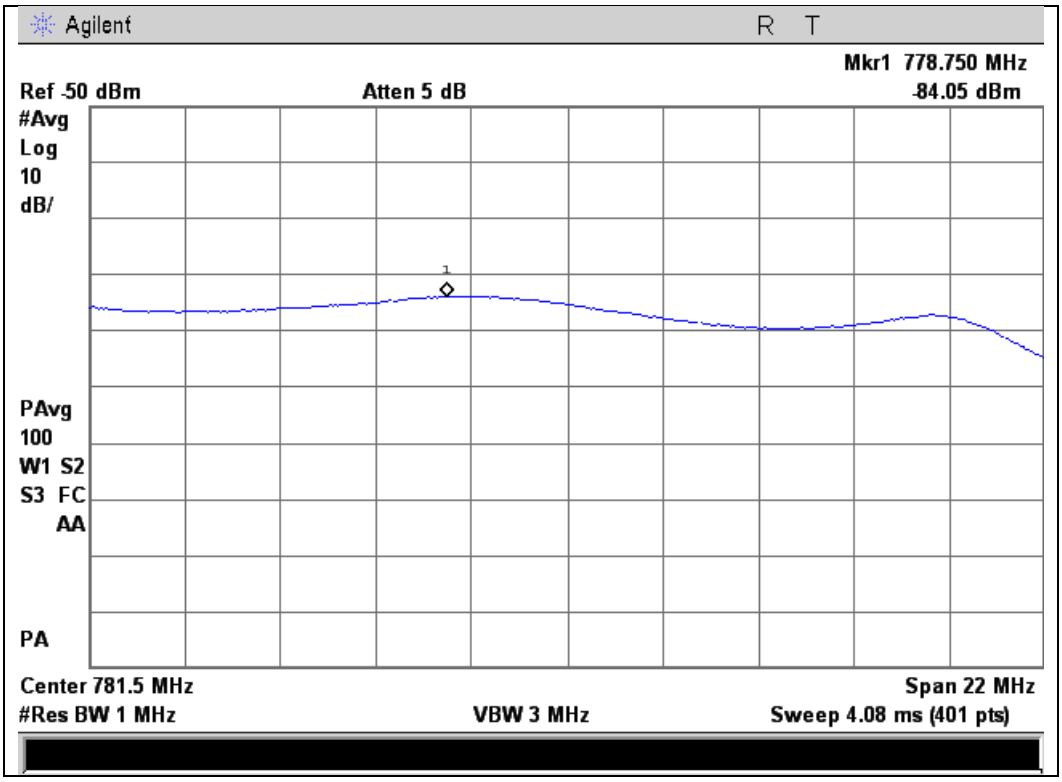
Frequency Band (MHz)	Measured Noise (dBm)	Limit (dBm)	Margin (dB)	Result
728 - 746	-86.45	-59.0	-27.5	Pass
746 - 757	-86.01	-59.0	-27.0	Pass
869 - 894	-86.32	-59.0	-27.3	Pass
1930 - 1990	-79.11	-59.0	-20.1	Pass
2110 - 2155	-84.09	-59.0	-25.1	Pass

Maximum Uplink Noise Test Plots

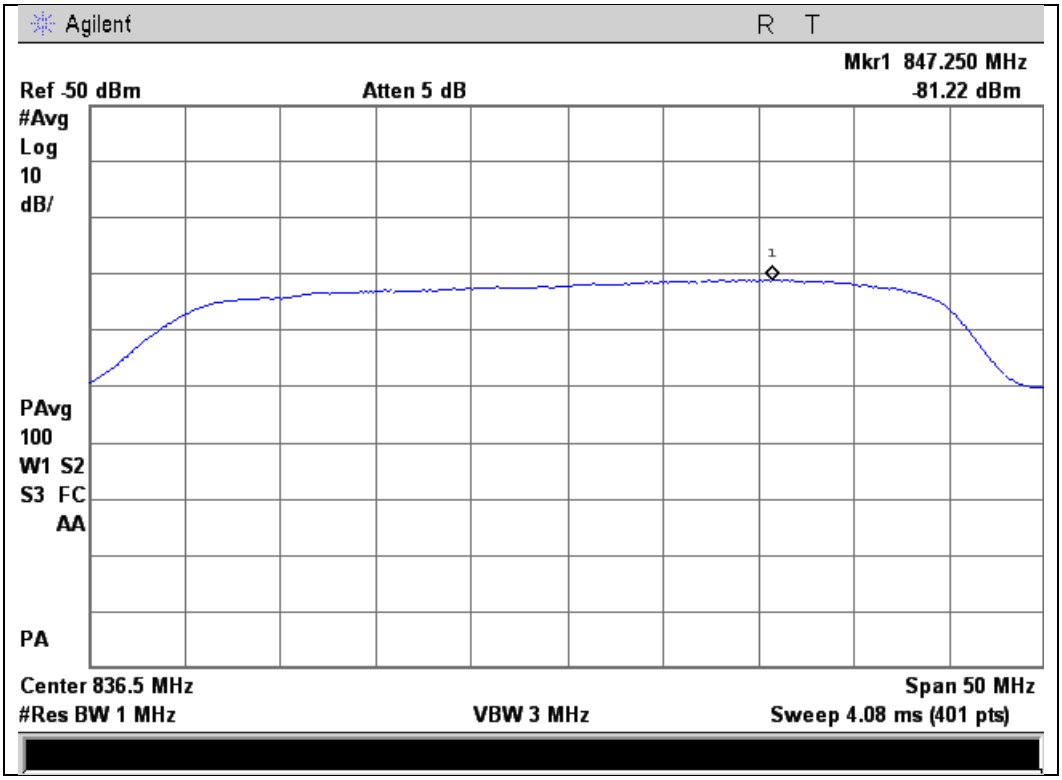
698 – 716 MHz Band



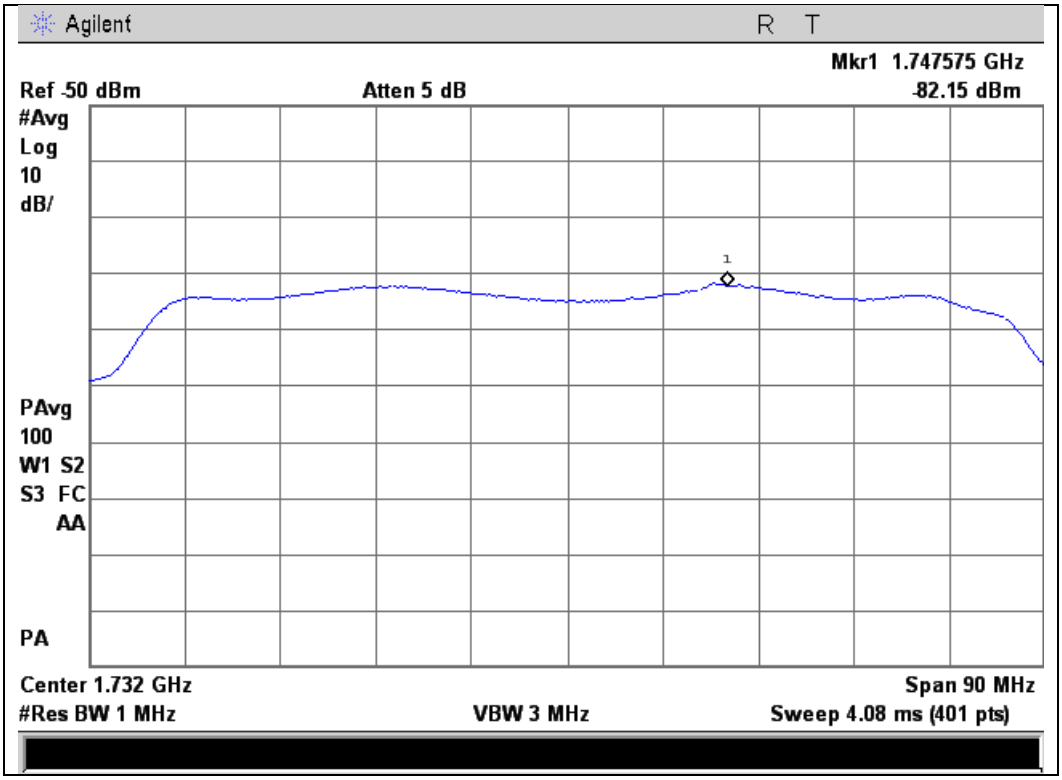
776 – 787 MHz Band



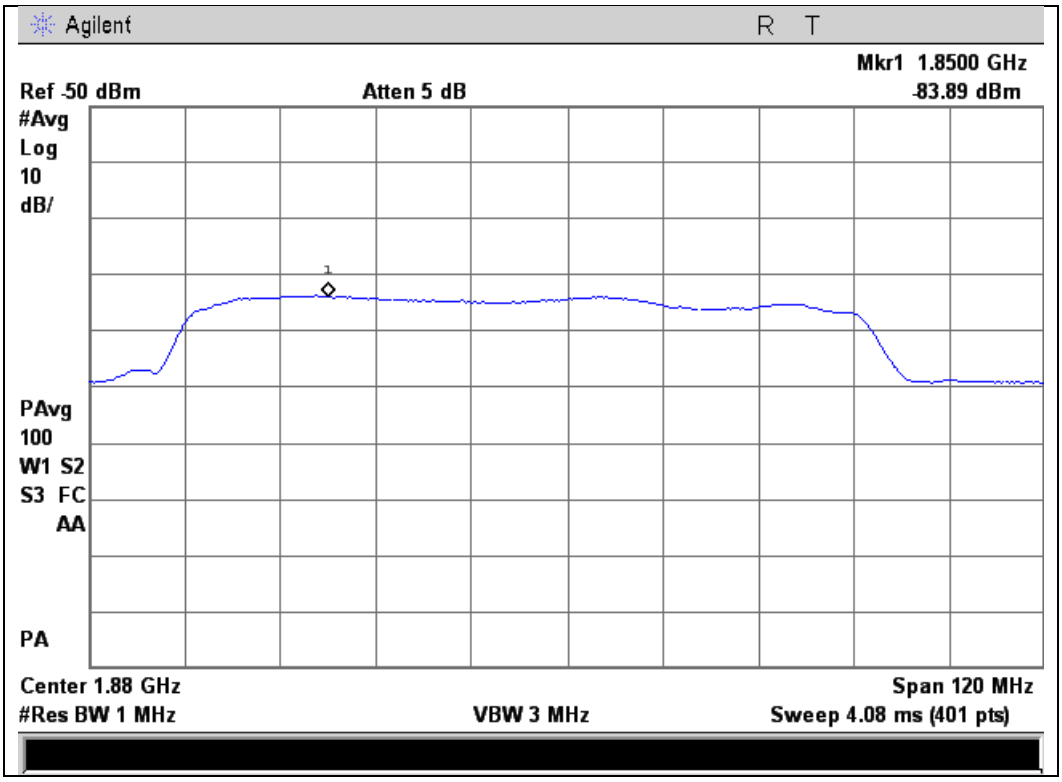
824 - 849 MHz Band



1710 - 1755 MHz Band

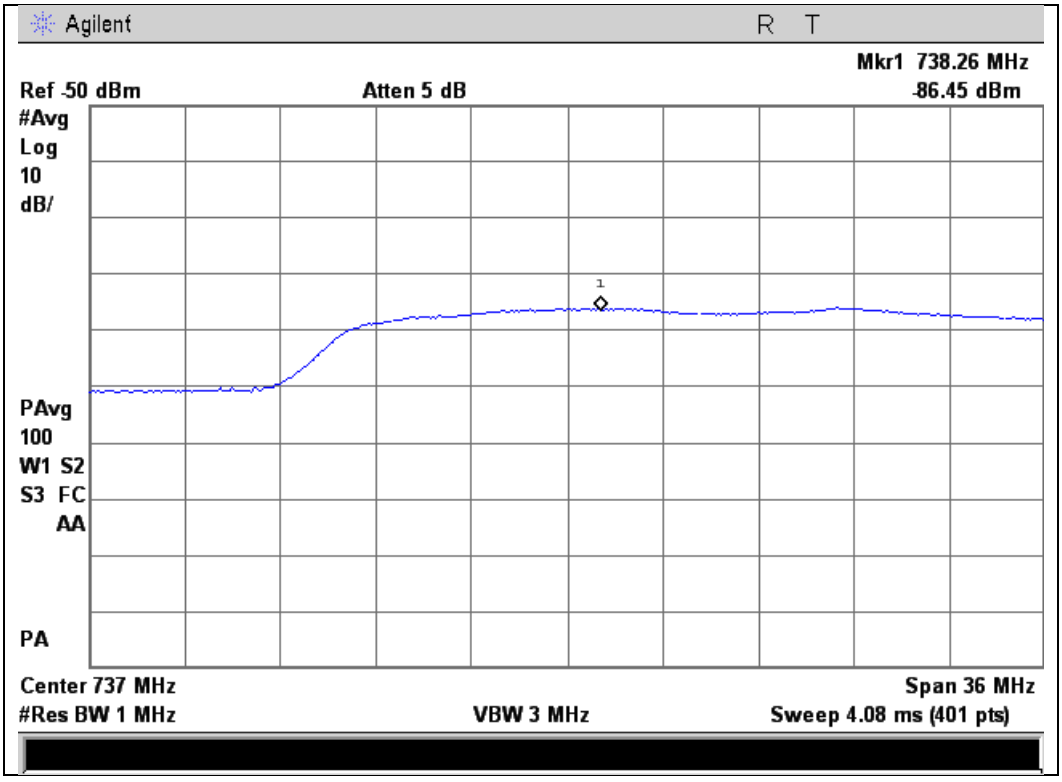


1850 - 1910 MHz Band

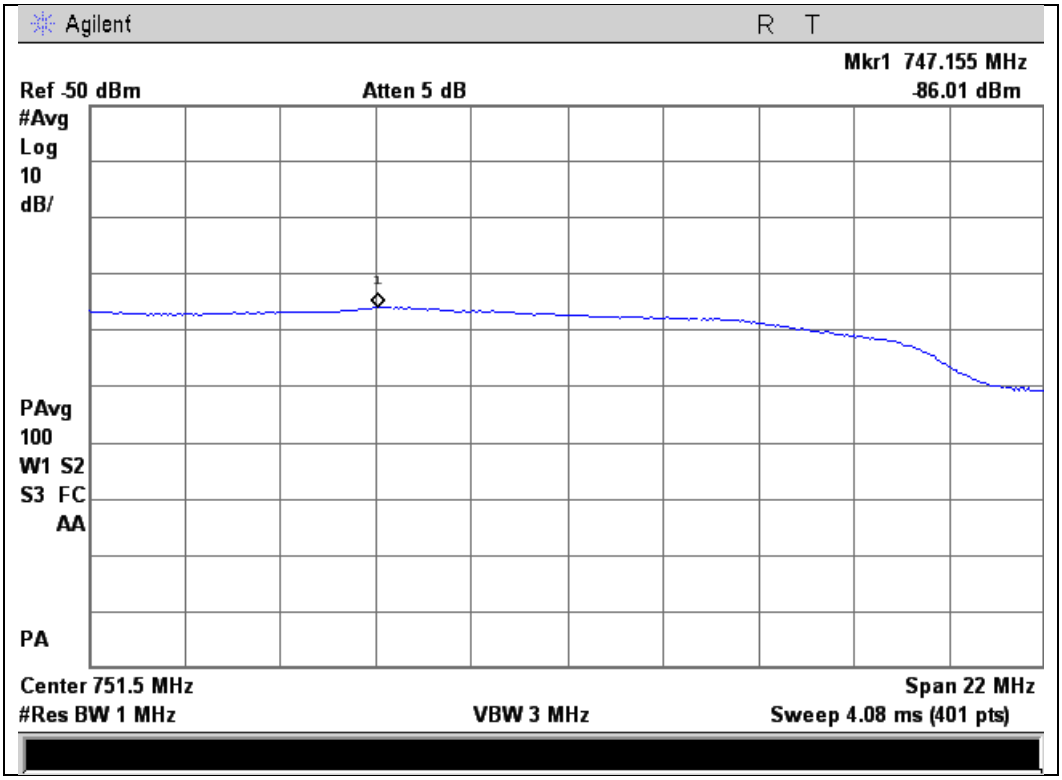


Maximum Downlink Noise Test Plots

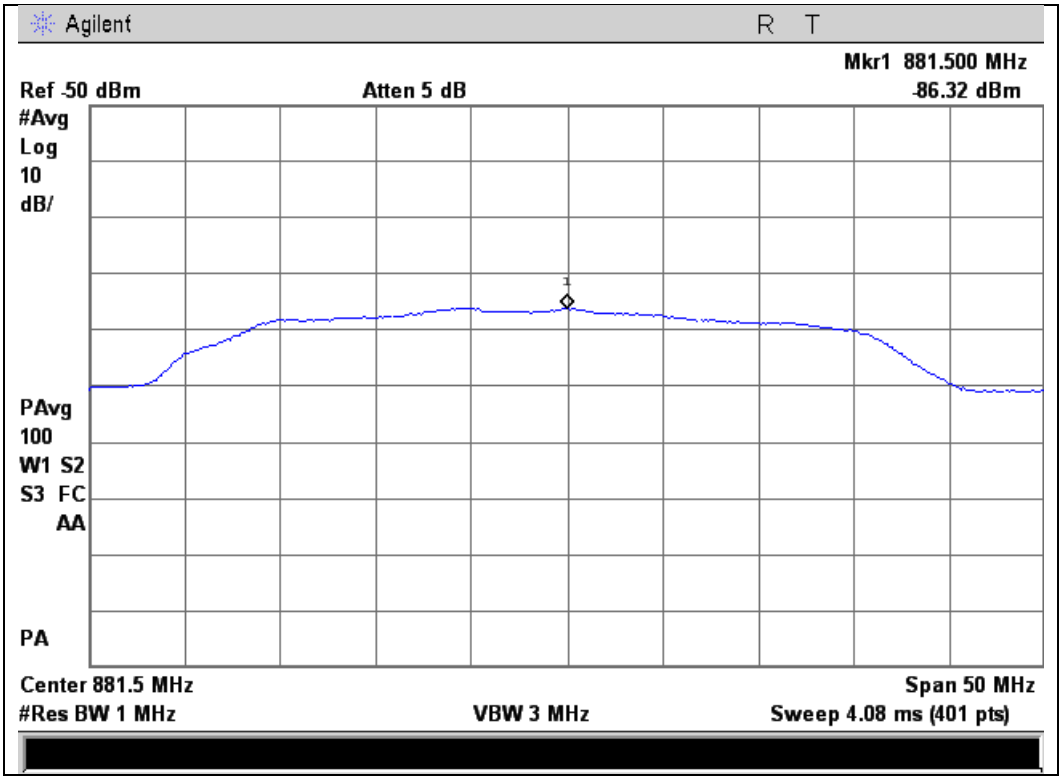
728 - 746 MHz Band



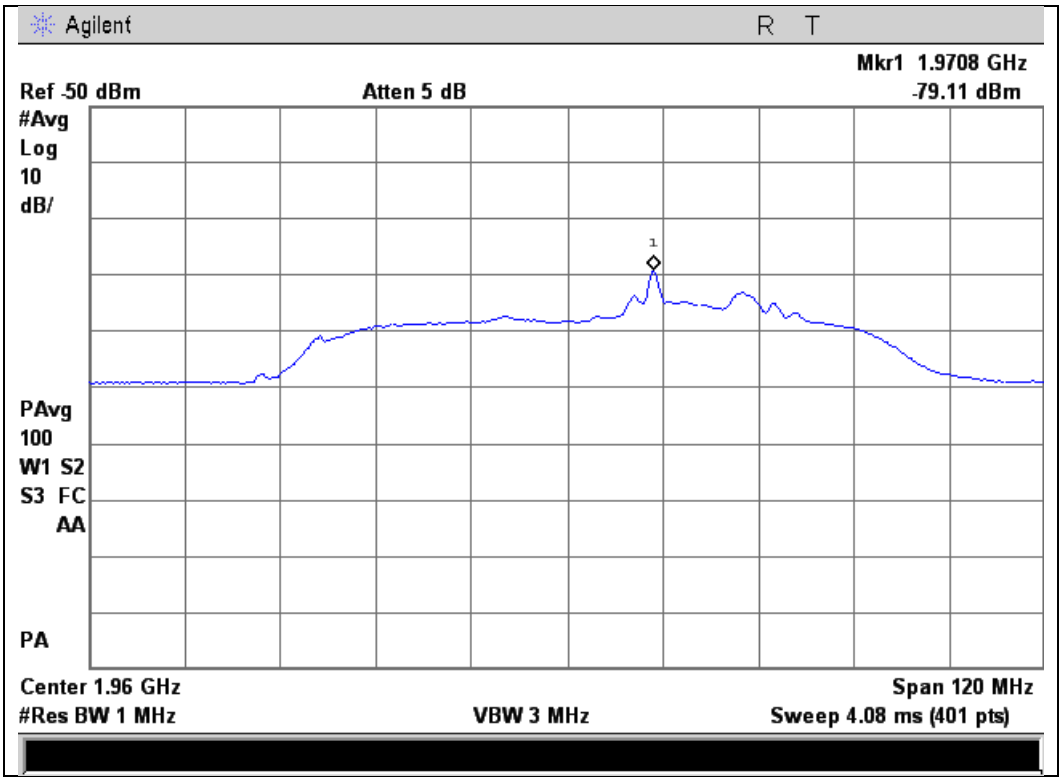
746 – 757 MHz Band



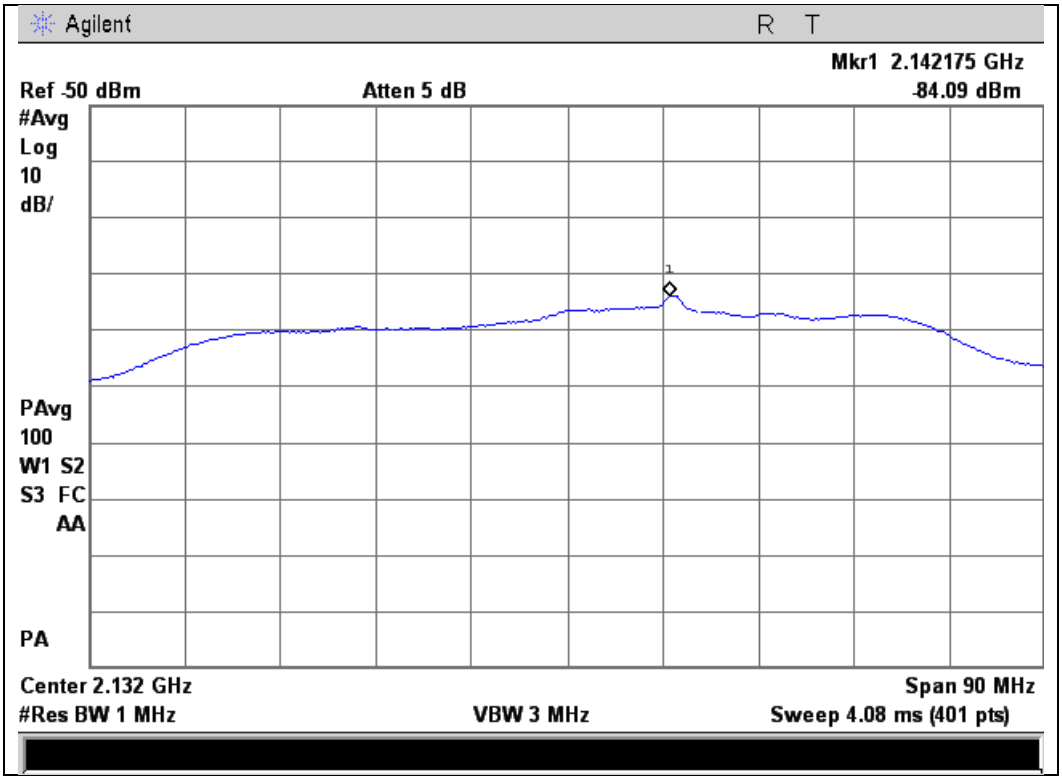
869 - 894 MHz Band



1930 – 1990 MHz Band



2110 - 2155 MHz Band



Variable Gain

Name of Test:	Variable Gain	**Engineer:**	Mike Graffeo
Test Equipment Utilized:	i00331, i00405, i00412	**Test Date:**	11/20/13

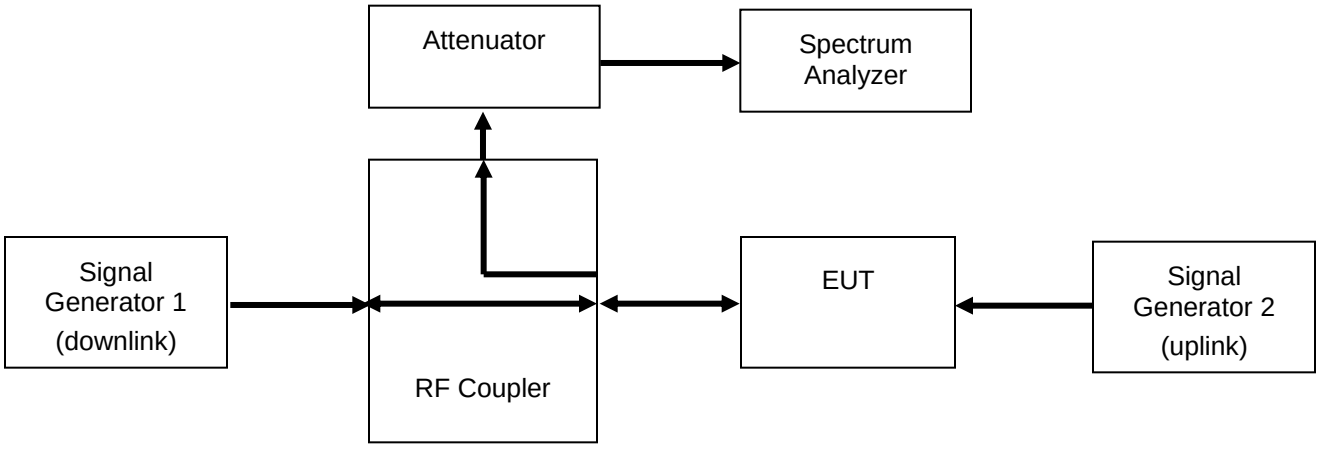
Test Procedure

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 within 1second.

Test Setup



Uplink Test Results

698 – 716 MHz

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-42.0	18.0	1.8	7.3	5.5	-12.5
-35.0	11.0	1.8	0.5	-1.3	-12.3
-43.0	19.0	1.8	10.2	8.4	-10.6
-33.0	9.0	1.8	0.5	-1.3	-10.3
-45.0	21.0	1.8	12.6	10.8	-10.2
-44.0	20.0	1.8	12.3	10.5	-9.5

776 – 787 MHz

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-33.0	9.0	3.4	-2.5	-5.9	-14.9
-32.0	8.0	3.4	-2.5	-5.9	-13.9
-46.0	22.0	3.4	12.2	8.8	-13.2
-45.0	21.0	3.4	11.3	7.9	-13.1
-44.0	20.0	3.4	10.8	7.4	-12.6
-43.0	19.0	3.4	9.9	6.5	-12.5

824 - 849 MHz

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-38.0	14.0	5.8	10.6	4.8	-9.2
-39.0	15.0	5.8	12.9	7.1	-7.9
-40.0	16.0	5.8	15.5	9.7	-6.3
-43.0	19.0	5.8	18.5	12.7	-6.3
-41.0	17.0	5.8	16.6	10.8	-6.2
-42.0	18.0	5.8	17.8	12.0	-6.0

1710 - 1755 MHz

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-42.0	18.0	2.9	8.6	5.7	-12.3
-44.0	20.0	2.9	11.2	8.3	-11.7
-43.0	19.0	2.9	10.5	7.6	-11.4
-46.0	22.0	2.9	13.9	11.0	-11.0
-47.0	23.0	2.9	15.0	12.1	-10.9
-45.0	21.0	2.9	13.5	10.6	-10.4

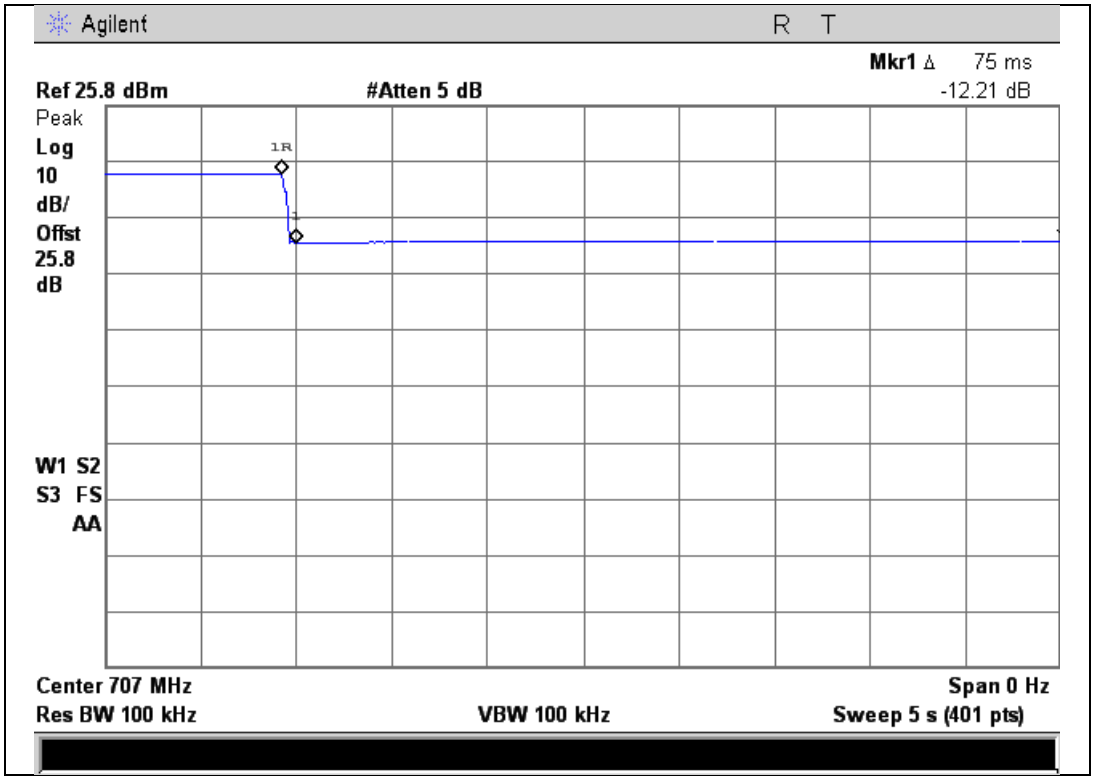
1850 - 1910 MHz

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) (dBm)	Gain (dB)	Margin (dB)
-42.0	18.0	4.4	13.3	8.9	-9.1
-47.0	23.0	4.4	18.7	14.3	-8.7
-44.0	20.0	4.4	15.7	11.3	-8.7
-43.0	19.0	4.4	15.5	11.1	-7.9
-46.0	22.0	4.4	18.5	14.1	-7.9
-45.0	21.0	4.4	17.6	13.2	-7.8

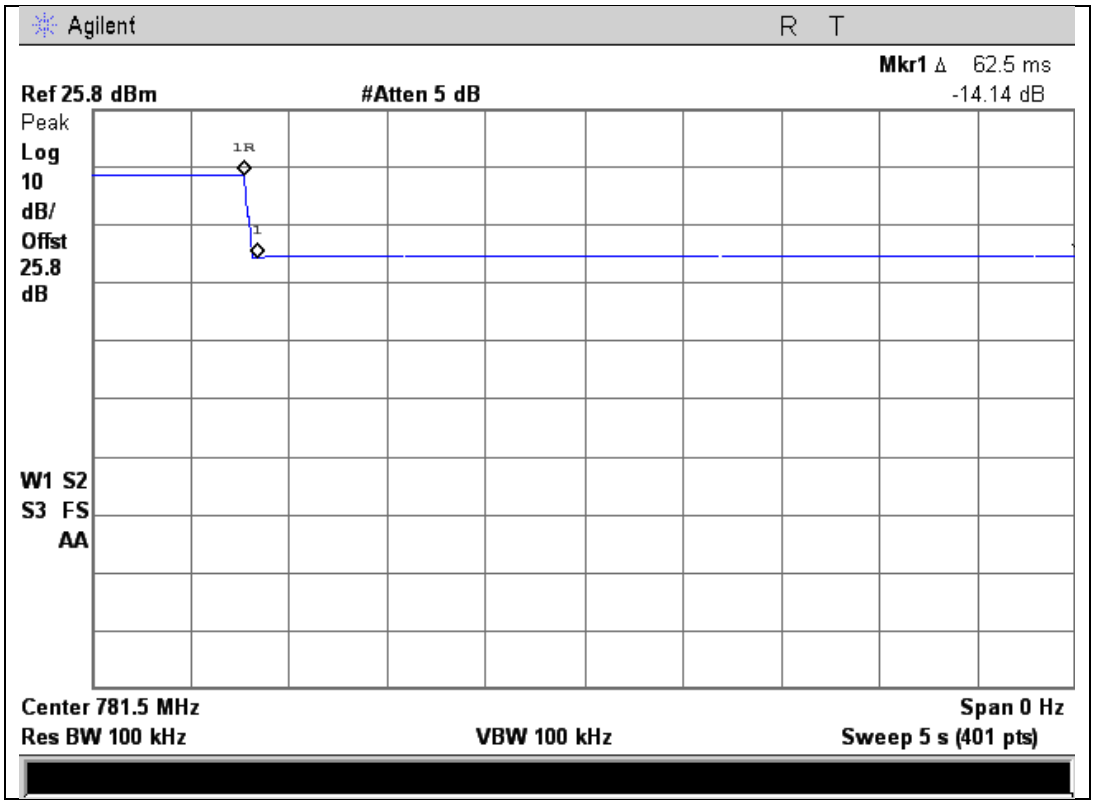
Variable Uplink Gain Timing Test Results

Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Result
698 - 716	0.075	1.0	Pass
776 - 787	0.063	1.0	Pass
824 - 849	0.800	1.0	Pass
1710 - 1755	0.926	1.0	Pass
1850 - 1910	0.613	1.0	Pass

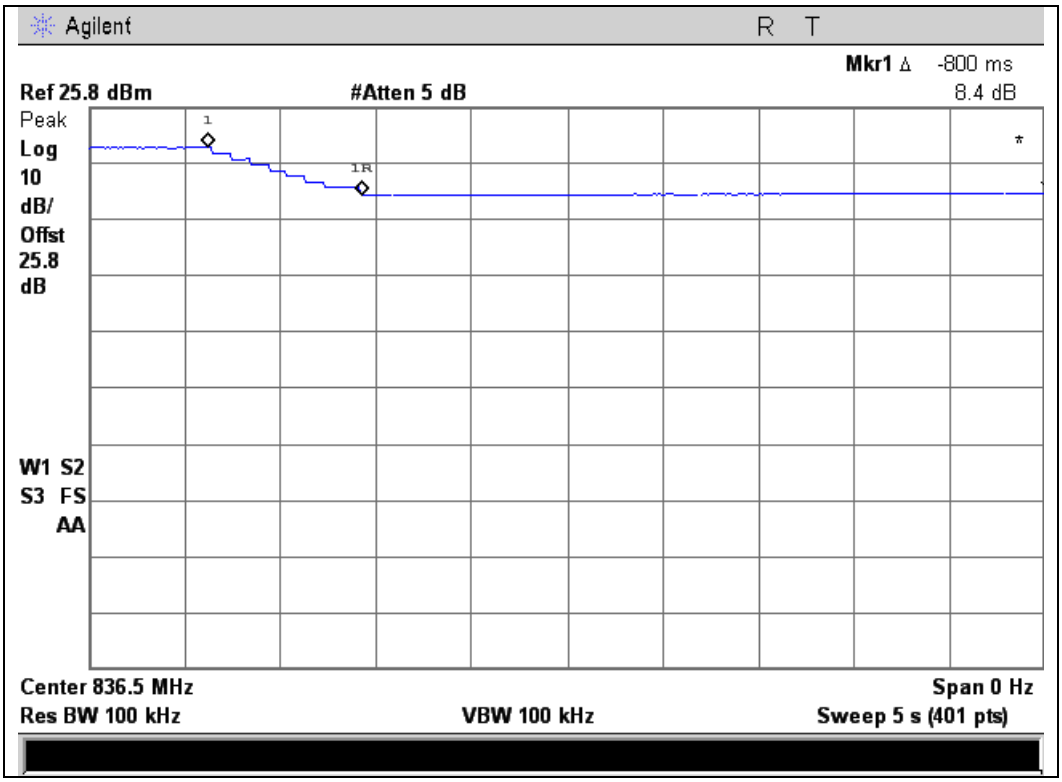
Variable Uplink Gain Timing
698 – 716 MHz Band



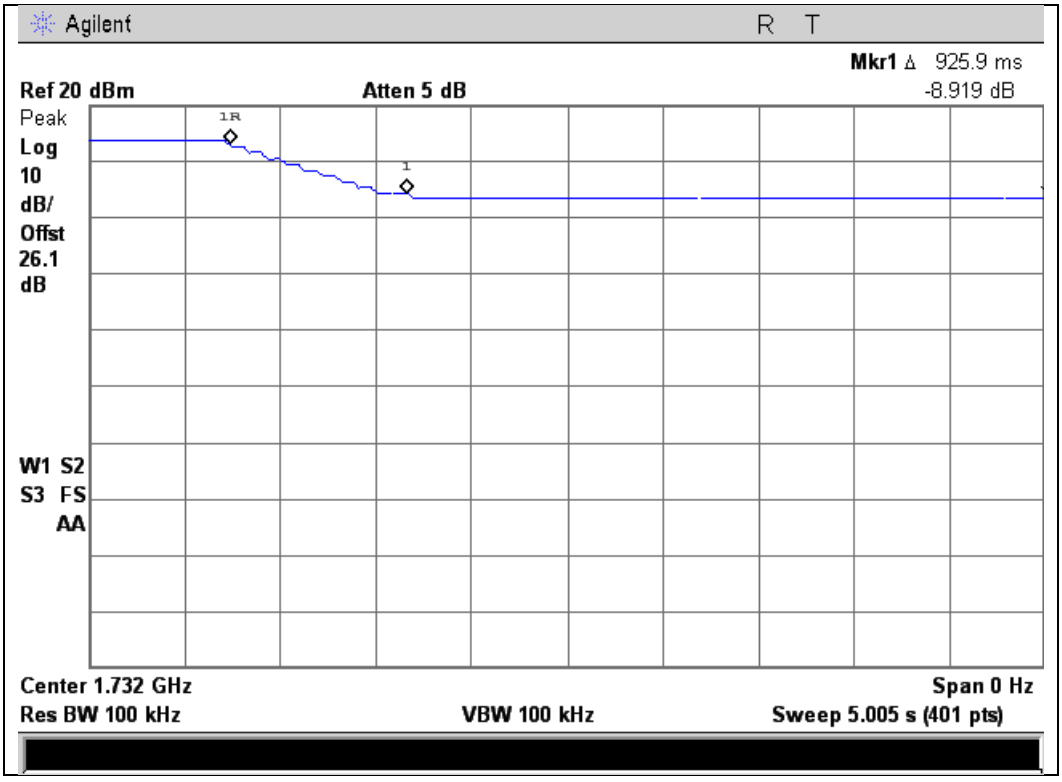
776 – 787 MHz Band



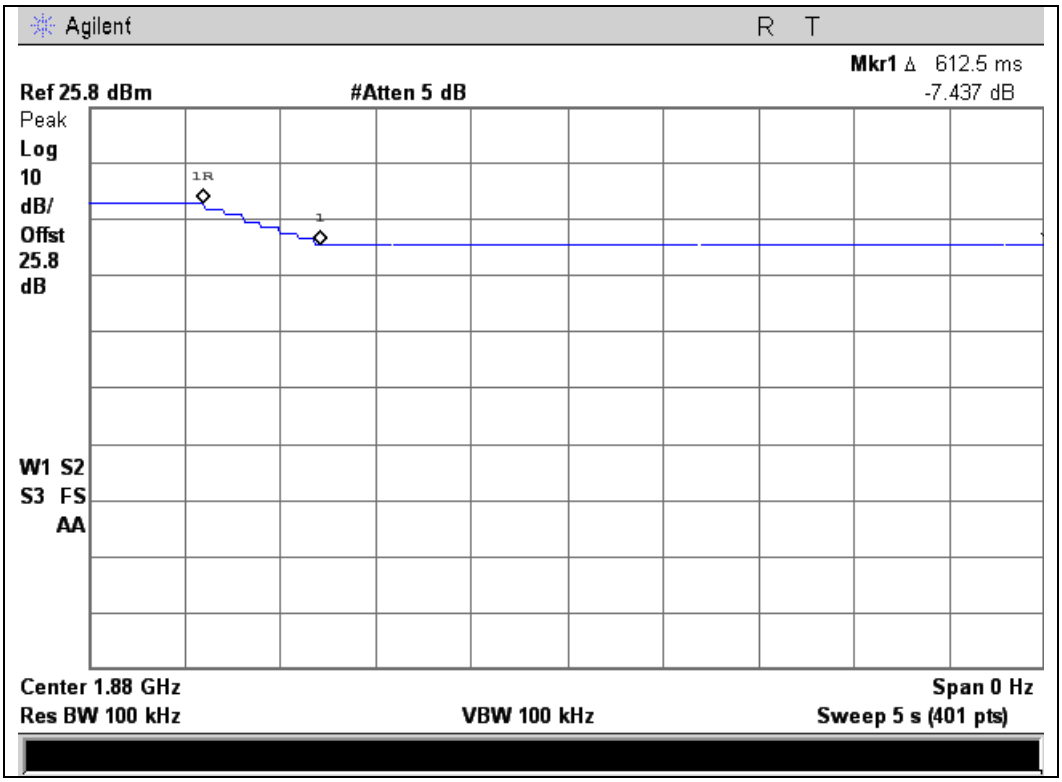
824 - 849 MHz Band



1710-1755 MHz Band



1850-1910 MHz Band



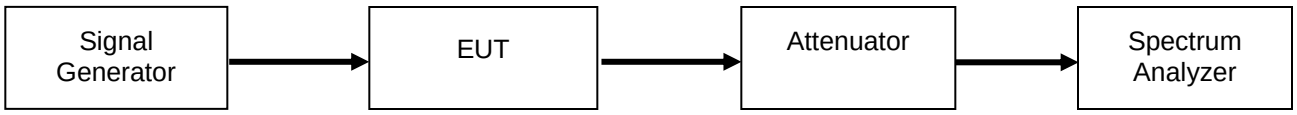
Occupied Bandwidth

Name of Test:	Occupied Bandwidth	**Engineer:** Mike Graffeo
Test Equipment Utilized:	i00331 and i00405	**Test Date:** 11/19/13

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 of the EUT operational uplink and downlink bands 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.

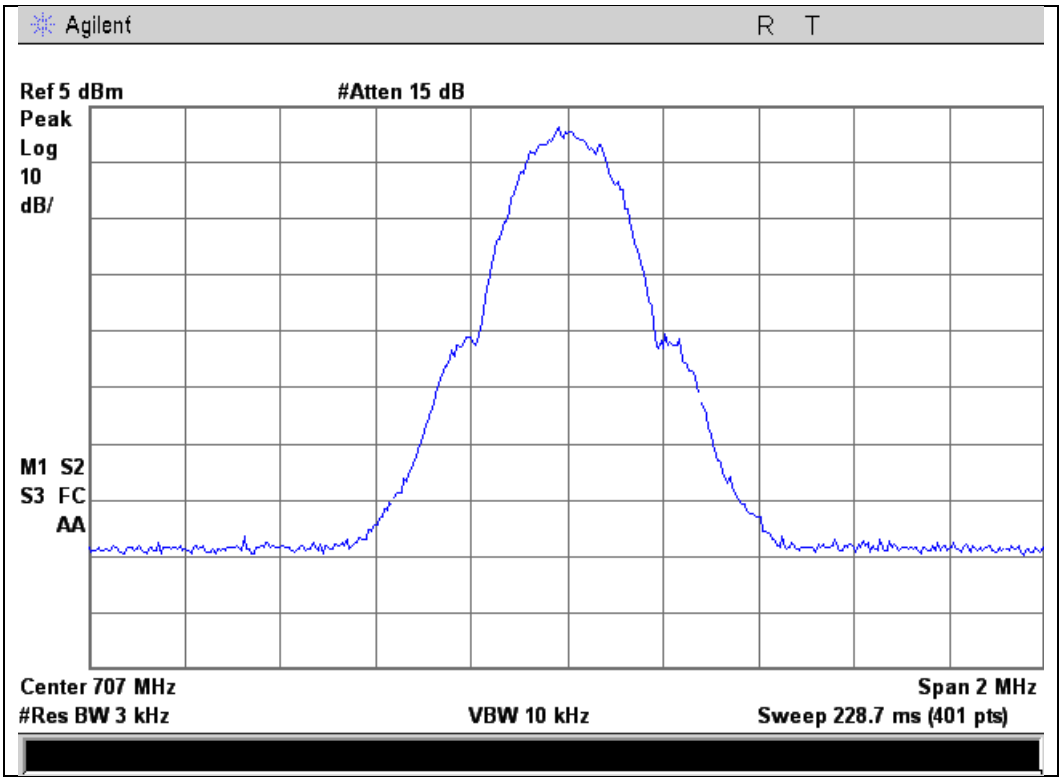
Test Setup



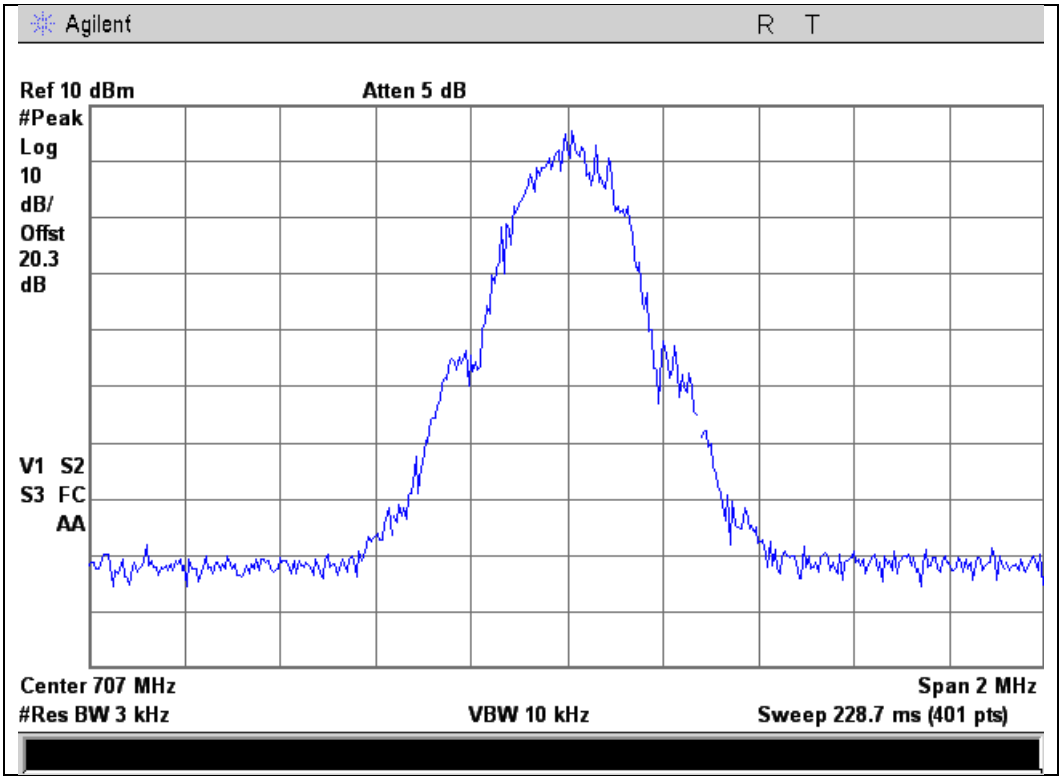
GSM Uplink Test Plots

698 – 716 MHz Band

Input

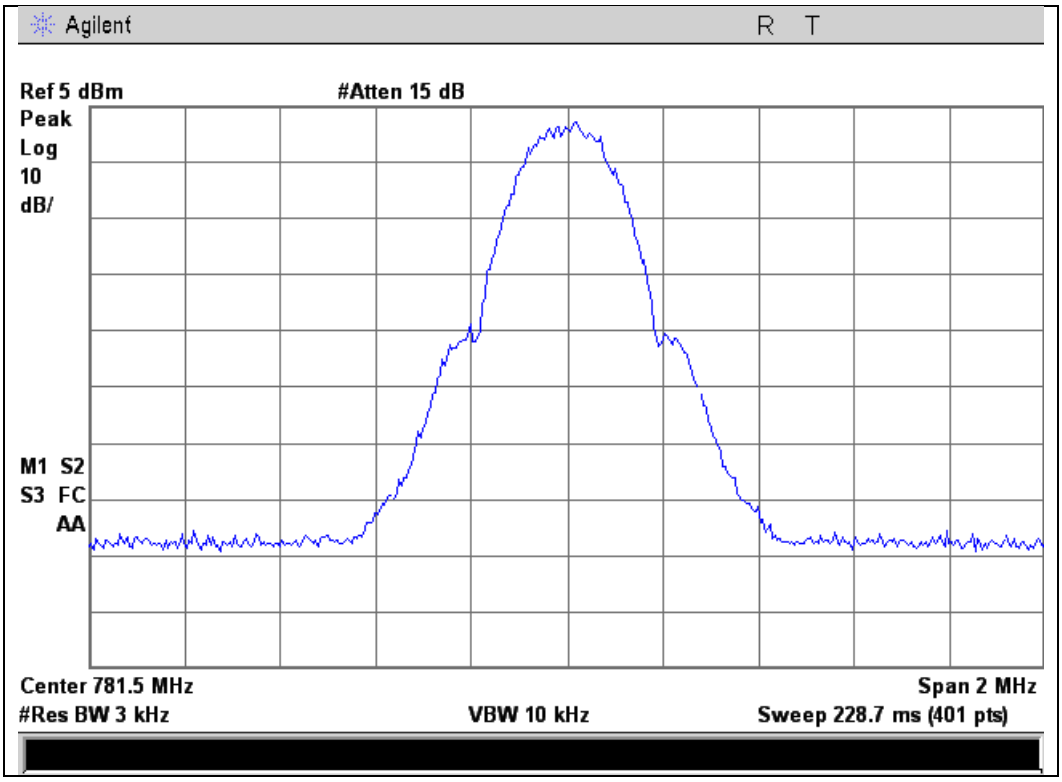


Output

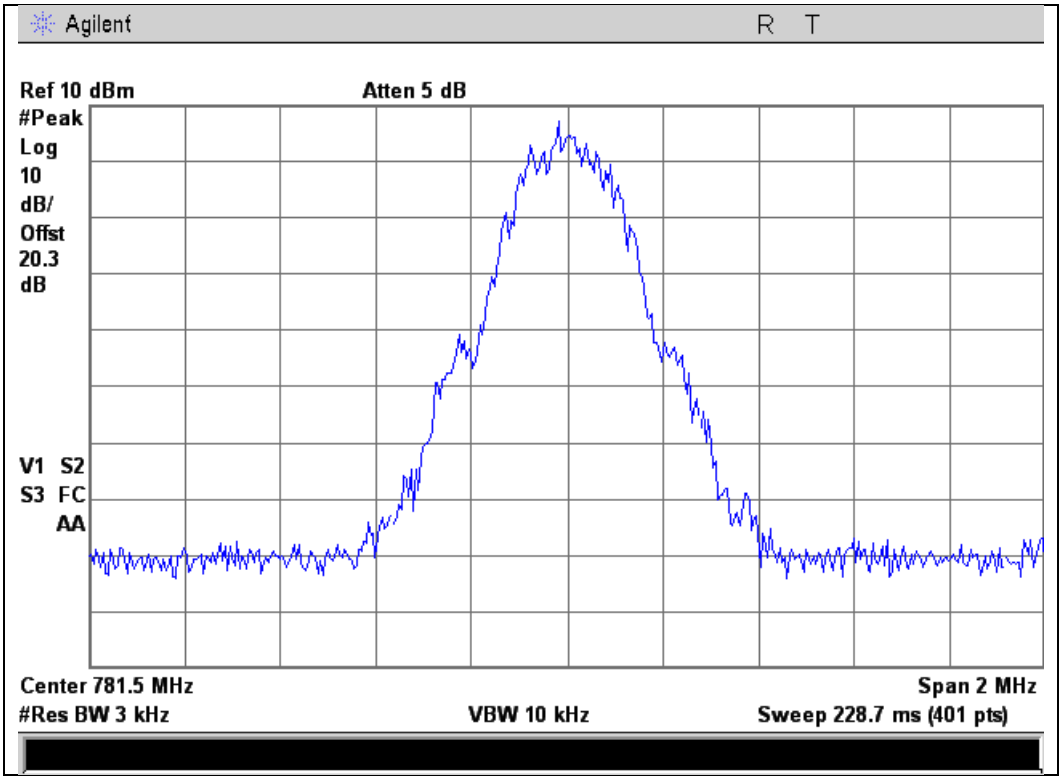


776 – 787 MHz Band

Input

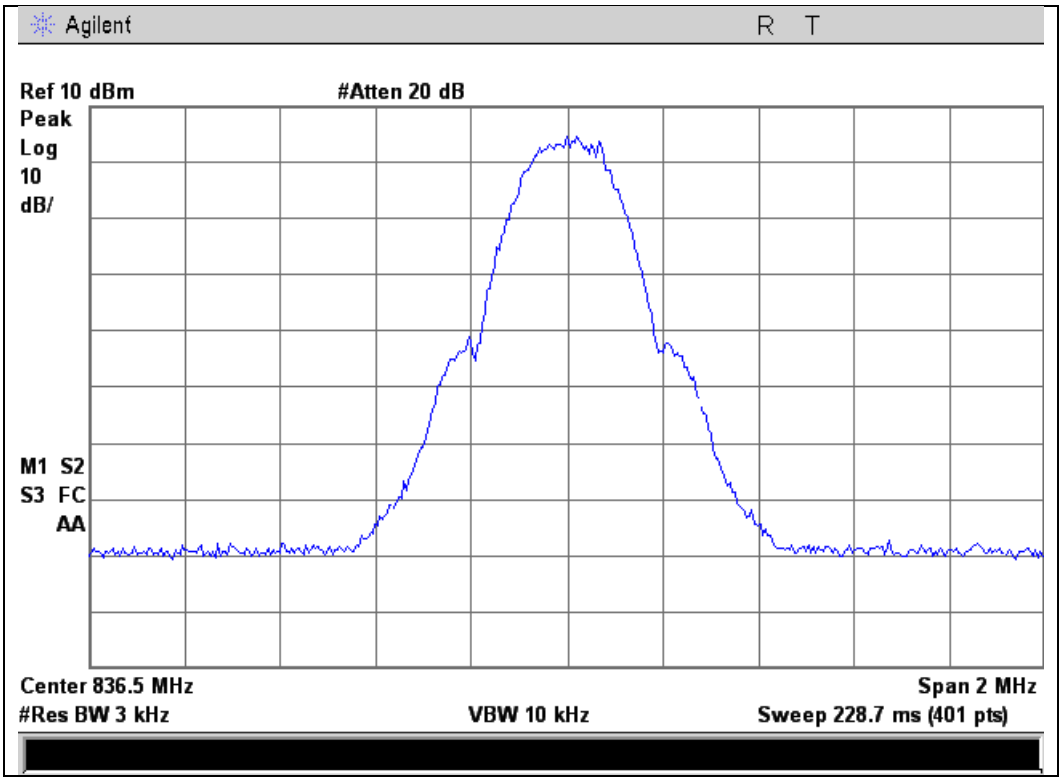


Output

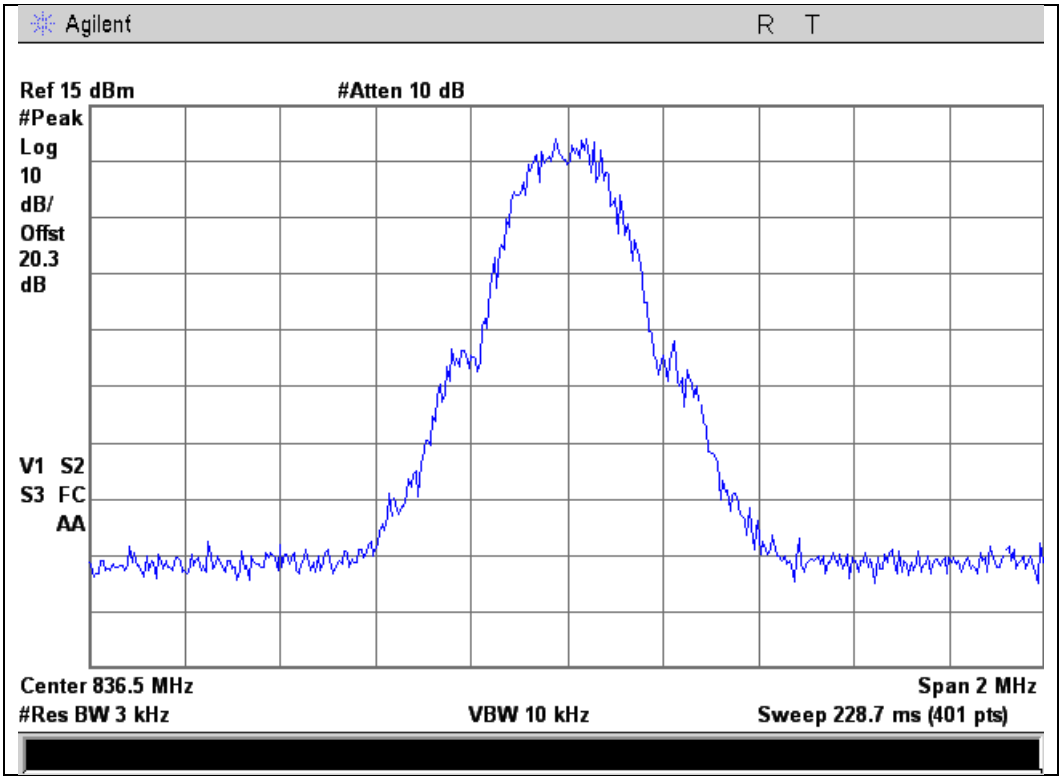


824 - 849 MHz Band

Input

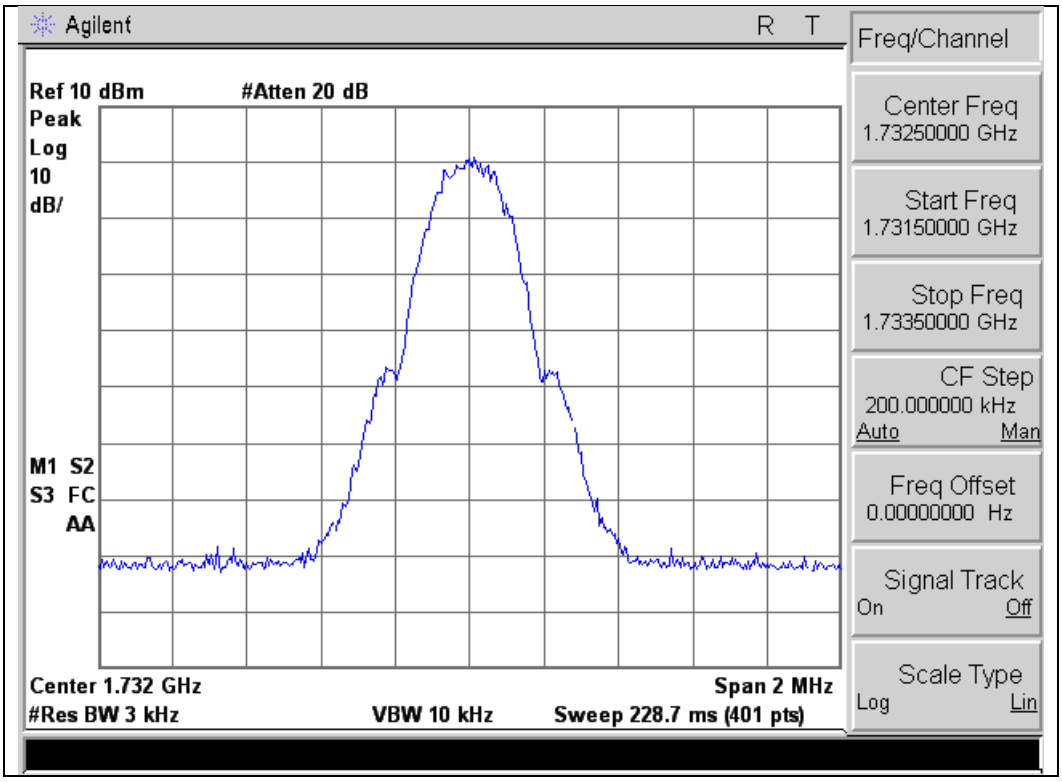


Output

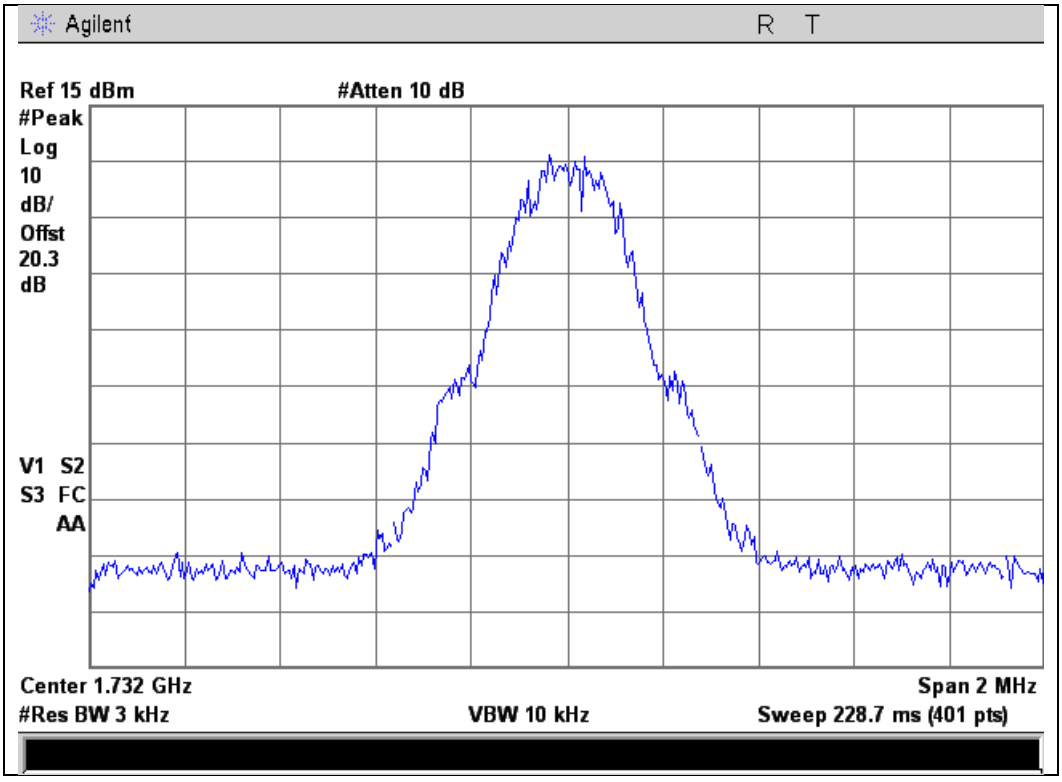


1710 - 1755 MHz Band

Input

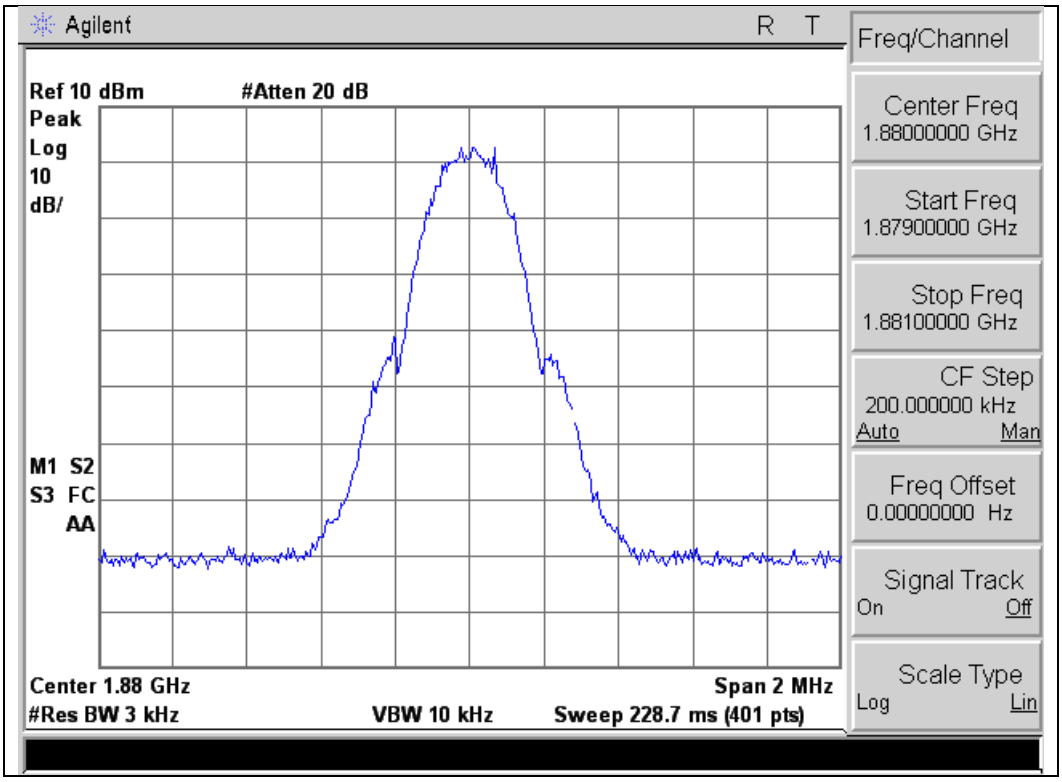


Output

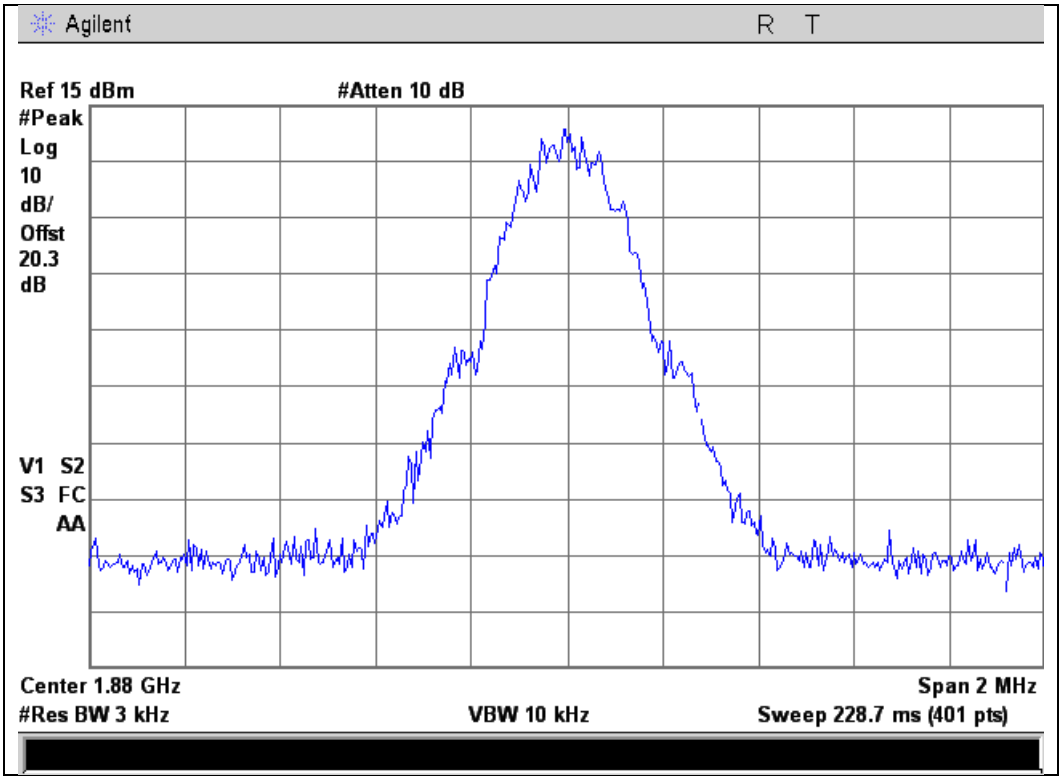


1850 - 1910 MHz Band

Input



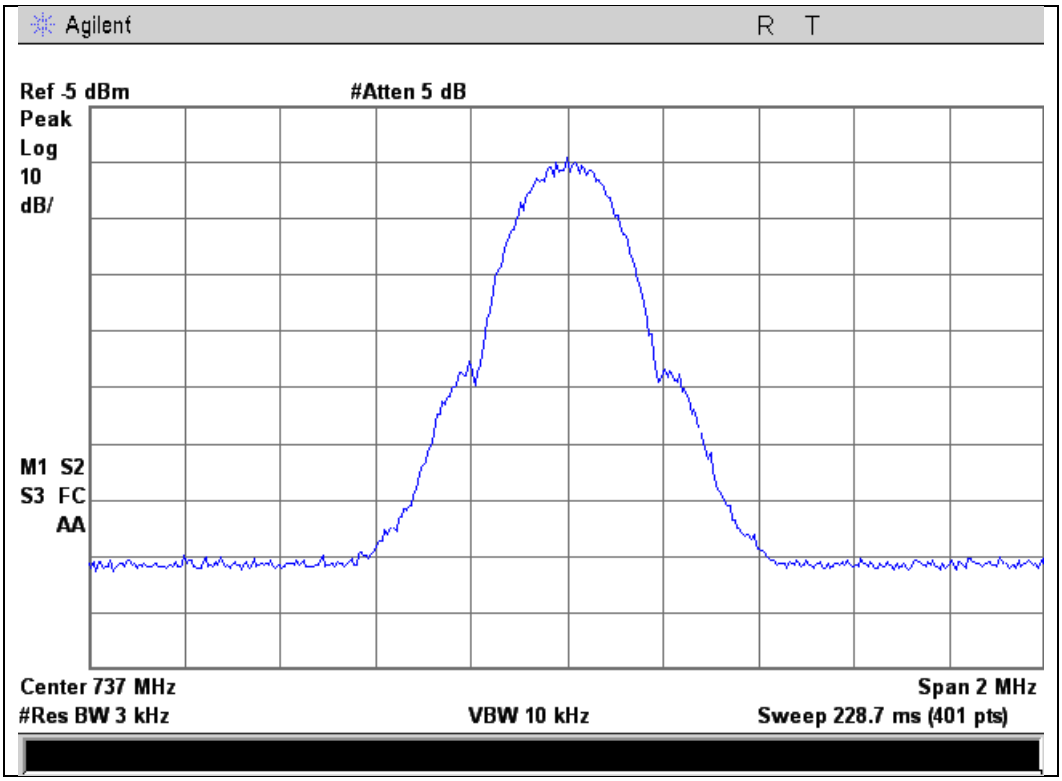
Output



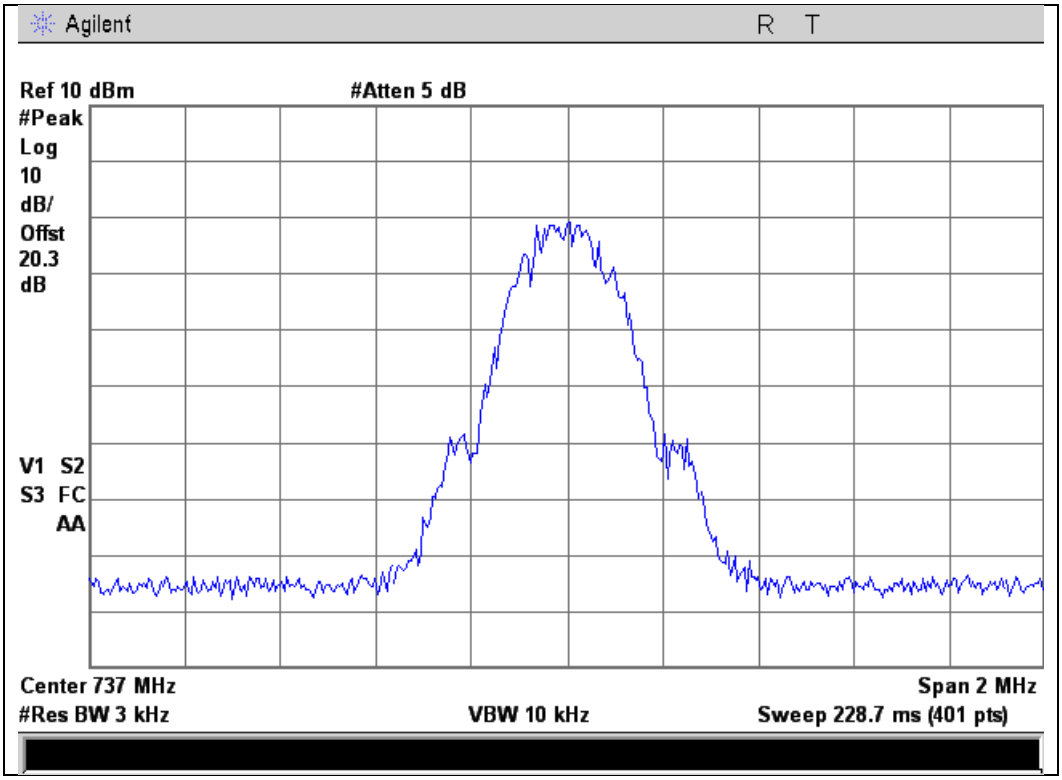
GSM Downlink Test Plots

728 - 746 MHz Band

Input

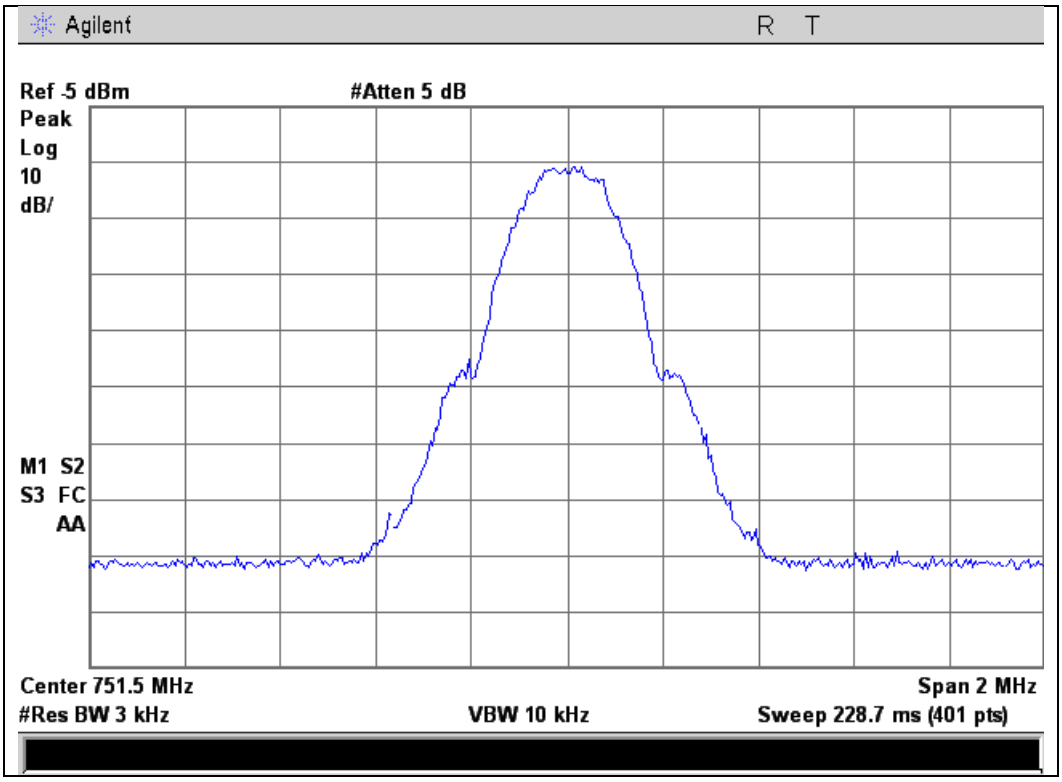


Output

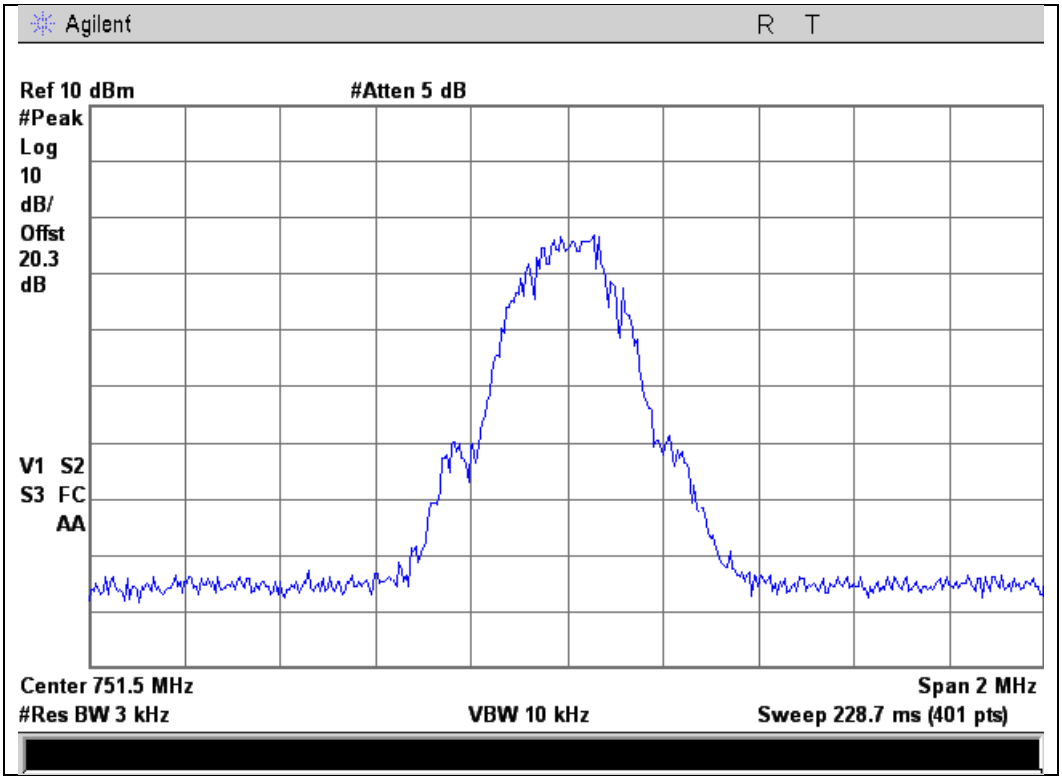


746 – 757 MHz Band

Input

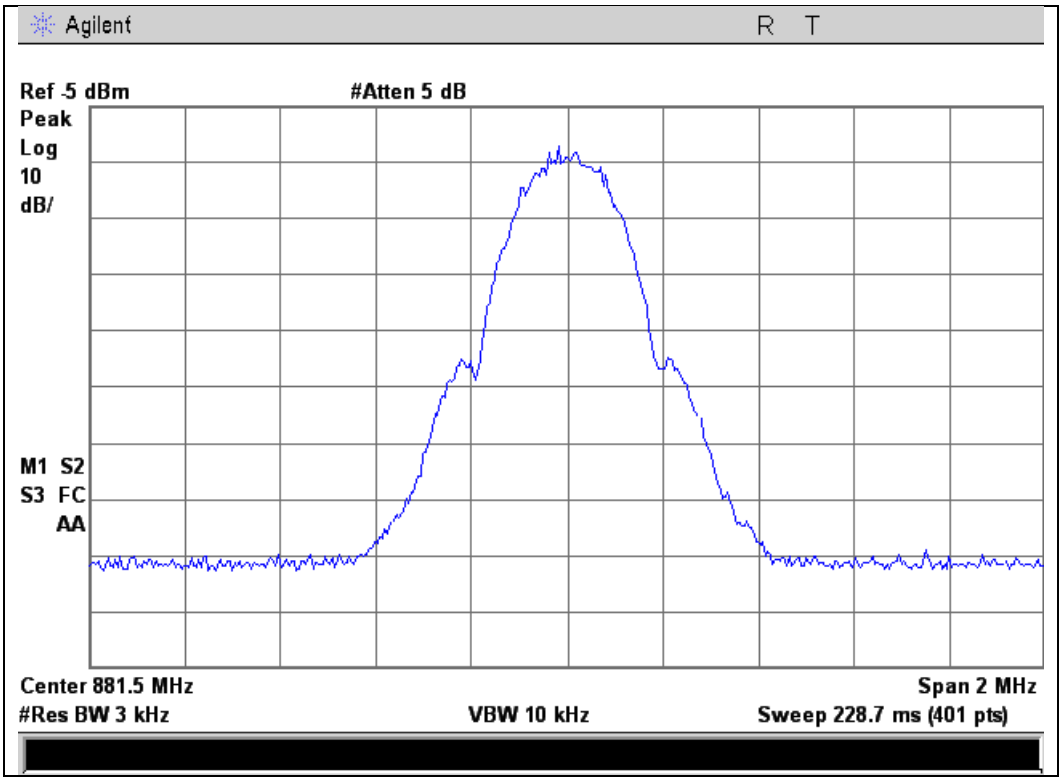


Output

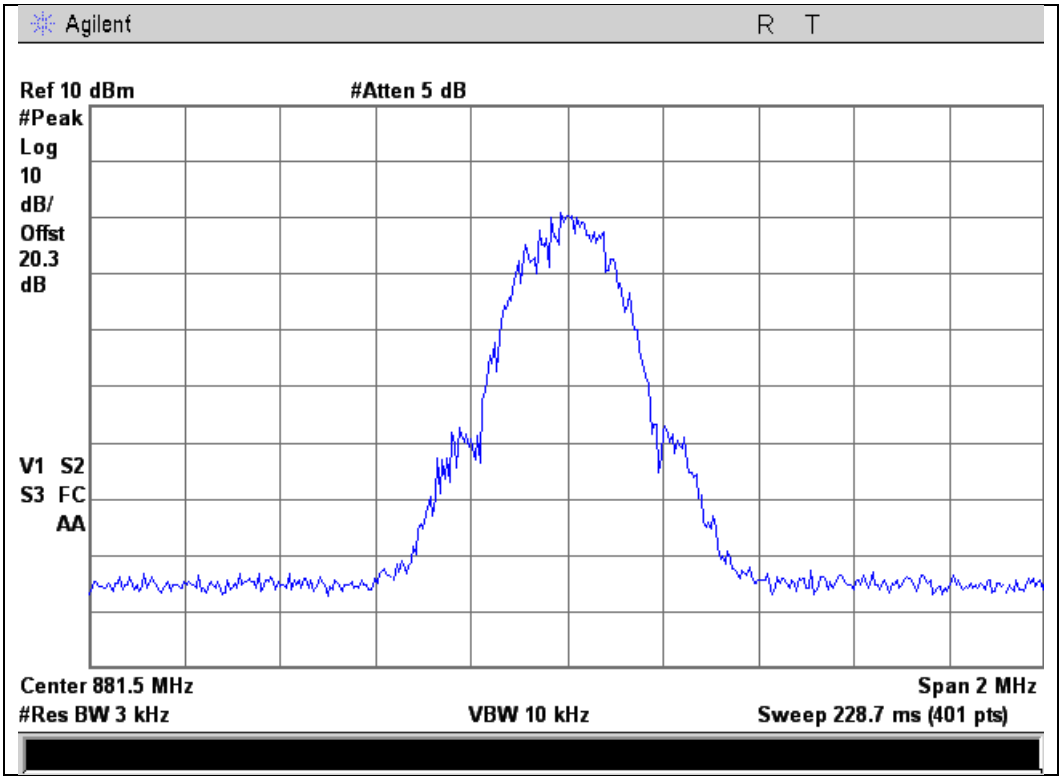


869 - 894 MHz Band

Input

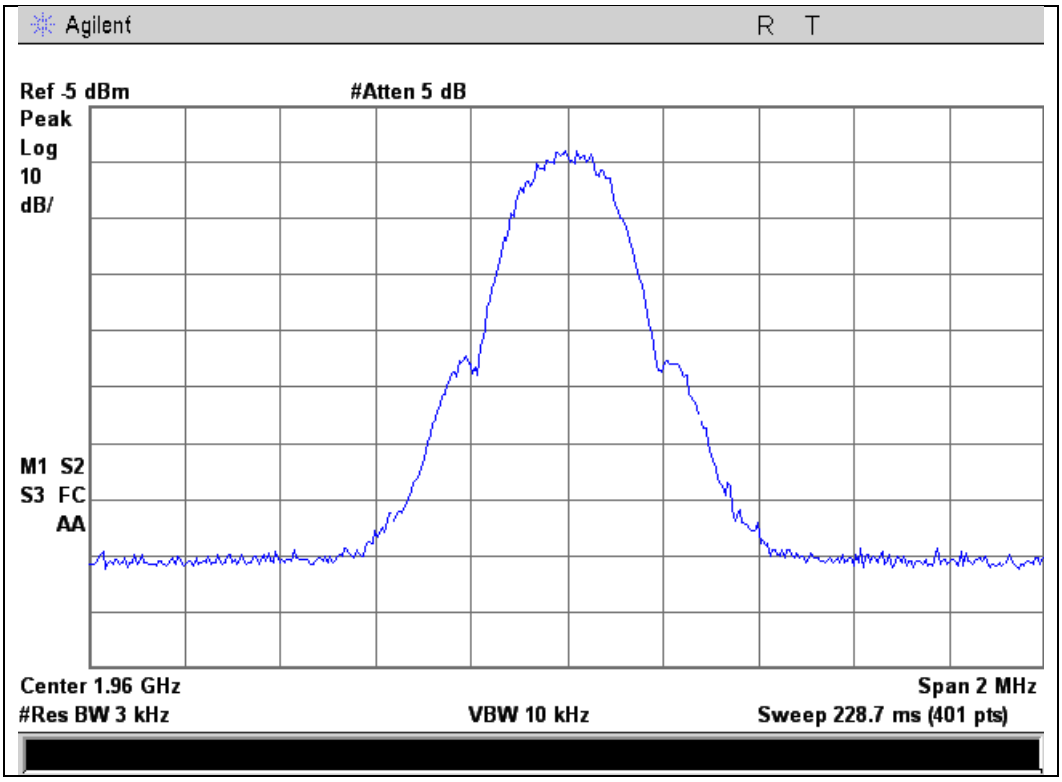


Output

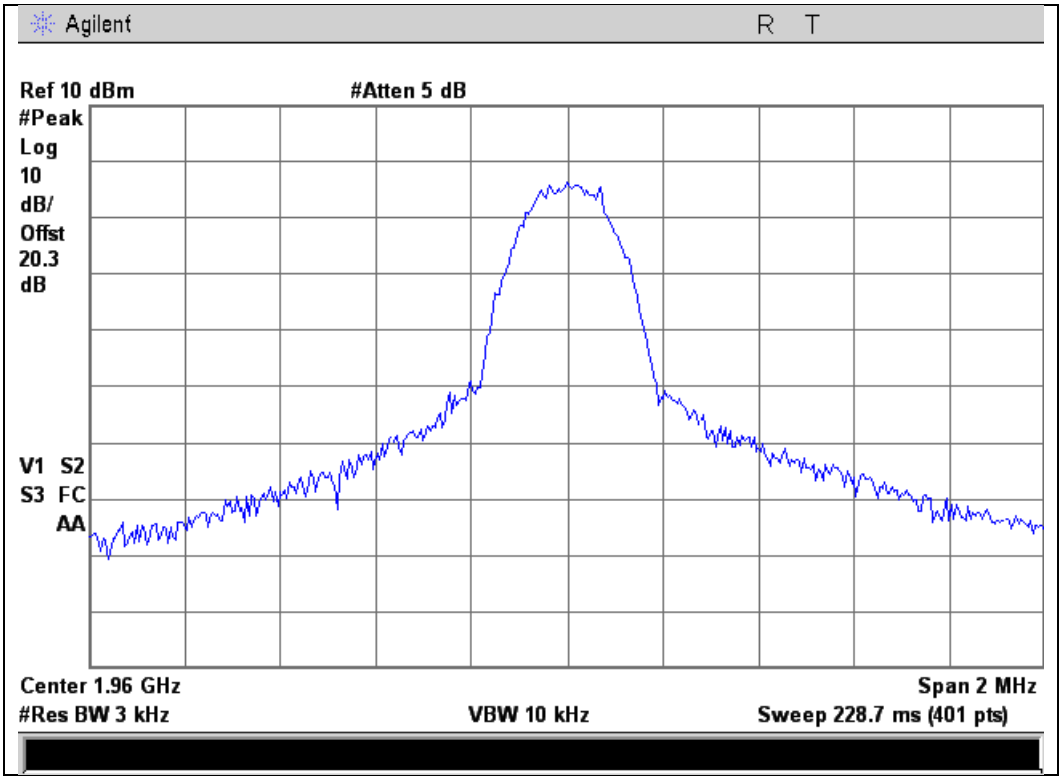


1930 – 1990 MHz Band

Input

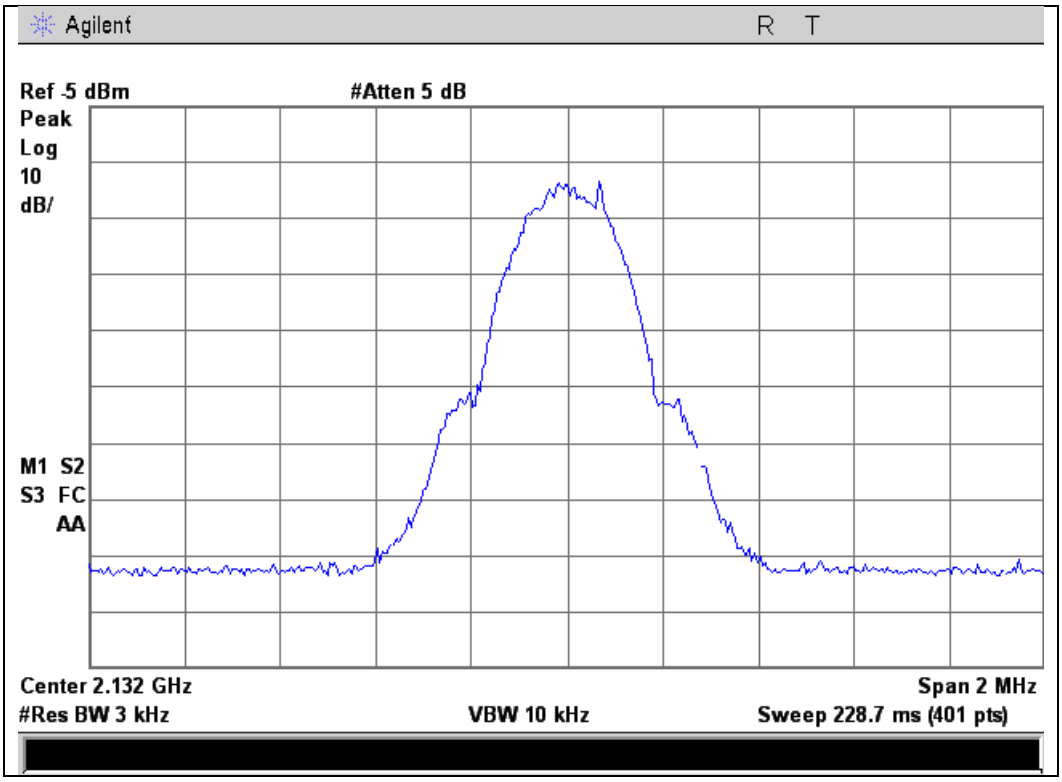


Output

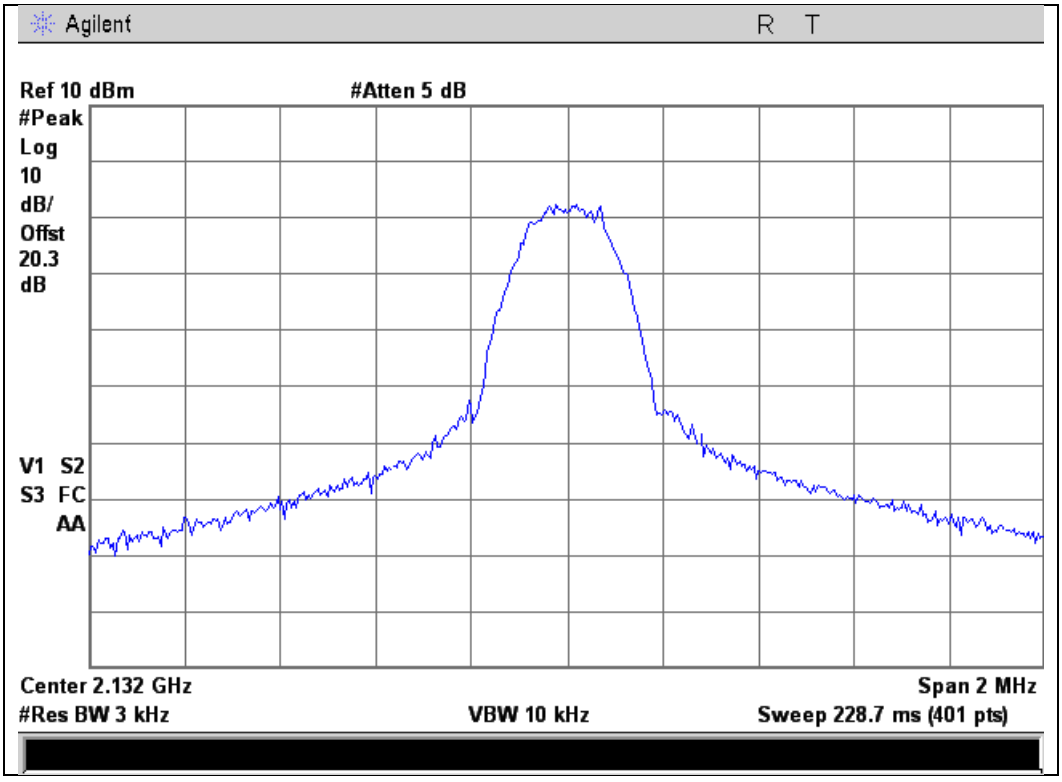


2110 - 2155 MHz Band

Input



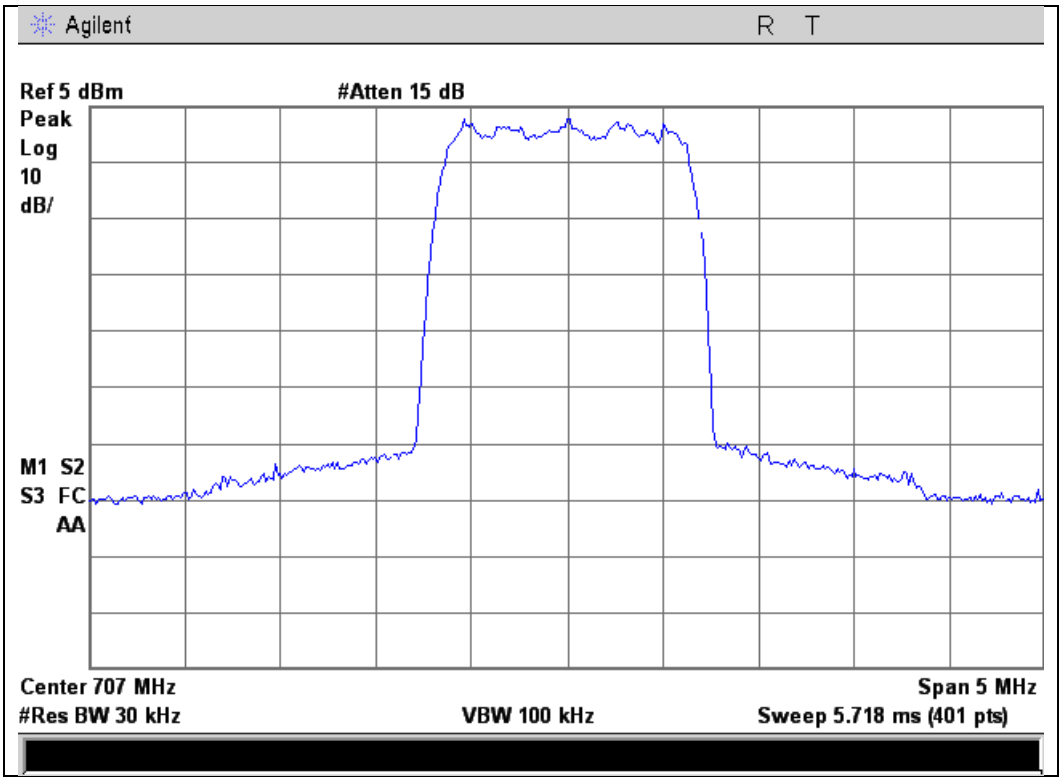
Output



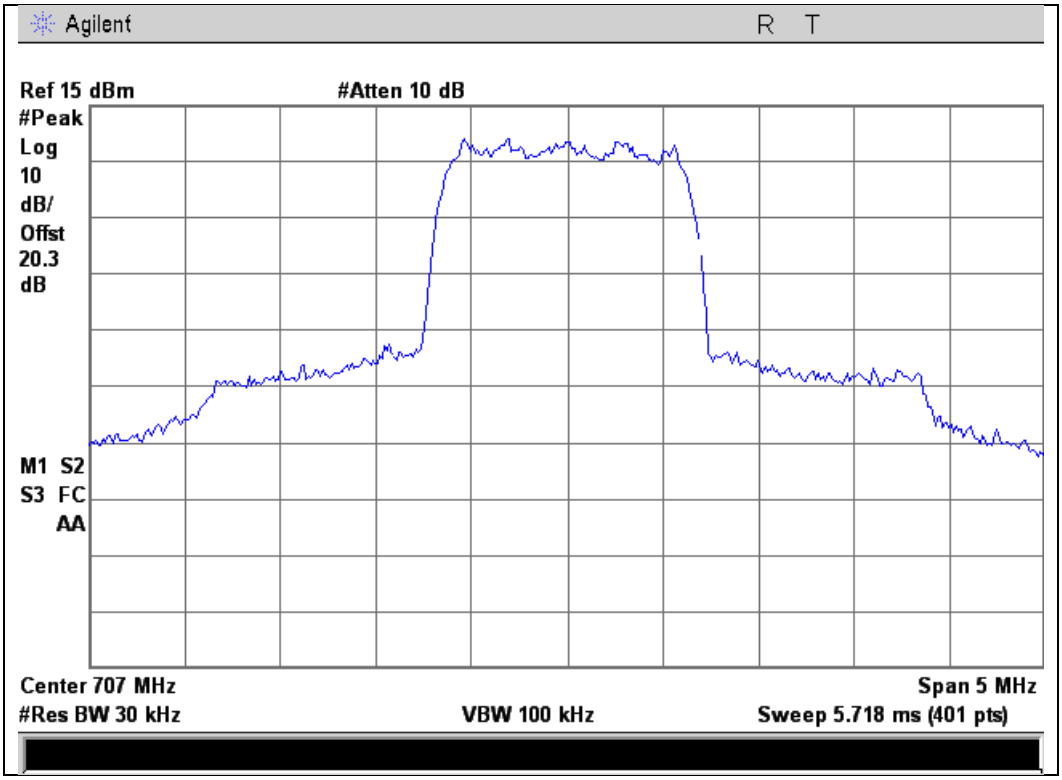
CDMA Uplink Test Plots

698 – 716 MHz Band

Input

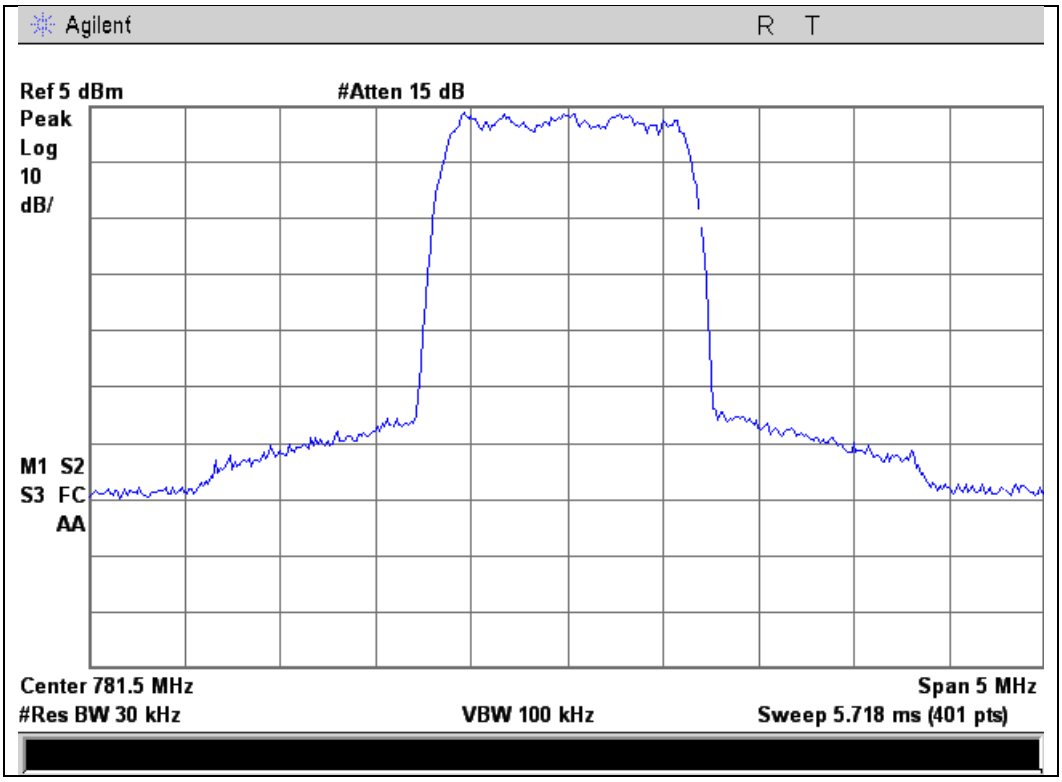


Output

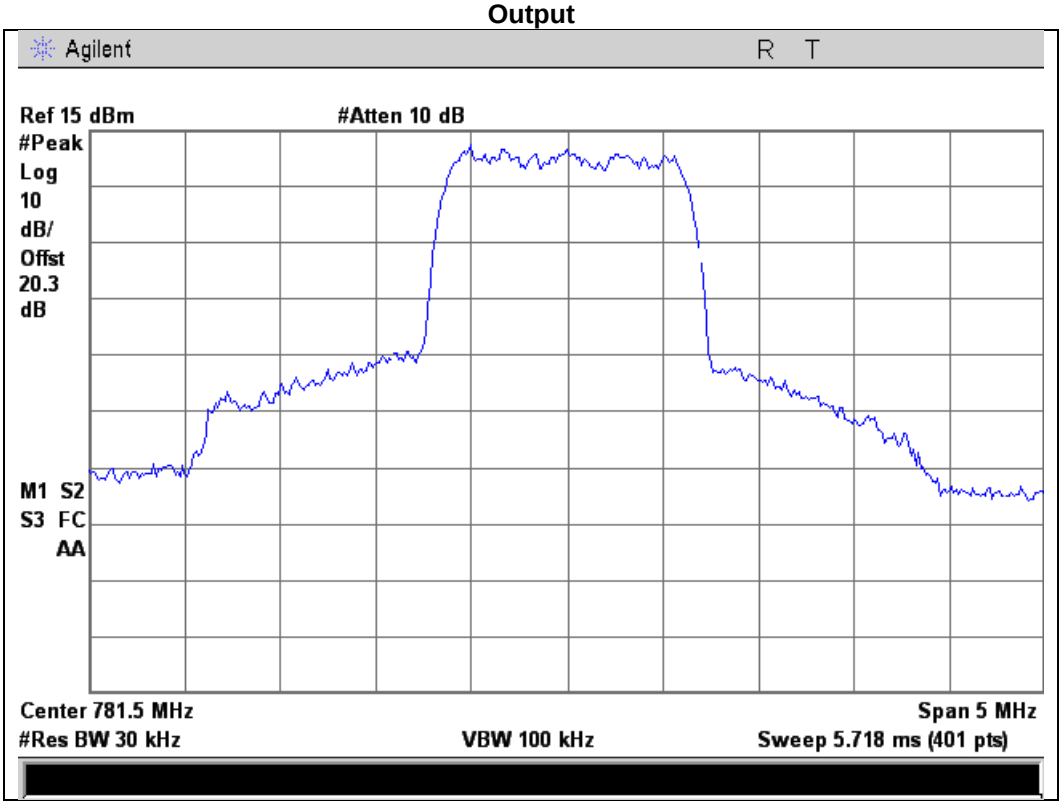


776 – 787 MHz Band

Input

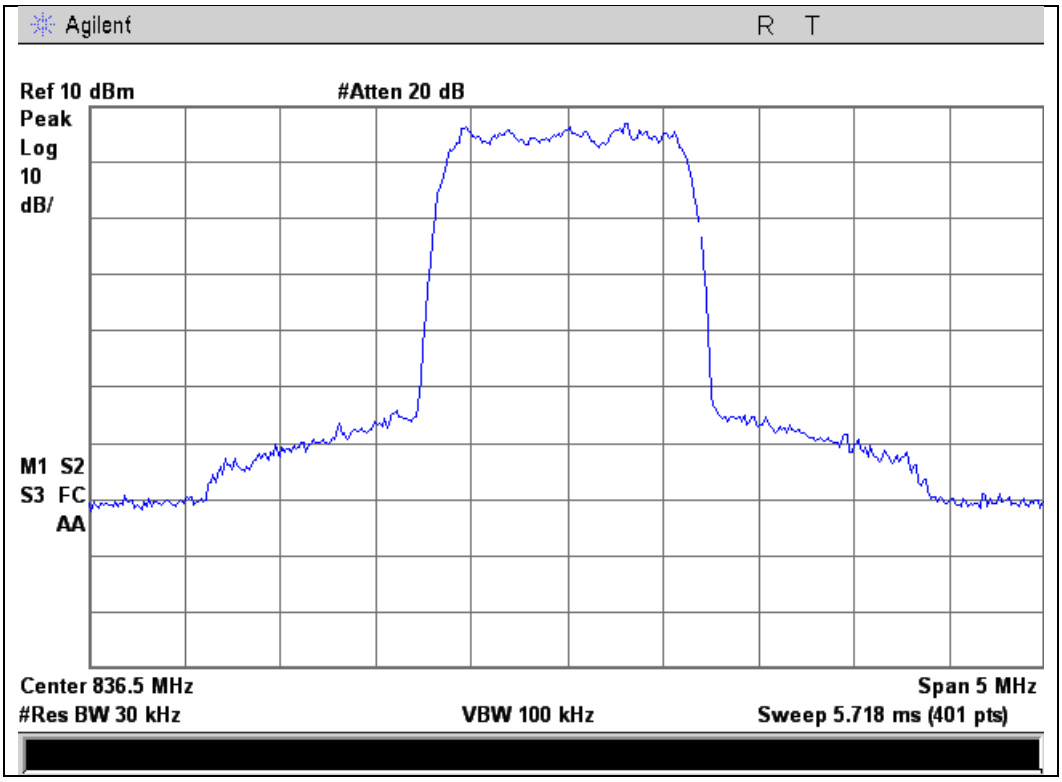


Output

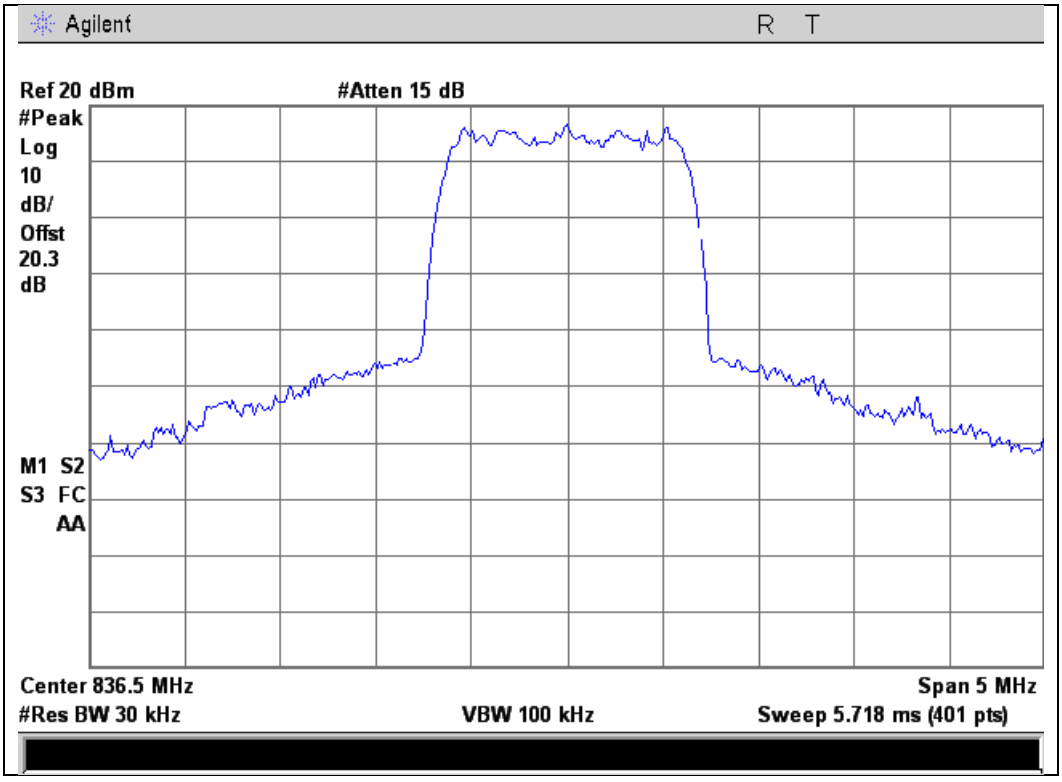


824 - 849 MHz Band

Input

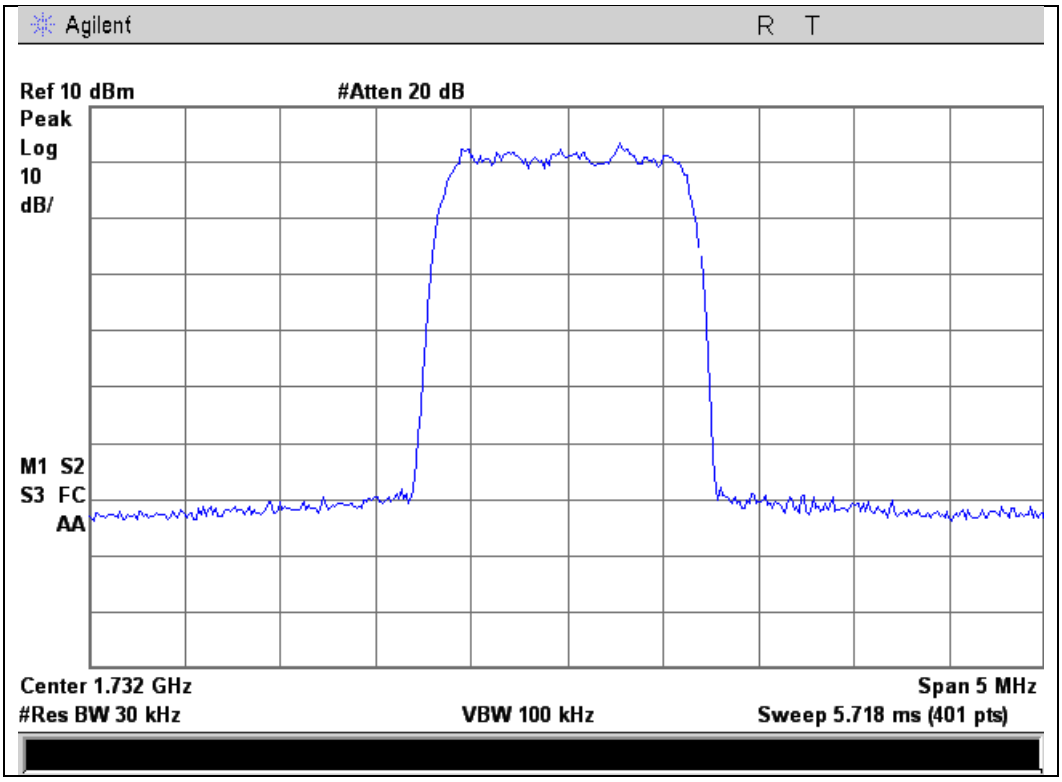


Output

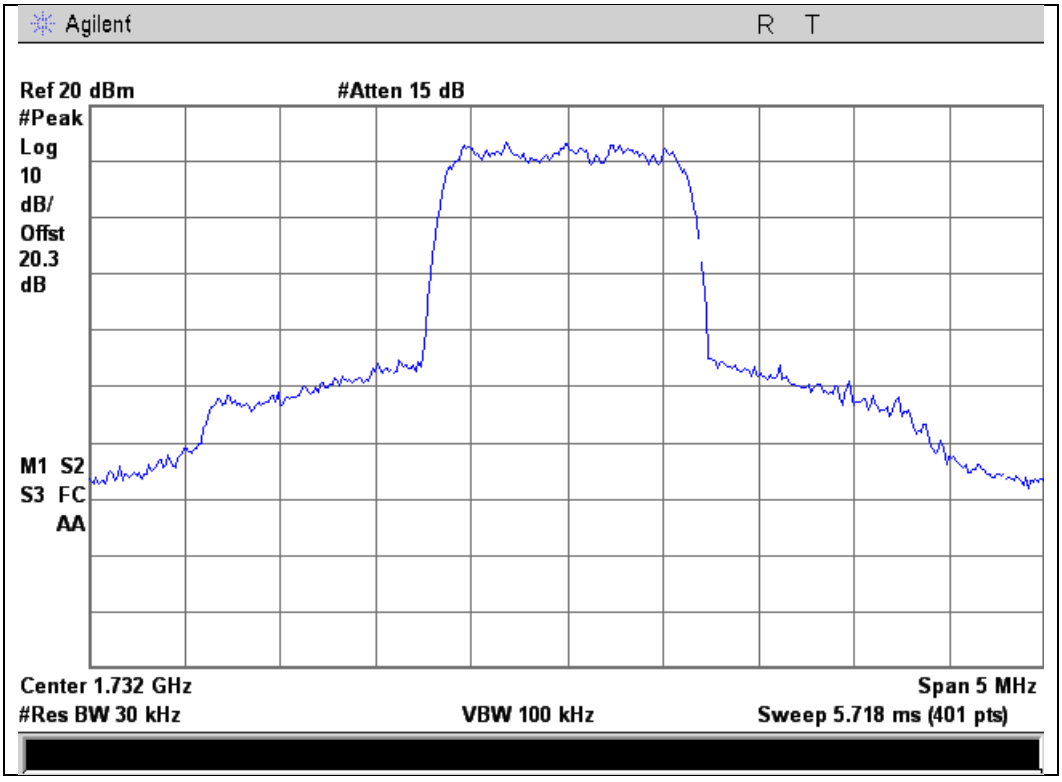


1710 - 1755 MHz Band

Input

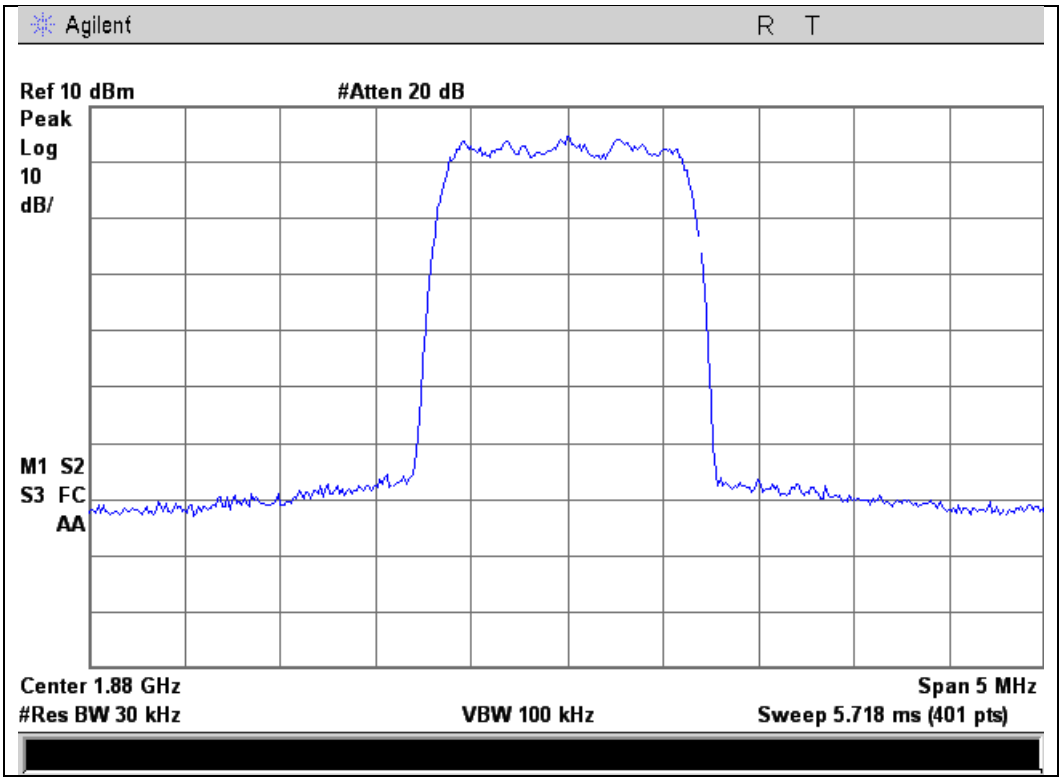


Output

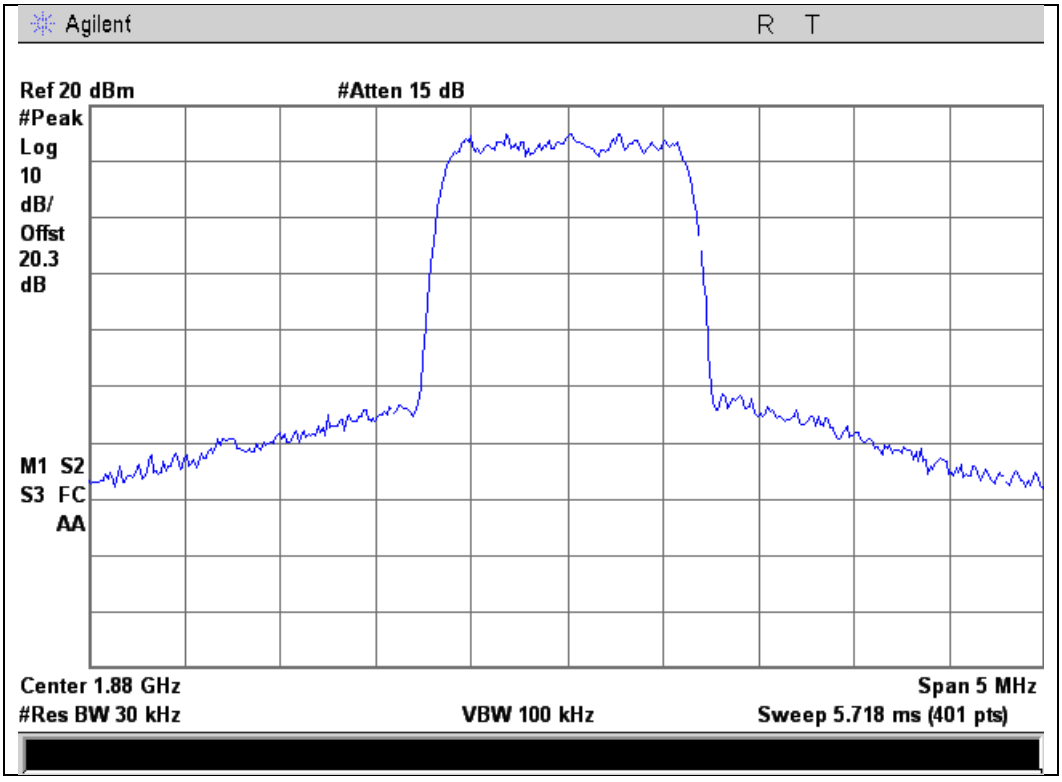


1850 - 1910 MHz Band

Input



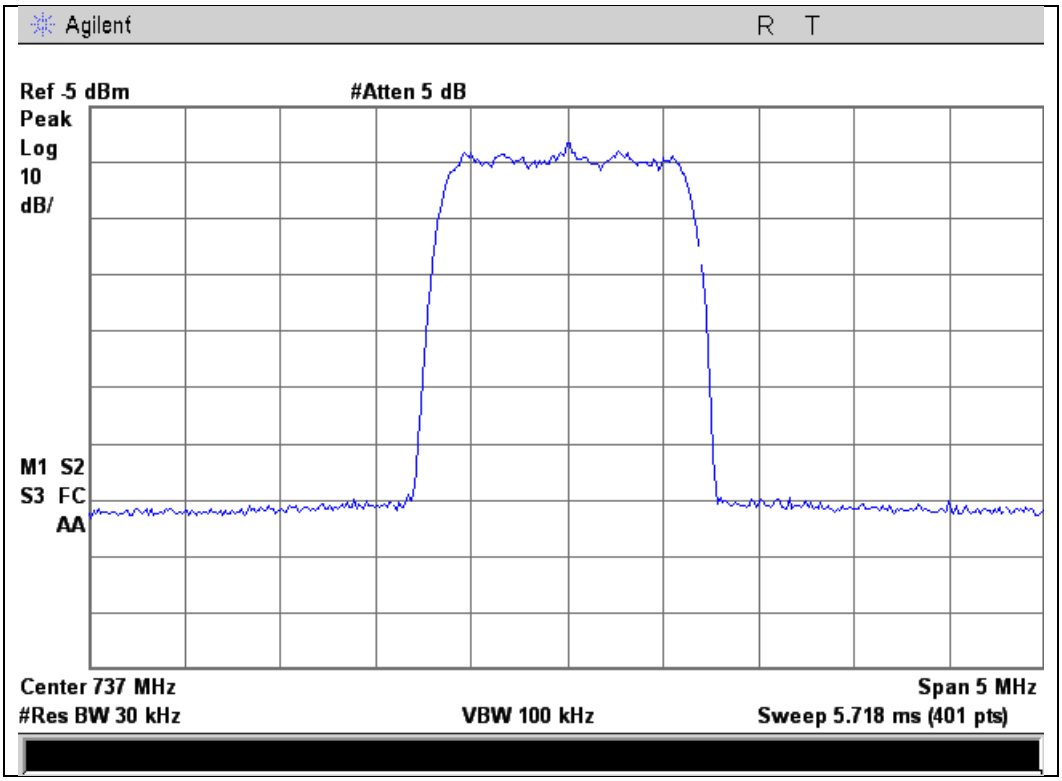
Output



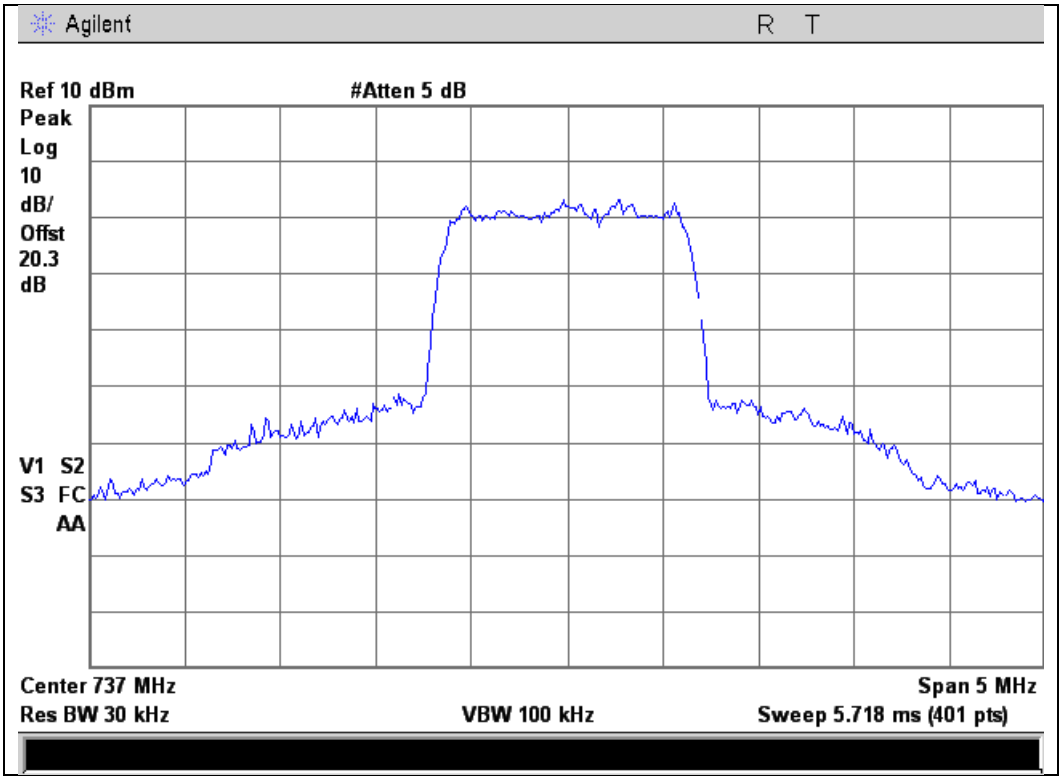
CDMA Downlink Test Plots

728 - 746 MHz Band

Input

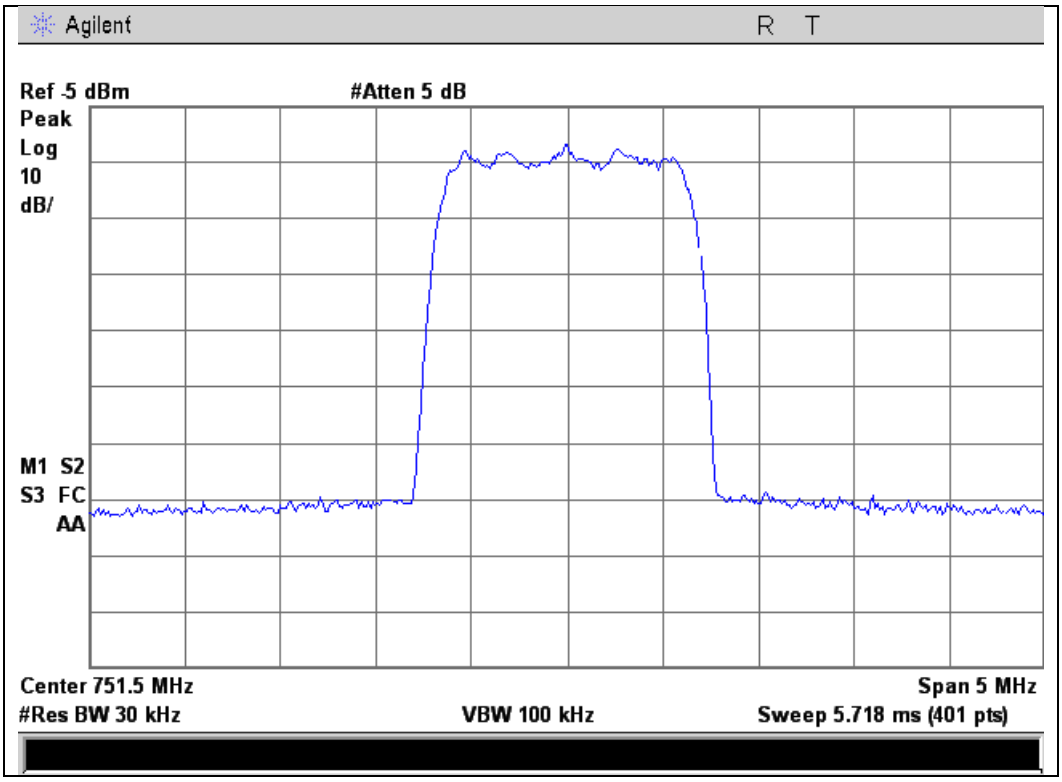


Output

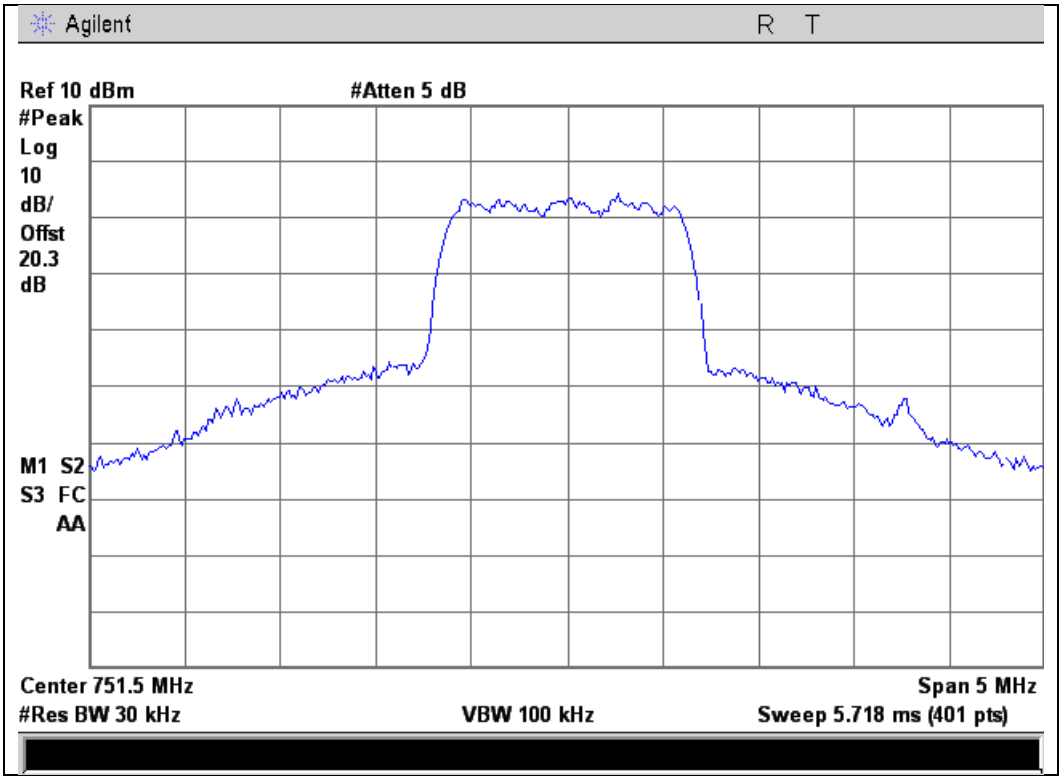


746 – 757 MHz Band

Input

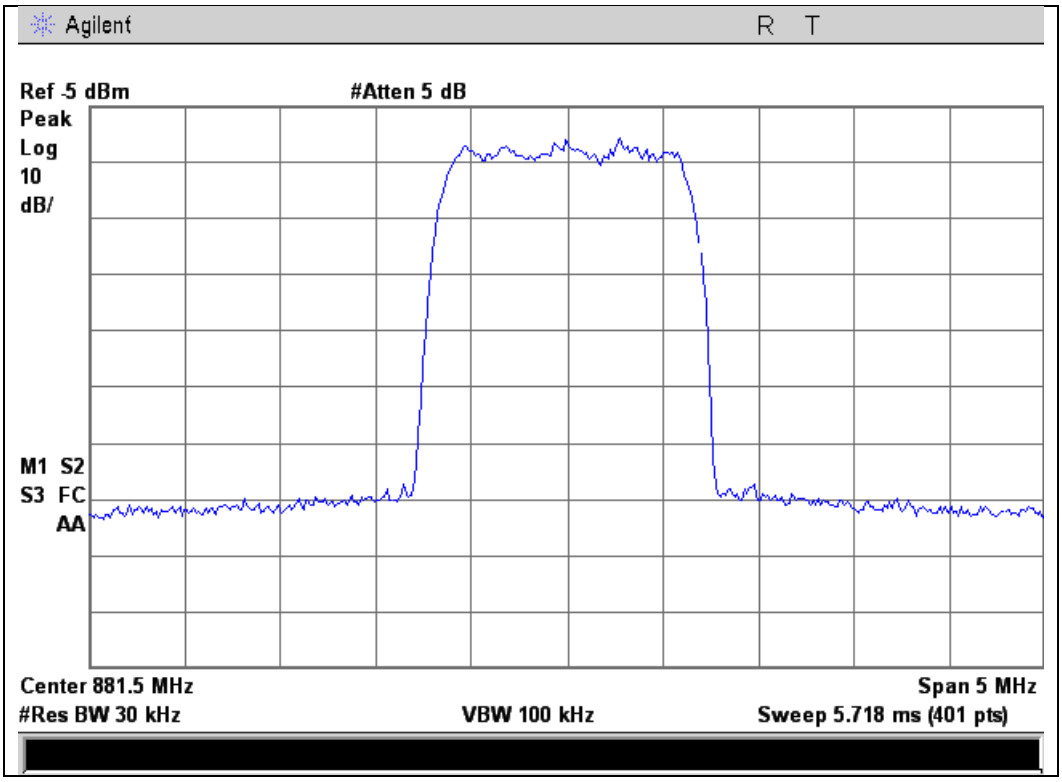


Output

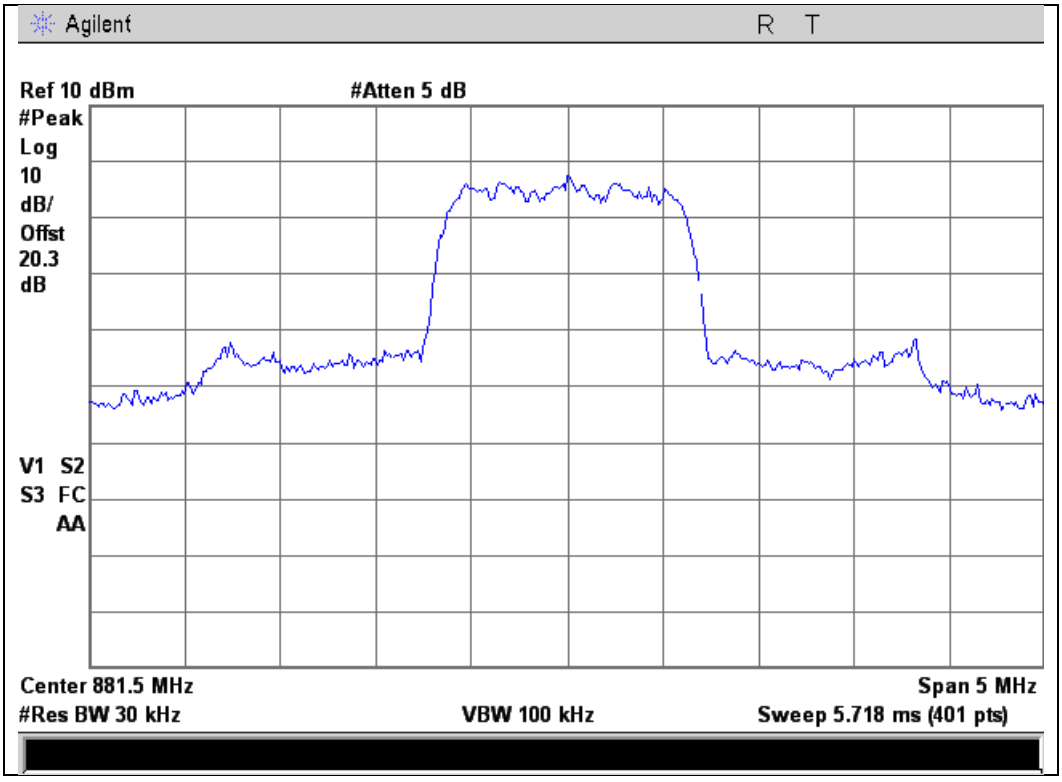


869 - 894 MHz Band

Input

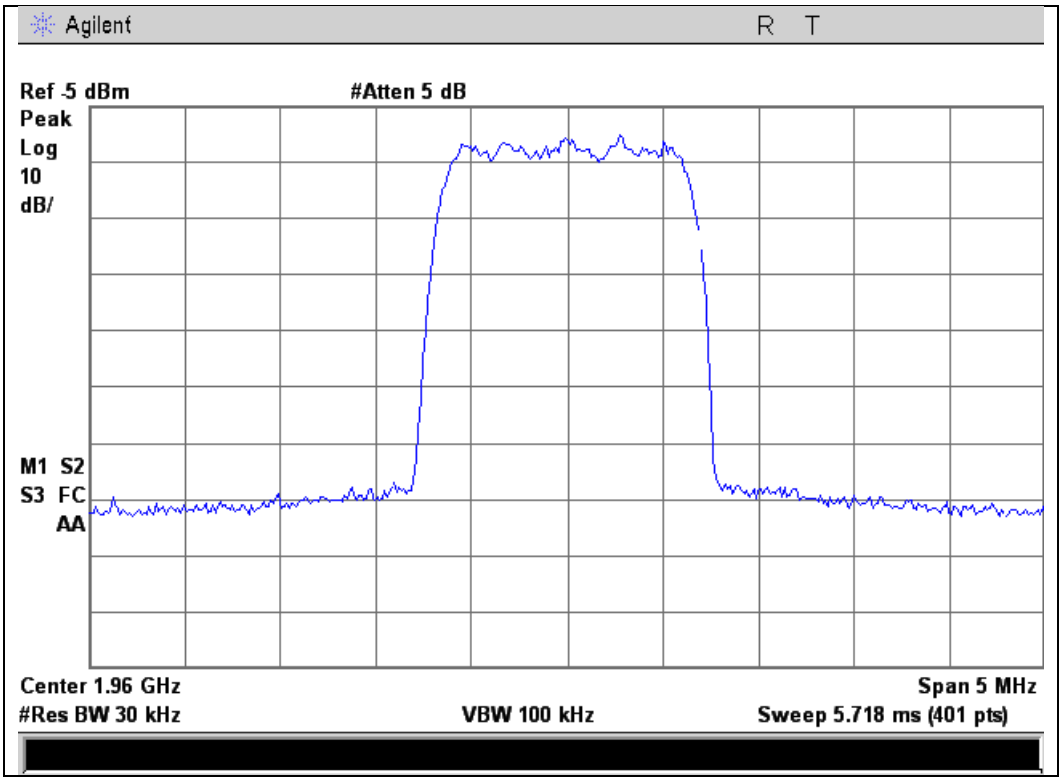


Output

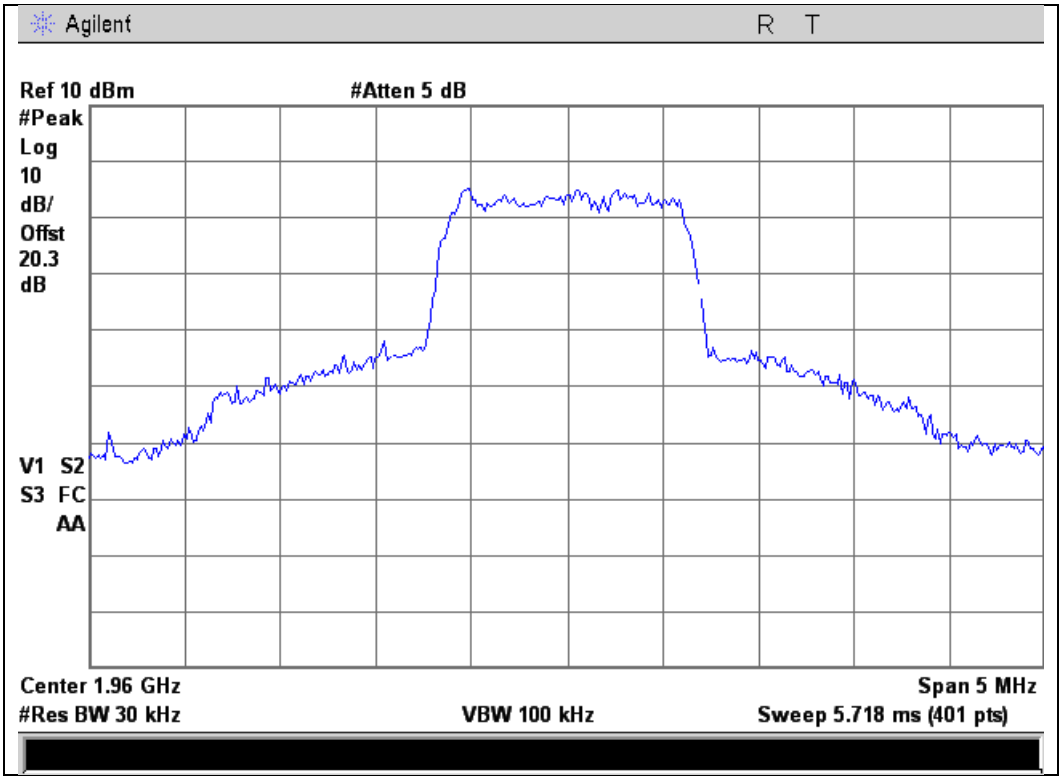


1930 – 1990 MHz Band

Input

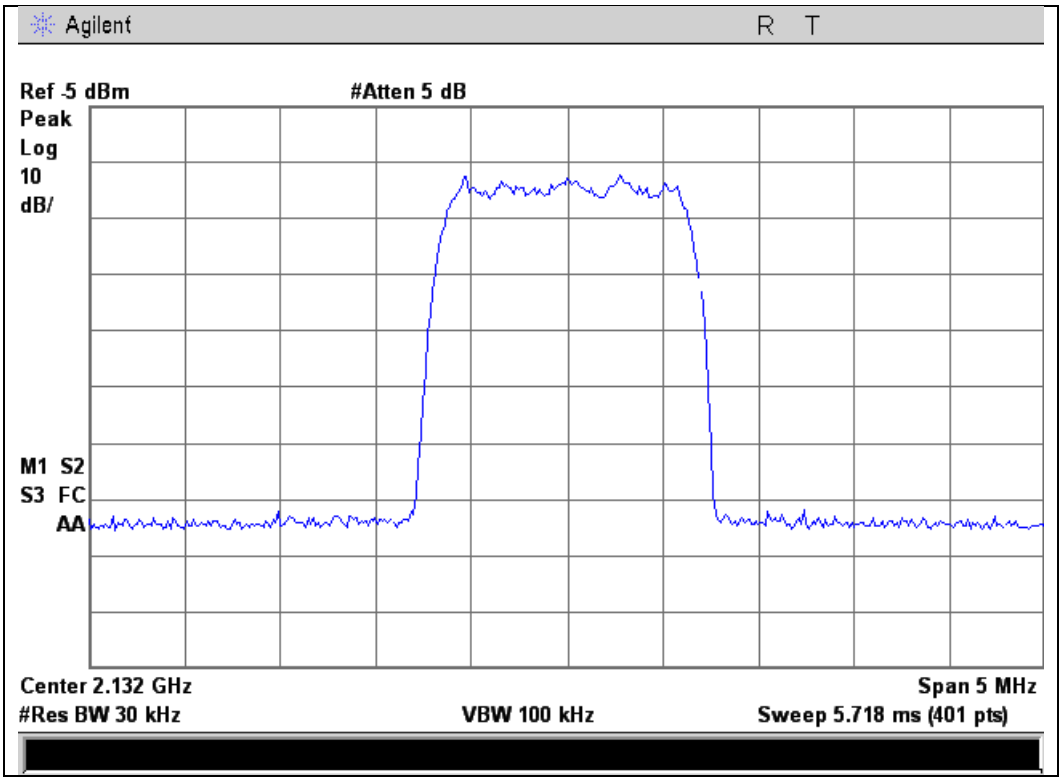


Output

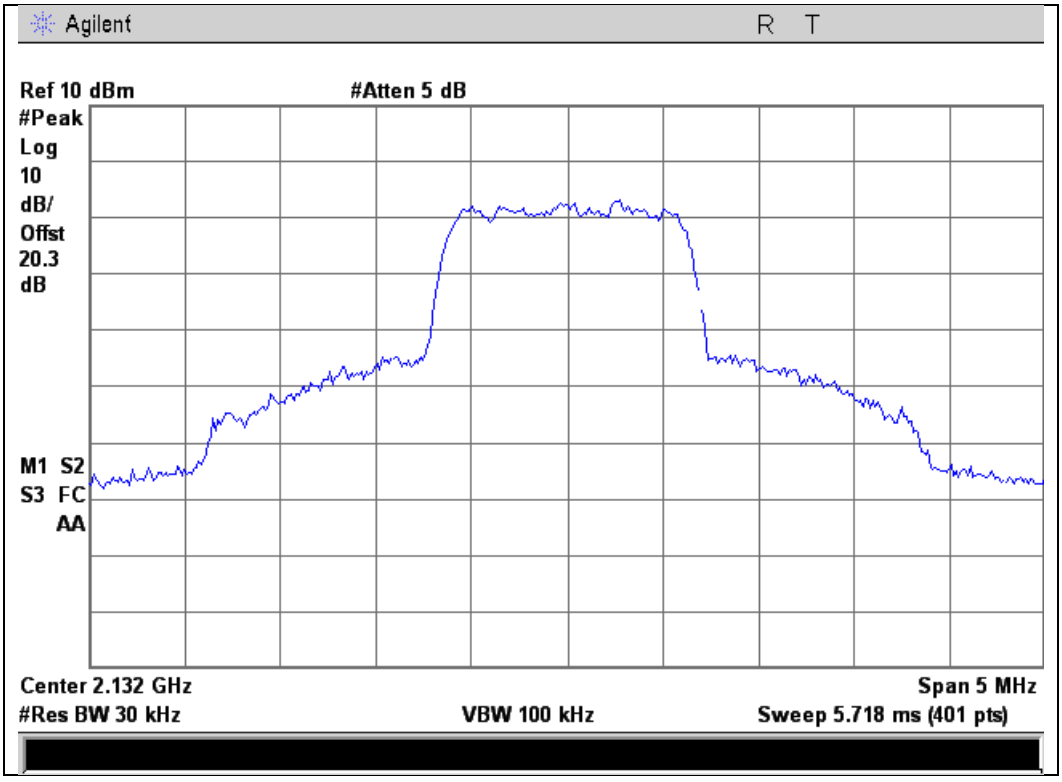


2110 - 2155 MHz Band

Input



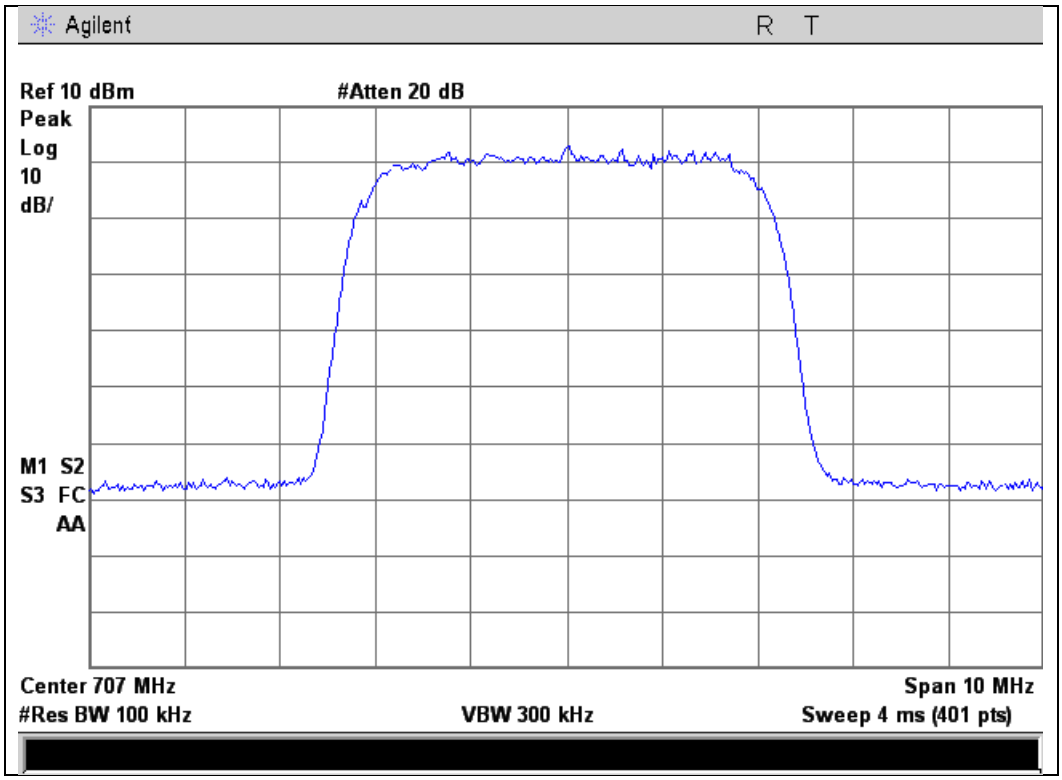
Output



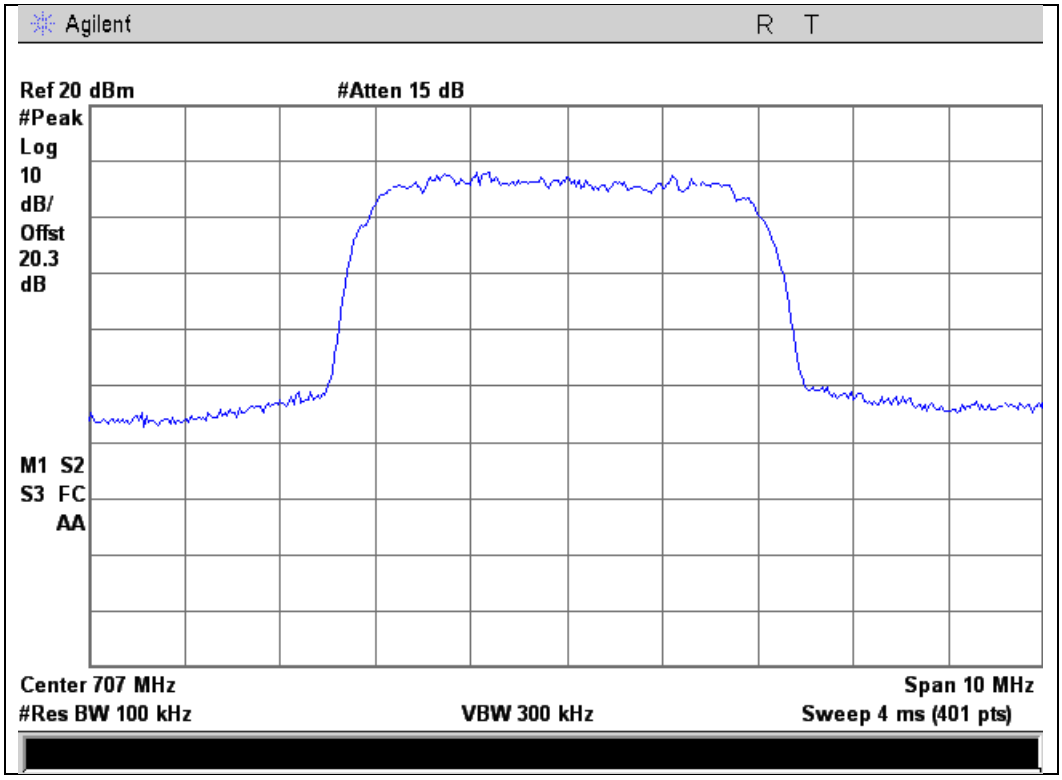
WCDMA Uplink Test Plots

698 – 716 MHz Band

Input

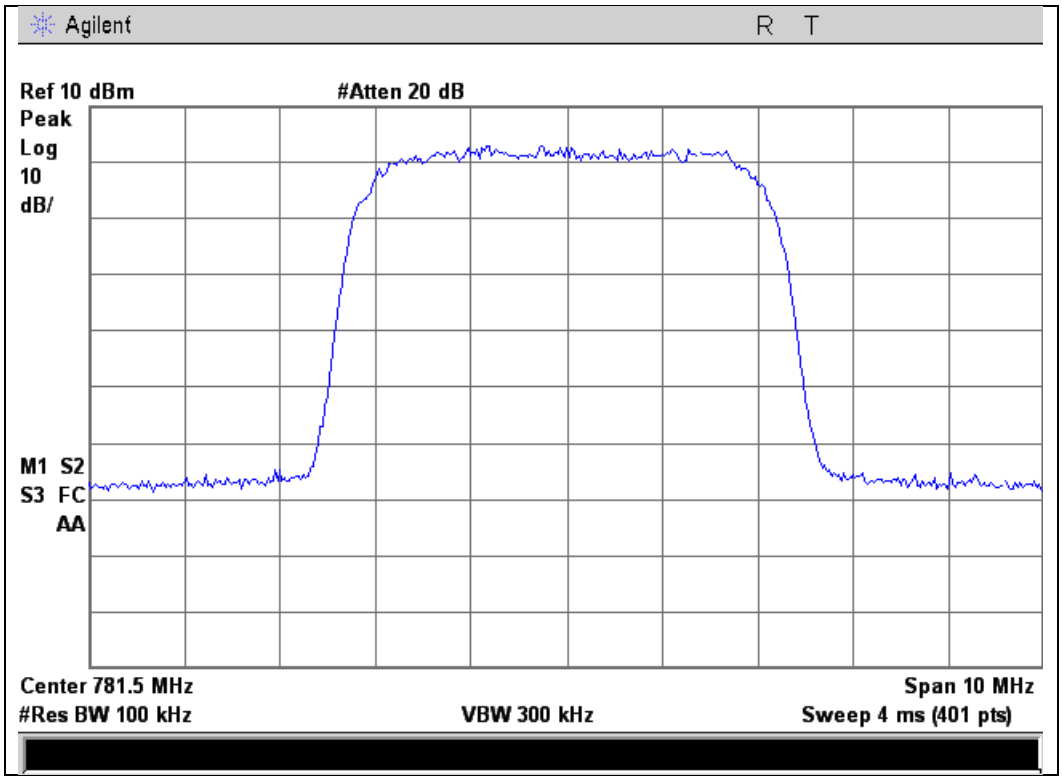


Output

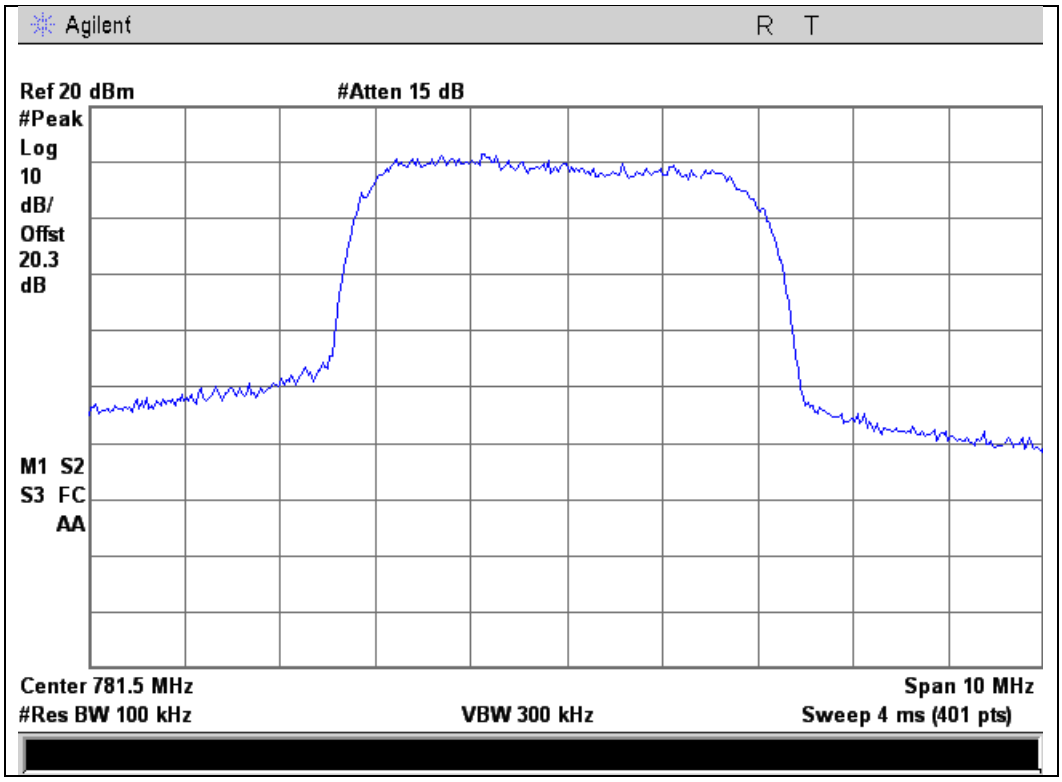


776 – 787 MHz Band

Input

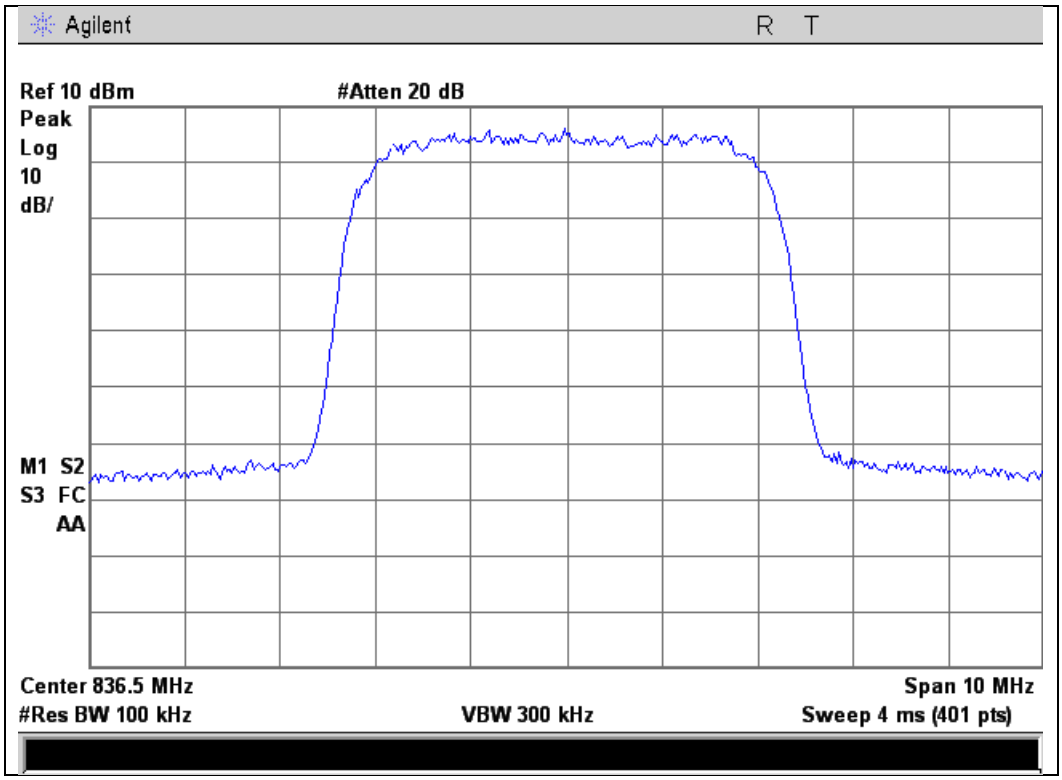


Output

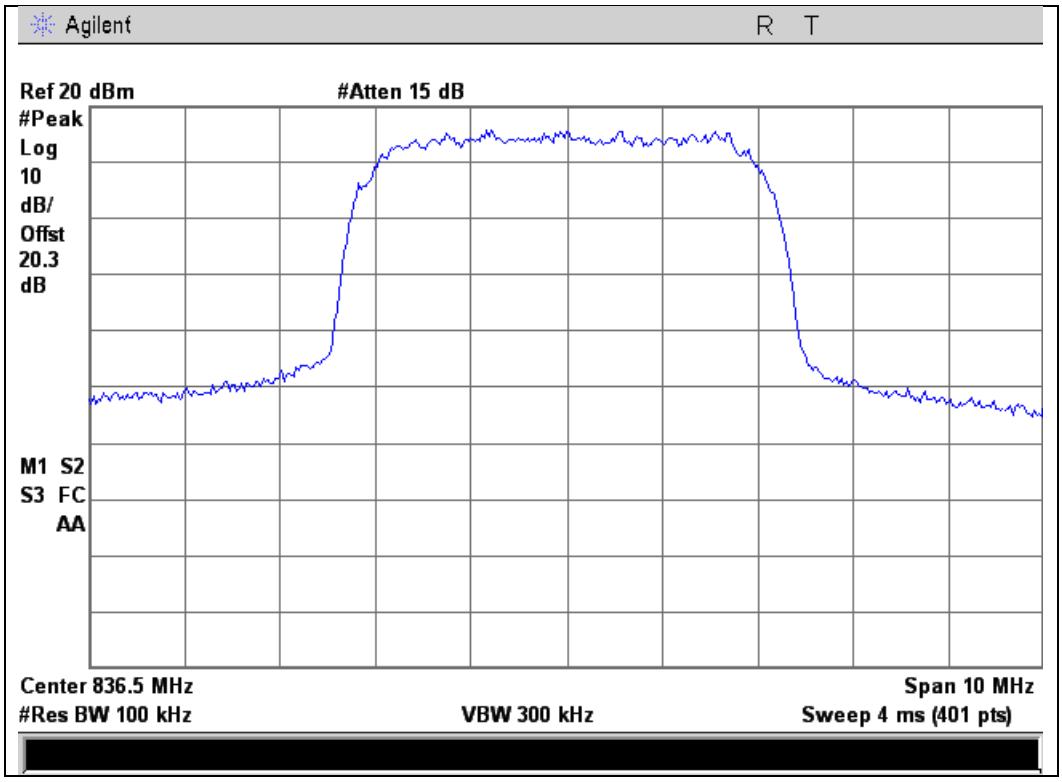


824 - 849 MHz Band

Input

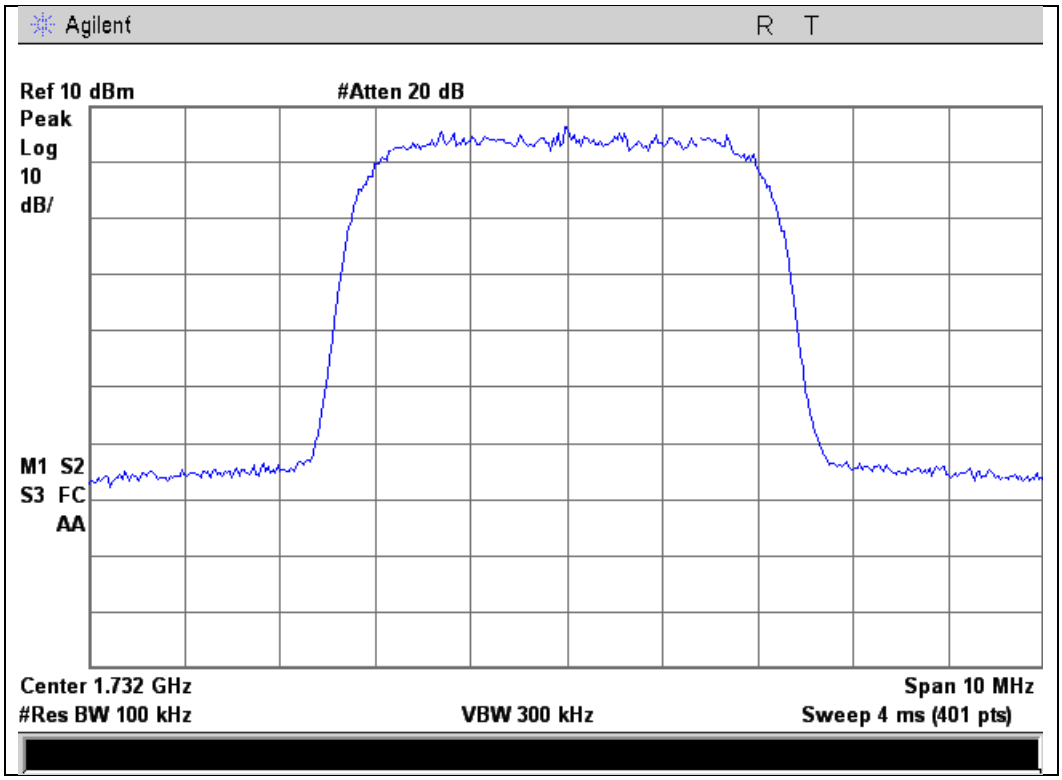


Output

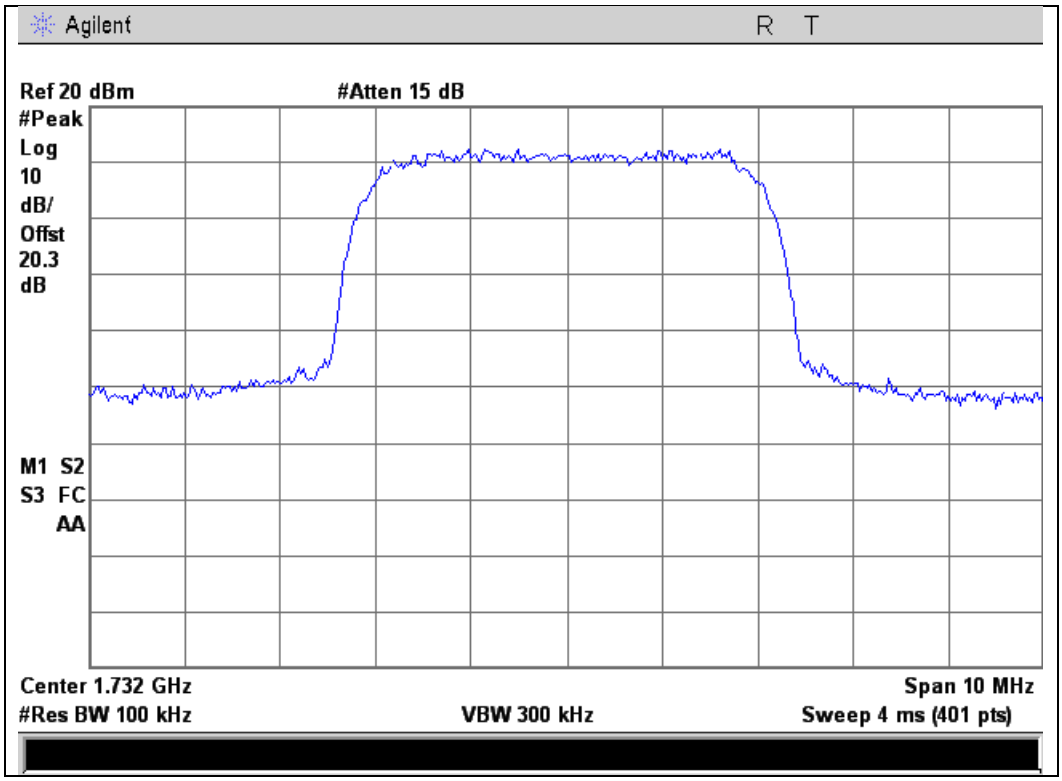


1710 - 1755 MHz Band

Input

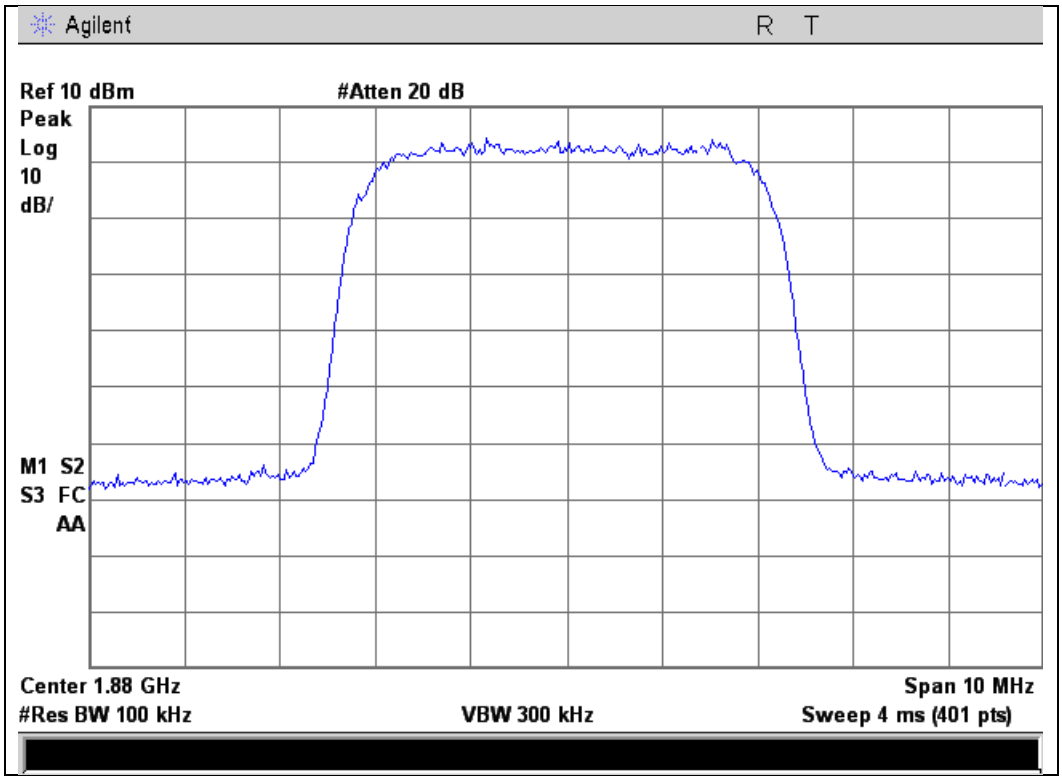


Output

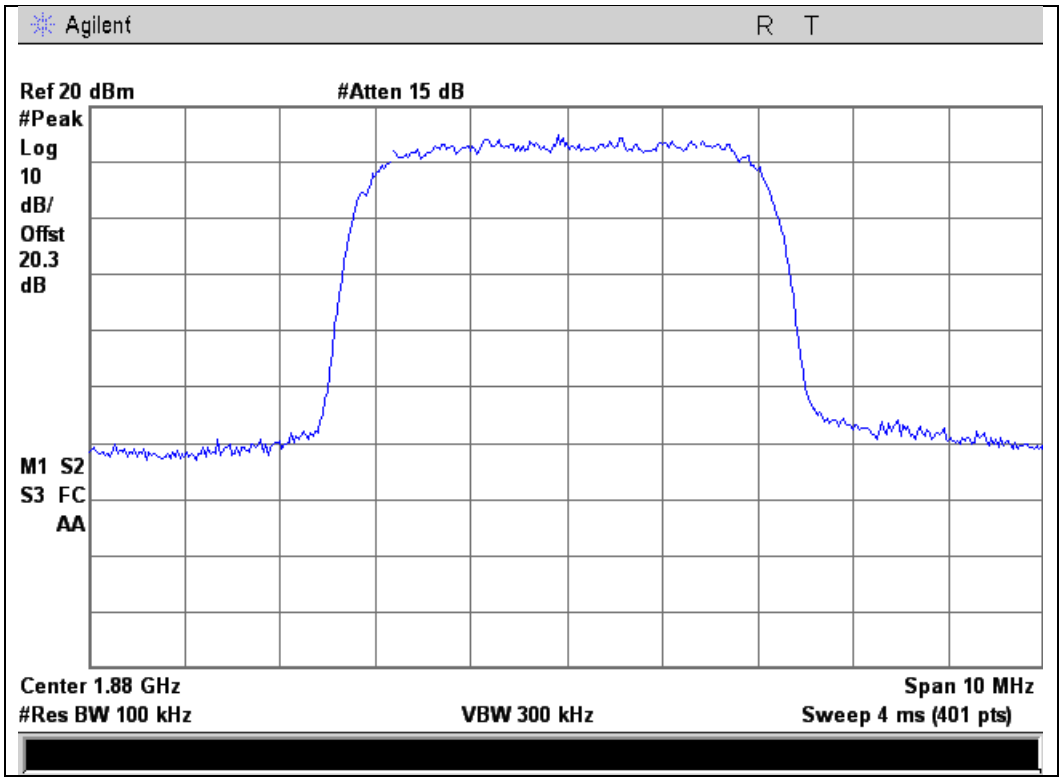


1850 - 1910 MHz Band

Input



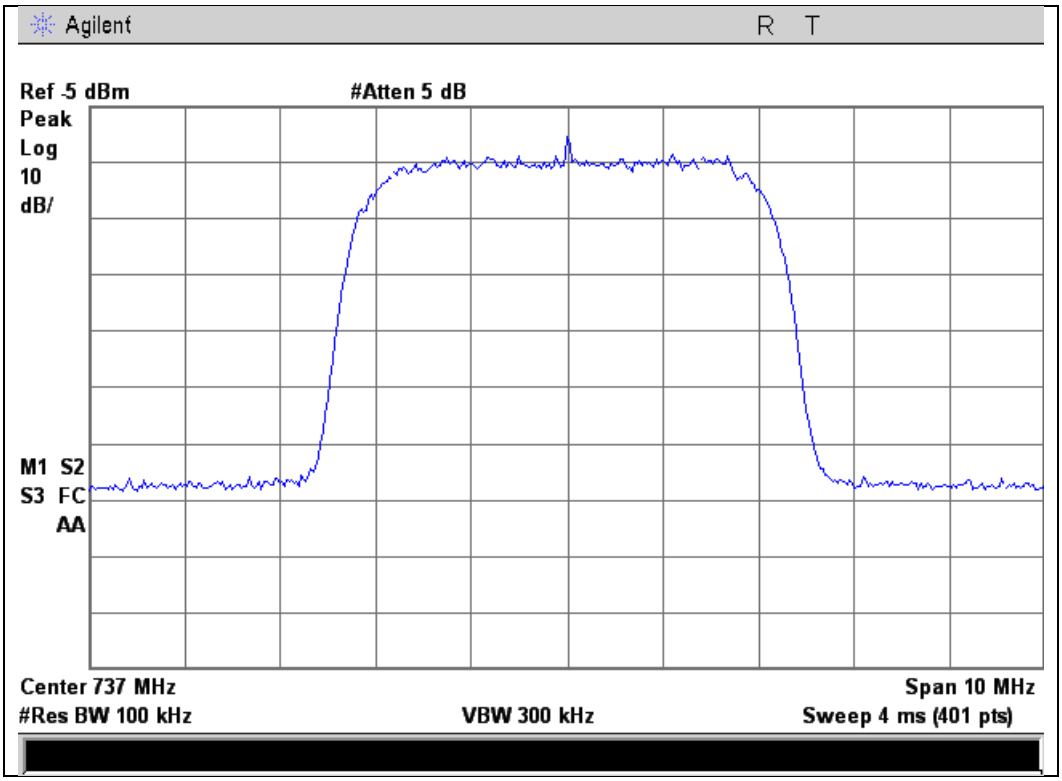
Output



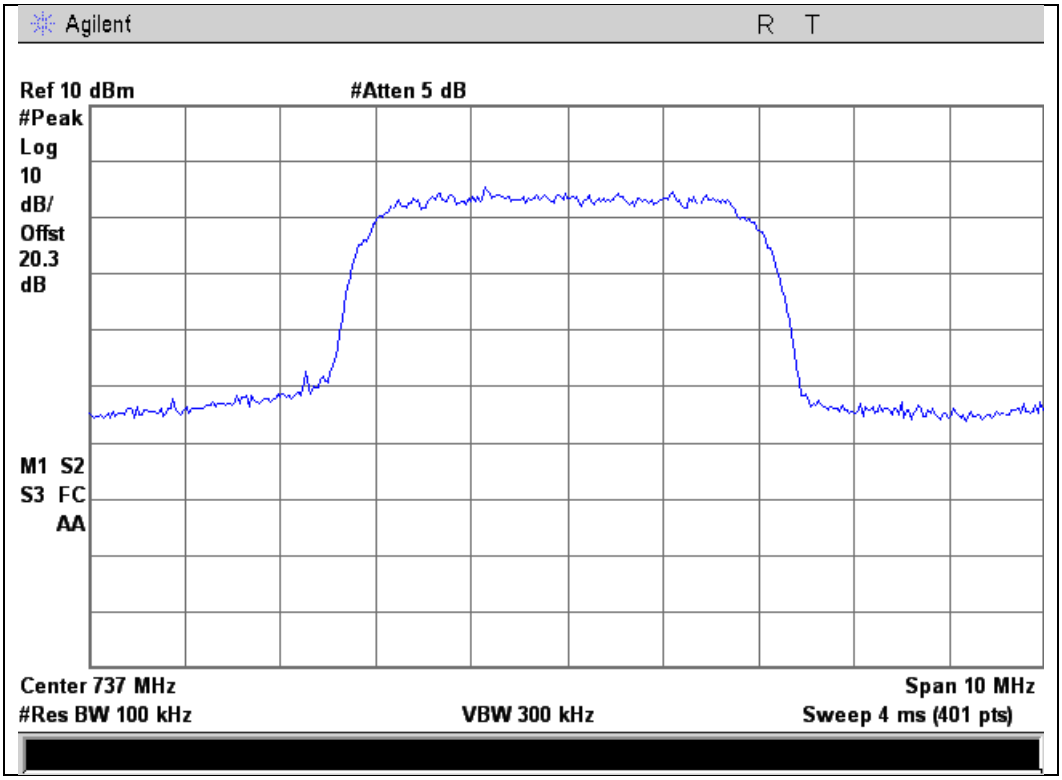
WCDMA Downlink Test Plots

728 - 746 MHz Band

Input

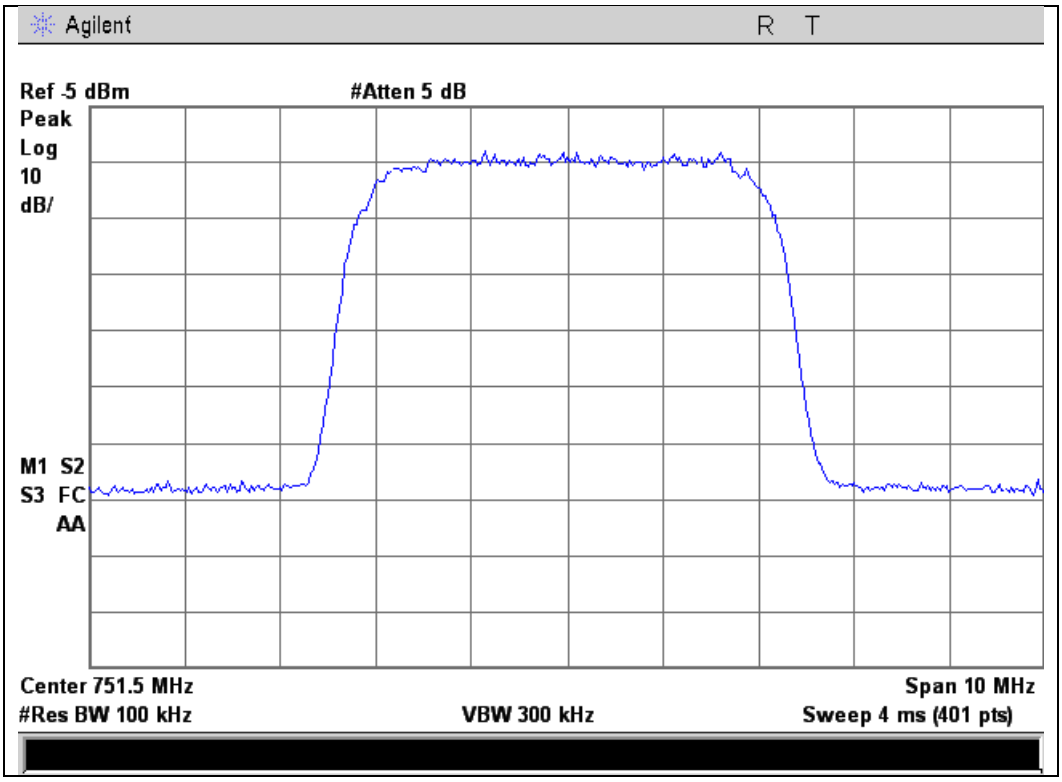


Output

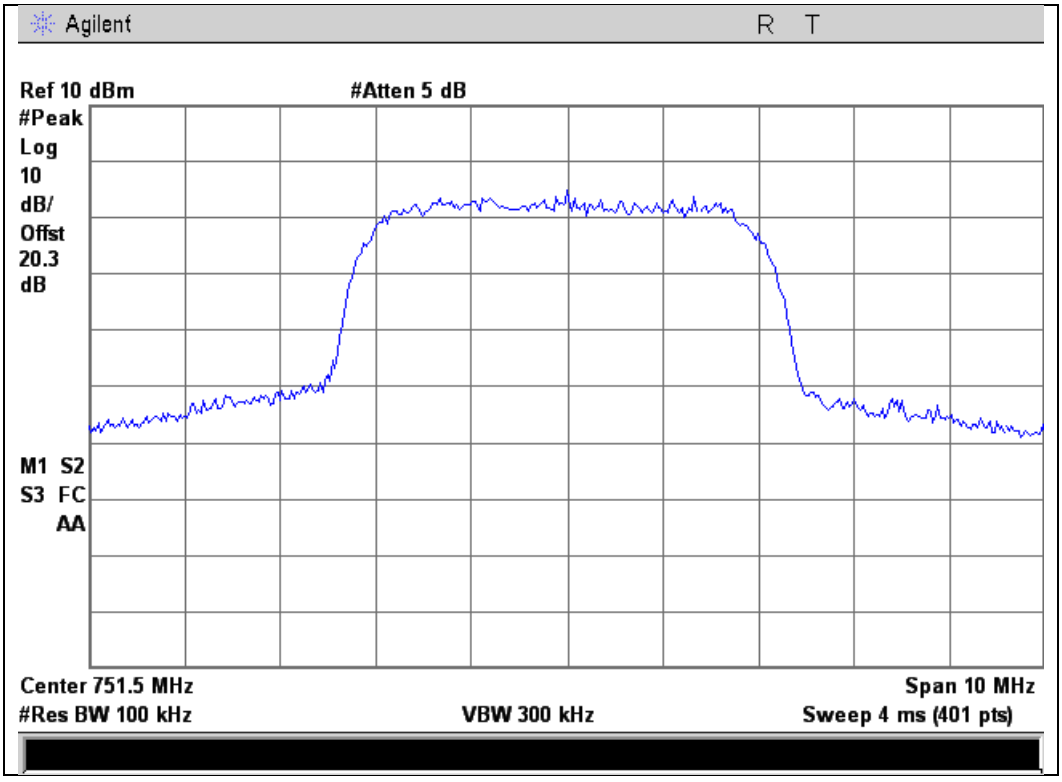


746 – 757 MHz Band

Input

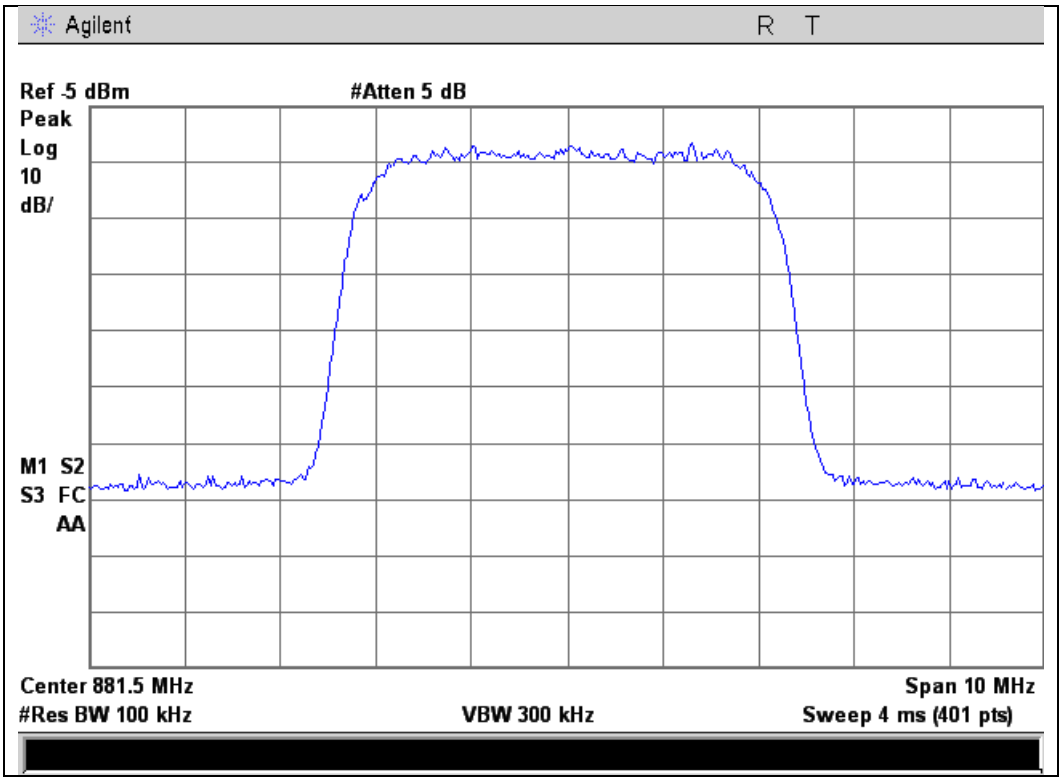


Output

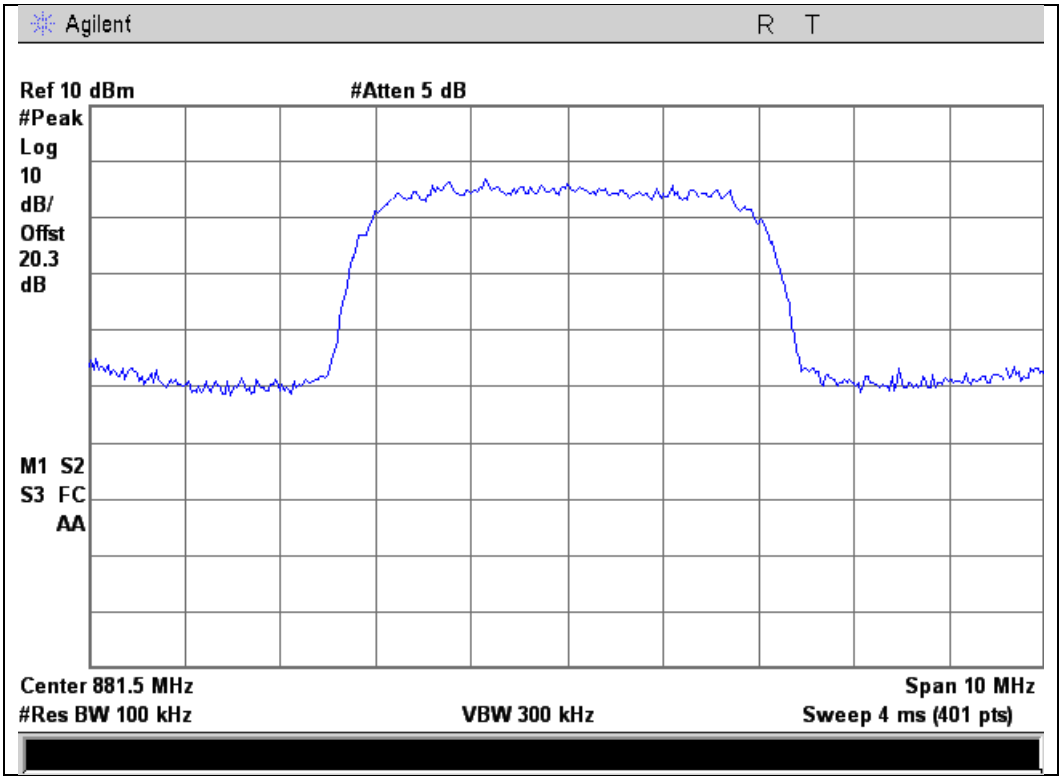


869 - 894 MHz Band

Input

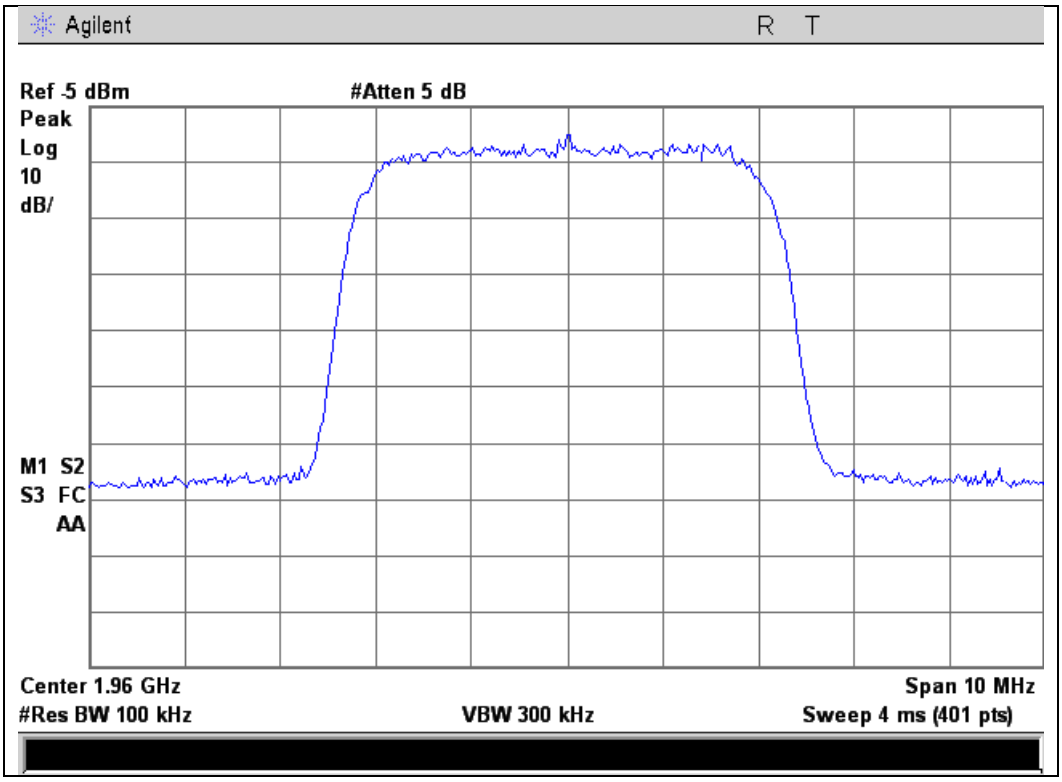


Output

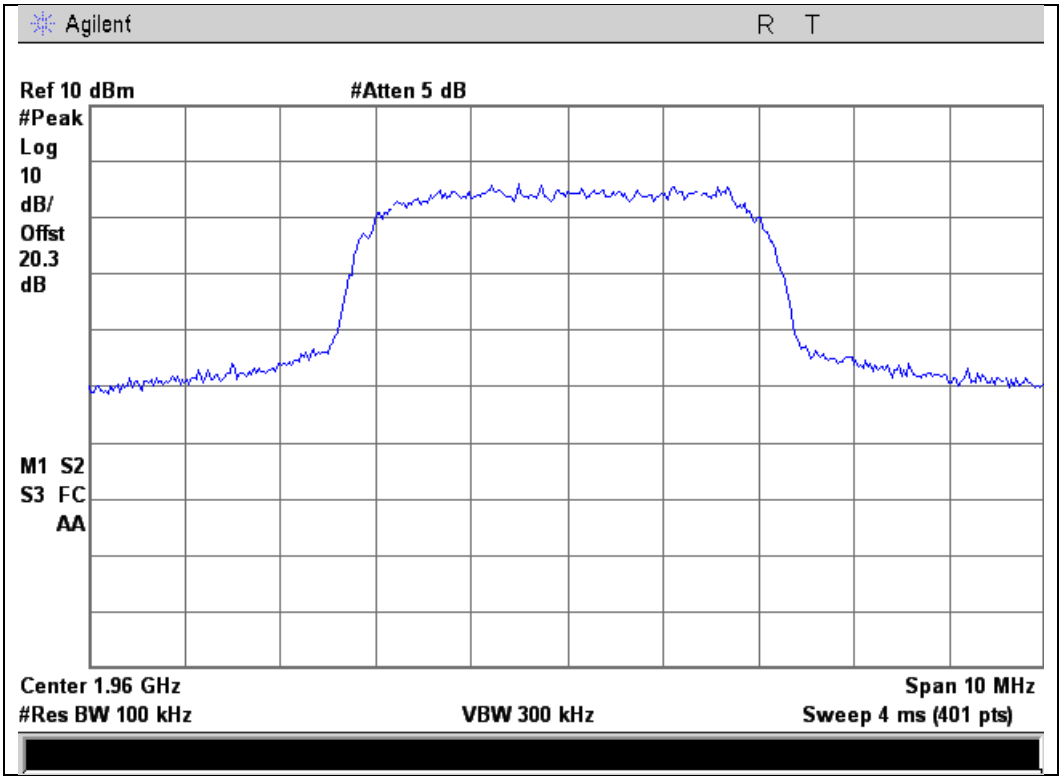


1930 – 1990 MHz Band

Input

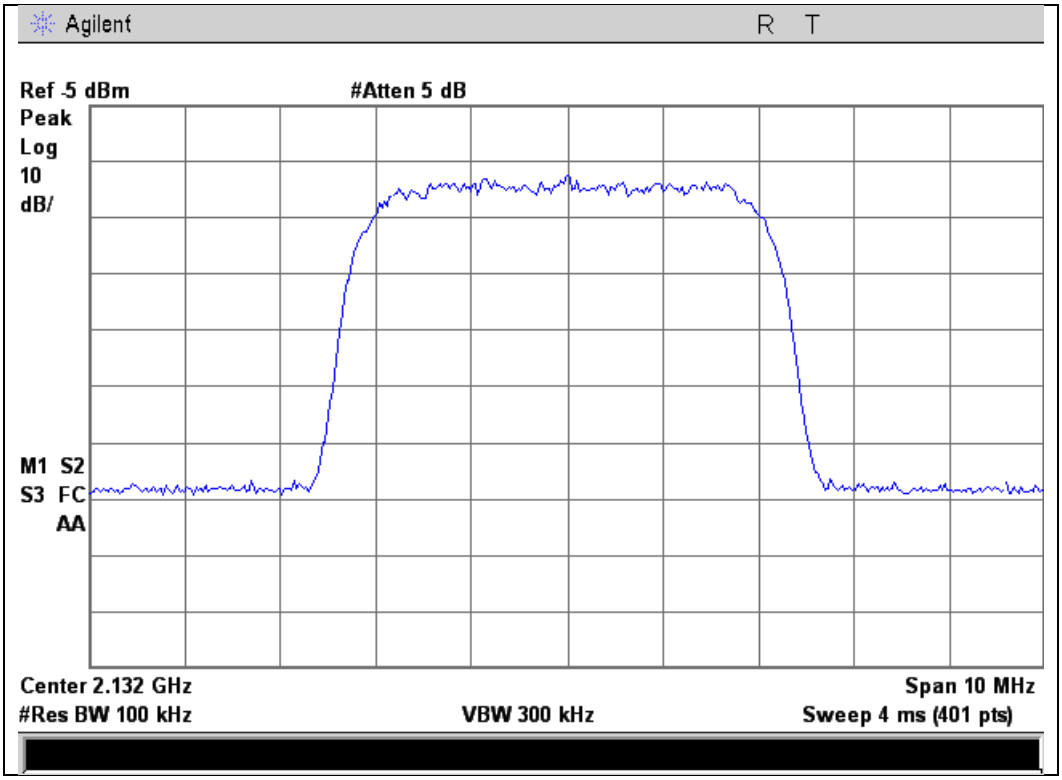


Output

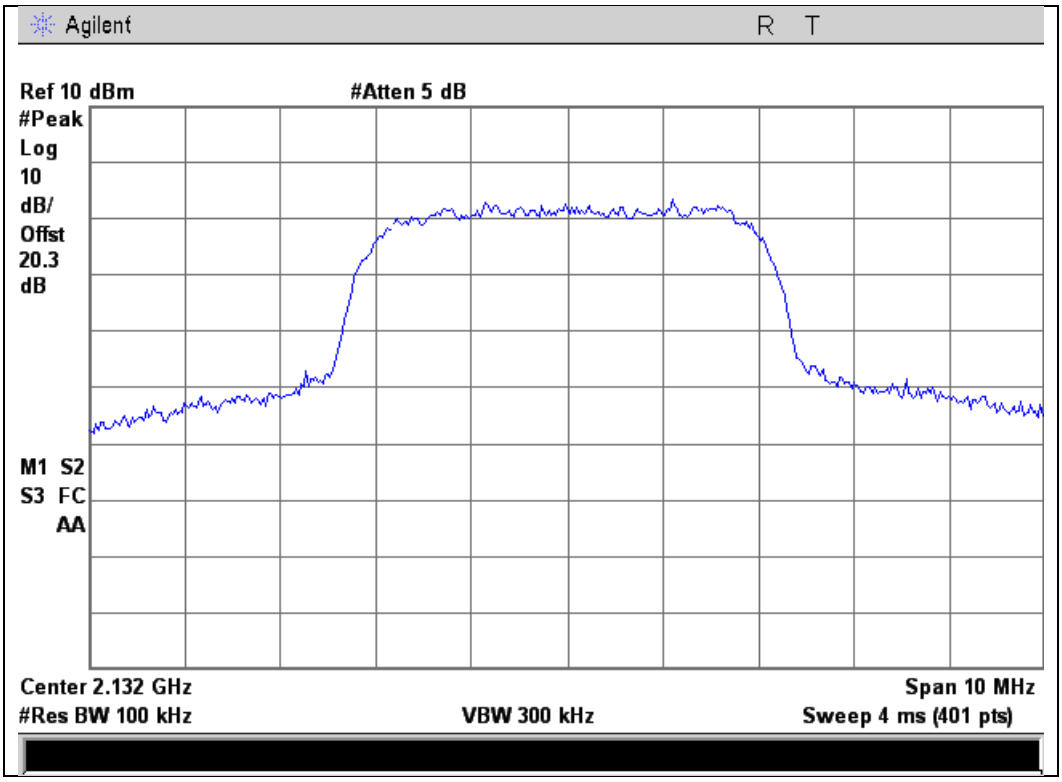


2110 - 2155 MHz Band

Input



Output



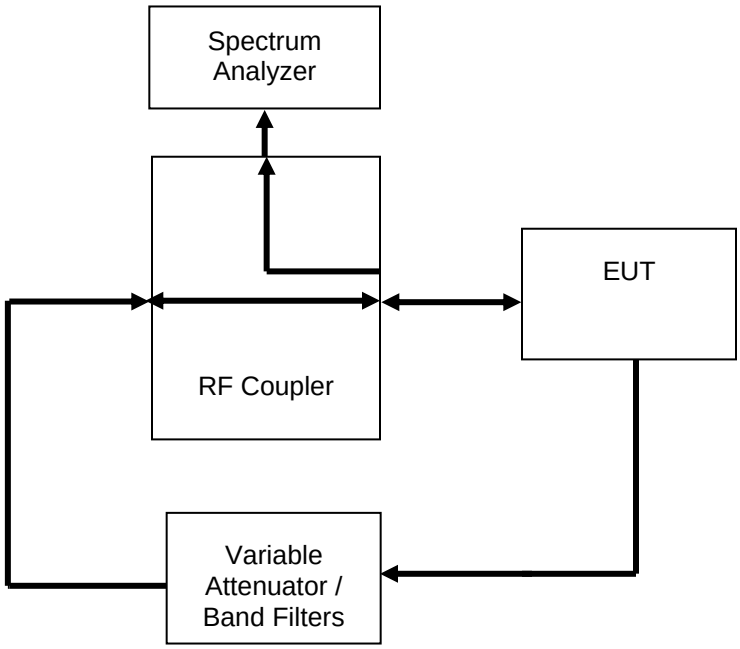
Oscillation Detection

Name of Test:	Oscillation Detection	**Engineer:**	Mike Graffeo
Test Equipment Utilized:	i00331, i00405, i00412	**Test Date:**	11/19/13

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
698 - 716	107.1	300	Pass
776 - 787	108.0	300	Pass
824 - 849	129.6	300	Pass
1710 - 1755	129.6	300	Pass
1850 - 1910	118.8	300	Pass

Downlink Detection Time Test Results

Frequency Band (MHz)	Measured Time (mS)	Limit (S)	Result
728 - 746	107.1	1	Pass
746 - 757	107.1	1	Pass
869 - 894	118.8	1	Pass
1930 - 1990	117.9	1	Pass
2110 - 2155	107.1	1	Pass

Uplink Restart Time Test Results

Frequency Band (MHz)	Measured Time (S)	Limit (S)	Result
698 - 716	65.45	≥60	Pass
776 - 787	65.45	≥60	Pass
824 - 849	65.62	≥60	Pass
1710 - 1755	65.62	≥60	Pass
1850 - 1910	65.45	≥60	Pass

Downlink Restart Time Test Results

Frequency Band (MHz)	Measured Time (mS)	Limit (mS)	Result
728 - 746	62.8	≥60	Pass
746 – 757	62.6	≥60	Pass
869 - 894	63.0	≥60	Pass
1930 - 1990	62.8	≥60	Pass
2110 - 2155	62.8	≥60	Pass

Uplink Restart Count Test Results

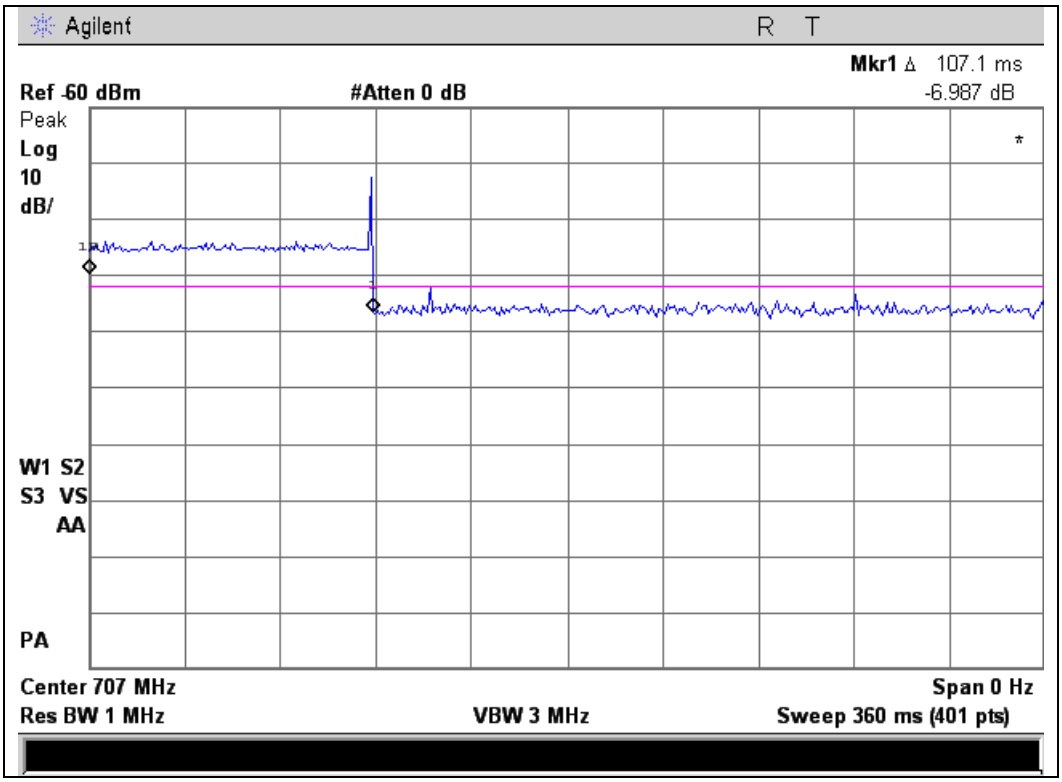
Frequency Band (MHz)	Restarts	Limit	Result
698 - 716	4	≤5	Pass
776 - 787	4	≤5	Pass
824 - 849	4	≤5	Pass
1710 - 1755	4	≤5	Pass
1850 - 1910	4	≤5	Pass

Downlink Restart Count Test Results

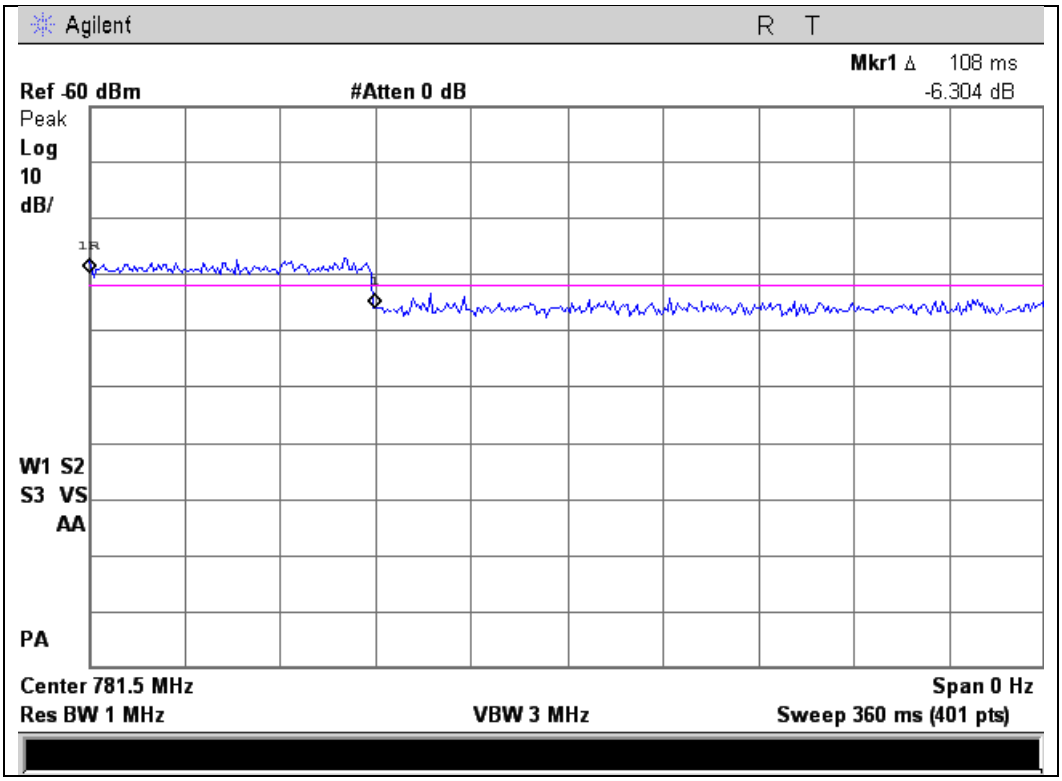
Frequency Band (MHz)	Restarts	Limit	Result
728 - 746	4	≤5	Pass
746 - 757	4	≤5	Pass
869 - 894	4	≤5	Pass
1930 - 1990	4	≤5	Pass
2110 - 2155	4	≤5	Pass

Uplink Detection Time Test Results

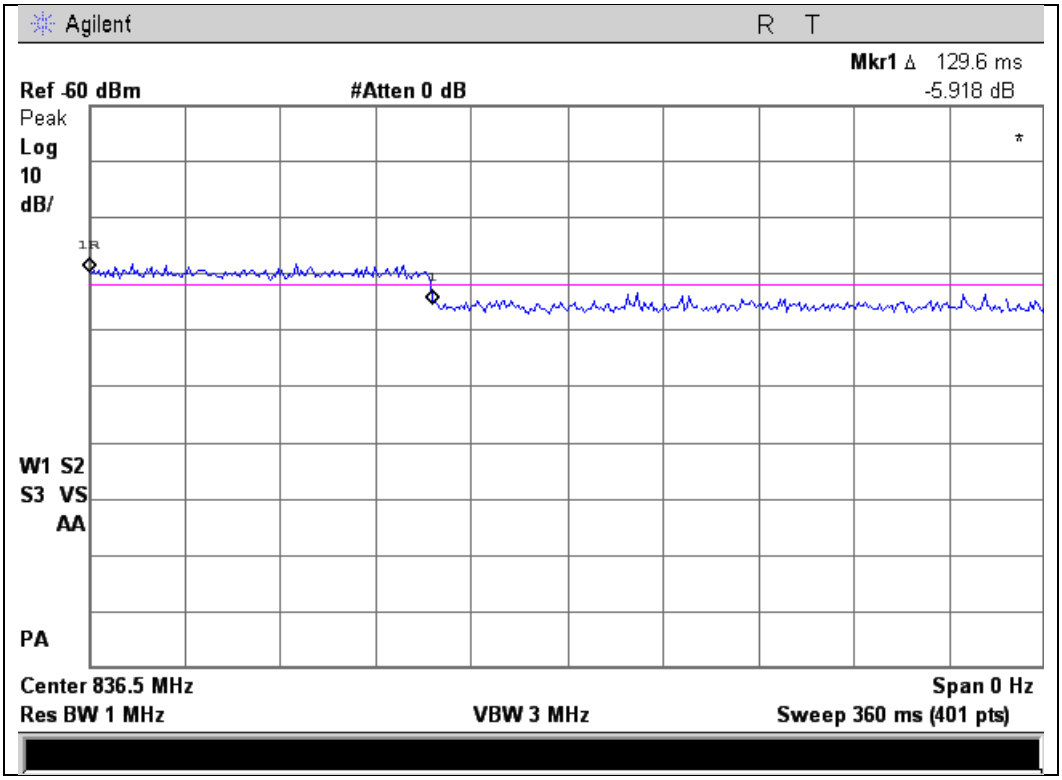
698 – 716 MHz Band



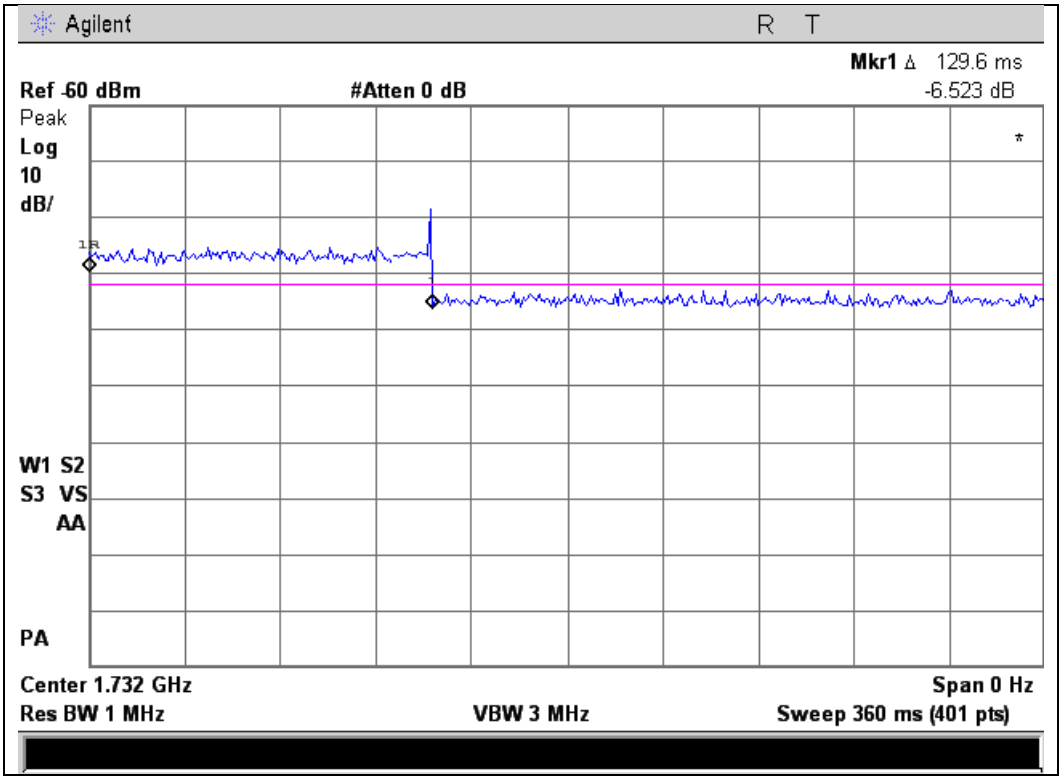
776 – 787 MHz Band



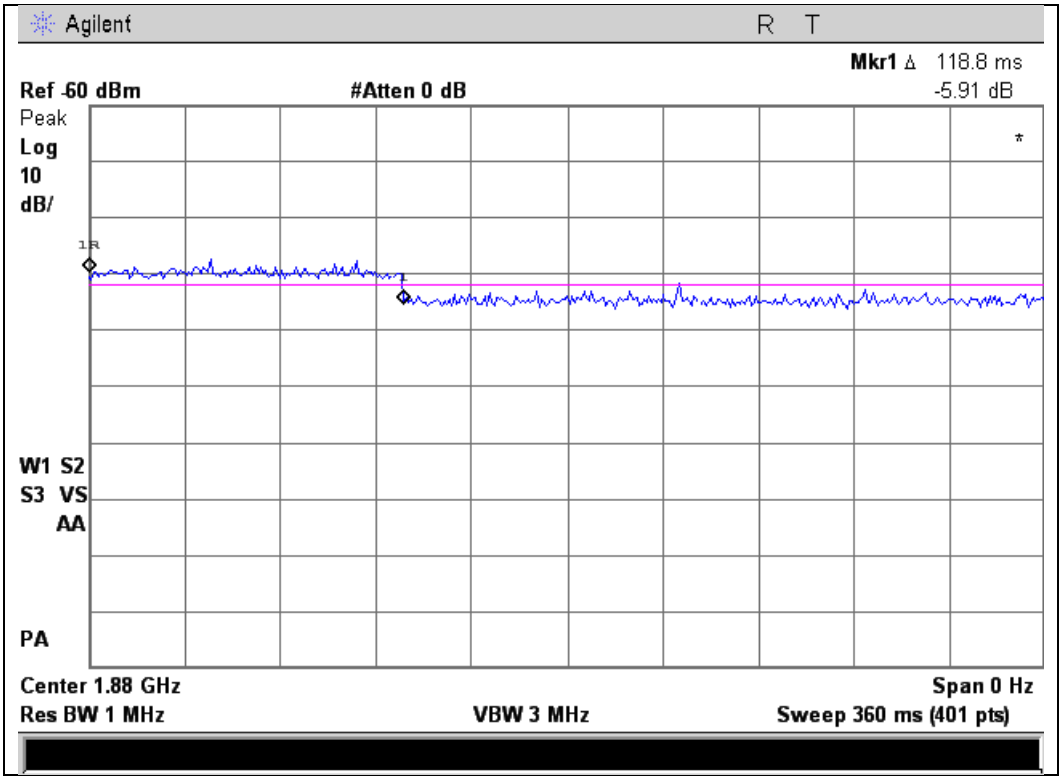
824 - 849 MHz Band



1710 - 1755 MHz Band

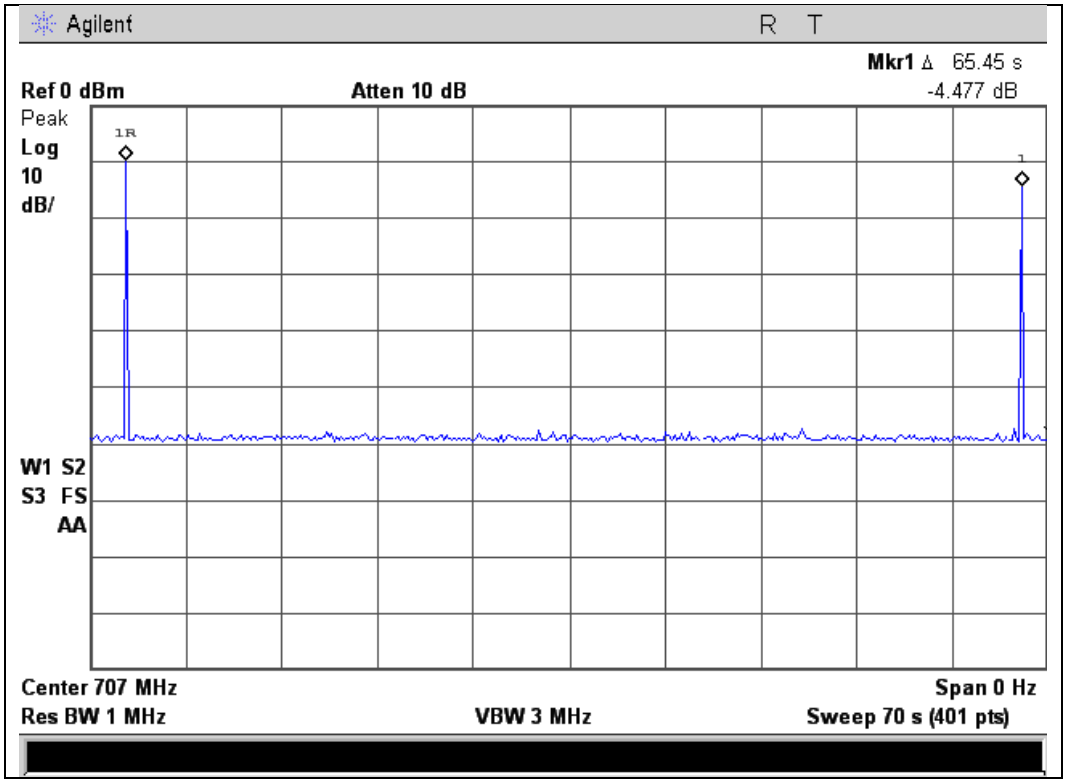


1850 - 1910 MHz Band

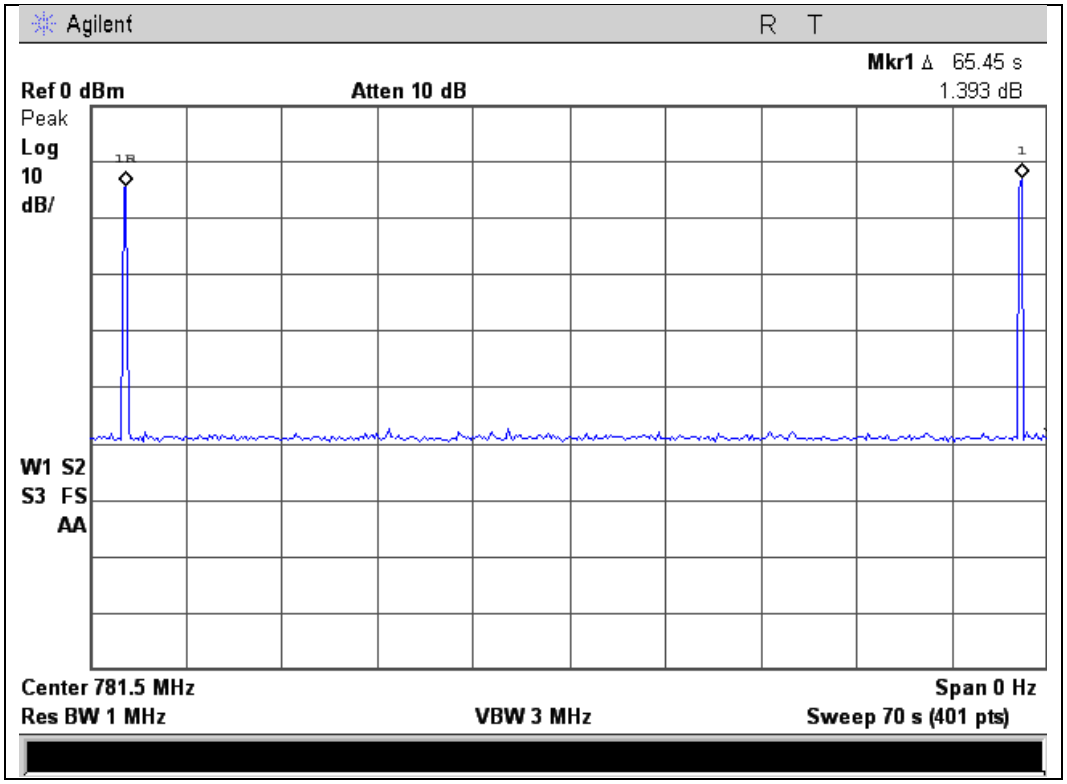


Uplink Restart Time Test Results

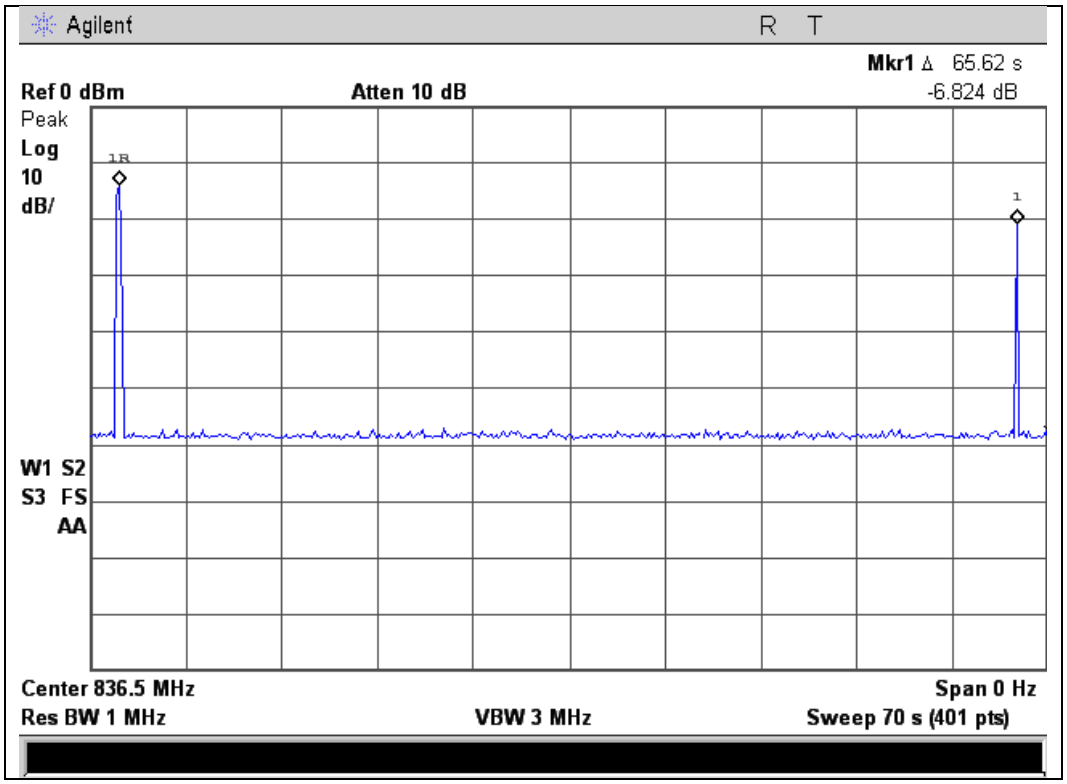
698 – 716 MHz Band



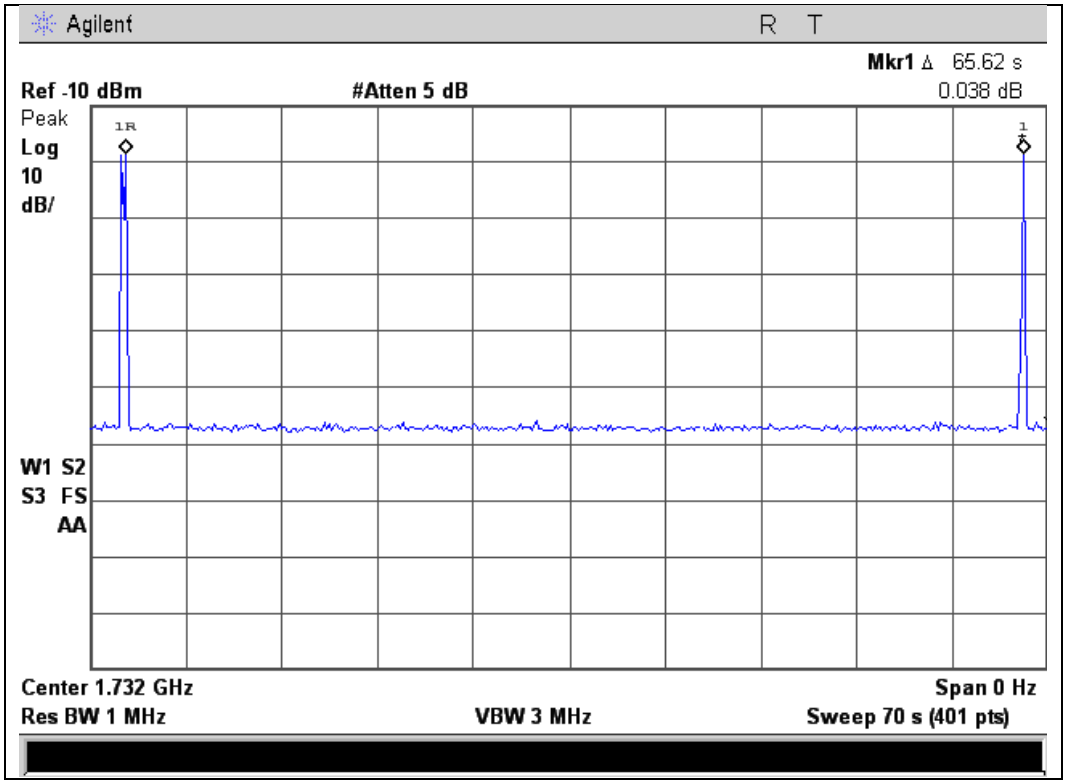
776 – 787 MHz Band



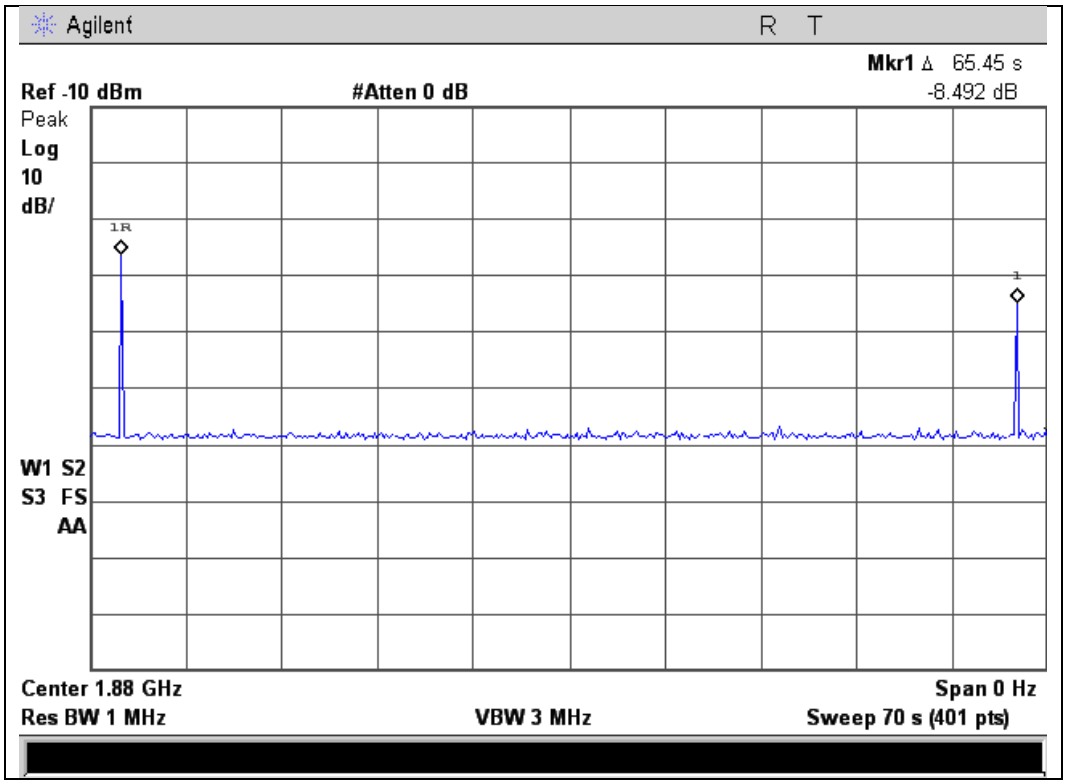
824 - 849 MHz Band



1710 - 1755 MHz Band

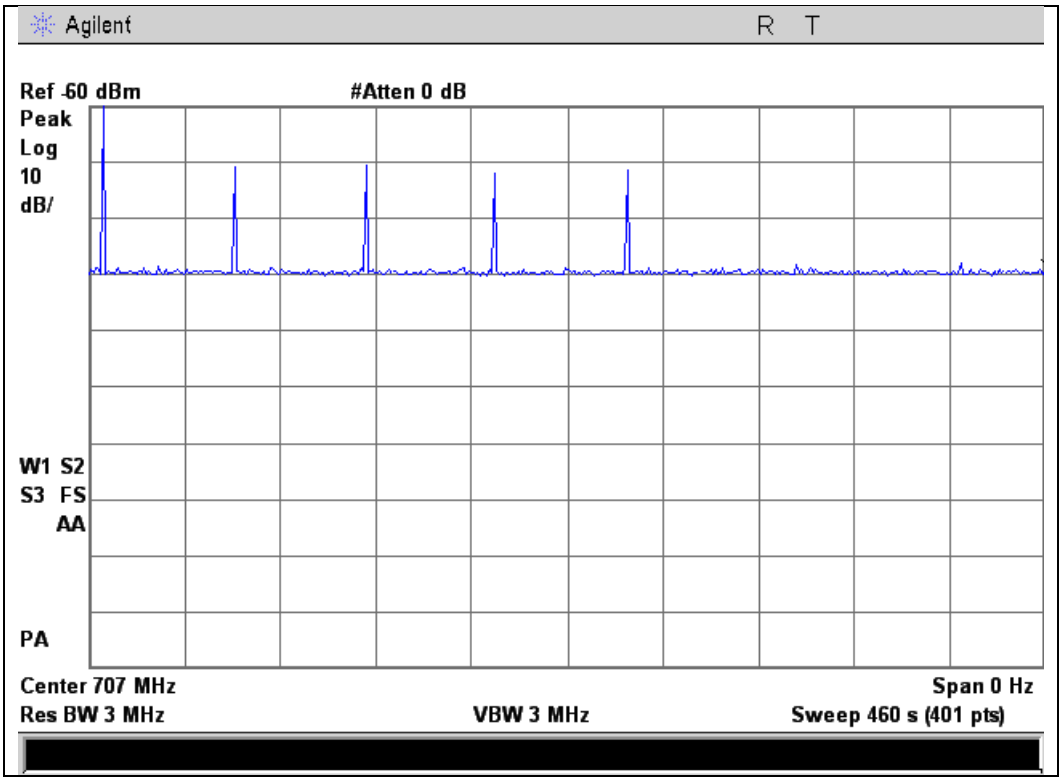


1850 - 1910 MHz Band

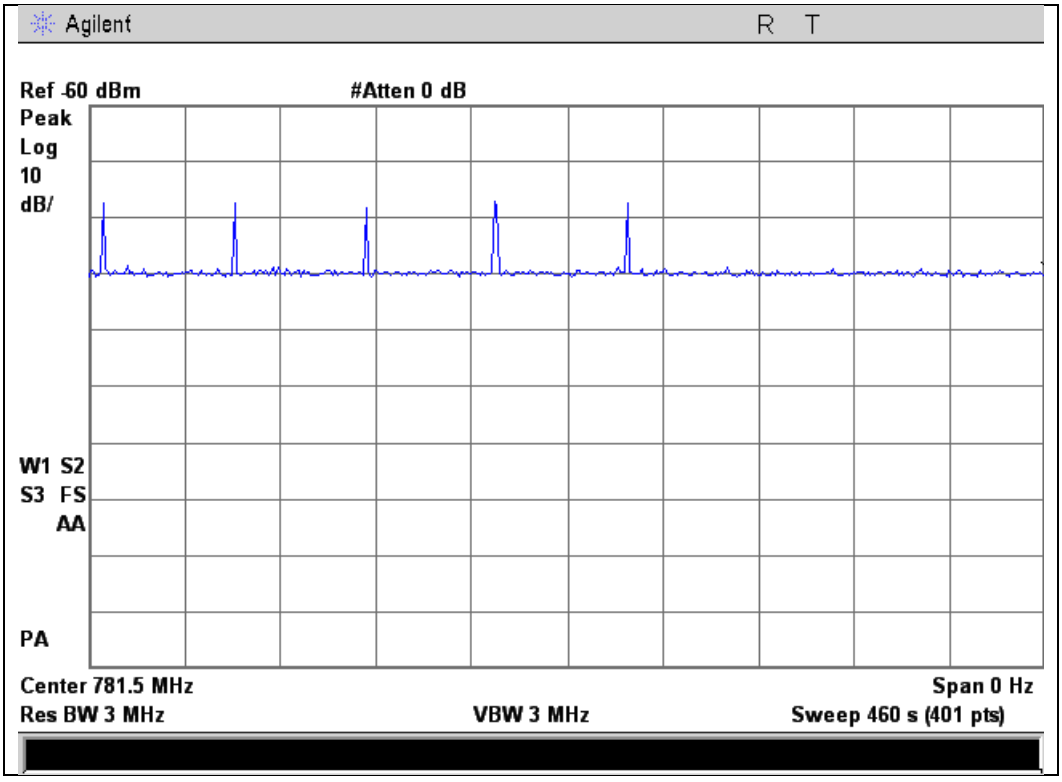


Uplink Restart Count Test Results

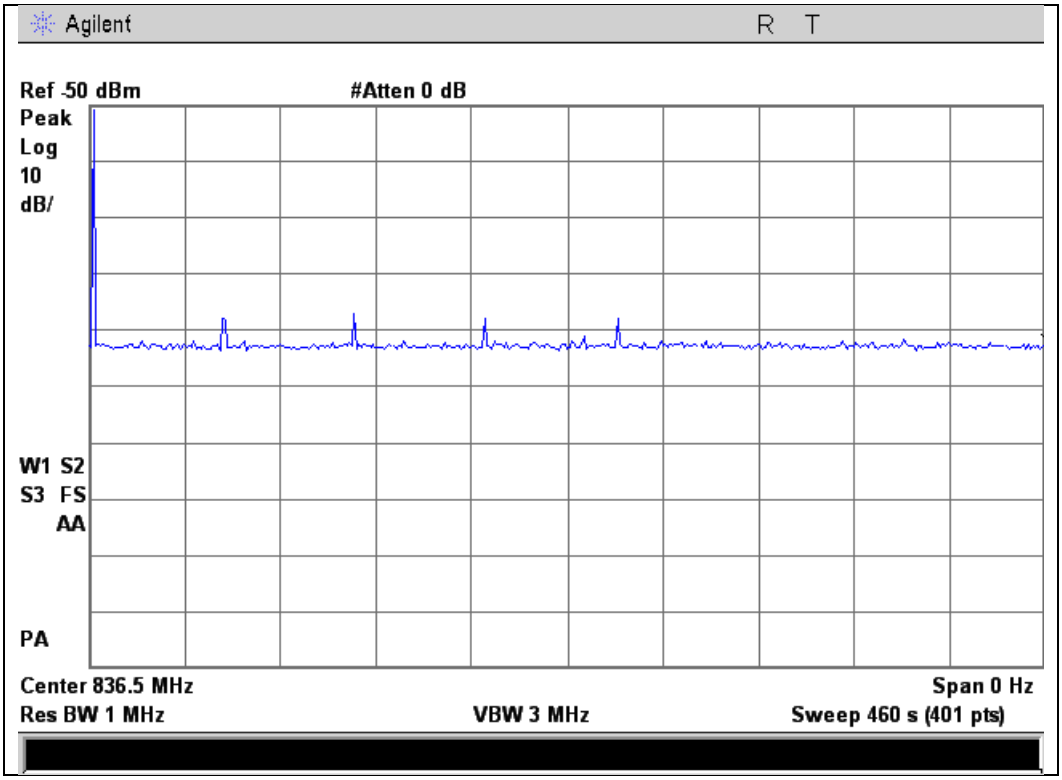
698 – 716 MHz Band



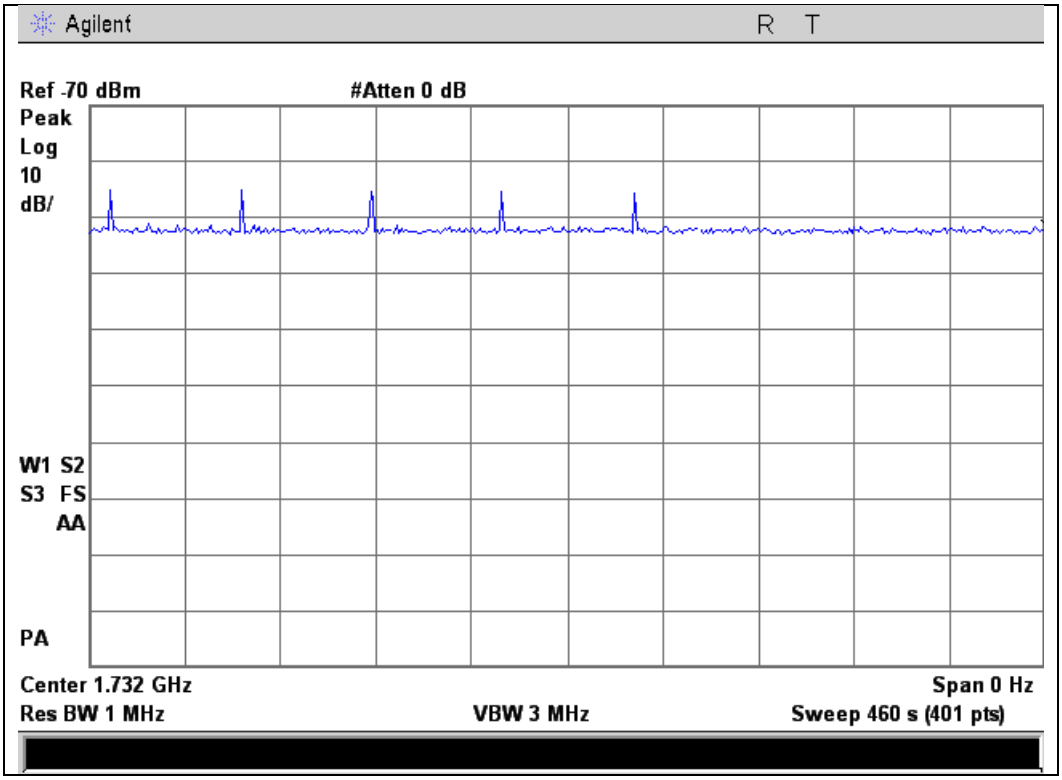
776 – 787 MHz Band



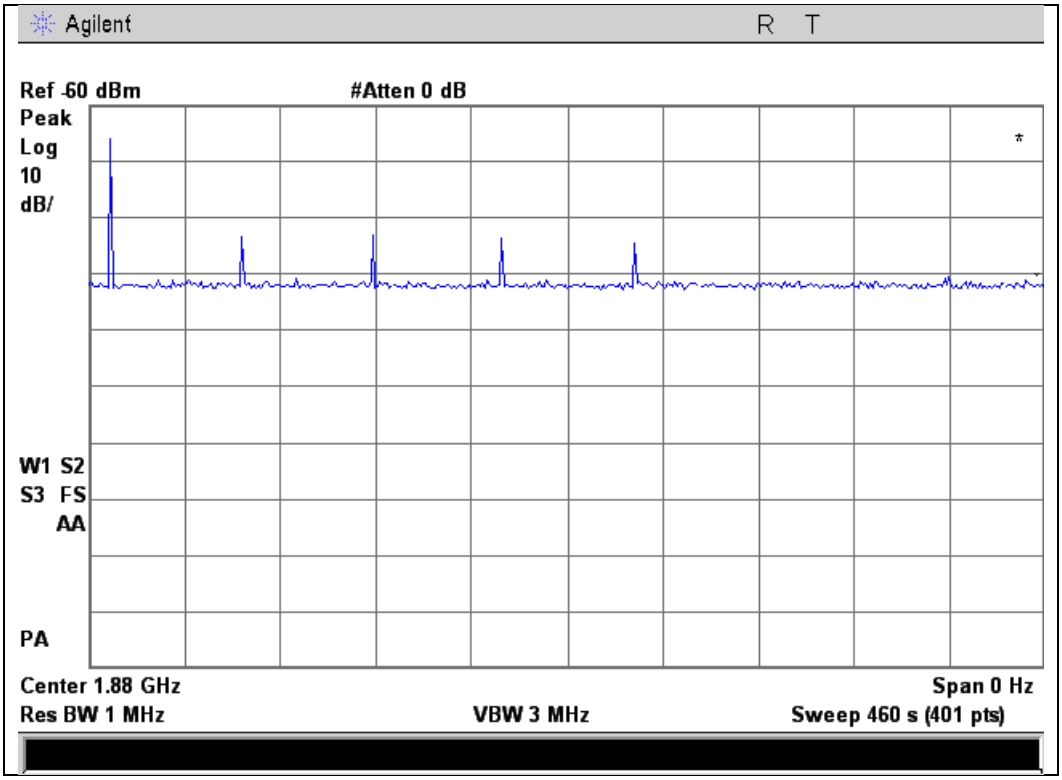
824 - 849 MHz Band



1710 - 1755 MHz Band

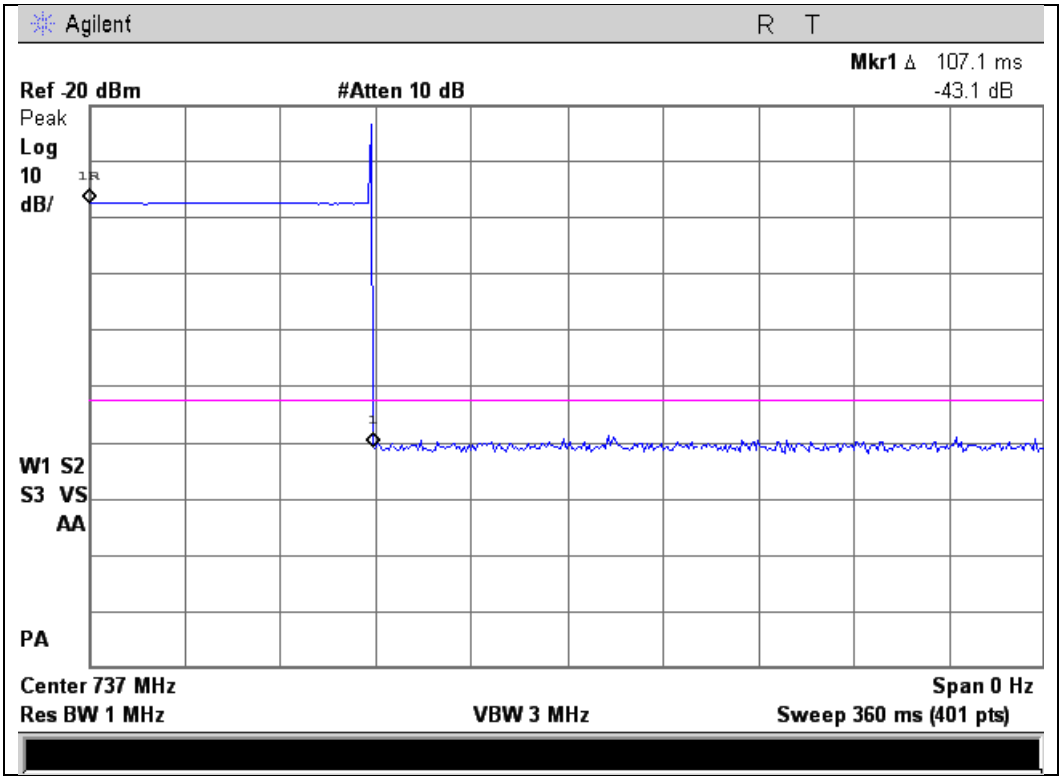


1850 - 1910 MHz Band

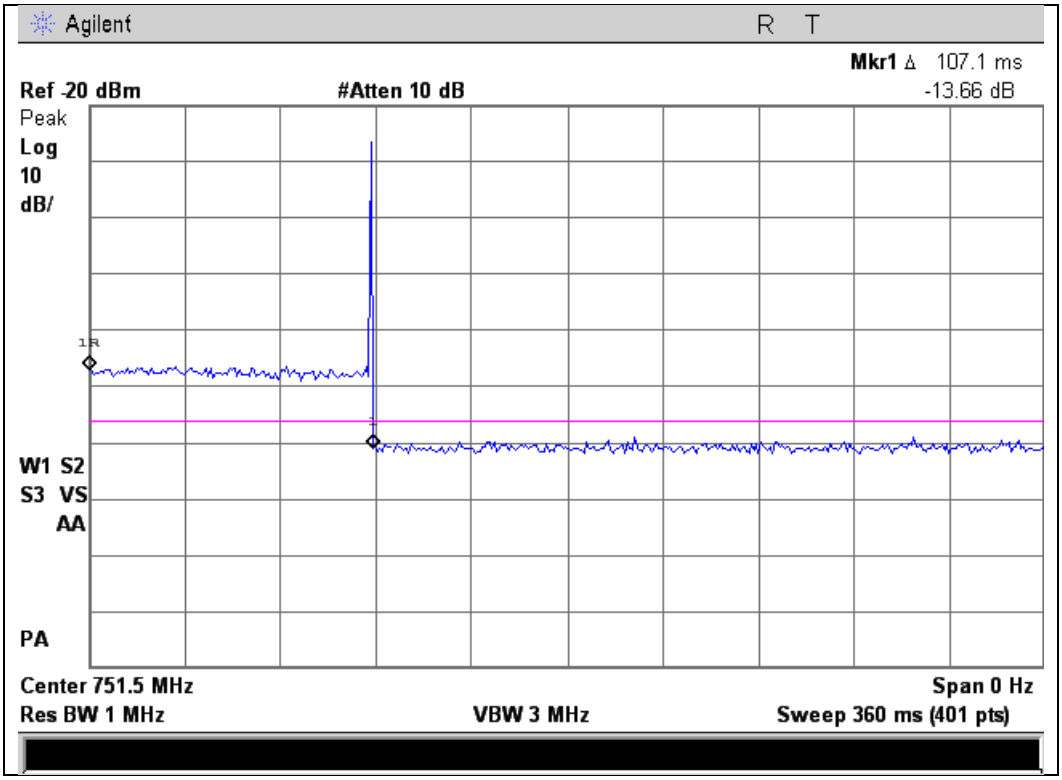


Downlink Detection Time Test Results

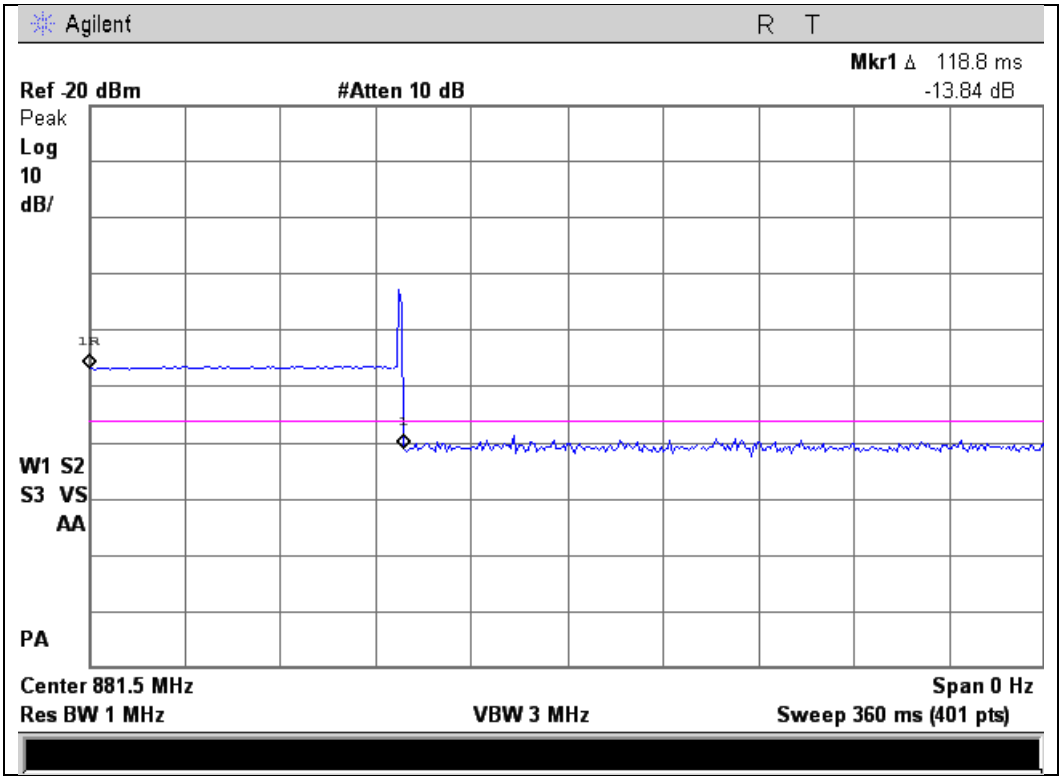
728 - 746 MHz Band



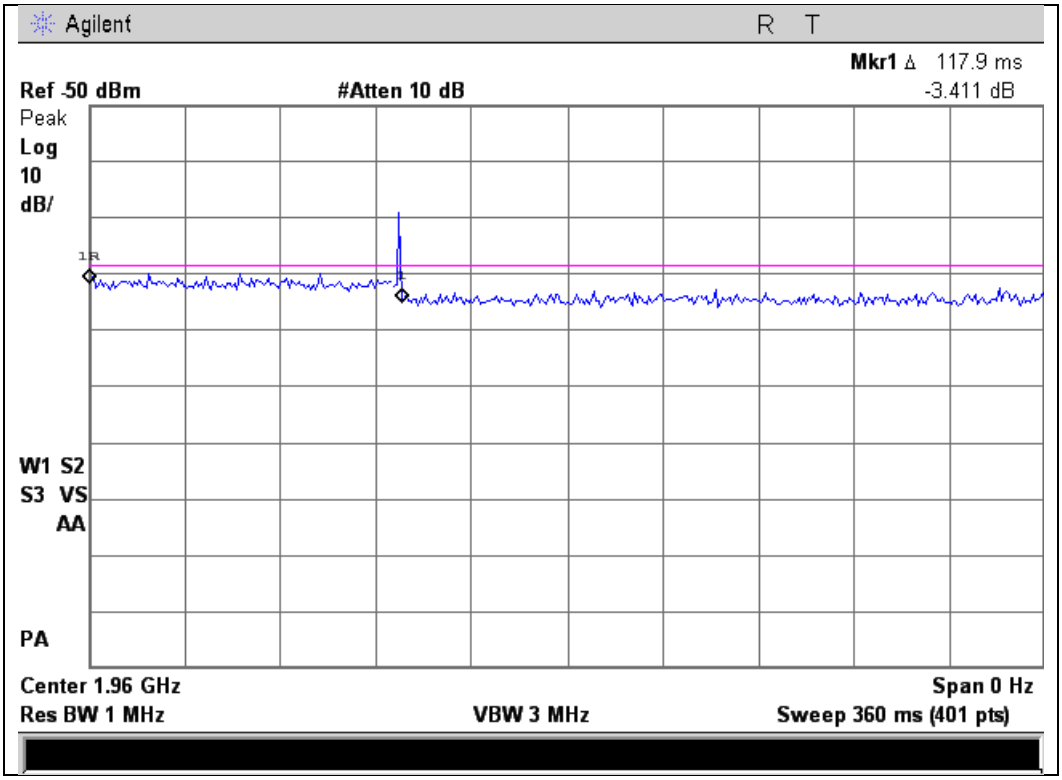
746 – 757 MHz Band



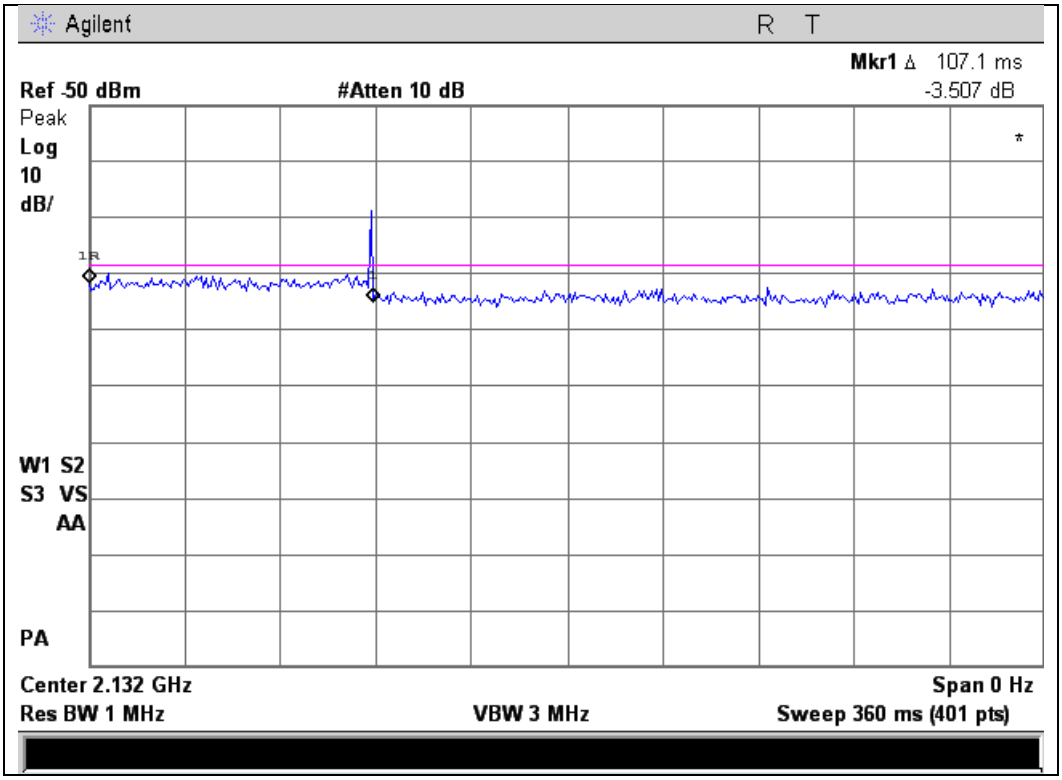
869 - 894 MHz Band



1930 – 1990 MHz Band

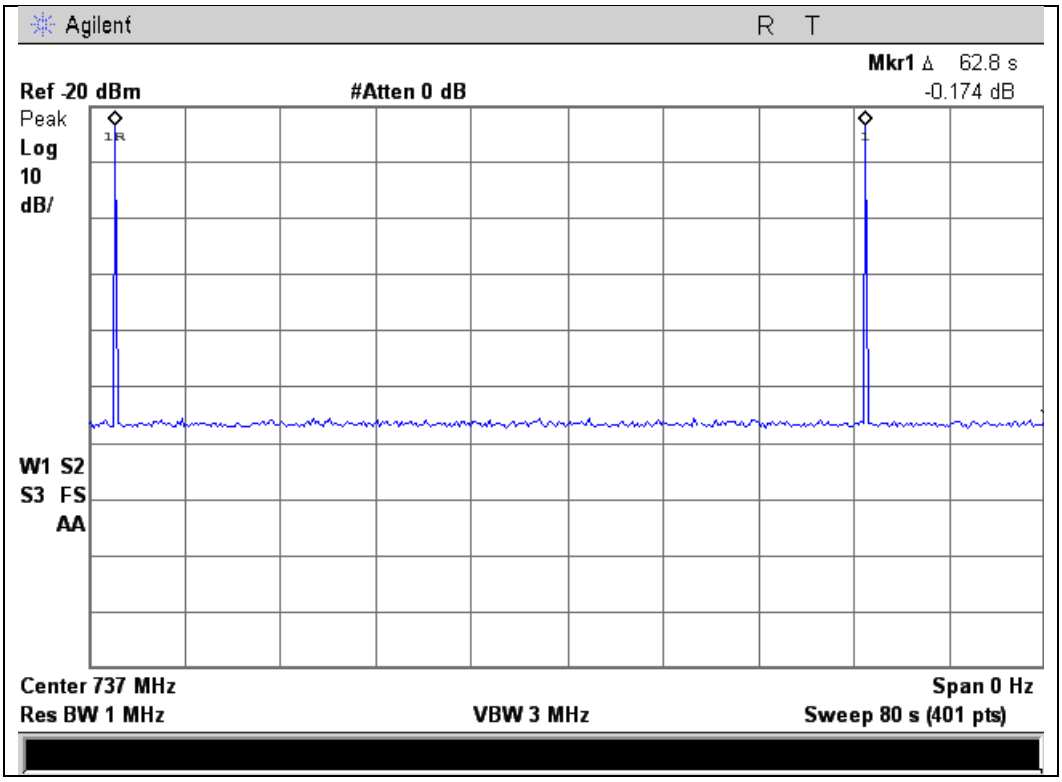


2110 - 2155 MHz Band

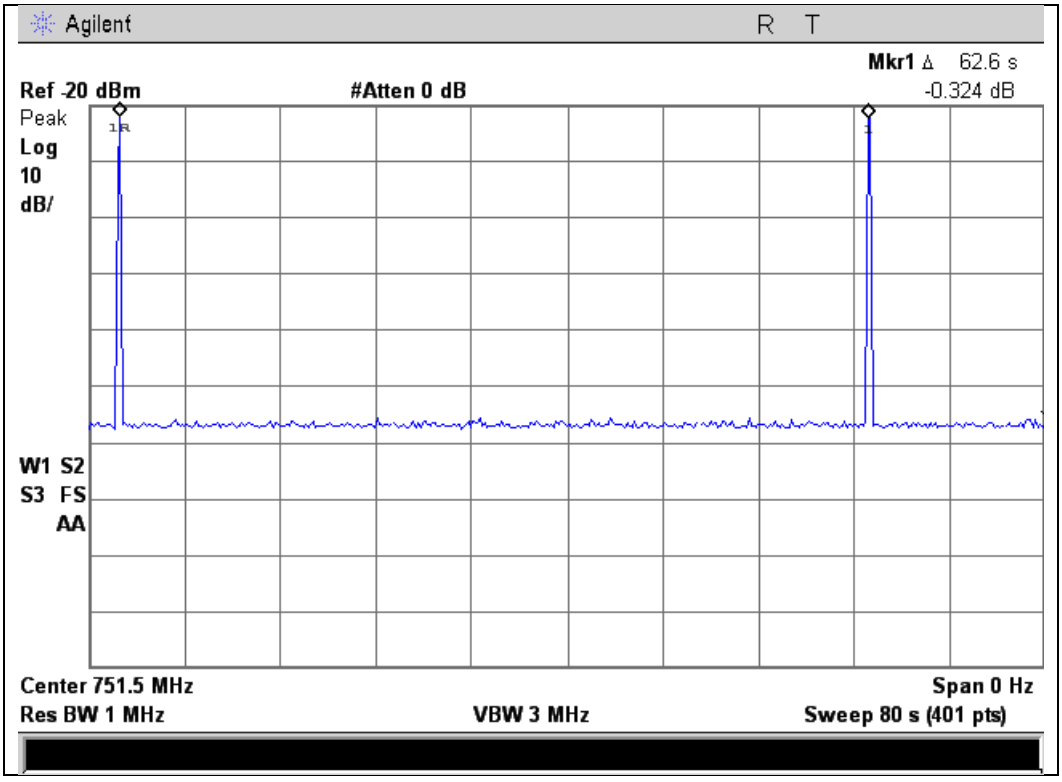


Downlink Restart Time Test Results

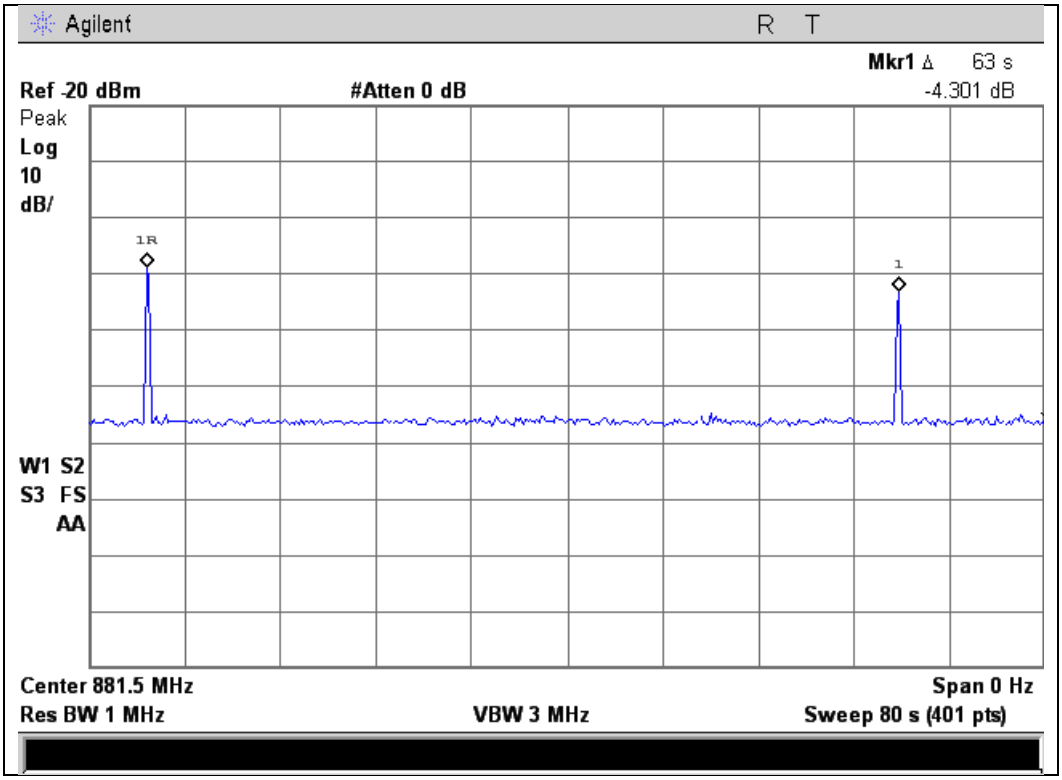
728 - 746 MHz Band



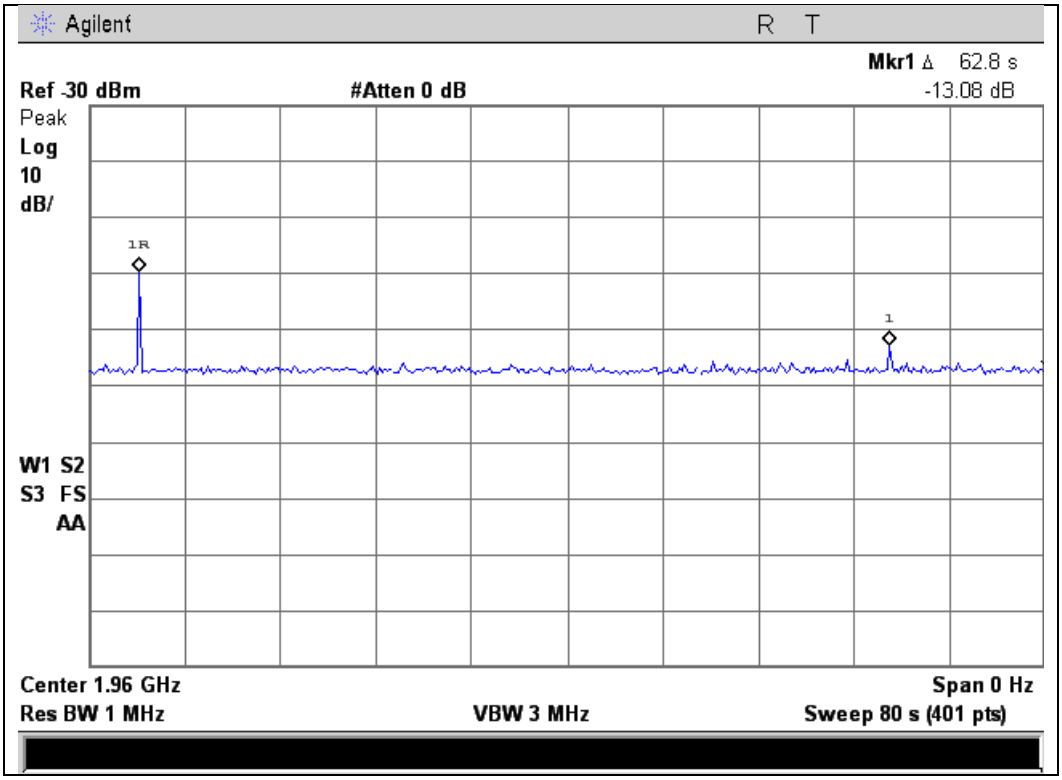
746 – 757 MHz Band



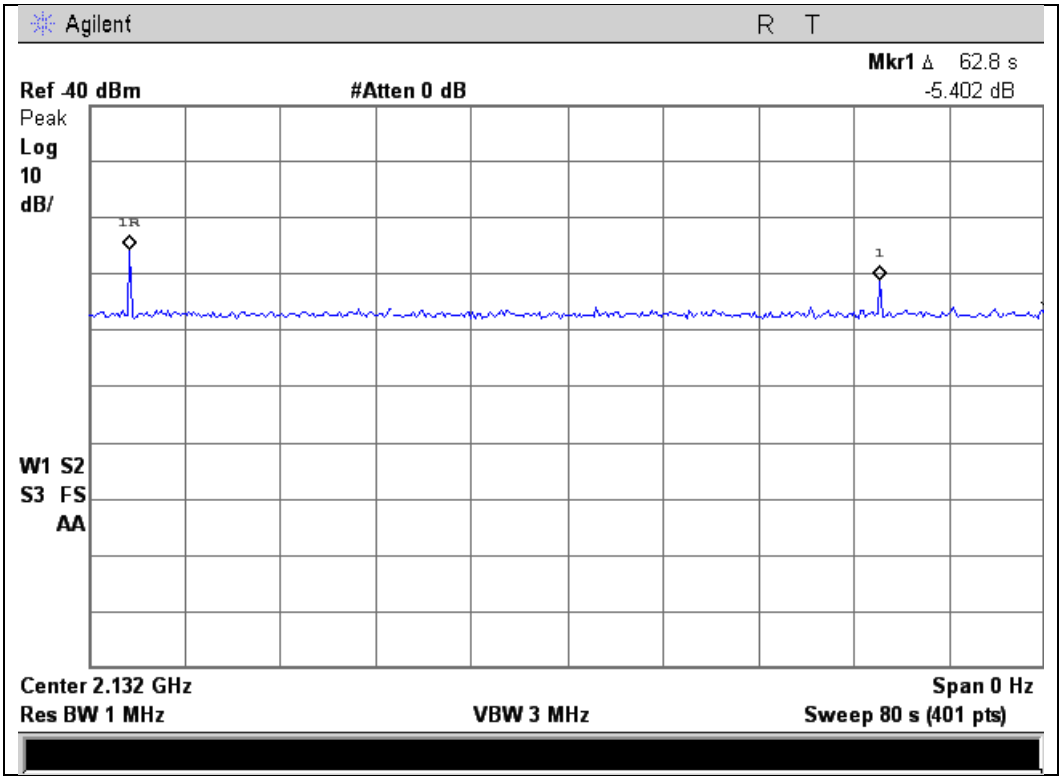
869 - 894 MHz Band



1930 – 1990 MHz Band

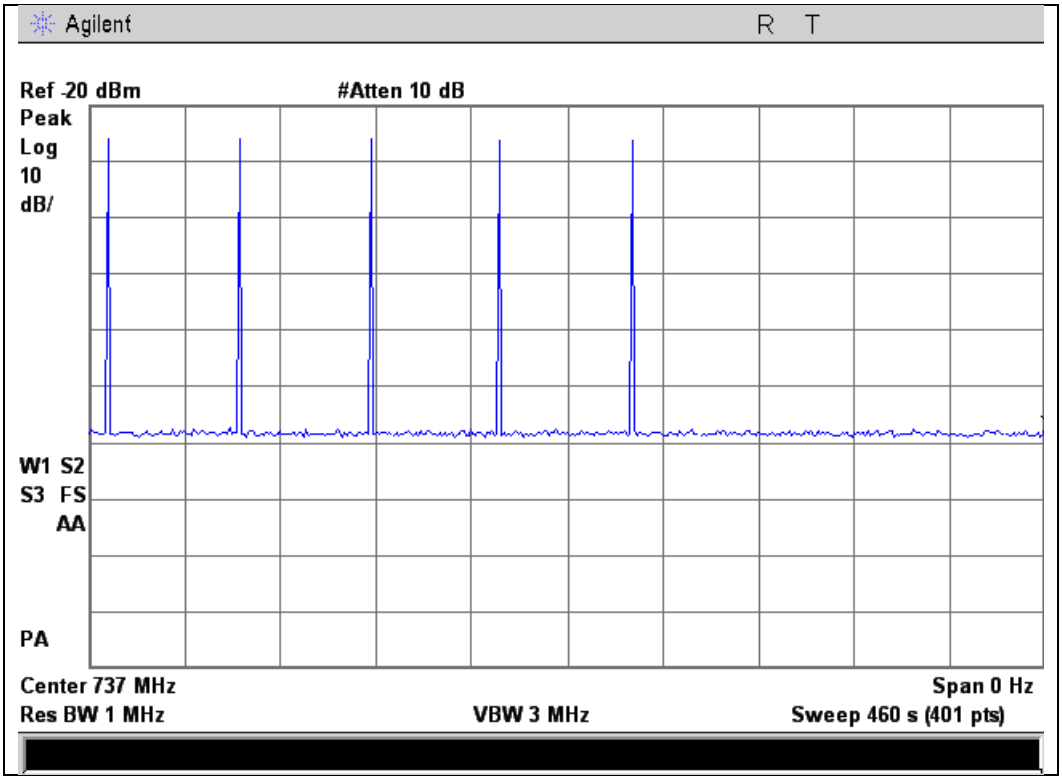


2110 - 2155 MHz Band

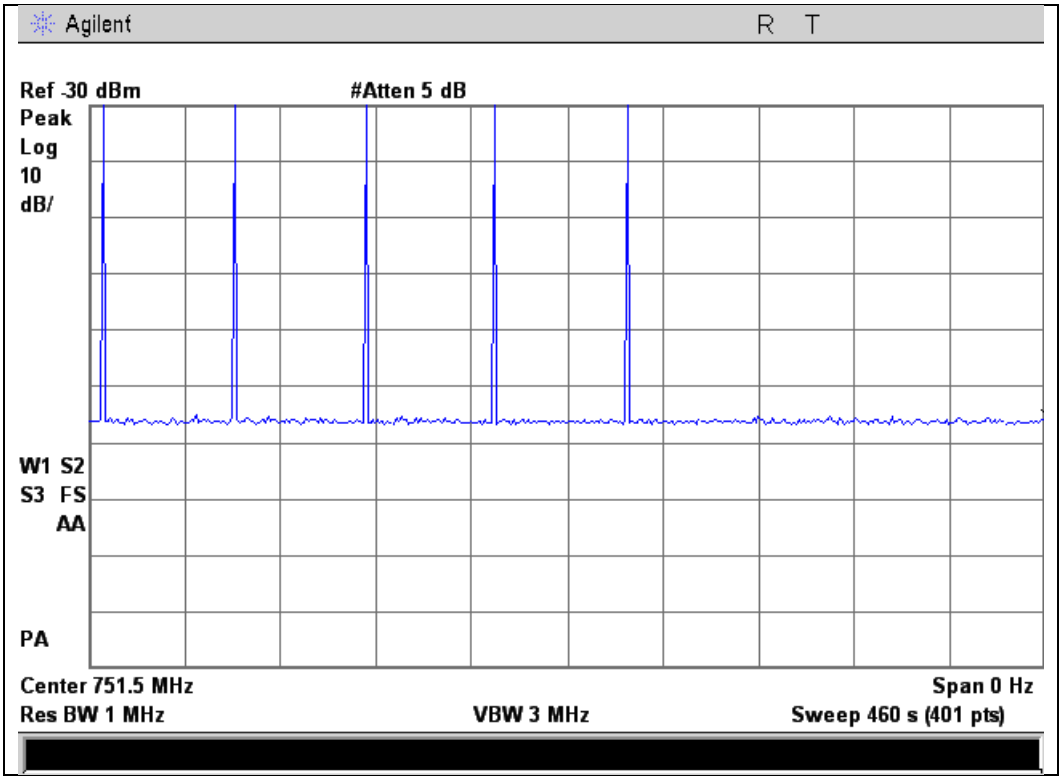


Downlink Restart Count Test Results

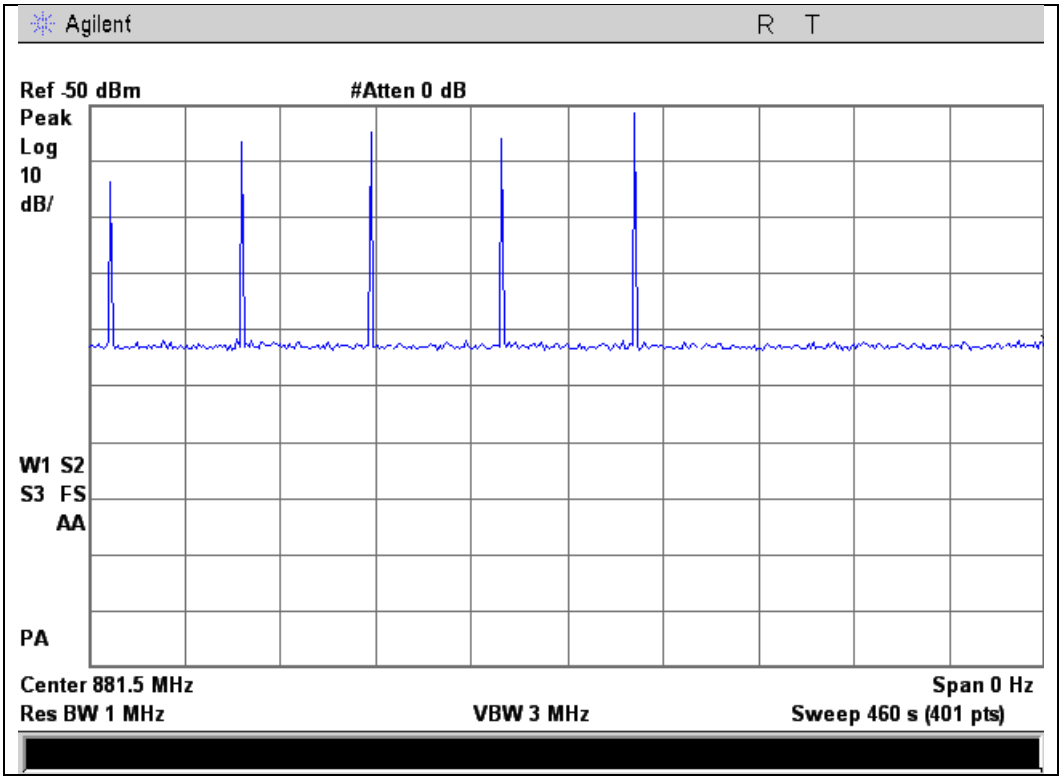
728 - 746 MHz Band



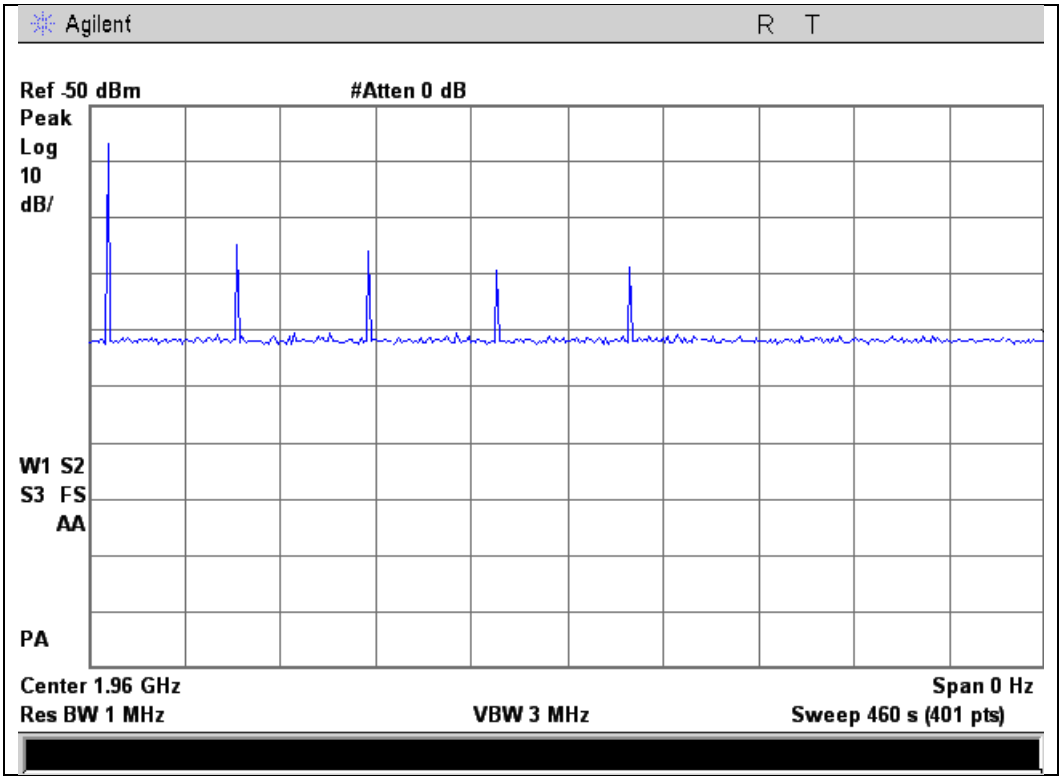
746 – 757 MHz Band



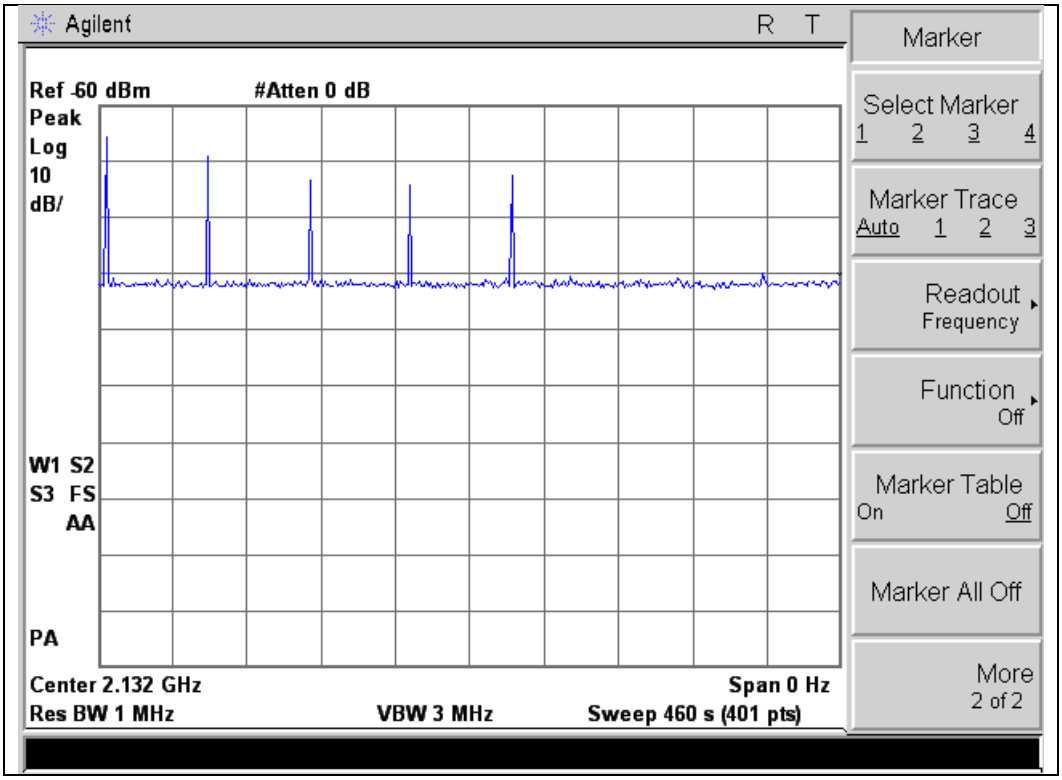
869 - 894 MHz Band



1930 – 1990 MHz Band



2110 - 2155 MHz Band



Radiated Spurious

Name of Test:	Radiated Spurious	**Engineer:** Mike Graffeo
Test Equipment Utilized:	i00405, i00334, i00103, i00331	**Test Date:** 11/19/13

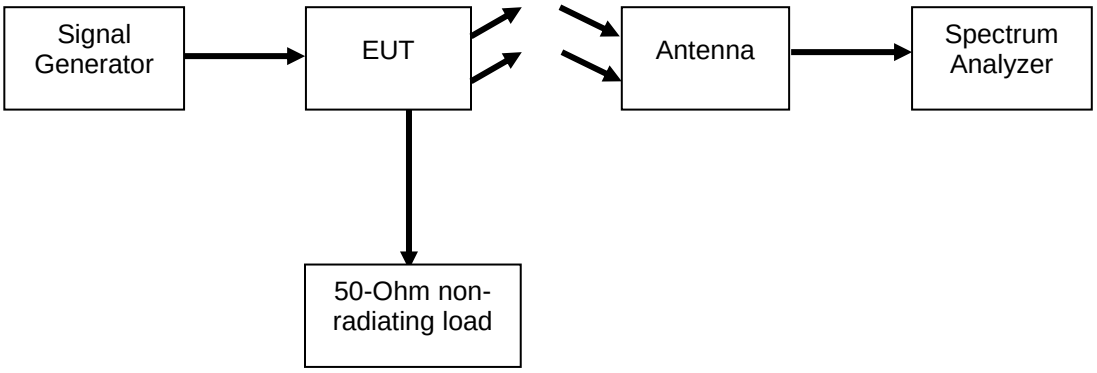
Test Procedure

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 = P1 – (43 + 10Log(P2))= -13dBm
where P1=power in dBm, and P2=power in Watt

Test Setup



Uplink Test Results

698 - 716MHz Band 707 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1414.0	-75.56	-13	Pass
2121.0	-70.93	-13	Pass
2828.0	-63.67	-13	Pass

776 - 787MHz Band 781.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1563.0	-72.00	-13	Pass
2344.5	-67.54	-13	Pass
3126.0	-52.67	-13	Pass

824 - 849 MHz Band 836.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1673.0	-65.42	-13	Pass
2509.5	-66.97	-13	Pass
3346.0	-52.38	-13	Pass

1710 - 1755 MHz Band 1732.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3465.0	-40.57	-13	Pass
5197.5	-48.46	-13	Pass
6930.0	-43.95	-13	Pass

1850 - 1910 MHz Band 1880 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3760.0	-50.48	-13	Pass
5640.0	-47.83	-13	Pass
7520.0	-35.35	-13	Pass

Downlink Test Results

728 - 746 MHz Band 737 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1474.0	-67.87	-13	Pass
2211.0	-63.27	-13	Pass
2948.0	-61.96	-13	Pass

746 - 757MHz Band 751.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1503.0	-71.41	-13	Pass
2254.5	-64.87	-13	Pass
3006.0	-49.38	-13	Pass

869 - 894 MHz Band 881.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
1763.0	-67.23	-13	Pass
2644.5	-60.32	-13	Pass
3526.0	-51.32	-13	Pass

1930 - 1990MHz Band 1960 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3920.0	-48.83	-13	Pass
5880.0	-49.38	-13	Pass
7840.0	-42.63	-13	Pass

2110 - 2155 MHz Band 2132.5 MHz Tuned Frequency

Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
4265.0	-53.03	-13	Pass
6397.5	-46.94	-13	Pass
8530.0	-38.90	-13	Pass

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

Test Equipment Utilized

Description	Manufacturer	Model Number	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3115	i00103	12/11/12	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:10/15/13	
Vector Signal Generator	Agilent	E4438C	i00348	1/4/13	1/4/14
EMI Analyzer	Agilent	E7405A	i00379	11/21/12	11/21/13
* 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	

* Note a 30 day calibration extension was issued for the equipment
** This equipment was calibrated in Dec 2013 prior to the addition testing performed in January 2014

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

END OF TEST REPORT