



# H.B. Compliance Solutions

## Intentional Radiator Test Report

For the

**Wilson Electronics.**

**Quint Band Bi-Directional Amplifier Model # 460019**

Tested under

FCC Part 20

For Direct Connect Consumer Signal Booster

**Prepared for:**

Wilson Electronics

3301 E. Desert Drive,

St. George, UT 8479085224

**Prepared By:**

H.B. Compliance Solutions

5005 S. Ash Avenue, Suite # A-10

Tempe, Arizona 85282

**Reviewed By:**

Hoosamuddin Bandukwala



Cert # ATL-0062-E

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedure indicated, I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

## Report Status Sheet

Revision #	Report Date	Reason for Revision
∅	November 14, 2014	Initial Issue
1	December 20,2014	Update plots for out of band emissions
2	January 07,2014	Updated table 7 &10
3	January 07,2014	Updated column header in Table 17

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## EXECUTIVE SUMMARY

### 1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 20. All tests were conducted using measurement procedure from FCC Signal Booster Measurement KDB 935210 D03 v02r01 July 24, 2014 as appropriate.

Test Name	Test Method/Standard	Result	Comments
Authorized Frequency Band	20.21(e)(3)	Pass	
Maximum Power & Booster Gain	20.21(e)(8)(i)(B) 20.21(e)(8)(i)(C) 20.21(e)(8)(i)(D)	Pass	
Intermodulation	20.21(e)(8)(i)(F)	Pass	
Out-of-Band Emissions	20.21(e)(8)(i)(E)	Pass	
Conducted Spurious Emissions	2.1051	Pass	
Noise Limits	20.21(e)(8)(i)(A) 20.21(e)(9)(i)(I)	Pass	If noise is less than -70dBm/MHz then EUT will not shut off therefore following test are N/A 1) Variable Uplink Noise Power Test 2) Noise Timing Test
Uplink Inactivity	20.21(e)(8)(i)(I) 20.21(e)(9)(i)(J)	N/A	Since noise is less than -70dBm/MHz in normal mode the EUT will not exceed this level after 5 mins when not serving an active device therefore following test are N/A
Variable Booster Gain	20.21(e)(8)(i)(C)	Pass	
Occupied Bandwidth	2.1049	Pass	
Oscillation Detection	20.21(e)(8)(ii)(A)	Pass	
Radiated Spurious Emissions	2.1053	Pass	
Spectrum Block Filtering	20.21(e)(8)(i)(B)	N/A	Applies to devices utilizing spectrum block filtering, In this case this is not applicable

## EQUIPMENT CONFIGURATION

### 1. Overview

H.B Compliance Solutions was contracted by Wilson Electronics to perform testing on the Bi-Directional Amplifier Model # 460019 under the purchase order number PO460019-HB.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Wilson Electronics, Bi-Directional Amplifier Model # 460019.

The tests were based on FCC Part 20 Rules. The tests described in this document were formal tests as described with the objective of the testing was to evaluate compliance of the Equipment Under Test (EUT) to the requirements of the aforementioned specifications. Wilson Electronics should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been permanently discontinued. The results obtained relate only to the item(s) tested.

<b>Product Name:</b>	Quint Band Bi-Directional Amplifier
<b>Model(s) Tested:</b>	460019
<b>FCC ID:</b>	None
<b>Supply Voltage Input:</b>	Primary Power : 5.0 Vdc
<b>Frequency Range:</b>	Uplink 824-849MHz, 1850-1915MHz, 1710-1755, 698-716 & 776-787MHz Downlink 728-746MHz, 746-757MHz, 869-894MHz, 1930-1995MHz & 2110-2155MHz
<b>No. of Channels:</b>	N/A
<b>Type(s) of Modulation:</b>	CDMA, GSM, EDGE, HSPA, EVDO, LTE
<b>Range of Operation Power:</b>	0.254 – 0.362W
<b>Emission Designator:</b>	F9W, GXW, G7W & G7D
<b>Channel Spacing(s)</b>	N/A
<b>Test Item:</b>	Pre-Production
<b>Type of Equipment :</b>	Direct Connect
<b>Antenna Requirement</b>	External
<b>Environmental Test Conditions:</b>	Temperature: 15-35°C Humidity: 30-60% Barometric Pressure: 860-1060 mbar
<b>Modification to the EUT:</b>	None
<b>Evaluated By:</b>	Staff at H.B. Compliance Solutions
<b>Test Date(s):</b>	09/26/14 till 10/09/14

## 2. Test Facility

Radiated Emission testing was performed at Artesyn Embedded Technologies. This facility is located at 2900 S. Diablo Way, Suite 190, Tempe, AZ 85282. All equipment used in making physical determination is accurate and bears recent traceability to the National Institute of Standards and Technology.

Test facility at Emerson Network power is an A2LA accredited test site. The A2LA certificate number is 2716.01. The scope of accreditation covers the FCC Method - 47 CFR Part 15, ICES-003, CISPR 22, AS/NZS 3548 and VCCI.

Conducted testing was performed at H.B. Compliance Solutions. This facility is located at 5005 S. Ash Avenue, Suite # A-10, Tempe AZ 85282.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at Emerson Network Power.

## 3. Description of Test Sample

The Wilson Electronics is a quint band bi-directional amplifier used for enhancing the range of cell phones and data communication devices in in-building applications. The components are contained in a metal enclosure. It runs off 5 volt DC power

## 4. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
# 1	Quint Band Bi-Directional Amplifier	460019	46001999012941631

Table 1. Equipment Configuration

## 5. Support Equipment

All support equipment supplied is listed in the following Support Equipment List.

Ref ID	Name / Description	Manufacturer	Model #	Serial #
N/A	-	-	-	-

Table 2. Support Equipment

## 6. Ports and Cabling Information

Ref ID	Port name on the EUT	Cable Description	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
#2	Power	2 wire	1	1	N	DC Power Supply

Table 3. Ports and Cabling Information

## 7. Method of Monitoring EUT Operation

A test receiver will be used to monitor the data transmission from the EUT.

## 8. Mode of Operation

The EUT will be configured as defined in the FCC KDB 935210 D03 guidance document. These settings were created for testing purpose only.

## 9. Modifications

### 9.1 Modifications to EUT

No modifications were made to the EUT

### 9.2 Modifications to Test Standard

No Modifications were made to the test standard.

## 10. Disposition of EUT

The test sample including all support equipment submitted to H.B Compliance Solutions for testing will be returned to Wilson Electronics upon completion of testing & certification

## Criteria for Intentional Radiators

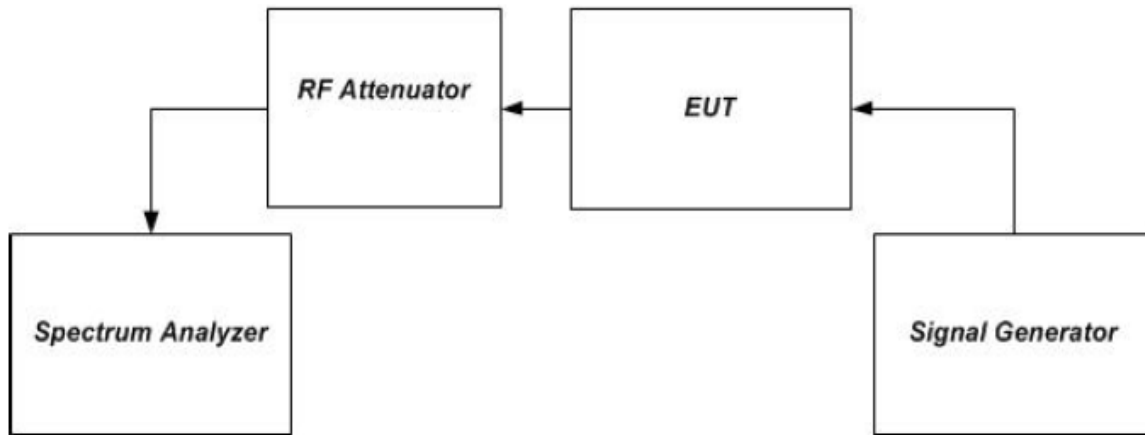
### 1. Authorized Frequency Band

<b>Test Requirement(s):</b>	§20.21(e)(3)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	Oct/29/14

**Test Procedures:** As required by 47 CFR §20.21(e)(3), Authorized frequency band measurements were made at the RF output terminals of the EUT.

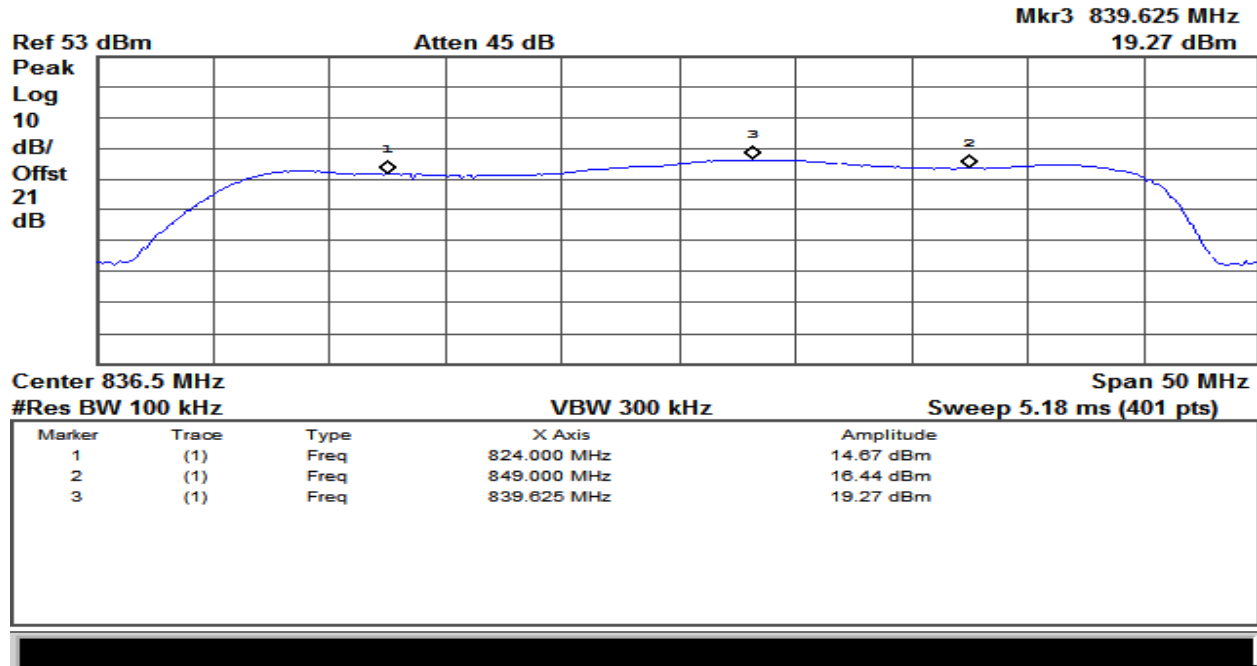
The EUT was connected through an attenuator to a Spectrum Analyzer. A signal generator was used for the input to the EUT to provide a CW signal tuned to the center channel of each uplink and downlink operational band. Measurements were made at the low and high channels of each uplink and downlink frequency band.

**Test Setup:**

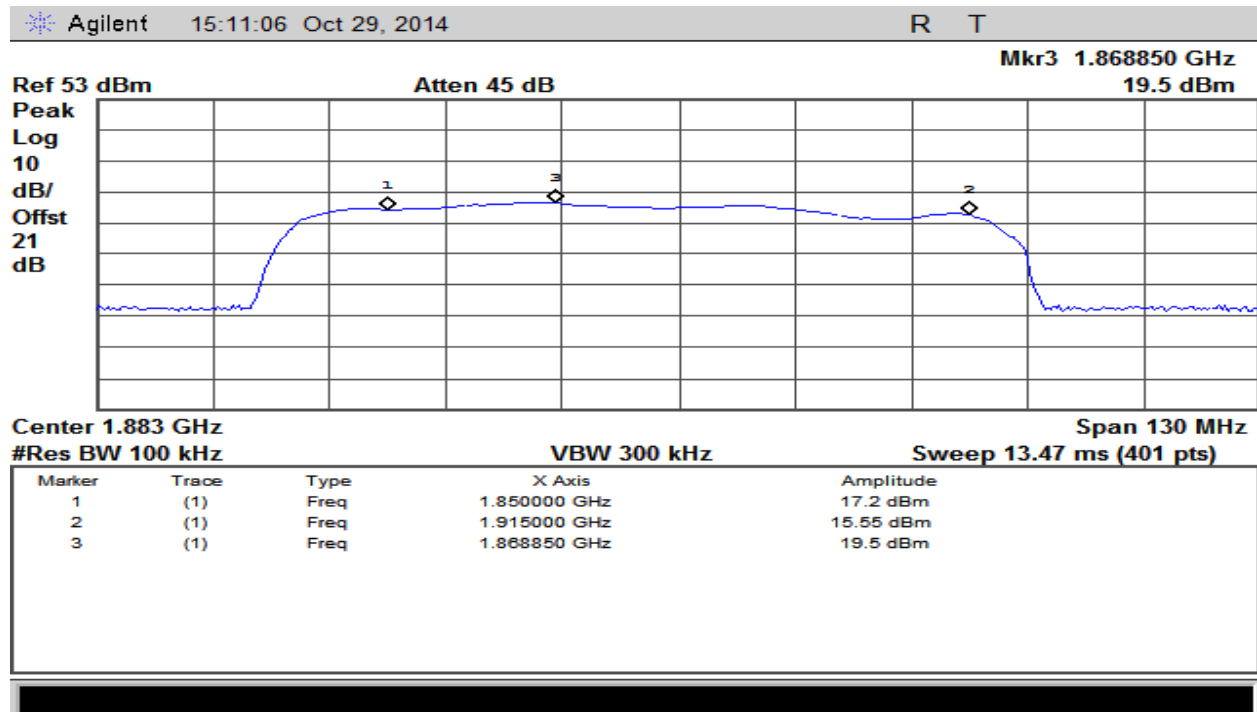


**Figure 1 – Band Verification**

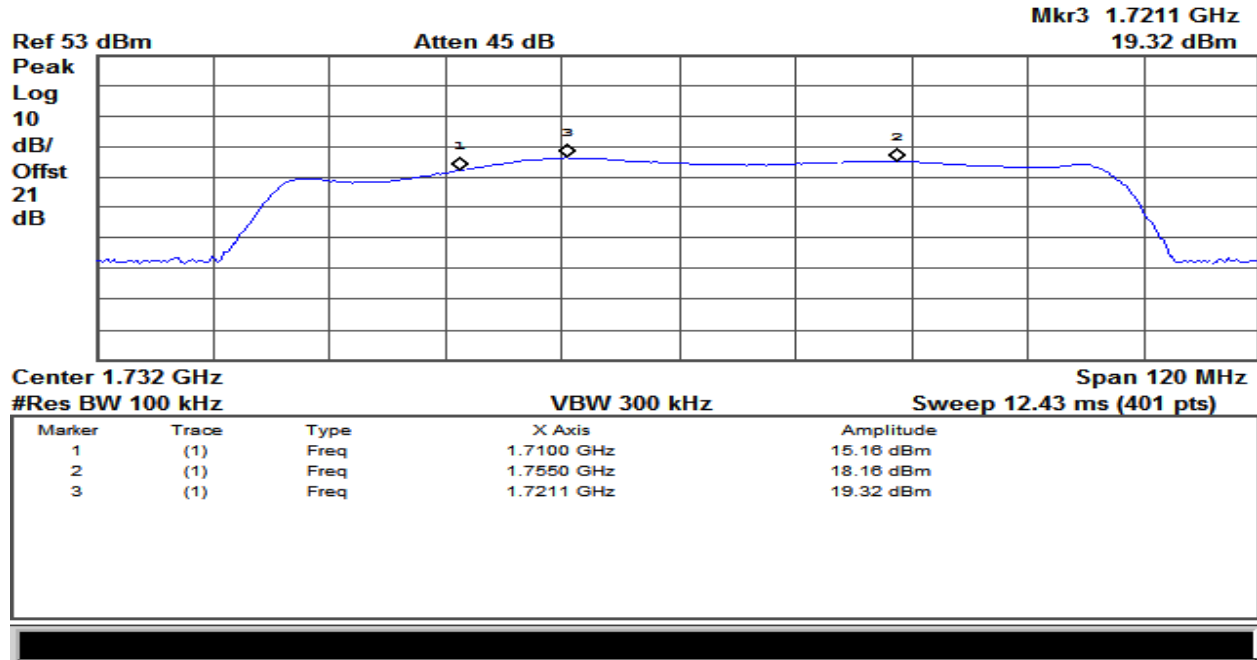




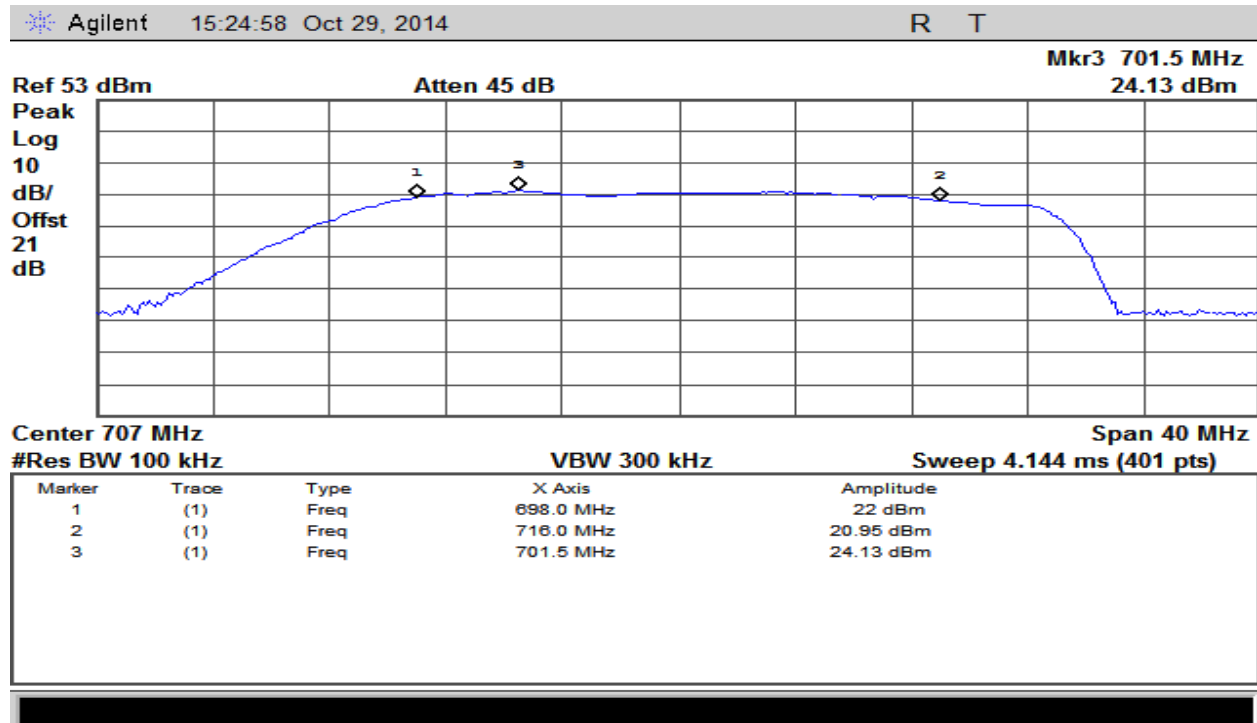
Plot 1 – 824-849MHz Band – Uplink



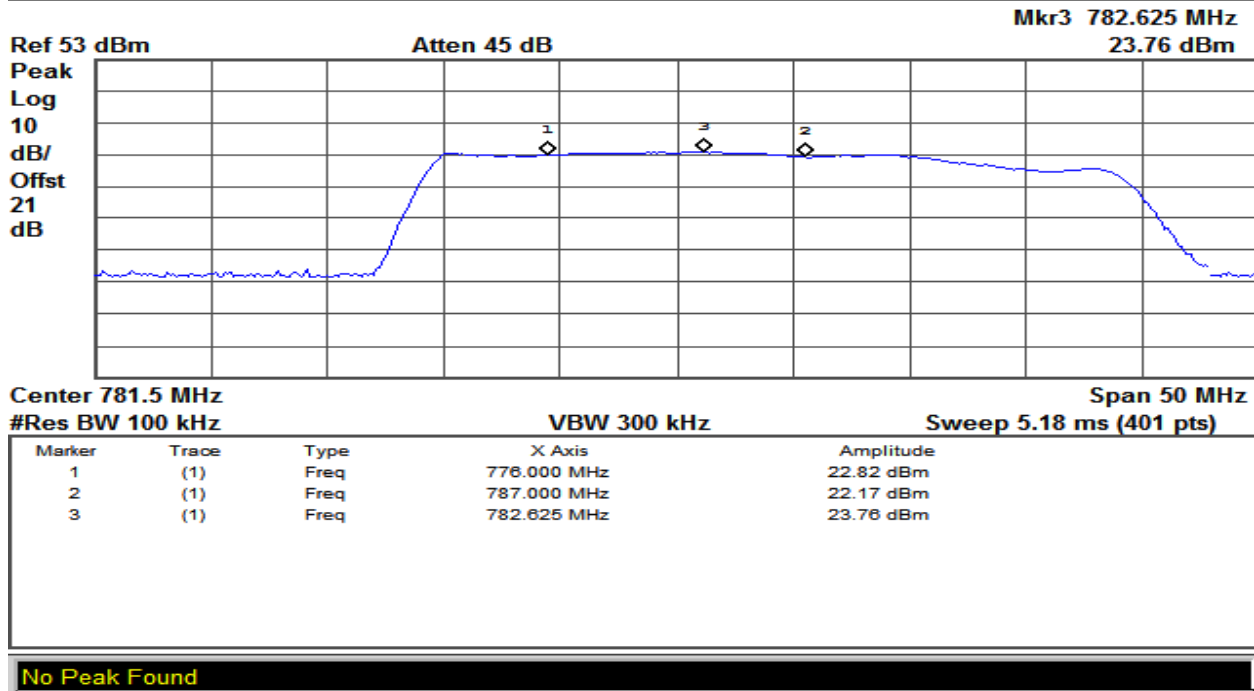
Plot 2 – 1850-1915MHz Band – Uplink



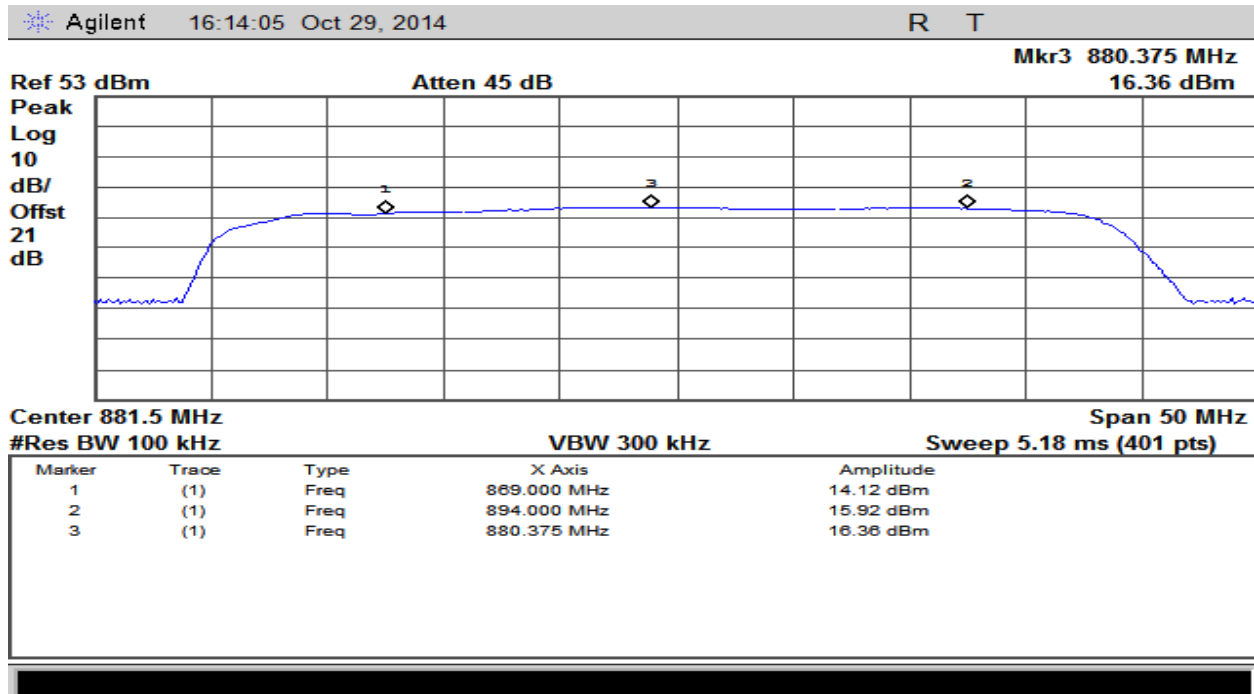
Plot 3 – 1710-1755MHz Band – Uplink



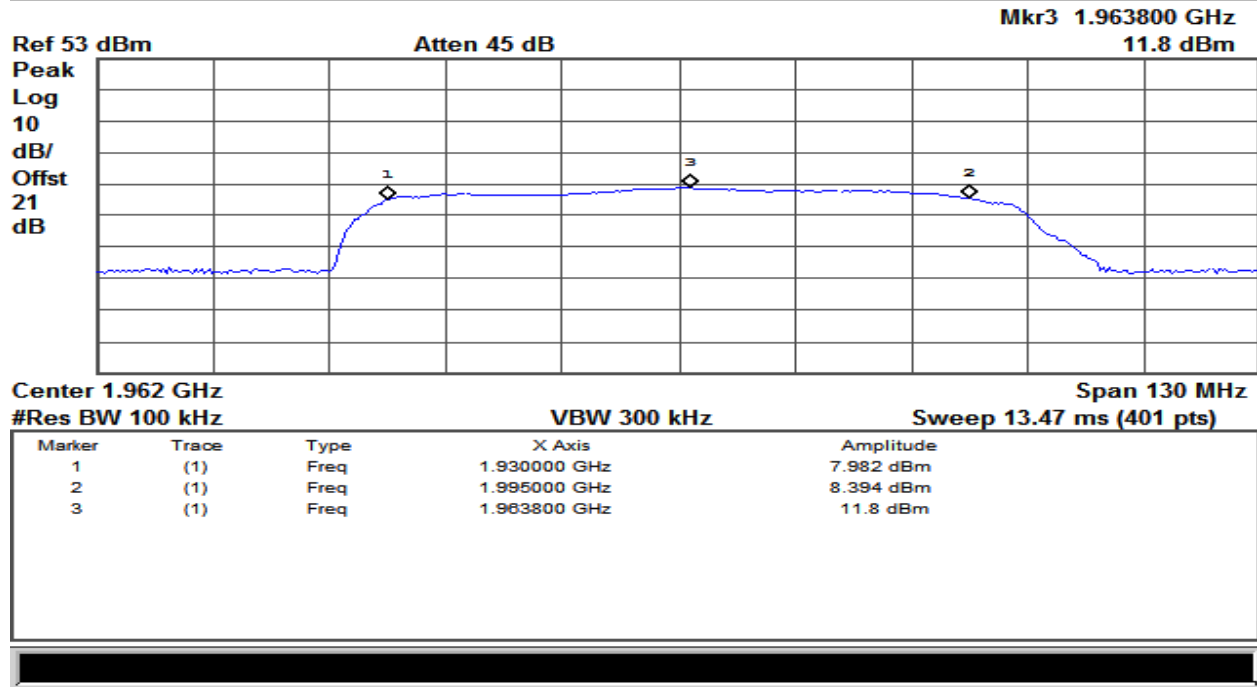
Plot 4 – 698-716MHz Band – Uplink



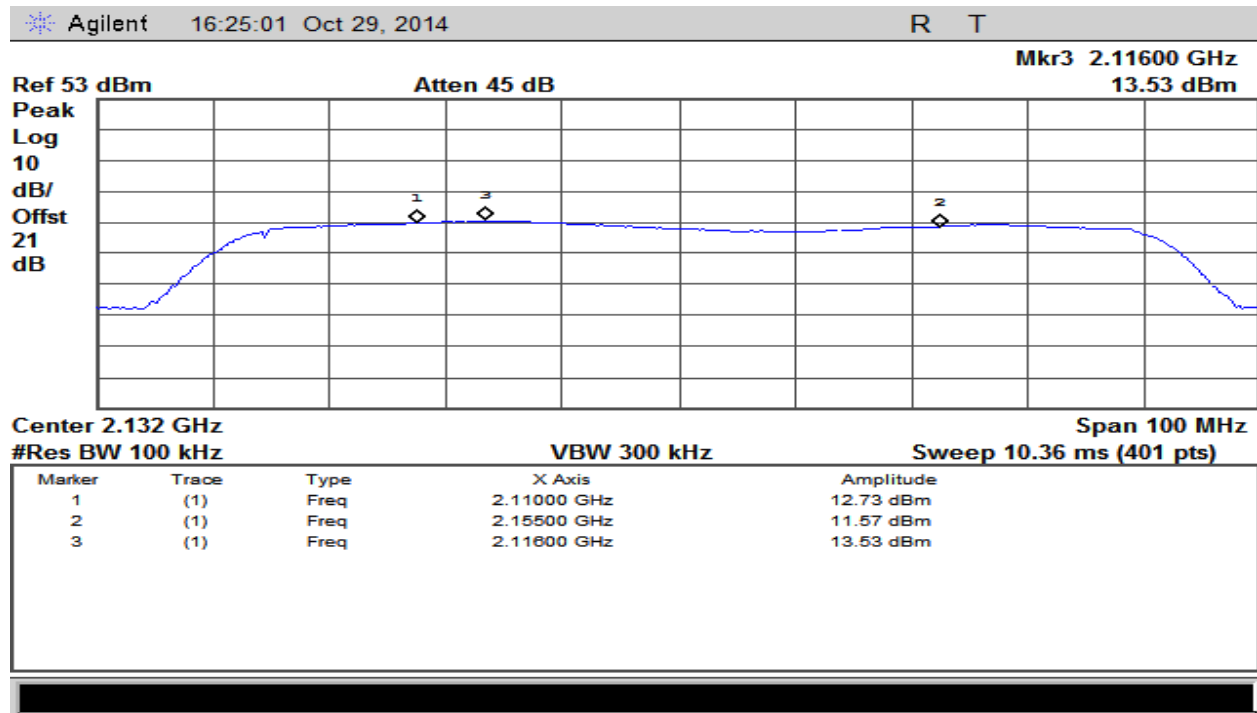
Plot 5 – 776-787MHz Band – Uplink



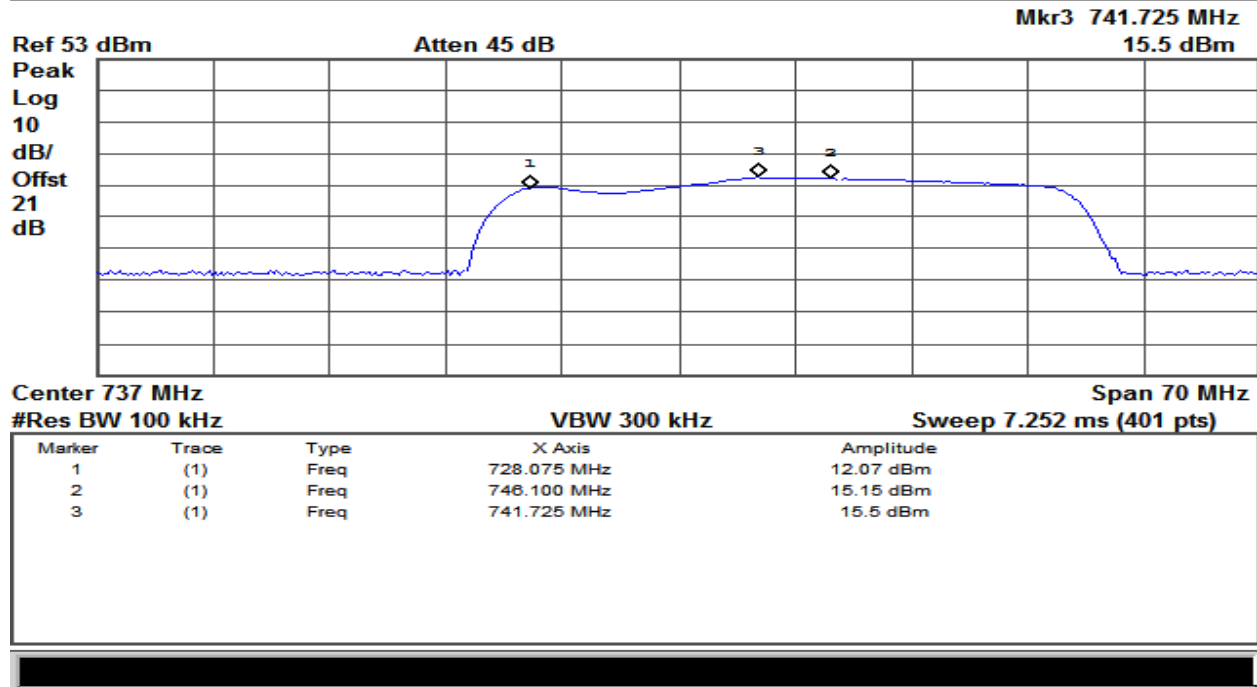
Plot 6 – 869-894MHz Band – Downlink



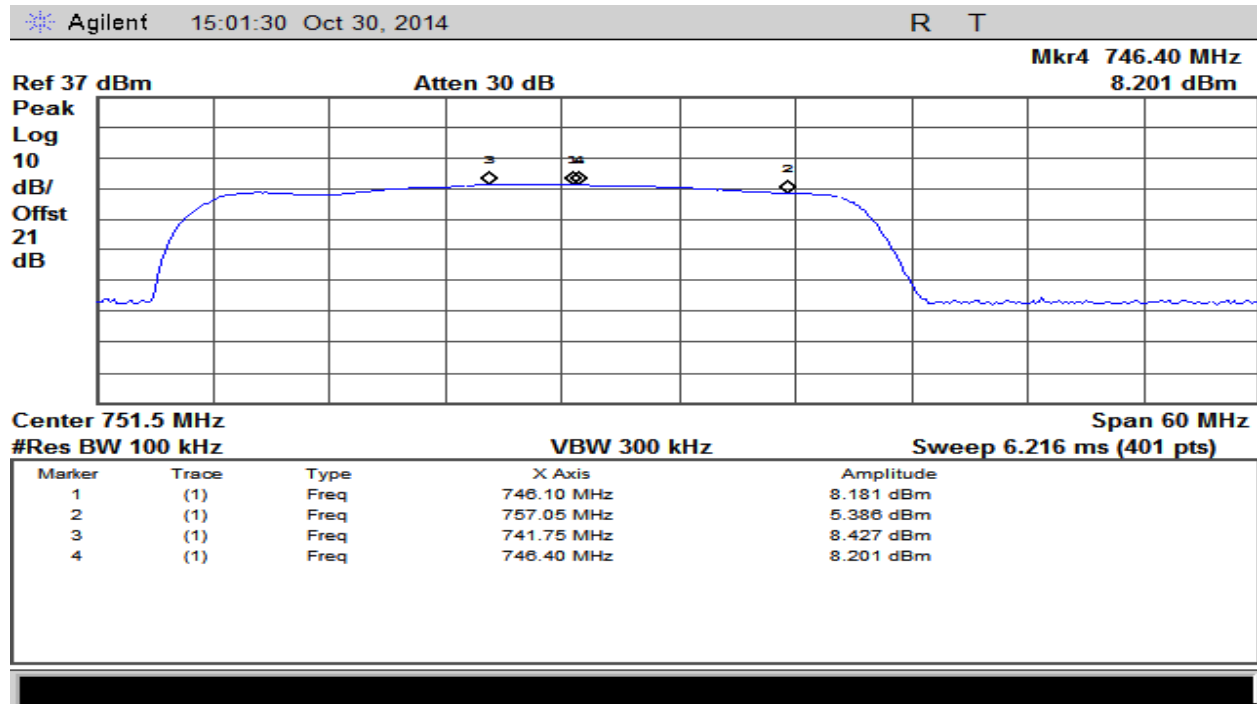
Plot 7 – 1930-1995MHz Band – Downlink



Plot 8 – 2110-2155MHz Band – Downlink



Plot 9 – 728-746MHz Band – Downlink



Plot 10 – 746-757MHz Band – Downlink

## 2. Maximum Power and Gain

<b>Test Requirement(s):</b>	§20.21(e)(8)(i)(D)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	Oct/30/14

**Test Procedure:** As required by 47 CFR 20.21(e)(8)(i)(D): Maximum power measurements were made at the RF output terminals of the EUT.

The EUT was connected as per Figure 1 through an attenuator to a Spectrum Analyzer. A signal generator was used for the input to the EUT to provide a GSM & AWGN with 4.1MHz bandwidth signal tuned to the highest frequency measured in Authorized frequency band test of each uplink and downlink operational band.

KDB Procedure 935210 D03 §7.2.2 and §7.3 was used to measure the maximum power and to calculate the maximum gain.

### Test Results:

Frequency (MHz)	Input Level (dBm)	Output Power (dBm)	Lower Limit (dBm)	Upper Limit (dBm)
698-716 GSM	10.3	24.32	17	30
698-716 AWGN	10.9	24.73	17	30
776-787 GSM	10	24.93	17	30
776-787 GSM	11.3	24.88	17	30
824-849 GSM	9.5	24.05	17	30
824-849 AWGN	5.7	20.55	17	30
1710-1755 GSM	12.1	25.59	17	30
1710-1755 AWGN	8.2	21.88	17	30
1850-1915 GSM	10.8	25.0	17	30
1850-1915 AWGN	11.4	21.85	17	30

**Table 1. Uplink Max Power Test Results**

Frequency (MHz)	Input Level (dBm)	Output Power (dBm)	Upper Limit (dBm)
728-746 GSM	-20	-6.36	17
728-746 AWGN	-20	-7.66	17
746-757 GSM	-20	-6.55	17
746-757 AWGN	-20	-7.5	17
869-894 GSM	-20	-6.5	17
869-894 AWGN	-20	-7.56	17
1930-1995 GSM	-20	-5.78	17
1930-1995 AWGN	-20	-6.65	17
2110-2155 GSM	-20	-7.72	17
2110-2155 AWGN	-20	-8.53	17

Table 2. Downlink Max Power Test Results

Modulation	Uplink Frequency (MHz)	Downlink Frequency (MHz)	Uplink Gain (dB)	Uplink Limit (dB)	Downlink Gain (dB)	Downlink Limit (dB)	UL Gain - DL Gain (Delta in dB)	Limit (dB)	Margin (dB)
GSM	701.5	741.72	14.02	15	13.64	15	0.38	9	-8.62
AWGN	701.5	741.72	13.83	15	12.34	15	1.49	9	-7.51
GSM	782.62	746.40	14.93	15	13.45	15	1.48	9	-7.52
AWGN	782.62	746.40	13.58	15	12.5	15	1.08	9	-7.92
GSM	839.625	880.37	14.55	15	13.5	15	1.05	9	-7.95
AWGN	839.625	880.37	14.85	15	12.44	15	2.41	9	-6.59
GSM	1868.85	1963.8	14.2	15	14.22	15	0.02	9	-8.98
AWGN	1868.85	1963.8	10.45	15	13.35	15	2.9	9	-6.1
GSM	1721.1	2116.0	13.49	15	12.28	15	1.21	9	-7.79
AWGN	1721.1	2116.0	13.68	15	11.47	15	2.21	9	-6.79

Table 3. Maximum Booster Gain Test Results

### 3. Intermodulation

<b>Test Requirement(s):</b>	CFR §20.21(e)(8)(i)(F)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	01/08/14

**Test Procedures:** As required by 47 CFR §20.21(e)(8)(i)(F), Intermodulation measurements were made at the RF output terminals of the EUT.

The EUT was connected through an attenuator to a Spectrum Analyzer. Signal generator was setup for a two tone CW signal with 300kHz offset below and above the operational band frequency. Measurements were made as per KDB 935210 D03 §7.4 procedure.

Detector Setting	Resolution Bandwidth	Video Bandwidth	Span
RMS	3kHz	≤3 x RBW	5MHz

Table 4 – Analyzer Settings

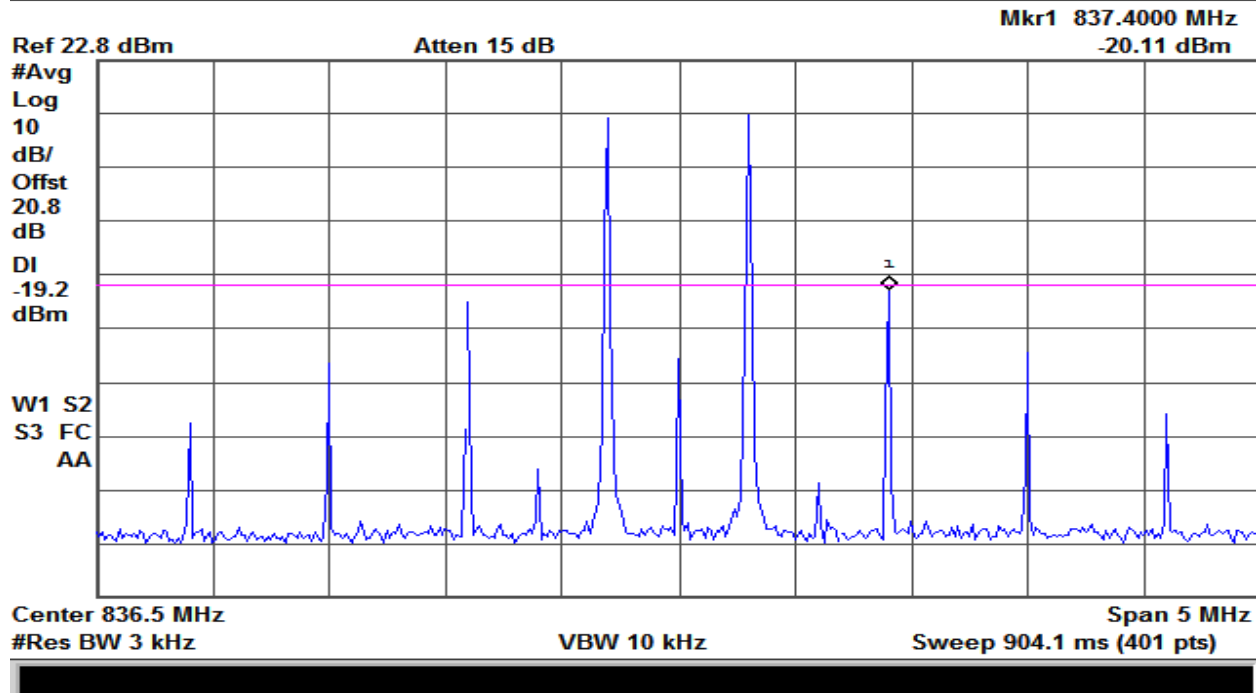
Frequency Band (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Margin (dB)
824-849	-20.11	-19	-1.11
1850-1915	-20.22	-19	-1.22
1710-1755	-21.65	-19	-2.65
698-716	-29.69	-19	-10.69
776-787	-23.86	-19	-4.86

Table 5. Summary Uplink Intermodulation, Test Results

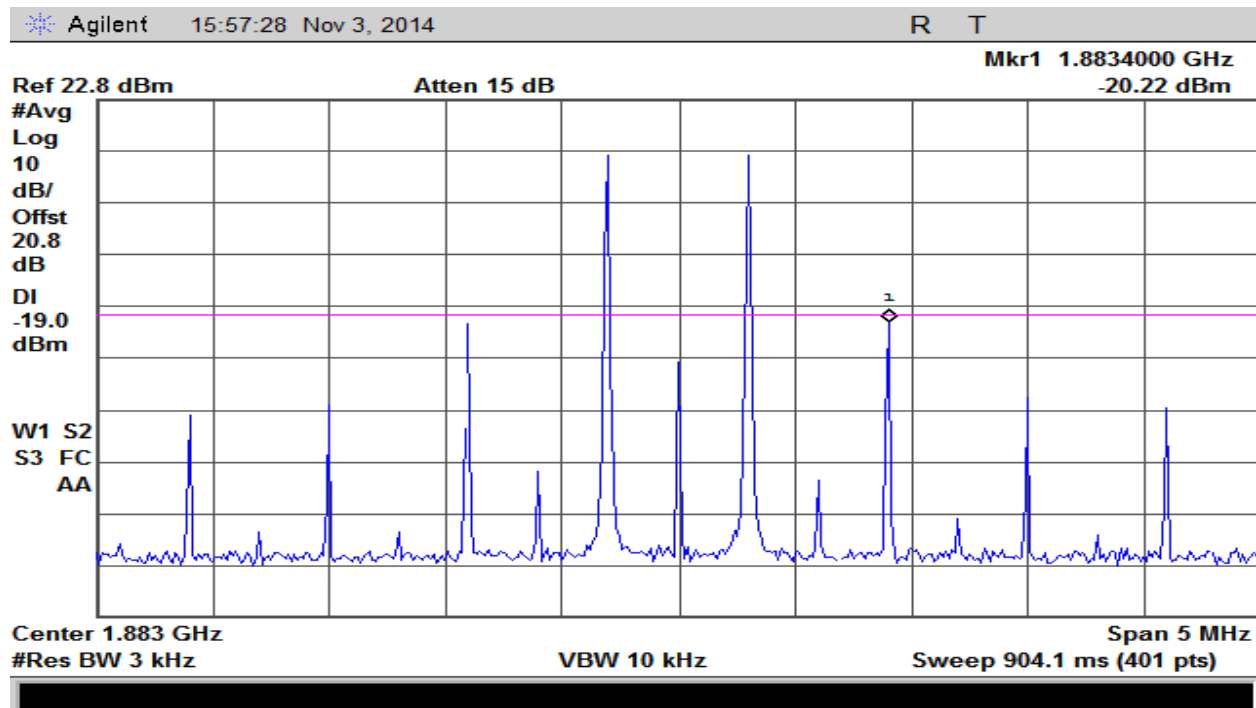
Frequency (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Margin (dB)
869-894	-67.36	-19	-48.36
1930-1995	-73.01	-19	-54.01
2110-2155	--76.94	-19	-57.94
728-746	-69.55	-19	-88.55
746-757	-70.58	-19	51.58

Table 6. Summary Downlink Intermodulation Test Results

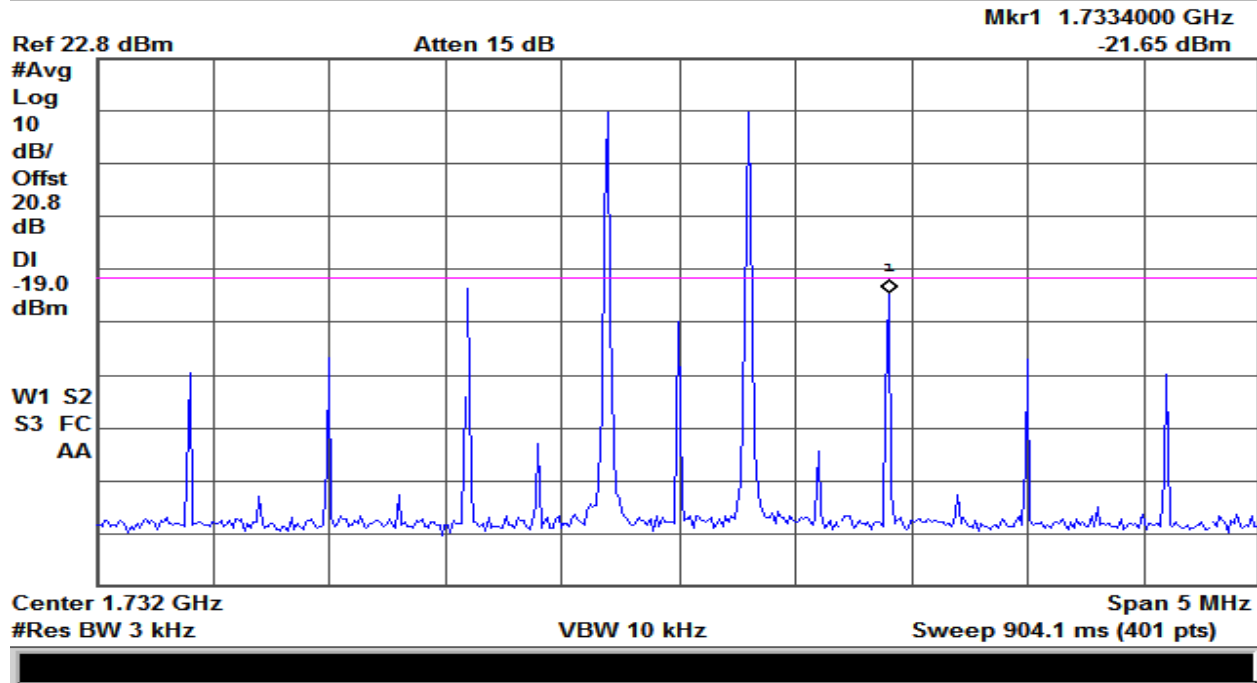




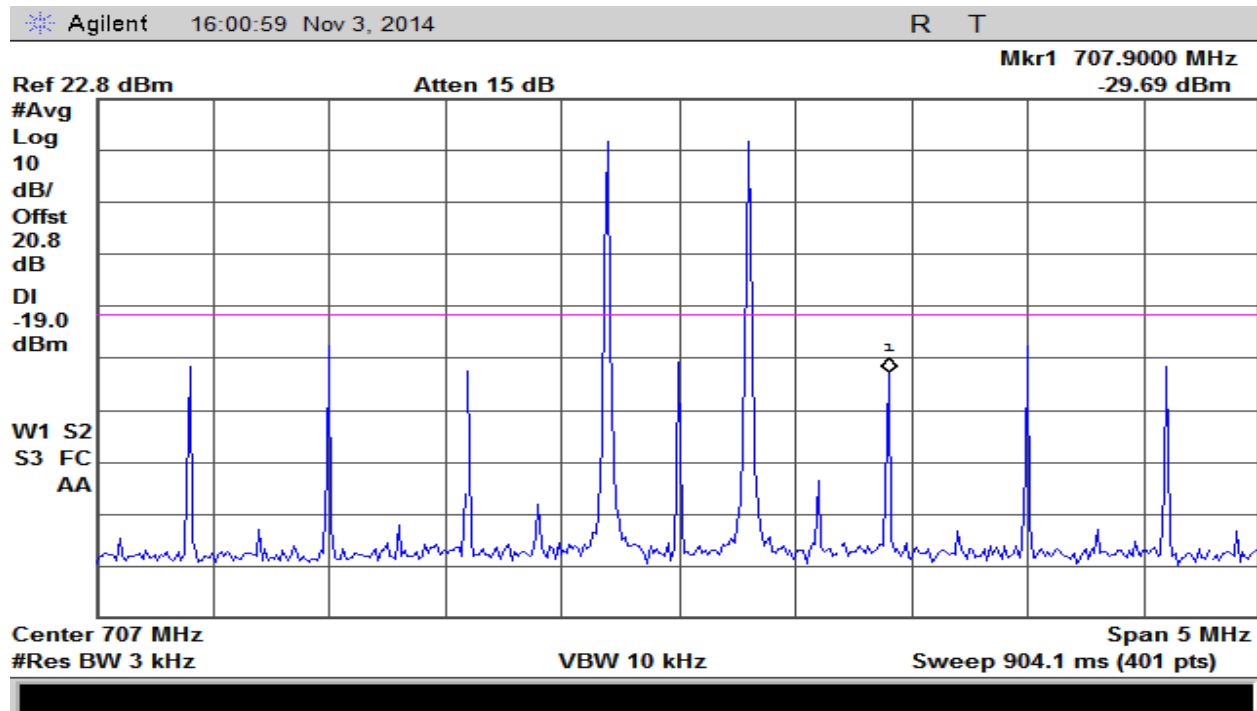
Plot 11 – 824-849MHz Band – Uplink



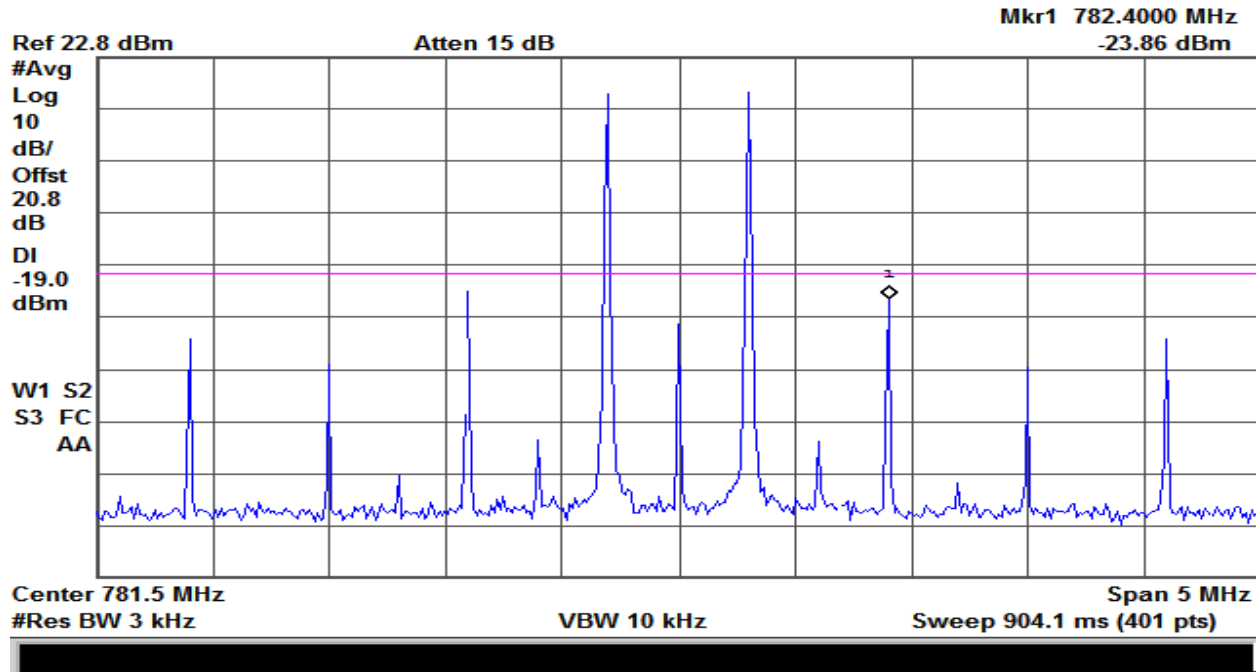
Plot 12 – 1850-1915MHz Band – Uplink



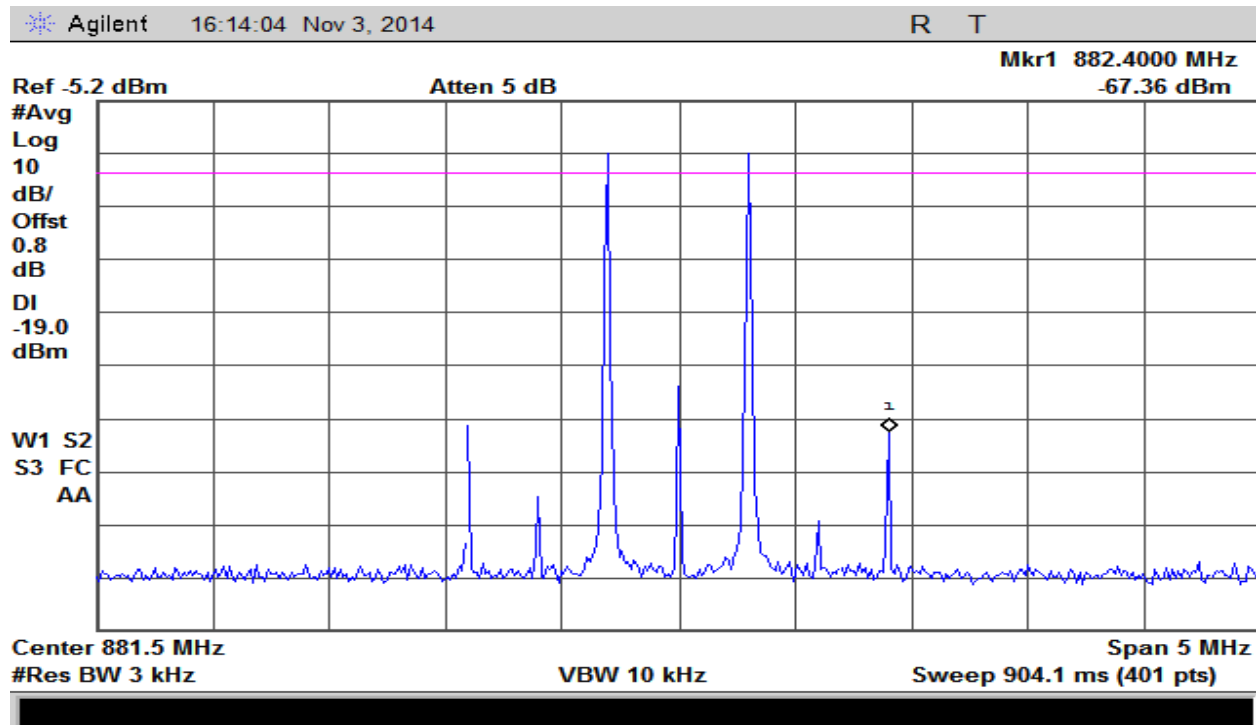
Plot 13 – 1710-1755MHz Band – Uplink



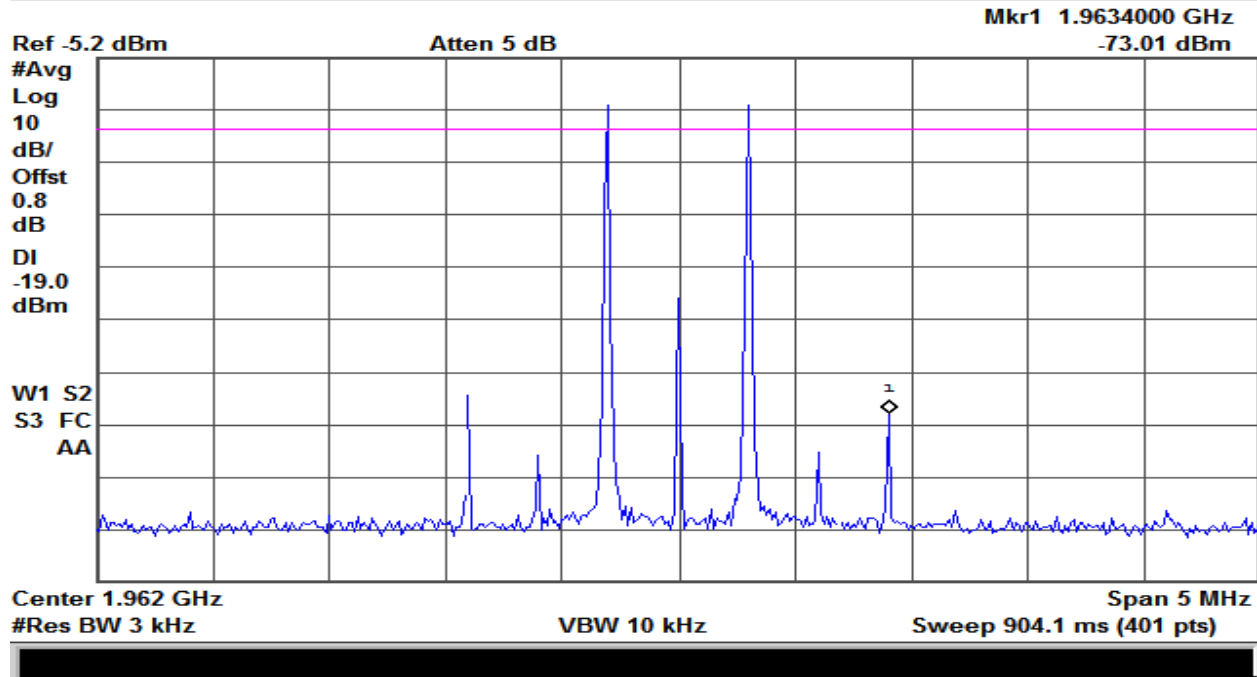
Plot 14 – 698-716MHz Band – Uplink



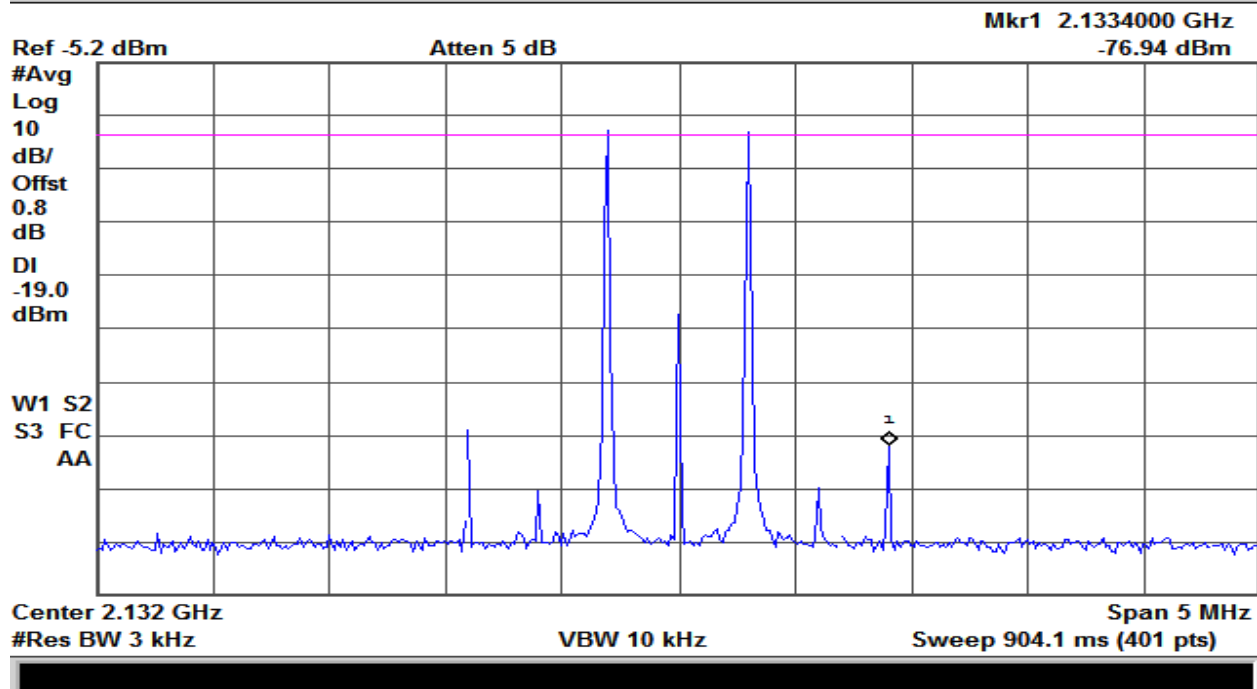
Plot 15 – 776-787MHz Band – Uplink



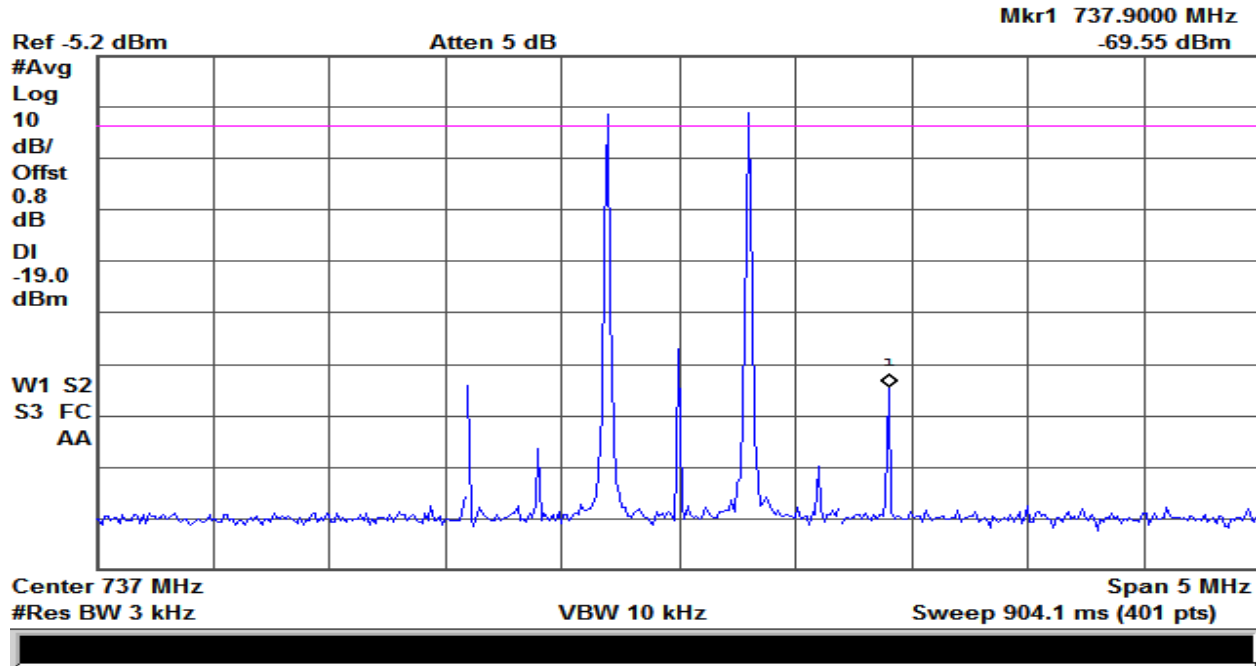
Plot 16 – 869-894MHz Band – Downlink



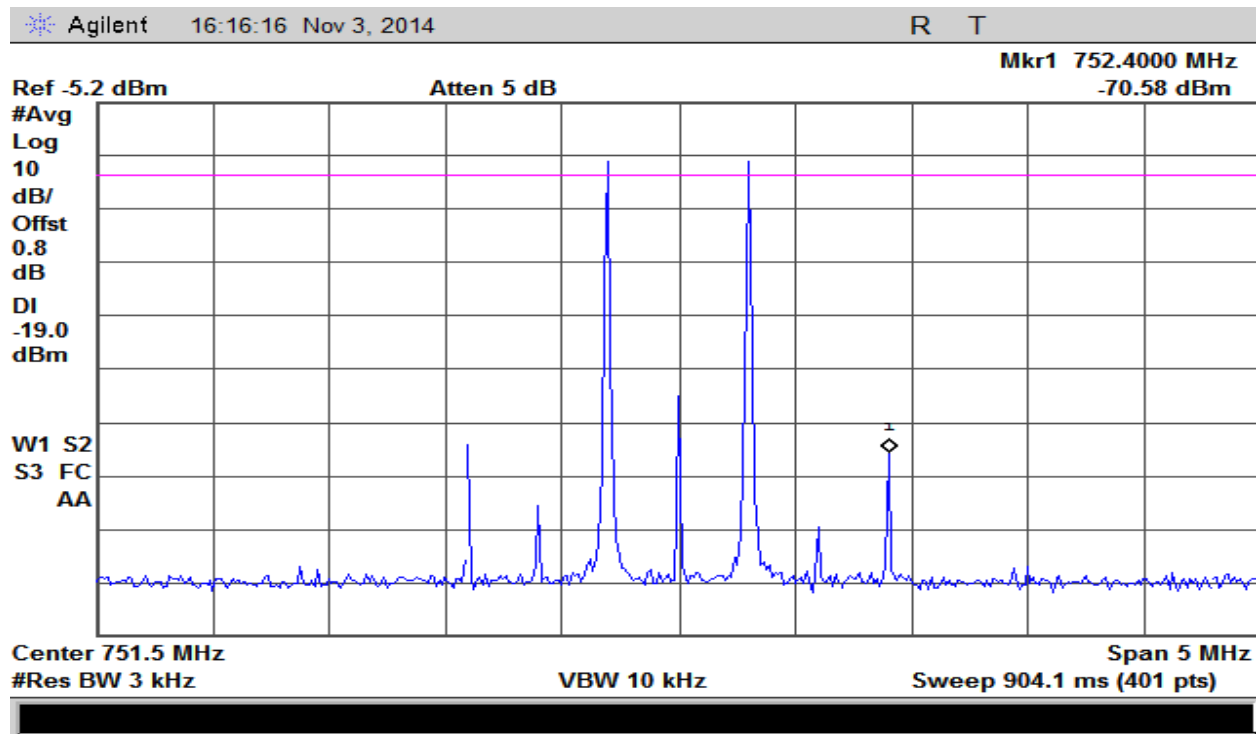
Plot 17 – 1930-1995MHz Band – Downlink



Plot 18 – 2110-2155MHz Band – Downlink



Plot 19 – 728-746MHz Band – Downlink



Plot 20 – 746-757MHz Band – Downlink

#### 4. Out-of-band emissions

<b>Test Requirement(s):</b>	§20.21§(8)(i)(E)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	Nov/04/14

**Test Procedures:** As required by 47 CFR §20.21(8)(i)(E), Out-of-band emissions measurements were made at the RF output terminals of the EUT.

The EUT was connected through an attenuator to a Spectrum Analyzer as per figure 1. Signal generator was setup to produce GSM, LTE & CDMA signals for all uplink and downlink bands. Measurements were made as per procedure defined in KDB 935210 D03 §7.5.

$$\text{Out of Band Emission Limits} = P1 - 6 - (43 - 10 \log (P2)) = -19\text{dBm}$$

Where P1 = Power in dBm and P2 = Power in Watts

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
824-849	Lower	-40.22	-19
824-849	Upper	-38.39	-19
1850-1915	Lower	-38.52	-19
1850-1915	Upper	-39.83	-19
1710-1755	Lower	-38.65	-19
1710-1755	Upper	-36.88	-19
698-716	Lower	-24.73	-19
698-716	Upper	-26.06	-19
776-787	Lower	-22.33	-19
776-787	Upper	-21.85	-19

**Table 7. GSM Uplink – Out-of band Emissions, Test Results**

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
824-849	Lower	-38.24	-19
824-849	Upper	-35.57	-19
1850-1915	Lower	-30.09	-19
1850-1915	Upper	-33.34	-19
1710-1755	Lower	-34.92	-19
1710-1755	Upper	-36.36	-19
698-716	Lower	-20.42	-19
698-716	Upper	-21.02	-19
776-787	Lower	-20.56	-19
776-787	Upper	-22.95	-19

Table 8. CDMA Uplink – Out-of band Emissions, Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
824-849	Lower	-41.69	-19
824-849	Upper	-35.72	-19
1850-1915	Lower	-33.6	-19
1850-1915	Upper	-35.01	-19
1710-1755	Lower	-36.88	-19
1710-1755	Upper	-34.65	-19
698-716	Lower	-22.91	-19
698-716	Upper	-26.11	-19
776-787	Lower	-23.34	-19
776-787	Upper	-22.06	-19

Table 9. LTE Uplink – Out-of band Emissions, Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
869-894	Lower	-70.38	-19
869-894	Upper	-68.7	-19
1930-1995	Lower	-69.12	-19
1930-1995	Upper	-69.62	-19
2110-2155	Lower	-68.31	-19
2110-2155	Upper	-69.21	-19
728-746	Lower	-56.89	-19
728-746	Upper	-54.44	-19
746-757	Lower	-50.97	-19
746-757	Upper	-50.4	-19

Table 10. GSM Downlink – Out-of band Emissions, Test Results

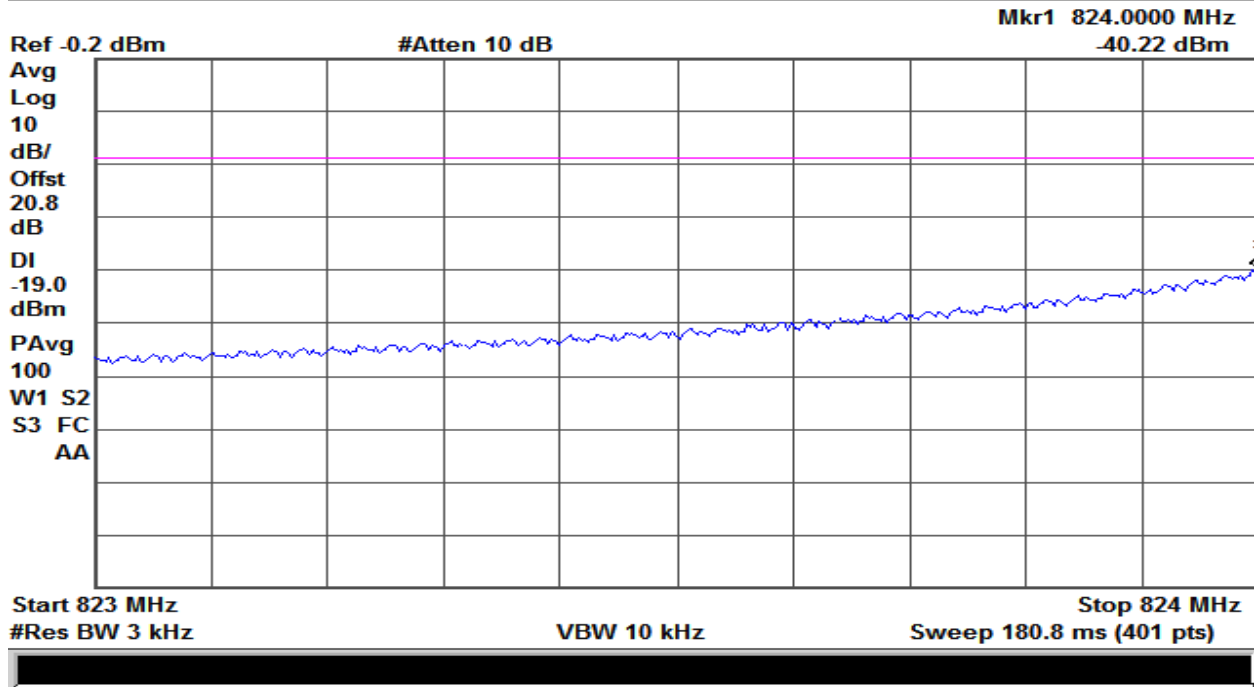
Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
869-894	Lower	-73.84	-19
869-894	Upper	-73.83	-19
1930-1995	Lower	-75.17	-19
1930-1995	Upper	-76.34	-19
2110-2155	Lower	-75.5	-19
2110-2155	Upper	-75.36	-19
728-746	Lower	-74.44	-19
728-746	Upper	-73.12	-19
746-757	Lower	-72.86	-19
746-757	Upper	-75.24	-19

Table 11. CDMA Downlink – Out-of band Emissions, Test Results

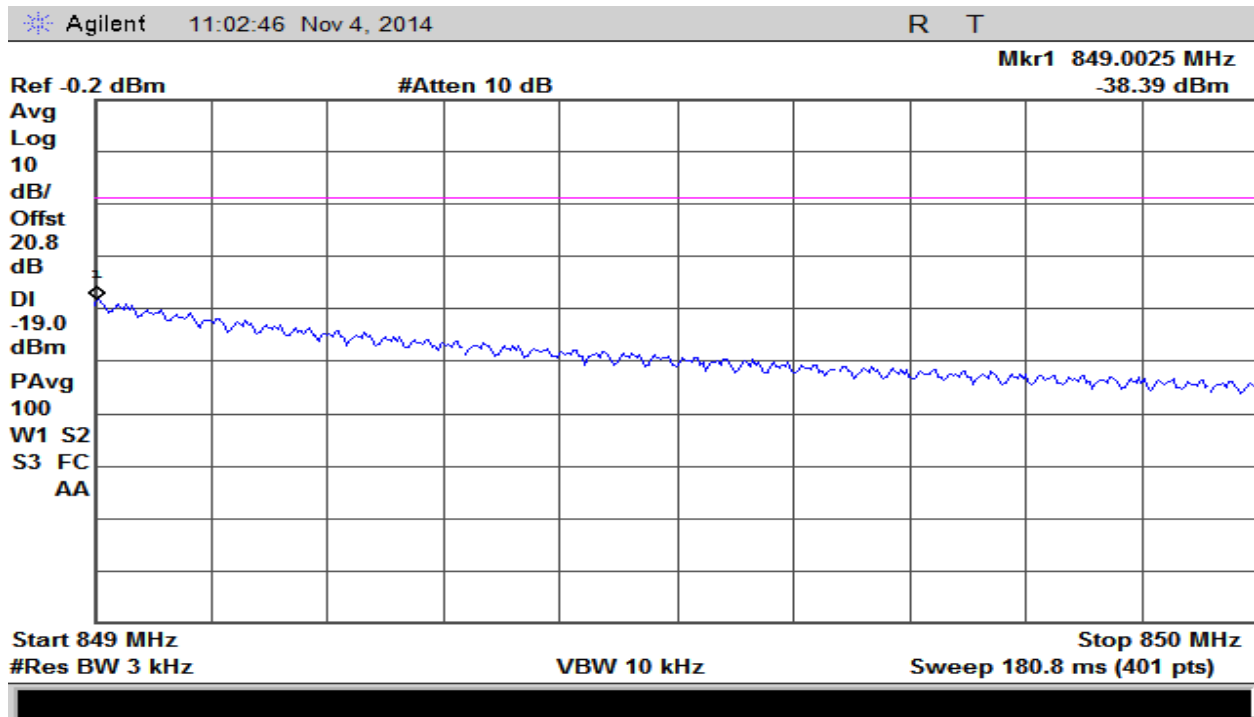


Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
869-894	Lower	-71.64	-19
869-894	Upper	-71.28	-19
1930-1995	Lower	-71.36	-19
1930-1995	Upper	-72.03	-19
2110-2155	Lower	-72.08	-19
2110-2155	Upper	-71.64	-19
728-746	Lower	-71.41	-19
728-746	Upper	-71.07	-19
746-757	Lower	-71.11	-19
746-757	Upper	-72.52	-19

Table 12. LTE Downlink – Out-of band Emissions, Test Results



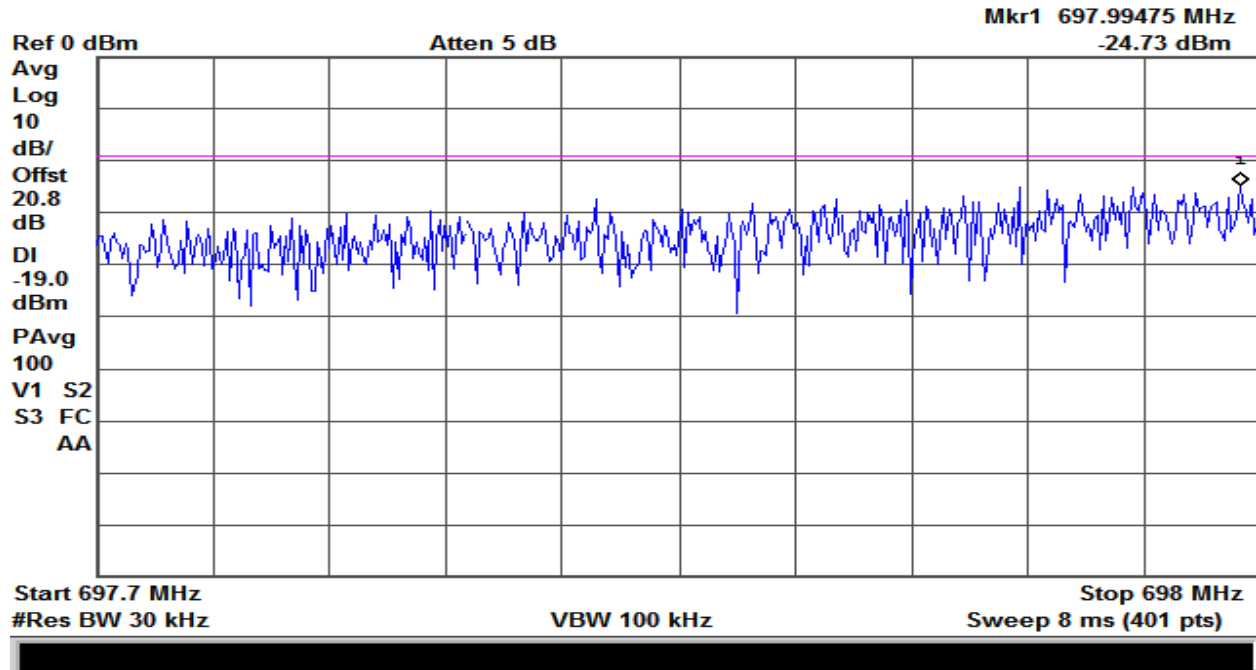
Plot 21 – 824-849MHz Band – GSM Uplink Lower Band Edge



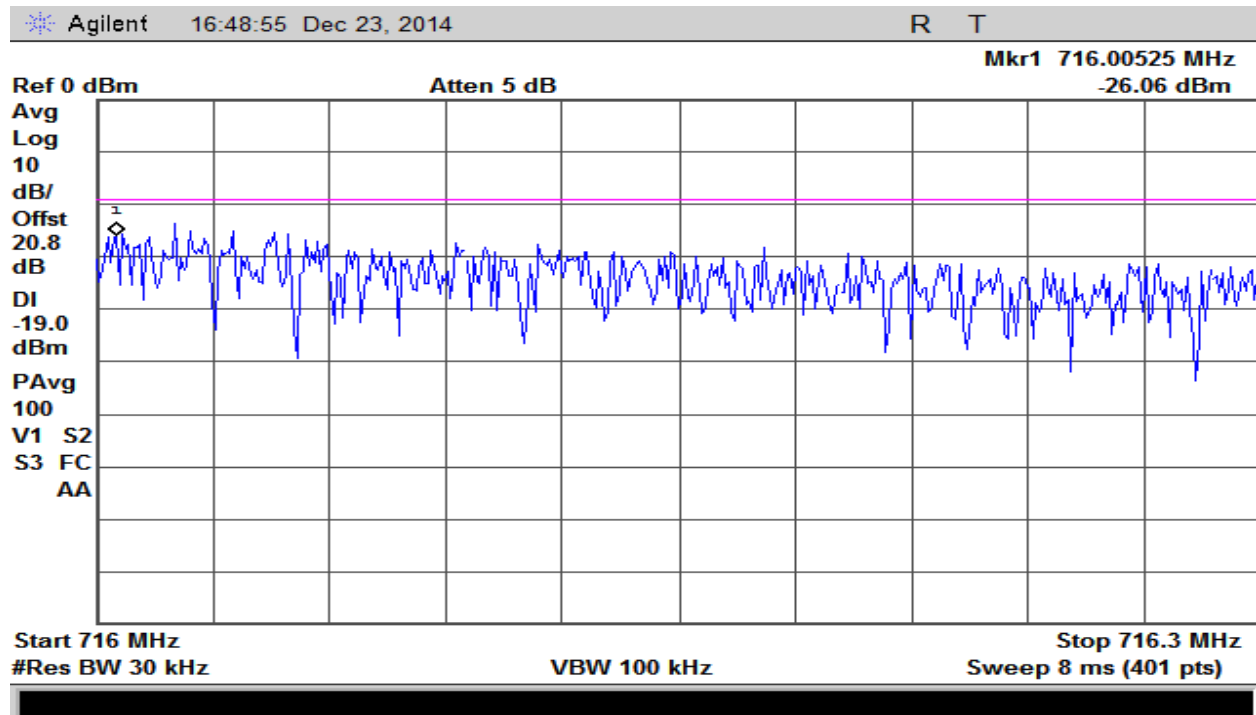
Plot 22 - 824-849MHz Band – GSM Uplink Upper Band Edge



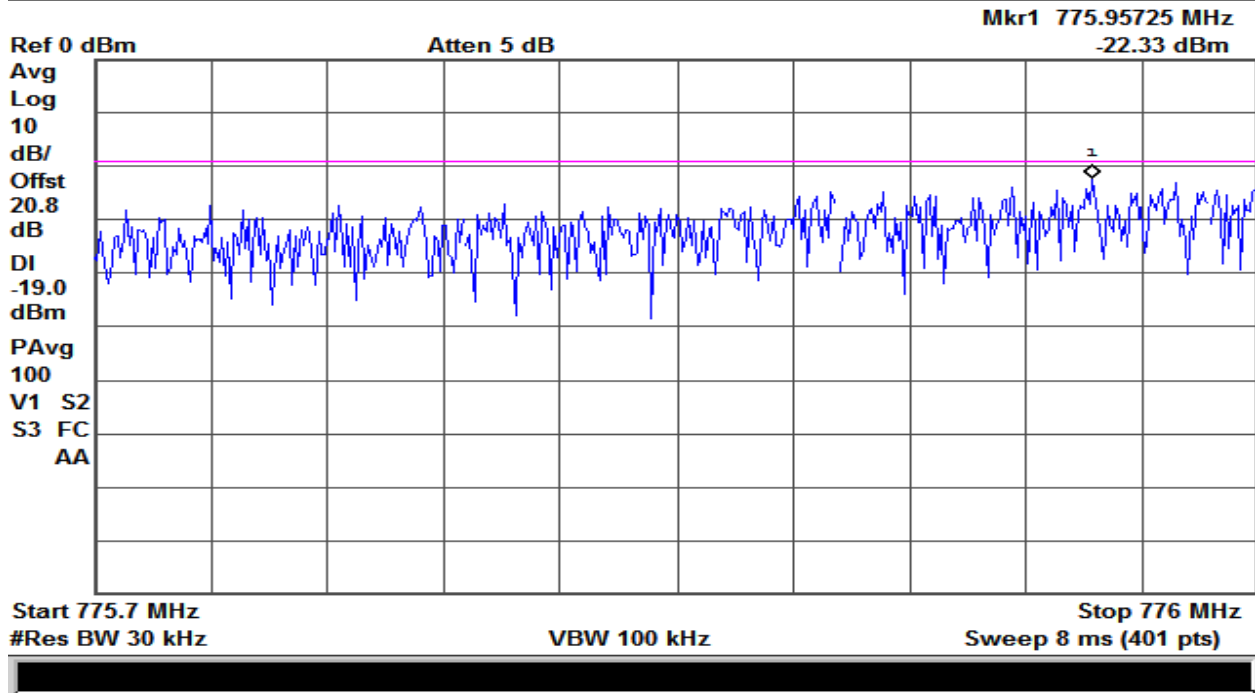




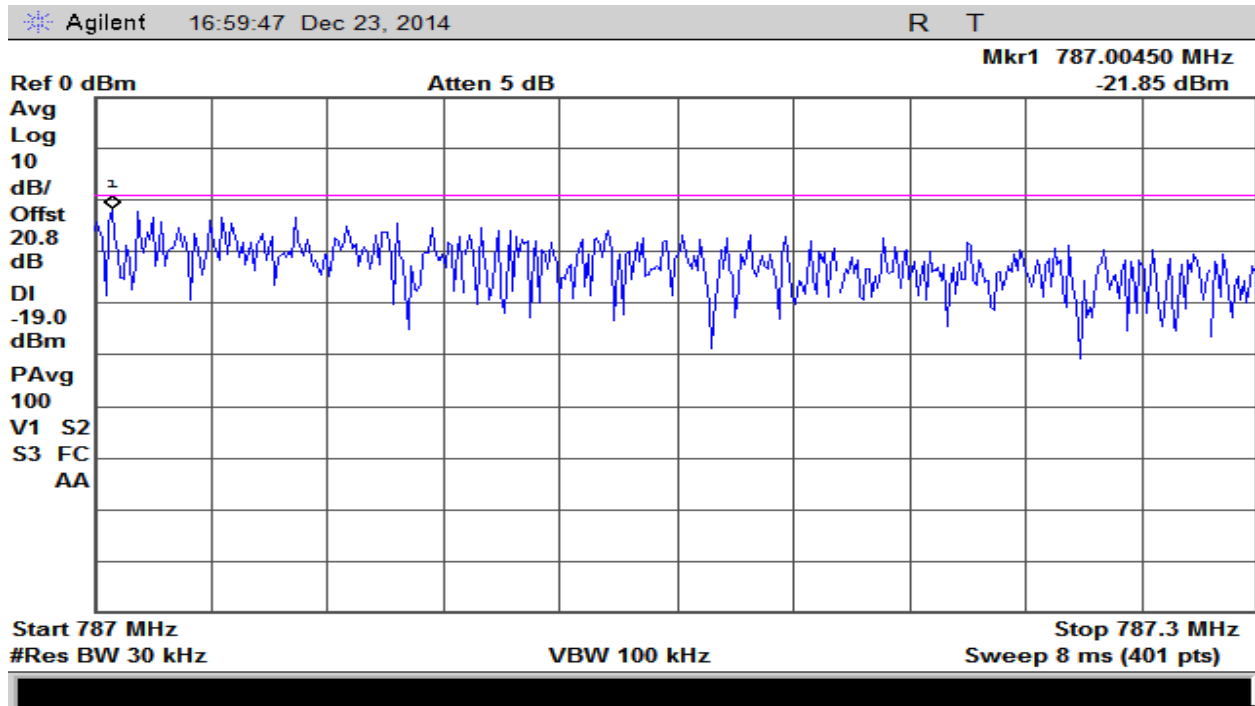
Plot 26 – 698-716MHz Band – GSM Uplink Lower Band Edge



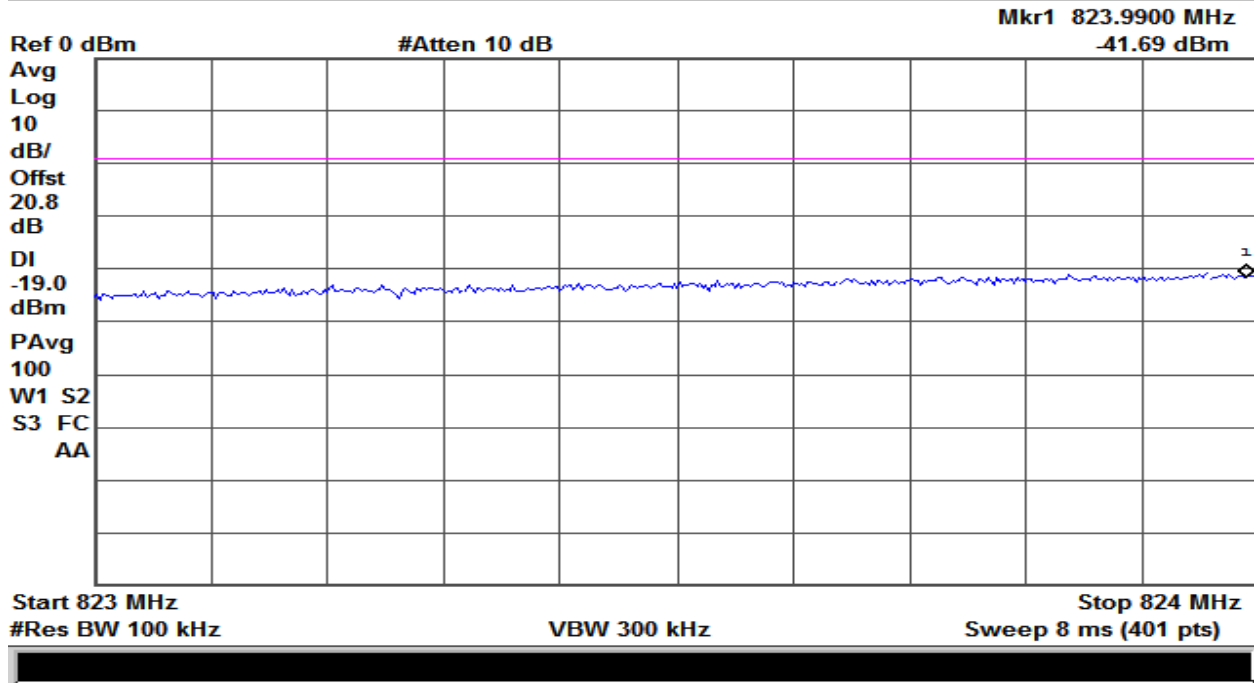
Plot 27 – 698-716MHz Band – GSM Uplink Upper Band Edge



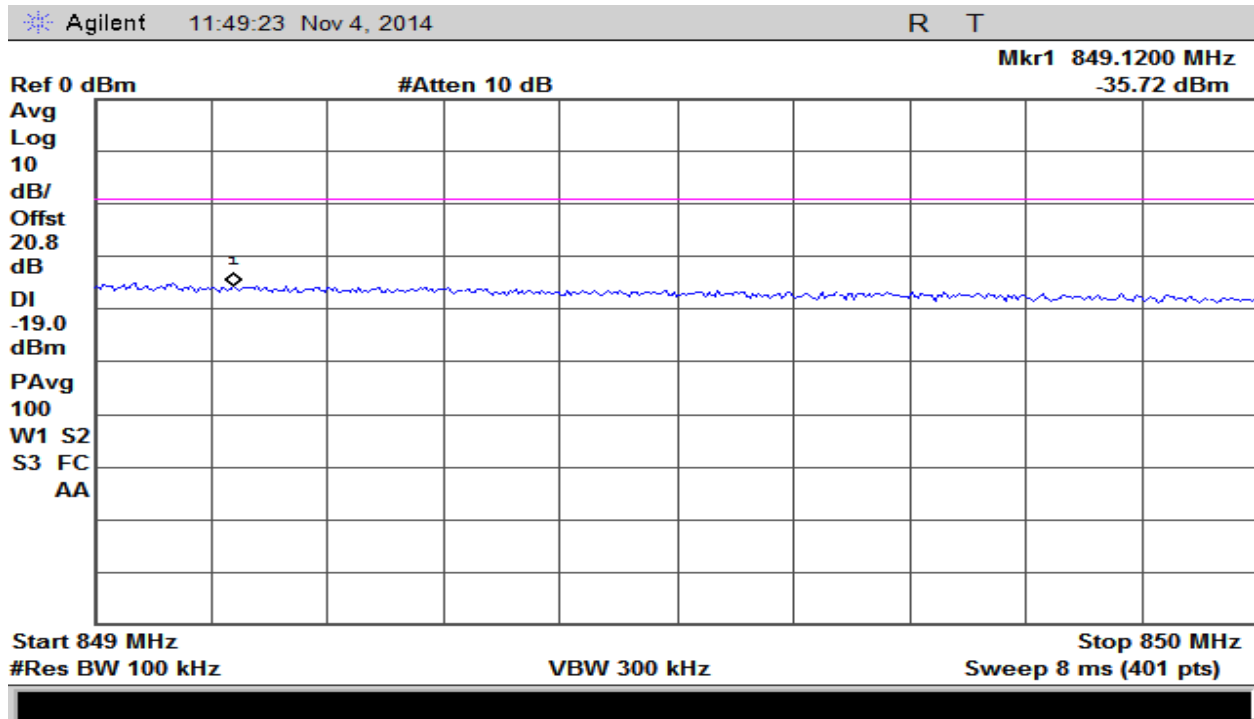
Plot 28 – 776-787MHz Band – GSM Uplink Lower Band Edge



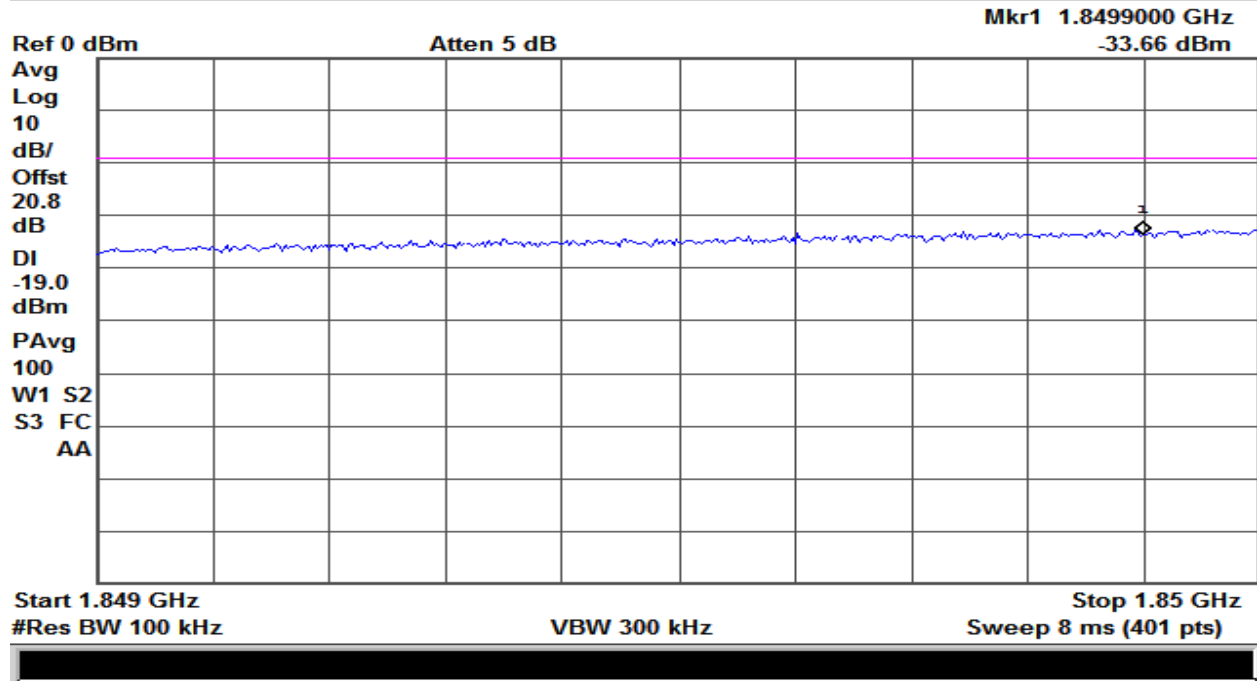
Plot 29 – 776-787MHz Band – GSM Uplink Upper Band Edge



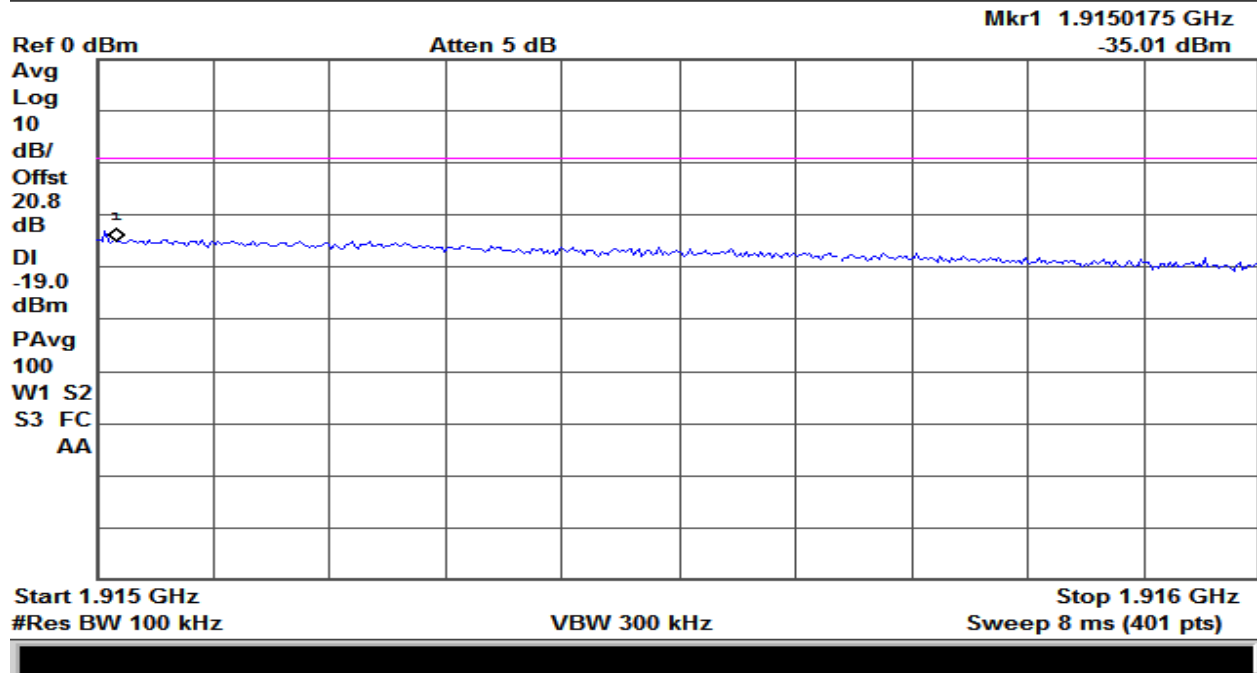
Plot 30 – 824-849MHz Band – LTE Uplink Lower Band Edge



Plot 31 – 824-849 Band – LTE Uplink Upper Band Edge



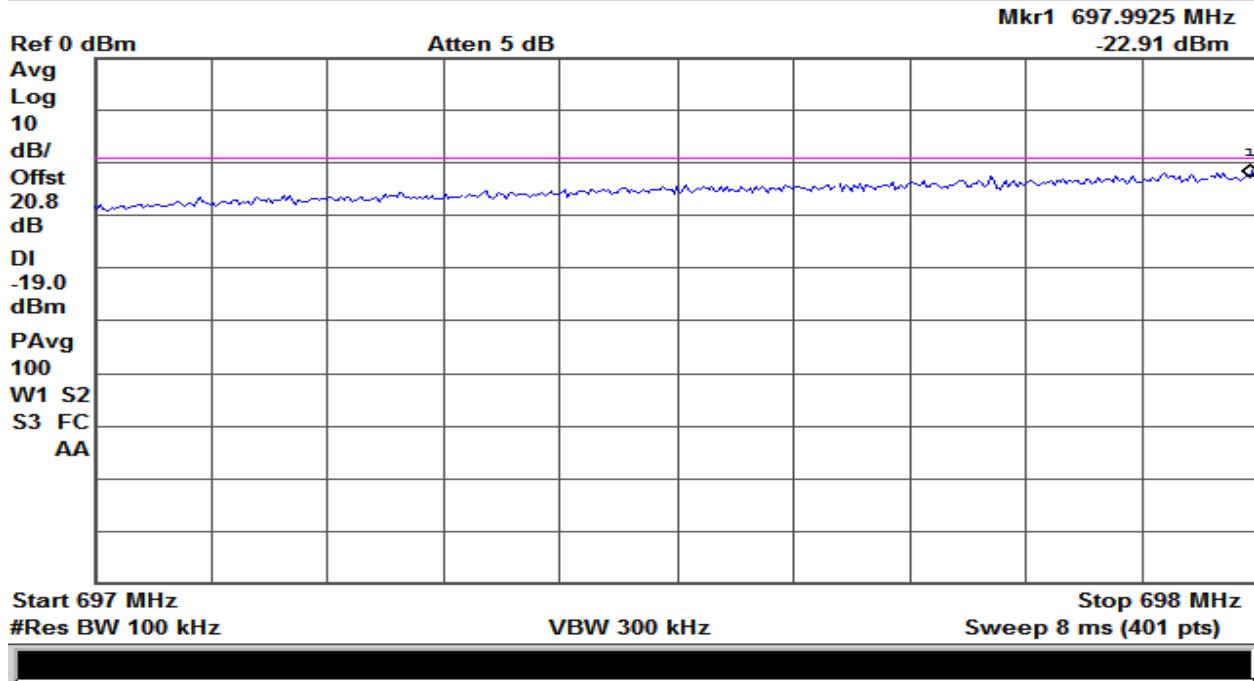
Plot 32 – 1850-1915MHz Band – LTE Uplink Lower Band Edge



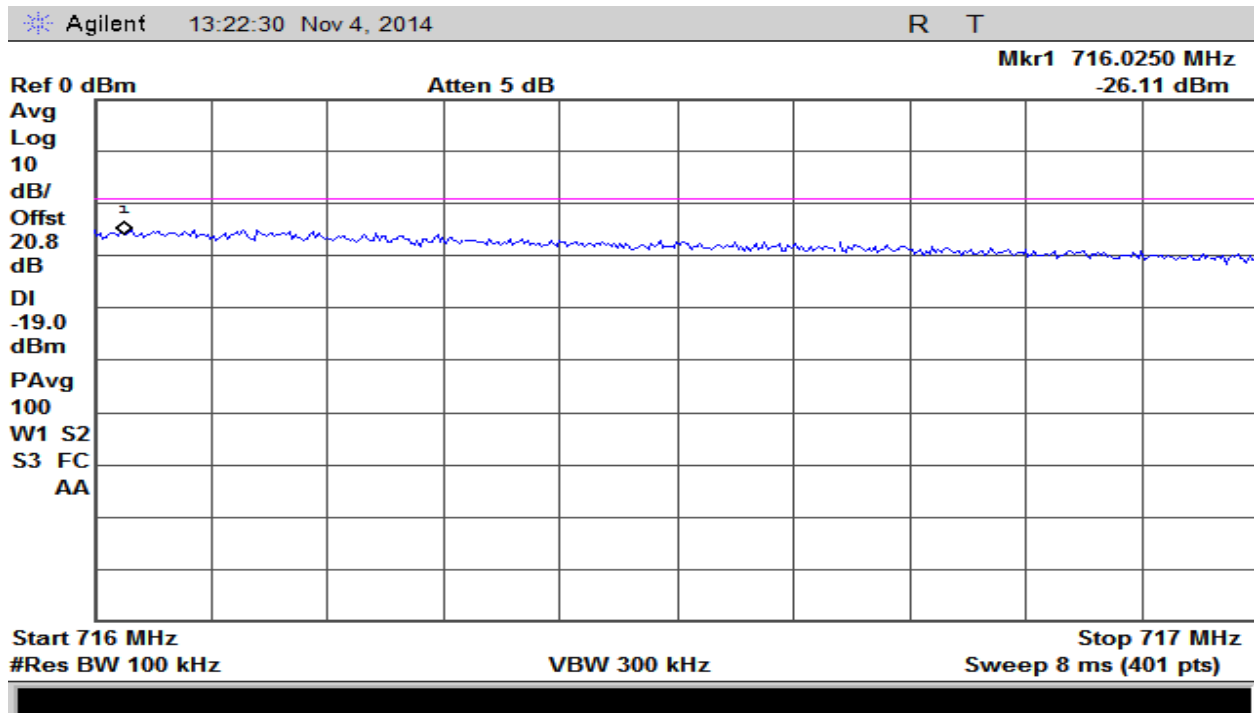
Plot 33 – 1850-1915MHz Band – LTE Uplink Upper Band Edge







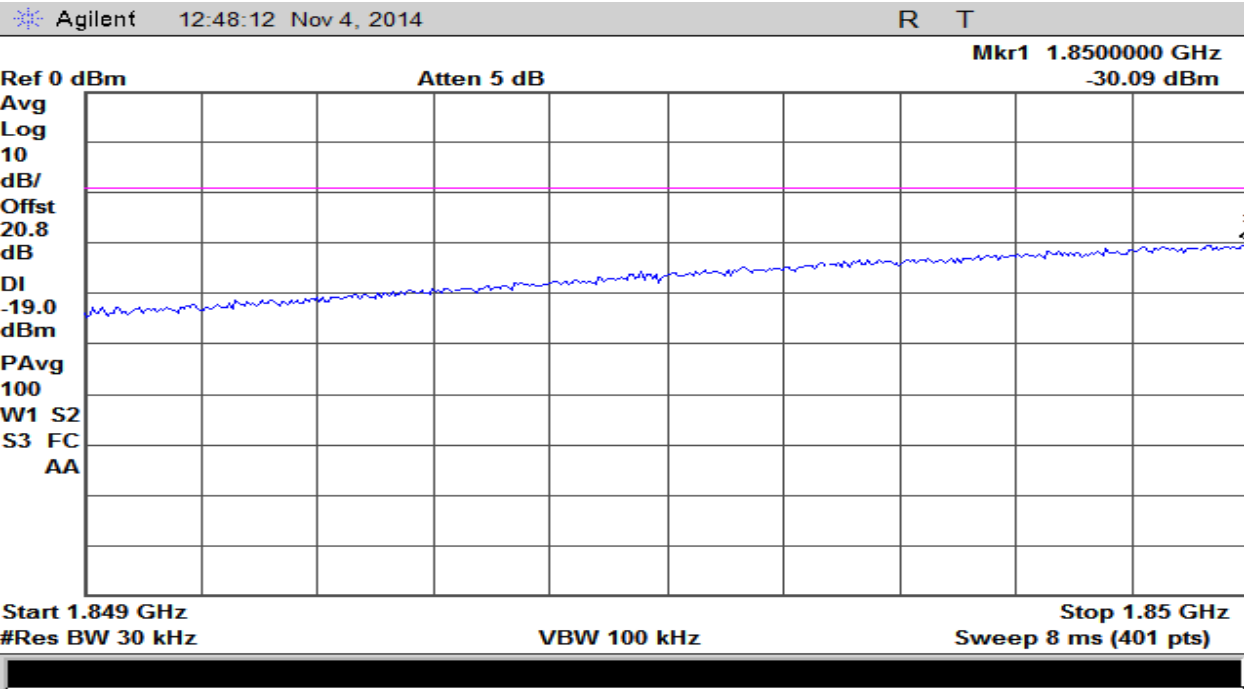
Plot 36 – 698-716MHz Band – LTE Uplink Lower Band Edge



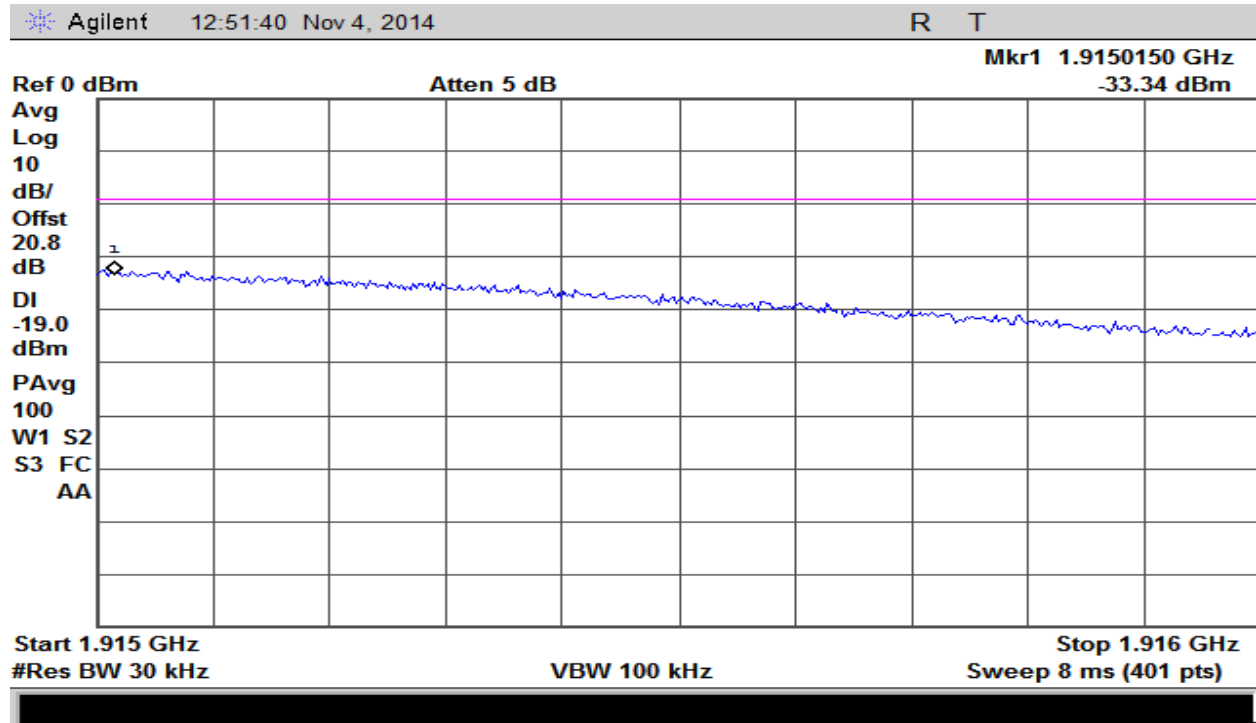
Plot 37 – 698-716MHz Band – LTE Uplink Upper Band Edge



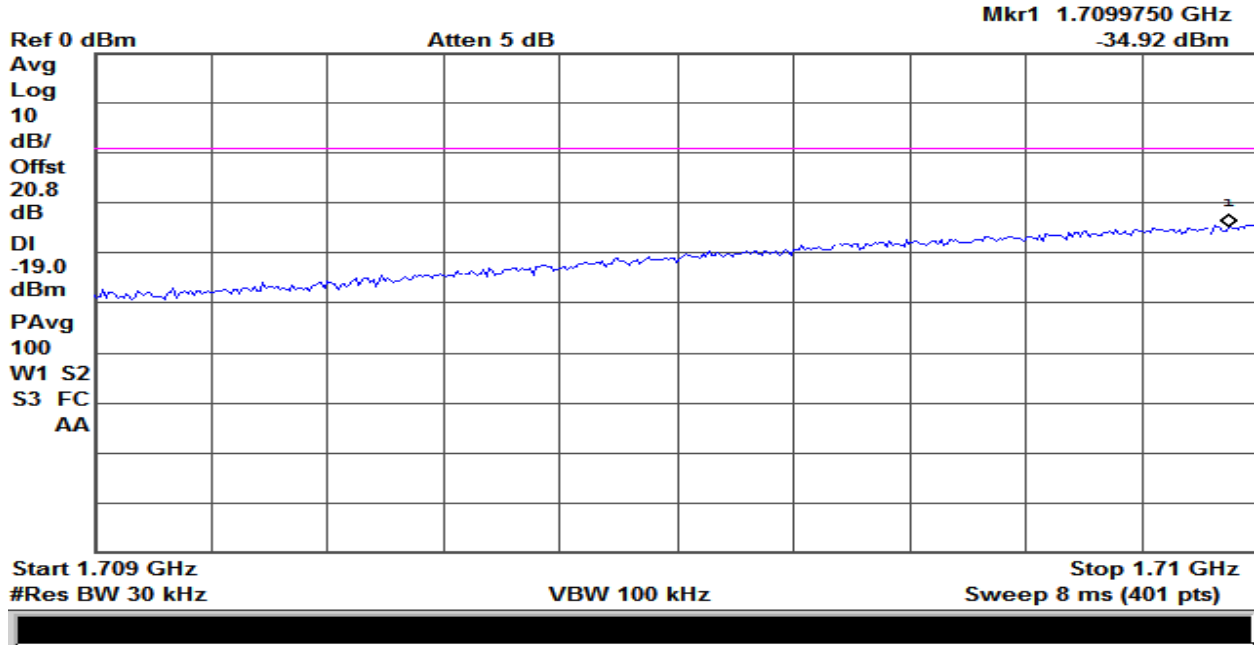




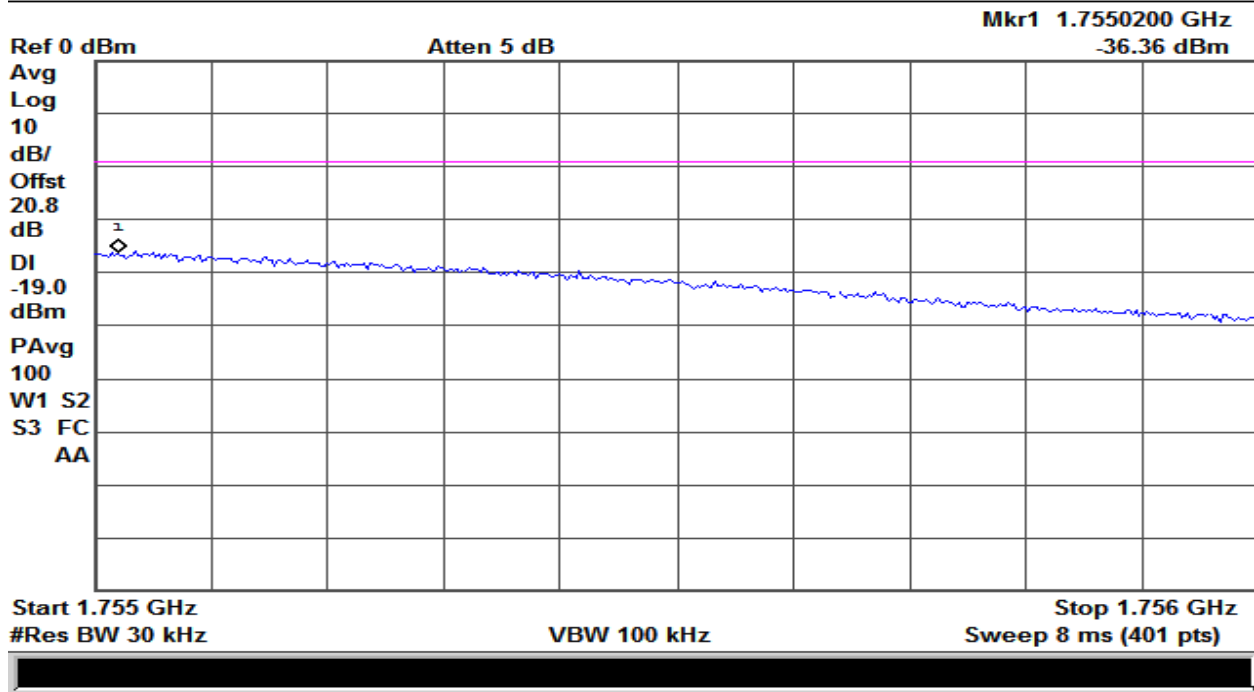
Plot 42 – 1850-1915MHz Band – CDMA Uplink Lower Band Edge



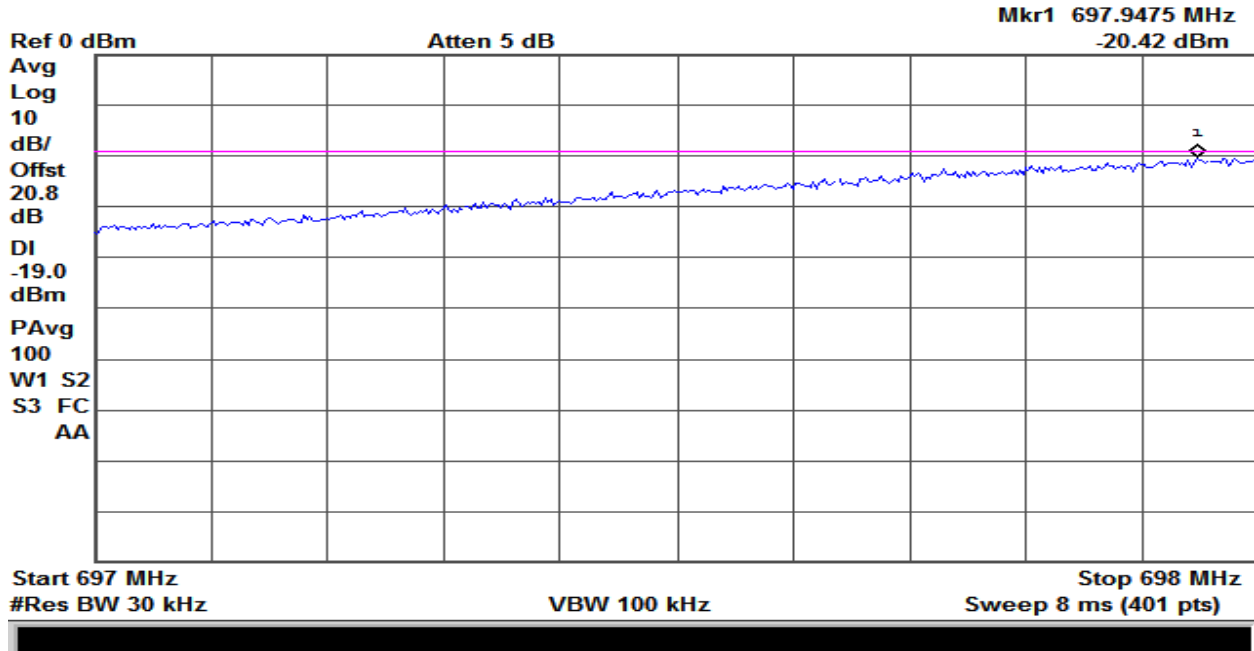
Plot 43 - 1850-1915MHz Band – CDMA Uplink Upper Band Edge



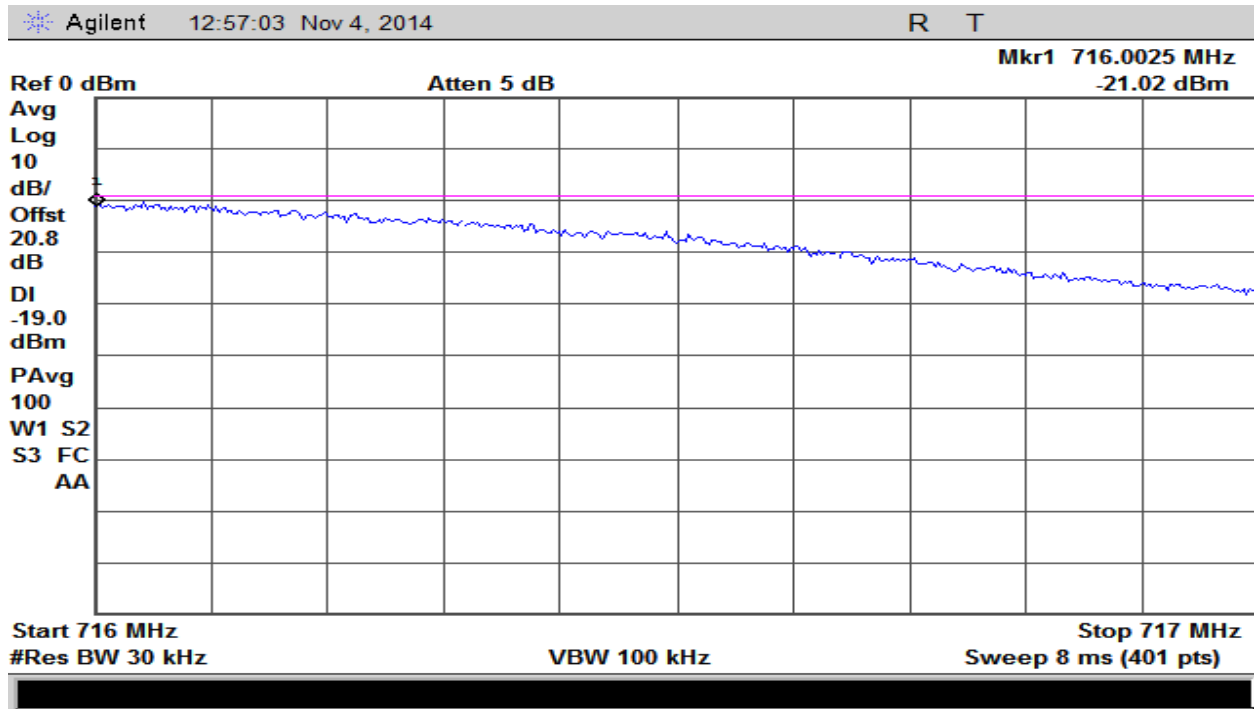
Plot 44 – 1710-1755MHz Band – CDMA Uplink Lower Band Edge



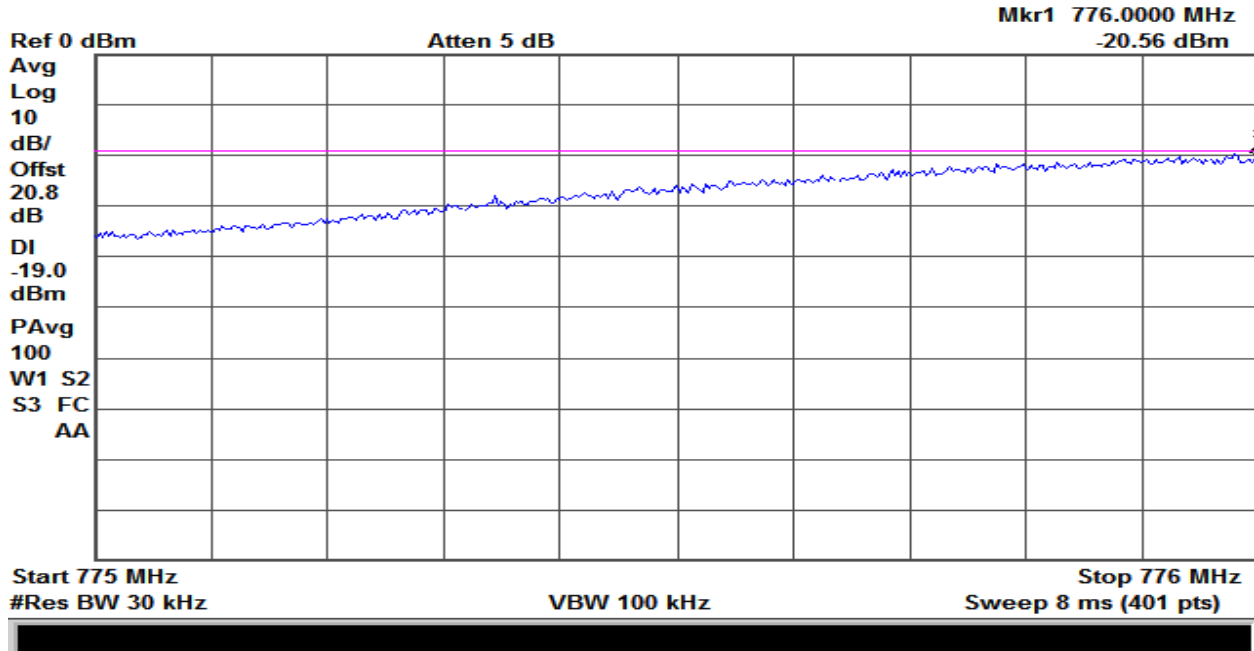
Plot 45 - 1710-1755MHz Band – CDMA Uplink Upper Band Edge



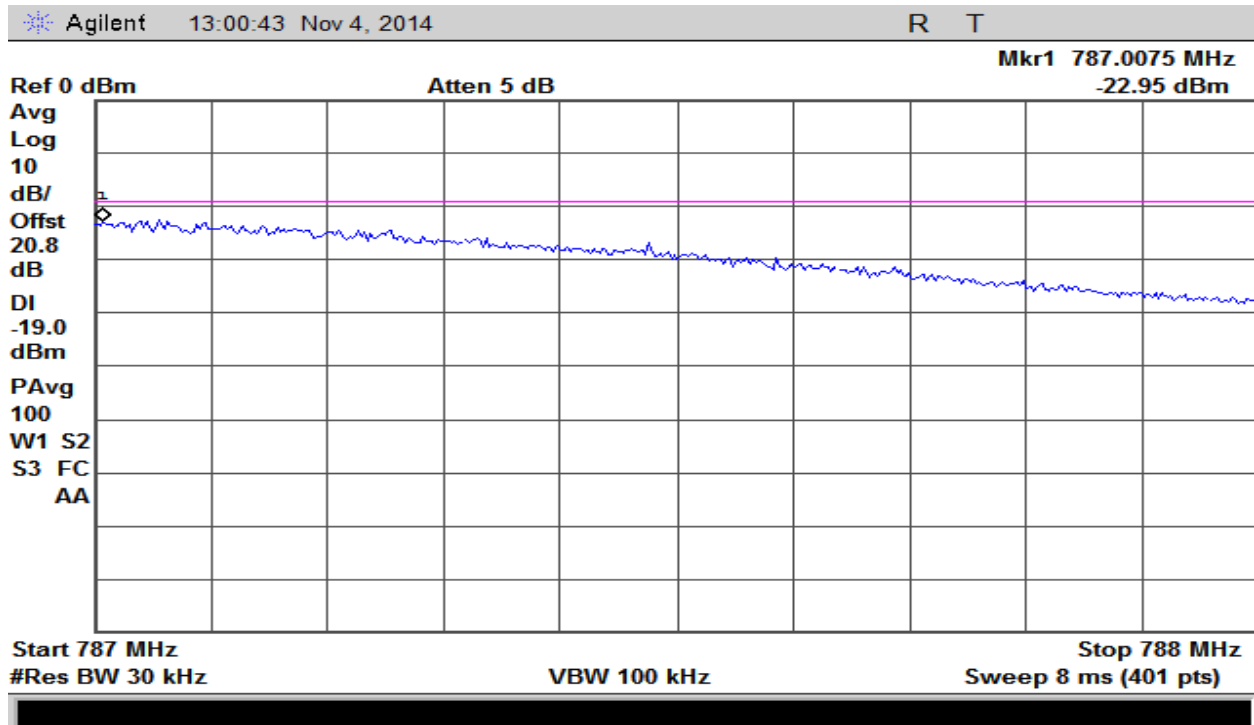
Plot 46 – 698-716MHz Band – CDMA Uplink Lower Band Edge



Plot 47 – 698-716MHz Band – CDMA Uplink Upper Band Edge



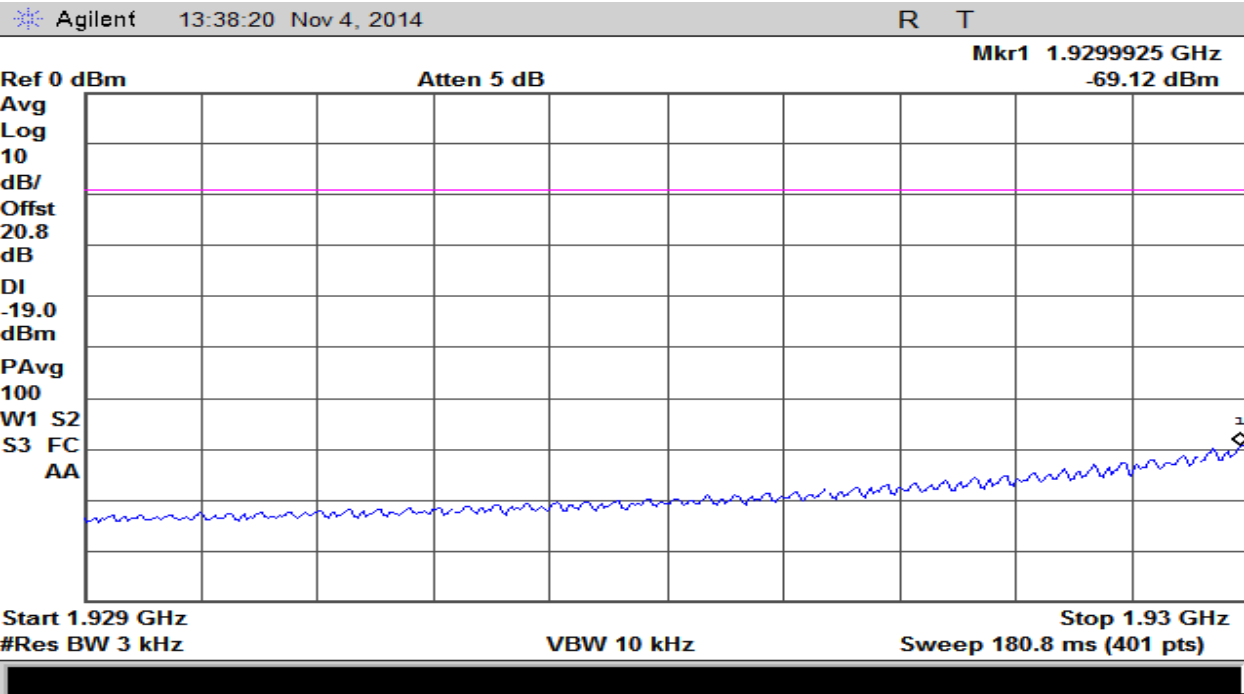
Plot 48 – 776-787MHz Band – CDMA Uplink Lower Band Edge



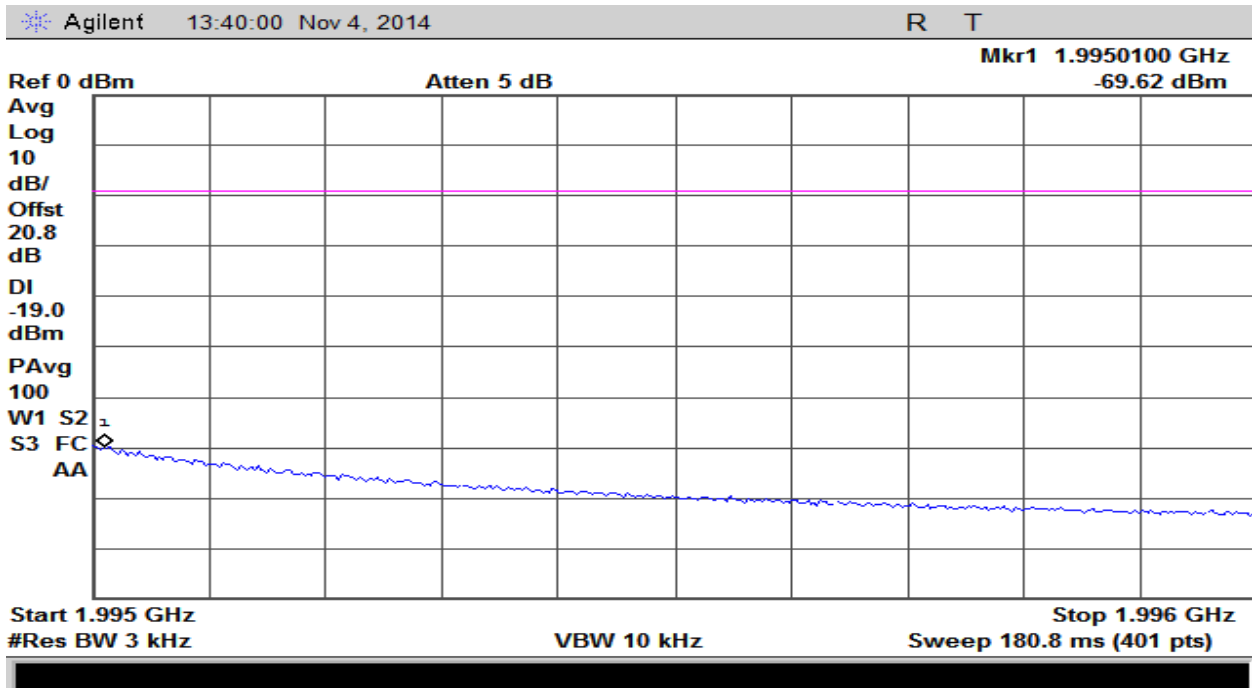
Plot 49 – 776-787MHz Band – CDMA Uplink Upper Band Edge



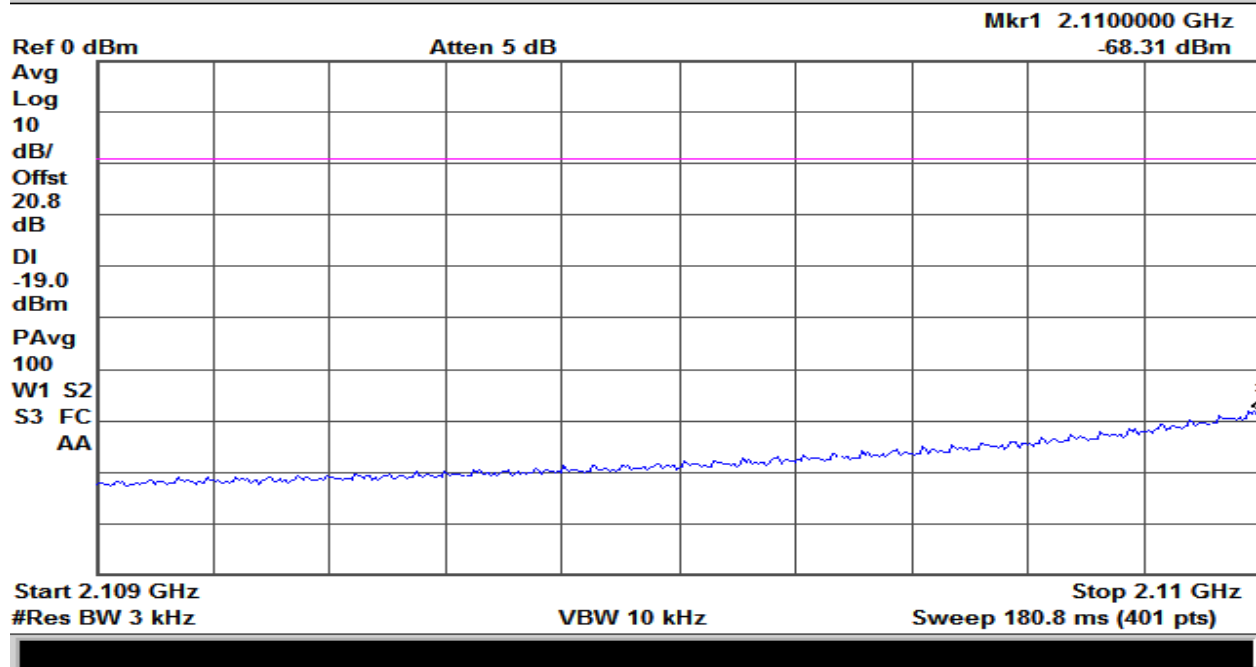




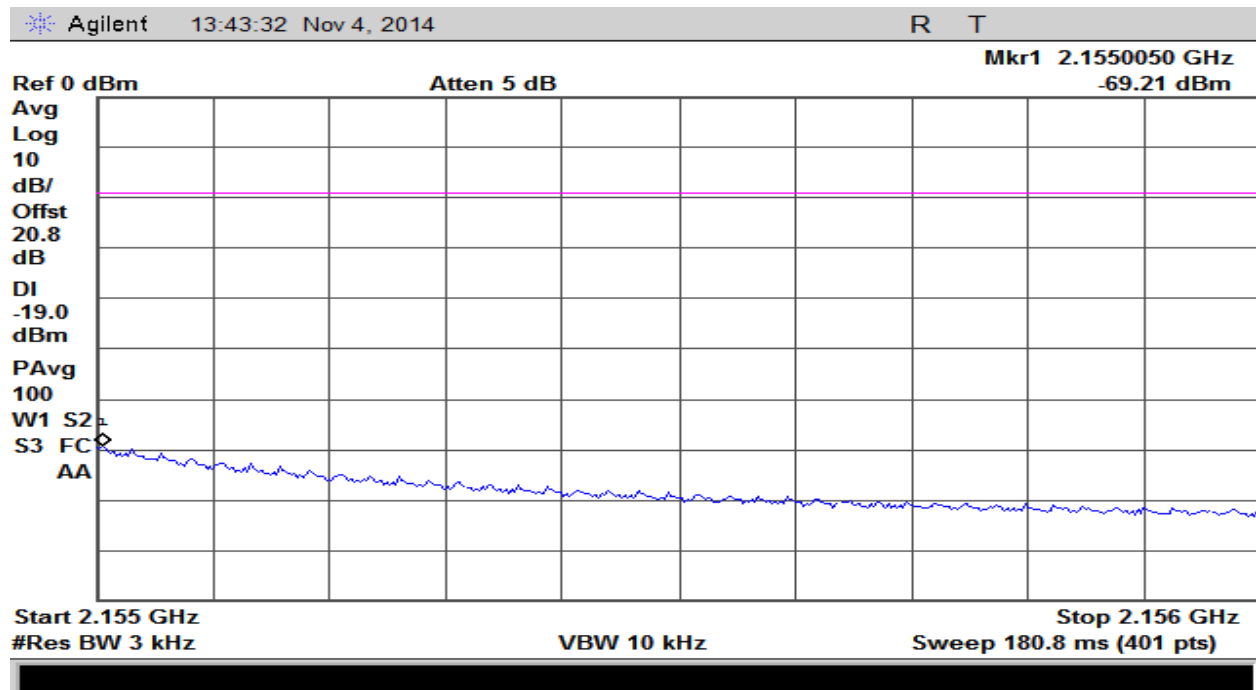
Plot 52 – 1930-1995MHz Band – GSM Downlink Lower Band Edge



Plot 53 – 1930-1995MHz Band – GSM Downlink Upper Band Edge

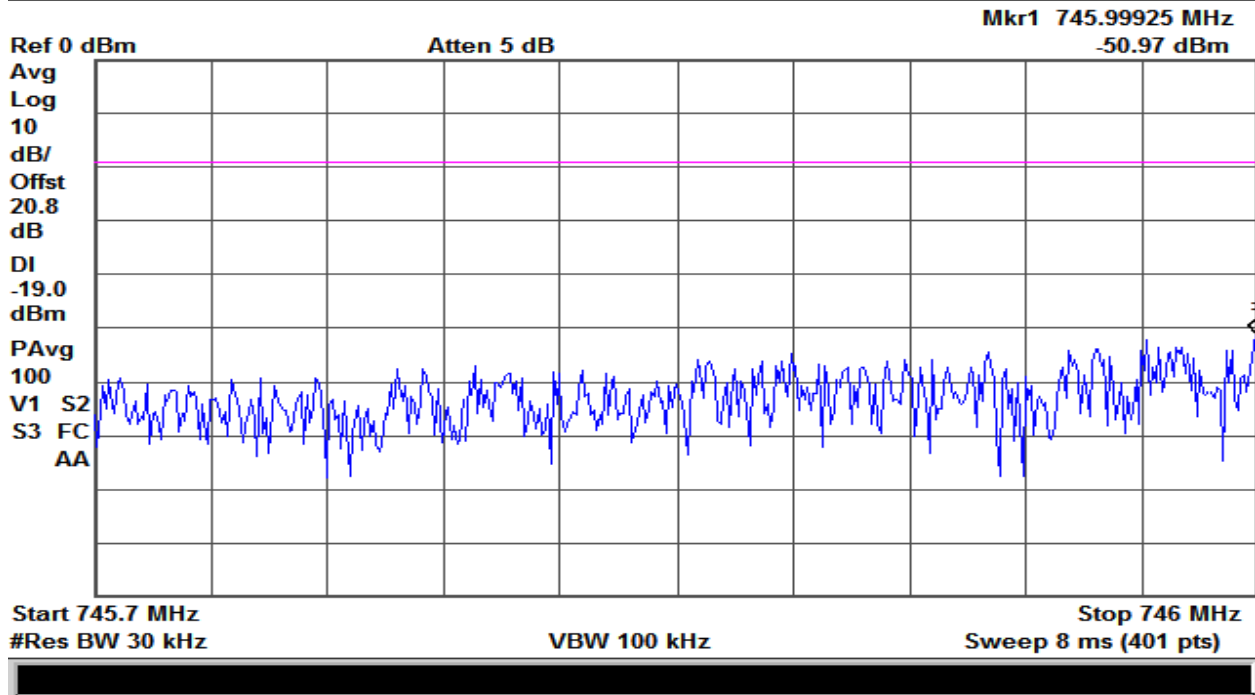


Plot 54 – 2110-2155MHz Band – GSM Downlink Lower Band Edge

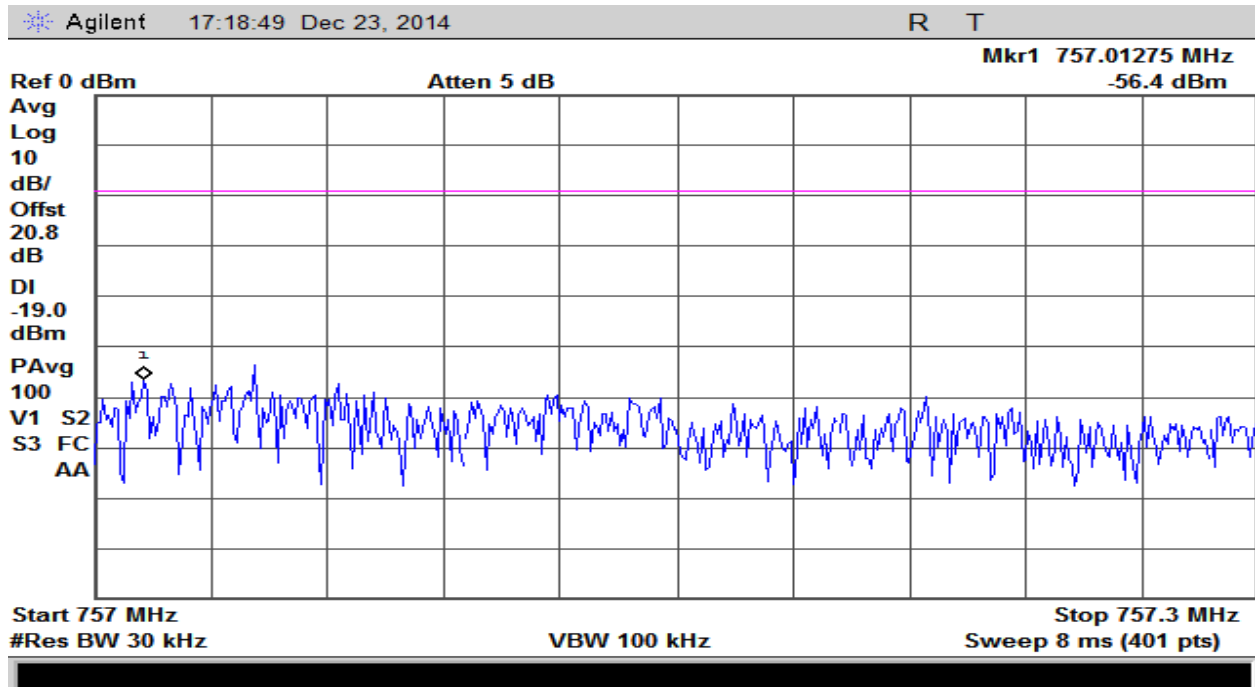


Plot 55 – 2110-2155MHz Band – GSM Downlink Upper Band Edge



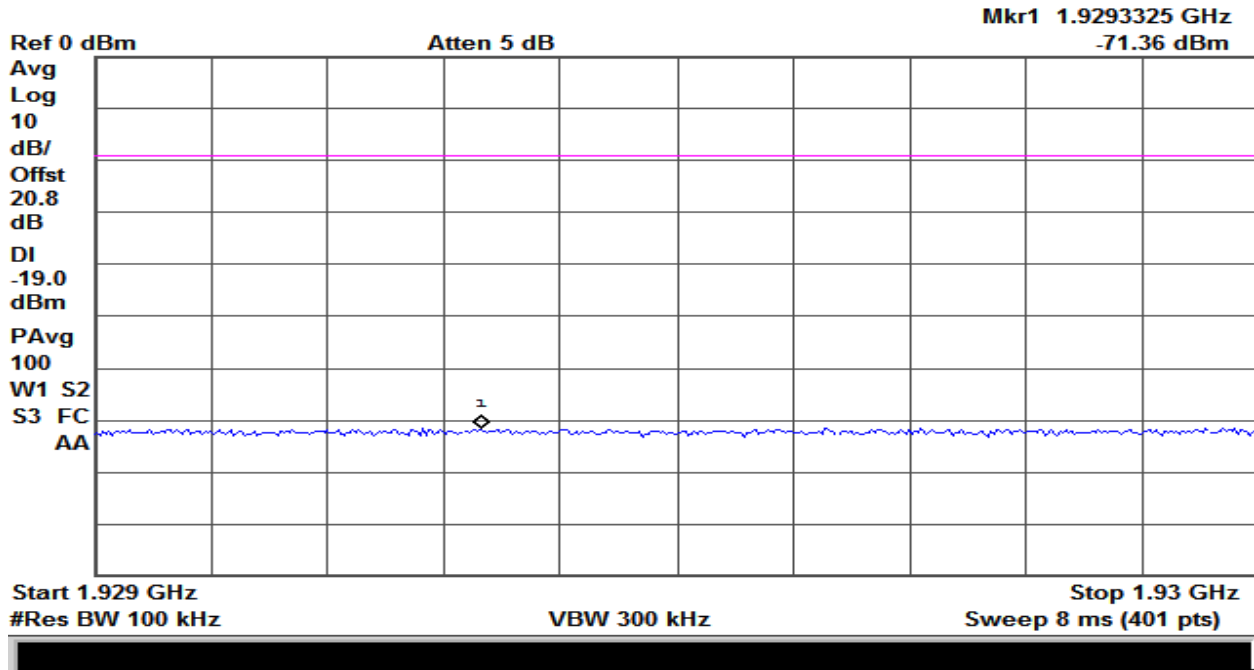


Plot 58 – 746-757MHz Band – GSM Downlink Lower Band Edge

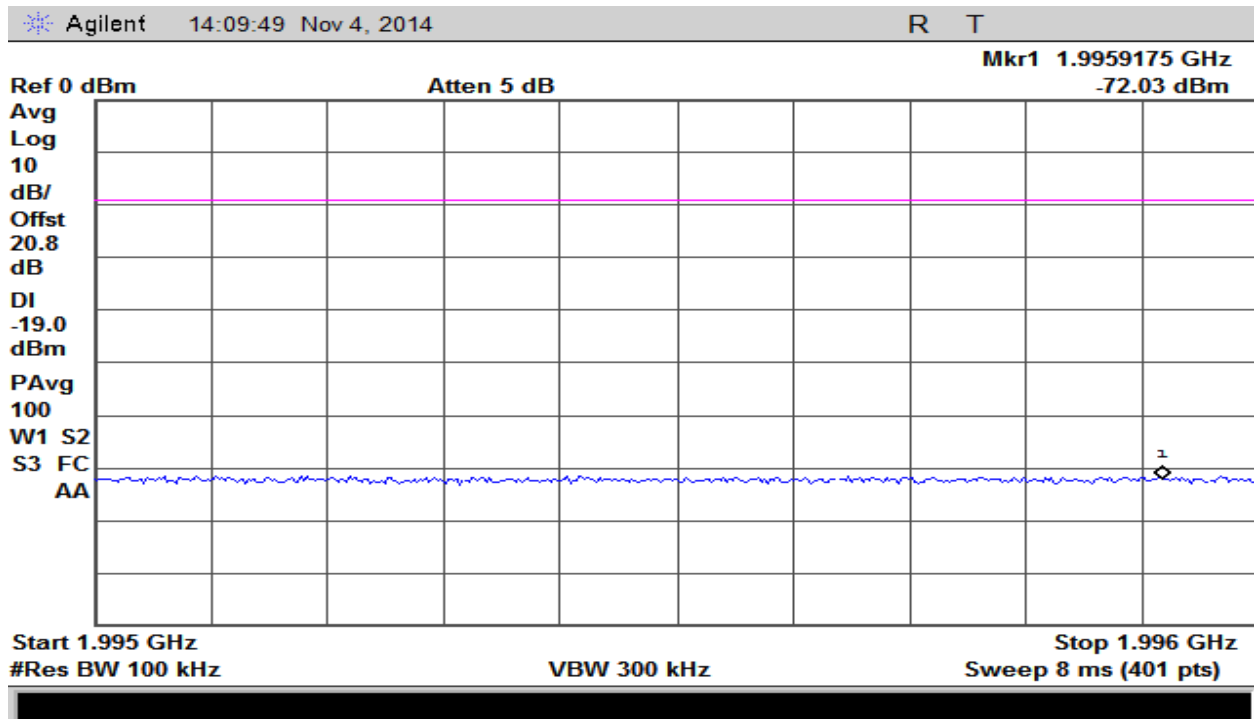


Plot 59 – 746-757MHz Band – GSM Downlink Upper Band Edge





Plot 62 – 1930-1995MHz Band – LTE Downlink Lower Band Edge

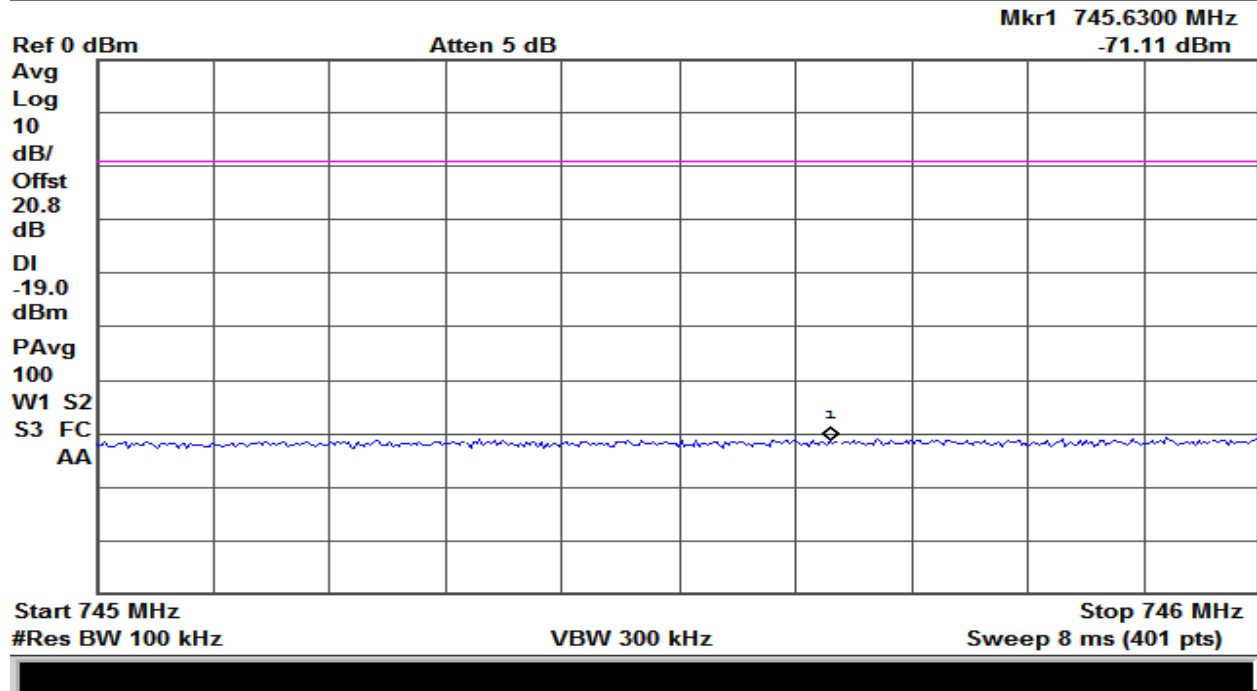


Plot 63 – 1930-1995MHz Band – LTE Downlink Upper Band Edge

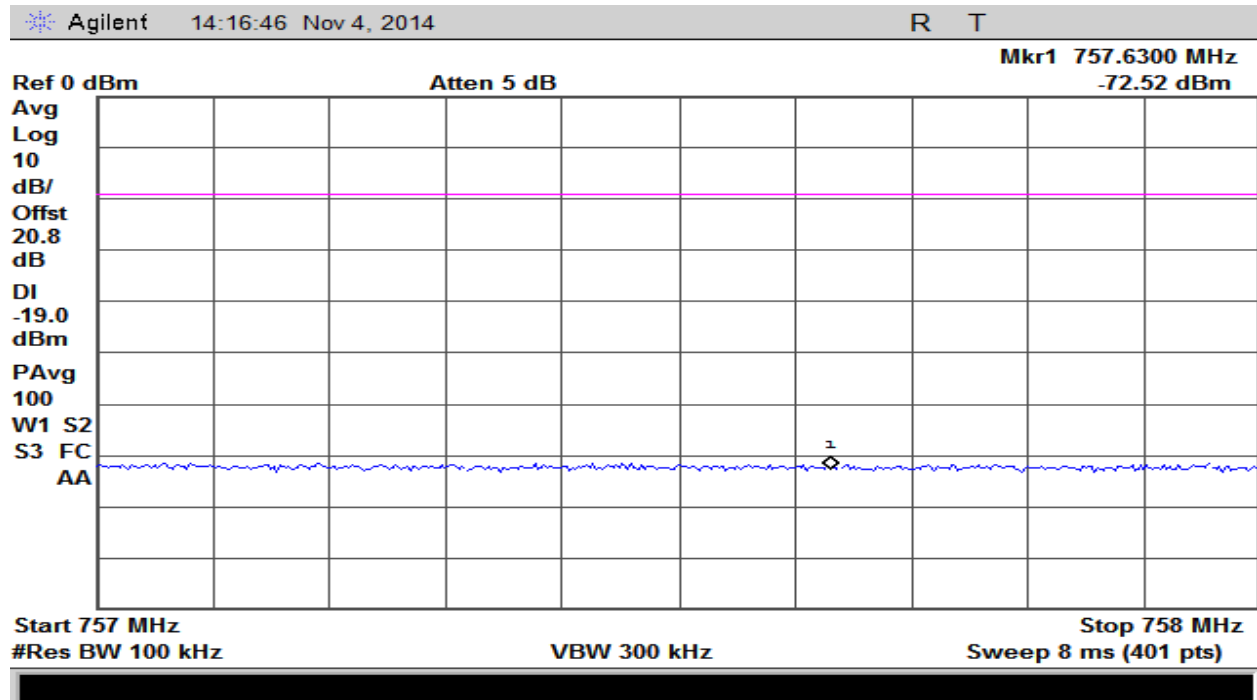








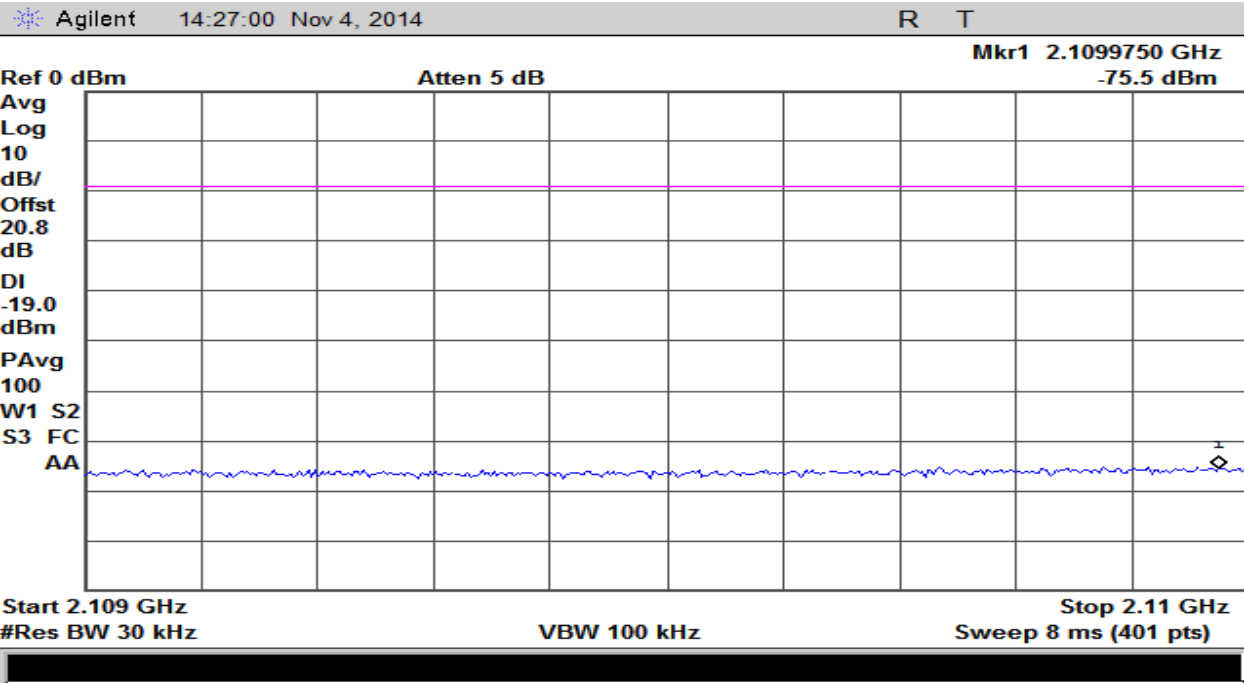
Plot 68 – 746-757MHz Band – LTE Downlink Lower Band Edge



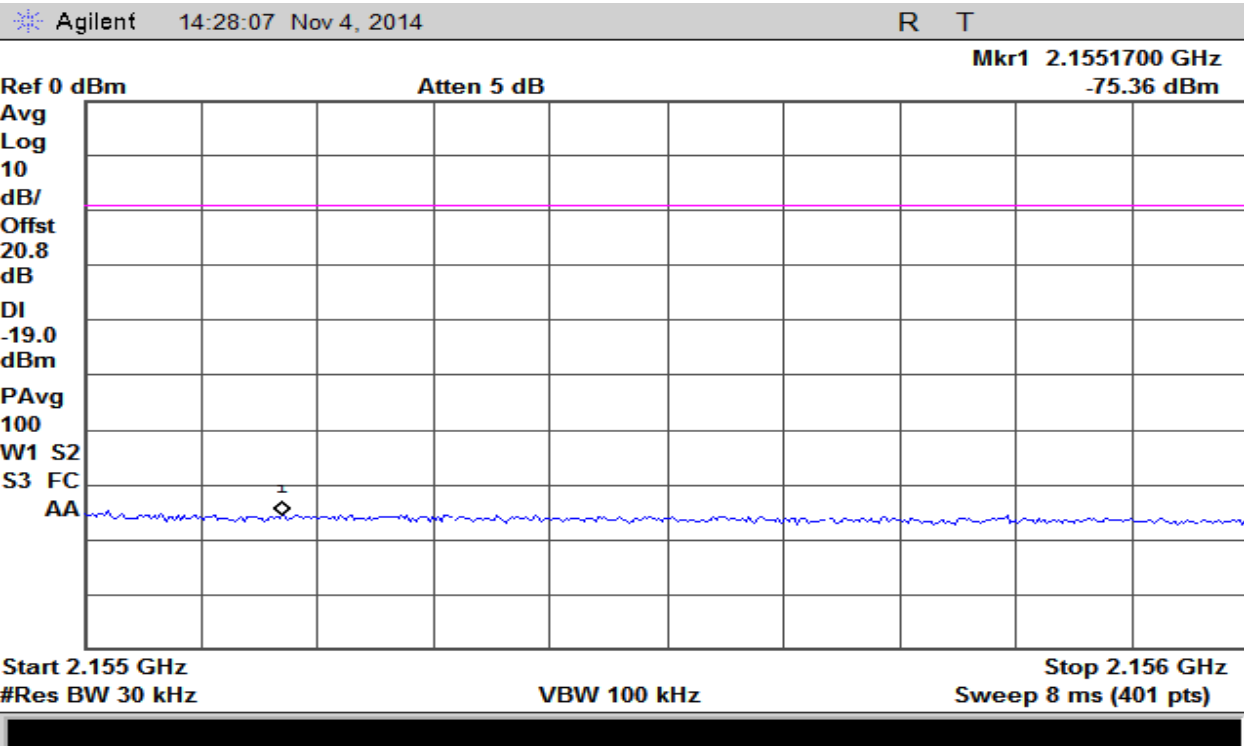
Plot 69 – 746-757MHz Band – LTE Downlink Upper Band Edge



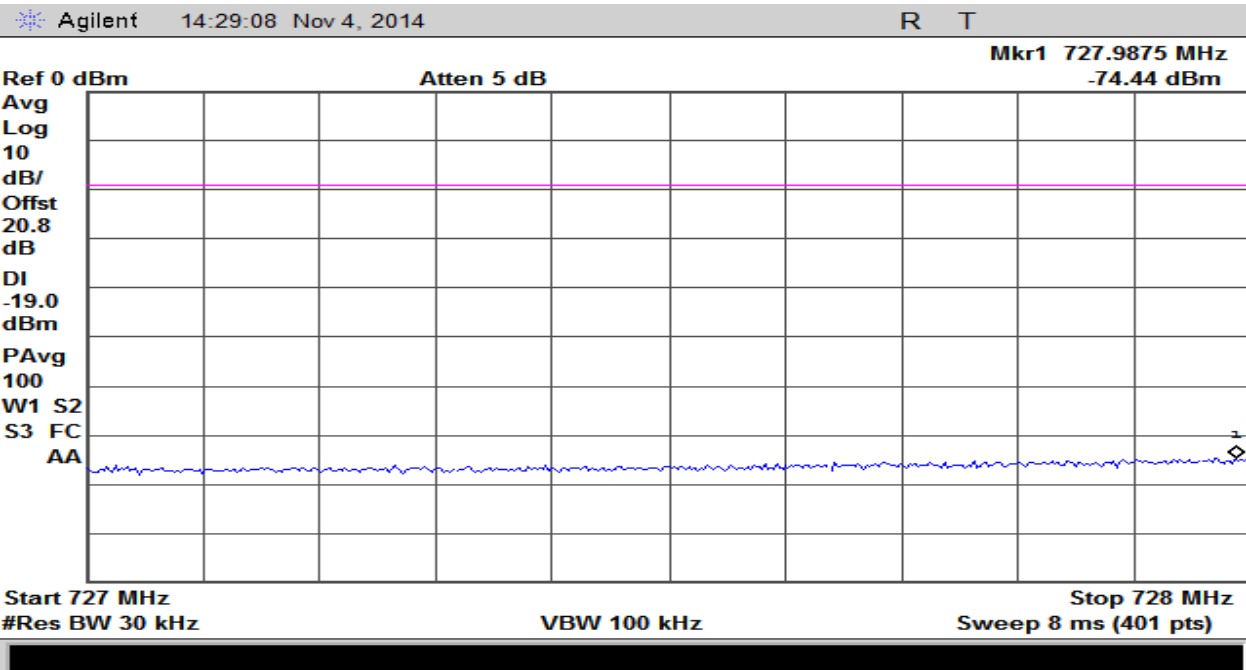




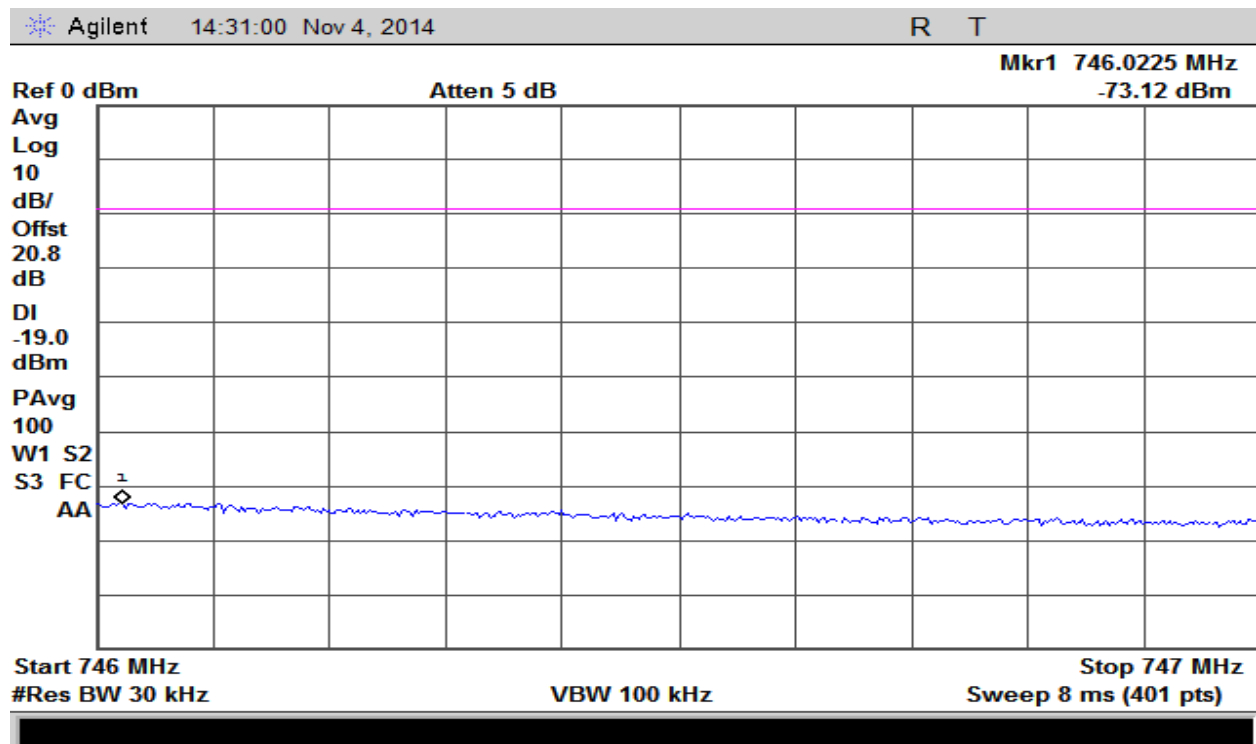
Plot 74 – 2110-2155MHz Band – CDMA Downlink Lower Band Edge



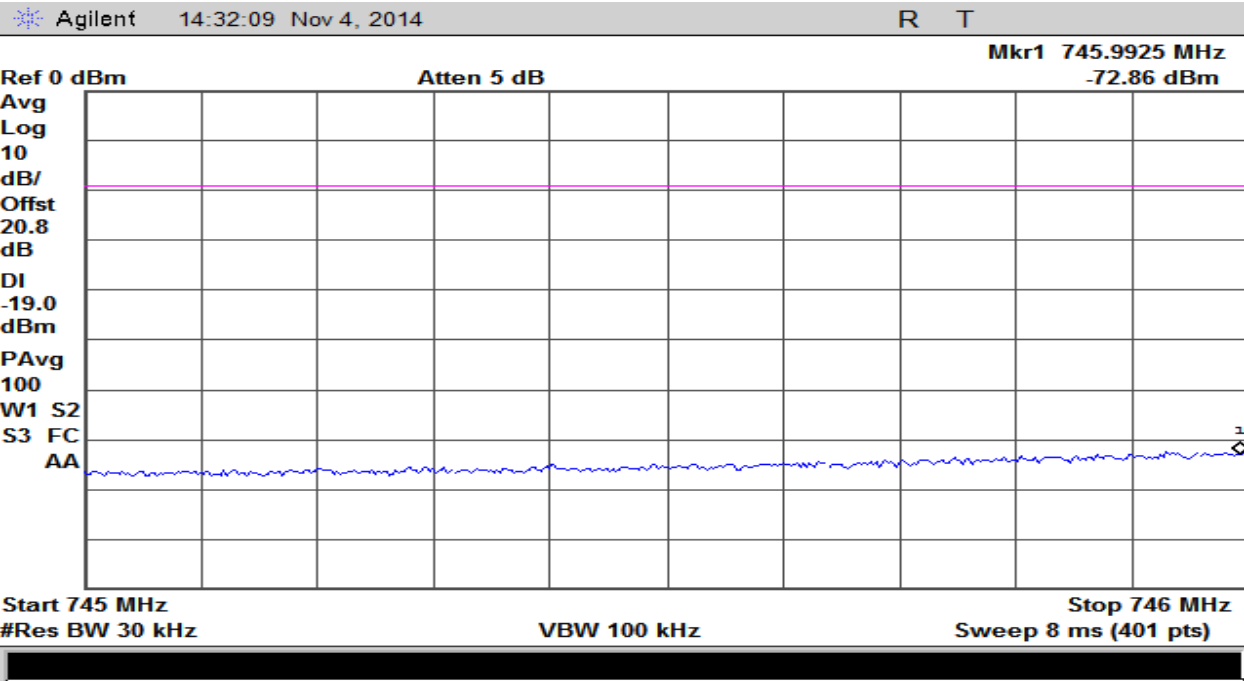
Plot 75 – 2110-2155MHz Band – CDMA Downlink Upper Band Edge



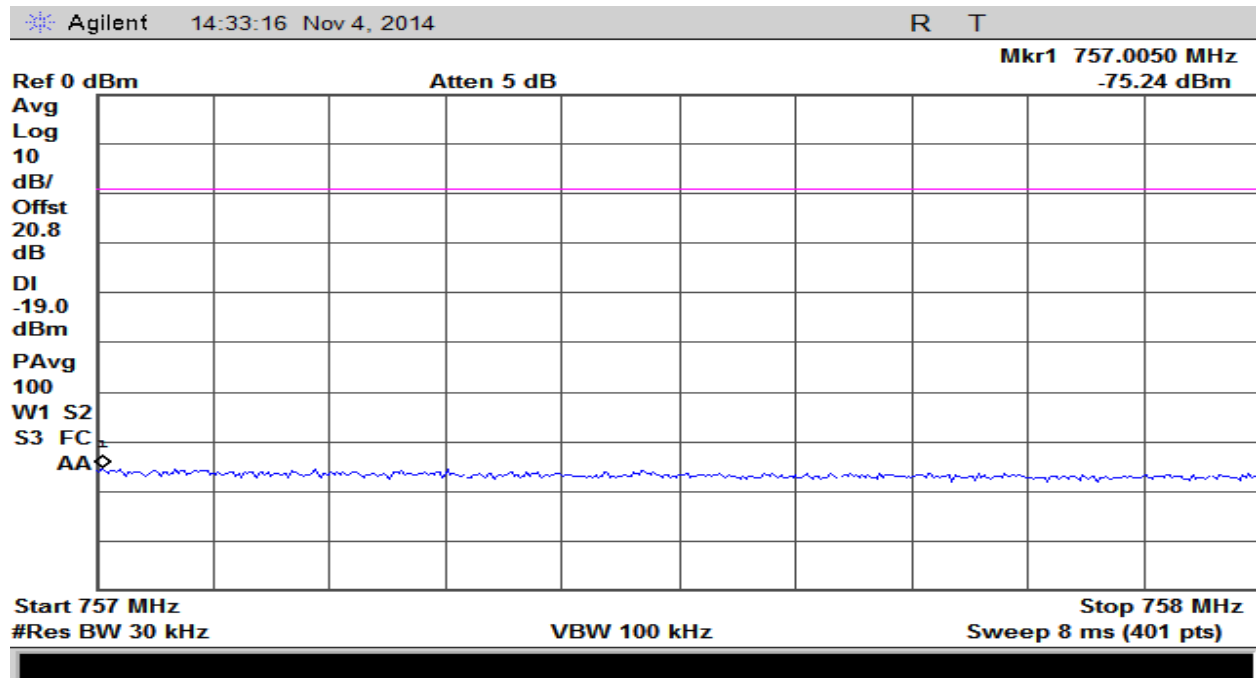
Plot 76 – 728-746MHz Band – CDMA Downlink Lower Band Edge



Plot 77 – 728-746MHz Band – CDMA Downlink Upper Band Edge



Plot 78 – 746-757MHz Band – CDMA Downlink Lower Band Edge



Plot 79 – 746-757MHz Band – CDMA Downlink Upper Band Edge

## 5. Conducted Spurious Emissions

<b>Test Requirement(s):</b>	§2.1051	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	Nov/05/14

**Test Procedures:** As required by 47 CFR §2.1051, Spurious emissions measurements were made at antenna terminals in accordance with the procedures of the KDB 935210 D03.

The EUT was connected through an attenuator to a spectrum analyzer. A signal generator was used at the input of the EUT to produce a 4.1MHz AWGN signal at the center of each CMRS operating band. Measurements were made at the low and high frequency of the uplink and downlink operational band.

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin
824-849	2506	-34.04	-13	-21.04
1850-1915	839	-34.56	-13	-21.56
1710-1755	1759	-38.53	-13	-25.53
698-716	2120	-15.63	-13	-2.63
776-787	788	-15.81	-13	-2.81

Table 13 – Conducted Spurious Emission Data – Uplink Summary

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin
869-894	7610	-39.20	-13	-26.2
1930-1995	16830	-39.7	-13	-26.7
2110-2155	7333	-42.03	-13	-29.03
728-746	7470	-42.03	-13	-29.03
746-757	7267	-42.20	-13	-29.2

Table 14 – Conducted Spurious Emission Data – Downlink Summary



Per FCC § 27.53 (C) for frequency operating in 746 – 758MHz and 776-788MHz band following additional requirements apply

As per § 27.53 (C)(4) On all frequencies between 763-775MHz and 793-895MHz, by a factor not less than  $65 + 10\log(P)$  dB in a 6.25kHz band segment, for mobile and portable stations.

BW correction for 6.25kHz to 10kHz RBW is following

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

Therefore BW correction factor =  $10\log 6.25/10 = -2.04$

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
763-775	774.97	-37.23	-2.04	-39.27	-35	-4.27
793-805	793.03	-48.9	-2.04	-50.95	-35	-15.95

**Table 15 – Conducted Spurious Emission Data – 776-787MHz Uplink Band Summary**

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
763-775	766.75	-83.26	-2.04	-85.3	-35	-50.3
793-805	796.75	-83.46	-2.04	-85.5	-35	-50.5

**Table 16 – Conducted Spurious Emission Data – 746-757MHz Downlink Band Summary**

Per FCC § 27.53 (f) for frequency operating in 746 – 763MHz and 775-793MHz emissions in the band 1559-1610MHz shall be limited to -70dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80dBW EIRP for discrete emissions of less than 700Hz bandwidth.

Since the limit is in EIRP, the Antenna Kitting (gain/loss) information supplied by manufacturer is added along with the bandwidth correction factor.

BW correction for 700Hz to 10kHz RBW is following

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

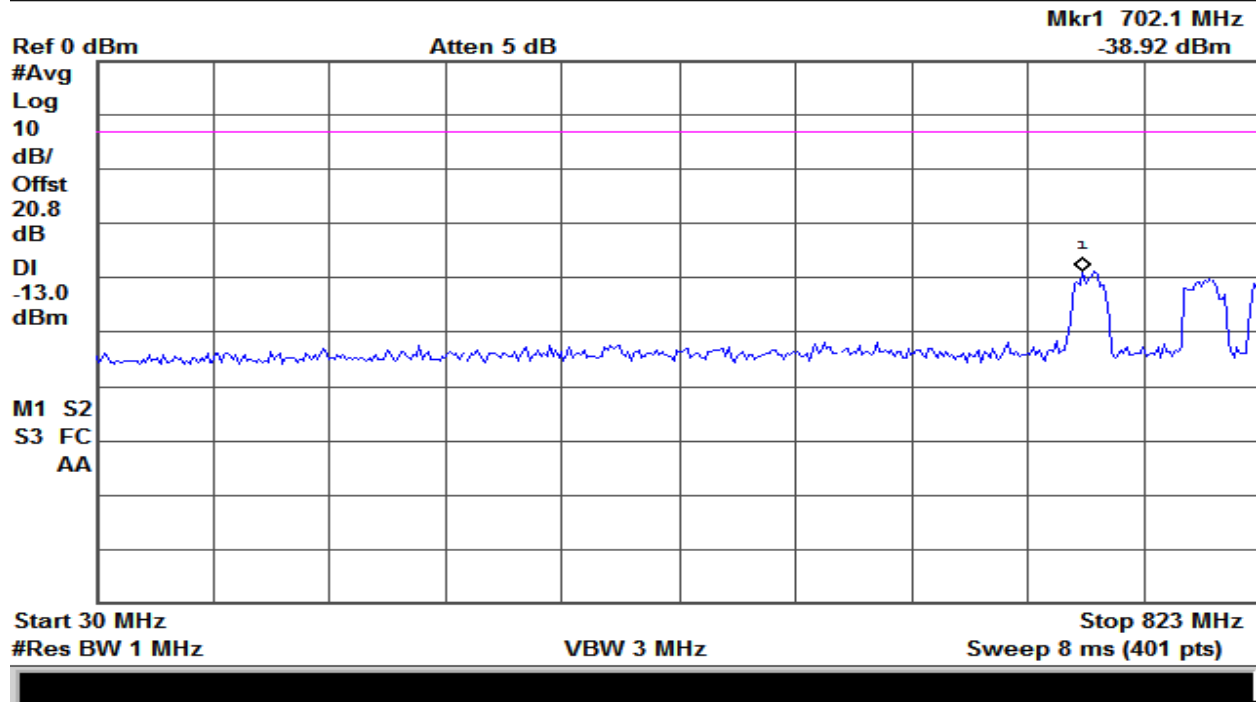
$$\text{Therefore BW correction factor} = 10\log 700/1000 = -11.55$$

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	Gain/Loss (dB) from Antenna Kitting Info	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
1559-1610 (Wideband)	1563.34	-45.67	0	4.2	-41.47	-40	-1.47
1559-1610 (Narrowband)	1563.34	-63.98	-11.55	4.2	-71.33	-50	-21.13

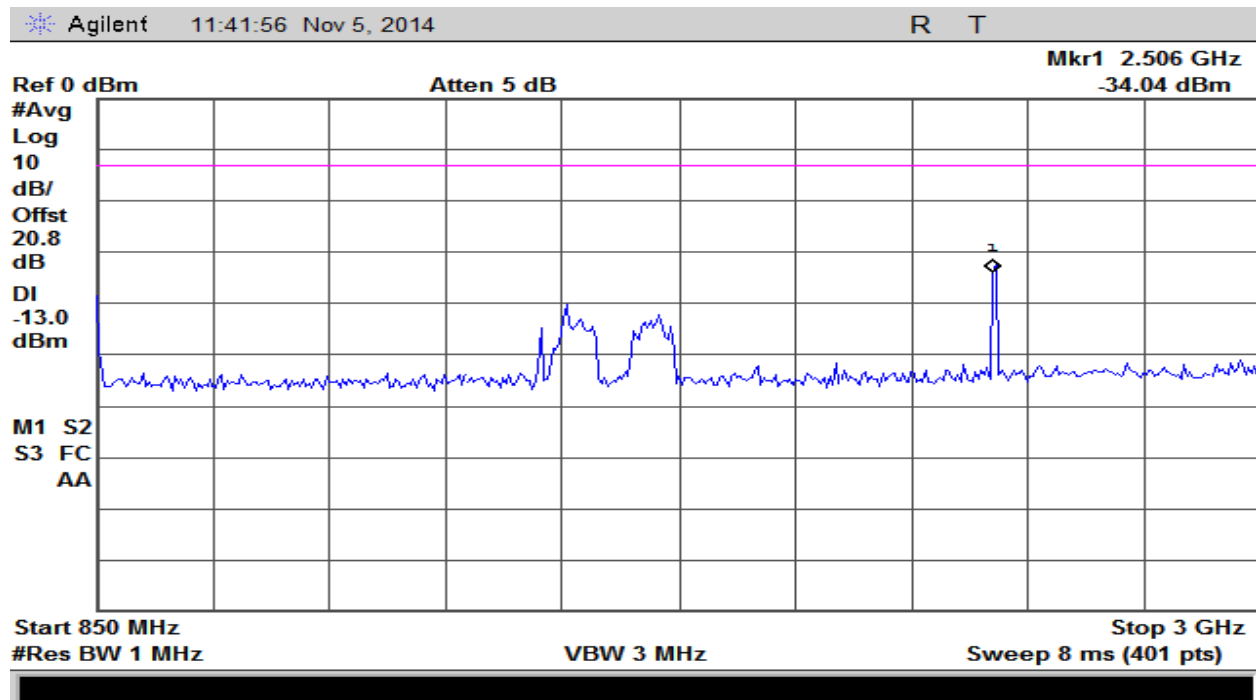
Table 17 – Conducted Spurious Emission Data – 776-787MHz Uplink Band Summary

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	MSCL	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
1559-1610 (Wideband)	1591.9	-63.8	0	0	-63.8	-40	-23.8
1559-1610 (Narrowband)	1589.6	-83.0	-11.55	0	-94.55	-50	-44.55

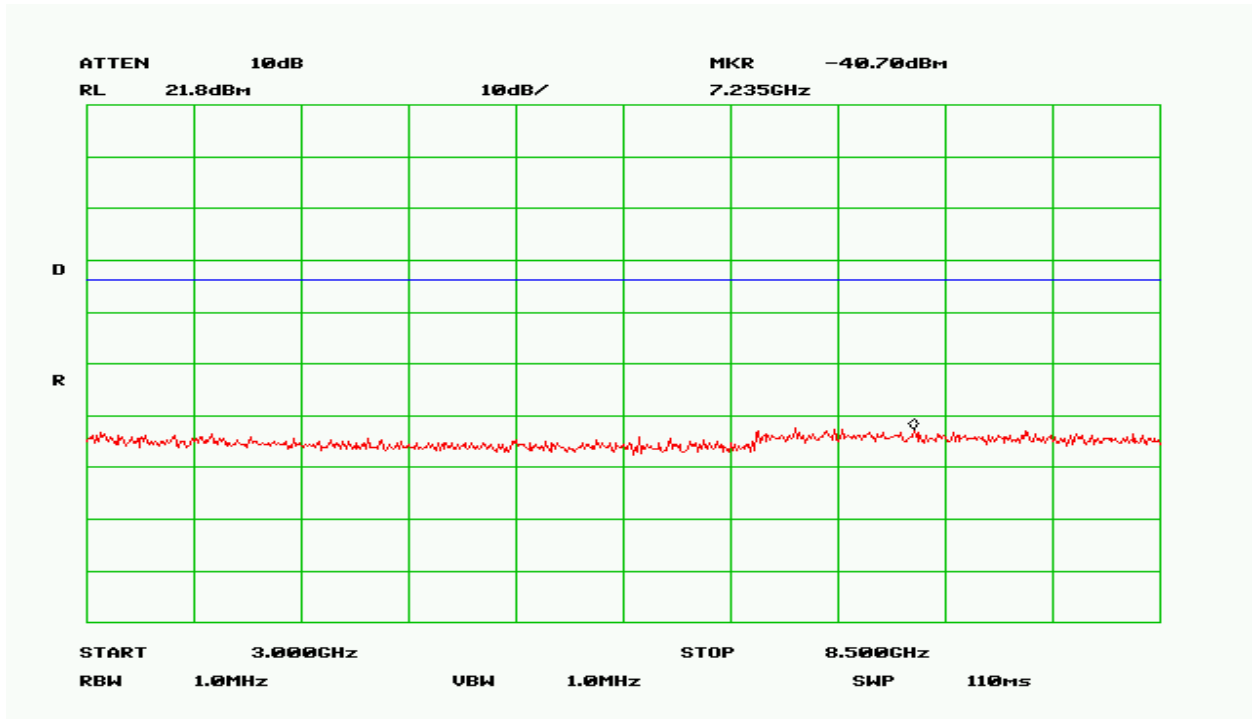
Table 18 – Conducted Spurious Emission Data – 746-757MHz Downlink Band Summary



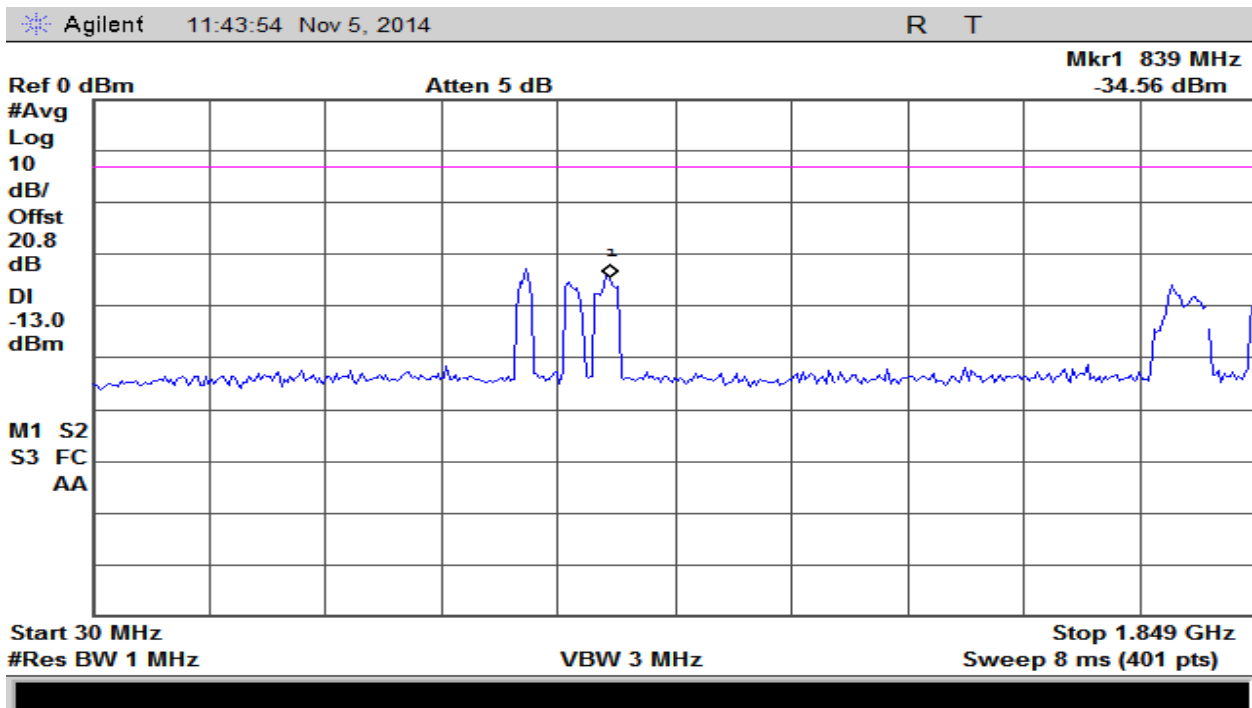
Plot 80 – 824-849MHz Band – Uplink



Plot 81 – 824-849MHz Band – Uplink

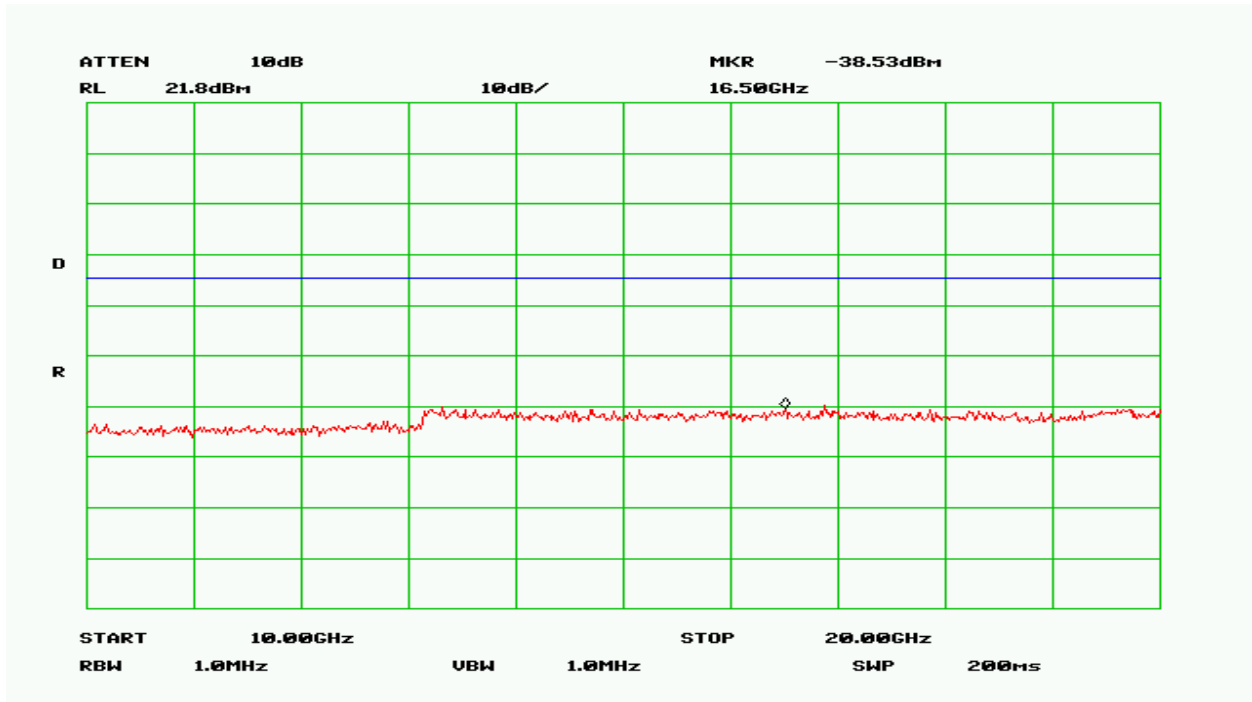


**Plot 82 – 824-849MHz Band – Uplink**

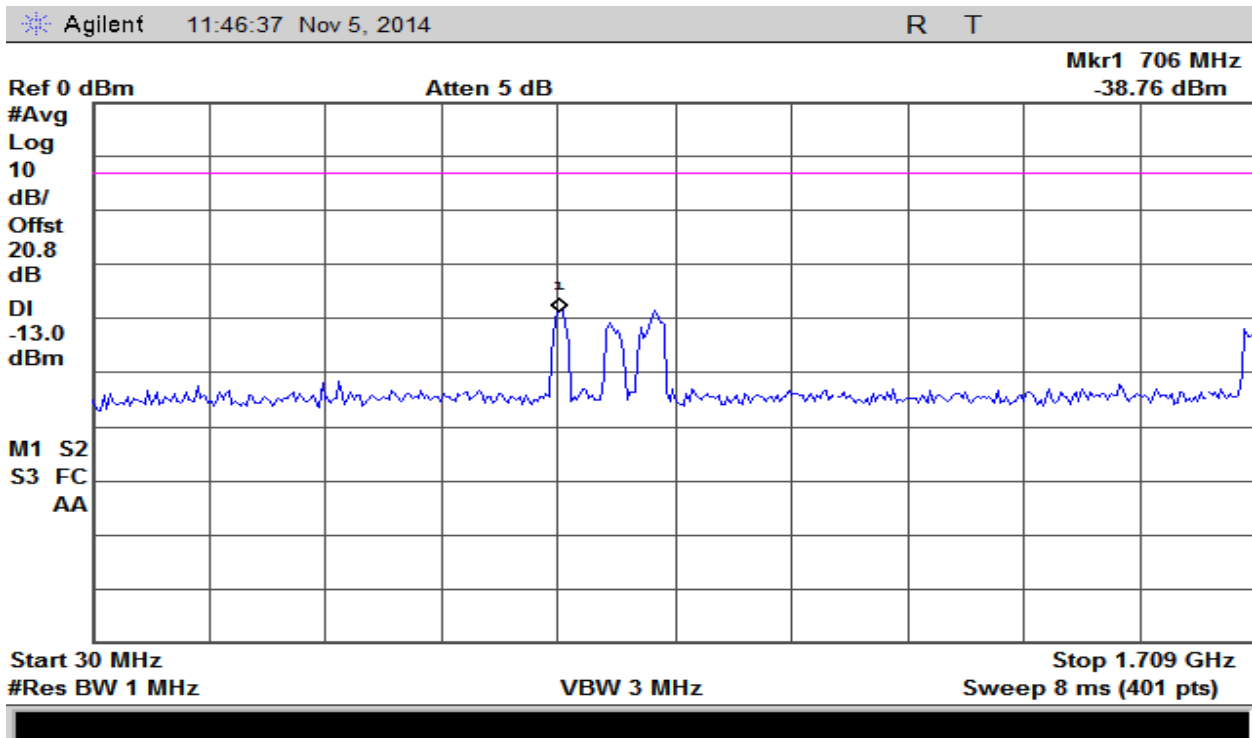


**Plot 83 – 1850-1915MHz Band – Uplink**



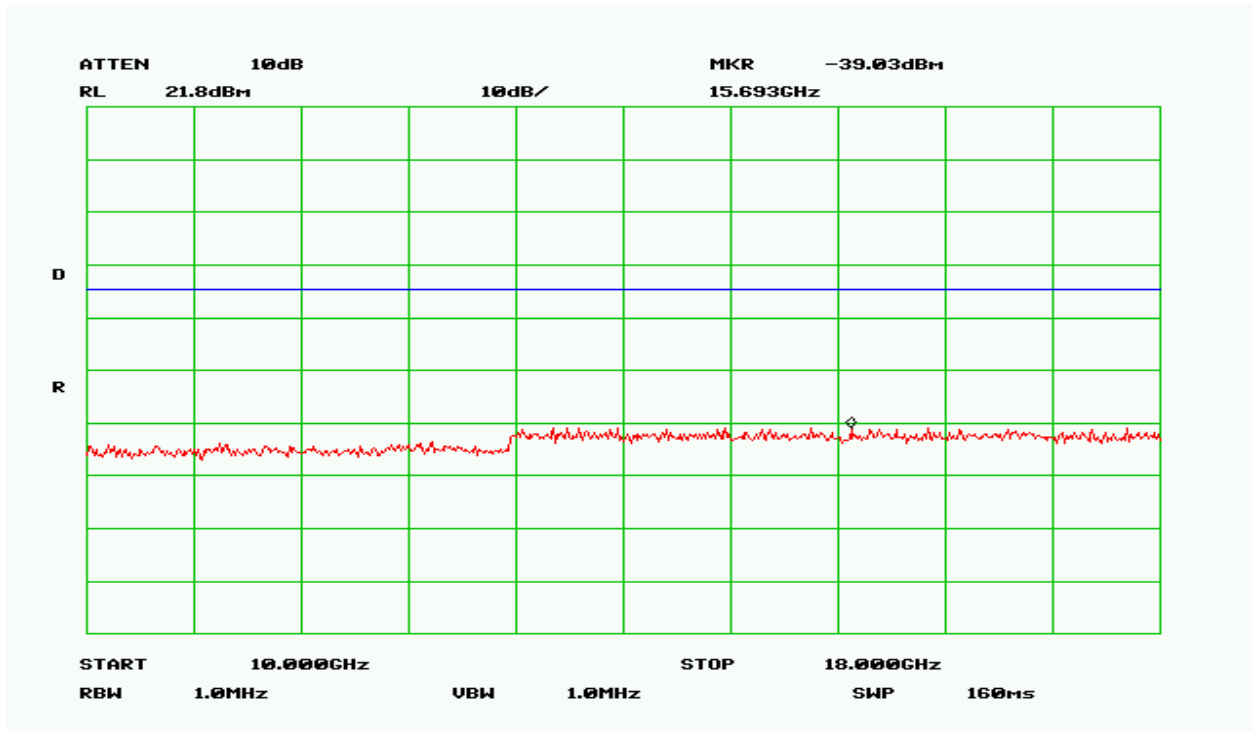


**Plot 86 – 1850-1915MHz Band – Uplink**

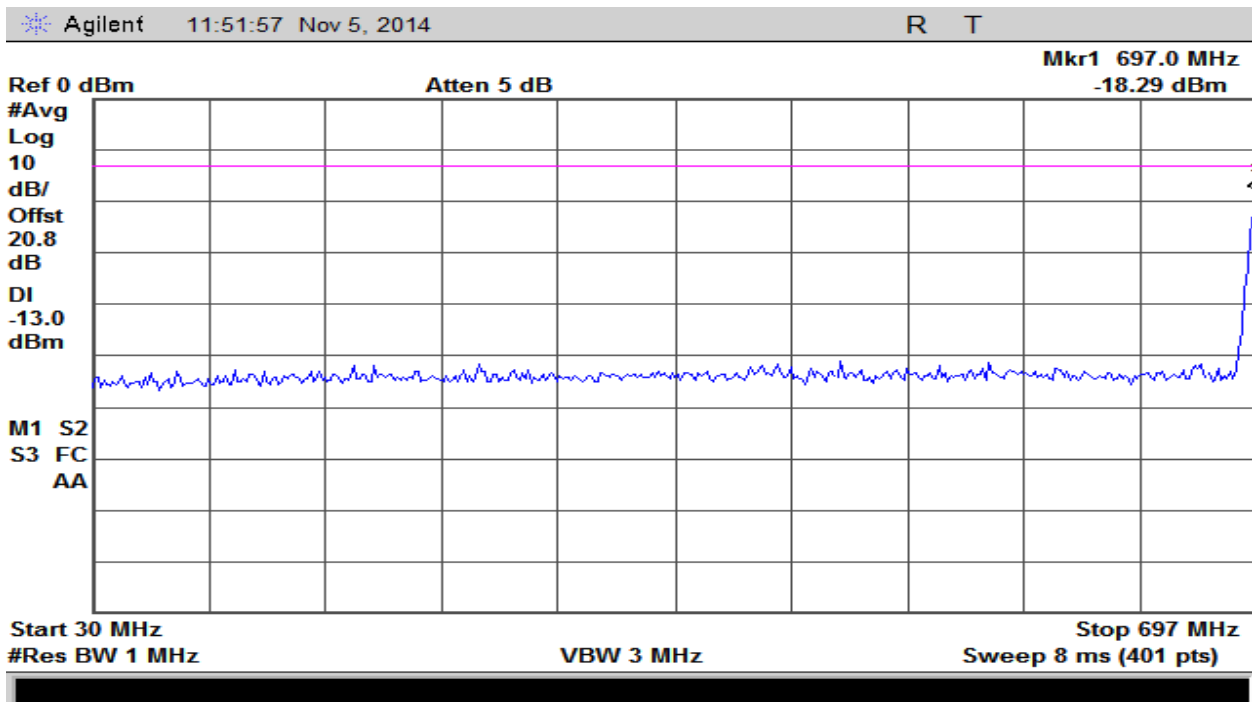


**Plot 87 – 1710-1755MHz Band – Uplink**



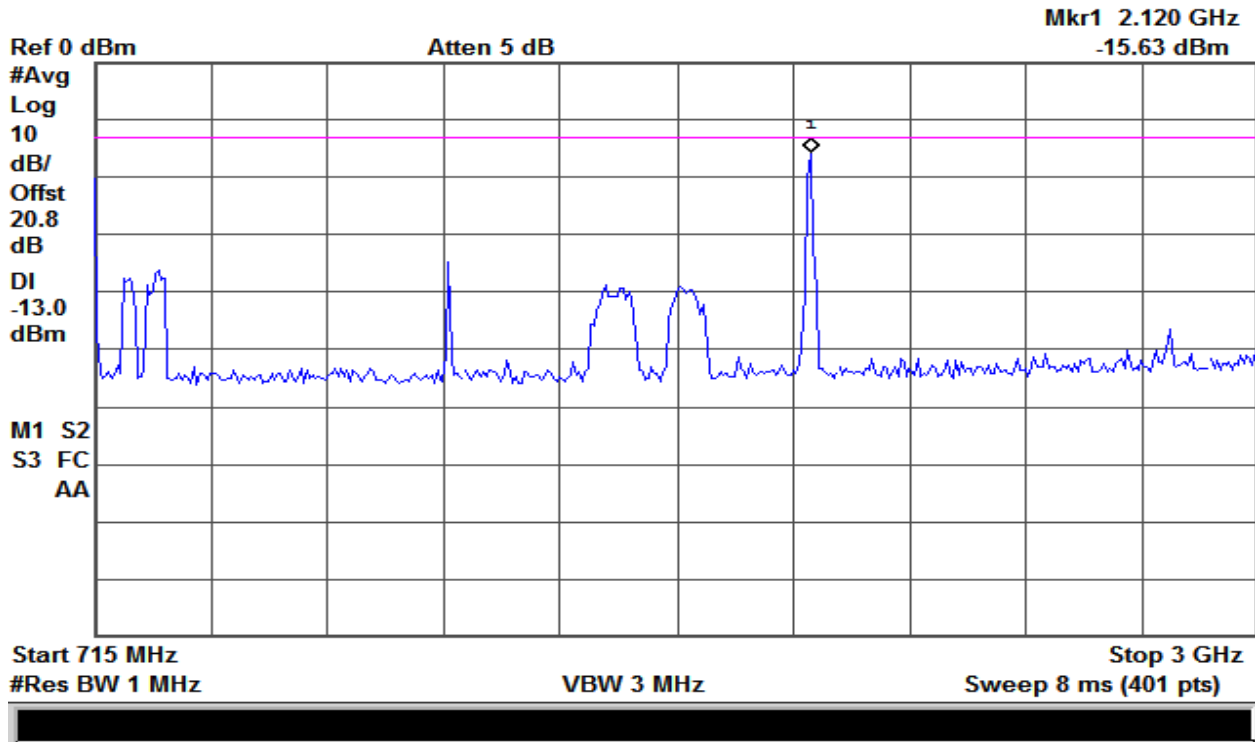


Plot 90 – 1710-1755MHz Band – Uplink

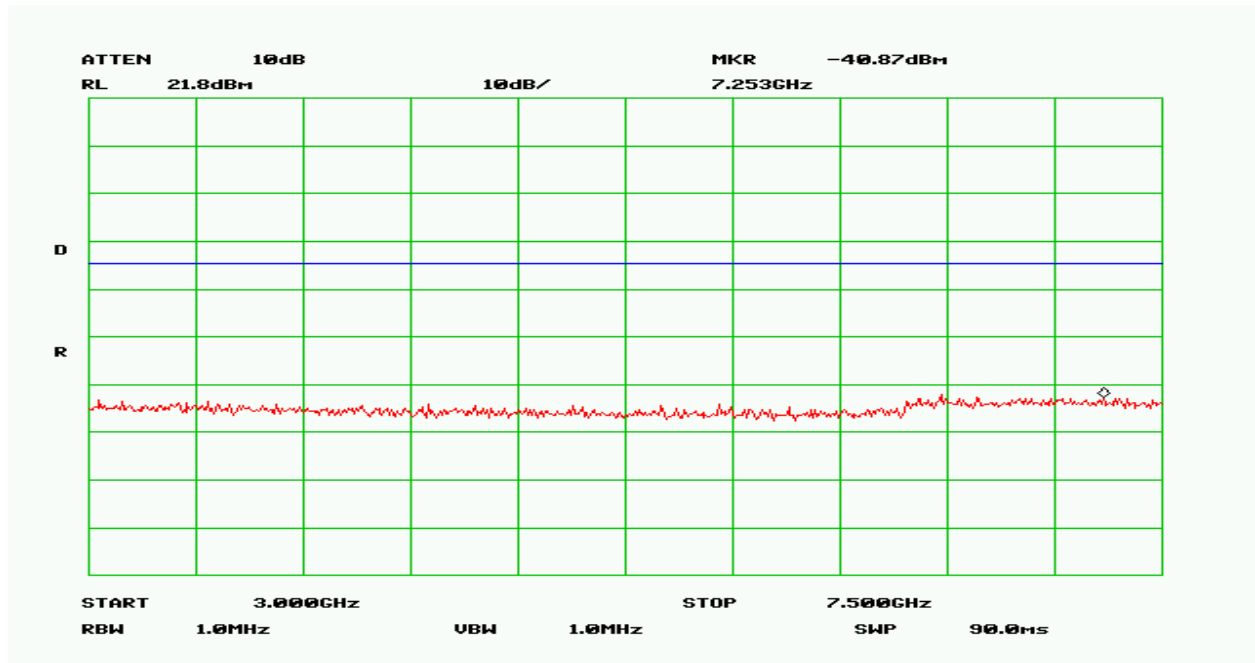


Plot 91 – 698-716MHz Band – Uplink

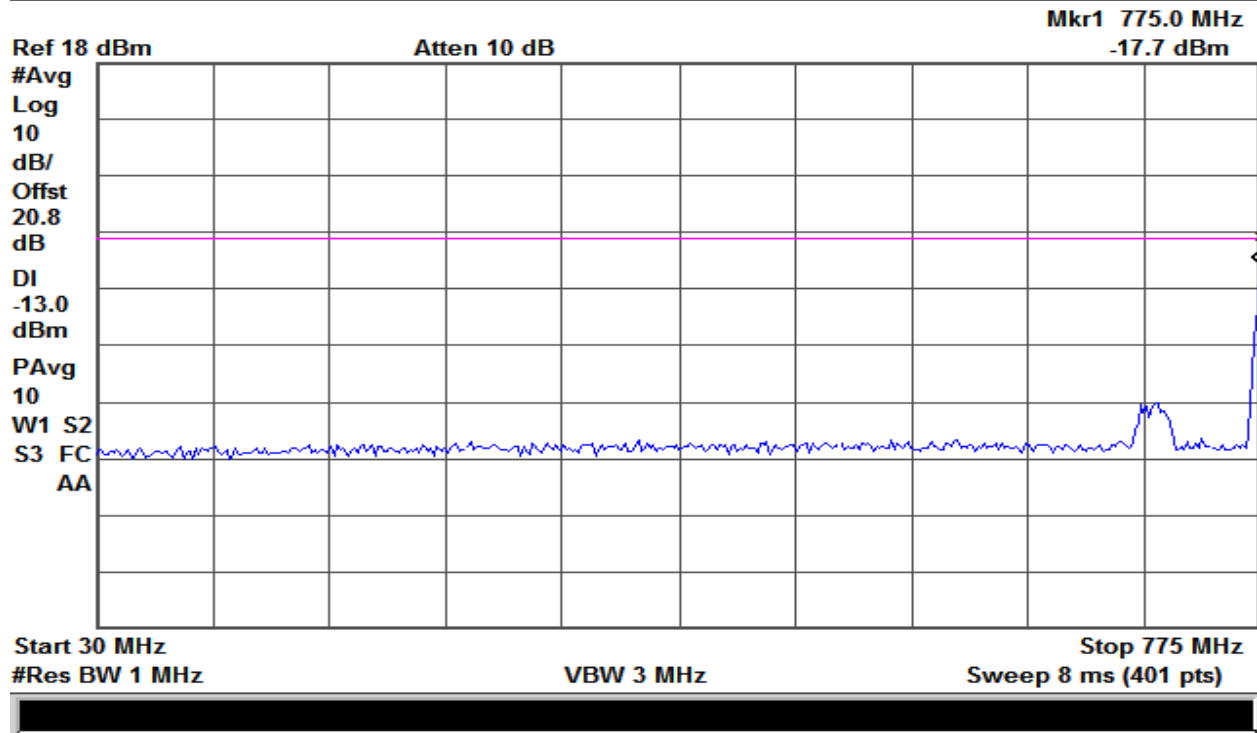




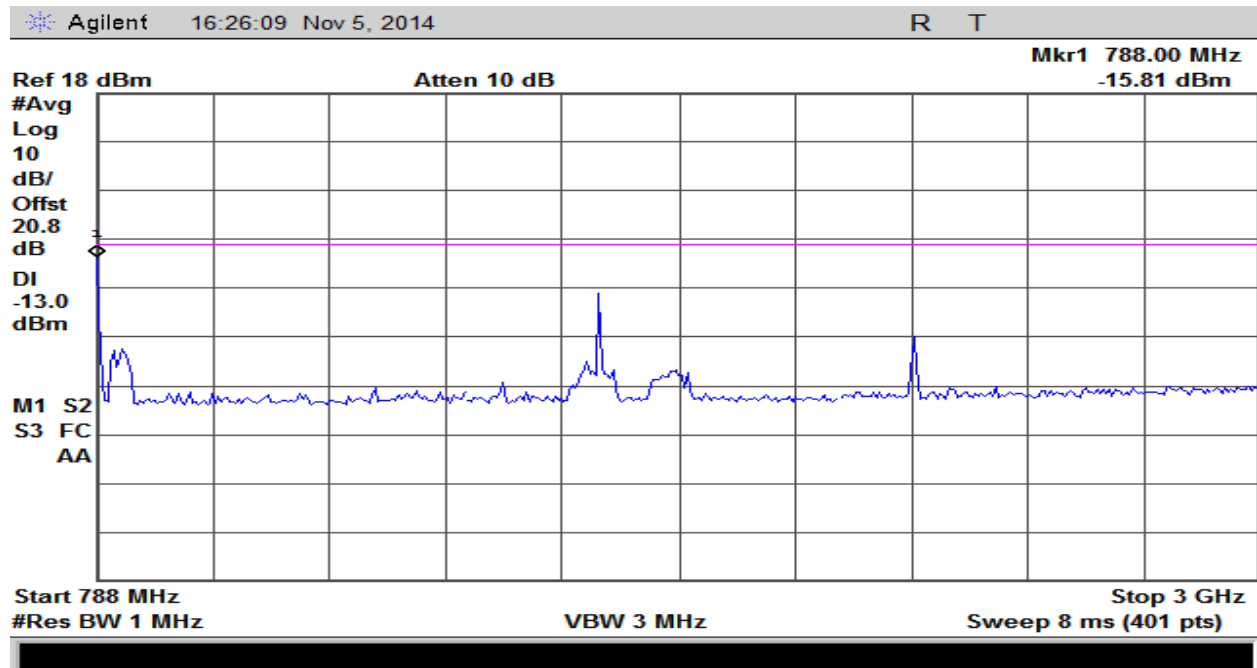
Plot 92 – 698-716MHz Band – Uplink



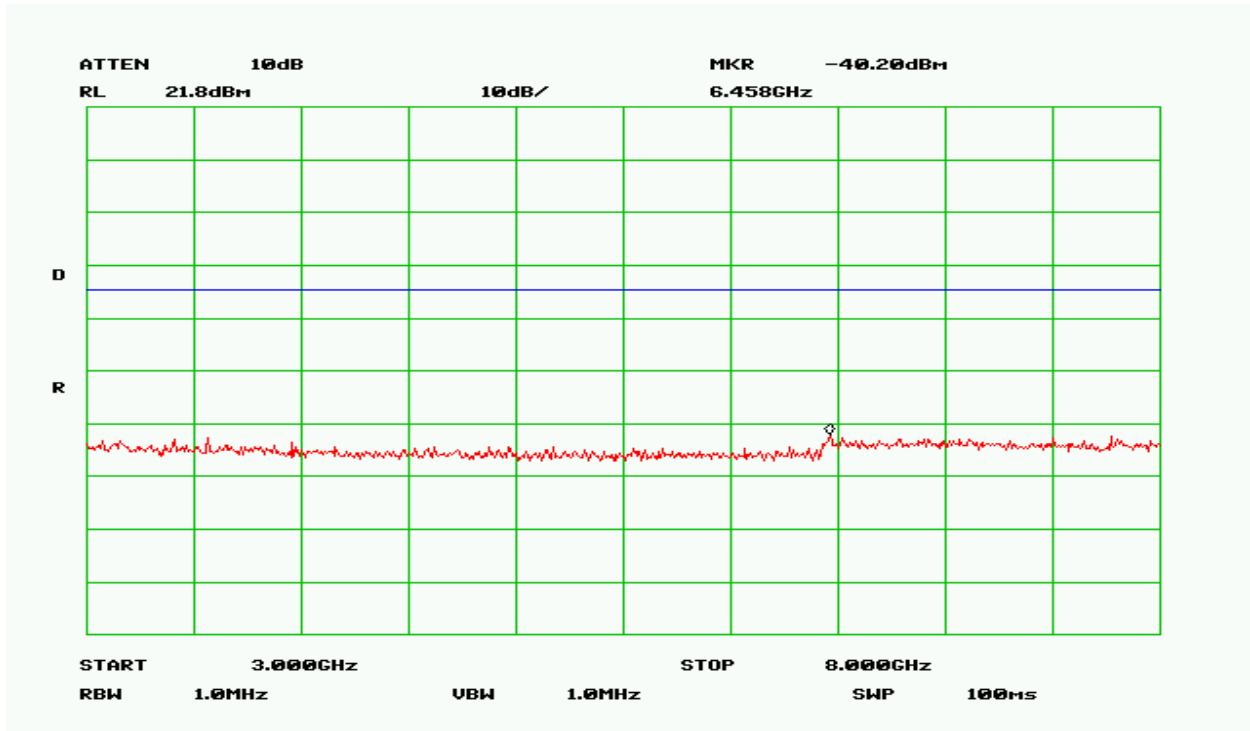
Plot 93 – 698-716MHz Band – Uplink



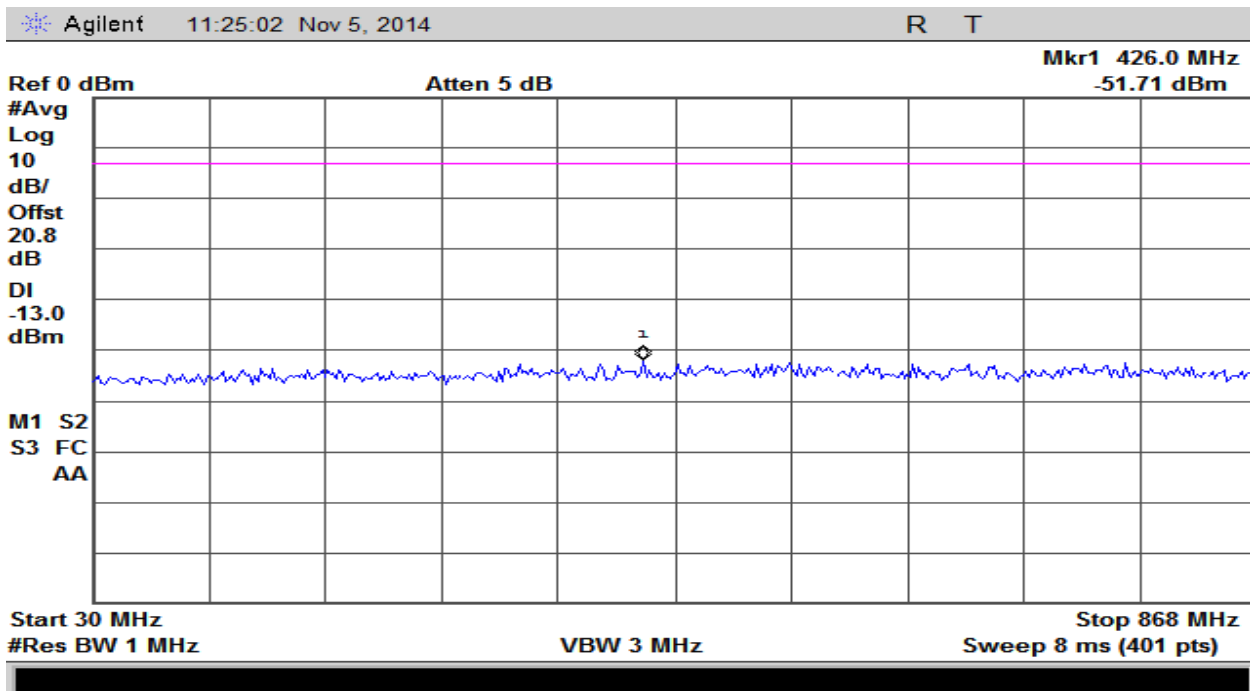
Plot 94 – 776-787MHz Band – Uplink



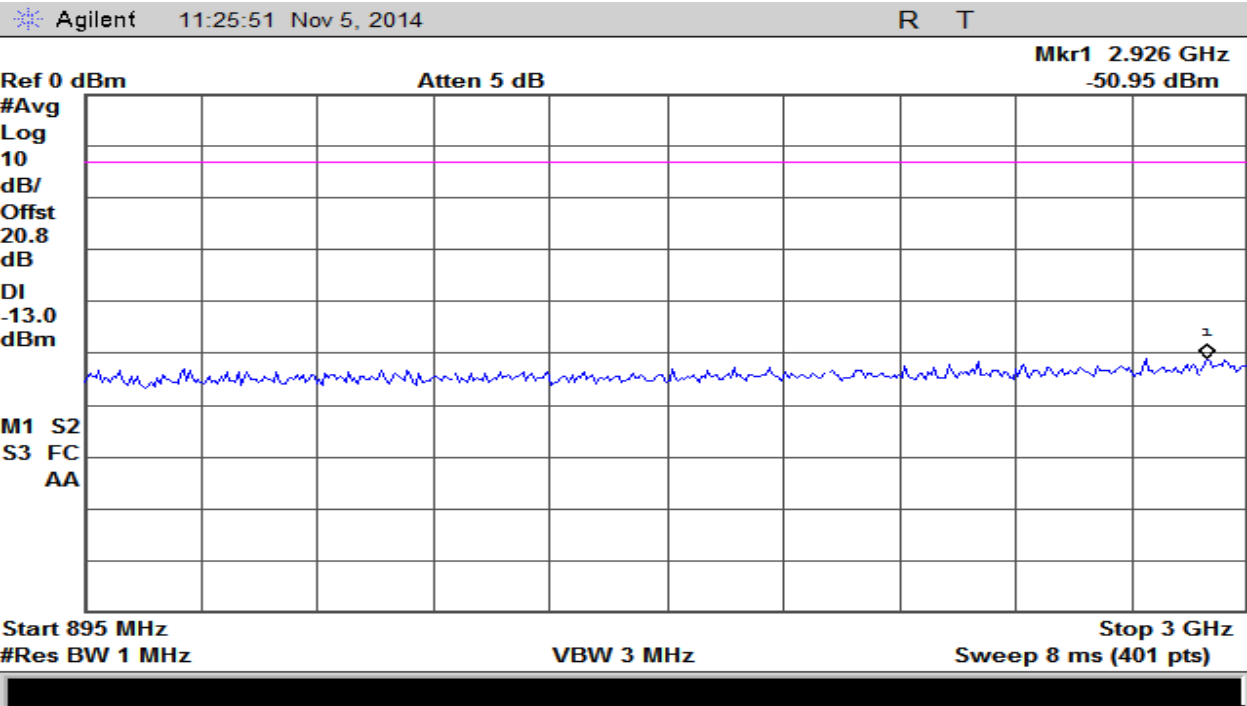
Plot 95 – 776-787MHz Band – Uplink



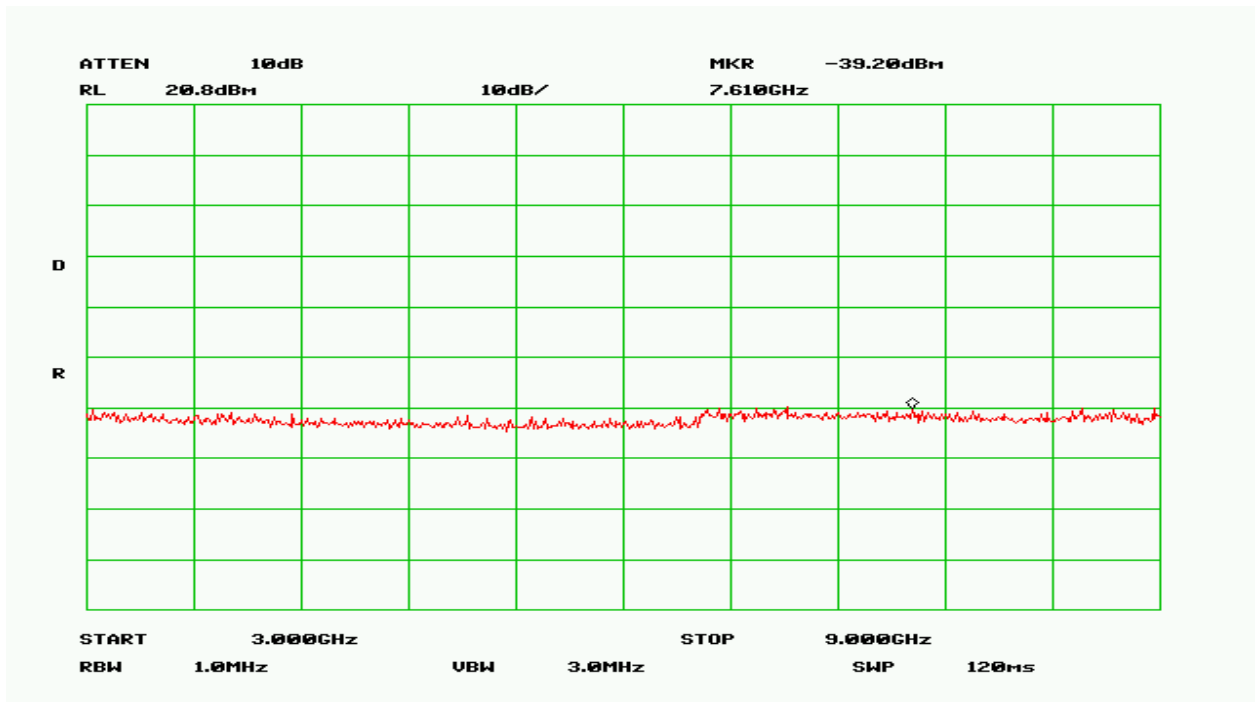
Plot 96 – 776-787MHz Band – Uplink



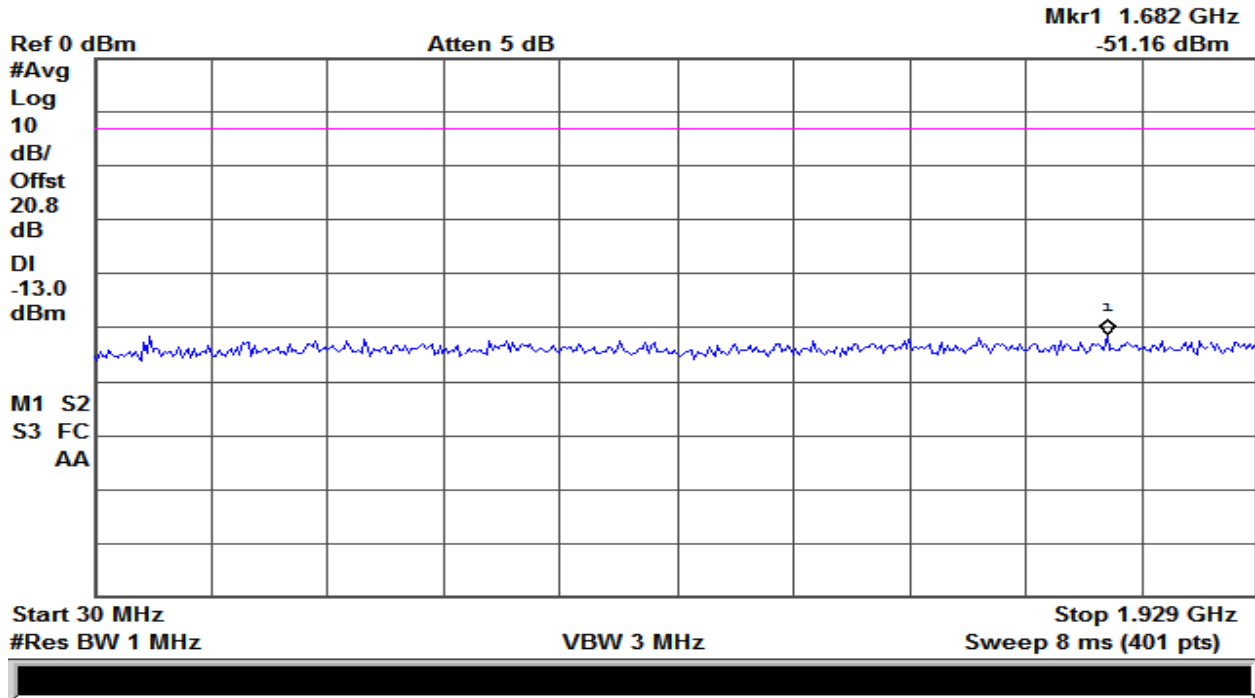
Plot 97 – 869-894MHz Band – Downlink



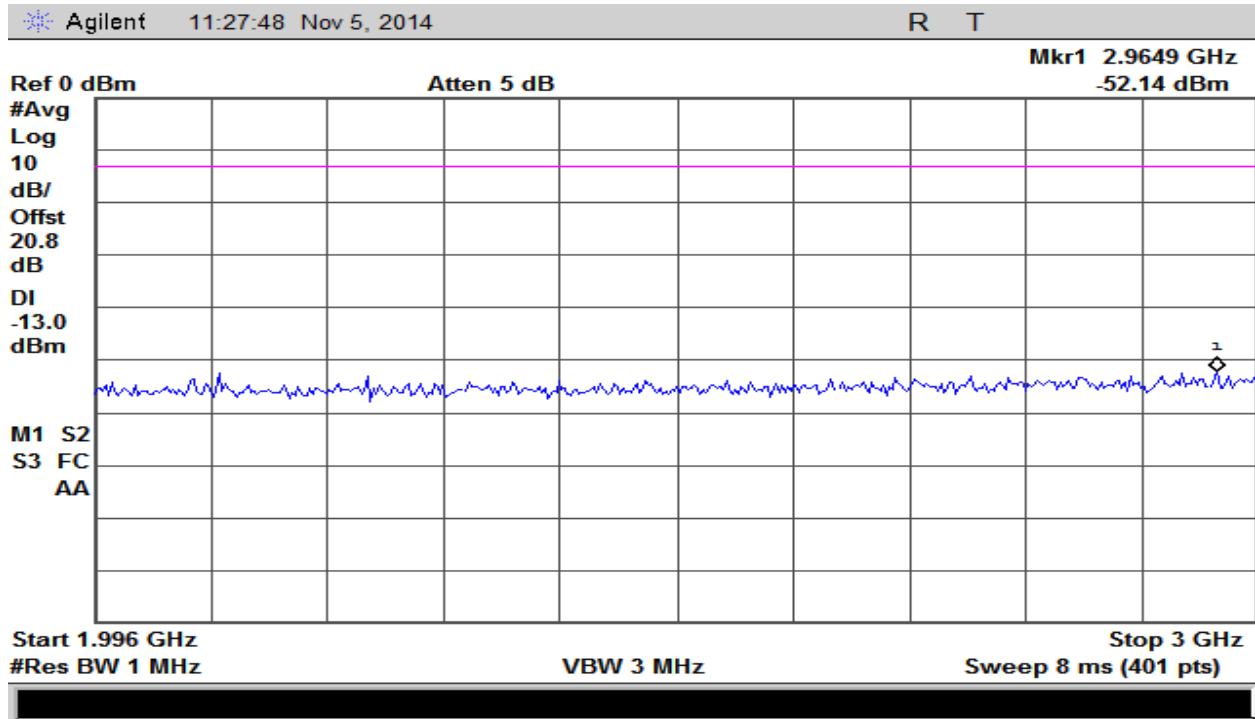
Plot 98 – 869-894MHz Band – Downlink



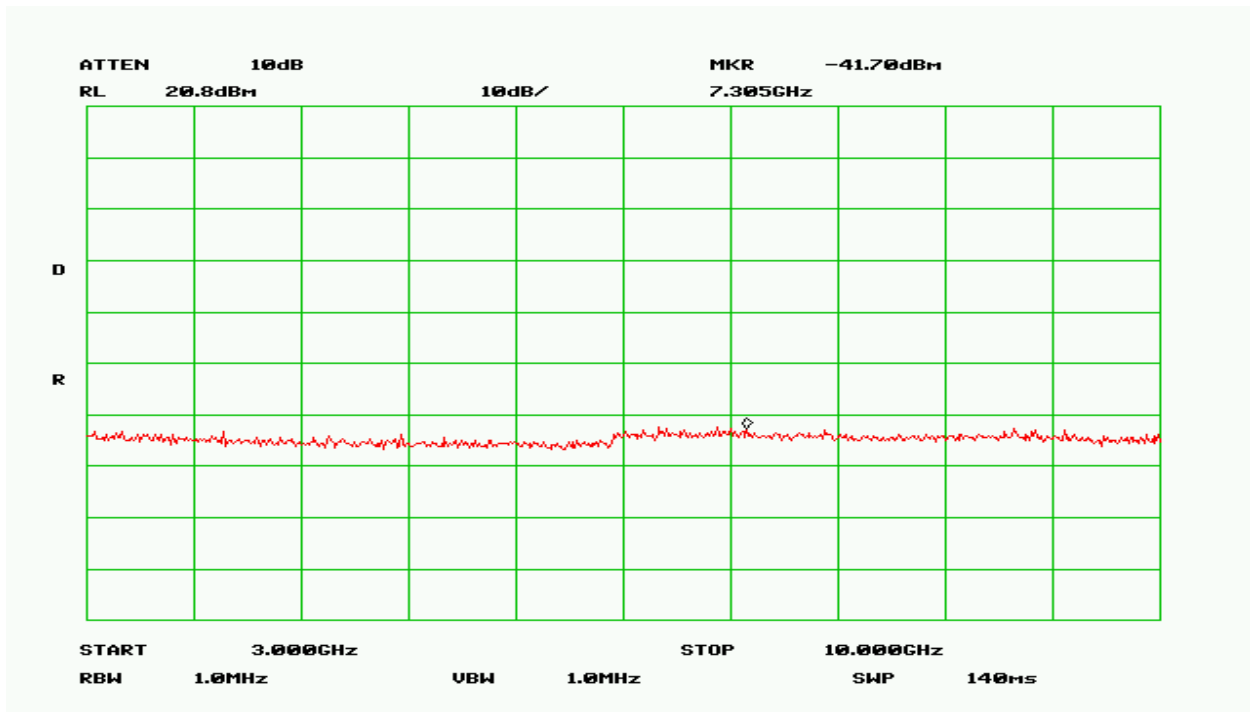
Plot 99 – 869-894MHz Band – Downlink



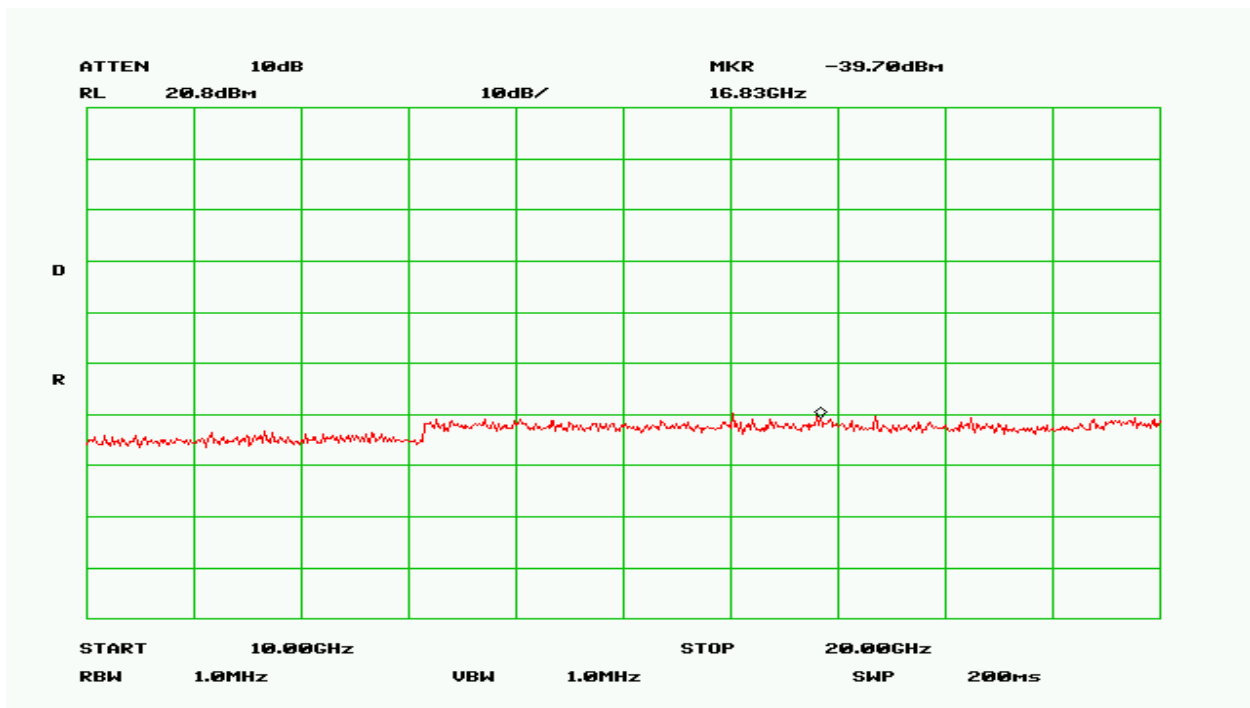
Plot 100 – 1930-1995MHz Band – Downlink



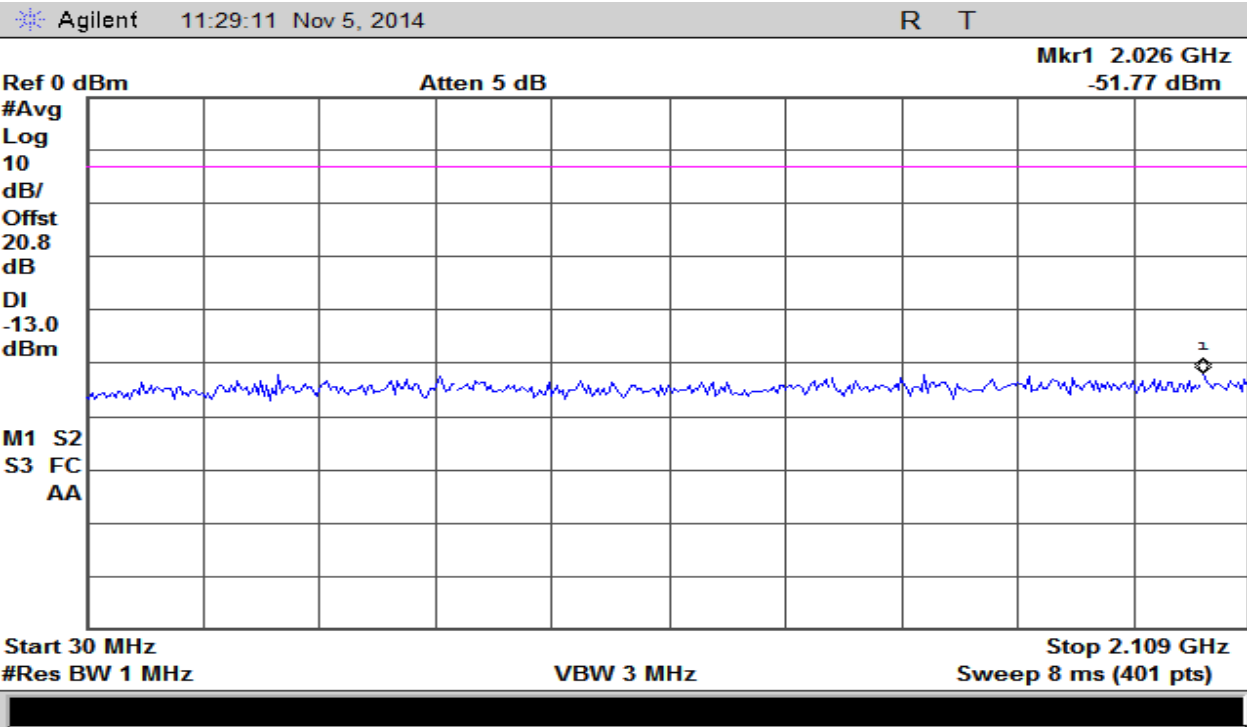
Plot 101 – 1930-1995MHz Band – Downlink



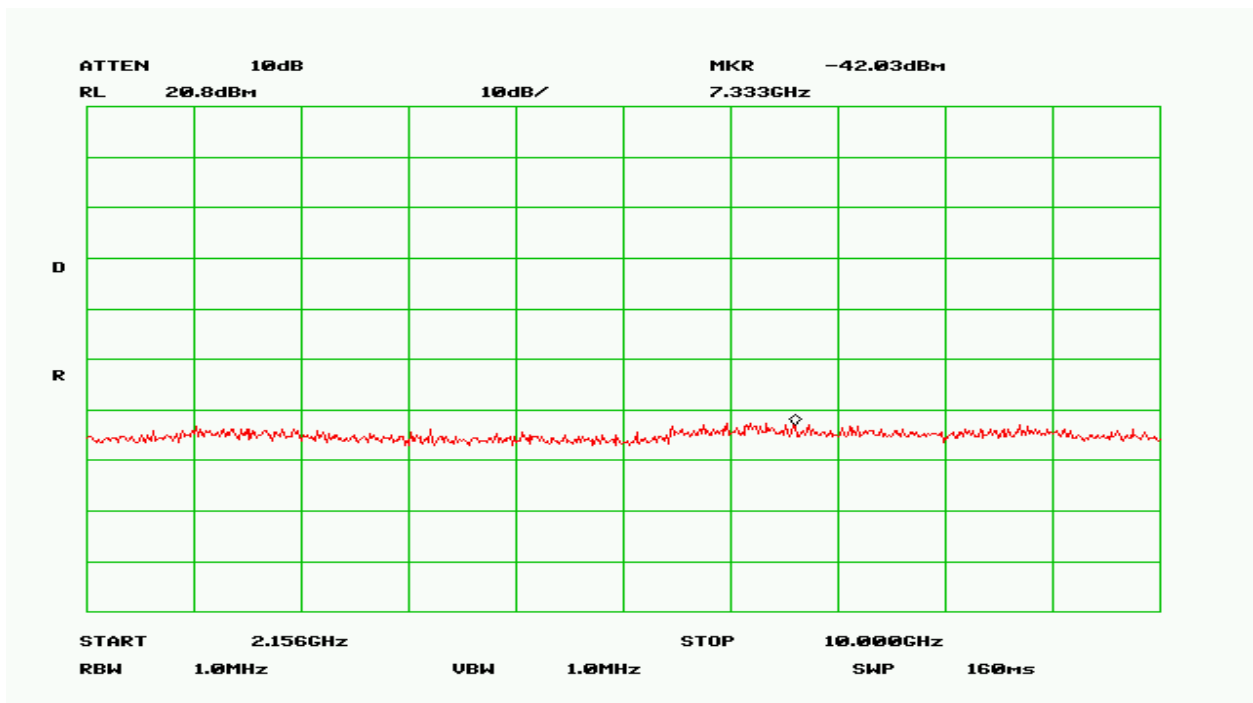
Plot 102 – 1930-1995MHz Band – Downlink



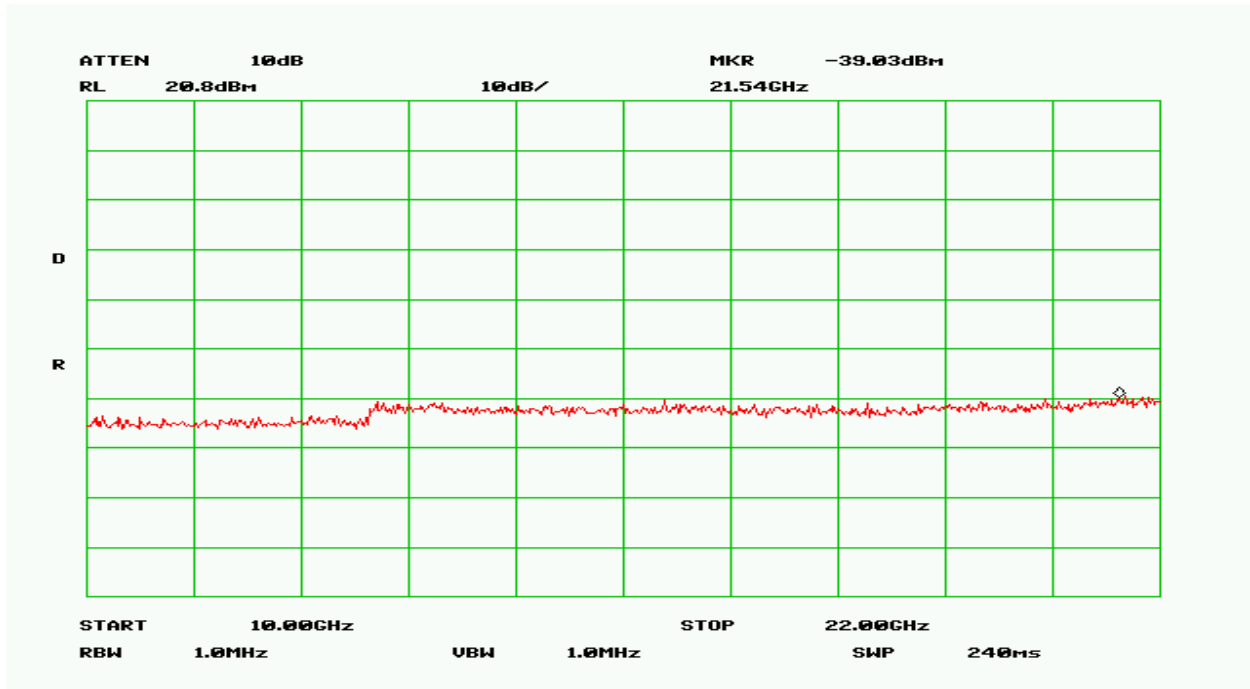
Plot 103 – 1930-1995MHz Band – Downlink



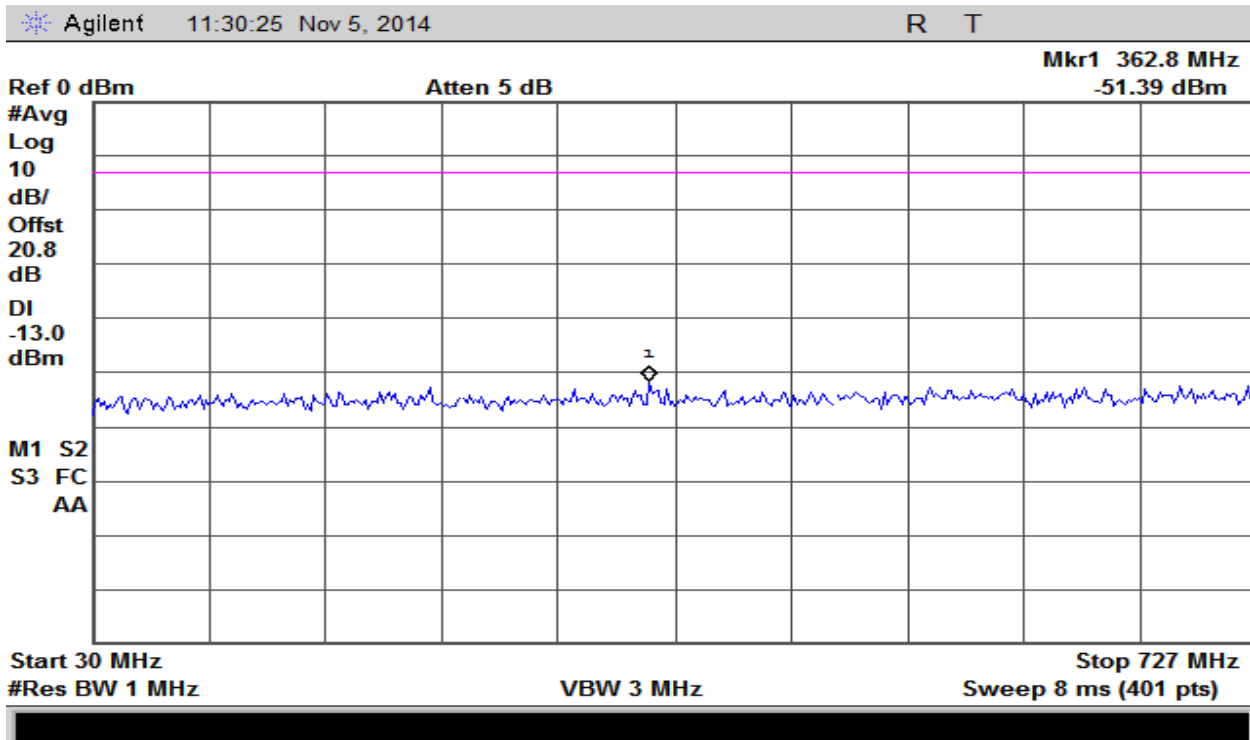
Plot 104 – 2110-2155MHz Band – Downlink



Plot 105 – 2110-2155MHz Band – Downlink

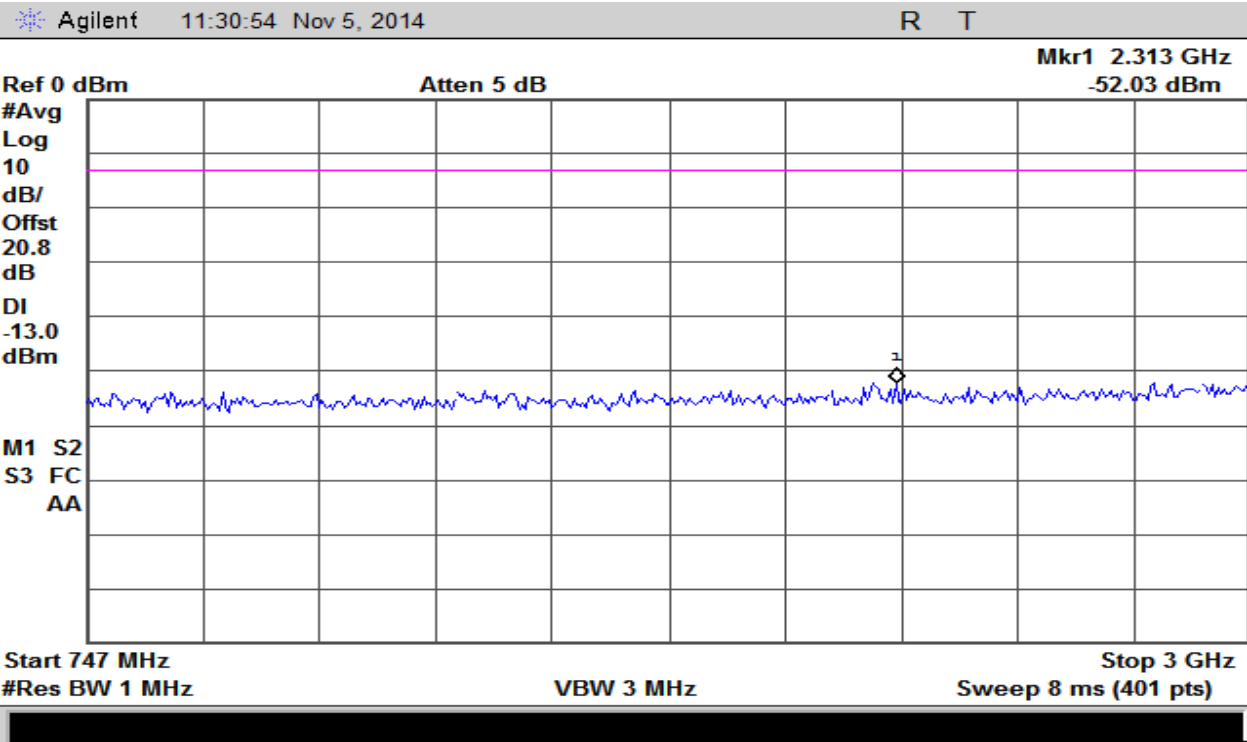


Plot 106 – 2110-2155MHz Band – Downlink

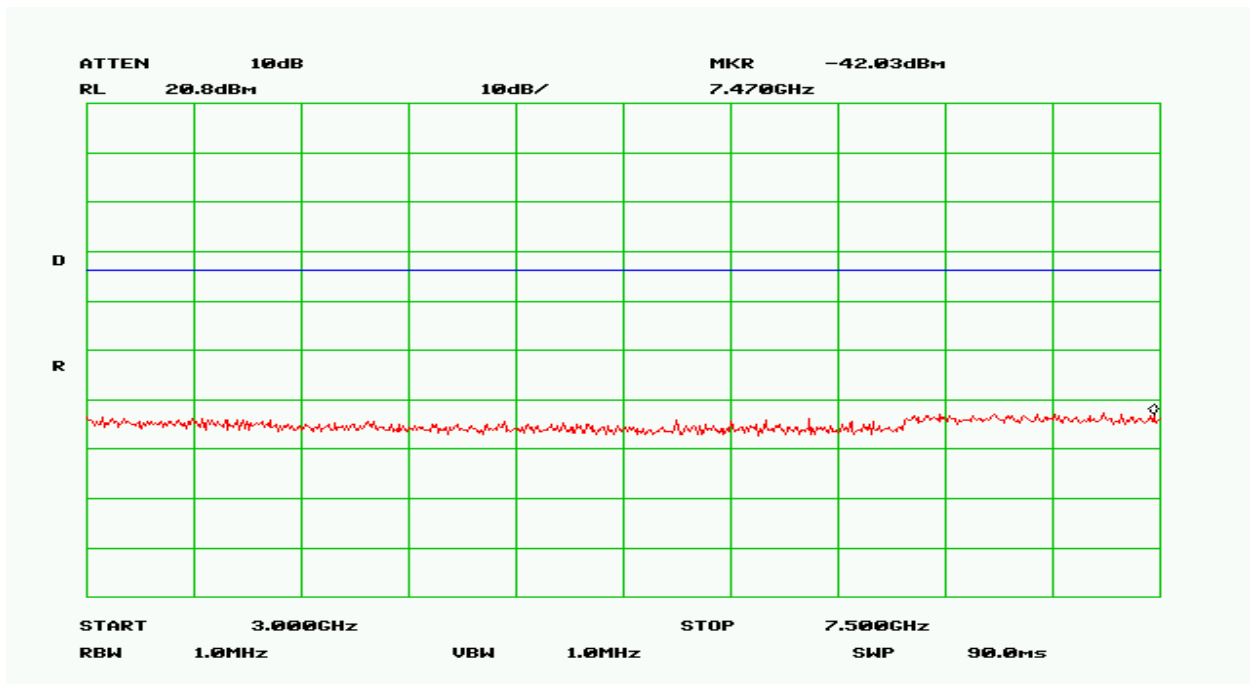


Plot 107 – 728-746MHz Band – Downlink

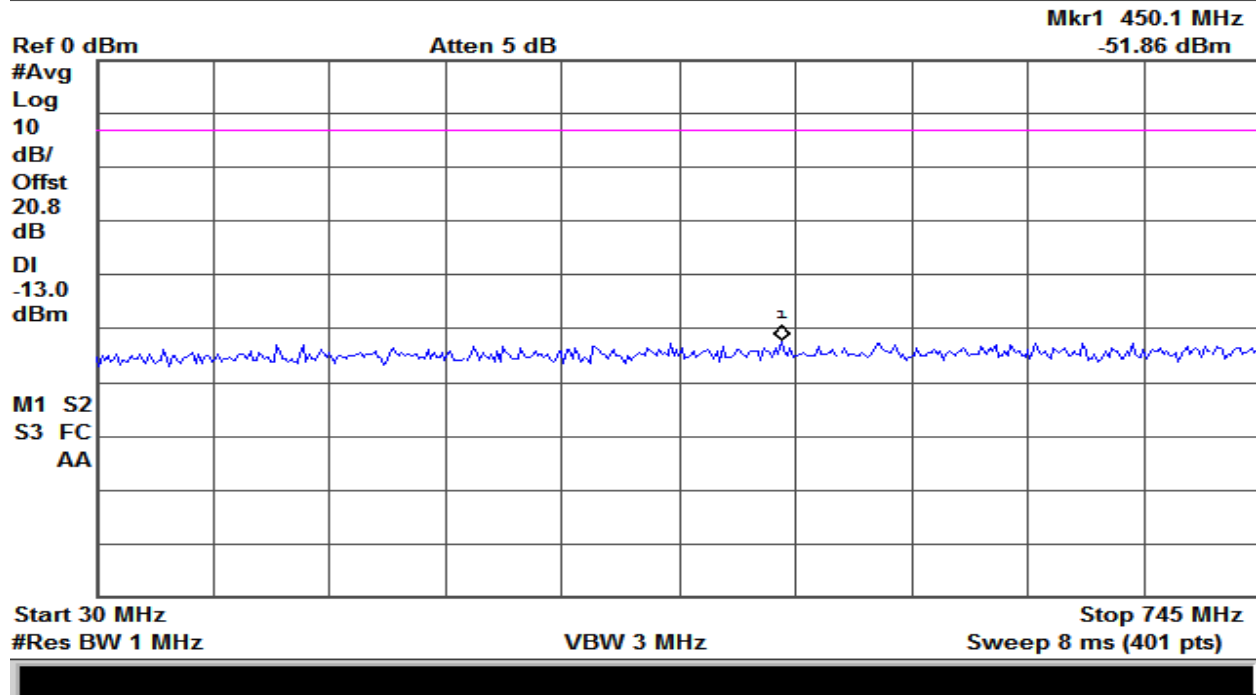




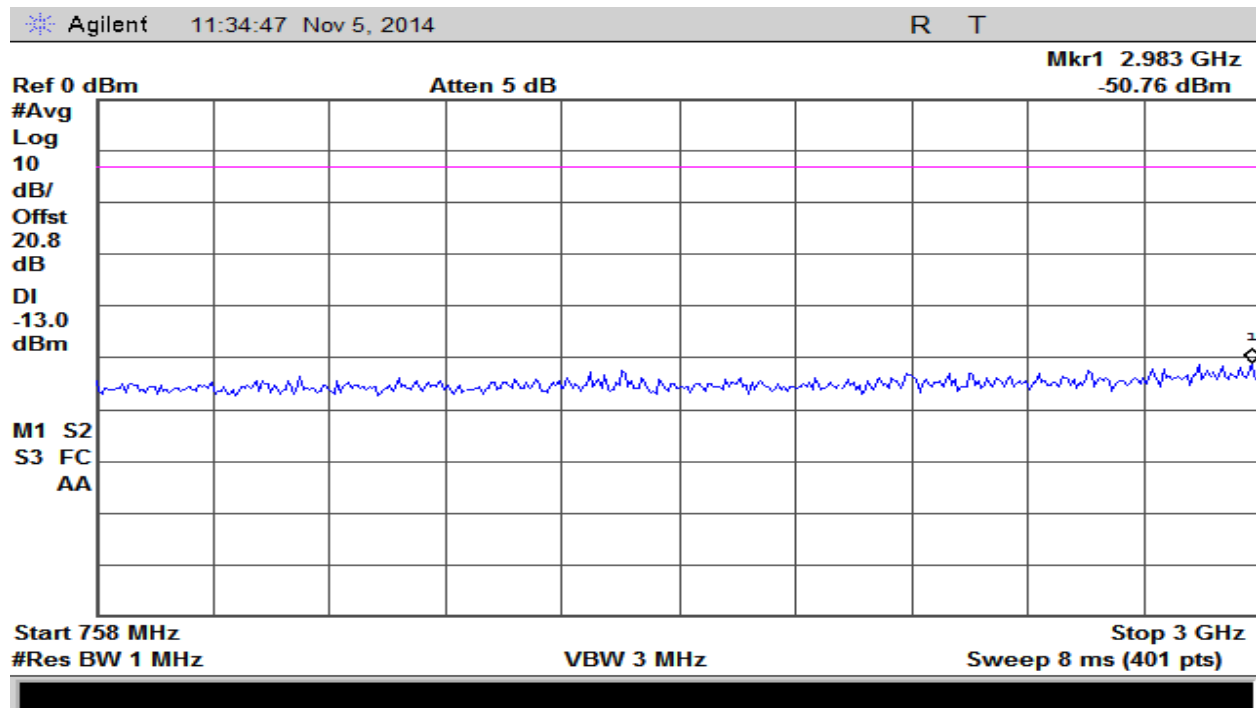
Plot 108 – 728-746MHz Band – Downlink



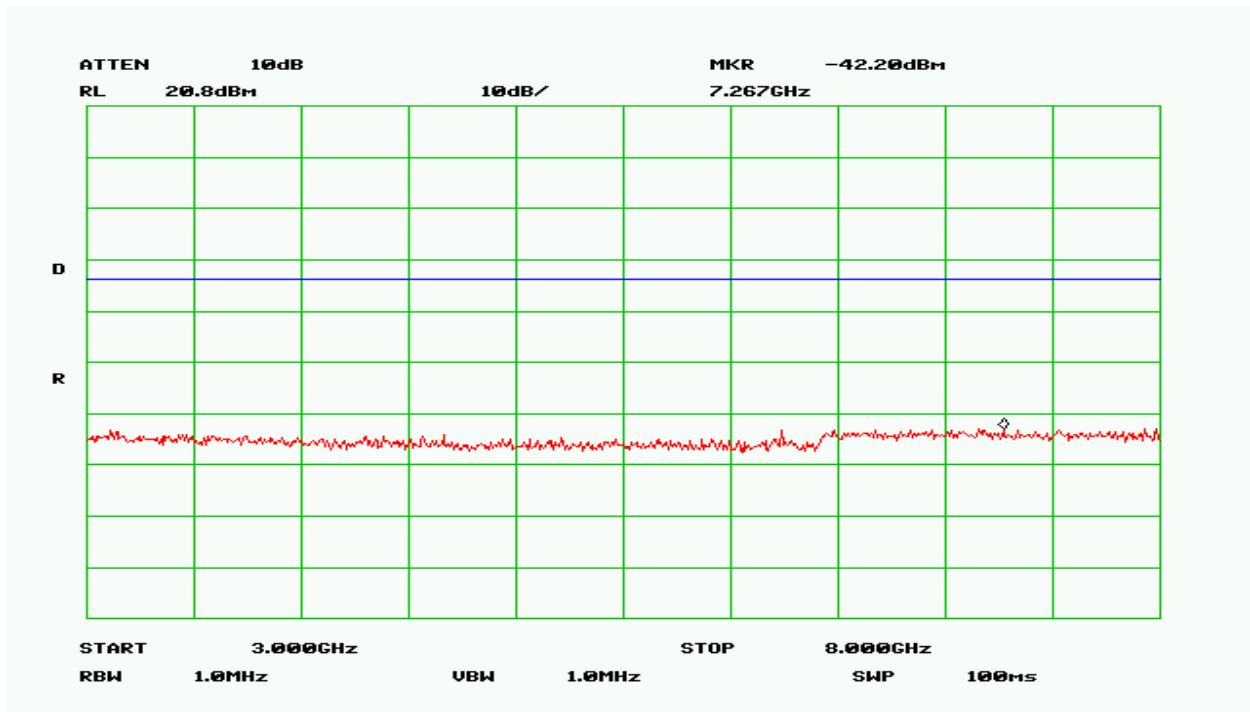
Plot 109 – 728-746MHz Band – Downlink



Plot 110 -746-757MHz Band - Downlink

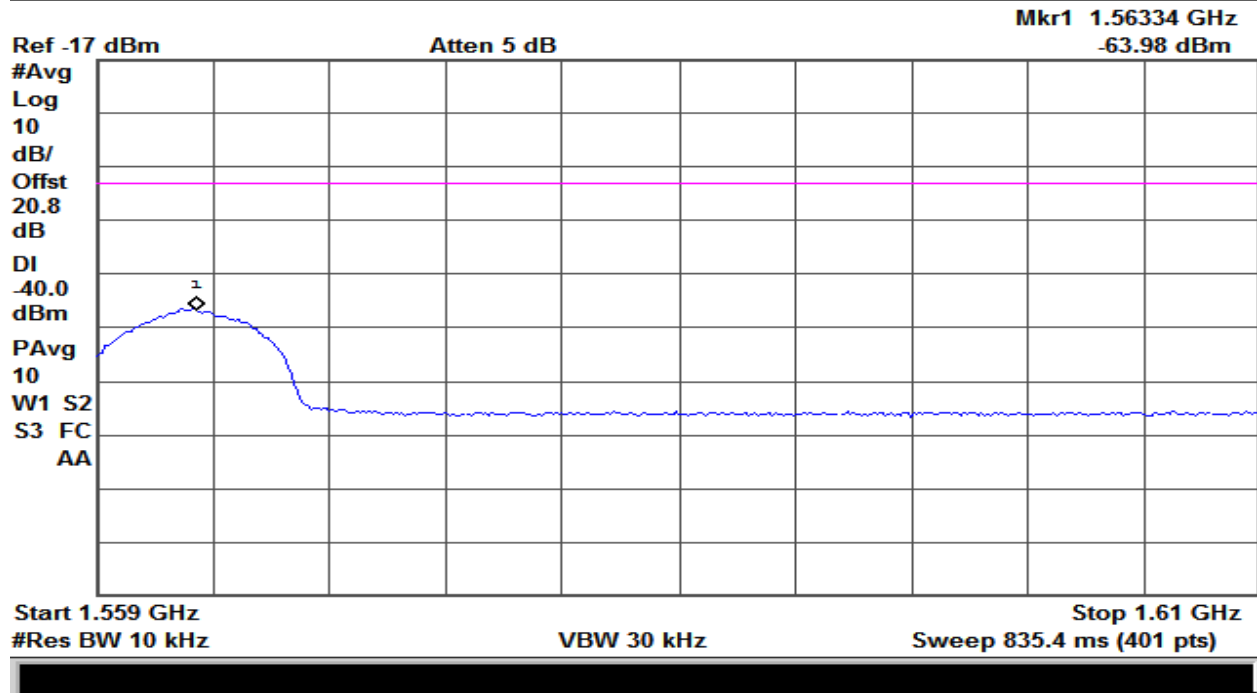


Plot 111 -746-757MHz Band - Downlink

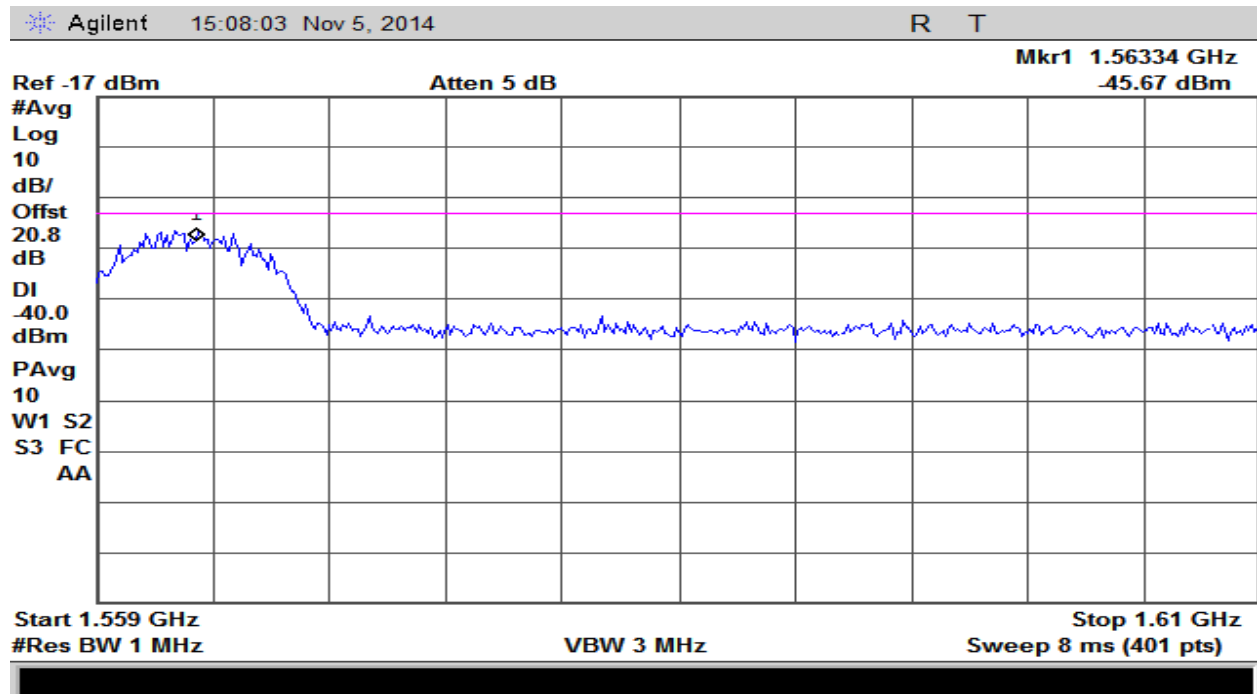


Plot 112 -746-757MHz Band – Downlink

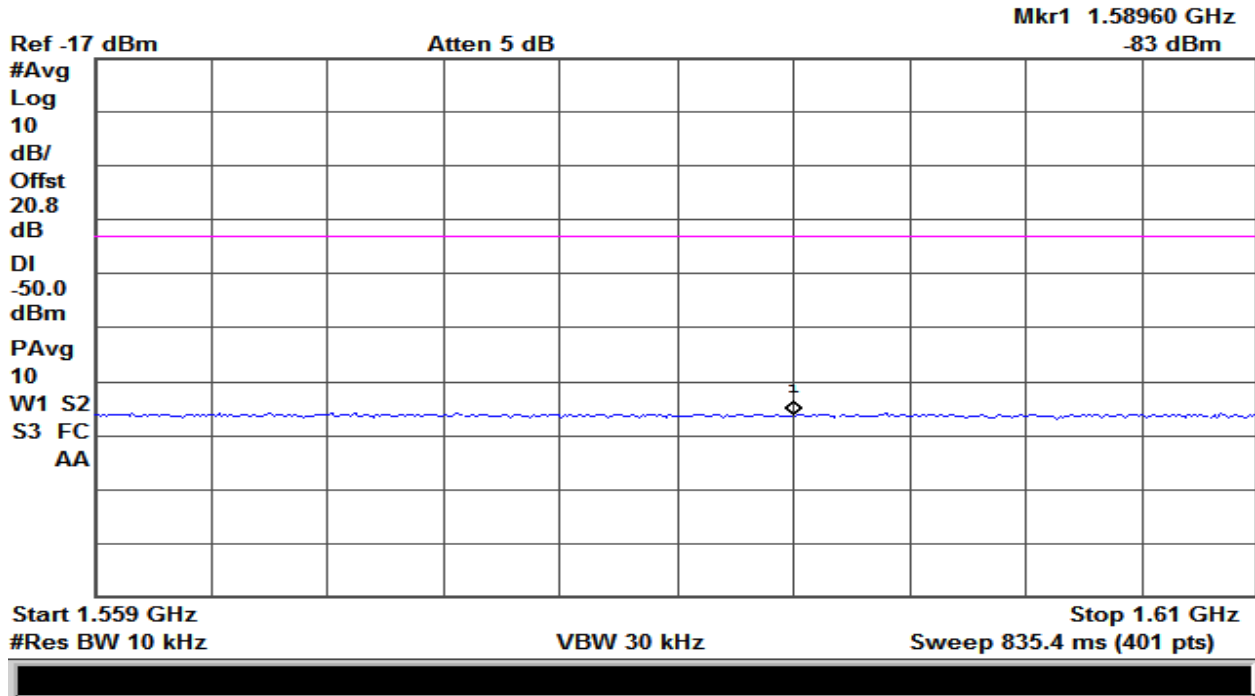




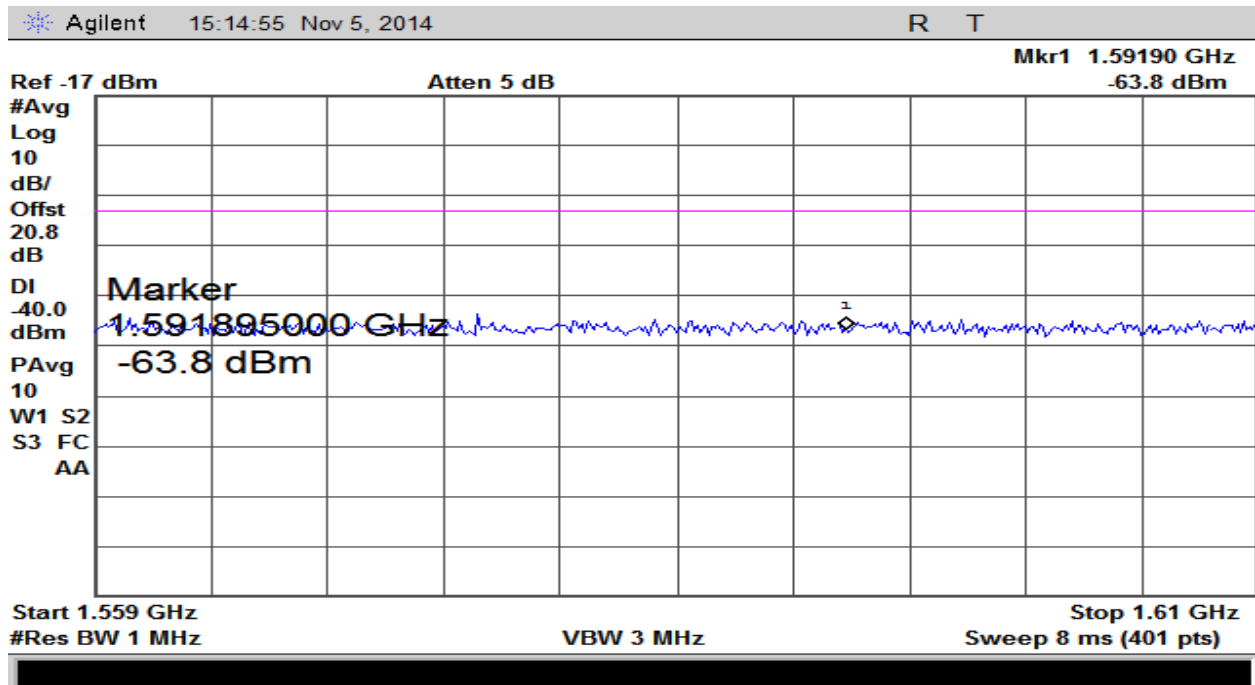
Plot 115 -27.53f - Uplink Narrowband



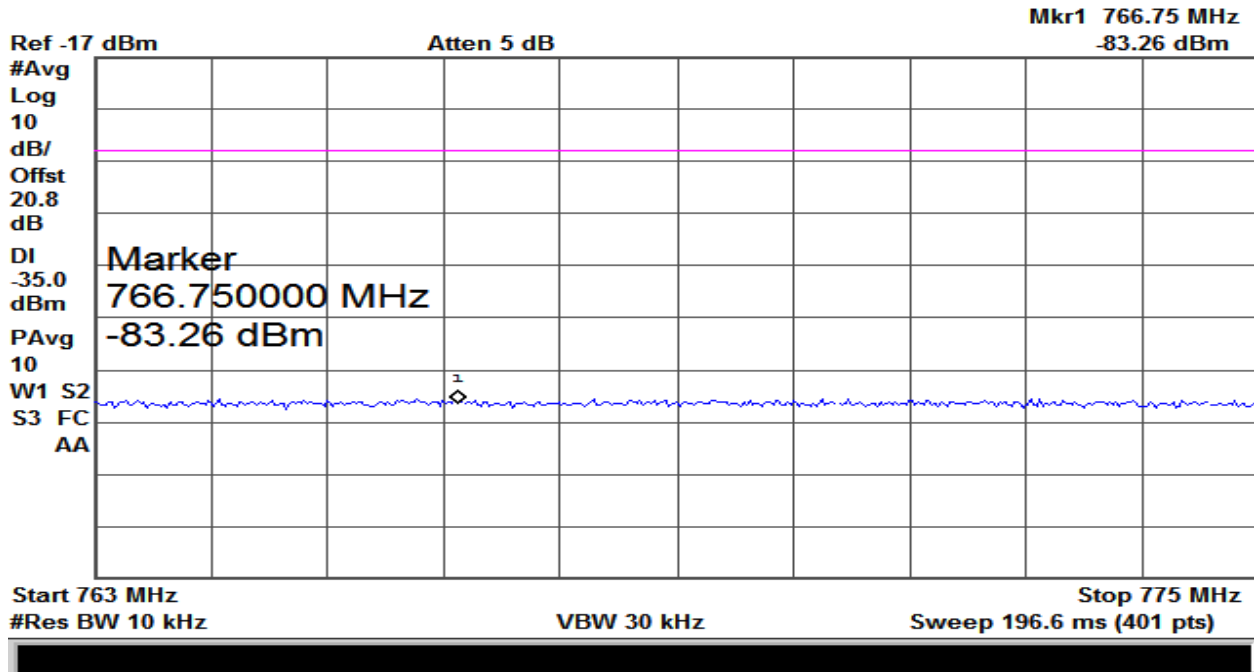
Plot 116 -27.53f - Uplink Wideband



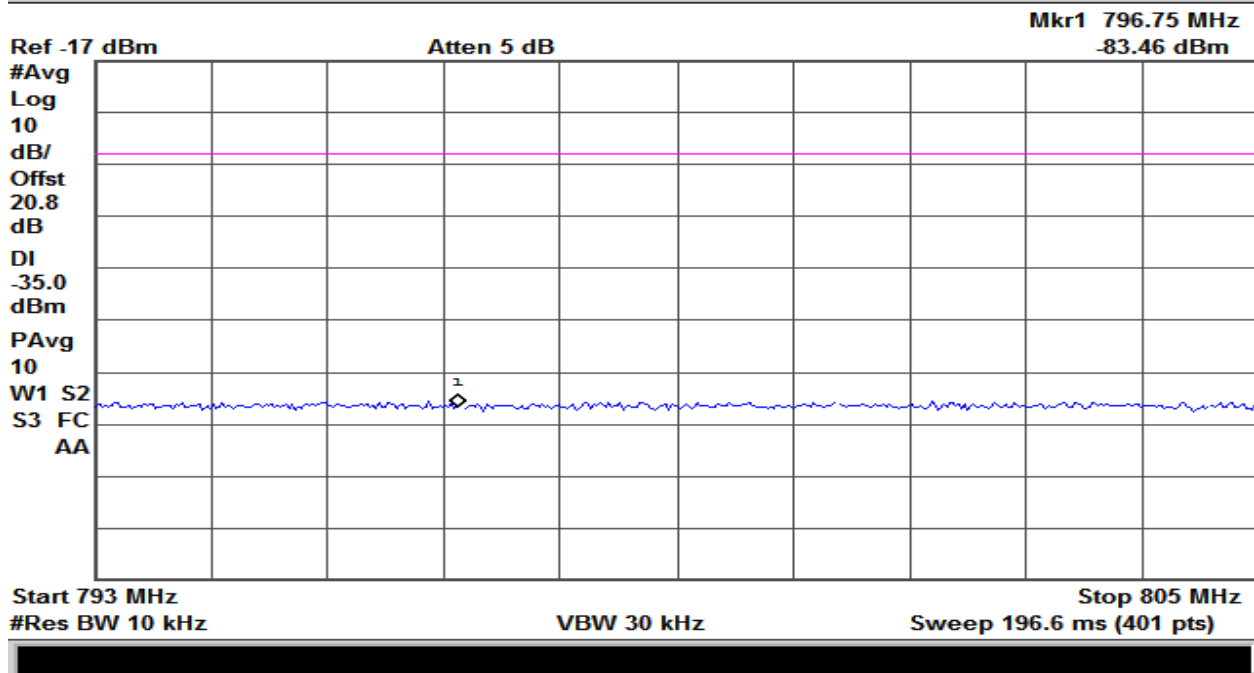
Plot 117 -27.53f - Downlink Narrowband



Plot 118 -27.53f - Downlink Wideband



Plot 119 -27.53c4 - Downlink



Plot 120 -27.53c4 - Downlink

## 6. Noise Limits

<b>Test Requirement(s):</b>	§20.21(e)(8)(i)(A)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	Oct/31/14

**Test Procedures:** As required by 47 CFR §20.21(e)(8)(i)(A), Noise limits measurements were made as per the FCC KDB 935210 D03 procedures defined in §7.7.

The EUT was set up as per Figure 2 and 3.

### Test Setup:

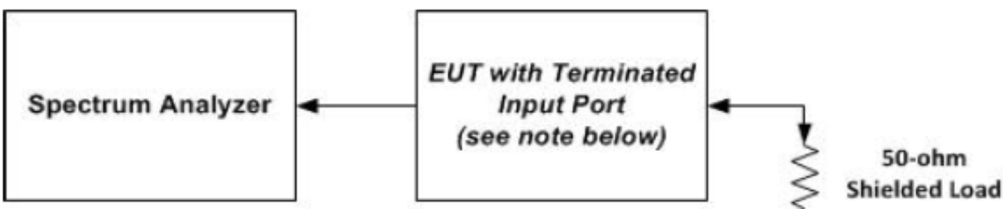


Figure 2 – Noise Limit

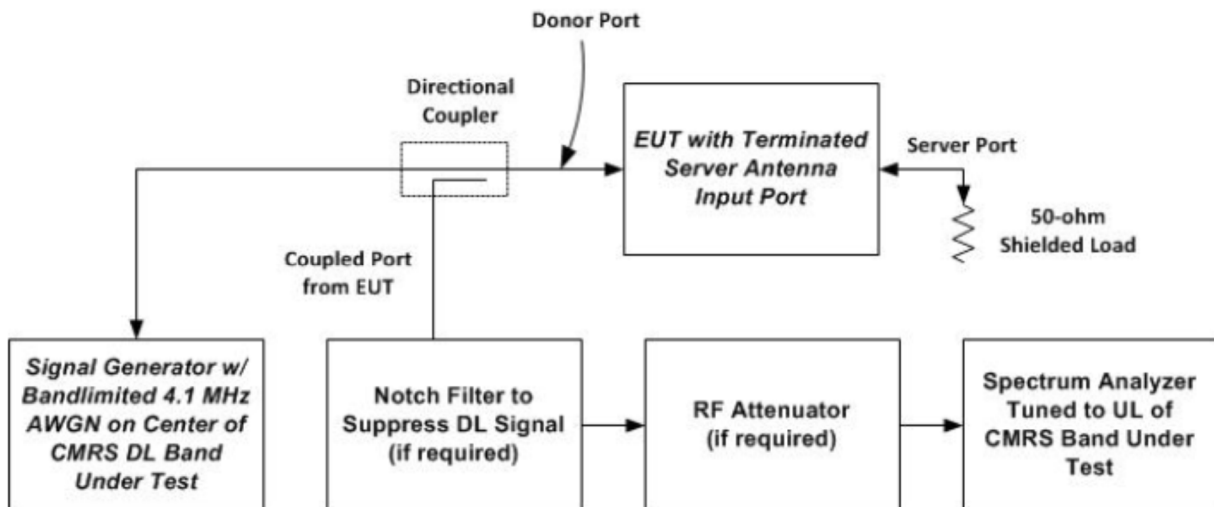
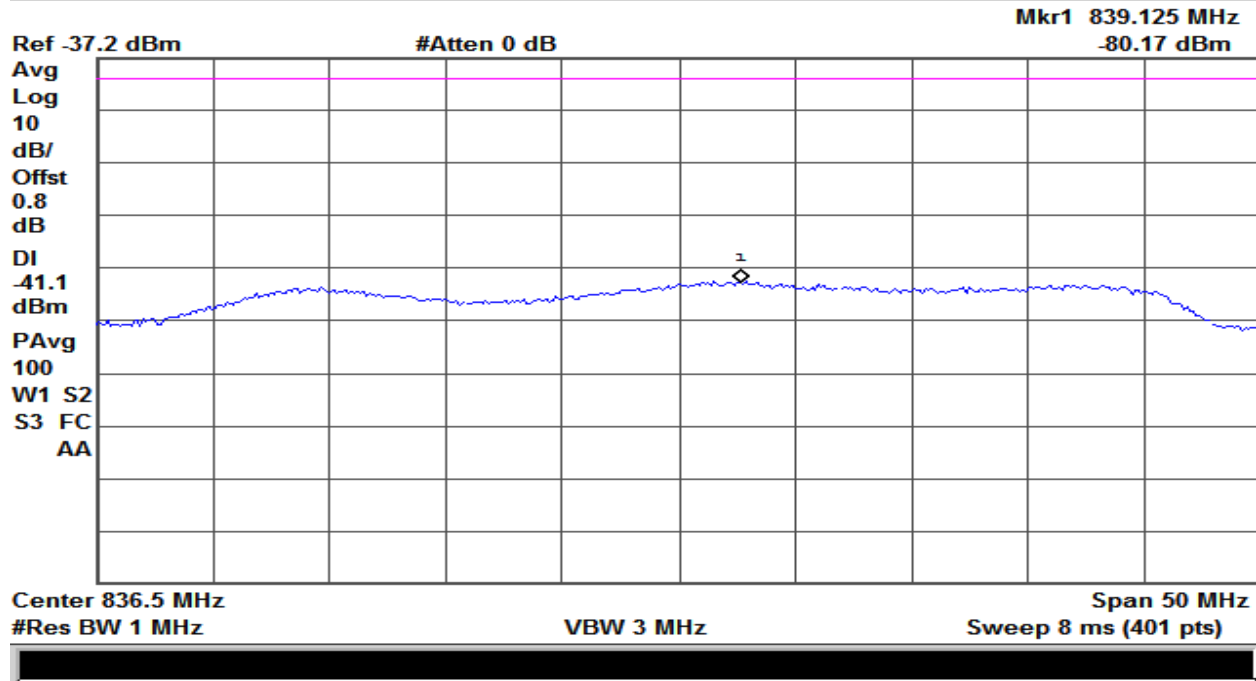


Figure 3 – Uplink Noise power in presence of a downlink signal

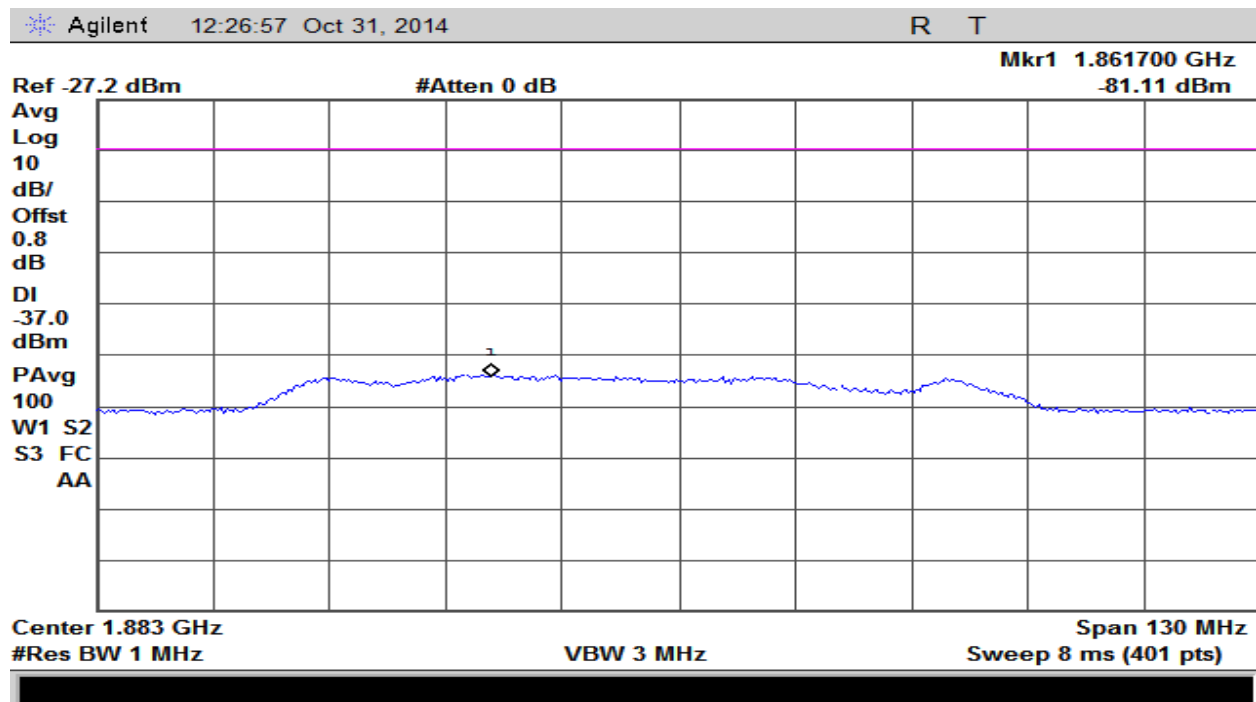


<b>Frequency Band (MHz)</b>	<b>Measured Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
824-849	-80.17	-59	-21.17
1850-1915	-81.11	-59	-22.11
1710-1755	-79.57	-59	-20.57
698-716	-80.24	-59	-21.24
776-787	-81.11	-59	-22.11

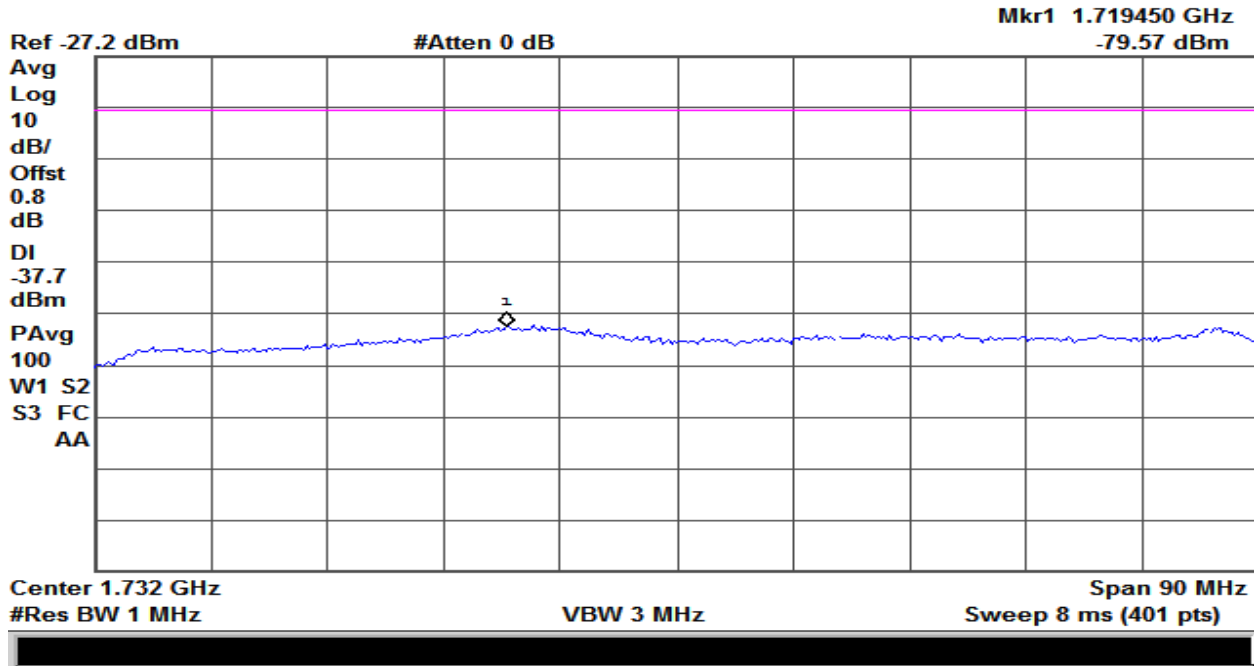
**Table 19 – Maximum Uplink Noise Summary**



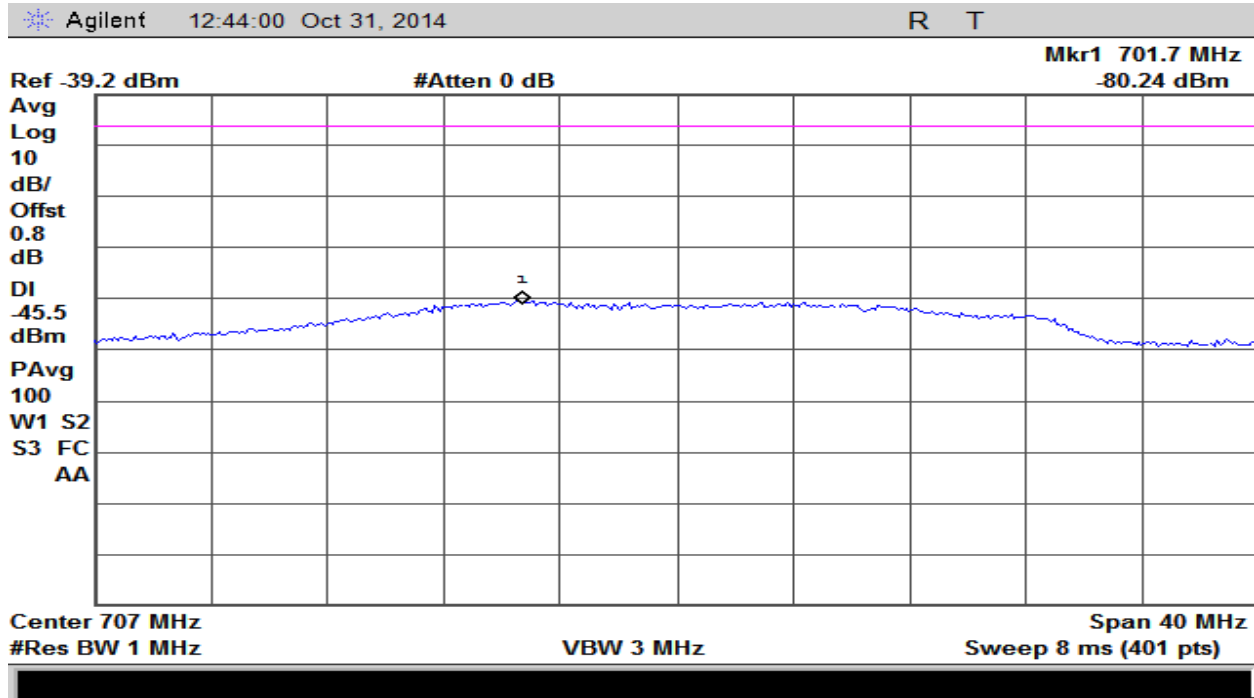
Plot 121 – 824-849MHz Band – Maximum Uplink Noise



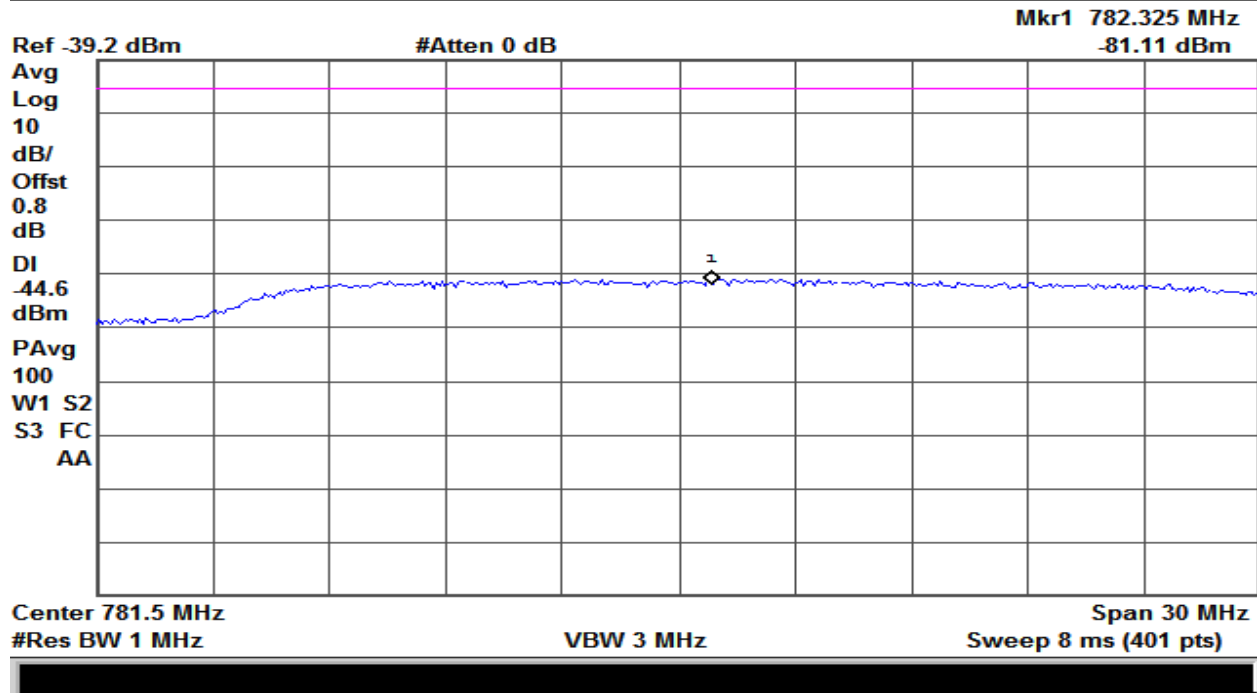
Plot 122 – 1850-1915MHz Band – Maximum Uplink Noise



Plot 123 – 1710-1755MHz Band – Maximum Uplink Noise



Plot 124 – 698-716MHz Band – Maximum Uplink Noise



Plot 125 – 776-787MHz Band – Maximum Uplink Noise

## 7. Variable Booster Gain

<b>Test Requirement(s):</b>	§20.21(e)(8)(i)(c)(1)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	Nov/06/14

**Test Procedures:** As required by 47 §20.21(e)(8)(i)(c)(1), Variable Booster Gain measurements were made as per FCC KDB procedures 935210 D03 defined in §7.9.

The EUT was set up as per Figure 4.

Gain limits are based on §20.21(e)(8)(i)(C)(2)(iii) for Direct contact coupling 23dB or 15dB.

### Test Setup:

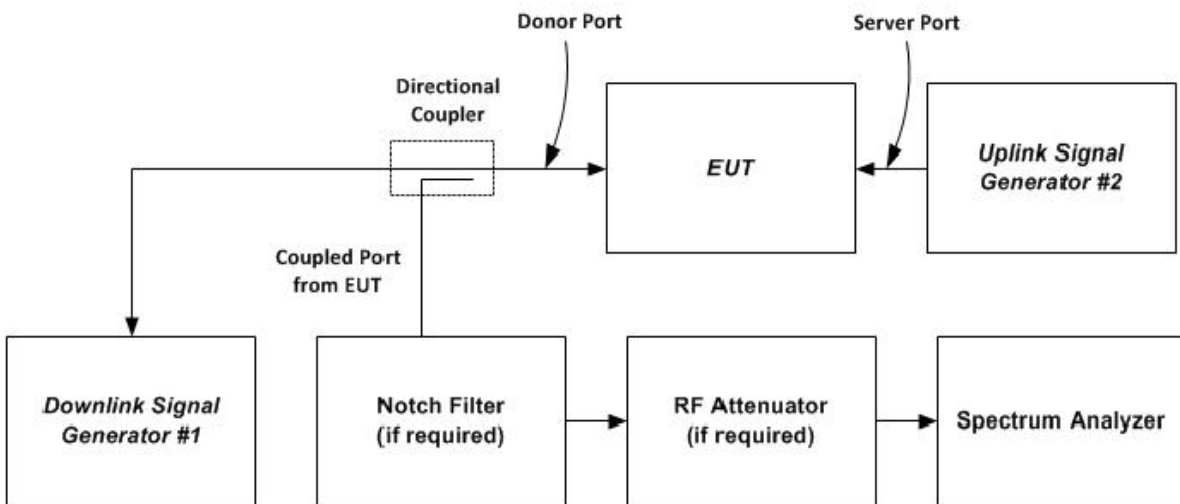


Figure 4 – Variable Gain

Detector Setting	Resolution Bandwidth	Video Bandwidth	Sweep Time
RMS	100 kHz	300 kHz	Auto

Table 20 – Analyzer Settings

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	15	0.7	2.29	1.59	-13.41
-32	15	0.7	2.25	1.55	-13.45
-36	15	0.7	10.25	9.55	-5.45
-38	15	0.7	12.52	11.82	-3.18
-39	15	0.7	14.06	13.36	-1.64
-50	15	0.7	15.1	14.4	-0.6

Table 21 – 824-849MHz Band – Uplink Data

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	15	5.5	3.26	-2.24	-17.24
-32	15	5.5	4.63	-0.87	-15.87
-35	15	5.5	9.01	3.51	-11.49
-37	15	5.5	11.48	5.98	-9.02
-39	15	5.5	14.11	8.61	-6.39
-43	15	5.5	17.11	11.61	-3.39

Table 22 – 1850-1915MHz Band – Uplink Data

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	15	3.3	1.11	-2.19	-17.19
-34	15	3.3	6.24	2.94	-12.06
-35	15	3.3	4.92	1.62	-13.38
-36	15	3.3	8.2	4.9	-10.1
-37	15	3.3	10.14	6.84	-8.16
-41	15	3.3	14.23	10.93	-4.07

Table 23 – 1710-1755MHz Band – Uplink Data

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	15	5.9	7.7	1.8	-13.2
-33	15	5.9	8.65	2.75	-12.25
-35	15	5.9	13.6	7.7	-7.3
-37	15	5.9	14.6	8.7	-6.3
-39	15	5.9	15.4	9.5	-5.5
-40	15	5.9	17	11.1	-3.9

Table 24 – 698-716MHz Band – Uplink Data

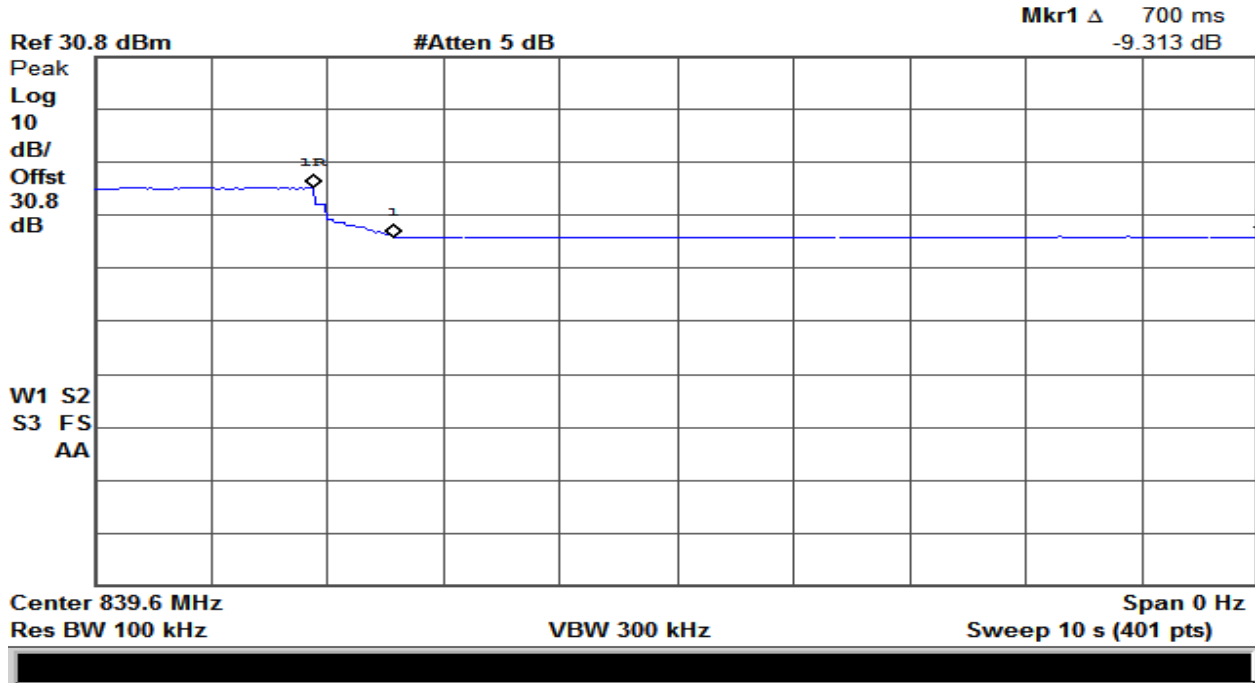
RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	15	6.3	7.3	1	-14
-32	15	6.3	9.7	3.4	-11.6
-33	15	6.3	11.2	4.9	-10.1
-35	15	6.3	13.7	7.4	-7.6
-36	15	6.3	15.3	9	-6
-41	15	6.3	18.9	12.6	-2.4

Table 25 – 776-787MHz Band – Uplink Data

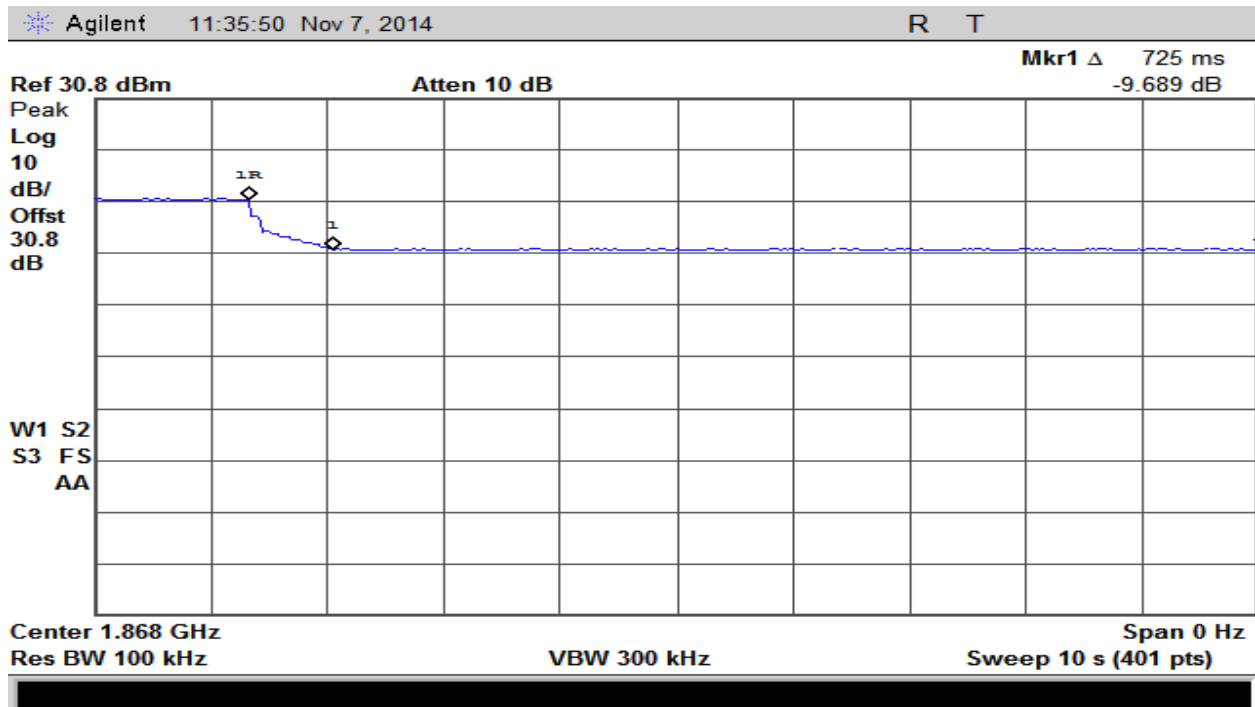
Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Margin (Seconds)
824-824	0.700	1.0	-0.3
1850-1915	0.725	1.0	-0.275
1710-1755	0.675	1.0	-0.325
698-716	0.900	1.0	-0.1
776-787	0.650	1.0	-0.35

Table 26 – Variable Uplink Gain Timing - Summary Table

The following pages show measurements of Variable Booster Gain Timing plots:

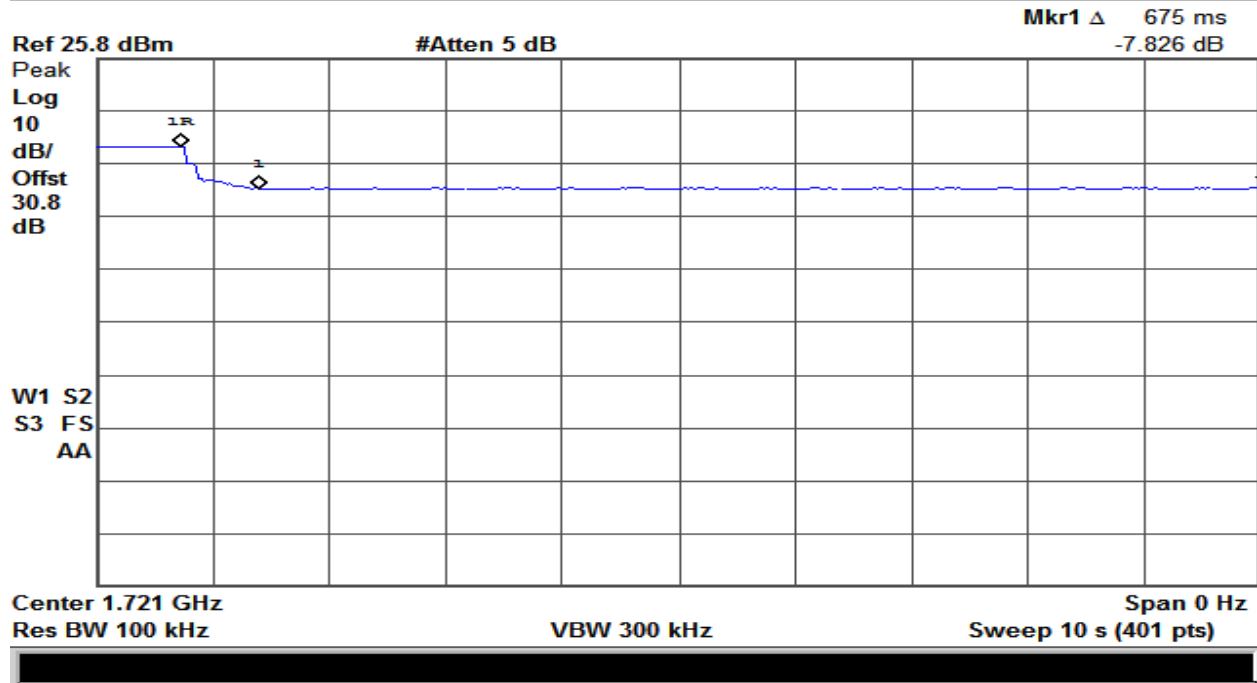


Plot 126 – 824-849MHz Band – Uplink Gain Timing

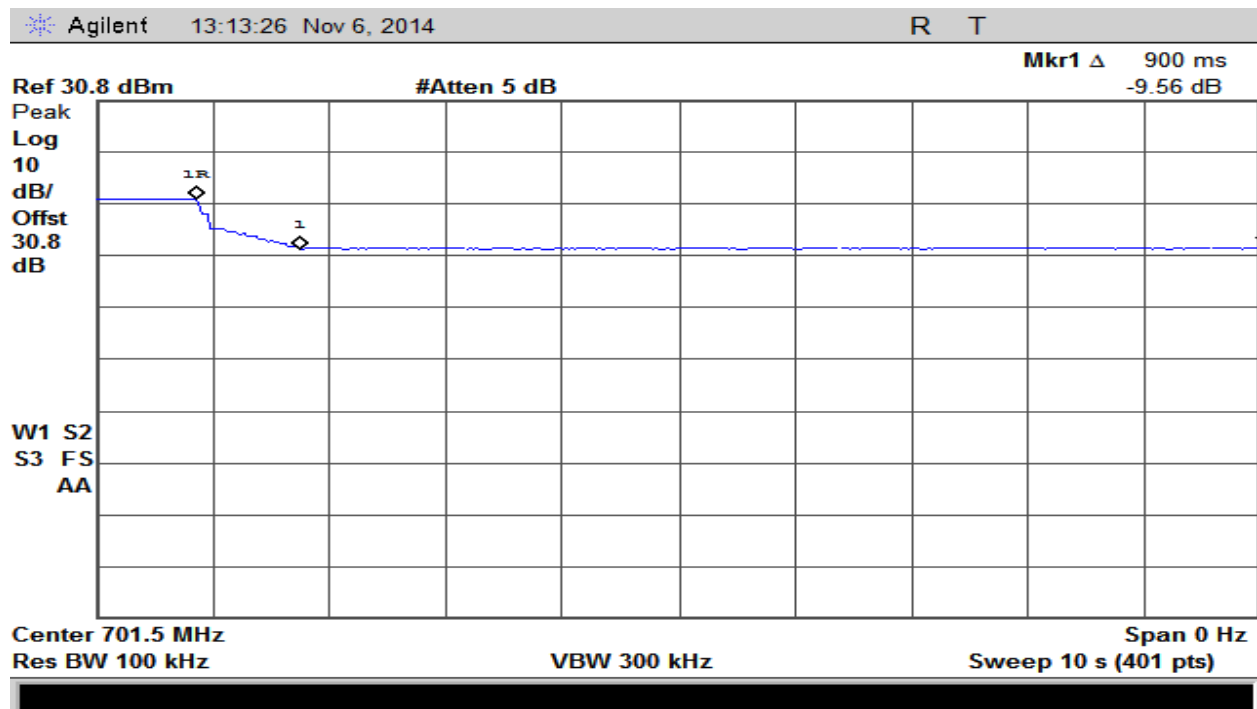


Plot 127 – 1850-1915MHz Band – Uplink Gain Timing

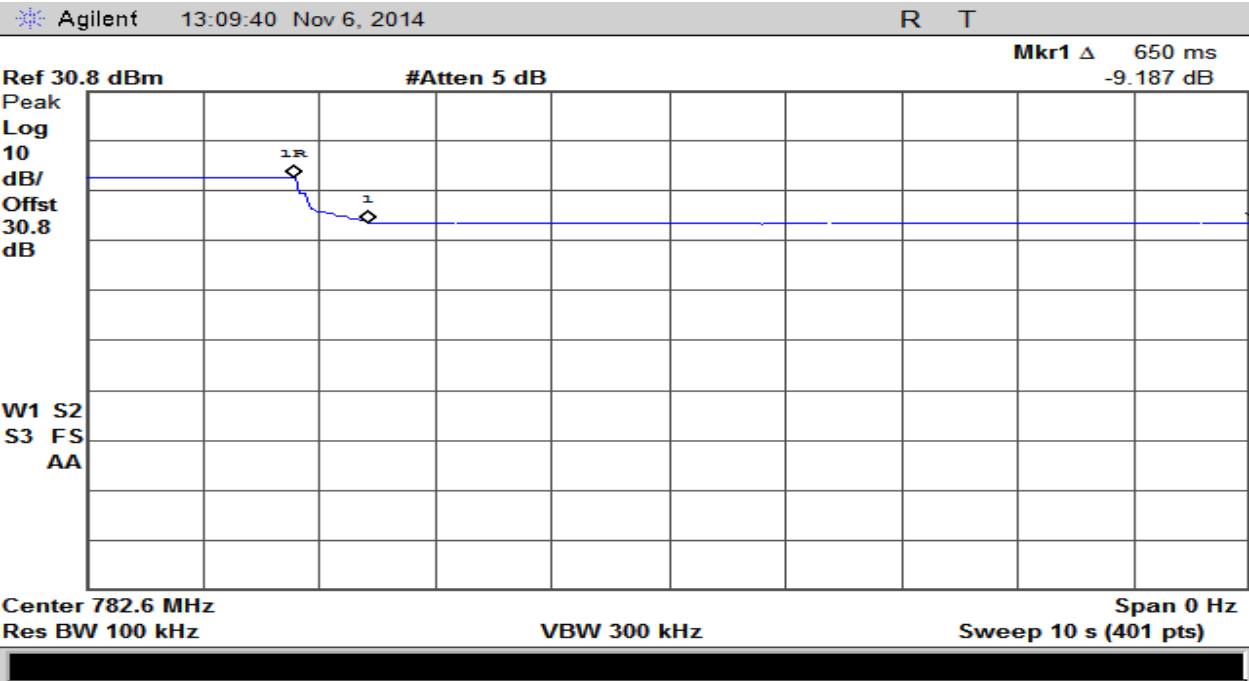




Plot 128 – 1710-1755MHz Band – Uplink Gain Timing



Plot 129 – 698-716MHz Band – Uplink Gain Timing



Plot 130 – 776-787MHz Band – Uplink Gain Timing

## 8. Occupied Bandwidth

<b>Test Requirement(s):</b>	§2.1049	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	01/08/14

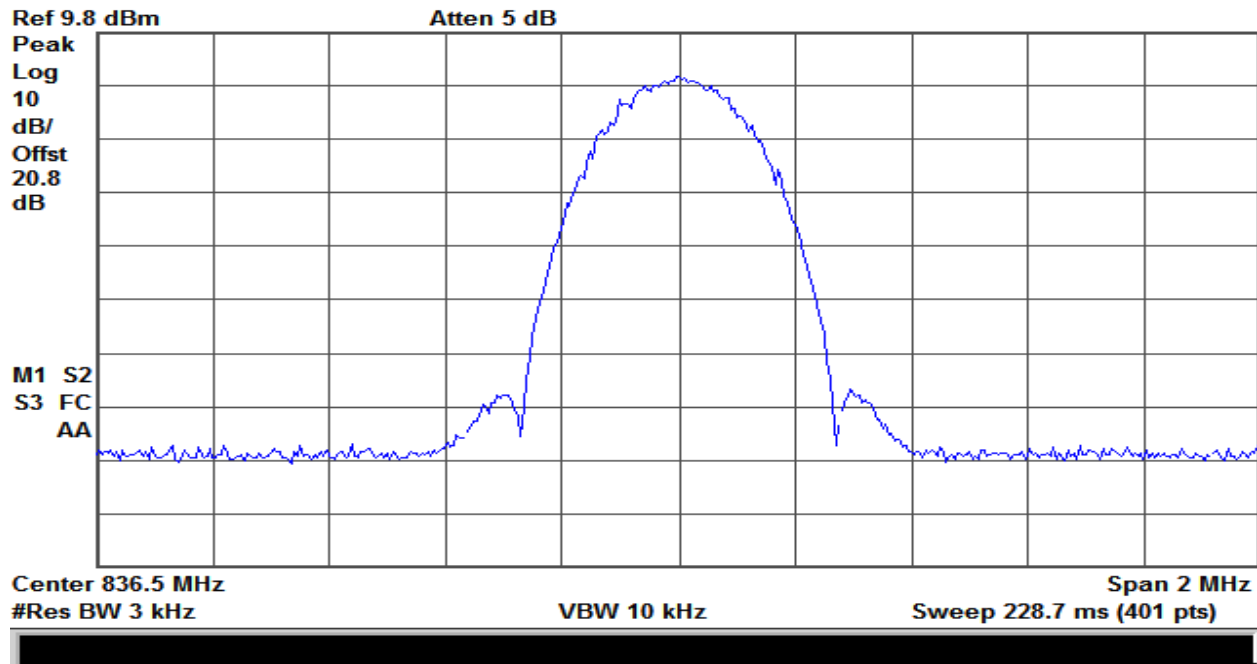
**Test Procedures:** As required by CFR47 §2.1049, Occupied Bandwidth were made at the RF antenna output terminals of the EUT. Measurements were made as per the FCC KDB 935210 D03 procedures defined in §7.10

The EUT output was connected directly to a spectrum analyzer through an attenuator. A signal generator was connected to the EUT to produce GSM, CDMA & LTE signals to show the input and output signals were similar.

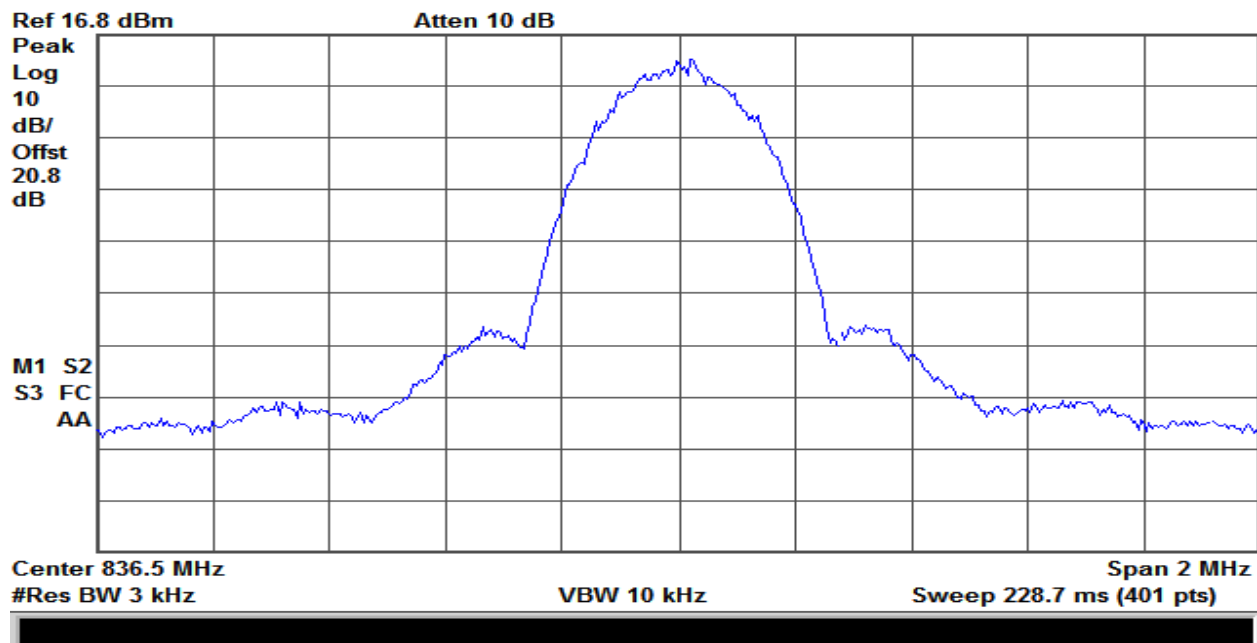
The following pages show measurements of Occupied Bandwidth plots:

<b>Detector Setting</b>	<b>Resolution Bandwidth</b>	<b>Video Bandwidth</b>	<b>Sweep Time</b>	<b>Span</b>
Peak	1% - 5%	≥3 x RBW	Auto	As per Modulation Type

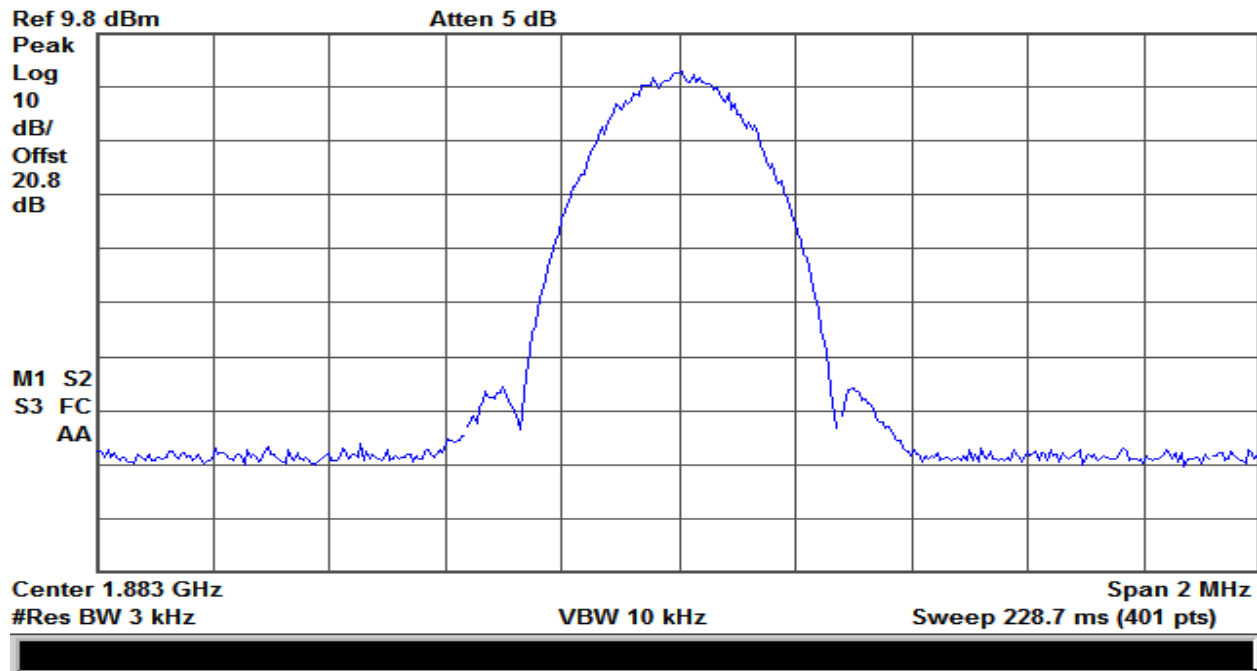
**Table 27 – Analyzer Settings**



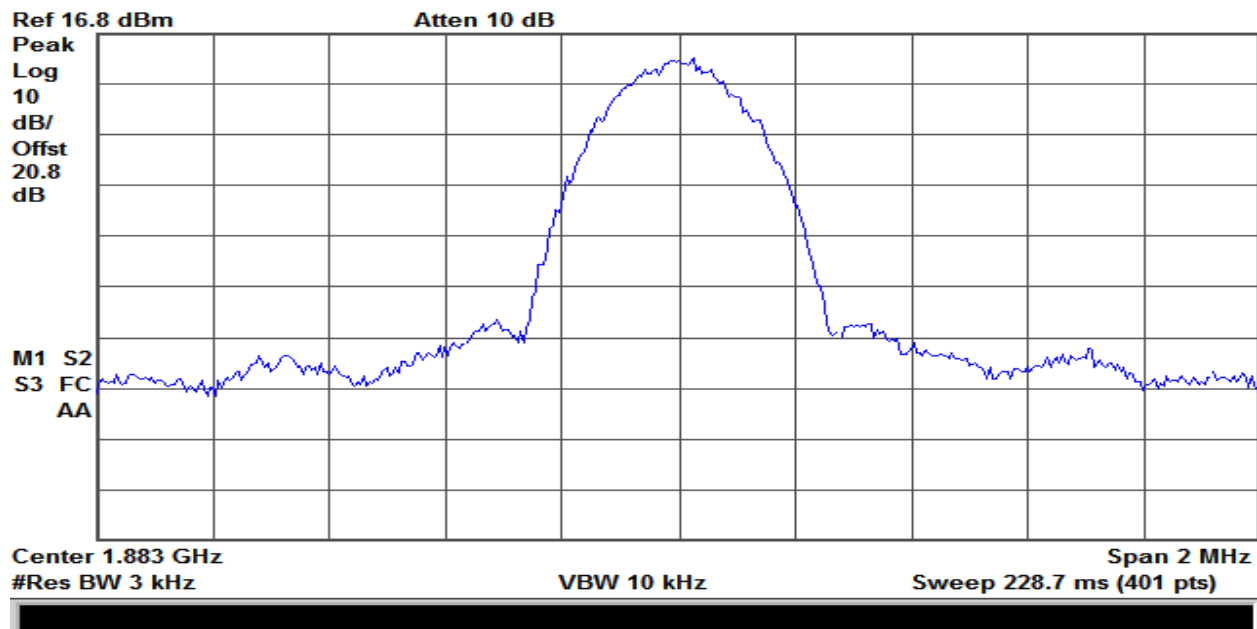
Plot 131 – 824-849MHz Band – Uplink Input – GSM



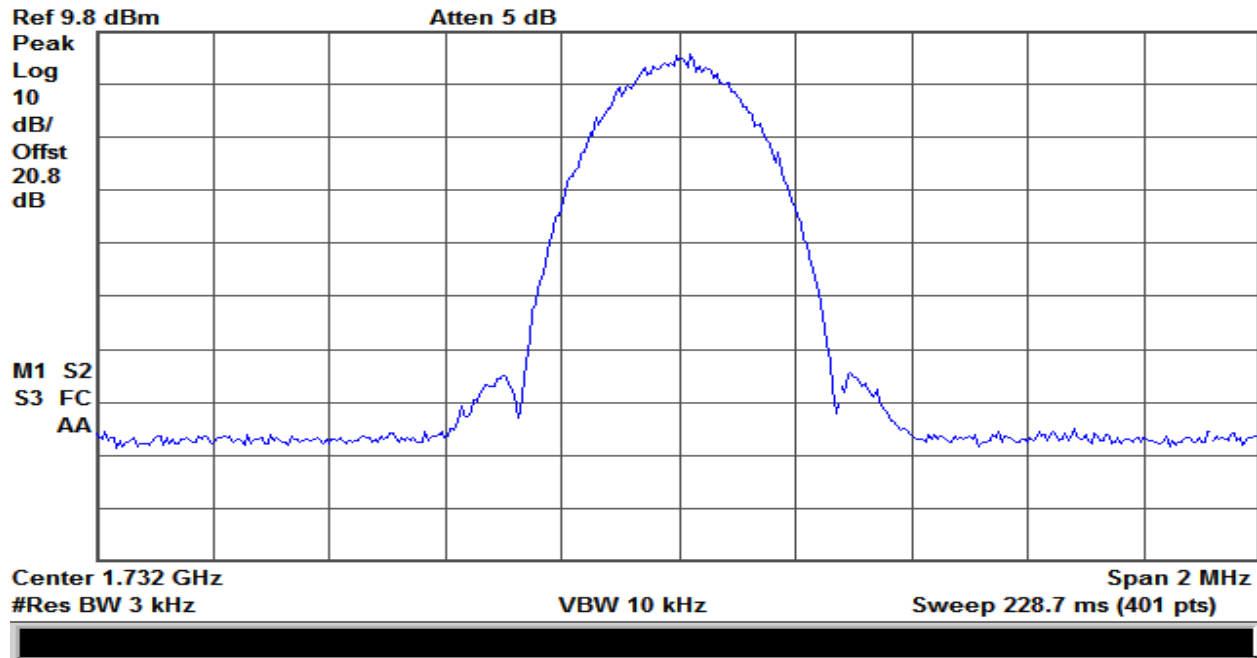
Plot 132 – 824-849MHz Band – Uplink Output – GSM



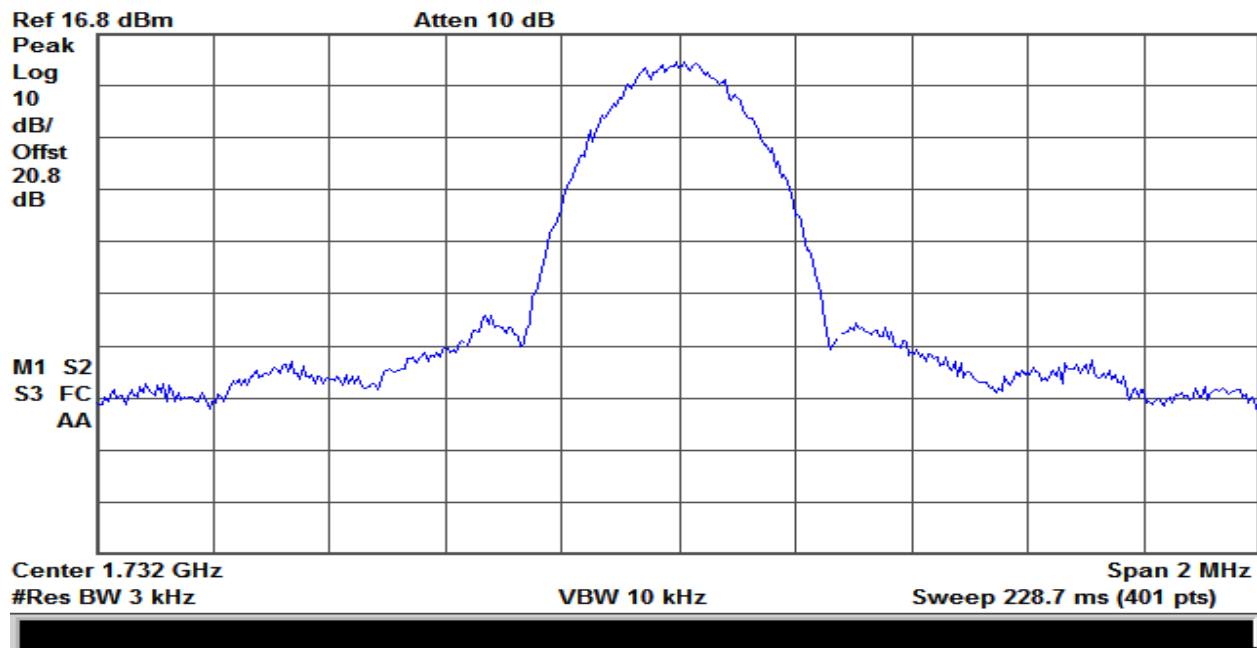
Plot 133 – 1850-1915MHz Band – Uplink Input – GSM



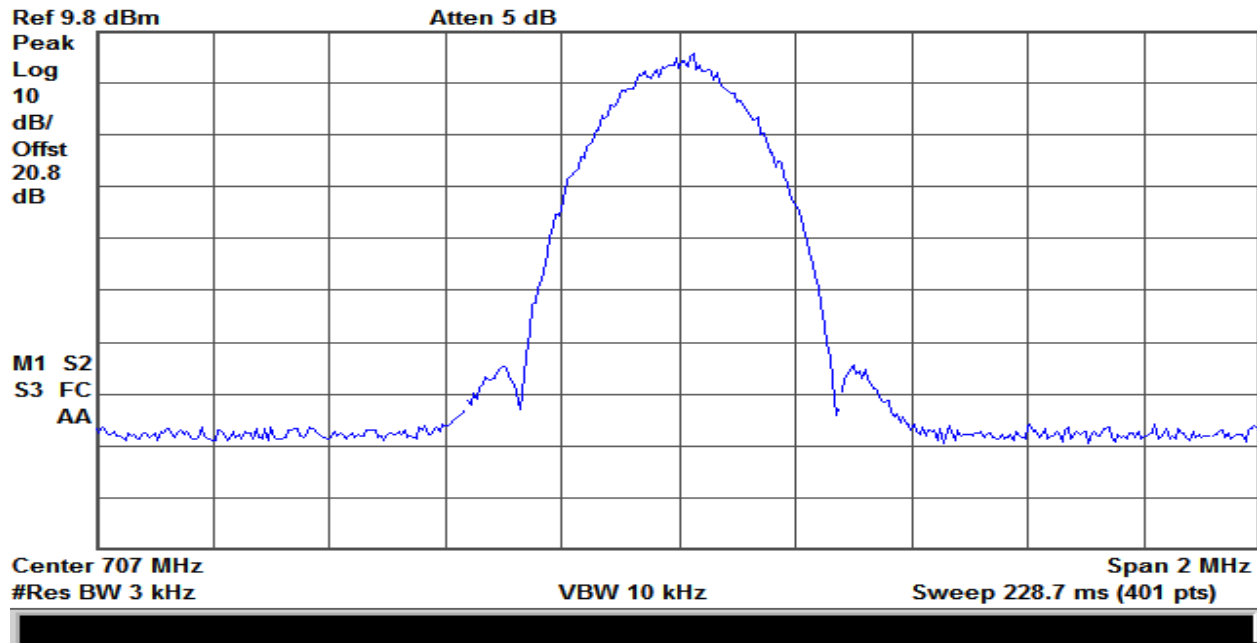
Plot 134 – 1850-1915MHz Band – Uplink Output – GSM



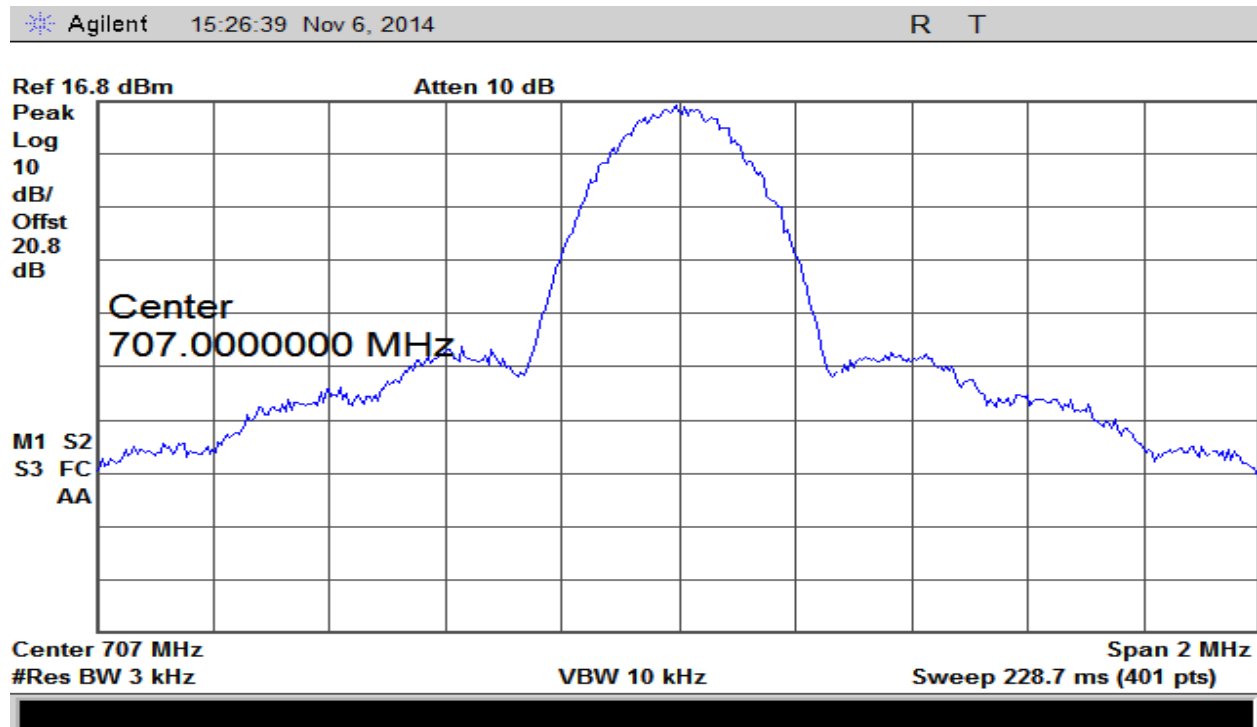
Plot 135 – 1710-1755MHz Band – Uplink Input – GSM



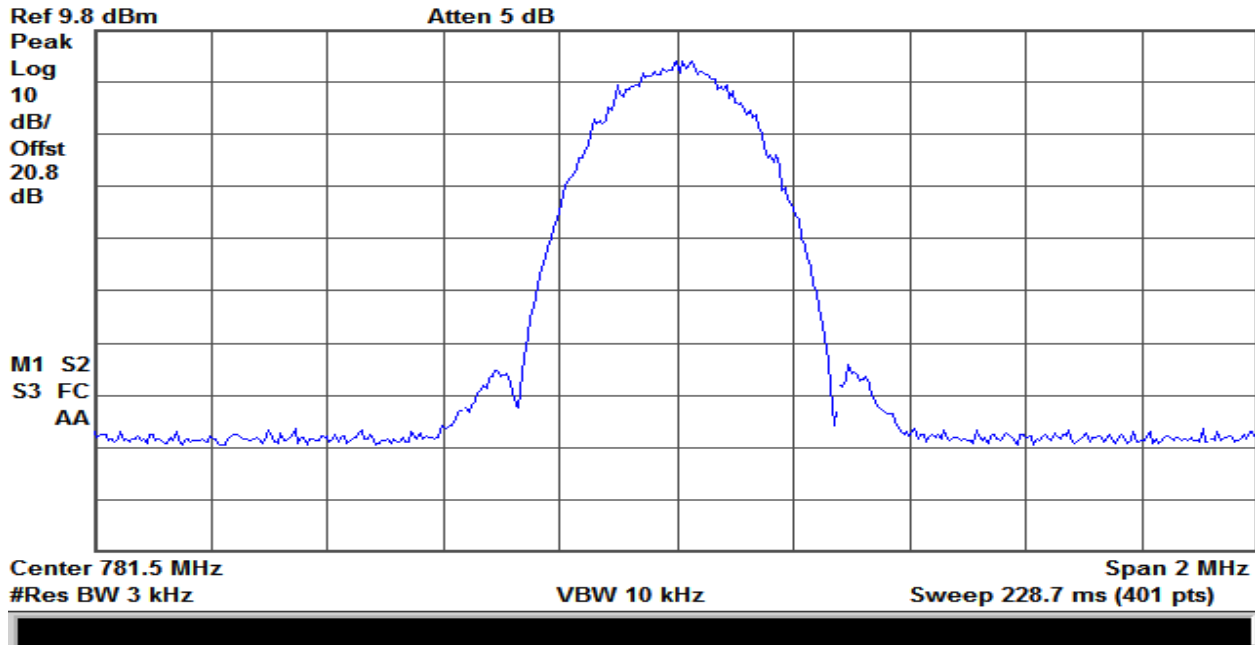
Plot 136 – 1710-1755MHz Band – Uplink Output – GSM



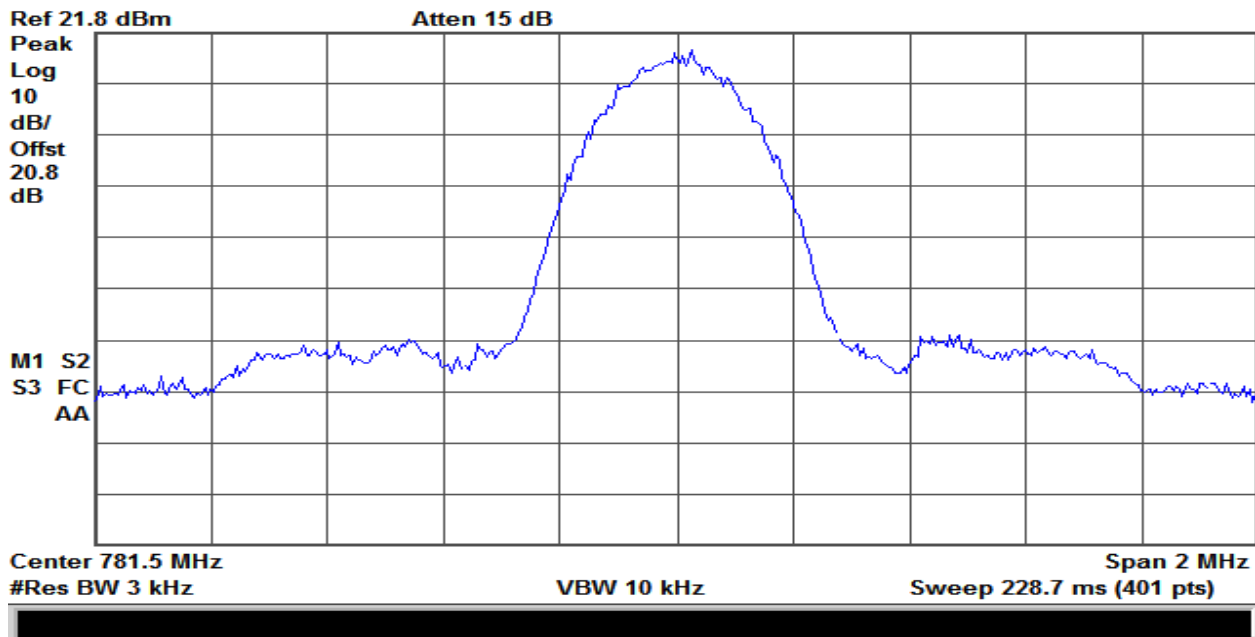
Plot 137 – 698-716MHz Band – Uplink Input – GSM



Plot 138 – 698-716MHz Band – Uplink Output – GSM

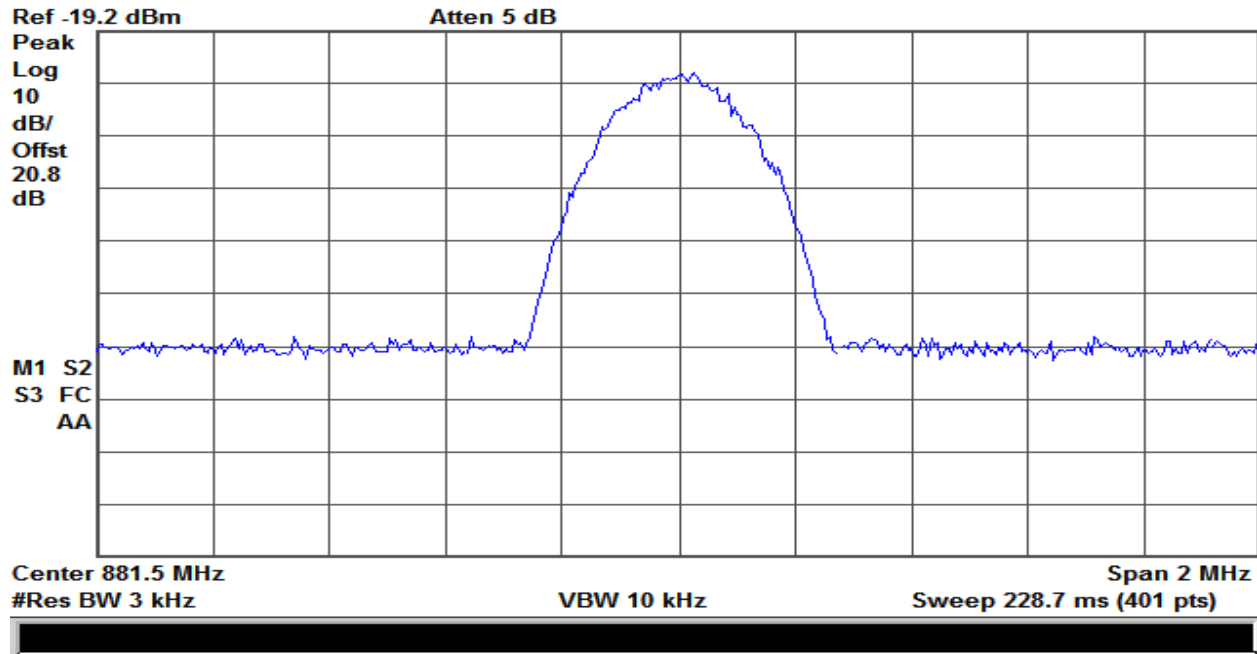


Plot 139 – 776-787MHz Band – Uplink Input – GSM

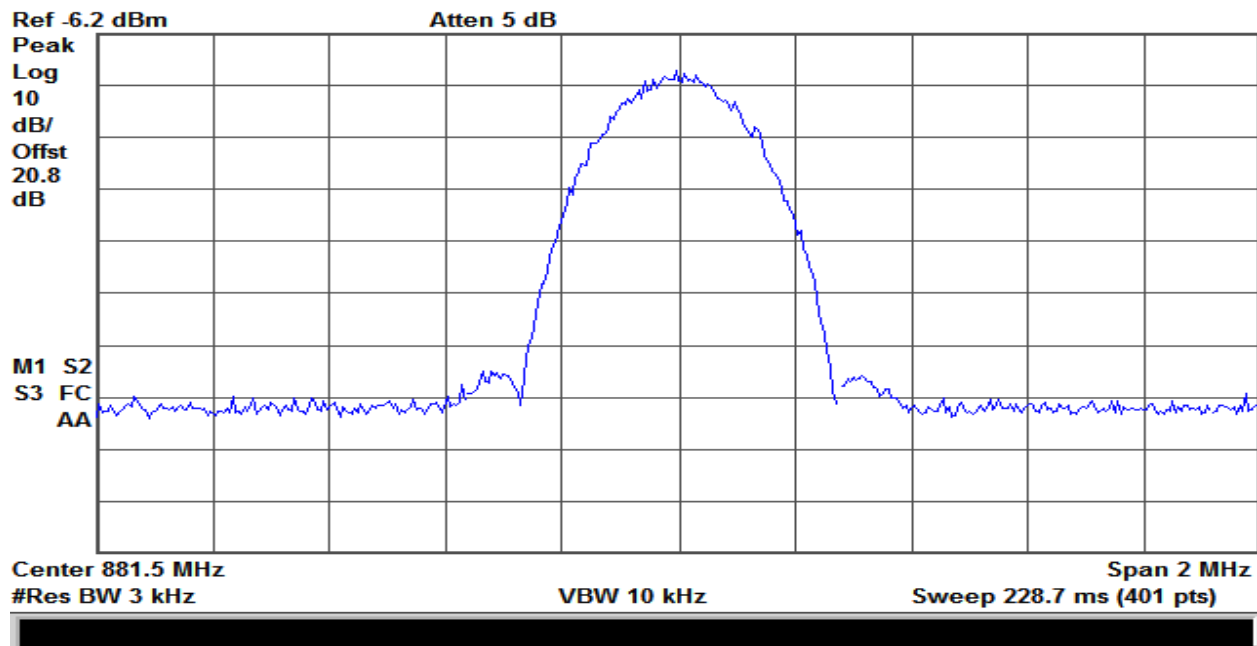


Plot 140 – 776-787MHz Band – Uplink Output – GSM

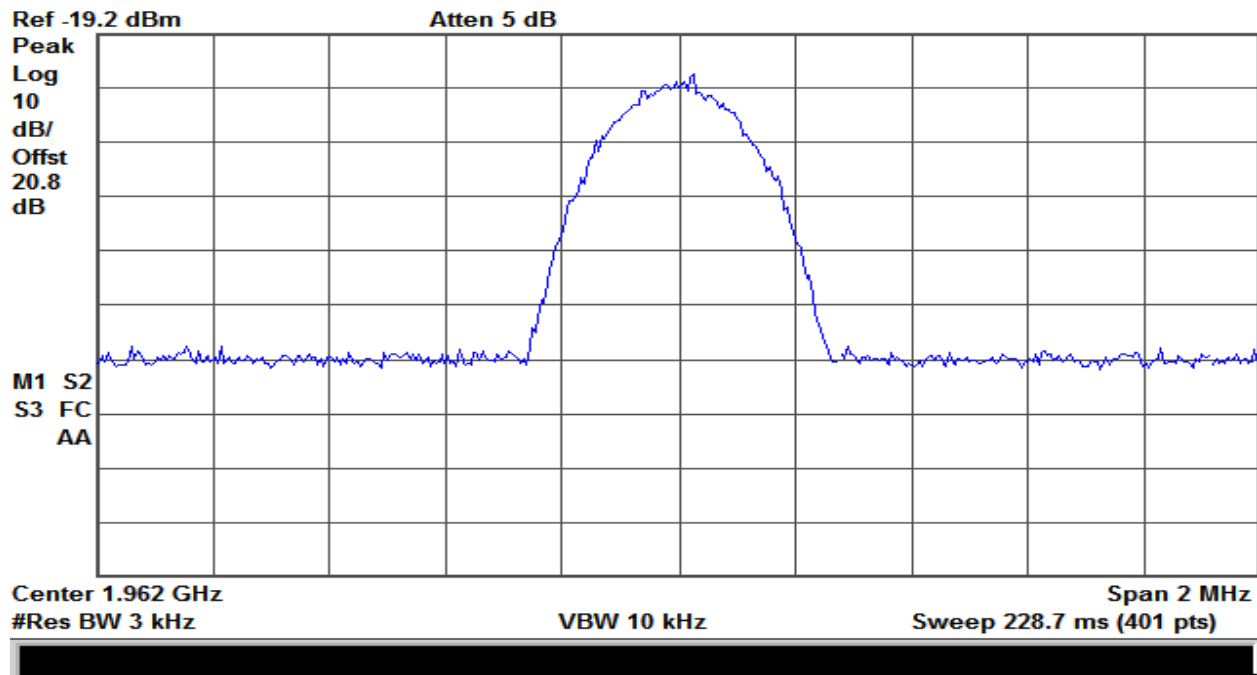




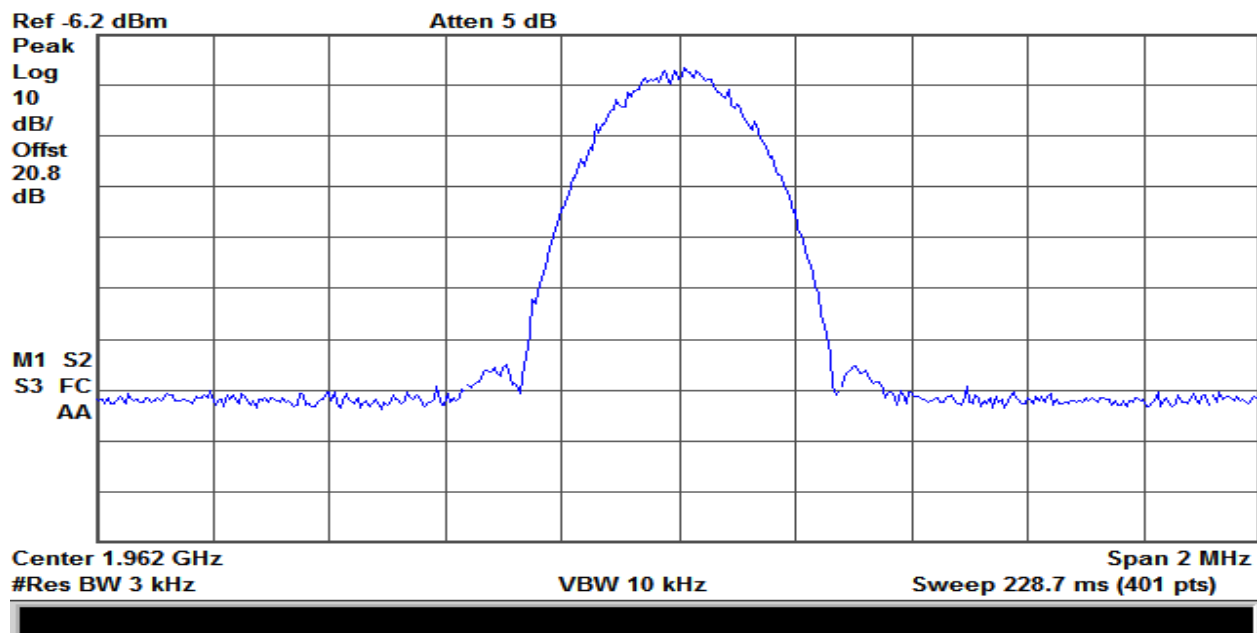
Plot 141 – 869-894MHz Band – Downlink Input – GSM



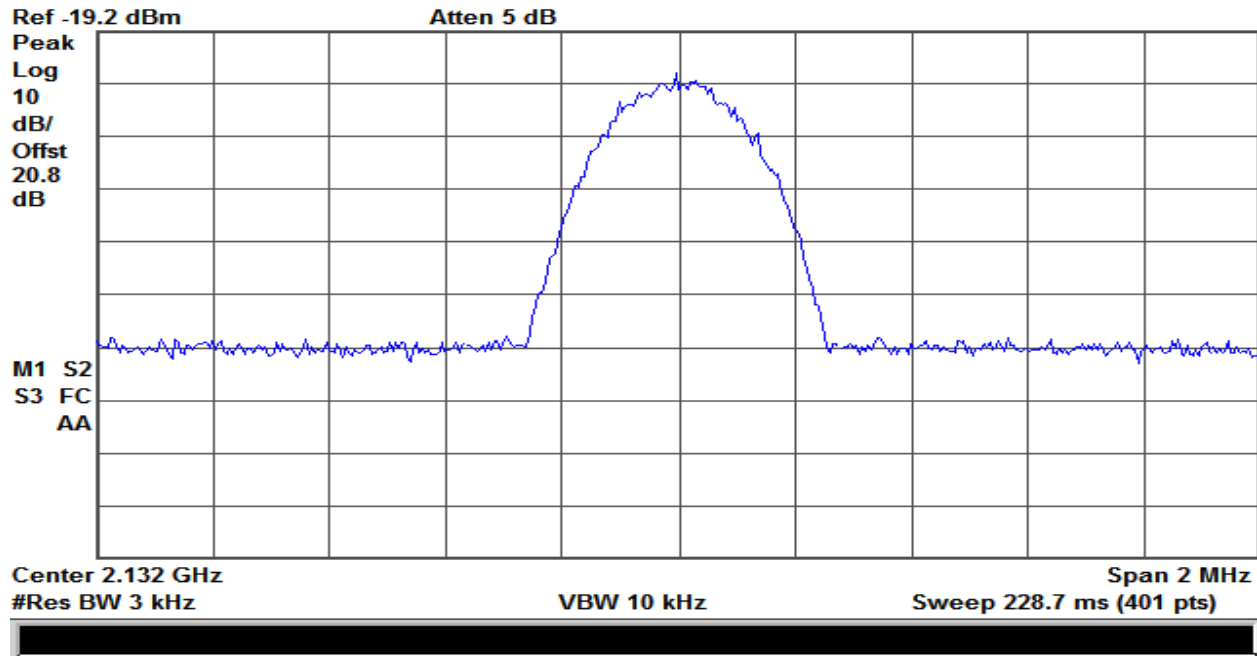
Plot 142 – 869-894MHz Band – Downlink Output – GSM



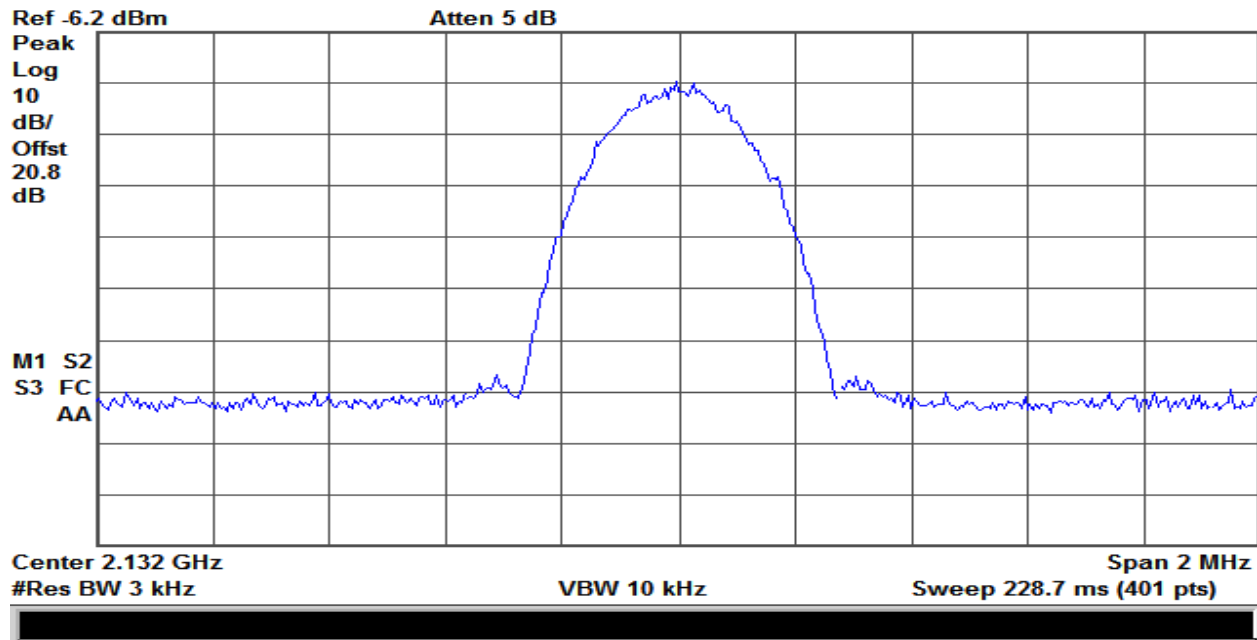
Plot 143 – 1930-1995MHz Band – Downlink Input – GSM



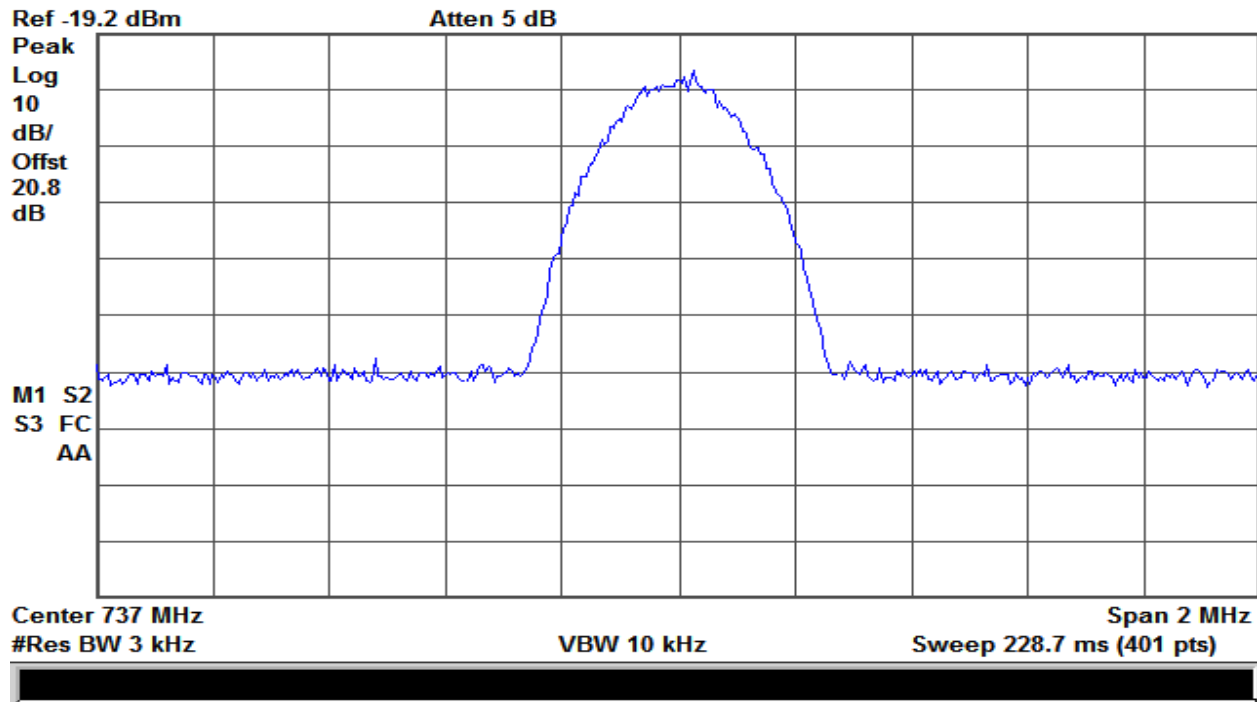
Plot 144 – 1930-1995MHz Band – Downlink Output – GSM



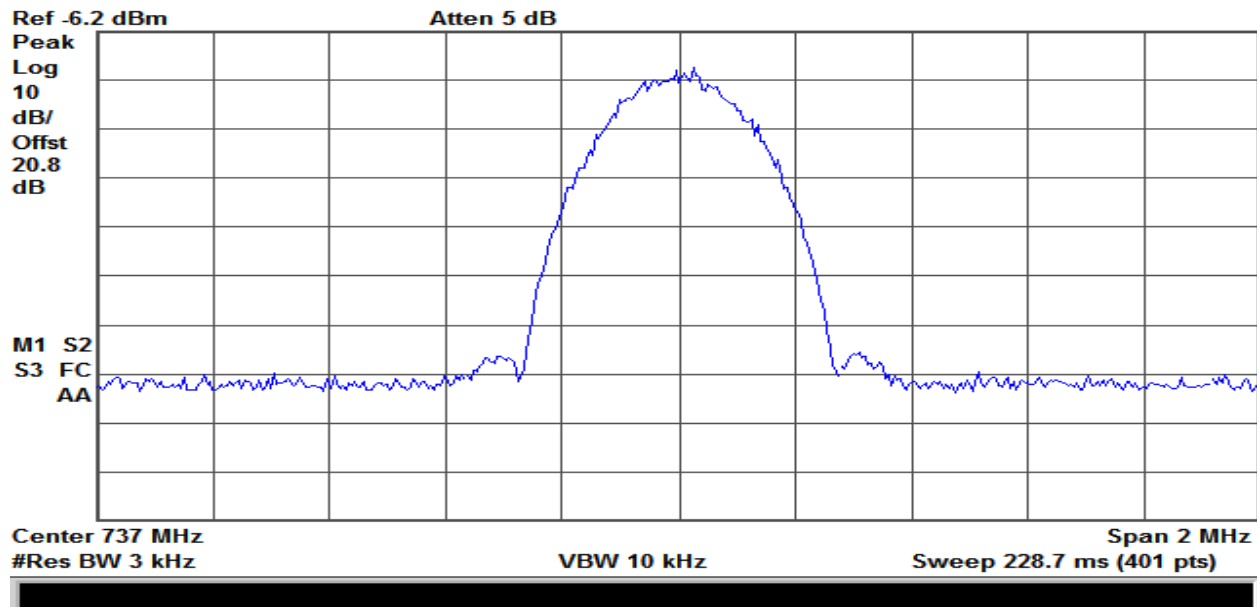
Plot 145 – 2110-2155MHz Band – Downlink Input – GSM



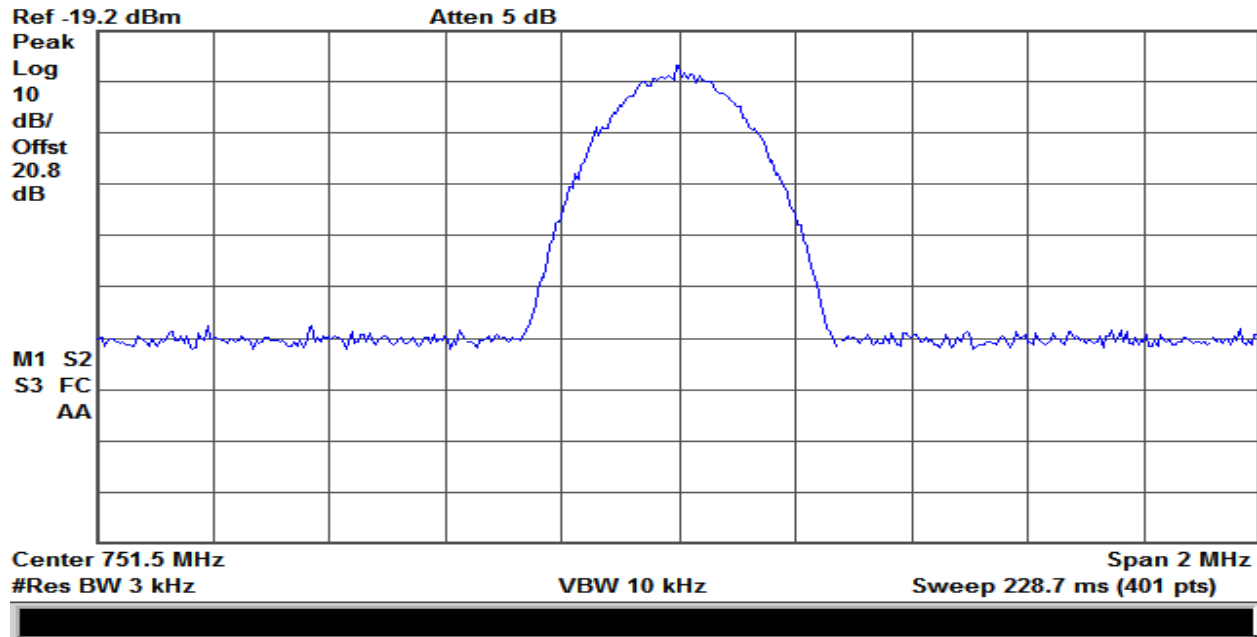
Plot 146 – 2110-2155MHz Band – Uplink Output – GSM



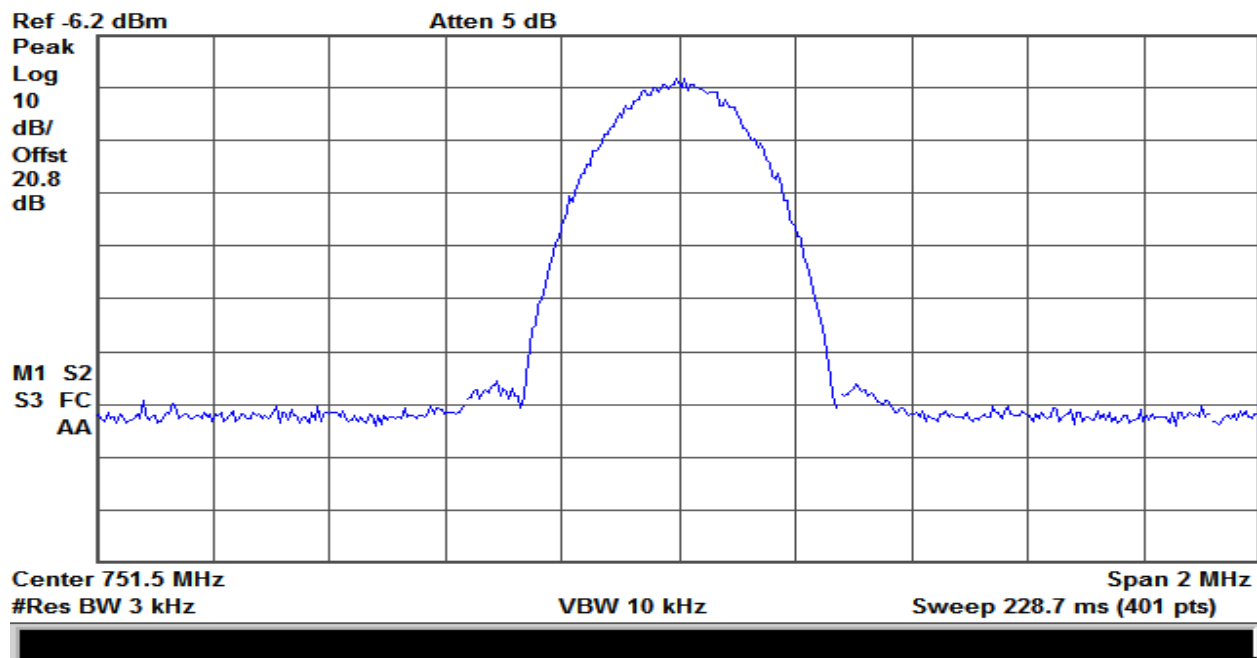
Plot 147 – 728-746MHz Band – Downlink Input – GSM



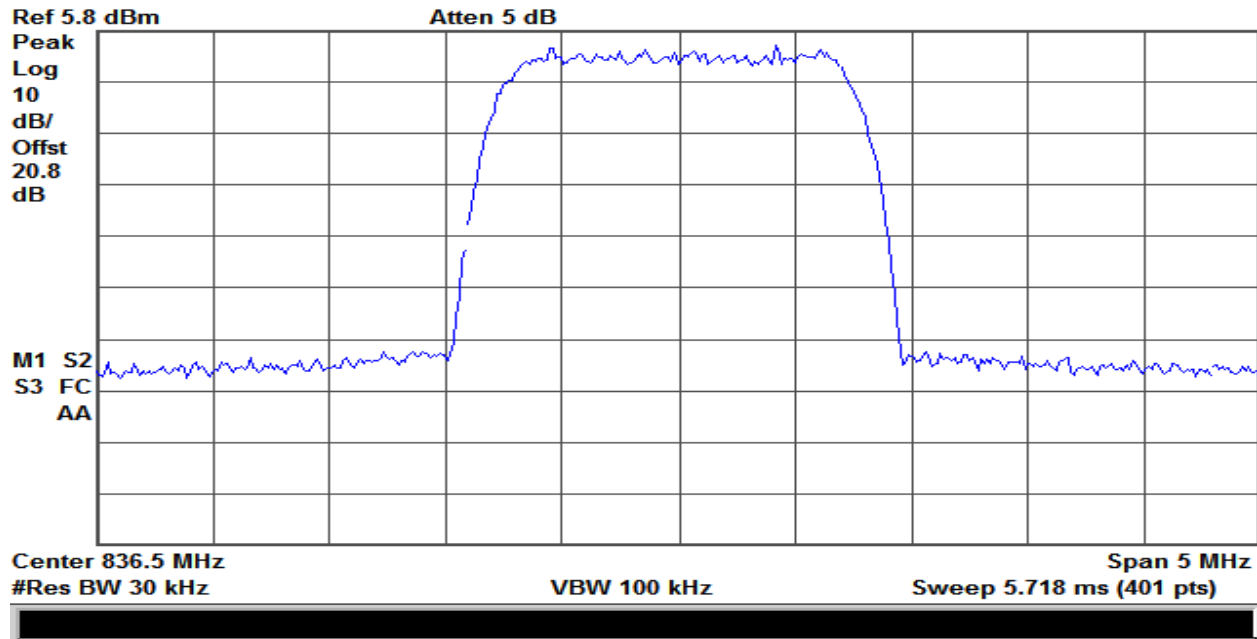
Plot 148 – 728-746MHz Band – Downlink Output – GSM



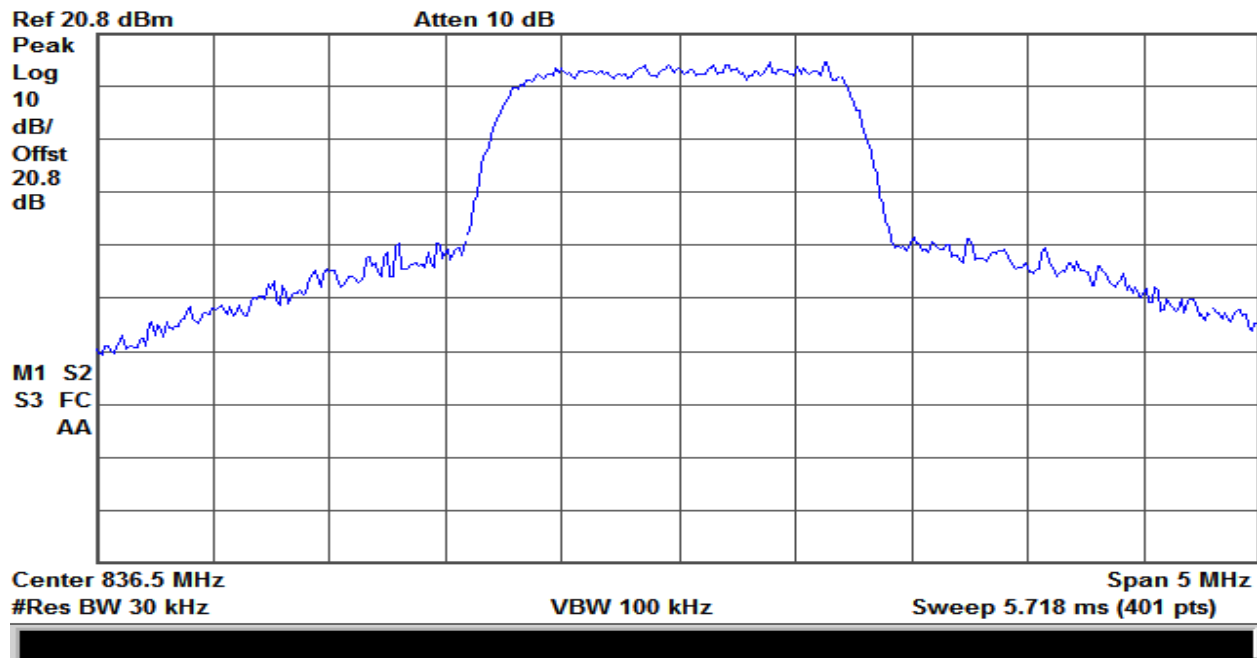
Plot 149 – 746-757MHz Band – Downlink Input – GSM



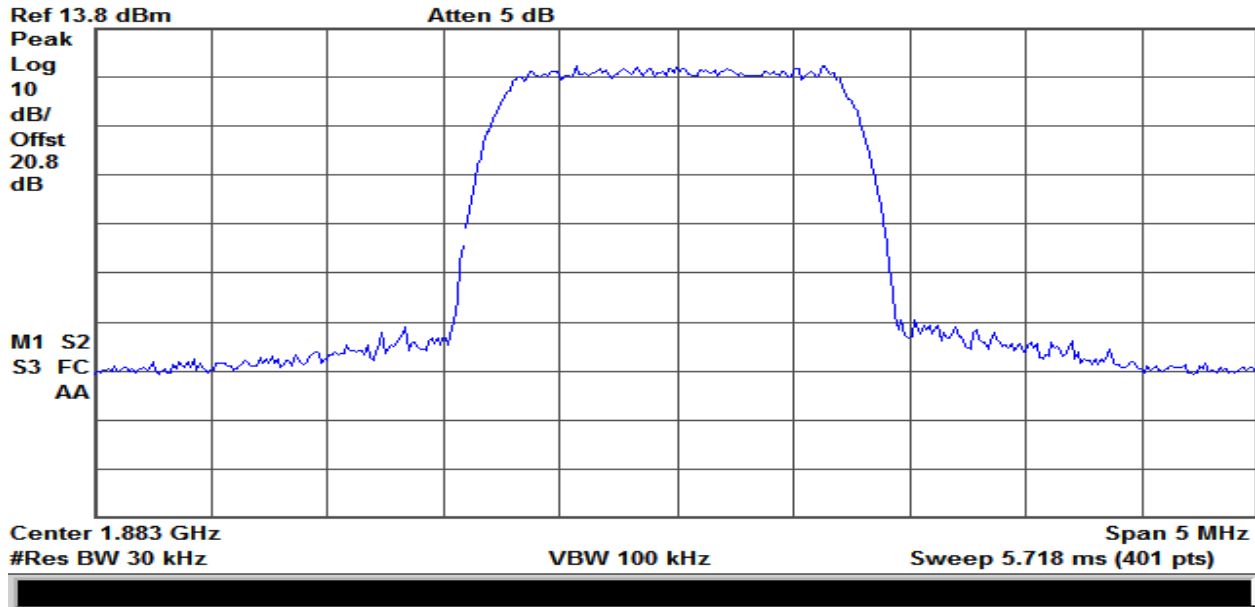
Plot 150 – 746-757MHz Band – Downlink Output – GSM



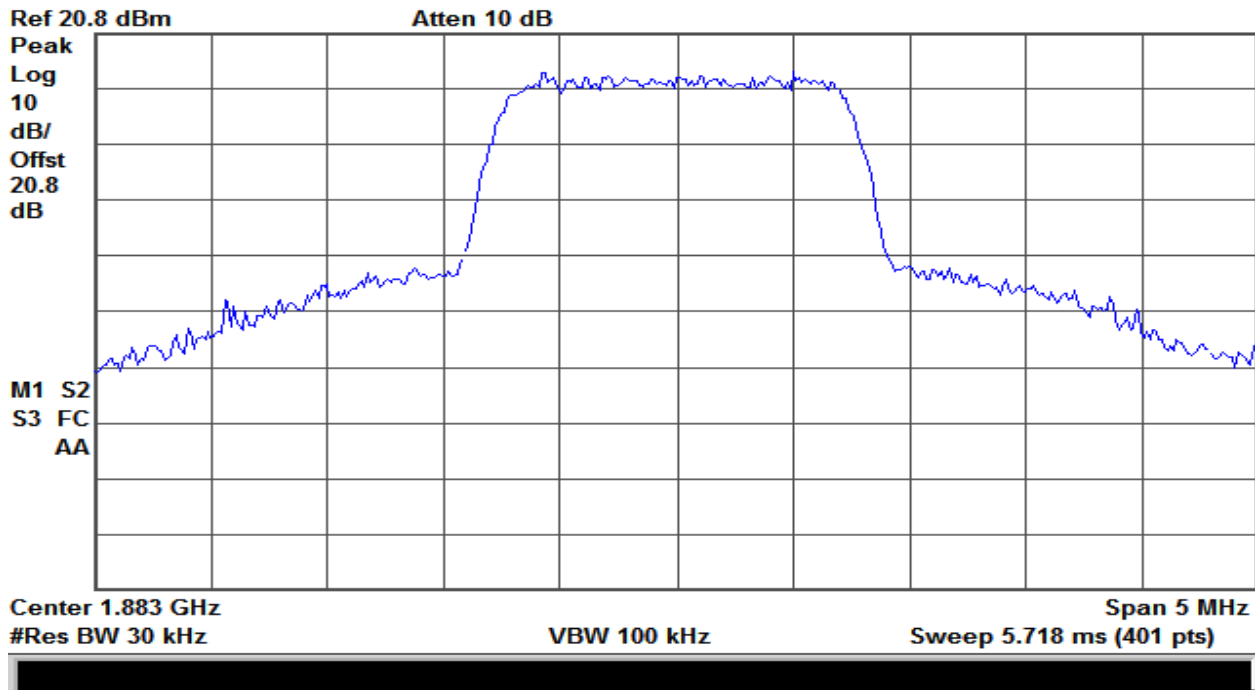
Plot 151 – 824-849MHz Band – Uplink Input – CDMA



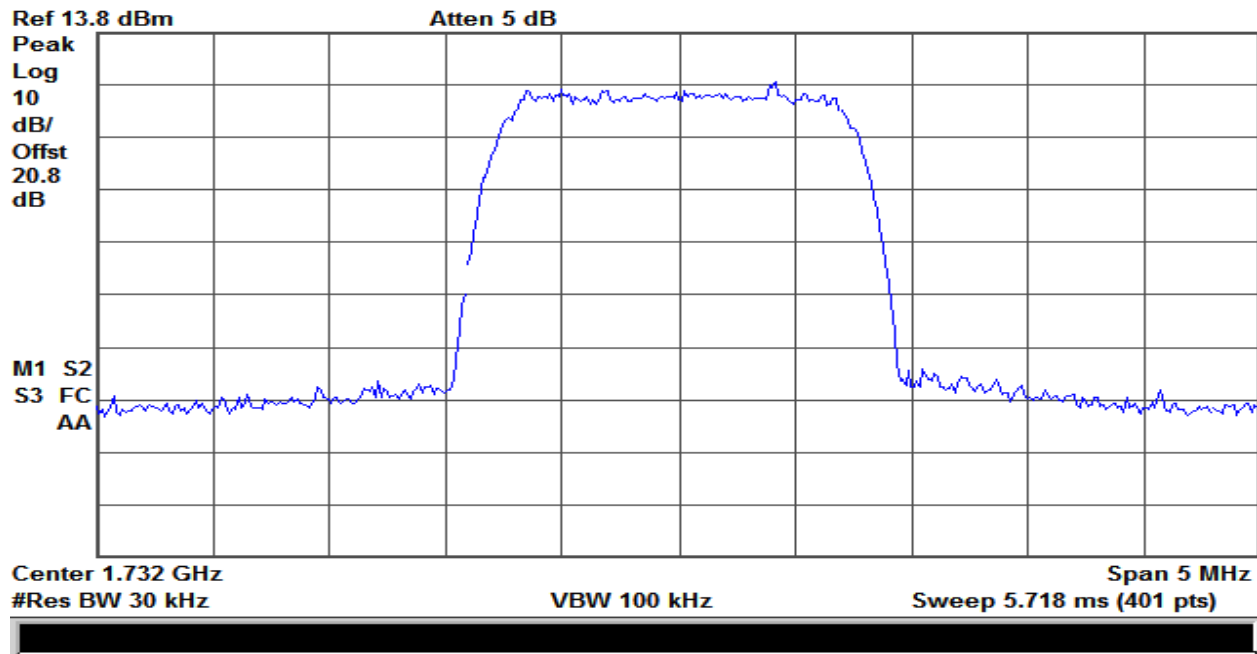
Plot 152 – 824-849MHz Band – Uplink Output – CDMA



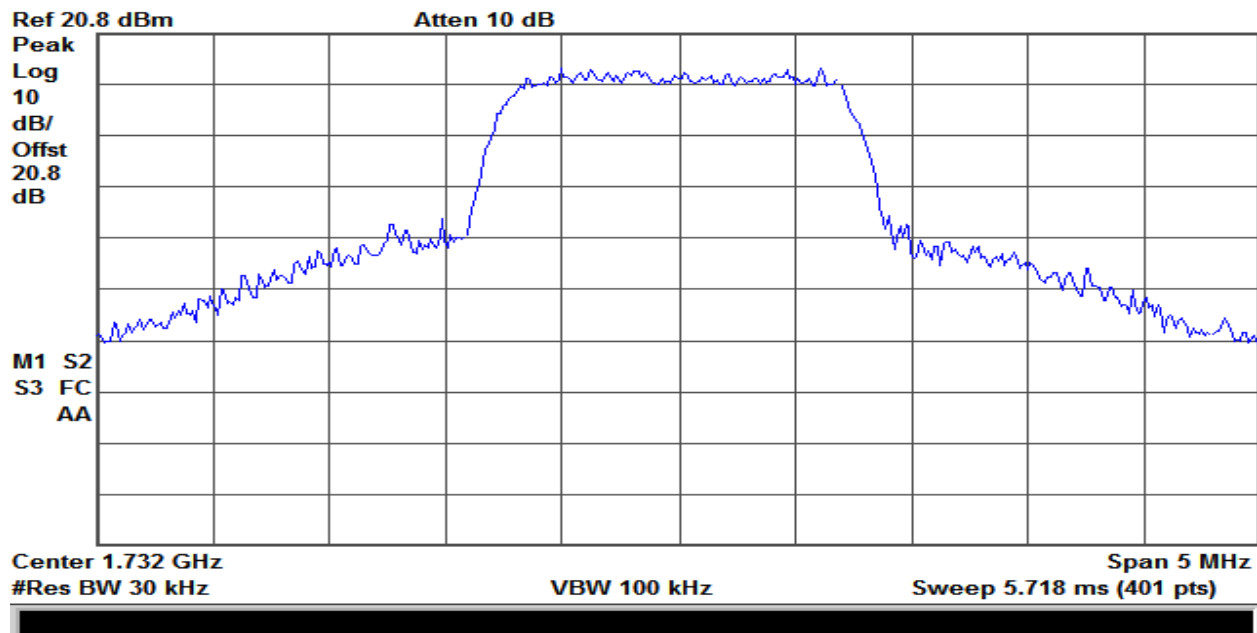
Plot 153 – 1850-1915MHz Band – Uplink Input – CDMA



Plot 154 – 1850-1915MHz Band – Uplink Output – CDMA

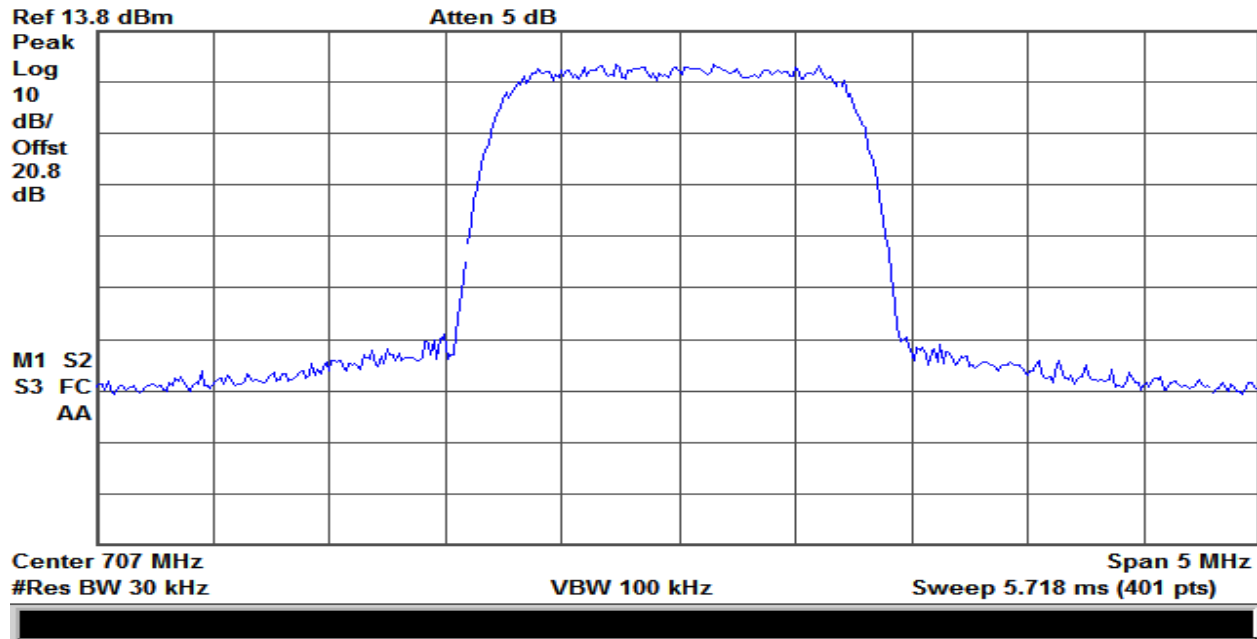


Plot 155 – 171011755MHz Band – Uplink Input – CDMA

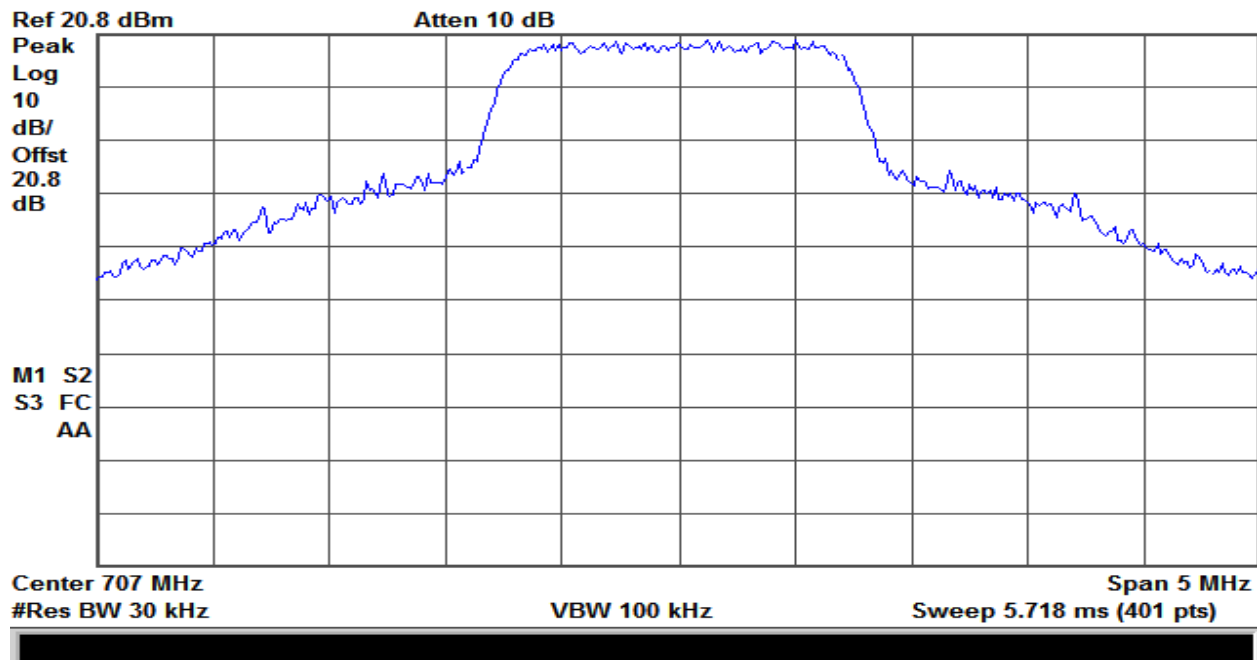


Plot 156 – 171011755MHz Band – Uplink Output – CDMA

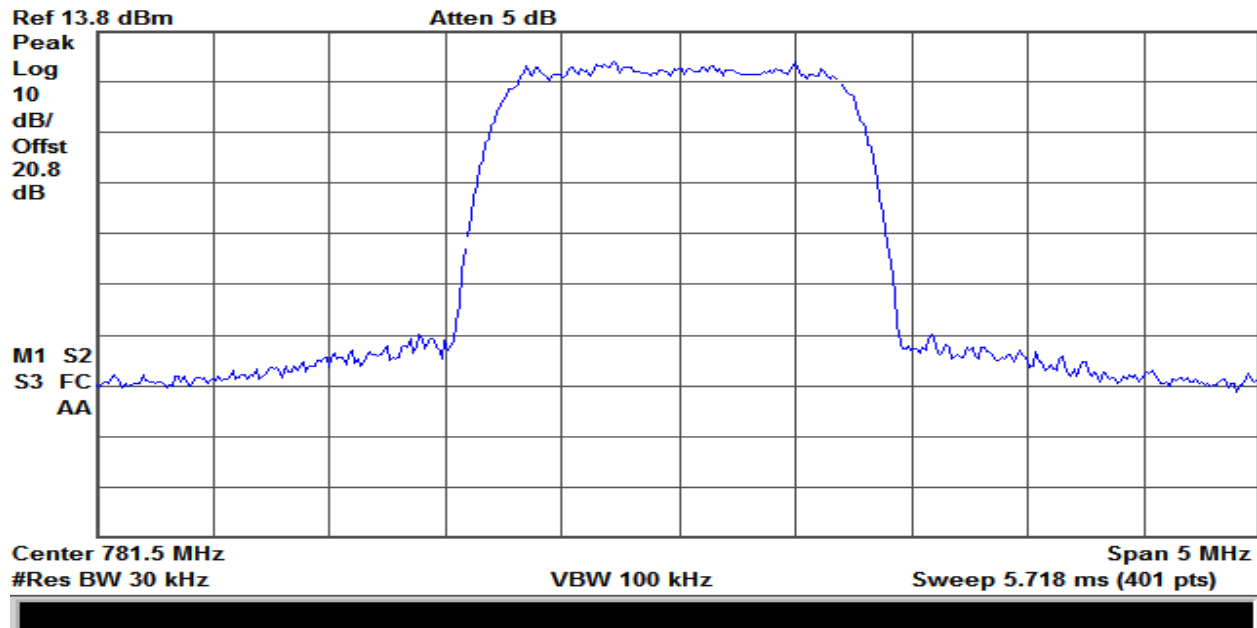




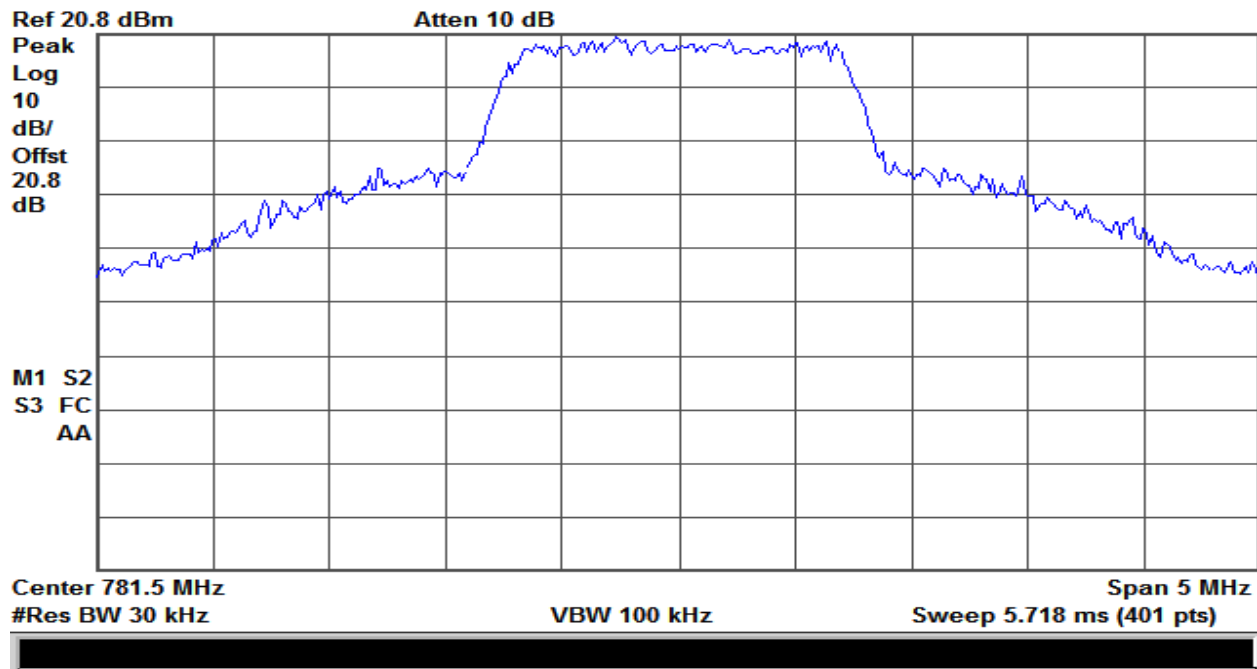
Plot 157 – 698-716MHz Band – Uplink Input – CDMA



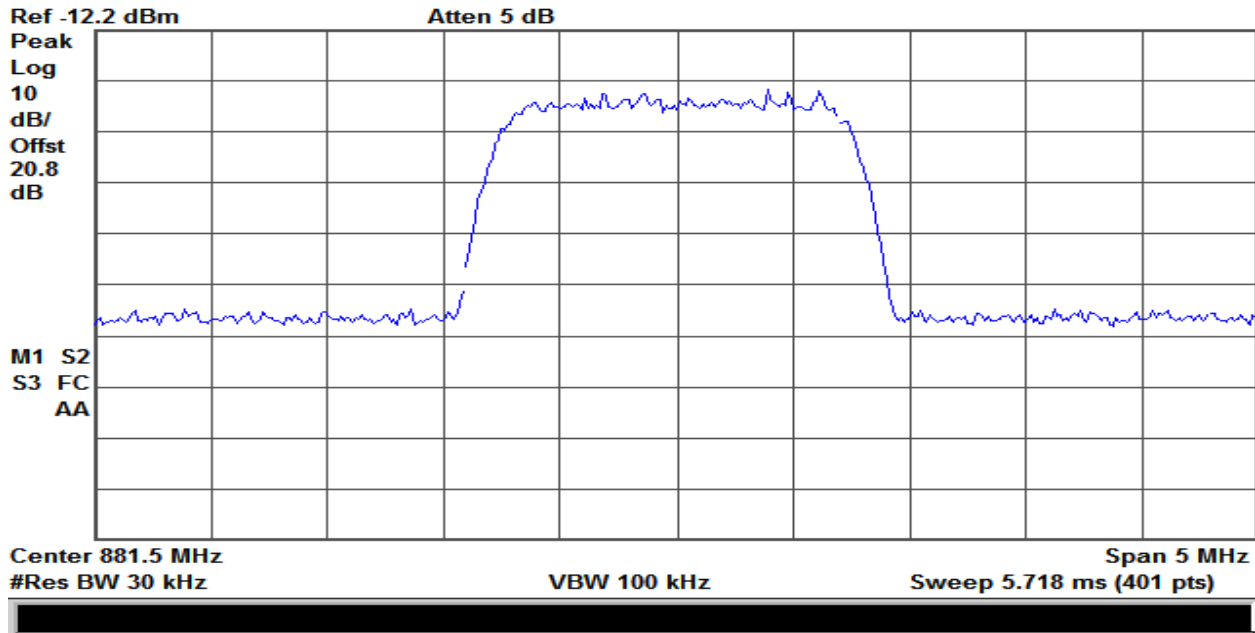
Plot 158 – 698-716MHz Band – Uplink Output – CDMA



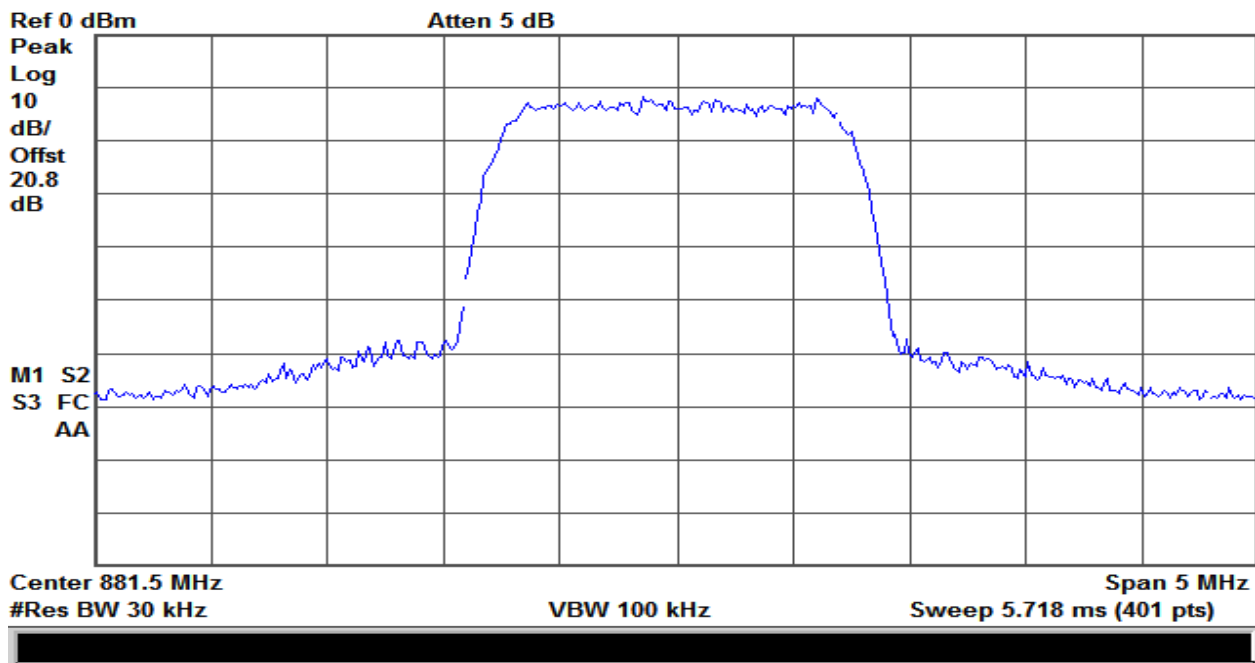
Plot 159 – 776-787MHz Band – Uplink Input – CDMA



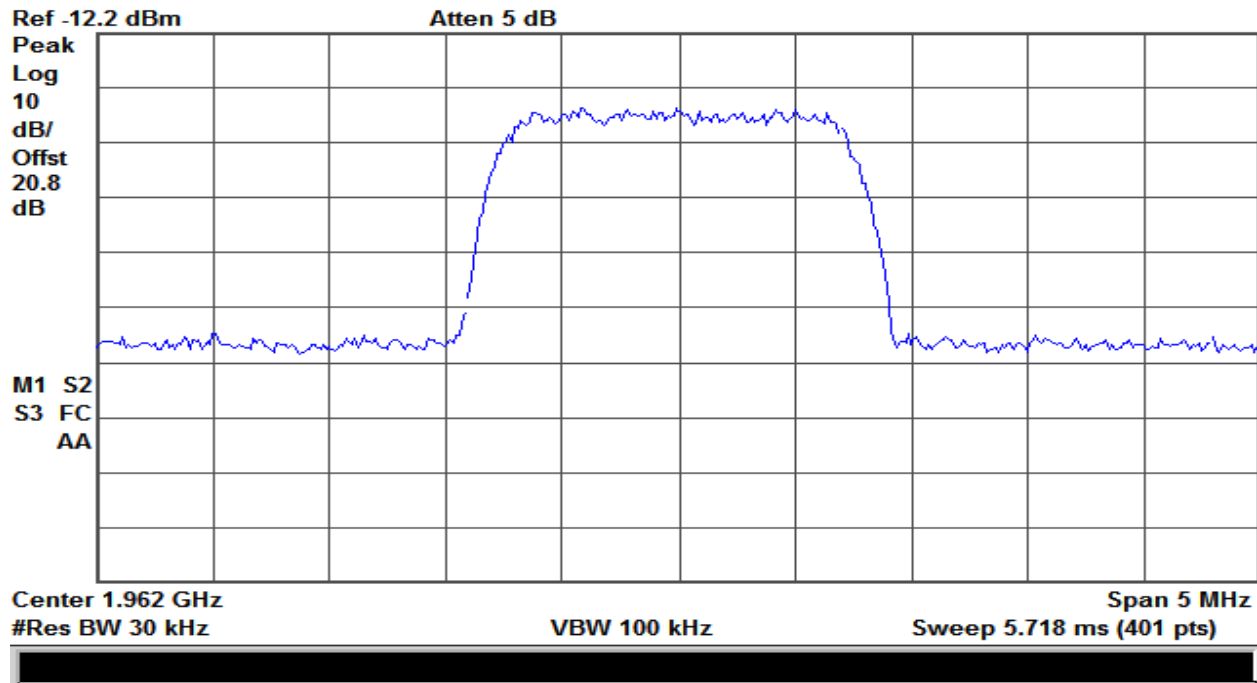
Plot 160 – 776-787MHz Band – Uplink Output – CDMA



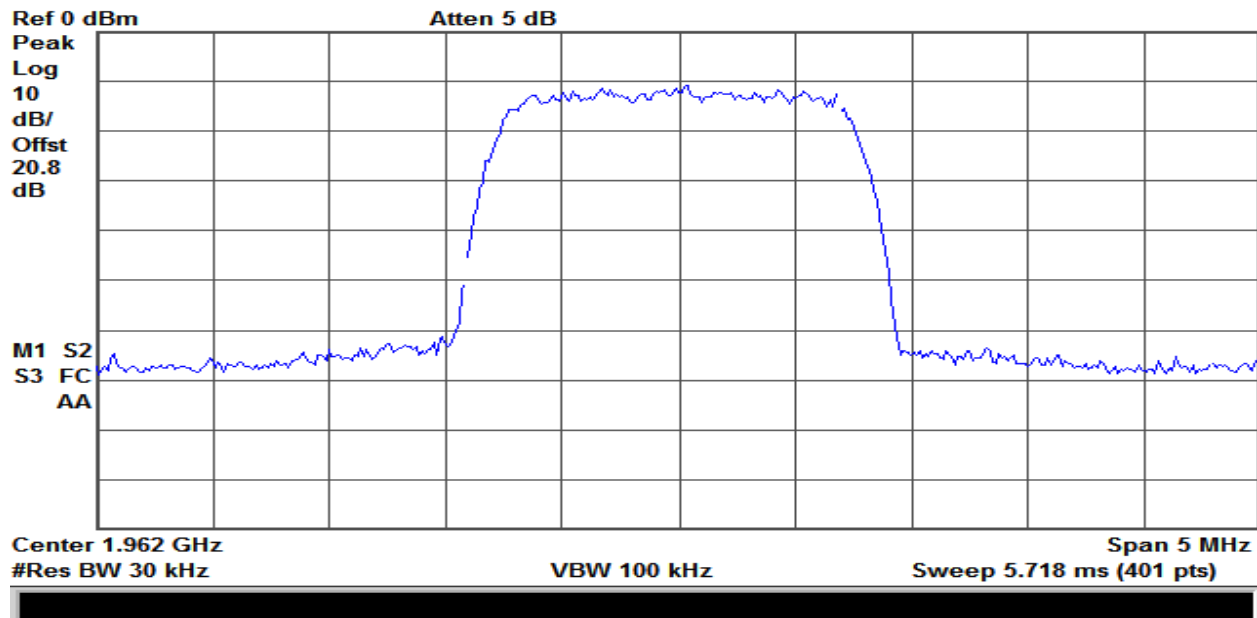
Plot 161 – 869-894MHz Band – Downlink Input – CDMA



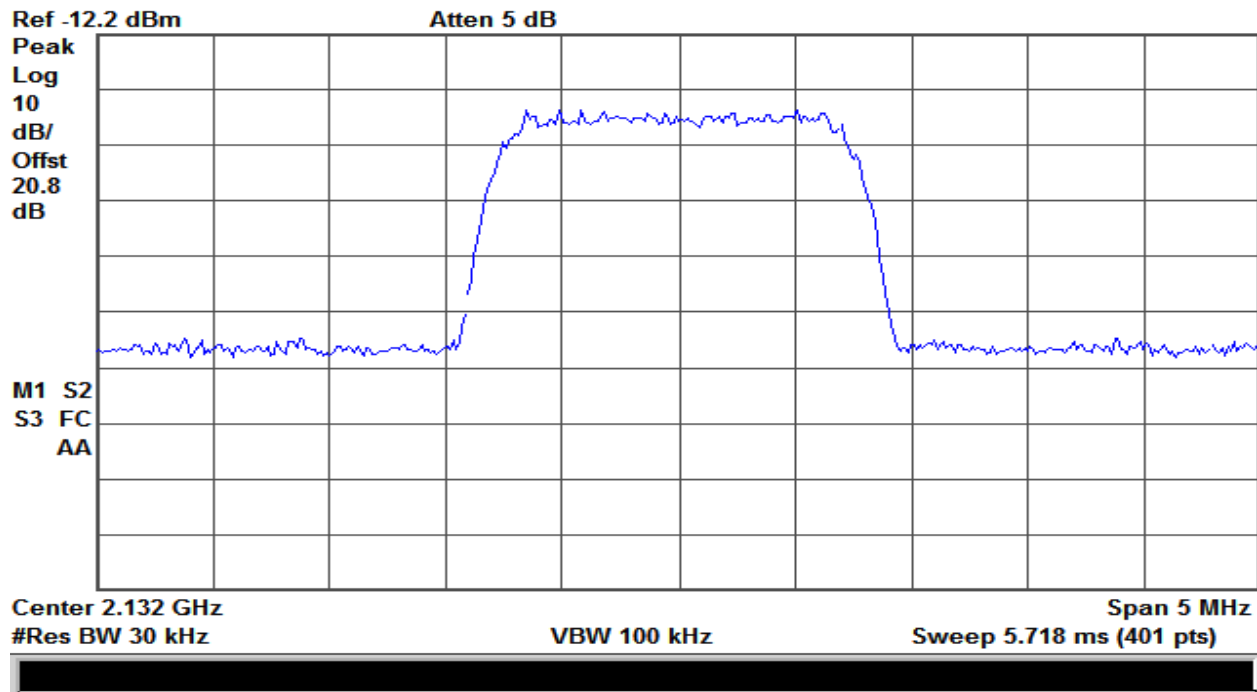
Plot 162 – 869-894MHz Band – Downlink Output – CDMA



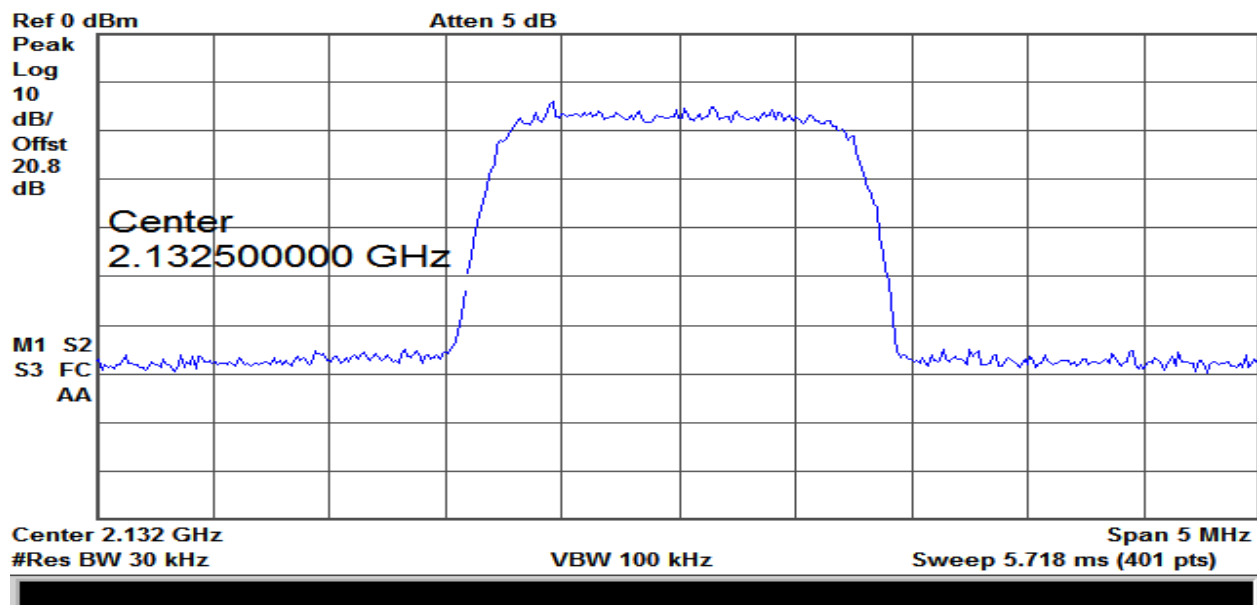
Plot 163 – 1930-1995MHz Band – Downlink Input – CDMA



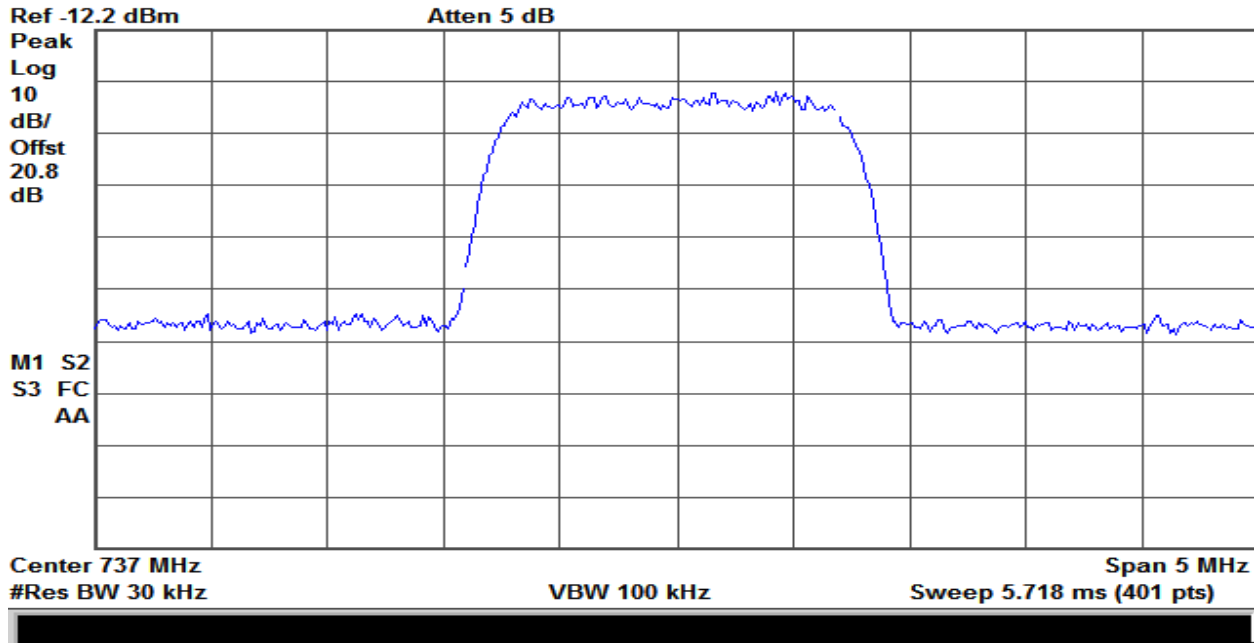
Plot 164 – 1930-1995MHz Band – Downlink Output – CDMA



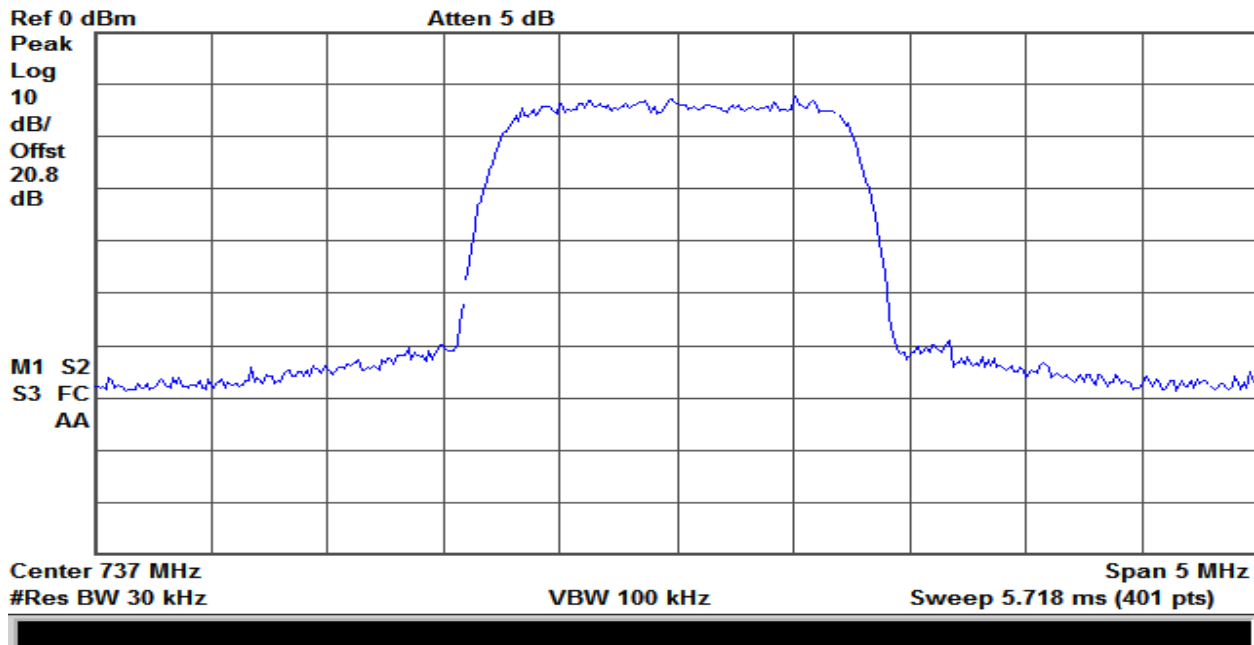
Plot 165 – 2110-2155MHz Band – Downlink Input – CDMA



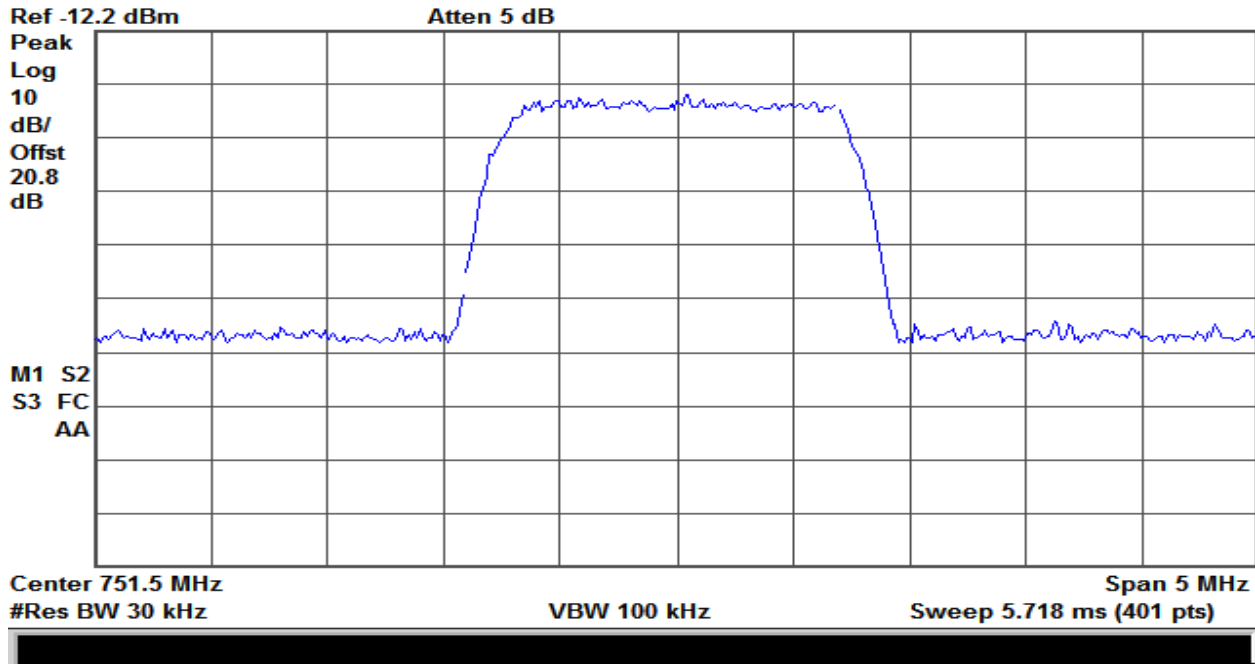
Plot 166 – 2110-2155MHz Band – Downlink Output – CDMA



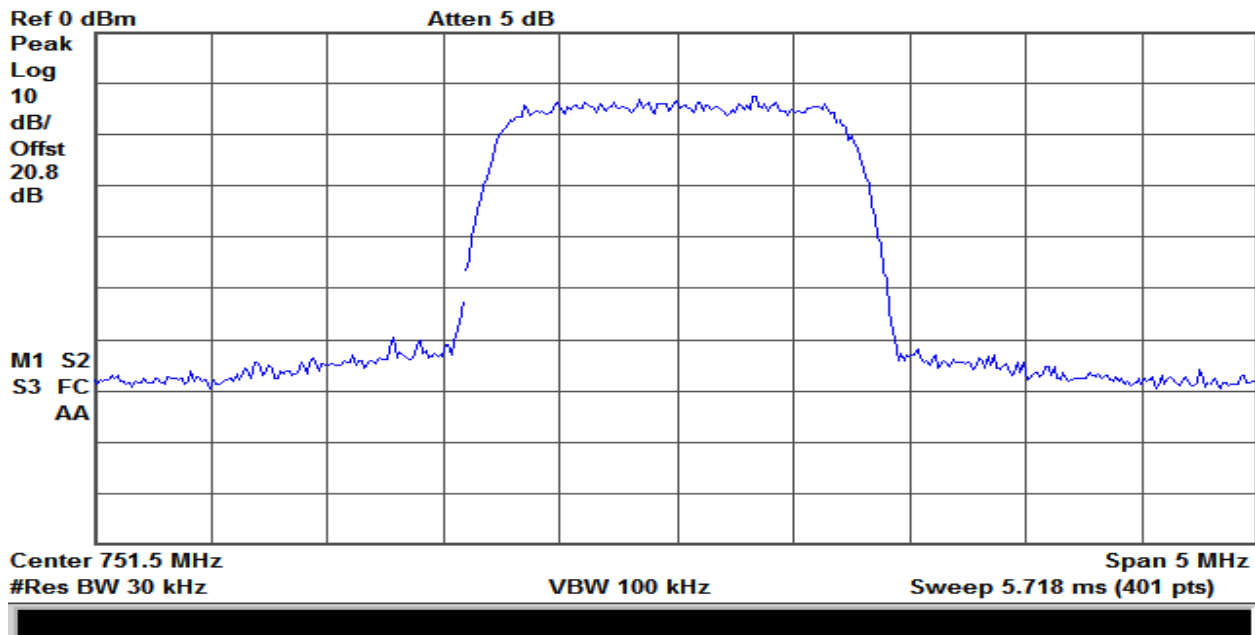
Plot 167 – 728-746MHz Band – Downlink Input – CDMA



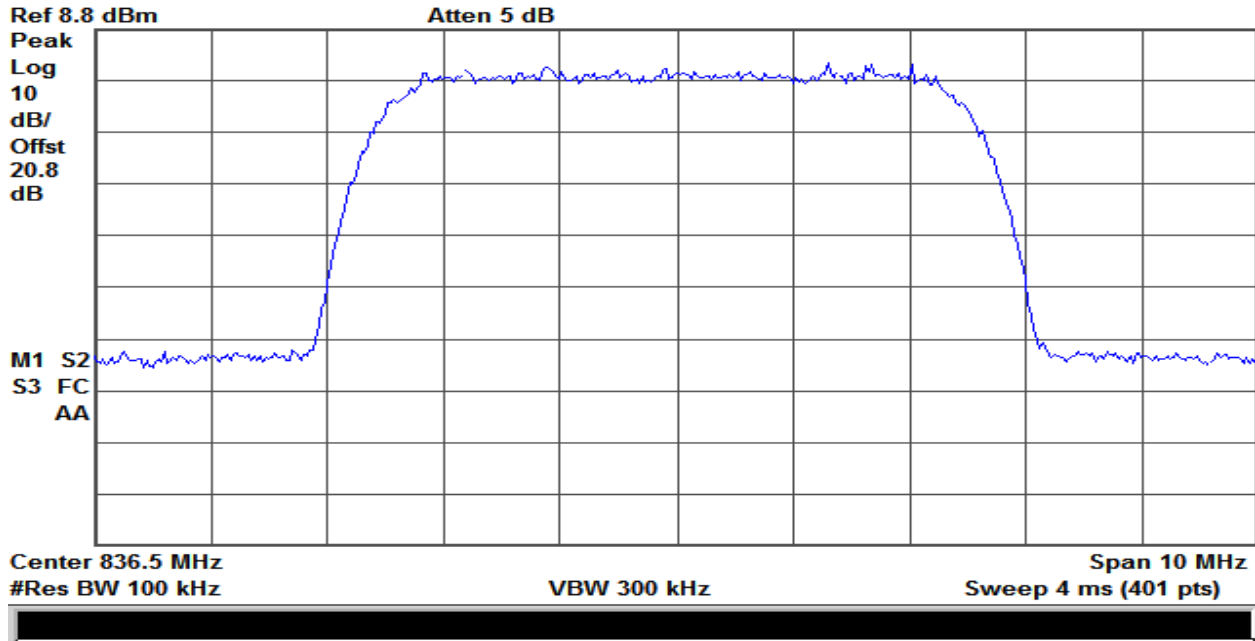
Plot 168 – 728-746MHz Band – Downlink Output – CDMA



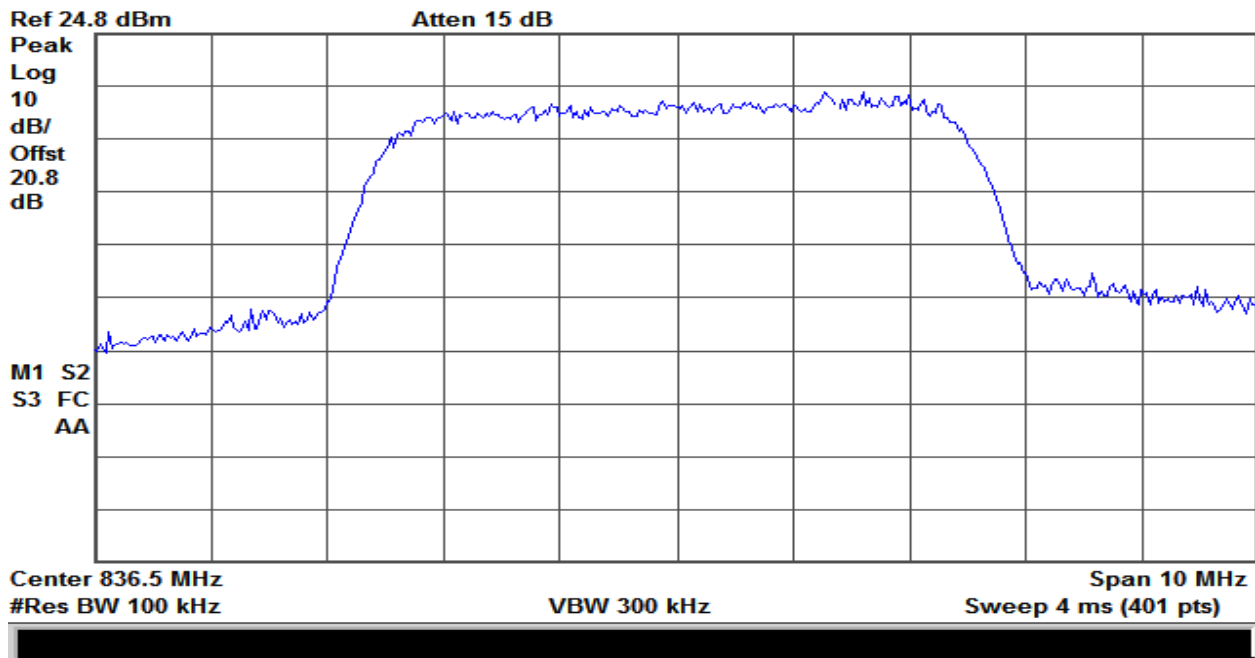
Plot 169 – 746-757MHz Band – Downlink Input – CDMA



Plot 170 – 746-757MHz Band – Downlink Output – CDMA

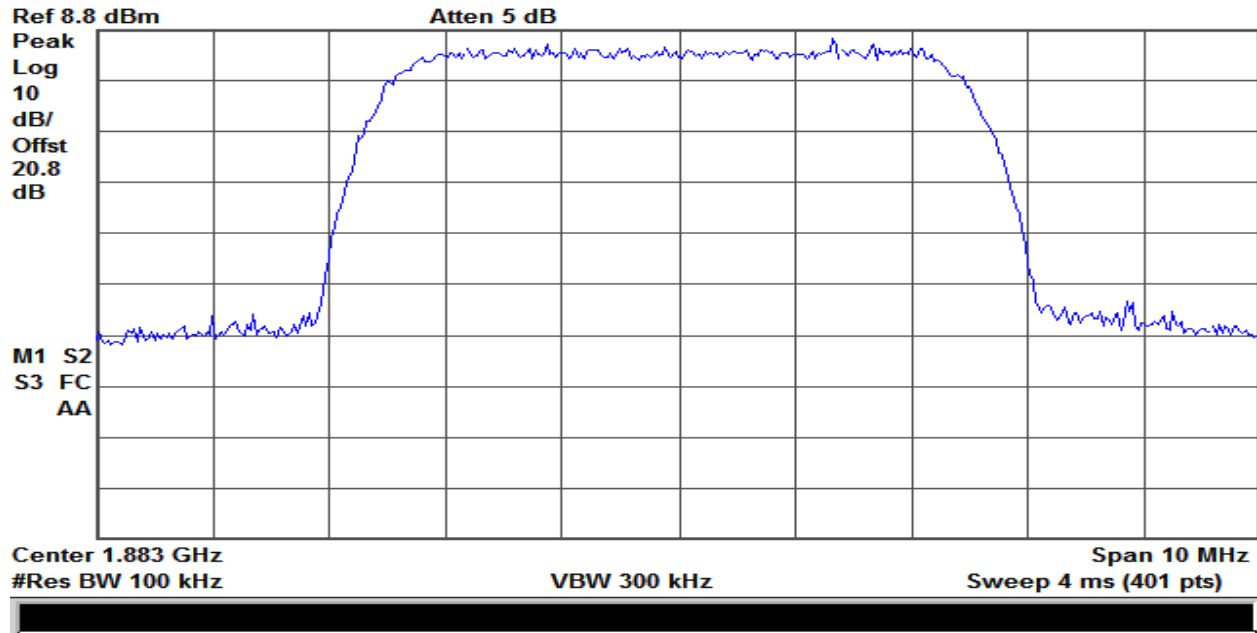


Plot 171 – 824-849MHz Band – Uplink Input – LTE

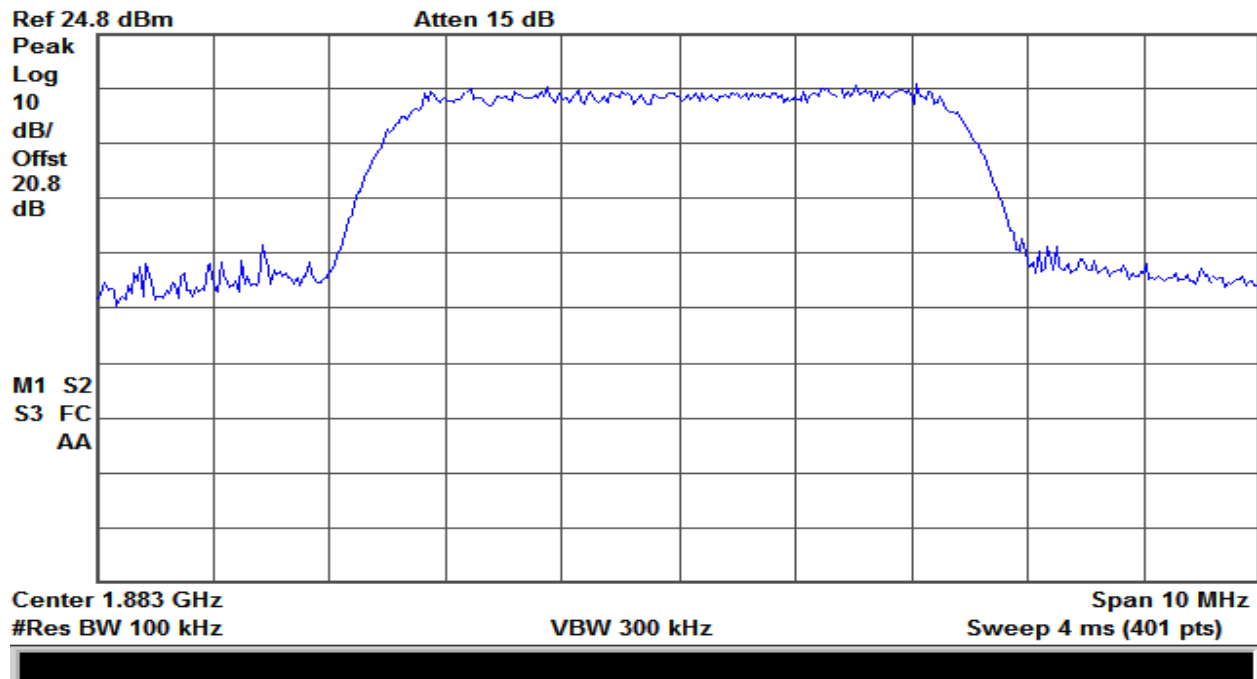


Plot 172 – 824-849MHz Band – Uplink Output – LTE

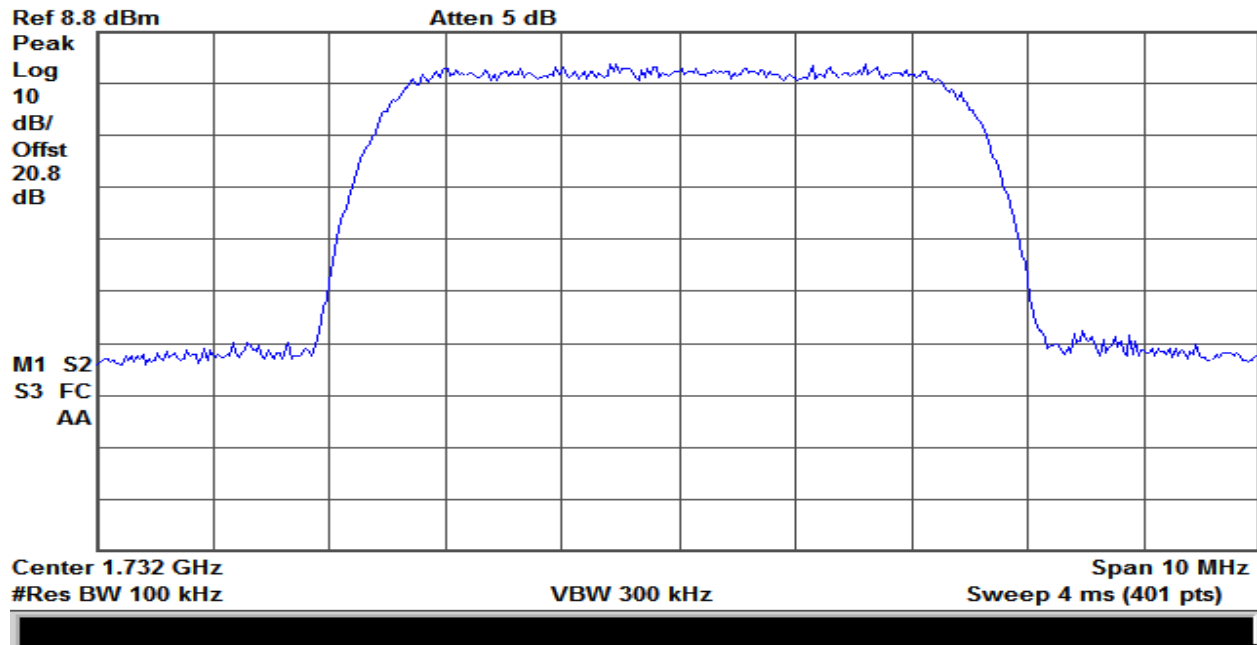




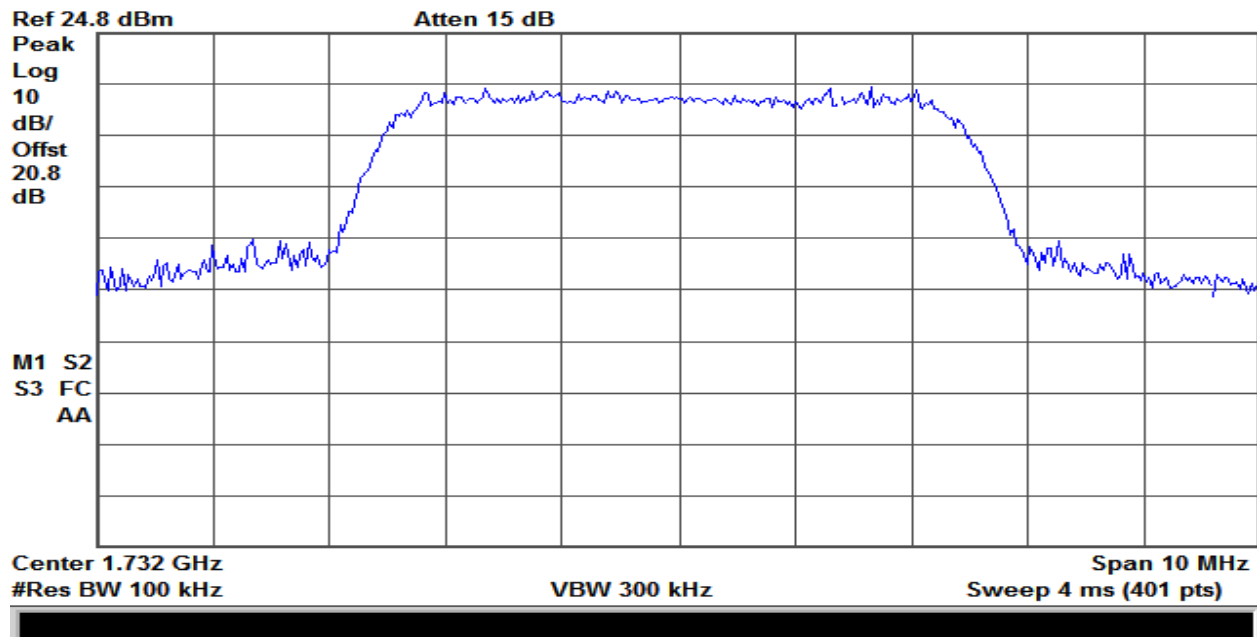
Plot 173 – 1850-1915MHz Band – Uplink Input – LTE



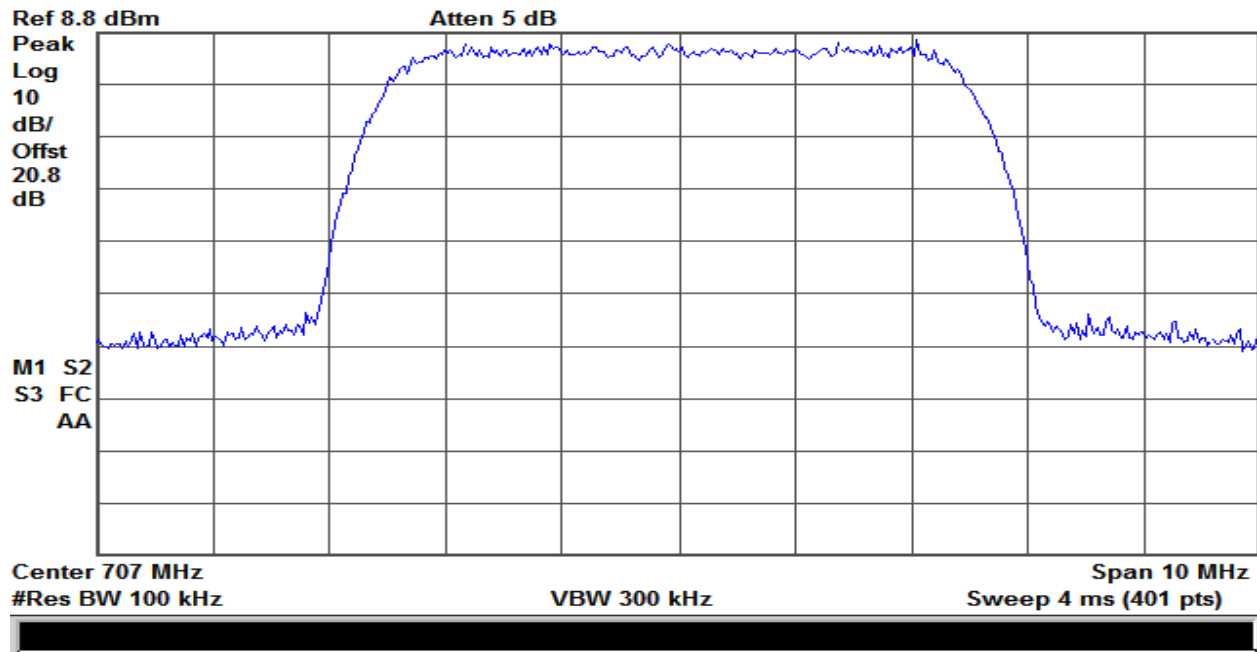
Plot 174 – 1850-1915MHz Band – Uplink Output – LTE



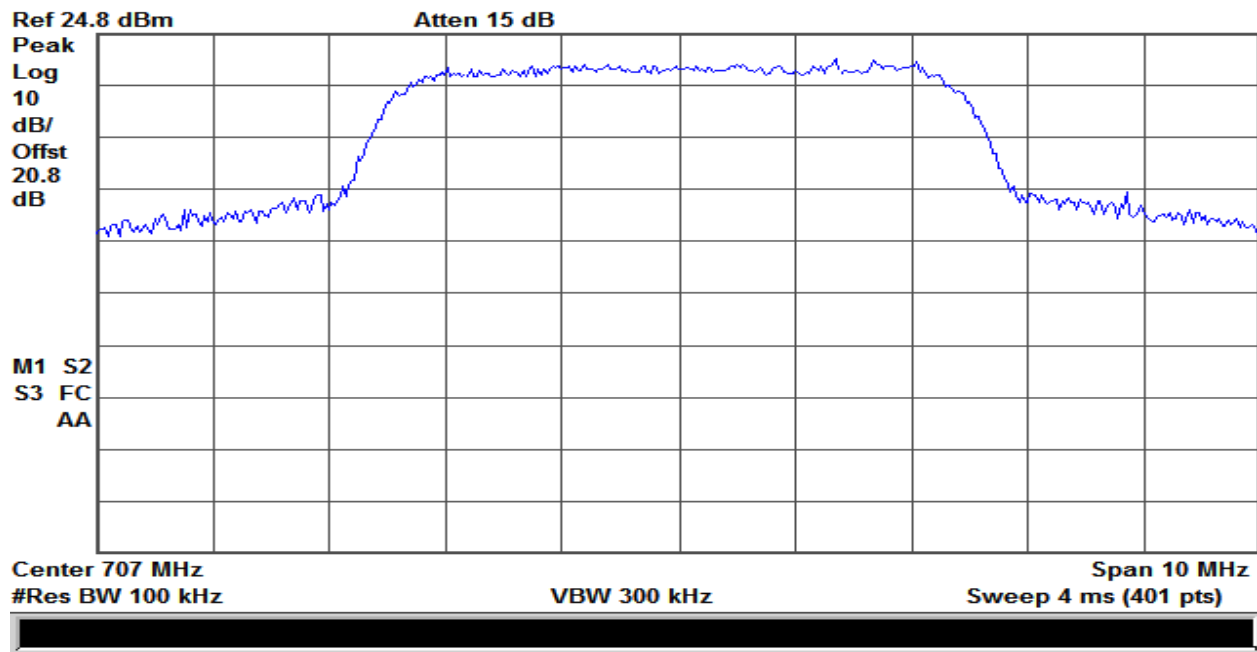
Plot 175 – 1710-1755MHz Band – Uplink Input – LTE



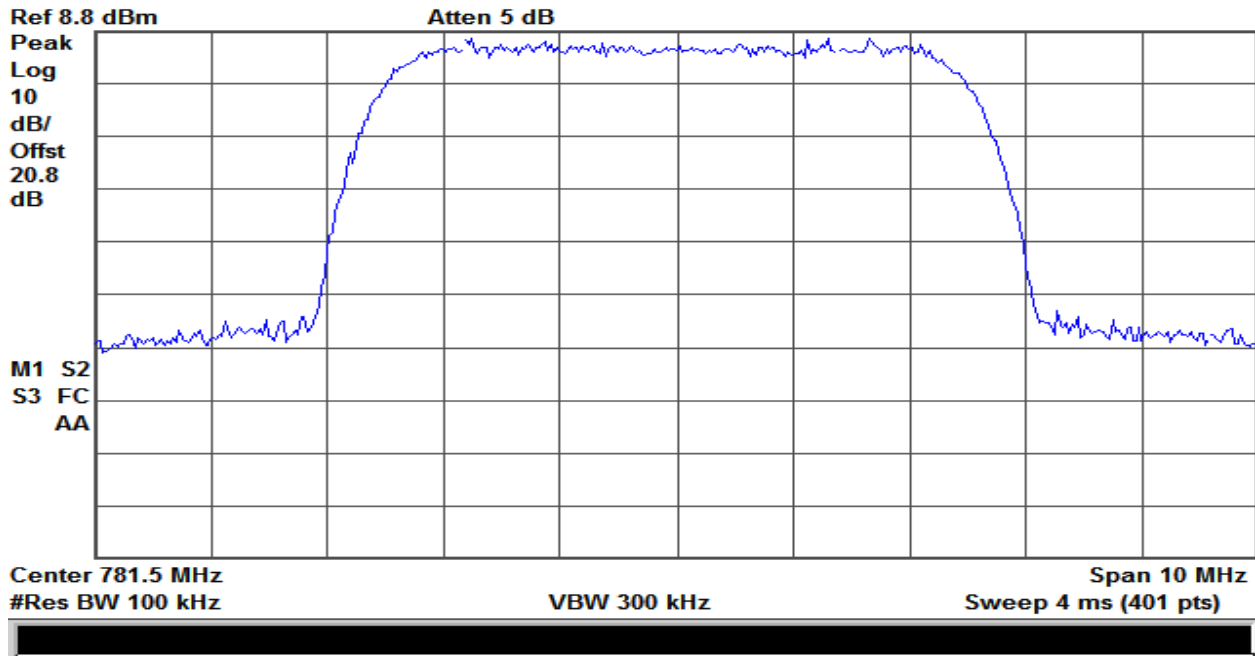
Plot 176 – 1710-1755MHz Band – Uplink Output – LTE



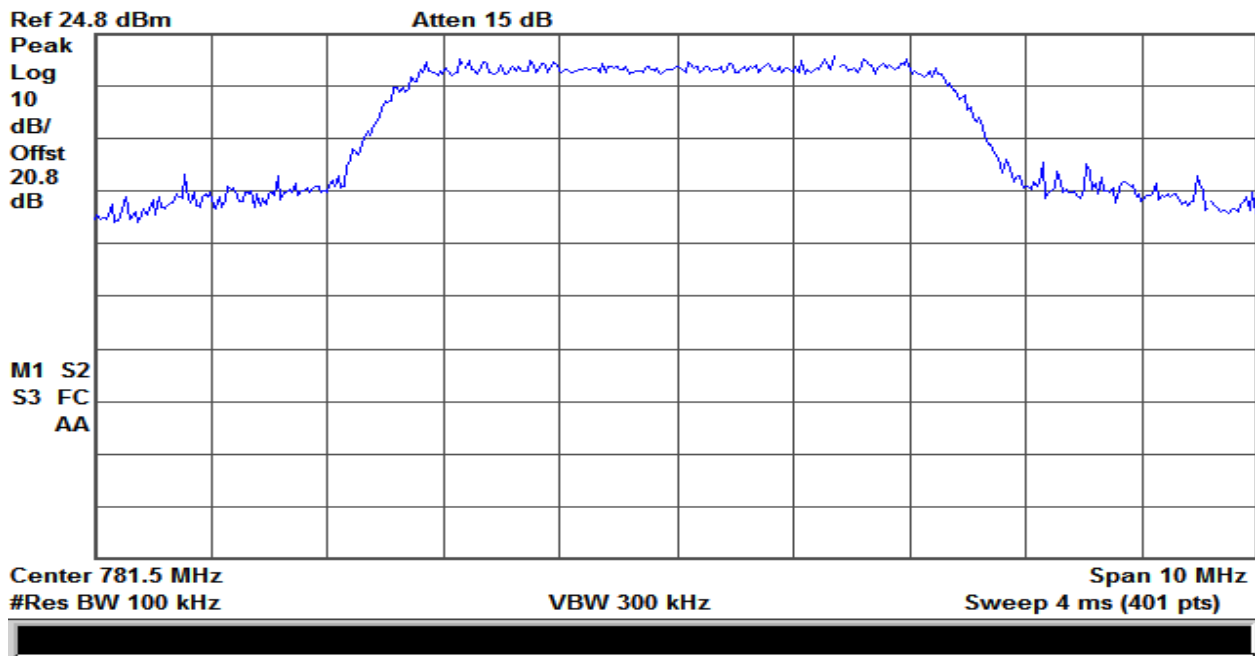
Plot 177 – 698-716MHz Band – Uplink Input – LTE



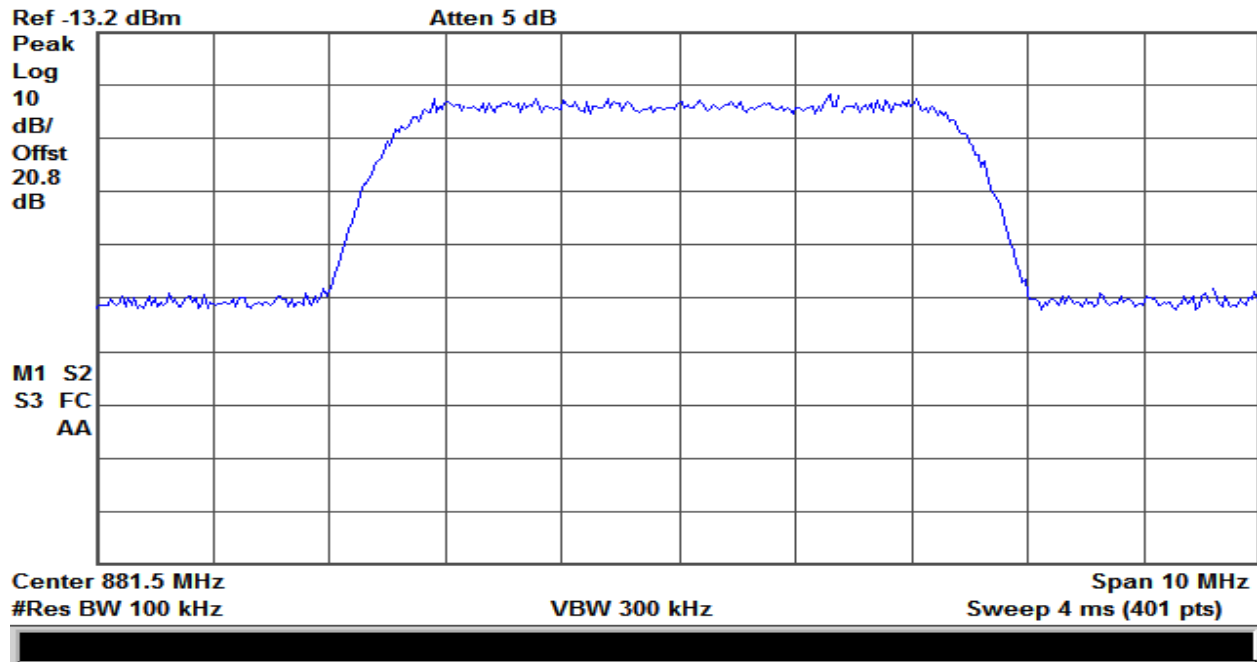
Plot 178 – 698-716MHz Band – Uplink Output – LTE



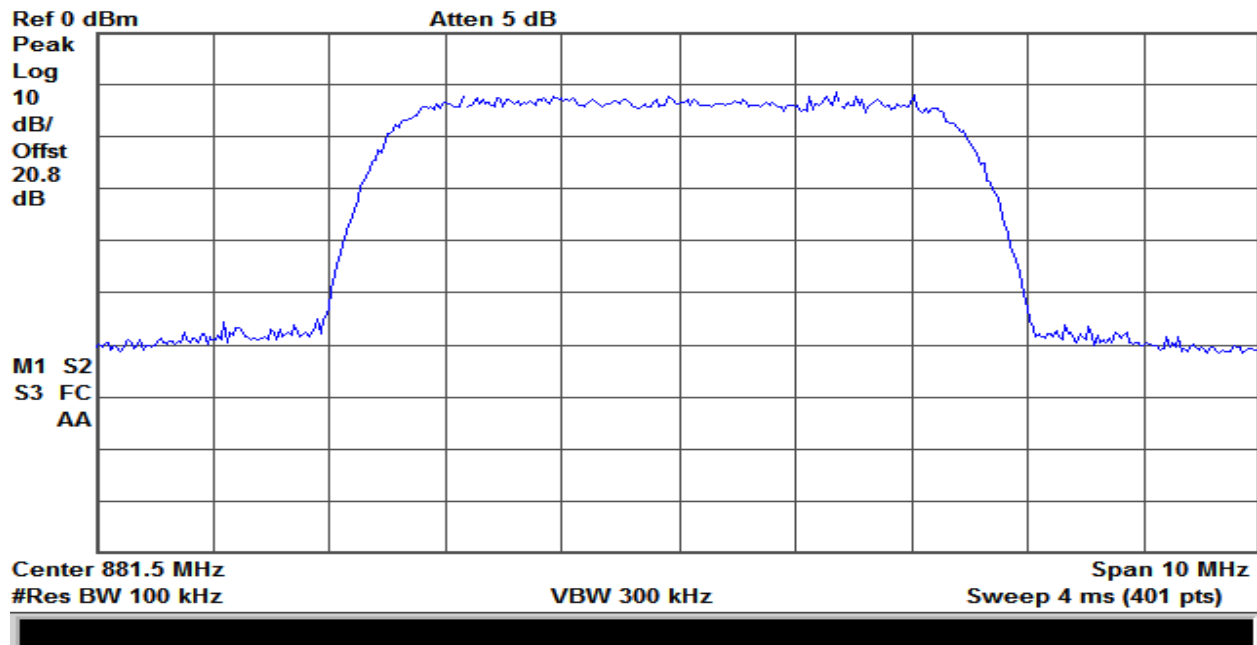
Plot 179 – 776-787MHz Band – Uplink Input – LTE



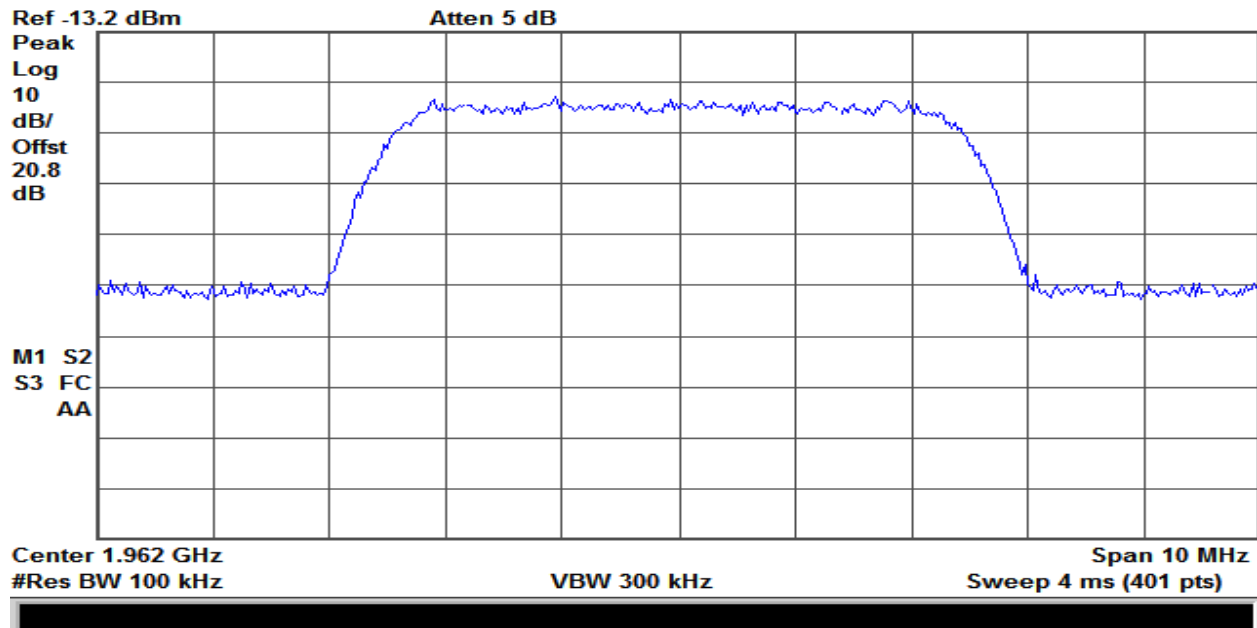
Plot 180 – 776-787MHz Band – Uplink Output – LTE



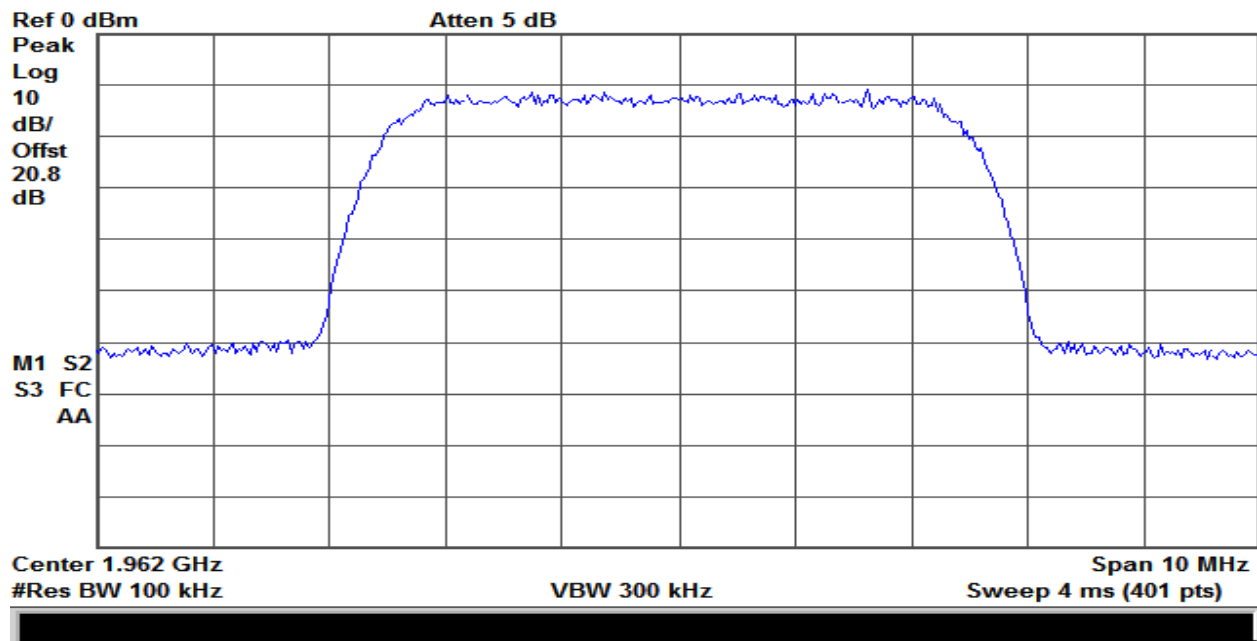
Plot 181 -869-894MHz Band - Downlink Input - LTE



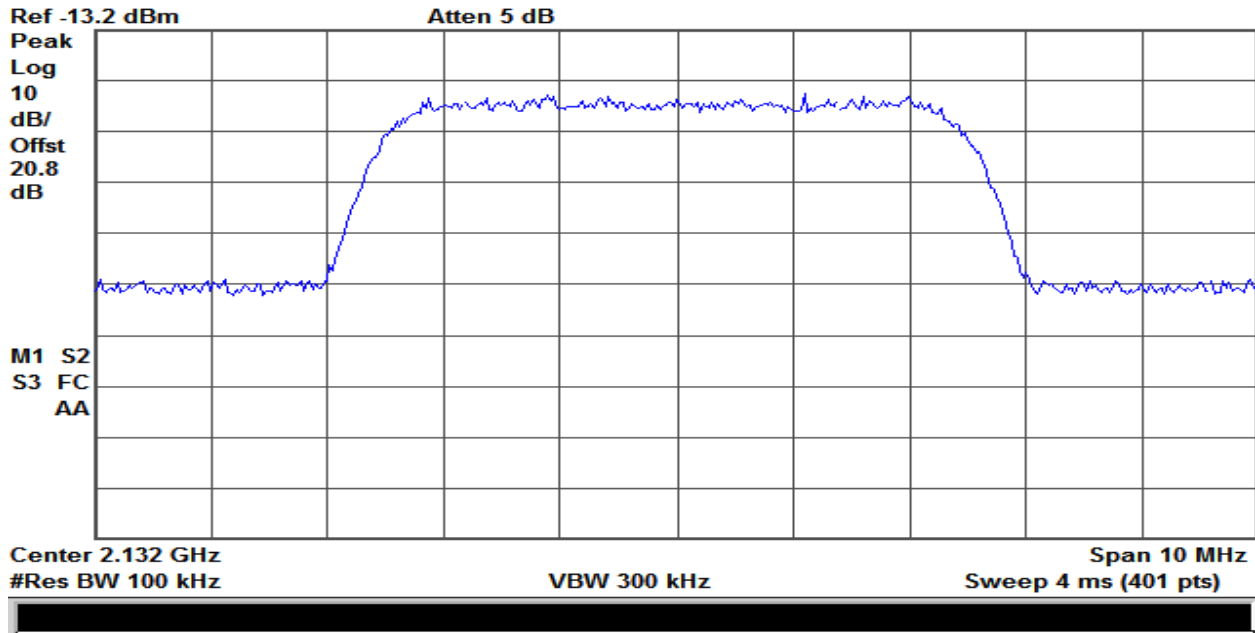
Plot 182 -869-894MHz Band - Downlink Output - LTE



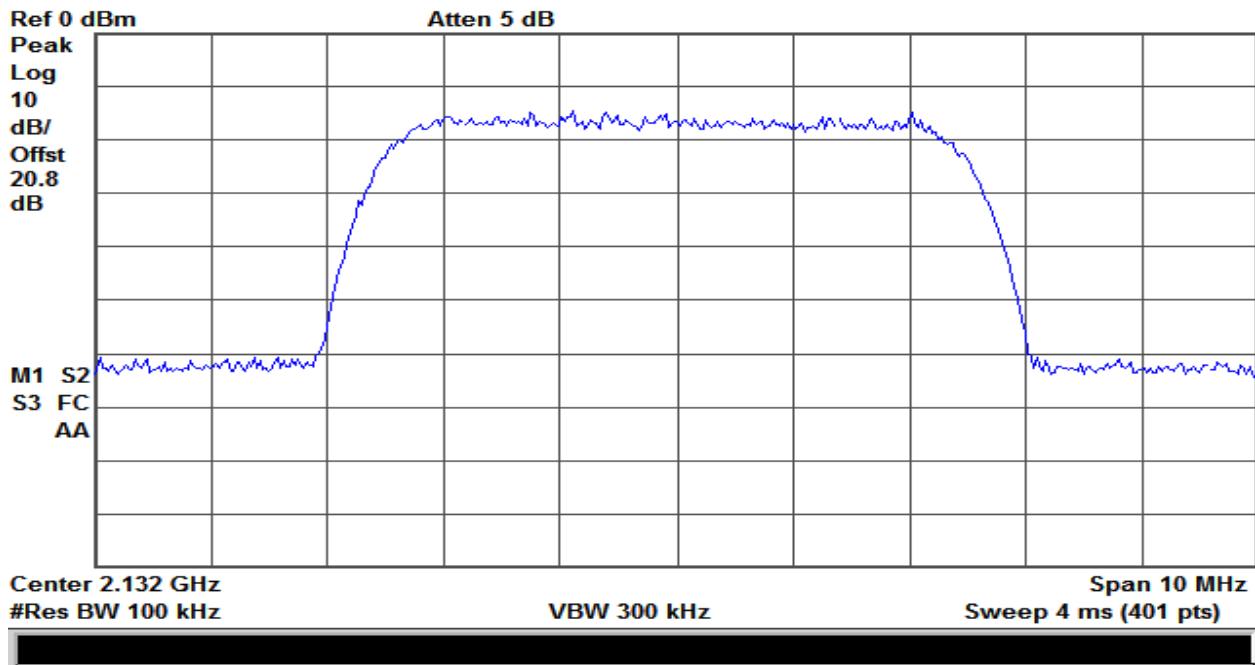
Plot 183 – 1930-1995MHz Band – Downlink Input – LTE



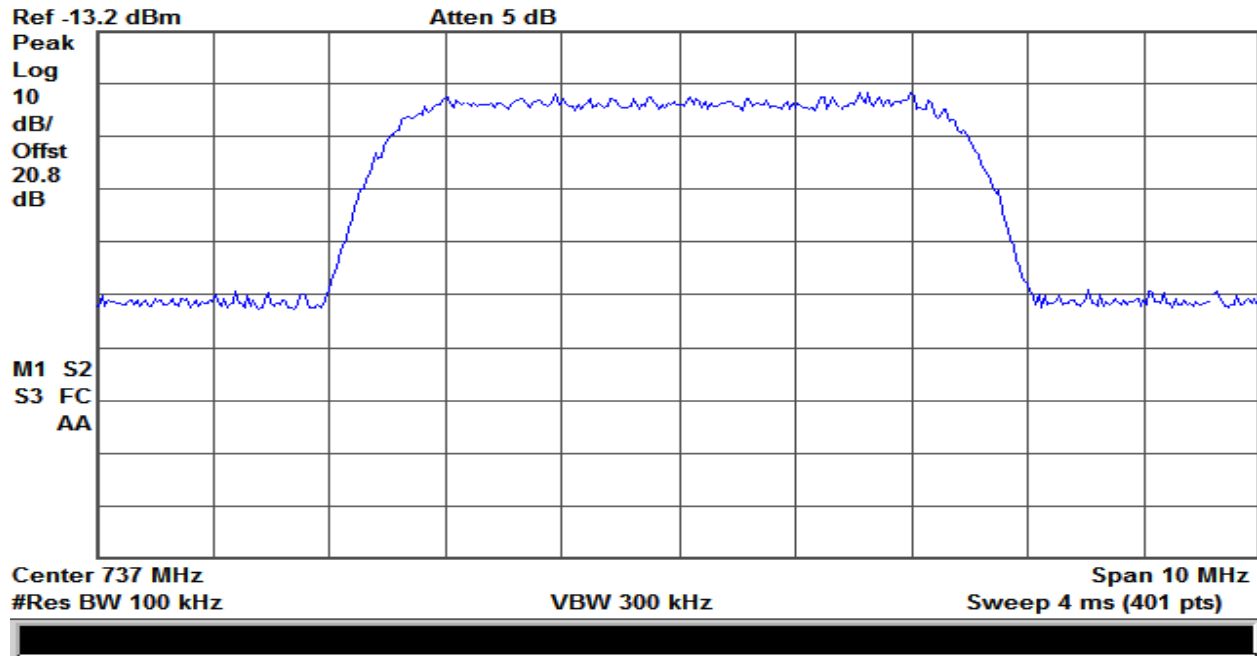
Plot 184 – 1930-1995MHz Band – Downlink Output – LTE



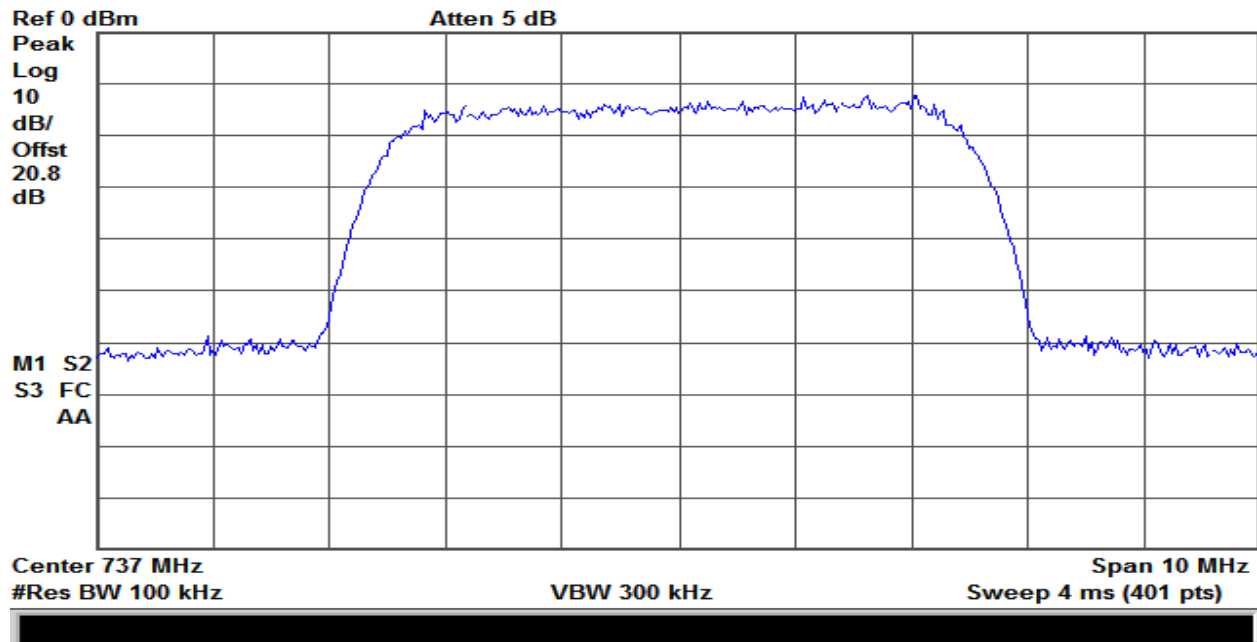
Plot 185 – 2110-2155MHz Band – Downlink Input – LTE



Plot 186 – 2110-2155MHz Band – Downlink Output – LTE

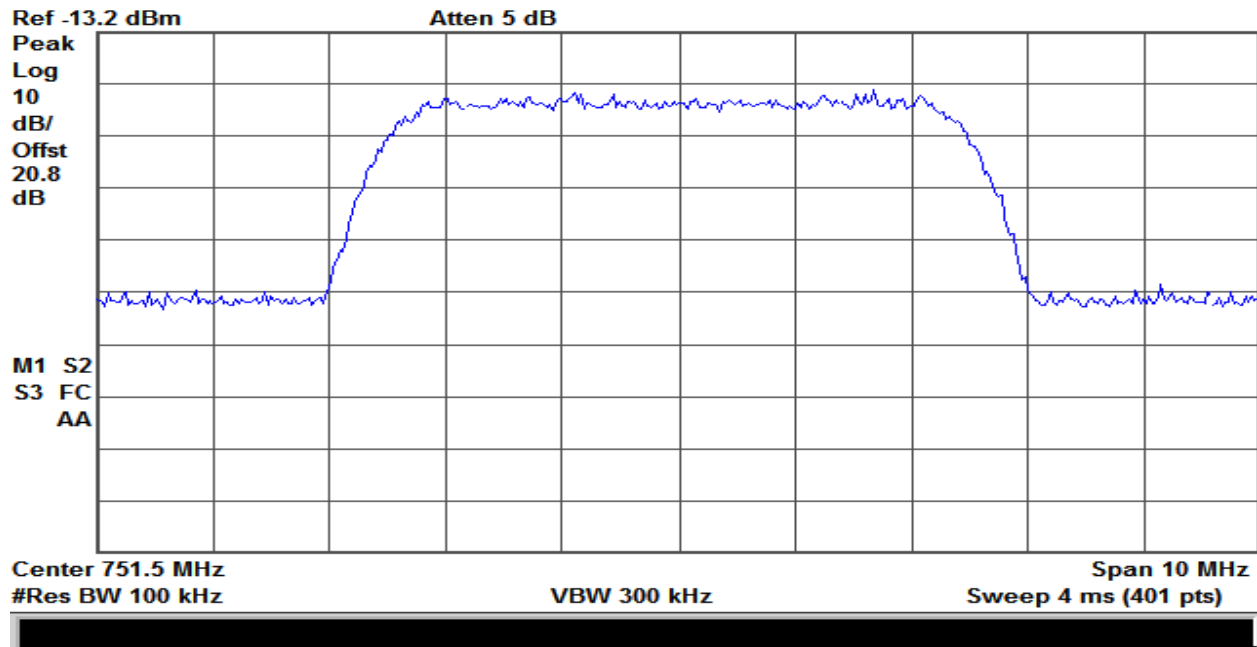


Plot 187 – 728-746MHz Band – Downlink Input – LTE

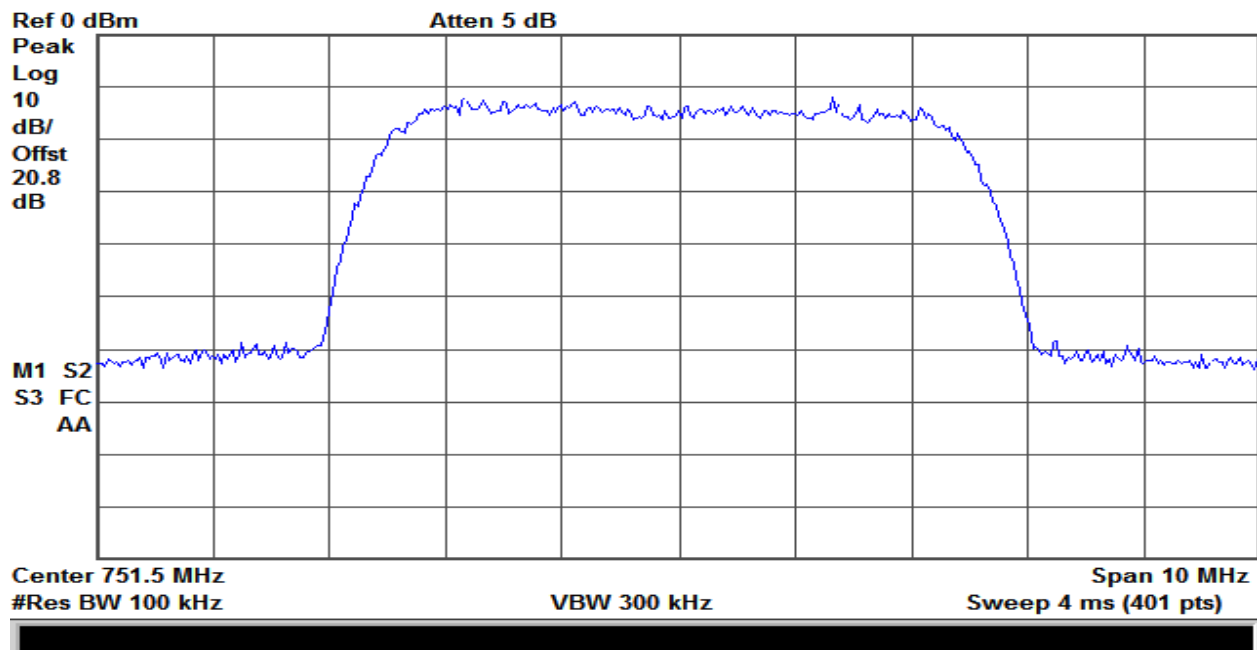


Plot 188 – 728-746MHz Band – Downlink Output – LTE





Plot 189 – 746-757MHz Band – Downlink Input – LTE



Plot 190 – 746-757MHz Band – Downlink Output – LTE

## 9. Oscillation Detection

<b>Test Requirement(s):</b>	§20.21(e)(8)(ii)(A)	<b>Test Engineer(s):</b>	Hoosam B.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	01/08/14

**Test Procedures:** As required by 47 §20.21(e)(8)(ii)(A), Oscillation detection measurement were made at the RF antenna output terminals of the EUT.

The EUT output was connected to the spectrum analyzer through a 10dB coupled directional coupler. The measurements were made as per procedure defined in KDB 935210 D03 §7.11.

Detector Setting	Resolution Bandwidth	Video Bandwidth	Sweep Time
Peak	≥1 MHz	>3X RBW	Auto

Table 28 – Analyzer settings

### Test Setup:

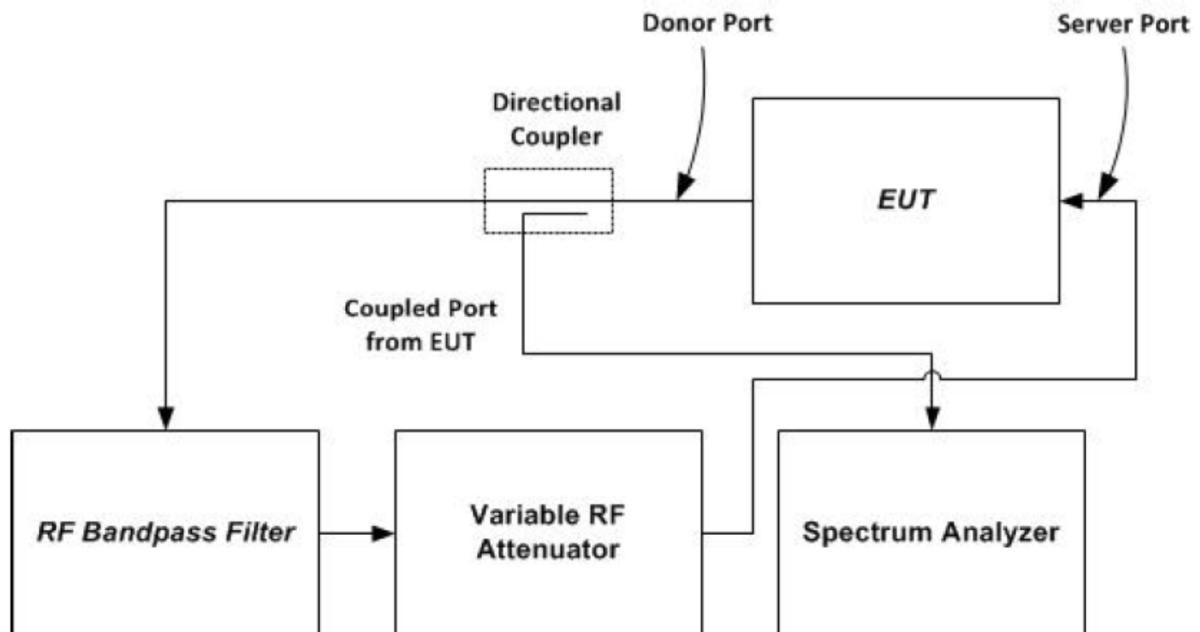


Figure 4 – Oscillation detection

Frequency Band (MHz)	Measured Time (mS)	Limit (mS)
824-849	140	300
1850-1915	122.5	300
1710-1755	149.2	300
698-716	45	300
776-787	48.75	300

**Table 29 –Uplink Detection Time – Summary**

Frequency Band (MHz)	Measured Time (Second)	Limit (Second)
869-894	0.195	1.0
1930-1995	0.188	1.0
2110-2155	0.087	1.0
728-746	0.095	1.0
746-757	0.093	1.0

**Table 30 –Downlink Detection Time – Summary**

Frequency Band (MHz)	Measured Time (Second)	Limit (Second)
824-849	70.0	≥60
1850-1915	70.25	≥60
1710-1755	70.0	≥60
698-716	70.0	≥60
776-787	70.0	≥60

**Table 31 –Uplink Restart Time – Summary**

Frequency Band (MHz)	Measured Time (Second)	Limit (Second)
869-894	70.0	≥60
1930-1995	70.25	≥60
2110-2155	70.0	≥60
728-746	70.0	≥60
746-757	70.0	≥60

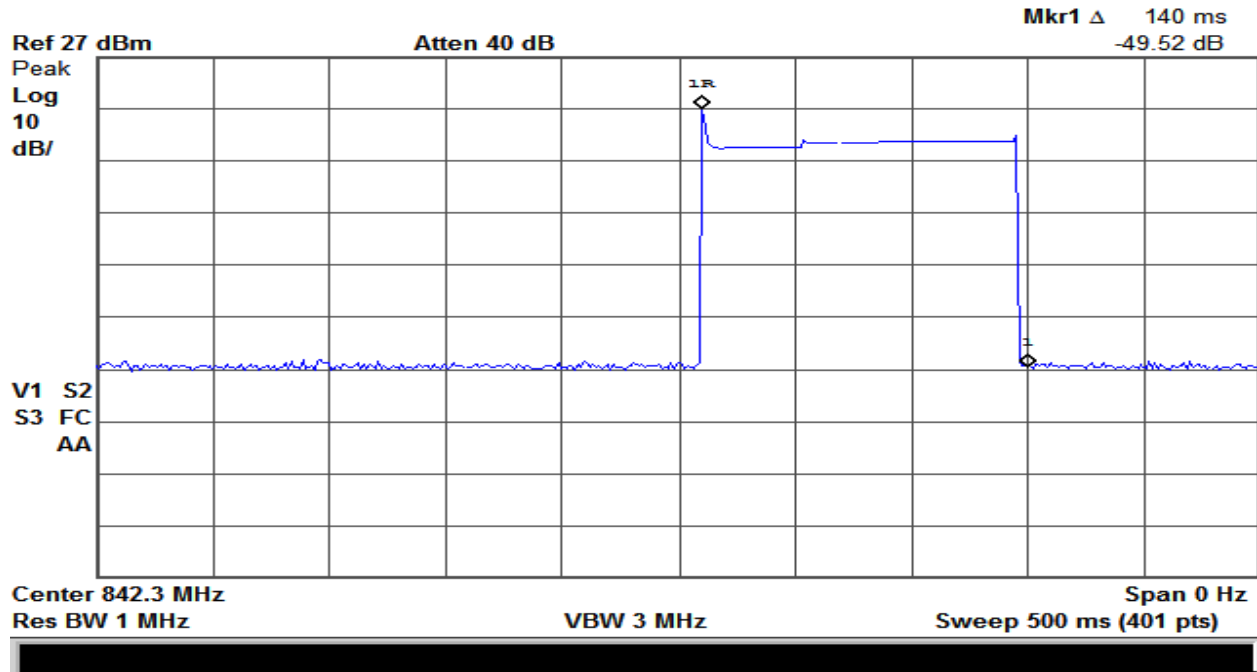
**Table 32 –Downlink Restart Time – Summary**

Frequency Band (MHz)	Restart	Limit
824-849	5	≥5
1850-1915	5	≥5
1710-1755	5	≥5
698-716	5	≥5
776-787	5	≥5

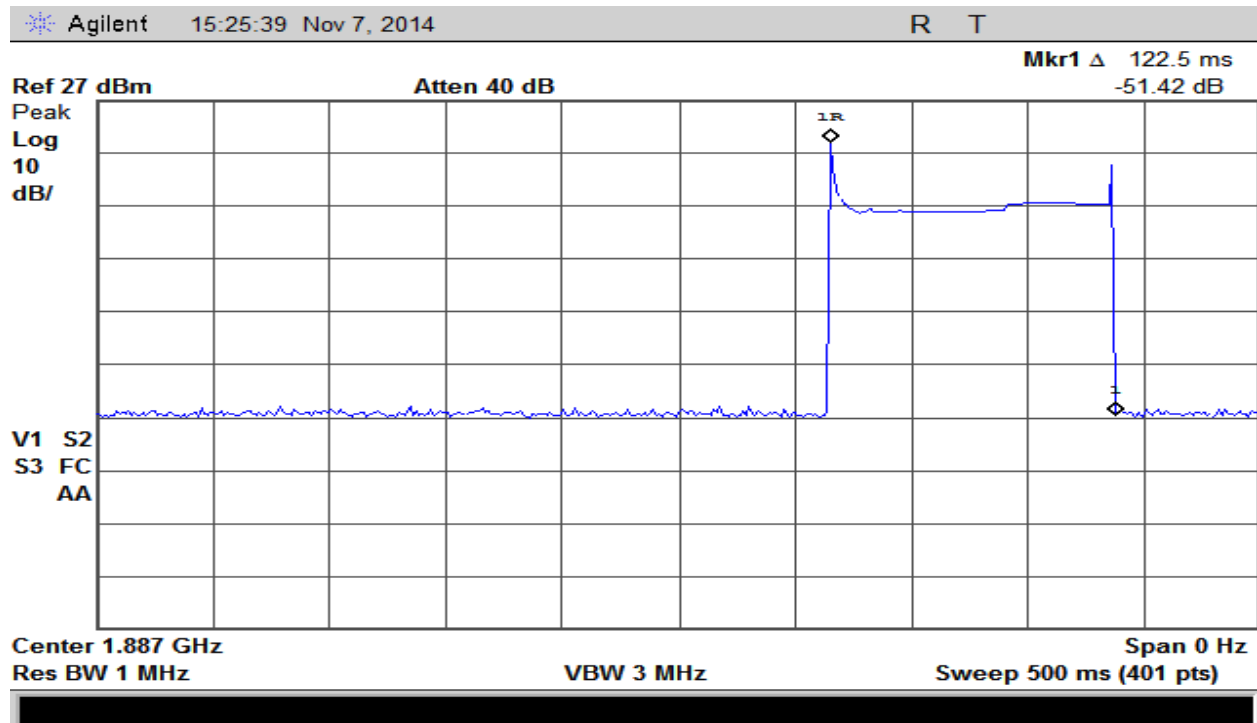
**Table 33 –Uplink Restart Count – Summary**

Frequency Band (MHz)	Restart	Limit
869-894	5	≥5
1930-1995	5	≥5
2110-2155	5	≥5
728-746	5	≥5
746-757	5	≥5

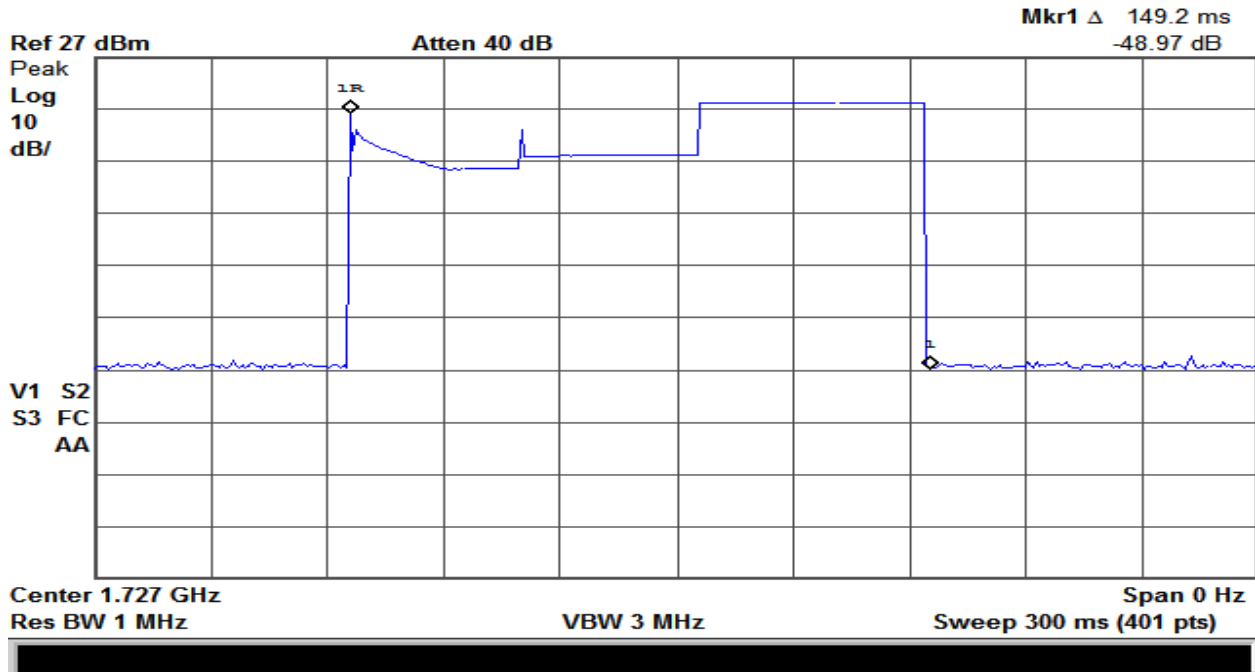
**Table 34 –Downlink Restart Count – Summary**



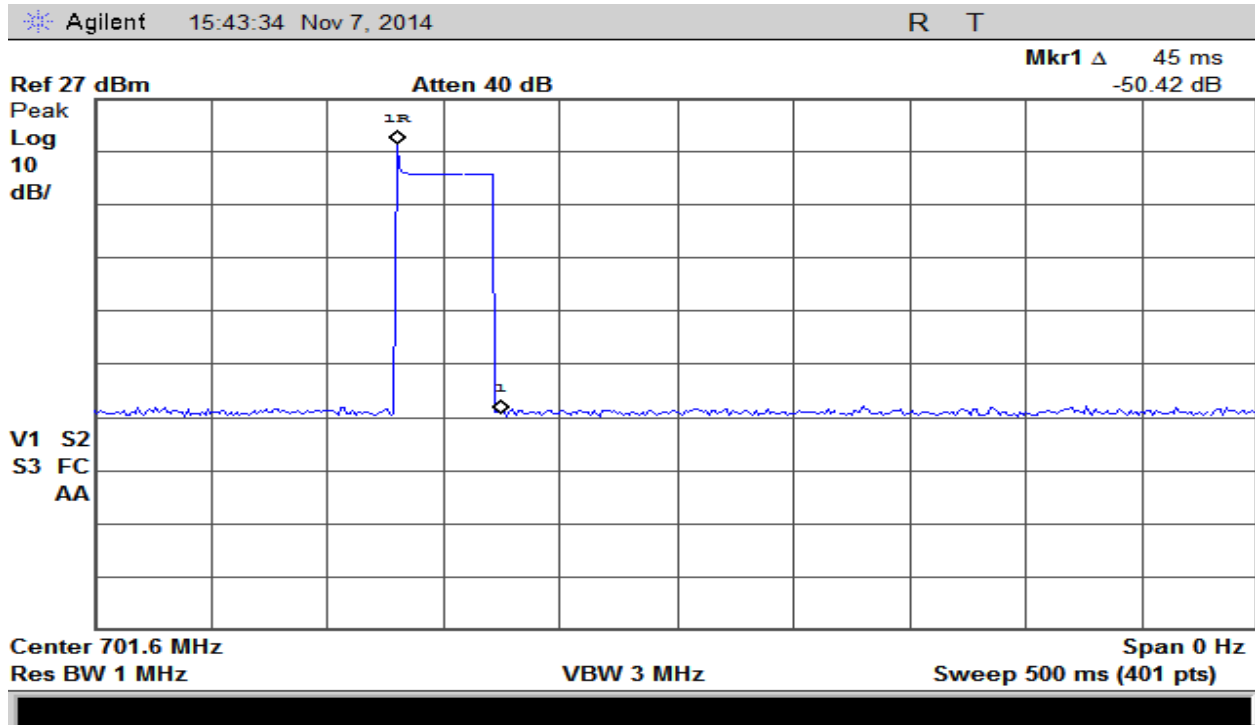
Plot 191 – 824-849MHz Band – Uplink Oscillation Detection Time



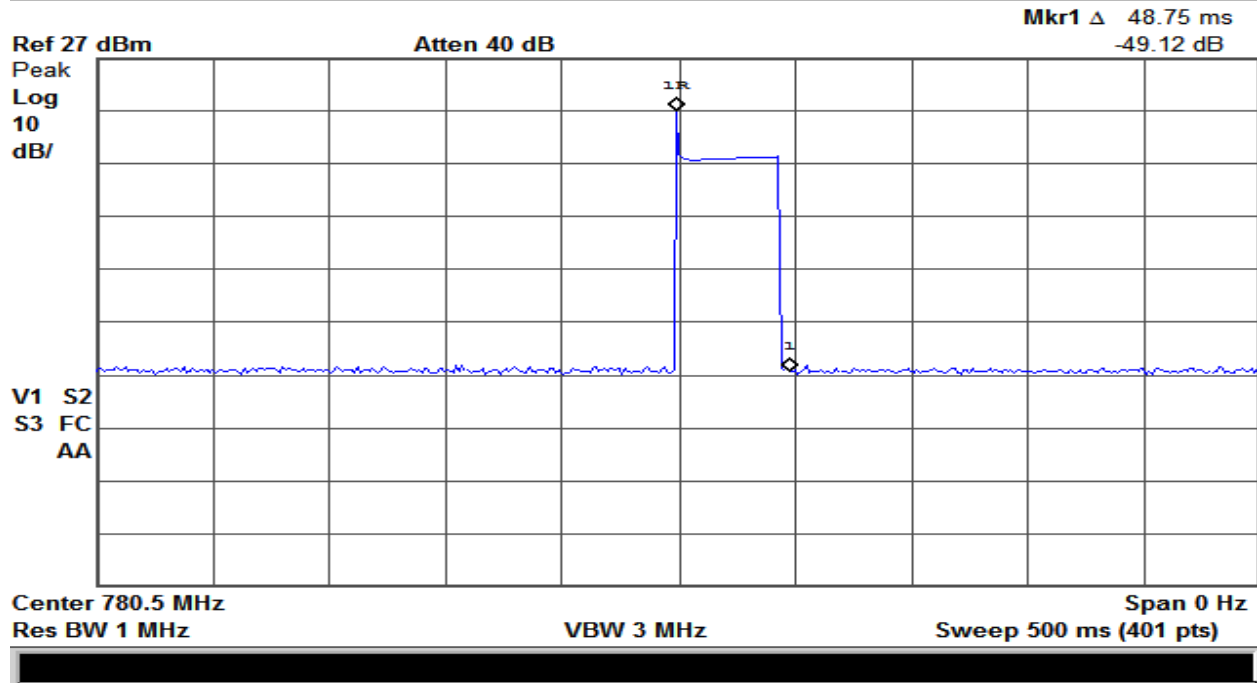
Plot 191 – 1850-1915MHz Band – Uplink Oscillation Detection Time



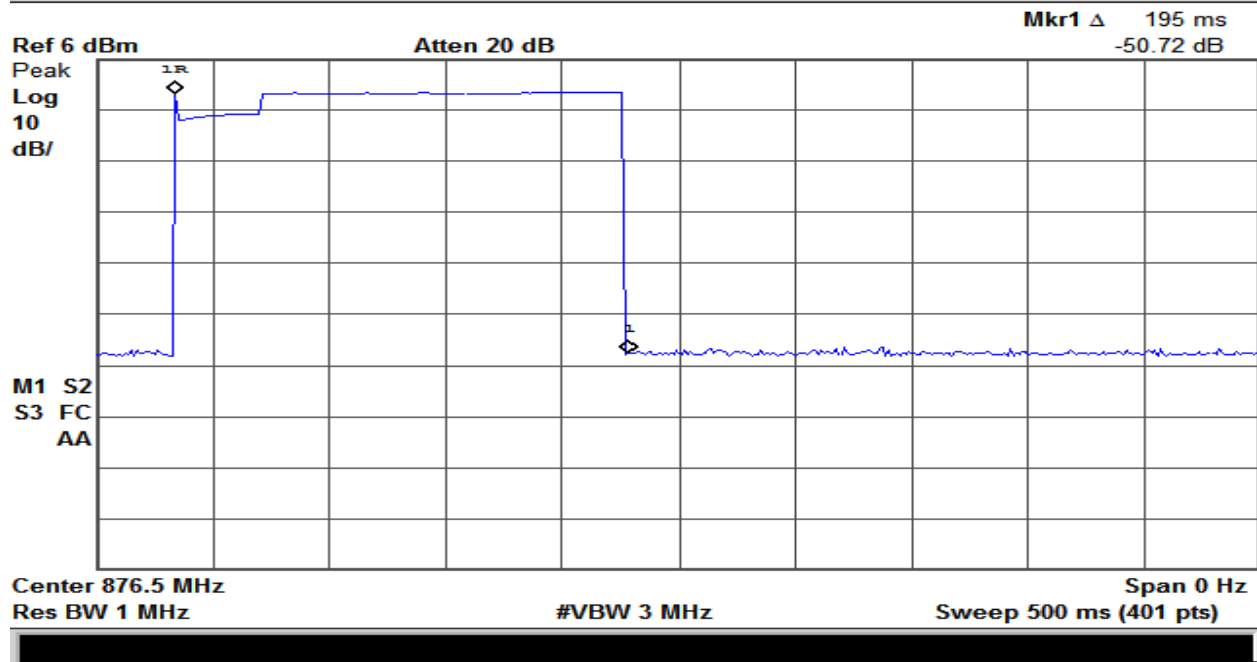
Plot 192 – 1710-1755MHz Band – Uplink Oscillation Detection Time



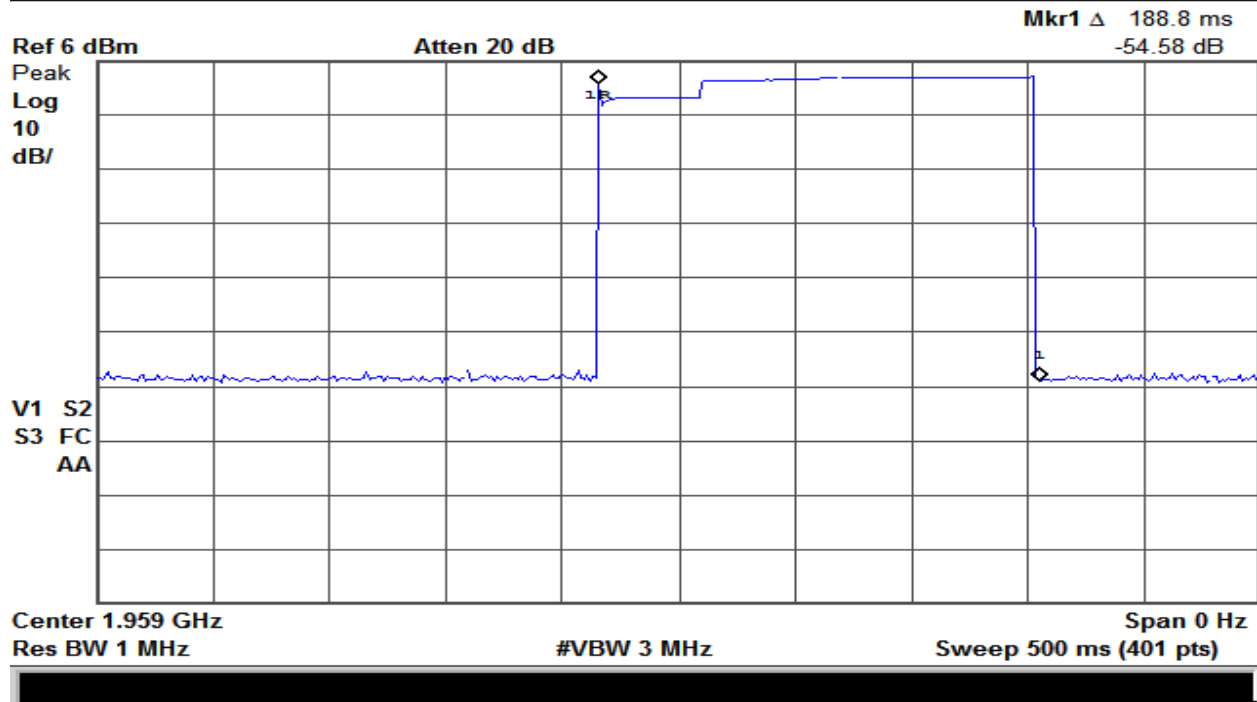
Plot 193 – 698-716MHz Band – Uplink Oscillation Detection Time



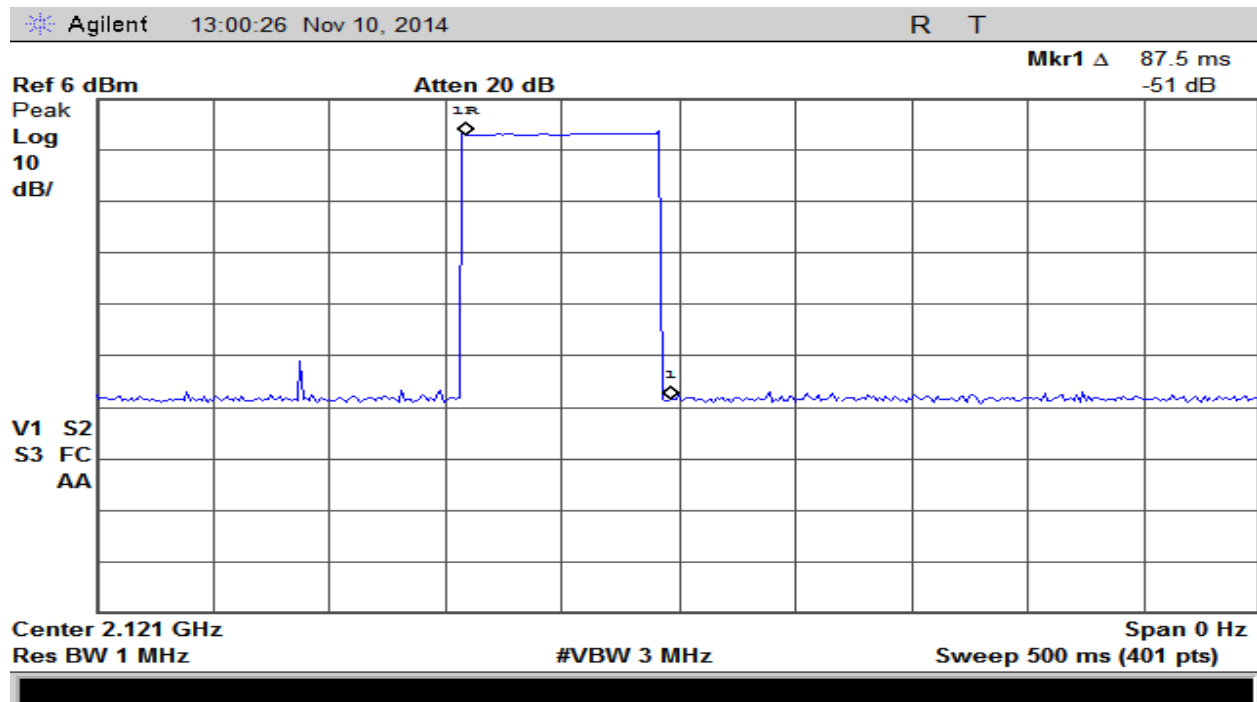
Plot 194 – 776-787 Band – Uplink Oscillation Detection Time



Plot 195 – 869-894MHz Band – Downlink Oscillation Detection Time

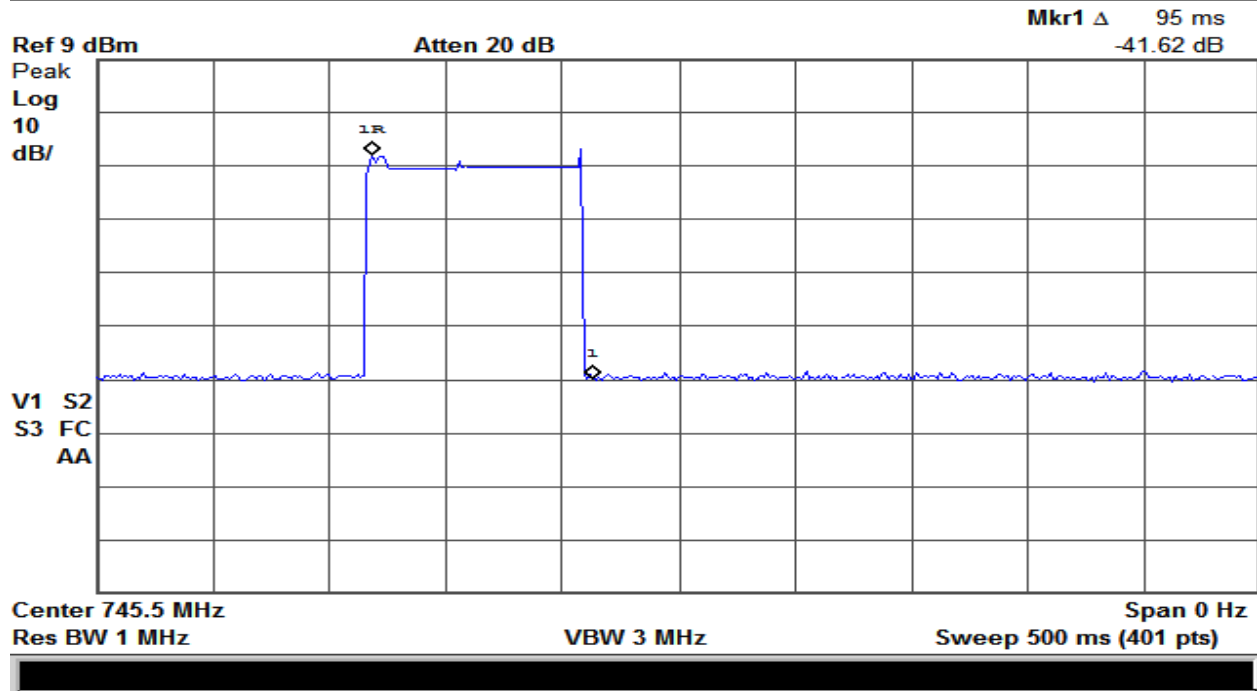


Plot 196 – 1930-1995MHz Band – Downlink Oscillation Detection Time

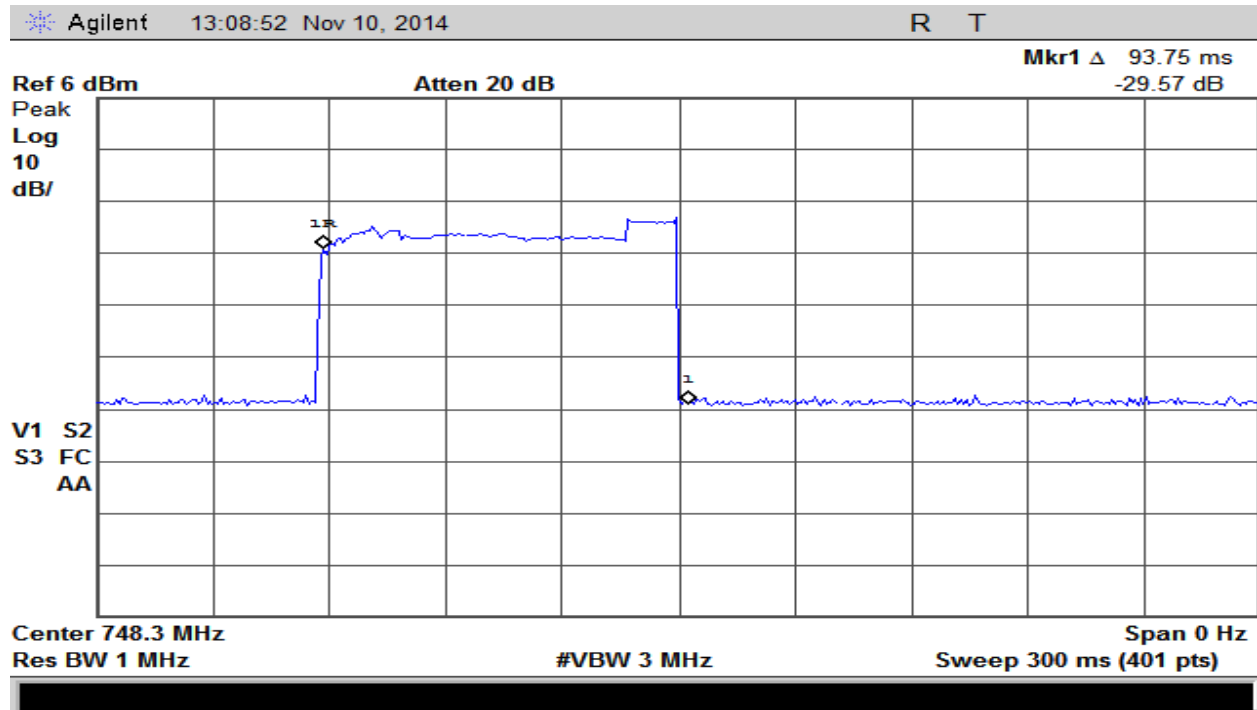


Plot 197 – 2110-2155MHz Band – Downlink Oscillation Detection Time

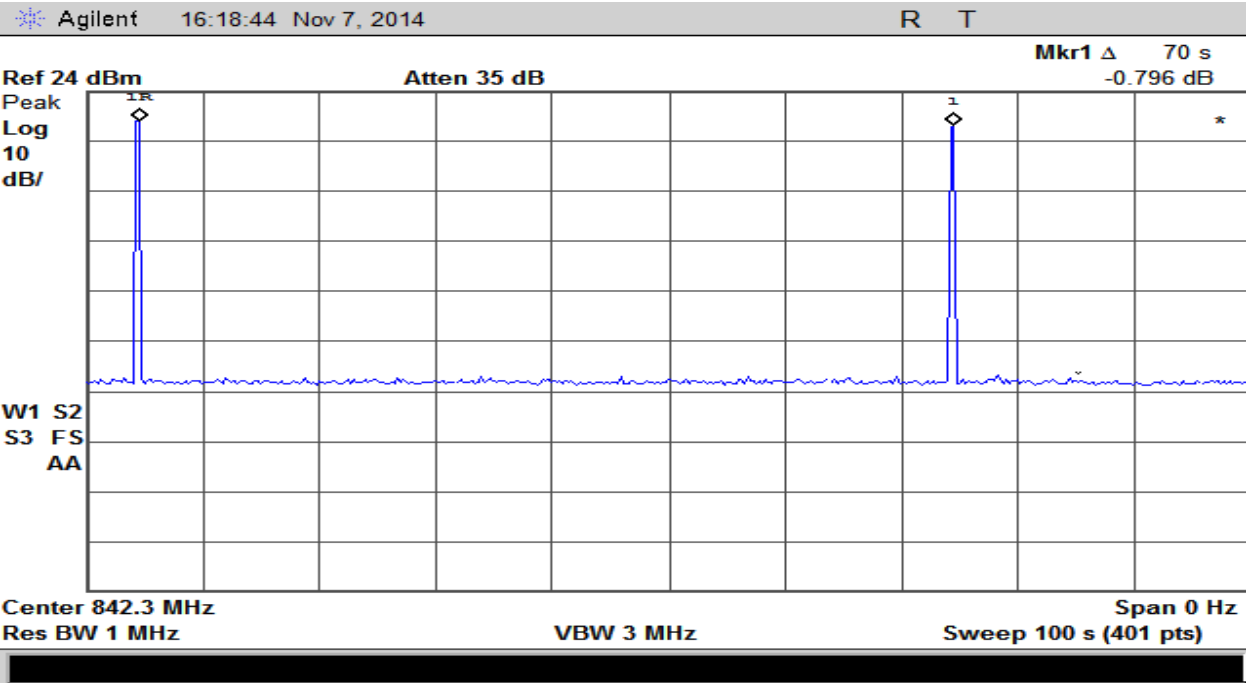




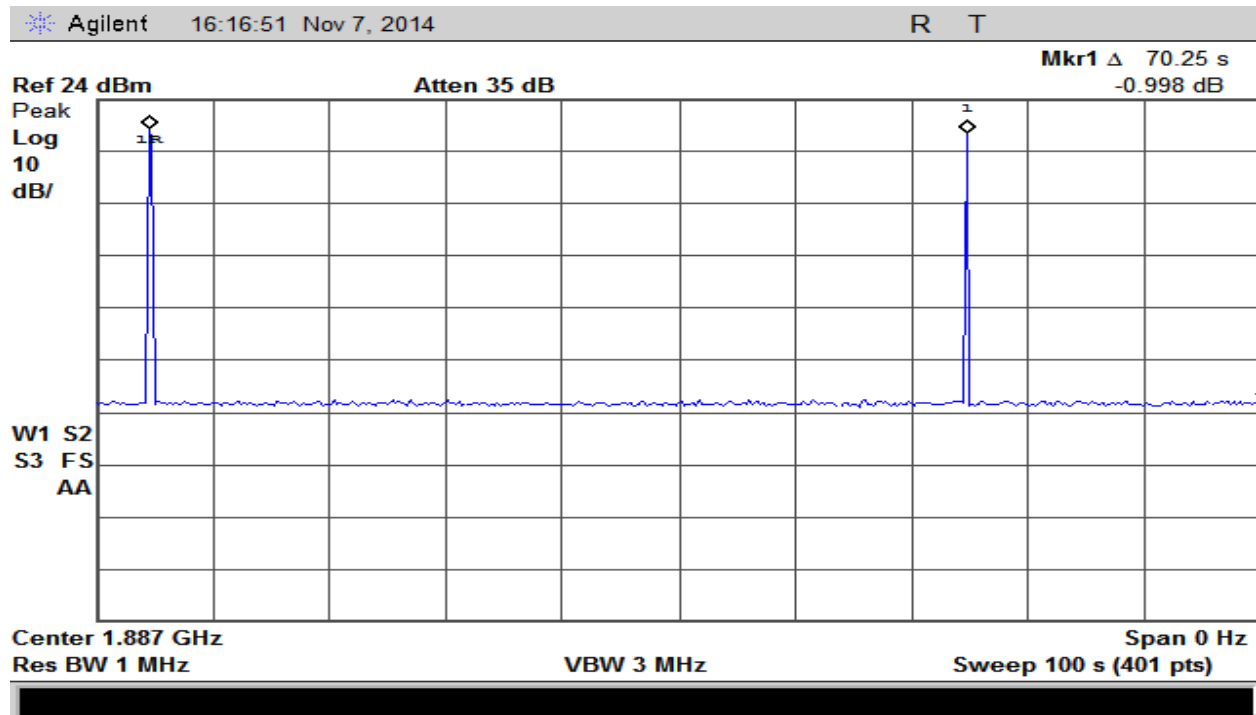
198 – 728-746MHz Band – Downlink Oscillation Detection Time



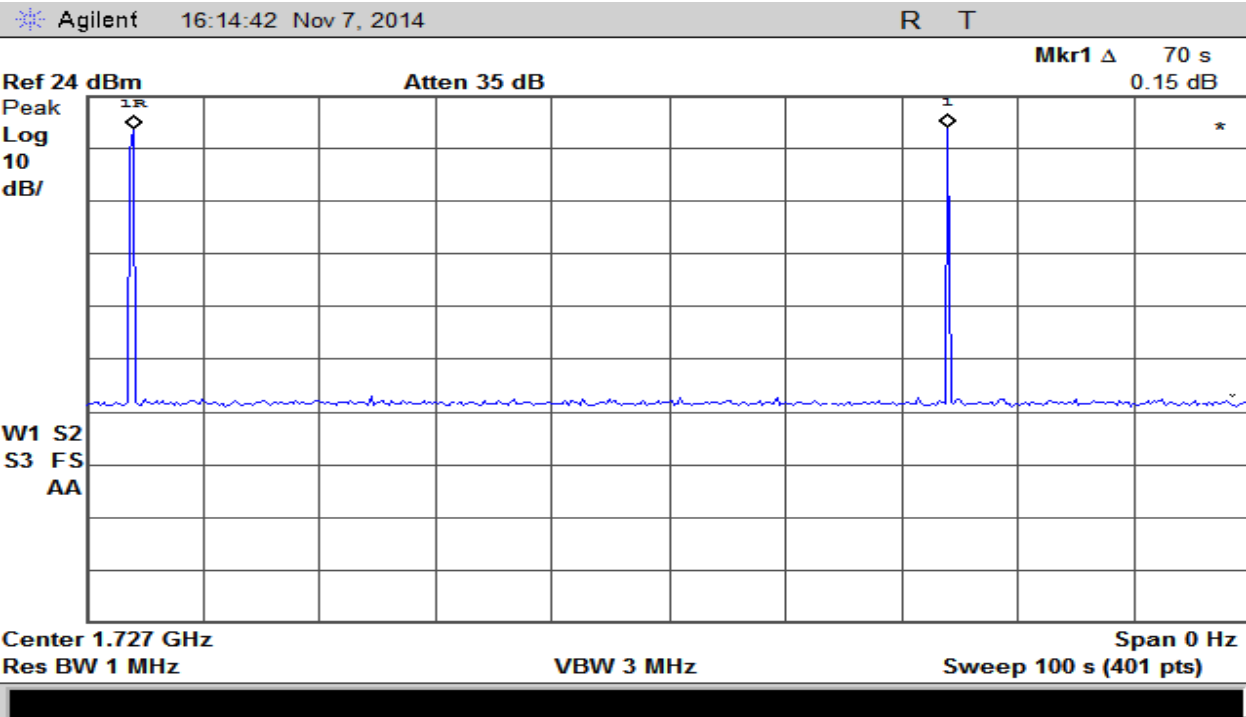
Plot 199 – 746-757MHz Band – Downlink Oscillation Detection Time



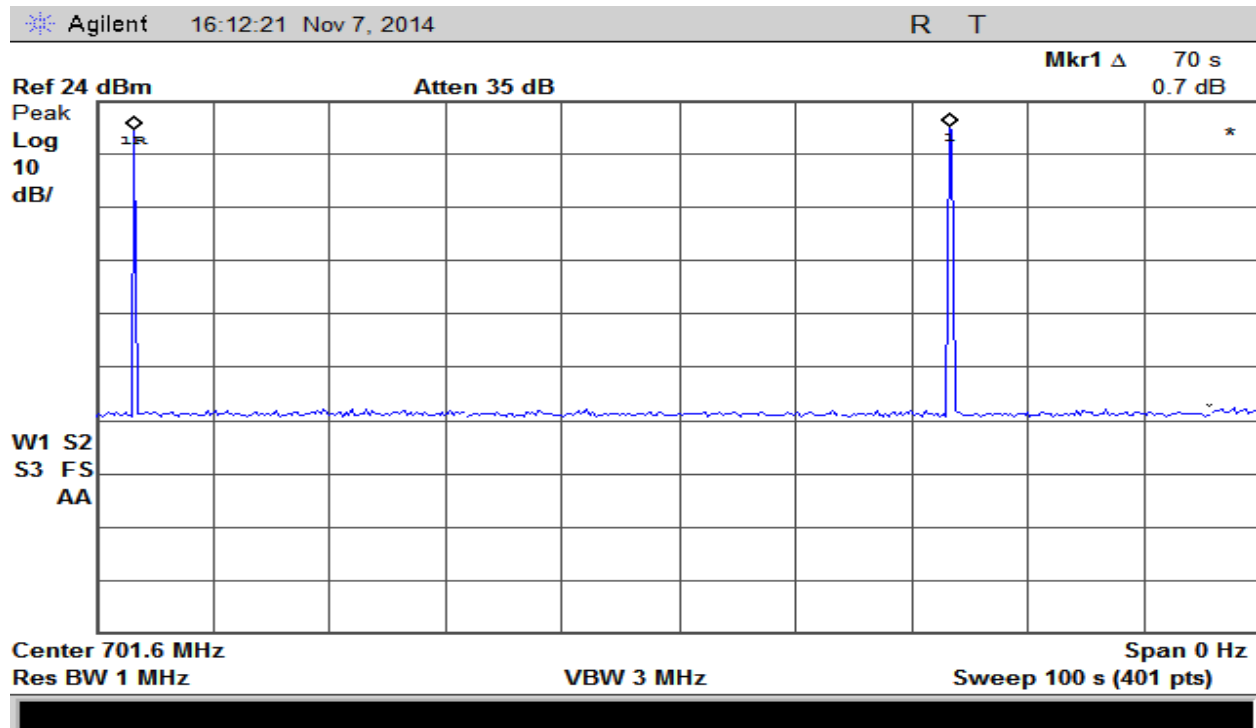
Plot 200 – 824-849MHz Band –Uplink Restart Time



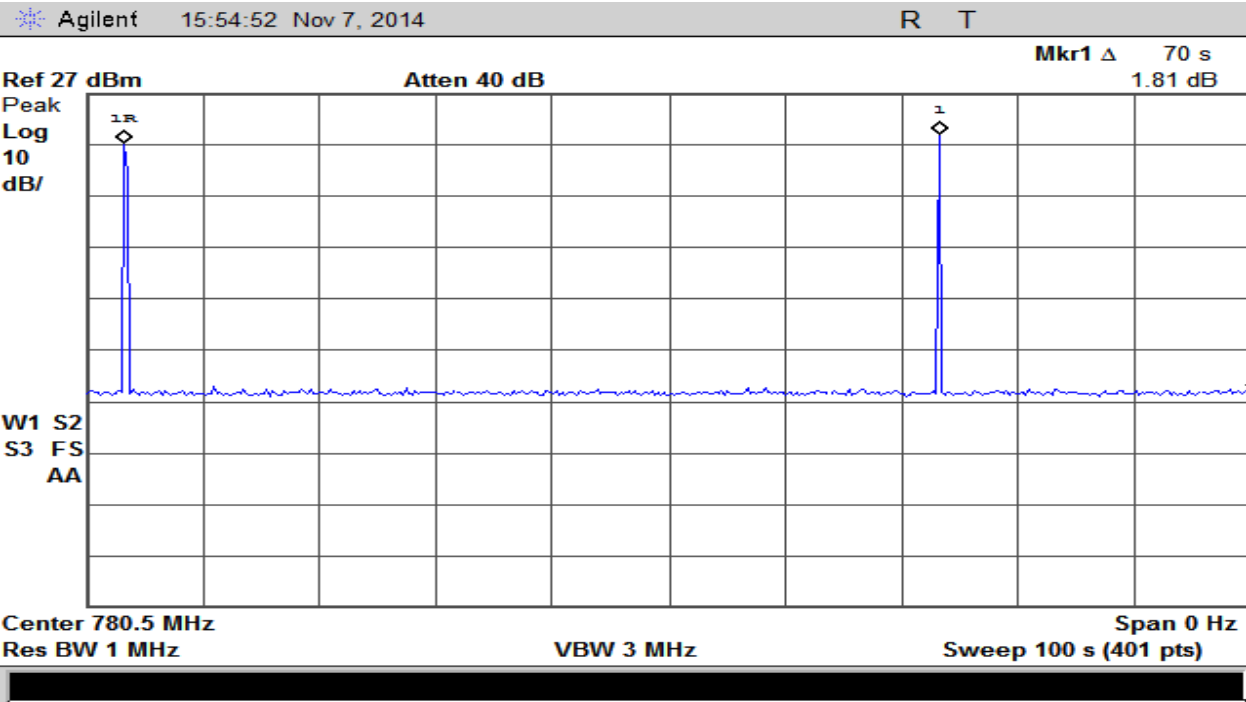
Plot 201 – 1850-1915MHz Band –Uplink Restart Time



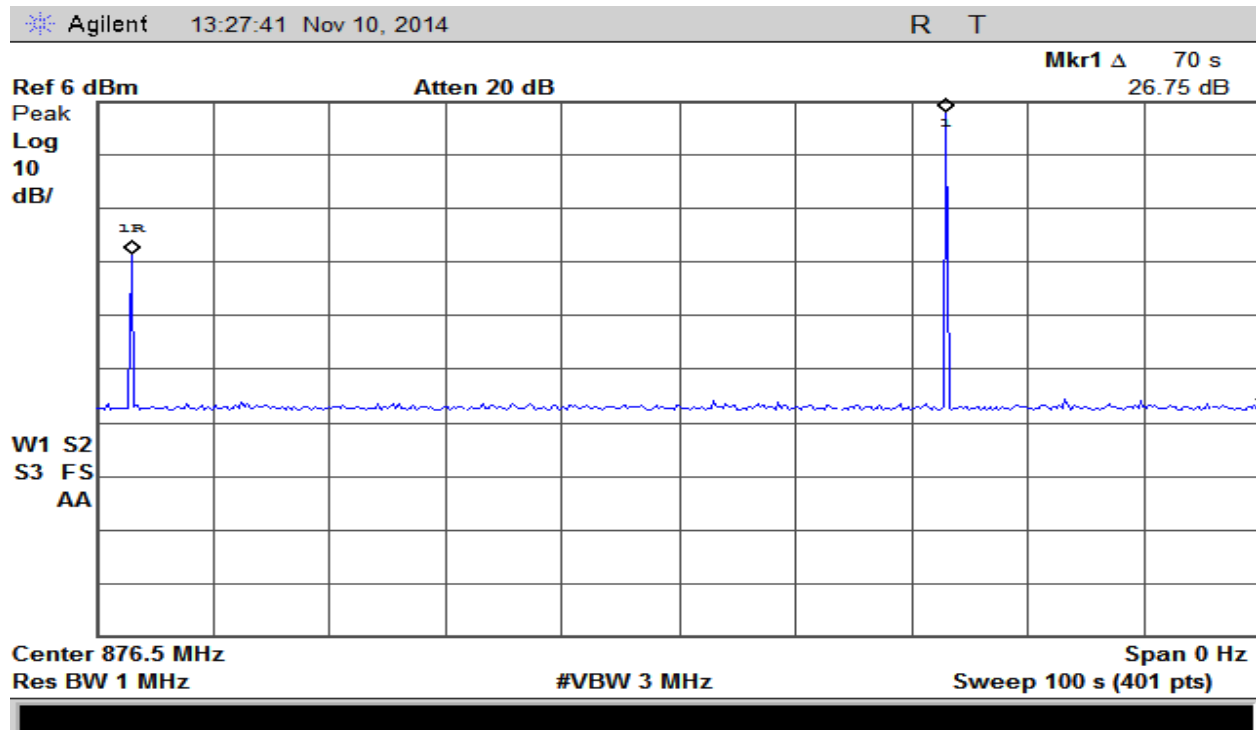
**Plot 202 – 1710-1755MHz Band –Uplink Restart Time**



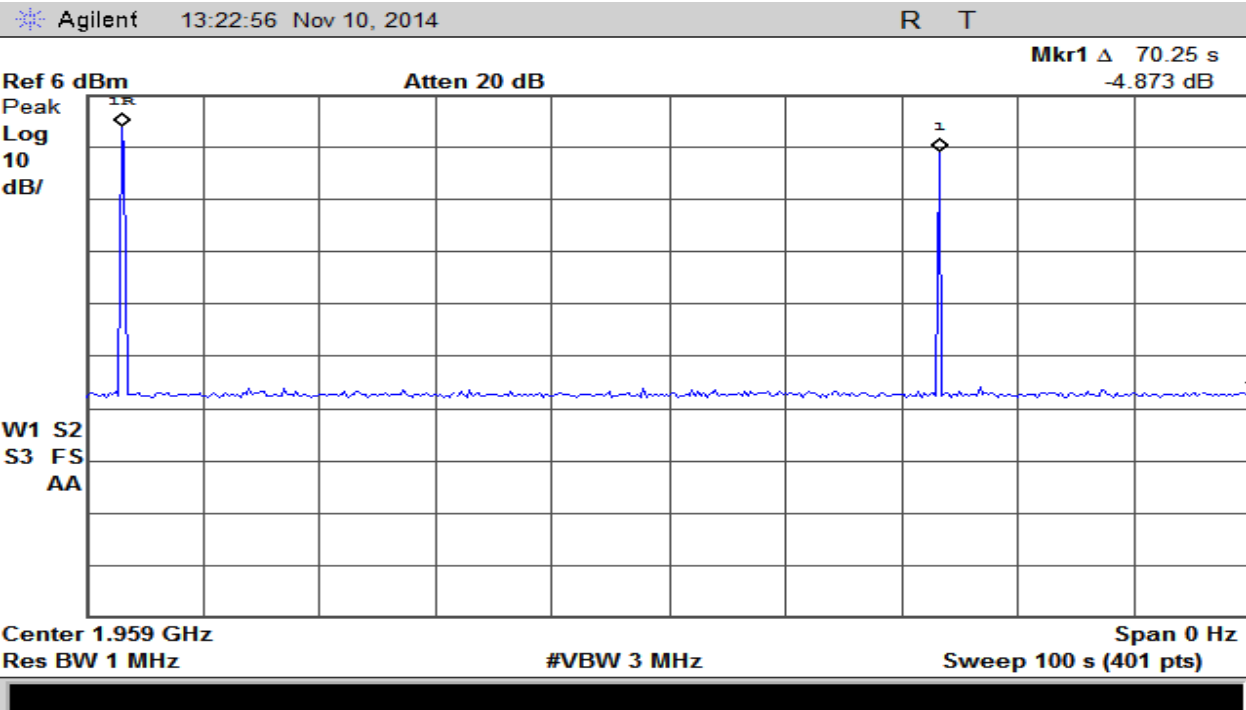
**Plot 203 – 698-716MHz Band –Uplink Restart Time**



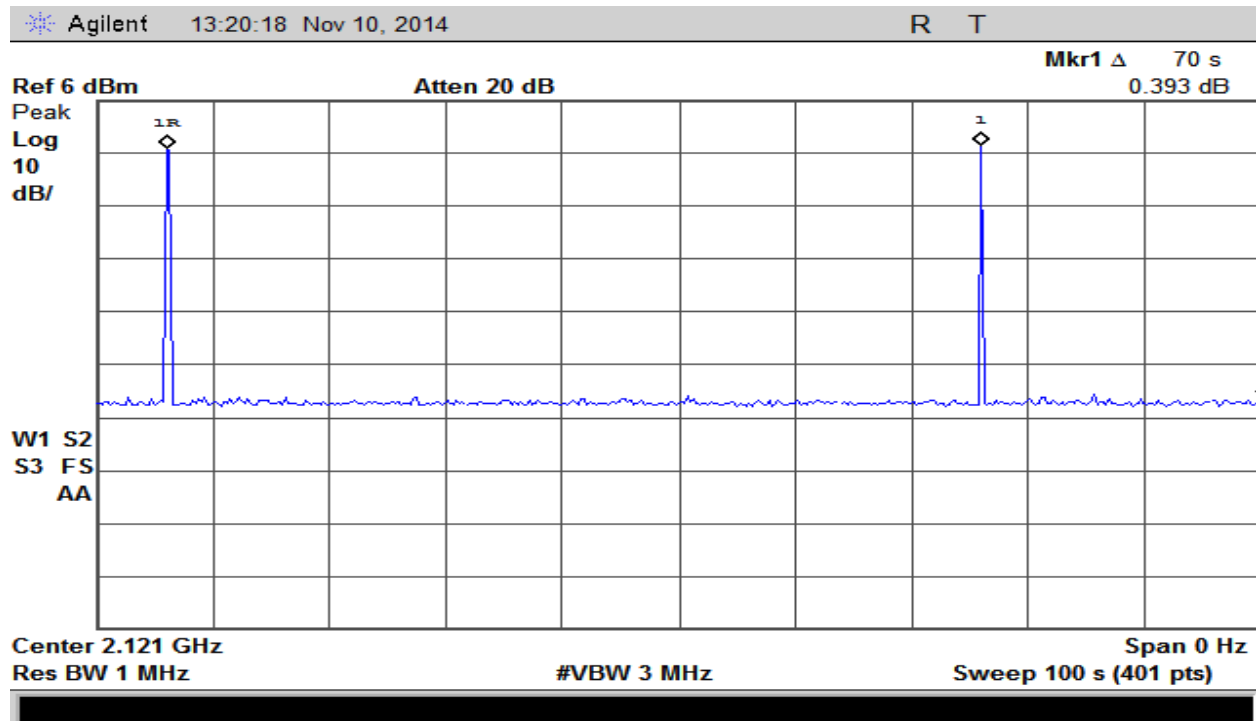
Plot 204 – 776-787MHz Band –Uplink Restart Time



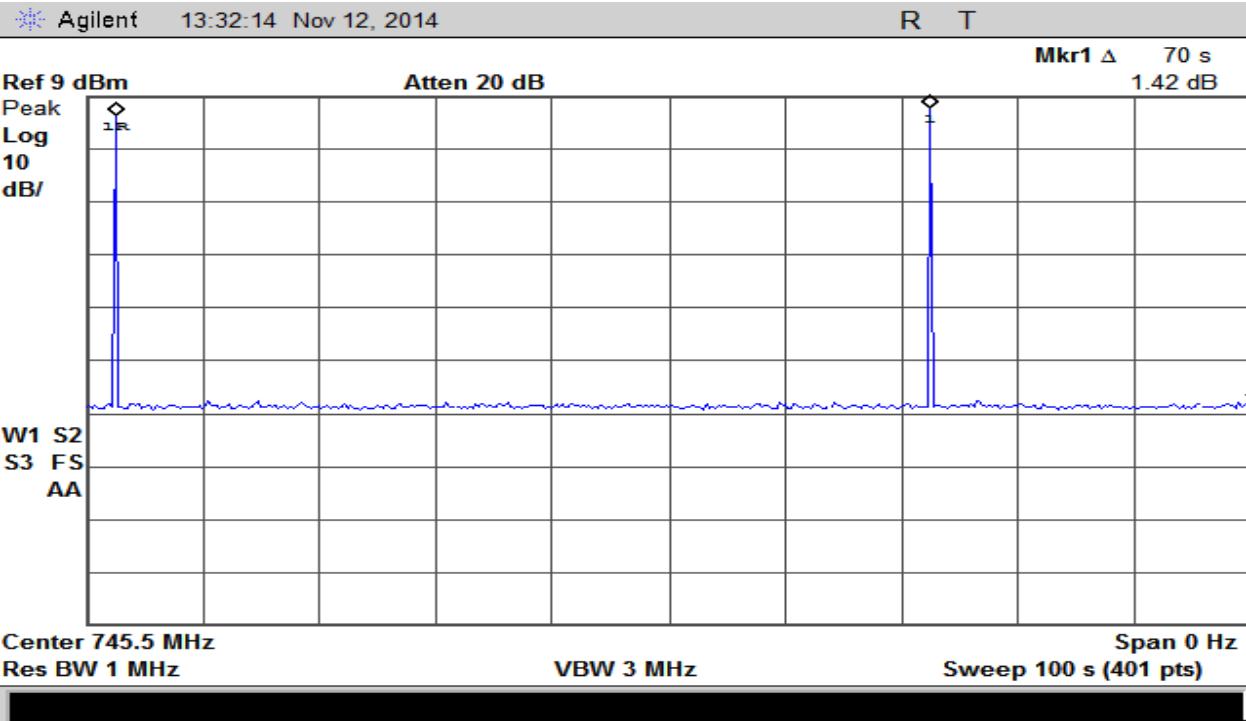
Plot 205 – 869-894MHz Band –Downlink Restart Time



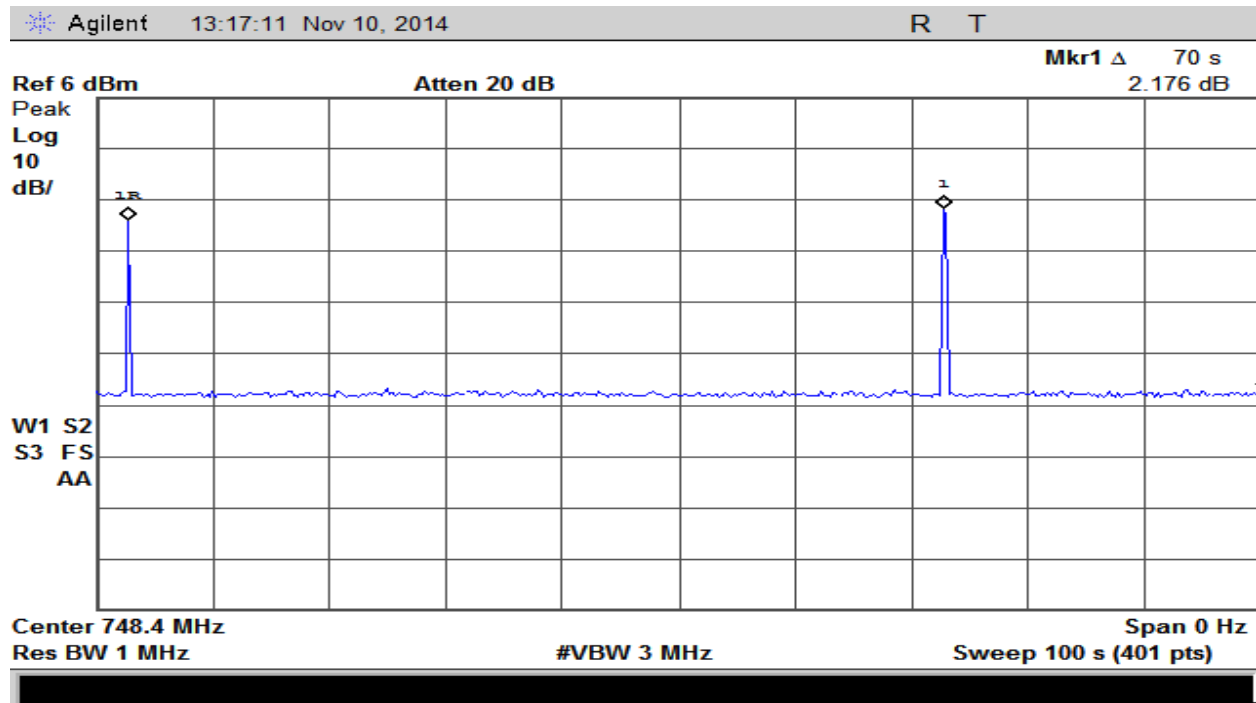
Plot 206 – 1930-1995MHz Band –Downlink Restart Time



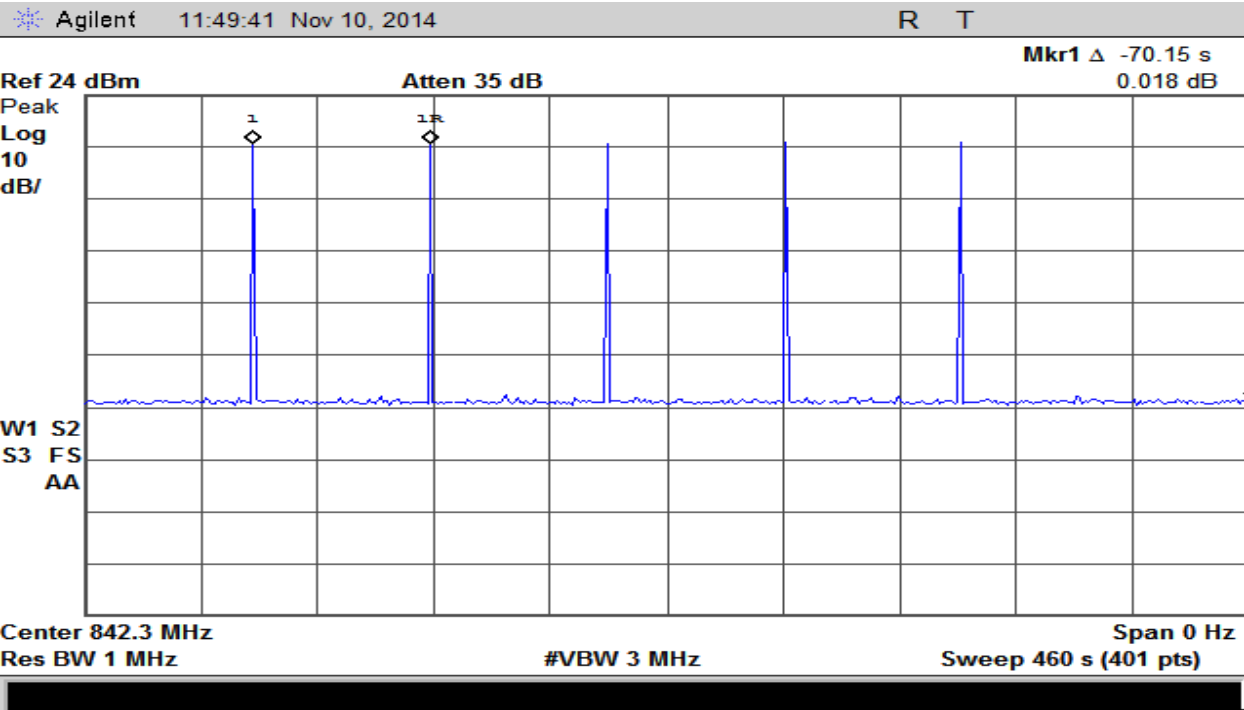
Plot 207 – 2110-2155MHz Band –Downlink Restart Time



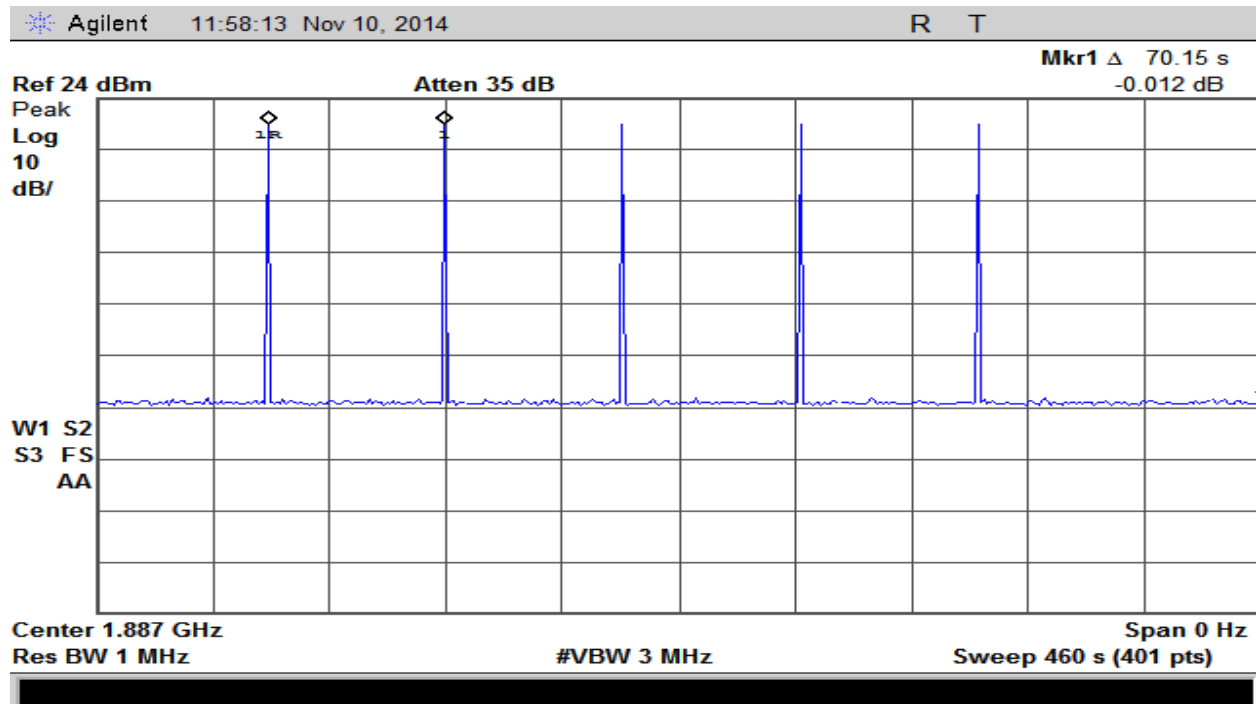
Plot 208 – 728-746MHz Band –Downlink Restart Time



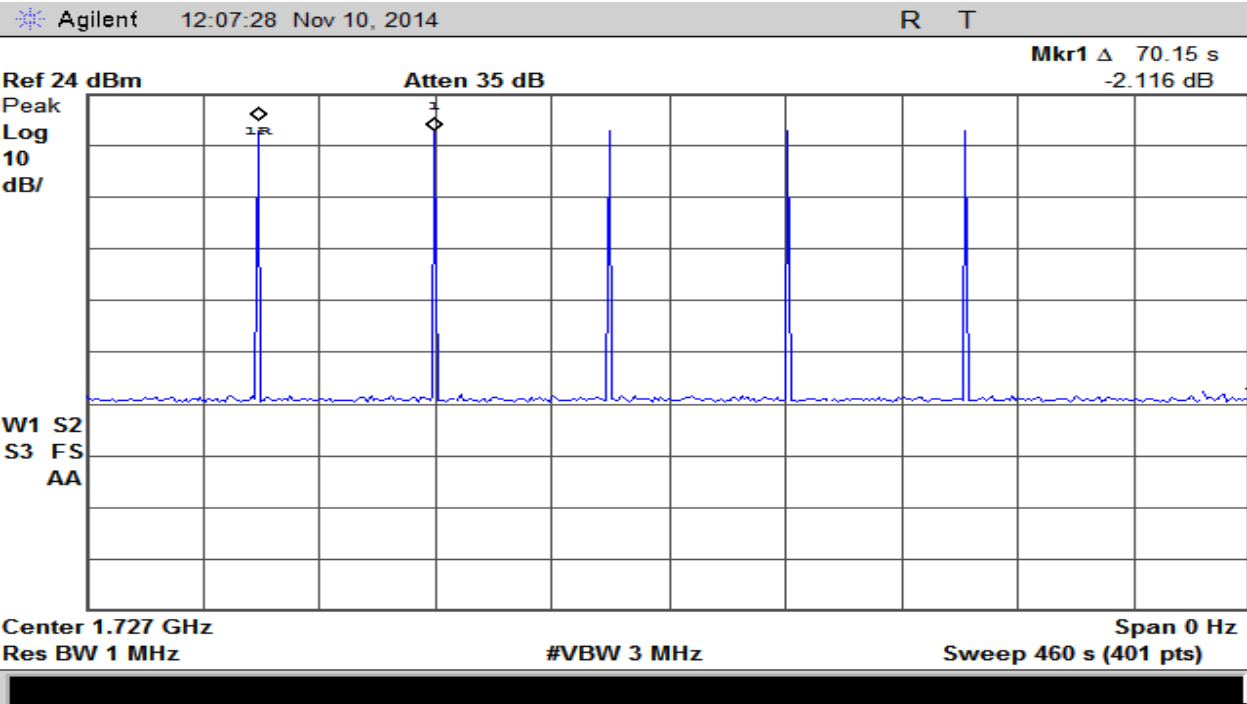
Plot 209 – 746-757MHz Band –Downlink Restart Time



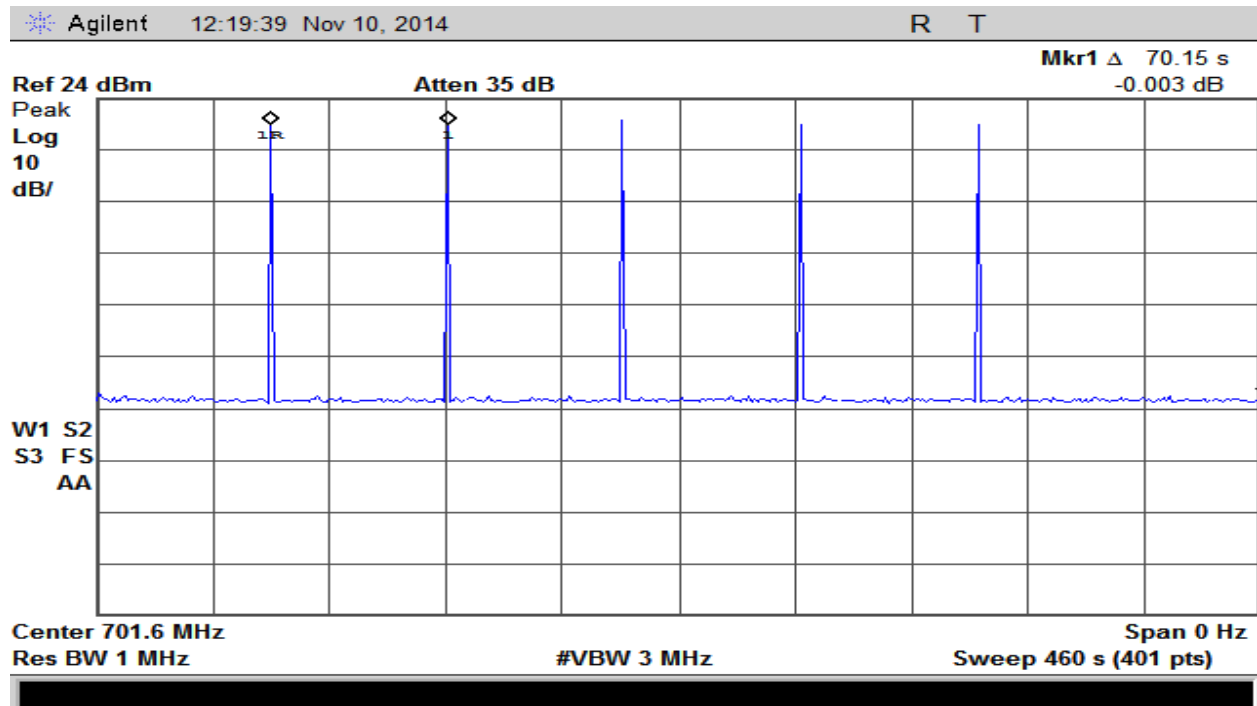
Plot 210 – 824-849MHz Band – Uplink # of Restart Time



Plot 211 – 1850-1915MHz Band – Uplink # of Restart Time

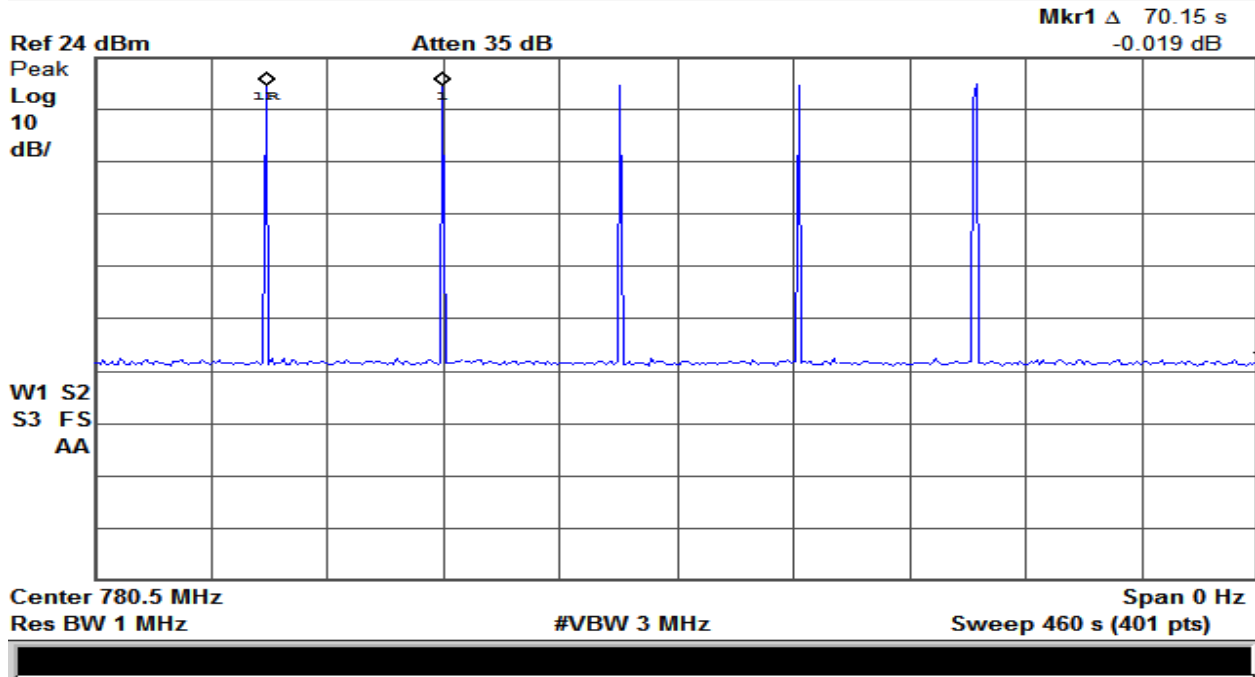


Plot 212 – 1710-1755MHz Band – Uplink # of Restart Time

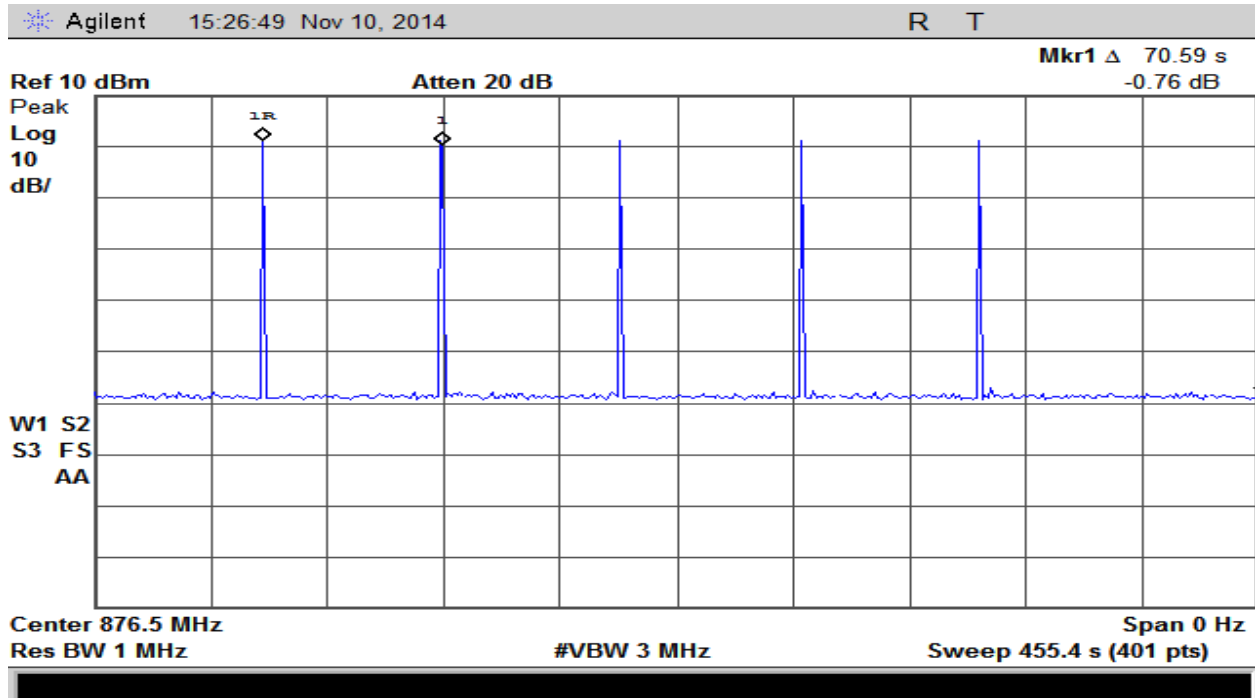


Plot 213 – 698-716MHz Band – Uplink # of Restart Time

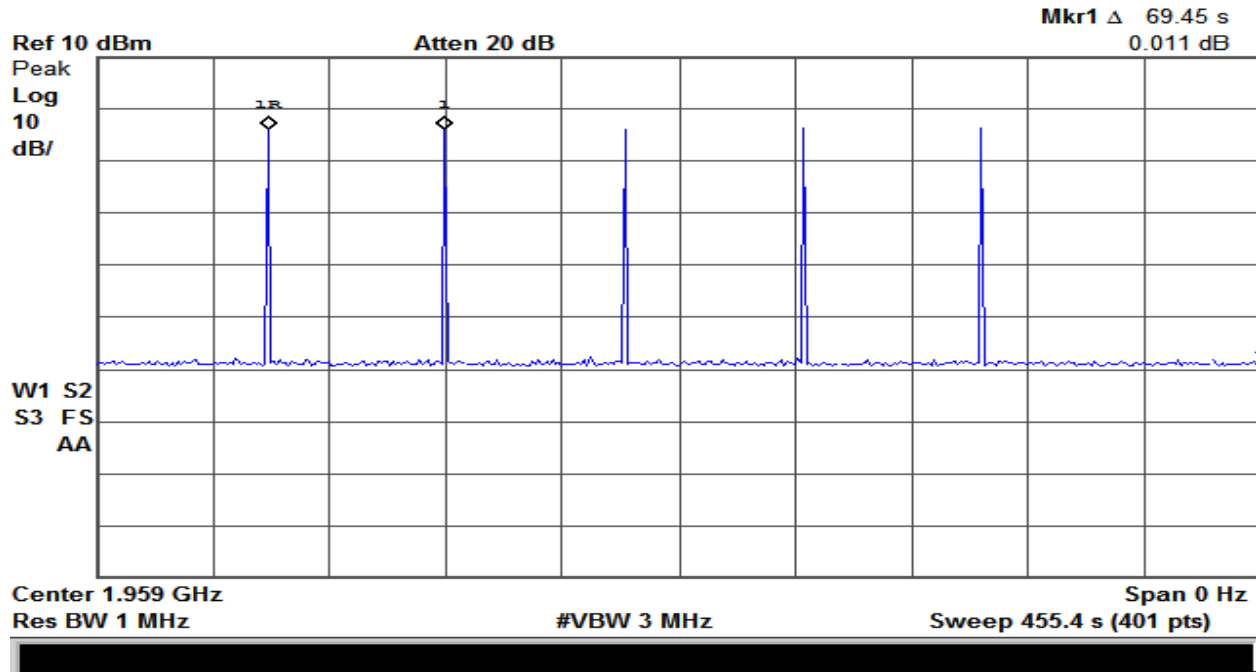




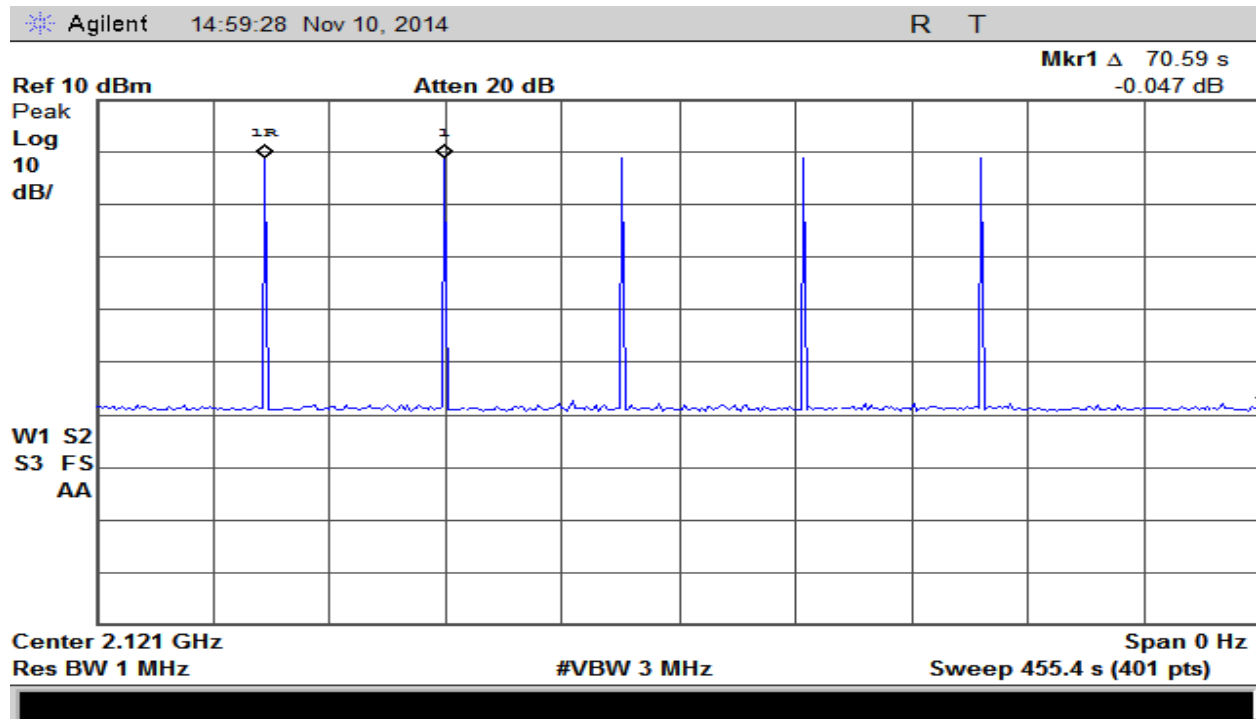
Plot 214 – 776-787MHz Band – Uplink # of Restart Time



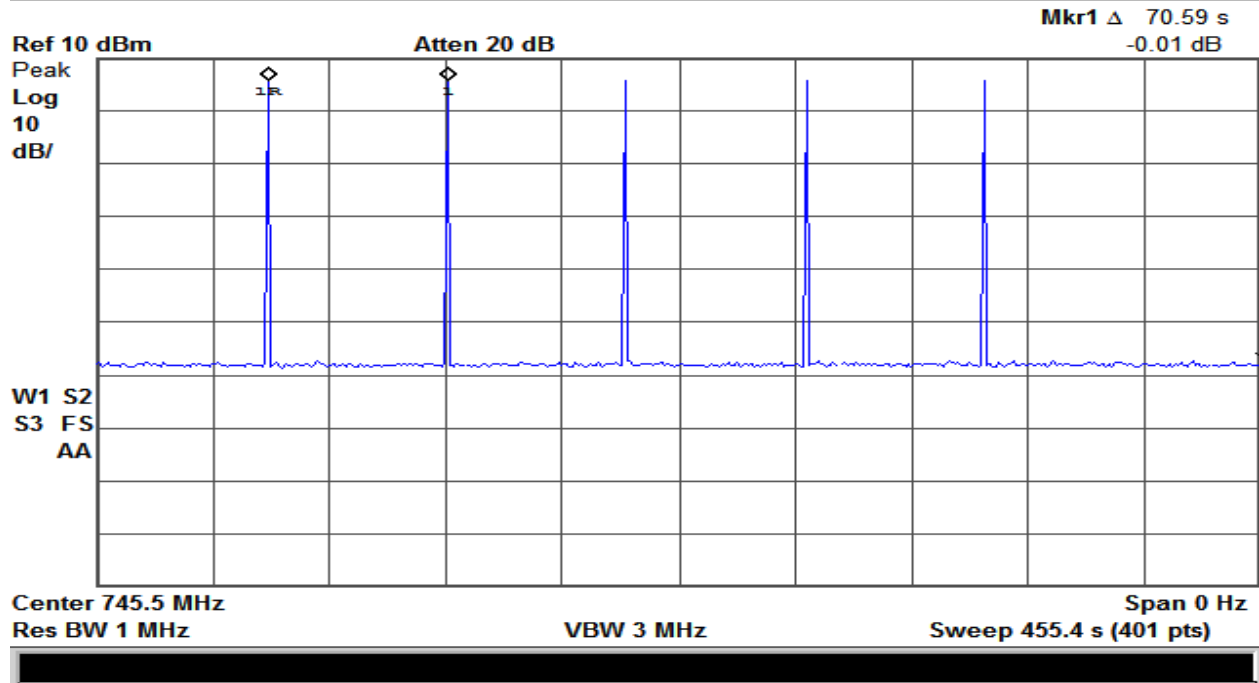
Plot 215 – 869-894MHz Band – Downlink # of Restart Time



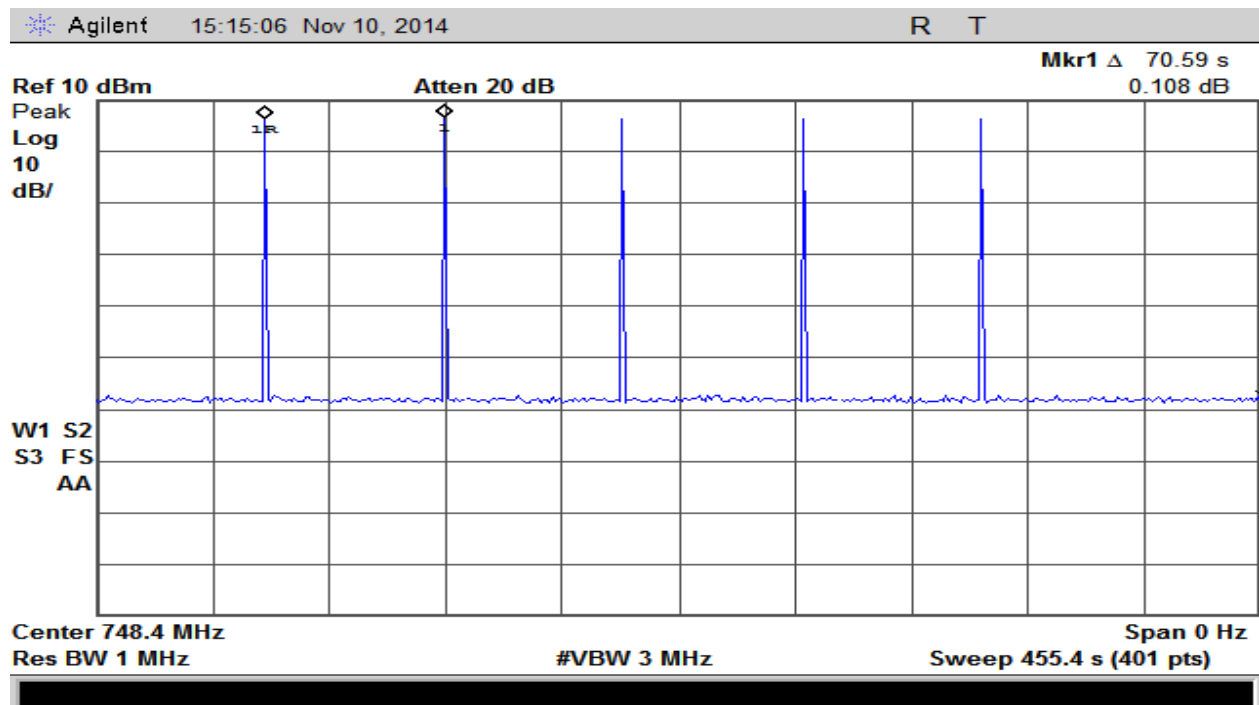
Plot 216 – 1930-1995MHz Band – Downlink # of Restart Time



Plot 217 – 2110-2155MHz Band – Downlink # of Restart Time



Plot 218 – 728-746MHz Band – Downlink # of Restart Time



Plot 219 – 746-757MHz Band – Downlink # of Restart Time

## 10. Radiated Spurious Emissions

<b>Test Requirement(s):</b>	§2.1053	<b>Test Engineer(s):</b>	Frank F.
<b>Test Results:</b>	Pass	<b>Test Date(s):</b>	01/08/14

**Test Procedures:** As required by 47 §2.1053, Radiated Spurious Emissions measurement were made in accordance with the procedures of TIA-603 and KDB 935210 D03 §7.12 .

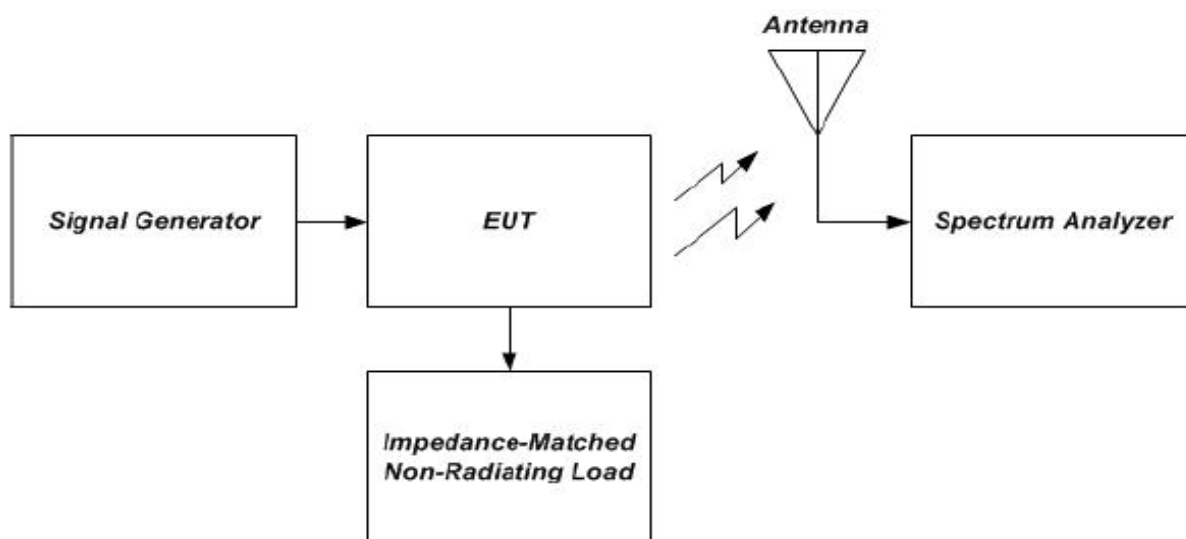
The EUT was placed on a wooden table inside a 3 meter semi-anechoic chamber. The EUT was transmitting into a 50Ω non-radiating load which was directly connected to the EUT antenna port as shown in figure 4.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3 orthogonal axis. The frequency range up to the 10<sup>th</sup> harmonic was investigated.

Spurious attenuation limit in dB =  $P1 - (43 + 10 \log_{10} (P2)) = -13\text{dBm}$

Where P1 = Transmitter Power in dBm and P2= Power in Watt

### Test Setup:



**Figure 5 – Radiated Spurious Emission Test Setup**

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1673	-59.43	-13	-46.43
2509	-71.73	-13	-58.73
3346	-60.27	-13	-47.27

Table 35 – 824-849MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
3765	-49.43	-13	-36.43
5647	-55.35	-13	-42.35
7530	-51.2	-13	-38.2

Table 36 – 1850-1915MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
3465	-55.51	-13	-42.51
5197	-52.18	-13	-39.18
6930	-48.43	-13	-35.43

Table 37 – 1710-1755MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1414	-64.93	-13	-51.93
2121	-51.8	-13	-38.8
2828	-60.1	-13	-47.1

Table 38 – 698-716MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1563	-63.27	-13	-50.27
2344	-60.43	-13	-47.43
3126	-58.07	-13	-45.07

Table 39 – 776-787MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1763	-68.27	-13	-55.27
2644	-60.56	-13	-47.56
3526	-57.85	-13	-44.85

Table 40 – 869-894MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
3925	-57.32	-13	-44.32
5887	-56.19	-13	-43.19
7850	-48.87	-13	-35.87

Table 41 – 1930-1995MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
4265	-55.82	-13	-42.82
6397	-53.23	-13	-40.23
8530	-49.38	-13	-36.38

Table 42 – 2110-2155MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1474	-65.74	-13	-52.74
2211	-59.8	-13	-46.8
2948	-56.57	-13	-43.57

Table 43 – 728-746MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1503	-65.1	-13	-52.1
2254	-61.27	-13	-48.27
3006	-56.35	-13	-43.35

Table 44 – 746-757MHz Downlink Band – Radiated Spurious Test Data

NOTE: There were no detectable emissions above the 2<sup>nd</sup> harmonic. Measurement was made above 2<sup>nd</sup> harmonic to show the Receiver Noise Floor (N.F)

## I. Test Equipment

Equipment	Manufacturer	Model	Serial #	Last Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4402B	US41192757	Dec/10/13	Dec/10/14
Temperature Meter	Control Company	4184	122670346	Nov/15/12	Nov/15/14
Spectrum Analyzer	Hewlett Packard	8563E	3821A09316	Sep/19/14	Sep/19/15
Directional Coupler	Andrew	C-10-CPUS-N	150503142544	NCR	None
Attenuator 20dB	Weinschel	41-20-12	86332	NCR	None
**Variable Attenuator	JFW	50DR-061	223632-9740	NCR	None
Signal Generator	Agilent	E4432B	US40053021	NCR	None
Signal Generator	Hewlett Packard	8340B	2804A00782	NCR	None
Horn Antenna	Com-Power	AHA-118	071150	Sep/13/13	Sep/13/15
Bilog Antenna	Chase	CBL6140	1040	Oct/28/14	Oct/28/15
Attenuator 10dB	Huber+Suhner	6810.17.A	747300	NCR	None
Digital Multimeter	Fluke	77 III	72550270	Jan/04/14	Jan/04/15
Power Supply	Hewlett Packard	6236B	2735A-19608	NCR	None

Table 46 – Test Equipment List

\*\* Customer supplied Equipment

**\*Statement of Traceability:** Test equipment is maintained and calibrated on a regular basis. All calibrations have been performed by a 17025 accredited test facility, traceable to National Institute of Standards and Technology (NIST)

**END OF TEST REPORT**