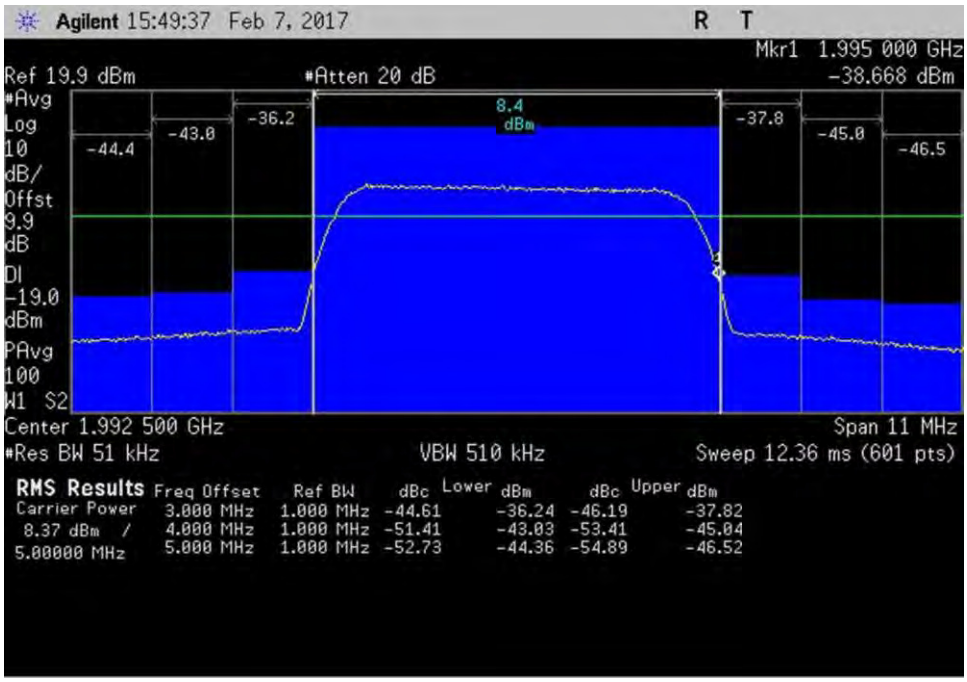
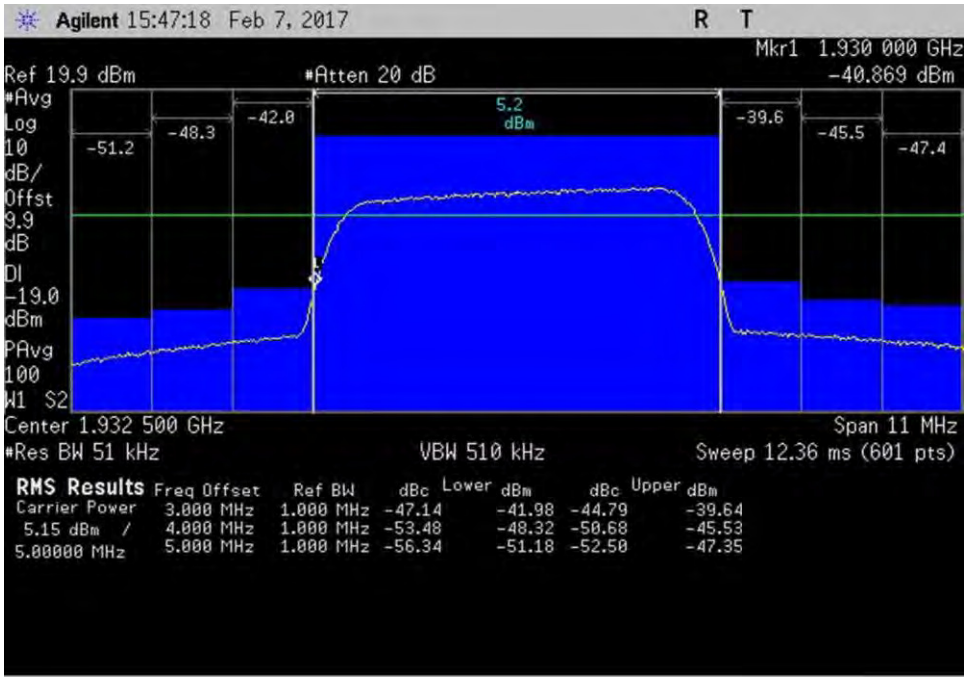
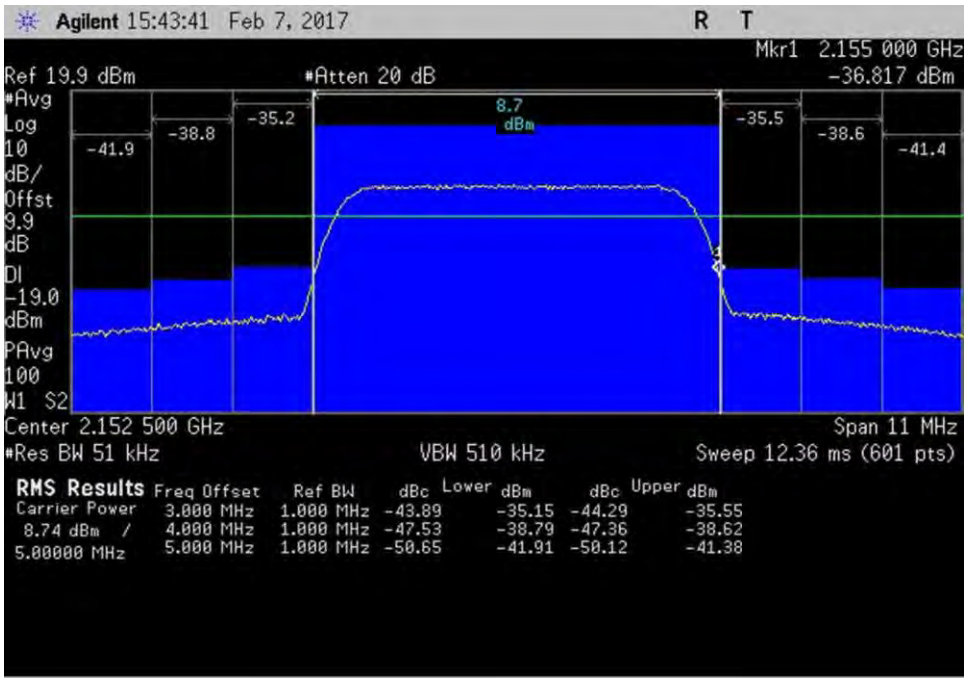


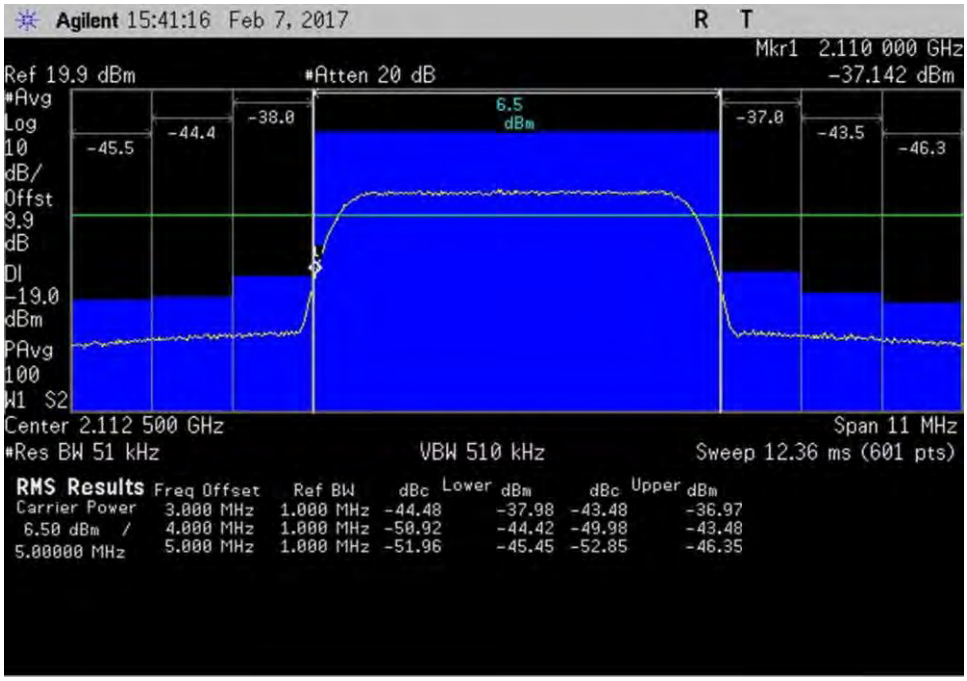
7.5_OBE_DL_1930-1995MHz_H_PreAGC_LTE



7.5_OBE_DL_1930-1995MHz_L_PreAGC_LTE



7.5_OBE_DL_2110-2155MHz_H_PreAGC_LTE



7.5_OBE_DL_2110-2155MHz_L_PreAGC_LTE

7.6 Conducted Spurious Emissions

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	Huaptec		
Specification:	**7.6 Conducted Spurious Emissions / 47 CFR §2.1051 Spurious Emissions at Antenna Terminals**		
Work Order #:	**99439**	Date:	2/8/2017
Test Type:	**Conducted Emissions**	Time:	8:45:00 AM
Tested By:	**Daniel Bertran**	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is a Fixed Wideband Consumer Booster.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Server port is a type N connector and 50-ohm impedance.
The EUT Donor port is type N connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

The test was performed in accordance with section 7.6 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016.

Test environment conditions:
Temperature: 22°C
Relative Humidity: 50%
Pressure: 101.5 kPa

Frequency range of measurement = 9kHz- 22GHz.
9 kHz - 150 kHz - RBW= 200Hz VBW= 200Hz
150 kHz - 30 MHz - RBW= 9kHz VBW= 9kHz
30 MHz - 1000MHz - RBW*= 1MHz VBW= 3MHz
1000 MHz - 22000MHz -RBW= 1MHz VBW= 3MHz

*Note: As specified on 7.6 Conducted spurious emissions test procedure of 935210 D03 Signal Booster Measurements v04, for frequencies below 1 GHz, an RBW of 1 MHz may be used in a preliminary measurement. If

non-compliant emissions are detected, a final measurement shall be made with a 100 kHz RBW. Additionally, a peak detector may also be used for the preliminary measurement. If non-compliant emissions are detected, then a final measurement of these emissions shall be made with the power averaging (RMS) detector.

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

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
AN03418	Signal Generator	E4438C	7/30/2015	7/30/2017
ANP06467	Attenuator	PE7014-10	5/13/2015	5/13/2017
ANP06897	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP06898	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP05411	Attenuator	54A-10	1/18/2016	1/18/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018

Summary of Results

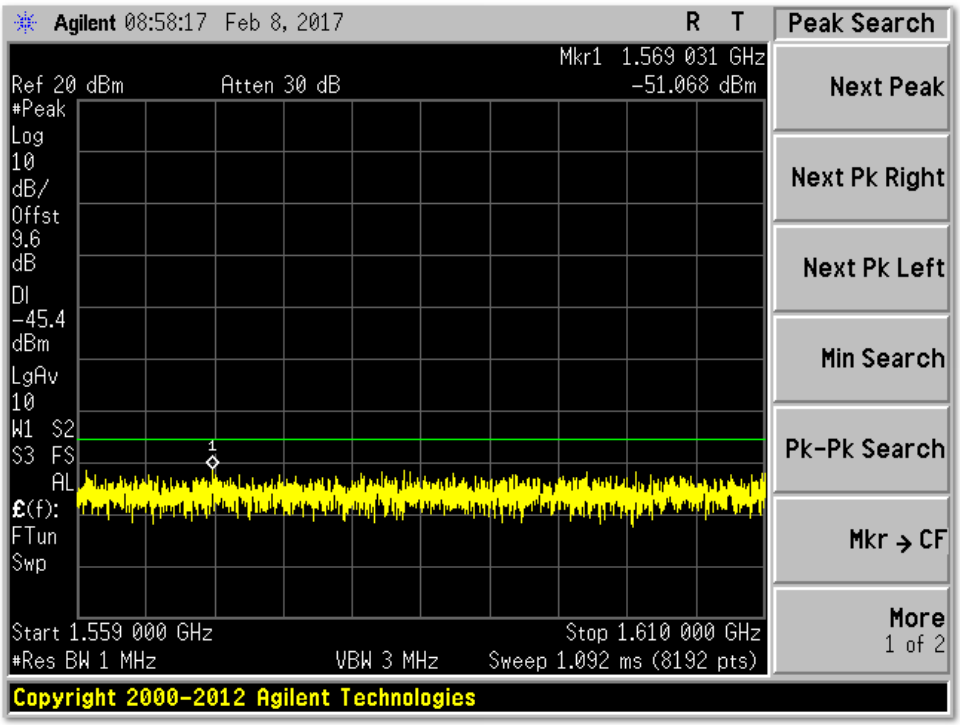
Pass: As summarized in plots below, the conducted spurious emissions are within limits.

9 KHz-30 MHz

No Conducted Spurious Emissions were found within 20dB of the limit.

Per section 27.53 (f), the 1559-1610 band was also investigated and found emission within limits using applied correction (see calculation below).

Limit Line Calculation*					
Frequency (MHz)	**Antenna Gain** (dBi)	**Cable Loss** (dB)	**Limit line EIRP** (dBW/MHz)	**Limit line EIRP** (dBm)	**Limit line EIRP corrected** (dBm)
UL 776-787	-10.0	4.6	-70.0	-40	-45.4



*Used Kit number 11-7550 (Yagi 11dbi Antenna with 75' 5D N male).

LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P DB

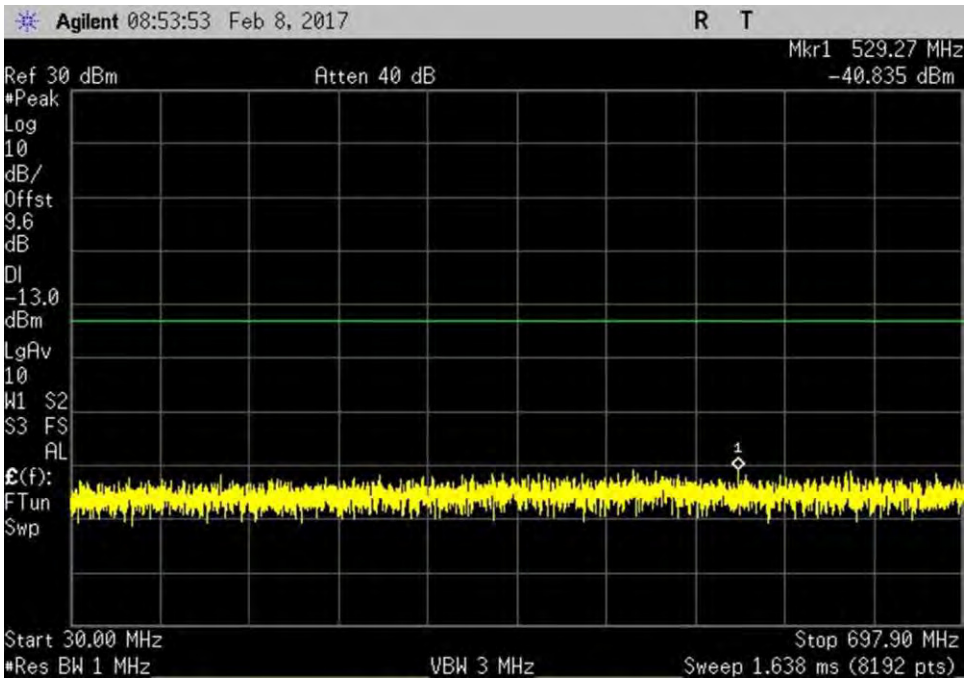
Limit line (dBuV) = V_{dBuv} - Attenuation

$$V_{dBuV} = 20 \text{Log} \frac{V}{1 \text{x} 10^{-6}}$$
$$= 20\left(\text{Log V} - \text{Log} 1 \text{x} 10^{-6}\right)$$
$$= 20 \text{Log V} - 20 \text{Log} 1 \text{x} 10^{-6}$$
$$= 20 \text{Log V} - 20(-6)$$
$$= 20 \text{Log V} + 120$$

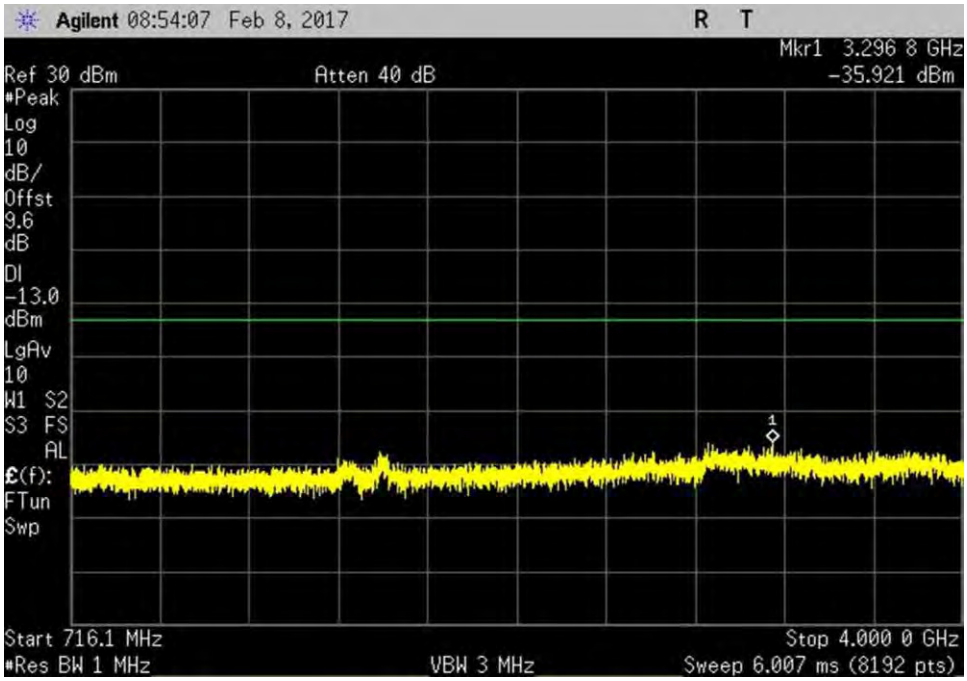
$$\text{Attenuation} = 43 + 10 \text{Log P}$$
$$= 43 + 10 \text{Log} \frac{V^2}{R}$$
$$= 43 + 10\left(\text{Log V}^2 - \text{Log R}\right)$$
$$= 43 + 10\left(2 \text{Log V} - \text{Log R}\right)$$
$$= 43 + 20 \text{Log V} - 10 \text{Log R}$$

Limit line = V_{dBuv} - Attenuation
= 20 Log V + 120 – (43 + 20 Log V – 10Log R)
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 120 – 43 + 10 Log 50 Note : R = 50 Ω
= 120 –43 + 16.897
= 94 dBuV at any power level

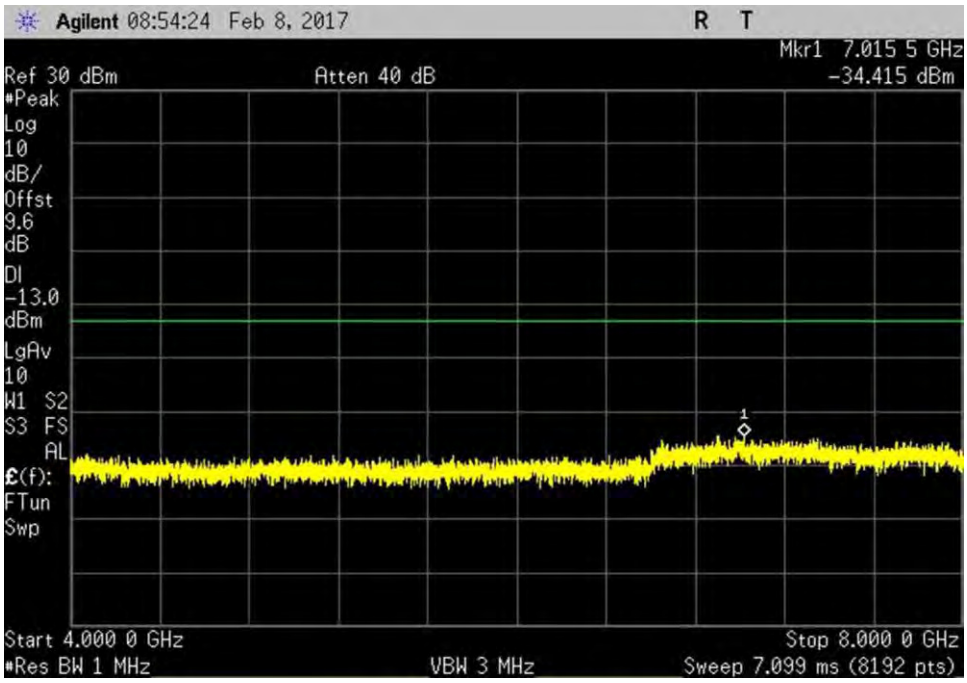
Plots



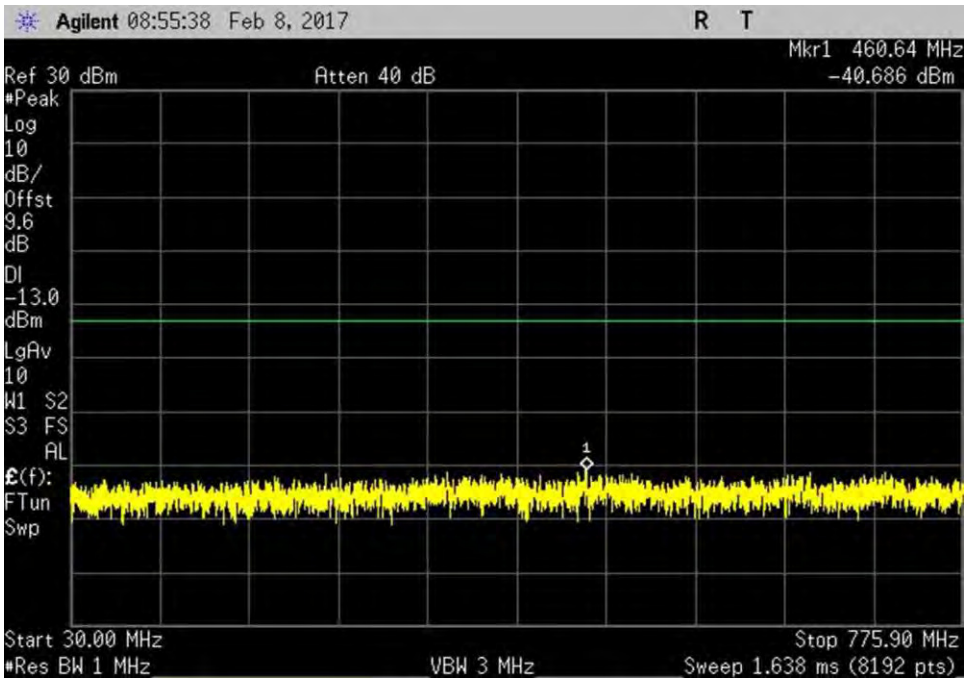
7.6_CSE_UL_698-716MHz_L



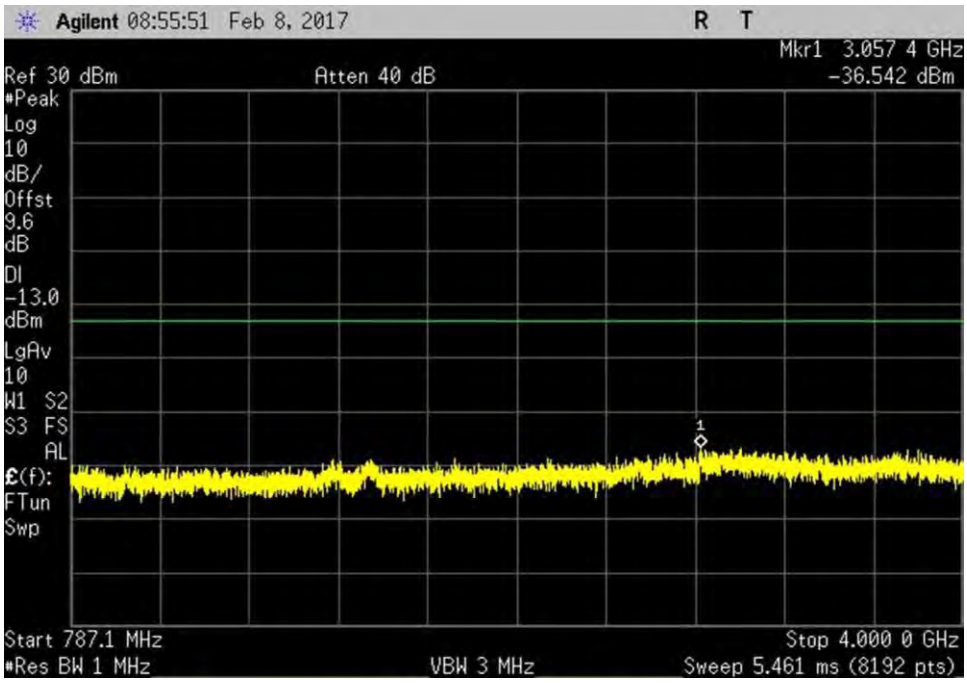
7.6_CSE_UL_698-716MHz_R1



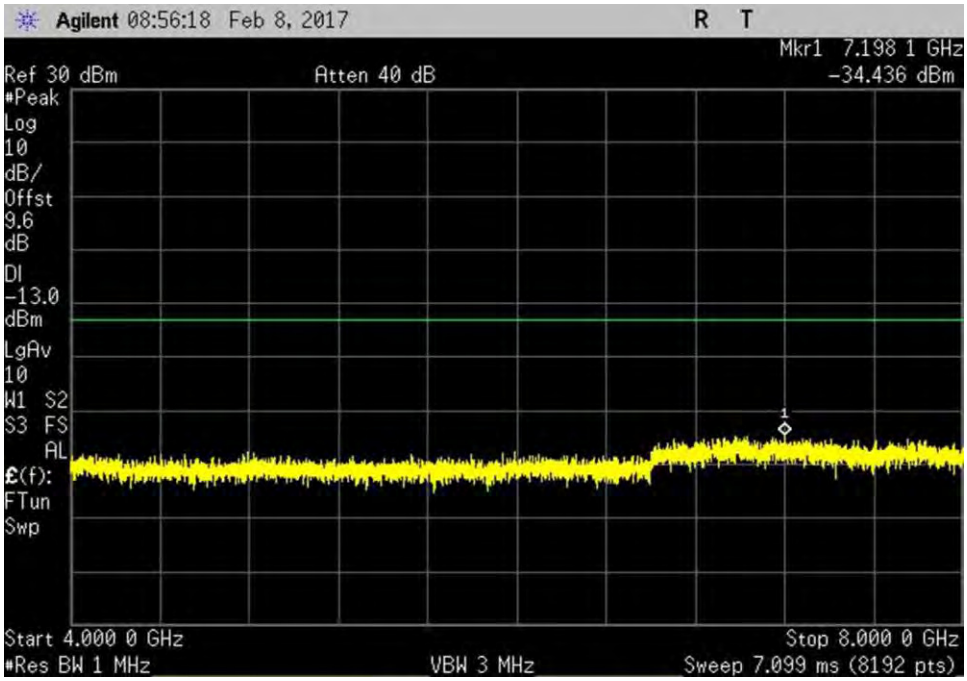
7.6_CSE_UL_698-716MHz_R2



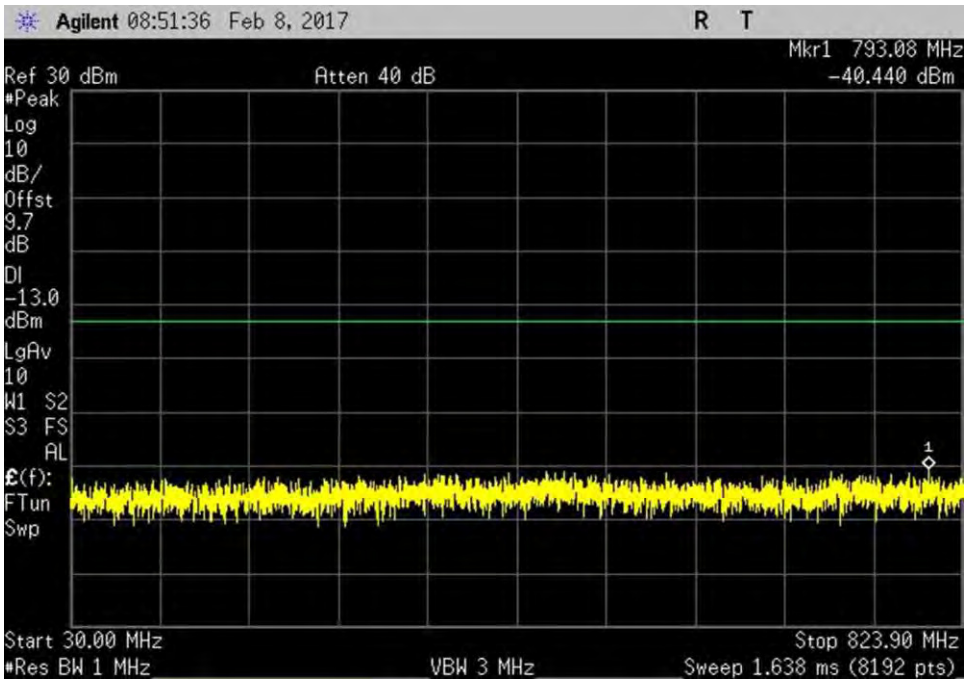
7.6_CSE_UL_776-787MHz_L



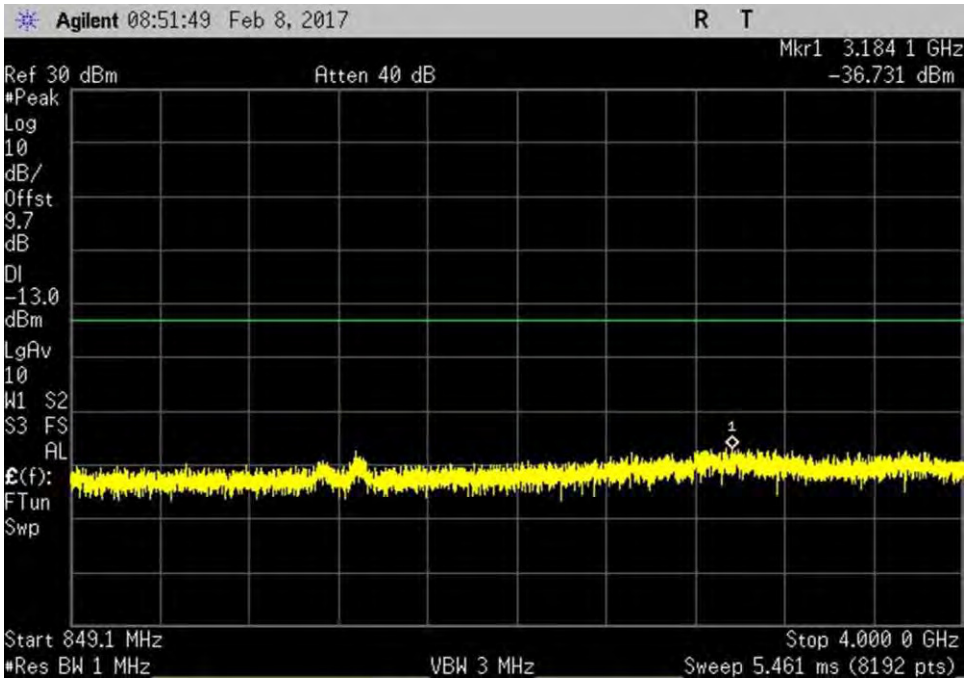
7.6_CSE_UL_776-787MHz_R1



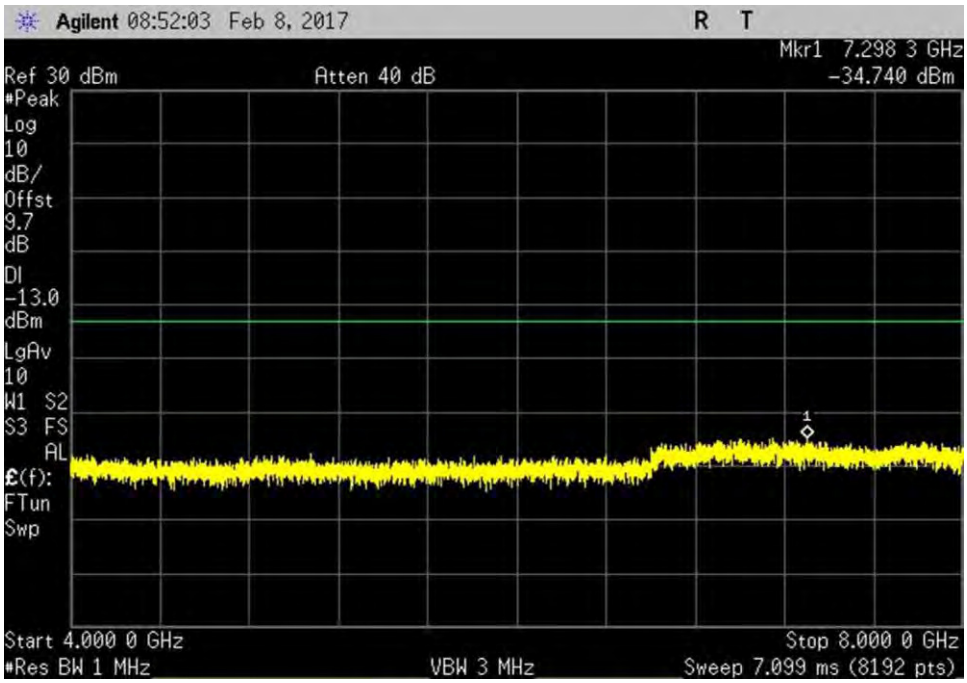
7.6_CSE_UL_776-787MHz_R2



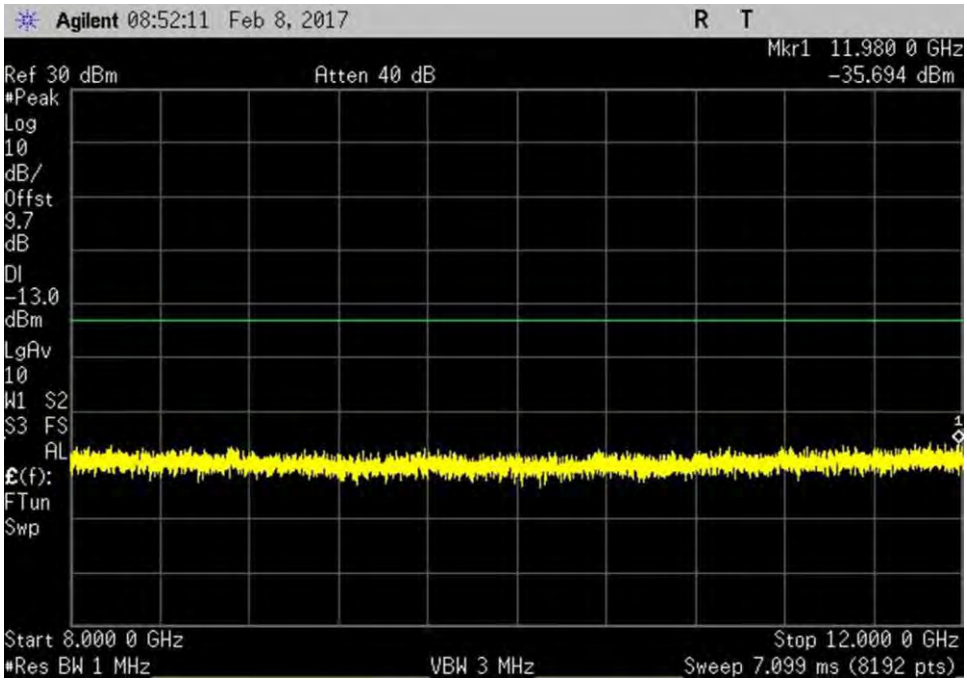
7.6_CSE_UL_824-849MHz_L



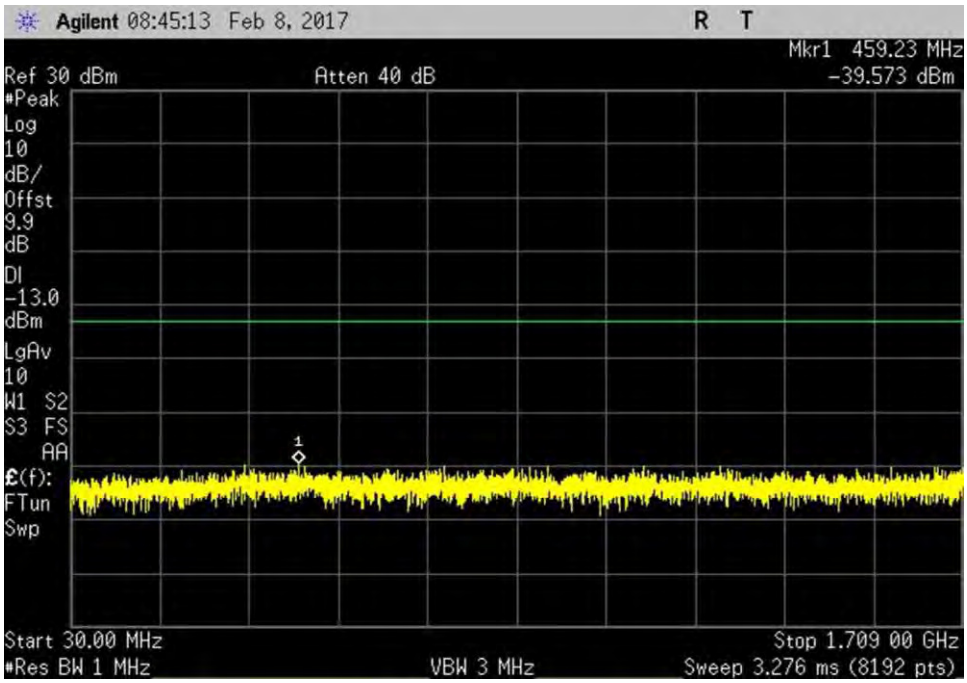
7.6_CSE_UL_824-849MHz_R1



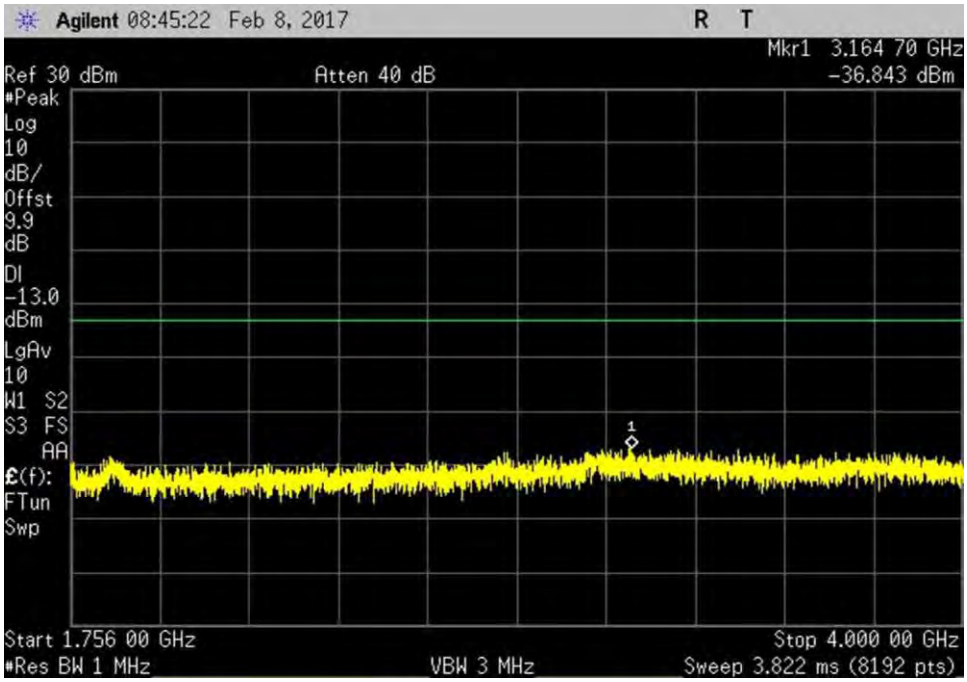
7.6_CSE_UL_824-849MHz_R2



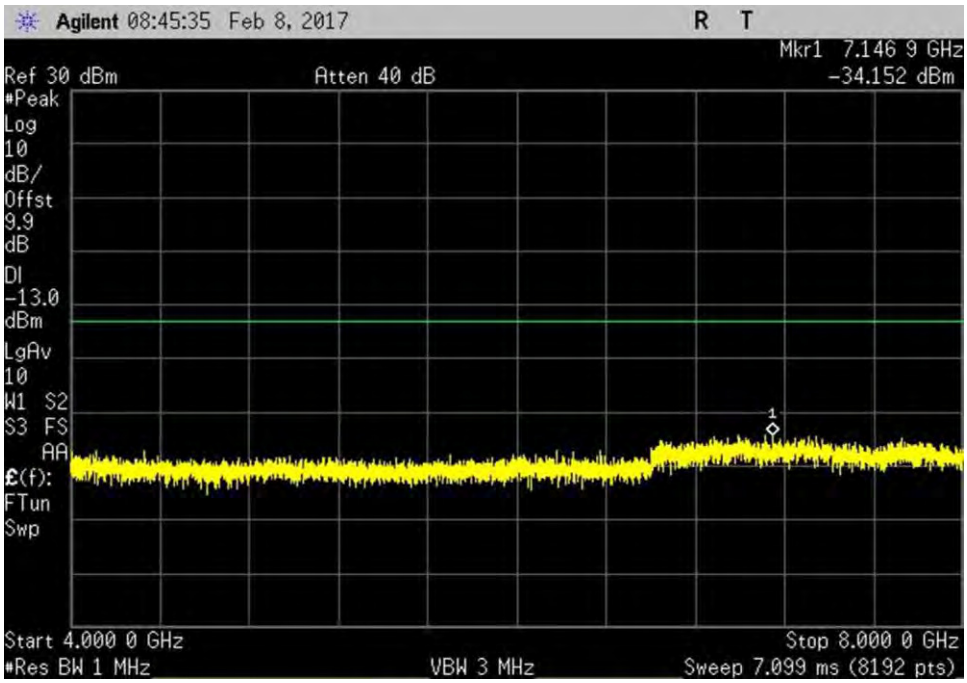
7.6_CSE_UL_824-849MHz_R3



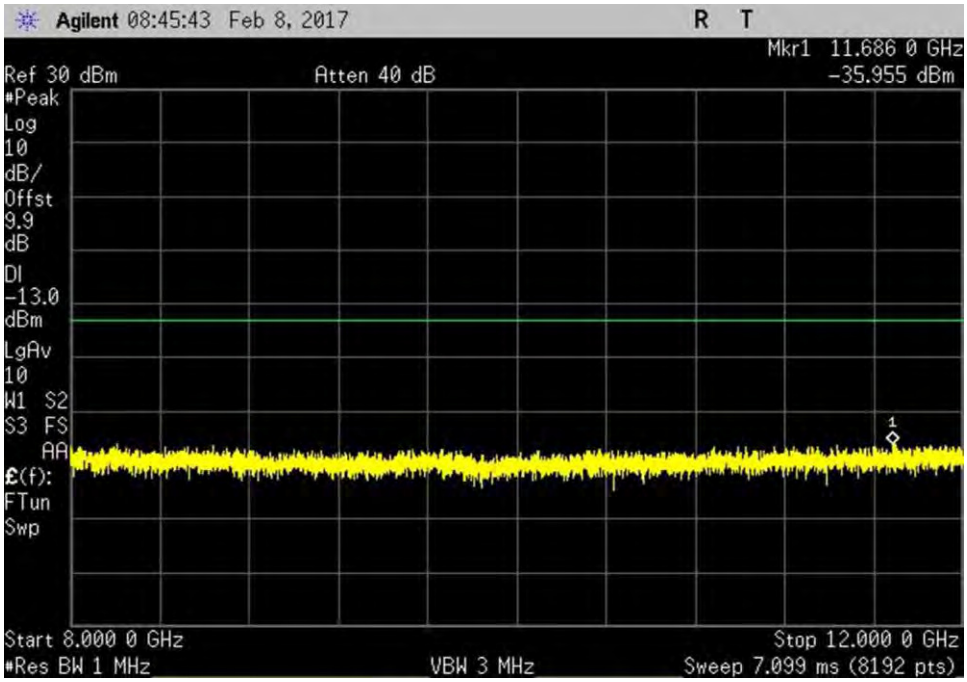
7.6_CSE_UL_1710-1755MHz_L



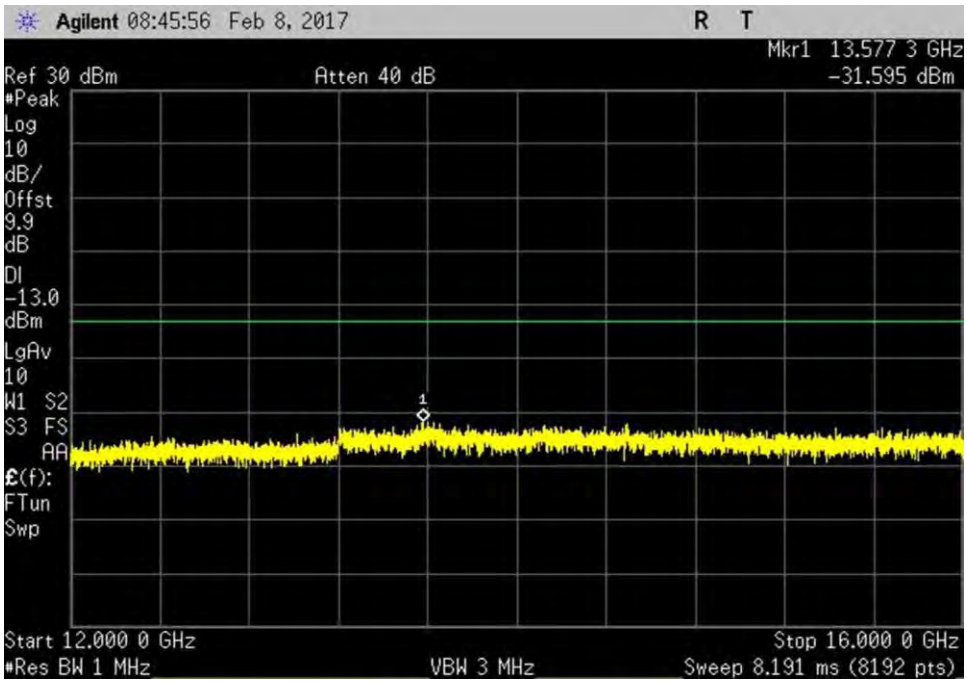
7.6_CSE_UL_1710-1755MHz_R1



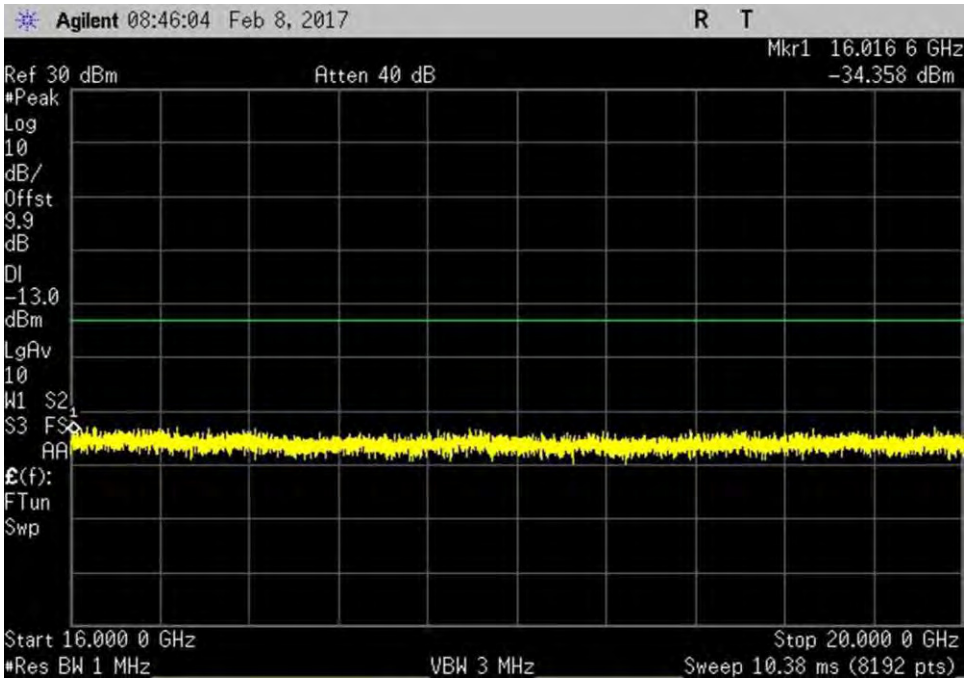
7.6_CSE_UL_1710-1755MHz_R2



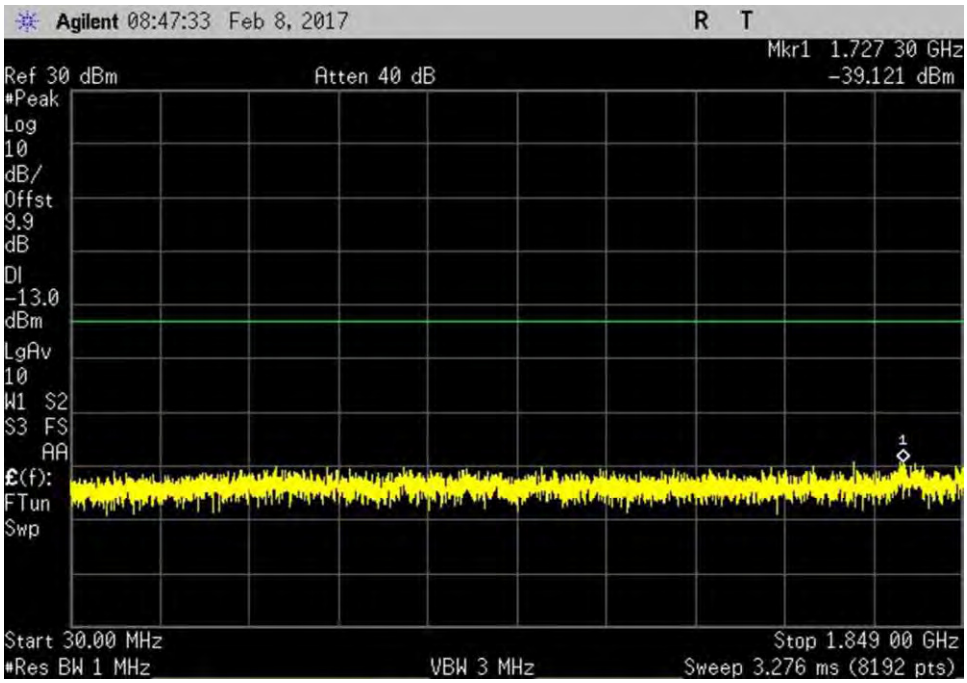
7.6_CSE_UL_1710-1755MHz_R3



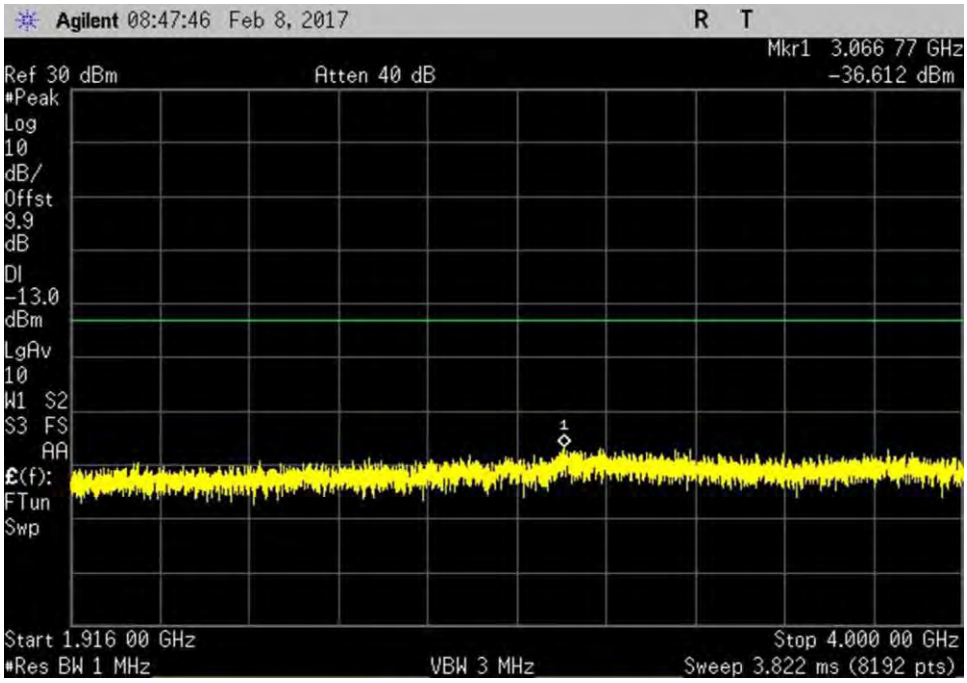
7.6_CSE_UL_1710-1755MHz_R4



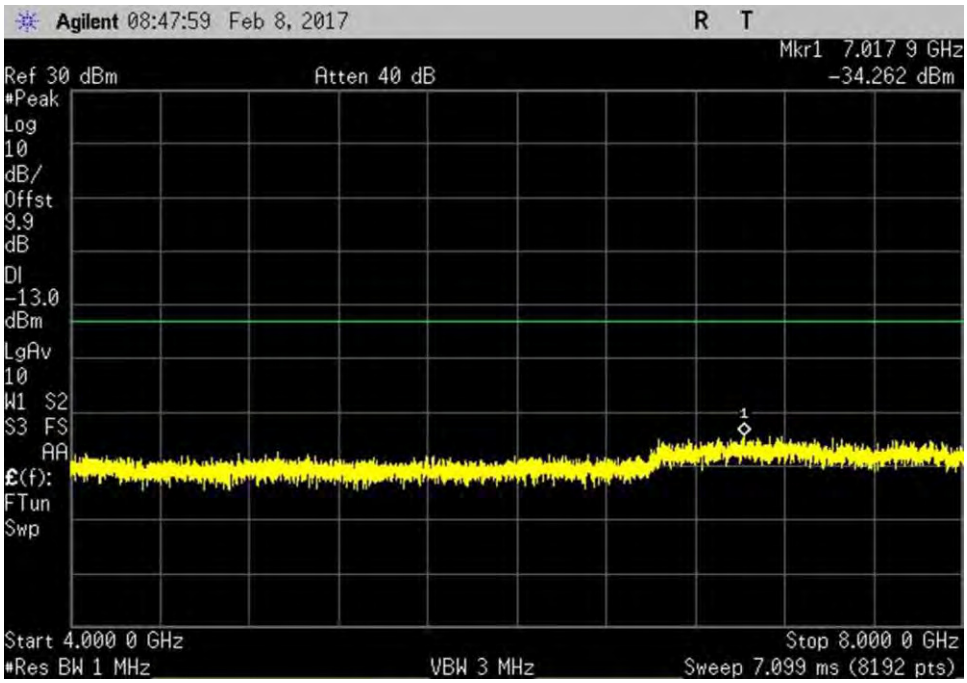
7.6_CSE_UL_1710-1755MHz_R5



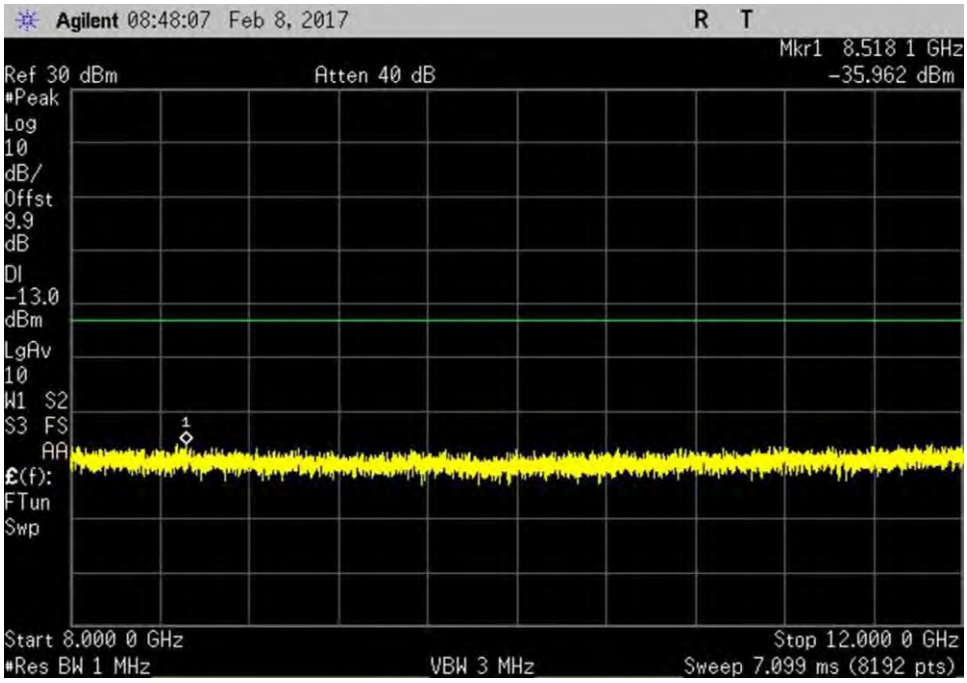
7.6_CSE_UL_1850-1915MHz_L1



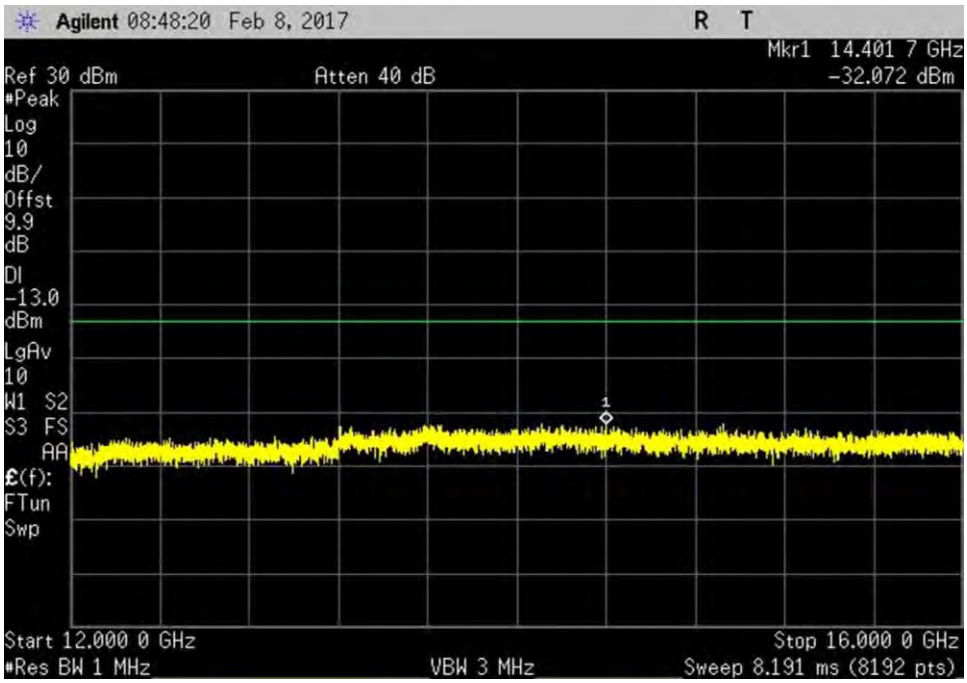
7.6_CSE_UL_1850-1915MHz_R1



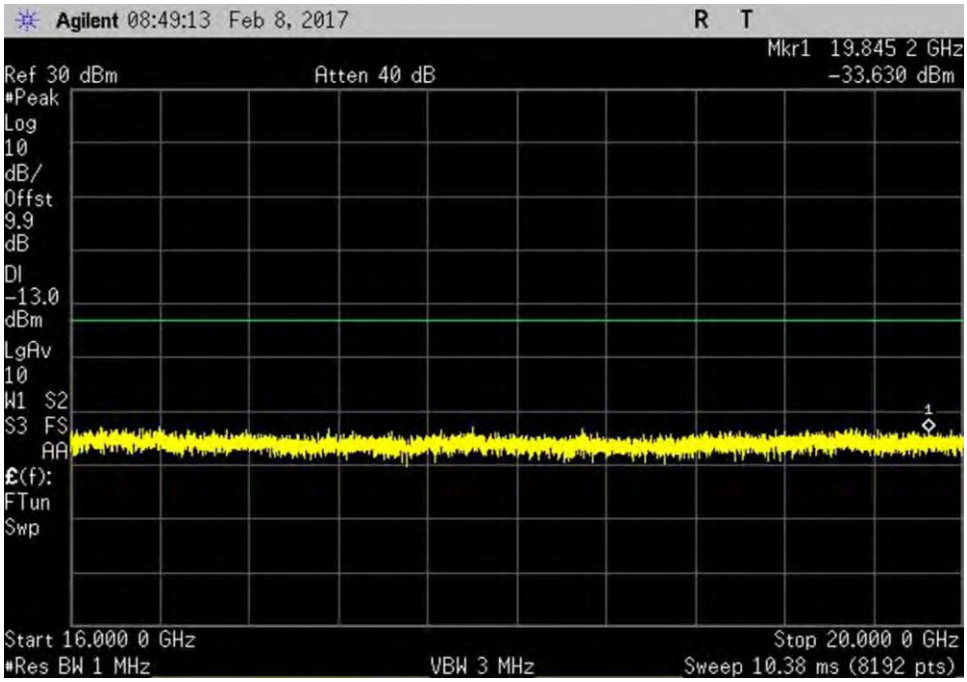
7.6_CSE_UL_1850-1915MHz_R2



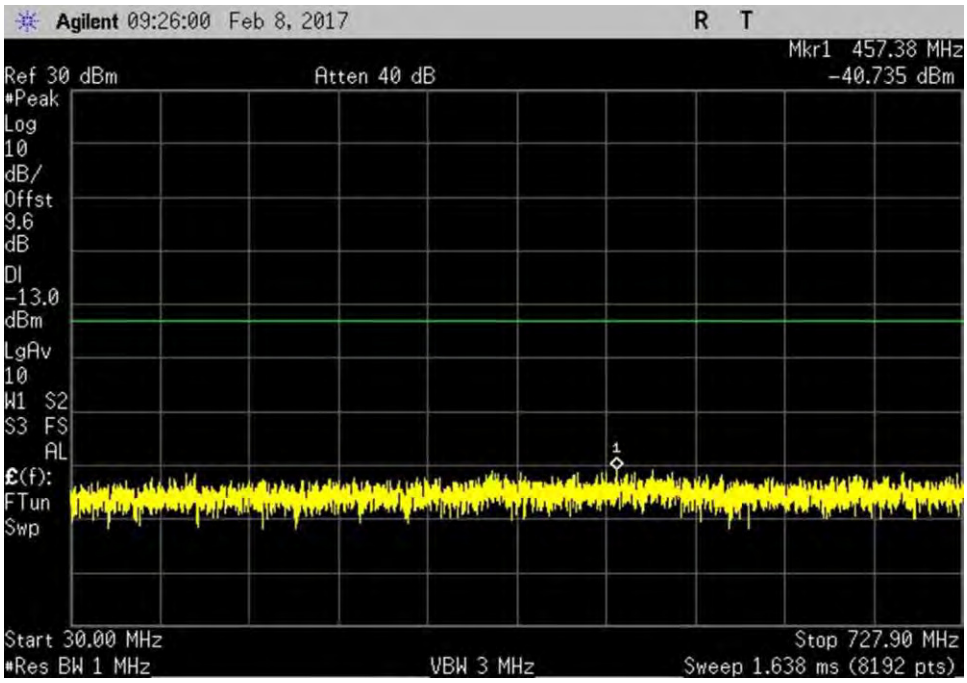
7.6_CSE_UL_1850-1915MHz_R3



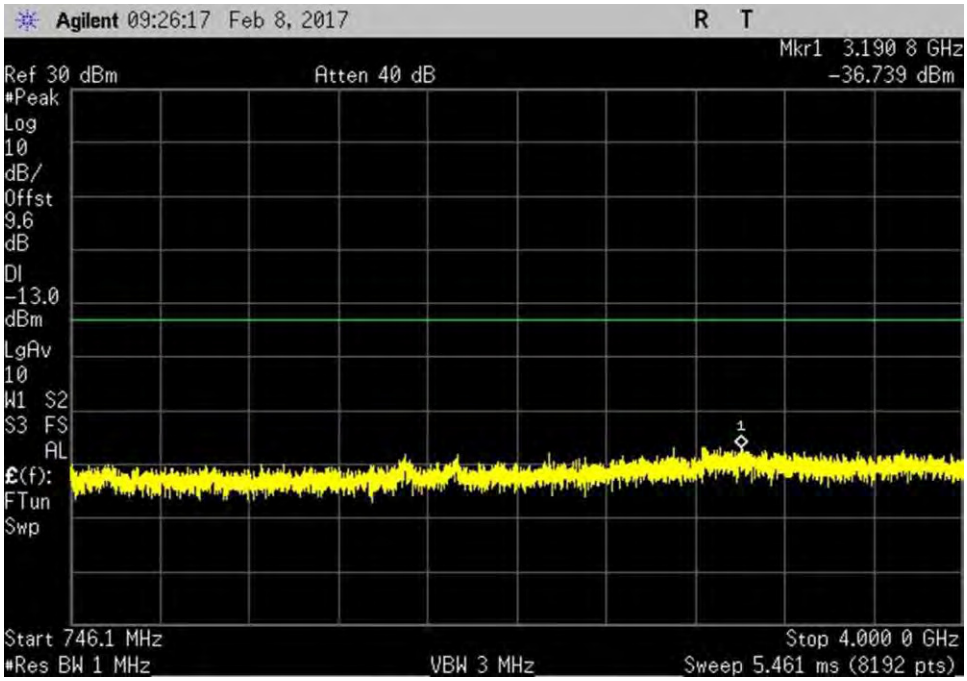
7.6_CSE_UL_1850-1915MHz_R4



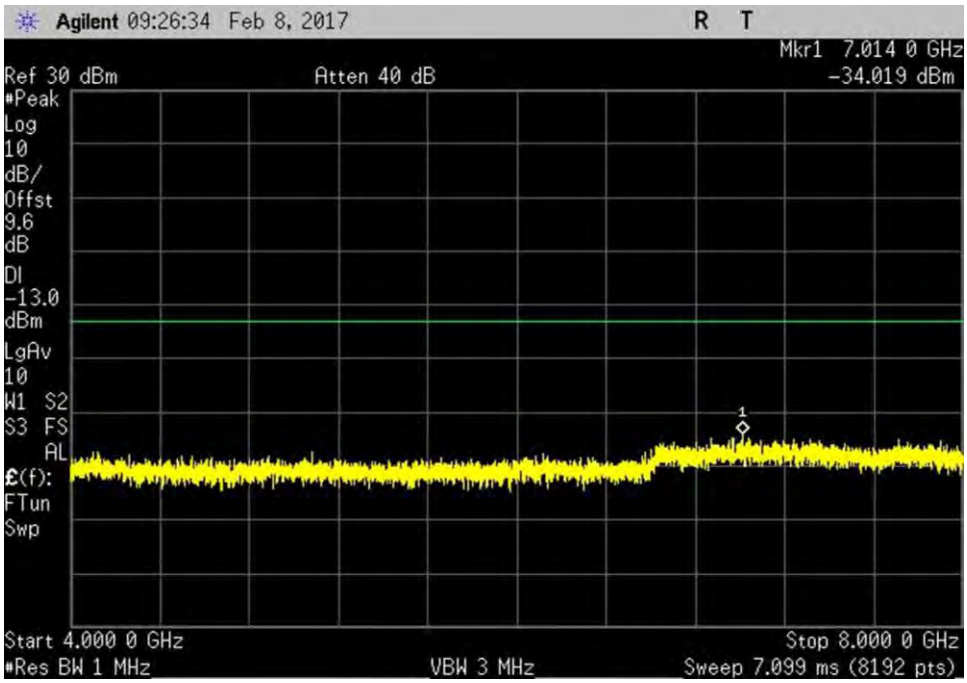
7.6_CSE_UL_1850-1915MHz_R5



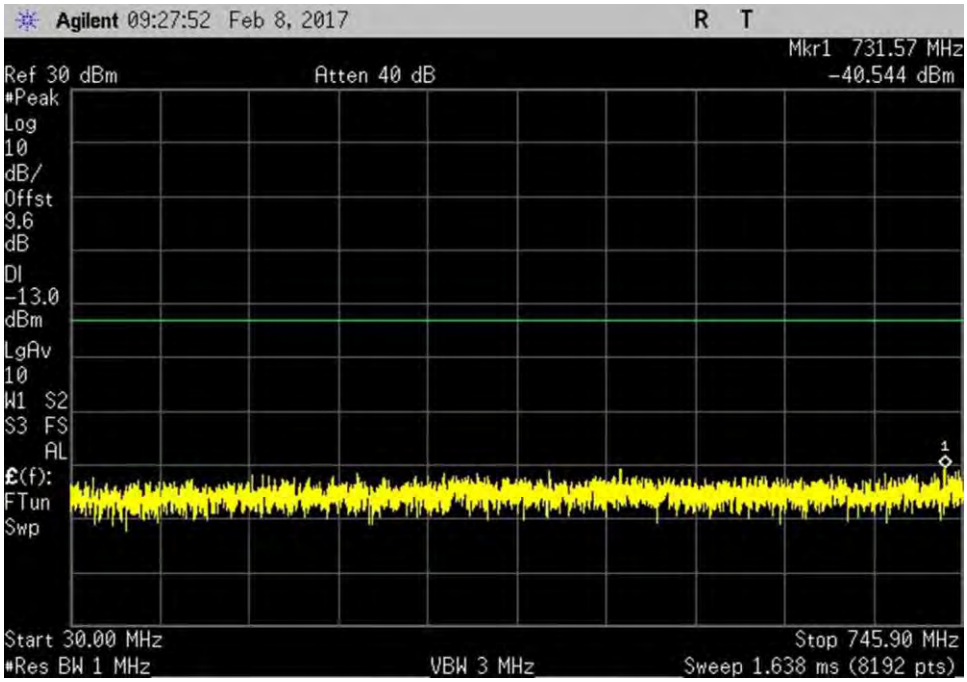
7.6_CSE_DL_728-746MHz_L



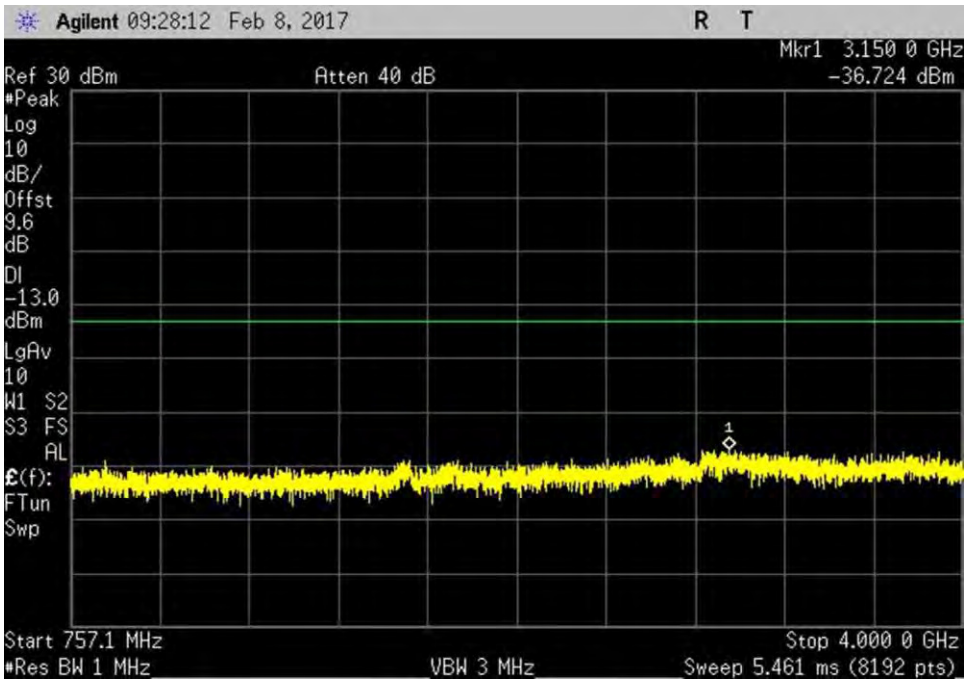
7.6_CSE_DL_728-746MHz_R1



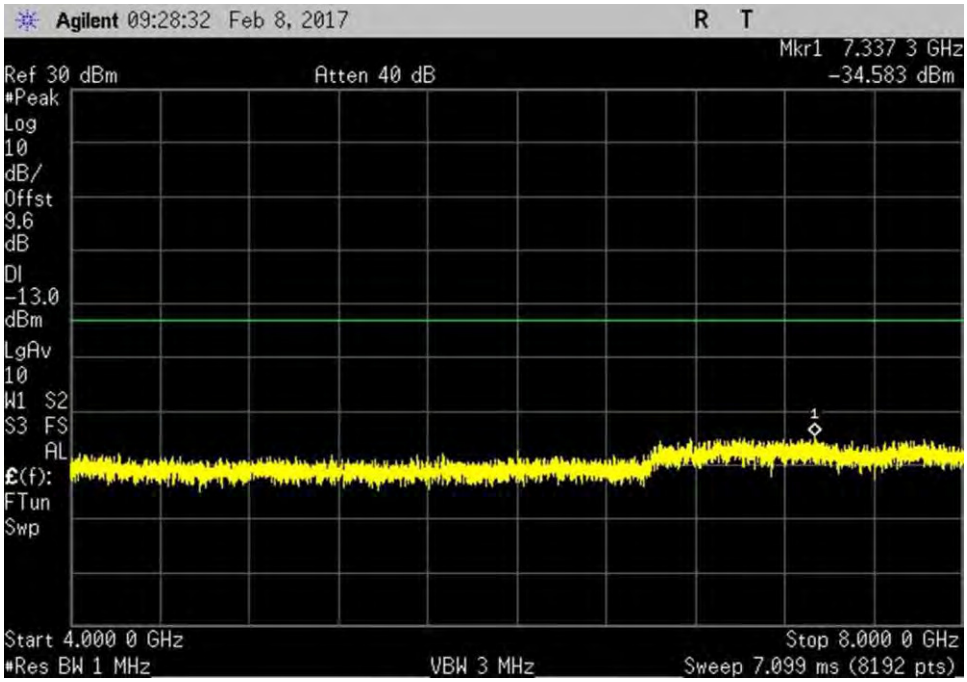
7.6_CSE_DL_728-746MHz_R2



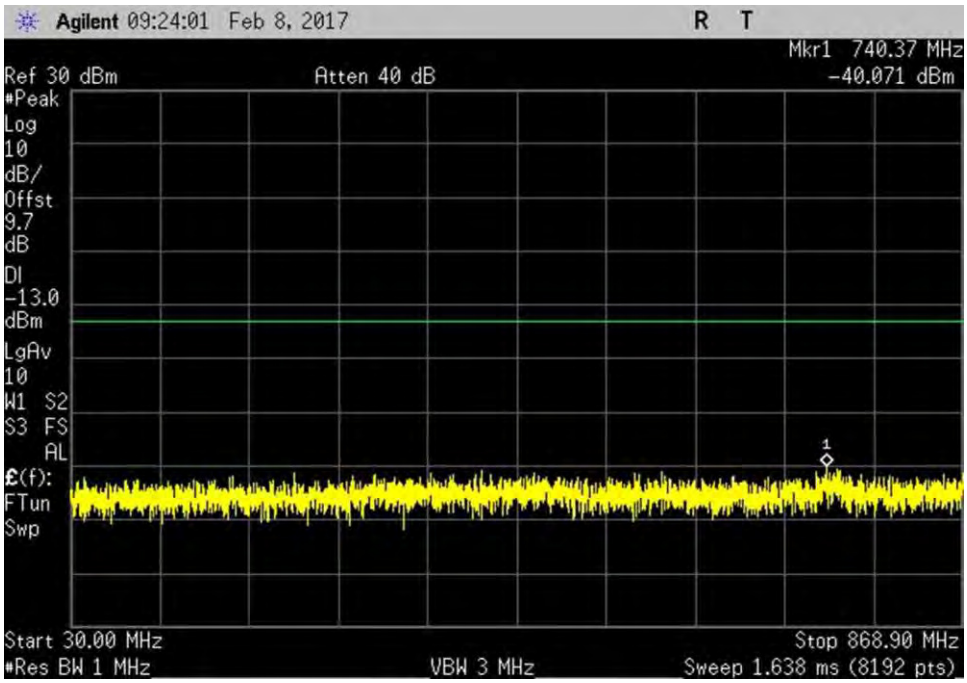
7.6_CSE_DL_746-757MHz_L



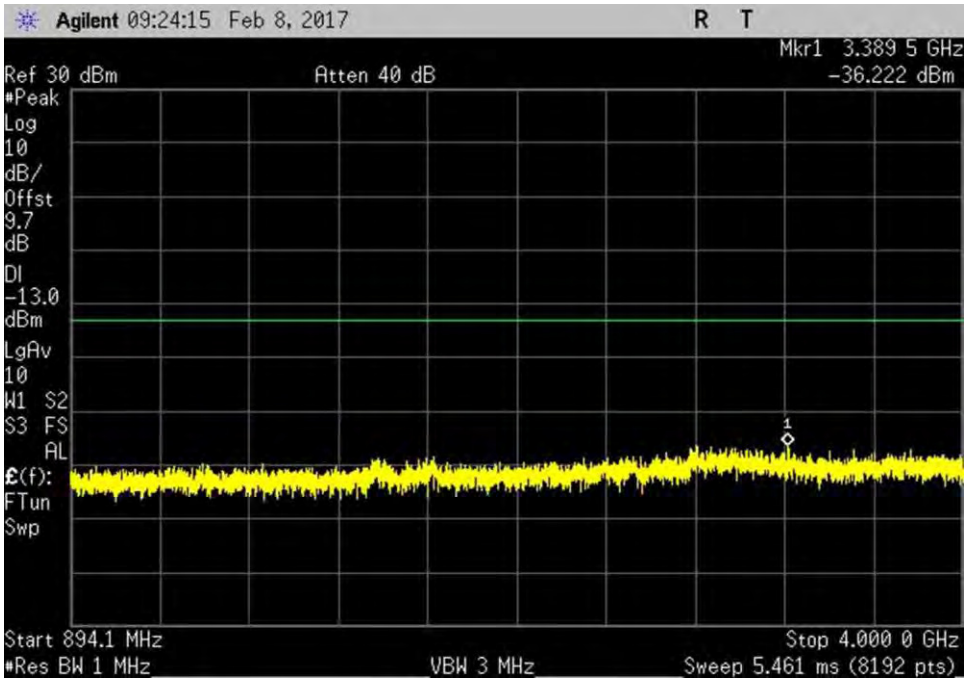
7.6_CSE_DL_746-757MHz_R1



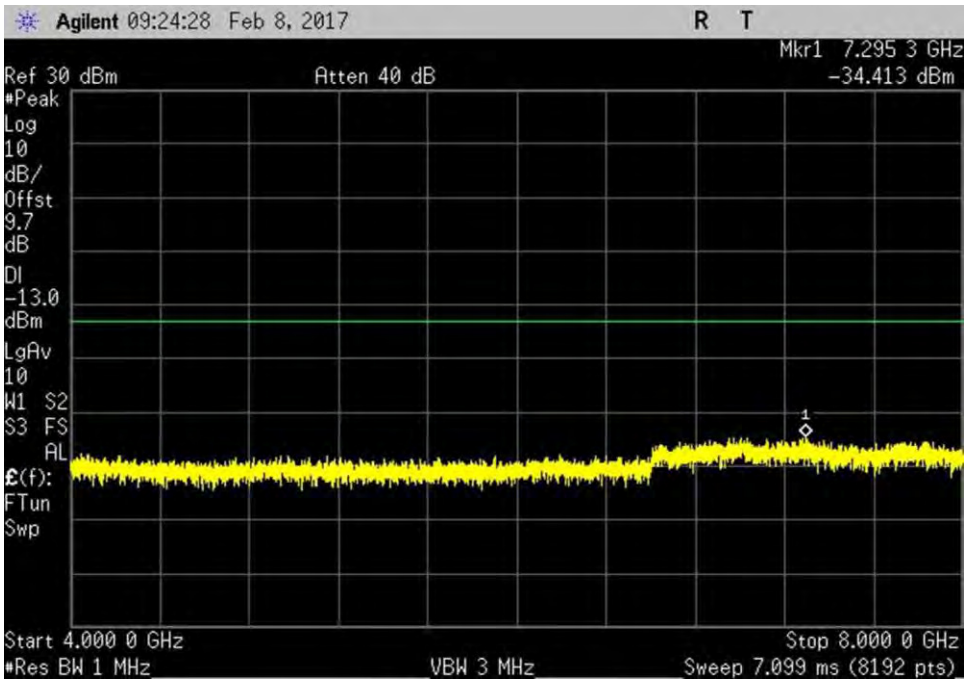
7.6_CSE_DL_746-757MHz_R2



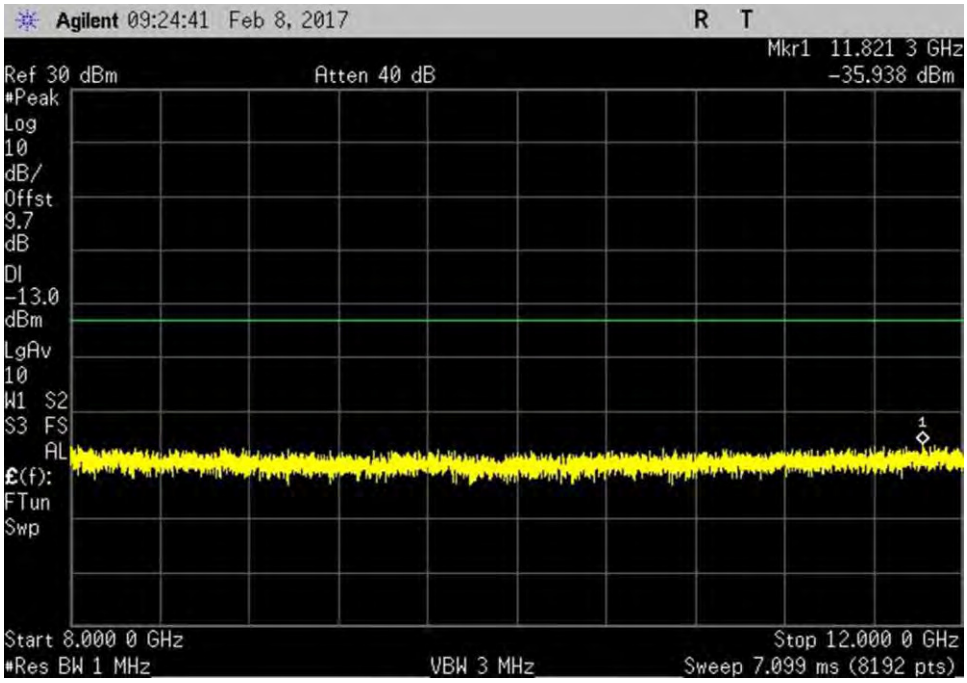
7.6_CSE_DL_869-894MHz_L



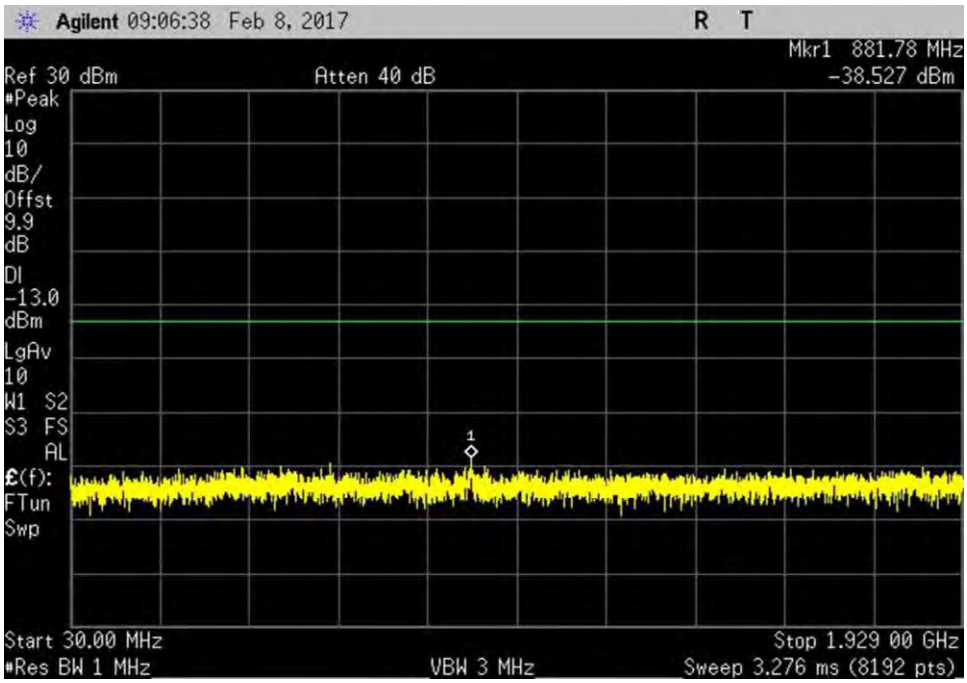
7.6_CSE_DL_869-894MHz_R1



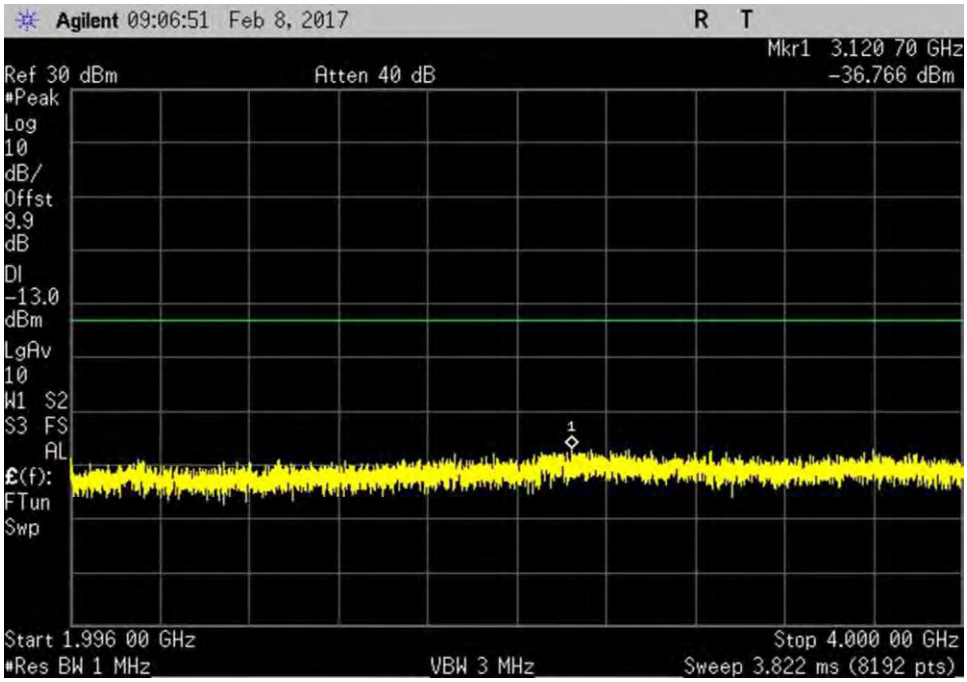
7.6_CSE_DL_869-894MHz_R2



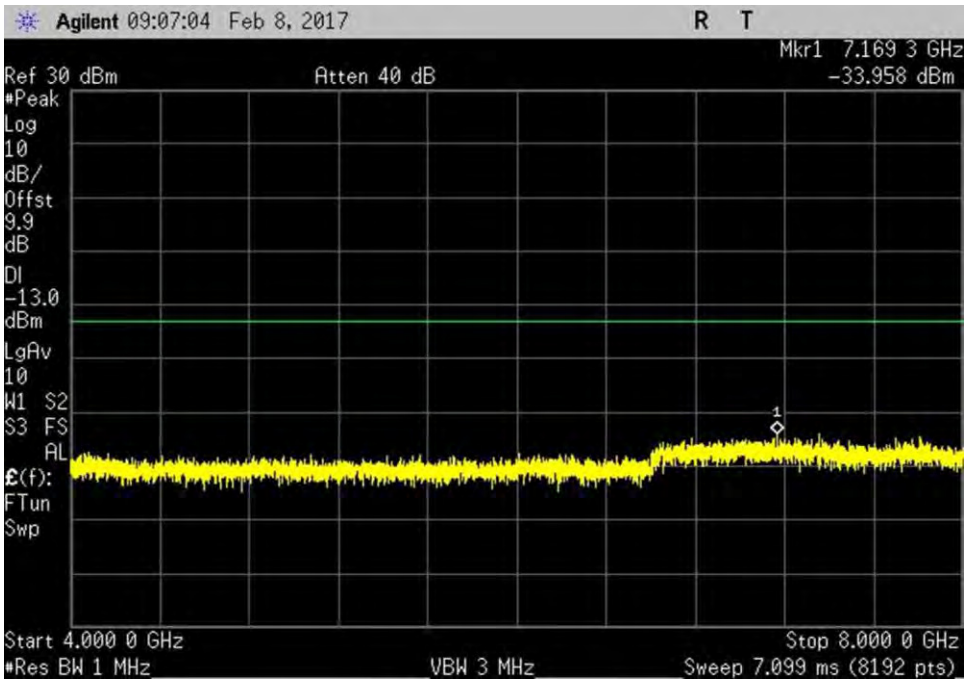
7.6_CSE_DL_869-894MHz_R3



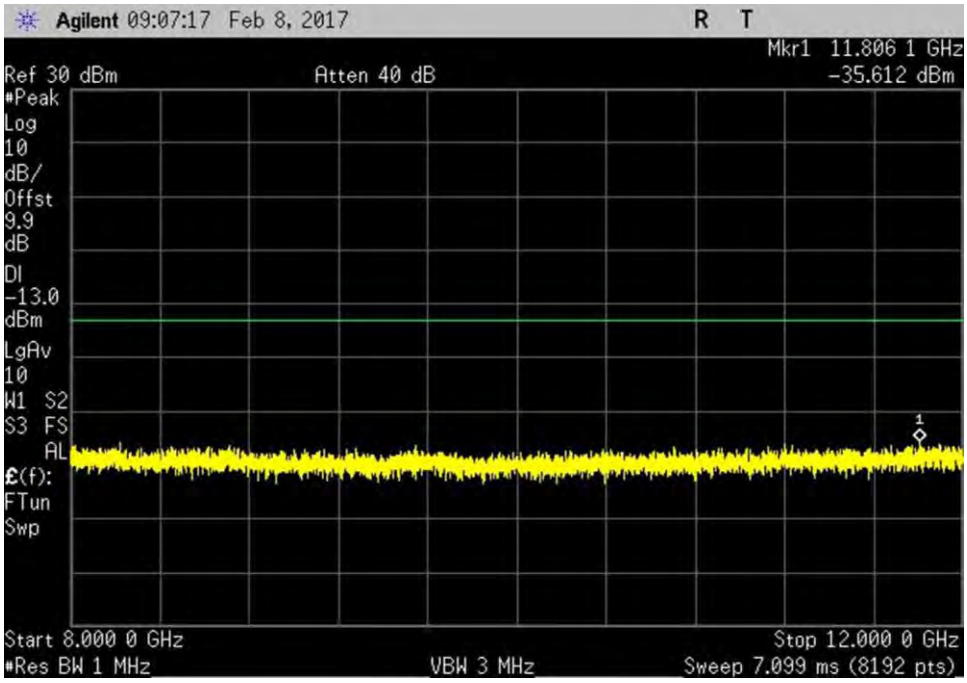
7.6_CSE_DL_1930-1995MHz_L



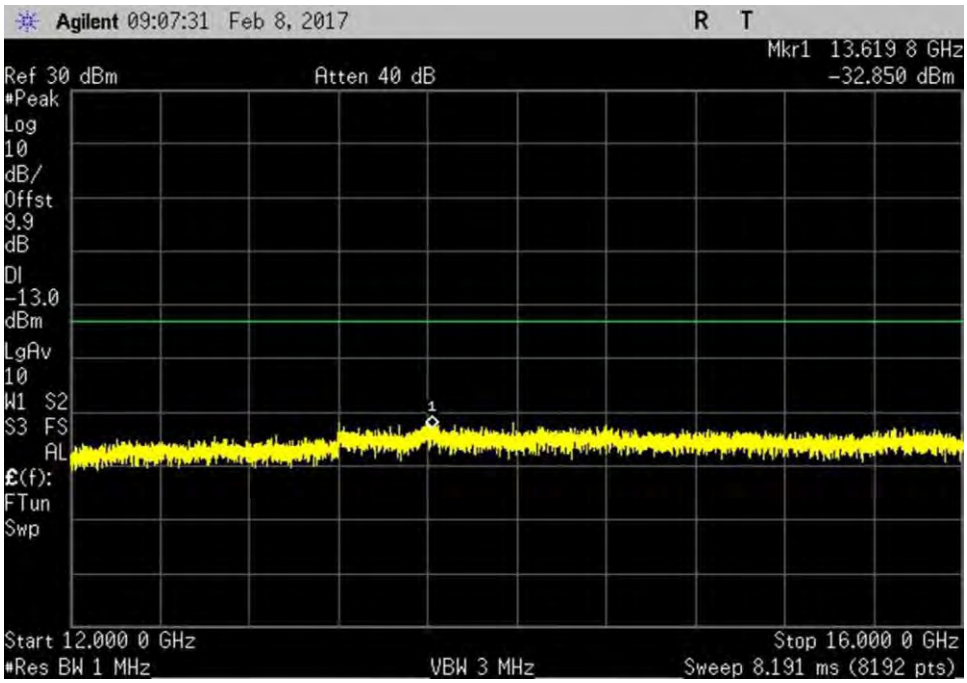
7.6_CSE_DL_1930-1995MHz_R1



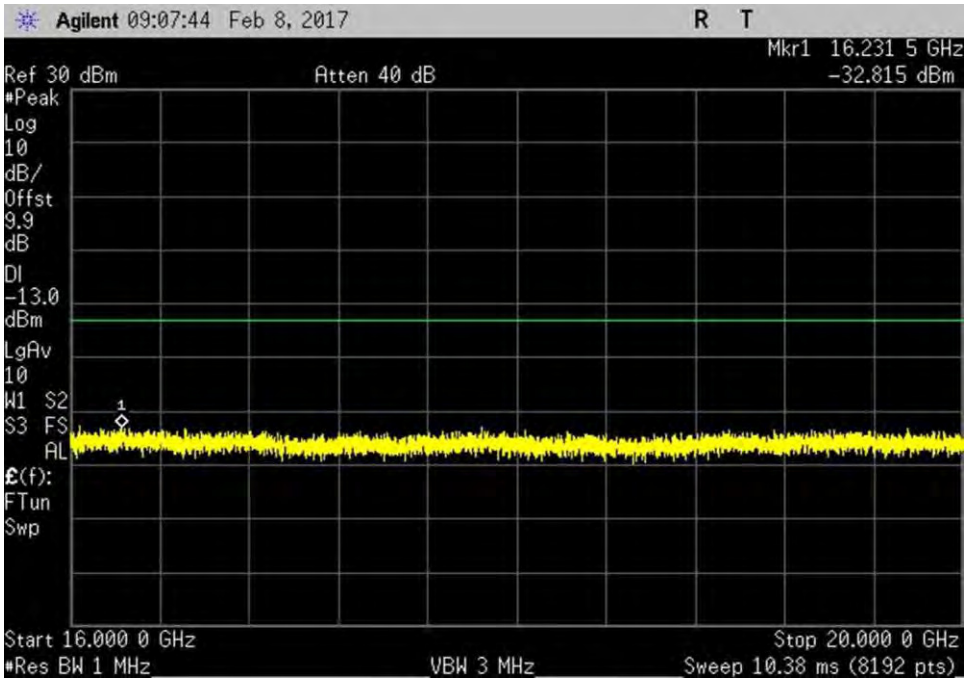
7.6_CSE_DL_1930-1995MHz_R2



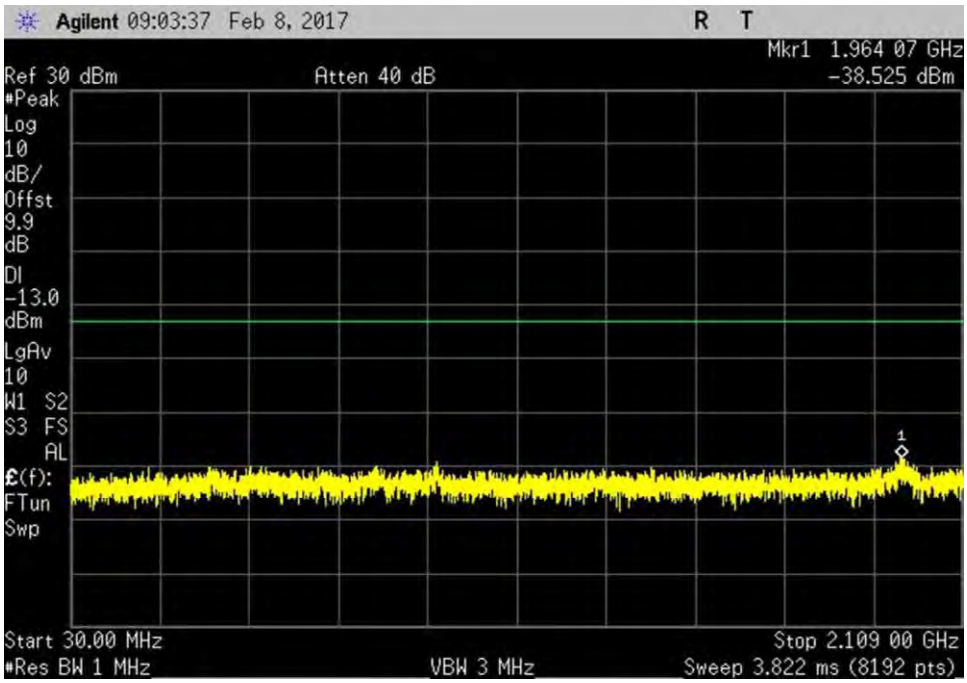
7.6_CSE_DL_1930-1995MHz_R3



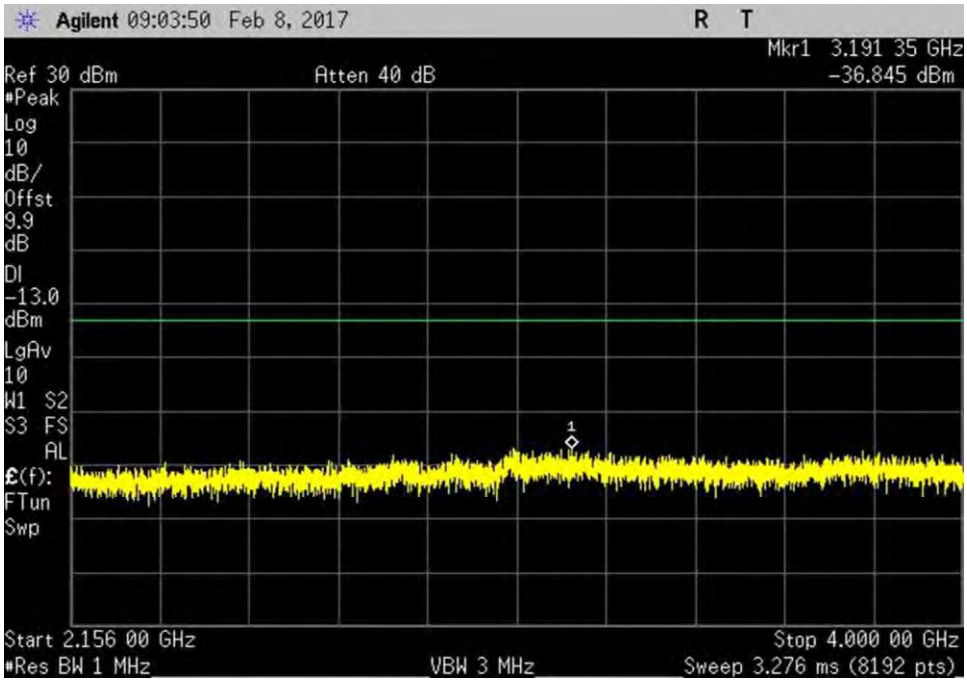
7.6_CSE_DL_1930-1995MHz_R4



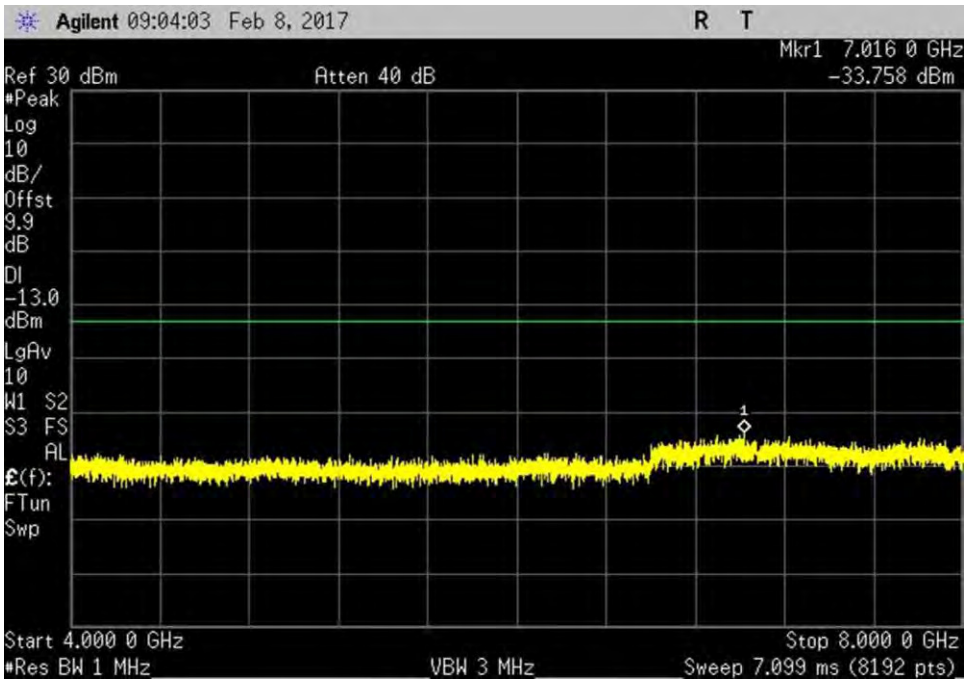
7.6_CSE_DL_1930-1995MHz_R5



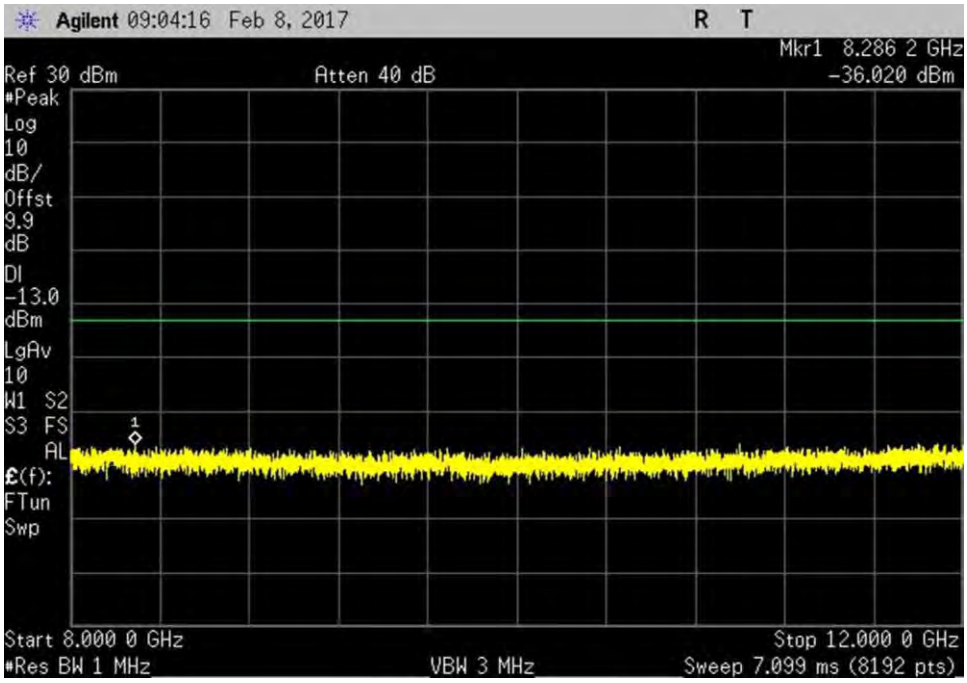
7.6_CSE_DL_2110-2155MHz_L



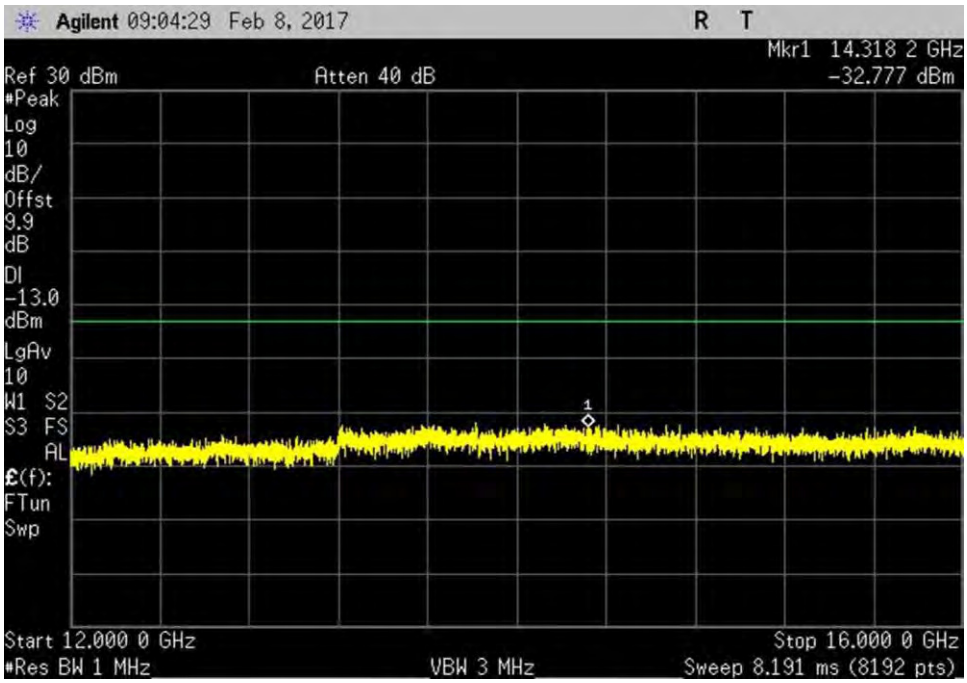
7.6_CSE_DL_2110-2155MHz_R1



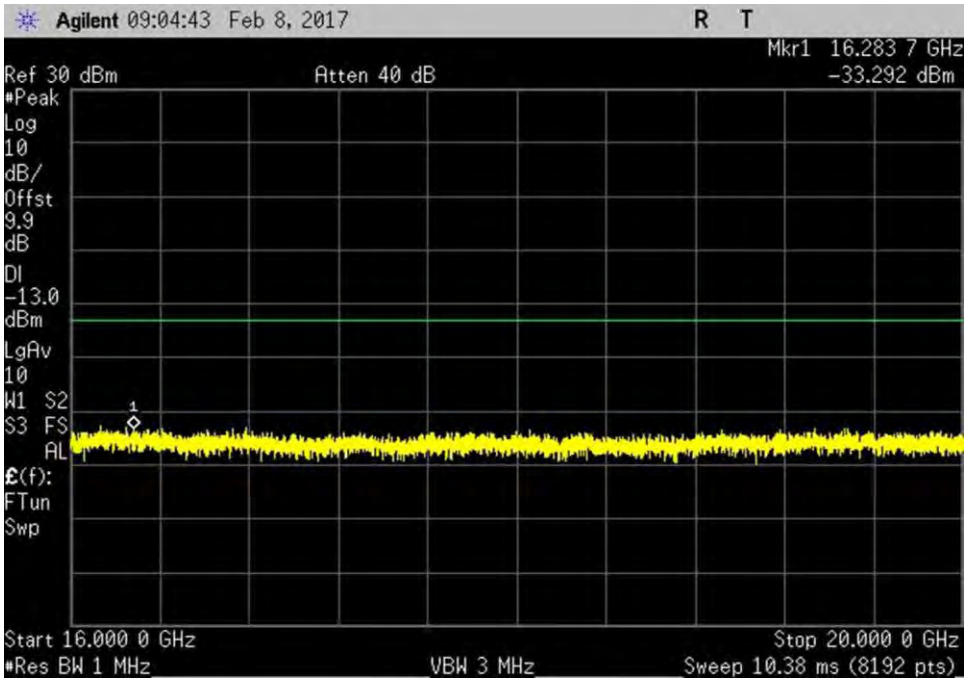
7.6_CSE_DL_2110-2155MHz_R2



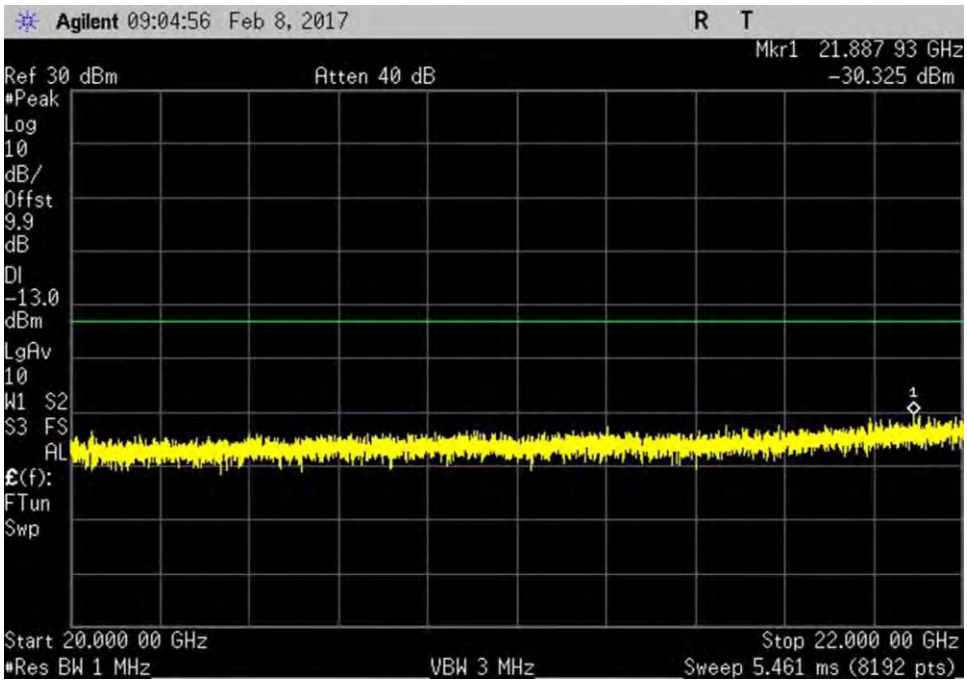
7.6_CSE_DL_2110-2155MHz_R3



7.6_CSE_DL_2110-2155MHz_R4



7.6_CSE_DL_2110-2155MHz_R5



7.6_CSE_DL_2110-2155MHz_R6

7.7 Noise limit

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	Huaptec		
Specification:	**7.7 Noise Limit (Maximum Transmitter Noise Power Level / Variable UL Noise Timing)**		
Work Order #:	**99439**	Date:	2/8/2017
Test Type:	**Conducted Emissions**	Time:	9:45:00 AM
Tested By:	**Daniel Bertran**	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is a Fixed Wideband Consumer Booster.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Server port is a type N connector and 50-ohm impedance.
The EUT Donor port is type N connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

The test was performed in accordance with section 7.7 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016.
Firmware: AF17-5S-V02

Test environment conditions:
Temperature: 22°C
Relative Humidity: 50%
Pressure: 101.5 kPa

Note:
7.7.1 Maximum Transmitter Noise Power Level
Per figure 3, input port was terminated with 50 Ohm Pasternack load (MN: PE6187 and SN: 1443).
Input donor port was terminated with 50 Ohm Pasternack load via a 75/50 Ohm impedance matching pad.

7.7.2 Variable UL Noise Timing
Per figure 4, server port was terminated with 50 Ohm Pasternack load (MN: PE6187 and SN: 1443).

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
AN03418	Signal Generator	E4438C	7/30/2015	7/30/2017
ANP06467	Attenuator	PE7014-10	5/13/2015	5/13/2017
ANP06897	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP06898	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP05411	Attenuator	54A-10	1/18/2016	1/18/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018

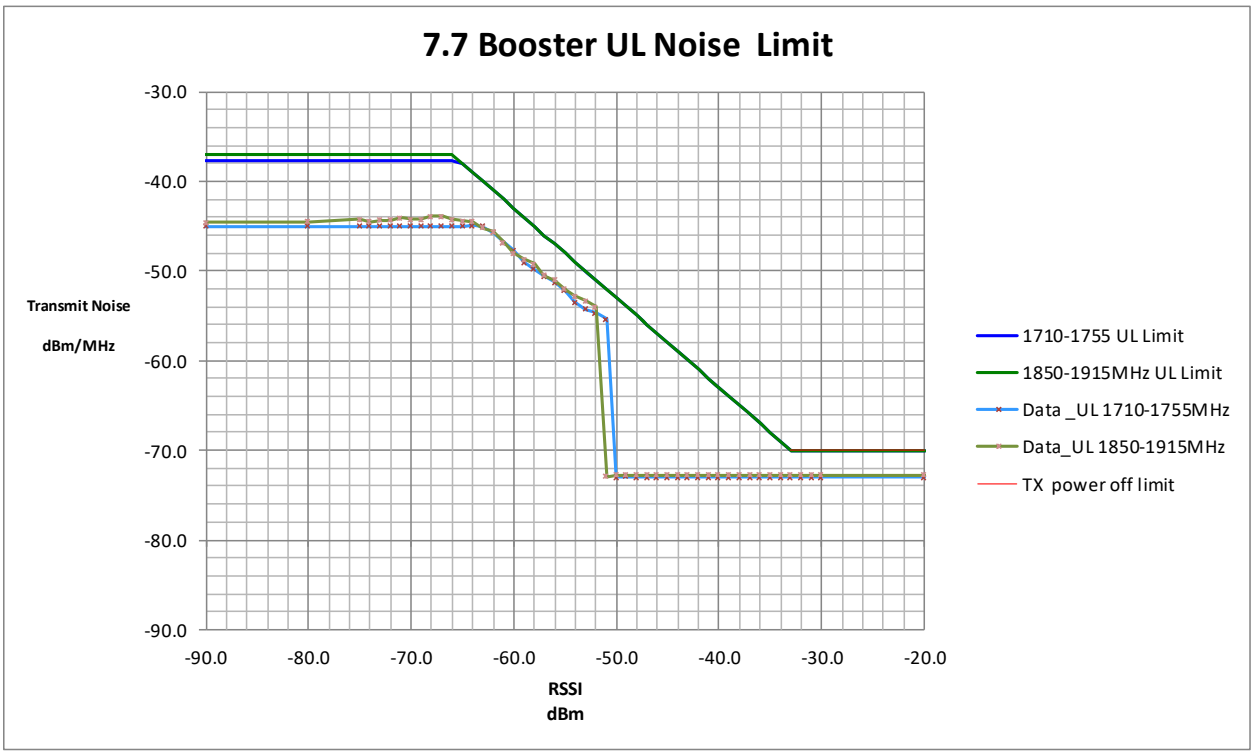
Summary of Results

7.7.1 Maximum transmitter noise power level

- 7.7.1 a-g: Maximum transmitter noise with 50-ohm shielded load

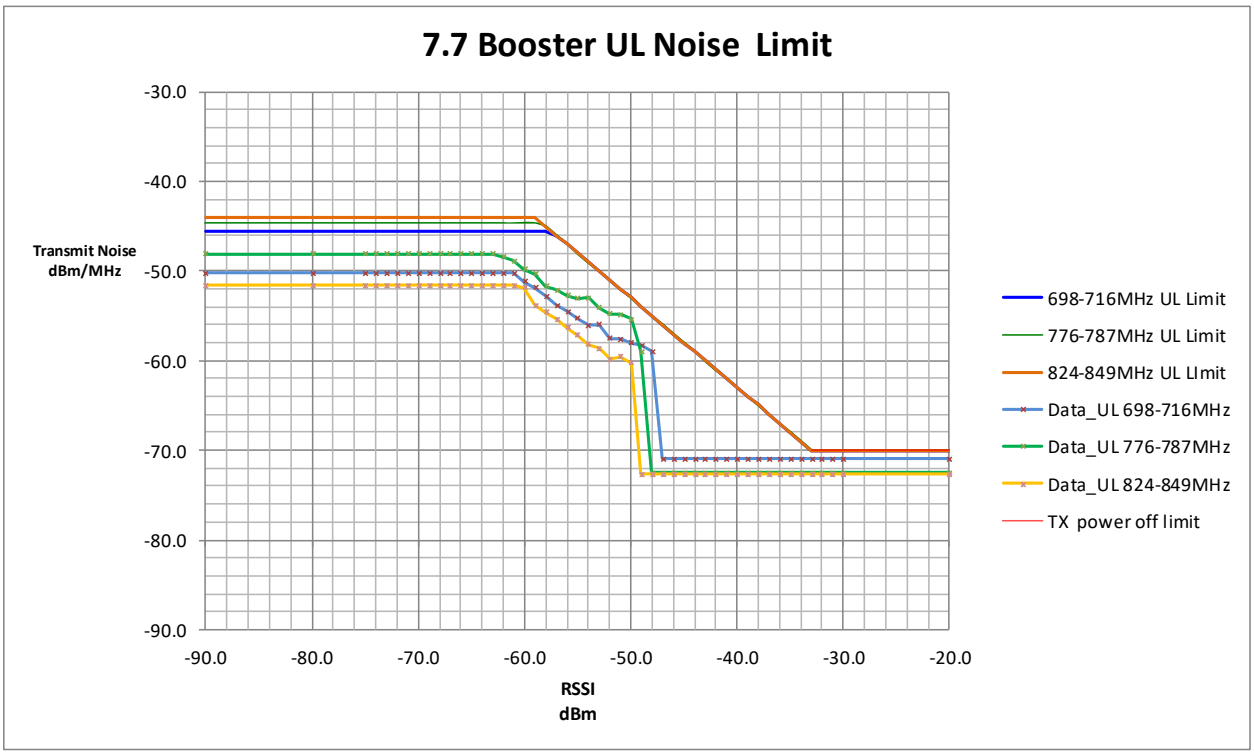
Maximum Noise Power			
Frequency	**Measured**	**Limit**	**Margin**
MHz	**dBm./MHz**	**dBm/MHz**	
UL 1710-1755	-46.4	-37.7	-8.7
UL 1850-1915	-45.0	-37.0	-8.0
UL 824-849	-51.8	-44.1	-7.7
UL 698-716	-50.6	-45.5	-5.1
UL 776-787	-49.6	-44.6	-5.0
DL 2110-2155	-47.2	-37.7	-9.5
DL 1930-1995	-45.9	-37.0	-8.9
DL 869-894	-50.6	-44.1	-6.5
DL 728-746	-50.2	-45.5	-4.7
DL 746-757	-51.7	-44.6	-7.1

- 7.7.1 h-n: Maximum transmitter noise when varying the DL signal generator output level with a 4.1MHz AWGN signal


7.7 Booster UL Noise Limit
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
Transmit Noise
dBm/MHz
-90.0
-80.0
-70.0
-60.0
-50.0
-40.0
-30.0
-20.0
RSSI
dBm
1710-1755 UL Limit
1850-1915MHz UL Limit
Data _UL 1710-1755MHz
Data_UL 1850-1915MHz
TX power off limit

1710.0 - 1755.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster Limit	TX off	
-74.0	-45.0	-	-37.7	-	-7.3
-70.0	-45.0	-	-37.7	-	-7.3
-54.0	-53.5	-49.0	-	-	-4.5
-53.0	-54.3	-50.0	-	-	-4.3
-52.0	-54.7	-51.0	-	-	-3.7
-51.0	-55.4	-52.0	-	-	-3.4
-32.0	-73.0	-	-	-70	-3.0

1850.0 - 1915.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster Limit	TX off	
-68.0	-43.9	-	-37.0	-	-6.9
-67.0	-43.9	-	-37.0	-	-6.9
-55.0	-52.0	-48.0	-	-	-4.0
-54.0	-52.8	-49.0	-	-	-3.8
-53.0	-53.3	-50.0	-	-	-3.3
-52.0	-54.0	-51.0	-	-	-3.0
-32.0	-72.8	-	-	-70	-2.8



824.0 - 849.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster Limit	TX off	
-72.0	-51.6		-44.1		-7.5
-65.0	-51.6		-44.1		-7.5
-53.0	-58.6	-50.0			-8.6
-52.0	-59.8	-51.0			-8.8
-51.0	-59.6	-52.0			-7.6
-50.0	-60.3	-53.0			-7.3
-32.0	-72.7			-70	-2.7

698.0 - 716.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster Limit	TX off	
-70.0	-50.2	-	-45.5	-	-4.7
-63.0	-50.2	-	-45.5	-	-4.7
-51.0	-57.6	-52.0	-	-	-5.6
-50.0	-58.0	-53.0	-	-	-5.0
-49.0	-58.3	-54.0	-	-	-4.3
-48.0	-59.0	-55.0	-	-	-4.0
-32.0	-71.0	-	-	-70	-1.0

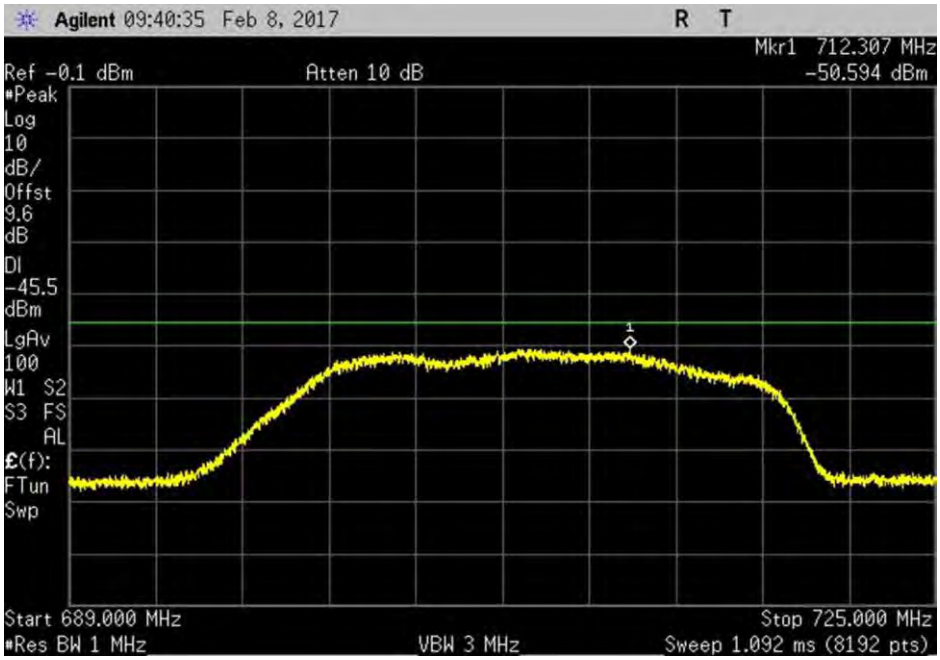
776.0 - 787.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster Limit	TX off	
-71.0	-48.1	-	-44.6	-	-3.5
-65.0	-48.1	-	-44.6	-	-3.5
-54.0	-53.0	-49.0	-	-	-4.0
-52.0	-54.8	-51.0	-	-	-3.8
-51.0	-54.9	-52.0	-	-	-2.9
-50.0	-55.4	-53.0	-	-	-2.4
-32.0	-72.5	-	-	-70	-2.5

7.7.2 Variable uplink noise timing

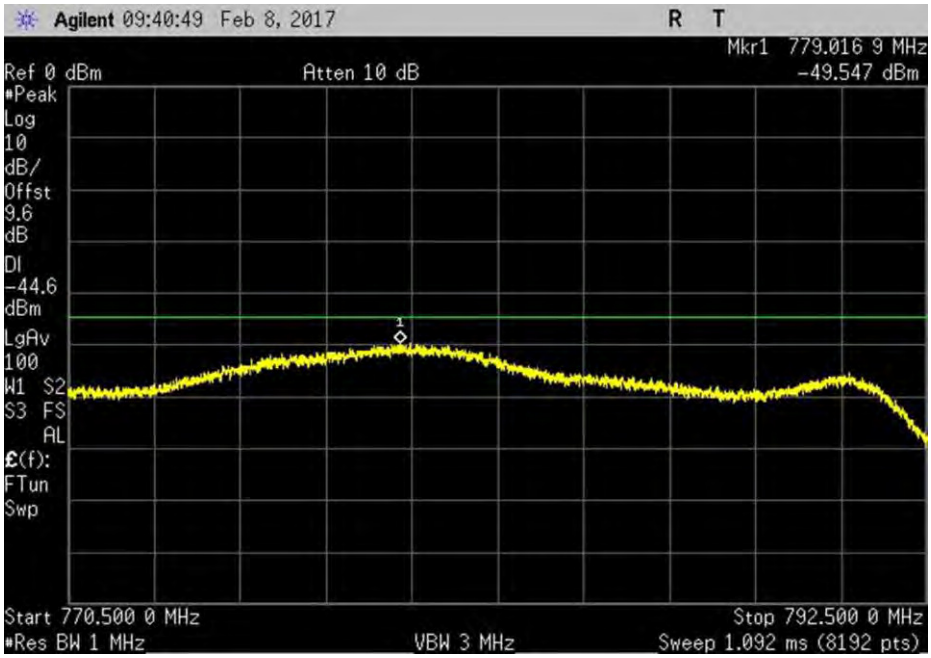
Uplink Noise timing		
Frequency	Measured	Limit
MHz	Sec	sec
UL1710-1755	0.2	3
UL1850-1915	0.3	3
UL824-849	0.2	3
UL 698-716	0.3	3
UL776-787	0.2	3

7.7.1 Maximum Transmitter Noise Power Level

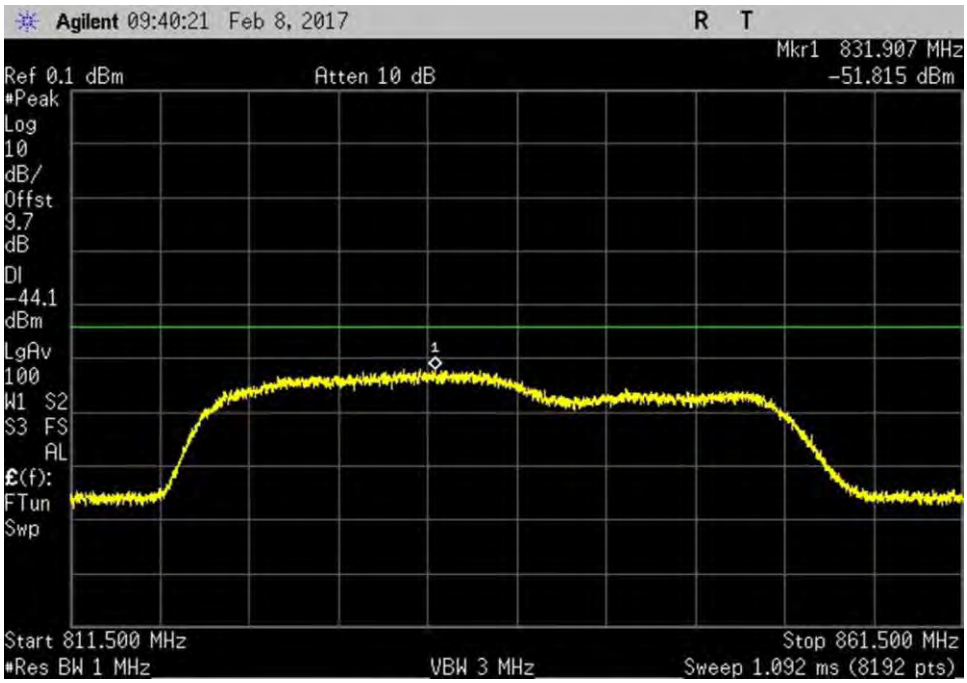
Plots



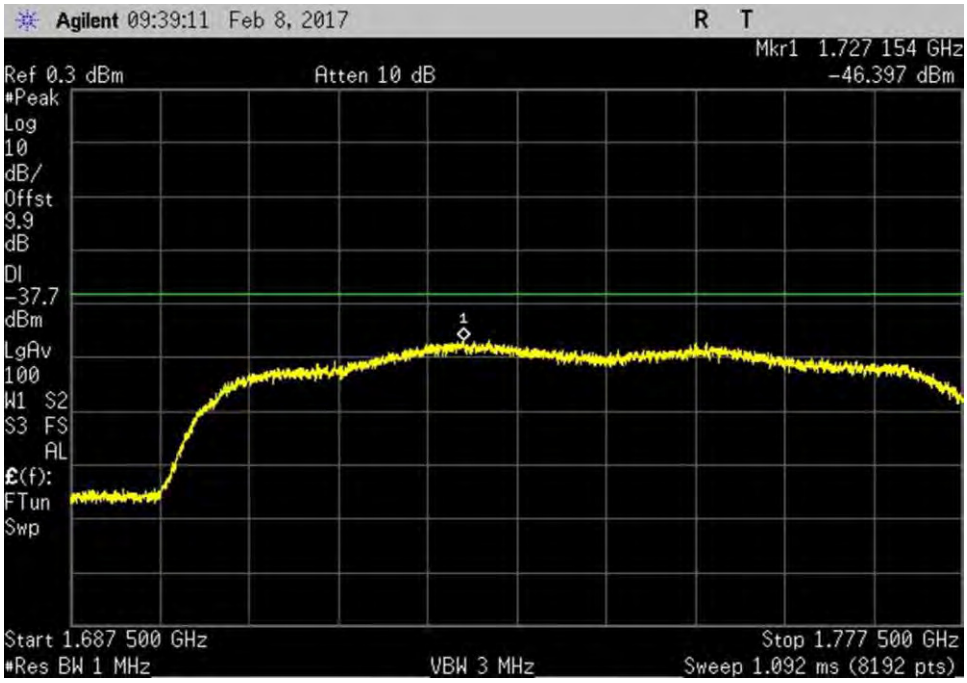
7.7.1_Noise_UL_698-716MHz



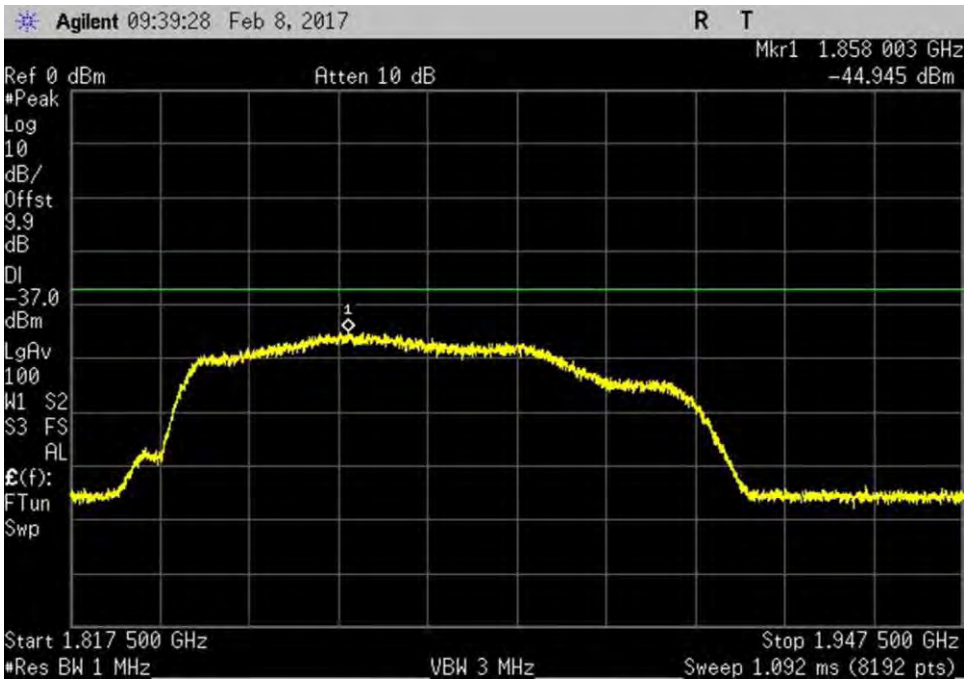
7.7.1_Noise_UL_776-787MHz



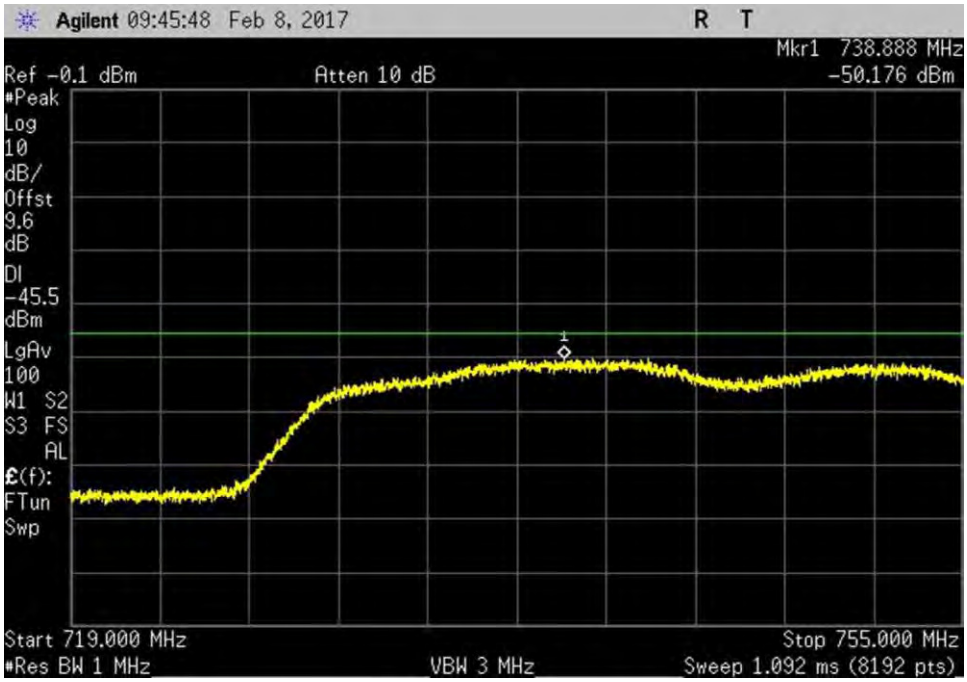
7.7.1_Noise_UL_824-849MHz



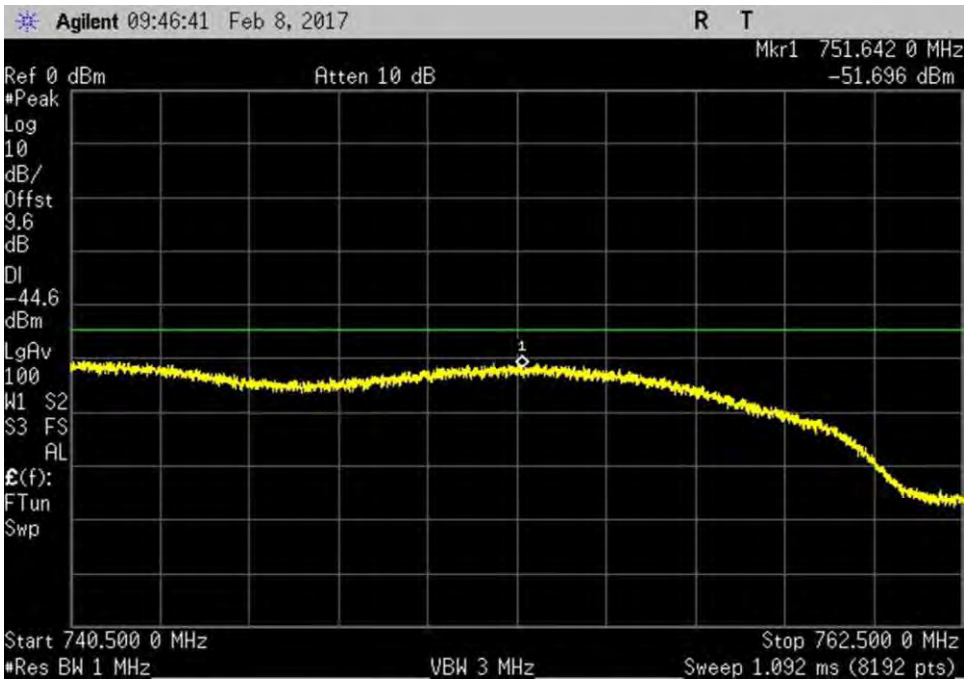
7.7.1_Noise_UL_1710-1755MHz



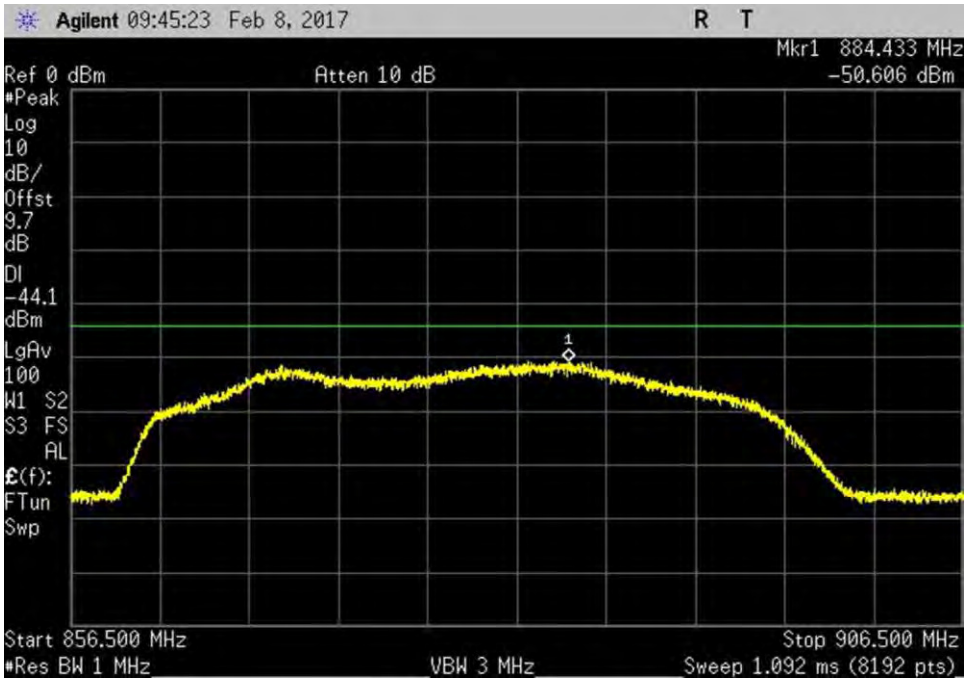
7.7.1_Noise_UL_1850-1915MHz



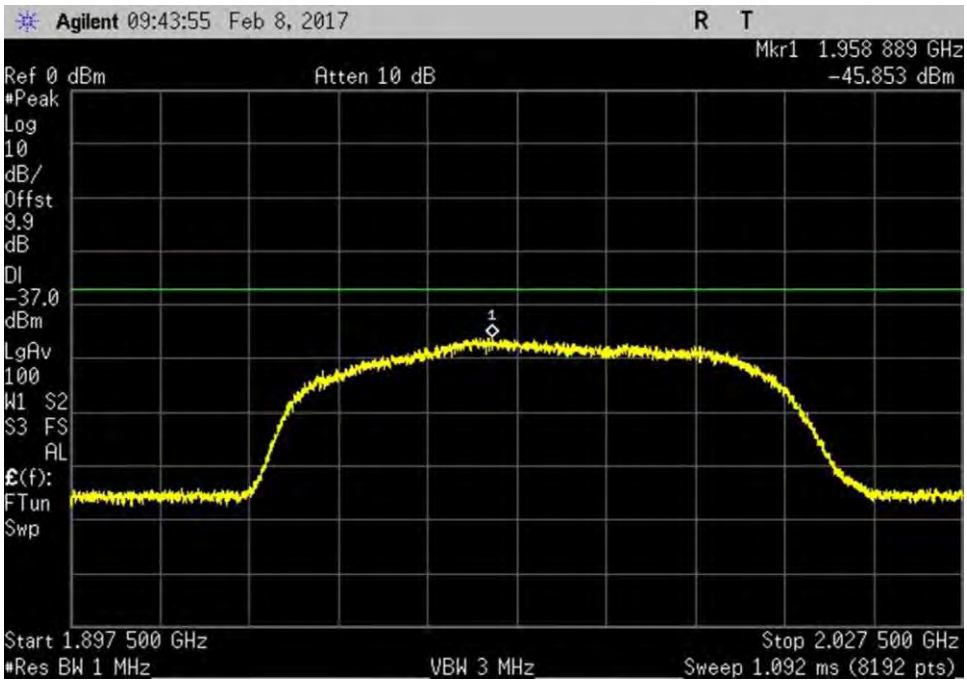
7.7.1_Noise_DL_728-746MHz



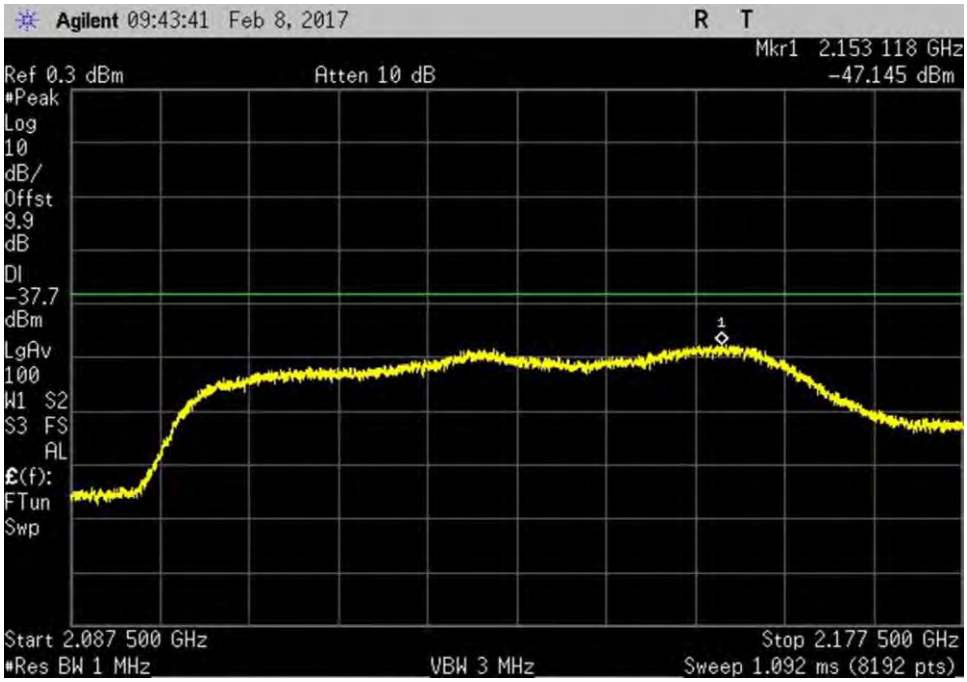
7.7.1_Noise_DL_746-757MHz



7.7.1_Noise_DL_869-894MHz



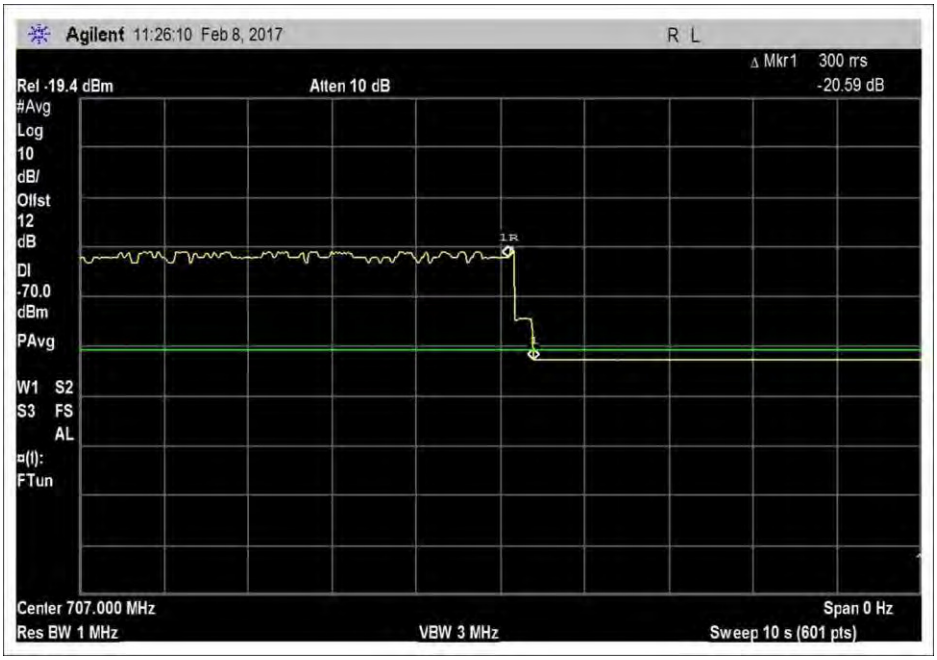
7.7.1_Noise_DL_1930-1995MHz



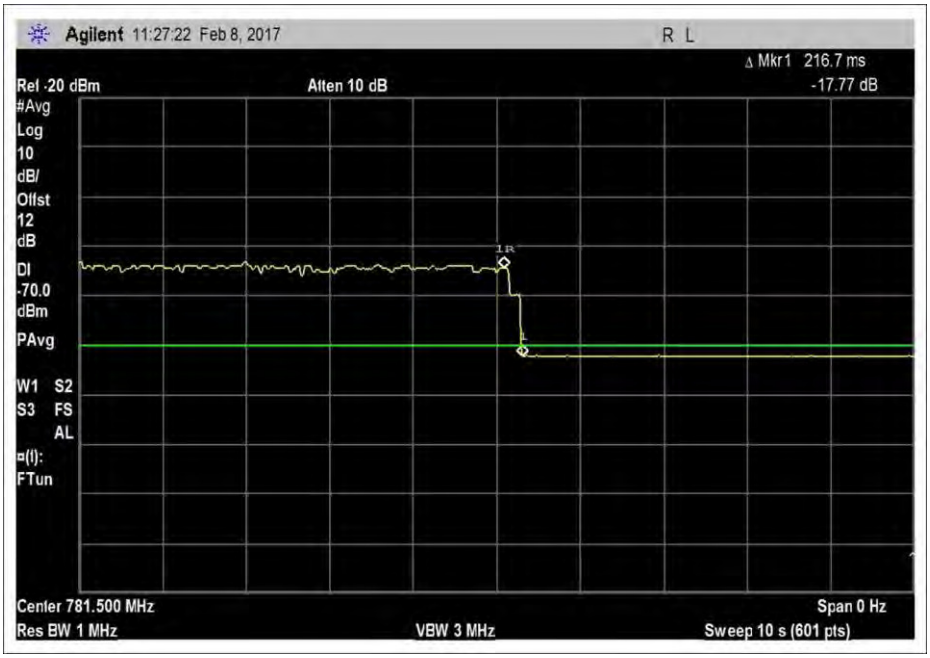
7.7.1_Noise_DL_2110-2155MHz

7.7.2 Variable UL Noise Timing

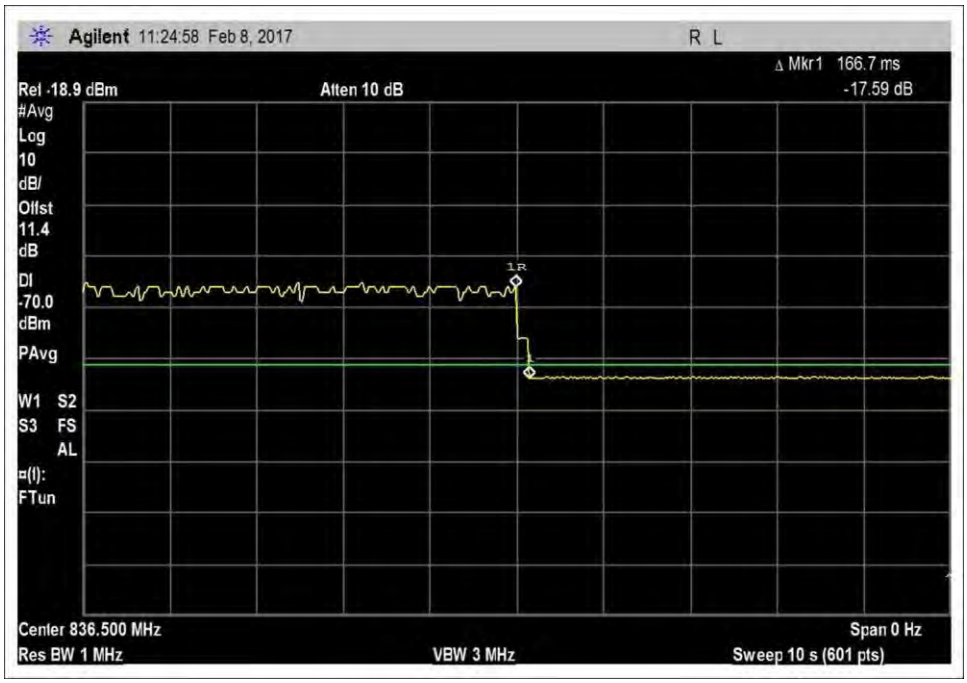
Plots



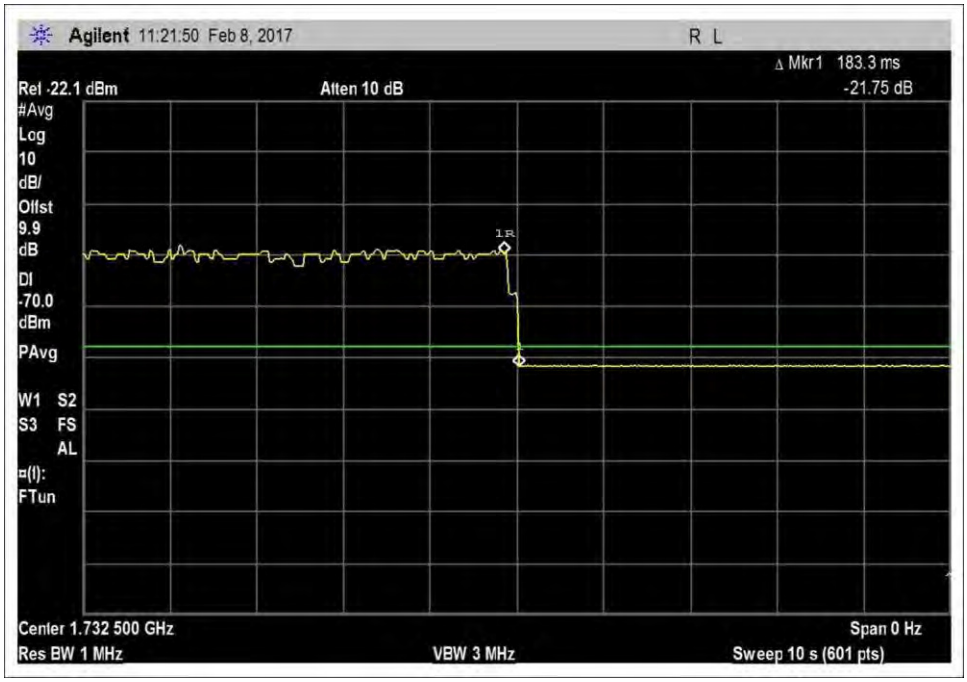
7.7.2_VarNoise_UL_698-716MHz



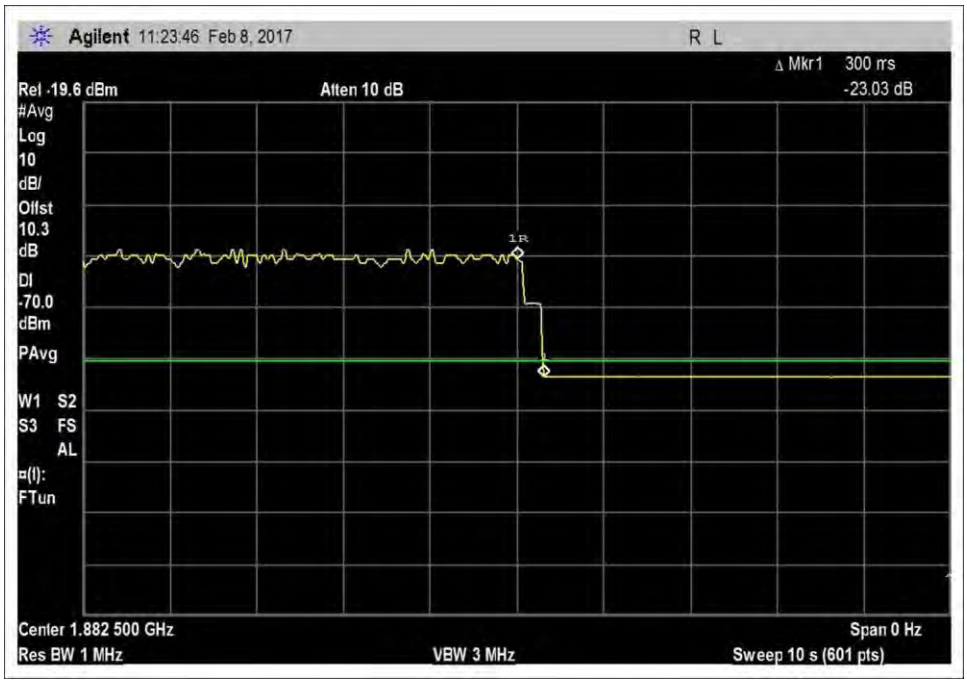
7.7.2_VarNoise_UL_776-787MHz



7.7.2_VarNoise_UL_824-849MHz



7.7.2_VarNoise_UL_1710-1755MHz



7.7.2_VarNoise_UL_1850-1915MHz

7.8 Uplink Inactivity

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	Huaptec		
Specification:	**7.8 Uplink Inactivity**		
Work Order #:	**99439**	Date:	2/8/2017
Test Type:	**Conducted Emissions**	Time:	11:40:00 AM
Tested By:	**Daniel Bertran**	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is a Fixed Wideband Consumer Booster.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Server port is a type N connector and 50-ohm impedance.
The EUT Donor port is type N connector and 50-ohm impedance.
Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

The test was performed in accordance with section 7.8 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016.
Firmware: AF17-5S-V02

Test environment conditions:
Temperature: 22°C
Relative Humidity: 50%
Pressure: 101.5 kPa

Test Equipment:

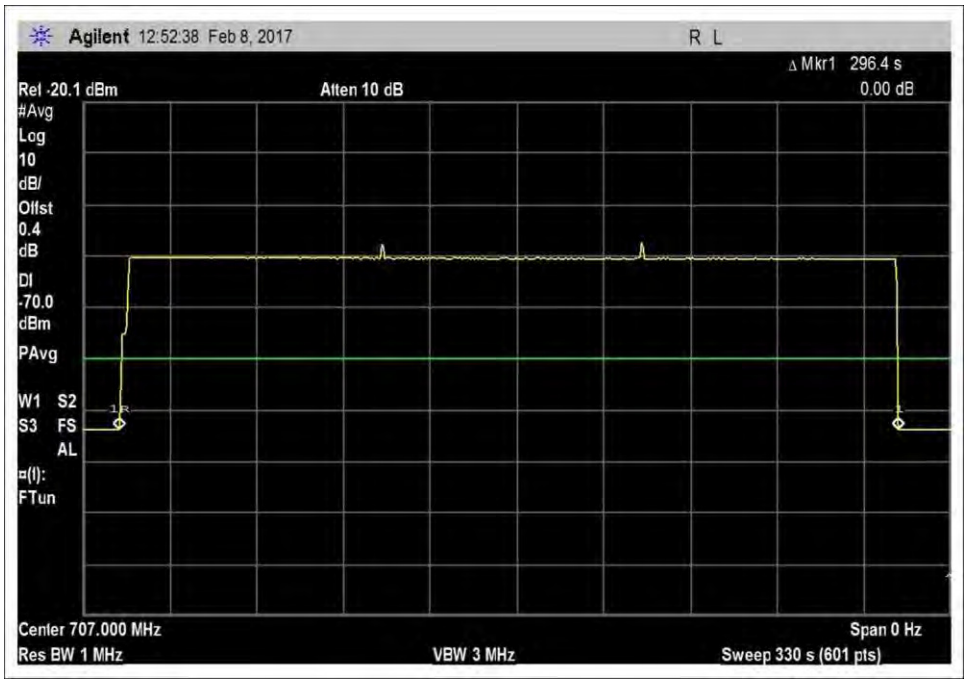
Asset #	Description	Model	Calibration Date	Cal Due Date
AN03418	Signal Generator	E4438C	7/30/2015	7/30/2017
ANP06467	Attenuator	PE7014-10	5/13/2015	5/13/2017
ANP06897	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP06898	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP05411	Attenuator	54A-10	1/18/2016	1/18/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018

Summary of Results

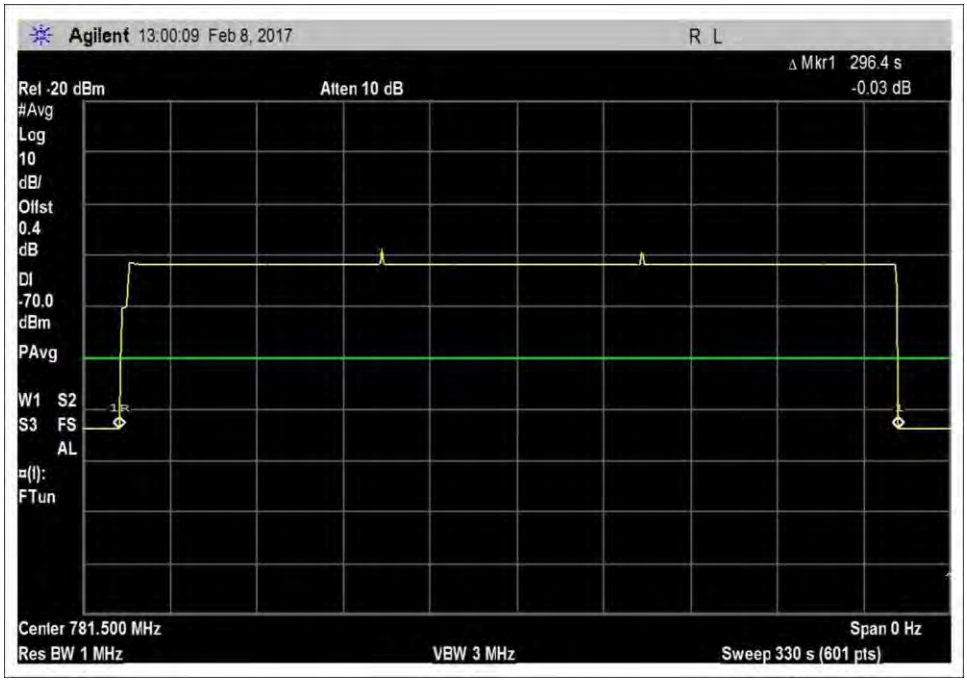
Pass: As demonstrated, when the booster is not serving an active device connection after 5 minutes the uplink noise power does not exceed -70dBm/MHz

Uplink Inactivity		
Frequency	**Measured**	**Limit**
MHz	**Min**	**Min**
UL 698-716	4.9	5.0
UL776-787	4.9	5.0
UL824-849	4.9	5.0
UL1710-1755	4.9	5.0
UL1850-1915	4.9	5.0

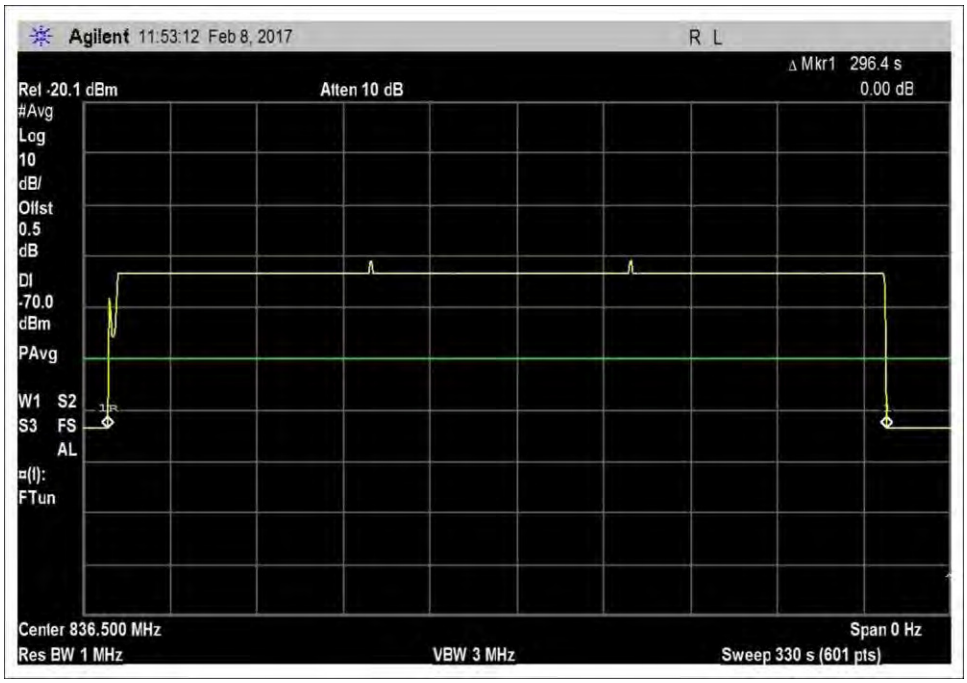
Plots



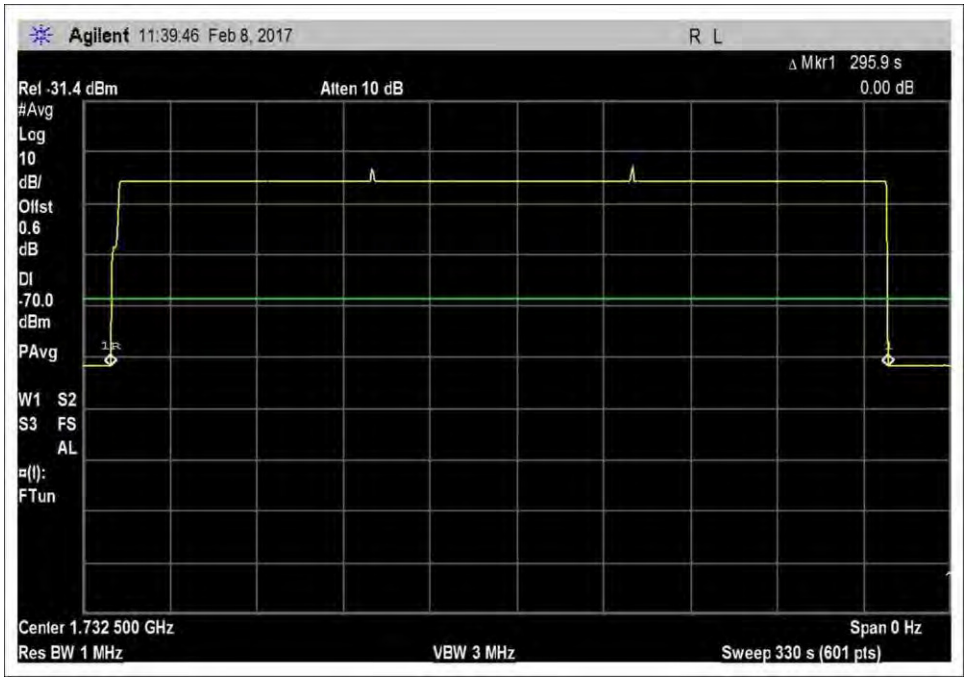
7.8_InactivityUL_698-716MHz



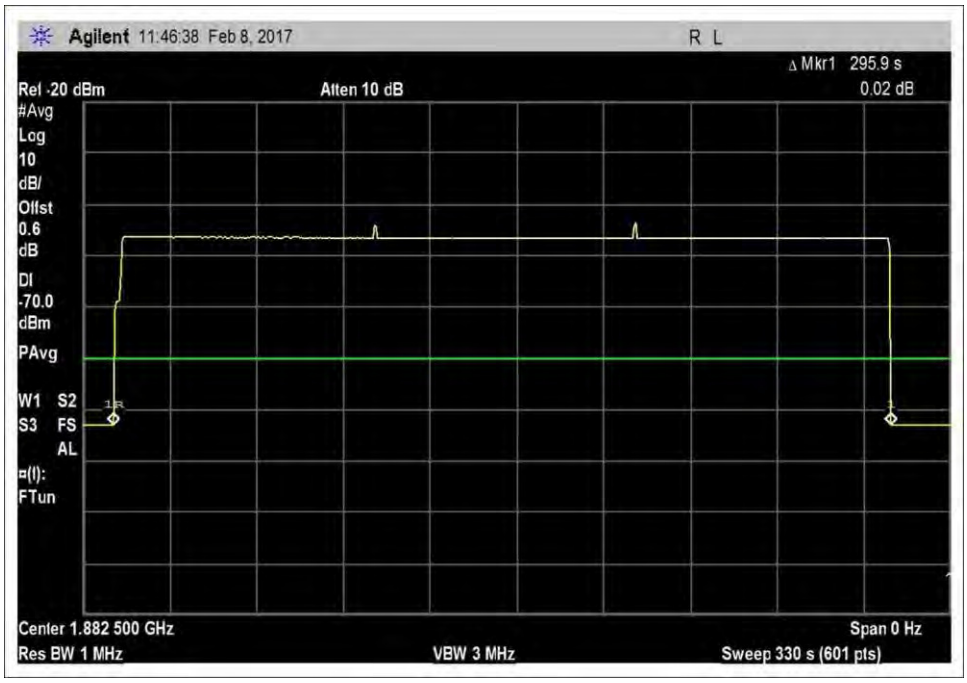
7.8_InactivityUL_776-787MHz



7.8_InactivityUL_824-849MHz



7.8_Inactivity_UL_1710-1755MHz



7.8_InactivityUL_1850-1915MHz

7.9 Booster Gain Limit

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	Huaptec		
Specification:	**7.9 Variable Booster gain(Max Gain / Variable Uplink Gain Timing)**		
Work Order #:	**99439**	Date:	2/8/2017
Test Type:	**Conducted Emissions**	Time:	2:53:00 PM
Tested By:	**Daniel Bertran**	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is a Fixed Wideband Consumer Booster.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Server port is a type N connector and 50-ohm impedance.
The EUT Donor port is type N connector and 50-ohm impedance.
Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

The test was performed in accordance with section 7.9 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016.
Firmware: AF17-5S-V02

Test environment conditions:
Temperature: 22°C
Relative Humidity: 50%
Pressure: 101.5 kPa

Used MSCL* provided by the manufacturer's antenna kitting.

***Mobile station coupling loss (MSCL):** the minimum coupling loss (in dB) between the wireless device and the input (server) port of the consumer booster. MSCL must be calculated or measured for each band of operation and provided in compliance test reports. MSCL includes the path loss from the wireless device, and the booster's server antenna gain and cable loss. The wireless device is assumed to be an isotropic (0 dBi) antenna reference. Minimum standoff distances from inside wireless devices to the booster's server antenna must be reasonable and specified by the manufacturer in customer provided installation manuals.

L P = 20logf + 20logd – 27.5

Where:

L P = basic free space path loss,
f = Center frequency,
d = 1.8 meters.

MSCL

Frequency (MHz)	MSCL (dB)
1850-1915	43.7
824-849	37.7
698-716	36.2
779-787	37.1
1710-1755	43.0

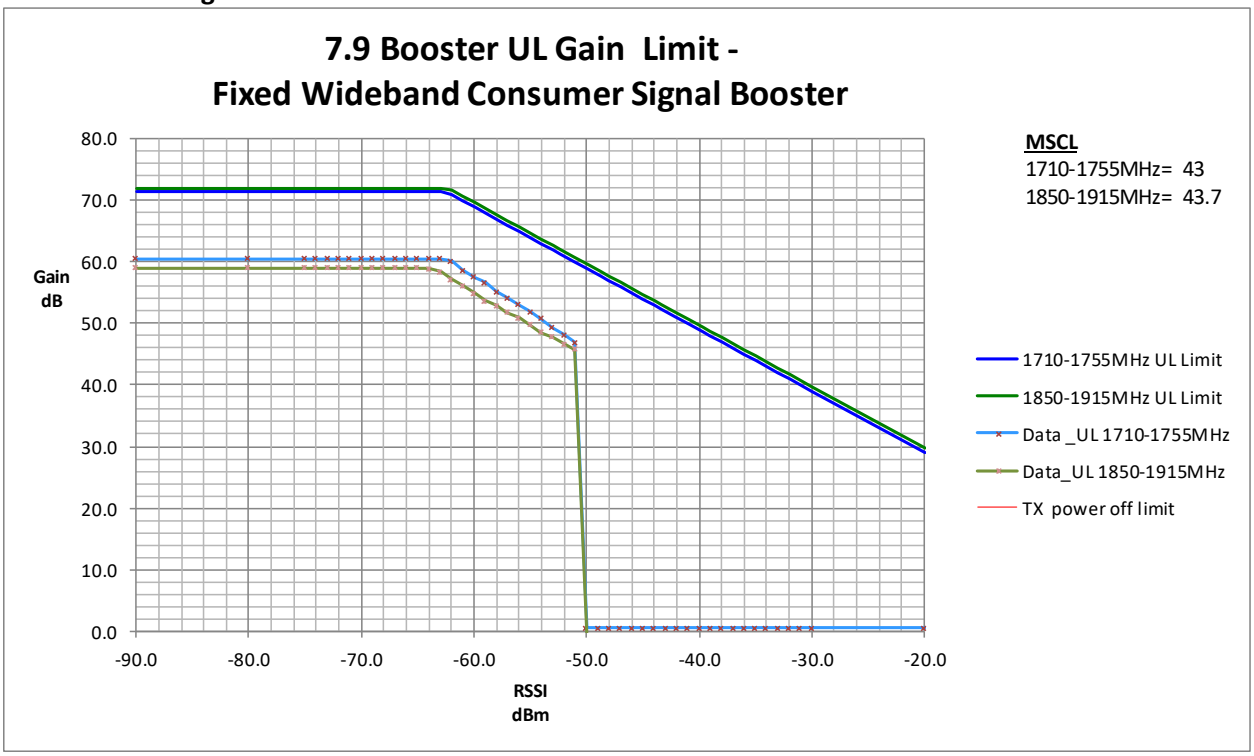
Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
AN03418	Signal Generator	E4438C	7/30/2015	7/30/2017
ANP06467	Attenuator	PE7014-10	5/13/2015	5/13/2017
ANP06897	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP06898	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP05411	Attenuator	54A-10	1/18/2016	1/18/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018

Summary of Results

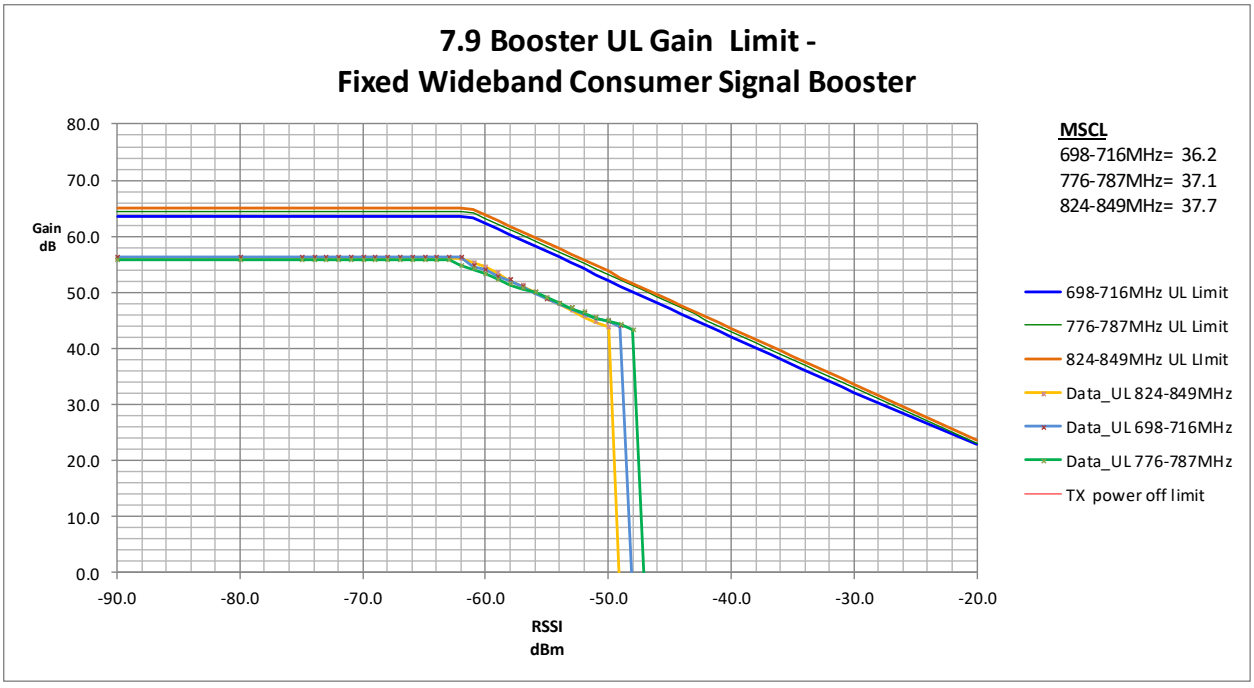
Pass: As demonstrated, computed gains are within the gain limit. All maximum variable uplink gain timings are within 3 second limit.

7.9.1 Maximum gain



1850.0 - 1915.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	RSSI Dependent	Fixed Booster Limit	TX off	
-73.0	-46	13	59.0	-	72.0	-	-13.0
-67.0	-46	13	59.0	-	72.0	-	-13.0
-62.0	-46	11.1	57.1	71.7	-	-	-14.6
-61.0	-46	10.1	56.1	70.7	-	-	-14.6
-60.0	-46	8.9	54.9	69.7	-	-	-14.8
-58.0	-46	6.9	52.9	67.7	-		-14.8

1710.0 - 1755.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	RSSI Dependent	Fixed Booster Limit	TX off	
-71.0	-47.5	13	60.5	-	71.3	-	-10.8
-66.0	-47.5	13	60.5	-	71.3	-	-10.8
-62.0	-47.5	12.6	60.1	71.0	-	-	-10.9
-61.0	-47.5	11.1	58.6	70.0	-	-	-11.4
-60.0	-47.5	10	57.5	69.0	-	-	-11.5
-59.0	-47.5	9.1	56.6	68.0	-	-	-11.4



824.0 -849.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	RSSI Dependent	Fixed Booster Limit	TX off	
-72.0	-43.0	13.0	56.0		64.9		-8.9
-67.0	-43.0	13.0	56.0		64.9		-8.9
-61.0	-43.0	12.2	55.2	64.7			-9.5
-60.0	-43.0	11.5	54.5	63.7			-9.2
-59.0	-43.0	10.4	53.4	62.7			-9.3
-58.0	-43.0	9.2	52.2	61.7			-9.5

698.0 - 716.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	RSSI Dependent	Fixed Booster Limit	TX off	
-74.0	-43.5	12.8	56.3		63.5		-7.2
-68.0	-43.5	12.8	56.3		63.5		-7.2
-53.0	-43.5	3.6	47.1	55.2			-8.1
-51.0	-43.5	1.9	45.4	53.2			-7.8
-50.0	-43.5	1.3	44.8	52.2			-7.4
-49.0	-43.5	0.4	43.9	51.2			-7.3

776.0 - 787.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	RSSI Dependent	Fixed Booster Limit	TX off	
-71.0	-42.5	13.2	55.7		64.4		-8.7
-64.0	-42.5	13.2	55.7		64.4		-8.7
-51.0	-42.5	2.9	45.4	54.1			-8.7
-50.0	-42.5	2.4	44.9	53.1			-8.2
-49.0	-42.5	1.8	44.3	52.1			-7.8
-48.0	-42.5	0.8	43.3	51.1			-7.8

7.9.2 Variable uplink gain timing

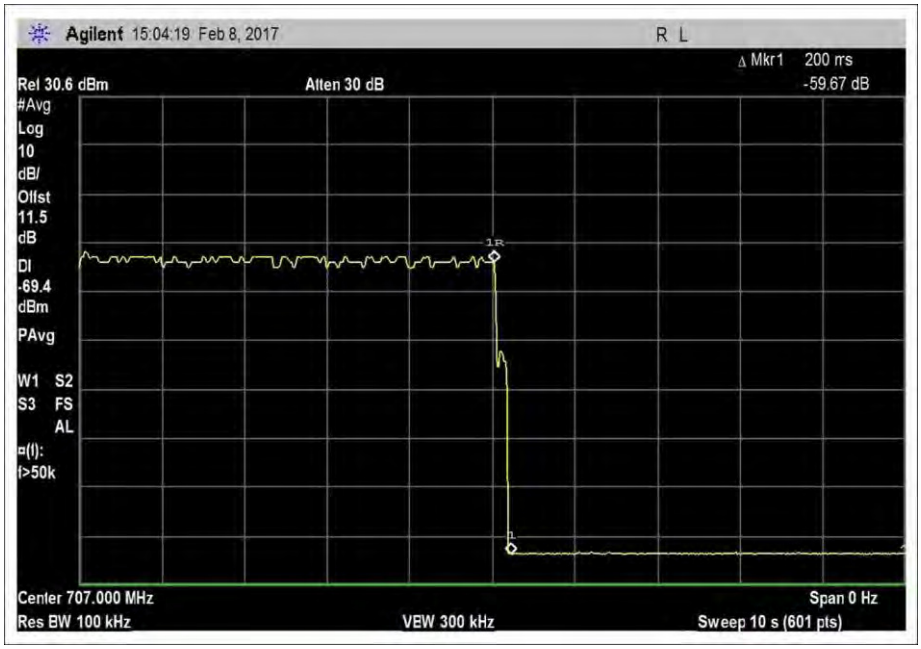
Uplink Gain Timing		
Frequency (MHz)	**Measured (Sec)**	**Limit (Sec)**
UL 698-716	0.20	3
UL 776-787	0.18	3
UL 824-849	0.18	3
UL 1710-1755	0.18	3
UL 1850-1915	0.27	3

7.9.1 Maximum Gain

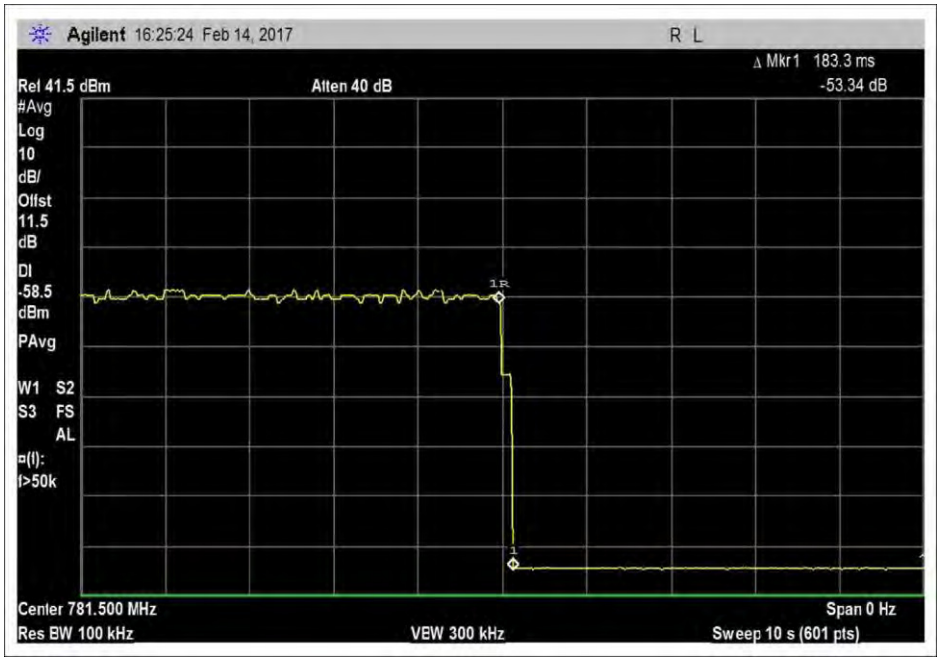
For this subsection, see summary of results of Section 7.9, 7.9.1 Maximum Gain.

7.9.2 Variable uplink Gain Timing

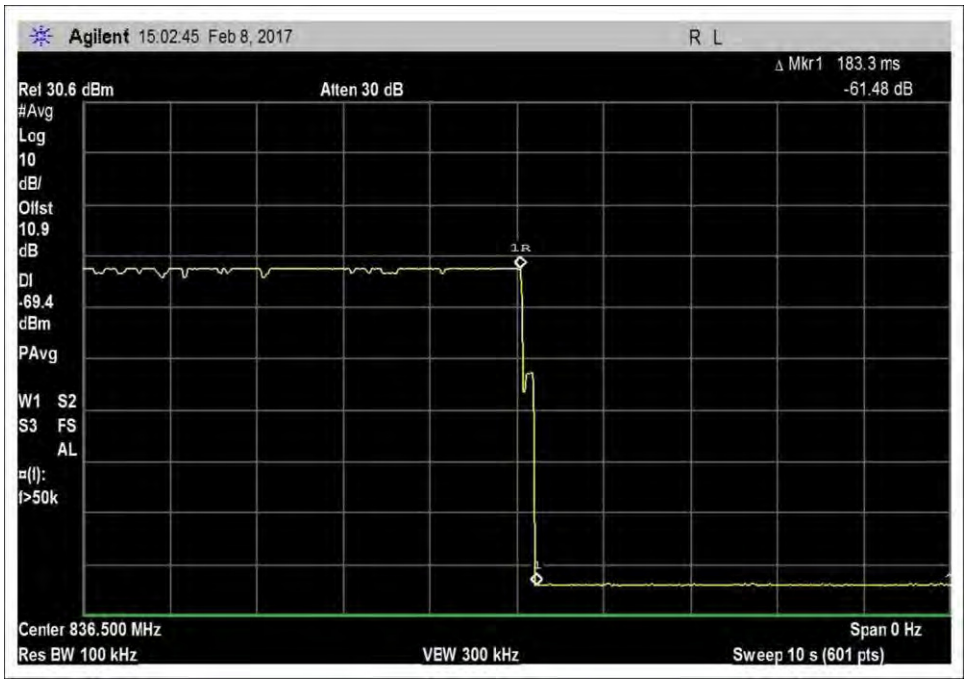
Plots



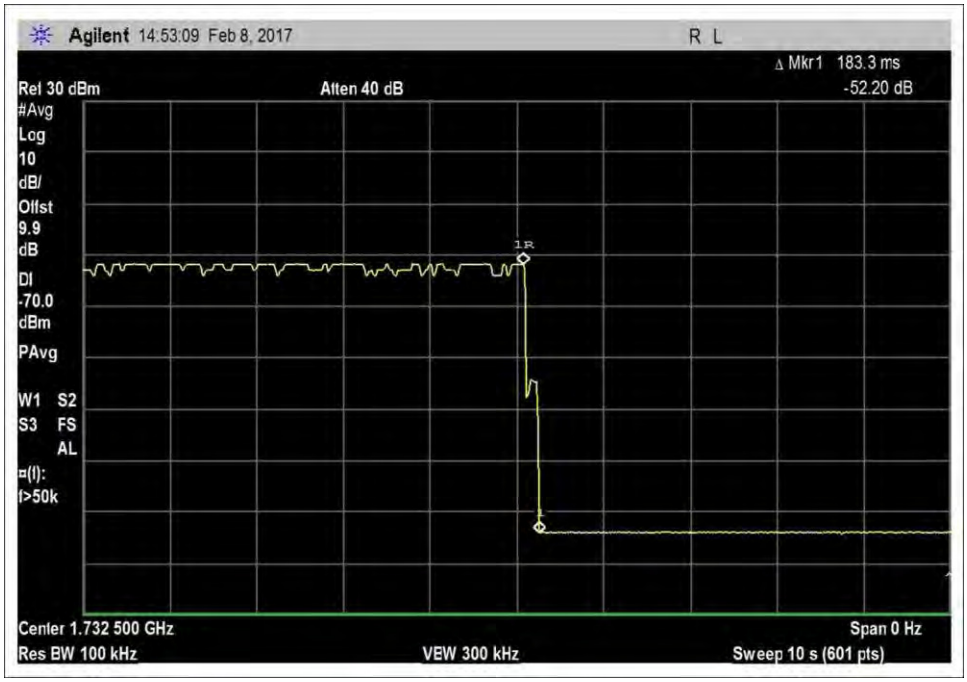
7.9.2_VarULGainTiming_UL_698-716MHz



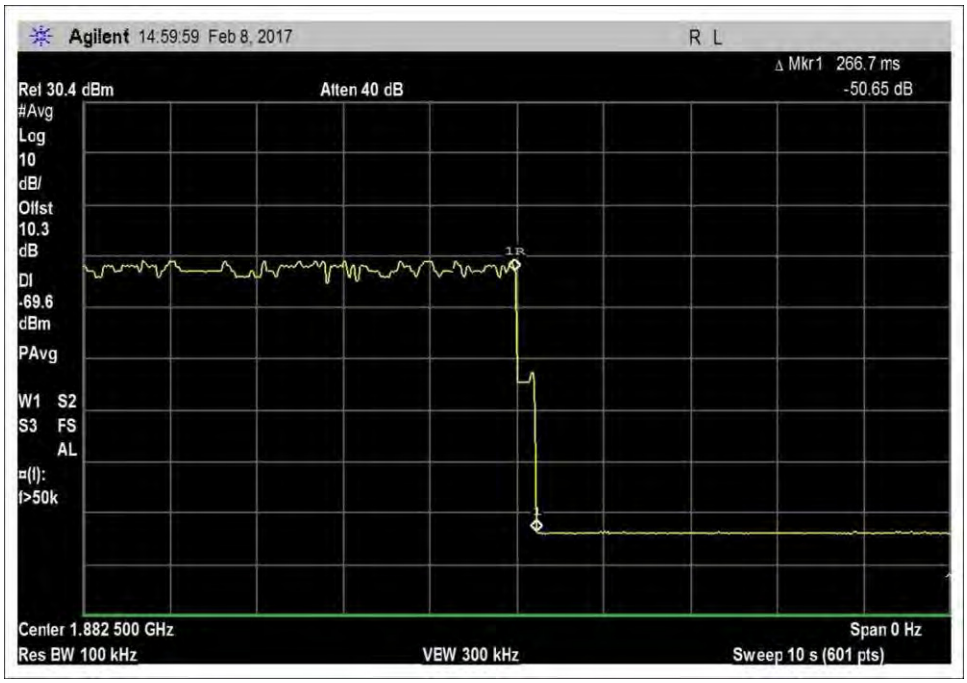
7.9.2_VarULGainTiming_UL_776-787MHz



7.9.2_VarULGainTiming_UL_824-849MHz



7.9.2_VarULGainTiming_UL_1710-1755MHz



7.9.2_VarULGainTiming_UL_1850-1915MHz

7.10 Occupied Band Width

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	Huaptec		
Specification:	**7.10 Occupied Band Width / 47 CFR §2.1049 Occupied Band Width**		
Work Order #:	**99439**	Date:	2/9/2017
Test Type:	**Conducted Emissions**	Time:	8:36:00 AM
Tested By:	**Daniel Bertran**	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is a Fixed Wideband Consumer Booster.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Server port is a type N connector and 50-ohm impedance.
The EUT Donor port is type N connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

The test was performed in accordance with section 7.10 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016.

Test environment conditions:
Temperature: 19.6°C
Relative Humidity: 63%
Pressure101.9 kPa

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
AN03418	Signal Generator	E4438C	7/30/2015	7/30/2017
ANP06467	Attenuator	PE7014-10	5/13/2015	5/13/2017
ANP06897	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP06898	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP05411	Attenuator	54A-10	1/18/2016	1/18/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018

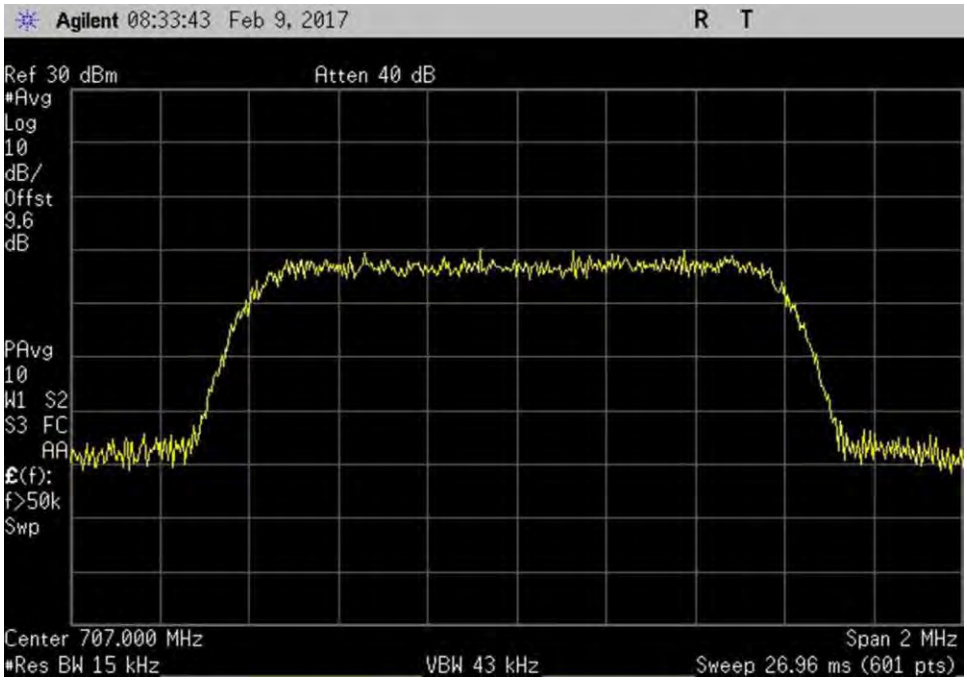
Summary of Results

Pass: As summarized in plots below, the uniformity of the output signal relative to the input signal are practically identical. Therefore, the comparison is within limits.

Plots

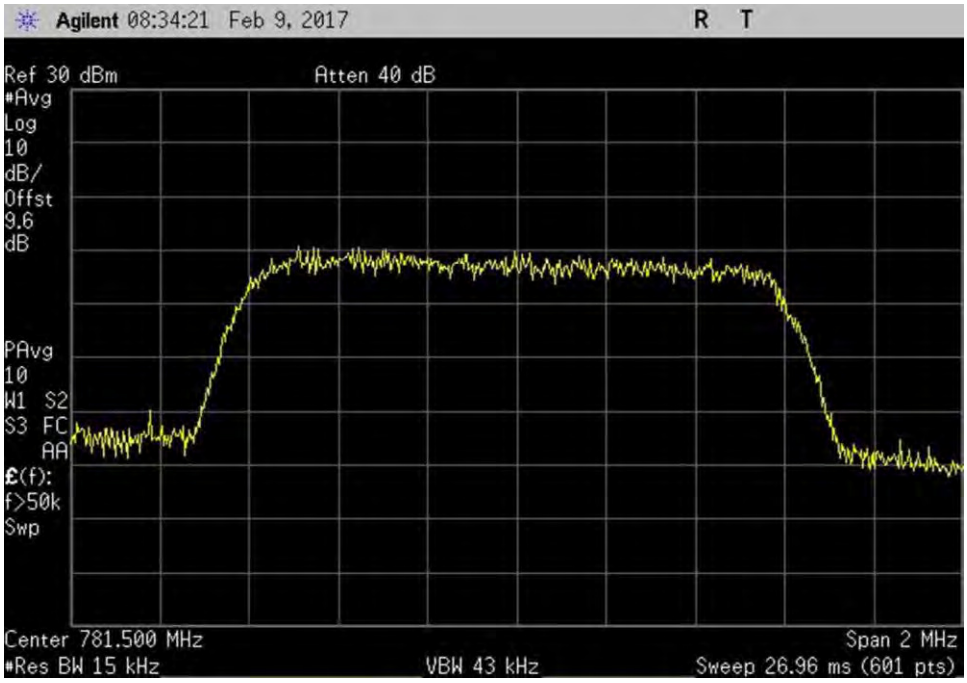
CDMA

7.10_OBW_UL_698-716MHz_CDMA_In

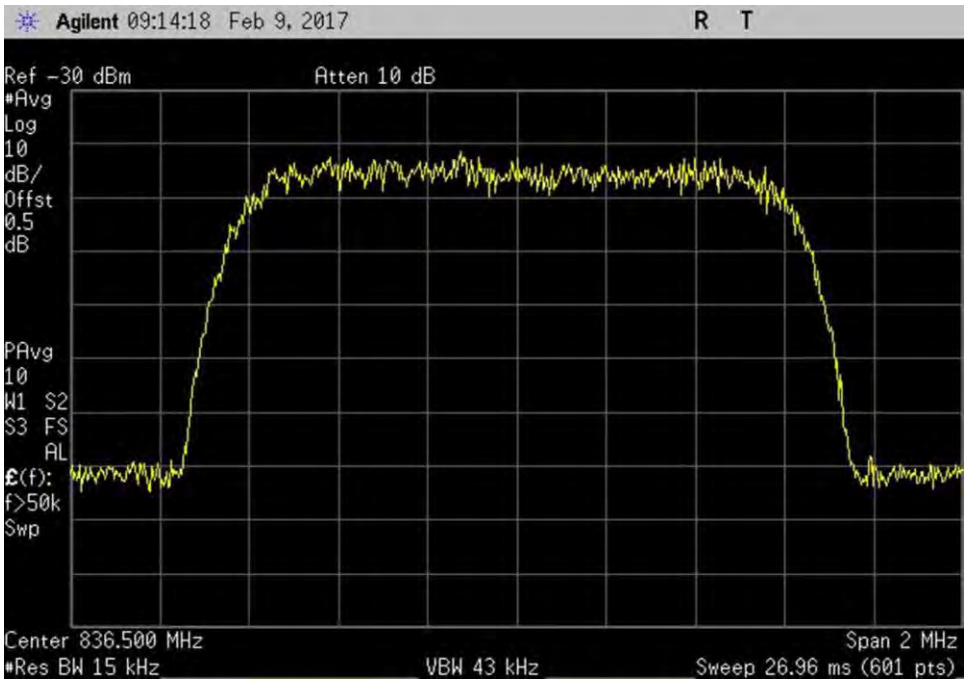


7.10_OBW_UL_698-716MHz_CDMA_Out

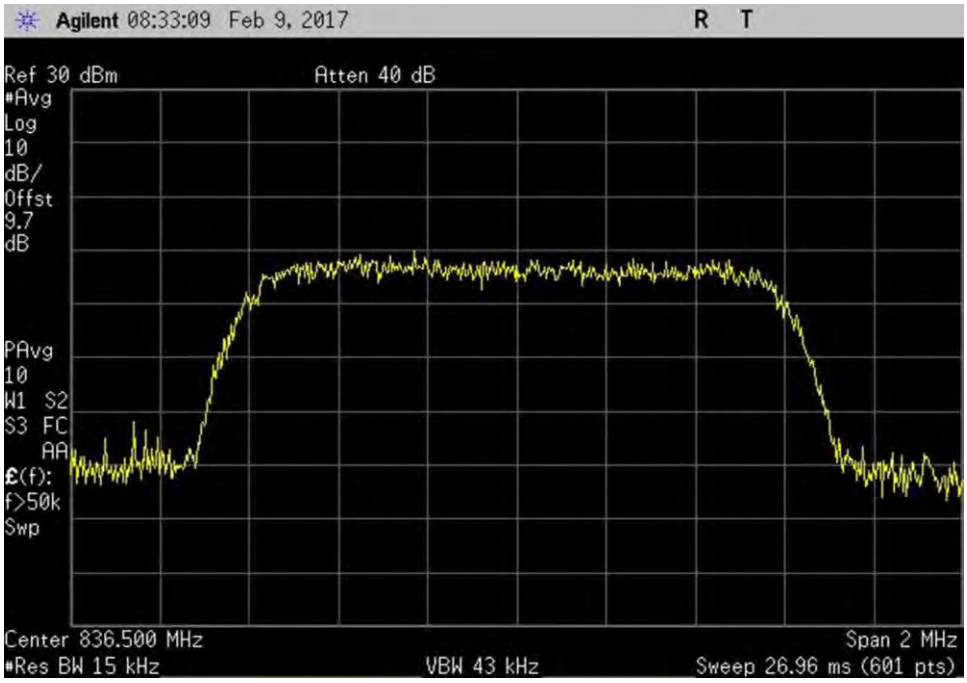
7.10_OBW_UL_776-787MHz_CDMA_In



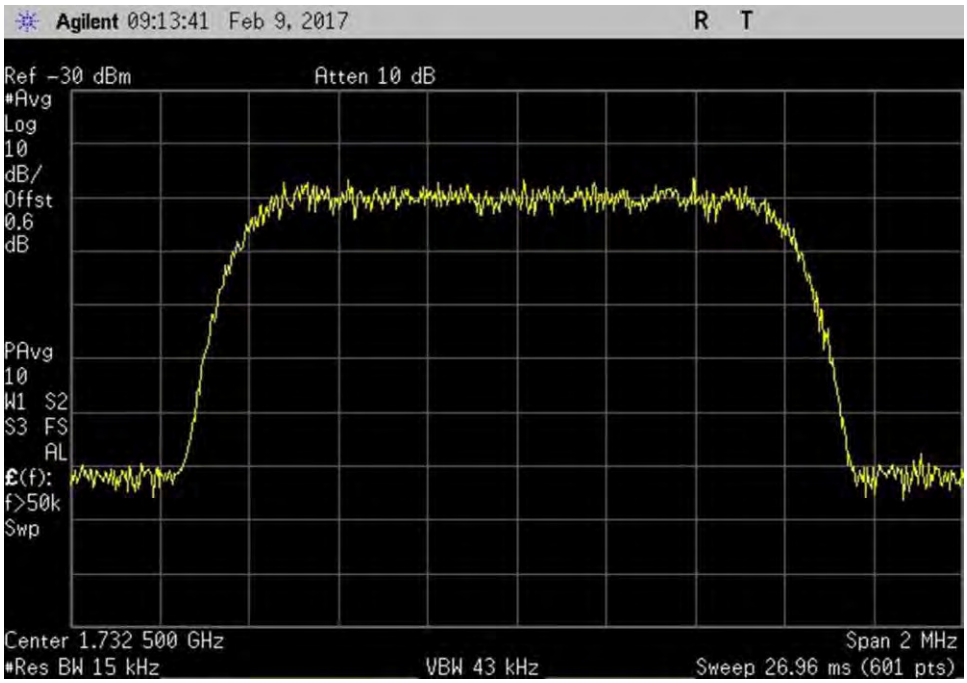
7.10_OBW_UL_776-787MHz_CDMA_Out



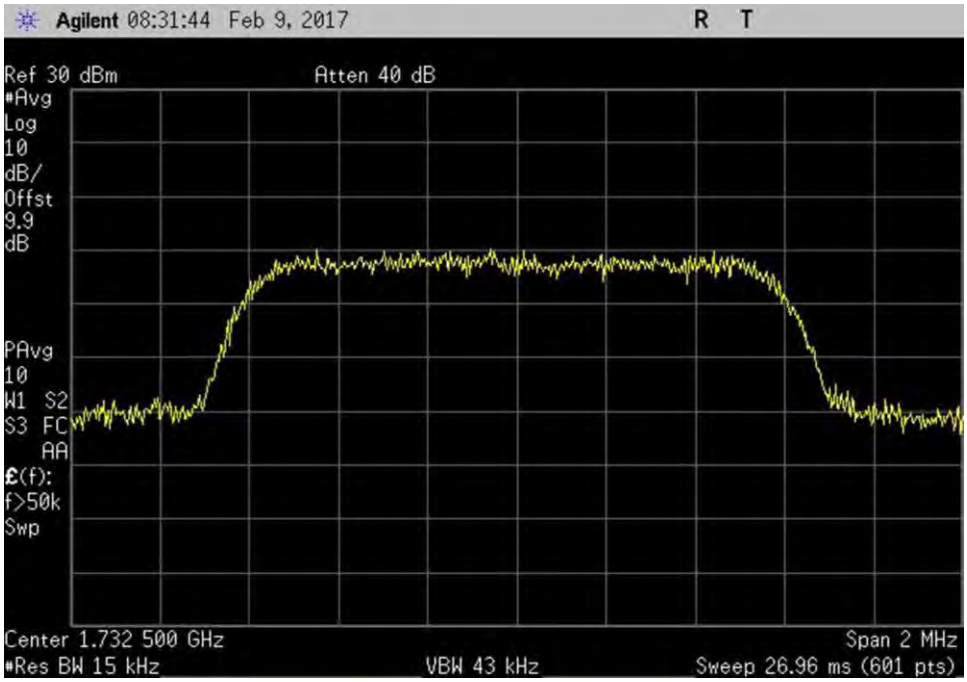
7.10_OBW_UL_824-849MHz_CDMA_In



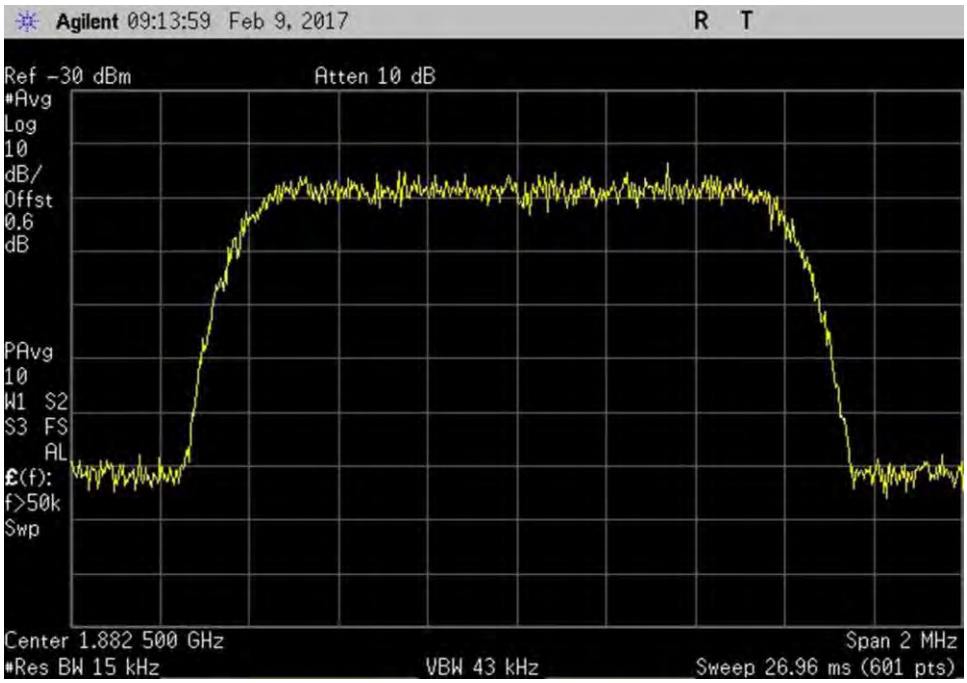
7.10_OBW_UL_824-849MHz_CDMA_Out



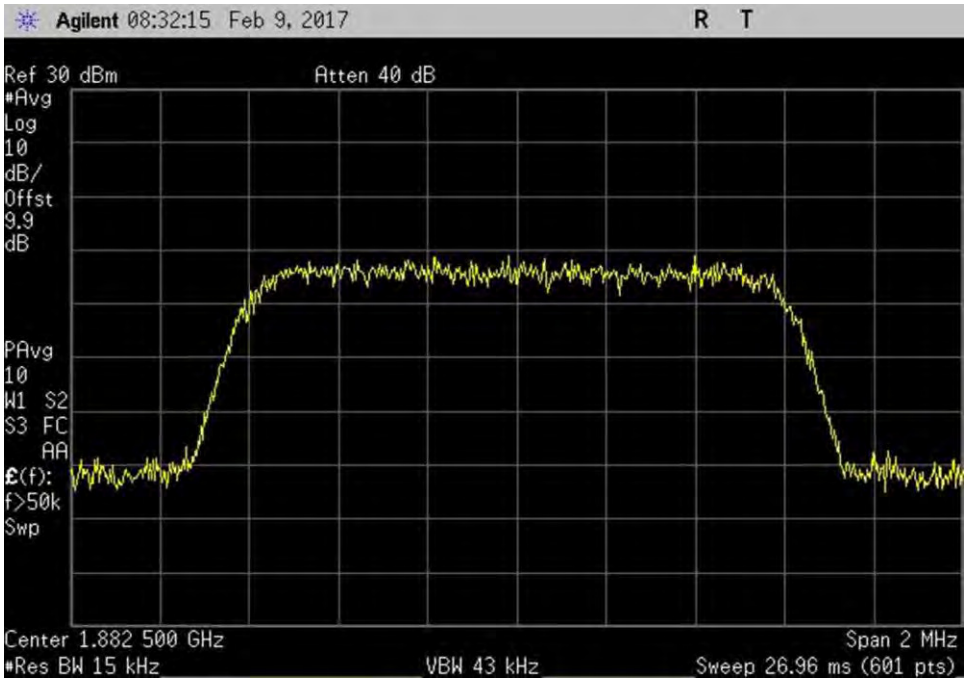
7.10_OBW_UL_1710-1755MHz_CDMA_In



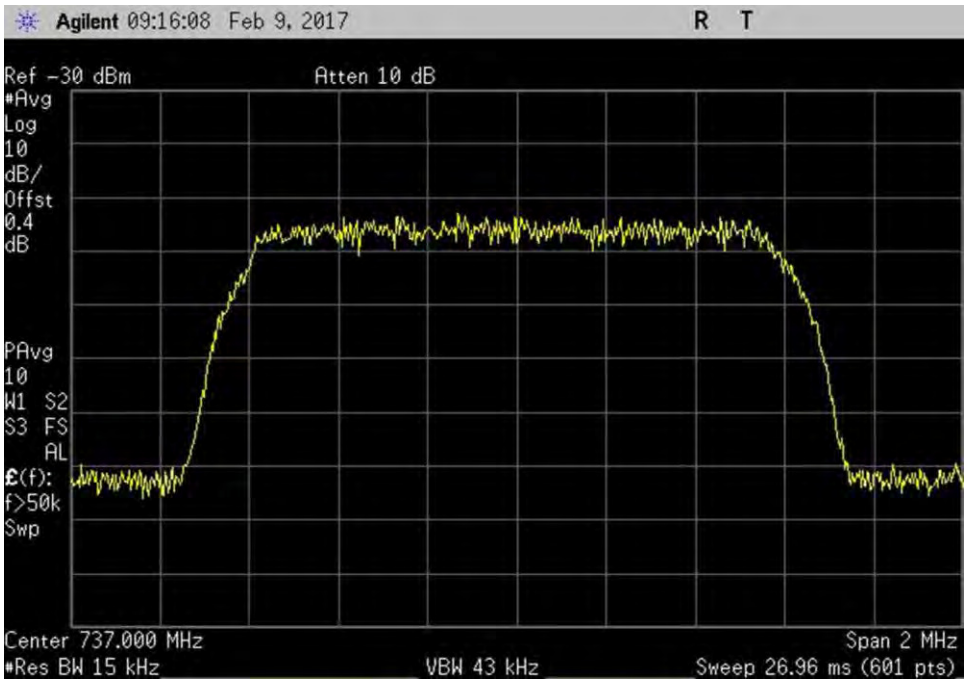
7.10_OBW_UL_1710-1755MHz_CDMA_Out



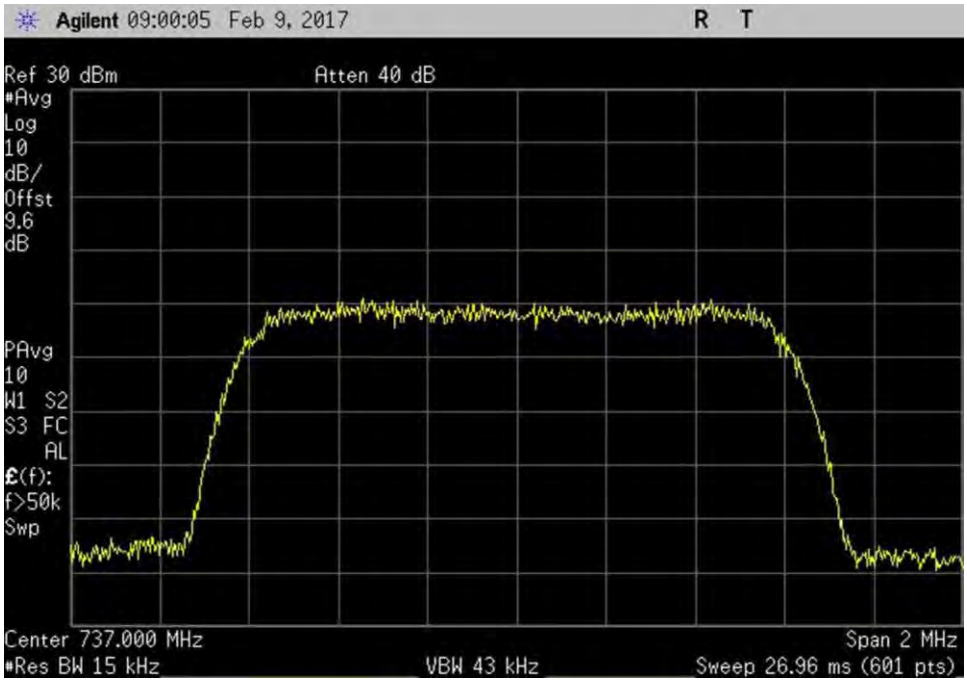
7.10_OBW_UL_1850-1915MHz_CDMA_In



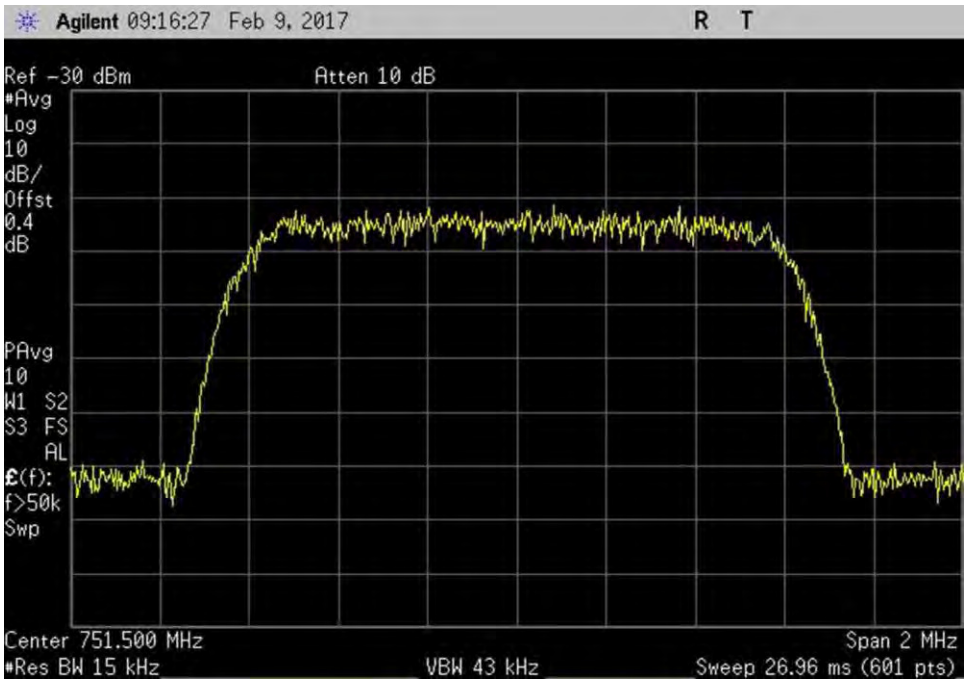
7.10_OBW_UL_1850-1915MHz_CDMA_Out



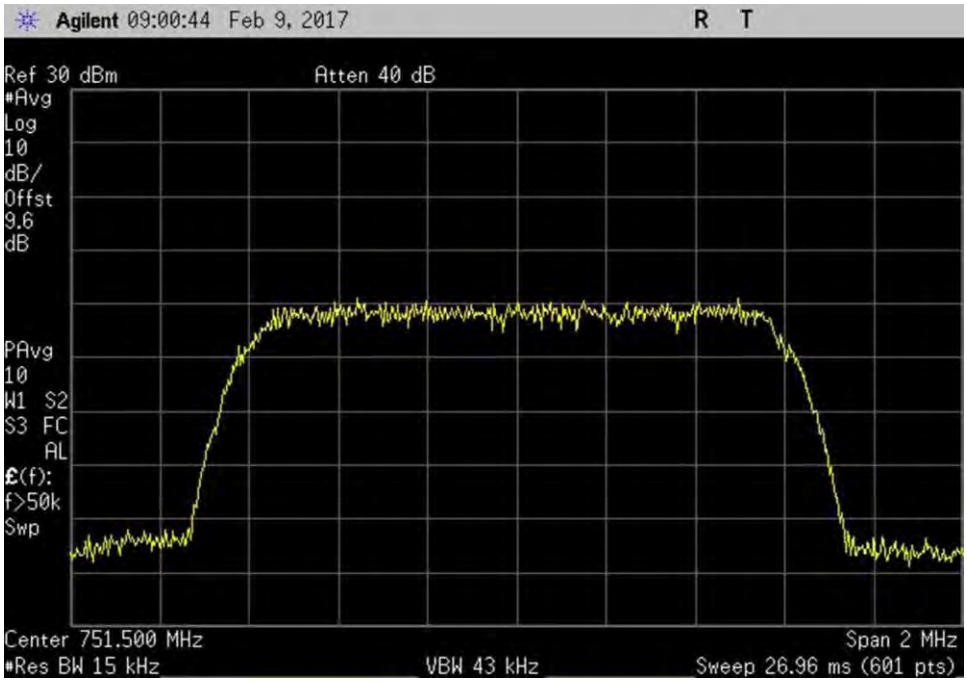
7.10_OBW_DL_728-746MHz_CDMA_In



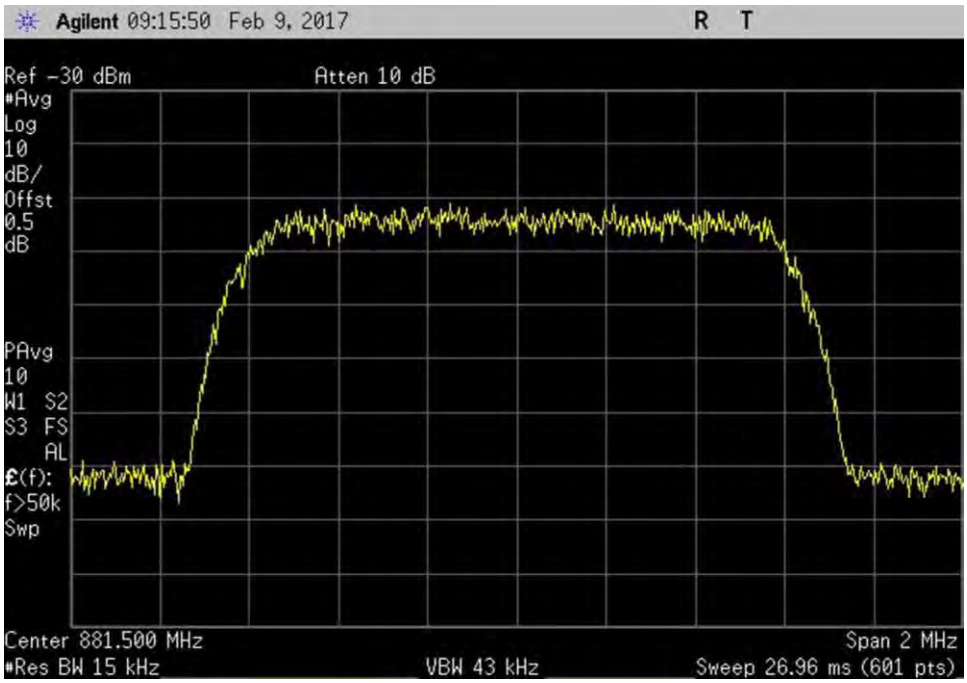
7.10_OBW_DL_728-746MHz_CDMA_Out



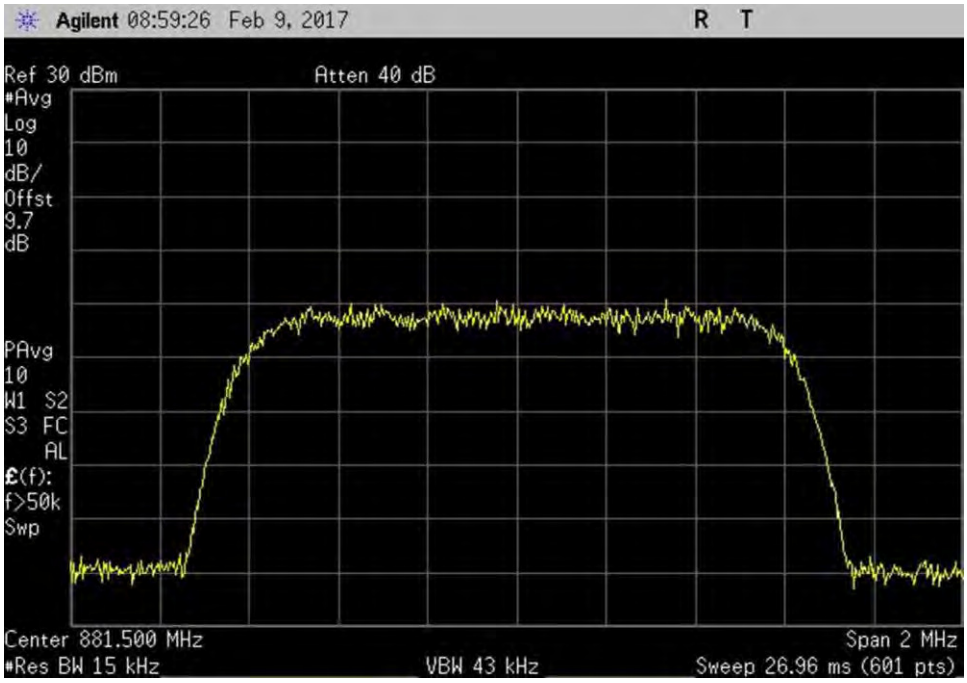
7.10_OBW_DL_746-757MHz_CDMA_In



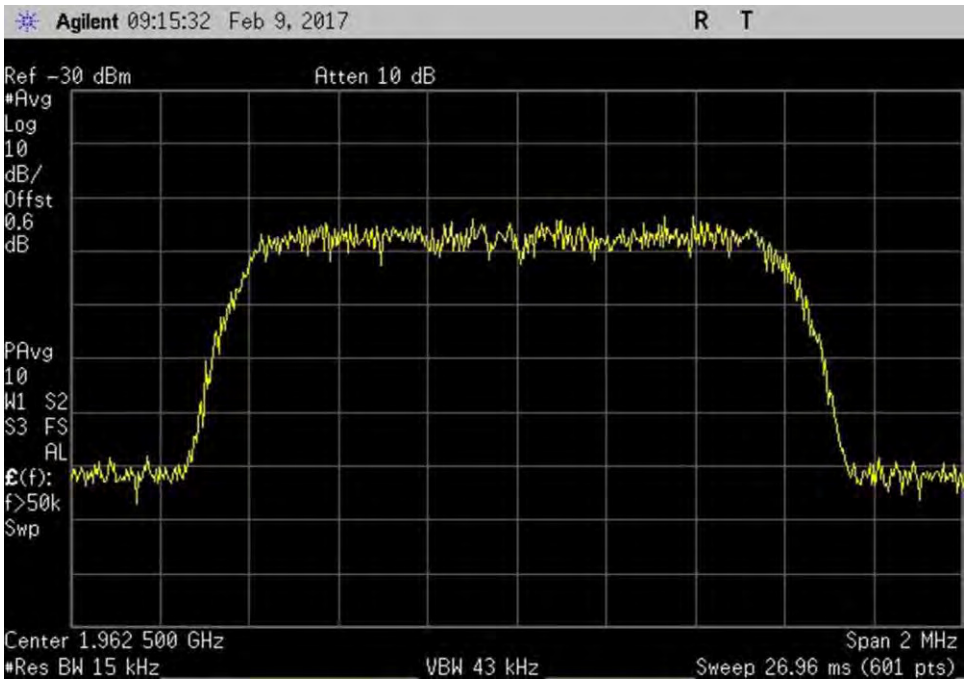
7.10_OBW_DL_746-757MHz_CDMA_Out



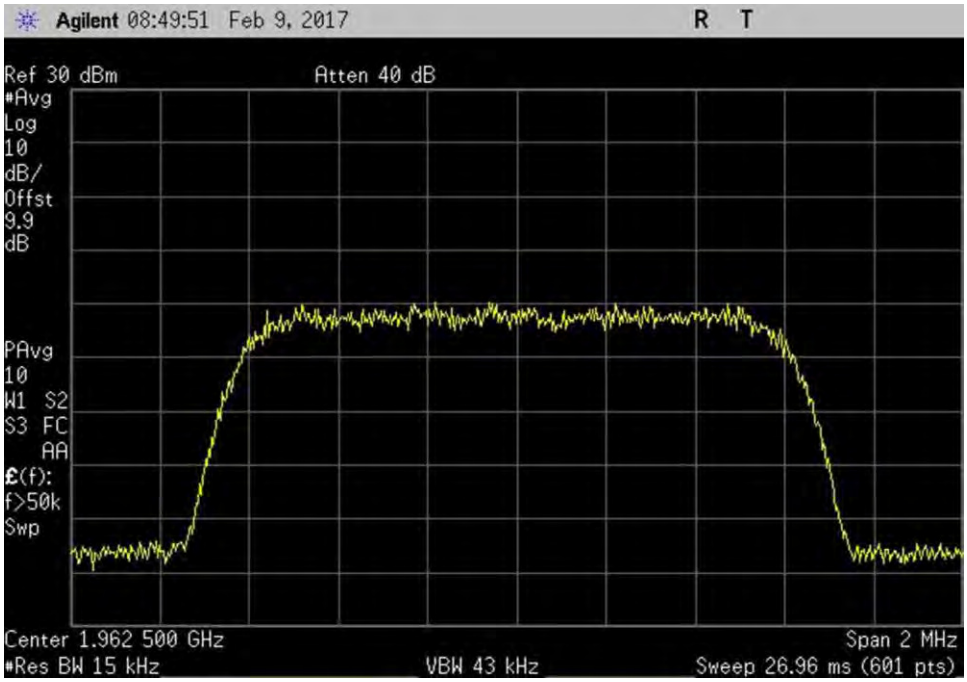
7.10_OBW_DL_869-894MHz_CDMA_In



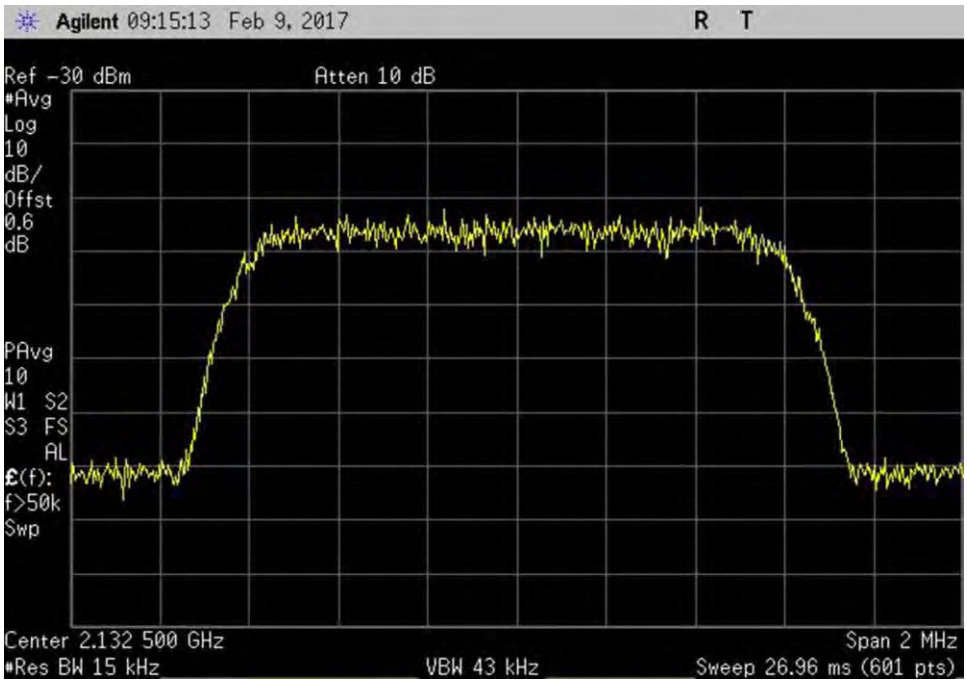
7.10_OBW_DL_869-894MHz_CDMA_Out



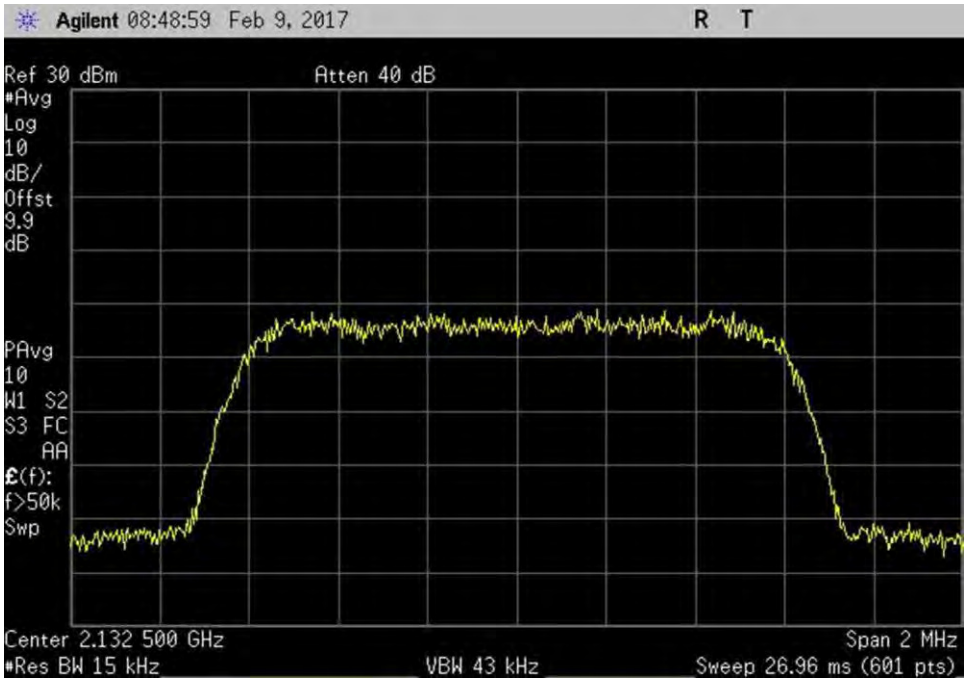
7.10_OBW_DL_1930-1995MHz_CDMA_In



7.10_OBW_DL_1930-1995MHz_CDMA_Out

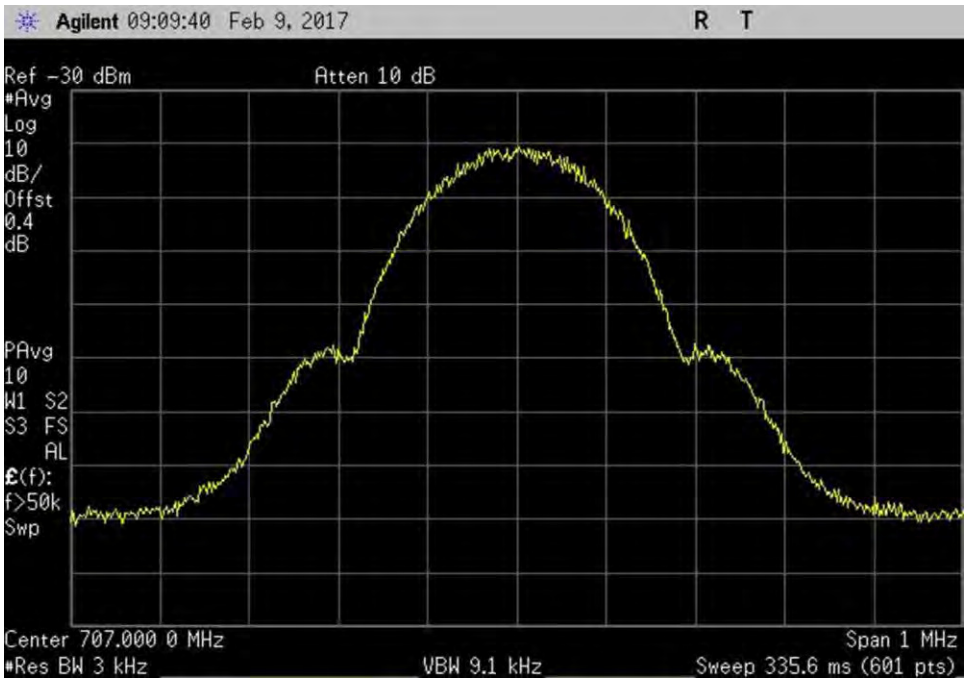


7.10_OBW_DL_2110-2155MHz_CDMA_In

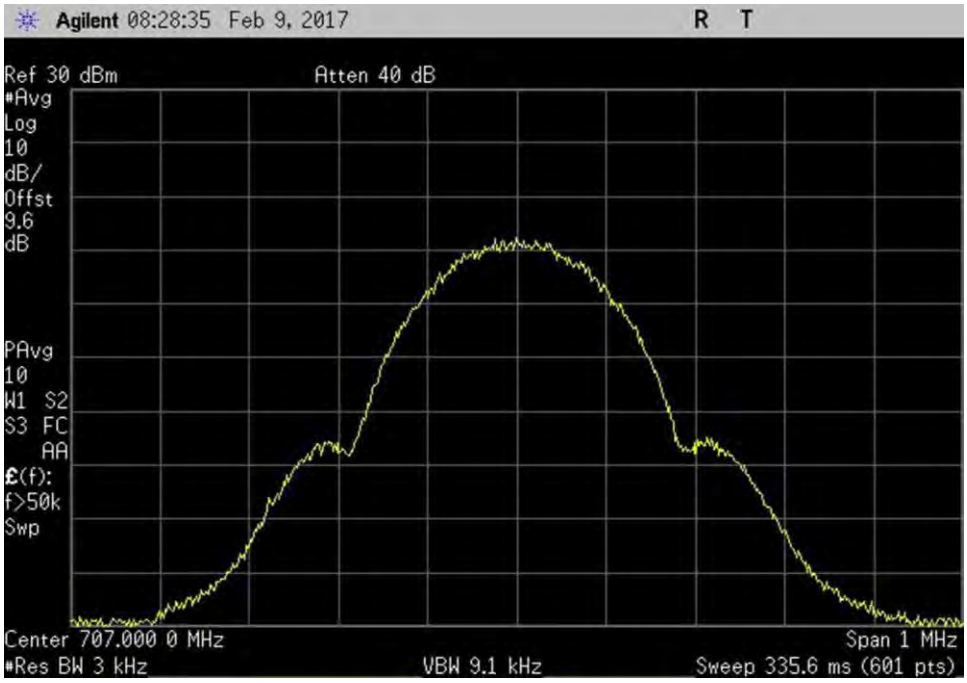


7.10_OBW_DL_2110-2155MHz_CDMA_Out

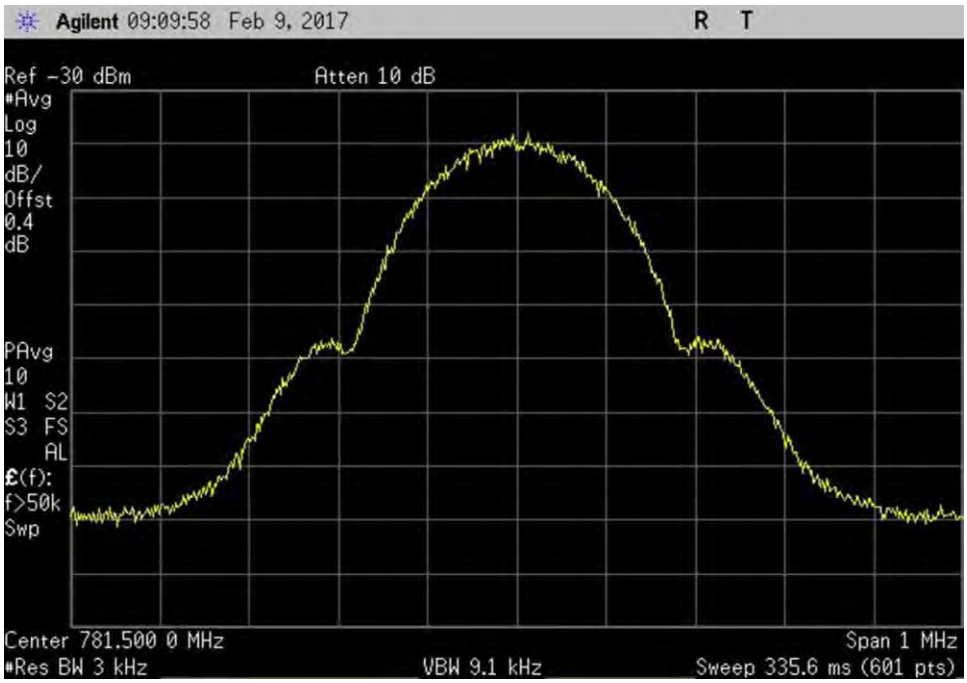
GSM



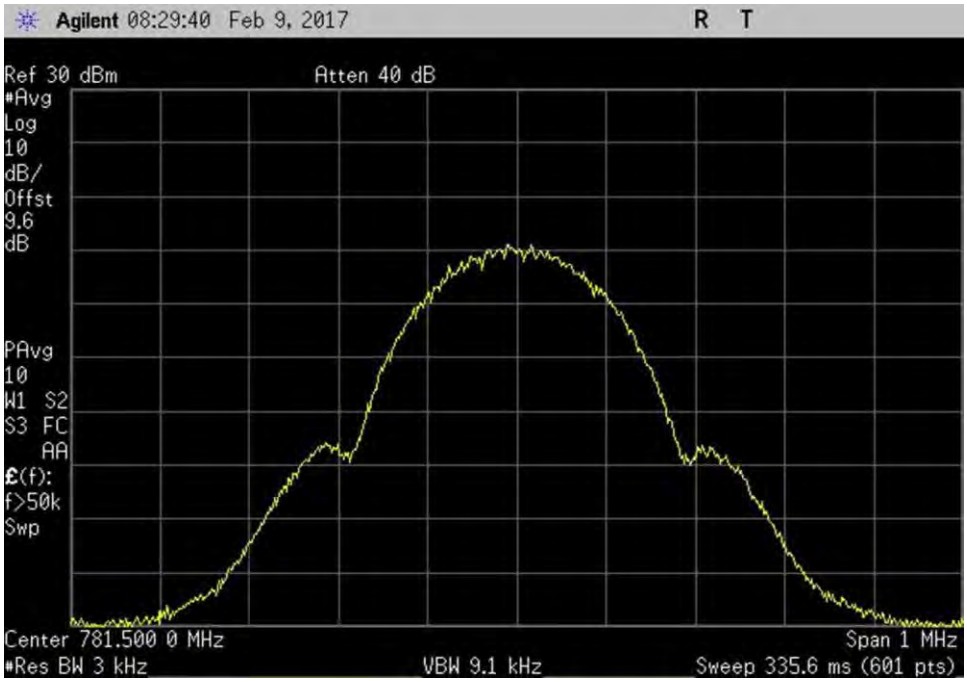
7.10_OBW_UL_698-716MHz_GSM_In



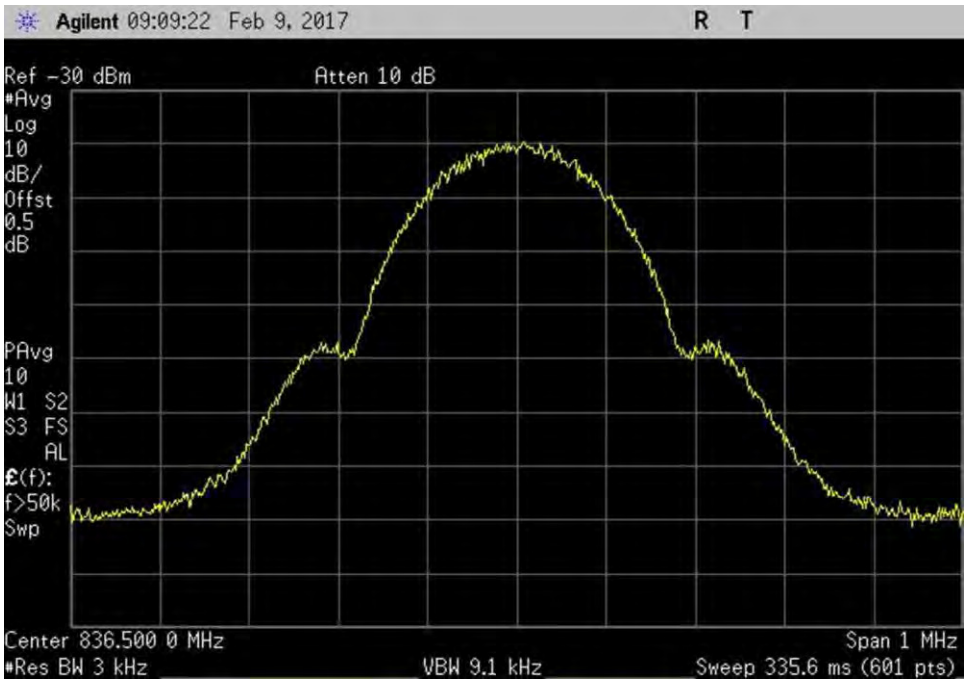
7.10_OBW_UL_698-716MHz_GSM_Out



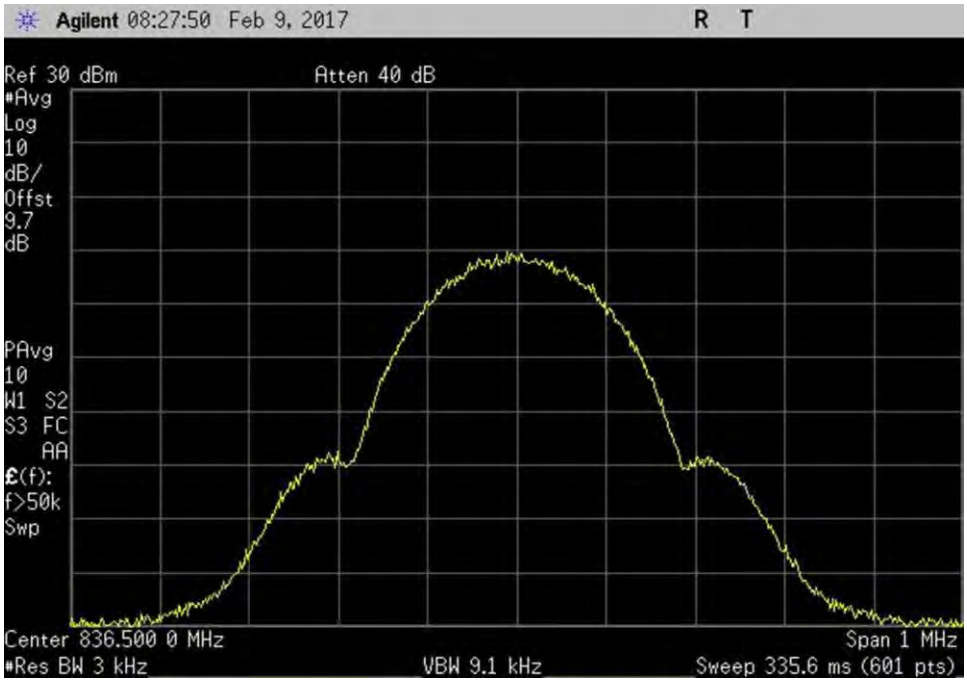
7.10_OBW_UL_776-787MHz_GSM_In



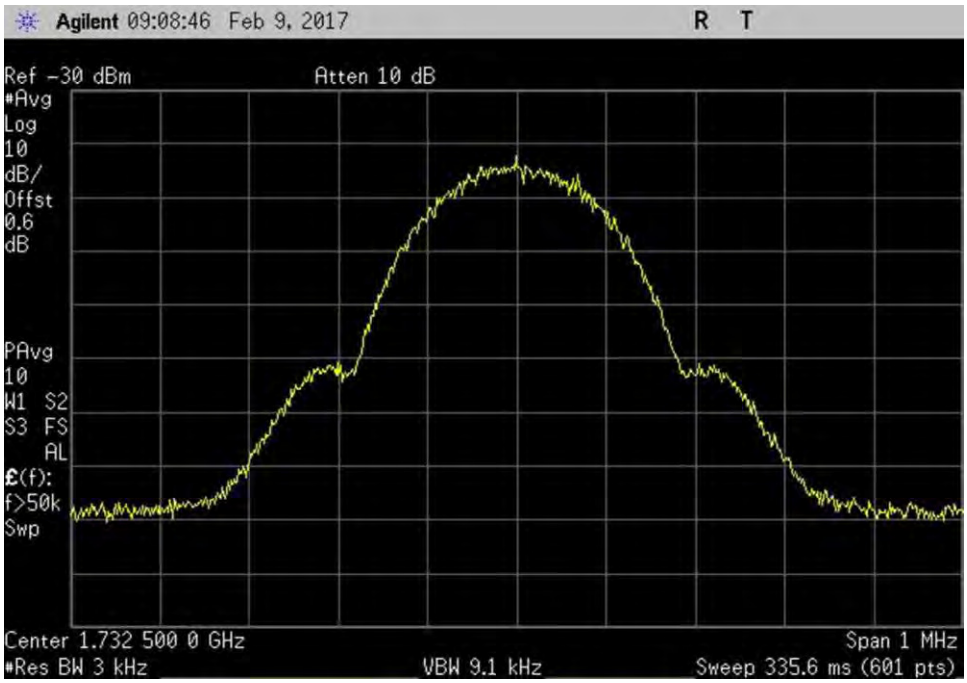
7.10_OBW_UL_776-787MHz_GSM_Out



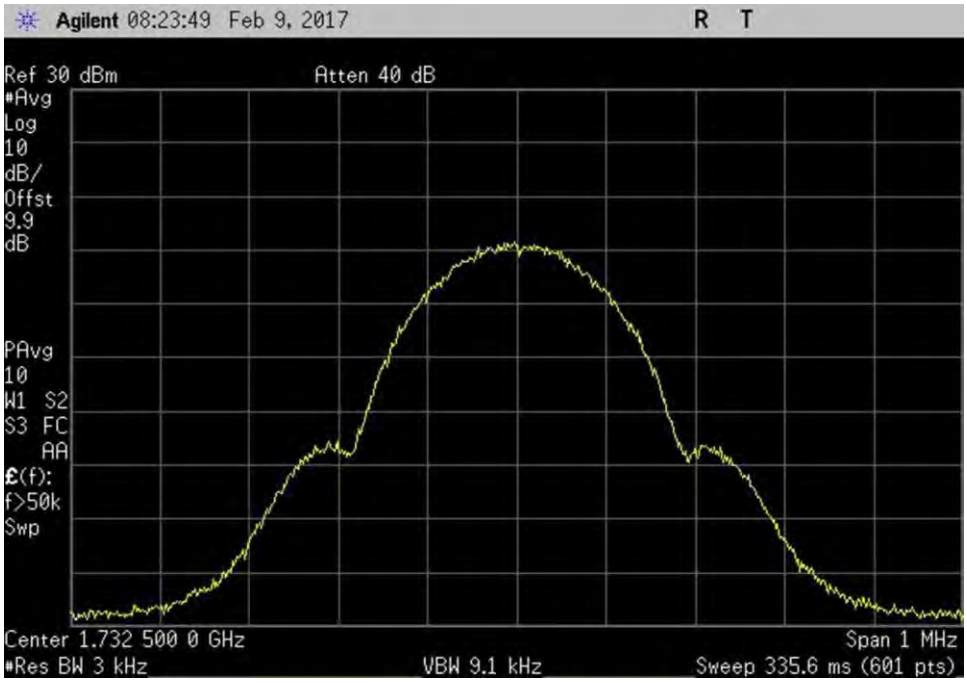
7.10_OBW_UL_824-849MHz_GSM_In



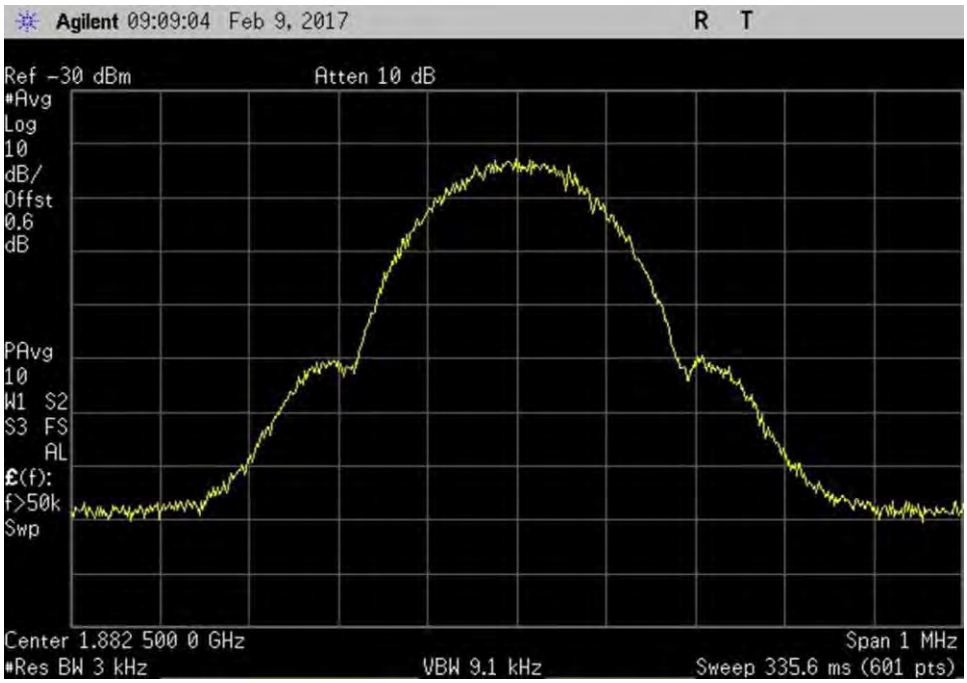
7.10_OBW_UL_824-849MHz_GSM_Out



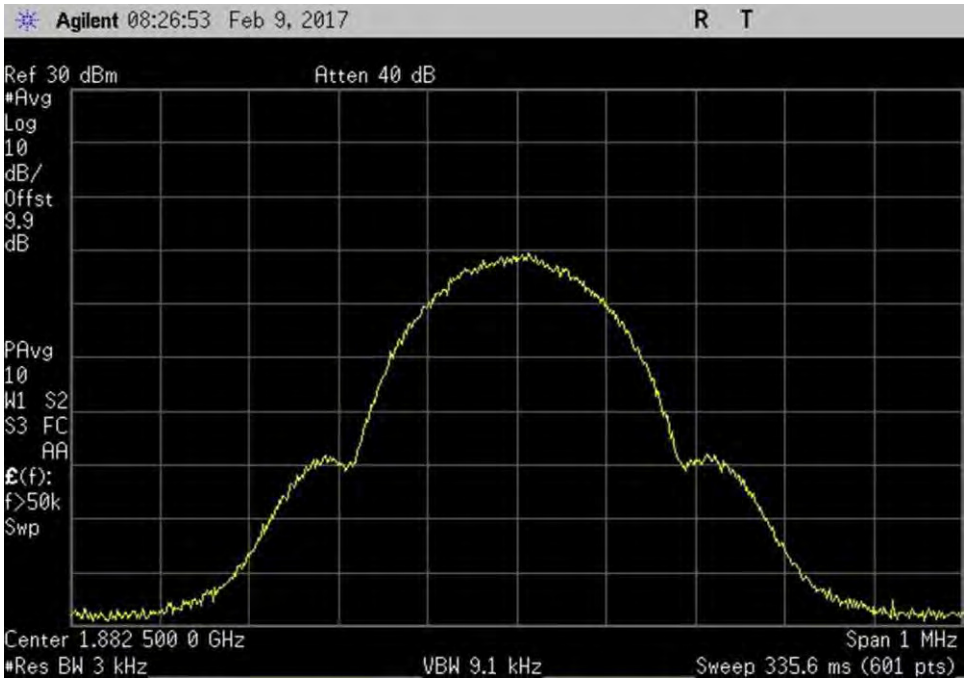
7.10_OBW_UL_1710-1755MHz_GSM_In



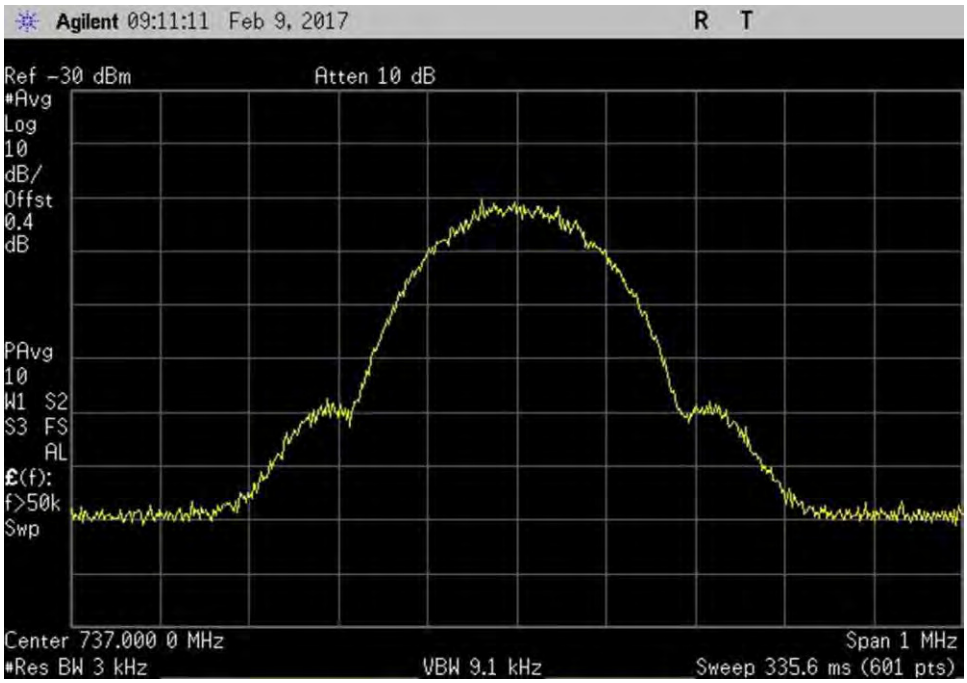
7.10_OBW_UL_1710-1755MHz_GSM_Out



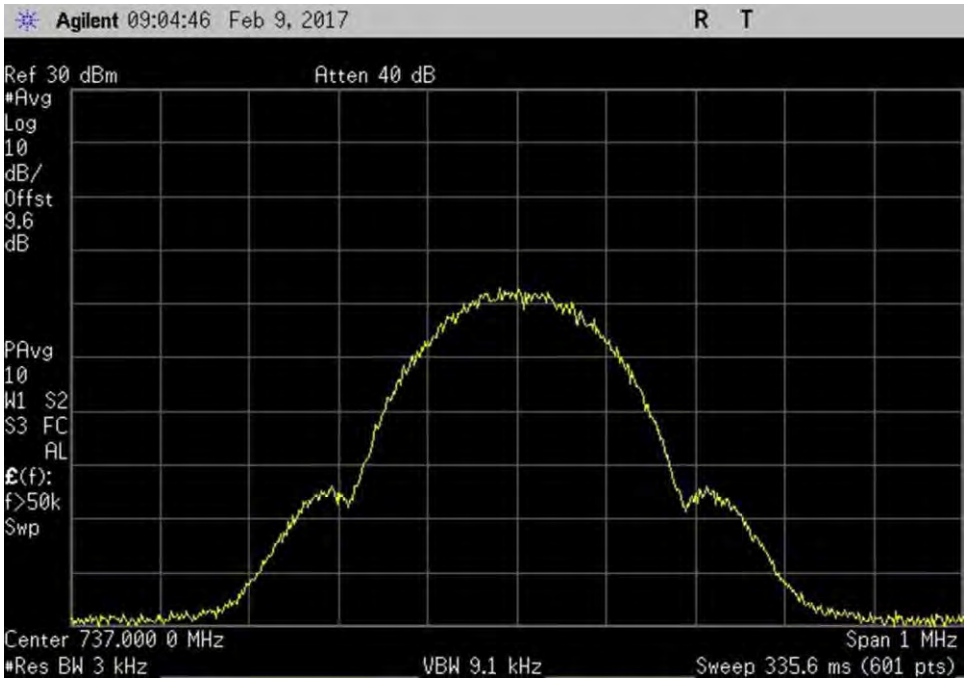
7.10_OBW_UL_1850-1915MHz_GSM_In



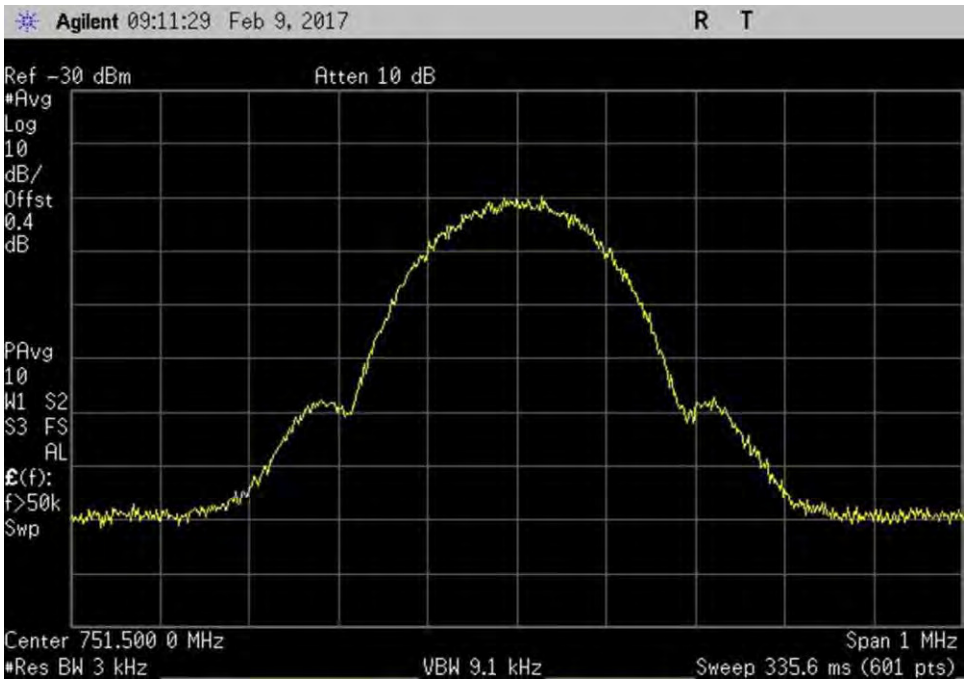
7.10_OBW_UL_1850-1915MHz_GSM_Out



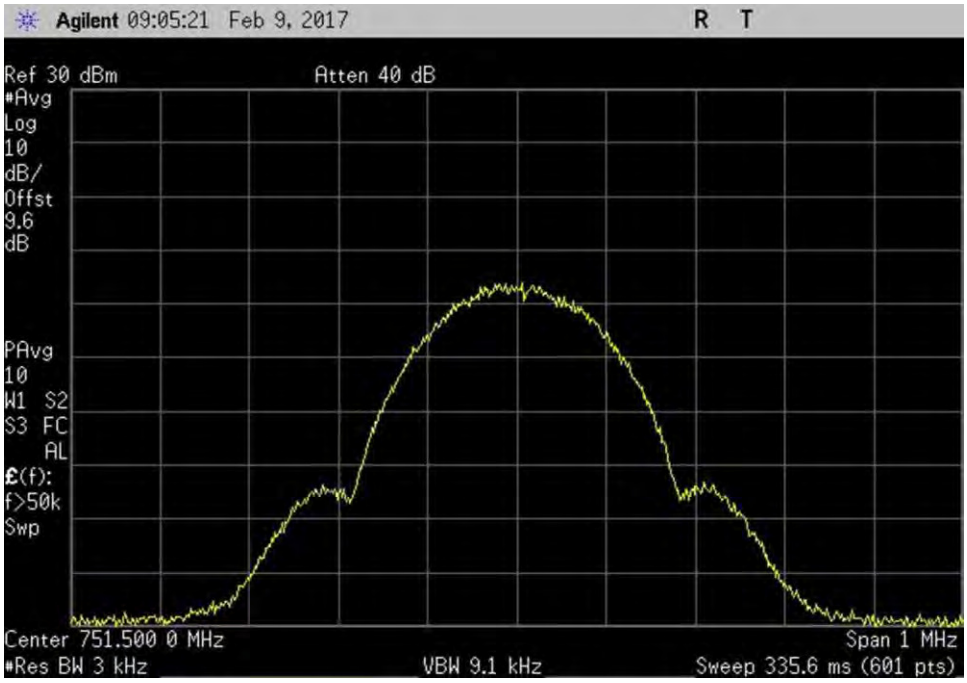
7.10_OBW_DL_728-746MHz_GSM_In



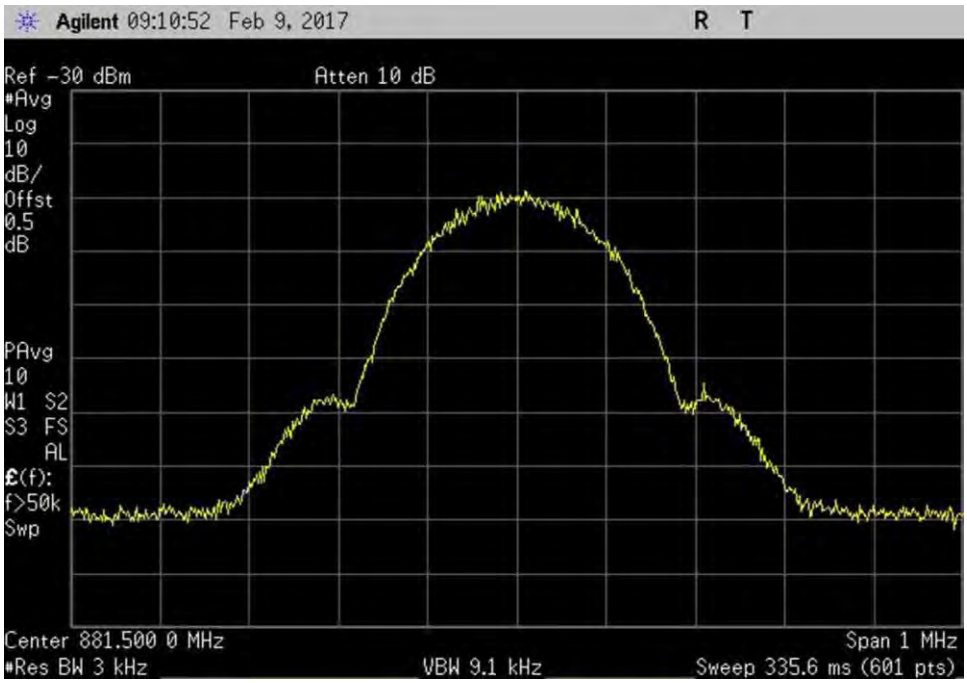
7.10_OBW_DL_728-746MHz_GSM_Out



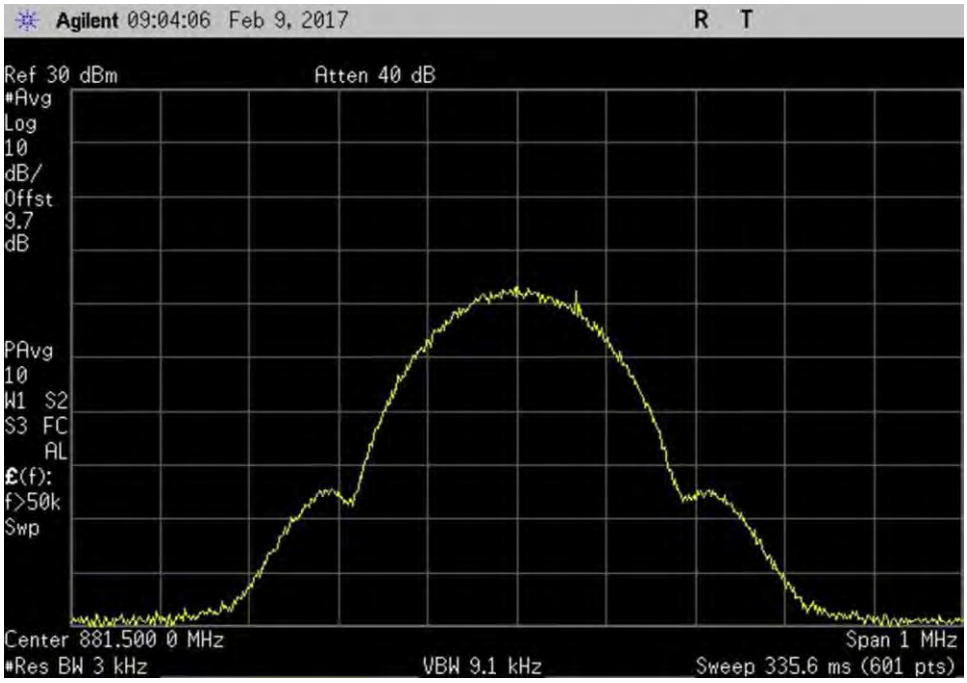
7.10_OBW_DL_746-757MHz_GSM_In



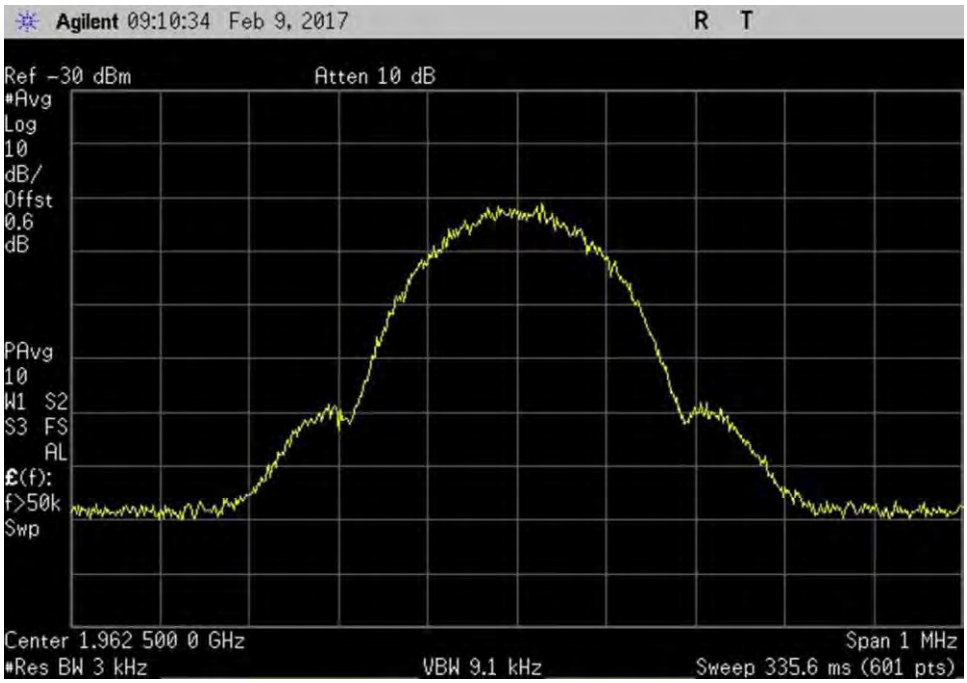
7.10_OBW_DL_746-757MHz_GSM_Out



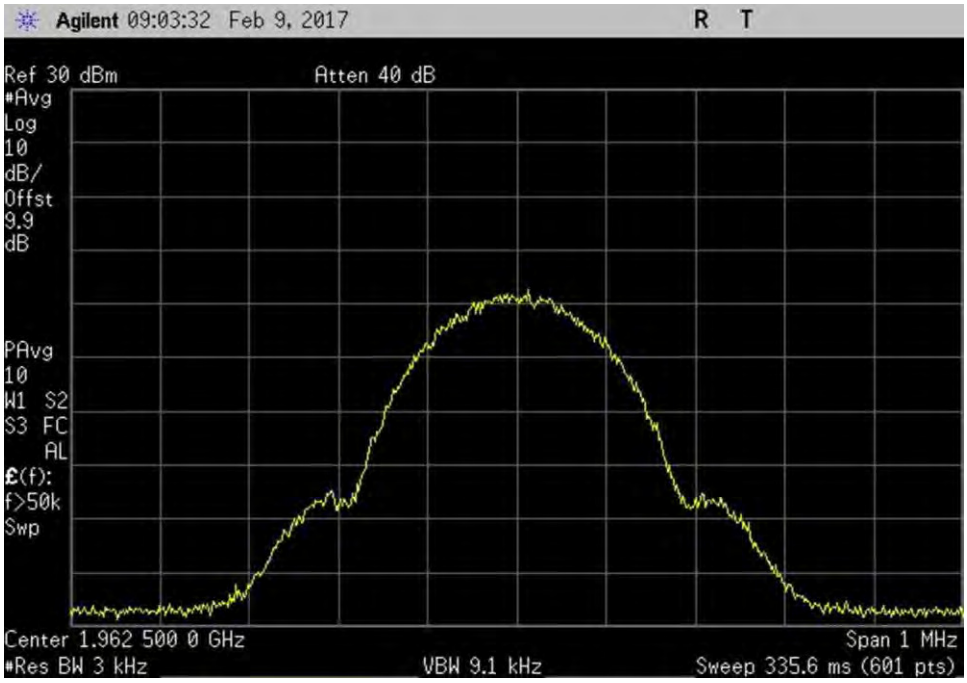
7.10_OBW_DL_869-894MHz_GSM_In



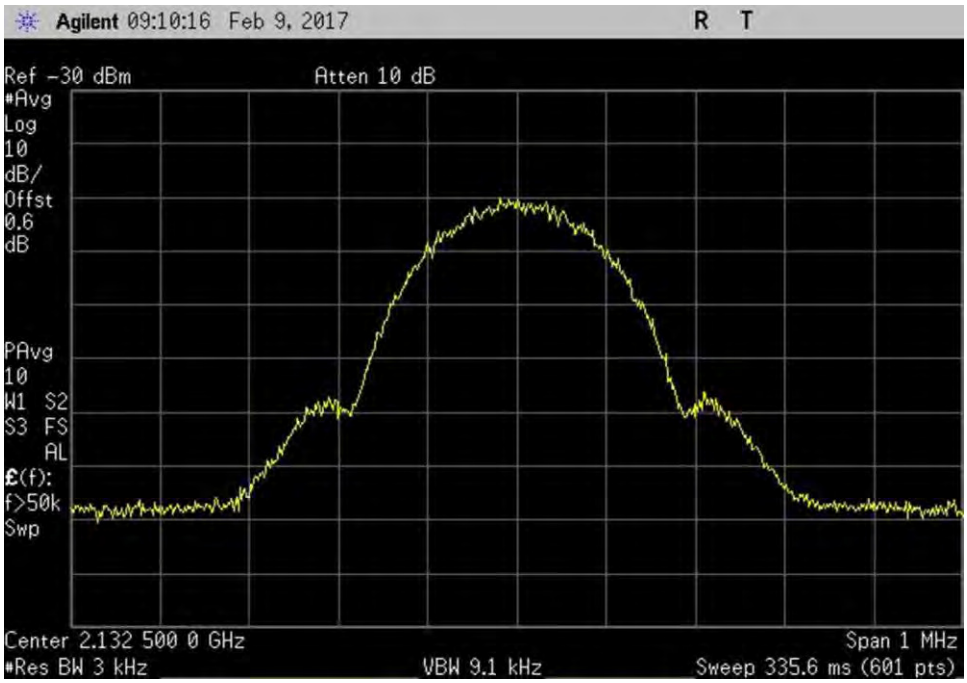
7.10_OBW_DL_869-894MHz_GSM_Out



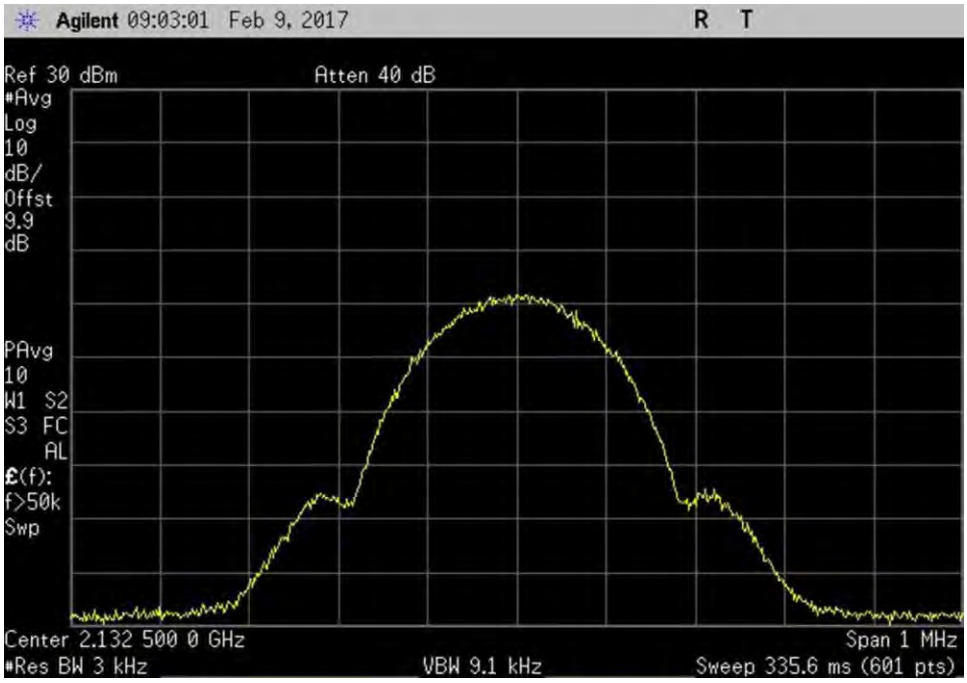
7.10_OBW_DL_1930-1995MHz_GSM_In



7.10_OBW_DL_1930-1995MHz_GSM_Out

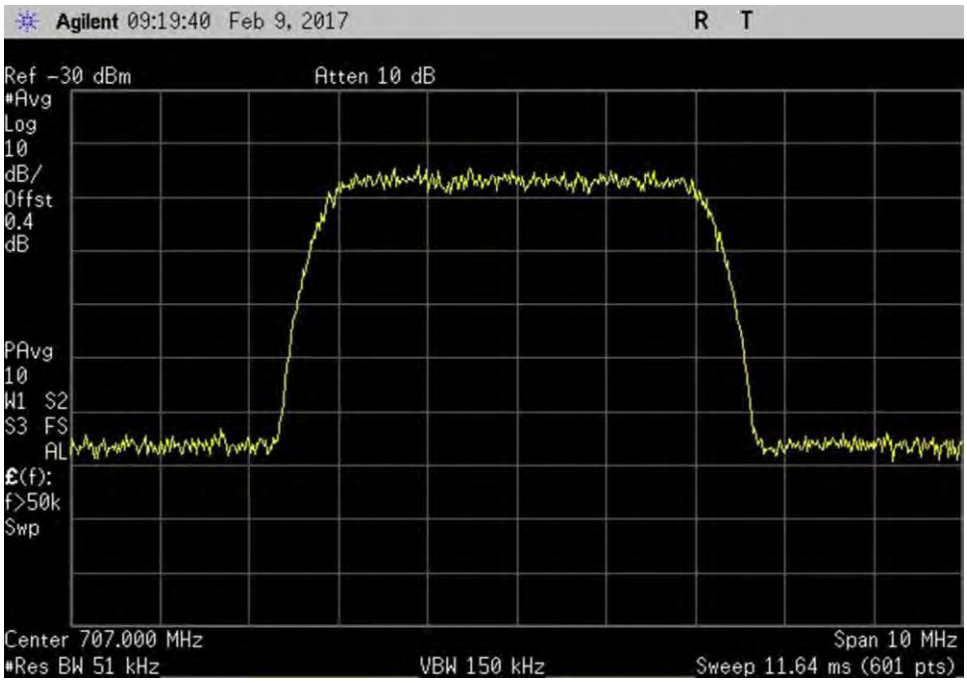


7.10_OBW_DL_2110-2155MHz_GSM_In

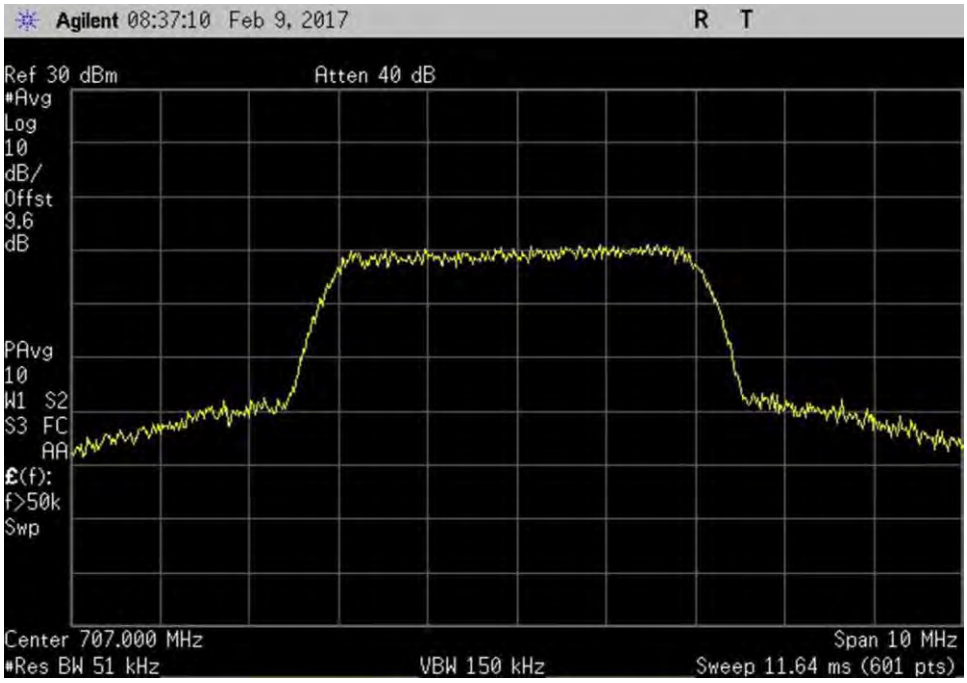


7.10_OBW_DL_2110-2155MHz_GSM_Out

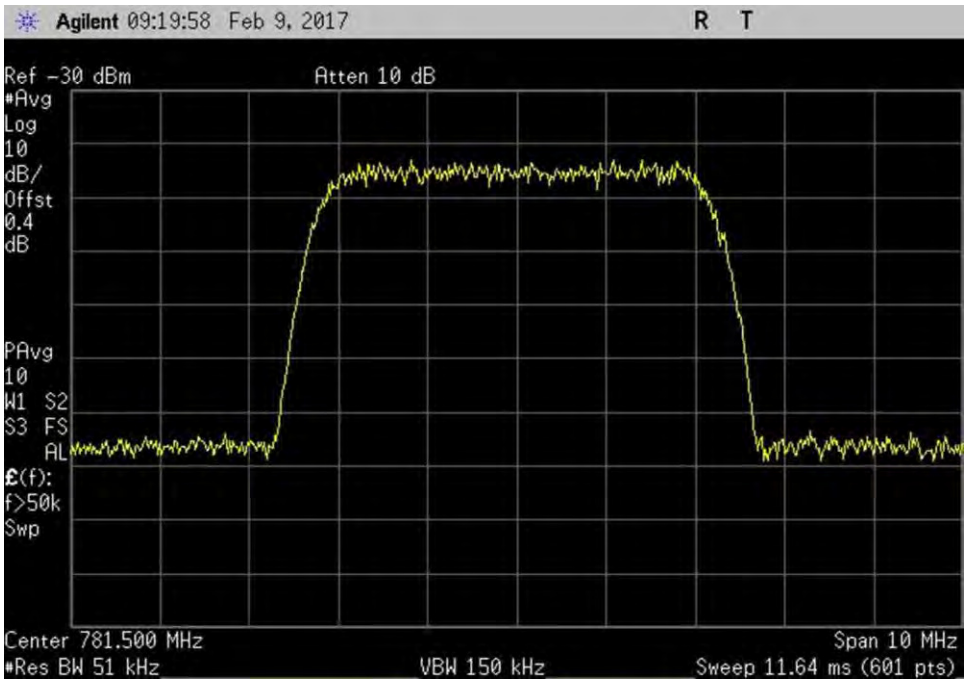
WCDMA



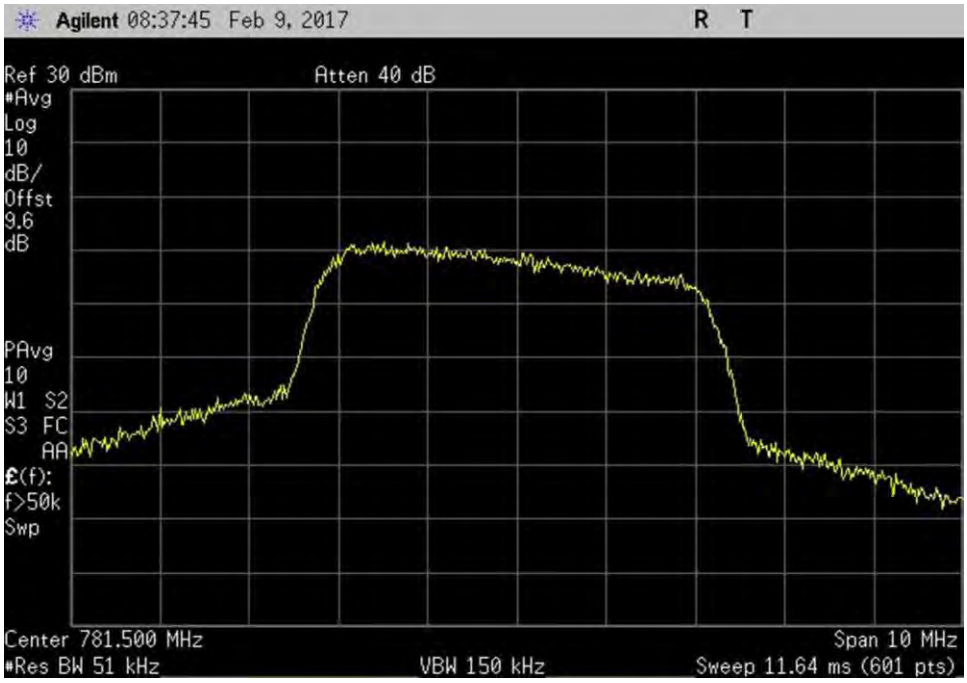
7.10_OBW_UL_698-716MHz_WCDMA_In



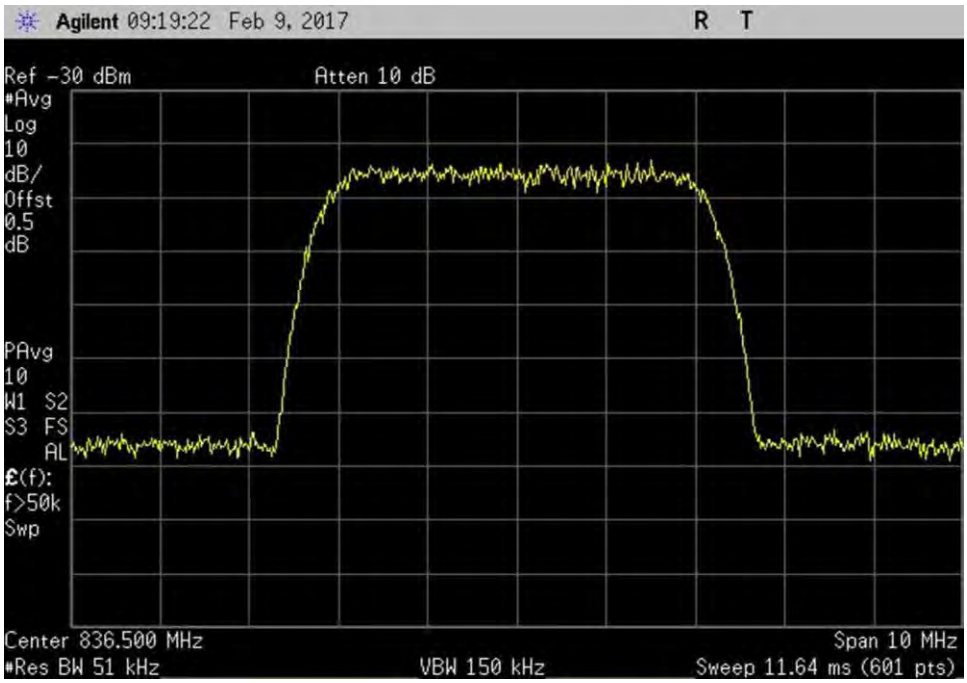
7.10_OBW_UL_698-716MHz_WCDMA_Out



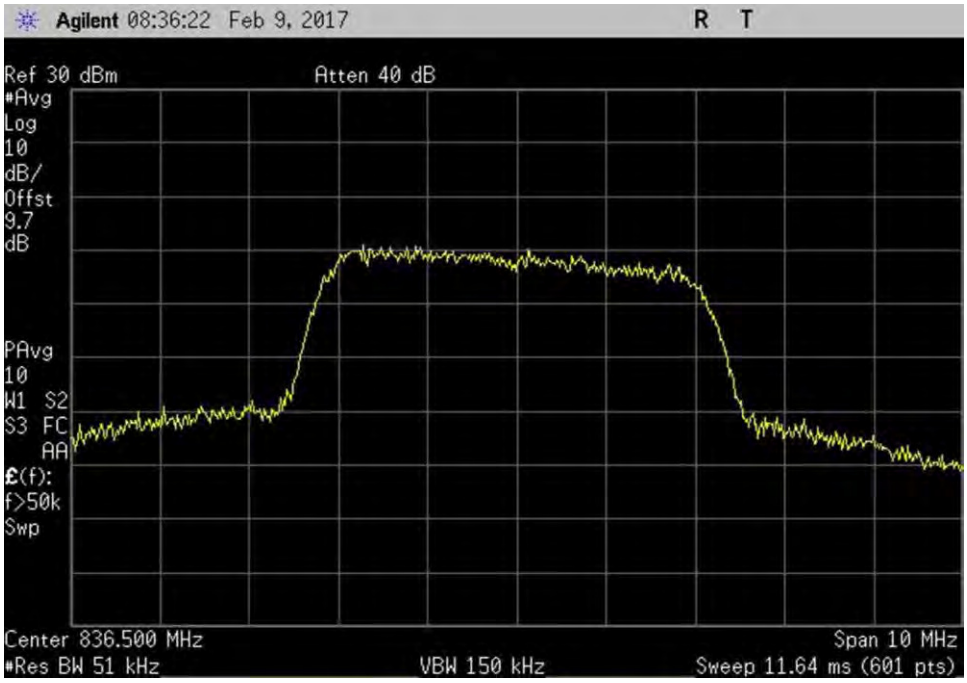
7.10_OBW_UL_776-787MHz_WCDMA_In



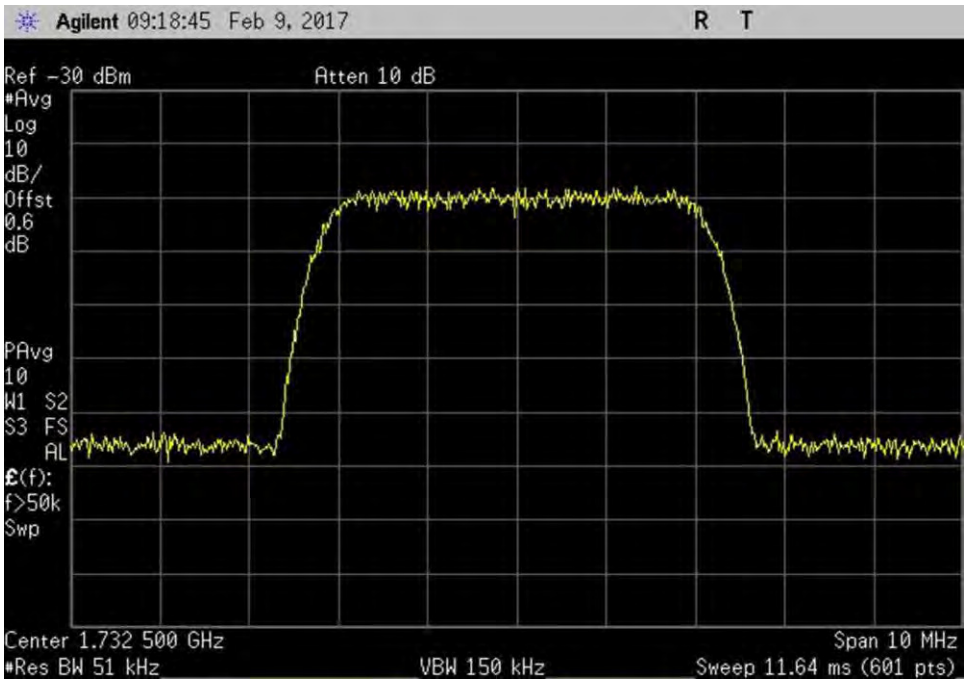
7.10_OBW_UL_776-787MHz_WCDMA_Out



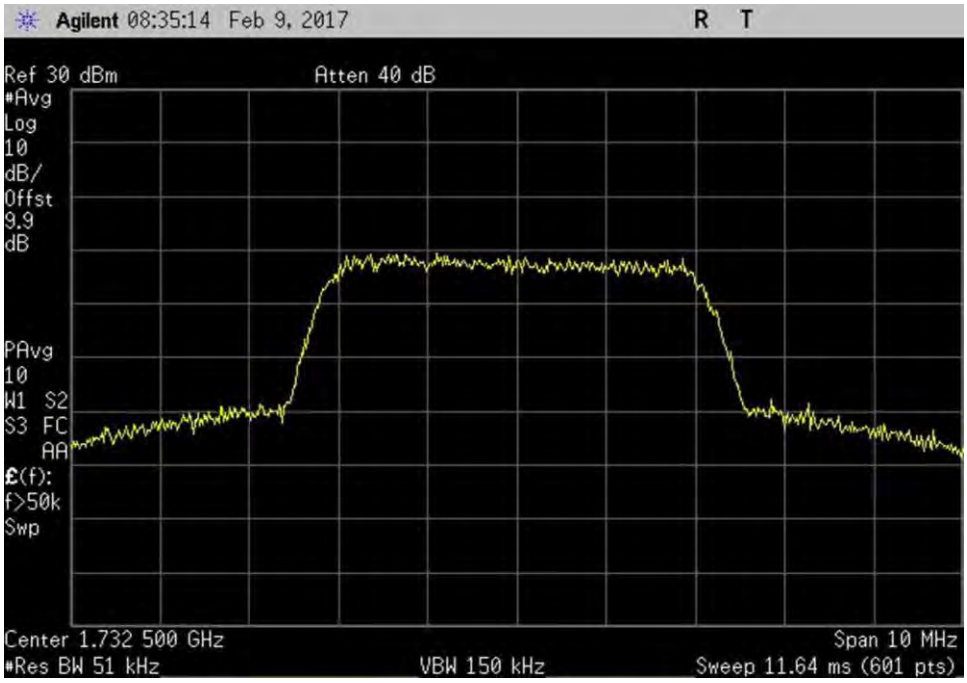
7.10_OBW_UL_824-849MHz_WCDMA_In



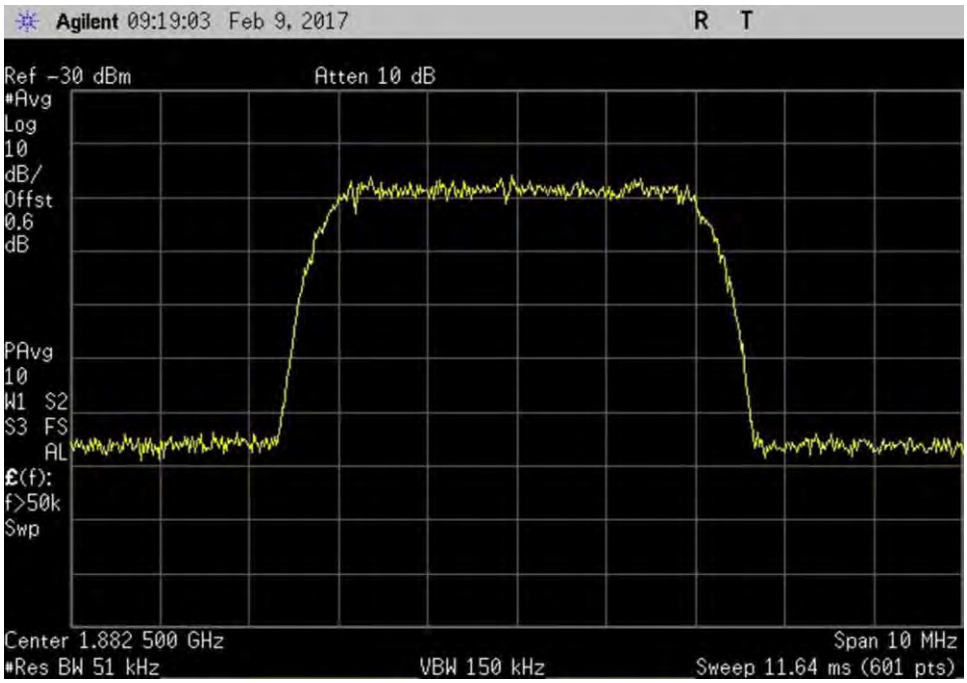
7.10_OBW_UL_824-849MHz_WCDMA_Out



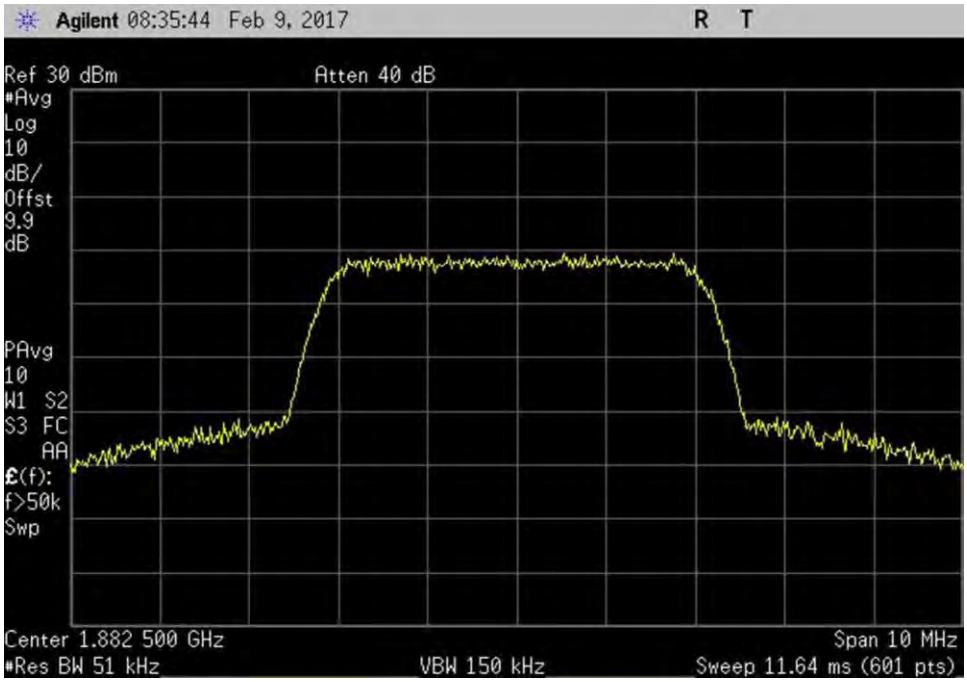
7.10_OBW_UL_1710-1755MHz_WCDMA_In



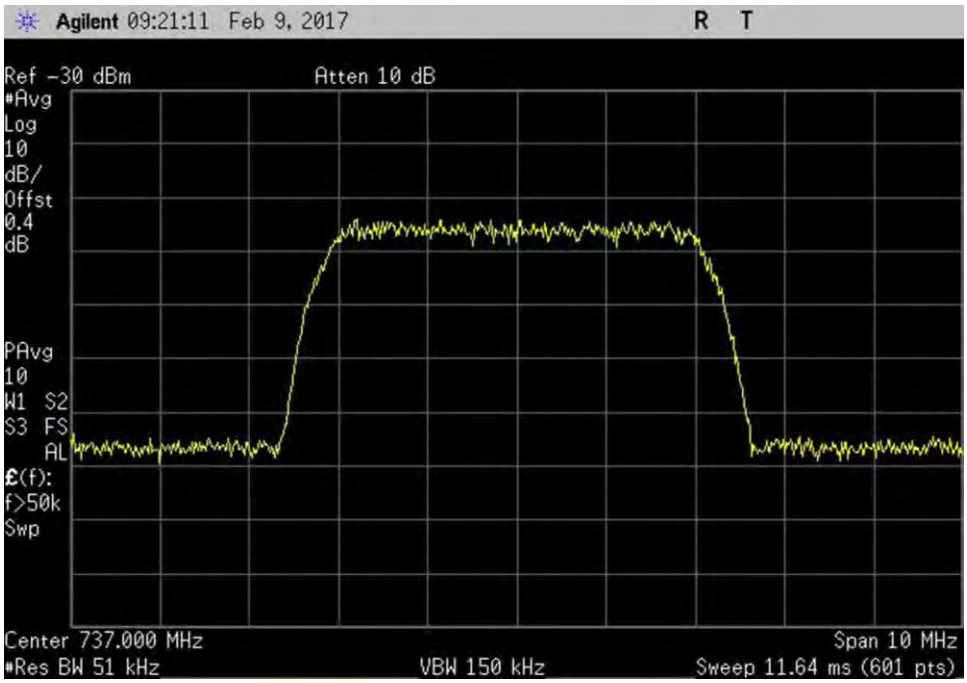
7.10_OBW_UL_1710-1755MHz_WCDMA_Out



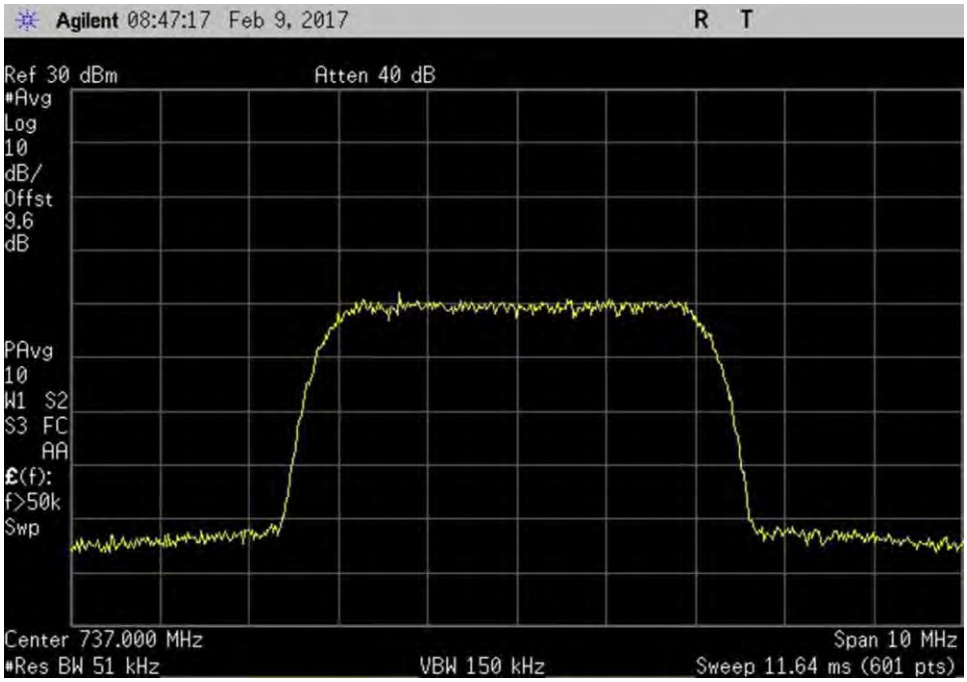
7.10_OBW_UL_1850-1915MHz_WCDMA_In



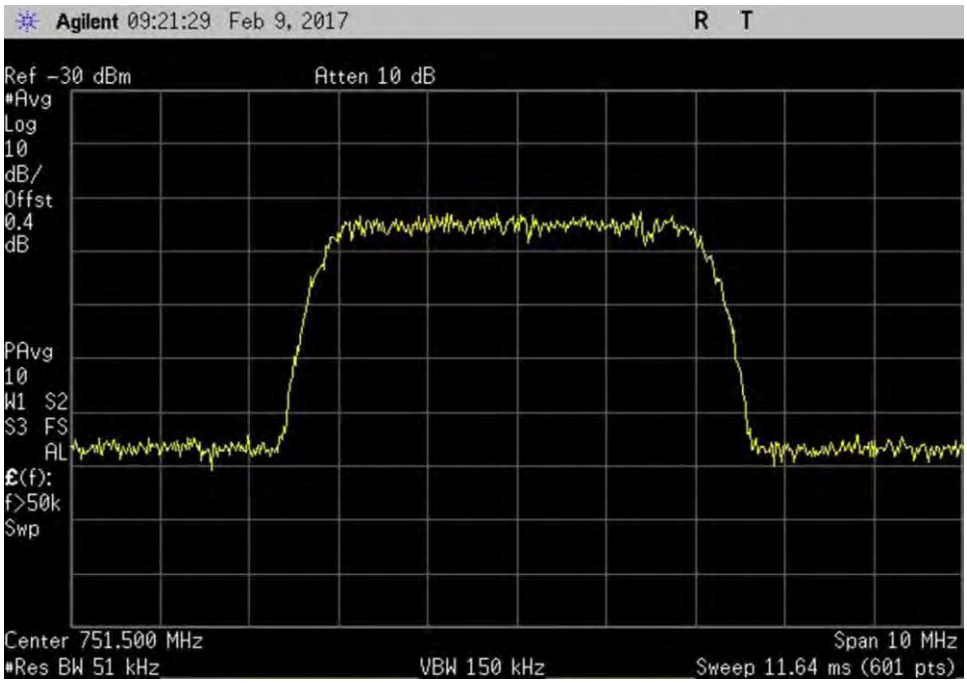
7.10_OBW_UL_1850-1915MHz_WCDMA_Out



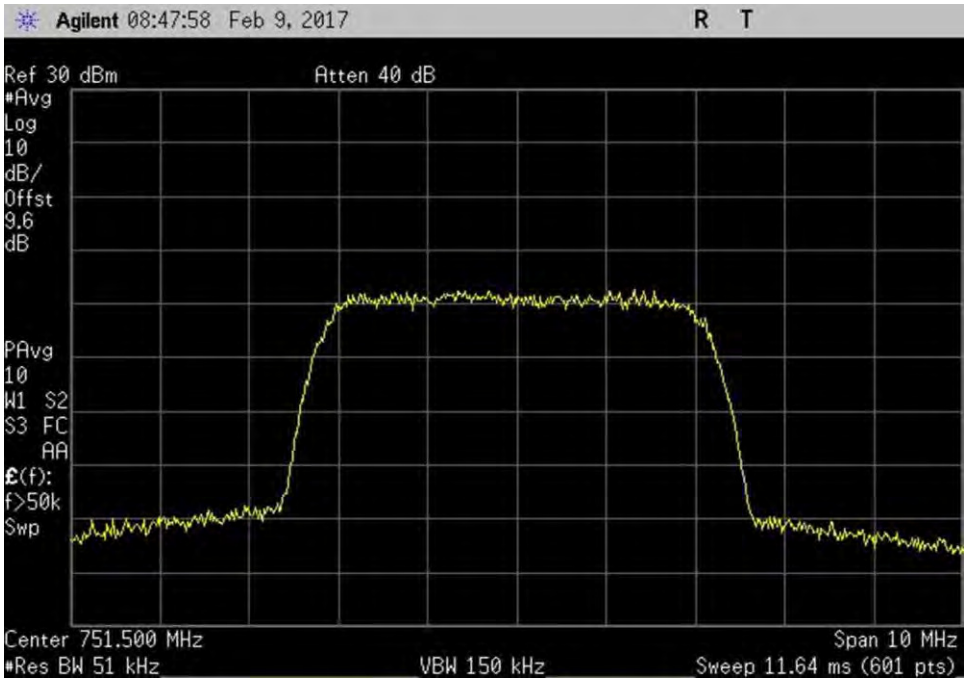
7.10_OBW_DL_728-746MHz_WCDMA_In



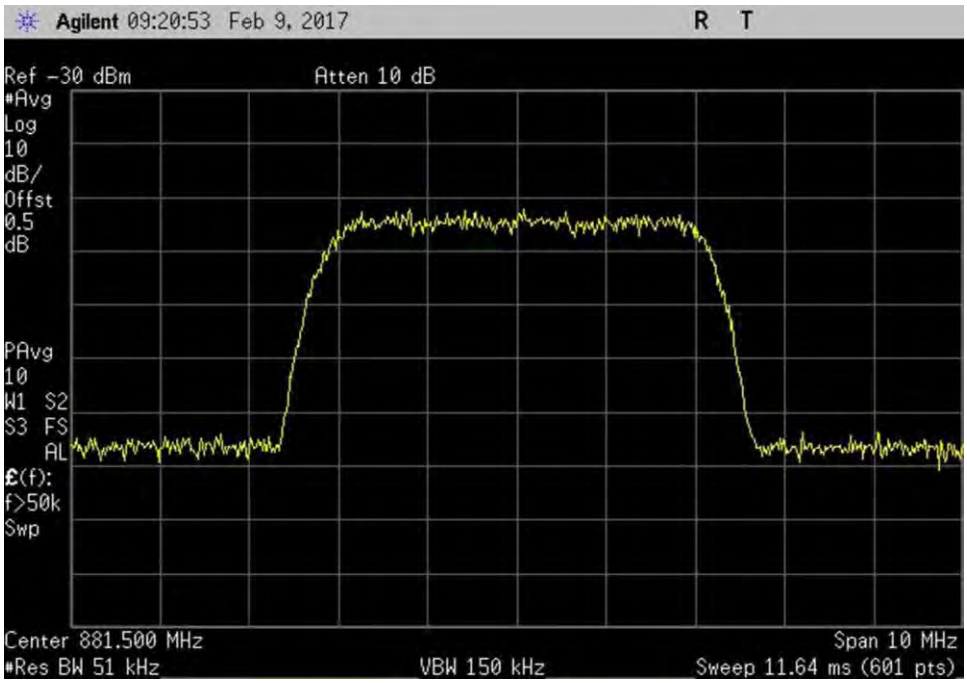
7.10_OBW_DL_728-746MHz_WCDMA_Out



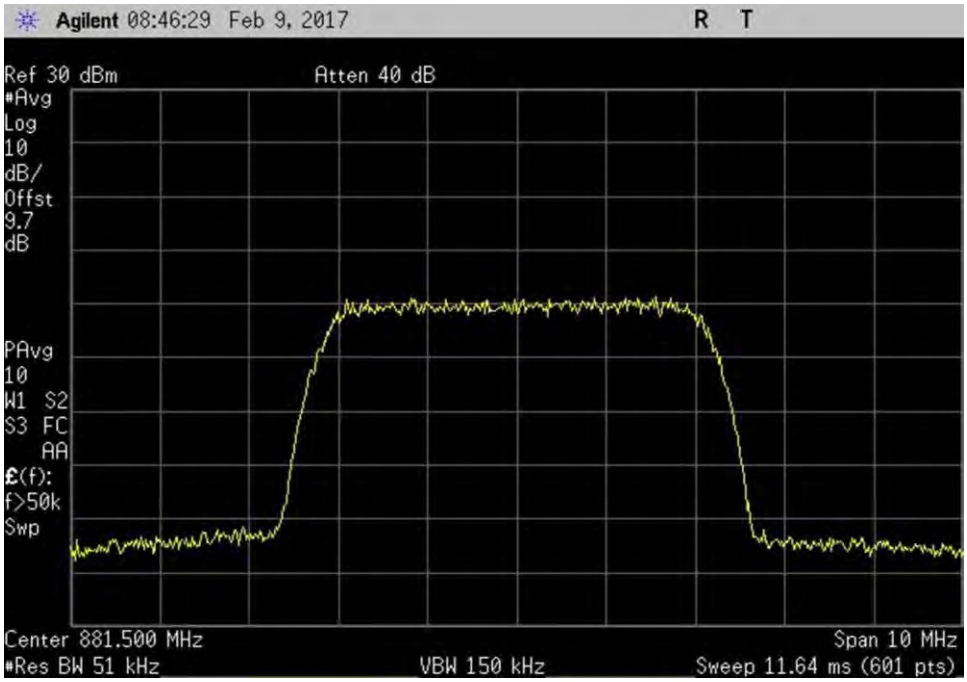
7.10_OBW_DL_746-757MHz_WCDMA_In



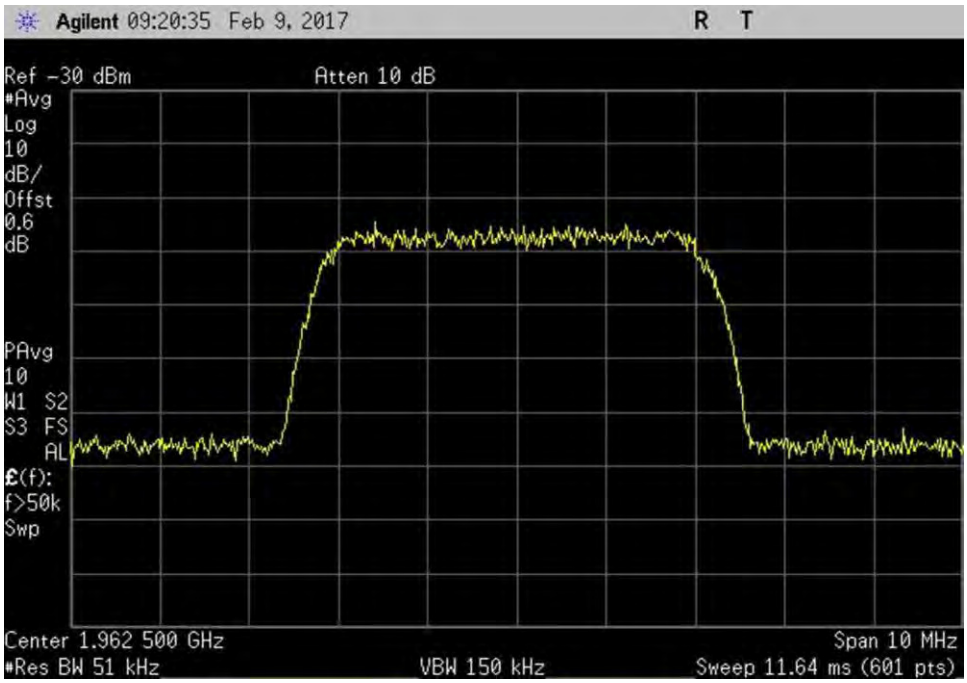
7.10_OBW_DL_746-757MHz_WCDMA_Out



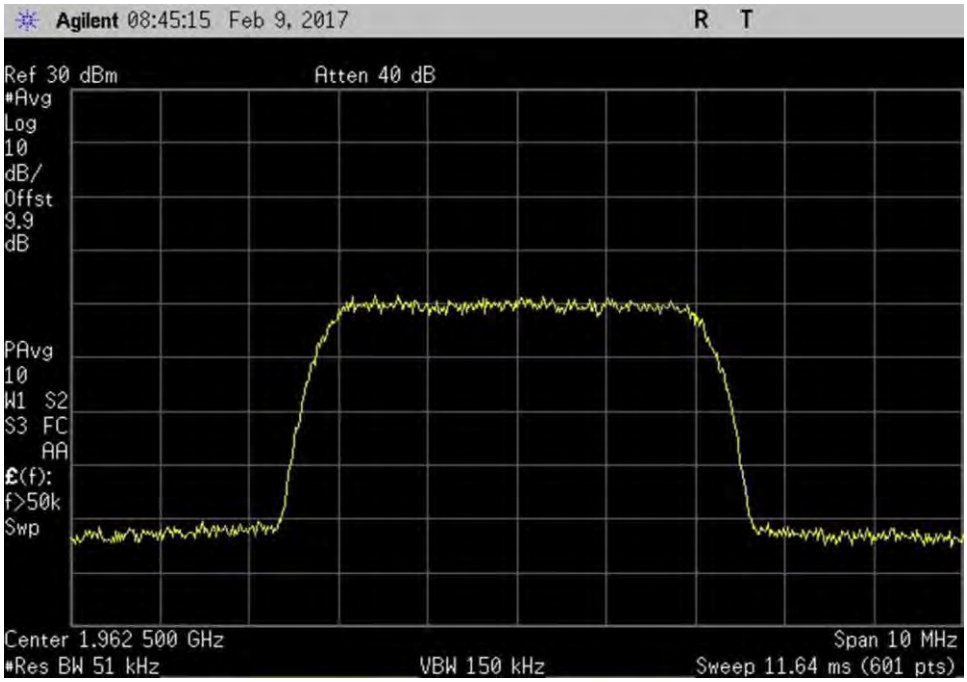
7.10_OBW_DL_869-894MHz_WCDMA_In



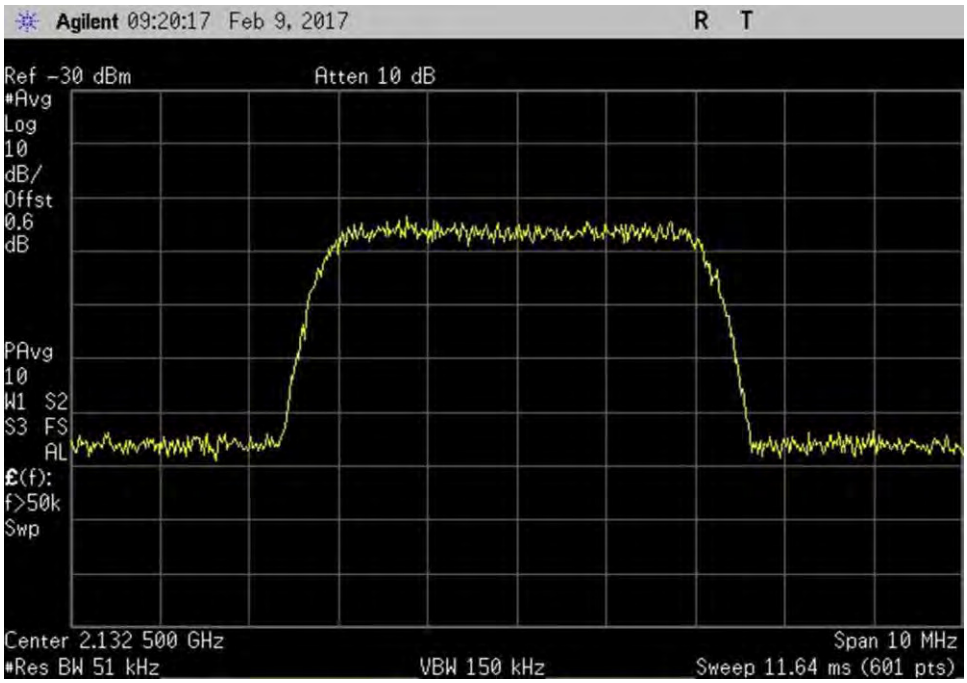
7.10_OBW_DL_869-894MHz_WCDMA_Out



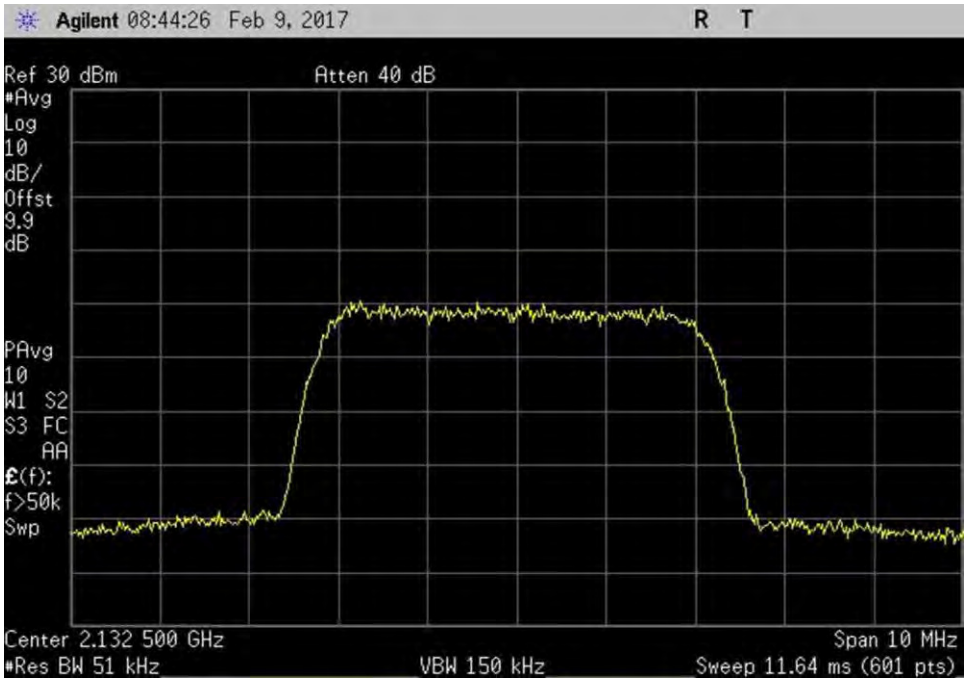
7.10_OBW_DL_1930-1995MHz_WCDMA_In



7.10_OBW_DL_1930-1995MHz_WCDMA_Out



7.10_OBW_DL_2110-2155MHz_WCDMA_In



7.10_OBW_DL_2110-2155MHz_WCDMA_Out

7.11 Oscillation Detection

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	Huaptec		
Specification:	**7.11 Anti-Oscillation (Oscillation Restarts / Oscillation mitigation or shutdown)**		
Work Order #:	**99439**	Date:	2/9/2017
Test Type:	**Conducted Emissions**	Time:	9:30:00 AM
Tested By:	**Daniel Bertran**	Sequence#:	1
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is a Fixed Wideband Consumer Booster.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Server port is a type N connector and 50-ohm impedance.
The EUT Donor port is type N connector and 50-ohm impedance.
Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

The test was performed in accordance with section 7.11 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016
Firmware: AF17-5S-V02

Test environment conditions:
Temperature: 19.6°C
Relative Humidity: 63%
Pressure: 101.9 kPa

Note: UL1850-1915MHz -AWGNL+5:
- AWGNL denotes a 4.1MHz AWGN signal (99% occupied bandwidth) tuned to the frequency of 2.5 MHz above the lower edge of the operating band 1850-1915MHz
- +5 denotes a variable attenuator adjusted such that the insertion loss for center of band under test (isolation) between the booster's donor and server ports is 5 dB greater than the maximum gain, as recorded in the maximum gain test procedure, for the band under test.

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
AN03418	Signal Generator	E4438C	7/30/2015	7/30/2017
ANP06467	Attenuator	PE7014-10	5/13/2015	5/13/2017
ANP06897	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP06898	Cable	32022-29094K-29094K-48TC	12/30/2015	12/30/2017
ANP05411	Attenuator	54A-10	1/18/2016	1/18/2018
AN03471	Spectrum Analyzer	E4440A	1/4/2016	1/4/2018

Summary of Results

Pass: All oscillations detections and mitigations occur within 0.3 seconds in uplink bands, within 1 second in the downlink bands and the noise level is below the -70dBm/MHz limit.

7.11.2 Oscillation restart tests

Oscillation detection				Time Between restart		Number of restart	
Frequency	Measured	Limit	Peak Level	Measured	Limit	Measured	Limit
MHz	Sec	Sec	dBm	Sec	At least sec		
UL1710-1755	0.27	0.30	24.6	62	60	3	5
UL1850-1915	0.20	0.30	23.7	62	60	3	5
UL824-894	0.29	0.30	15.4	62	60	3	5
UL 698-716	0.22	0.30	23.5	62	60	3	5
UL776-787	0.30	0.30	22.2	62	60	3	5
DL2110-2155	0.25	1.00	9.6	62	60	3	5
DL1930-1995	0.22	1.00	5.5	63	60	3	5
DL869-894	0.20	1.00	23.8	62	60	3	5
DL:728-746	0.28	1.00	22.4	62	60	3	5
DL 746-757	0.27	1.00	24.0	62	60	3	5

The booster continues to mitigate at least 1 minute before restarting. The plots demonstrate after 3 restarts (the limit is 5 restart), the booster does not resume operation until manually reset.

7.11.3 Test procedure for measuring oscillation mitigation or shutdown

	UL 1710-1755	UL1850-1915	UL 824-894	UL 698-716	UL 776-787	
Max Gain Isolation	Pk-Pk Difference	Pk-Pk Difference	Pk-Pk Difference	Pk-Pk Difference	Pk-Pk Difference	Limit
dB	dB	dB	dB	dB	dB	dB
+5dB	10.6	9.1	10.6	10.4	10.2	12.0
+4dB	11.9	11.3	(12.7)*	11.2	(13.2)*	12.0
+3dB	(13.6)*	(12.3)*	(14.8)*	(12.7)*	(14.2)*	12.0
+2dB	(15.9)*	(14.5)*	(18.1)*	(14.4)*	(15.5)*	12.0
+1dB	(19.3)*	(17.4)*	(21.8)*	(17.1)*	(17.5)*	12.0
0dB	(22.2)*	(25.4)*	(32.1)*	(21.3)*	(19.8)*	12.0
-1dB	(34.2)*	(58.8)*	**	(27)*	(24.4)*	12.0
-2dB	**	**	**	(86.3)*	(36.7)*	12.0
-3dB	**	**	**	**	(88.4)*	12.0
-4dB	**	**	**	**	(90.1)*	12.0
-5dB	**	**	**	**	**	12.0

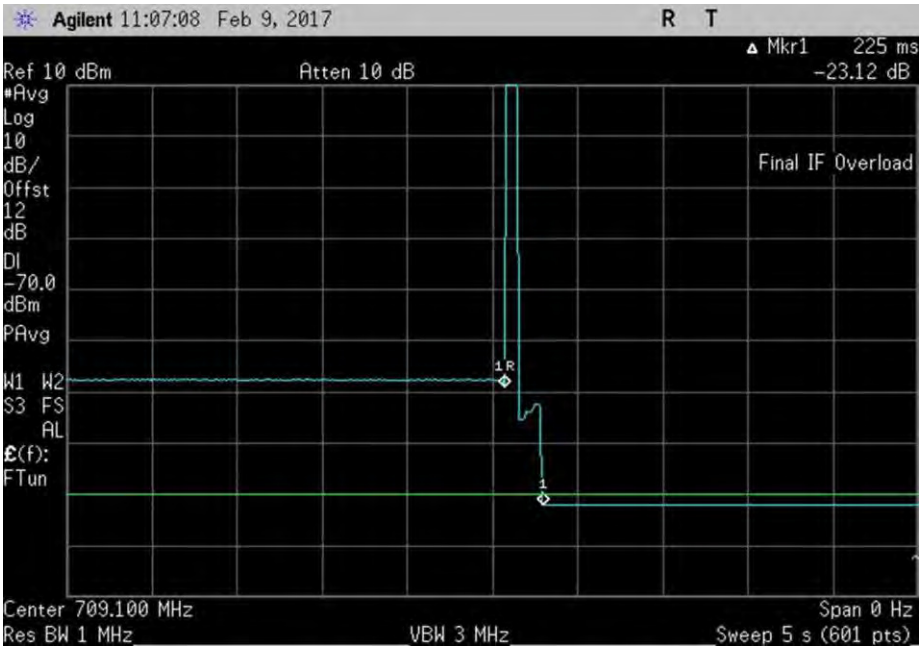
	DL 2110-2155	DL 1930-1995	DL 869-894	DL 728-746	DL 746-775	
Max Gain Isolation	Pk-Pk Difference	Pk-Pk Difference	Pk-Pk Difference	Pk-Pk Difference	Pk-Pk Difference	Limit
dB	dB	dB	dB	dB	dB	dB
+5dB	9.1	8.7	8.0	9.8	10.1	12.0
+4dB	10.5	9.3	9.5	10.5	10.9	12.0
+3dB	11.9	10.5	11.3	(12)*	11.8	12.0
+2dB	(13.4)*	(12.4)*	(13.6)*	(13.4)*	(16.6)*	12.0
+1dB	(16.2)*	(14.2)*	(17.2)*	(15.7)*	(19.6)*	12.0
0dB	(22.3)*	(16.8)*	(24.5)*	(19.2)*	(25.9)*	12.0
-1dB	(39.3)*	(24)*	**	(24.3)*	(44.2)*	12.0
-2dB	**	(52)*	**	(38.2)*	**	12.0
-3dB	**	**	**	**	**	12.0
-4dB	**	**	**	**	**	12.0
-5dB	**	**	**	**	**	12.0

* The measured difference exceeds the limit for a period of less than 300 second before device mitigates and shuts down. The maximum recorded time prior to shutdown was 98 seconds for the Uplink bands and 100 seconds for the Downlink bands.

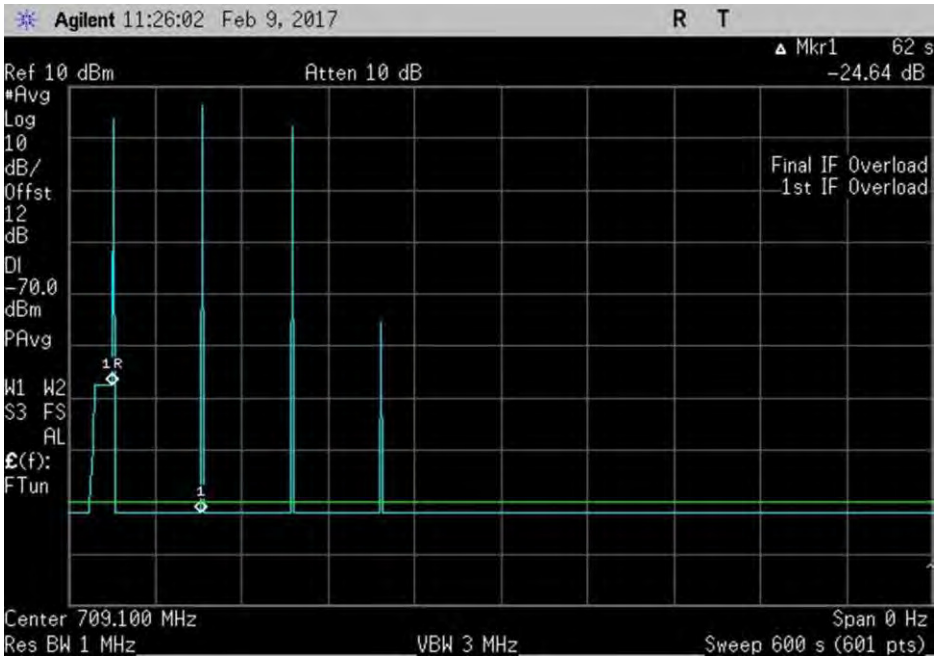
** The device shuts down immediately.

7.11.2 Oscillation Restart Tests

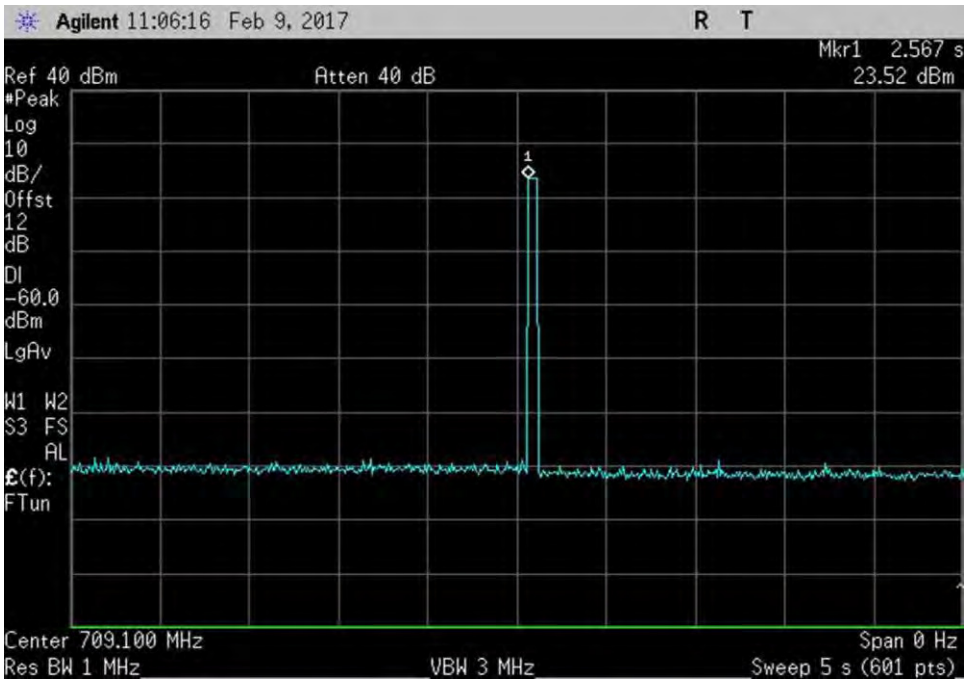
Plots



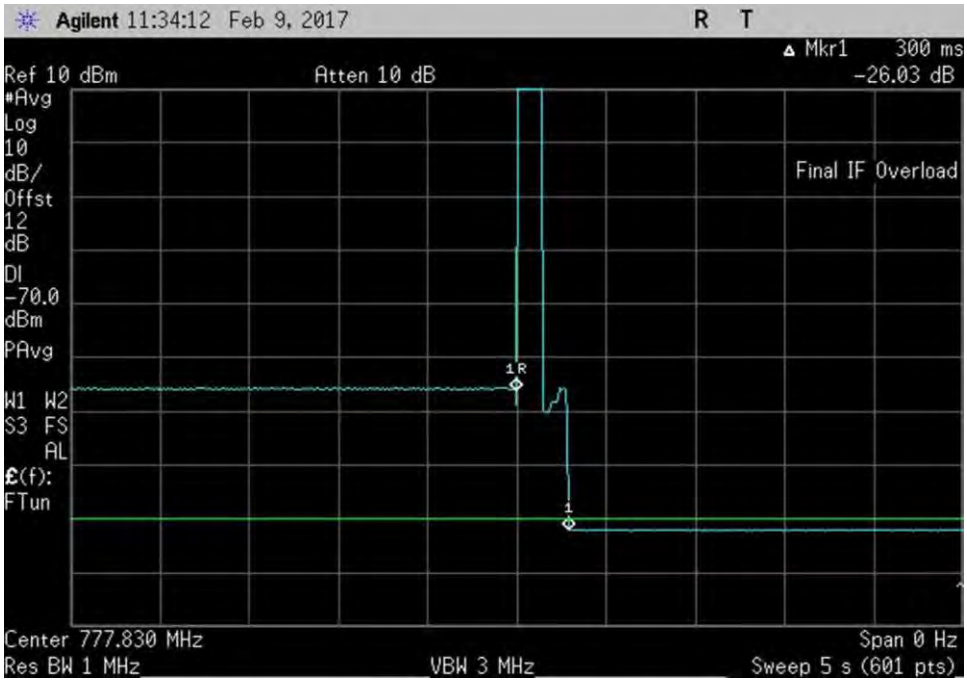
7.11.2_osc_UL_698-716MHz



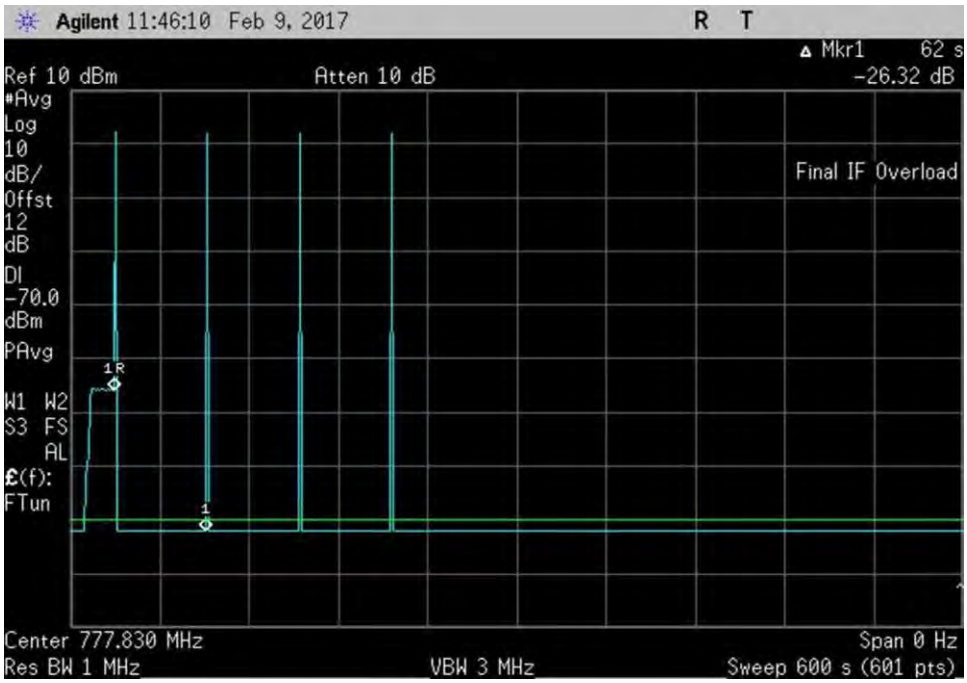
7.11.2_osc_UL_698-716MHz600sec



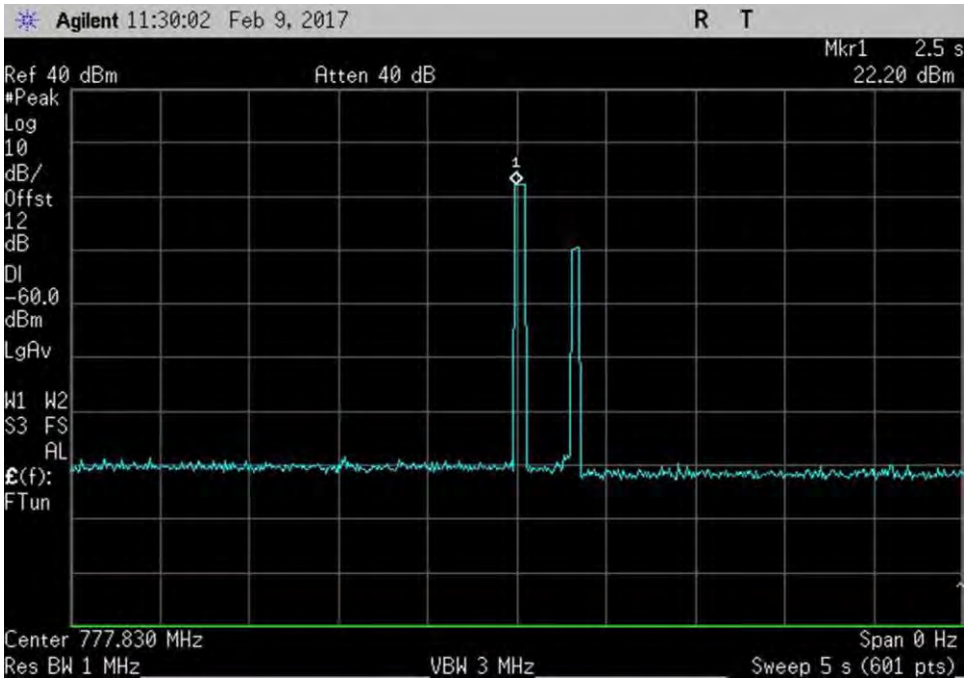
7.11.2_osc_UL_698-716MHzPk



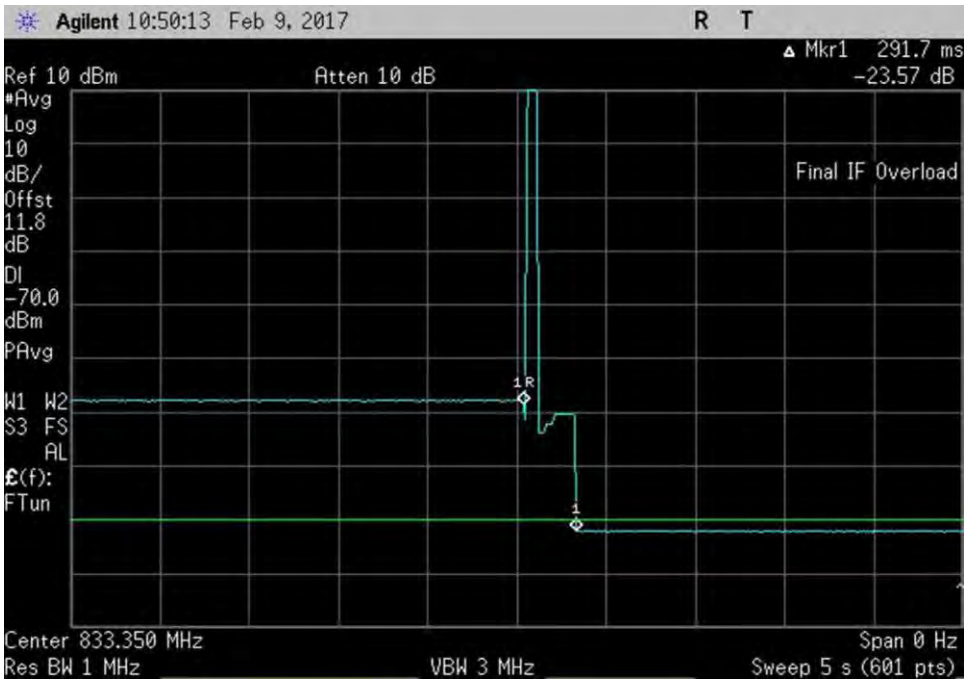
7.11.2_osc_UL_776-787MHz



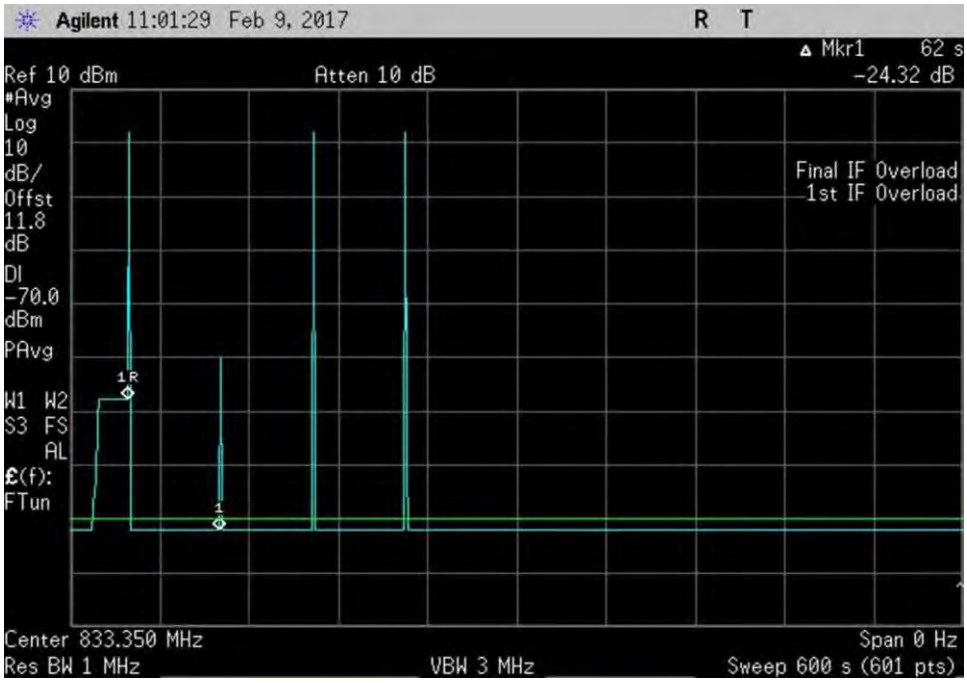
7.11.2_osc_UL_776-787MHz600sec



7.11.2_osc_UL_776-787MHzPk



7.11.2_osc_UL_824-849MHz



7.11.2_osc_UL_824-849MHz600sec