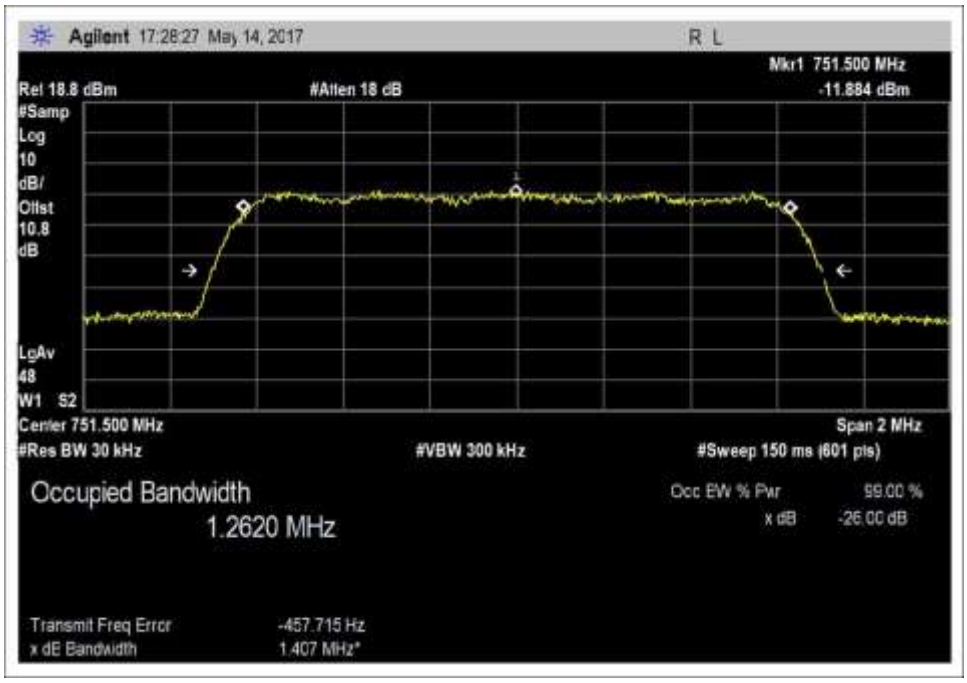
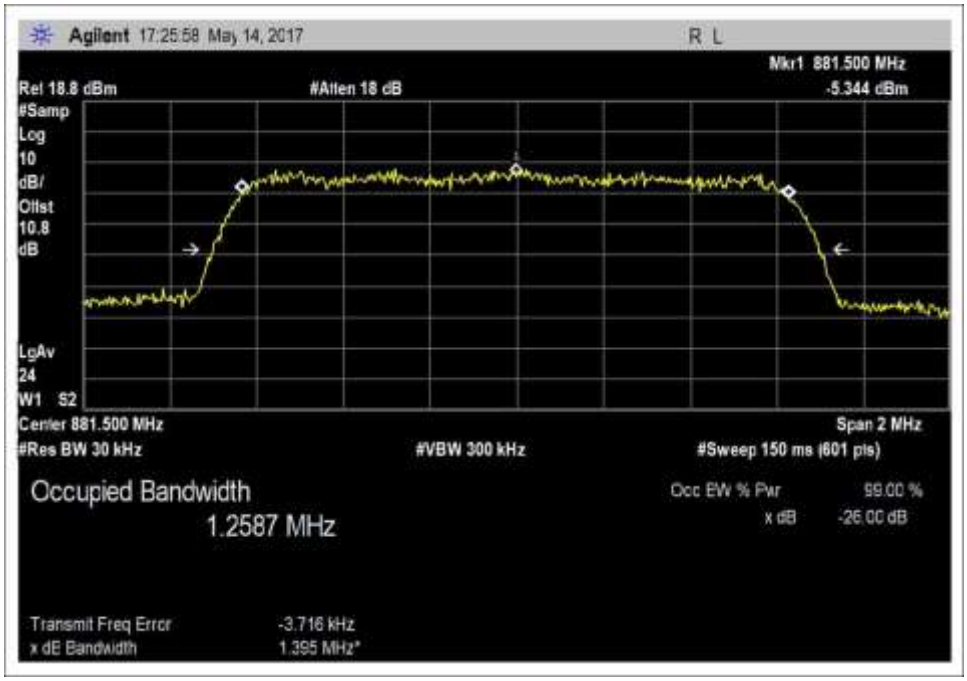
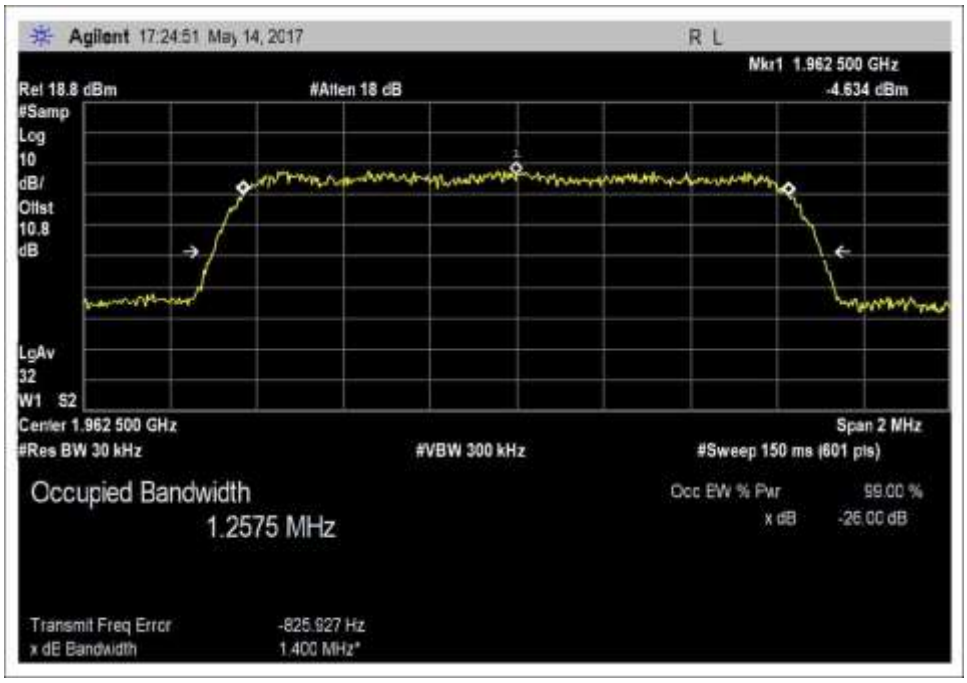


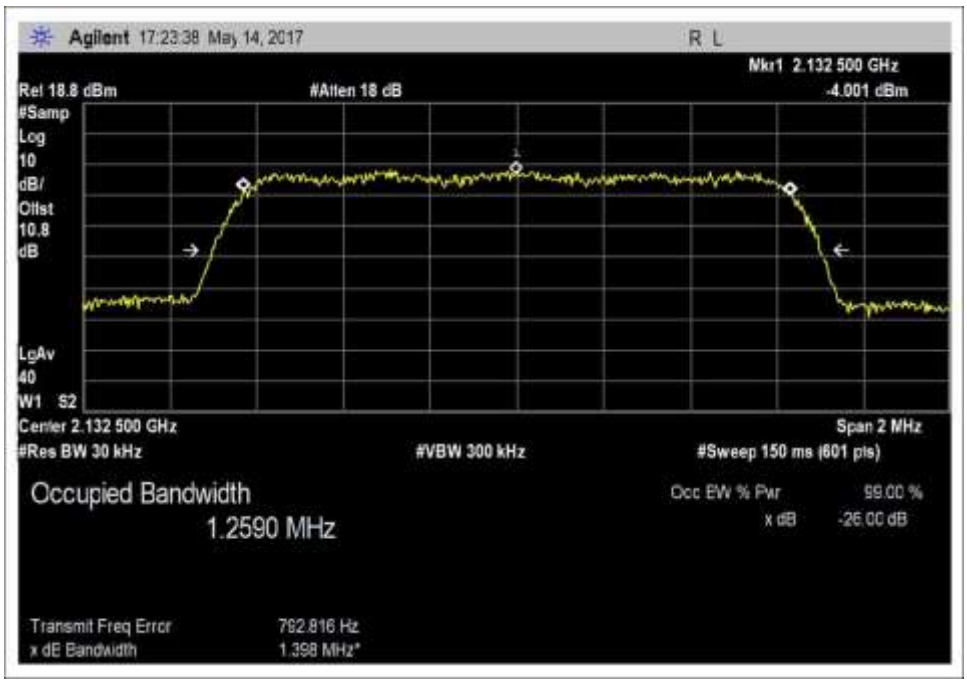
Output_OBW_DL_746-757MHz _CDMA



Output_OBW_DL_869-894MHz _CDMA

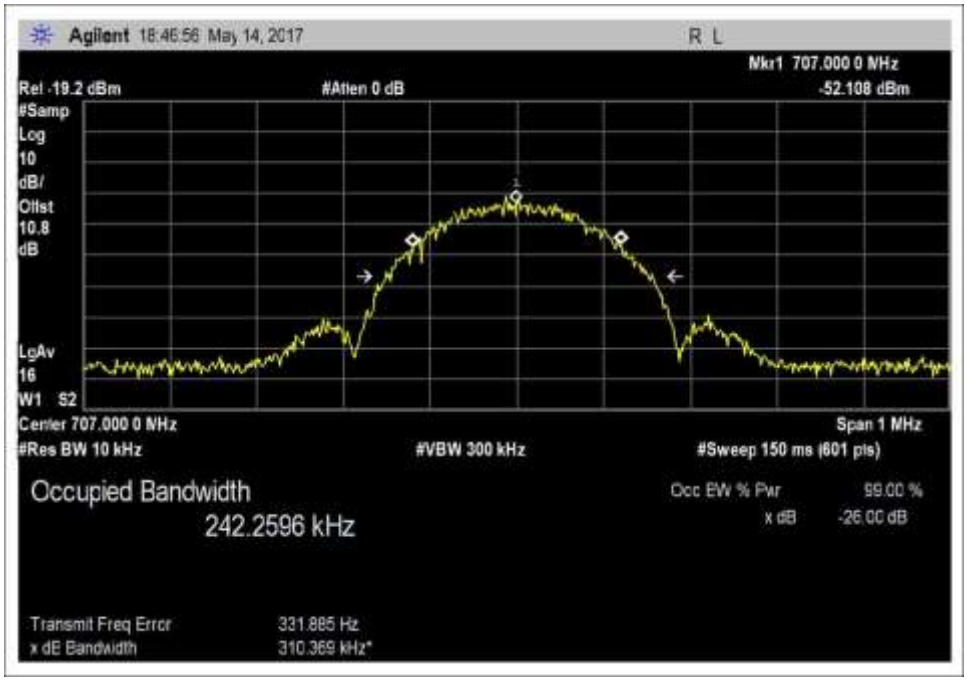


Output_OBW_DL_1930-1995MHz_CDMA

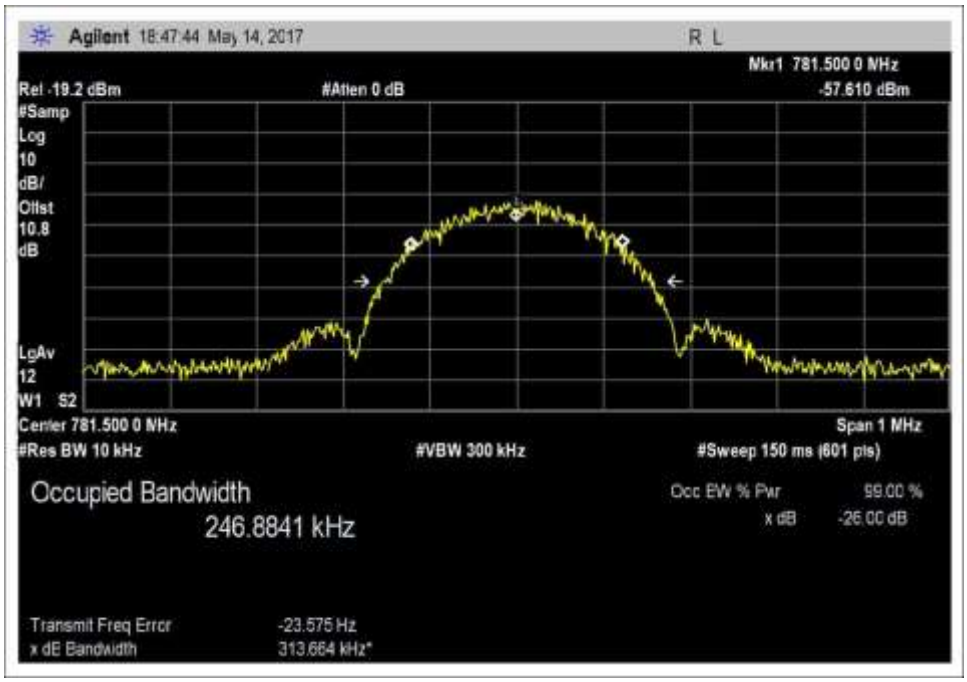


Output_OBW_DL_2110-2155MHz _CDMA

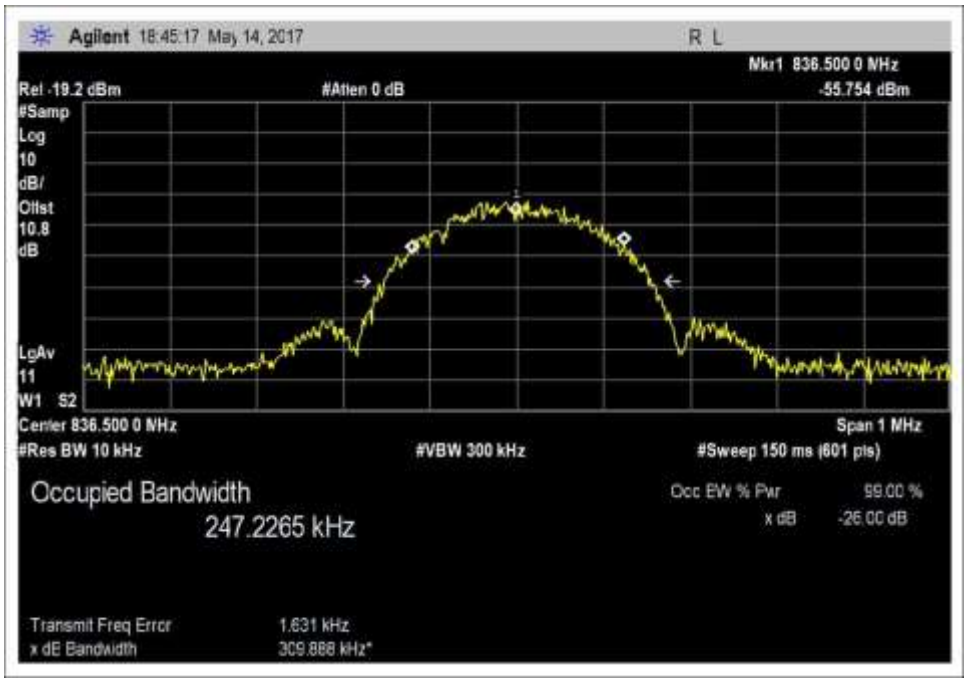
EDGE



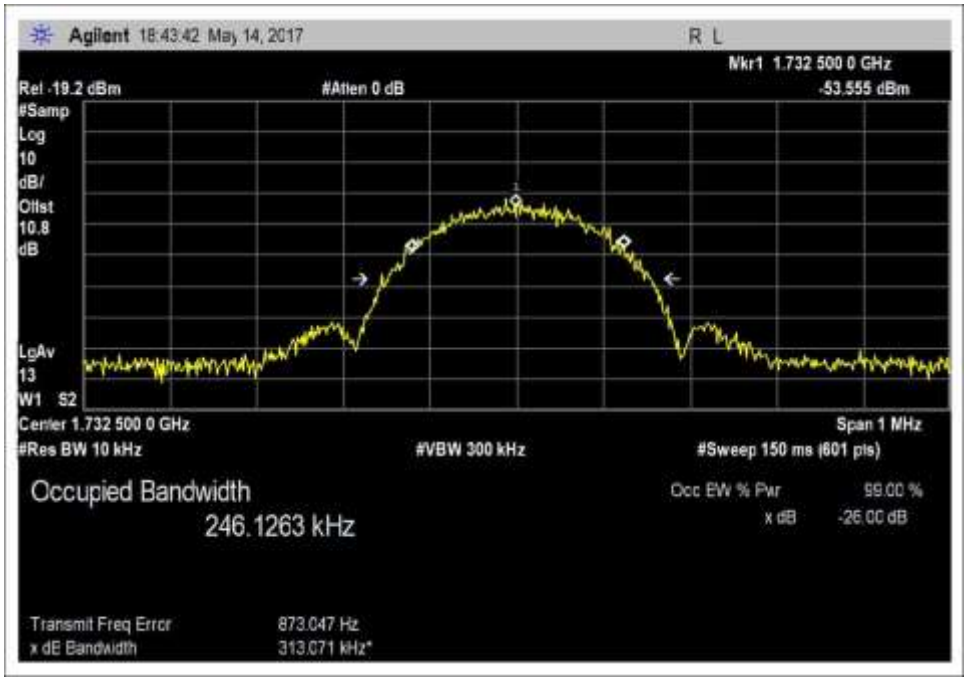
Input_OBW_UL_698-716MHz _EDGE



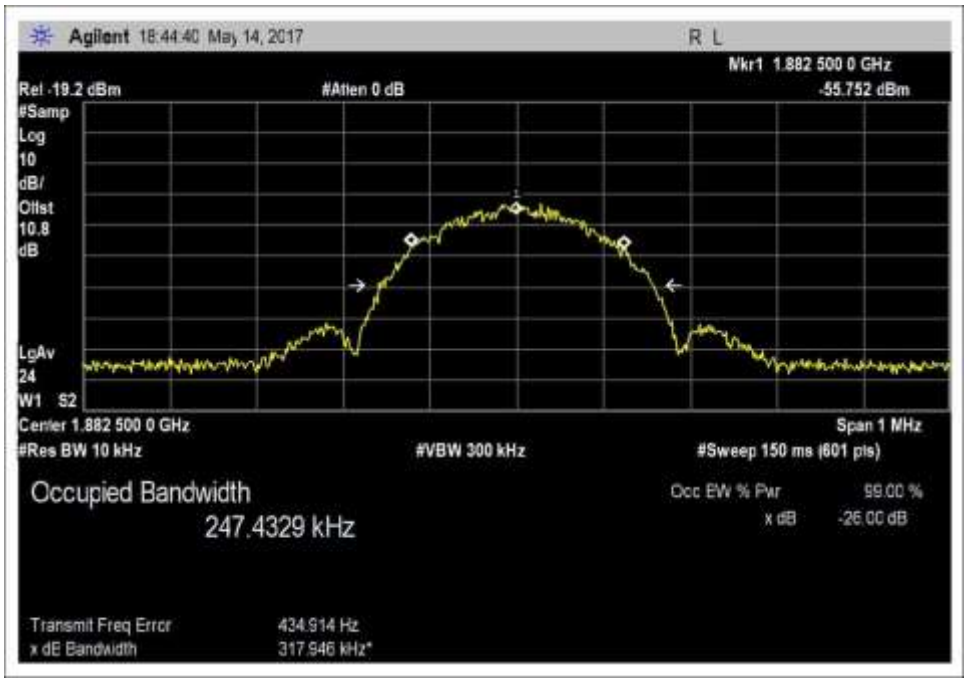
Input_OBW_UL_776-787MHz _EDGE



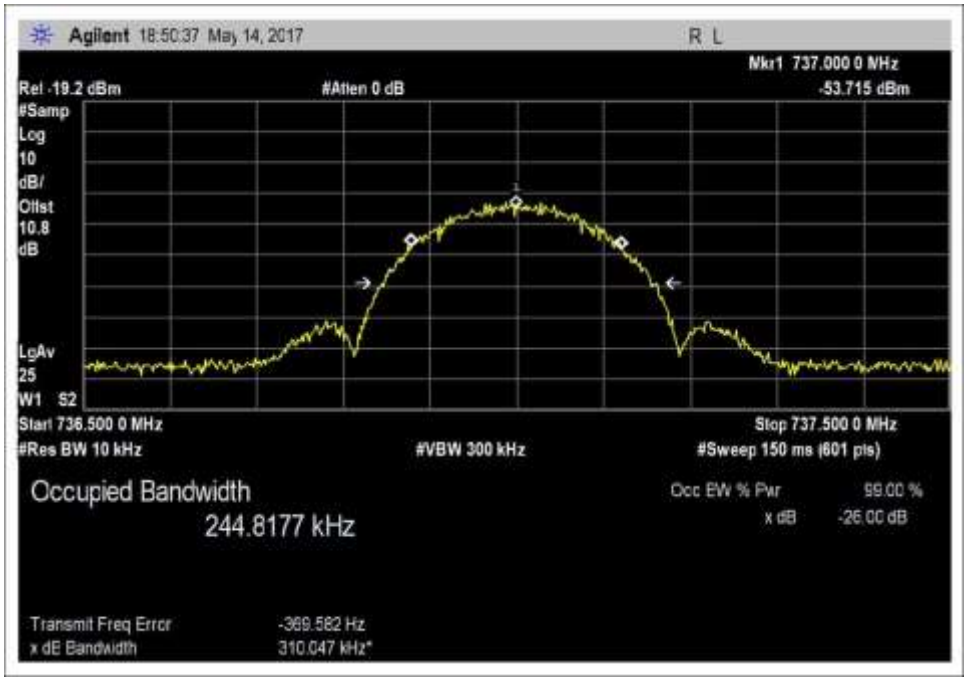
Input_OBW_UL_824-849MHz _EDGE



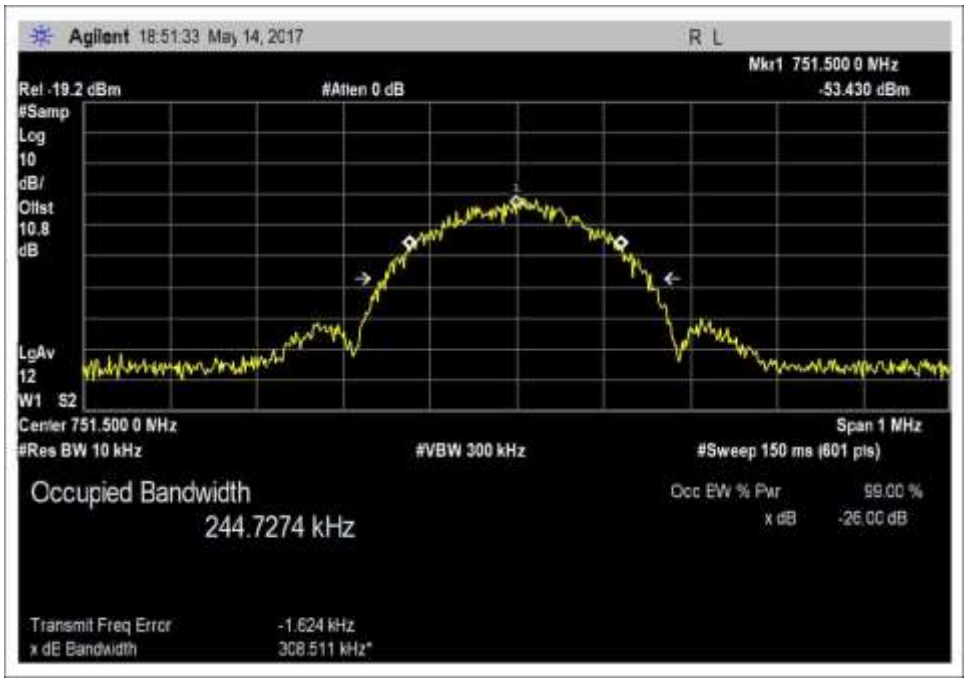
Input_OBW_UL_1710-1755MHz_EDGE



Input_OBW_UL_1850-1915MHz _EDGE

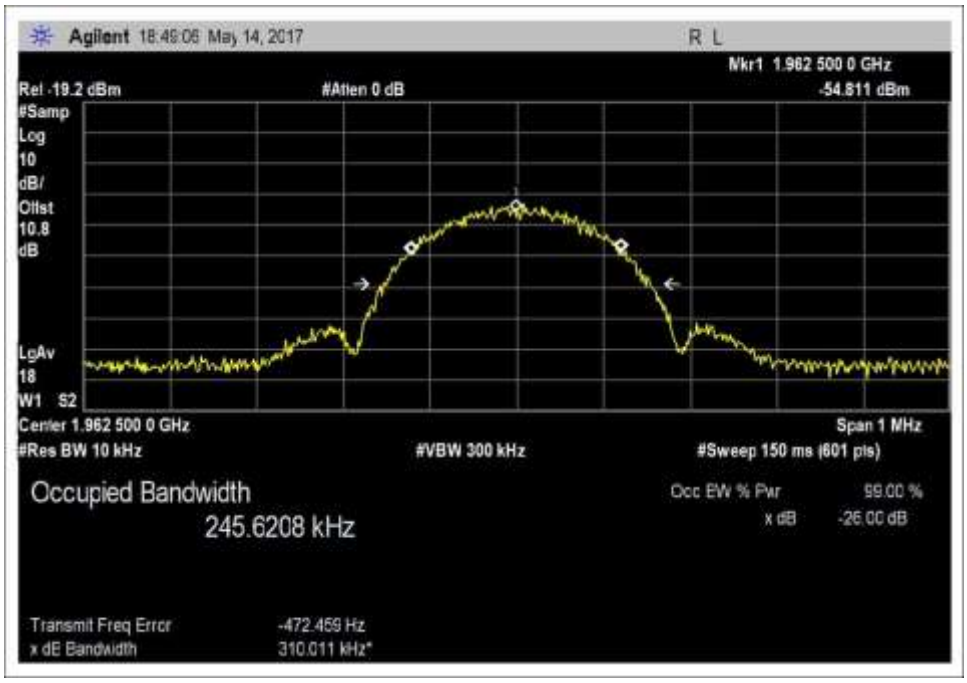


Input_OBW_DL_728-746MHz_EDGE

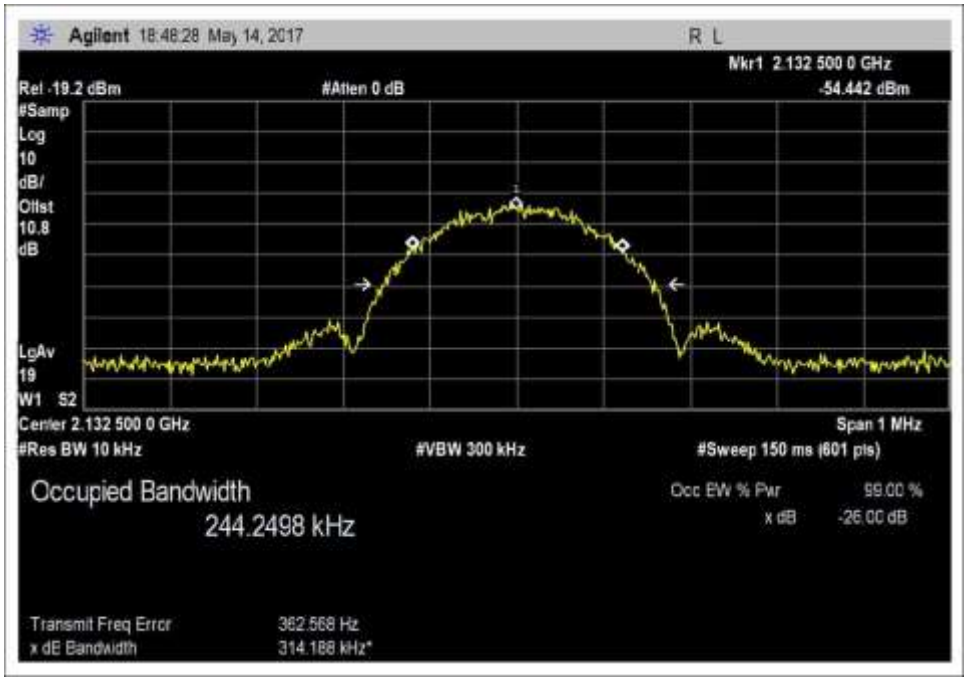


Input_OBW_DL_746-757MHz _EDGE

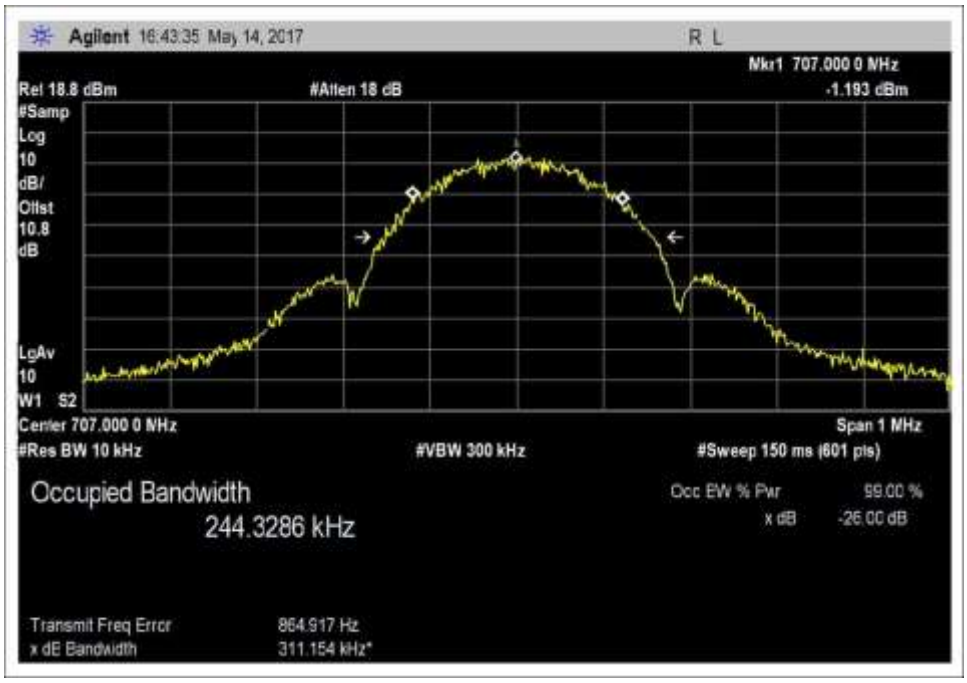
Input_OBW_DL_869-894MHz _EDGE



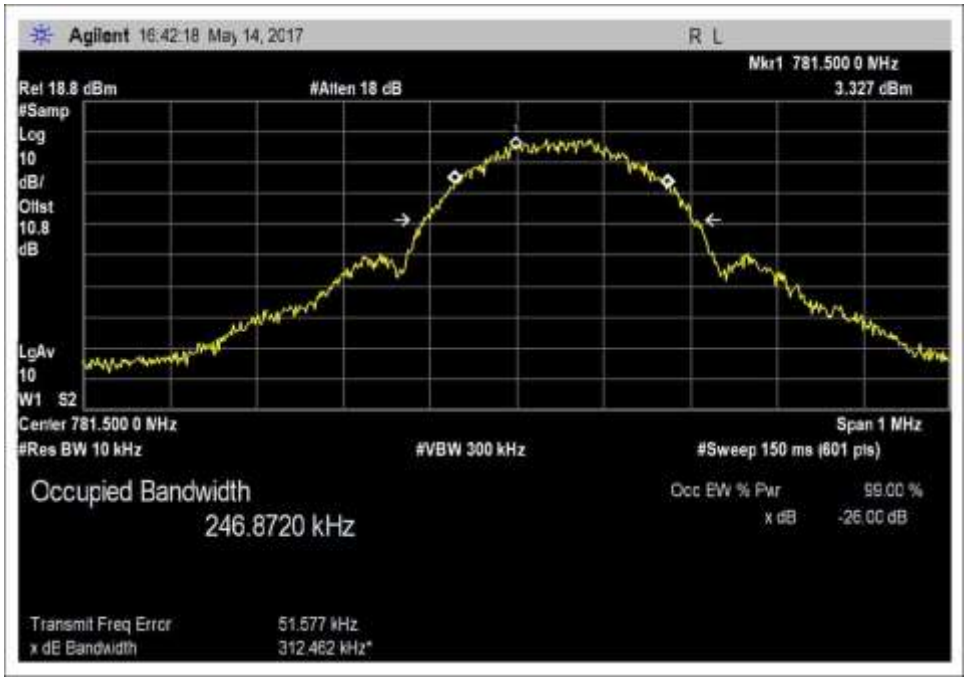
Input_OBW_DL_1930-1995MHz_EDGE



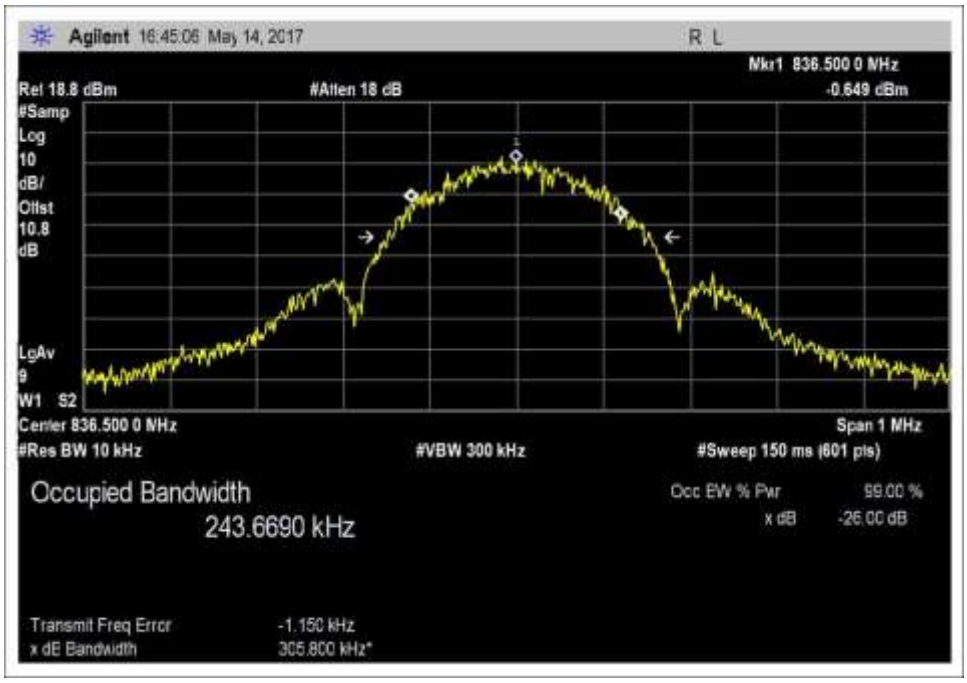
Input_OBW_DL_2110-2155MHz _EDGE



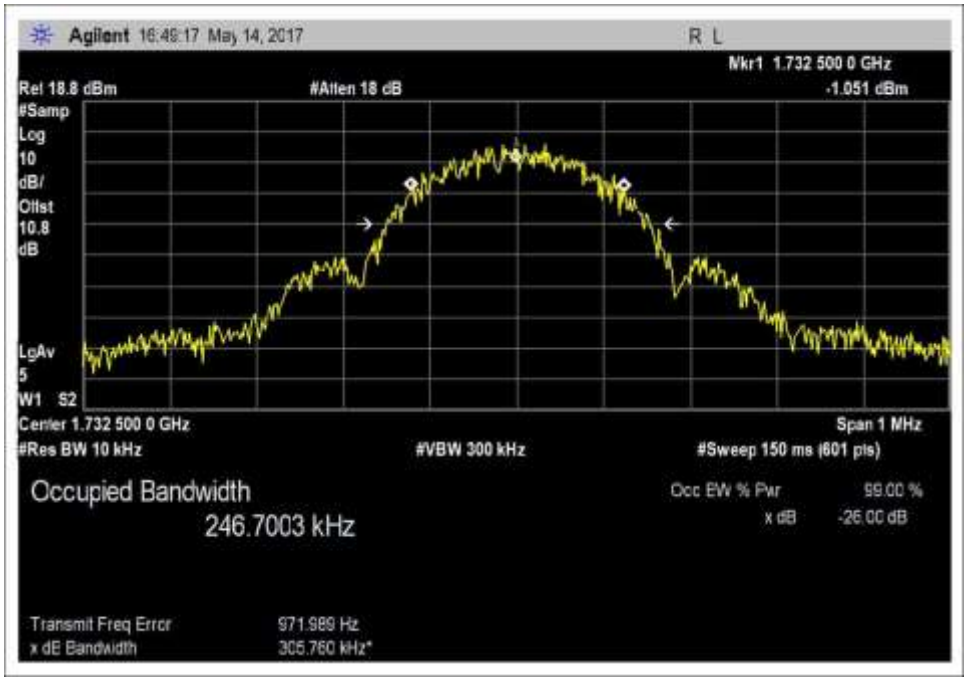
Output_OBW_UL_698-716MHz _EDGE



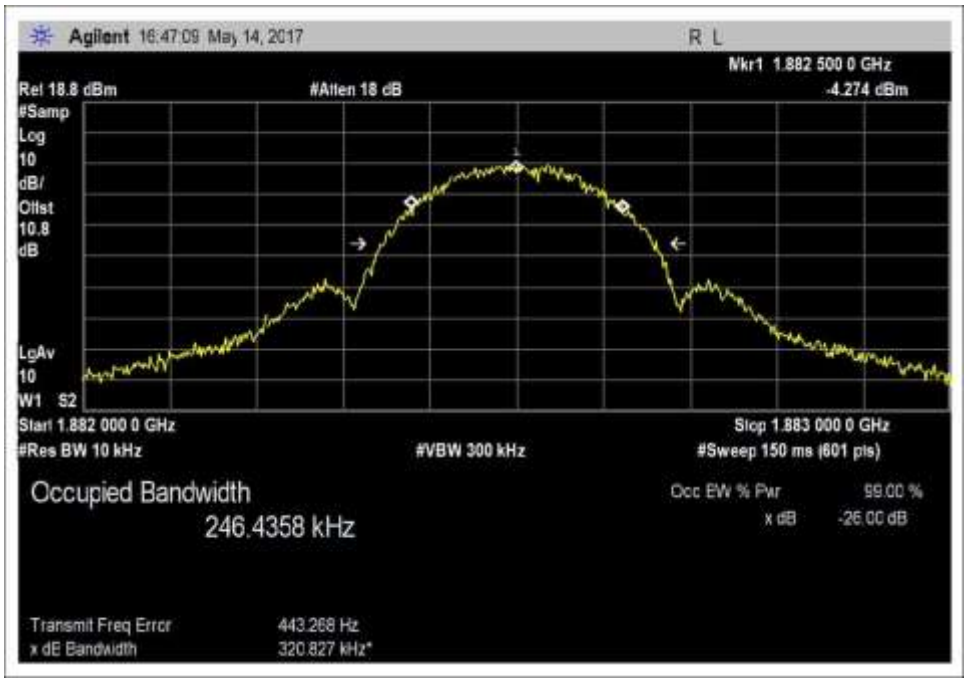
Output_OBW_UL_776-787MHz _EDGE



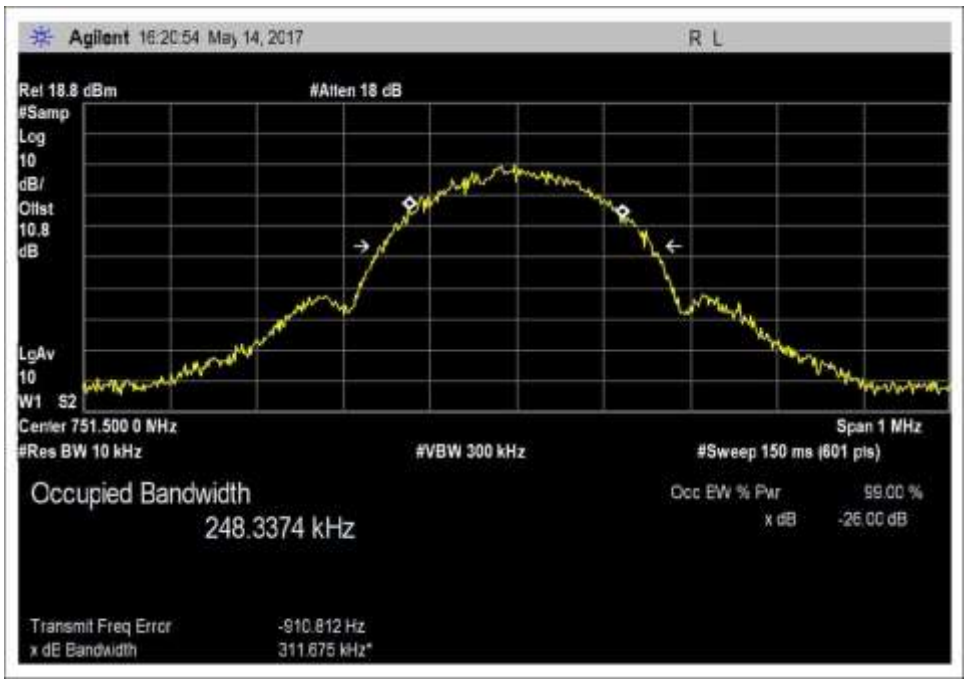
Output_OBW_UL_824-849MHz _EDGE



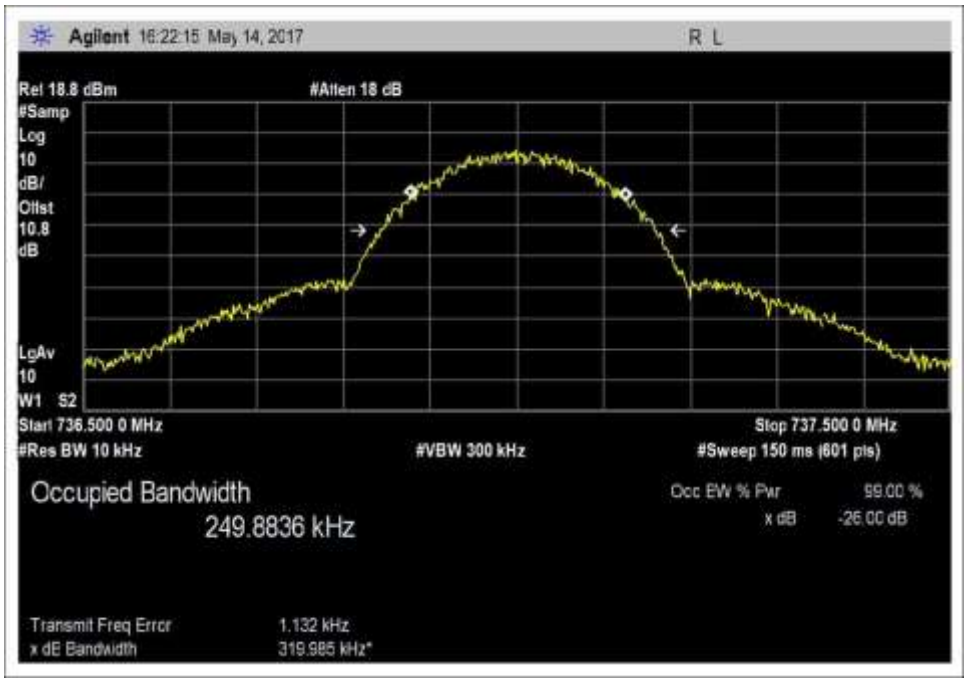
Output_OBW_UL_1710-1755MHz _EDGE



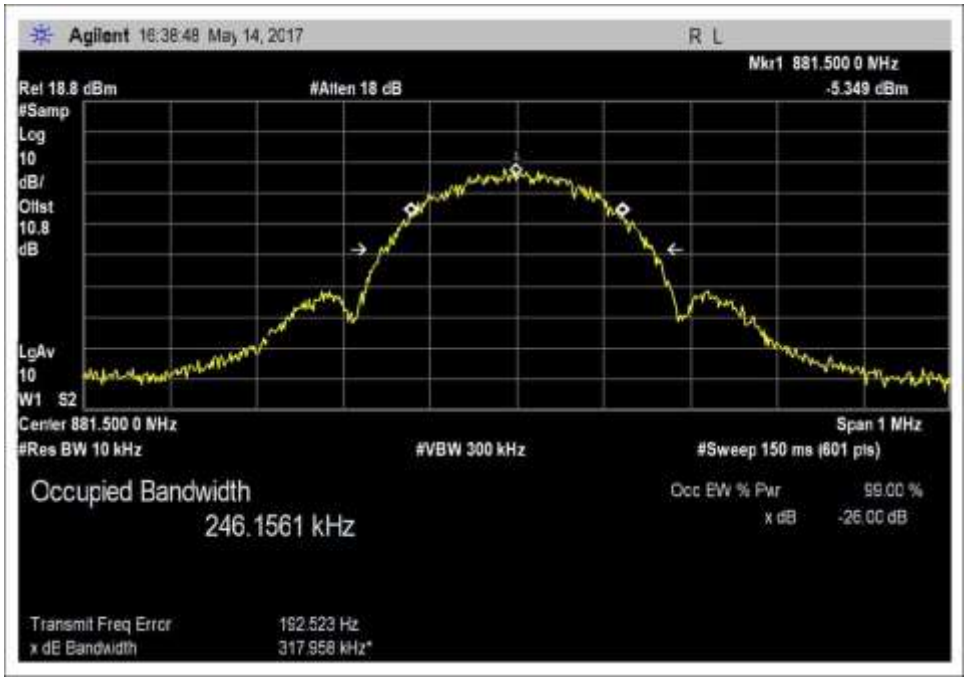
Output_OBW_UL_1850-1915MHz _EDGE



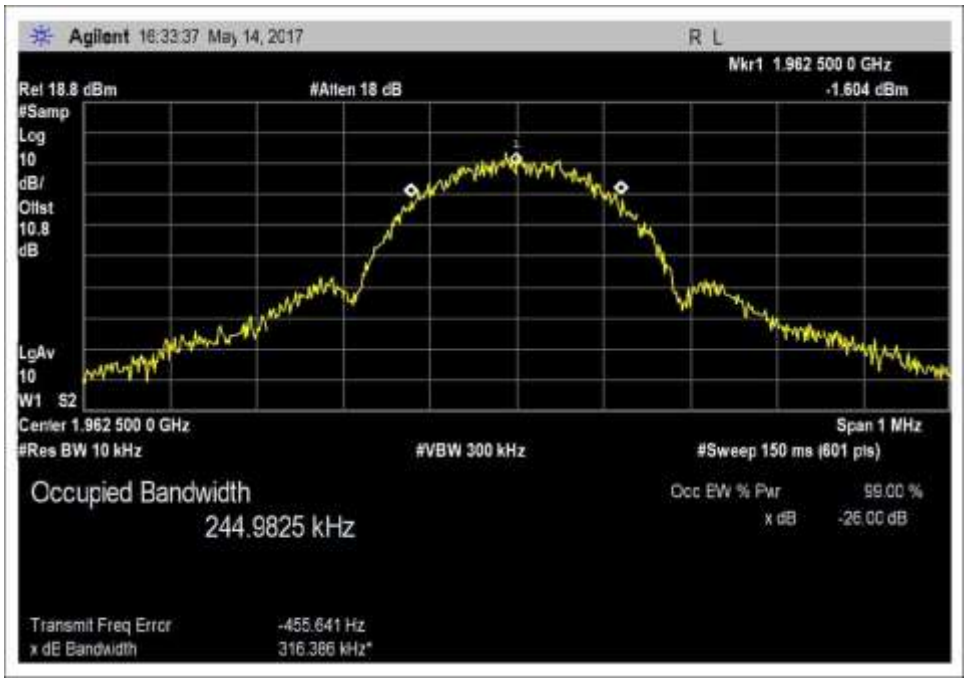
Output__OBW_DL 746-757MHz_EDGE



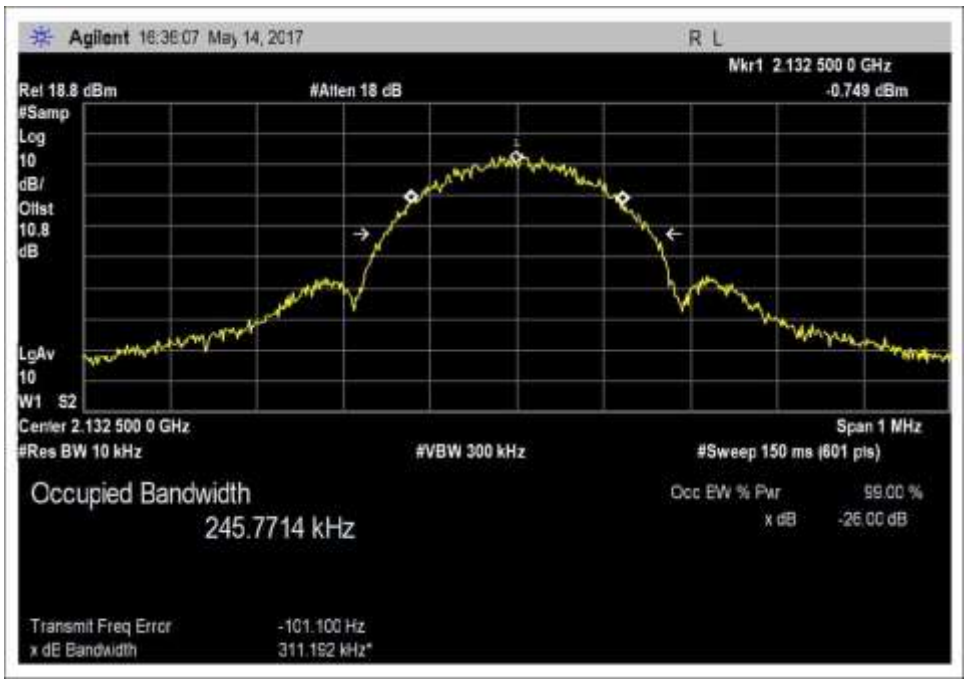
Output__OBW_DL_728-746MHz _EDGE



Output__OBW_DL_869-894MHz _EDGE

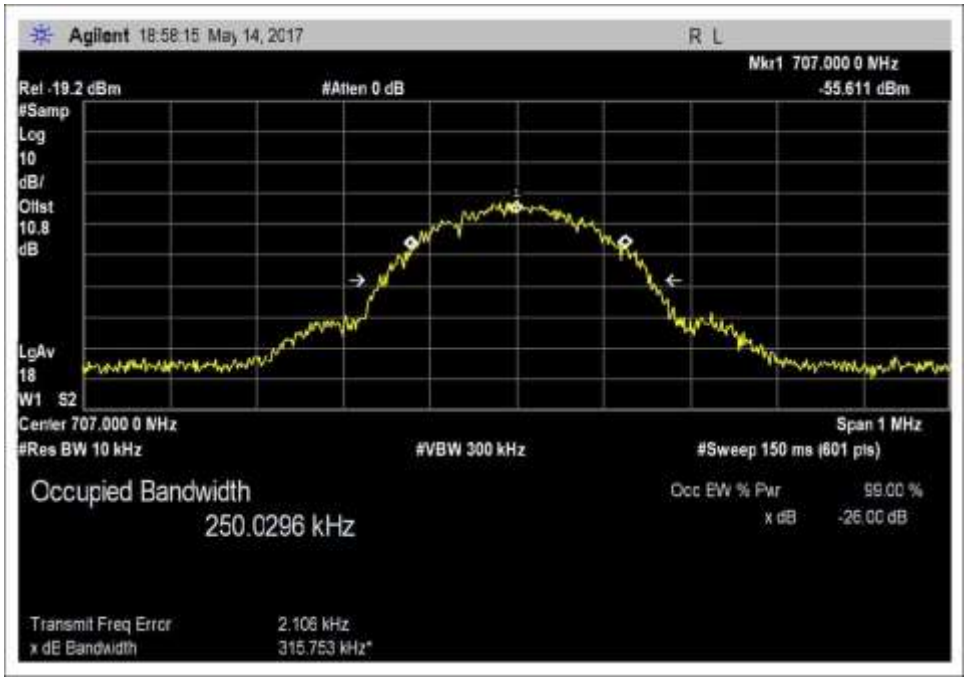


Output_OBW_DL_1930-1995MHz _EDGE

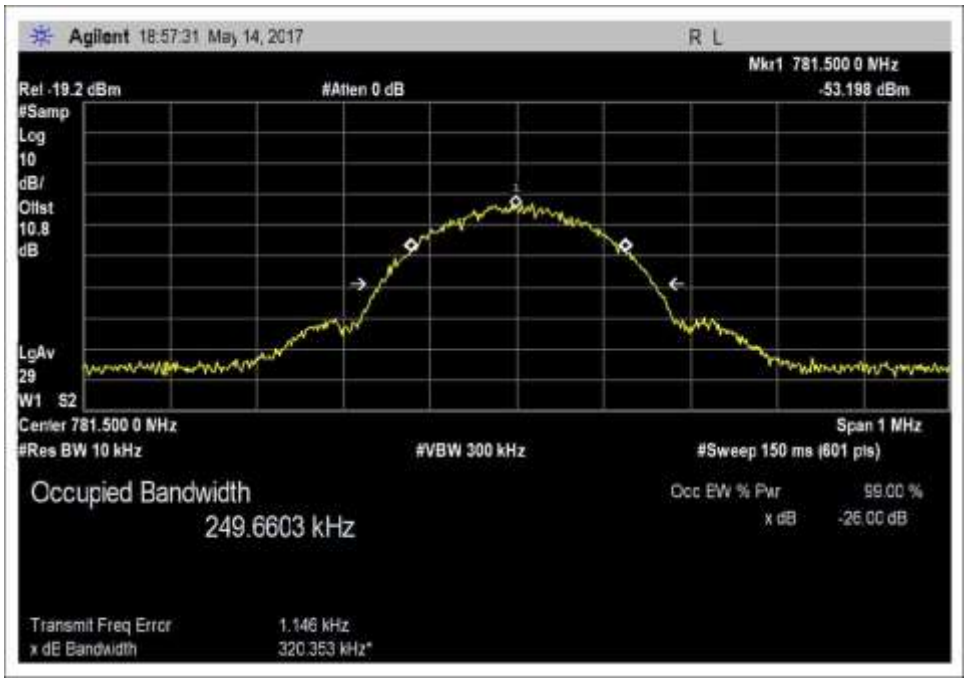


Output_OBW_DL_2110-2155MHz _EDGE

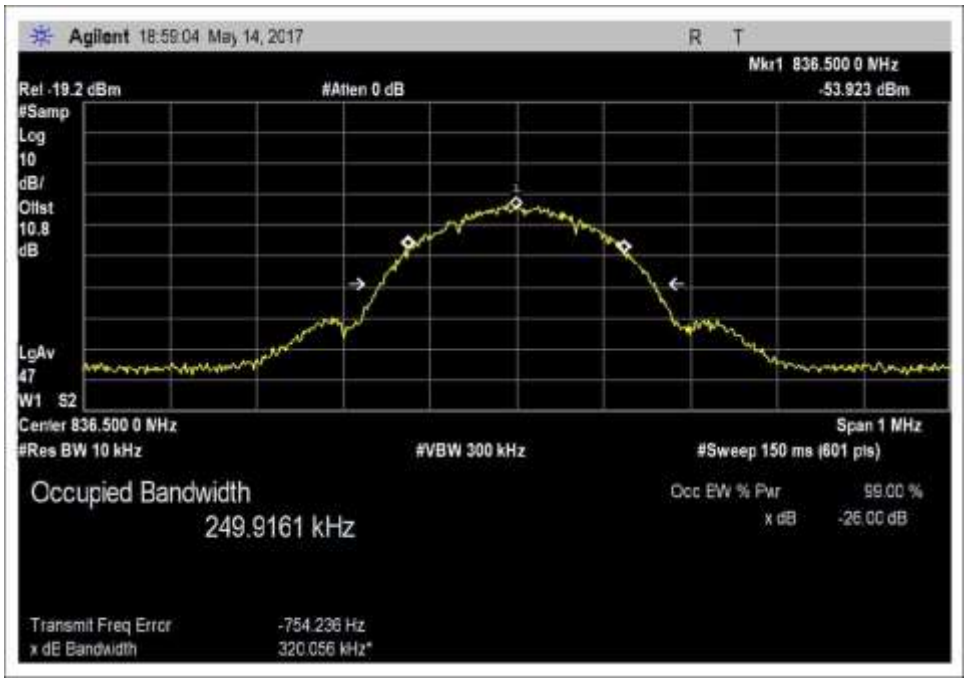
GSM



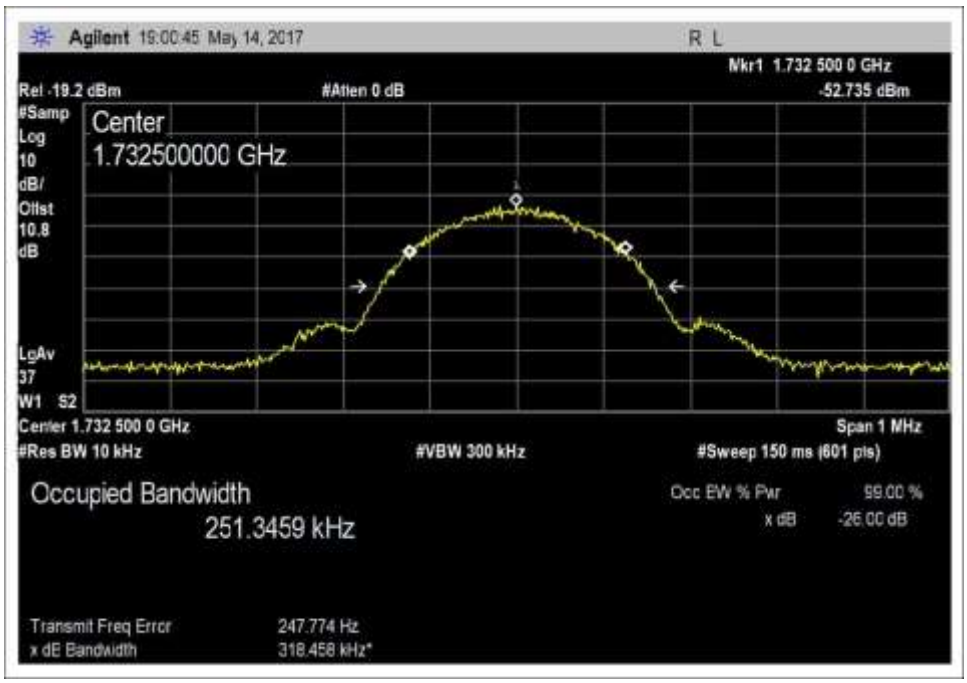
Input_OBW_UL_698-716MHz_GSM



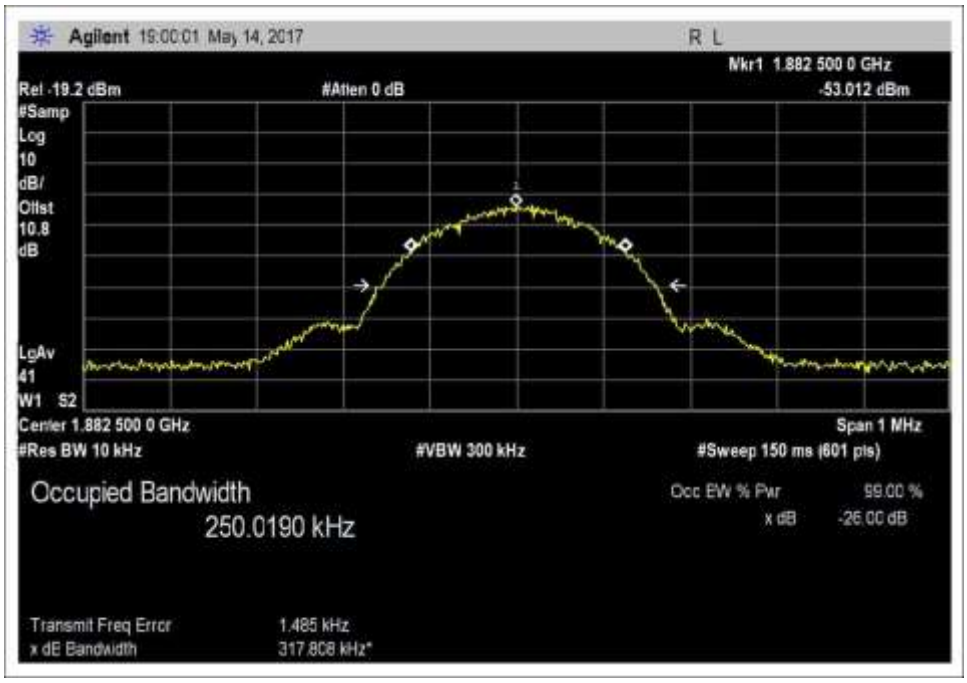
Input_OBW_UL_776-787MHz_GSM



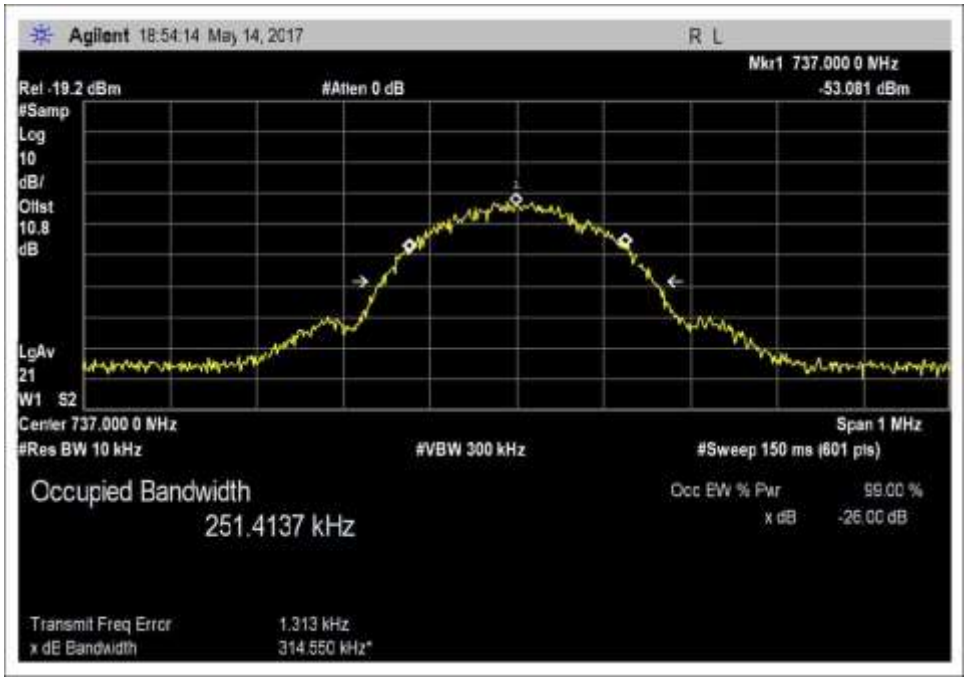
Input_OBW_UL_824-849MHz_GSM



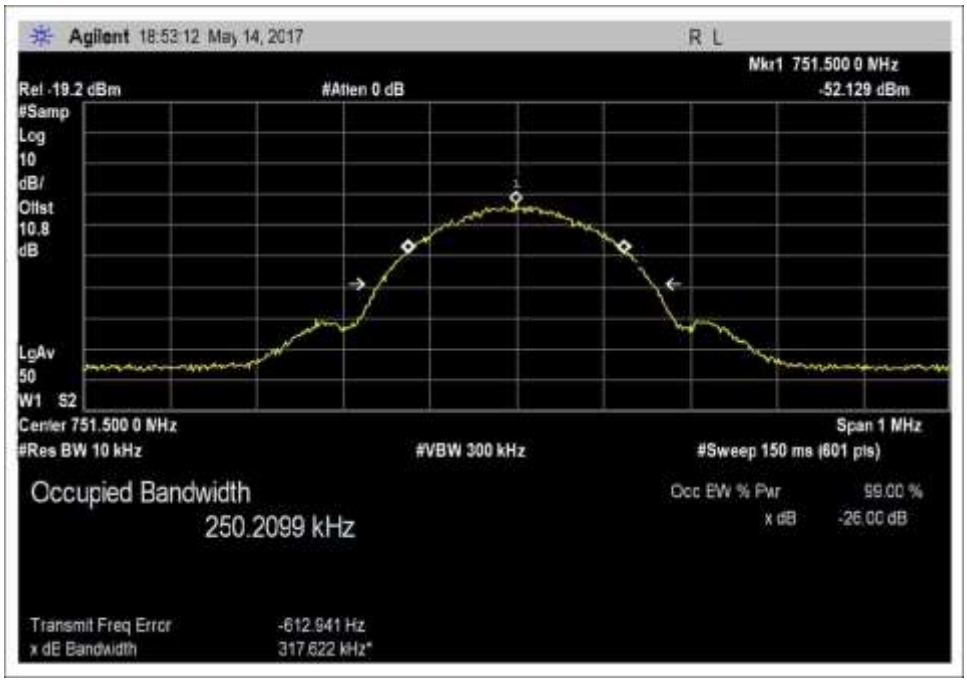
Input_OBW_UL_1710-1755MHz _GSM



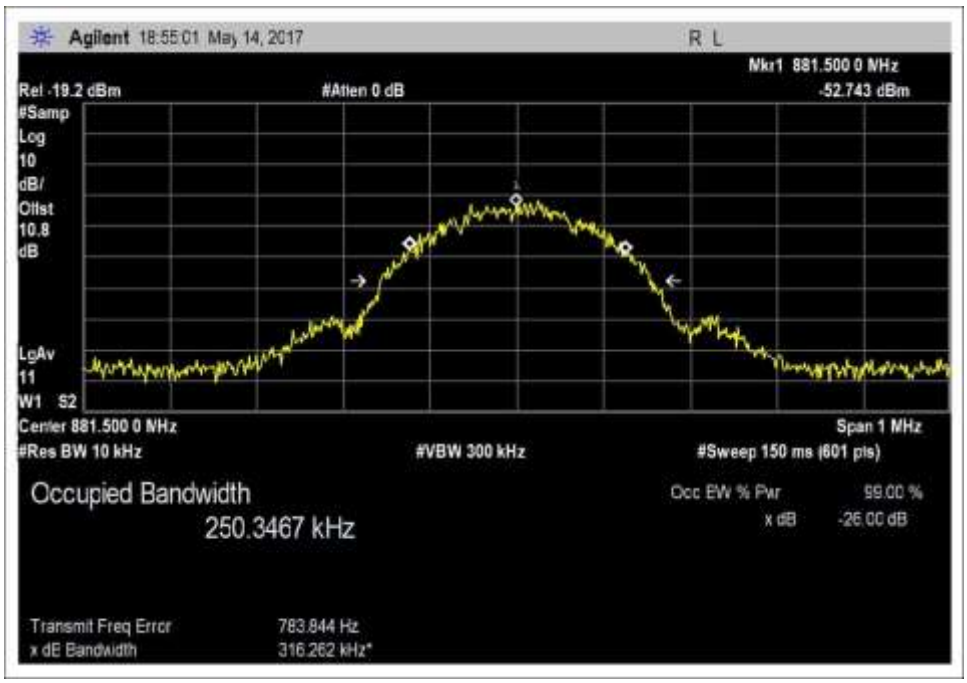
Input_OBW_UL_1850-1915MHz _GSM



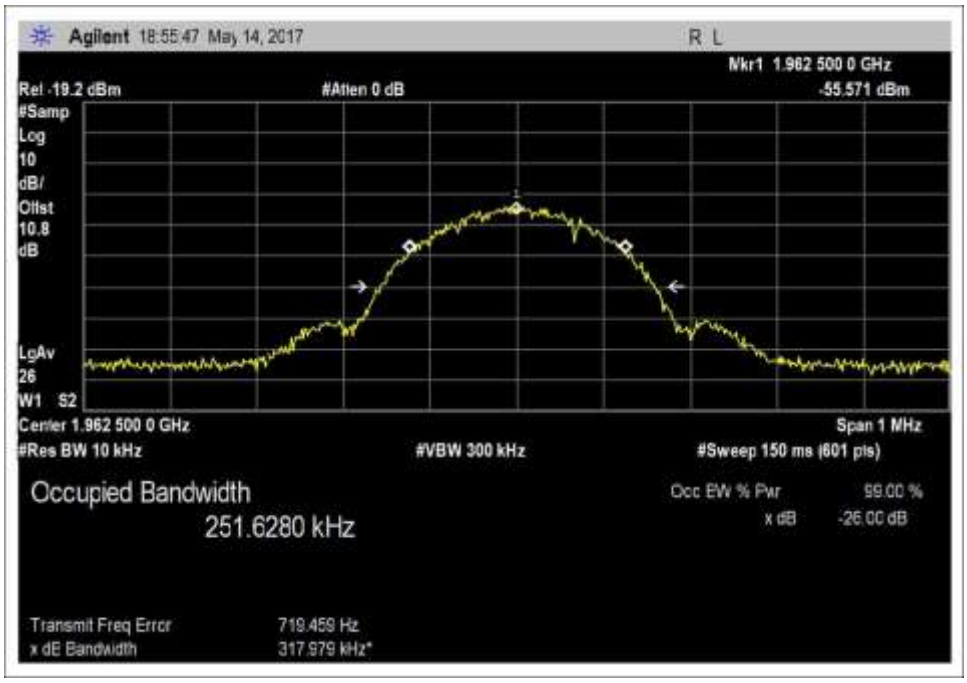
Input_OBW_DL_728-746MHz_GSM



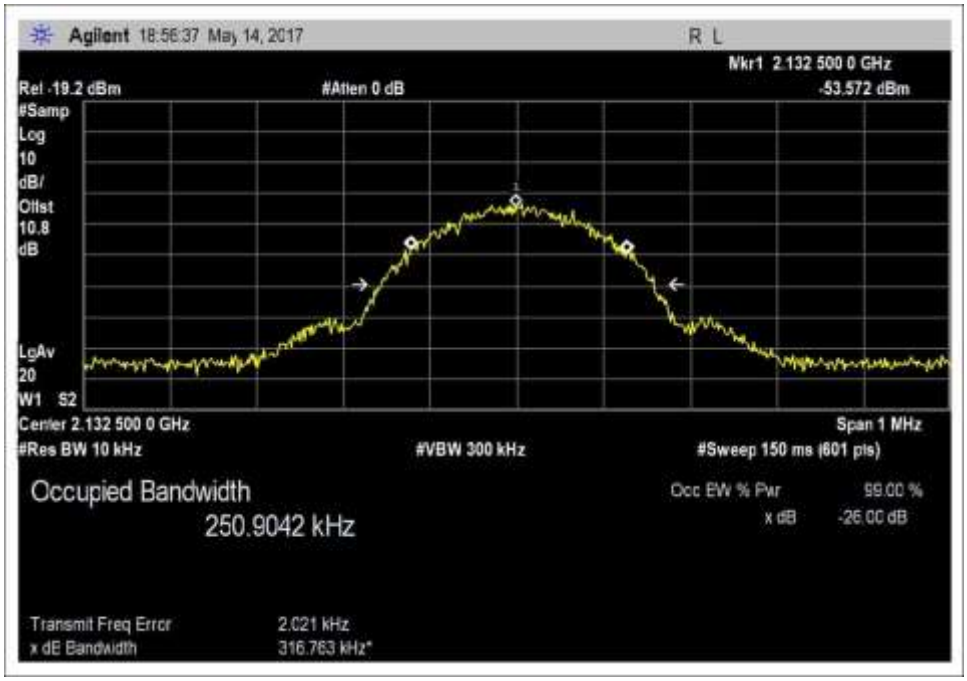
Input_OBW_DL_746-757MHz_GSM



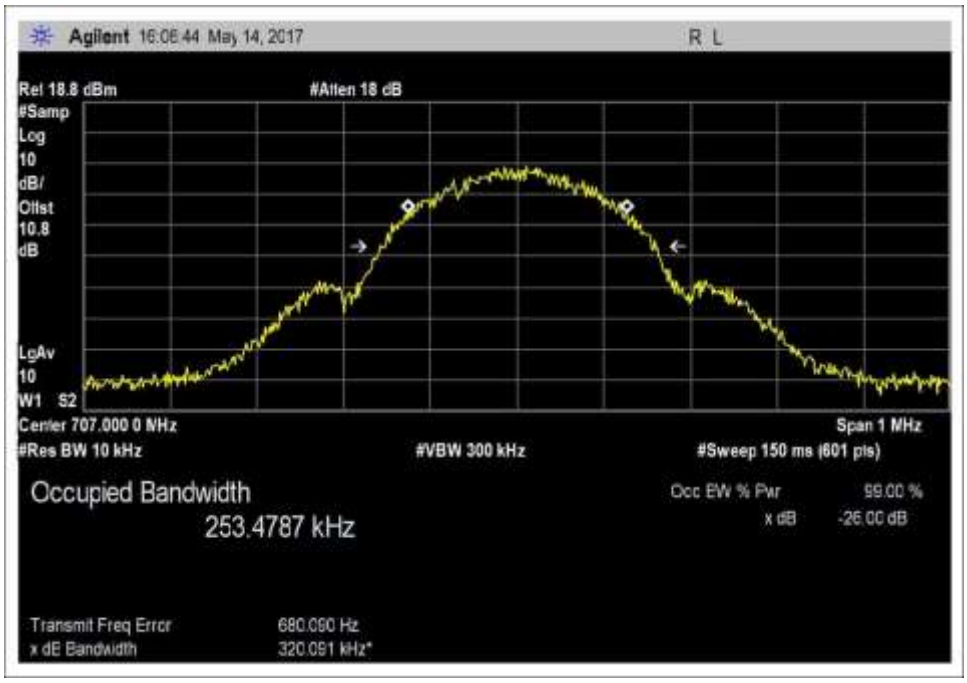
Input_OBW_DL_869-894MHz_GSM



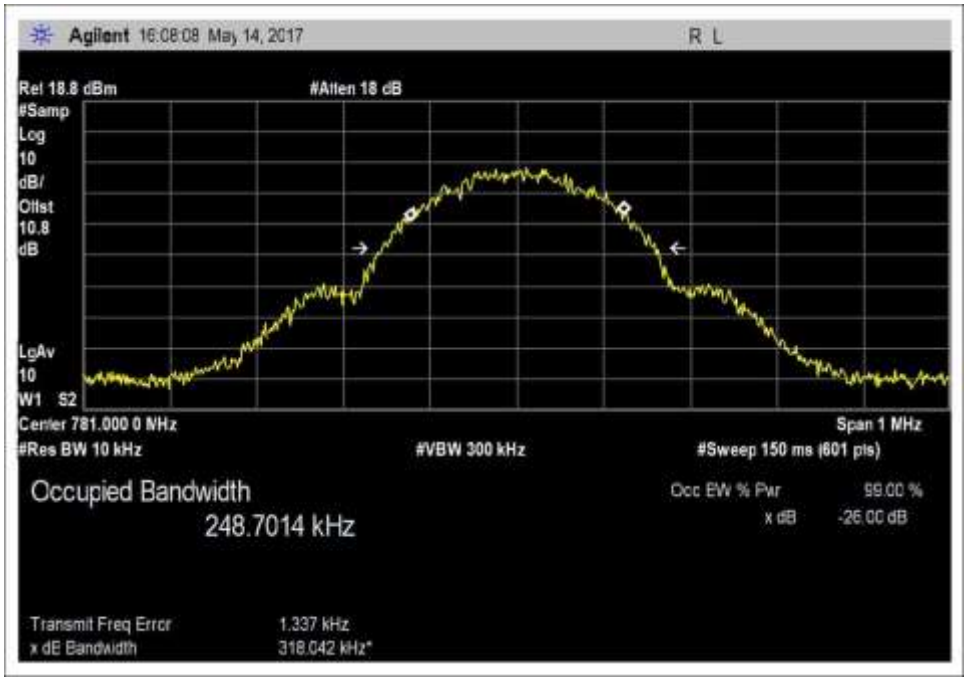
Input_OBW_DL_1930-1995MHz_GSM



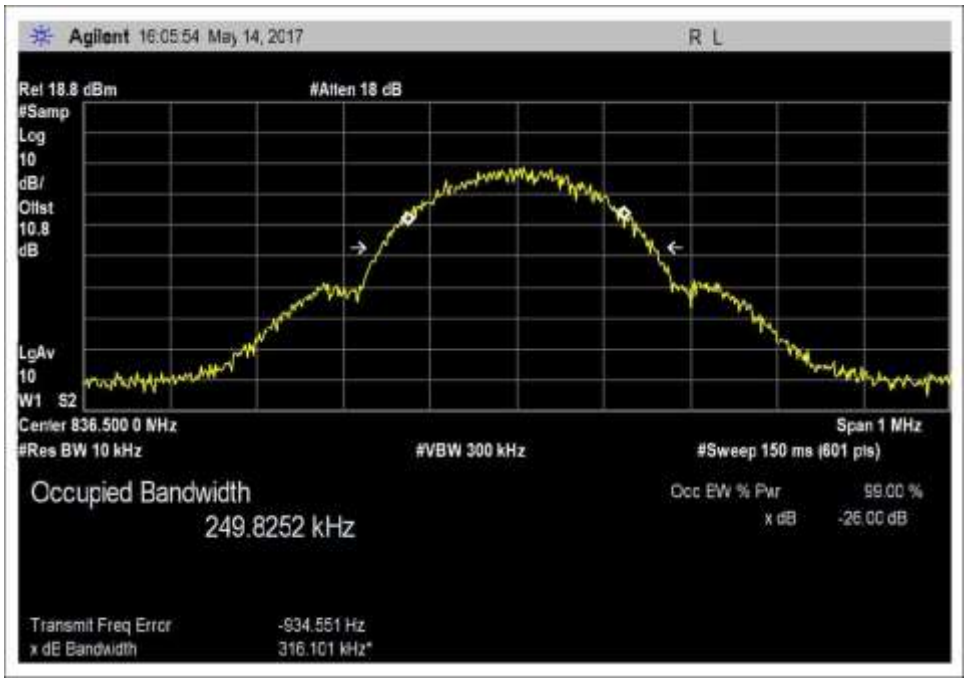
Input_OBW_DL_2110-2155MHz_GSM



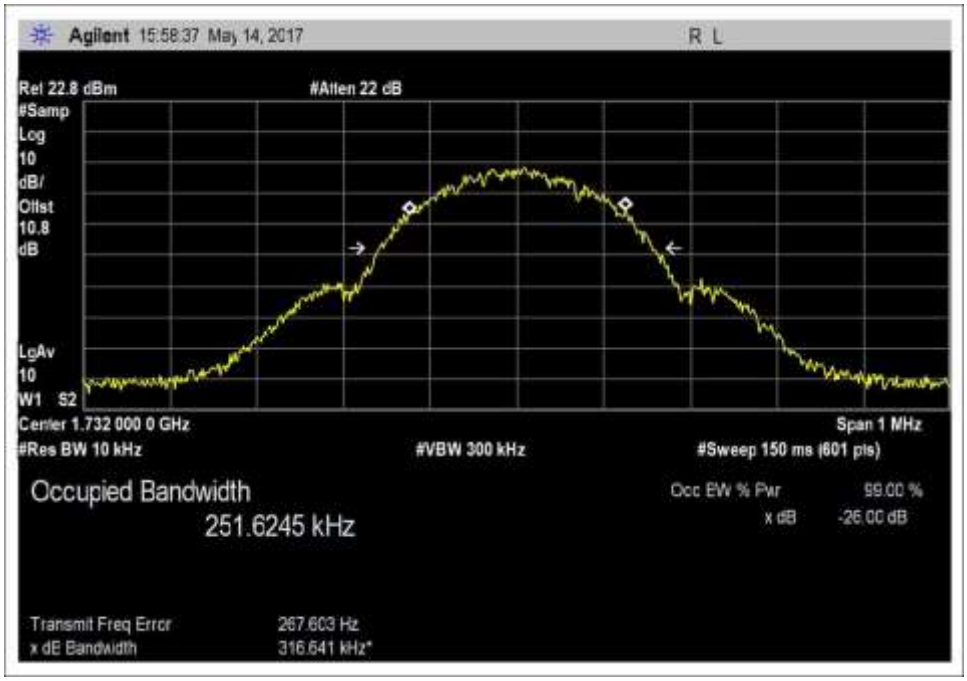
Output__OBW_UL_698-716MHz _GSM



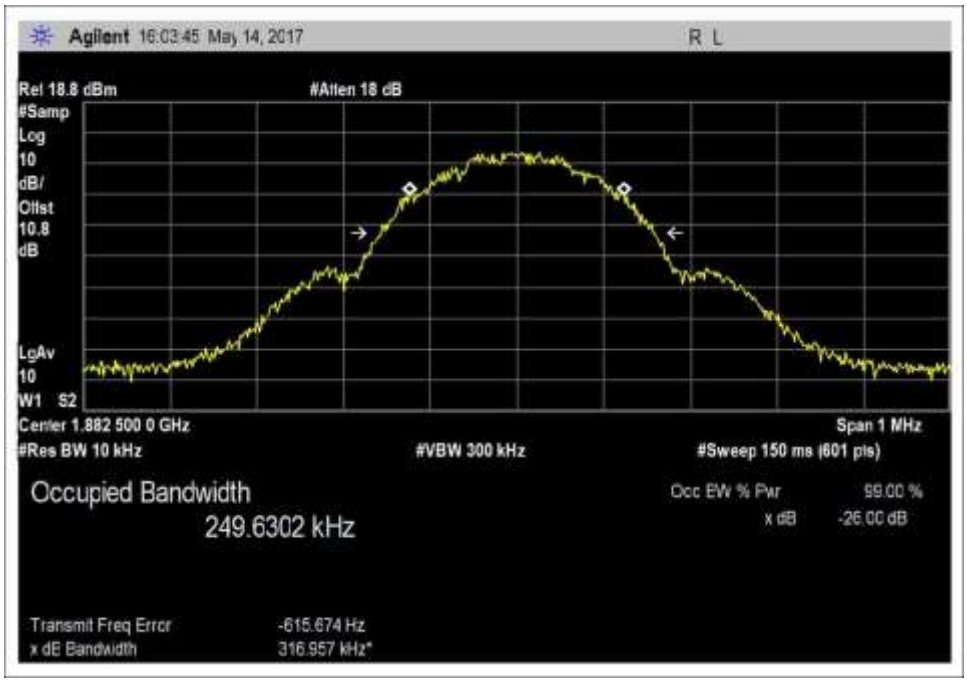
Output__OBW_UL 776-787MHz_GSM



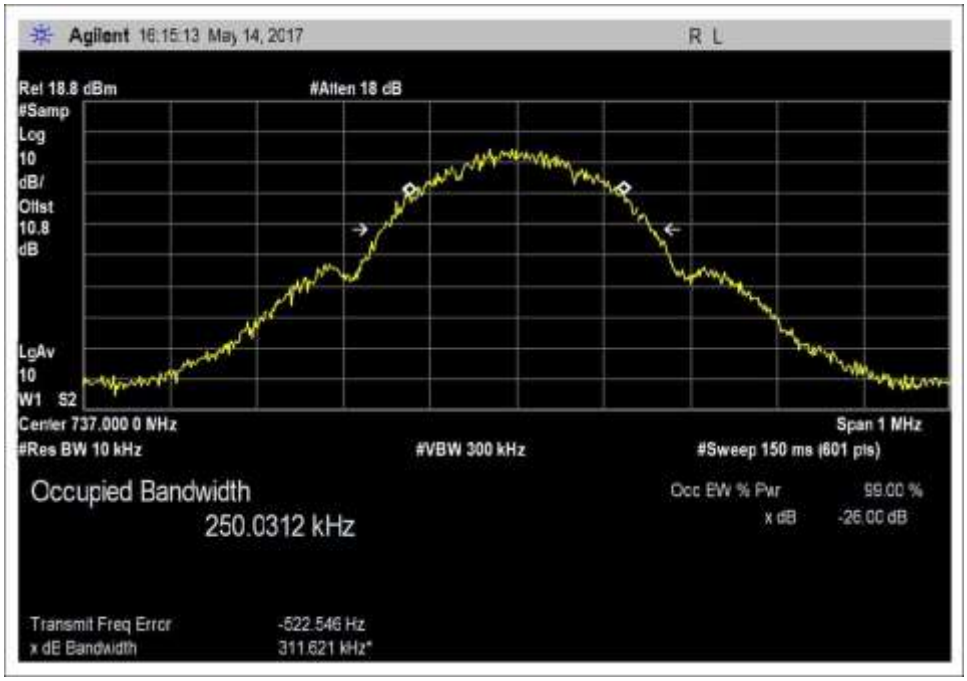
Output__OBW_UL_824-849MHz _GSM



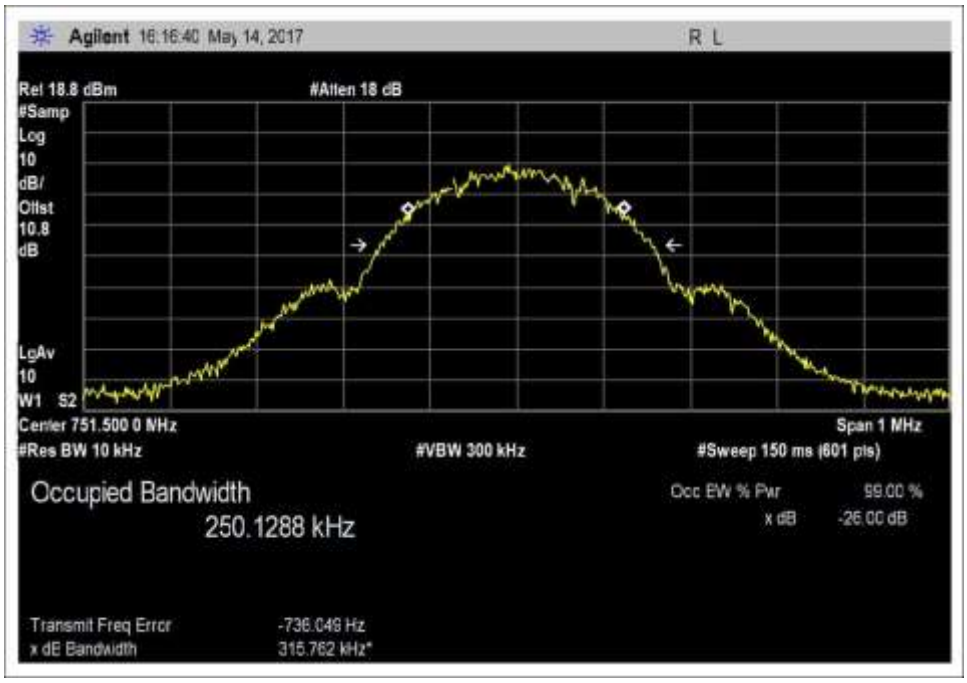
Output_OBW_UL_1710-1755MHz_GSM



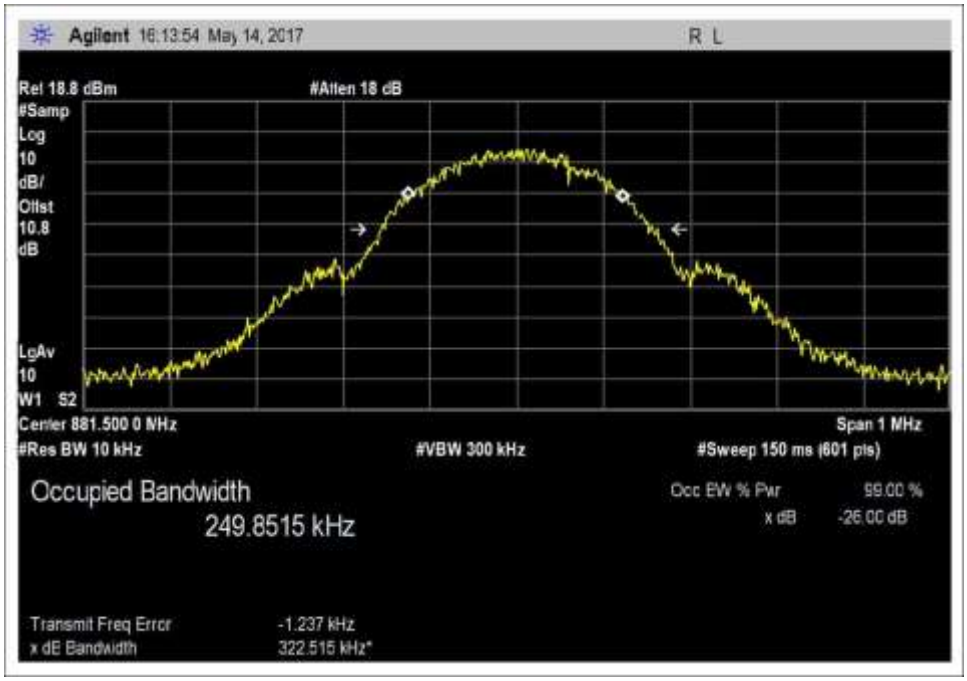
Output_OBW_UL_1850-1915MHz _GSM



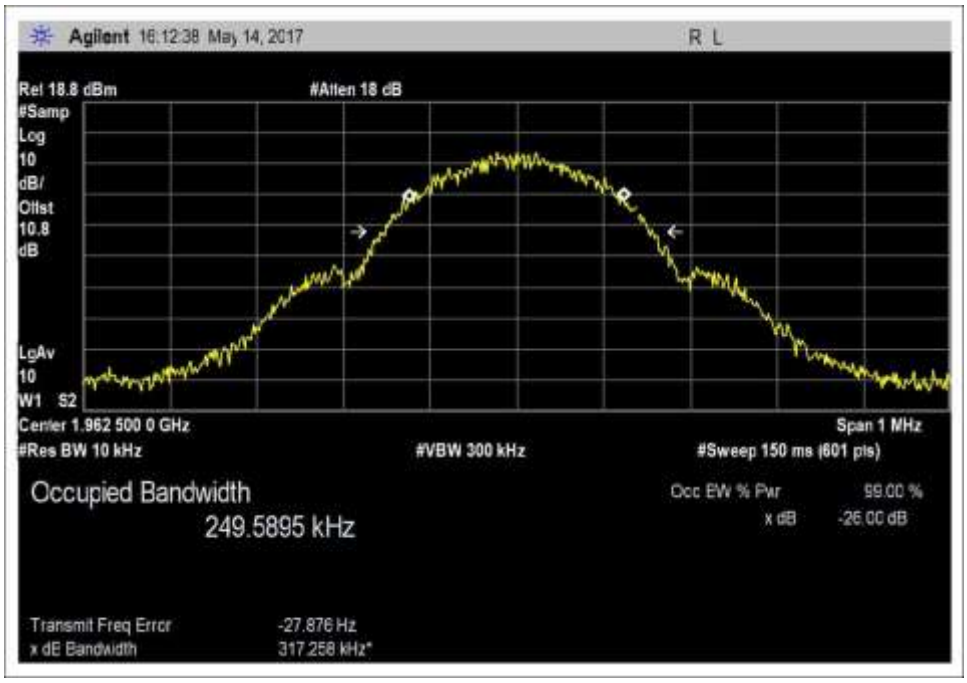
Output OBW_DL_728-746MHz _GSM



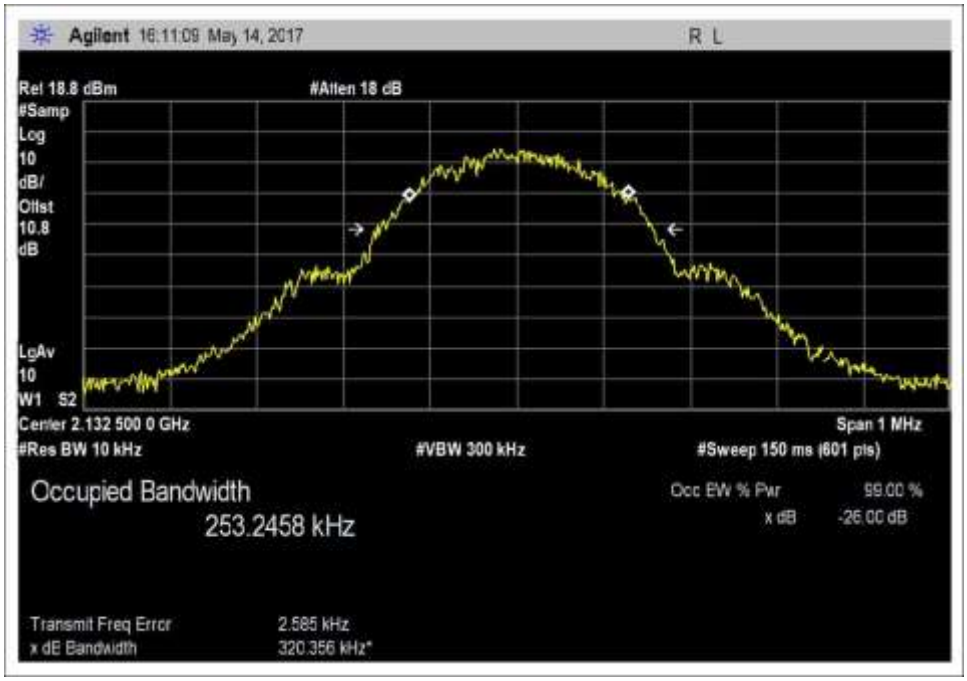
Output_OBW_DL_746-757MHz _GSM



Output_OBW_DL_869-894MHz _GSM

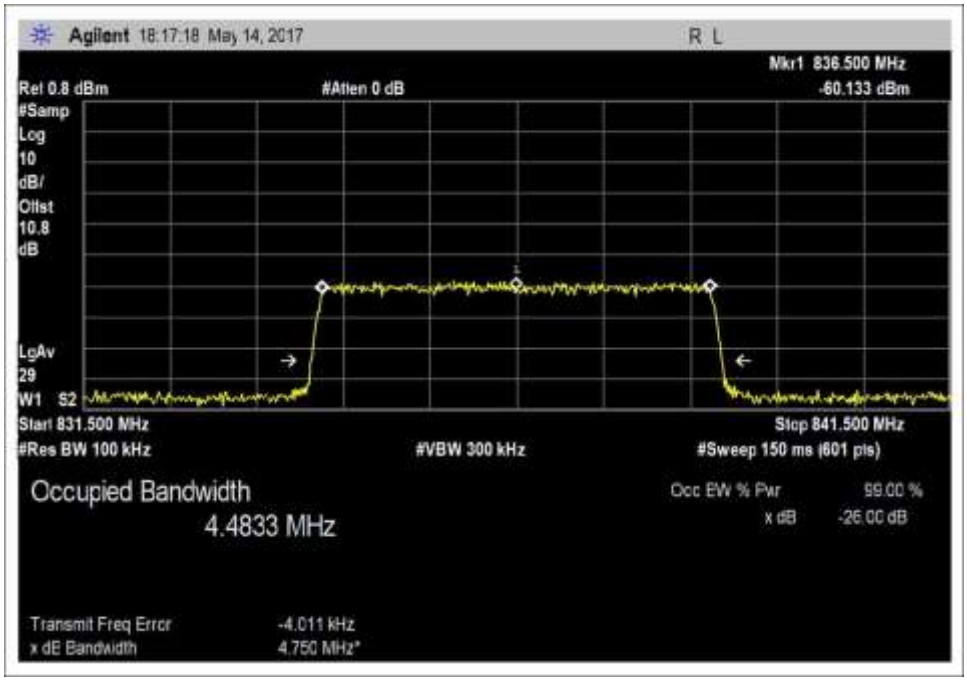


Output_OBW_DL_1930-1995MHz _GSM

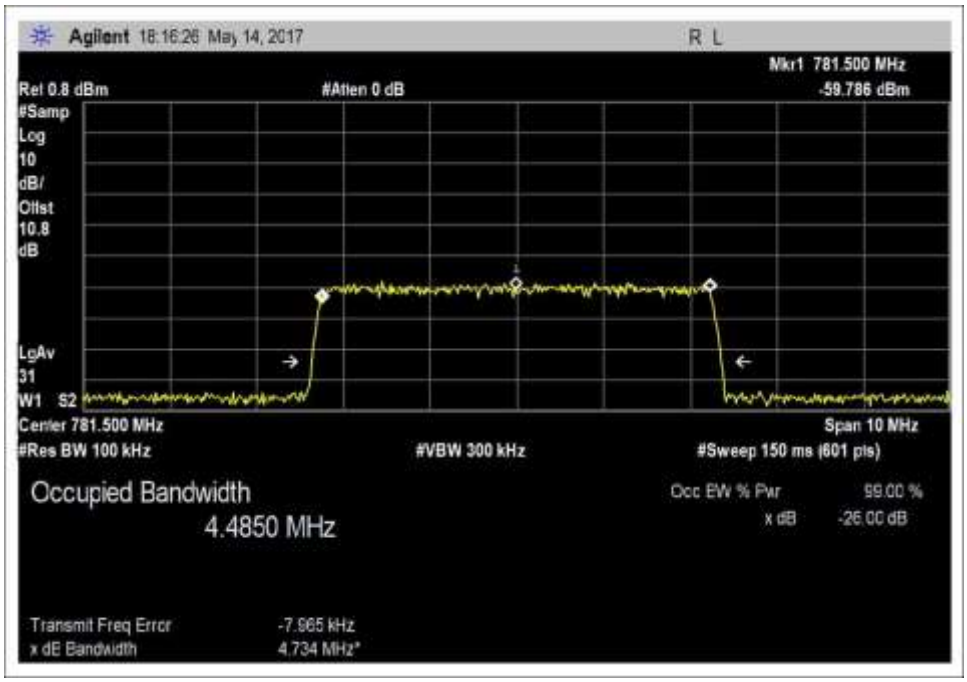


Output_OBW_DL_2110-2155MHz _GSM

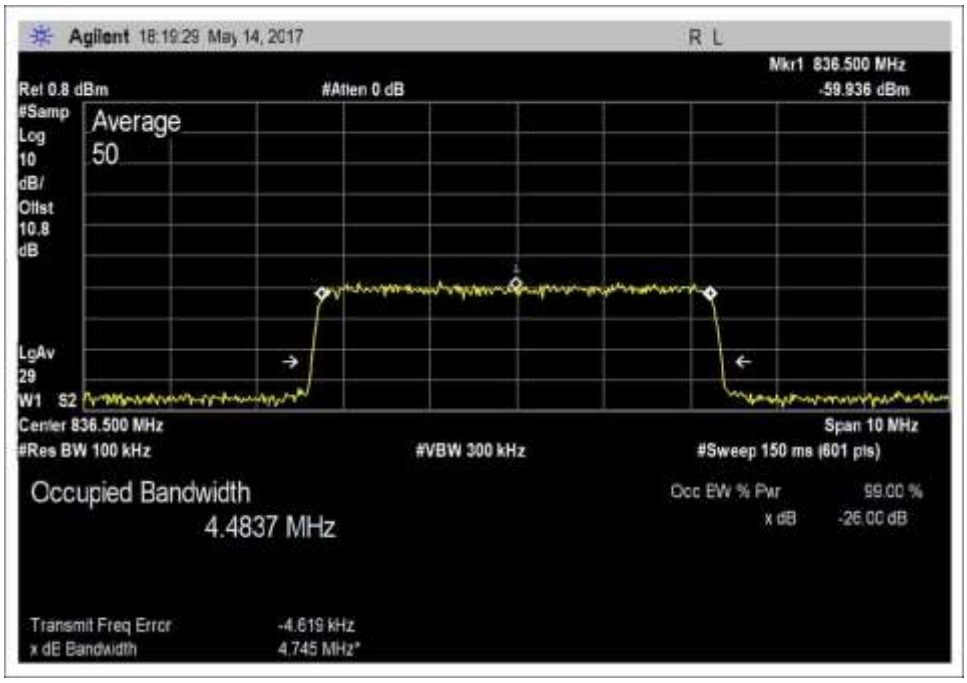
LTE



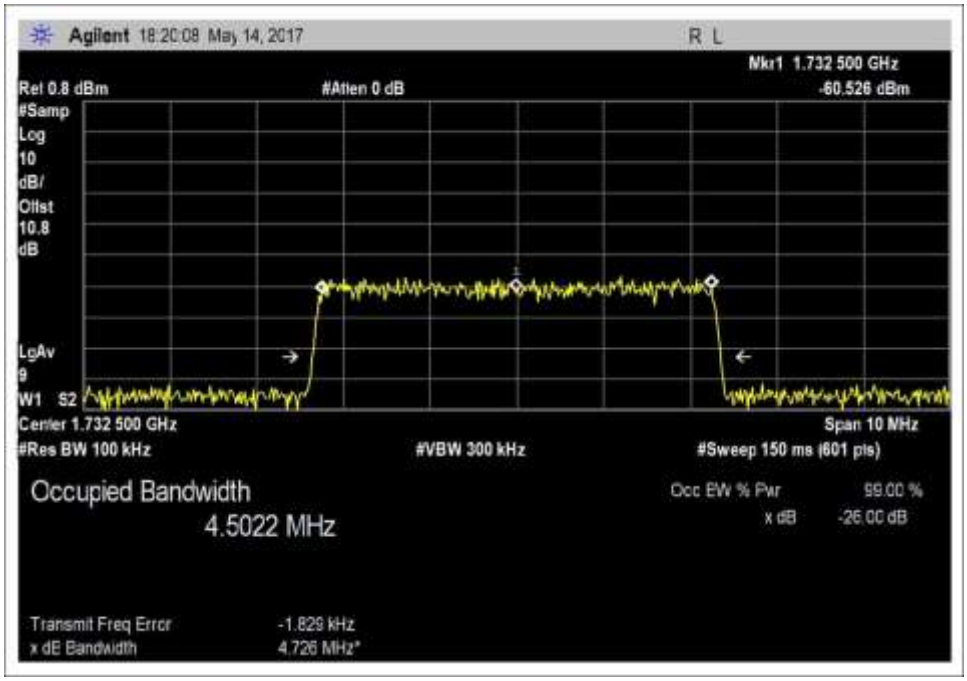
Input_OBW_UL_698-716MHz _LTE



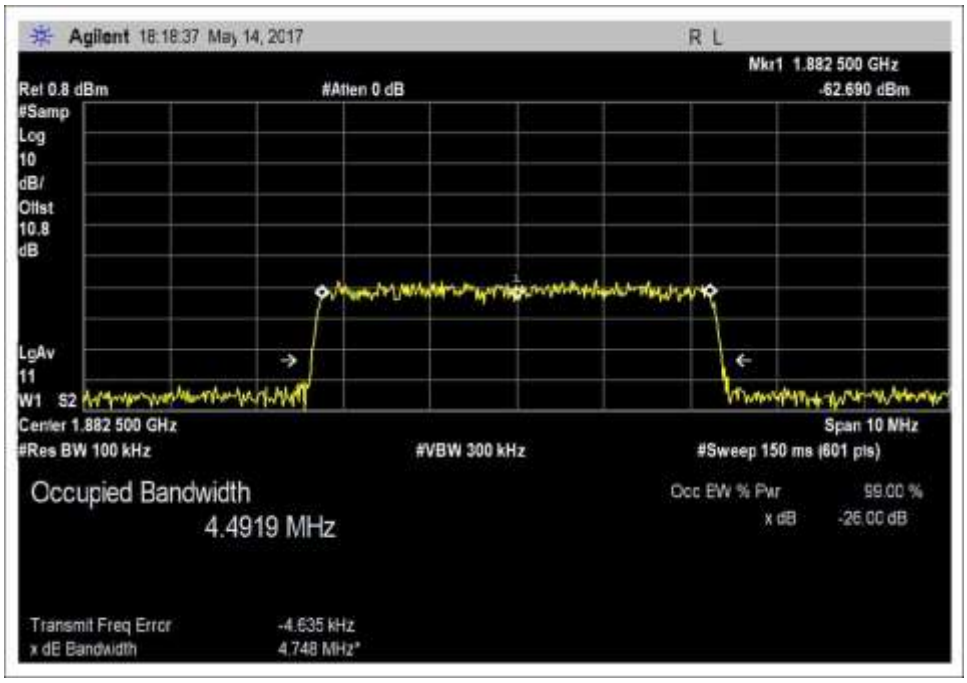
Input_OBW_UL_776-787MHz _LTE



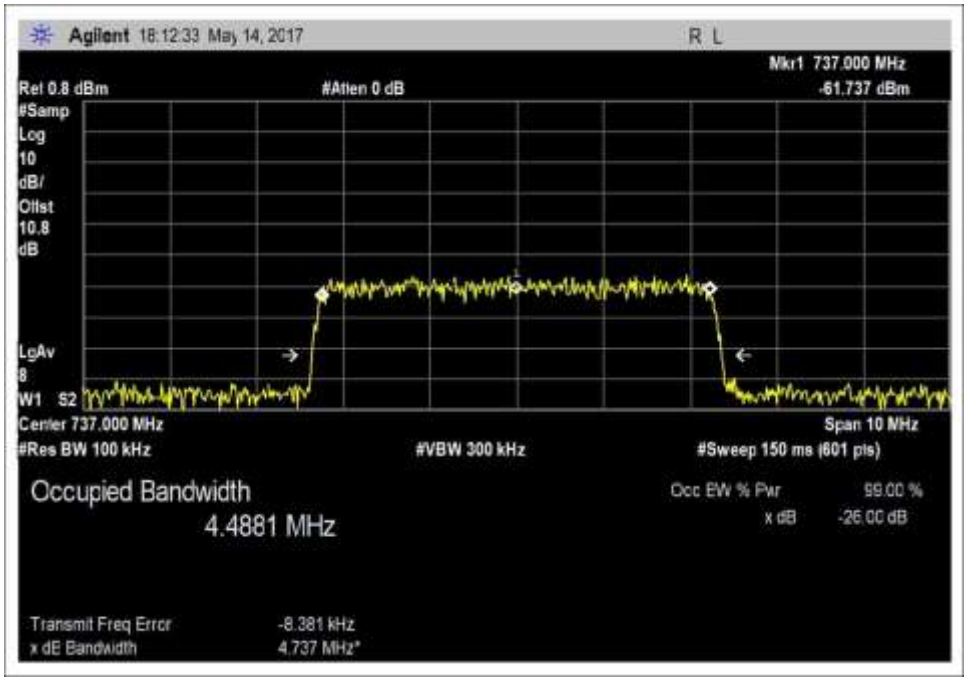
Input_OBW_UL_824-849MHz_LTE



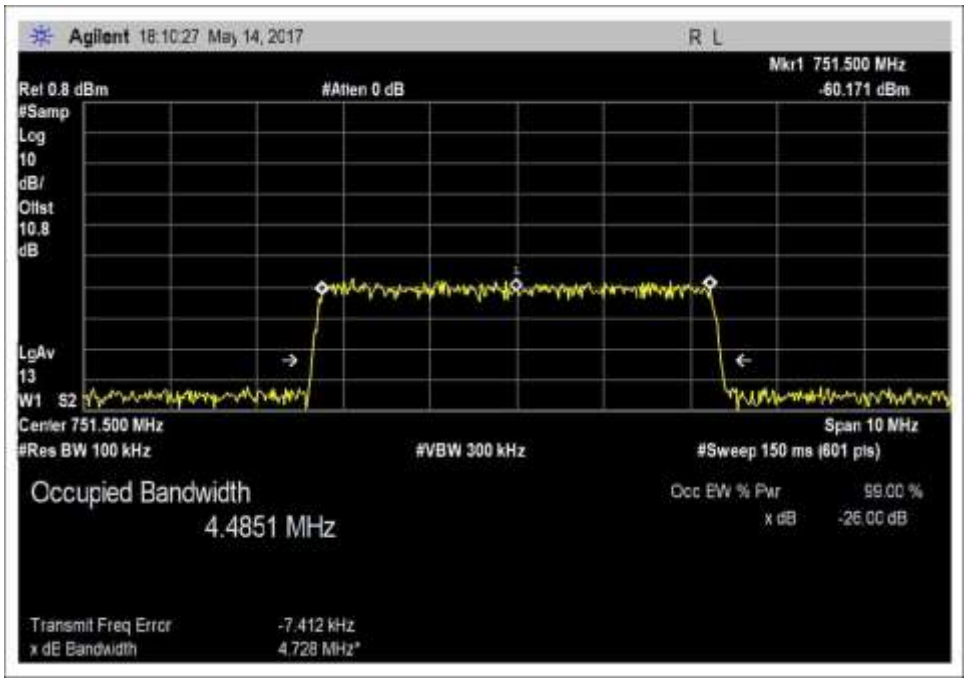
Input_OBW_UL_1710-1755MHz _LTE



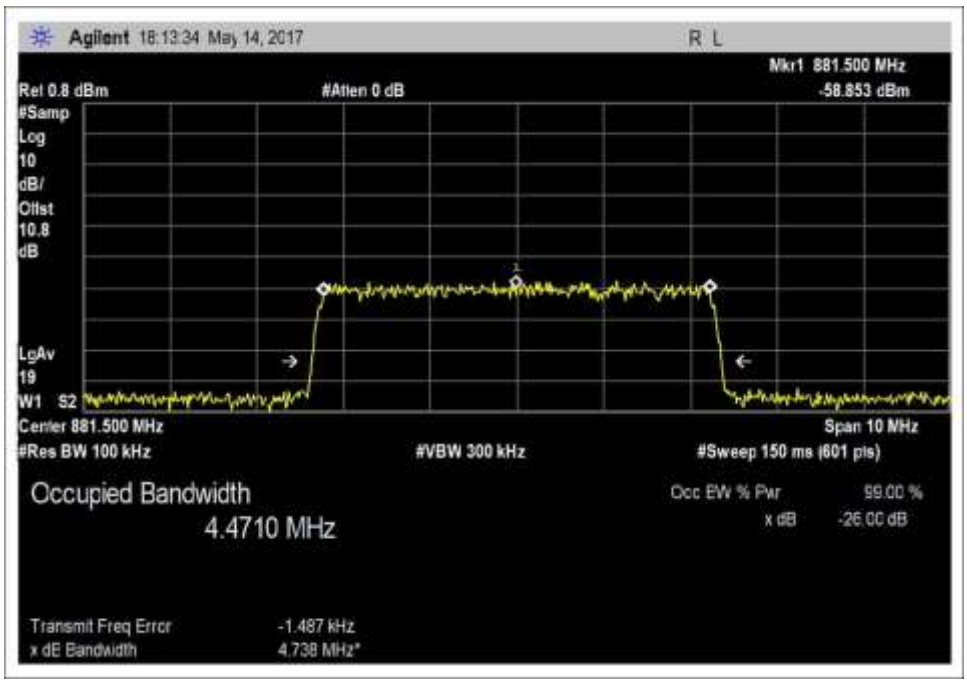
Input_OBW_UL_1850-1915MHz z _LTE



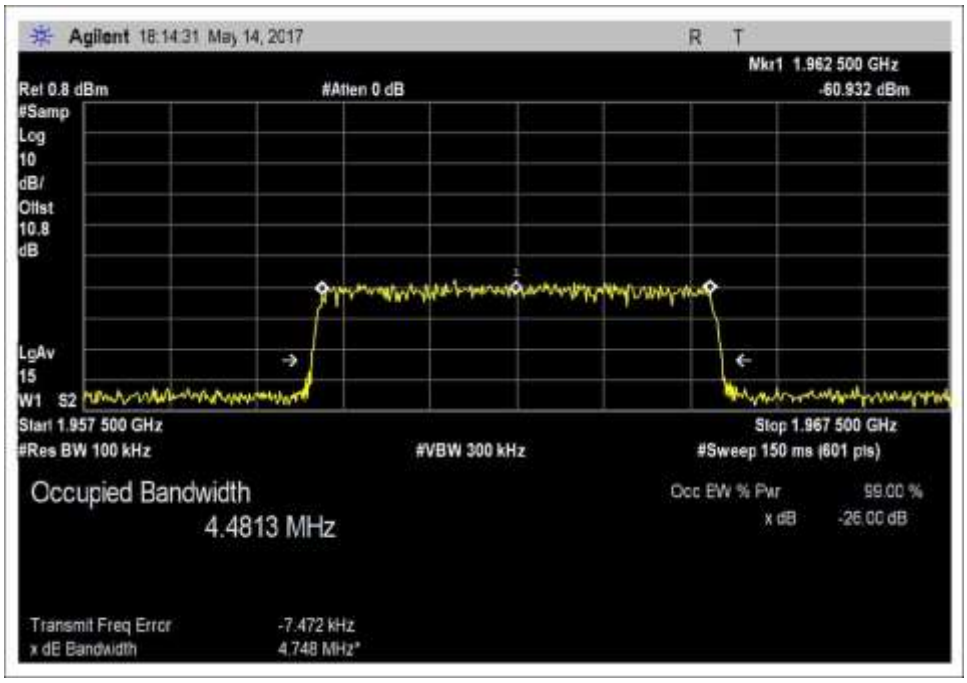
Input_OBW_DL_728-746MHz _LTE



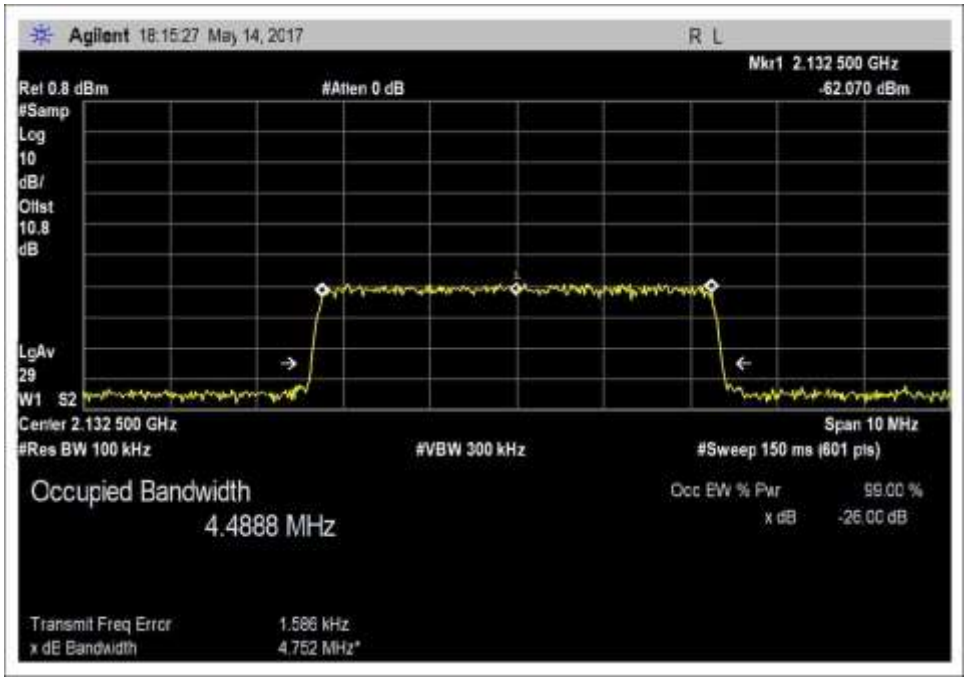
Input_OBW_DL_746-757MHz _LTE



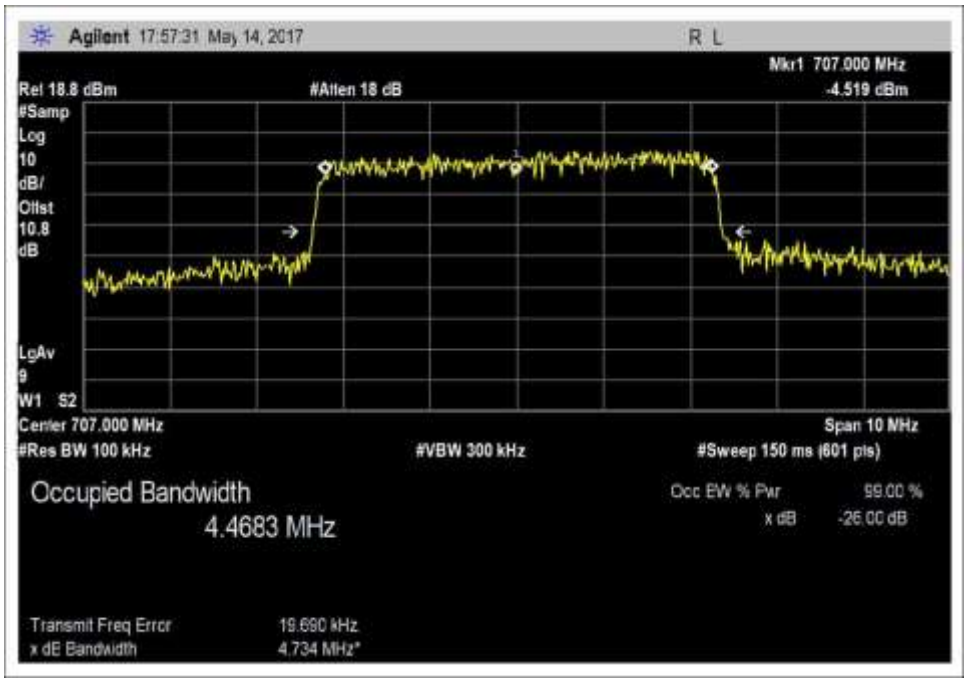
Input_OBW_DL_869-894MHz _LTE



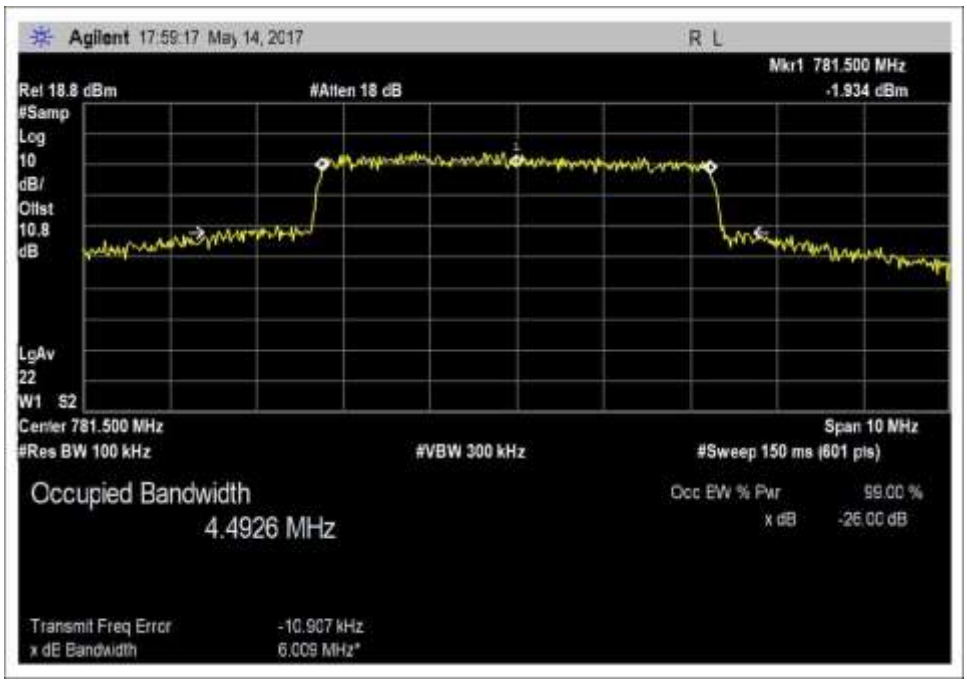
Input_OBW_DL_1930-1995MHz _LTE



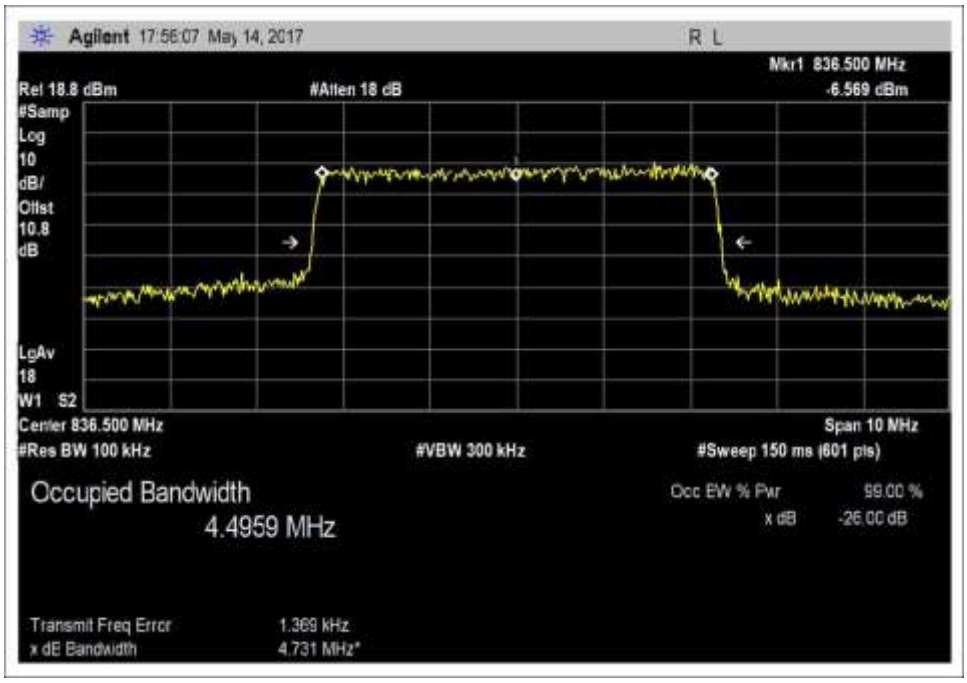
Input_OBW_DL_2110-2155MHz_LTE



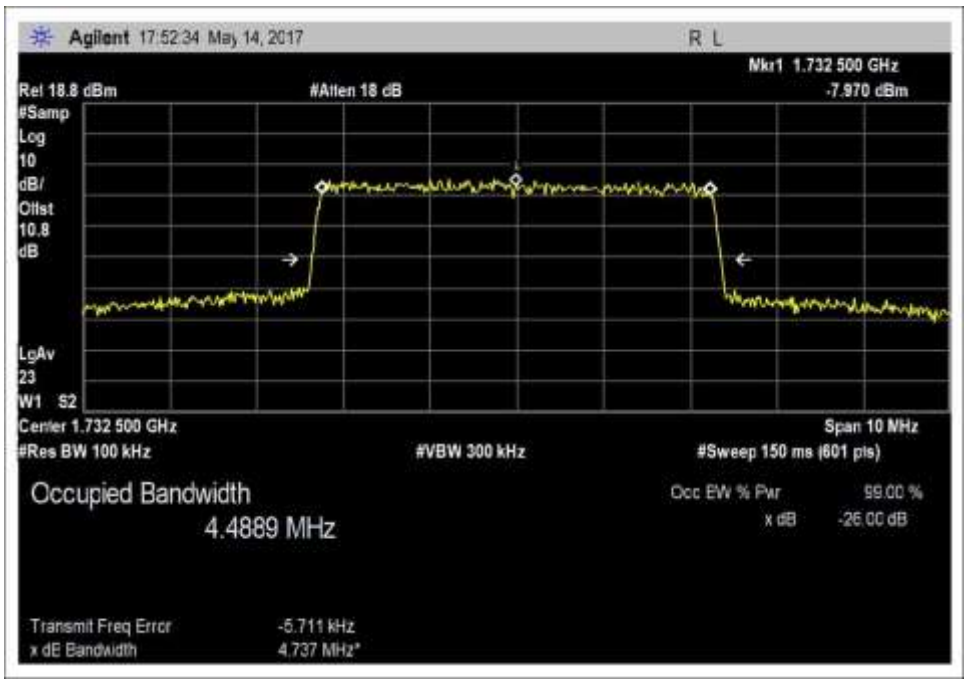
Output__OBW_UL_698-716MHz_LTE



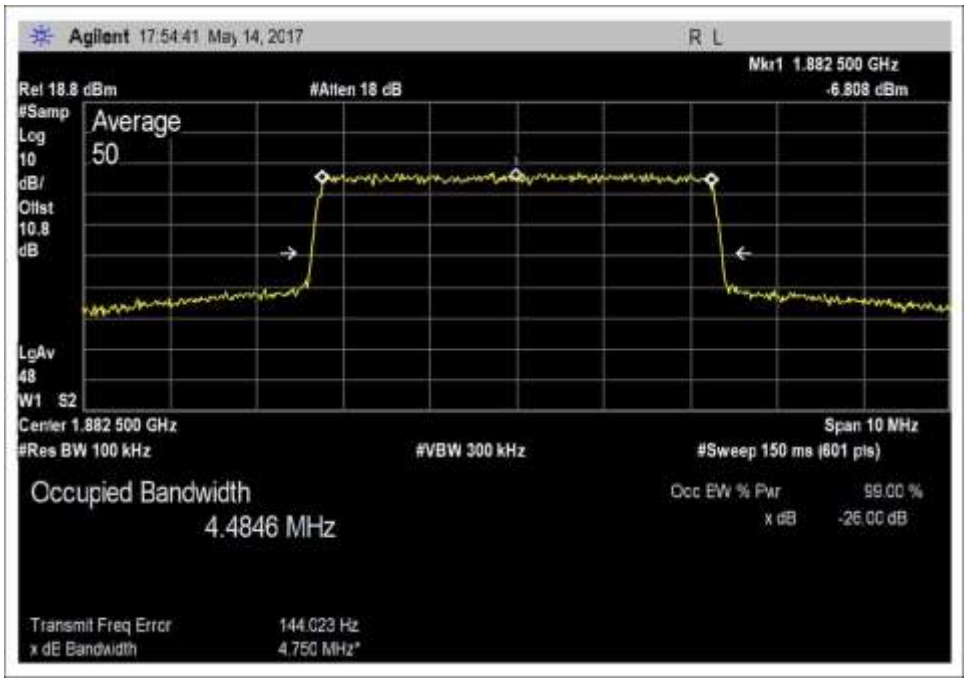
Output_OBW_UL_776-787MHz _LTE



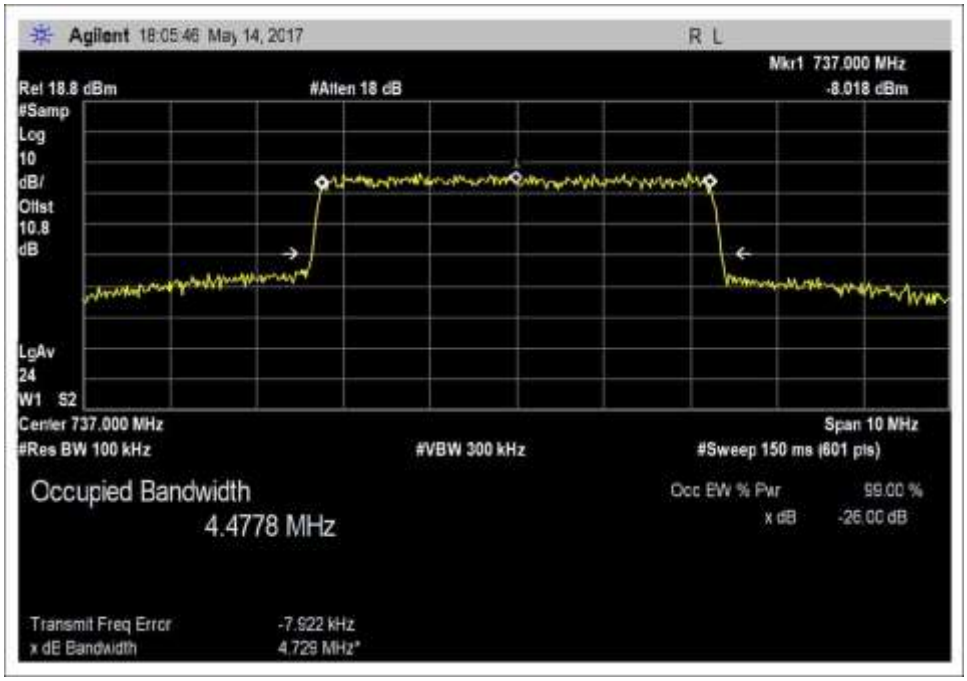
Output_OBW_UL_824-849MHz _LTE



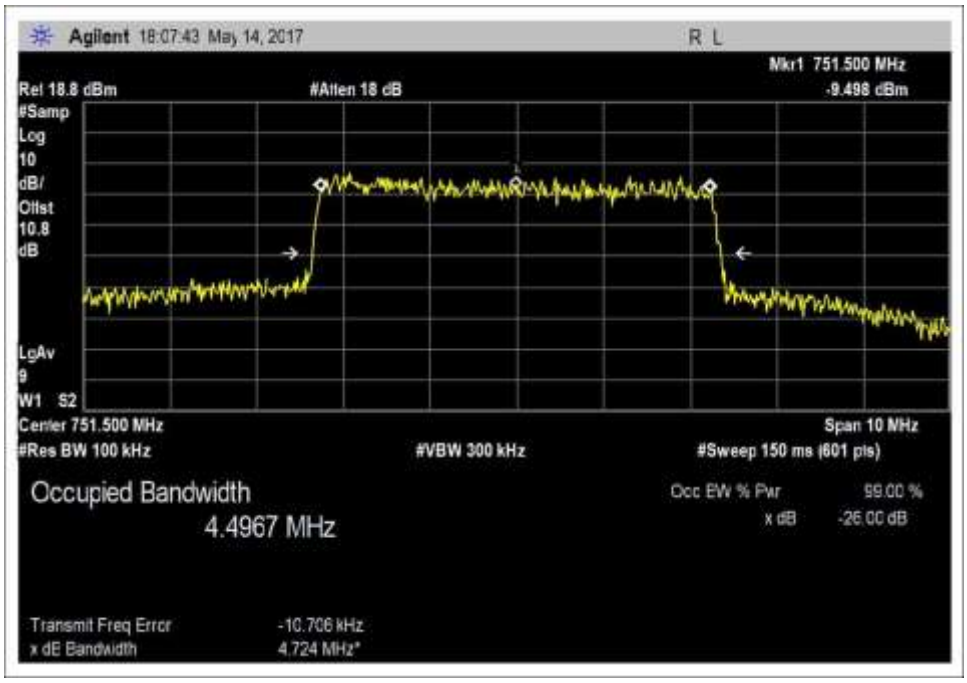
Output_OBW_UL_1710-1755MHz _LTE



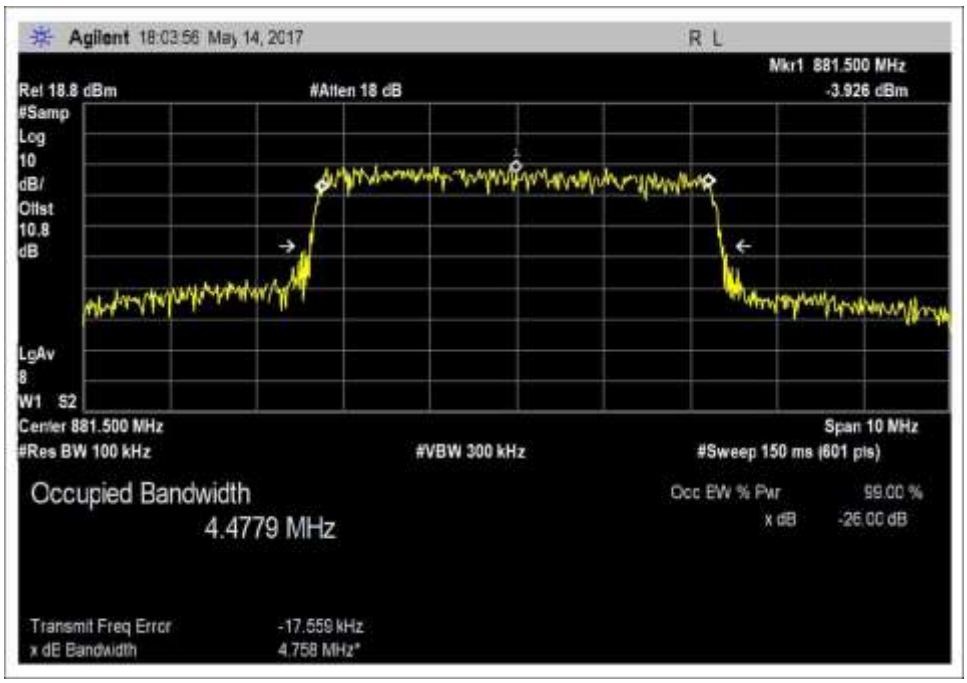
Output_OBW_UL_1850-1915MHz _LTE



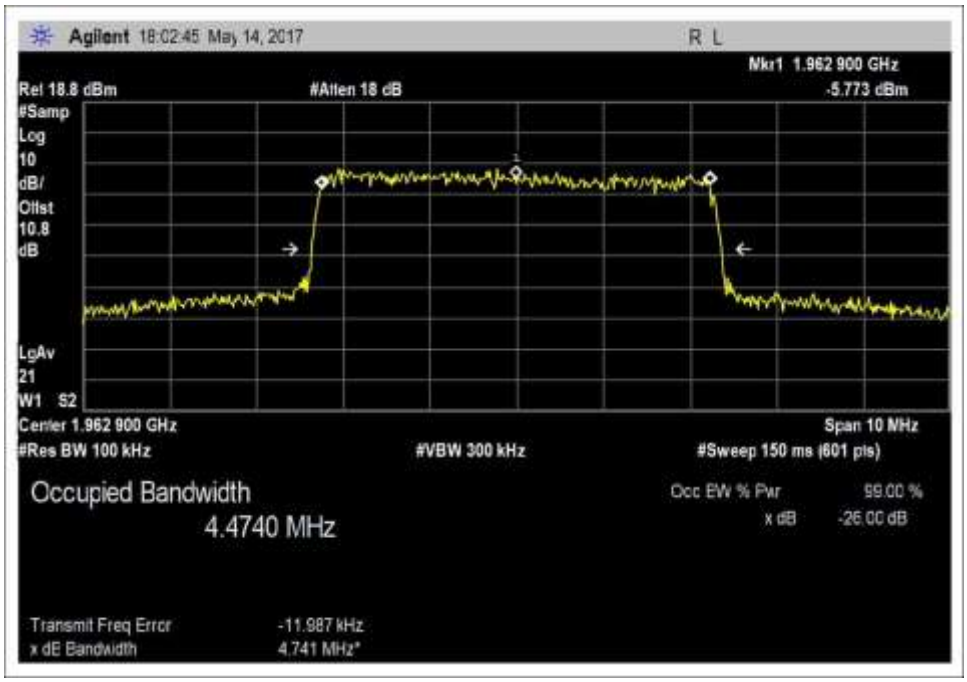
Output_OBW_DL_728-746MHz_LTE



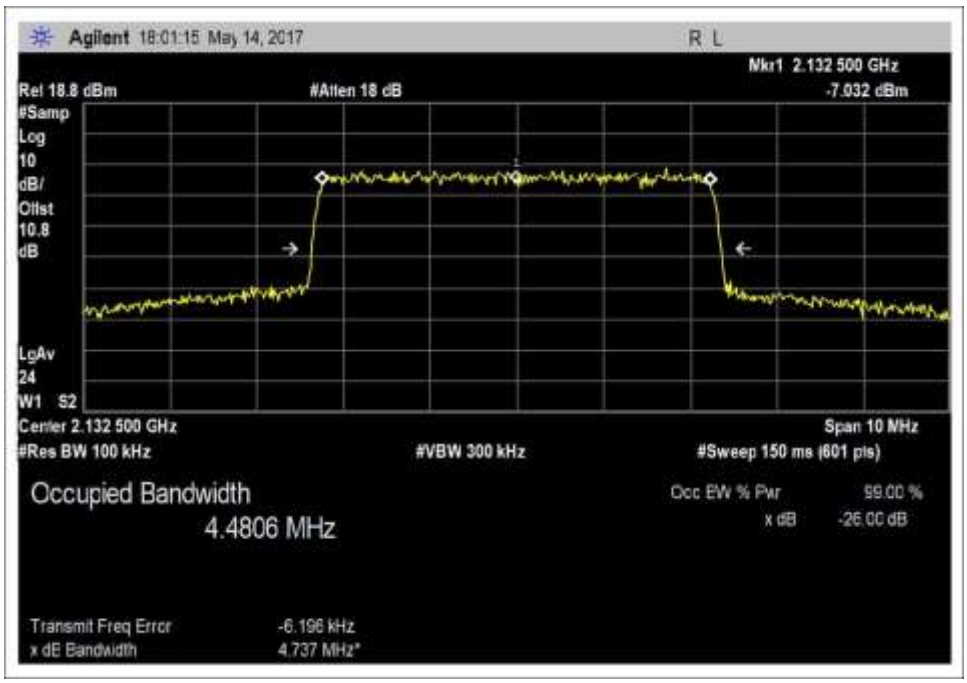
Output_OBW_DL_746-757MHz _LTE



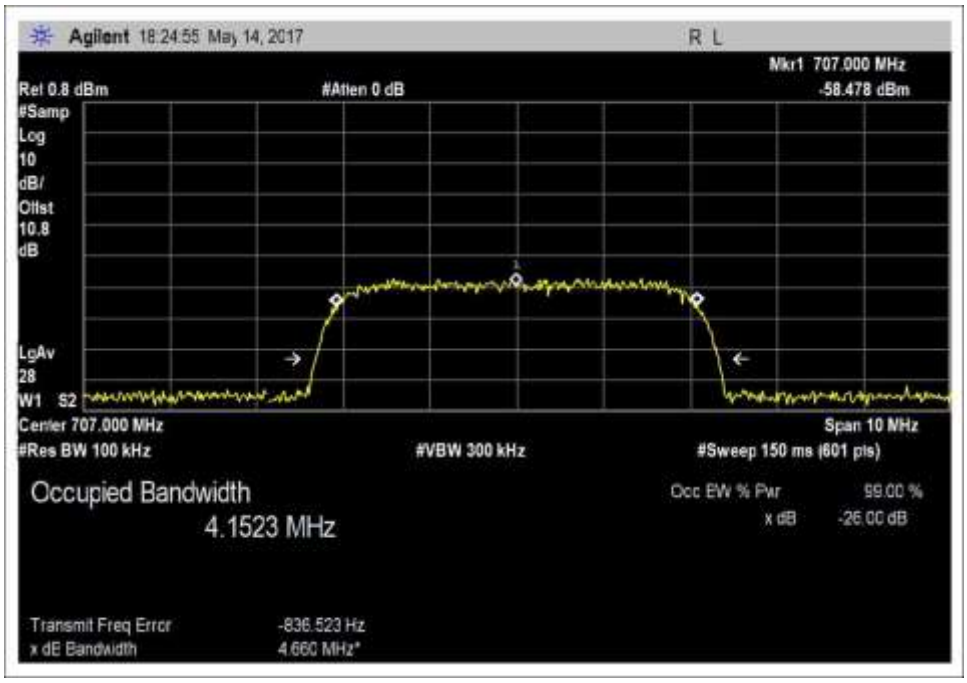
Output_OBW_DL_869-894MHz_LTE



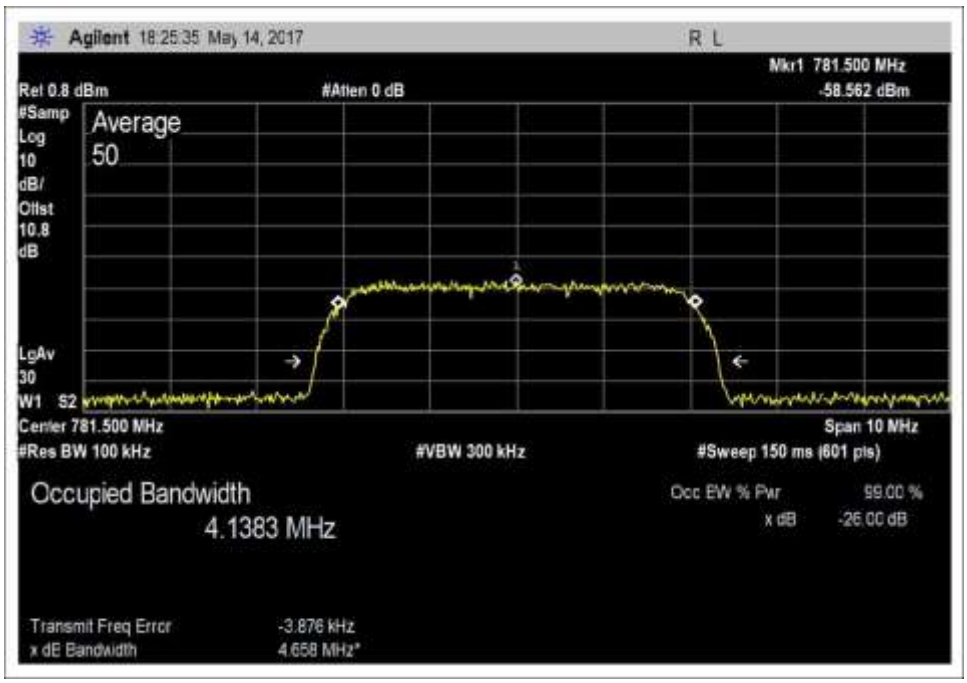
Output_OBW_DL_1930-1995MHz_LTE



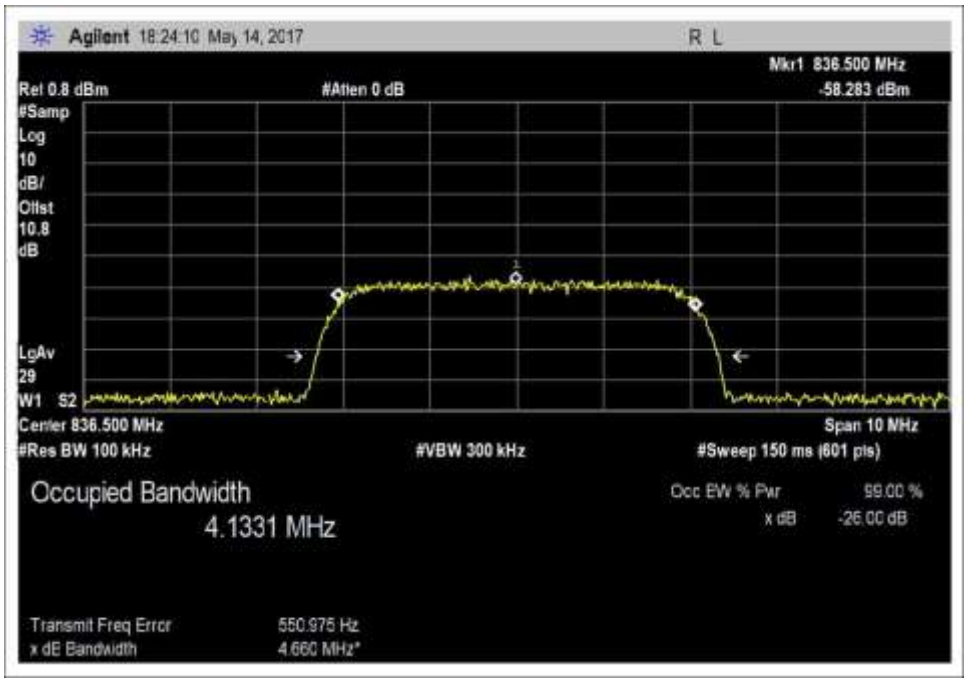
Output_OBW_DL_2110-2155MHz _LTE



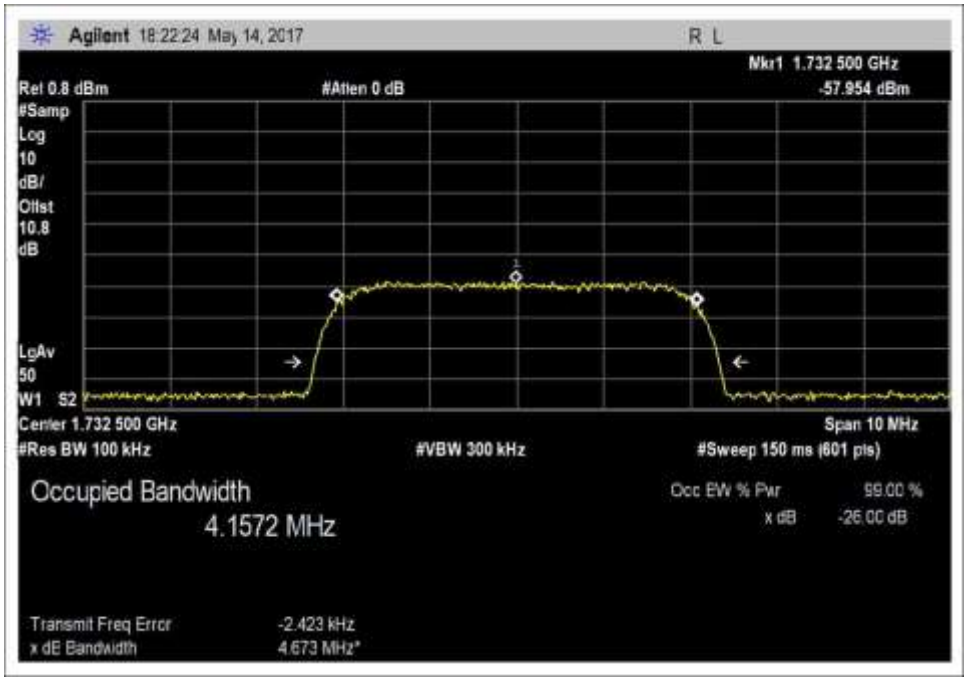
Input_OBW_UL_698-716MHz _WCDMA



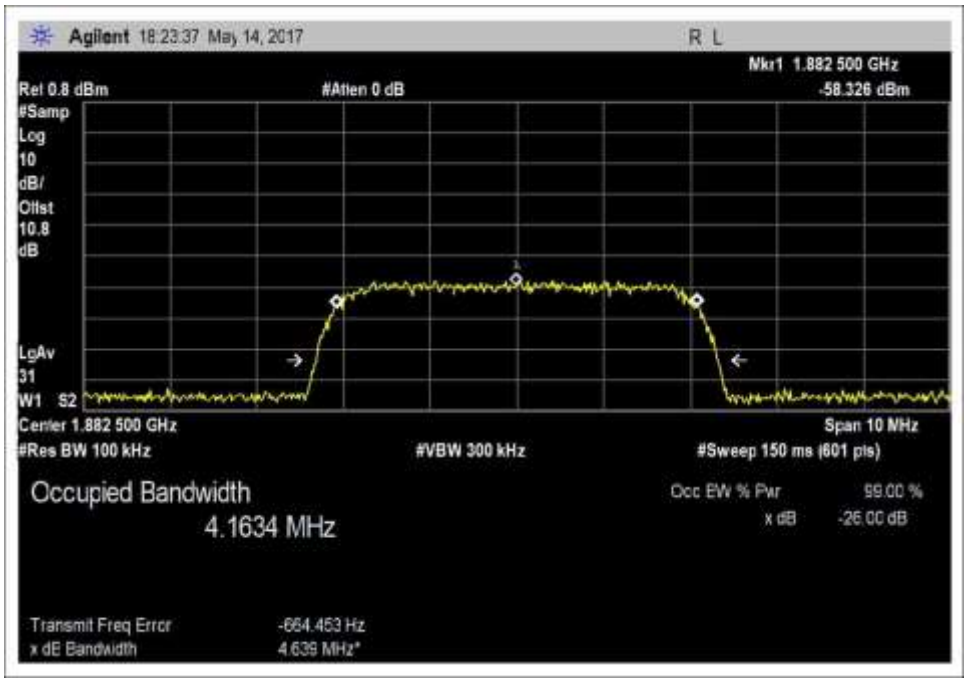
Input_OBW_UL_776-787MHz_WCDMA



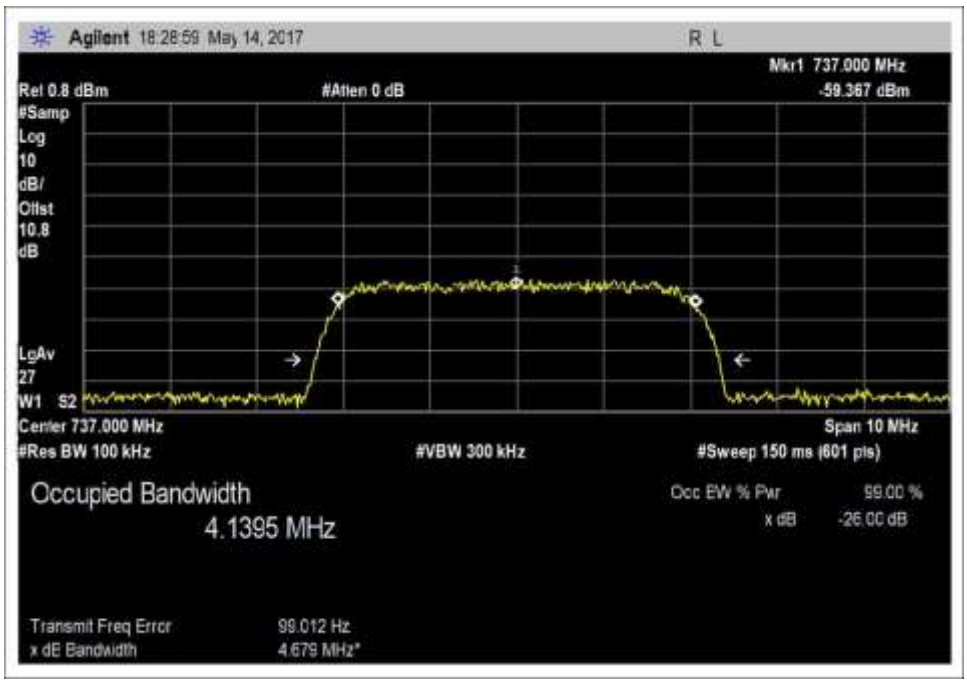
Input__OBW_UL_824-849MHz_WCDMA



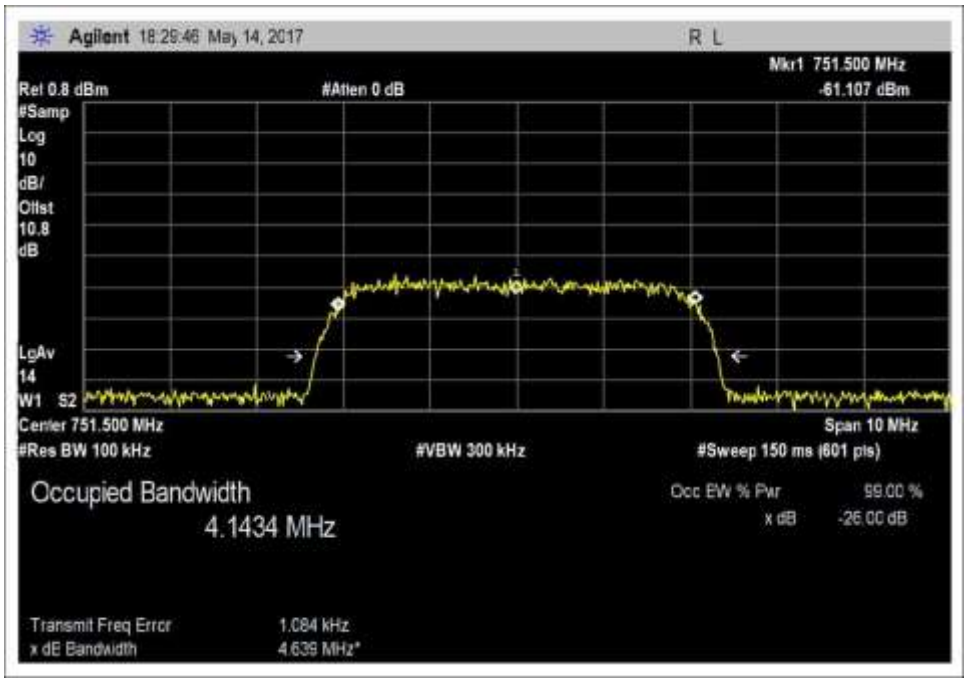
Input_OBW_UL_1710-1755MHz _WCDMA



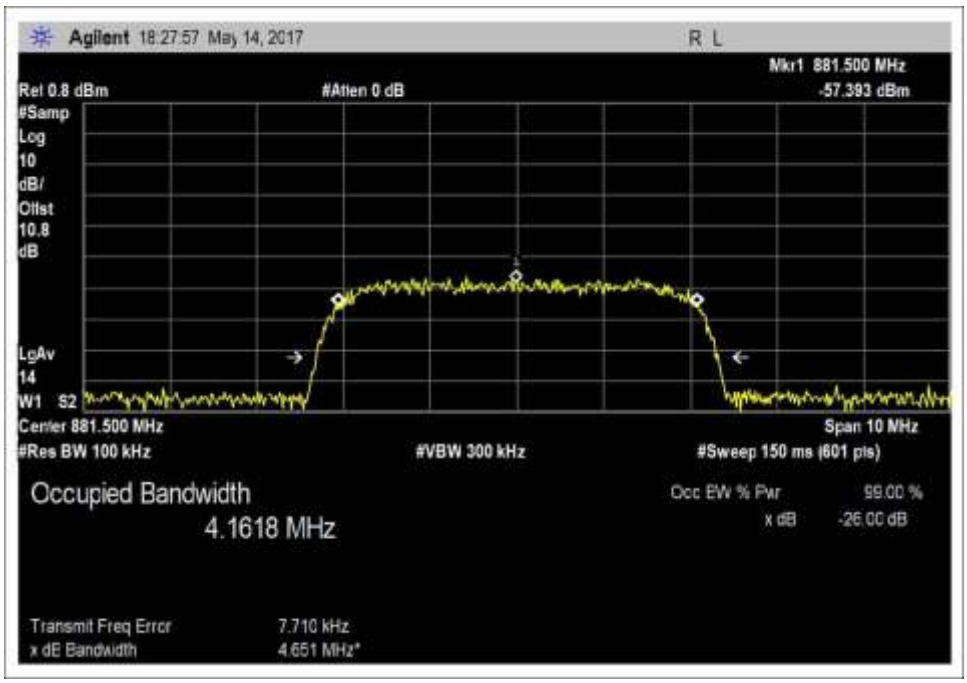
Input_OBW_UL_1850-1915MHz _WCDMA



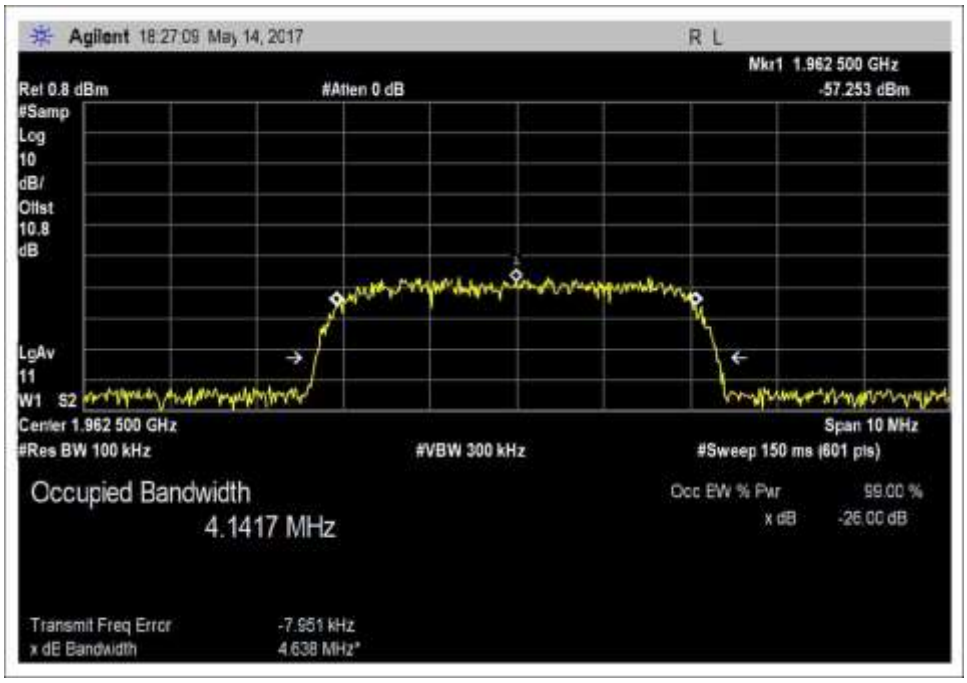
Input_OBW_DL_728-746MHz_WCDMA



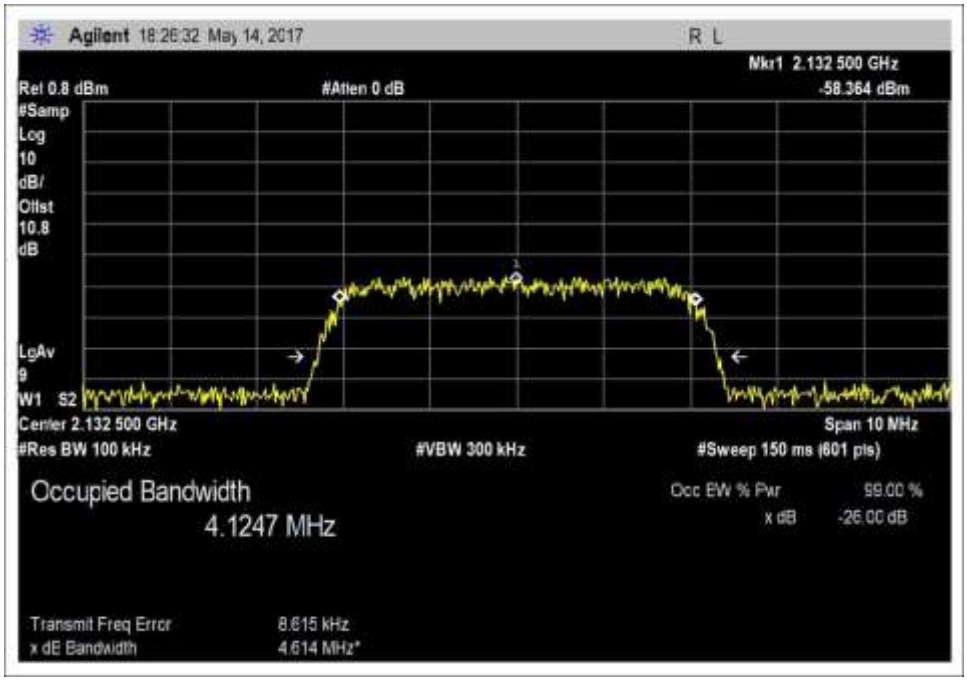
Input_OBW_DL_746-757MHz_WCDMA



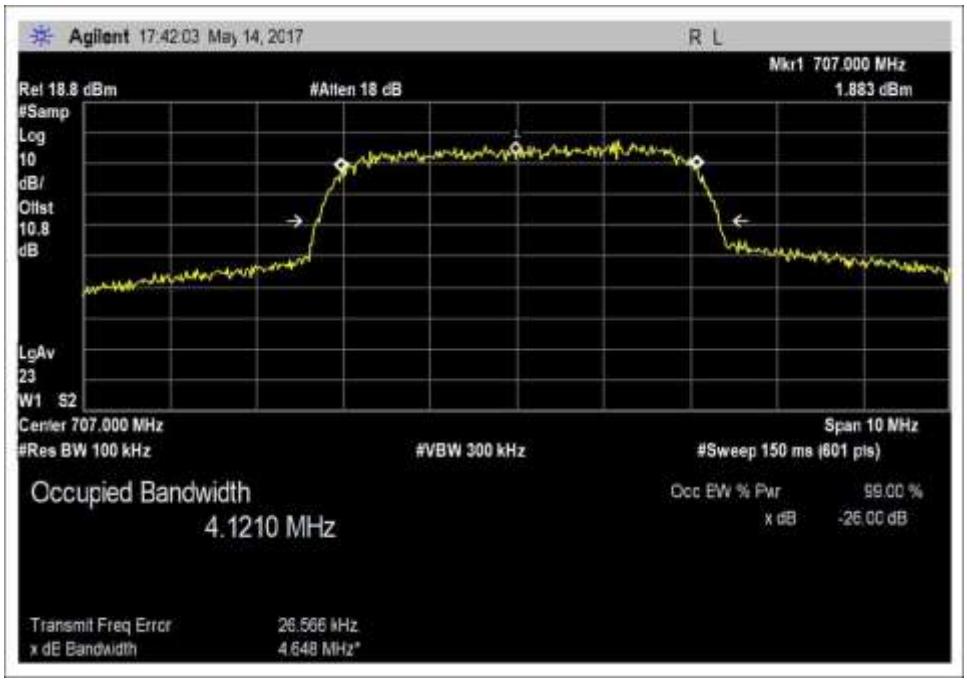
Input_OBW_DL_869-894MHz_WCDMA



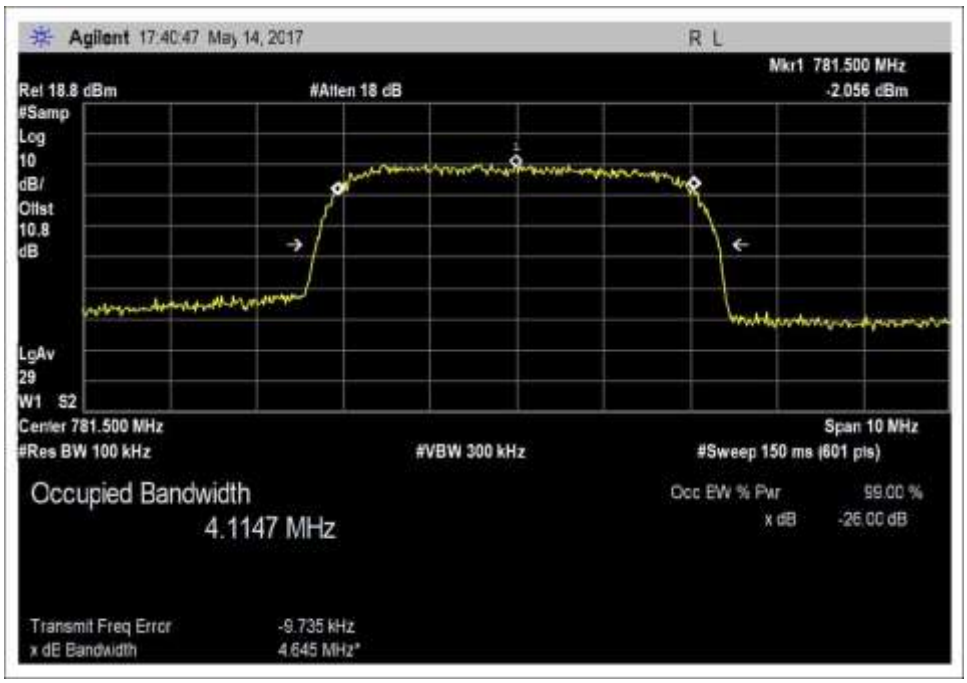
Input_OBW_DL_1930-1995MHz_WCDMA



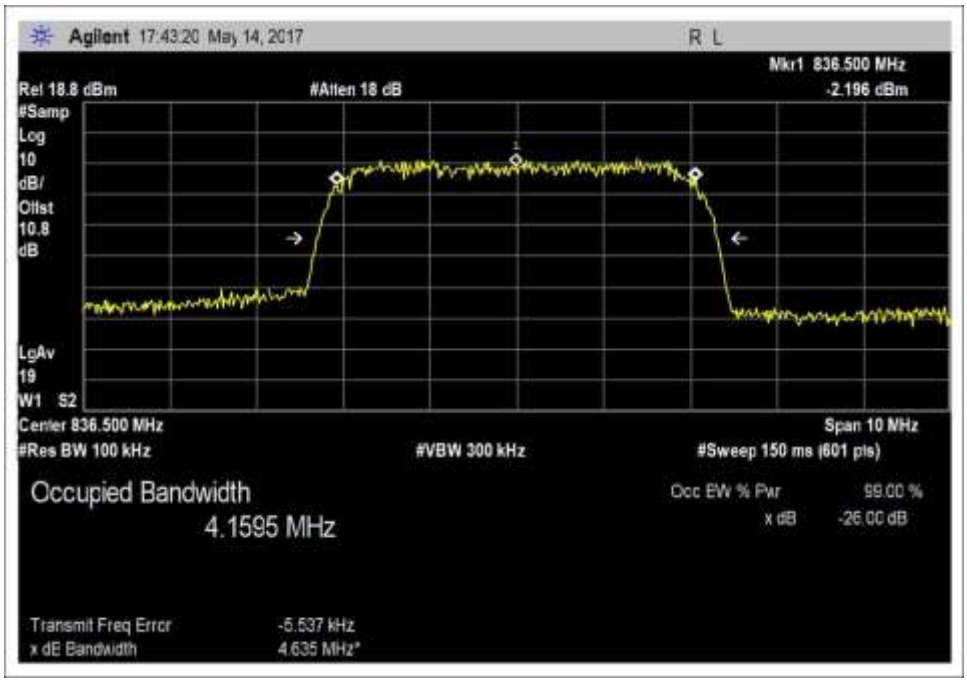
Input_OBW_DL_2110-2155MHz_WCDMA



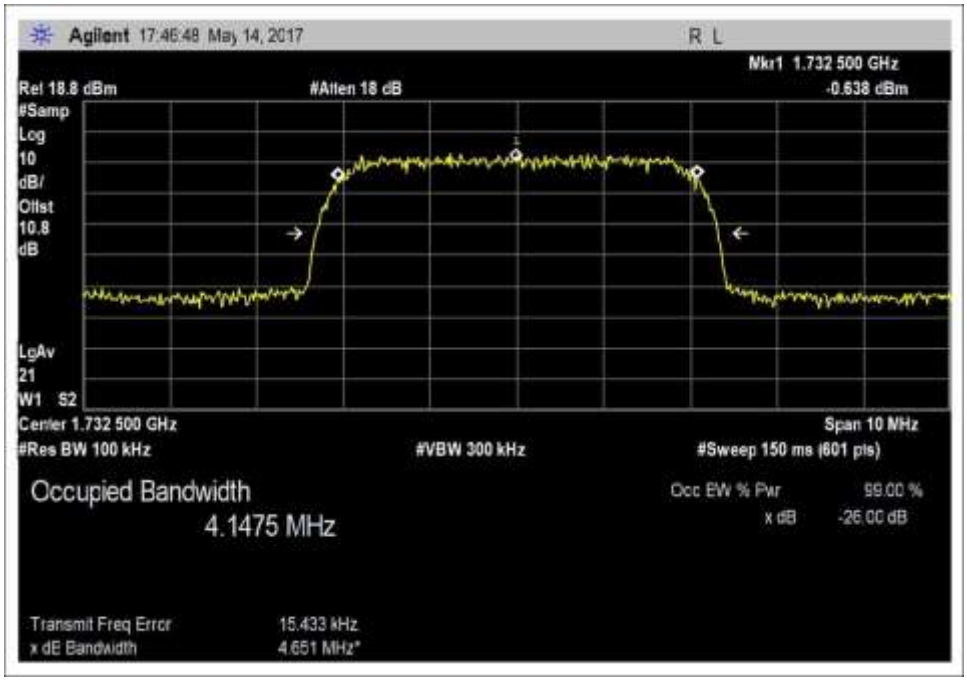
Output_OBW_UL_698-716MHz_WCDMA



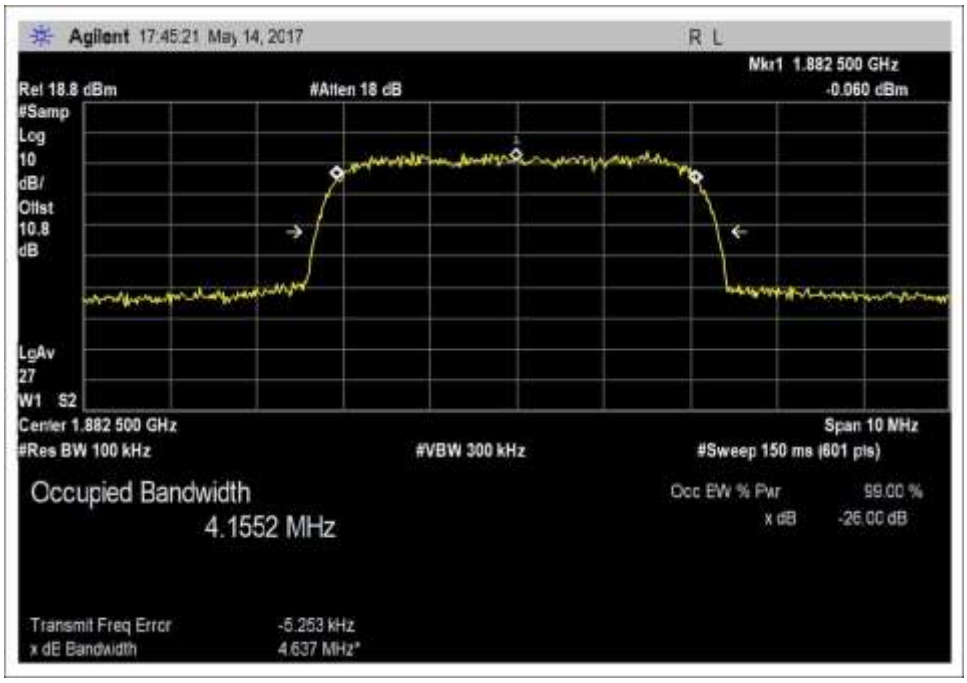
Output_OBW_UL_776-787MHz_WCDMA



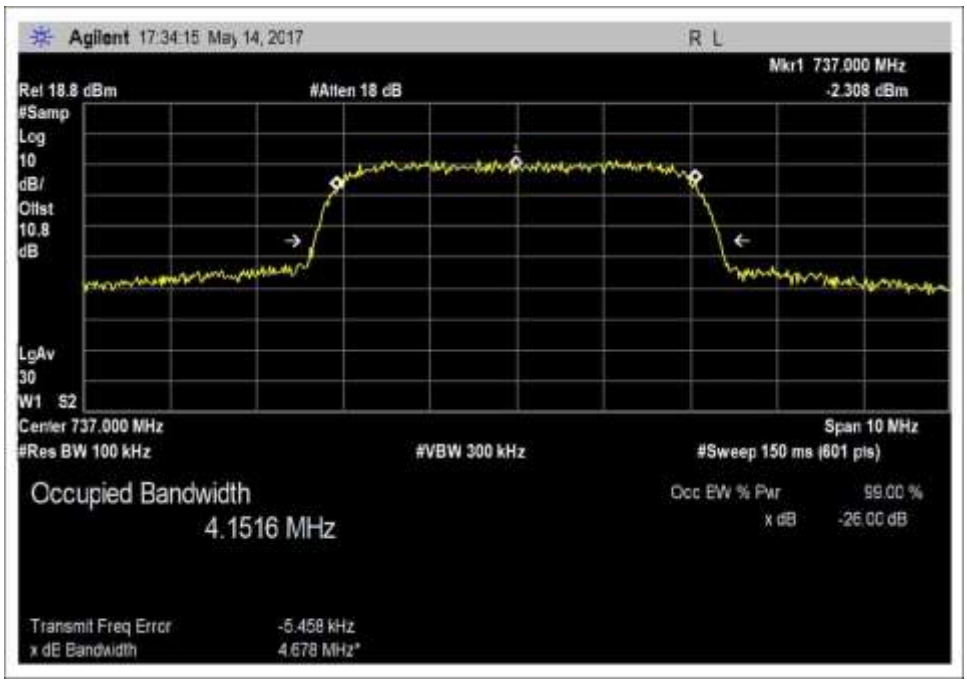
Output_OBW_UL_824-849MHz_WCDMA



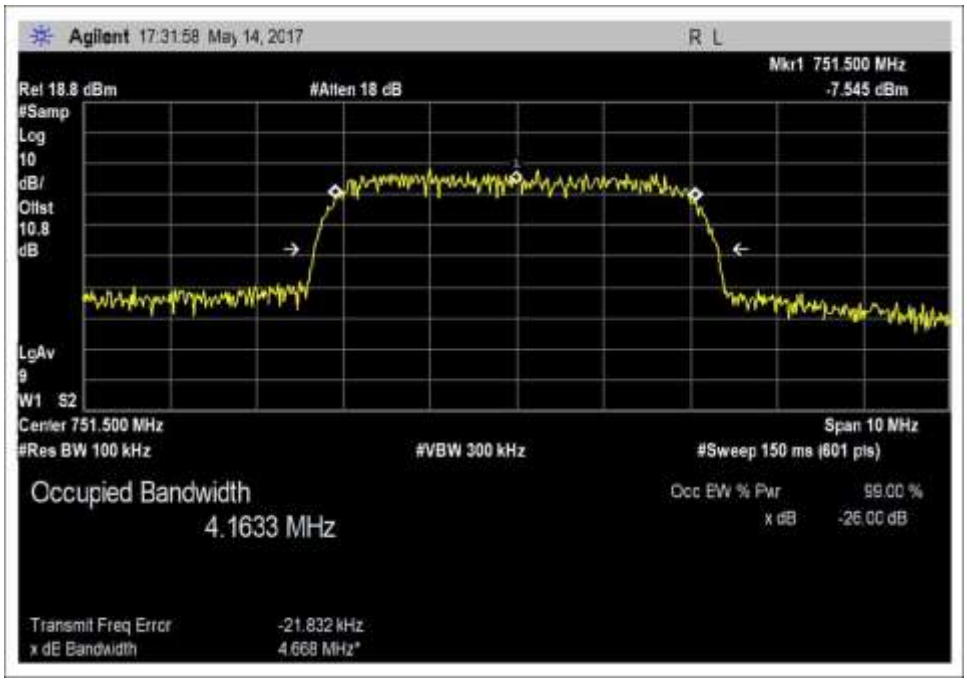
Output_OBW_UL_1710-1755MHz_WCDMA



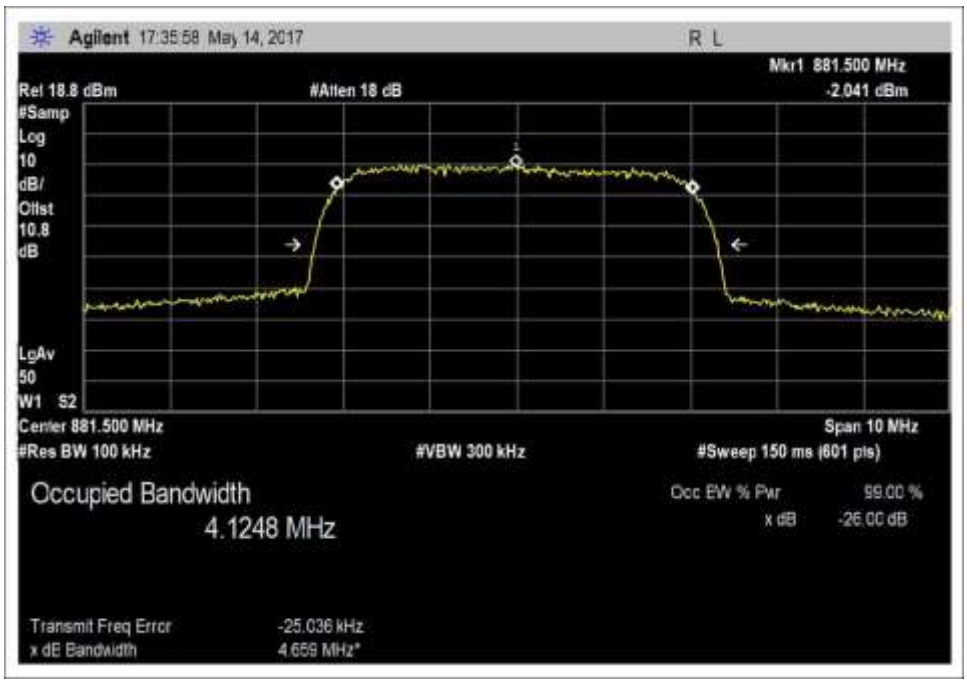
Output_OBW_UL_1850-1915MHz _WCDMA



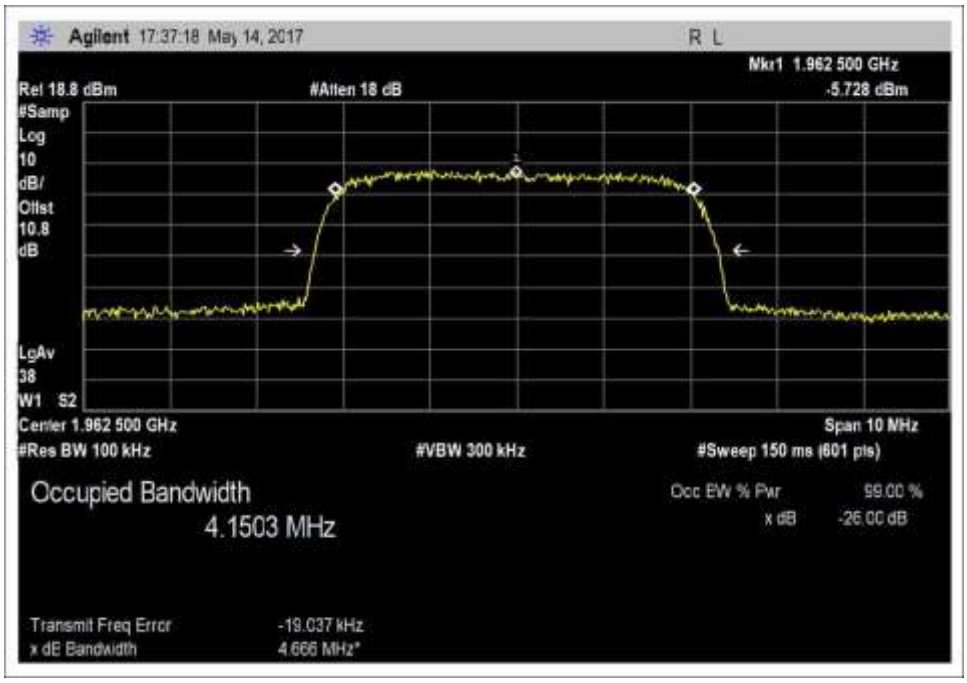
Output_OBW_ DL_728-746MHz _WCDMA



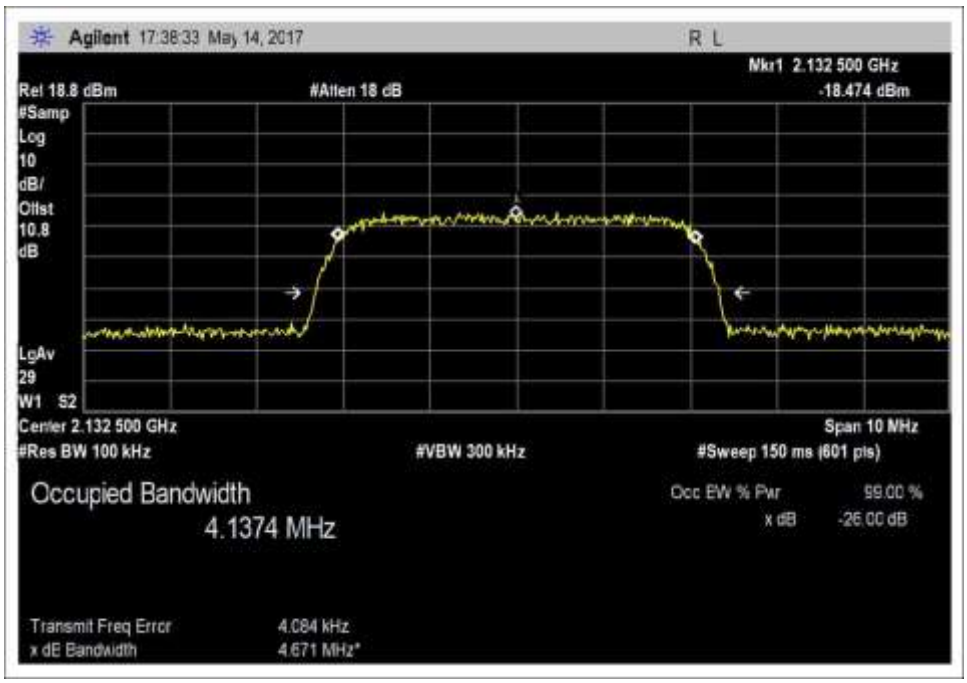
Output_OBW_DL_746-757MHz _WCDMA



Output_OBW_DL_869-894MHz_WCDMA



Output_OBW_DL_1930-1995MHz_WCDMA



Output_OBW_DL_2110-2155MHzz_WCDMA

7.11 Oscillation Detection

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92821 • 714 993-6112		
Customer:	Huaptec		
Specification:	**7.11 Anti-Oscillation (Oscillation Restarts / Oscillation mitigation or shutdown)**		
Work Order #:	**99881**	Date:	6/1/17
Test Type:	**Conducted Emissions**	Time:	17:56
Tested By:	**E. Wong**	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.
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.
RS232 service port is left unpopulated

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

Test procedure: 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: V1.6.

Test environment conditions:
Temperature: 21.1°C
Relative Humidity: 40%
Pressure: 100.8 kPa

Note:
- +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.

Due to the unique filter and frequency of max gain in the 746-757MHz band, the forced oscillation at insertion loss of (Max Gain -1) dB created the Oscillation at 745.5 MHz. However, the band pass filter employed does not provide sufficient loss to force the oscillation occurs in band. An additional tunable notch filter tuned to 745.5MHz was placed in the signal path to force the oscillation to occur and mitigated within 746-757MHz.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	7/8/2016	7/8/2017
	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
	P07037	RF Signal Generator	E4433B	10/6/2016	10/6/2018
	C00116	Cavity Filter	DLX 781.5-11-QT-S-HPT141210	05/31/2017	05/31/2019
	03416	Filter	3TNF-500/1000-N/N	5/9/2016	5/9/2018
	AN03412	Band Pass Filter	PE8705	8/12/2015	8/12/2017
	AN03413	Band Pass Filter	PE8706	8/12/2015	8/12/2017
	AN03414	Band Pass Filter	PE8707	8/12/2015	8/12/2017
	AN03415	Band Pass Filter	PE8708	8/12/2015	8/12/2017
	AN03447	Band Pass Filter	PE8710	8/12/2015	8/12/2017
	AN03448	Band Pass Filter	PE8711	8/12/2015	8/12/2017
	AN03446	Band Pass Filter	4FV50-707/H18-O/O	1/4/2016	1/4/2018
	AN03467	Band Pass Filter	4FV50-731/H30-O/O	1/4/2016	1/4/2018
	AN03468	Band Pass Filter	4CS10-781.5/E12.2-O/O	1/4/2016	1/4/2018
	AN03469	Band Pass Filter	4CS10-751.5/E12-O/O	1/4/2016	1/4/2018
	AN02475	1 dB step Attenuator	8494B	6/29/2015	6/29/2017
	AN03429	10dB step Attenuator	8496B	8/27/2015	8/27/2017
	ANC00082	RF Coupler	722-10-1.500V	8/26/2015	8/26/2017

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**		**Measured**	**Limit**	**Measured**	**Limit**
			Peak Level				
MHz	**Sec**	**Sec**	**dBm**	**Sec**	**At least sec**		
UL1710-1755	0.14	0.3	24.4	60.5	60	3	5
UL1850-1915	0.14	0.3	25.7	61.0	60	3	5
UL824-894	0.26	0.3	22.8	60.5	60	3	5
UL 698-716	0.24	0.3	20.8	60.5	60	3	5
UL776-787	0.26	0.3	21.1	60.5	60	3	5
DL2110-2155	0.21	1	23.7	61.0	60	3	5
DL1930-1995	0.22	1	21.7	60.5	60	3	5
DL869-894	0.24	1	23.7	60.5	60	3	5
DL:728-746	0.25	1	19.8	60.5	60	3	5
DL 746-757	0.24	1	17.4	60.5	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

Max Gain	UL 1710-1755	UL1850-1915	UL 824-894	UL 698-716	UL 776-787	Limit
	Pk-Pk	Pk-Pk	Pk-Pk	Pk-Pk	Pk-Pk	
Isolation	Difference	Difference	Difference	Difference	Difference	
dB	dB	dB	dB	dB	dB	dB
+5dB	(18.6) * 96s	(15)* 101s	11.8	(13.1)*89s	10.5	12
+4dB	(20.5)* 96s	(18.3)* 89s	(12.5)* 83s	(14.7) *89s	11.9	12
+3dB	(30.3) *95s	(21.3)* 88s	(15.1)* 86s	(17.7) *89s	(14.88) *93s	12
+2dB	**	(30.5)* 280s	(19.9)* 92s	(21.8) *89s	(18) *95s	12
+1dB	**	**	(24.9)*89s	**	**	12
0dB	**	**	**	**	**	12
-1dB	**	**	**	**	**	12
-2dB	**	**	**	**	**	12
-3dB	**	**	**	**	**	12
-4dB	**	**	**	**	**	12
-5dB	**	**	**	**	**	12

Max Gain	DL 2110-2155	DL 1930-1995	DL 869-894	DL 728-746	DL 746-775	Limit
	Pk-Pk	Pk-Pk	Pk-Pk	Pk-Pk	Pk-Pk	
Isolation	Difference	Difference	Difference	Difference	Difference	
dB	dB	dB	dB	dB	dB	dB
+5dB	(13) *92s	11.6	11.9	(12.4) * 95s	9.4	12
+4dB	(15.6) *97s	(14.9) *96s	(12.4) *96s	(14) *96s	10.2	12
+3dB	(18.7) *96s	(14.9)* 94s	(15.4) * 95s	(17)* 96s	11.4	12
+2dB	(25)* 96s	(16) *96s	(19.7) * 96s	(22) * 96s	(16)*95s	12
+1dB	(51) *91s	(23) *96s	(26) *95s	(39) *96s	(17.1) *293 s	12
0dB	**	(44) * 93s	(77) *96s	(79) *96s	(17.5) * 96s	12
-1dB	**	**	**	**	(27)* 193s See Note 1	12
-2dB	**	**	**	**	(15.3)* 93s	12
-3dB	**	**	**	**	(14.8) * 290s	12
-4dB	**	**	**	**	(14.8)* 95s	12
-5dB	**	**	**	**	(12.5)* 96s	12

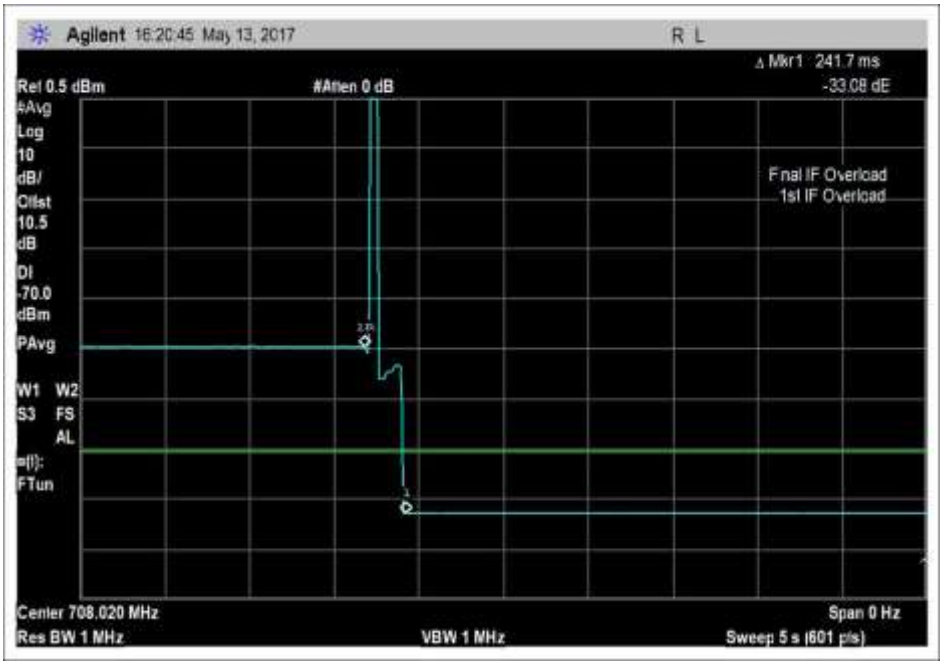
Note: * The measured difference exceeds the limit for a period of less than 300 second before device mitigates and shuts down. The maximum recorded time prior to shutdown was 98 seconds for the Uplink bands and 100 seconds for the Downlink bands.

** The device shuts down immediately.

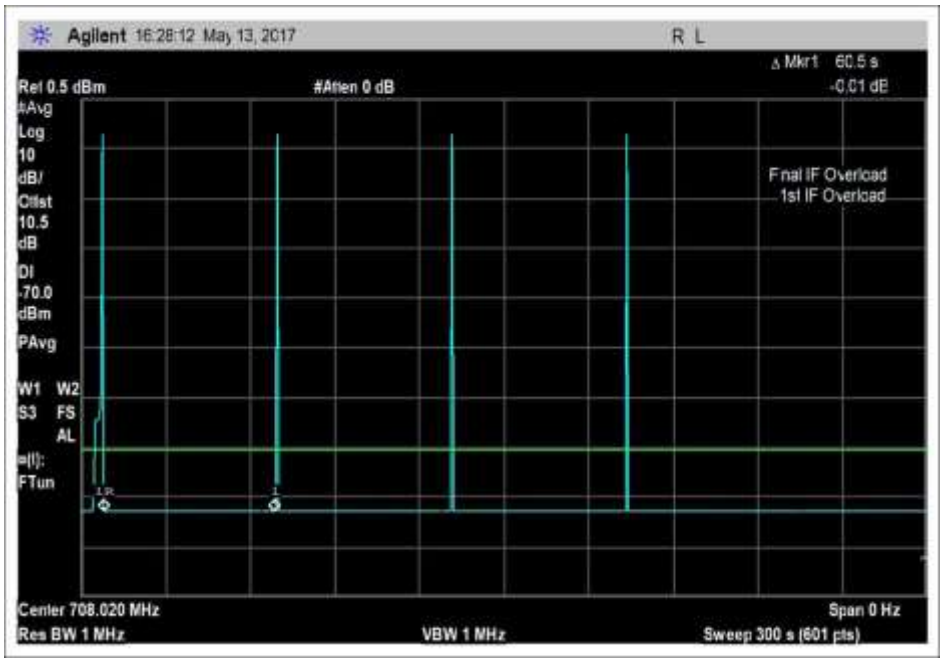
Note 1: A notch filter tuned to lower Bandedge -0,5 MHz was used.

7.11.2 Oscillation Restart Tests

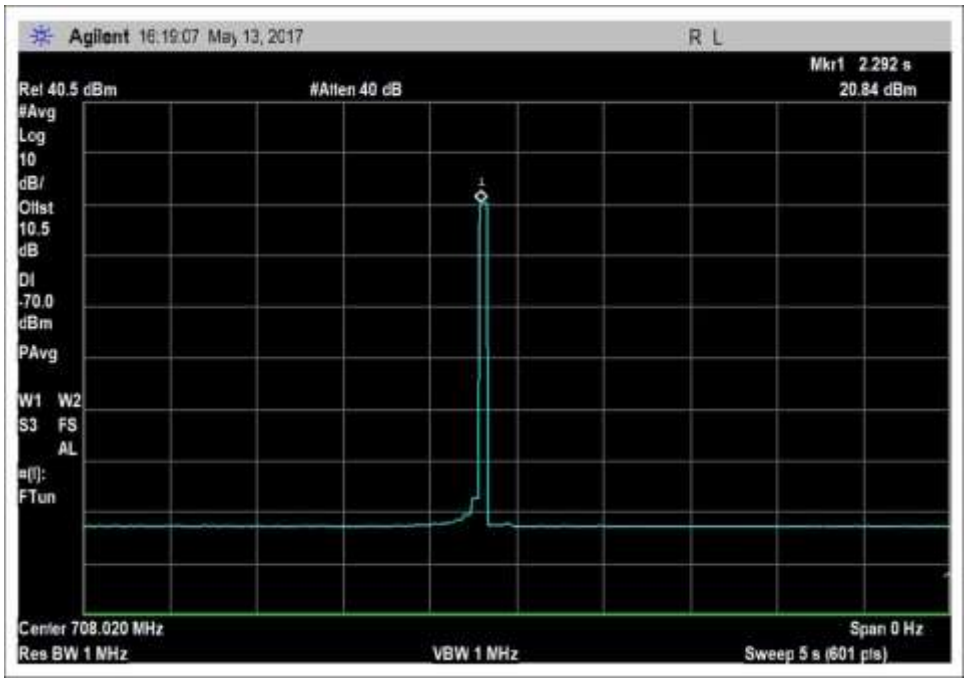
Plots



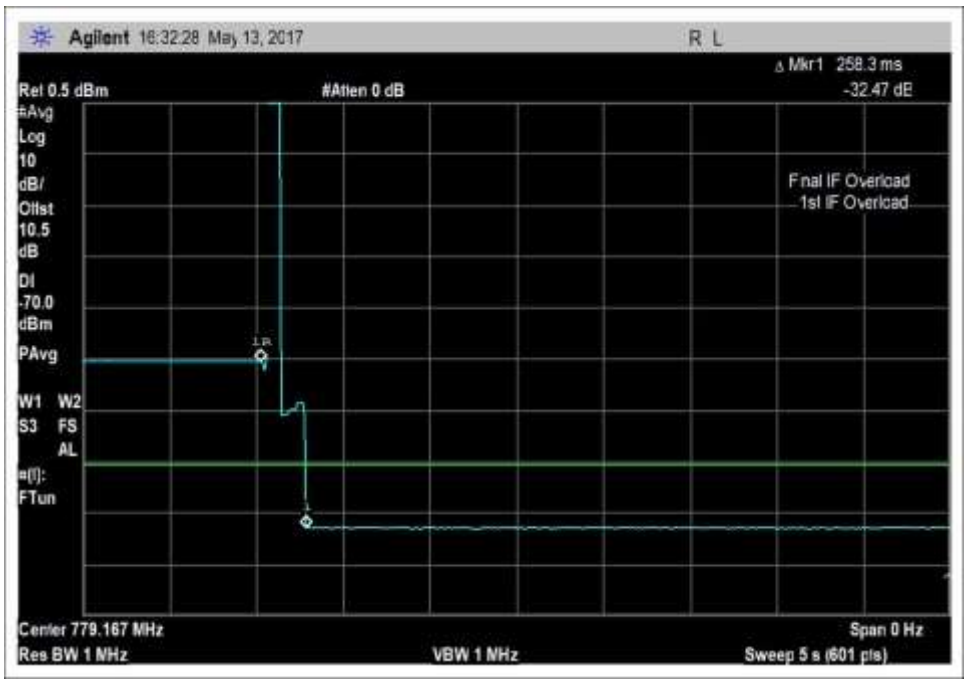
UL-698-716MHz



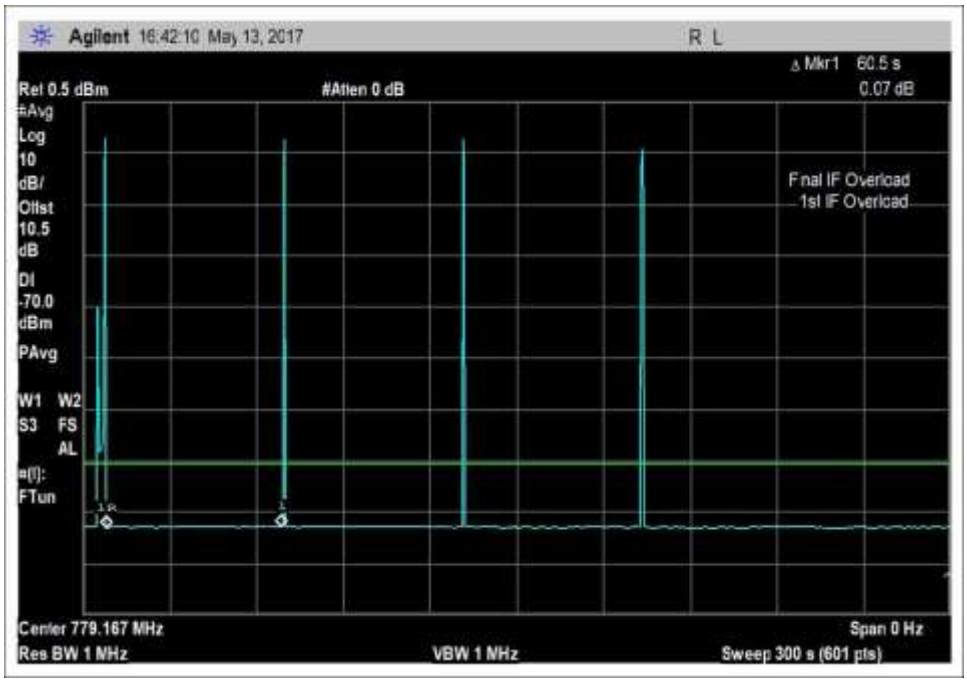
UL-698-716MHz_300s



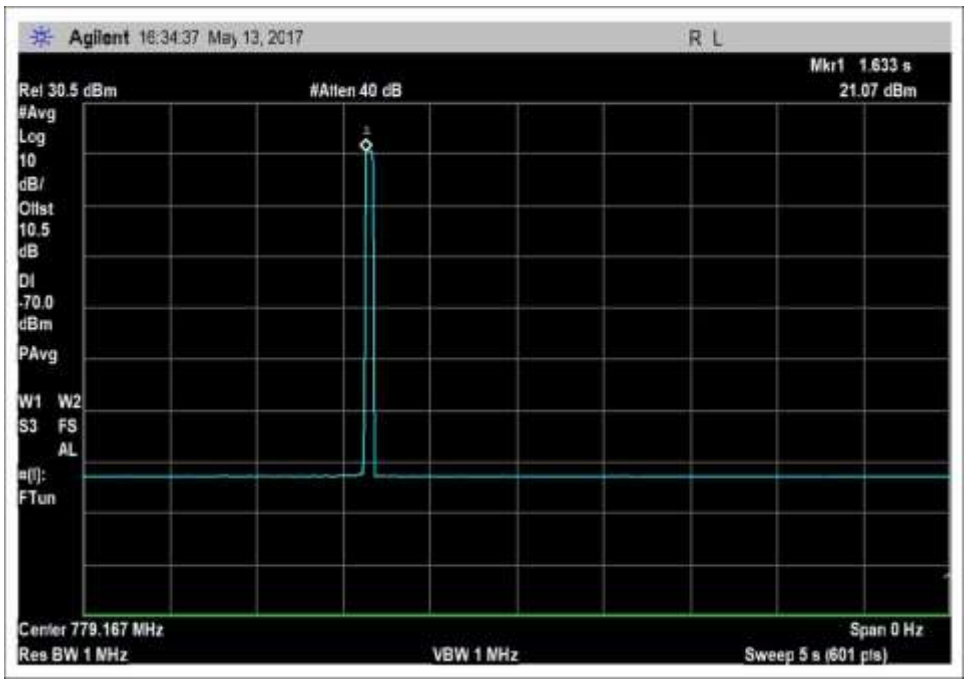
UL-698-716MHz_Peak



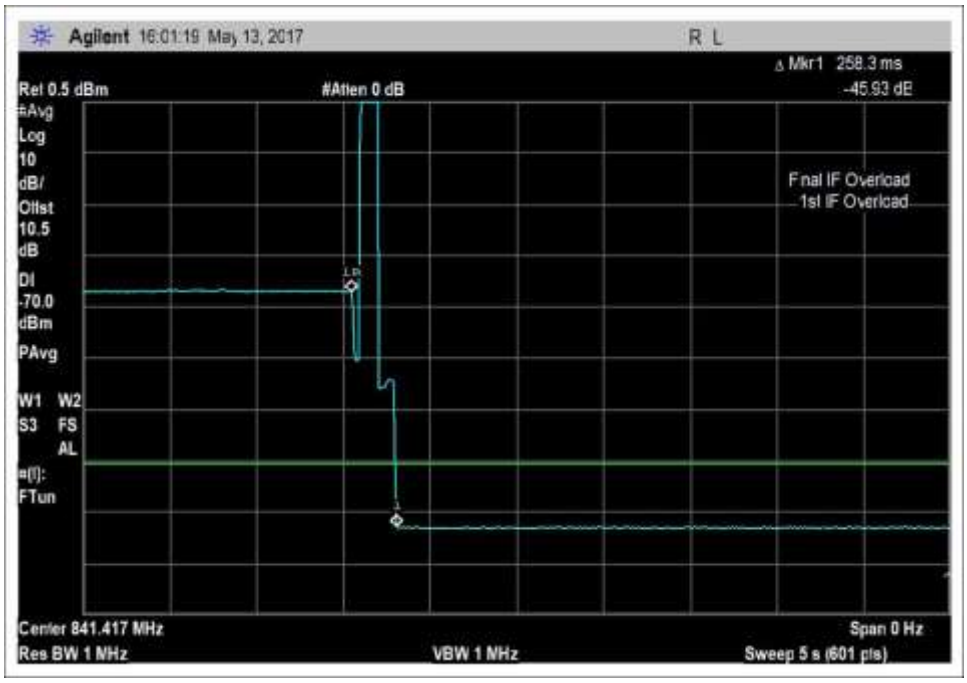
UL-776-787MHz



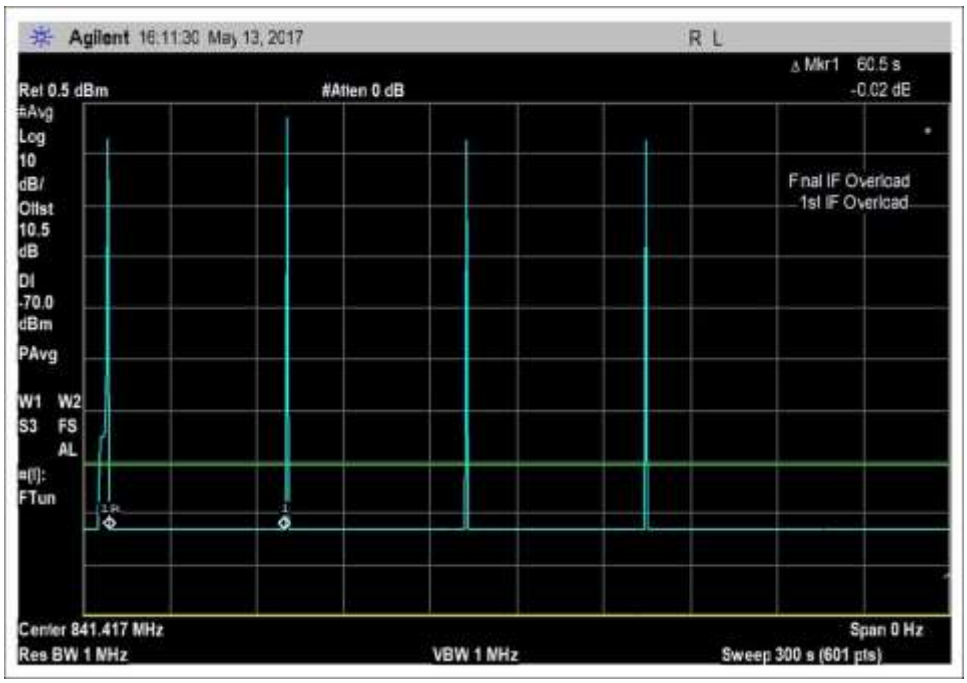
UL-776-787MHz_300s



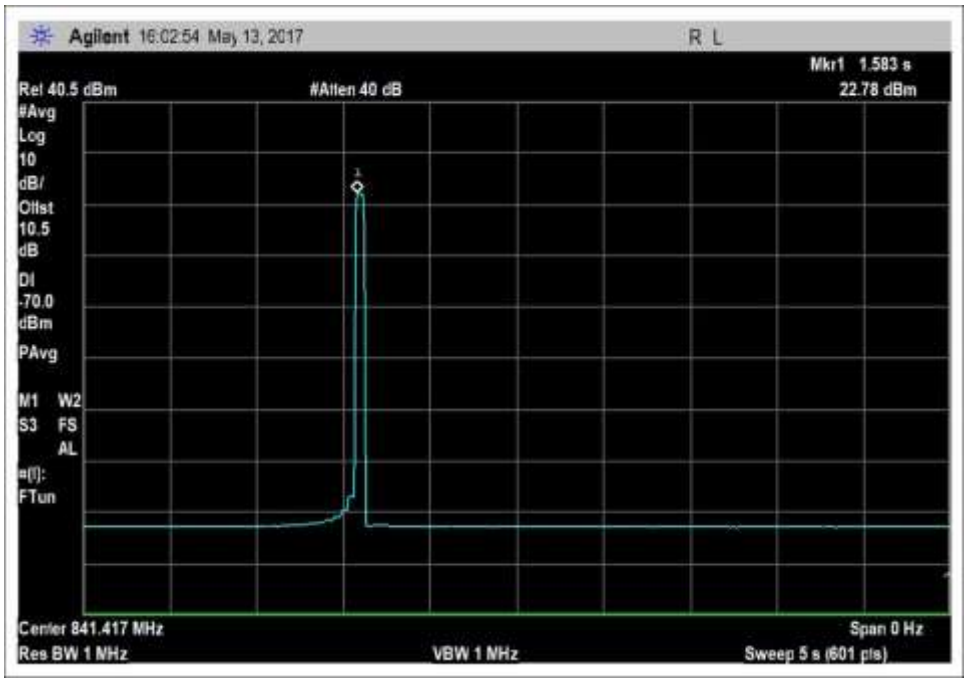
UL-776-787MHz Peak



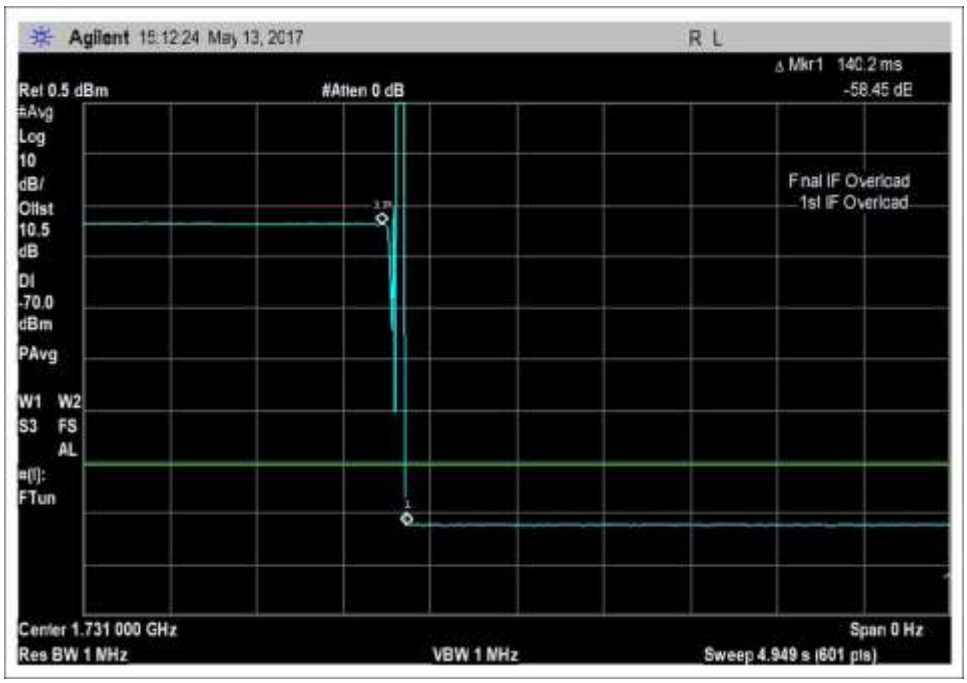
UL-824-849MHz



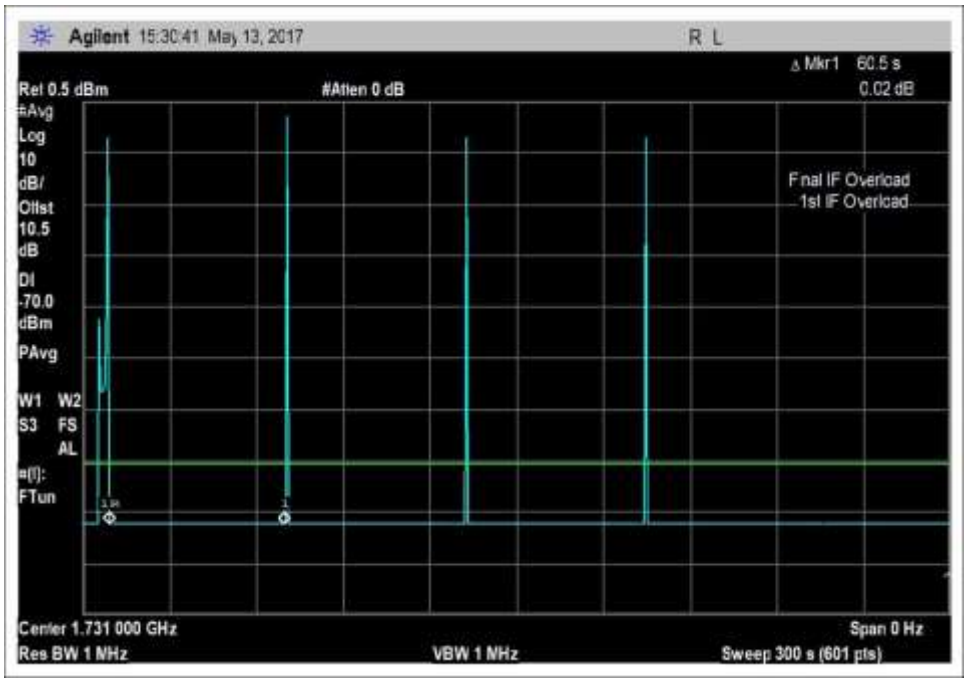
UL-824-849MHz_300s



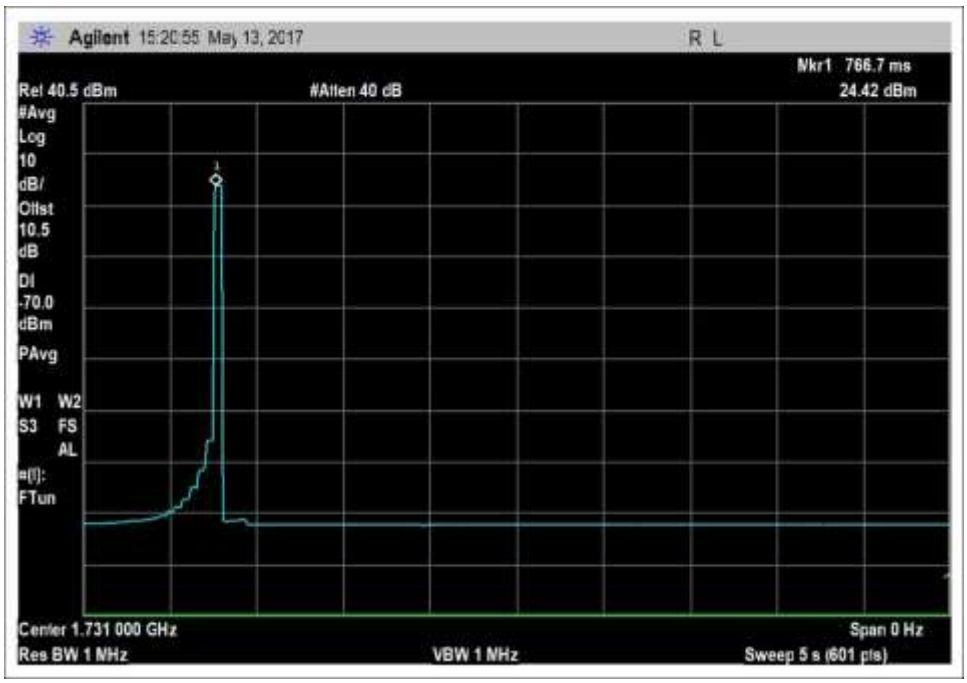
UL-824-849MHz_Peak



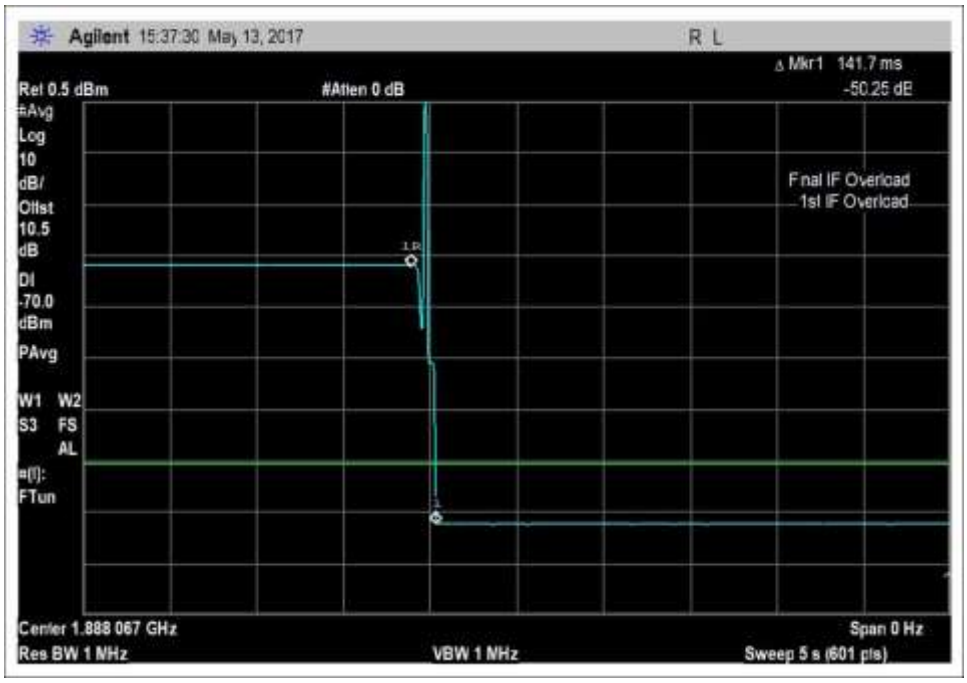
UL-1710-1755MHz



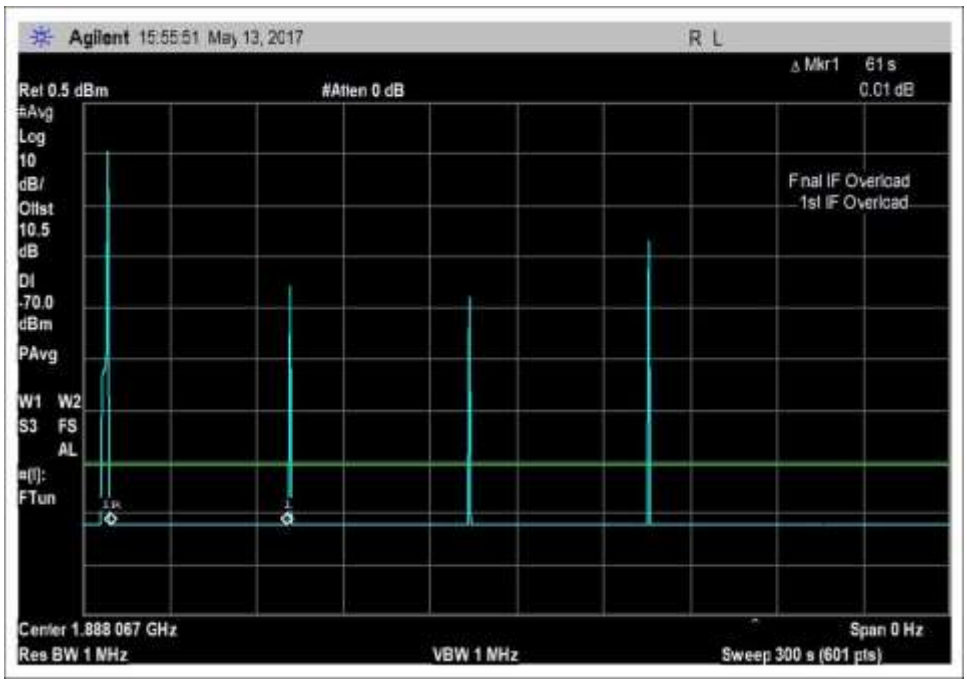
UL-1710-1755MHz_300s



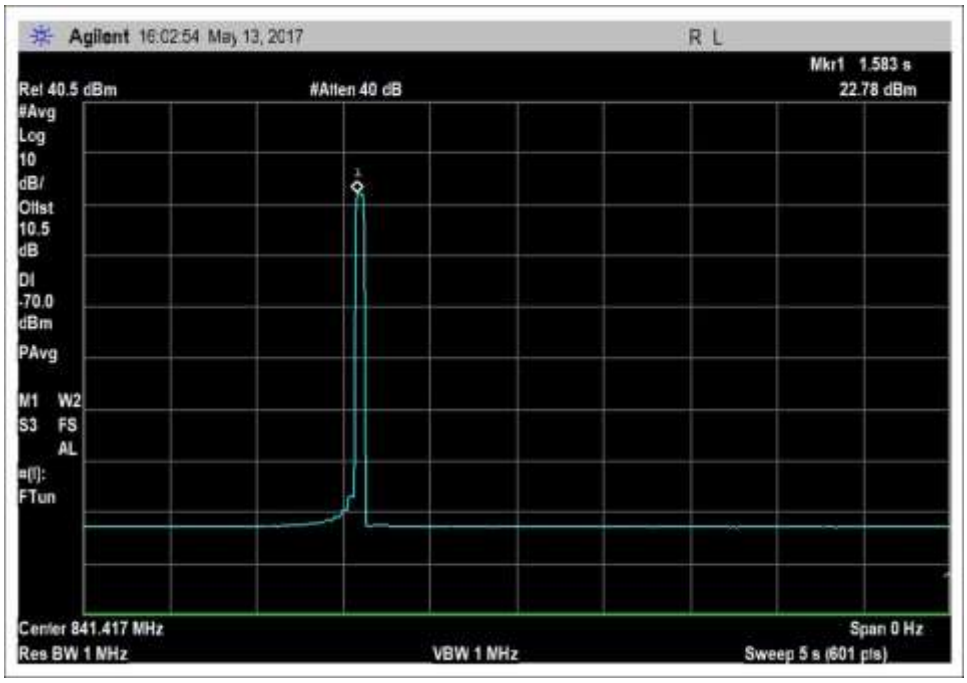
UL-1710-1755MHz_Peak



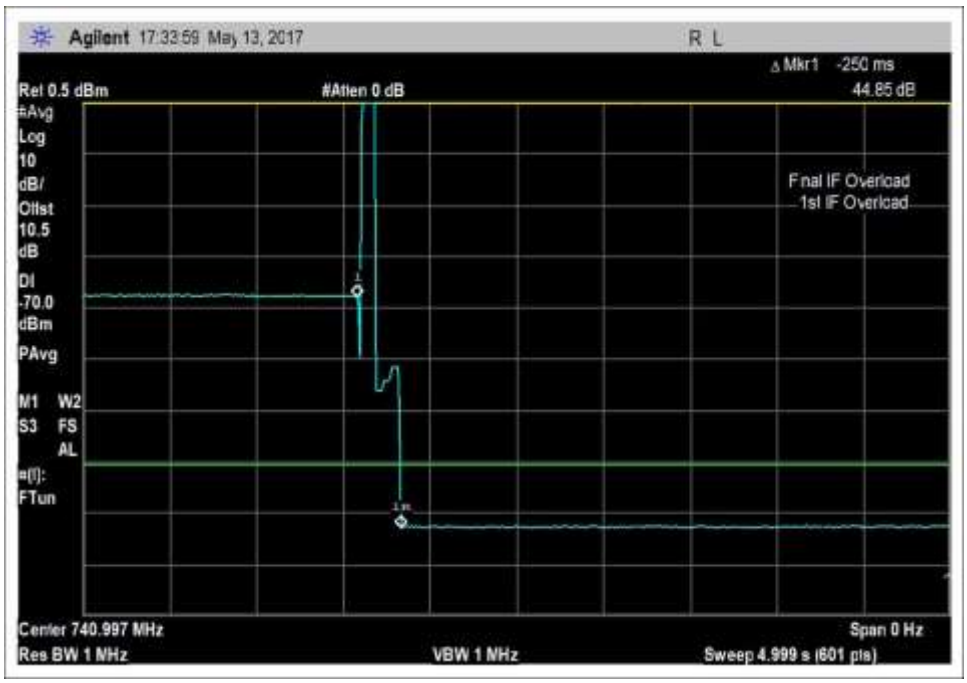
UL-1850-1915MHz



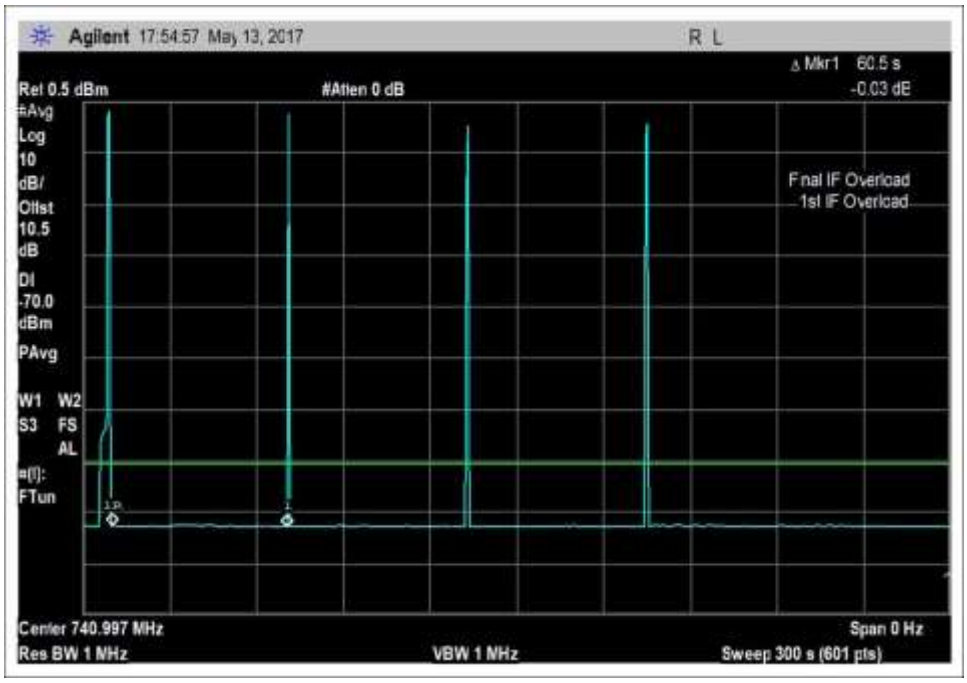
UL-1850-1915MHz_300s



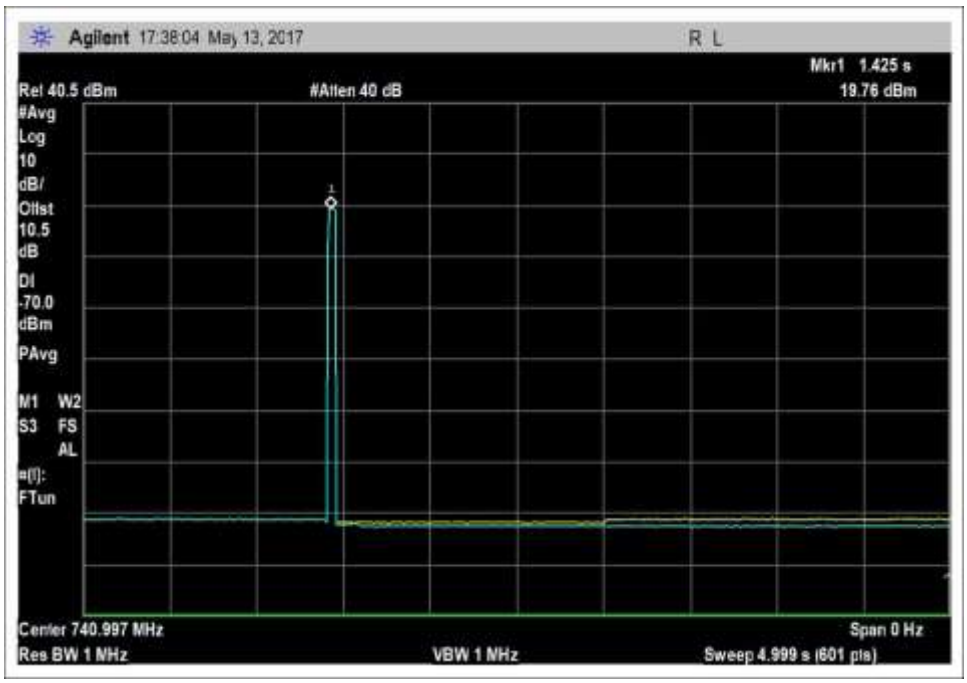
UL-1850-1915MHz_Peak



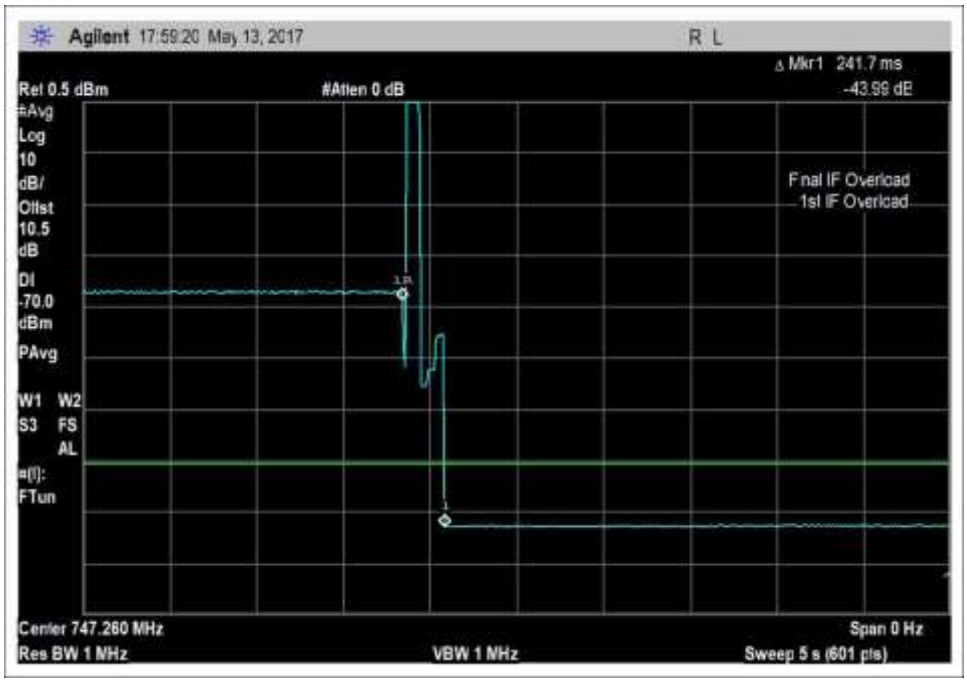
DL- 728-746MHz



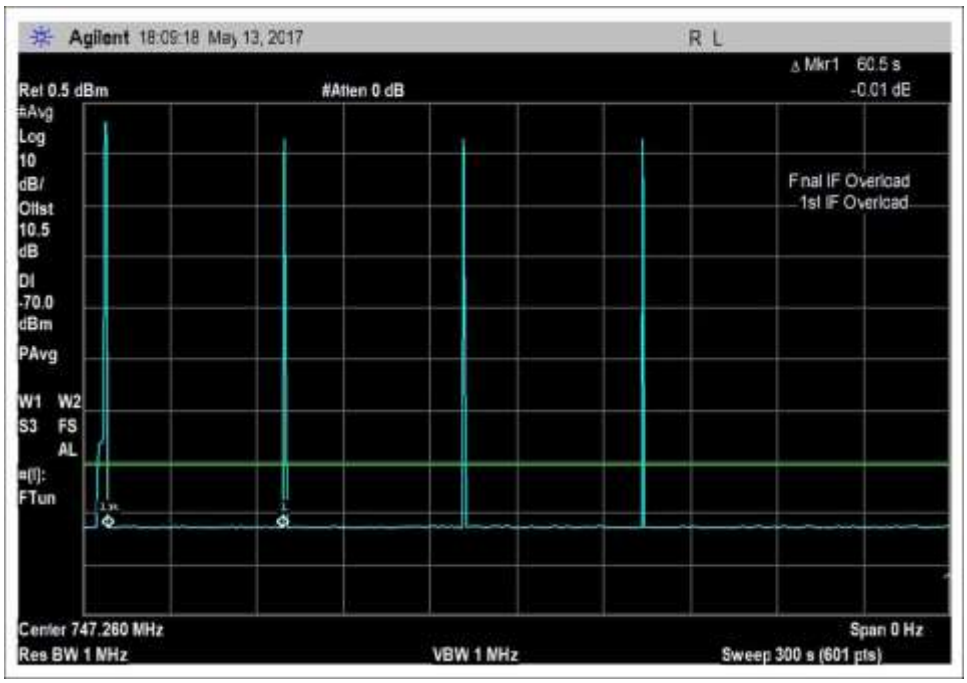
DL- 728-746MHz_300s



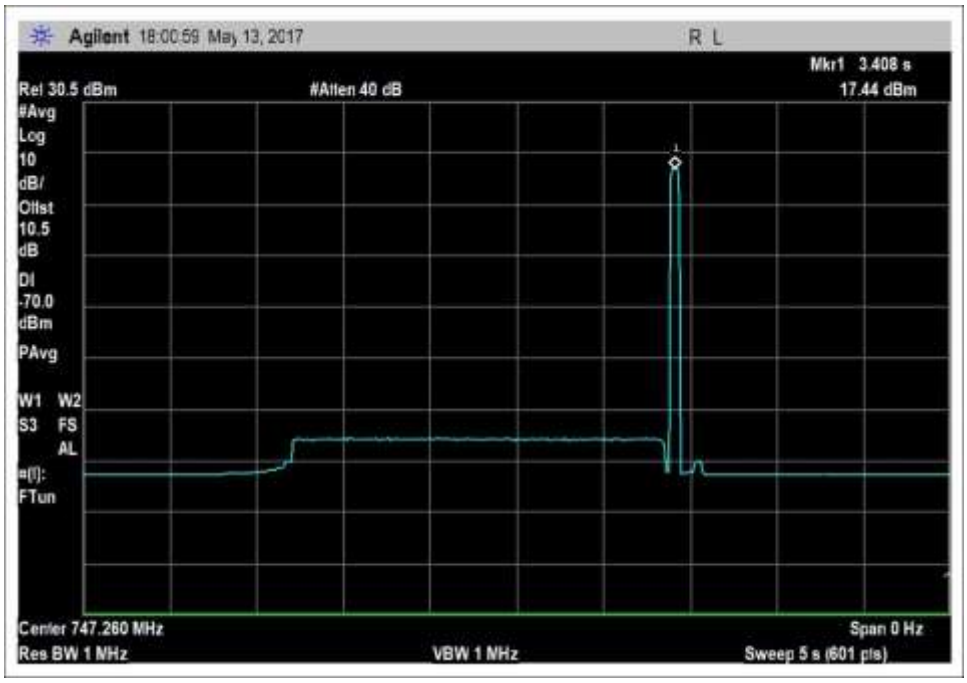
DL- 728-746MHz_Peak



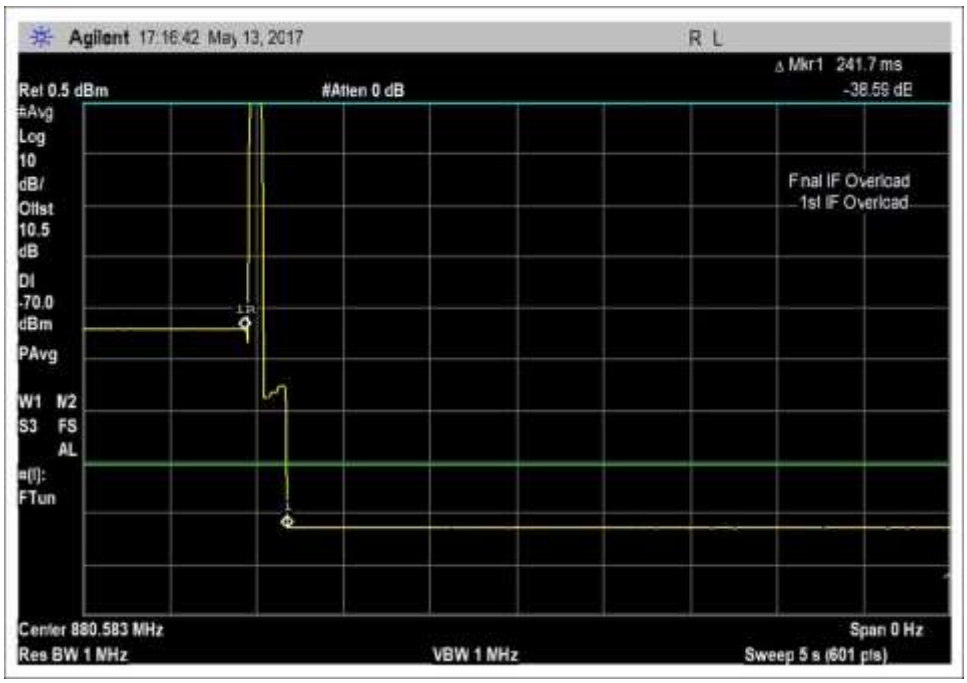
DL- 746-757MHz



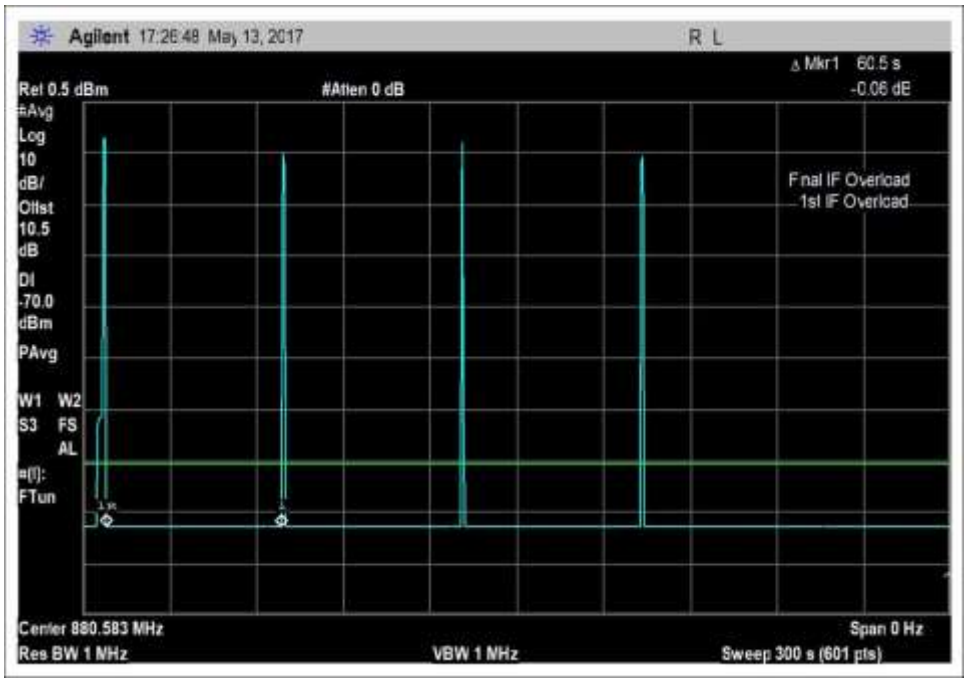
DL- 746-757MHz_300s



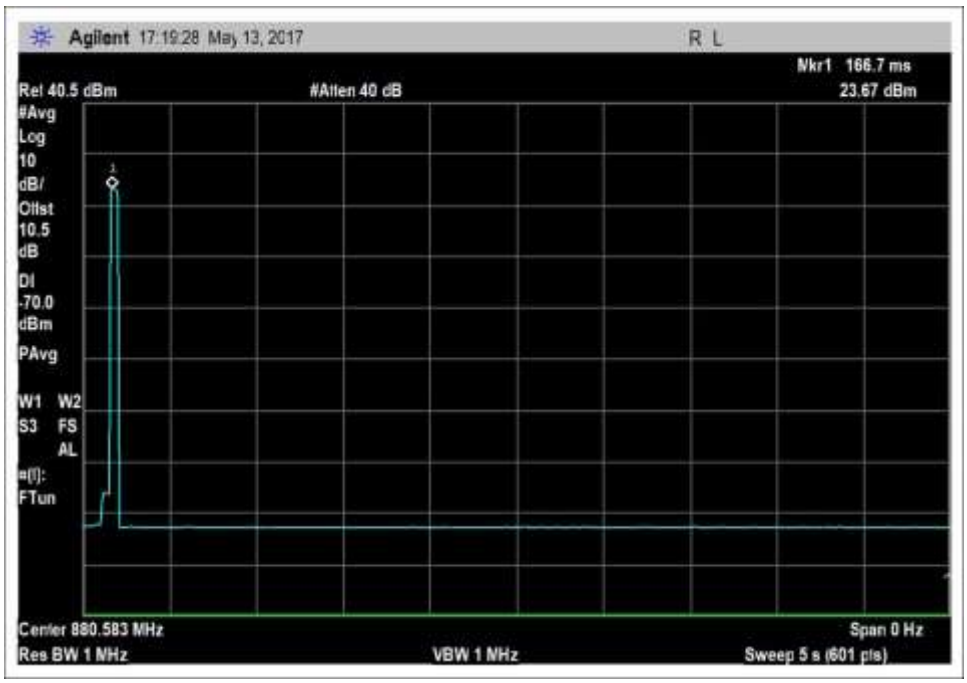
DL- 746-757MHz_Peak



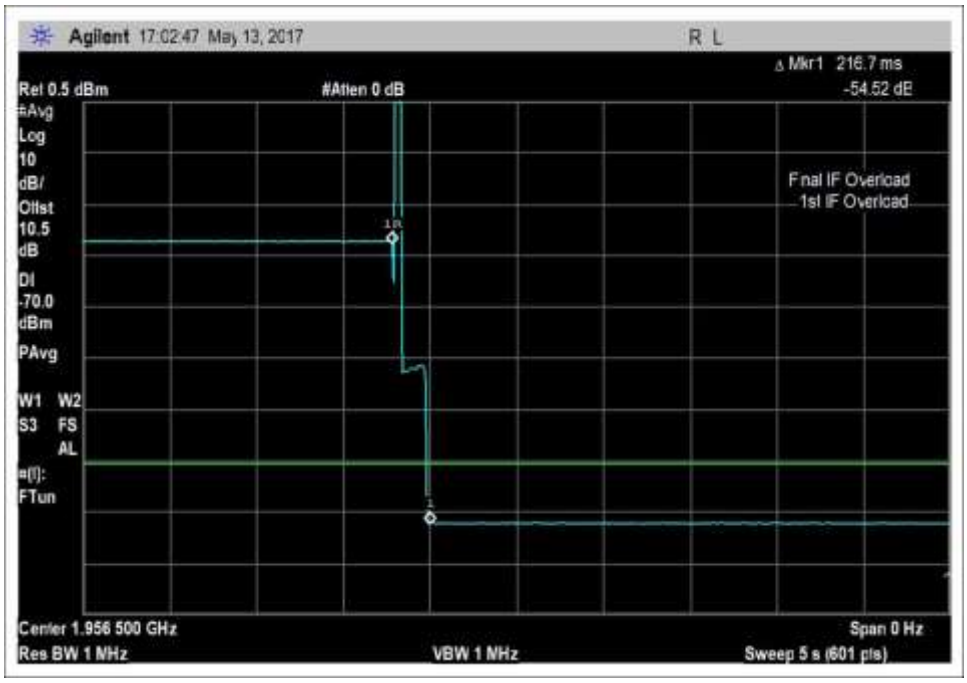
DL-869-894MHz



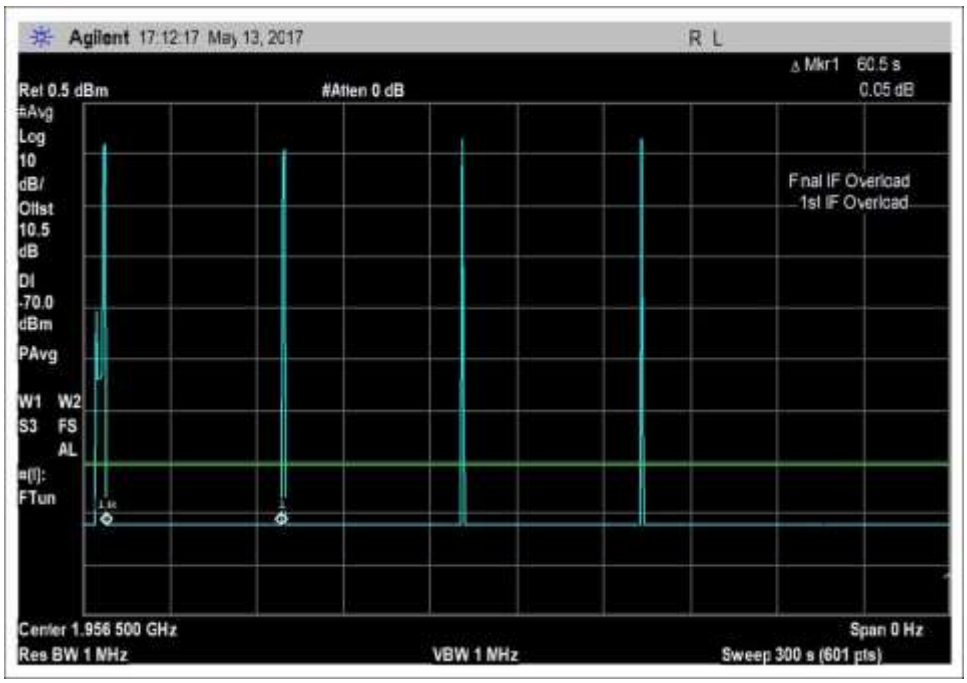
DL-869-894MHz_300s



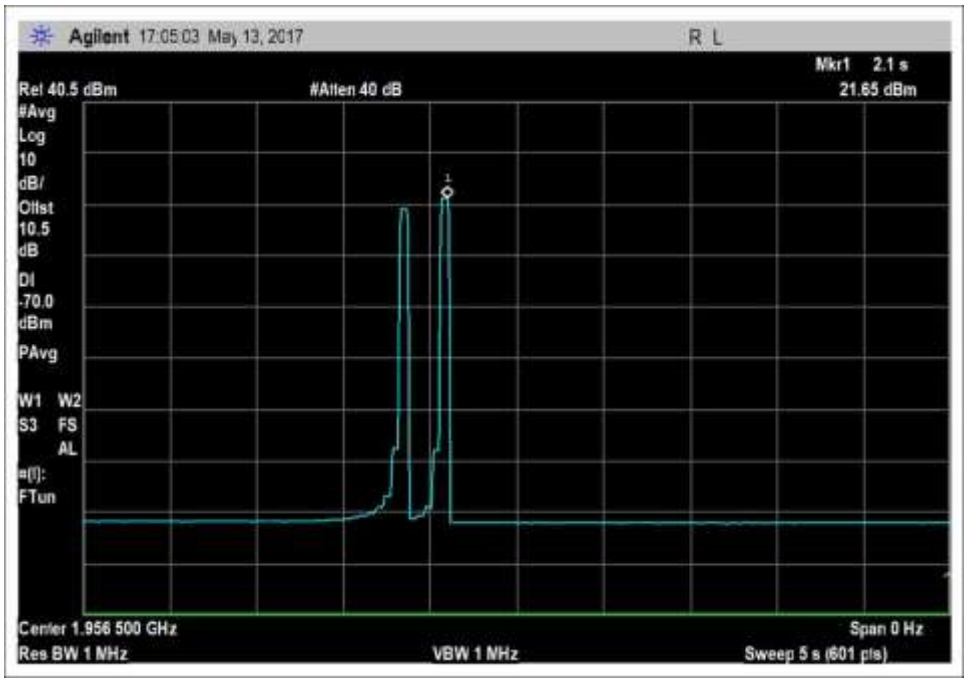
DL-869-894MHz_Peak



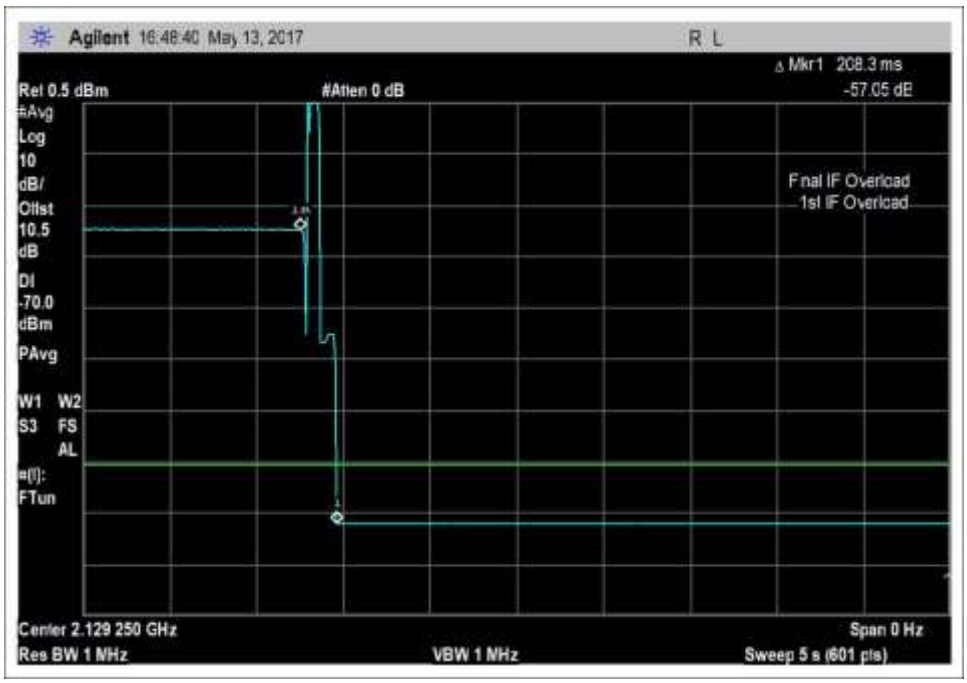
DL-1930-1995MHz



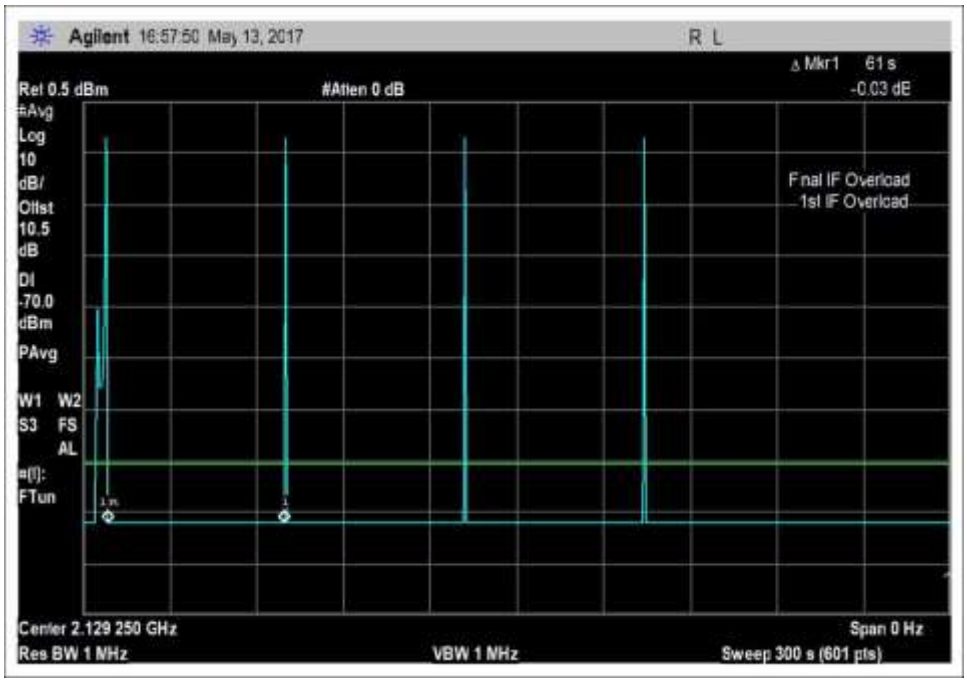
DL-1930-1995MHz_300s



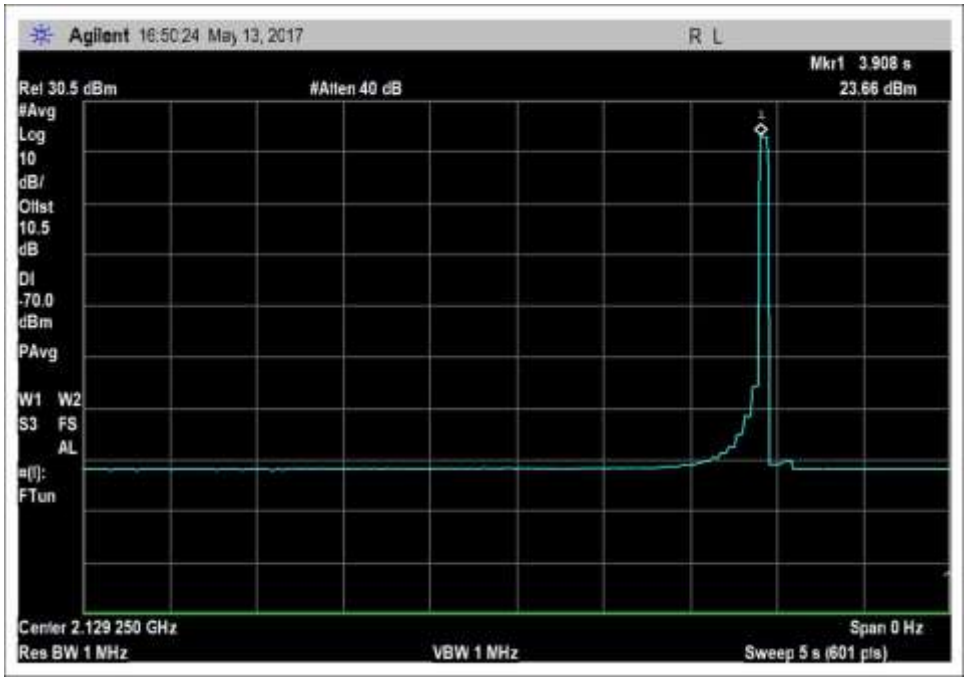
DL-1930-1995MHz_Peak



DL-2110-2155MHz



DL-2110-2155MHz_300s



DL-2110-2155MHz_Peak

7.12 Radiated Spurious Emissions

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92821 • 714 993-6112
Customer: **Huaptec**
Specification: **7.12 Radiated Spurious Emissions / 2.1053 Radiated Spurious Emissions**
47 CFR §22.917(a) Radiated Spurious Emissions
47 CFR §24.238(a) Radiated Spurious Emissions
47 CFR §27.53(c), (f), (g) and (h) Spurious Emissions

Work Order #:	**99881**	Date:	5/15/2017
Test Type:	**Radiated Scan**	Time:	13:44:03
Tested By:	E. Wong	Sequence#:	2
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 Styrofoam block with output port of the frequency band under evaluation terminated to 50 ohm load while the associated transmit band connected to a signal generator.

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.
RS232 service port is left unpopulated

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

Test procedure: The test was performed in accordance with section 7.12 of the FCC document: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance v04 Dated February 12, 2016 using antenna substitution method for detected emission within 20 dB of the limit line

Firmware: V1.6.

Test environment conditions:
Temperature: 21.1°C
Relative Humidity: 40%
Pressure:100.8 kPa

Frequency range of measurement = 9 kHz- 22 GHz.
9 kH -150 kHz;RBW=200 Hz,VBW=200 Hz;150 kHz-30 MHz;RBW=9 kHz,VBW=9 kHz;30 MHz-1000 MHz;RBW=120 kHz,VBW=120 kHz,1000 MHz-22000 MHz; RBW=1 MHz,VBW=1 MHz.

No emission found within 20 dB of the limit line.

Emissions in the band 1559-1610 MHz were investigated and these were not found within 20dB of the limit line.
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 isotopically radiated power (EIRP) for wideband signals, and 80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

Test Equipment:

ID	Asset #/	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
	AN00309	Preamp	8447D	3/14/2016	3/14/2018
	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019
	AN00314	Loop Antenna	6502	5/20/2016	5/20/2018
	AN00849	Horn Antenna	3115	3/4/2016	3/4/2018
	AN02946	Cable	32022-2-2909K-36TC	11/2/2015	11/2/2017
	AN00786	Preamp	83017A	5/9/2016	5/9/2018
	ANP06661	Cable	LDF1-50	5/6/2016	5/6/2018
	AN01413	Horn Antenna	84125-80008	10/7/2016	10/7/2018

Summary of Results

Pass: All Radiated Spurious Emissions were found with more than 20dB margin of the limit line.

Frequency Range of measurement 9kHz –> 22GHz

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P (DB)

For radiated spurious emission measured at 3 meter test distance,
Required attenuation = 43+10 Log $P_{t\ at\ 3\ meter}$ dB
Limit line (dBuV) = E_{dBuv} - Attenuation

E_{dBuv} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic)

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m^2
Pt = Average Transmit Power
r = Test distance

Field Intensity E (V/m)

$$E = \sqrt{P_D \times 377}$$

$$E = \frac{\sqrt{P_t \times 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \times 30}{r^2}}$$

$$P_t = \left(\frac{E^2 \times r^2}{30} \right)$$

10 Log P_t = 10 Log E^2 (V/m)+ 10 Log r^2 – 10 Log 30
10 Log P_t = 20 Log E (V/m) + 20 Log r – 10 Log 30

At 3 meter, r = 3 m

10 Log P_t = 20 Log E (V/m) + 20 Log 3 – 10 Log 30
10 Log Pt = 20 Log E (V/m) + 9.54 – 14.77
10 Log P_t = 20 Log E (V/m) - 5.23

Since 20 Log E (V/m) = 20 Log E (uV/m) –120

10 Log P_t = 20 Log E (uV/m) - 120 - 5.23
10 Log P_t = 20 Log E (uV/m) –125.23

Limit line (dBuV) at 3 meter = E_{dBuv} – Attenuation

= E_{dBuv} - (43+10 Log $P_{t\ at\ 3\ meter}$)

= E_{dBuv} - 43 - 10 Log $P_{t\ at\ 3\ meter}$

= E_{dBuv} - 43 – (20 Log E (uV/m) –125.23)

= E_{dBuv} - 43 - 20 Log E (uV/m) + 125.23

= E_{dBuv} - 20 Log E (uV/m) + 82.23

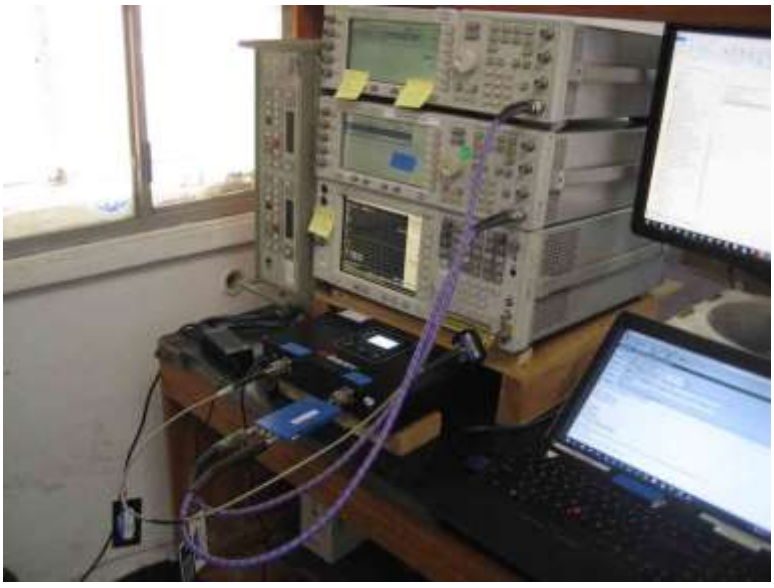
Since 20 Log E (uV/m) = E in dBuV/m

= ~~E_{dBuv}~~ - ~~E_{dBuv}~~ + 82.23

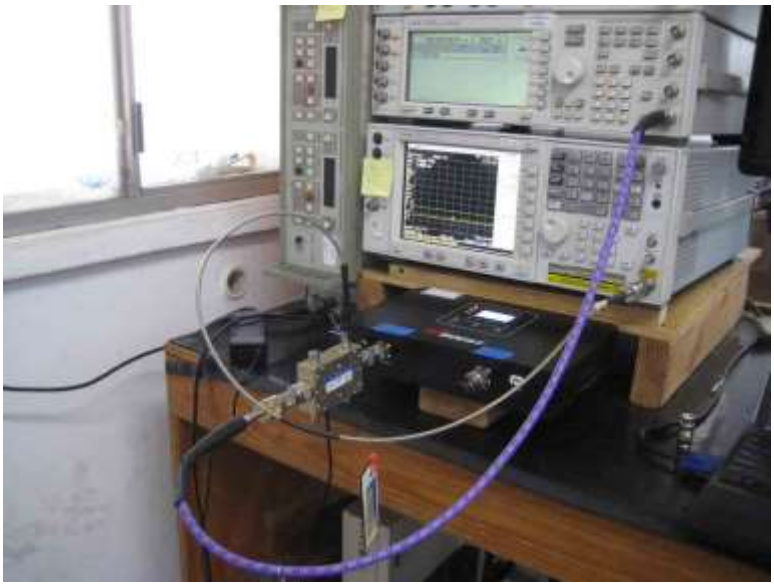
Radiated Emission limit 3 meter = 82.23 dBuV at any power level measured in dBuV

EXHIBIT A: TEST SETUP PHOTOS

Section 7.1, 7.2, 7.3, 7.5, 7.6, 7.10 Test Setup



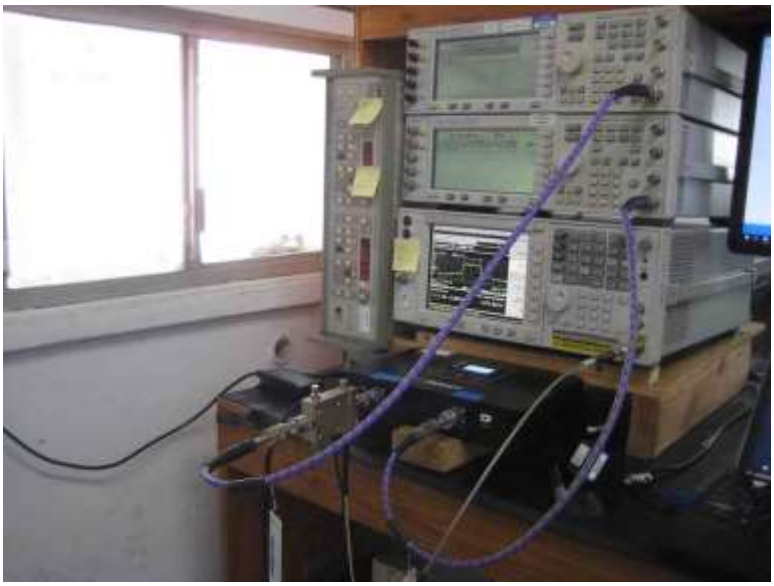
Section 7.4 Test Setup



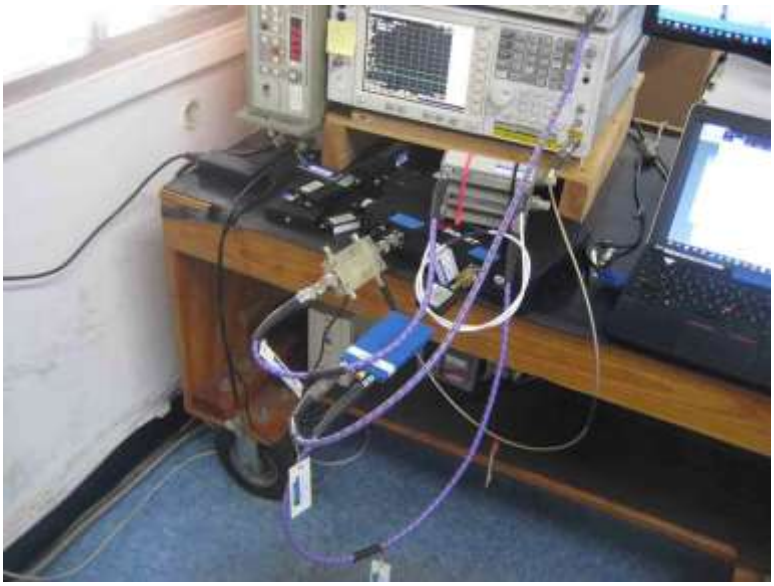
Section 7.7 Variable Uplink Test Setup

Section 7.7 Max Noise Uplink Test Setup

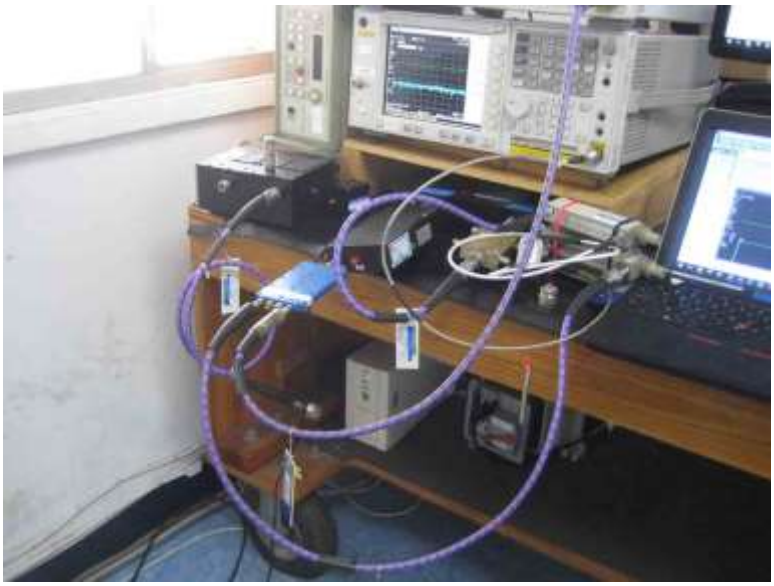
Section 7.8 Inactive Max Noise Uplink Test Setup



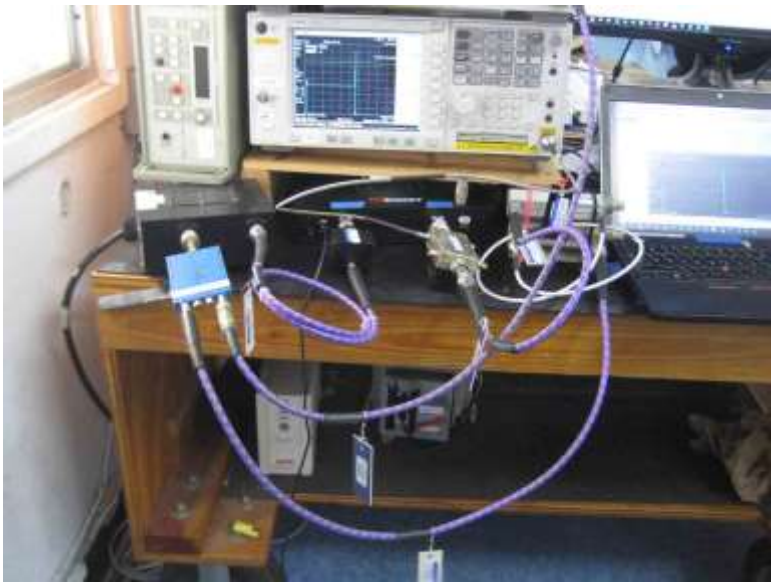
Section 7.9 Test Setup



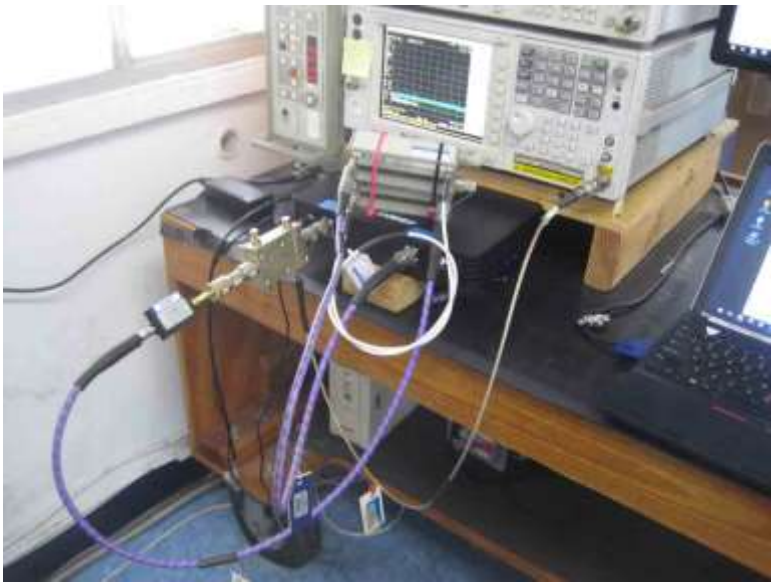
Section 7.11 Oscillation Mitigation Test Setup



Section 7.11 Oscillation Mitigation (Filter) Test Setup



Section 7.11 Oscillation Mitigation (Notch Filter) Test Setup



Section 7.11 Oscillation Timing Test Setup

Section 7.12 Test Setup

Section 7.12 Test Setup

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret (“^”) was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.