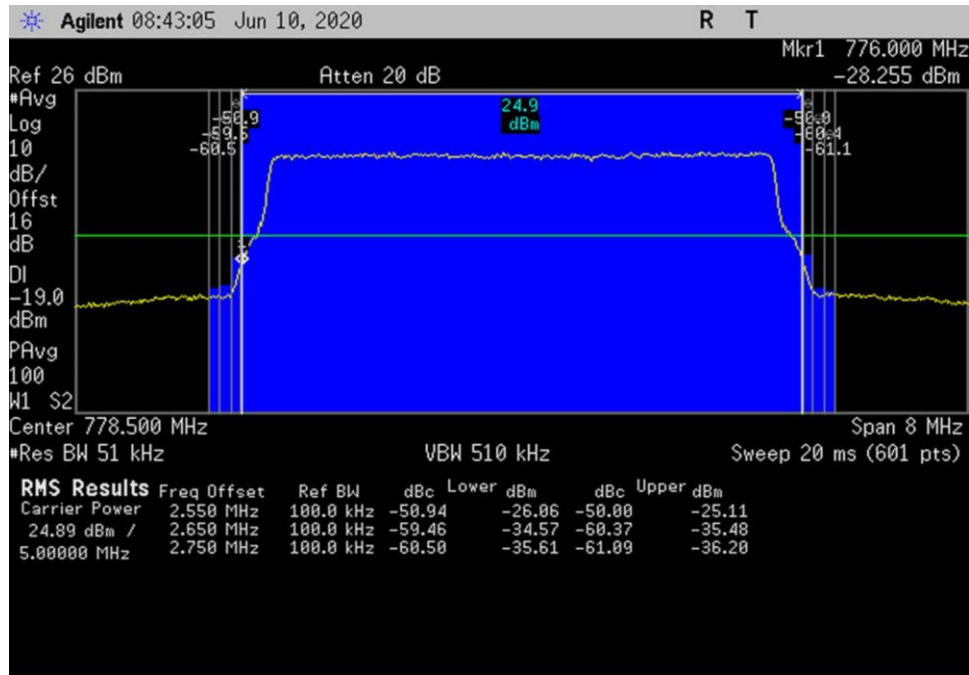
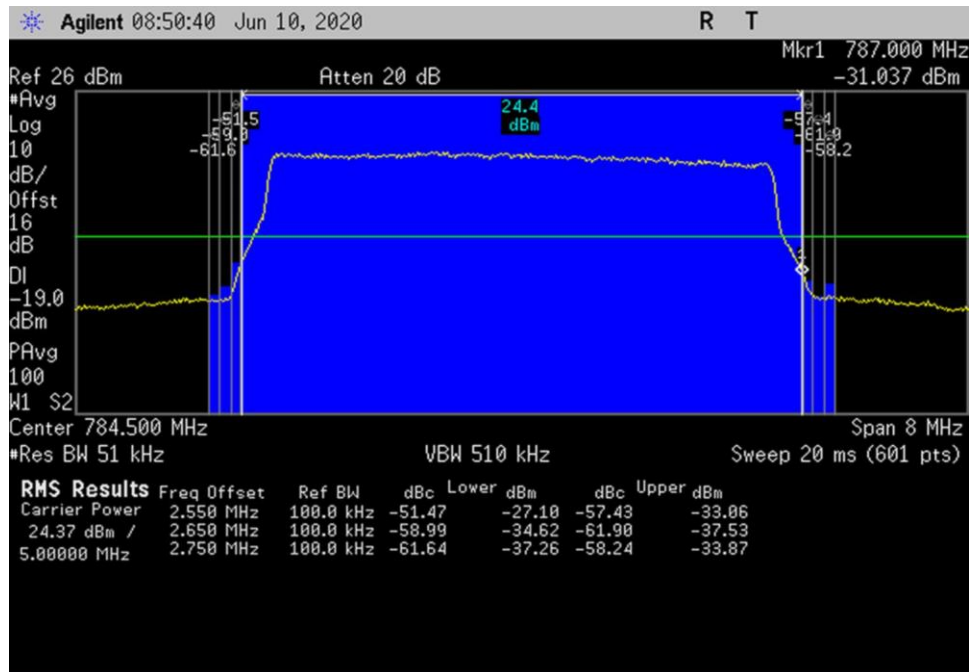
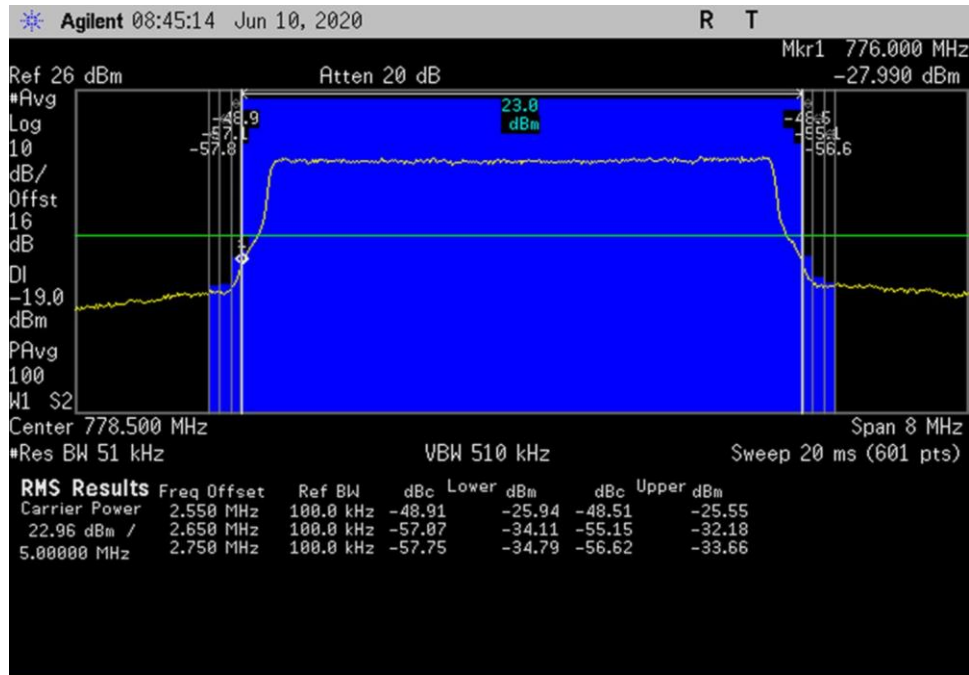




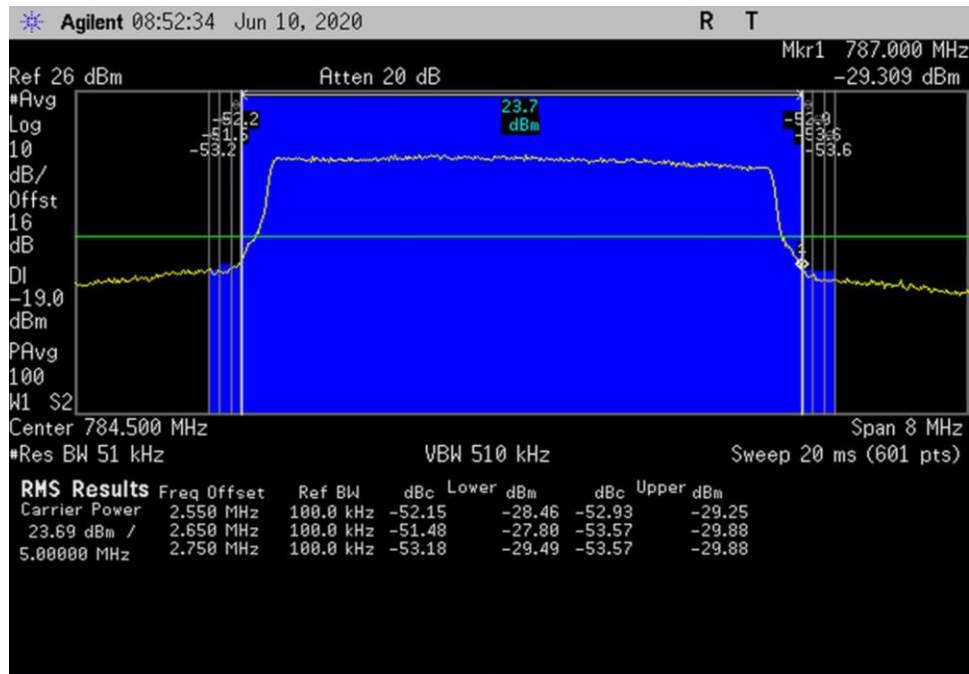
UL_776-787_LTE_774.5- 782.5MHz



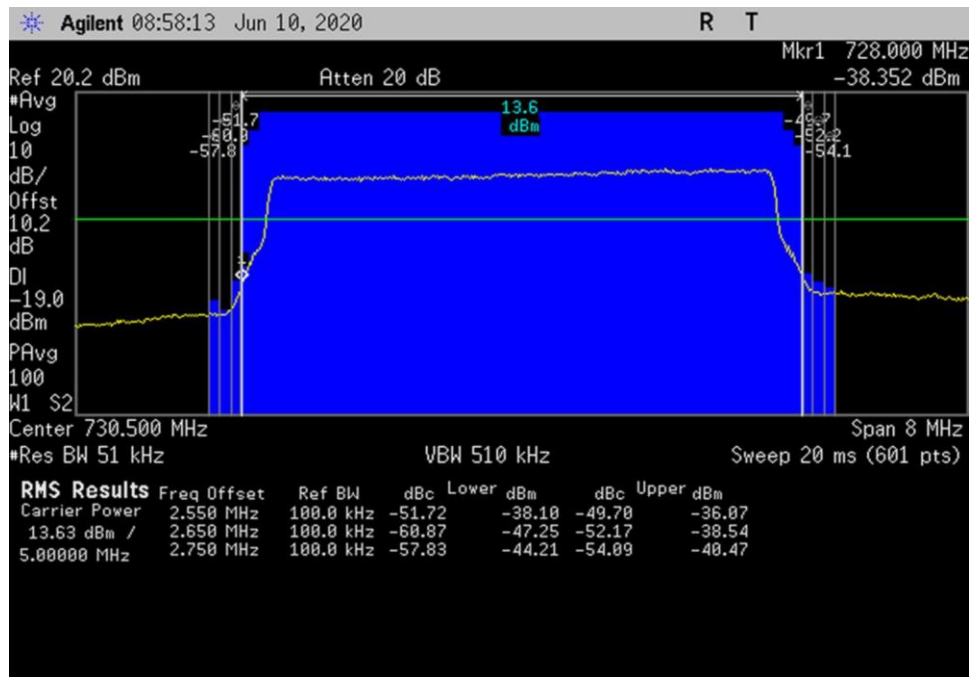
UL_776-787_LTE_780.5- 788.5MHz



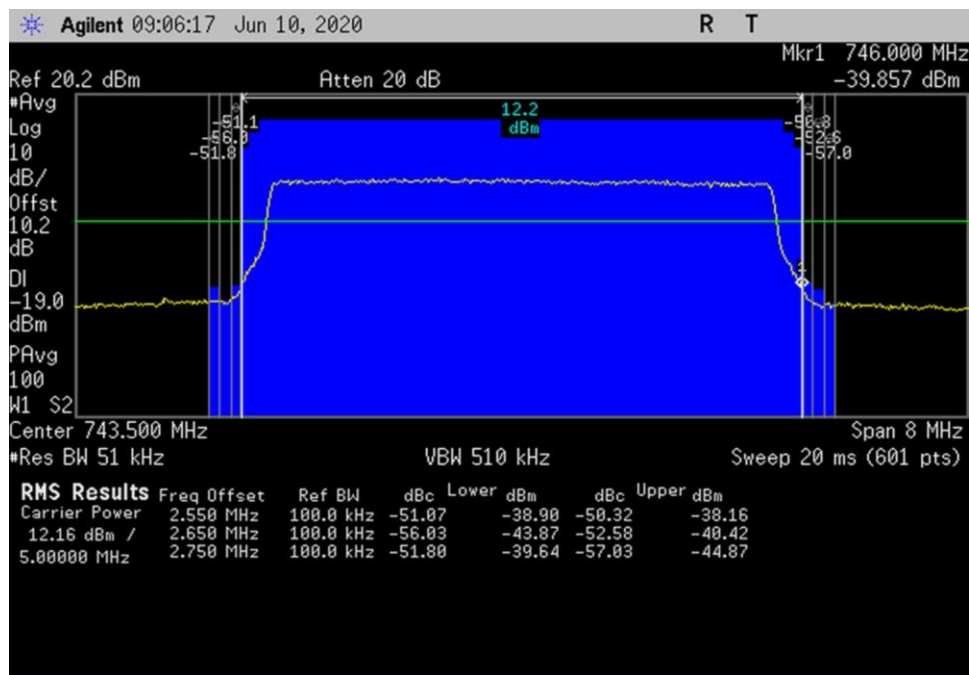
UL_776-787_LTE_Max_ 774.5- 782.5MHz



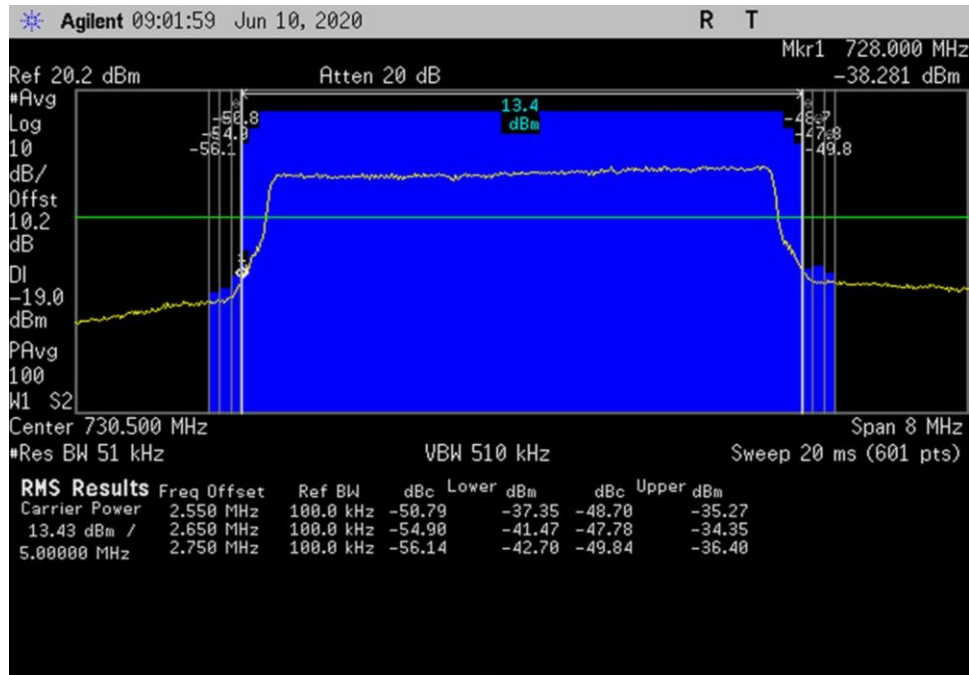
UL_776-787_LTE_Max_ 780.5- 788.5MHz



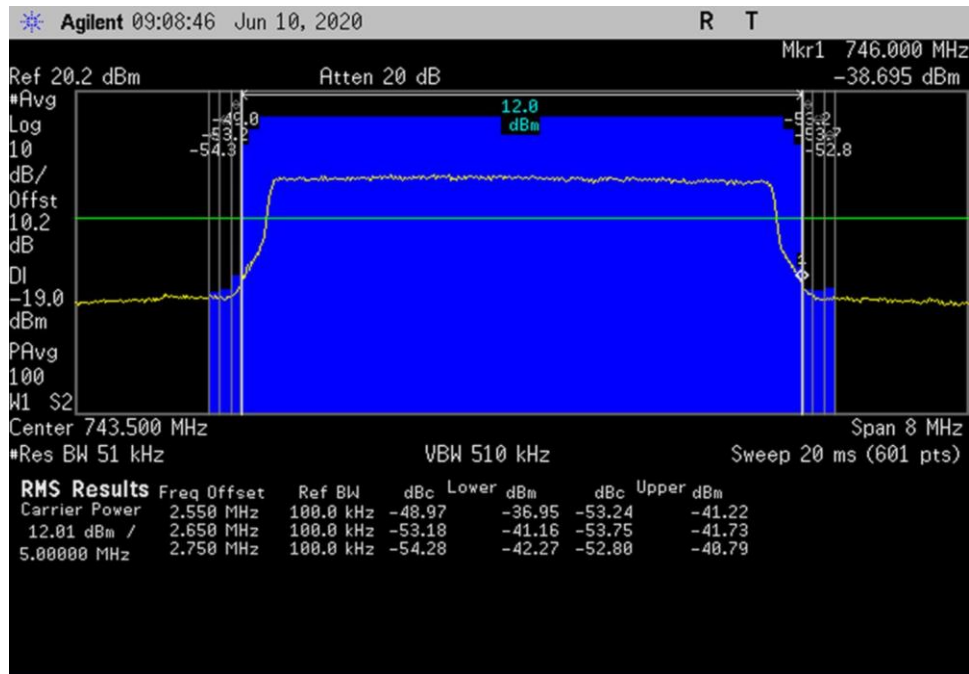
DL_728-746_LTE_ 726.5- 734.5MHz



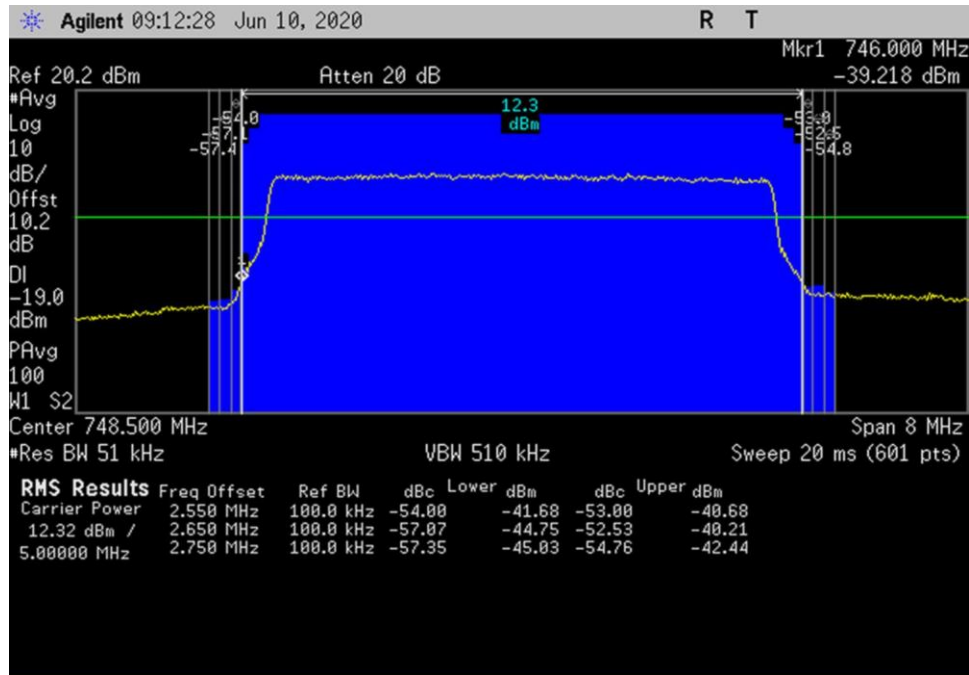
DL_728-746_LTE_ 739.5- 747.5MHz



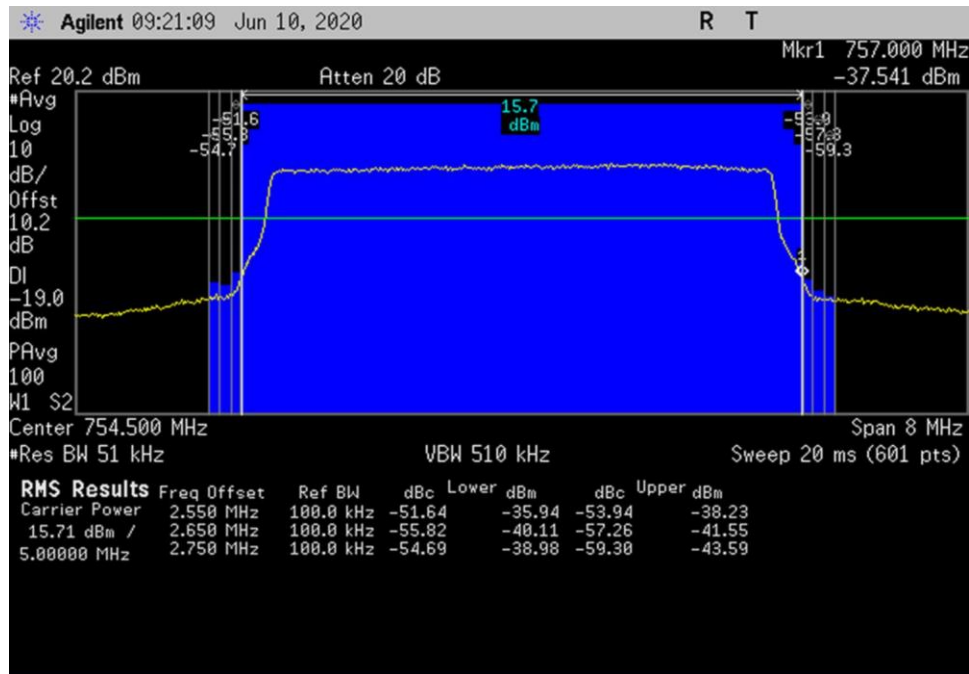
DL_728-746_LTE_Max_ 726.5- 734.5MHz



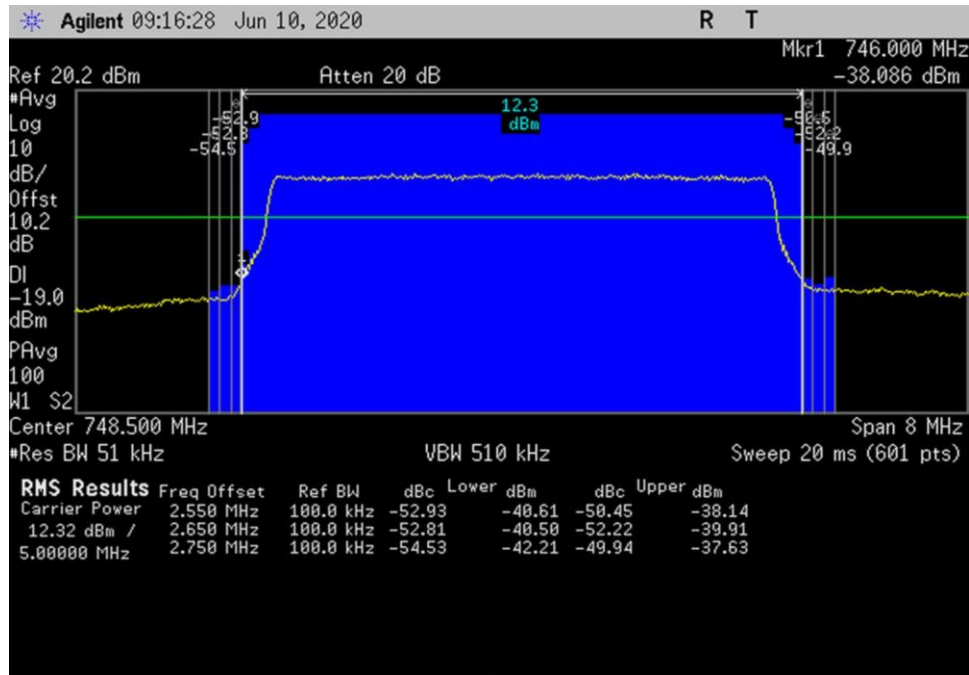
DL_728-746_LTE_Max_ 739.5- 747.5MHz



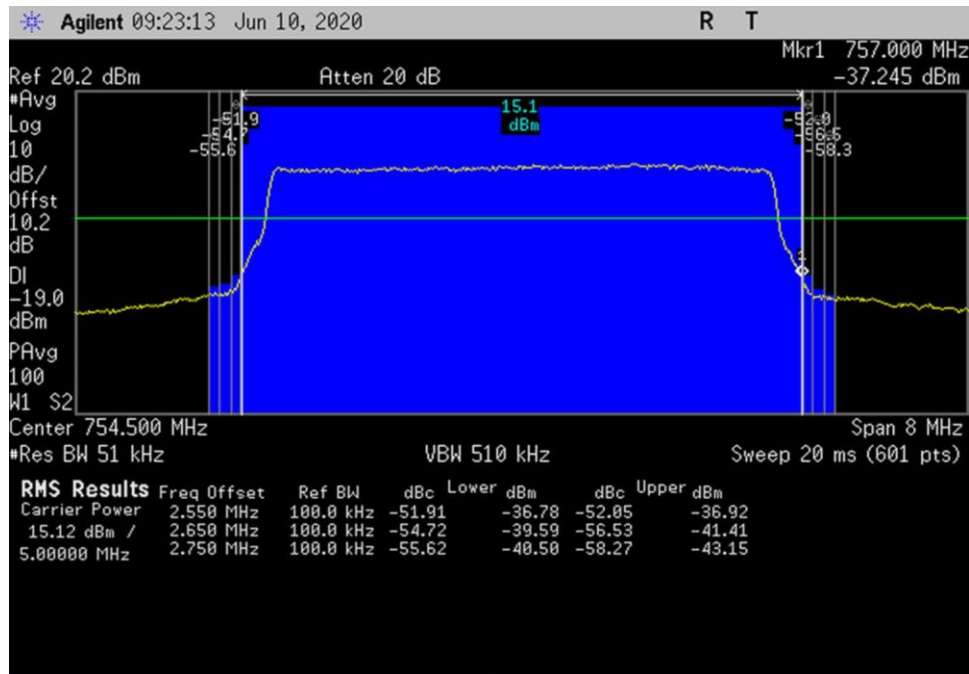
DL_746-757_LTE_ 744.5- 752.5MHz



DL_746-757_LTE_ 750.5- 758.5MHz



DL_746-757_LTE_Max_ 744.5- 752.5MHz



DL_746-757_LTE_Max_ 750.5- 758.5MHz

7.6 Conducted Spurious Emissions

Test Setup/Conditions			
Test Location:	Fremont	Test Engineer:	E. Wu
Test Date(s):	6/10/2020		
Configuration:	1		
Test Setup:	Frequency range of measurement = 9kHz- 8GHz. 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 - 8000MHz ->RBW= 1MHz VBW= 3MHz *Note: As specified on 7.6 Conducted spurious emissions test procedure of 935210 D03 Signal Booster Measurements v04r02, 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.		

Environmental Conditions					
Temperature (°C)	24.0	Relative Humidity (%):	46	Pressure: kPa	101.6

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
P05411	Attenuator	Weinschel	54A-10	11/27/2019	11/27/2021
P07192	Cable	Astro	32022-29094K-29094K-48TC	11/27/2019	11/27/2021
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020
P06909	Attenuator	Pasternack	PE7083	1/7/2020	1/7/2022

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	8.0	-3.5	-70.0	-40	-35.5

LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

$$\text{REQUIRED ATTENUATION} = 43 + 10 \log P \text{ DB}$$

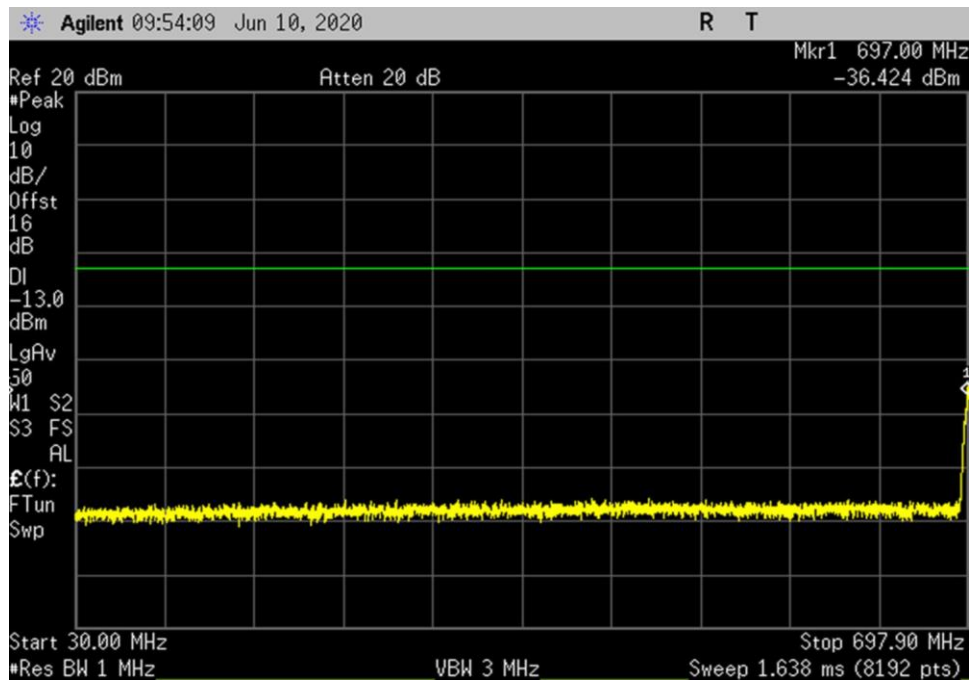
$$\text{Limit line (dBuV)} = V_{\text{dBuV}} - \text{Attenuation}$$

$$\begin{aligned} V_{\text{dBuV}} &= 20 \log \frac{V}{1 \times 10^{-6}} \\ &= 20 (\log V - \log 1 \times 10^{-6}) \\ &= 20 \log V - 20 \log 1 \times 10^{-6} \\ &= 20 \log V - 20(-6) \\ &= 20 \log V + 120 \end{aligned}$$

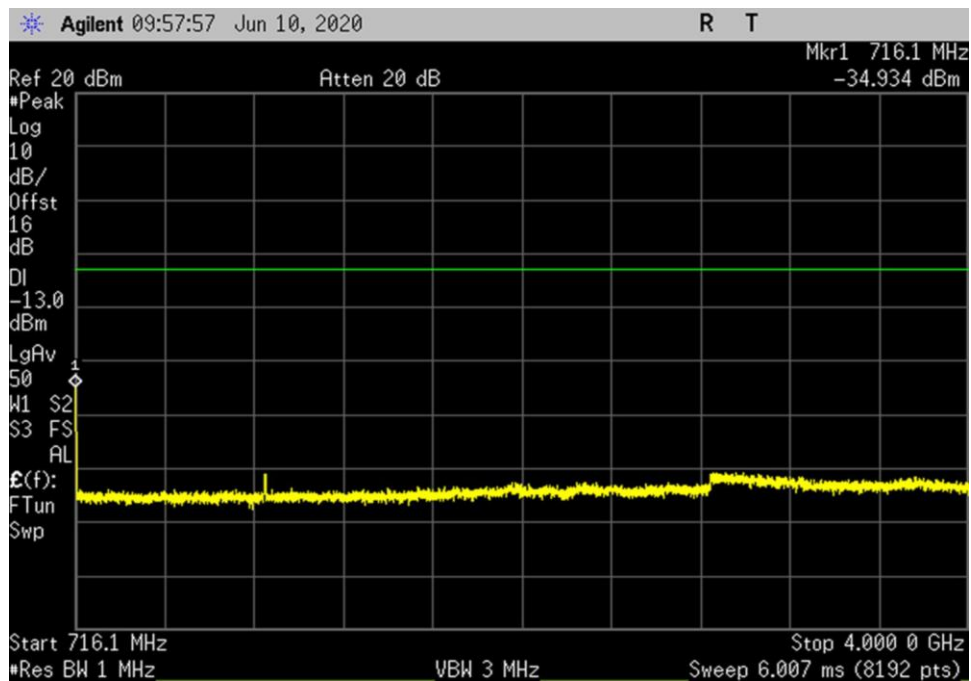
$$\begin{aligned} \text{Attenuation} &= 43 + 10 \log P \\ &= 43 + 10 \log \frac{V^2}{R} \\ &= 43 + 10 (\log V^2 - \log R) \\ &= 43 + 10 (2 \log V - \log R) \\ &= 43 + 20 \log V - 10 \log R \end{aligned}$$

$$\begin{aligned} \text{Limit line} &= V_{\text{dBuV}} - \text{Attenuation} \\ &= 20 \log V + 120 - (43 + 20 \log V - 10 \log R) \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 120 - 43 + 10 \log 50 \quad \text{Note : } R = 50 \Omega \\ &= 120 - 43 + 16.897 \\ &= 94 \text{ dBuV at any power level} \end{aligned}$$

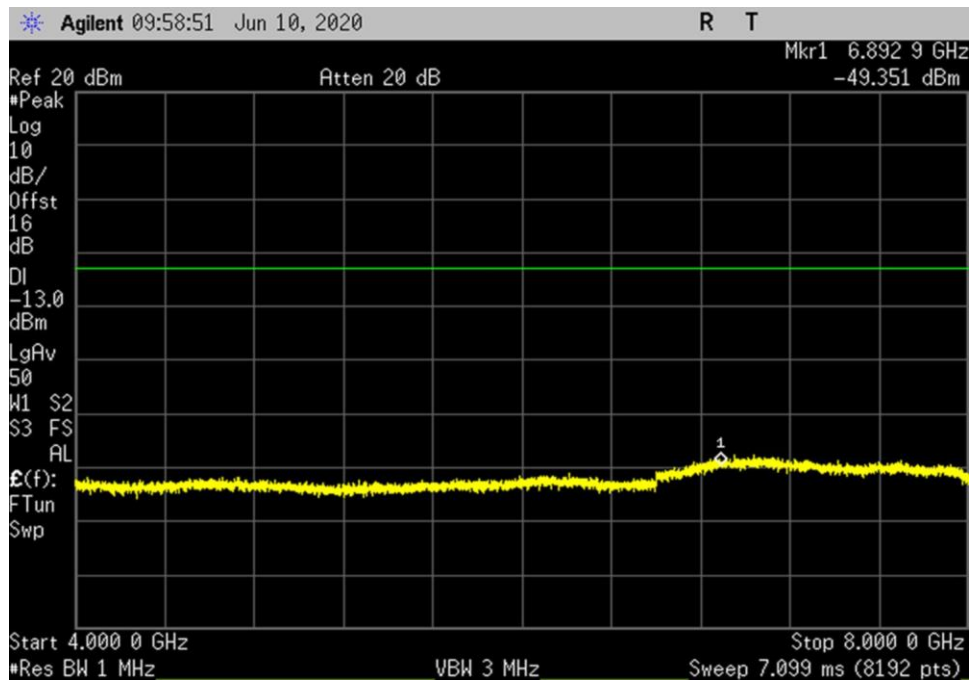
Plots



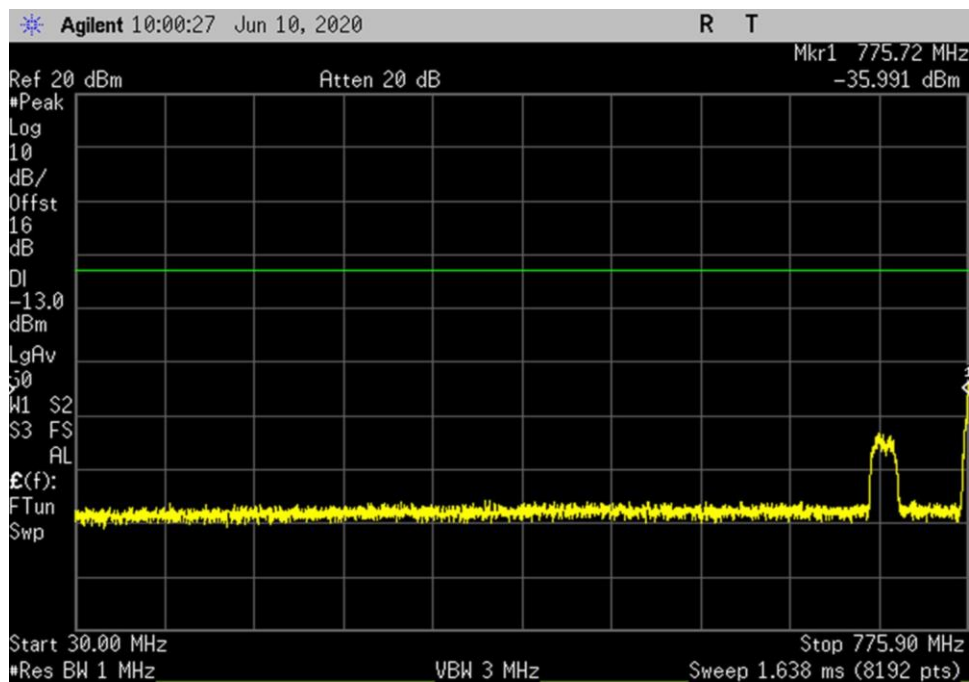
UL_698-716_ 30- 697.9MHz



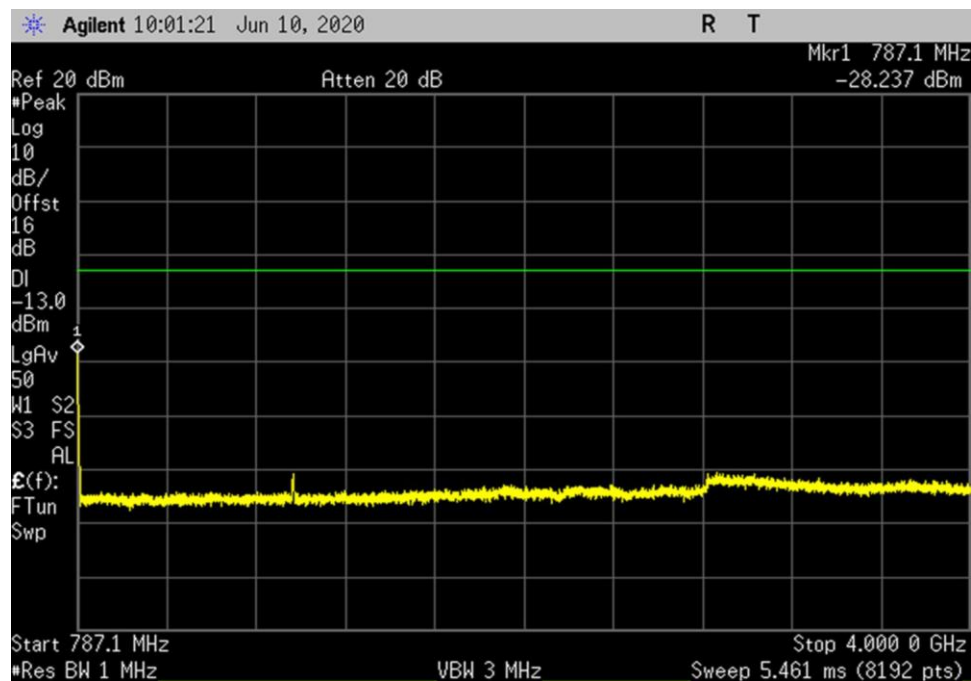
UL_698-716_ 716.1- 4000MHz



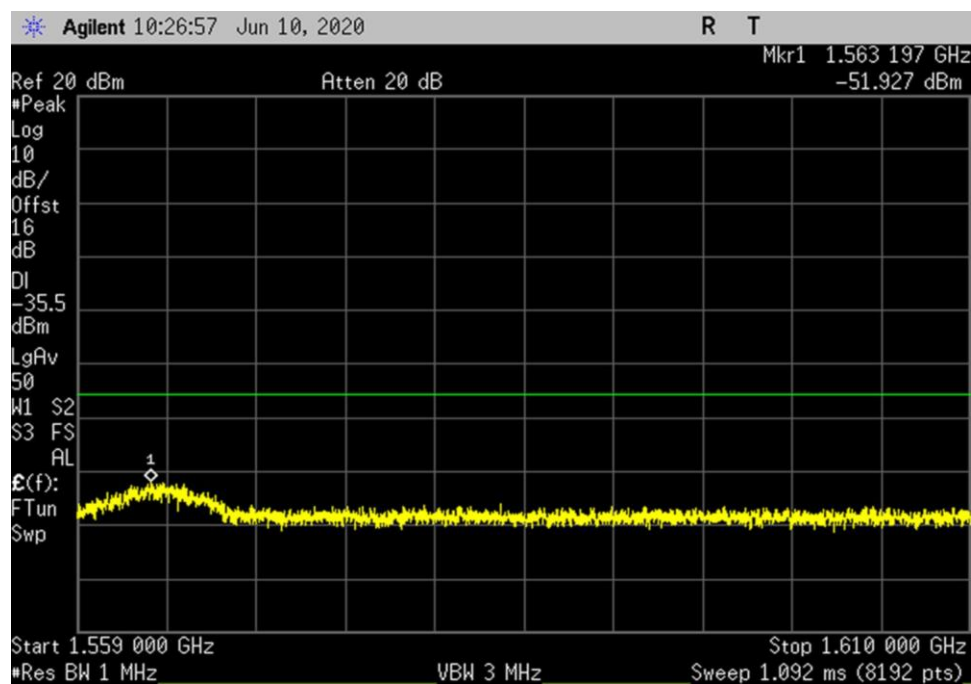
UL_698-716_ 4000- 8000MHz



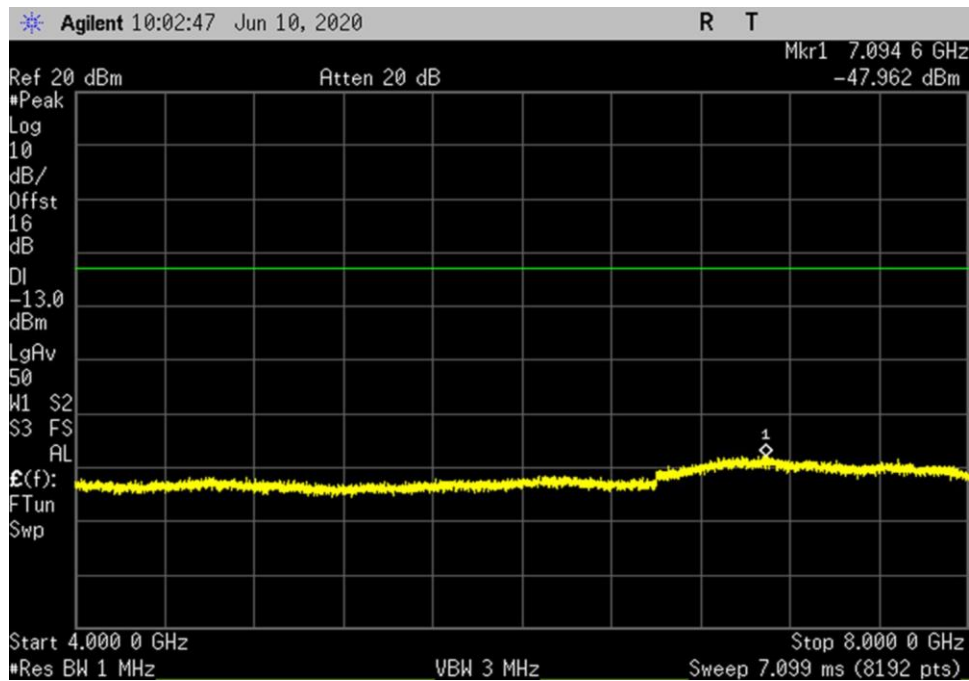
UL_776-787_ 30- 775.9MHz



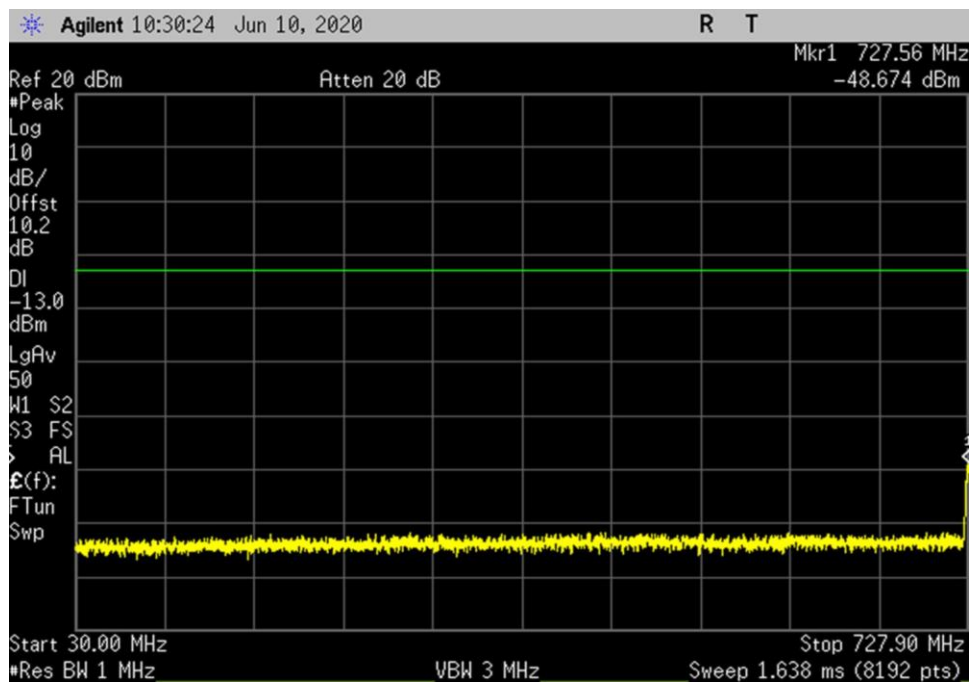
UL_776-787_ 787.1- 4000MHz



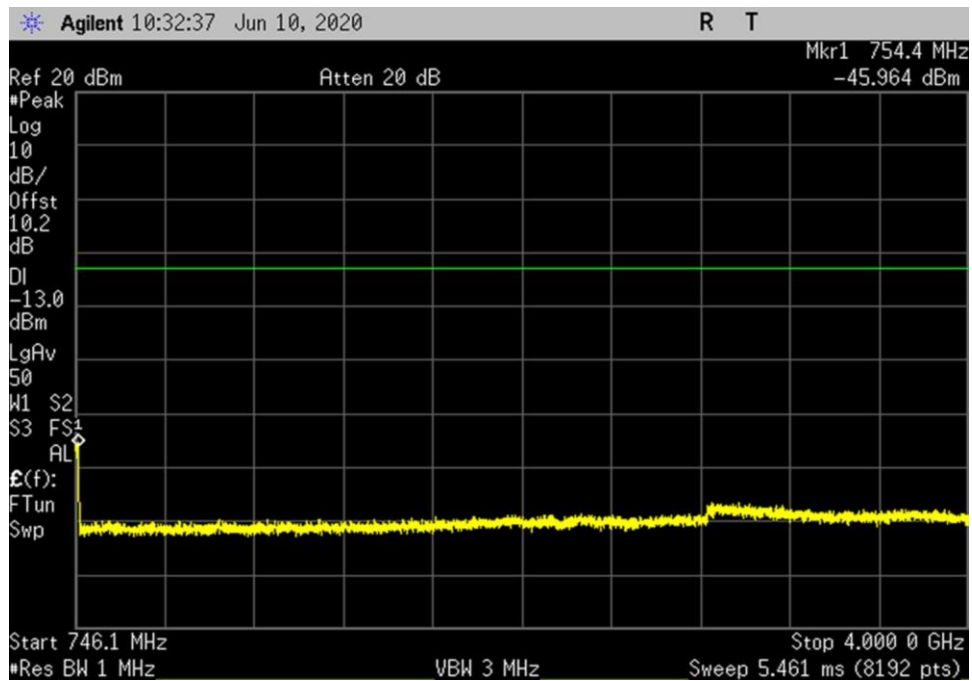
UL_776-787_ 1559- 1610MHz



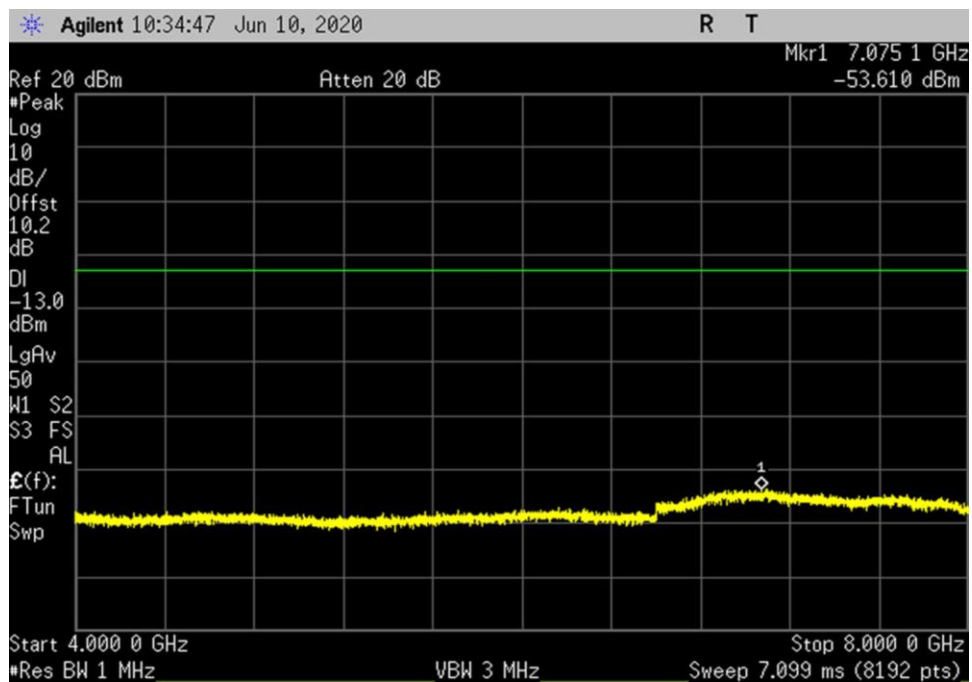
UL_776-787_ 4000- 8000MHz



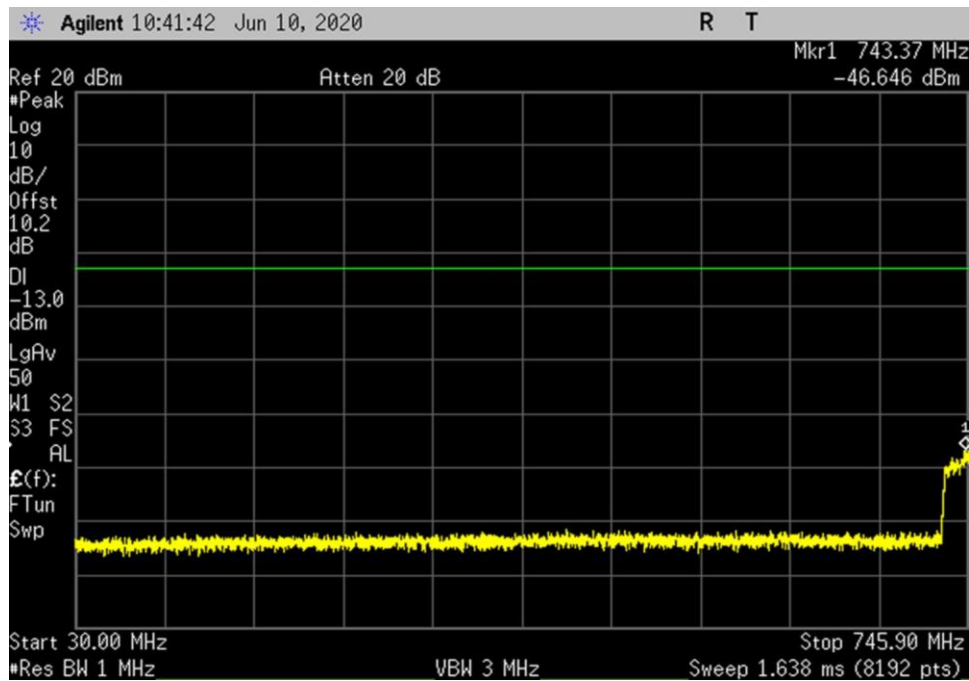
DL_728-746_ 30- 727.9MHz



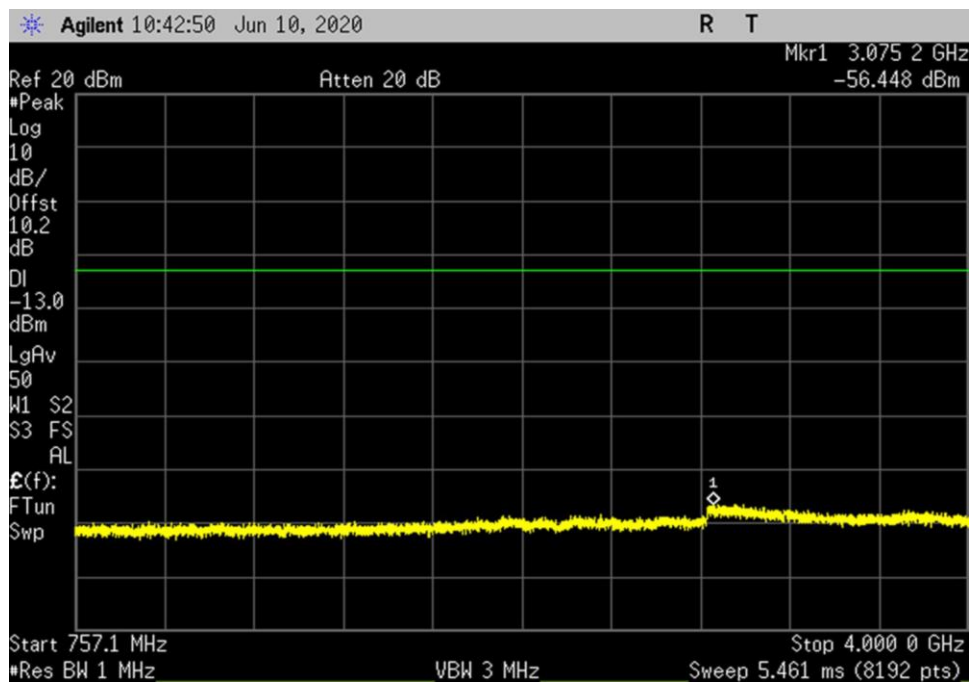
DL_728-746_ 746.1- 4000MHz



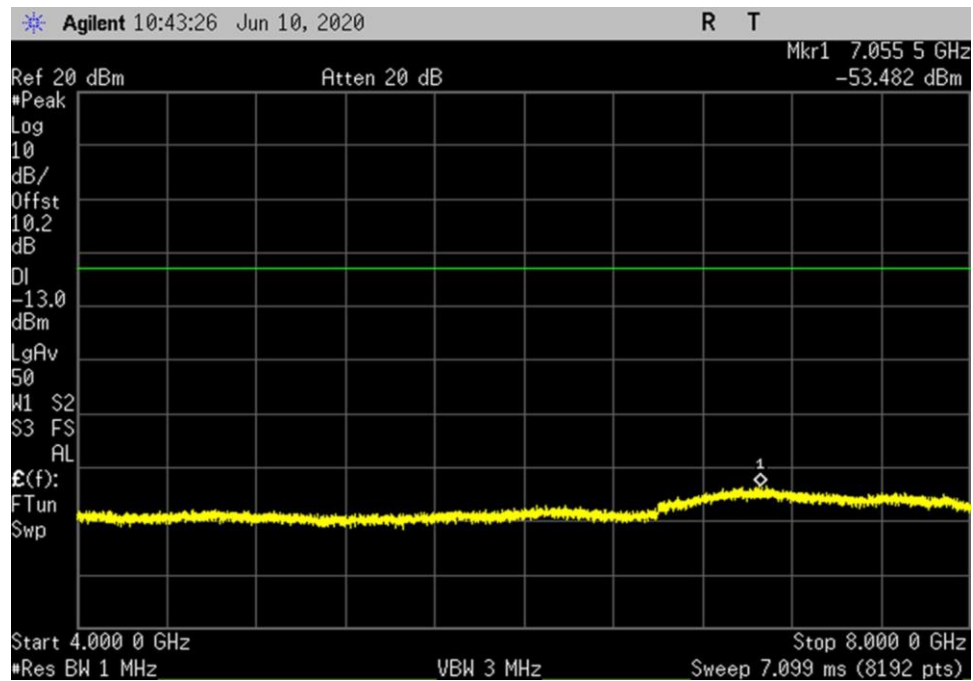
DL_728-746_ 4000- 8000MHz



DL_746-757_ 30- 745.9MHz



DL_746-757_ 757.1- 4000MHz



DL_746-757_ 4000- 8000MHz

7.7 Noise limit

Test Setup/Conditions

Test Location:	Fremont	Test Engineer:	E. Wu
Test Date(s):	6/10/2020		
Configuration:	1		
Test Setup:	See General Test Setup		

Environmental Conditions

Temperature (°C)	24.0	Relative Humidity (%):	46	Pressure: kPa	101.6
------------------	------	------------------------	----	---------------	-------

Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
P05411	Attenuator	Weinschel	54A-10	11/27/2019	11/27/2021
P07192	Cable	Astro	32022-29094K-29094K-48TC	11/27/2019	11/27/2021
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020
P06909	Attenuator	Pasternack	PE7083	1/7/2020	1/7/2022

Summary of Results

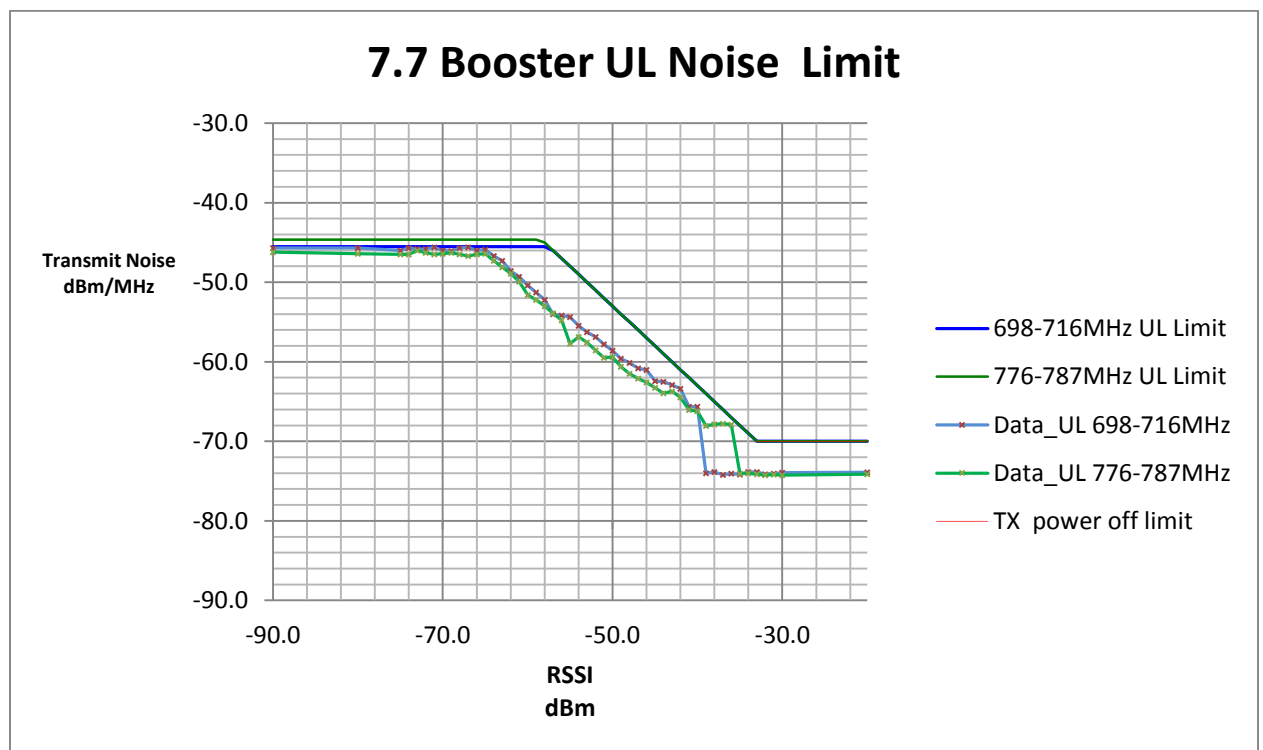
Pass: As demonstrated, measured noise are within the limit. All maximum variable uplink noise timings are within 3 second limit.

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 MHz	Measured dBm./MHz	Limit dBm/MHz	Margin
UL 698-716	-47.0	-45.50	-1.5
UL 776-787	-47.0	-44.60	-2.4
DL 728-746	-46.94	-45.50	-1.44
DL 746-757	-46.98	-44.60	-2.38

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



698.0- 716.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster	TX off	
-90.0	-45.7		-45.5		-0.2
-80.0	-45.7		-45.5		-0.2
-34.0	-73.9	-69.0			-4.9
-33.0	-73.9	-70.0			-3.9
-32.0	-74.1			-70	-4.1
-31.0	-74.0			-70	-4.0

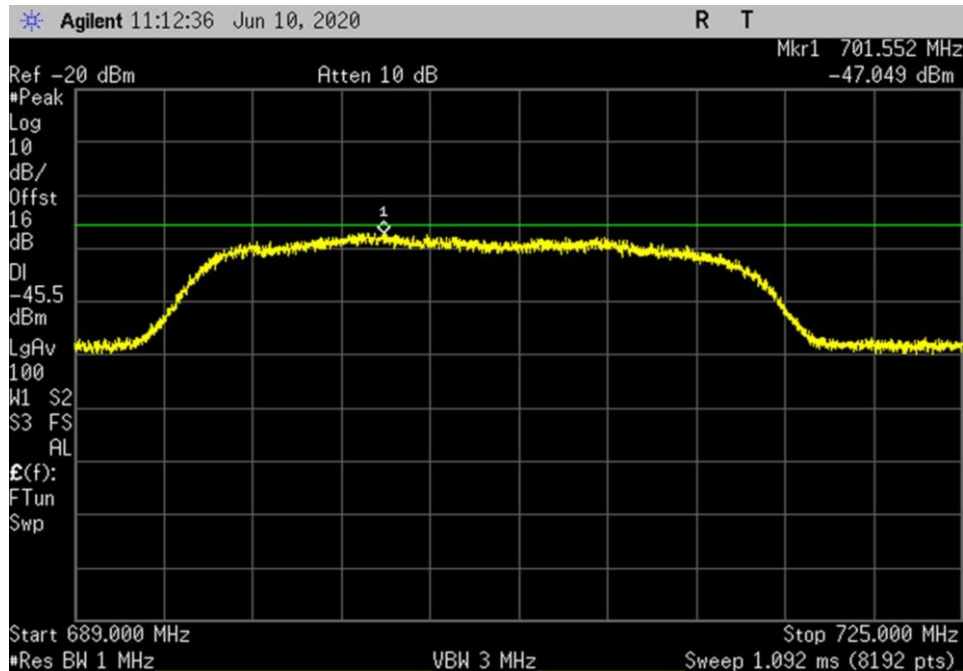
776.0- 787.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster	TX off	
-69.0	-46.3		-44.6		-1.7
-68.0	-46.5		-44.6		-1.9
-34.0	-34.0	-69.0			-5.0
-33.0	-33.0	-70.0			-4.1
-32.0	-32.0			-70	-4.3
-31.0	-31.0			-70	-4.2

7.7.2 Variable uplink noise timing

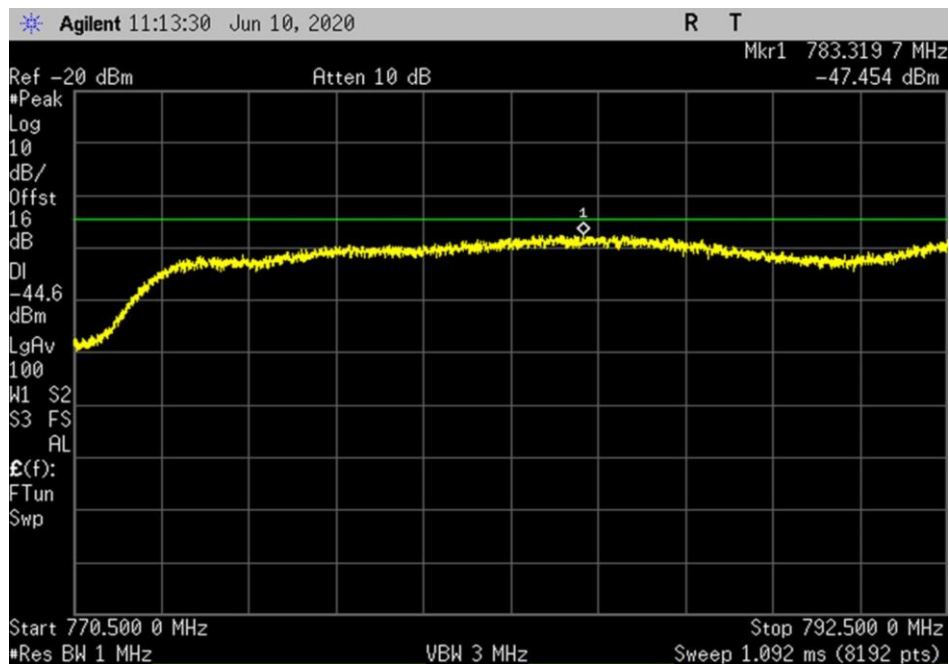
Uplink Noise timing		
Frequency MHz	Measured Sec	Limit sec
UL 698-716	0.20	3
UL776-787	0.7833	3

7.7.1 Maximum Transmitter Noise Power Level

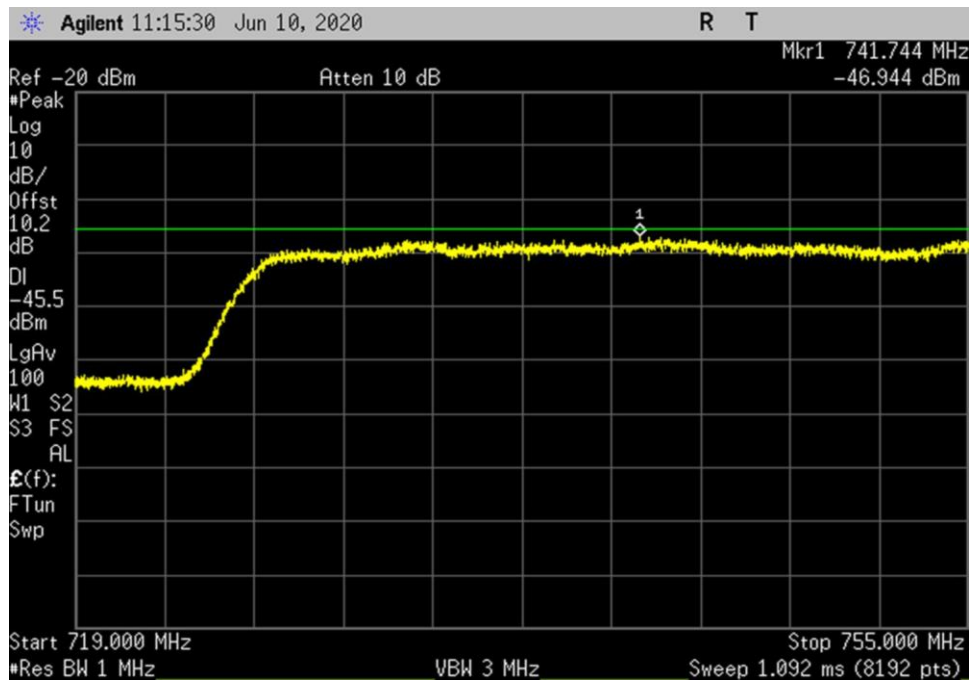
Plots



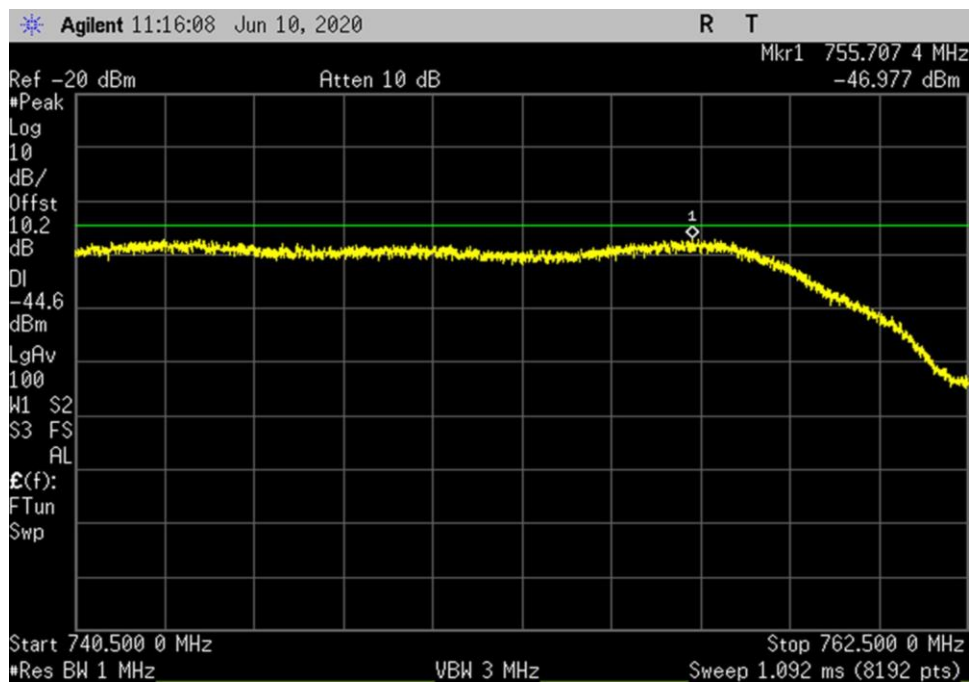
UL_698-716_707MHz_Max.



UL_776-787_781.5MHz_Max



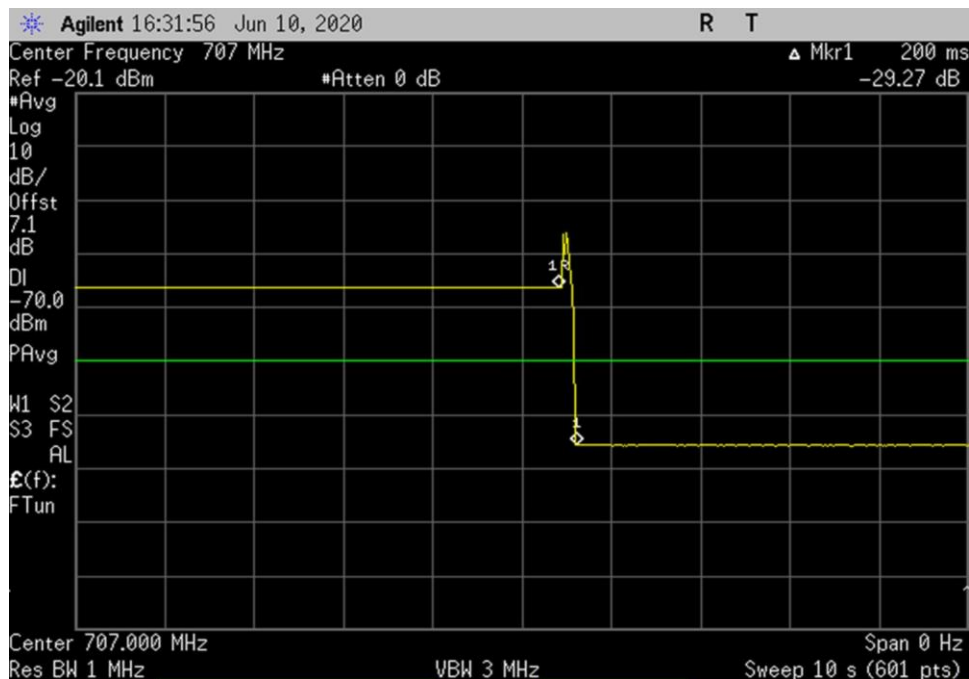
DL_728-746_737MHz_Max



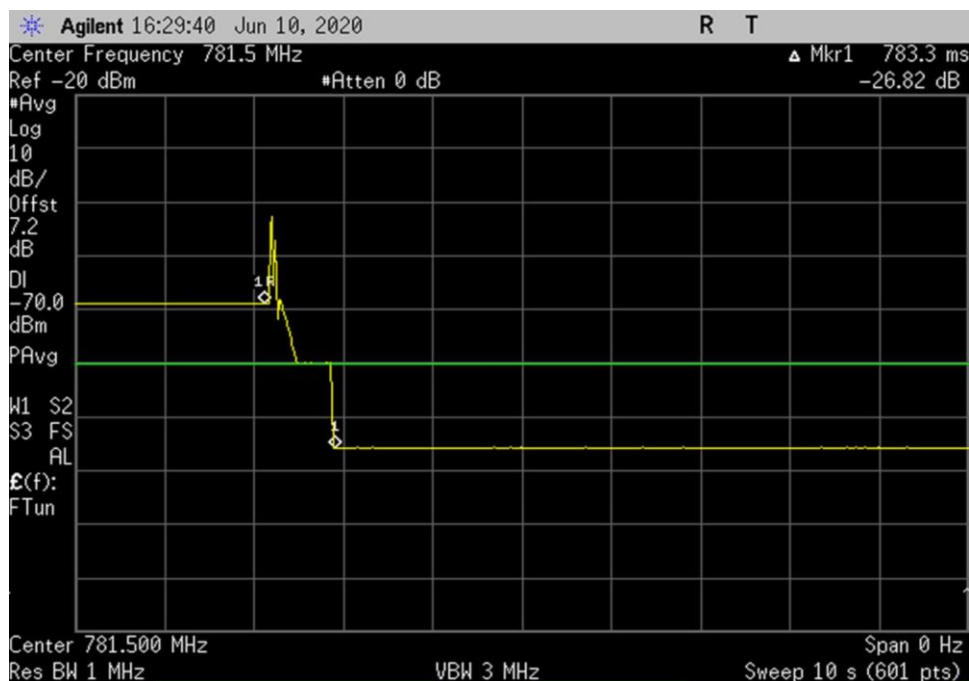
DL_746-757_751.5MHz_Max

7.7.2 Variable UL Noise Timing

Plots



UL_698-716_ 707MHz



UL_776-787_ 781.5MHz

7.8 Uplink Inactivity

Test Setup/Conditions

Test Location:	Fremont	Test Engineer:	E. Wu
Test Date(s):	6/11/2020		
Configuration:	1		
Test Setup:	See General Test Setup		

Environmental Conditions

Temperature (°C)	22.2	Relative Humidity (%):	44	Pressure: kPa	101.5
------------------	------	------------------------	----	---------------	-------

Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020
P07192	Cable	Astro	32022-29094K-29094K-48TC	11/27/2019	11/27/2021
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
P06909	Attenuator	Pasternack	PE7083	1/7/2020	1/7/2022

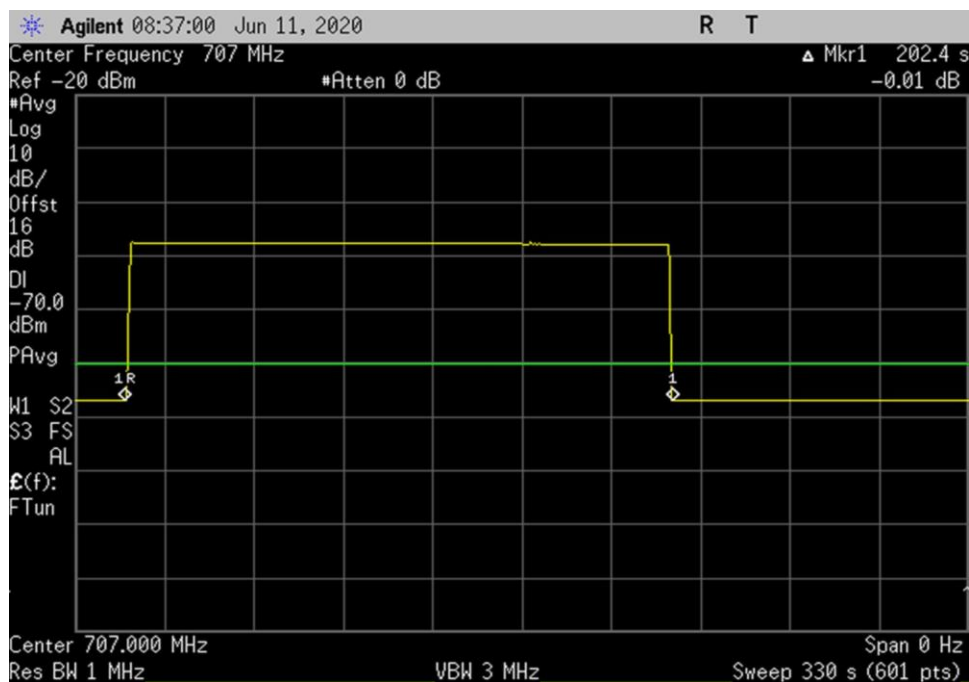
Summary of Results

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.

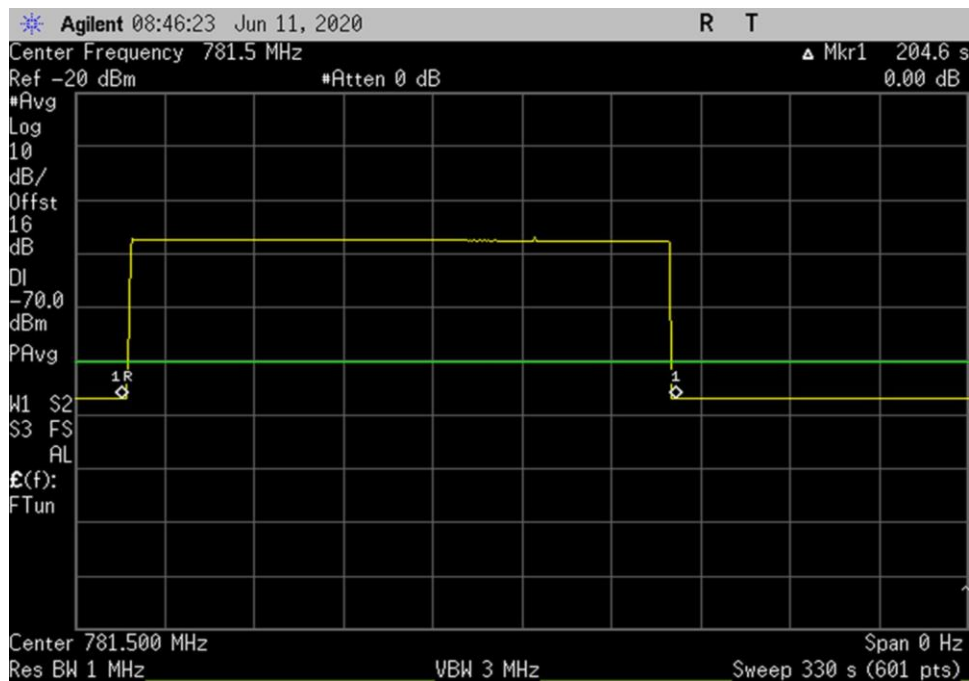
Uplink Inactivity

Frequency MHz	Measured Min	Limit Min
UL 698-716	3.4	5.0
UL776-787	3.4	5.0

Plots



UL_698-716_707MHz



UL_776-787_781.5MHz

7.9 Booster Gain Limit

Test Setup/Conditions

Test Location:	Fremont	Test Engineer:	E. Wu						
Test Date(s):	6/12/2020								
Configuration:	1								
Test Setup:	<table><tr><th>Frequency (MHz)</th><th>MSCL (dB)</th></tr><tr><td>LTE(698-716)</td><td>35.8</td></tr><tr><td>LTE(776-787)</td><td>36.8</td></tr></table>			Frequency (MHz)	MSCL (dB)	LTE(698-716)	35.8	LTE(776-787)	36.8
Frequency (MHz)	MSCL (dB)								
LTE(698-716)	35.8								
LTE(776-787)	36.8								

Environmental Conditions

Temperature (°C)	22.5	Relative Humidity (%):	43	Pressure: kPa	101.5
------------------	------	------------------------	----	---------------	-------

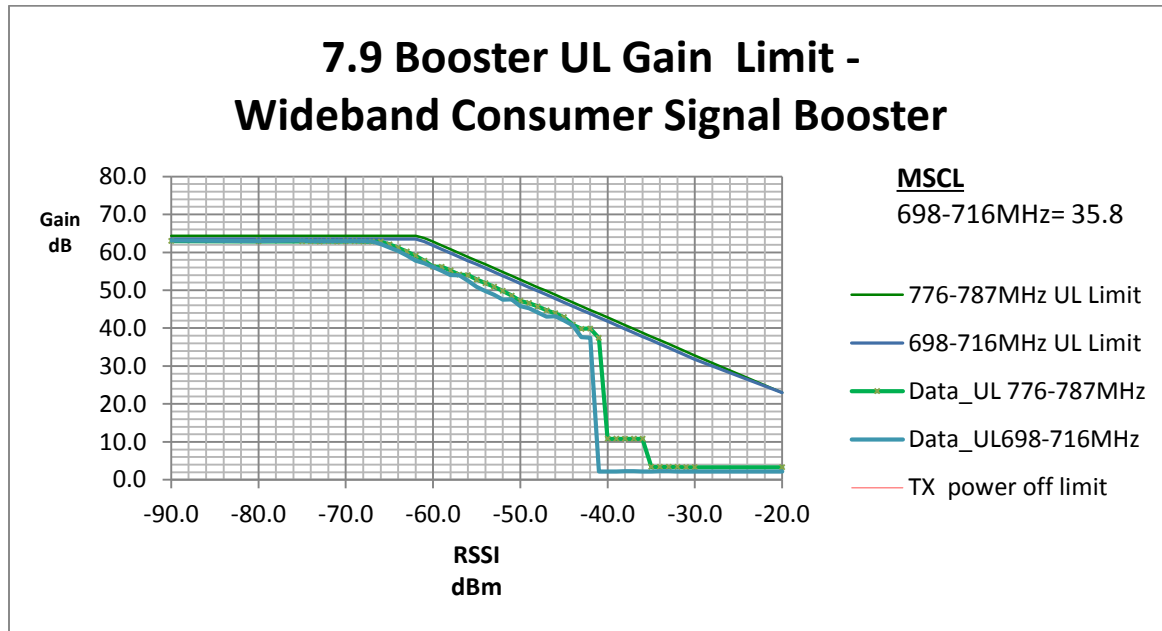
Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
P07192	Cable	Astro	32022-29094K-29094K-48TC	11/27/2019	11/27/2021
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020
P06898	Cable	Astrolab	32022-29094K-29094K-48TC	3/25/2020	3/25/2022
C00082	Directional Coupler	MECA Electronics, Inc	722-10-1.500V	11/27/2019	11/27/2020
C00032	Arbitrary Waveform Generator	Agilent	E4433B	3/30/2020	3/30/2022
P06909	Attenuator	Pasternack	PE7083	1/7/2020	1/7/2022

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



698.0- 716.0 MHz							
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	Limit			Margin
				RSSI Dependent	Fixed Booster	TX off	
-90.0	-42.6	20.5	63.1	-	63.5	23	-0.4
-80.0	-42.6	20.4	63.0	-	63.5	23	-0.5
-75.0	-42.6	20.5	63.1	-	63.5	23	-0.4
-43	-42.6	14.5	57.1	62.8	-	23	-5.7
-42	-42.6	13.5	56.1	61.8	-	23	-5.7
-41	-42.6	12.5	55.1	60.8	-	23	-5.7

776.0 - 787.0 MHz							
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	Limit			Margin
				RSSI Dependent	Fixed Booster	TX off	
-90.0	-43.9	19.1	63.0	-	64.4	23	-1.4
-80.0	-43.9	19.0	62.9	-	64.4	23	-1.5
-75.0	-43.9	19.0	62.9	-	64.4	23	-1.5
-61.0	-43.9	13.9	57.8	63.8	-	23	-6.0
-60.0	-43.9	12.3	56.2	62.8	-	23	-6.6
-59.0	-43.9	12.3	56.2	61.8	-	23	-5.6

7.9.2 Variable uplink gain timing

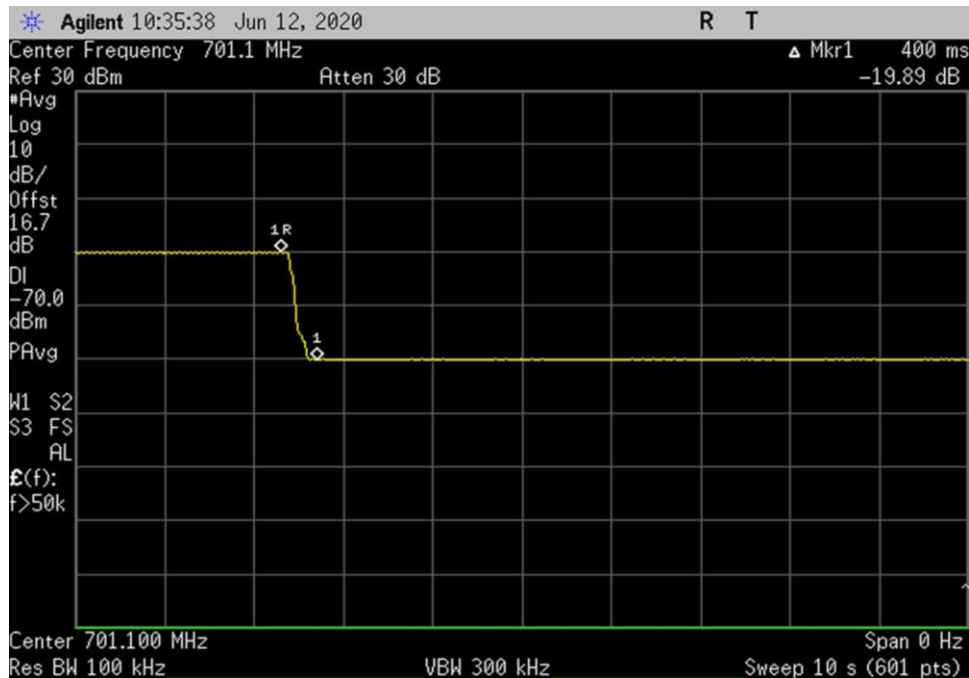
Uplink Gain Timing		
Frequency (MHz)	Measured (Sec)	Limit (Sec)
UL 698-716	0.4	3
UL 776-787	0.3333	3

7.9.1 Maximum Gain

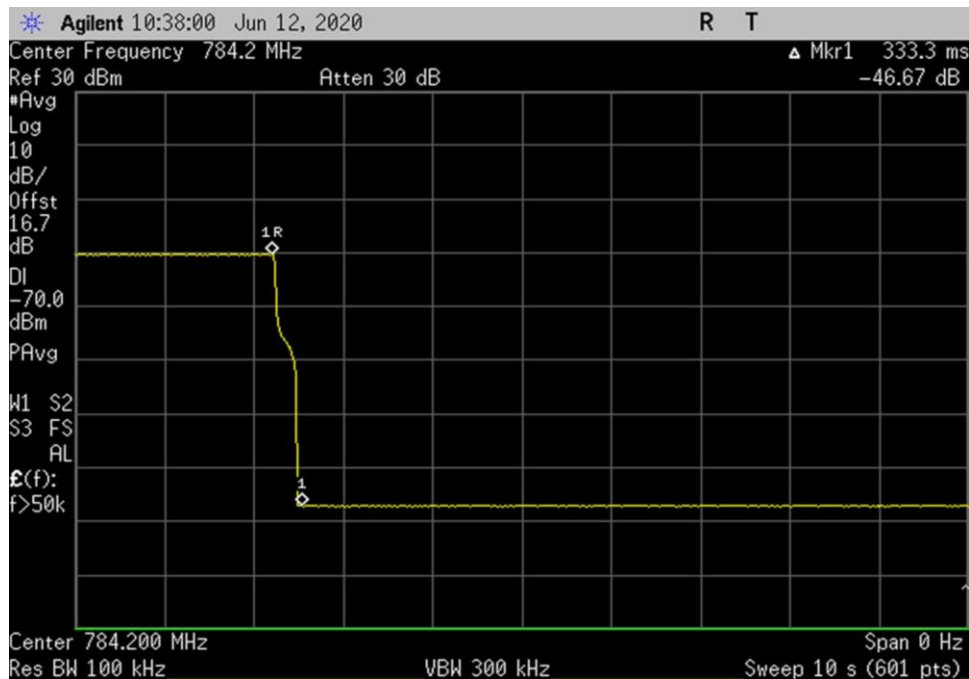
For this subsection, see summary of results of 7.9
7.9.1 Maximum gain

7.9.2 Variable uplink Gain Timing

Plots



UL_698-716_ 701.1MHz_Timing



UL_776-787_ 784.2MHz_Timing

7.10 Occupied Band Width

Test Setup/Conditions

Test Location:	Fremont	Test Engineer:	E. Wu
Test Date(s):	6/11/2020		
Configuration:	1		
Test Setup:	See General Test Setup		

Environmental Conditions

Temperature (°C)	22.2	Relative Humidity (%):	44	Pressure: kPa	101.5
------------------	------	------------------------	----	---------------	-------

Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
P05411	Attenuator	Weinschel	54A-10	11/27/2019	11/27/2021
P07192	Cable	Astro	32022-29094K-29094K-48TC	11/27/2019	11/27/2021
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
03418	Signal Generator	Agilent	E4438C	5/13/2019	5/13/2021
02660	Spectrum Analyzer	Agilent	E4446A	10/19/2018	10/19/2020
P06909	Attenuator	Pasternack	PE7083	1/7/2020	1/7/2022

Summary of Results

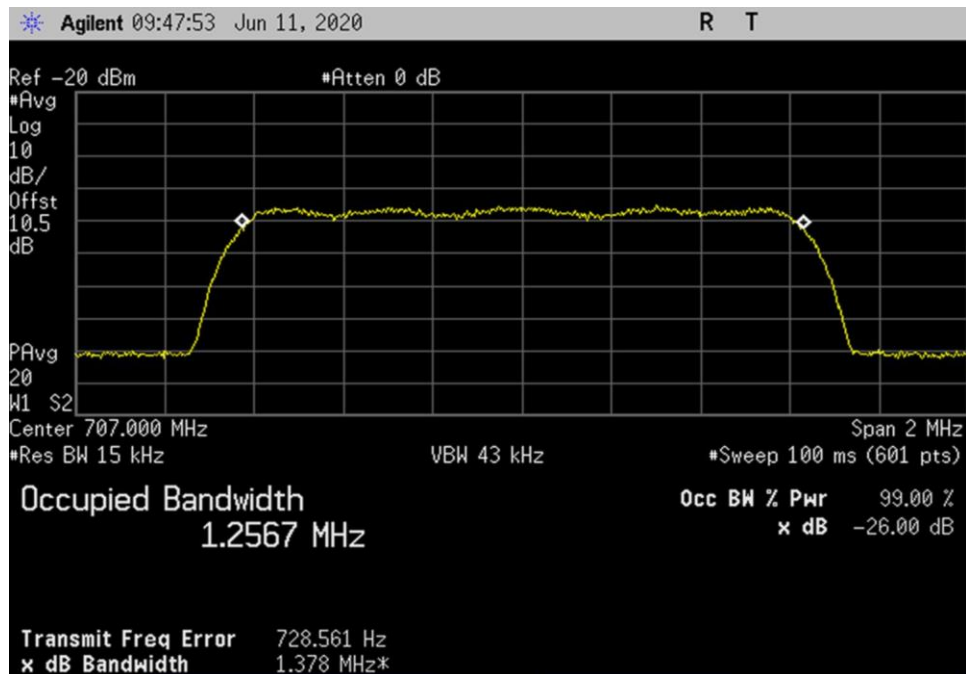
Pass: As summarized in plots below, the uniformity of the output signal relative to the input signal are practically identical. Therefore, the comparison is within limits.

OBW-Input (Hz)				
EDGE	GSM	CDMA	WCDMA	LTE
234922	253193	1256700	4161900	4447000
245156	245846	1255700	4162700	4453700
245689	247698	1263700	4169000	4447800
244358	244600	1254200	4172400	4458600
OBW-Output (Hz)				
EDGE	GSM	CDMA	WCDMA	LTE
244421	244152	1258200	4163600	4442800
247345	245355	1257400	4157700	4454200
245451	245889	1258200	4141300	4458300
246043	248712	1260400	4176400	4454200

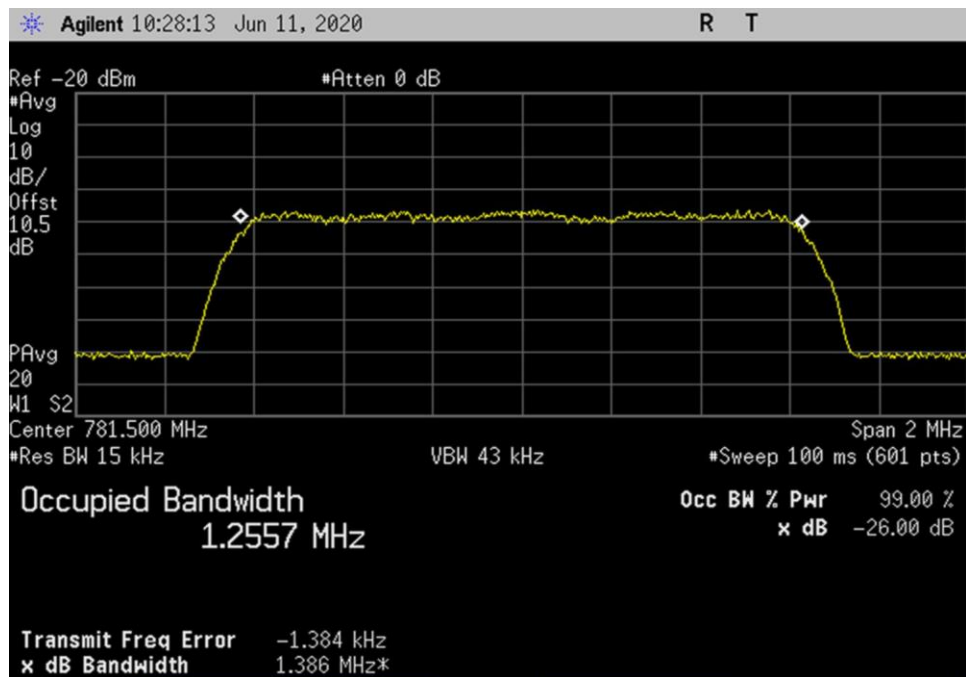
Max Difference In&Out Occ BW 99% Pwr					
Frequency Range	EDGE	GSM	CDMA	AWGN	LTE
UL_698-716MHz	4.04%	3.57%	0.12%	0.04%	0.09%
UL_777-787MHz	0.89%	0.20%	0.14%	0.12%	0.01%
DL_728-746MHz	0.10%	0.73%	0.44%	0.66%	0.24%
DL_746-756MHz	0.69%	1.68%	0.49%	0.10%	0.10%

Plots

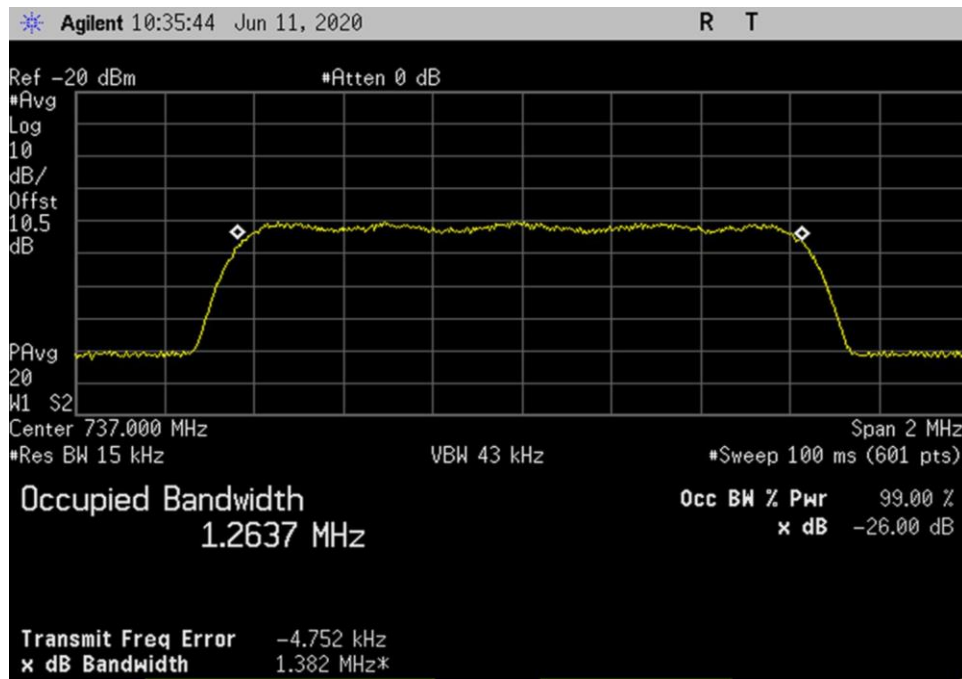
CDMA Input



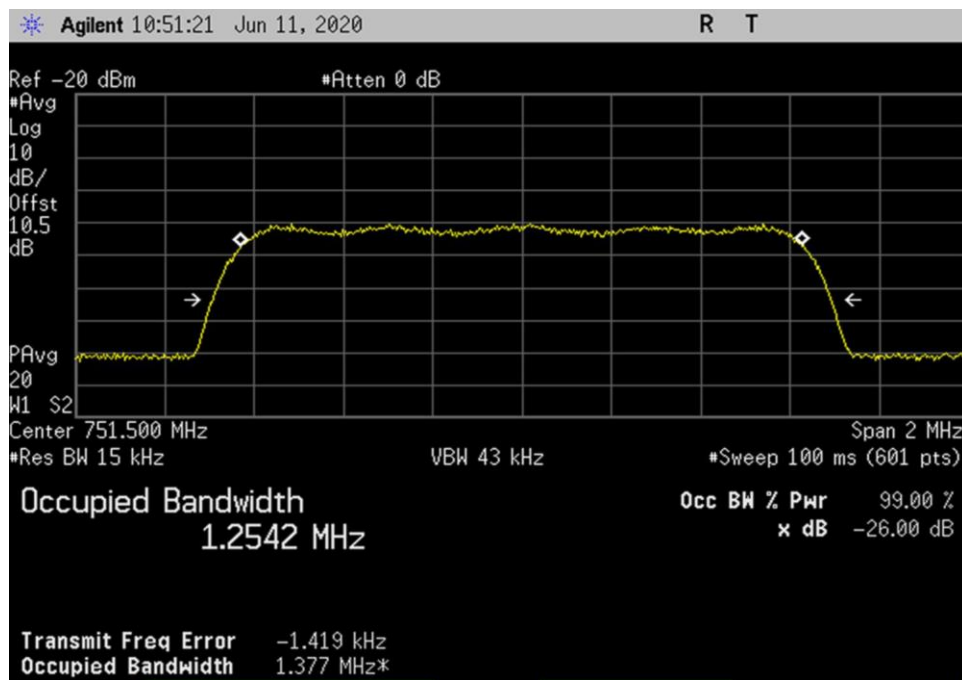
UL_698-716_CDMA_707MHz



UL_776-787_CDMA_781.5MHz

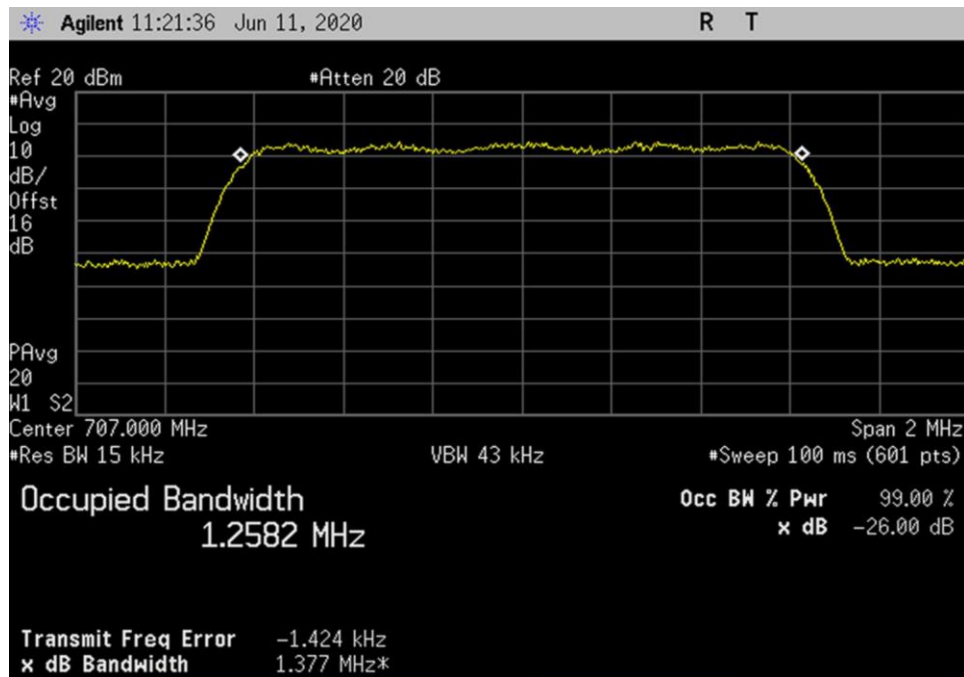


DL_728-746_CDMA_737MHz

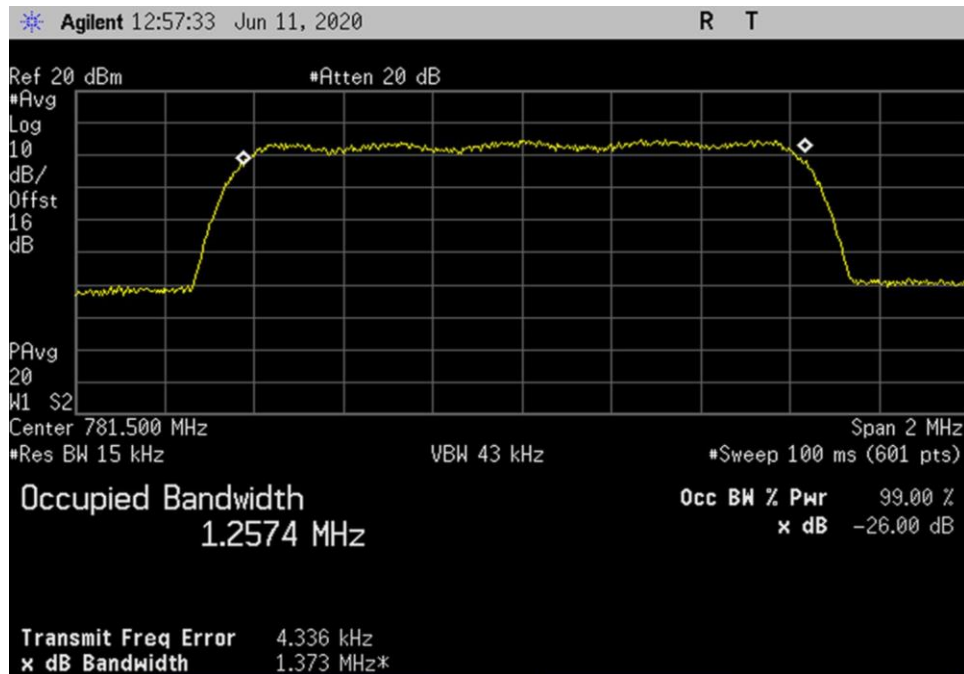


DL_746-757_CDMA_751.5MHz

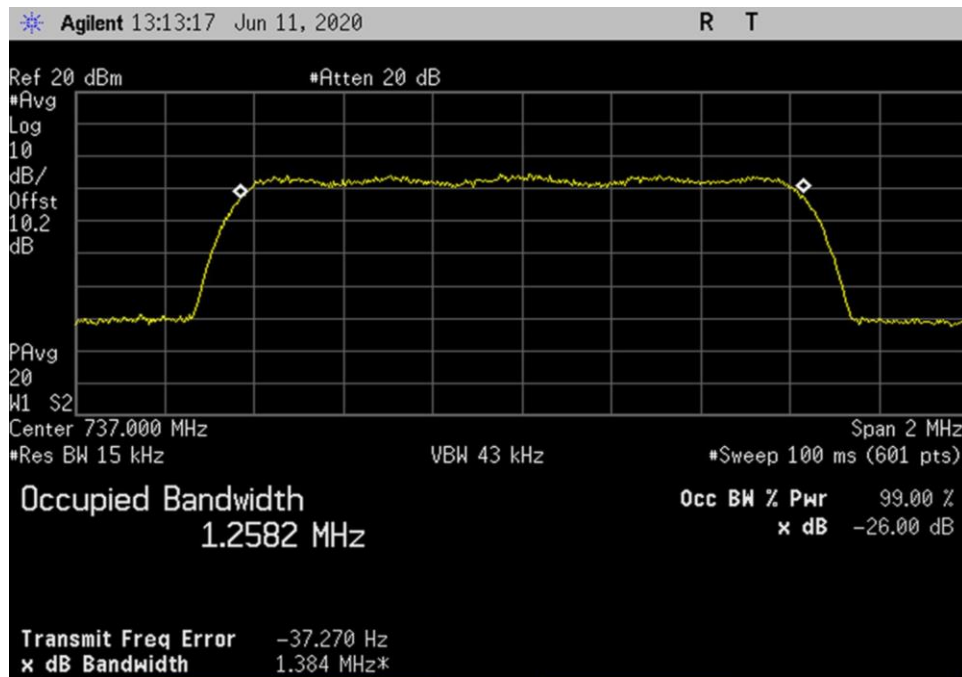
CDMA Output



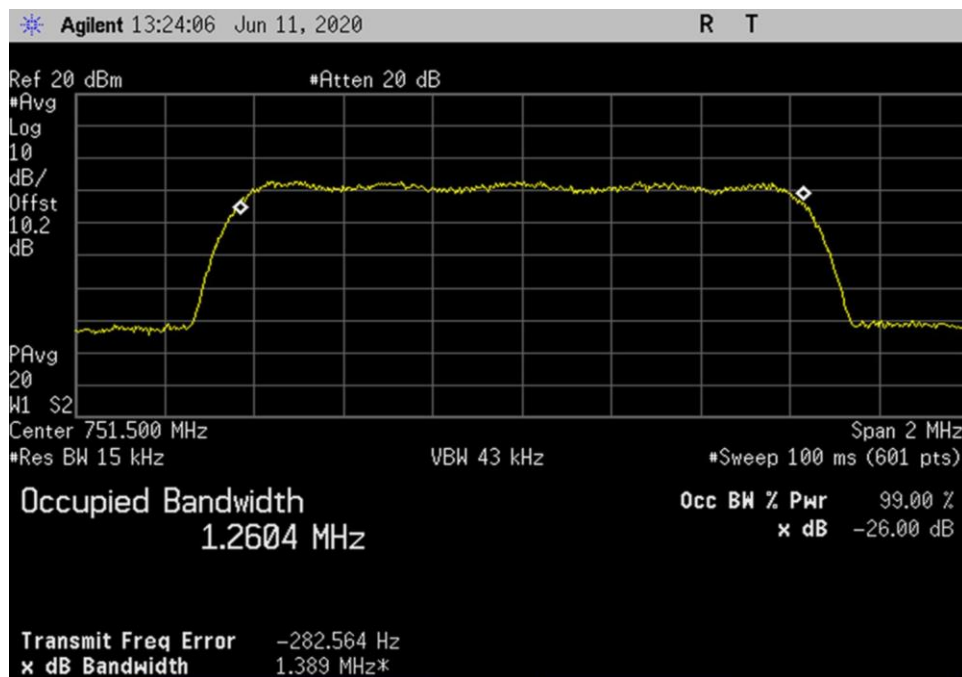
UL_698-716_CDMA_707MHz



UL_776-787_CDMA_781.5MHz

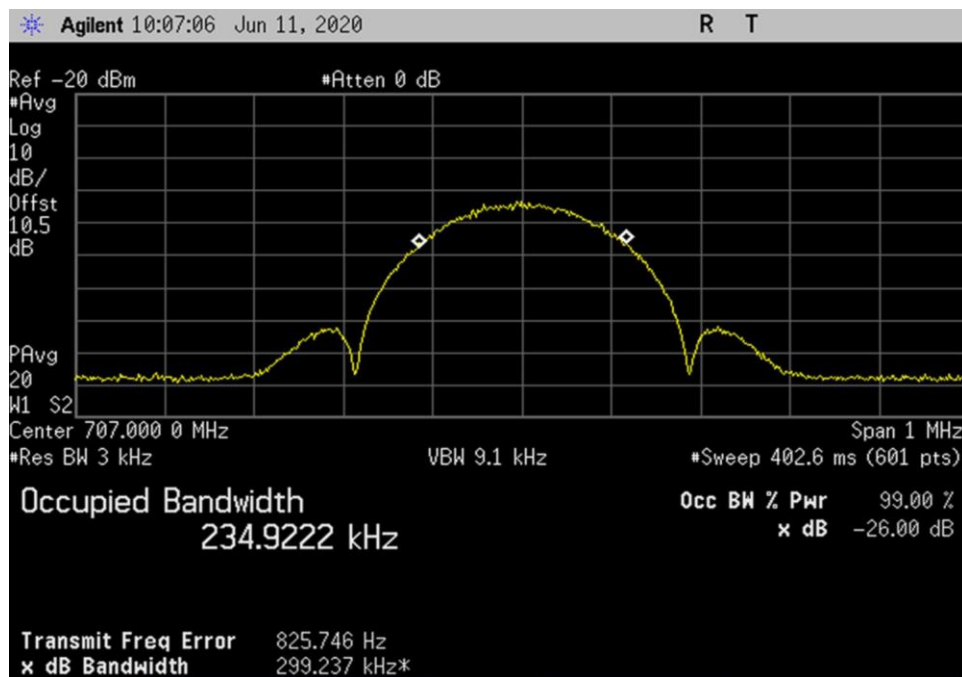


DL_728-746_CDMA_737MHz

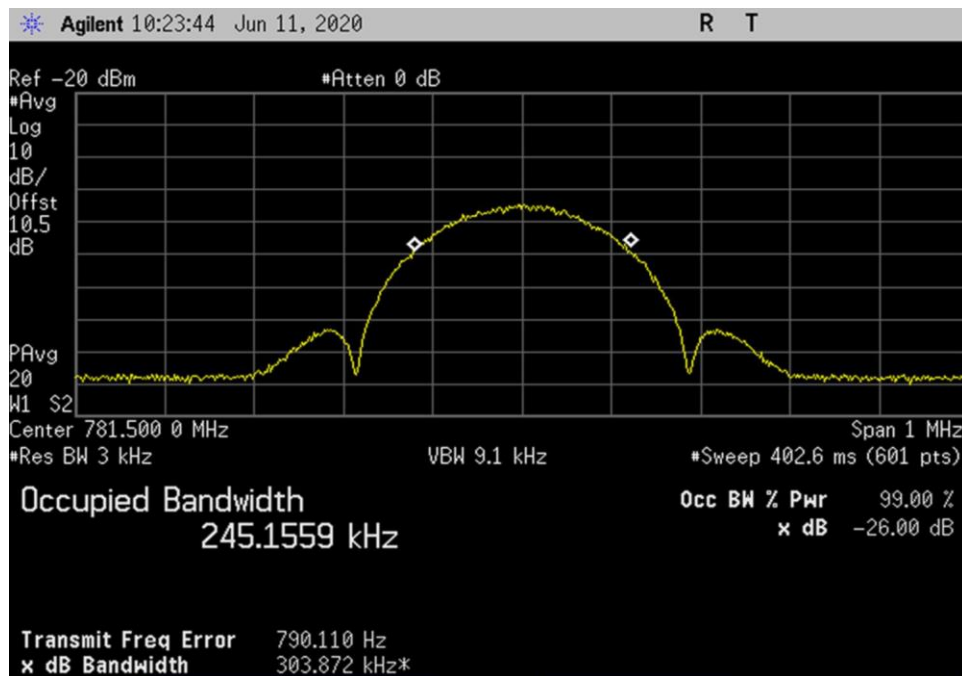


DL_746-757_CDMA_751.5MHz

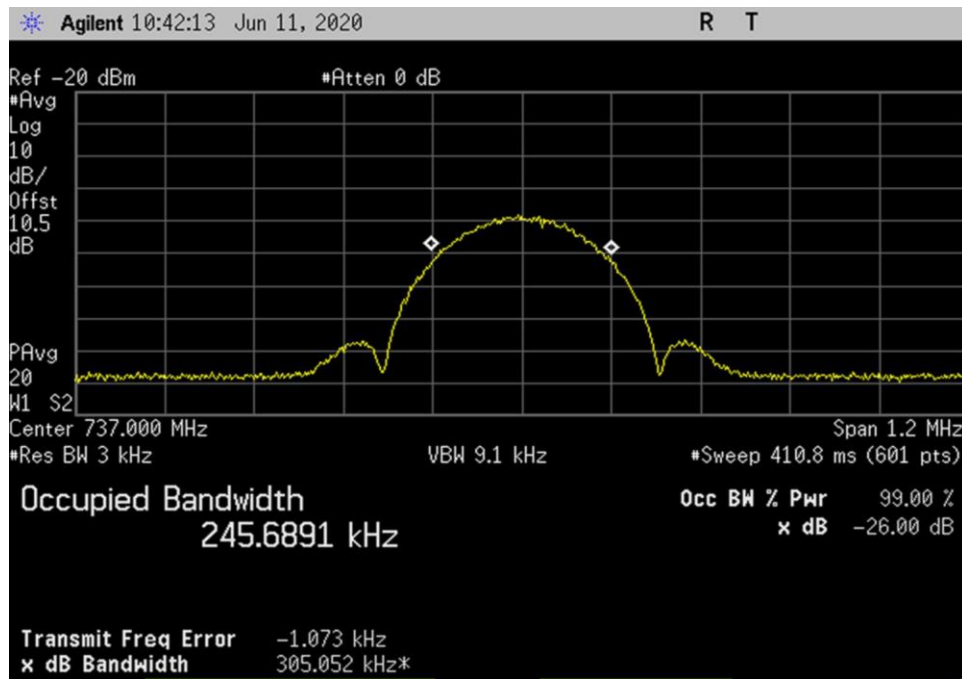
EDGE Input



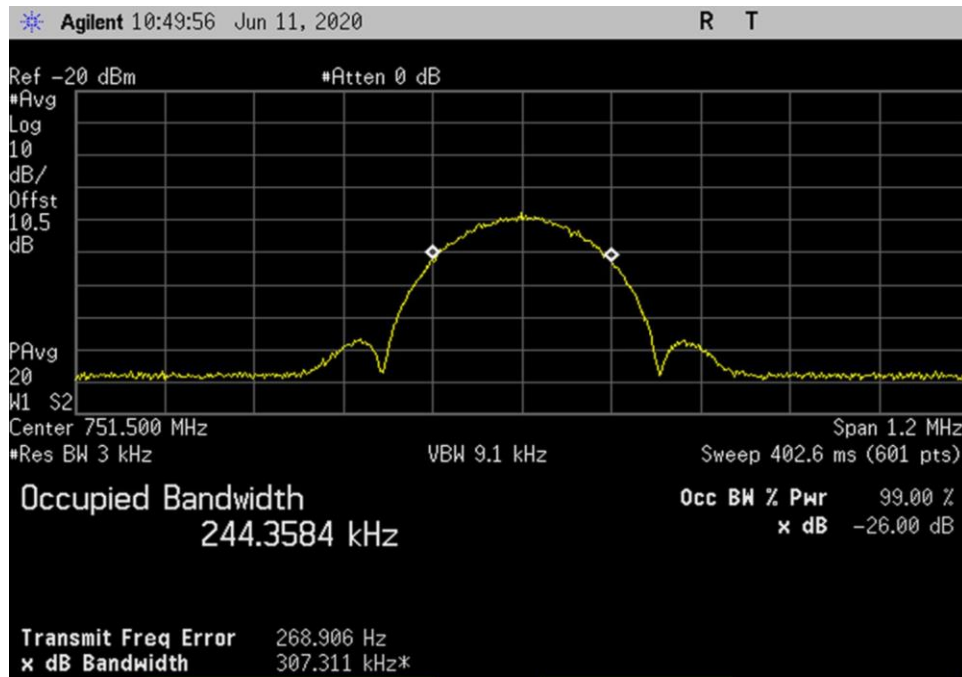
UL_698-716_EDGE_707MHz



UL_776-787_EDGE_781.5MHz

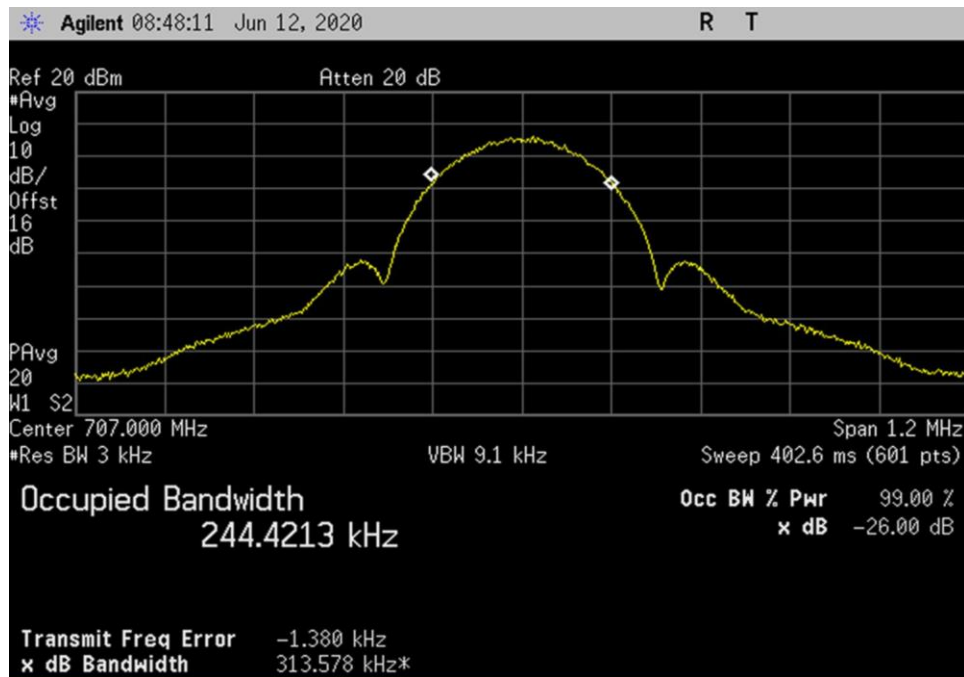


DL_728-746_EDGE_737MHz

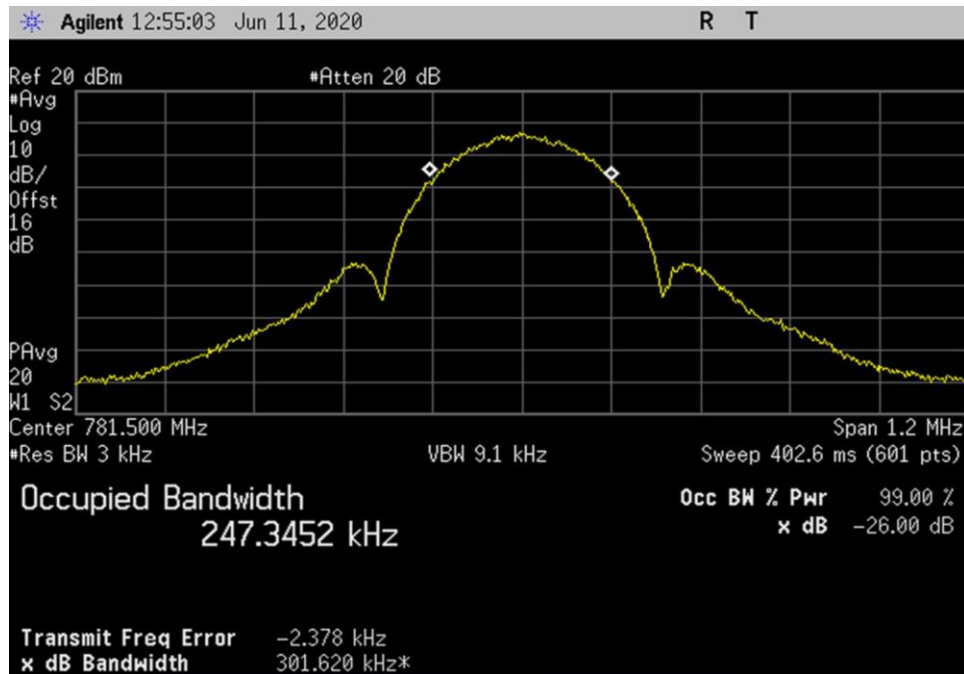


DL_746-757_EDGE_751.5MHz

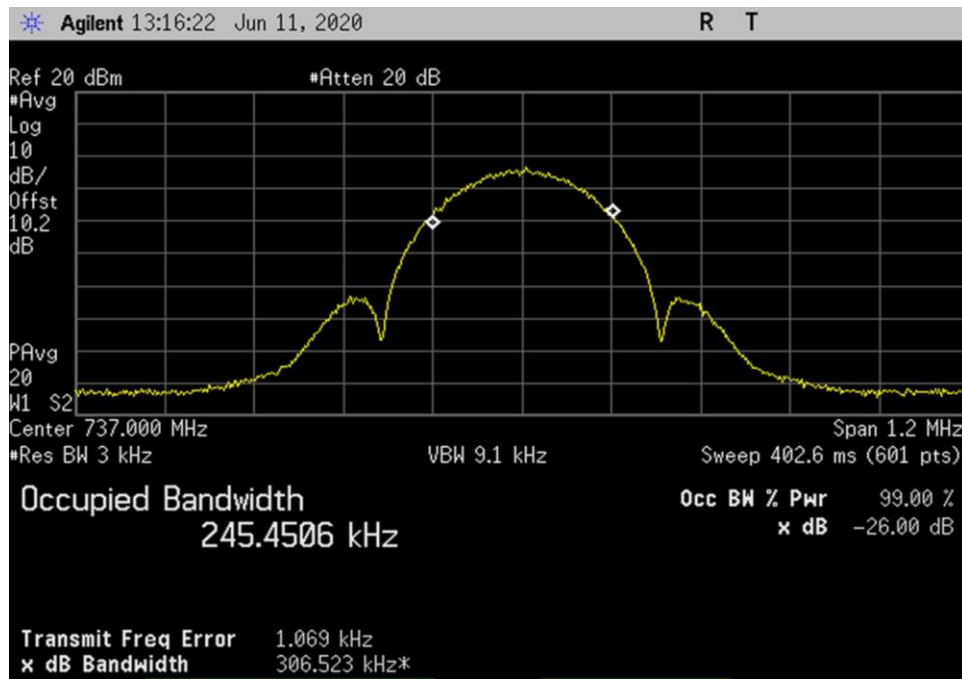
EDGE Output



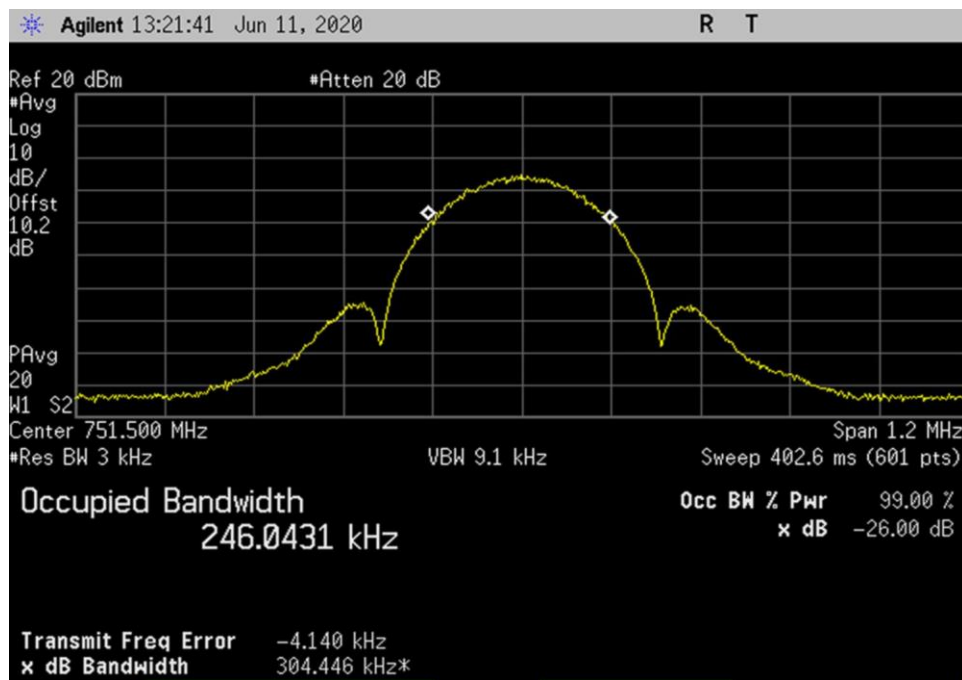
UL_698-716_EDGE_ 707MHz



UL_776-787_EDGE_ 781.5MHz

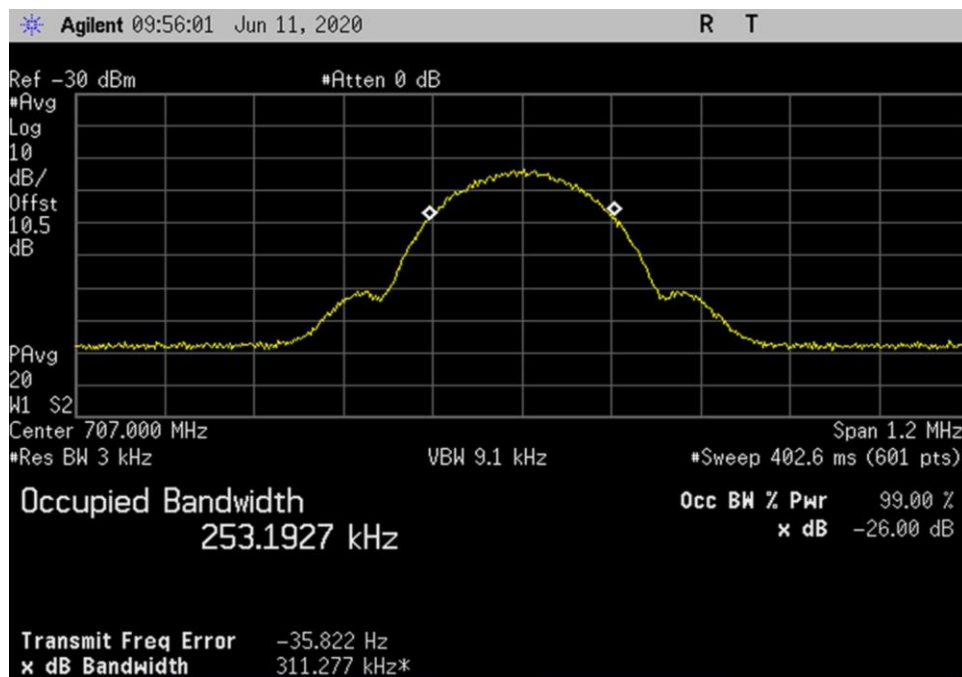


DL_728-746_EDGE_737MHz

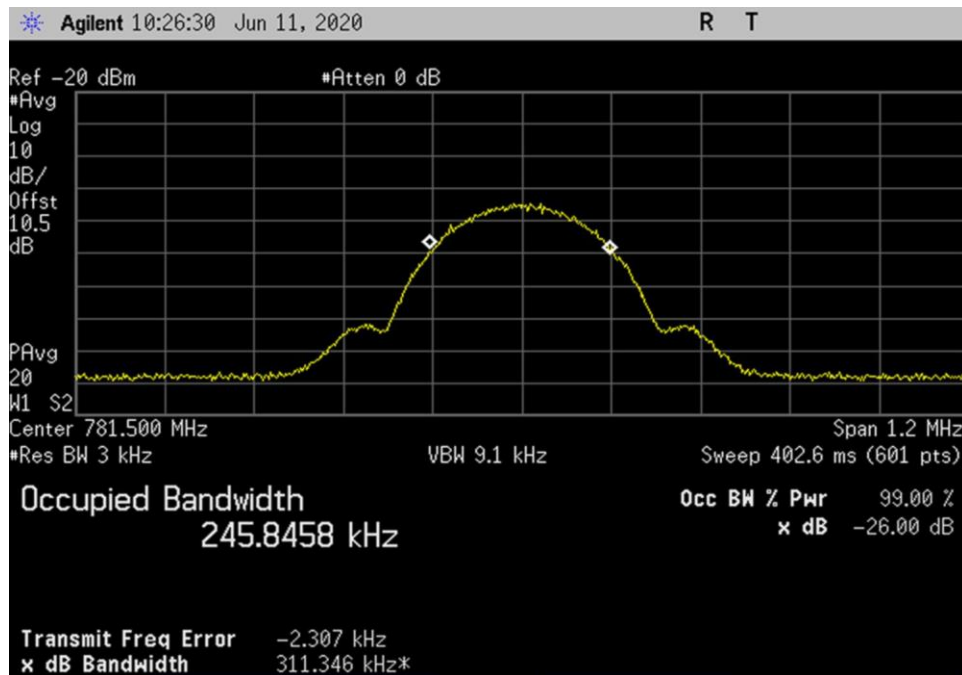


DL_746-757_EDGE_751.5MHz

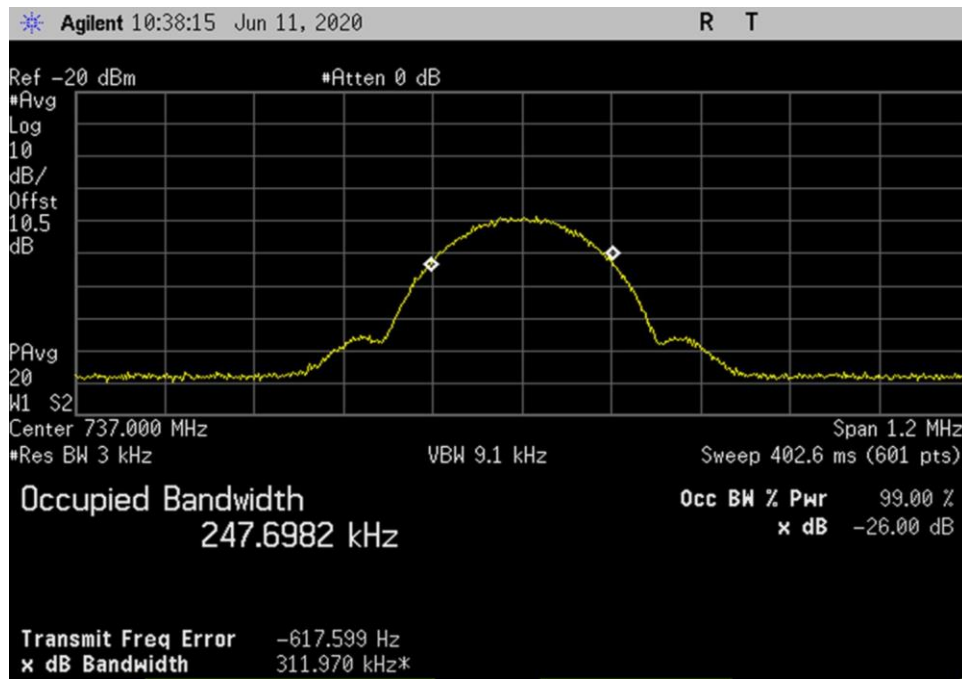
GSM Input



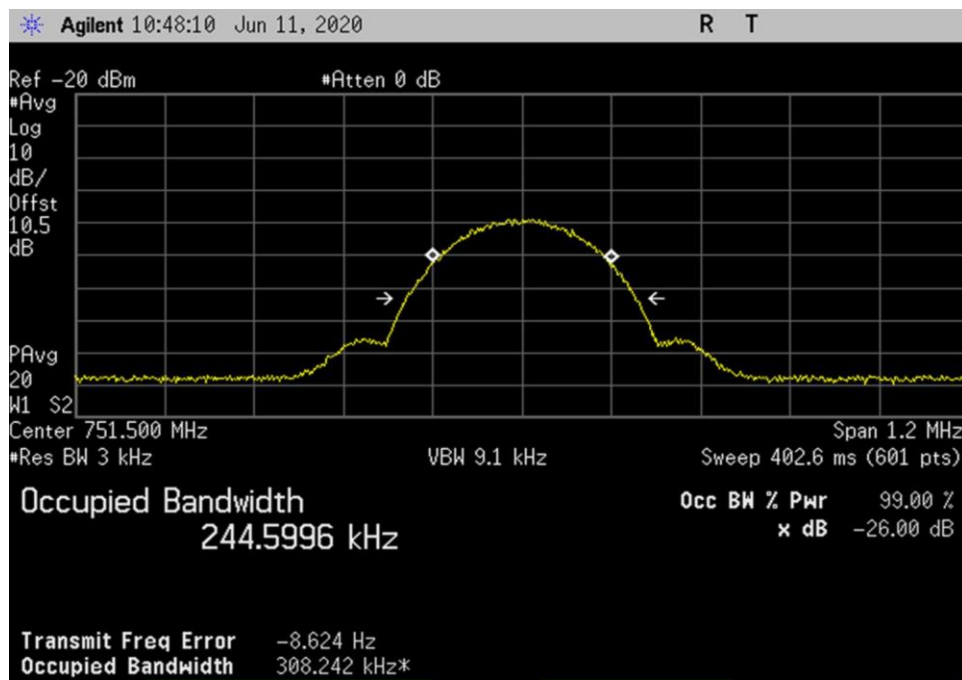
UL_698-716_GSM_ 707MHz



UL_776-787_GSM_ 781.5MHz

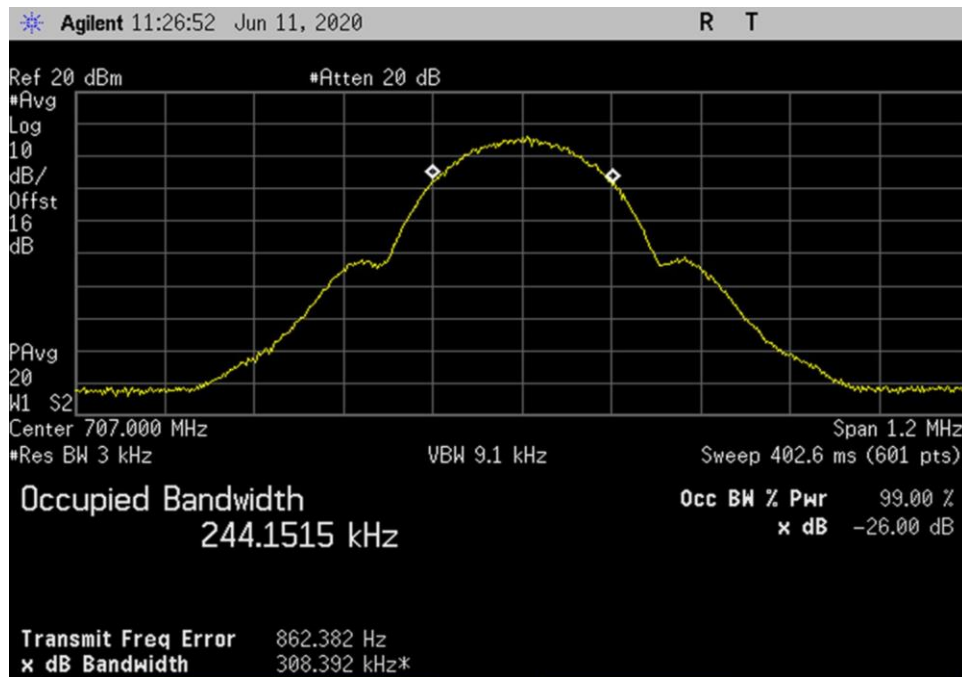


DL_728-746_GSM_737MHz

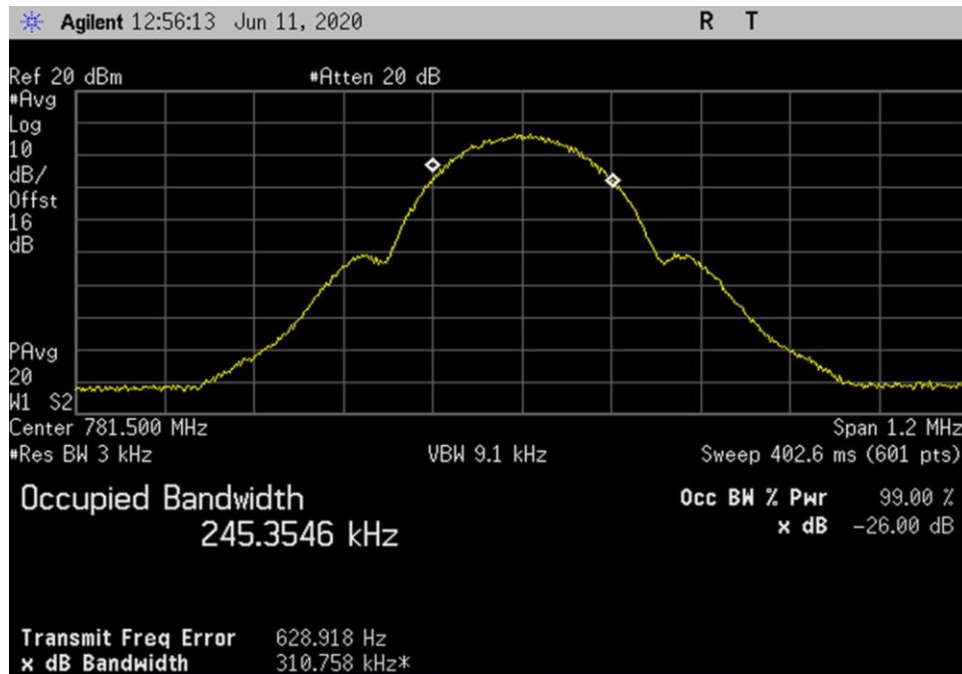


DL_746-757_GSM_751.5MHz

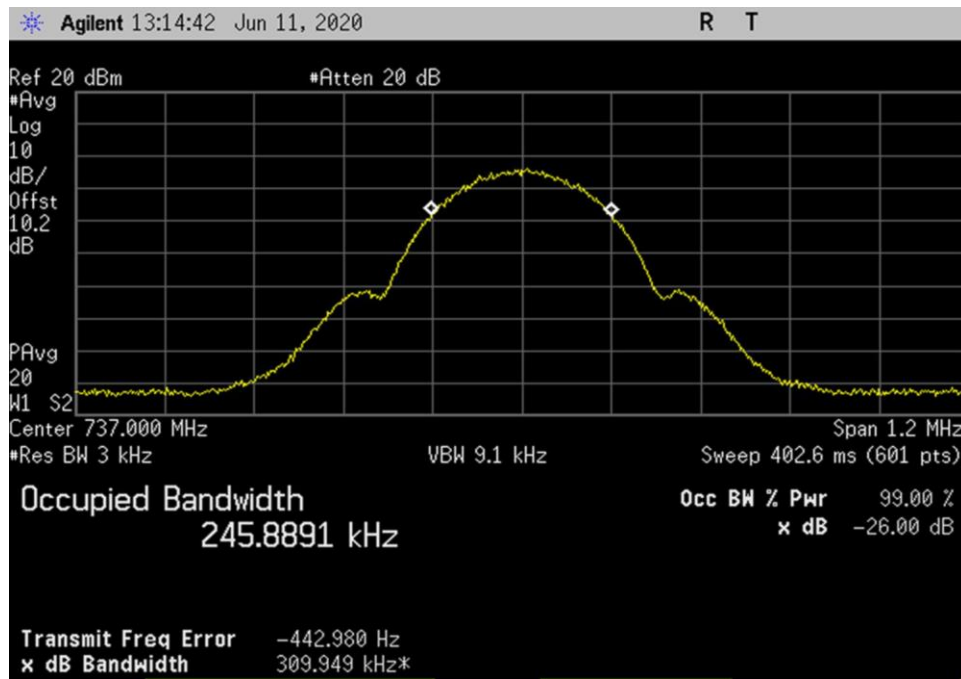
GSM Output



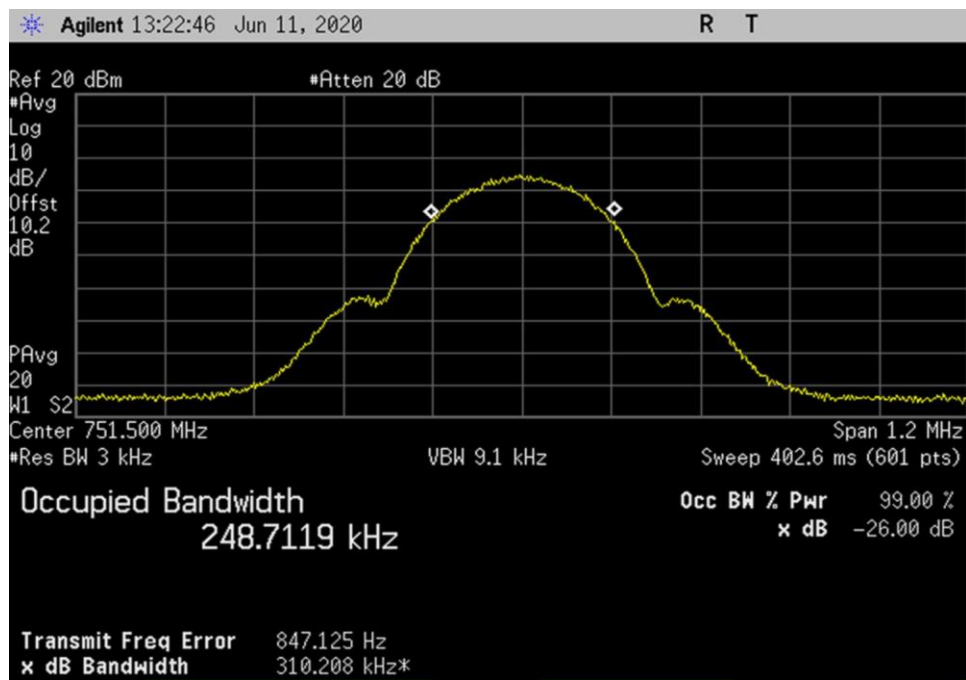
UL_698-716_GSM_707MHz



UL_776-787_GSM_781.5MH

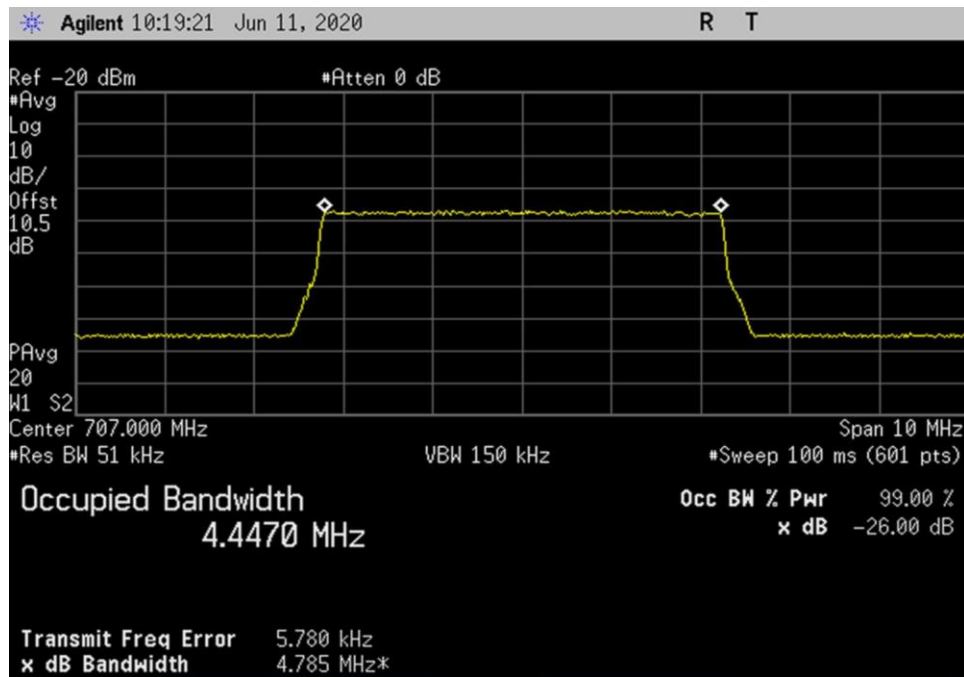


DL_728-746_GSM_737MHz

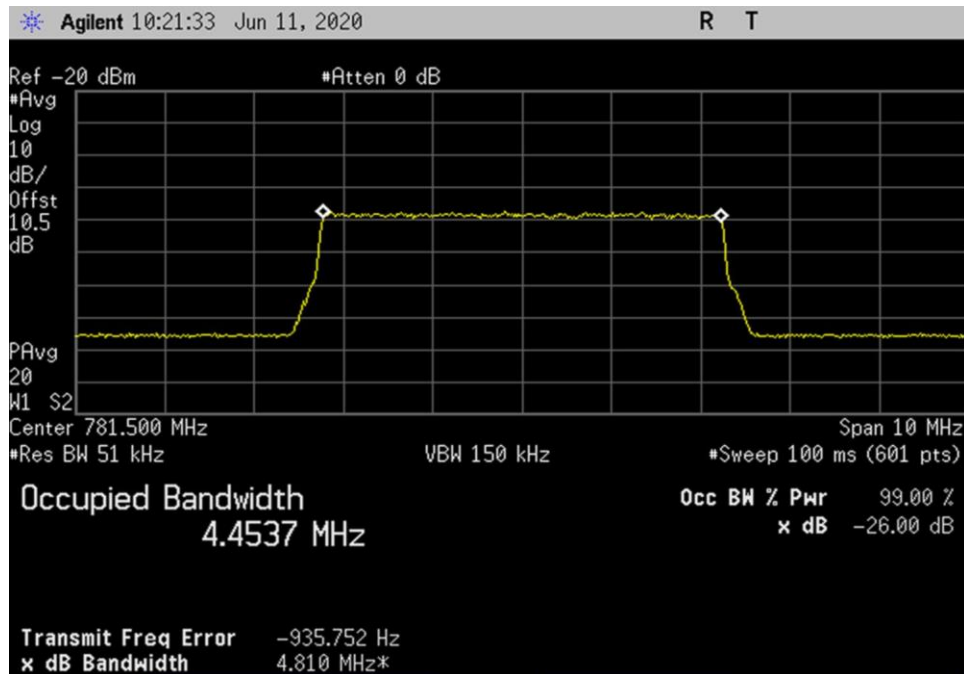


DL_746-757_GSM_751.5MHz

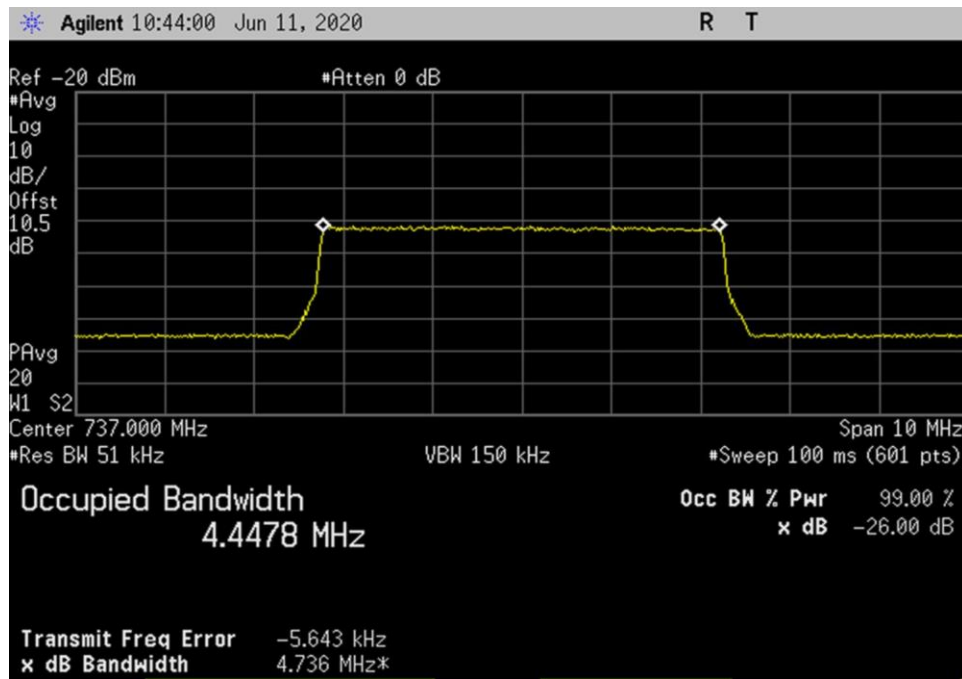
LTE Input



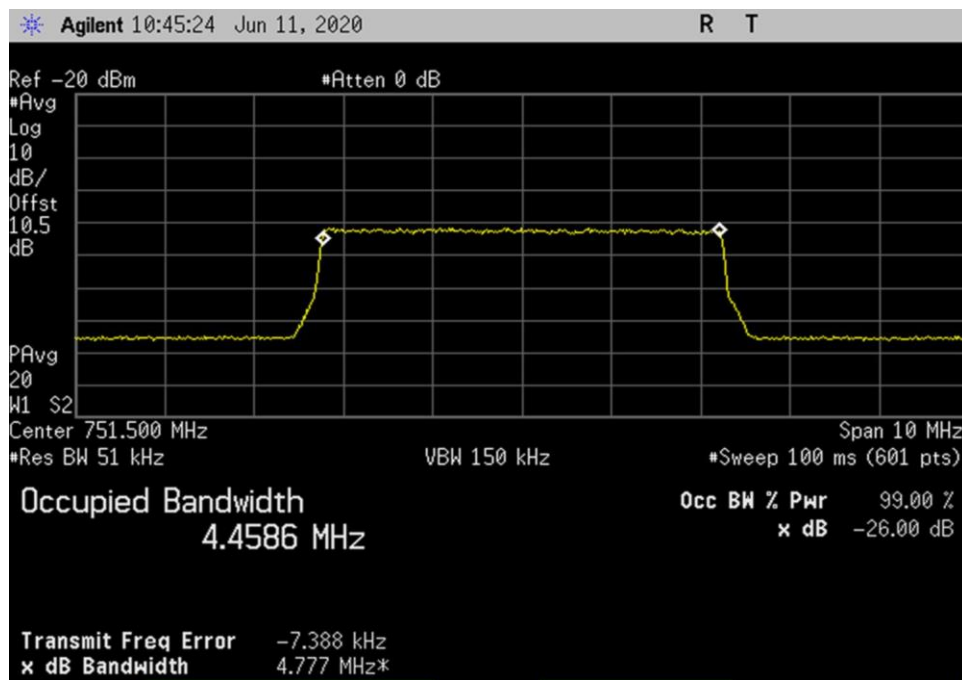
UL_698-716_LTE_ 707MHz



UL_776-787_LTE_ 781.5MHz

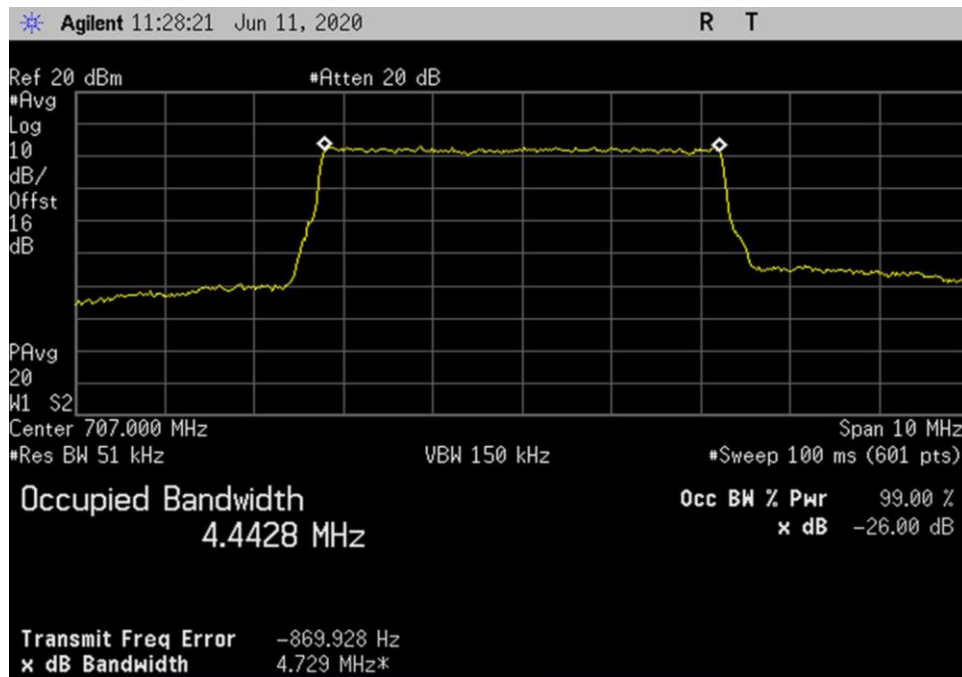


DL_728-746_LTE_ 737MHz

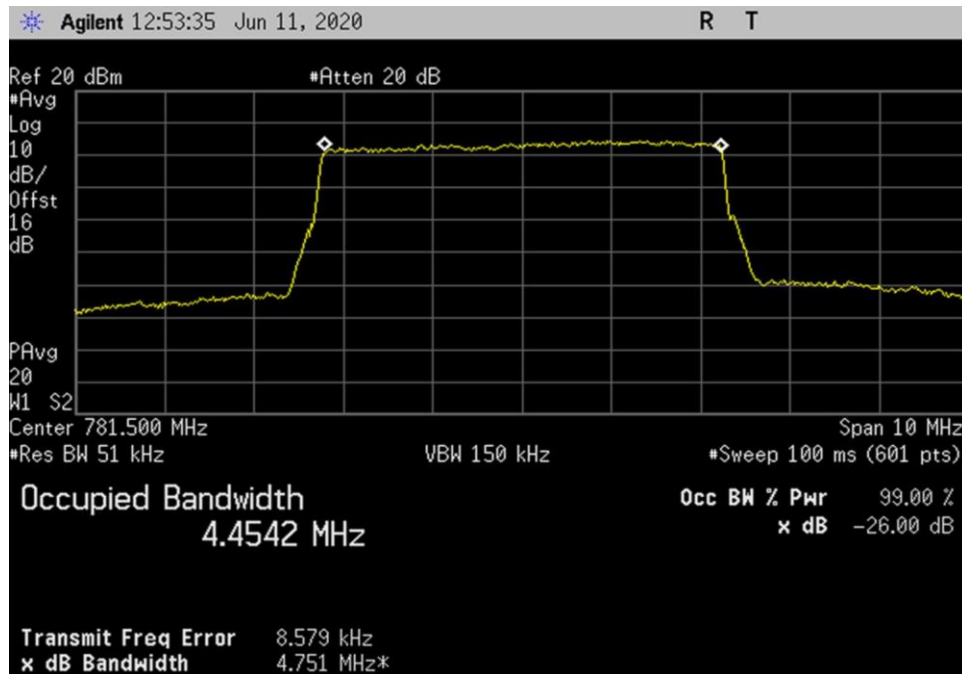


DL_746-757_LTE_ 751.5MHz

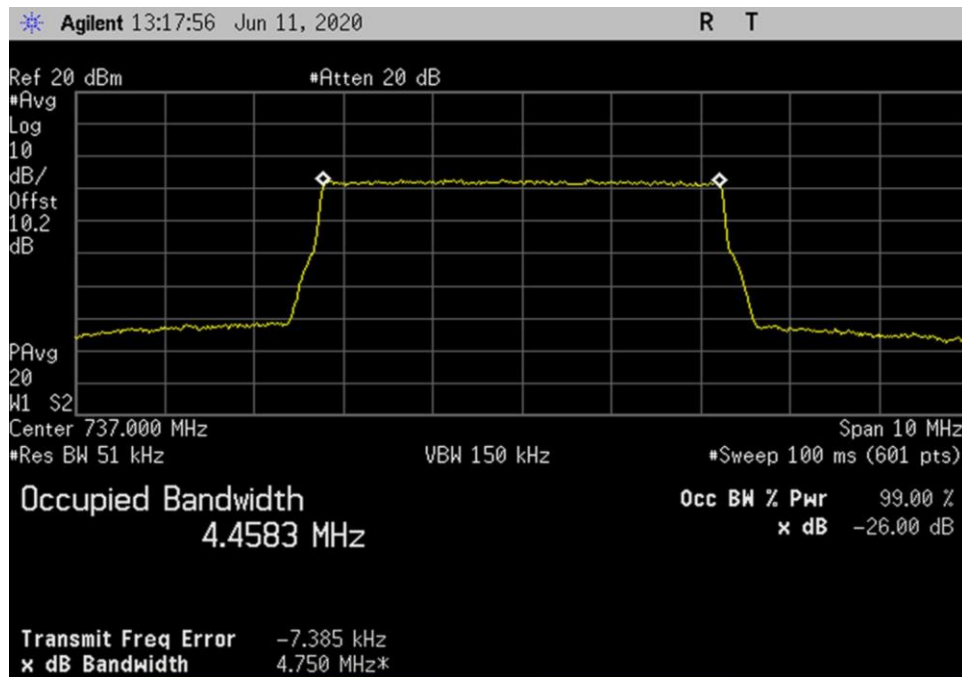
LTE Output



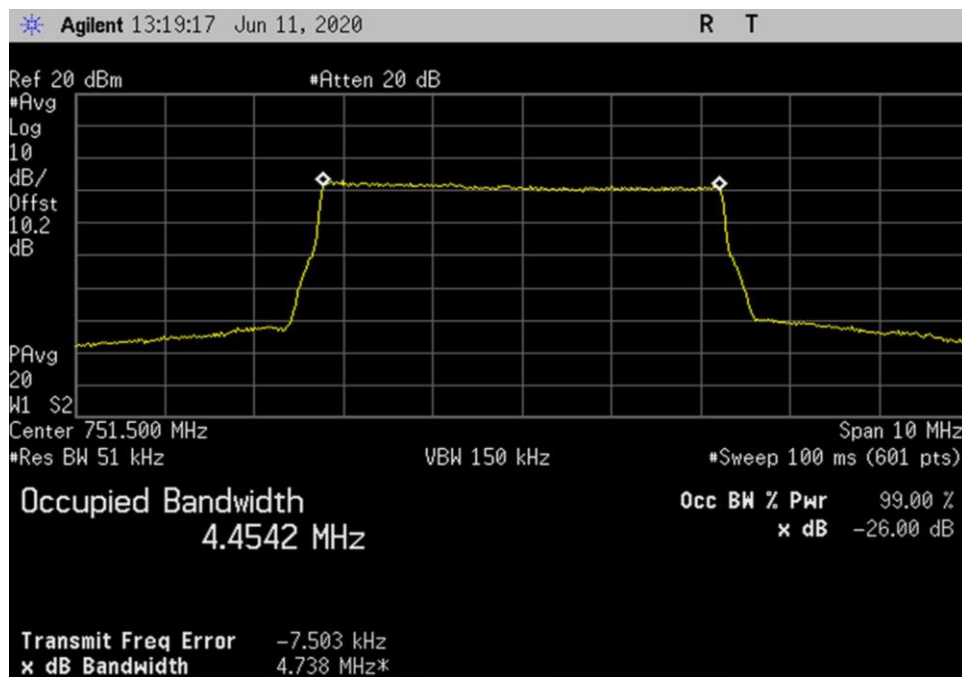
UL_698-716_LTE_ 707MHz



UL_776-787_LTE_ 781.5MHz

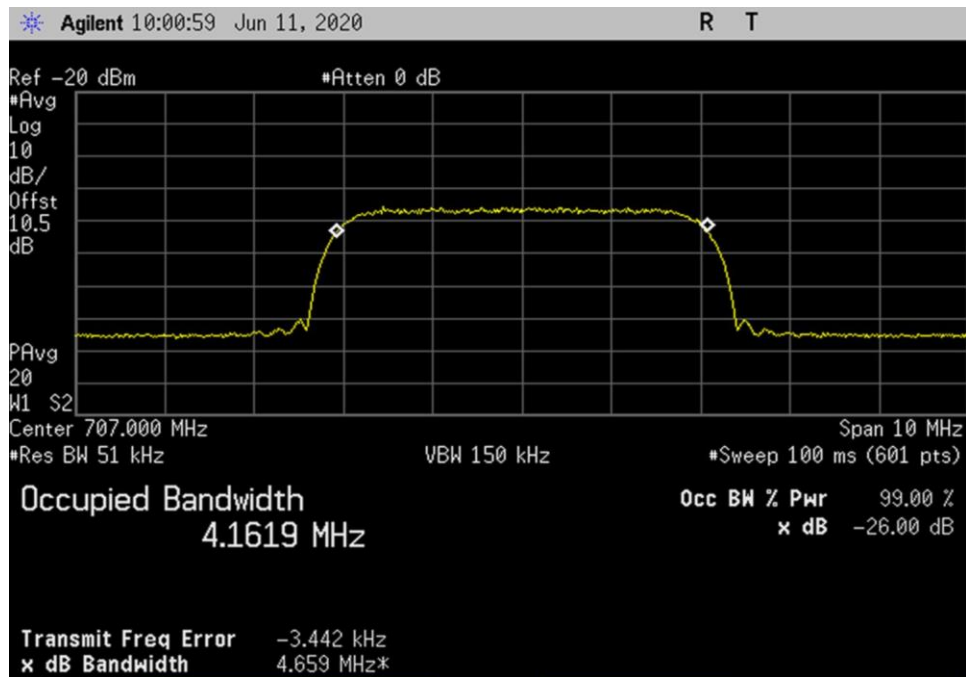


DL_728-746_LTE_737MHz

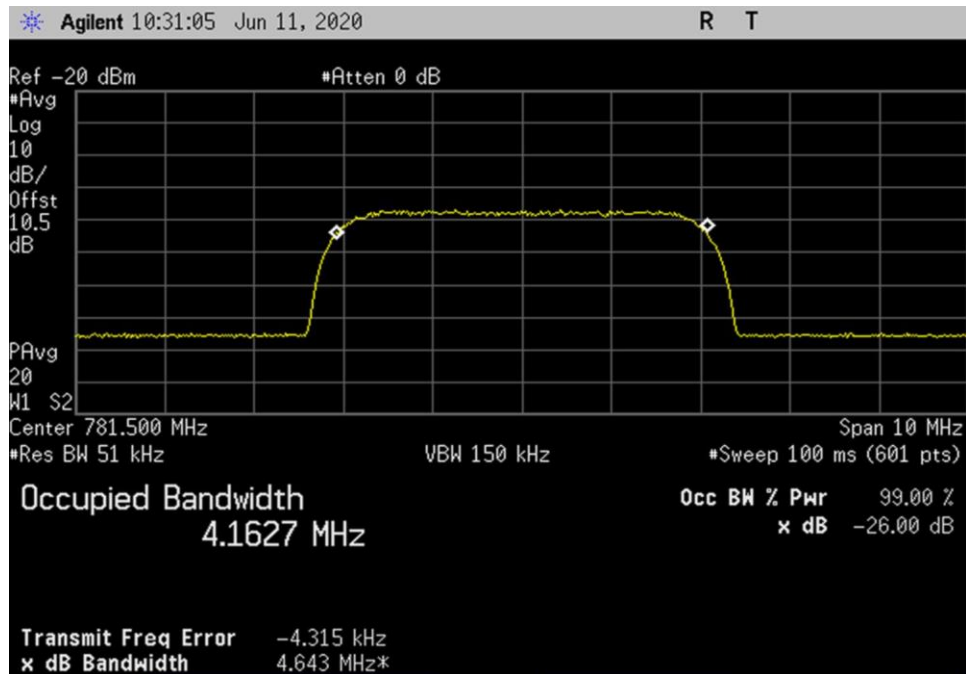


DL_746-757_LTE_751.5MHz

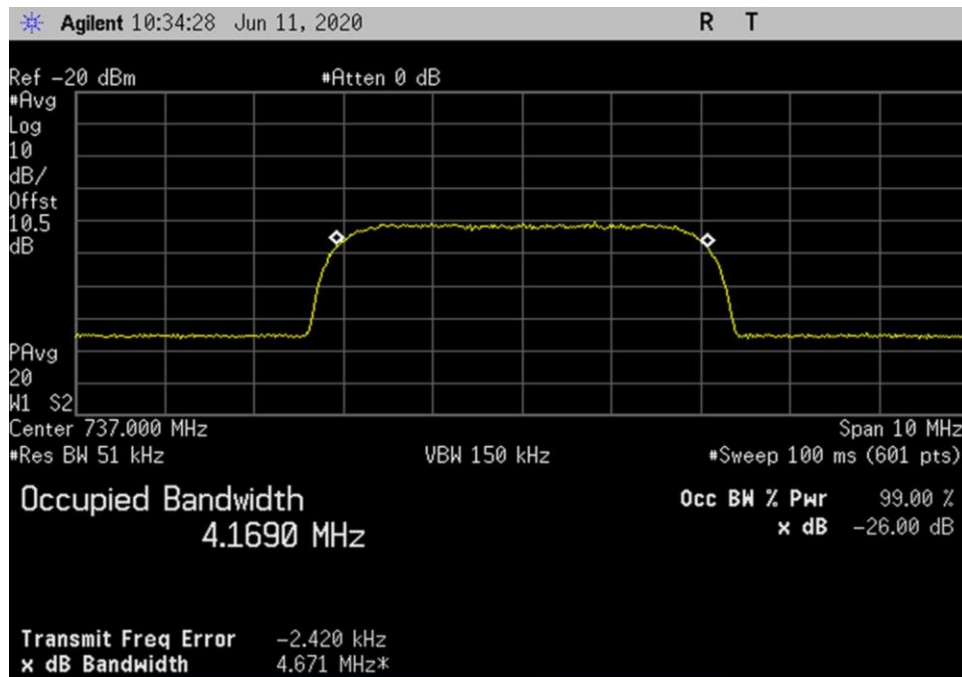
WCDMA Input



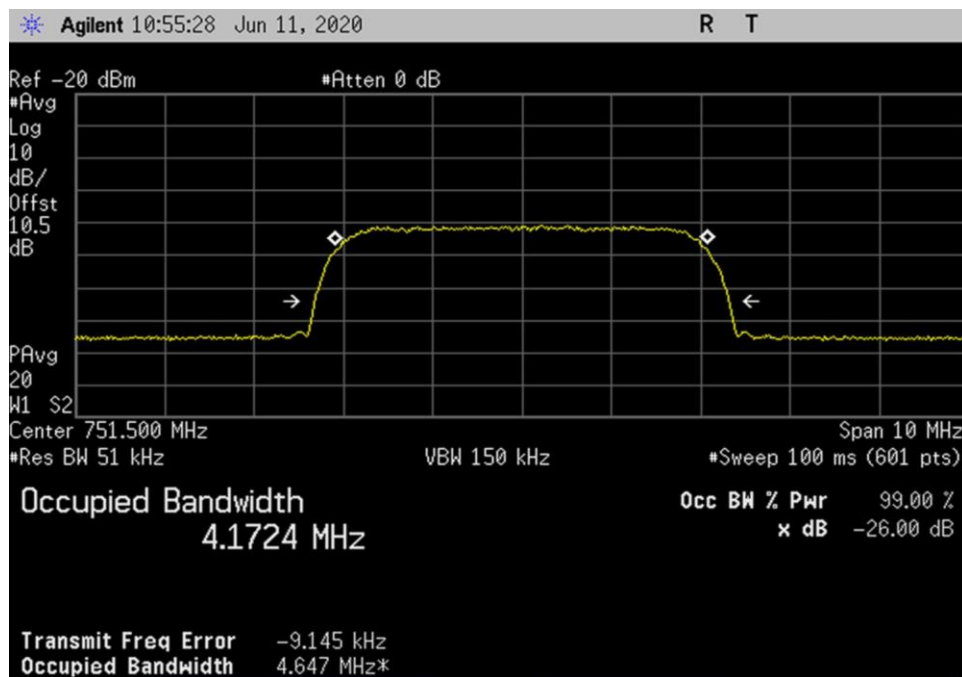
UL_698-716_WCDMA_707MHz



UL_776-787_WCDMA_781.5MHz



DL_728-746_WCDMA_737MHz



DL_746-757_WCDMA_751.5MHz