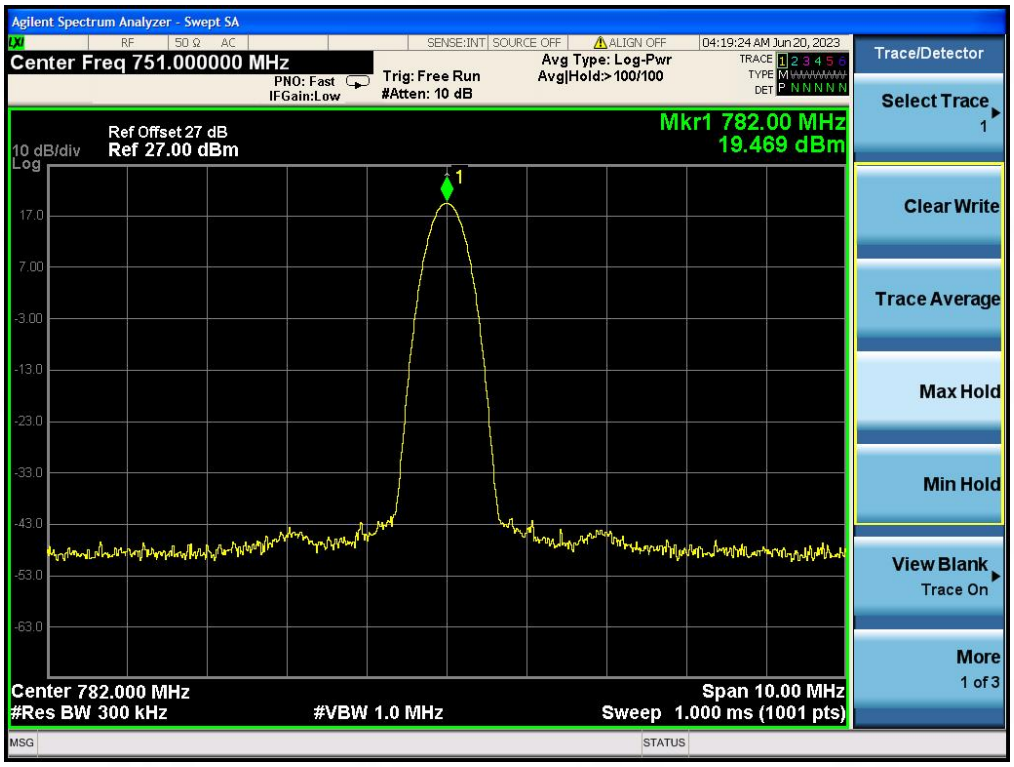
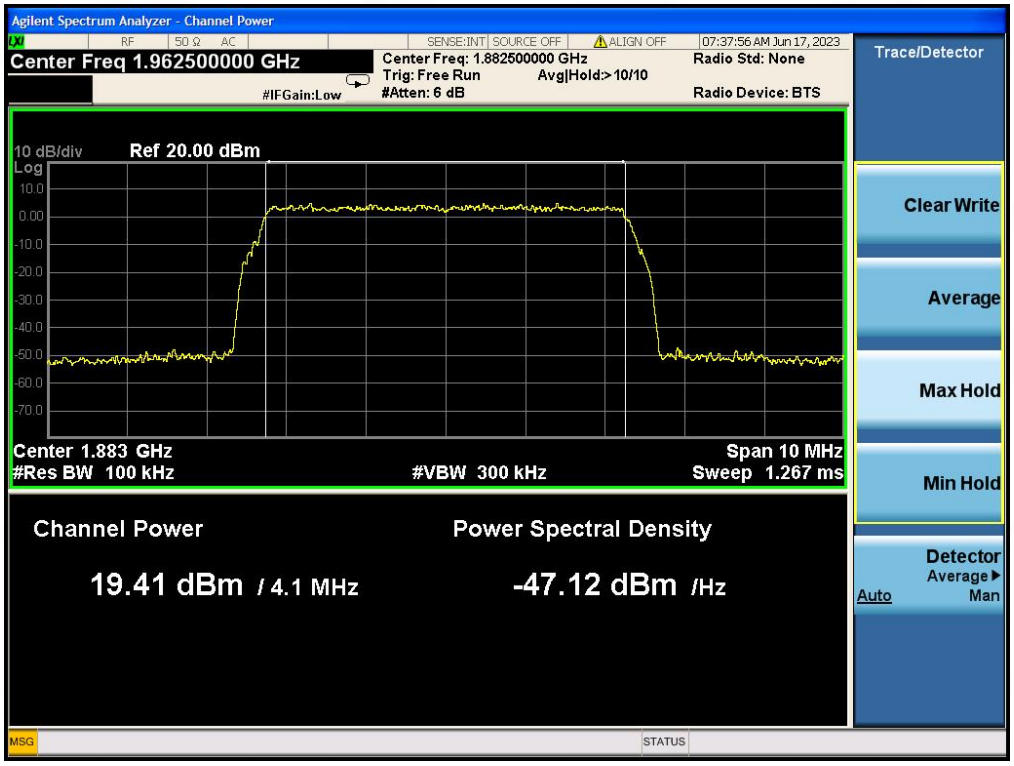


UL1850-1915, AWGN



UL1850-1915, CW

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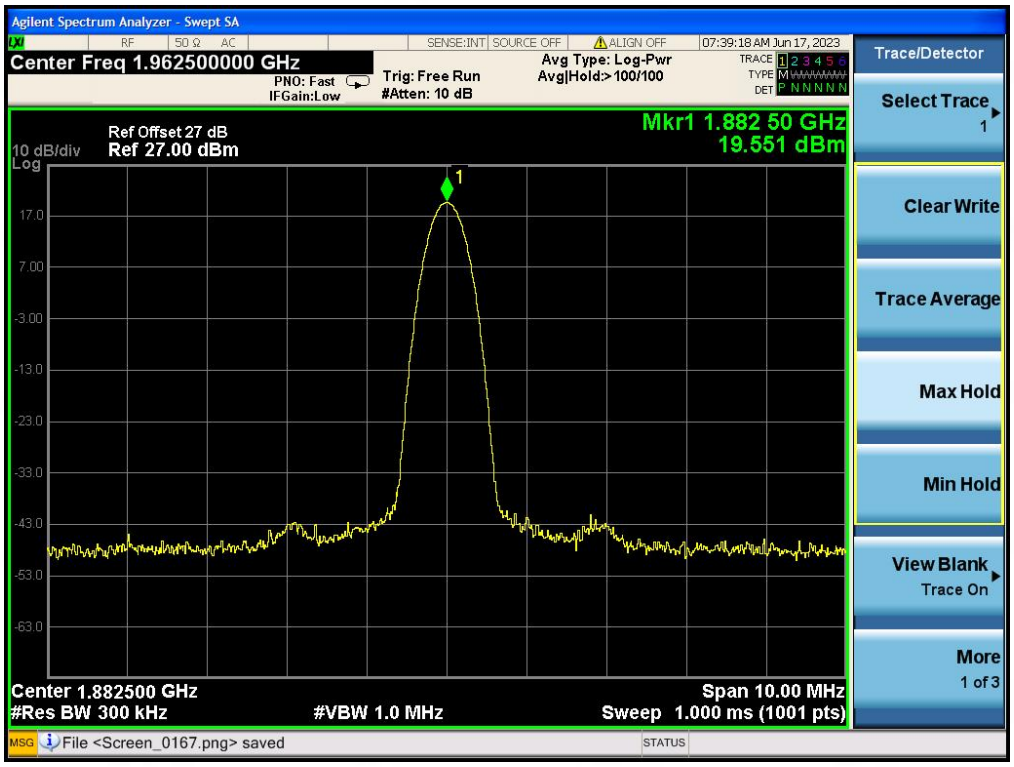

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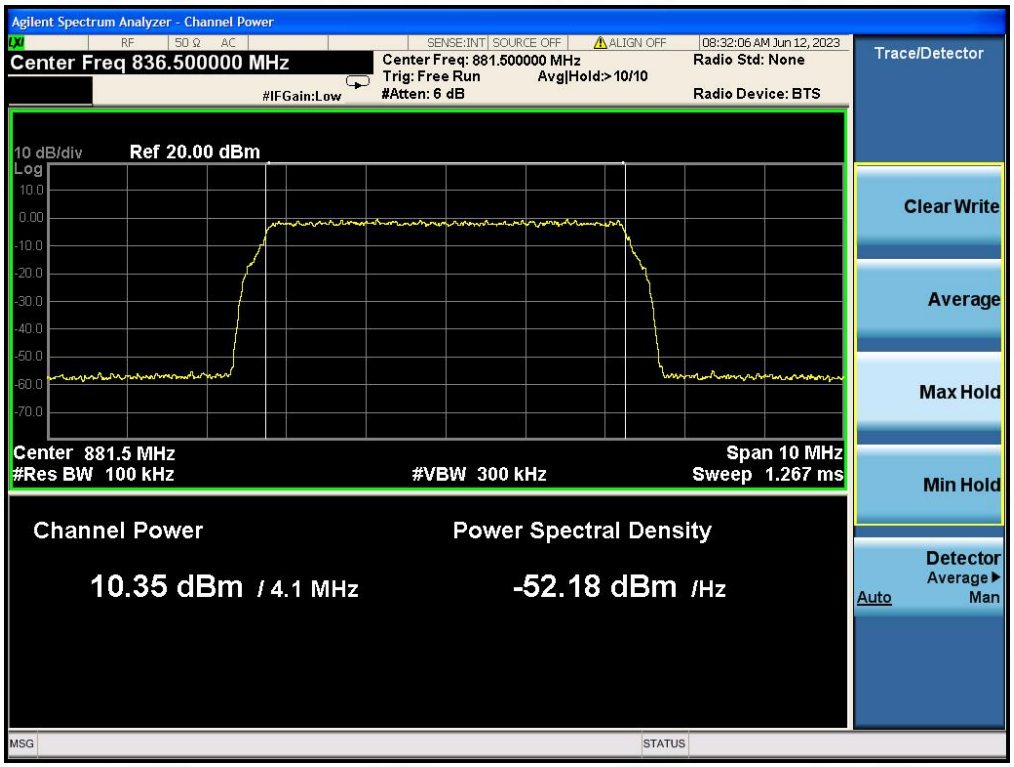
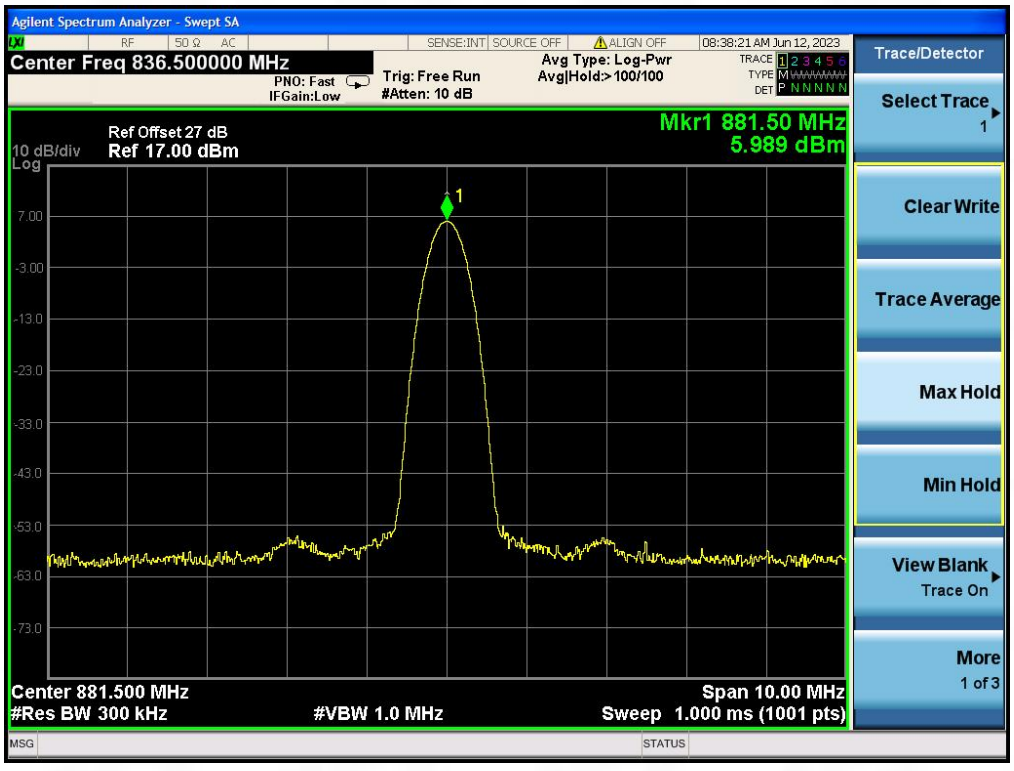
DL LTE Band5, AWGN



DL LTE Band5, CW



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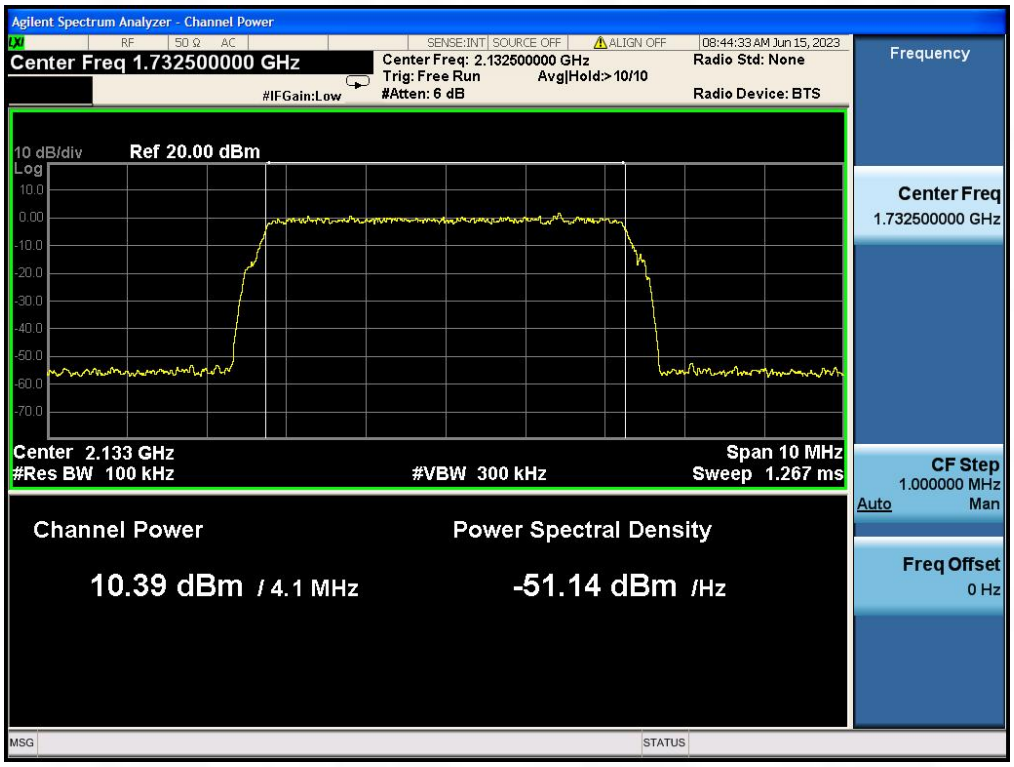
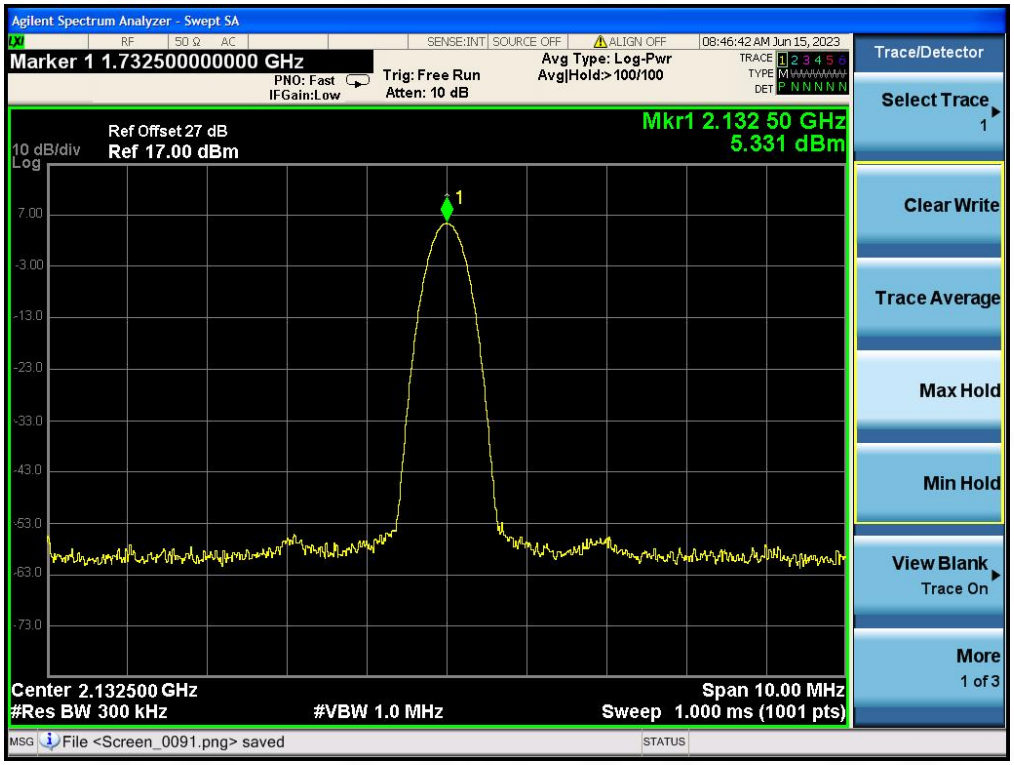
DL2110-2155, AWGN



DL2110-2155, CW



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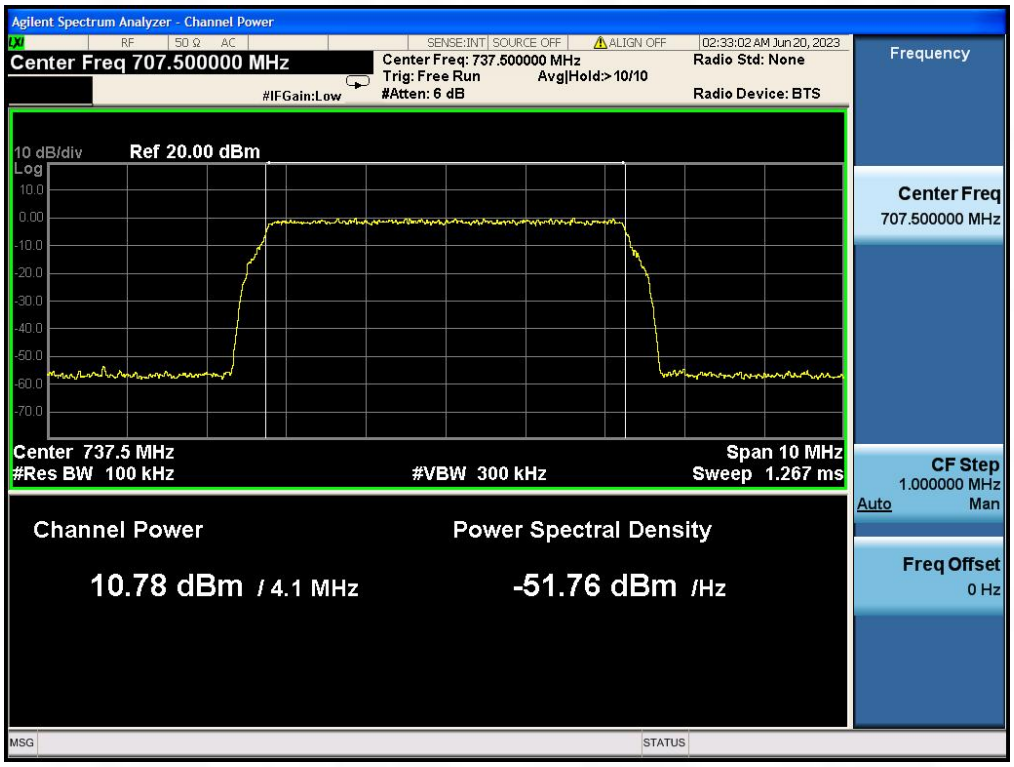
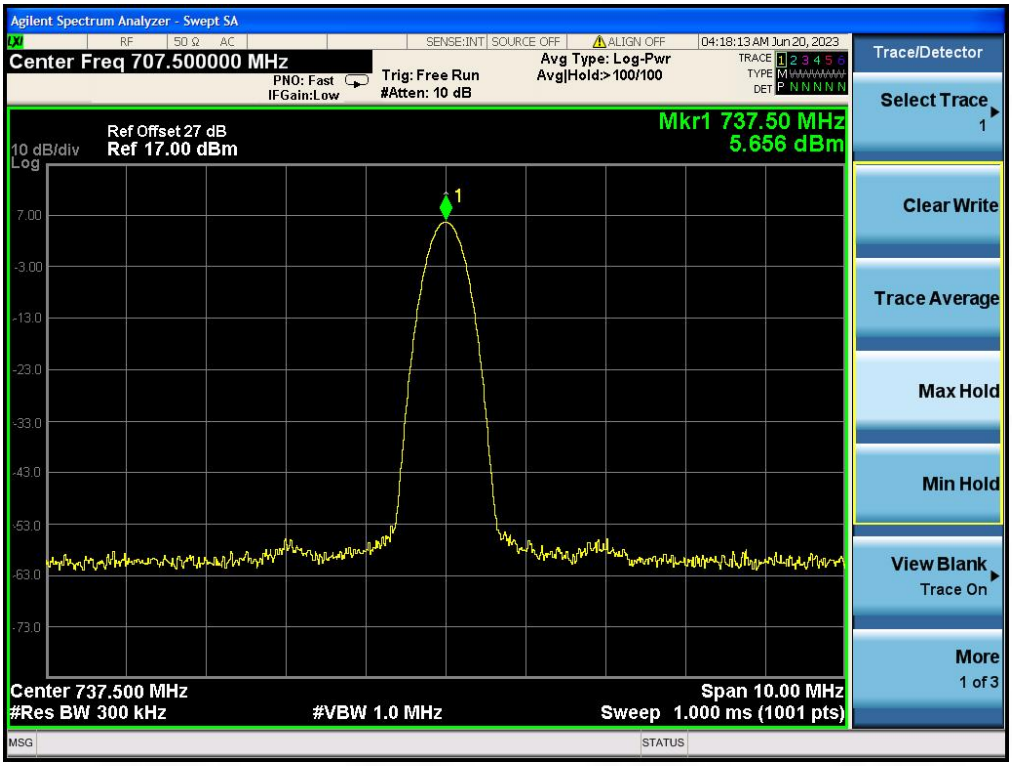
DL729-746, AWGN



DL729-746, CW



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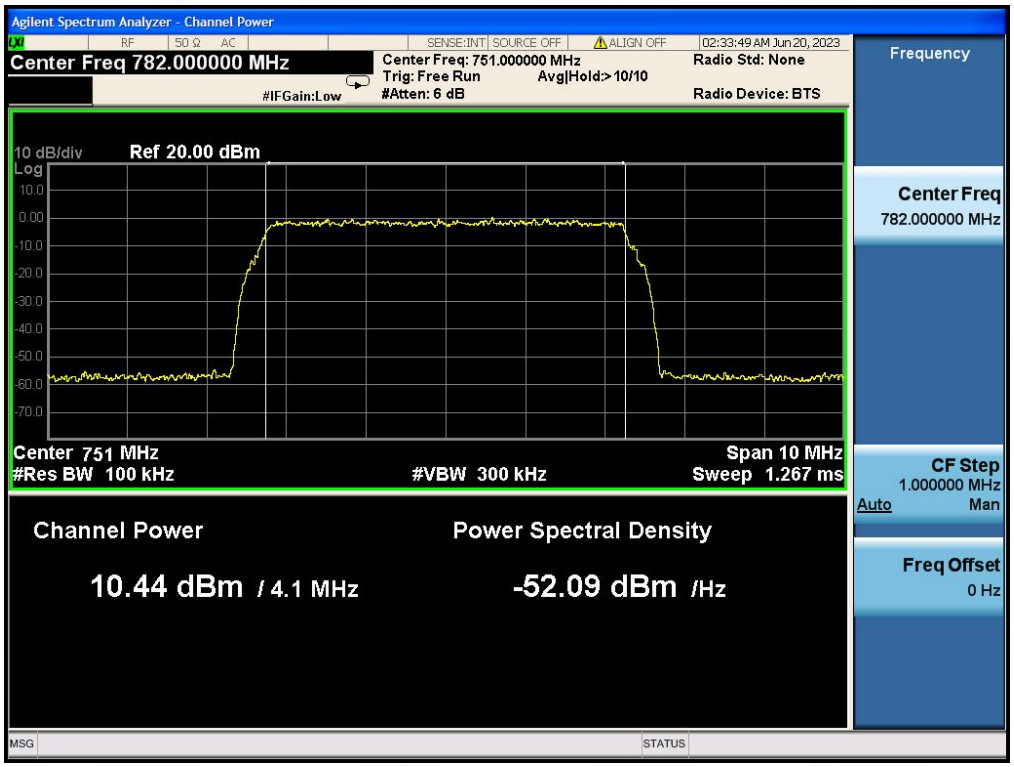
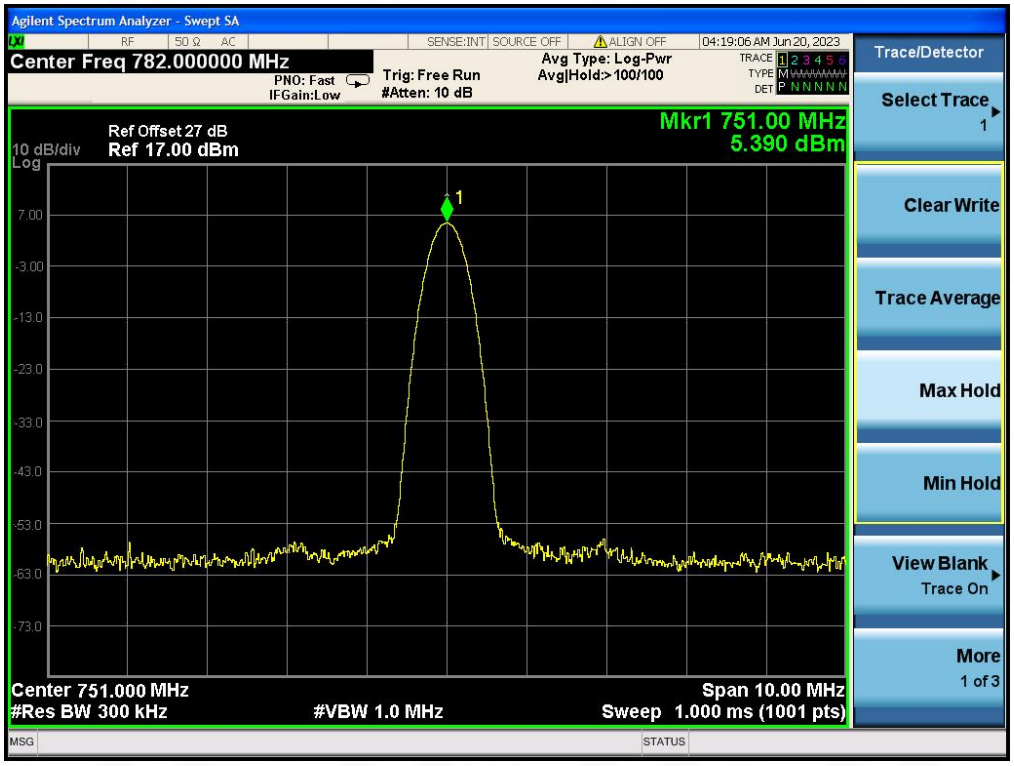
DL746-756, AWGN



DL746-756, CW



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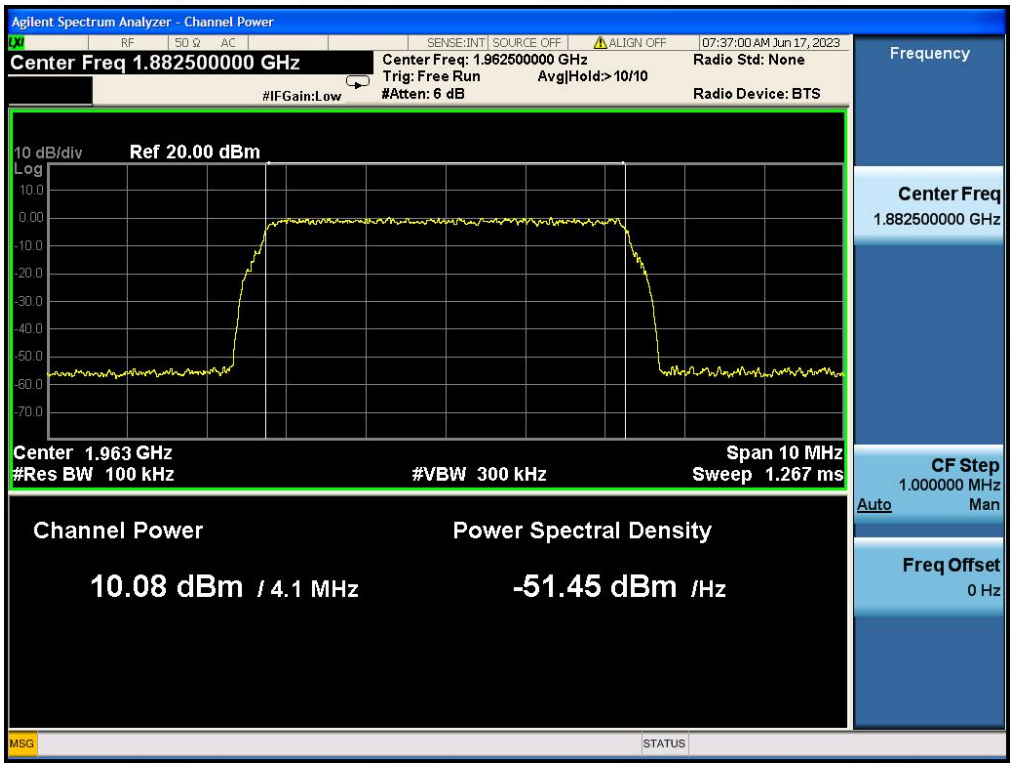
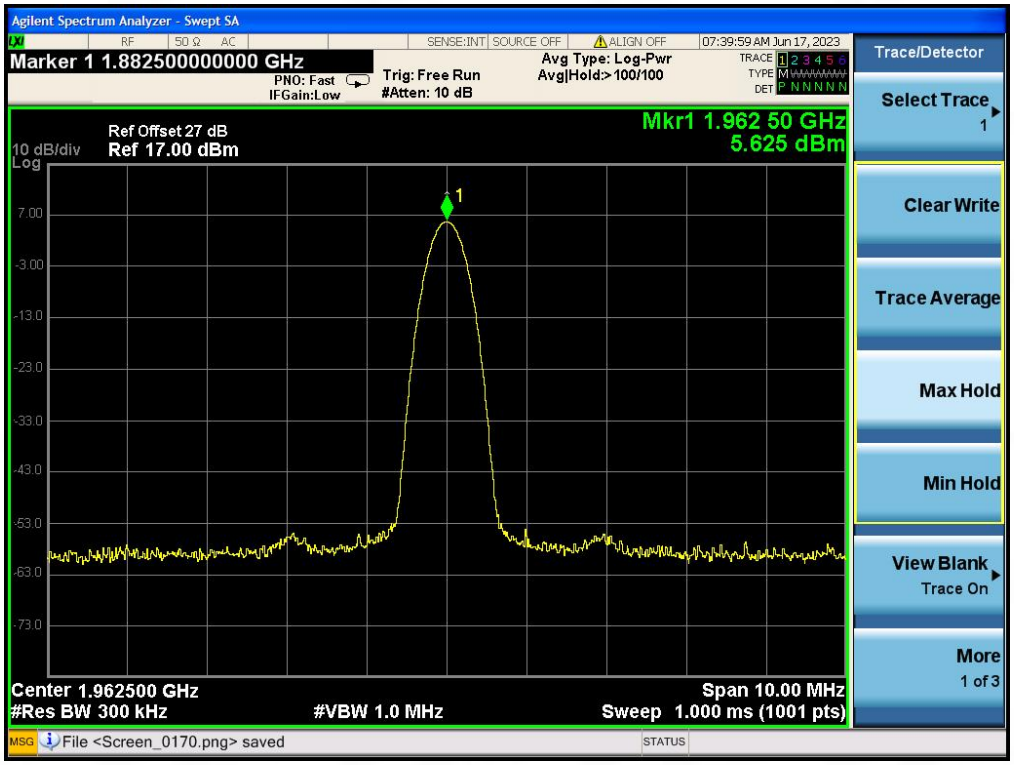
DL1930-1995, AWGN



DL1930-1995, CW



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5.3 Maximum Booster Gian Computation

Test Requirement:	This section provides guidance on the computation of the maximum gain based on the results obtained from previous measurements. The NPS limits on maximum gain for fixed and mobile Wideband Consumer Signal Boosters are provided in §20.21(e)(8)(i)(C)(2). Additionally, §20.21(e)(8)(i)(B) requires that Wideband Consumer Signal Boosters be able to provide equivalent uplink and downlink gain (within 9 dB).
Procedure:	a) Compute the maximum gain of the booster as follows to demonstrate compliance to the applicable gain limits as specified. b) For both the uplink and downlink in each supported frequency band, use each of the POUT and PIN value pairs determined in 7.2 in the following equation to determine the maximum gain (G) of the booster: G (dB) = P_{OUT}(dBm) - P_{IN}(dBm). c) Record the maximum gain of the uplink and downlink paths for each supported frequency band and verify that the each gain value complies with the applicable limit.

5.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

5.3.2 Test Data:

Uplink Gain VS Downlink Gain

Band	Signal Type	Uplink Gain (dB)	Downlink Gain(dB)	D-value	Limit (dBm)
Band 5	CW	53.80	52.99	-0.81	9
	AWGN	54.33	57.35	3.02	
Band 4	CW	55.99	53.33	-2.66	
	AWGN	56.56	58.39	1.83	
Band 12	CW	58.47	52.66	-5.81	
	AWGN	58.28	57.78	-0.5	
Band 13	CW	59.47	53.39	-6.08	
	AWGN	59.30	58.44	-0.86	
Band 25	CW	59.55	52.63	-6.92	
	AWGN	59.41	57.08	-2.33	

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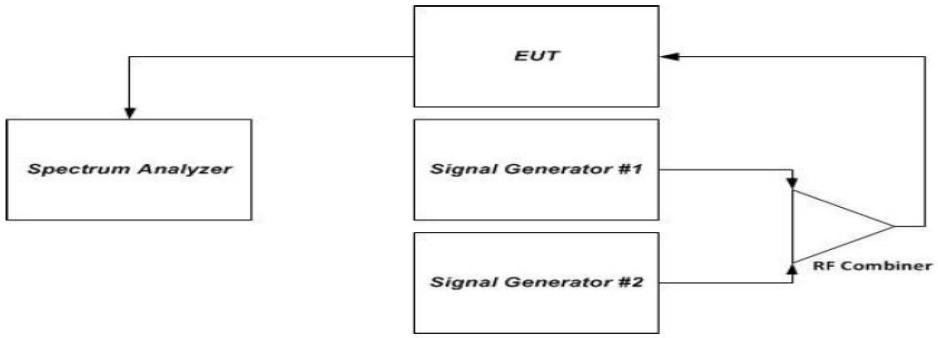
5.4 Intermodulation Product

Test Requirement:	The following procedures shall be used to demonstrate compliance to the intermodulation limit specified in §20.21(e)(8)(i)(F) for Wideband Consumer Signal Boosters (i.e., -19 dBm).
Limit:	-19dBm
Test Setup:	 Figure 2 – Intermodulation product instrumentation test setup
Procedure:	a) Connect the signal booster to the test equipment as shown in Figure 2. Begin with the uplink output connected to the spectrum analyzer. b) Set the spectrum analyzer RBW = 3 kHz. c) Set the VBW ⩾ 3 X the RBW. d) Select the RMS detector. e) Set the spectrum analyzer center frequency to the center of the supported operational band under test. f) Set the span to 5 MHz. g) Configure the two signal generators for CW operation with generator 1 tuned 300 kHz below the operational band center frequency and generator 2 tuned 300 kHz above the operational band center frequency. h) Set the signal generator amplitudes so that the power from each into the RF combiner is equivalent and turn on the RF output. i) Increase the signal generators' amplitudes equally until just before the EUT begins AGC and ensure that all intermodulation products (if any exist), are below the specified limit of -19 dBm. j) Utilize the MAX HOLD function of the spectrum analyzer and wait for the trace to stabilize. Place a marker at the highest amplitude intermodulation product. k) Record the maximum intermodulation product amplitude level that is observed. l) Capture the spectrum analyzer trace for inclusion in the test report. m) Repeat steps 7.4.5 to 7.4.12 for all uplink and downlink operational bands. Note: If using a single signal generator with dual outputs, ensure that intermodulation products are not the result of the generator.

5.4.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

5.4.2 Test Data:

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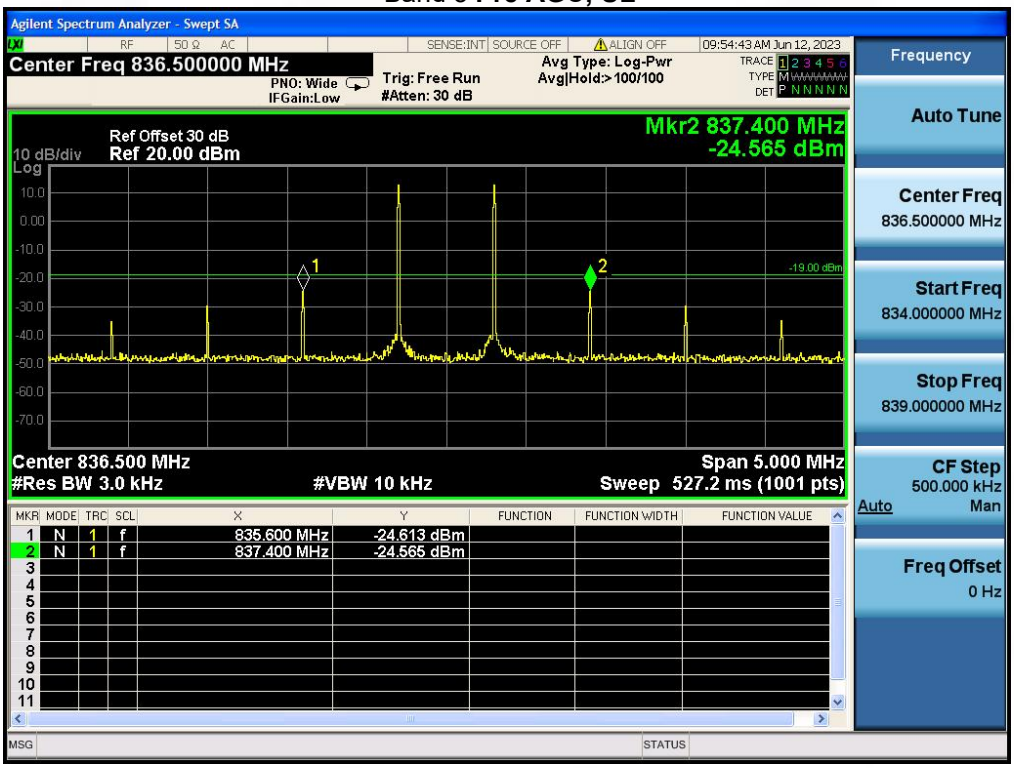
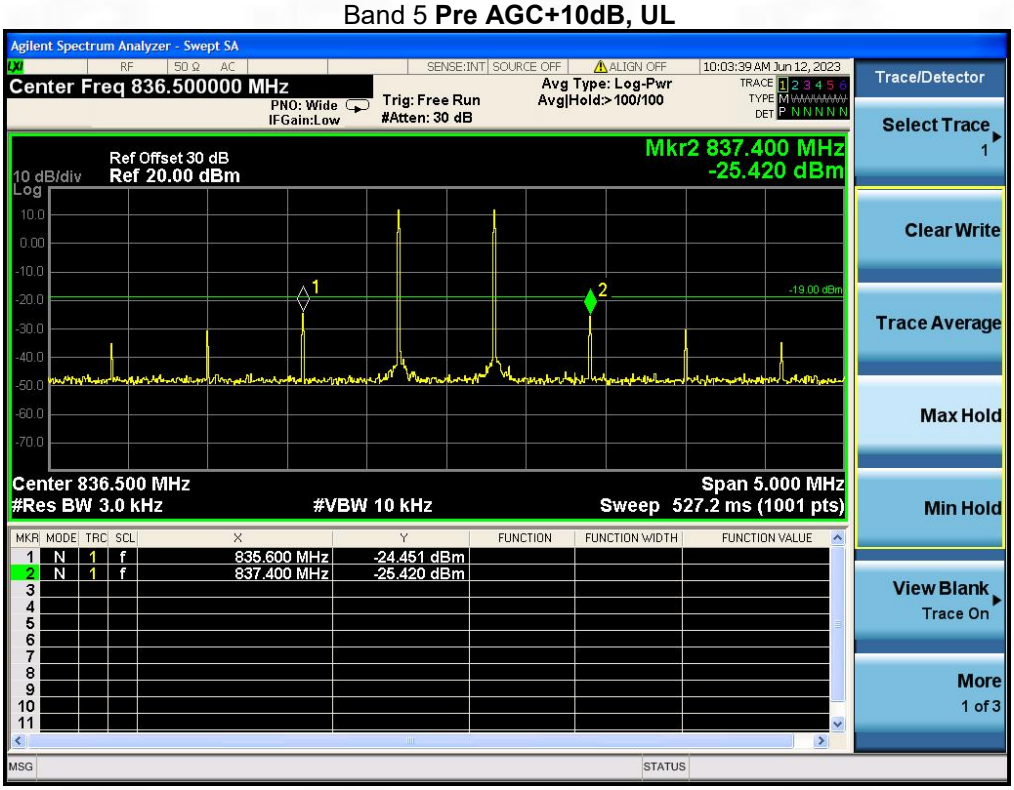
Band 5 **Pre AGC, UL**



Band 5 **Pre AGC+10dB, UL**



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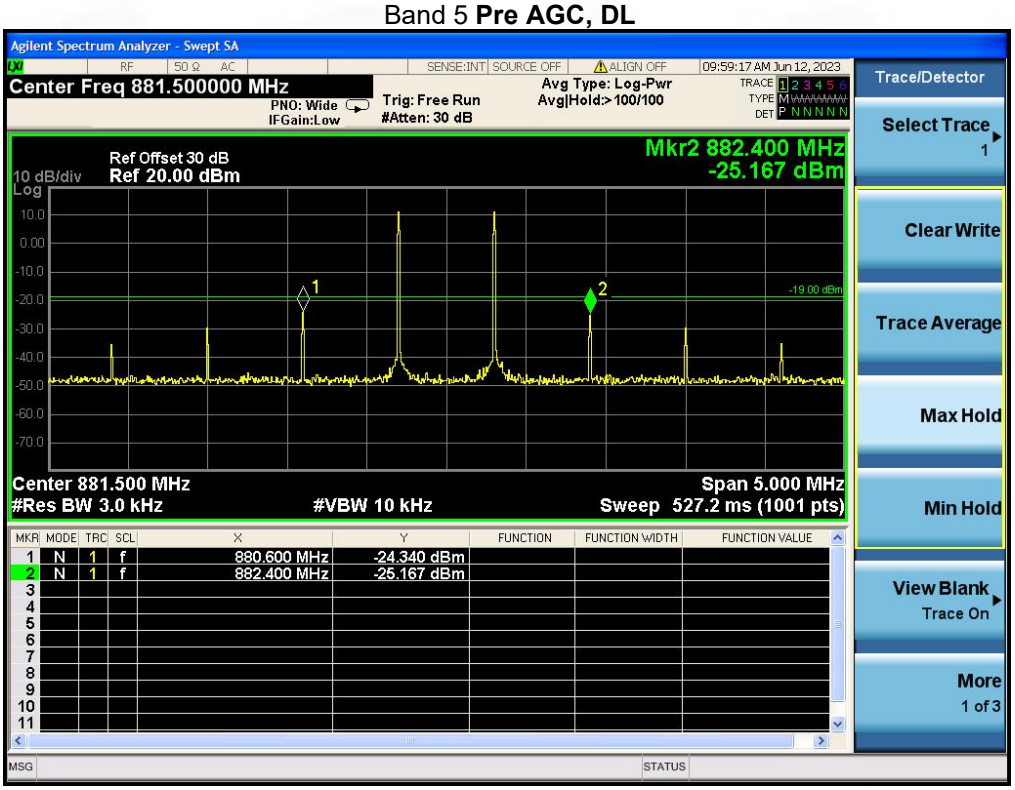
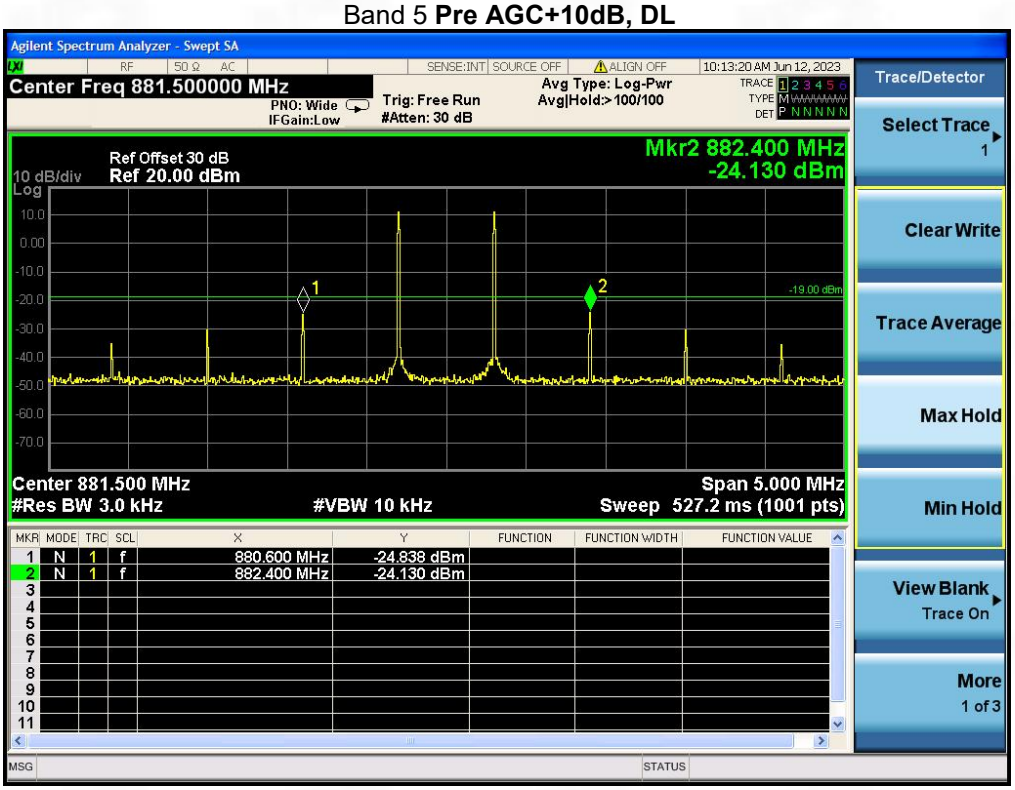
Band 5 **Pre AGC, DL**



Band 5 **Pre AGC+10dB, DL**



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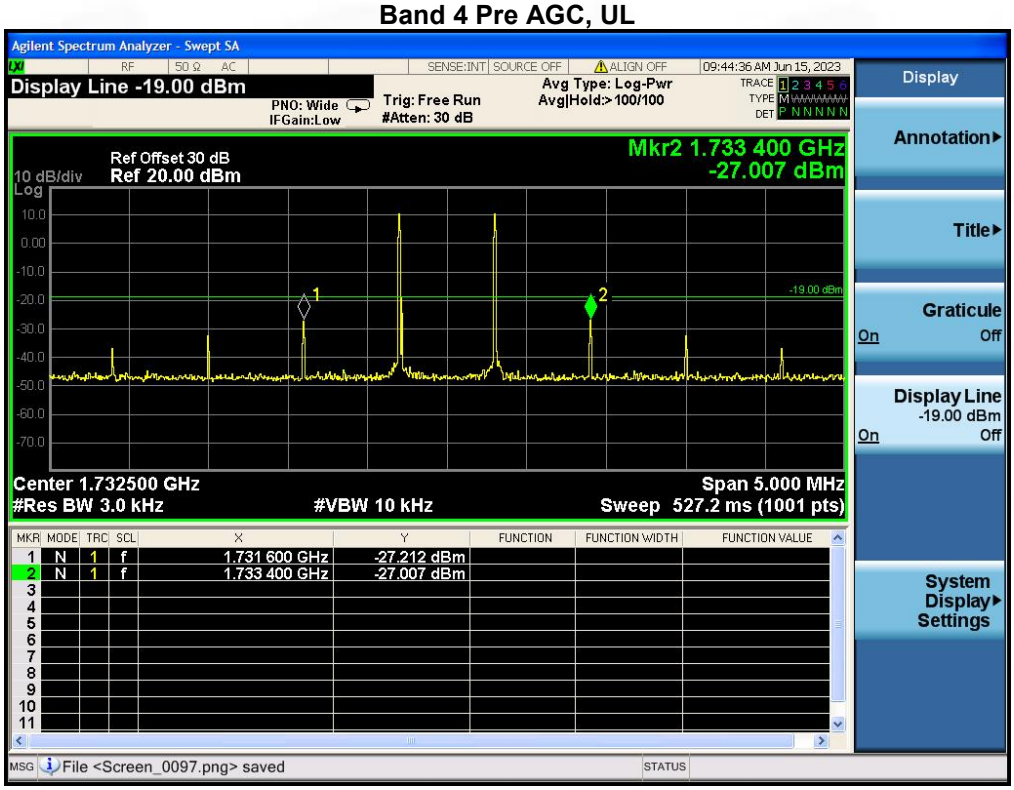
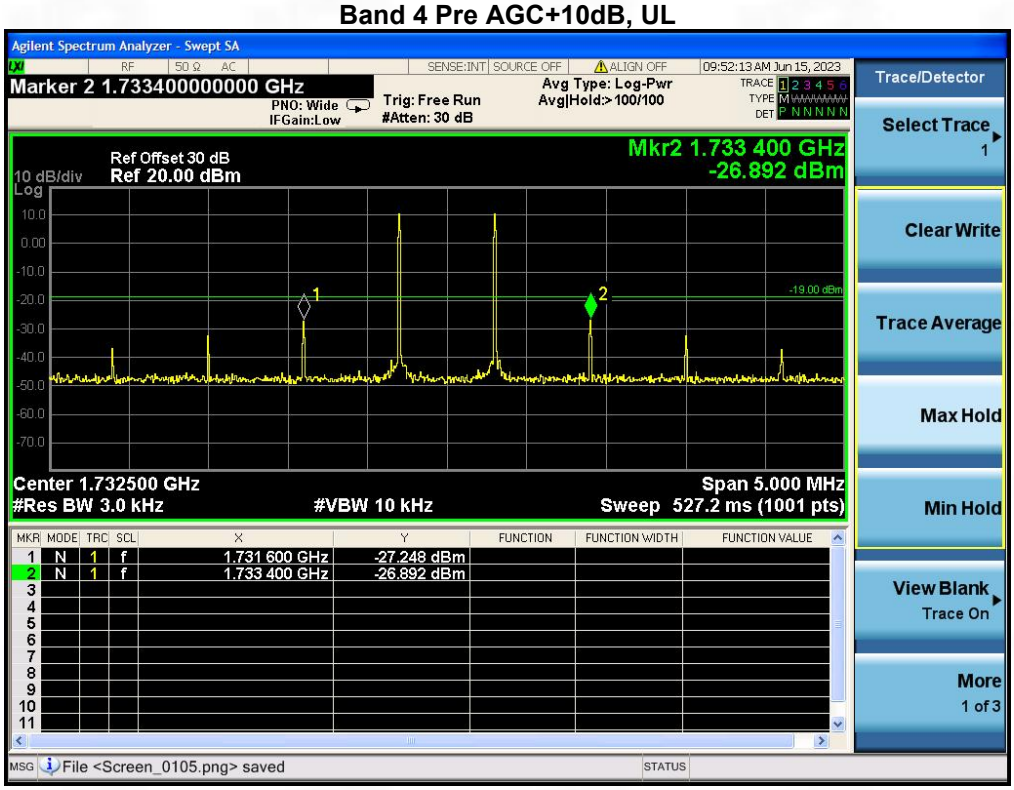
Band 4 Pre AGC, UL



Band 4 Pre AGC+10dB, UL



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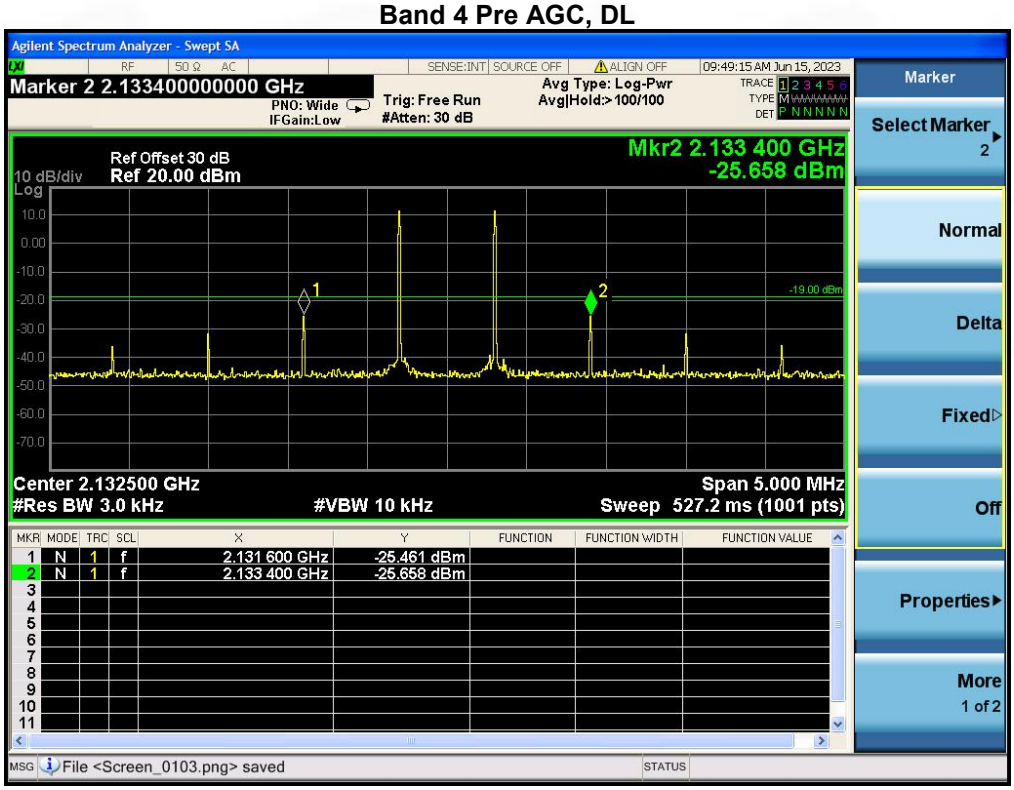
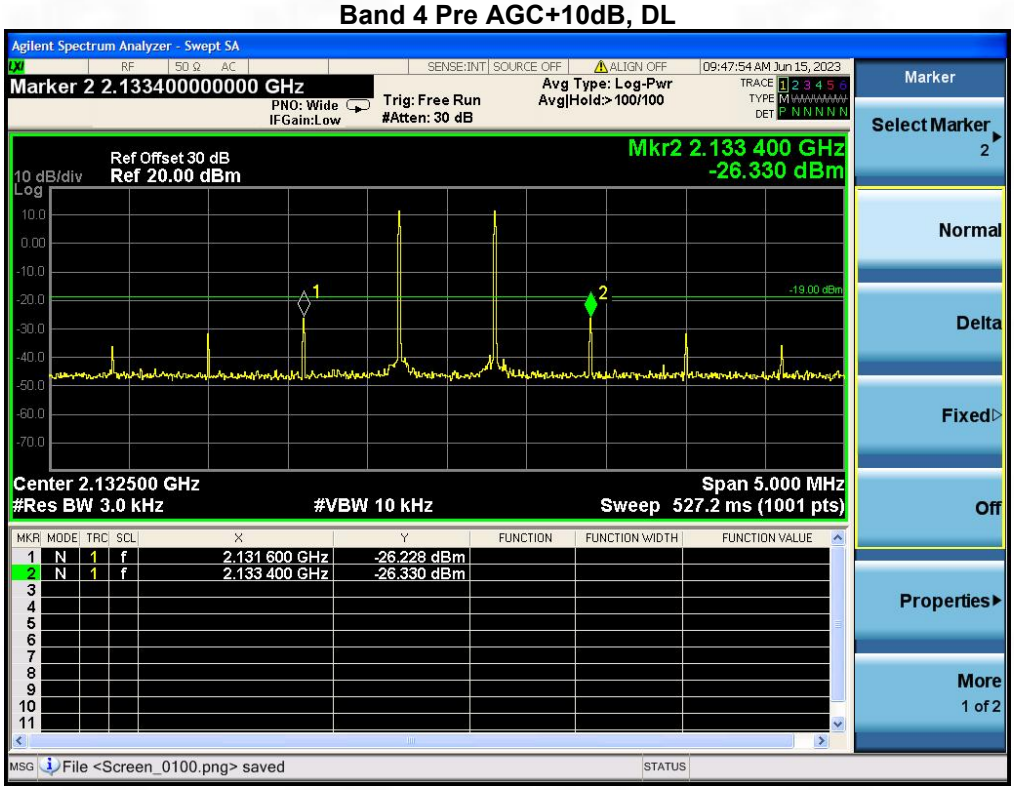
Band 4 Pre AGC, DL



Band 4 Pre AGC+10dB, DL



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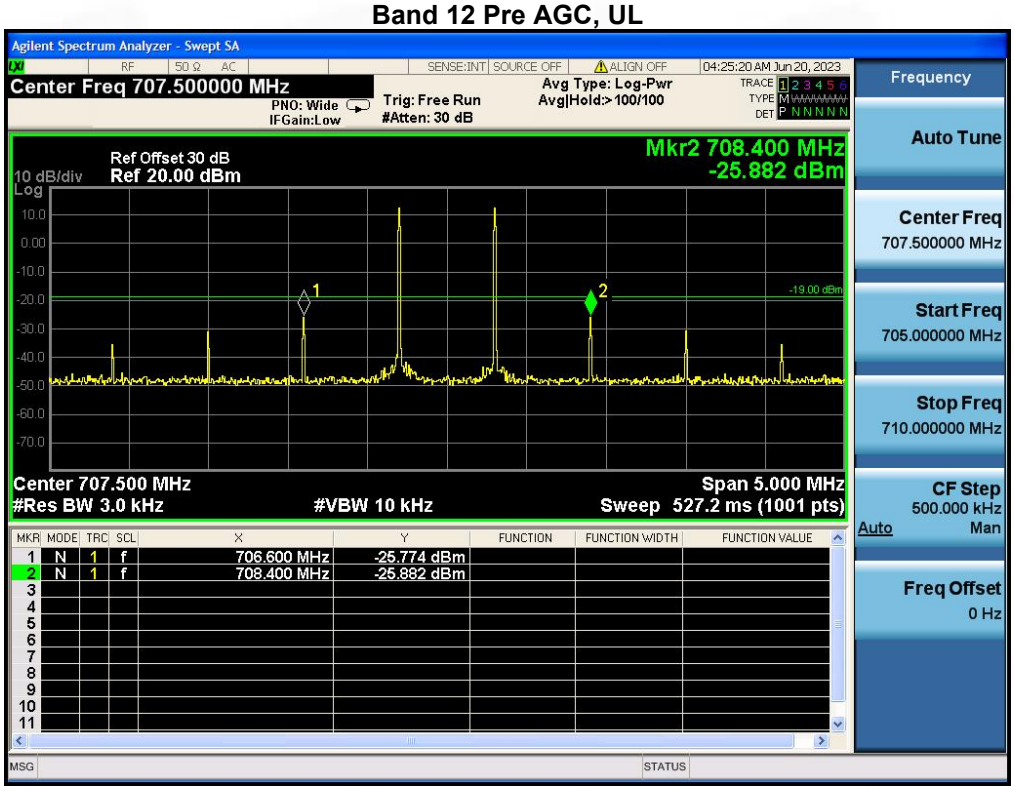
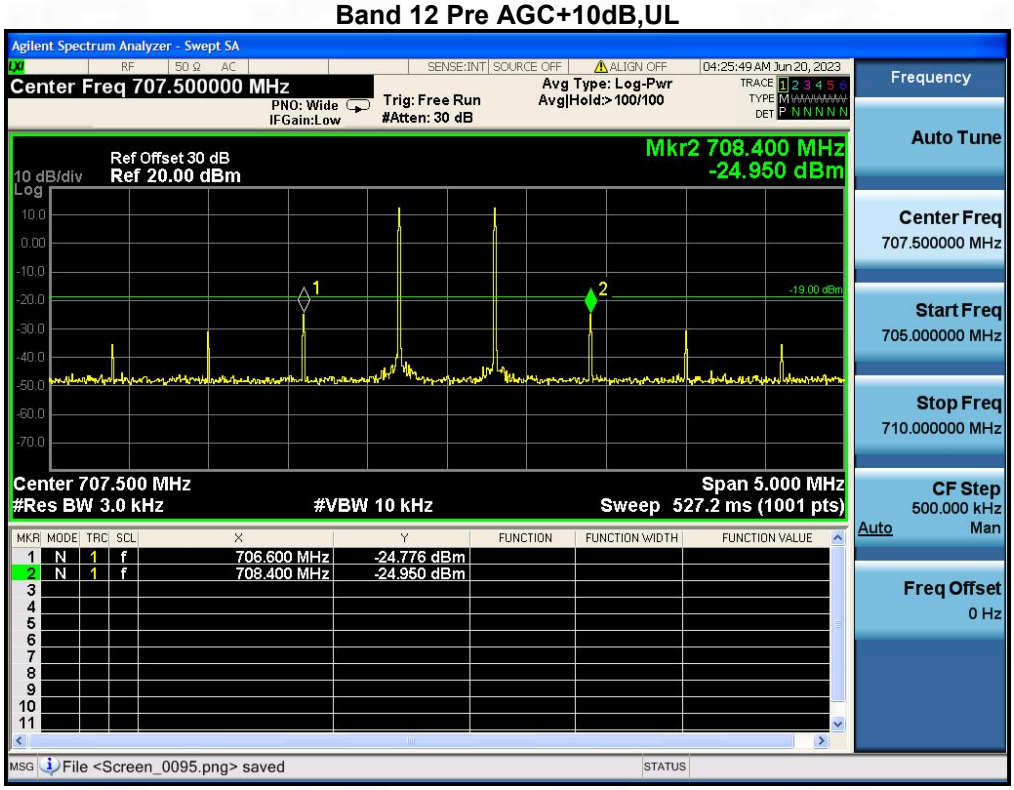
Band 12 Pre AGC, UL



Band 12 Pre AGC+10dB,UL



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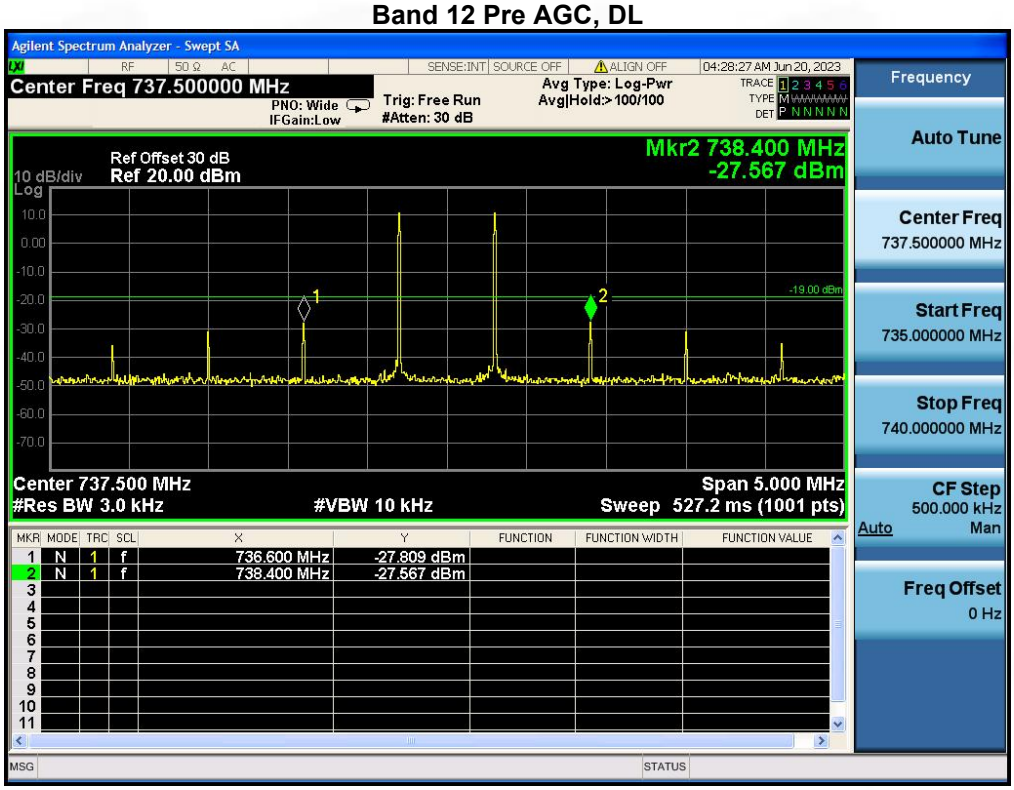
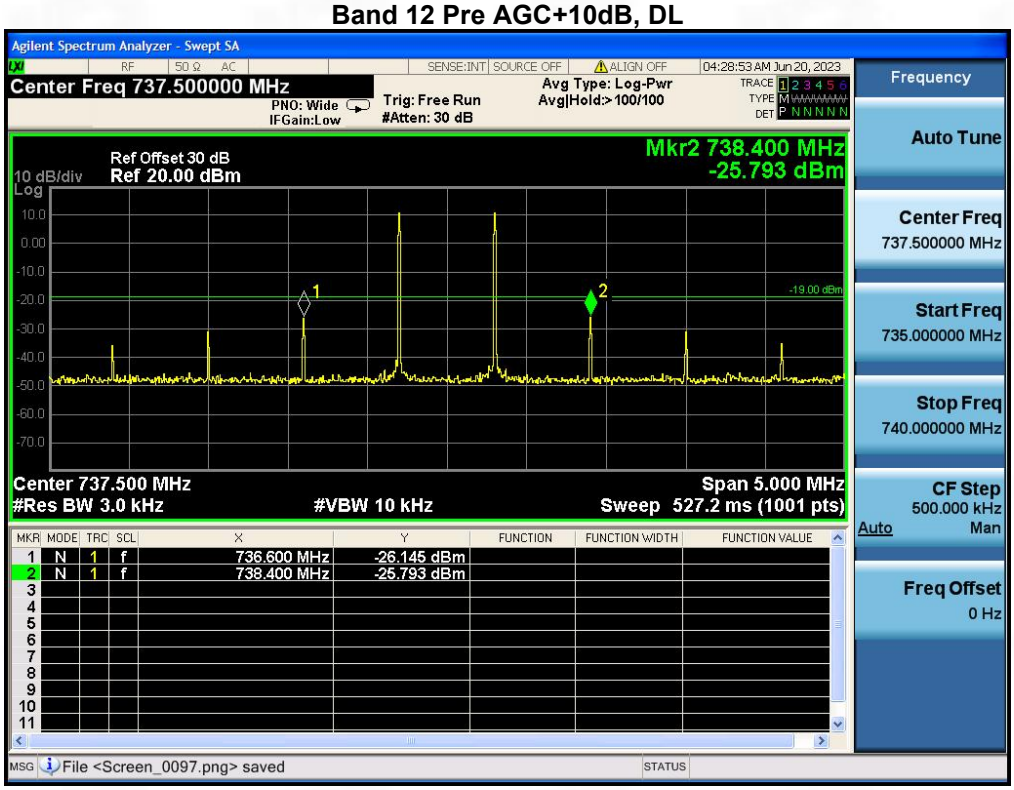
Band 12 Pre AGC, DL



Band 12 Pre AGC+10dB, DL



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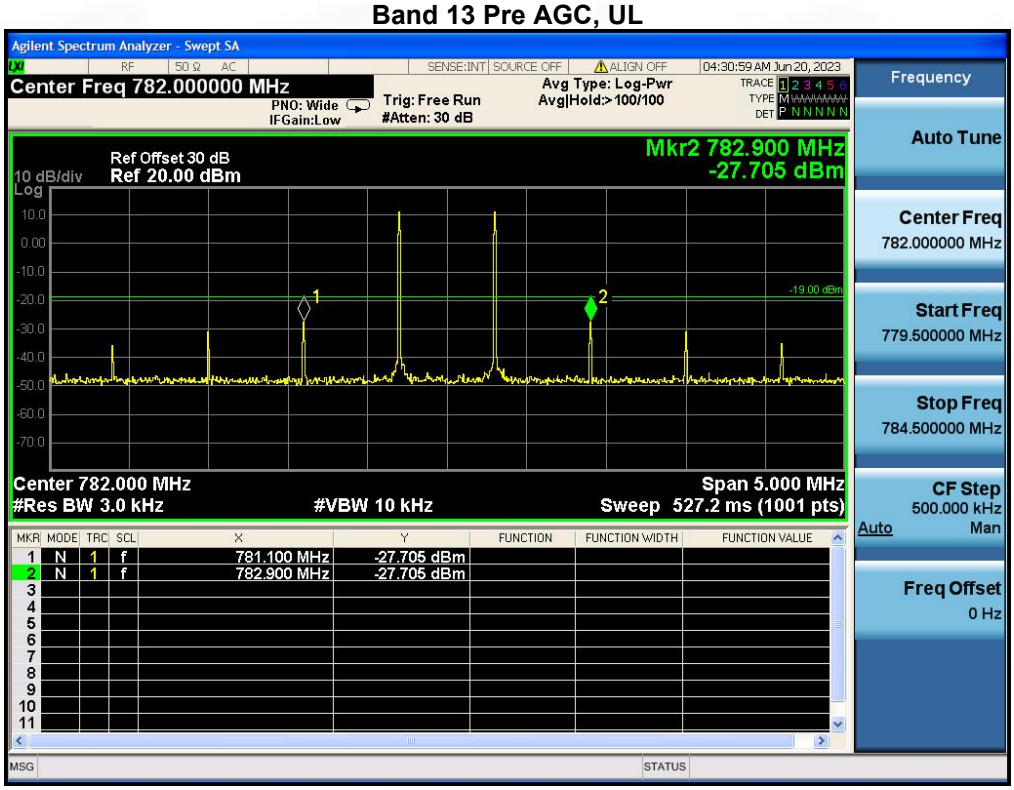
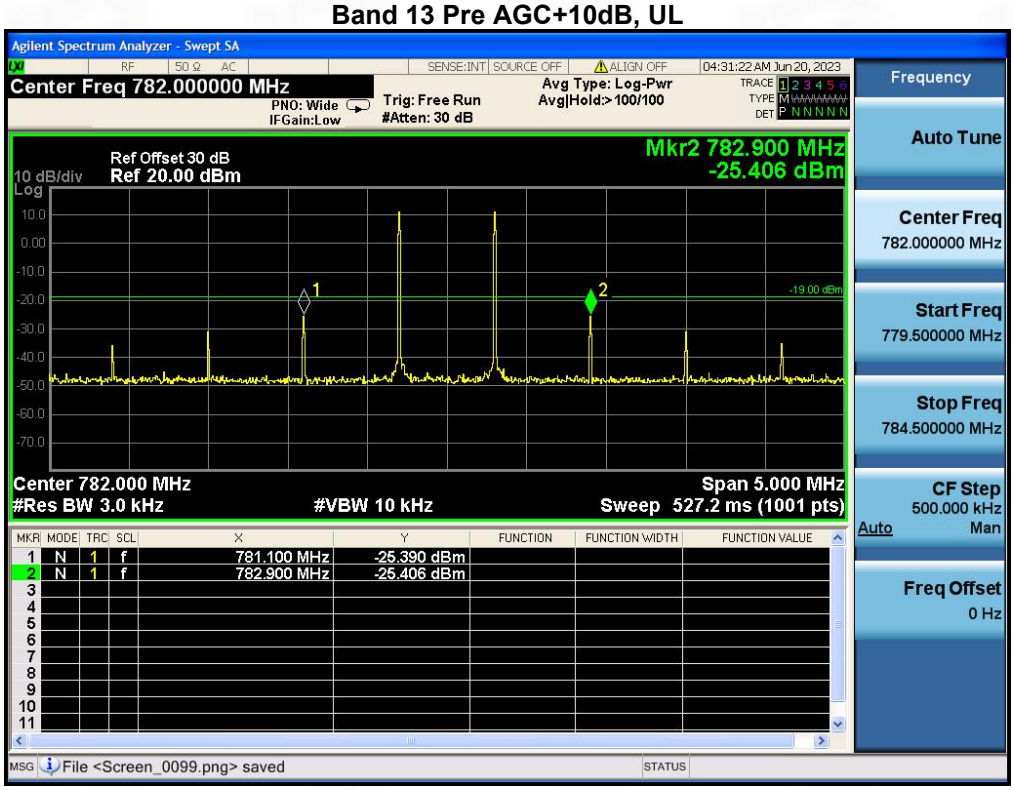
Band 13 Pre AGC, UL



Band 13 Pre AGC+10dB, UL



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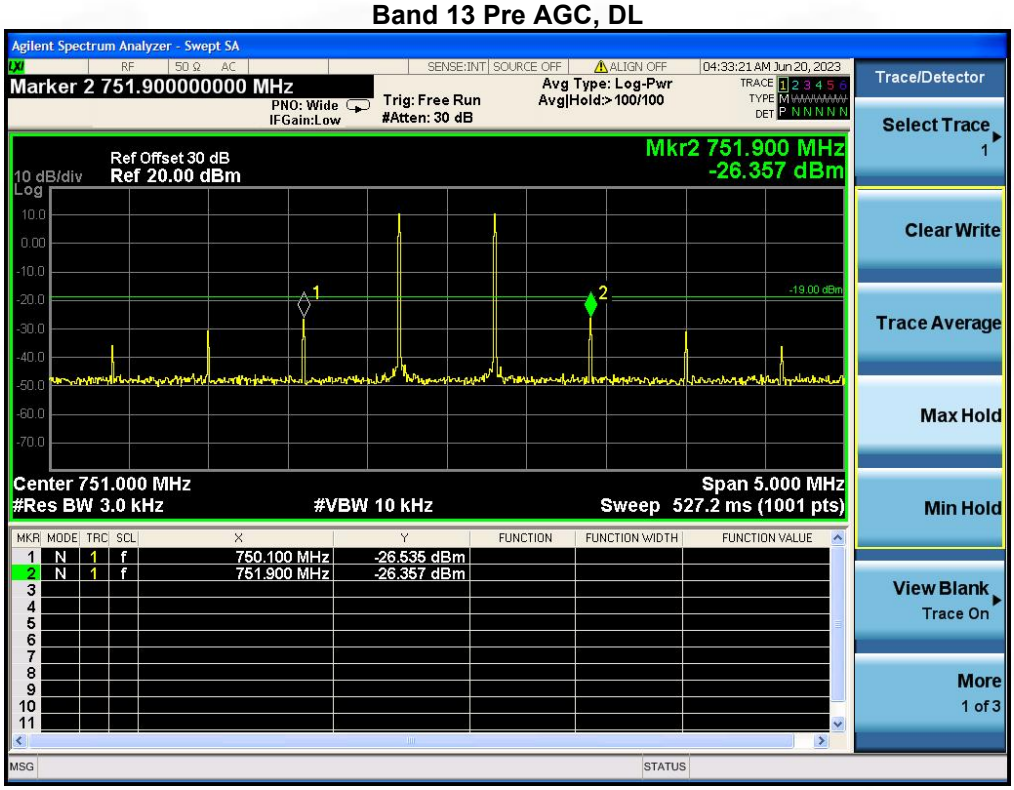
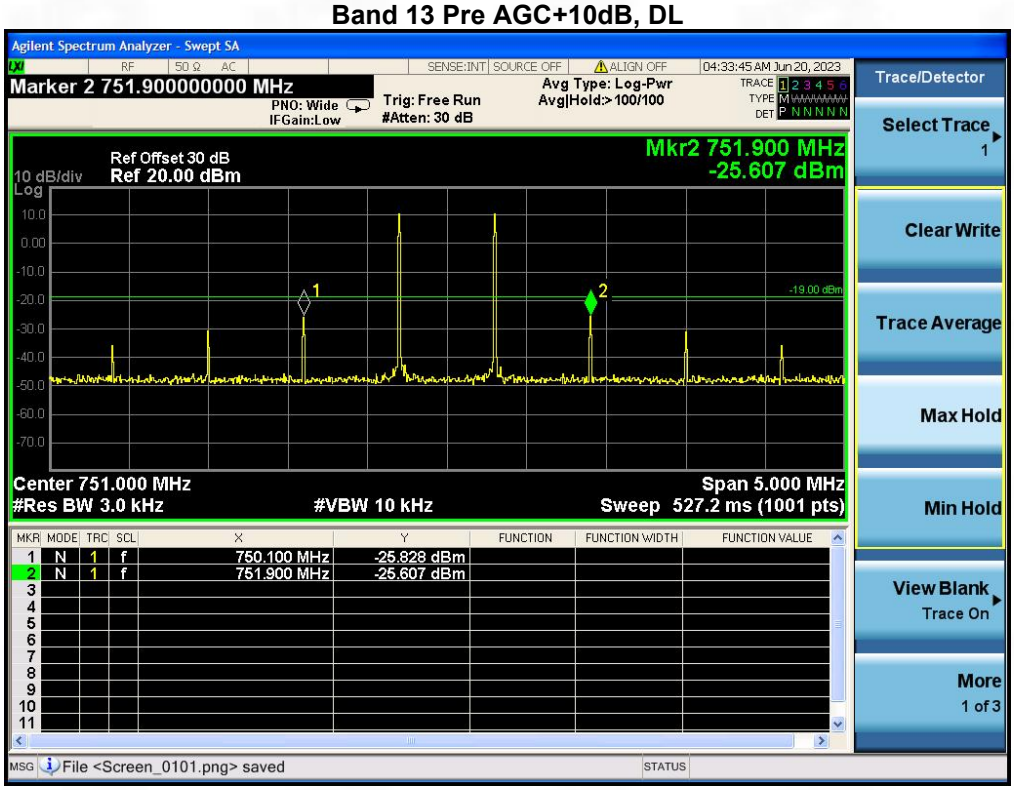
Band 13 Pre AGC, DL



Band 13 Pre AGC+10dB, DL



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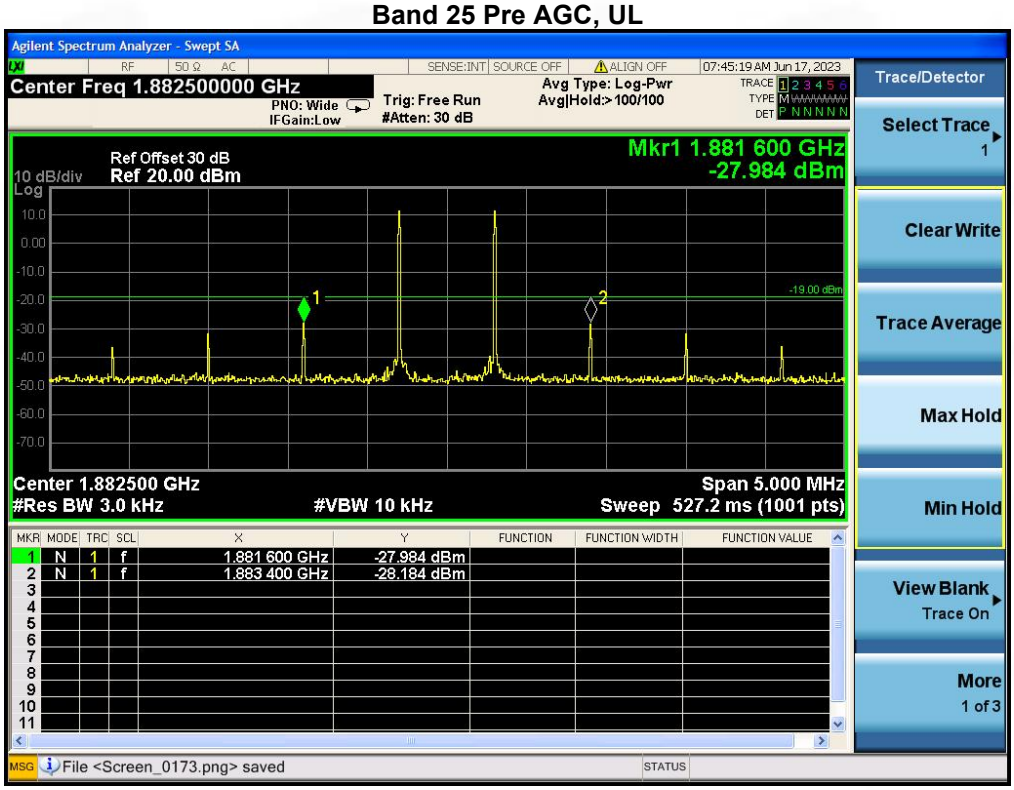
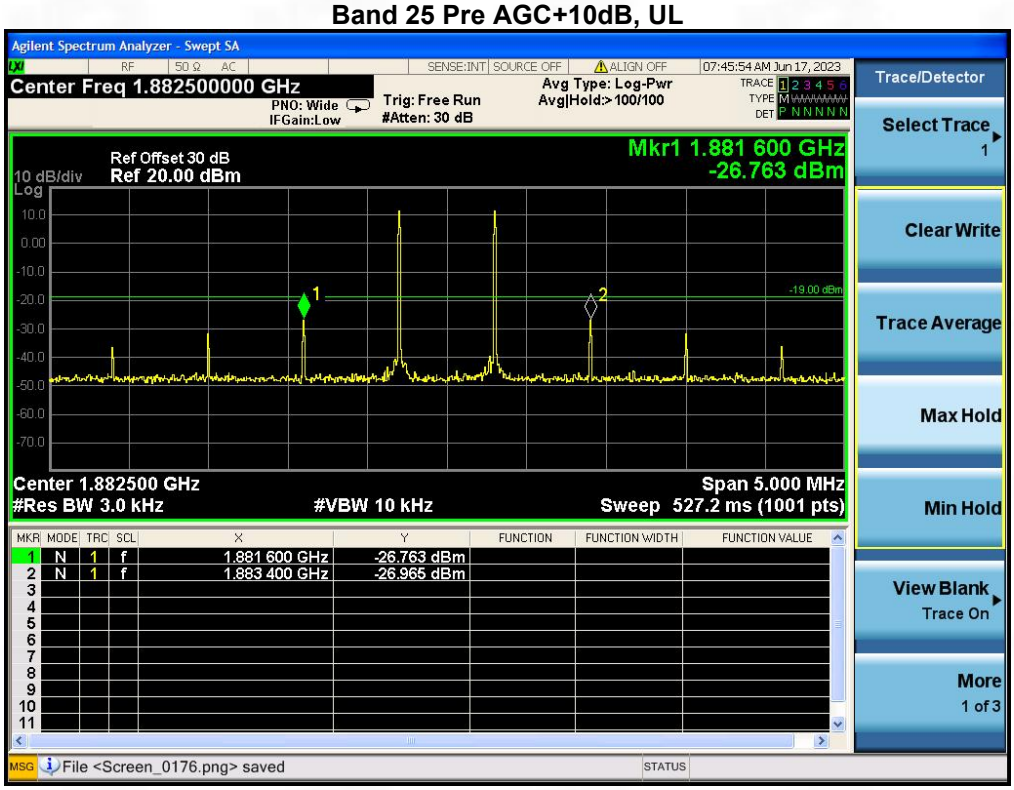
Band 25 Pre AGC, UL



Band 25 Pre AGC+10dB, UL



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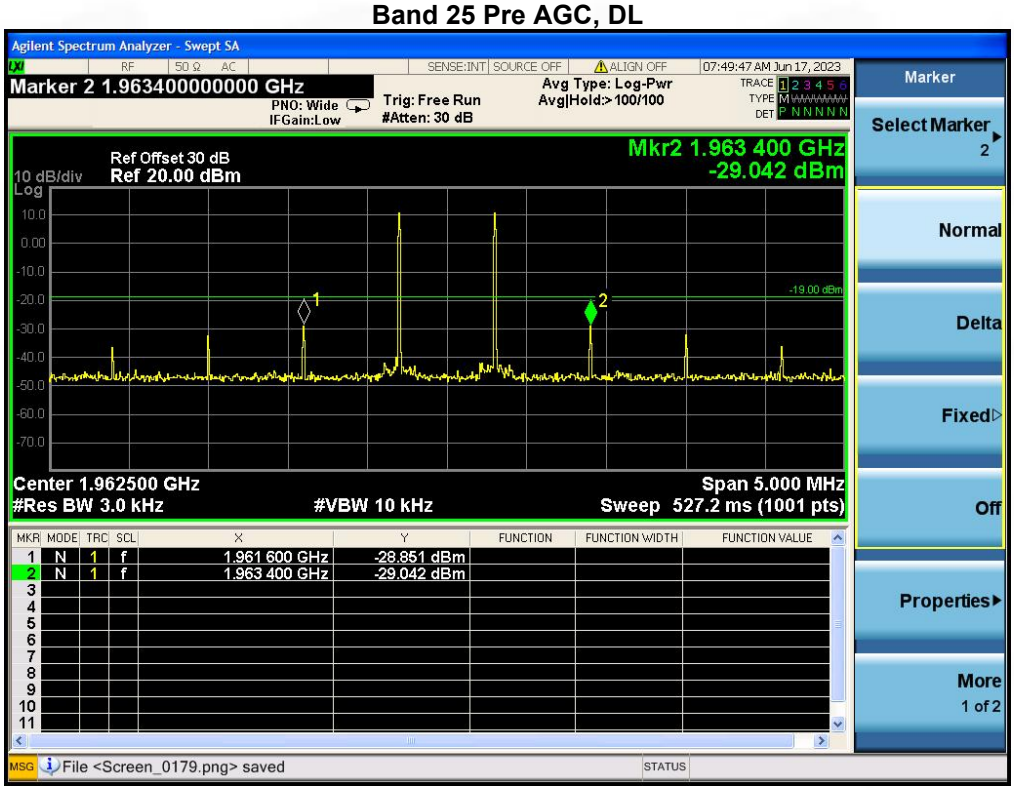
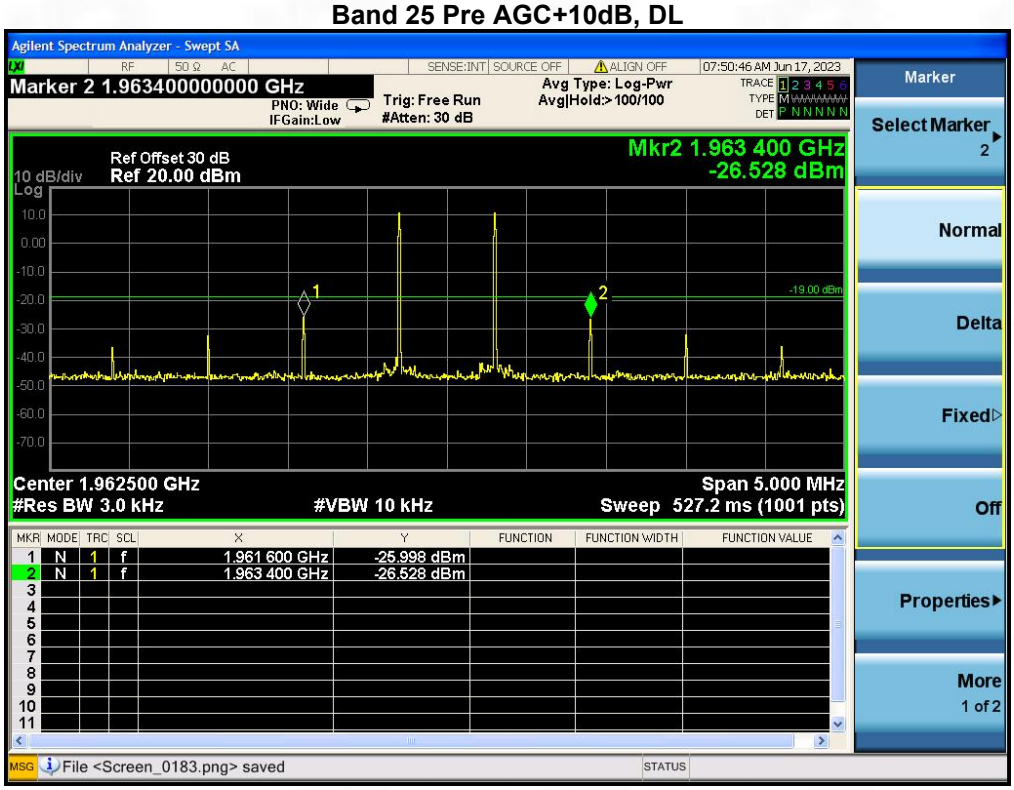
Band 25 Pre AGC, DL



Band 25 Pre AGC+10dB, DL



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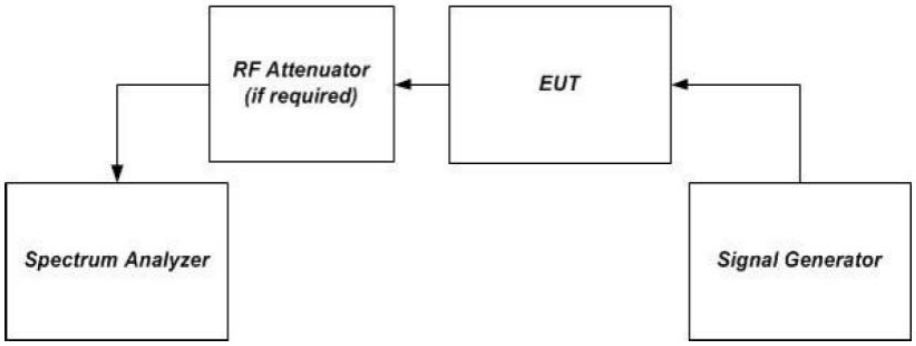
5.5 Out Of Band Emissions

Test Requirement:	This measurement is intended to demonstrate compliance to the limit specified in §20.21(e)(8)(i)(E), which specifies that out-of-band emissions generated by a Wideband Signal Booster shall be at least 6 dB below the mobile emission limit applicable to the supported band of operation. The mobile emission limit applicable to the supported band of operation can be determined from the applicable rule part which is referenced in Annex A for each authorized operating band.
Limit:	-19dBm
Test Setup:	
Procedure:	a) Connect the EUT to the test equipment as shown in figure 1. Begin with the uplink output connected to the spectrum analyzer. b) Configure the signal generator for the appropriate operation for all uplink and downlink bands: 1) GSM: 0.2 MHz from upper and lower band edges. 2) LTE (5 MHz): 2.5 MHz from upper and lower band edges. 3) CDMA: 1.25 MHz from upper and lower band edges, except for cellular band as follows (only the upper and lower frequencies need to be tested): 824.88 MHz, 845.73 MHz, 836.52 MHz, 848.10 MHz, 869.88 MHz, 890.73 MHz, 881.52 MHz, 893.10 MHz. c) Set the signal generator amplitude to the maximum power level prior to AGC similar to the procedures in 7.2.4 to 7.2.6 of power measurement procedure for appropriate modulations. d) Set RBW = measurement bandwidth specified in the applicable rule section for the supported frequency band (see Annex A for cross-reference to applicable rule section). e) Set VBW = 3 X RBW. f) Select the RMS (power averaging) detector. g) Sweep time = auto-couple. h) Set the analyzer start frequency to the upper band/block edge frequency and the stop frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, per applicable rule part. i) Trace average at least 100 traces in power averaging (i.e., RMS) mode. j) Use peak marker function to find the maximum power level. k) Capture the Spectrum Analyzer trace of the power level for inclusion in the test report. l) Increase the signal generator amplitude to the saturation level indicated in 5.4. Ensure that the EUT maintains compliance with the OOBE limits. m) Reset the analyzer start frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as per applicable rule part, and the stop frequency to the lower band/block edge frequency and repeat steps 7.5.10-7.5.12. n) Repeat steps 7.5.2 through 7.5.14 for each uplink and downlink operational

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	band.

5.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

5.5.2 Test Data:

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Band 5 UL Left Side Pre AGC

Band 5 UL Left Side Max Input

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Band 5 UL Right Side Pre AGC

Band 5 UL Right Side Max Input

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Band 5 DL Left Side Pre AGC

Band 5 DL Left Side Max Input

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