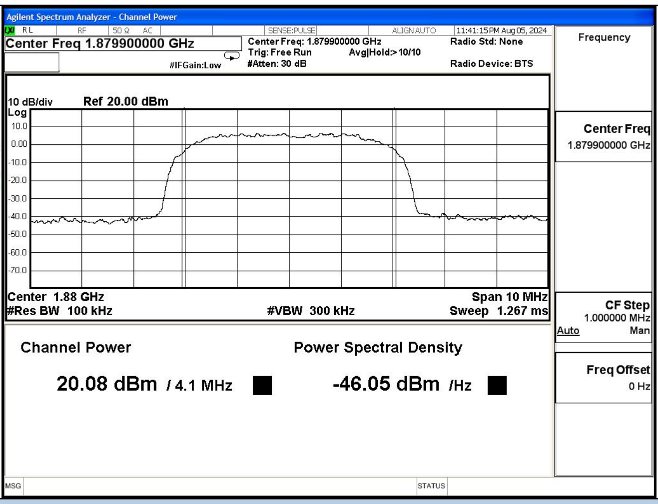
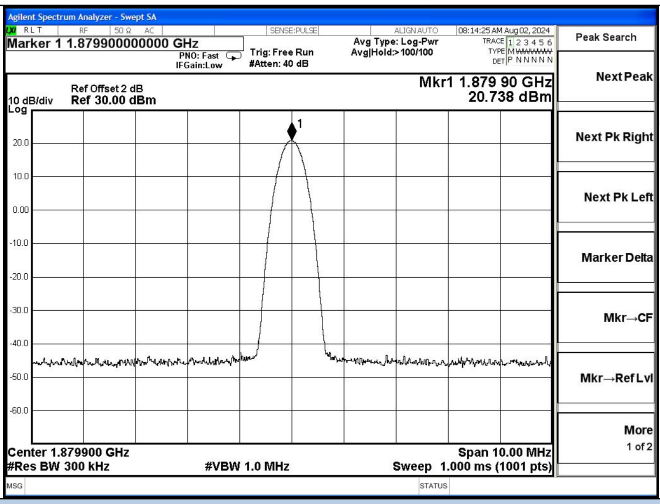
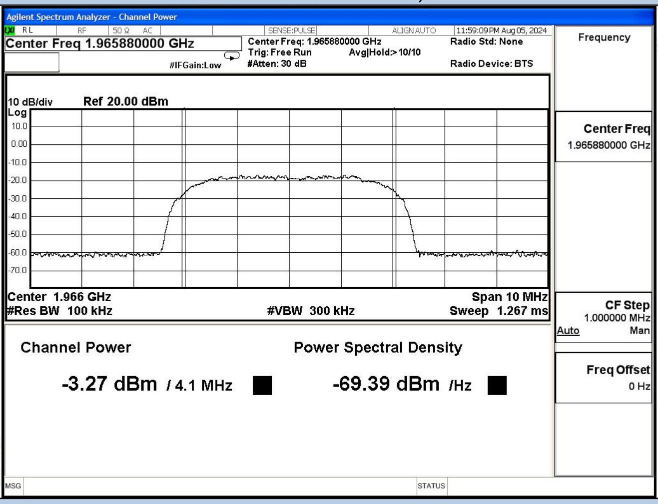


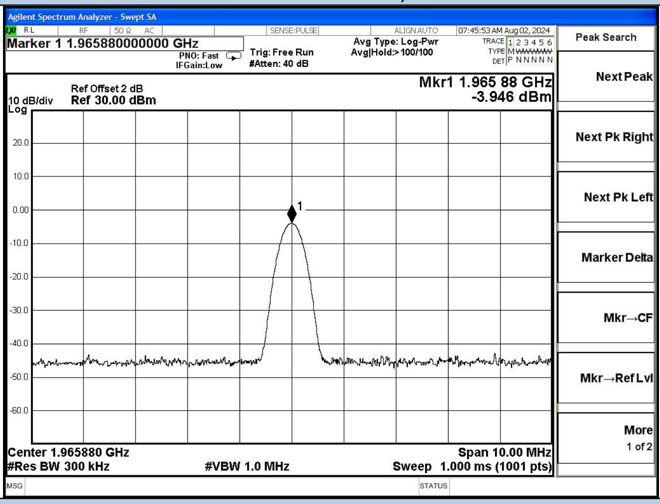
PCS Band AWGN, UL



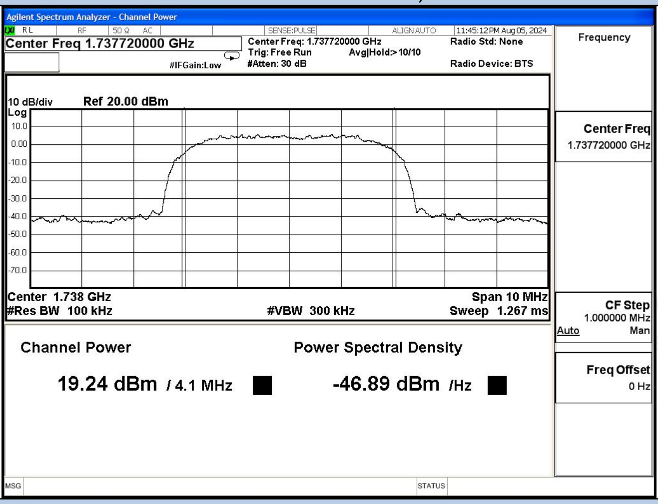
PCS Band CW, UL



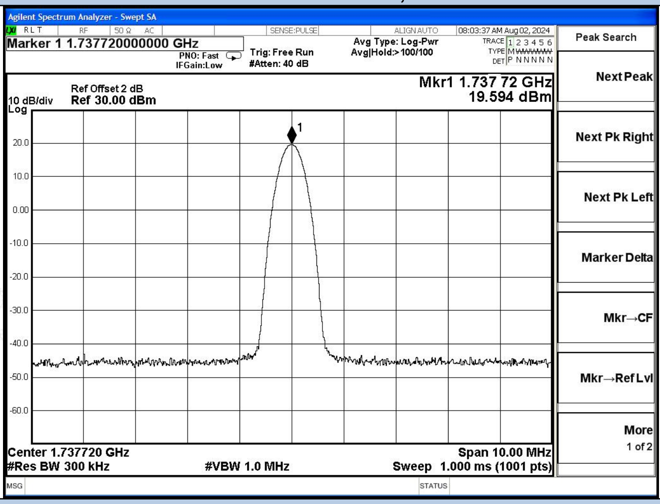
PCS Band AWGN, DL



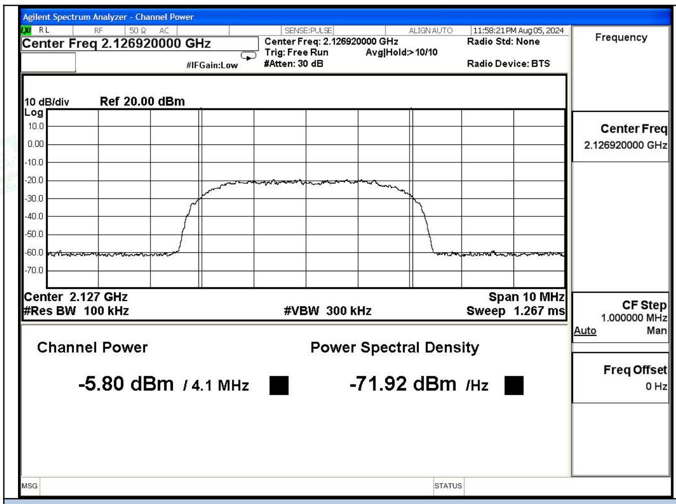
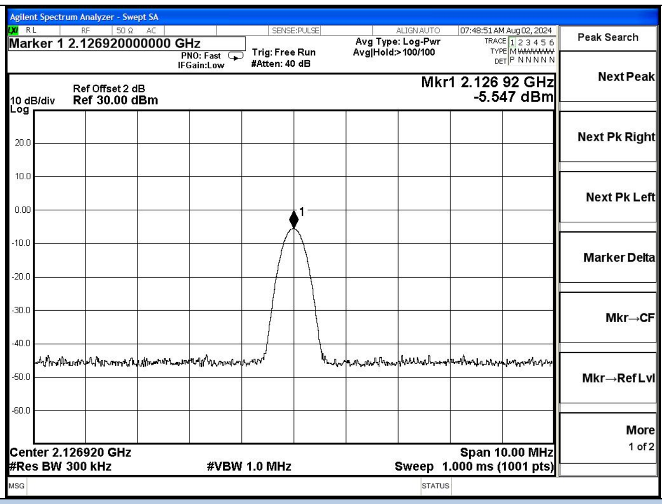
PCS Band CW, DL



AWS Band AWGN, UL



AWS Band CW, UL

	
AWS Band AWGN, DL	AWS Band CW, DL

6.4 Gain Limits and Bidirectional Capability&Variable Gain&Variable Uplink Gain Timing

6.4.1 Applicable Standard

According to§20.21(e)(8)(i)(C)(2) Booster Gain Limits (maximum gain);§20.21(e)(8)(i)(B) Bidirectional Capability (equivalent uplink and downlink gain):

The uplink and downlink maximum gain of a Consumer Booster referenced to its input and output ports shall not exceed the following limits:
(i) Fixed Booster maximum gain shall not exceed 6.5 dB + 20 Log10 (Frequency)
(ii) Where, Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.
(iii) Mobile Booster maximum gain shall not exceed 50 dB when using an inside antenna (e.g., inside a vehicle), 23 dB when using direct contact coupling (e.g., cradle-type boosters), or 15 dB when directly connected (e.g., boosters with a physical connection to the phone).

6.4.2 Test Procedure

According to section 7.3 of KDB 935210 D03 Signal Booster Measurement v04r04:

This subclause provides guidance for the calculation of the maximum gain, based on the results obtained from the 7.1 and 7.2 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, i.e., within 9 dB.
a) Calculate 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 result pairs for all signal types used in 7.2 in the following equation to obtain the maximum gain, G:

$$G\ (dB) = POUT(dBm) - PIN(dBm).$$

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.
d) Provide tabulated results in the test report

6.4.3 Test Data

Temperature	23.6℃	Humidity	52.3%
Test Engineer	Nick Peng	Test Mode	Transmitting

Max Gain							
Mode	Operation Band	Signal Type	Pre AGC Input Level (dBm)	Conducted Output Level (dBm)	Max Gain (dB)	Gain Limit (dB)	Verdict
Uplink	Lower 700 Band	CW	-26	18.569	44.27	≤50.0	PASS
		AWGN	-26	18.270	44.31		PASS
	Upper 700 Band	CW	-26	18.239	44.03		PASS
		AWGN	-26	18.530	44.66		PASS
	Cellular Band	CW	-24	19.388	43.69		PASS
		AWGN	-24	19.250	43.26		PASS
	PCS Band	CW	-16	20.738	36.47		PASS
		AWGN	-16	20.080	36.34		PASS
	AWS Band	CW	-19	19.594	38.12		PASS
		AWGN	-20	19.240	38.77		PASS
Downlink	Lower 700 Band	CW	-50	-5.748	43.91		PASS
		AWGN	-48	-4.810	43.20		PASS
	Upper 700 Band	CW	-49	-5.533	43.39		PASS
		AWGN	-49	-5.290	43.24		PASS
	Cellular Band	CW	-50	-7.478	42.15		PASS
		AWGN	-50	-7.900	42.36		PASS
	PCS Band	CW	-48	-3.946	43.91		PASS
		AWGN	-46	-3.270	43.05		PASS
	AWS Band	CW	-47	-5.547	41.19		PASS
		AWGN	-48	-5.800	41.70		PASS

Uplink Gain VS Downlink Gain						
Band	Signal Type	Uplink Gain (dB)	Downlink Gain (dB)	Caculated (dB)	Limit (dB)	Verdict
Lower 700 Band	CW	44.27	43.91	0.36	≤9	PASS
	AWGN	44.31	43.20	1.11		PASS
Upper 700 Band	CW	44.03	43.39	0.64		PASS
	AWGN	44.66	43.24	1.42		PASS
Cellular Band	CW	43.69	42.15	1.54		PASS
	AWGN	43.26	42.36	0.9		PASS
PCS Band	CW	36.47	43.91	-7.44		PASS
	AWGN	36.34	43.05	-6.71		PASS
AWS Band	CW	38.12	41.19	-3.07		PASS
	AWGN	38.77	41.70	-2.93		PASS

6.4.4 Variable Gain Test Procedure

According to §20.21(e)(8)(i)(C)(1) Booster Gain Limits (variable gain); §20.21(e)(8)(i)(H) Transmit Power Off Mode (uplink gain):

The uplink gain in dB of a consumer booster referenced to its input and output ports shall not exceed −34 dB - RSSI + MSCL.
(i) Where RSSI is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation. RSSI is expressed in negative dB units relative to 1 mW.
(ii) Where MSCL (Mobile Station Coupling Loss) is the minimum coupling loss in dB between the wireless device and input port of the consumer booster. MSCL must be calculated or measured for each band of operation and provided in compliance test reports.

According to section 7.9.1 of KDB 935210 D03 Signal Booster Measurement v04r04:

a) Connect the EUT to the test equipment as shown in Figure 5 with the uplink output (donor) port connected to signal generator #1. Affirm that the coupled path of the RF coupler is connected to the spectrum analyzer.
b) Configure downlink signal generator #1 for AWGN operation with a 99% OBW of 4.1 MHz, tuned to the center of the operational band.
c) Set the power level and frequency of signal generator #2 to a value that is 5 dB below the AGC level determined from 7.2. The signal type is AWGN with a 99% OBW of 4.1 MHz.
d) Set RBW = 100 kHz.
e) Set VBW ≥ 300 kHz.
f) Select the CHANNEL POWER measurement mode.
g) Select the power averaging (rms) detector.
h) Affirm that the number of measurement points per sweep ≥ (2 span)/RBW.
i) Sweep time = auto couple or as necessary (but no less than auto couple value).
j) Trace average at least 10 traces in power averaging (i.e., rms) mode.
k) Measure the maximum channel power and compute maximum gain when varying the signal generator #1 output to a level from −90 dBm to −20 dBm, as measured at the input port (i.e., downlink signal level at the booster donor port node of Figure 5), in 1 dB steps inside the RSSI-dependent region, and 10 dB steps outside the RSSI-dependent region. Report the six values closest to the limit, including at least two points from within the RSSI-dependent region of operation. See gain limit in charts in Appendix D for uplink gain requirements. Additionally, document that the EUT provides equivalent uplink and downlink gain, and when operating in shutoff mode that the uplink and downlink gain is within the transmit power off mode gain limits.
l) Repeat 7.9.1b) to 7.9.1k) for all operational uplink bands.

6.4.5 Variable uplink gain timing Test Procedure

According to section 7.9.2 (Variable uplink gain timing) of KDB 935210 D03 Signal Booster Measurement v04r04:

m) Connect the EUT to the test equipment as shown in Figure 5 with the uplink output (donor) port connected to signal generator #1. Affirm that the coupled path of the RF coupler is connected to the spectrum analyzer.
n) Configure downlink signal generator #1 for AWGN operation with a 99% OBW of 4.1 MHz, tuned to the center of the operational band.
o) Set the power level and frequency of signal generator #2 to a value that is 5 dB below the AGC level determined from 7.2. The signal type is AWGN with a 99% OBW of 4.1 MHz.
p) Set RBW = 100 kHz.
q) Set VBW ≥ 300 kHz.
r) Select the CHANNEL POWER measurement mode.
s) Select the power averaging (rms) detector.
t) Affirm that the number of measurement points per sweep ≥ (2 span)/RBW.
u) Sweep time = auto couple or as necessary (but no less than auto couple value).
v) Trace average at least 10 traces in power averaging (i.e., rms) mode.
w) Measure the maximum channel power and compute maximum gain when varying the signal generator #1 output to a level from −90 dBm to −20 dBm, as measured at the input port (i.e., downlink signal level at the booster donor port node of Figure 5), in 1 dB steps inside the RSSI-dependent region, and 10 dB steps outside the RSSI-dependent region. Report the six values closest to the limit, including at least two points from within the RSSI-dependent region of operation. See gain limit in charts in Appendix D for uplink gain requirements. Additionally, document that the EUT provides equivalent uplink and downlink gain, and when operating in shutoff mode that the uplink and downlink gain is within the transmit power off mode gain limits.
x) Repeat 7.9.1b) to 7.9.1k) for all operational uplink bands.

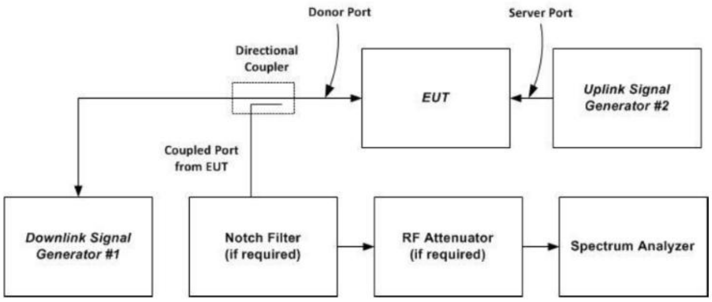


Figure 5 – Variable gain instrumentation test setup

6.4.6 Test data

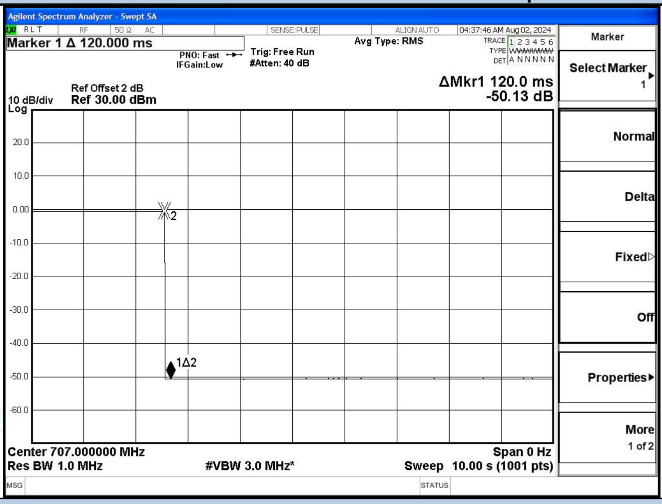
Temperature	23.6℃	Humidity	52.3%
Test Engineer	Nick Peng	Test Mode	Transmitting

Variable uplink gain

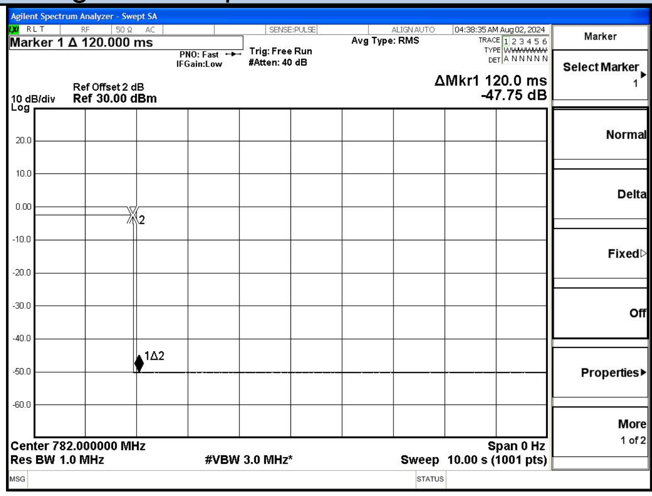
Operation Band	RSSI (dBm)	P_{in} (dBm)	P_{out} (dBm)	Measured Value(dB)	MSCL	Limit (dB)	Results
Lower 700 Band	-80.0	-40.0	4.31	44.31	40.29	50.0	PASS
	-70.0	-40.0	4.31	44.31	40.29	50.0	PASS
	-63.0	-40.0	-1.76	38.24	40.29	49.0	PASS
	-62.0	-40.0	-0.98	39.02	40.29	48.0	PASS
	-20.0	-40.0	-39.64	0.36	40.29	20.0	PASS
	-10.0	-40.0	-39.53	0.47	40.29	20.0	PASS
Upper 700 Band	-80.0	-38.0	6.66	44.66	41.22	50.0	PASS
	-70.0	-38.0	6.66	44.66	41.22	50.0	PASS
	-63.0	-38.0	2.13	40.13	41.22	49.0	PASS
	-62.0	-38.0	-0.39	37.61	41.22	48.0	PASS
	-20.0	-38.0	-37.35	0.65	41.22	20.0	PASS
	-10.0	-38.0	-37.48	0.52	41.22	20.0	PASS
Cellular Band	-80.0	-39.0	4.69	43.69	37.65	50.0	PASS
	-70.0	-39.0	4.69	43.69	37.65	50.0	PASS
	-63.0	-39.0	1.26	40.26	37.65	49.0	PASS
	-62.0	-39.0	0.77	39.77	37.65	48.0	PASS
	-20.0	-39.0	-38.84	0.16	37.65	20.0	PASS
	-10.0	-39.0	-38.75	0.25	37.65	20.0	PASS
PCS Band	-80.0	-41.0	-4.53	36.47	49.01	50.0	PASS
	-70.0	-41.0	-4.53	36.47	49.01	50.0	PASS
	-63.0	-41.0	-7.98	33.02	49.01	49.0	PASS
	-62.0	-41.0	-8.84	32.16	49.01	48.0	PASS
	-20.0	-41.0	-40.34	0.66	49.01	20.0	PASS
	-10.0	-41.0	-40.66	0.34	49.01	20.0	PASS
AWS Band	-80.0	-40.0	-1.23	38.77	47.28	50.0	PASS
	-70.0	-40.0	-1.23	38.77	47.28	50.0	PASS
	-63.0	-40.0	-2.36	37.64	47.28	49.0	PASS
	-62.0	-40.0	-4.09	35.91	47.28	48.0	PASS
	-20.0	-40.0	-39.85	0.15	47.28	20.0	PASS
	-10.0	-40.0	-39.57	0.43	47.28	20.0	PASS

Variable Uplink Gain Timing			
Operation Band	Measured (s)	Limit (s)	Result
Lower 700 Band	0.120	3.0	PASS
Upper 700 Band	0.120	3.0	PASS
Cellular Band	0.120	3.0	PASS
PCS Band	0.120	3.0	PASS
AWS Band	0.120	3.0	PASS

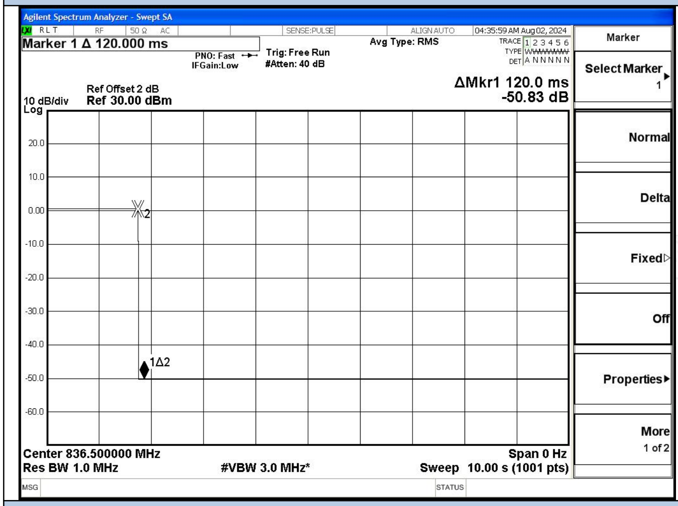
Variable Uplink Gain Timing-Test Graphs



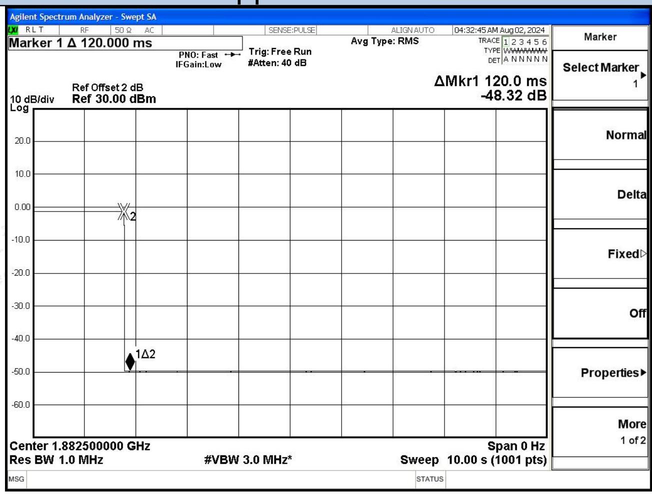
Lower 700 Band



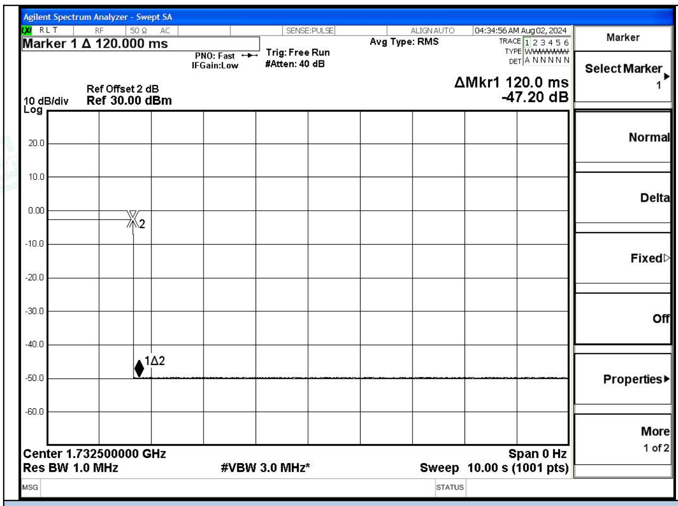
Upper 700 Band



Cellular Band



PCS Band

Agilent Spectrum Analyzer - Swept SA Marker 1 Δ 120.000 ms PNO: Fast IFGain:Low Trig: Free Run #Atten: 40 dB Avg Type: RMS 04:34:56 AM Aug 02, 2024 ΔMkr1 120.0 ms -47.20 dB Ref Offset 2 dB 10 dB/div Ref 30.00 dBm Log 1Δ2 Center 1.732500000 GHz Span 0 Hz Res BW 1.0 MHz #VBW 3.0 MHz* Sweep 10.00 s (1001 pts) Marker Select Marker 1 Normal Delta Fixed Off Properties More 1 of 2	
AWS Band	

6.5 Anti-Oscillation

6.5.1 Applicable Standard

According to §20.21(e)(8)(ii)(A) Anti-Oscillation:

1. Consumer boosters must be able to detect and mitigate (i.e., by automatic gain reduction or shut down), any oscillations in uplink and downlink bands. Oscillation detection and mitigation must occur automatically within 0.3 seconds in the uplink band and within 1 second in the downlink band. In cases where oscillation is detected, the booster must continue mitigation for at least one minute before restarting. After five such restarts, the booster must not resume operation until manually reset.
2. Use of two EUTs is permitted for this measurement, which can greatly reduce the test time required. One EUT shall operate in a normal mode, and the second EUT shall operate in a test mode that is capable of disabling the uplink inactivity function and/or allows a reduction to 5 seconds of the time between restarts.

The procedures in 7.11.3 and 7.11.4 do not apply for devices that operate only as direct-connection mobile boosters having gain of less than or equal to 15 dB.

6.5.2 Test Procedure

Oscillation restart tests

According to section 7.11.2 of KDB 935210 D03 Signal Booster Measurement v04r04:

a) Connect the normal-operating mode EUT to the test equipment as shown in Figure 6 beginning with the spectrum analyzer on the uplink output (donor) port. Confirm that the RF coupled path is connected to the spectrum analyzer.
NOTE–The band-pass filter shall provide sufficient out-of-band rejection to prevent oscillations from occurring in bands not under test.
b) Spectrum analyzer settings:
   1) Center frequency at the center of the band under test
   2) Span equal or slightly exceeding the width of the band under test
   3) Continuous sweep, max-hold
   4) RBW≧1 MHz, VBW > 3 RBW
c) Decrease the variable attenuator until the spectrum analyzer displays a signal within the band under test. Using a marker, identify the approximate center frequency of this signal on the max-hold display, increase the attenuation by 10 dB, then reset the EUT (e.g., cycle ac/dc power).
d) Repeat 7.11.2c) twice to ensure that the center of the signal created by the booster remains within 250 kHz of the spectrum analyzer display center frequency. If the frequency of the signal is unstable, confirm that the spectrum analyzer display is centered between the frequency extremes observed. If the signal is wider than 1 MHz, ensure that the spectrum analyzer display is centered on the signal by increasing the RBW. Reset the EUT (e.g., cycle ac/dc power) after each oscillation event, if necessary. Set the spectrum analyzer sweep trigger level to just below the peak amplitude of the displayed EUT oscillation signal.
e) Set the spectrum analyzer to zero-span, with a sweep time of 5 seconds, and single-sweep with max-hold. The spectrum analyzer sweep trigger level in this and the subsequent steps shall be the level identified in 7.11.2d).
f) Decrease the variable attenuator until the spectrum analyzer sweep is triggered, increase the attenuation by 10 dB, then reset the EUT (e.g., cycle ac/dc power).

g) Reset the zero-span trigger of the spectrum analyzer, then repeat 7.11.2f) twice to ensure that the spectrum analyzer is reliably triggered, resetting the EUT (e.g., cycle ac/dc power) after each oscillation event if necessary.
h) Reset the zero-span sweep trigger of the spectrum analyzer, and reset the EUT (e.g., cycle ac/dc power).
i) Force the EUT into oscillation by reducing the attenuation.
j) Use the marker function of the spectrum analyzer to measure the time from the onset of oscillation until the EUT turns off, by setting Marker 1 on the leading edge of the oscillation signal and Marker 2 on the trailing edge. The spectrum analyzer sweep time may be adjusted to improve the time resolution of these cursors.
k) Capture the spectrum analyzer zero-span trace for inclusion in the test report. Report the power level associated with the oscillation separately if it can't be displayed on the trace.
l) Repeat 7.11.2b) to 7.11.2k) for all operational uplink and downlink bands.
m) Set the spectrum analyzer zero-span sweep time for longer than 60 seconds, then measure the restart time for each operational uplink and downlink band.
n) Replace the normal-operating mode EUT with the EUT that supports an anti-oscillation test mode.
o) Set the spectrum analyzer zero-span time for a minimum of 120 seconds, and a single sweep.
p) Manually trigger the spectrum analyzer zero-span sweep, and manually force the booster into oscillation as described in 7.11.2i).
q) When the sweep is complete, place cursors between the first two oscillation detections, and save the plot for inclusion in the test report. The time between restarts must match the manufacturer's timing for the test mode, and there shall be no more than 5 restarts.
r) Repeat 7.11.2m) to 7.11.2q) for all operational uplink and downlink bands.

Oscillation mitigation or shutdown

According to section 7.11.3 of KDB 935210 D03 Signal Booster Measurement v04r04:
a) Connect the normal-operating mode EUT to the test equipment as shown in Figure 7.
b) Set the spectrum analyzer center frequency to the center of band under test, and use the following settings:
1) RBW=30 kHz, VBW ≥ 3 × RBW,
2) power averaging (rms) detector,
3) trace averages ≥ 100,
4) span ≥ 120% of operational band under test,
5) number of sweep points ≥ 2 × Span/RBW.
c) Configure the signal generator for AWGN operation with a 99% OBW of 4.1 MHz, tuned to the frequency of 2.5 MHz above the lower edge or below the upper edge of the operating band under test. Adjust the RF output level of the signal generator such that the measured power level of the AWGN signal at the output port of the booster is 30 dB less than the maximum power of the booster for the band under test. Affirm that the input signal is not obstructing the measurement of the strongest oscillation peak in the band, and is not included within the span in the measurement.
1) Boosters with operating spectrum passbands of 10 MHz or less may use a CW signal source at the band edge rather than AWGN.
2) For device passbands greater than 10 MHz, standard CMRS signal sources (i.e., CDMA, W-CDMA, LTE) may be used instead of AWGN at the band edge.
d) Set the variable attenuator to a high attenuation setting such that the booster will operate at maximum gain when powered on. Reset the EUT (e.g., cycle ac/dc power). Allow the EUT to

complete its boot-up process, to reach full operational gain, and to stabilize its operation.

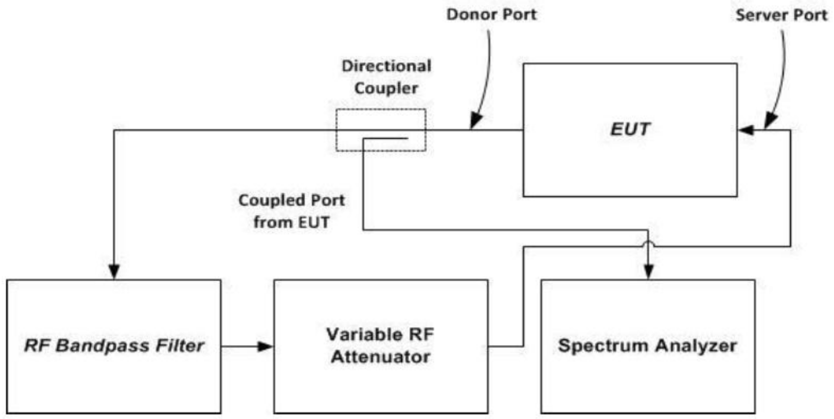
e) Set the variable attenuator such that the insertion loss for the center of the band under test (isolation) between the booster donor port and server port is 5 dB greater than the maximum gain, as recorded in the maximum gain test procedure (see 7.3), for the band under test.

f) Verify the EUT shuts down, i.e., to mitigate the oscillations. If the booster does not shut down, measure and verify the peak oscillation level as follows.

1) Allow the spectrum analyzer trace to stabilize.
2) Place the marker at the highest oscillation level occurring within the span, and record its output level and frequency.
3) Set the spectrum analyzer center frequency to the frequency with the highest oscillation signal level, and reduce the span such that the upper and lower adjacent oscillation peaks are within the span.
4) Use the Minimum Search Marker function to find the lowest output level that is within the span, and within the operational band under test, and record its output level and frequency.
5) Affirm that the peak oscillation level measured in 7.11.3f2), does not exceed by 12.0 dB the minimal output level measured in 7.11.3f)4). Record the measurement results of 7.11.3f2) and 7.11.3f4) in tabular format for inclusion in the test report.
6) The procedure of 7.11.3f1) to 7.11.3.f5) allows the spectrum analyzer trace to stabilize, and verification of shutdown or oscillation level measurement must occur within 300 seconds.20

g) Decrease the variable attenuator in 1 dB steps, and repeat step 7.11.3f) for each 1 dB step. Continue testing to the level when the insertion loss for the center of band under test (isolation) between the booster donor port and server port is 5 dB lower than the maximum gain (see 7.3).

h) Repeat 7.11.3a) to 7.11.3g) for all operational uplink and downlink bands.



NOTE—This figure shows the test setup for uplink bands transmission path tests; i.e., signal flow is out from the donor port into the directional coupler. For downlink bands transmission path tests, the feedback signal flow path direction and equipment connections shall be reversed, i.e., signal flow is out from the server port into the directional coupler, and signal flow is into the donor port from the variable RF attenuator.

Figure 6 – Oscillation detection (7.11.2) test setup

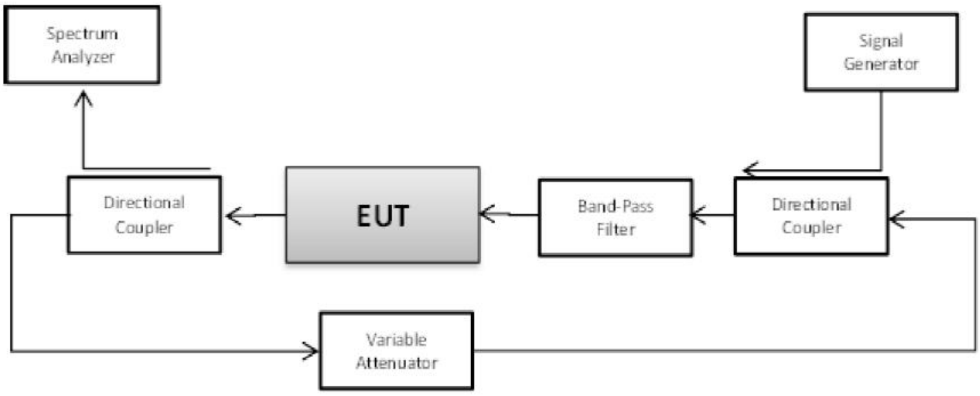


Figure 7 – Oscillation mitigation/shutdown test setup

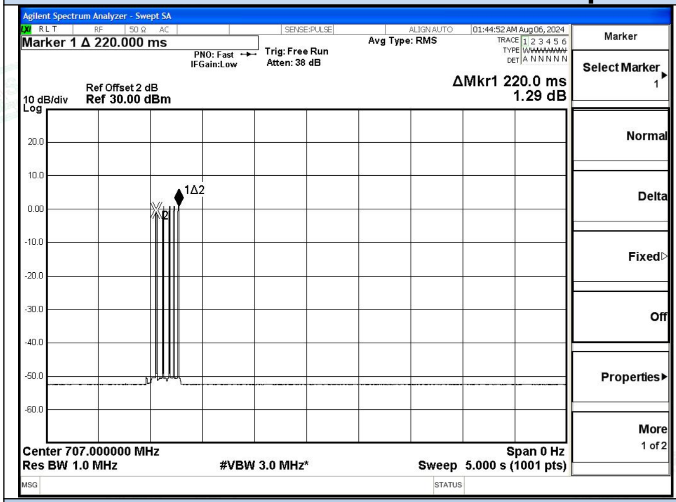
6.5.3 Test data

Temperature	23.6℃	Humidity	52.3%
Test Engineer	Nick Peng	Test Mode	Transmitting

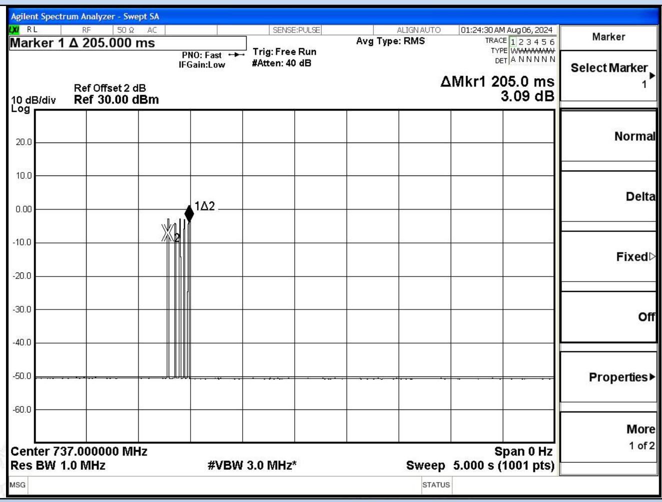
Test Results Of Detection Time				
Operation Band		Detection Time (s)	Limit (s)	Result
Uplink	Lower 700 Band	0.220	0.300	PASS
	Upper 700 Band	0.215	0.300	PASS
	Cellular Band	0.265	0.300	PASS
	PCS Band	0.250	0.300	PASS
	AWS Band	0.280	0.300	PASS
Downlink	Lower 700 Band	0.205	1.000	PASS
	Upper 700 Band	0.205	1.000	PASS
	Cellular Band	0.160	1.000	PASS
	PCS Band	0.265	1.000	PASS
	AWS Band	0.250	1.000	PASS

Test Results Of Restarting Time						
Operation Band		Restarting Time (s)	Limit (s)	Restarting Counts	Limit	Result
Uplink	Lower 700 Band	See Test Graphs of Restarting Time	60	4	5	PASS
	Upper 700 Band		60	4	5	PASS
	Cellular Band		60	4	5	PASS
	PCS Band		60	4	5	PASS
	AWS Band		60	4	5	PASS
Downlink	Lower 700 Band		60	4	5	PASS
	Upper 700 Band		60	4	5	PASS
	Cellular Band		60	4	5	PASS
	PCS Band		60	4	5	PASS
	AWS Band		60	4	5	PASS

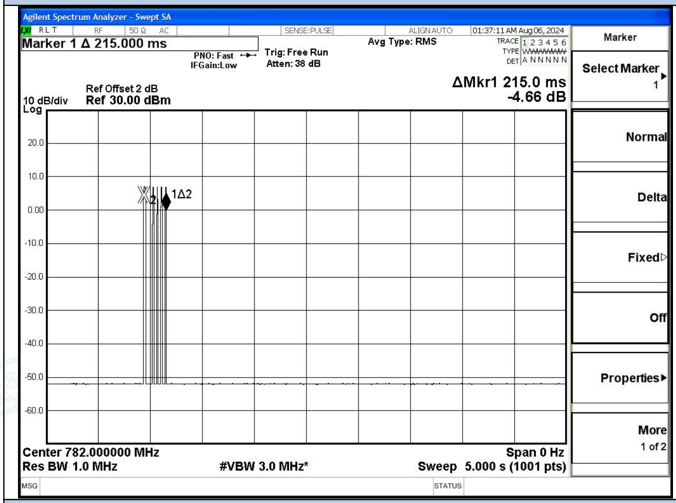
Test Graphs of Detection Time



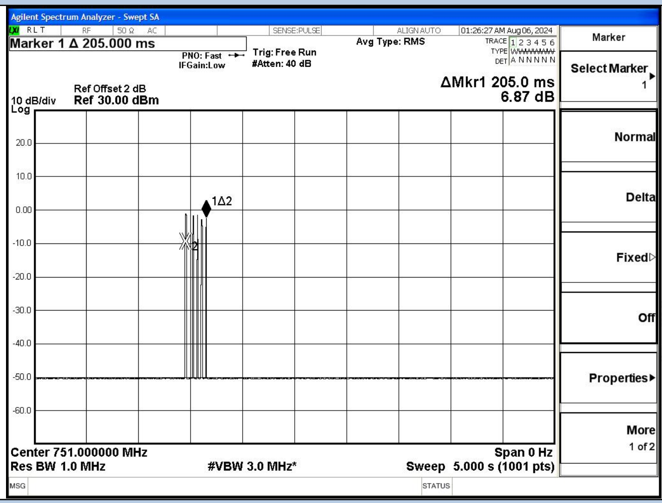
Detection Time-Lower 700 Band UL



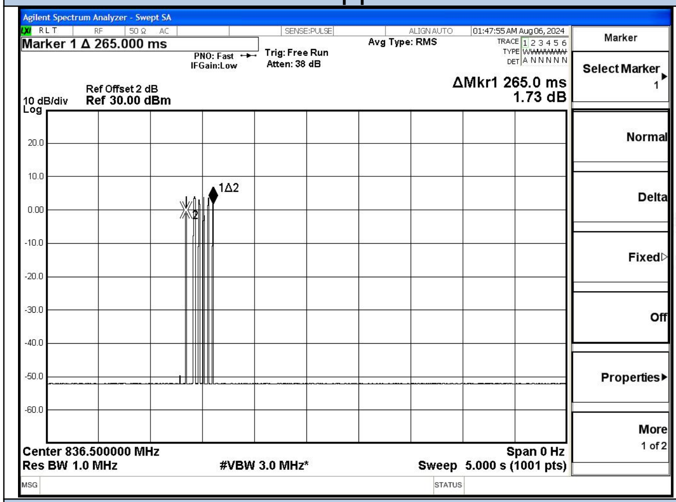
Detection Time-Lower 700 Band DL



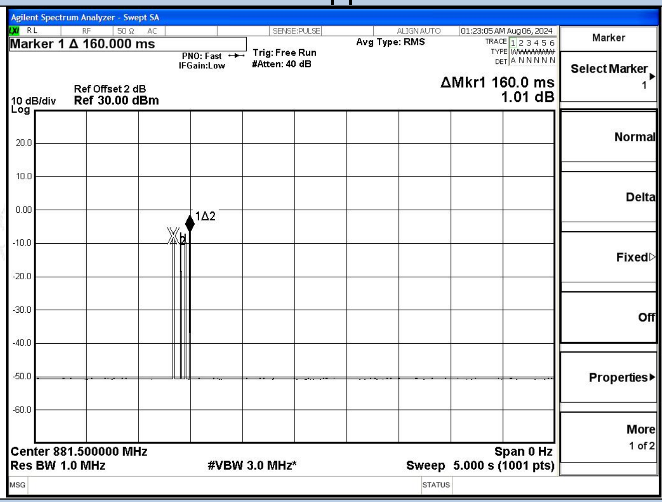
Detection Time-Upper 700 Band UL



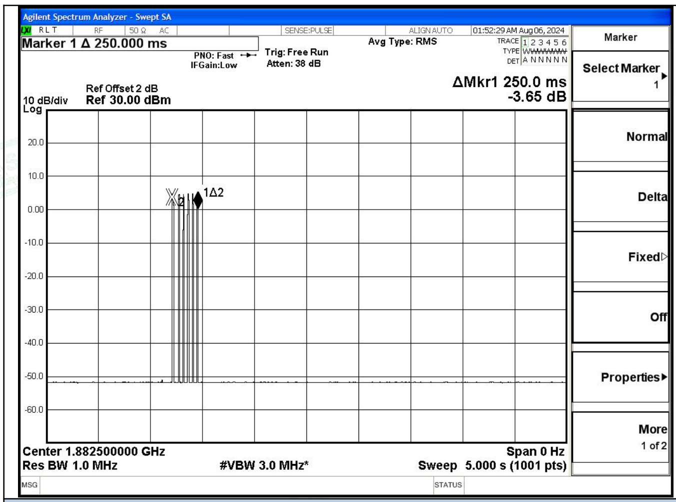
Detection Time-Upper 700 Band DL



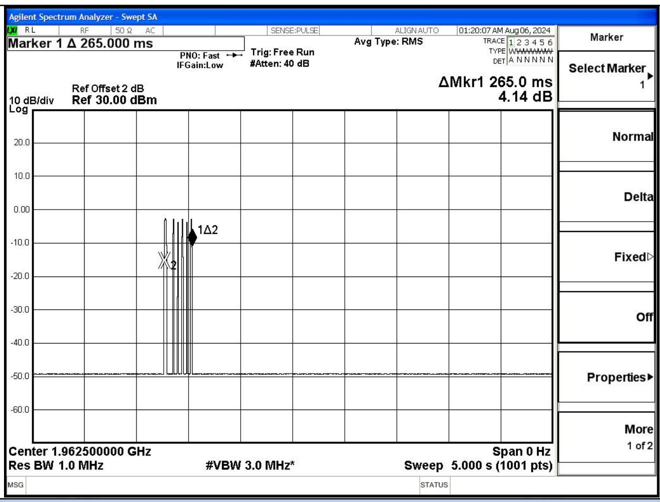
Detection Time-Cellular Band UL



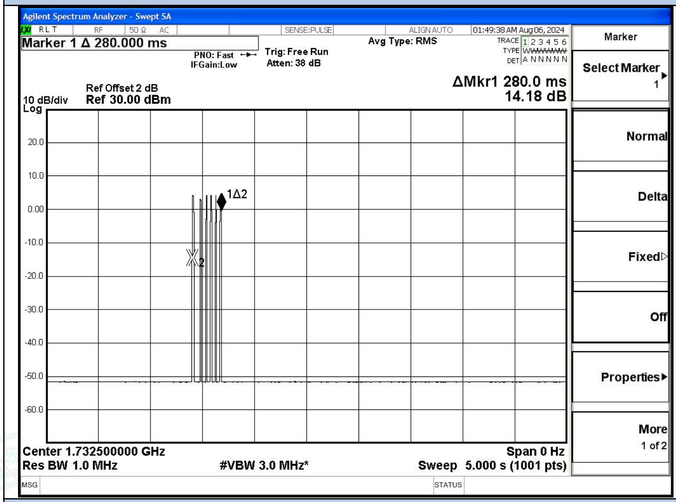
Detection Time-Cellular Band DL



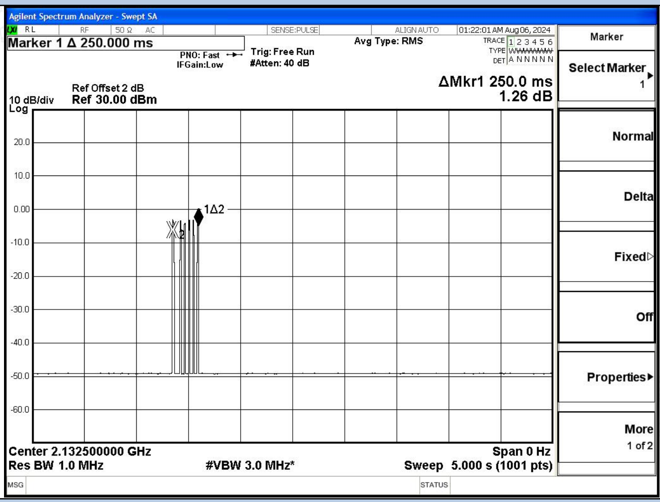
Detection Time-PCS Band UL



Detection Time-PCS Band DL

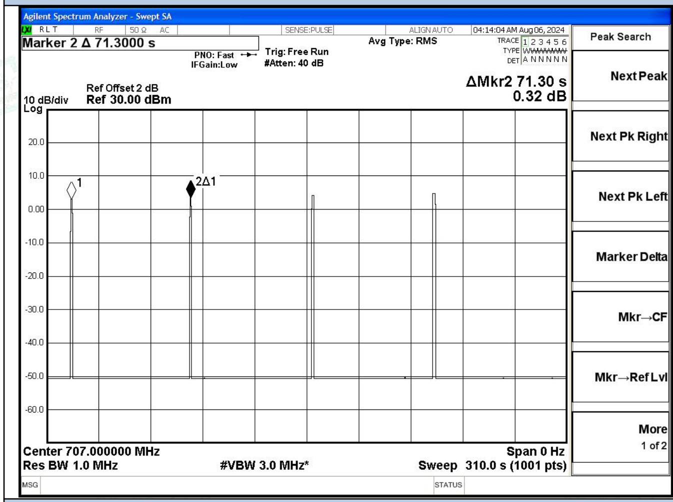


Detection Time-AWS Band UL

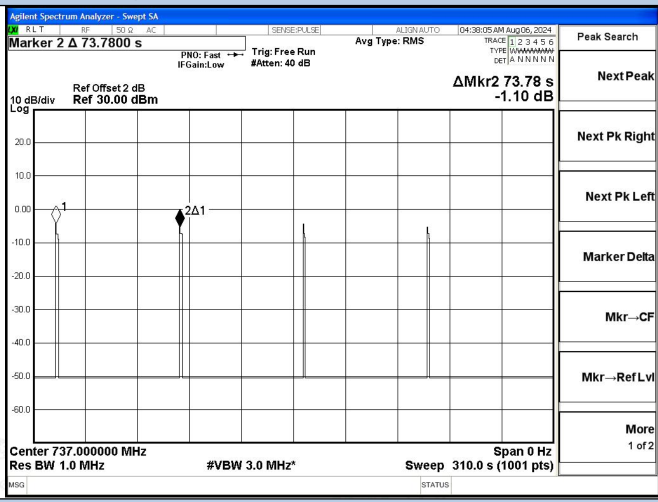


Detection Time-AWS Band DL

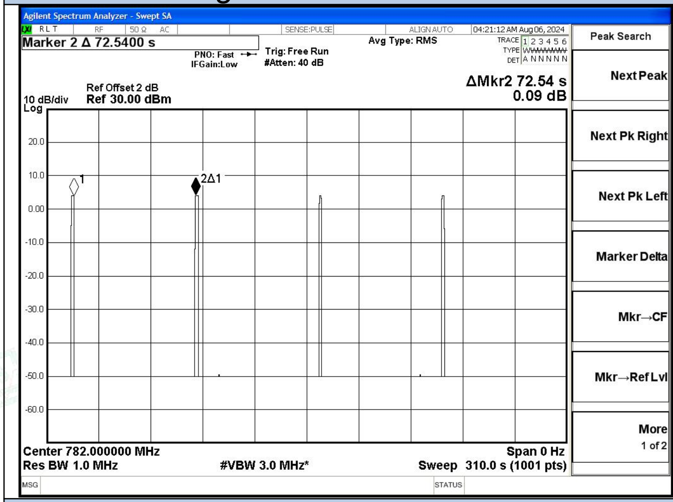
Test Graphs of Restarting Time



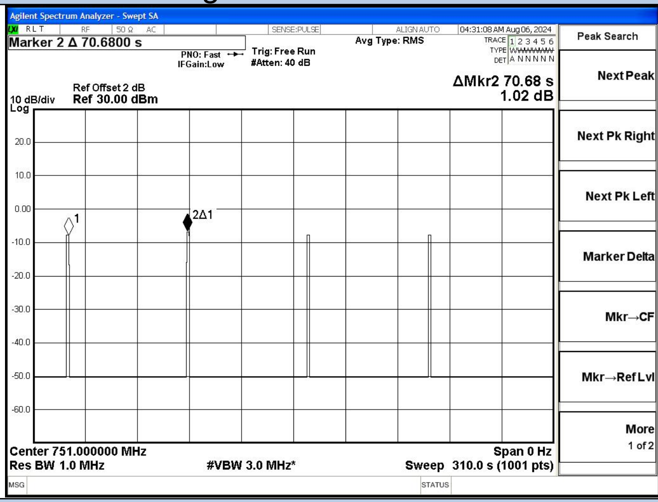
Restarting Time-Lower 700 Band UL



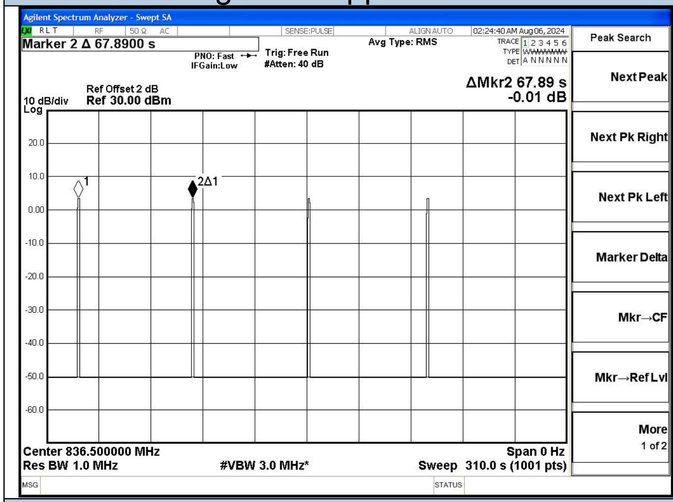
Restarting Time-Lower 700 Band DL



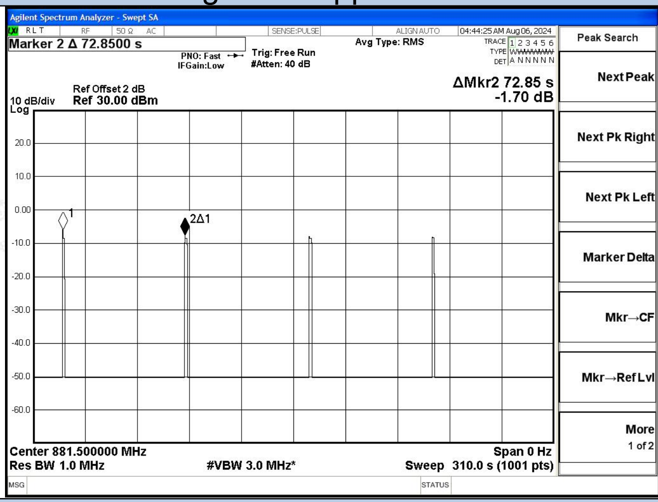
Restarting Time-Upper 700 Band UL



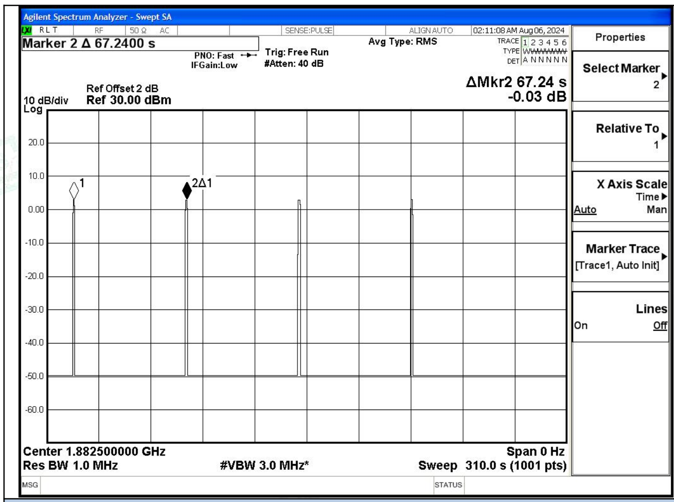
Restarting Time-Upper 700 Band DL

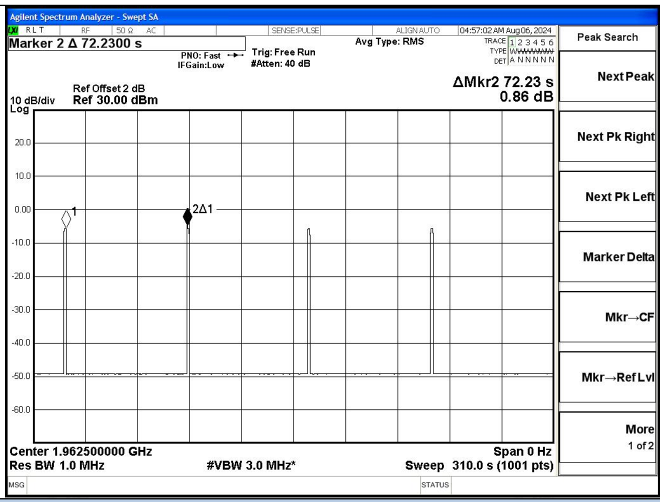


Restarting Time-Cellular Band UL

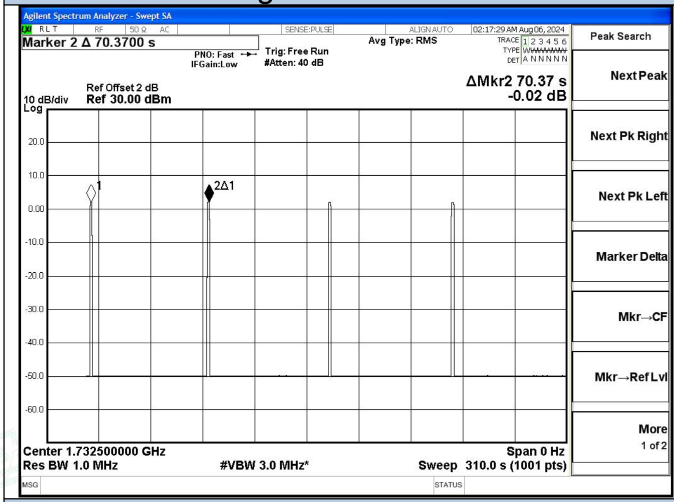


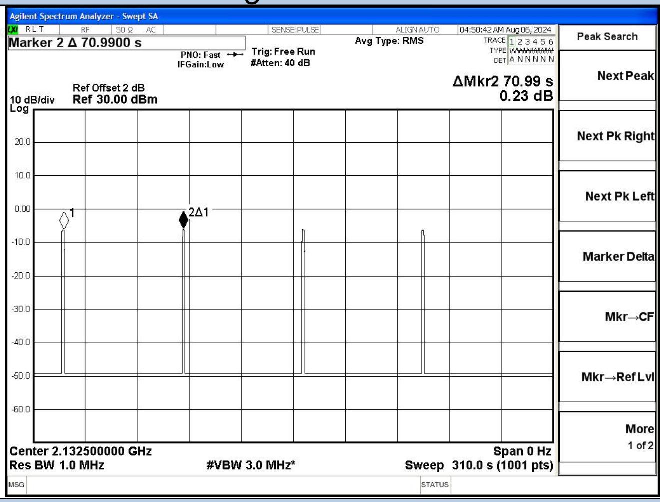
Restarting Time-Cellular Band DL





Restarting Time-PCS Band UL	Restarting Time-PCS Band DL





Restarting Time-AWS Band UL	Restarting Time-AWS Band DL

Oscillation mitigation or shutdown:

Lower 700 Band	Uplink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	6.37	<12	Pass
+4	8.50	<12	Pass
+3	8.03	<12	Pass
+2	10.09	<12	Pass
+1	10.11	<12	Pass
0	shutdown		

Lower 700 Band	Downlink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	7.17	<12	Pass
+4	7.57	<12	Pass
+3	8.81	<12	Pass
+2	10.19	<12	Pass
+1	10.34	<12	Pass
0	11.62	<12	Pass
-1	shutdown		

Upper 700 Band	Uplink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	6.70	<12	Pass
+4	7.45	<12	Pass
+3	9.14	<12	Pass
+2	9.40	<12	Pass
+1	10.10	<12	Pass
0	11.16	<12	Pass
-1	shutdown		

Upper 700 Band	Downlink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	6.57	<12	Pass
+4	7.92	<12	Pass
+3	9.41	<12	Pass
+2	9.30	<12	Pass
+1	11.17	<12	Pass
0	shutdown		

Cellular Band	Uplink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	8.16	<12	Pass
+4	9.64	<12	Pass
+3	10.36	<12	Pass
+2	11.26	<12	Pass
+1	shutdown		

Cellular Band	Downlink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	5.55	<12	Pass
+4	8.71	<12	Pass
+3	9.42	<12	Pass
+2	10.20	<12	Pass
+1	10.48	<12	Pass
0	shutdown		

PCS Band	Uplink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	6.30	<12	Pass
+4	7.37	<12	Pass
+3	7.22	<12	Pass
+2	7.83	<12	Pass
+1	10.39	<12	Pass
0	10.54	<12	Pass
-1	shutdown		

PCS Band	Downlink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	7.42	<12	Pass
+4	8.79	<12	Pass
+3	10.51	<12	Pass
+2	10.75	<12	Pass
+1	11.36	<12	Pass
0	shutdown		

AWS Band	Uplink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	7.51	<12	Pass
+4	9.30	<12	Pass
+3	10.10	<12	Pass
+2	10.76	<12	Pass
+1	10.71	<12	Pass
0	shutdown		

AWS Band	Downlink		
Signal Type	AWGN		
Isolation	Deffrence	Limit	Result
dB	dB	dB	
+5	6.81	<12	Pass
+4	8.75	<12	Pass
+3	8.95	<12	Pass
+2	9.79	<12	Pass
+1	10.63	<12	Pass
0	shutdown		

6.6 Intermodulation Limits

6.6.1 Applicable Standard

According to §20.21(e)(8)(i)(F) Intermodulation Limits:

The transmitted intermodulation products of a consumer booster at its uplink and downlink ports shall not exceed the power level of −19 dBm for the supported bands of operation.

6.6.2 Test Procedure

According to section 7.4 of KDB 935210 D03 Signal Booster Measurement v04r04:

a) Connect the signal booster to the test equipment as shown in Figure 9. Begin with the uplink output (donor) port connected to the spectrum analyzer.
b) Set the spectrum analyzer RBW = 3 kHz.
c) Set the VBW ≥ 3 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. Affirm that the number of measurement points per sweep ≥ (2 × span)/RBW.
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. If the maximum output power is not at the operational-band (booster pass band) center frequency, configure the test signal pair around the frequency with maximum output power as determined per 7.2.
h) Set the signal generator amplitudes so that the power from each into the EUT is equivalent, then turn on the RF output.
i) Simultaneously increase each signal generators' amplitude equally until just before the EUT begins AGC, then affirm that all intermodulation-product emissions (if any occur) are below the specified limit of −19 dBm.
j) Use the trace averaging function of the spectrum analyzer, and wait for the trace to stabilize. Place a marker at the highest amplitude intermodulation-product emission.
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 7.4e) to 7.4l) for all uplink and downlink operational bands.
NOTE–If using a single signal generator with dual outputs, affirm that intermodulation products are not the result of the generator.
n) Increase the signal generator amplitude in 2 dB steps to 10 dB above the AGC threshold determined in 7.4i), but not exceeding the maximum input level of 5.5, to affirm that the EUT maintains compliance with the intermodulation limit. The test report shall include either a statement describing that the device complies at 10 dB above AGC or at the 5.5 power levels, or a table showing compliance at the additional input power(s) required.

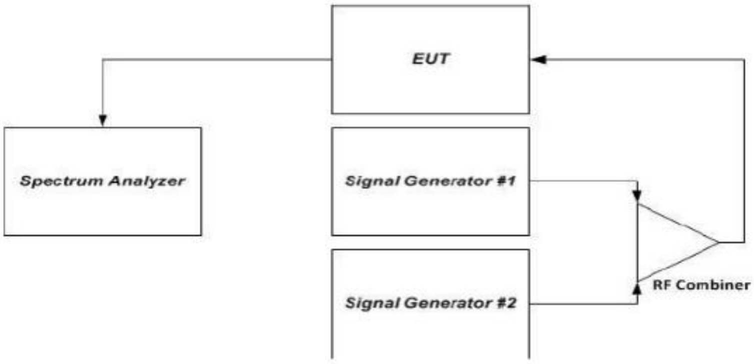
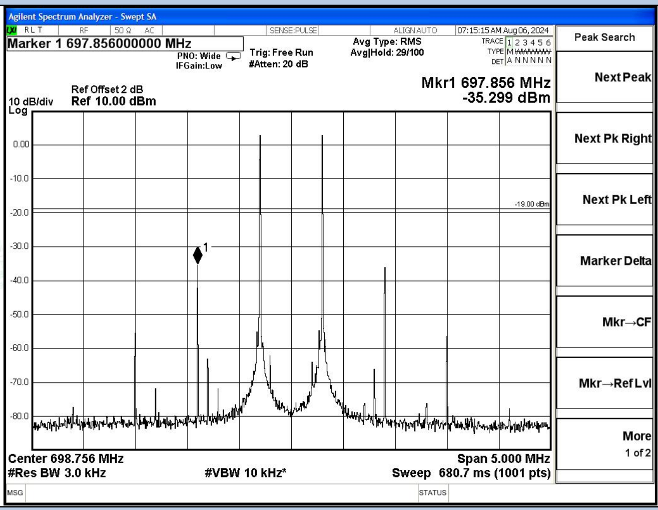
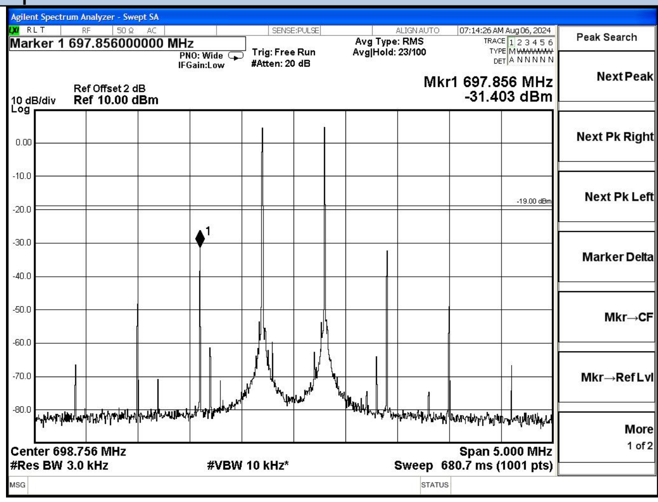
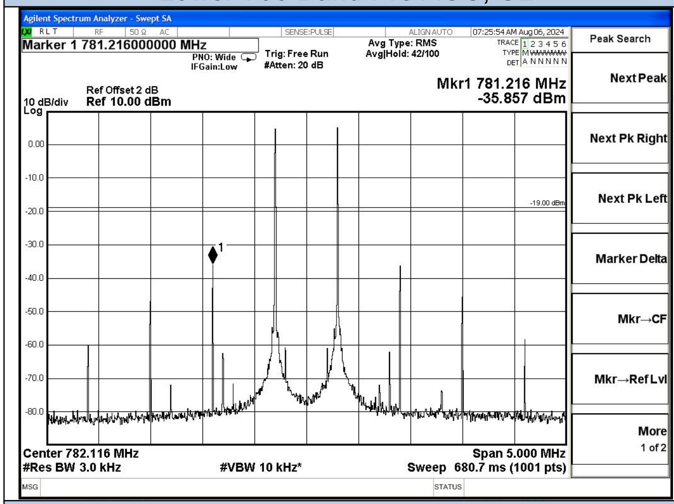
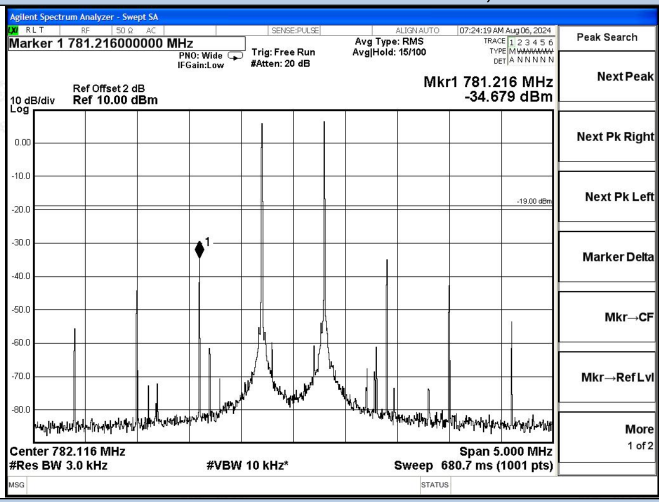


Figure 9 – Intermodulation product instrumentation test setup

6.6.3 Test Data

Temperature	23.6℃	Humidity	52.3%
Test Engineer	Nick Peng	Test Mode	Transmitting

Test Graphs	
	
Lower 700 Band Pre AGC, UL	Lower 700 Band AGC+10dB, UL
	
Upper 700 Band Pre AGC, UL	Upper 700 Band AGC+10dB, UL