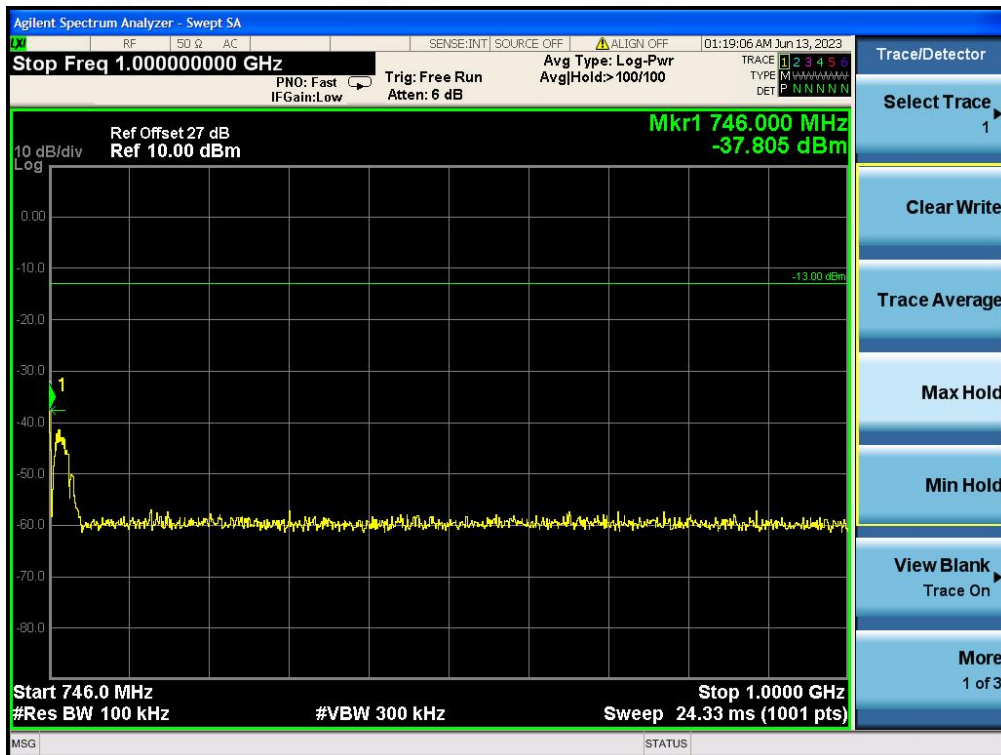
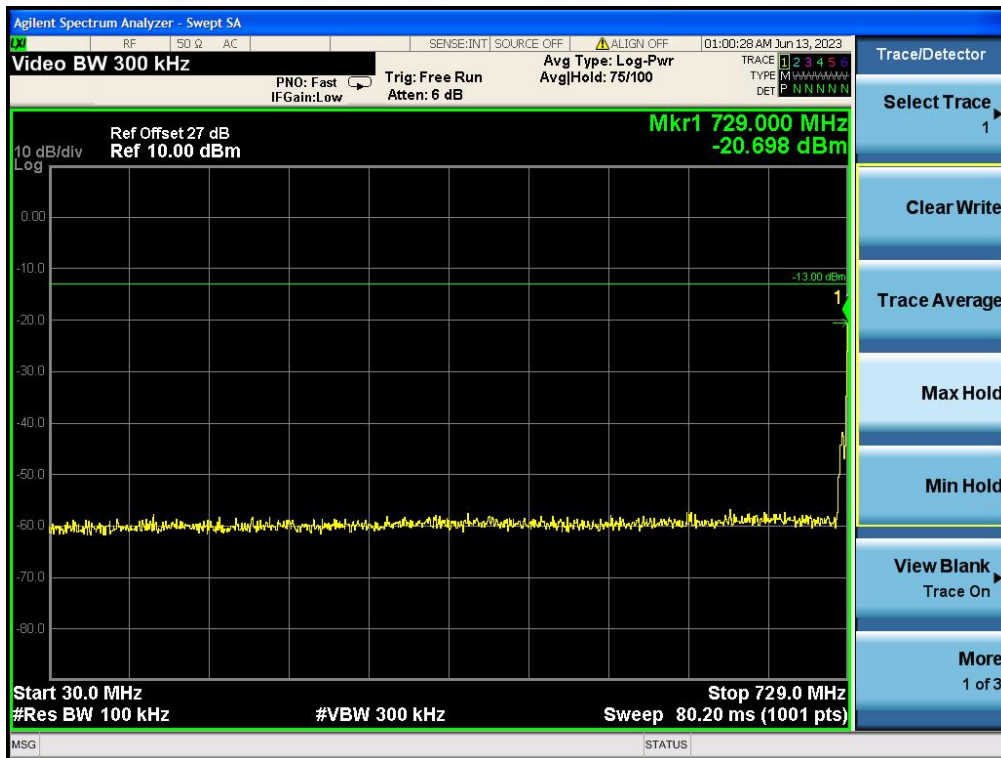
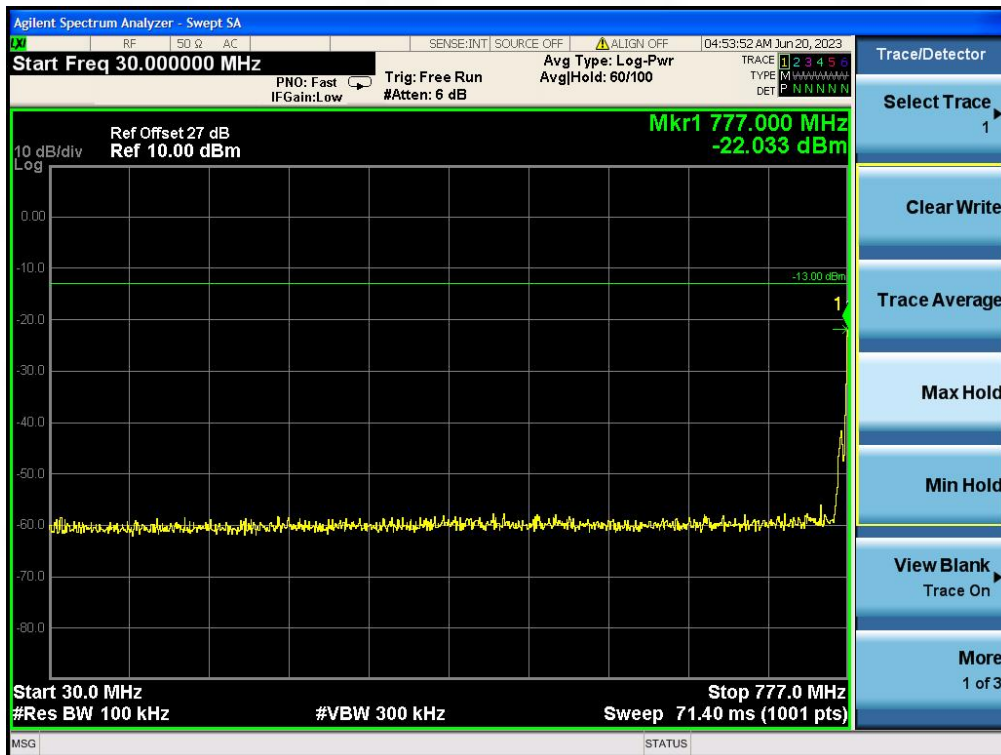


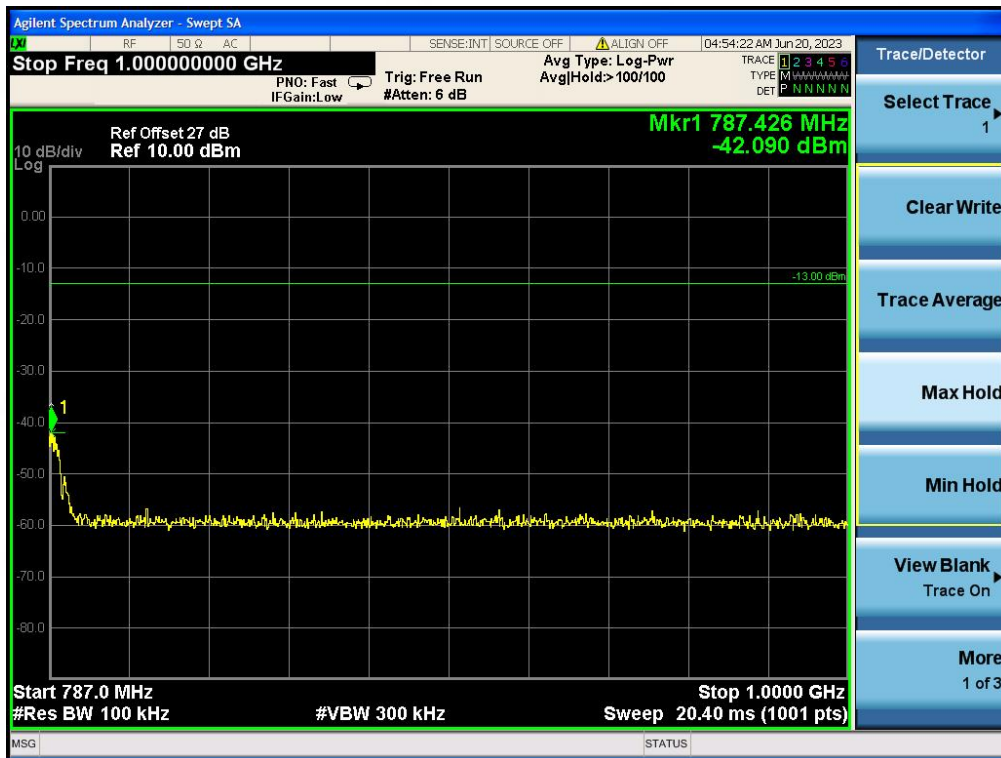
Band 12 Downlink



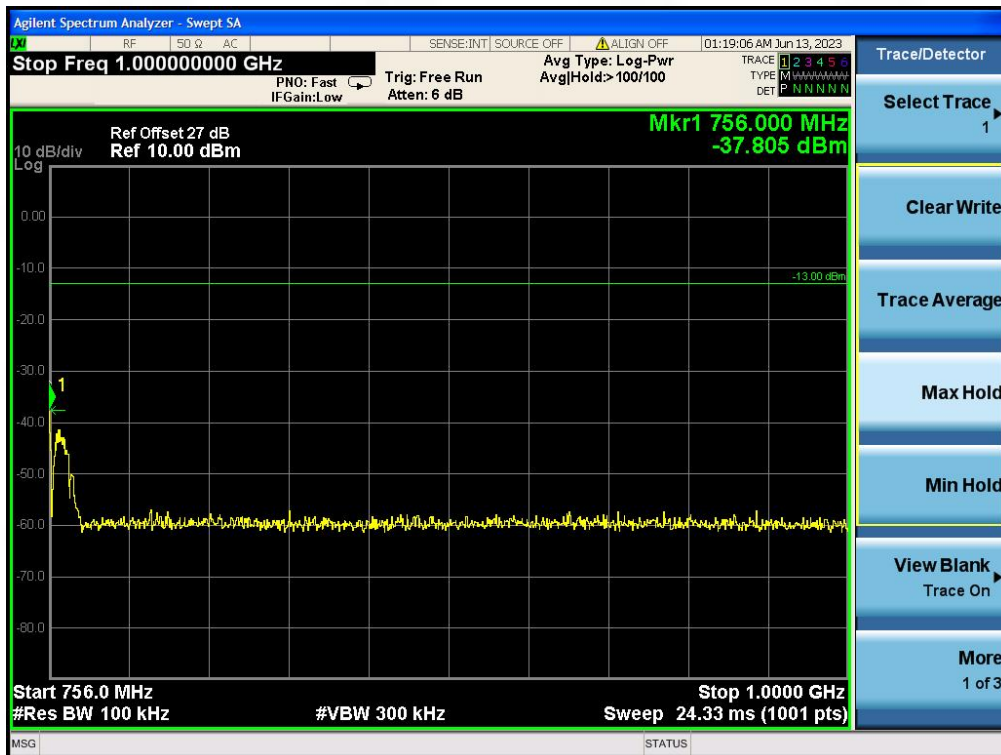
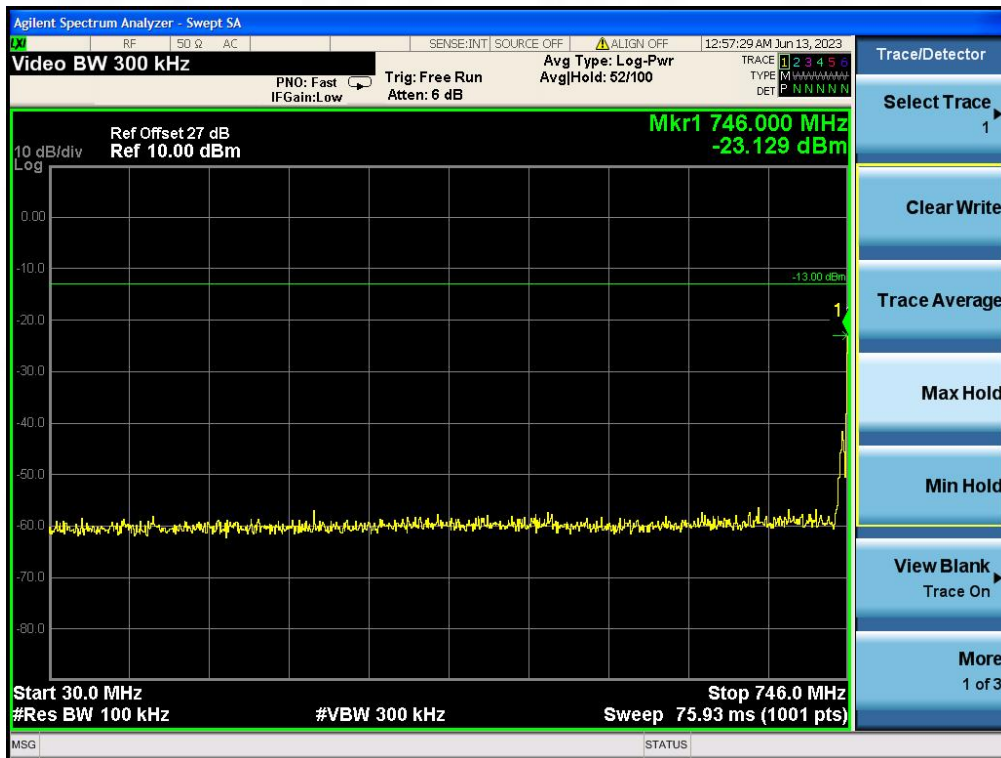


Band 13 Uplink



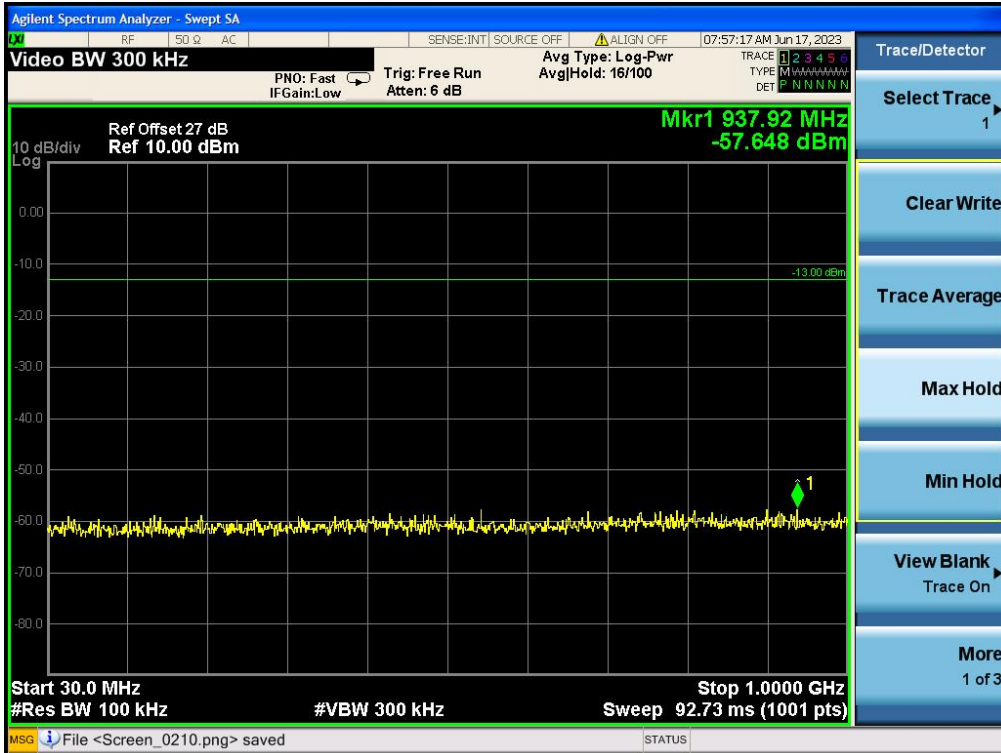


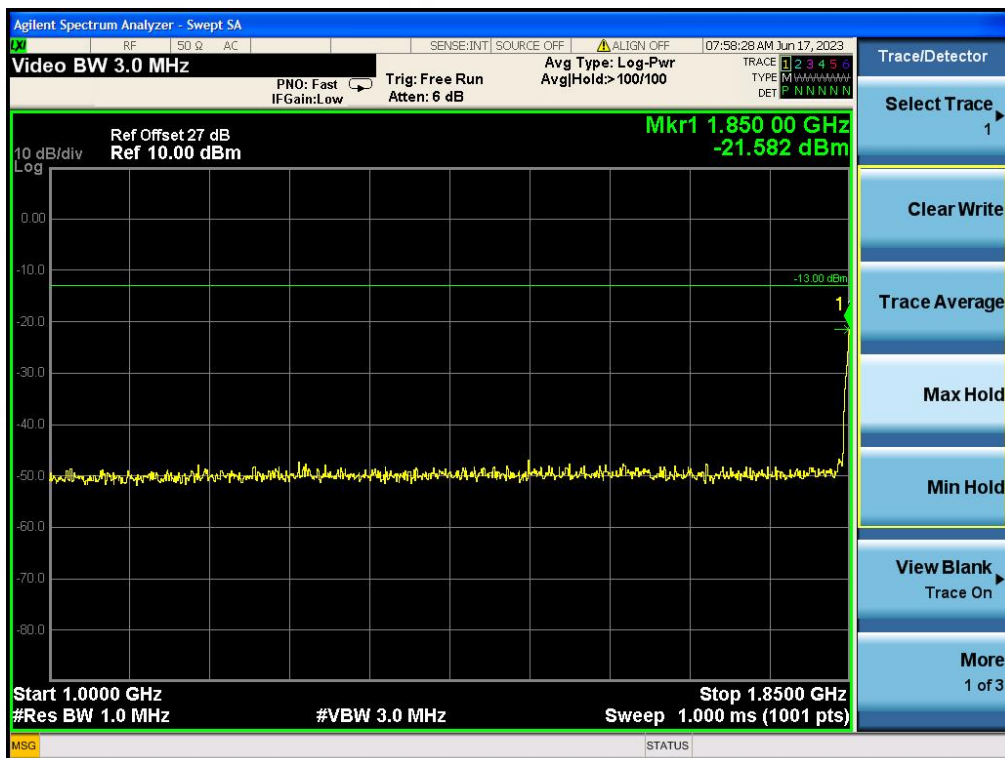
Band 13 Downlink



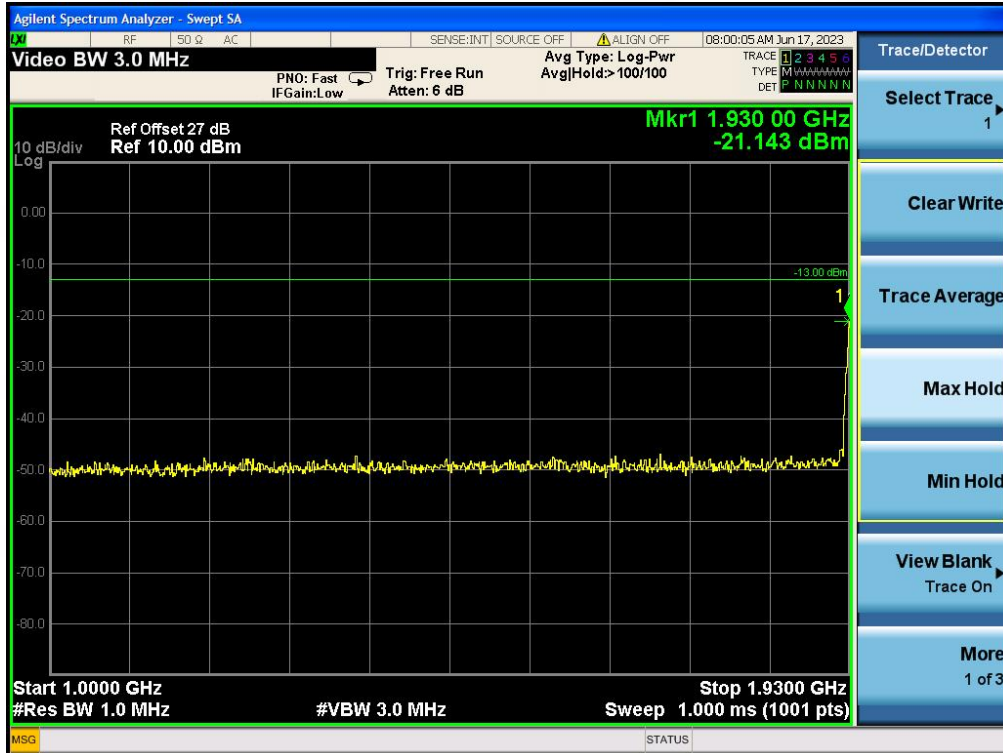
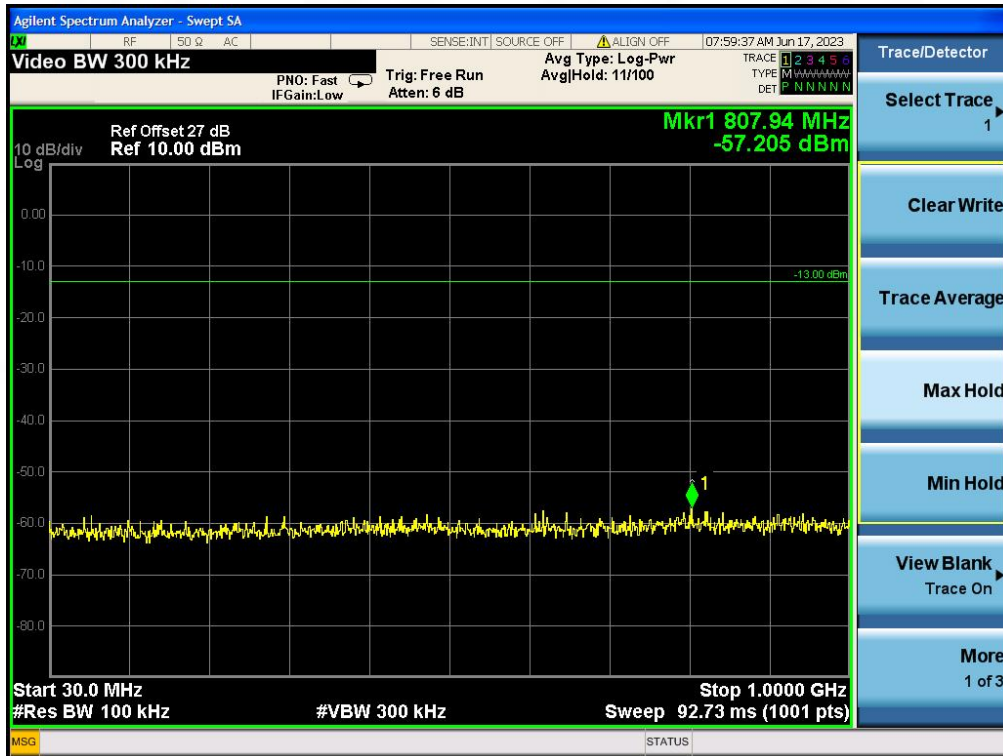


Band25 Uplink



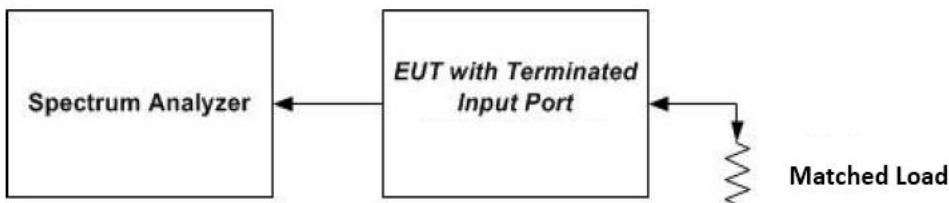
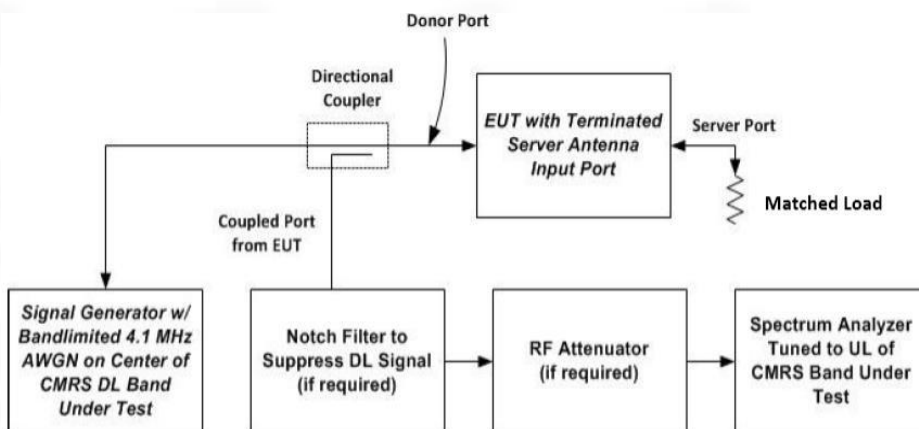


Band25 Downlink





5.7 Noise Limits

Test Requirement:	This procedure provides a measurement methodology for demonstrating compliance to the noise limits specified in §20.21(e)(8)(i)(A) for Wideband Consumer Signal Boosters.
Limit:	not exceed -103 dBm/MHz —RSSI. not exceed $-102.5 \text{ dBm/MHz} + 20 \log (F)$, where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.
Test Setup:	 <p style="text-align: center;">Figure 3 – Noise limit test setup (also used for 7.8)</p>  <p style="text-align: center;">Figure 4 – Test setup for uplink noise power measurement in the presence of a downlink signal</p>
Procedure:	<ol style="list-style-type: none"> Connect the EUT to the test equipment as shown in Figure 3. Begin with the uplink output connected to the spectrum analyzer. Set the spectrum analyzer RBW to 1 MHz with the VBW $\geq 3X$ RBW Select the power averaging (RMS) detector and trace average over at least 100 traces. Set the center frequency of the spectrum analyzer to the center of the CMRS band under test with the span $\geq 2X$ the CMRS band. Measure the maximum Transmitter Noise Power Level. Save the spectrum analyzer plot as necessary for inclusion in the final test report. Repeat steps 7.7.2 to 7.7.6 for all operational uplink and downlink bands. Connect the EUT to the test equipment as shown in Figure 4 for uplink and Figure 5 for downlink. Ensure the coupled path of the RF coupler is connected to the spectrum analyzer. Configure the signal generator for 4.1 MHz AWGN operation for uplink test and 200 kHz 99% OBW AWGN for downlink test. Set the spectrum analyzer RBW for 1 MHz with the VBW $\geq 3X$ the RBW with an

- RMS AVERAGE detector with at least 100 trace averages.
- k) Set the center frequency of the spectrum analyzer to the center of the CMRS band under test with the span $\geq 2X$ the CMRS band. This shall include all spectrum blocks in the particular CMRS band under test (see Annex A). For uplink noise measurements, set the spectrum analyzer center frequency for the uplink band under test and tune the signal generator to the center of the paired downlink band. For downlink noise measurements, set the spectrum analyzer to the center of the downlink band and tune the signal generator to the upper or lower band-edge of the same band, ensuring that the maximum noise power is being measured.
 - l) Measure the maximum Transmitter Noise Power Level when varying the downlink signal generator level from -90 to -10 dBm 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 with at least 2 points within the RSSI dependent region of the limit.
 - m) Repeat 7.7.7 through 7.7.11 for all operational uplink and downlink bands.
 - n) Variable Uplink noise timing is to be measured as follows.
 - o) Set the spectrum analyzer to the uplink frequency to be measured.
 - p) Set the span to 0 Hz with a sweep time of 10 seconds.
 - q) Set the power level of signal generator 1 to the lowest level of the RSSI dependent noise.
 - r) Select MAX HOLD and increase the power level of signal generator 1 by 10 dB for mobile boosters and 20 dB for fixed boosters.
 - s) Ensure that the Uplink noise decrease to the specified levels within 1 second for mobile devices and 3 seconds for fixed devices.
 - t) Repeat 7.7.14 – 7.7.19 for all operational uplink bands
- Note: Some signal boosters will require a signal generator input as they will not operate unless a signal is received at the input terminals. If this is the case connect a signal generator and cycle the RF output to simulate this function.

5.7.1 E.U.T. Operation:

Operating Environment:	
Temperature:	-30 °C and +50
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

5.7.2 Test Data:

Frequency (MHz)	Max Noise Power Measured dBm/MHz	Limit dBm/MHz	Result (dB)
UL 824-849	-49.926	-44.05	PASS
UL1710-1755	-50.398	-37.72	PASS
UL699-716	-48.959	-45.51	PASS
UL777-787	-50.885	-44.64	PASS
UL1850-1915	-51.818	-37.00	PASS
DL 869-894	-48.942	-44.05	PASS
DL2110-2155	-49.931	-37.72	PASS
DL729-746	-51.033	-45.51	PASS
DL746-756	-51.441	-44.64	PASS
DL1930-1995	-51.926	-37.00	PASS

Note: Fixed booster maximum noise power shall not exceed $-102.5 \text{ dBm/MHz} + 20 \log (F)$, where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

Operation Bands	RSSI dBm	Variable Uplink Noise Measured dBm/MHz	Limit dBm/MHz	Result (dB)
Band 5	-90	-52.85	-44.05	PASS
	-80	-52.63	-44.05	PASS
	-70	-53.28	-44.05	PASS
	-45	-62.37	-58.00	PASS
	-41	-65.69	-62.00	PASS
	-40	-65.38	-63.00	PASS
Band 4	-90	-52.94	-37.72	PASS
	-80	-52.46	-37.72	PASS
	-70	-53.19	-37.72	PASS
	-45	-62.37	-58.00	PASS
	-41	-65.69	-62.00	PASS
	-40	-65.38	-63.00	PASS
Band 12	-90	-59.34	-45.51	PASS
	-80	-58.13	-45.51	PASS
	-70	-58.28	-45.51	PASS
	-46	-59.13	-57.00	PASS
	-41	-64.96	-62.00	PASS
	-40	-66.01	-63.00	PASS
Band 13	-90	-52.34	-44.64	PASS
	-80	-56.58	-44.64	PASS
	-70	-57.31	-44.64	PASS
	-45	-59.64	-58.00	PASS
	-41	-63.54	-62.00	PASS
	-40	-66.74	-63.00	PASS
	-40	-66.47	-63.00	PASS
Band 25	-90	-52.69	-37.00	PASS
	-80	-56.47	-37.00	PASS
	-70	-57.01	-37.00	PASS
	-45	-59.27	-58.00	PASS
	-41	-63.38	-62.00	PASS

Note: According to the KDB 935210 D03 Signal Booster Measurements v04r04 APPENDIX D, when outside of RSSI Dependent limit (20.21.e.8.1.A.1), fixed booster maximum noise power shall not exceed $-102.5 \text{ dBm/MHz} + 20 \log (F)$. RSSI limit not exceed $-103 \text{ dBm/MHz-RSSI}$.

Variable Uplink Noise Timing

Operation Bands	Measured Sec	Limit Sec	Results
Band 5	1.28	3	PASS
Band 4	1.40	3	PASS
Band 12	1.38	3	PASS
Band 13	1.52	3	PASS
Band 25	1.56	3	PASS

Band 5 Uplink Noise



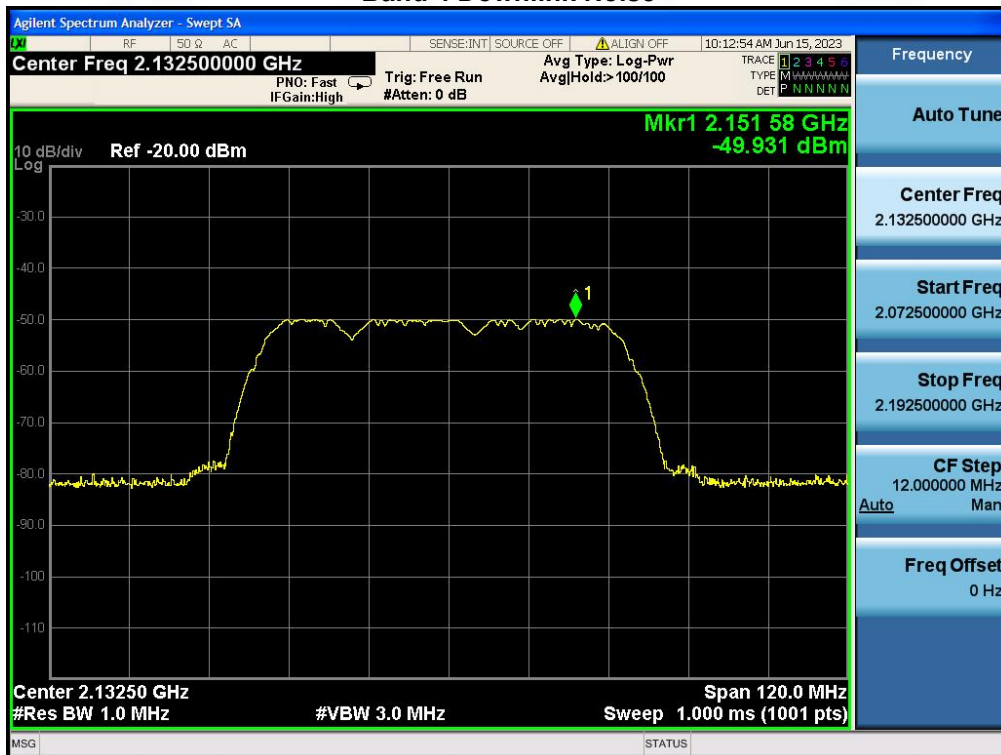
Band 5 Downlink Noise

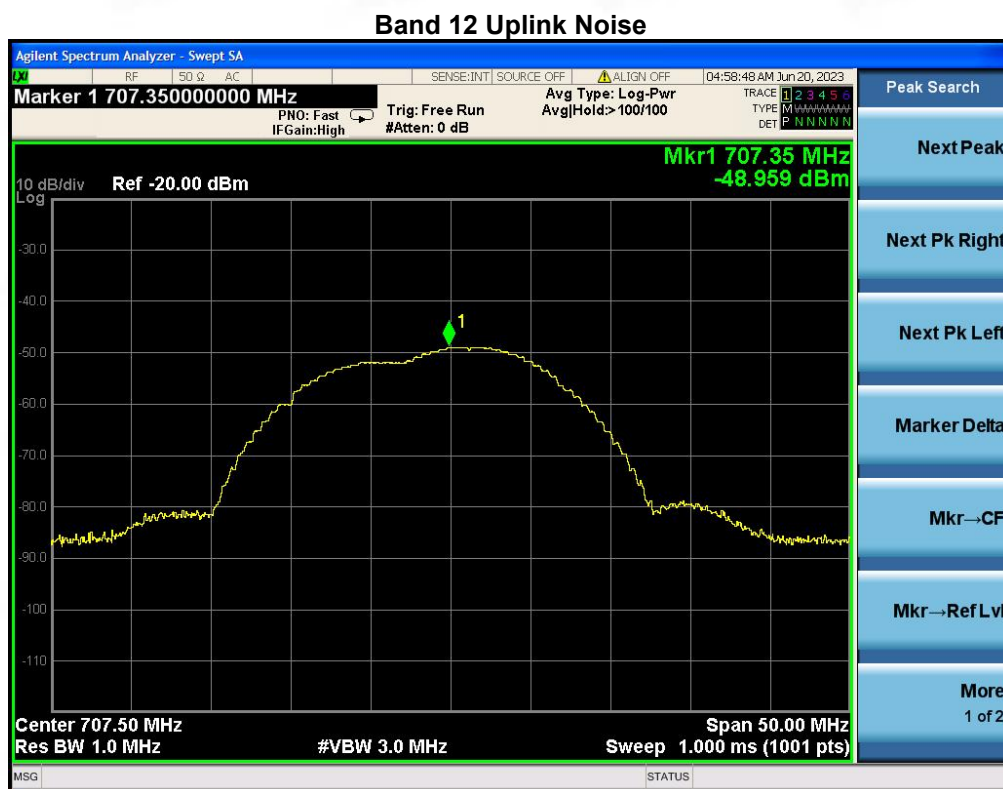


Band 4 Uplink Noise



Band 4 Downlink Noise





Band 12 Downlink Noise



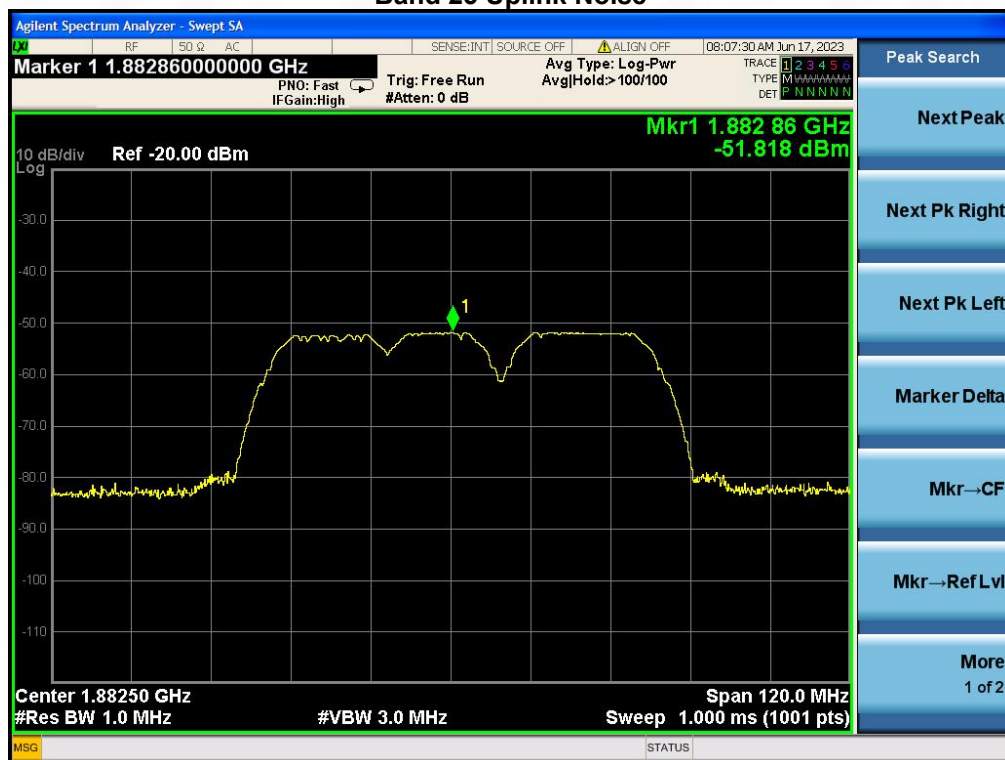
Band 13 Uplink Noise



Band 13 Downlink Noise



Band 25 Uplink Noise



Band 17 Downlink Noise

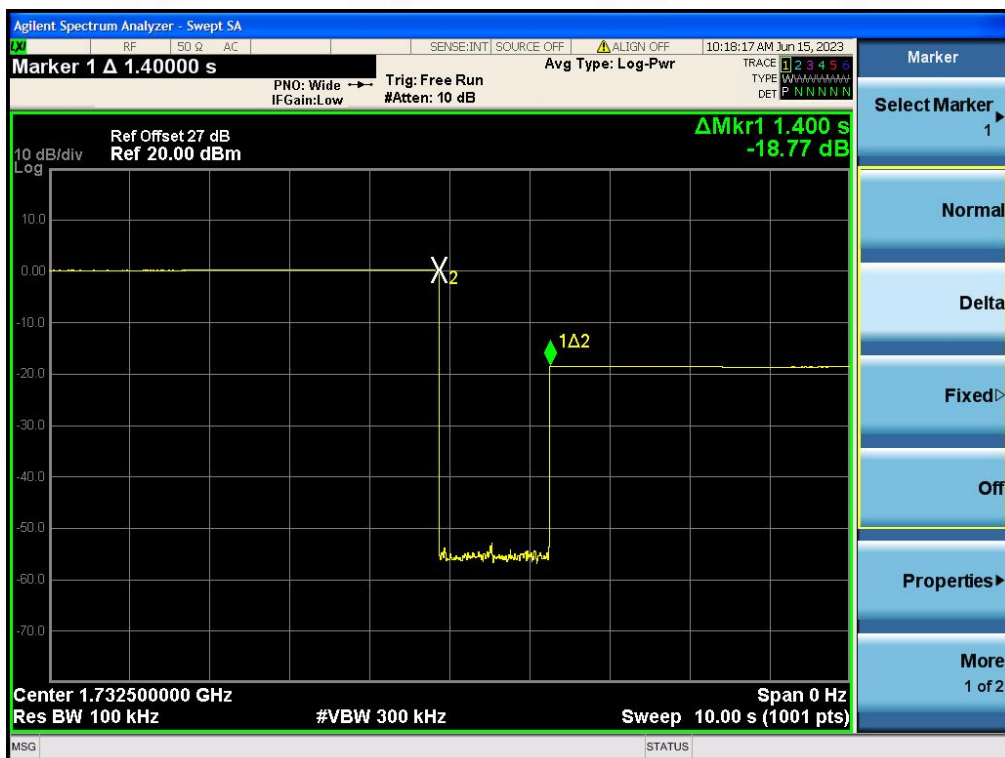


Variable Noise Timing Test Plots

Band 5



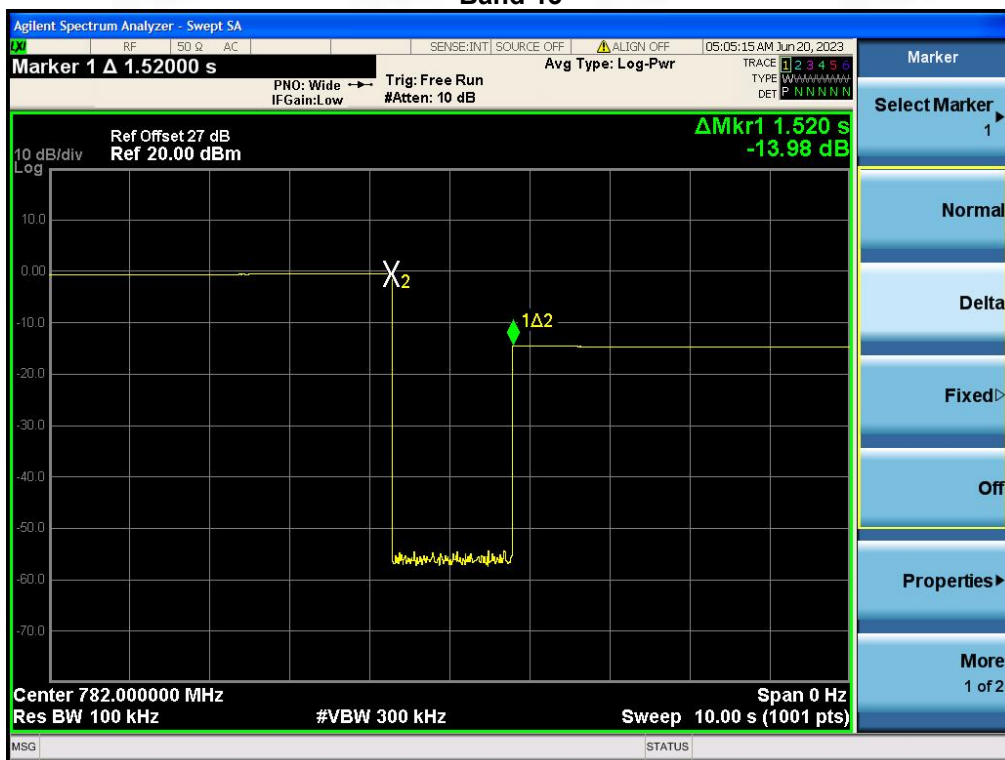
Band 4



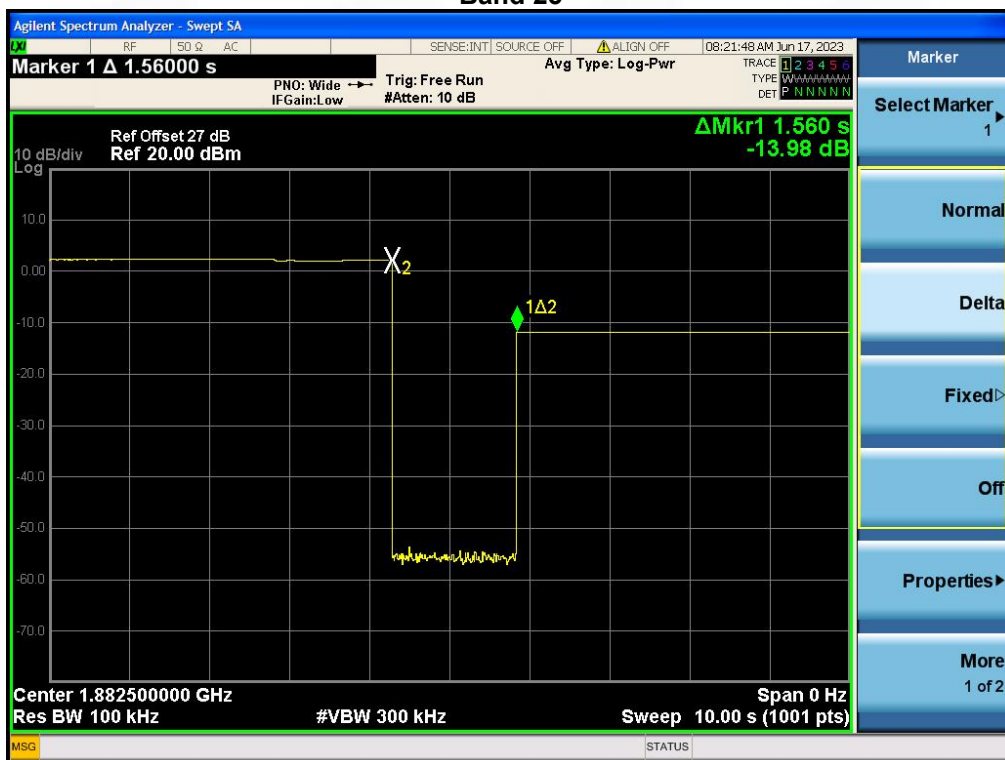
Band 12



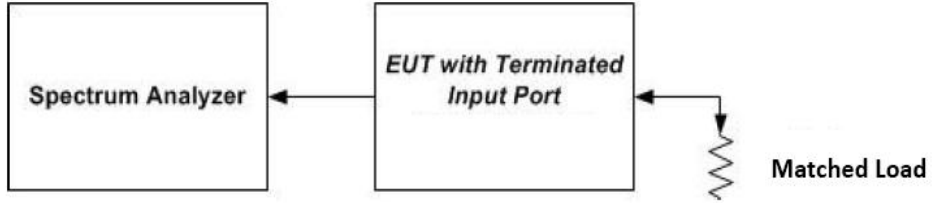
Band 13



Band 25



5.8 Uplink Inactivity

Test Requirement:	This measurement procedure is intended to demonstrate compliance to the uplink inactivity requirements specified for Wideband Consumer Signal Boosters in §20.21(e)(8)(i)(I).
Limit:	20.21(e), When a consumer booster is not serving an active device connection after 5 minutes the uplink noise power shall not exceed -70 dBm/MHz.
Test Setup:	 <p style="text-align: center;">Figure 3 – Noise limit test setup (also used for 7.8)</p>
Procedure:	<p>a) Connect the EUT to the test equipment as shown in Figure 3 with the uplink output connected to the spectrum analyzer.</p> <p>b) Select the RMS power averaging detector.</p> <p>c) Set the spectrum analyzer RBW for 1 MHz with the VBW \geq 3X RBW.</p> <p>d) Set the center frequency of the spectrum analyzer to the center of the uplink operational band.</p> <p>e) Set the span for 0 Hz with a single sweep time for a minimum of 330 seconds.</p> <p>f) Start to capture a new trace using MAX HOLD.</p> <p>g) After approximately 15 seconds turn on the EUT power.</p> <p>h) Once the full spectrum analyzer trace is complete place a MARKER on the leading edge of the pulse and use the DELTA MARKER METHOD to measure the time until the uplink was squelched.</p> <p>i) Ensure the noise level for the squelched signal is below the uplink inactivity noise power limit, as specified by the rules.</p> <p>j) Capture the plot for inclusion in the test report.</p> <p>k) Measure noise using procedures in sections 7.7.1- 7.7.5.</p> <p>l) Repeat steps 7.8.3 to 7.8.10 for all operational uplink bands.</p> <p>Note: Some signal boosters will require a signal generator input as they will not operate unless a signal is received at the input terminals. If this is the case connect a signal generator and cycle the RF output to simulate this function.</p>

5.8.1 E.U.T. Operation:

Operating Environment:	
Temperature:	-30 °C and +50
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

5.8.2 Test Data:

Operation Bands			
	Uplink Inactivity Measured(s)	Limit(s)	Result
Band 5	286.1	300.0	PASS
Band 4	282.4	300.0	PASS
Band 12	279.2	300.0	PASS
Band 13	278.5	300.0	PASS
Band 25	278.9	300.0	PASS

Band 5



Band 4

