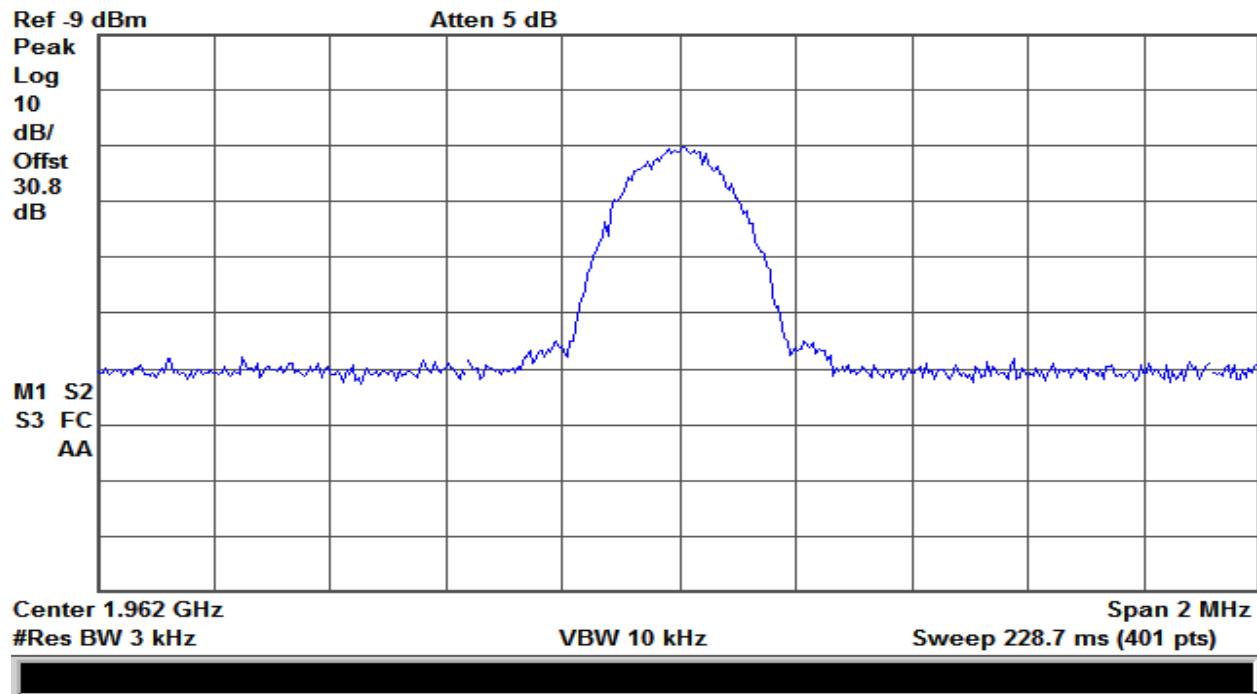
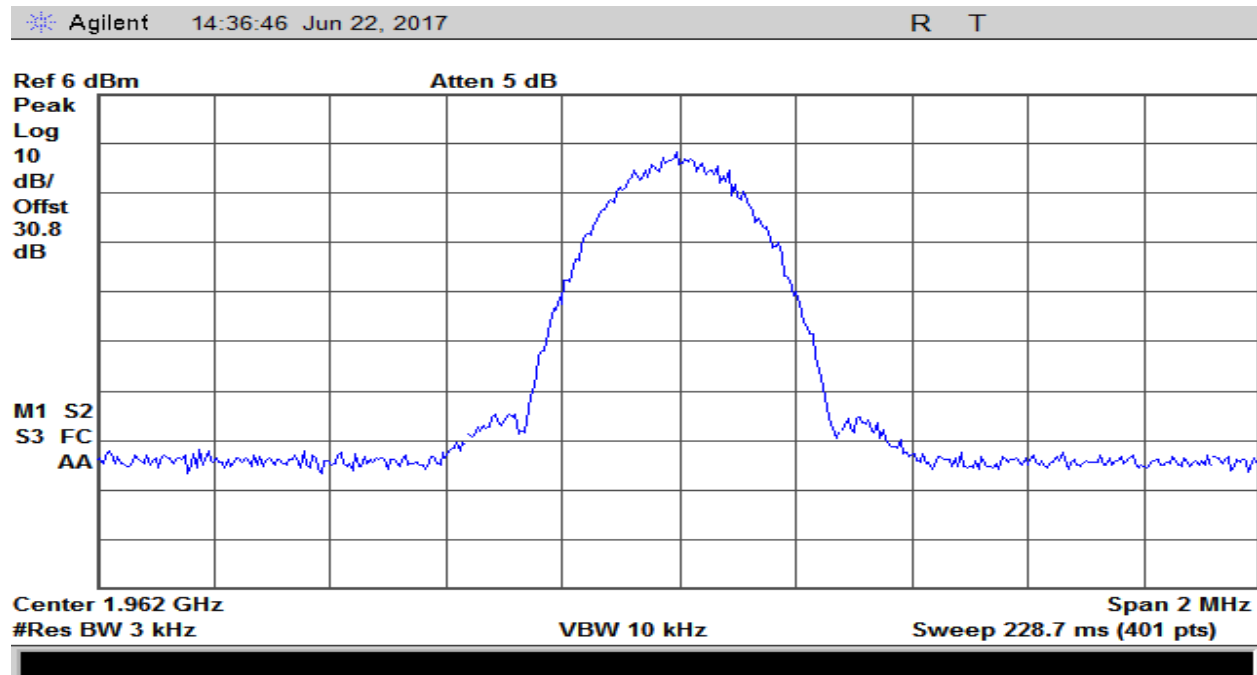
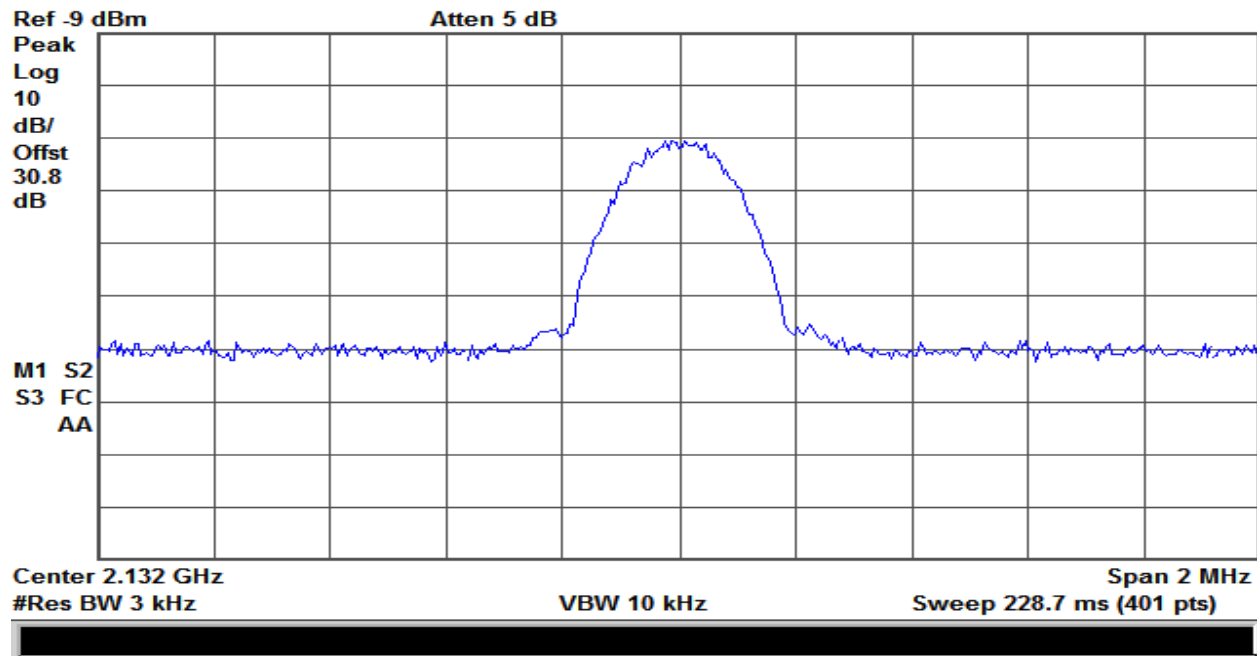




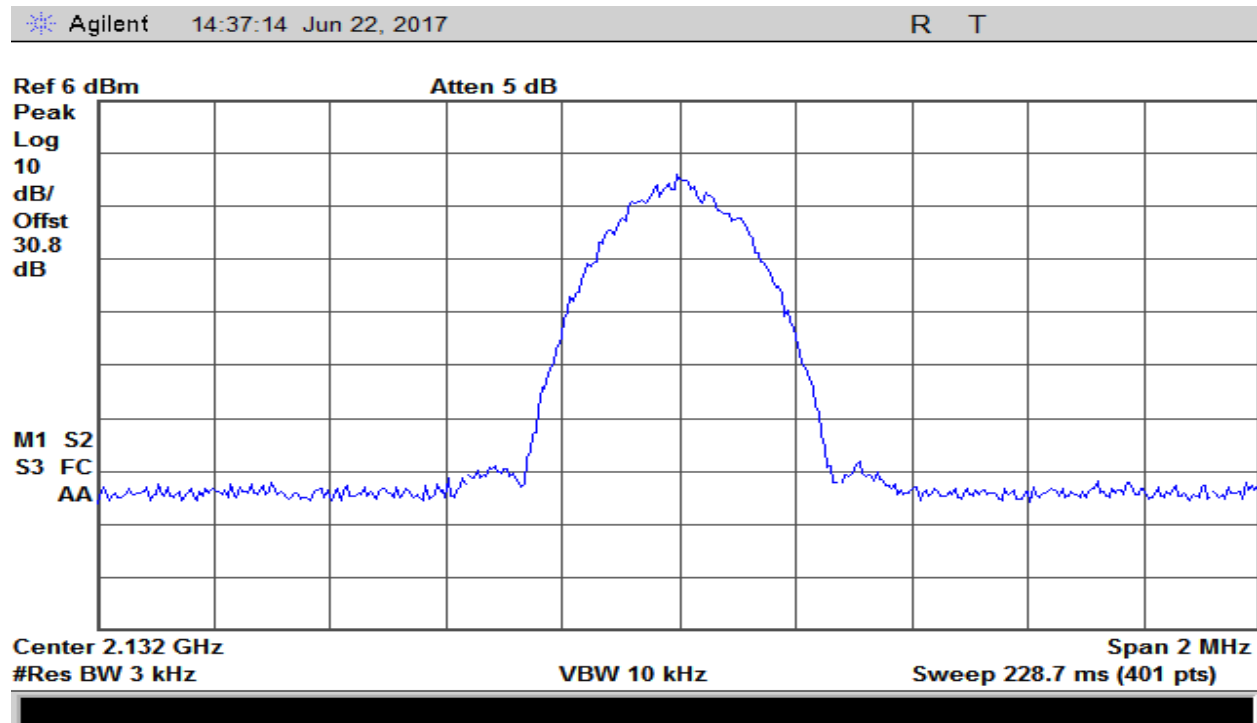
Plot 147 – 1930-1995MHz Band – Downlink Input – GSM



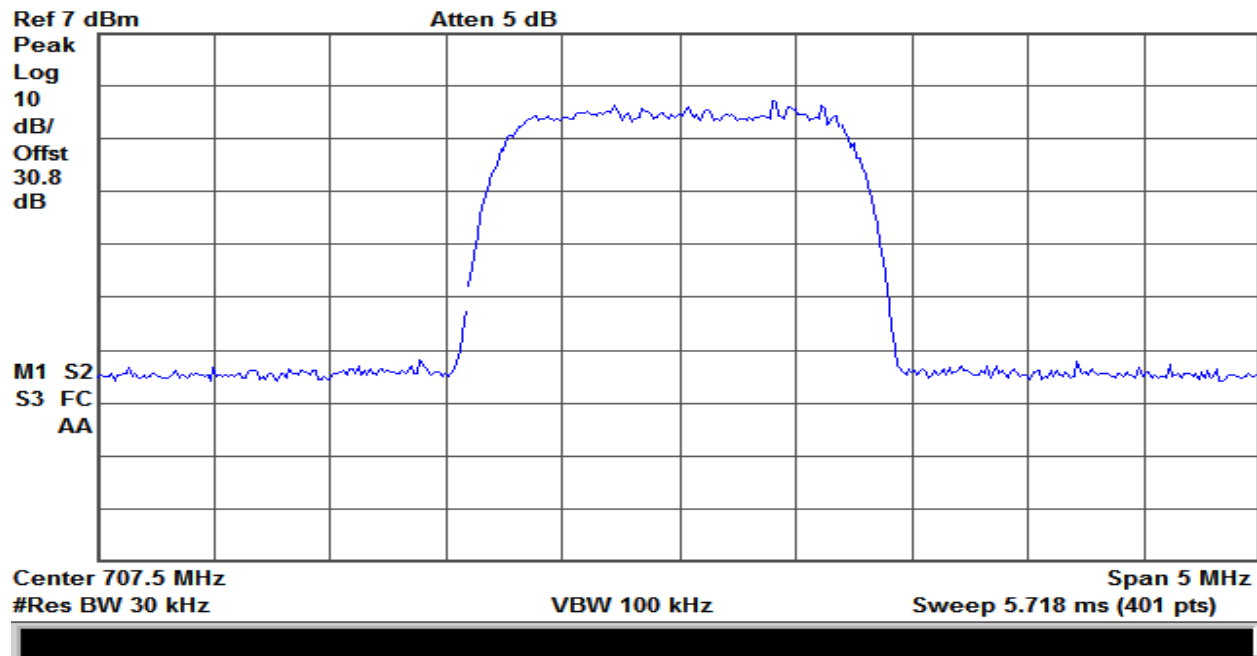
Plot 148 – 1930-1995MHz Band – Downlink Output – GSM



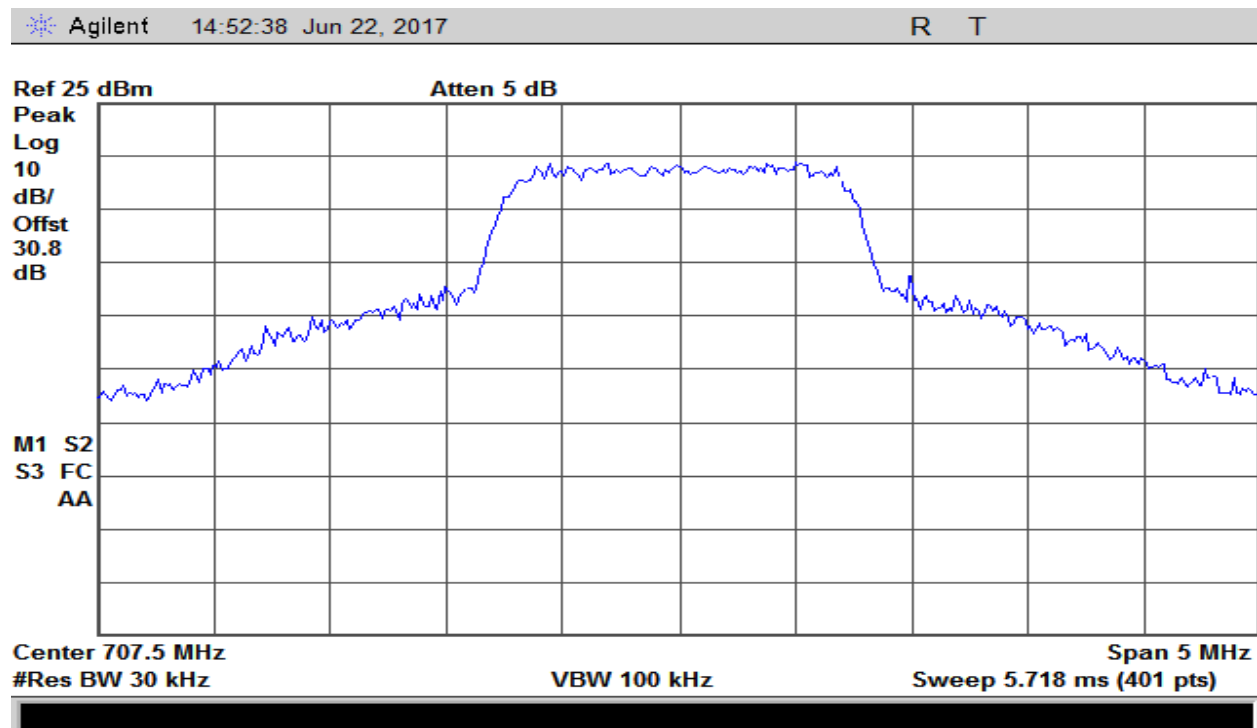
Plot 149 – 2110-2155MHz Band – Downlink Input – GSM



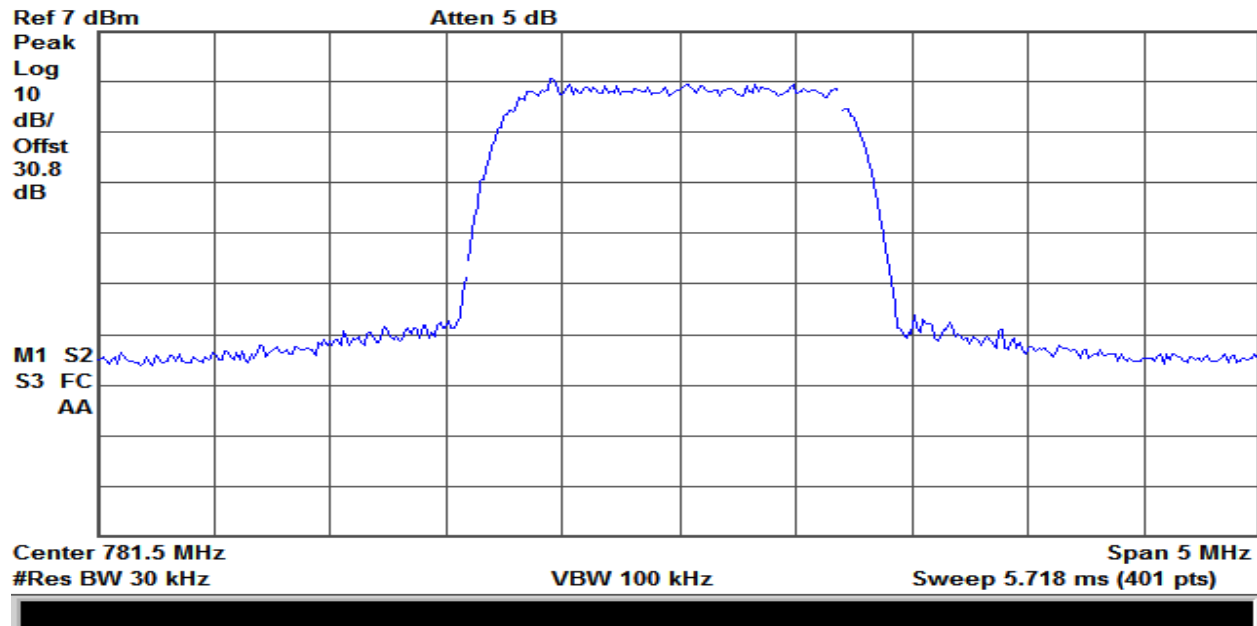
Plot 150 – 2110-2155MHz Band – Downlink Output – GSM



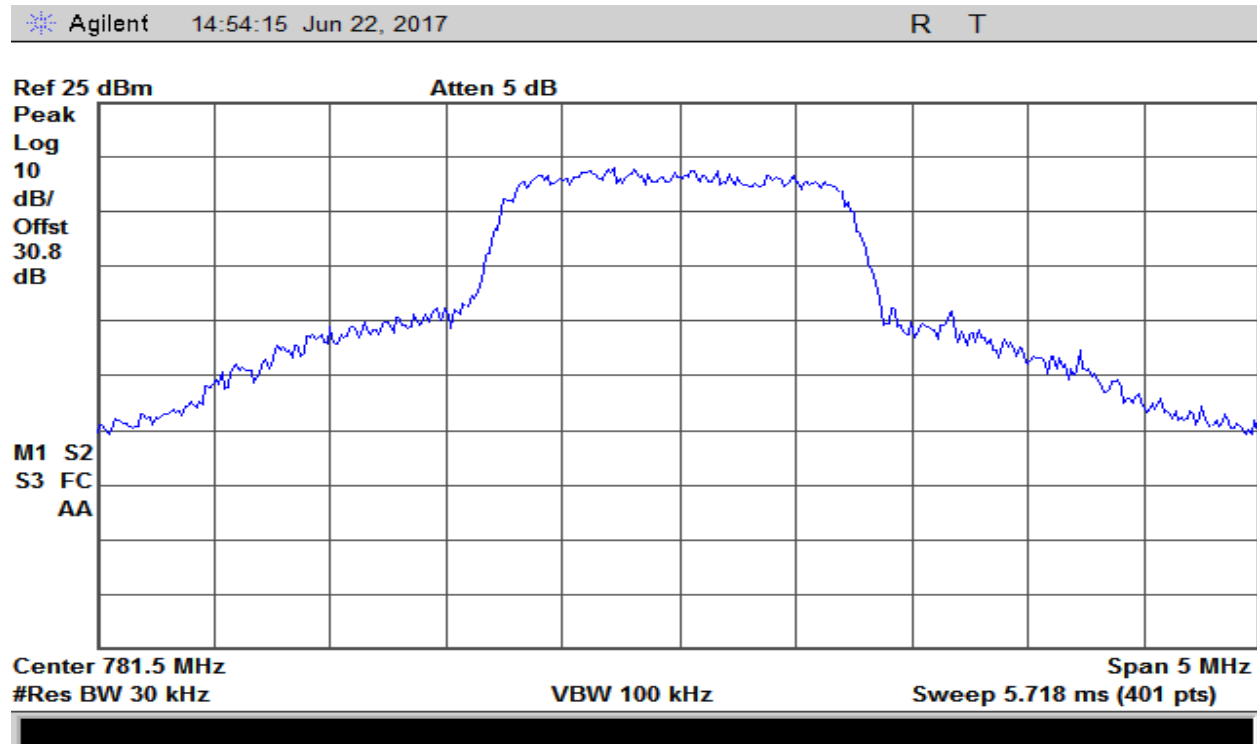
Plot 151 – 698-716MHz Band – Uplink Input – CDMA



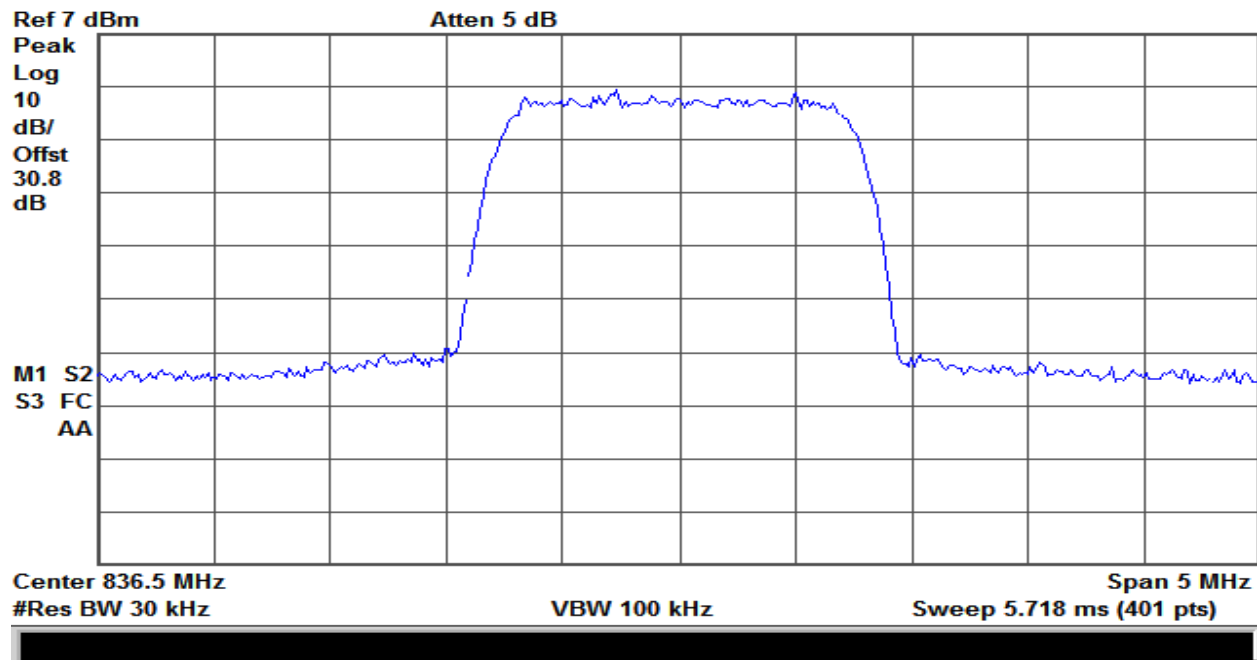
Plot 152 – 698-716MHz Band – Uplink Output – CDMA



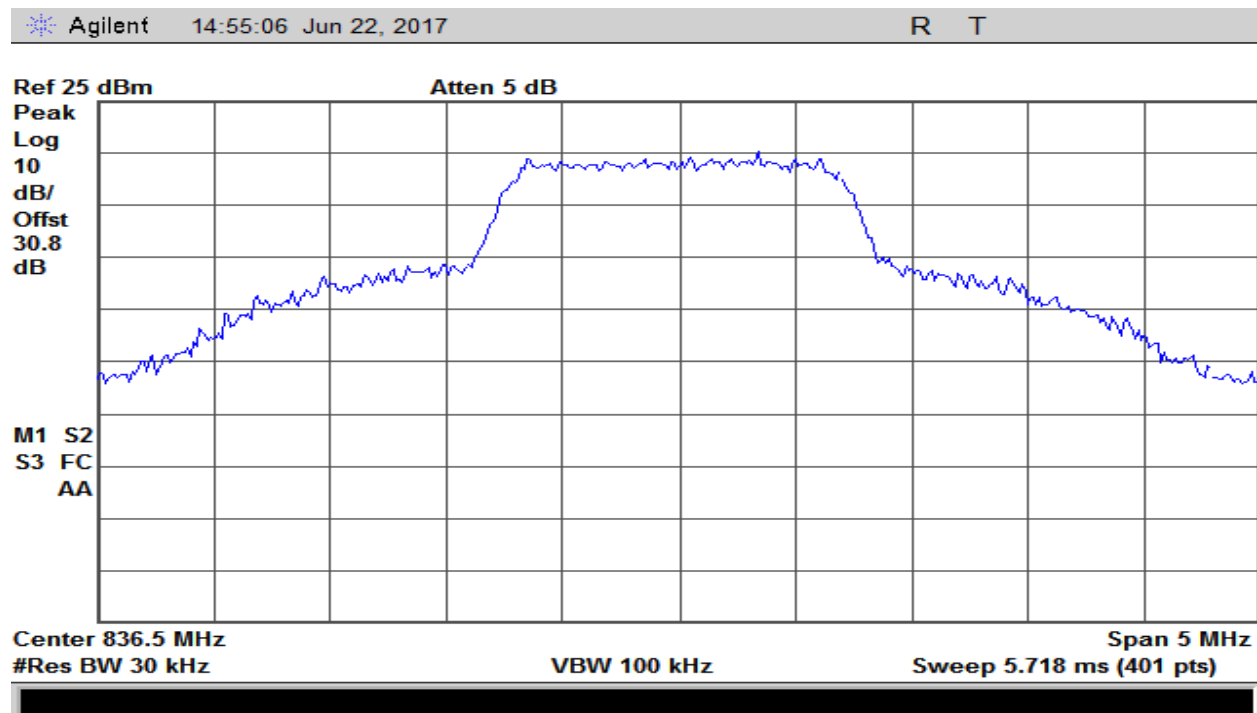
Plot 153 – 776-787MHz Band – Uplink Input – CDMA



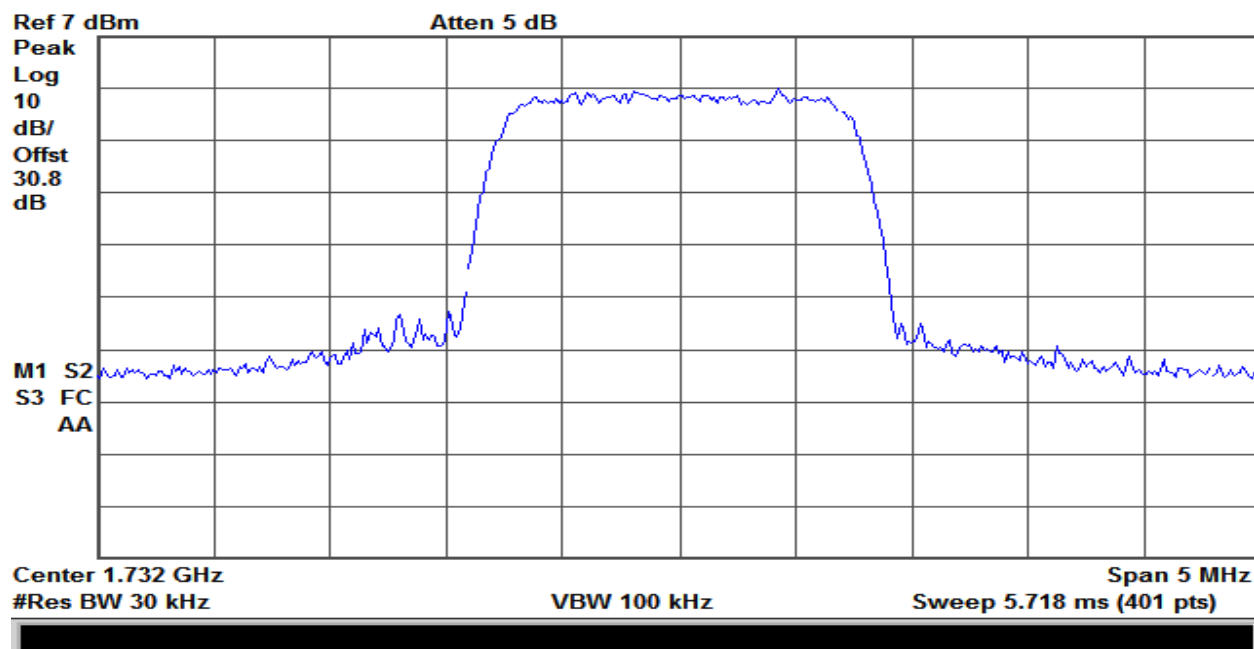
Plot 154 – 776-787MHz Band – Uplink Output – CDMA



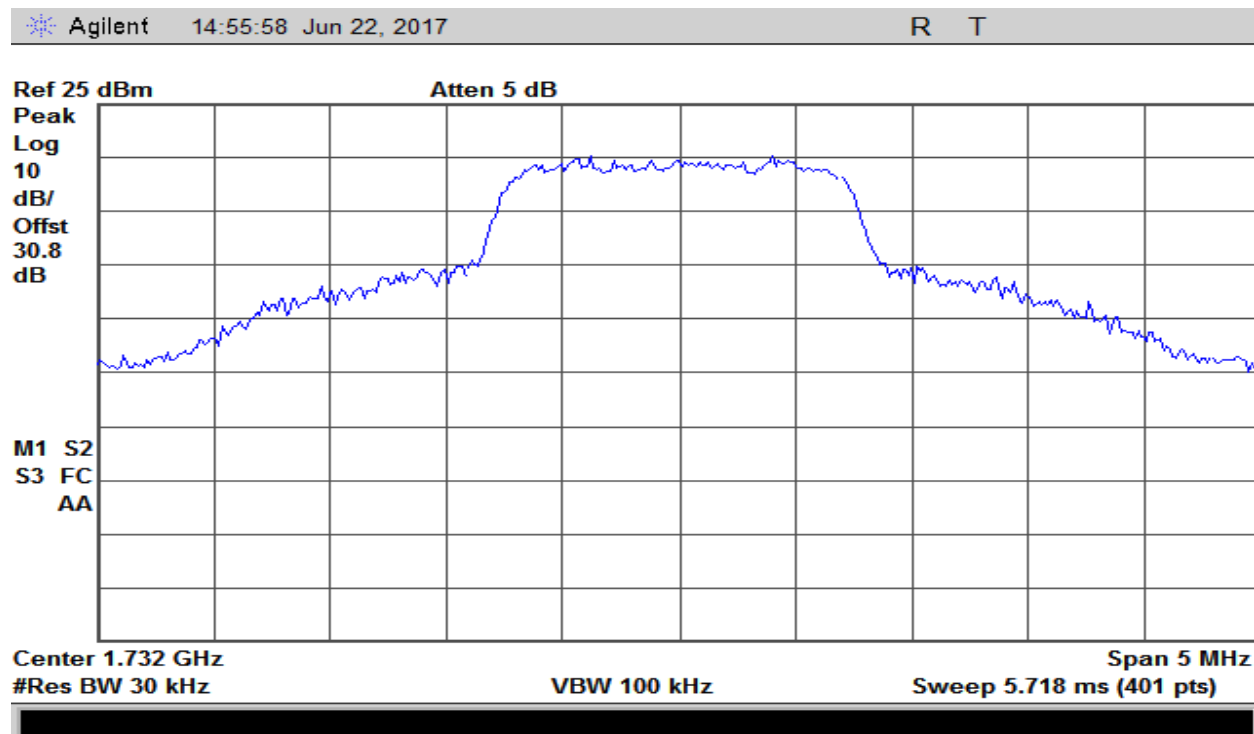
Plot 155 – 824-849MHz Band – Uplink Input – CDMA



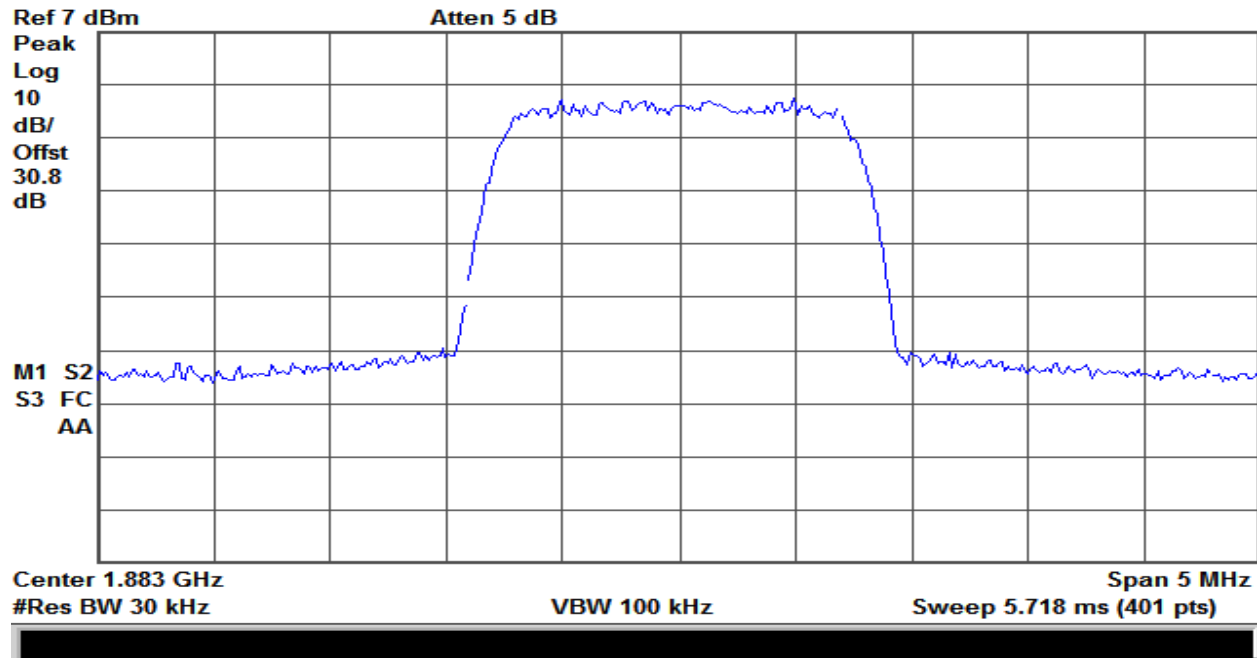
Plot 156 – 824-849MHz Band – Uplink Output – CDMA



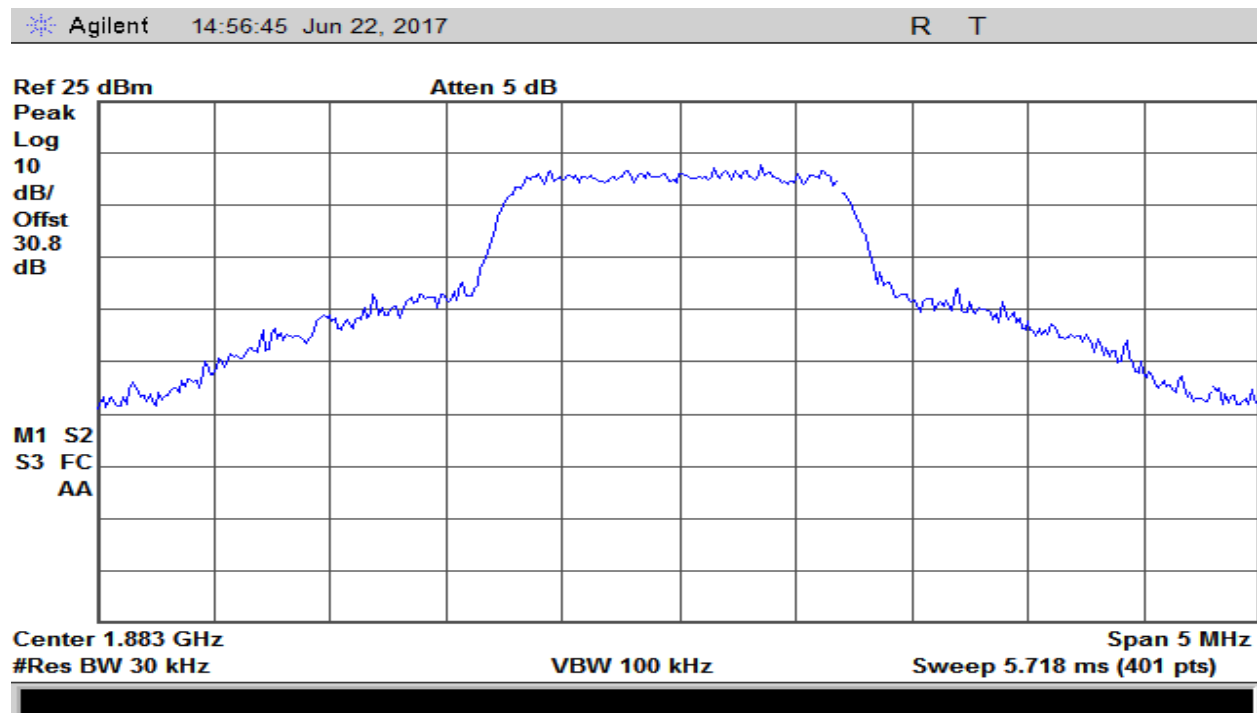
Plot 157 – 1710-1755MHz Band – Uplink Input – CDMA



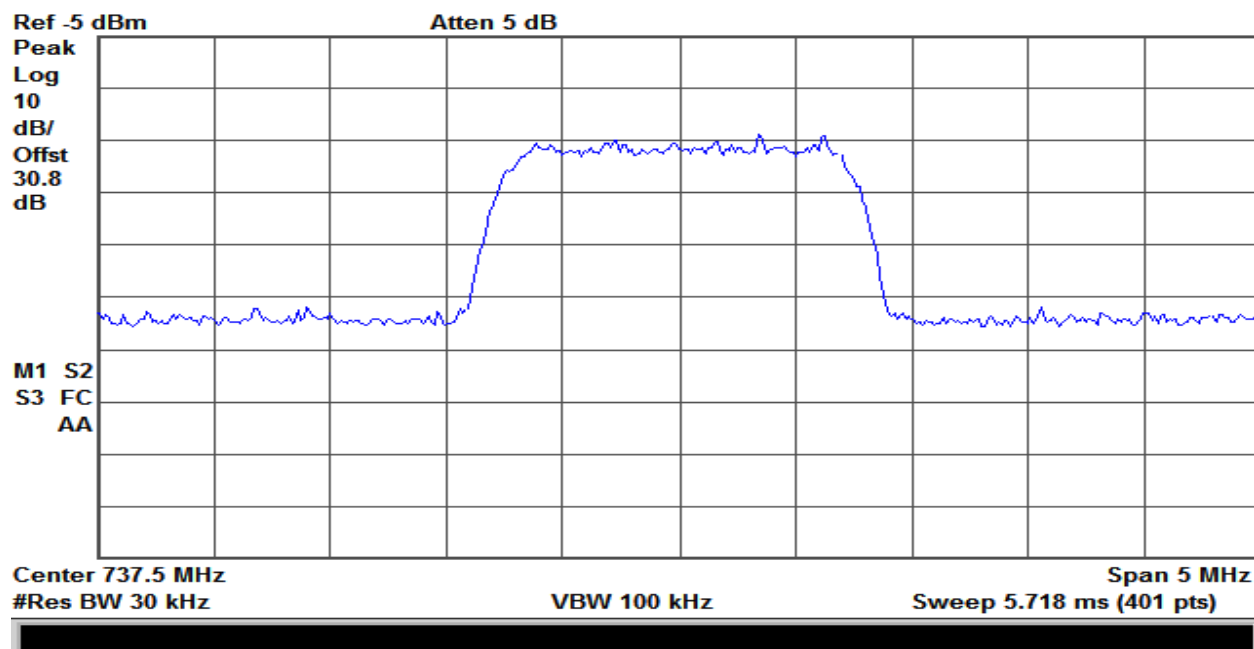
Plot 158 – 1710-1755MHz Band – Uplink Output – CDMA



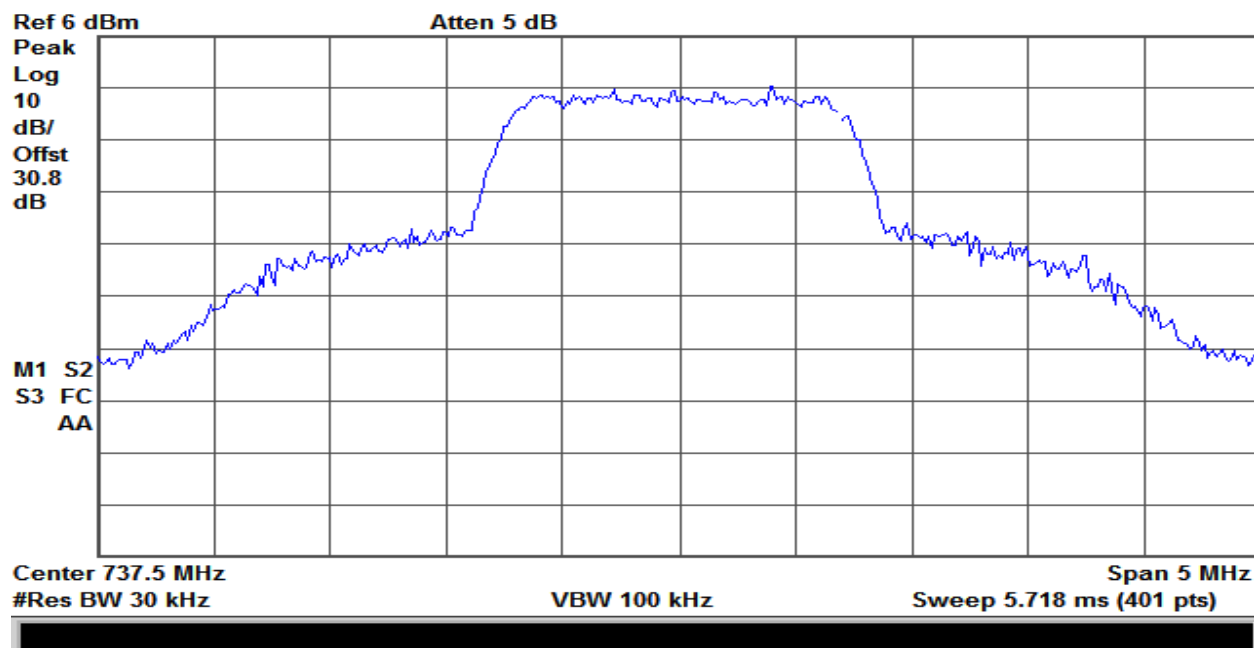
Plot 159 – 1850-1915MHz Band – Uplink Input – CDMA



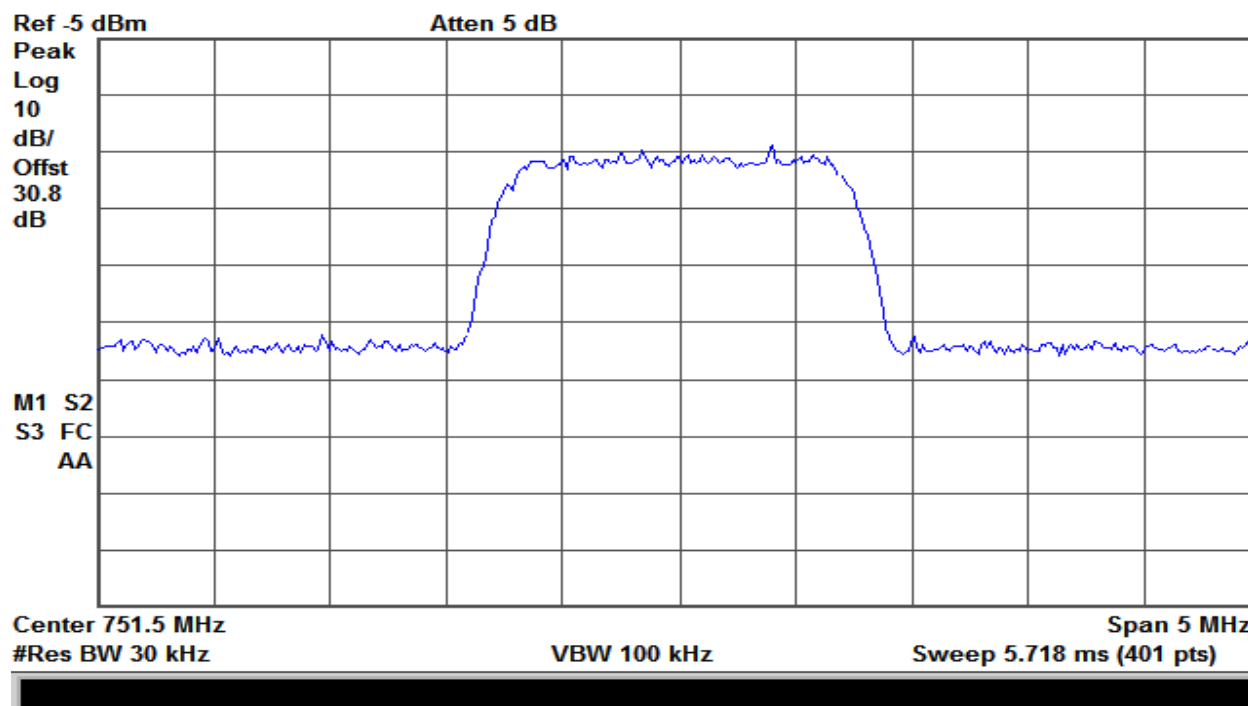
Plot 160 – 1850-1915MHz Band – Uplink Output – CDMA



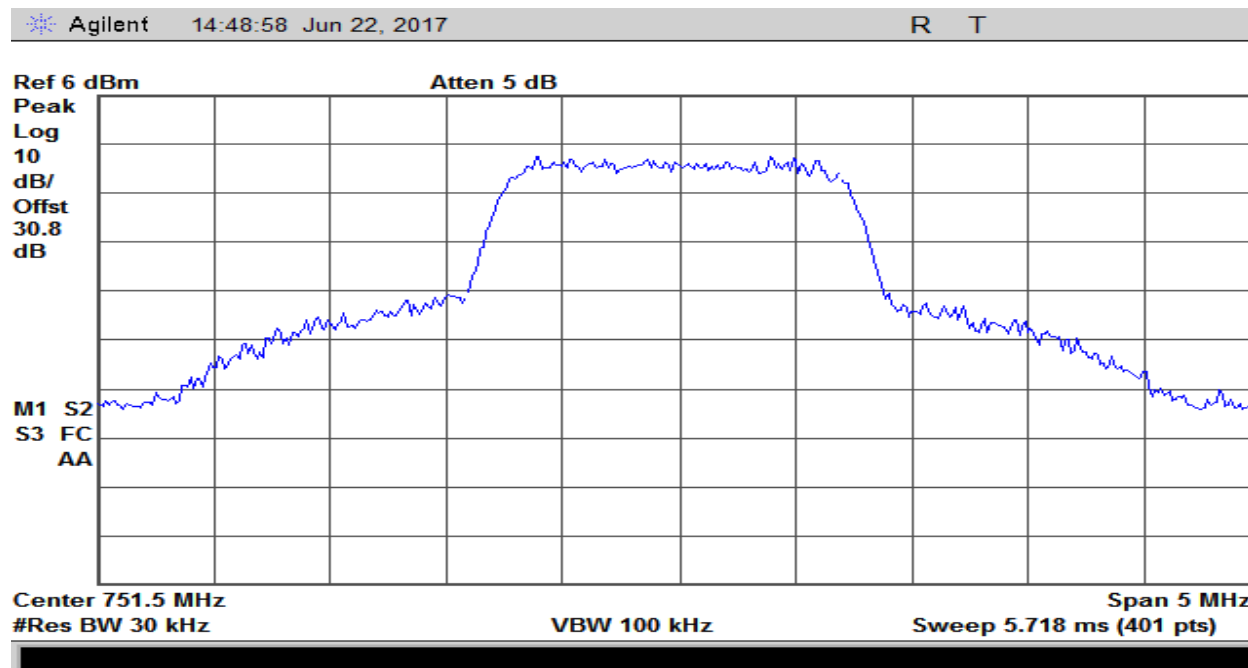
Plot 161 – 728-746MHz Band – Downlink Input – CDMA



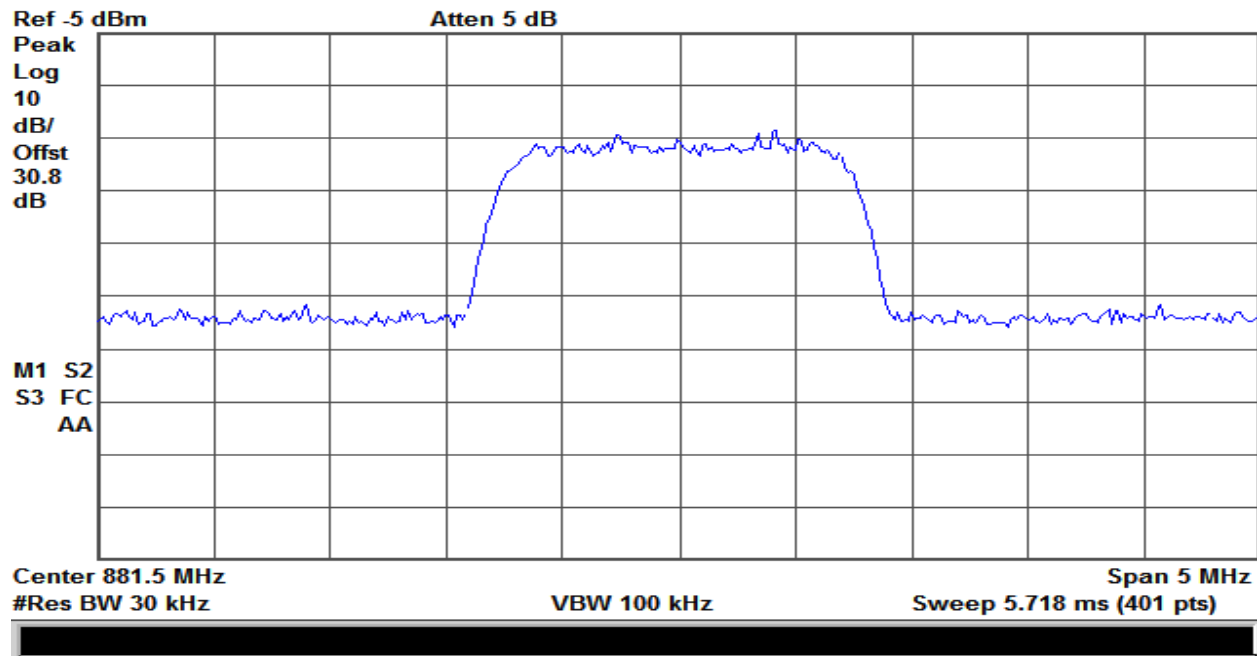
Plot 162 – 728-746MHz Band – Downlink Output – CDMA



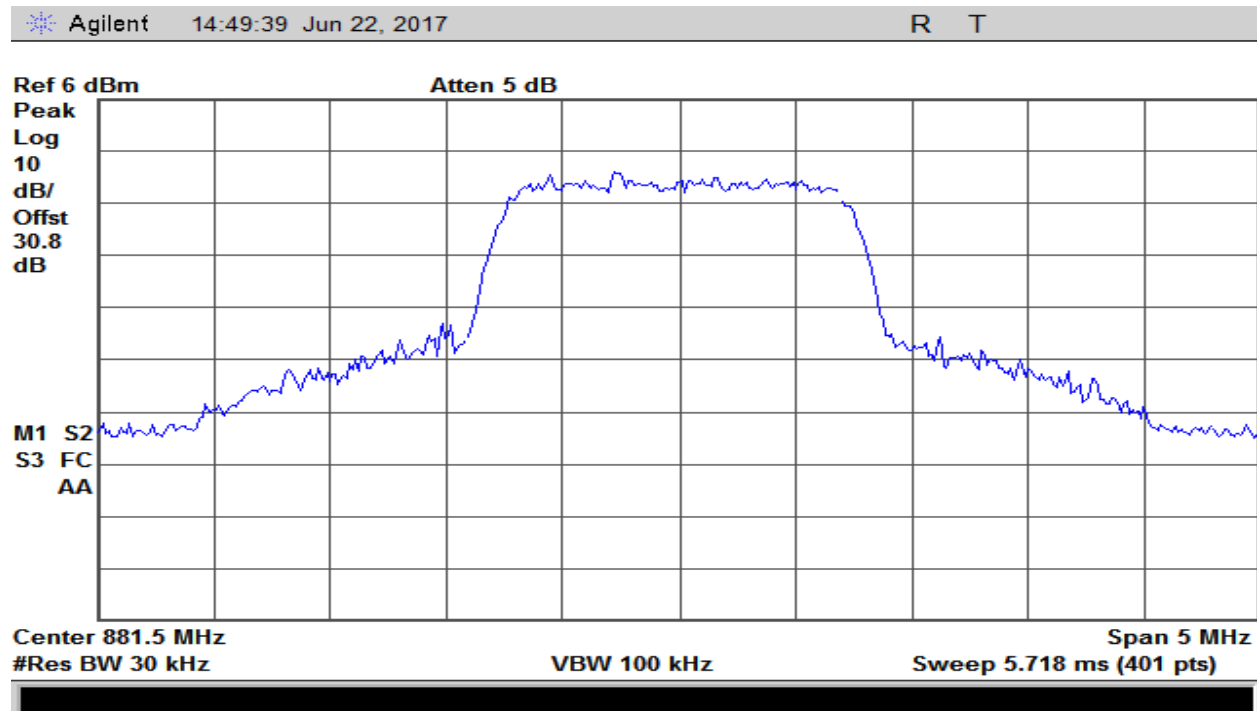
Plot 163 – 746-757MHz Band – Downlink Input – CDMA



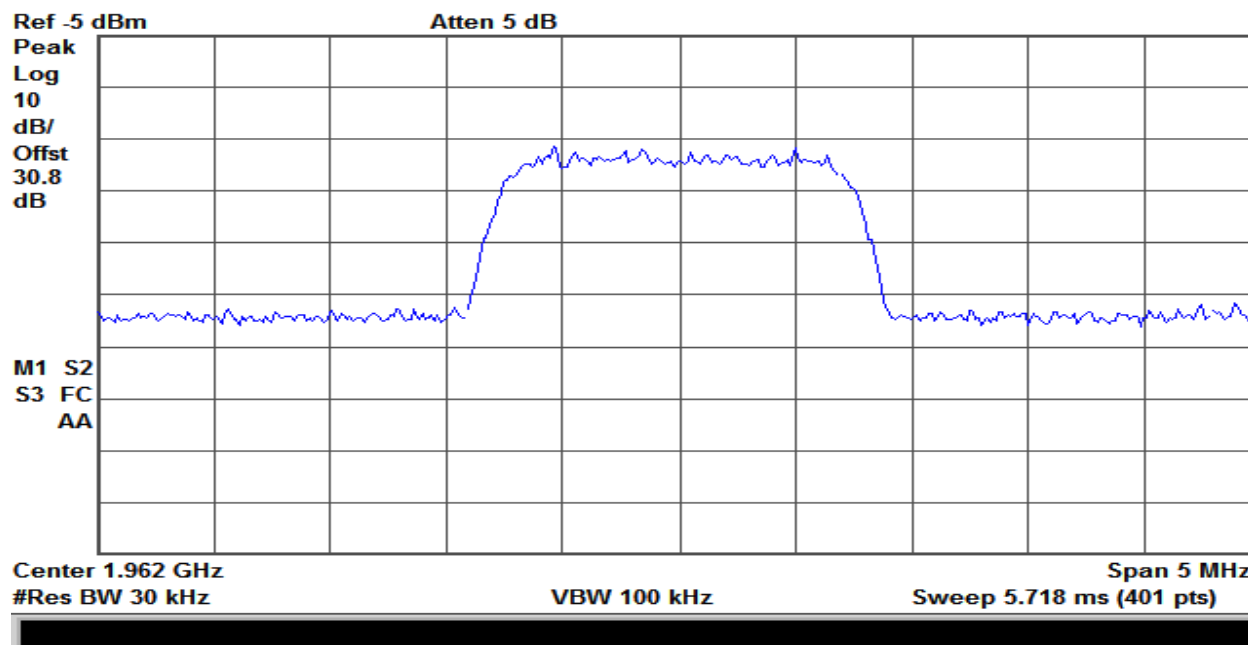
Plot 164 – 746-757MHz Band – Downlink Output – CDMA



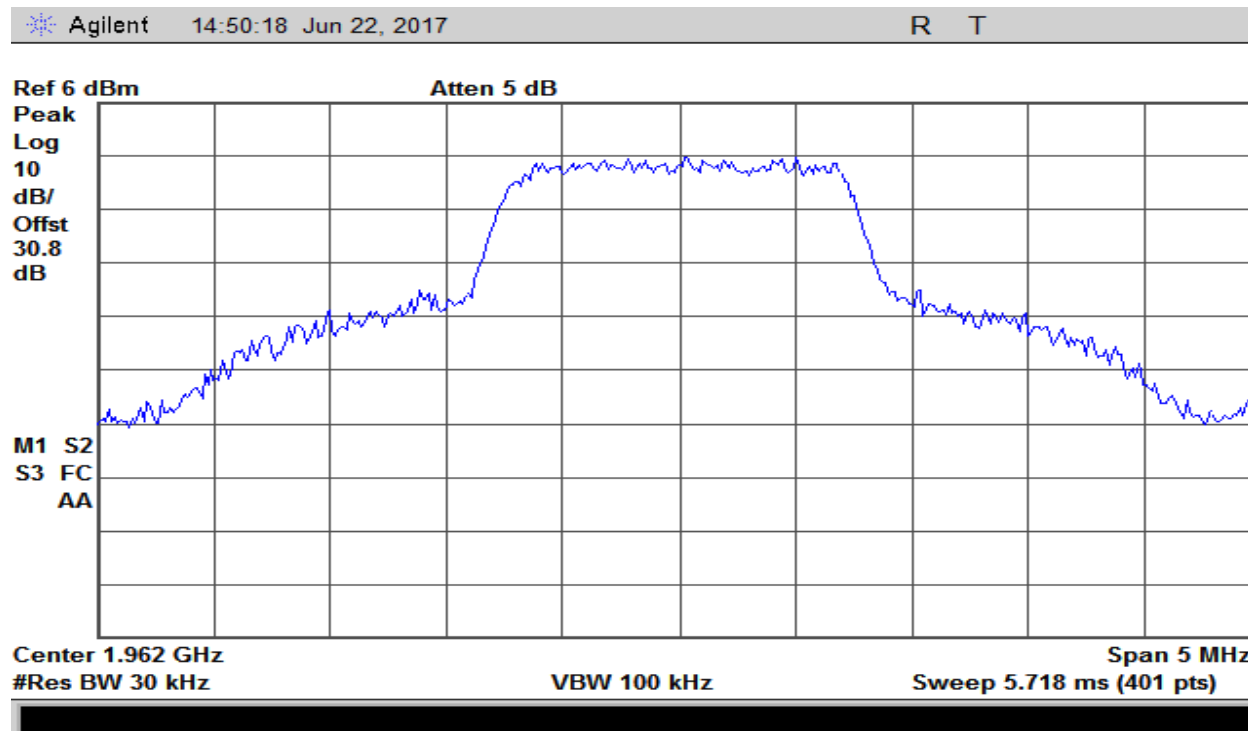
Plot 165 – 869-894MHz Band – Downlink Input – CDMA



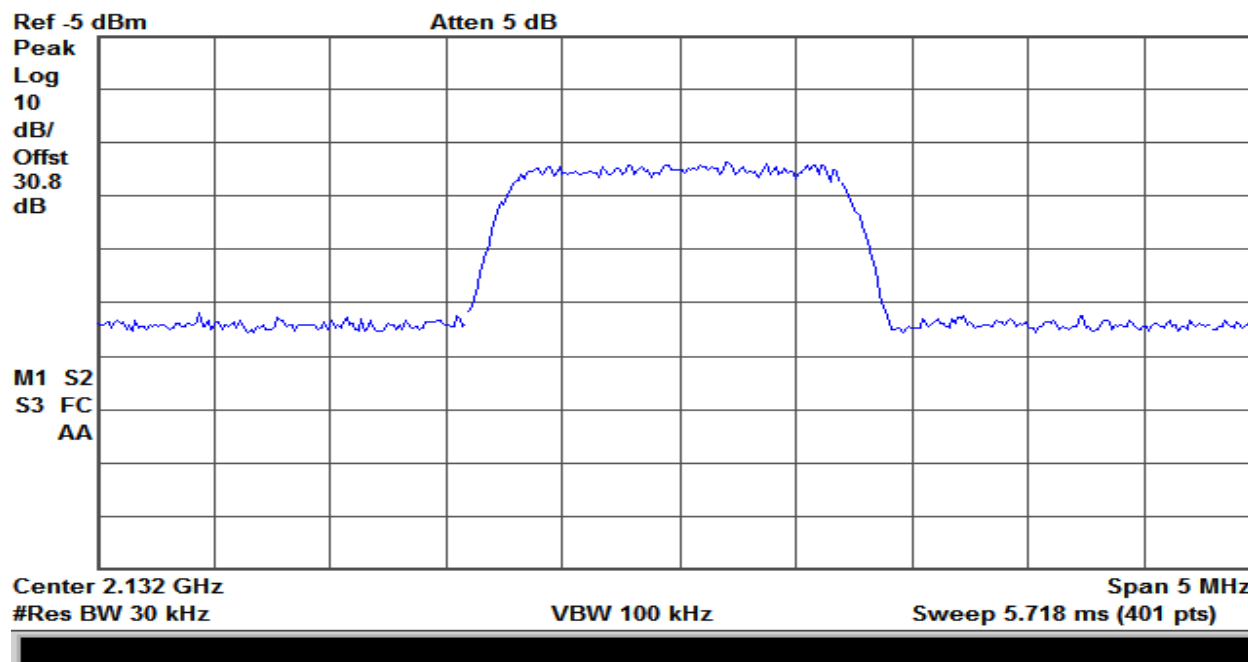
Plot 166 – 869-894MHz Band – Downlink Output – CDMA



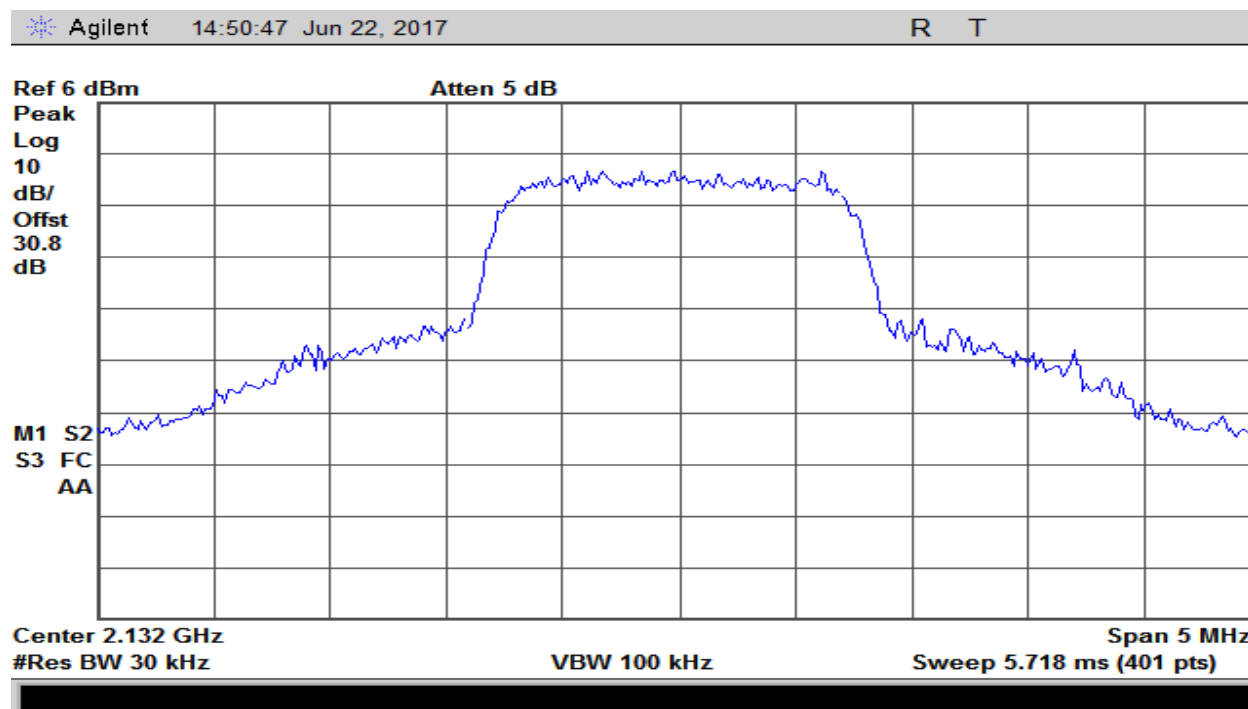
Plot 167 – 1930-1995MHz Band – Downlink Input – CDMA



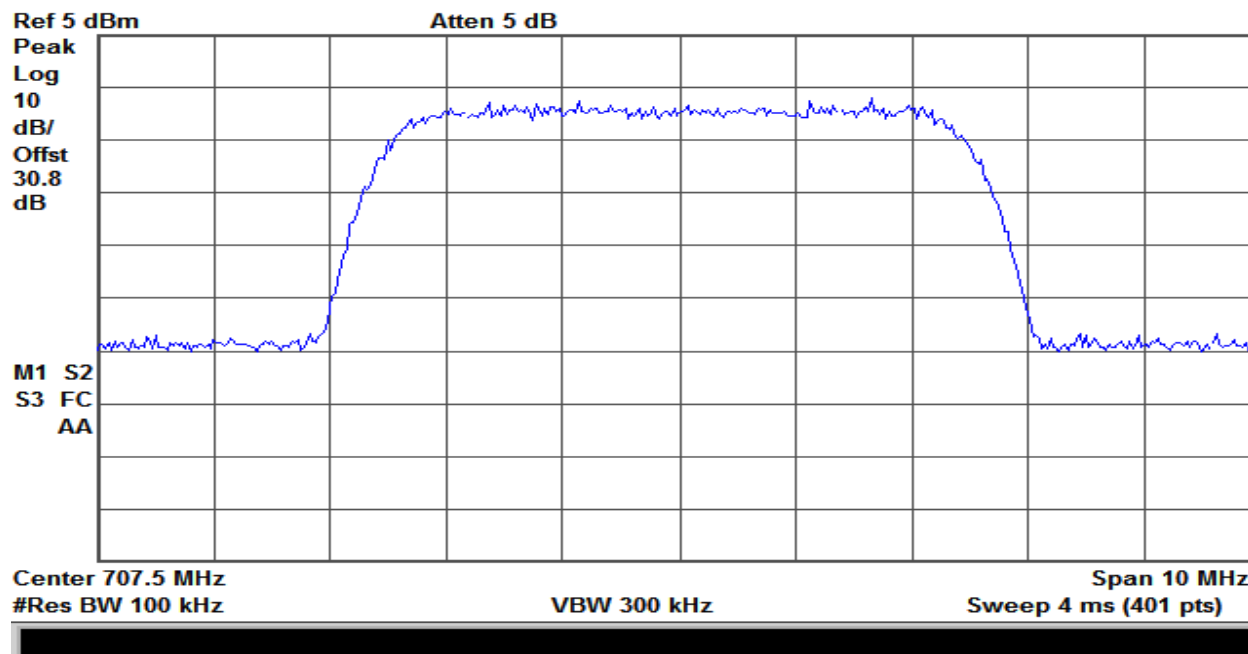
Plot 168 – 1930-1995MHz Band – Downlink Output – CDMA



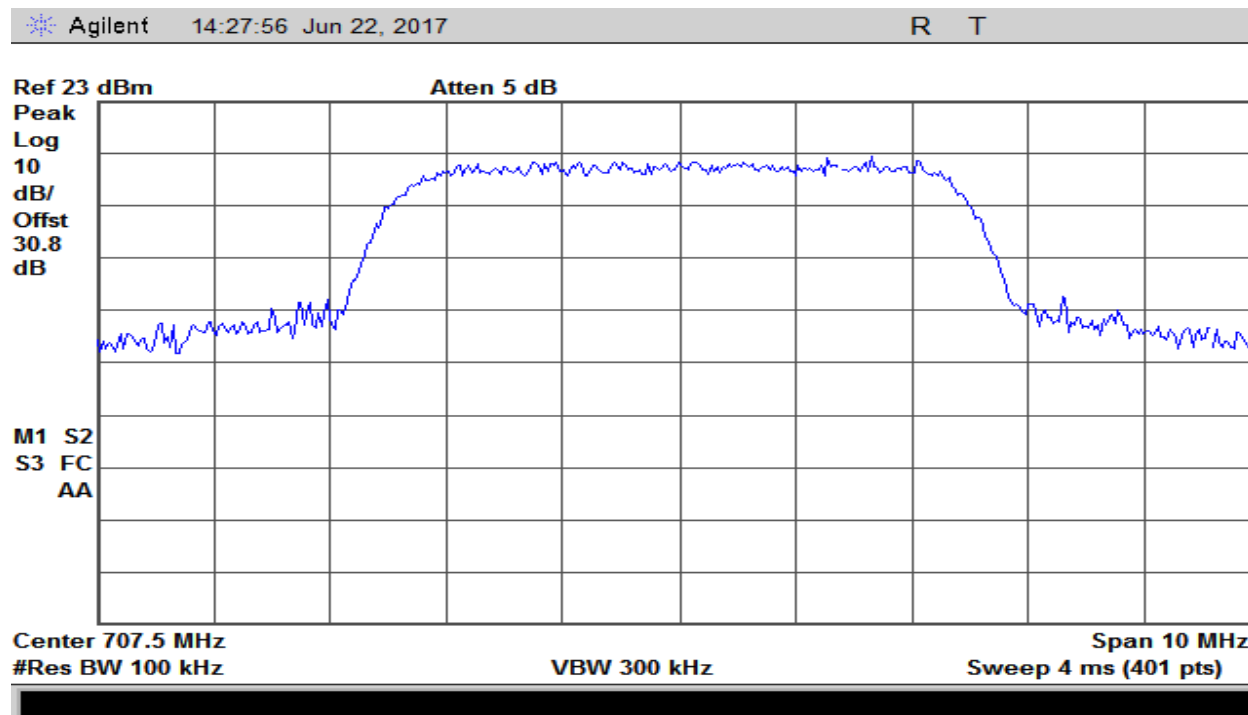
Plot 169 – 2110-2155MHz Band – Downlink Input – CDMA



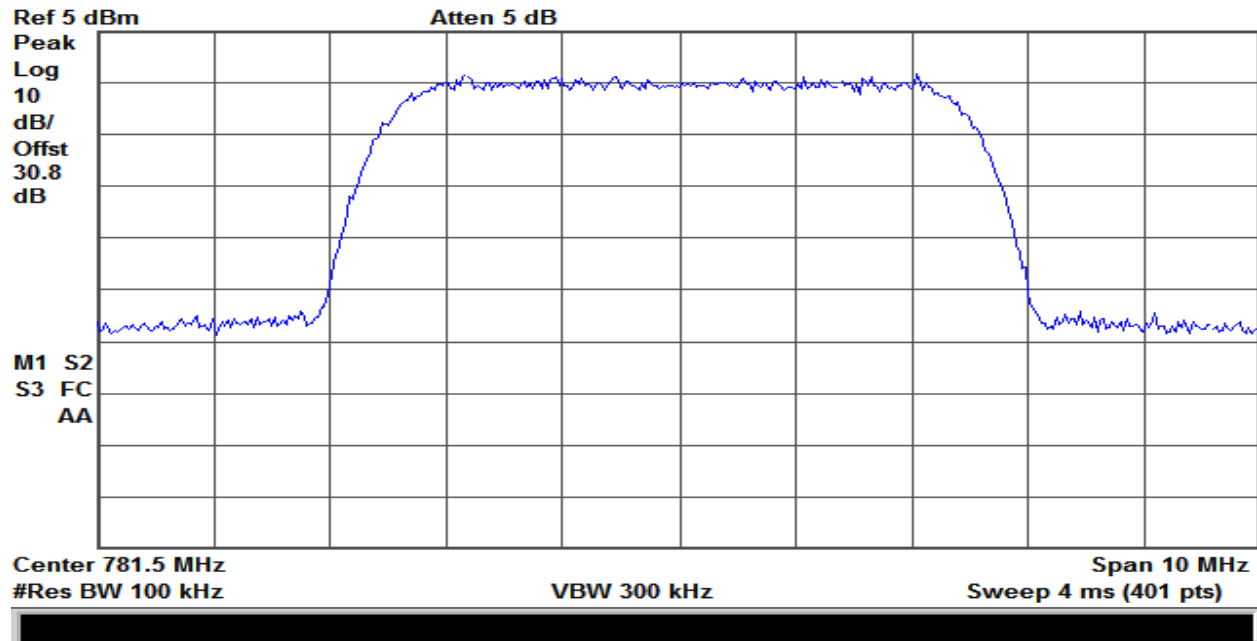
Plot 170 – 2110-2155MHz Band – Downlink Output – CDMA



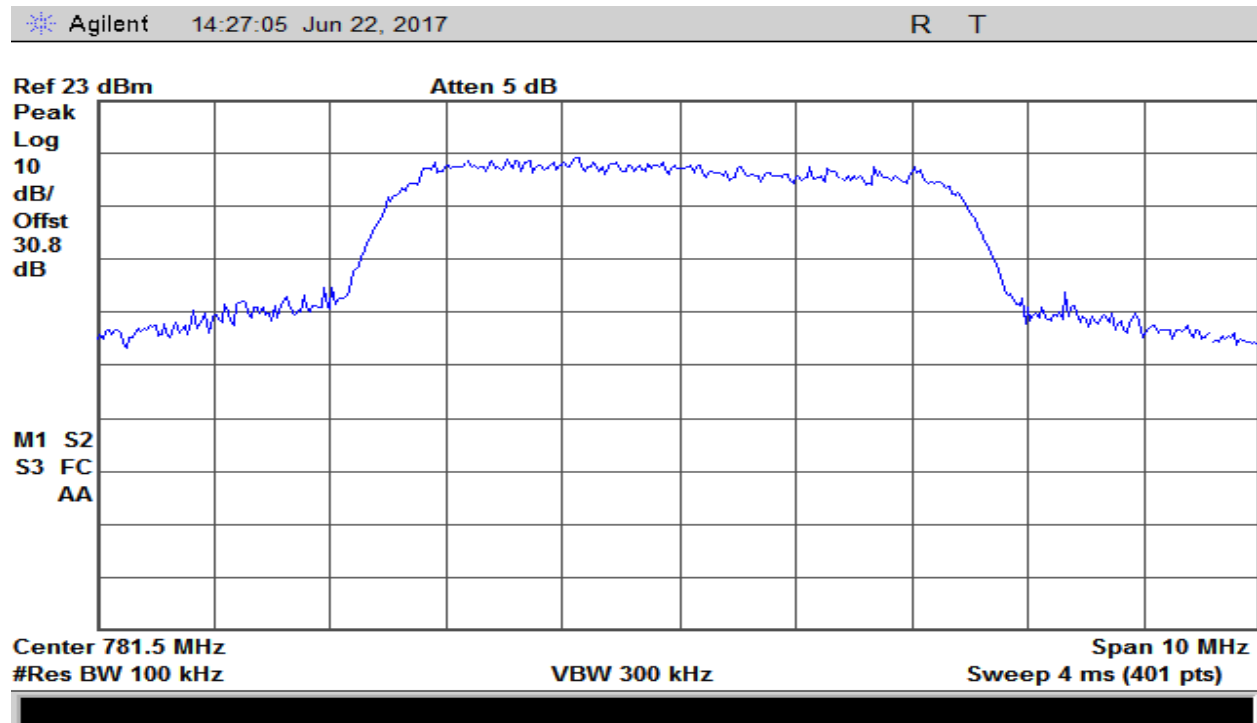
Plot 171 – 698-716MHz Band – Uplink Input – LTE



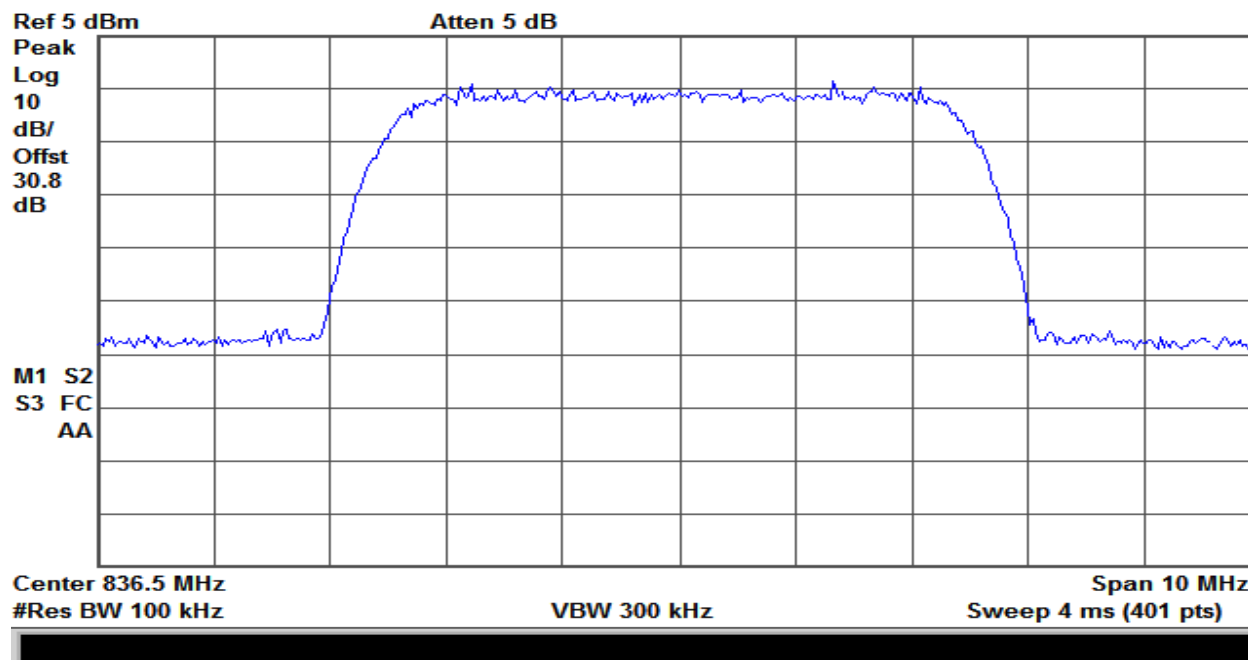
Plot 172 – 698-716MHz Band – Uplink Output – LTE



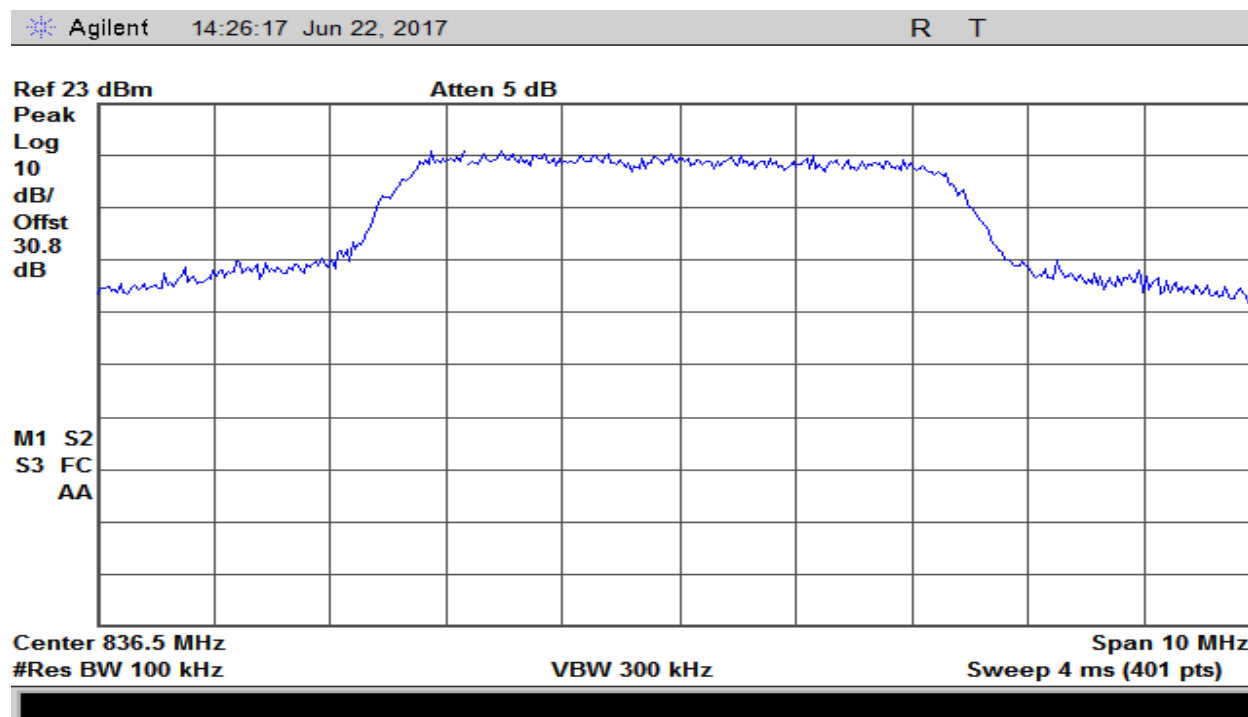
Plot 173 – 776-787MHz Band – Uplink Input – LTE



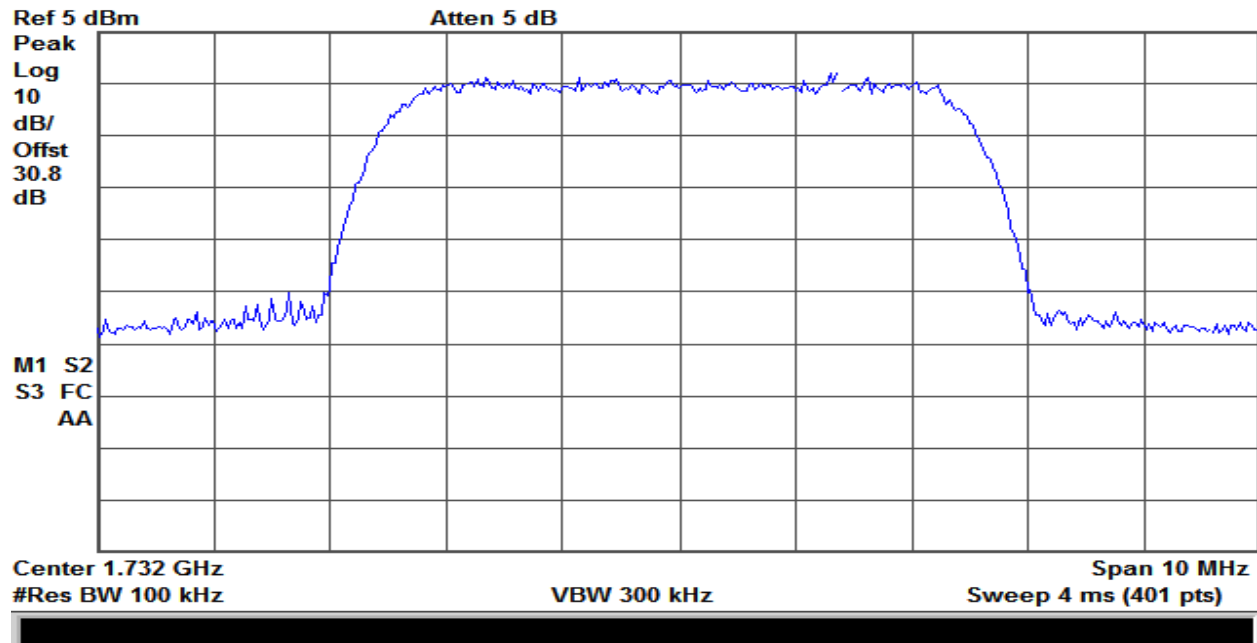
Plot 174 – 776-787MHz Band – Uplink Output – LTE



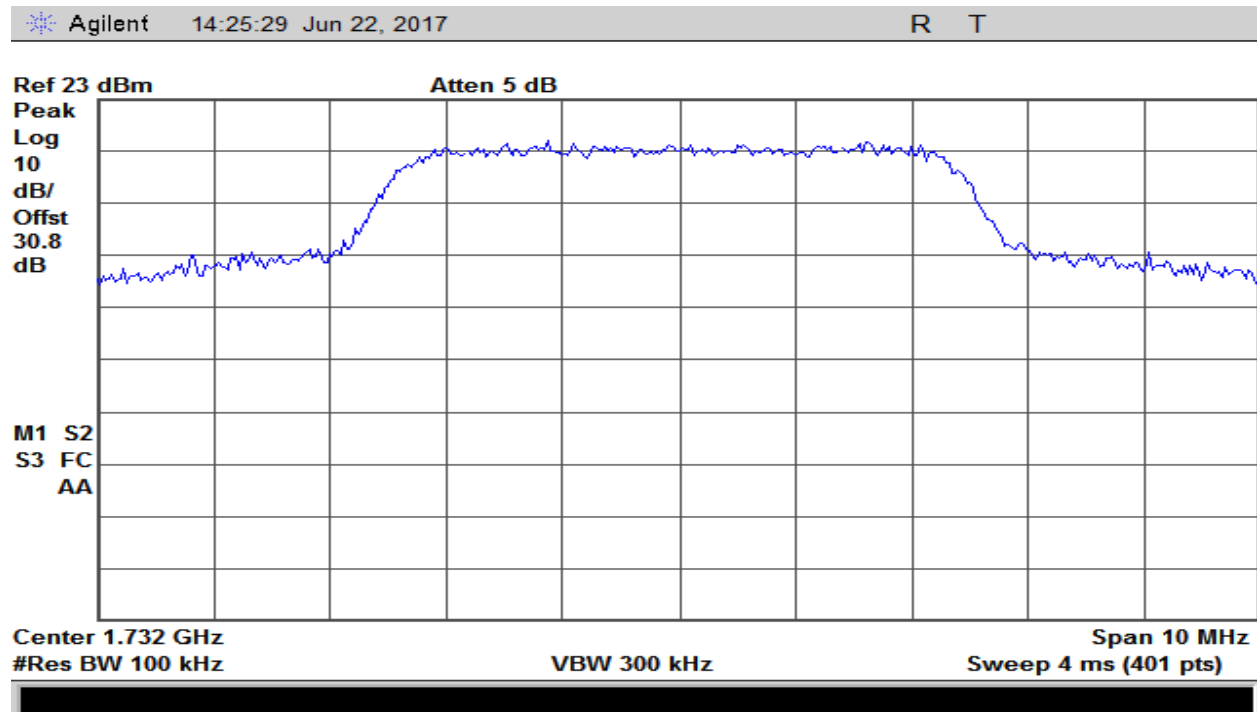
Plot 175 – 824-849MHz Band – Uplink Input – LTE



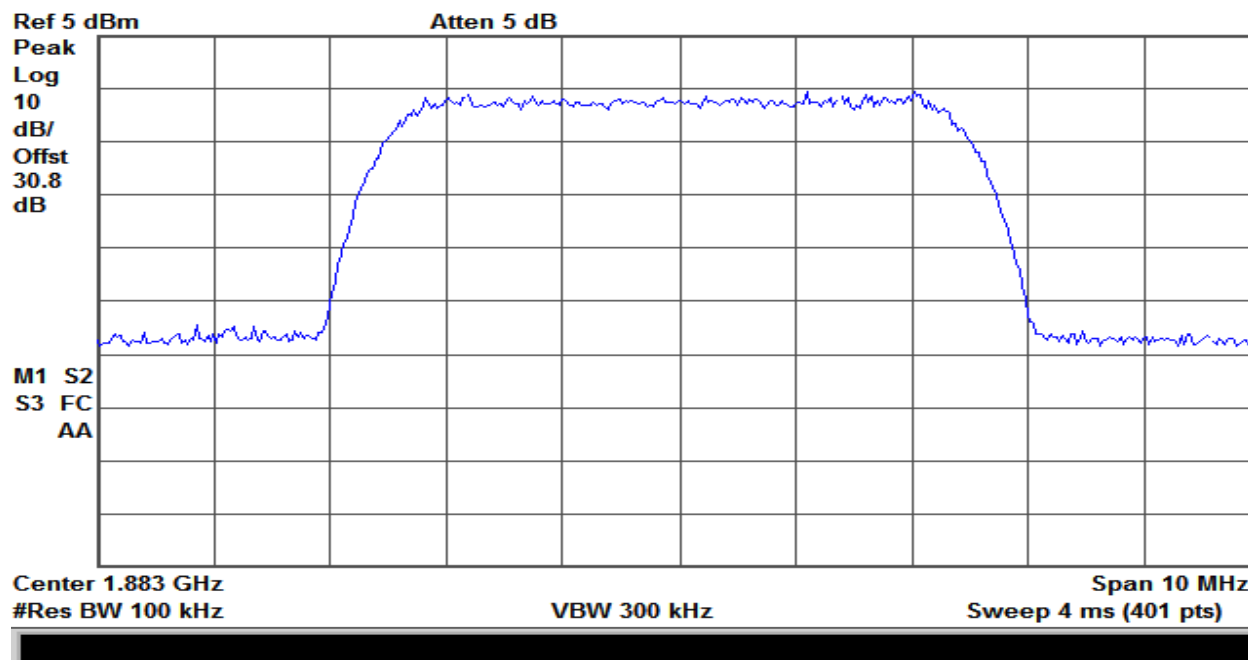
Plot 176 – 824-849MHz Band – Uplink Output – LTE



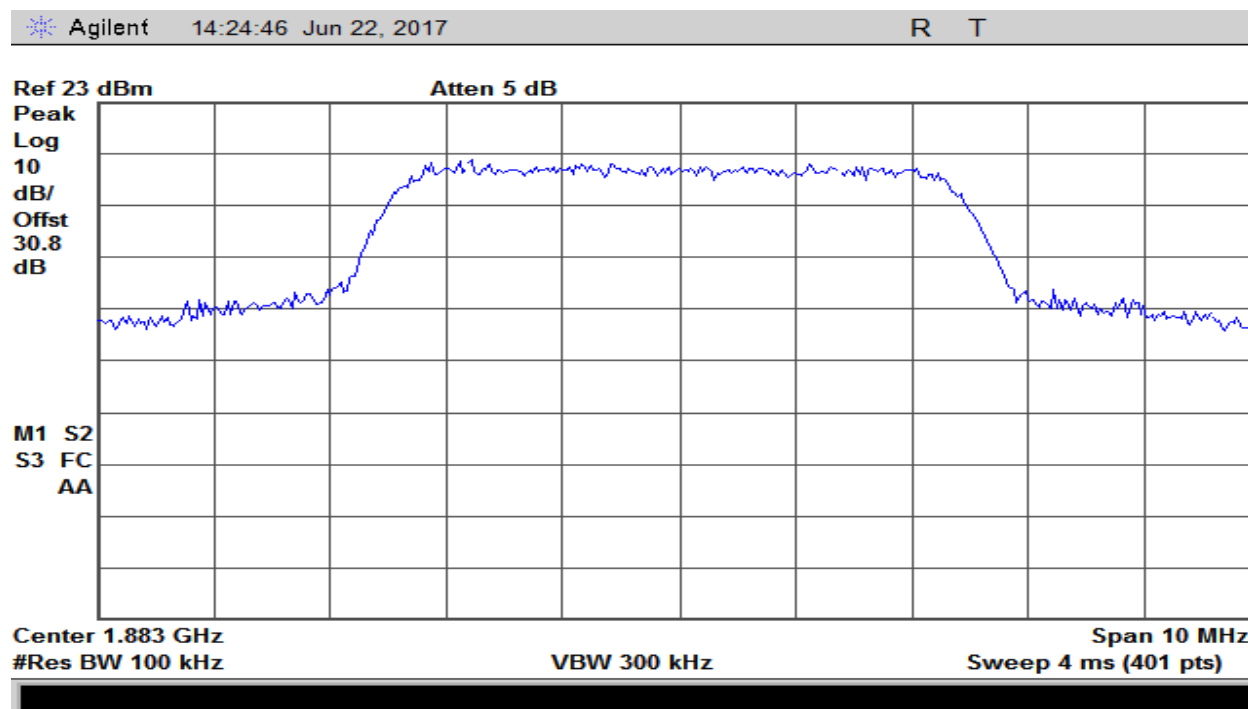
Plot 177 – 1710-1755MHz Band – Uplink Input – LTE



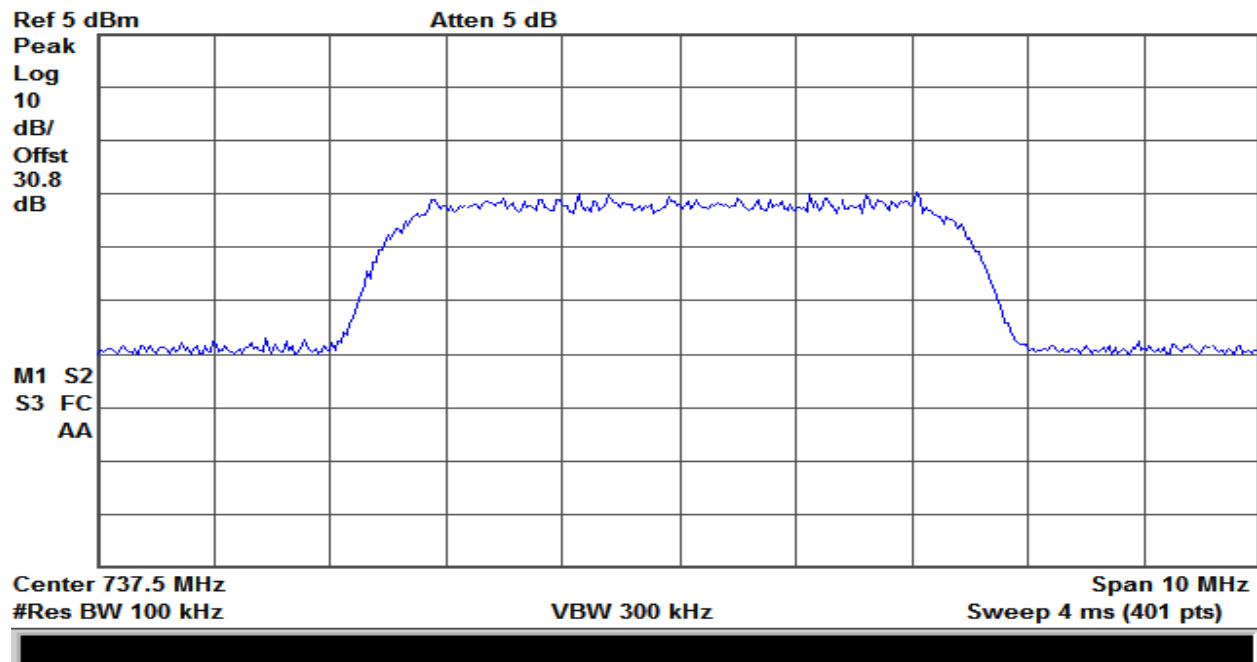
Plot 178 – 1710-1755MHz Band – Uplink Output – LTE



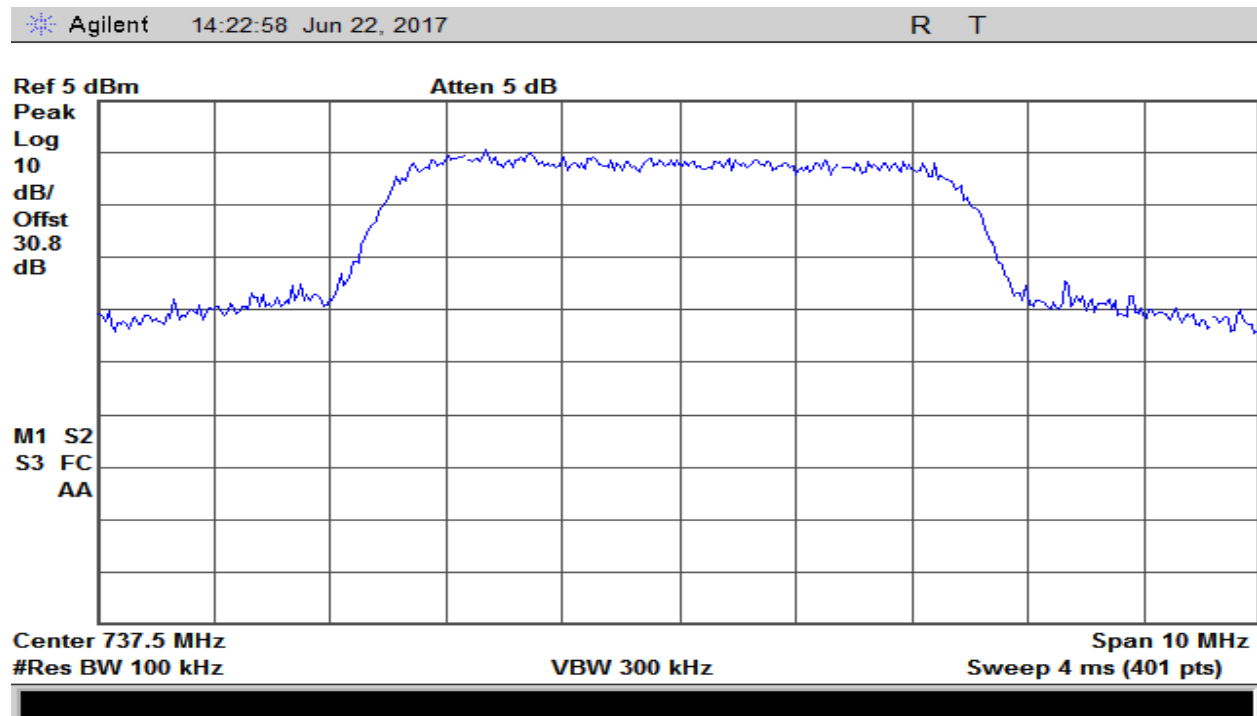
Plot 179 – 1850-1915MHz Band – Uplink Input – LTE



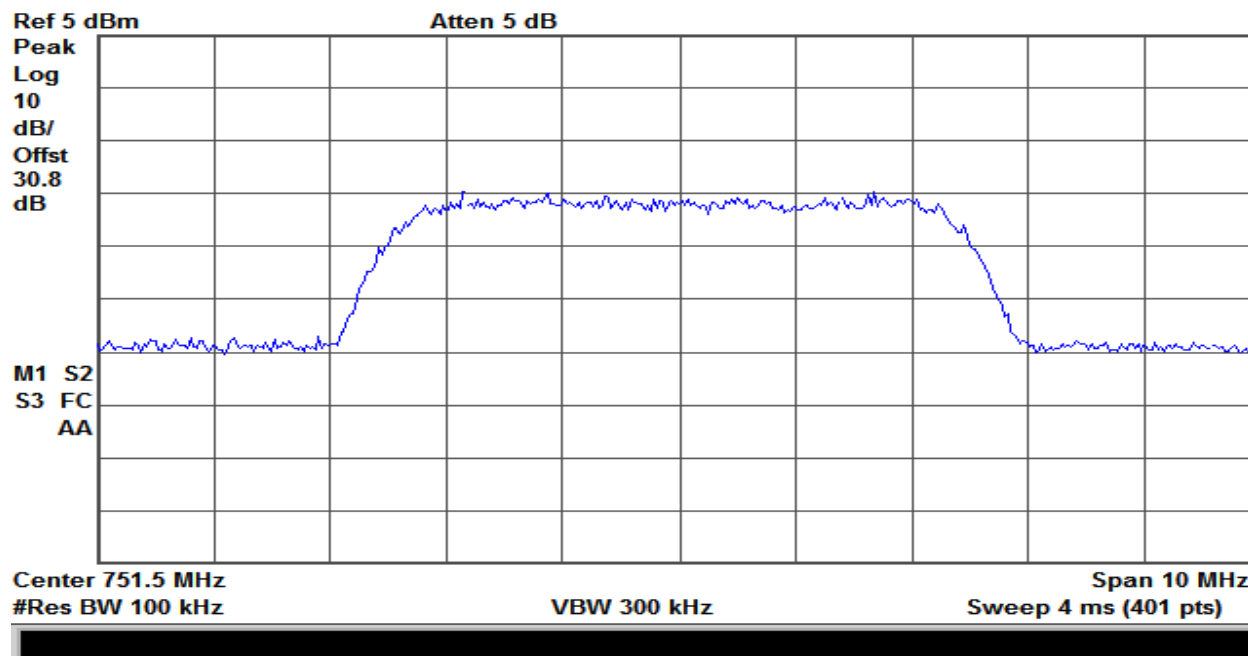
Plot 180 – 1850-1915MHz Band – Uplink Output – LTE



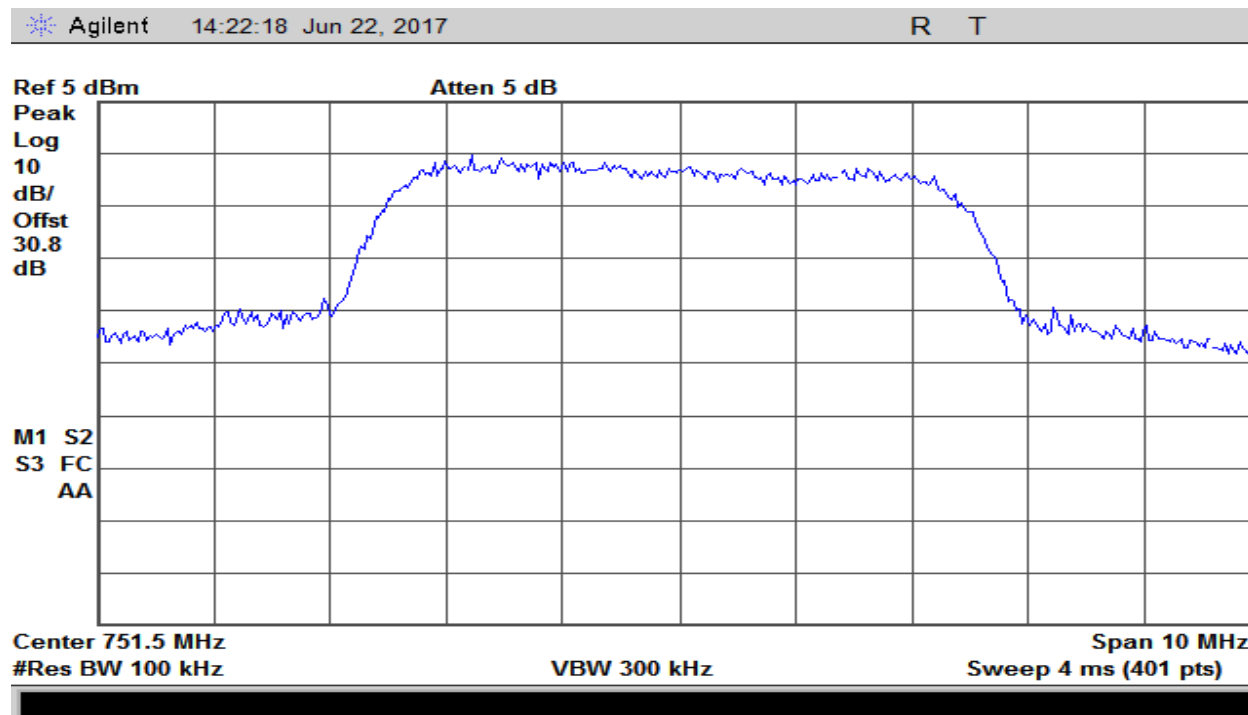
Plot 181 – 728-746MHz Band – Downlink Input – LTE



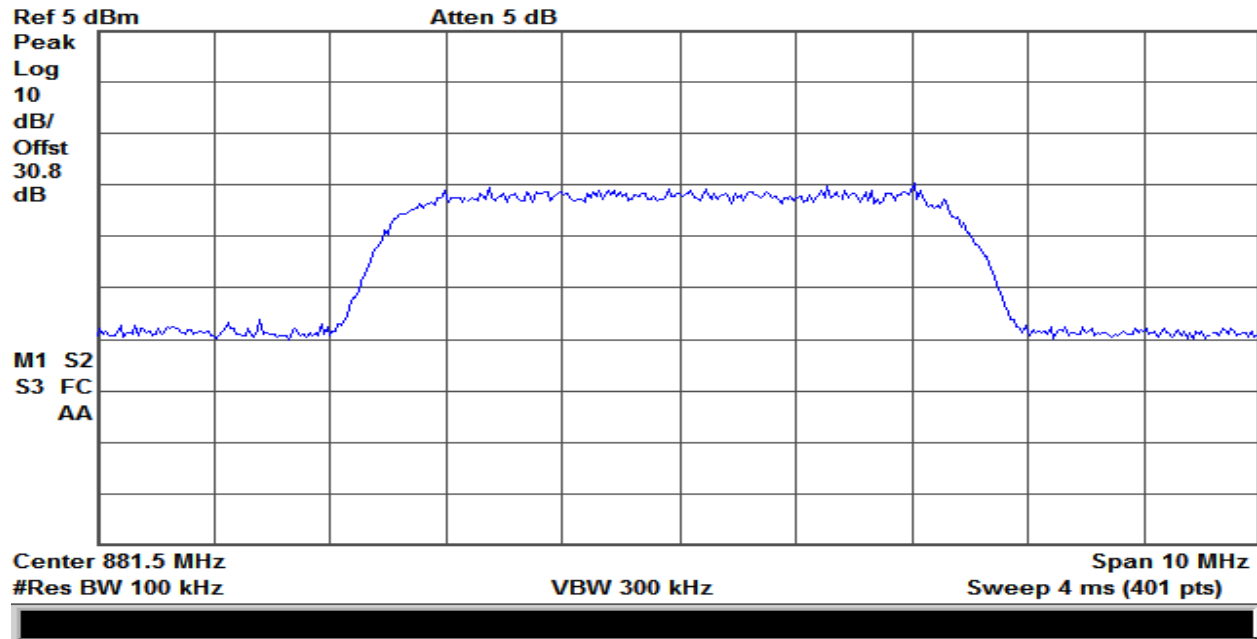
Plot 182 – 728-746MHz Band – Downlink Output – LTE



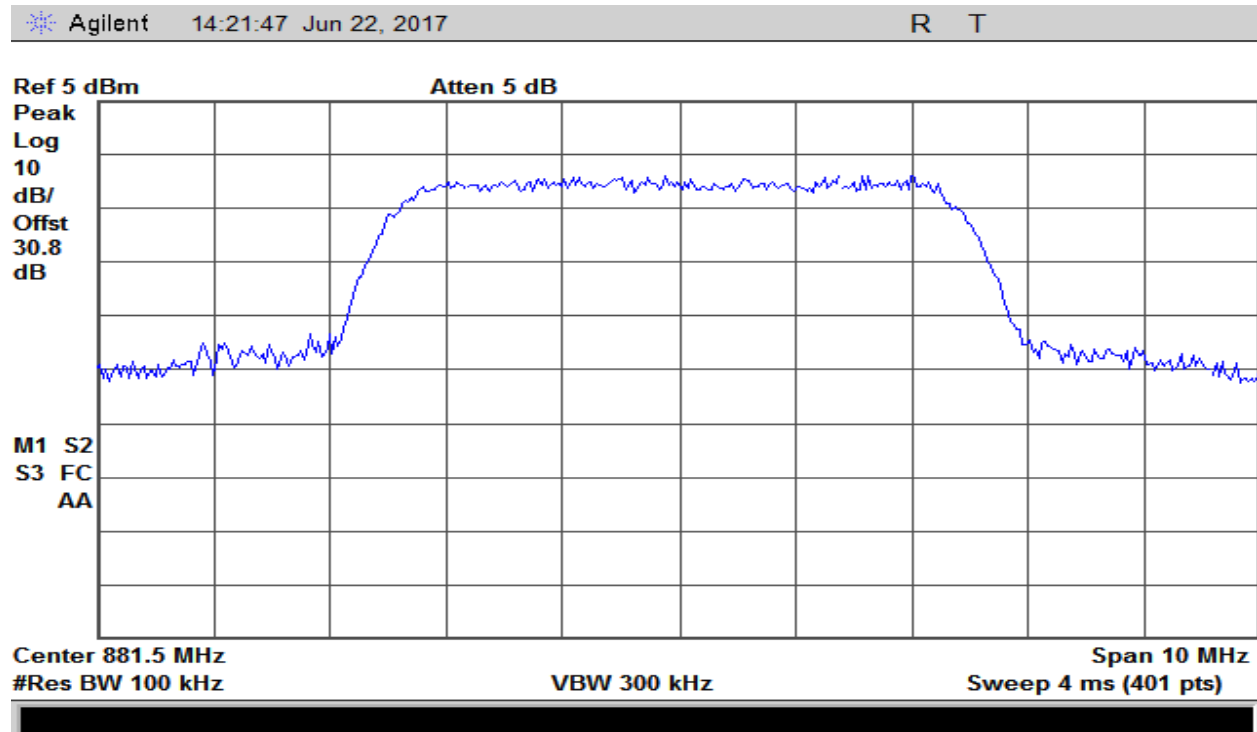
Plot 183 – 746-757MHz Band – Downlink Input – LTE



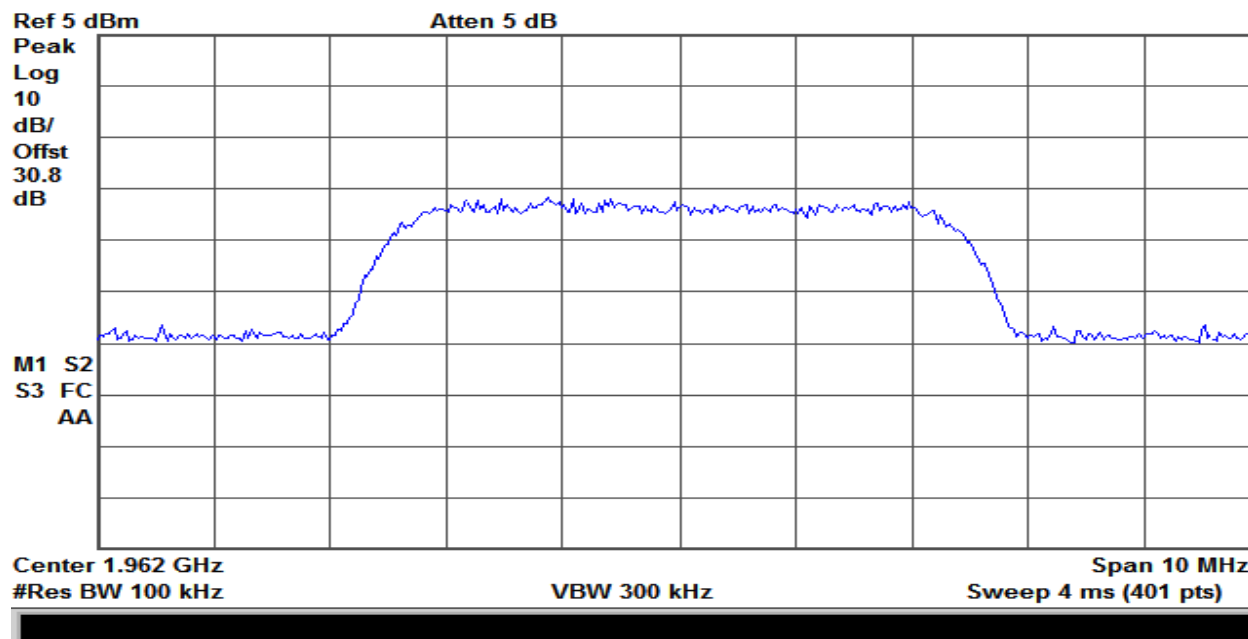
Plot 184 – 746-757MHz Band – Downlink Output – LTE



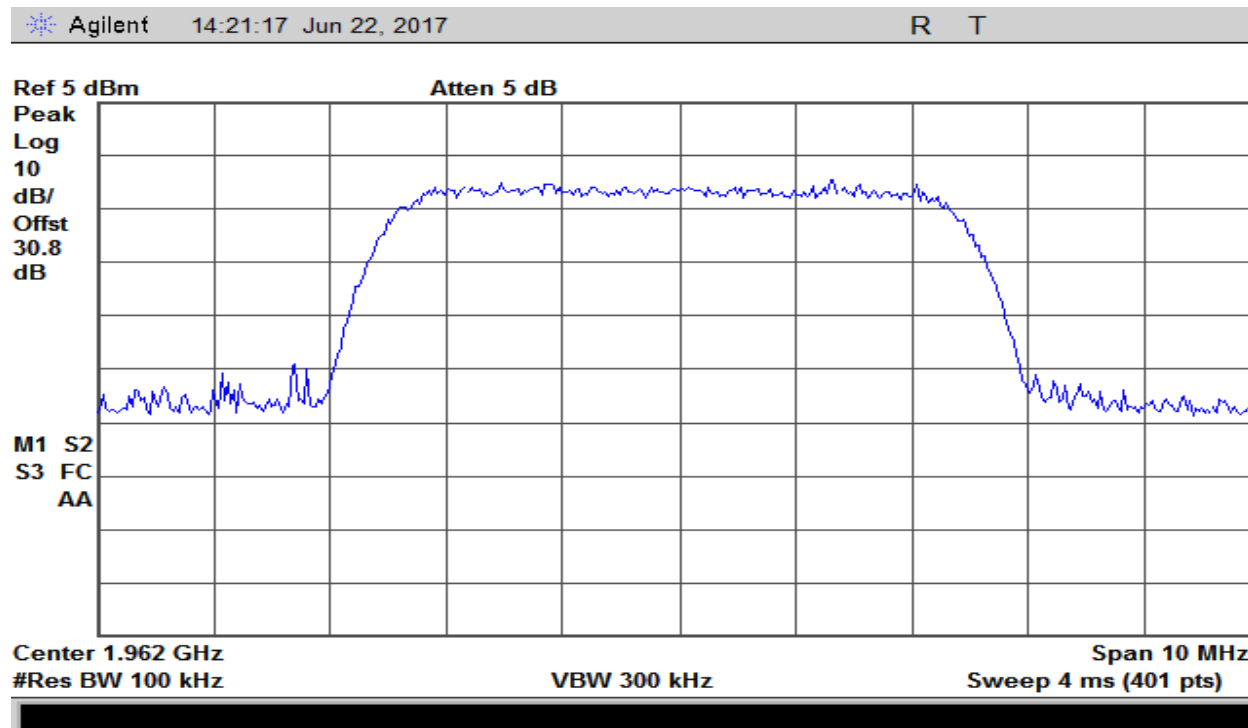
Plot 185 – 869-894MHz Band – Downlink Input – LTE



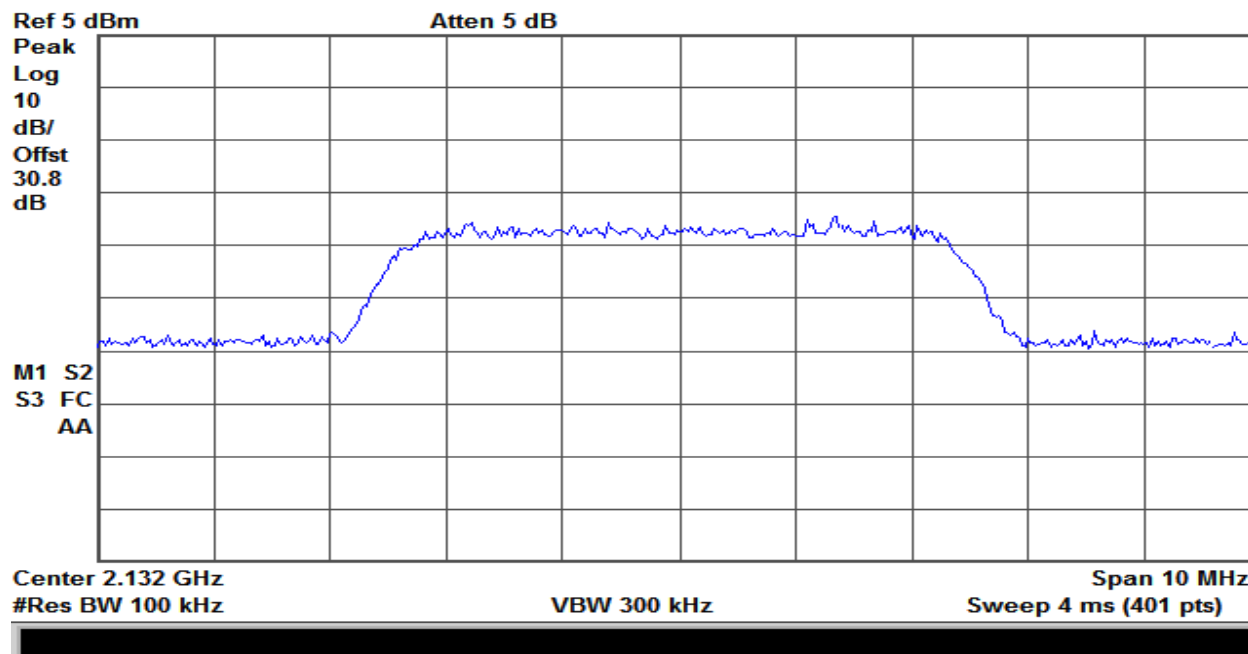
Plot 186 – 869-894MHz Band – Downlink Output – LTE



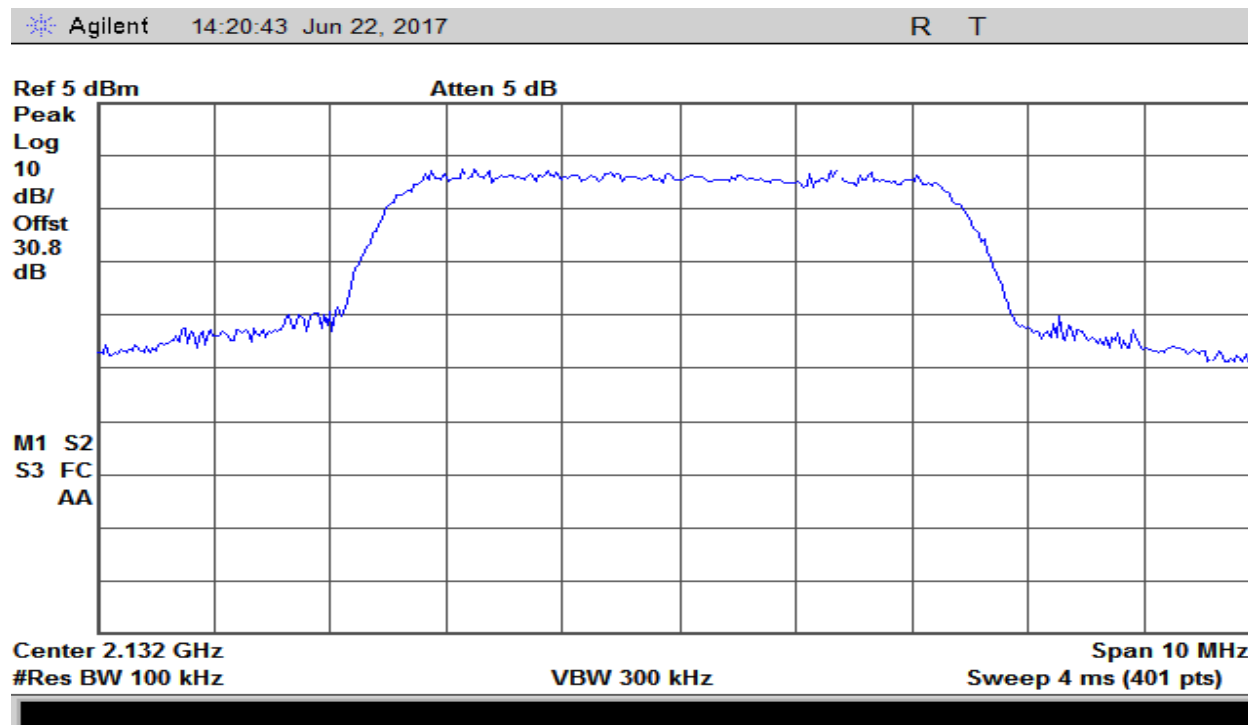
Plot 187 – 1930-1995MHz Band – Downlink Input – LTE



Plot 188 – 1930-1995MHz Band – Downlink Output – LTE



Plot 189 – 2110-2155MHz Band – Downlink Input – LTE



Plot 190 – 2110-2155MHz Band – Downlink Output – LTE

9. Oscillation Detection

Test Requirement(s):	§20.21(e)(8)(ii)(A)	Test Engineer(s):	Hoosam B.
Test Results:	Pass	Test Date(s):	Jun/26/2017

Test Procedures: As required by 47 §20.21(e)(8)(ii)(A), Oscillation detection measurement were made at the RF antenna output terminals of the EUT.

The EUT output was connected to the spectrum analyzer through a 10dB coupled directional coupler. The measurements were made as per procedure defined in KDB 935210 D03 §7.11.

Detector Setting	Resolution Bandwidth	Video Bandwidth	Sweep Time
Peak	≥1 MHz	>3X RBW	Auto

Table 28 – Analyzer settings – Oscillation Detection

Detector Setting	Resolution Bandwidth	Video Bandwidth	Sweep Time
RMS (Power Averaging)	30 kHz	>3X RBW	≥ 2 x Span/RBW

Table 29 – Analyzer settings – Oscillation Mitigation or Shutdown

Test Setup:

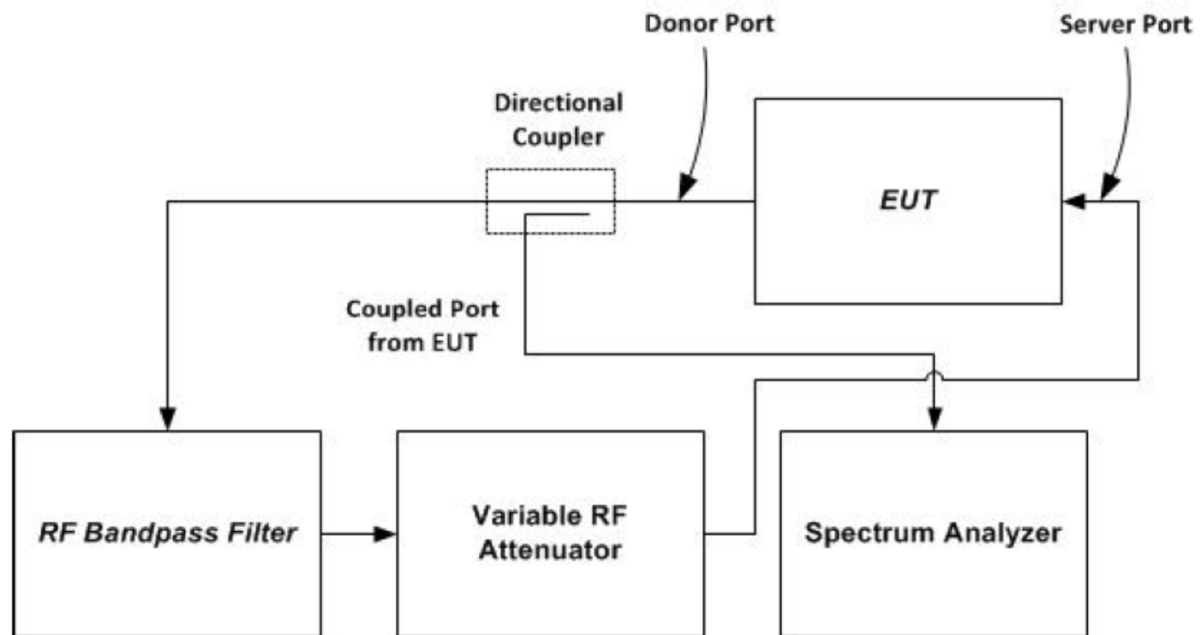


Figure 4 – Oscillation detection

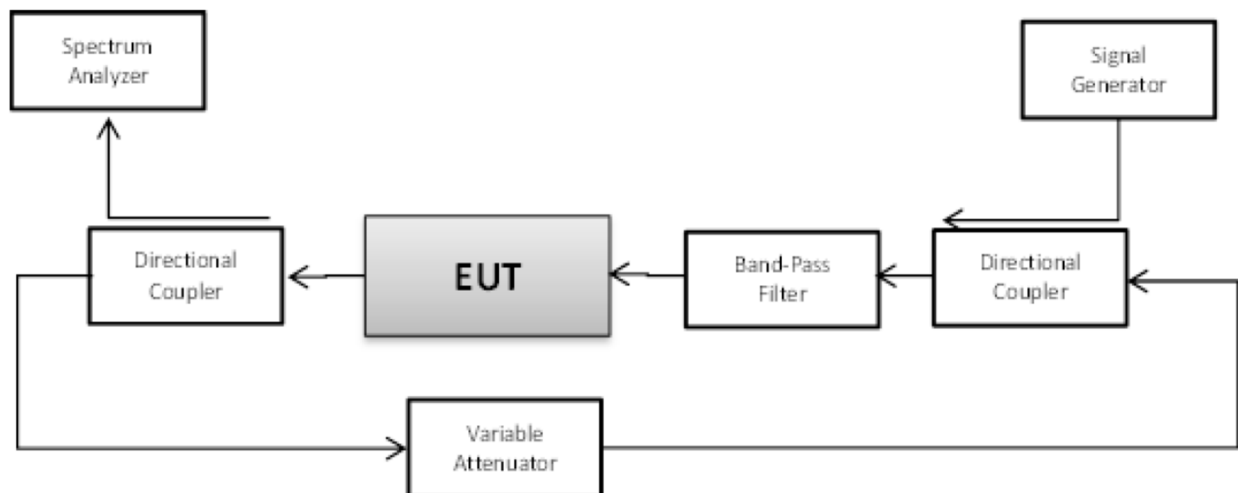


Figure 5 – Oscillation mitigation/shutdown

Frequency Band (MHz)	Measured Time (mS)	Limit (mS)
698-716	65.25	300
776-787	65.25	300
824-849	65.25	300
1710-1755	65.25	300
1850-1915	63.0	300

Table 30 –Uplink Detection Time – Summary

Frequency Band (MHz)	Measured Time (Second)	Limit (Second)
728-746	0.189	1.0
746-757	0.031	1.0
869-894	0.031	1.0
1930-1995	0.031	1.0
2110-2155	0.031	1.0

Table 31 –Downlink Detection Time – Summary

Frequency Band (MHz)	Measured Time (Second)	Limit (Second)
698-716	174.8	≥60
776-787	175.0	≥60
824-849	174.5	≥60
1710-1755	175.0	≥60
1850-1915	174.5	≥60

Table 32 –Uplink Restart Time – Summary

Frequency Band (MHz)	Measured Time (Second)	Limit (Second)
728-746	76.5	≥60
746-757	175.0	≥60
869-894	175.0	≥60
1930-1995	175.0	≥60
2110-2155	175.0	≥60

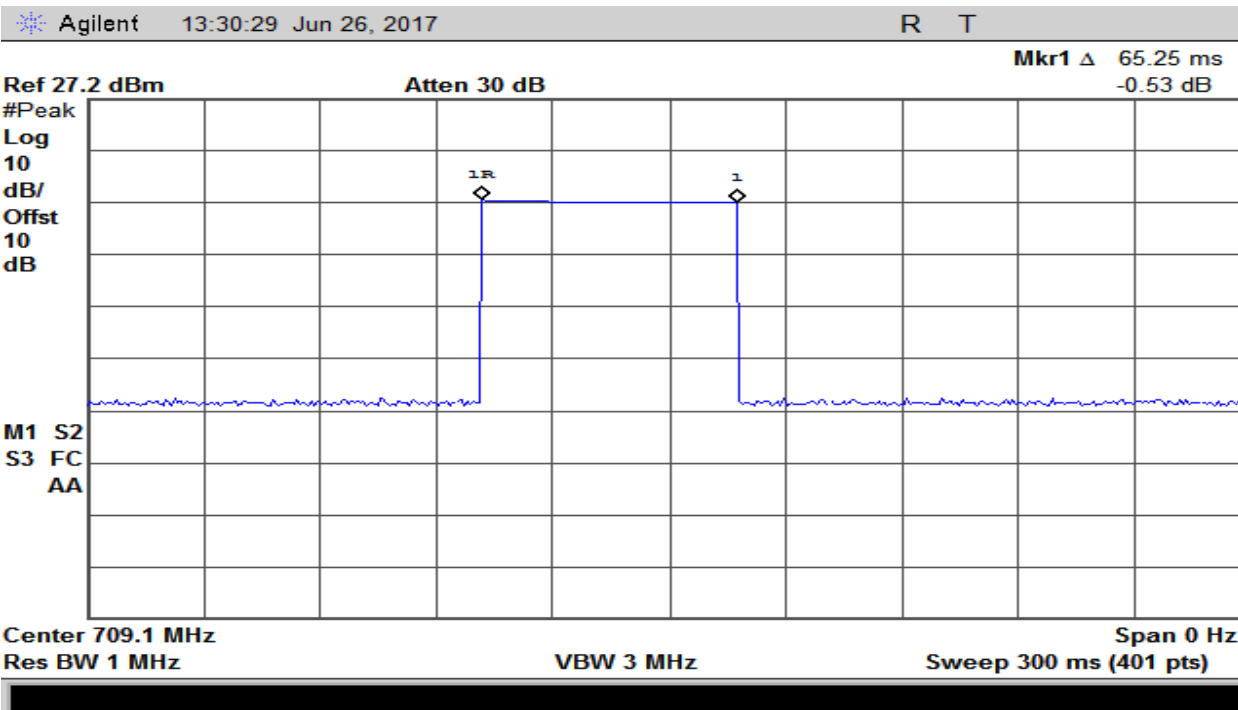
Table 33 –Downlink Restart Time – Summary

Frequency Band (MHz)	Restart	Limit
698-716	3	≤5
776-787	3	≤5
824-849	3	≤5
1710-1755	3	≤5
1850-1915	3	≤5

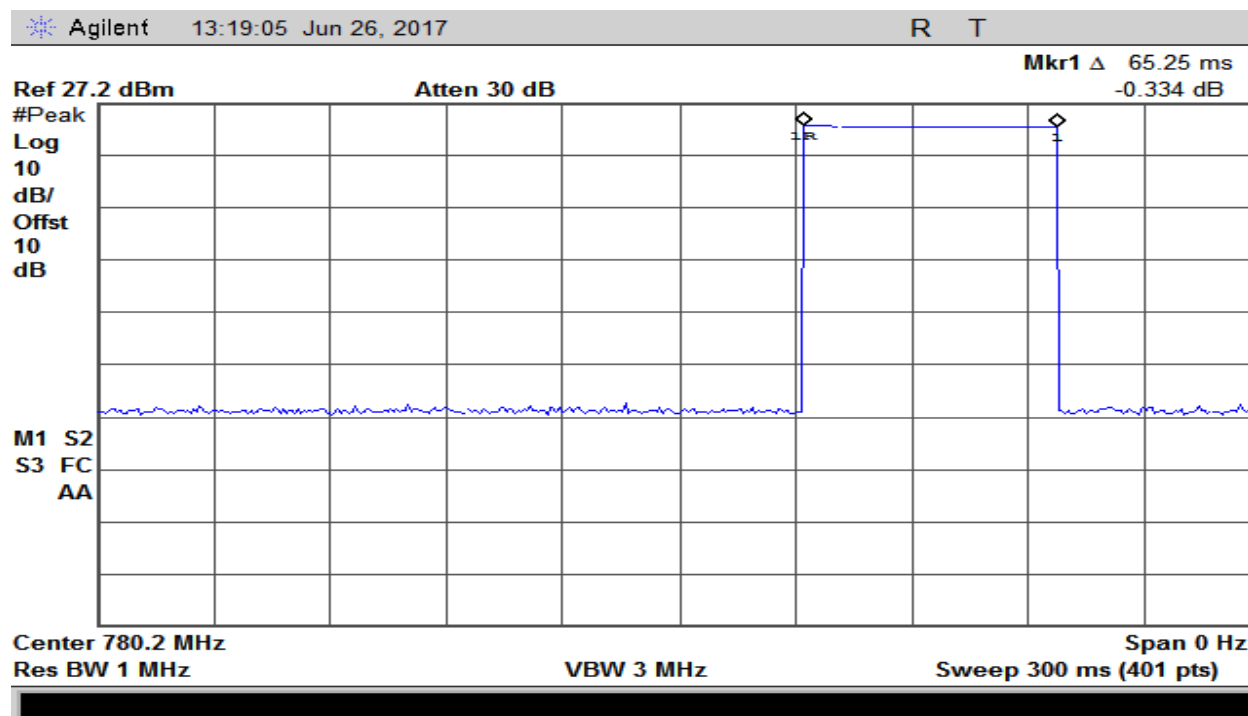
Table 34 –Uplink Restart Count – Summary

Frequency Band (MHz)	Restart	Limit
728-746	5	≤5
746-757	3	≤5
869-894	3	≤5
1930-1995	3	≤5
2110-2155	3	≤5

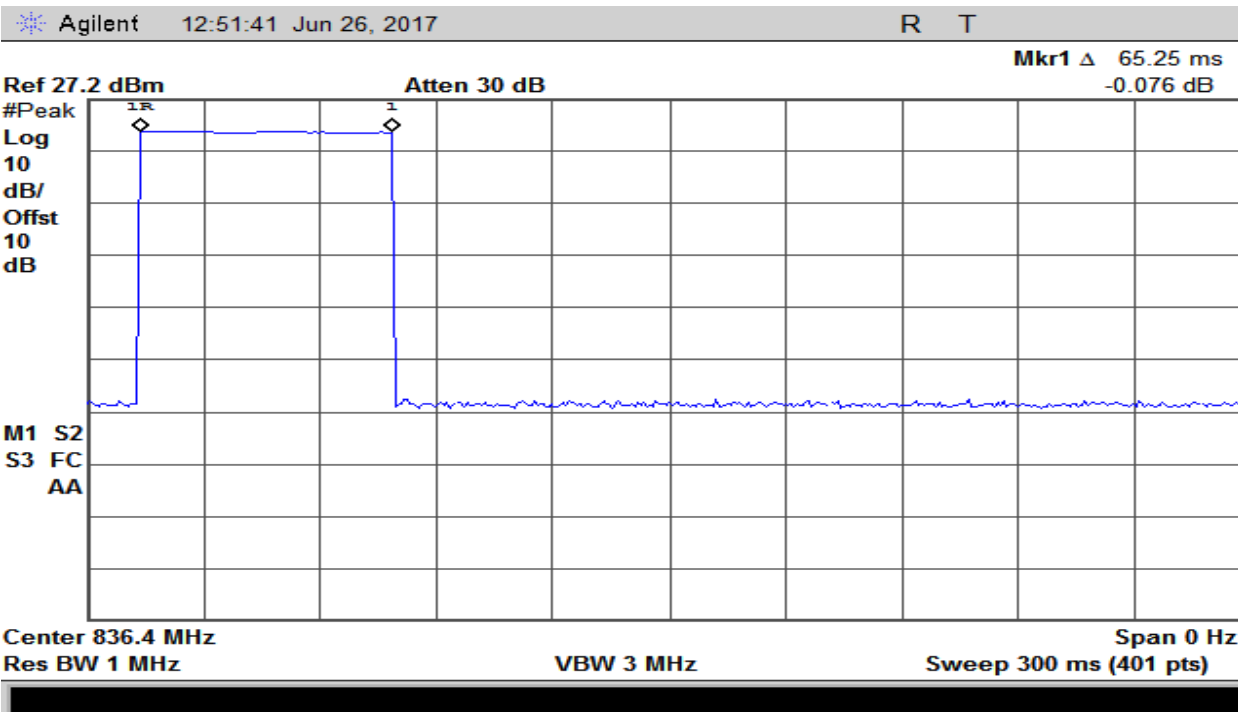
Table 35 –Downlink Restart Count – Summary



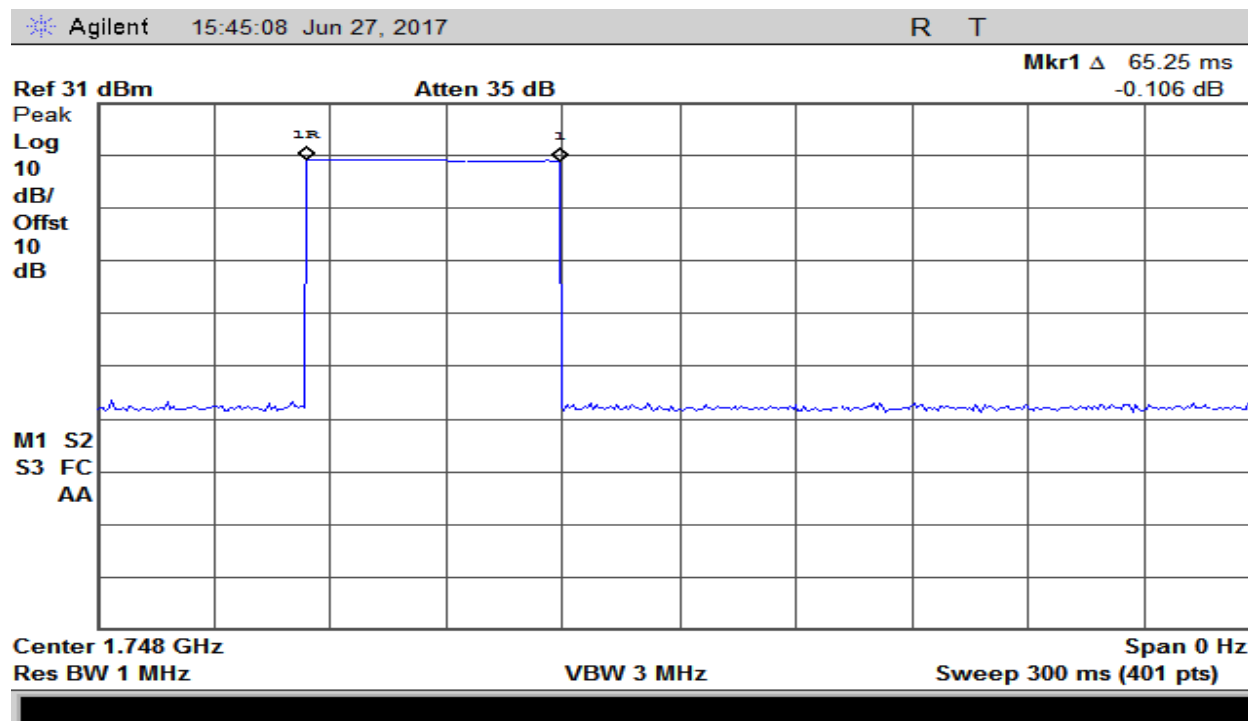
Plot 191 – 698-716MHz Band – Uplink Oscillation Detection Time



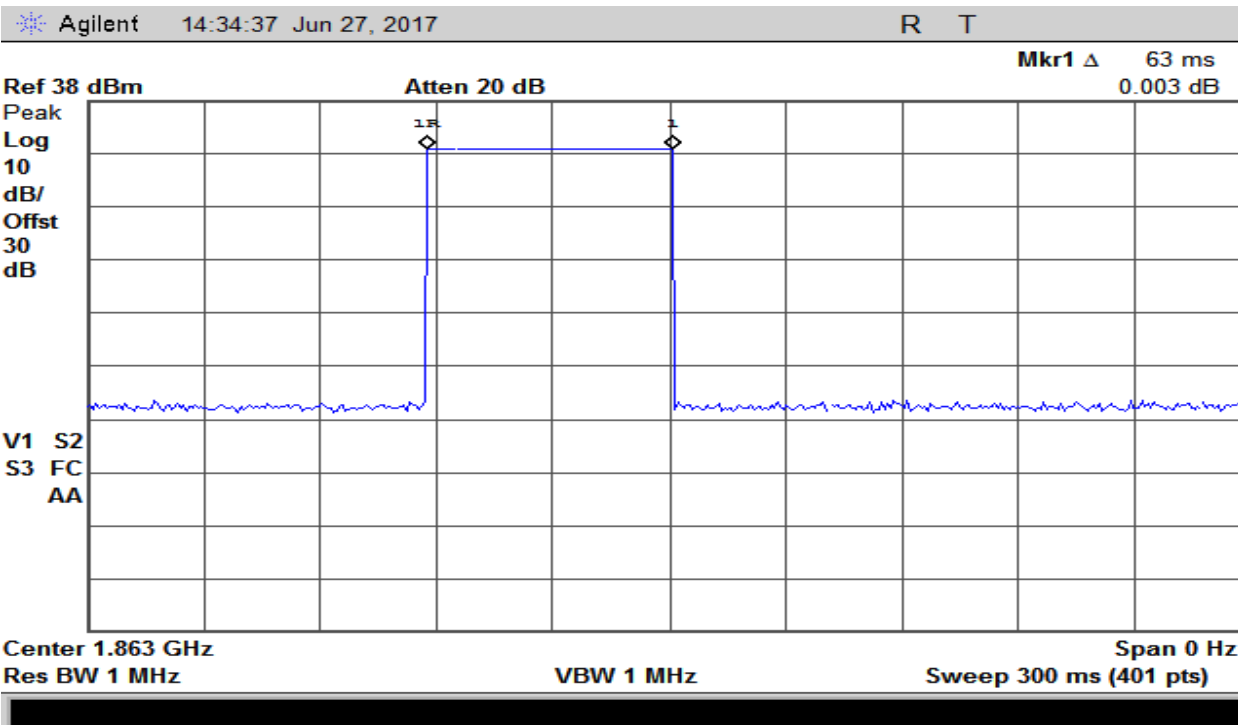
Plot 191 – 776-787MHz Band – Uplink Oscillation Detection Time



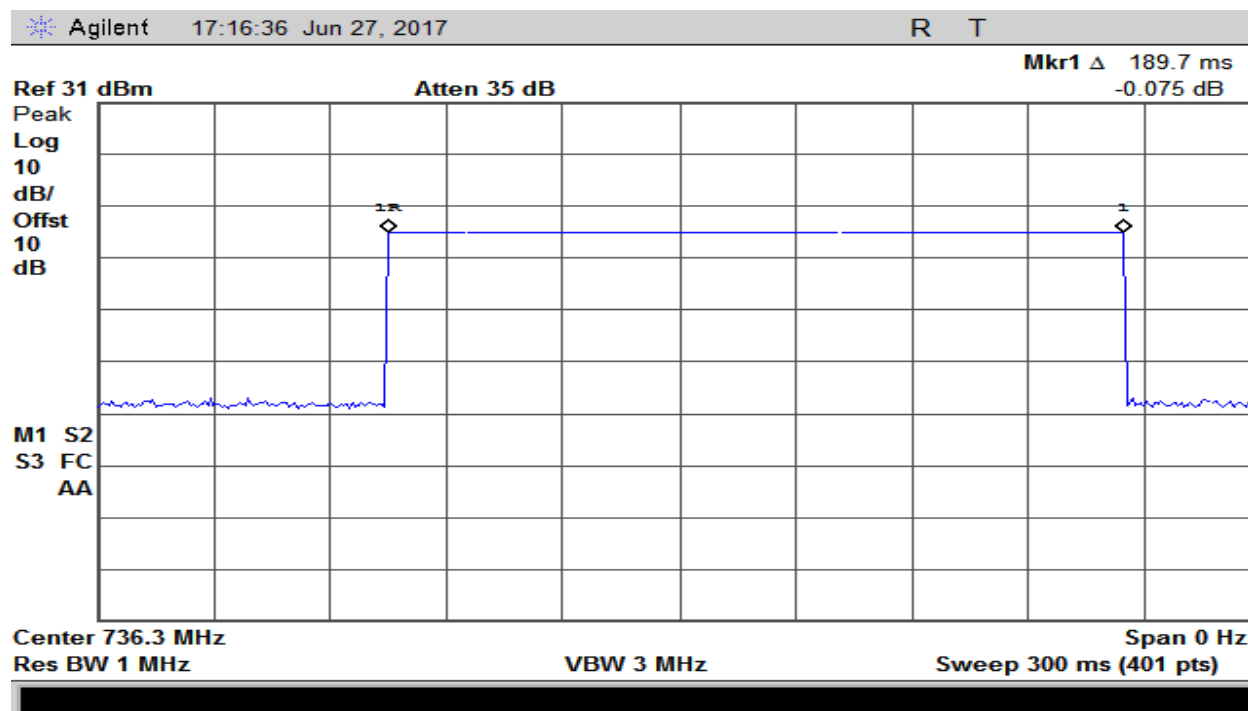
Plot 192 – 824-849MHz Band – Uplink Oscillation Detection Time



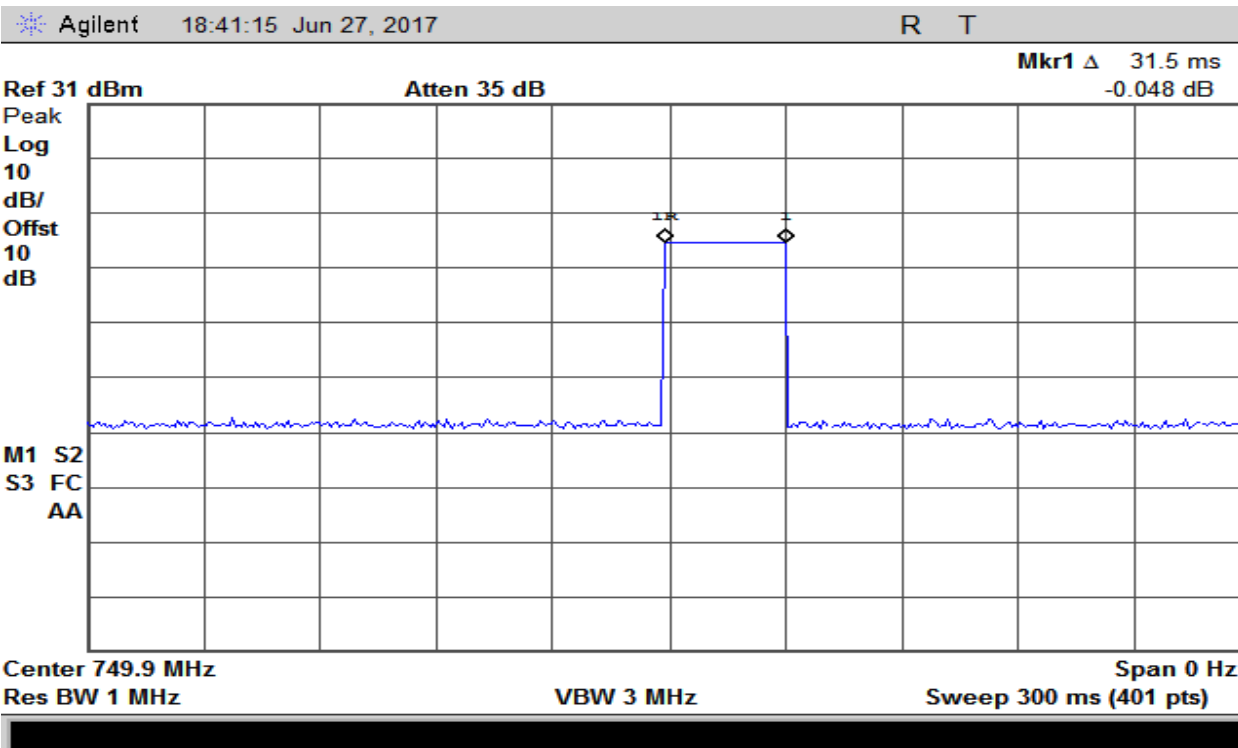
Plot 193 – 1710-1755MHz Band – Uplink Oscillation Detection Time



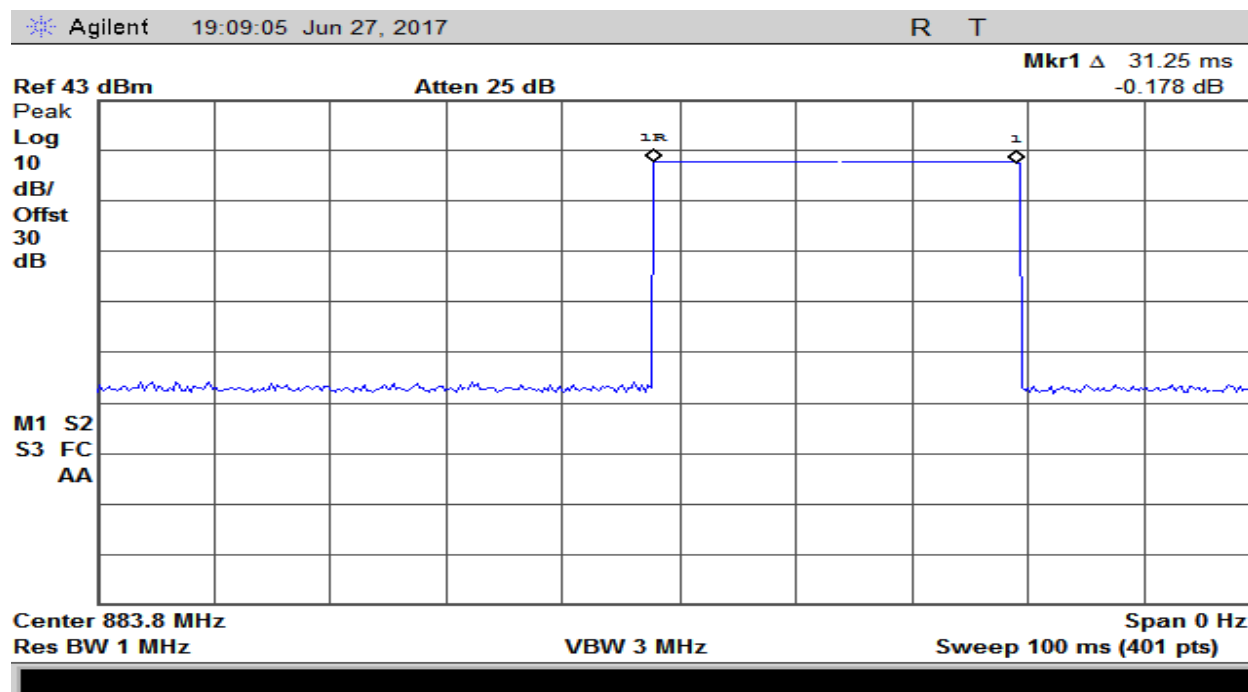
Plot 194 – 1850-1915MHz Band – Uplink Oscillation Detection Time



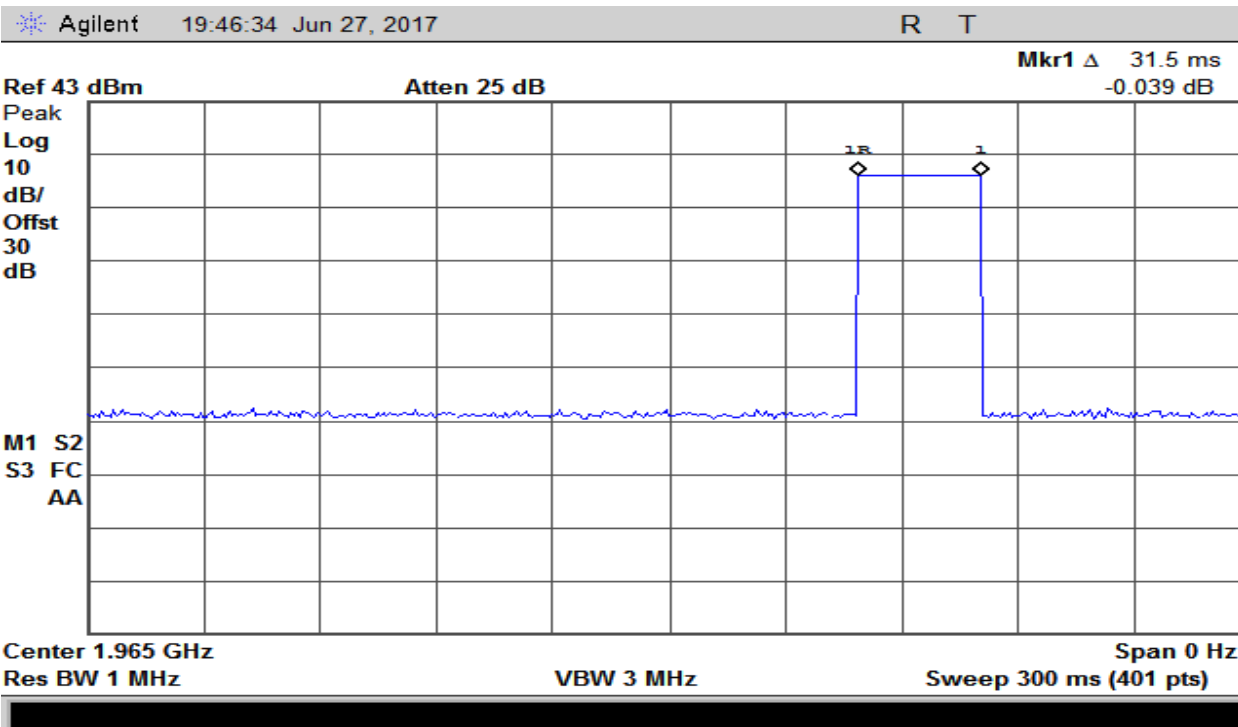
Plot 195 – 728-746MHz Band – Downlink Oscillation Detection Time



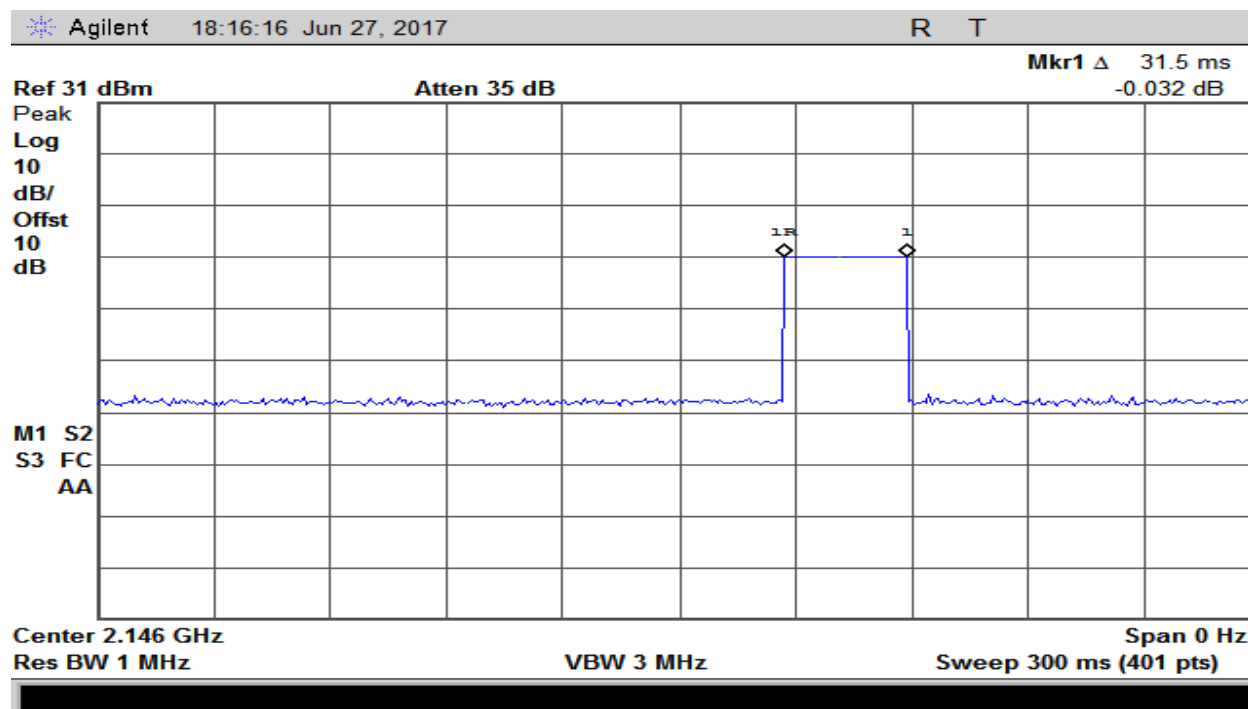
Plot 196 – 746-757MHz Band – Downlink Oscillation Detection Time



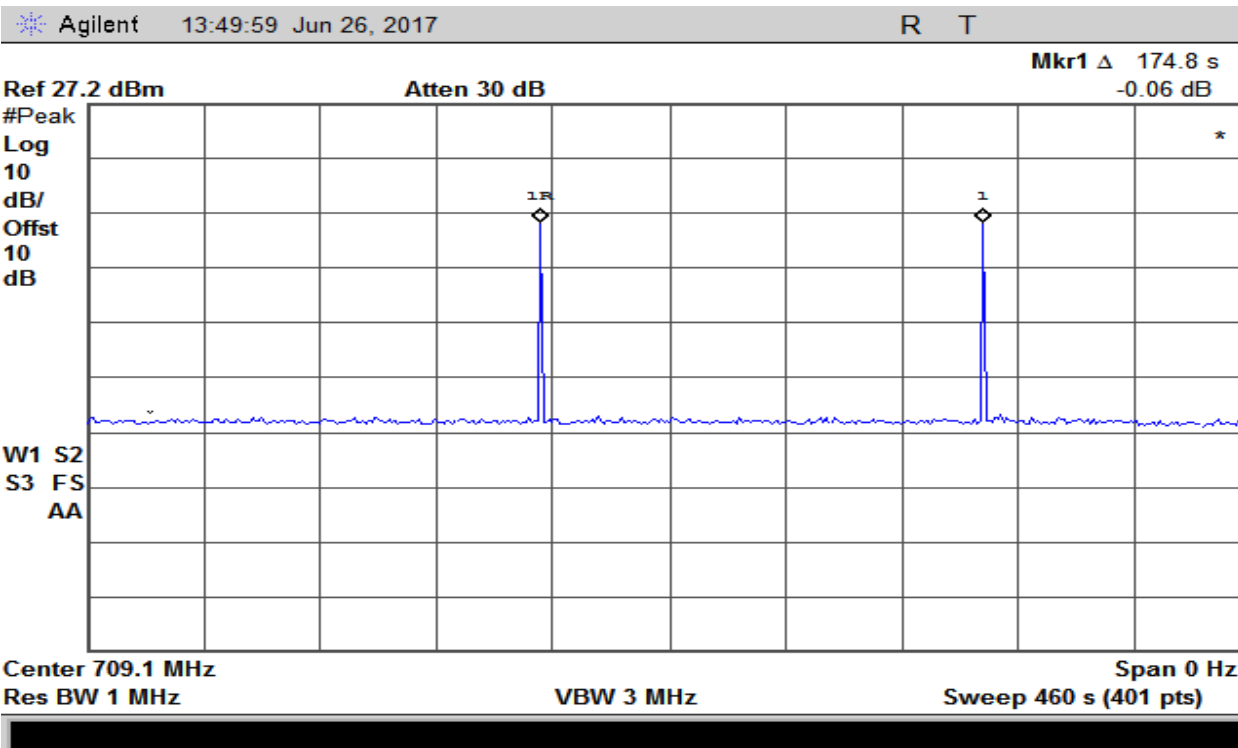
Plot 197 – 869-894MHz Band – Downlink Oscillation Detection Time



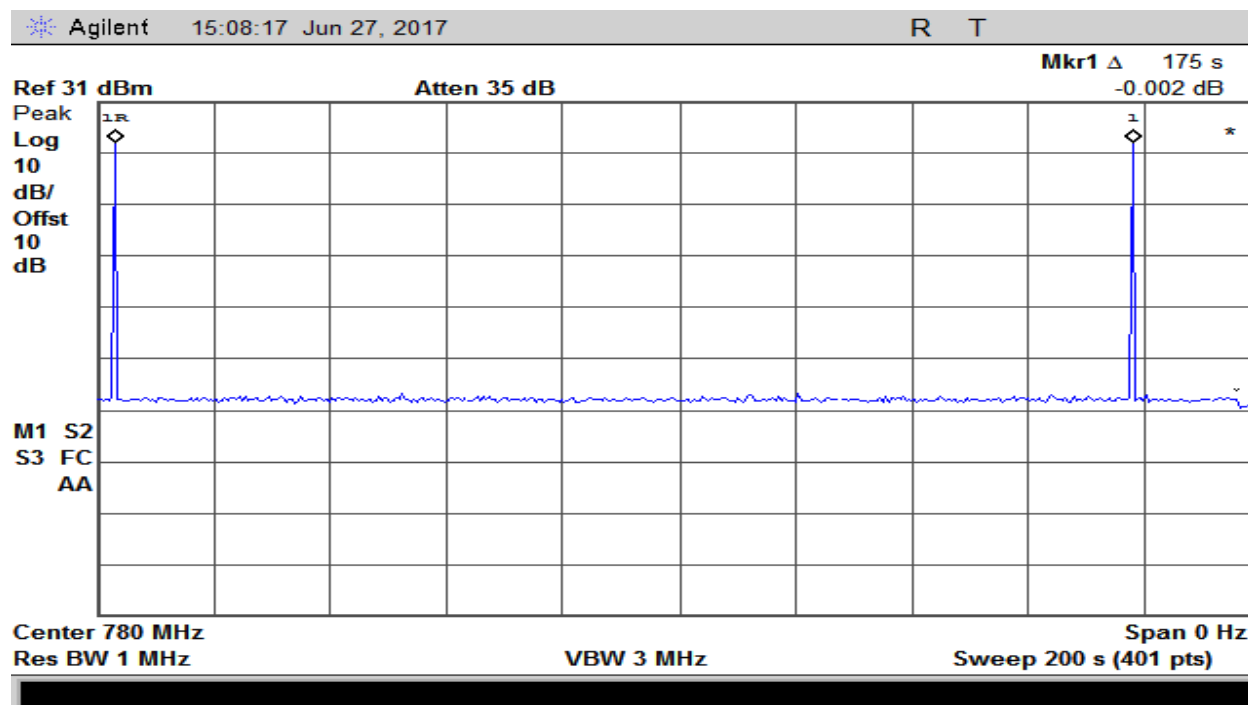
Plot 198 – 1930-1995MHz Band – Downlink Oscillation Detection Time



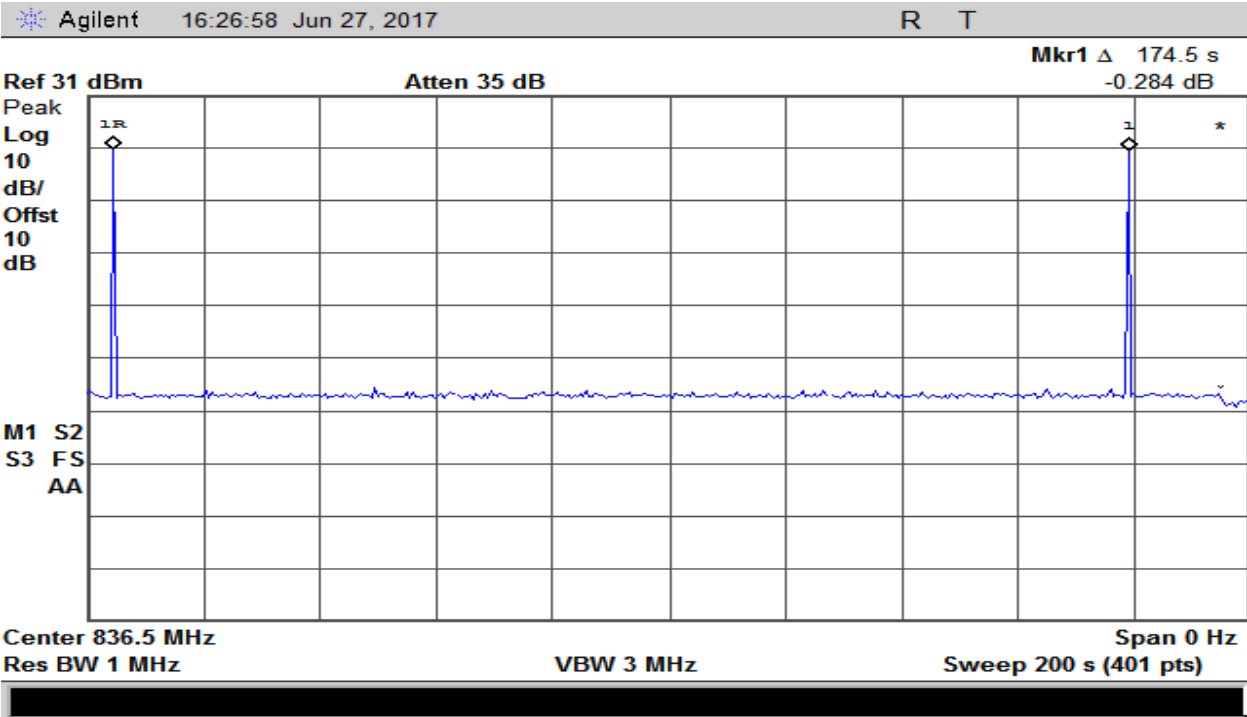
Plot 199 – 2110-2155MHz Band – Downlink Oscillation Detection Time



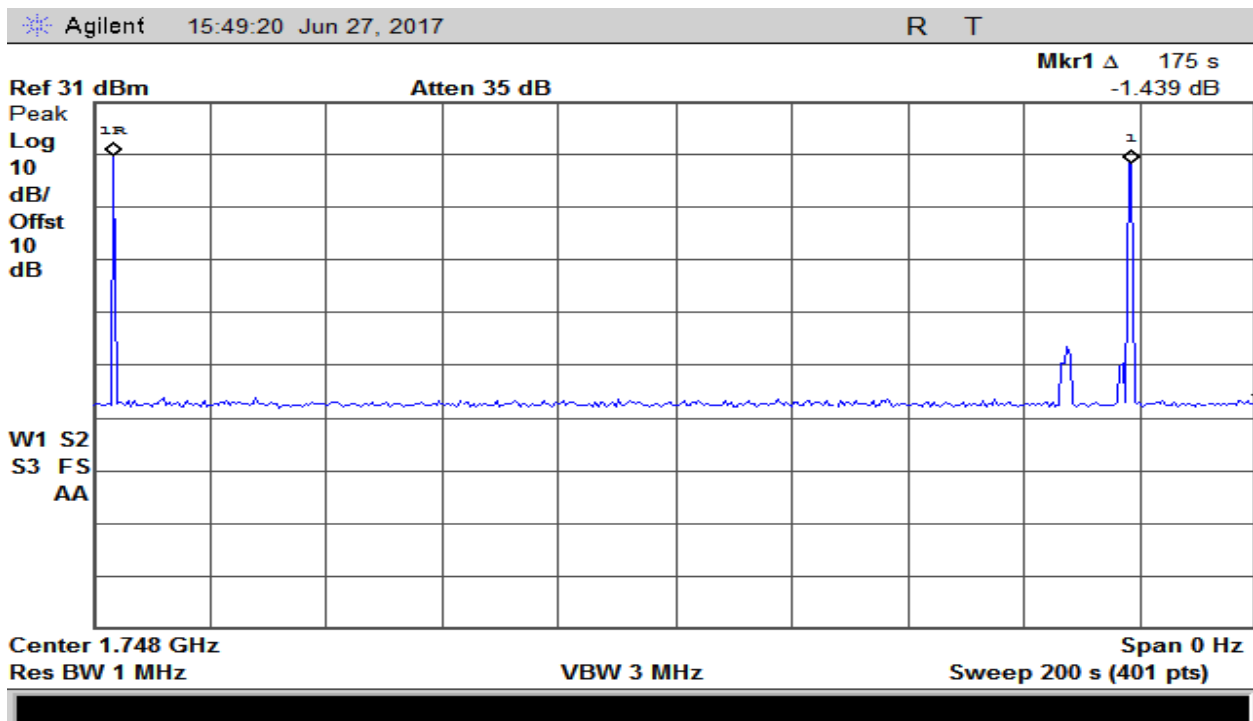
Plot 200 – 698-716MHz Band –Uplink Restart Time



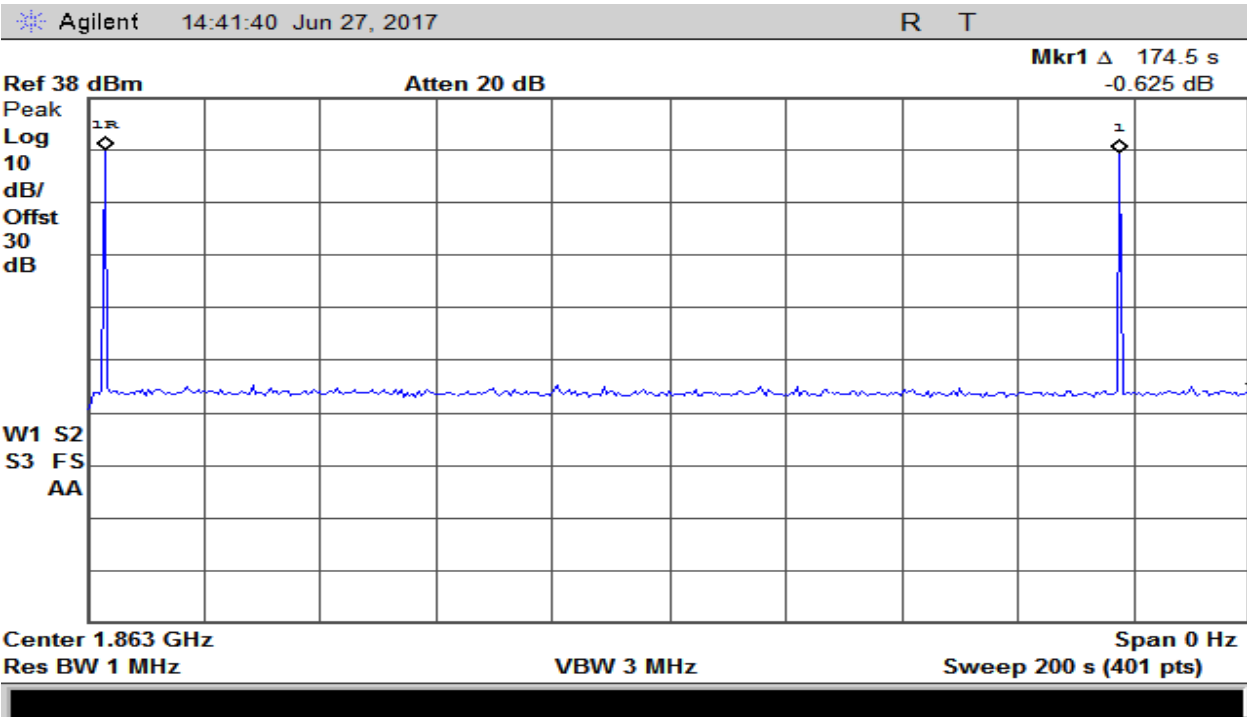
Plot 201 – 776-787MHz Band –Uplink Restart Time



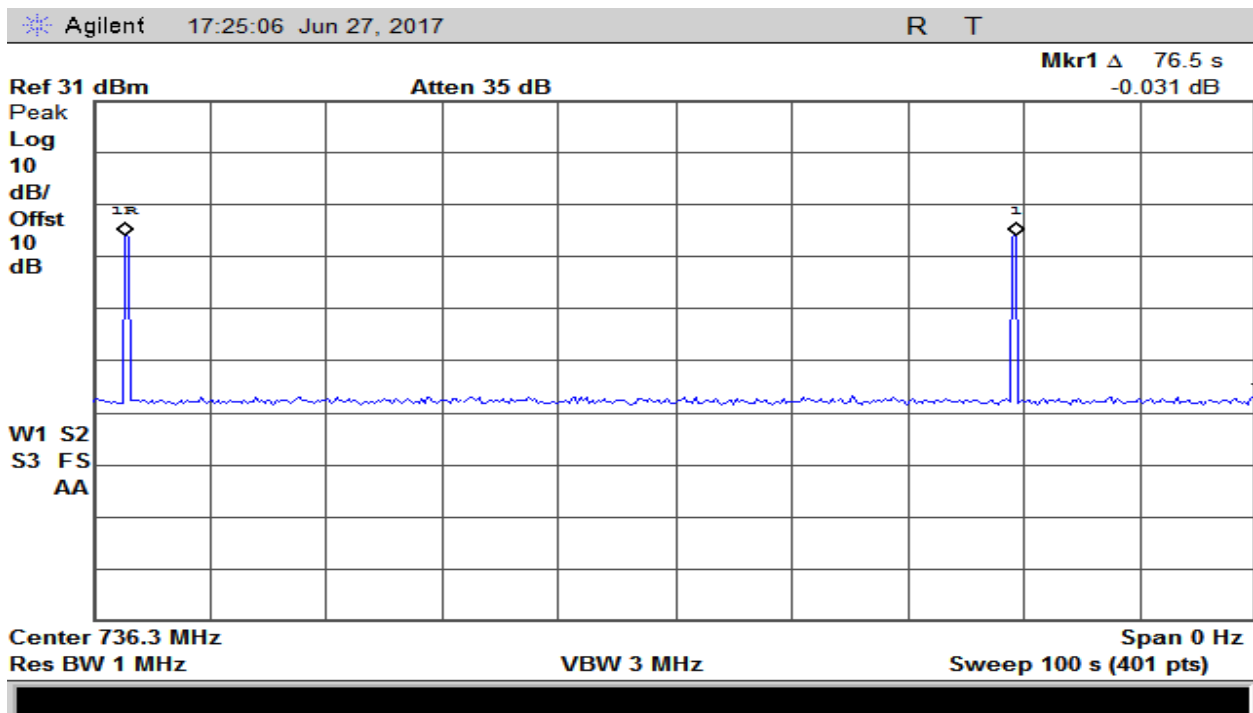
Plot 202 – 824-849MHz Band –Uplink Restart Time



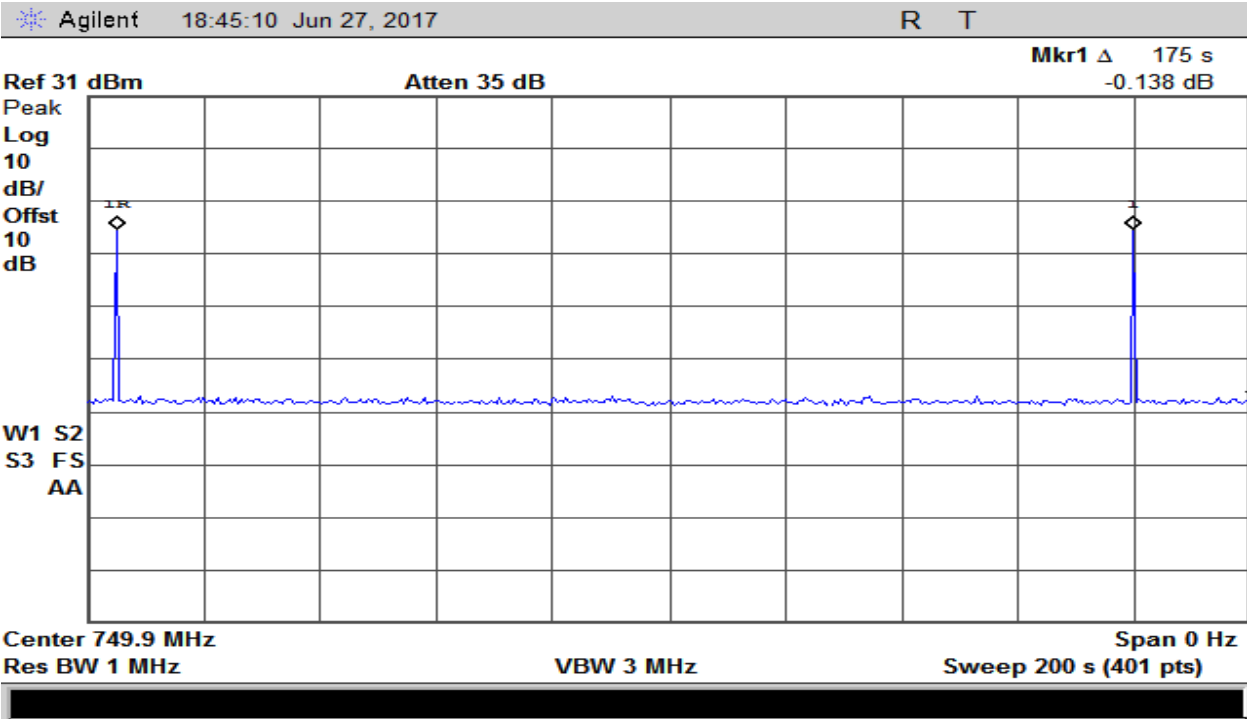
Plot 203 – 1710-1755MHz Band –Uplink Restart Time



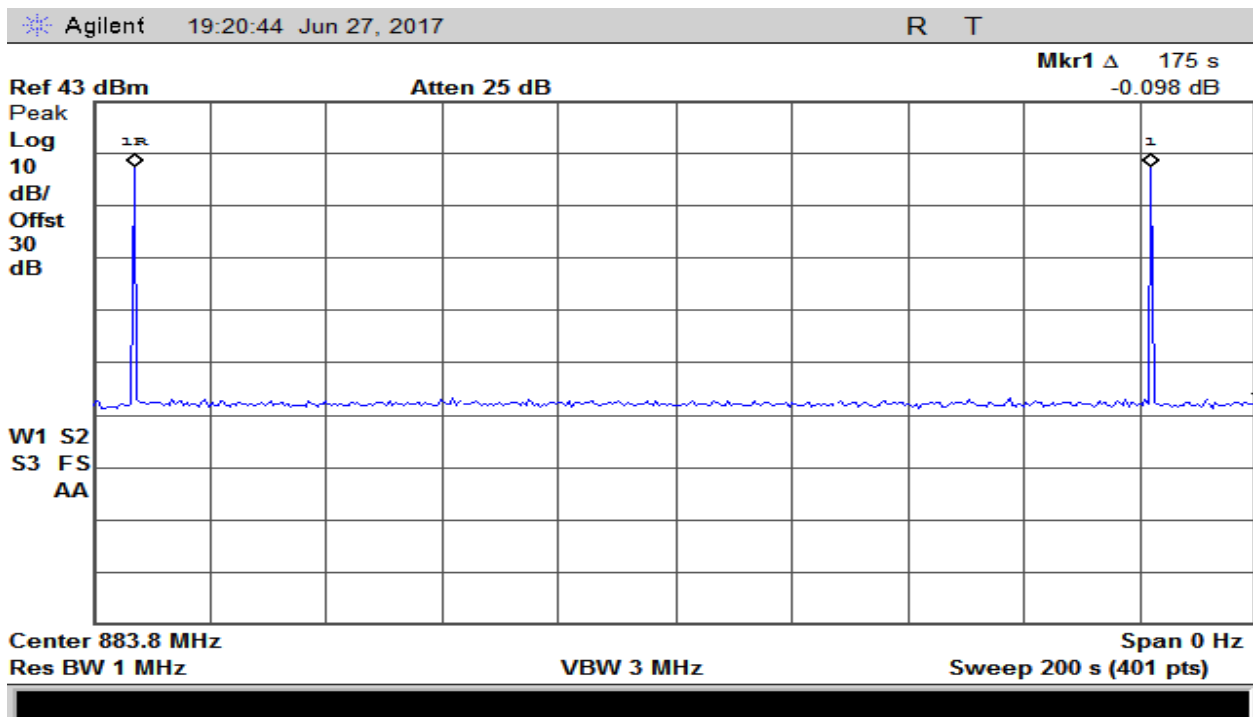
Plot 204 – 1850-1915MHz Band –Uplink Restart Time



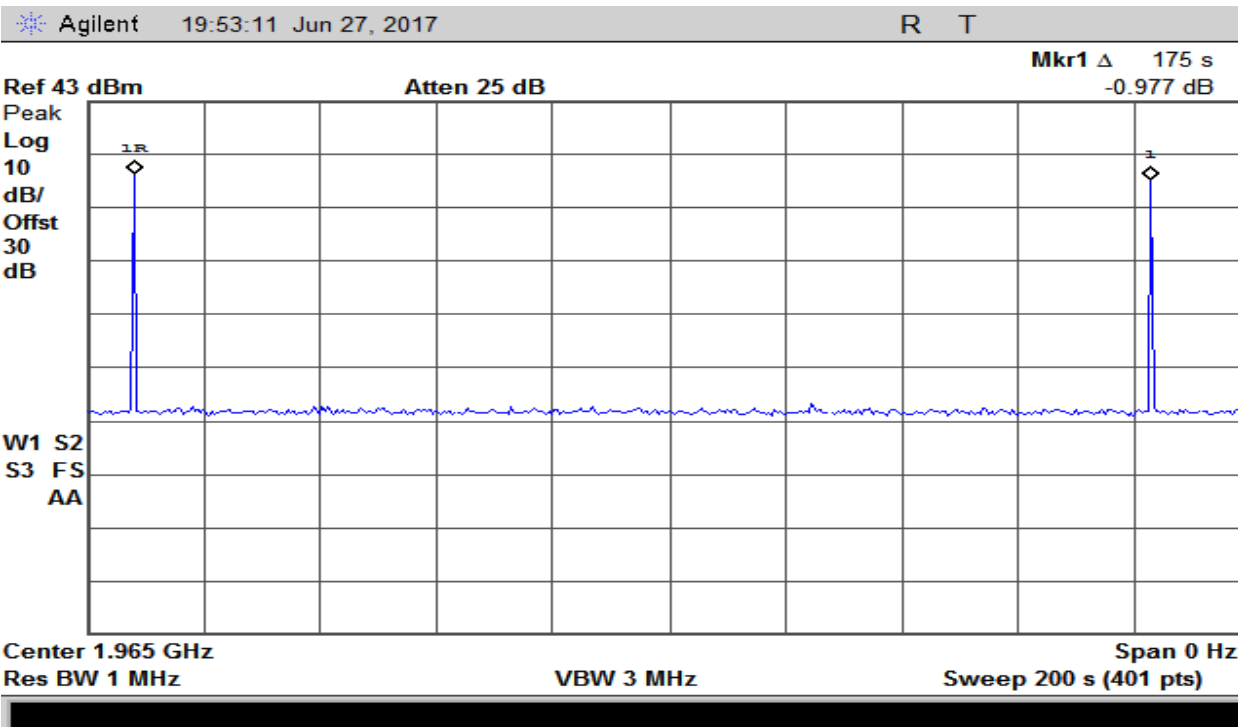
Plot 205 – 728-746MHz Band –Downlink Restart Time



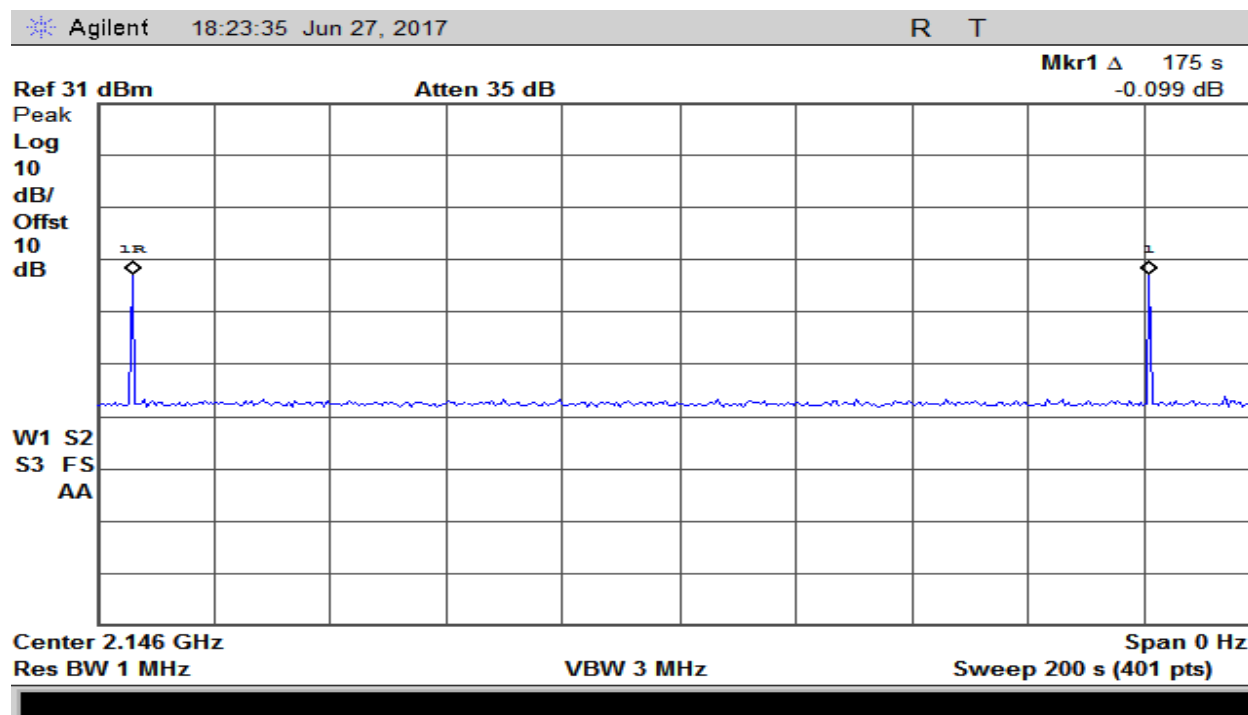
Plot 206 – 746-757MHz Band –Downlink Restart Time



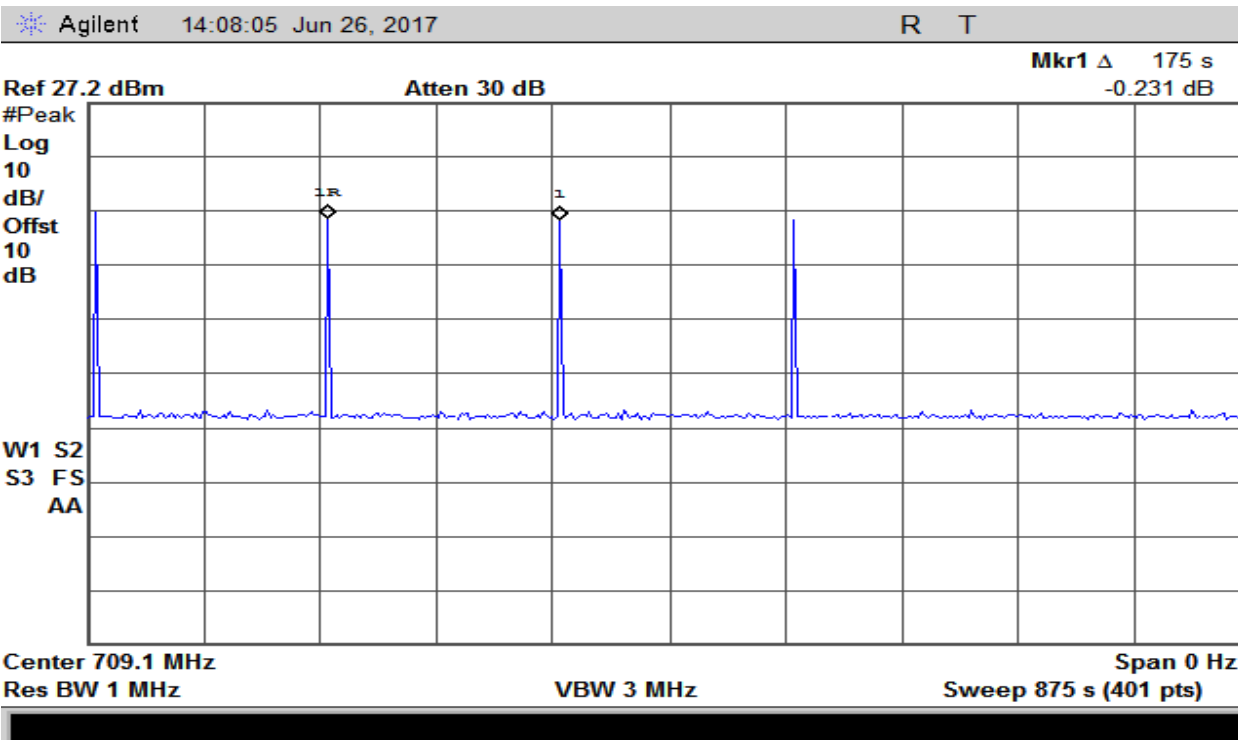
Plot 207 – 869-894MHz Band –Downlink Restart Time



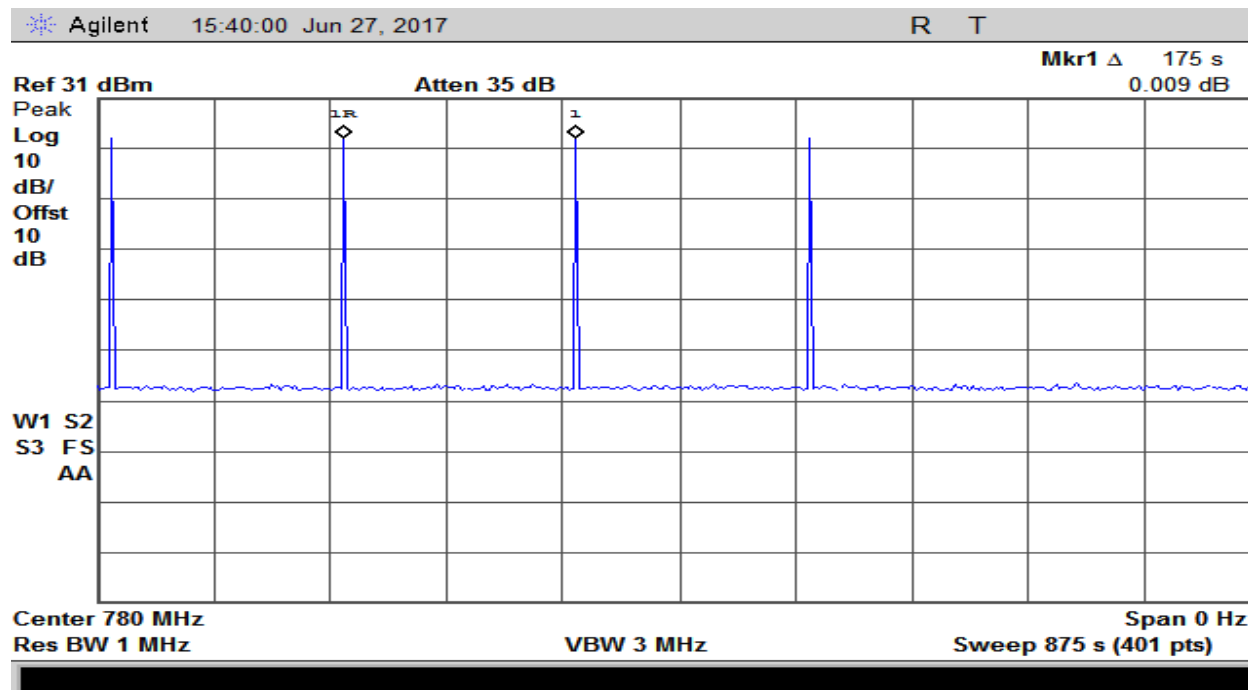
Plot 208 – 1930-1995MHz Band –Downlink Restart Time



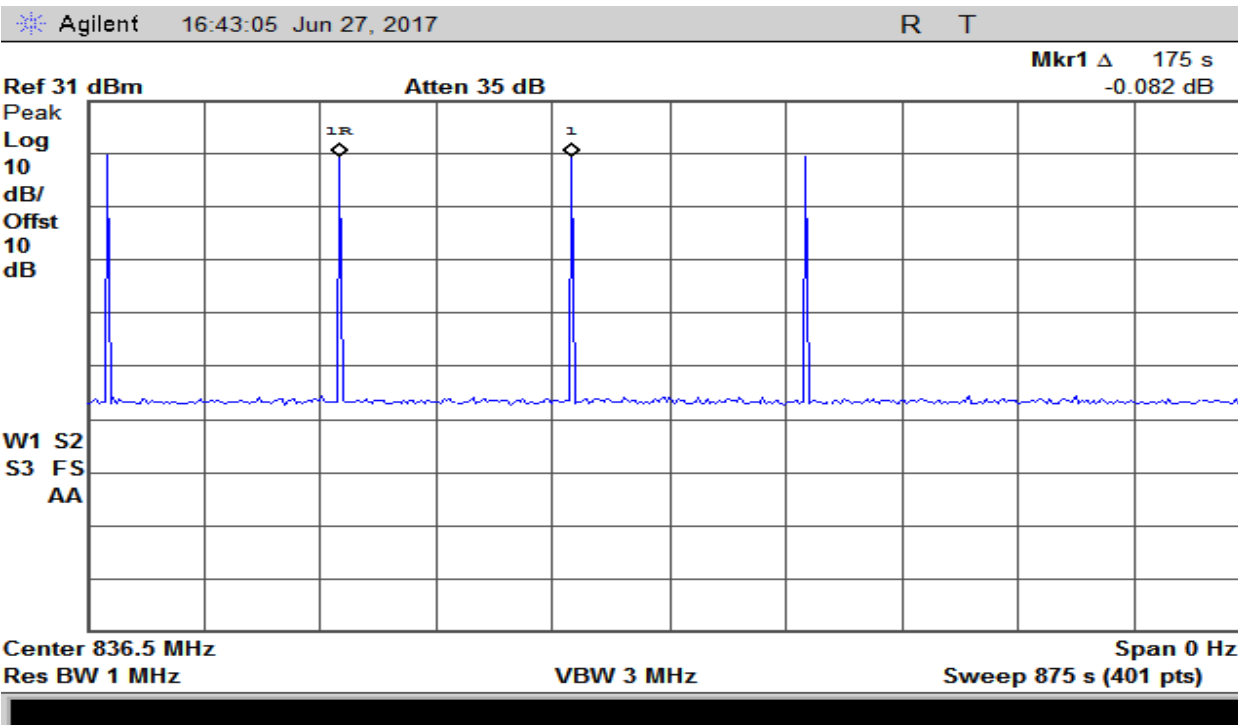
Plot 209 – 2110-2155MHz Band –Downlink Restart Time



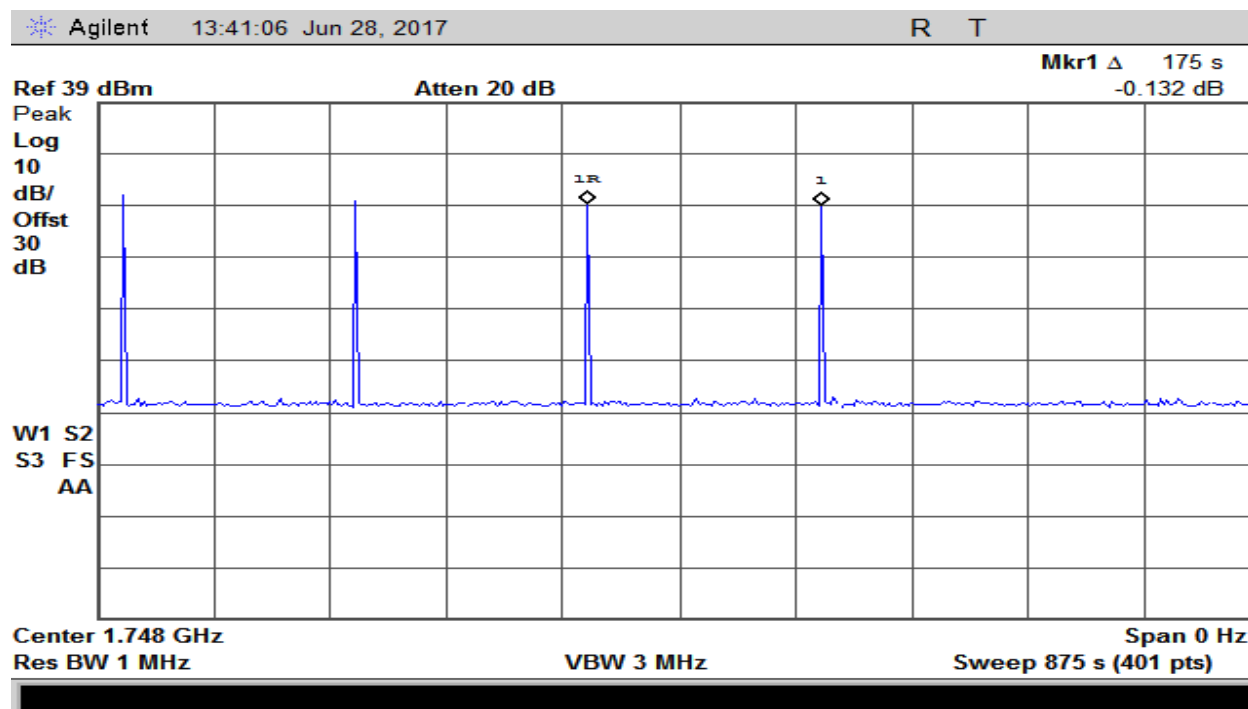
Plot 210 – 698-716MHz Band – Uplink # of Restart Time



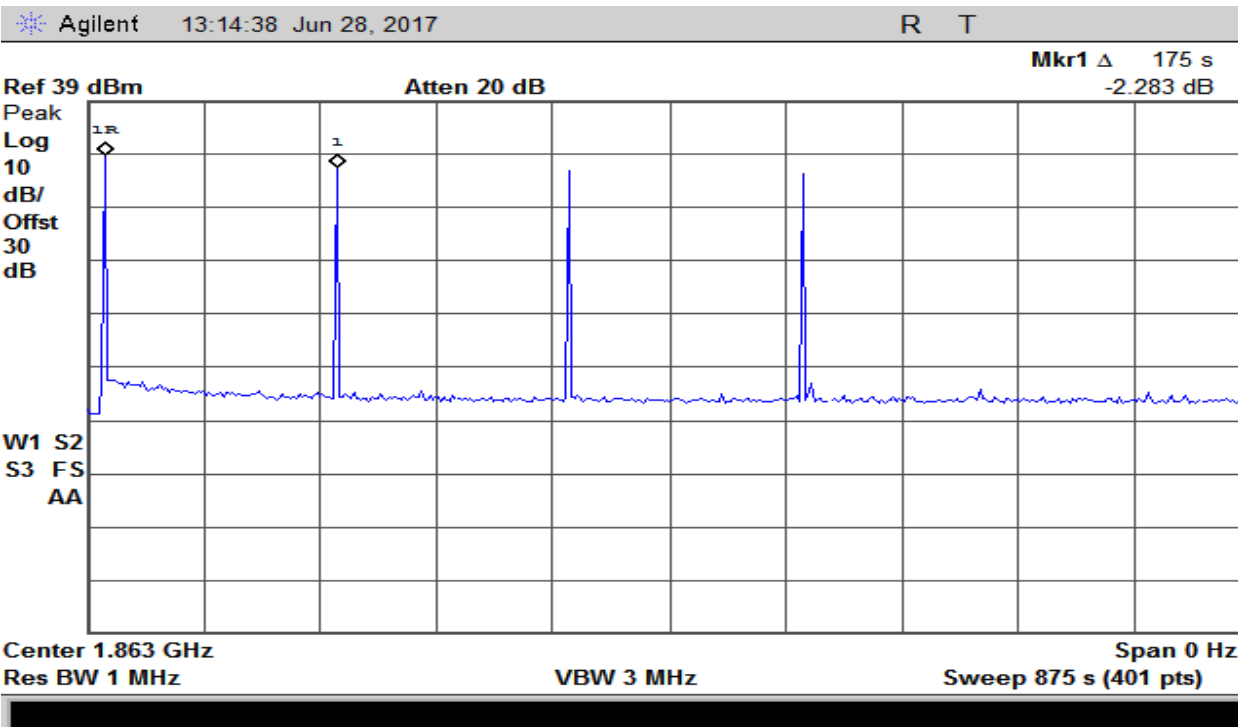
Plot 211 – 776-787MHz Band – Uplink # of Restart Time



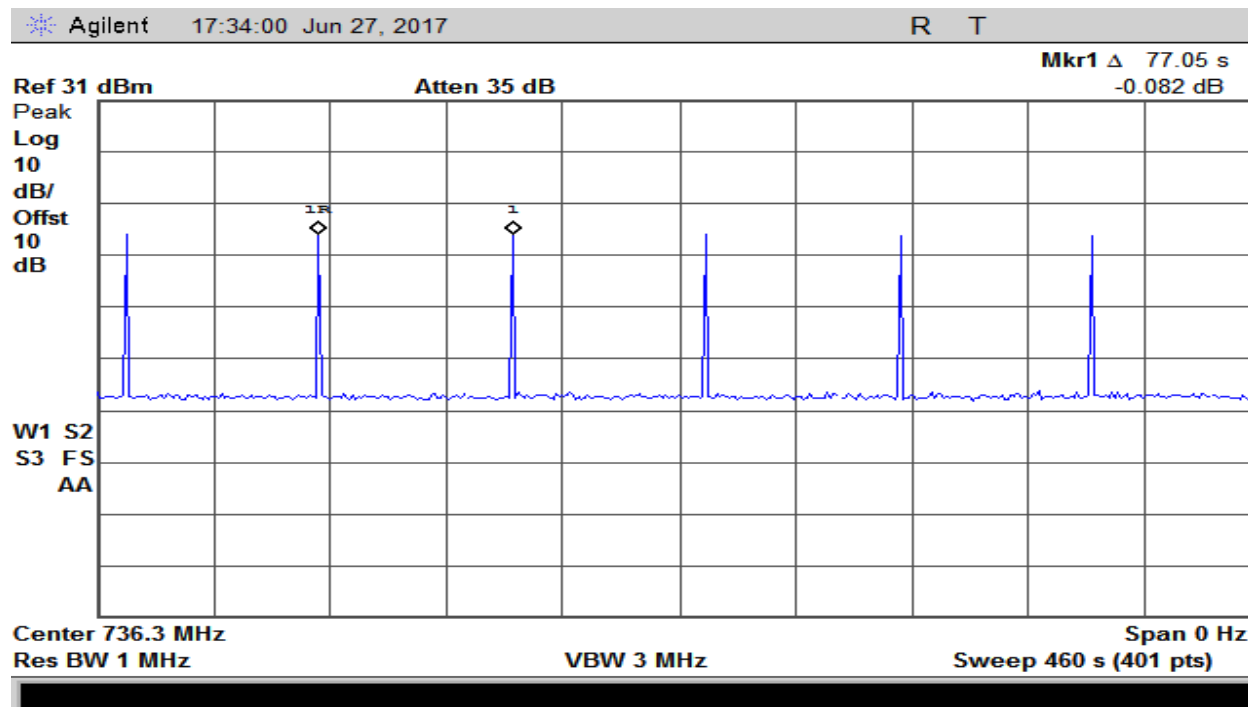
Plot 212 – 824-849MHz Band – Uplink # of Restart Time



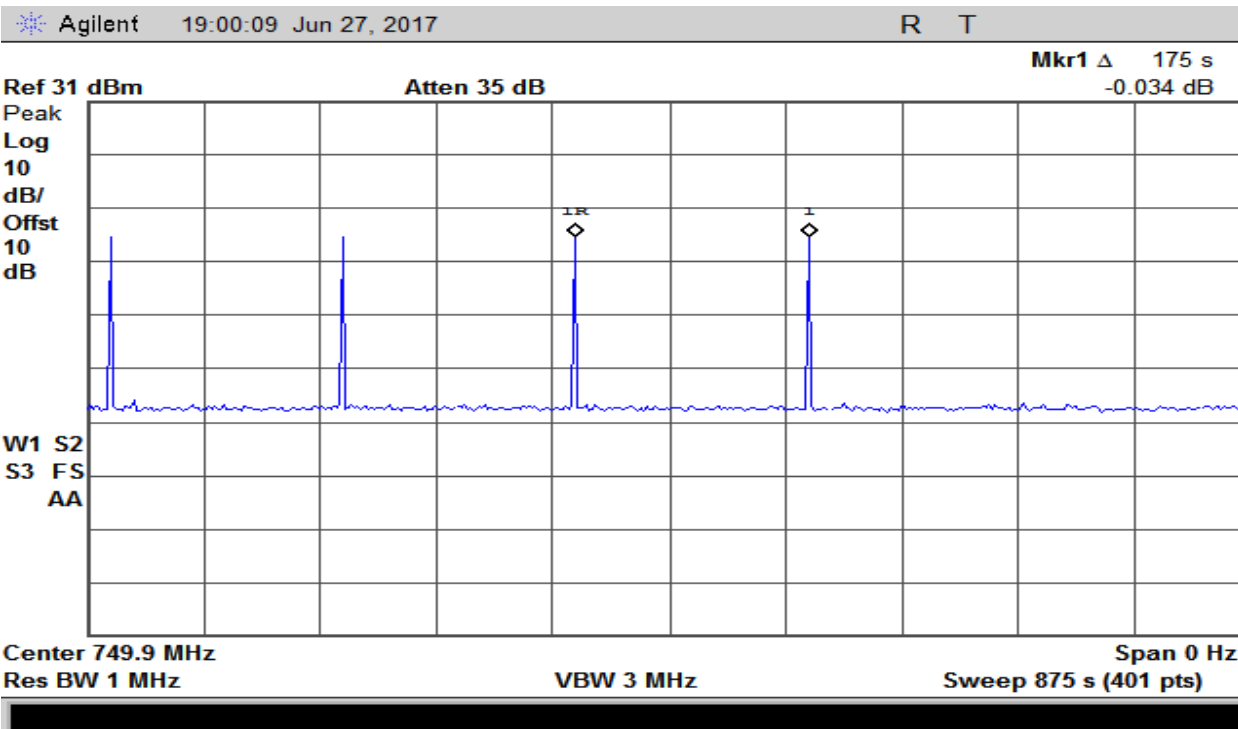
Plot 213 – 1710-1755MHz Band – Uplink # of Restart Time



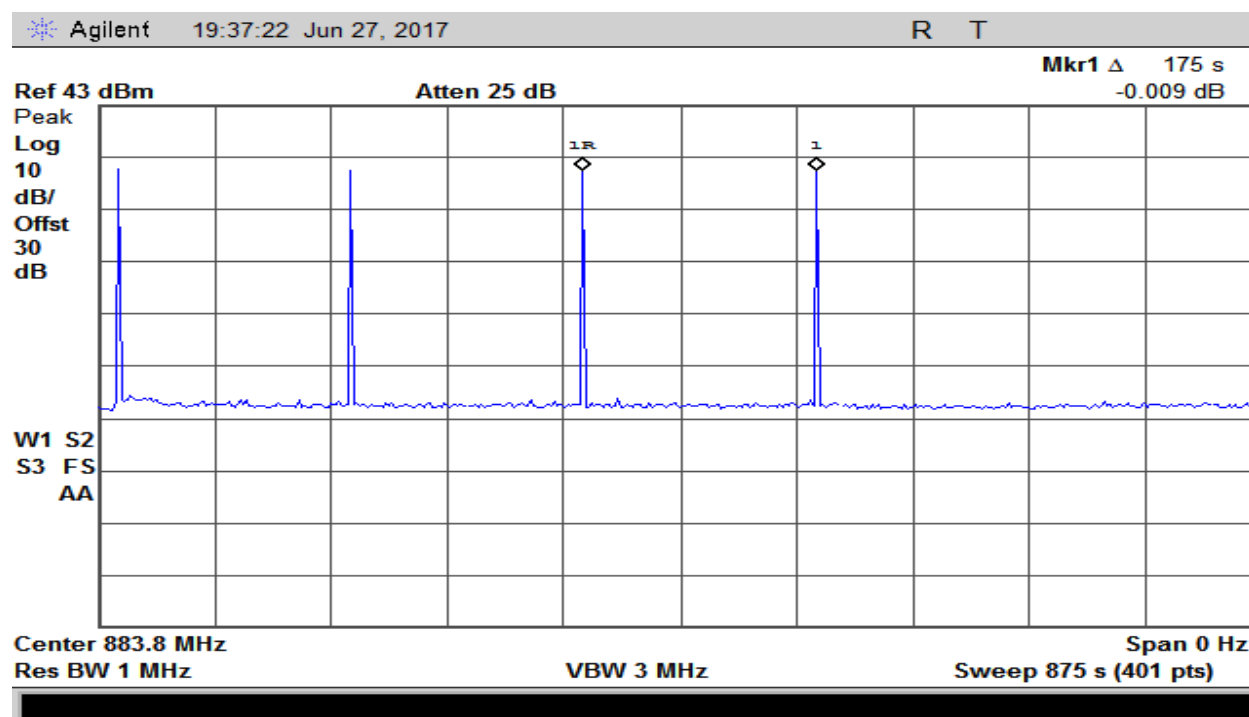
Plot 214 – 1850-1915MHz Band – Uplink # of Restart Time



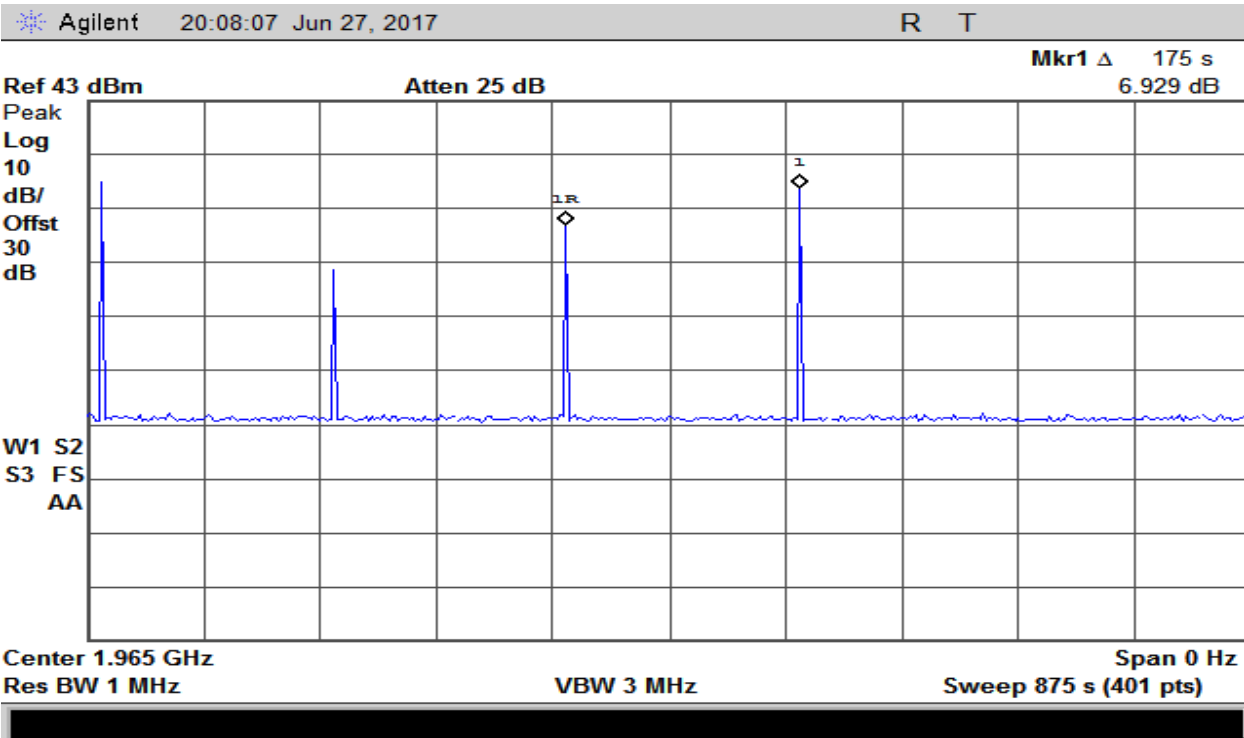
Plot 215 – 728-746MHz Band – Downlink # of Restart Time



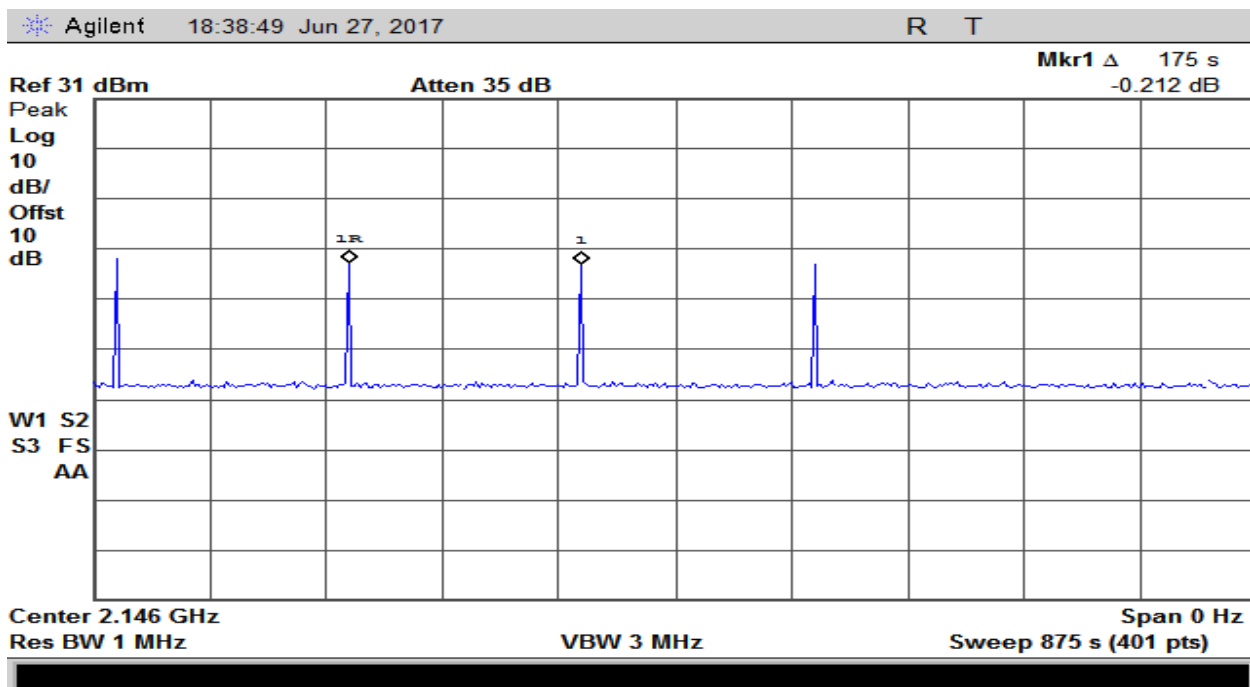
Plot 216 – 746-757MHz Band – Downlink # of Restart Time



Plot 217 – 869-894MHz Band – Downlink # of Restart Time



Plot 218 – 1930-1995MHz Band – Downlink # of Restart Time



Plot 219 – 2110-2155MHz Band – Downlink # of Restart Time

Oscillation Mitigation / Shutdown

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	-82.6	-87.8	5.2	12
+4dB	-82.8	-87.9	5.1	12
+3dB	-81.8	-88.15	6.35	12
+2dB	-81.7	-88.3	6.6	12
+1dB	** Shutdown	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
-5dB	-	-	-	12

Table 36 – 698-716MHz Uplink Band – Mitigation/Shutdown Test Data

** The device shuts down immediately

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	-81.5	-90	8.5	12
+4dB	-80	-90.7	10.7	12
+3dB	-81.2	-90.1	8.9	12
+2dB	**Shutdown	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
-5dB	-	-	-	12

Table 37 – 776-787MHz Uplink Band – Oscillation/Shutdown Test Data

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	**Shutdown	-	-	12
+4dB	-	-	-	12
+3dB	-	-	-	12
+2dB	-	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
-5dB	-	-	-	12

Table 38 – 824-849MHz Uplink Band – Oscillation/Shutdown Test Data

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	-84.7	-88	3.3	12
+4dB	-83.5	-88.3	4.8	12
+3dB	-80	-88	8	12
+2dB	-84	-88	4	12
+1dB	-84.7	-88.5	3.8	12
0dB	-83.8	-88.4	4.6	12
-1dB	-83	-88	5	12
-2dB	-81.8	-88.6	6.8	12
-3dB	-81.2	-89	7.8	12
-4dB	**Shutdown	-	-	12
-5dB	-	-	-	12

Table 39 – 1710-1755MHz Uplink Band – Oscillation/Shutdown Test Data

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	-78	-88.5	10.5	12
+4dB	-81	-88.6	7.6	12
+3dB	-83.1	-88.4	5.3	12
+2dB	-83.4	-88.5	5.1	12
+1dB	-84.4	-88.3	3.9	12
0dB	**Shutdown	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
-5dB	-	-	-	12

Table 40 – 1850-1915MHz Uplink Band – Oscillation/Shutdown Test Data

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	*Shutdown	-	-	12
+4dB	-	-	-	12
+3dB	-	-	-	12
+2dB	-	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
+5dB	-	-	-	12

Table 41 – 728-746MHz Downlink Band – Oscillation/Shutdown Test Data

*The device shutdowns after 4 seconds.

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	*Shutdown	-	-	12
+4dB	-	-	-	12
+3dB	-	-	-	12
+2dB	-	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
+5dB	-	-	-	12

Table 42 – 746-757MHz Downlink Band – Oscillation/Shutdown Test Data

*The device Shutdown after 3 seconds

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	**Shutdown	-	-	12
+4dB	-	-	-	12
+3dB	-	-	-	12
+2dB	-	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
+5dB	-	-	-	12

Table 43 – 869-894MHz Downlink Band – Oscillation/Shutdown Test Data

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	*-78.00	-89.0	11	12
+4dB	**Shutdown	-	-	12
+3dB	-	-	-	12
+2dB	-	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
+5dB	-	-	-	12

Table 44 – 1930-1995MHz Downlink Band – Oscillation/Shutdown Test Data

*The measured difference exceeds the limit for a period of less than 300 seconds before device mitigates and shutdown

Max Gain (dB)	Peak (dBm)	Min (dBm)	Difference (dB)	Limit (dB)
+5dB	**Shutdown	-	-	12
+4dB	-	-	-	12
+3dB	-	-	-	12
+2dB	-	-	-	12
+1dB	-	-	-	12
0dB	-	-	-	12
-1dB	-	-	-	12
-2dB	-	-	-	12
-3dB	-	-	-	12
-4dB	-	-	-	12
+5dB	-	-	-	12

Table 45 – 2110-2155MHz Downlink Band – Oscillation/Shutdown

10. Radiated Spurious Emissions

Test Requirement(s):	§2.1053	Test Engineer(s):	Jerry M.
Test Results:	Pass	Test Date(s):	Jun/28/2017

Test Procedures: As required by 47 §2.1053, Radiated Spurious Emissions measurement were made in accordance with the procedures of TIA-603 and KDB 935210 D03 §7.12.

The EUT was placed on a wooden table inside a 3 meter semi-anechoic chamber. The EUT was transmitting into a 50Ω non-radiating load which was directly connected to the EUT antenna port as shown in figure 4.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3 orthogonal axis. The frequency range up to the 10th harmonic was investigated.

Spurious attenuation limit in dB = $P1 - (43 + 10 \log_{10} (P2)) = -13\text{dBm}$

Where P1 = Transmitter Power in dBm and P2= Power in Watt

Test Setup:

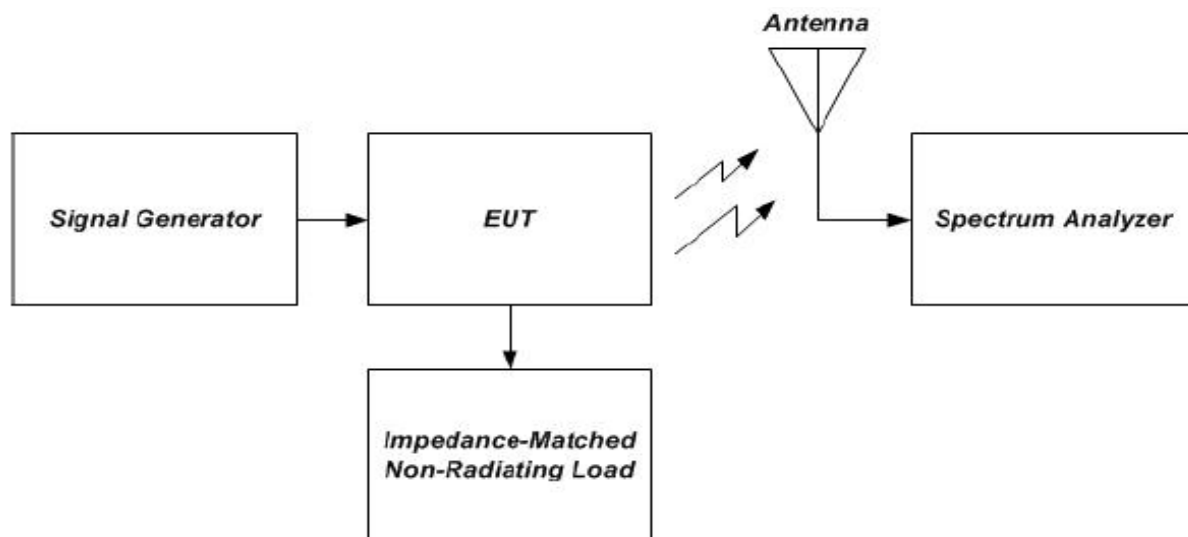


Figure 6 – Radiated Spurious Emission Test Setup

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1673	-60.87	-13	-52.87
2509	-63.87	-13	-51.33
3346	-62.53	-13	-49.2

Table 46 – 824-849MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
3765	-62.2	-13	-48.91
5647	-62.37	-13	-49.25
7530	-59.87	-13	-45.93

Table 47 – 1850-1915MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
3465	-52.37	-13	-53.02
5197	-62.53	-13	-53.61
6930	-59.03	-13	

Table 48 – 1710-1755MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1415	-63.87	-13	-49.83
2122.5	-32.53	-13	-26.36
2830	-63.2	-13	-49.83

Table 49 – 698-716MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1563	-63.53	-13	-47.17
2344	-64.2	-13	-46.0
3126	-60.87	-13	-51.17

Table 50 – 776-787MHz Uplink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1763	-64.37	-13	-50.83
2644	-62.37	-13	-47.46
3526	-62.2	-13	-45.58

Table 51 – 869-894MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
3925	-63.2	-13	-42.39
5887	-63.37	-13	-40.83
7850	-61.03	-13	-37.67

Table 52 – 1930-1995MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
4265	-62.7	-13	-43.06
6397	-61.53	-13	-41.73
8530	-61.37	-13	-36.28

Table 53 – 2110-2155MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1474	-64.7	-13	-49.5
2211	-65.2	-13	-48.29
2948	-60.37	-13	-47.13

Table 54 – 728-746MHz Downlink Band – Radiated Spurious Test Data

Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
1503	-63.2	-13	-52.1
2254	-64.7	-13	-47.3
3006	-61.37	-13	-45.07

Table 55 – 746-757MHz Downlink Band – Radiated Spurious Test Data

NOTE: There were no detectable emissions above the 2nd harmonic. Measurement was made above 2nd harmonic to show the Receiver Noise Floor (N.F)

I. Test Equipment

Equipment	Manufacturer	Model	Serial #	Last Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4402B	US41192757	Mar/15/17	Mar/15/18
Spectrum Analyzer	Hewlett Packard	8563E	3821A09316	Nov/05/16	Nov/05/17
Directional Coupler	Andrew	C-10-CPUS-N	150503142544	NCR	None
Attenuator 20dB	Weinschel	41-20-12	86332	NCR	None
Variable Attenuator	JFW	50R-320-SMA	7054221439	NCR	None
Signal Generator	Agilent	E4432B	US40053021	NCR	None
Signal Generator	Agilent	E4432B	US38220446	NCR	None
Horn Antenna	Com-Power	AHA-118	071150	May/10/16	May/10/18
Horn Antenna	Com-Power	AH-118	71350	NCR	None
Bilog Antenna	Chase	CBL6140	1040	Oct/28/16	Oct/28/17
Attenuator 10dB	Huber+Suhner	6810.17.A	747300	NCR	None
Digital Multimeter	Fluke	77 III	72550270	Nov/30/15	Nov/30/17
Power Supply	Hewlett Packard	6236B	2735A-19608	NCR	None

Table 56 – Test Equipment List

***Statement of Traceability:** Test equipment is maintained and calibrated on a regular basis. All calibrations have been performed by a 17025 accredited test facility, traceable to National Institute of Standards and Technology (NIST)

END OF TEST REPORT