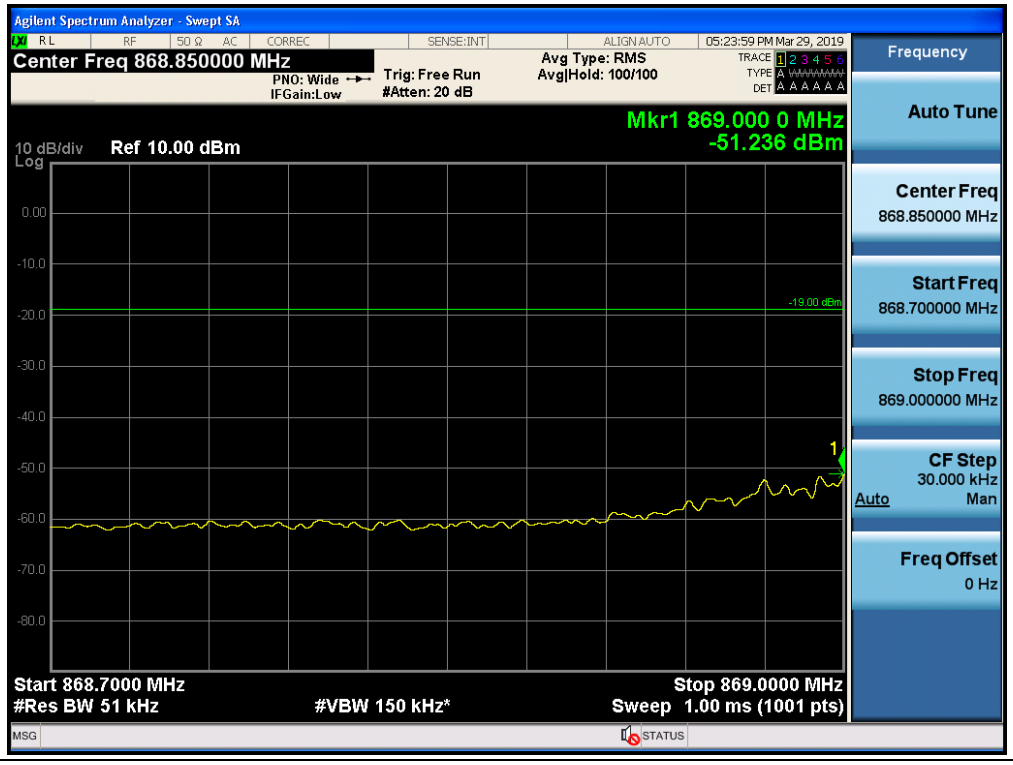
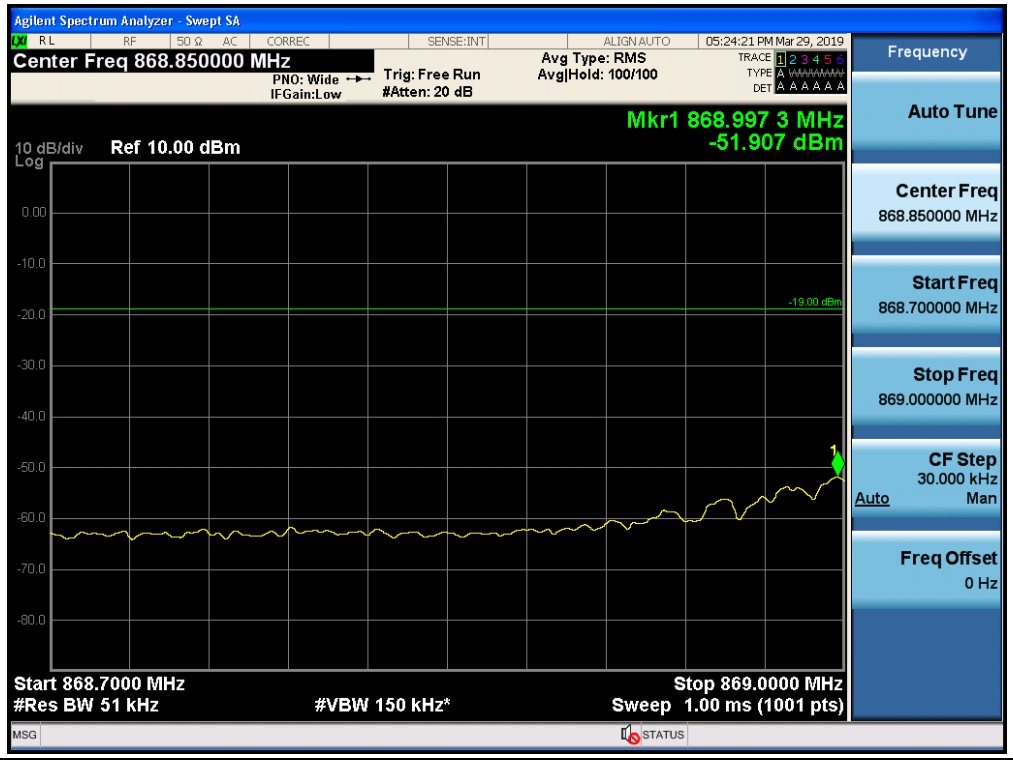
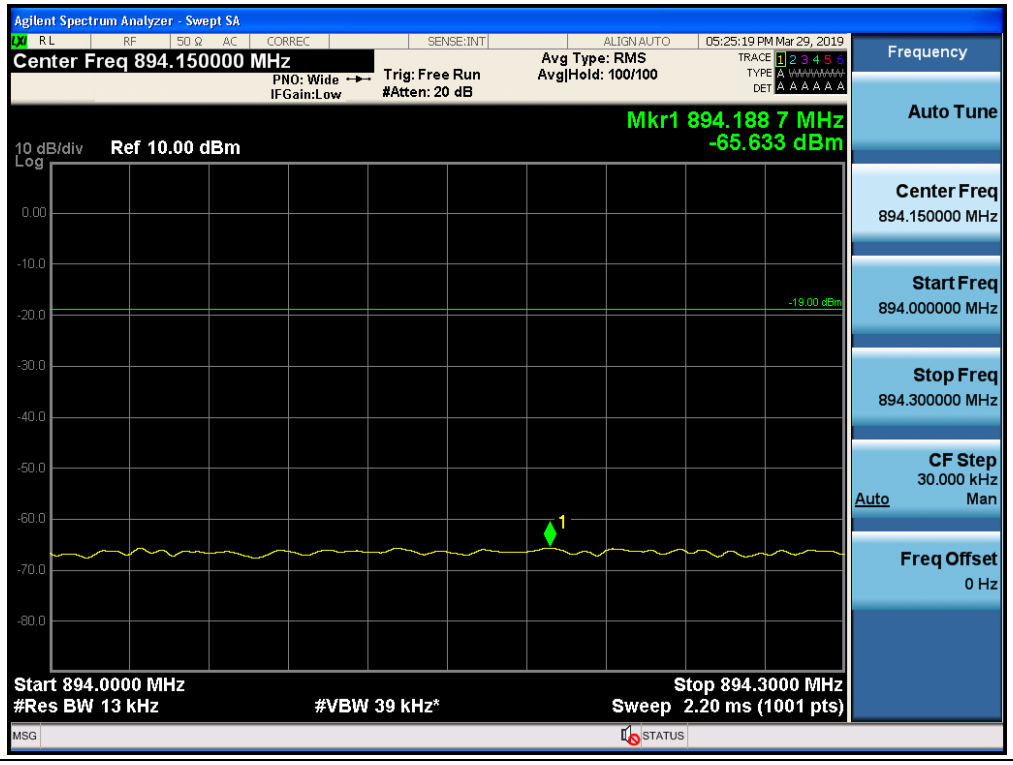
Out-of-Band Emissions / Cellular / Downlink / LTE 5 MHz / Lower Edge / AGC threshold



Out-of-Band Emissions / Cellular / Downlink / LTE 5 MHz / Lower Edge / AGC threshold +10 dB



Out-of-Band Emissions / Cellular / Downlink / CDMA / Upper Edge / AGC threshold



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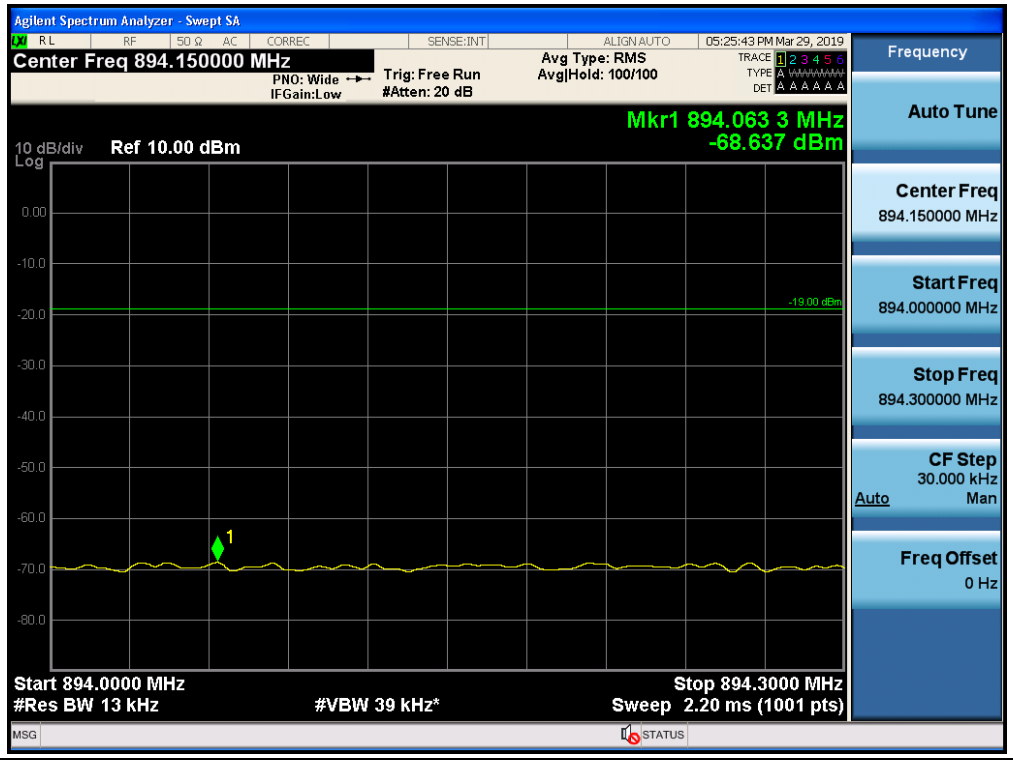
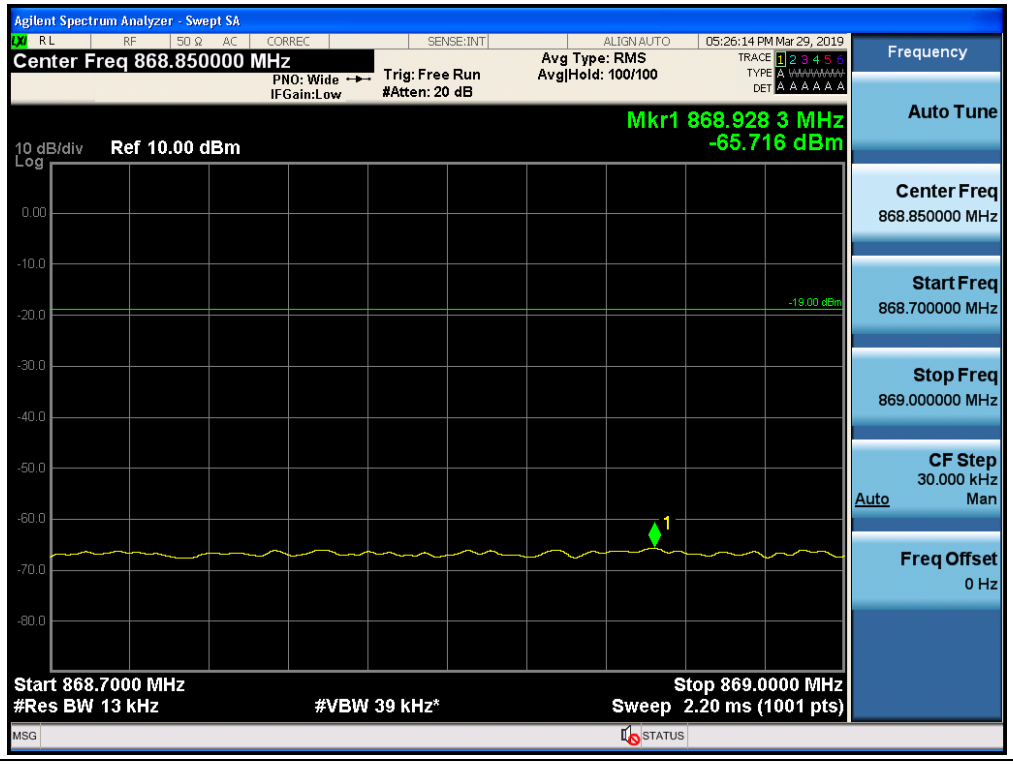
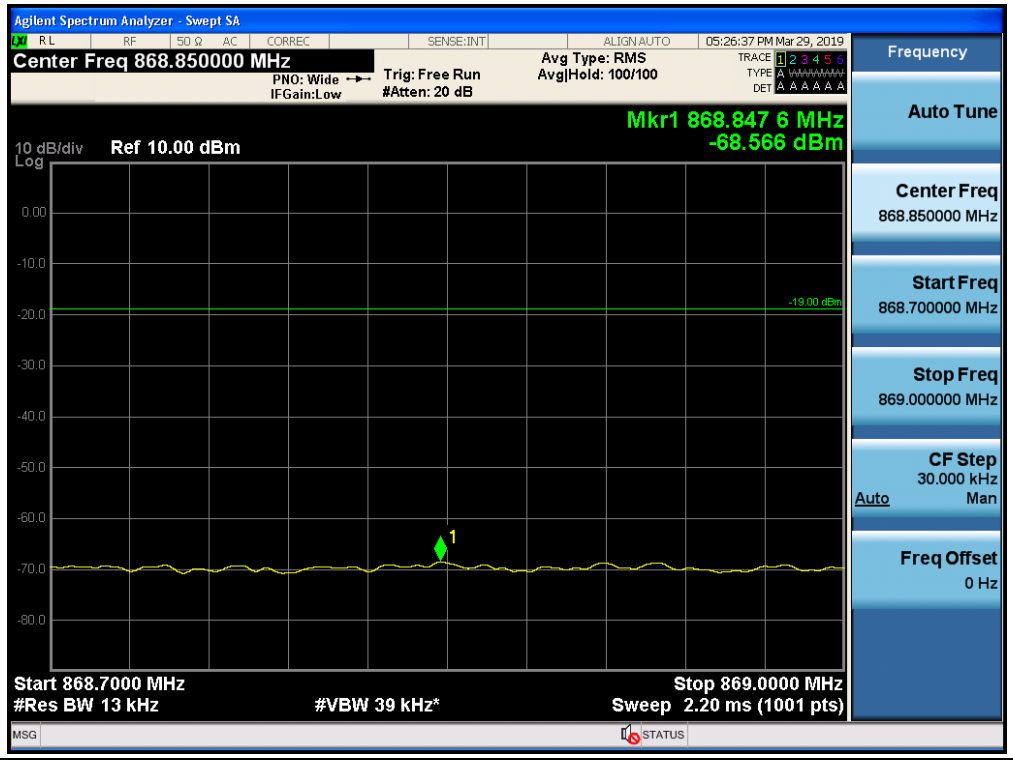


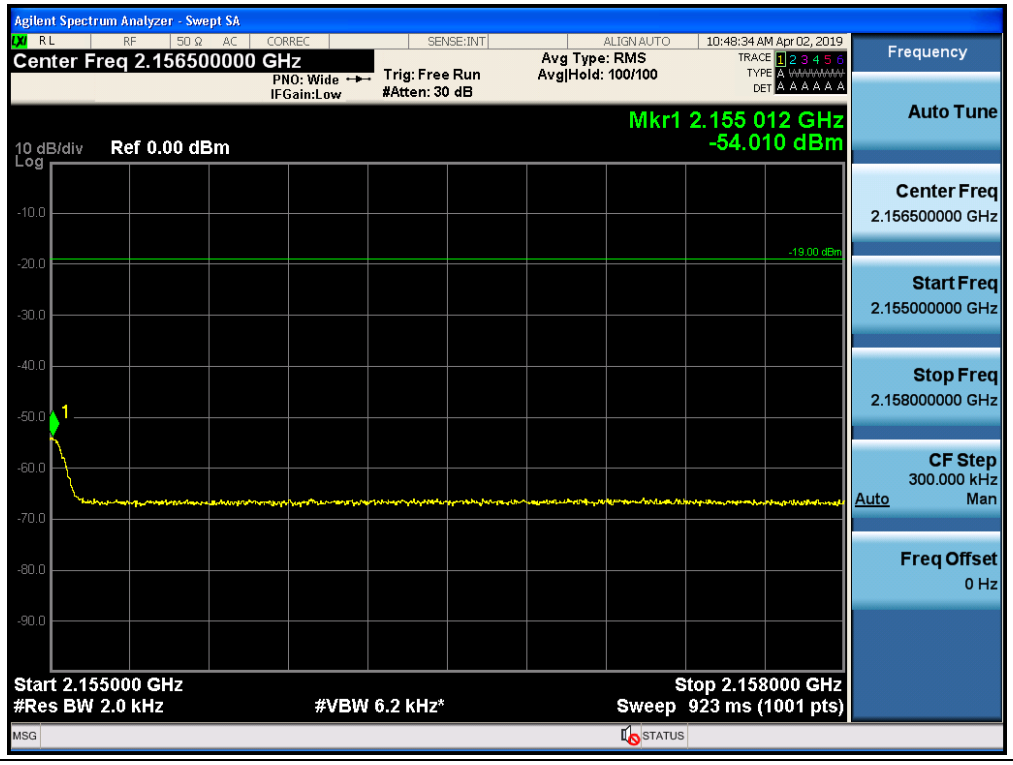
Out-of-Band Emissions / Cellular / Downlink / CDMA / Lower Edge / AGC threshold



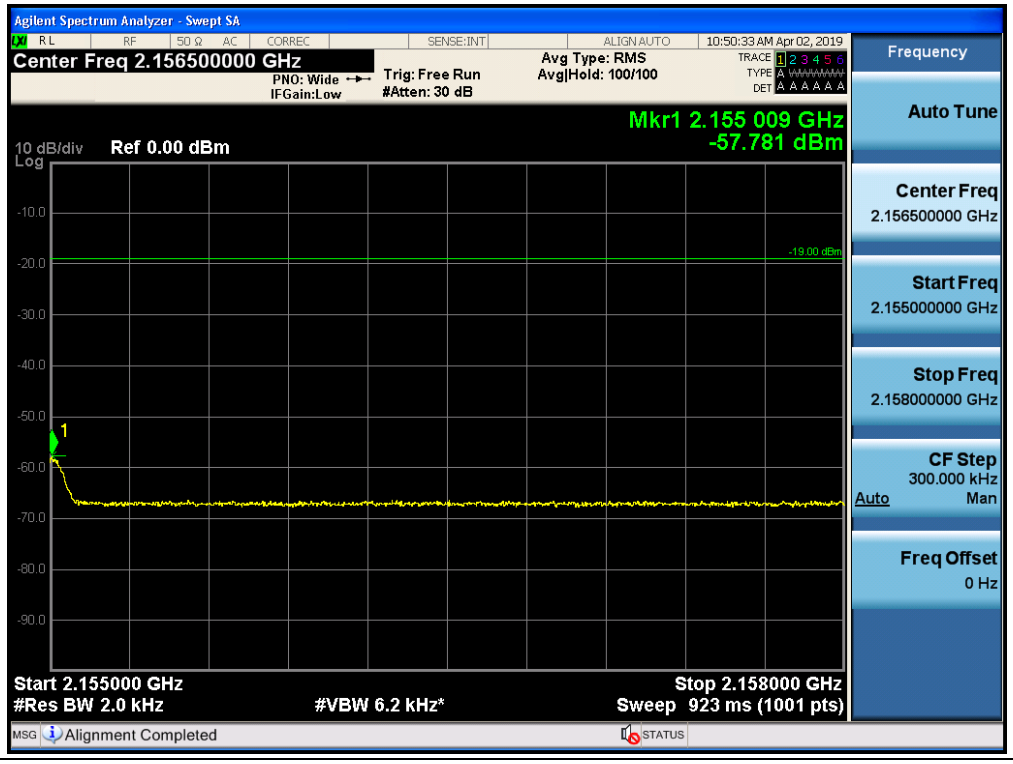
Out-of-Band Emissions / Cellular / Downlink / CDMA / Lower Edge / AGC threshold +10 dB



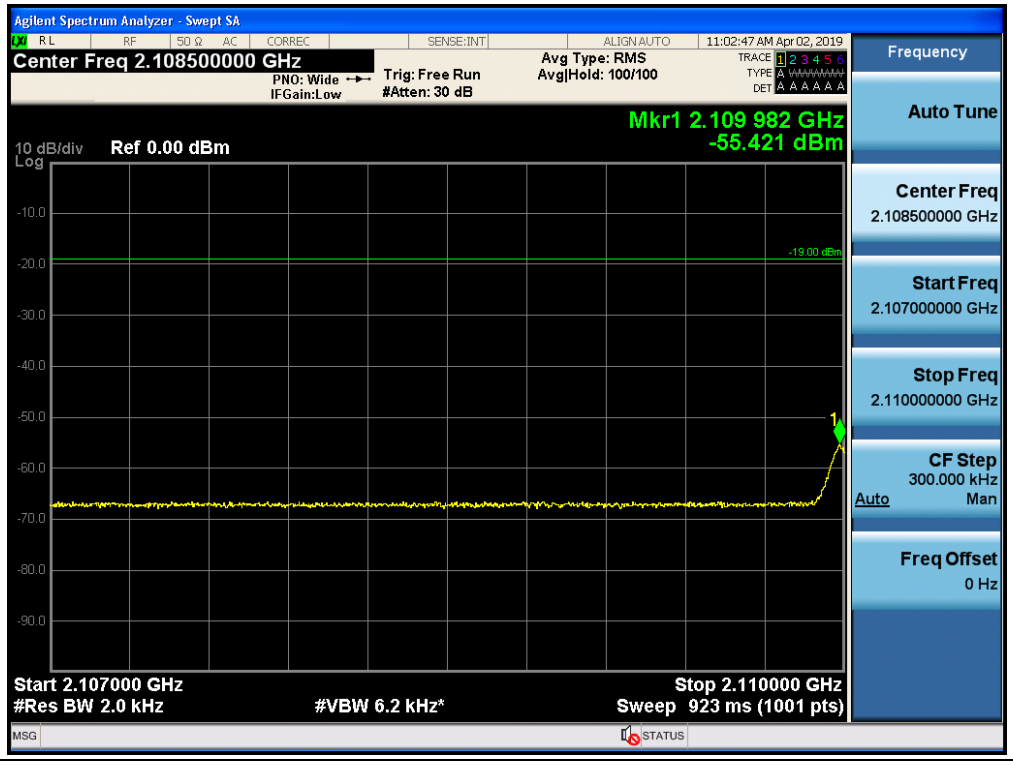
Out-of-Band Emissions / AWS-1 / Downlink / GSM / Upper Edge / AGC threshold



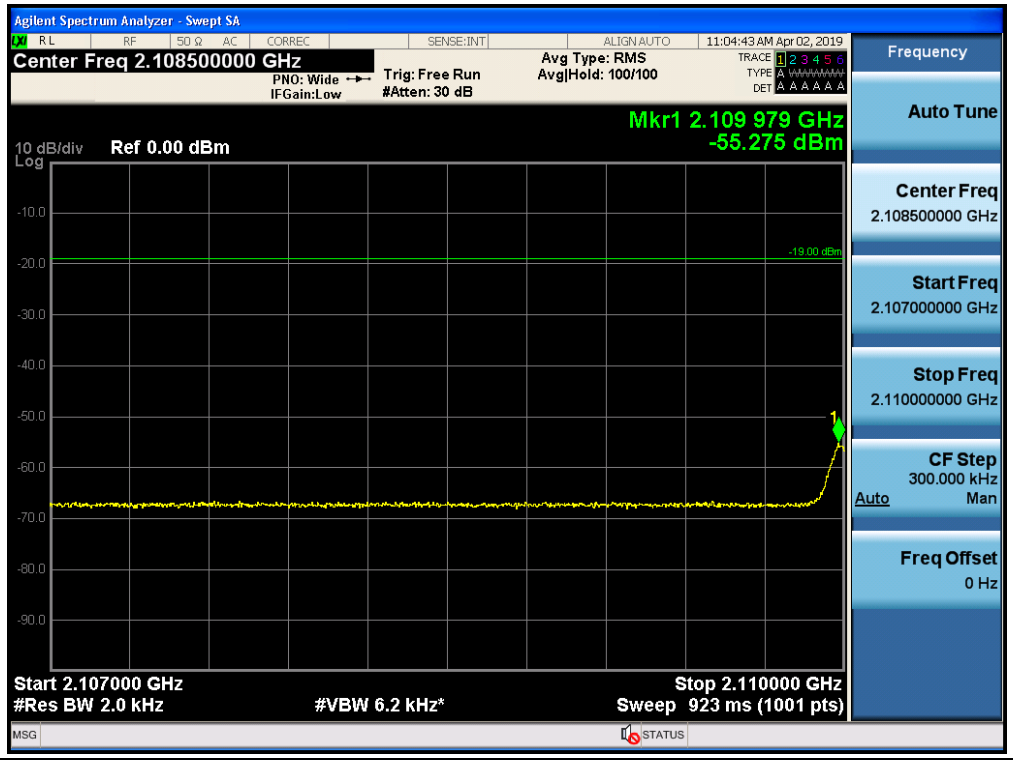
Out-of-Band Emissions / AWS-1 / Downlink / GSM / Upper Edge / AGC threshold +10 dB



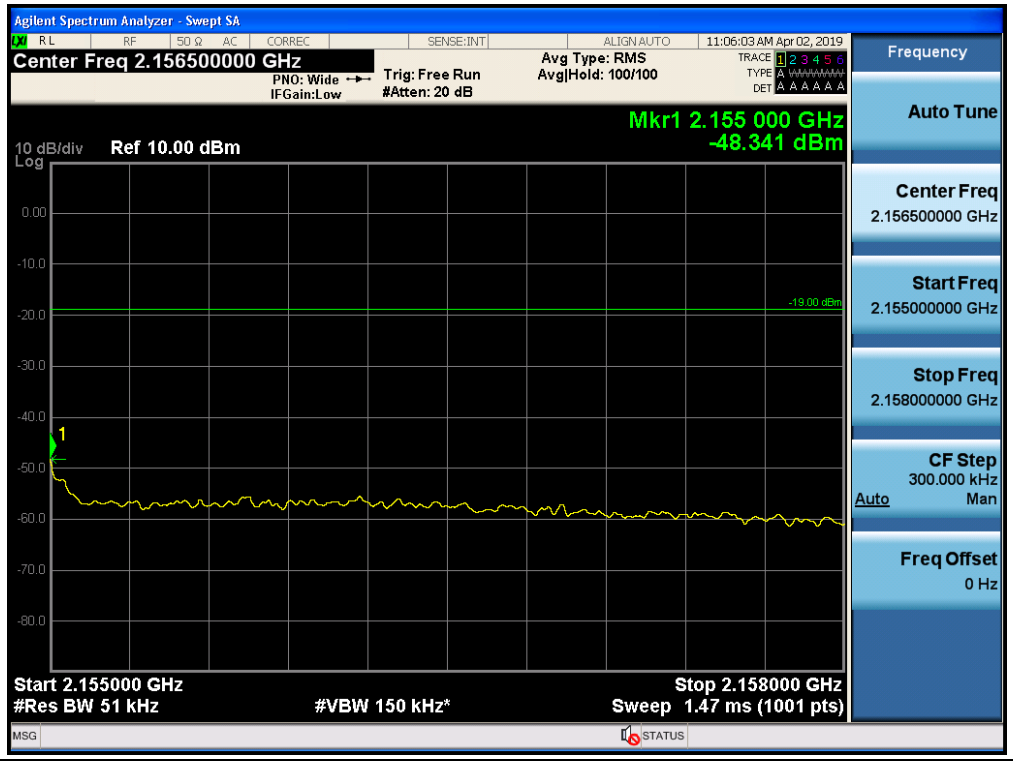
Out-of-Band Emissions / AWS-1 / Downlink / GSM / Lower Edge / AGC threshold



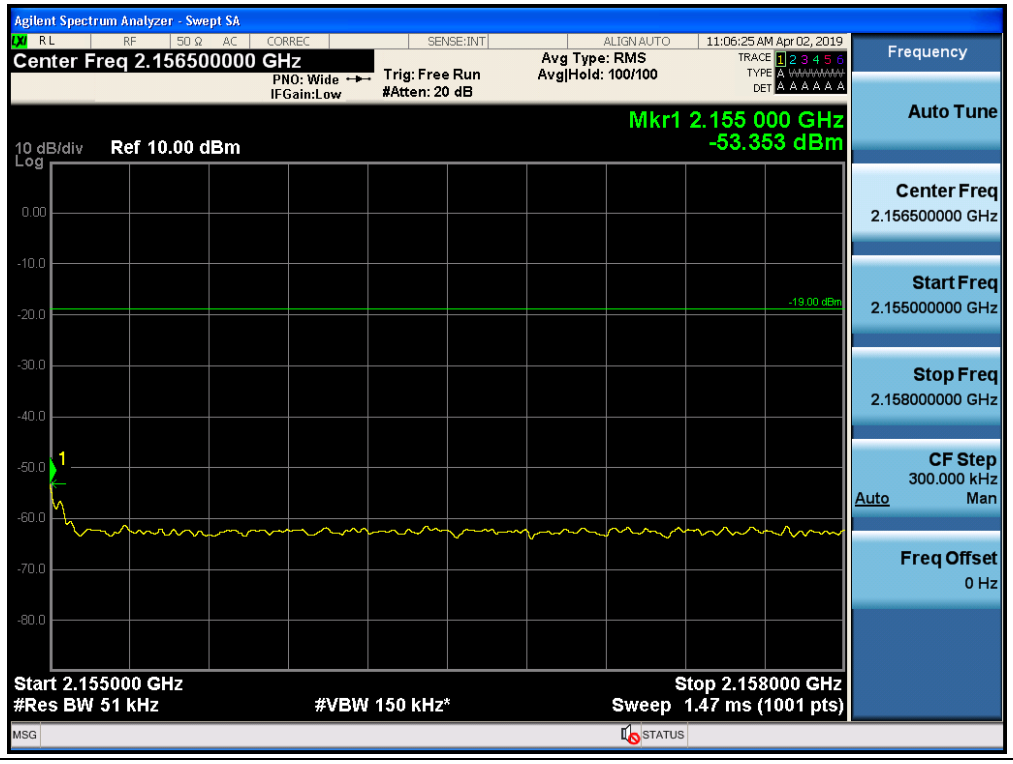
Out-of-Band Emissions / AWS-1 / Downlink / GSM / Lower Edge / AGC threshold +10 dB



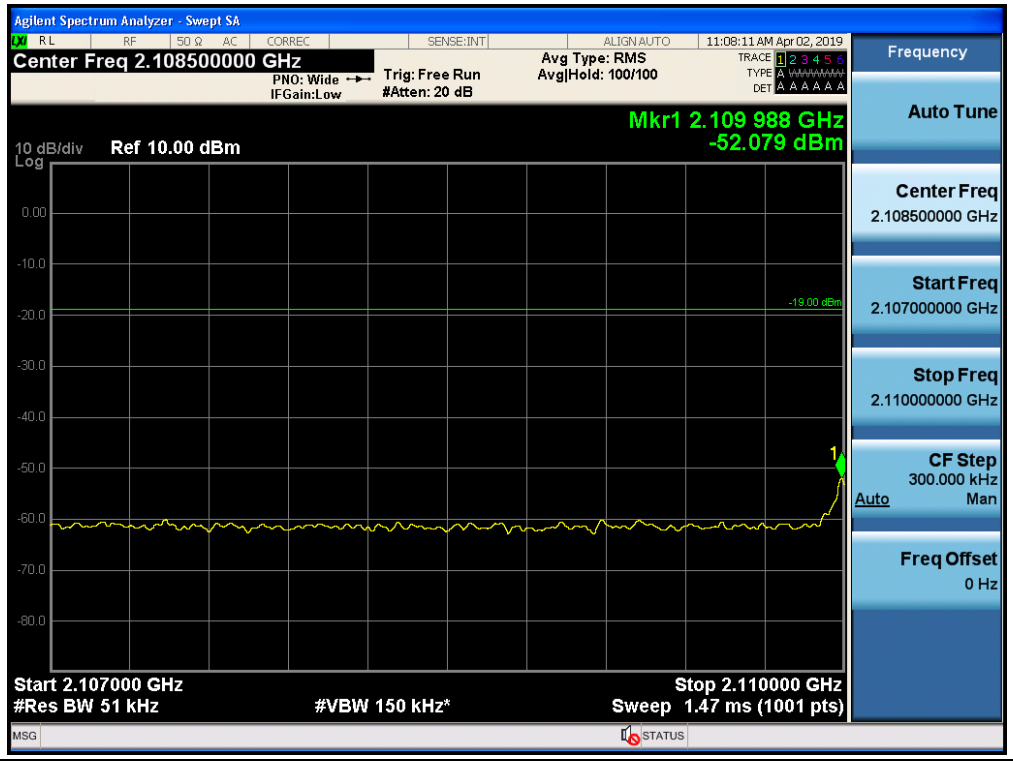
Out-of-Band Emissions / AWS-1 / Downlink / LTE 5 MHz / Upper Edge / AGC threshold



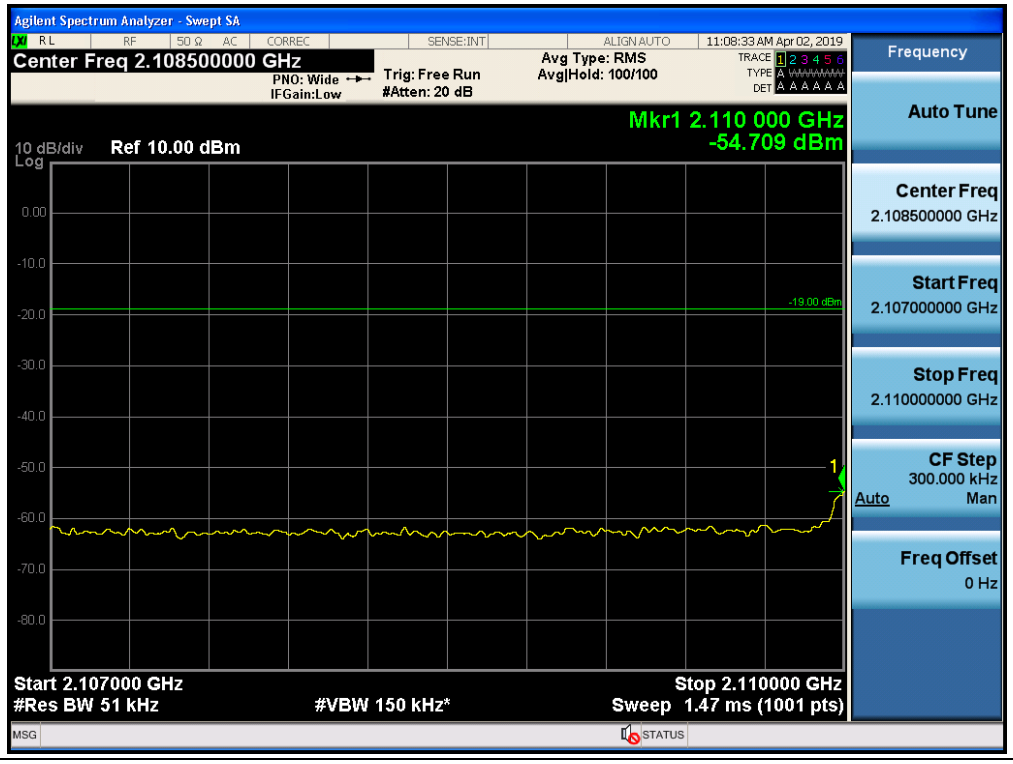
Out-of-Band Emissions / AWS-1 / Downlink / LTE 5 MHz / Upper Edge / AGC threshold +10 dB



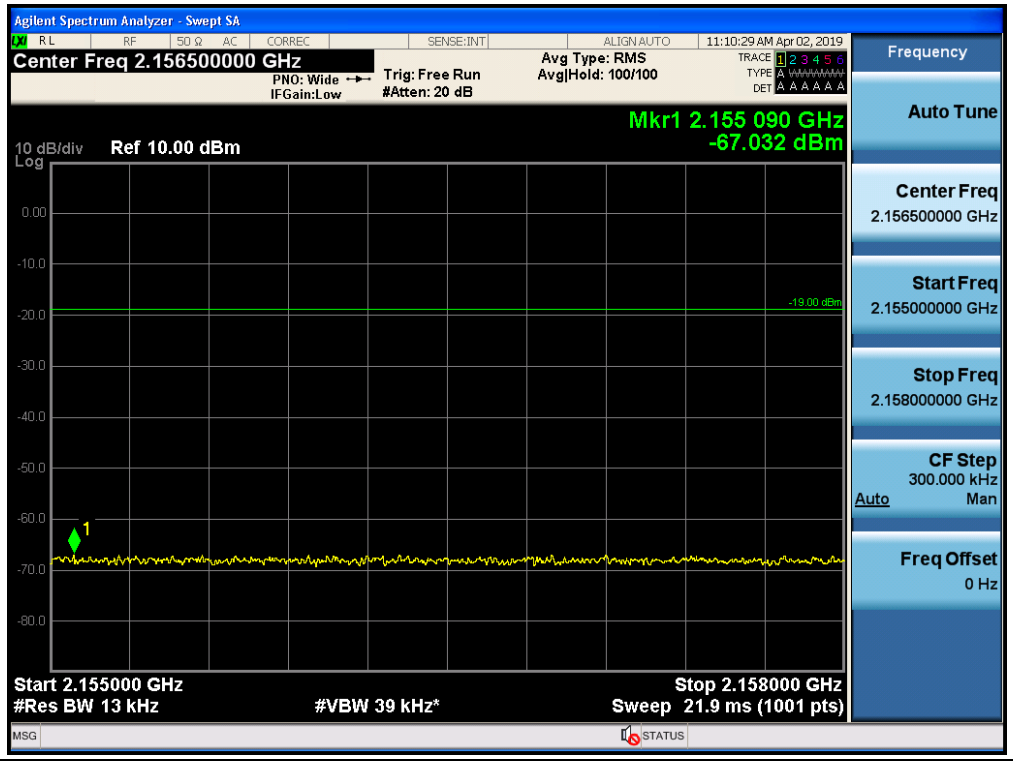
Out-of-Band Emissions / AWS-1 / Downlink / LTE 5 MHz / Lower Edge / AGC threshold



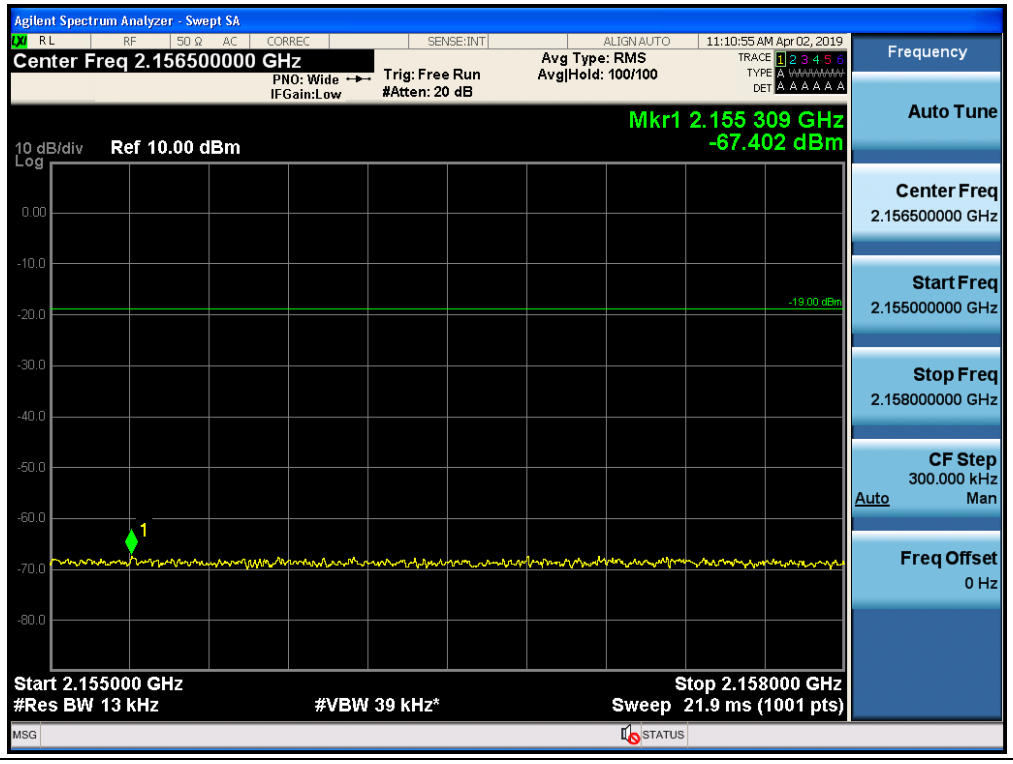
Out-of-Band Emissions / AWS-1 / Downlink / LTE 5 MHz / Lower Edge / AGC threshold +10 dB



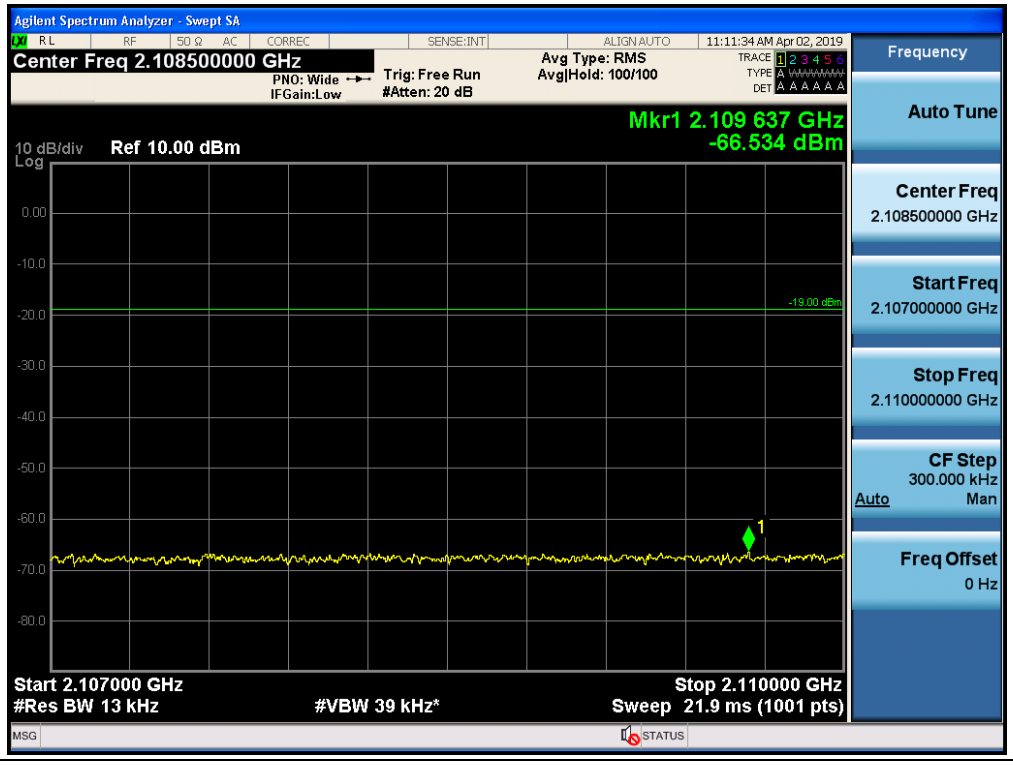
Out-of-Band Emissions / AWS-1 / Downlink / CDMA / Upper Edge / AGC threshold



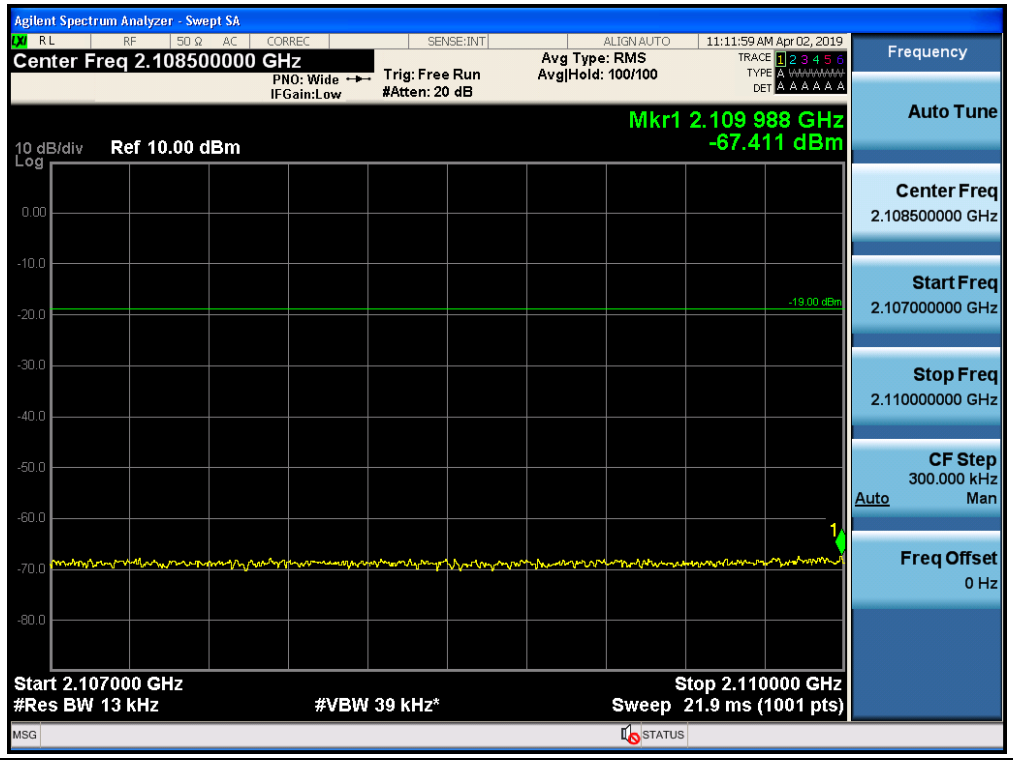
Out-of-Band Emissions / AWS-1 / Downlink / CDMA / Upper Edge / AGC threshold +10 dB



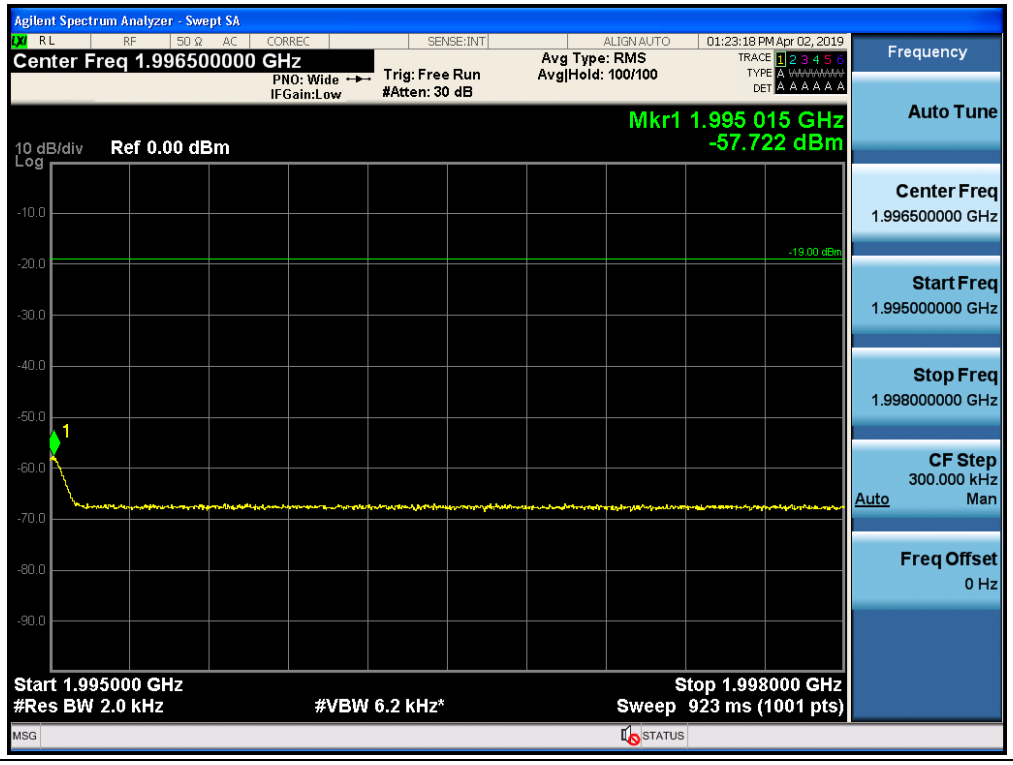
Out-of-Band Emissions / AWS-1 / Downlink / CDMA / Lower Edge / AGC threshold



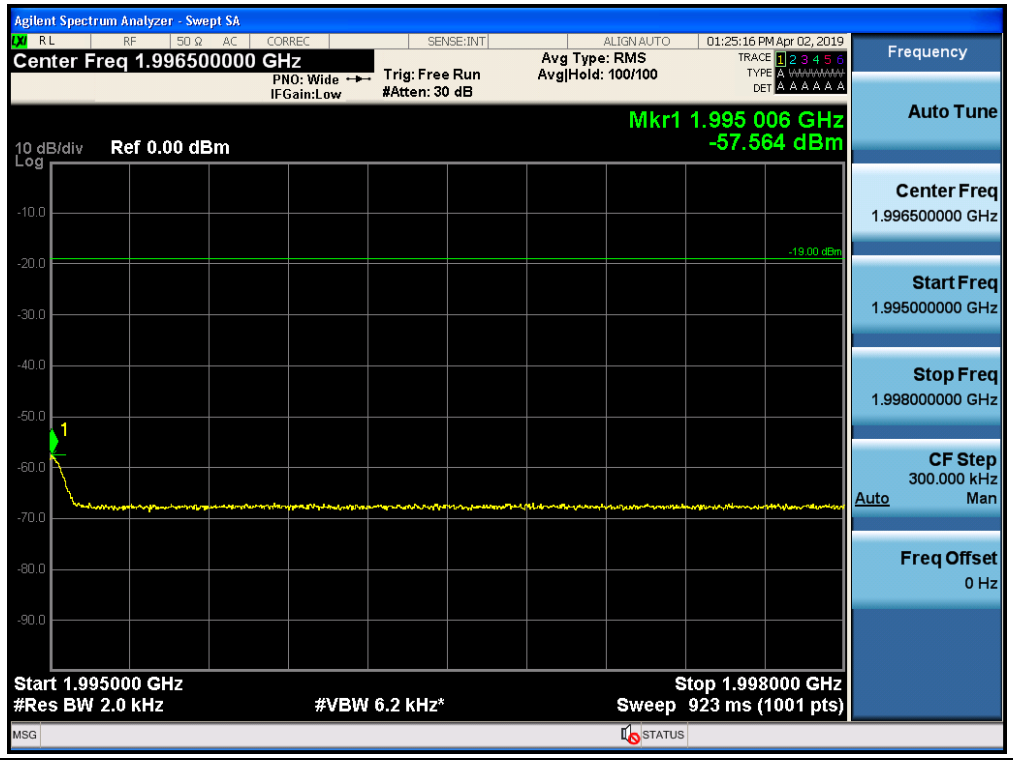
Out-of-Band Emissions / AWS-1 / Downlink / CDMA / Lower Edge / AGC threshold +10 dB



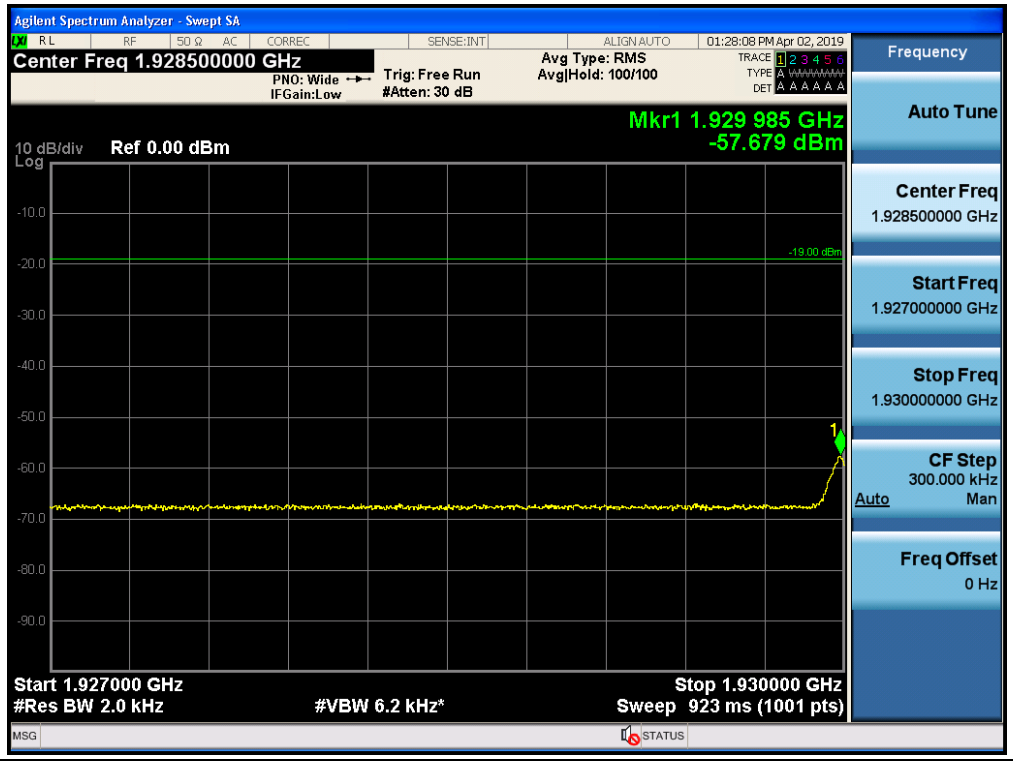
Out-of-Band Emissions / Broadband PCS / Downlink / GSM / Upper Edge / AGC threshold



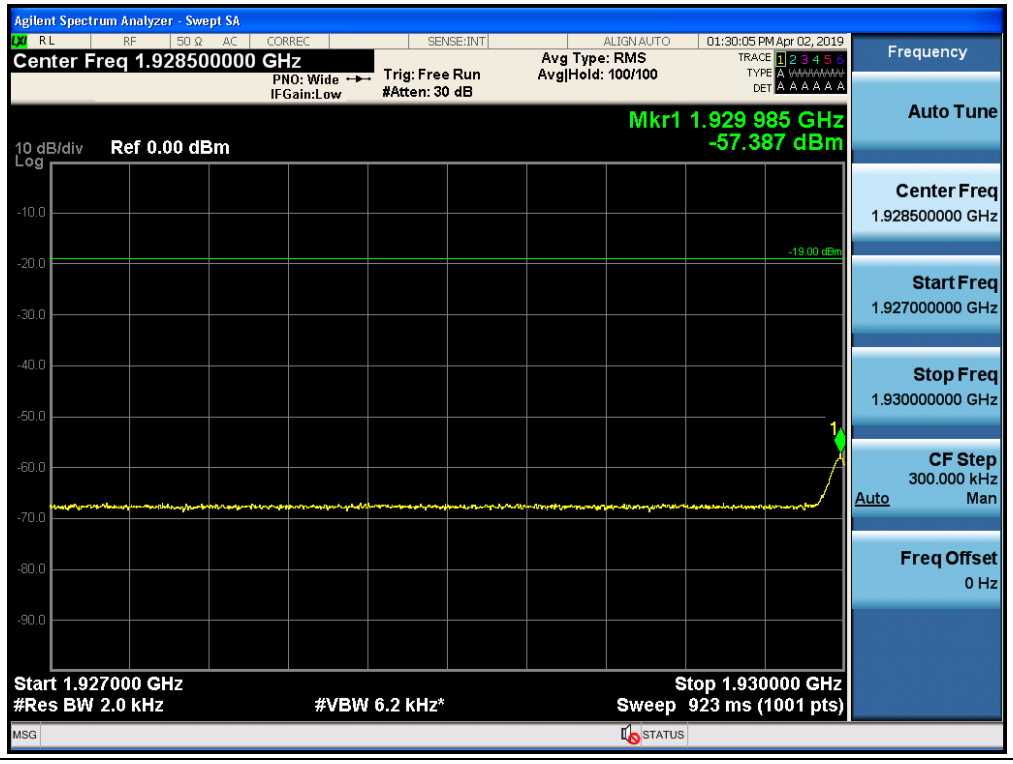
Out-of-Band Emissions / Broadband PCS / Downlink / GSM / Upper Edge / AGC threshold +10 dB



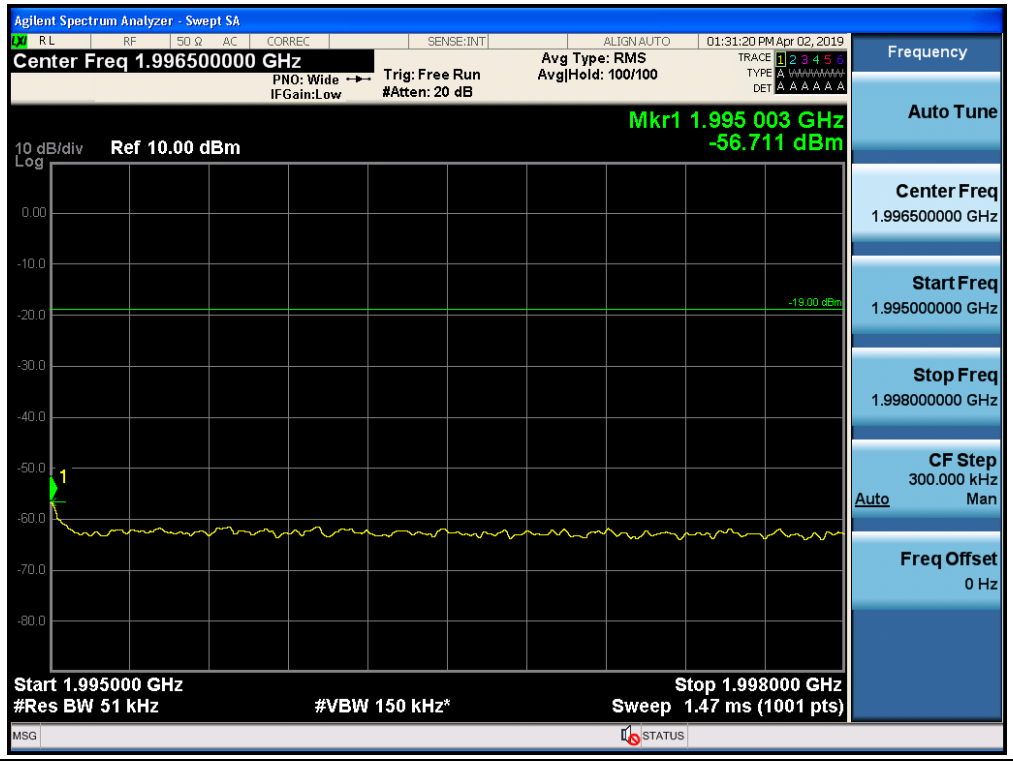
Out-of-Band Emissions / Broadband PCS / Downlink / GSM / Lower Edge / AGC threshold



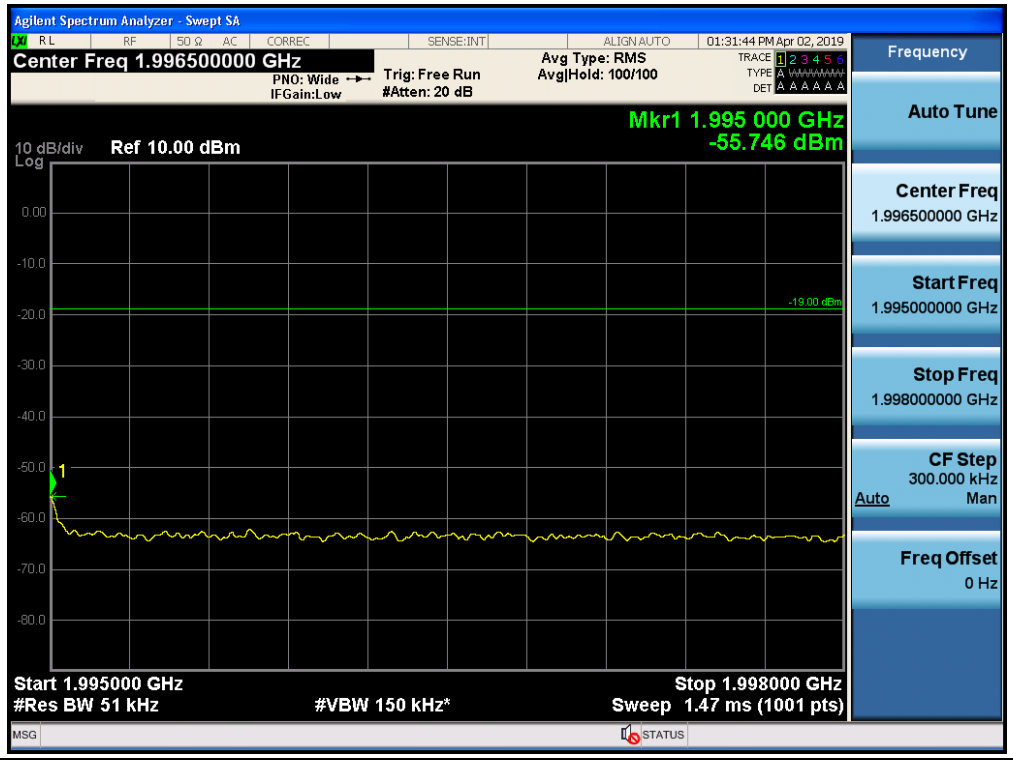
Out-of-Band Emissions / Broadband PCS / Downlink / GSM / Lower Edge / AGC threshold +10 dB



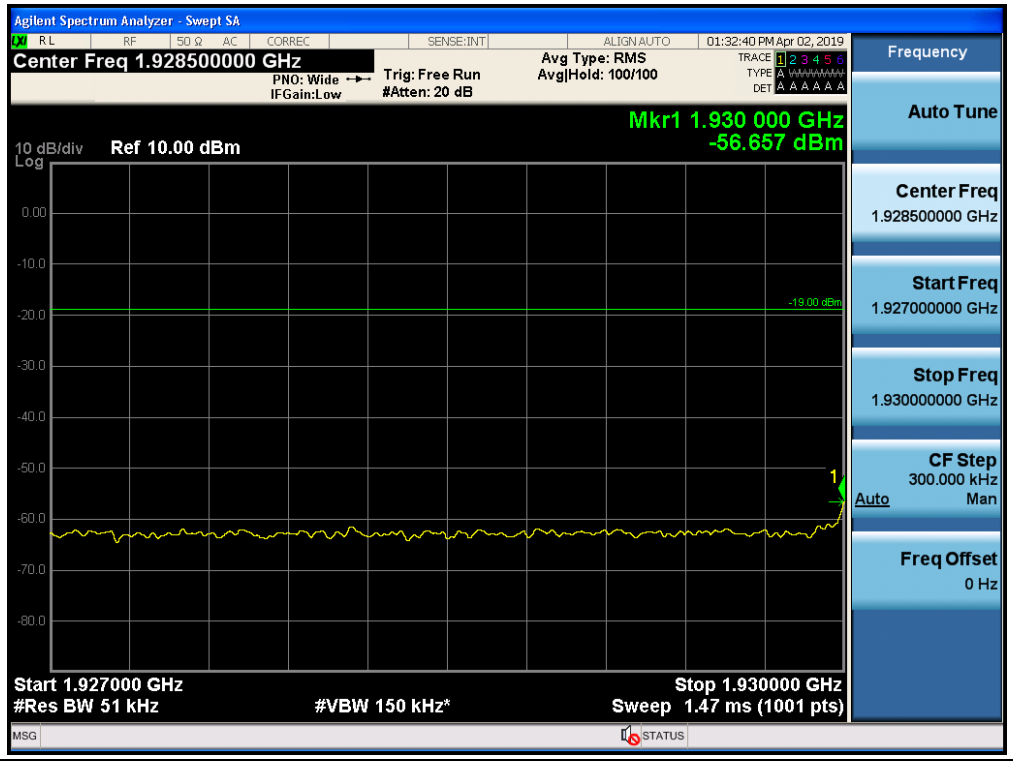
Out-of-Band Emissions / Broadband PCS / Downlink / LTE 5 MHz / Upper Edge / AGC threshold



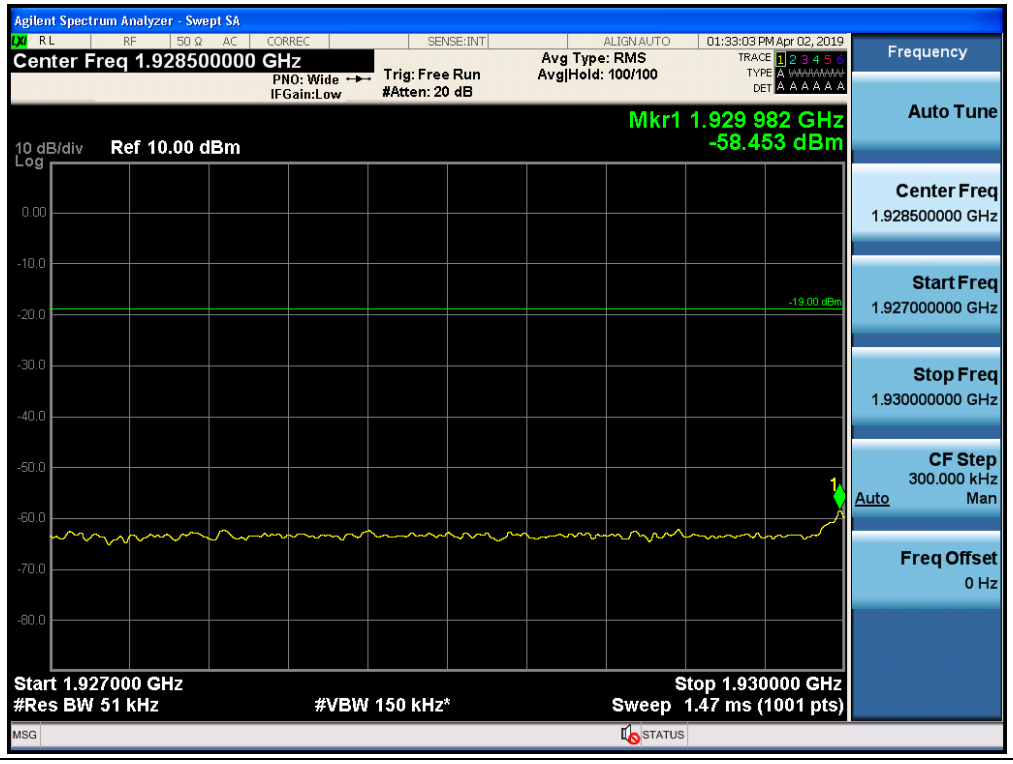
Out-of-Band Emissions / Broadband PCS / Downlink / LTE 5 MHz / Upper Edge / AGC threshold +10 dB



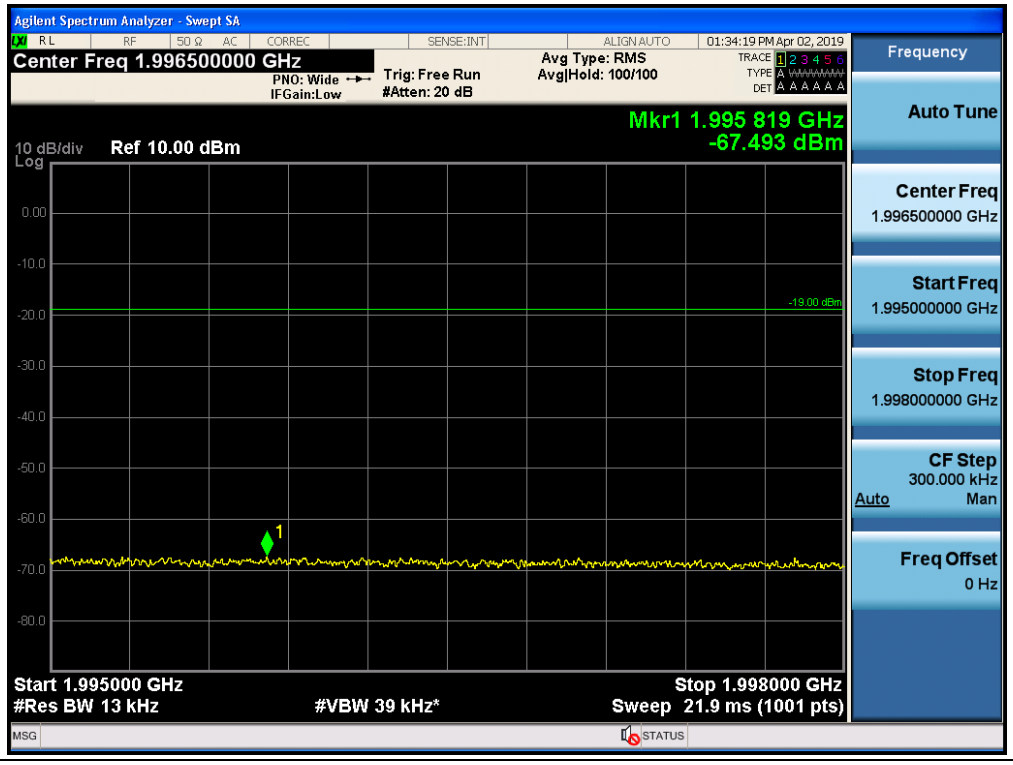
Out-of-Band Emissions / Broadband PCS / Downlink / LTE 5 MHz / Lower Edge / AGC threshold



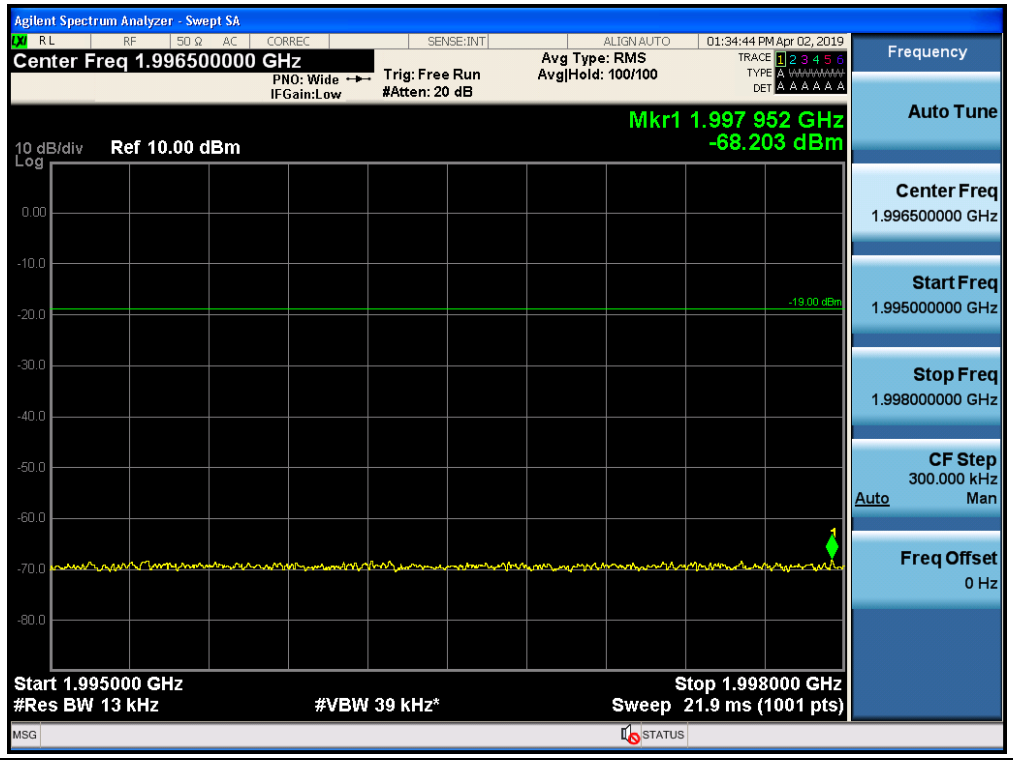
Out-of-Band Emissions / Broadband PCS / Downlink / LTE 5 MHz / Lower Edge / AGC threshold +10 dB



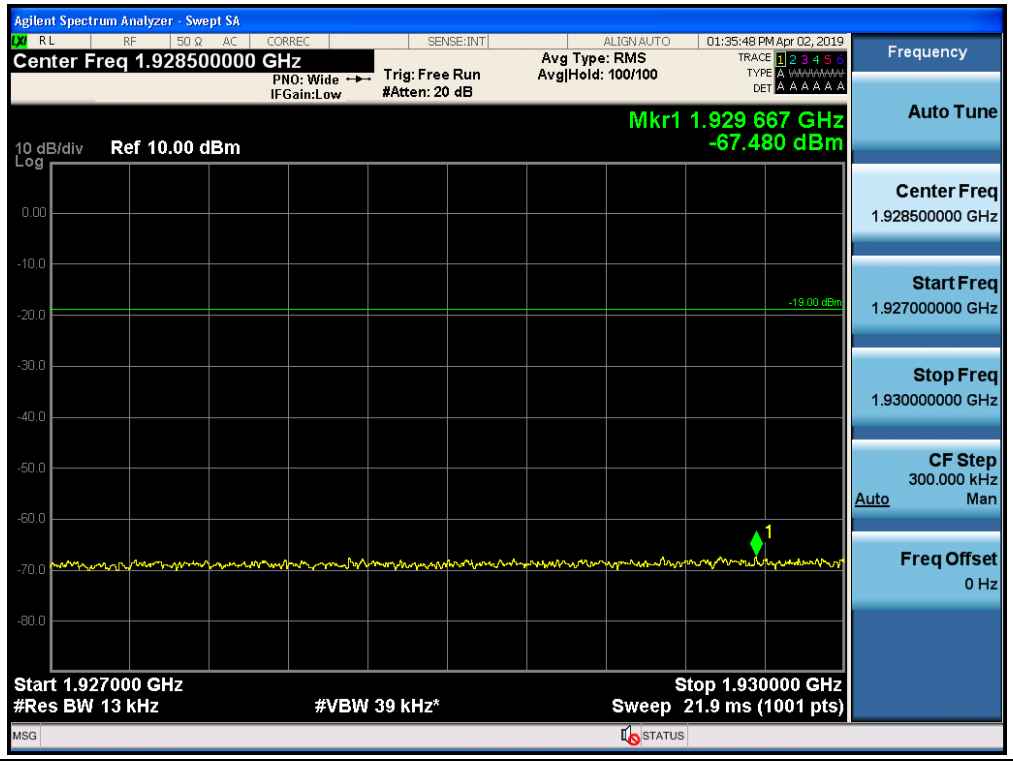
Out-of-Band Emissions / Broadband PCS / Downlink / CDMA / Upper Edge / AGC threshold



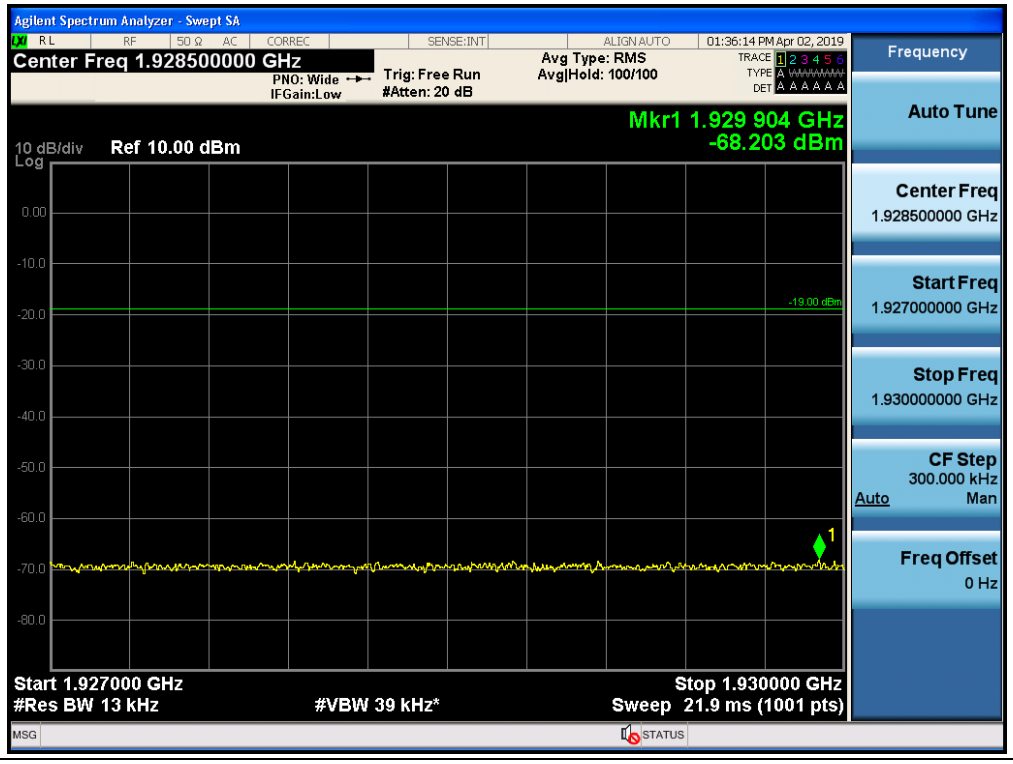
Out-of-Band Emissions / Broadband PCS / Downlink / CDMA / Upper Edge / AGC threshold +10 dB



Out-of-Band Emissions / Broadband PCS / Downlink / CDMA / Lower Edge / AGC threshold



Out-of-Band Emissions / Broadband PCS / Downlink / CDMA / Lower Edge / AGC threshold +10 dB



5.6. CONDUCTED SPURIOUS EMISSIONS

Test Requirements:

§2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

§24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as

specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§27.53 Emission limits.

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(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.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) AWS emission limits

(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

Test Procedures:

Measurements were in accordance with the test methods section 7.6 of KDB 935210 D03 v04r03.

a) Begin with the uplink output (donor) port connected to the spectrum analyzer.

b) Configure the signal generator for AWGN with a 99% OBW of 4.1 MHz, with a center frequency corresponding to the center of the CMRS band under test.

c) Set the signal generator amplitude to the level determined in the power measurement procedure in maximum power measurement test.

d) Turn on the signal generator RF output and measure the spurious emission power levels with an appropriate measuring instrument as follows.

1) Set RBW = measurement bandwidth specified in the applicable rule section for the operational frequency band under consideration. Note that many of the individual rule sections permit the use of a narrower RBW [typically ≥ 1% of the emission bandwidth (EBW)] to enhance measurement accuracy, but the result must then be integrated over the specified measurement bandwidth.

2) Set VBW = 3 x RBW.

3) Select the power averaging (rms) detector.

4) Sweep time = auto-couple.

5) Set the analyzer start frequency to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part. Note that the number of measurement points in each sweep must be ≥ (2 x span/RBW), which may require that the measurement range defined by the preceding start and stop frequencies be subdivided, depending on the available number of measurement points of the spectrum analyzer. Trace average at least 10 traces in power averaging (i.e., rms) mode.

6) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.

7) Reset the analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the analyzer stop frequency to 10 times the highest frequency of

the fundamental emission. Note that the number of measurement points in each sweep must be ≥ (2 x span/RBW) which may require that the measurement range defined by the start and stop frequencies above be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

8) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report.

e) Repeat b) through d) for each supported frequency band of operation.

Note1. Except band of upper 700 MHz, '43 + 10 Log (Power) = -13 dBm' limit is applied for all spurious test. For upper 700 MHz band, in 763-775 MHz and 793-805 MHz '65 + 10 log (Power) = -35 dBm (6.25 kHz RBW)' limit is applied. Additionally in 1559-1610 MHz shall be limited to −70 dBW/MHz (-40 dBm, 1 MHz RBW) and −80 dBW (-50 dBm, 700 Hz RBW) EIRP.

Note2. Coupling In 9 kHz-150 kHz and 150 kHz-30 MHz bands, RBW was reduced to 1 kHz and 10 kHz and correction factor was applied according to section 5.7.2 of ANSI C63.26-2015.

Band	9 ~ 150 kHz Correction	150 kHz ~ 30 MHz Correction
Below 1 GHz (Ref.RBW: 100 kHz)	20 dB	10 dB
Above 1 GHz (Ref.RBW: 1 MHz)	30 dB	20 dB

Note3. RBW and Band Separation is according to note 1 of out-of-band emissions test in this report

Test Results:

Tabulated Result of Uplink Conducted Spurious Emissions

Band	Range (MHz)	Frequency (MHz)	Limit (dBm)	Spurious Emission (dBm)
Lower 700 MHz	0.009 ~ 0.15	0.009 423	-13	-38.063
	0.15 ~ 30	0.150		-48.216
	30 ~ 703.9	702.72		-53.358
	716.1 ~ 2 000	782.01		-54.254
	2 000 ~ 4 000	2 667.95		-63.388
	4 000 ~ 6 000	5 046.55		-61.302
	6 000 ~ 8 000	7 403.20		-61.743
Upper 700 MHz	0.009 ~ 0.15	0.009 000		-37.665
	0.15 ~ 30	0.150		-48.957
	30 ~ 775.9	775.49		-45.026
	787.1 ~ 2 000	787.22		-40.480
	2 000 ~ 4 000	2 681.00		-63.111
	4 000 ~ 6 000	5 612.70		-61.143
	6 000 ~ 8 000	7 419.70		-61.349
	737 ~ 775	774.99	-46	-57.630
	793 ~ 805	793.64		-68.096
	1 559 ~ 1 610 (1 MHz)	1 563.13	-40	-54.945
	1 559 ~ 1 610 (700 Hz)-1	1 563.75	-50	-85.582
	1 559 ~ 1 610 (700 Hz)-2	1 579.37		-88.322
	1 559 ~ 1 610 (700 Hz)-3	1 597.76		-88.741
	1 559 ~ 1 610 (700 Hz)-4	1 606.13		-88.687

Band	Range (MHz)	Frequency (MHz)	Limit (dBm)	Spurious Emission (dBm)
Cellular	0.009 ~ 0.15	0.010 410	-13	-39.105
	0.15 ~ 30	0.160		-49.829
	30 ~ 823	822.21		-55.594
	850 ~ 1 000	904.55		-56.813
	1 000 ~ 10 000	9 454.15		-39.986
AWS-1	0.009 ~ 0.15	0.011 397		-29.879
	0.15 ~ 30	0.150		-39.690
	30 ~ 1 709	709.58		-43.847
	1 756 ~ 10 000	9 504.54		-40.403
	10 000 ~ 26 500	26 298.70		-37.019
Broadband PCS	0.009 ~ 0.15	0.009 282		-30.136
	0.15 ~ 30	0.150		-41.453
	30 ~ 1 849	1 719.85		-43.474
	1 916 ~ 10 000	9 543.25		-40.013
	10 000 ~ 26 500	26 489.69		-36.935

Tabulated Result of Downlink Conducted Spurious Emissions

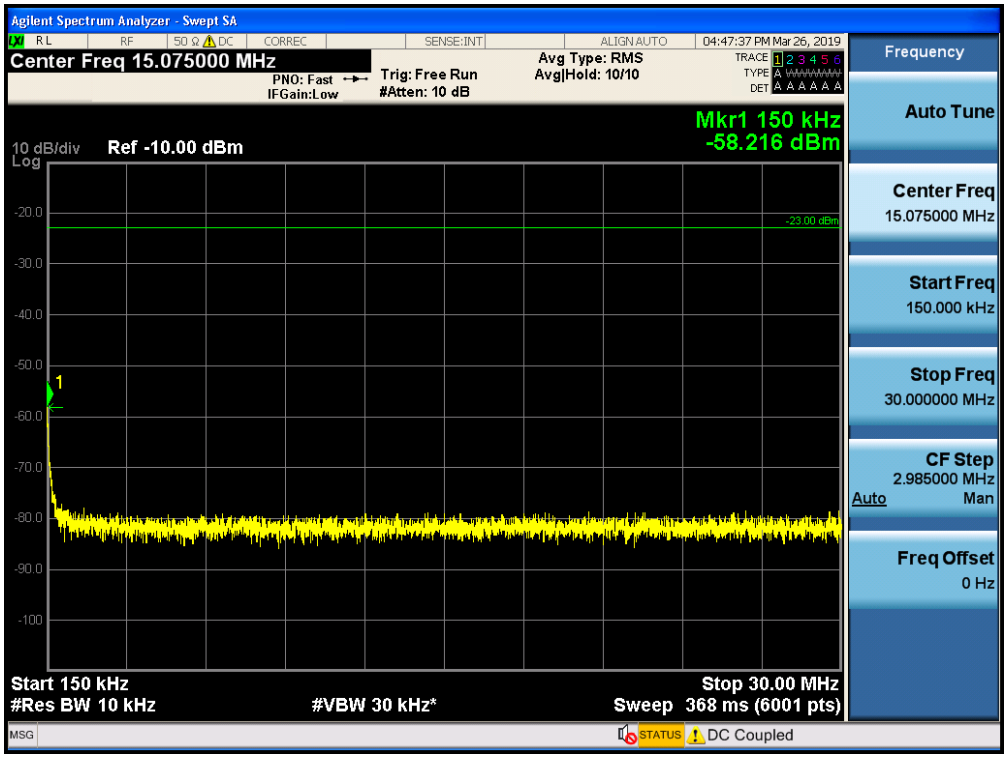
Band	Range (MHz)	Frequency (MHz)	Limit (dBm)	Spurious Emission (dBm)
Lower 700 MHz	0.009 ~ 0.15	0.009 846	-13	-38.866
	0.15 ~ 30	0.155		-49.897
	30 ~ 733.9	732.25		-54.720
	746.1 ~ 2 000	884.70		-38.508
	2 000 ~ 4 000	2 163.40		-29.740
	4 000 ~ 6 000	5 690.45		-61.192
	6 000 ~ 8 000	6 132.90		-61.061
Upper 700 MHz	0.009 ~ 0.15	0.009 423		-38.543
	0.15 ~ 30	0.150		-47.999
	30 ~ 745.9	736.09		-53.252
	757.1 ~ 2 000	891.29		-39.170
	2 000 ~ 4 000	2 162.80		-23.247
	4 000 ~ 6 000	5 618.10		-60.902
	6 000 ~ 8 000	6 719.30		-61.816
	737 ~ 775	772.45	-46	-79.655
	793 ~ 805	794.66		-79.551
	1 559 ~ 1 610 (1 MHz)	1 604.24	-40	-58.696
	1 559 ~ 1 610 (700 Hz)-1	1 561.06	-50	-89.132
	1 559 ~ 1 610 (700 Hz)-2	1 586.29		-89.236
	1 559 ~ 1 610 (700 Hz)-3	1 588.37		-89.226
	1 559 ~ 1 610 (700 Hz)-4	1 606.15		-88.833

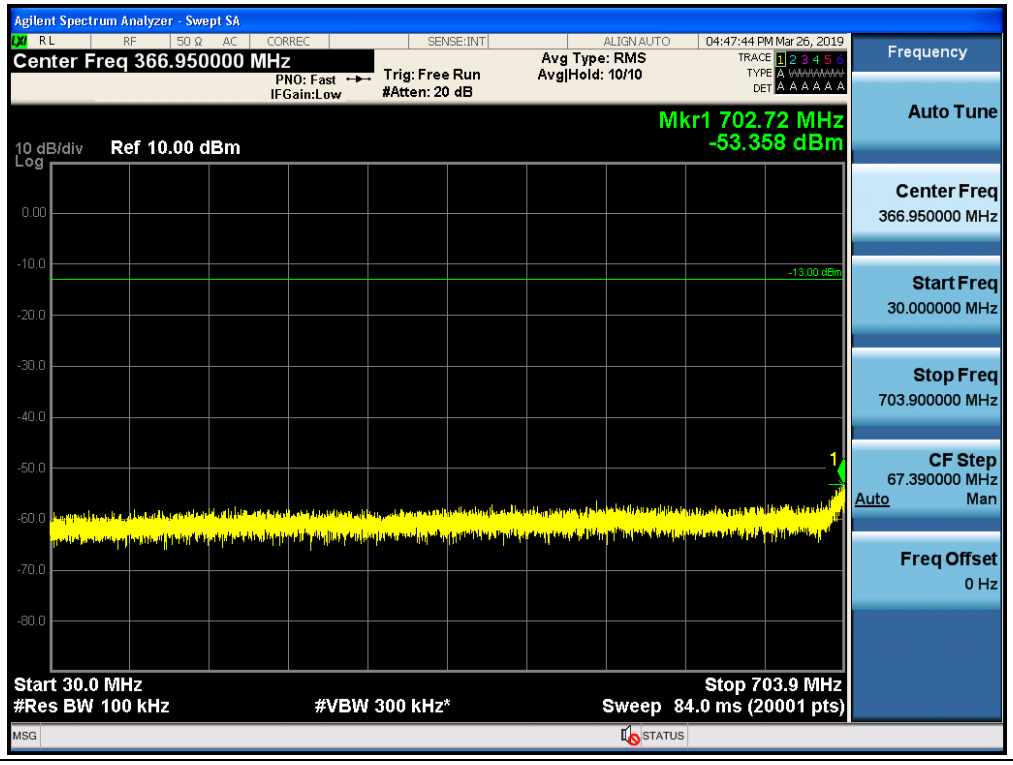
Band	Range (MHz)	Frequency (MHz)	Limit (dBm)	Spurious Emission (dBm)
Cellular	0.009 ~ 0.15	0.010 269	-13	-39.324
	0.15 ~ 30	0.155		-50.790
	30 ~ 868	836.32		-56.261
	895 ~ 1 000	995.68		-56.393
	1 000 ~ 10 000	9 515.80		-40.210
AWS-1	0.009 ~ 0.15	0.013 089		-28.375
	0.15 ~ 30	0.160		-40.310
	30 ~ 2 109	892.37		-37.751
	2 156 ~ 10 000	9 503.87		-39.444
	10 000 ~ 26 500	26 342.43		-36.958
Broadband PCS	0.009 ~ 0.15	0.011 538		-29.654
	0.15 ~ 30	0.150		-40.182
	30 ~ 1 929	892.62		-40.184
	1 996 ~ 10 000	9 486.94		-39.508
	10 000 ~ 26 500	26 476.49		-37.434

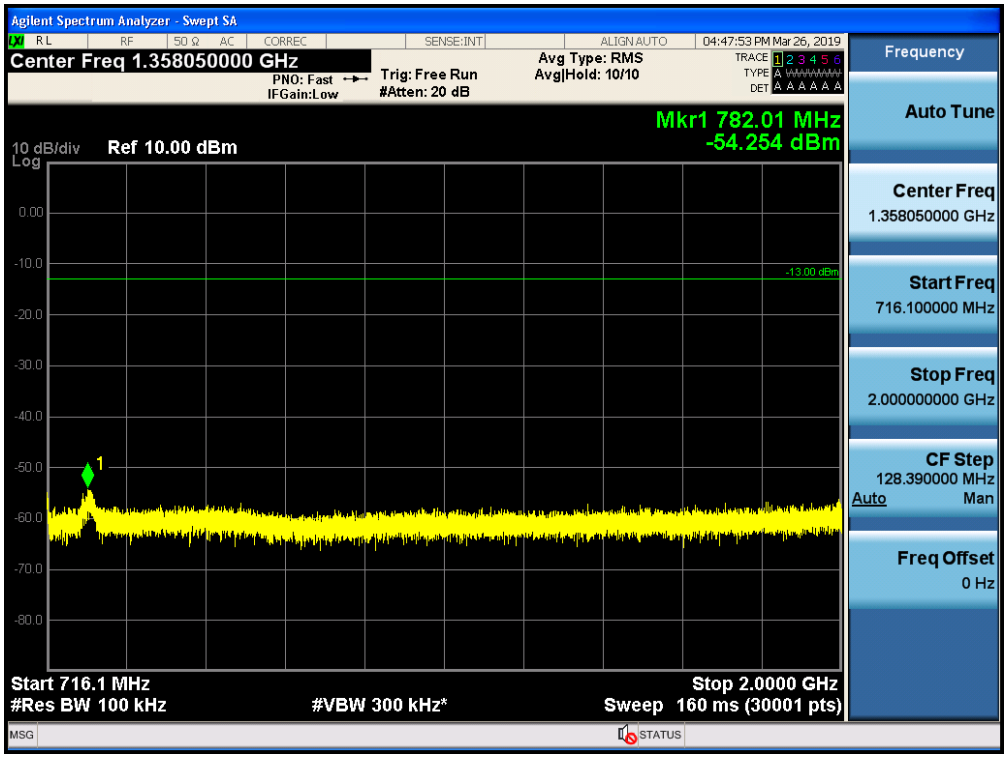
Plot data of Conducted Spurious Emissions

Conducted Spurious Emissions / Lower 700 MHz / Uplink / 9 kHz ~ 150 kHz

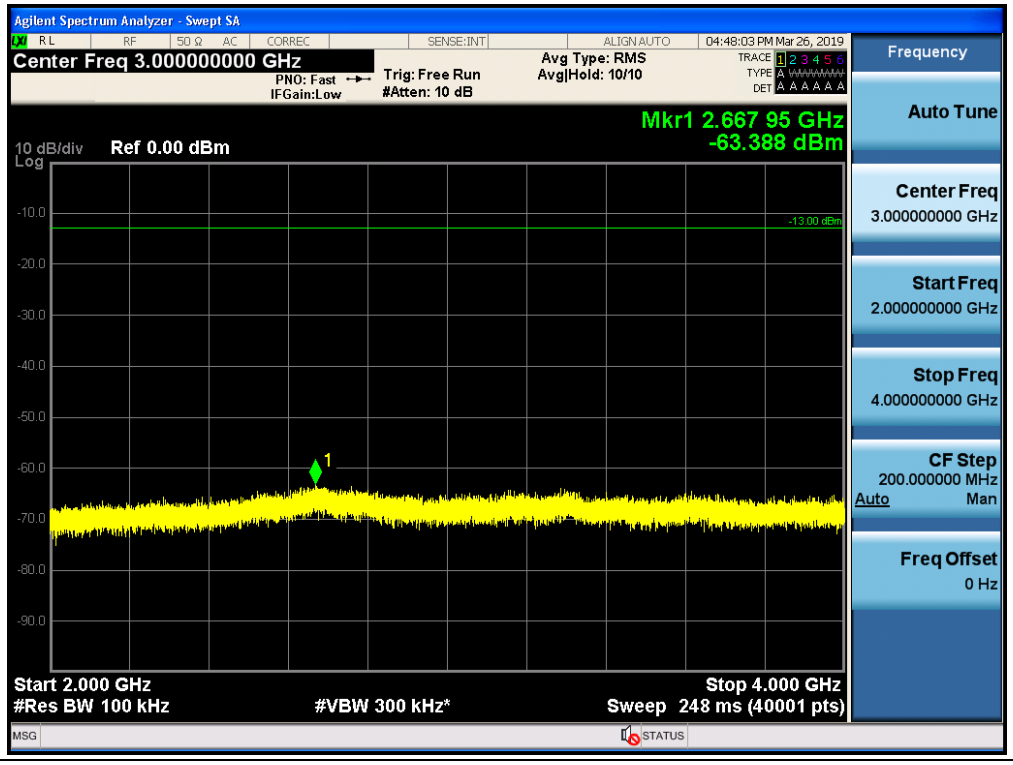
Conducted Spurious Emissions / Lower 700 MHz / Uplink / 150 kHz ~ 30 MHz



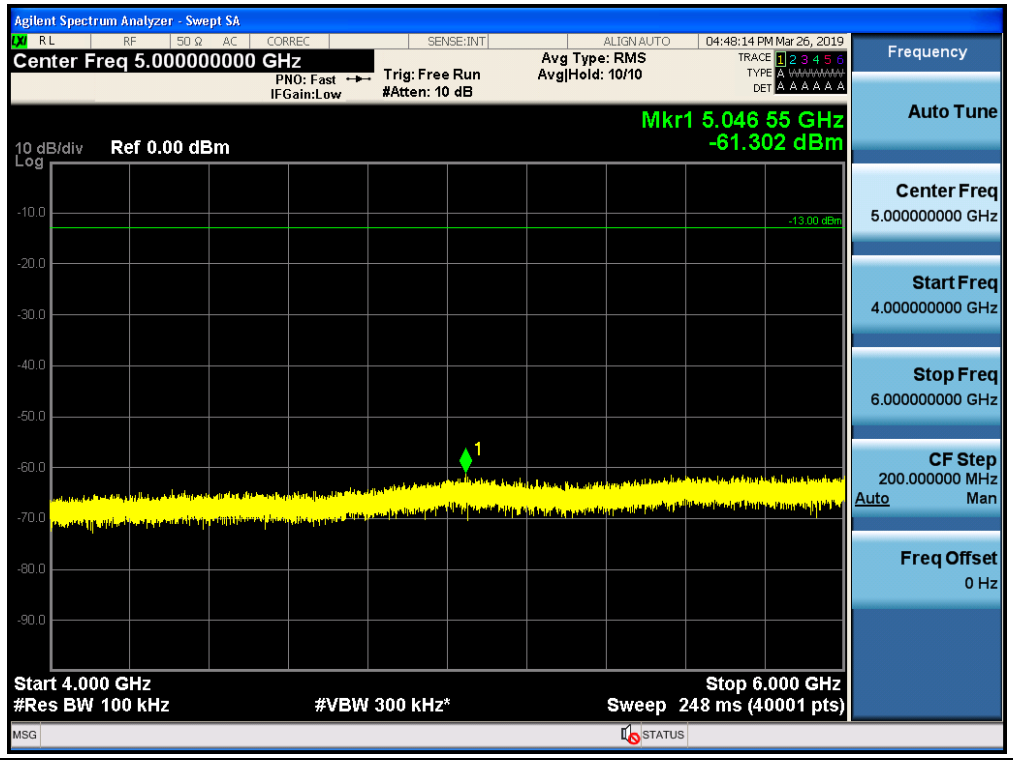
Conducted Spurious Emissions / Lower 700 MHz / Uplink / 30 MHz ~ 703.9 MHz


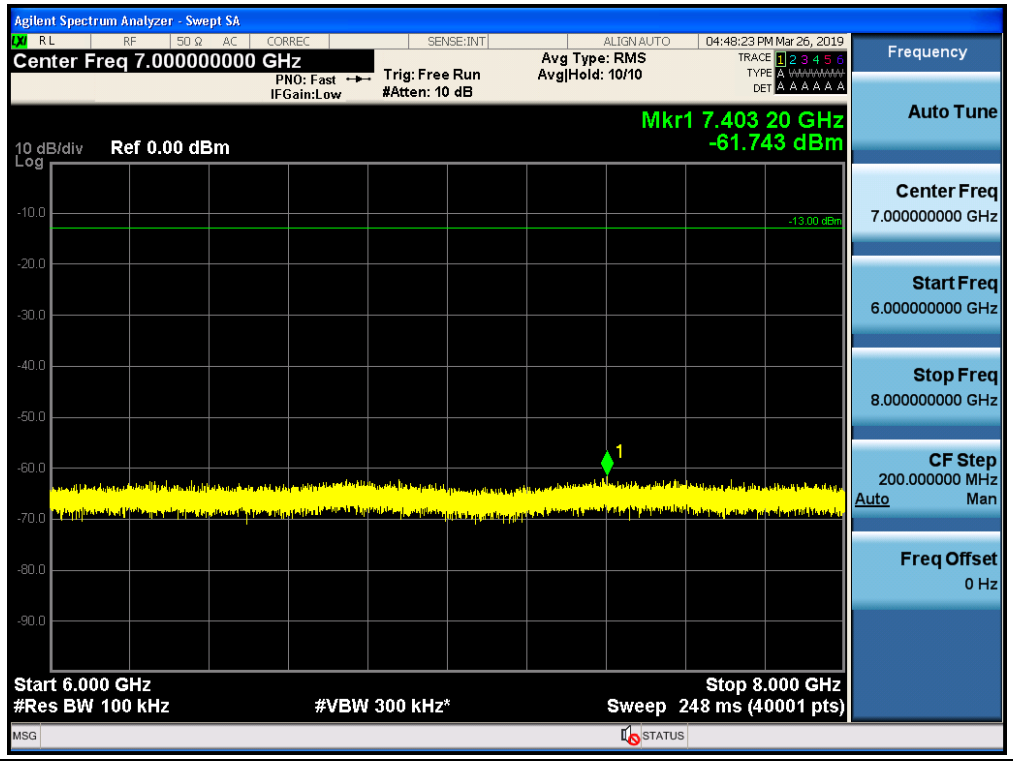
Conducted Spurious Emissions / Lower 700 MHz / Uplink / 716.1 MHz ~ 2 GHz


Conducted Spurious Emissions / Lower 700 MHz / Uplink / 2 GHz ~ 4 GHz

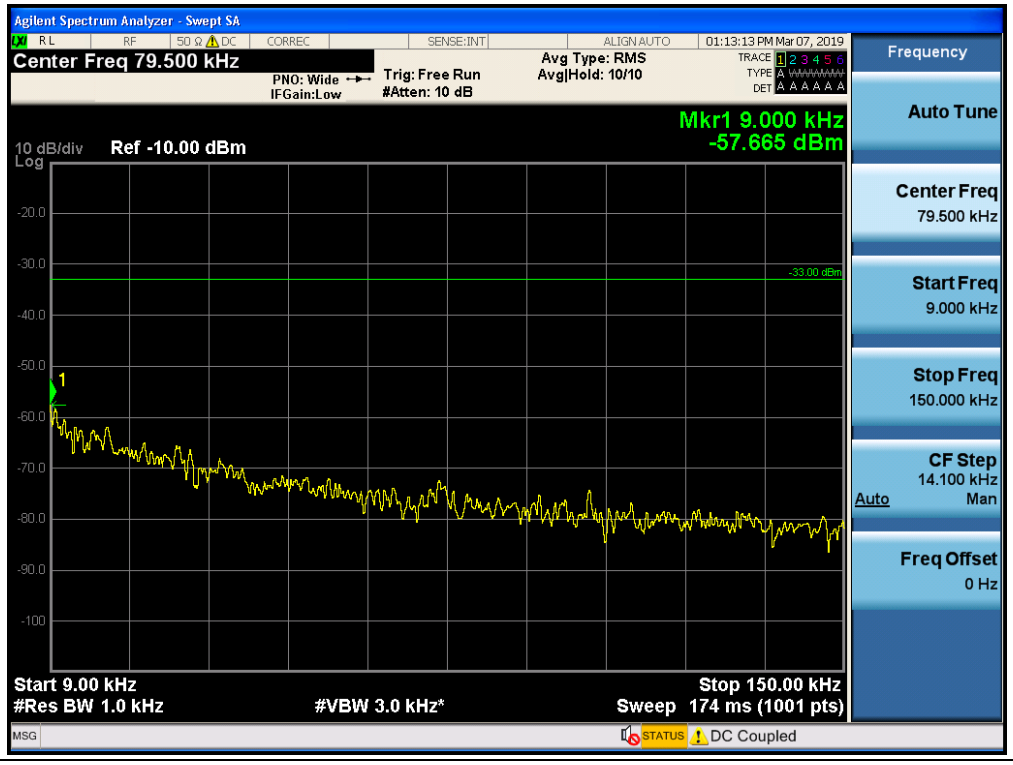


Conducted Spurious Emissions / Lower 700 MHz / Uplink / 4 GHz ~ 6 GHz

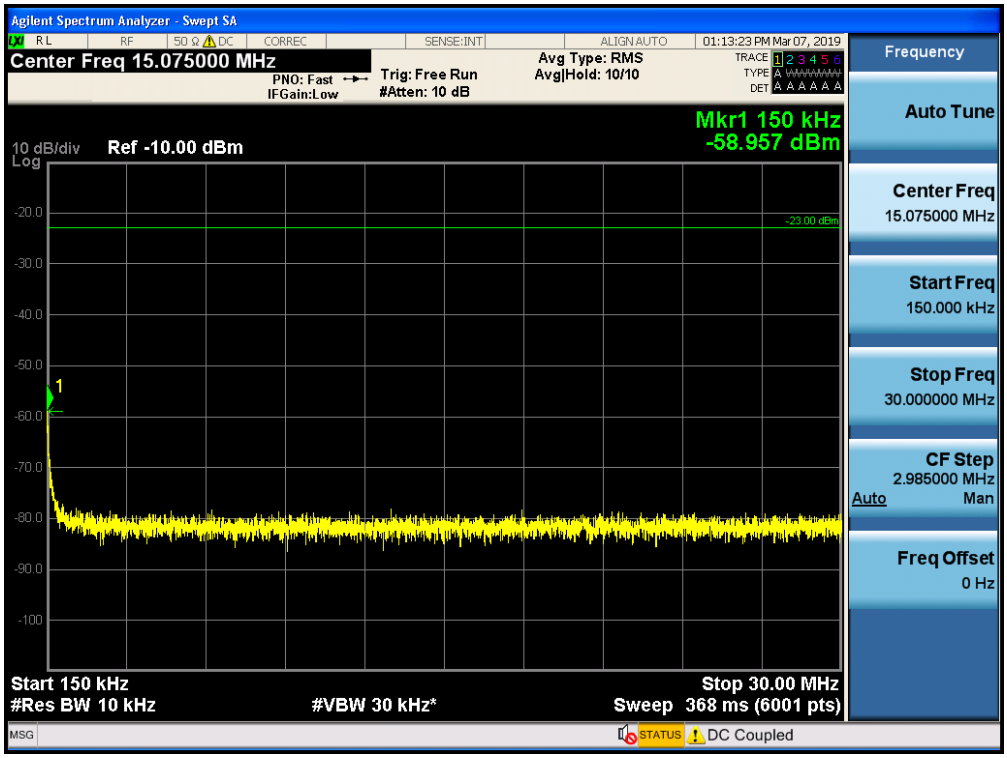


Conducted Spurious Emissions / Lower 700 MHz / Uplink / 6 GHz ~ 8 GHz


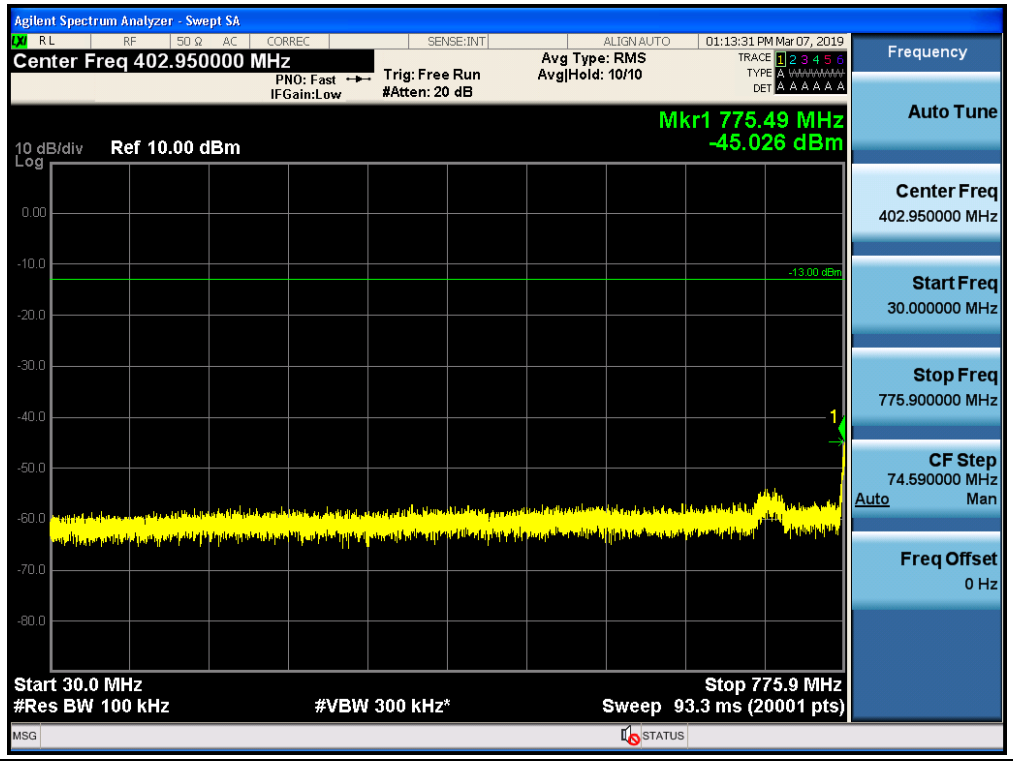
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 9 kHz ~ 150 kHz



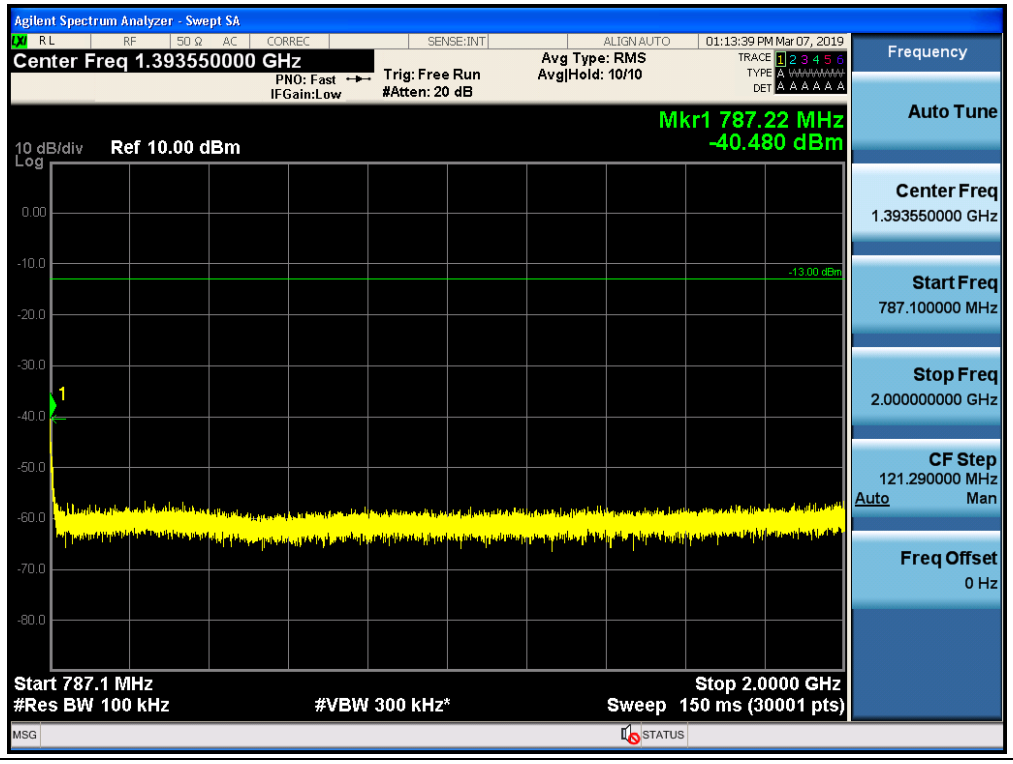
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 150 kHz ~ 30 MHz



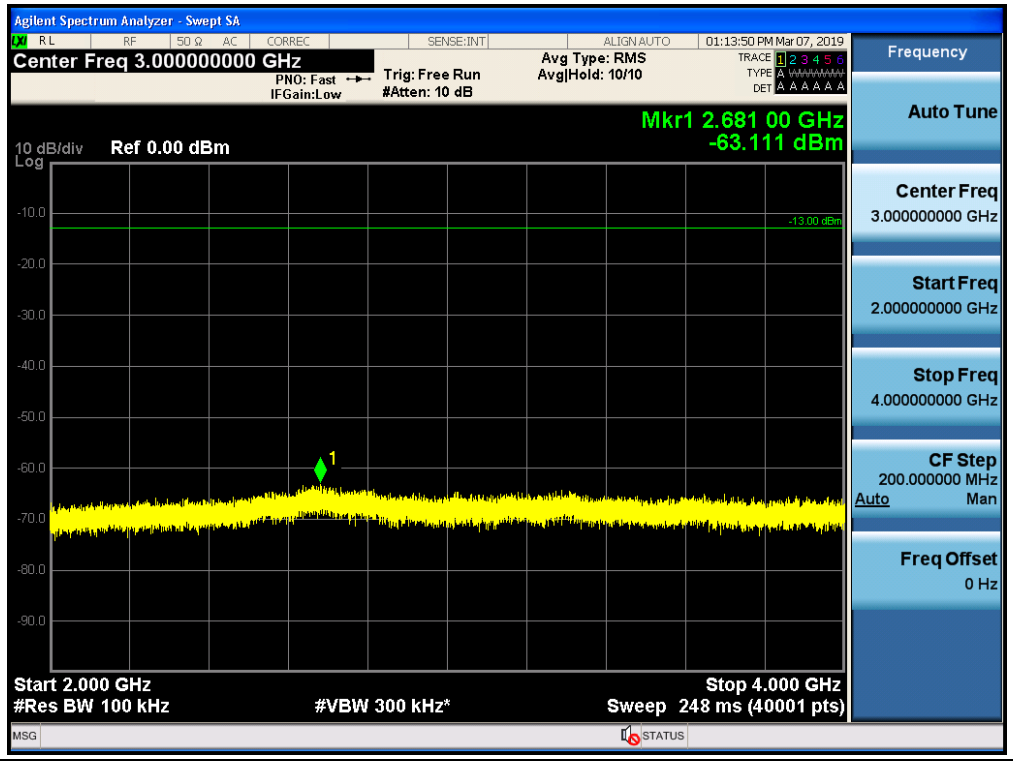
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 30 MHz ~ 775.9 MHz



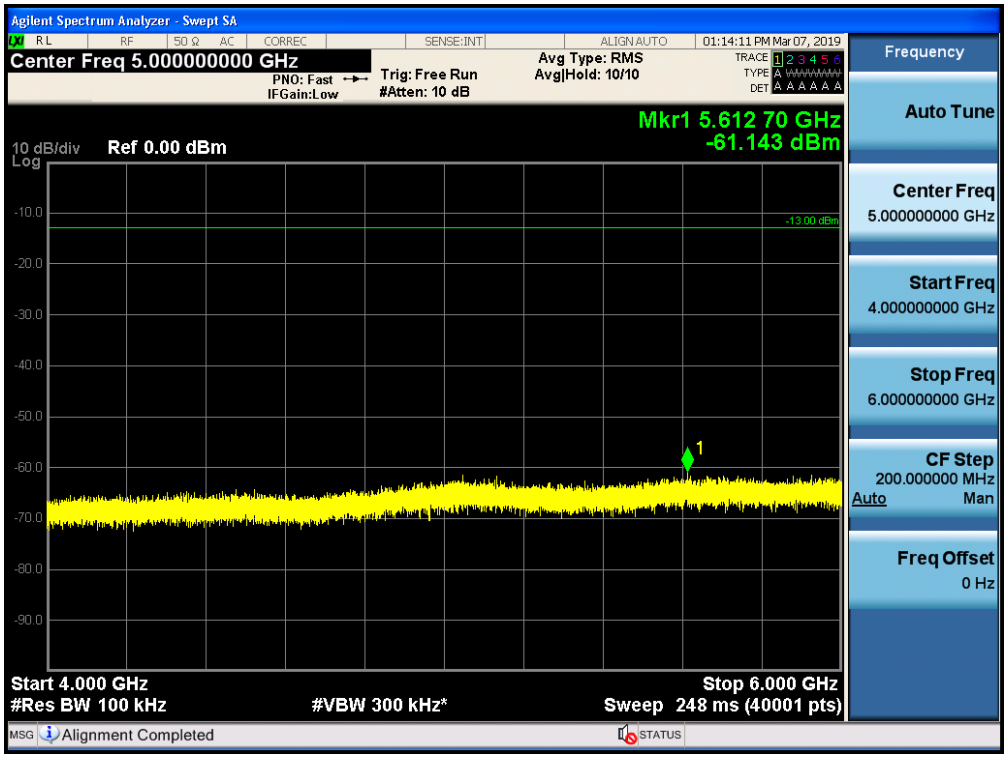
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 787.1 MHz ~ 2 GHz



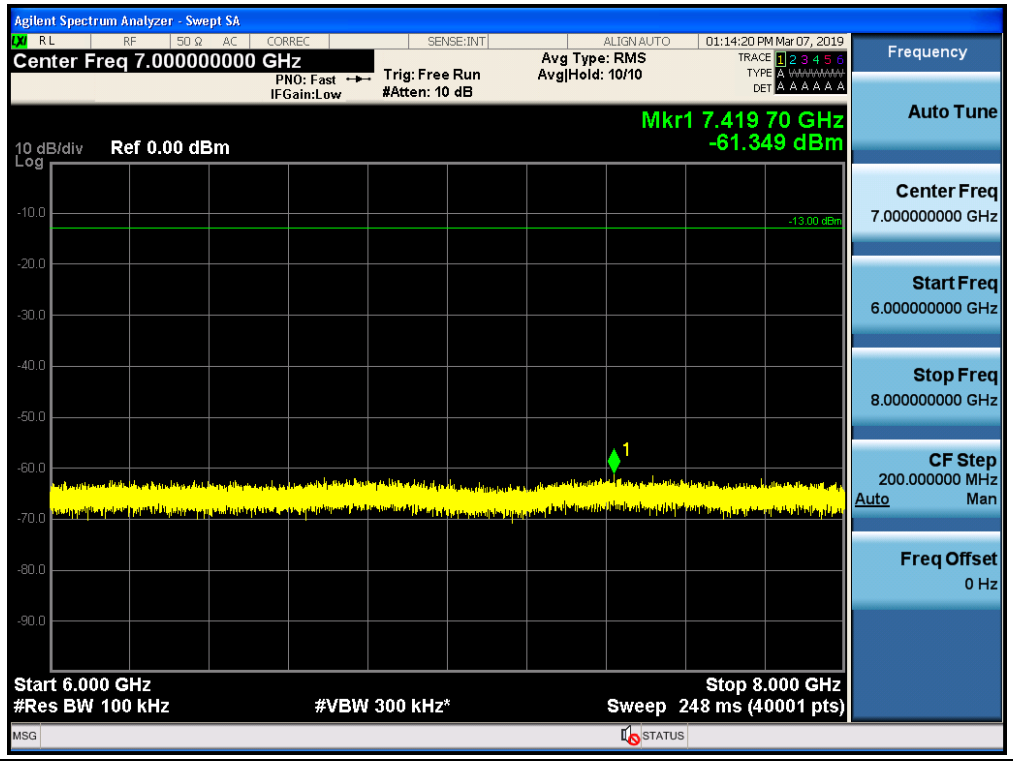
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 2 GHz ~ 4 GHz



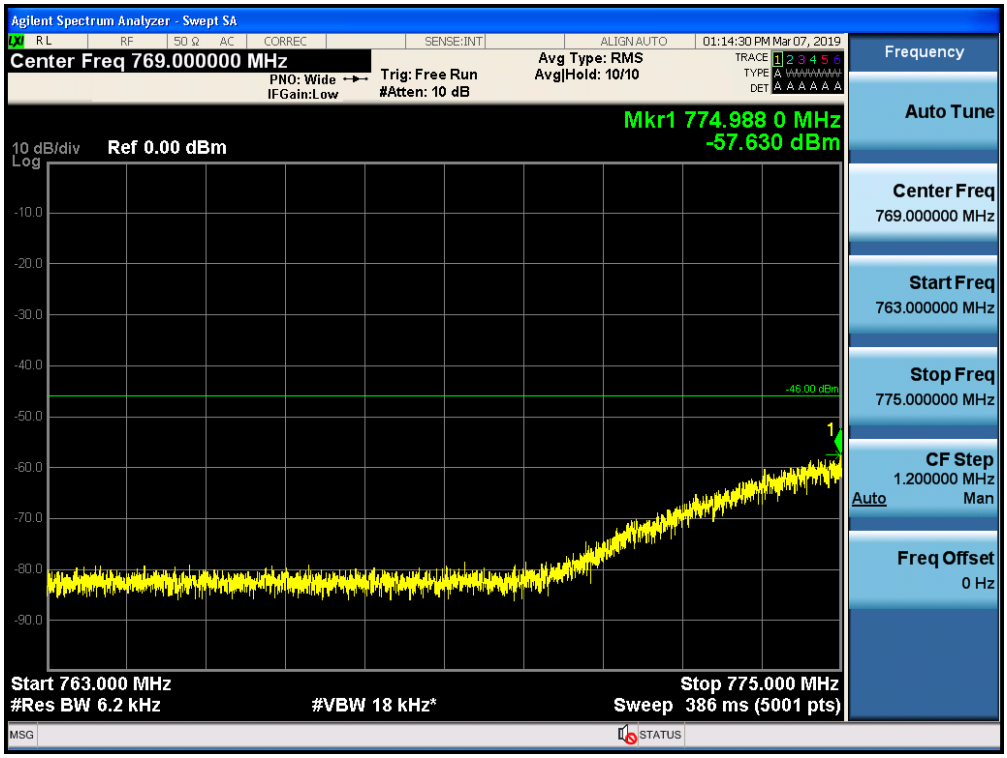
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 4 GHz ~ 6 GHz



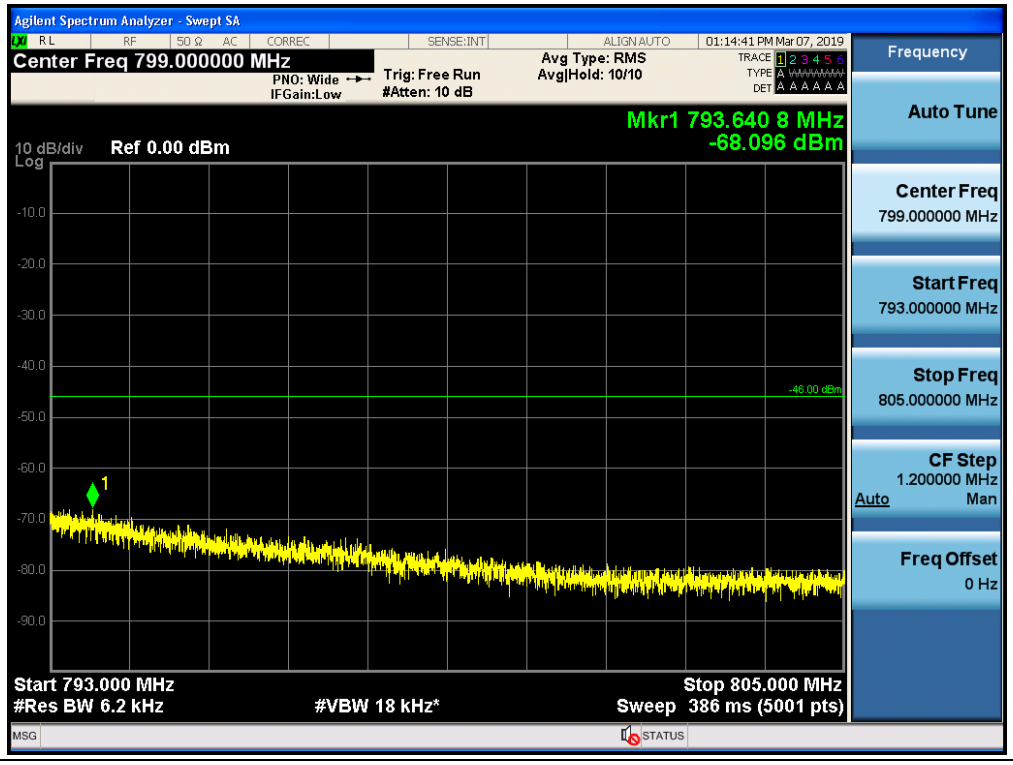
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 6 GHz ~ 8 GHz



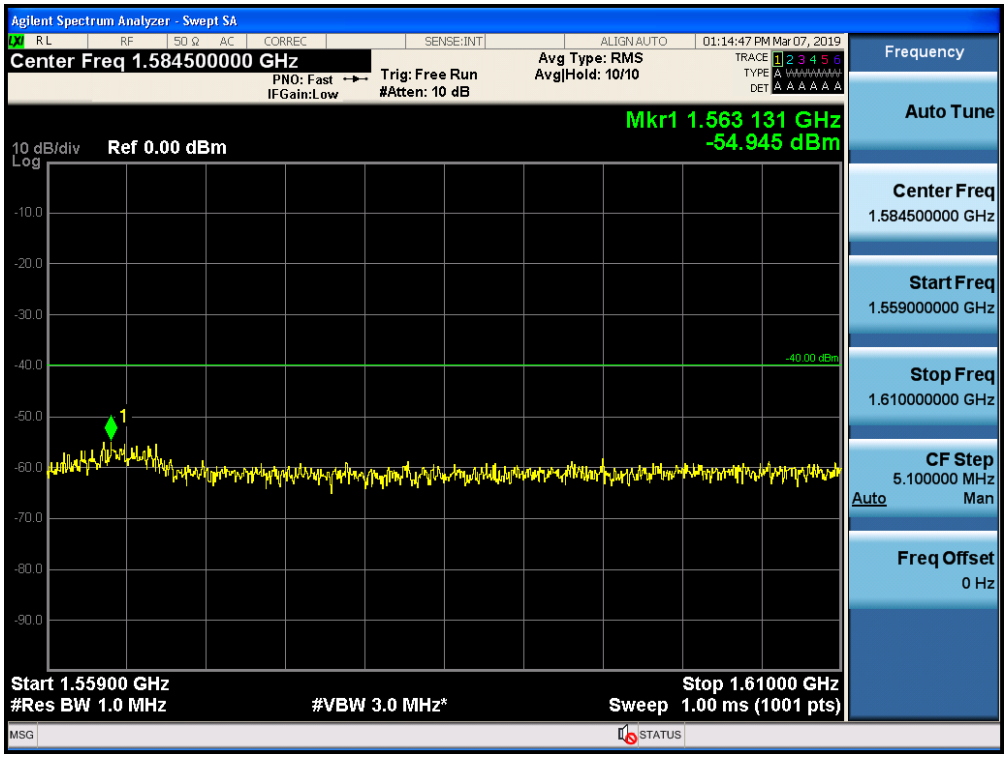
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 763 MHz ~ 775 MHz



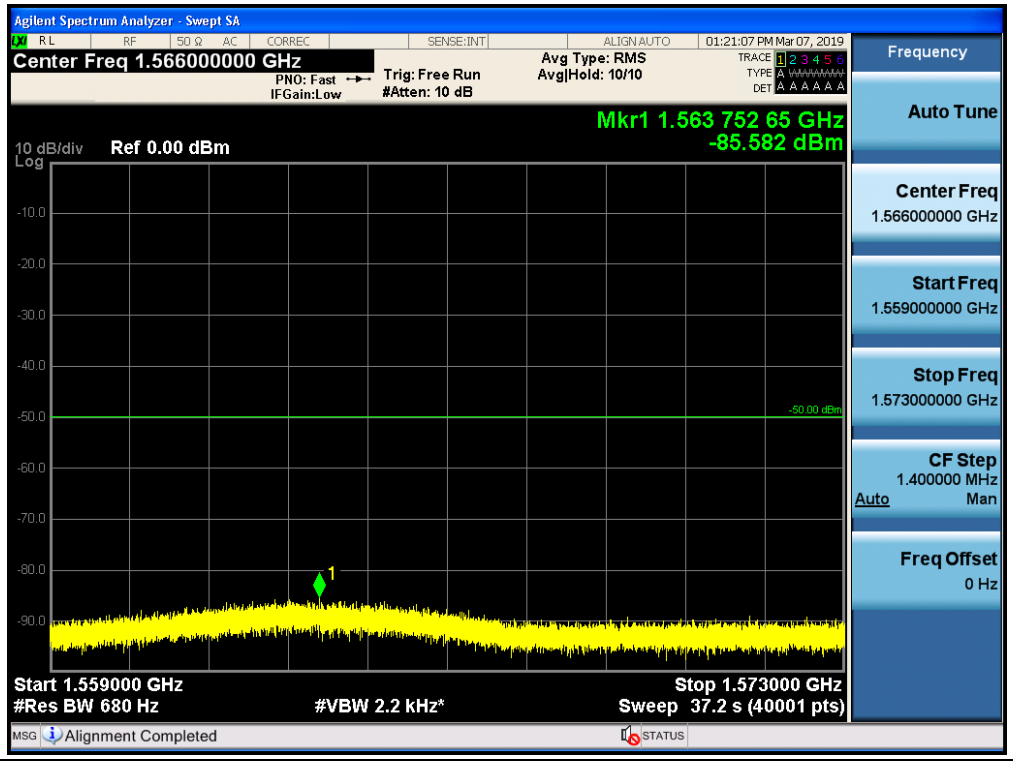
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 793 MHz ~ 805 MHz



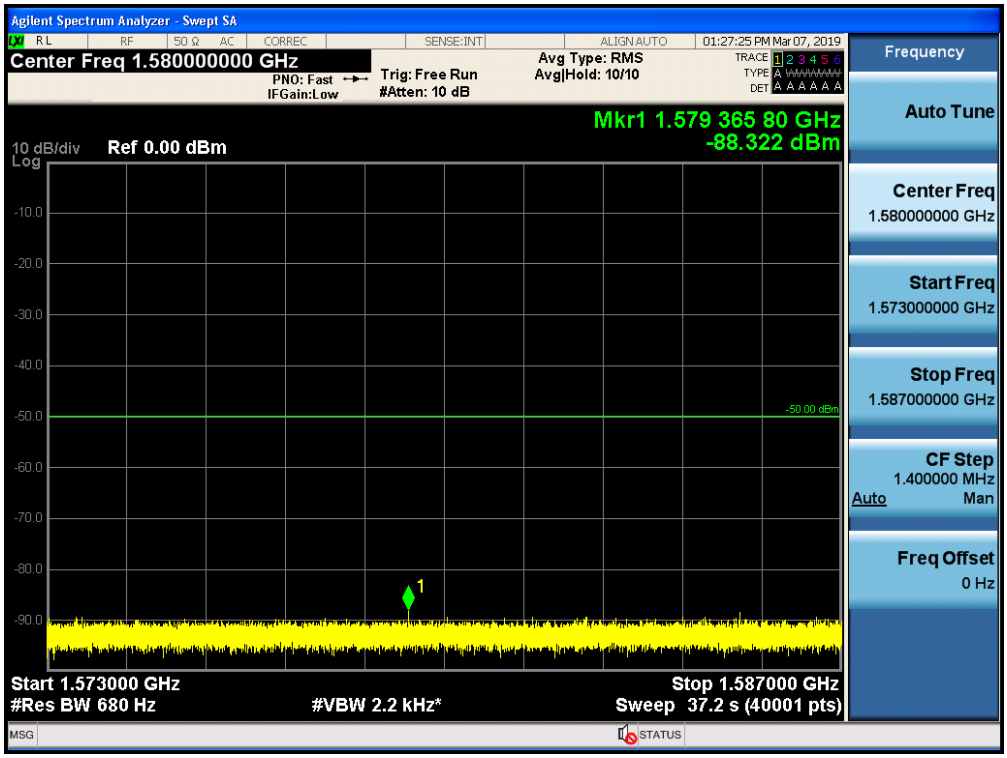
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 1.559 GHz ~ 1.610 GHz (1 MHz)



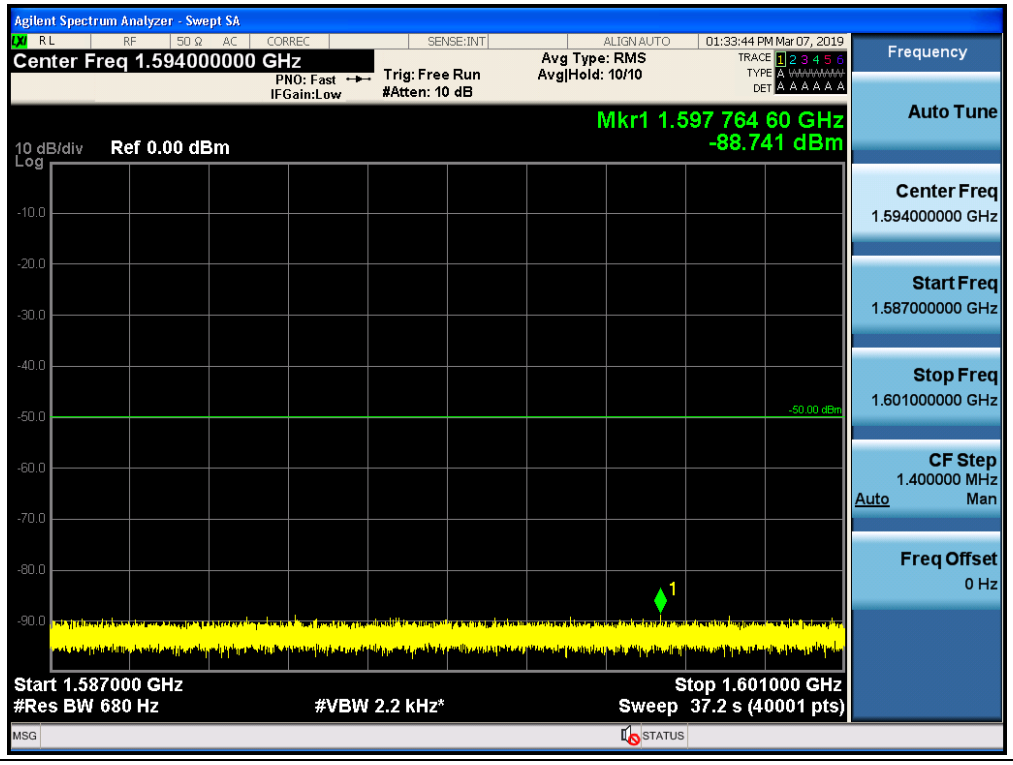
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 1.559 GHz ~ 1.573 GHz (700 Hz)



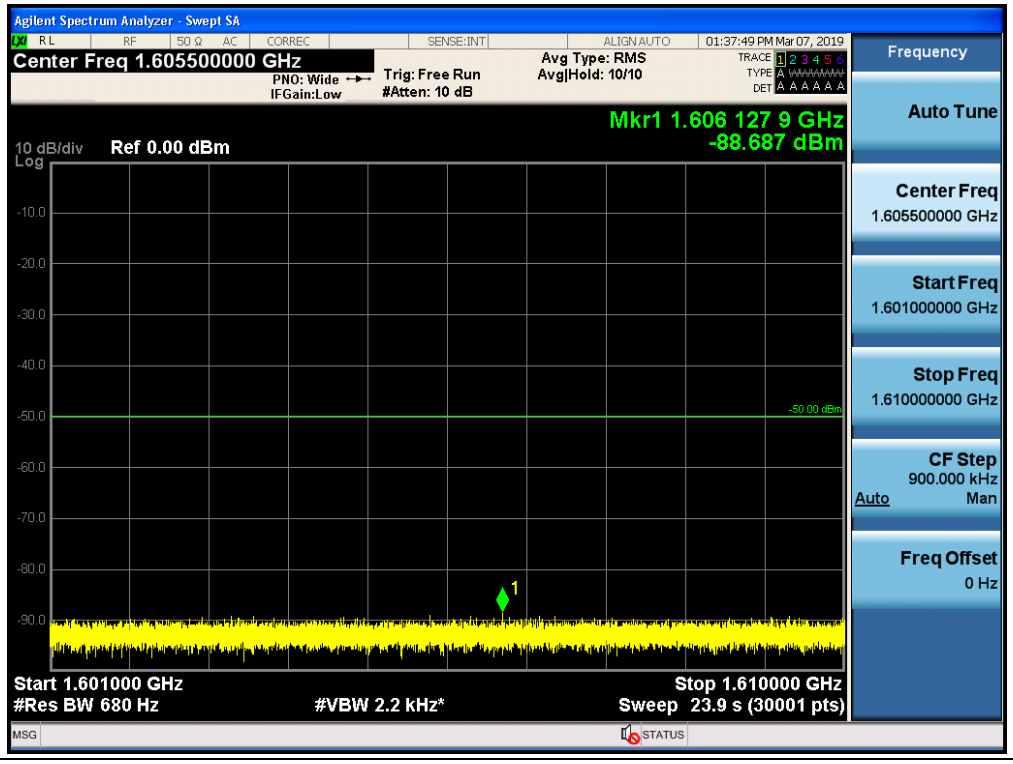
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 1.573 GHz ~ 1.587 GHz (700 Hz)



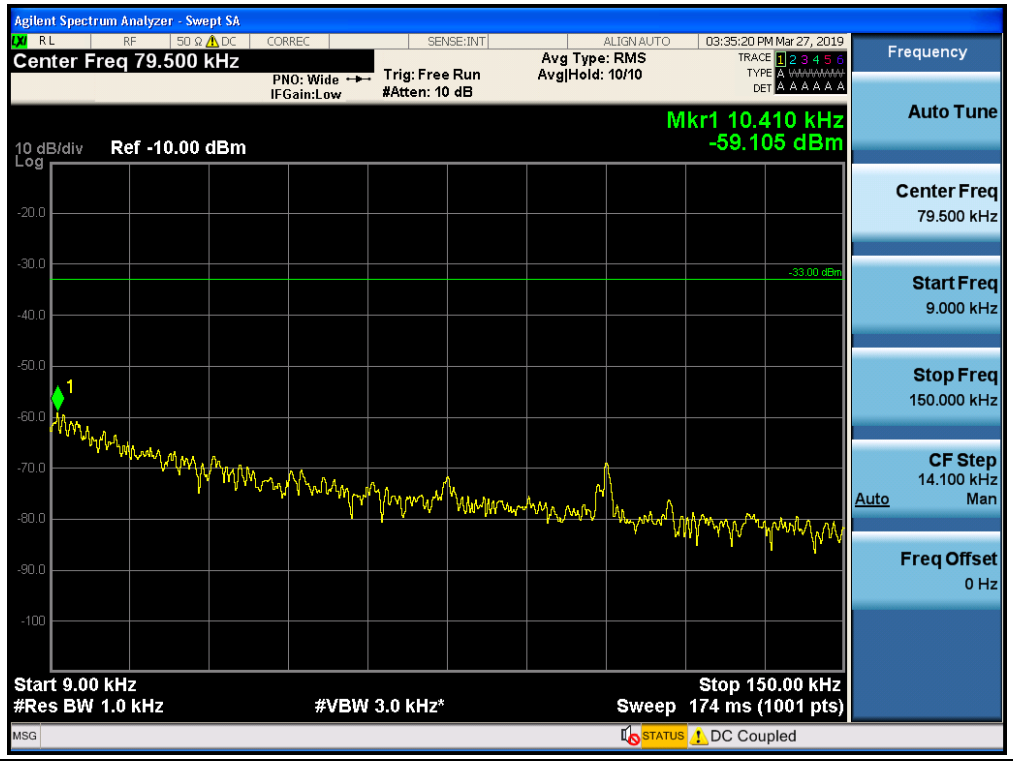
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 1.587 GHz ~ 1.601 GHz (700 Hz)



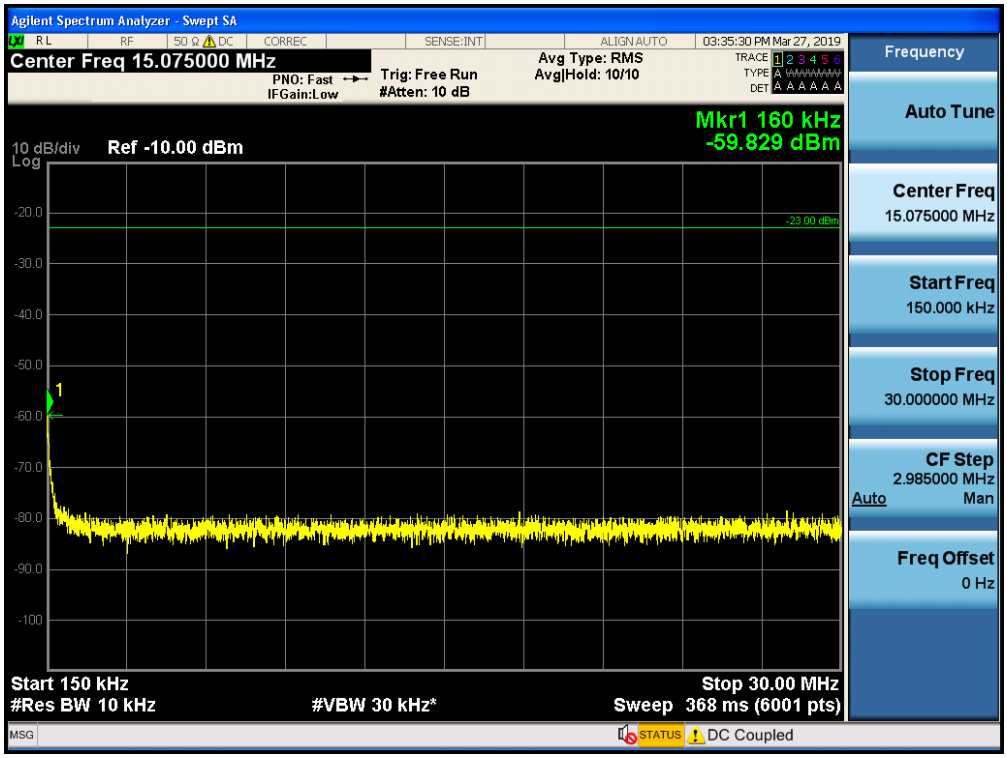
Conducted Spurious Emissions / Upper 700 MHz / Uplink / 1.601 GHz ~ 1.610 GHz (700 Hz)



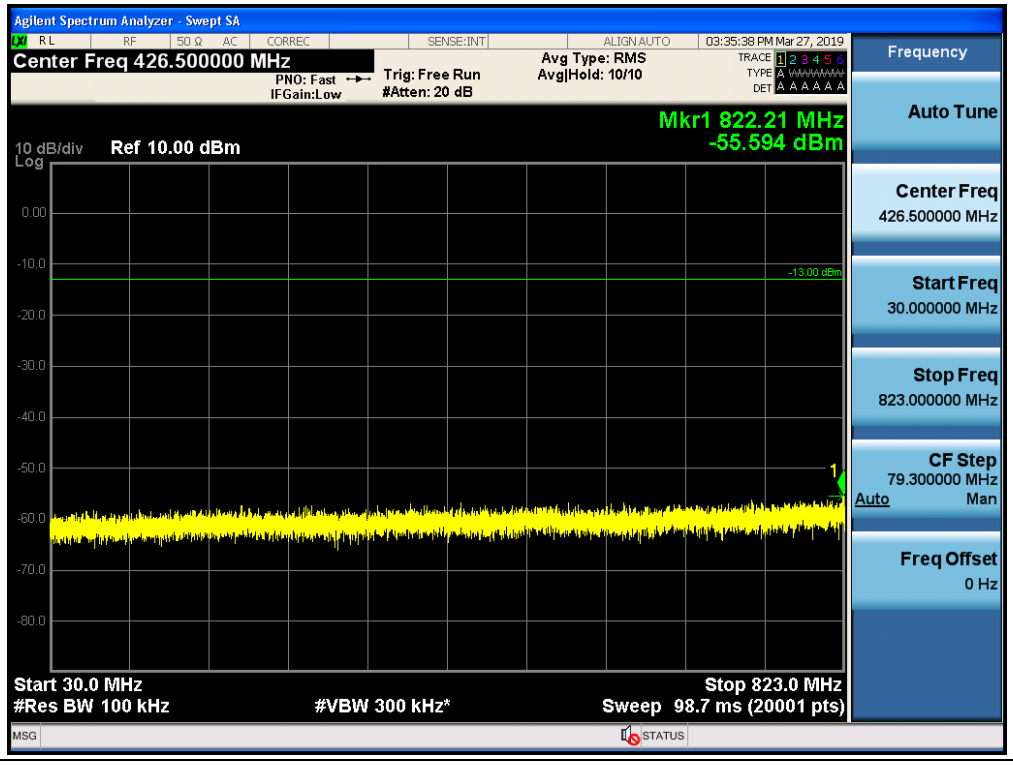
Conducted Spurious Emissions / Cellular / Uplink / 9 kHz ~ 150 kHz



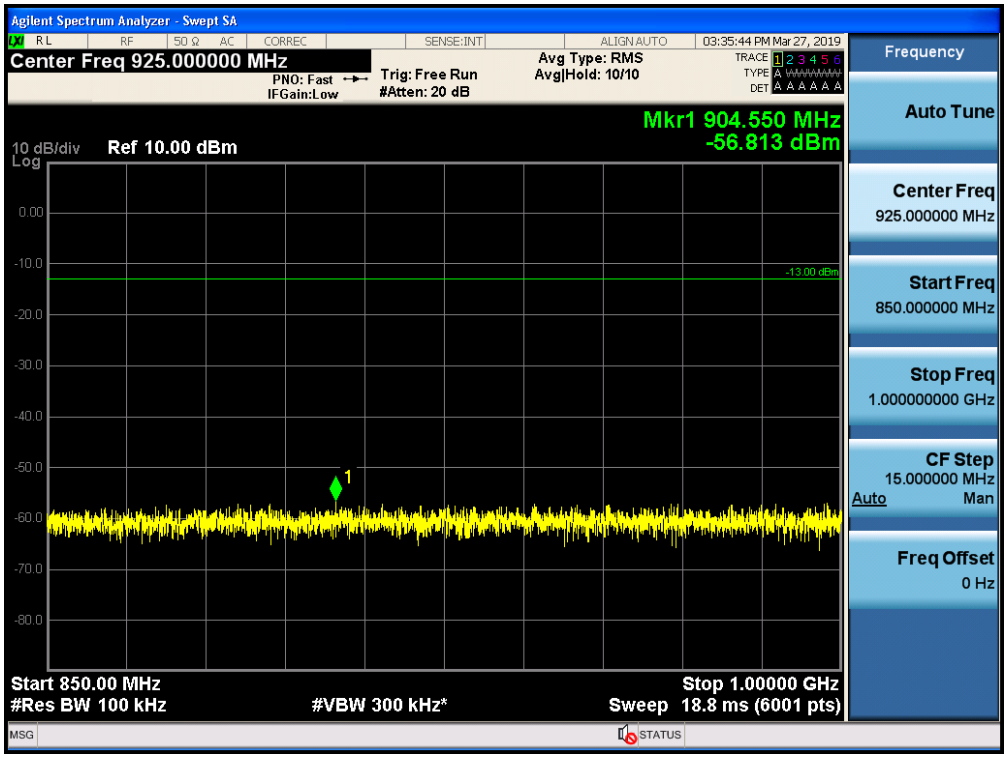
Conducted Spurious Emissions / Cellular / Uplink / 150 kHz ~ 30 MHz

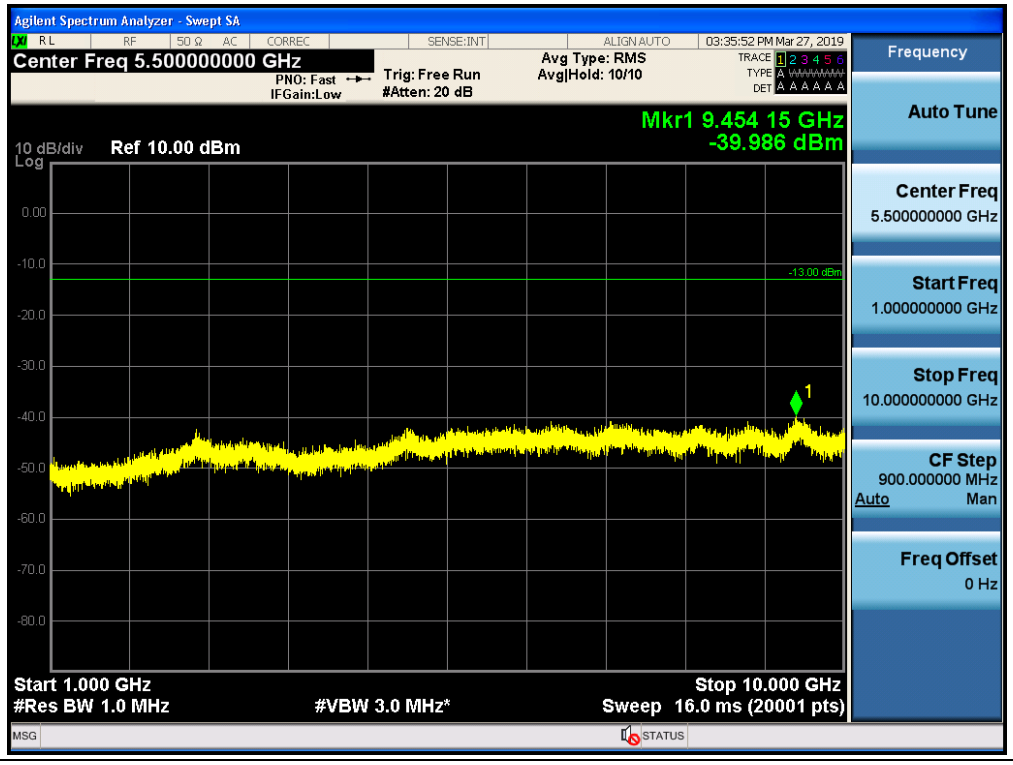


Conducted Spurious Emissions / Cellular / Uplink / 30 MHz ~ 823 MHz

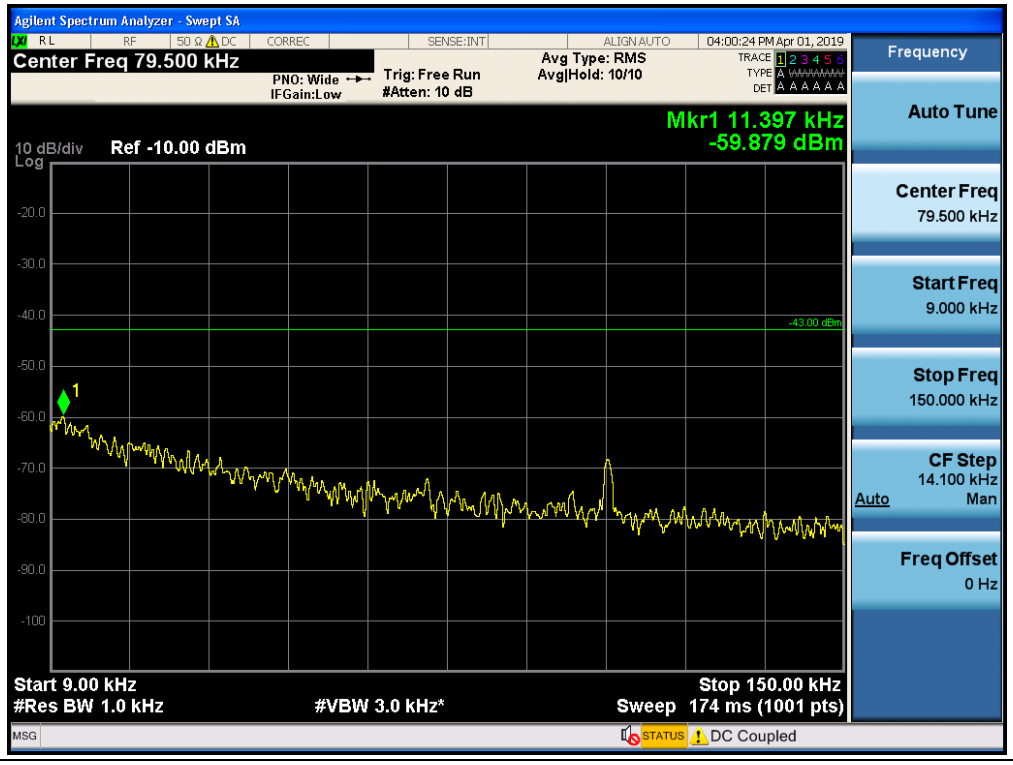


Conducted Spurious Emissions / Cellular / Uplink / 850 MHz ~ 1 GHz

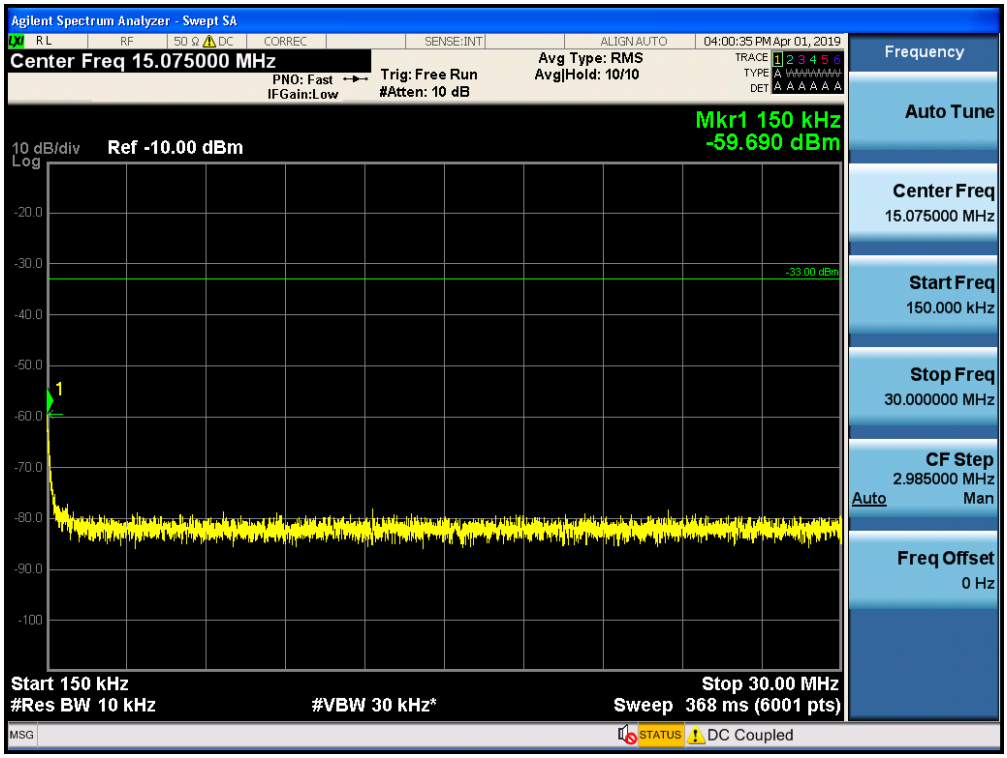


Conducted Spurious Emissions / Cellular / Uplink / 1 GHz ~ 10 GHz


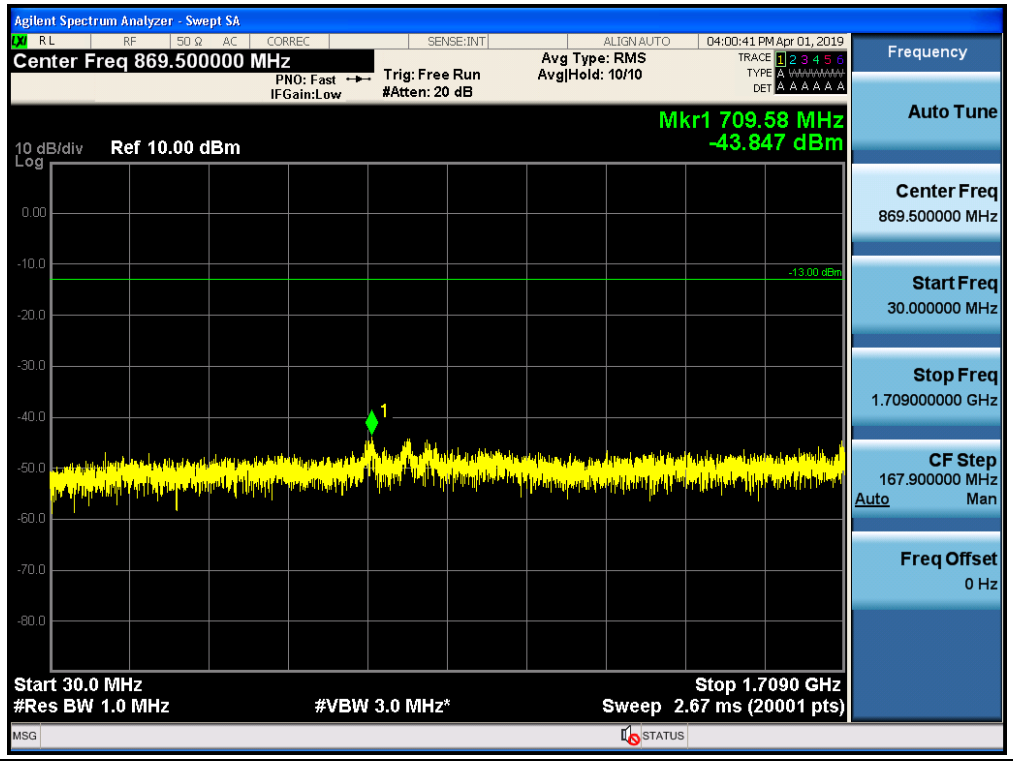
Conducted Spurious Emissions / AWS-1 / Uplink / 9 kHz ~ 150 kHz



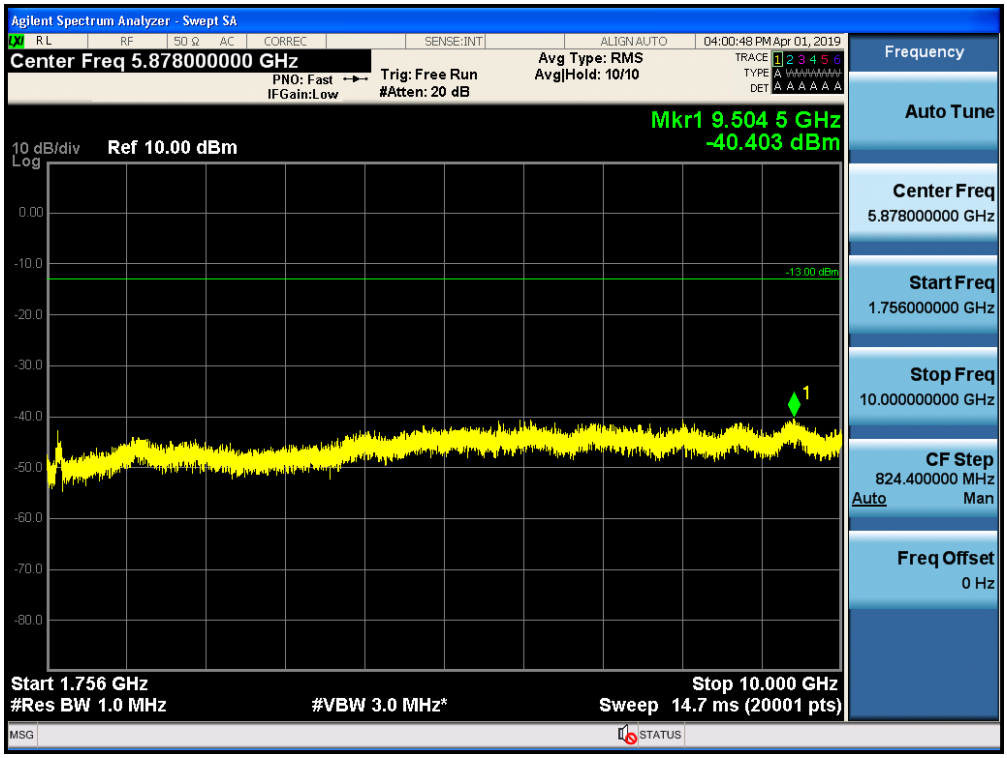
Conducted Spurious Emissions / AWS-1 / Uplink / 150 kHz ~ 30 MHz

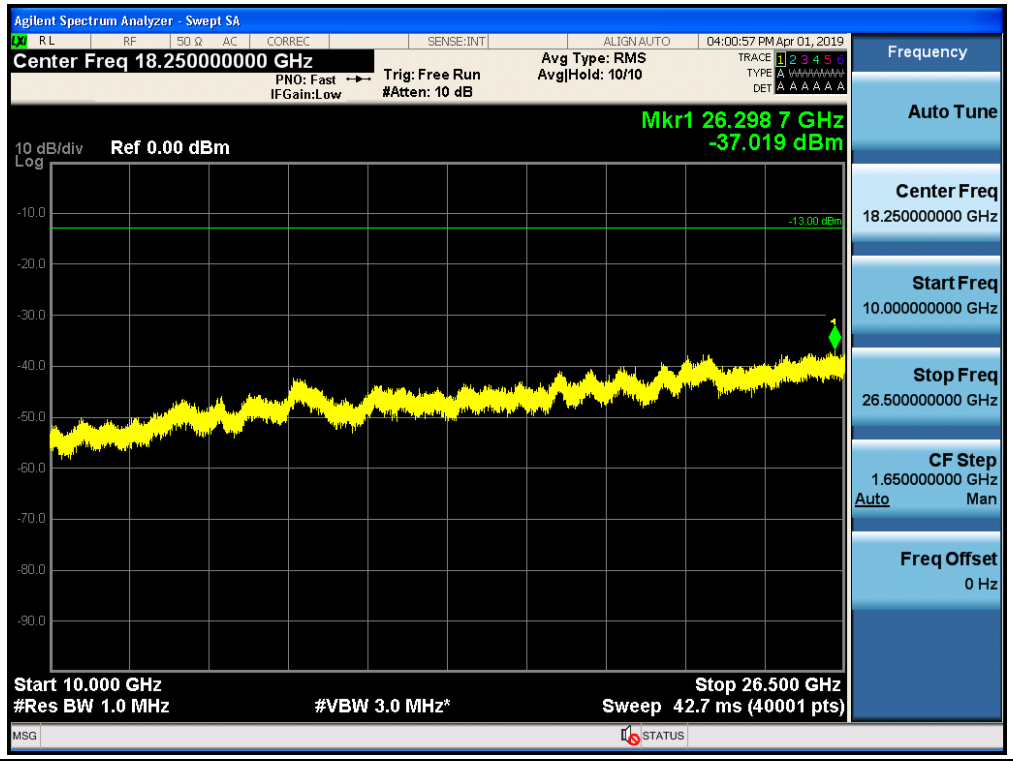


Conducted Spurious Emissions / AWS-1 / Uplink / 30 MHz ~ 1.709 GHz

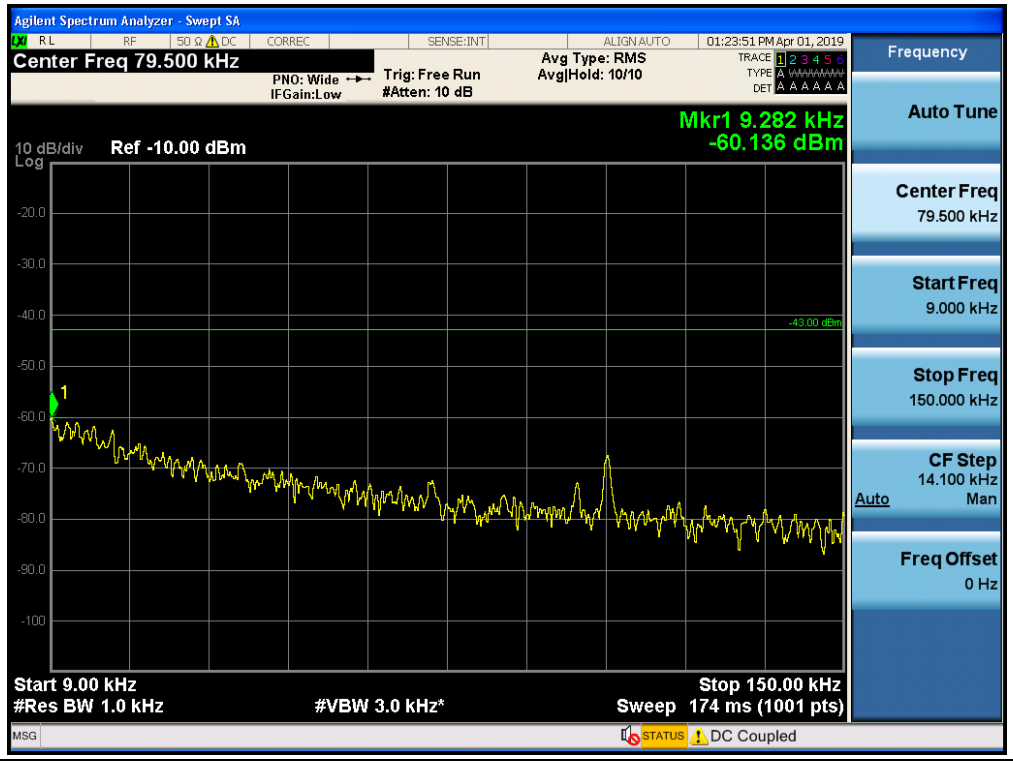


Conducted Spurious Emissions / AWS-1 / Uplink / 1.756 GHz ~ 10 GHz

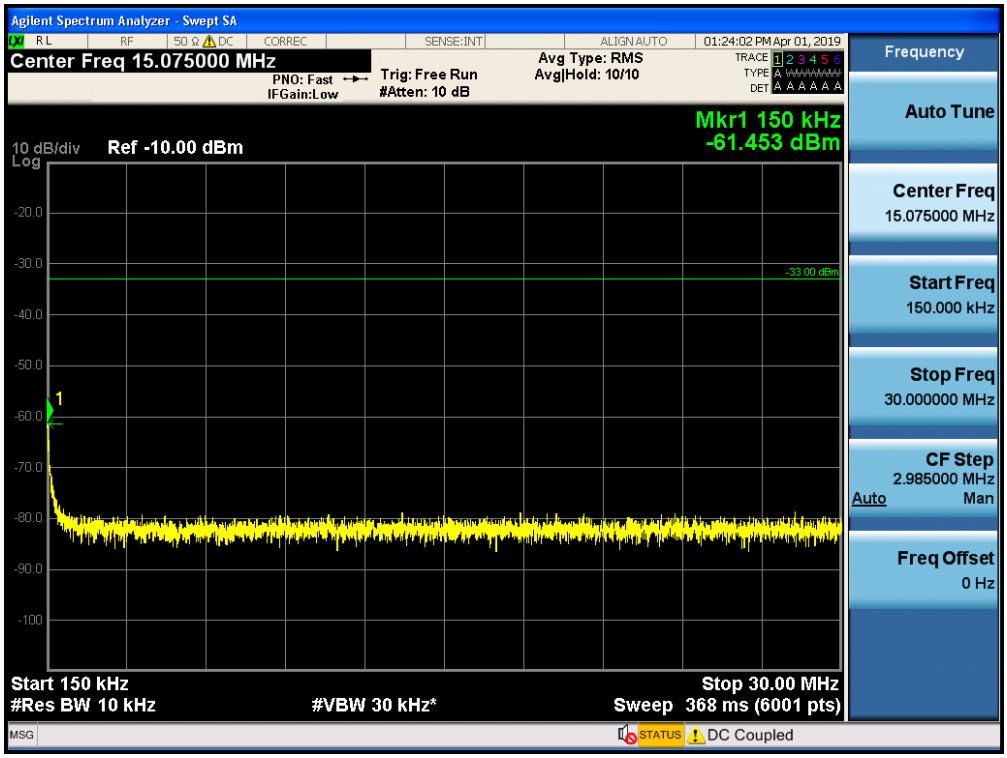


Conducted Spurious Emissions / AWS-1 / Uplink / 10 GHz ~ 26.5 GHz


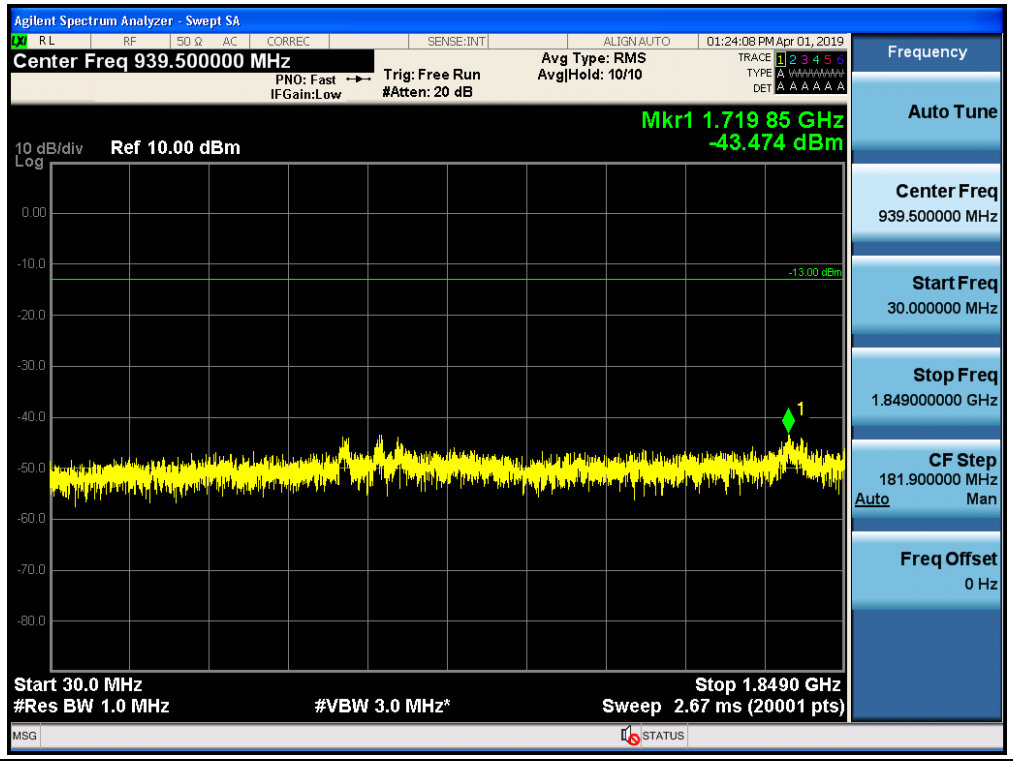
Conducted Spurious Emissions / Broadband PCS / Uplink / 9 kHz ~ 150 kHz



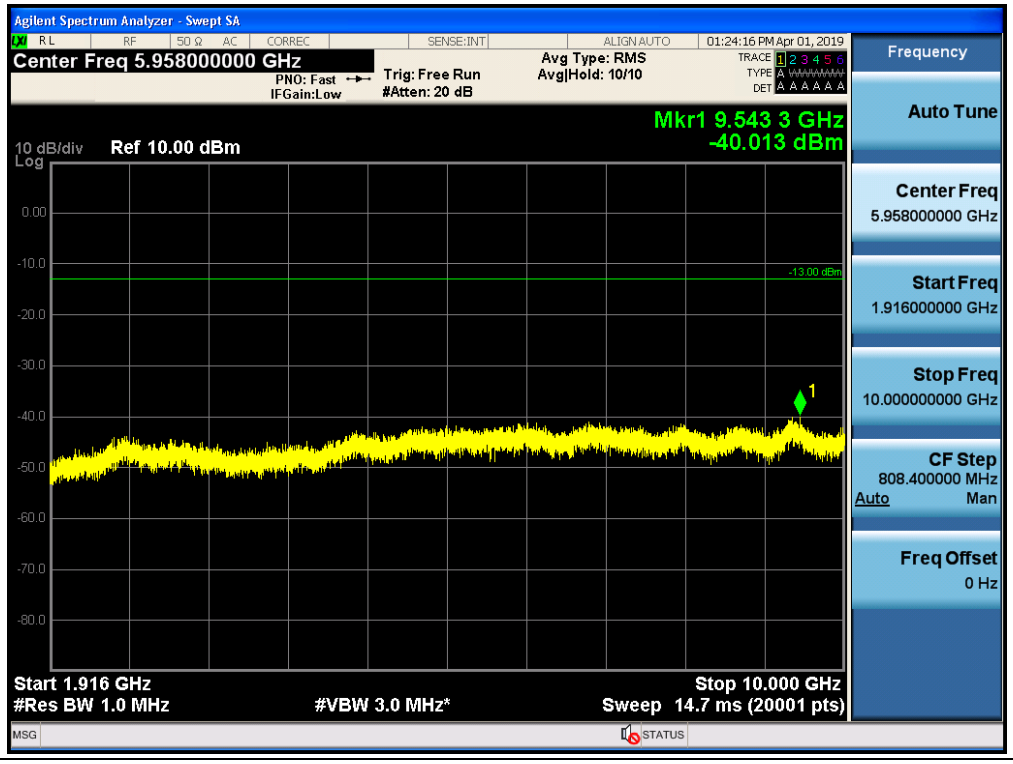
Conducted Spurious Emissions / Broadband PCS / Uplink / 150 kHz ~ 30 MHz

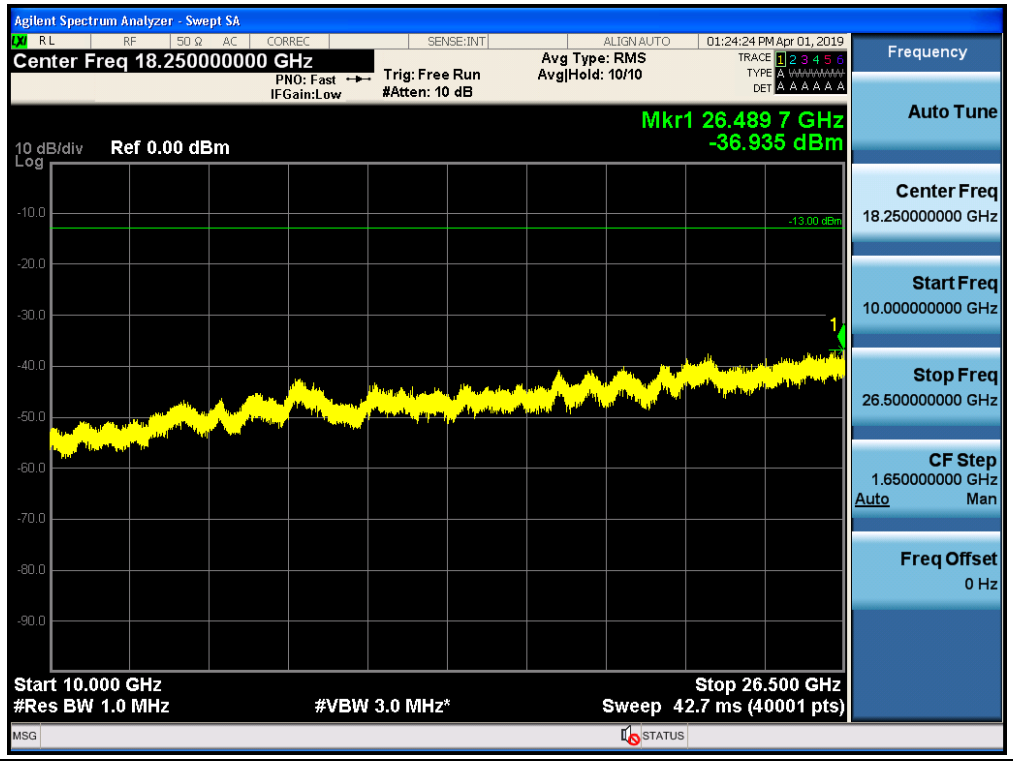


Conducted Spurious Emissions / Broadband PCS / Uplink / 30 MHz ~ 1.849 GHz

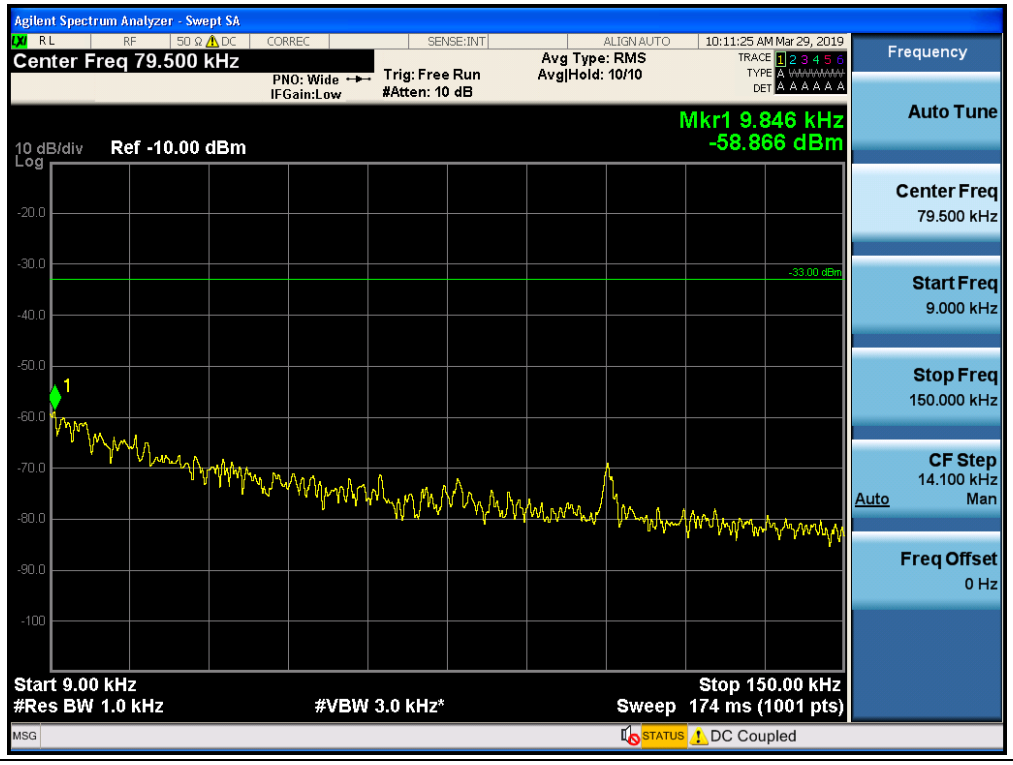


Conducted Spurious Emissions / Broadband PCS / Uplink / 1.916 GHz ~ 10 GHz

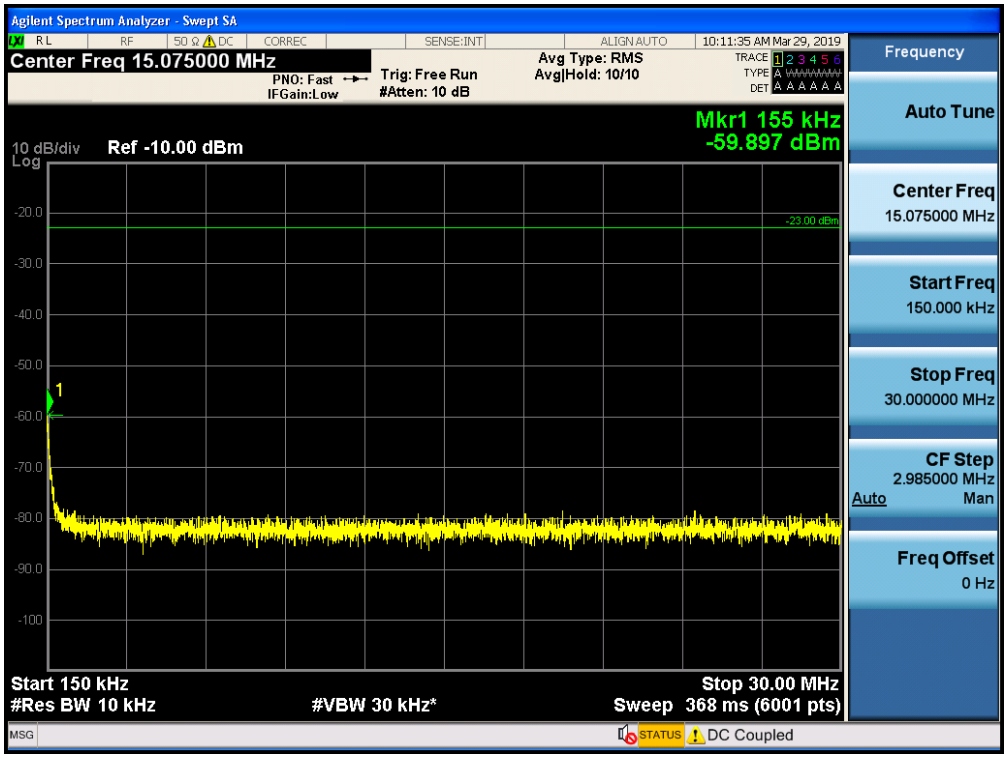


Conducted Spurious Emissions / Broadband PCS / Uplink / 10 GHz ~ 26.5 GHz


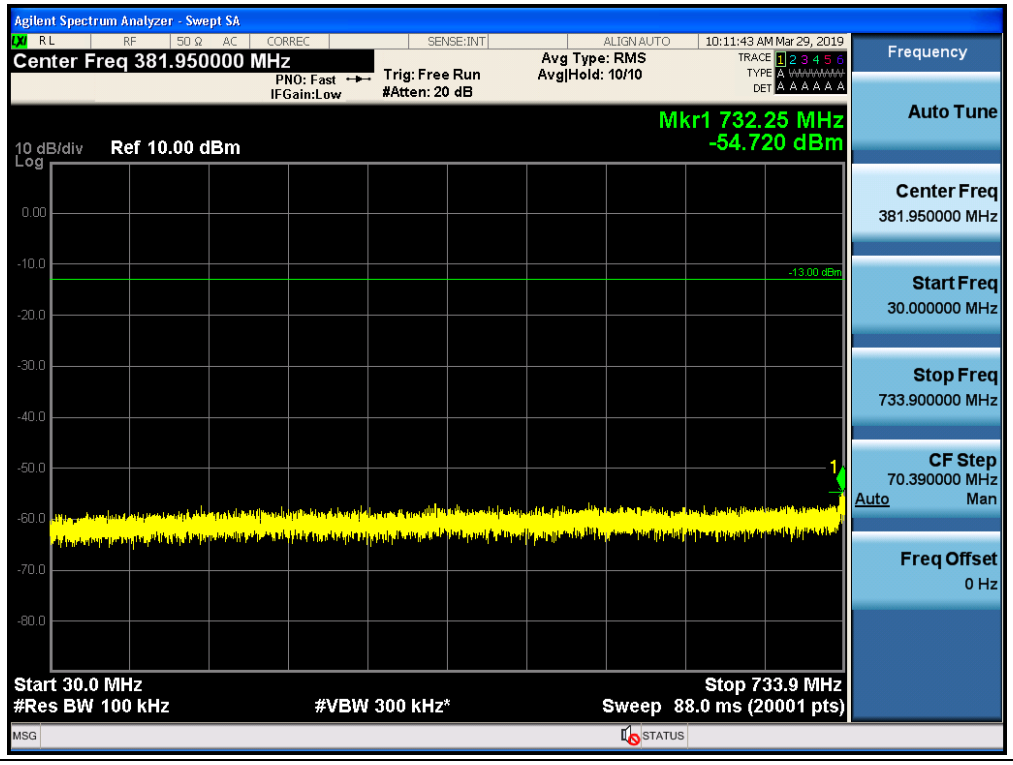
Conducted Spurious Emissions / Lower 700 MHz / Downlink / 9 kHz ~ 150 kHz



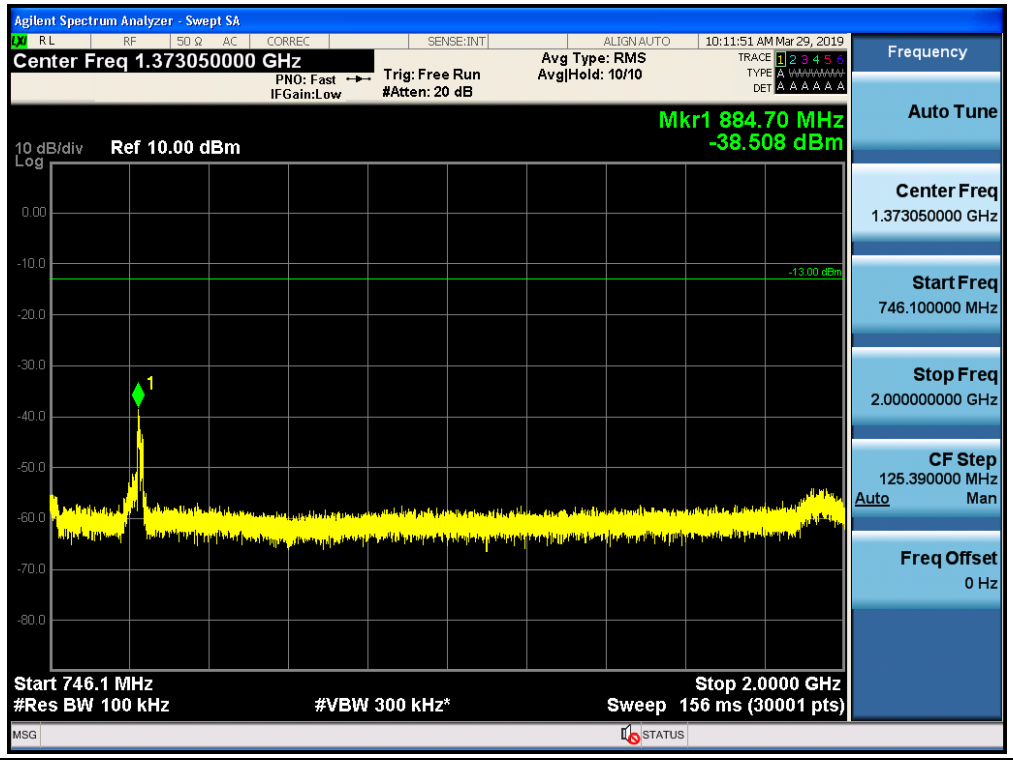
Conducted Spurious Emissions / Lower 700 MHz / Downlink / 150 kHz ~ 30 MHz



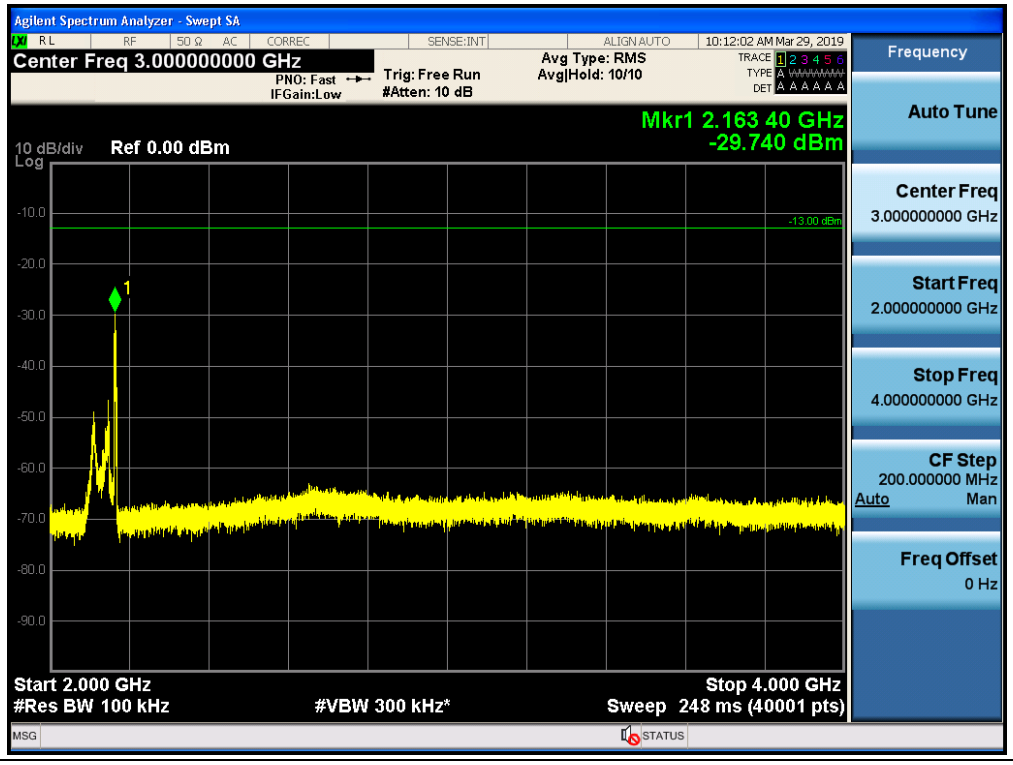
Conducted Spurious Emissions / Lower 700 MHz / Downlink / 30 MHz ~ 733.9 MHz



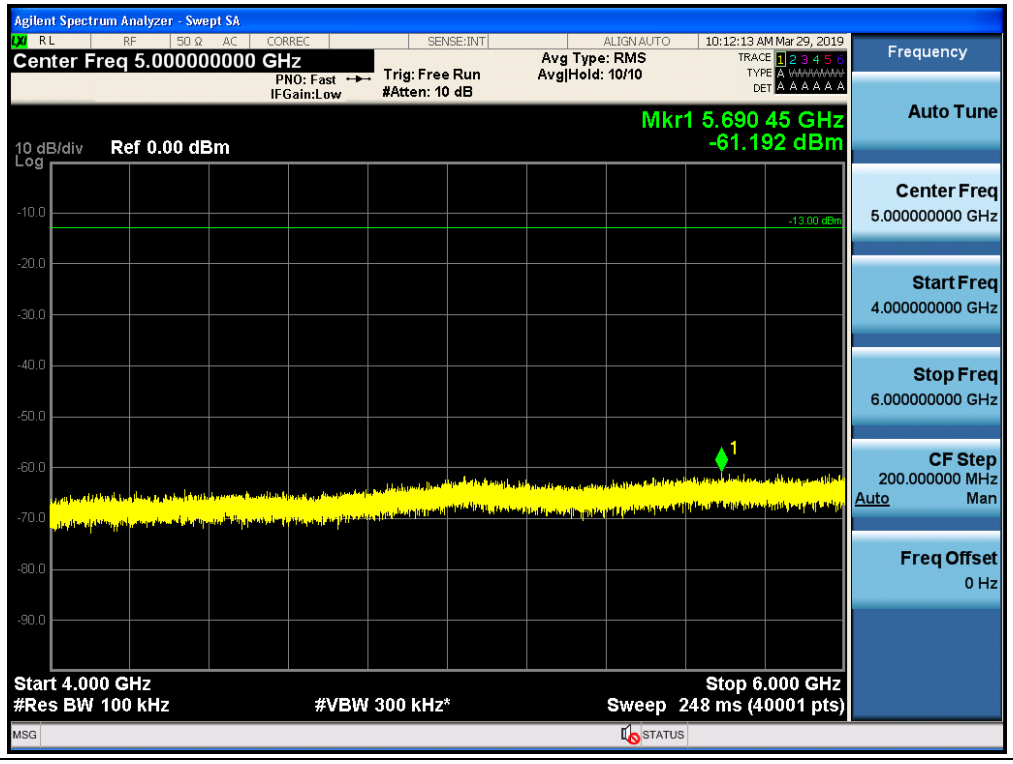
Conducted Spurious Emissions / Lower 700 MHz / Downlink / 746.1 MHz ~ 2 GHz

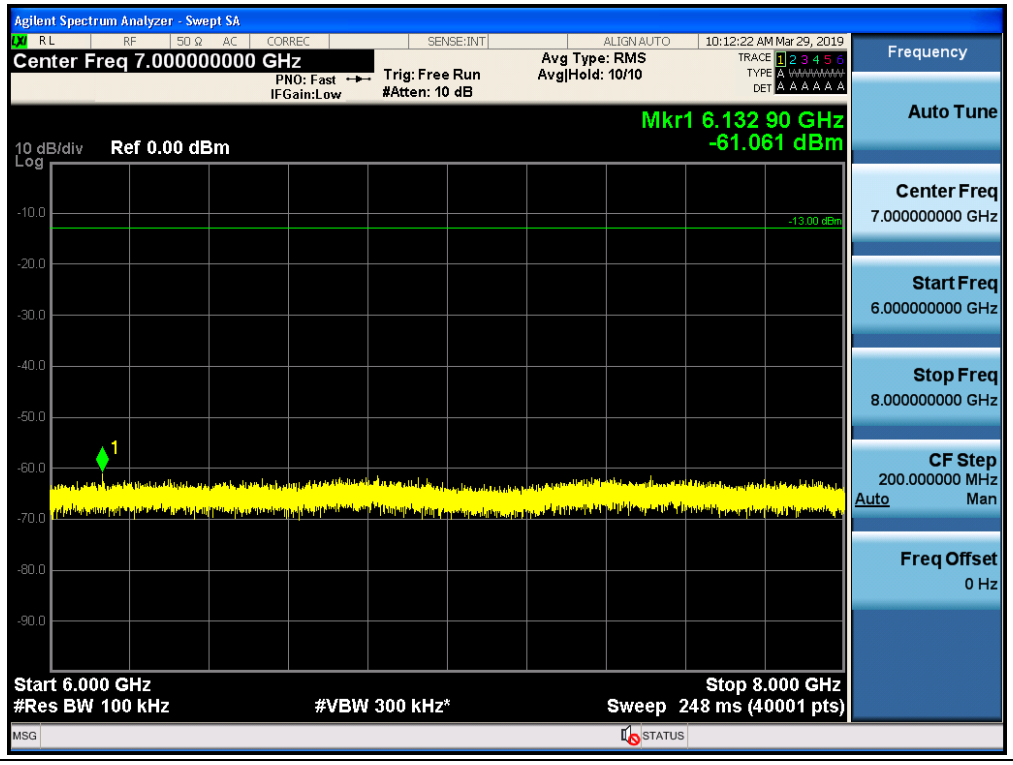


Conducted Spurious Emissions / Lower 700 MHz / Downlink / 2 GHz ~ 4 GHz

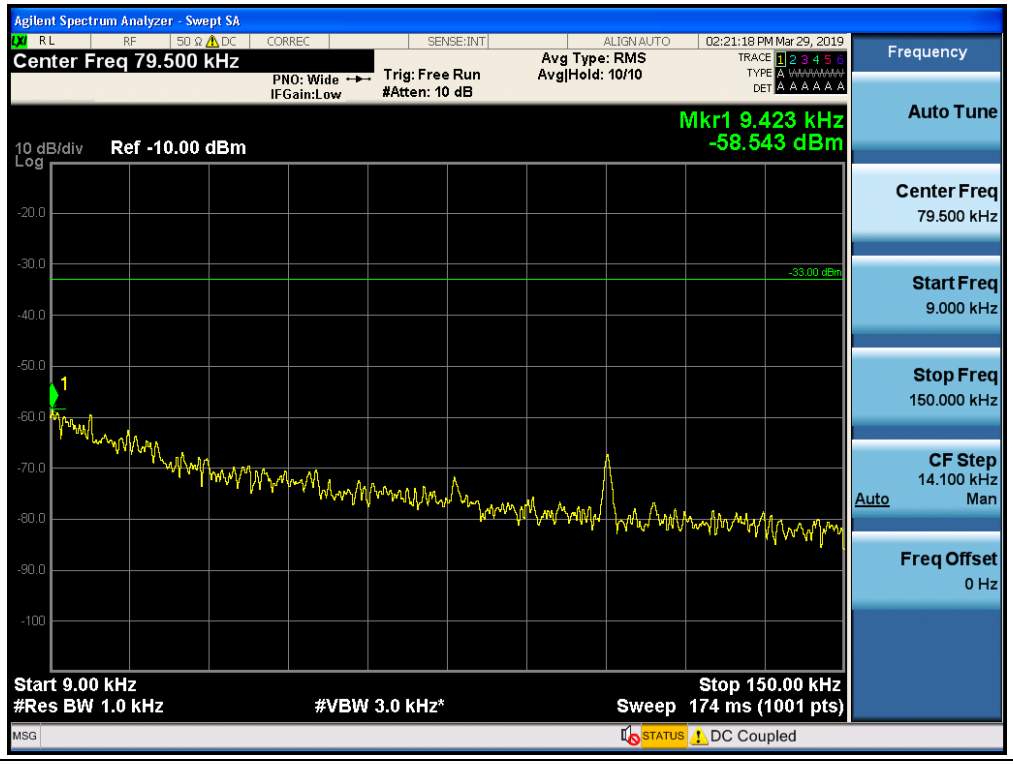


Conducted Spurious Emissions / Lower 700 MHz / Downlink / 4 GHz ~ 6 GHz

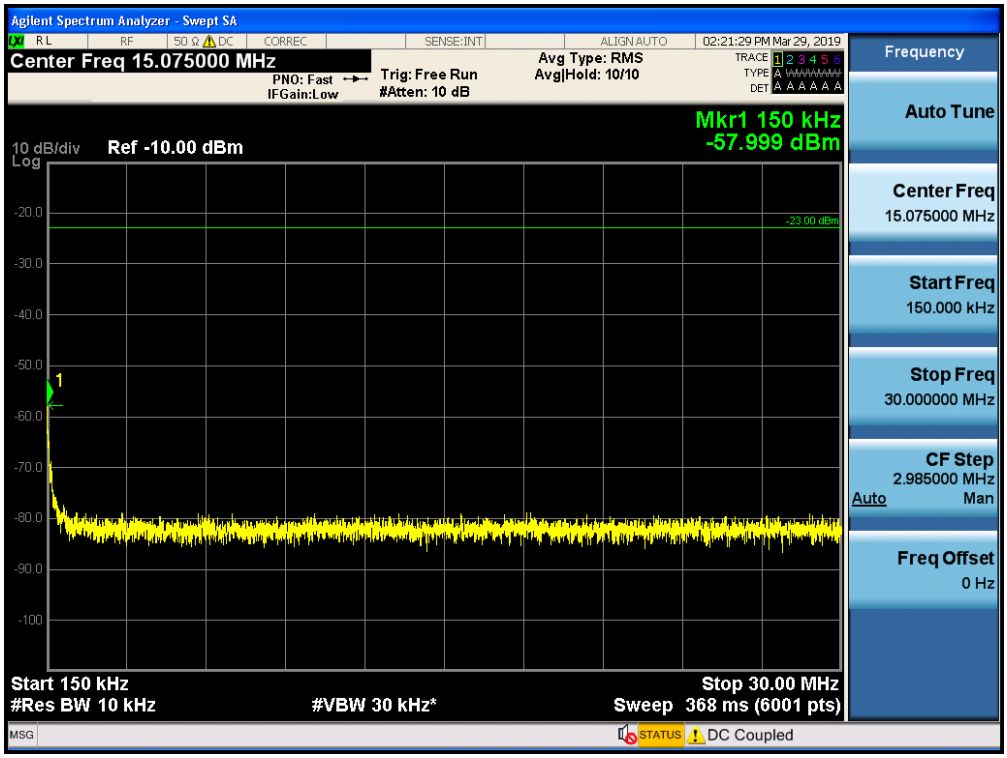


Conducted Spurious Emissions / Lower 700 MHz / Downlink / 6 GHz ~ 8 GHz


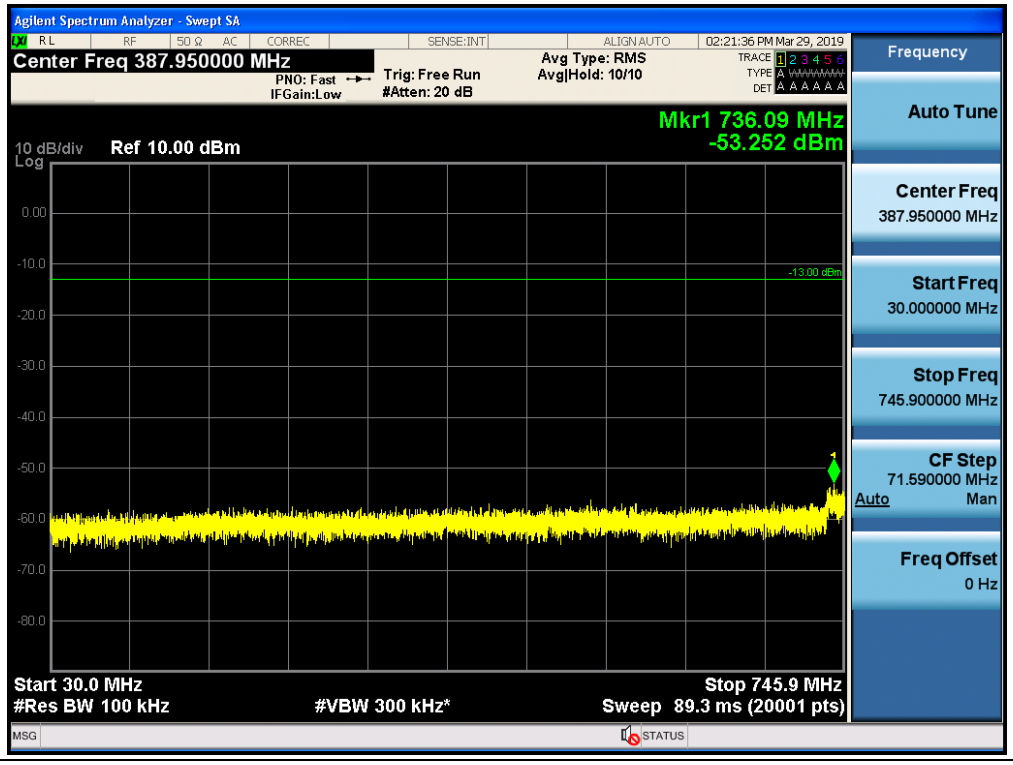
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 9 kHz ~ 150 kHz



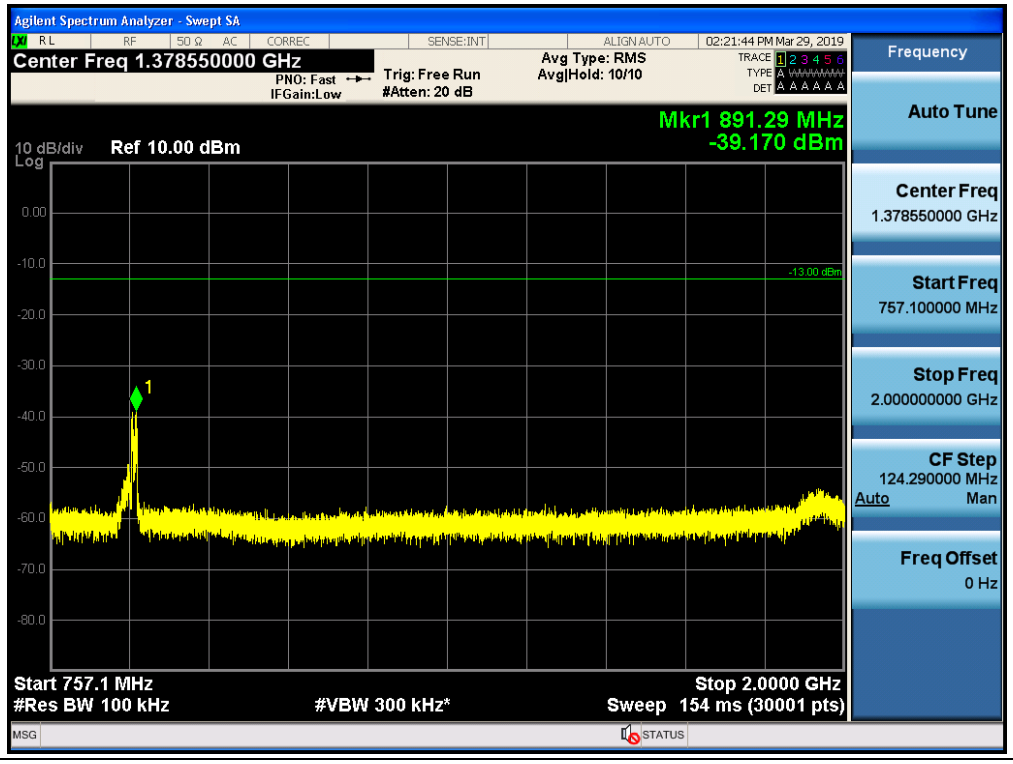
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 150 kHz ~ 30 MHz



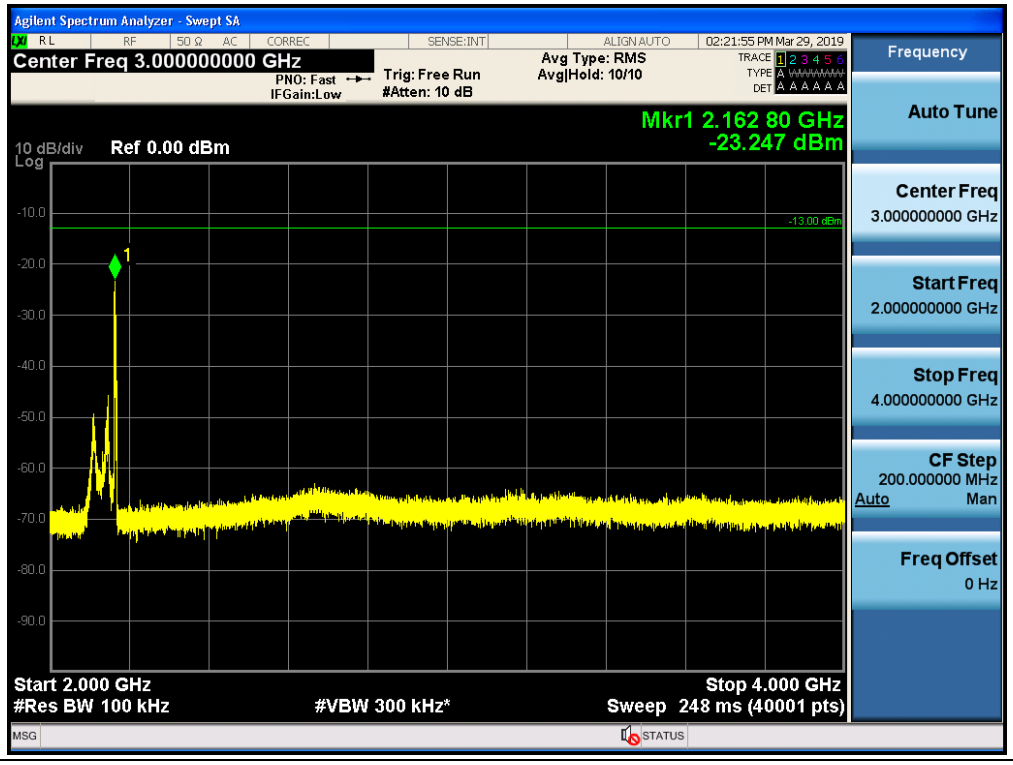
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 30 MHz ~ 745.9 MHz



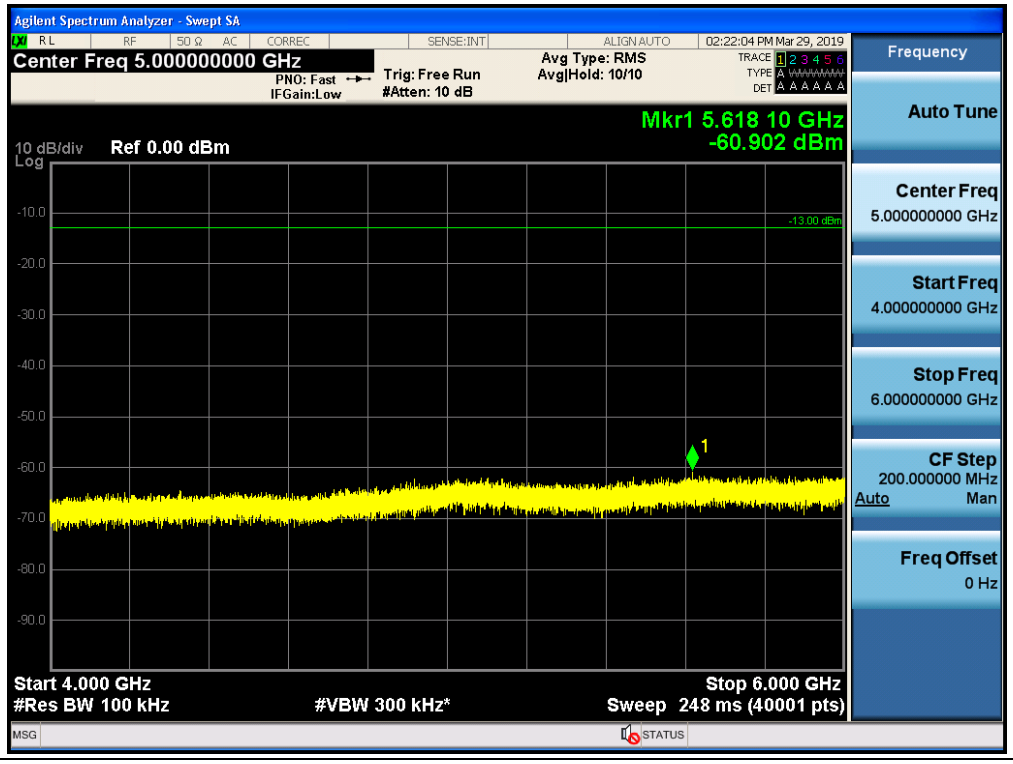
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 757.1 MHz ~ 2 GHz



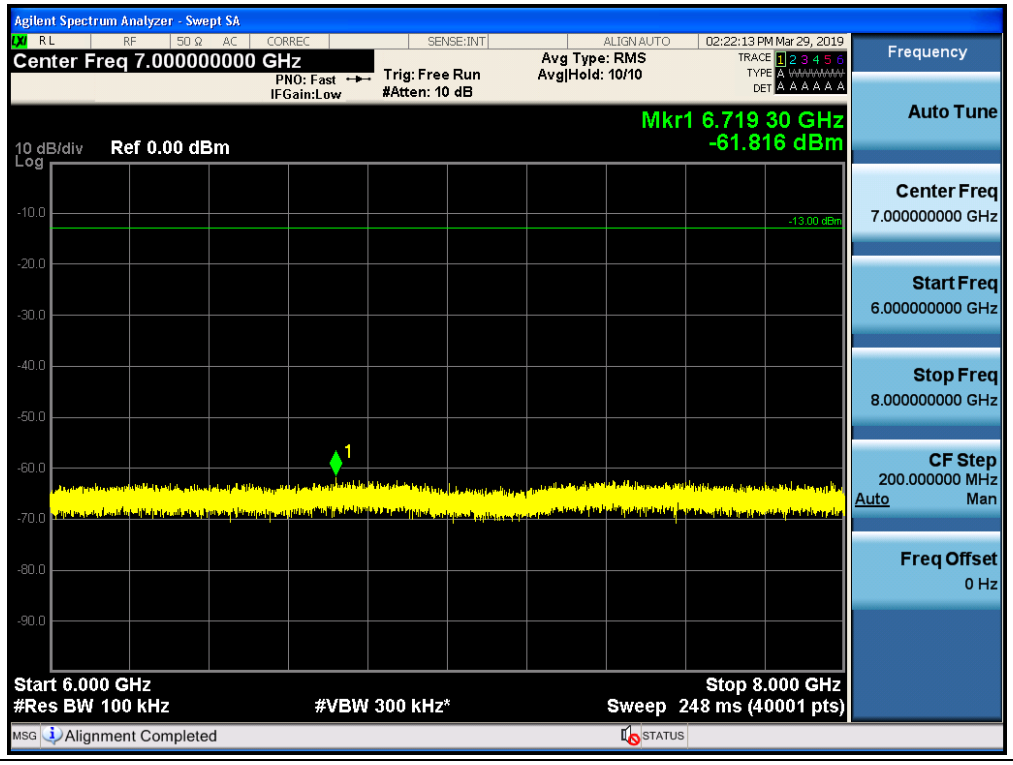
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 2 GHz ~ 4 GHz



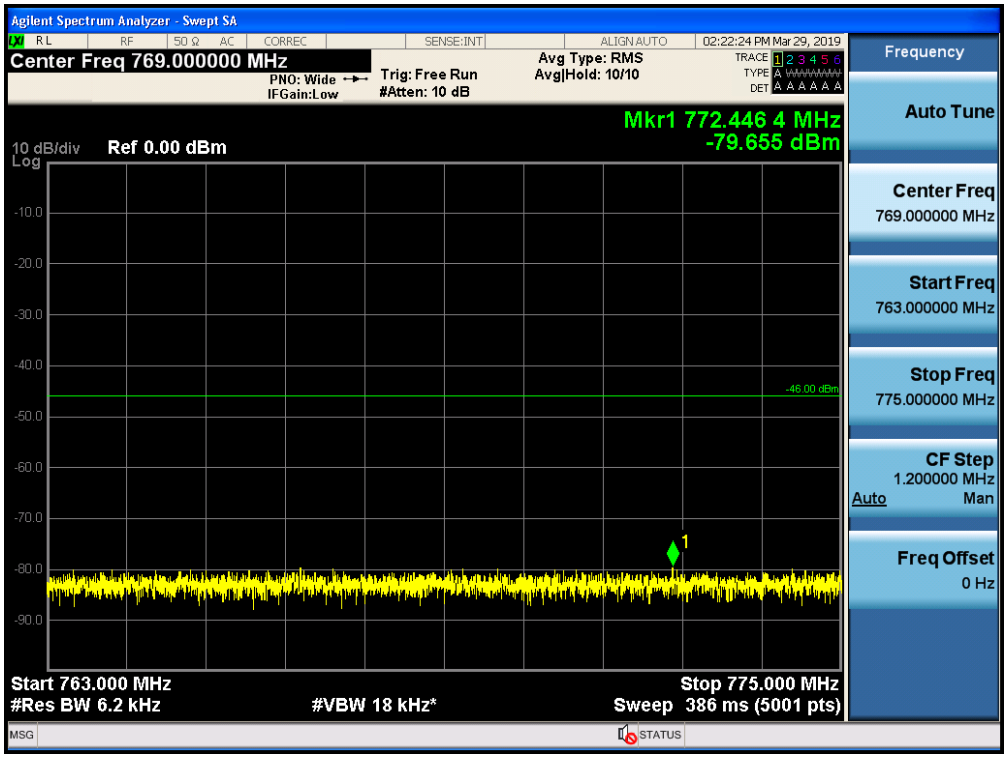
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 4 GHz ~ 6 GHz



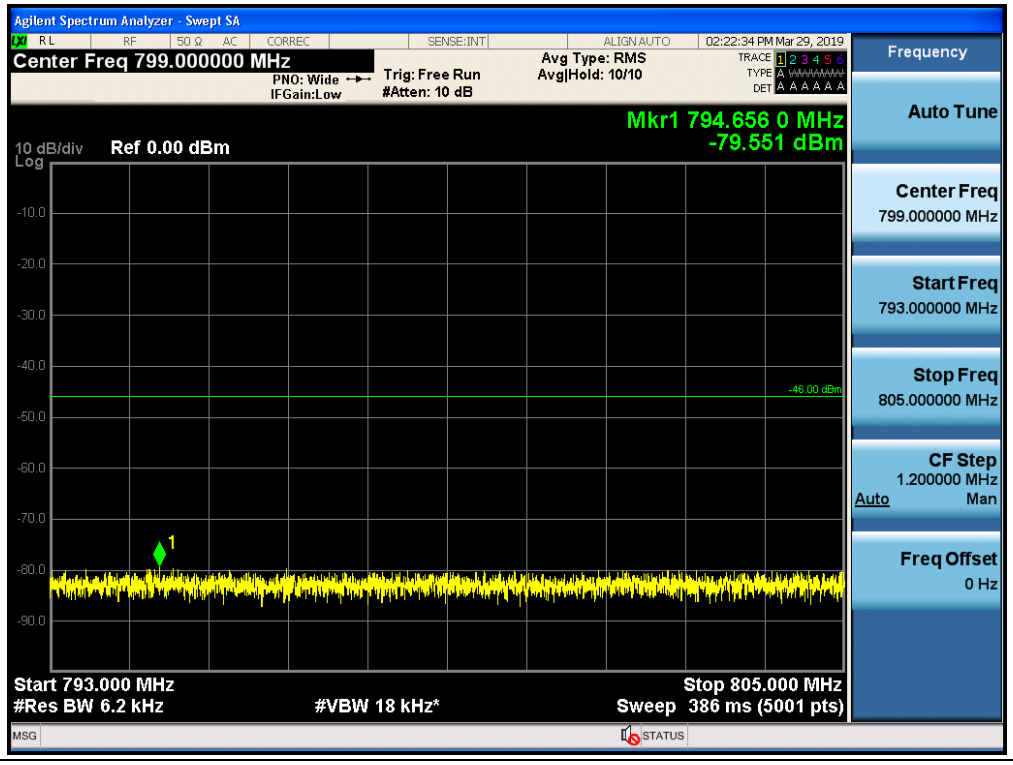
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 6 GHz ~ 8 GHz



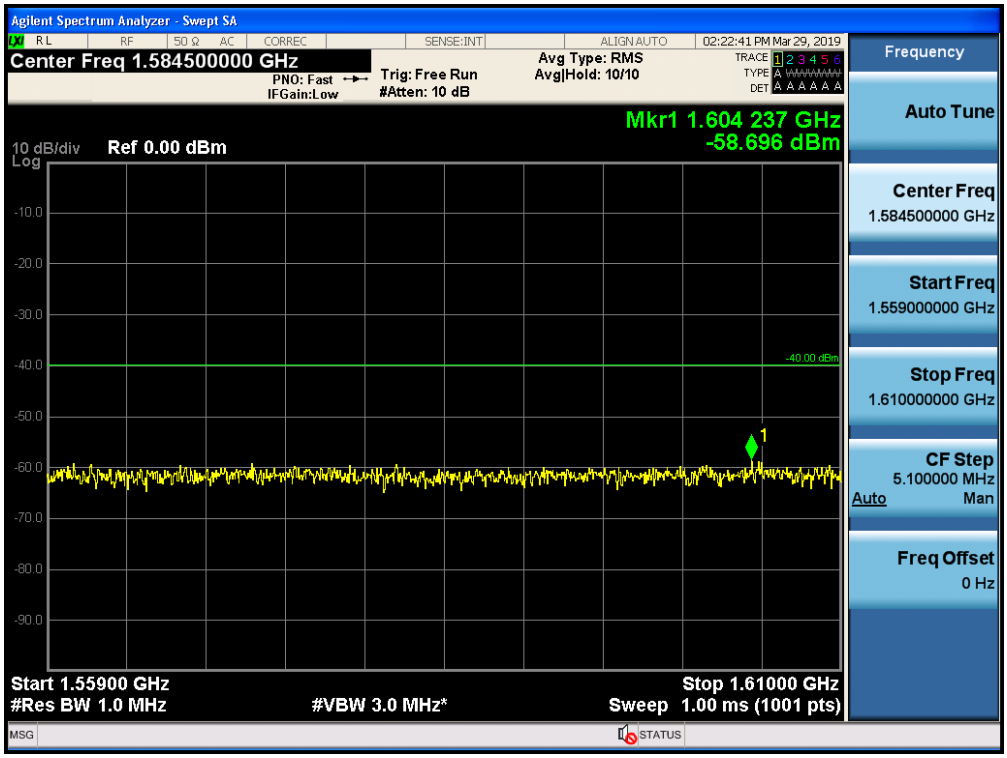
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 763 MHz ~ 775 MHz



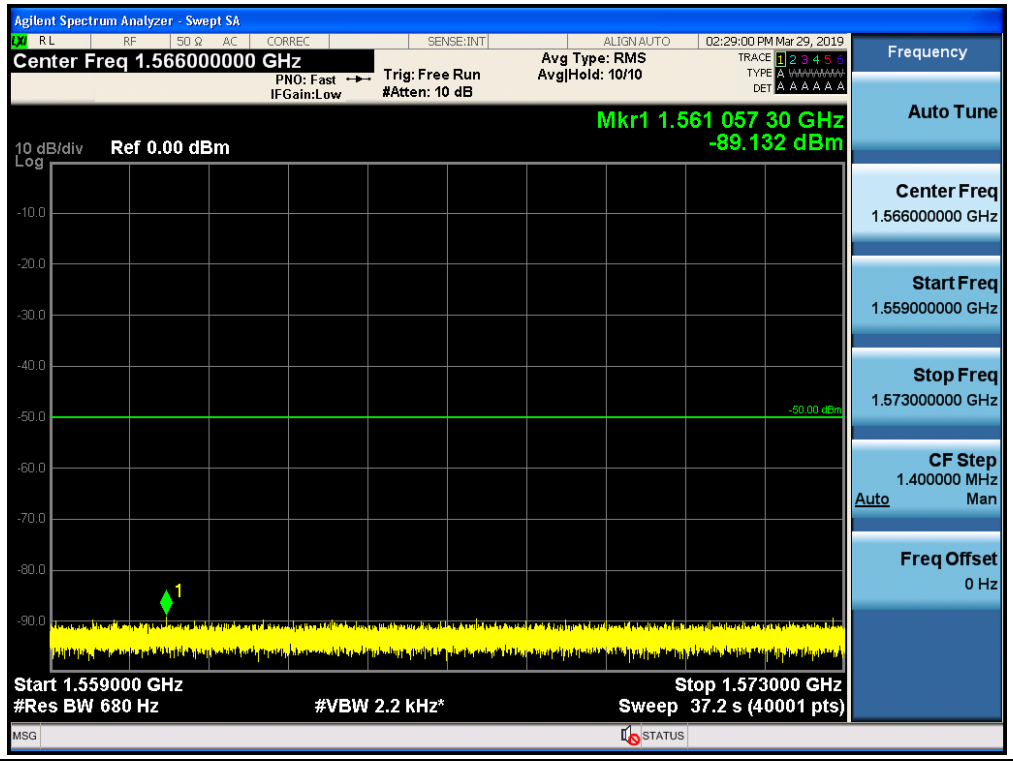
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 793 MHz ~ 805 MHz



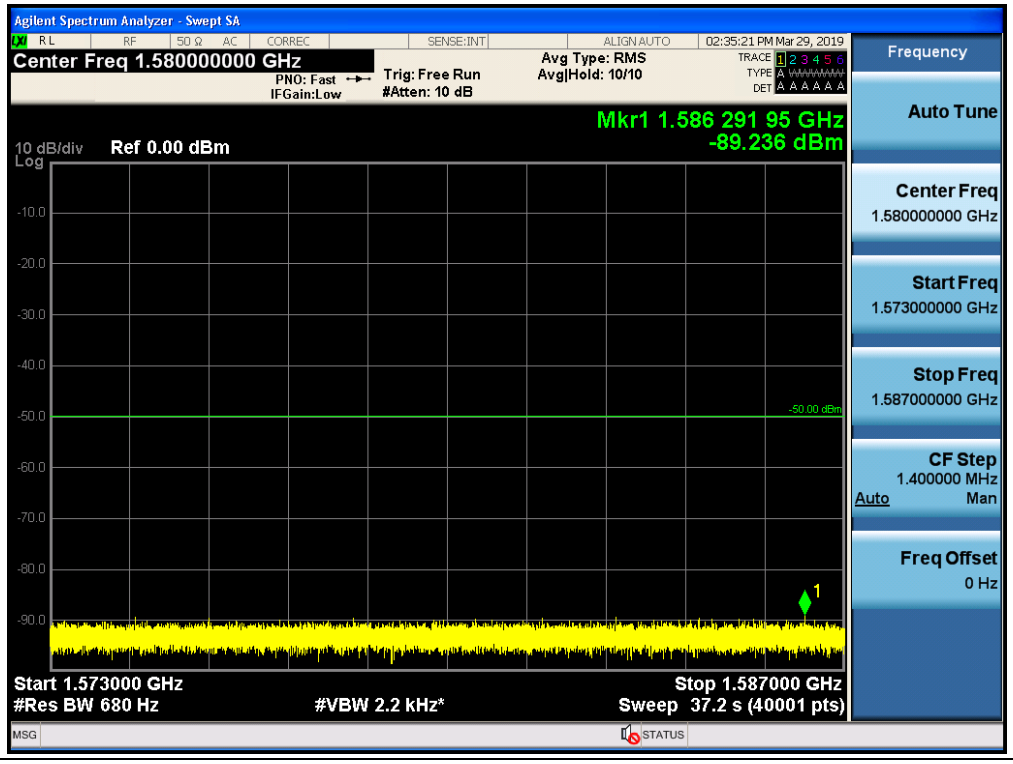
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 1.559 GHz ~ 1.610 GHz (1 MHz)



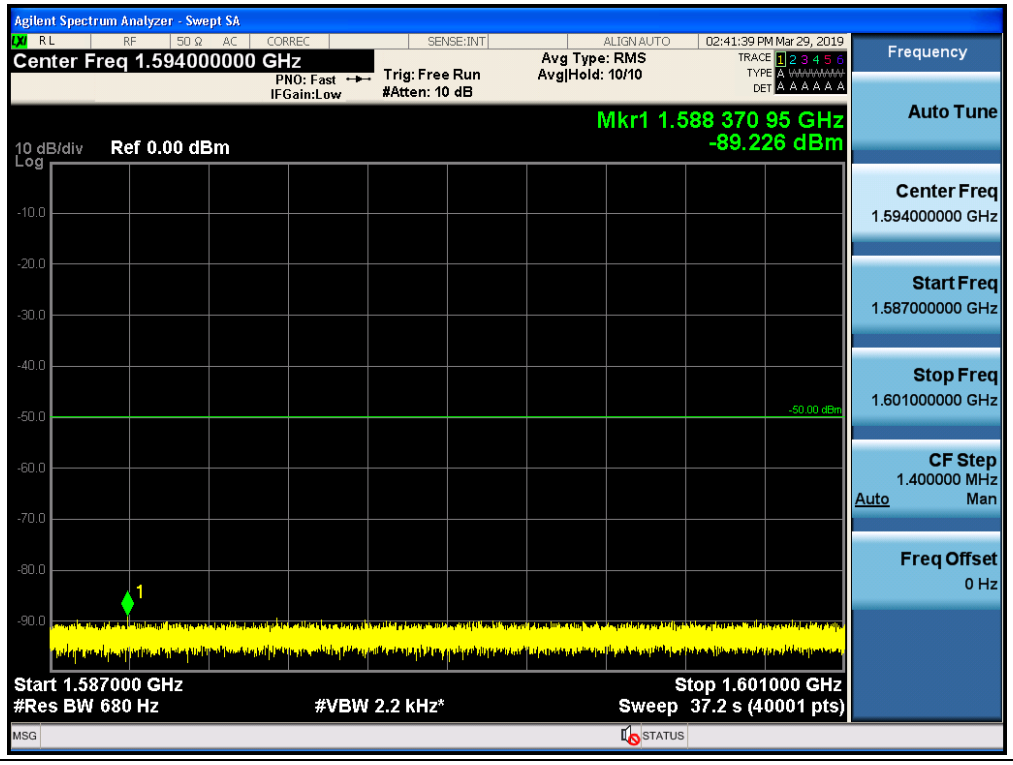
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 1.559 GHz ~ 1.573 GHz (700 Hz)



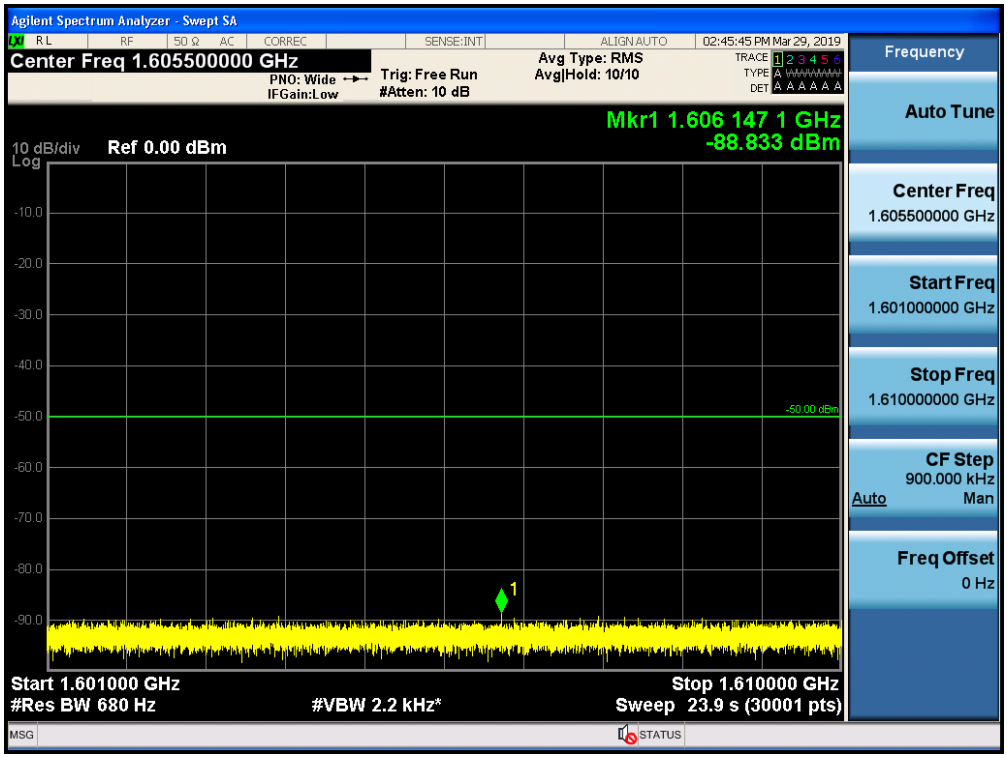
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 1.573 GHz ~ 1.587 GHz (700 Hz)



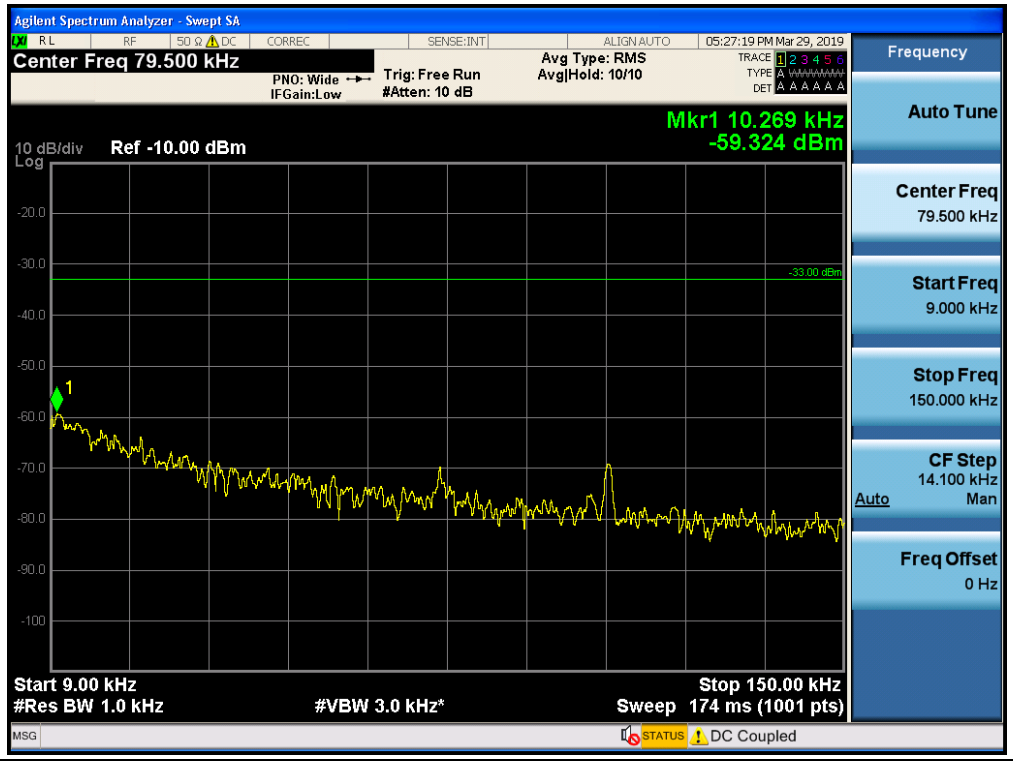
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 1.587 GHz ~ 1.601 GHz (700 Hz)



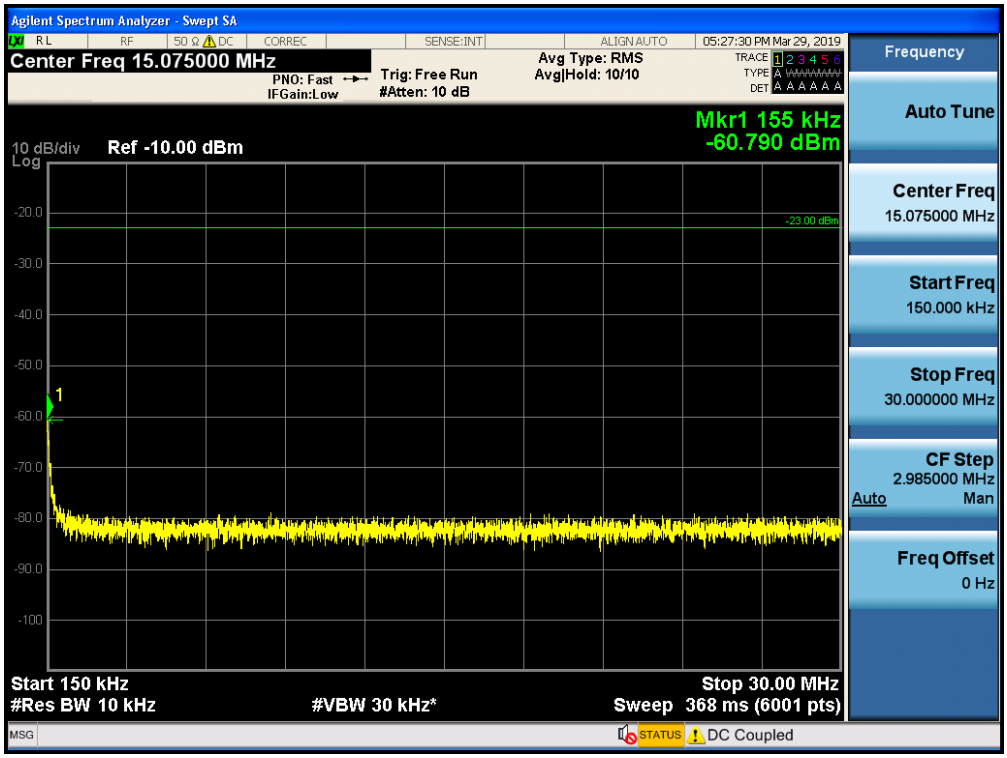
Conducted Spurious Emissions / Upper 700 MHz / Downlink / 1.601 GHz ~ 1.610 GHz (700 Hz)

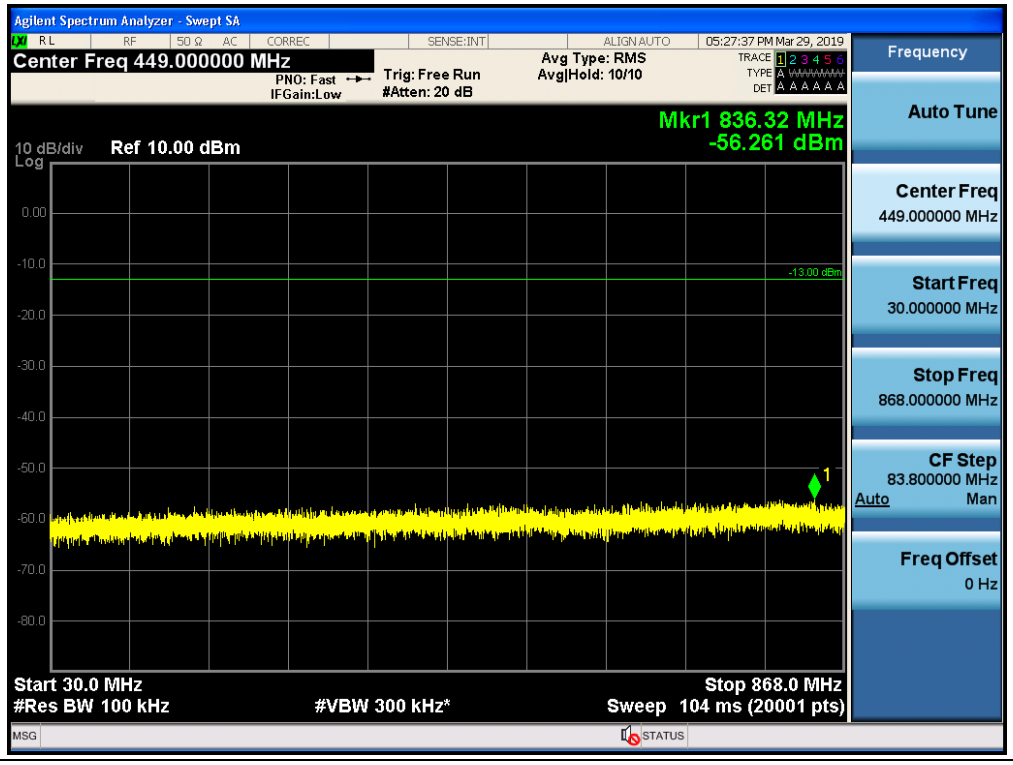


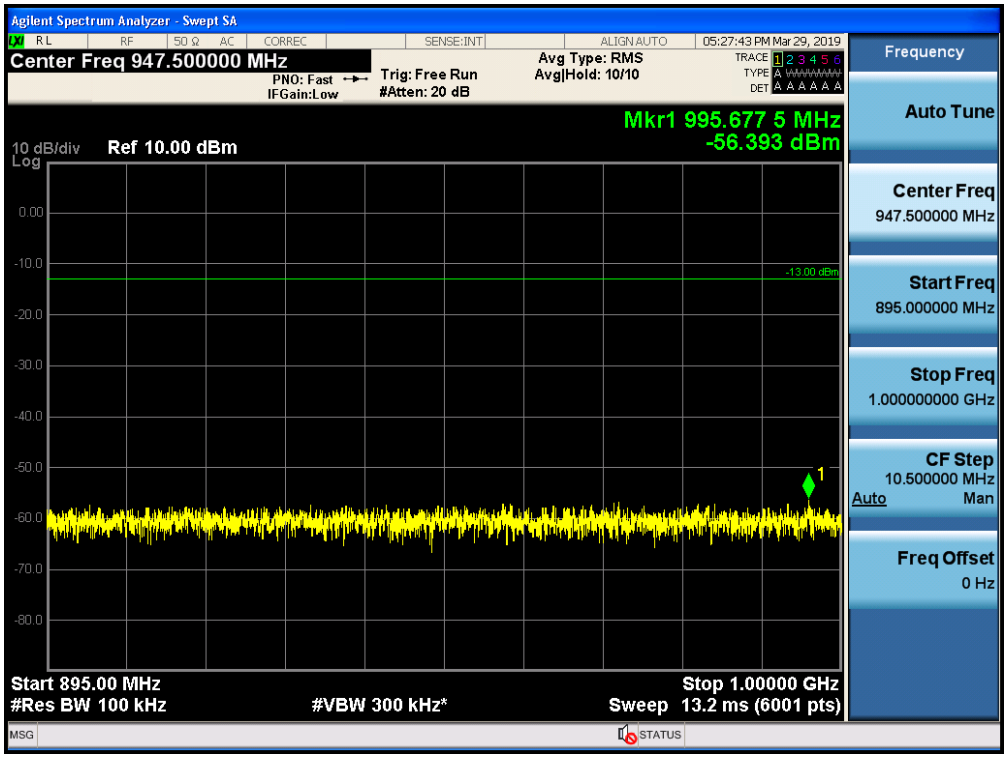
Conducted Spurious Emissions / Cellular / Downlink / 9 kHz ~ 150 kHz

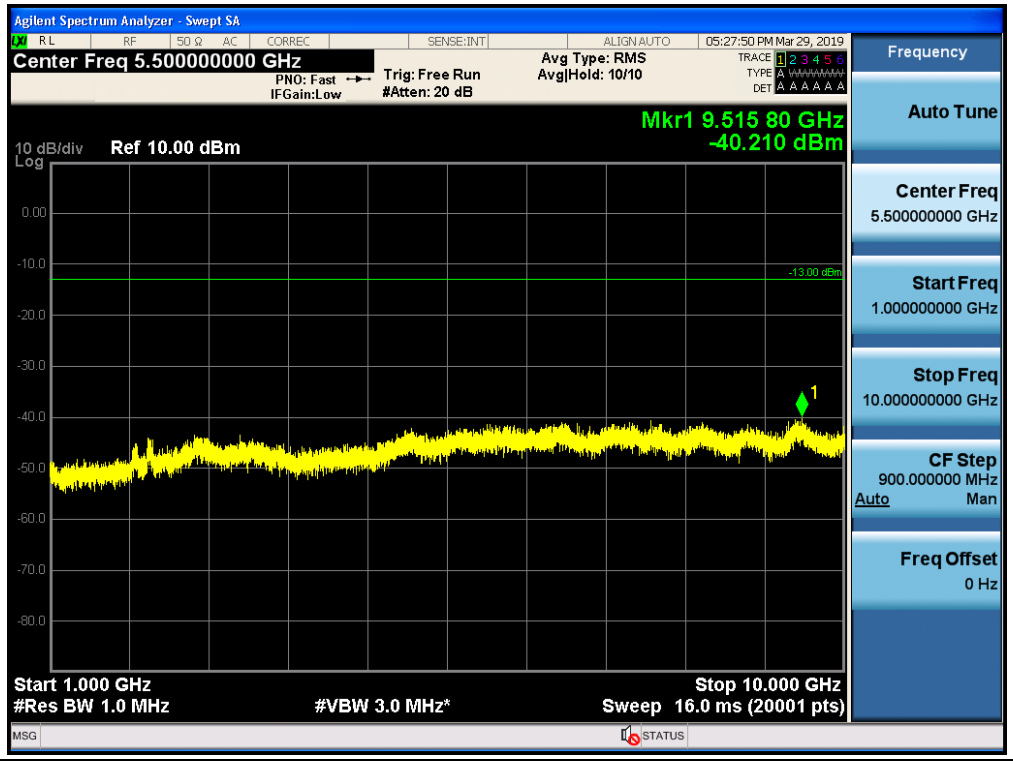


Conducted Spurious Emissions / Cellular / Downlink / 150 kHz ~ 30 MHz

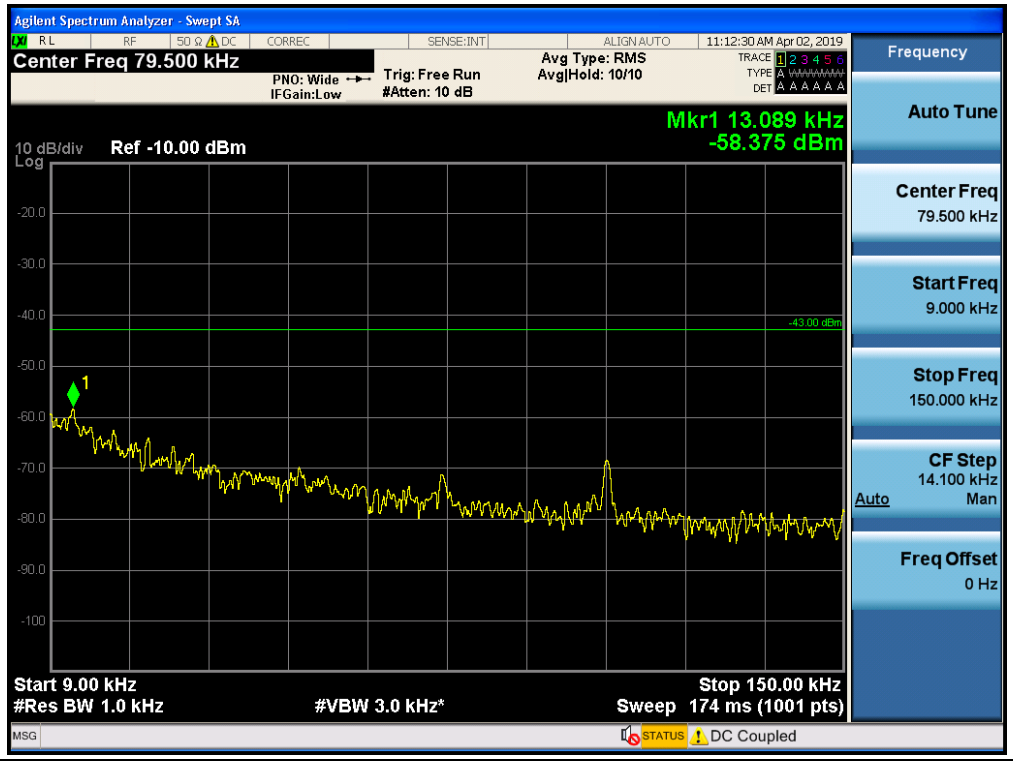


Conducted Spurious Emissions / Cellular / Downlink / 30 MHz ~ 868 MHz


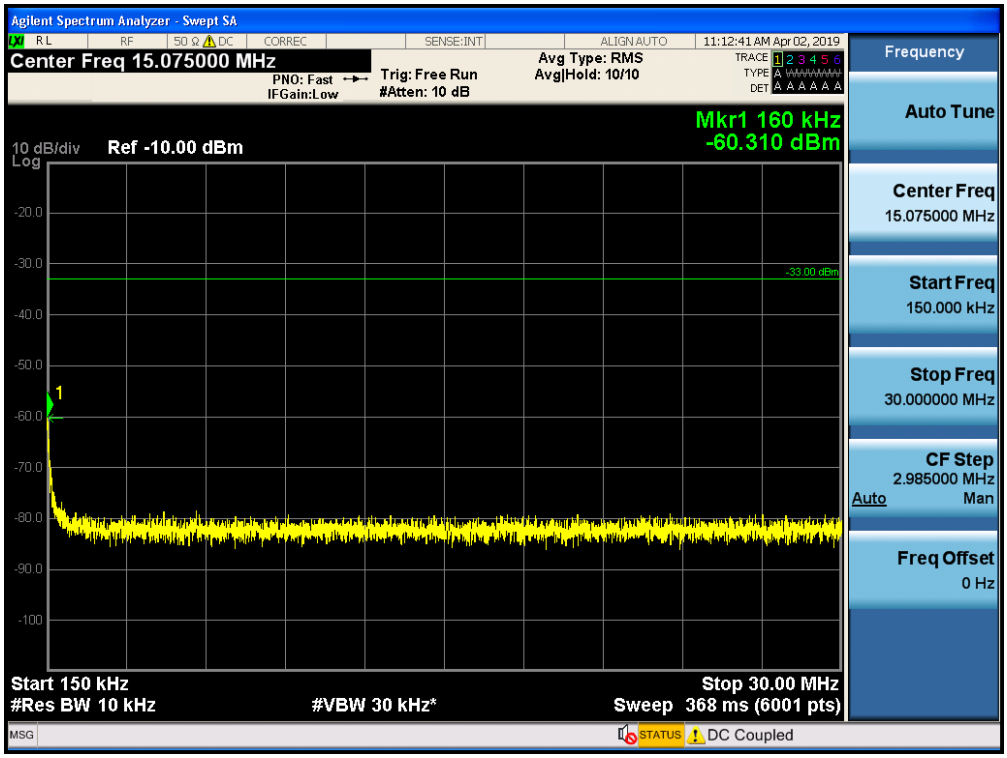
Conducted Spurious Emissions / Cellular / Downlink / 895 MHz ~ 1 GHz


Conducted Spurious Emissions / Cellular / Downlink / 1 GHz ~ 10 GHz


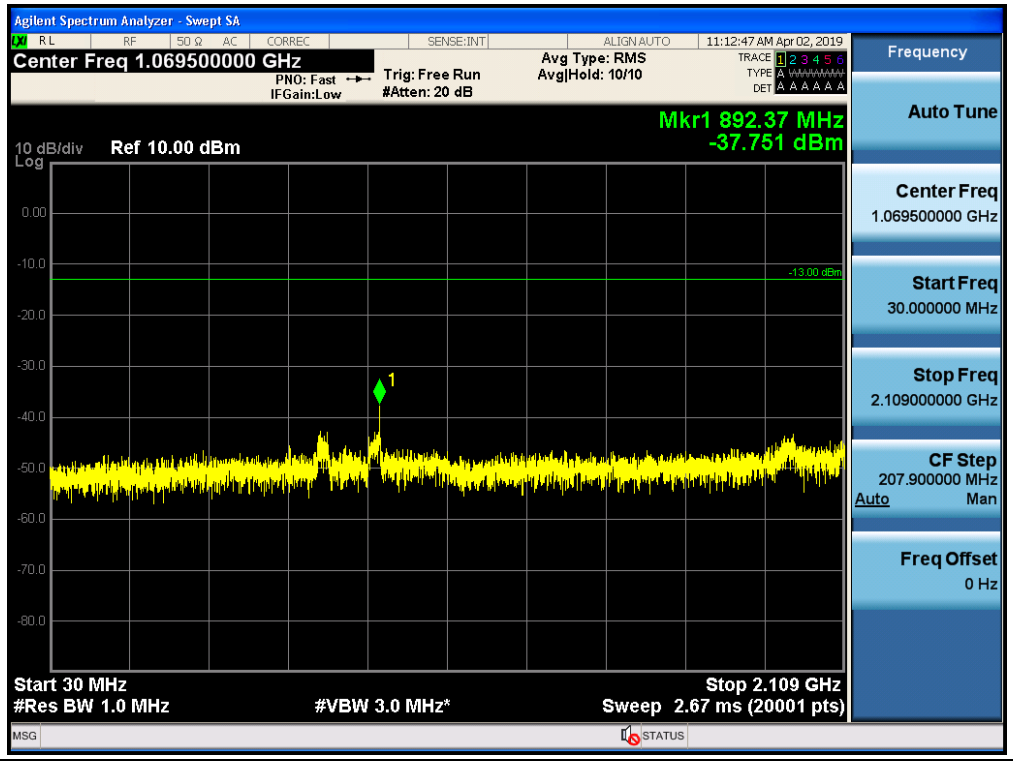
Conducted Spurious Emissions / AWS-1 / Downlink / 9 kHz ~ 150 kHz



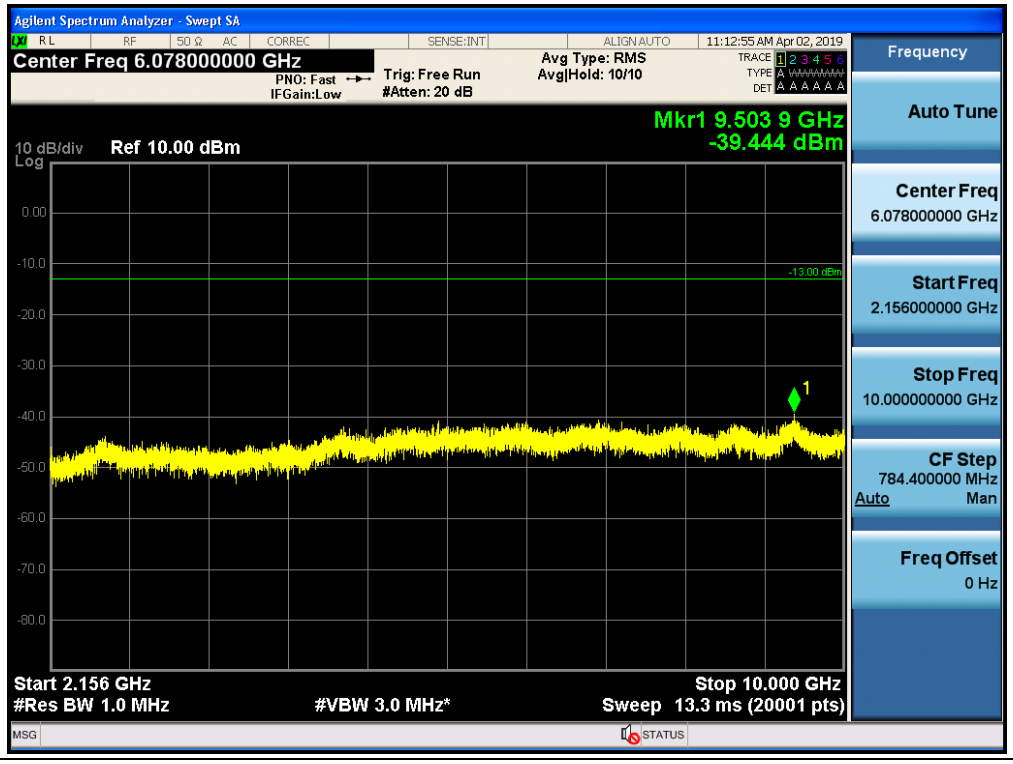
Conducted Spurious Emissions / AWS-1 / Downlink / 150 kHz ~ 30 MHz

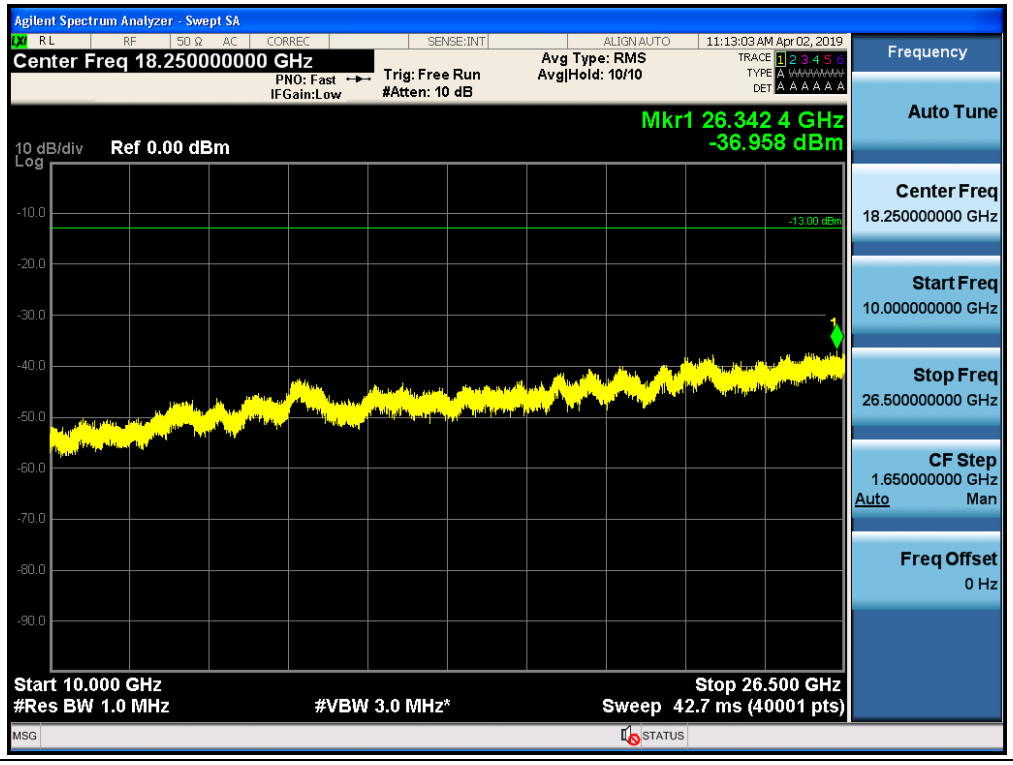


Conducted Spurious Emissions / AWS-1 / Downlink / 30 MHz ~ 2.109 GHz

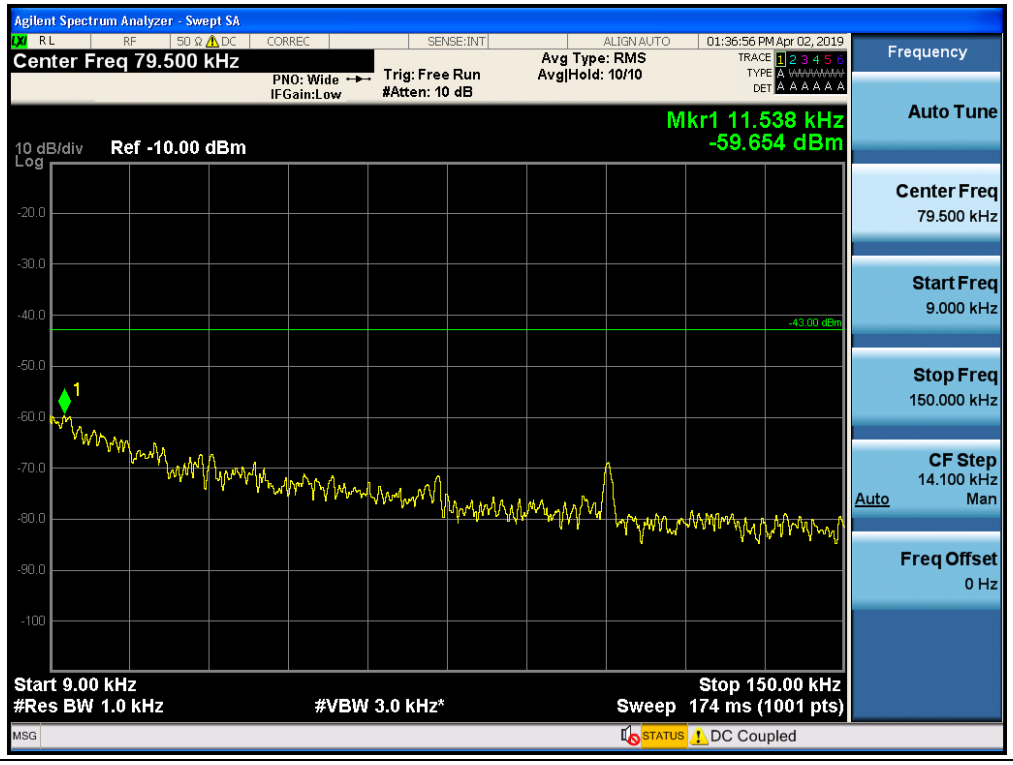


Conducted Spurious Emissions / AWS-1 / Downlink / 2.156 GHz ~ 10 GHz

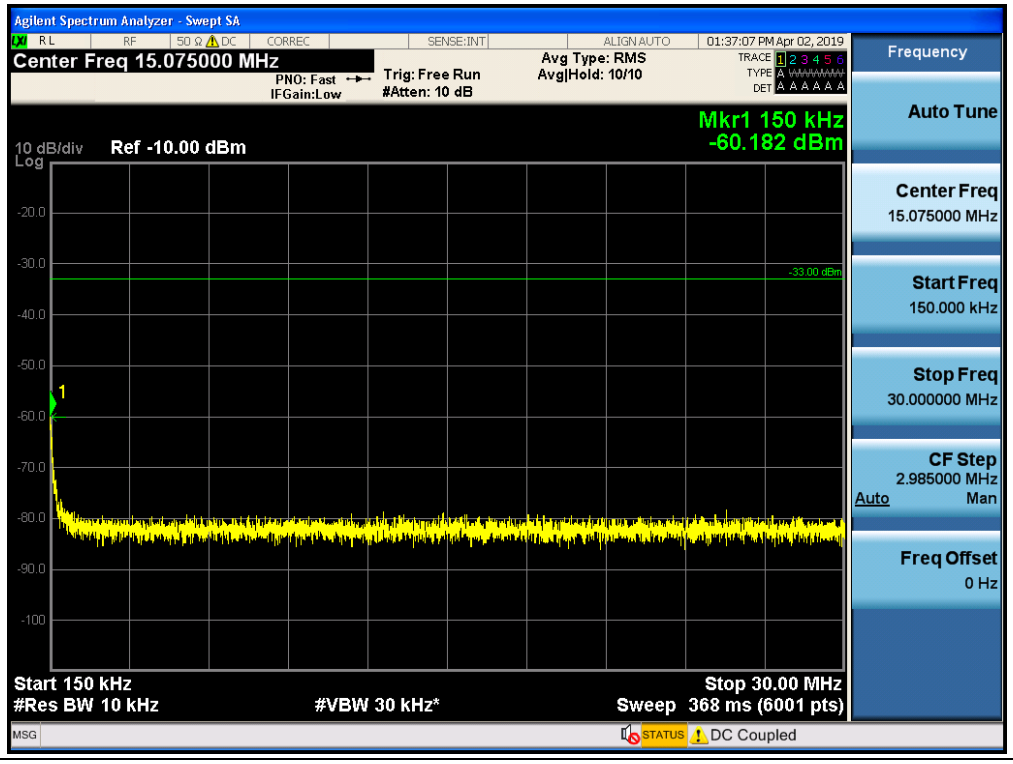


Conducted Spurious Emissions / AWS-1 / Downlink / 10 GHz ~ 26.5 GHz


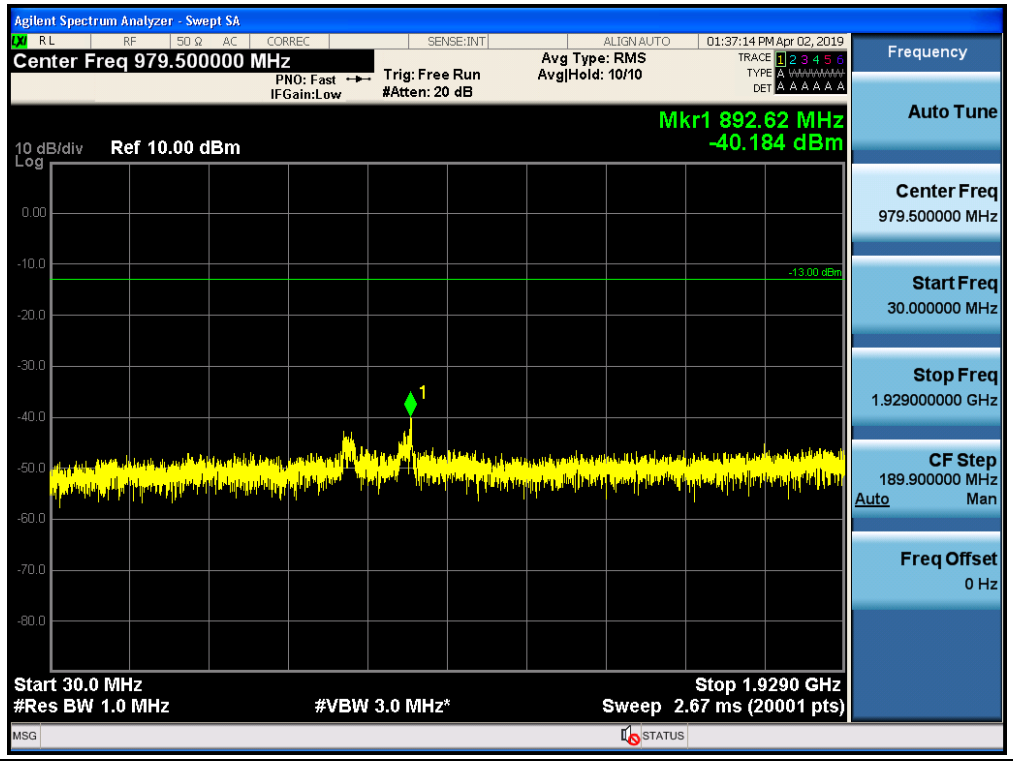
Conducted Spurious Emissions / Broadband PCS / Downlink / 9 kHz ~ 150 kHz



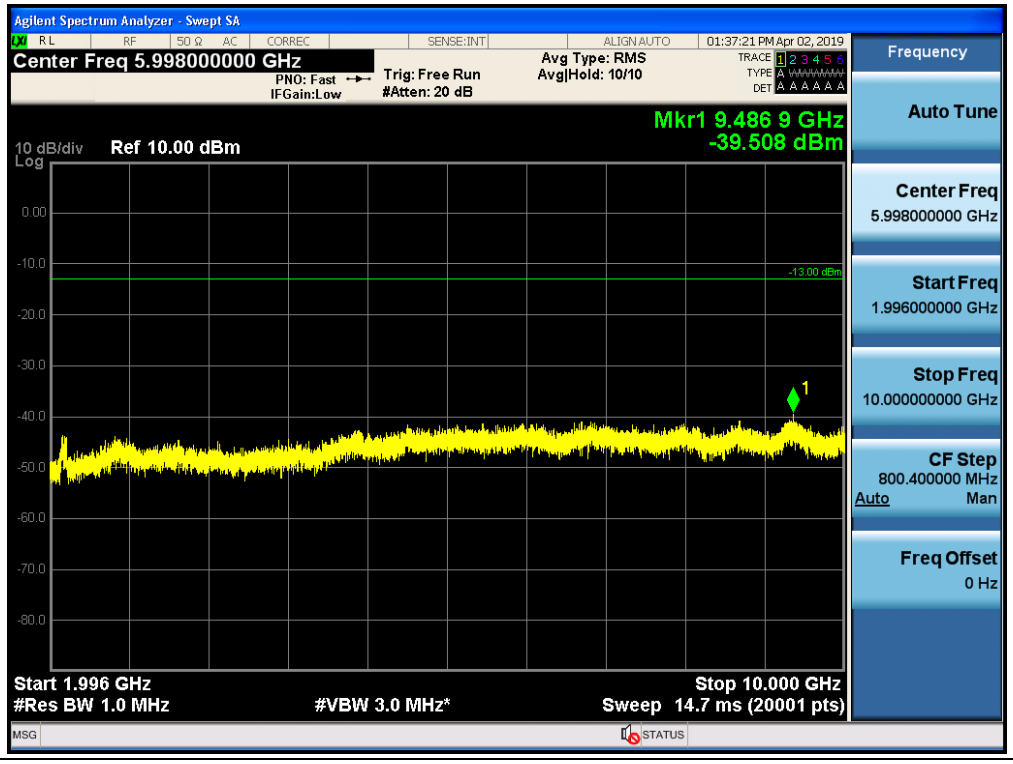
Conducted Spurious Emissions / Broadband PCS / Downlink / 150 kHz ~ 30 MHz

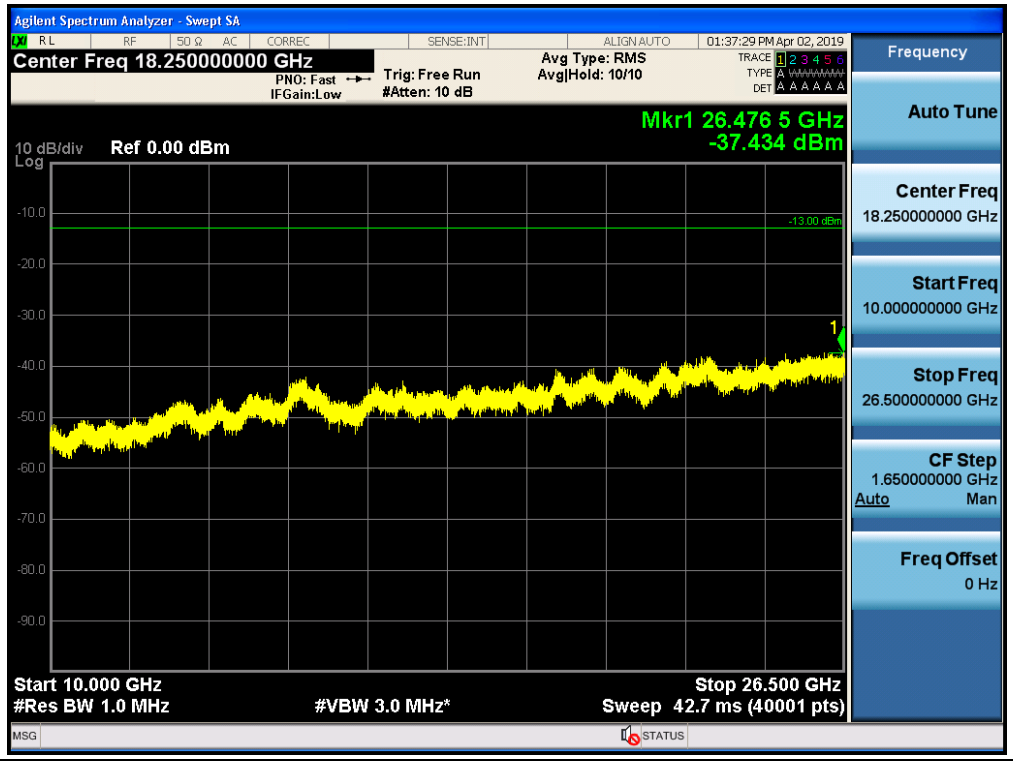


Conducted Spurious Emissions / Broadband PCS / Downlink / 30 MHz ~ 1.929 GHz



Conducted Spurious Emissions / Broadband PCS / Downlink / 1.996 GHz ~ 10 GHz



Conducted Spurious Emissions / Broadband PCS / Downlink / 10 GHz ~ 26.5 GHz


5.7. NOISE LIMITS

Test Requirements:

§20.21(e)(8)(i)(A) NOISE LIMITS.

(1) The transmitted noise power in dBm/MHz of consumer boosters at their uplink port shall not exceed −103 dBm/MHz—RSSI. RSSI (received signal strength indication expressed in negative dB units relative to 1 mW) is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation.

(2) The transmitted maximum noise power in dBm/MHz of consumer boosters at their uplink and downlink ports shall not exceed the following limits:

(i) Fixed booster maximum noise power shall not exceed −102.5 dBm/MHz + 20 Log_{10} (Frequency), where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

(ii) Mobile booster maximum noise power shall not exceed−59 dBm/MHz.

(iii) Compliance with Noise limits will use instrumentation calibrated in terms of RMS equivalent voltage, and with booster input ports terminated or without input signals applied within the band of measurement.

§20.21(e)(8)(i)(H) Transmit Power Off Mode (uplink and downlink noise power).

When the consumer booster cannot otherwise meet the noise and gain limits defined herein it must operate in “Transmit Power Off Mode.” In this mode of operation, the uplink and downlink noise power shall not exceed −70 dBm/MHz and both uplink and downlink gain shall not exceed the lesser of 23 dB or MSCL.

Test Procedures:

Measurements were in accordance with the test methods section 7.7 of KDB 935210 D03 v04r03.

7.7.1 Maximum transmitter noise power level

a) Begin with the uplink output (donor) port connected to the spectrum analyzer.

b) Set the spectrum analyzer RBW to 1 MHz with the VBW ≥ 3 RBW.

c) Select the power averaging (rms) detector and trace average over at least 100 traces.

d) Set the center frequency of the spectrum analyzer to the center of the CMRS band under test with the span ≥ 2 the CMRS band.

e) Measure the maximum transmitter noise power level.

f) Save the spectrum analyzer plot as necessary for inclusion in the final test report.

g) Repeat b) to f) for all operational uplink and downlink bands.

h) Connect the EUT for uplink noise power measurement in the presence a downlink signal. Affirm the coupled path of the RF coupler is connected to the spectrum analyzer.

i) Configure the signal generator for AWGN operation with a 99% OBW of 4.1 MHz.

j) Set the spectrum analyzer RBW for 1 MHz, VBW ≥ 3 RBW, with a power averaging (rms) 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

≥ 2 the CMRS band. This shall include all spectrum blocks in the particular CMRS band under.

l) 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.

m) Measure the maximum transmitter noise power level while varying the downlink signal generator output level from −90 dBm to −20 dBm, as measured at the input port, in 1 dB steps inside the RSSI-dependent region, and in 10 dB steps outside the RSSI-dependent region. Report the six values closest to the limit, with at least two points within the RSSI-dependent region of the limit.

n) Repeat h) through m) for all operational uplink bands.

7.7.2 Variable uplink noise timing

a) Set the spectrum analyzer to the uplink frequency to be measured.

b) Set the span to 0 Hz, with a sweep time of 10 seconds.

c) Set the power level of signal generator to the lowest level of the RSSI-dependent noise.

d) Select MAX HOLD and increase the power level of signal generator by 10 dB for mobile boosters, and 20 dB for fixed boosters.

e) Confirm that the uplink noise decreases to the specified level within 1 second for mobile devices, and within 3 seconds for fixed devices.

f) Repeat a) to e) for all operational uplink bands.

g) Include plots and summary table in test report.

Note1. Test limit is according to 'Frequency Dependent Limits' line of figure in Note3.

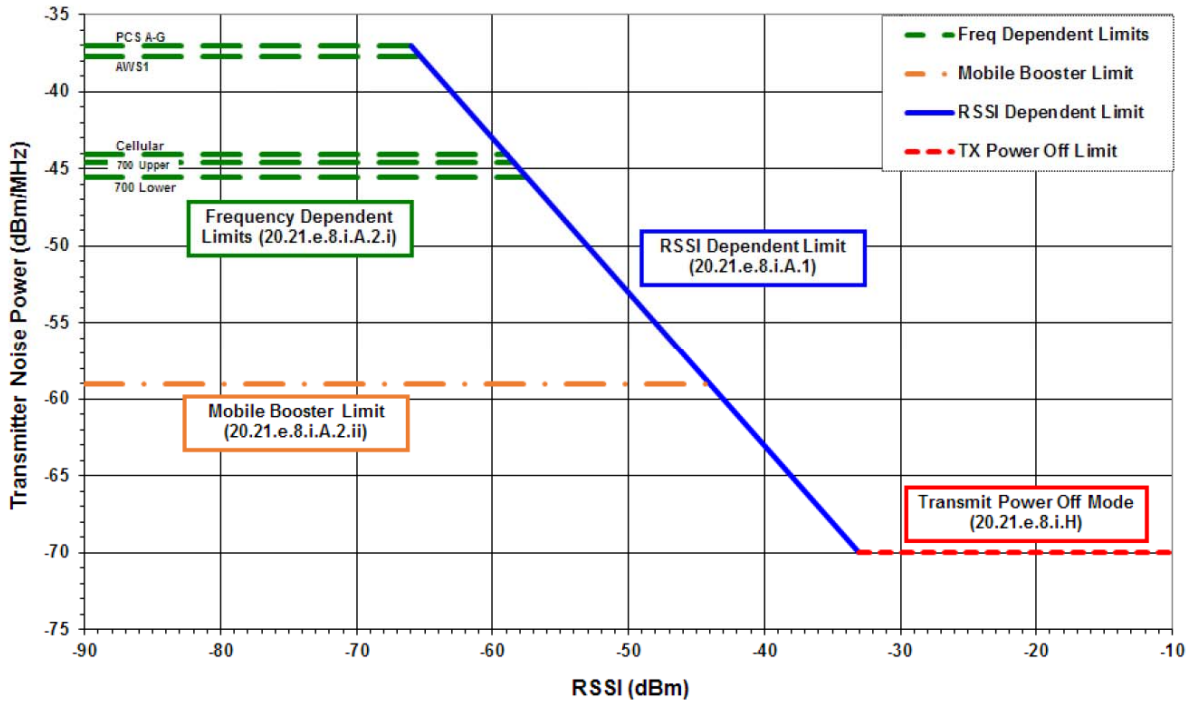
- Limit in -90 dBm to -103 dBm/MHz - (-102.5 dBm/MHz + 20 $\log_{10}$(f)), RSSI range
  : -102.5 dBm/MHz + 20 $\log_{10}$(f)
- Limit in -103 dBm/MHz - (-102.5 dBm/MHz + 20 $\log_{10}$(f)) to -33 dBm, RSSI range
  : -103 dBm/MHz—RSSI
- Limit in -33 dBm to -10 dBm RSSI range: -70 dBm/MHz
- Timing limit is according to fixed devices 3 second limit in section 7.7.2 of KDB 935210 D03

* (f) is the uplink mid-band frequency of the operating frequency bands (in MHz).

Note2. Following switch coupled loss is corrected in signal generating.

Band	Uplink generating loss (dB)	Downlink generating loss (dB)
Lower 700 MHz	3.46	4.62
Upper 700 MHz	4.04	3.96
Cellular	4.53	4.78
AWS-1	4.97	5.13
Broadband PCS	8.17	5.16

Note3. Tests refer to following noise limit in appendix D of KDB 935210 D03 v04r03.



Test Result:

Tabulated Result of Uplink Maximum Transmitter Noise Power Level

Band	Frequency (MHz)	Limit (dBm/MHz)	Noise Level (dBm/MHz)
Lower 700 MHz	708.920	-45.470	-48.004
Upper 700 MHz	788.958	-44.640	-46.568
Cellular	831.500	-44.050	-49.589
AWS-1	1 726.020	-37.730	-45.782
Broadband PCS	1 895.630	-37.010	-44.877

Tabulated Result of Downlink Maximum Transmitter Noise Power Level

Band	Frequency (MHz)	Limit (dBm/MHz)	Noise Level (dBm/MHz)
Lower 700 MHz	751.280	-45.120	-45.511
Upper 700 MHz	749.894	-44.980	-45.320
Cellular	885.100	-43.600	-45.327
AWS-1	2 162.650	-35.920	-42.248
Broadband PCS	1 957.690	-36.640	-46.168

Tabulated Result of Variable Uplink Noise Power

Band	RSSI (dBm)	Frequency (MHz)	Limit (dBm/MHz)	Noise Level (dBm/MHz)
Lower 700 MHz	-34	708.824	-69.47	-70.110
	-80	708.872	-45.47	-46.816
	-60	708.776	-45.47	-47.145
	-90	708.968	-45.47	-47.195
	-35	708.536	-68.47	-70.261
	-70	708.320	-45.47	-47.335
Upper 700 MHz	-33	781.852	-69.64	-70.341
	-34	781.632	-68.64	-69.501
	-35	781.830	-67.64	-68.771
	-37	782.050	-65.64	-66.811
	-38	782.072	-64.64	-65.820
	-36	782.226	-66.64	-67.841
Cellular	-34	827.700	-69.05	-73.302
	-35	827.700	-68.05	-73.286
	-38	827.950	-65.05	-70.296
	-36	827.950	-67.05	-72.357
	-70	828.300	-44.05	-49.508
	-60	827.750	-44.05	-49.512
AWS-1	-34	1 719.540	-68.73	-68.878
	-47	1 719.090	-55.73	-55.987
	-58	1 719.630	-44.73	-45.313
	-38	1 720.350	-64.73	-65.396
	-35	1 719.810	-67.73	-68.793
	-51	1 720.260	-51.73	-52.818
Broadband PCS	-34	1 883.150	-69.01	-69.245
	-35	1 881.460	-68.01	-69.251
	-48	1 882.890	-55.01	-56.284
	-61	1 882.890	-42.01	-43.368
	-36	1 883.540	-67.01	-68.461
	-50	1 881.460	-53.01	-54.590

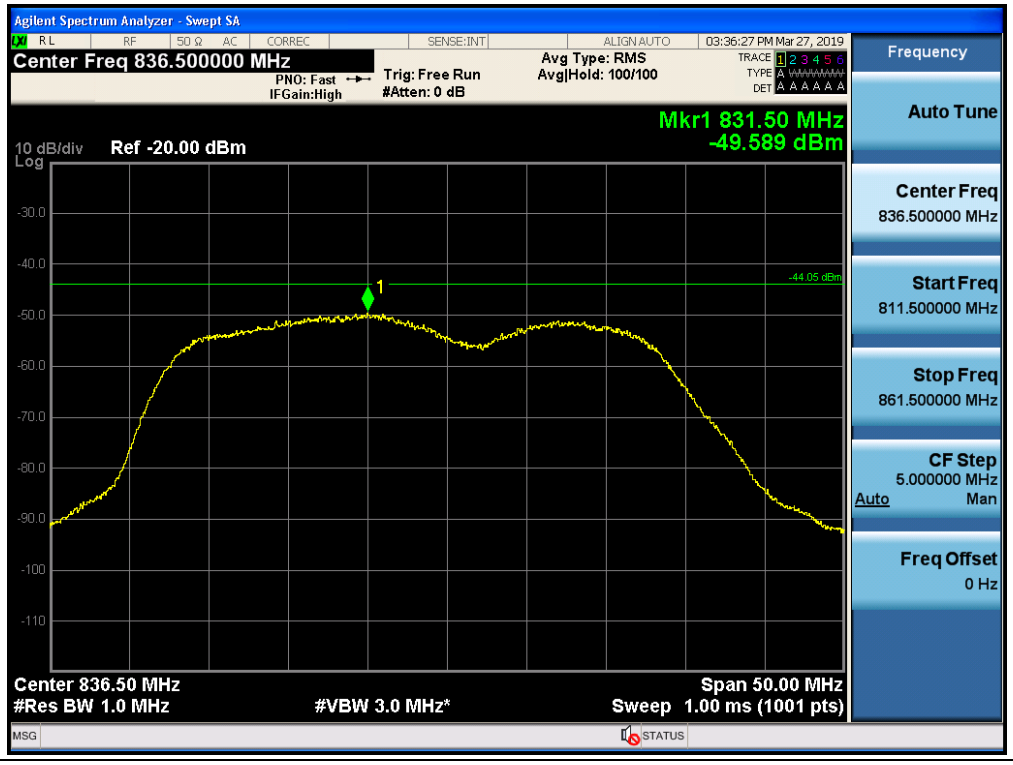
Tabulated Result of Variable Uplink Noise Timing

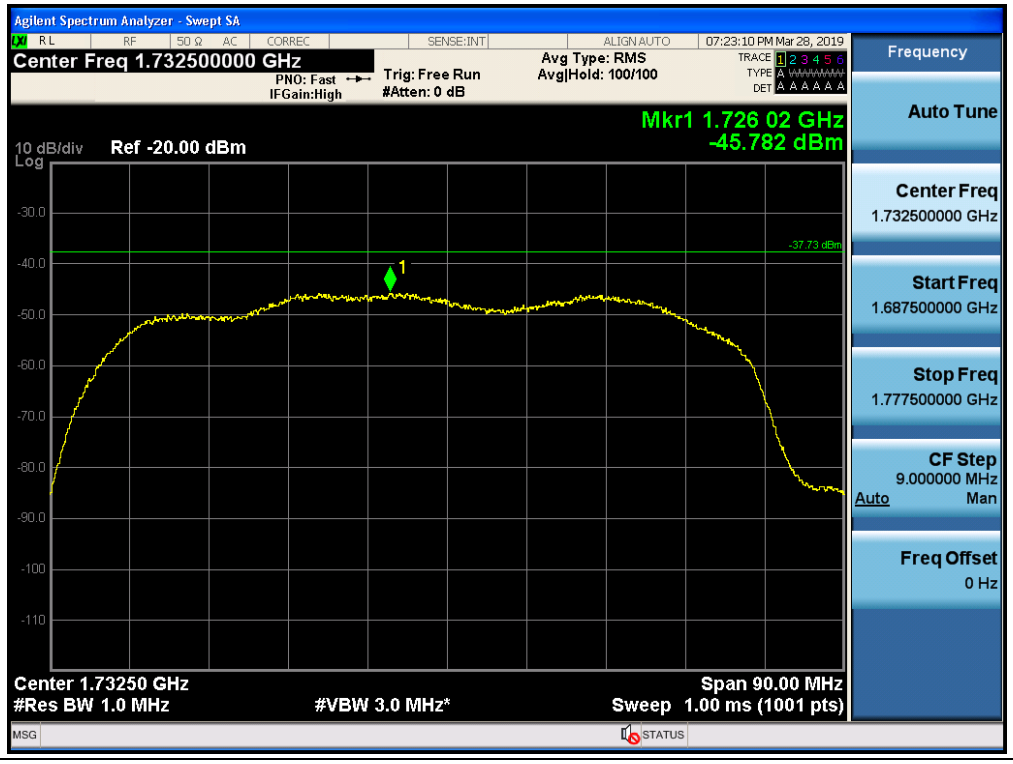
Band	Frequency (MHz)	Limit (ms)	Noise Timing (ms)
Lower 700 MHz	710.000	3 000	50
Upper 700 MHz	781.500		120
Cellular	836.500		180
AWS-1	1 732.500		40
Broadband PCS	1 882.500		240

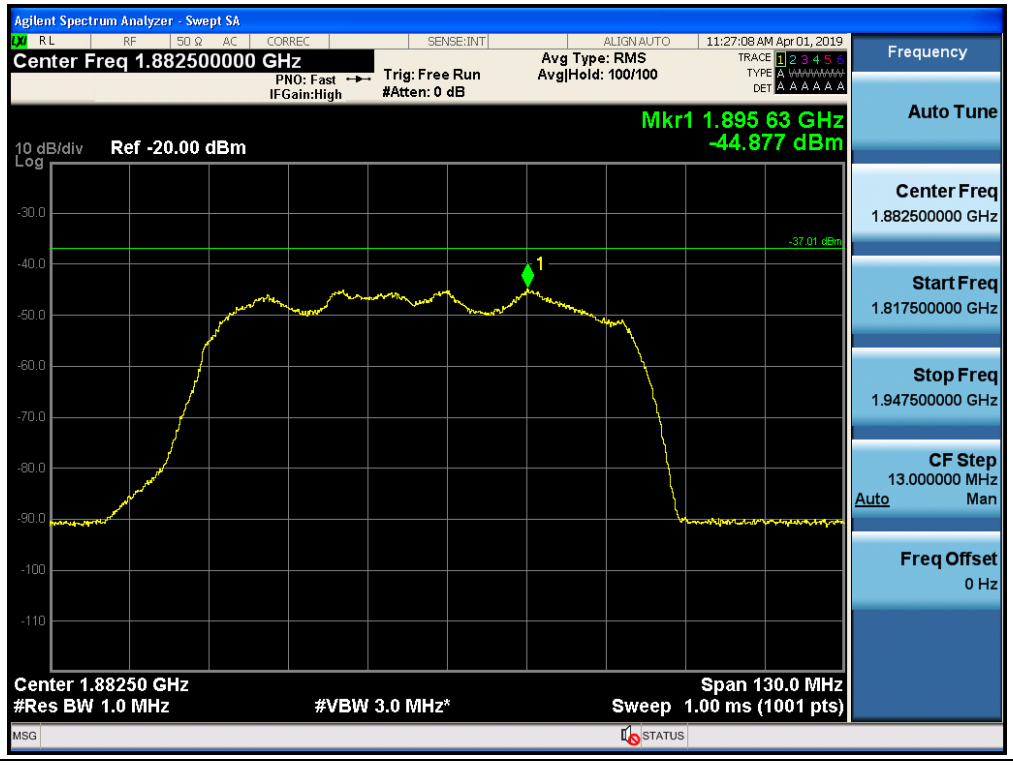
Plot data of Maximum transmitter noise power level

Maximum noise level / Lower 700 MHz / Uplink

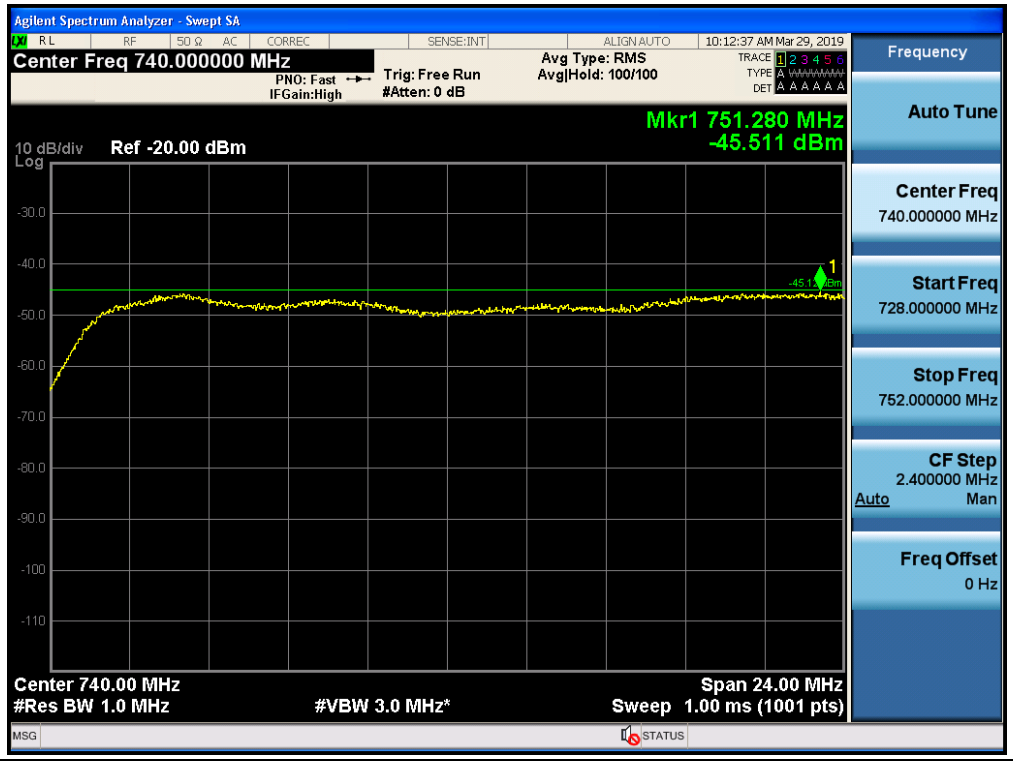

Maximum noise level / Upper 700 MHz / Uplink


Maximum noise level / Cellular / Uplink


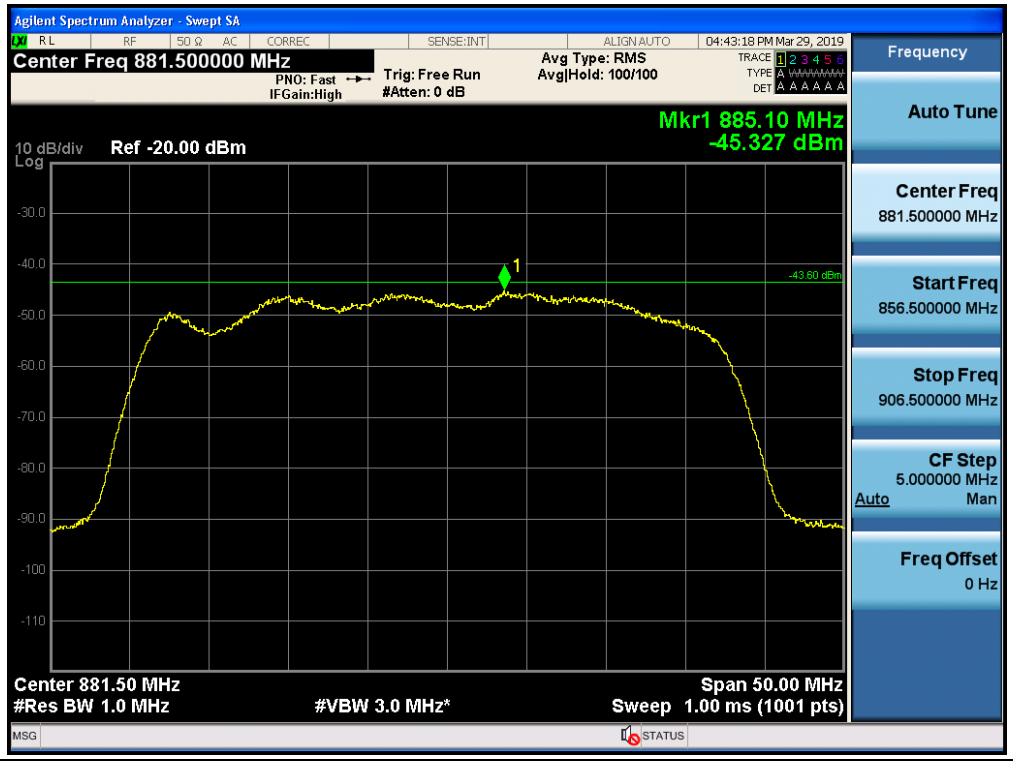
Maximum noise level / AWS-1 / Uplink


Maximum noise level / Broadband PCS / Uplink


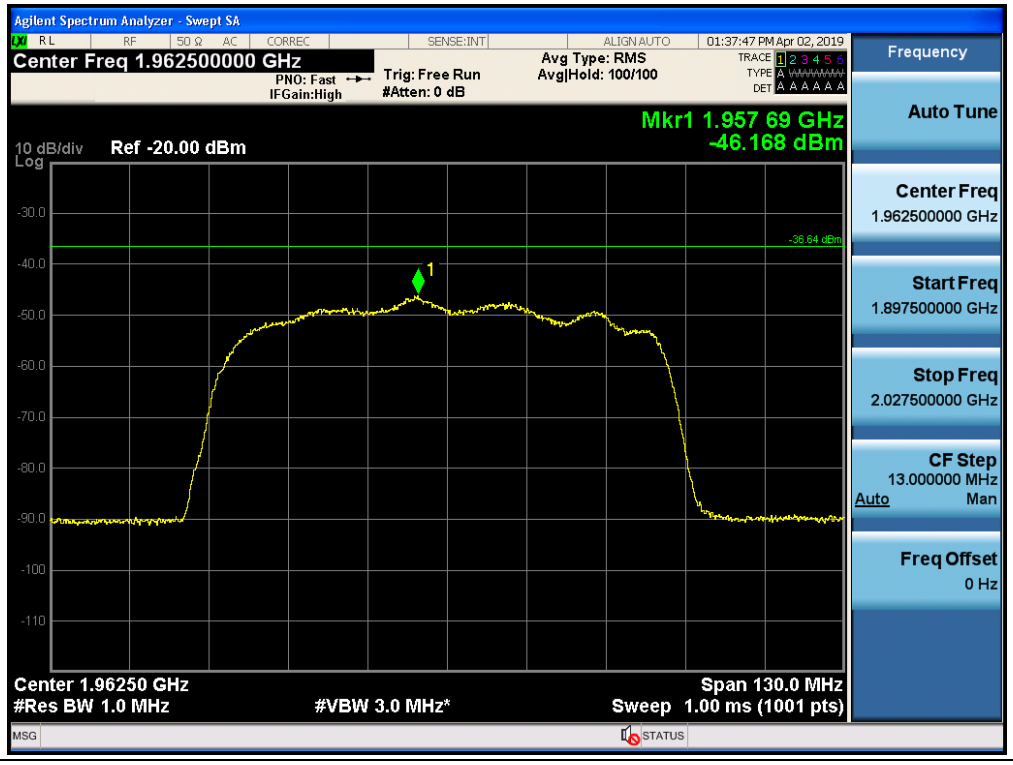
Maximum noise level / Lower 700 MHz / Downlink



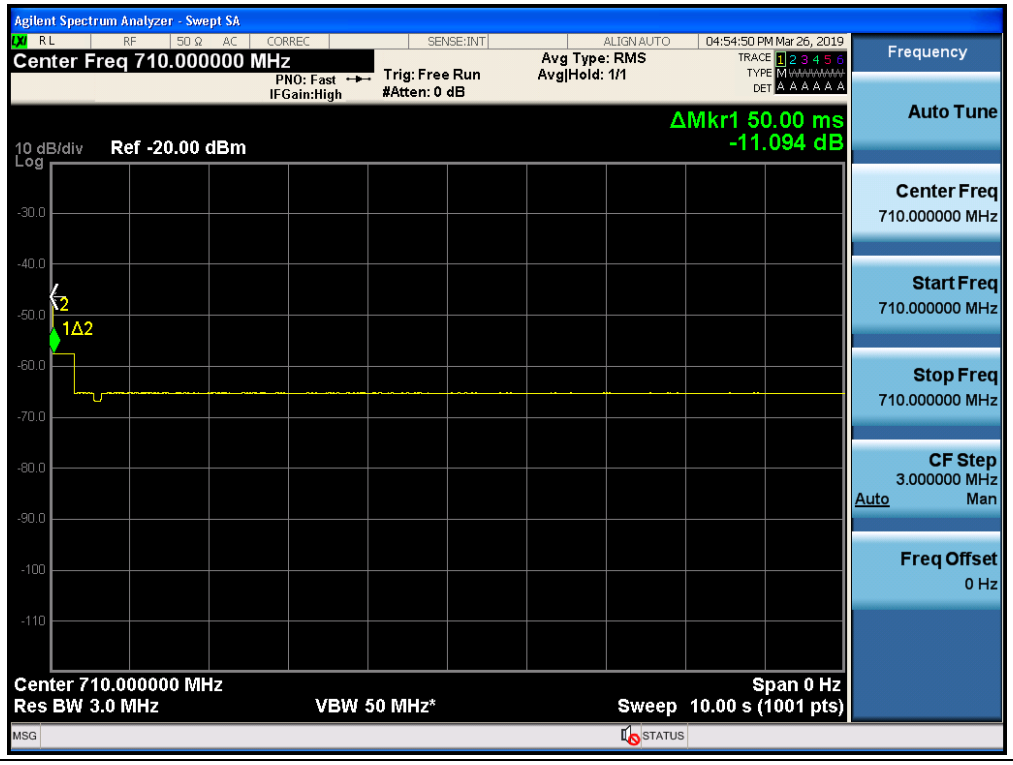
Maximum noise level / Upper 700 MHz / Downlink

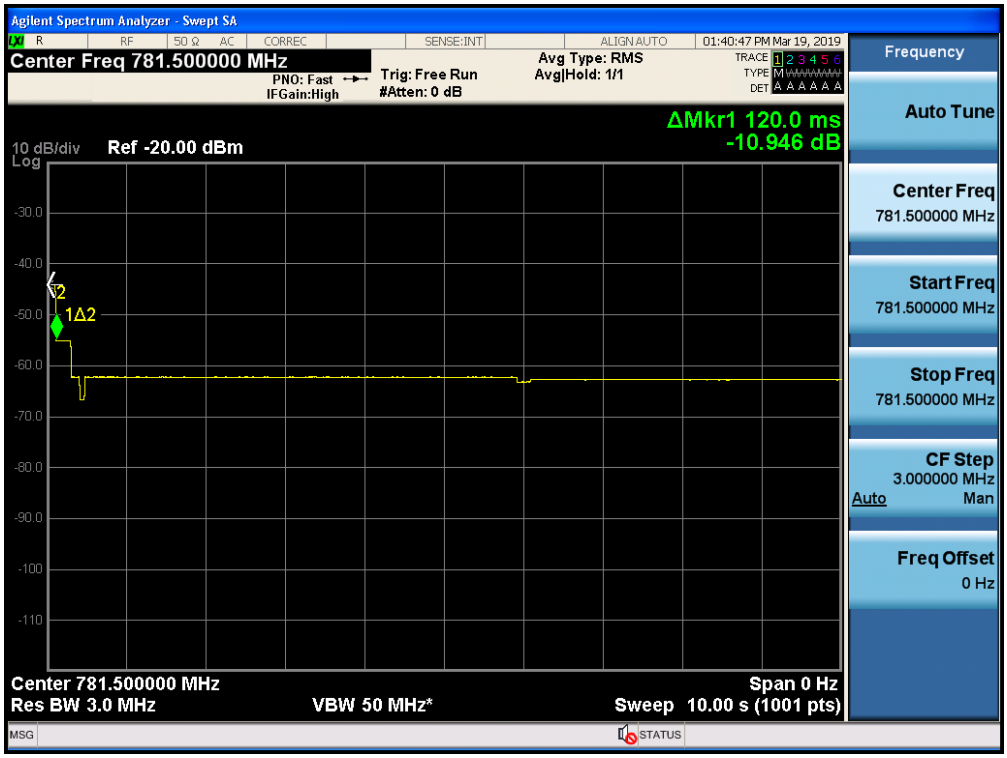
Maximum noise level / Cellular / Downlink


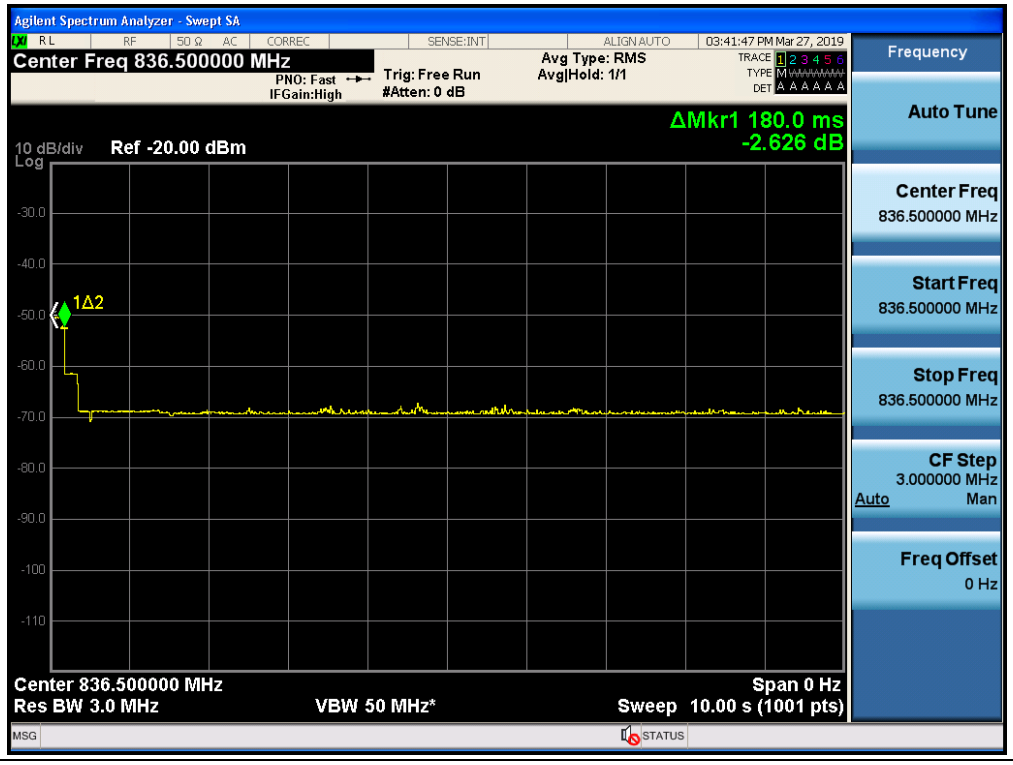
Maximum noise level / AWS-1 / Downlink

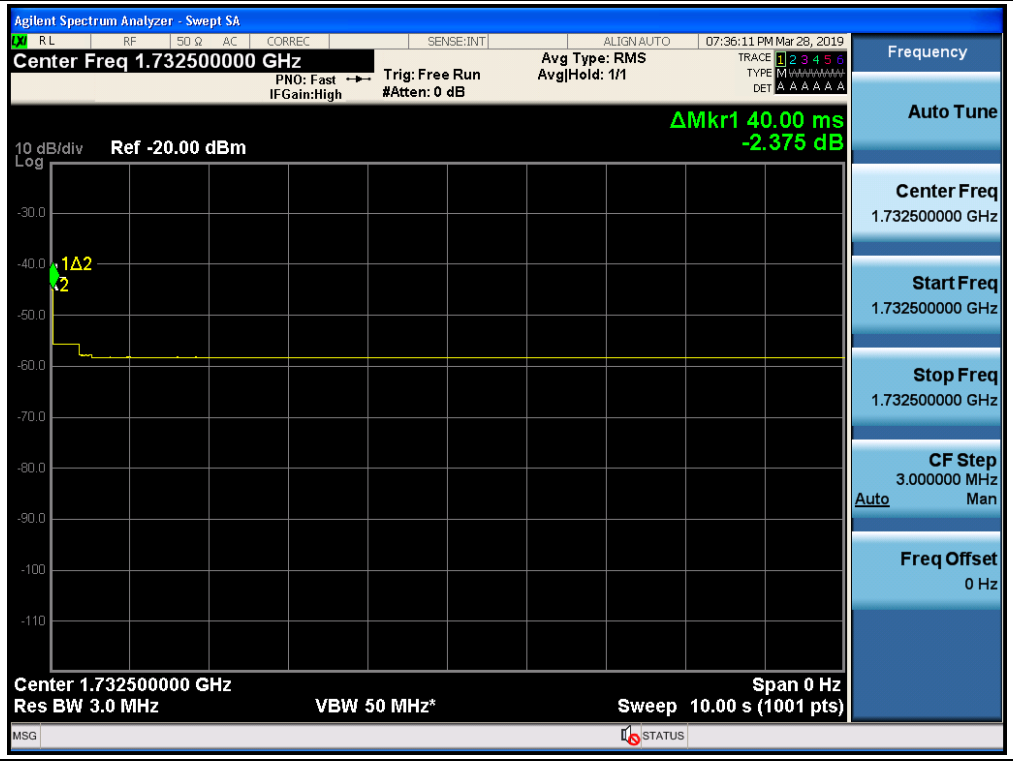

Maximum noise level / Broadband PCS / Downlink


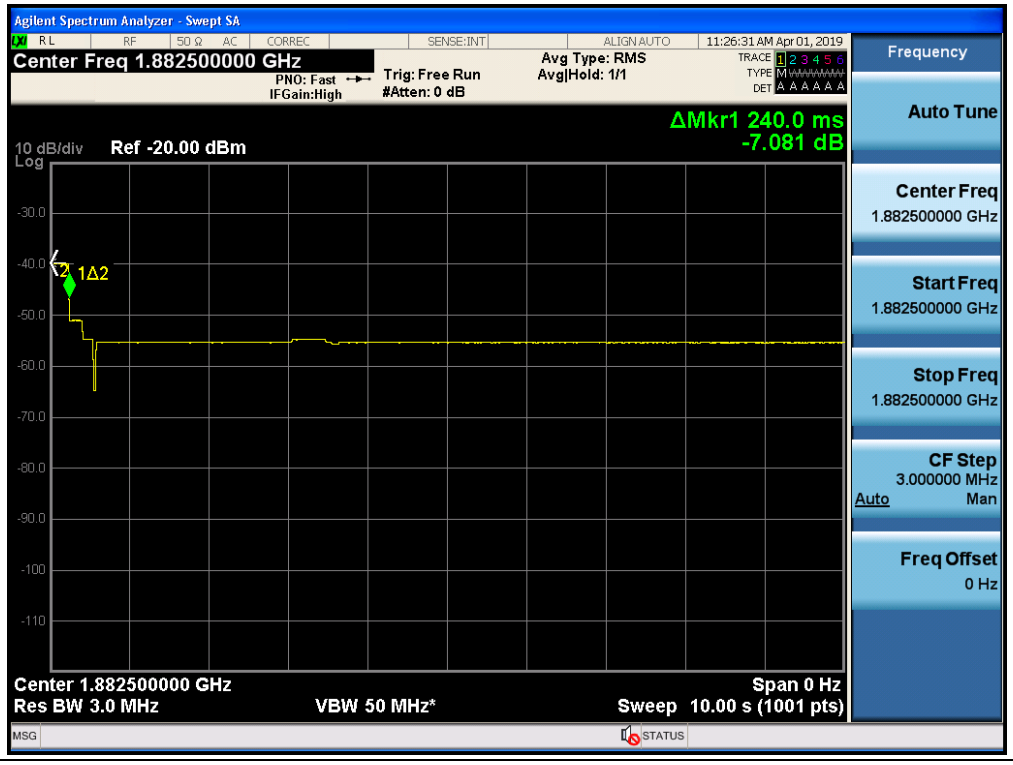
Plot data of Variable Uplink Noise Timing

Uplink Noise Timing / Lower 700 MHz


Uplink Noise Timing / Upper 700 MHz


Uplink Noise Timing / Cellular


Uplink Noise Timing / AWS-1


Uplink Noise Timing / Broadband PCS


5.8. UPLINK INACTIVITY

Test Requirements:

§ 20.21(e)(8)(i)(A) NOISE LIMITS (Uplink).

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 Procedures:

Measurements were in accordance with the test methods section 7.8 of KDB 935210 D03 v04r03.

a) The uplink output (donor) port connected to the spectrum analyzer.

b) Select the power averaging (rms) detector.

c) Set the spectrum analyzer RBW for 1 MHz with the VBW ≥ 3 RBW.

d) Set the center frequency of the spectrum analyzer to the center of the uplink operational band.

e) Set the span for 0 Hz with a single sweep time for a minimum of 330 seconds.

f) Start to capture a new trace using MAX HOLD.

g) After approximately 15 seconds, turn on the EUT power.

h) After the full spectrum analyzer trace is complete, place a MARKER on the leading edge of the pulse, then use the DELTA MARKER METHOD to measure the time until the uplink becomes inactive.

i) Affirm that the noise level is below the uplink inactivity noise power limit, as specified by the rules.

j) Capture the plot for inclusion in the test report.

k) Measure noise using procedures in a) to f).

l) Repeat d) through k) for all operational uplink bands.

Note1. Test limit is applied both time (5 minutes) and level (-70 dBm/MHz) in § 20.21(e)(8)(i)(A)

Test Result:

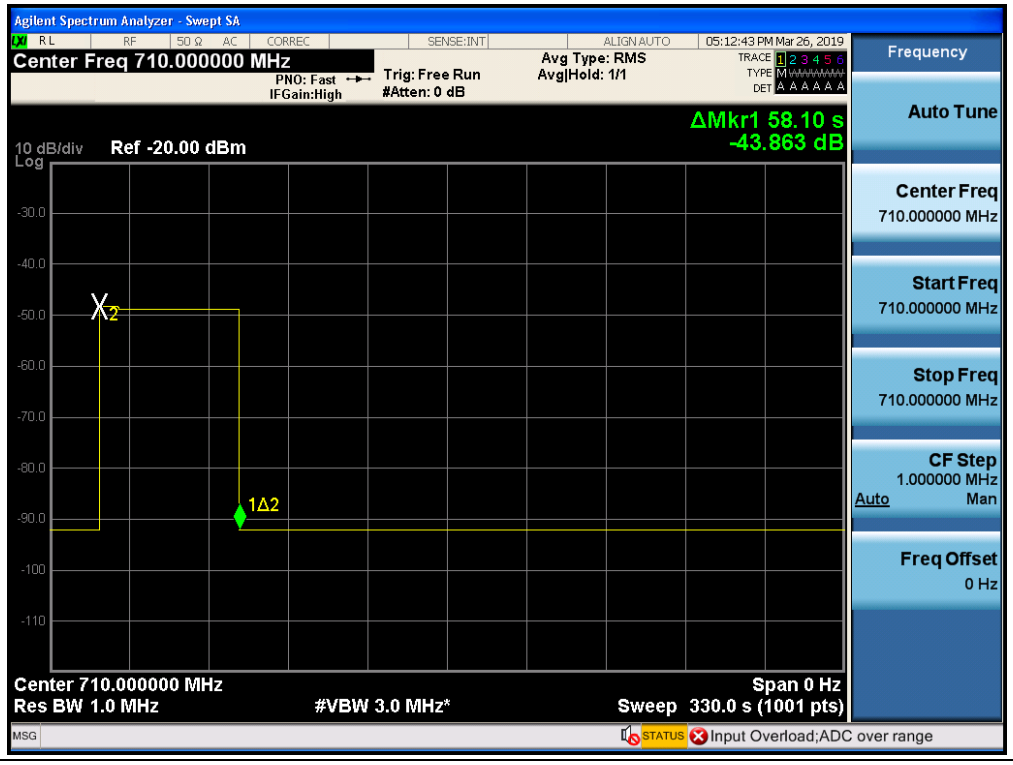
Tabulated Result of Uplink Inactivity

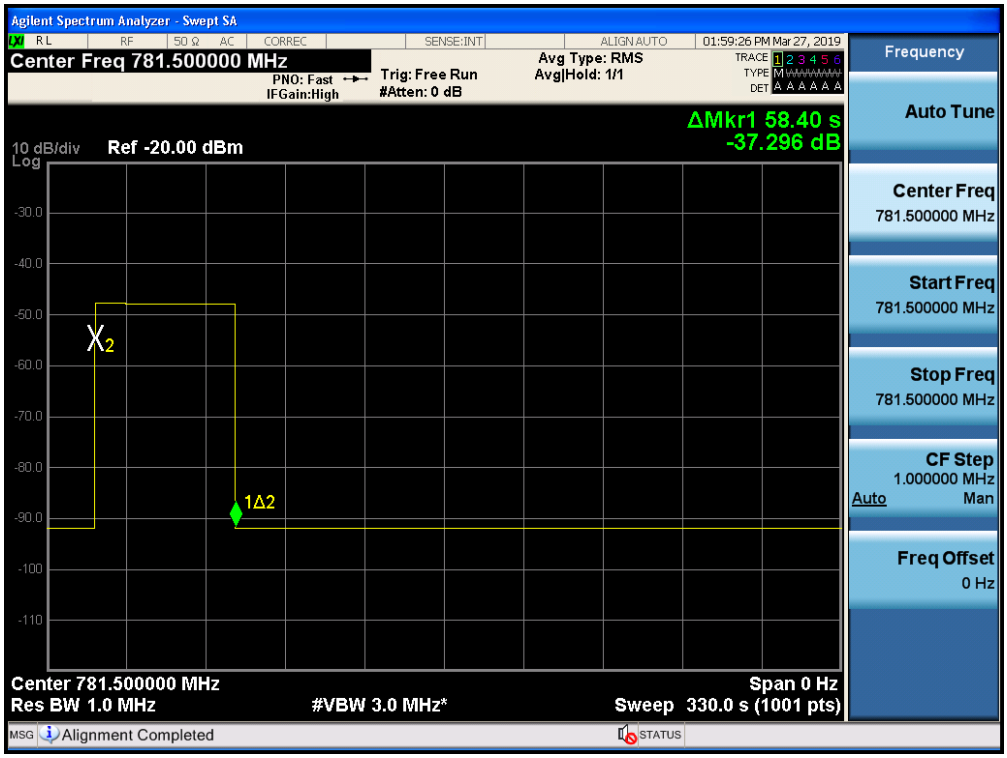
Band	Frequency (MHz)	Time Limit (s)	Inactivity Timing (s)
Lower 700 MHz	710.000	3 000	58.10
Upper 700 MHz	781.500		58.40
Cellular	836.500		58.40
AWS-1	1 732.500		58.10
Broadband PCS	1 882.500		58.40

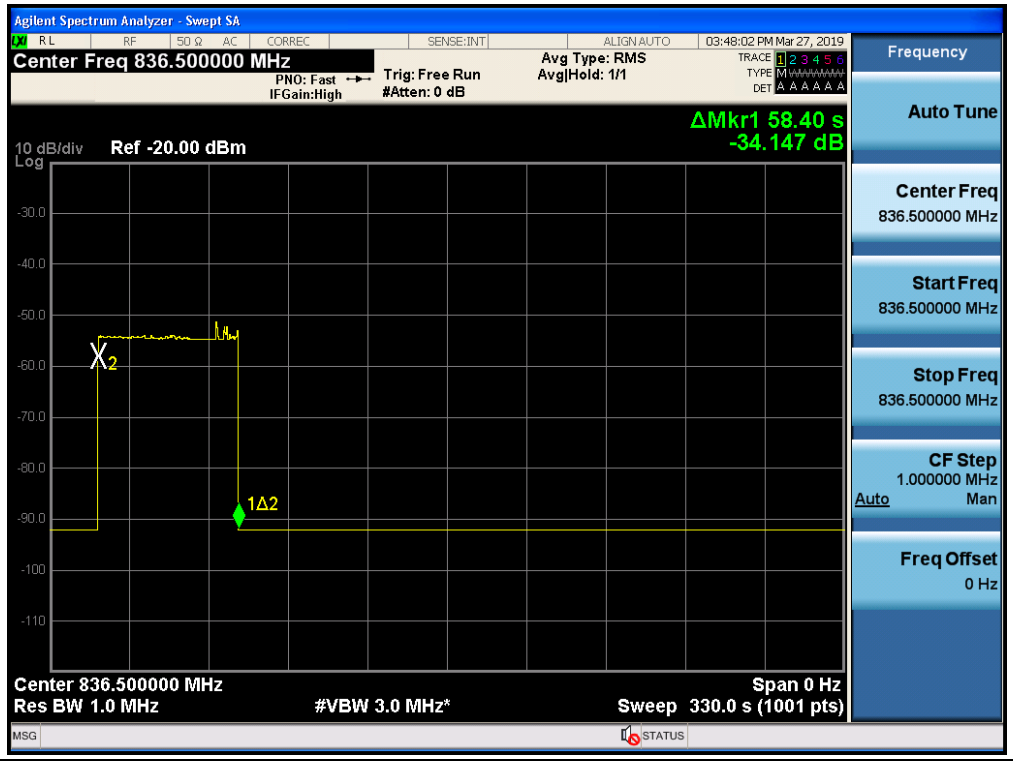
Tabulated Result of Uplink Inactivity Noise

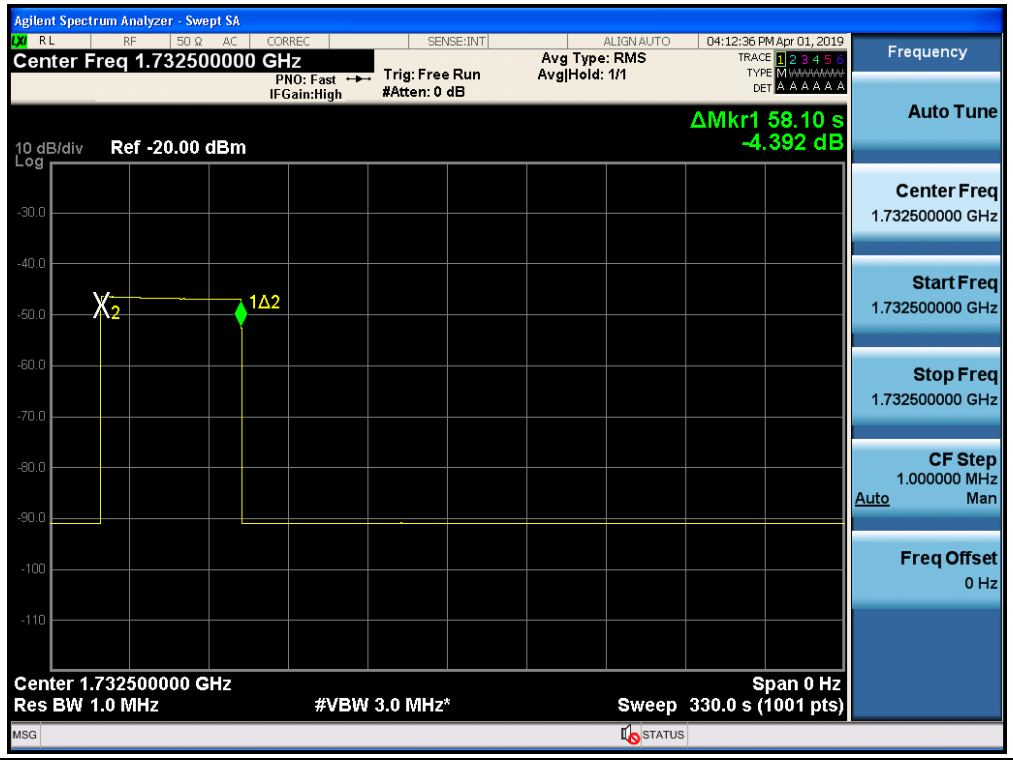
Band	Frequency (MHz)	Noise Limit (dBm/MHz)	Noise Level (dBm/MHz)
Lower 700 MHz	712.640	-70	-91.295
Upper 700 MHz	783.106		-90.789
Cellular	821.60		-91.029
AWS-1	1 752.48		-89.850
Broadband PCS	1 865.08		-89.178

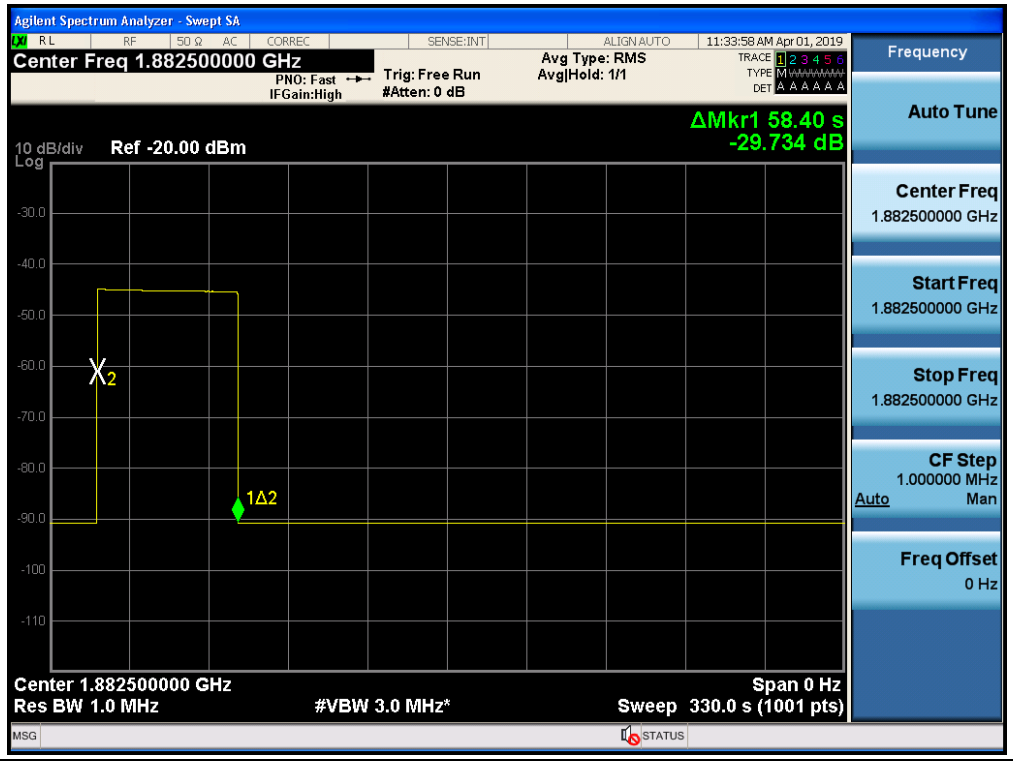
Plot data of Inactivity timing

Inactivity Timing / Lower 700 MHz


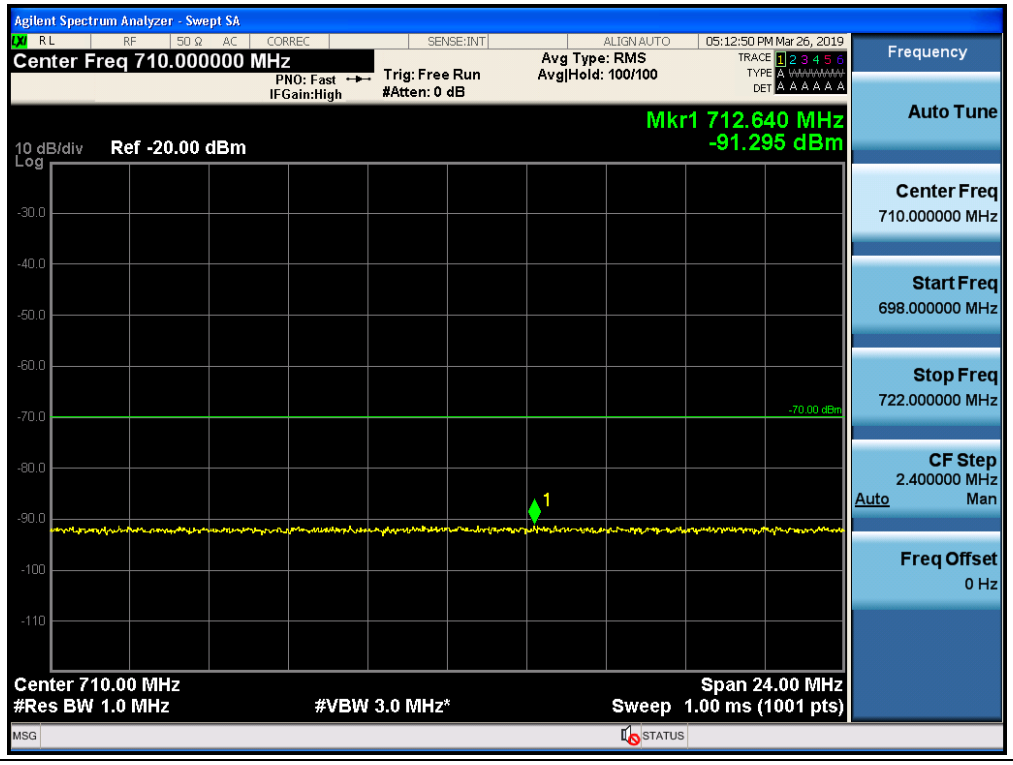
Inactivity Timing / Upper 700 MHz


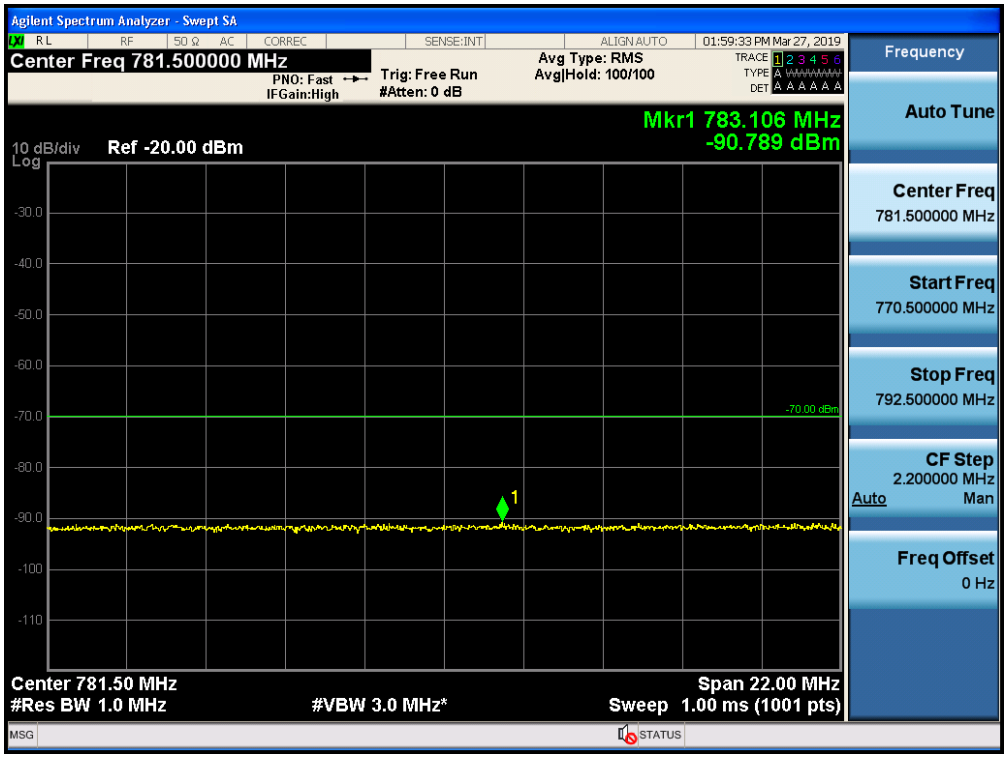
Inactivity Timing / Cellular


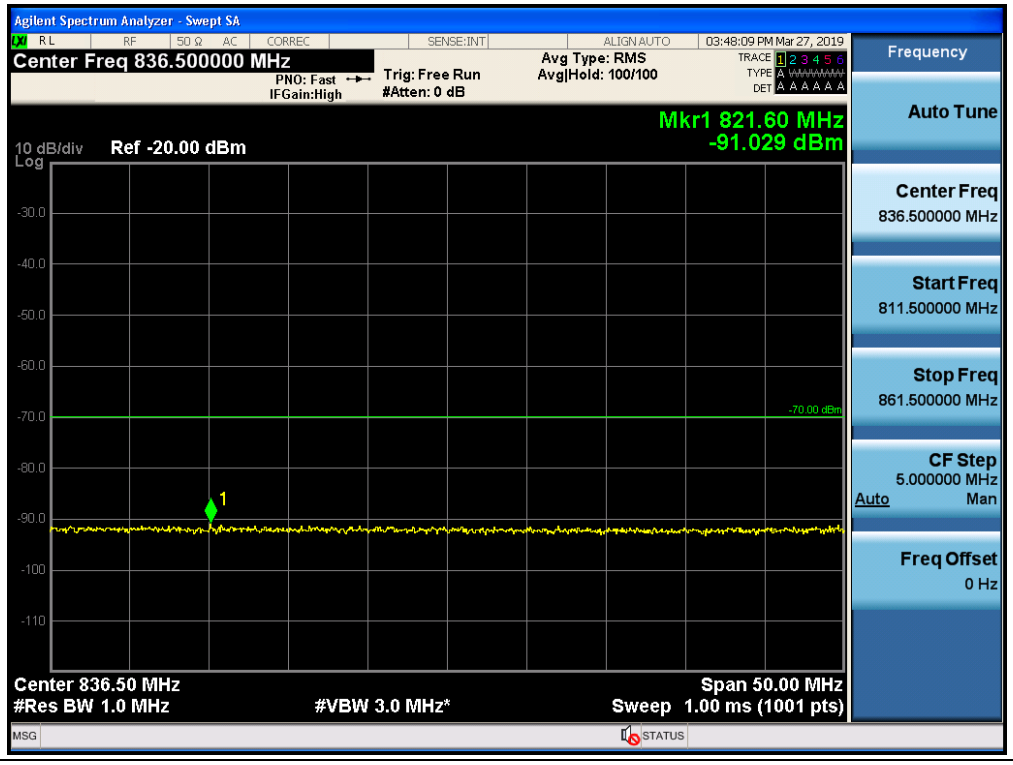
Inactivity Timing / AWS-1


Inactivity Timing / Broadband PCS


Plot data of Inactivity Noise Level

Inactivity Noise Level / Lower 700 MHz


Inactivity Noise Level / Upper 700 MHz


Inactivity Noise Level / Cellular


Inactivity Noise Level / AWS-1