8. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

Test Requirement(s): § 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 resolution 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 the measured power is integrated over the full required measurement 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.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

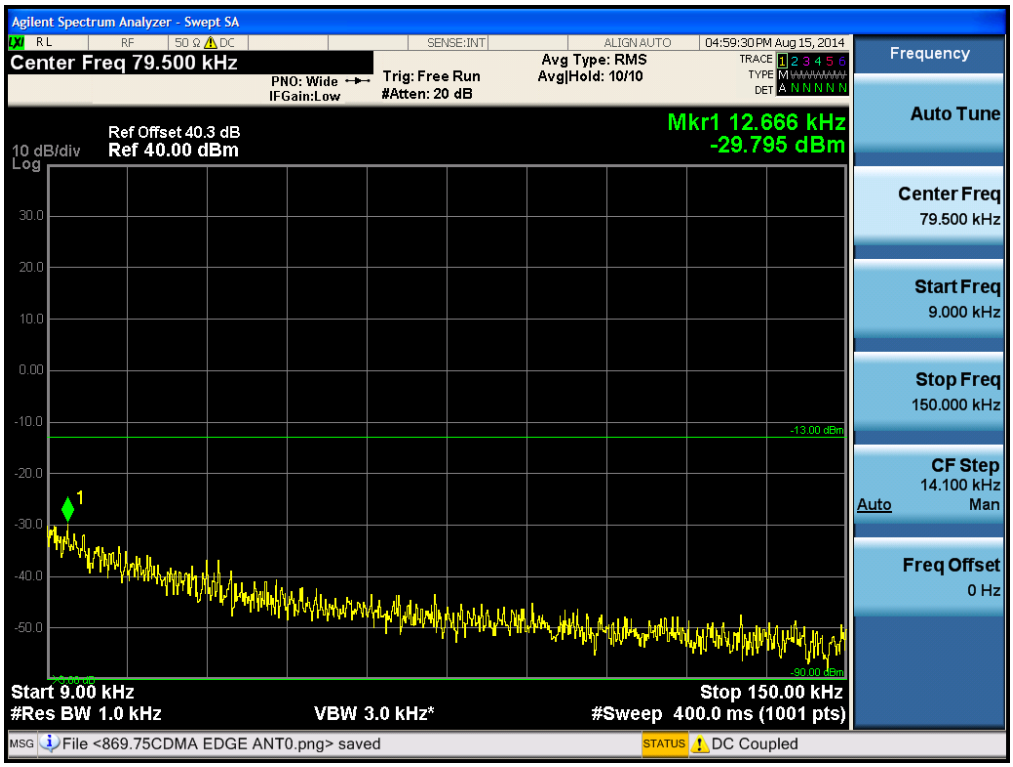
(d) Interference caused by out of band emissions. If any emission from a transmitter

operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

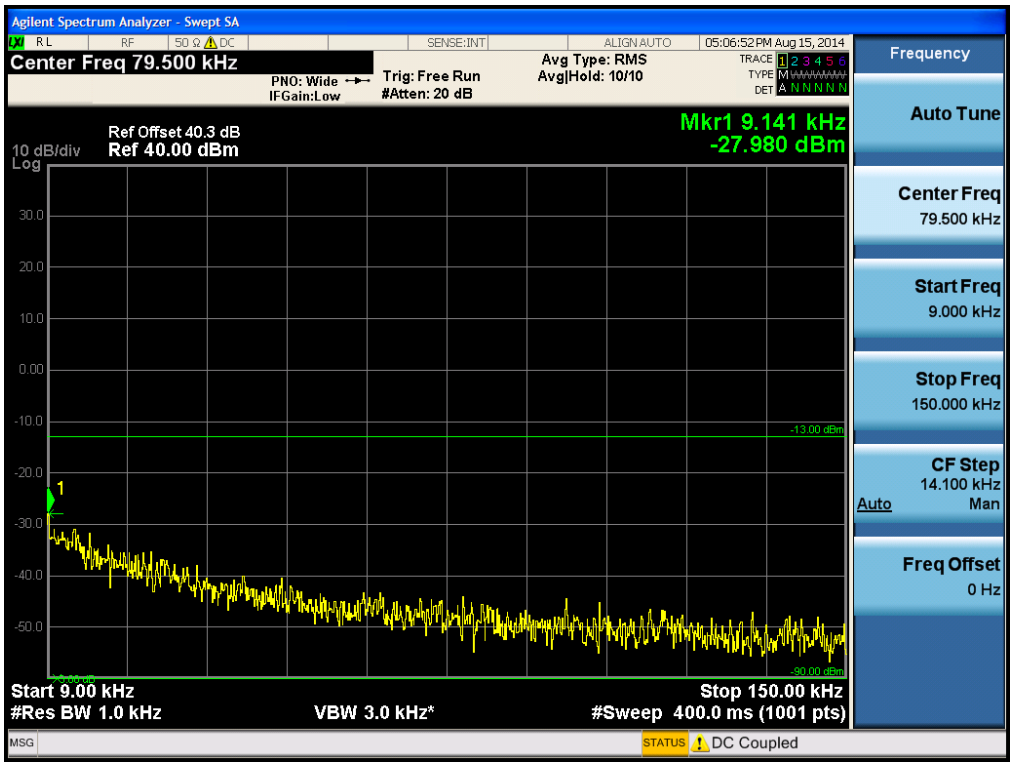
Plots of Spurious Emission

Conducted Spurious Emissions (9 kHz – 150 kHz)

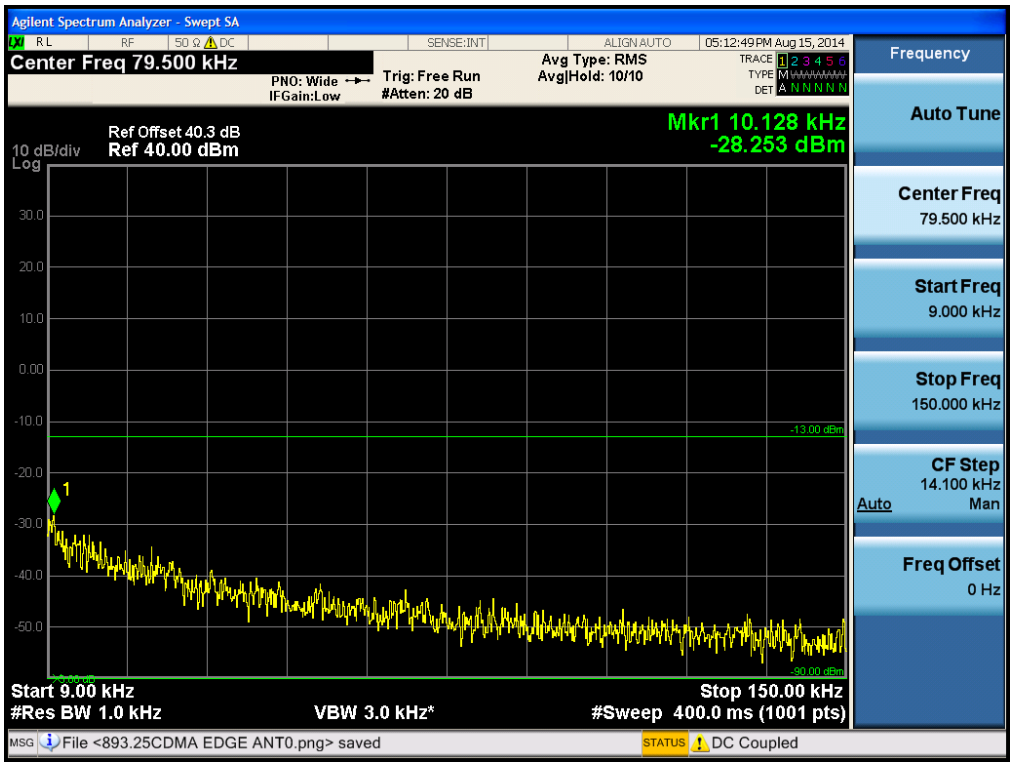
[CDMA Downlink Low]



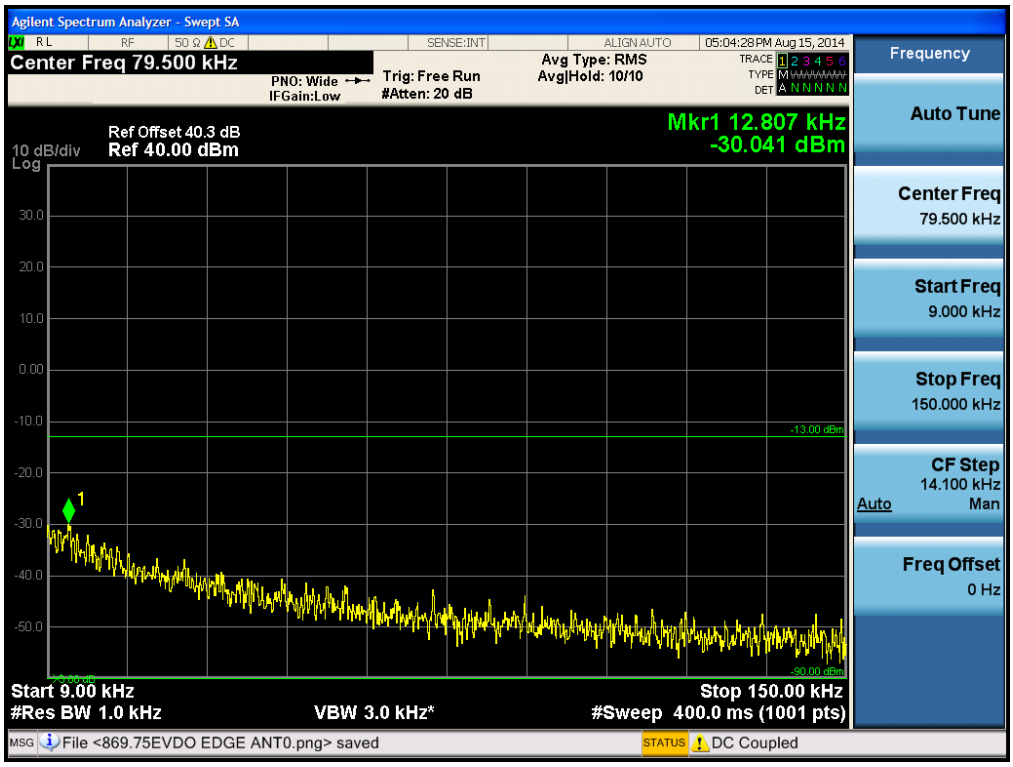
[CDMA Downlink Middle]



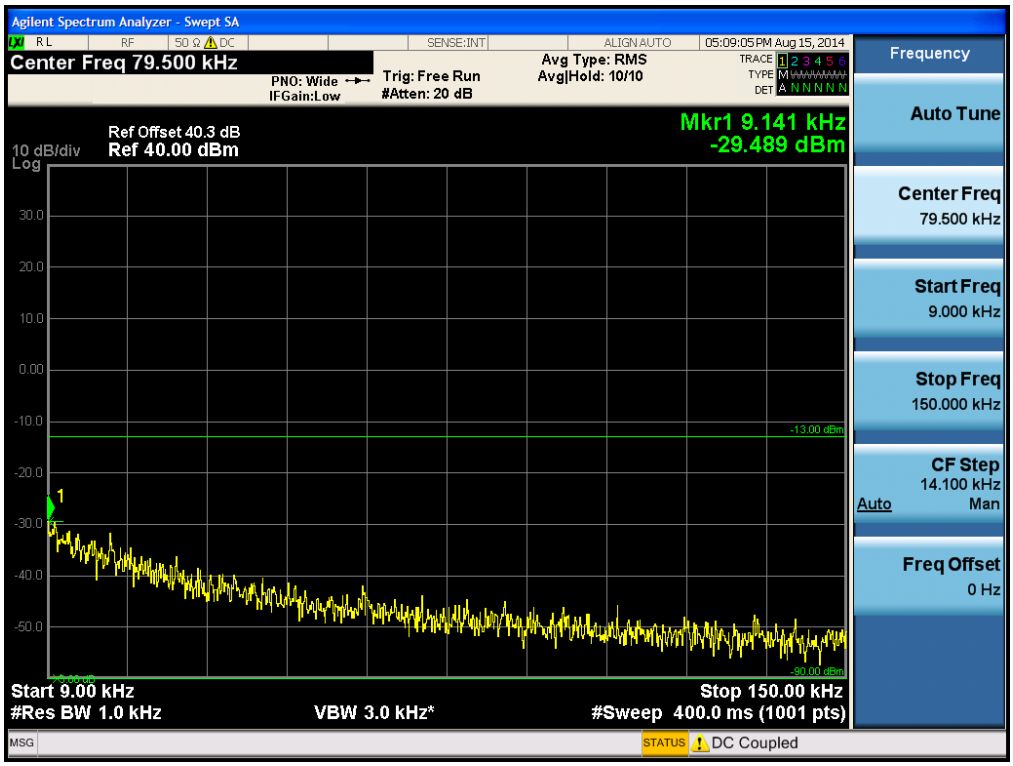
[CDMA Downlink High]



[EVDO Downlink Low]



[EVDO Downlink Middle]



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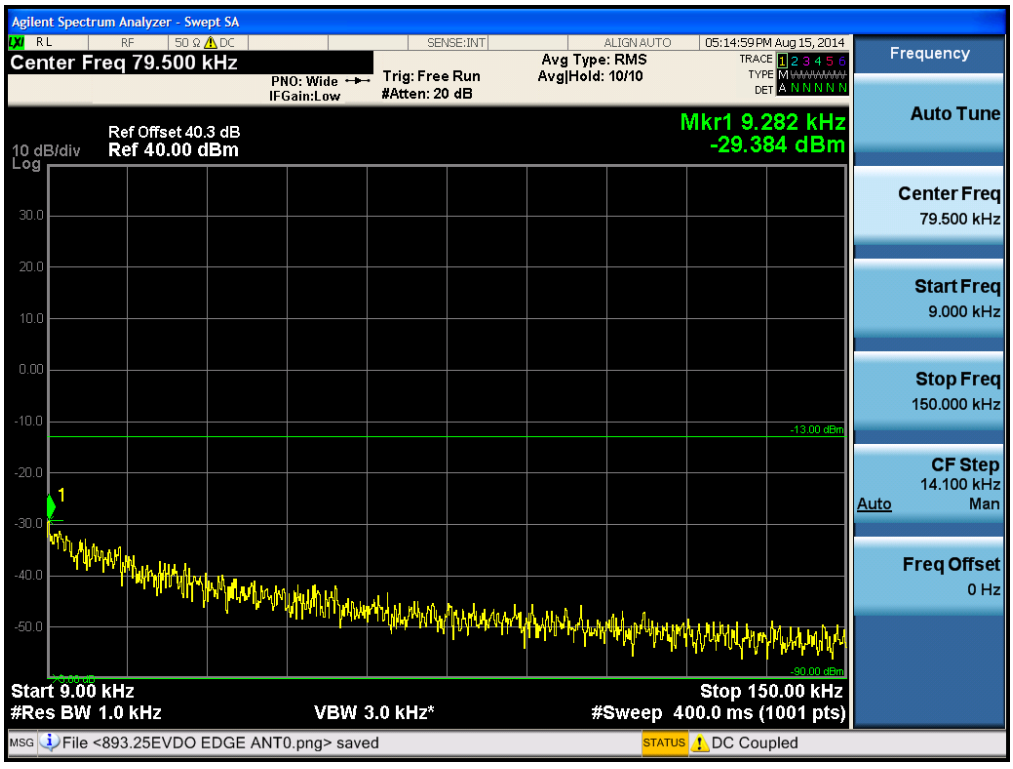
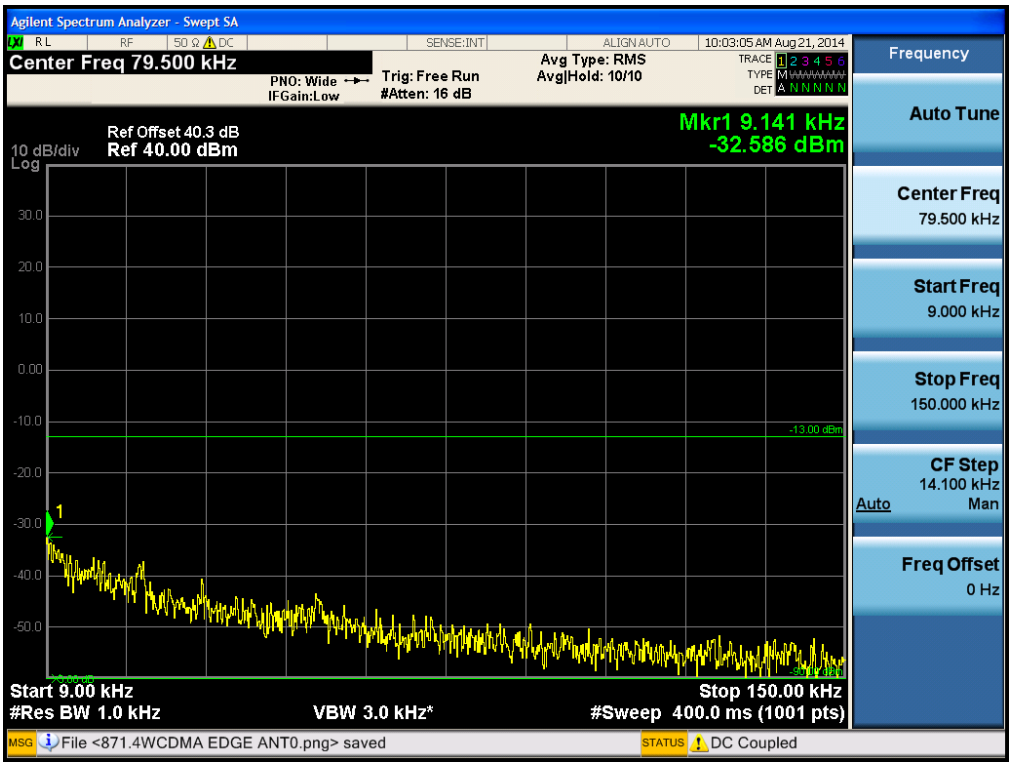
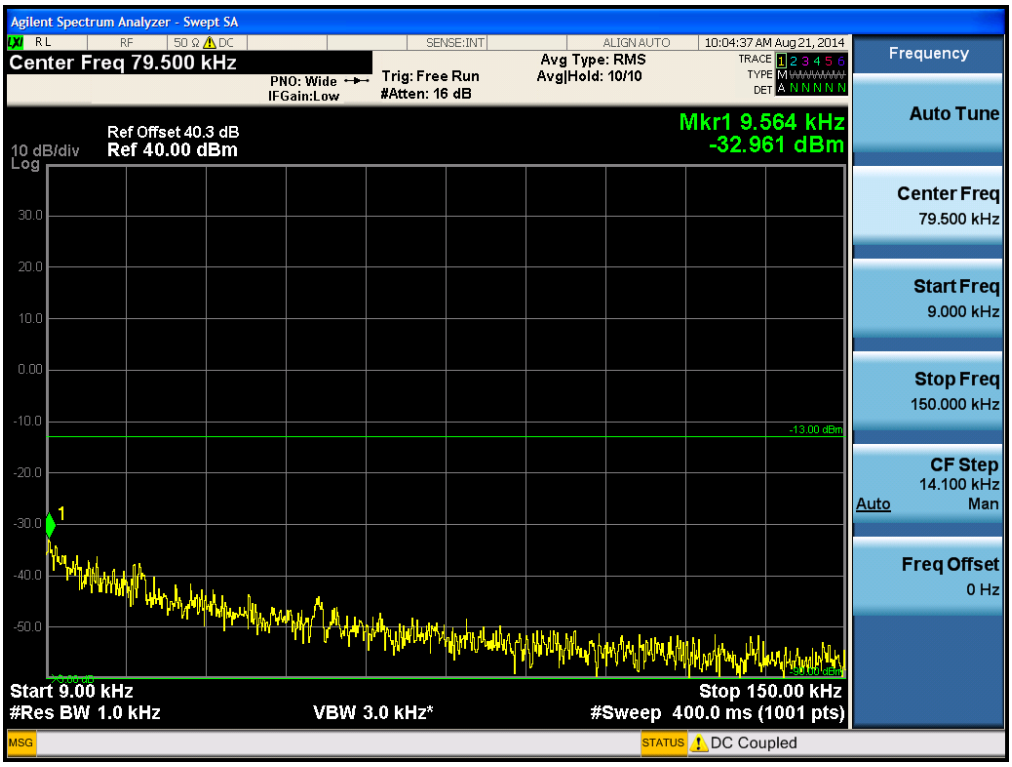


[WCDMA Downlink Low]



[WCDMA Downlink Middle]



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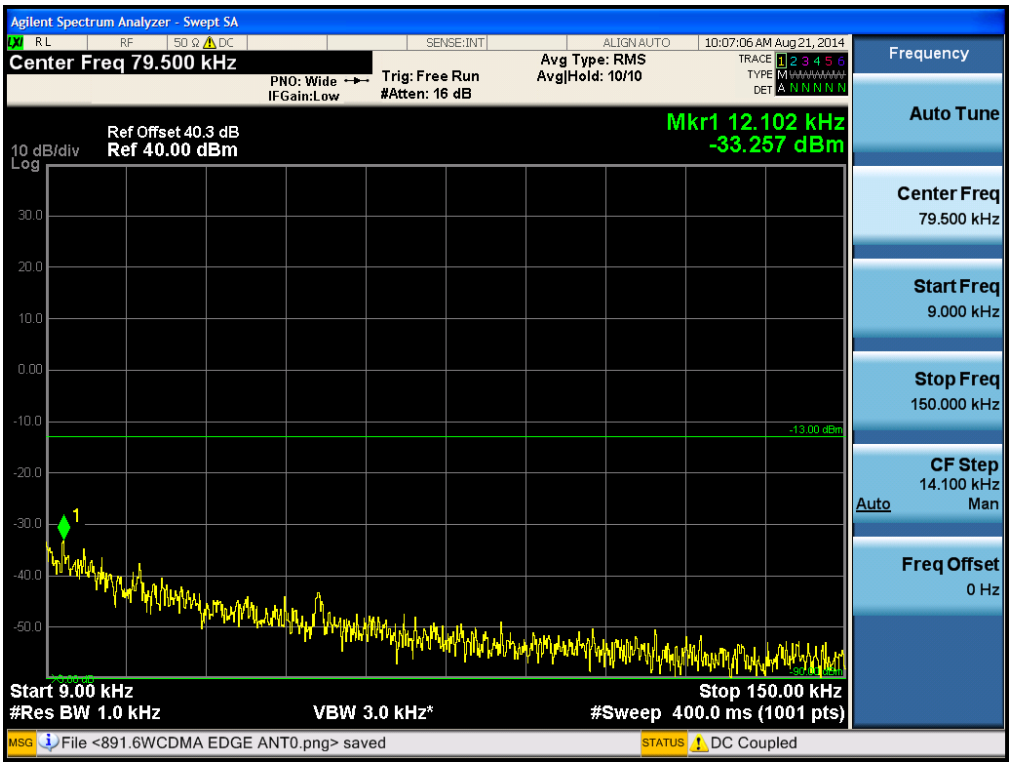

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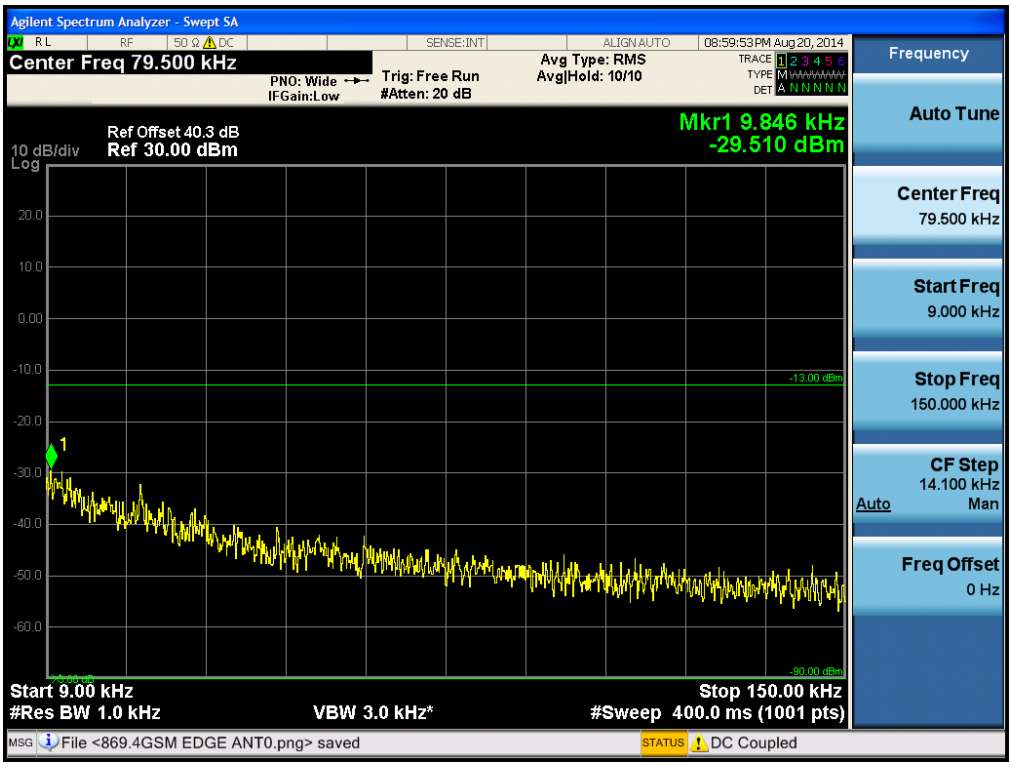

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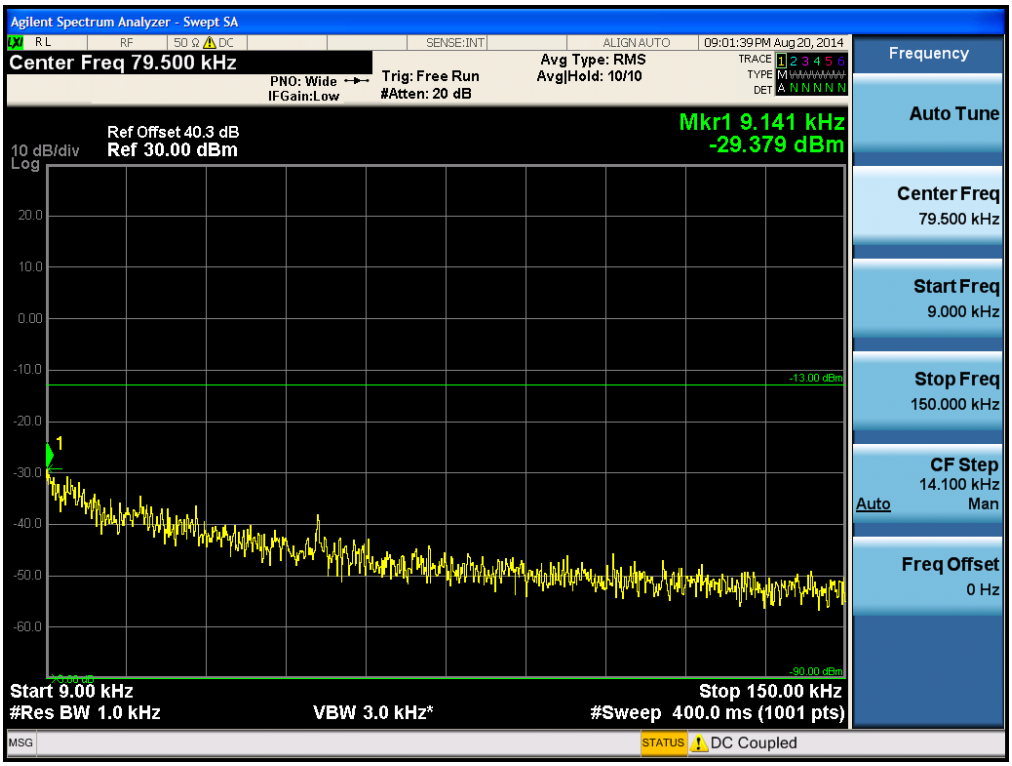

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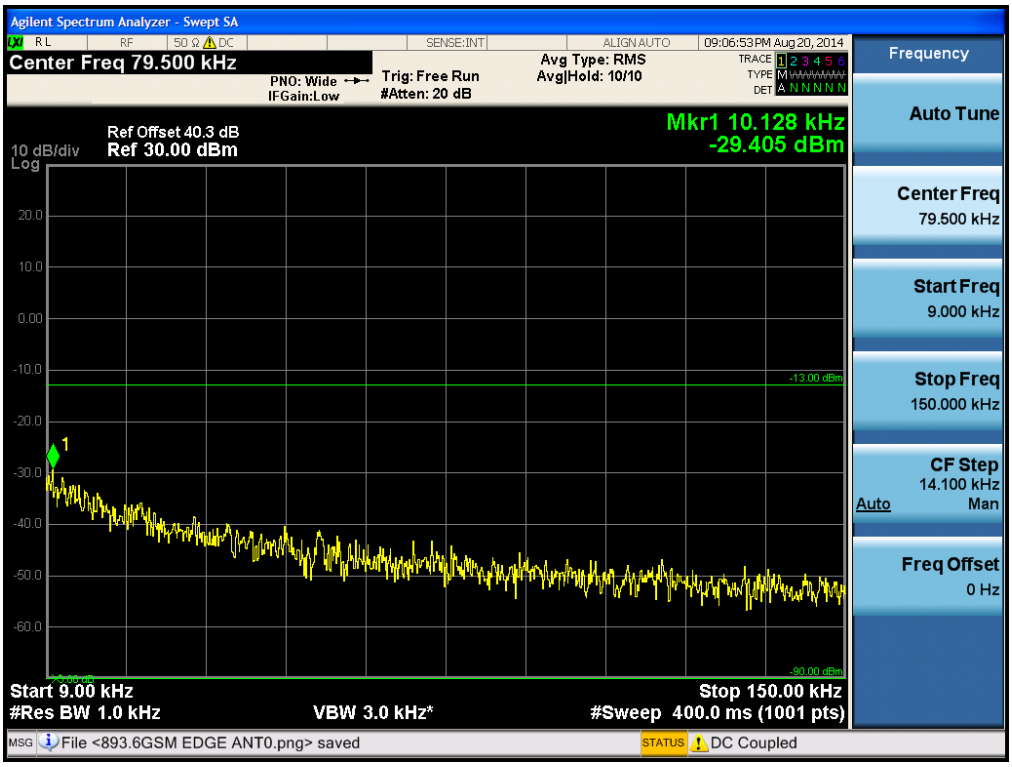

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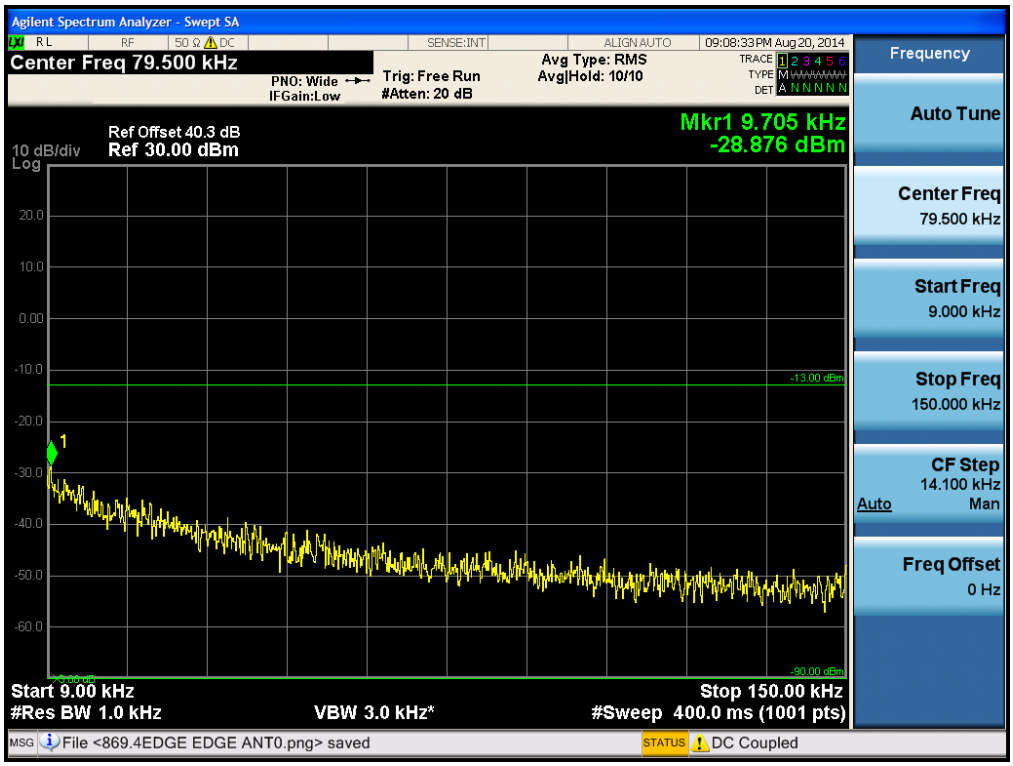

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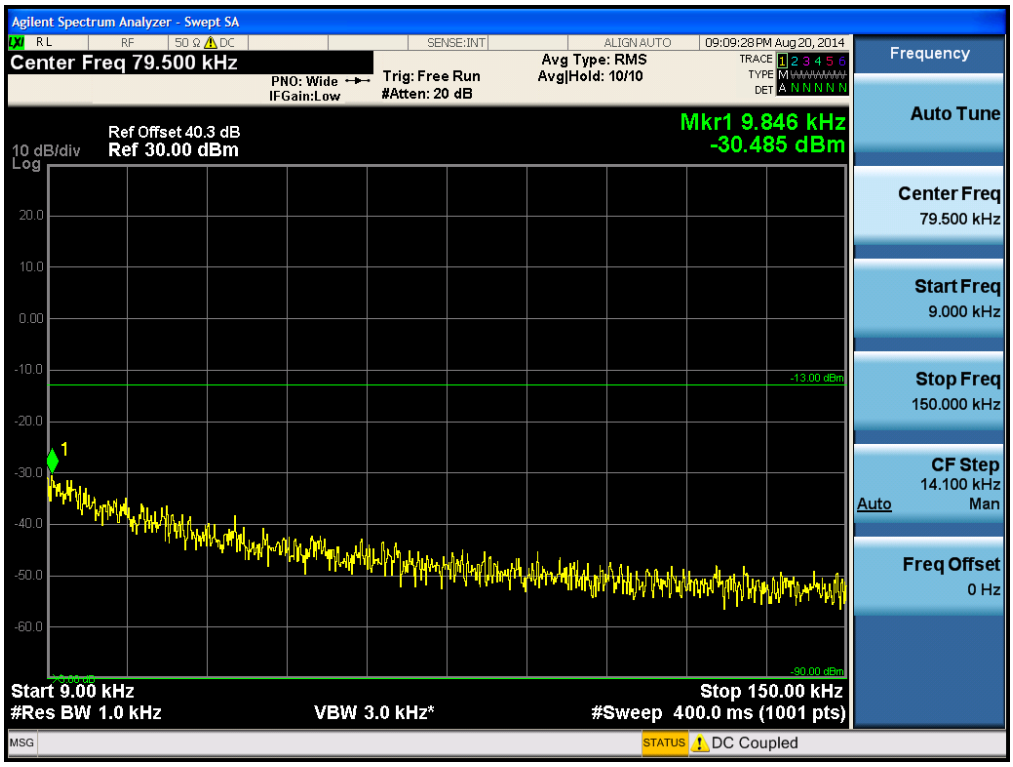

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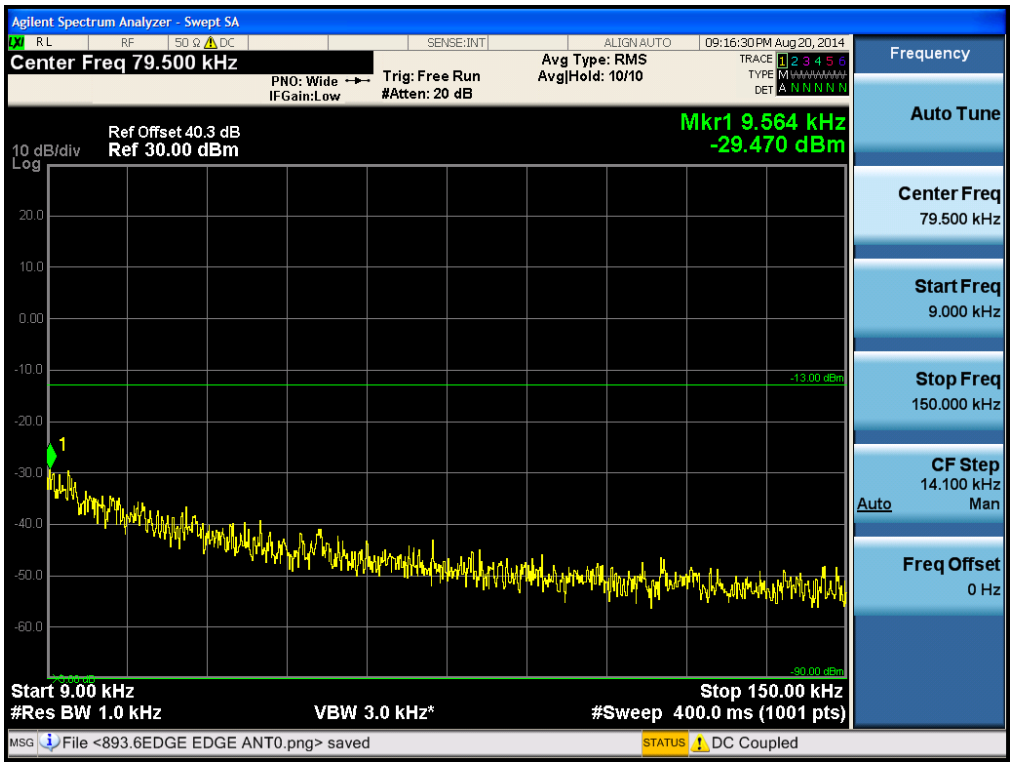
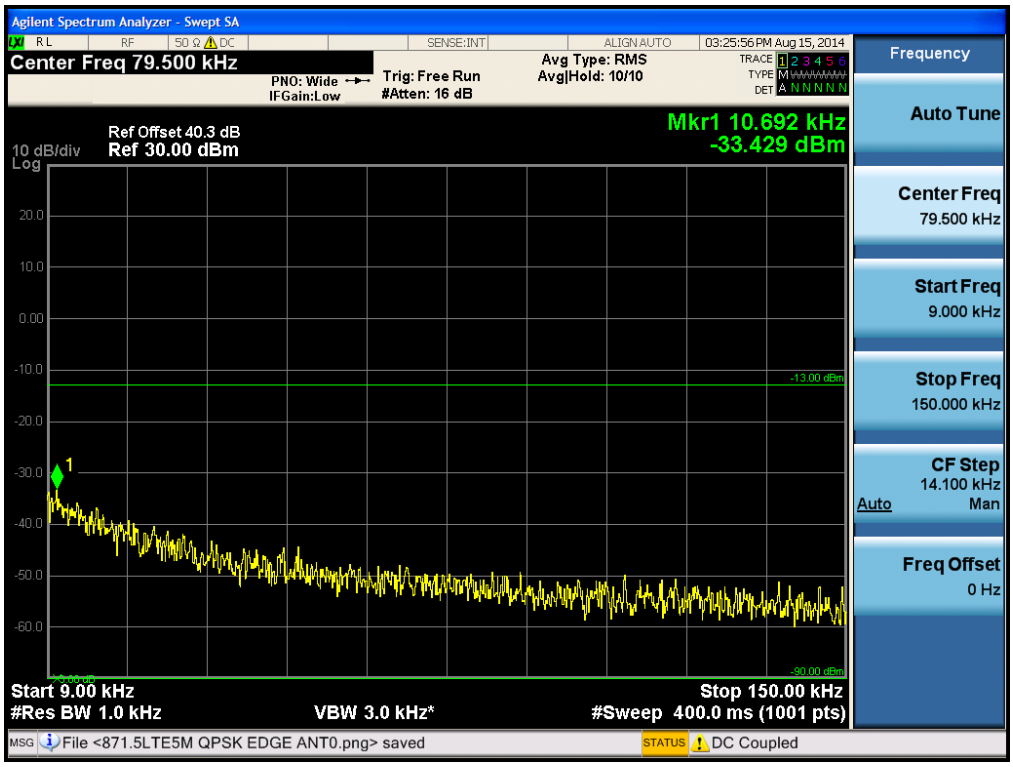


[LTE Downlink 5 MHz Low]



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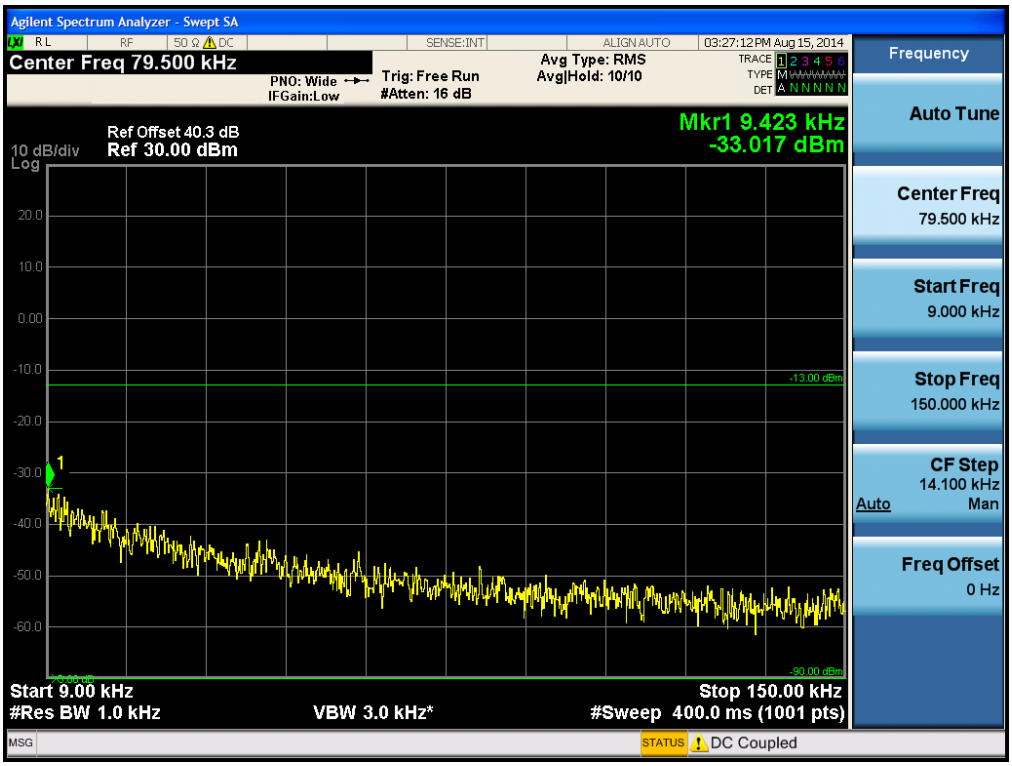

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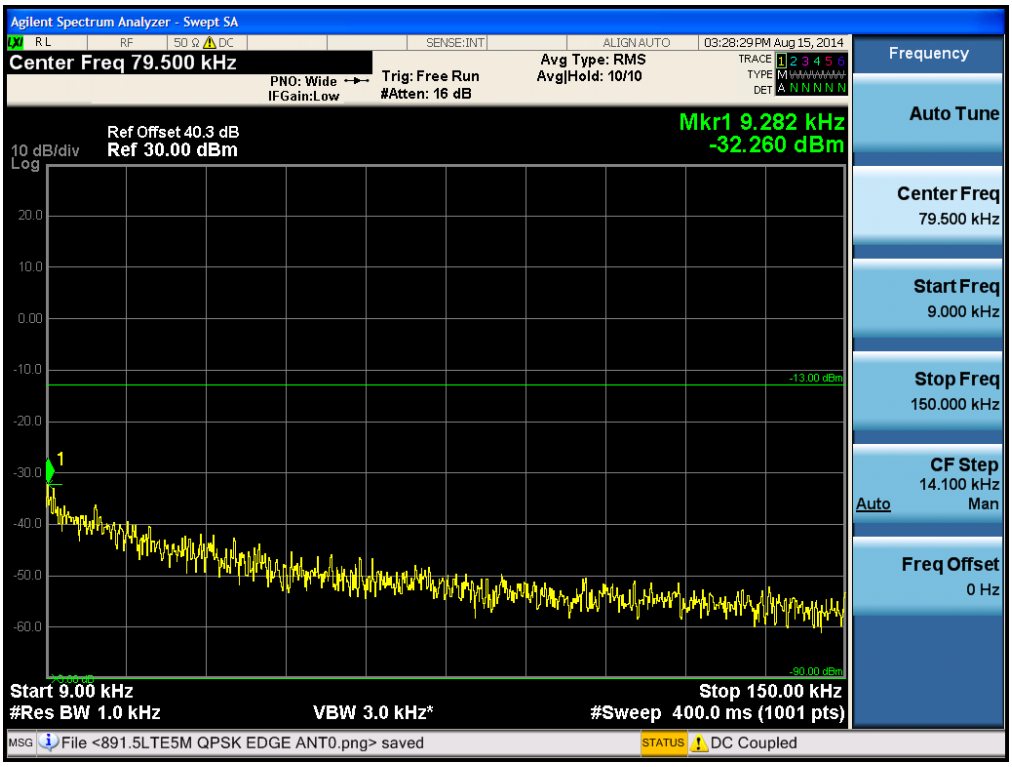
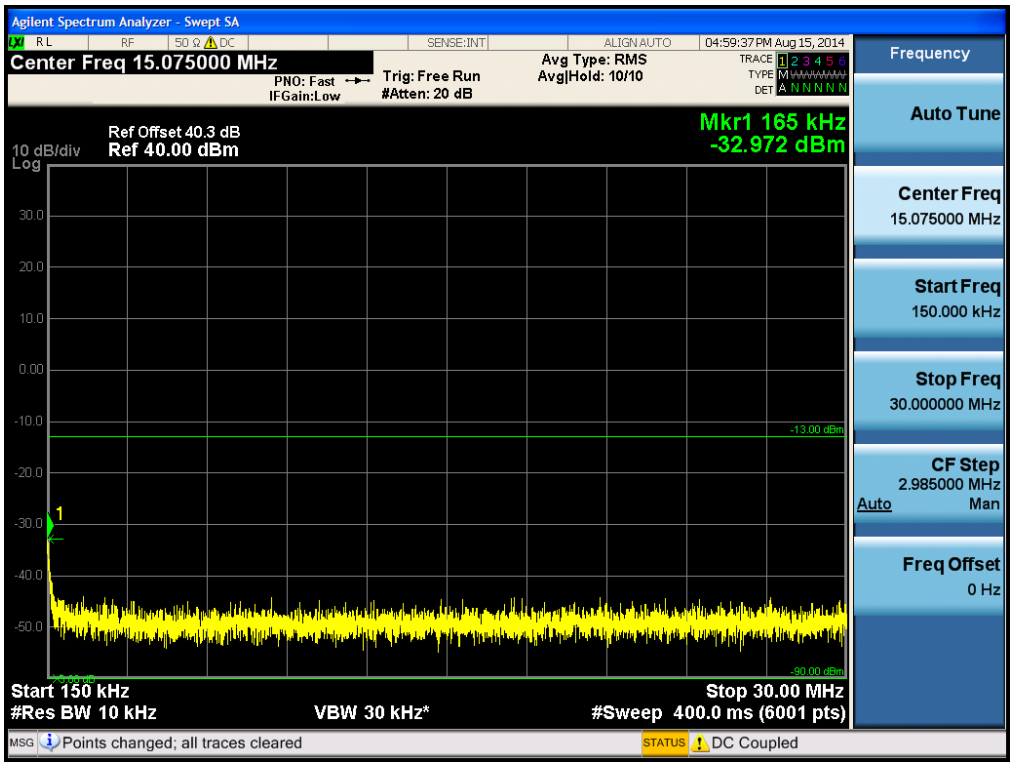


Conducted Spurious Emissions (150 kHz – 30 MHz)

[CDMA Downlink Low]



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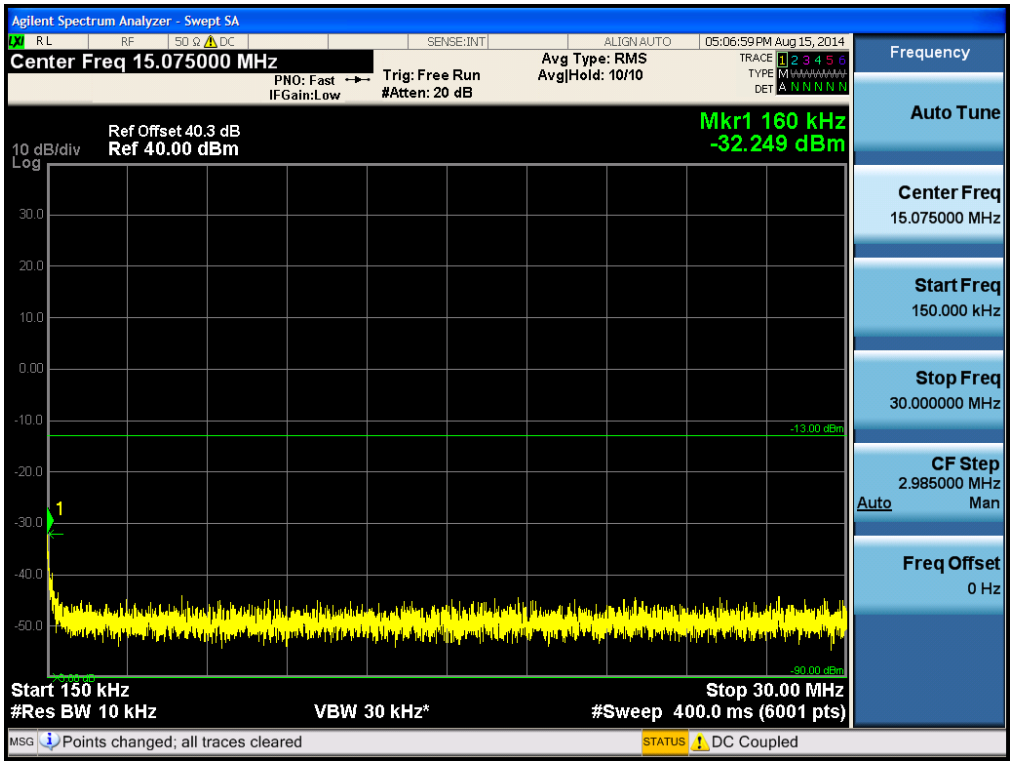

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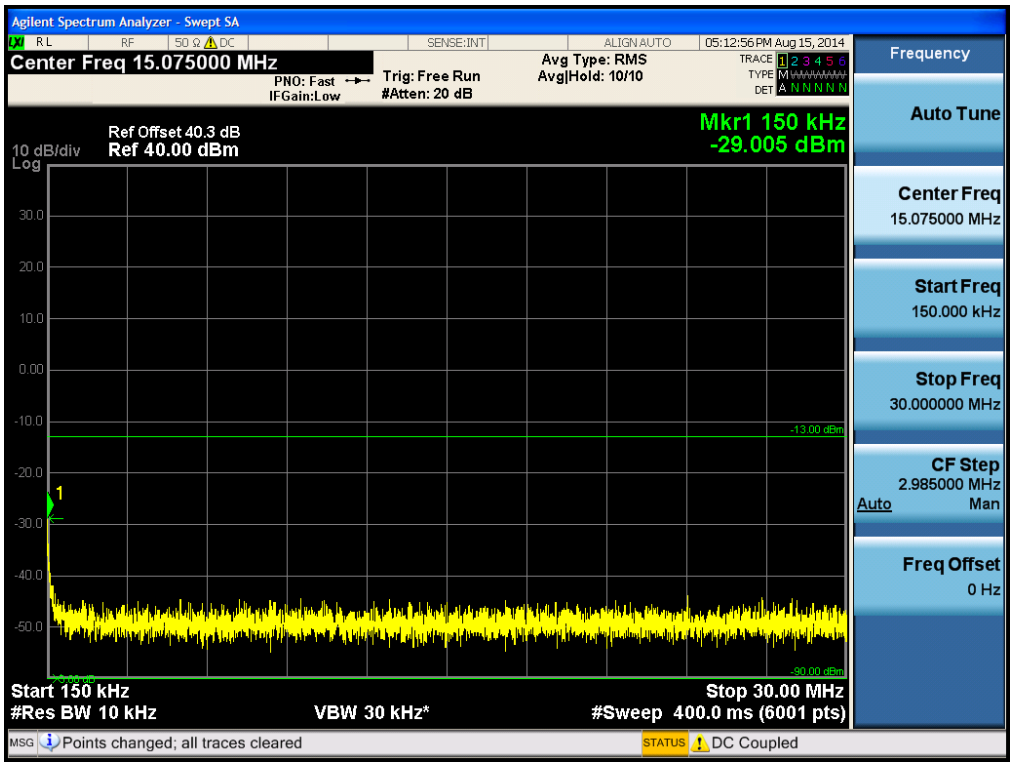

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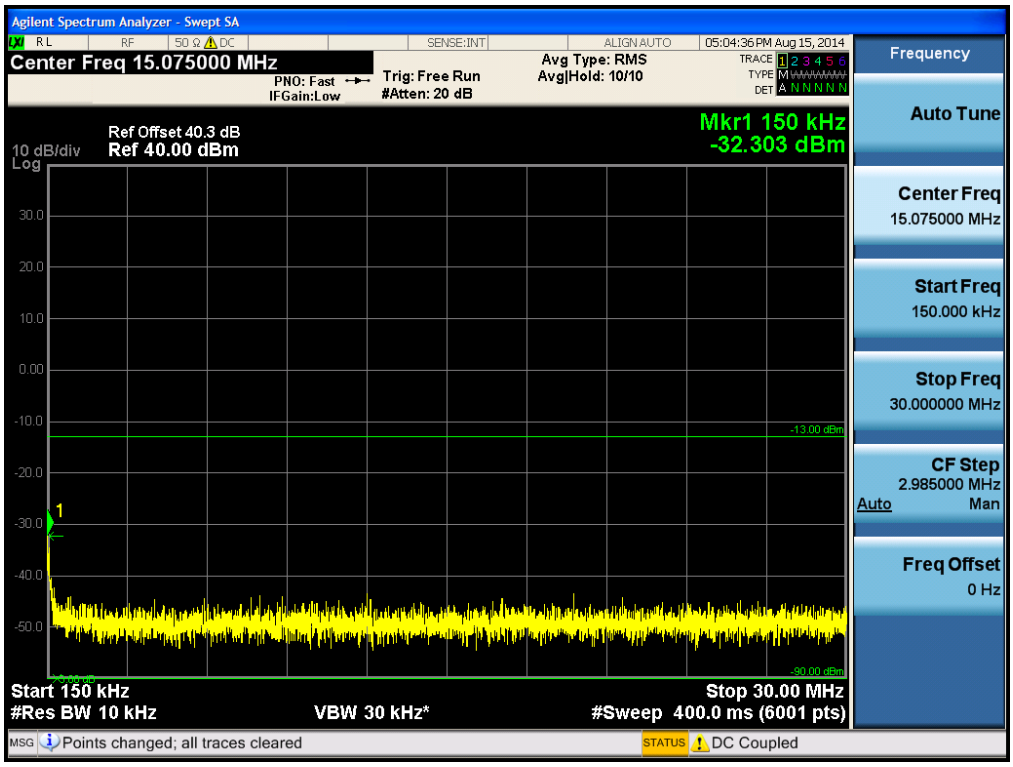

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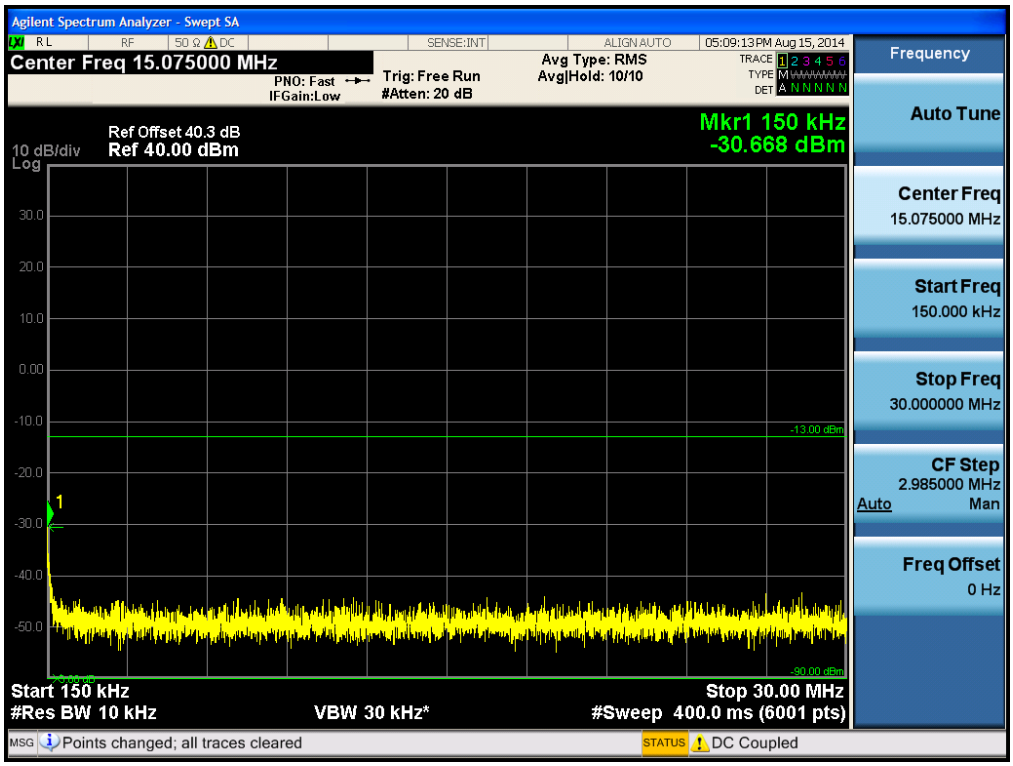
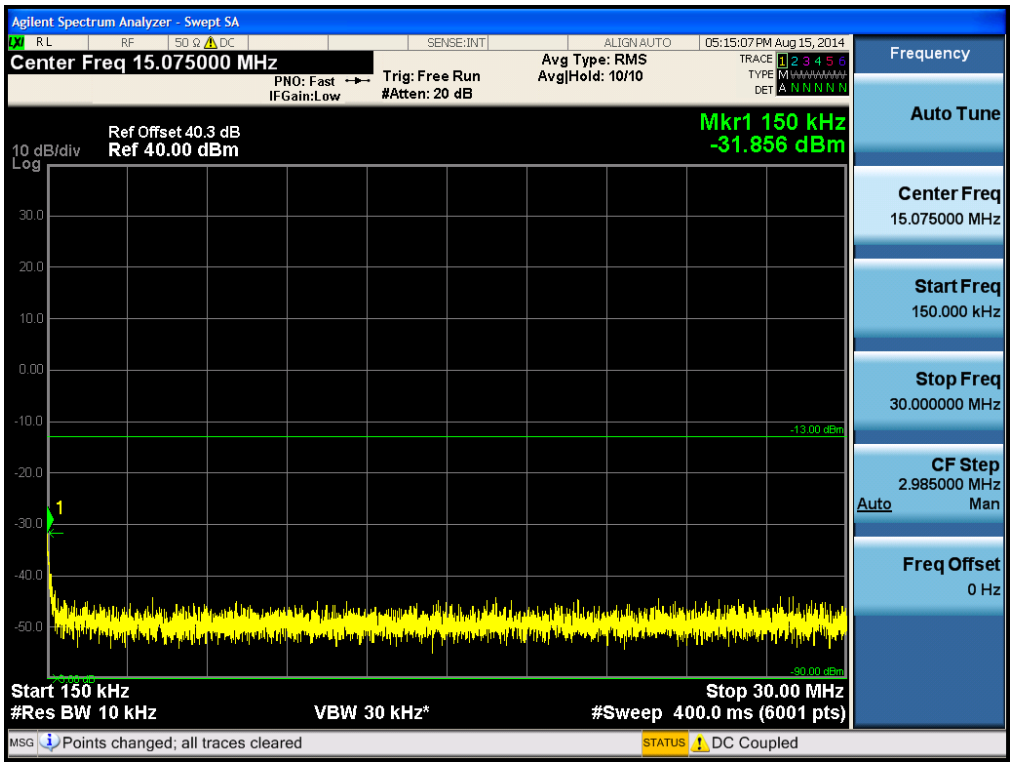


[EVDO Downlink High]



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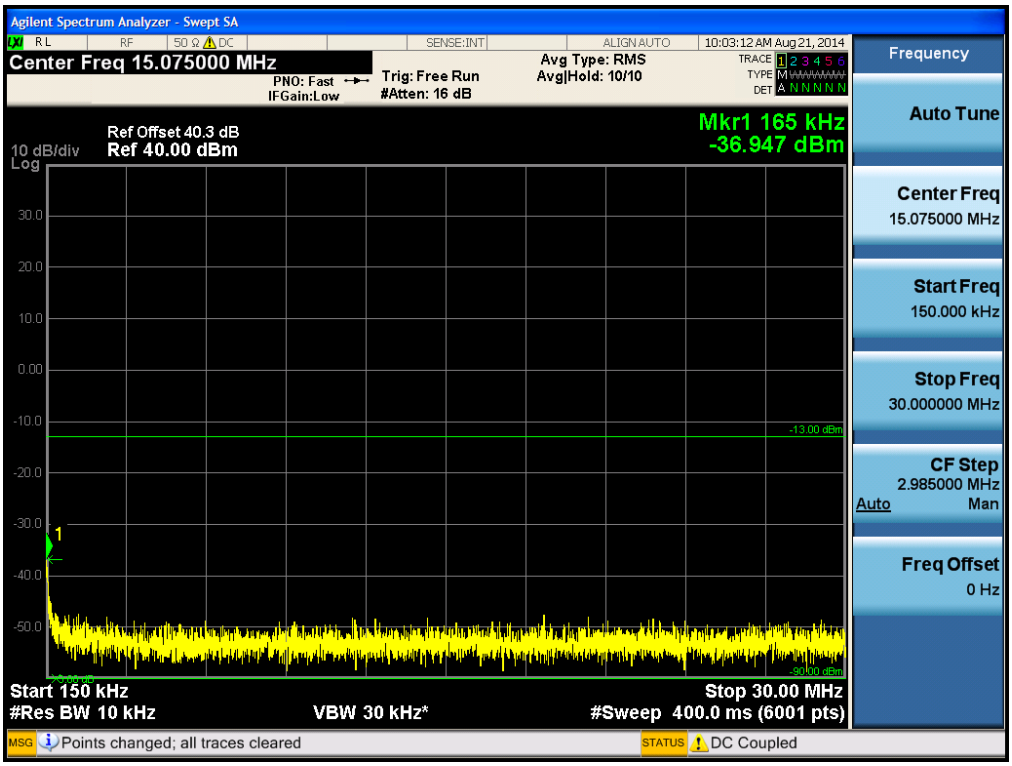

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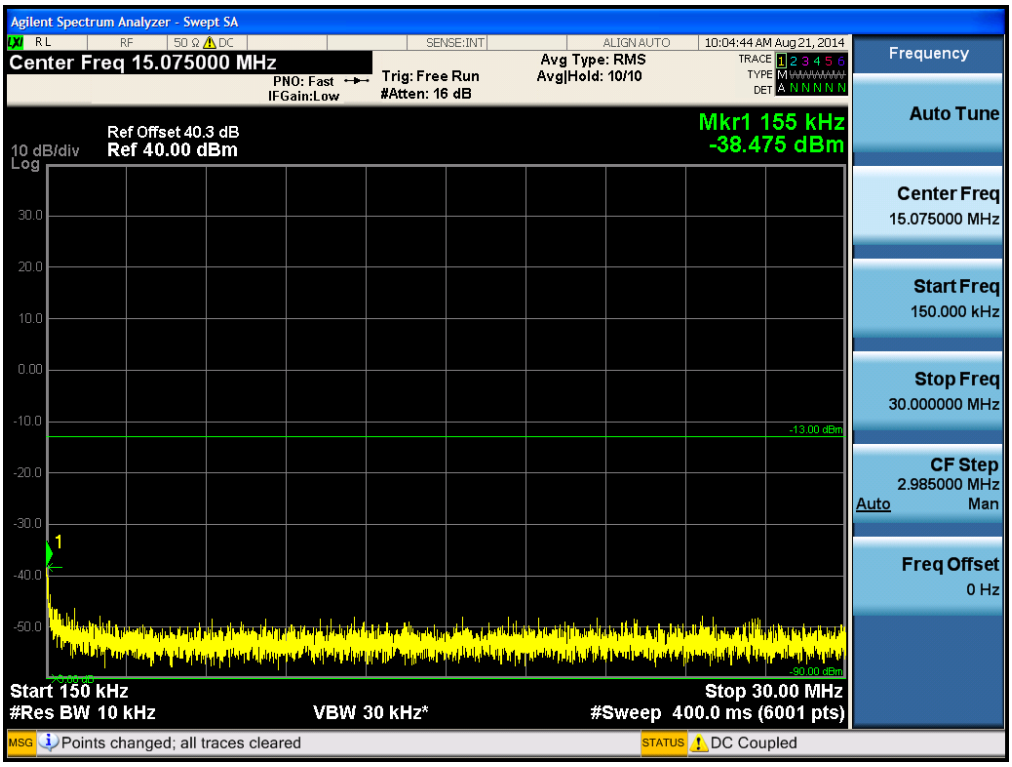

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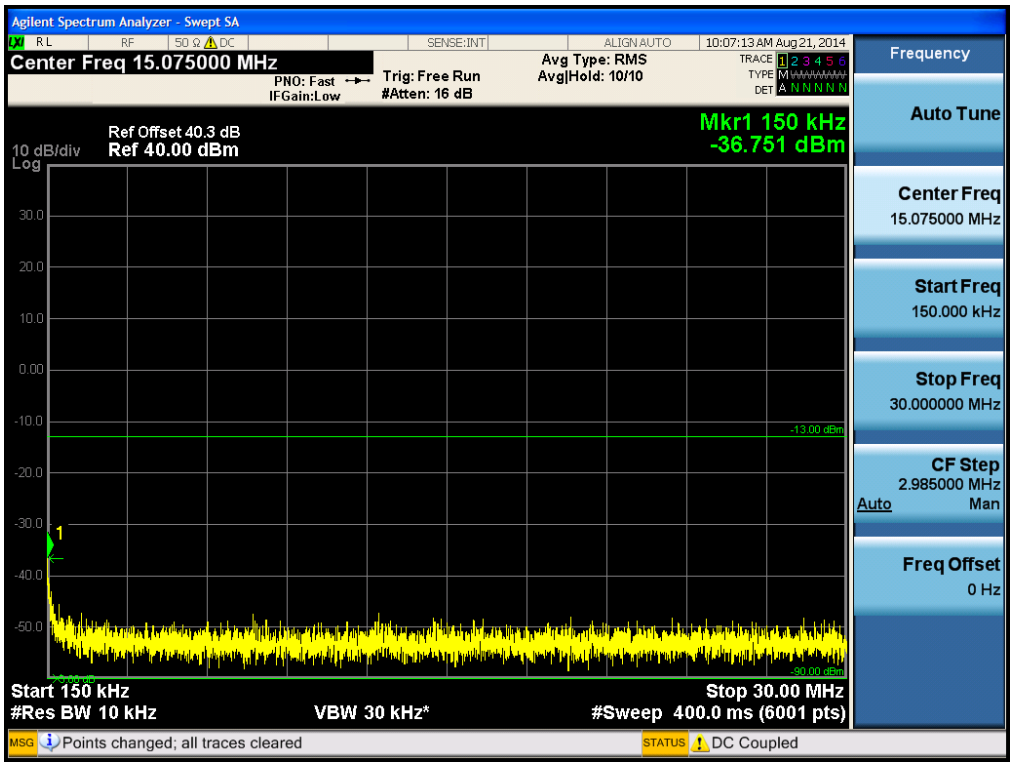

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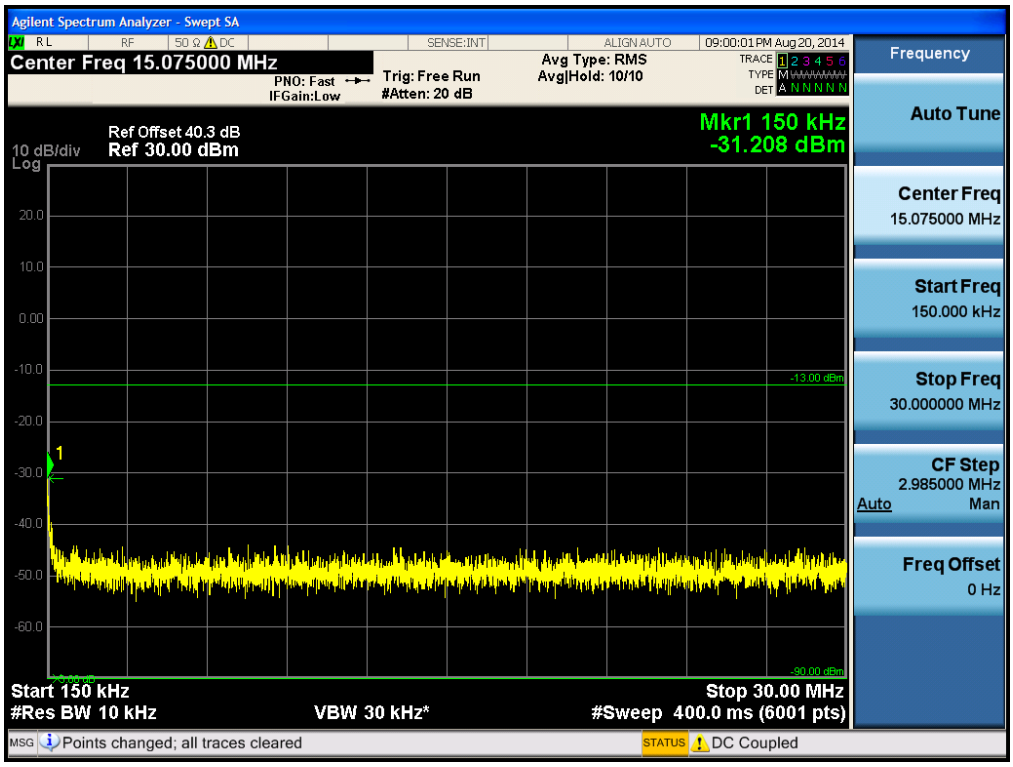

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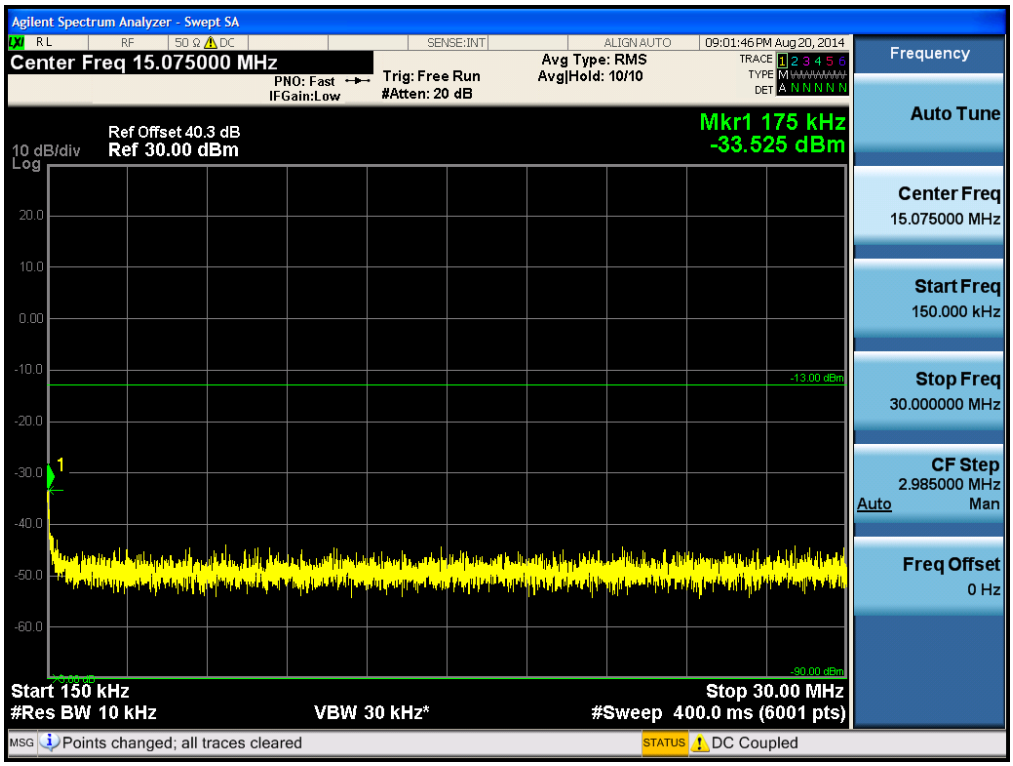

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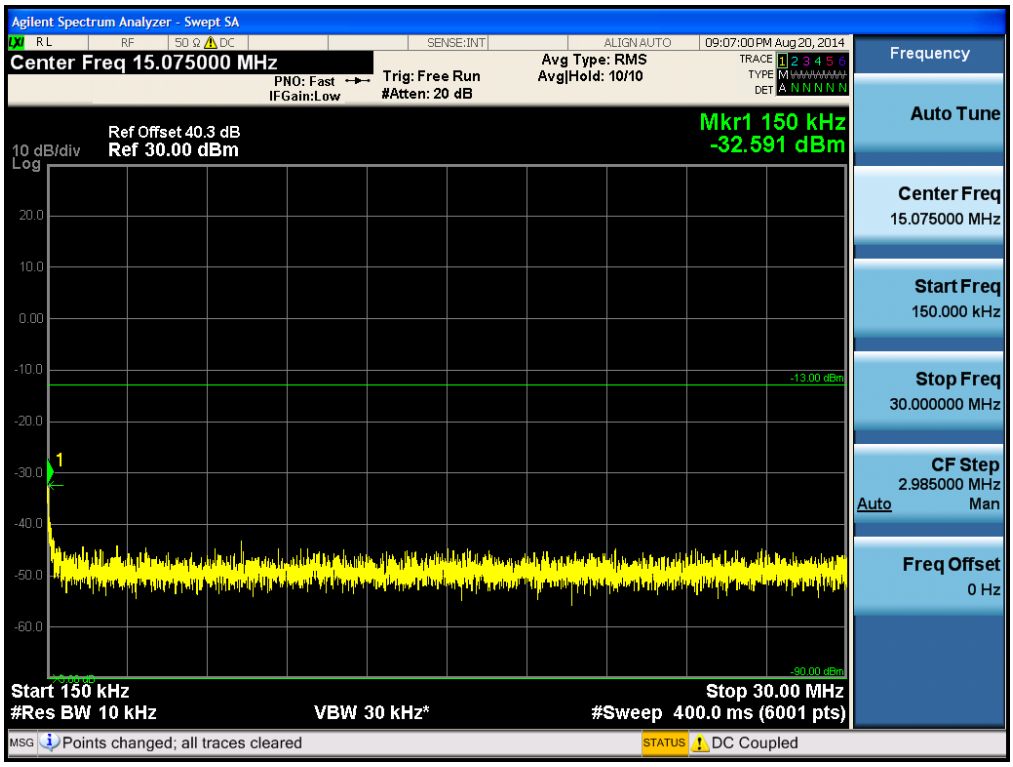

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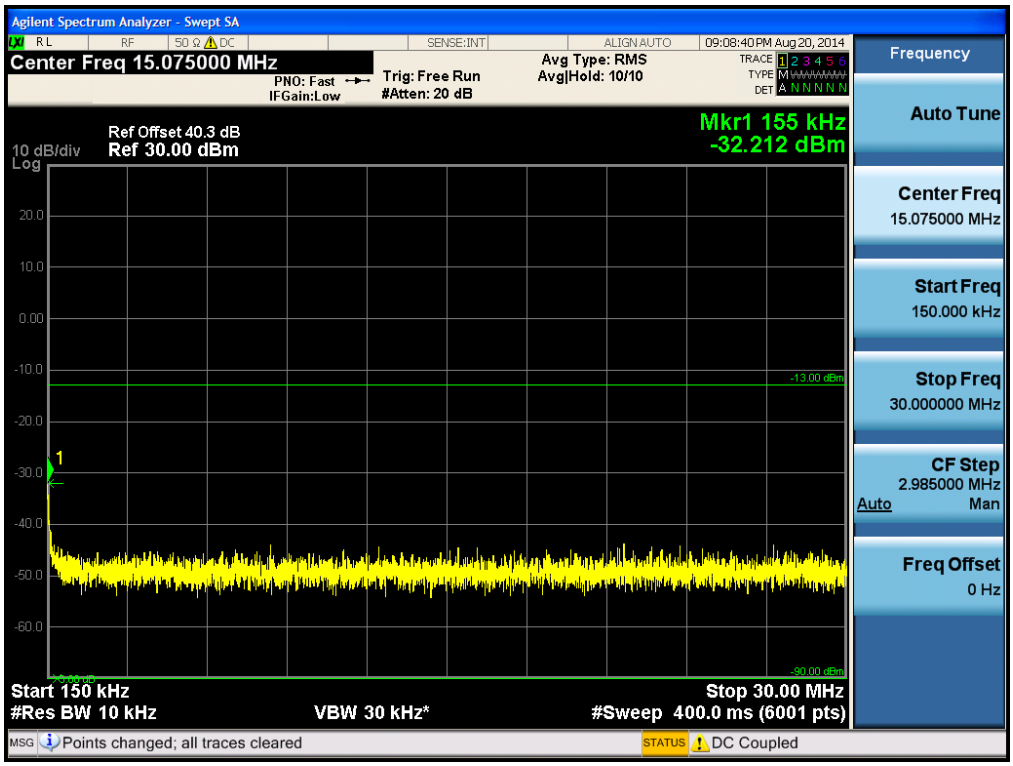

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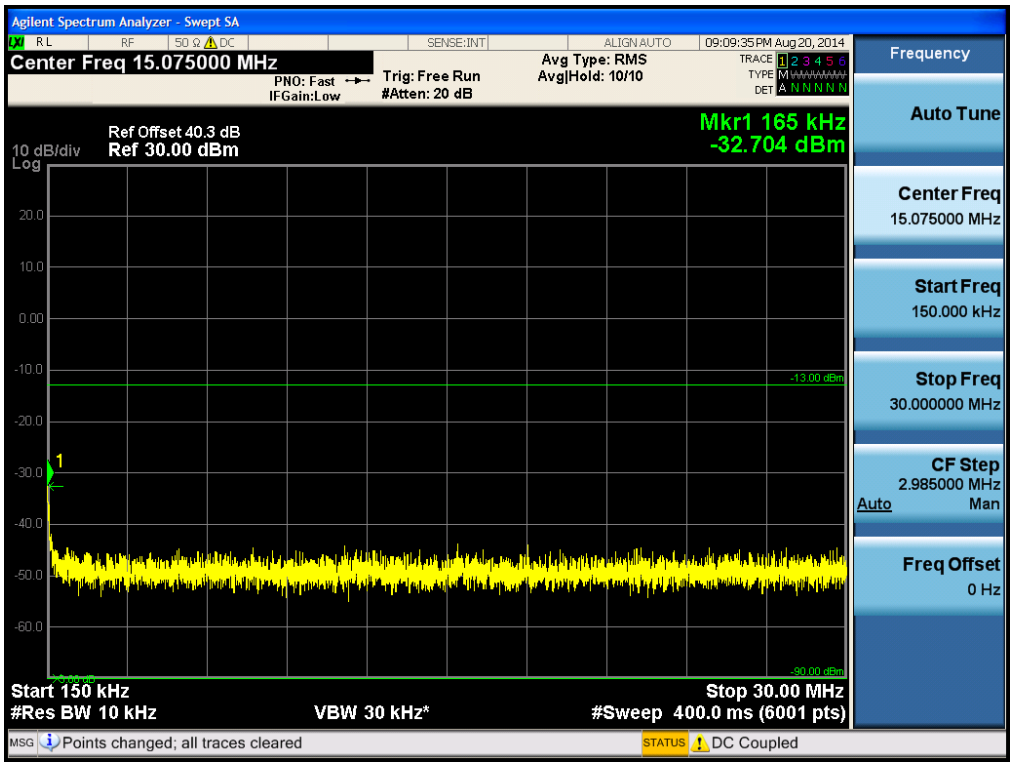

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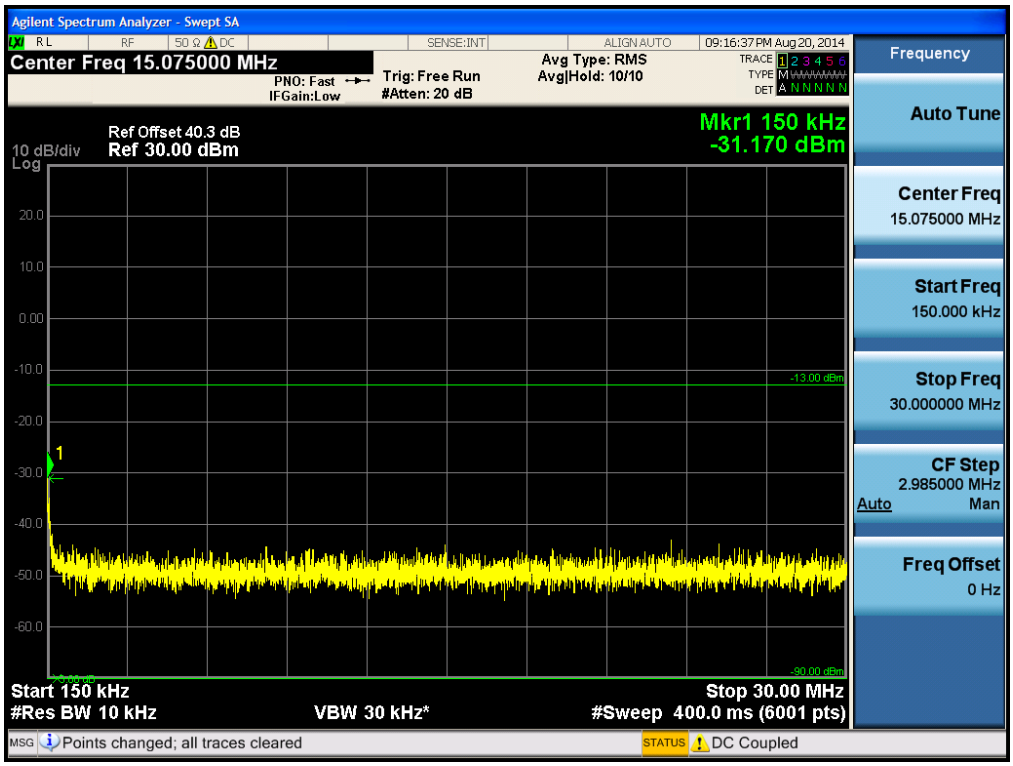
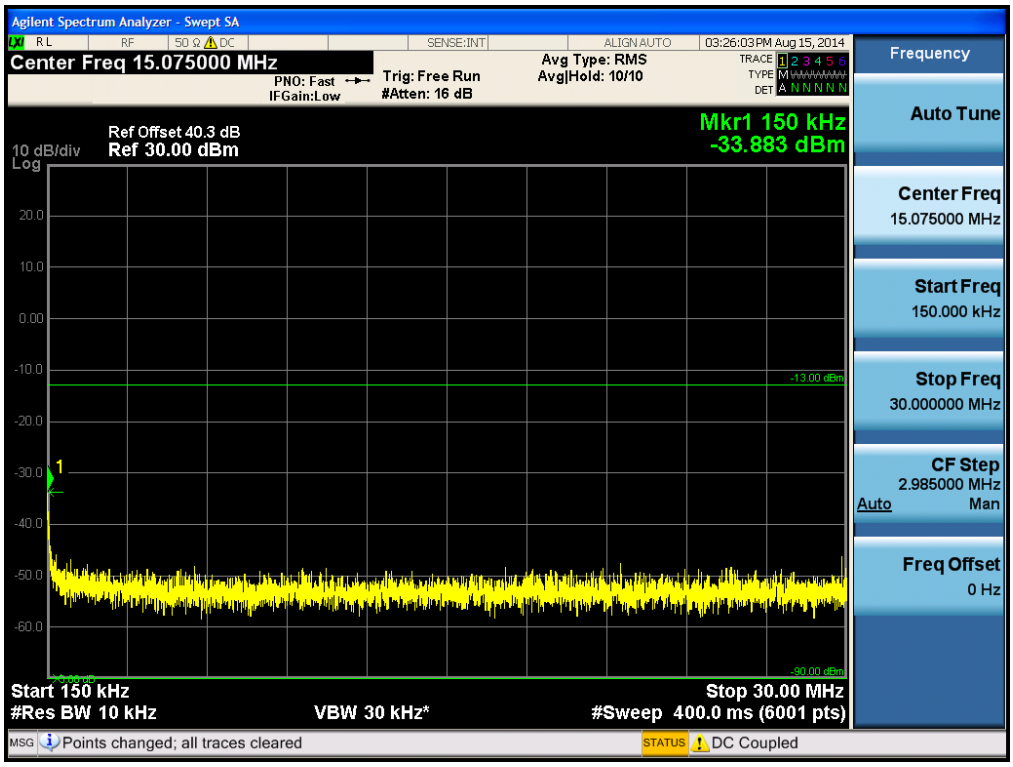


[LTE Downlink 5 MHz Low]



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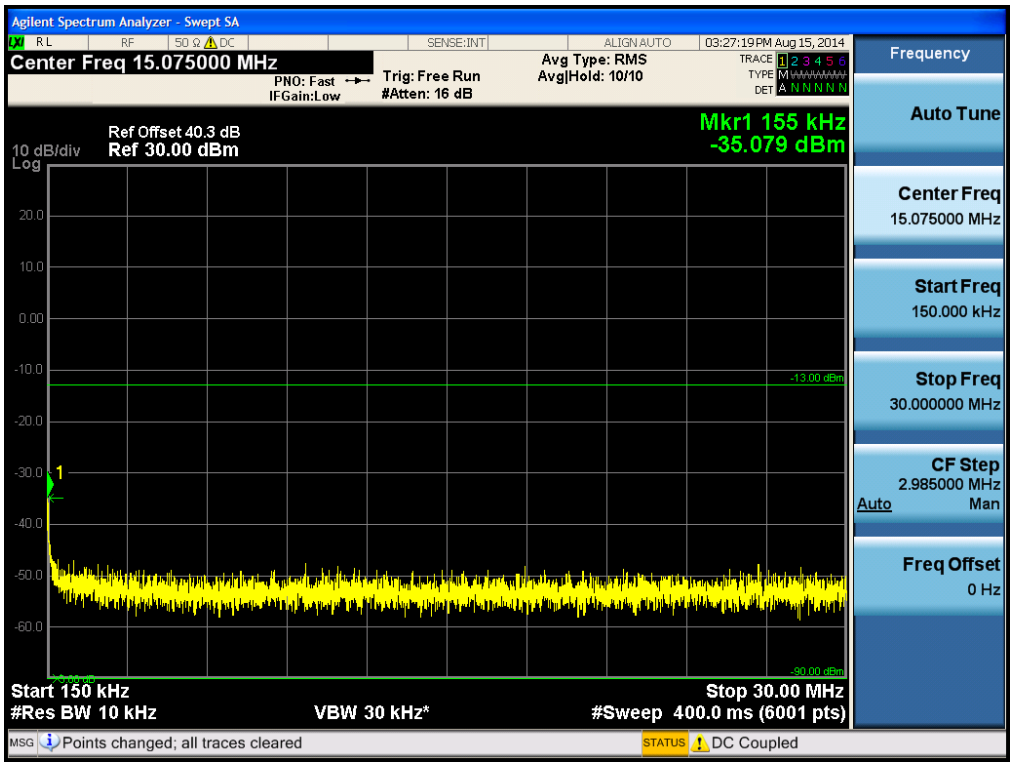
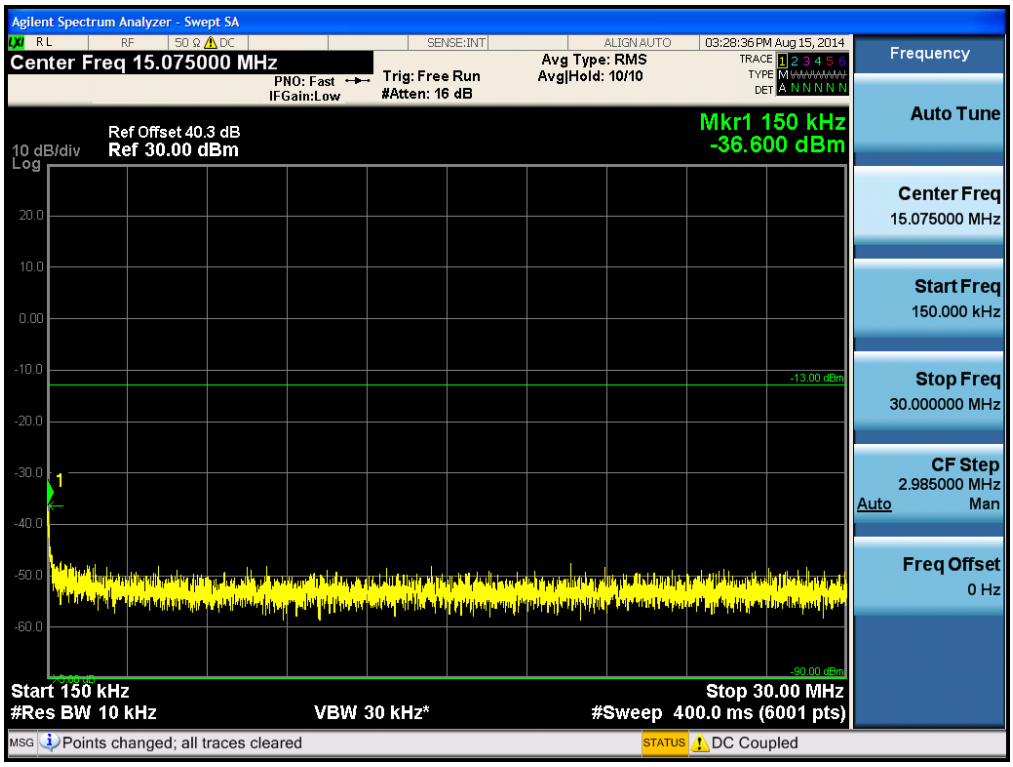
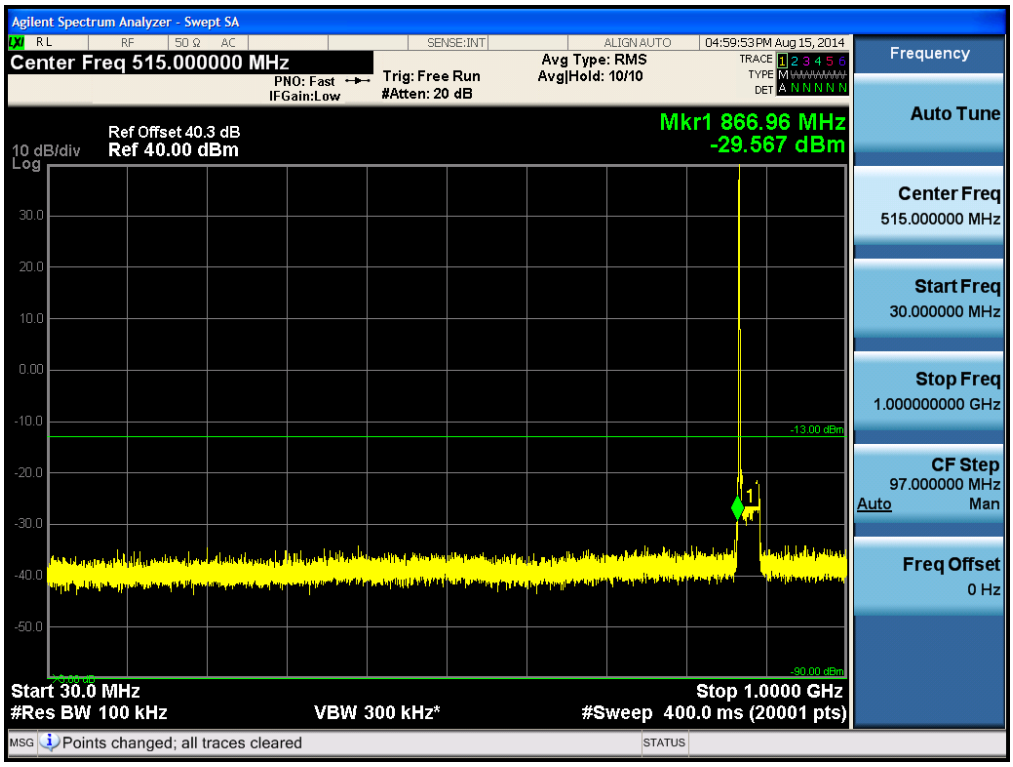


[LTE Downlink 5 MHz High]



Conducted Spurious Emissions (30 MHz – 1 GHz)

[CDMA Downlink Low]



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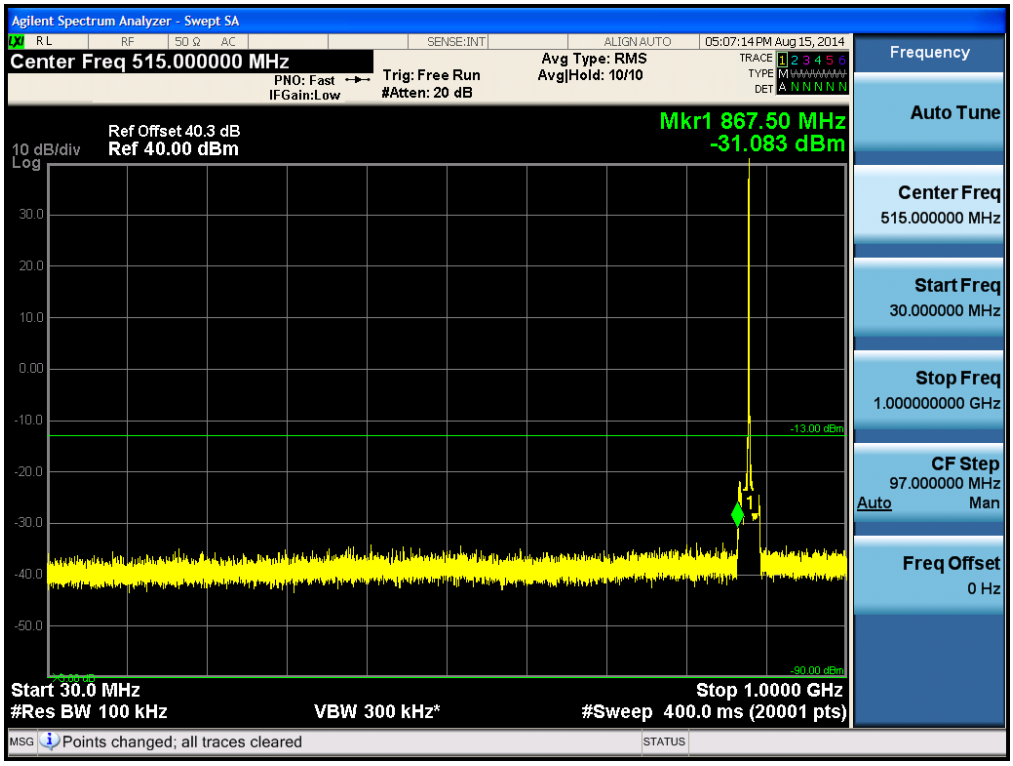

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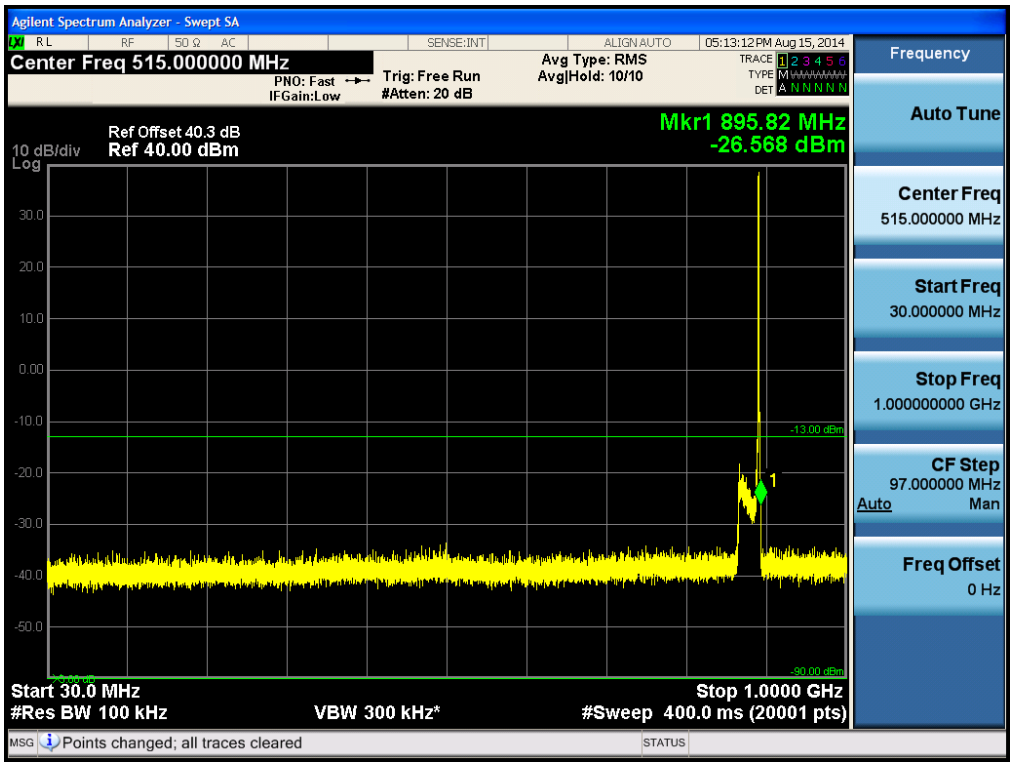
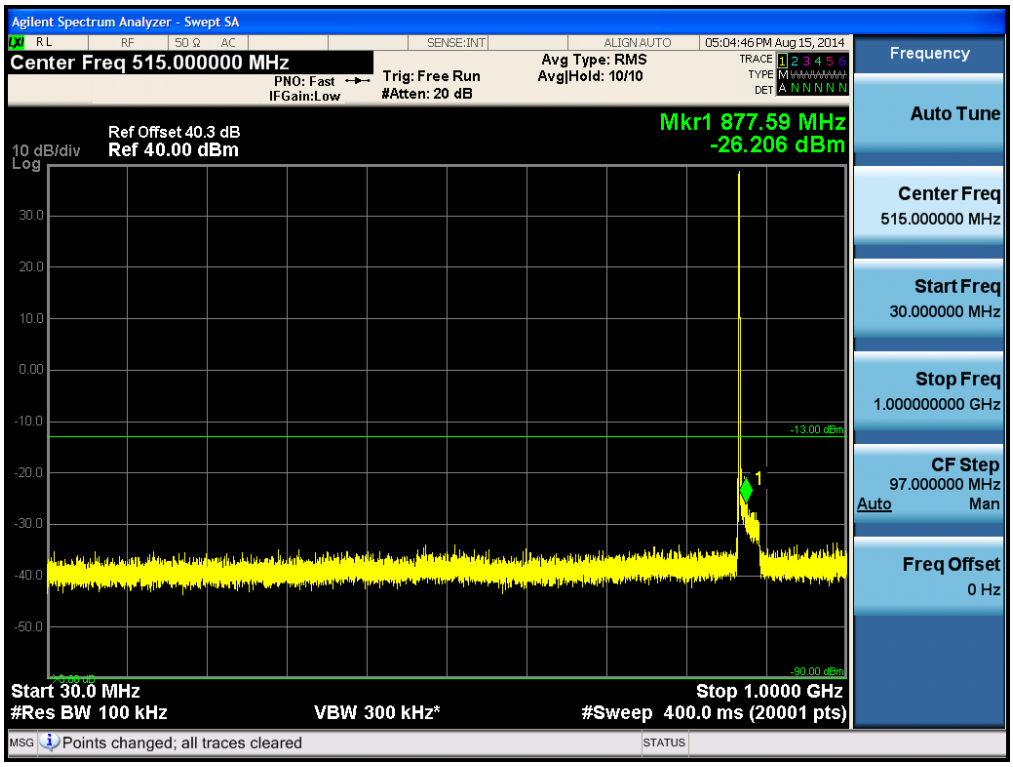
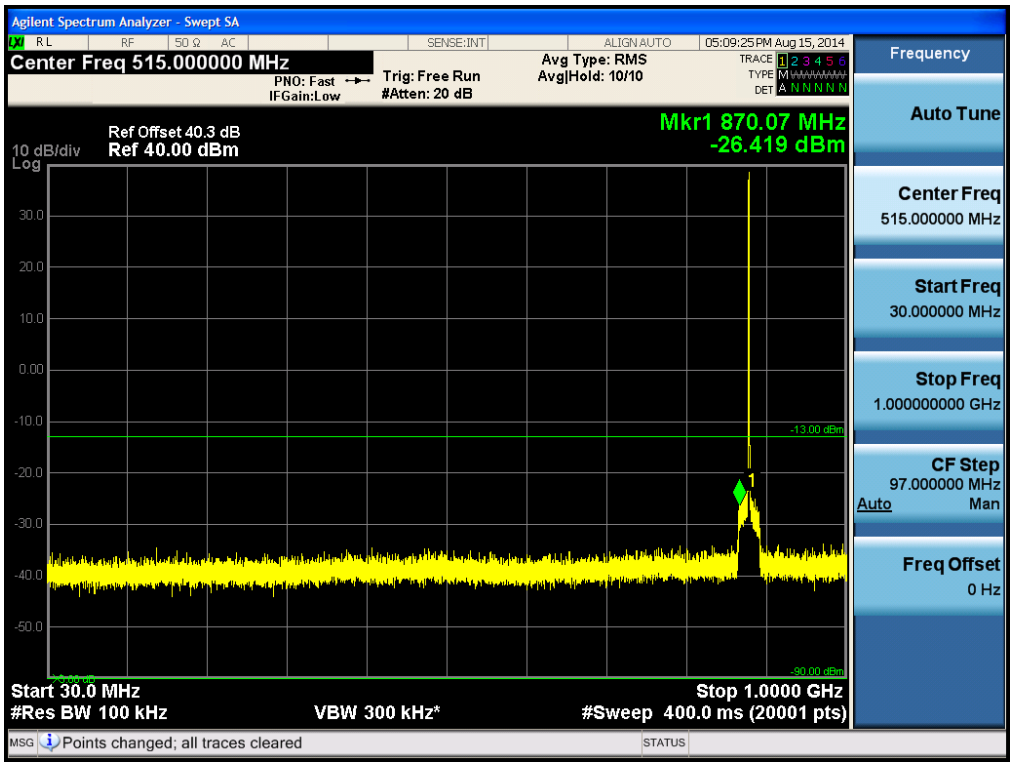


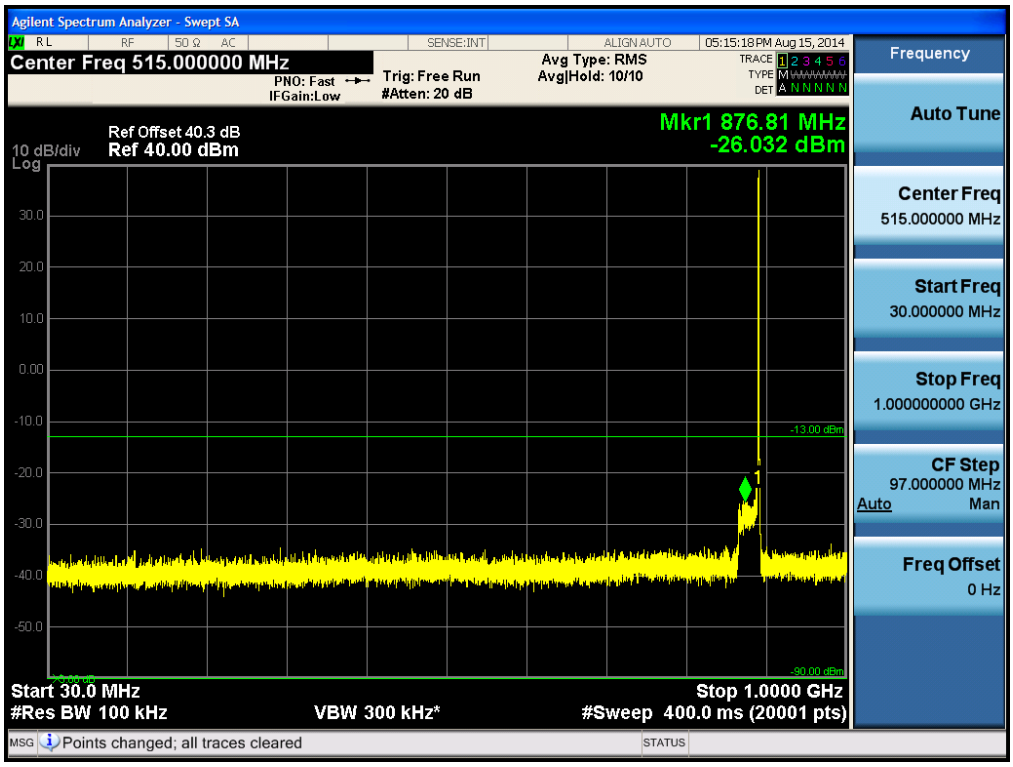
[EVDO Downlink Low]



[EVDO Downlink Middle]



[EVDO Downlink High]



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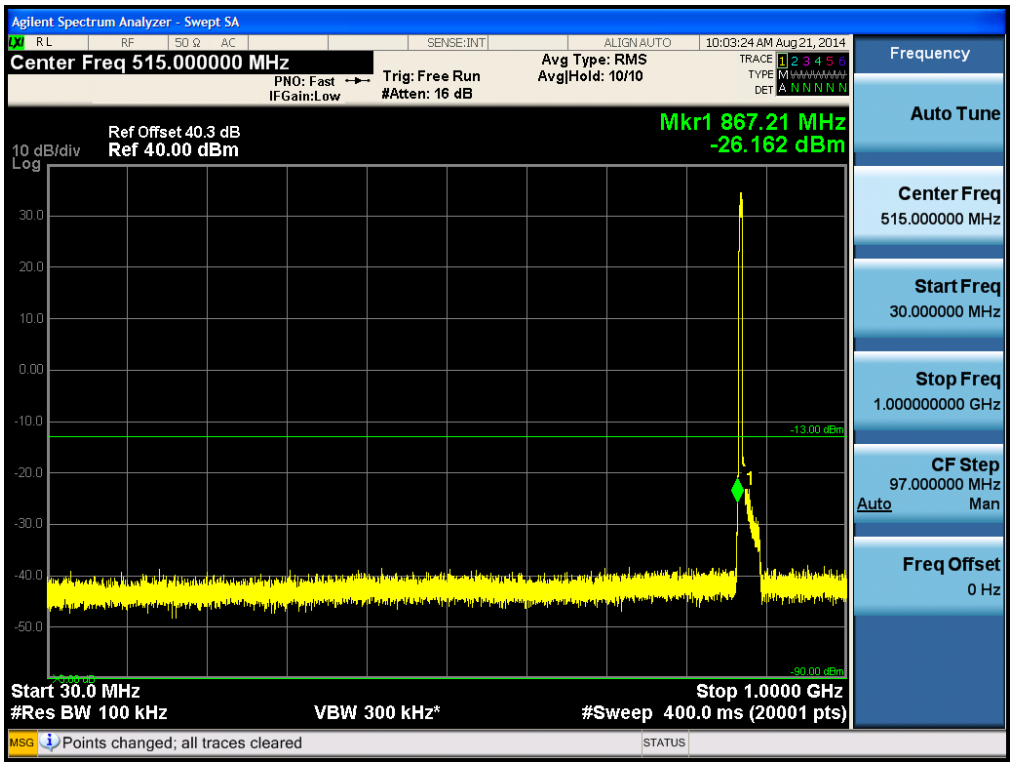

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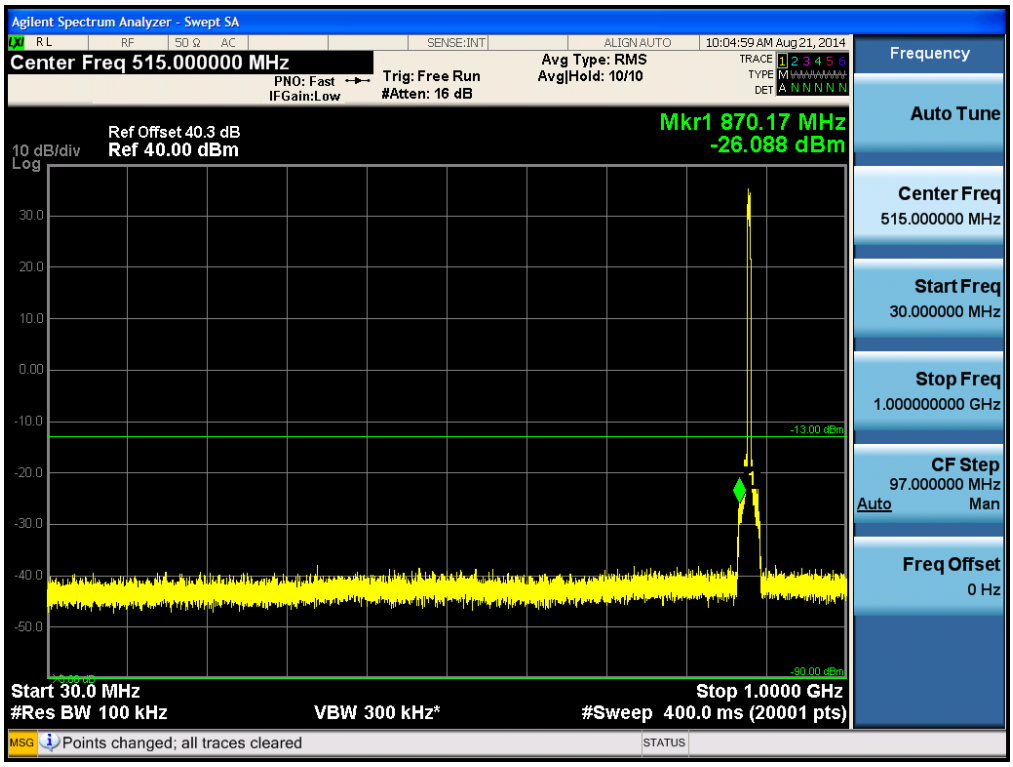

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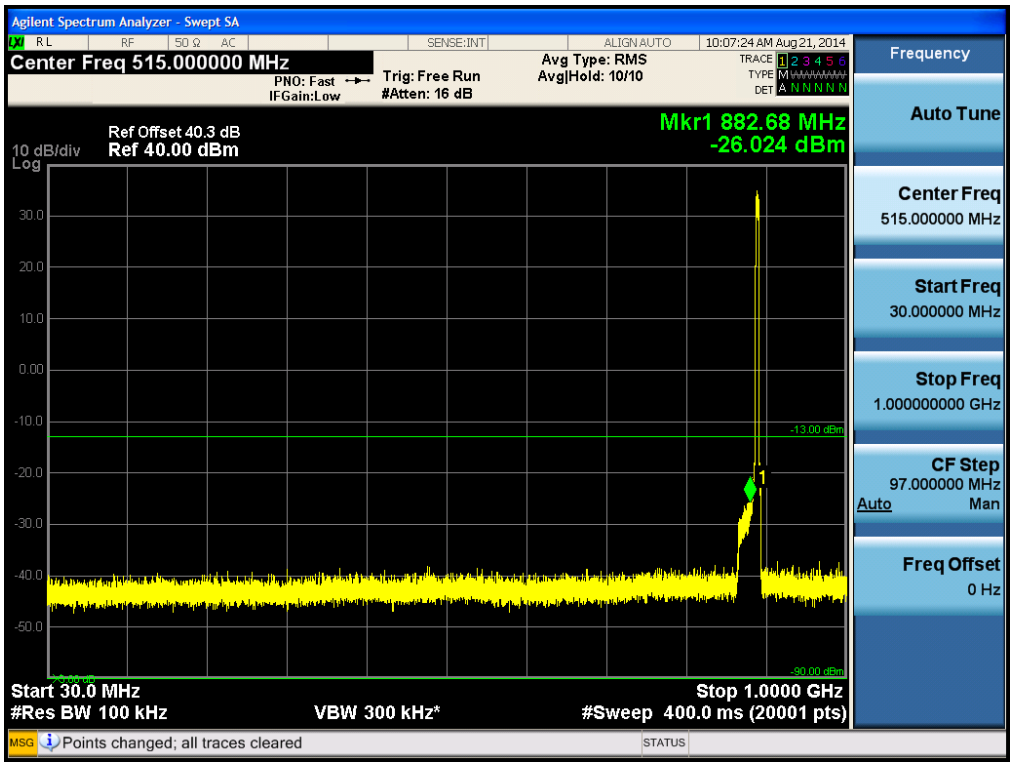
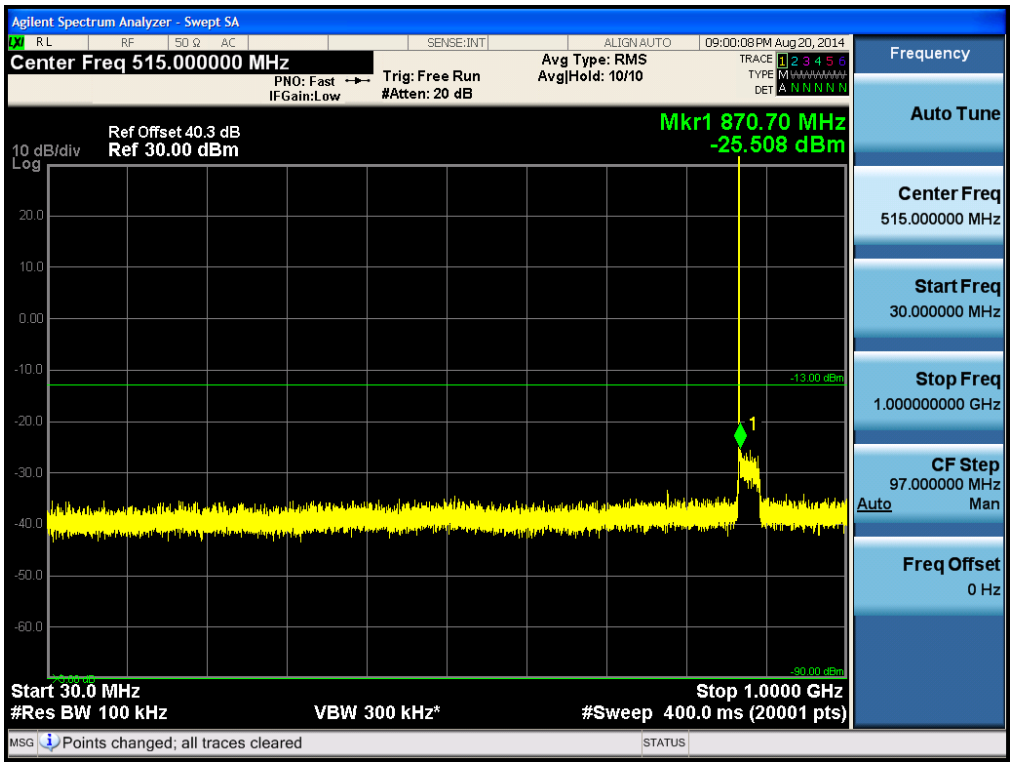


[GSM Downlink Low]



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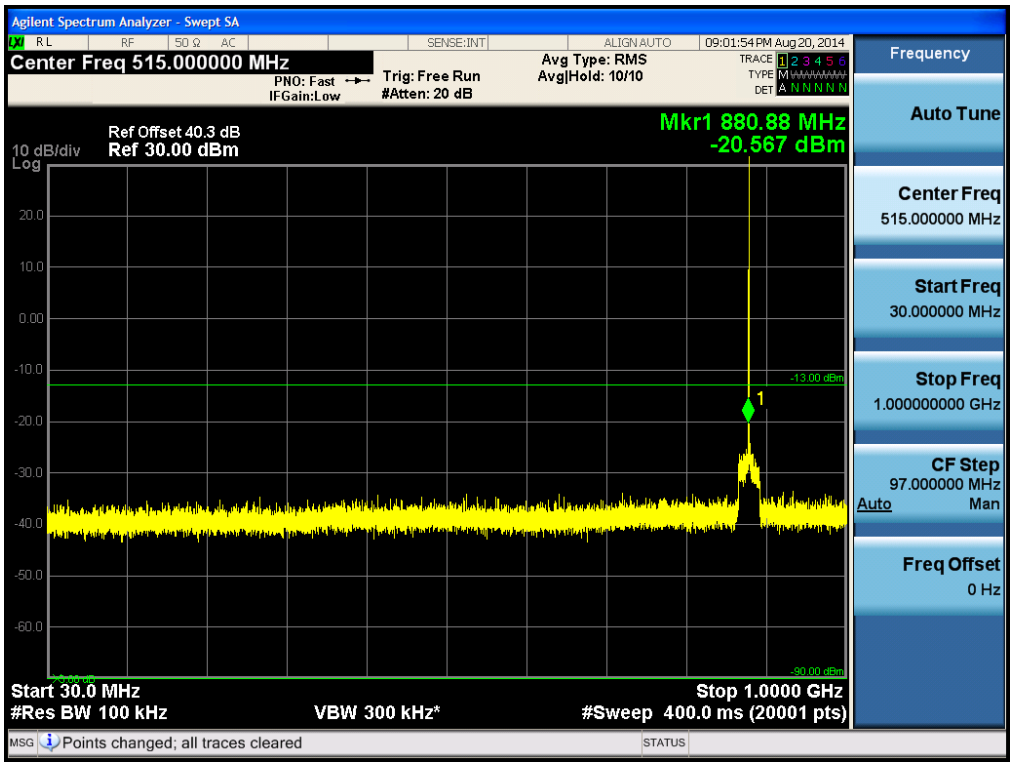

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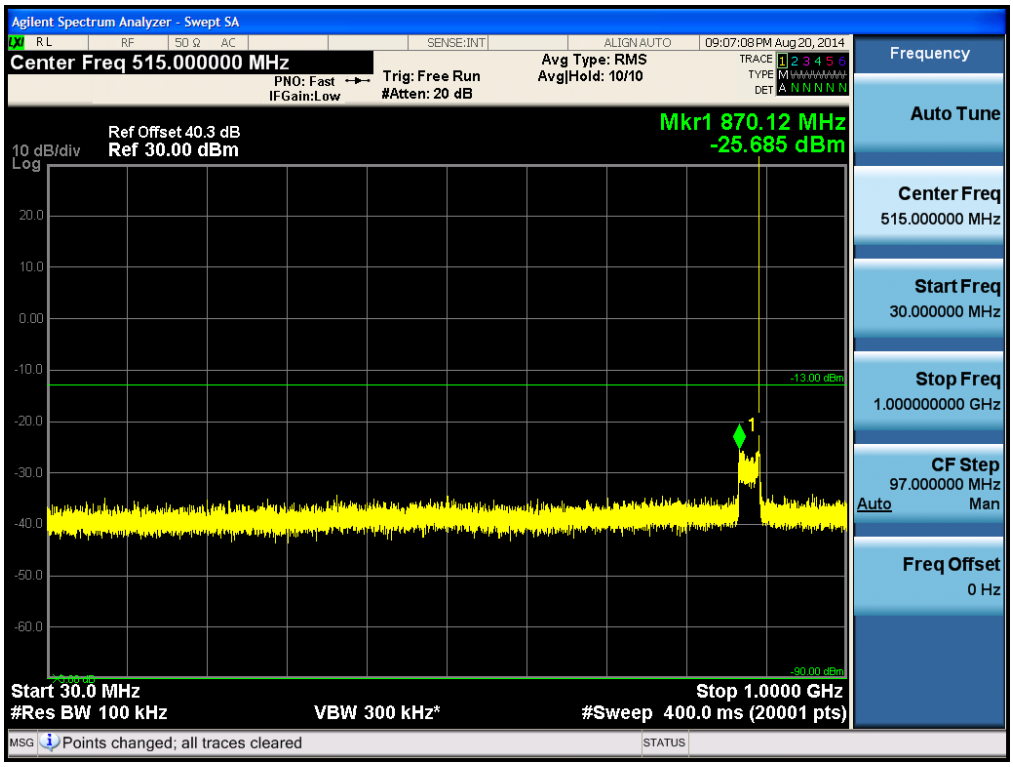
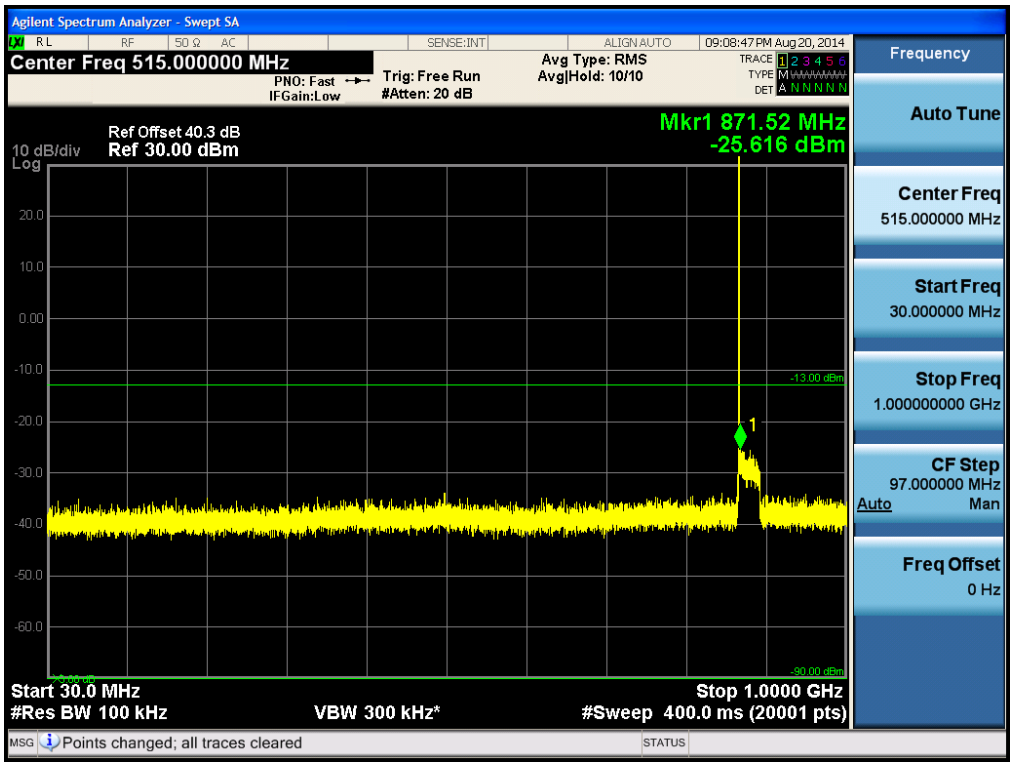


[EDGE Downlink Low]



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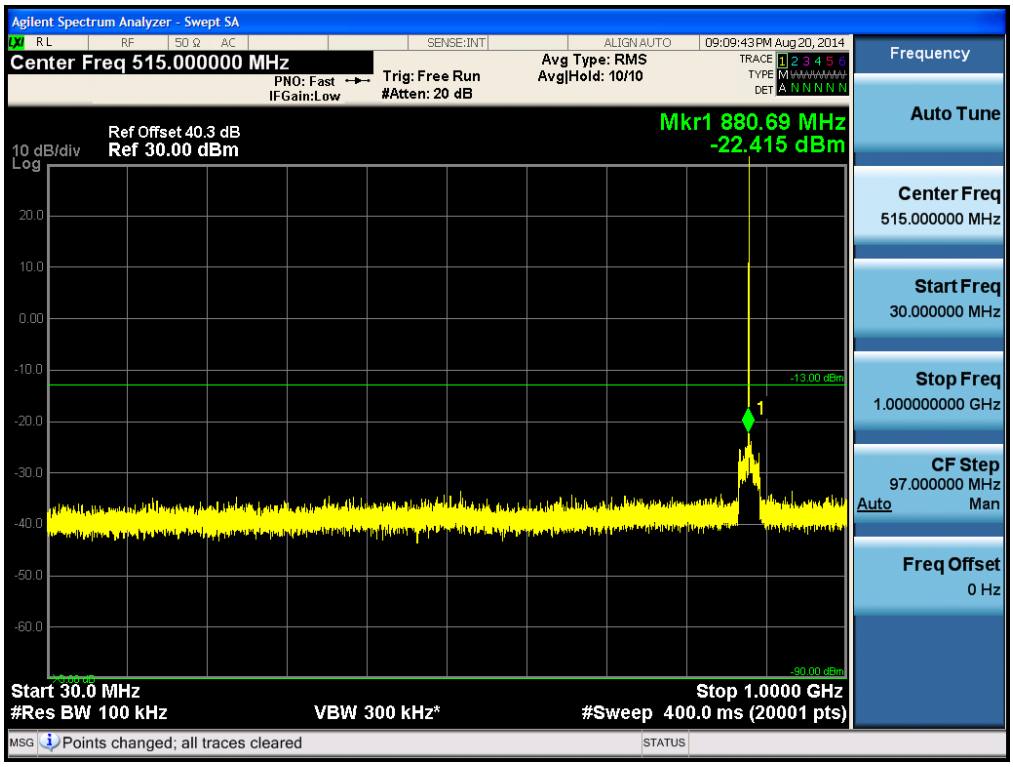
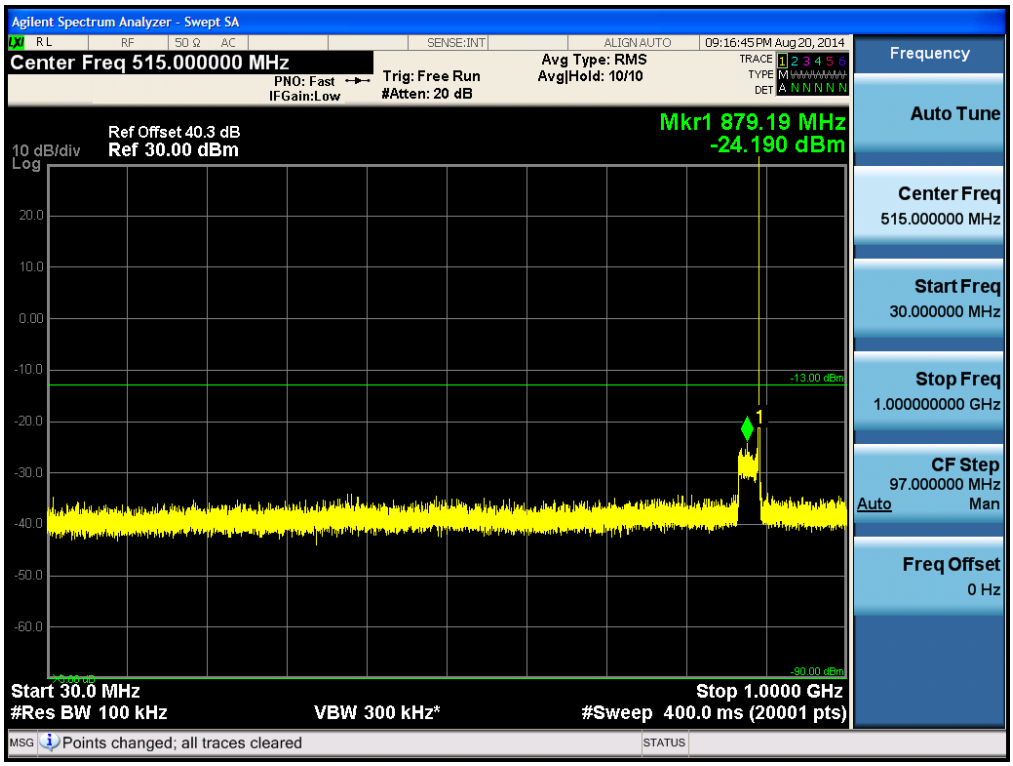
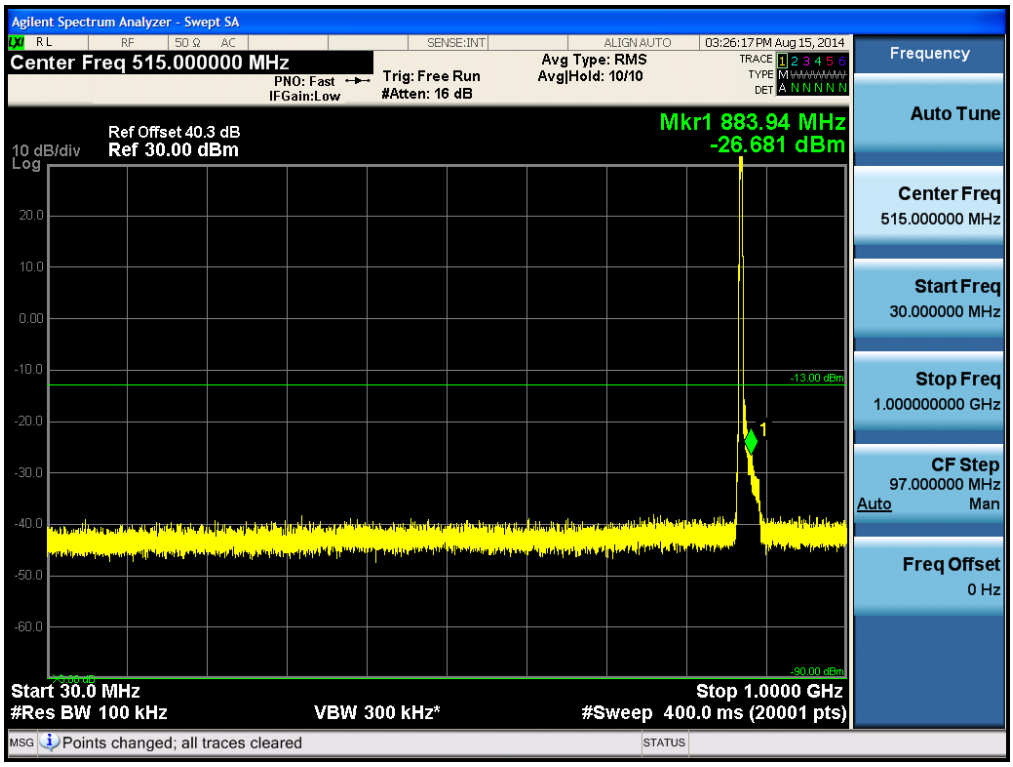


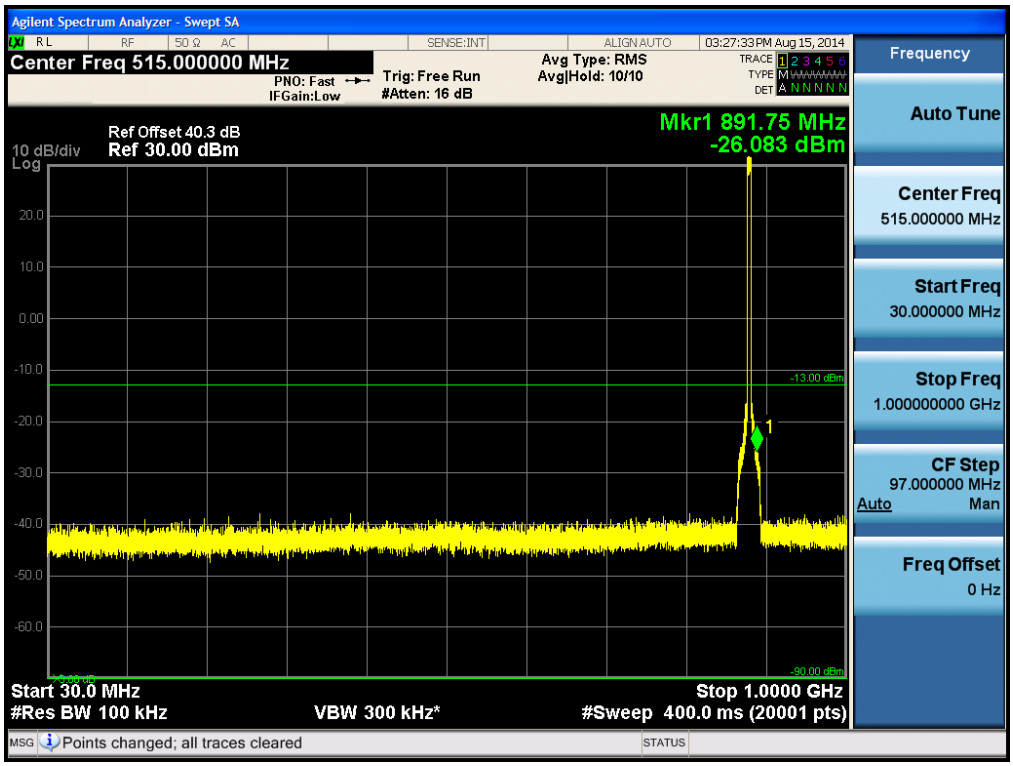
[EDGE Downlink High]



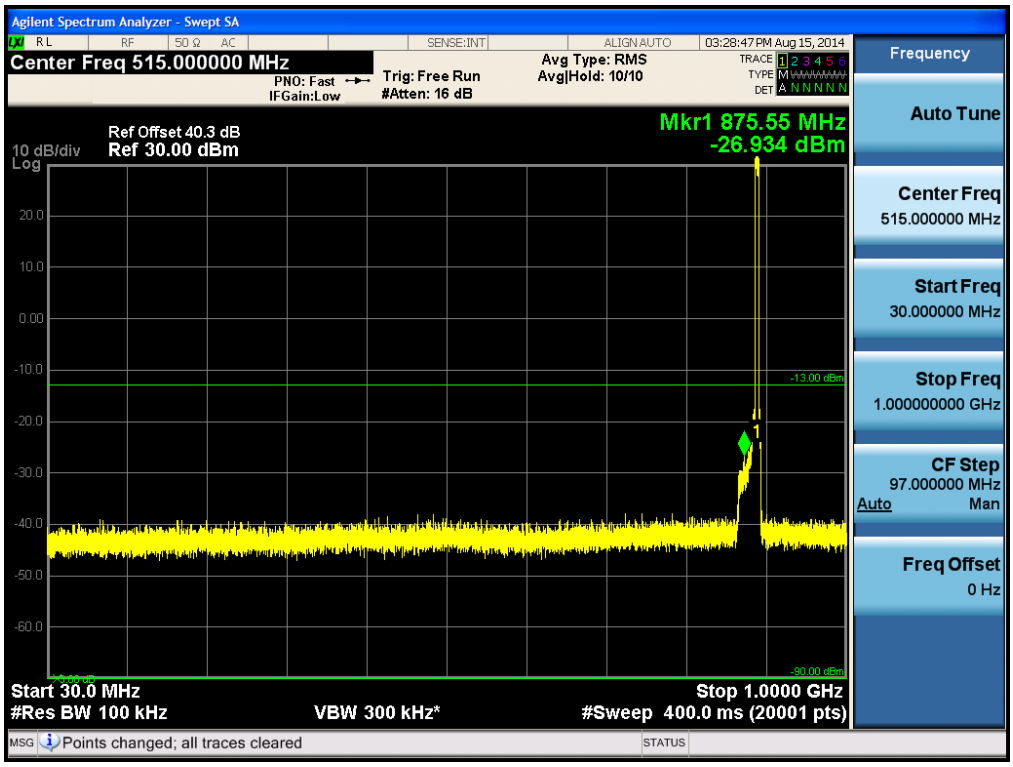
[LTE Downlink 5 MHz Low]



[LTE Downlink 5 MHz Middle]

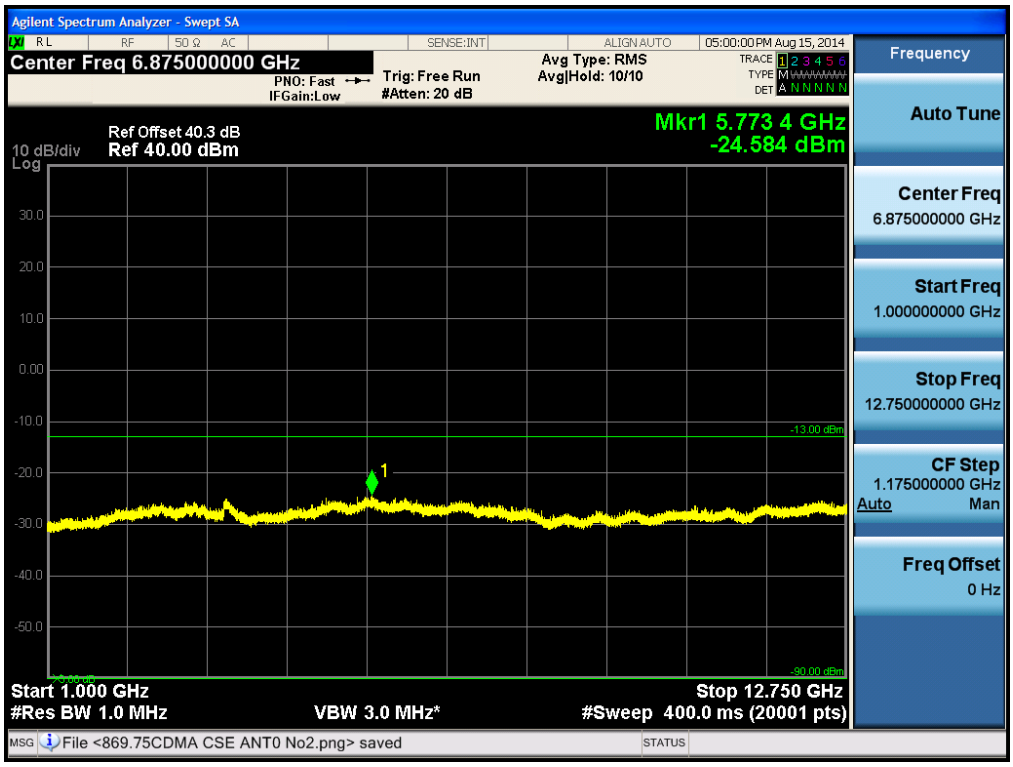


[LTE Downlink 5 MHz High]

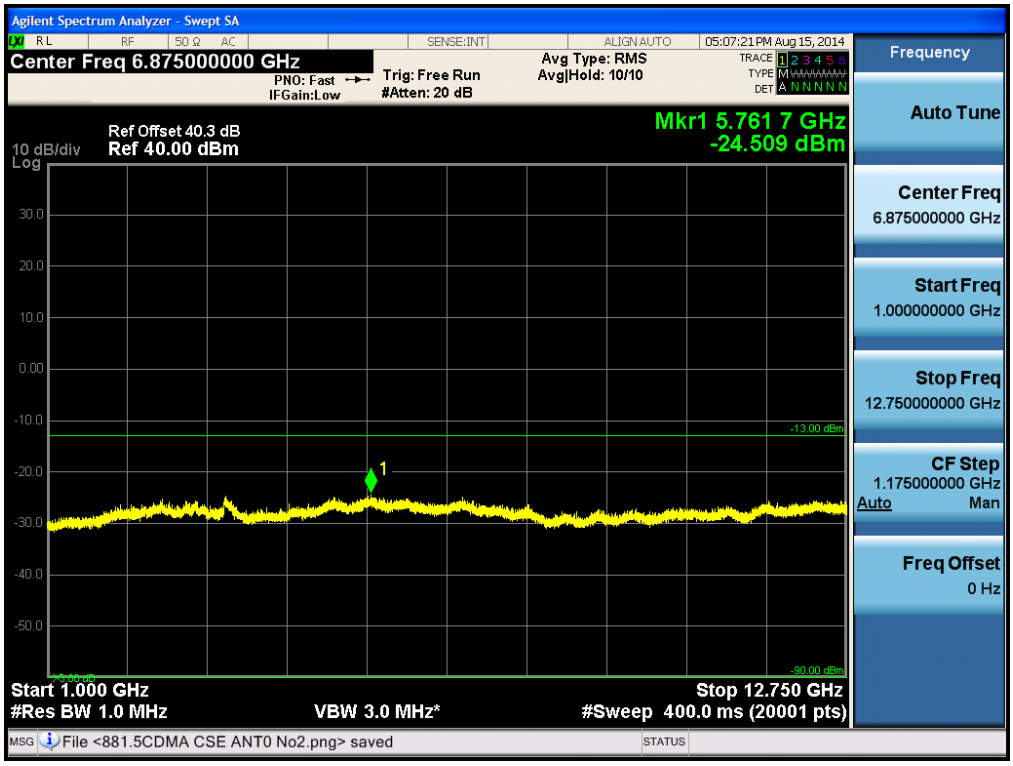


Conducted Spurious Emissions (1 GHz –12.75 GHz)

[CDMA Downlink Low]

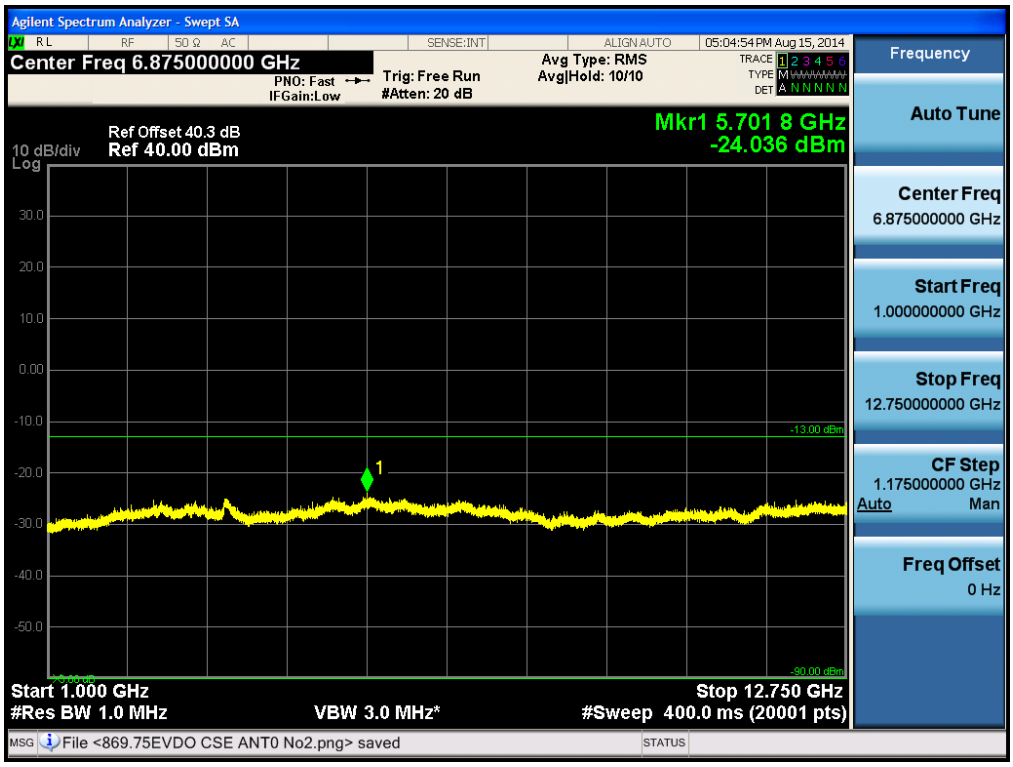


[CDMA Downlink Middle]



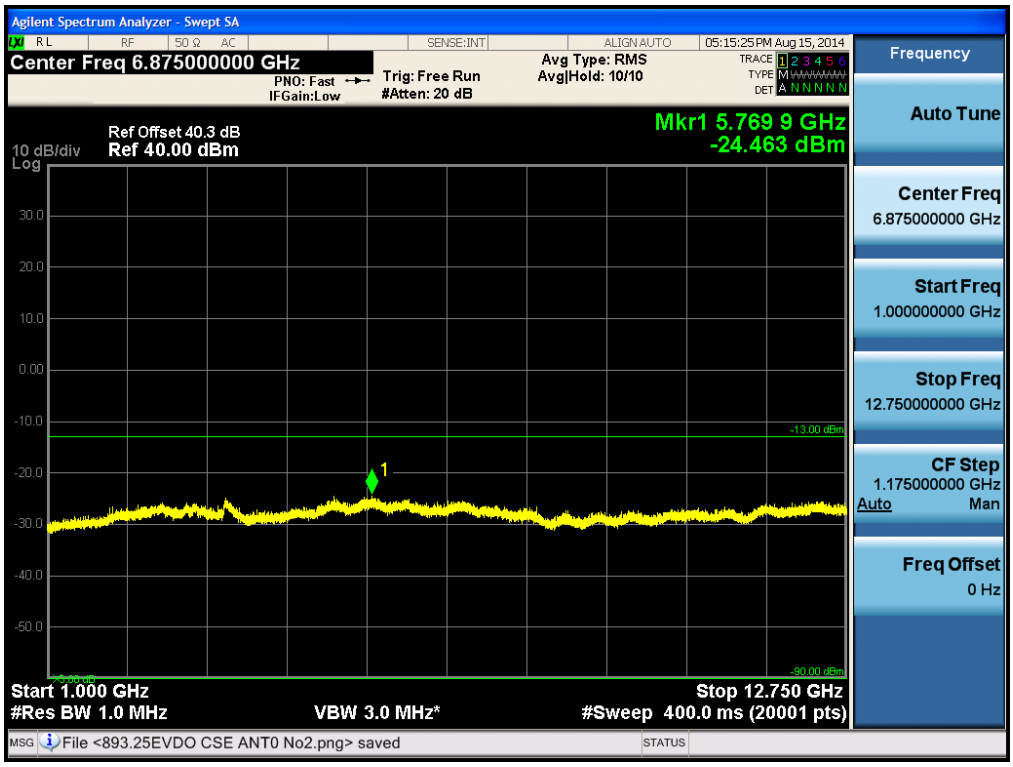
[CDMA Downlink High]

[EVDO Downlink Low]



[EVDO Downlink Middle]

[EVDO Downlink High]

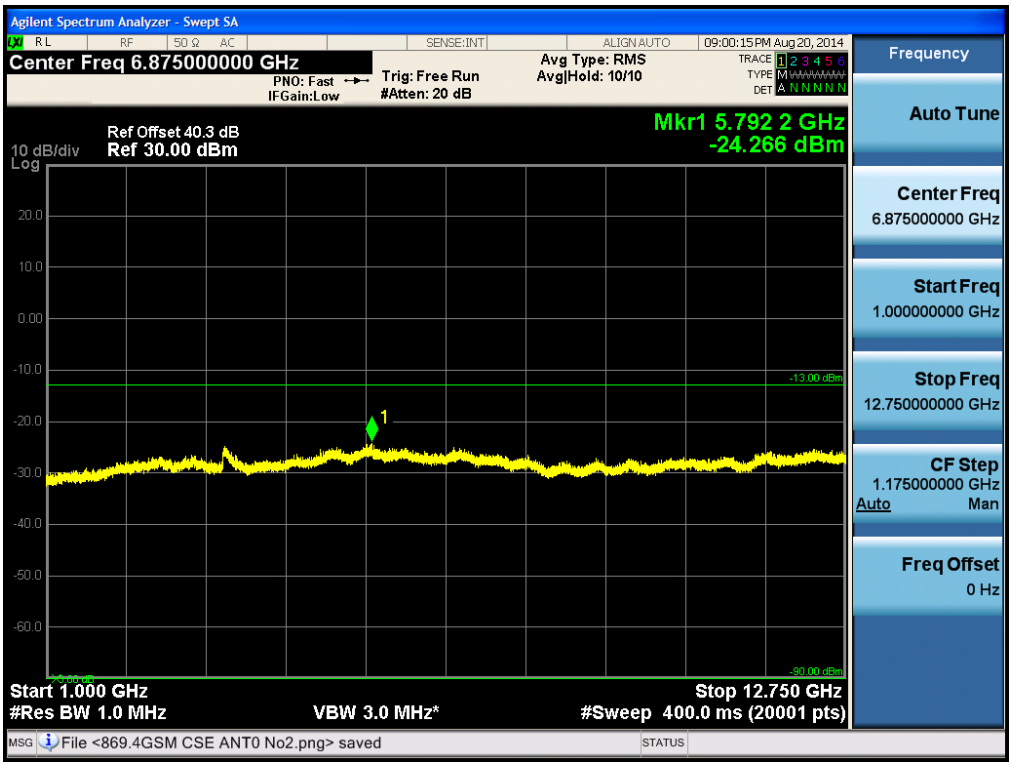


[WCDMA Downlink Low]

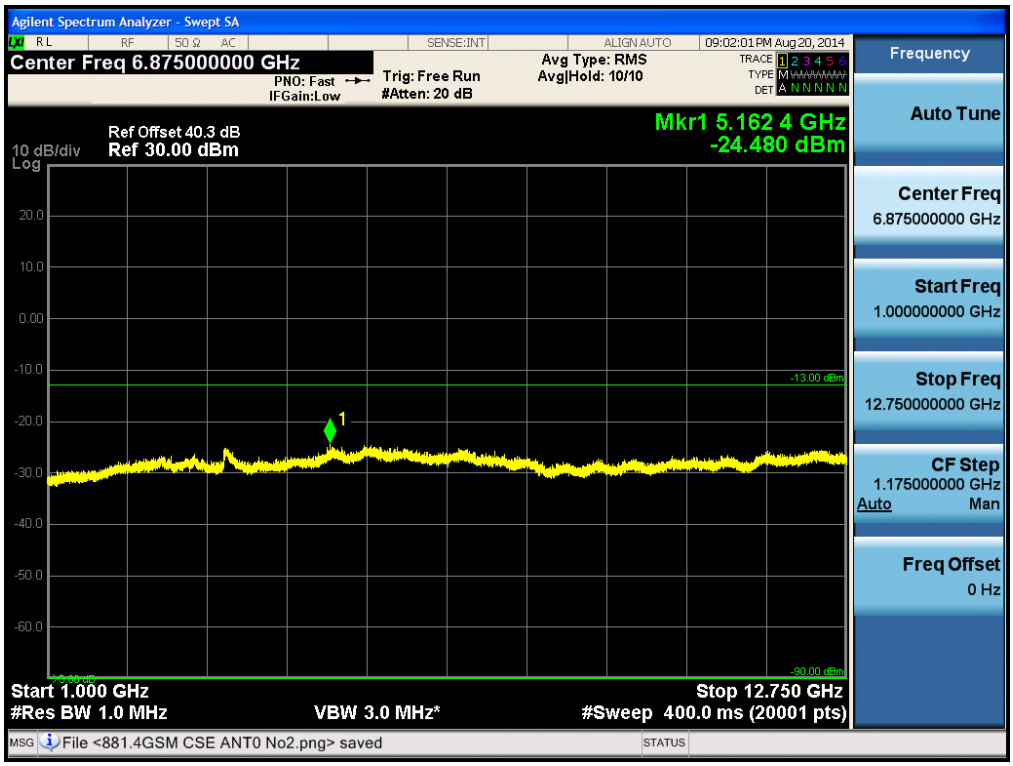
[WCDMA Downlink Middle]

[WCDMA Downlink High]

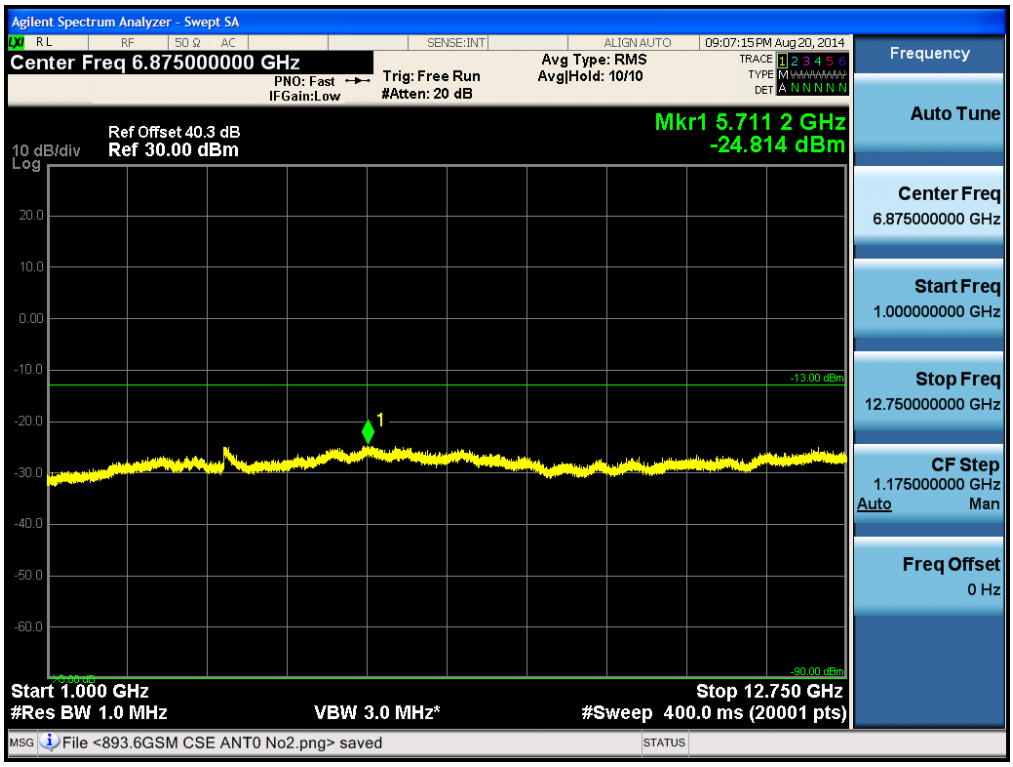
[GSM Downlink Low]



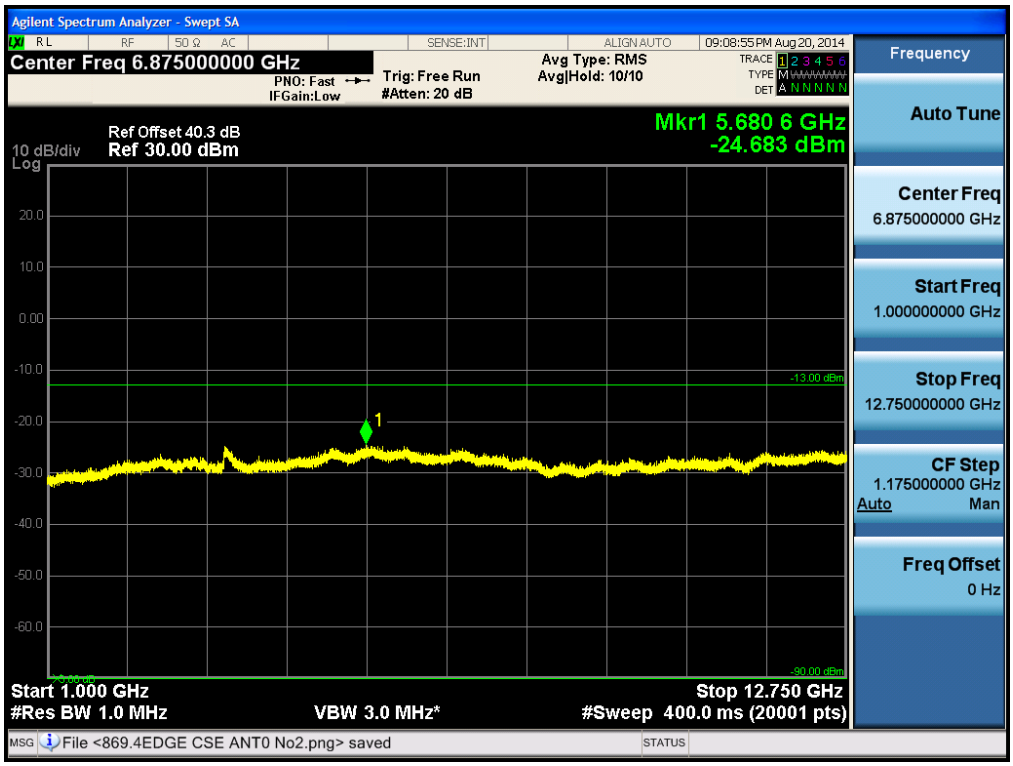
[GSM Downlink Middle]



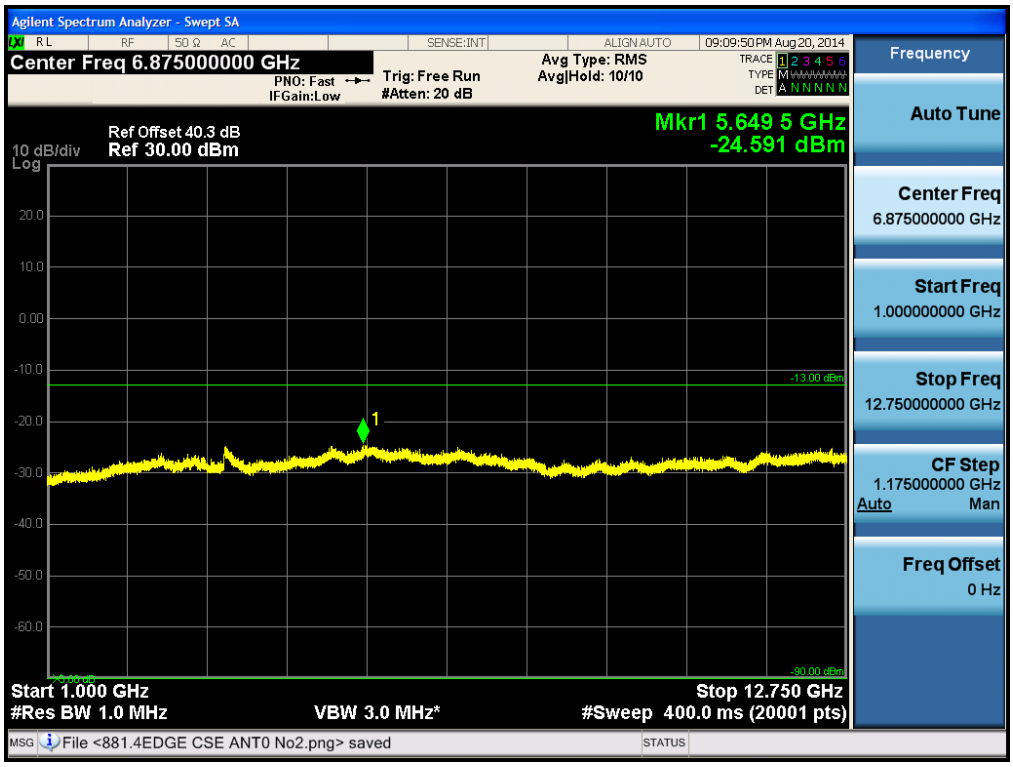
[GSM Downlink High]



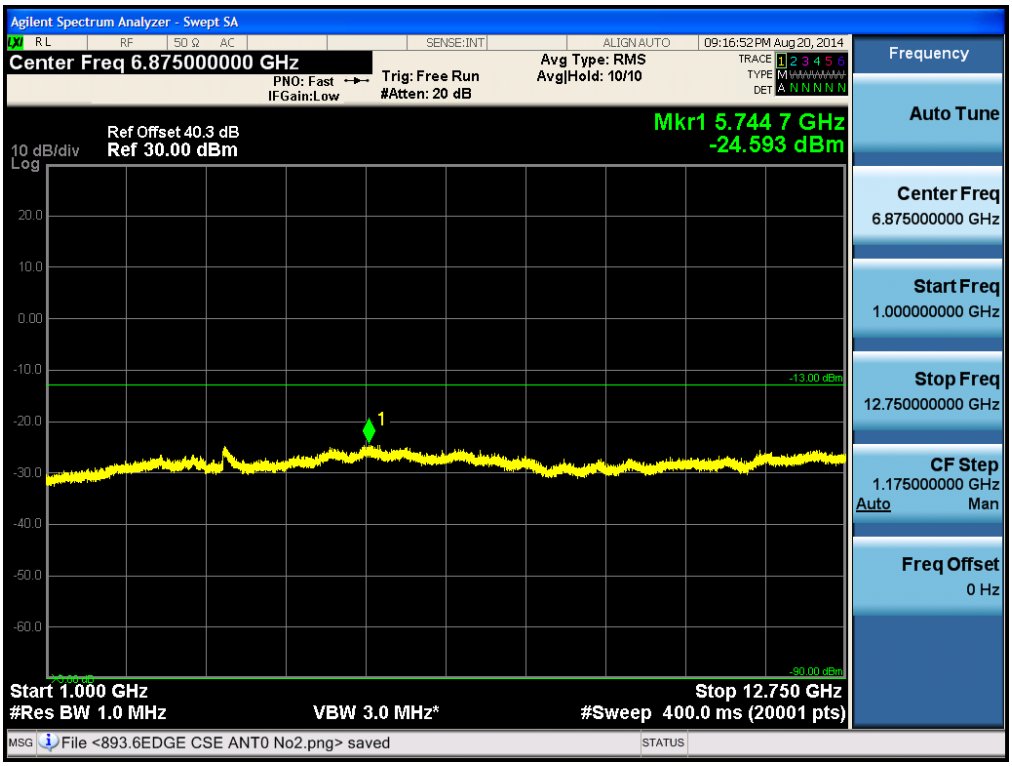
[EDGE Downlink Low]



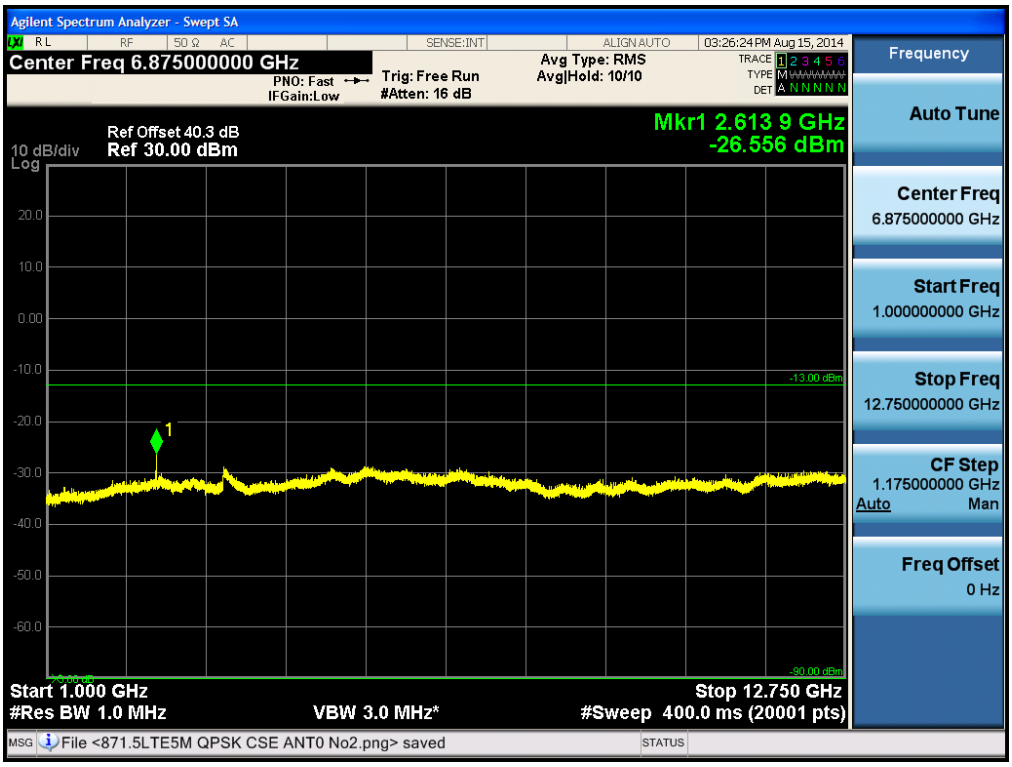
[EDGE Downlink Middle]



[EDGE Downlink High]



[LTE Downlink 5 MHz Low]

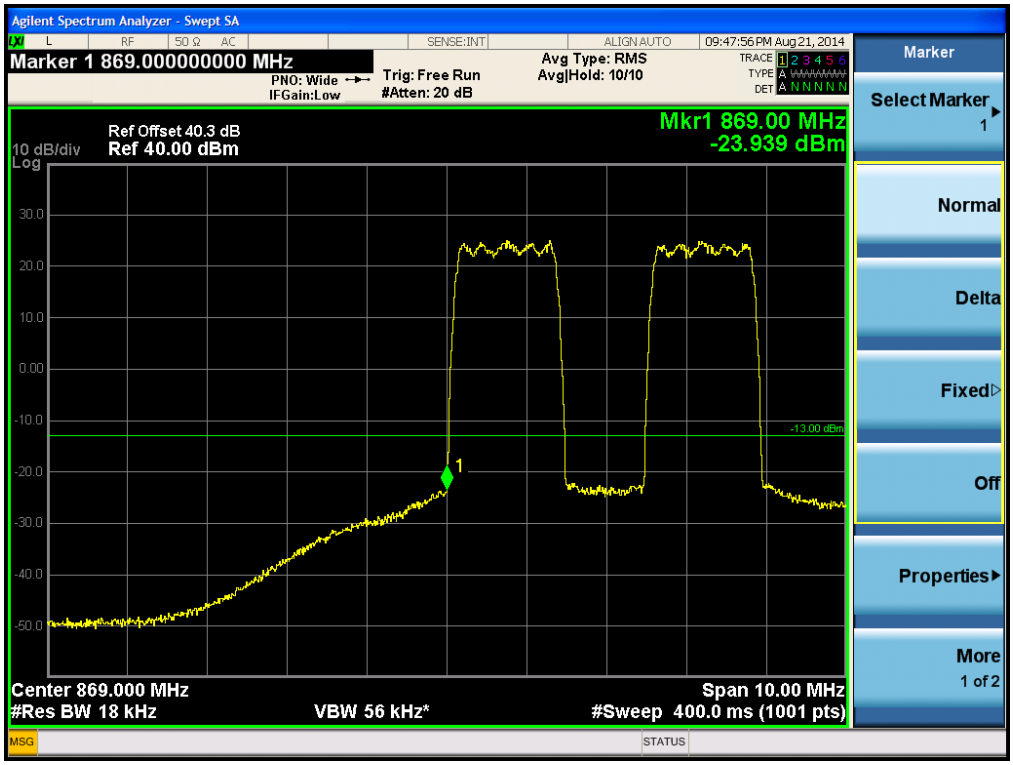


[LTE Downlink 5 MHz Middle]

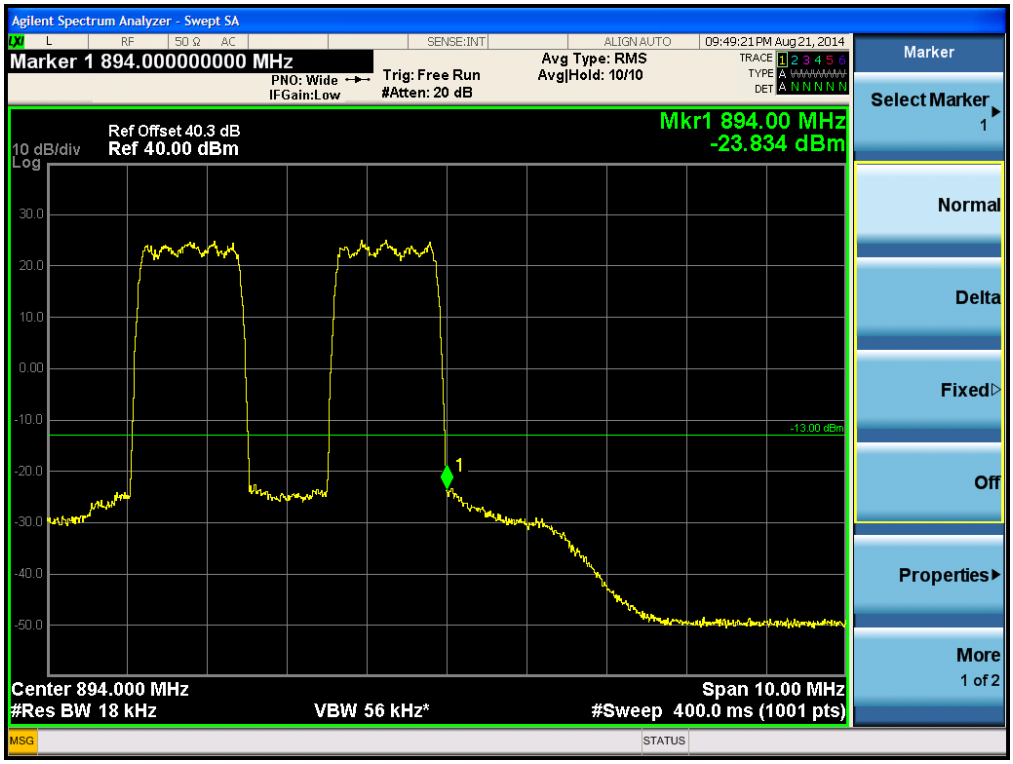
[LTE Downlink 5 MHz High]

Intermodulation Spurious Emissions

[CDMA Downlink Low]



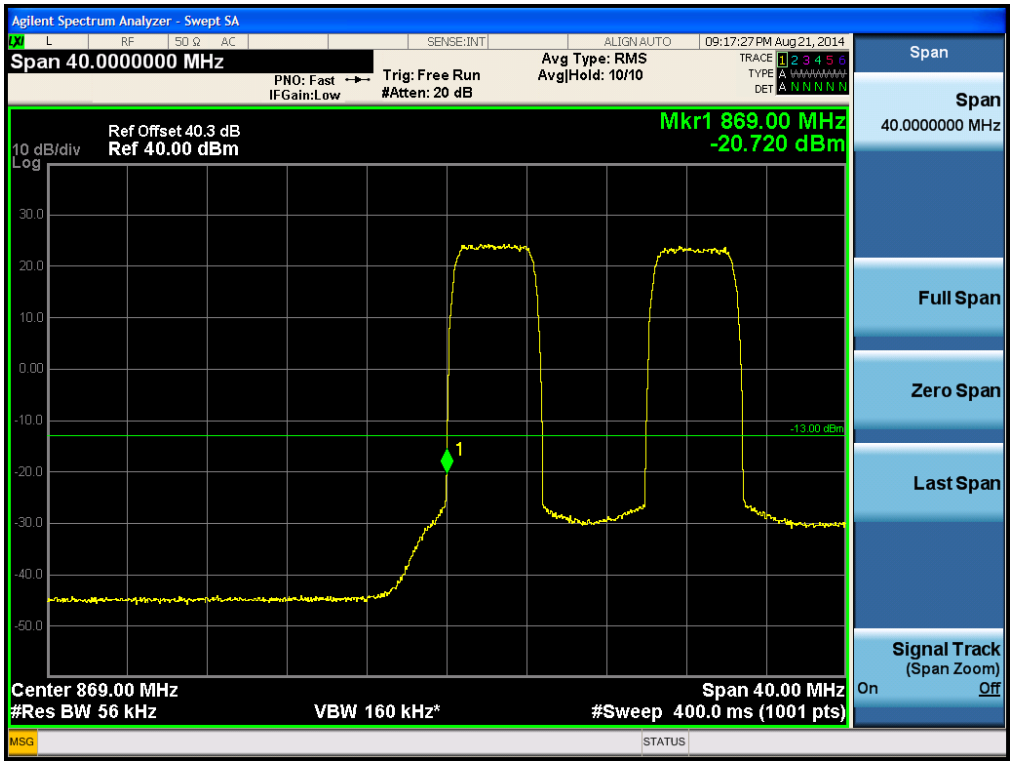
[CDMA Downlink High]



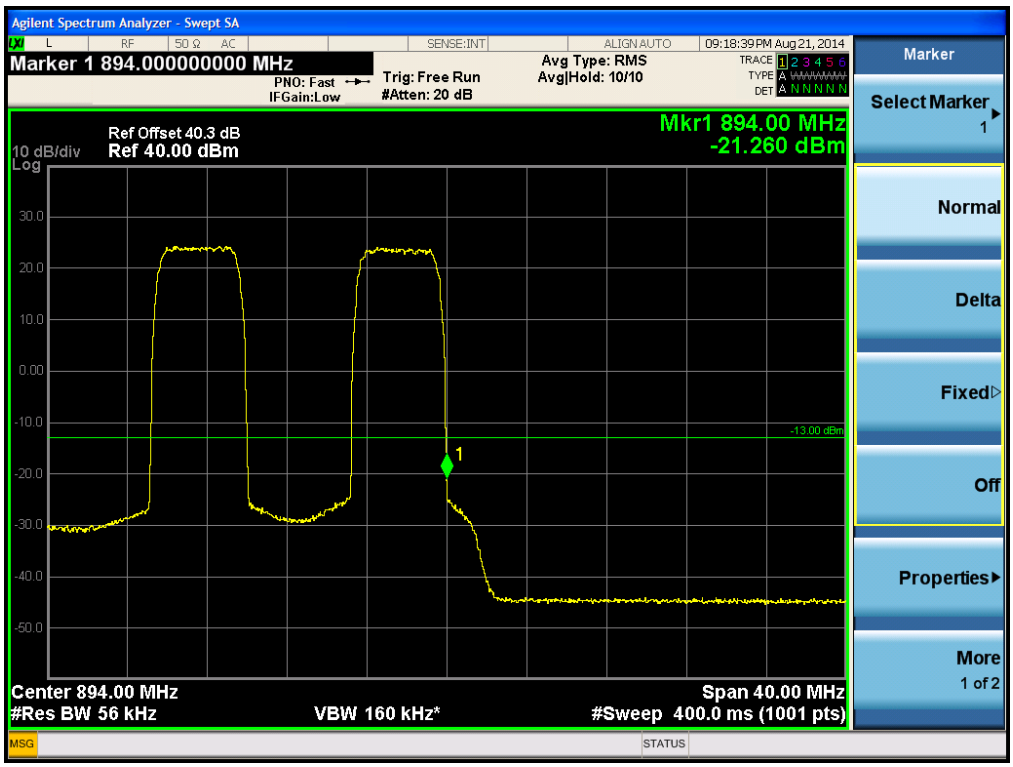
[EVDO Downlink Low]

[EVDO Downlink High]

[WCDMA Downlink Low]



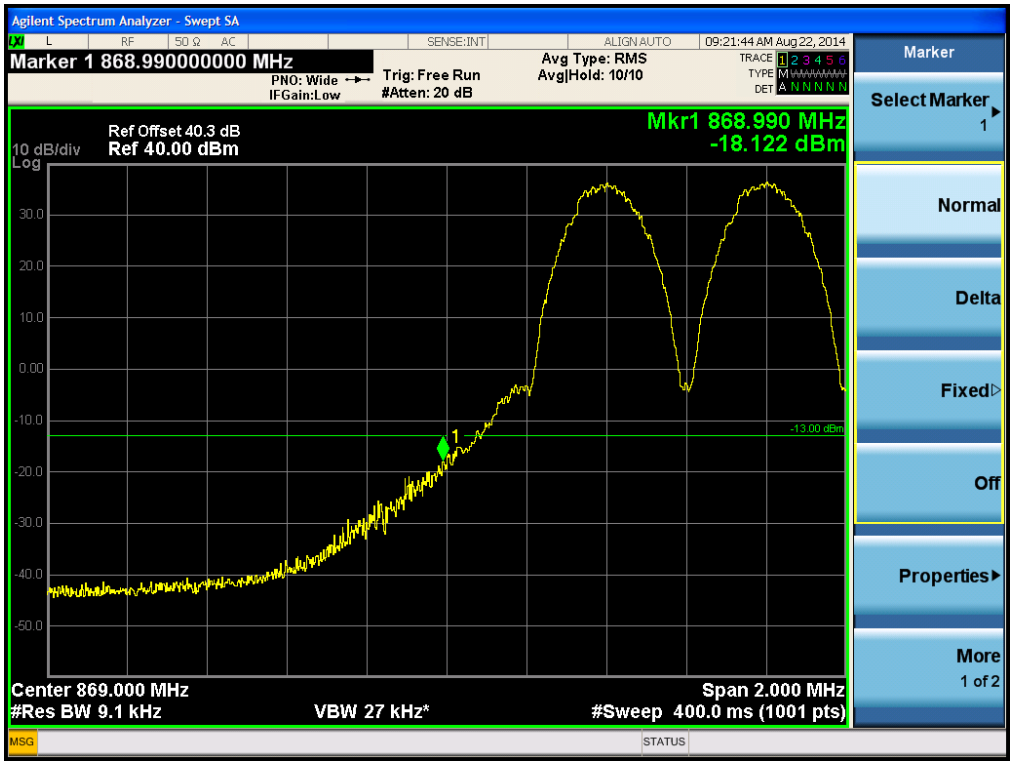
[WCDMA Downlink High]



[GSM Downlink Low]

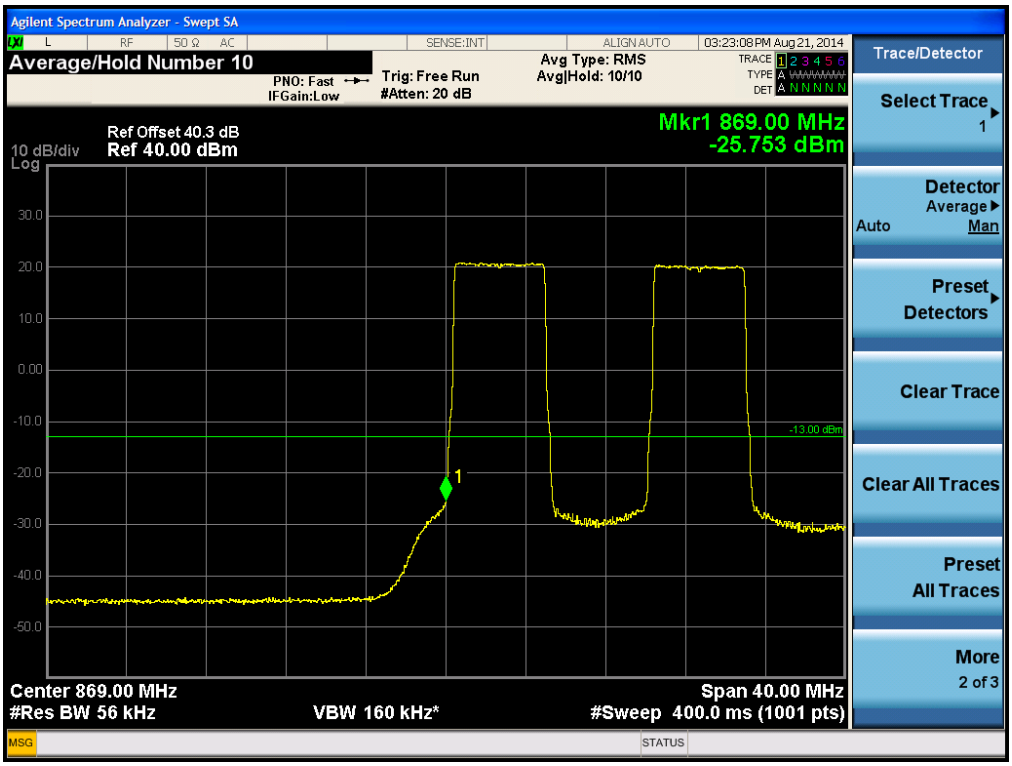
[GSM Downlink High]

[EDGE Downlink Low]

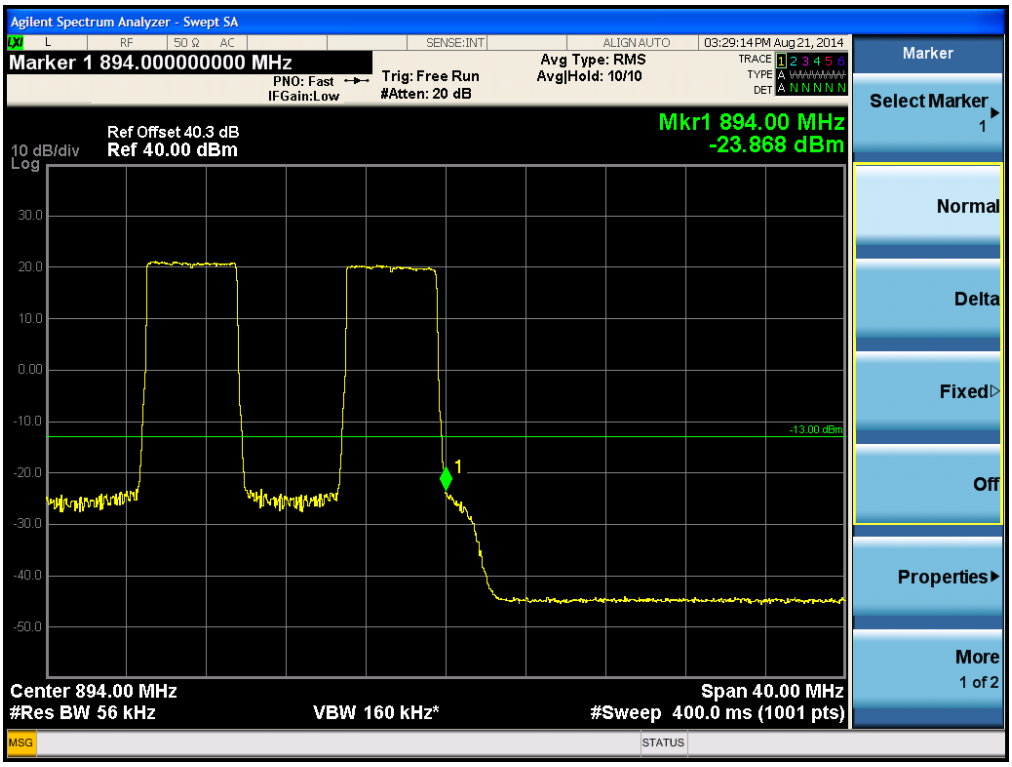


[EDGE Downlink High]

[LTE5 Downlink Low]

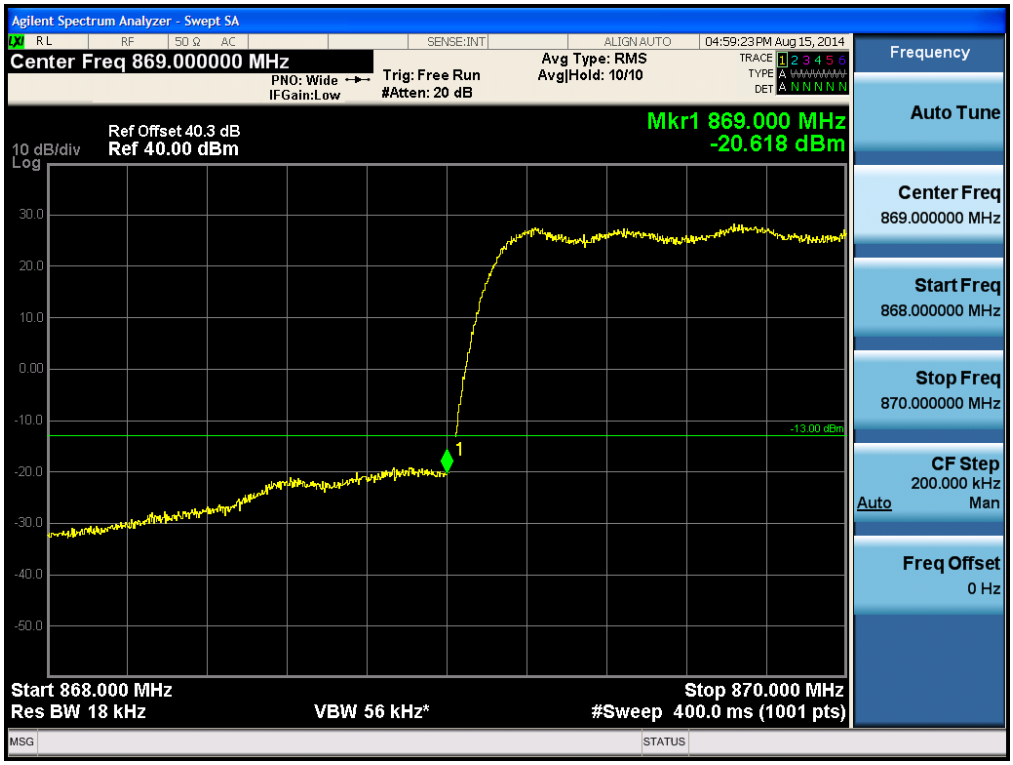


[LTE5 Downlink High]

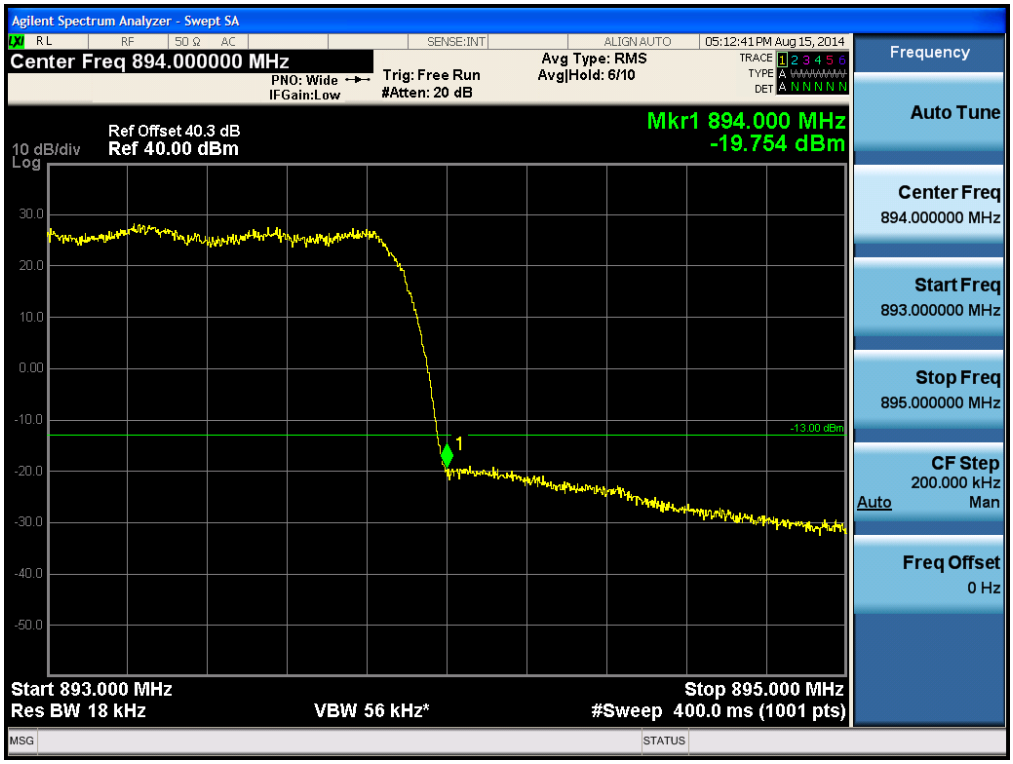


Band Edge

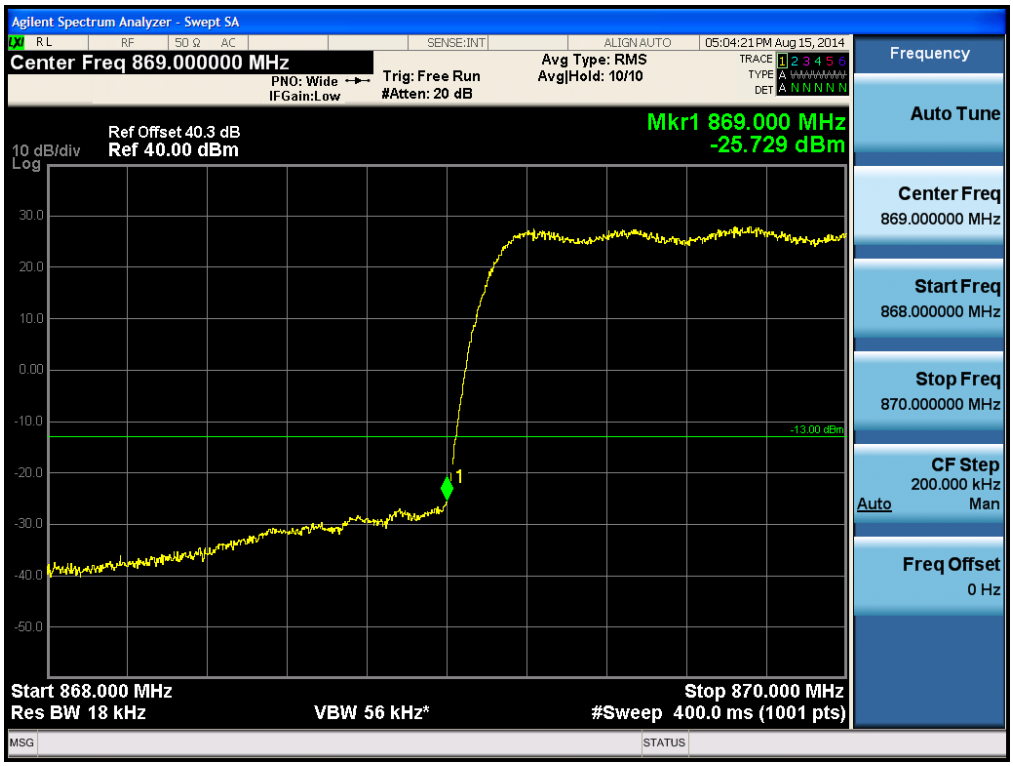
[CDMA Downlink Low]



[CDMA Downlink High]

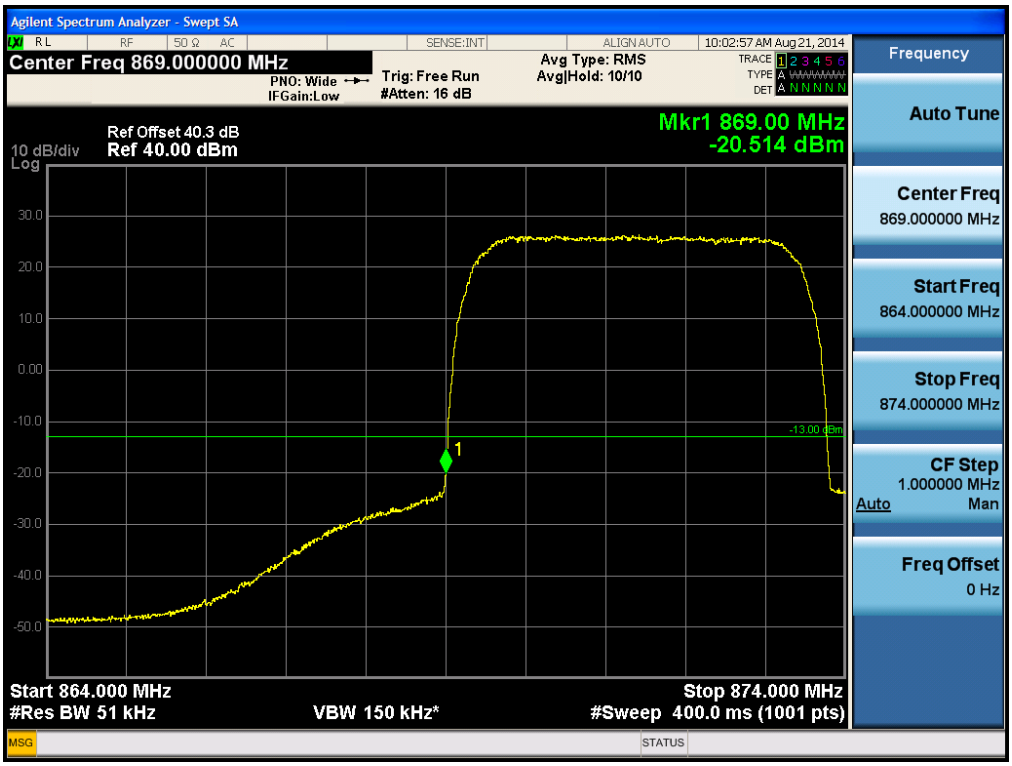


[EVDO Downlink Low]

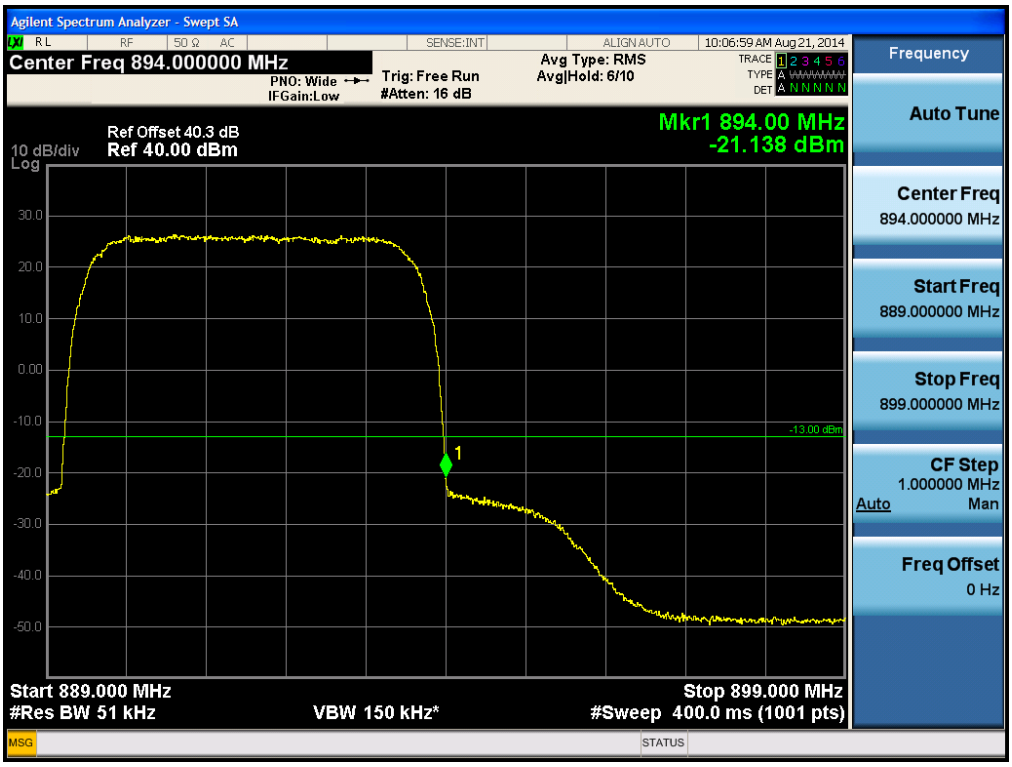


[EVDO Downlink High]

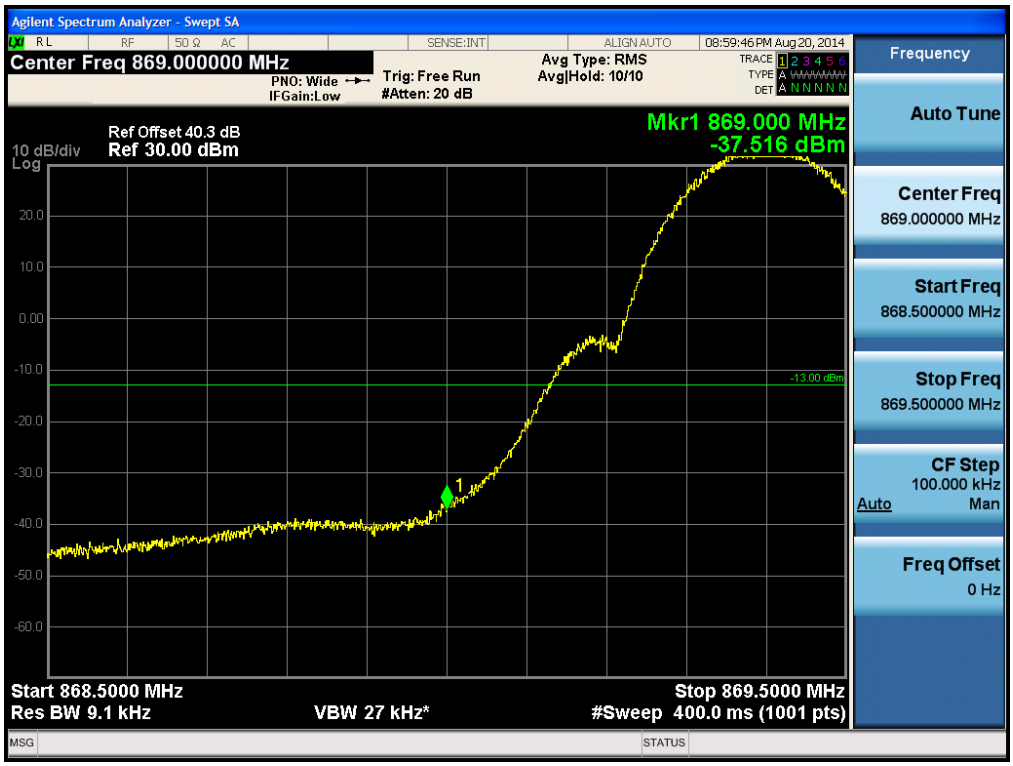
[WCDMA Downlink Low]



[WCDMA Downlink High]

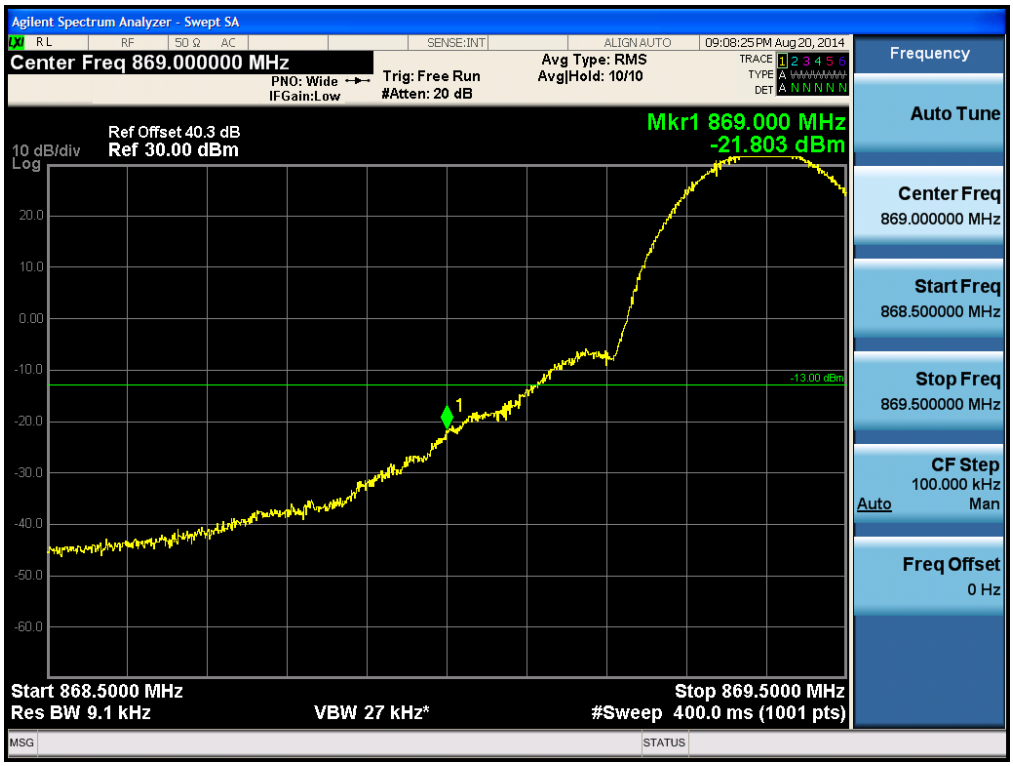


[GSM Downlink Low]



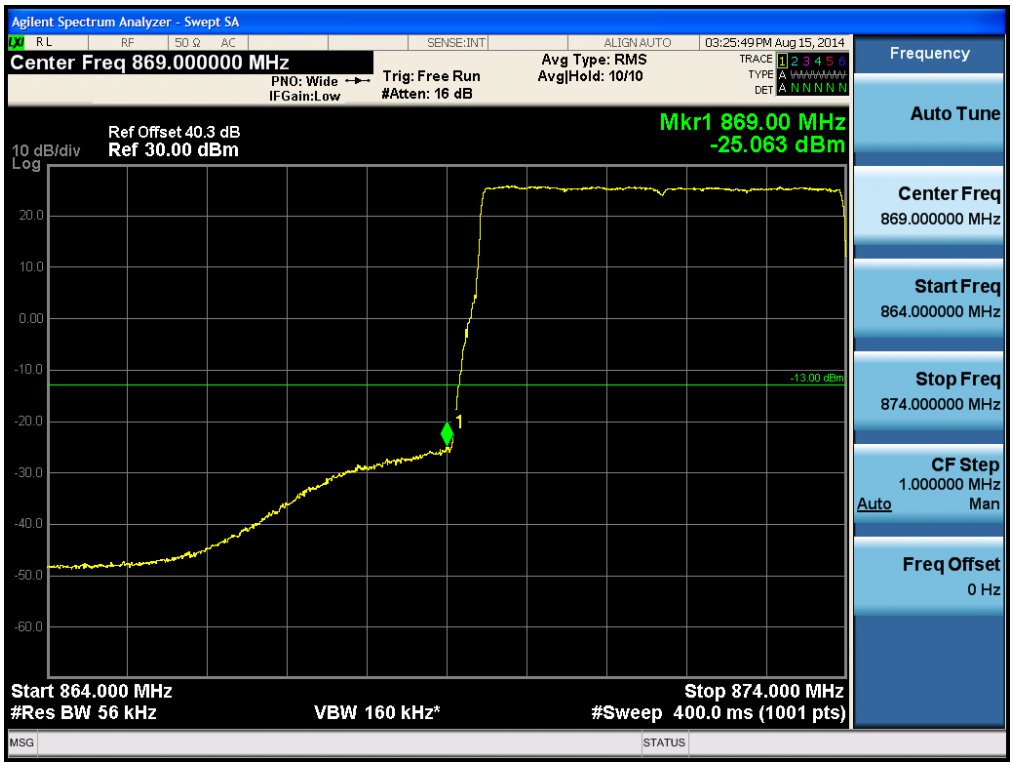
[GSM Downlink High]

[EDGE Downlink Low]



[EDGE Downlink High]

[LTE Downlink 5 MHz Low]



[LTE Downlink 5 MHz High]

9. OUT OF BAND REJECTION

Test Requirement(s): KDB 935210 D03 v02r01

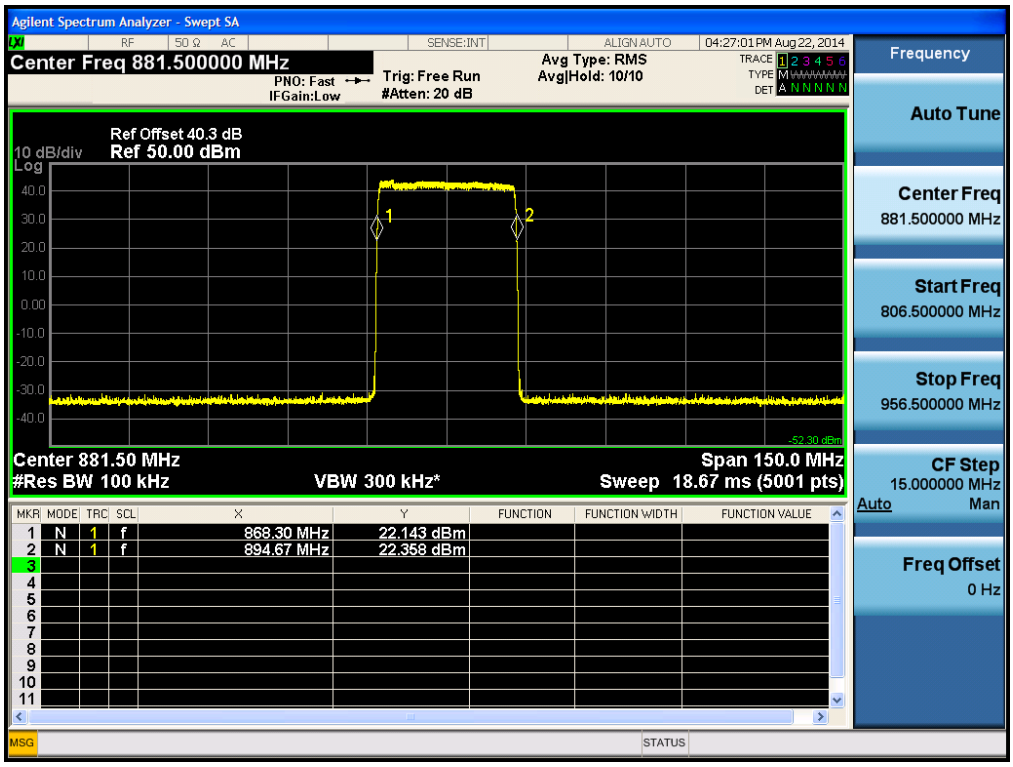
Out of Band Rejection – Test for rejection of out of band signals. Filter freq. response plots are acceptable.

Test Procedures: A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. Signal generator sweep from the frequency more lower than the operating frequency to the frequency more higher than it, find the product band filter characteristic

Test Results: The EUT complies with the requirements of this section.

Out of Band Rejection

[Cellular Band Downlink]



10. FIELD STRENGTH OF SPURIOUS RADIATION

Test Requirement(s): § 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be Radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§ 2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to The transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

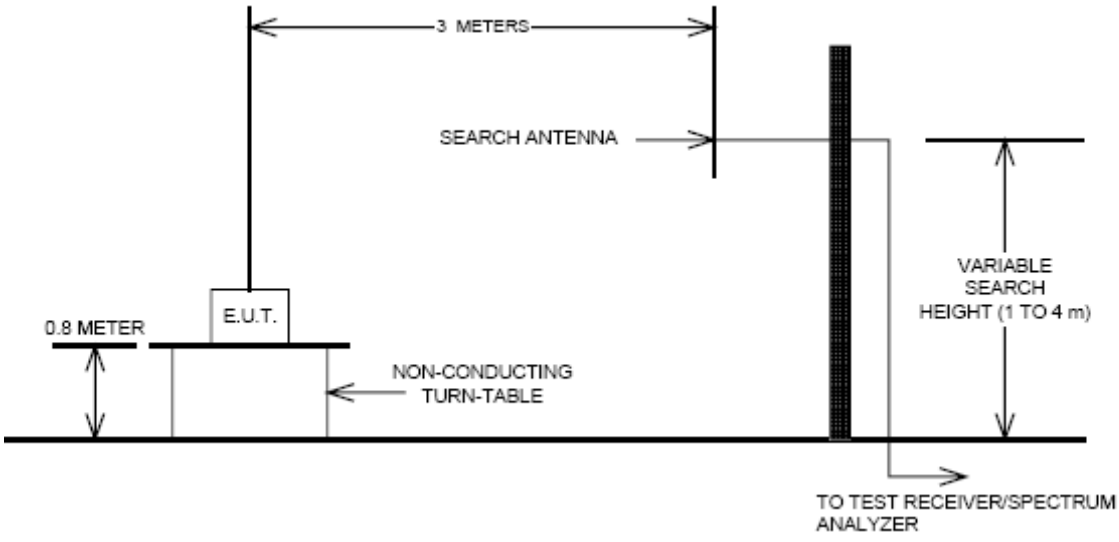
Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of ANSI/TIA-603-C-2004 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber.

The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports

were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360 and the receiving antenna scanned from 1-3m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried. out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40 GHz, whichever was the lesser, were investigated.

Radiated Spurious Emissions Test Setup



Test Result:

Note.

Input signal is the CW signal.

Harmonics were not found.

[Downlink]

Tx Freq.(MHz)	Freq.(MHz)	Substitute Level [dBm]	Ant. Gain (dBi)	C.L	Pol.	ERP (dBm)	Margin (dB)
869.4	1776	-31.41	7.94	5.24	H	-28.71	15.71
	2000	-33.14	8.45	5.64	H	-30.33	17.33
881.5	1776	-31.52	7.94	5.24	H	-28.82	15.82
	2000	-32.78	8.45	5.64	H	-29.97	16.97
893.6	1776	-31.73	7.94	5.24	H	-29.03	16.03
	2000	-32.53	8.45	5.64	H	-29.72	16.72

11. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

Test Requirement(s): §2.1055(a)(1) , §22.355

Test Procedures:

As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber.

A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations.

The frequency drift was investigated for every 10 °C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50 °C.

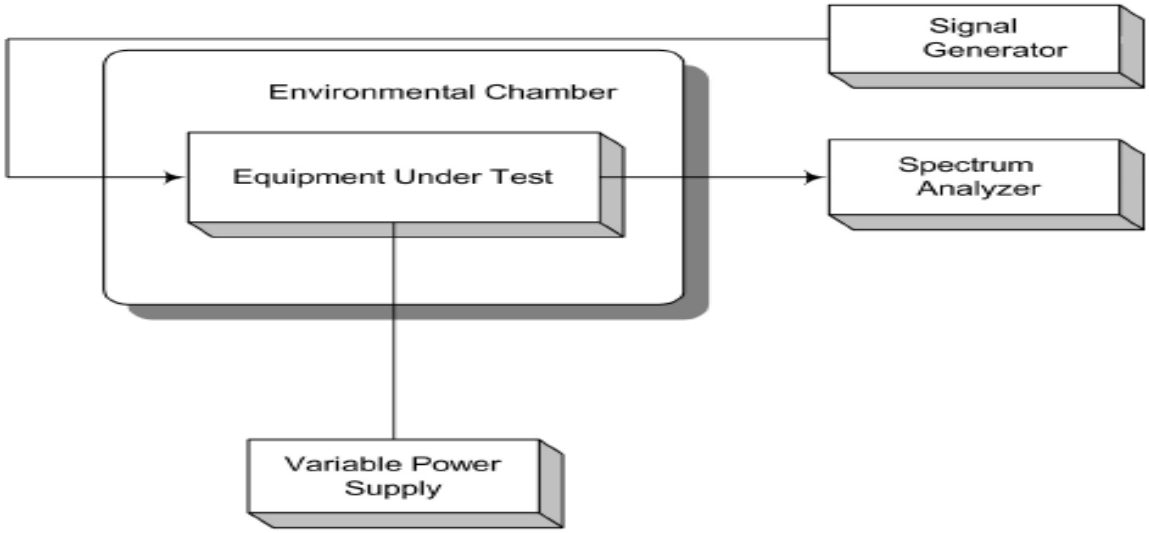
Voltage supplied to EUT is 110 Vac reference temperature was done at 20°C. The voltage was varied by ± 15 % of nominal

§ 22.355 Frequency tolerance. Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C–1 of this section.

Table C–1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile ≤3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

Test Setup:



Test Results:

The E.U.T was found in compliance for Frequency Stability and Voltage Test

AC Frequency Stability and Voltage Test Results

Reference: 120 Vac at 20°C **Freq.** = 881.5 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	881500000. 0	0.0	0.0	0.0000
	-30	881500000. 1	0.1	0.1	0.0000
	-20	881499999. 9	-0.1	-0.1	0.0000
	-10	881500000. 1	0.1	0.1	0.0000
	0	881500000. 0	0.0	0.0	0.0000
	+10	881500000. 0	0.0	0.0	0.0000
	+30	881499999. 9	-0.1	-0.1	0.0000
	+40	881500000. 0	0.0	0.0	0.0000
	+50	881499999. 9	-0.1	-0.1	0.0000
115%	+20	881500000. 0	0.0	0.0	0.0000
85%	+20	881500000. 0	0.0	0.0	0.0000

[Downlink]