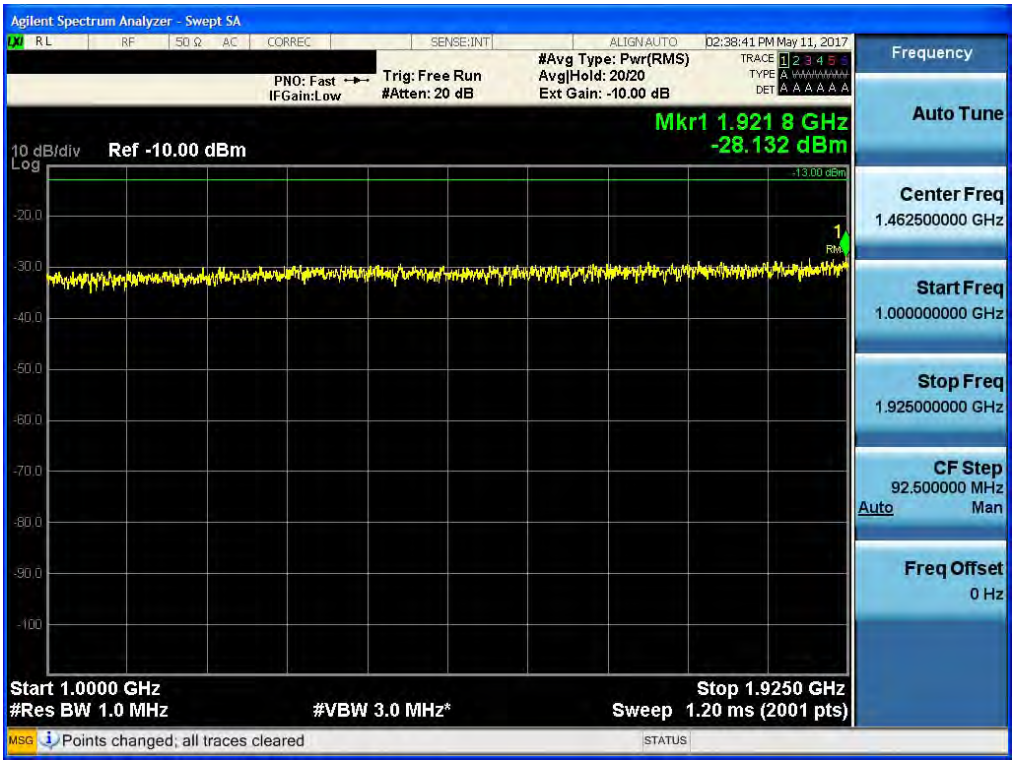
Conducted Spurious Emissions (1 GHz – 26.5 GHz)

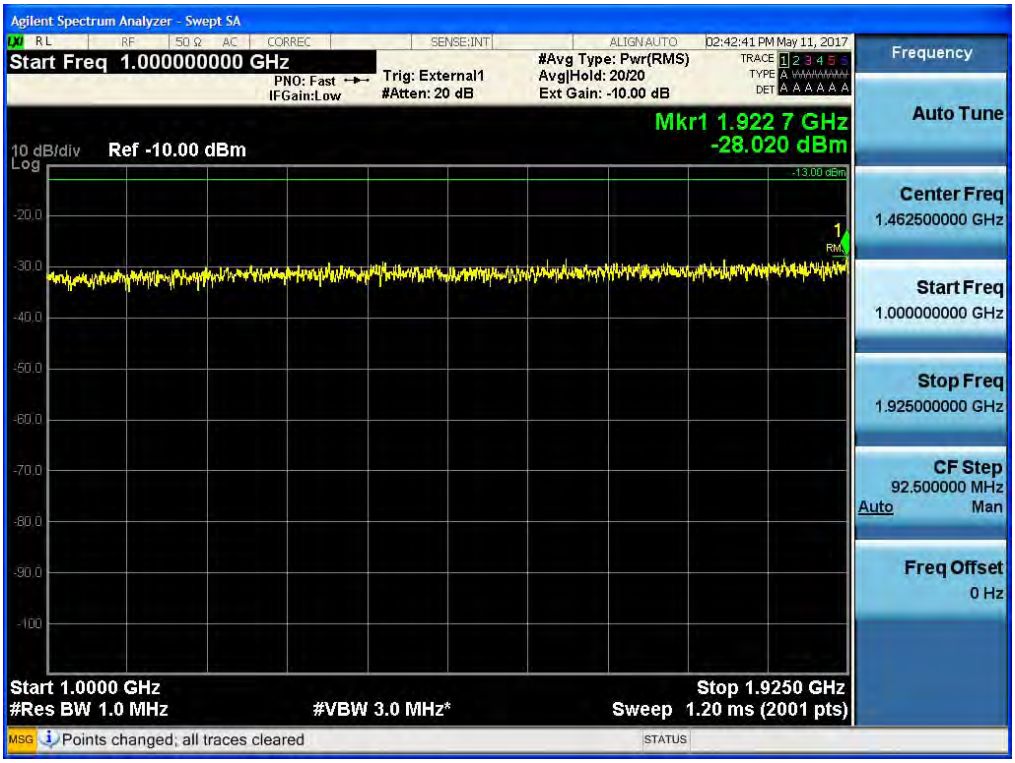
[Downlink Low]



[Downlink Low]

[Downlink Low]-3

[Downlink Middle]-1



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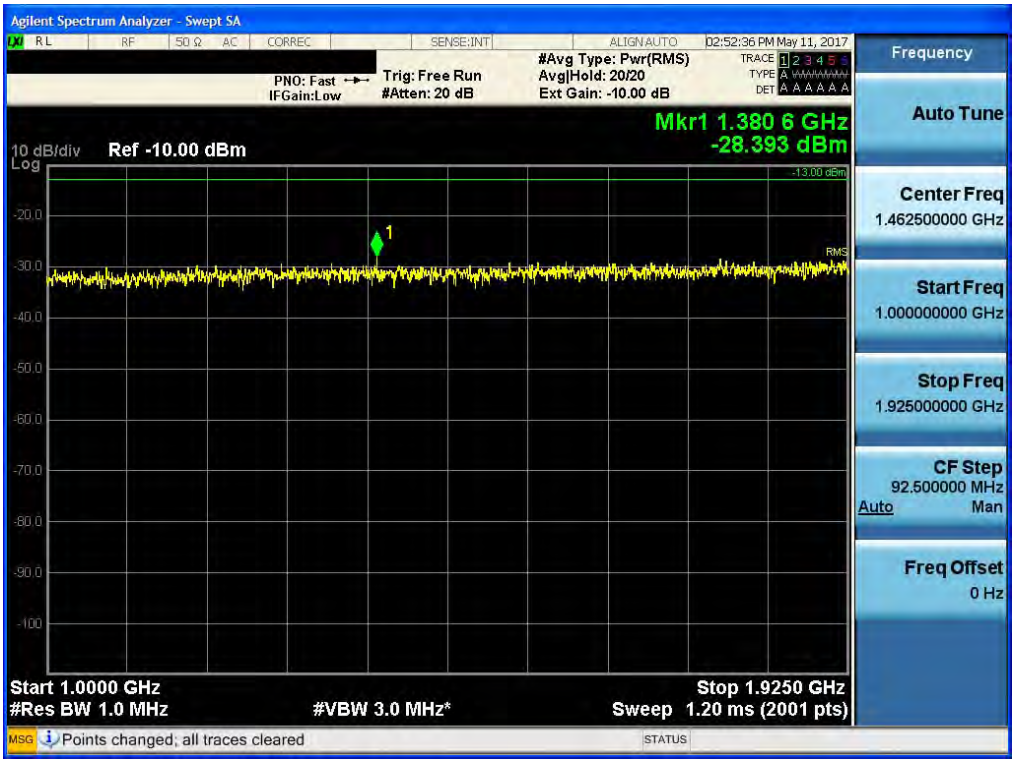


[Downlink High]-2

[Downlink High]-3

Single channel Enhancer Plots of Spurious Emission for 1900 PCS BAND WCDMA

Conducted Spurious Emissions (9 kHz – 150 kHz)

[Downlink Low]

[Downlink Middle]

[Downlink High]

Conducted Spurious Emissions (150 kHz – 30 MHz)

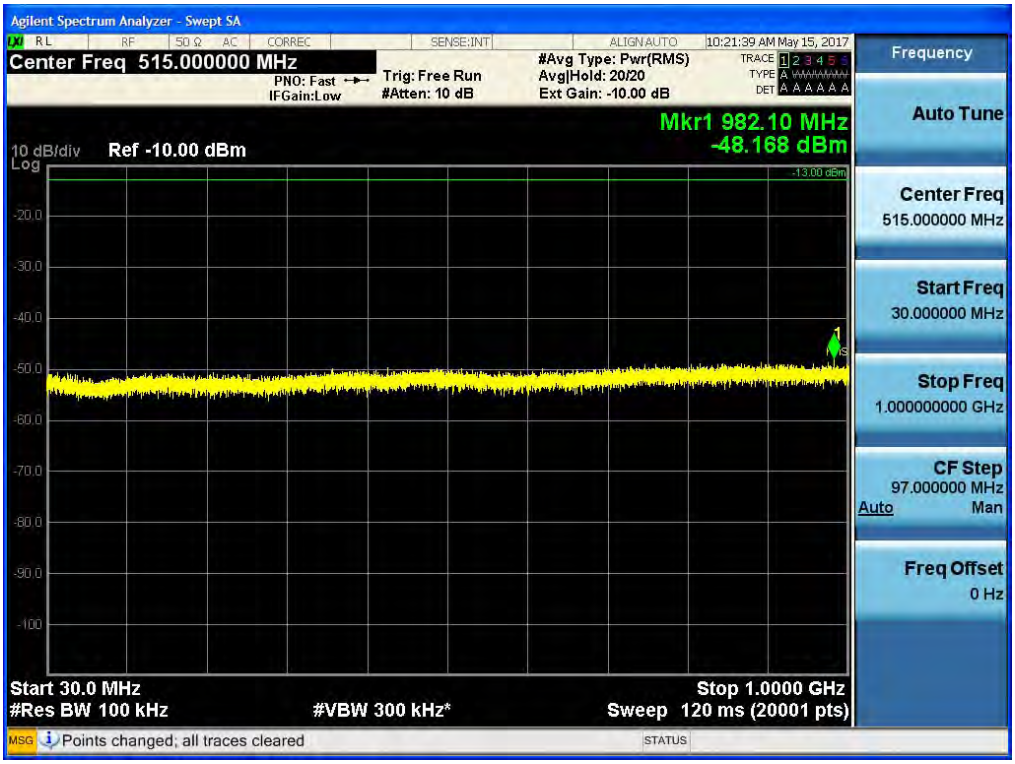
[Downlink Low]

[Downlink Middle]

[Downlink High]

Conducted Spurious Emissions (30 MHz – 1 GHz)

[Downlink Low]



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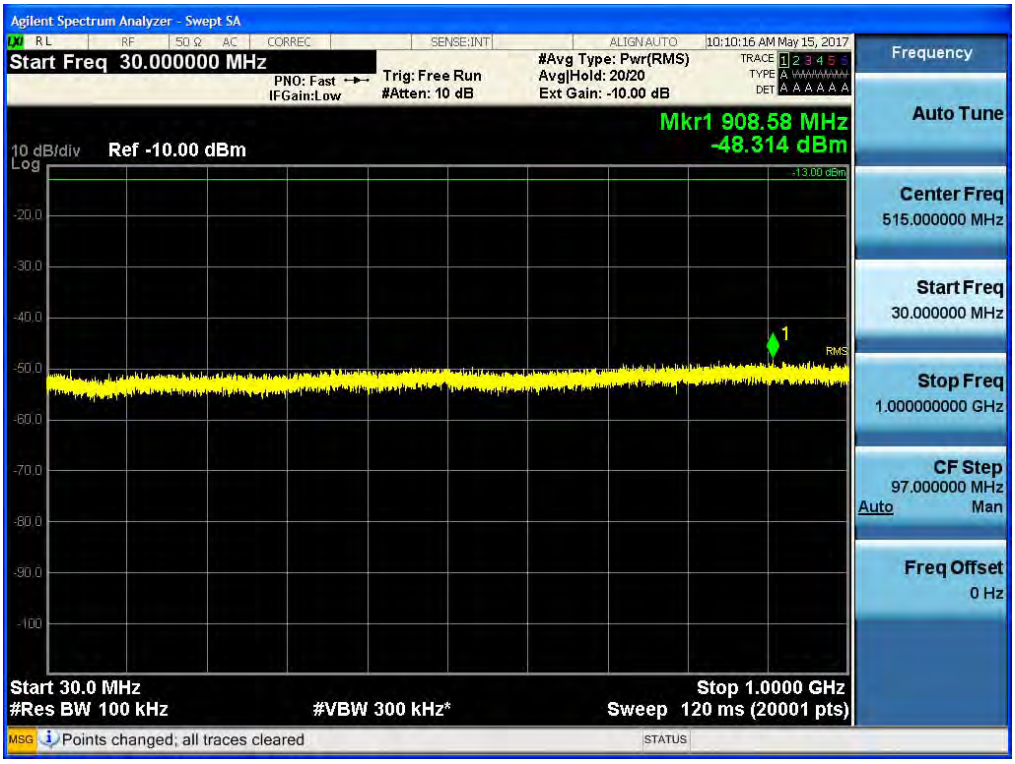

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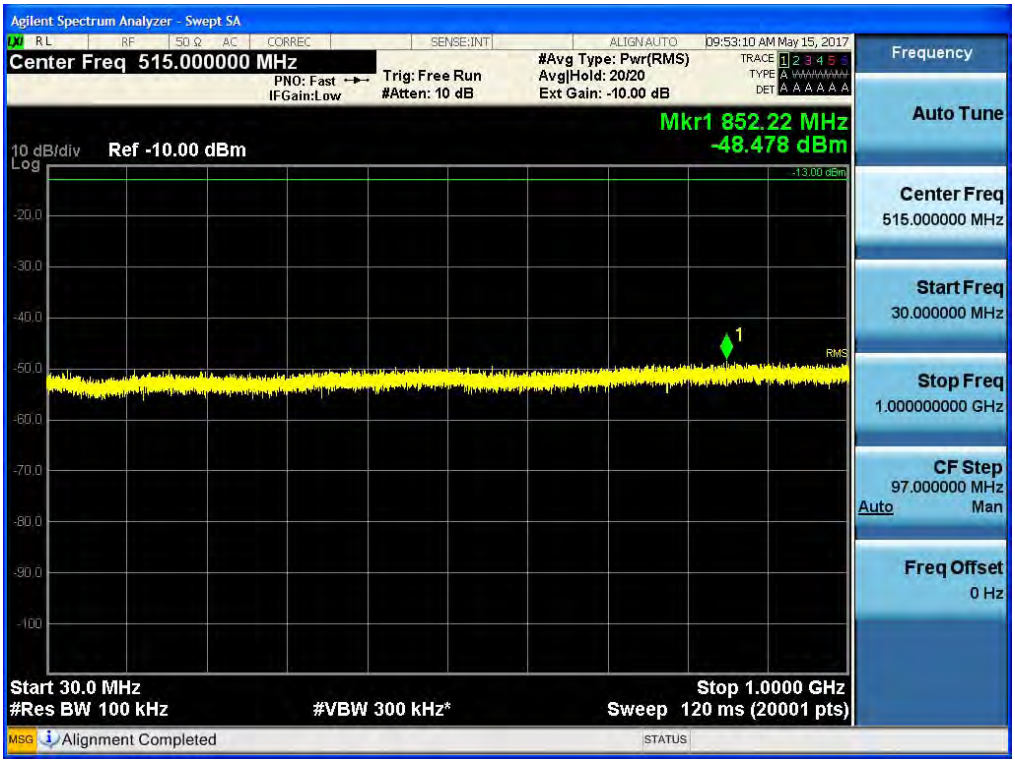
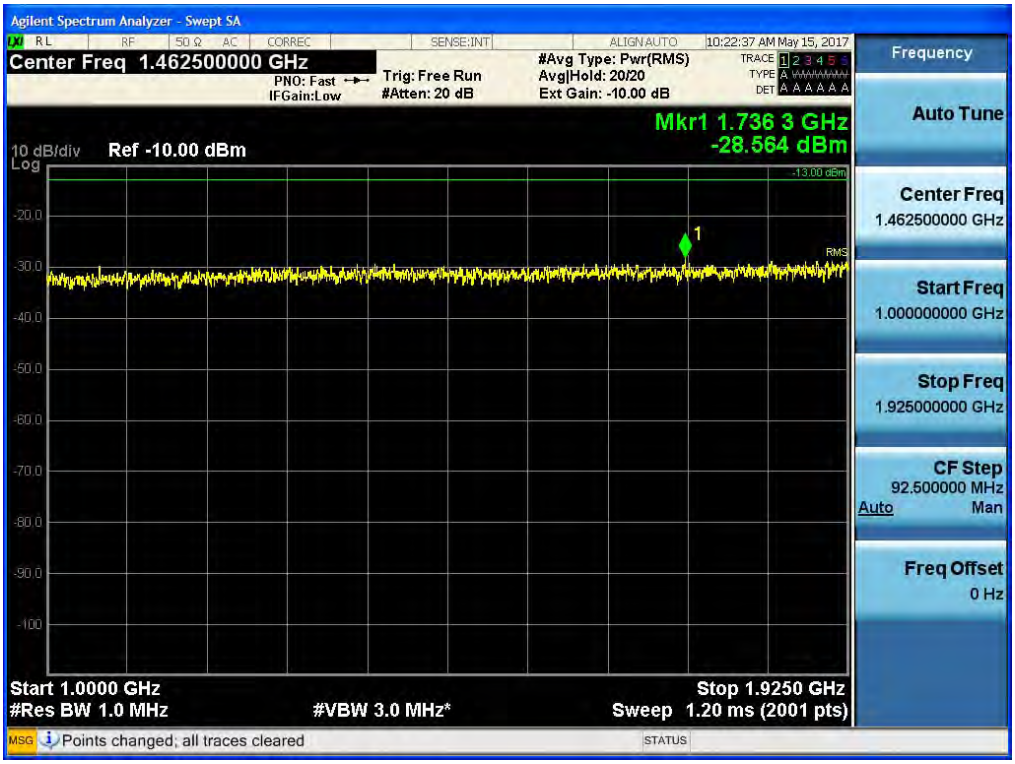


Conducted Spurious Emissions (1 GHz – 26.5 GHz)

[Downlink Low]-1



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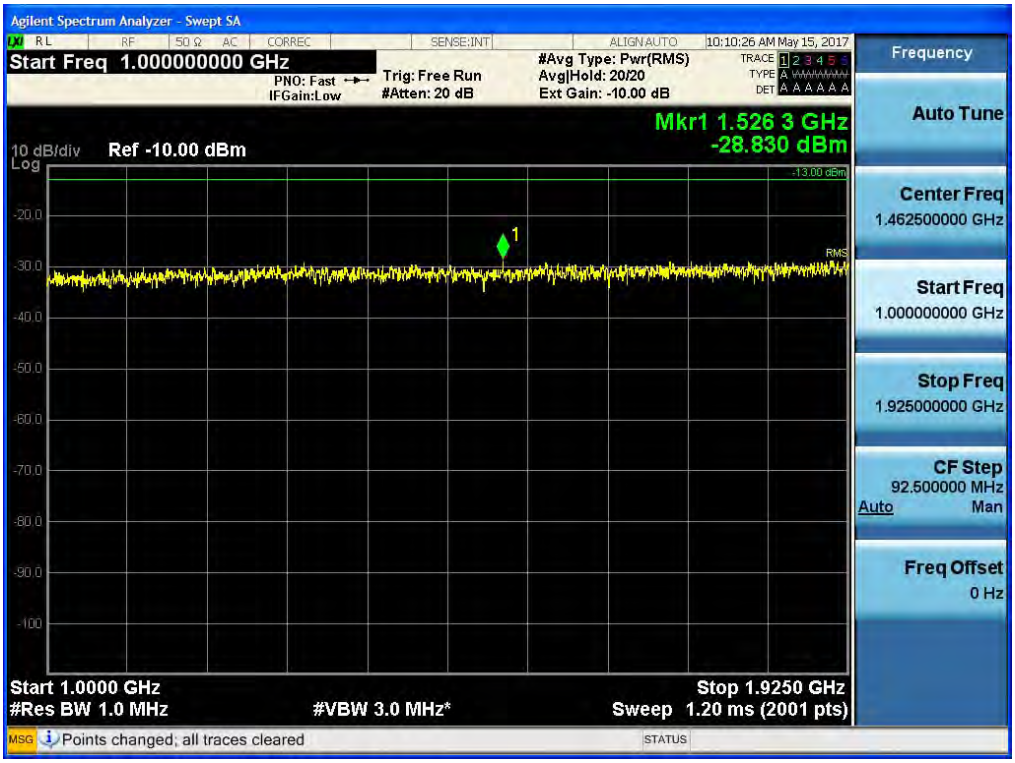


[Downlink Middle]-2

[Downlink Middle]-3

[Downlink High]-1

[Downlink High]-2

[Downlink High]-3

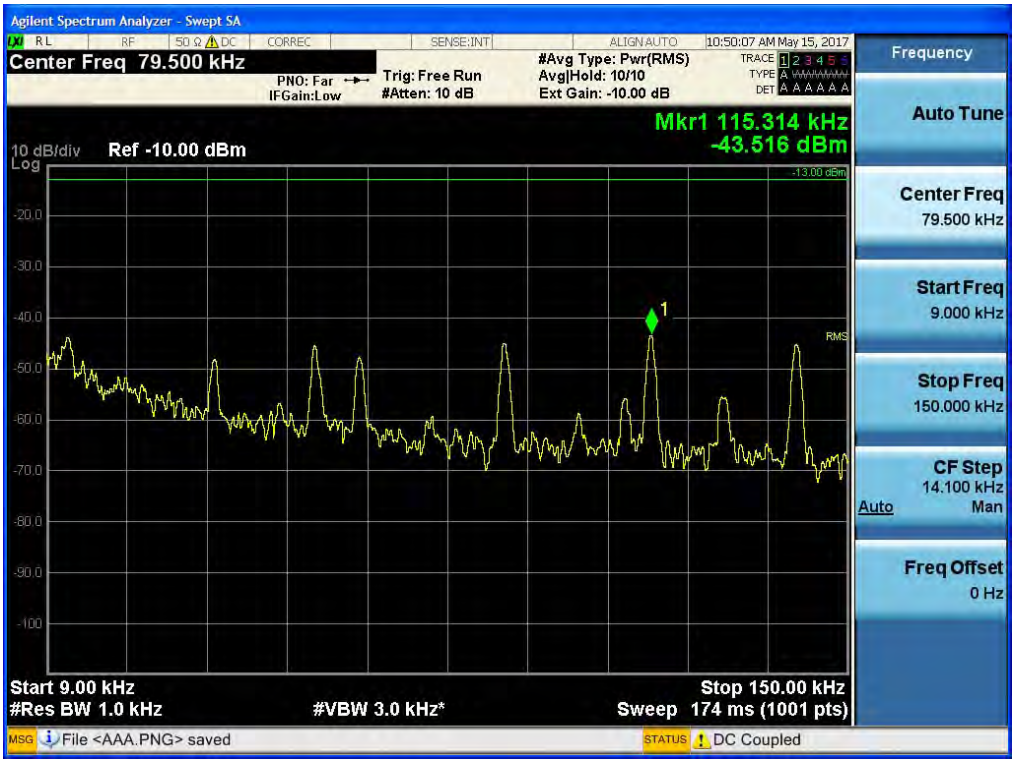
Single channel Enhancer Plots of Spurious Emission for 1900 PCS BAND CDMA

Conducted Spurious Emissions (9 kHz – 150 kHz)

[Downlink Low]

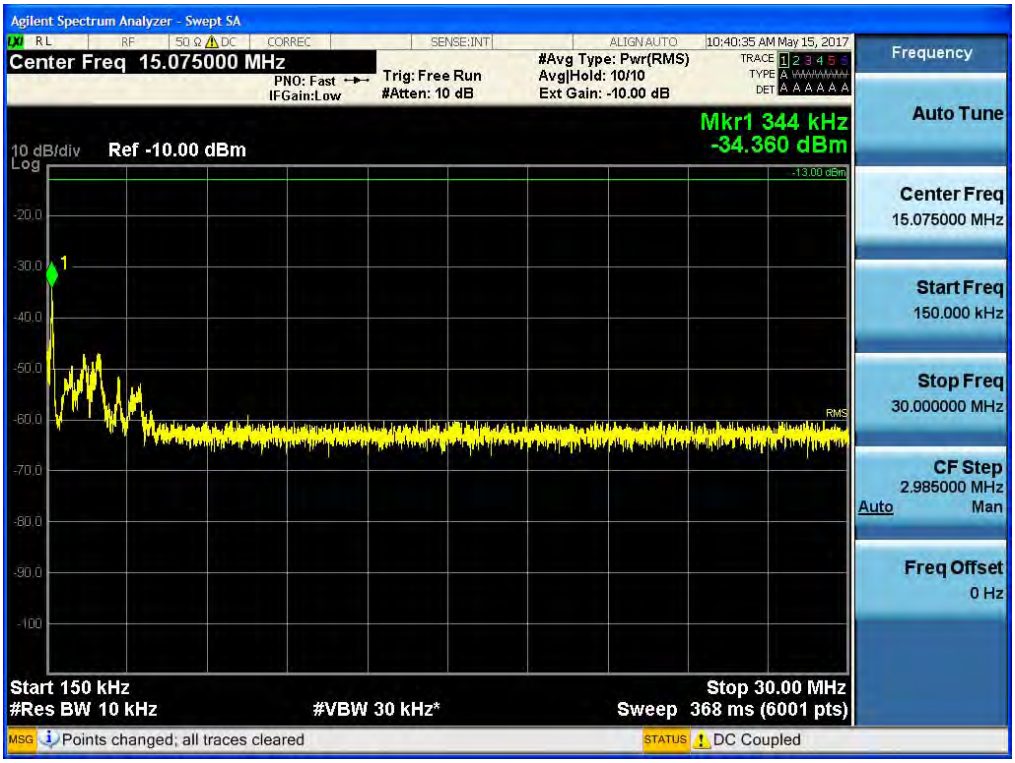
[Downlink Middle]

[Downlink High]



Conducted Spurious Emissions (150 kHz – 30 MHz)

[Downlink Low]



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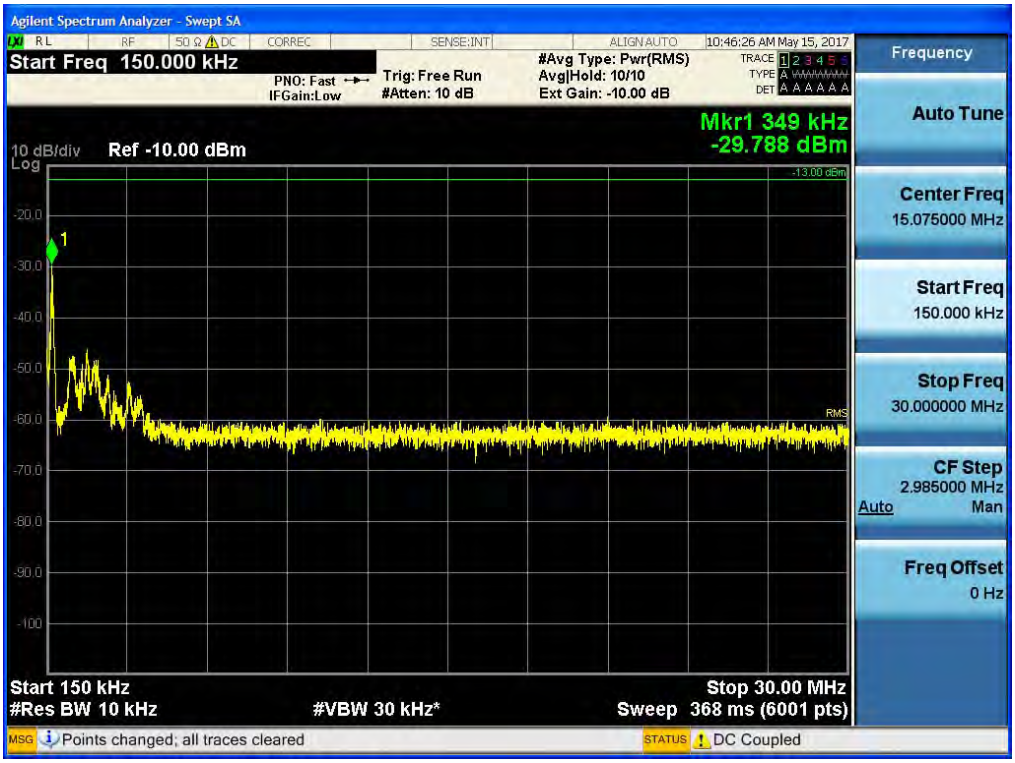
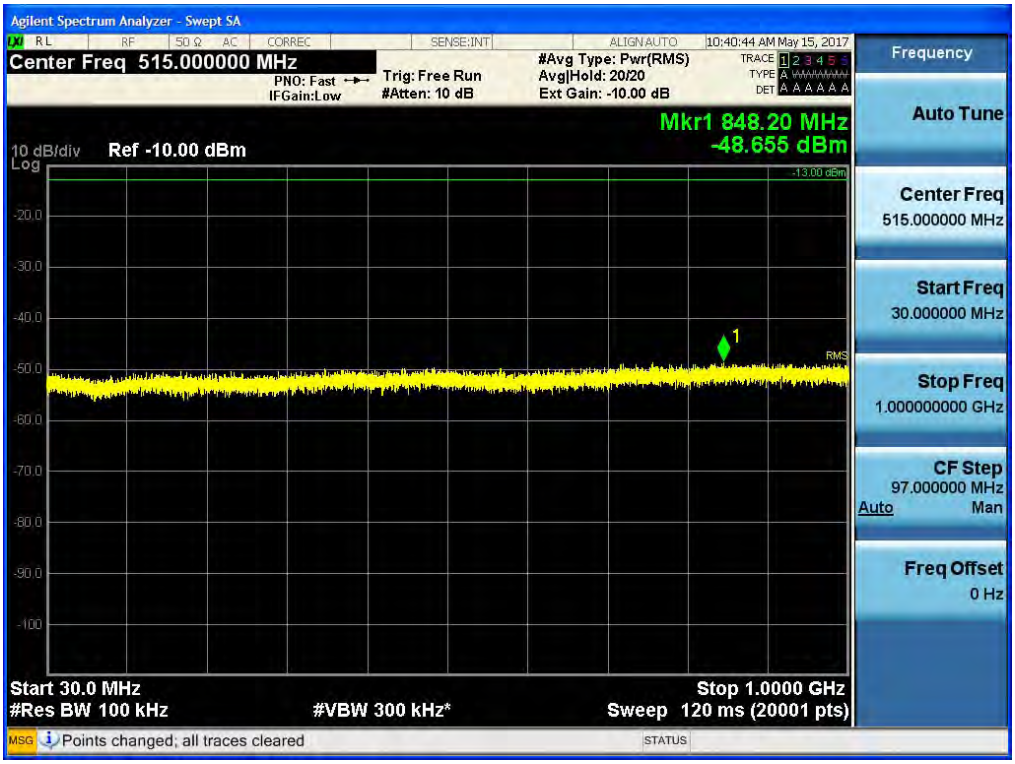


[Downlink High]

Conducted Spurious Emissions (30 MHz – 1 GHz)

[Downlink Low]



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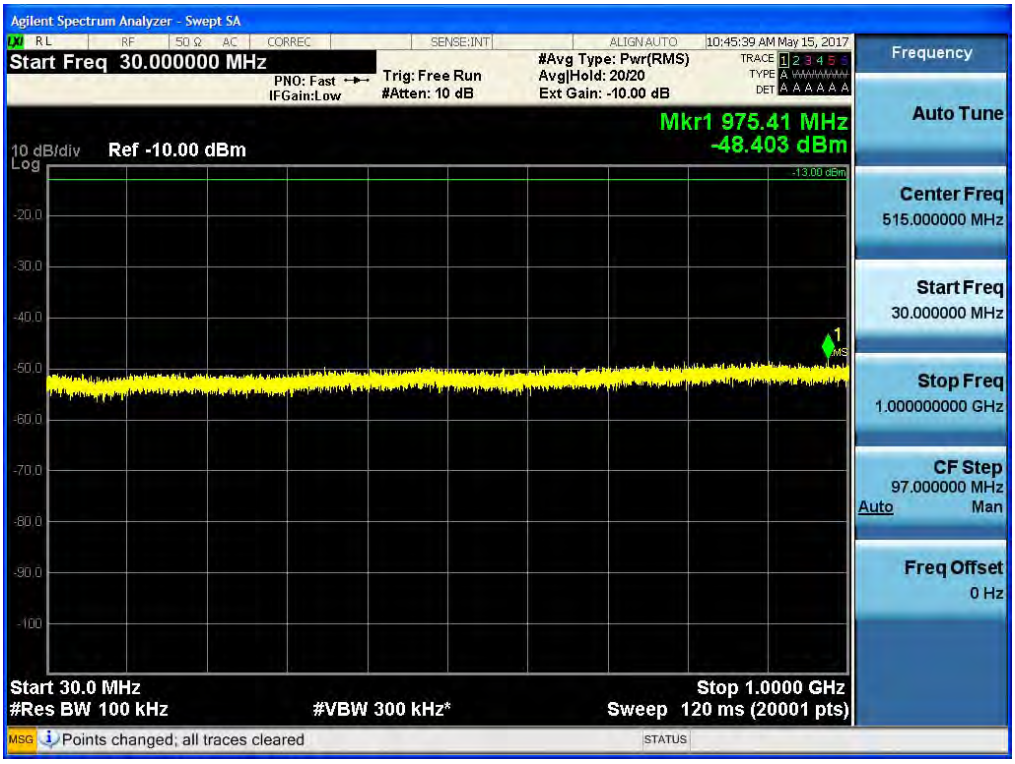

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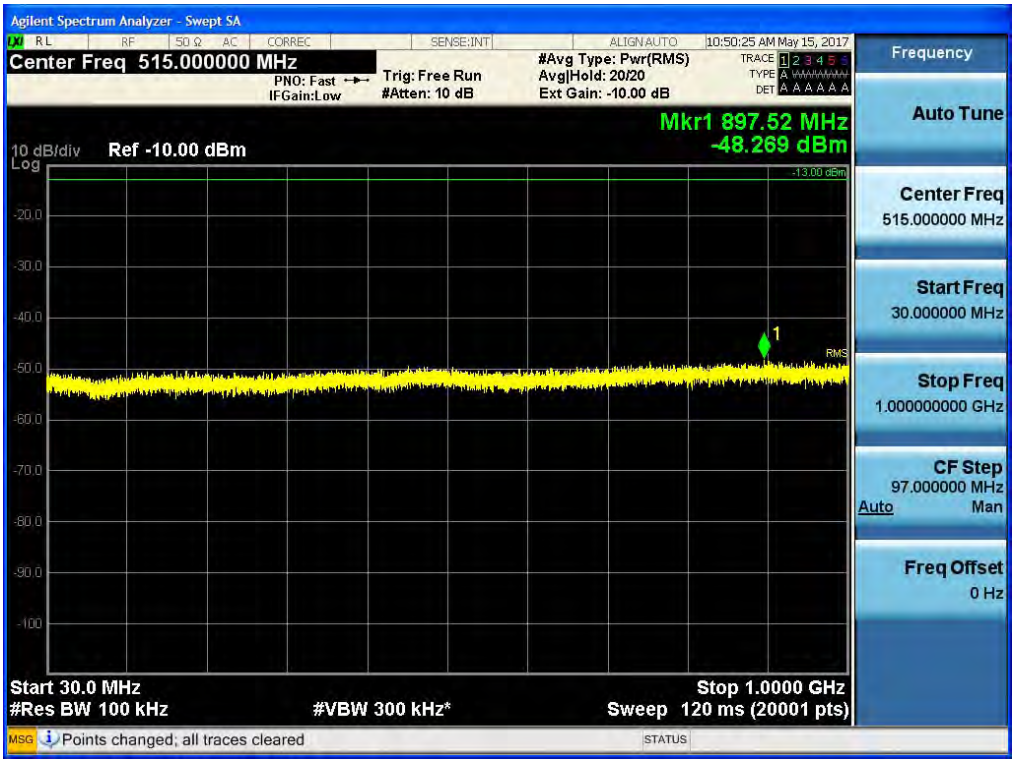


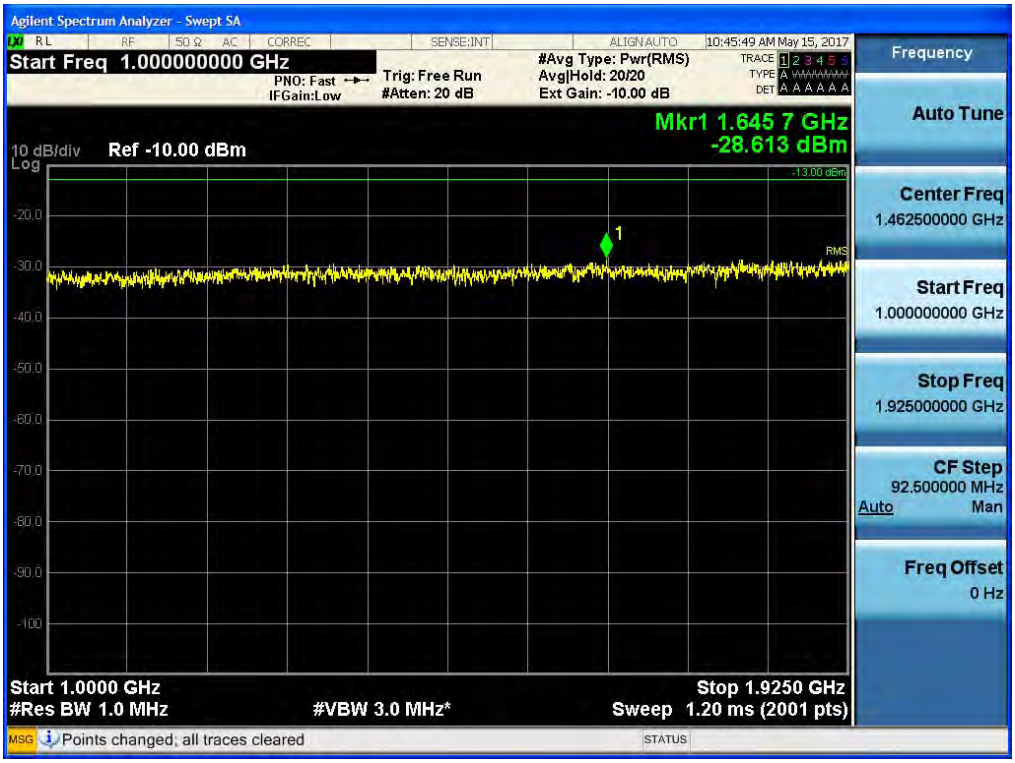
Conducted Spurious Emissions (1 GHz – 26.5 GHz)

[Downlink Low]-1

[Downlink Low]-2

[Downlink Low]-3

[Downlink Middle]-1



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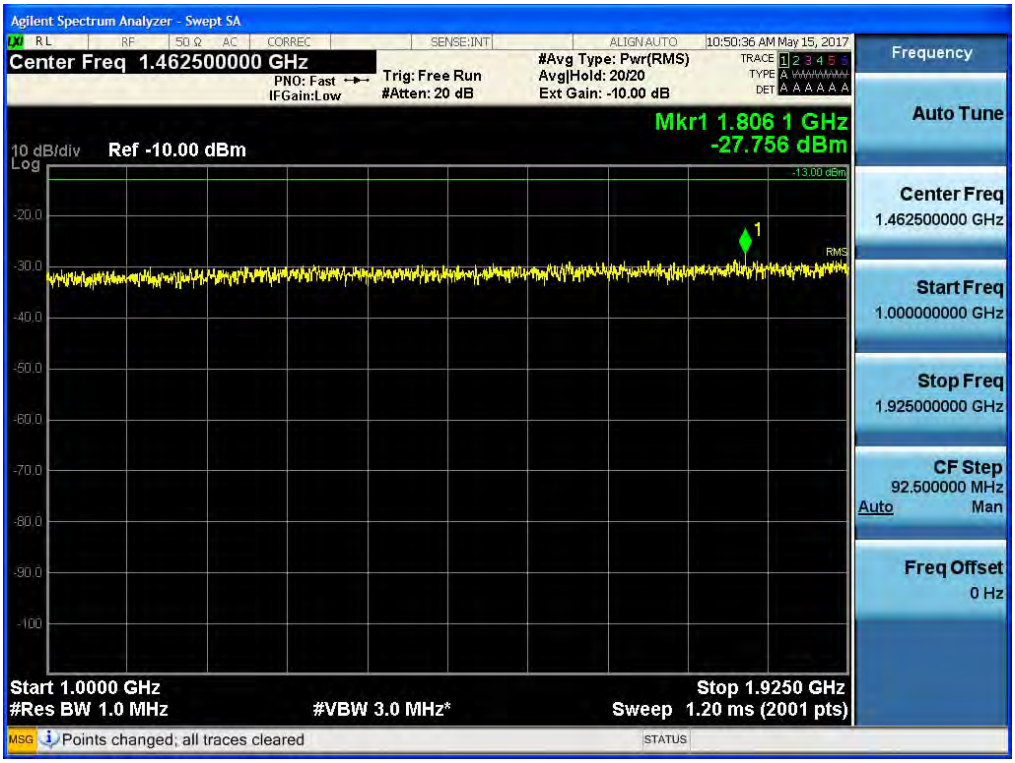


[Downlink High]-2

[Downlink High]-3

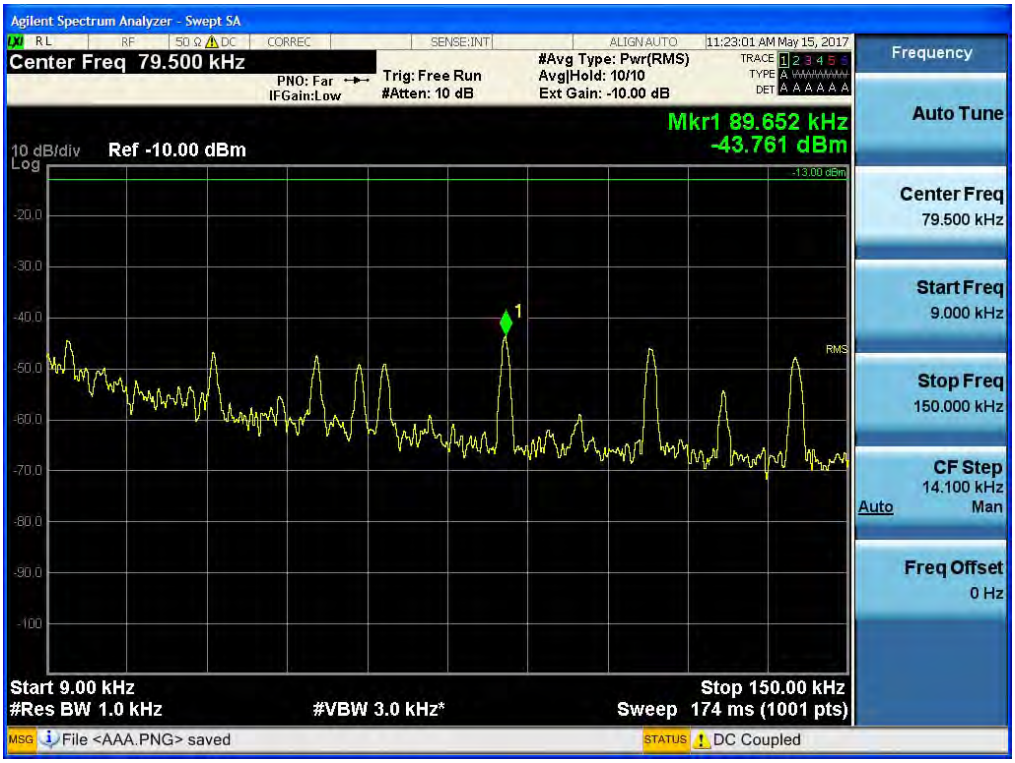
Single channel Enhancer Plots of Spurious Emission for 1900 PCS BAND GSM

Conducted Spurious Emissions (9 kHz – 150 kHz)

[Downlink Low]

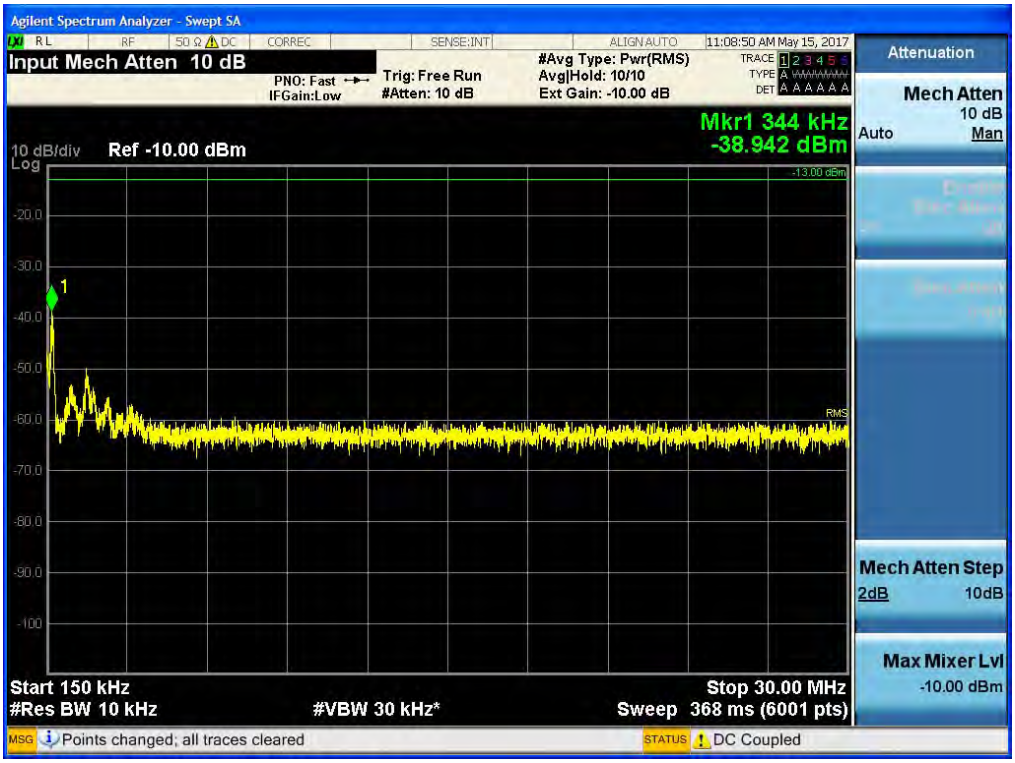
[Downlink Middle]

[Downlink High]



Conducted Spurious Emissions (150 kHz – 30 MHz)

[Downlink Low]



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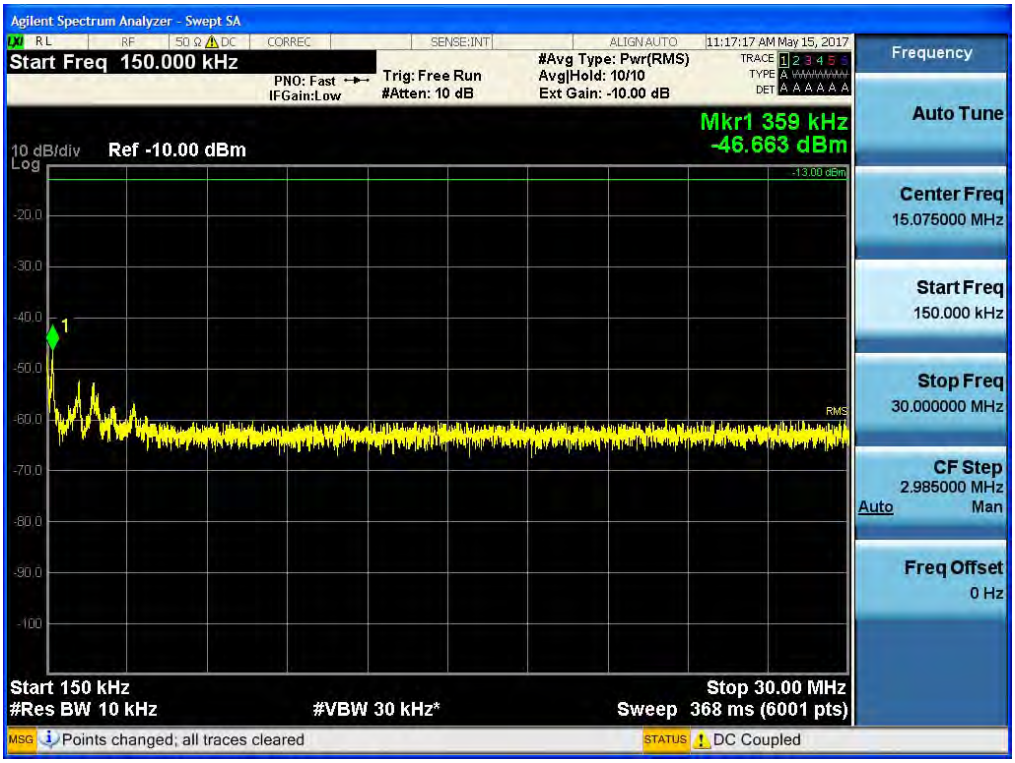

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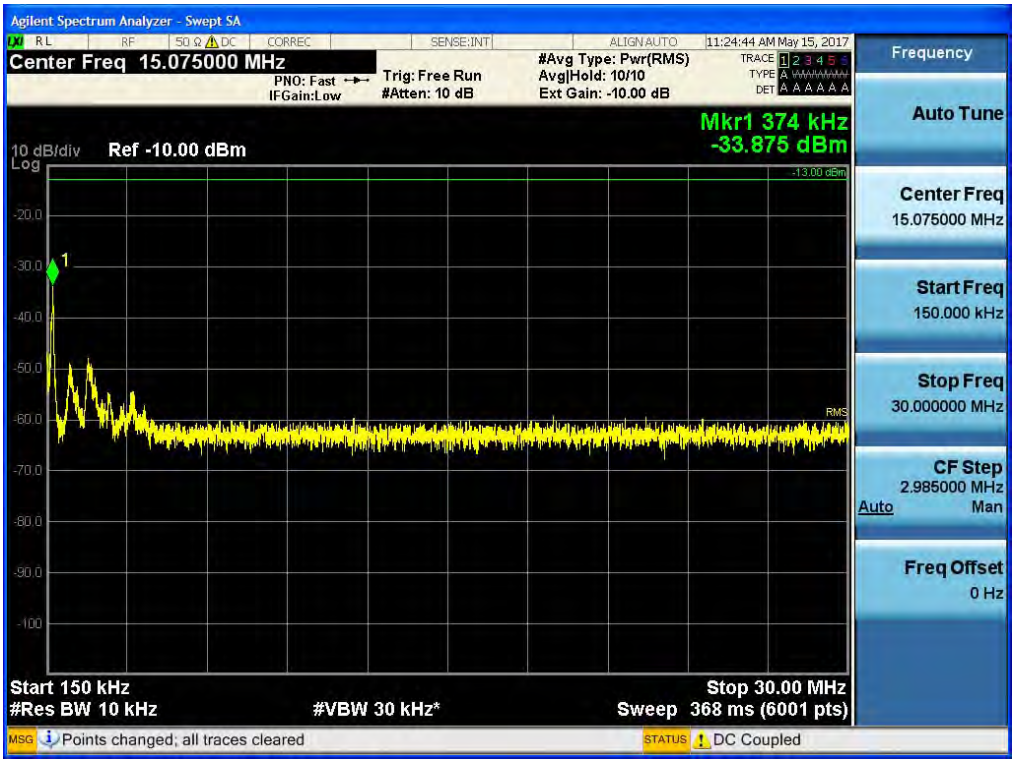
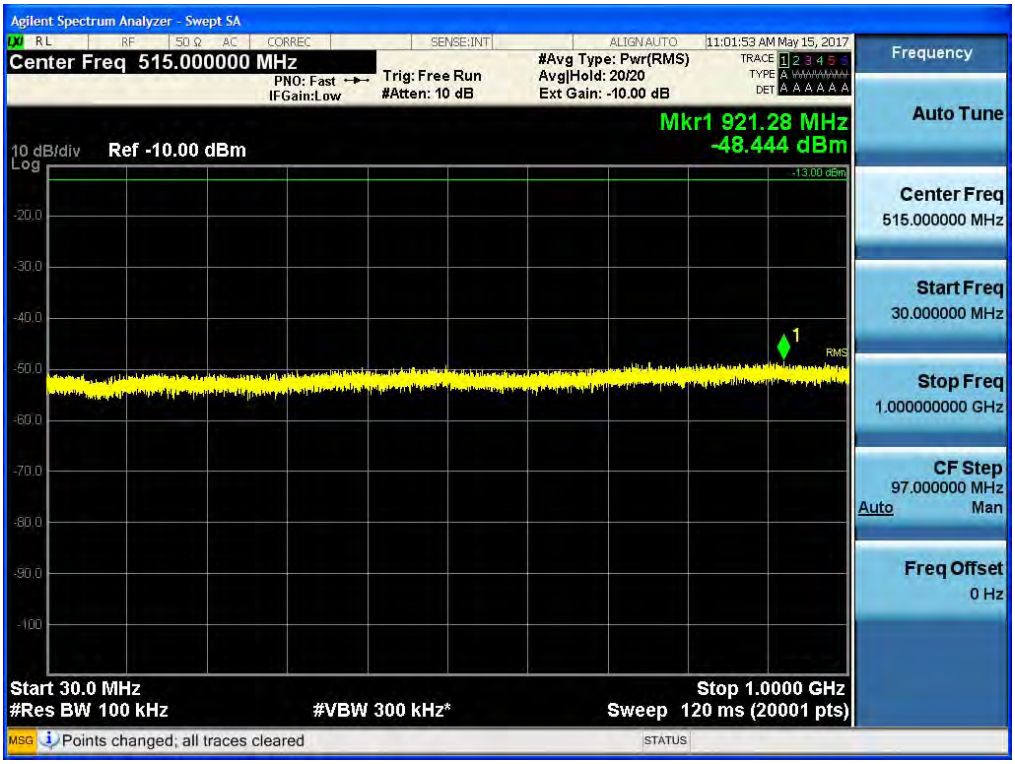


Conducted Spurious Emissions (30 MHz – 1 GHz)

[Downlink Low]



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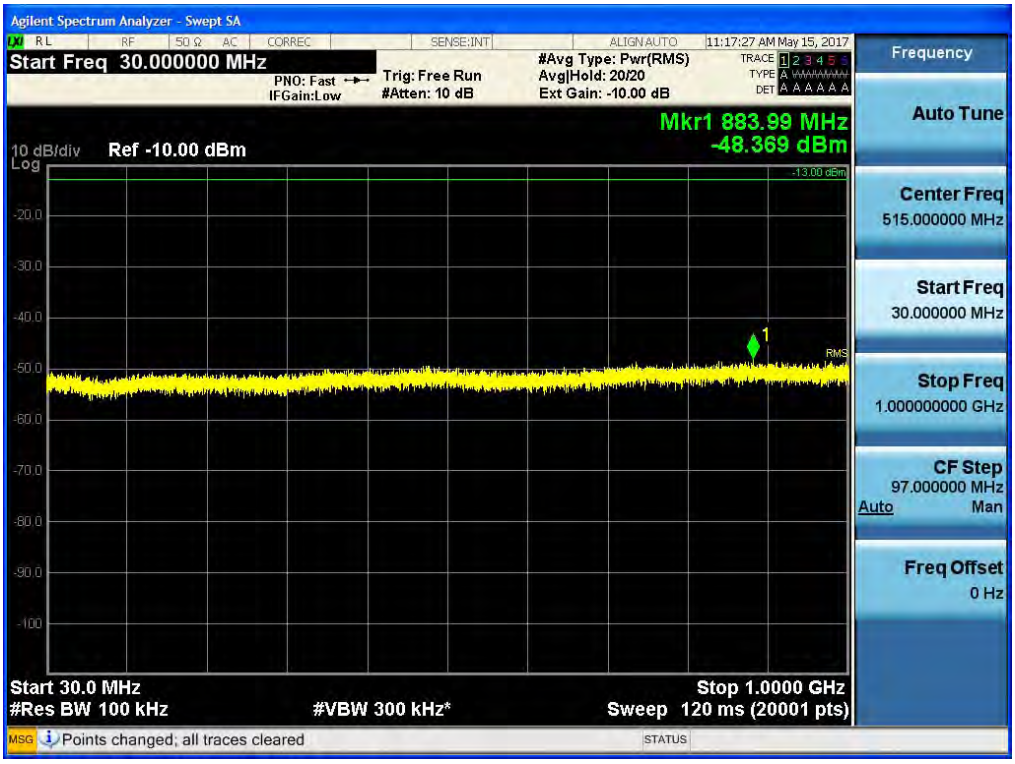

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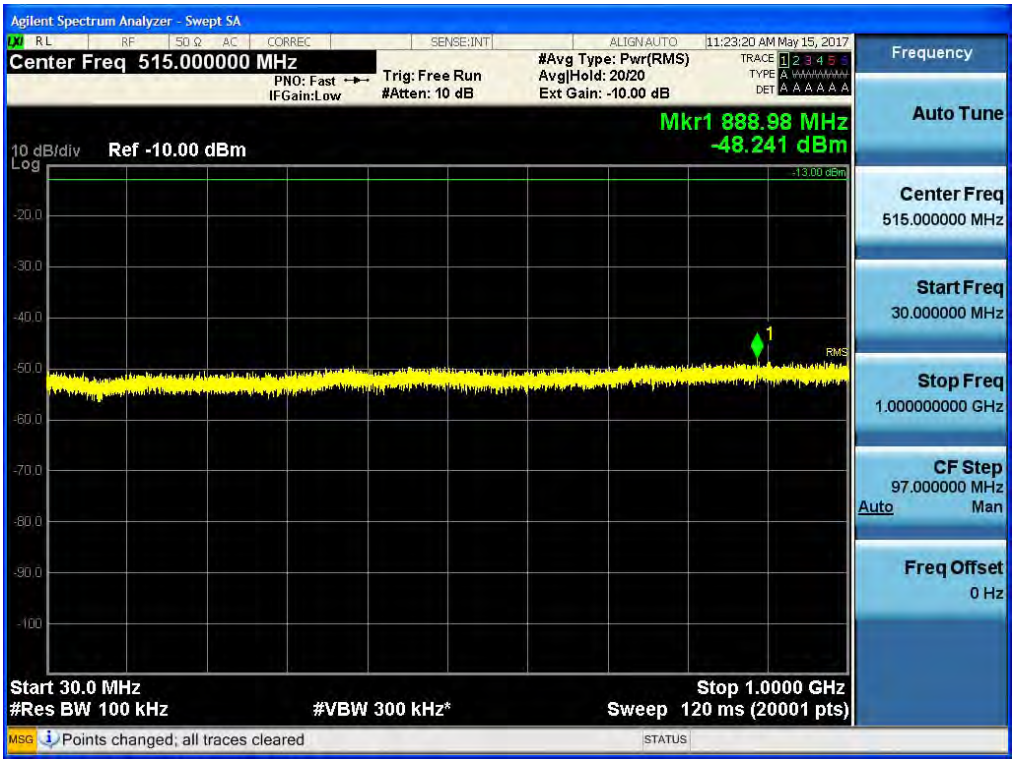
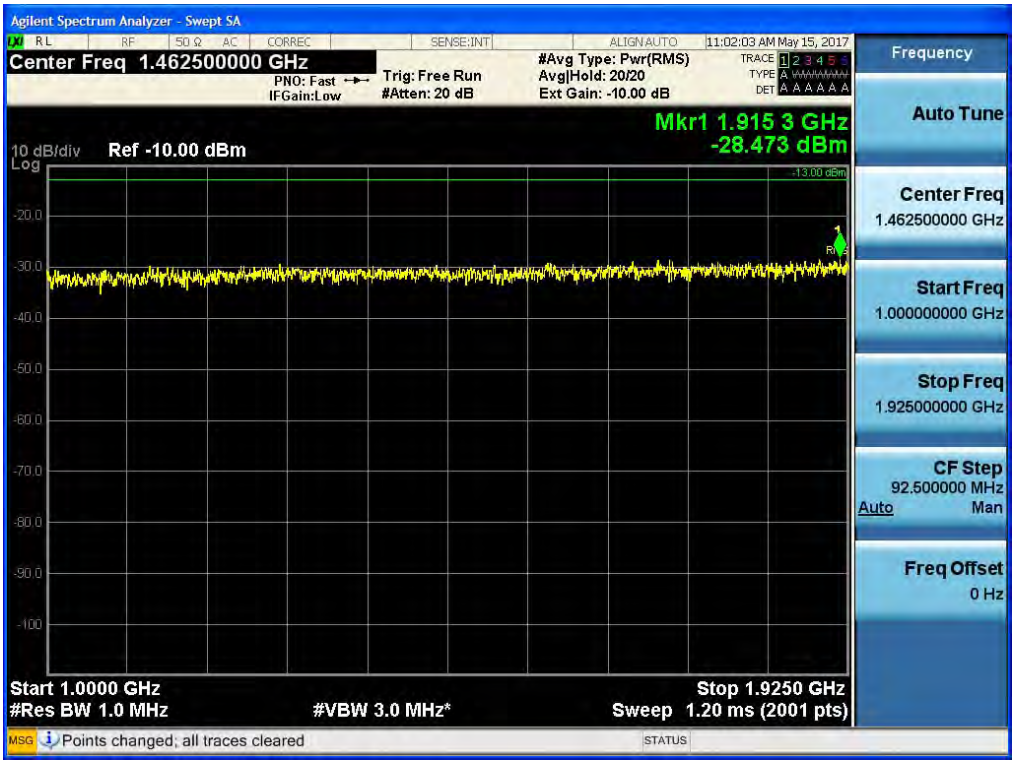


Conducted Spurious Emissions (1 GHz – 26.5 GHz)

[Downlink Low]-1



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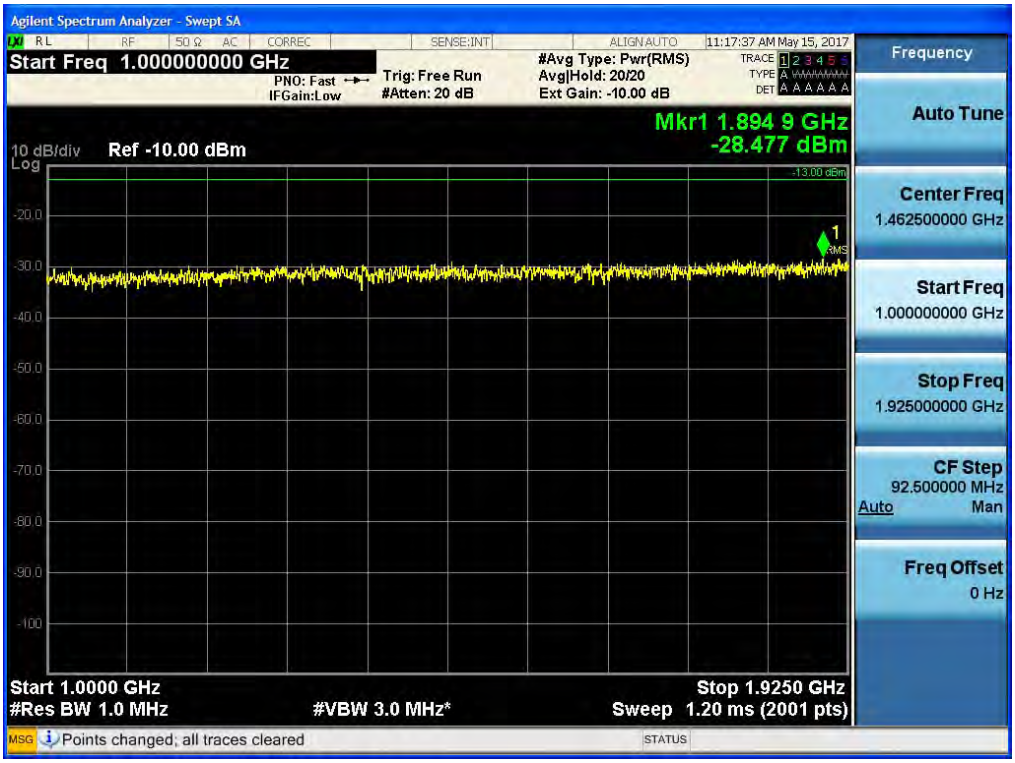

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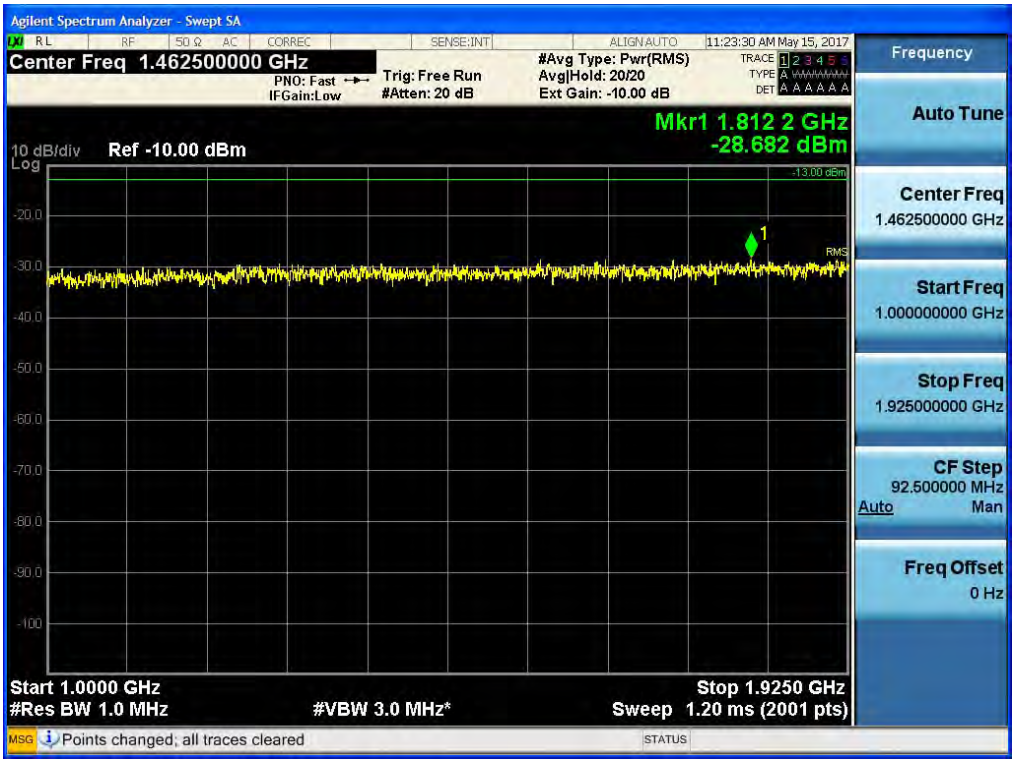

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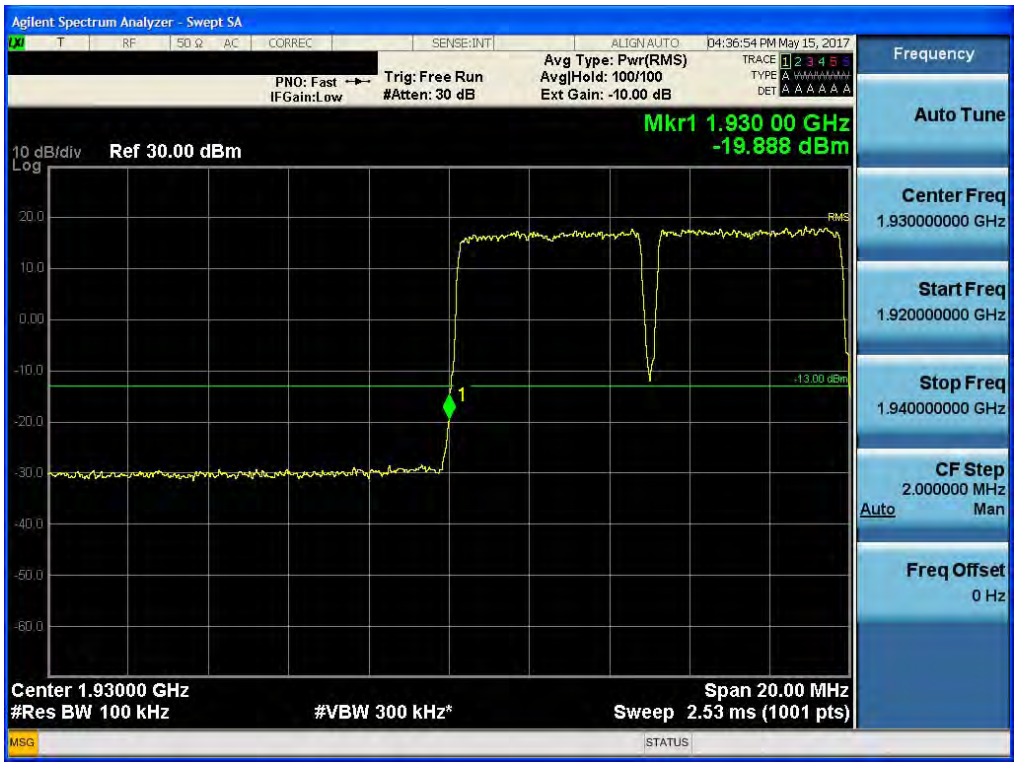
Intermodulation Spurious Emissions for FCC_1900 PCSBAND LTE 5 MHz

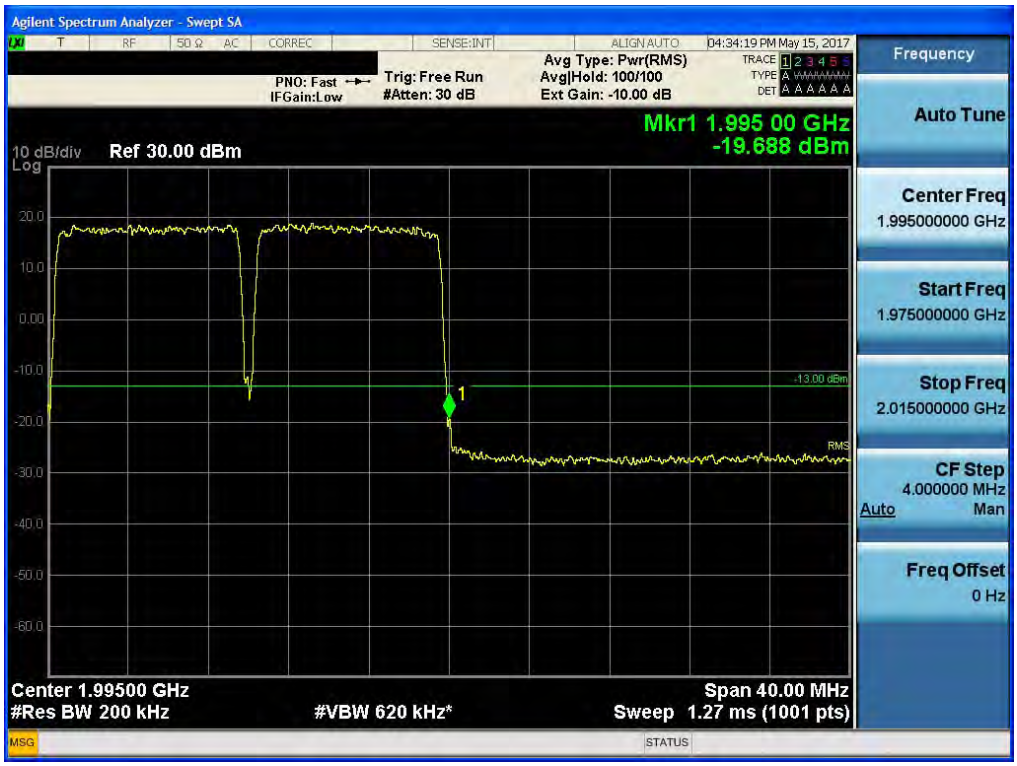
[Downlink Low]



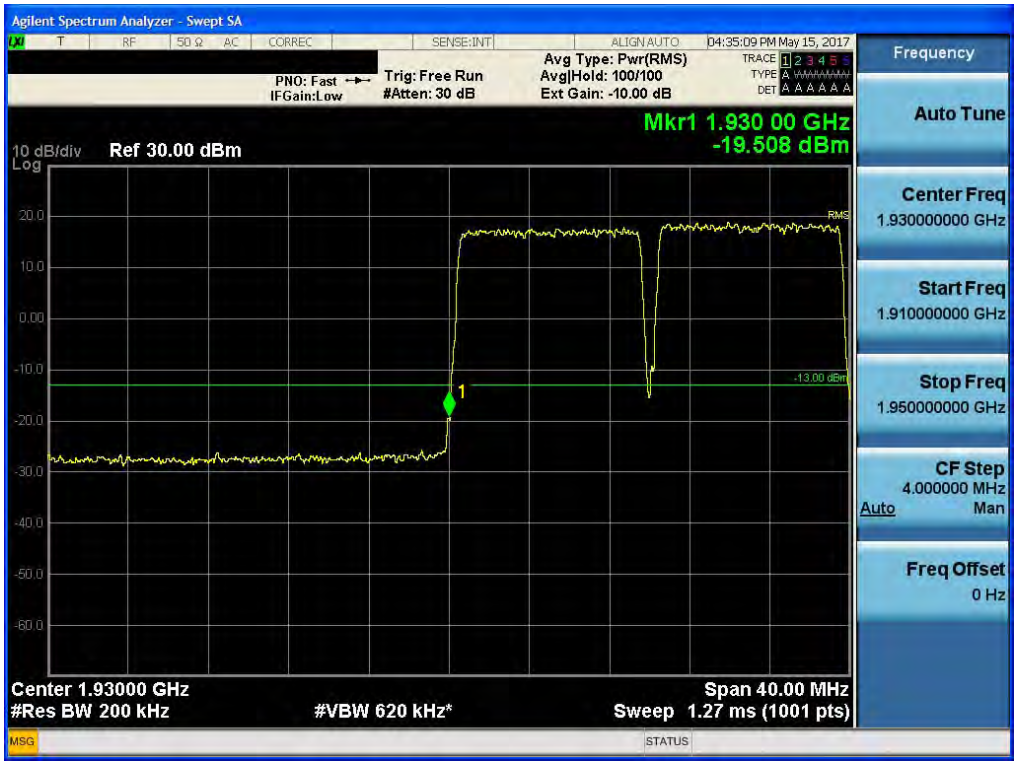
[Downlink High]

Intermodulation Spurious Emissions for FCC_1900 PCSBAND LTE 10 MHz

[Downlink Low]

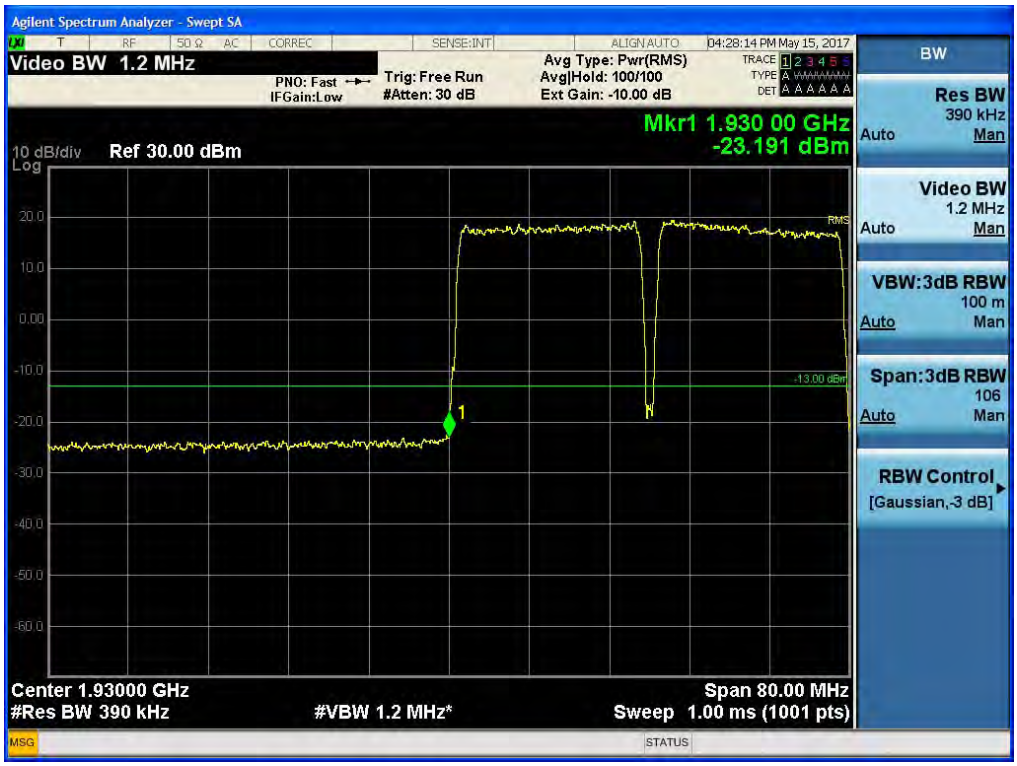


[Downlink High]



Intermodulation Spurious Emissions for FCC_1900 PCSBAND LTE 20 MHz

[Downlink Low]



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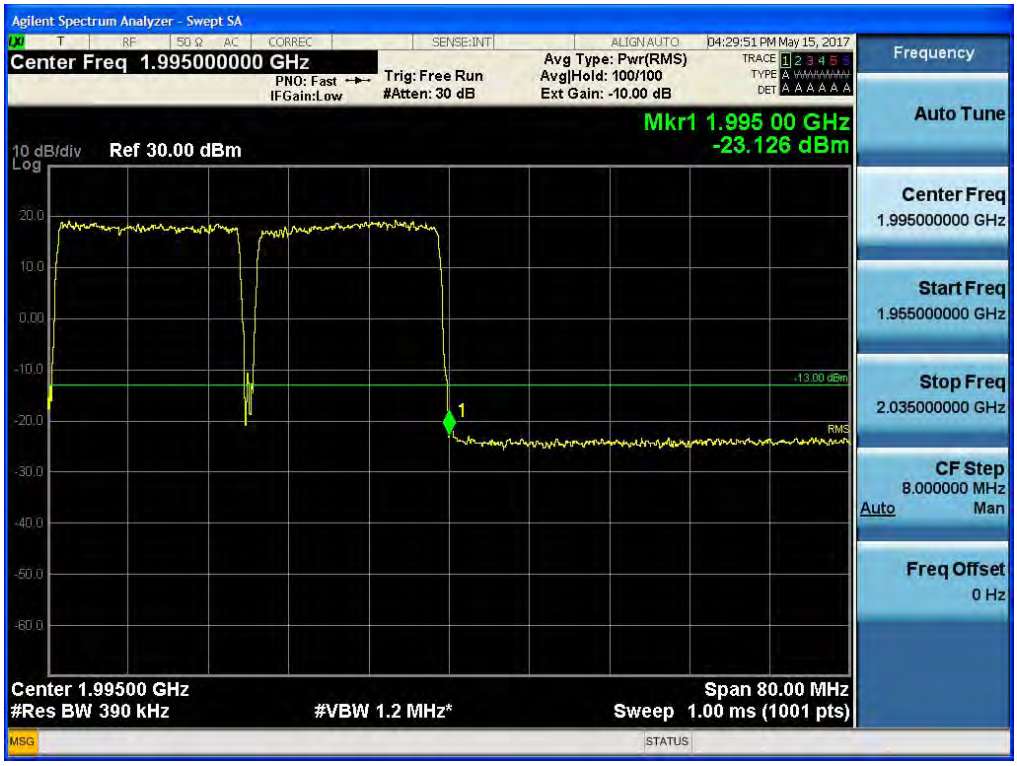
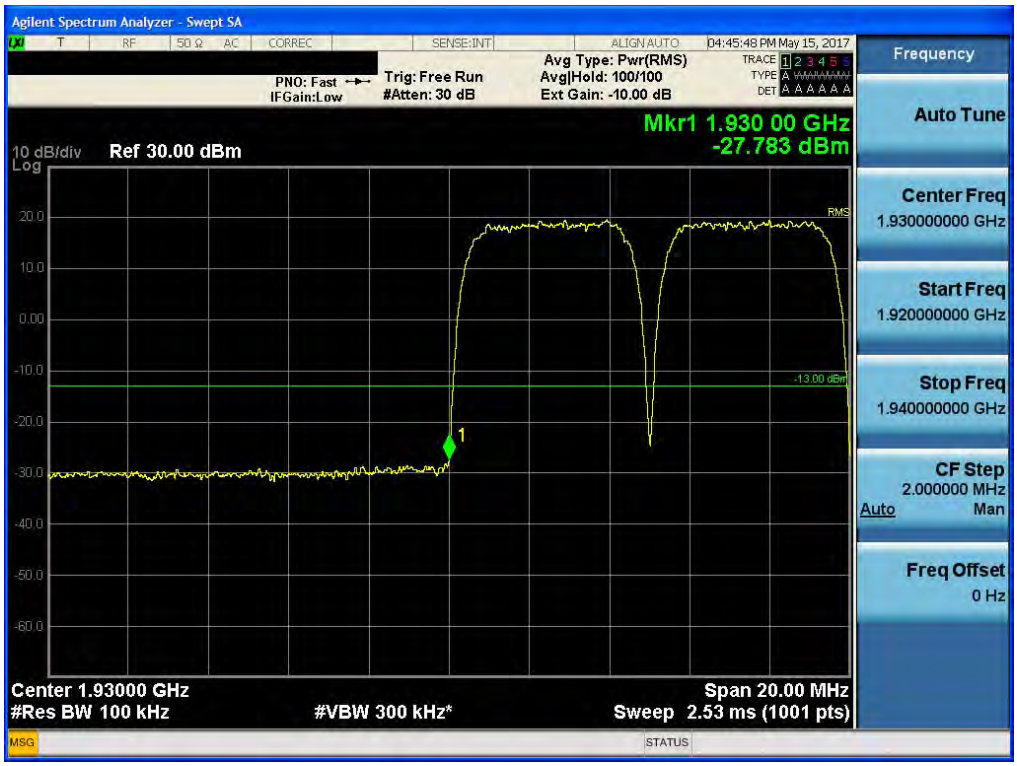


Intermodulation Spurious Emissions for FCC_1900 PCS WCDMA

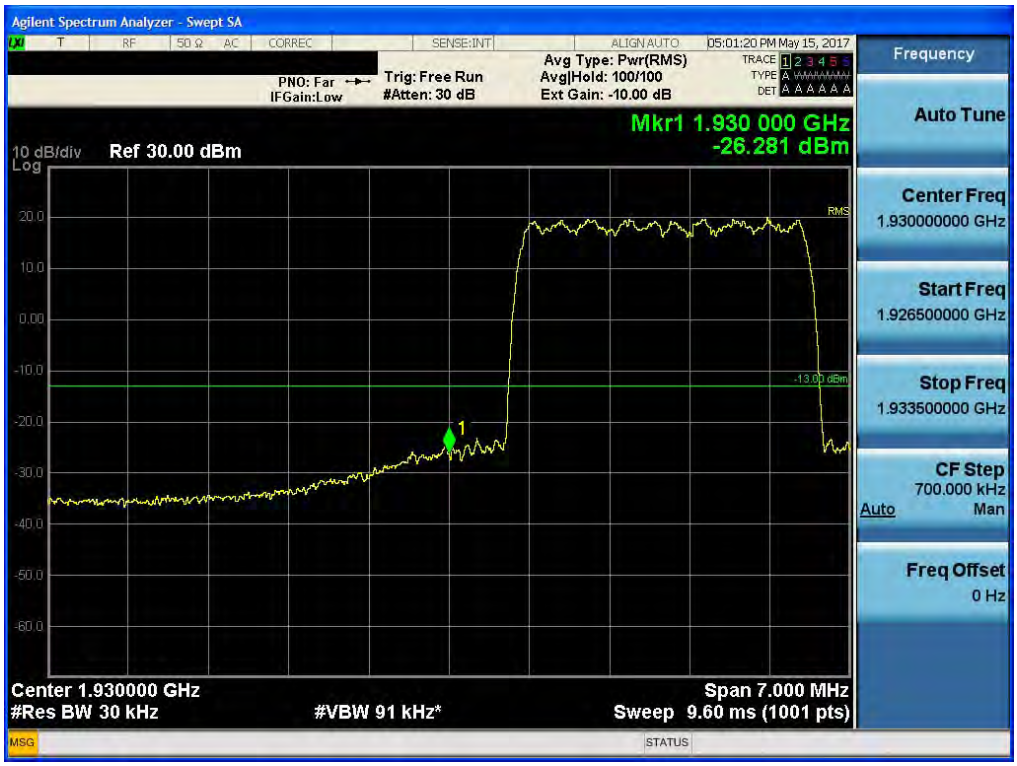
[Downlink Low]



[Downlink High]

Intermodulation Spurious Emissions for FCC_1900 PCS BAND CDMA

[Downlink Low]



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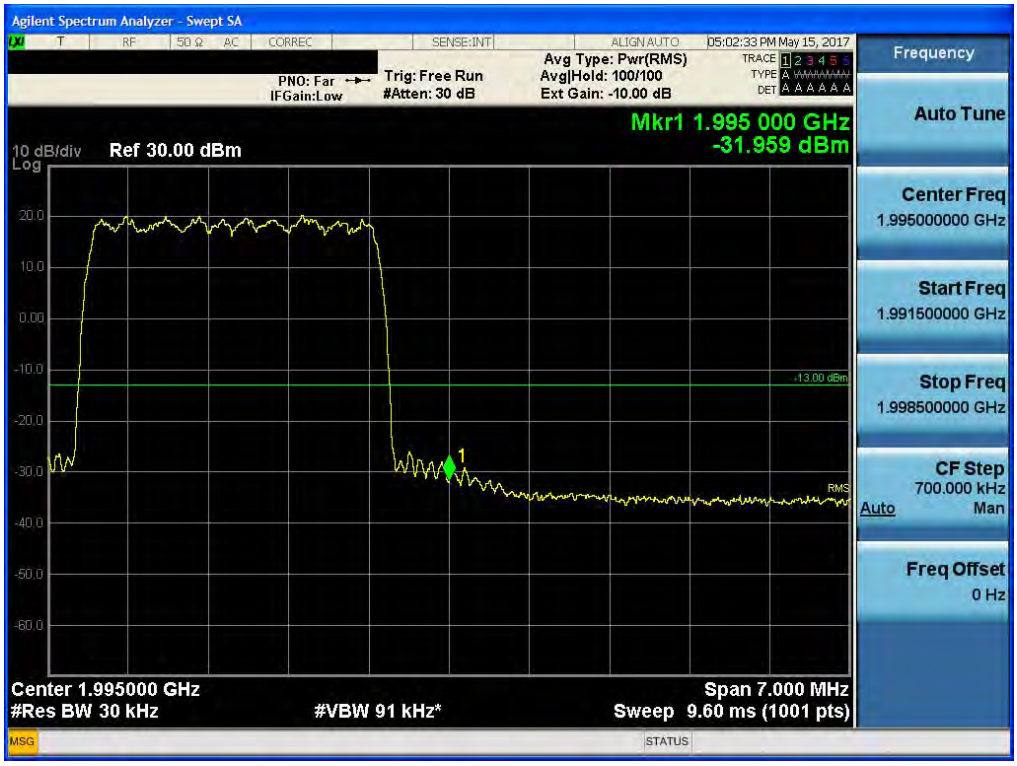
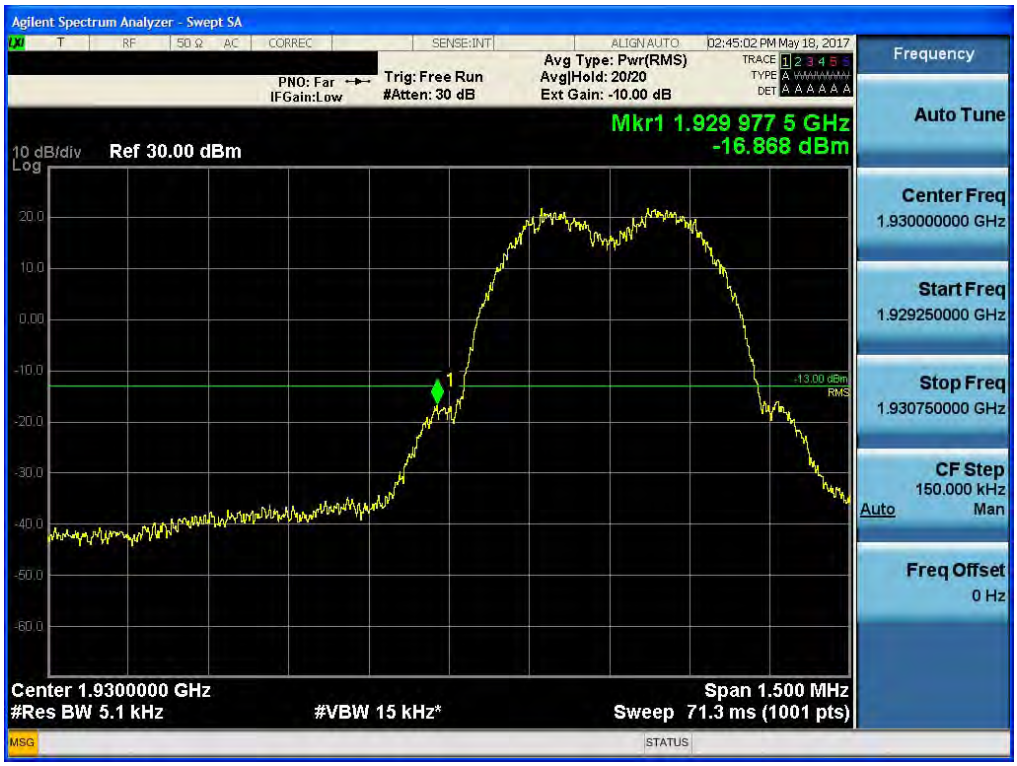
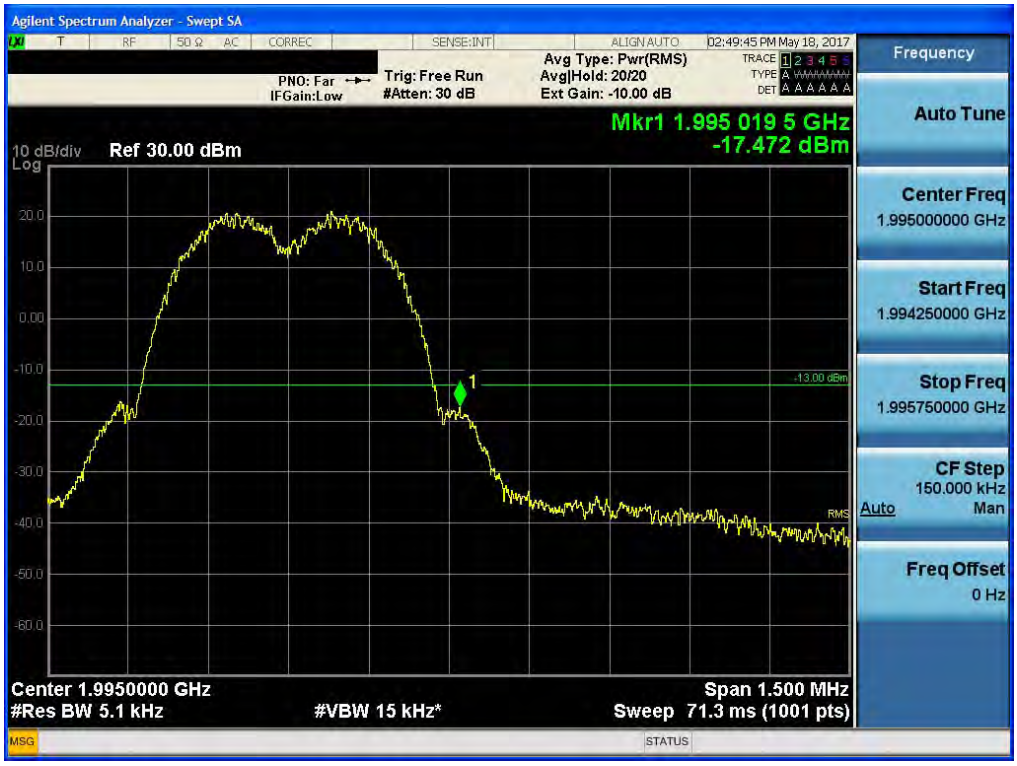


Intermodulation Spurious Emissions for FCC_1900 PCS BAND GSM

[Downlink Low]

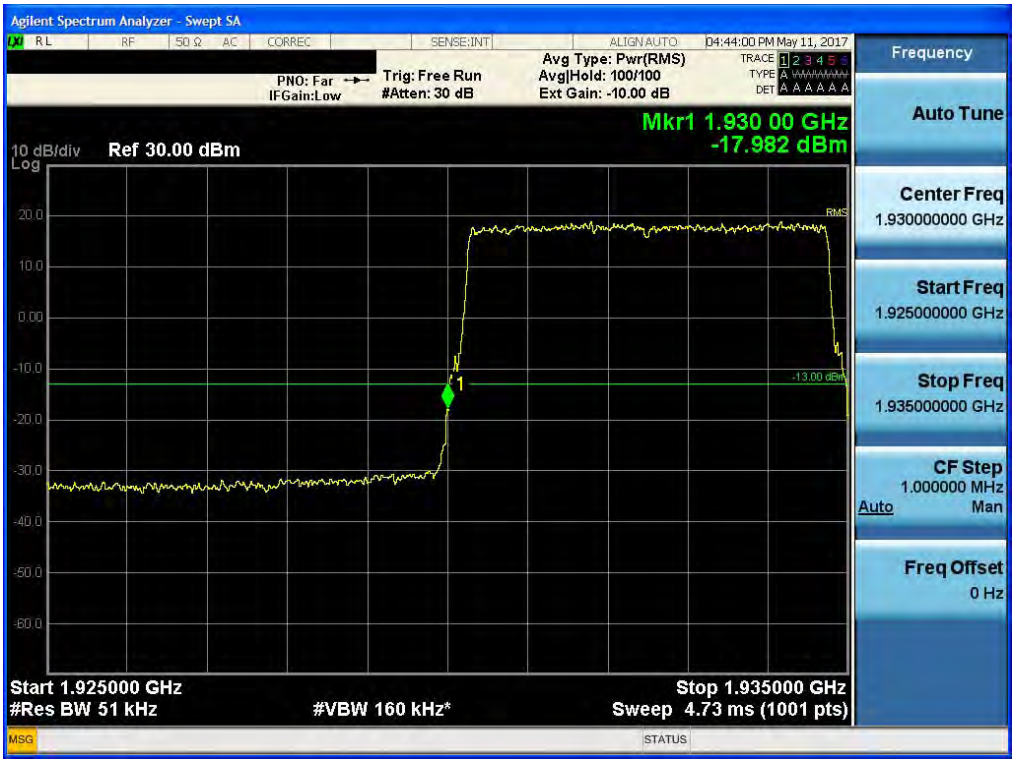


[Downlink High]



Single channel Enhancer Band Edge_1900 PCS BAND LTE 5 MHz

[Downlink Low]



[Downlink High]

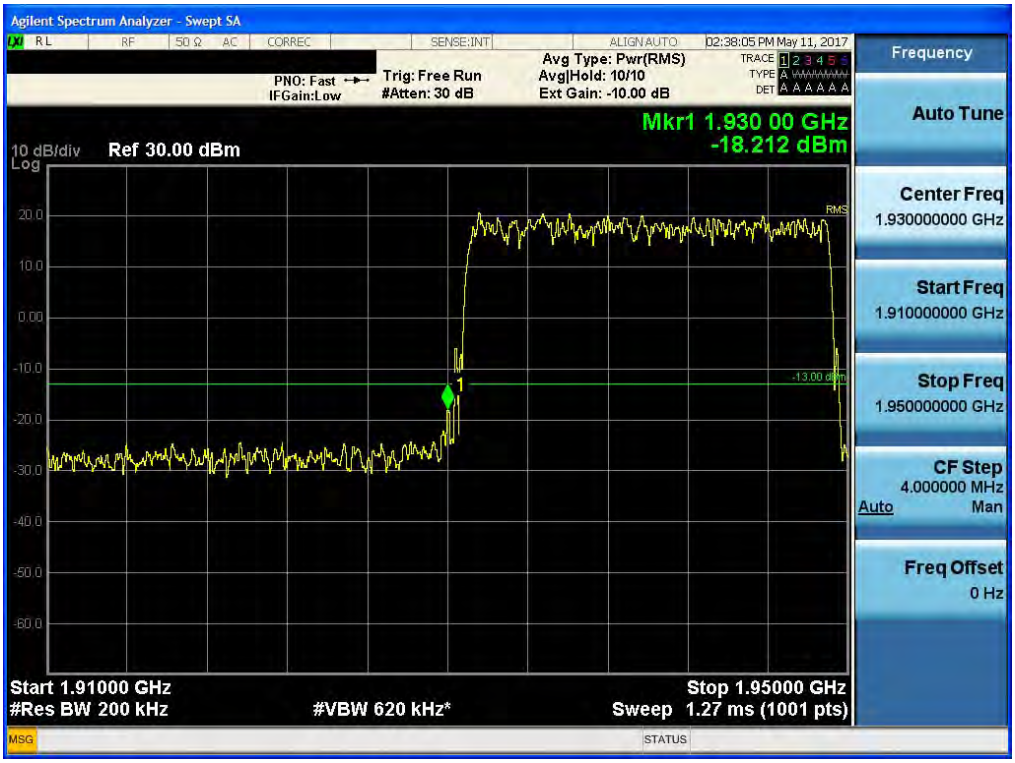
Single channel Enhancer Band Edge_1900 PCS BAND LTE 10 MHz

[Downlink Low]

[Downlink High]

Single channel Enhancer Band Edge_1900 PCS BAND LTE 20 MHz

[Downlink Low]



[Downlink High]

Single channel Enhancer Band Edge_1900 PCS BAND WCDMA

[Downlink Low]

[Downlink High]

Single channel Enhancer Band Edge_1900 PCS BAND CDMA

[Downlink Low]

[Downlink High]

Single channel Enhancer Band Edge_1900 PCS BAND GSM

[Downlink Low]

[Downlink High]

11. RADIATED SPURIOUS EMISSIONS

Test Requirements:

§ 2.1053 Measurements required: Field strength of spurious radiation.

(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 halfwave dipole antennas.

(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.

IC Rules

Test Requirements:

RSS-Gen

7. Receiver Limits

7.1 Receiver Emission Limits

7.1.2 Receiver Radiated Limits

Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 5x the highest tunable or local

oscillator frequency, whichever is higher, without exceeding 40 GHz.

Spurious emissions from receivers shall not exceed the radiated limits shown in Table 2 below:

Table 2 – Receiver Radiated Limits	
Frequency (MHz)	**Field Strength (μv/m at 3 metres)***
30-88	100
88-216	150
216-960	200
Above 960	500

Footnote *

Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 6.5.

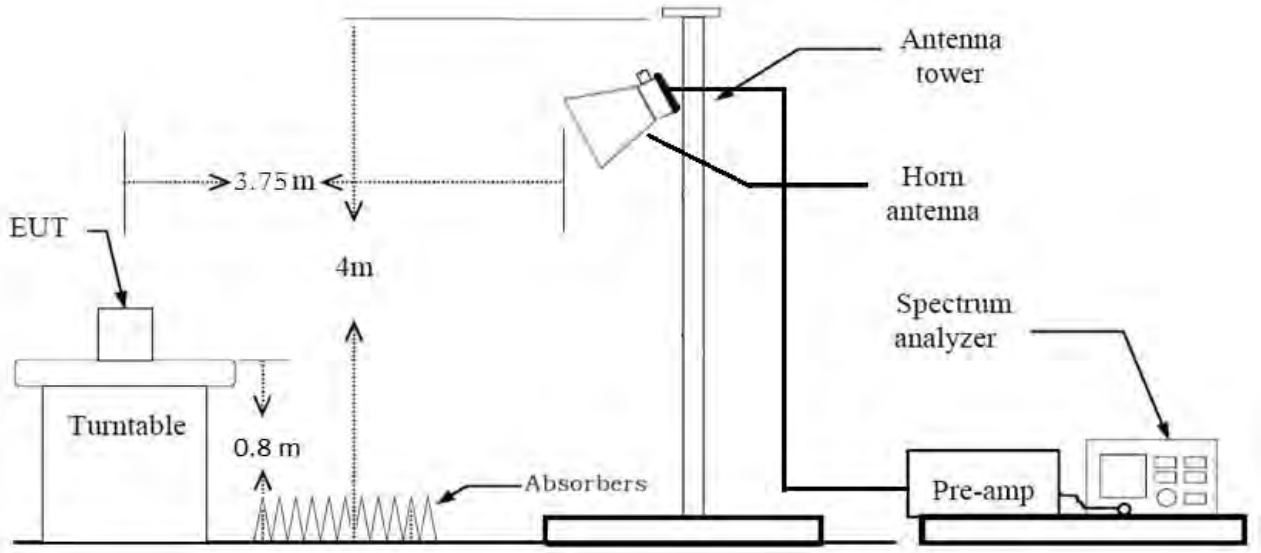
Test Procedures:

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 360and 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 40GHz, whichever was the lesser, were investigated.

Radiated Spurious Emissions Test Setup



Note :

1. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
2. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Receiver Spurious Emissions Test Result:

ISED Rule(s):	**RSS-GEN**
Test Requirements:	**Blow the table**
Operating conditions:	**Under normal test conditions**
Method of testing:	**Radiated**
S/A. Settings:	**F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)** **F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)**
Mode of operation:	**Receive**

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

30 MHz ~ 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμN	dB /m	dB	(H/V)	dBμN/m	dBμN/m	dB
No critical peaks found							

Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμN	dB /m	dB	(H/V)	dBμN/m	dBμN/m	dB
No critical peaks found							

Radiated Spurious Emissions Test Result:

Harmonics were not found.

1900 PCS Band

[Downlink]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
No Critical Peaks Found										

* C.L.: Cable Loss / A.G.: Ant. Gain / H.P.F.: High Pass Filter / D.F.: Distance Factor (3.75 m)

[Uplink]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
No Critical Peaks Found										

* C.L.: Cable Loss / A.G.: Ant. Gain / H.P.F.: High Pass Filter / D.F.: Distance Factor (3.75 m)

Notes:

We have done horizontal and vertical polarization in detecting antenna.

12. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

FCC Rules

Test Requirements:

§ 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

§ 24.235 Frequency stability.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

IC Rules

Test Requirements:

RSS-131

5. Equipment standard specifications for zone enhancers working with equipment certified in RSSs listed in section 1 except RSS-119

5.2 Industrial Zone Enhancers

5.2.4 Frequency stability

Industrial Zone Enhancers shall comply with the frequency stability given in the RSS that applies to the equipment with which the zone enhancer is to be used. In cases where the frequency stability limit is not given in the applicable RSS, the equipment shall comply with a frequency stability of ± 1.5 ppm.

For zone enhancers with no input signal processing capability, the frequency stability measurement in this section is not required.

RSS-139

6. Transmitter and Receiver Standard Specifications

6.3 Frequency Stability

The carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

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

RSS-Gen

6. Technical Requirements

6.11 Transmitter Frequency Stability

In circumstances when the transmitter frequency stability is not stated in the applicable RSS or reference measurement method, the following applies:

- Frequency stability is a measure of frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage. Unless specified otherwise in an RSS applicable to the device, the reference temperature for radio transmitters is +20°C (+68°F);
- A hand-held device that is only capable of operating using internal batteries shall be tested at the battery's nominal voltage, and again at the battery's operating end-point voltage, which must be specified by the equipment manufacturer. For this test, either a battery or an external power supply can be used; and
- The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency-determiningcircuit element shall be made subsequent to this initial set-up.

With the transmitter installed in an environmental test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement. The following temperatures and supply voltage ranges apply, unless specified otherwise in the applicable RSS:

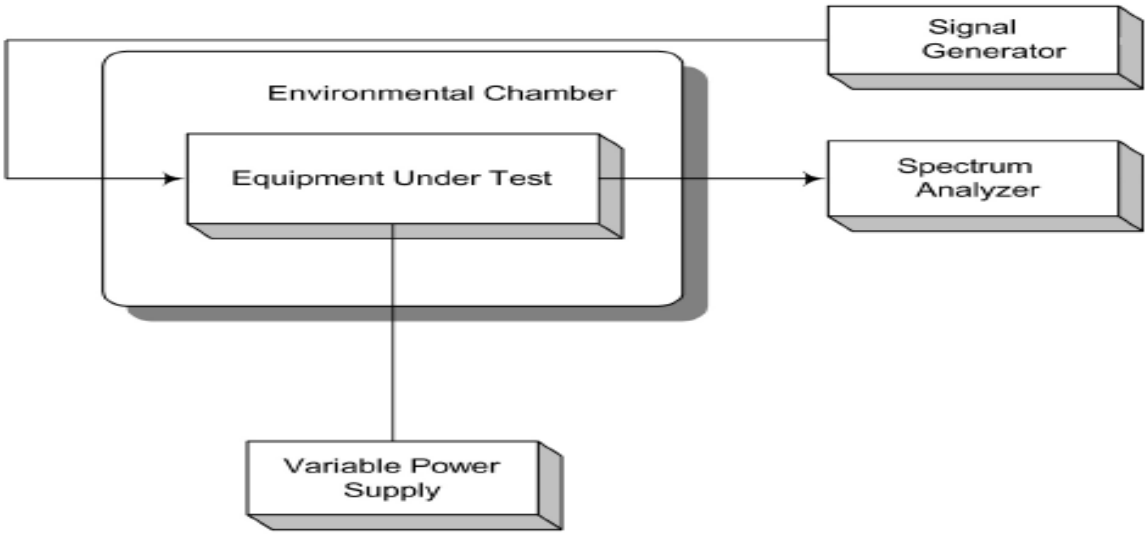
(a) at the temperatures of −30°C (−22°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage; and

(b) at the temperature of +20°C (+68°F) and at ±15% of the manufacturer's rated supply voltage.

If the frequency stability limits are only met within a temperature range that is smaller than the −30°C to +50°C range specified in (a), the frequency stability requirement will be deemed to be

met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics for the equipment are revised to reflect this restricted temperature range.
In addition, if an unmodulated carrier is not available, the measurement method shall be described in the test report.

Test Setup:



* Note: This EUT is supported power supply both of AC and DC. Test results are only attached worst cases.

Test Results:

Frequency Stability and Voltage Test Results

[Downlink]

Reference: 120 Vac at 20°C **Freq.** = 1962.5 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	1962 500 000	0.067	0.000	0.00000
	-30	1962 499 999	-1.123	-1.190	-0.00046
	-20	1962 500 001	0.521	0.454	0.00018
	-10	1962 500 001	0.899	0.832	0.00032
	0	1962 500 001	0.958	0.891	0.00034
	+10	1962 499 997	-2.917	-2.984	-0.00115
	+30	1962 499 998	-1.639	-1.706	-0.00066
	+40	1962 500 002	1.675	1.608	0.00062
	+50	1962 500 002	2.150	2.083	0.00080
High	+20	1962 500 000	-0.138	-0.205	-0.00008
Low	+20	1962 500 000	0.241	0.174	0.00007