[Downlink Output] – AWS 2100

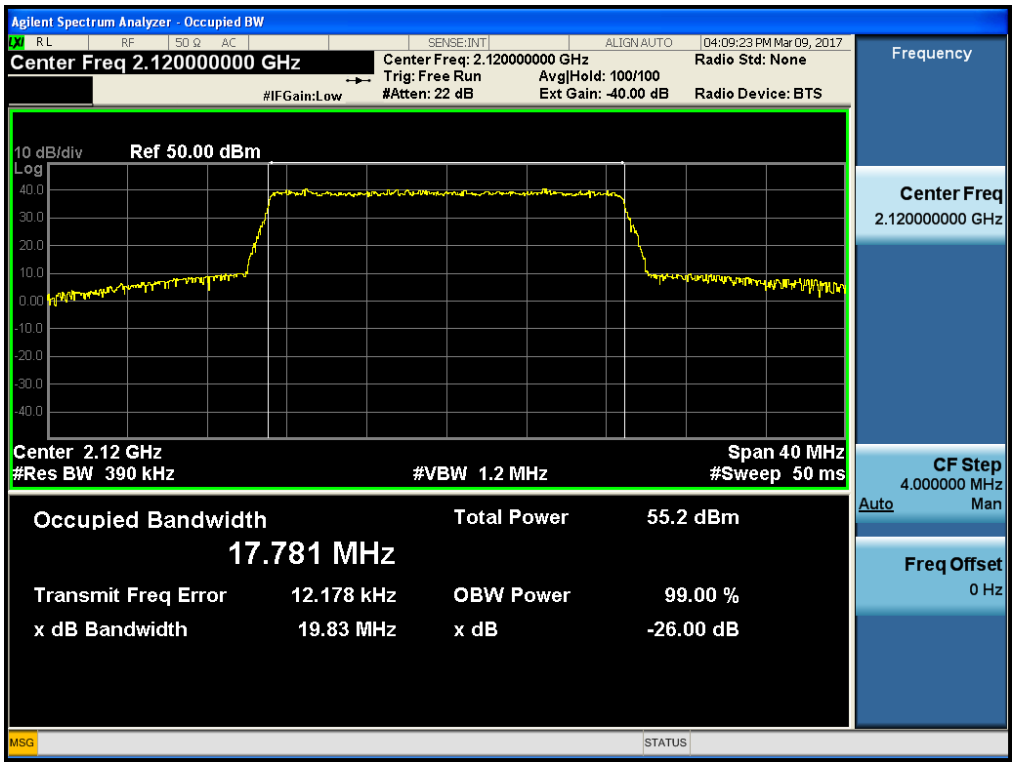
	Channel	Frequency (MHz)	OBW (MHz)
LTE 20 MHz AGC threshold	Low	2120.00	17.781
	Middle	2145.00	17.834
	High	2170.00	17.817
LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	17.787
	Middle	2145.00	17.813
	High	2170.00	17.809
CDMA AGC threshold	Low	2111.25	1.2738
	Middle	2145.00	1.2753
	High	2178.75	1.2707
CDMA +3dBm above the AGC threshold	Low	2111.25	1.2778
	Middle	2145.00	1.2739
	High	2178.75	1.2724

[Downlink Input] – AWS 2100

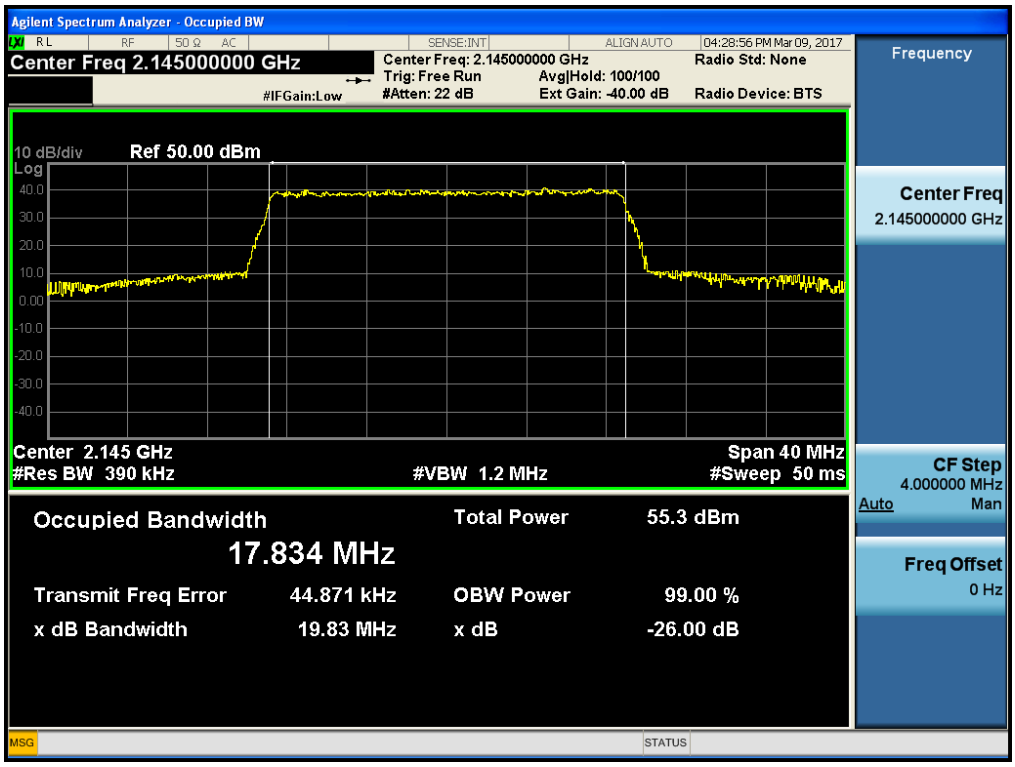
	Channel	Frequency (MHz)	OBW (MHz)
LTE 20 MHz AGC threshold	Low	2120.00	18.015
	Middle	2145.00	18.050
	High	2170.00	18.032
CDMA AGC threshold	Low	2111.25	1.2717
	Middle	2145.00	1.2699
	High	2178.75	1.2706

Occupied Bandwidth for AWS 2100_LTE 20 MHz

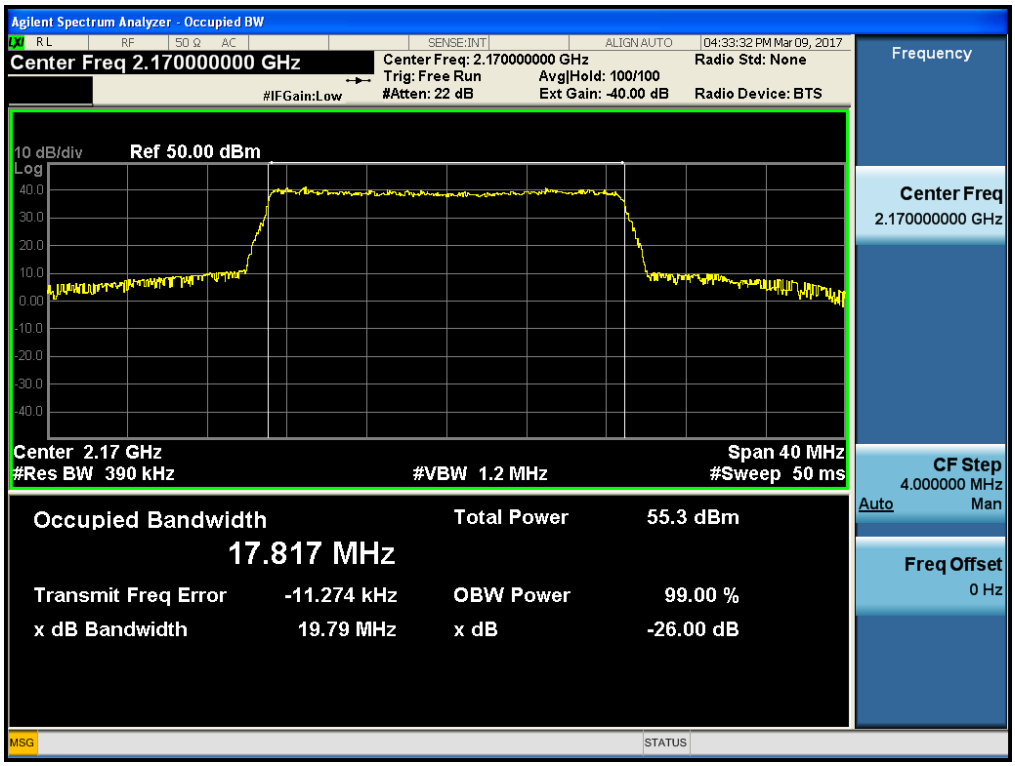
[AGC threshold Output Downlink Low]



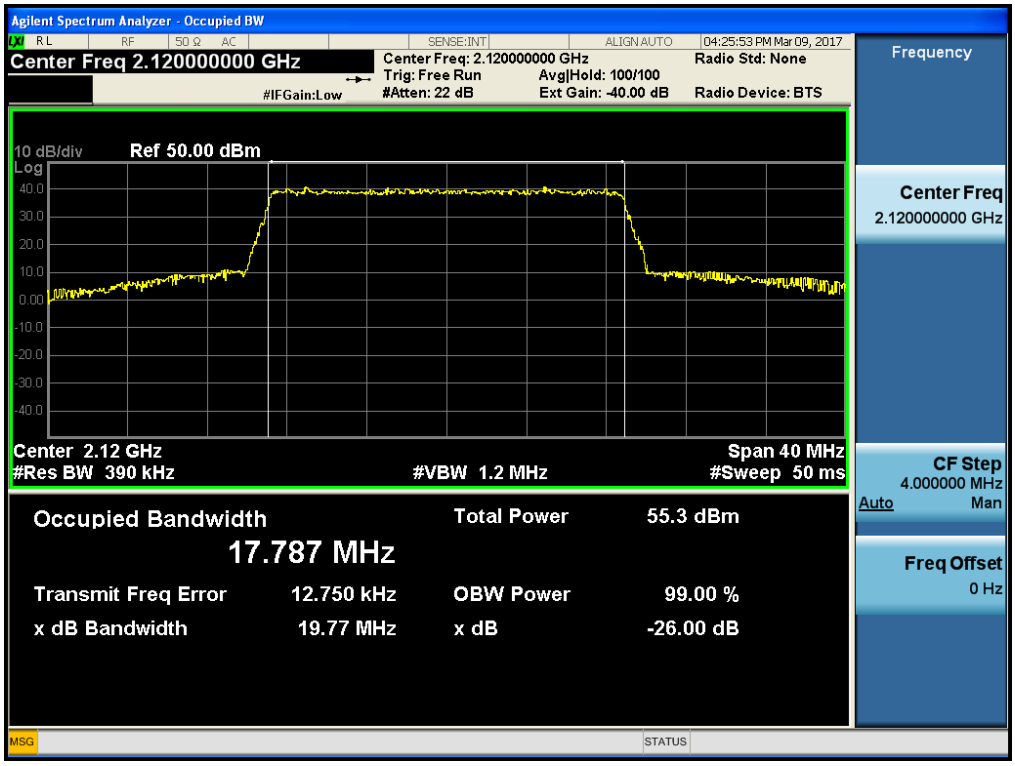
[AGC threshold Output Downlink Middle]



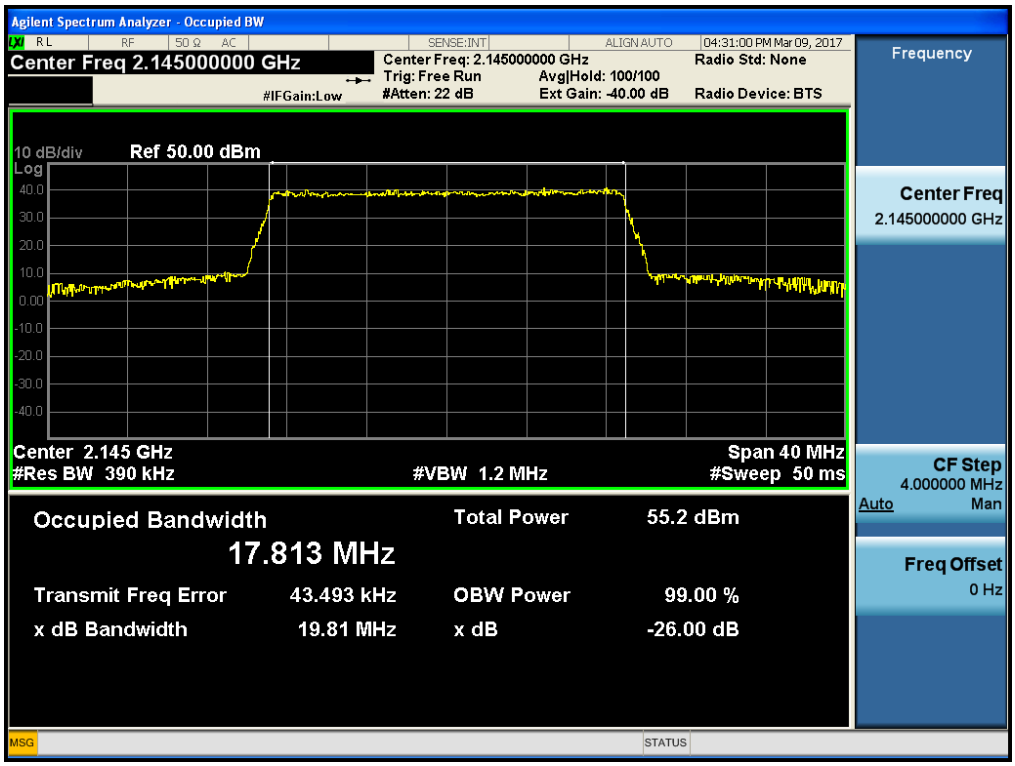
[AGC threshold Output Downlink High]



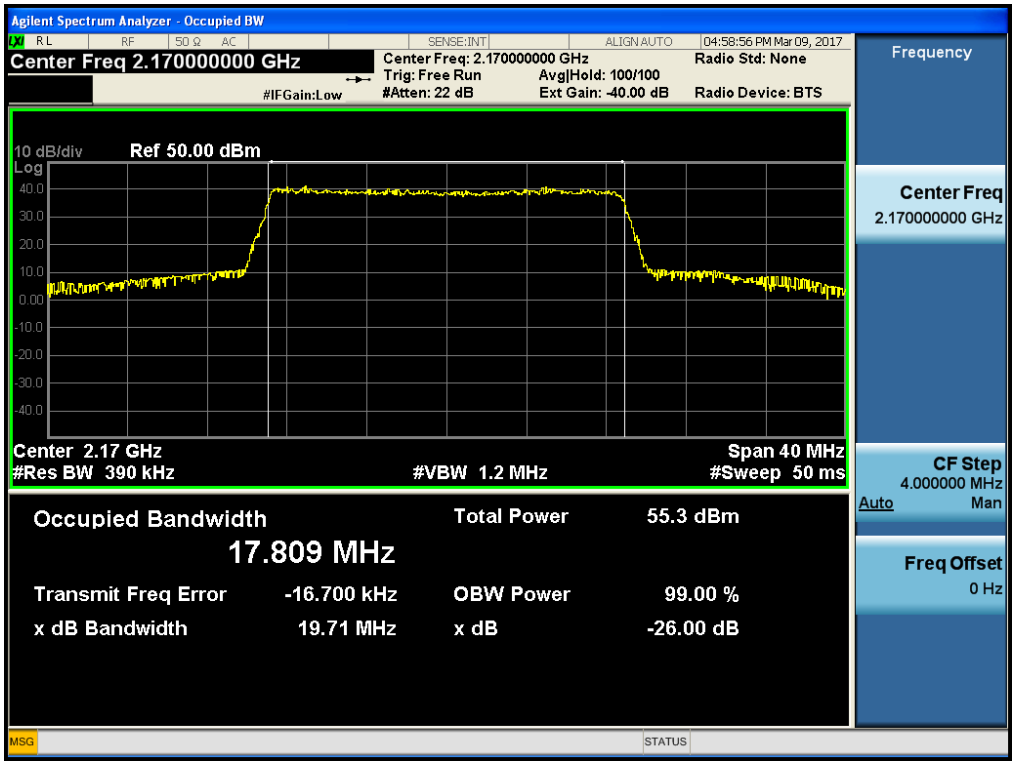
[+3dBm above AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

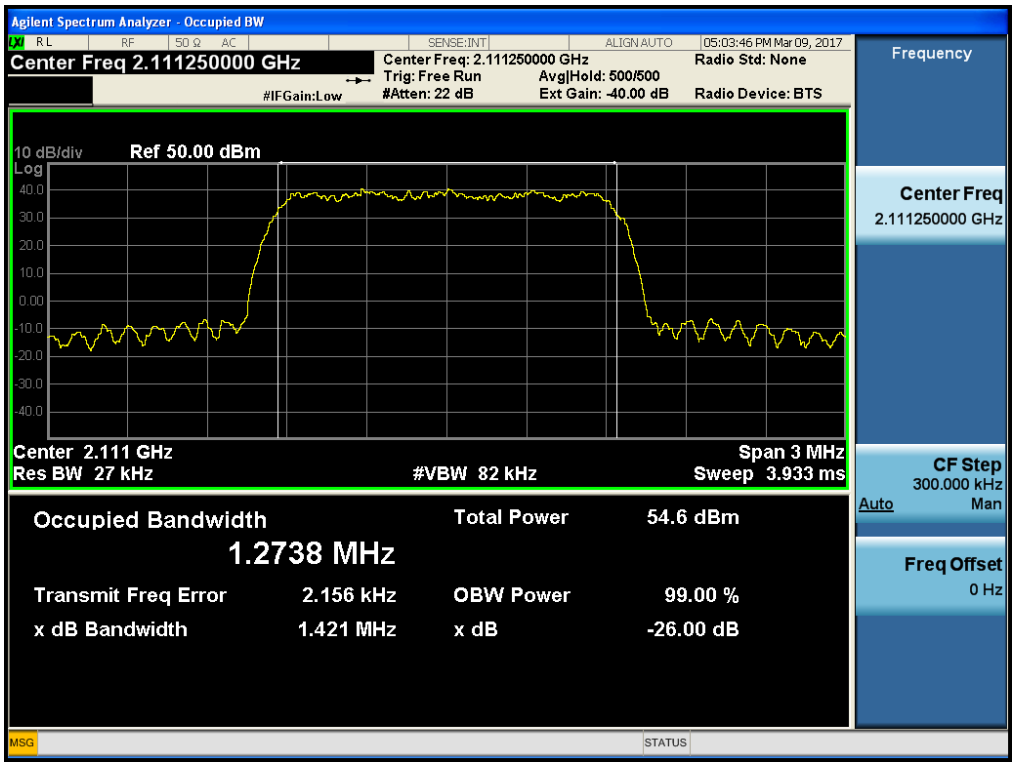


[+3dBm above AGC threshold Output Downlink High]

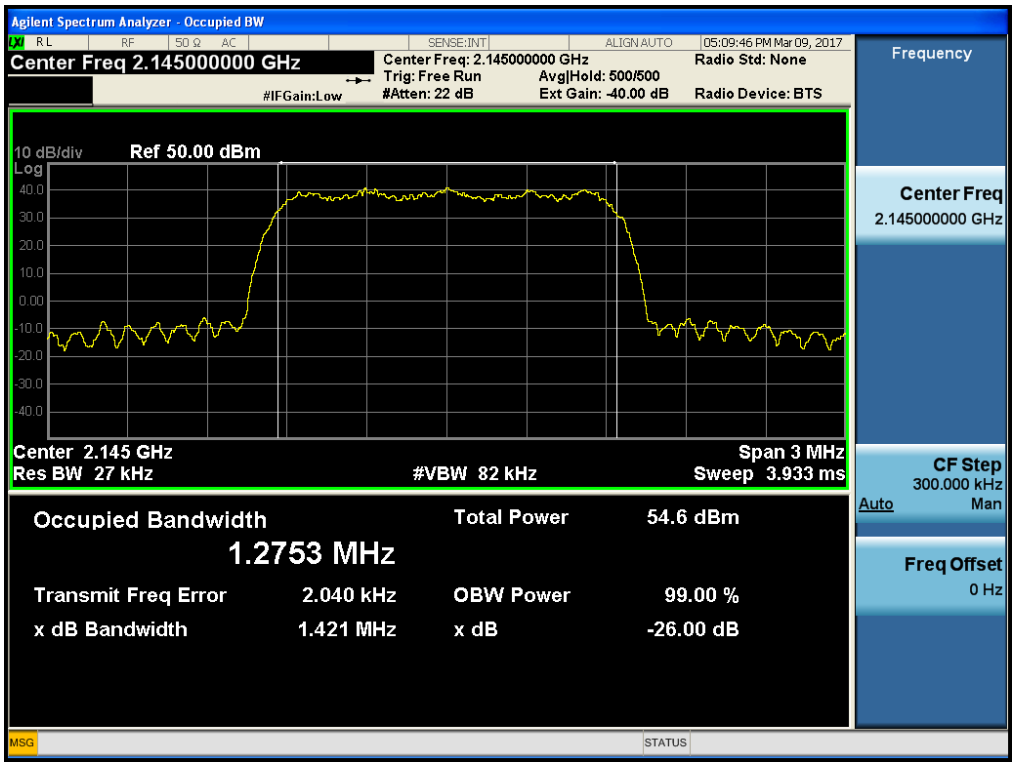


Occupied Bandwidth for AWS 2100_CDMA

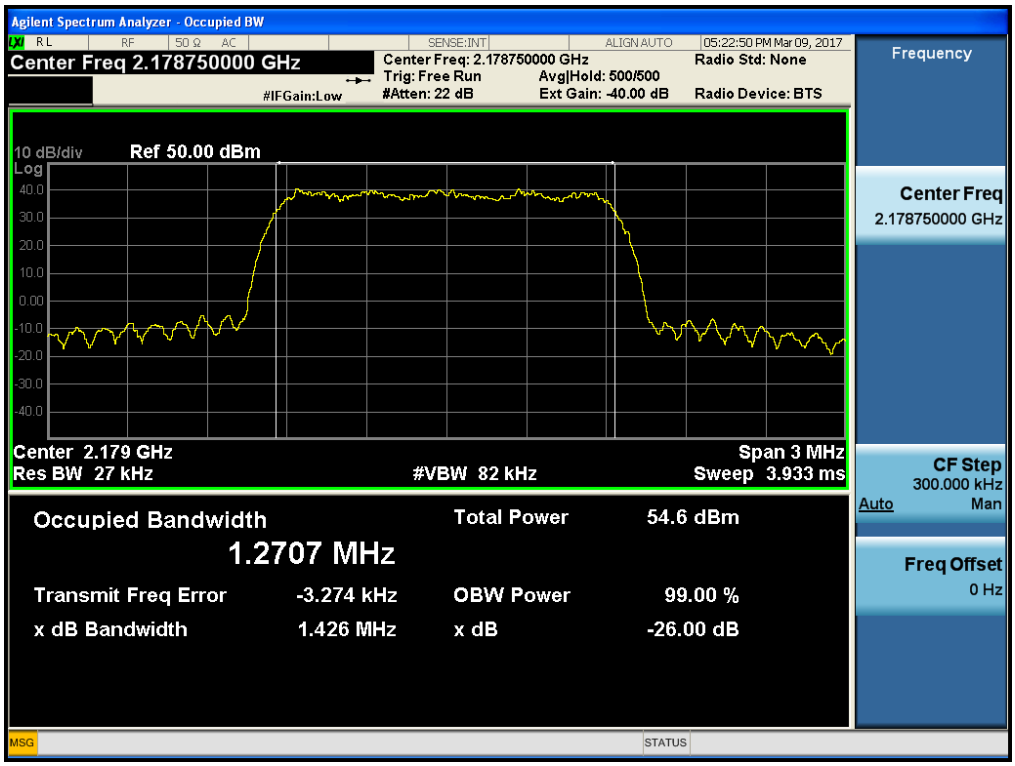
[AGC threshold Output Downlink Low]



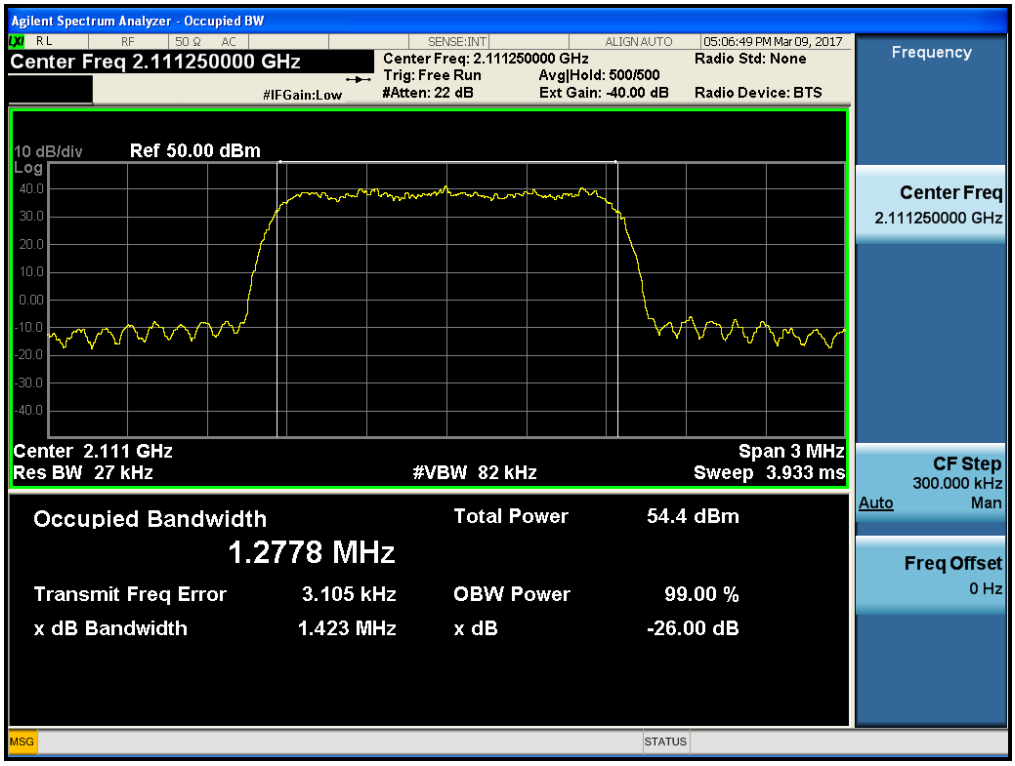
[AGC threshold Output Downlink Middle]



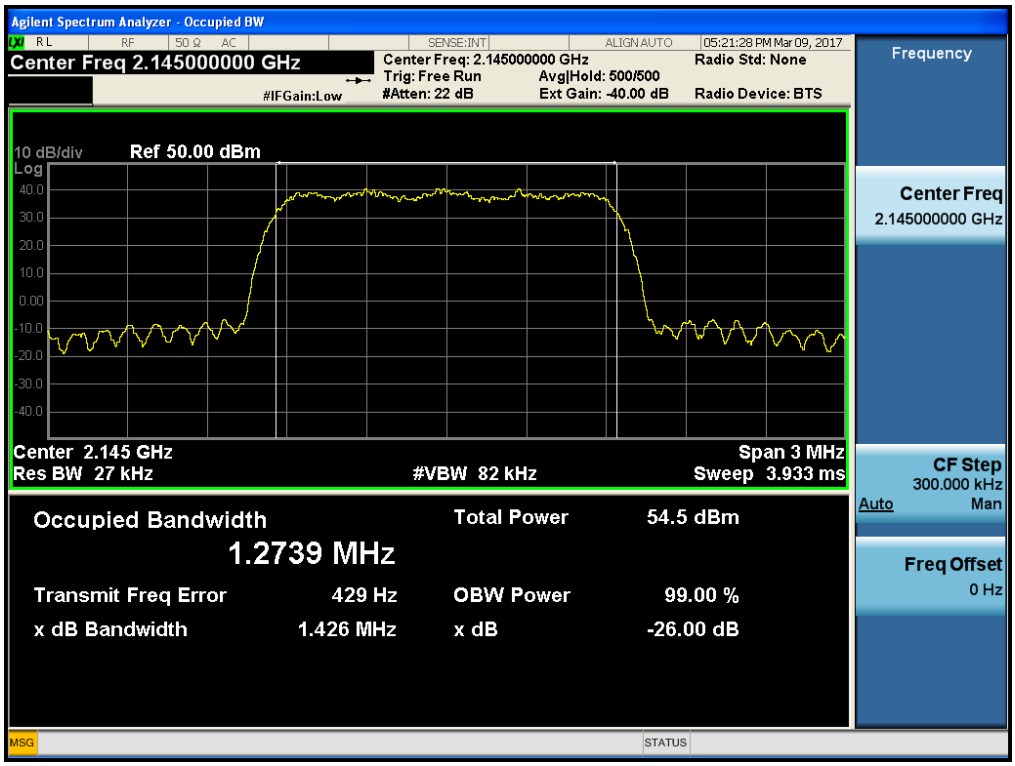
[AGC threshold Output Downlink High]



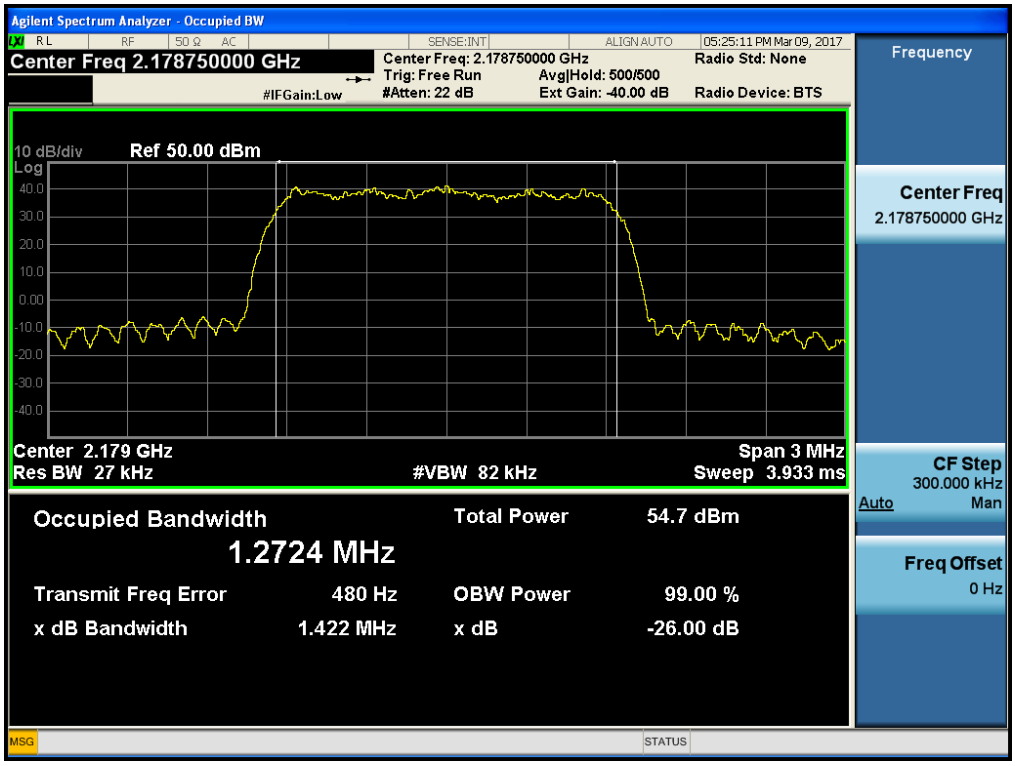
[+3dBm above AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

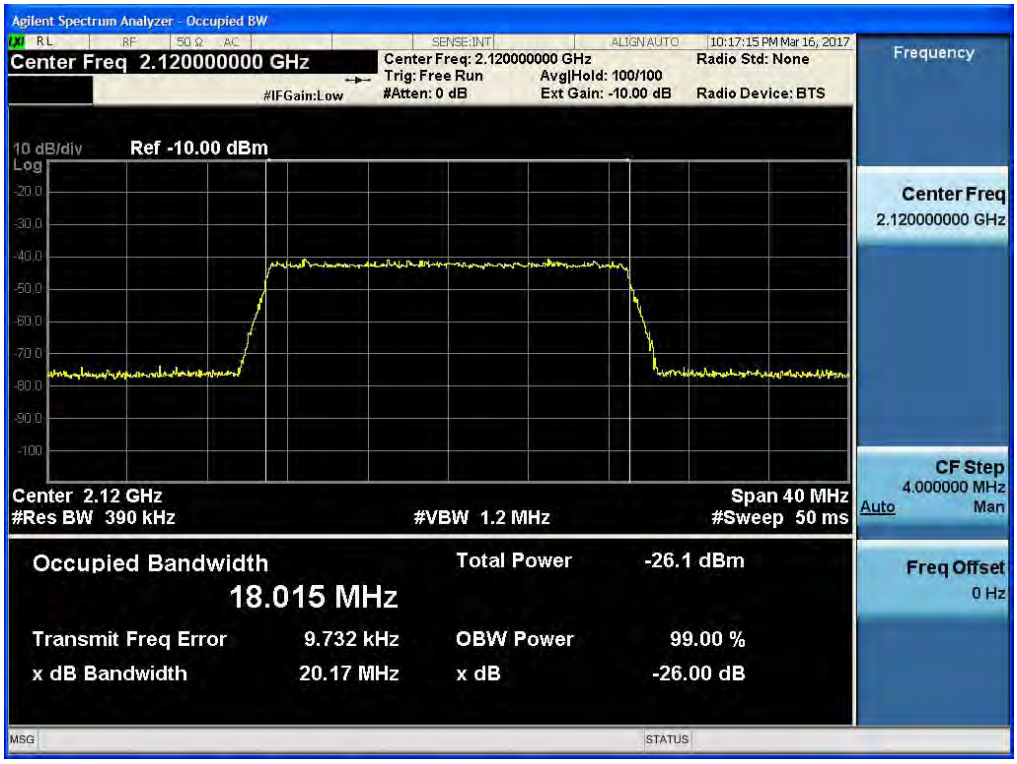


[+3dBm above AGC threshold Output Downlink High]

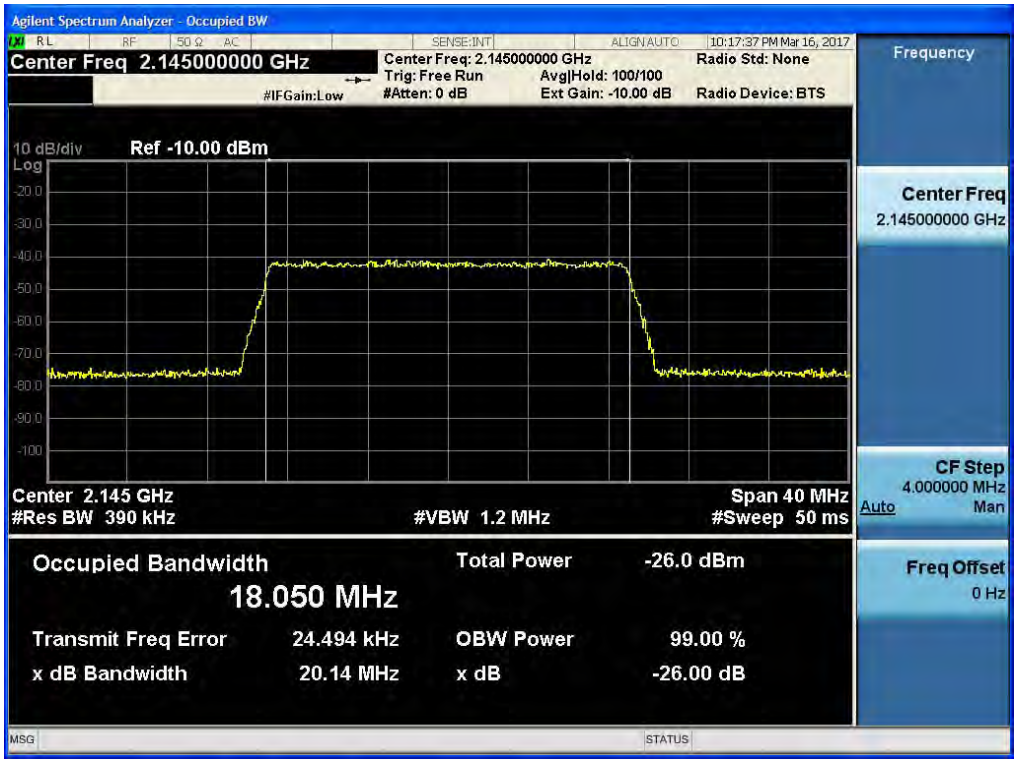


Occupied Bandwidth for AWS 2100_LTE 20 MHz

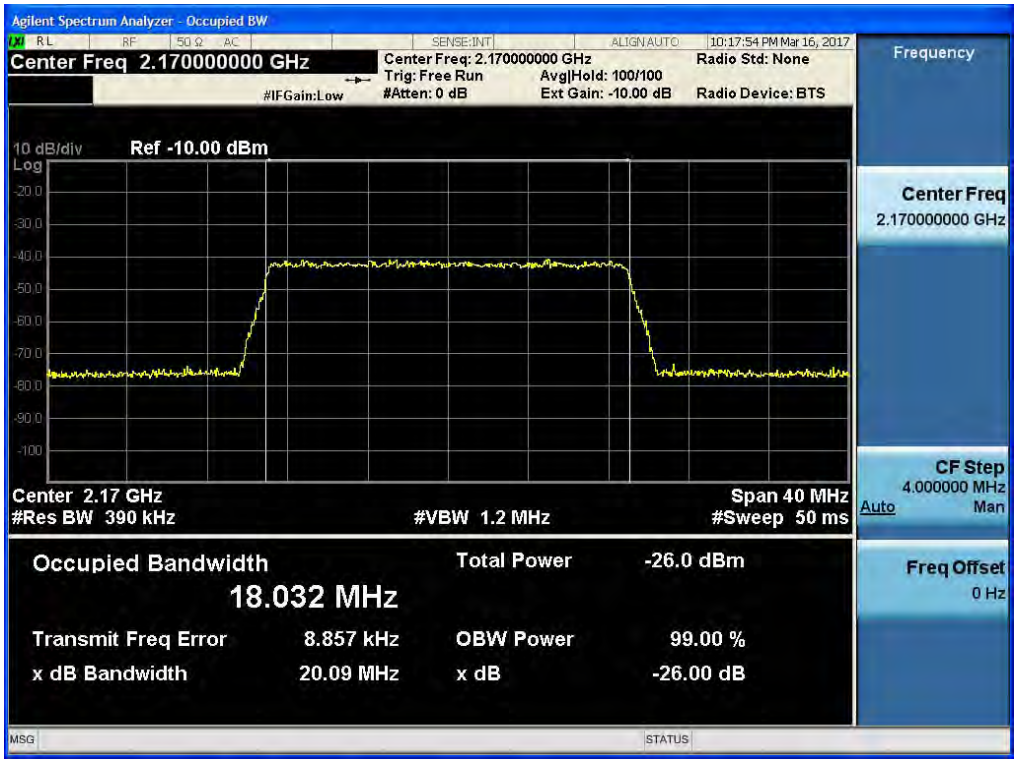
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

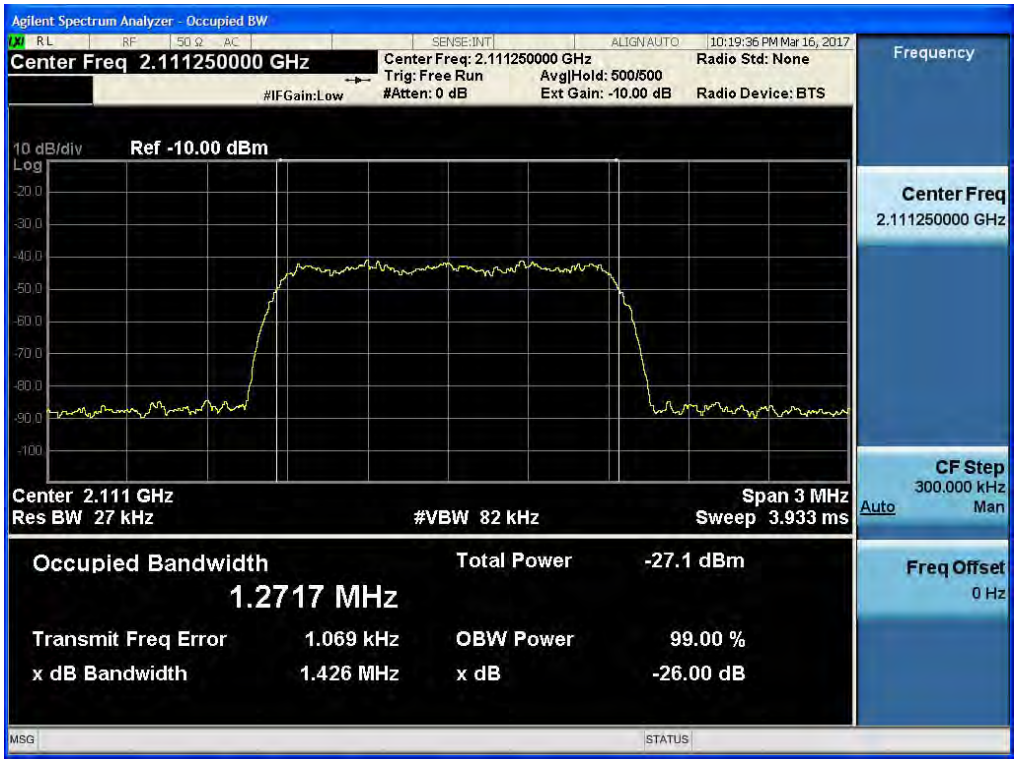


[AGC threshold Input Downlink High]

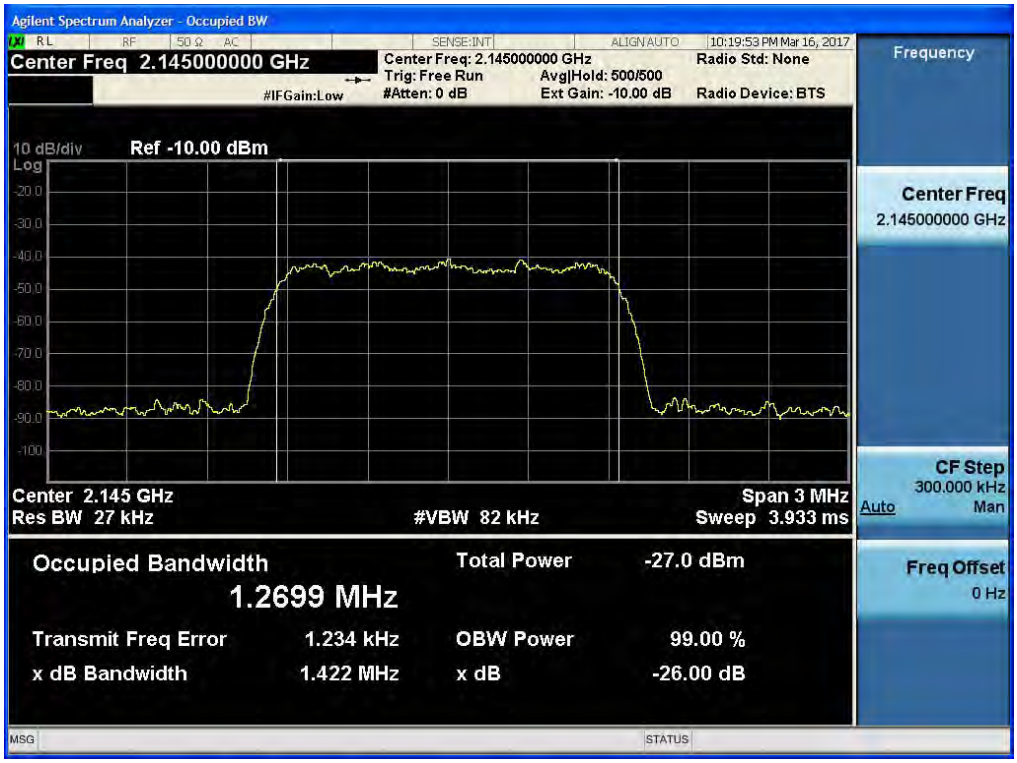


Occupied Bandwidth for AWS 2100_CDMA

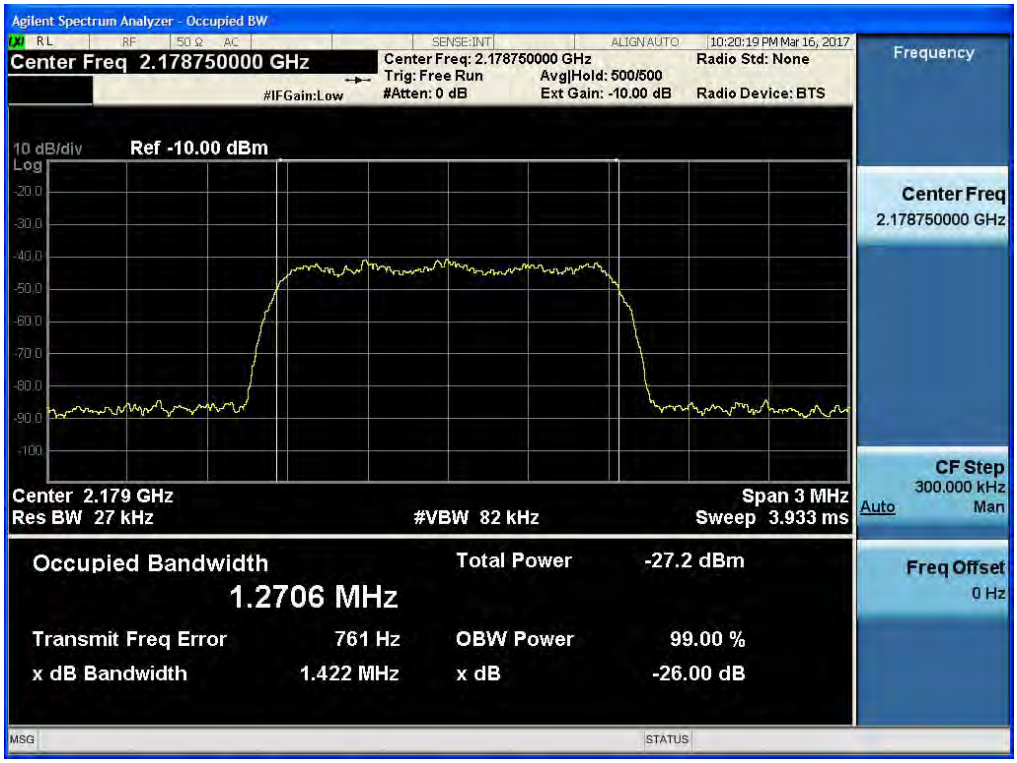
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]



[AGC threshold Input Downlink High]



[Downlink Output_WCS 2300]

	Channel	Frequency (MHz)	OBW (MHz)
2300_WCS Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	2355.00	8.9971
	High	-	-
2300_WCS Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	-	-
	Middle	2355.00	8.9914
	High	-	-

[Downlink Input_WCS 2300]

	Channel	Frequency (MHz)	OBW (MHz)
2300_WCS Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	2355.00	8.9926
	High	-	-

[Uplink Output_WCS 2300]

	Channel	Frequency (MHz)	OBW (MHz)
2300_WCS Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	2310.00	9.0100
	High	-	-
2300_WCS Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	-	-
	Middle	2310.00	8.7766
	High	-	-

[Uplink Input_2300_WCS 2300]

	Channel	Frequency (MHz)	OBW (MHz)
2300_WCS Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	2310.00	9.0096
	High	-	-

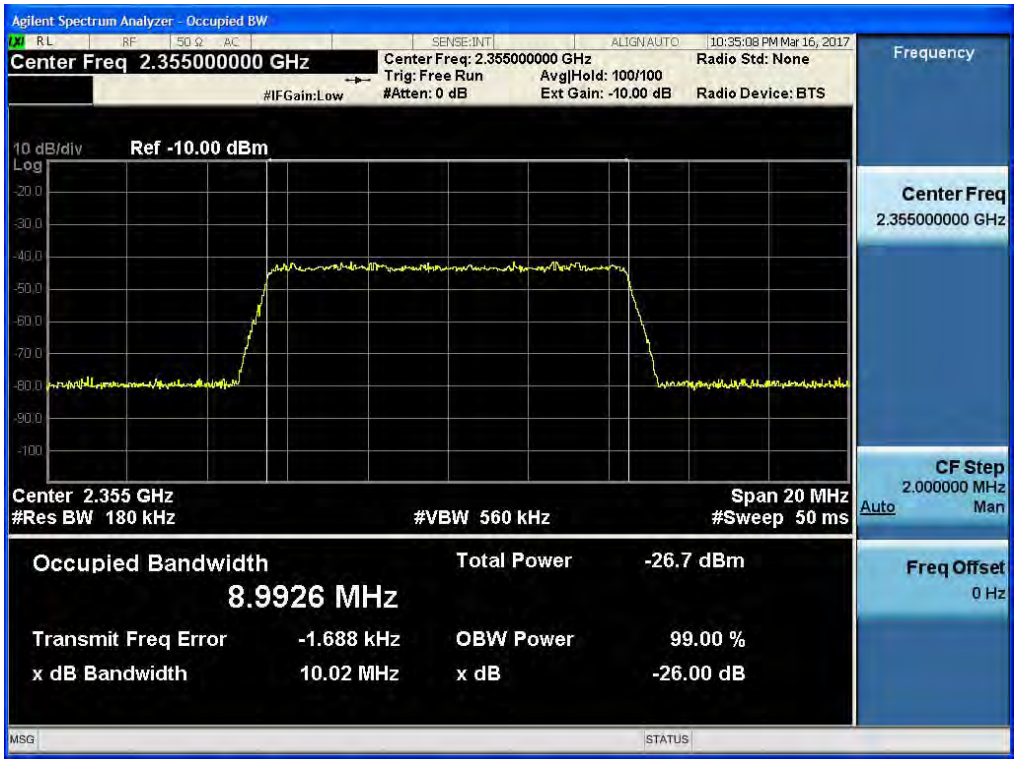
Occupied Bandwidth_ 2300_WCS BAND LTE 10 MHz_Output

[AGC threshold Output Downlink Middle]

[+3dBm above AGC threshold Output Downlink Middle]

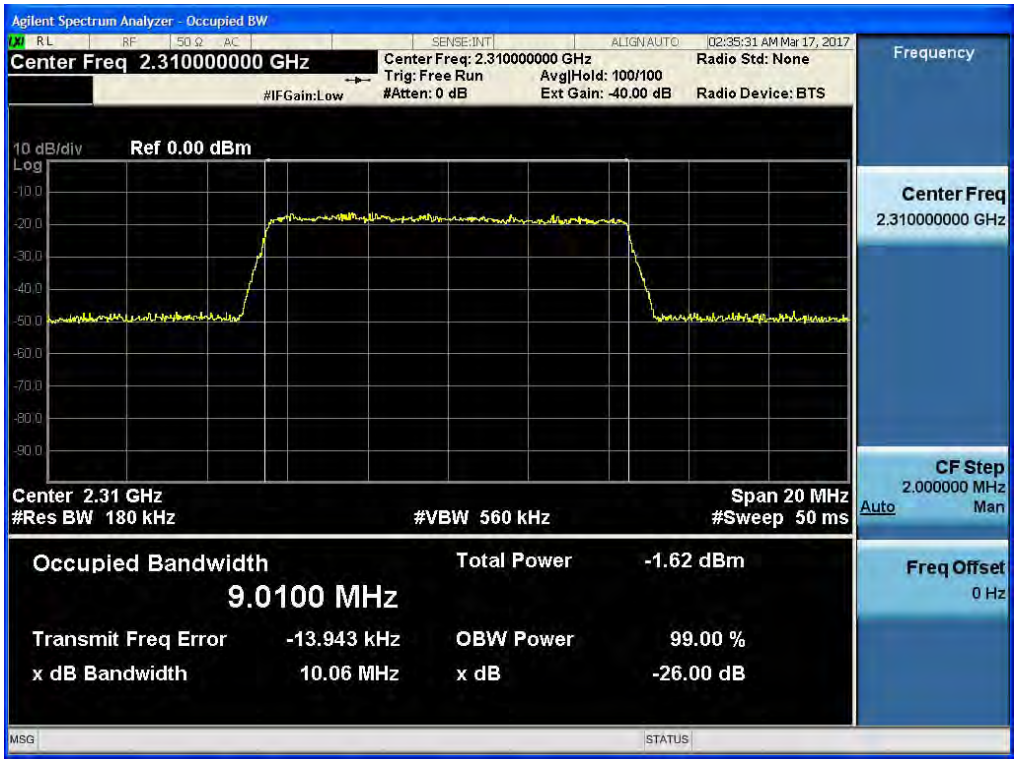
Occupied Bandwidth_ 2300_WCS BAND LTE 10 MHz_Input

[AGC threshold Input Downlink Middle]

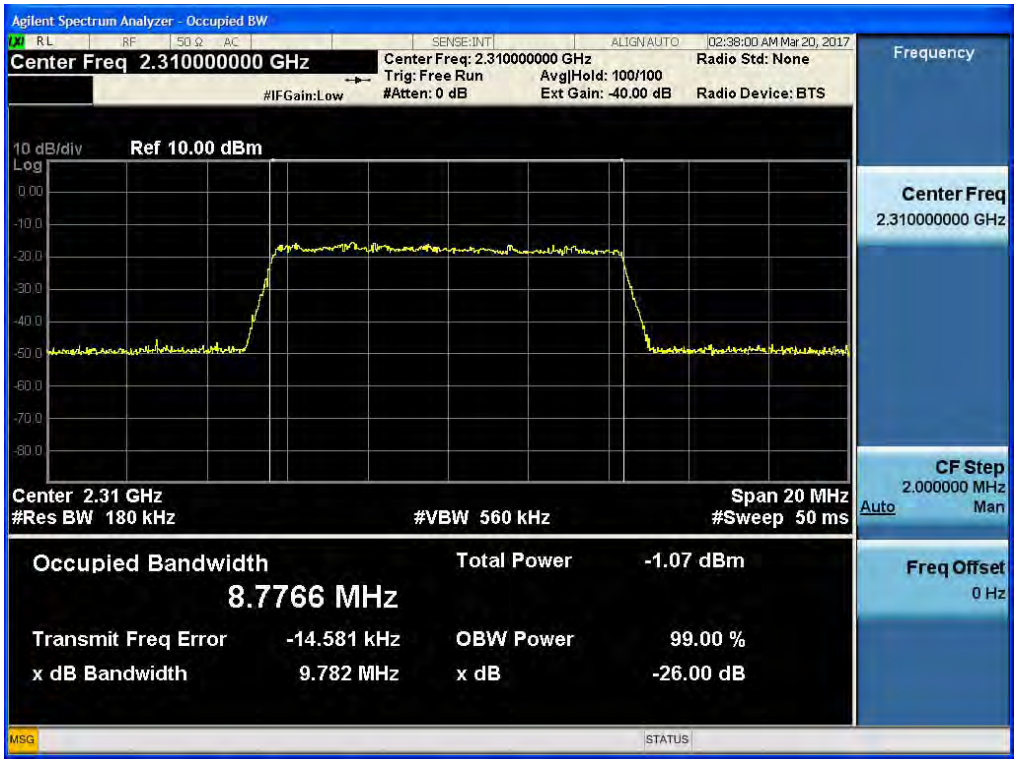


Occupied Bandwidth_ 2300_WCS BAND LTE 10 MHz_Output

[AGC threshold Output Uplink Middle]

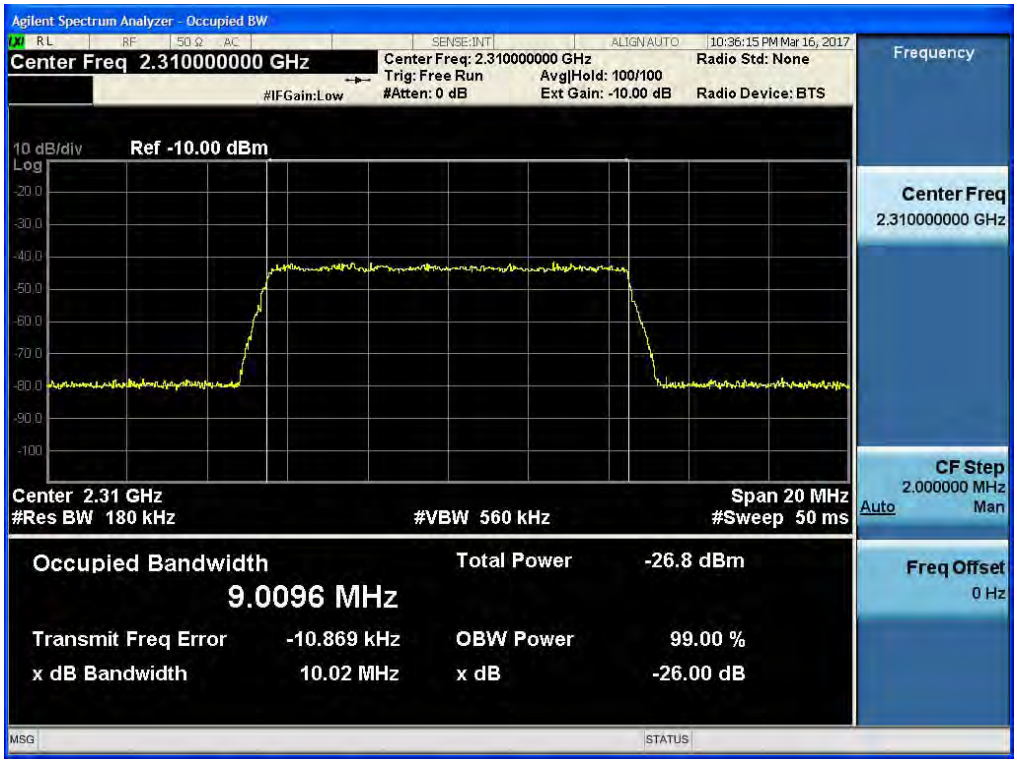


[+3dBm above AGC threshold Output Uplink Middle]



Occupied Bandwidth_ 2300_WCS BAND LTE 10 MHz_Input

[AGC threshold Input Uplink Middle]



[Downlink Output_BRS 2600]

	Channel	Frequency (MHz)	OBW (MHz)
BRS Band_ LTE 20 MHz AGC threshold	Low	2506.00	18.022
	Middle	2593.00	17.995
	High	2680.00	17.989
BRS Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	2506.00	18.010
	Middle	2593.00	18.014
	High	2680.00	17.722

[Downlink Input_BRS 2600]

	Channel	Frequency (MHz)	OBW (MHz)
BRS Band_ LTE 20 MHz AGC threshold	Low	2506.00	18.042
	Middle	2593.00	18.031
	High	2680.00	18.039

[Uplink Output_BRS 2600]

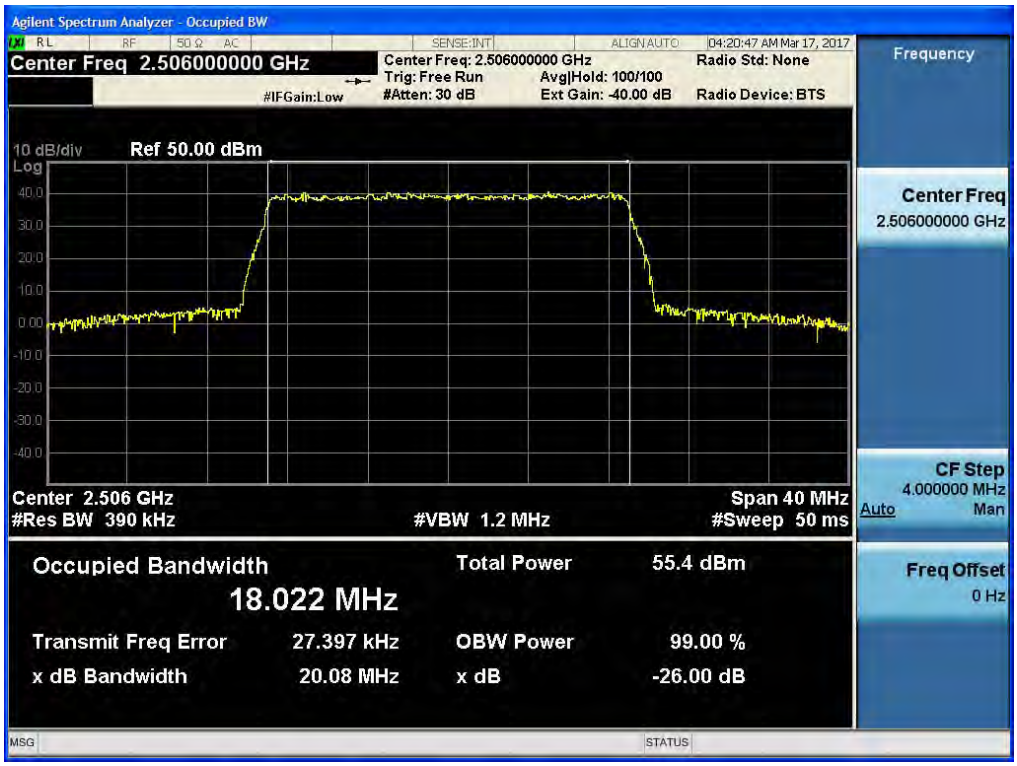
	Channel	Frequency (MHz)	OBW (MHz)
BRS Band_ LTE 20 MHz AGC threshold	Low	2506.00	18.078
	Middle	2593.00	18.090
	High	2680.00	18.101
BRS Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	2506.00	18.092
	Middle	2593.00	18.096
	High	2680.00	18.118

[Uplink Input_BRS 2600]

	Channel	Frequency (MHz)	OBW (MHz)
BRS Band_ LTE 20 MHz AGC threshold	Low	2506.00	18.078
	Middle	2593.00	18.033
	High	2680.00	18.039

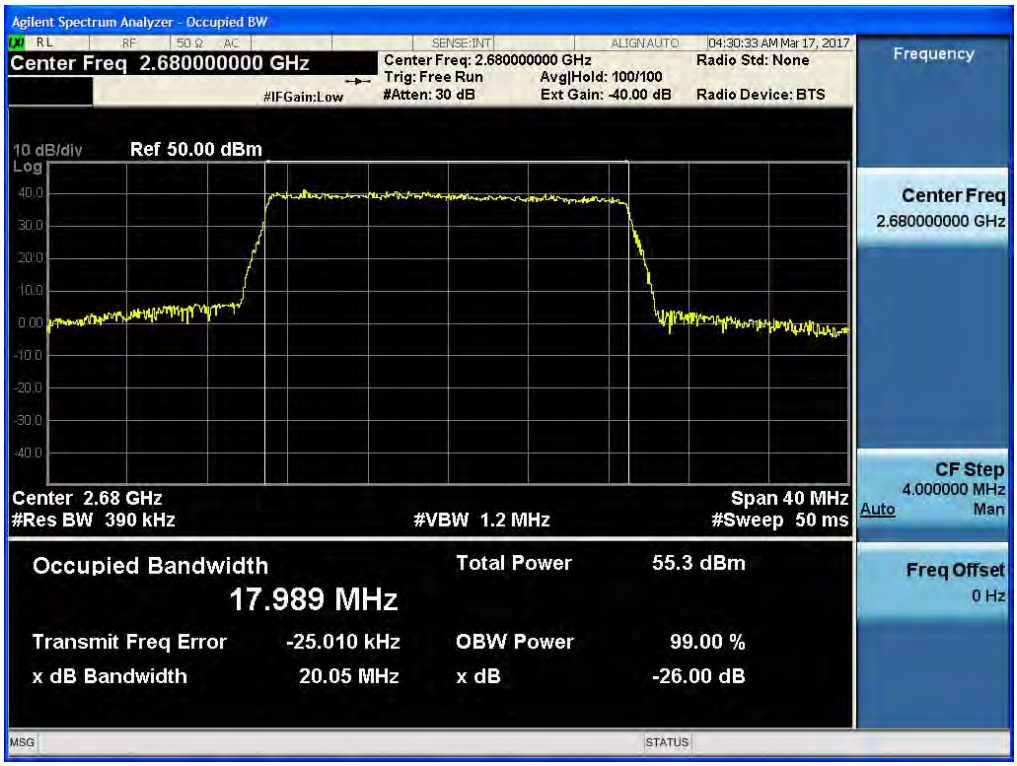
Plots of Occupied Bandwidth_ BRS BAND LTE 20MHz

[AGC threshold Output Downlink Low]

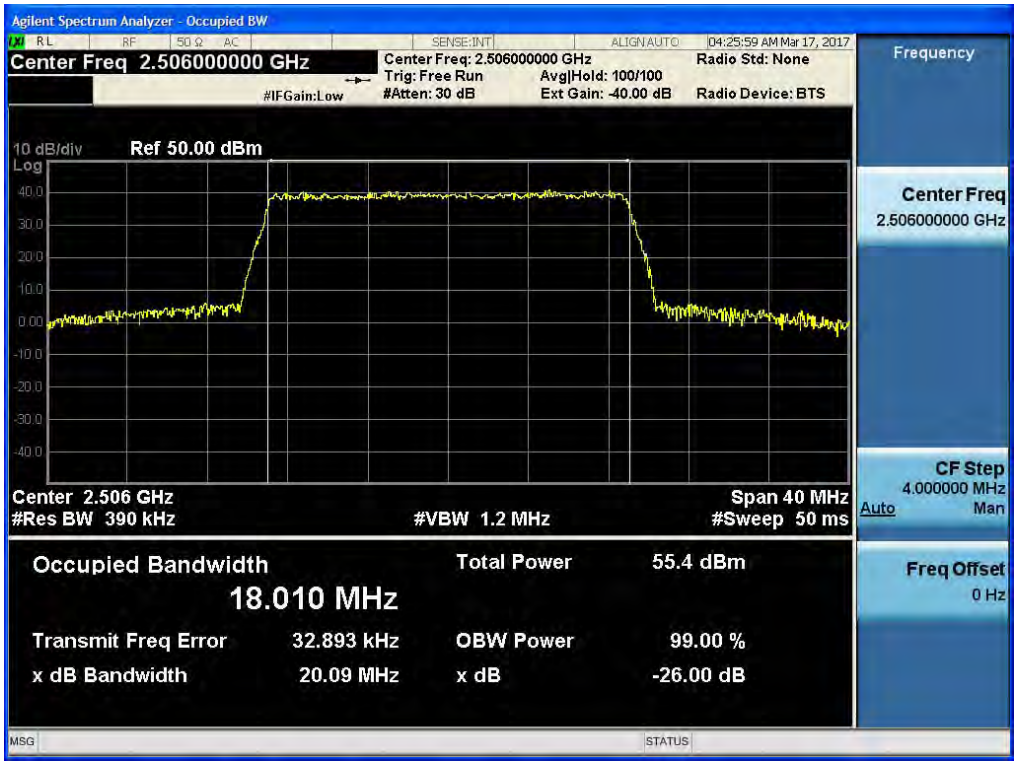


[AGC threshold Output Downlink Middle]

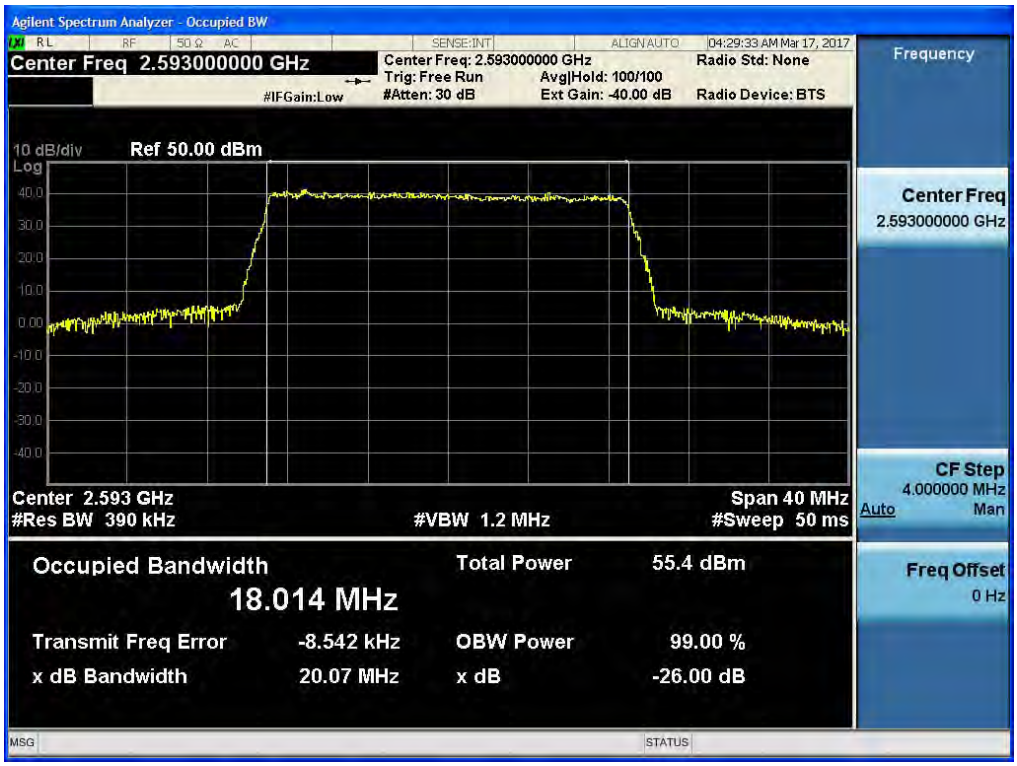
[AGC threshold Output Downlink High]



[+3dBmabove AGC threshold Output Downlink Low]



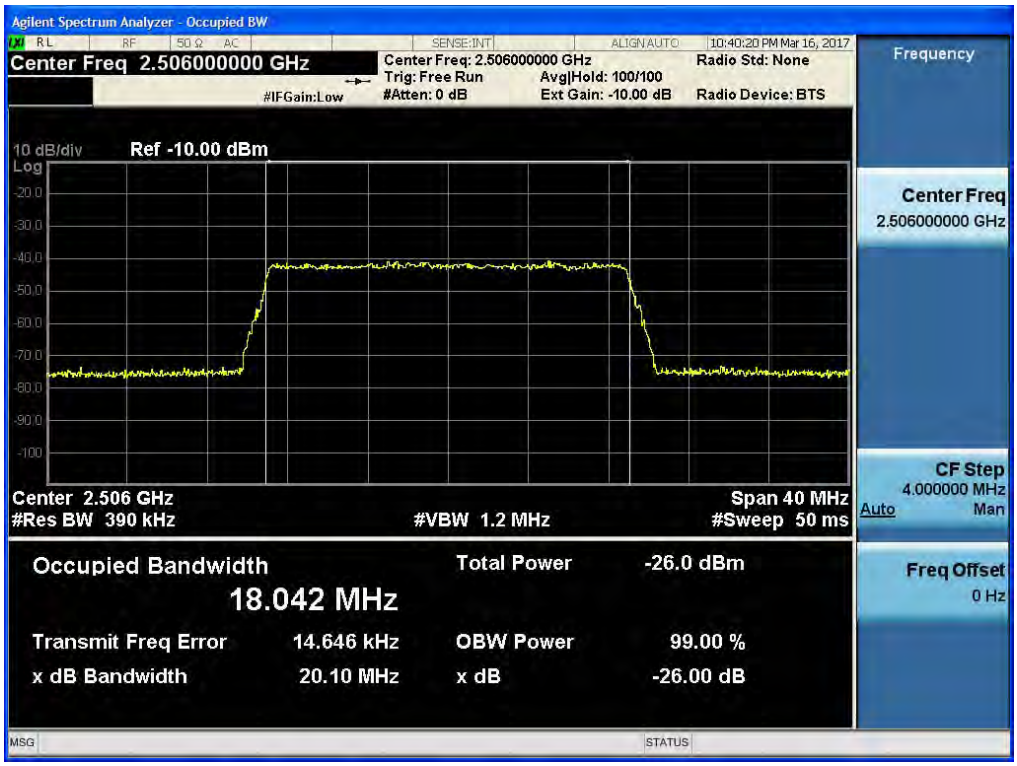
[+3dBm above AGC threshold Output Downlink Middle]



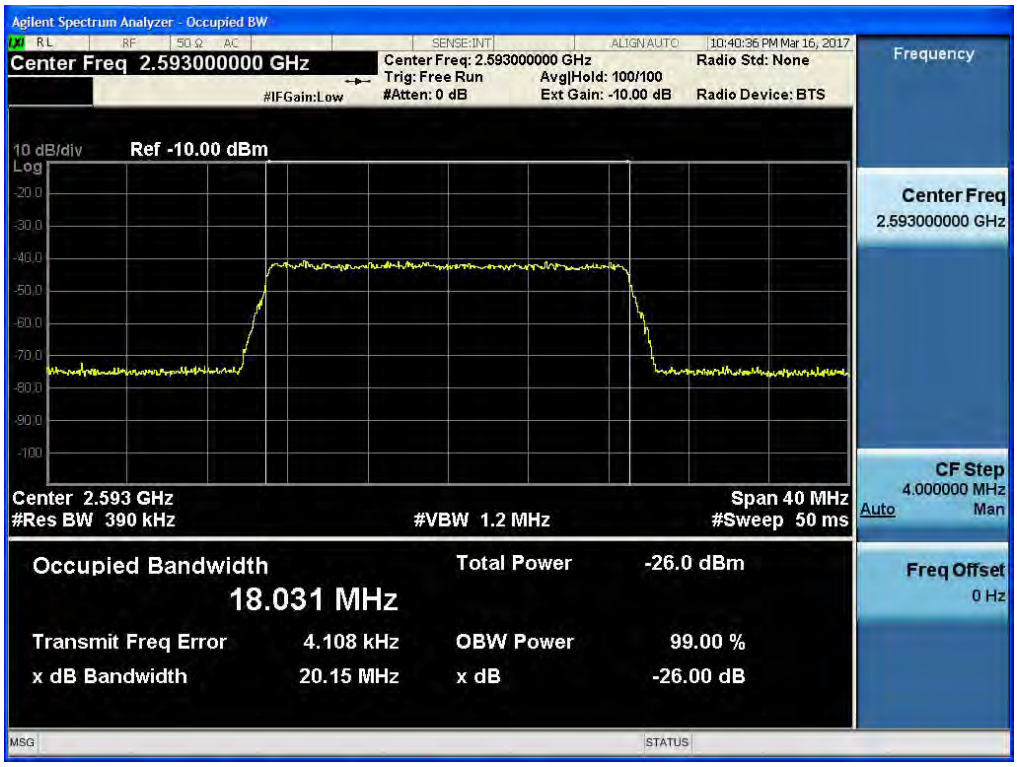
[+3dBm above AGC threshold Output Downlink High]

Plots of Occupied Bandwidth_BRS BAND LTE 20MHz

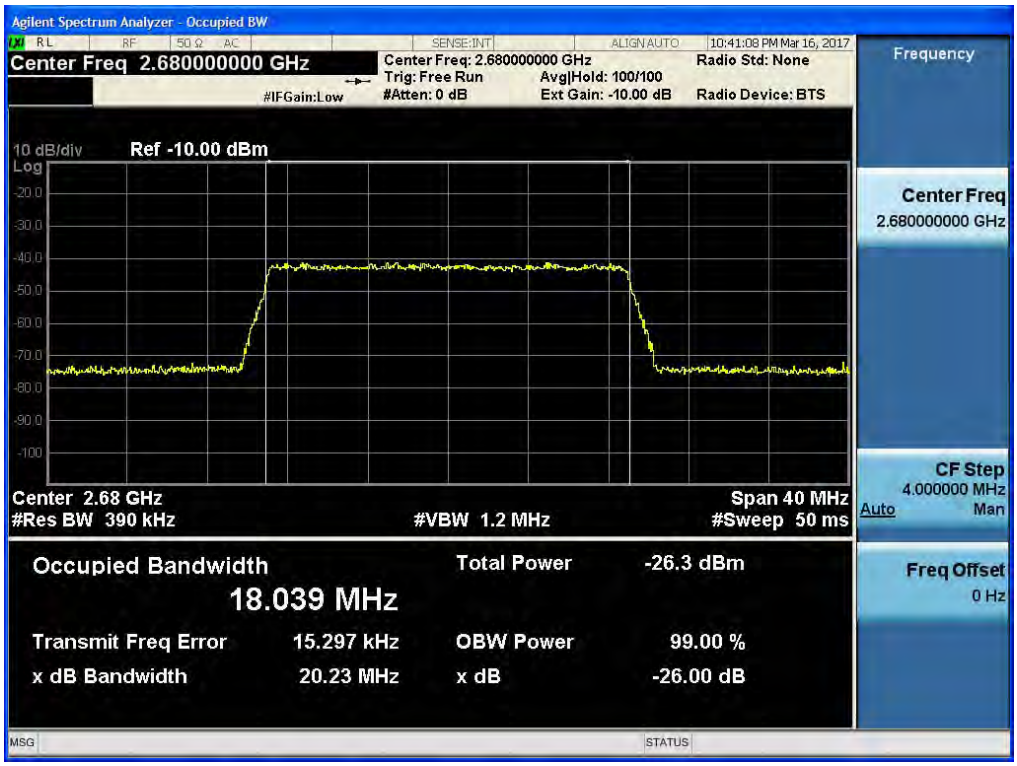
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

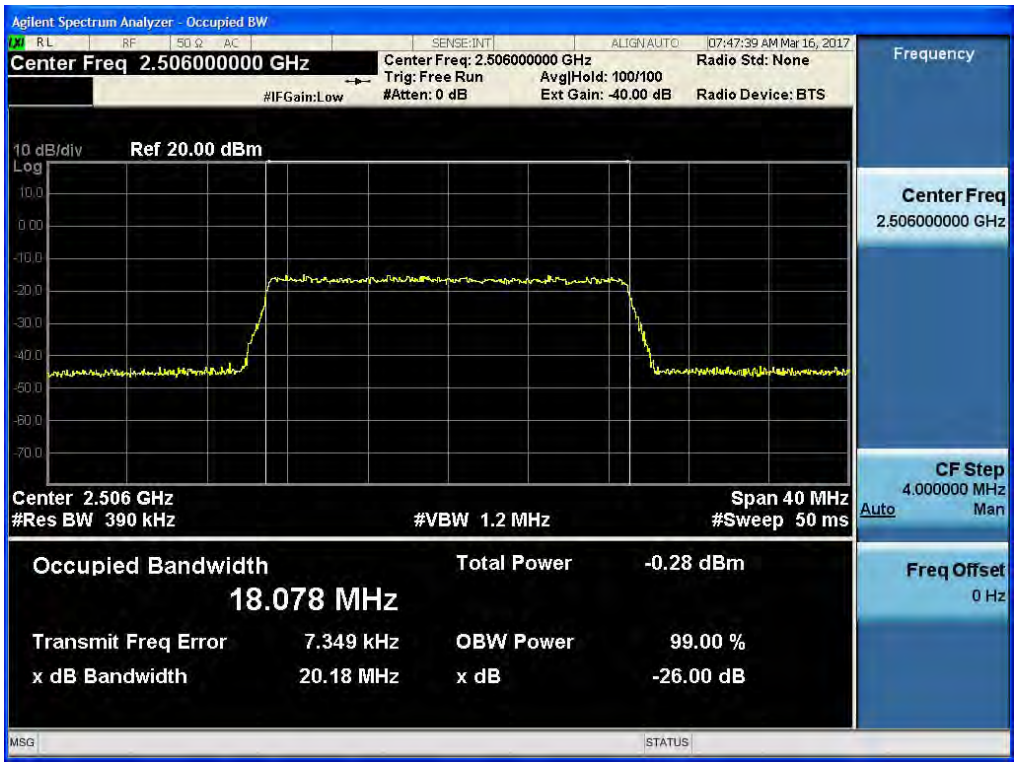


[AGC threshold Input Downlink High]

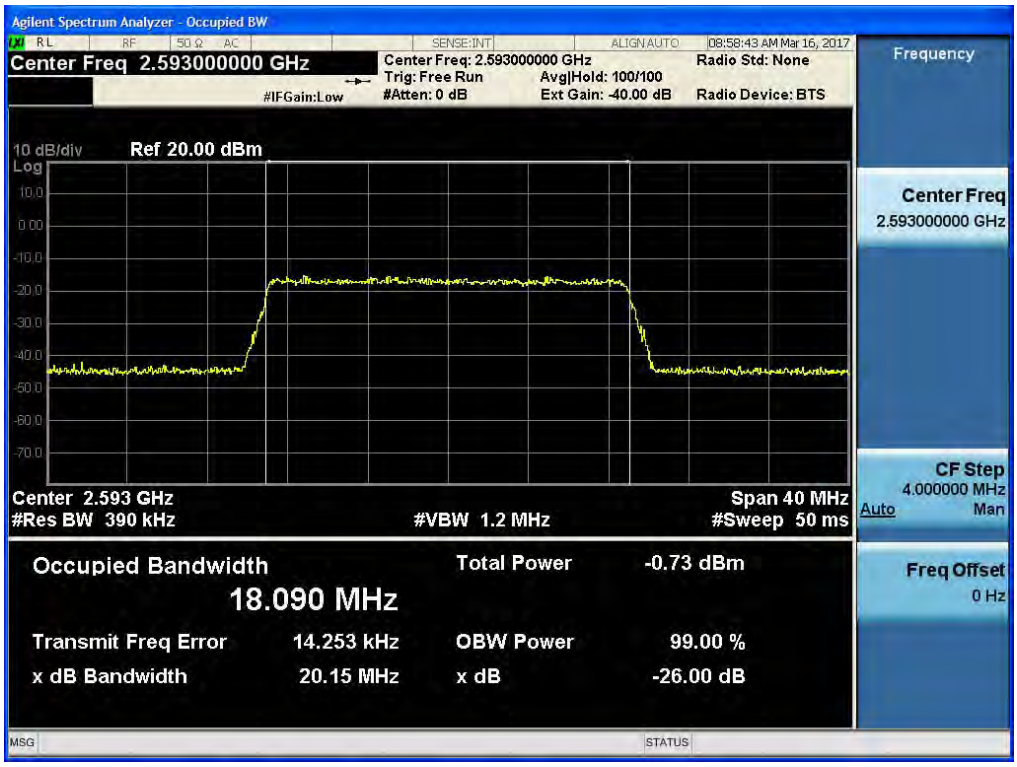


Plots of Occupied Bandwidth_ BRS BAND LTE 20MHz

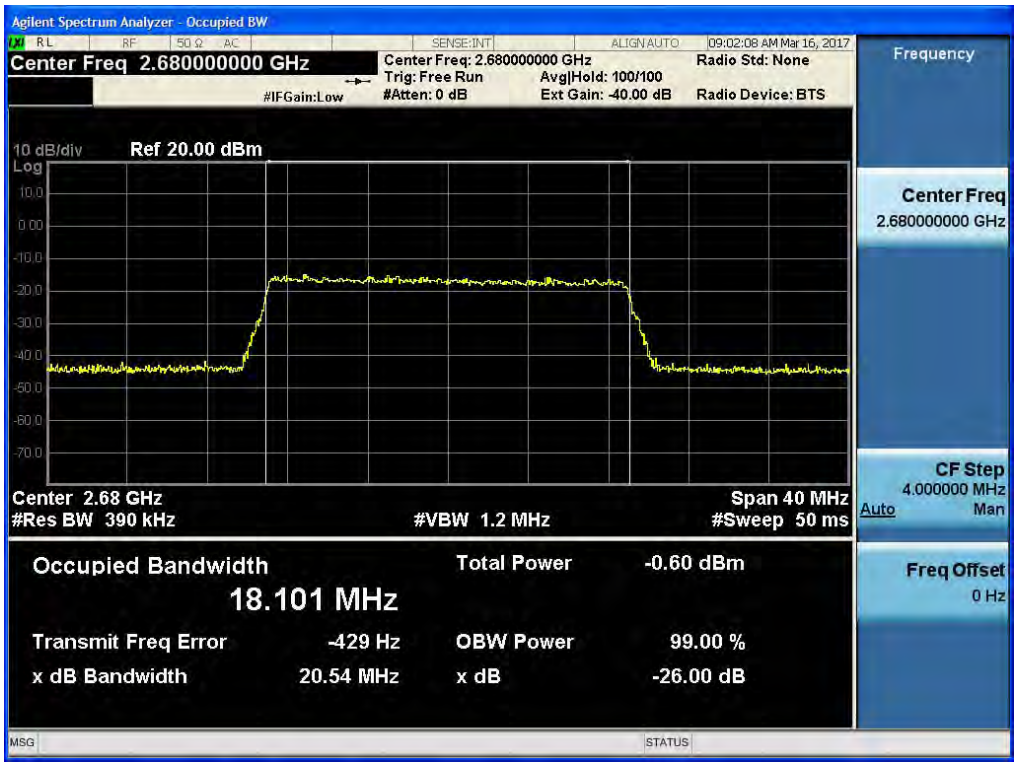
[AGC threshold Output Uplink Low]



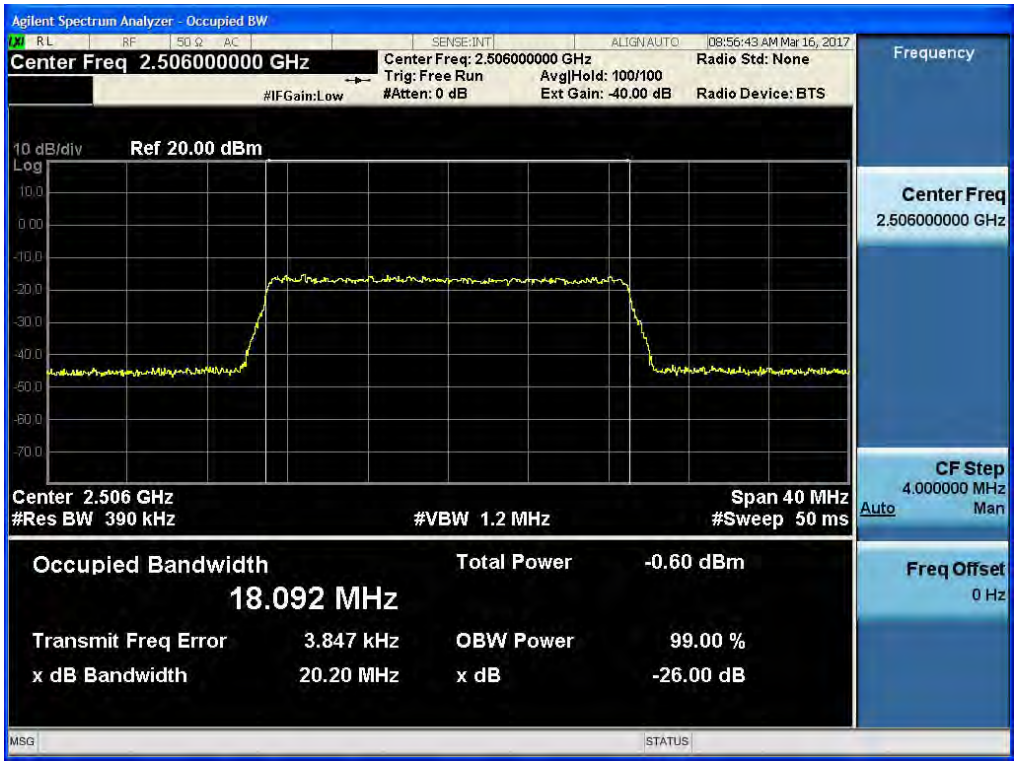
[AGC threshold Output Uplink Middle]



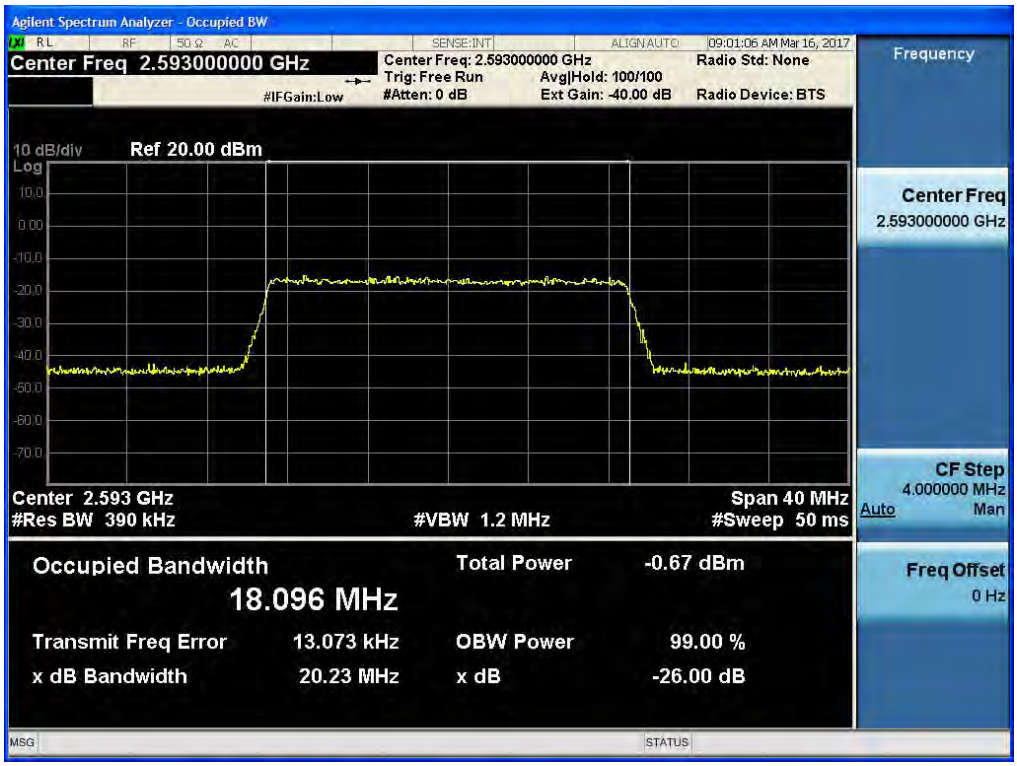
[AGC threshold Output Uplink High]



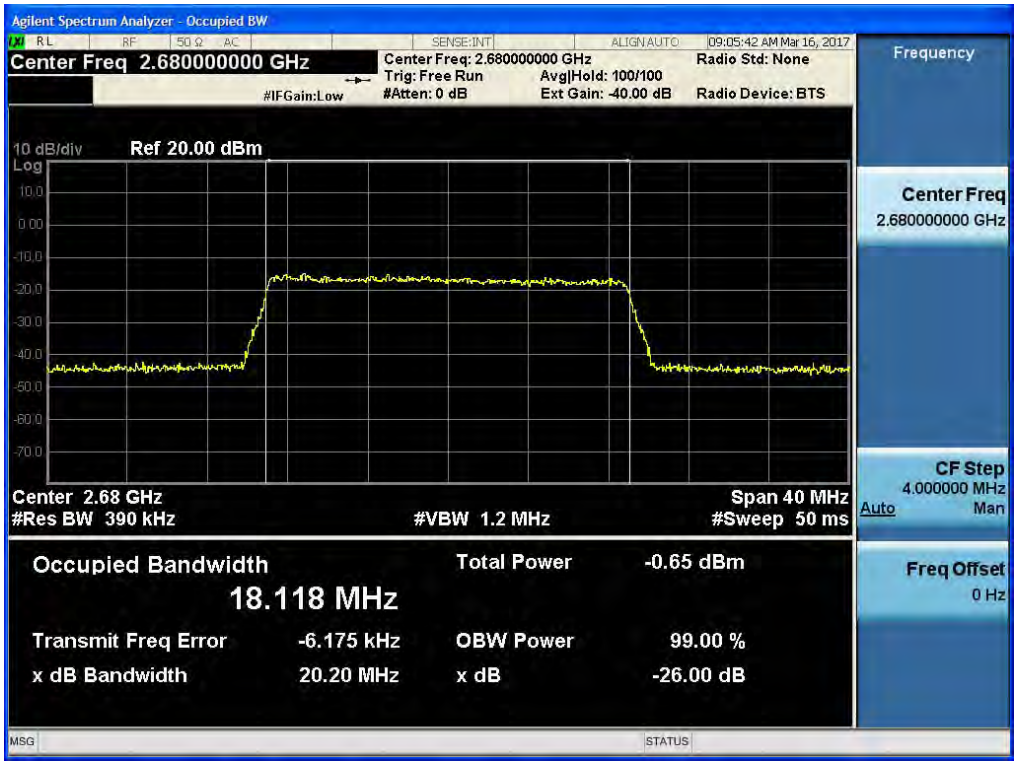
[+3dBmabove AGC threshold Output Uplink Low]



[+3dBm above AGC threshold Output Uplink Middle]

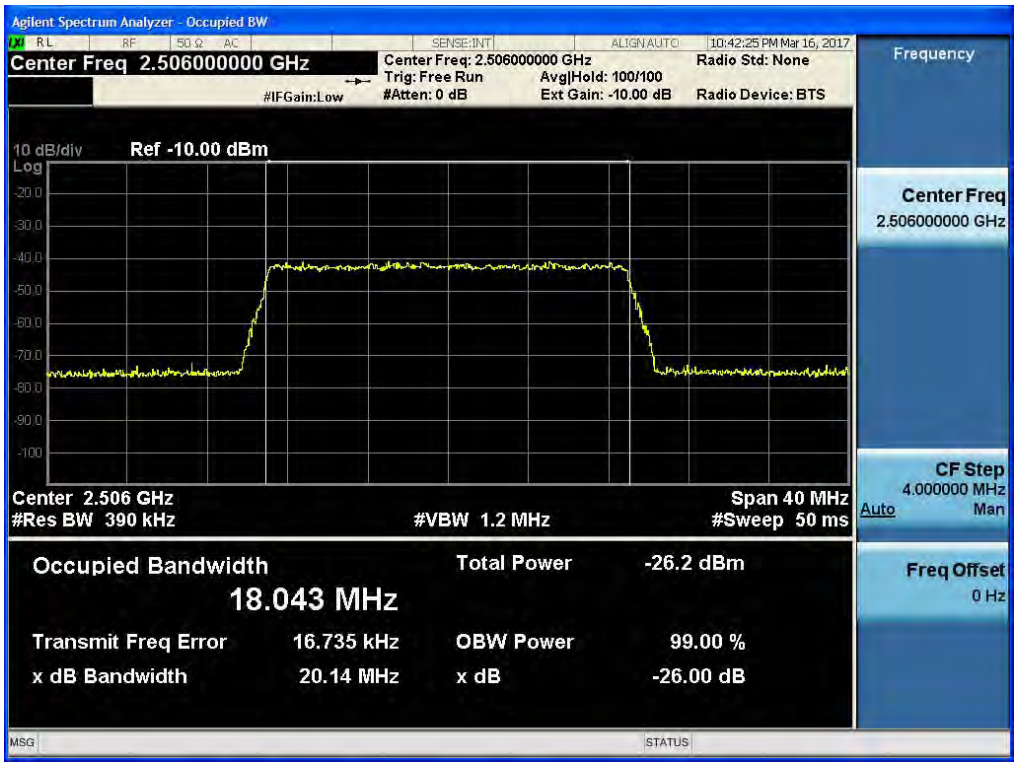


[+3dBm above AGC threshold Output Uplink High]

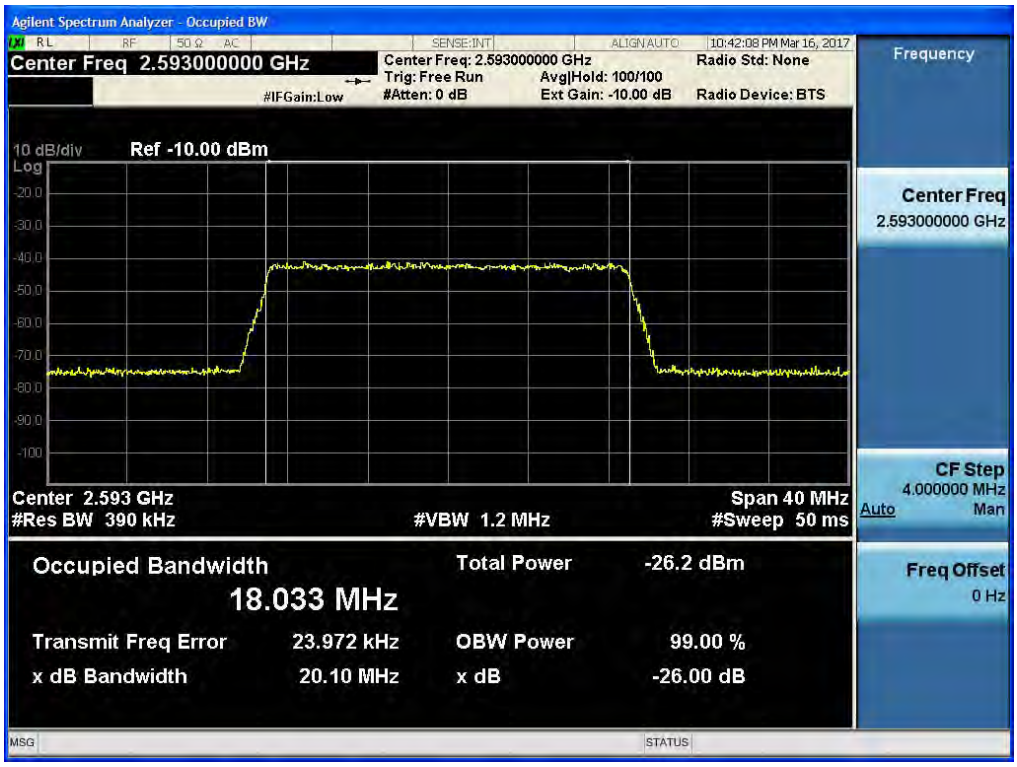


Plots of Occupied Bandwidth_BRS BAND LTE 20MHz

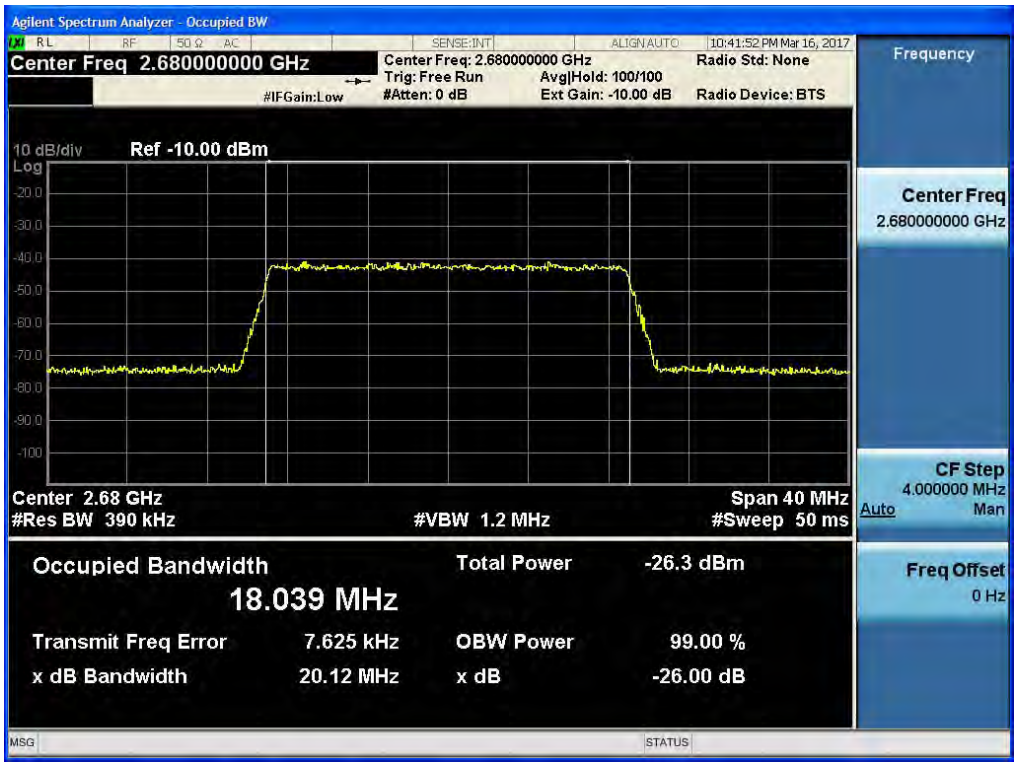
[AGC threshold Input Uplink Low]



[AGC threshold Input Uplink Middle]



[AGC threshold Input Uplink High]



8. INPUT VERSUS OUTPUT SPECTRUM

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

5.2.2 Input-versus-output spectrum

The spectral growth of the 26 dB bandwidth of the output signal shall be less than 5% of the input signal spectrum.

Test Procedures:

RSS-GEN

6 Technical Requirements

6.6 Occupied Bandwidth

The emission bandwidth (X dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated X dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3 x the resolution bandwidth.

Note : We tested using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 26 dB.

Test Results:

[Downlink Output] – 700 LTE

	Channel	Frequency (MHz)	26 dB BW (MHz)
700 LTE Band_ LTE 10 MHz AGC threshold	Low	733.00	9.878
	Middle	742.00	9.896
	High	751.00	9.964
700 LTE Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	733.00	9.875
	Middle	742.00	9.857
	High	751.00	9.870

*** Plots of results are the same as Section 7.**

[Downlink Output] – 800 MHz

	Channel	Frequency (MHz)	26 dB BW (MHz)
LTE 20 MHz AGC threshold	Low	879.00	20.09
	Middle	-	-
	High	884.00	20.00
LTE 20 MHz +3dBm above the AGC threshold	Low	879.00	20.04
	Middle	-	-
	High	884.00	20.02
CDMA AGC threshold	Low	870.25	1.427
	Middle	881.50	1.425
	High	892.75	1.426
CDMA +3dBm above the AGC threshold	Low	870.25	1.423
	Middle	881.50	1.425
	High	892.75	1.426

*** Plots of results are the same as Section 7.**

[Downlink Output] – PCS 1900

	Channel	Frequency (MHz)	26 dB BW (MHz)
LTE 20 MHz AGC threshold	Low	2120.00	19.81
	Middle	2145.00	19.84
	High	2170.00	19.76
LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	19.78
	Middle	2145.00	19.77
	High	2170.00	19.70
CDMA AGC threshold	Low	2111.25	1.423
	Middle	2145.00	1.423
	High	2178.75	1.424
CDMA +3dBm above the AGC threshold	Low	2111.25	1.422
	Middle	2145.00	1.422
	High	2178.75	1.422

*** Plots of results are the same as Section 7.**

[Downlink Output] – AWS 2100

	Channel	Frequency (MHz)	26 dB BW (MHz)
LTE 20 MHz AGC threshold	Low	2120.00	19.83
	Middle	2145.00	19.83
	High	2170.00	19.79
LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	19.77
	Middle	2145.00	19.81
	High	2170.00	19.71
CDMA AGC threshold	Low	2111.25	1.421
	Middle	2145.00	1.421
	High	2178.75	1.426
CDMA +3dBm above the AGC threshold	Low	2111.25	1.423
	Middle	2145.00	1.426
	High	2178.75	1.422

*** Plots of results are the same as Section 7.**

[Downlink Output] – WCS 2300

	Channel	Frequency (MHz)	26 dB BW (MHz)
2300_WCS Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	2355.00	10.03
	High	-	-
2300_WCS Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	-	-
	Middle	2355.00	10.02
	High	-	-

*** Plots of results are the same as Section 7.**

[Downlink Output] – BRS 2600

	Channel	Frequency (MHz)	26 dB BW (MHz)
LTE 20 MHz AGC threshold	Low	2120.00	20.08
	Middle	2145.00	20.09
	High	2170.00	20.05
LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	20.09
	Middle	2145.00	20.07
	High	2170.00	19.70

*** Plots of results are the same as Section 7.**

9. OUT OF BAND REJECTION & MEAN OUTPUT POWER AND ZONE ENHANCER GAIN

FCC Rules

Test Requirements:

KDB 935210 D05 v01r01

Out of Band Rejection – Testing for rejection of out of band signals. Alternatively, filter freq. response plots are acceptable.

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

5.2.1 Out-of-band rejection

The gain-versus-frequency response and the 20 dB bandwidth of the zone enhancer shall be reported. The zone enhancer shall reject amplification of other signals outside the passband of the zone enhancer.

5.2.3 Mean output power and zone enhancer gain

The zone enhancer gain shall not exceed the nominal gain by more than 1.0 dB. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

6. Equipment standard specifications for zone enhancers working with equipment certified under RSS-119

6.1 Types of zone enhancers

Two types of zone enhancers can be used with equipment certified under RSS-119:

1. Class A Zone Enhancer: A zone enhancer designed to retransmit signals on one or more specific channels. A zone enhancer is deemed to be a class A zone enhancer if none of its passbands for one or more specific channels exceed 75 kHz.
2. Class B Zone Enhancer: A zone enhancer designed to retransmit any signals within a wide frequency band. A zone enhancer is deemed to be a class B zone enhancer if it has a passband that exceeds 75 kHz.

Test Procedures:

Measurements were in accordance with the test methods section 3.3, 4.3 of KDB 935210 D05 v01r01.

Measurements were in accordance with the test methods section 3.3, 4.3 of KDB 935210 D05

v01r01.

3.3 EUT out-of-band rejection

a) Connect a signal generator to the input of the EUT.

b) Configure a swept CW signal with the following parameters:

1) Frequency range = ± 250 % of the passband from the center of the passband.

2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.

3) Dwell time = approx. 10 ms.

4) Number of points = SPAN/(RBW/2).

c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.

e) Set the resolution bandwidth of the spectrum analyzer to be 1 % to 5 % of the passband and the video bandwidth shall be set to ≥ 3 × RBW.

f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.

g) Place a marker to the peak of the frequency response and record this frequency as f0.

h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the −20 dB down amplitude to determine the 20 dB bandwidth. Capture the frequency response of the EUT.

4.3 PLMRS device out-of-band rejection

Adjust the internal gain control of the equipment under test to the maximum gain for which equipment certification is sought.

a) Connect a signal generator to the input of the EUT.

b) Configure a swept CW signal with the following parameters:

c) Frequency range = ± 250 % of the manufacturer's pass band.

d) The CW amplitude will be 3 dB below the AGC threshold (see 4.2) and but not activate the AGC threshold throughout the test.

e) Dwell time = approx. 10 ms.

f) Frequency step = 50 kHz.

g) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

h) Set the resolution bandwidth of the spectrum analyzer between 1 % and 5 % of the manufacturer's pass band with the video bandwidth set to 3 × RBW.

i) Set the detector to Peak and the trace to Max-Hold.

j) After the trace is completely filled, place a marker at the peak amplitude, which is designated as f0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the gain has fallen by 20 dB).

k) Capture the frequency response plot and for inclusion in the test report.

Test Results:

The EUT complies with the requirements of this section.

[700 LTE, 800 MHz]

Input Signal	Input Level Input Signal : Sinusoidal	Maximum Amp Gain
700 LTE Band, 800 MHz	DL: -8 dBm	DL : 51 dB
	UL: -45 dBm	UL : 35 dB

[PCS 1900]

Input Signal	Input Level (dBm)		Maximum Amp Gain (dB)	
	DL	UL	DL	UL
LTE 20 MHz	-8	-45	54	35
CDMA				

[AWS 2100]

Input Level Input Signal : Sinusoidal	Maximum Amp Gain
DL: -8 dBm	DL : 54 dB
UL: -45 dBm	UL : 35 dB

[WCS 2300]

Input Signal	Input Level (dBm)		Maximum Amp Gain (dB)	
	DL	UL	DL	UL
2300_WCS	-8 dBm	-45 dBm	52.8 dB	35 dB

[BRS 2600]

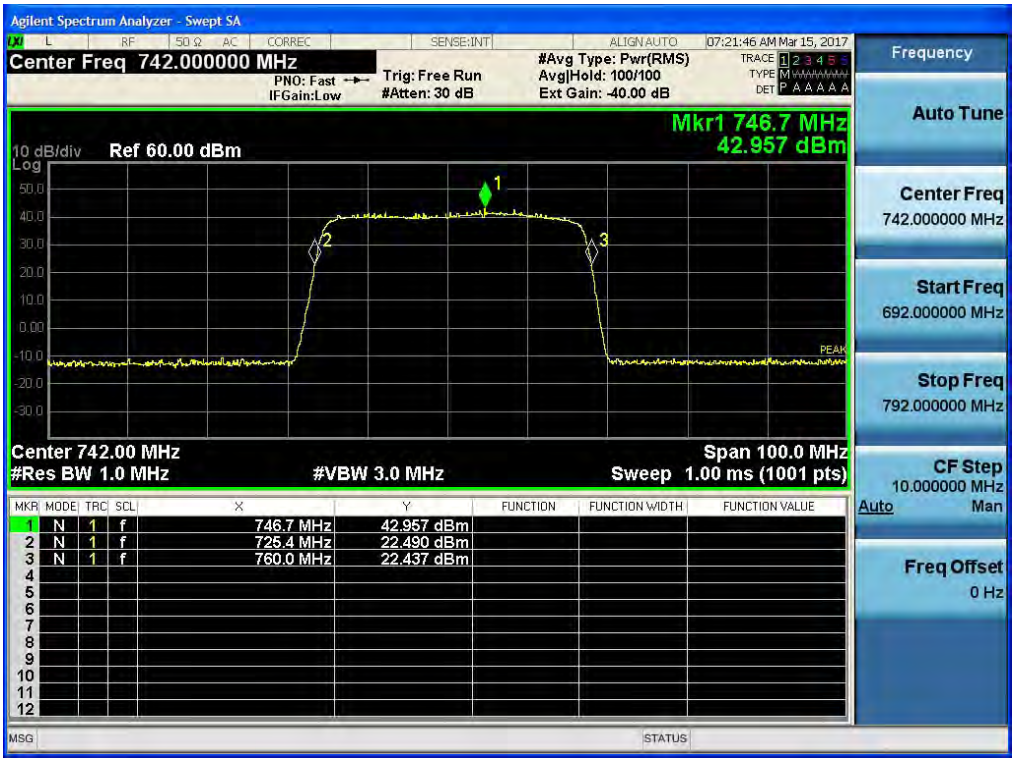
Input Signal	Input Level (dBm) Input Signal : Sinusoidal	Maximum Amp Gain
BRS	DL: -8 dBm	DL : 54 dB
	UL: -45 dBm	UL : 35 dB

[Downlink_700 LTE]

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
700 LTE Band	725.400 MHz ~ 760.000 MHz	42.957	50.957

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[700 LTE BAND]

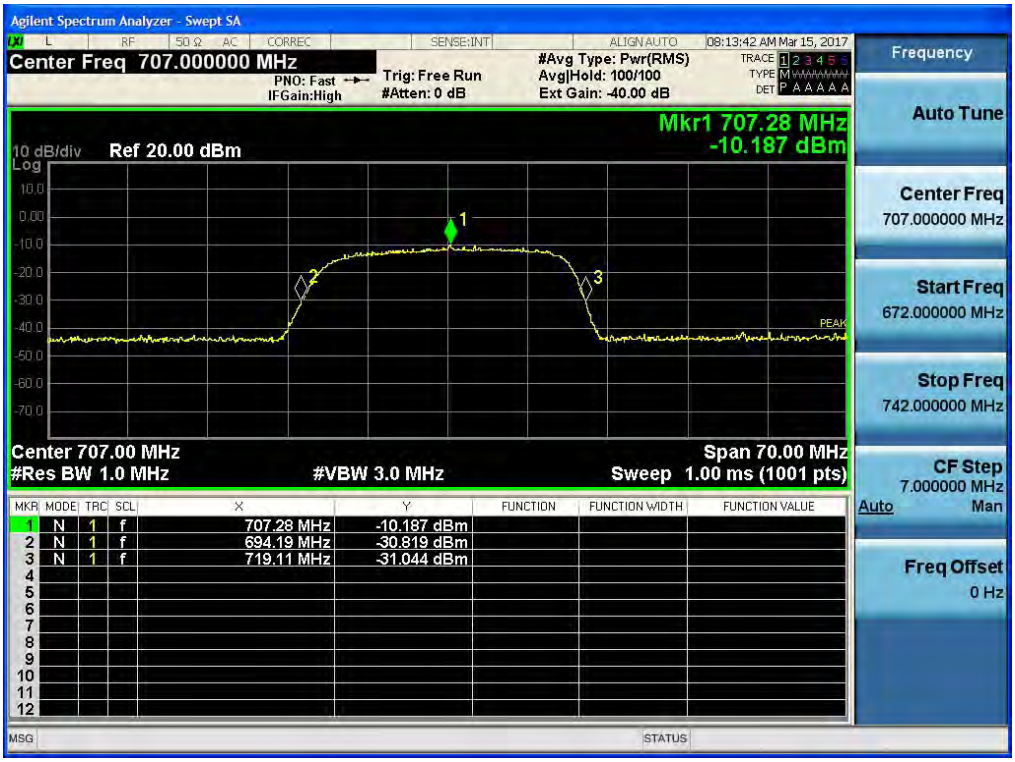


[Uplink(Lower)_700 LTE]

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
700 LTE Band	694.190 MHz ~ 719.110 MHz	-10.187	34.813

Plots of Passband Gain and Bandwidth & Out of Band Rejection

[700 LTE BAND]

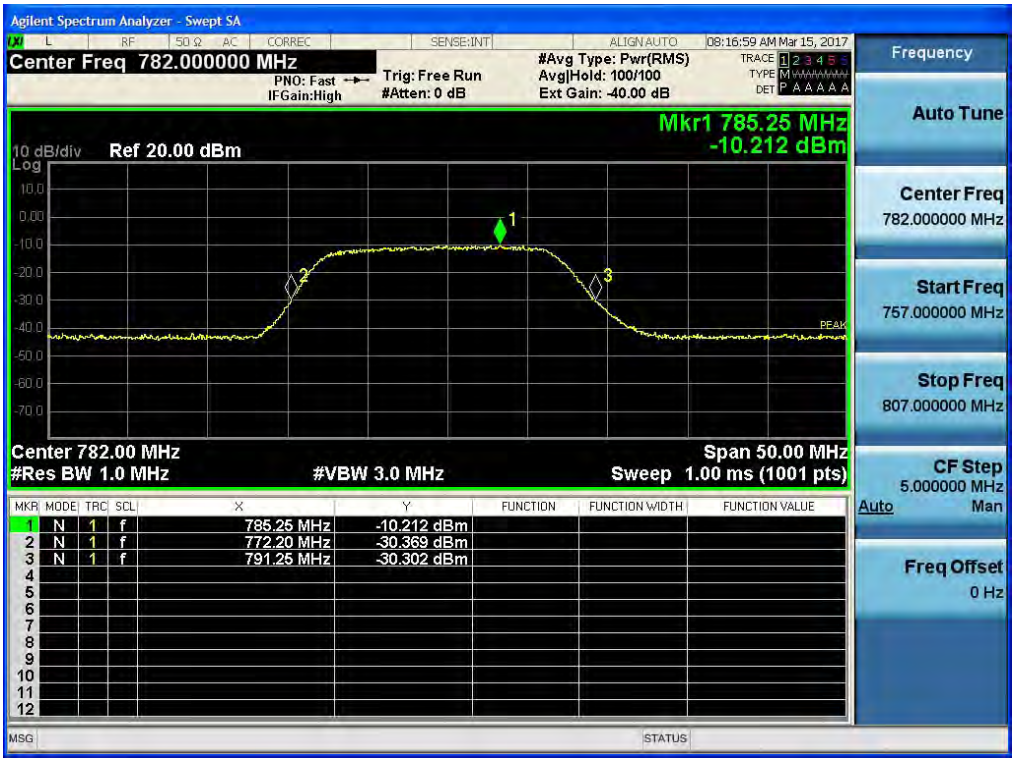


[Uplink(Upper)_700 LTE]

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
700 LTE Band	772.200 MHz ~ 791.250 MHz	-10.212	34.788

Plots of Passband Gain and Bandwidth & Out of Band Rejection

[700 LTE BAND]

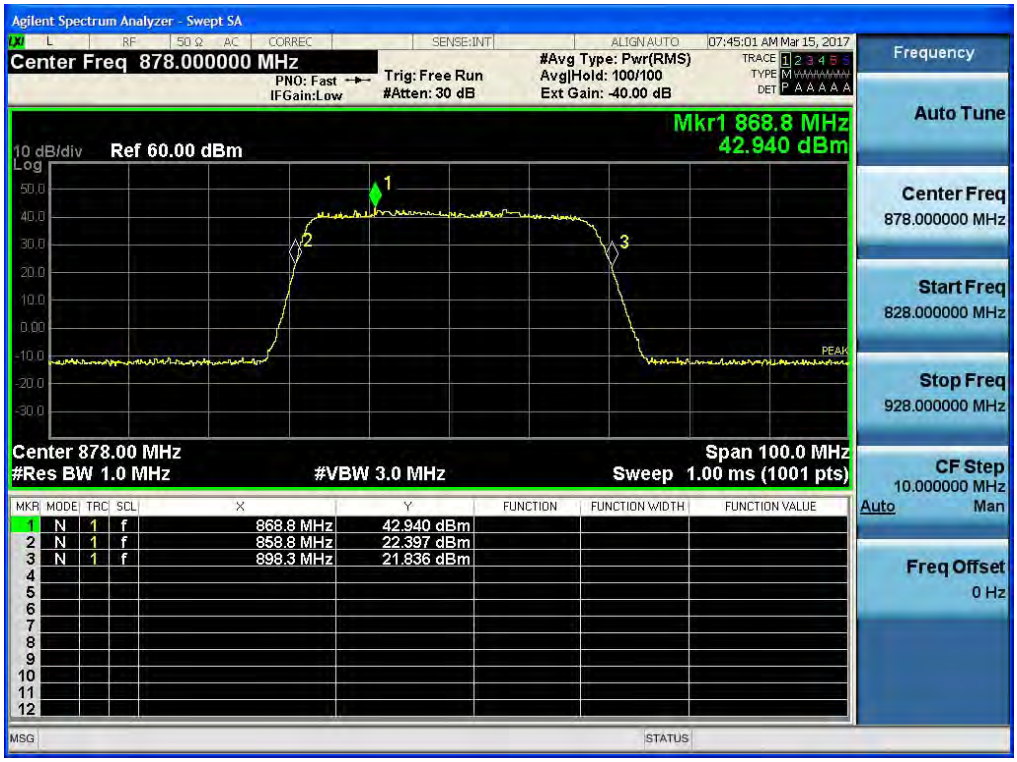


[Downlink] – 800 MHz

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
800 MHz Band	858.800 MHz ~ 898.300 MHz	42.940	50.940

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[Downlink 800 MHz]

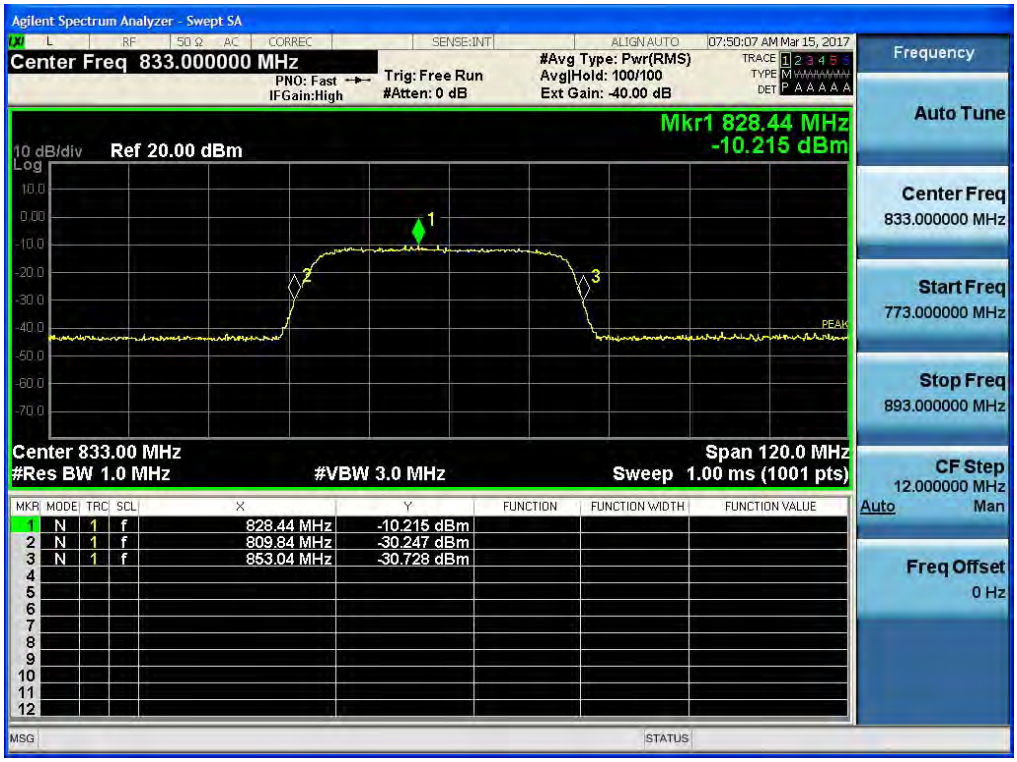


[Uplink_Part 22] – 800 MHz

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
800 MHz Band	809.840 MHz ~ 853.040 MHz	-10.215	34.785

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[Uplink 800 MHz]

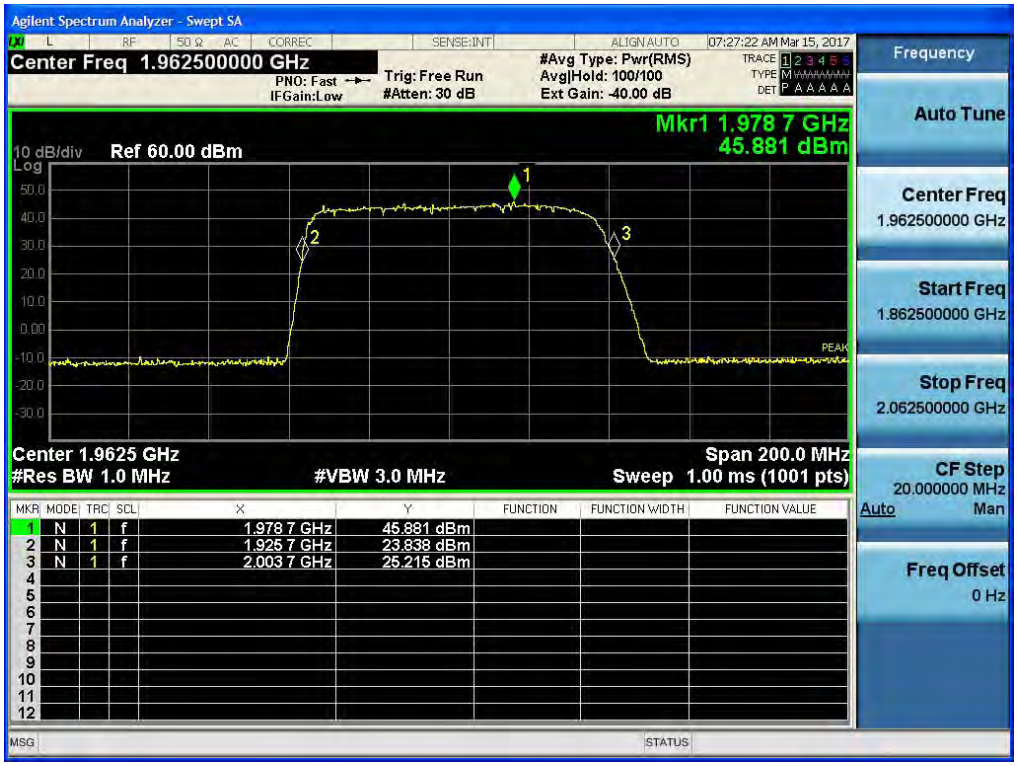


[Downlink] – PCS 1900

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
1925.700 ~ 2003.700	45.881	53.881

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[Downlink]

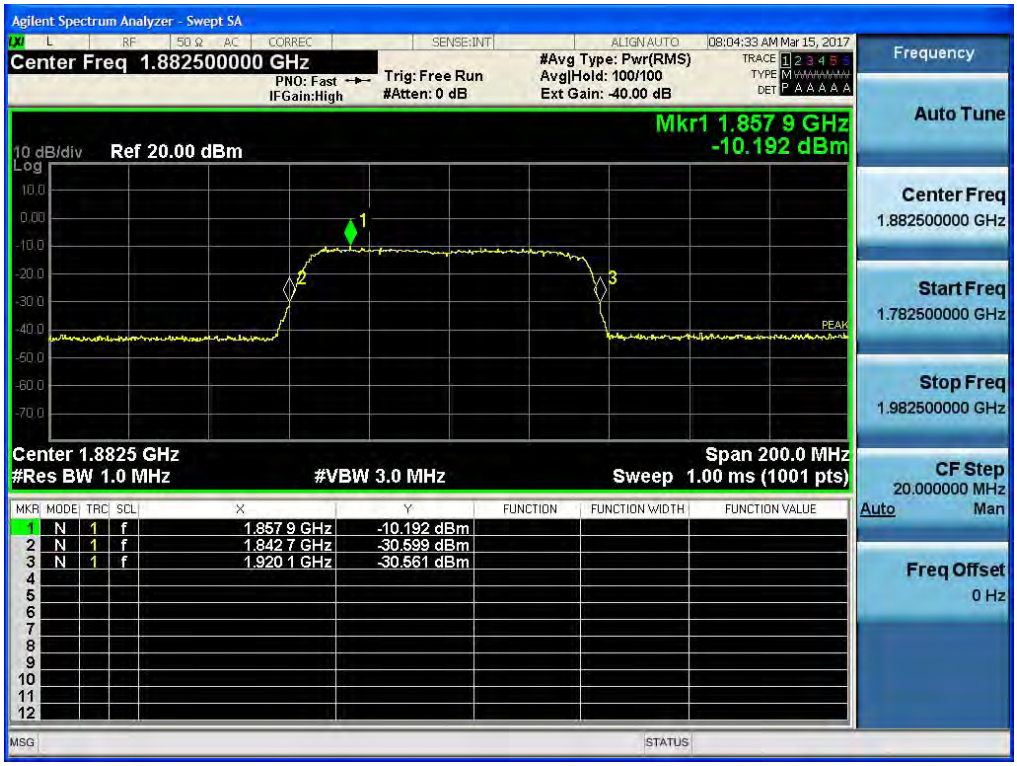


[Upnlink] – PCS 1900

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
1842.700 ~ 1920.100	-10.192	34.808

Plots of Passband Gain and Bandwidth & Out of Band Rejection

[Uplink]



[Downlink] – AWS 2100

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
AWS 2100	2086.800 MHz ~ 2188.800 MHz	45.876	53.876

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[AWS 2100 Band]

[Downlink] – WCS 2300

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
2300_WCS Band	2342.900 MHz ~ 2365.550 MHz	44.758	52.758

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

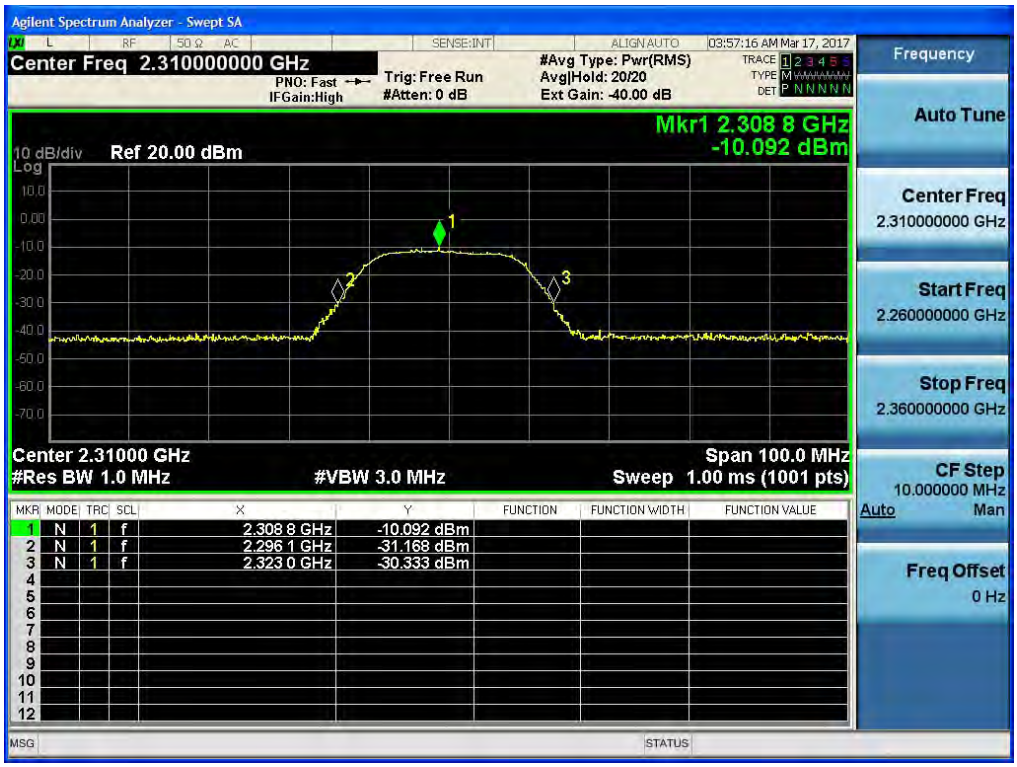
[2300_WCS BAND]

[Uplink] – WCS 2300

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
2300_WCS Band	2296.100 MHz ~ 2323.000 MHz	-10.092	34.908

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[2300_WCS BAND]

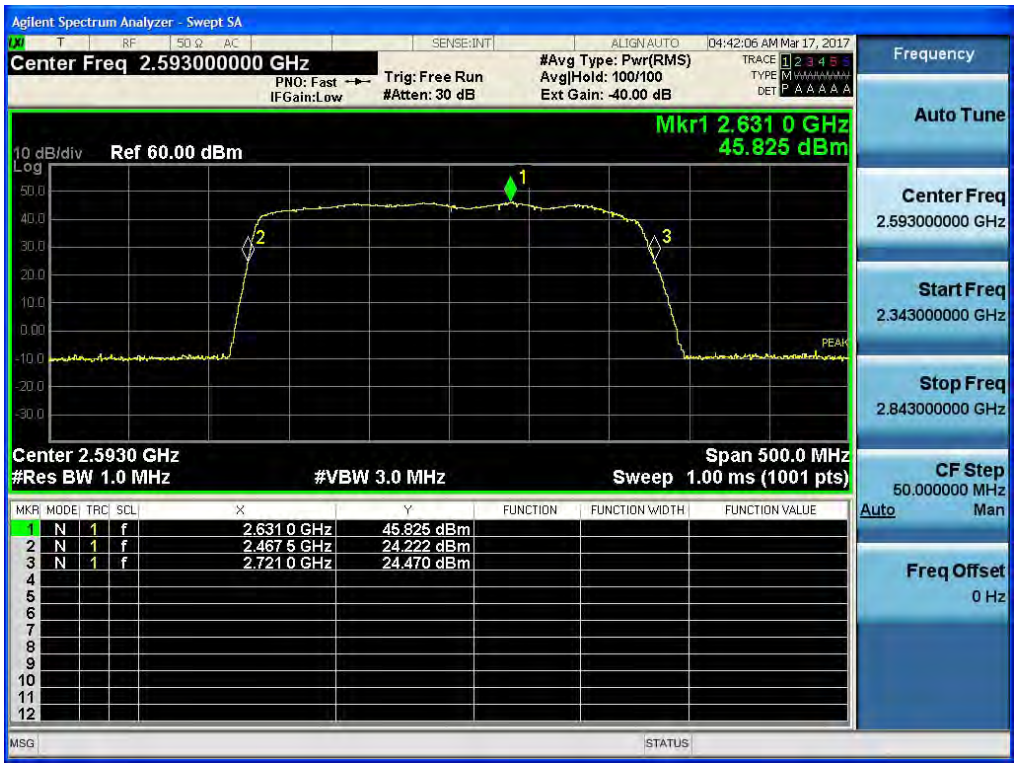


[Downlink] – BRS 2600

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
BRS 2600	2467.500 MHz ~ 2721.000 MHz	45.825	53.825

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[BRS BAND]

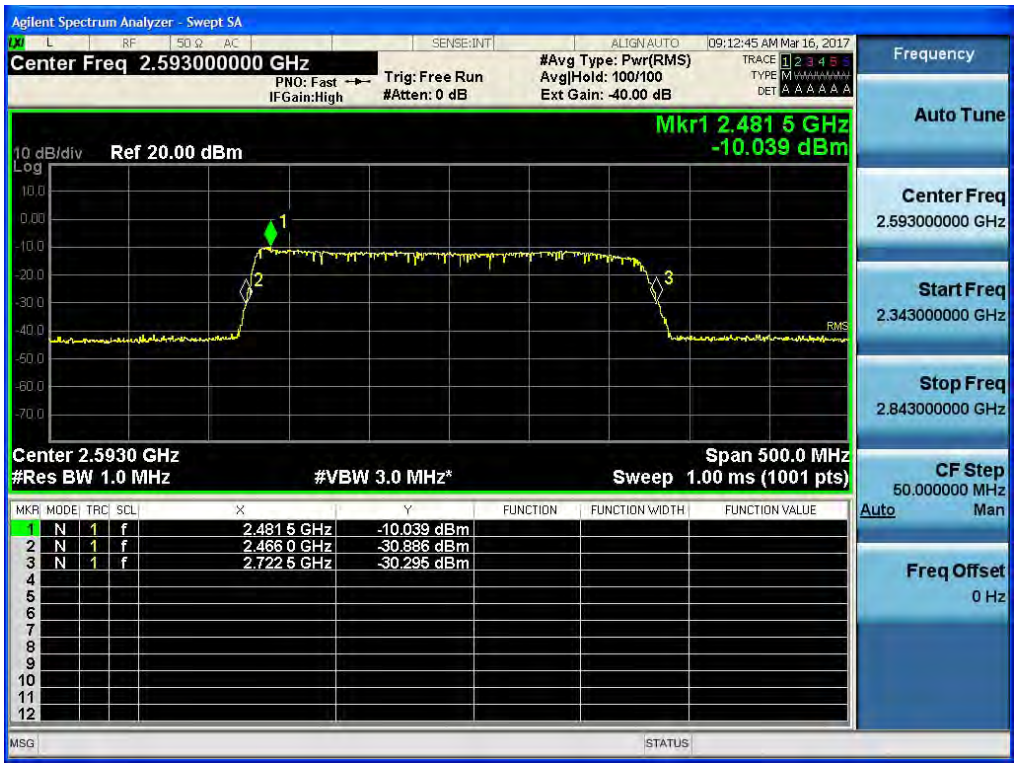


[Uplink] – BRS 2600

	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
BRS 2600	2466.000 MHz ~ 2722.500 MHz	-10.039	34.961

Plots of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

[BRS BAND]



10. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

FCC Rules

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.

§ 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;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable 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.

§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.

§90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log_{10}(f/6.1) decibels or 50 + 10 Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

§ 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.

(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.

IC Rules

Test Requirements:

RSS-130

4. Transmitter and Receiver Standard Specifications

4.6 Transmitter Unwanted Emissions

4.6.1 The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 $\log_{10}$ p (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.

4.6.2 In addition to the limit outlined in Section 4.6.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

(i) 76 + 10 $\log_{10}$ p (watts), dB, for base and fixed equipment, and

(ii) 65 + 10 $\log_{10}$ p (watts), dB, for mobile and portable equipment.

(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed −70 dBW/MHz for wideband signal and −80 dBW for discrete emission with bandwidth less than 700 Hz.

RSS-131

6. Equipment standard specifications for zone enhancers working with equipment certified under RSS-119

6.5 Spurious emissions

The spurious emissions of a zone enhancer shall not exceed −13 dBm in any 100 kHz measurement bandwidth.

RSS-132

5. Transmitter Standard Specifications

5.5 Transmitter Unwanted Emissions

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p (watts).

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the

transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$ p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

RSS-133

6. Transmitter and Receiver Standard Specifications

6.5 Transmitter Unwanted Emissions

6.5.1 Out-of-Block Emissions

Equipment shall comply with the limits in (i) and (ii) below.

i. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p(watts).

ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

RSS-139

6. Transmitter Standard Specifications

6.6 Transmitter Unwanted Emissions

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB.

RSS-195

5. Transmitter and Receiver Standard Specifications

5.6 Transmitter Unwanted Emissions

The transmitter unwanted emissions shall be measured with a resolution bandwidth of 1 MHz. A smaller resolution bandwidth is permitted provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz. However, in the 1 MHz bands immediately adjacent to the edges of the frequency range(s) in which the equipment is allowed to operate, a resolution bandwidth of as close as possible to, without being less than 1% of the occupied bandwidth, shall be employed provided that the measured power is integrated over the full

required measurement bandwidth of 1 MHz.

5.6.1 Base Station, Fixed Station and High-Power Fixed Subscriber Equipment

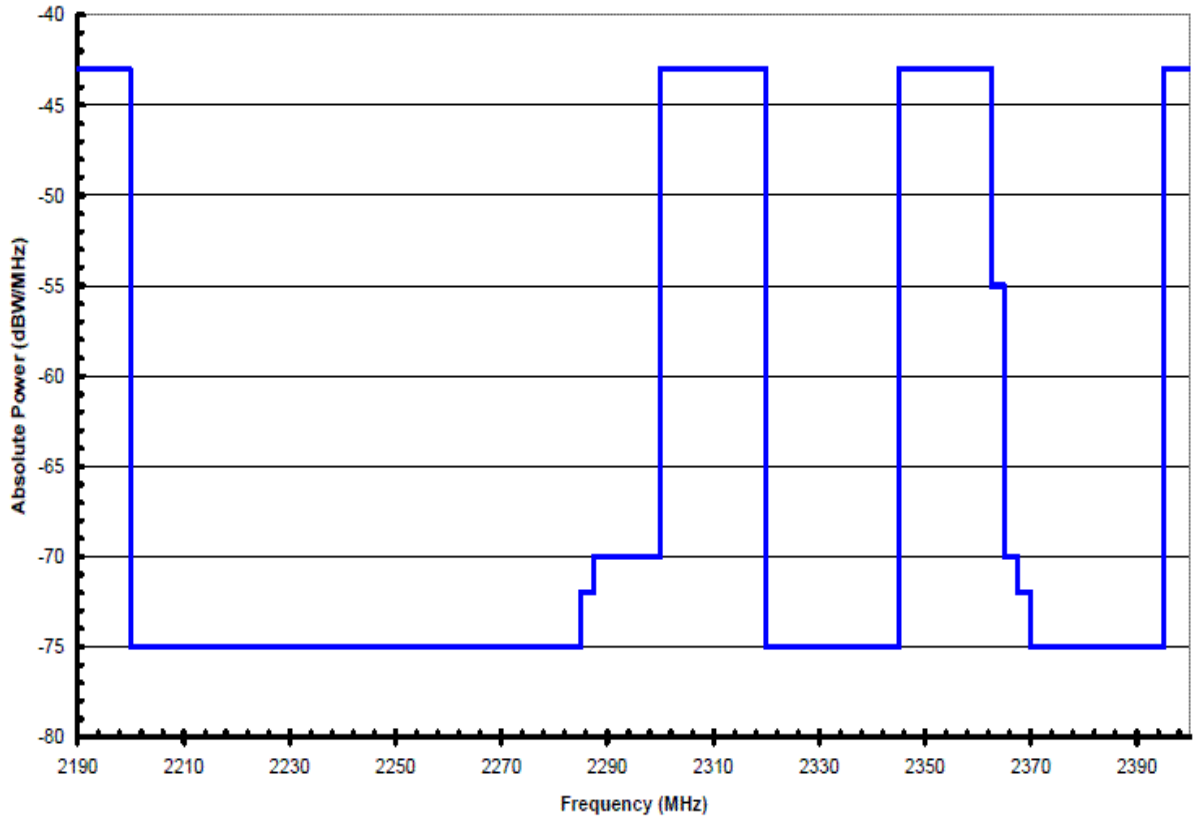
The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power, P(dBW), by the amount indicated in Table 1 and graphically represented in Figure 1, where p is the transmitter output power measured in watts.

Table 1 — Unwanted Emissions for Base Station, Fixed Station and High-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2285	$75 + 10 \log_{10}(p)$
2285 - 2287.5	$72 + 10 \log_{10}(p)$
2287.5 - 2300	$70 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)^{*}$
2320 - 2345	$75 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)^{*}$
2360 - 2362.5	$43 + 10 \log_{10}(p)$
2362.5 - 2365	$55 + 10 \log_{10}(p)$
2365 - 2367.5	$70 + 10 \log_{10}(p)$
2367.5 - 2370	$72 + 10 \log_{10}(p)$
2370 - 2395	$75 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

* Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 5.2 for the permitted frequency ranges for the various equipment types.

Figure 1 — Unwanted Emissions for Base Station, Fixed Station and High-Power Fixed Subscriber Equipment



RSS-199

4. Transmitter and receiver standard specifications

4.5 Transmitter unwanted emissions

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

a. for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least 43 + 10 $\log_{10}$ p

Test Procedures:

Measurements were in accordance with the test methods section 3.6 and 4.7 of KDB 935210 D05 v01r01.

3.6.1 General

Refer to the applicable rule part(s) for specified limits on unwanted (out-of-band/out-of-block and spurious) emissions.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single-channel boosters that cannot accommodate two simultaneous signals within the passband may be excluded from the test stipulated in step a).

3.6.2 Out-of-band/out-of-block emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.

b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.

d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168, but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the EBW or 100 kHz or 1 MHz)

g) Set the VBW = 3 × RBW.

h) Set the detector to power averaging (rms) detector.

i) Set the Sweep time = auto-couple.

j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (rms) mode.

l) Use the marker function to find the maximum power level.

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.

n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.

o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.

p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.

q) Repeat steps k) to n).

r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.

s) Repeat steps a) to r) with the narrowband test signal.

t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

3.6.3 Spurious emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

b) Set the signal generator to produce the broadband test signal as previously described (i.e., 4.1 MHz OBW AWGN).

c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.

d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).

g) Set the VBW ≥ 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the spectrum analyzer start frequency to the lowest RF 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.

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

j) Select the power averaging (rms) detector function.

k) Trace average at least 10 traces in power averaging (rms) mode.

l) 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.

m) Reset the spectrum 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 spectrum analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see § 2.1057). The number of measurement points in each sweep must be ≥ (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

n) Trace average at least 10 traces in power averaging (rms) mode.

o) 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; also provide tabular data, if required.

p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.

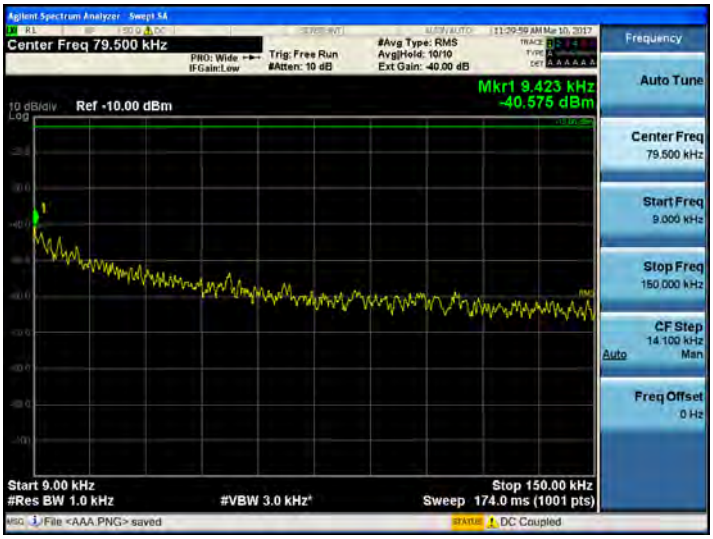
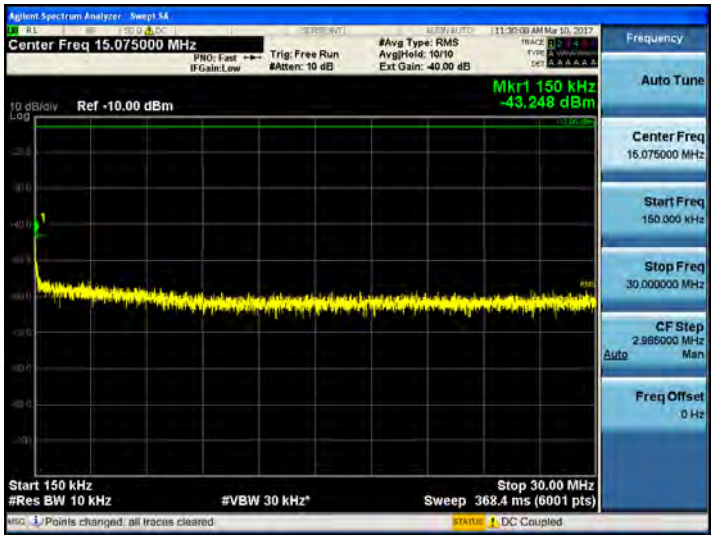
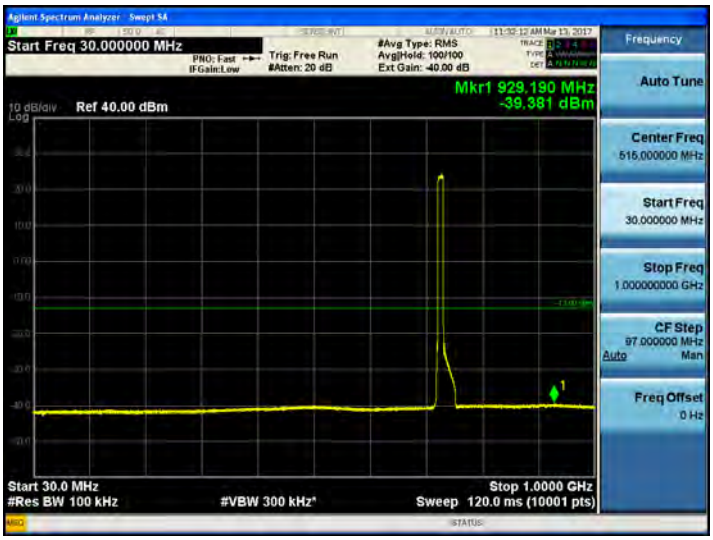
q) Repeat steps b) to p) with the narrowband test signal.

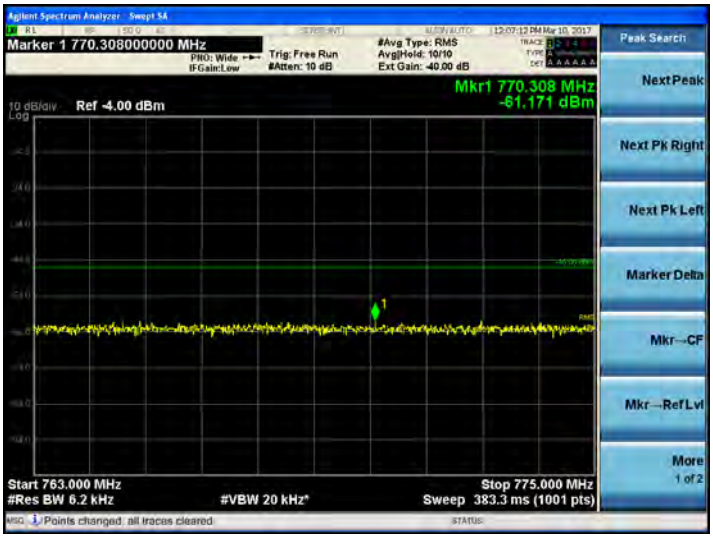
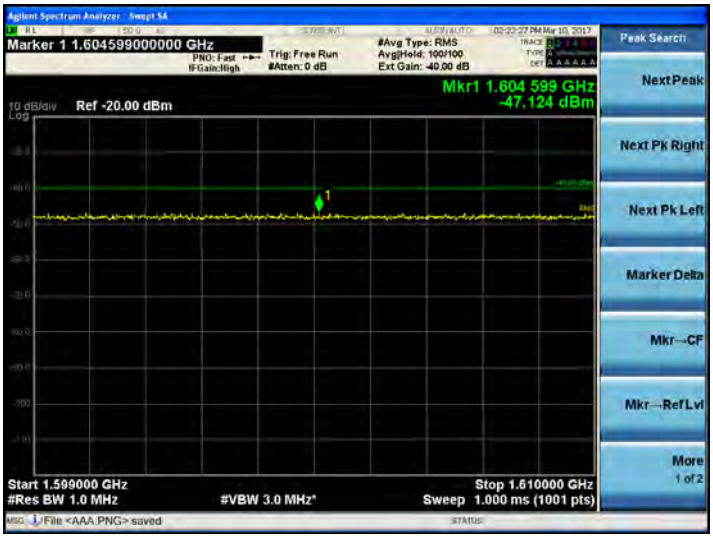
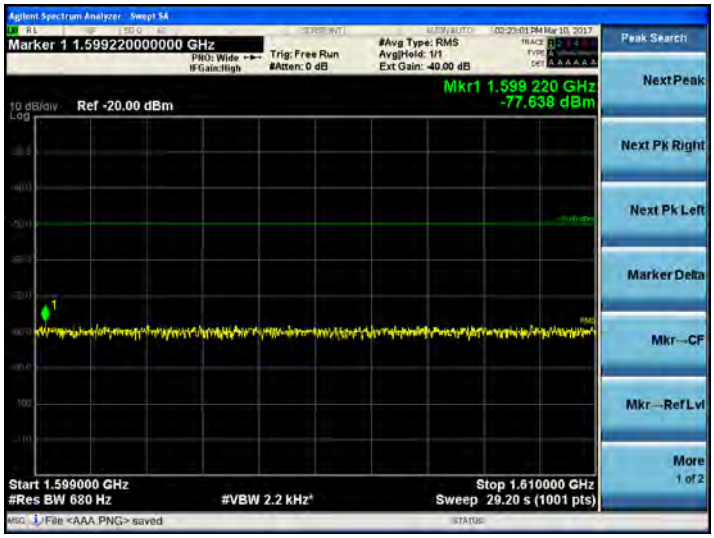
r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT.

Notes: In 9 KHz-150 KHz and 150 KHz-30 MHz bands, RBW was reduced to 1% and 10% of the reference bandwidth for measuring unwanted emission level(typically, 100KHz if the authorized frequency band is below 1GHz) and power was integrated.(1% = +20 dB, 10% = +10 dB)

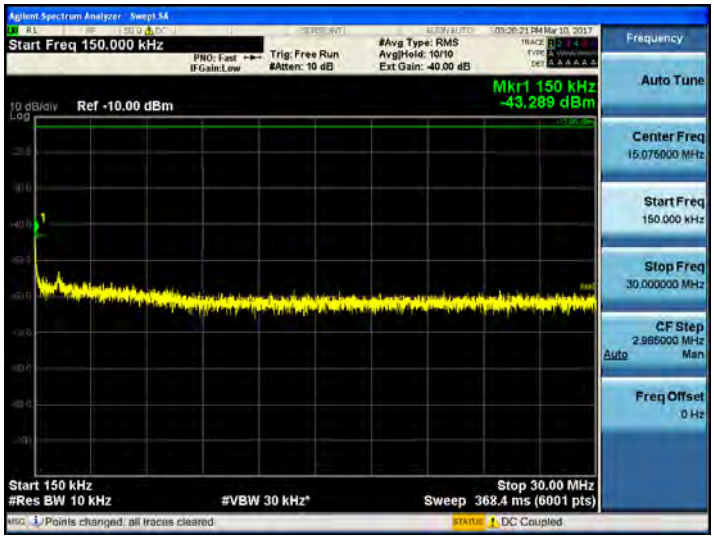
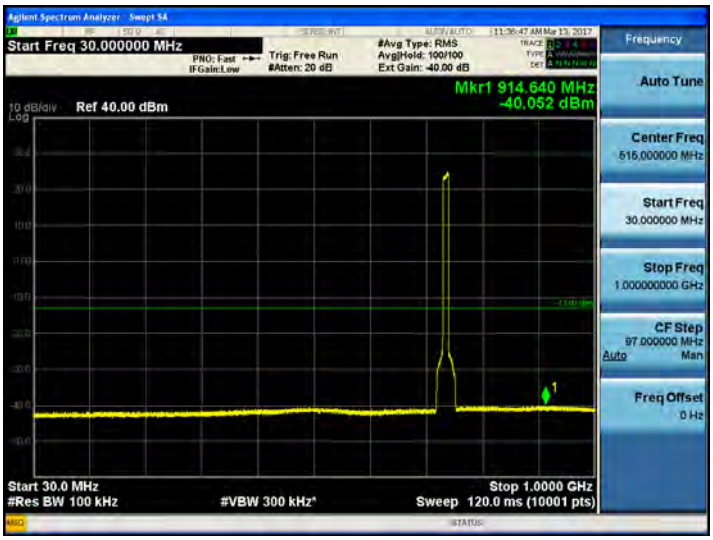
Single channel Enhancer Plots of Spurious Emission
700 LTE BAND LTE 10 MHz_DL

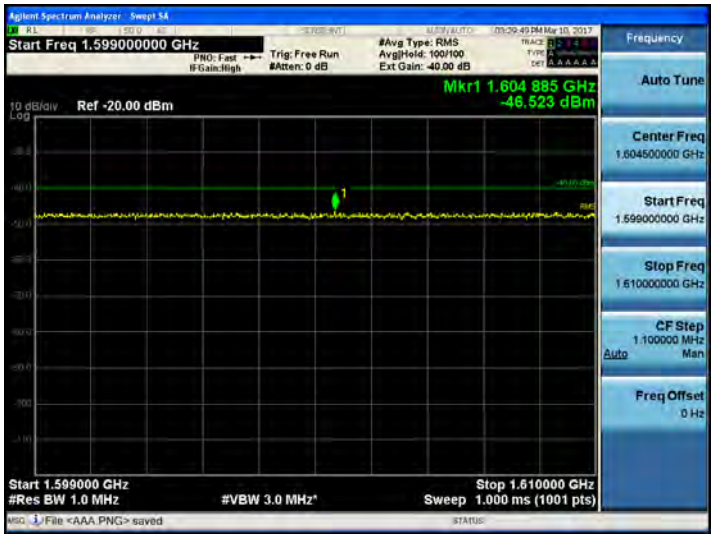
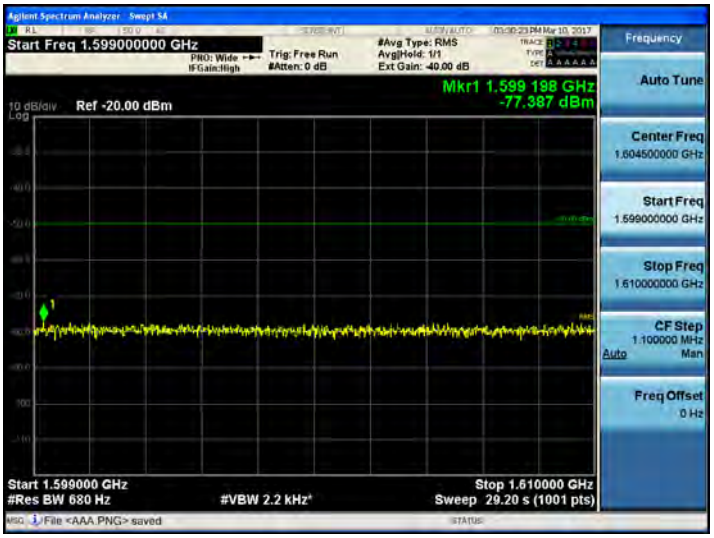
[Downlink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 12.75 ㎓**
	

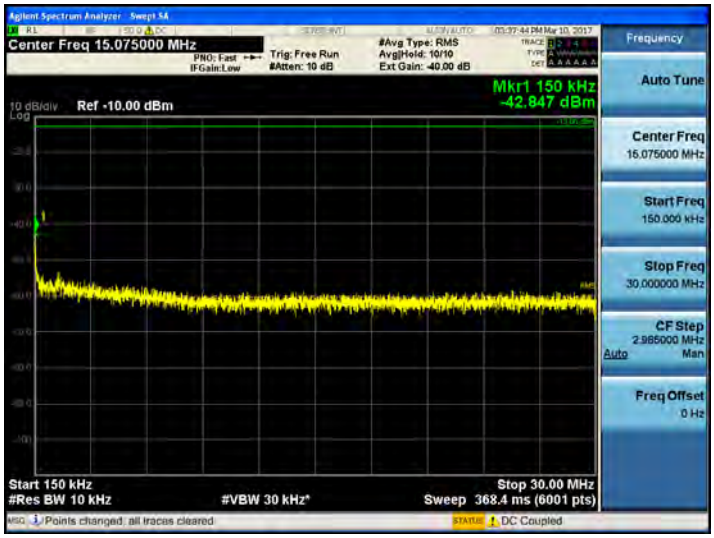
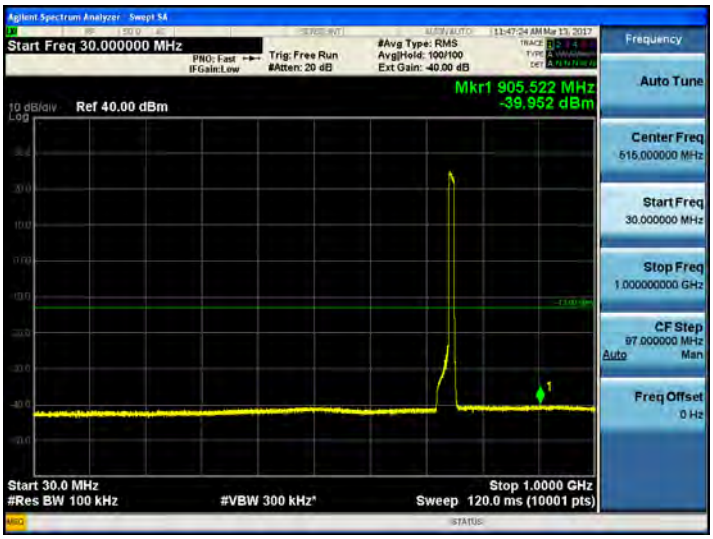
763 ㎒ ~ 775 ㎒	793 ㎒ ~ 805 ㎒
	
1 599 ㎒ ~ 1 610 ㎒ (1)	**1 599 ㎒ ~ 1 610 ㎒ (2)**
	

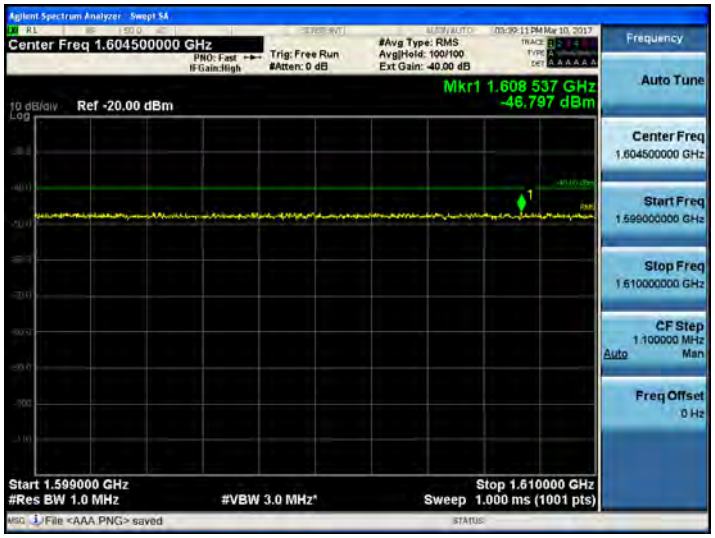
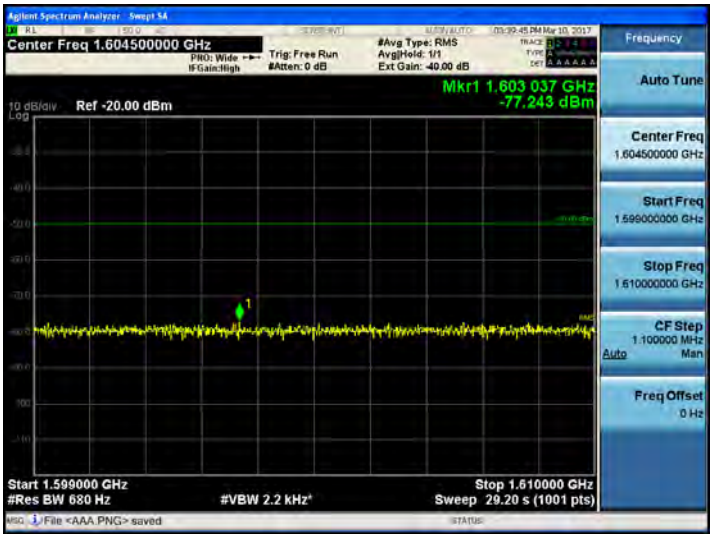
[Downlink_Middle]

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 12.75 GHz**
	

763 ㎒ ~ 775 ㎒	793 ㎒ ~ 805 ㎒
	
1 599 ㎒ ~ 1 610 ㎒ (1)	**1 599 ㎒ ~ 1 610 ㎒ (2)**
	

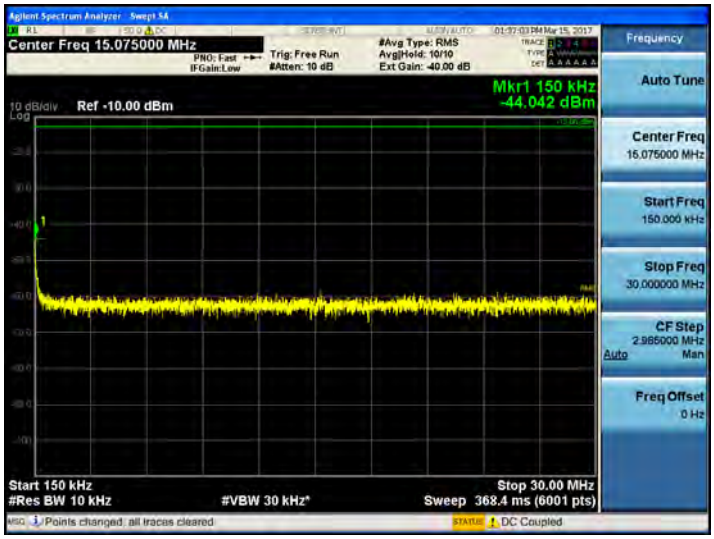
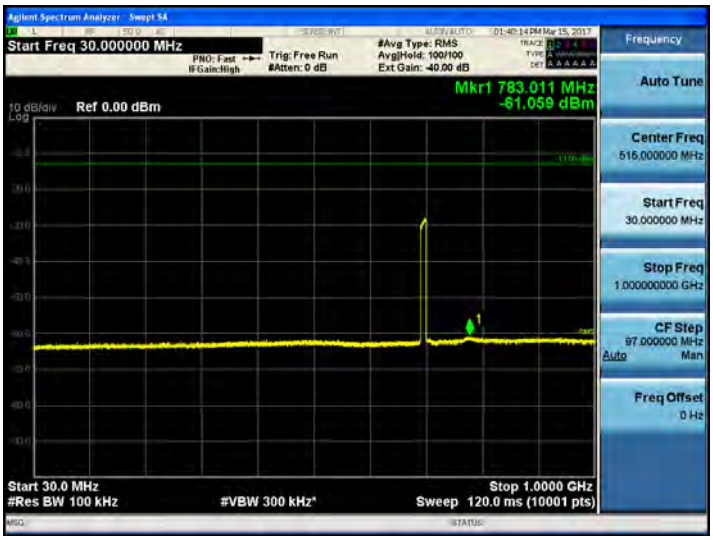
[Downlink_High]

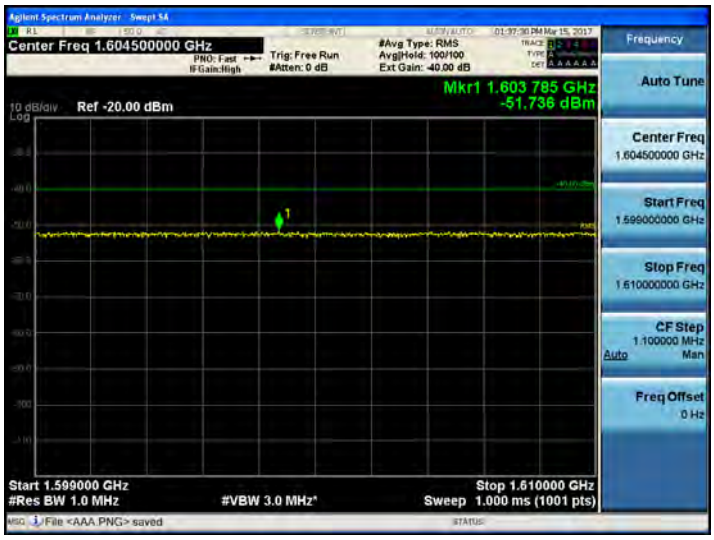
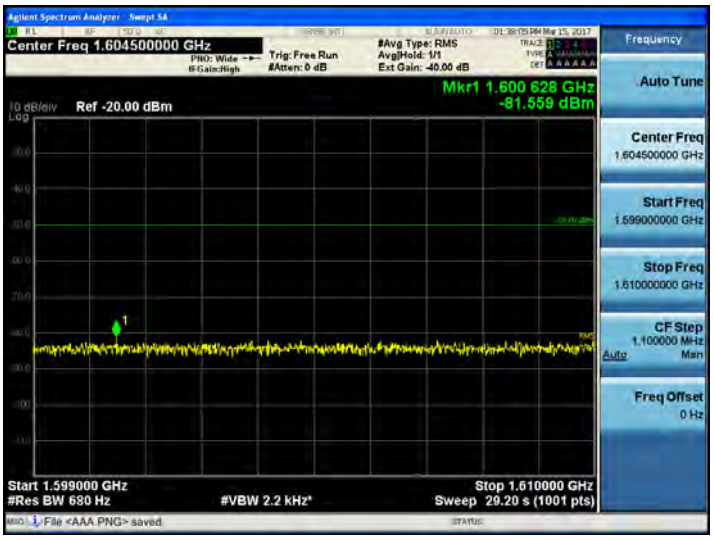
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 12.75 ㎓**
	

763 ㎒ ~ 775 ㎒	793 ㎒ ~ 805 ㎒
	
1 599 ㎒ ~ 1 610 ㎒ (1)	**1 599 ㎒ ~ 1 610 ㎒ (2)**
	

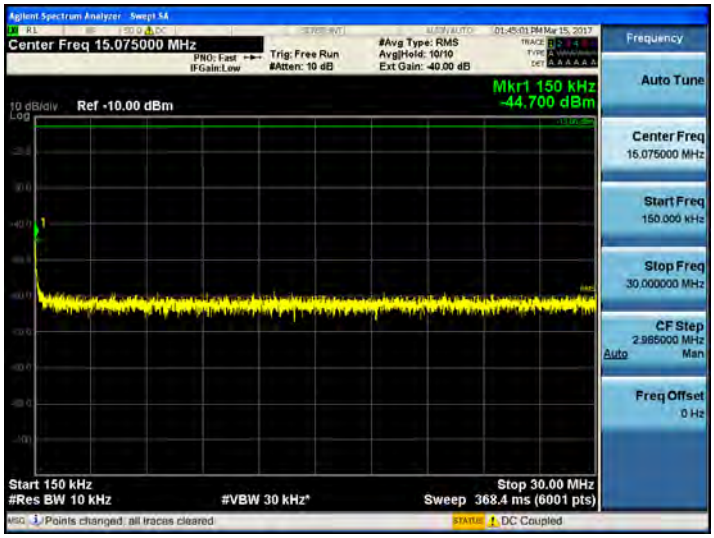
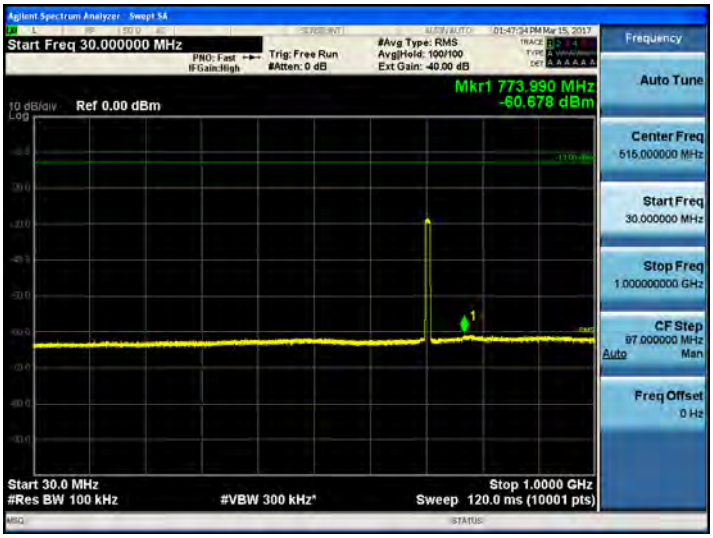
700 LTE BAND LTE 10 MHz_UL(Lower)

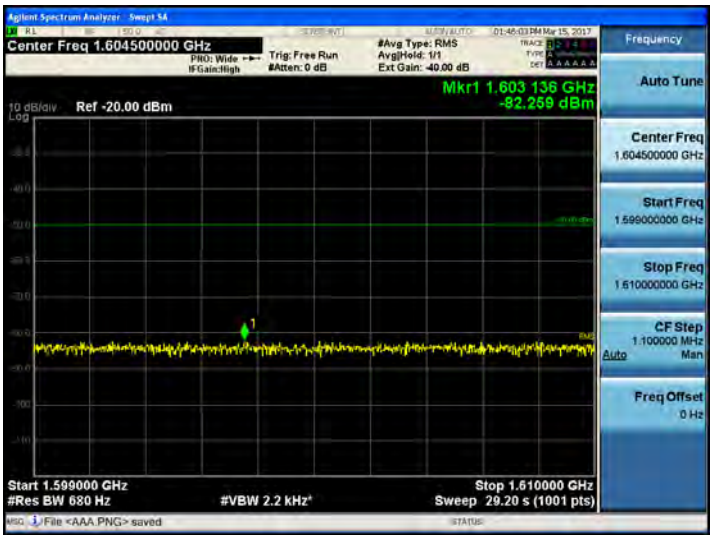
[Uplink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 12.75 ㎓**
	

763 ㎒ ~ 775 ㎒	793 ㎒ ~ 805 ㎒
	
1 599 ㎒ ~ 1 610 ㎒ (1)	**1 599 ㎒ ~ 1 610 ㎒ (2)**
	

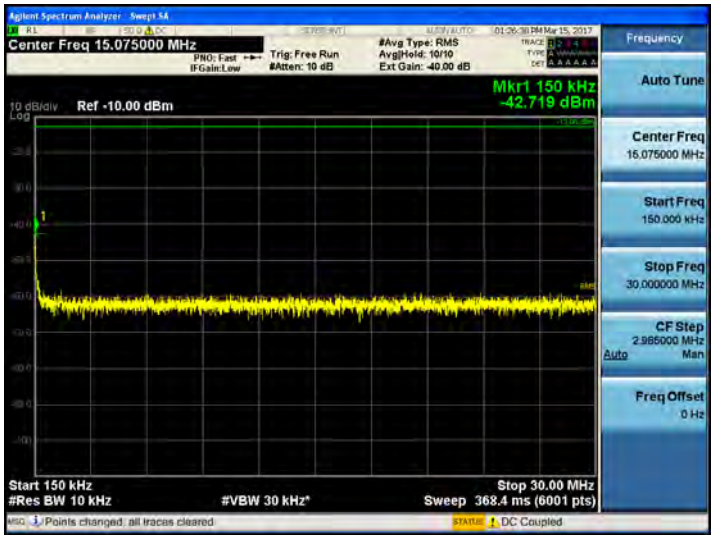
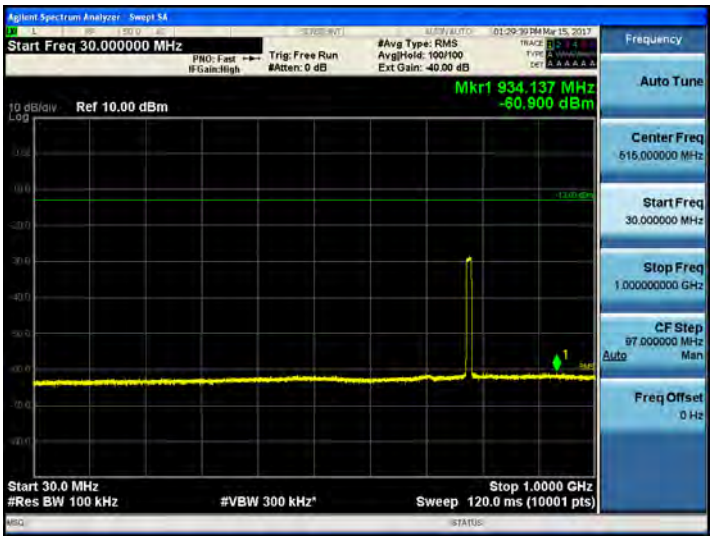
[Uplink _High]

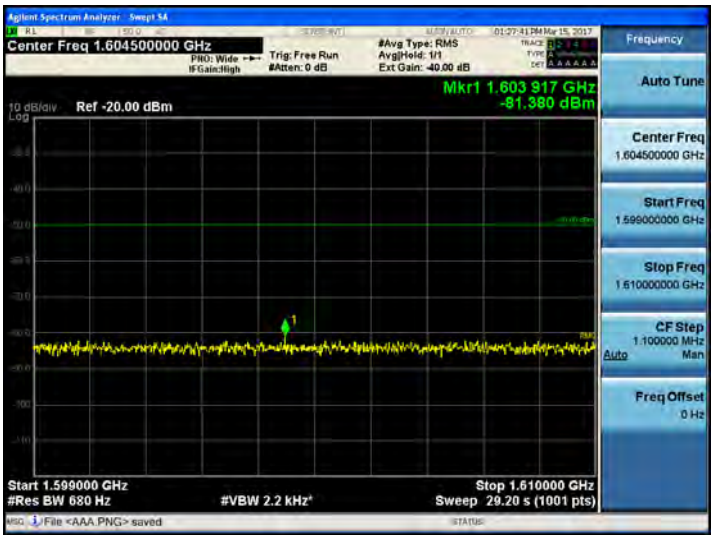
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 12.75 ㎓**
	

763 ㎒ ~ 775 ㎒	793 ㎒ ~ 805 ㎒
	
1 599 ㎒ ~ 1 610 ㎒ (1)	**1 599 ㎒ ~ 1 610 ㎒ (2)**
	

700 LTE BAND LTE 10 MHz_UL(Upper)

[Uplink_Middle]

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 12.75 GHz**
	

763 ㎒ ~ 775 ㎒	793 ㎒ ~ 805 ㎒
	
1 599 ㎒ ~ 1 610 ㎒ (1)	**1 599 ㎒ ~ 1 610 ㎒ (2)**
	

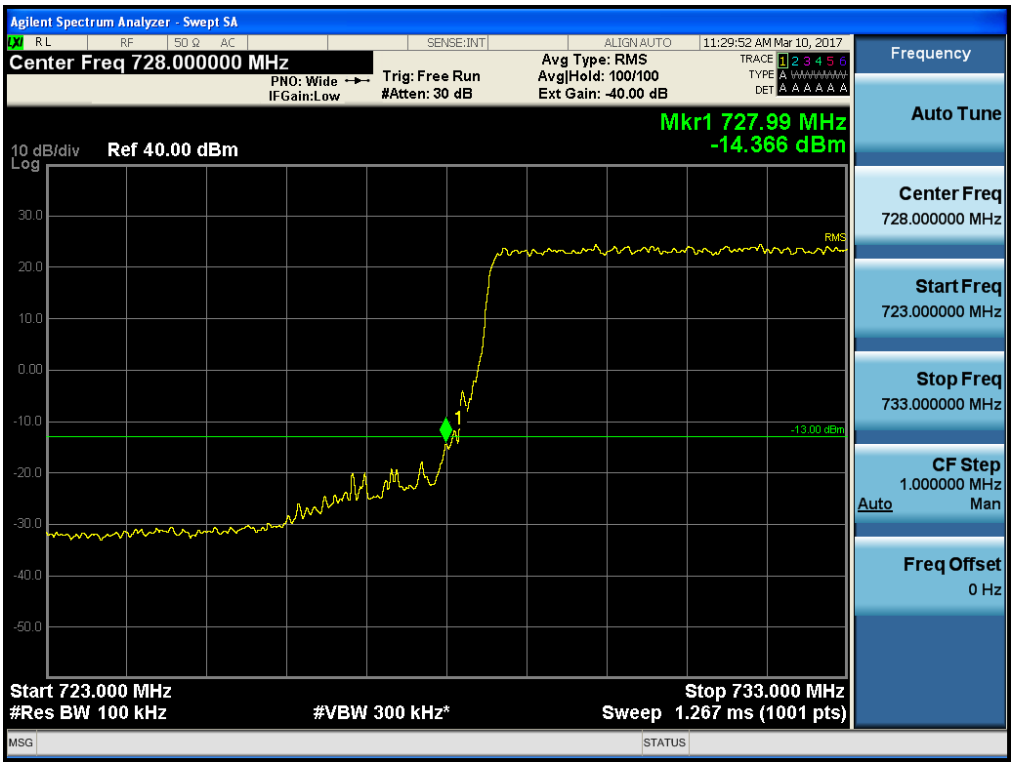
Intermodulation Spurious Emissions for FCC_700 LTE BAND LTE 10 MHz

[Downlink Low]

[Downlink High]

Single channel Enhancer Band Edge_700 LTE BAND LTE 10 MHz

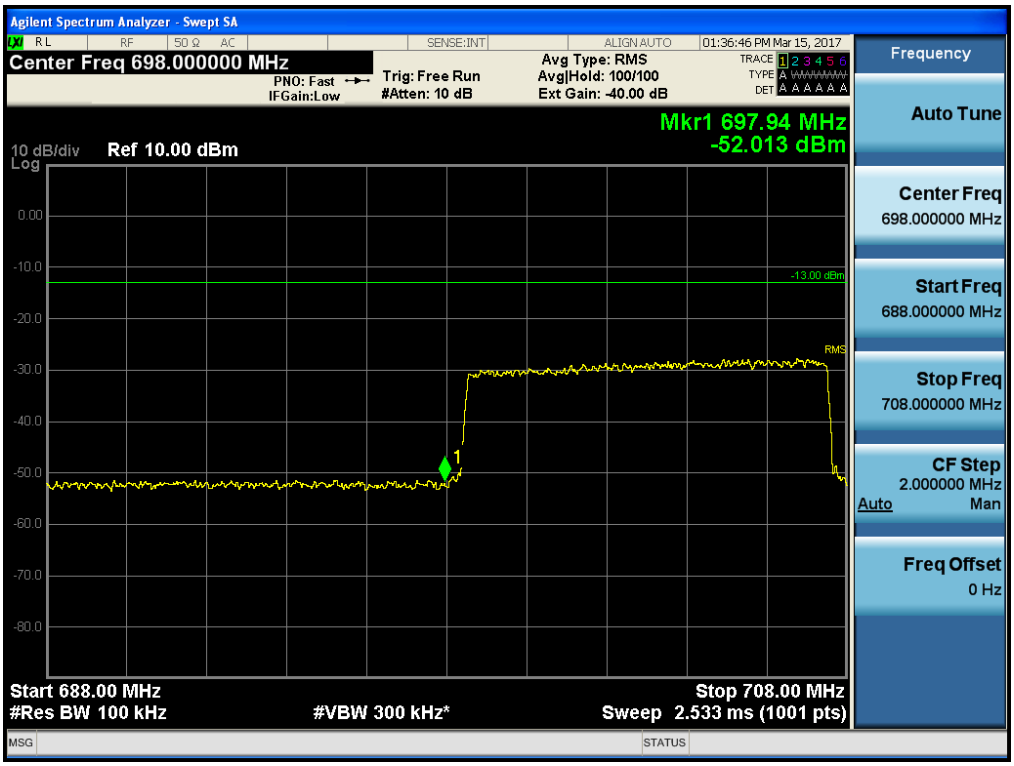
[Downlink Low]



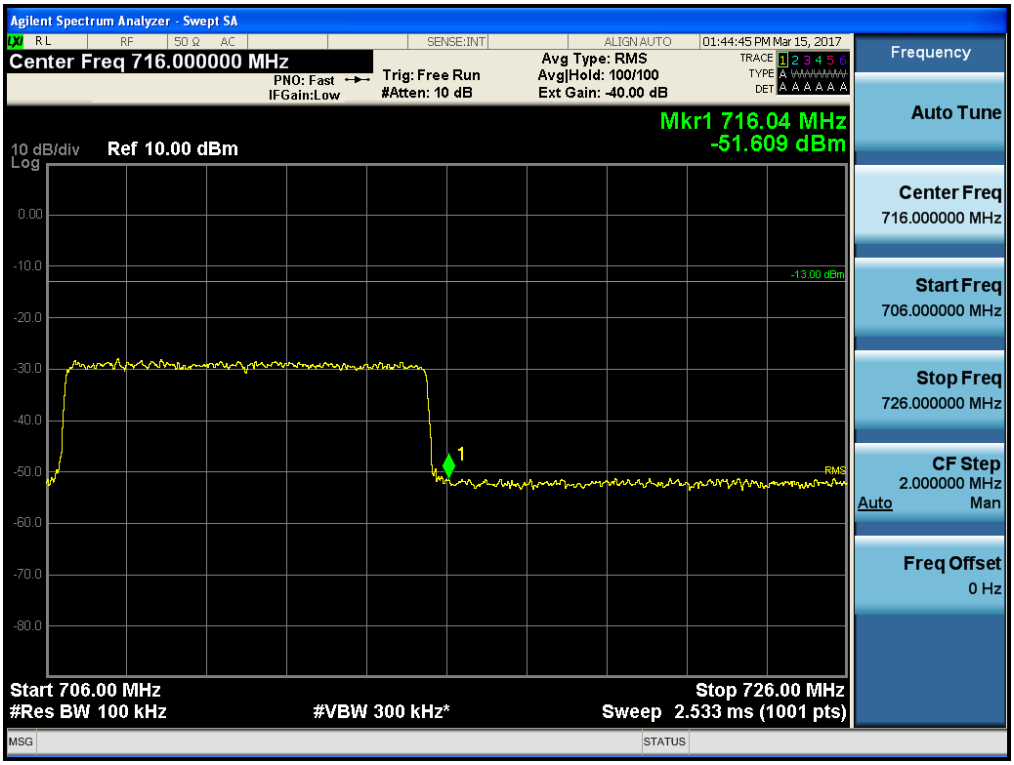
[Downlink High]

Single channel Enhancer Band Edge_700 LTE BAND LTE 10 MHz_Lower

[Uplink Low]

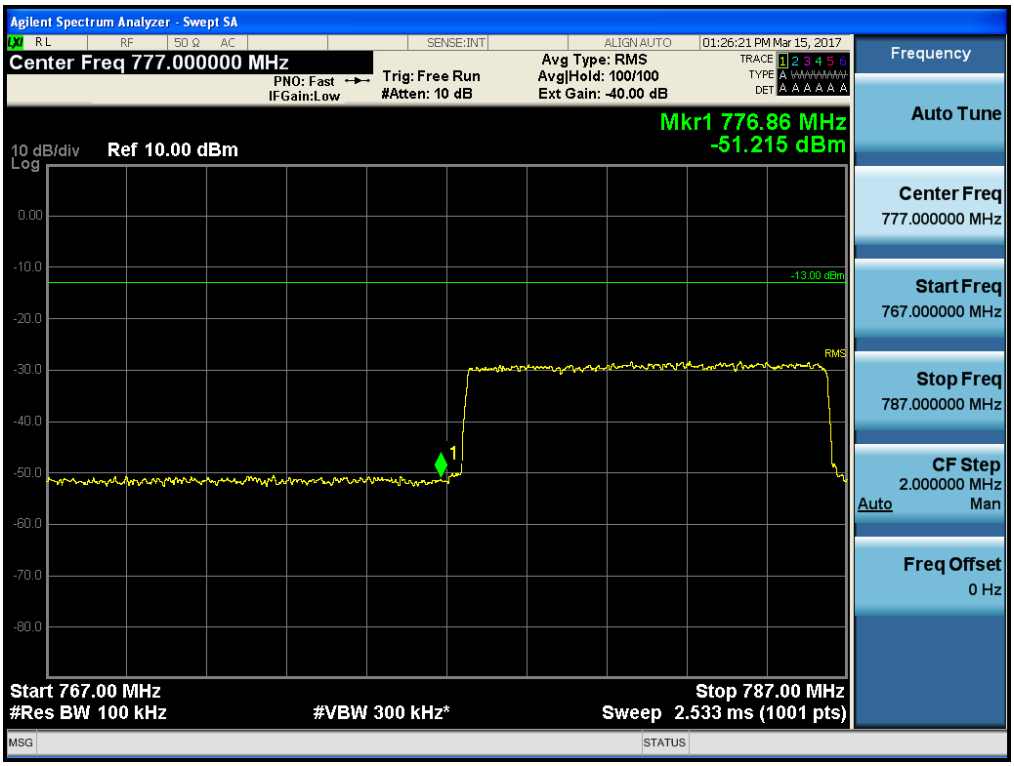


[Uplink High]

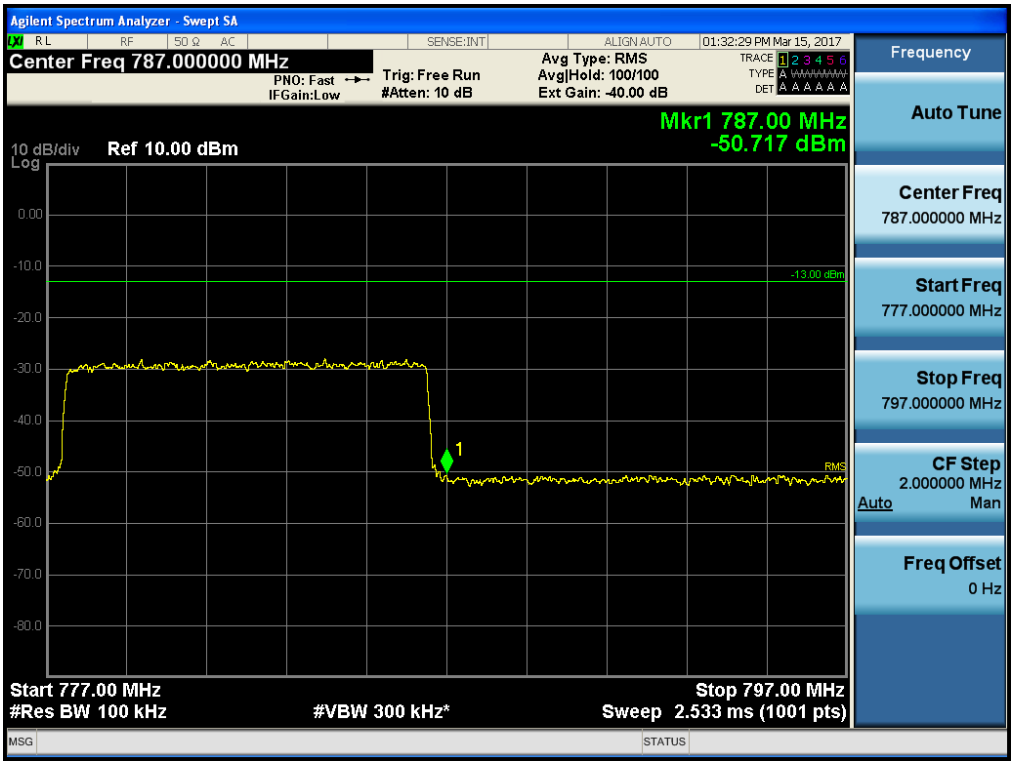


Single channel Enhancer Band Edge_700 LTE BAND LTE 10 MHz_Upper

[Uplink Low]



[Uplink High]

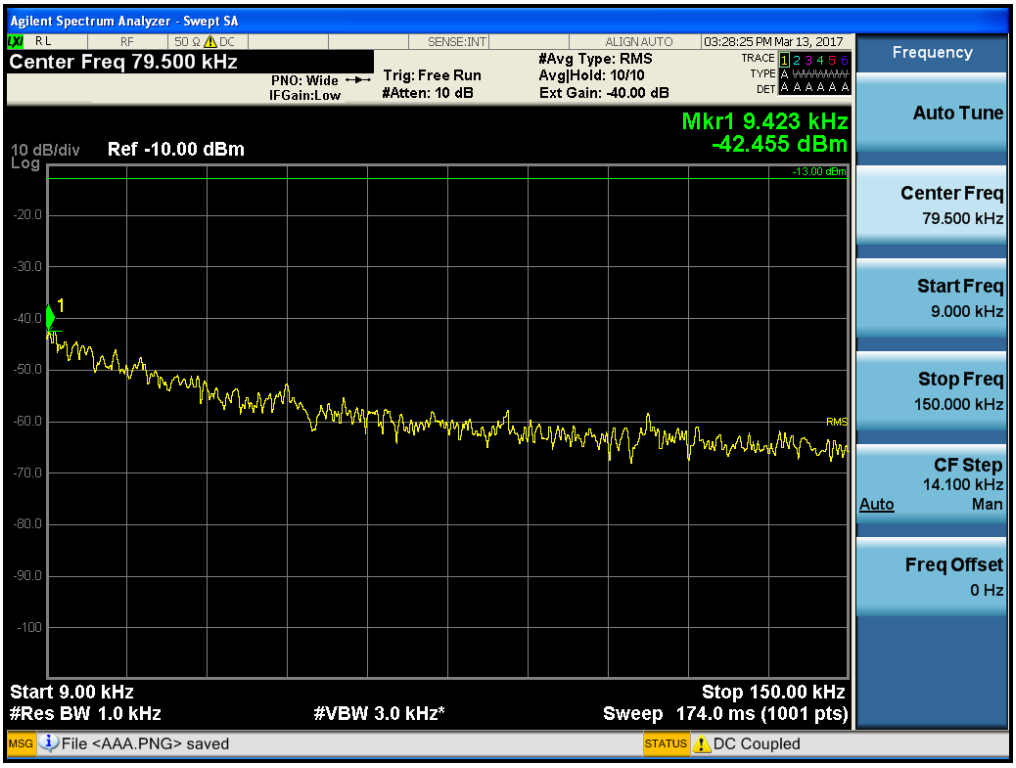


Single channel Enhancer Plots of Spurious Emission for 800 MHz BAND LTE 20 MHz

Conducted Spurious Emissions (9 kHz – 150 kHz)

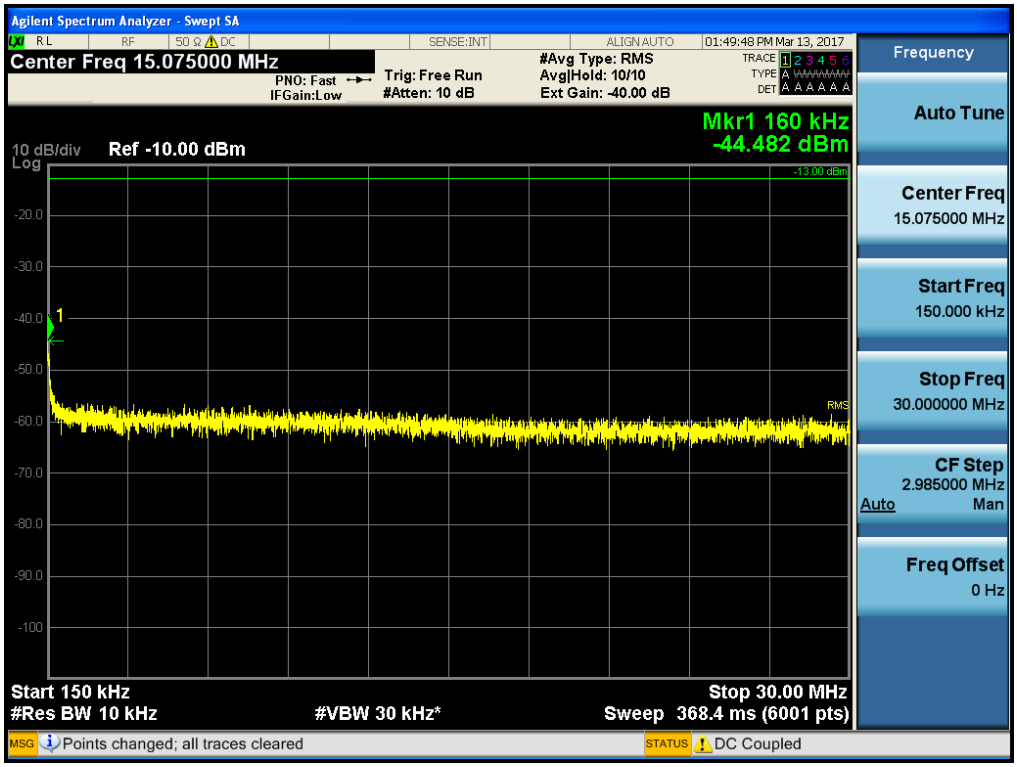
[Downlink Low]

[Downlink High]



Conducted Spurious Emissions (150 kHz – 30 MHz)

[Downlink Low]



[Downlink High]