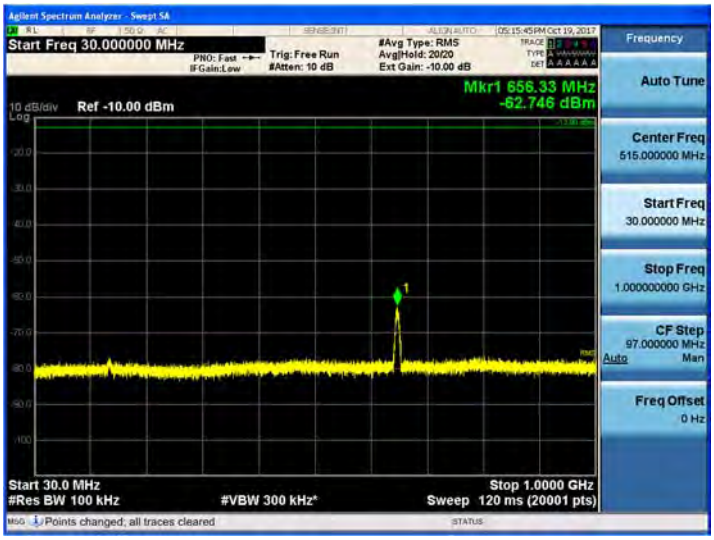
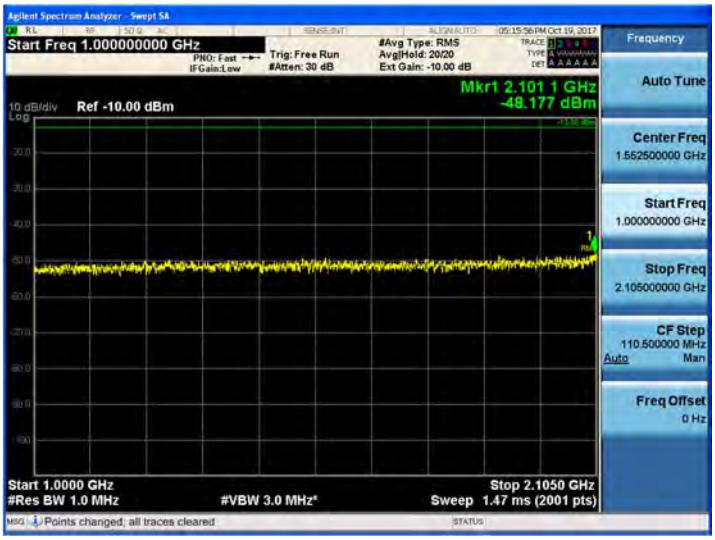
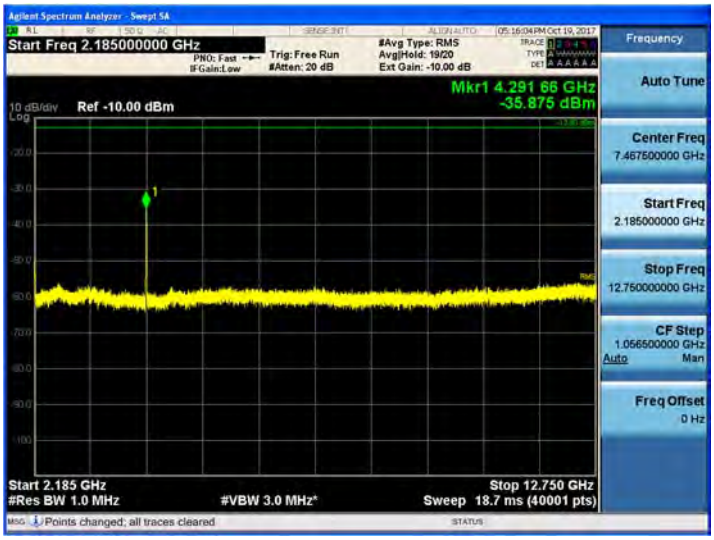
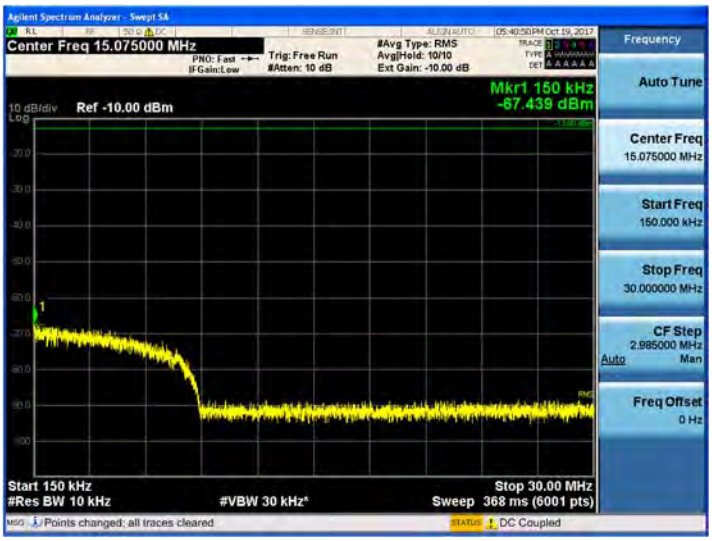
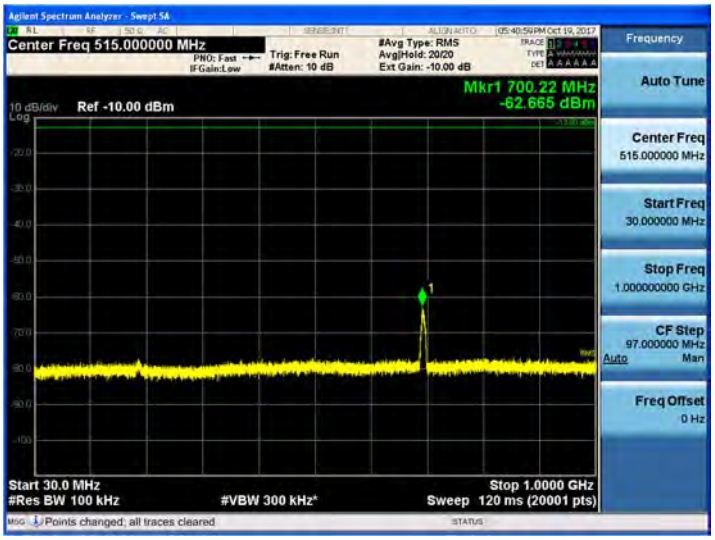
30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

(16QAM High channel)

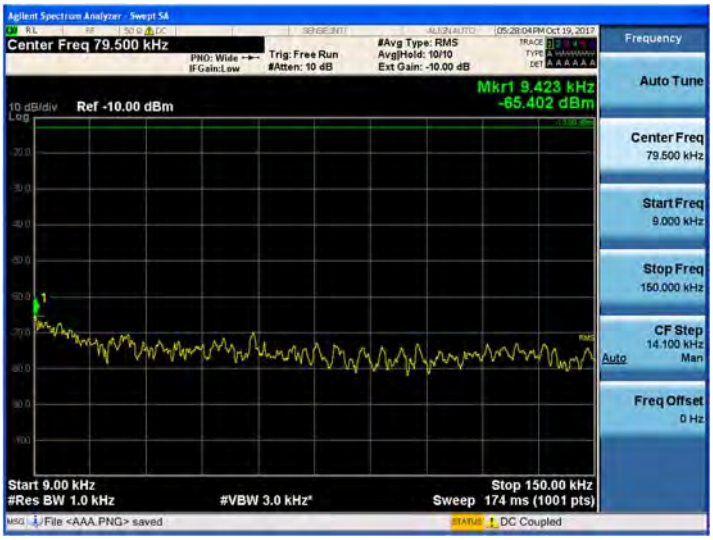
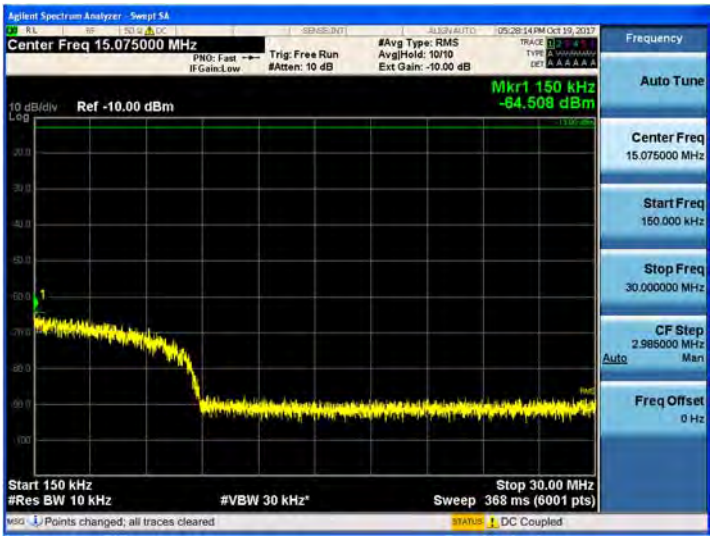
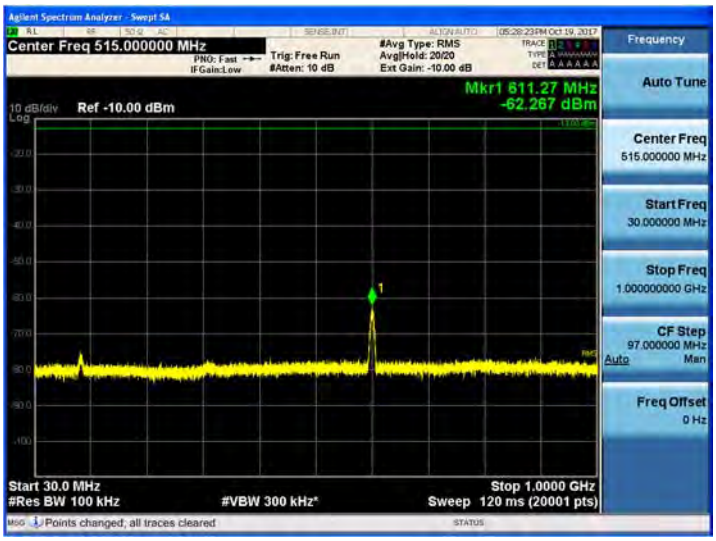
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 ㎓ ~ 12.75 ㎓	12.75 ㎓ ~ 26.5 ㎓

AWS 2100_LTE 10M

Test Data at Output Port 5

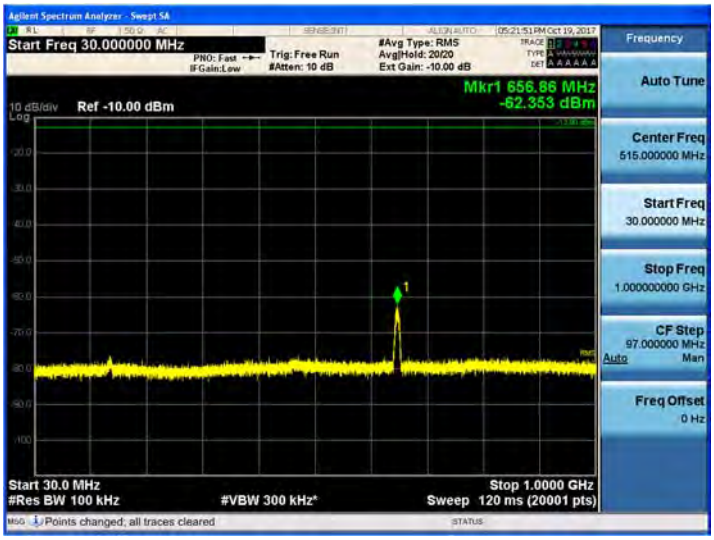
(QPSK Low channel)

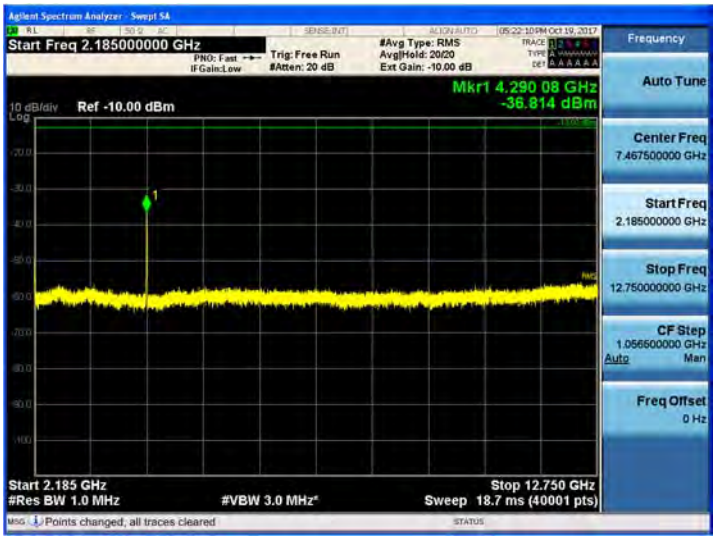
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz

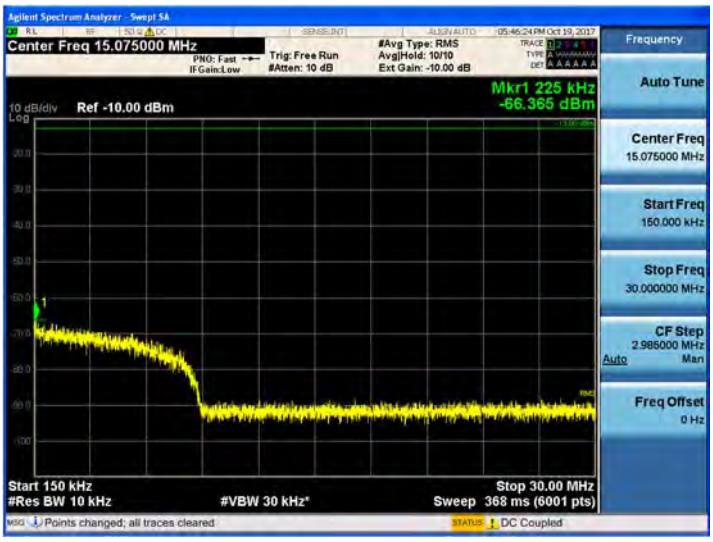
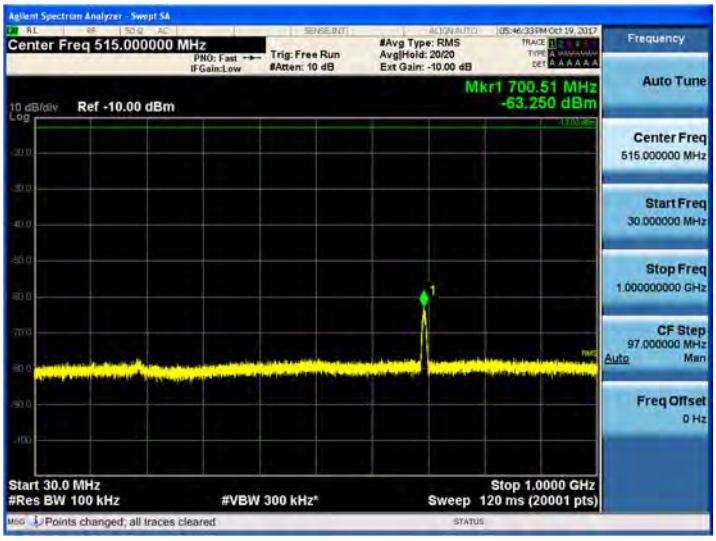
(QPSK Middle channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

(QPSK High channel)

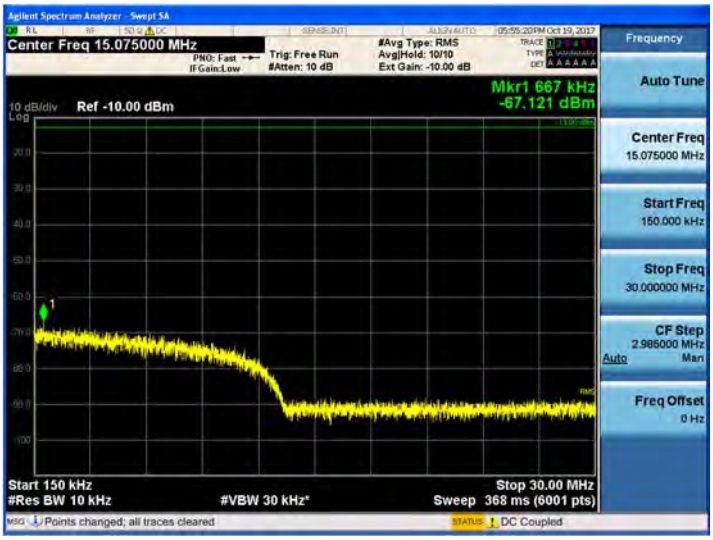
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 ㎓ ~ 12.75 ㎓	12.75 ㎓ ~ 26.5 ㎓

AWS 2100_LTE 15M

Test Data at Output Port 5

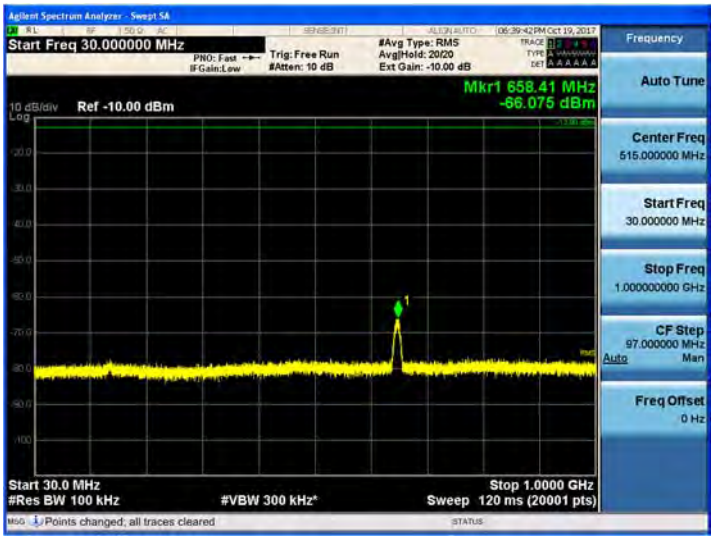
(64QAM Low channel)

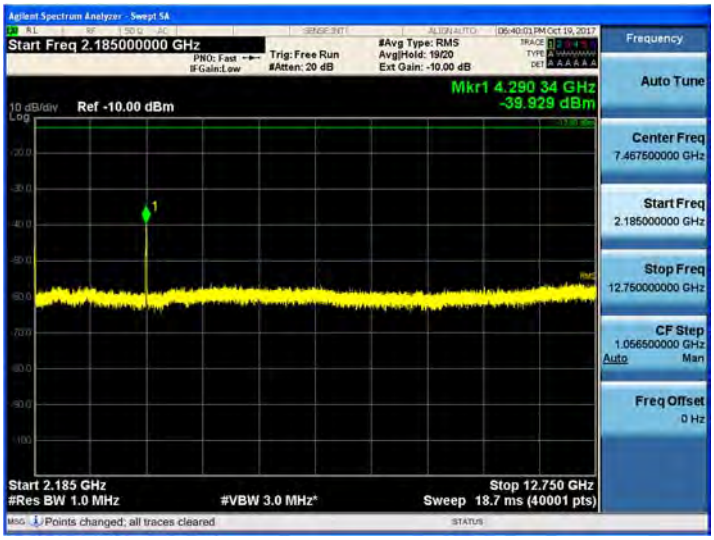
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz

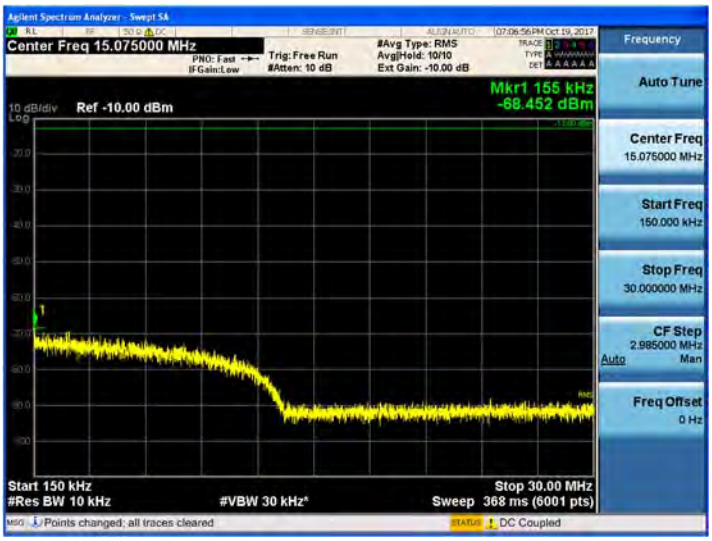
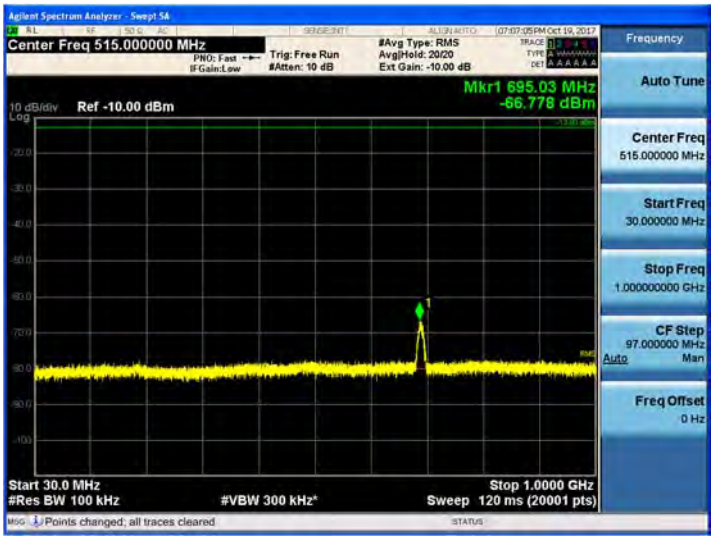
(64QAM Middle channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

(64QAM High channel)

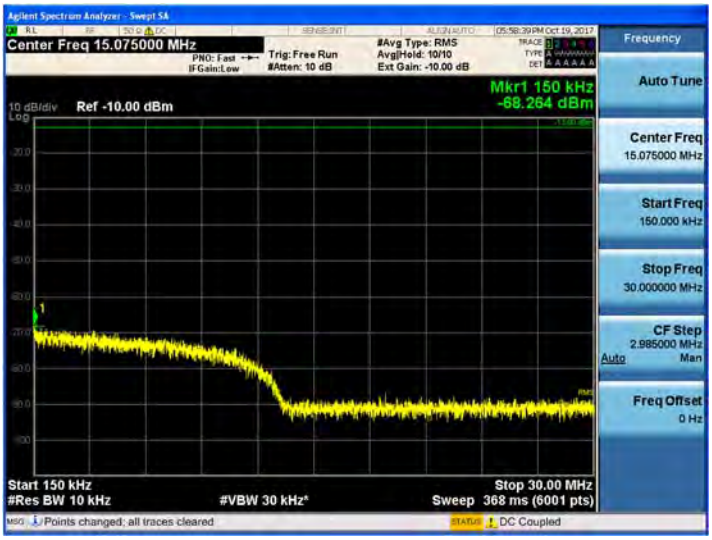
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 ㎓ ~ 12.75 ㎓	12.75 ㎓ ~ 26.5 ㎓

AWS 2100_LTE 15M

Test Data at Output Port 5

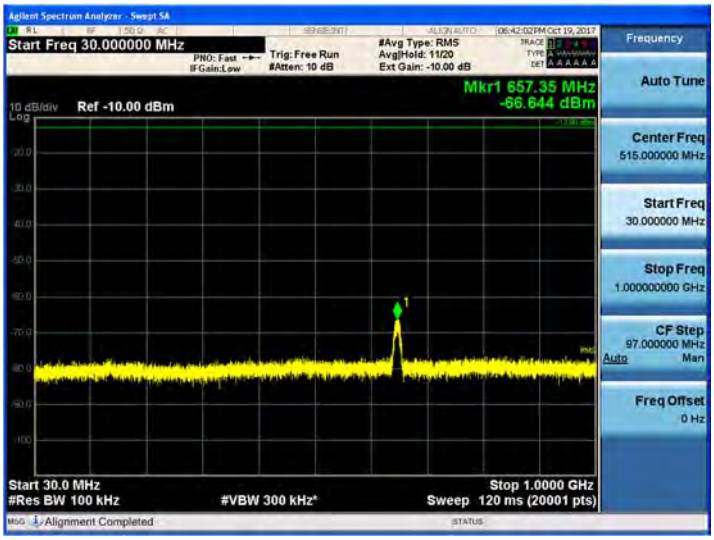
(16QAM Low channel)

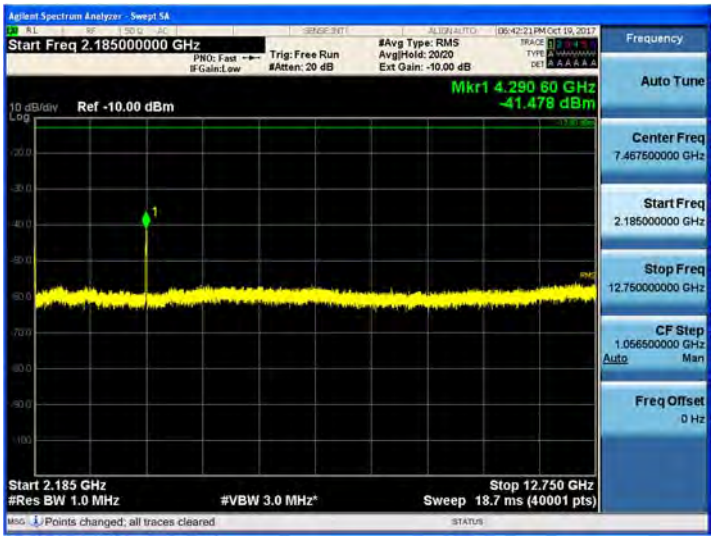
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz

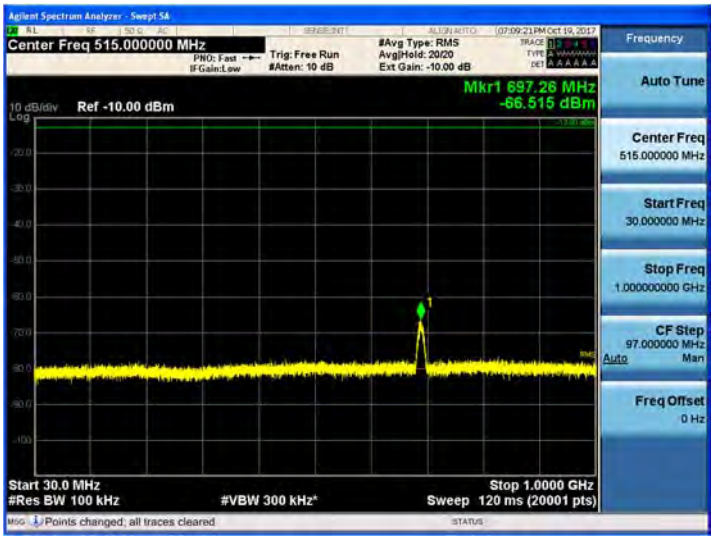
(16QAM Middle channel)

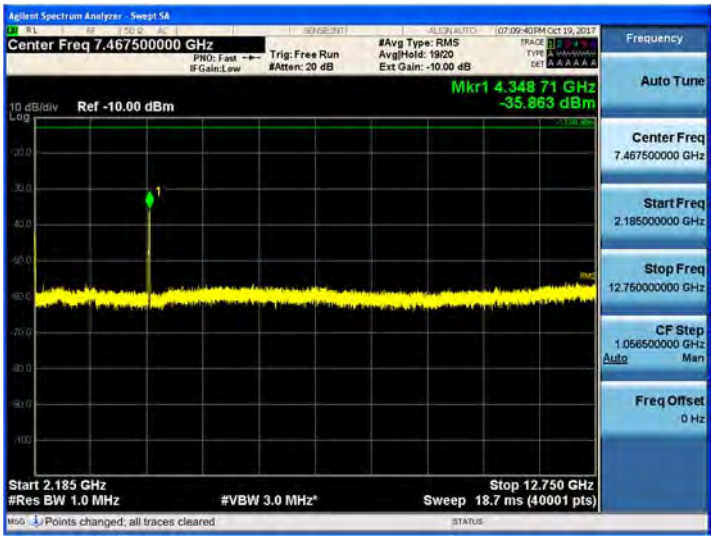
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

(16QAM High channel)

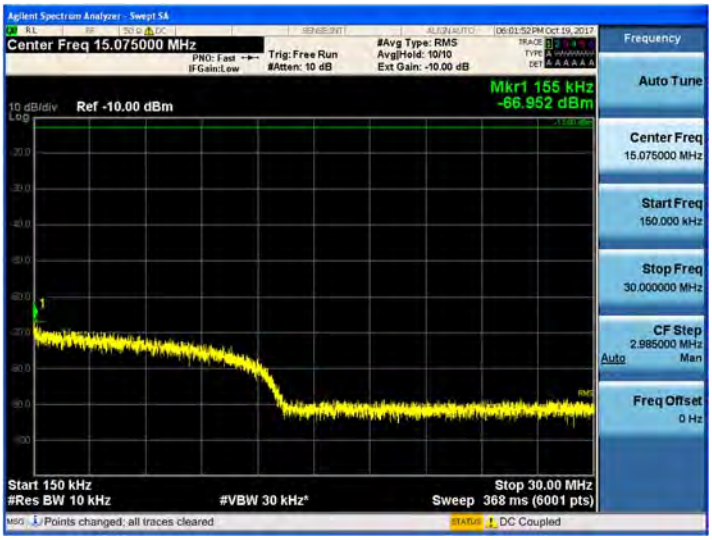
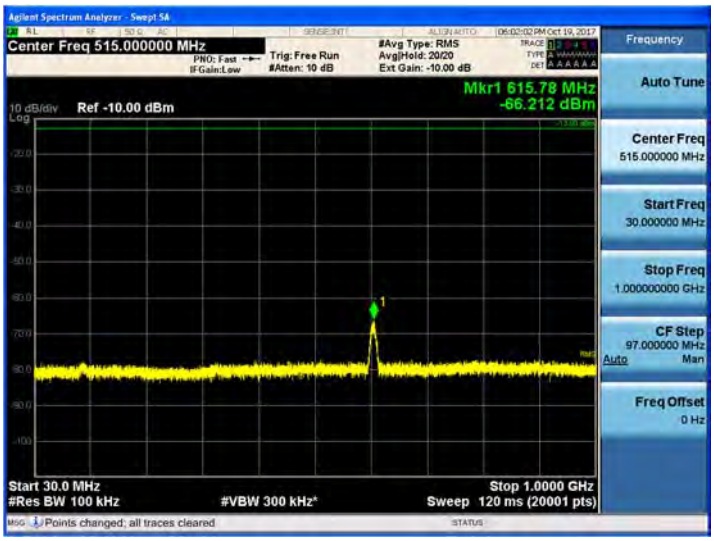
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

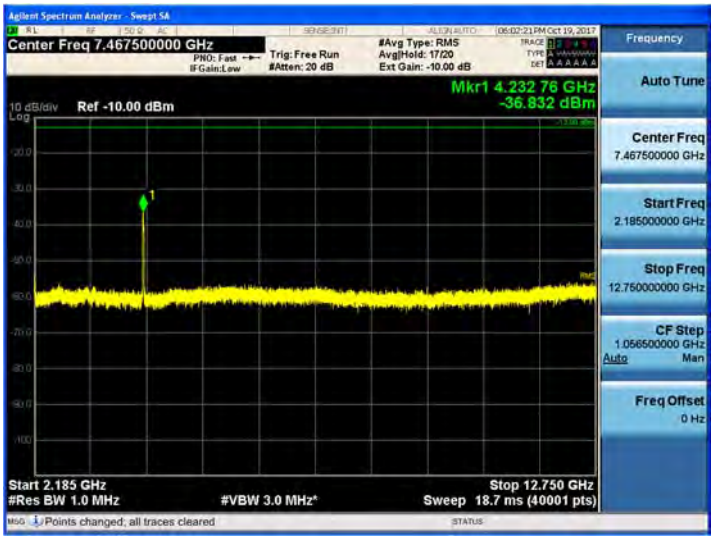
2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

AWS 2100_LTE 15M

Test Data at Output Port 5

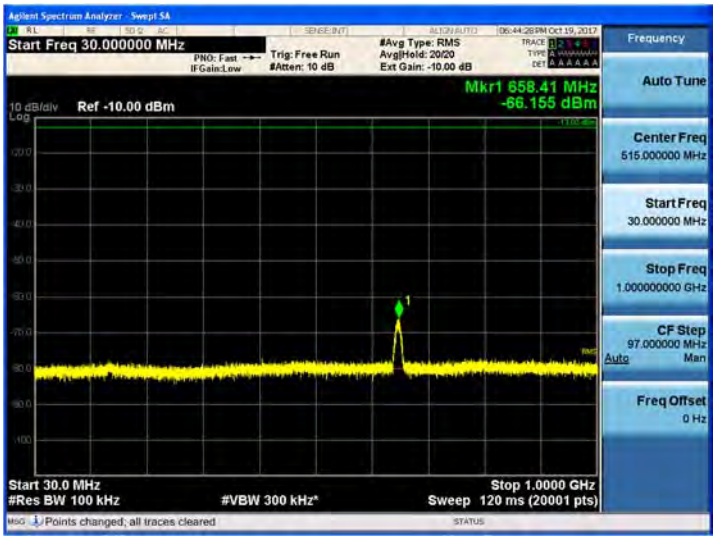
(QPSK Low channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

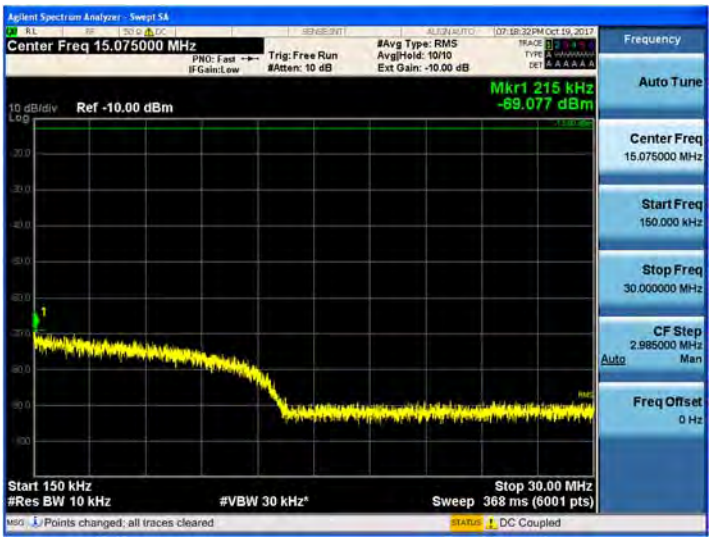
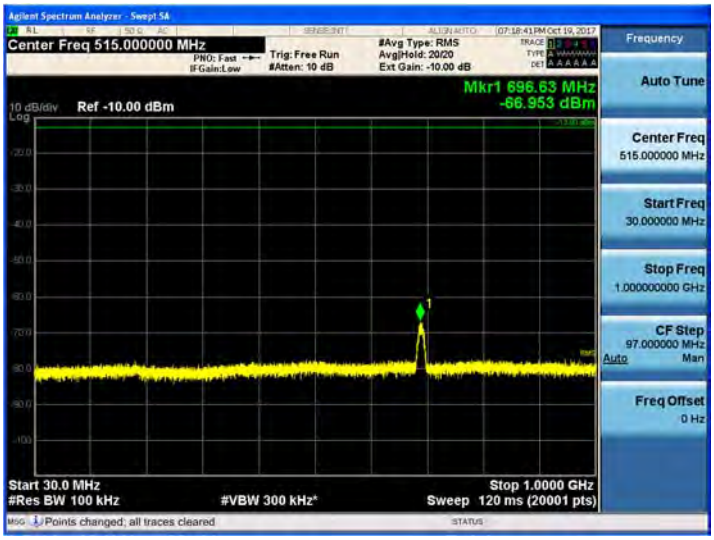
(QPSK Middle channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz

(QPSK High channel)

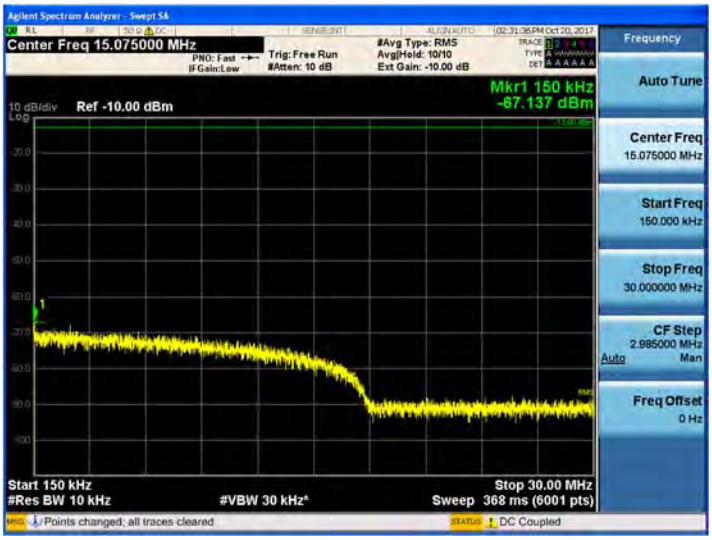
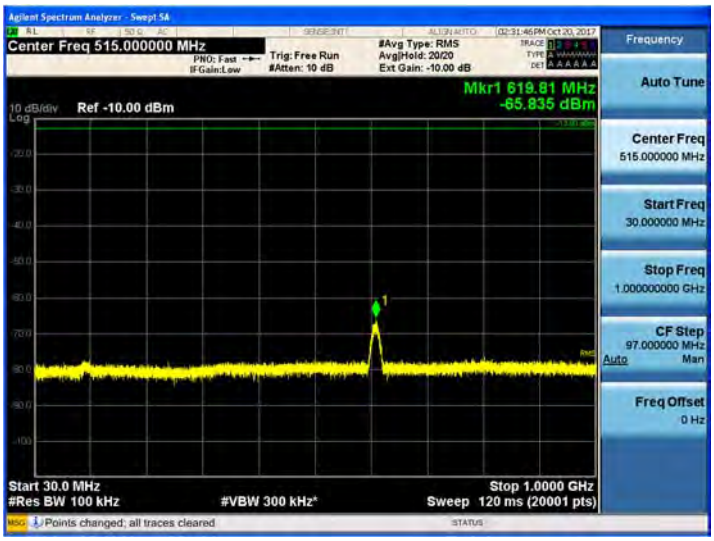
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

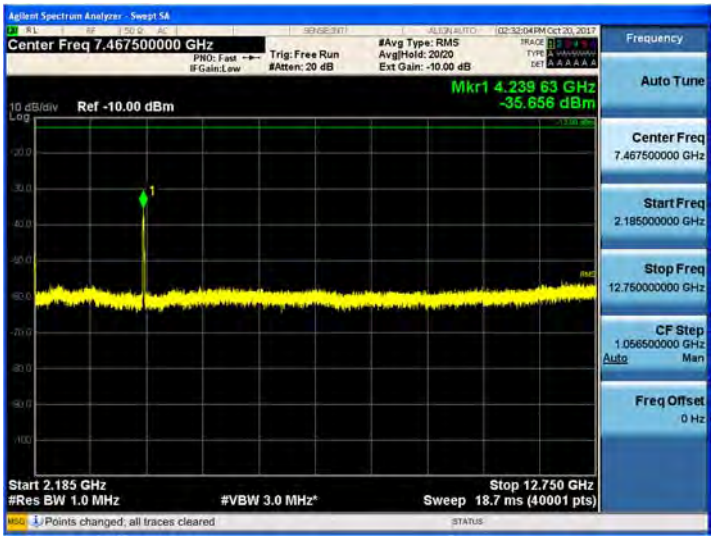
2.185 ㎓ ~ 12.75 ㎓	12.75 ㎓ ~ 26.5 ㎓

AWS 2100_LTE 20M

Test Data at Output Port 5

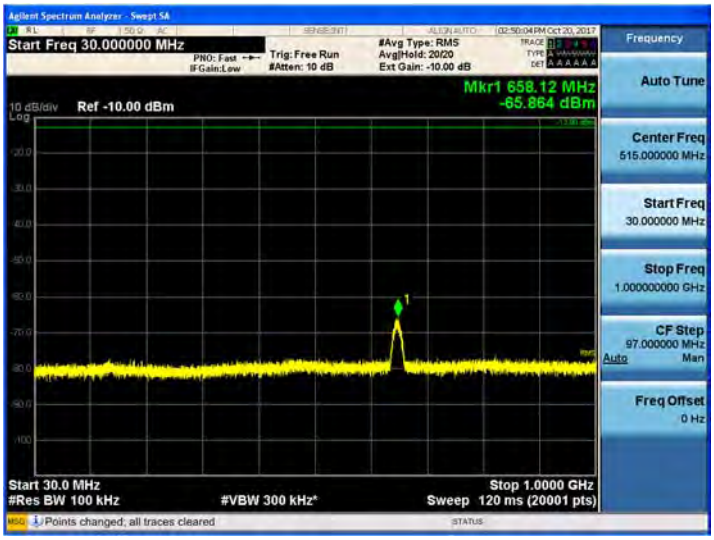
(64QAM Low channel)

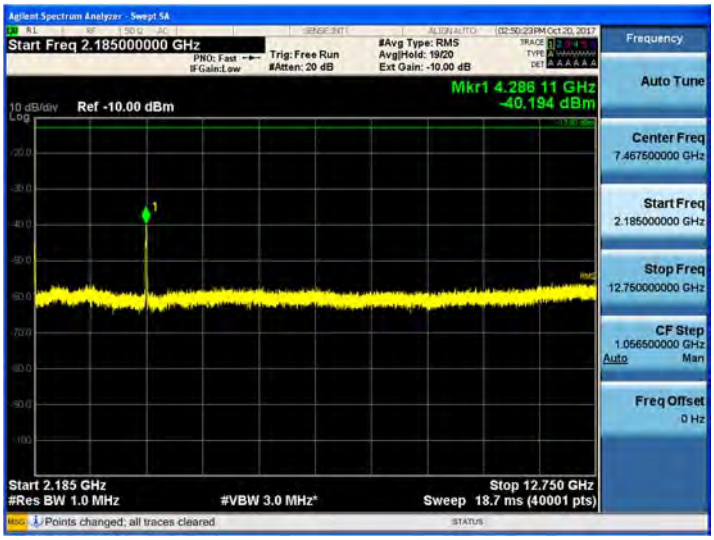
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

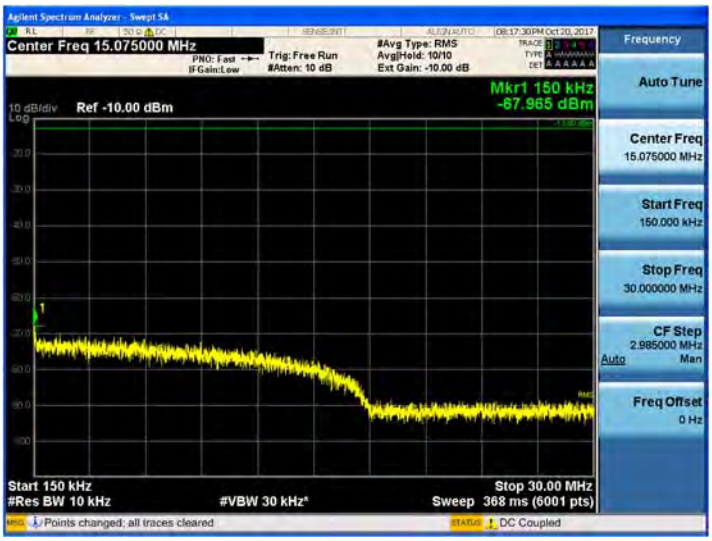
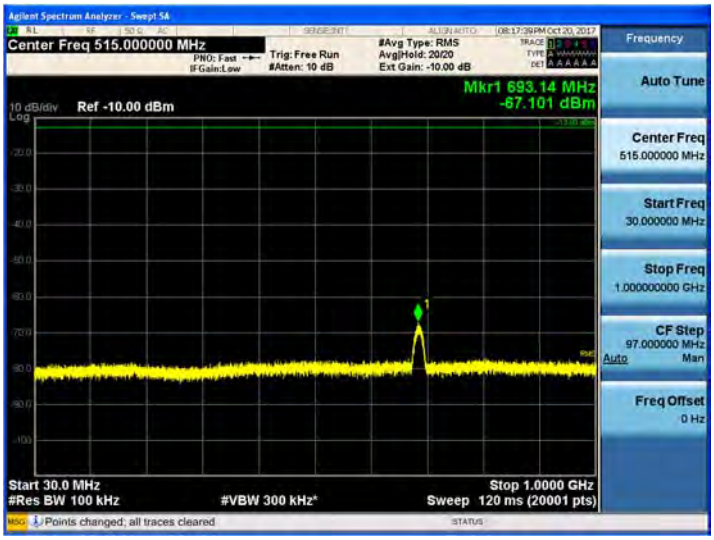
(64QAM Middle channel)

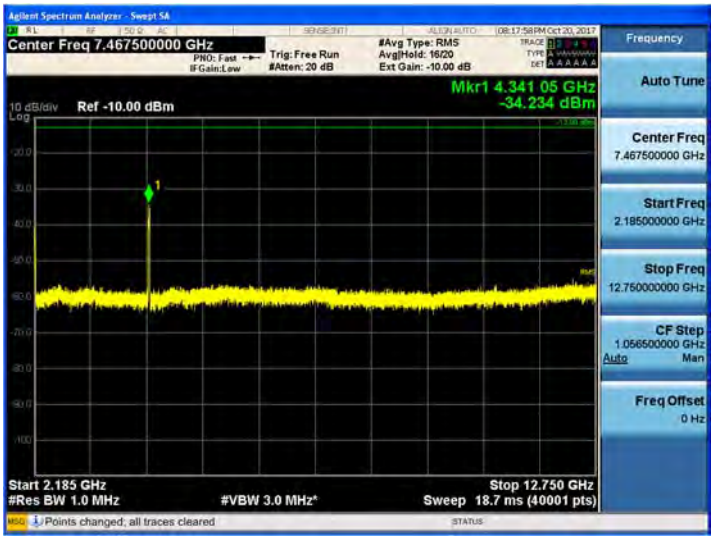
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

(64QAM High channel)

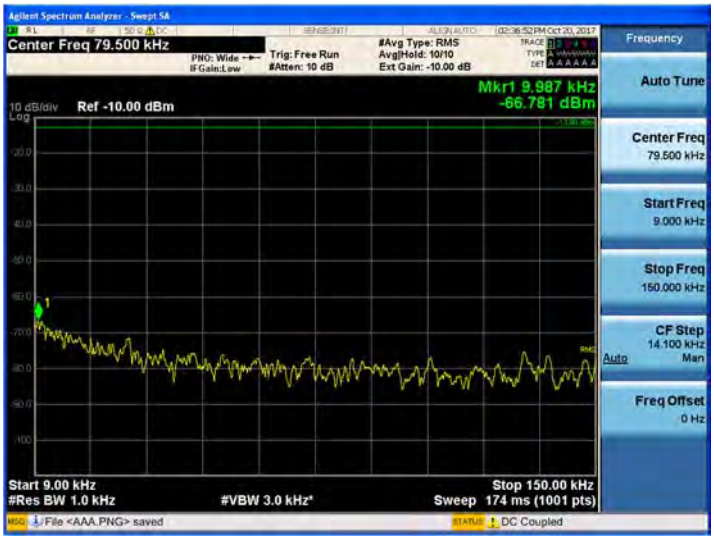
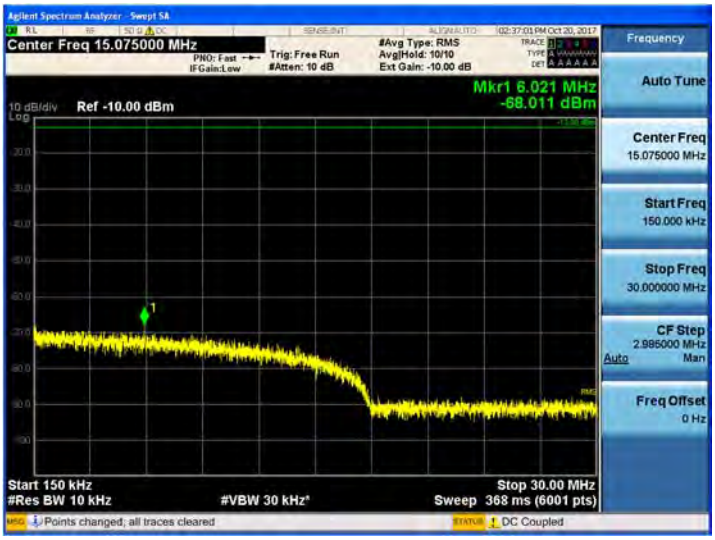
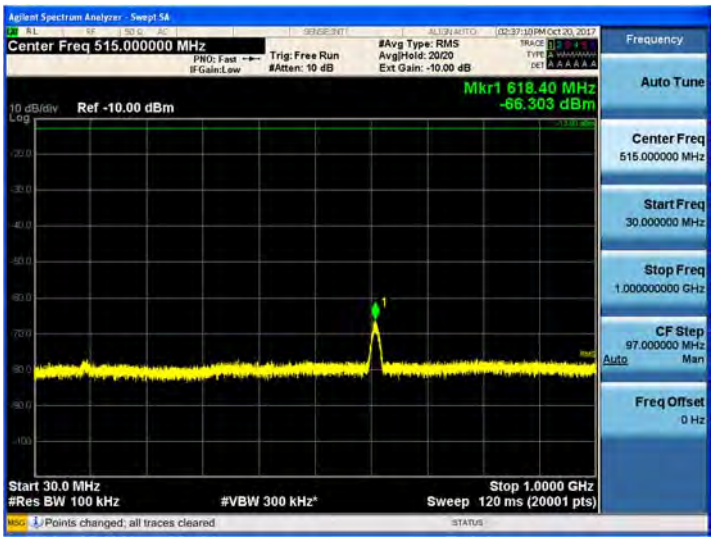
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

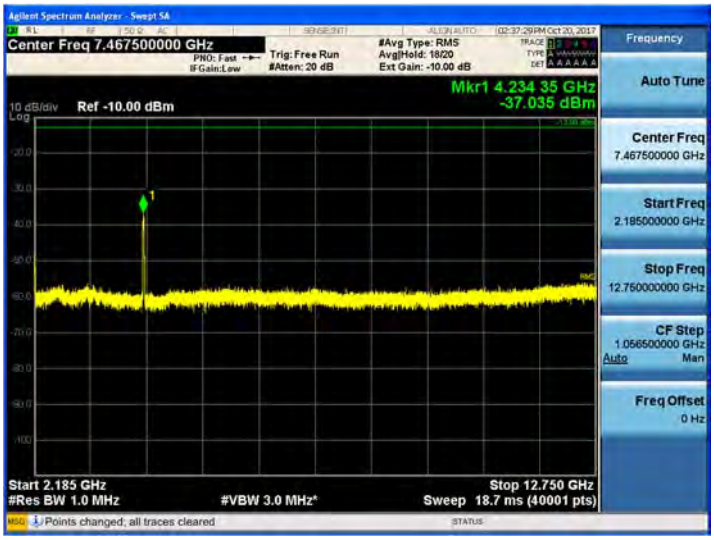
2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

AWS 2100_LTE 20M

Test Data at Output Port 5

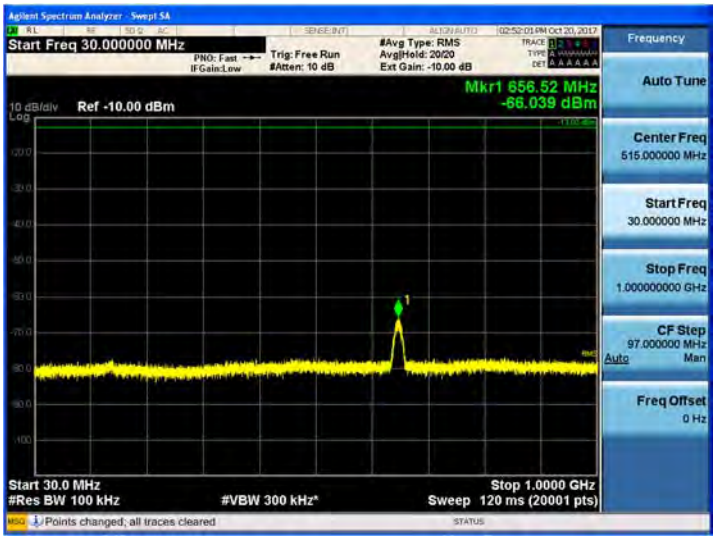
(16QAM Low channel)

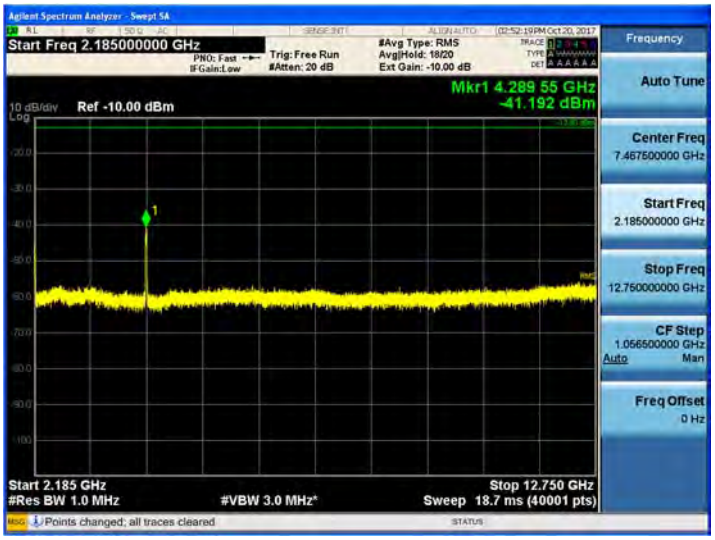
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

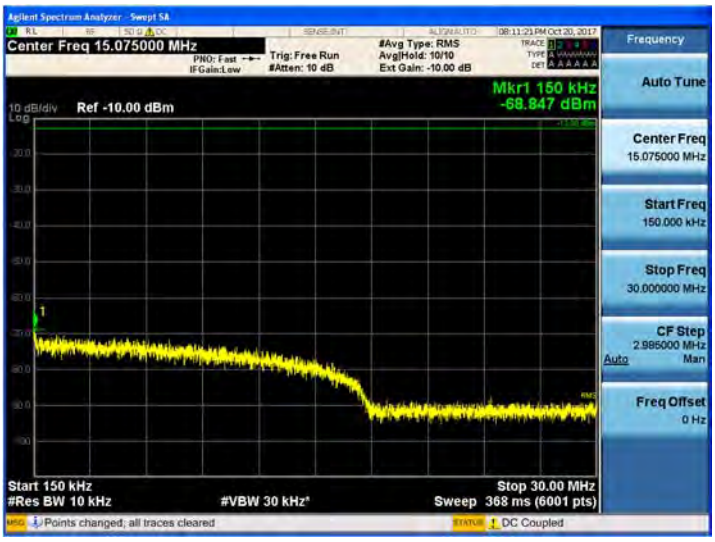
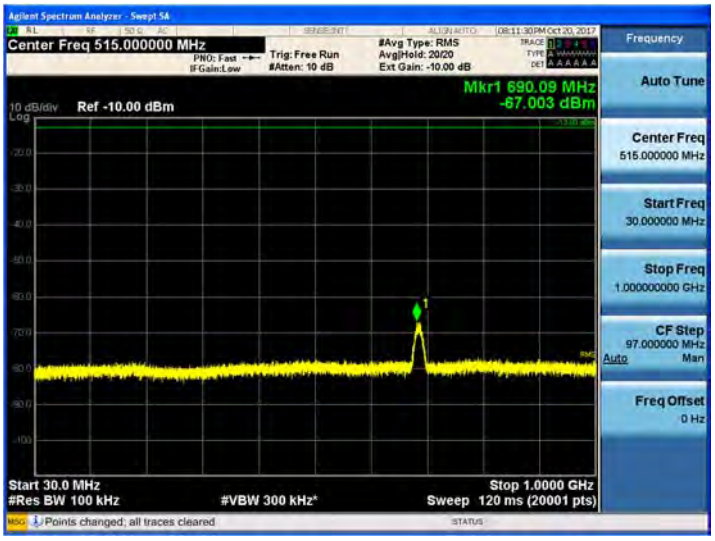
(16QAM Middle channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz
	

(16QAM High channel)

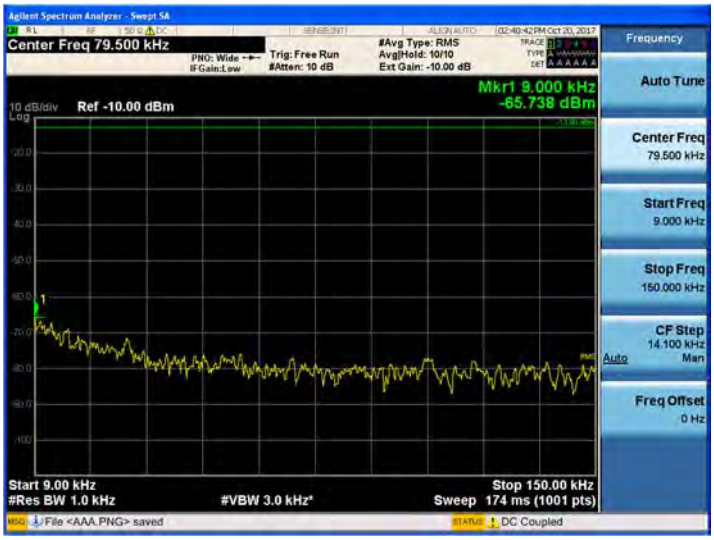
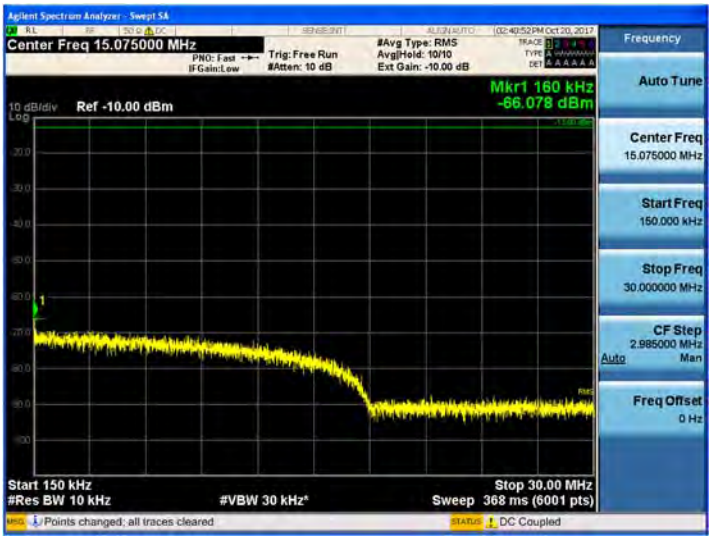
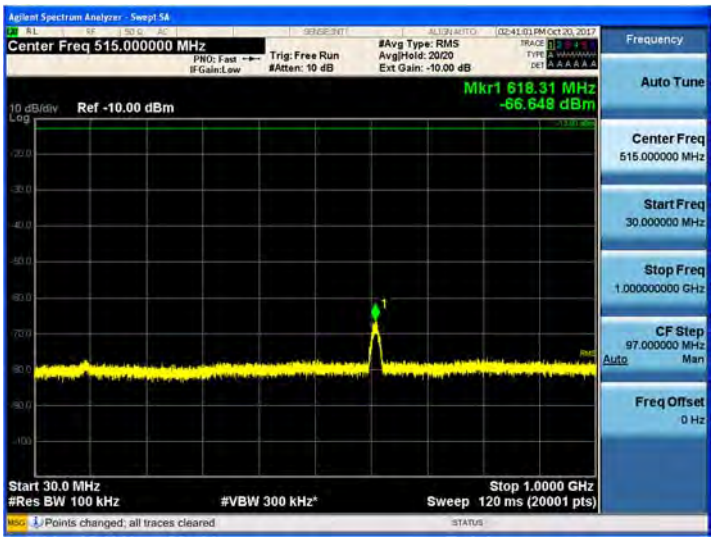
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

2.185 ㎓ ~ 12.75 ㎓	12.75 ㎓ ~ 26.5 ㎓

AWS 2100_LTE 20M

Test Data at Output Port 5

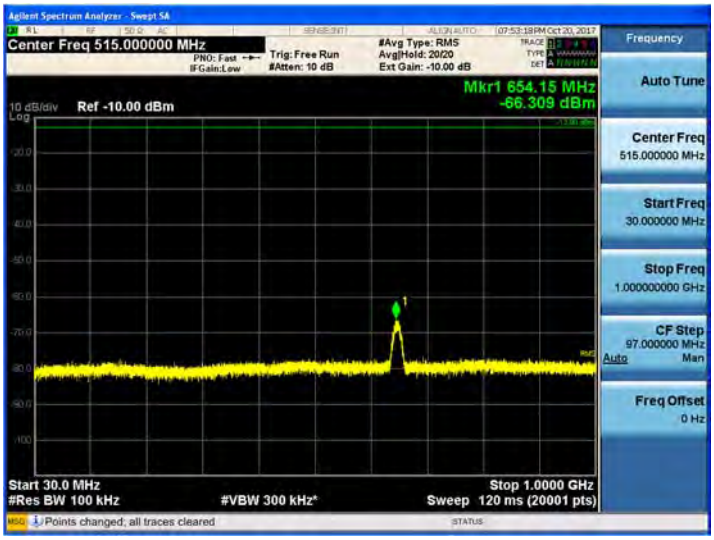
(QPSK Low channel)

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 2.105 ㎓**
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz

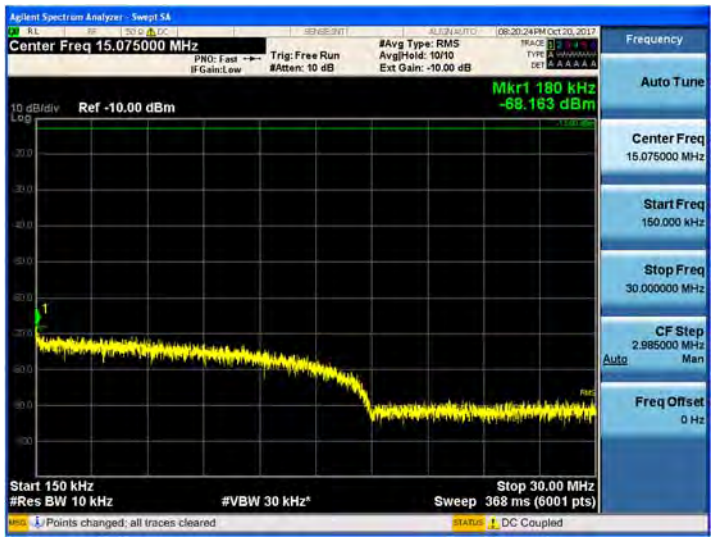
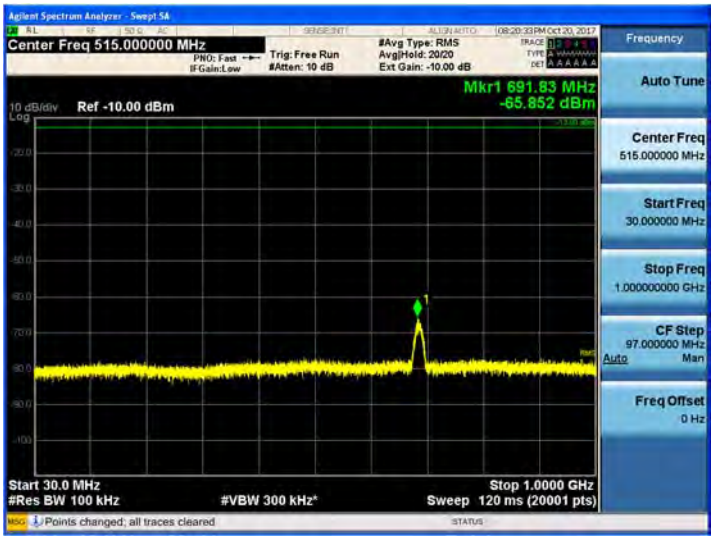
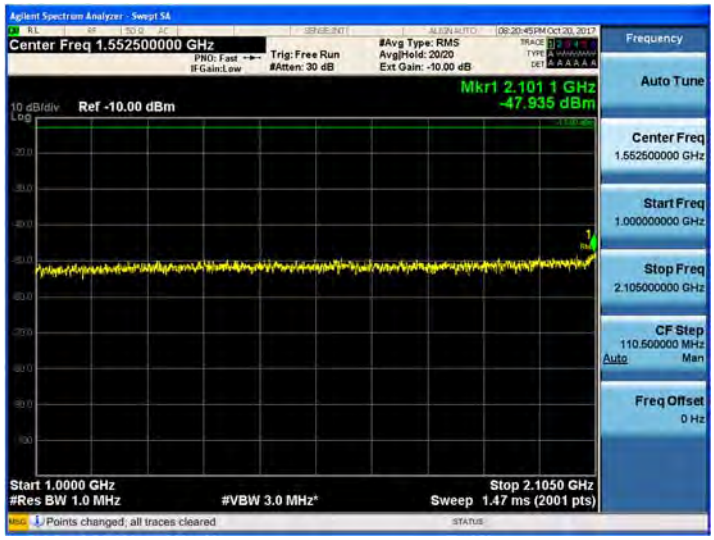
(QPSK Middle channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz

30 MHz ~ 1 GHz	1 GHz ~ 2.105 GHz
	

2.185 GHz ~ 12.75 GHz	12.75 GHz ~ 26.5 GHz

(QPSK High channel)

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 2.105 GHz**
	

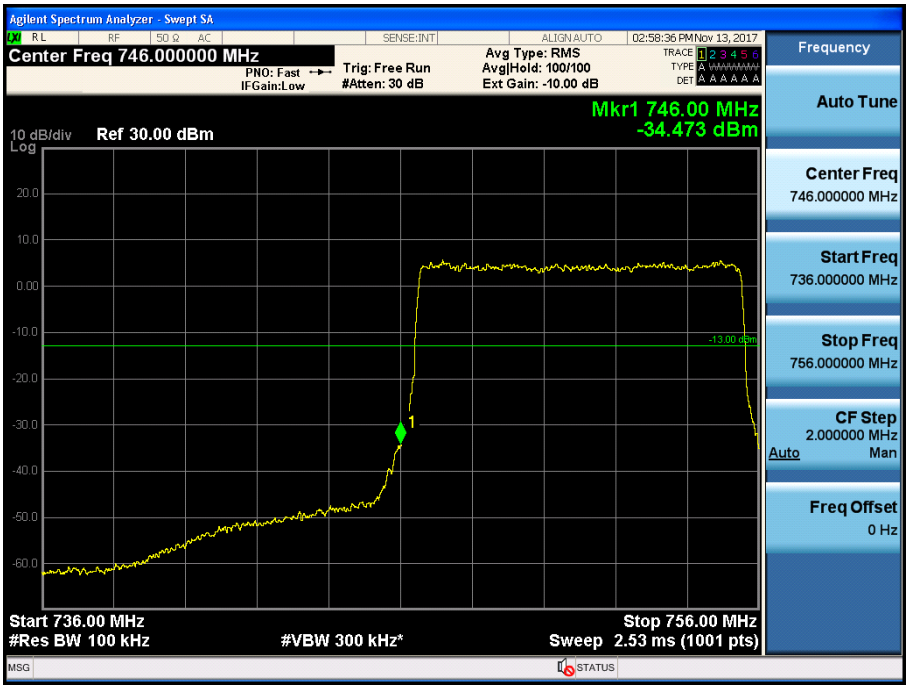
2.185 ㎓ ~ 12.75 ㎓	12.75 ㎓ ~ 26.5 ㎓

Band Edge

700 MHZ_LTE 10M_64QAM

Test Data at Output Port 4

[Downlink Low]

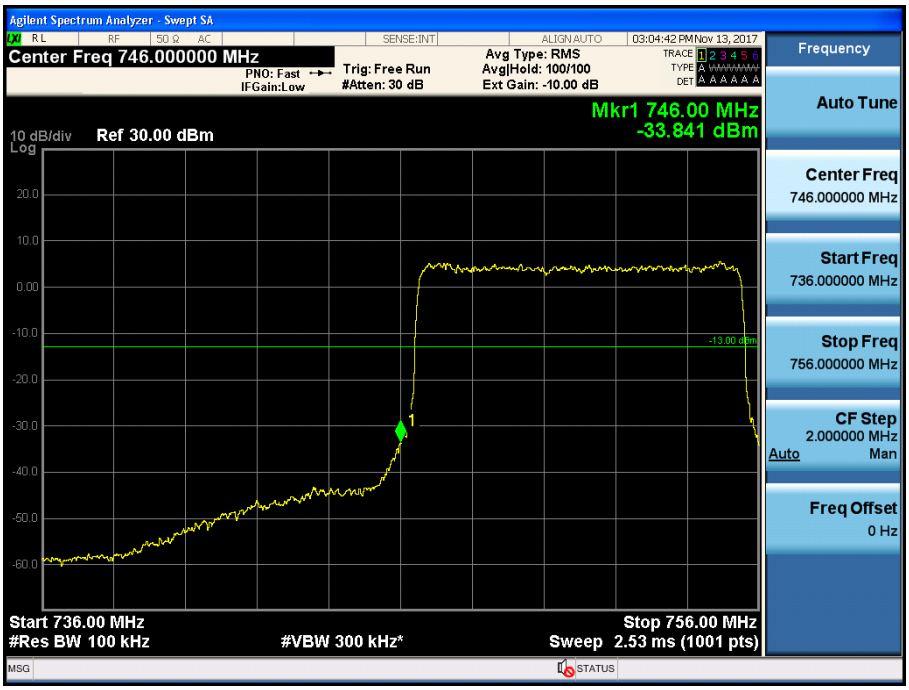


[Downlink High]

700 MHZ_LTE 10M_16QAM

Test Data at Output Port 4

[Downlink Low]



[Downlink High]

700 MHZ_LTE 10M_QPSK

Test Data at Output Port 4

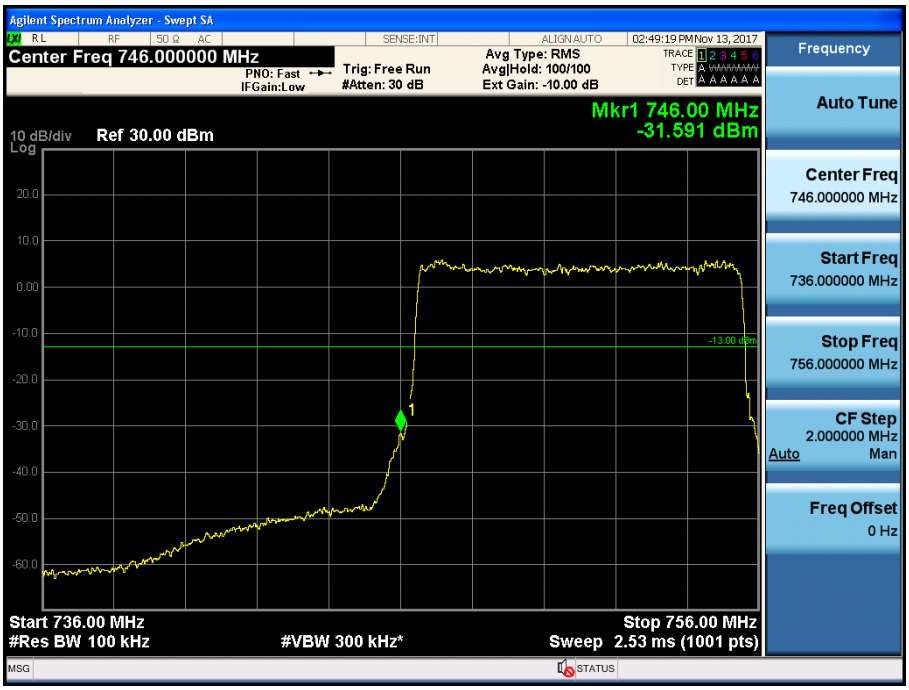
[Downlink Low]

[Downlink High]

700 MHZ_LTE 10M_64QAM

Test Data at Output Port 5

[Downlink Low]



[Downlink High]

700 MHZ_LTE 10M_16QAM

Test Data at Output Port 5

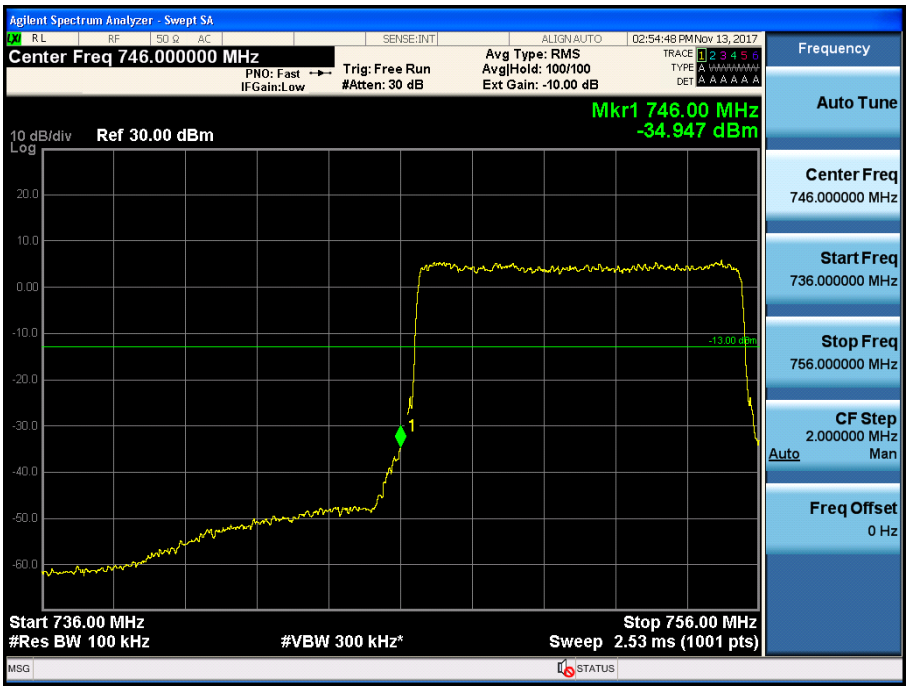
[Downlink Low]

[Downlink High]

700 MHZ_LTE 10M_QPSK

Test Data at Output Port 5

[Downlink Low]

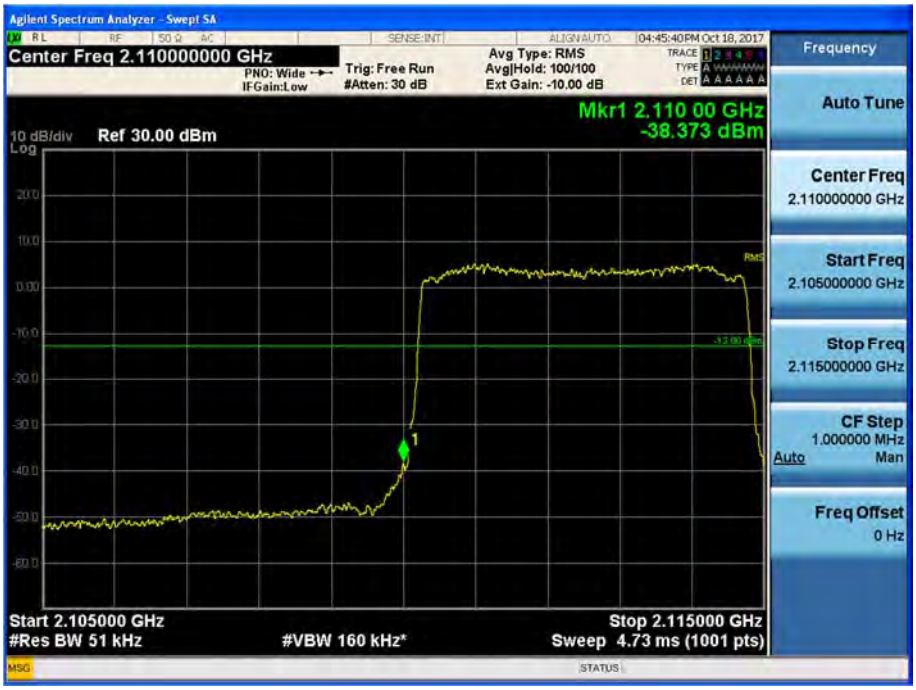


[Downlink High]

AWS2100_LTE 5M_64QAM

Test Data at Output Port 4

[Downlink Low]

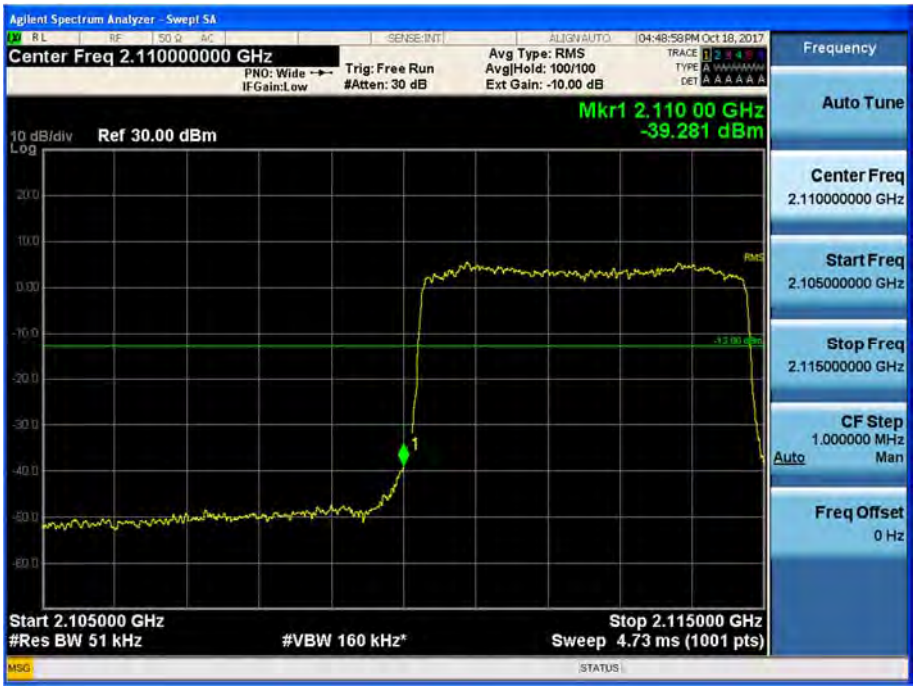


[Downlink High]

AWS2100_LTE 5M_16QAM

Test Data at Output Port 4

[Downlink Low]

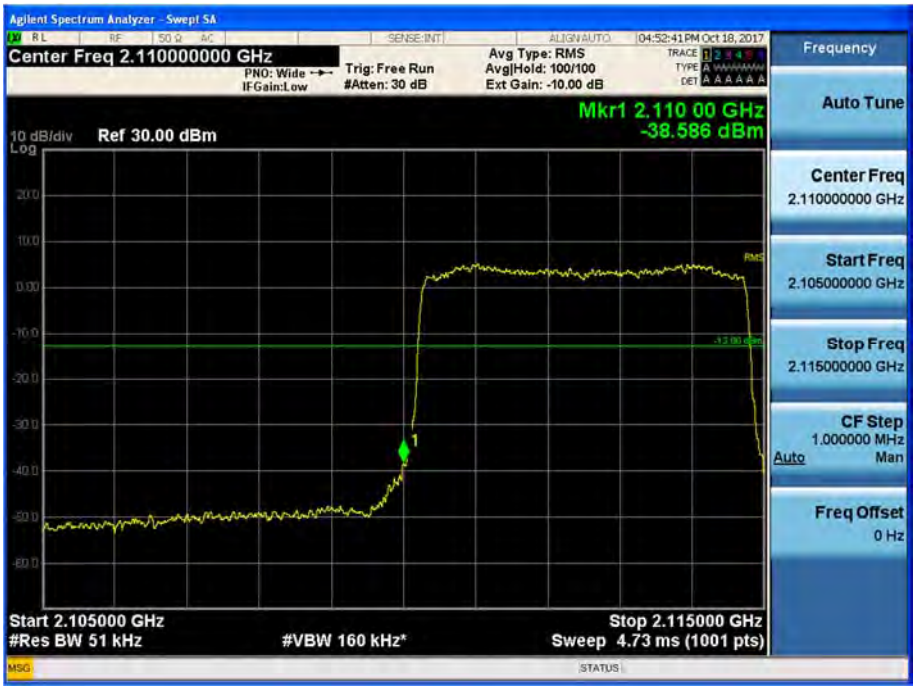


[Downlink High]

AWS2100_LTE 5M_QPSK

Test Data at Output Port 4

[Downlink Low]

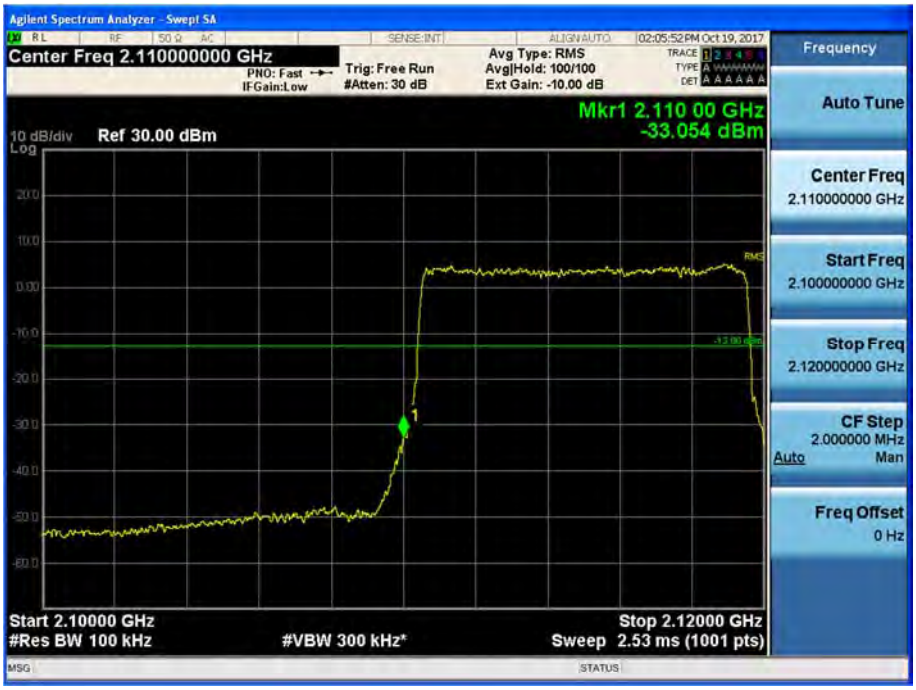


[Downlink High]

AWS2100_LTE 10M_64QAM

Test Data at Output Port 4

[Downlink Low]

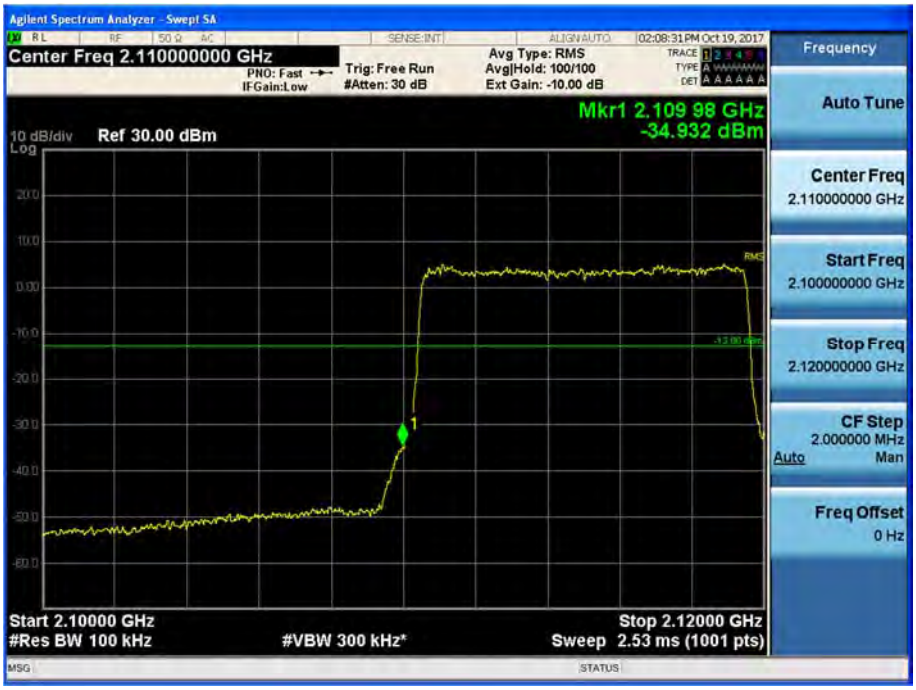


[Downlink High]

AWS2100_LTE 10M_16QAM

Test Data at Output Port 4

[Downlink Low]



[Downlink High]

AWS2100_LTE 10M_QPSK

Test Data at Output Port 4

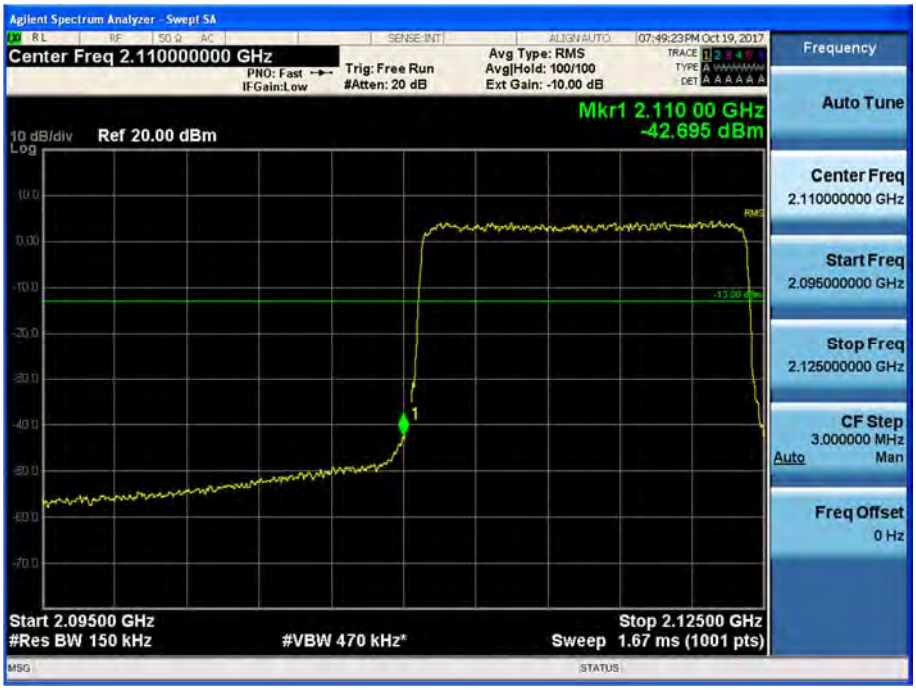
[Downlink Low]

[Downlink High]

AWS2100_LTE 15M_64QAM

Test Data at Output Port 4

[Downlink Low]

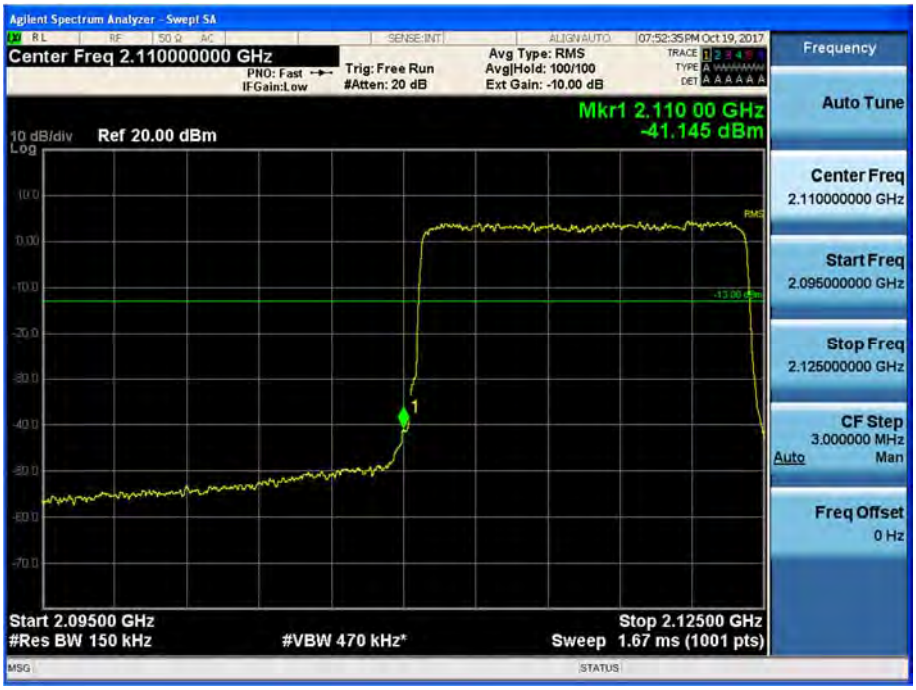


[Downlink High]

AWS2100_LTE 15M_16QAM

Test Data at Output Port 4

[Downlink Low]



[Downlink High]

AWS2100_LTE 15M_QPSK

Test Data at Output Port 4

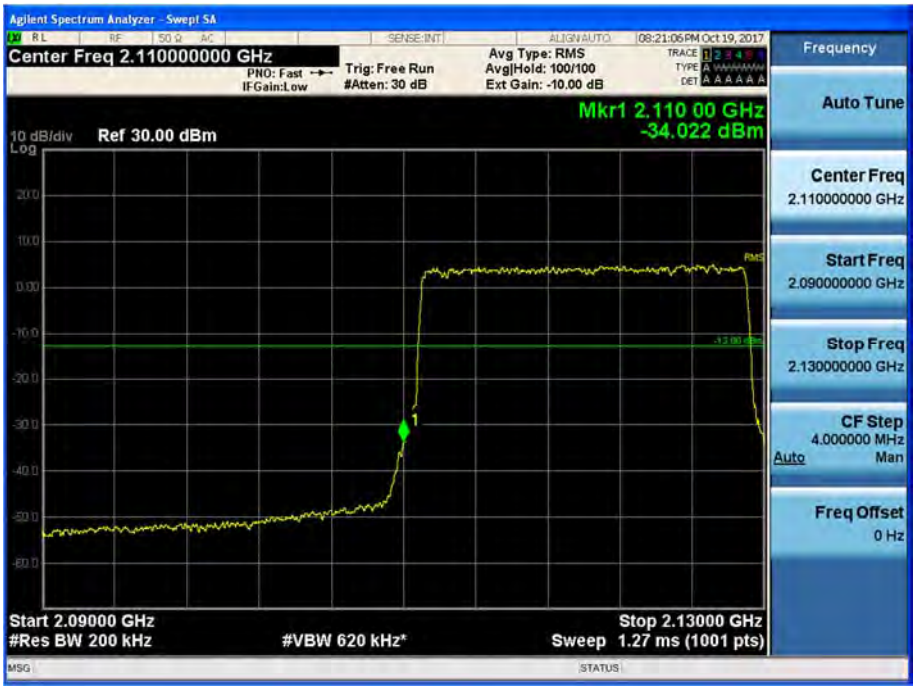
[Downlink Low]

[Downlink High]

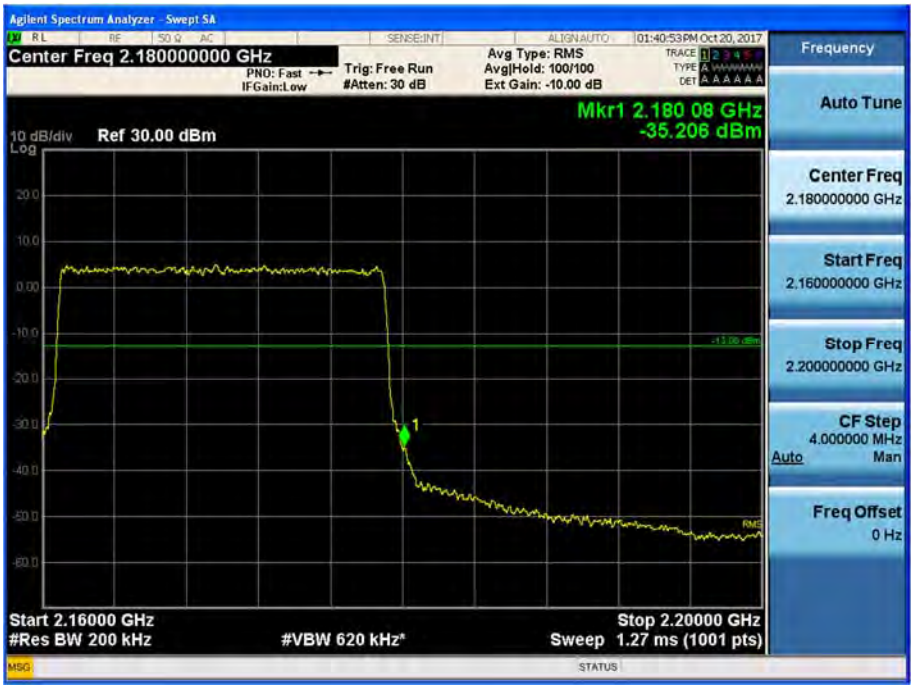
AWS2100_LTE 20M_64QAM

Test Data at Output Port 4

[Downlink Low]



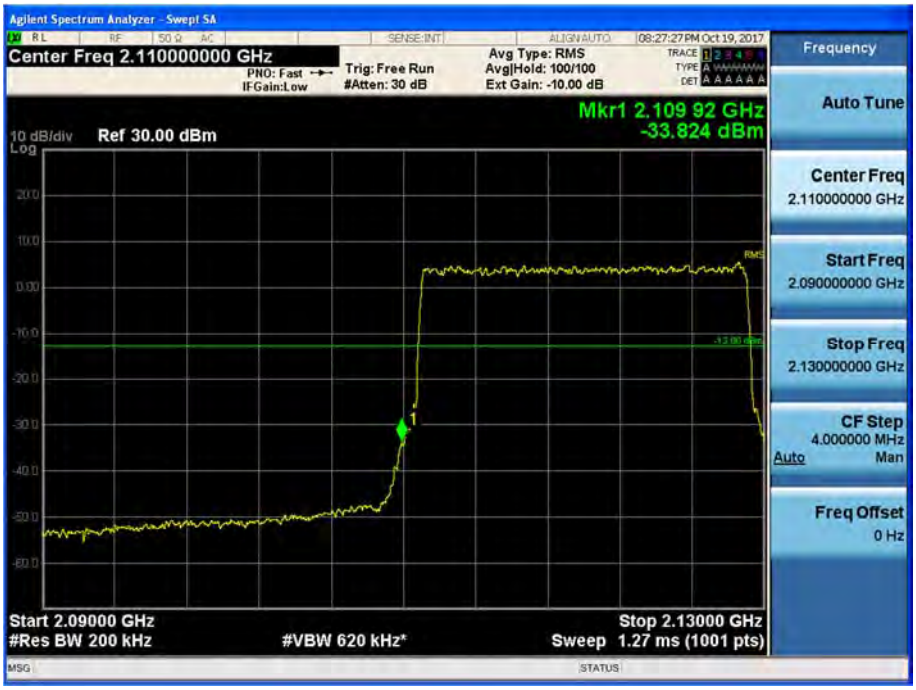
[Downlink High]



AWS2100_LTE 20M_16QAM

Test Data at Output Port 4

[Downlink Low]

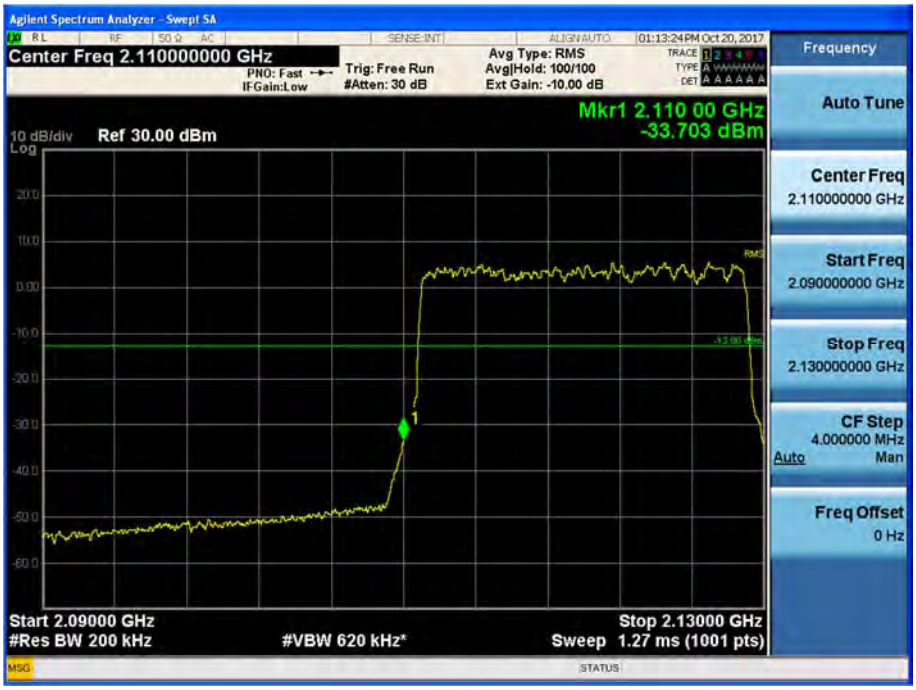


[Downlink High]

AWS2100_LTE 20M_QPSK

Test Data at Output Port 4

[Downlink Low]

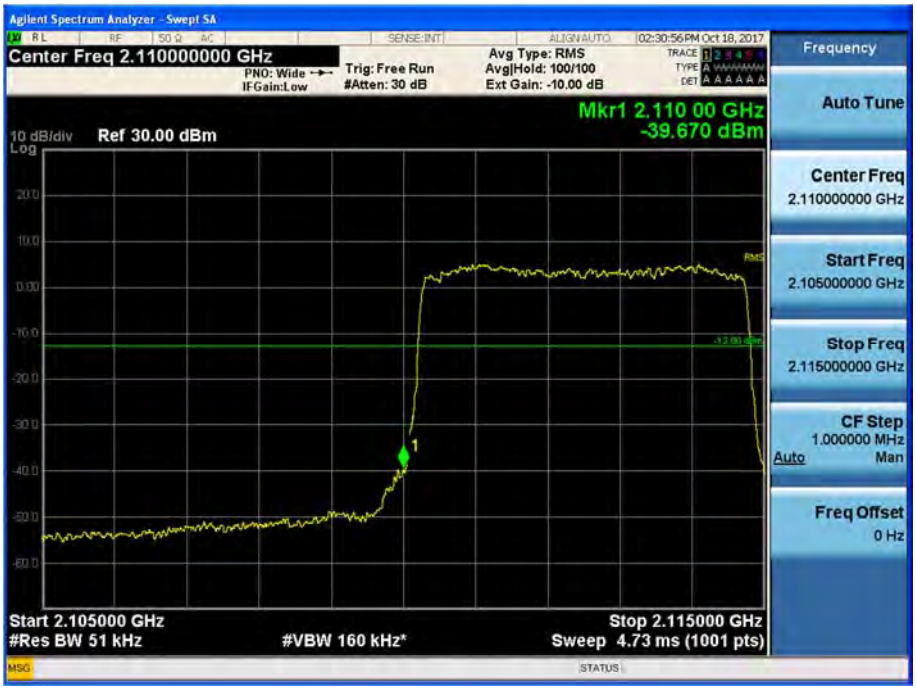


[Downlink High]

AWS2100_LTE 5M_64QAM

Test Data at Output Port 5

[Downlink Low]

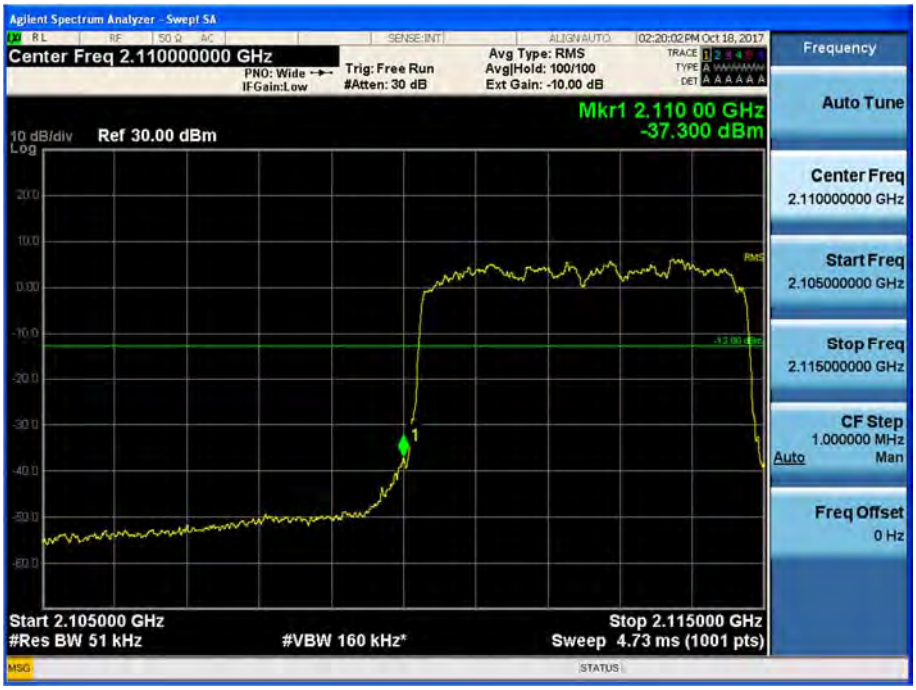


[Downlink High]

AWS2100_LTE 5M_16QAM

Test Data at Output Port 5

[Downlink Low]



[Downlink High]

AWS2100_LTE 5M_QPSK

Test Data at Output Port 5

[Downlink Low]

[Downlink High]

AWS2100_LTE 10M_64QAM

Test Data at Output Port 5

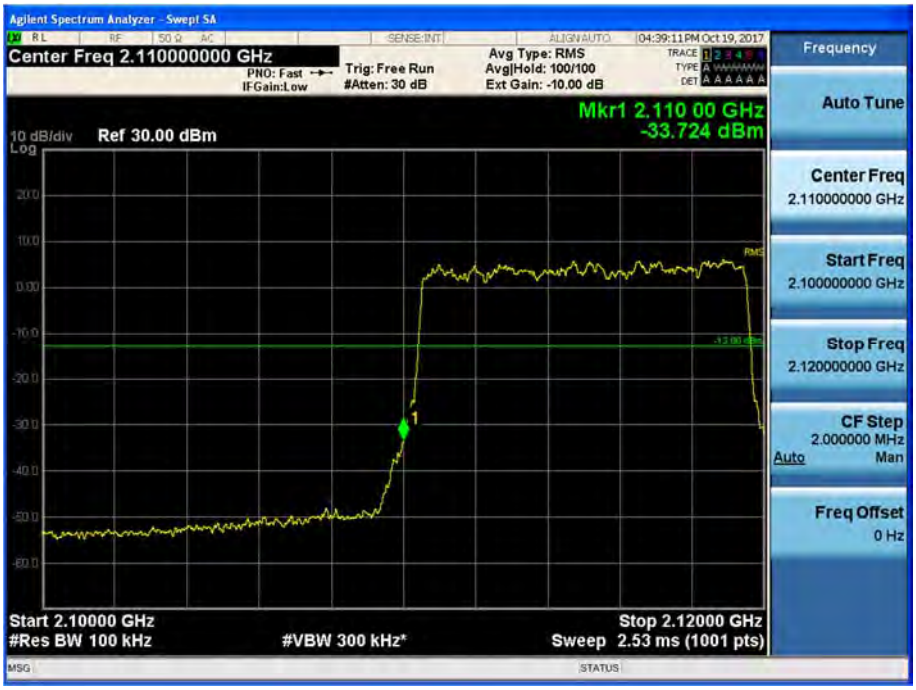
[Downlink Low]

[Downlink High]

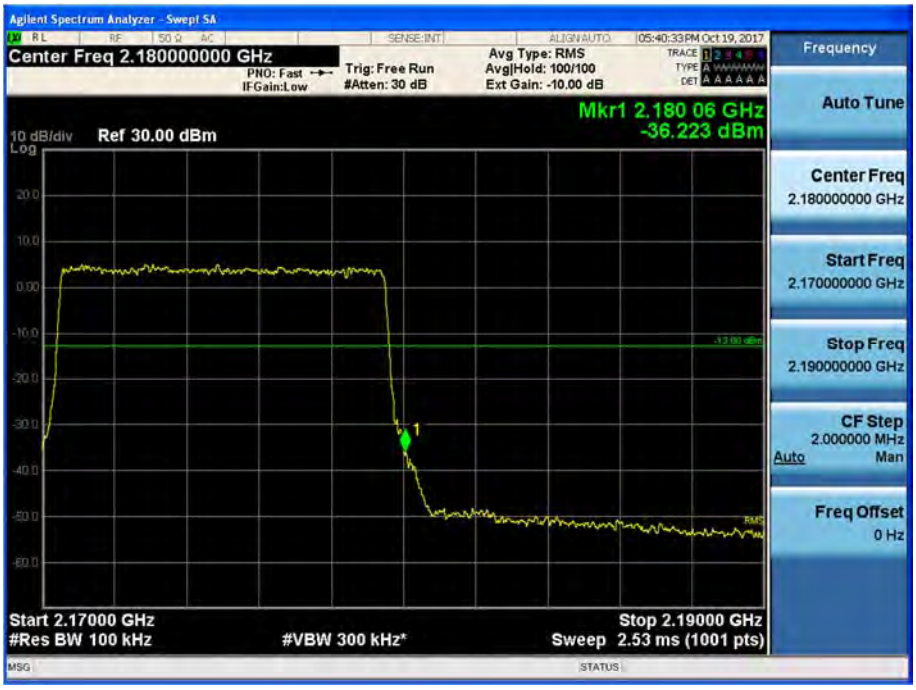
AWS2100_LTE 10M_16QAM

Test Data at Output Port 5

[Downlink Low]



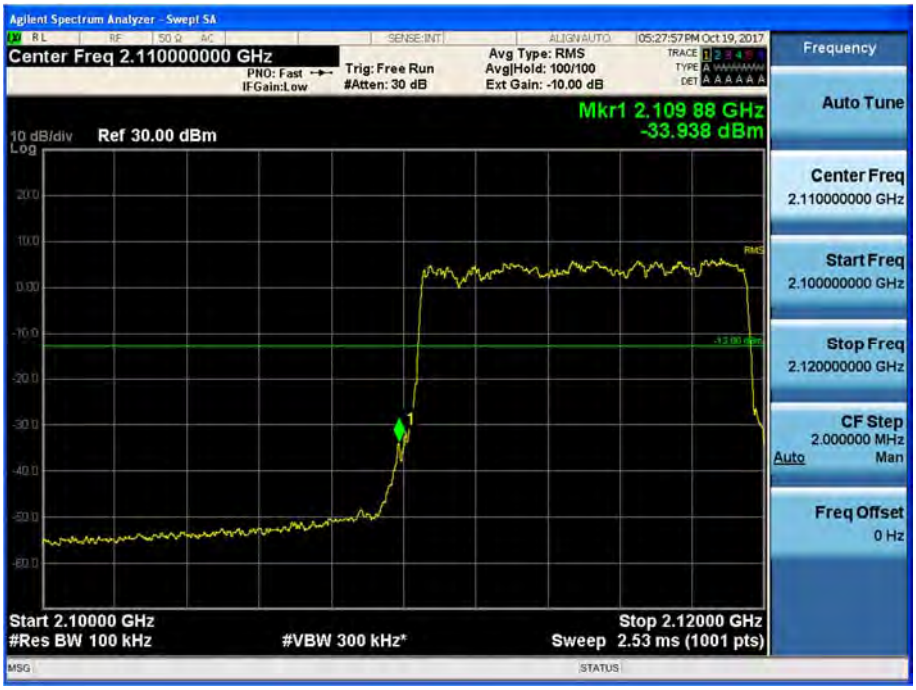
[Downlink High]



AWS2100_LTE 10M_QPSK

Test Data at Output Port 5

[Downlink Low]

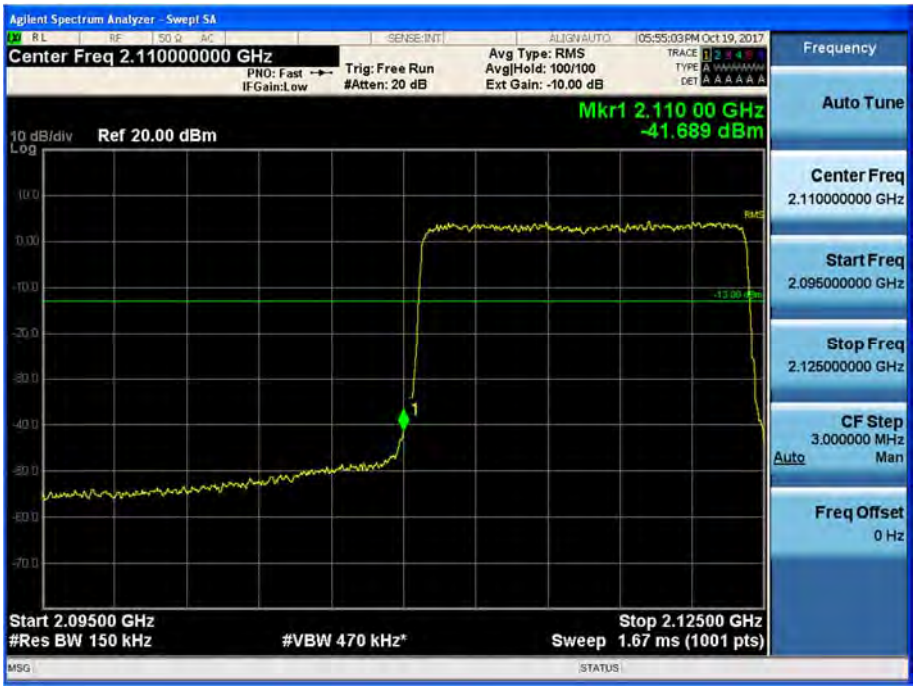


[Downlink High]

AWS2100_LTE 15M_64QAM

Test Data at Output Port 5

[Downlink Low]

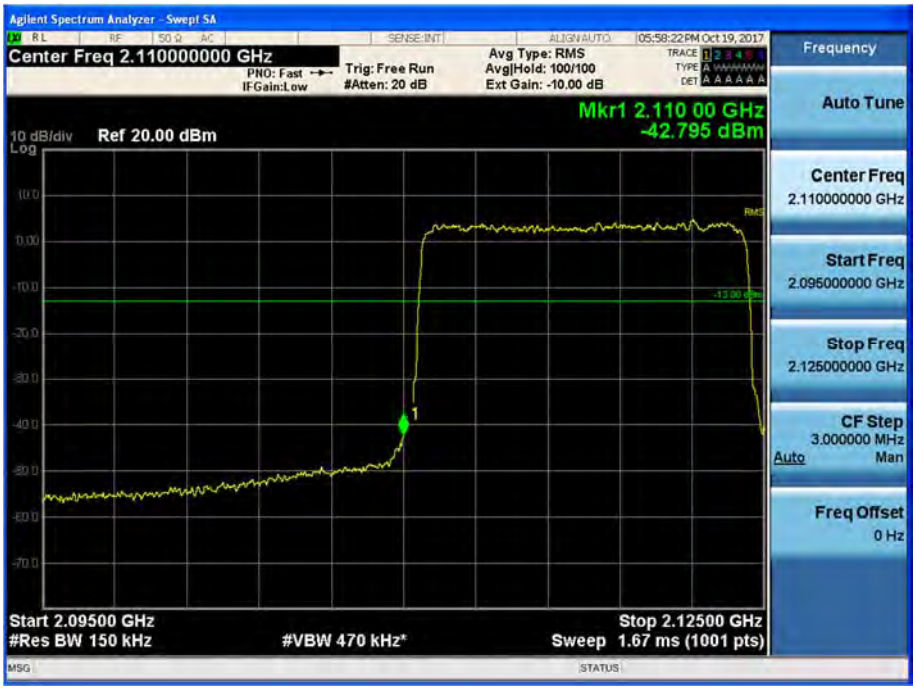


[Downlink High]

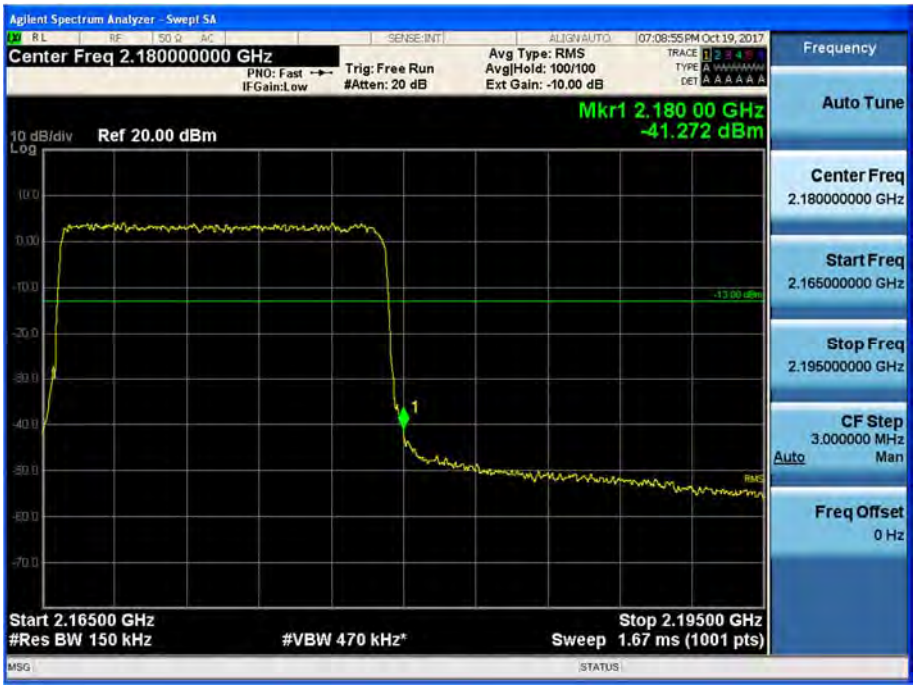
AWS2100_LTE 15M_16QAM

Test Data at Output Port 5

[Downlink Low]



[Downlink High]



AWS2100_LTE 15M_QPSK

Test Data at Output Port 5

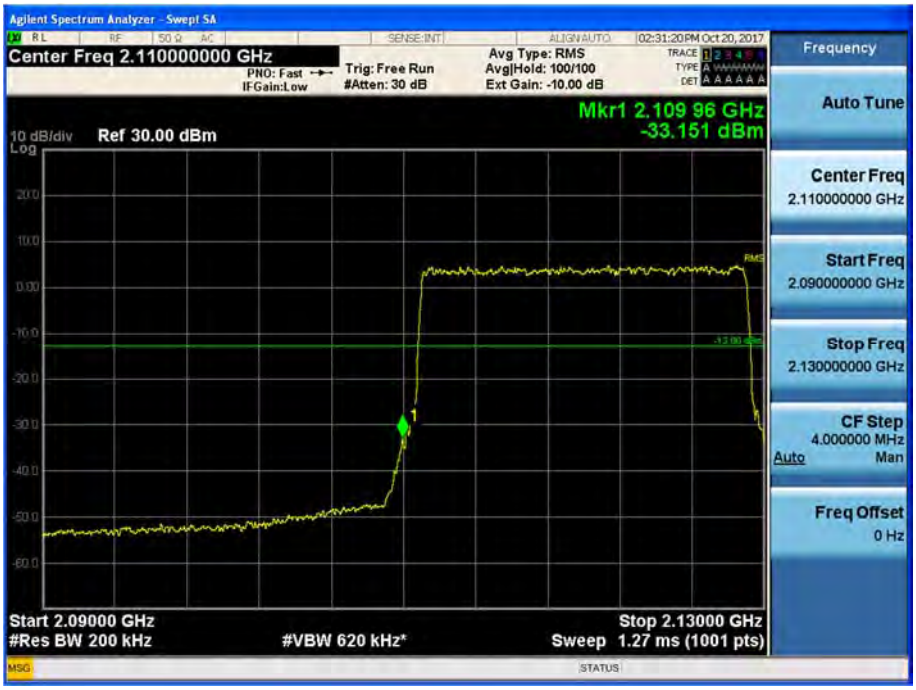
[Downlink Low]

[Downlink High]

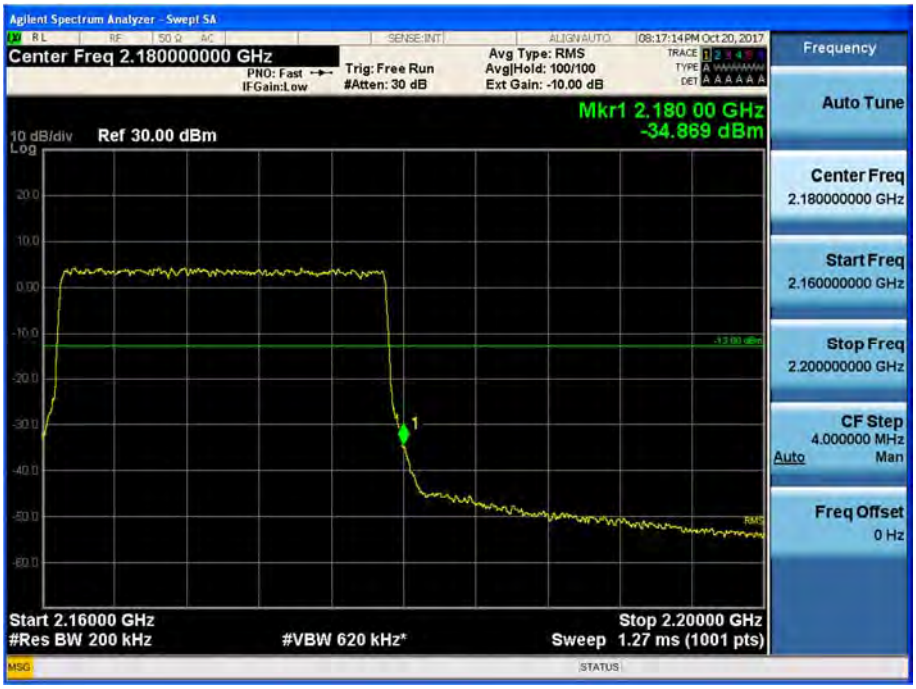
AWS2100_LTE 20M_64QAM

Test Data at Output Port 5

[Downlink Low]



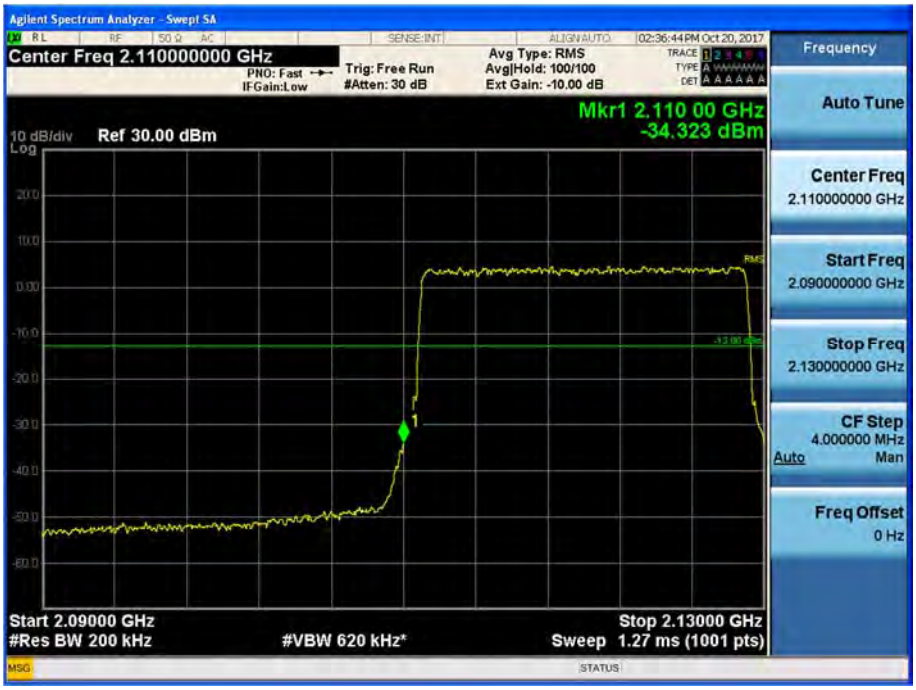
[Downlink High]



AWS2100_LTE 20M_16QAM

Test Data at Output Port 5

[Downlink Low]

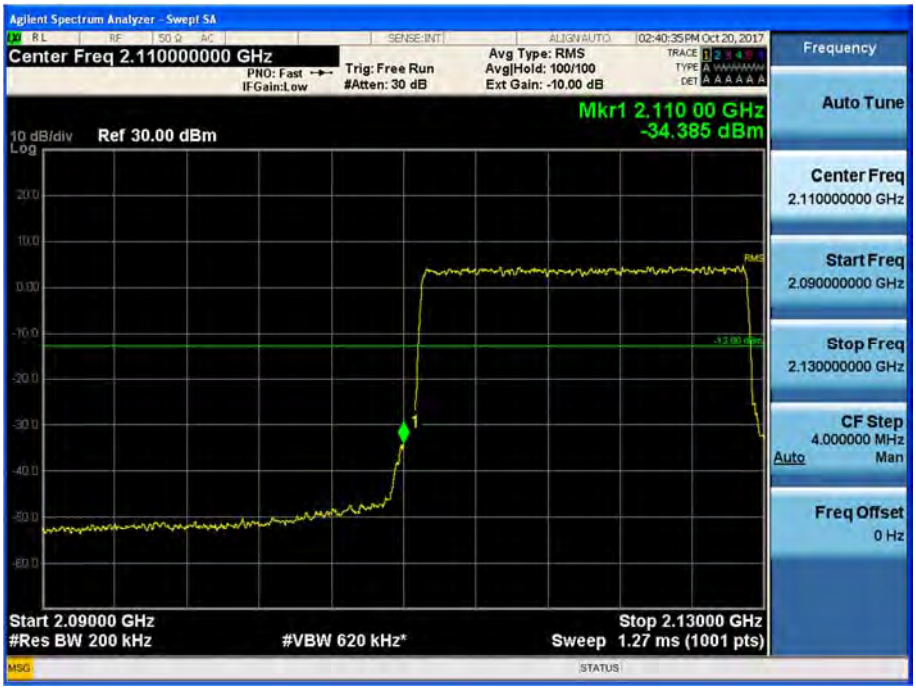


[Downlink High]

AWS2100_LTE 20M_QPSK

Test Data at Output Port 5

[Downlink Low]



[Downlink High]

8. RADIATED SPURIOUS EMISSION

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.

§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.

(h) *AWS emission limits*

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

(2) *Additional protection levels.* Notwithstanding the foregoing paragraph (h)(1) of this section:

(i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in §27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band.

(ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.

(iii) For operations in the 1915-1920 MHz band, the power of any emission between 1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.

(iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.

(3) *Measurement procedure.*

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

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as

close to the licensee's frequency block edges, both upper and lower, as the design permits.

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

(4) *Private agreements.*

(i) For AWS operations in the 2000-2020 MHz and 2180-2200 MHz bands, to the extent a licensee establishes unified operations across the AWS blocks, that licensee may choose not to observe the emission limit specified in paragraph (h)(1), above, strictly between its adjacent block licenses in a geographic area, so long as it complies with other Commission rules and is not adversely affecting the operations of other parties by virtue of exceeding the emission limit.

(ii) For AWS operations in the 2000-2020 MHz band, a licensee may enter into private agreements with all licensees operating between 1995 and 2000 MHz to allow the 70 + 10 $\log_{10}$(P) dB limit to be exceeded within the 1995-2000 MHz band.

(iii) An AWS licensee who is a party to a private agreement described in this section (4) must maintain a copy of the agreement in its station files and disclose it, upon request, to prospective AWS assignees, transferees, or spectrum lessees and to the Commission.

Test Procedures:

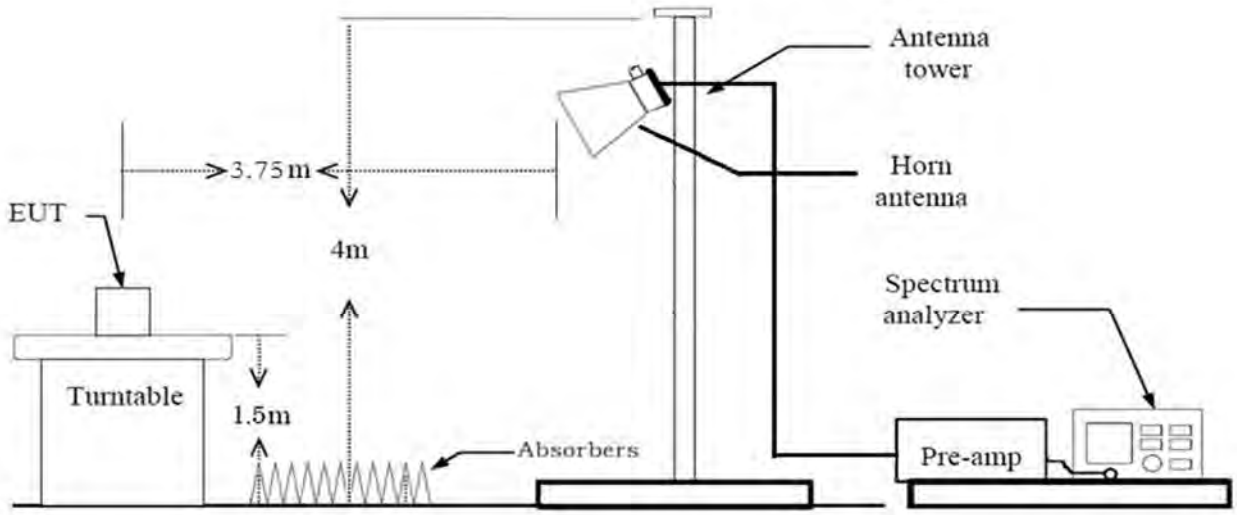
Radiated emission measurements were performed at an semi-anechoic chamber.

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 360^0 and the receiving antenna scanned from 1-4m 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)

Test Result:

700 MHZ_LTE 10M

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

* C.L.: Cable Loss / D.F.: Distance Factor (3.75 m)

AWS2100_LTE 20M

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

* C.L.: Cable Loss / D.F.: Distance Factor (3.75 m)

9. FREQUECNY STABILITY

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.

§27.54 Frequency stability.

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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.

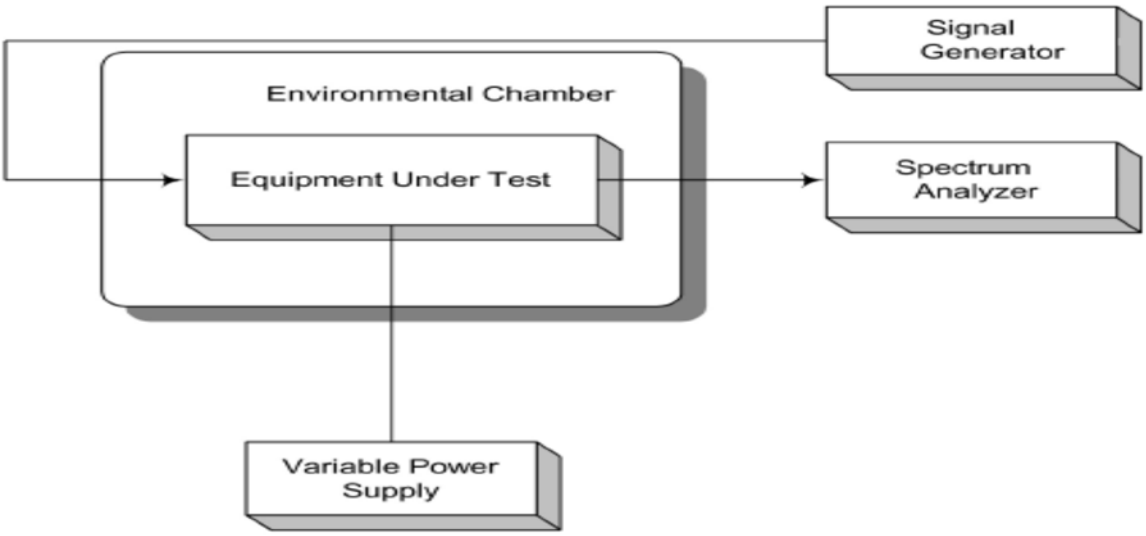
A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations.

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

Test Setup:



Test Results:

LTE Band 13

Reference: 12 VDC at 20°c **Freq.** = 751,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	751 000 000	0.224	-0.664	-0.00031
	0	751 000 001	0.825	-0.062	-0.00003
	+10	751 000 000	-0.111	-0.998	-0.00047
	+30	751 000 001	0.631	-0.256	-0.00012
	+40	751 000 000	0.388	-0.500	-0.00023
	+50	751 000 000	0.248	-0.639	-0.00030
110%	+20	751 000 000	-0.361	-1.249	-0.00059
90%	+20	751 000 000	0.425	-0.463	-0.00022

LTE Band 66

Reference: 12 VDC at 20°c **Freq.** = 2145,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2145 000 001	0.904	0.367	0.00017
	0	2145 000 001	0.520	-0.017	-0.00001
	+10	2144 999 999	-0.982	-1.519	-0.00071
	+30	2145 000 000	0.487	-0.050	-0.00002
	+40	2145 000 000	0.232	-0.305	-0.00014
	+50	2145 000 000	0.160	-0.378	-0.00018
110%	+20	2145 000 000	-0.224	-0.761	-0.00036
90%	+20	2145 000 000	0.206	-0.331	-0.00016

Note:

The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each port, so attached data were only the worst case.