AWS2100_LTE 5M_64QAM

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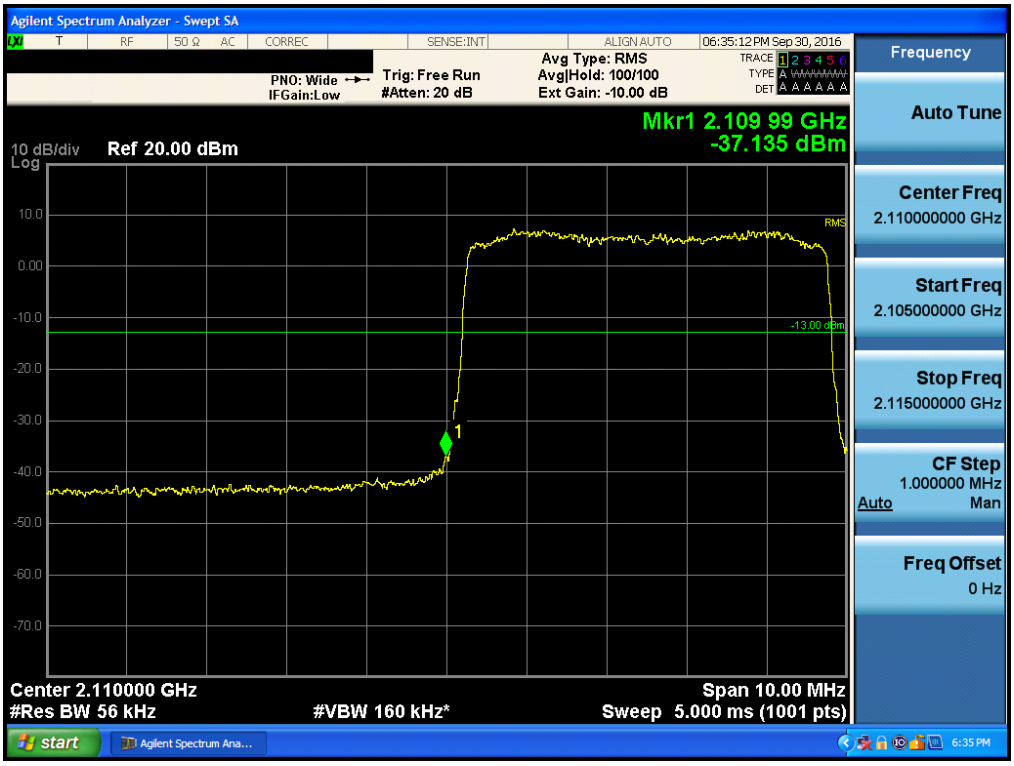

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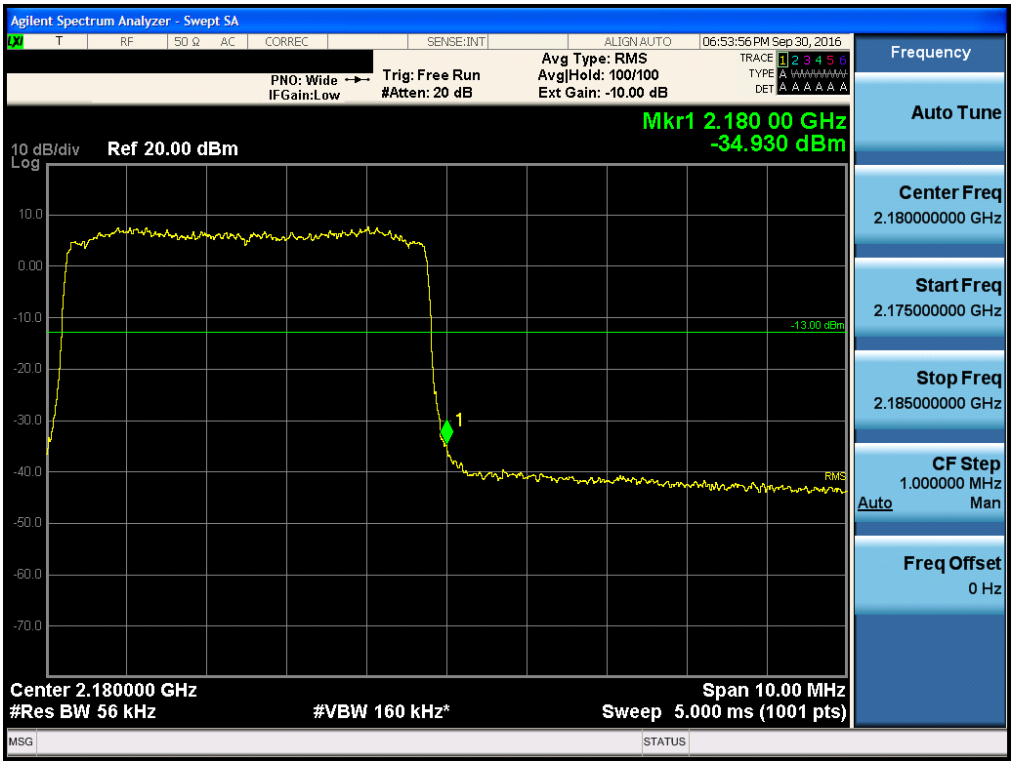

AWS2100_LTE 10M_QPSK

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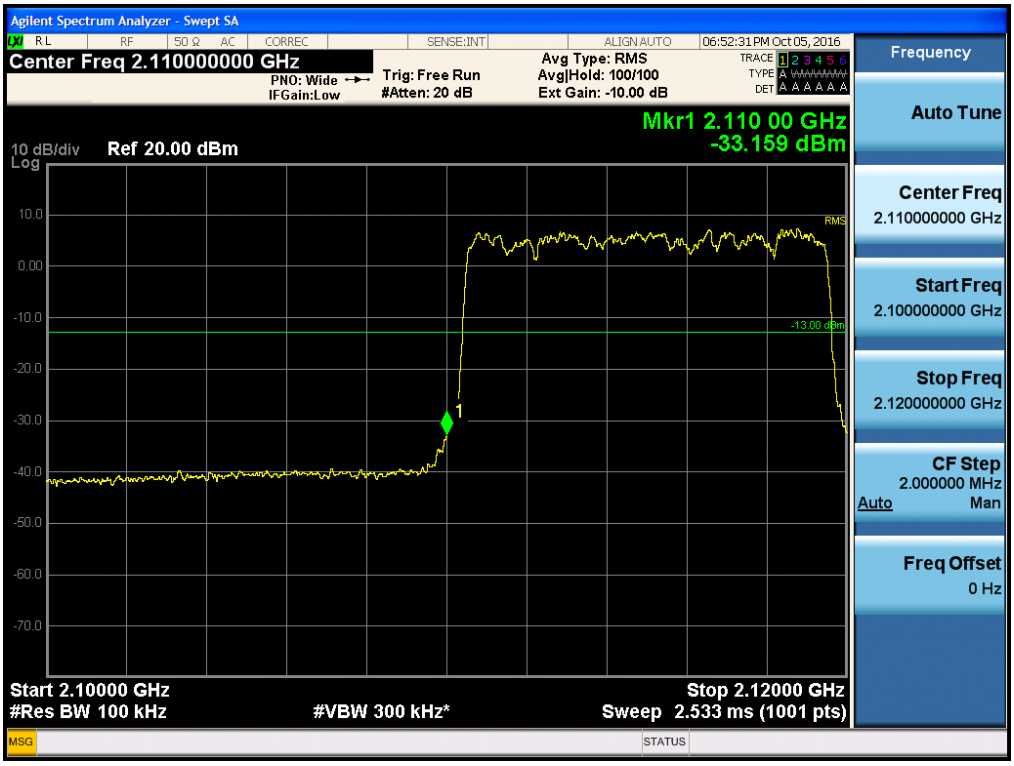

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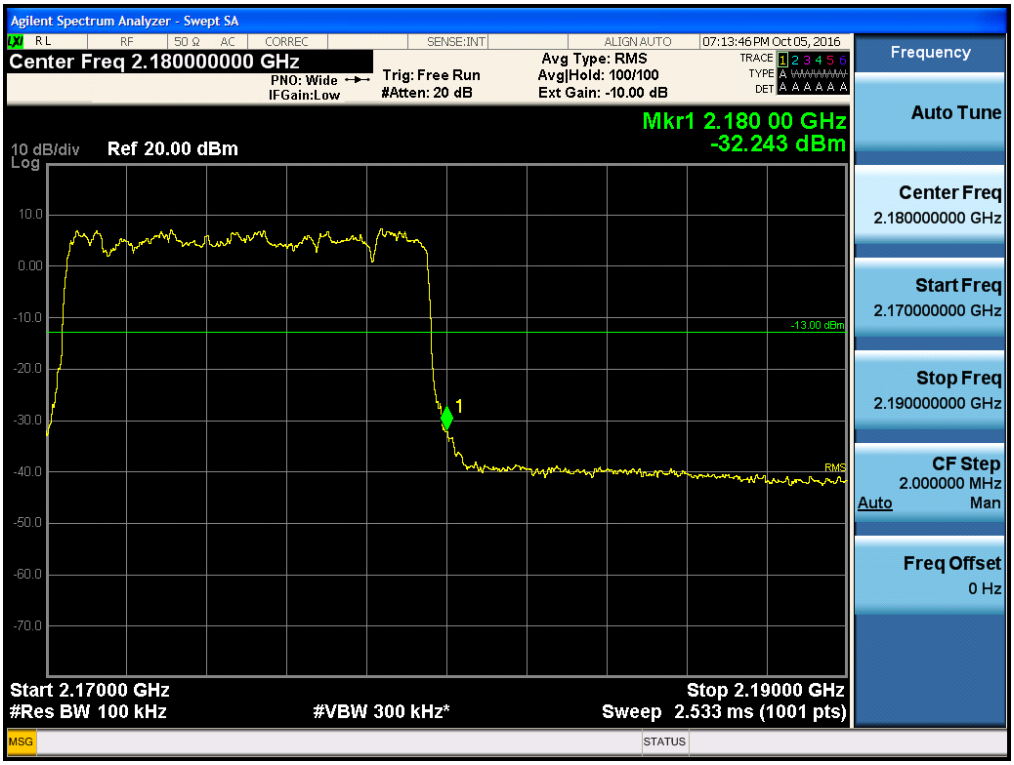

AWS2100_LTE 10M_16QAM

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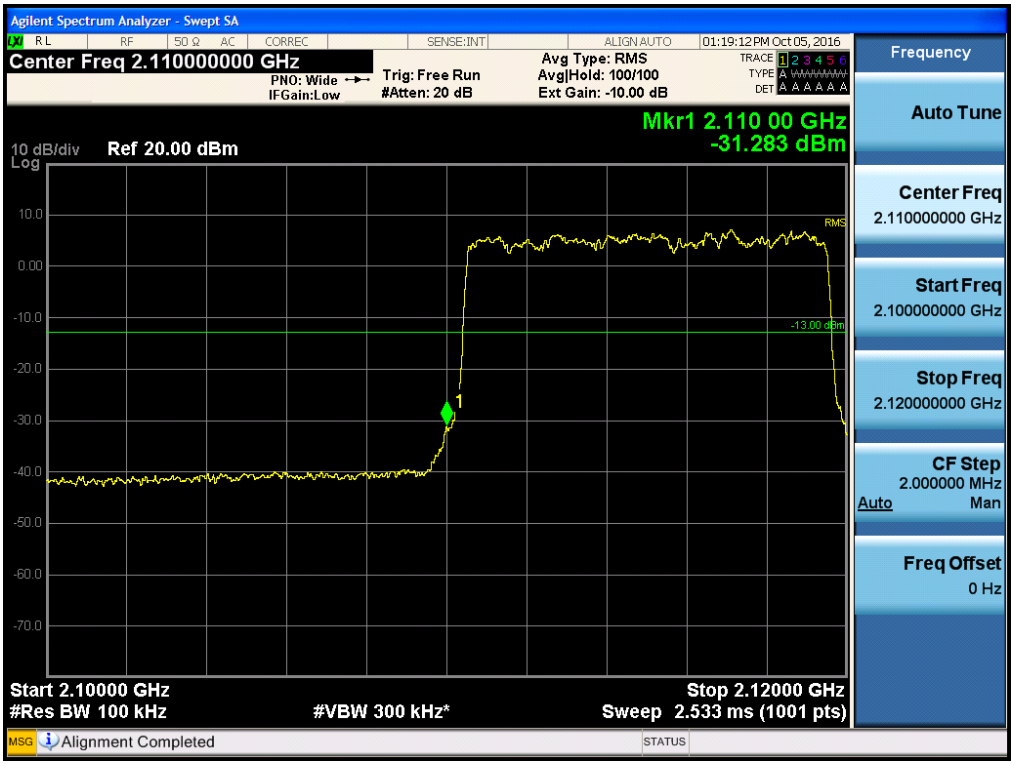

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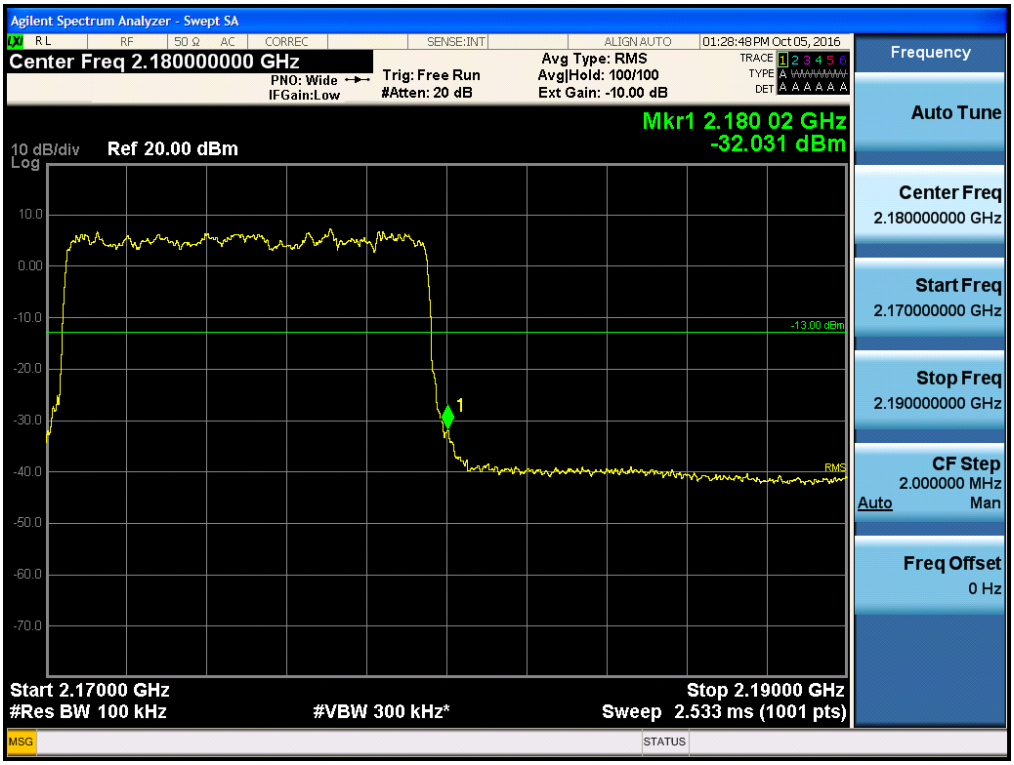

AWS2100_LTE 10M_64QAM

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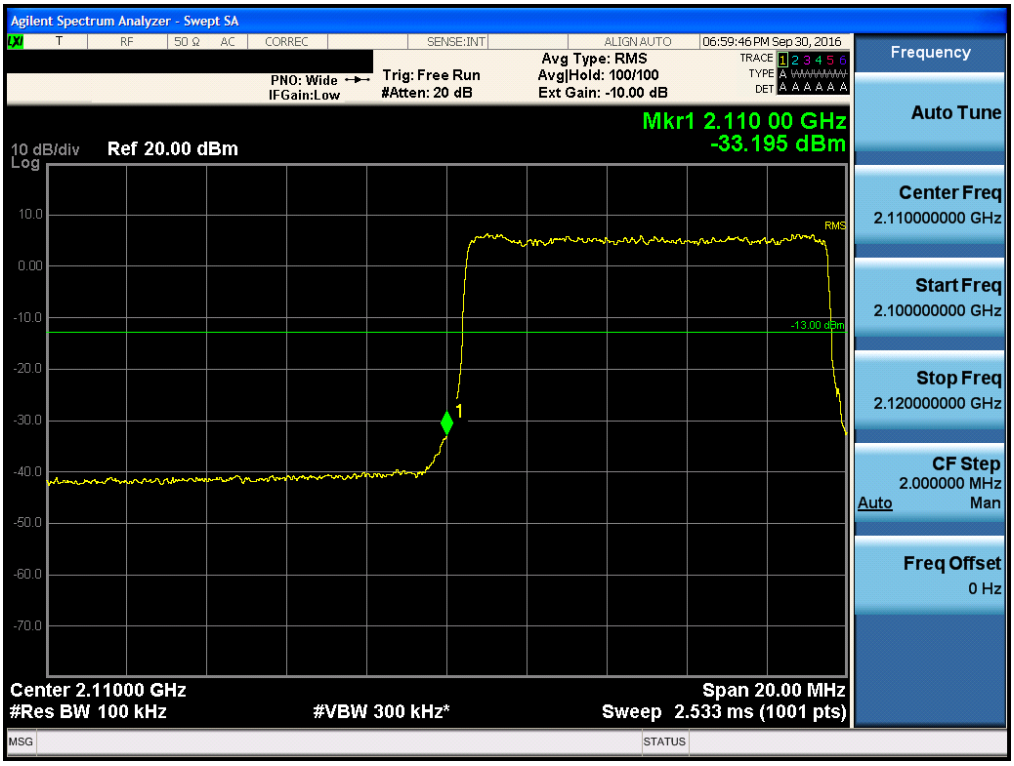

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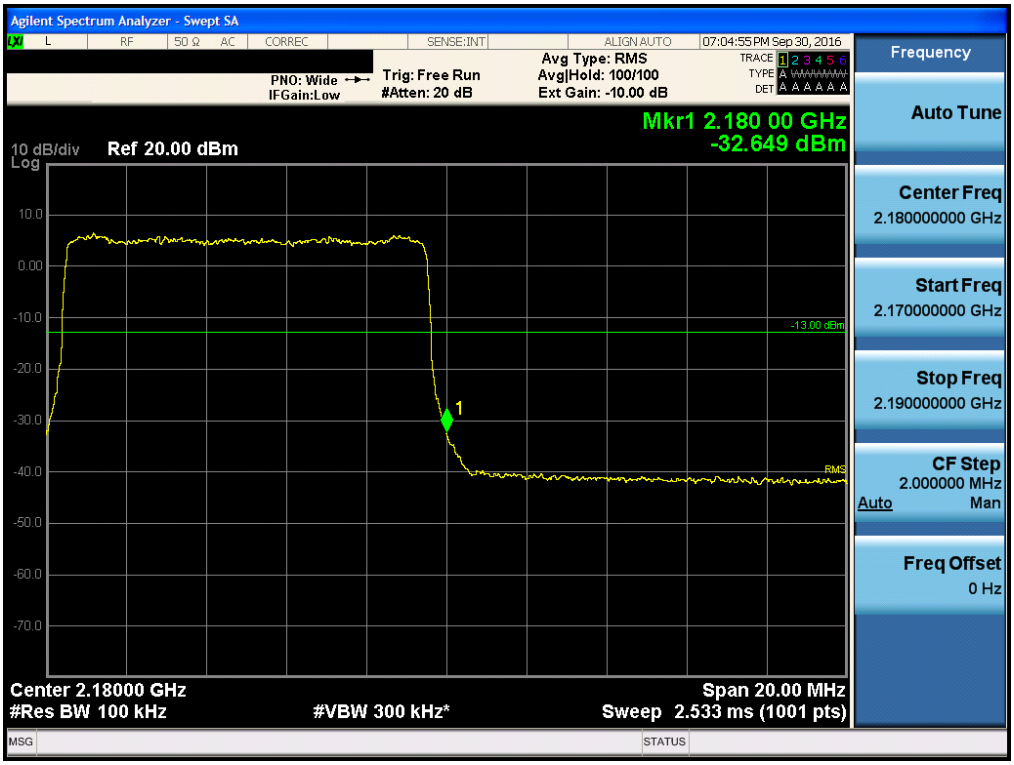

AWS2100_LTE 15M_QPSK

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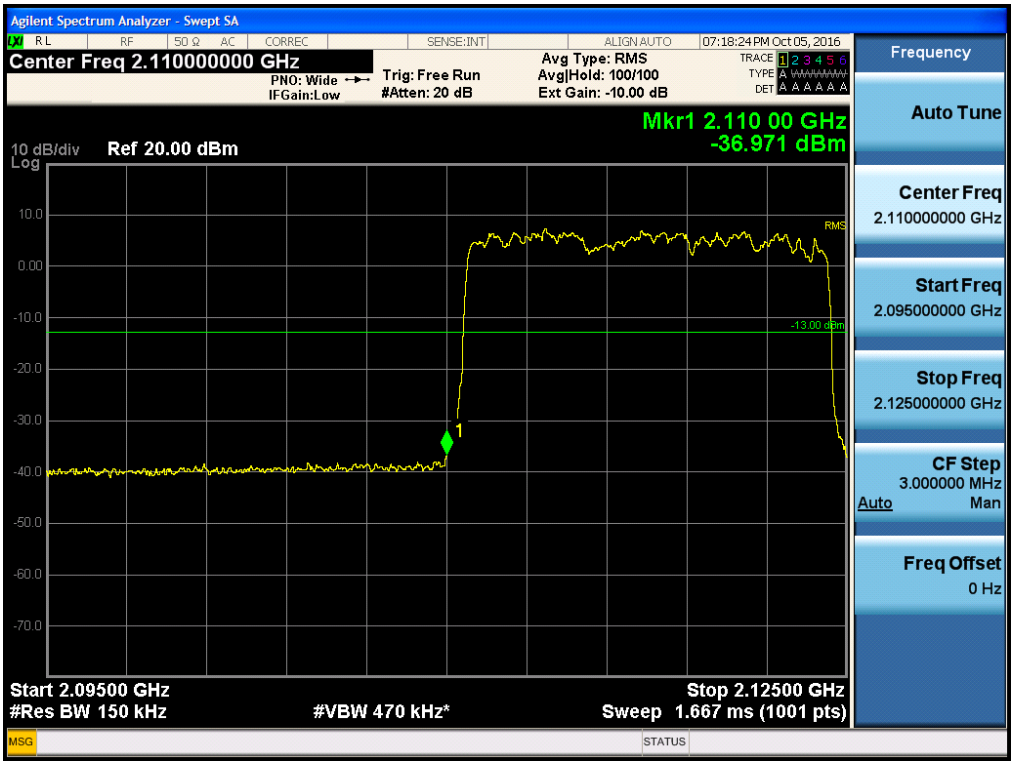

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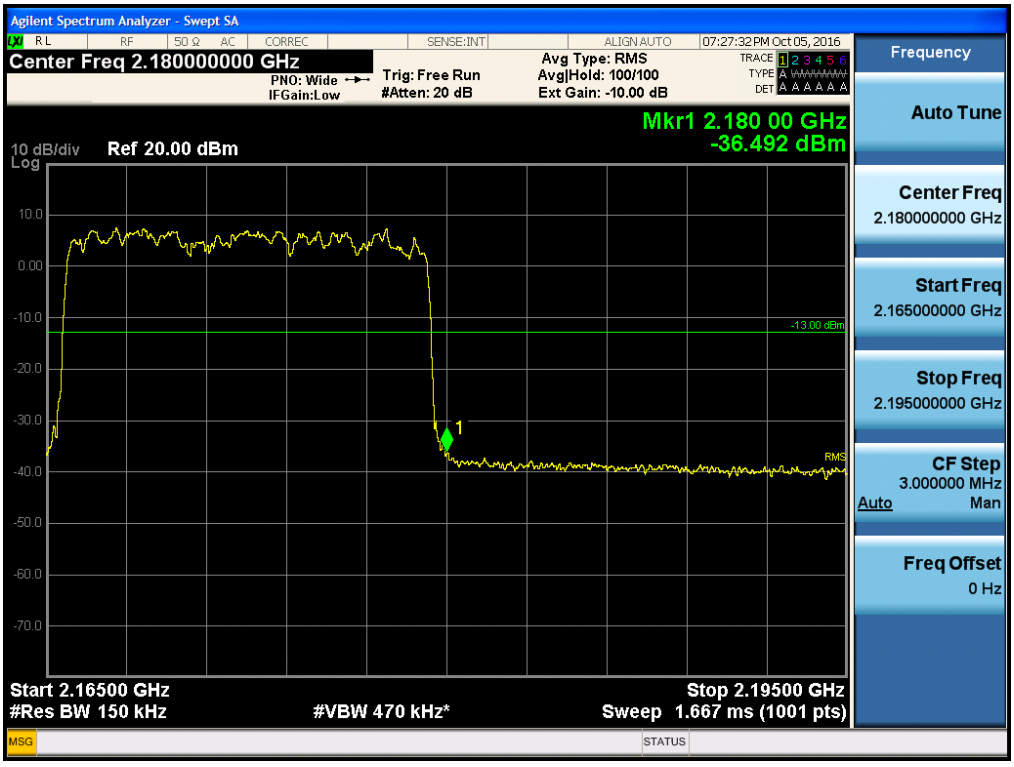

AWS2100_LTE 15M_16QAM

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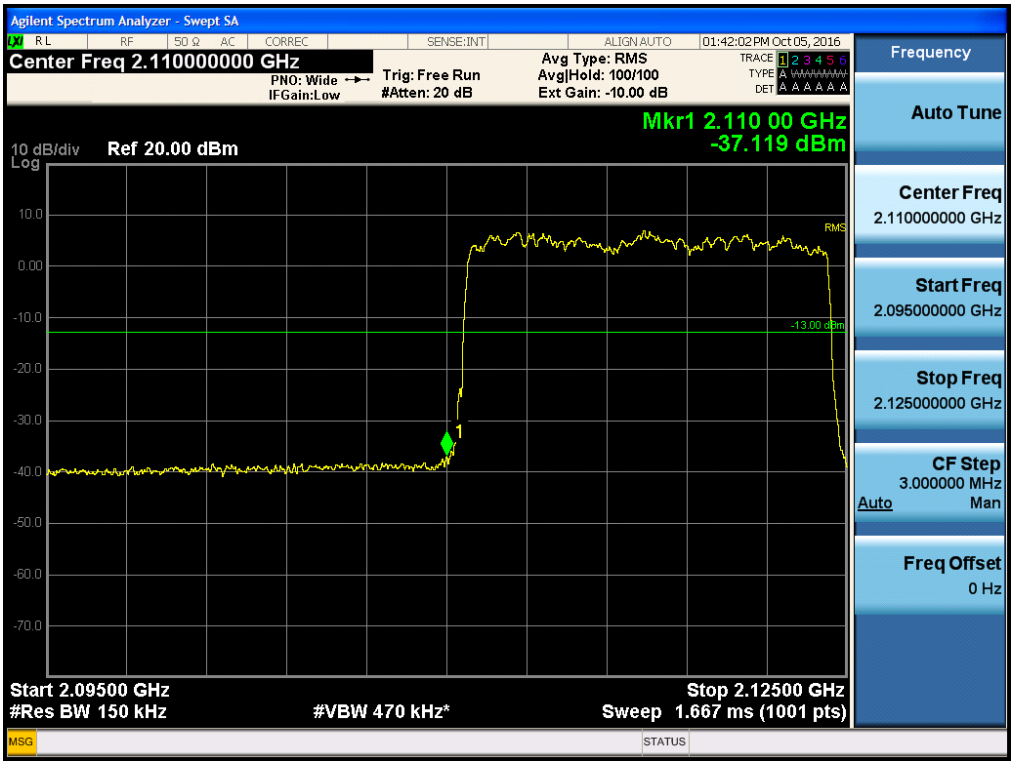

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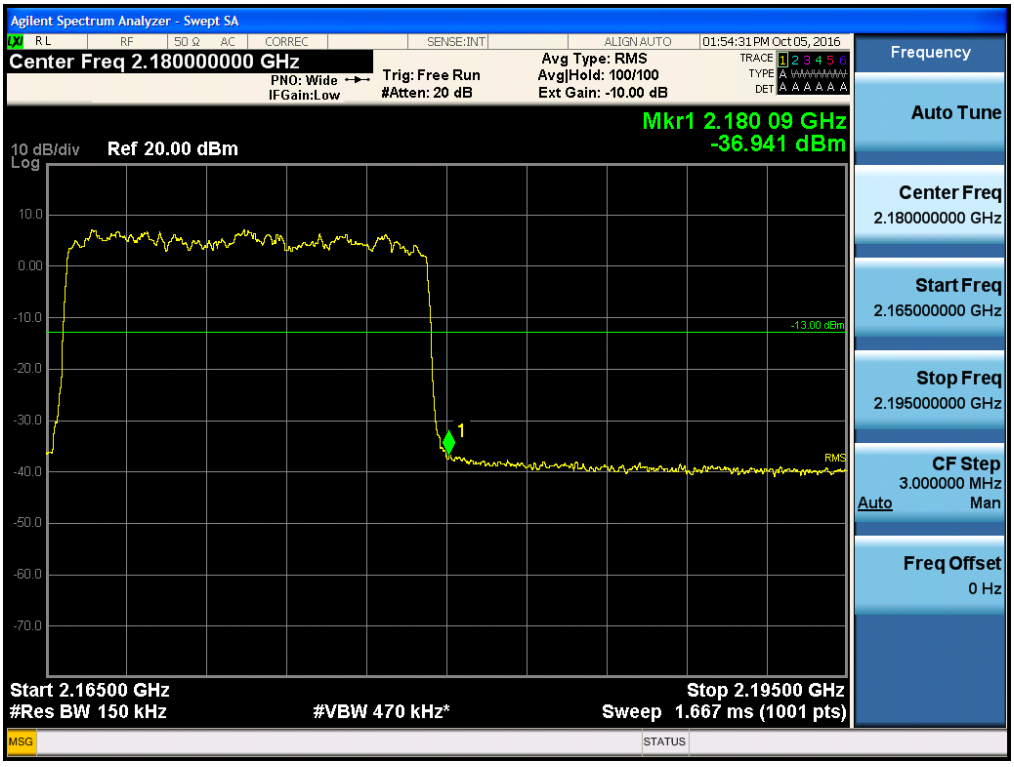

AWS2100_LTE 15M_64QAM

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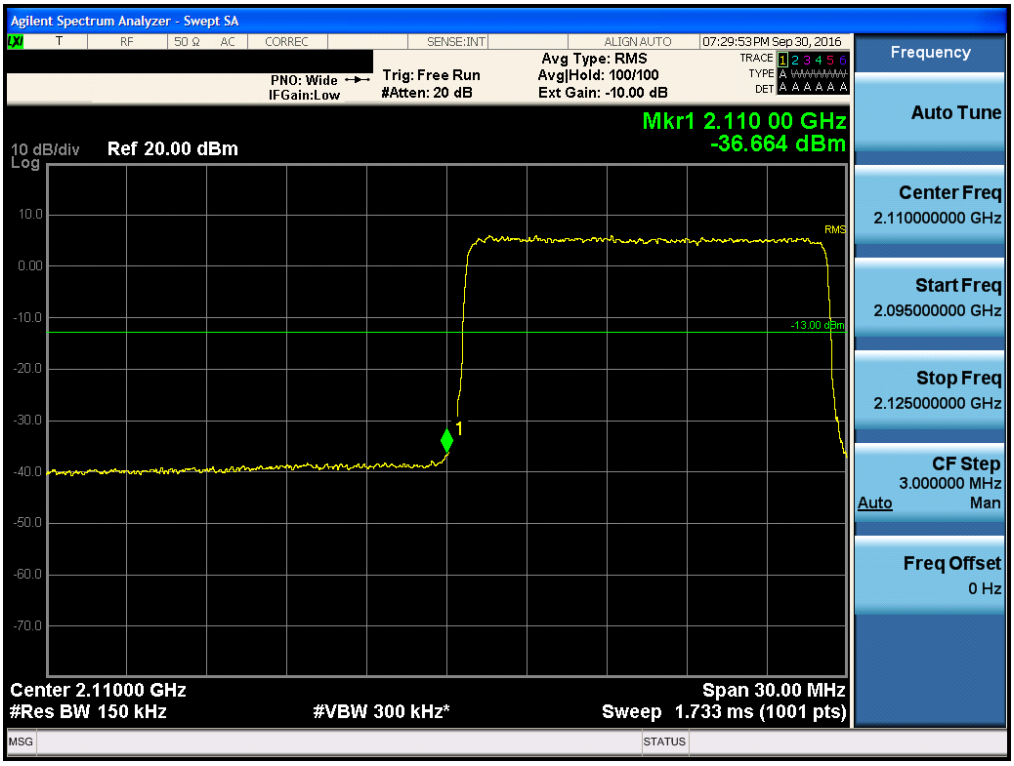

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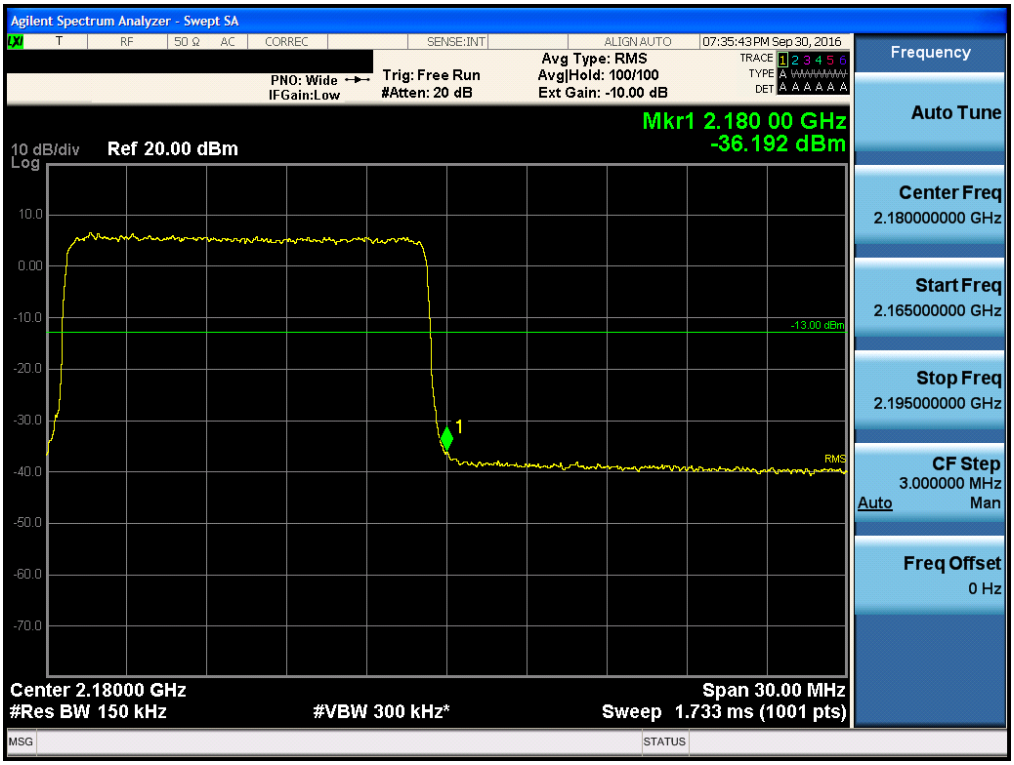

AWS2100_LTE 20M_QPSK

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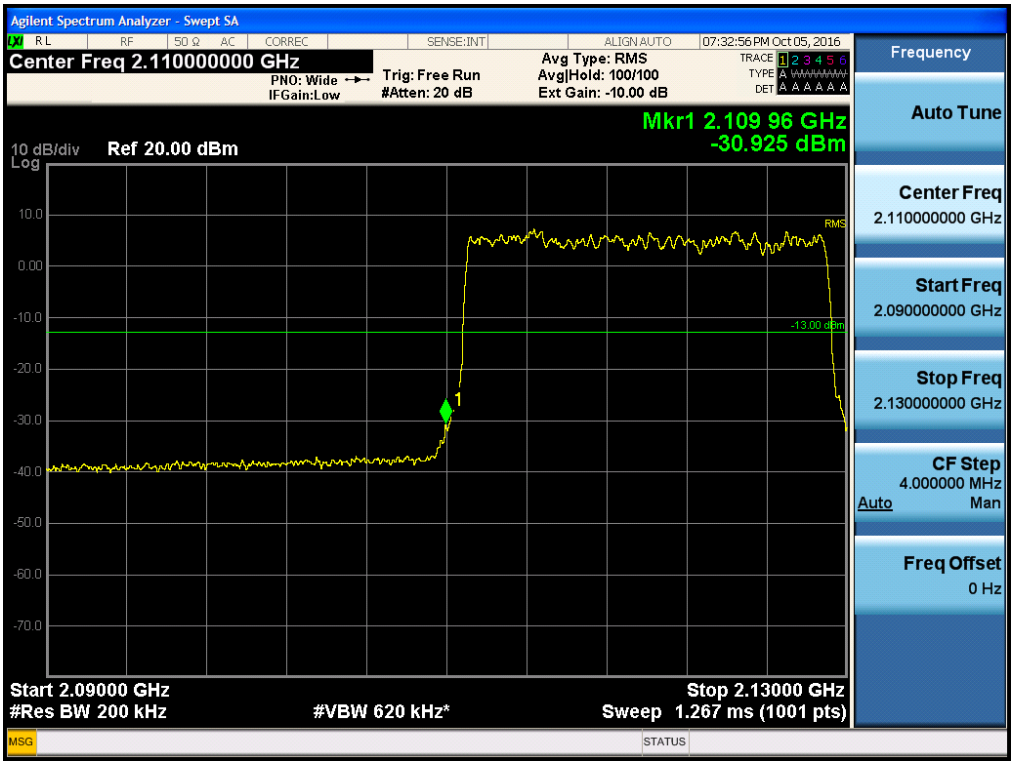

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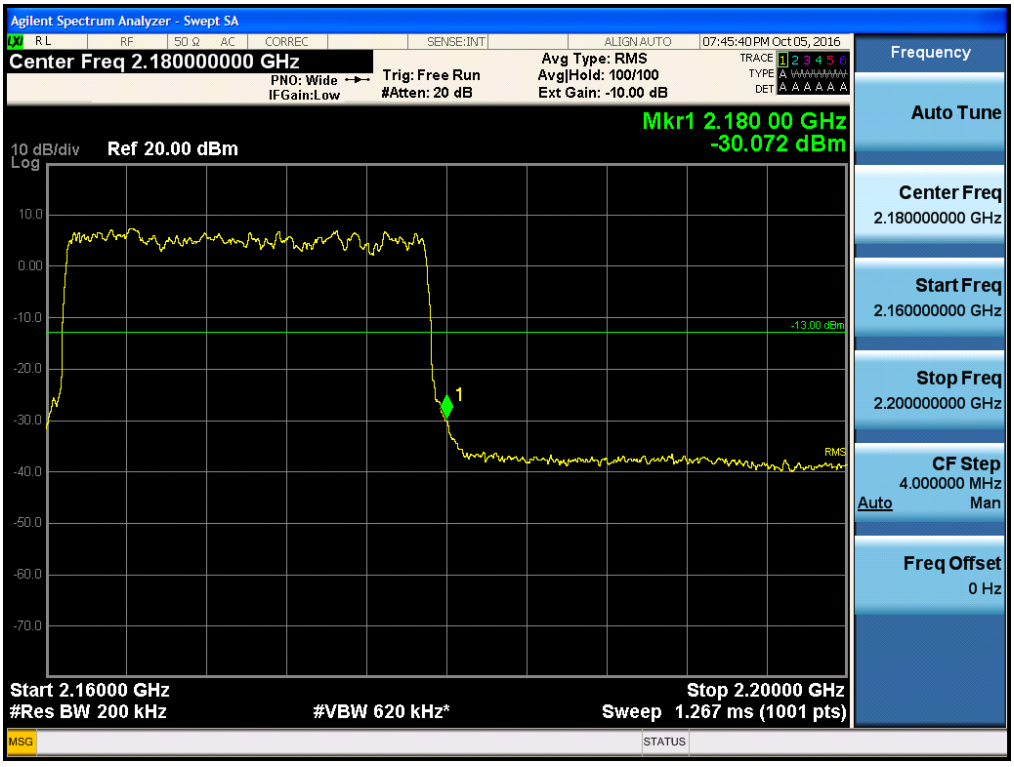

AWS2100_LTE 20M_16QAM

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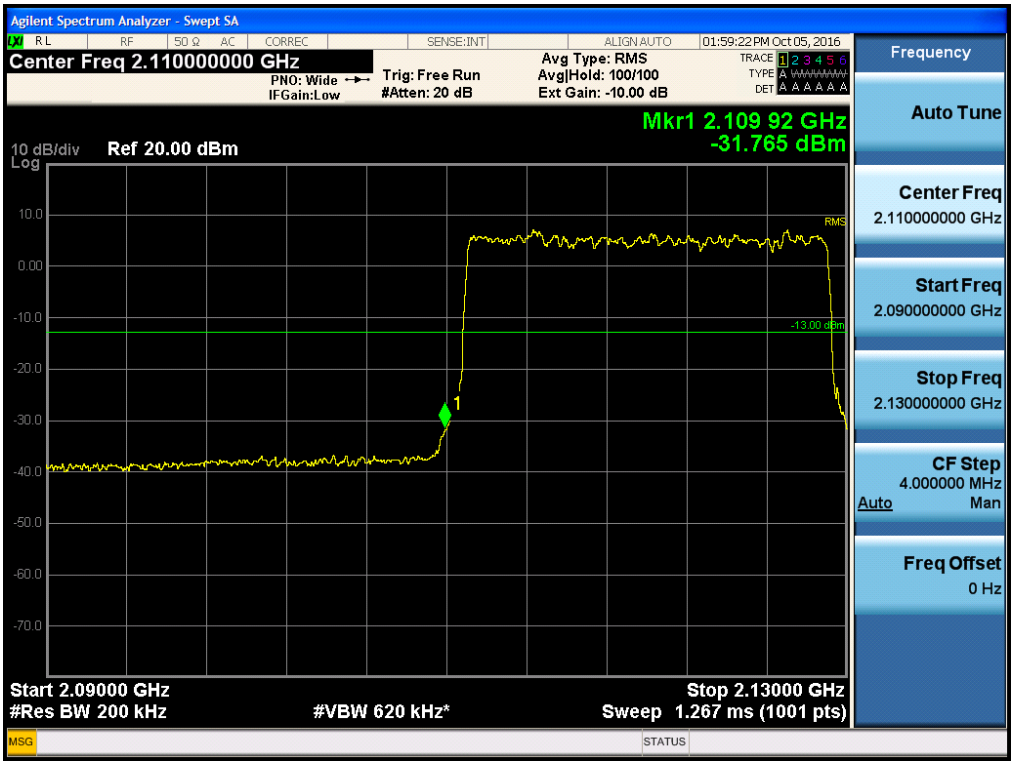

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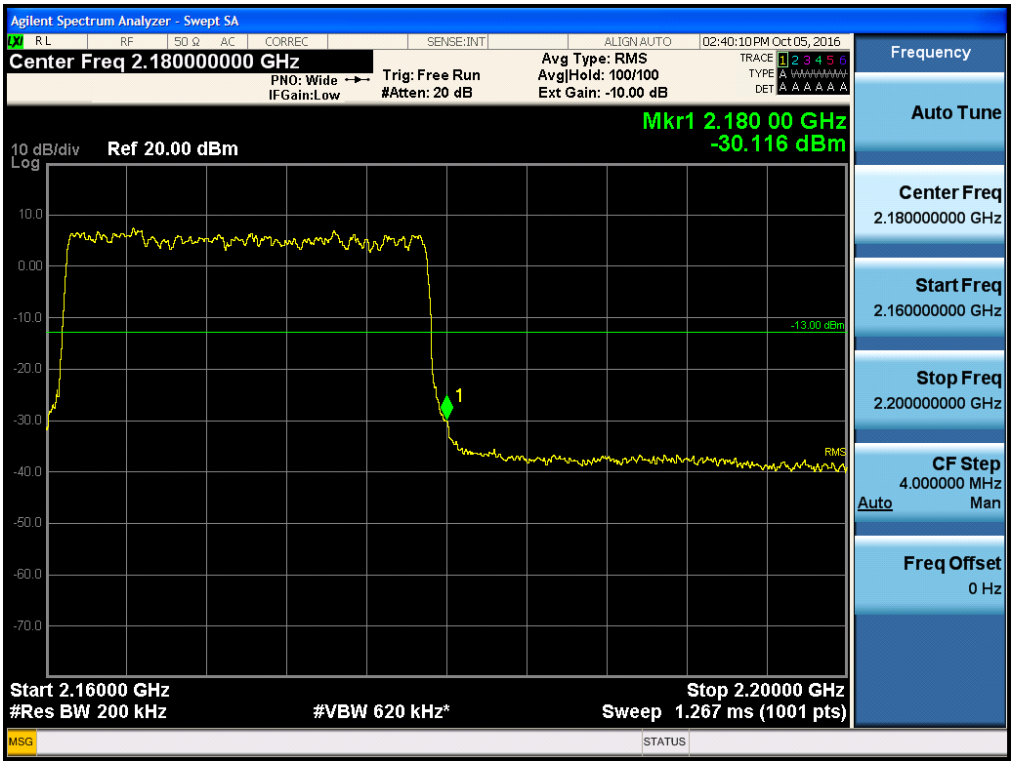

AWS2100_LTE 20M_64QAM

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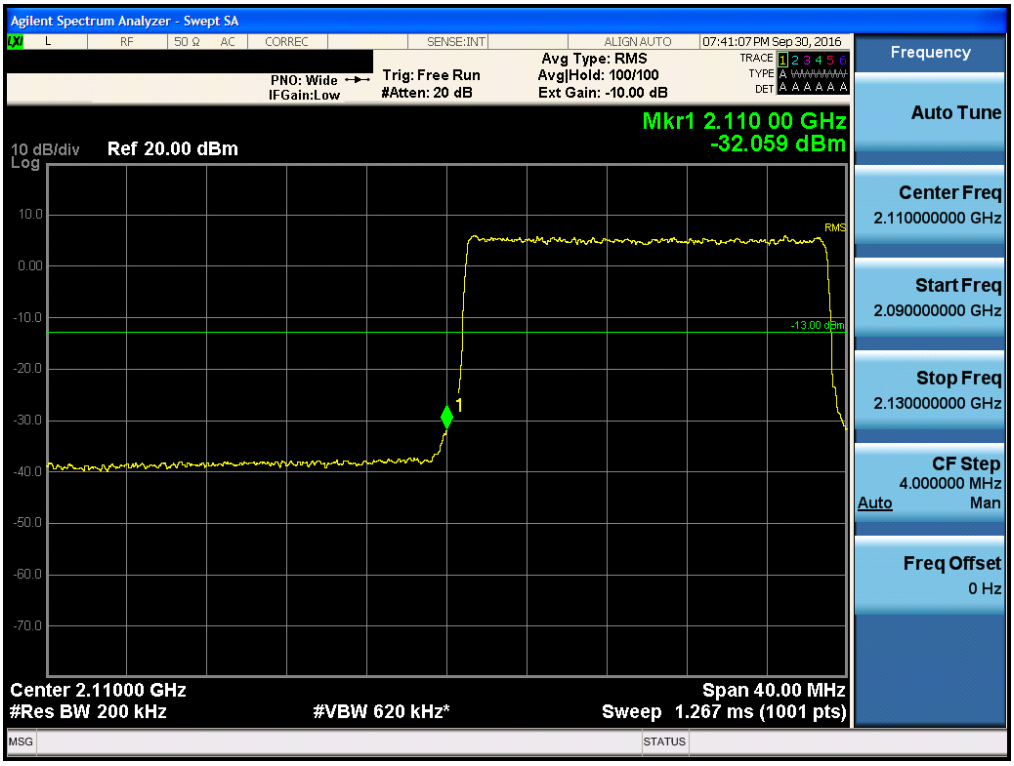

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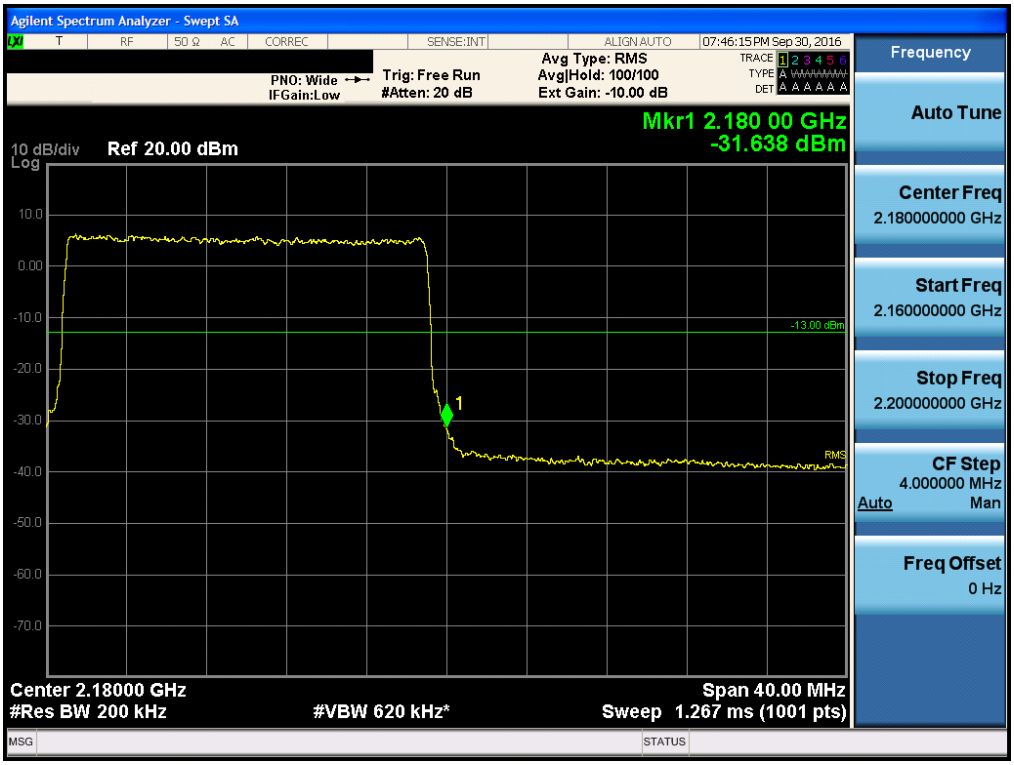


8. RADIATED SPURIOUS EMISSION

Test Requirements:

§24.238 Emission limitations for Broadband PCS equipment.

(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.

§27.53 Emission limits.

(h) *AWS emission limits*

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

(3) *Measurement procedure.*

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

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

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

Test Procedures:

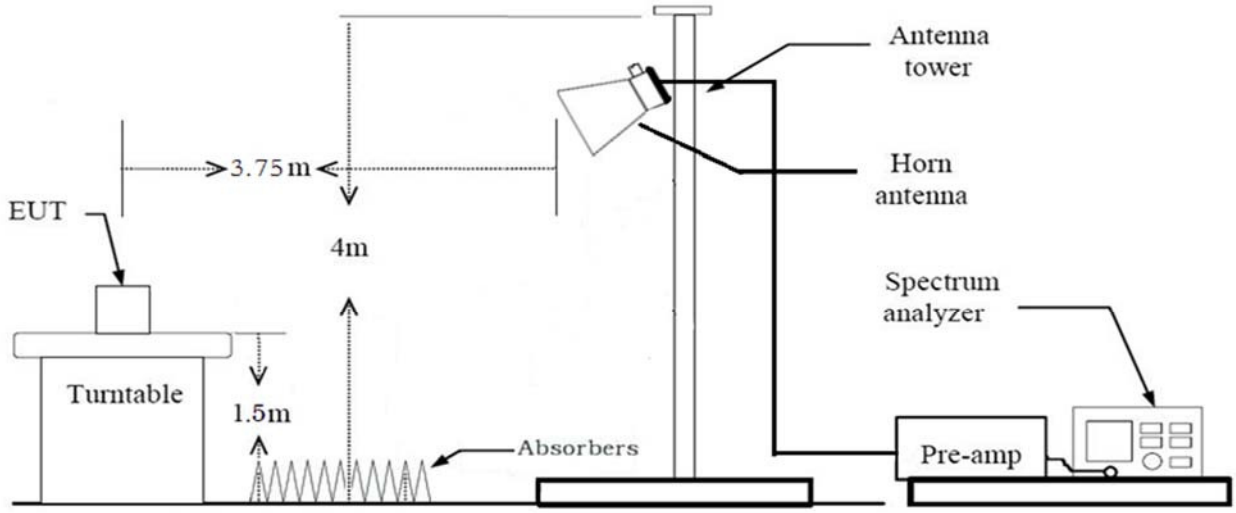
Radiated emission measurements were performed at an semi-anechoic chamber.

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 Results:

PCS Band

[LTE 5 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	3,865.00	82.19	-13.01	29.535	4.09	44.60	0.19	1.96	H	-21.835
Mid.	3,920.00	74.65	-20.55	29.680	4.02	45.04	-0.17	1.96	H	-30.100
High	3,975.00	65.69	-29.51	29.750	4.15	44.73	-0.10	1.96	H	-38.475

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[LTE 10 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	3,870.00	77.28	-17.92	29.510	4.08	44.67	0.15	1.96	H	-26.890
Mid.	3,920.00	73.14	-22.06	29.680	4.02	45.04	-0.17	1.96	H	-31.610
High	3,970.00	63.70	-31.50	29.750	4.18	44.76	-0.12	1.96	H	-40.490

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[LTE 15 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	3,875.00	74.15	-21.05	29.485	4.07	44.68	0.10	1.96	H	-30.115
Mid.	3,920.00	72.25	-22.95	29.680	4.02	45.04	-0.17	1.96	H	-32.500
High	3,965.00	62.82	-32.38	29.750	4.18	44.82	-0.15	1.96	H	-41.460

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[LTE 20 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	3,880.00	70.71	-24.49	29.460	4.06	44.68	0.05	1.96	H	-33.640
Mid.	3,920.00	69.83	-25.37	29.680	4.02	45.04	-0.17	1.96	H	-34.920
High	3,960.00	60.99	-34.21	29.750	4.18	44.88	-0.18	1.96	H	-43.380

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

AWS Band

[LTE 5 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	4,225.00	69.82	-25.38	30.025	4.14	44.92	-0.81	1.96	V	-34.985
Mid.	4,290.00	64.63	-30.57	29.978	3.53	44.56	-0.17	1.96	V	-39.832
High	4,355.00	60.52	-34.68	30.322	4.62	44.59	-0.360	1.96	V	-42.728

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[LTE 10 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	4,230.00	60.71	-34.49	30.018	4.10	44.93	-0.79	1.96	V	-44.132
Mid.	4,290.00	62.63	-32.57	29.978	3.53	44.56	-0.17	1.96	V	-41.832
High	4,350.00	58.48	-36.72	30.340	4.61	44.56	-0.36	1.96	V	-44.730

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[LTE 15 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	4,235.00	59.22	-35.98	30.011	4.06	44.95	-0.75	1.96	V	-45.649
Mid.	4,290.00	61.23	-33.97	29.978	3.53	44.56	-0.17	1.96	V	-43.232
High	4,345.00	56.42	-38.78	30.322	4.55	44.64	-0.48	1.96	V	-47.068

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

[LTE 20 MHz]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
Low	4,240.00	58.48	-36.72	30.004	4.01	44.96	-0.71	1.96	V	-46.416
Mid.	4,290.00	60.39	-34.81	29.978	3.53	44.56	-0.17	1.96	V	-44.072
High	4,340.00	56.62	-38.58	30.304	4.49	44.71	-0.60	1.96	V	-47.136

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

Notes:

1. We have done all test case. Test datas were only the worst case.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

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.

§24.235 Frequency stability.

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

§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:

Frequency Stability over Temperature variation:

The equipment under test was connected to an external DC power supply and the RF output was connected to a Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 30 minutes, the frequency output was recorded from the VSA8960 S/W via MXA Signal Analyzer.

Frequency stability over Voltage variation: An external variable DC power supply Source. The voltage was set to 85% and 115% of the nominal value. The output frequency was recorded for each voltage.

Test Results:

PCS Band

Modulation: QPSK

Reference: - 48 Vdc at 20°c **Freq.** = 1960,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	1959 999 999	-1.210	0.000	0.00000
	-30	1959 999 998	-2.277	-2.289	-0.00088
	-20	1959 999 997	-3.002	-3.014	-0.00116
	-10	1959 999 997	-2.629	-2.641	-0.00102
	0	1959 999 999	-1.467	-1.479	-0.00057
	+10	1960 000 001	1.340	1.328	0.00051
	+30	1960 000 002	1.887	1.875	0.00072
	+40	1959 999 996	-3.569	-3.581	-0.00138
	+50	1959 999 996	-3.814	-3.826	-0.00148
115%	+20	1959 999 998	-1.862	-1.874	-0.00072
85%	+20	1959 999 998	-2.093	-2.105	-0.00081

Modulation: 16QAM

Reference: - 48 Vdc at 20°c **Freq.** = 1960,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	1959 999 998	-1.782	0.000	0.00000
	-30	1960 000 001	1.313	1.301	0.00050
	-20	1959 999 997	-2.886	-2.898	-0.00112
	-10	1960 000 002	2.035	2.023	0.00078
	0	1959 999 998	-2.137	-2.149	-0.00083
	+10	1959 999 998	-1.892	-1.904	-0.00073
	+30	1960 000 003	3.360	3.348	0.00129
	+40	1959 999 999	-0.967	-0.979	-0.00038
	+50	1959 999 998	-1.552	-1.564	-0.00060
115%	+20	1959 999 998	-2.072	-2.084	-0.00080
85%	+20	1960 000 002	1.833	1.821	0.00070

Modulation: 64QAM

Reference: - 48 Vdc at 20°c **Freq.** = 1960,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	1959 999 998	-2.319	0.000	0.00000
	-30	1960 000 002	1.860	1.848	0.00071
	-20	1959 999 998	-1.522	-1.534	-0.00059
	-10	1959 999 997	-2.937	-2.949	-0.00114
	0	1960 000 003	3.005	2.993	0.00115
	+10	1959 999 999	-0.811	-0.823	-0.00032
	+30	1960 000 002	2.226	2.214	0.00085
	+40	1959 999 998	-1.966	-1.978	-0.00076
	+50	1960 000 002	1.597	1.585	0.00061
115%	+20	1960 000 003	2.667	2.655	0.00102
85%	+20	1959 999 998	-2.003	-2.015	-0.00078

AWS Band

Modulation: QPSK

Reference: - 48 Vdc at 20°C **Freq.** = 2145,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2145 000 000	0.212	0.000	0.00000
	-30	2144 999 998	-1.765	-1.777	-0.00069
	-20	2144 999 999	-1.101	-1.113	-0.00043
	-10	2145 000 000	0.403	0.391	0.00015
	0	2145 000 001	1.013	1.001	0.00039
	+10	2145 000 002	2.046	2.034	0.00078
	+30	2145 000 003	3.109	3.097	0.00119
	+40	2144 999 999	-1.117	-1.129	-0.00044
	+50	2144 999 998	-1.966	-1.978	-0.00076
115%	+20	2145 000 000	0.011	-0.001	0.00000
85%	+20	2145 000 000	0.131	0.119	0.00005

Modulation: 16QAM

Reference: - 48 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	0.529	0.000	0.00000
	-30	2145 000 001	1.002	0.990	0.00038
	-20	2144 999 998	-2.227	-2.239	-0.00086
	-10	2144 999 998	-2.042	-2.054	-0.00079
	0	2144 999 999	-1.372	-1.384	-0.00053
	+10	2145 000 001	1.205	1.193	0.00046
	+30	2145 000 002	2.469	2.457	0.00095
	+40	2145 000 004	3.521	3.509	0.00135
	+50	2145 000 003	2.862	2.850	0.00110
115%	+20	2145 000 001	0.772	0.760	0.00029
85%	+20	2145 000 001	0.697	0.685	0.00026

Modulation: 64QAM

Reference: - 48 Vdc at 20°c **Freq.** = 2145,000,000 Hz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2144 999 998	-1.690	0.000	0.00000
	-30	2145 000 003	3.361	3.349	0.00129
	-20	2145 000 003	3.052	3.040	0.00117
	-10	2145 000 003	2.829	2.817	0.00109
	0	2145 000 002	2.172	2.160	0.00083
	+10	2145 000 002	1.963	1.951	0.00075
	+30	2144 999 999	-1.363	-1.375	-0.00053
	+40	2144 999 998	-2.033	-2.045	-0.00079
	+50	2144 999 999	-0.967	-0.979	-0.00038
115%	+20	2144 999 999	-1.384	-1.396	-0.00054
85%	+20	2144 999 998	-1.840	-1.852	-0.00071

Note:

The results of the frequency stability test shown above the frequency deviation measured values are very small and similer trend for each port, so attached datas were only the port 0, DC power test result.