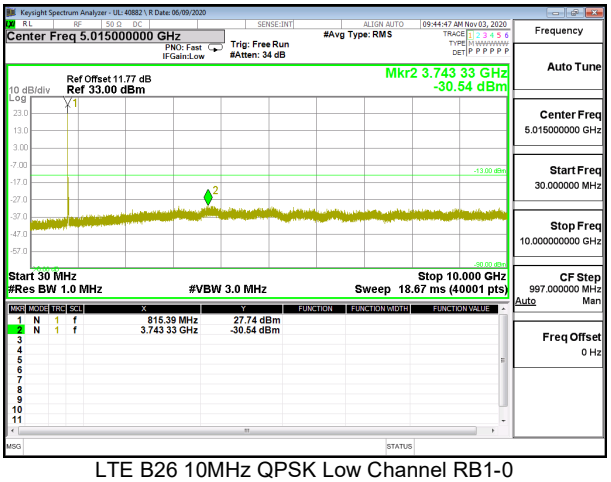
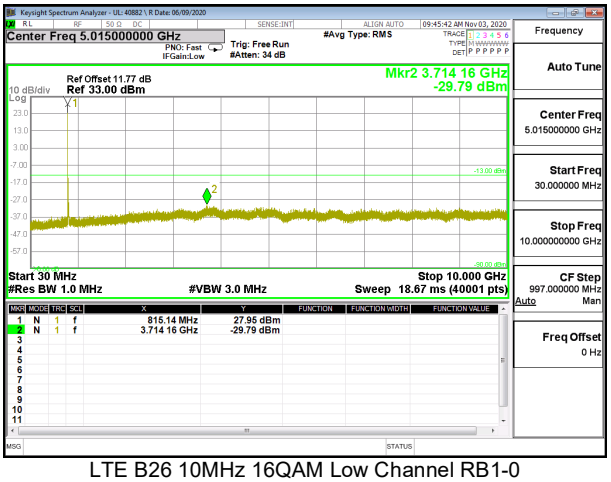
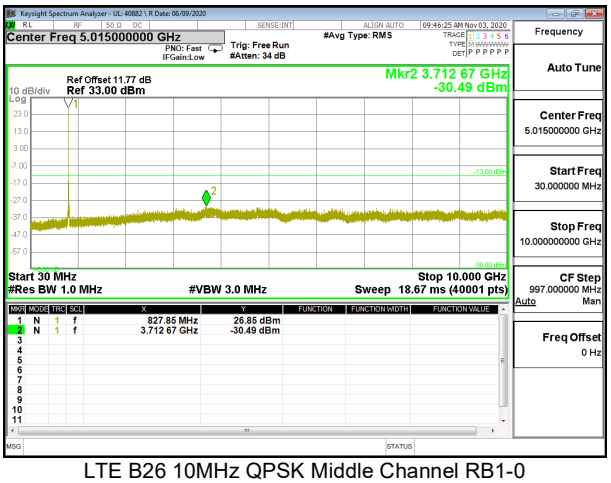


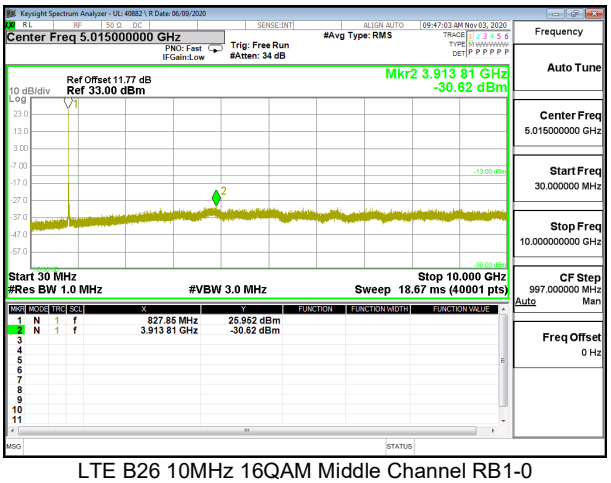
LTE B26 10MHz QPSK Low Channel RB1-0



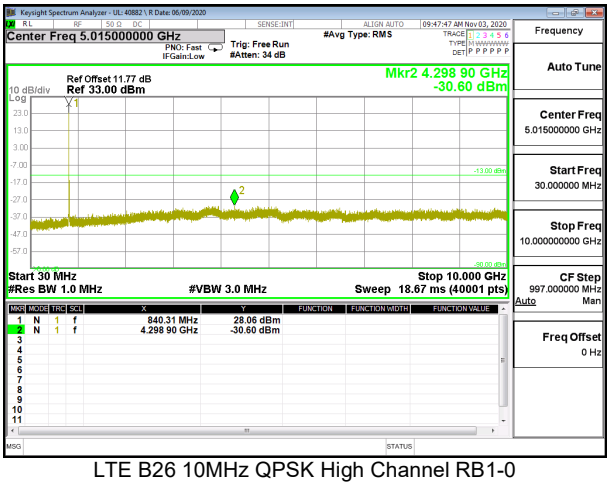
LTE B26 10MHz 16QAM Low Channel RB1-0



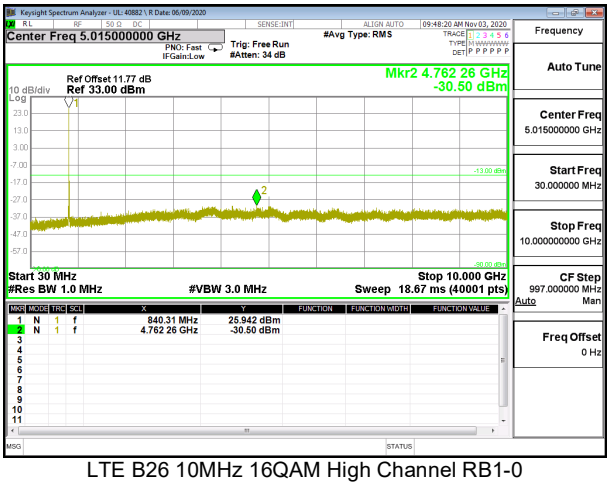
LTE B26 10MHz QPSK Middle Channel RB1-0



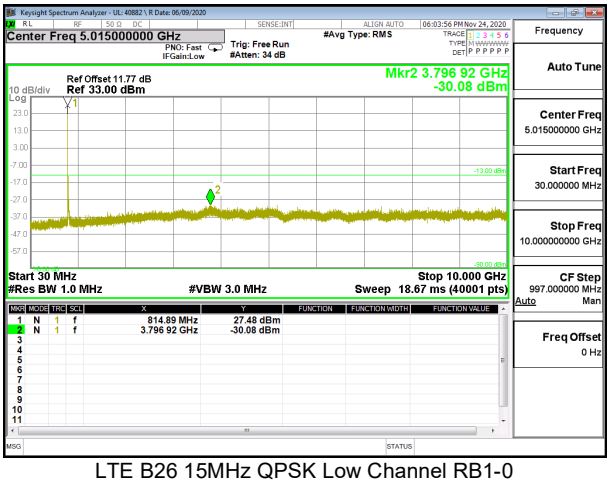
LTE B26 10MHz 16QAM Middle Channel RB1-0



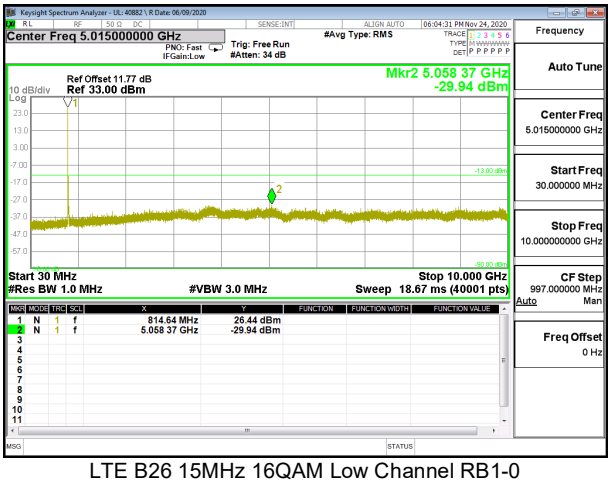
LTE B26 10MHz QPSK High Channel RB1-0



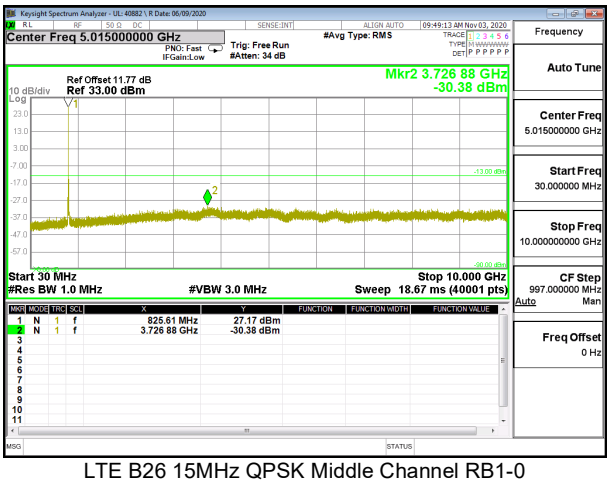
LTE B26 10MHz 16QAM High Channel RB1-0



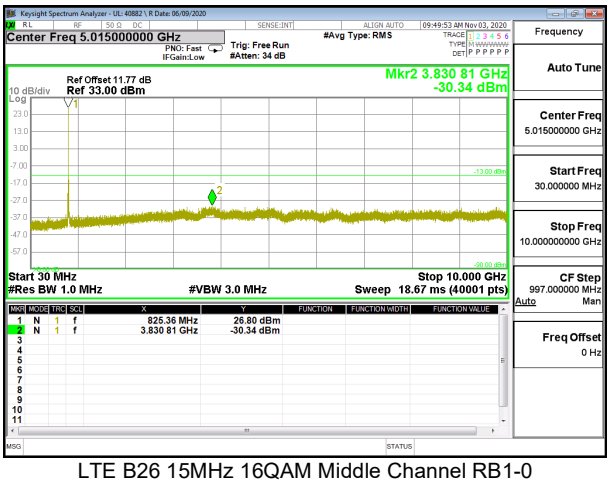
LTE B26 15MHz QPSK Low Channel RB1-0



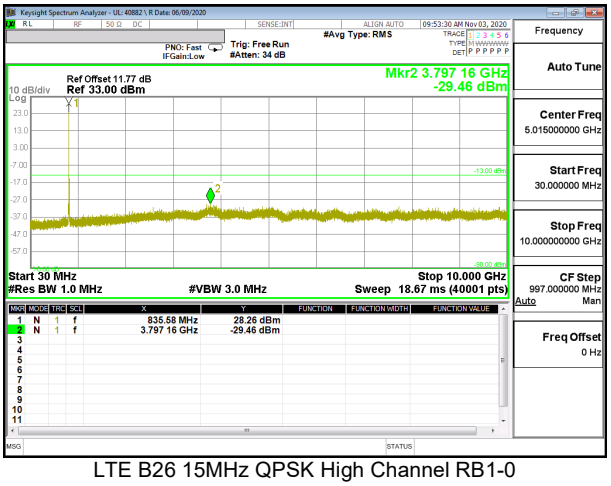
LTE B26 15MHz 16QAM Low Channel RB1-0



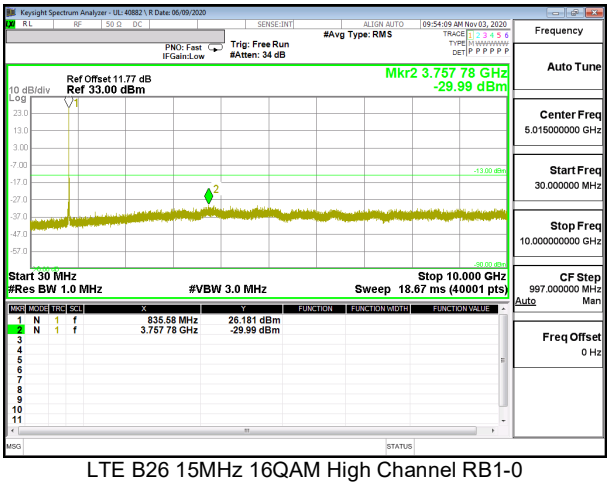
LTE B26 15MHz QPSK Middle Channel RB1-0



LTE B26 15MHz 16QAM Middle Channel RB1-0

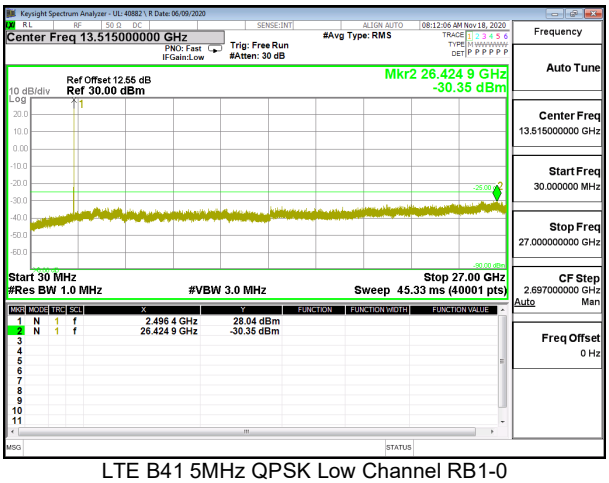


LTE B26 15MHz QPSK High Channel RB1-0

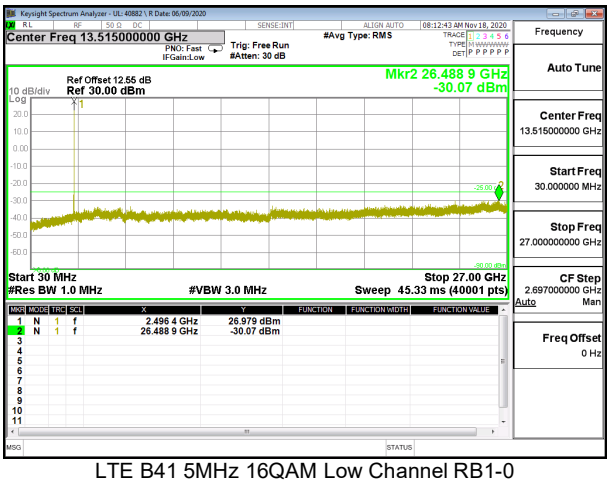


LTE B26 15MHz 16QAM High Channel RB1-0

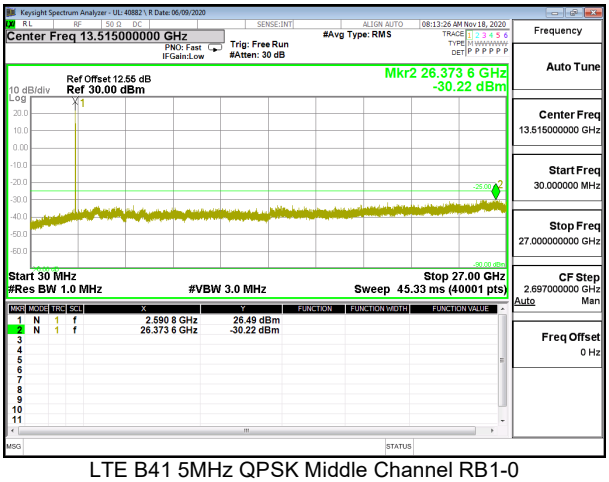
8.3.5. LTE BAND 41 (FCC)



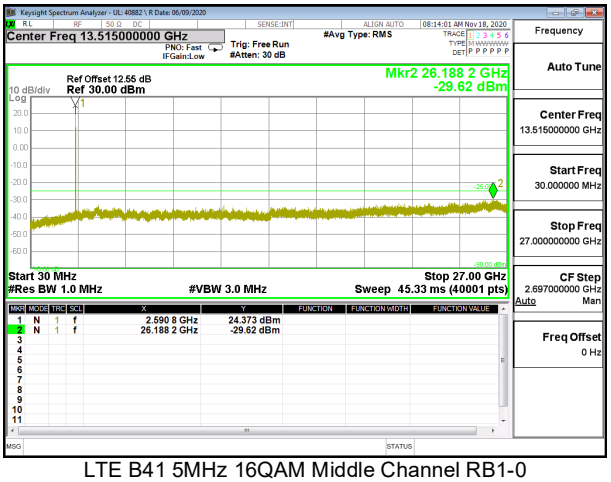
LTE B41 5MHz QPSK Low Channel RB1-0



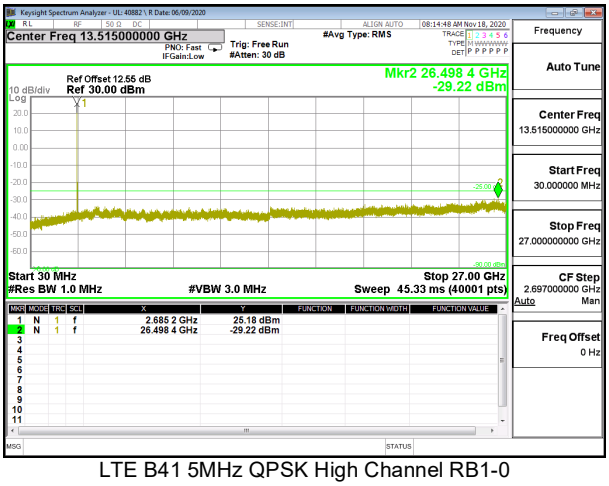
LTE B41 5MHz 16QAM Low Channel RB1-0



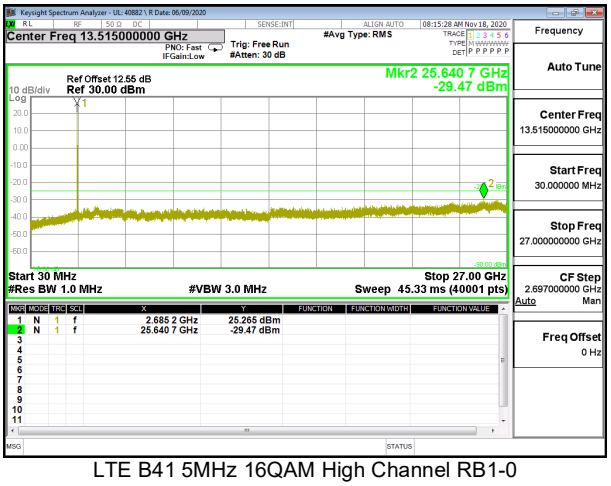
LTE B41 5MHz QPSK Middle Channel RB1-0



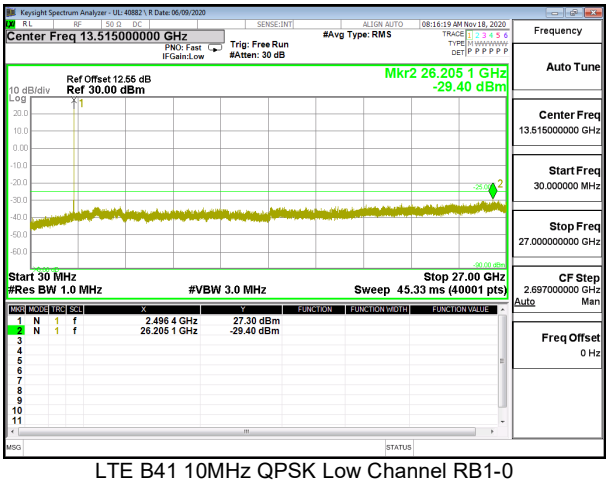
LTE B41 5MHz 16QAM Middle Channel RB1-0



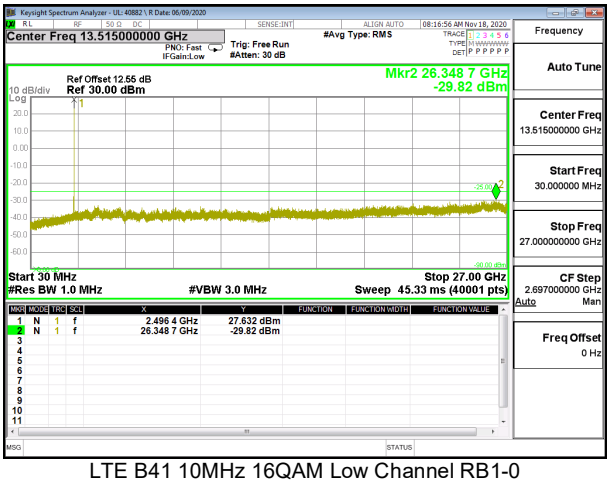
LTE B41 5MHz QPSK High Channel RB1-0



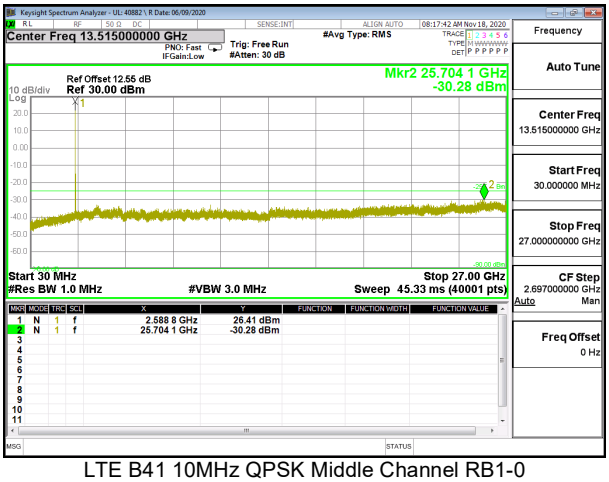
LTE B41 5MHz 16QAM High Channel RB1-0



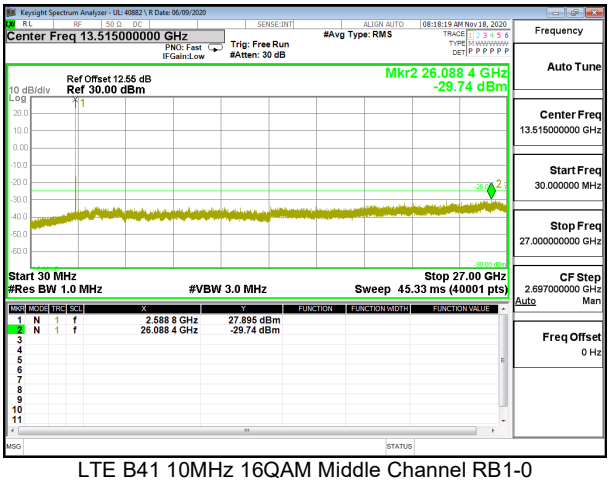
LTE B41 10MHz QPSK Low Channel RB1-0



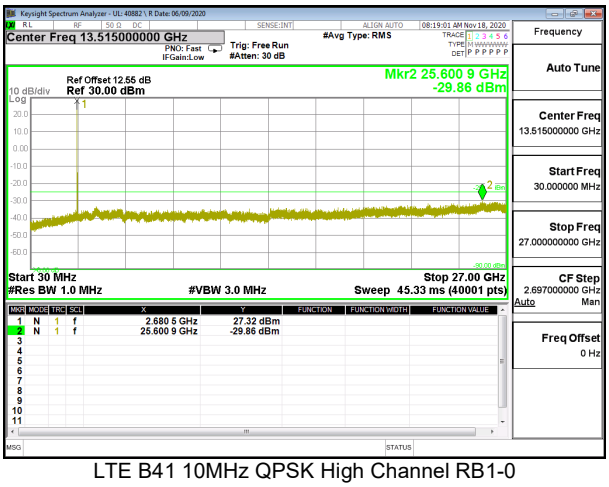
LTE B41 10MHz 16QAM Low Channel RB1-0



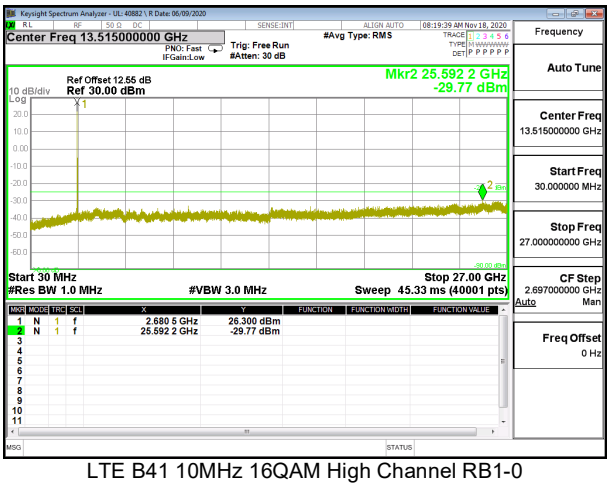
LTE B41 10MHz QPSK Middle Channel RB1-0



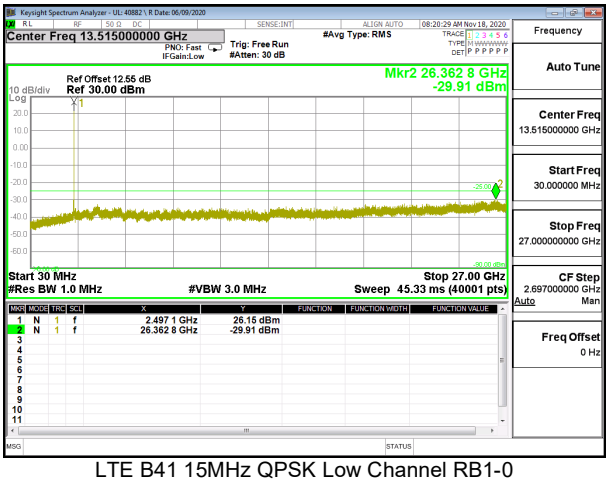
LTE B41 10MHz 16QAM Middle Channel RB1-0



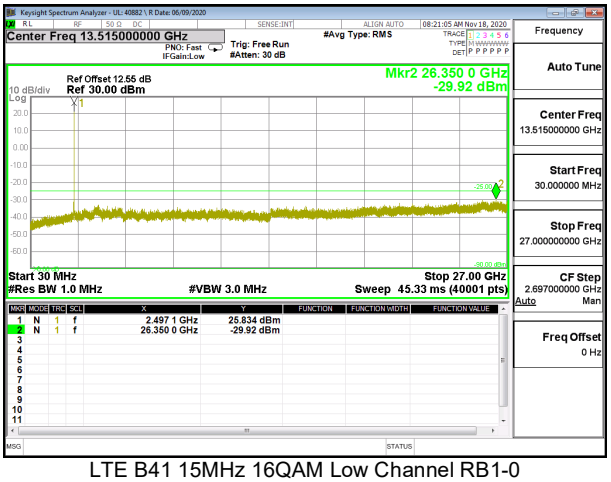
LTE B41 10MHz QPSK High Channel RB1-0



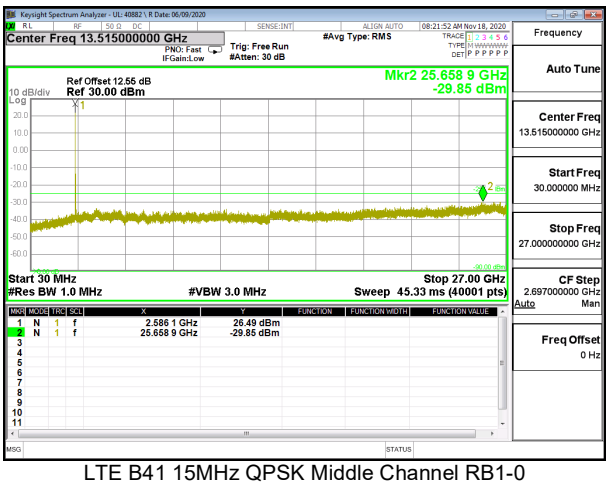
LTE B41 10MHz 16QAM High Channel RB1-0



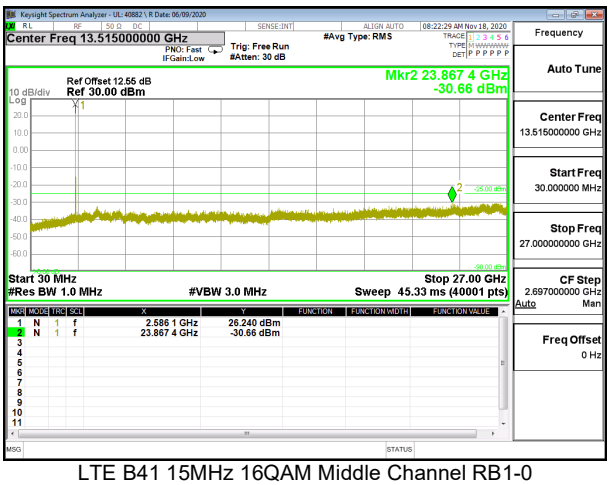
LTE B41 15MHz QPSK Low Channel RB1-0



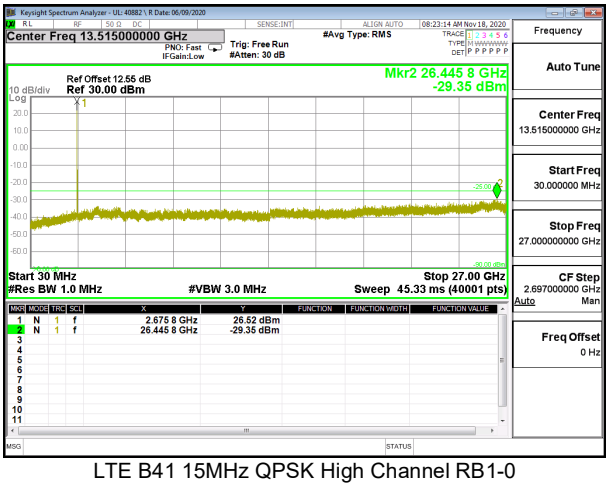
LTE B41 15MHz 16QAM Low Channel RB1-0



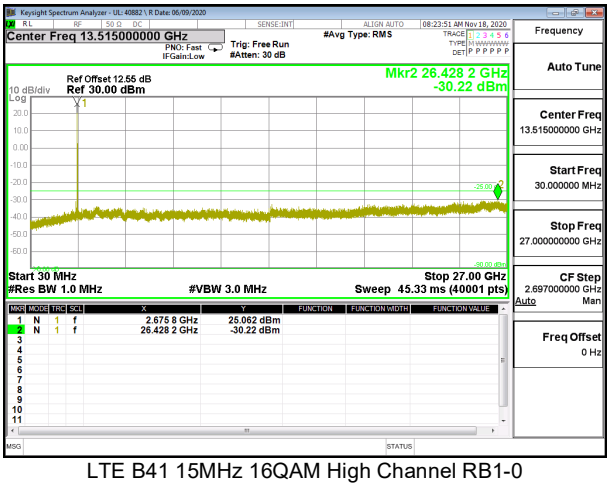
LTE B41 15MHz QPSK Middle Channel RB1-0



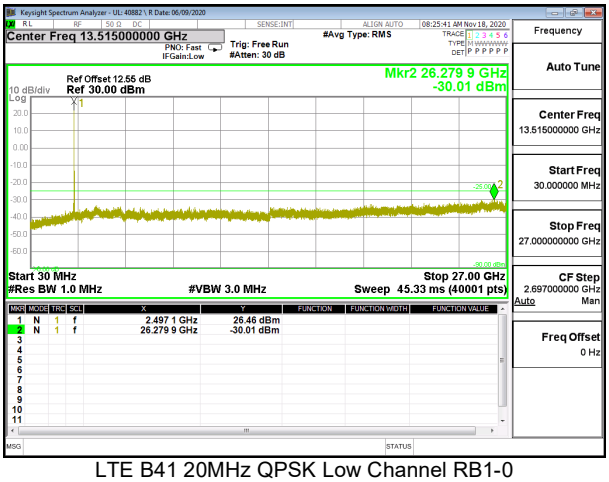
LTE B41 15MHz 16QAM Middle Channel RB1-0



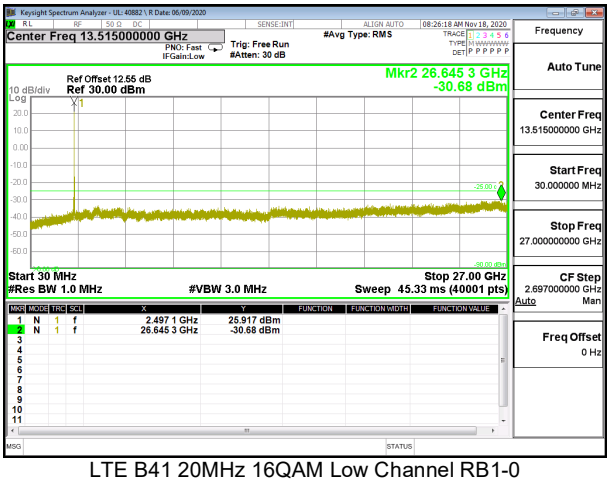
LTE B41 15MHz QPSK High Channel RB1-0



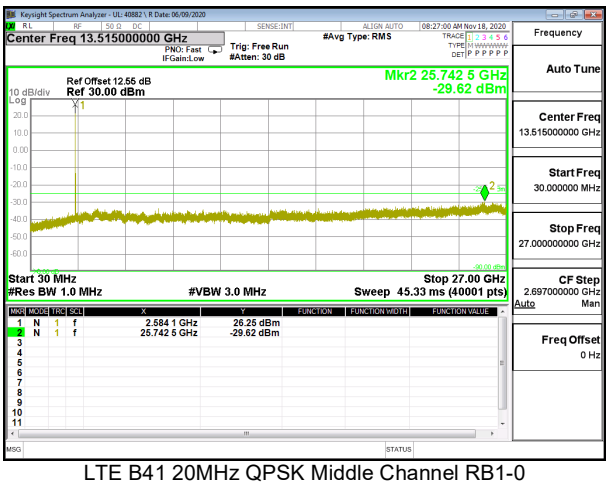
LTE B41 15MHz 16QAM High Channel RB1-0



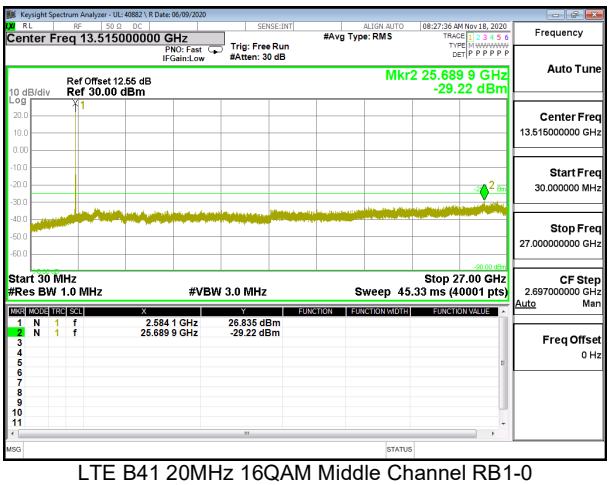
LTE B41 20MHz QPSK Low Channel RB1-0



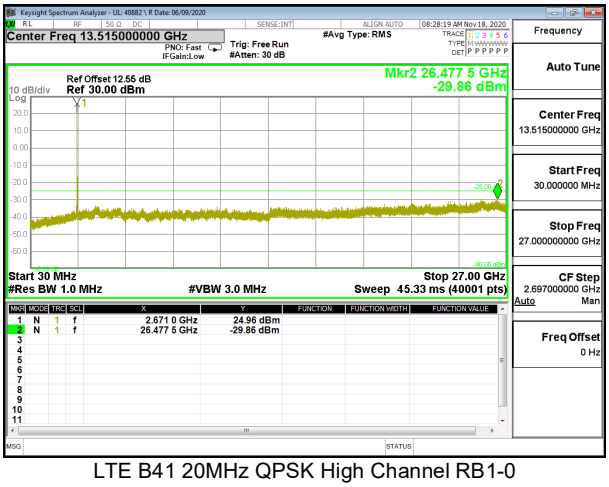
LTE B41 20MHz 16QAM Low Channel RB1-0



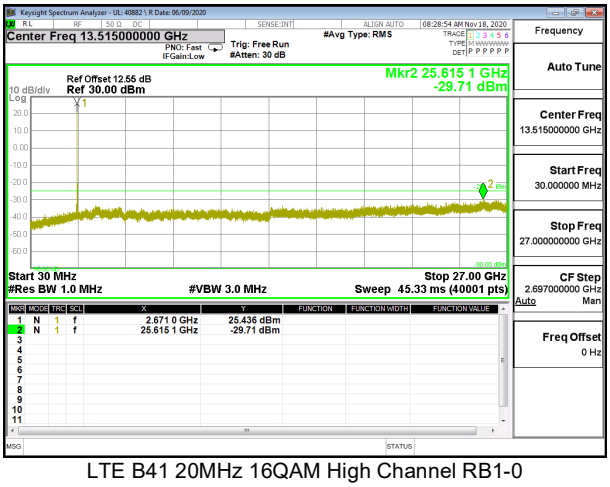
LTE B41 20MHz QPSK Middle Channel RB1-0



LTE B41 20MHz 16QAM Middle Channel RB1-0

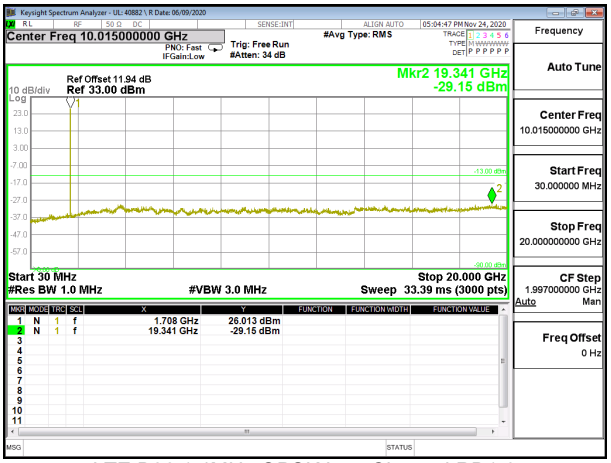


LTE B41 20MHz QPSK High Channel RB1-0

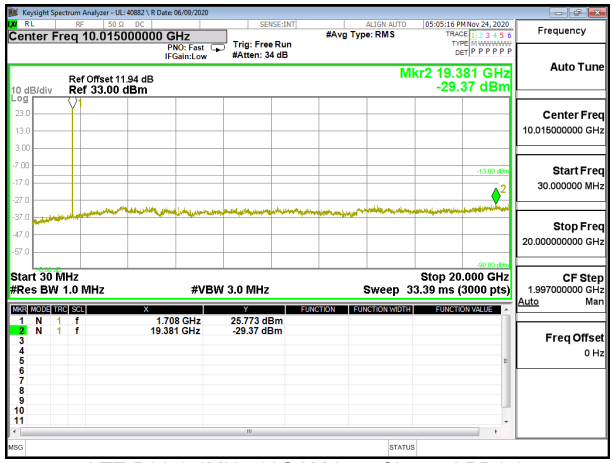


LTE B41 20MHz 16QAM High Channel RB1-0

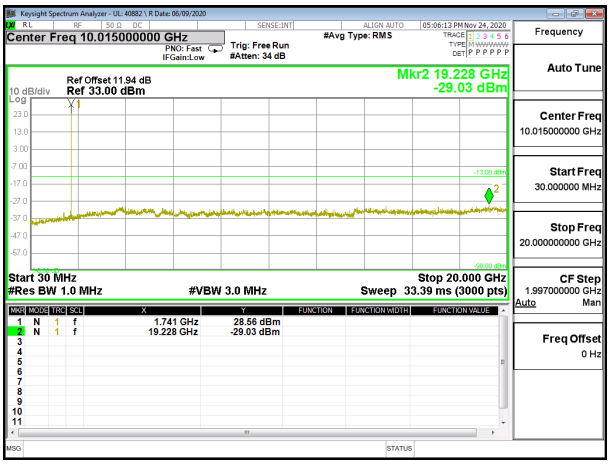
8.3.6. LTE BAND 66



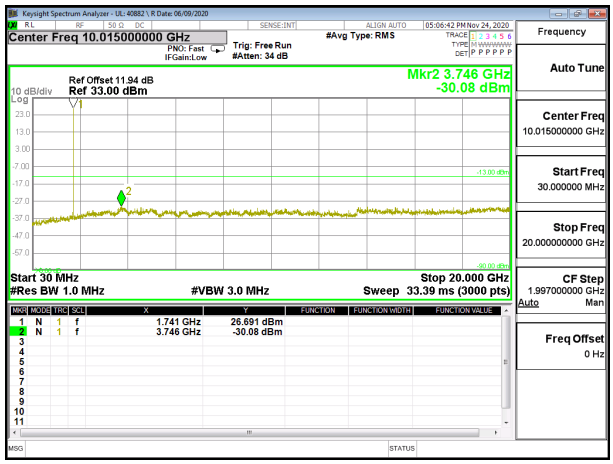
LTE B66 1.4MHz QPSK Low Channel RB1-0



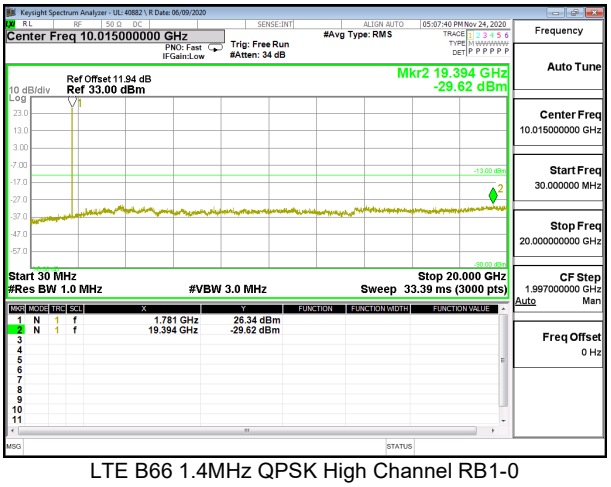
LTE B66 1.4MHz 16QAM Low Channel RB1-0



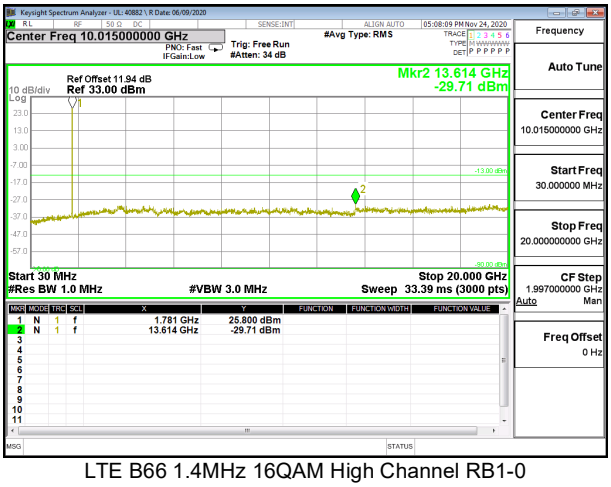
LTE B66 1.4MHz QPSK Middle Channel RB1-0



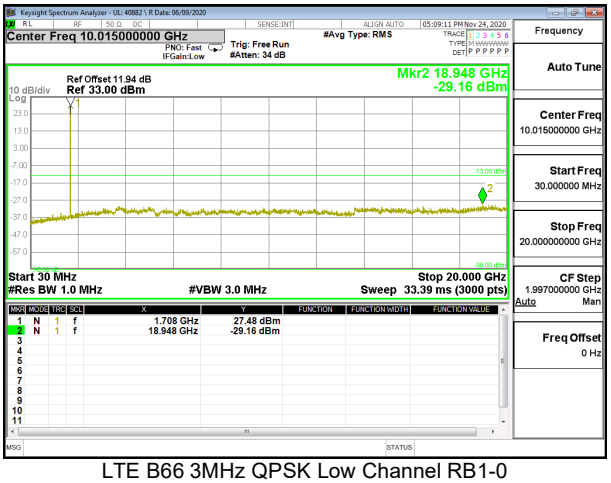
LTE B66 1.4MHz 16QAM Middle Channel RB1-0



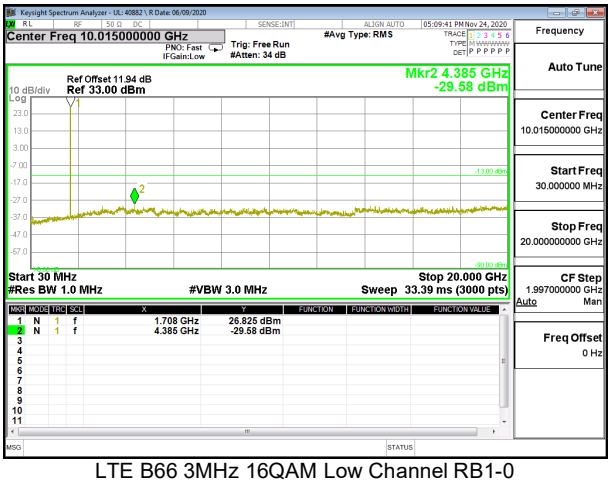
LTE B66 1.4MHz QPSK High Channel RB1-0



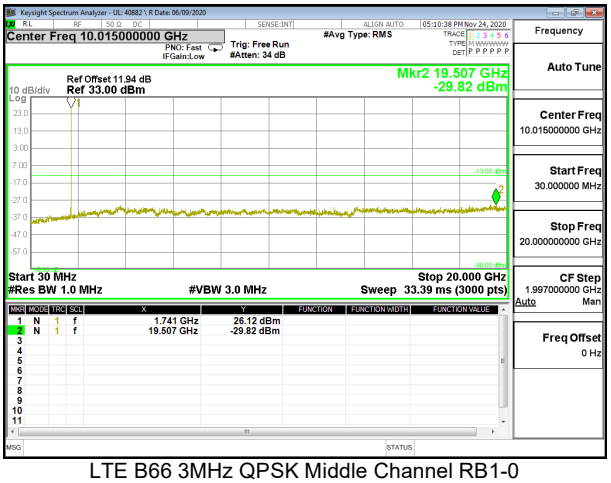
LTE B66 1.4MHz 16QAM High Channel RB1-0



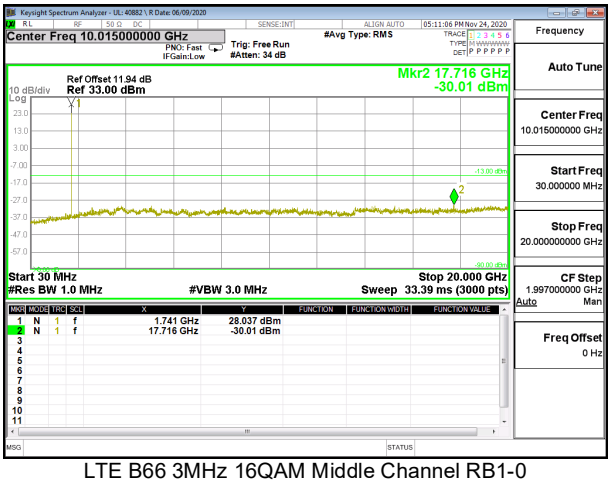
LTE B66 3MHz QPSK Low Channel RB1-0



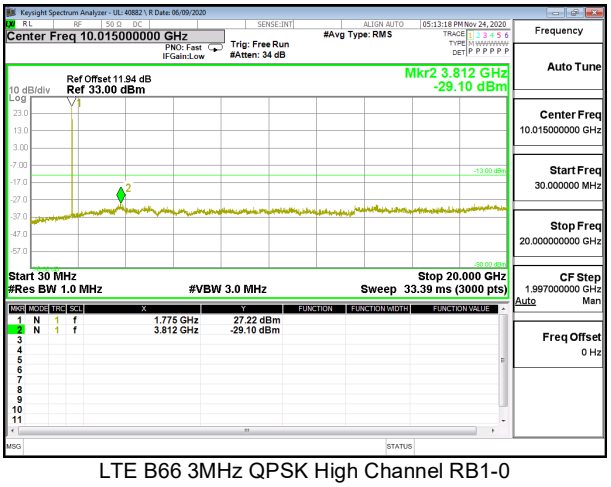
LTE B66 3MHz 16QAM Low Channel RB1-0



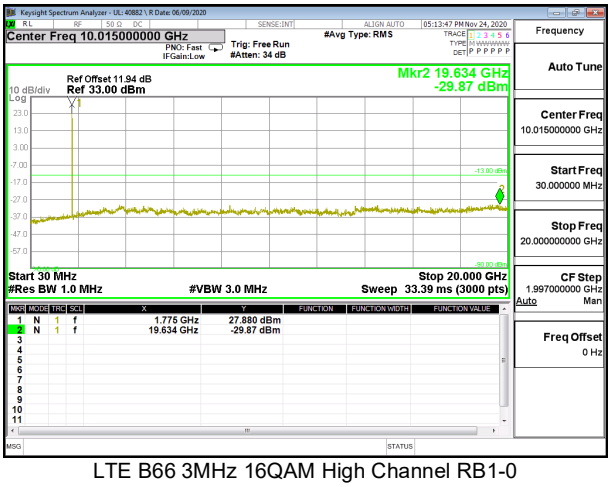
LTE B66 3MHz QPSK Middle Channel RB1-0



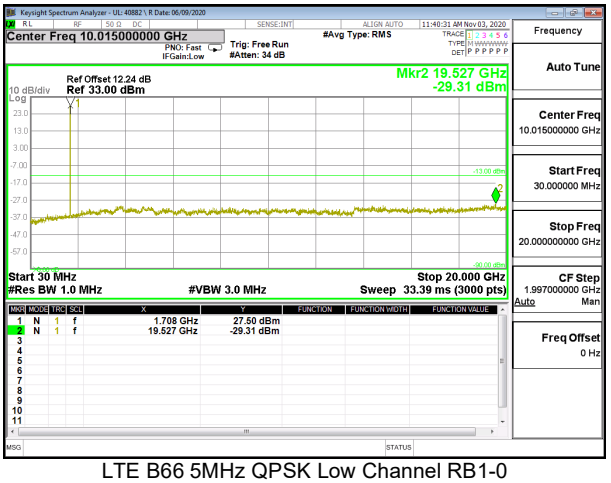
LTE B66 3MHz 16QAM Middle Channel RB1-0



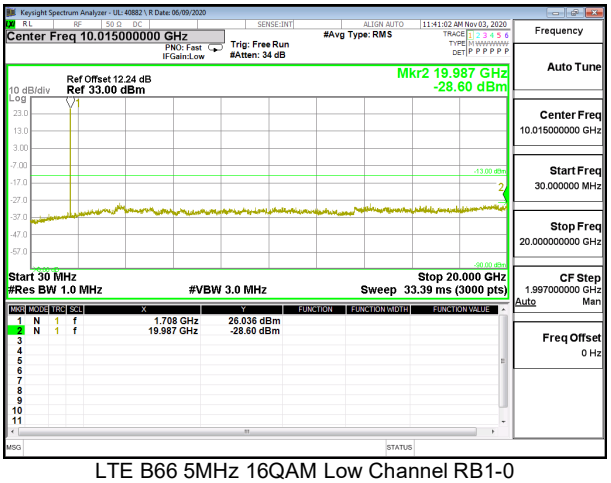
LTE B66 3MHz QPSK High Channel RB1-0



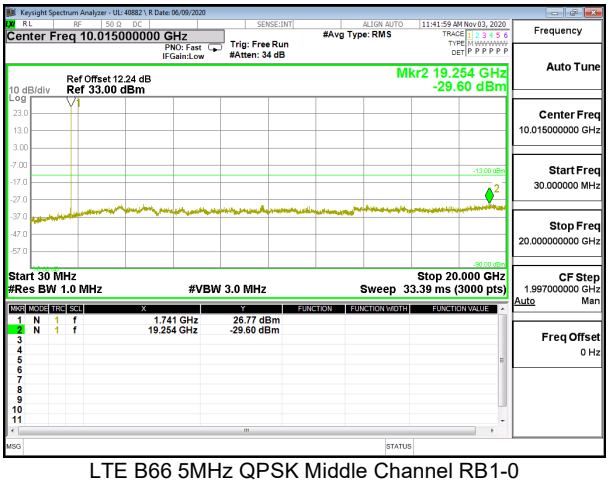
LTE B66 3MHz 16QAM High Channel RB1-0



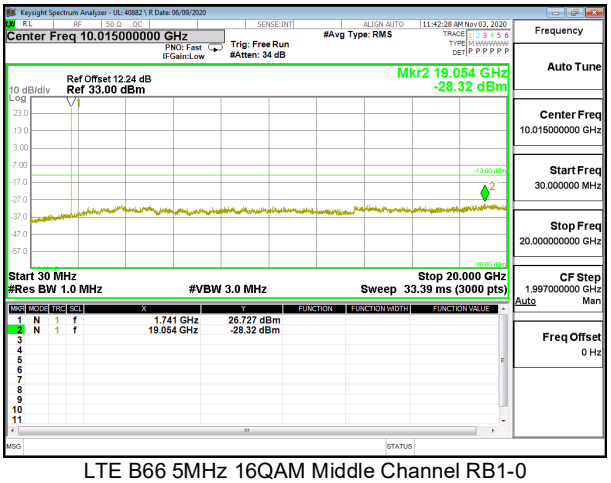
LTE B66 5MHz QPSK Low Channel RB1-0



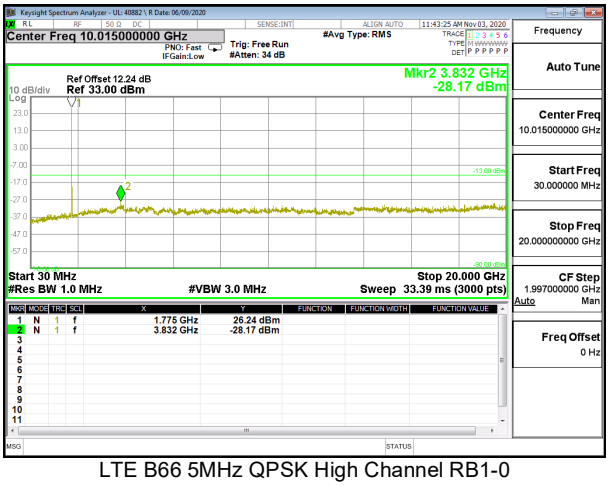
LTE B66 5MHz 16QAM Low Channel RB1-0



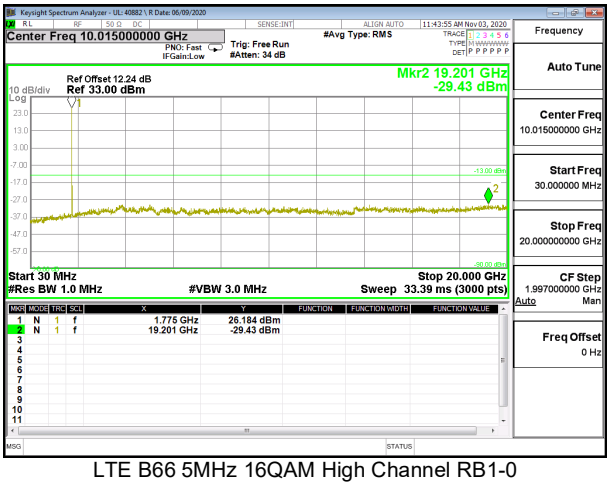
LTE B66 5MHz QPSK Middle Channel RB1-0



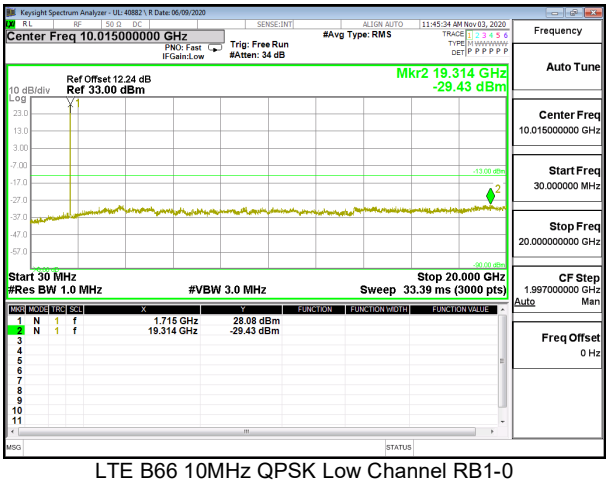
LTE B66 5MHz 16QAM Middle Channel RB1-0



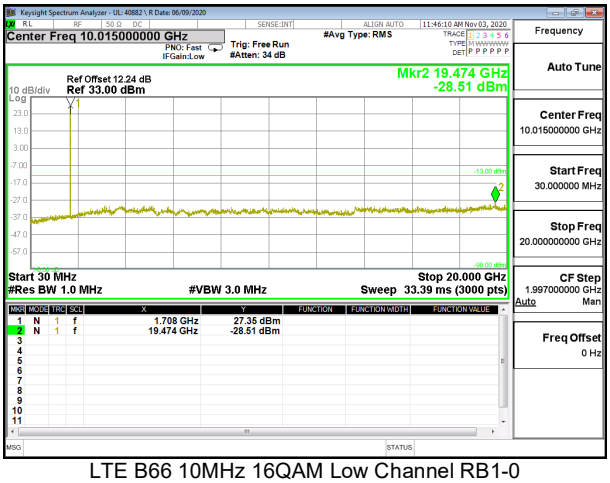
LTE B66 5MHz QPSK High Channel RB1-0



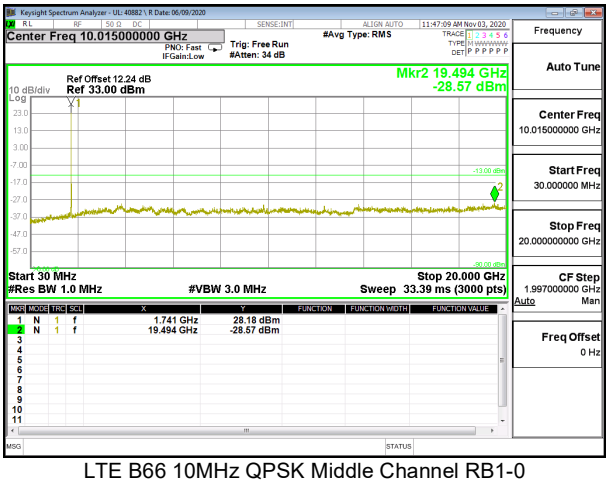
LTE B66 5MHz 16QAM High Channel RB1-0



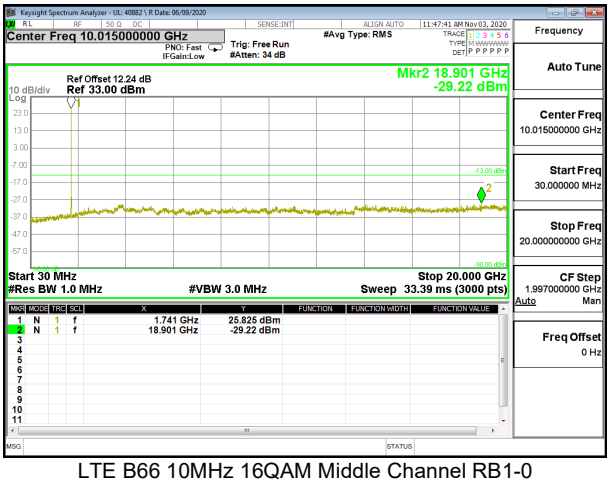
LTE B66 10MHz QPSK Low Channel RB1-0



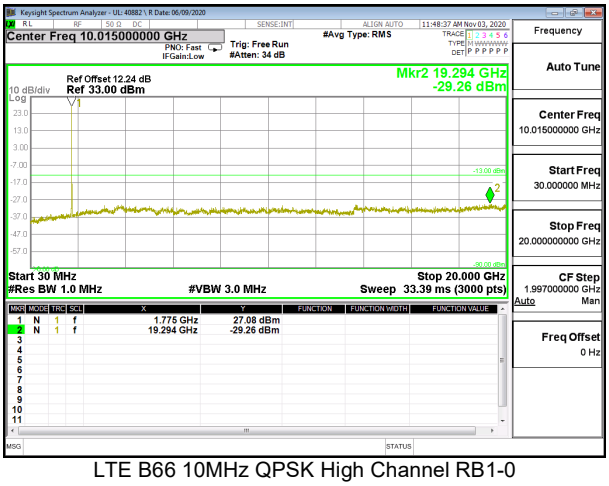
LTE B66 10MHz 16QAM Low Channel RB1-0



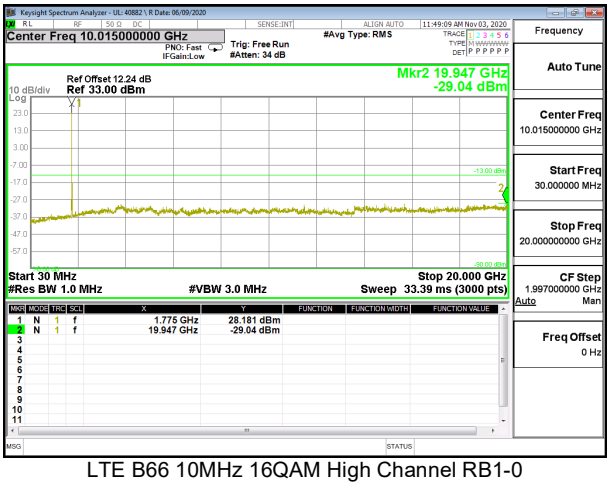
LTE B66 10MHz QPSK Middle Channel RB1-0



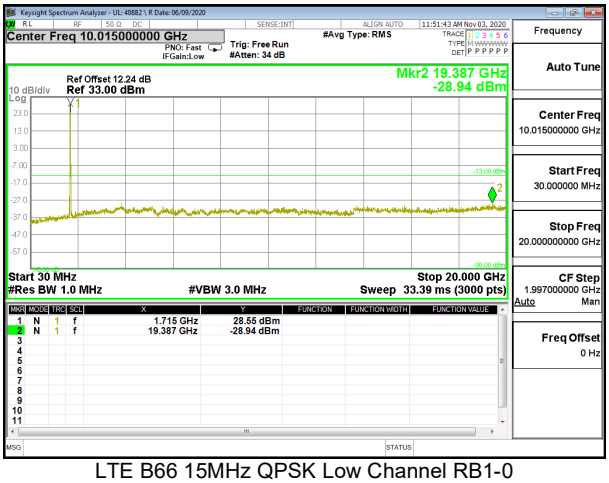
LTE B66 10MHz 16QAM Middle Channel RB1-0



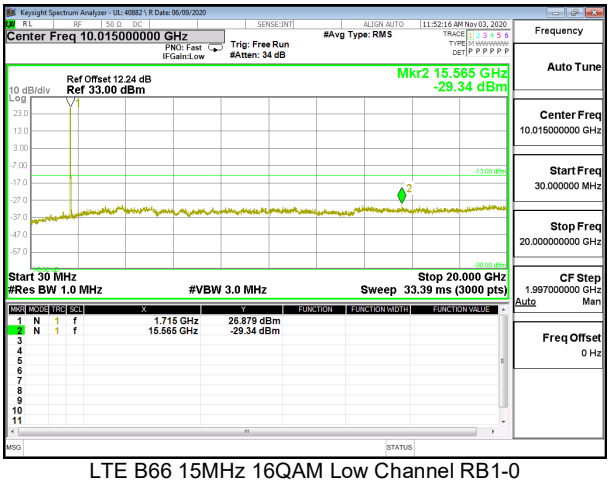
LTE B66 10MHz QPSK High Channel RB1-0



LTE B66 10MHz 16QAM High Channel RB1-0



LTE B66 15MHz QPSK Low Channel RB1-0



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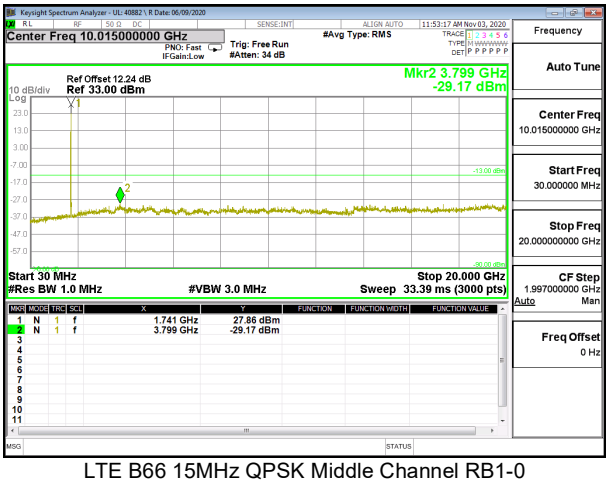
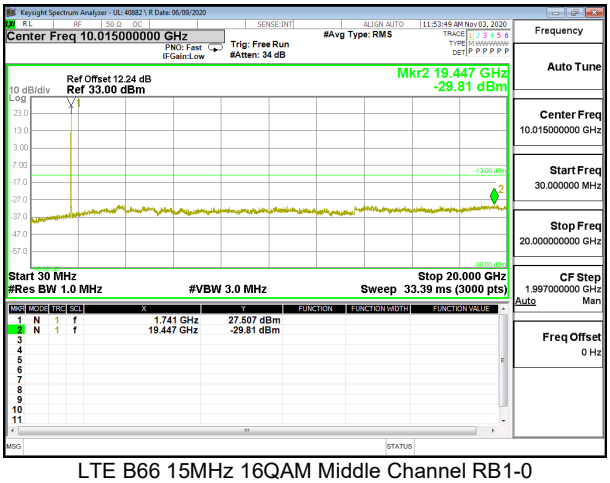


LTE B66 15MHz QPSK Middle Channel RB1-0



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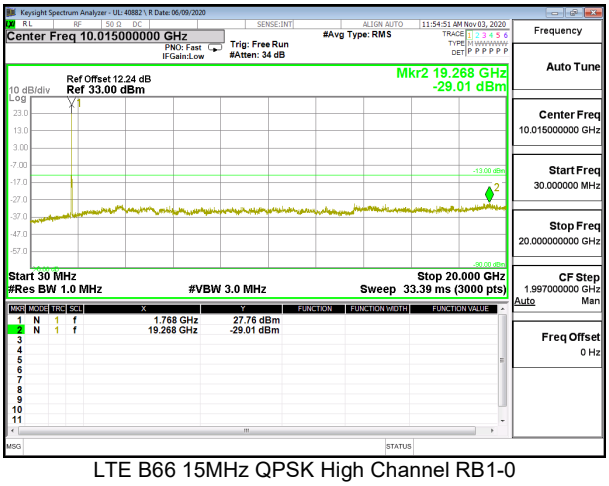

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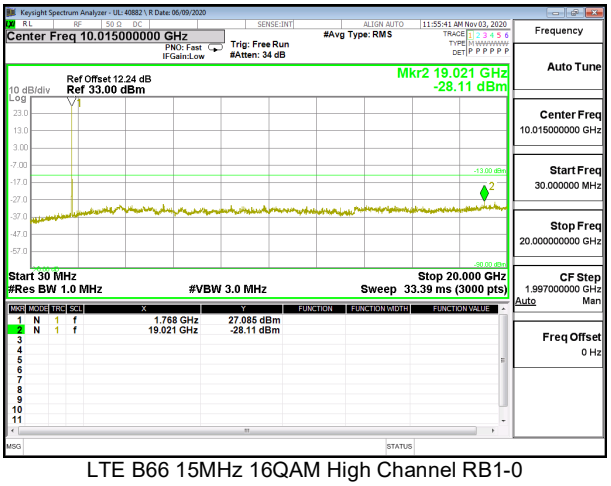
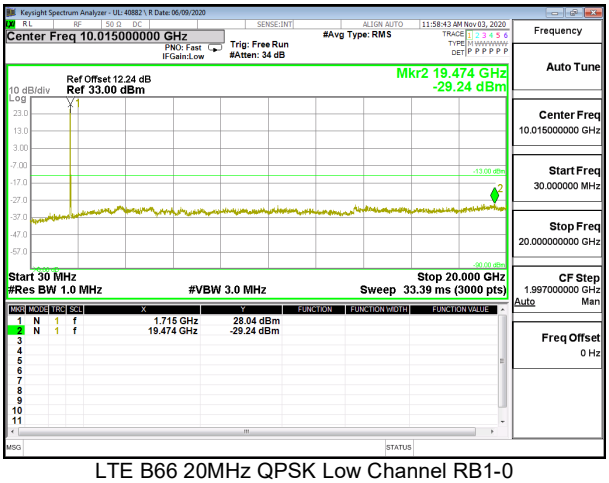
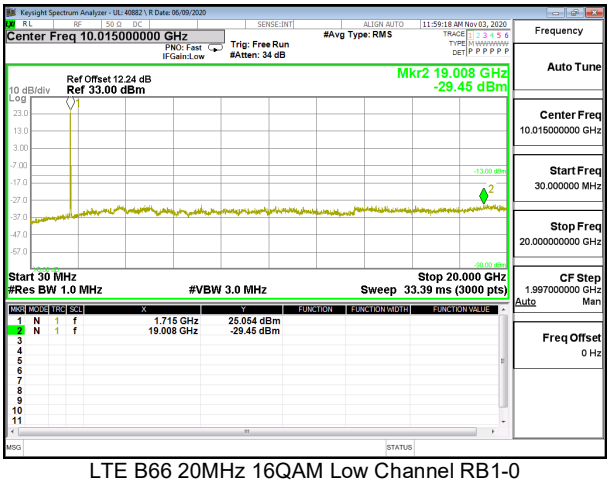


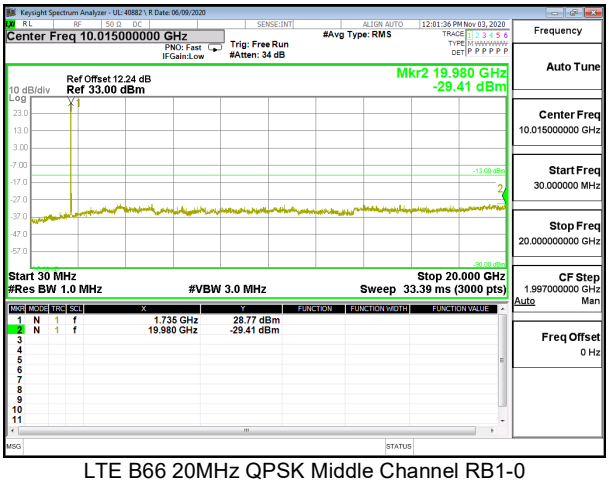
LTE B66 15MHz 16QAM High Channel RB1-0



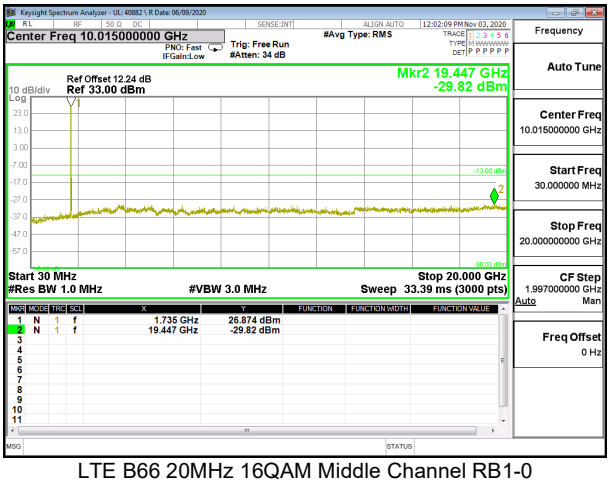
LTE B66 20MHz QPSK Low Channel RB1-0



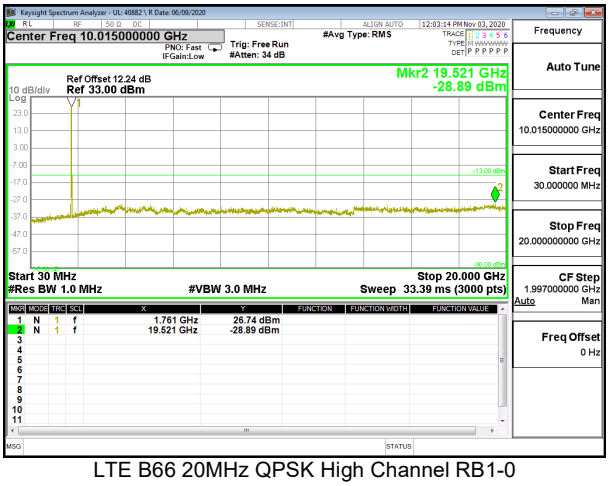
LTE B66 20MHz 16QAM Low Channel RB1-0



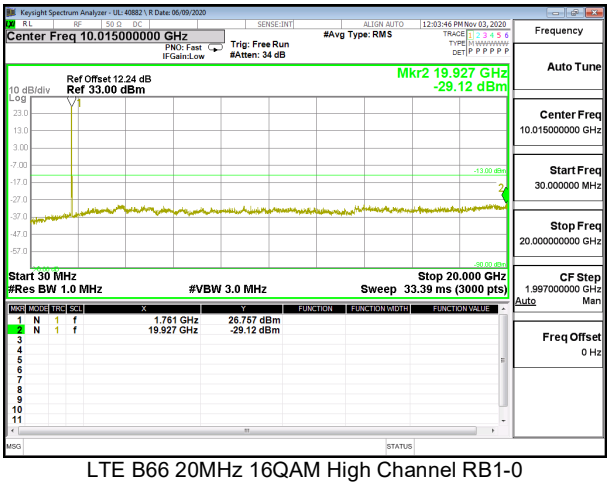
LTE B66 20MHz QPSK Middle Channel RB1-0



LTE B66 20MHz 16QAM Middle Channel RB1-0



LTE B66 20MHz QPSK High Channel RB1-0



LTE B66 20MHz 16QAM High Channel RB1-0

8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, and §27.54

LIMITS

FCC: §22.355
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC: §24.235 & §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30°C to +50°C
- Voltage = (85% - 115%)
  Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
  End Voltage, 2.8VDC.

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

8.4.1. LTE BAND 2

Test Engineer ID:	40882	Test Date:	2020-11-14 – 2020-11-17

QPSK, (20MHz BANDWIDTH)

Limit		1860	1900	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	1860.0000	1900.0000				
Extreme (50C)		1860.0000	1900.0000	-4.69	-3.19	-0.0025	-0.0017
Extreme (40C)		1860.0000	1900.0000	-5.54	-3.75	-0.0029	-0.0020
Extreme (30C)		1860.0000	1900.0000	-6.38	-5.53	-0.0034	-0.0029
Extreme (10C)		1860.0000	1900.0000	-2.49	-1.27	-0.0013	-0.0007
Extreme (0C)		1860.0000	1900.0000	-2.64	-3.19	-0.0014	-0.0017
Extreme (-10C)		1860.0000	1900.0000	-2.35	-2.79	-0.0012	-0.0015
Extreme (-20C)		1860.0000	1900.0000	9.54	-4.16	0.0051	-0.0022
Extreme (-30C)		1860.0000	1900.0000	-9.78	-6.91	-0.0052	-0.0037
20C	15%	1860.0000	1900.0000	-7.71	-7.28	-0.0041	-0.0039
	-15%	1860.0000	1900.0000	-8.80	-5.59	-0.0047	-0.0030
	End Point	1860.0000	1900.0000	-6.19	-6.91	-0.0033	-0.0037

8.4.2. LTE BAND 4

Test Engineer ID:	40882	Test Date:	2020-12-28

QPSK, (20MHz BANDWIDTH)

Limit		1710	1755	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	1710.0000	1755.0000				
Extreme (50C)		1710.0000	1755.0000	-8.67	-7.55	-0.0050	-0.0044
Extreme (40C)		1710.0000	1755.0000	-7.27	-5.11	-0.0042	-0.0029
Extreme (30C)		1710.0000	1755.0000	-7.01	-8.64	-0.0040	-0.0050
Extreme (10C)		1710.0000	1755.0000	-8.40	-8.20	-0.0048	-0.0047
Extreme (0C)		1710.0000	1755.0000	-8.07	-4.42	-0.0047	-0.0026
Extreme (-10C)		1710.0000	1755.0000	-9.03	-8.94	-0.0052	-0.0052
Extreme (-20C)		1710.0000	1755.0000	-8.50	-9.16	-0.0049	-0.0053
Extreme (-30C)		1710.0000	1755.0000	-8.85	-8.31	-0.0051	-0.0048
20C	15%	1710.0000	1755.0000	-5.97	-7.41	-0.0034	-0.0043
	-15%	1710.0000	1755.0000	-3.96	-8.83	-0.0023	-0.0051
	End Point	1710.0000	1755.0000	-6.72	-8.03	-0.0039	-0.0046

8.4.3. LTE BAND 12

Test Engineer ID:	40882	Test Date:	2020-11-14 – 2020-11-17

QPSK, (10MHz BANDWIDTH)

Limit		704	711	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	704.0000	711.0000				
Extreme (50C)		704.0000	711.0000	-9.41	-8.49	-0.0133	-0.0120
Extreme (40C)		704.0000	711.0000	-2.54	-1.46	-0.0036	-0.0021
Extreme (30C)		704.0000	711.0000	-3.67	-6.48	-0.0052	-0.0092
Extreme (10C)		704.0000	711.0000	-3.93	-4.68	-0.0056	-0.0066
Extreme (0C)		704.0000	711.0000	-3.21	-2.61	-0.0045	-0.0037
Extreme (-10C)		704.0000	711.0000	-5.11	-2.82	-0.0072	-0.0040
Extreme (-20C)		704.0000	711.0000	-7.04	-3.84	-0.0100	-0.0054
Extreme (-30C)		704.0000	711.0000	-8.84	-7.96	-0.0125	-0.0113
20C	15%	704.0000	711.0000	-3.20	-2.27	-0.0045	-0.0032
	-15%	704.0000	711.0000	-1.96	-4.29	-0.0028	-0.0061
	End Point	704.0000	711.0000	-3.22	-3.08	-0.0046	-0.0044

8.4.4. LTE BAND 26 (FCC PART 90S)

Test Engineer ID:	40882	Test Date:	2020-12-28

QPSK, (10MHz BANDWIDTH)

Limit		814	824	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	814.0000	824.0000				
Extreme (50C)		814.0000	824.0000	-8.5	-7.4	-0.0104	-0.0090
Extreme (40C)		814.0000	824.0000	-7.8	-8.8	-0.0095	-0.0108
Extreme (30C)		814.0000	824.0000	-6.5	-7.5	-0.0079	-0.0091
Extreme (10C)		814.0000	824.0000	-5.7	-6.3	-0.0070	-0.0077
Extreme (0C)		814.0000	824.0000	-7.1	-8.3	-0.0087	-0.0101
Extreme (-10C)		814.0000	824.0000	-5.9	-8.8	-0.0072	-0.0108
Extreme (-20C)		814.0000	824.0000	-7.3	-7.6	-0.0089	-0.0093
Extreme (-30C)		814.0000	824.0000	-8.6	-8.9	-0.0105	-0.0109
20C	15%	814.0000	824.0000	-6.8	-7.1	-0.0083	-0.0086
	-15%	814.0000	824.0000	-8.1	-7.4	-0.0099	-0.0091
	End Point	814.0000	824.0000	-6.5	-8.9	-0.0079	-0.0109

8.4.5. LTE BAND 26 (FCC PART 22)

Test Engineer ID:	84740/40882	Test Date:	2020-11-25

QPSK, (15MHz BANDWIDTH)

Limit		824	849	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	824.0000	849.0000				
Extreme (50C)		824.0000	849.0000	-4.9	-3.8	-0.0059	-0.0045
Extreme (40C)		824.0000	849.0000	-5.2	-6.1	-0.0063	-0.0074
Extreme (30C)		824.0000	849.0000	-2.6	-4.0	-0.0031	-0.0047
Extreme (10C)		824.0000	849.0000	-3.2	-6.2	-0.0039	-0.0074
Extreme (0C)		824.0000	849.0000	-4.6	-3.4	-0.0055	-0.0040
Extreme (-10C)		824.0000	849.0000	-2.5	-3.3	-0.0030	-0.0040
Extreme (-20C)		824.0000	849.0000	-3.5	-4.5	-0.0041	-0.0054
Extreme (-30C)		824.0000	849.0000	-3.6	-6.5	-0.0043	-0.0078
20C	15%	824.0000	849.0000	-3.6	-4.9	-0.0043	-0.0059
	-15%	824.0000	849.0000	-5.2	-4.7	-0.0062	-0.0056
	End Point	824.0000	849.0000	-3.8	-4.5	-0.0046	-0.0054

8.4.6. LTE BAND 41 (FCC)

Test Engineer ID:	40882	Test Date:	2020-11-14 – 2020-11-17

QPSK, (20MHz BANDWIDTH)

Limit		2506	2680	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	2506.0000	2680.0000				
Extreme (50C)		2506.0000	2680.0000	-4.8	-10.7	-0.0018	-0.0041
Extreme (40C)		2506.0000	2680.0000	-4.5	-5.2	-0.0018	-0.0020
Extreme (30C)		2506.0000	2680.0000	-5.5	-2.1	-0.0021	-0.0008
Extreme (10C)		2506.0000	2680.0000	-7.9	-7.1	-0.0030	-0.0027
Extreme (0C)		2506.0000	2680.0000	-4.6	-5.5	-0.0018	-0.0021
Extreme (-10C)		2506.0000	2680.0000	-7.5	-7.8	-0.0029	-0.0030
Extreme (-20C)		2506.0000	2680.0000	-9.8	-8.1	-0.0038	-0.0031
Extreme (-30C)		2506.0000	2680.0000	-20.1	-18.5	-0.0077	-0.0071
20C	15%	2506.0000	2680.0000	-9.0	-13.4	-0.0035	-0.0052
	-15%	2506.0000	2680.0000	-12.0	-13.2	-0.0046	-0.0051
	End Point	2506.0000	2680.0000	-10.7	-16.0	-0.0041	-0.0062

8.4.7. LTE BAND 66

Test Engineer ID:	40882	Test Date:	2020-11-14 – 2020-11-17

QPSK, (20MHz BANDWIDTH)

Limit		1720	1770	Delta (Hz) LOW	Delta (Hz) HIGH	Frequency Stability (ppm) LOW	Frequency Stability (ppm) HIGH
Condition		F low @ -13dBm	F high @ -13dBm				
Temperature	Voltage	(MHz)	(MHz)				
Normal (20C)	Normal	1720.0000	1770.0000				
Extreme (50C)		1720.0000	1770.0000	-2.78	-6.15	-0.0016	-0.0035
Extreme (40C)		1720.0000	1770.0000	-6.69	-10.47	-0.0038	-0.0060
Extreme (30C)		1720.0000	1770.0000	-6.55	-6.98	-0.0038	-0.0040
Extreme (10C)		1720.0000	1770.0000	-10.76	-6.27	-0.0062	-0.0036
Extreme (0C)		1720.0000	1770.0000	-4.59	-4.67	-0.0026	-0.0027
Extreme (-10C)		1720.0000	1770.0000	-2.51	-3.65	-0.0014	-0.0021
Extreme (-20C)		1720.0000	1770.0000	-10.09	-11.60	-0.0058	-0.0066
Extreme (-30C)		1720.0000	1770.0000	-9.99	-9.43	-0.0057	-0.0054
20C	15%	1720.0000	1770.0000	-6.31	-6.81	-0.0036	-0.0039
	-15%	1720.0000	1770.0000	-5.95	-8.98	-0.0034	-0.0051
	End Point	1720.0000	1770.0000	-6.55	-7.48	-0.0038	-0.0043

8.5. PEAK-TO-AVERAGE POWER RATIO

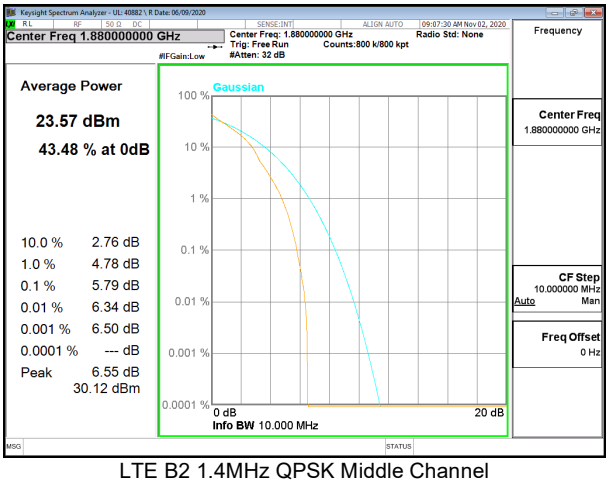
LIMIT

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

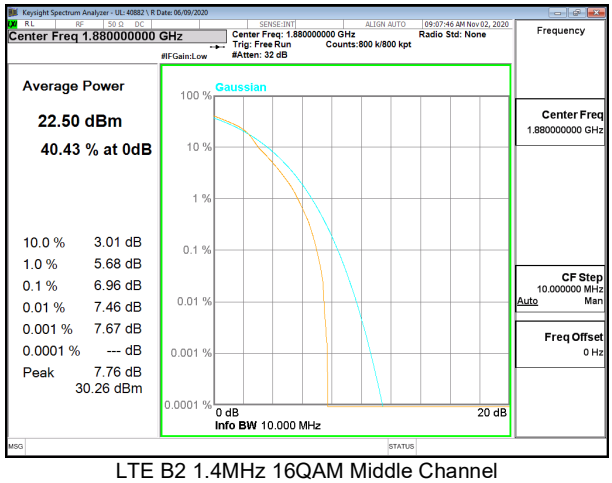
RESULT

The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

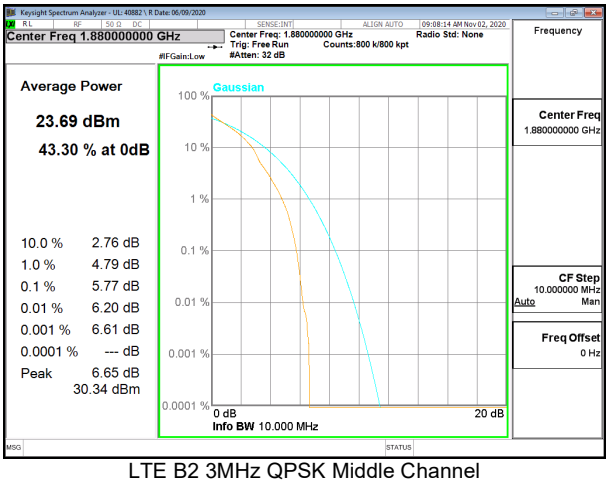
8.5.1. LTE BAND 2



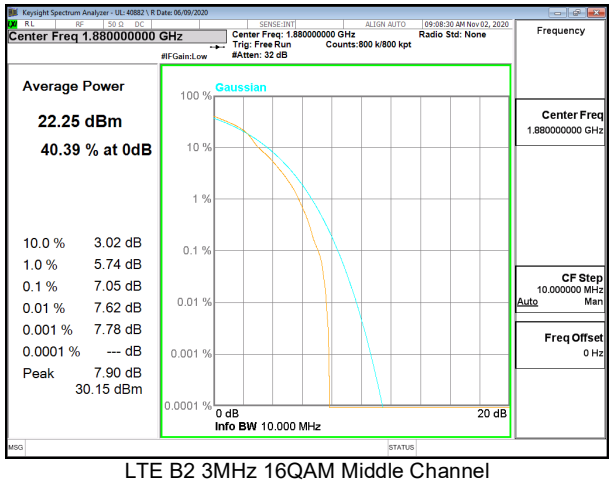
LTE B2 1.4MHz QPSK Middle Channel



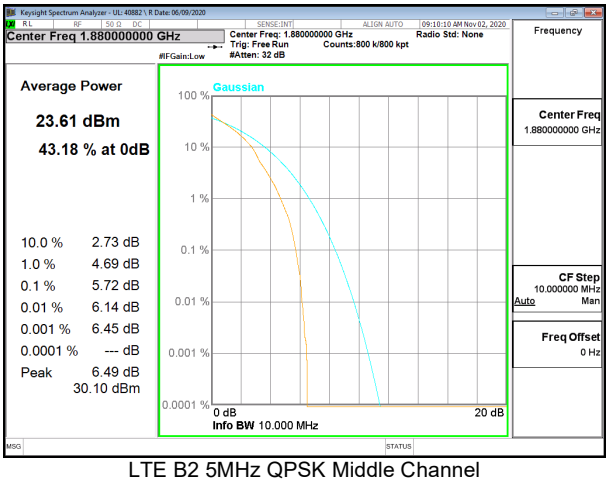
LTE B2 1.4MHz 16QAM Middle Channel



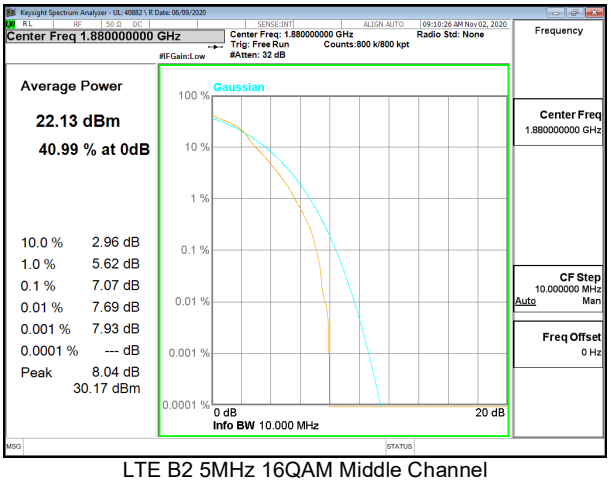
LTE B2 3MHz QPSK Middle Channel



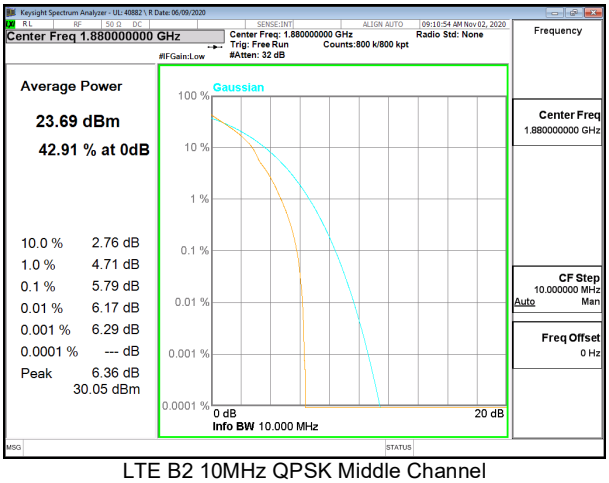
LTE B2 3MHz 16QAM Middle Channel



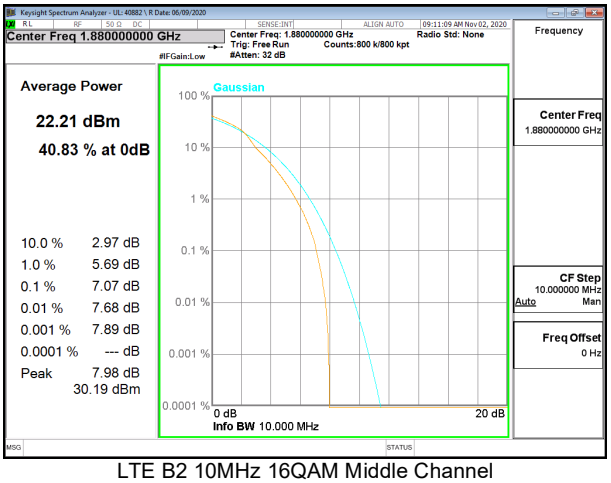
LTE B2 5MHz QPSK Middle Channel



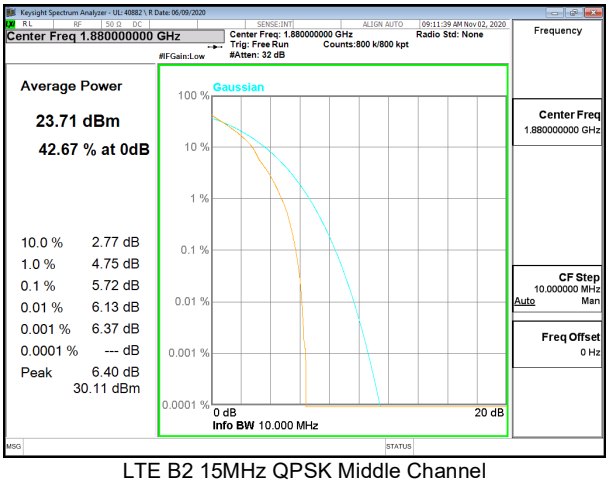
LTE B2 5MHz 16QAM Middle Channel



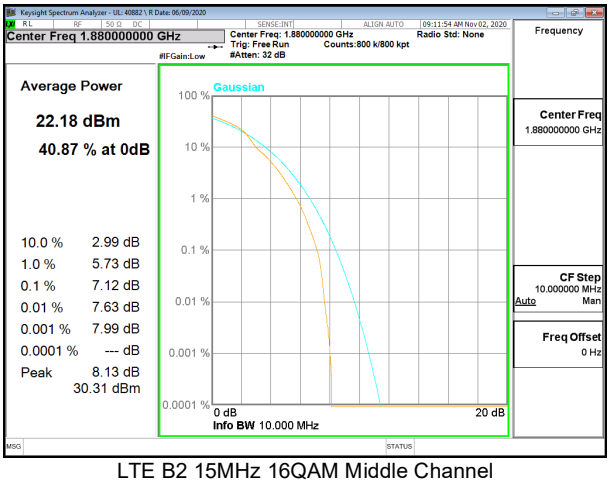
LTE B2 10MHz QPSK Middle Channel



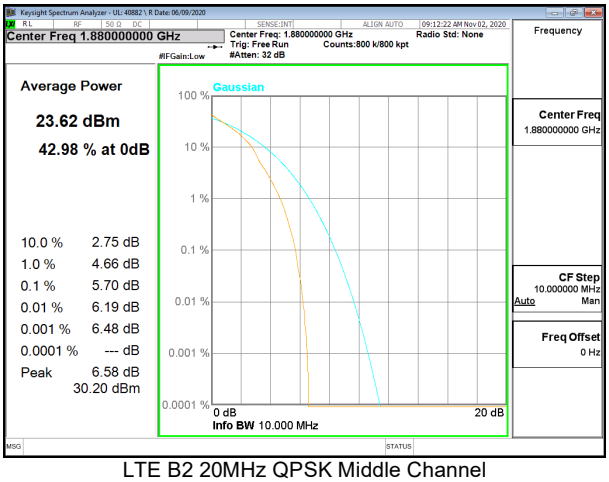
LTE B2 10MHz 16QAM Middle Channel



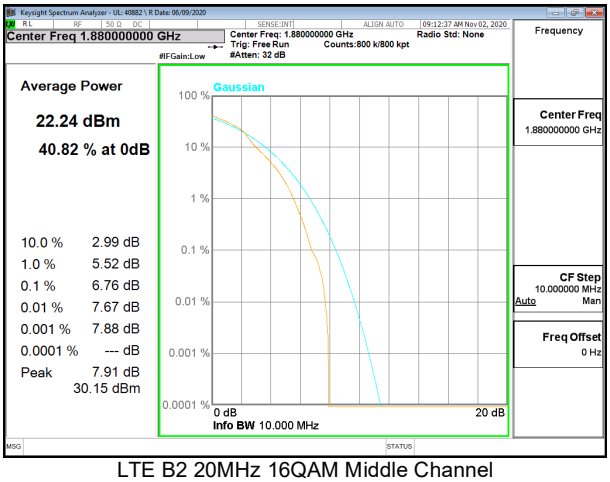
LTE B2 15MHz QPSK Middle Channel



LTE B2 15MHz 16QAM Middle Channel

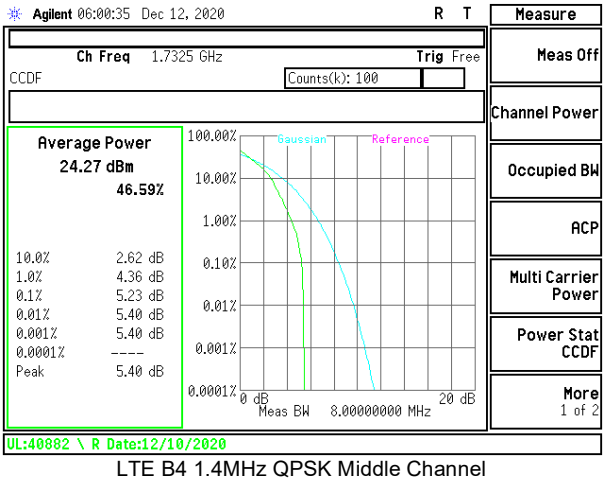


LTE B2 20MHz QPSK Middle Channel

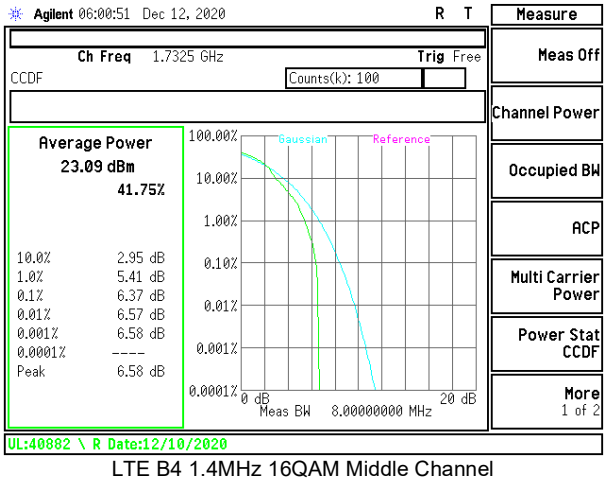


LTE B2 20MHz 16QAM Middle Channel

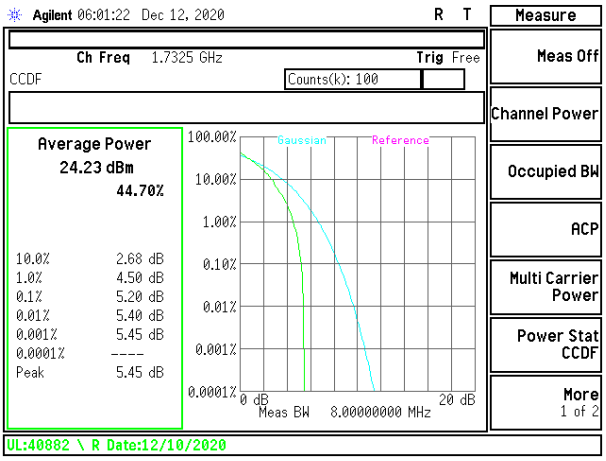
8.5.2. LTE BAND 4



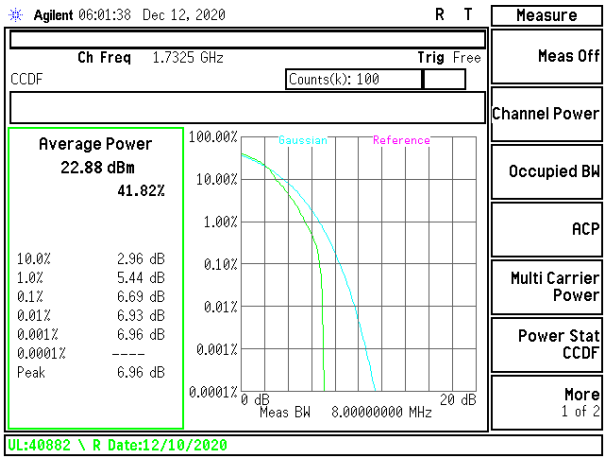
LTE B4 1.4MHz QPSK Middle Channel



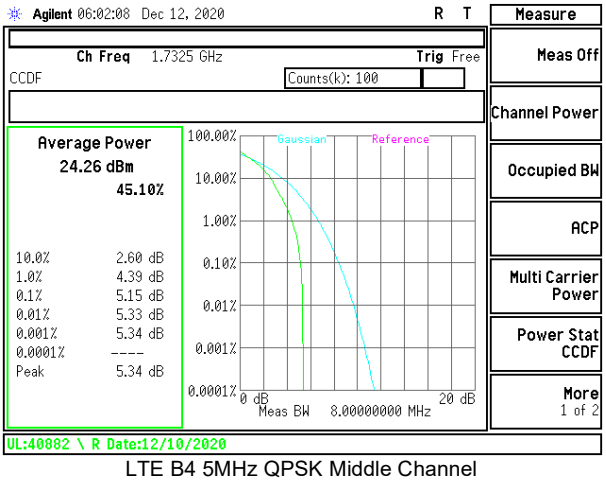
LTE B4 1.4MHz 16QAM Middle Channel



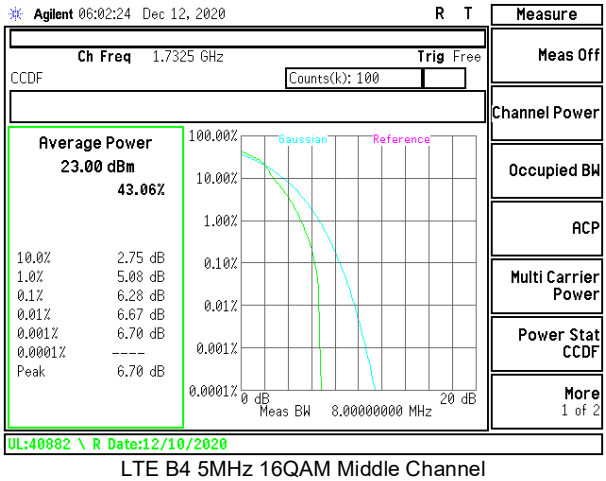
LTE B4 3MHz QPSK Middle Channel



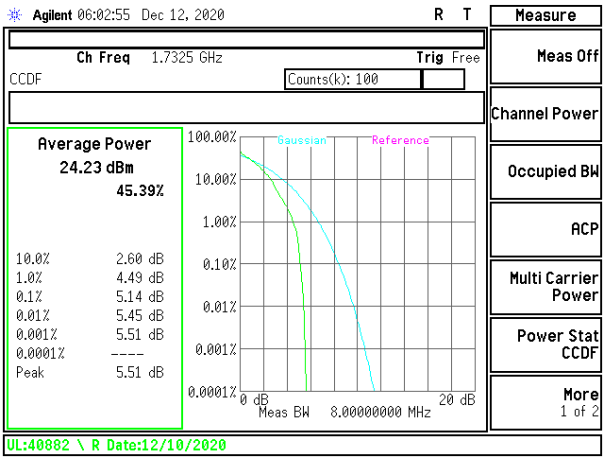
LTE B4 3MHz 16QAM Middle Channel



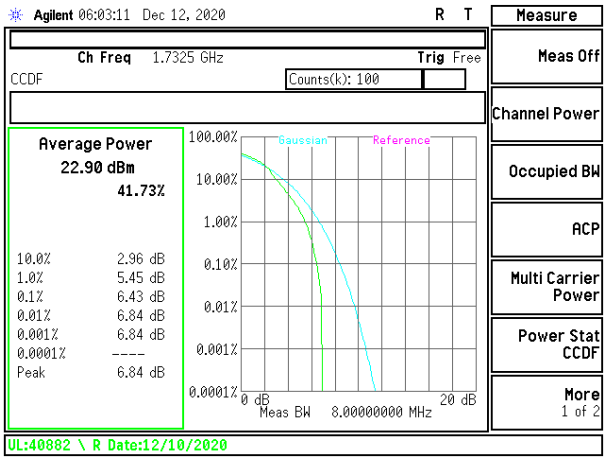
LTE B4 5MHz QPSK Middle Channel



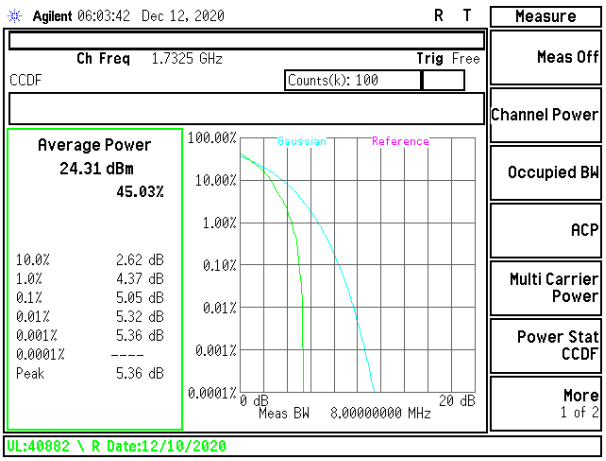
LTE B4 5MHz 16QAM Middle Channel



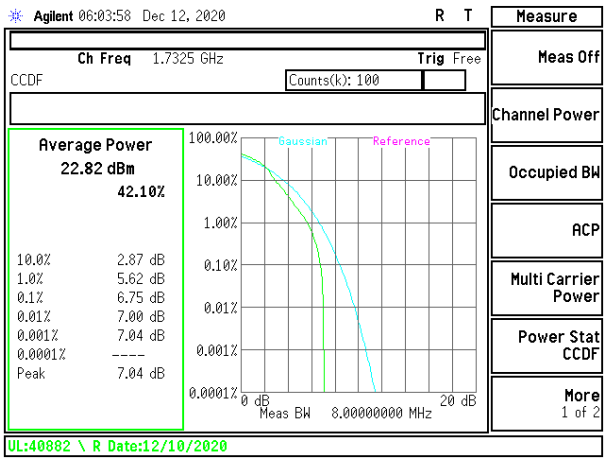
LTE B4 10MHz QPSK Middle Channel



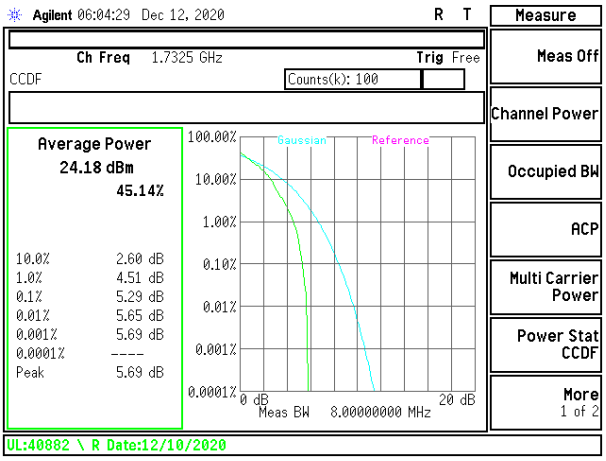
LTE B4 10MHz 16QAM Middle Channel



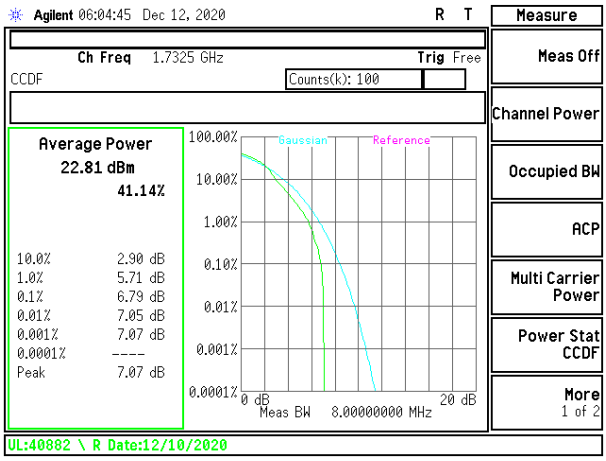
LTE B4 15MHz QPSK Middle Channel



LTE B4 15MHz 16QAM Middle Channel



LTE B4 20MHz QPSK Middle Channel



LTE B4 20MHz 16QAM Middle Channel