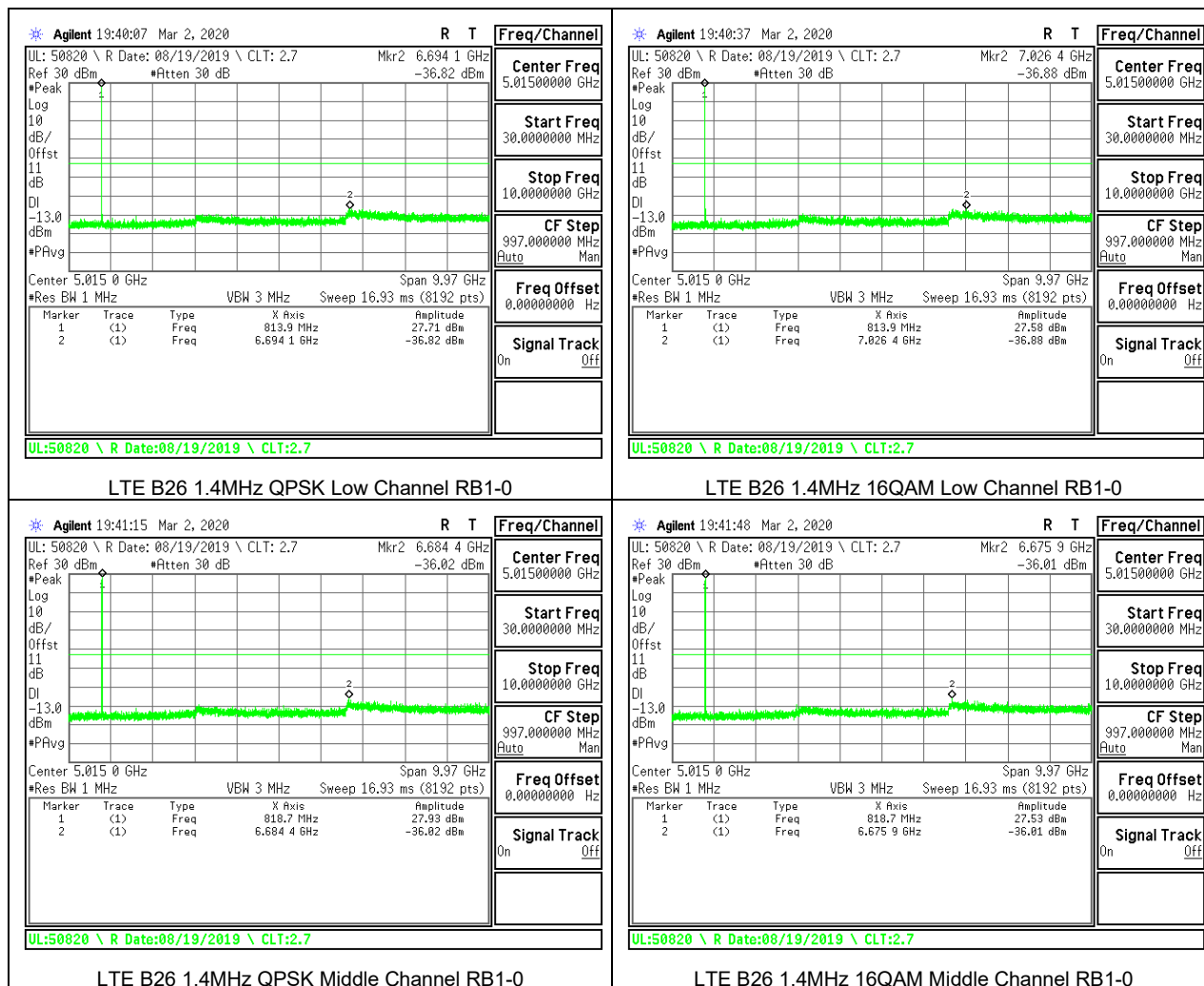


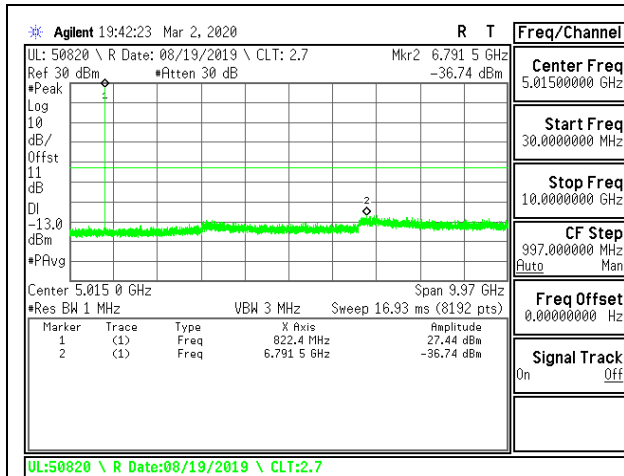
8.3.9. LTE BAND 26 (FCC PART 90S)

LIMITS

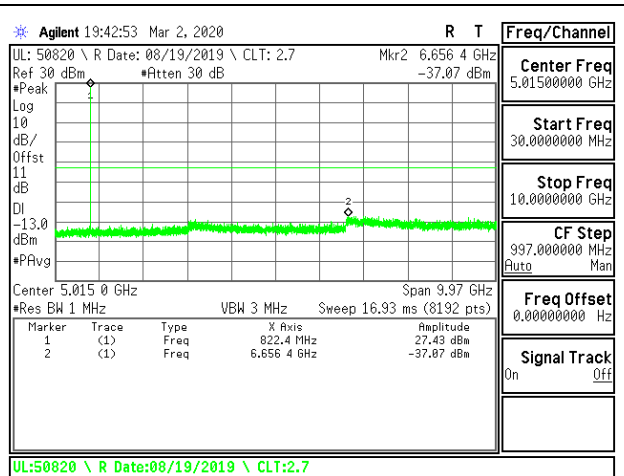
FCC: §90.691

The minimum permissible attenuation level of any spurious emissions is $43 + 10 \log(P)$ dB where transmitting power (P) in Watts.

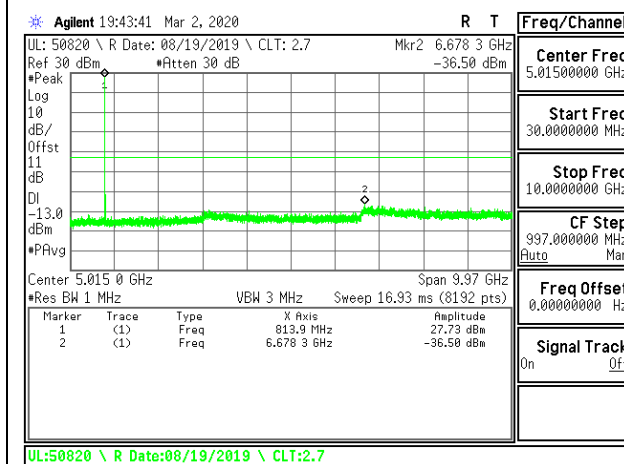




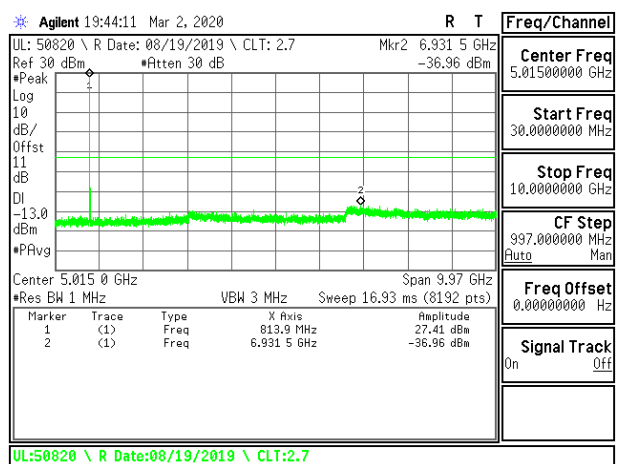
LTE B26 1.4MHz QPSK High Channel RB1-0



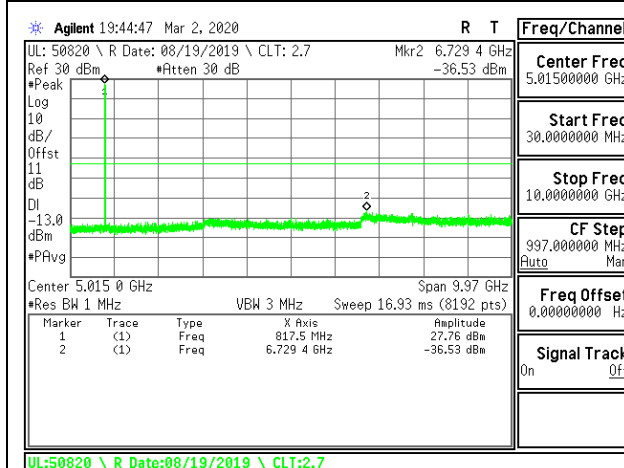
LTE B26 1.4MHz 16QAM High Channel RB1-0



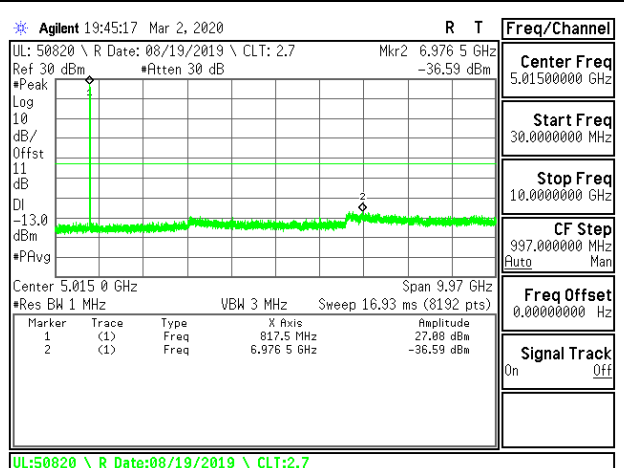
LTE B26 3MHz QPSK Low Channel RB1-0



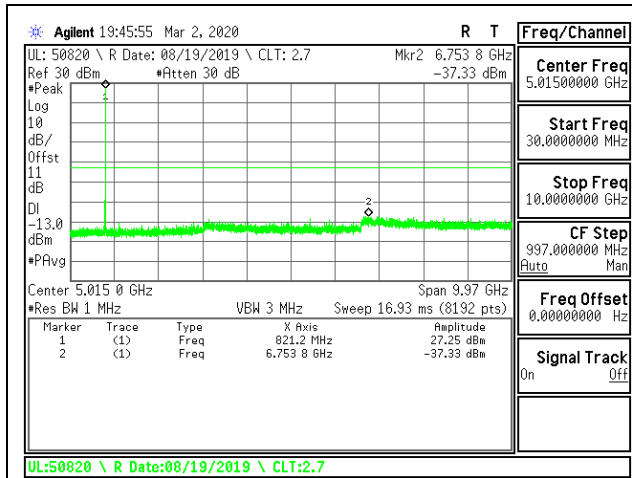
LTE B26 3MHz 16QAM Low Channel RB1-0



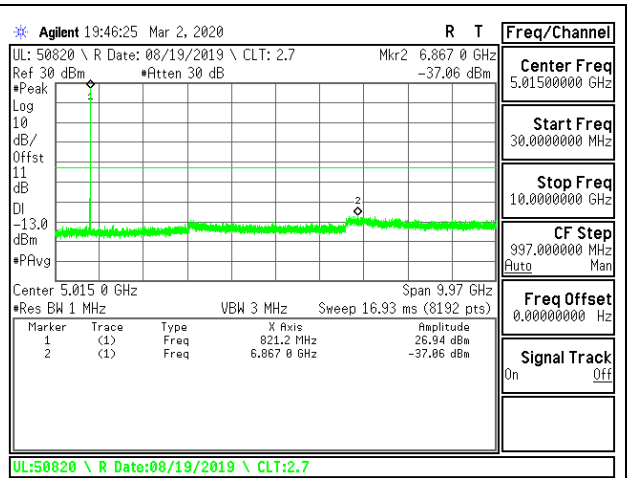
LTE B26 3MHz QPSK Middle Channel RB1-0



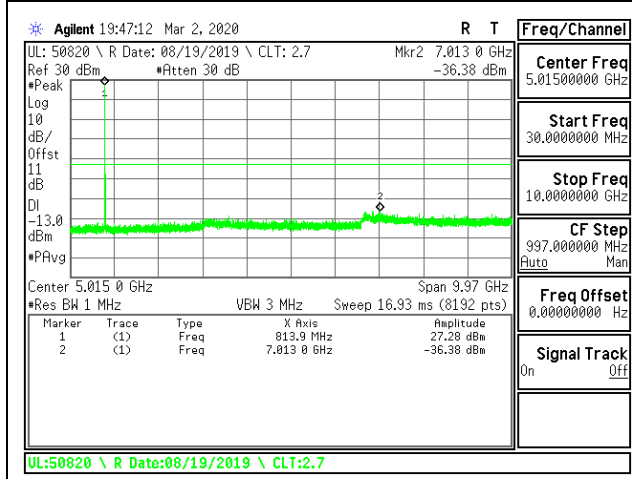
LTE B26 3MHz 16QAM Middle Channel RB1-0



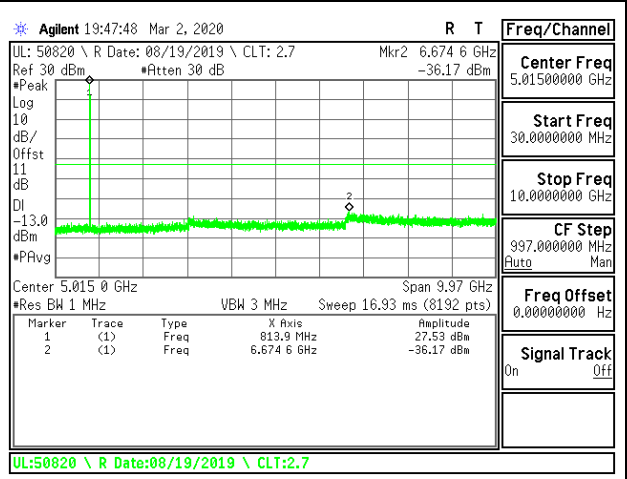
LTE B26 3MHz QPSK High Channel RB1-0



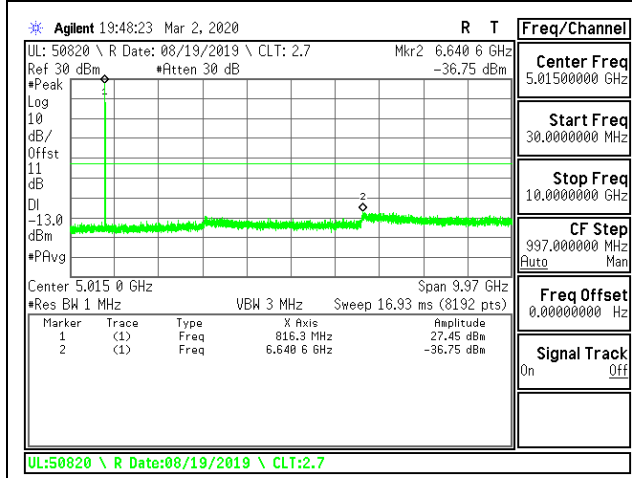
LTE B26 3MHz 16QAM High Channel RB1-0



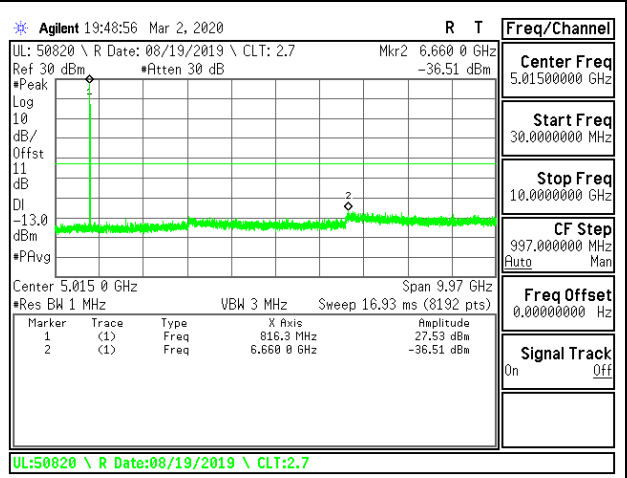
LTE B26 5MHz QPSK Low Channel RB1-0



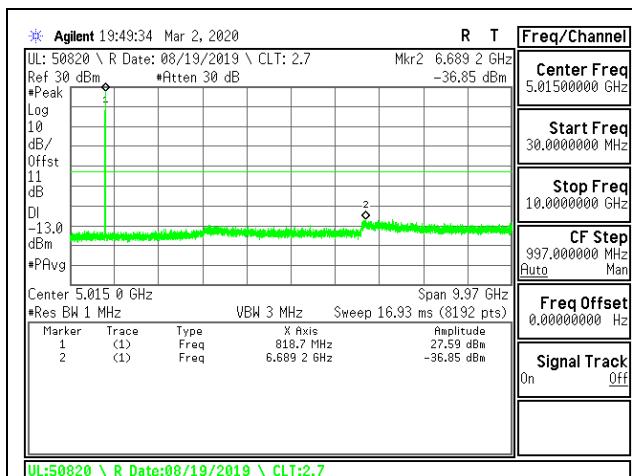
LTE B26 5MHz 16QAM Low Channel RB1-0



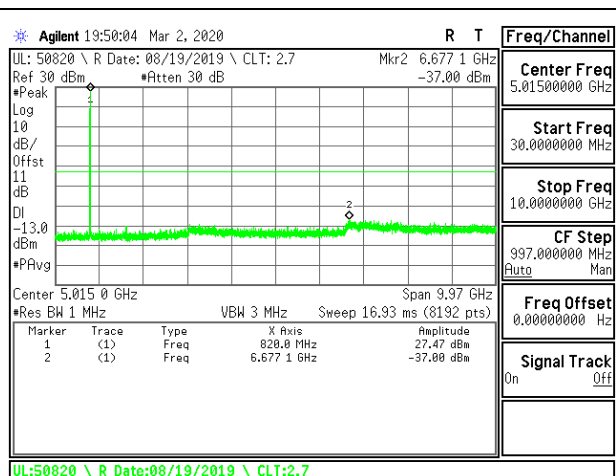
LTE B26 5MHz QPSK Middle Channel RB1-0



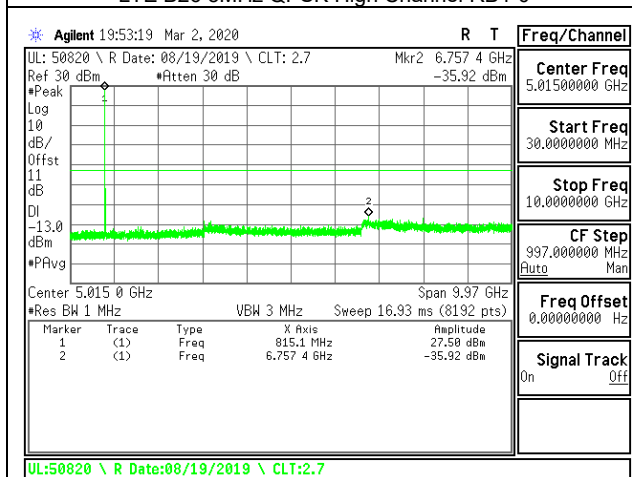
LTE B26 5MHz 16QAM Middle Channel RB1-0



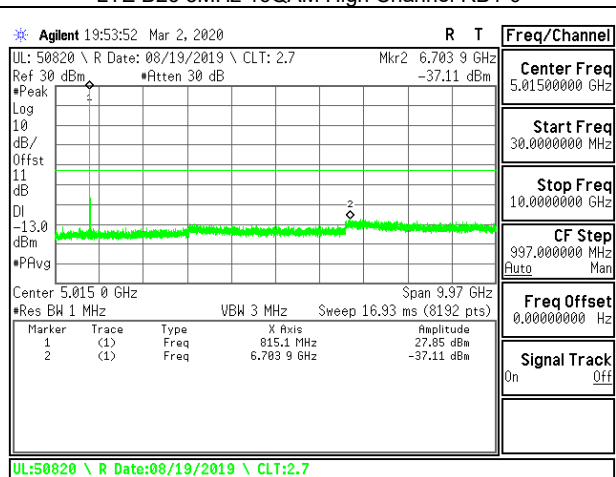
LTE B26 5MHz QPSK High Channel RB1-0



LTE B26 5MHz 16QAM High Channel RB1-0



LTE B26 10MHz QPSK Middle Channel RB1-0



LTE B26 10MHz 16QAM Middle Channel RB1-0

8.3.10. LTE BAND 26 (FCC PART 22)

LIMITS

FCC: §22.917

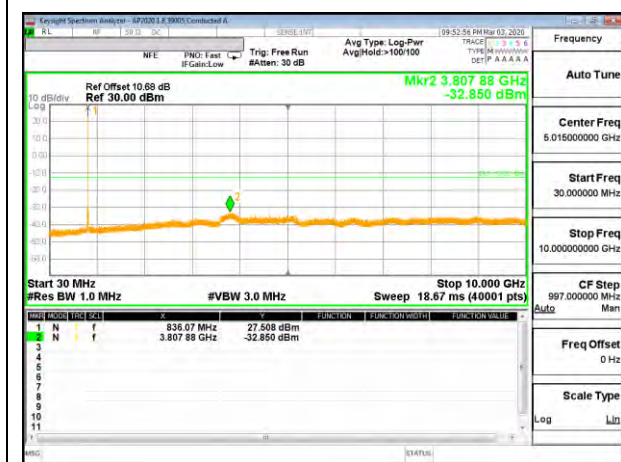
The minimum permissible attenuation level of any spurious emissions is $43 + 10 \log(P)$ dB where transmitting power (P) in Watts.



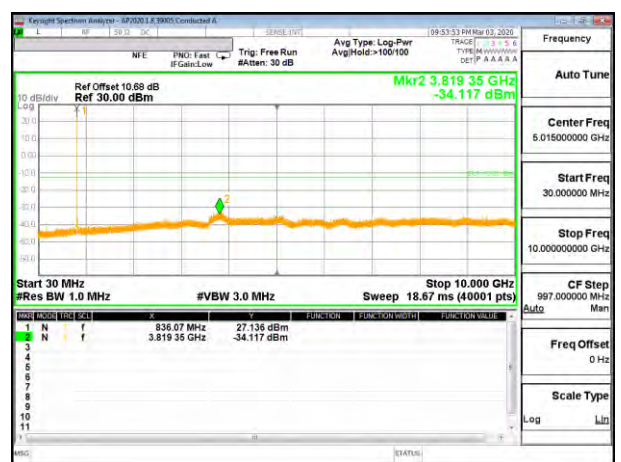
LTE B26 1.4MHz QPSK Low Channel RB1-0



LTE B26 1.4MHz 16QAM Low Channel RB1-0



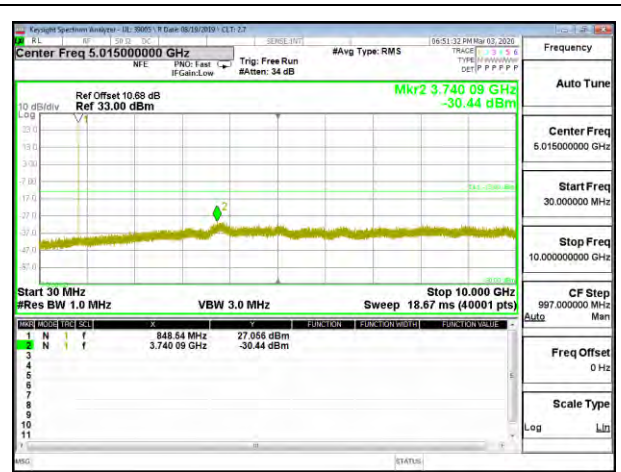
LTE B26 1.4MHz QPSK Middle Channel RB1-0



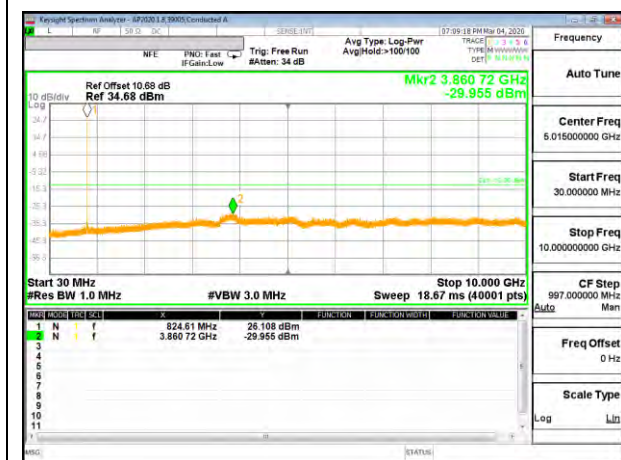
LTE B26 1.4MHz 16QAM Middle Channel RB1-0



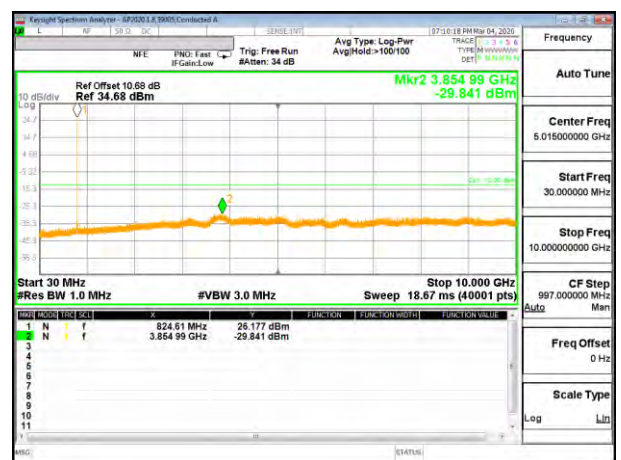
LTE B26 1.4MHz QPSK High Channel RB1-0



LTE B26 1.4MHz 16QAM High Channel RB1-0



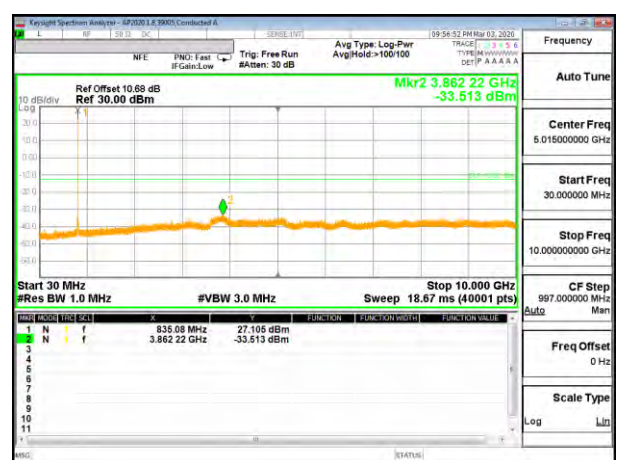
LTE B26 3MHz QPSK Low Channel RB1-0



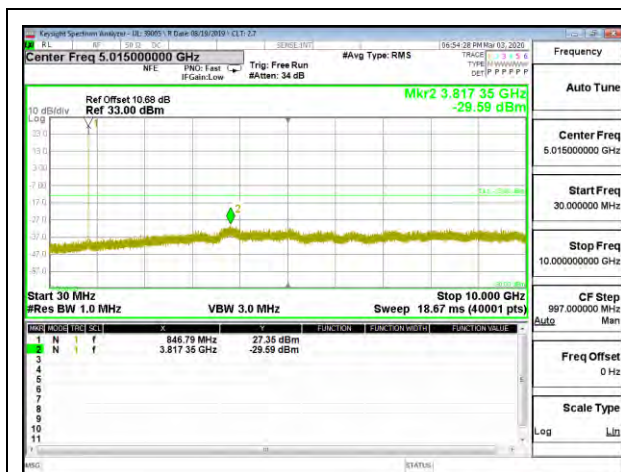
LTE B26 3MHz 16QAM Low Channel RB1-0



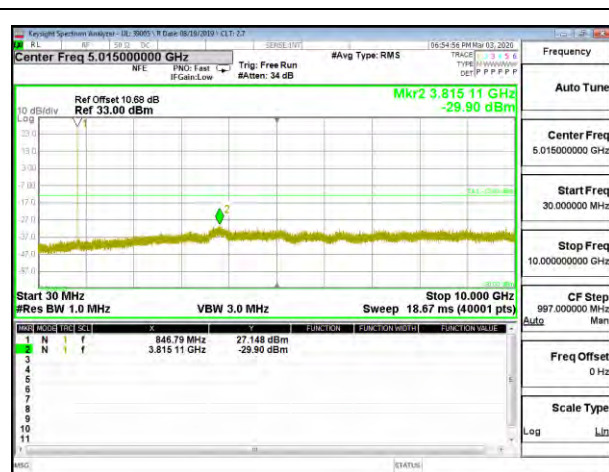
LTE B26 3MHz QPSK Middle Channel RB1-0



LTE B26 3MHz 16QAM Middle Channel RB1-0



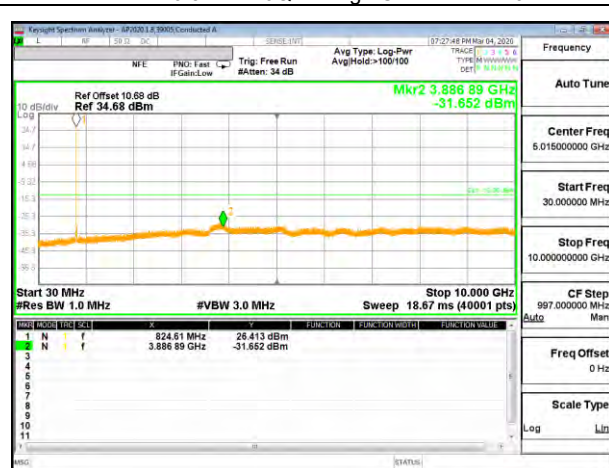
LTE B26 3MHz QPSK High Channel RB1-0



LTE B26 3MHz 16QAM High Channel RB1-0



LTE B26 5MHz QPSK Low Channel RB1-0



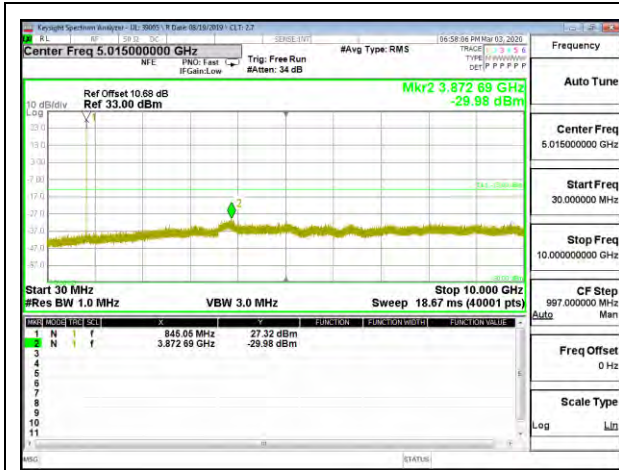
LTE B26 5MHz 16QAM Low Channel RB1-0



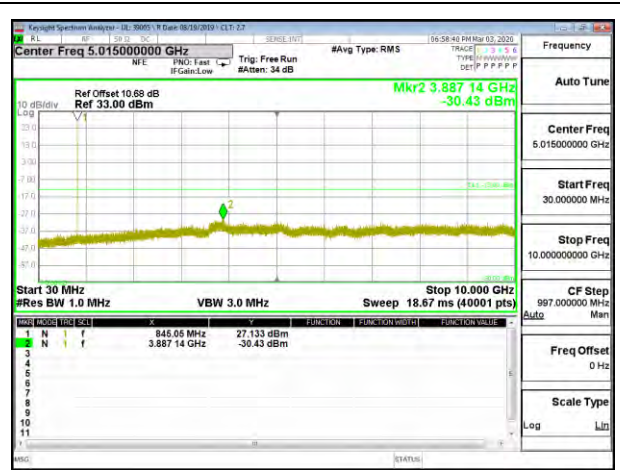
LTE B26 5MHz QPSK Middle Channel RB1-0



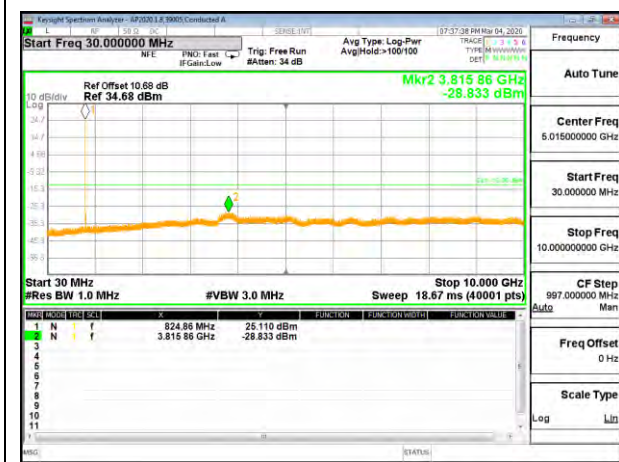
LTE B26 5MHz 16QAM Middle Channel RB1-0



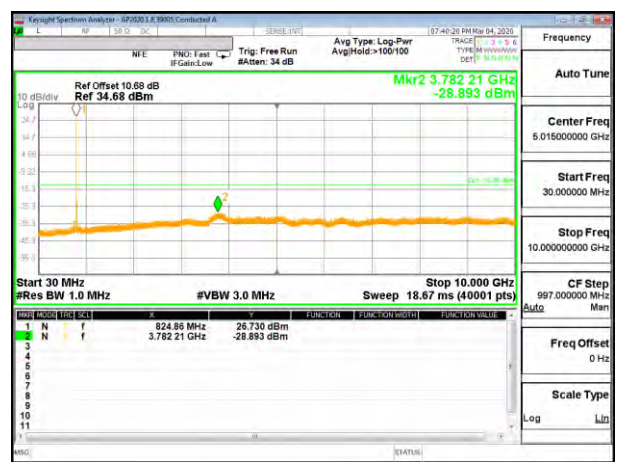
LTE B26 5MHz QPSK High Channel RB1-0



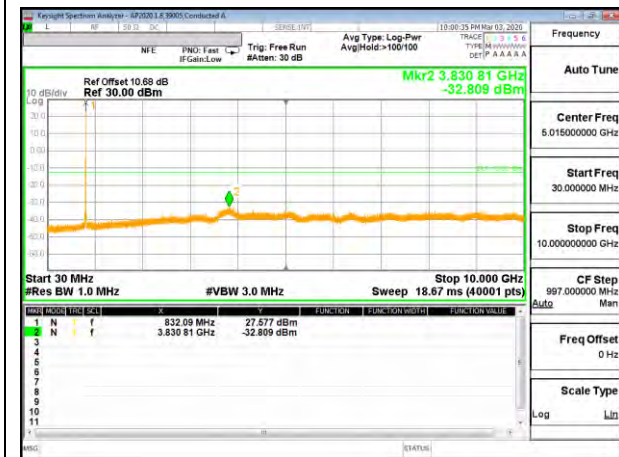
LTE B26 5MHz 16QAM High Channel RB1-0



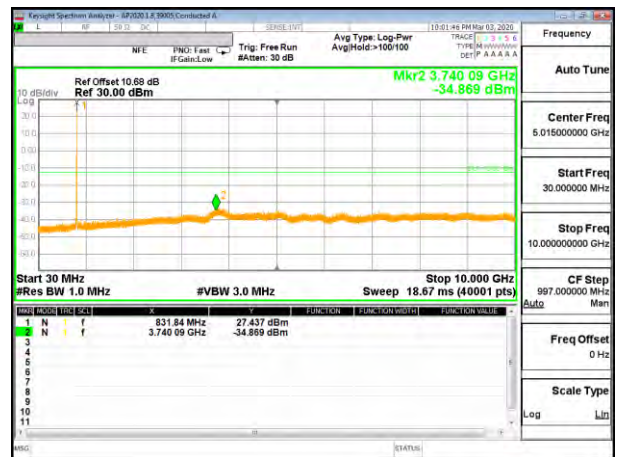
LTE B26 10MHz QPSK Low Channel RB1-0



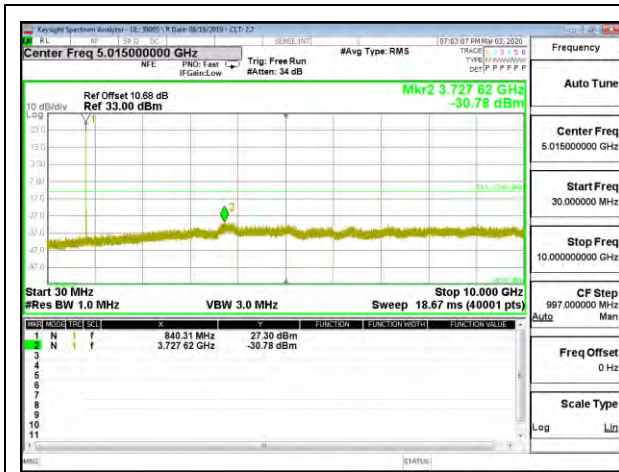
LTE B26 10MHz 16QAM Low Channel RB1-0



LTE B26 10MHz QPSK Middle Channel RB1-0



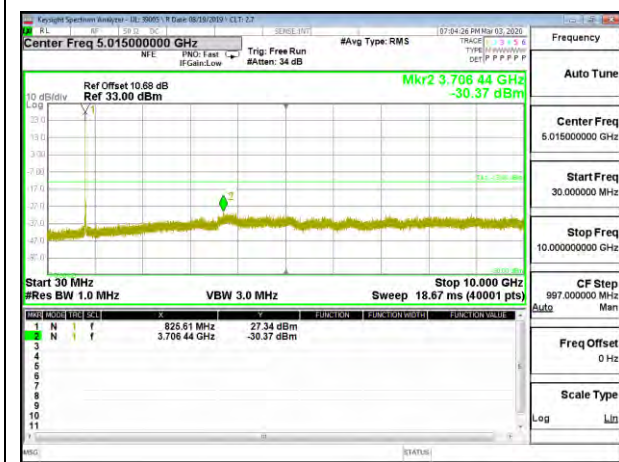
LTE B26 10MHz 16QAM Middle Channel RB1-0



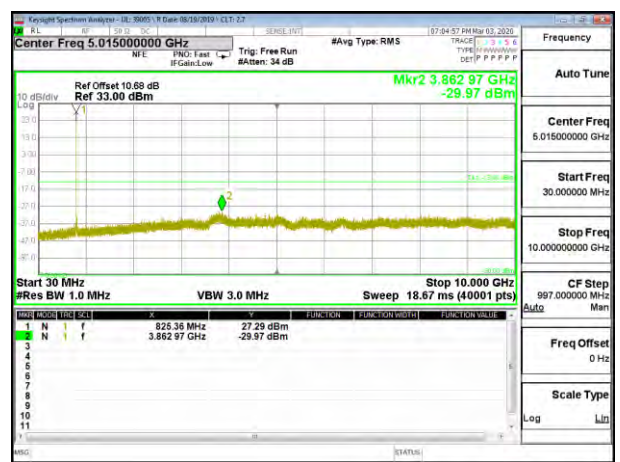
LTE B26 10MHz QPSK High Channel RB1-0



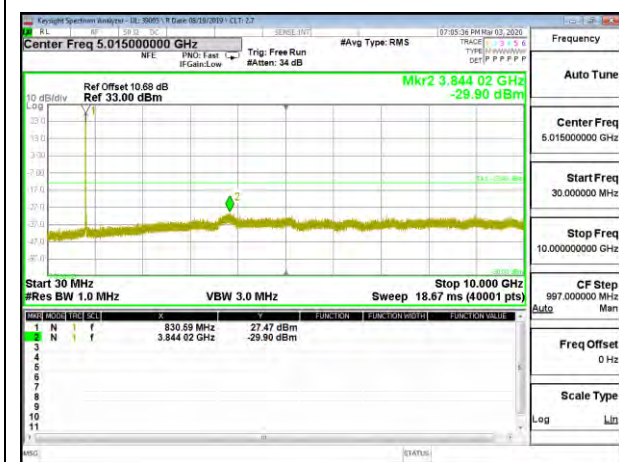
LTE B26 10MHz 16QAM High Channel RB1-0



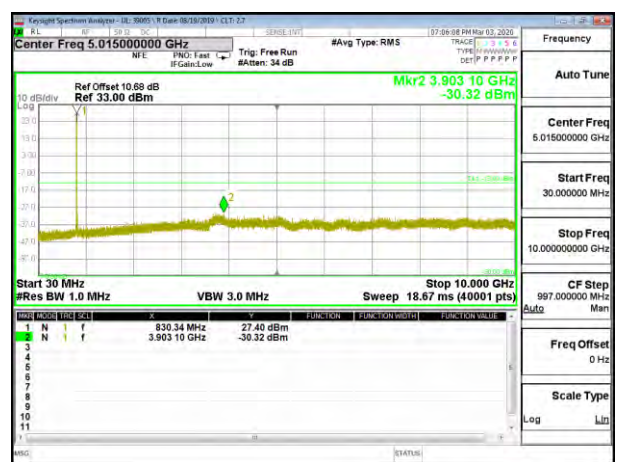
LTE B26 15MHz QPSK Low Channel RB1-0



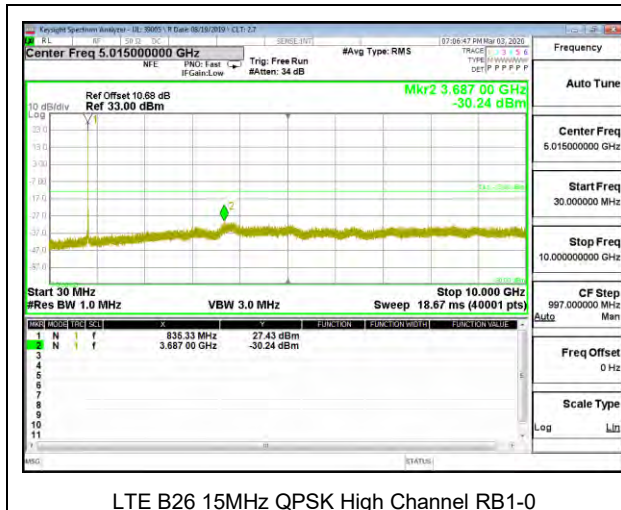
LTE B26 15MHz 16QAM Low Channel RB1-0



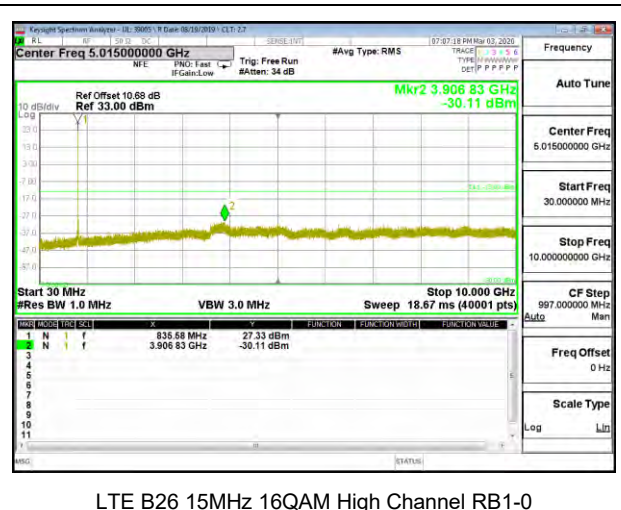
LTE B26 15MHz QPSK Middle Channel RB1-0



LTE B26 15MHz 16QAM Middle Channel RB1-0



LTE B26 15MHz QPSK High Channel RB1-0



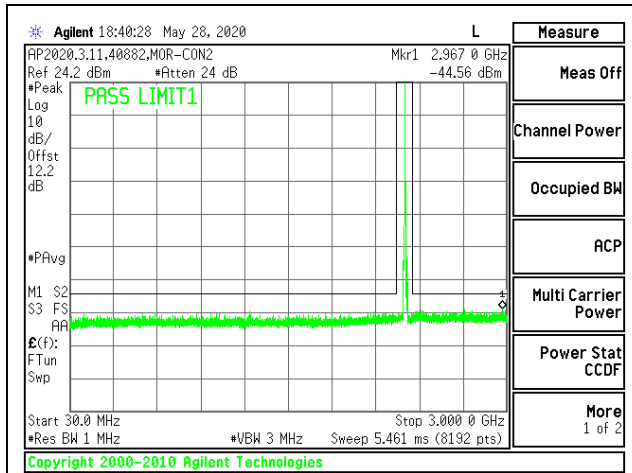
LTE B26 15MHz 16QAM High Channel RB1-0

8.3.11. LTE BAND 30

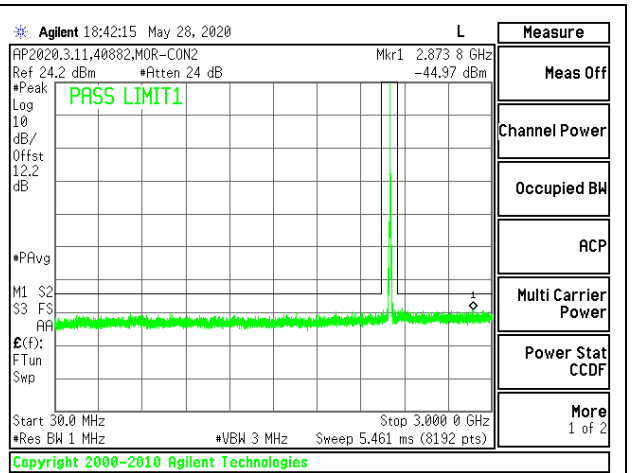
LIMITS

FCC: §27.53 (a)

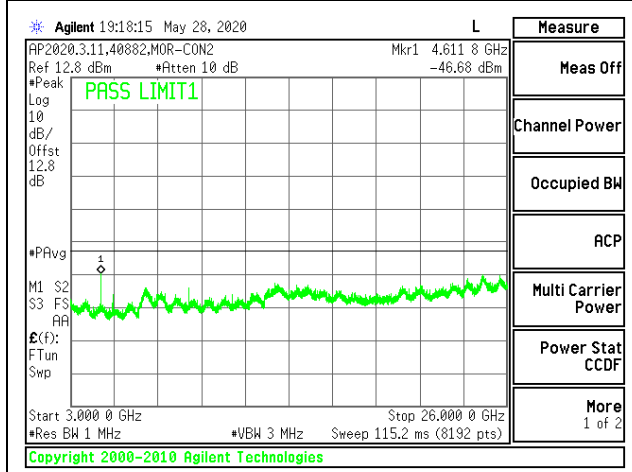
The minimum permissible attenuation level of any spurious emissions is $70 + 10 \log(P)$ dB where transmitting power (P) in Watts.



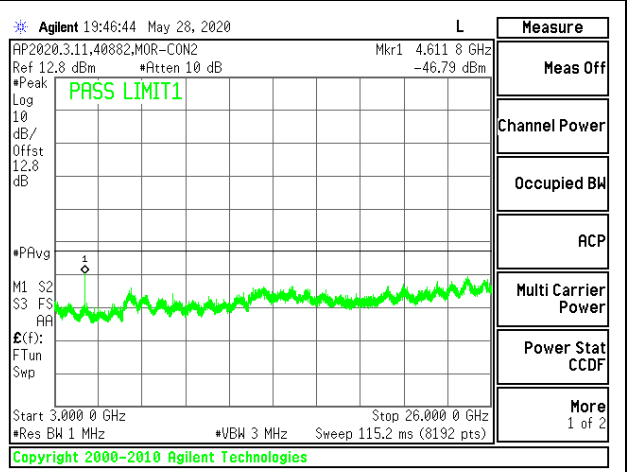
LTE B30 5MHz QPSK Low Channel RB8-0 (30MHz to 3GHz)



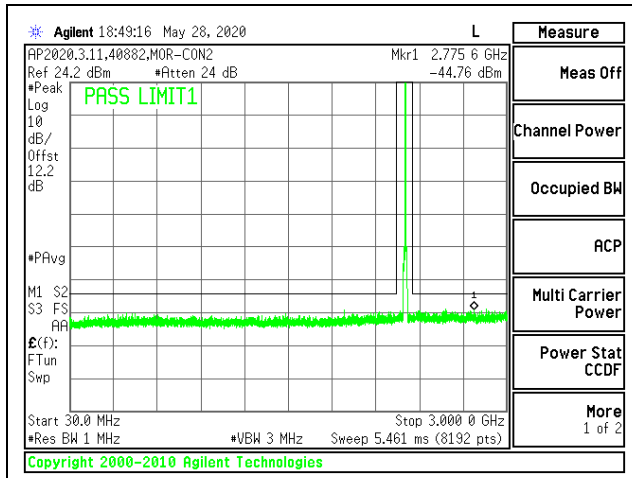
LTE B30 5MHz 16QAM Low Channel RB8-0 (30MHz to 3GHz)



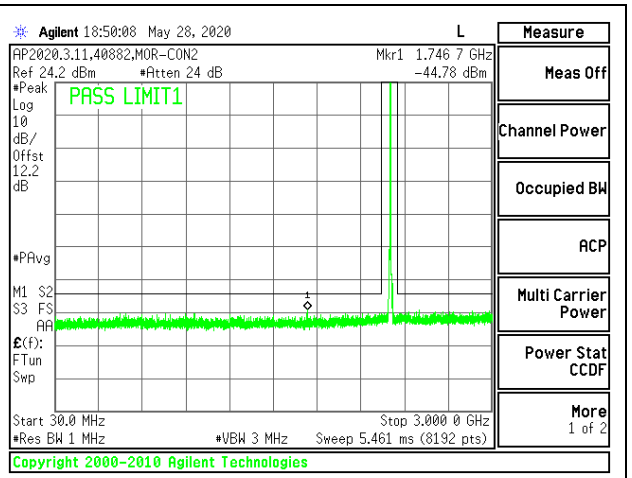
LTE B30 5MHz QPSK Low Channel RB8-0 (3G to 26G)



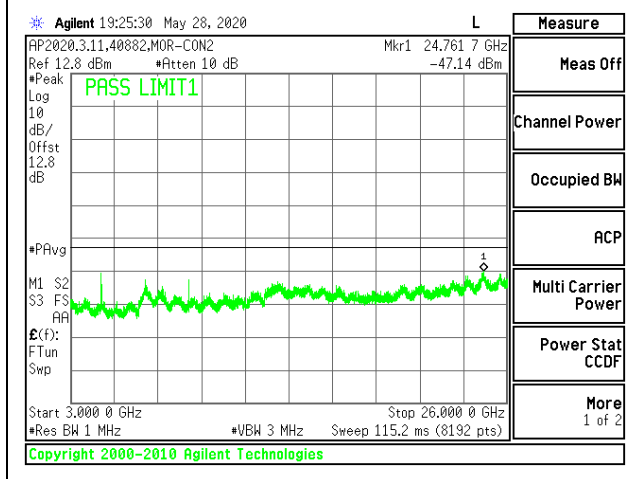
LTE B30 5MHz 16QAM Low Channel RB8-0 (3G to 26G)



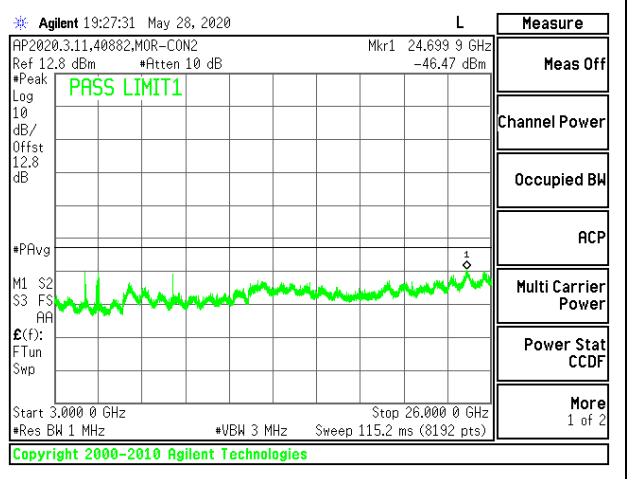
LTE B30 5MHz QPSK Mid Channel RB8-0 (30MHz to 3GHz)



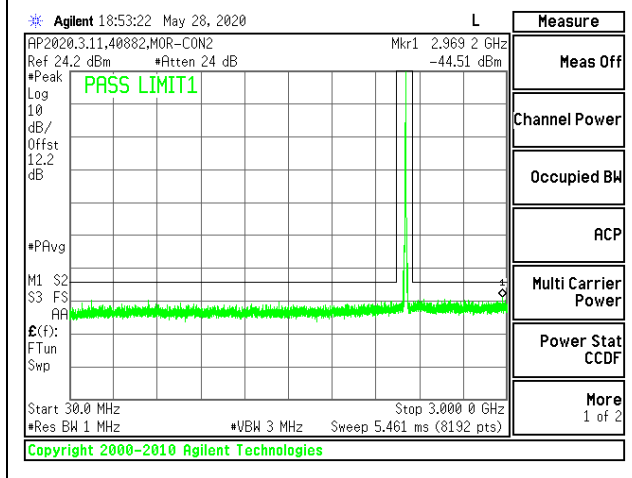
LTE B30 5MHz 16QAM Mid Channel RB8-0 (30MHz to 3GHz)



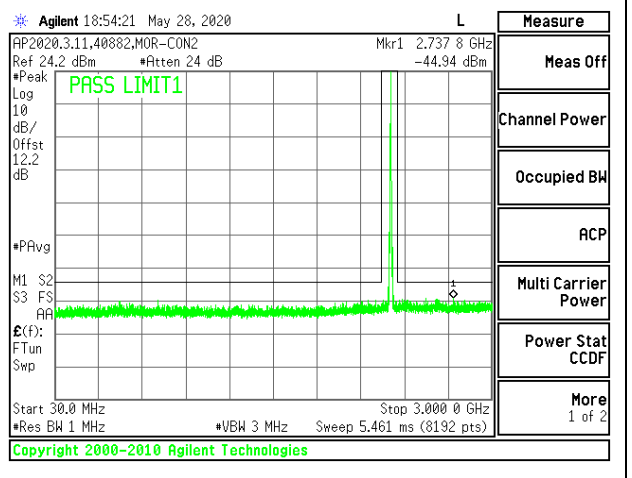
LTE B30 5MHz QPSK Middle Channel RB1-0 (3G to 26G)



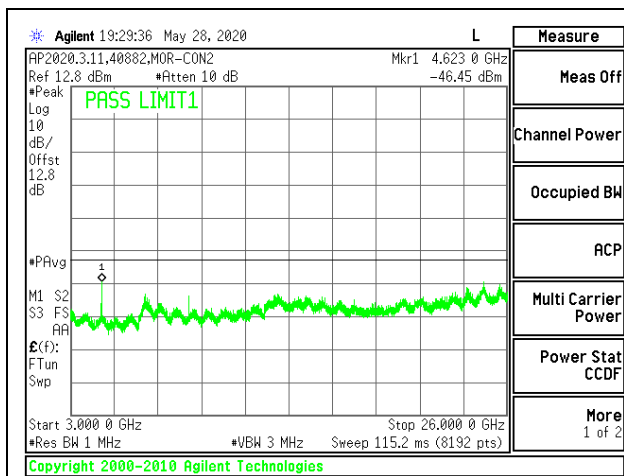
LTE B30 5MHz 16QAM Middle Channel RB1-0 (3G to 26G)



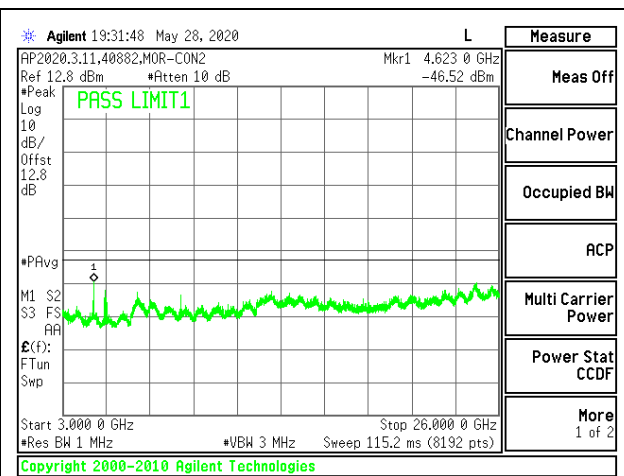
LTE B30 5MHz QPSK High Channel RB8-0 (30MHz to 3GHz)



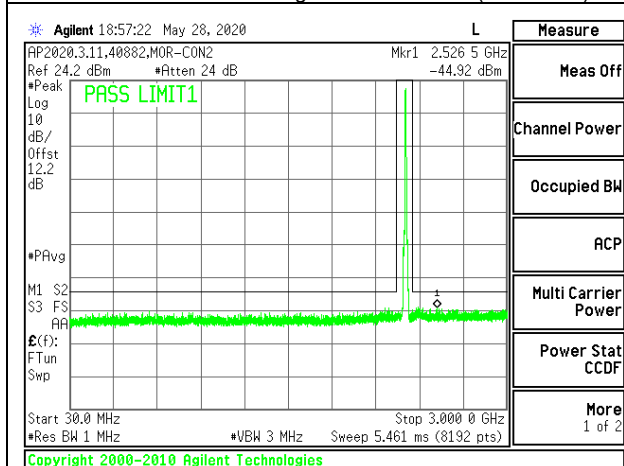
LTE B30 5MHz 16QAM High Channel RB8-0 (30MHz to 3GHz)



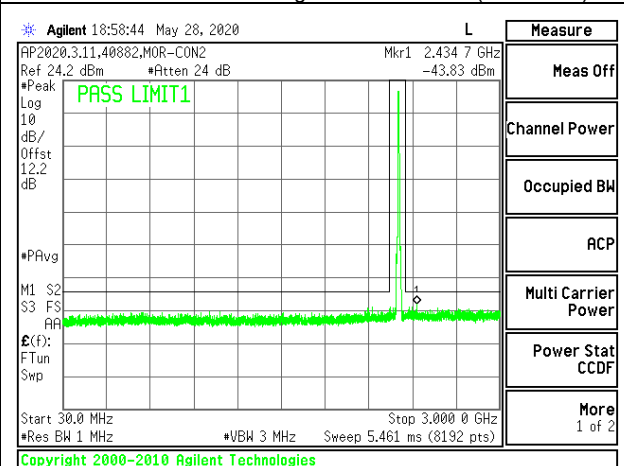
LTE B30 5MHz QPSK High Channel RB8-0 (3G to 26G)



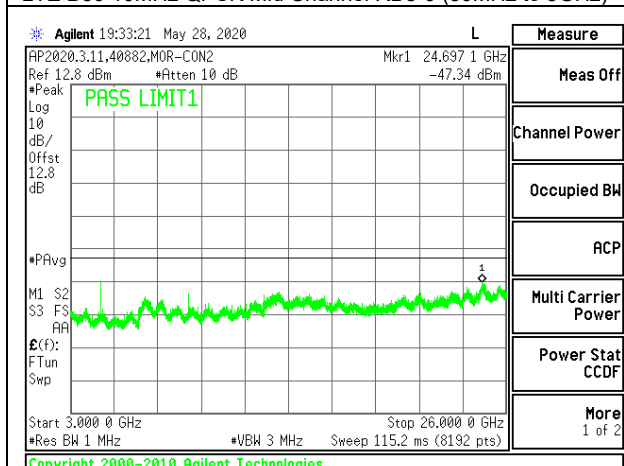
LTE B30 5MHz 16QAM High Channel RB8-0 (3G to 26G)



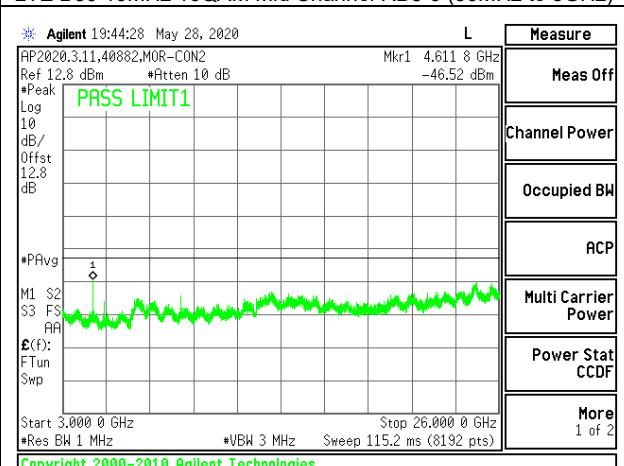
LTE B30 10MHz QPSK Mid Channel RB8-0 (30MHz to 3GHz)



LTE B30 10MHz 16QAM Mid Channel RB8-0 (30MHz to 3GHz)



LTE B30 10MHz QPSK Middle Channel RB8-0 (3G to 26G)



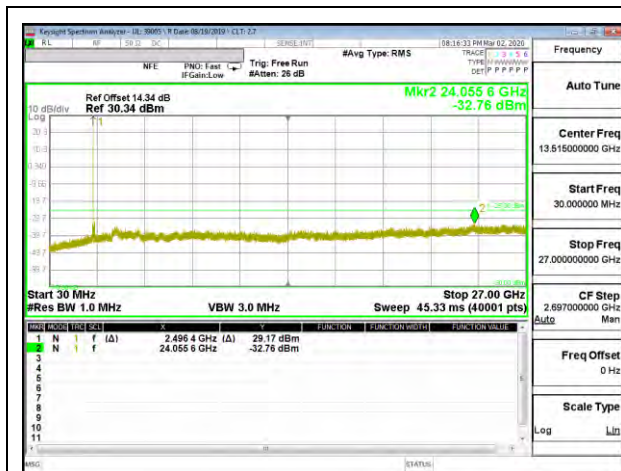
LTE B30 10MHz 16QAM Middle Channel RB8-0 (3G to 26G)

8.3.12. LTE BAND 41

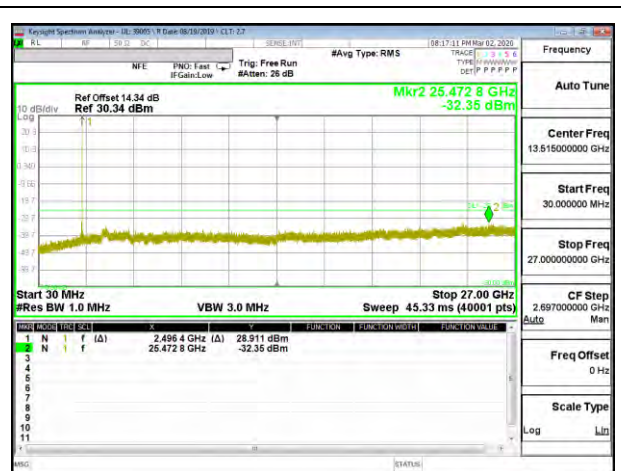
LIMITS

FCC: §27.53 (m)

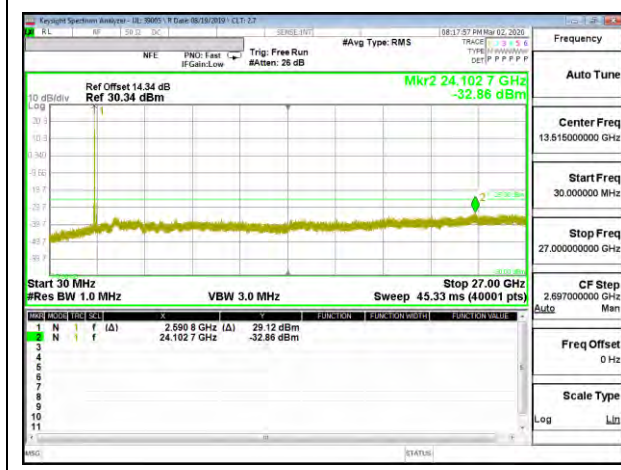
The minimum permissible attenuation level of any spurious emissions is $55 + 10 \log(P)$ dB where transmitting power (P) in Watts.



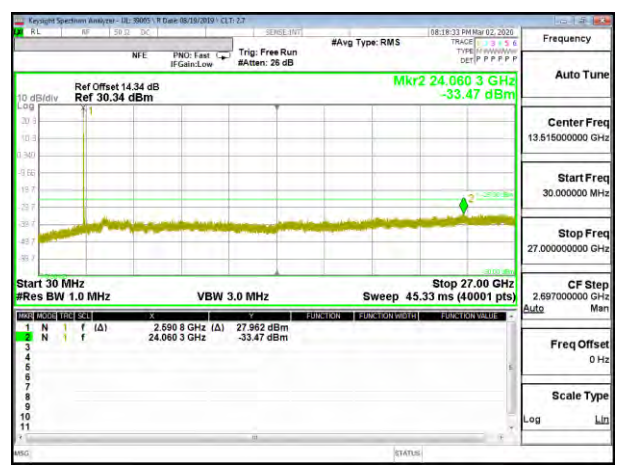
LTE B41 5MHz QPSK Low Channel RB1-0



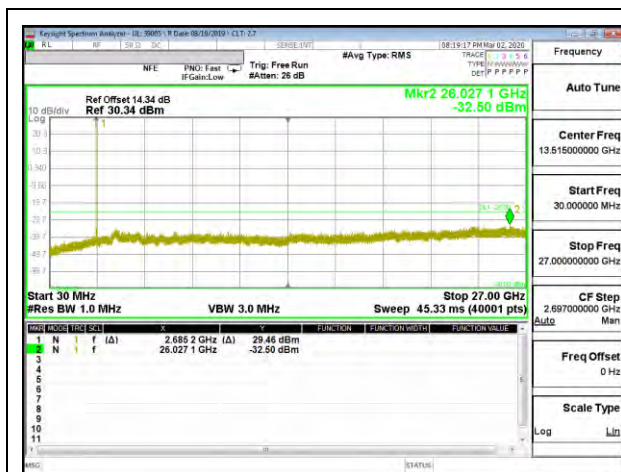
LTE B41 5MHz 16QAM Low Channel RB1-0



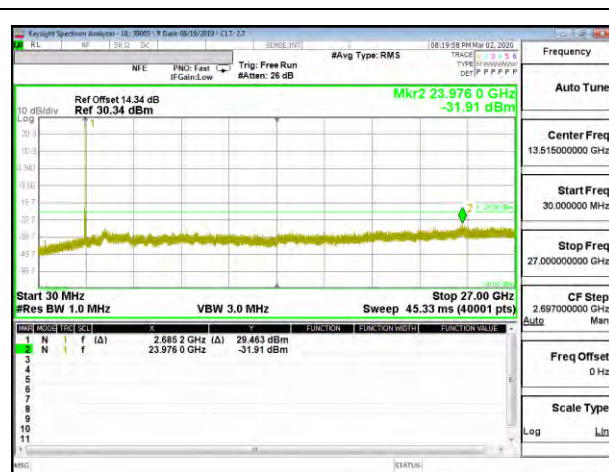
LTE B41 5MHz QPSK Middle Channel RB1-0



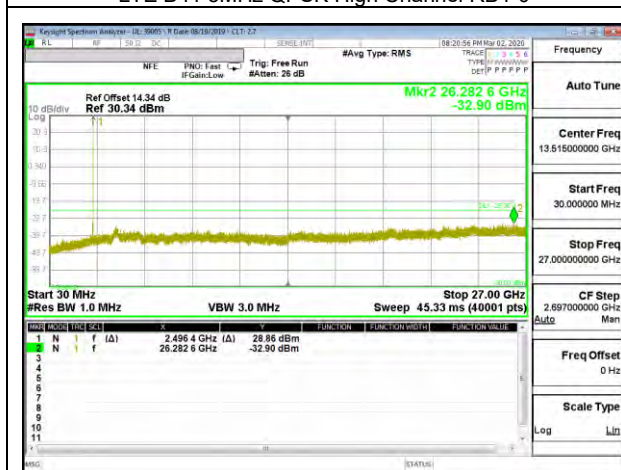
LTE B41 5MHz 16QAM Middle Channel RB1-0



LTE B41 5MHz QPSK High Channel RB1-0



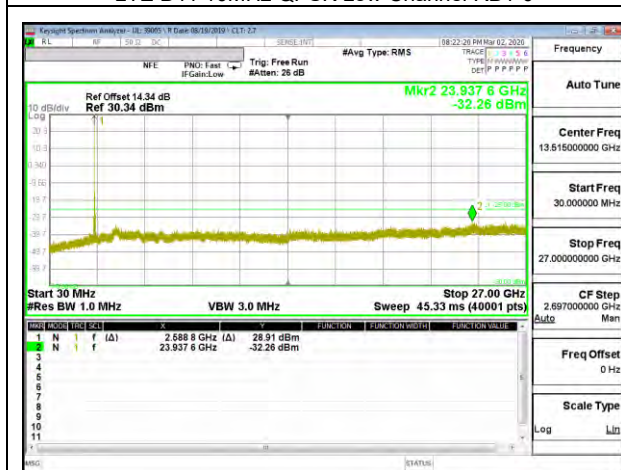
LTE B41 5MHz 16QAM High Channel RB1-0



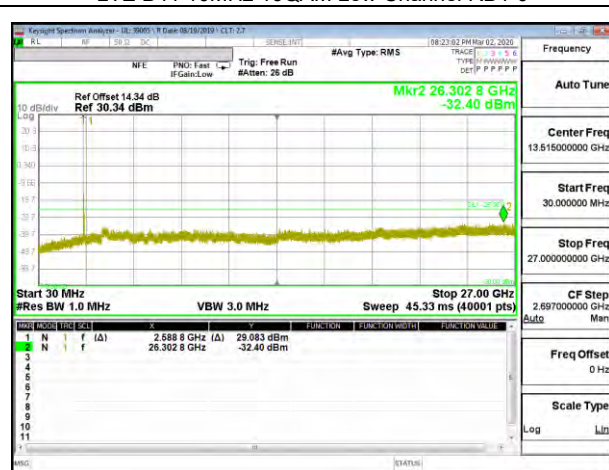
LTE B41 10MHz QPSK Low Channel RB1-0



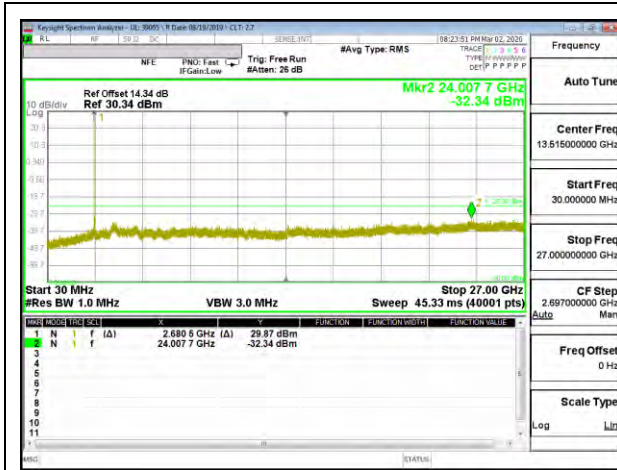
LTE B41 10MHz 16QAM Low Channel RB1-0



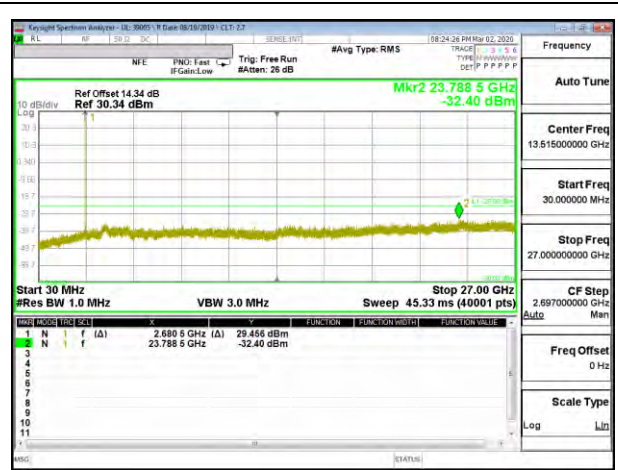
LTE B41 10MHz QPSK Middle Channel RB1-0



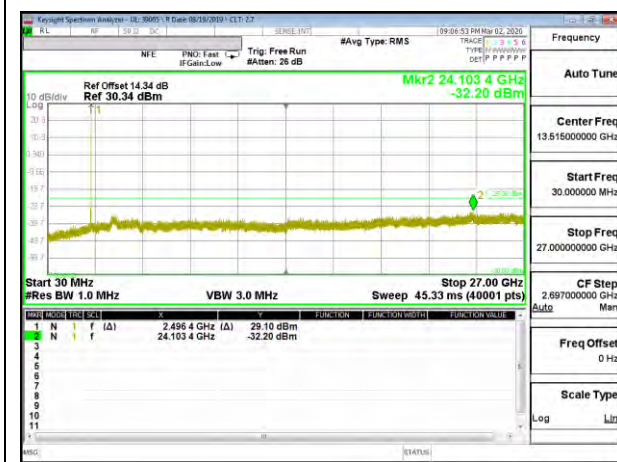
LTE B41 10MHz 16QAM Middle Channel RB1-0



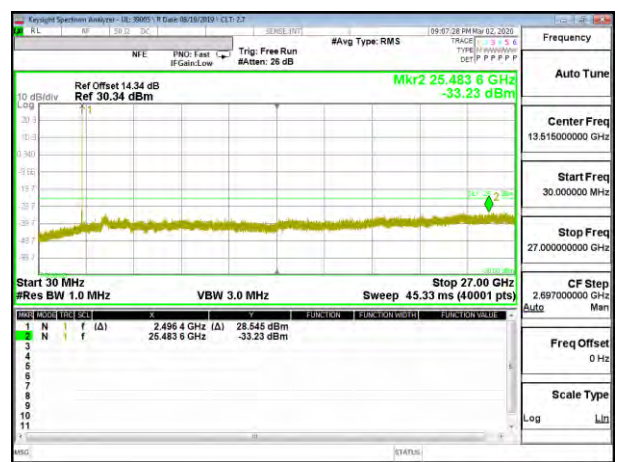
LTE B41 10MHz QPSK High Channel RB1-0



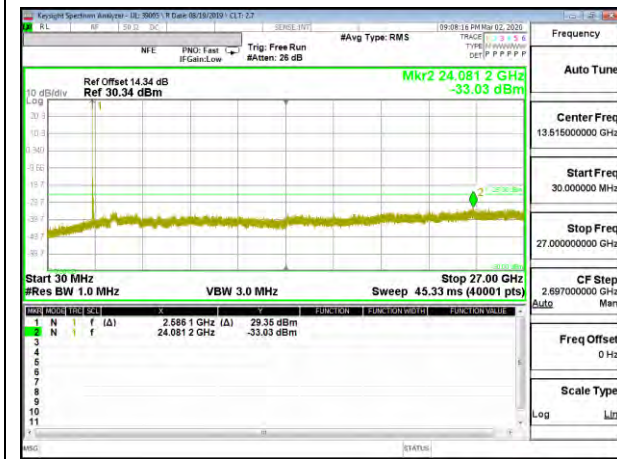
LTE B41 10MHz 16QAM High Channel RB1-0



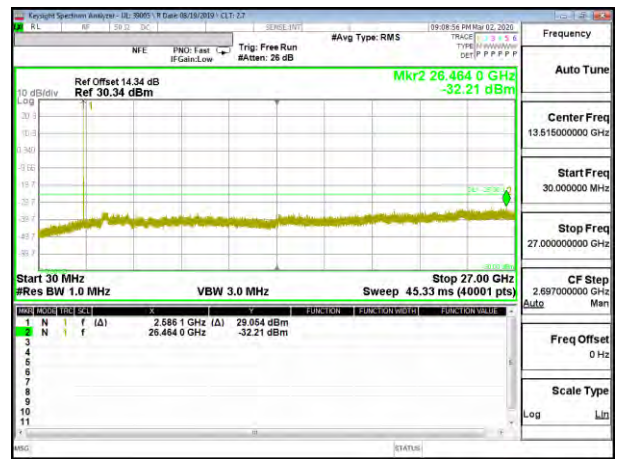
LTE B41 15MHz QPSK Low Channel RB1-0



LTE B41 15MHz 16QAM Low Channel RB1-0



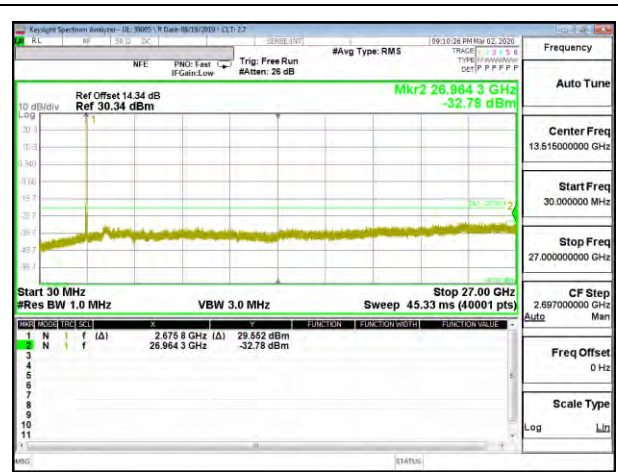
LTE B41 15MHz QPSK Middle Channel RB1-0



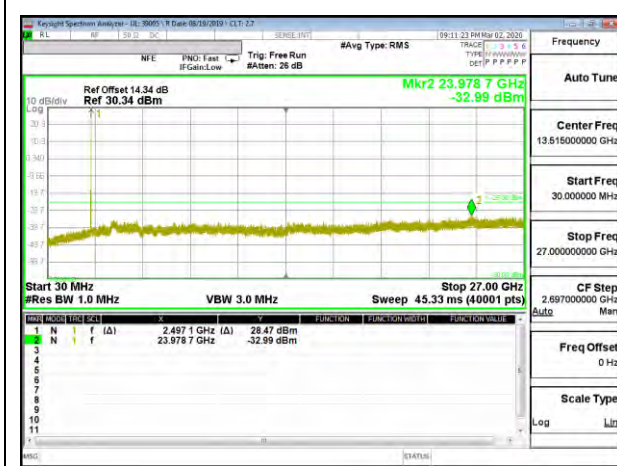
LTE B41 15MHz 16QAM Middle Channel RB1-0



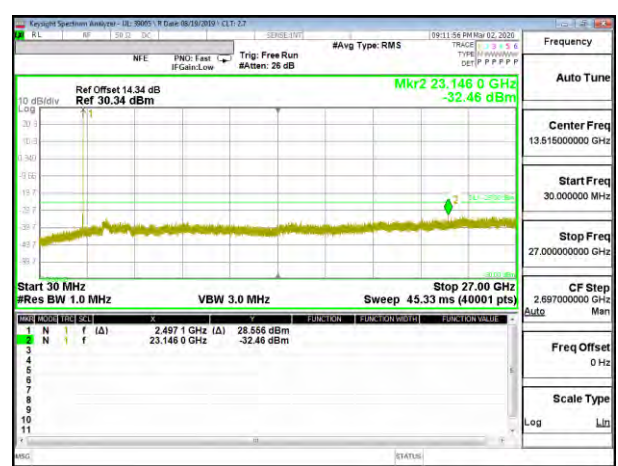
LTE B41 15MHz QPSK High Channel RB1-0



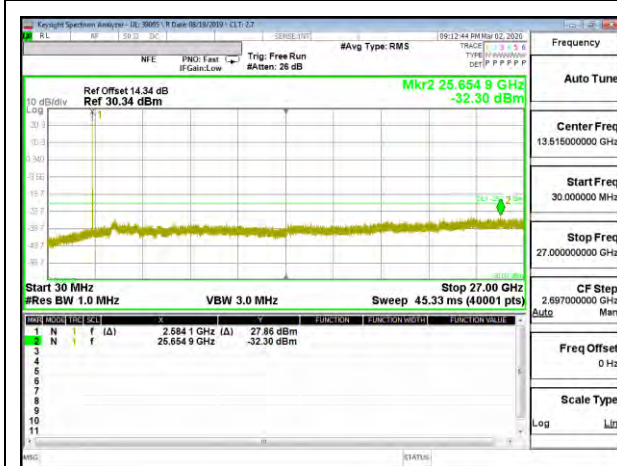
LTE B41 15MHz 16QAM High Channel RB1-0



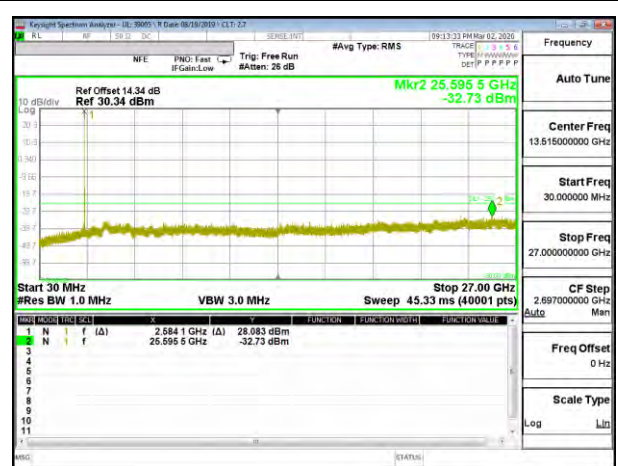
LTE B41 20MHz QPSK Low Channel RB1-0



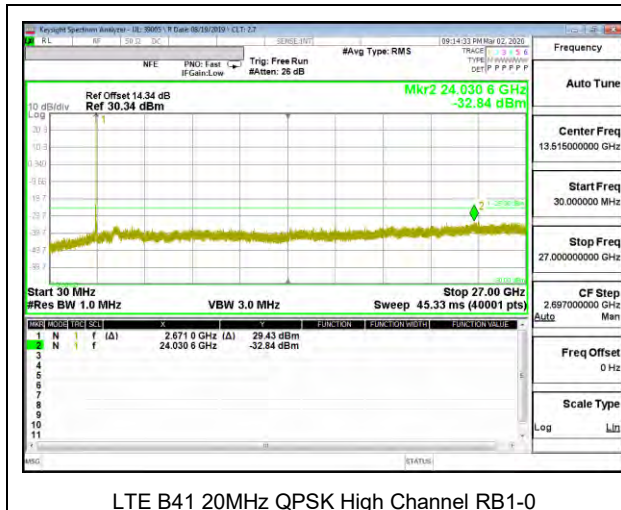
LTE B41 20MHz 16QAM Low Channel RB1-0



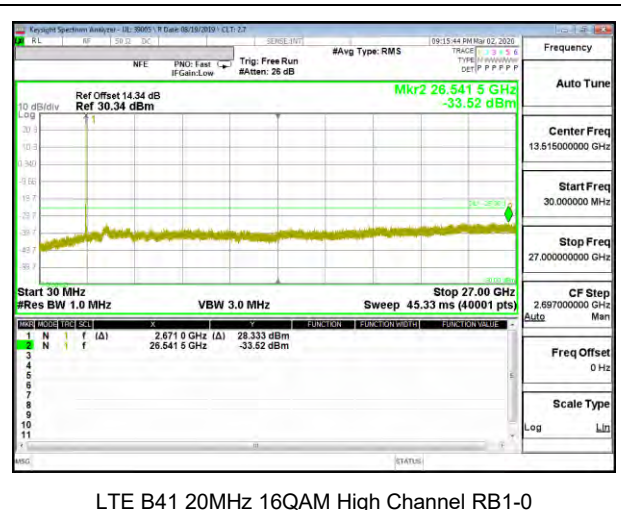
LTE B41 20MHz QPSK Middle Channel RB1-0



LTE B41 20MHz 16QAM Middle Channel RB1-0



LTE B41 20MHz QPSK High Channel RB1-0



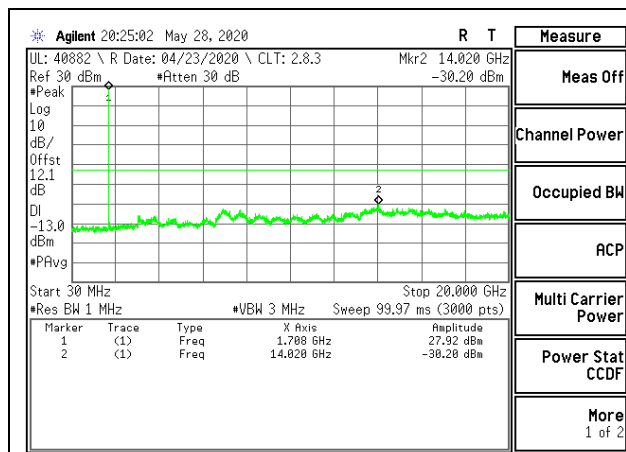
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8.3.13. LTE BAND 66

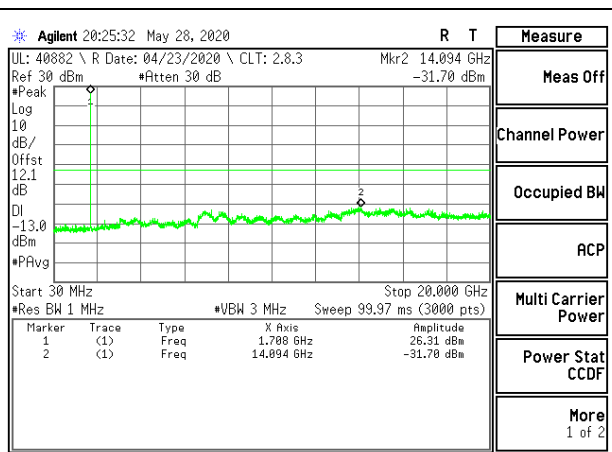
LIMITS

FCC: §27.53 (h)

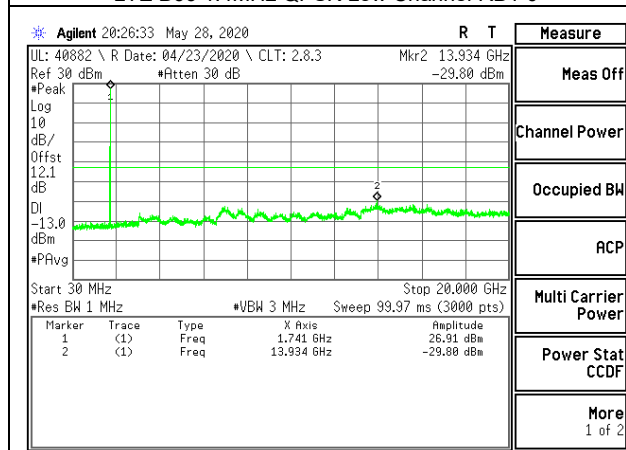
The minimum permissible attenuation level of any spurious emissions is $43 + 10 \log (P)$ dB where transmitting power (P) in Watts.



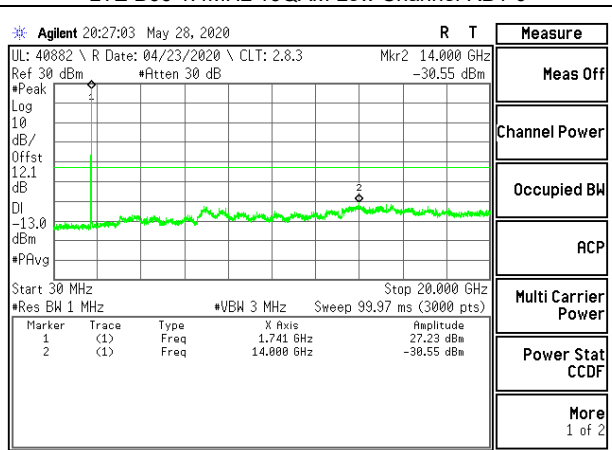
LTE B66 1.4MHz QPSK Low Channel RB1-0



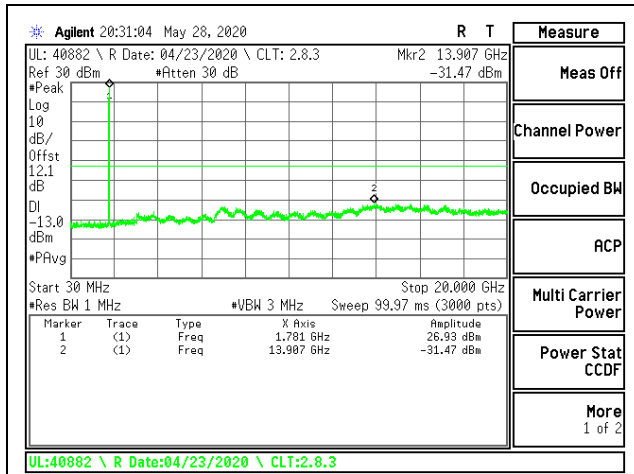
LTE B66 1.4MHz 16QAM Low Channel RB1-0



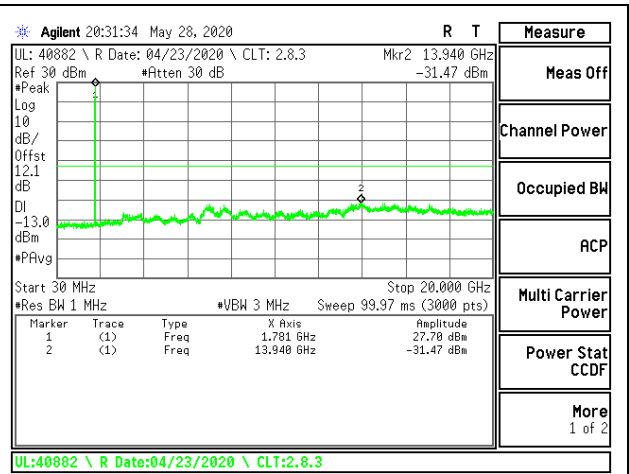
LTE B66 1.4MHz QPSK Middle Channel RB1-0



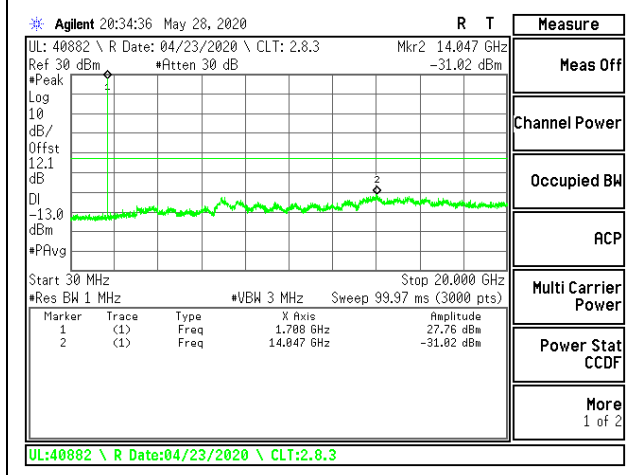
LTE B66 1.4MHz 16QAM Middle Channel RB1-0



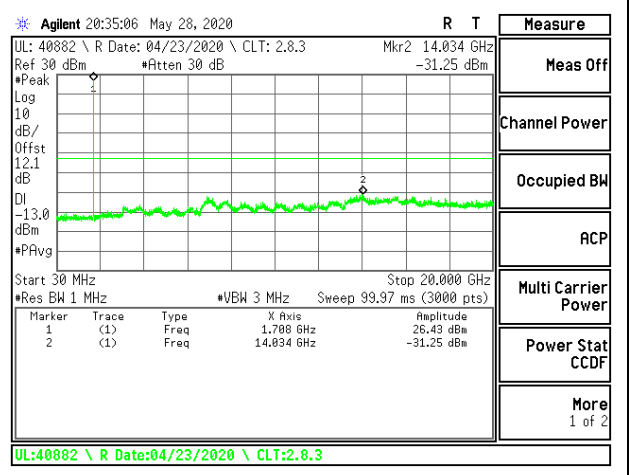
LTE B66 1.4MHz QPSK High Channel RB1-0



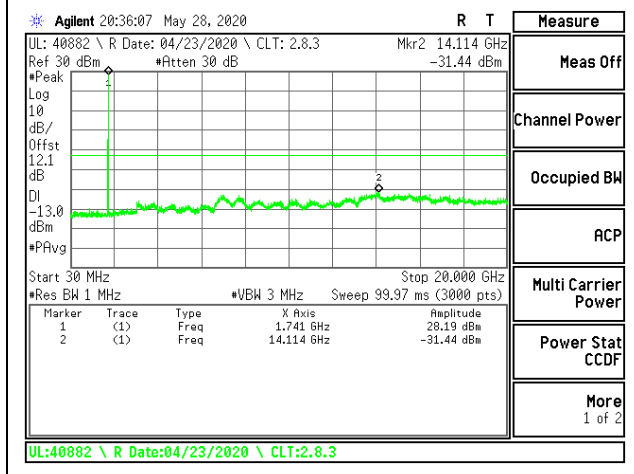
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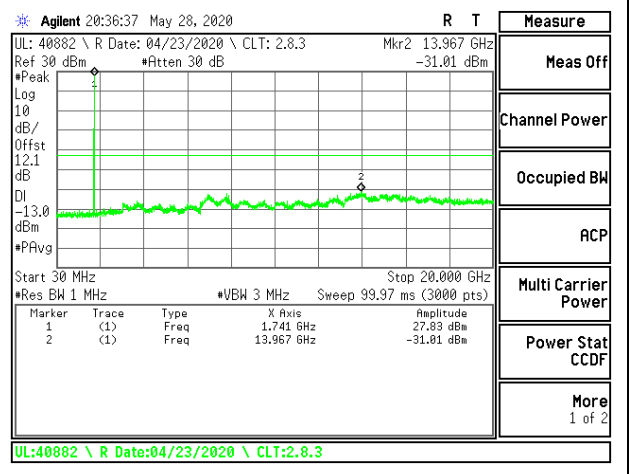
LTE B66 3MHz QPSK Low Channel RB1-0



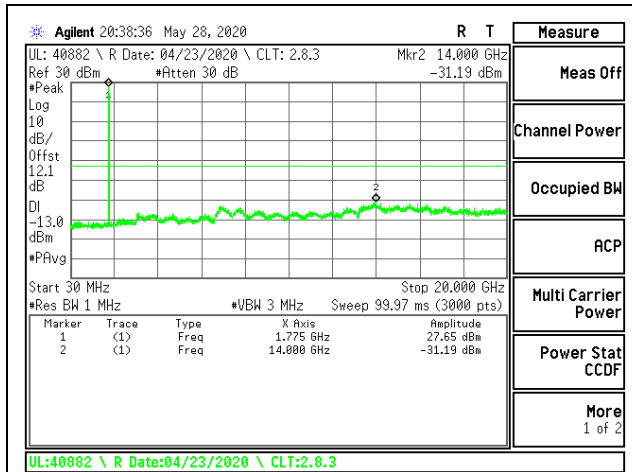
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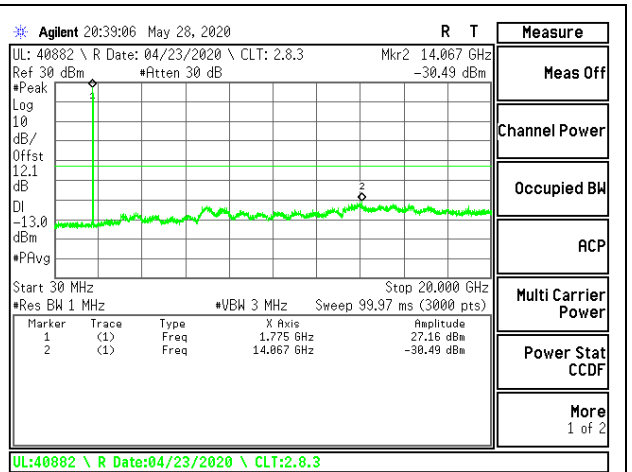
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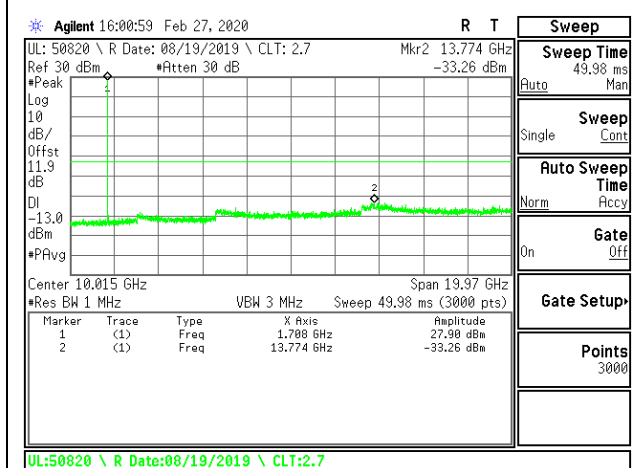
LTE B66 3MHz 16QAM Middle Channel RB1-0



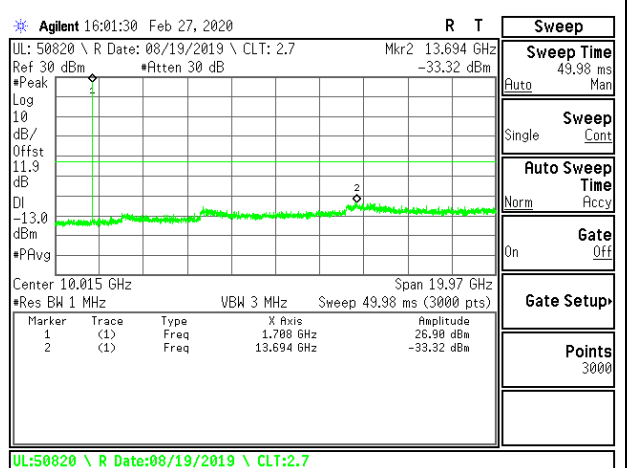
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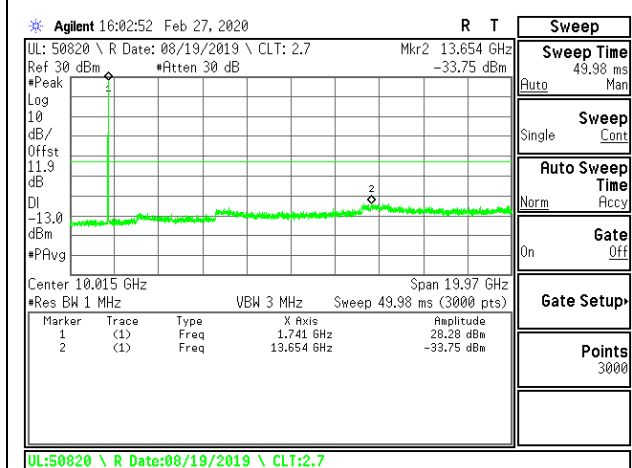
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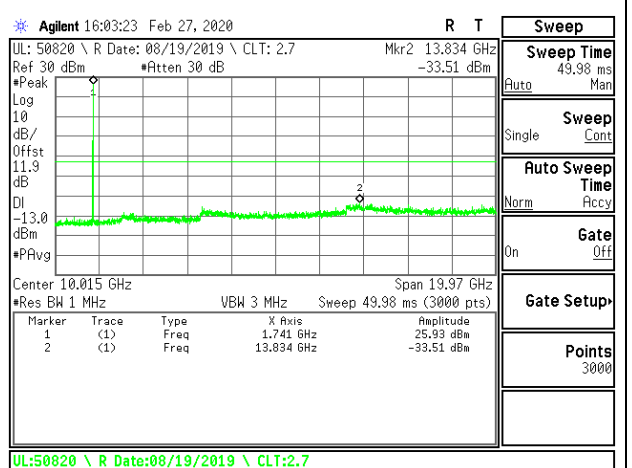
LTE B66 5MHz QPSK Low Channel RB1-0



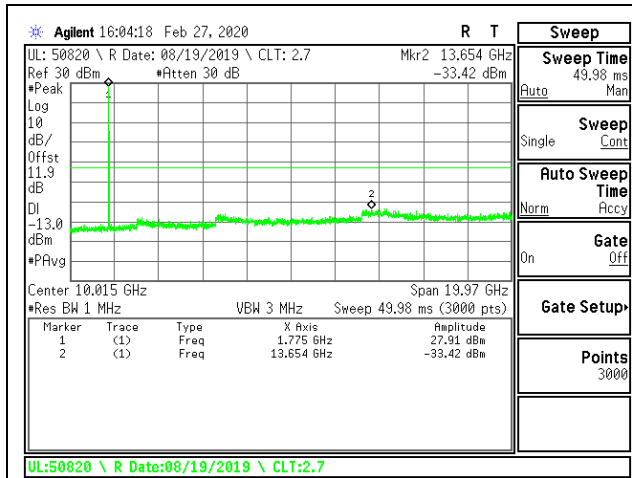
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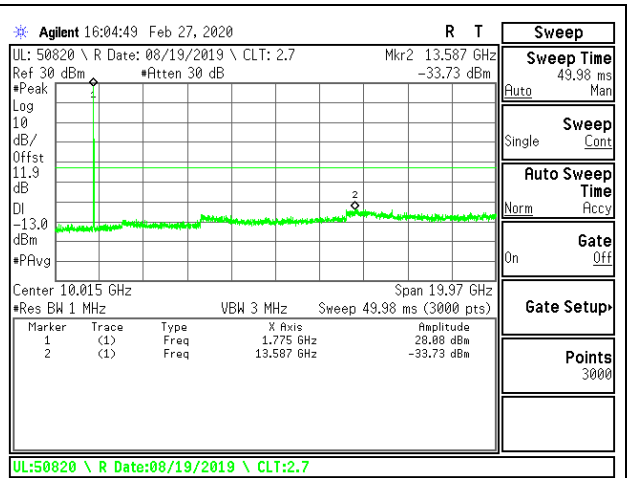
LTE B66 5MHz QPSK Middle Channel RB1-0



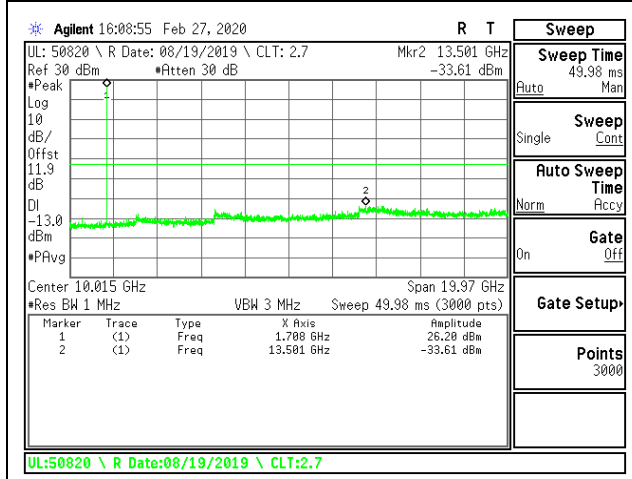
LTE B66 5MHz 16QAM Middle Channel RB1-0



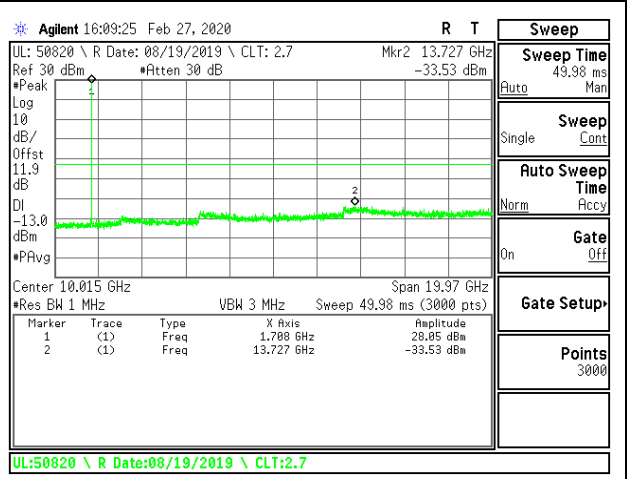
LTE B66 5MHz QPSK High Channel RB1-0



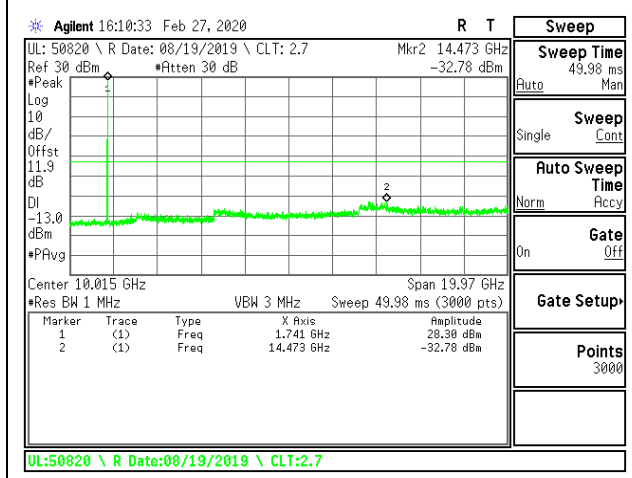
LTE B66 5MHz 16QAM High Channel RB1-0



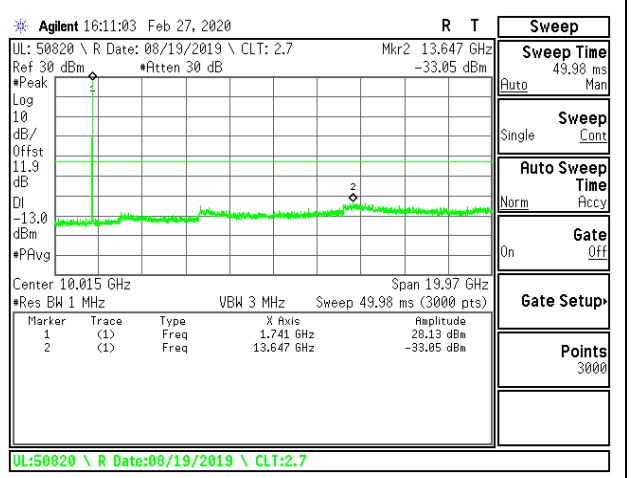
LTE B66 10MHz QPSK Low Channel RB1-0



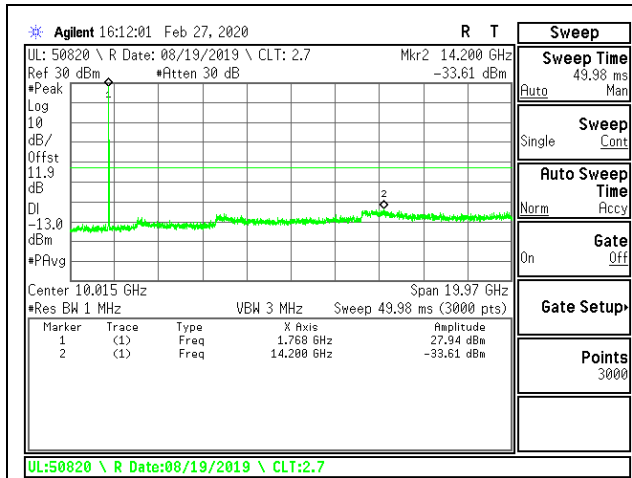
LTE B66 10MHz 16QAM Low Channel RB1-0



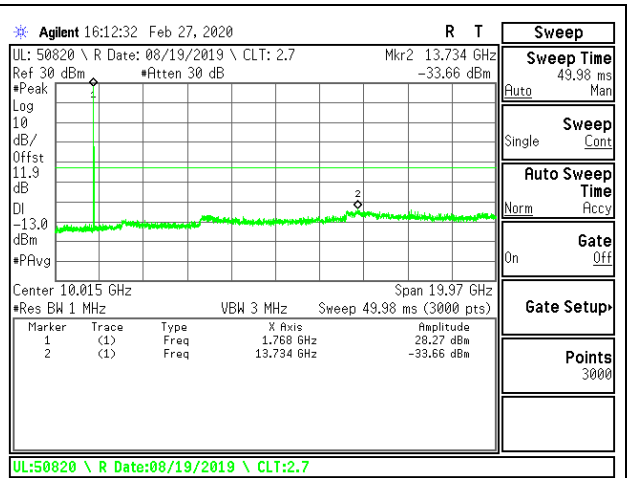
LTE B66 10MHz QPSK Middle Channel RB1-0



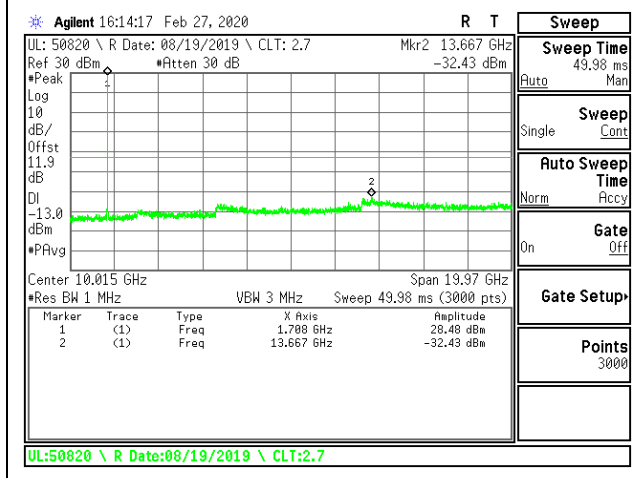
LTE B66 10MHz 16QAM Middle Channel RB1-0



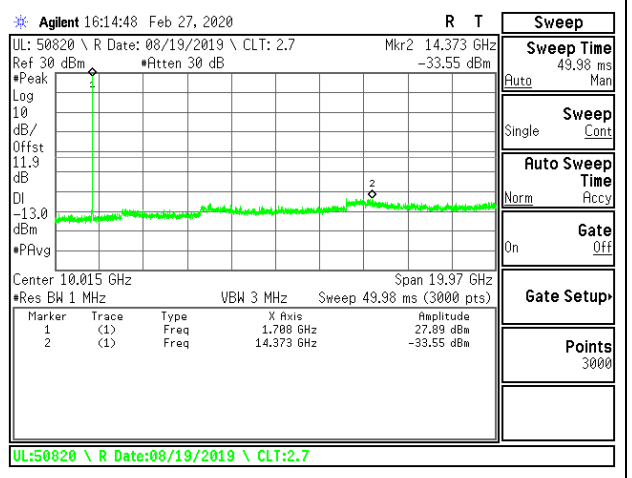
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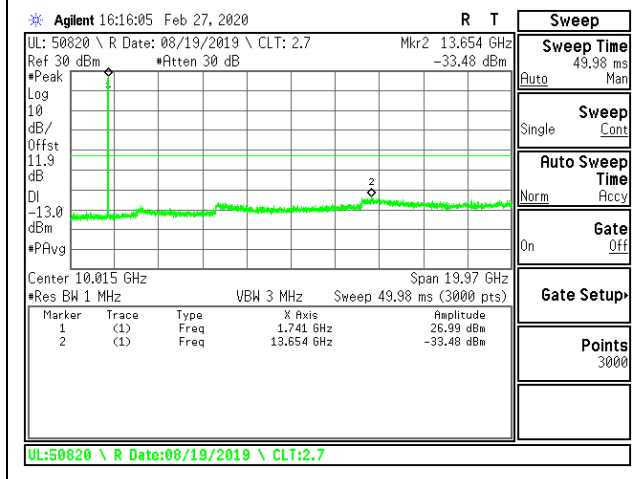
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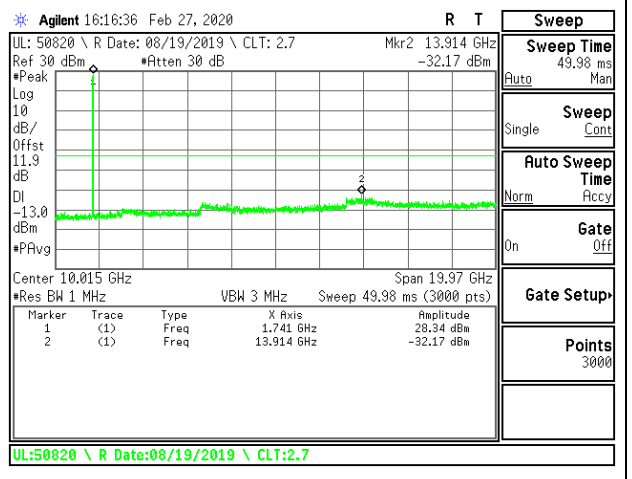
LTE B66 15MHz QPSK Low Channel RB1-0



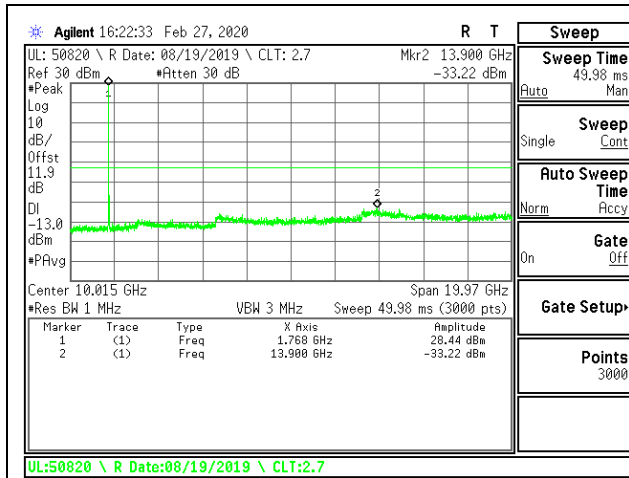
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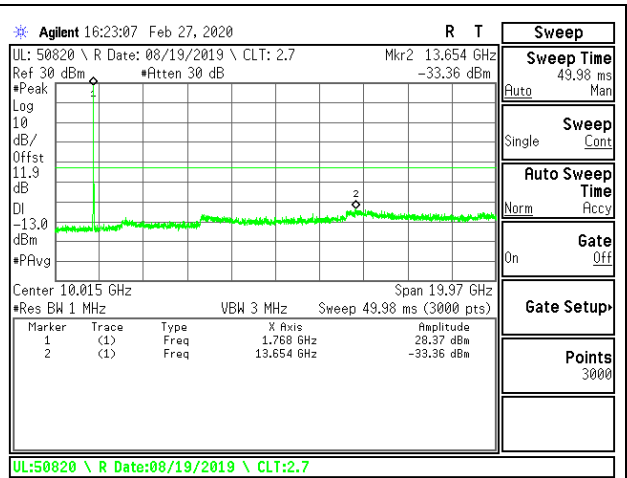
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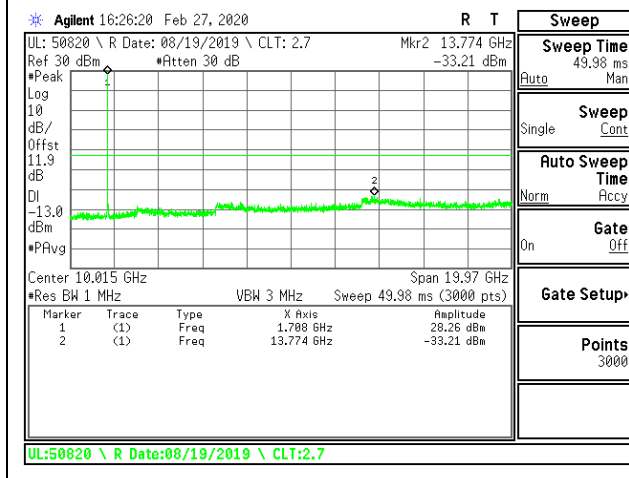
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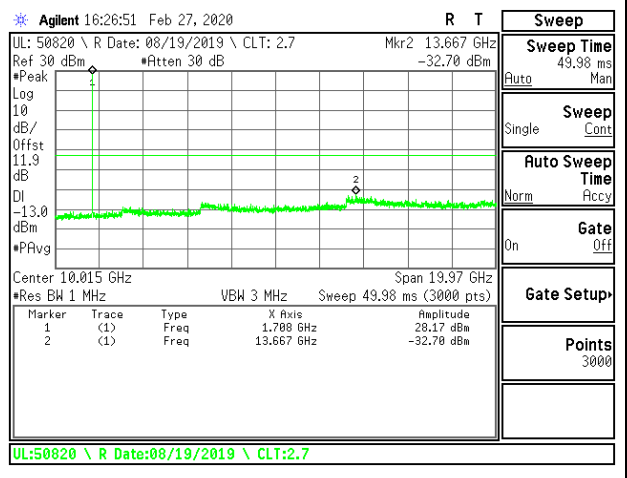
LTE B66 15MHz QPSK High Channel RB1-0



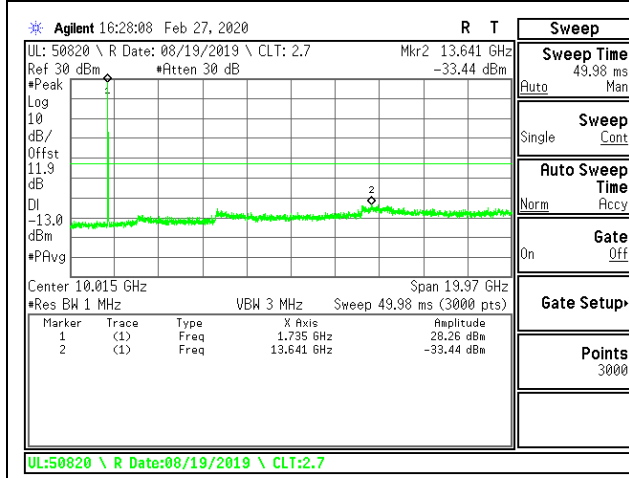
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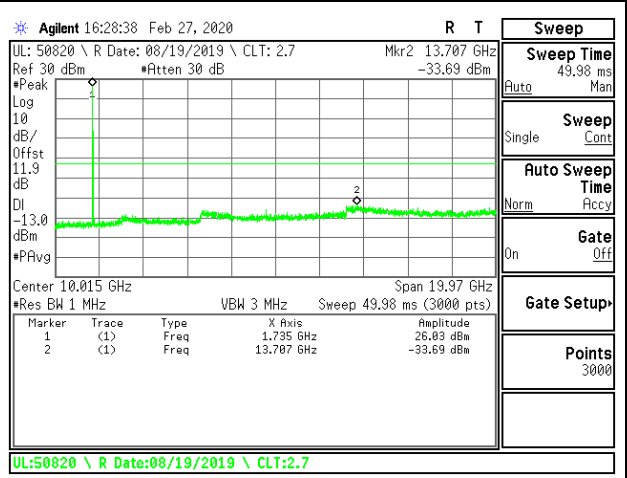
LTE B66 20MHz QPSK Low Channel RB1-0



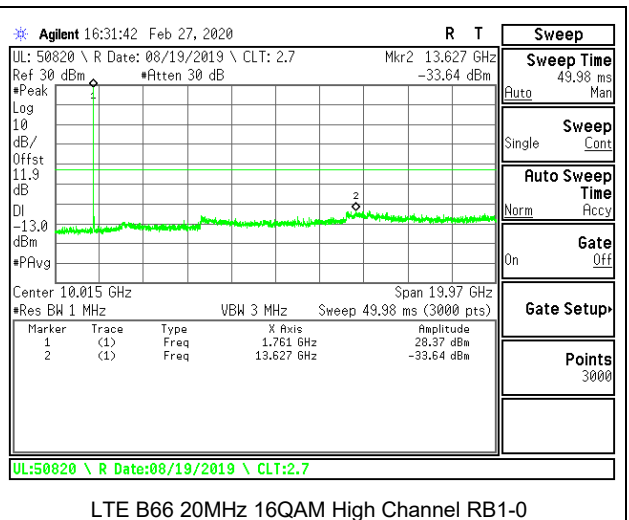
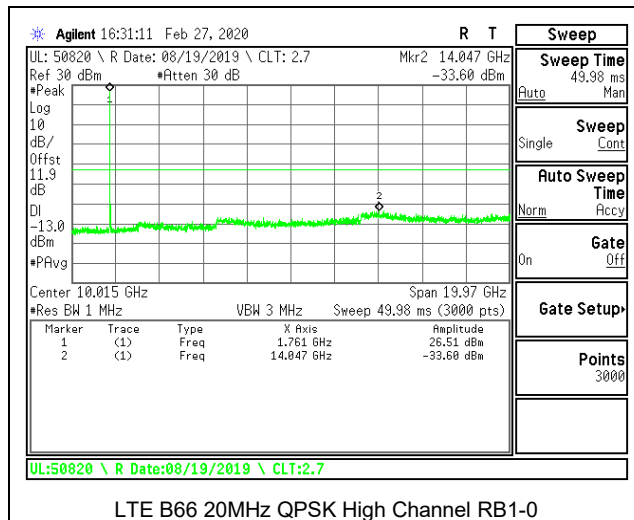
LTE B66 20MHz 16QAM Low Channel RB1-0



LTE B66 20MHz QPSK Middle Channel RB1-0



LTE B66 20MHz 16QAM Middle Channel RB1-0



8.4. FREQUENCY STABILITY

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = -30°C to +50°C
- Voltage = (85% - 115%)

Low voltage, 3.61VDC, Normal, 3.8VDC and High voltage, 4.18VDC.
End Voltage, 2.7VDC.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to 20°C 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 +50°C 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

LIMITS

FCC: §24.235

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (20MHz BANDWIDTH)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1850.9824	1908.9868		
Extreme (50C)		1850.9824	1908.9867	-13.6	-0.007
Extreme (40C)		1850.9824	1908.9867	-12.1	-0.006
Extreme (30C)		1850.9824	1908.9867	-13.3	-0.007
Extreme (10C)		1850.9824	1908.9867	-12.4	-0.007
Extreme (0C)		1850.9824	1908.9867	-6.7	-0.004
Extreme (-10C)		1850.9824	1908.9868	-4.1	-0.002
Extreme (-20C)		1850.9824	1908.9867	-10.5	-0.006
Extreme (-30C)		1850.9824	1908.9868	11.1	0.006
20C	15%	1850.9824	1908.9867	-12.2	-0.007
	-15%	1850.9824	1908.9867	-13.2	-0.007
	End Point	1850.9824	1908.9867	-11.6	-0.006

8.4.2. LTE BAND 4

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (20MHz BANDWIDTH)

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1711.0115	1753.9910		
Extreme (50C)		1711.0115	1753.9910	7.0	0.004
Extreme (40C)		1711.0115	1753.9910	-13.3	-0.008
Extreme (30C)		1711.0115	1753.9910	-12.7	-0.007
Extreme (10C)		1711.0115	1753.9910	11.2	0.006
Extreme (0C)		1711.0115	1753.9910	-9.5	-0.005
Extreme (-10C)		1711.0115	1753.9910	-9.2	-0.005
Extreme (-20C)		1711.0115	1753.9910	-11.0	-0.006
Extreme (-30C)		1711.0115	1753.9910	-11.7	-0.007
20C	15%	1711.0115	1753.9910	-12.7	-0.007
	-15%	1711.0115	1753.9910	-12.0	-0.007
	End Point	1711.0115	1753.9910	-10.8	-0.006

8.4.3. LTE BAND 5

LIMITS

FCC: §22.355

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (10MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.2347	848.4940		
Extreme (50C)		824.2347	848.4940	5.5	0.007
Extreme (40C)		824.2347	848.4940	5.5	0.007
Extreme (30C)		824.2347	848.4940	-7.3	-0.009
Extreme (10C)		824.2347	848.4940	7.1	0.008
Extreme (0C)		824.2347	848.4940	7.7	0.009
Extreme (-10C)		824.2347	848.4940	3.6	0.004
Extreme (-20C)		824.2347	848.4940	7.5	0.009
Extreme (-30C)		824.2347	848.4940	7.2	0.009
20C	15%	824.2347	848.4940	-6.9	-0.008
	-15%	824.2347	848.4940	-8.7	-0.010
	End Point	824.2347	848.4940	-7.9	-0.009

8.4.4. LTE BAND 7

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (20MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2501.0215	2568.9947		
Extreme (50C)		2501.0215	2568.9947	-18.4	-0.007
Extreme (40C)		2501.0215	2568.9947	-17.6	-0.007
Extreme (30C)		2501.0215	2568.9947	-18.7	-0.007
Extreme (10C)		2501.0215	2568.9947	-17.7	-0.007
Extreme (0C)		2501.0215	2568.9947	-18.5	-0.007
Extreme (-10C)		2501.0215	2568.9947	10.9	0.004
Extreme (-20C)		2501.0215	2568.9947	-17.7	-0.007
Extreme (-30C)		2501.0215	2568.9948	17.2	0.007
20C	15%	2501.0215	2568.9947	-17.9	-0.007
	-15%	2501.0215	2568.9947	-18.6	-0.007
	End Point	2501.0215	2568.9947	-17.9	-0.007

8.4.5. LTE BAND 12

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (10MHz BANDWIDTH)

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	699.5091	715.4930		
Extreme (50C)		699.5091	715.4930	-7.0	-0.010
Extreme (40C)		699.5091	715.4930	-6.9	-0.010
Extreme (30C)		699.5091	715.4930	-6.2	-0.009
Extreme (10C)		699.5091	715.4930	7.1	0.010
Extreme (0C)		699.5091	715.4930	7.2	0.010
Extreme (-10C)		699.5091	715.4930	6.9	0.010
Extreme (-20C)		699.5091	715.4930	7.2	0.010
Extreme (-30C)		699.5091	715.4930	-5.9	-0.008
20C	15%	699.5091	715.4930	6.8	0.010
	-15%	699.5091	715.4930	-7.0	-0.010
	End Point	699.5091	715.4930	-6.9	-0.010

8.4.6. LTE BAND 13

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (10MHz BANDWIDTH)

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	777.5138	786.5038		
Extreme (50C)		777.5138	786.5038	-2.8	-0.004
Extreme (40C)		777.5138	786.5038	-6.5	-0.008
Extreme (30C)		777.5138	786.5038	-5.1	-0.007
Extreme (10C)		777.5138	786.5038	7.3	0.009
Extreme (0C)		777.5138	786.5038	-8.4	-0.011
Extreme (-10C)		777.5138	786.5038	-8.7	-0.011
Extreme (-20C)		777.5138	786.5038	6.2	0.008
Extreme (-30C)		777.5138	786.5038	7.0	0.009
20C	15%	777.5138	786.5038	6.2	0.008
	-15%	777.5138	786.5038	-7.4	-0.009
	End Point	777.5138	786.5038	-8.0	-0.010

8.4.7. LTE BAND 14

LIMITS

FCC: §90.539

(e) The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 ppm or better when AFC is locked to a base station, and 5 ppm or better when AFC is not locked.

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (10MHz BANDWIDTH)

Limit		788	798	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	788.5081	797.4892		
Extreme (50C)		788.5081	797.4892	4.2	0.005
Extreme (40C)		788.5081	797.4891	-4.4	-0.005
Extreme (30C)		788.5081	797.4891	-5.6	-0.007
Extreme (10C)		788.5081	797.4892	4.2	0.005
Extreme (0C)		788.5081	797.4892	4.5	0.006
Extreme (-10C)		788.5081	797.4891	-4.1	-0.005
Extreme (-20C)		788.5081	797.4892	5.1	0.006
Extreme (-30C)		788.5081	797.4892	5.5	0.007
20C	15%	788.5081	797.4892	5.0	0.006
	-15%	788.5081	797.4891	-4.5	-0.006
	End Point	788.5081	797.4891	-5.4	-0.007

8.4.8. LTE BAND 25

LIMITS

FCC: §24.235

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (20MHz BANDWIDTH)

Limit		1850	1915	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1851.0082	1913.9902		
Extreme (50C)		1851.0082	1913.9901	-15.5	-0.008
Extreme (40C)		1851.0082	1913.9901	-14.1	-0.007
Extreme (30C)		1851.0082	1913.9901	-14.3	-0.008
Extreme (10C)		1851.0082	1913.9902	14.1	0.007
Extreme (0C)		1851.0082	1913.9901	-14.5	-0.008
Extreme (-10C)		1851.0082	1913.9901	-9.0	-0.005
Extreme (-20C)		1851.0082	1913.9901	-12.9	-0.007
Extreme (-30C)		1851.0082	1913.9901	-14.4	-0.008
20C	15%	1851.0082	1913.9901	-13.1	-0.007
	-15%	1851.0082	1913.9902	14.0	0.007
	End Point	1851.0082	1913.9901	-15.3	-0.008

8.4.9. LTE BAND 26(FCC PART 90S)

LIMITS

FCC: §90.213

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

Test Engineer ID:	43575	Test Date:	2/28/2020
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QPSK (10MHz BANDWIDTH)

Limit		814	824	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	814.2566	823.7504		
Extreme (50C)		814.2566	823.7503	-7.1	-0.009
Extreme (40C)		814.2566	823.7503	-7.1	-0.009
Extreme (30C)		814.2566	823.7503	-7.9	-0.010
Extreme (10C)		814.2566	823.7504	6.5	0.008
Extreme (0C)		814.2566	823.7504	6.7	0.008
Extreme (-10C)		814.2566	823.7504	4.1	0.005
Extreme (-20C)		814.2566	823.7504	8.4	0.010
Extreme (-30C)		814.2566	823.7504	7.8	0.010
20C	15%	814.2566	823.7503	-8.3	-0.010
	-15%	814.2566	823.7504	8.5	0.010
	End Point	814.2566	823.7503	-7.4	-0.009

8.4.10. LTE BAND 26(FCC PART 22)

LIMITS

FCC: §22.355

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

Test Engineer ID:	43575	Test Date:	2/28/2020
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QPSK (15MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.7604	848.2375		
Extreme (50C)		824.7604	848.2375	4.5	0.005
Extreme (40C)		824.7604	848.2375	3.7	0.004
Extreme (30C)		824.7604	848.2375	-6.9	-0.008
Extreme (10C)		824.7604	848.2375	6.2	0.007
Extreme (0C)		824.7604	848.2375	6.8	0.008
Extreme (-10C)		824.7604	848.2375	4.7	0.006
Extreme (-20C)		824.7604	848.2375	8.2	0.010
Extreme (-30C)		824.7604	848.2375	7.1	0.008
20C	15%	824.7604	848.2375	-6.6	-0.008
	-15%	824.7604	848.2375	-8.0	-0.010
	End Point	824.7604	848.2375	-7.8	-0.009

8.4.11. LTE BAND 30

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (10MHz BANDWIDTH)

Limit		2305	2315	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2305.5168	2314.4860		
Extreme (50C)		2305.5168	2314.4860	-15.4	-0.007
Extreme (40C)		2305.5168	2314.4860	-14.3	-0.006
Extreme (30C)		2305.5168	2314.4860	-14.2	-0.006
Extreme (10C)		2305.5168	2314.4860	-15.2	-0.007
Extreme (0C)		2305.5168	2314.4860	-15.4	-0.007
Extreme (-10C)		2305.5168	2314.4860	7.8	0.003
Extreme (-20C)		2305.5168	2314.4860	-13.6	-0.006
Extreme (-30C)		2305.5168	2314.4860	-13.8	-0.006
20C	15%	2305.5168	2314.4860	-15.8	-0.007
	-15%	2305.5168	2314.4860	-12.9	-0.006
	End Point	2305.5168	2314.4860	-13.4	-0.006

8.4.12. LTE BAND 41

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (20MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2496.9598	2689.0461		
Extreme (50C)		2496.9598	2689.0461	13.7	0.005
Extreme (40C)		2496.9598	2689.0461	17.1	0.007
Extreme (30C)		2496.9598	2689.0461	18.4	0.007
Extreme (10C)		2496.9598	2689.0461	11.9	0.005
Extreme (0C)		2496.9598	2689.0461	14.4	0.006
Extreme (-10C)		2496.9598	2689.0461	17.5	0.007
Extreme (-20C)		2496.9598	2689.0461	17.1	0.007
Extreme (-30C)		2496.9598	2689.0461	17.0	0.007
20C	15%	2496.9598	2689.0461	14.8	0.006
	-15%	2496.9597	2689.0461	-7.2	-0.003
	End Point	2496.9598	2689.0461	5.4	0.002

8.4.13. LTE BAND 66

LIMITS

FCC: §27.54

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

Test Engineer ID:	43575 OS	Test Date:	2/28/2020
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QPSK (20MHz BANDWIDTH)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1711.0159	1778.9893		
Extreme (50C)		1711.0159	1778.9893	-12.5	-0.007
Extreme (40C)		1711.0159	1778.9893	-12.4	-0.007
Extreme (30C)		1711.0159	1778.9893	-11.3	-0.006
Extreme (10C)		1711.0159	1778.9893	11.6	0.007
Extreme (0C)		1711.0159	1778.9893	-11.2	-0.006
Extreme (-10C)		1711.0159	1778.9893	6.5	0.004
Extreme (-20C)		1711.0159	1778.9893	-12.3	-0.007
Extreme (-30C)		1711.0159	1778.9893	-8.6	-0.005
20C	15%	1711.0159	1778.9893	-19.8	-0.011
	-15%	1711.0159	1778.9893	-17.5	-0.010
	End Point	1711.0159	1778.9893	-20.5	-0.012

8.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

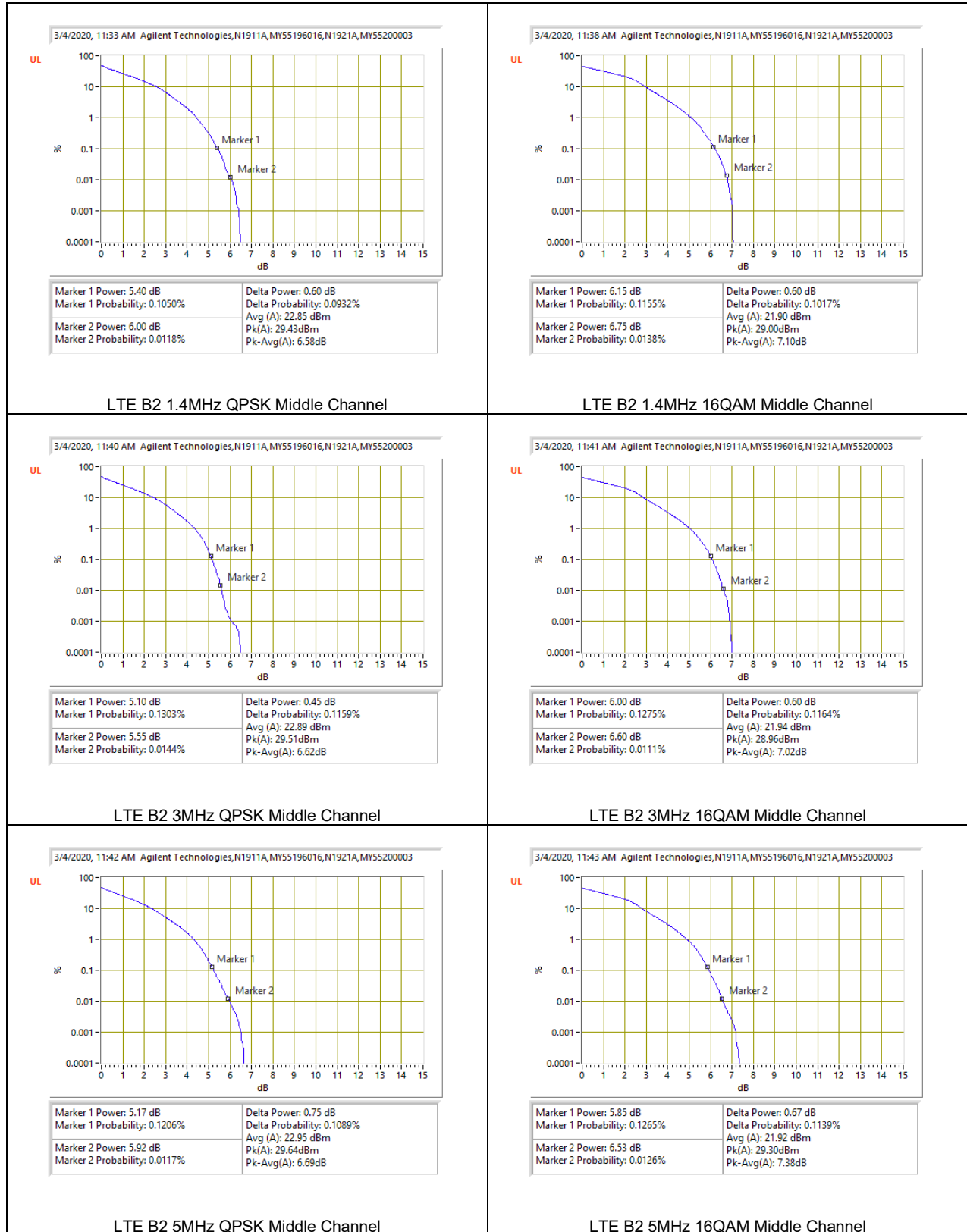
In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

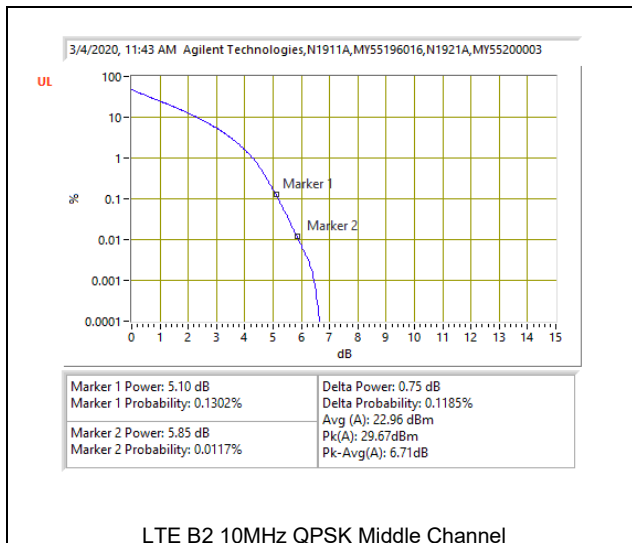
RESULT

Full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

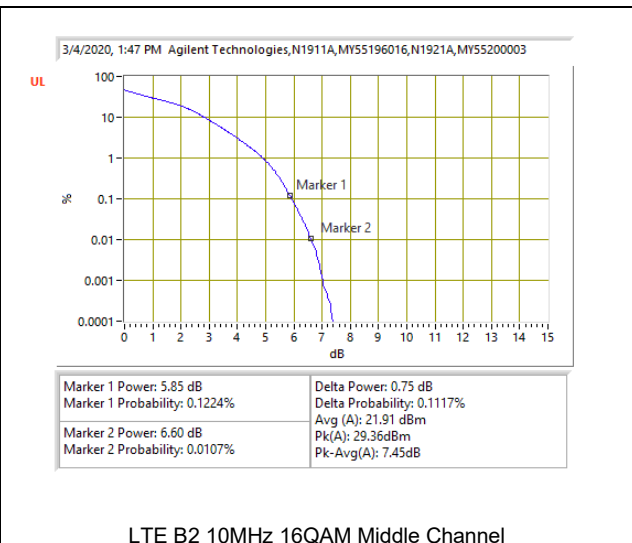
ID:	39005	Date:	3/4/2020
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8.5.1. LTE BAND 2

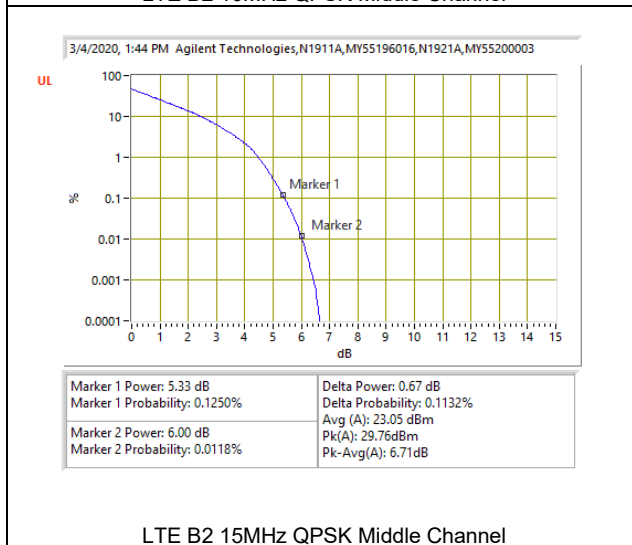




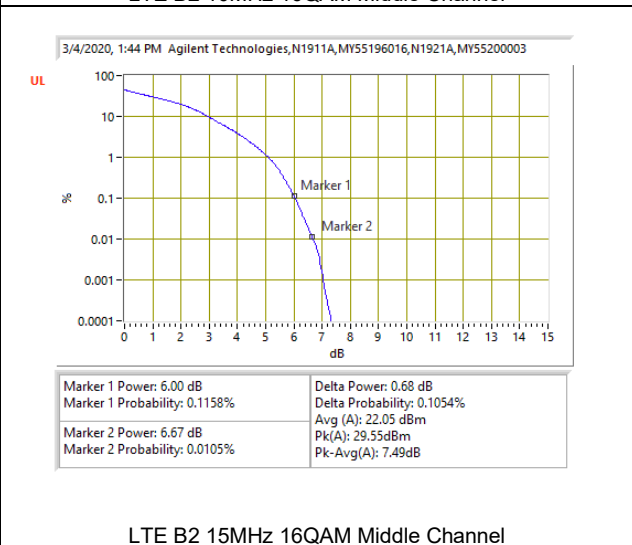
LTE B2 10MHz QPSK Middle Channel



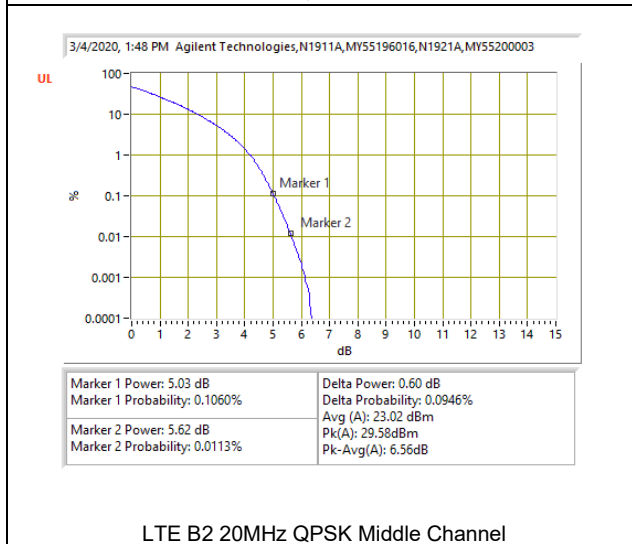
LTE B2 10MHz 16QAM Middle Channel



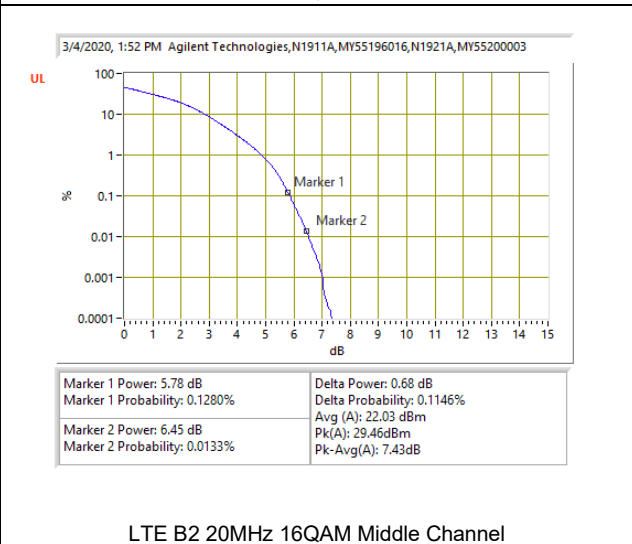
LTE B2 15MHz QPSK Middle Channel



LTE B2 15MHz 16QAM Middle Channel

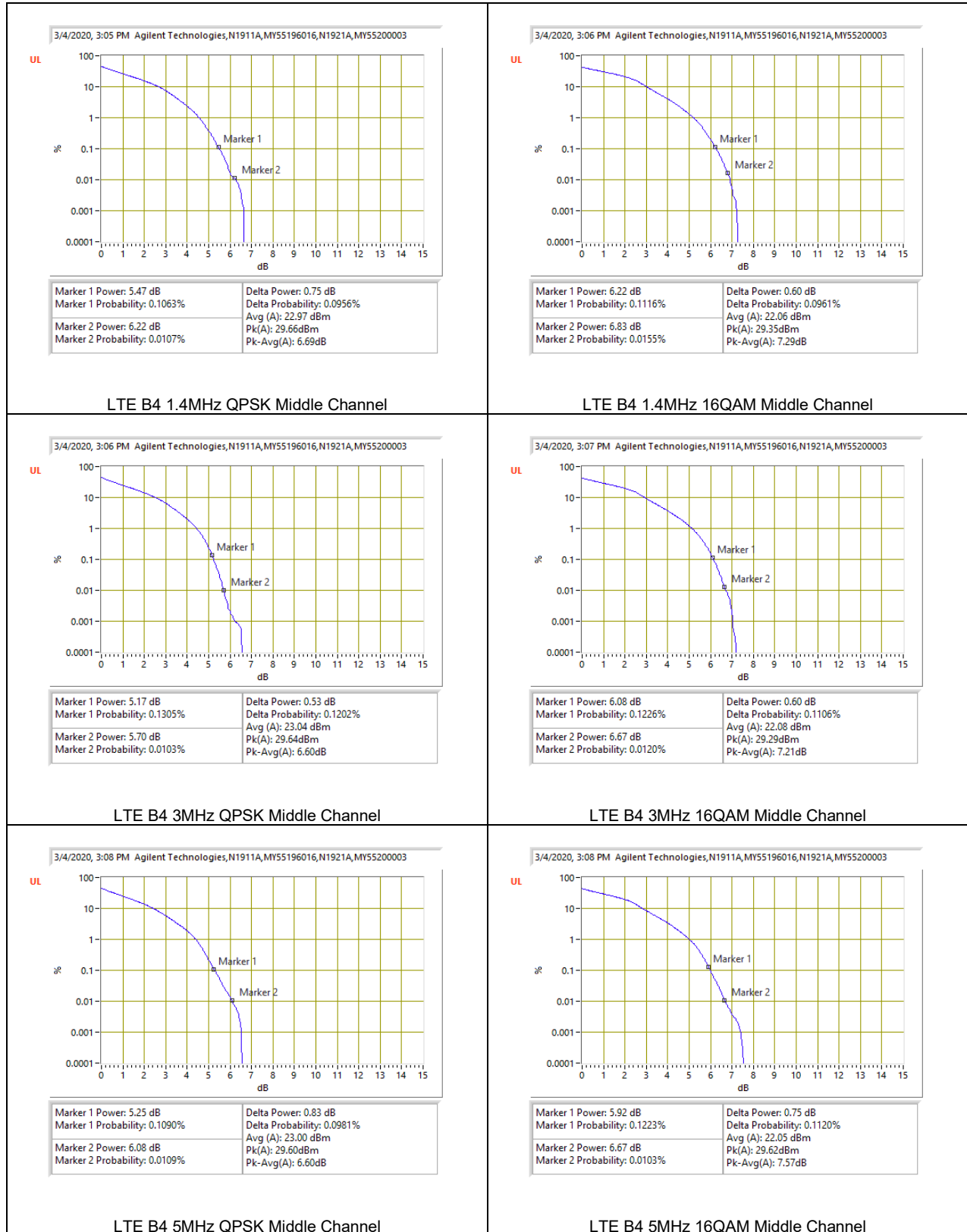


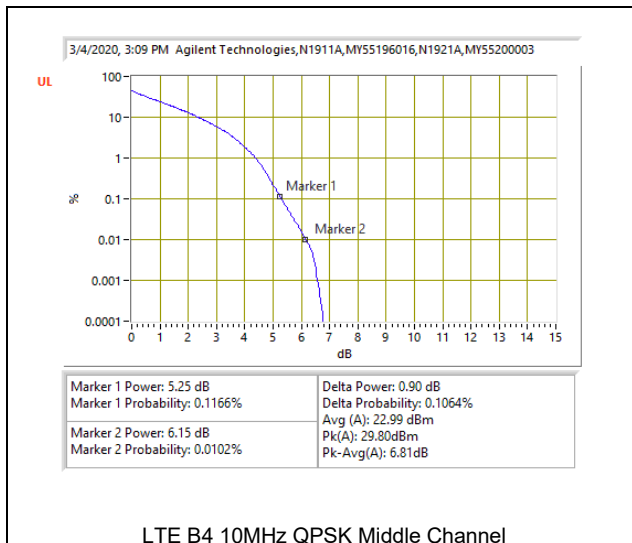
LTE B2 20MHz QPSK Middle Channel



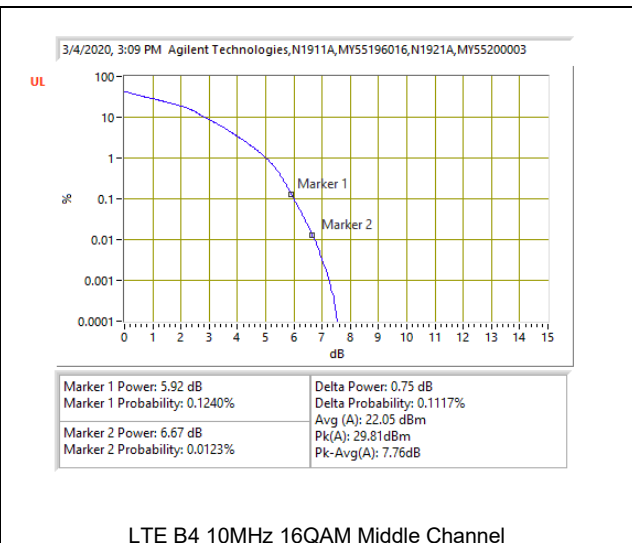
LTE B2 20MHz 16QAM Middle Channel

8.5.2. LTE BAND 4

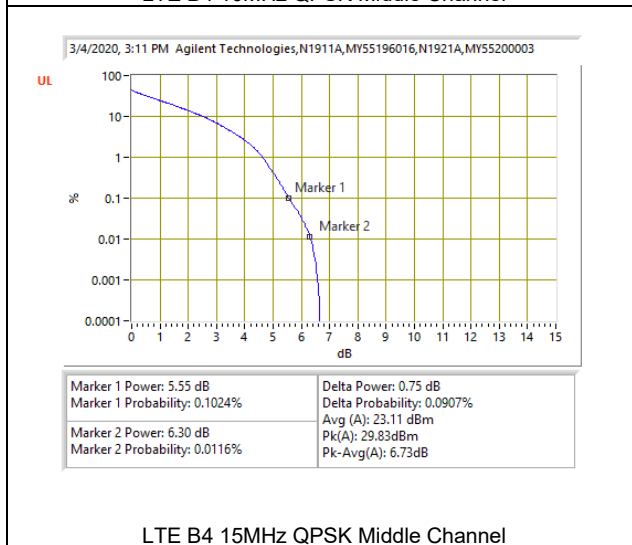




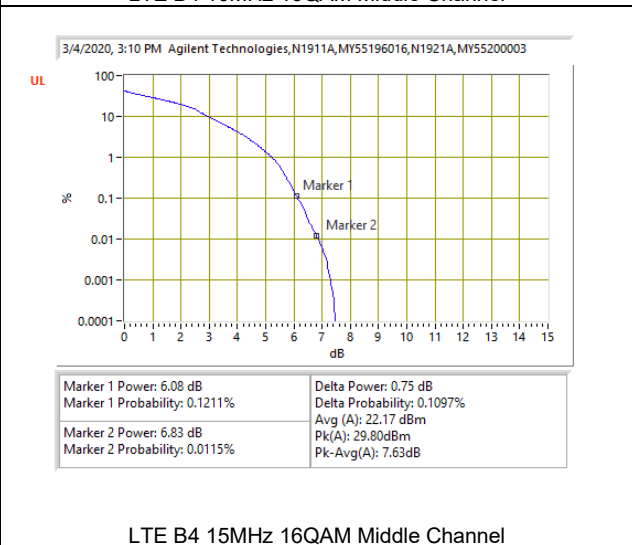
LTE B4 10MHz QPSK Middle Channel



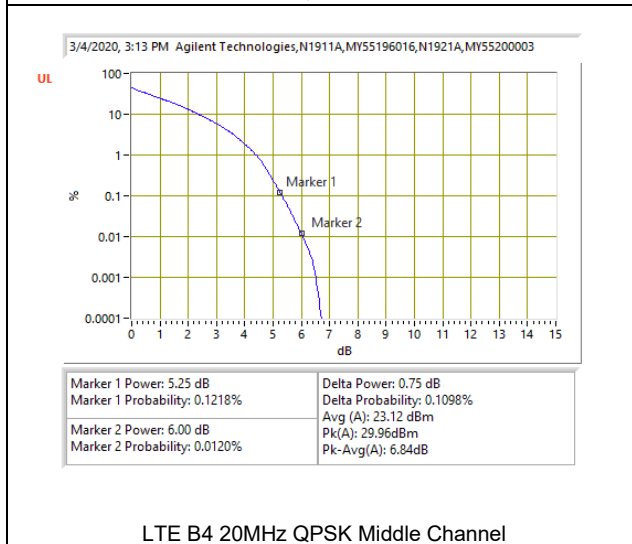
LTE B4 10MHz 16QAM Middle Channel



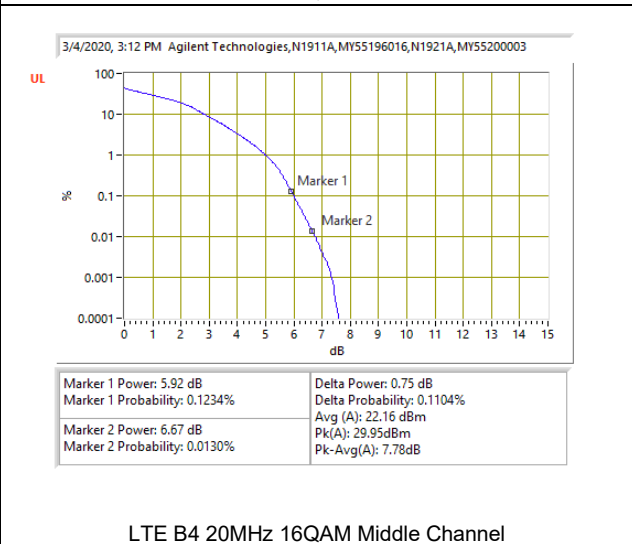
LTE B4 15MHz QPSK Middle Channel



LTE B4 15MHz 16QAM Middle Channel



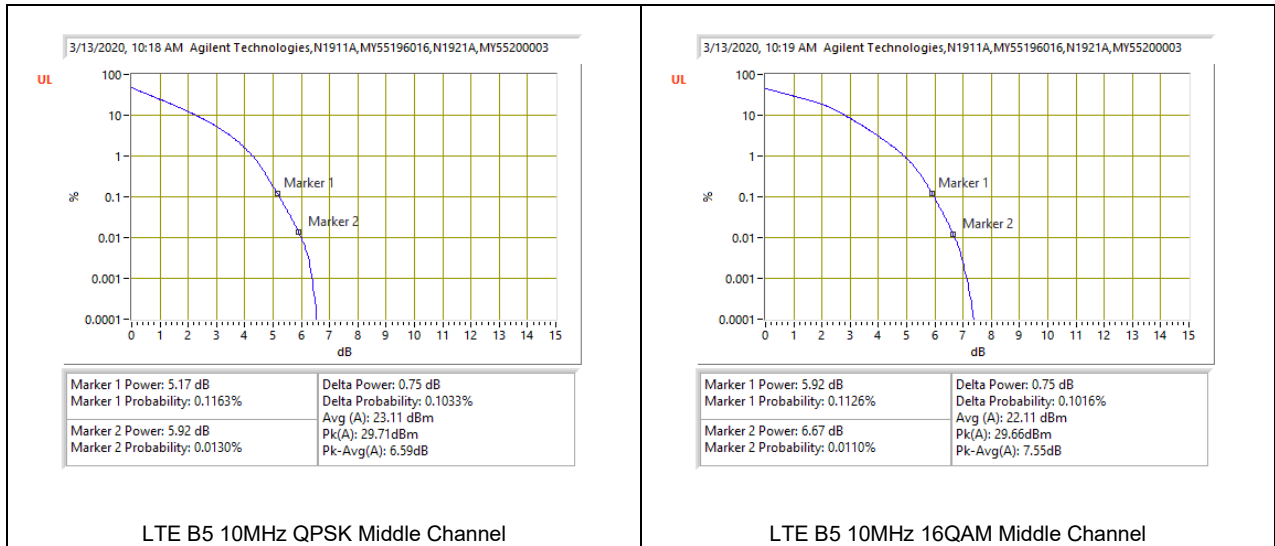
LTE B4 20MHz QPSK Middle Channel



LTE B4 20MHz 16QAM Middle Channel

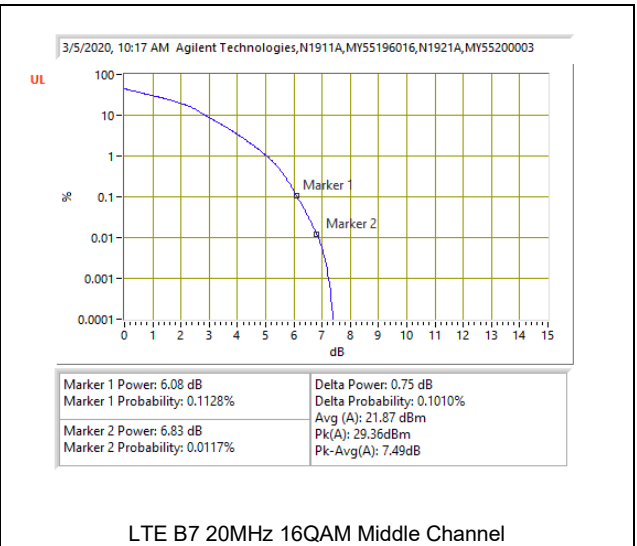
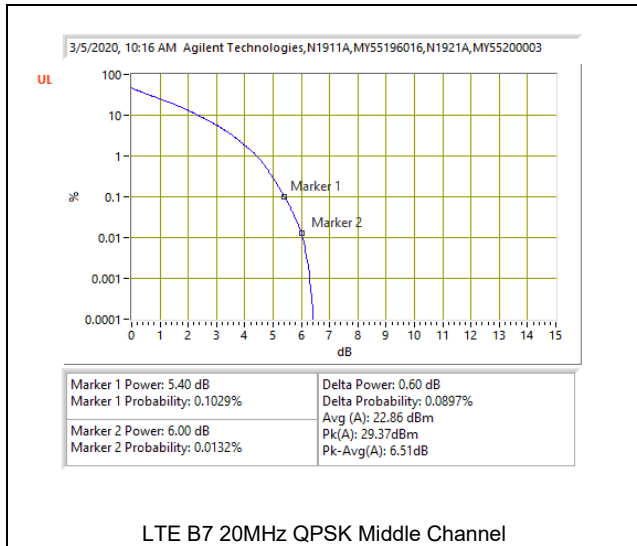
8.5.3. LTE BAND 5





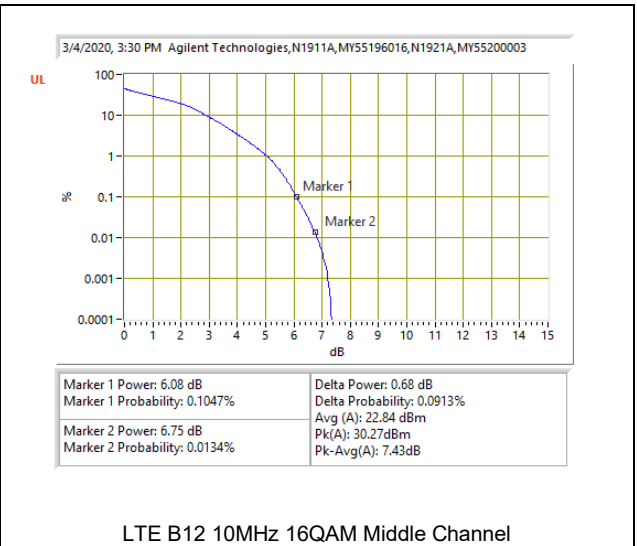
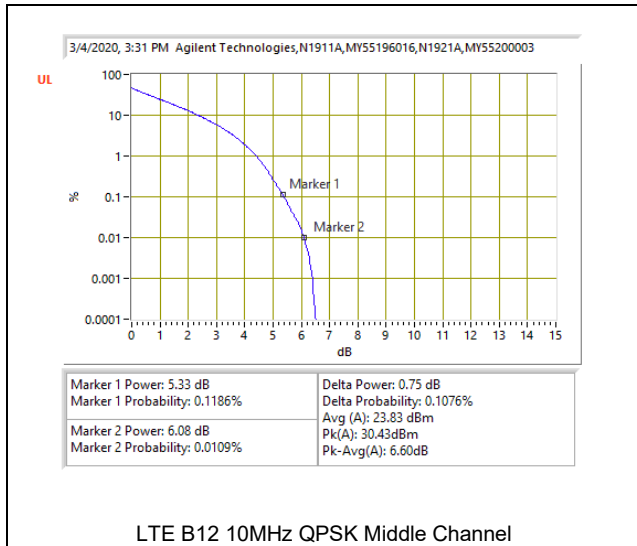
8.5.4. LTE BAND 7



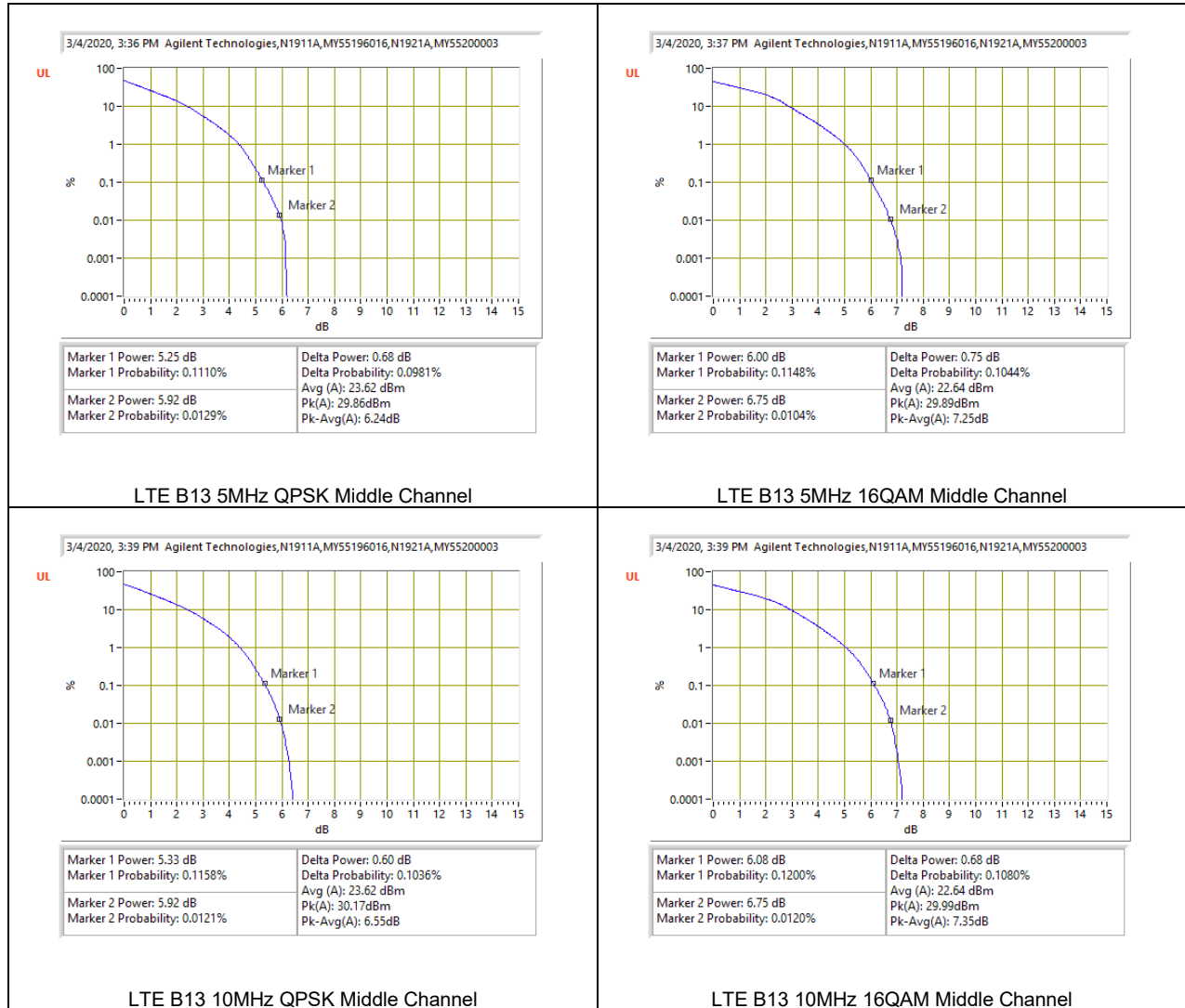


8.5.5. LTE BAND 12

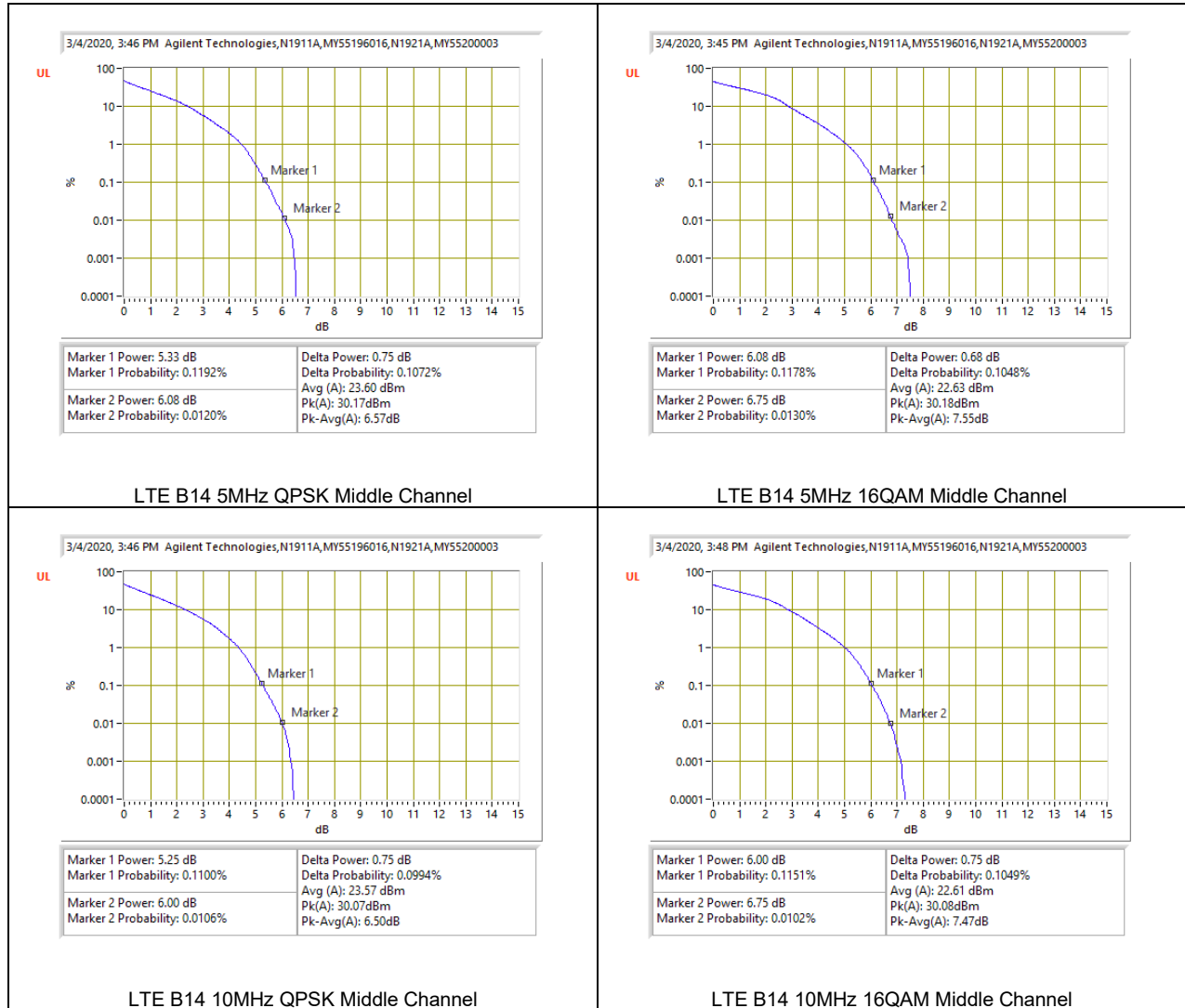




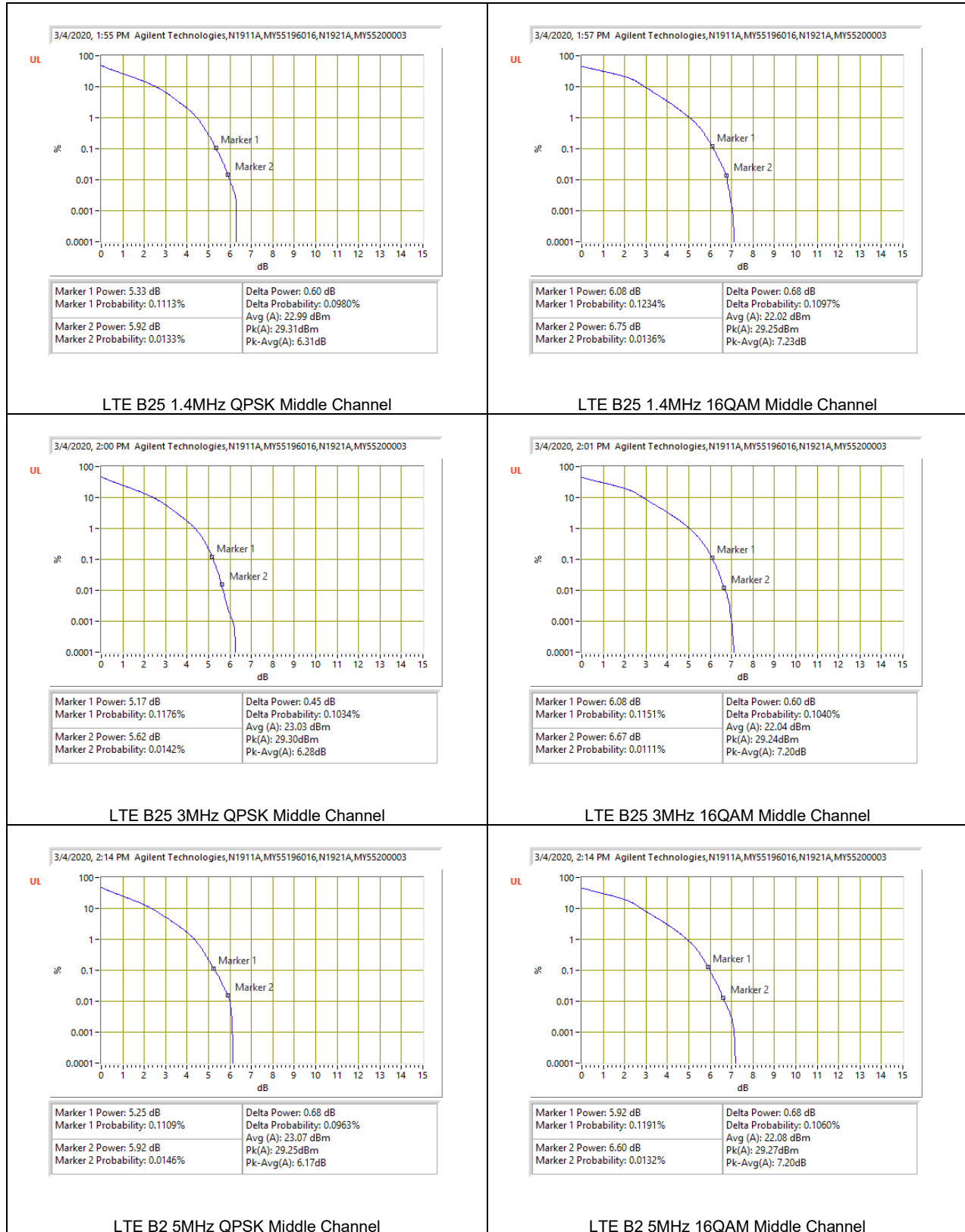
8.5.6. LTE BAND 13

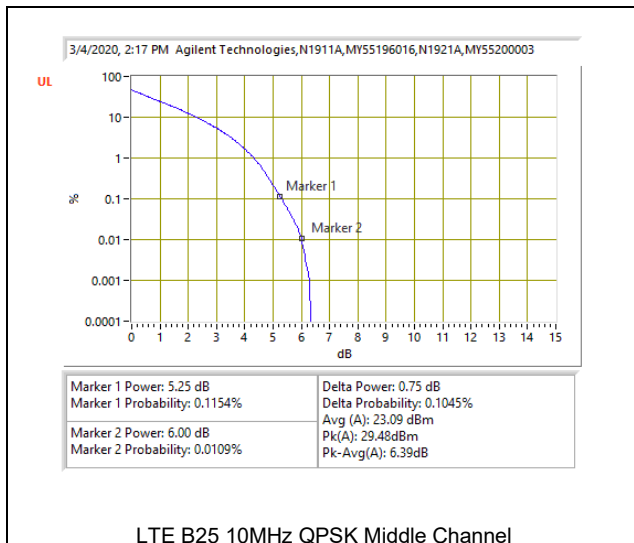


8.5.7. LTE BAND 14

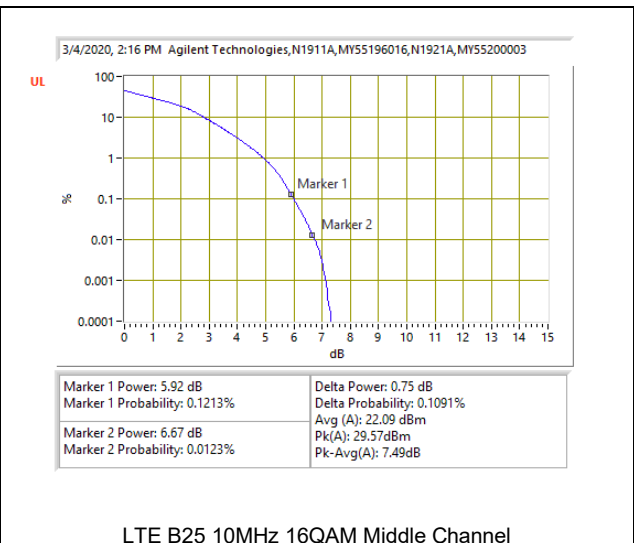


8.5.8. LTE BAND 25

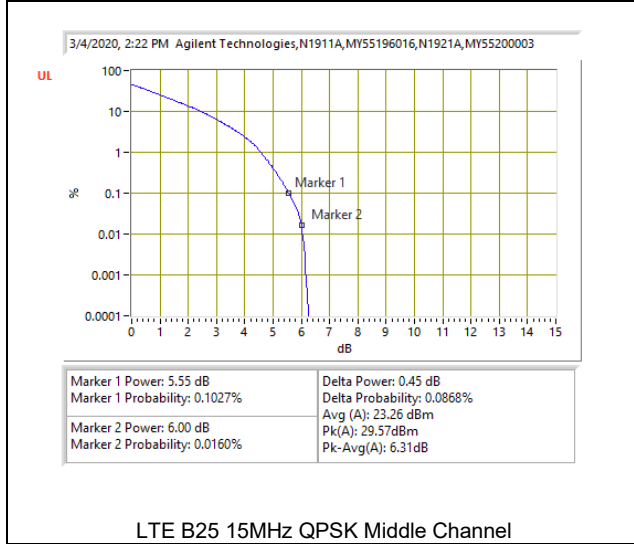




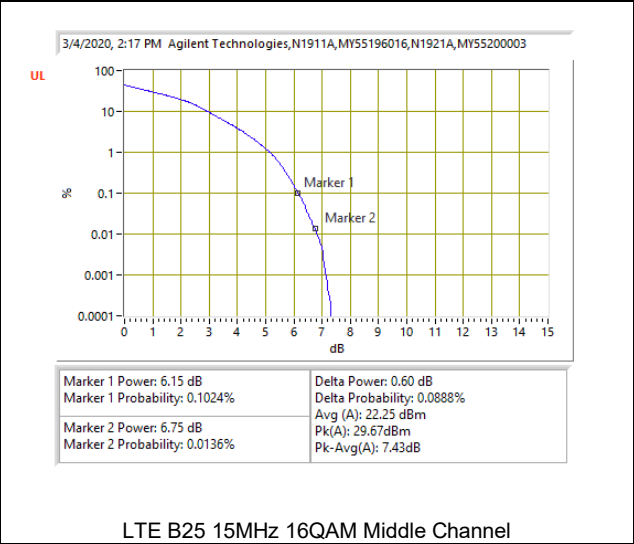
LTE B25 10MHz QPSK Middle Channel



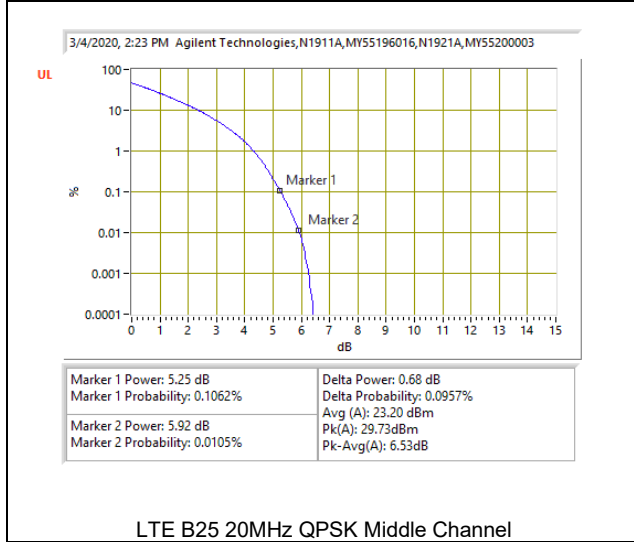
LTE B25 10MHz 16QAM Middle Channel



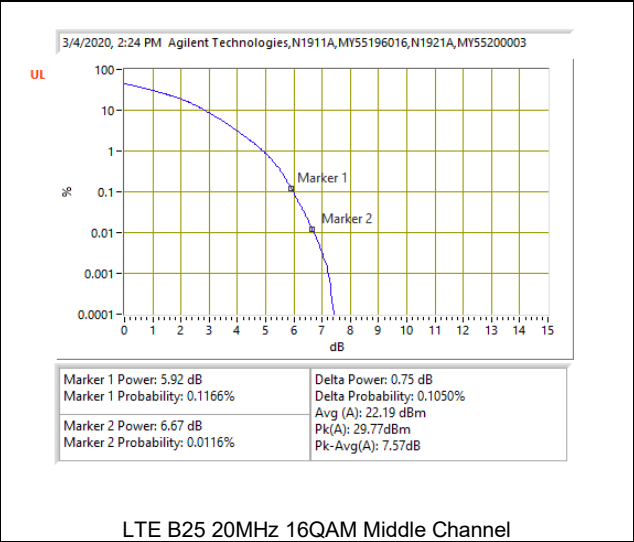
LTE B25 15MHz QPSK Middle Channel



LTE B25 15MHz 16QAM Middle Channel

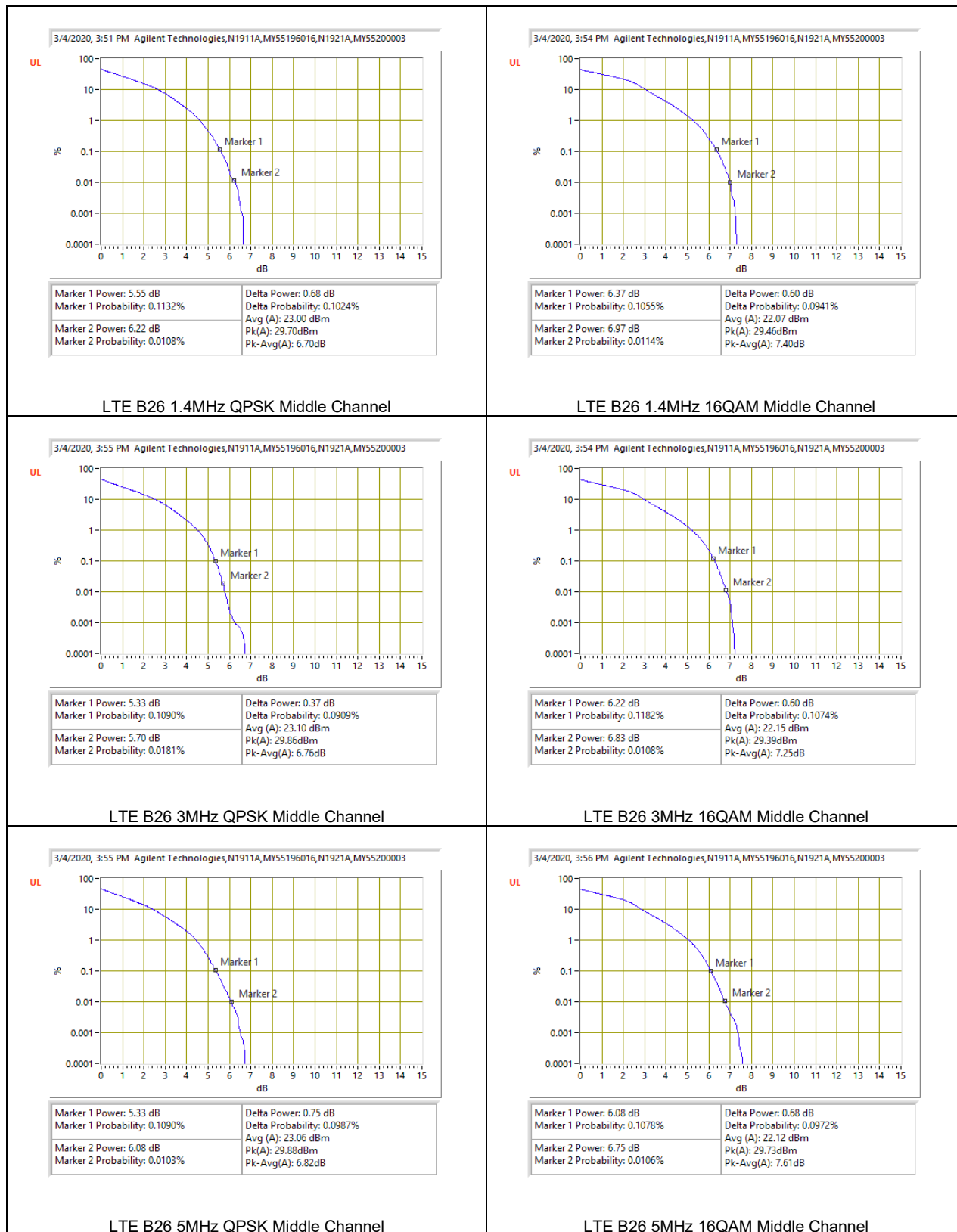


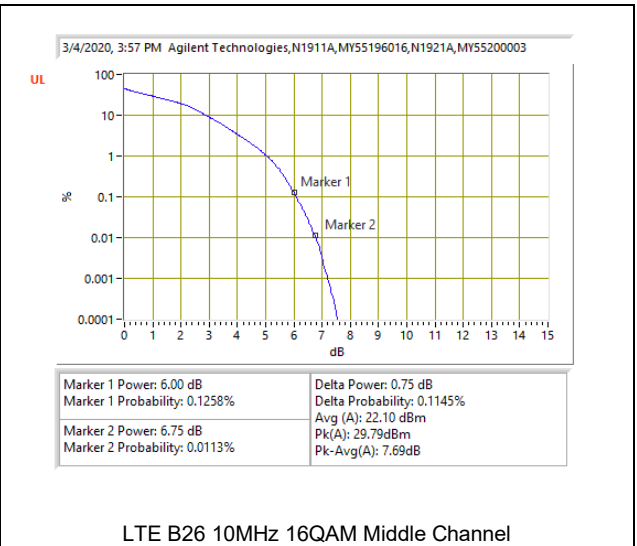
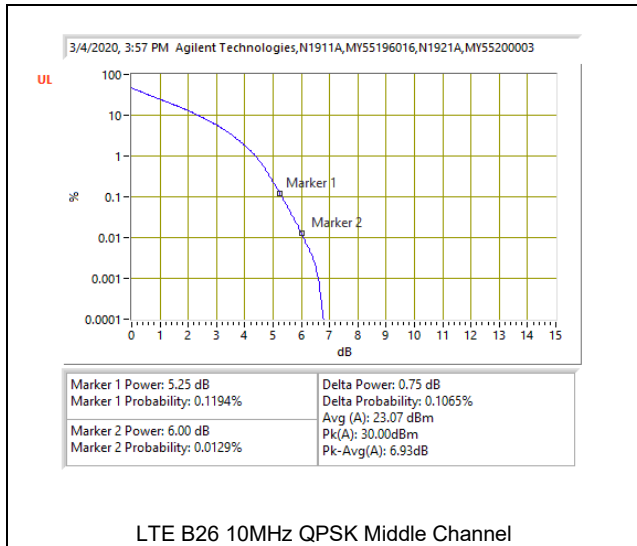
LTE B25 20MHz QPSK Middle Channel



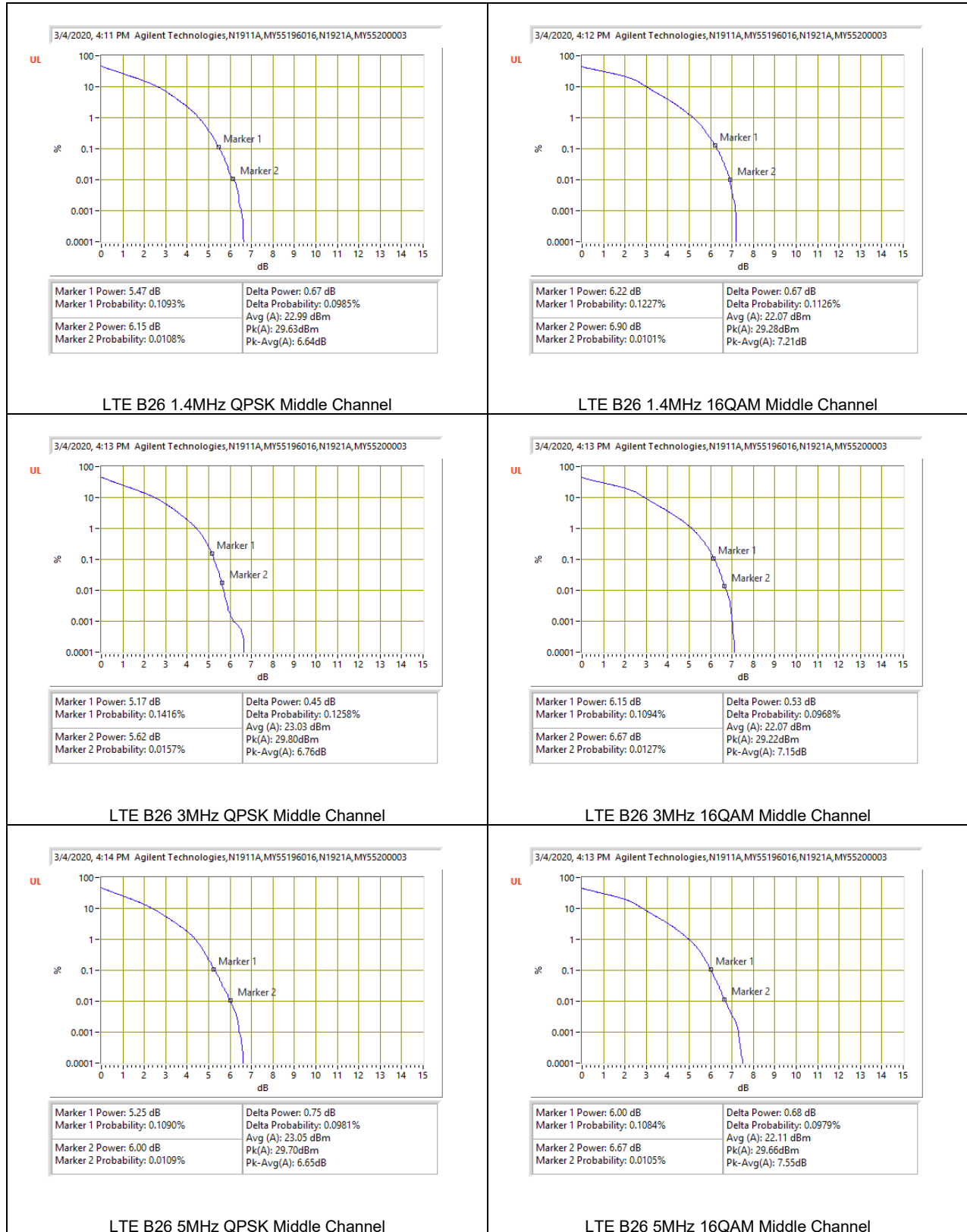
LTE B25 20MHz 16QAM Middle Channel

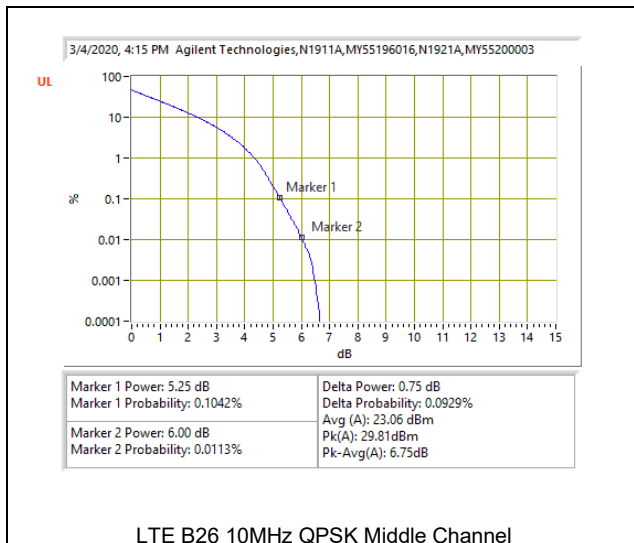
8.5.9. LTE BAND 26 (FCC PART 90S)



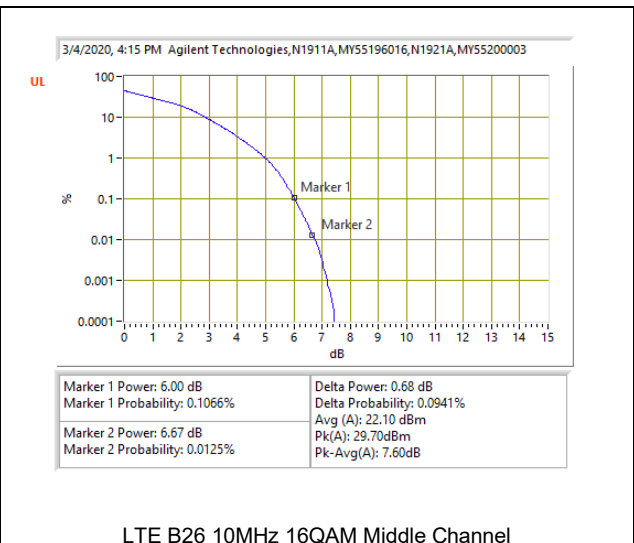


8.5.10. LTE BAND 26 (FCC PART 22)

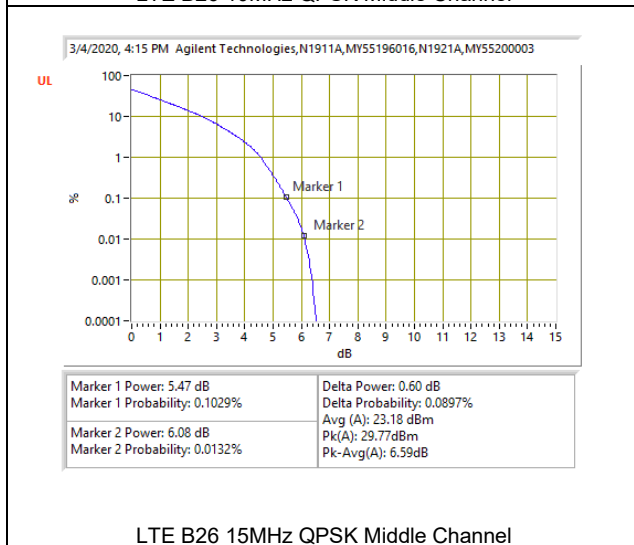




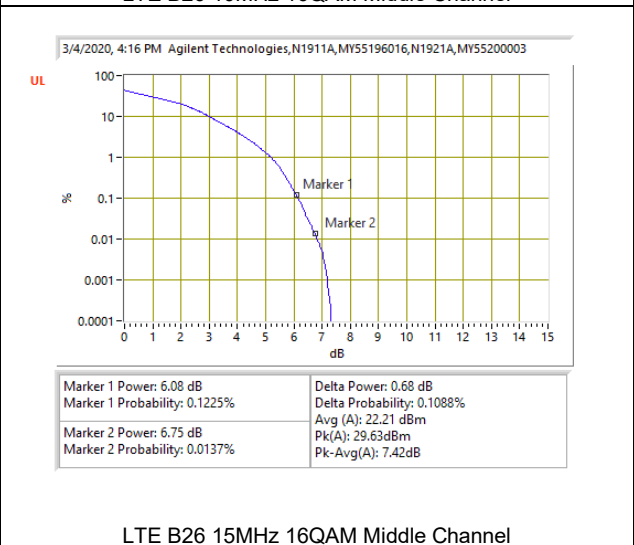
LTE B26 10MHz QPSK Middle Channel



LTE B26 10MHz 16QAM Middle Channel

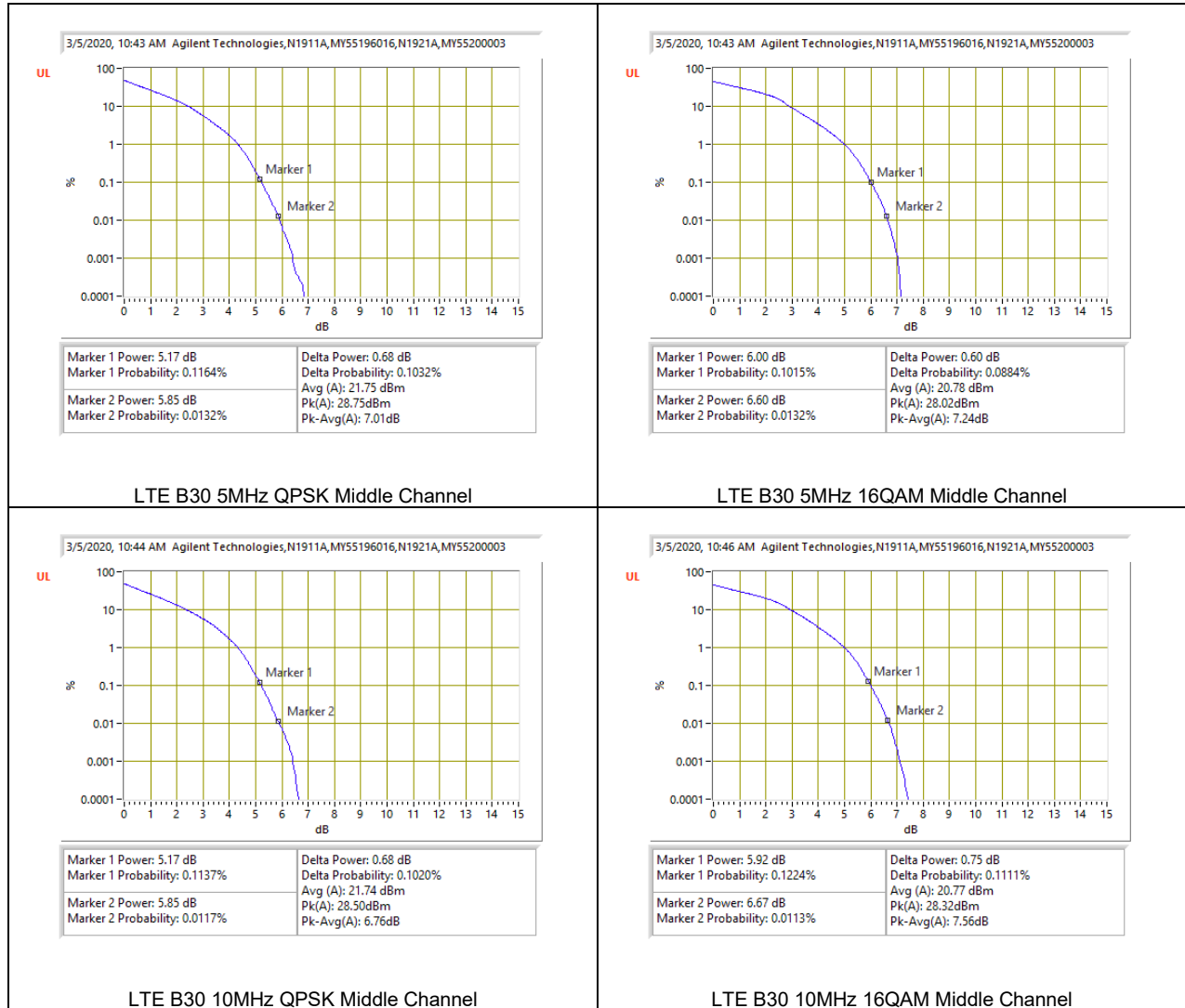


LTE B26 15MHz QPSK Middle Channel



LTE B26 15MHz 16QAM Middle Channel

8.5.11. LTE BAND 30

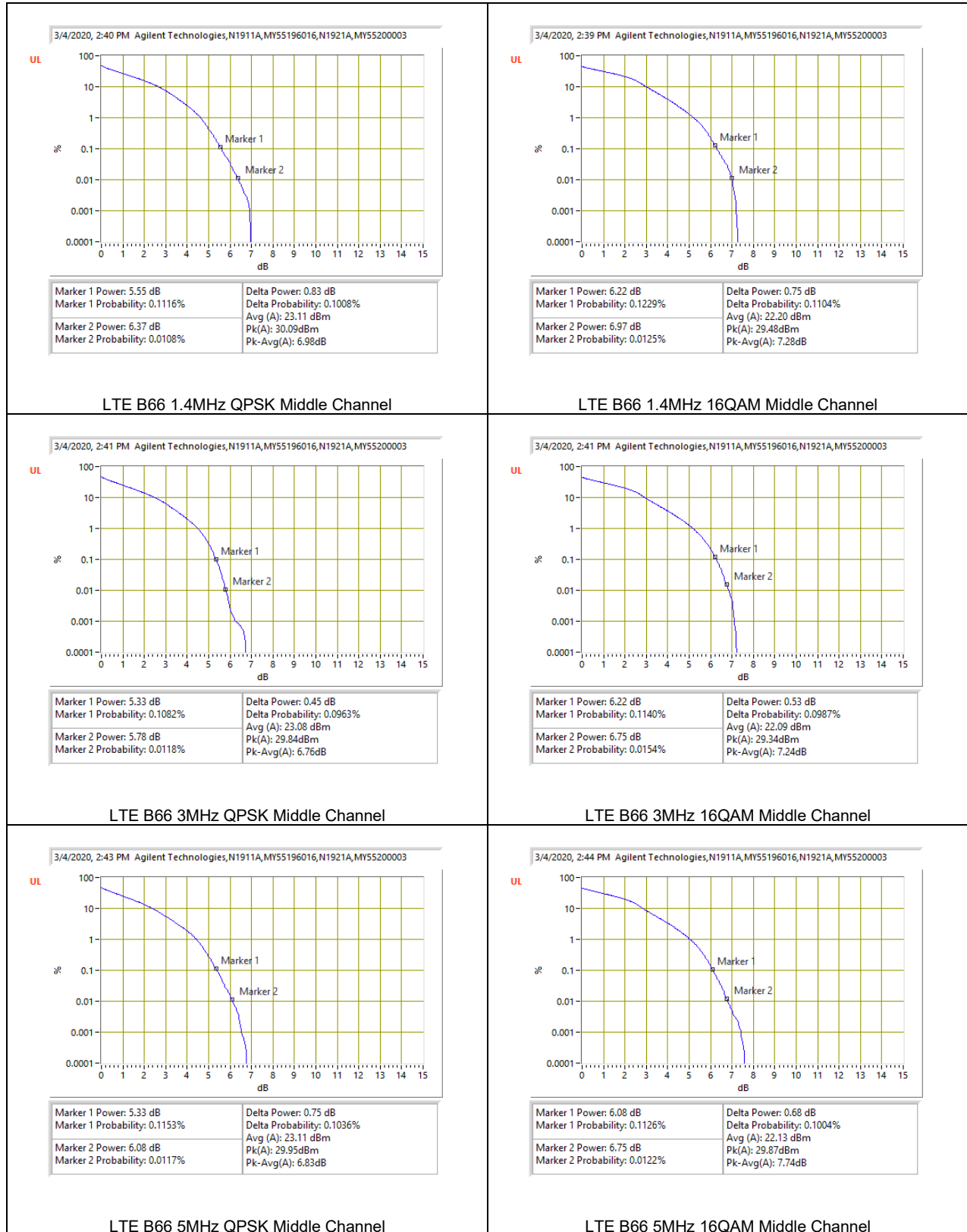


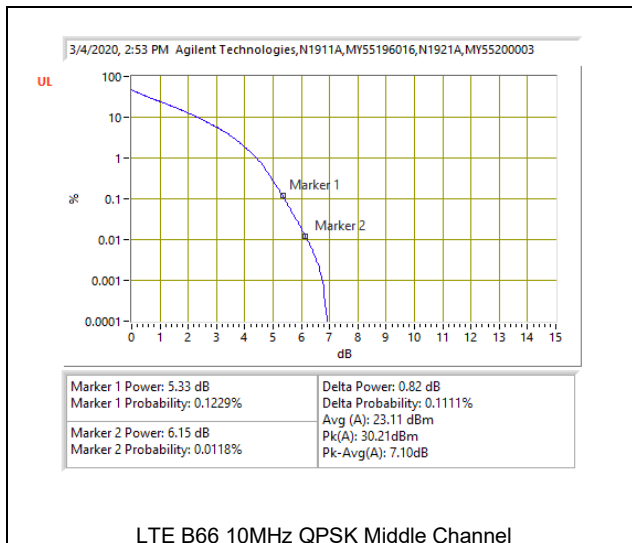
8.5.12. LTE BAND 41

Test Engineer ID:	39005	Test Date:	3/4/2020
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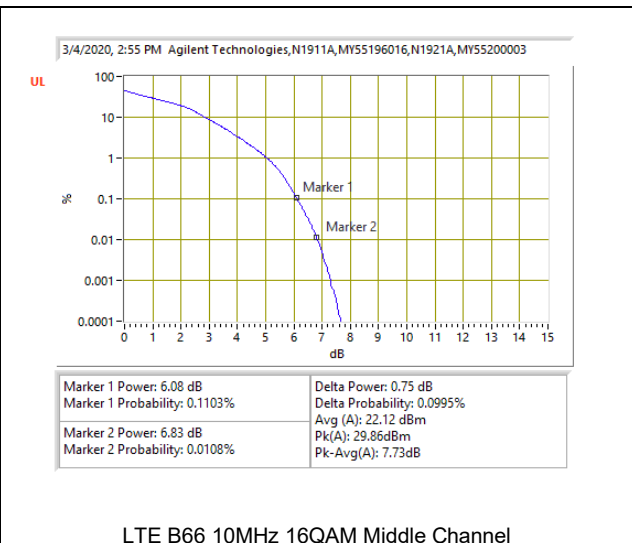
Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
Band 41	5MHz	2593.0	25	0	QPSK	28.60	20.38	5.99
					16QAM	27.96	19.36	6.37
	10MHz		50	0	QPSK	29.01	20.44	6.34
					16QAM	28.64	19.43	6.98
	15MHz		75	0	QPSK	29.32	20.47	6.62
					16QAM	28.66	19.45	6.98
	20MHz		100	0	QPSK	29.21	20.45	6.53
					16QAM	28.74	19.46	7.05
Duty Cycle Correction Factor (dB) =			2.23					
Peak-to-Average Power Ratio= Peak Reading - Average Reading - Duty Cycle Correction Factor								

8.5.13. LTE BAND 66

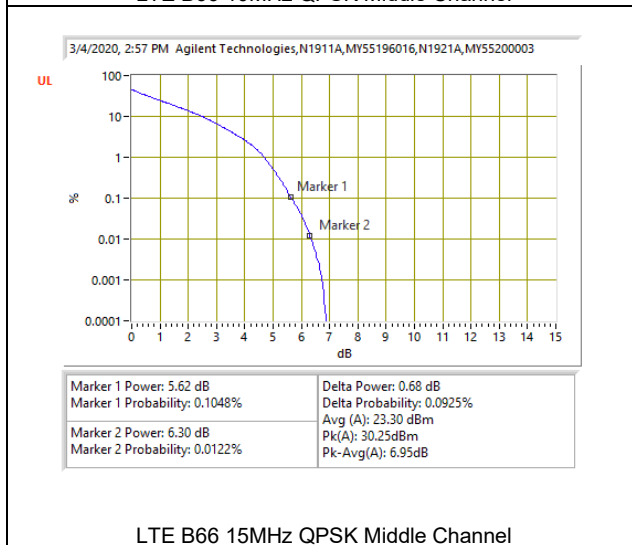




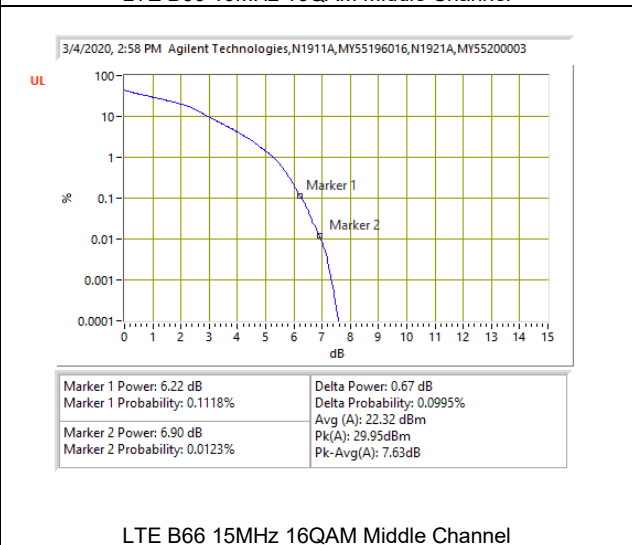
LTE B66 10MHz QPSK Middle Channel



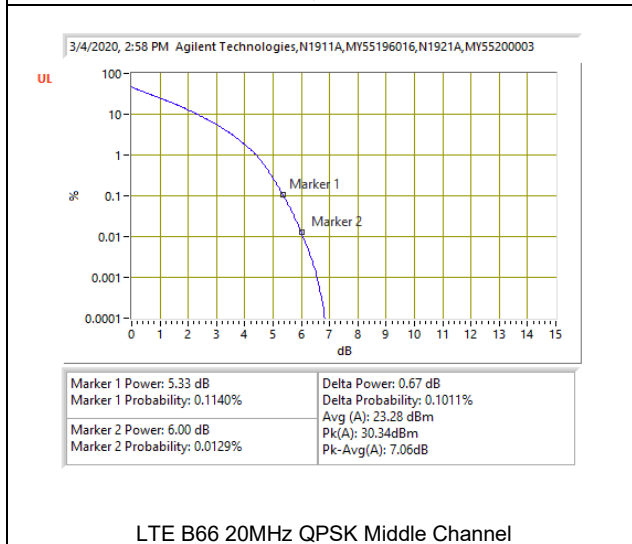
LTE B66 10MHz 16QAM Middle Channel



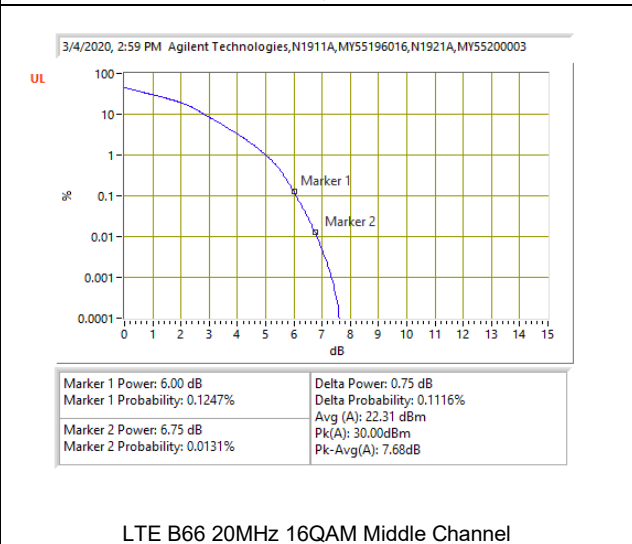
LTE B66 15MHz QPSK Middle Channel



LTE B66 15MHz 16QAM Middle Channel



LTE B66 20MHz QPSK Middle Channel



LTE B66 20MHz 16QAM Middle Channel

9. RADIATED TEST RESULTS

9.1. FIELD STRENGTH OF SPURIOUS RADIATION, ABOVE 1GHz

TEST PROCEDURE

KDB 971168 D01 v03r01/D02 v02/r01

All tests above 1GHz were done with a Resolution Bandwidth of 1MHz, and a Video Bandwidth of 3MHz.

RESULTS

9.1.1. LTE BAND 2

LIMITS

FCC: §24.238(a)

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.

QPSK LTE BAND 2 (20.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/3/2020
Test Engineer:	17051
Configuration:	EUT + Support Equipment
Mode	LTE 2 QPSK 20MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB/(m)]	Amp/Cbl/Ftr/Pad (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1860 MHz												
1	5.55341	-51.55	Pk	34.6	-31.8	11.8	-36.95	-13	-23.95	0-360	100	H
2	9.25529	-60.78	Pk	36.5	-27.8	11.8	-40.28	-13	-27.28	0-360	198	H
3	12.99466	-68.89	Pk	39.1	-25.7	11.8	-43.69	-13	-30.69	0-360	100	H
4	5.55341	-53.16	Pk	34.6	-31.8	11.8	-38.56	-13	-25.56	0-360	202	V
5	6.40188	-66.17	Pk	35.5	-29.4	11.8	-48.27	-13	-35.27	0-360	298	V
6	9.25529	-67.84	Pk	36.5	-27.8	11.8	-47.34	-13	-34.34	0-360	102	V
7	17.01002	-69.44	Pk	41.5	-23.7	11.8	-39.84	-13	-26.84	0-360	202	V
1880 MHz												
1	3.74198	-65.71	Pk	33.2	-32.2	11.8	-52.91	-13	-39.91	0-360	102	H
2	5.61341	-50.16	Pk	34.7	-31.6	11.8	-35.26	-13	-22.26	0-360	102	H
3	7.48385	-68.67	Pk	35.6	-28.6	11.8	-49.87	-13	-36.87	0-360	102	H
4	9.35578	-59.23	Pk	36.6	-27.8	11.8	-38.63	-13	-25.63	0-360	202	H
5	3.74298	-66.64	Pk	33.2	-32.3	11.8	-53.94	-13	-40.94	0-360	102	V
6	5.61291	-52.63	Pk	34.7	-31.6	11.8	-37.73	-13	-24.73	0-360	102	V
7	7.48435	-70.09	Pk	35.6	-28.6	11.8	-51.29	-13	-38.29	0-360	198	V
8	9.35478	-64.6	Pk	36.6	-27.8	11.8	-44	-13	-31	0-360	102	V
9	11.22672	-70.79	Pk	38	-25.4	11.8	-46.39	-13	-33.39	0-360	298	V
1900 MHz												
1	3.87597	-64.66	Pk	33.4	-31.4	11.8	-50.86	-13	-37.86	0-360	298	H
2	5.67291	-60.56	Pk	34.7	-31	11.8	-45.06	-13	-32.06	0-360	298	H
3	9.45478	-67.34	Pk	36.7	-27.2	11.8	-46.04	-13	-33.04	0-360	198	H
4	13.04716	-69.54	Pk	39	-25.1	11.8	-43.84	-13	-30.84	0-360	198	H
5	5.67341	-63.29	Pk	34.7	-31	11.8	-47.79	-13	-34.79	0-360	102	V
6	9.45428	-71.14	Pk	36.7	-27.2	11.8	-49.84	-13	-36.84	0-360	298	V
7	15.77657	-69.74	Pk	40.5	-24.1	11.8	-41.54	-13	-28.54	0-360	202	V

16QAM LTE BAND 2 (20.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/3/2020
Test Engineer:	17051
Configuration:	EUT + Support Equipment
Mode	LTE 2 16QAM 20MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB/(m)]	Amp/Cbl/Filtr/Pad (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1860 MHz												
1	5.01143	-63.77	Pk	34	-32.1	11.8	-50.07	-13	-37.07	0-360	298	H
2	5.55291	-50.73	Pk	34.6	-31.8	11.8	-36.13	-13	-23.13	0-360	100	H
3	9.25529	-62.59	Pk	36.5	-27.8	11.8	-42.09	-13	-29.09	0-360	198	H
4	17.04152	-68.93	Pk	41.5	-23.8	11.8	-39.43	-13	-26.43	0-360	198	H
5	5.55291	-53.56	Pk	34.6	-31.8	11.8	-38.96	-13	-25.96	0-360	202	V
6	9.25529	-67.72	Pk	36.5	-27.8	11.8	-47.22	-13	-34.22	0-360	202	V
7	15.65757	-68.07	Pk	40.3	-25.7	11.8	-41.67	-13	-28.67	0-360	102	V
1880 MHz												
1	3.0685	-63.48	Pk	33.3	-32.7	11.8	-51.08	-13	-38.08	0-360	98	H
2	5.61291	-50.78	Pk	34.7	-31.6	11.8	-35.88	-13	-22.88	0-360	98	H
3	7.48435	-67.71	Pk	35.6	-28.6	11.8	-48.91	-13	-35.91	0-360	98	H
4	9.35528	-62.83	Pk	36.6	-27.8	11.8	-42.23	-13	-29.23	0-360	98	H
5	3.89547	-67.49	Pk	33.4	-31.3	11.8	-53.59	-13	-40.59	0-360	298	V
6	5.61291	-54.66	Pk	34.7	-31.6	11.8	-39.76	-13	-26.76	0-360	298	V
7	7.48435	-68.38	Pk	35.6	-28.6	11.8	-49.58	-13	-36.58	0-360	202	V
8	9.35528	-66.18	Pk	36.6	-27.8	11.8	-45.58	-13	-32.58	0-360	102	V
9	17.15352	-69.36	Pk	41.4	-23.9	11.8	-40.06	-13	-27.06	0-360	298	V
1900 MHz												
1	5.67291	-59.78	Pk	34.7	-31	11.8	-44.28	-13	-31.28	0-360	298	H
2	9.45528	-65.99	Pk	36.7	-27.2	11.8	-44.69	-13	-31.69	0-360	100	H
3	16.74503	-69.78	Pk	41.7	-23.8	11.8	-40.08	-13	-27.08	0-360	100	H
4	5.67341	-62.99	Pk	34.7	-31	11.8	-47.49	-13	-34.49	0-360	102	V
5	9.19979	-67.24	Pk	36.4	-27.5	11.8	-46.54	-13	-33.54	0-360	202	V
6	9.45778	-69.74	Pk	36.7	-27.2	11.8	-48.44	-13	-35.44	0-360	202	V
7	13.27565	-67.25	Pk	38.8	-27.4	11.8	-44.05	-13	-31.05	0-360	298	V

9.1.2. LTE BAND 4

LIMITS

FCC: §27.53 (h)

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.

QPSK LTE BAND 4 (20.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/3/2020
Test Engineer:	17051
Configuration:	EUT + Support Equipment
Mode	LTE 4 QPSK 20MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB/(m)]	Amp/Cbi/Filt/Pad (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1720 MHz												
1	5.13293	-50.9	Pk	34.2	-31	11.8	-35.9	-13	-22.9	0-360	298	H
2	6.84437	-57.75	Pk	35.5	-29.9	11.8	-40.35	-13	-27.35	0-360	100	H
3	8.55531	-56.28	Pk	35.9	-28	11.8	-36.58	-13	-23.58	0-360	100	H
4	10.26625	-65.16	Pk	37.4	-26.1	11.8	-42.06	-13	-29.06	0-360	198	H
5	5.13343	-49.75	Pk	34.2	-31	11.8	-34.75	-13	-21.75	0-360	298	V
6	6.84412	-63.08	Pk	35.5	-29.9	11.8	-45.68	-13	-32.68	0-360	298	V
7	8.55531	-62.48	Pk	35.9	-28	11.8	-42.78	-13	-29.78	0-360	298	V
8	10.26675	-65.04	Pk	37.4	-26.1	11.8	-41.94	-13	-28.94	0-360	102	V
1732.5 MHz												
1	3.44749	-64.89	Pk	32.7	-32.3	11.8	-52.69	-13	-39.69	0-360	100	H
2	5.17043	-56.46	Pk	34.2	-31.5	11.8	-41.96	-13	-28.96	0-360	100	H
3	6.89387	-64.18	Pk	35.6	-29.5	11.8	-46.28	-13	-33.28	0-360	100	H
4	8.61781	-62.44	Pk	35.9	-28.1	11.8	-42.84	-13	-29.84	0-360	100	H
5	3.44699	-65.83	Pk	32.7	-32.3	11.8	-53.63	-13	-40.63	0-360	202	V
6	5.17043	-53.51	Pk	34.2	-31.5	11.8	-39.01	-13	-26.01	0-360	298	V
7	6.89437	-67.46	Pk	35.6	-29.5	11.8	-49.56	-13	-36.56	0-360	298	V
8	8.61781	-66.99	Pk	35.9	-28.1	11.8	-47.39	-13	-34.39	0-360	202	V
9	16.32055	-70.29	Pk	41.1	-23.2	11.8	-40.59	-13	-27.59	0-360	102	V
1745 MHz												
1	5.20793	-51.61	Pk	34.2	-31.8	11.8	-37.41	-13	-24.41	0-360	298	H
2	6.94437	-60.08	Pk	35.7	-28.9	11.8	-41.48	-13	-28.48	0-360	100	H
3	8.68031	-57.51	Pk	36	-27.8	11.8	-37.51	-13	-24.51	0-360	100	H
4	10.41625	-68.16	Pk	37.5	-25.5	11.8	-44.36	-13	-31.36	0-360	100	H
5	5.20843	-53.97	Pk	34.2	-31.8	11.8	-39.77	-13	-26.77	0-360	102	V
6	6.94437	-63.17	Pk	35.7	-28.9	11.8	-44.57	-13	-31.57	0-360	202	V
7	8.68031	-63.47	Pk	36	-27.8	11.8	-43.47	-13	-30.47	0-360	298	V
8	10.41625	-69.12	Pk	37.5	-25.5	11.8	-45.32	-13	-32.32	0-360	102	V

16QAM LTE BAND 4 (20.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/3/2020
Test Engineer:	17051
Configuration:	EUT + Support Equipment
Mode	LTE 4 16QAM 20MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB/(m)]	Amp/Cbl/Filtr/Pad (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1720 MHz												
1	5.13293	-51.65	Pk	34.2	-31	11.8	-36.65	-13	-23.65	0-360	298	H
2	6.84387	-57.34	Pk	35.5	-29.9	11.8	-39.94	-13	-26.94	0-360	100	H
3	8.55531	-56.41	Pk	35.9	-28	11.8	-36.71	-13	-23.71	0-360	100	H
4	10.26625	-64.06	Pk	37.4	-26.1	11.8	-40.96	-13	-27.96	0-360	198	H
5	5.13293	-48.93	Pk	34.2	-31	11.8	-33.93	-13	-20.93	0-360	298	V
6	6.84387	-61.76	Pk	35.5	-29.9	11.8	-44.36	-13	-31.36	0-360	298	V
7	8.55531	-61.43	Pk	35.9	-28	11.8	-41.73	-13	-28.73	0-360	298	V
8	10.26625	-65.93	Pk	37.4	-26.1	11.8	-42.83	-13	-29.83	0-360	102	V
1732.5 MHz												
1	3.44699	-63.78	Pk	32.7	-32.3	11.8	-51.58	-13	-38.58	0-360	100	H
2	5.17043	-58.56	Pk	34.2	-31.5	11.8	-44.06	-13	-31.06	0-360	100	H
3	6.89387	-62.16	Pk	35.6	-29.5	11.8	-44.26	-13	-31.26	0-360	100	H
4	8.61781	-61.25	Pk	35.9	-28.1	11.8	-41.65	-13	-28.65	0-360	100	H
5	3.44699	-64.99	Pk	32.7	-32.3	11.8	-52.79	-13	-39.79	0-360	202	V
6	5.17093	-56.21	Pk	34.2	-31.5	11.8	-41.71	-13	-28.71	0-360	202	V
7	6.89437	-67.26	Pk	35.6	-29.5	11.8	-49.36	-13	-36.36	0-360	298	V
8	8.61731	-67.71	Pk	35.9	-28.1	11.8	-48.11	-13	-35.11	0-360	298	V
1745 MHz												
1	5.20793	-50.3	Pk	34.2	-31.8	11.8	-36.1	-13	-23.1	0-360	298	H
2	6.94437	-58.73	Pk	35.7	-28.9	11.8	-40.13	-13	-27.13	0-360	100	H
3	8.68031	-57.11	Pk	36	-27.8	11.8	-37.11	-13	-24.11	0-360	100	H
4	10.41575	-67.87	Pk	37.5	-25.5	11.8	-44.07	-13	-31.07	0-360	100	H
5	5.20793	-53.83	Pk	34.2	-31.8	11.8	-39.63	-13	-26.63	0-360	298	V
6	6.94437	-62.86	Pk	35.7	-28.9	11.8	-44.26	-13	-31.26	0-360	298	V
7	8.68031	-62.17	Pk	36	-27.8	11.8	-42.17	-13	-29.17	0-360	102	V
8	10.41625	-67.21	Pk	37.5	-25.5	11.8	-43.41	-13	-30.41	0-360	102	V

9.1.3. LTE BAND 5

LIMITS

FCC: §22.917(a)

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.

QPSK LTE BAND 5 (10.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/7/2020
Test Engineer:	11993
Configuration:	EUT + Support Equipment
Mode	LTE 5 QPSK 10MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB/m]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
829 MHz													
1	3.12588	-64.03	Pk	33.6	-33.1	.5	11.8	-51.23	-13	-38.23	0-360	100	H
2	4.12283	-64.01	Pk	33.4	-32.6	.4	11.8	-51.01	-13	-38.01	0-360	198	H
3	9.52052	-69.19	Pk	36.7	-27.9	.4	11.8	-48.19	-13	-35.19	0-360	298	H
4	3.07188	-64.33	Pk	33.4	-33.2	.5	11.8	-51.83	-13	-38.83	0-360	298	V
5	5.61874	-65.22	Pk	34.7	-32.1	.3	11.8	-50.52	-13	-37.52	0-360	102	V
6	9.81251	-68.85	Pk	36.9	-27.4	.4	11.8	-47.15	-13	-34.15	0-360	298	V
836.5 MHz													
1	3.52736	-64.81	Pk	32.9	-33	.5	11.8	-52.61	-13	-39.61	0-360	298	H
2	6.4517	-66.24	Pk	35.5	-30.6	.4	11.8	-49.14	-13	-36.14	0-360	198	H
3	9.57152	-68.21	Pk	36.7	-28.1	.4	11.8	-47.41	-13	-34.41	0-360	298	H
4	3.38387	-63.82	Pk	32.7	-33	.5	11.8	-51.82	-13	-38.82	0-360	102	V
5	6.07822	-66.44	Pk	35.4	-31	.4	11.8	-49.84	-13	-36.84	0-360	202	V
6	9.21154	-68.55	Pk	36.4	-28.4	.5	11.8	-48.25	-13	-35.25	0-360	202	V
844 MHz													
1	4.34131	-64.29	Pk	33.6	-32.3	.4	11.8	-50.79	-13	-37.79	0-360	100	H
2	6.23271	-66.51	Pk	35.5	-31.3	.4	11.8	-50.11	-13	-37.11	0-360	100	H
3	9.72551	-69.06	Pk	36.8	-27.7	.4	11.8	-47.76	-13	-34.76	0-360	198	H
4	2.40192	-60.71	Pk	32	-34.3	.4	11.8	-50.81	-13	-37.81	0-360	102	V
5	4.76029	-64.21	Pk	34	-32.3	.3	11.8	-50.41	-13	-37.41	0-360	102	V
6	9.8855	-69.82	Pk	37	-27.5	.5	11.8	-48.02	-13	-35.02	0-360	201	V

16QAM LTE BAND 5 (10.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/7/2020
Test Engineer:	11993
Configuration:	EUT + Support Equipment
Mode	LTE 5 16QAM 10MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB(m)]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
829 MHz													
1	4.12283	-62.78	Pk	33.4	-32.6	.4	11.8	-49.78	-13	-36.78	0-360	100	H
2	6.63019	-66.61	Pk	35.5	-30.6	.4	11.8	-49.51	-13	-36.51	0-360	198	H
3	9.74151	-67.64	Pk	36.8	-27.8	.4	11.8	-46.44	-13	-33.44	0-360	198	H
4	2.40192	-60.18	Pk	32	-34.3	.4	11.8	-50.28	-13	-37.28	0-360	202	V
5	5.88723	-65.78	Pk	34.9	-31.2	.4	11.8	-49.88	-13	-36.88	0-360	102	V
6	9.8865	-69.74	Pk	37	-27.5	.5	11.8	-47.94	-13	-34.94	0-360	102	V
836.5 MHz													
1	3.07338	-64.53	Pk	33.4	-33.2	.5	11.8	-52.03	-13	-39.03	0-360	298	H
2	4.5498	-64.01	Pk	34	-32.6	.4	11.8	-50.41	-13	-37.41	0-360	100	H
3	9.12455	-68.63	Pk	36.3	-28.2	.5	11.8	-48.23	-13	-35.23	0-360	100	H
4	2.40142	-62.44	Pk	32	-34.3	.4	11.8	-52.54	-13	-39.54	0-360	202	V
5	6.05422	-66.11	Pk	35.3	-31.1	.4	11.8	-49.71	-13	-36.71	0-360	202	V
6	9.13604	-68.19	Pk	36.4	-28	.5	11.8	-47.49	-13	-34.49	0-360	298	V
844 MHz													
1	2.51842	-63.84	Pk	32.4	-33.9	.4	11.8	-53.14	-13	-40.14	0-360	100	H
2	7.29965	-66.67	Pk	35.5	-29.3	.3	11.8	-48.37	-13	-35.37	0-360	198	H
3	9.74001	-68.84	Pk	36.8	-27.8	.4	11.8	-47.64	-13	-34.64	0-360	298	H
4	2.40192	-58.61	Pk	32	-34.3	.4	11.8	-48.71	-13	-35.71	0-360	102	V
5	3.06788	-63.45	Pk	33.3	-33.2	.5	11.8	-51.05	-13	-38.05	0-360	298	V
6	9.14604	-68.44	Pk	36.4	-28.1	.4	11.8	-47.94	-13	-34.94	0-360	298	V

9.1.4. LTE BAND 7

LIMITS

FCC: §27.53 (m)

At least 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

QPSK LTE BAND 7 (20.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/6/2020
Test Engineer:	17051
Configuration:	EUT + Support Equipment
Mode	LTE 7 QPSK 20MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB(m)]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2510 MHz													
1	4.55748	-63.71	Pk	34	-32.5	.6	11.8	-49.81	-25	-24.81	0-360	298	H
2	5.00196	-50.22	Pk	34	-32.6	.7	11.8	-36.32	-25	-11.32	0-360	298	H
3	7.50337	-64.88	Pk	35.6	-29.1	.6	11.8	-45.98	-25	-20.98	0-360	102	H
4	10.00428	-59.59	Pk	37.2	-27.3	.6	11.8	-37.29	-25	-12.29	0-360	202	H
5	16.18456	-68.15	Pk	40.9	-26.1	.8	11.8	-40.75	-25	-15.75	0-360	102	H
6	17.837	-70.88	Pk	41.1	-22.9	1.1	11.8	-39.78	-25	-14.78	0-360	298	H
7	5.00196	-46.78	Pk	34	-32.6	.7	11.8	-32.88	-25	-7.88	0-360	198	V
8	7.50287	-68.86	Pk	35.6	-29.1	.6	11.8	-49.96	-25	-24.96	0-360	198	V
9	10.00378	-62.02	Pk	37.2	-27.3	.6	11.8	-39.72	-25	-14.72	0-360	102	V
2535 MHz													
1	5.05196	-49.17	Pk	34	-32.7	.7	11.8	-35.37	-25	-10.37	0-360	298	H
2	7.57837	-65.77	Pk	35.7	-29.2	.6	11.8	-46.87	-25	-21.87	0-360	100	H
3	10.10378	-60.29	Pk	37.3	-27	.6	11.8	-37.59	-25	-12.59	0-360	198	H
4	17.8265	-71.14	Pk	41.1	-23.1	1.1	11.8	-40.24	-25	-15.24	0-360	100	H
5	5.05196	-47.21	Pk	34	-32.7	.7	11.8	-33.41	-25	-8.41	0-360	298	V
6	7.57787	-66.34	Pk	35.7	-29.2	.6	11.8	-47.44	-25	-22.44	0-360	202	V
7	10.10428	-60.86	Pk	37.3	-27	.6	11.8	-38.16	-25	-13.16	0-360	102	V
8	17.08703	-69.4	Pk	41.4	-24.5	.8	11.8	-39.9	-25	-14.9	0-360	102	V
2560 MHz													
1	5.10196	-50.27	Pk	34.1	-32	.7	11.8	-35.67	-25	-10.67	0-360	298	H
2	7.65337	-64	Pk	35.7	-29.2	.6	11.8	-45.1	-25	-20.1	0-360	100	H
3	10.20378	-60.44	Pk	37.4	-27	.6	11.8	-37.64	-25	-12.64	0-360	198	H
4	16.93004	-69.58	Pk	41.6	-24	.8	11.8	-39.38	-25	-14.38	0-360	198	H
5	5.10196	-48.62	Pk	34.1	-32	.7	11.8	-34.02	-25	-9.02	0-360	202	V
6	7.65337	-67.75	Pk	35.7	-29.2	.6	11.8	-48.85	-25	-23.85	0-360	298	V
7	10.20428	-61.49	Pk	37.4	-27	.6	11.8	-38.69	-25	-13.69	0-360	102	V

16QAM LTE BAND 7 (20.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/6/2020
Test Engineer:	11993
Configuration:	EUT + Support Equipment
Mode	LTE 7 16QAM 20MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB(m)]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2510 MHz													
1	5.00196	-51.51	Pk	34	-32.6	.7	11.8	-37.61	-25	-12.61	0-360	298	H
2	7.50337	-64.22	Pk	35.6	-29.1	.6	11.8	-45.32	-25	-20.32	0-360	100	H
3	10.00428	-60.04	Pk	37.2	-27.3	.6	11.8	-37.74	-25	-12.74	0-360	198	H
4	16.30456	-70.36	Pk	41	-24.5	.8	11.8	-41.26	-25	-16.26	0-360	198	H
5	5.00196	-47.68	Pk	34	-32.6	.7	11.8	-33.78	-25	-8.78	0-360	202	V
6	7.50287	-67.43	Pk	35.6	-29.1	.6	11.8	-48.53	-25	-23.53	0-360	202	V
7	10.00378	-61.33	Pk	37.2	-27.3	.6	11.8	-39.03	-25	-14.03	0-360	102	V
8	17.71451	-71.54	Pk	41.1	-22.8	1.1	11.8	-40.34	-25	-15.34	0-360	202	V
2535 MHz													
1	5.05196	-49.22	Pk	34	-32.7	.7	11.8	-35.42	-25	-10.42	0-360	298	H
2	7.57787	-67.18	Pk	35.7	-29.2	.6	11.8	-48.28	-25	-23.28	0-360	98	H
3	10.10378	-60.03	Pk	37.3	-27	.6	11.8	-37.33	-25	-12.33	0-360	198	H
4	17.8415	-71.14	Pk	41.1	-22.8	1.2	11.8	-39.84	-25	-14.84	0-360	198	H
5	5.05196	-47.81	Pk	34	-32.7	.7	11.8	-34.01	-25	-9.01	0-360	202	V
6	7.57812	-68.85	Pk	35.7	-29.2	.6	11.8	-49.95	-25	-24.95	0-360	202	V
7	10.10428	-59.9	Pk	37.3	-27	.6	11.8	-37.2	-25	-12.2	0-360	102	V
2560 MHz													
1	5.10196	-51.24	Pk	34.1	-32	.7	11.8	-36.64	-25	-11.64	0-360	298	H
2	7.65337	-66.14	Pk	35.7	-29.2	.6	11.8	-47.24	-25	-22.24	0-360	100	H
3	10.20378	-61.18	Pk	37.4	-27	.6	11.8	-38.38	-25	-13.38	0-360	198	H
4	5.10196	-50.37	Pk	34.1	-32	.7	11.8	-35.77	-25	-10.77	0-360	202	V
5	7.65337	-68.29	Pk	35.7	-29.2	.6	11.8	-49.39	-25	-24.39	0-360	102	V
6	10.20428	-60.9	Pk	37.4	-27	.6	11.8	-38.1	-25	-13.1	0-360	102	V

9.1.5. LTE BAND 12

LIMITS

FCC: §27.53 (g)

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.

QPSK LTE BAND 12 (10.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/7/2020
Test Engineer:	11993
Configuration:	EUT + Support Equipment
Mode	LTE 12 QPSK 10MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB(m)]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
704 MHz													
1	1.87695	-55.37	Pk	30.7	-35.2	.4	11.8	-47.67	-13	-34.67	0-360	298	H
2	3.11088	-63.73	Pk	33.8	-33.2	.5	11.8	-50.83	-13	-37.83	0-360	100	H
3	9.891	-68.98	Pk	37	-27.5	.5	11.8	-47.18	-13	-34.18	0-360	100	H
4	2.40242	-61.94	Pk	32	-34.3	.4	11.8	-52.04	-13	-39.04	0-360	102	V
5	6.95967	-65.8	Pk	35.7	-30	.4	11.8	-47.9	-13	-34.9	0-360	298	V
6	8.42508	-68.03	Pk	35.8	-28.5	.4	11.8	-48.53	-13	-35.53	0-360	298	V
707.5 MHz													
1	1.40648	-58.66	Pk	28.5	-36.2	.5	11.8	-54.06	-13	-41.06	0-360	198	H
2	5.27126	-65.39	Pk	34.3	-31.9	.3	11.8	-50.89	-13	-37.89	0-360	100	H
3	9.12805	-68.34	Pk	36.4	-28.2	.5	11.8	-47.84	-13	-34.84	0-360	198	H
4	1.40548	-59.15	Pk	28.5	-36.2	.5	11.8	-54.55	-13	-41.55	0-360	298	V
5	4.07133	-64.45	Pk	33.4	-32.7	.5	11.8	-51.45	-13	-38.45	0-360	298	V
6	9.31004	-68.88	Pk	36.6	-28.2	.4	11.8	-48.28	-13	-35.28	0-360	298	V
711 MHz													
1	3.11488	-64.84	Pk	33.7	-33.2	.5	11.8	-52.04	-13	-39.04	0-360	100	H
2	4.23932	-62.8	Pk	33.4	-32.2	.4	11.8	-49.4	-13	-36.4	0-360	298	H
3	9.54552	-69.19	Pk	36.7	-27.8	.4	11.8	-48.09	-13	-35.09	0-360	100	H
4	3.11688	-64.26	Pk	33.7	-33.2	.5	11.8	-51.46	-13	-38.46	0-360	102	V
5	6.24221	-65.63	Pk	35.5	-31.1	.4	11.8	-49.03	-13	-36.03	0-360	102	V
6	9.78601	-68.98	Pk	36.9	-27.6	.4	11.8	-47.48	-13	-34.48	0-360	202	V

16QAM LTE BAND 12 (10.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/7/2020
Test Engineer:	11993
Configuration:	EUT + Support Equipment
Mode	LTE 12 16QAM 10MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB(m)]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
704 MHz													
1	2.40192	-62.49	Pk	32	-34.3	.4	11.8	-52.59	-13	-39.59	0-360	198	H
2	6.21271	-65.7	Pk	35.5	-31.5	.4	11.8	-49.5	-13	-36.5	0-360	100	H
3	8.32759	-68.11	Pk	35.8	-28.7	.4	11.8	-48.81	-13	-35.81	0-360	100	H
4	1.39948	-60.23	Pk	28.6	-36.2	.5	11.8	-55.53	-13	-42.53	0-360	298	V
5	2.40242	-61.05	Pk	32	-34.3	.4	11.8	-51.15	-13	-38.15	0-360	102	V
6	6.61019	-66.46	Pk	35.5	-30.6	.4	11.8	-49.36	-13	-36.36	0-360	102	V
707.5 MHz													
1	1.40648	-57.66	Pk	28.5	-36.2	.5	11.8	-53.06	-13	-40.06	0-360	198	H
2	6.62369	-66.77	Pk	35.5	-30.5	.4	11.8	-49.57	-13	-36.57	0-360	198	H
3	9.53452	-68.29	Pk	36.7	-27.8	.4	11.8	-47.19	-13	-34.19	0-360	198	H
4	1.40598	-60.47	Pk	28.5	-36.2	.5	11.8	-55.87	-13	-42.87	0-360	298	V
5	6.45619	-66.52	Pk	35.5	-30.6	.4	11.8	-49.42	-13	-36.42	0-360	298	V
6	9.81976	-68.15	Pk	36.9	-27.3	.4	11.8	-46.35	-13	-33.35	0-360	102	V
711 MHz													
1	2.40192	-63.16	Pk	32	-34.3	.4	11.8	-53.26	-13	-40.26	0-360	298	H
2	6.4507	-66.98	Pk	35.5	-30.6	.4	11.8	-49.88	-13	-36.88	0-360	100	H
3	9.855	-68.83	Pk	37	-27.3	.5	11.8	-46.83	-13	-33.83	0-360	298	H
4	1.41298	-60.48	Pk	28.4	-36.1	.5	11.8	-55.88	-13	-42.88	0-360	298	V
5	5.16127	-64.74	Pk	34.2	-32	.3	11.8	-50.44	-13	-37.44	0-360	102	V
6	9.866	-69.05	Pk	37	-27.3	.5	11.8	-47.05	-13	-34.05	0-360	102	V

9.1.6. LTE BAND 13

LIMITS

FCC: §27.53

(c) 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.

(f) Emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

QPSK LTE BAND 13 (10.0MHZ BANDWIDTH)

Company:	Microsoft
Project #:	13129294
Date:	4/7/2020
Test Engineer:	17051
Configuration:	EUT + Support Equipment
Mode	LTE 13 QPSK 10MHz
Chamber #:	N-SAC

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 [dB/(m)]	Amp/Cbl/Filtr /Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading (dBm)	WWAN Harmonics Limit	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
782 MHz													
1	1.56397*	-64.44	Pk	28	-35.9	.5	11.8	-60.04	-40	-20.04	0-360	298	H
2	2.54691	-63.62	Pk	32.3	-34	.4	11.8	-53.12	-13	-40.12	0-360	198	H
3	3.11738	-64.26	Pk	33.7	-33.2	.5	11.8	-51.46	-13	-38.46	0-360	298	H
4	4.22882	-64.84	Pk	33.3	-32.2	.4	11.8	-51.54	-13	-38.54	0-360	101	H
5	8.1456	-67.72	Pk	35.8	-28.7	.4	11.8	-48.42	-13	-35.42	0-360	198	H
6	1.56247*	-62.1	Pk	28	-35.9	.5	11.8	-57.7	-40	-17.7	0-360	298	V
7	2.97239	-64.09	Pk	32.7	-33.4	.5	11.8	-52.49	-13	-39.49	0-360	202	V
8	3.76335	-63.97	Pk	33.3	-32.7	.5	11.8	-51.07	-13	-38.07	0-360	102	V
9	6.02222	-65.67	Pk	35.2	-31.3	.4	11.8	-49.57	-13	-36.57	0-360	102	V

* Emissions in the GPS band were wideband emissions therefore the -40dBm/MHz limit was used.