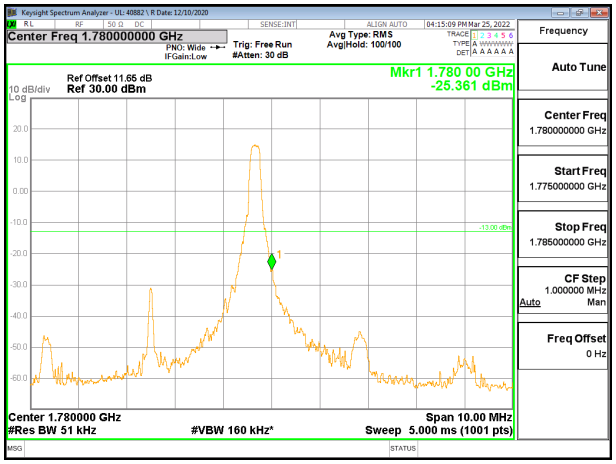
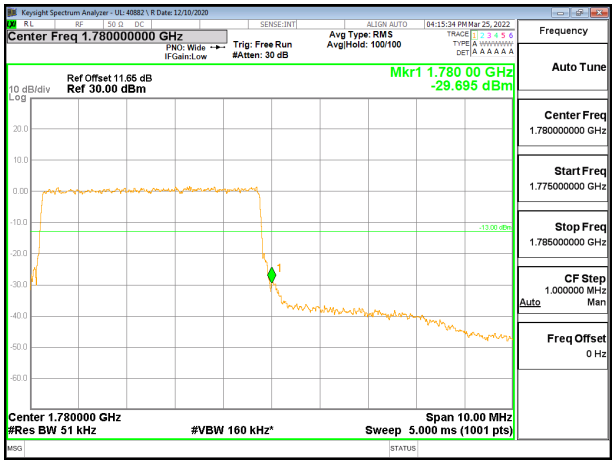
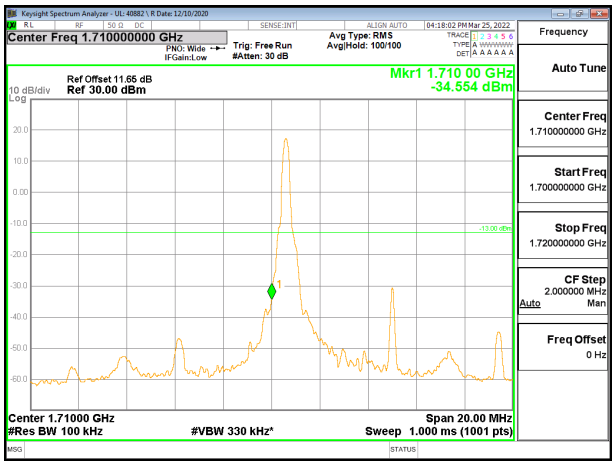


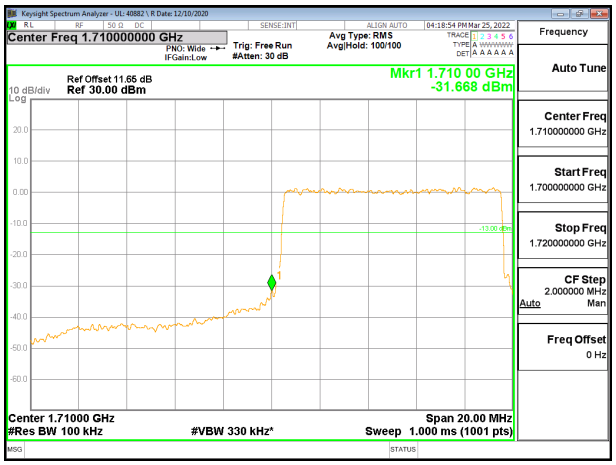
LTE66 5MHz 16QAM HIGH Ch RB1-24



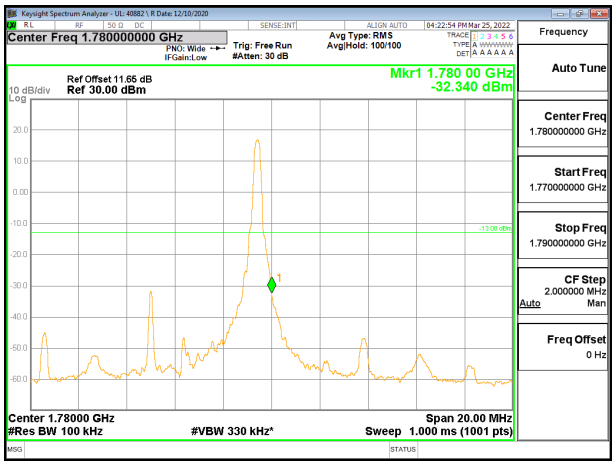
LTE66 5MHz 16QAM HIGH Ch RB25-0



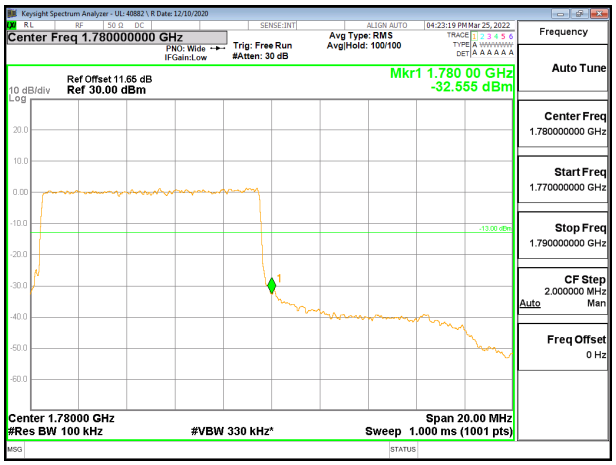
LTE66 10MHz QPSK LOW Ch RB1-0



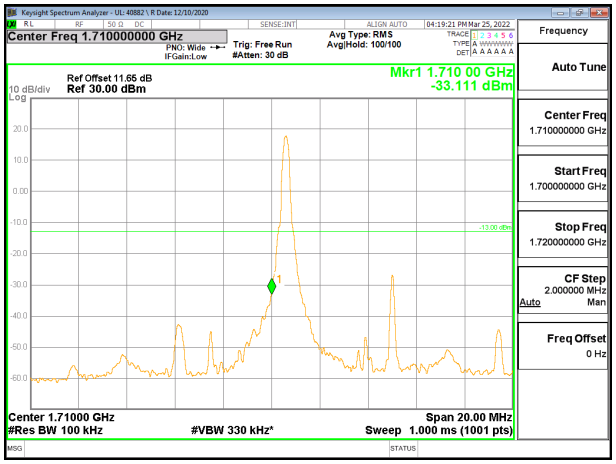
LTE66 10MHz QPSK LOW Ch RB50-0



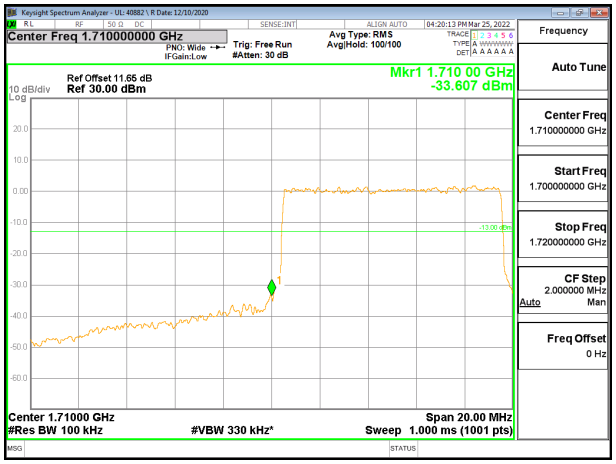
LTE66 10MHz QPSK HIGH Ch RB1-49



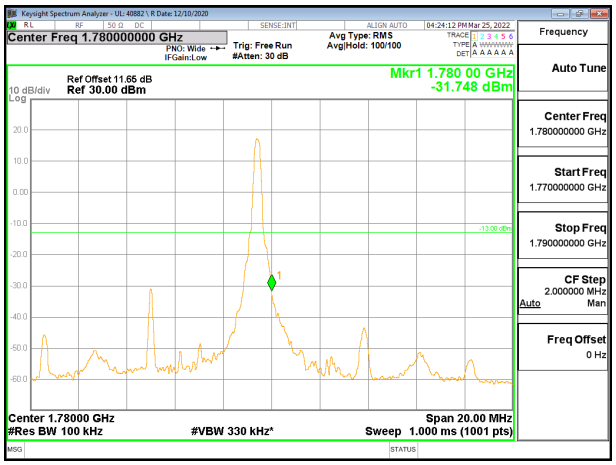
LTE66 10MHz QPSK HIGH Ch RB50-0



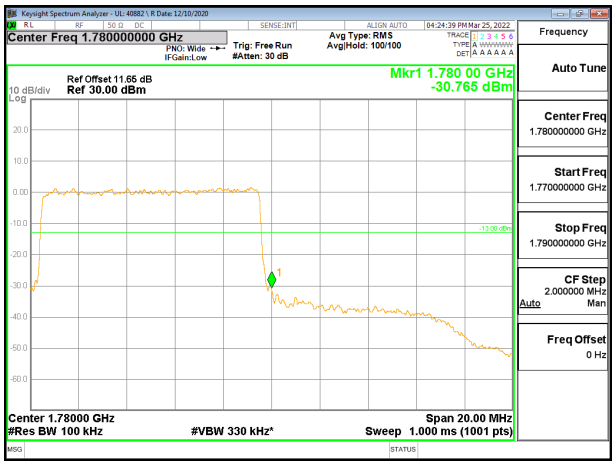
LTE66 10MHz 16QAM LOW Ch RB1-0



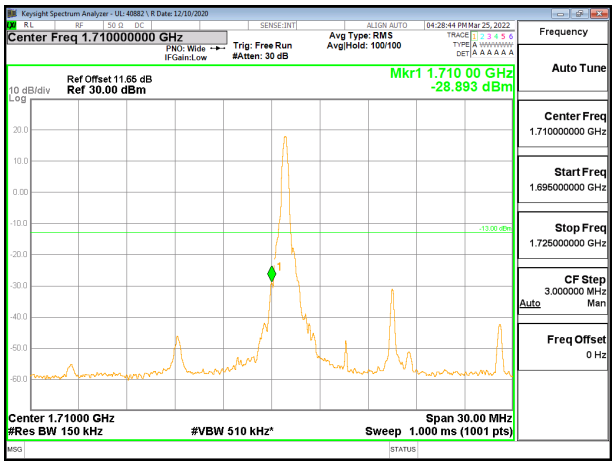
LTE66 10MHz 16QAM LOW Ch RB50-0



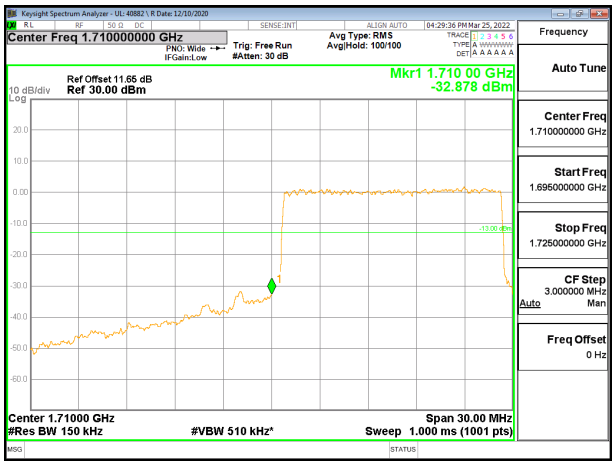
LTE66 10MHz 16QAM HIGH Ch RB1-49



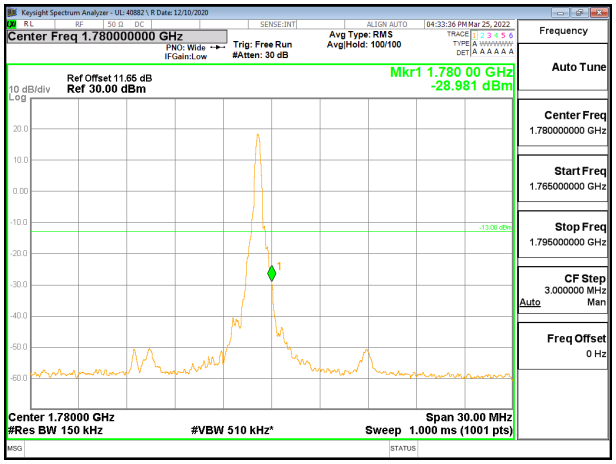
LTE66 10MHz 16QAM HIGH Ch RB50-0



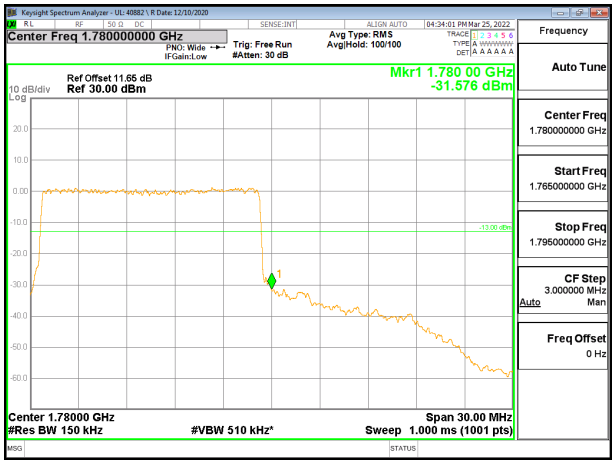
LTE66 15MHz QPSK LOW Ch RB1-0



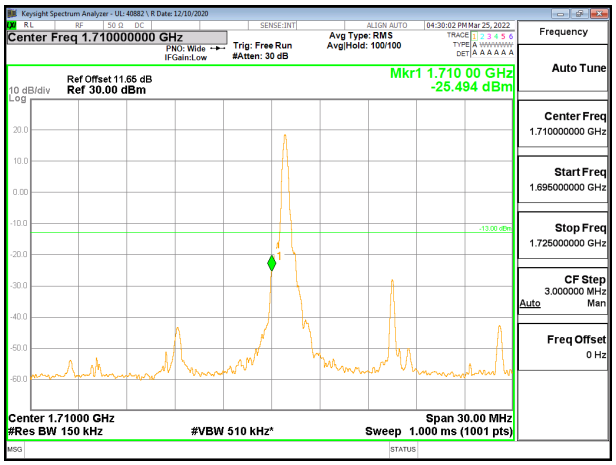
LTE66 15MHz QPSK LOW Ch RB75-0



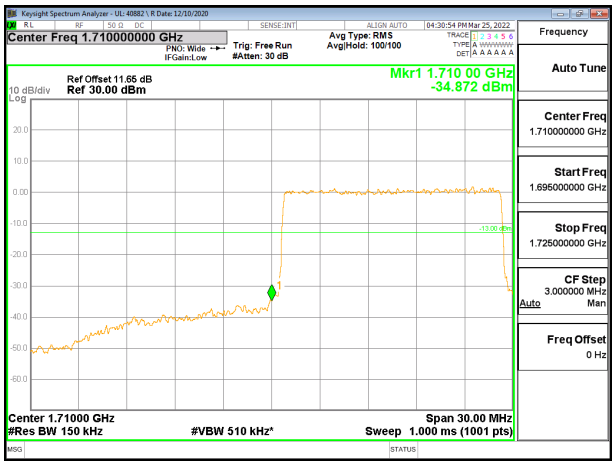
LTE66 15MHz QPSK HIGH Ch RB1-74



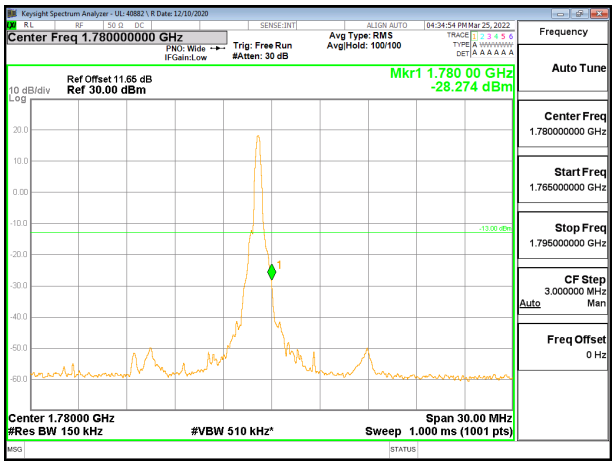
LTE66 15MHz QPSK HIGH Ch RB75-0



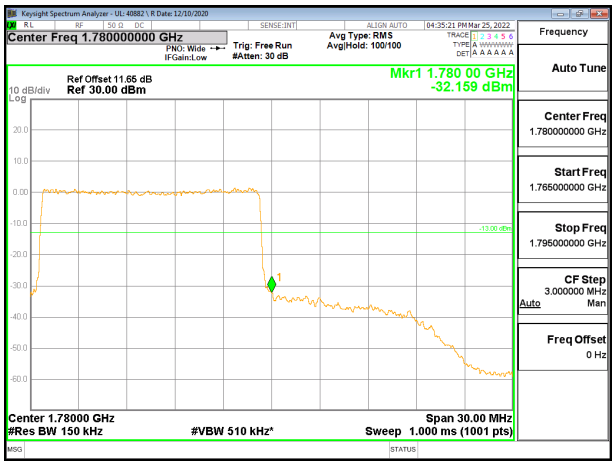
LTE66 15MHz 16QAM LOW Ch RB1-0



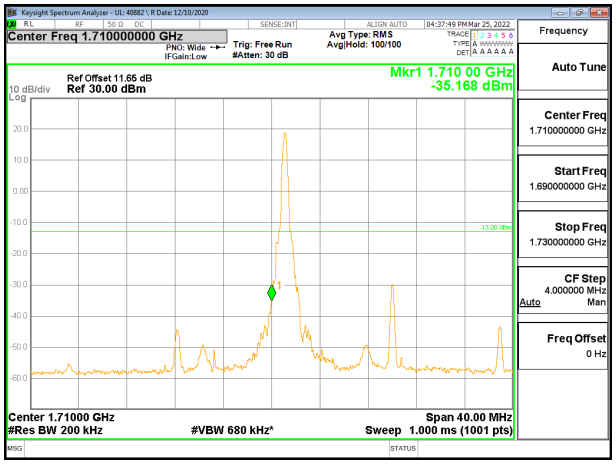
LTE66 15MHz 16QAM LOW Ch RB75-0



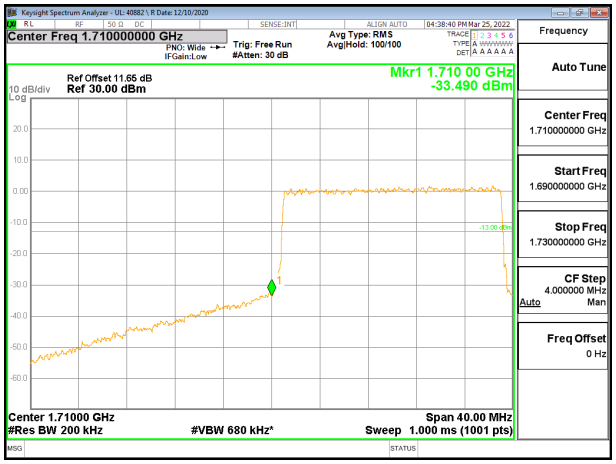
LTE66 15MHz 16QAM HIGH Ch RB1-74



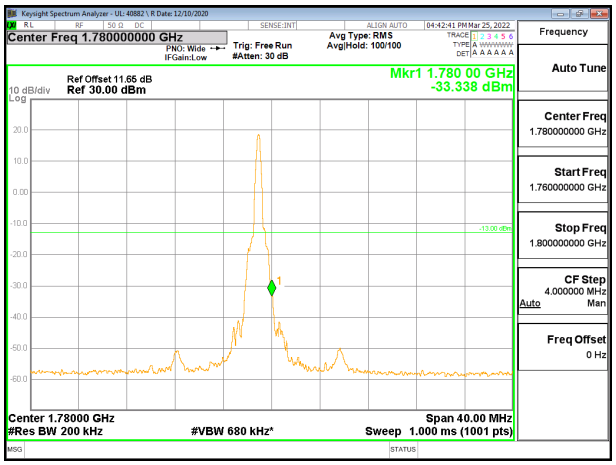
LTE66 15MHz 16QAM HIGH Ch RB75-0



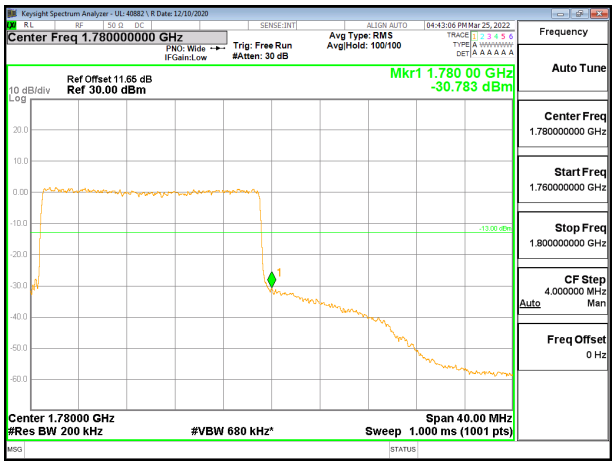
LTE66 20MHz QPSK LOW Ch RB1-0



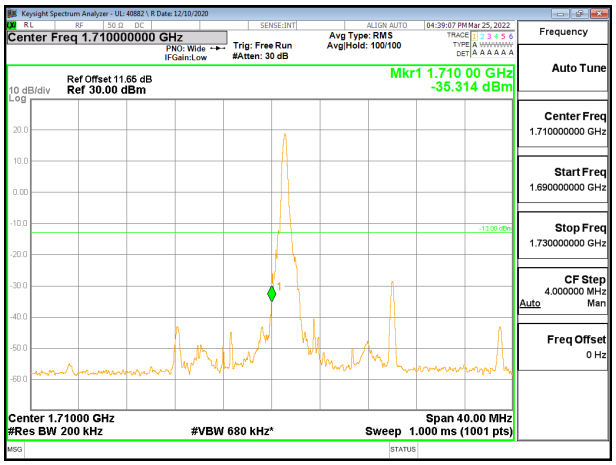
LTE66 20MHz QPSK LOW Ch RB100-0



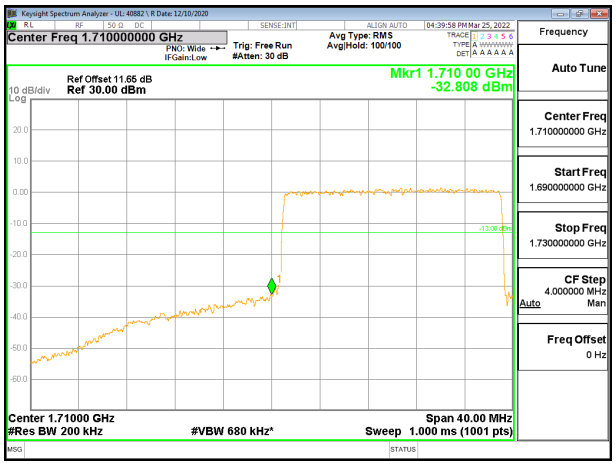
LTE66 20MHz QPSK HIGH Ch RB1-99



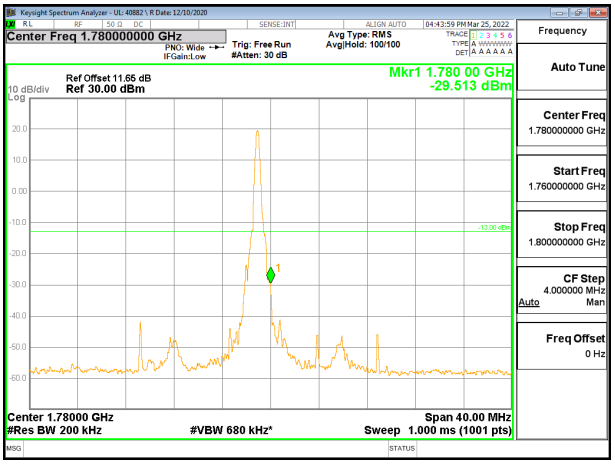
LTE66 20MHz QPSK HIGH Ch RB100-0



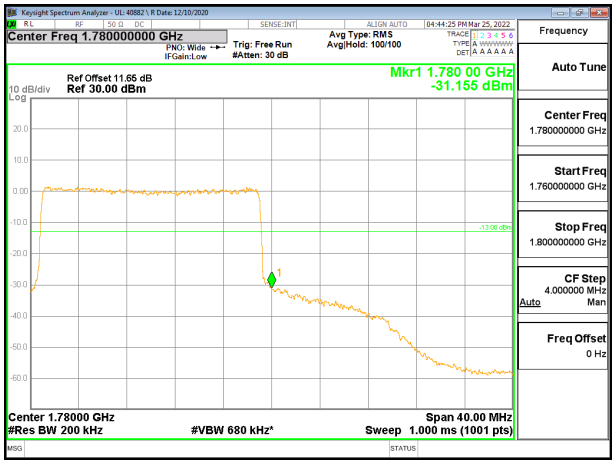
LTE66 20MHz 16QAM LOW Ch RB1-0



LTE66 20MHz 16QAM LOW Ch RB100-0



LTE66 20MHz 16QAM HIGH Ch RB1-99



LTE66 20MHz 16QAM HIGH Ch RB100-0

10.3. OUT OF BAND EMISSIONS

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

(v) Set display line at -13 dBm, -25dBm and -40dBm according to the band Limit

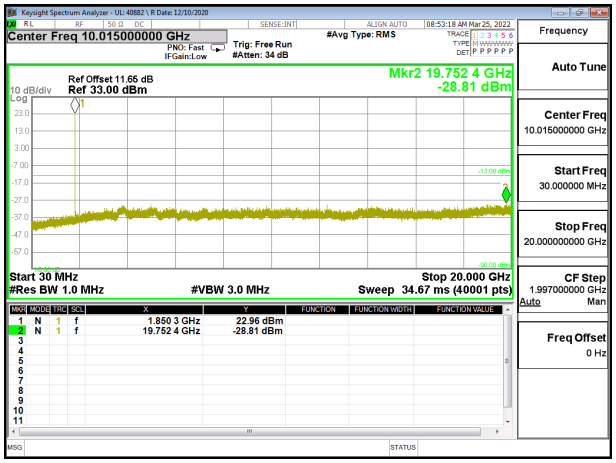
(vi) Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

RESULTS

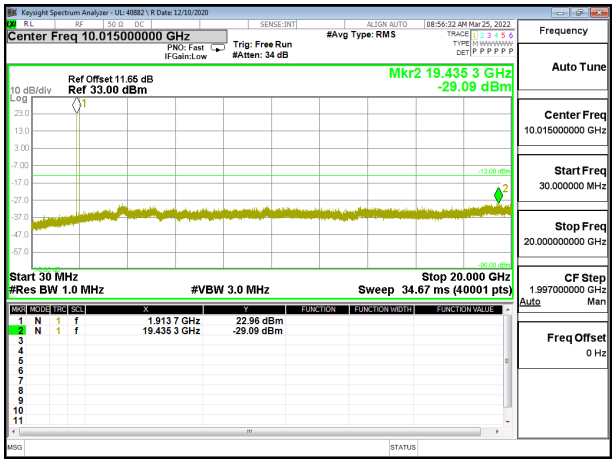
10.3.1. LTE25

LIMITS

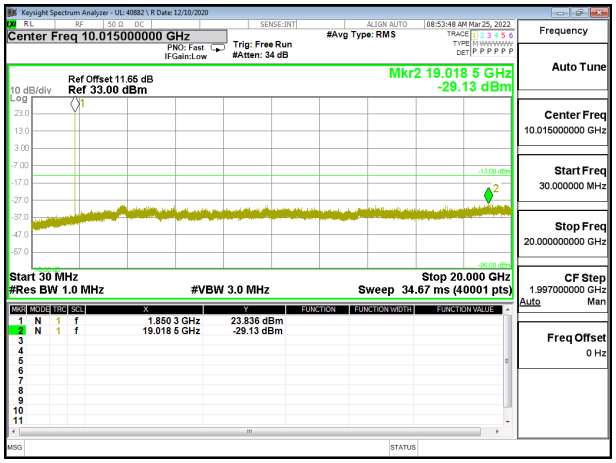
FCC: §24.238
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



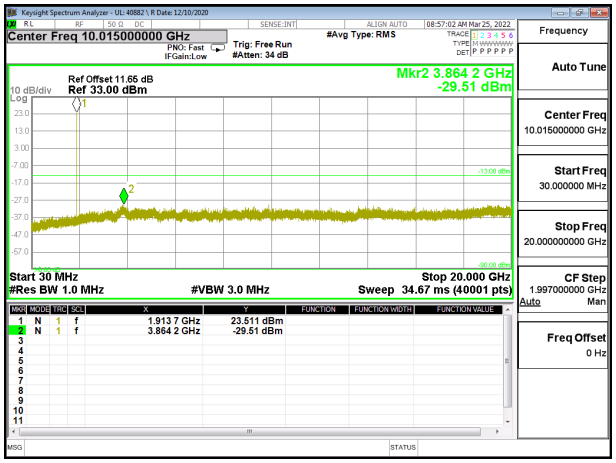
LTE25 1.4MHz QPSK LOW Ch RB1-0



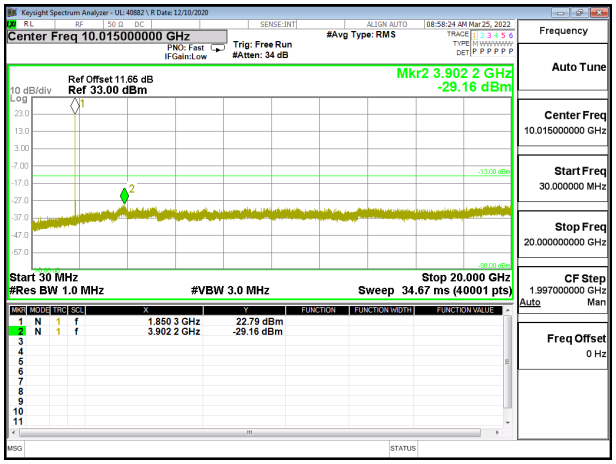
LTE25 1.4MHz QPSK HIGH Ch RB1-0



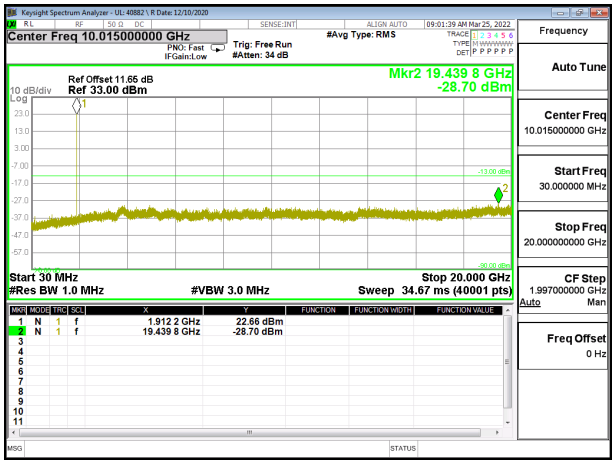
LTE25 1.4MHz 16QAM LOW Ch RB1-0



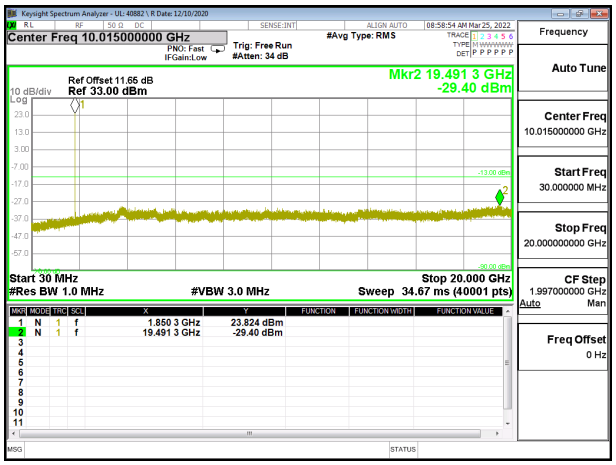
LTE25 1.4MHz 16QAM HIGH Ch RB1-0



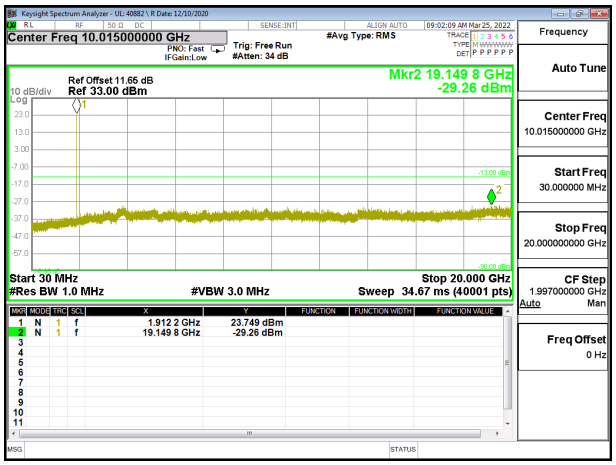
LTE25 3MHz QPSK LOW Ch RB1-0



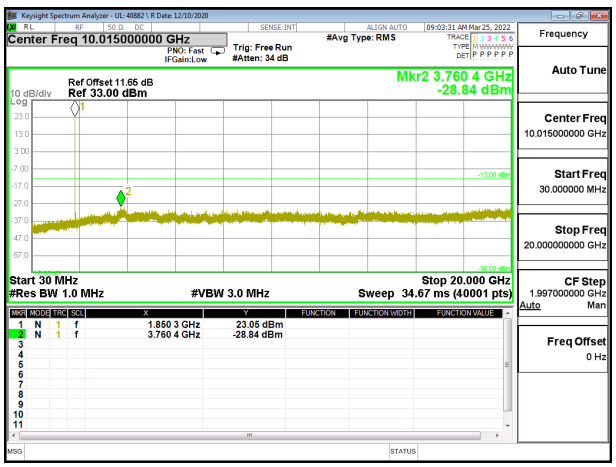
LTE25 3MHz QPSK HIGH Ch RB1-0



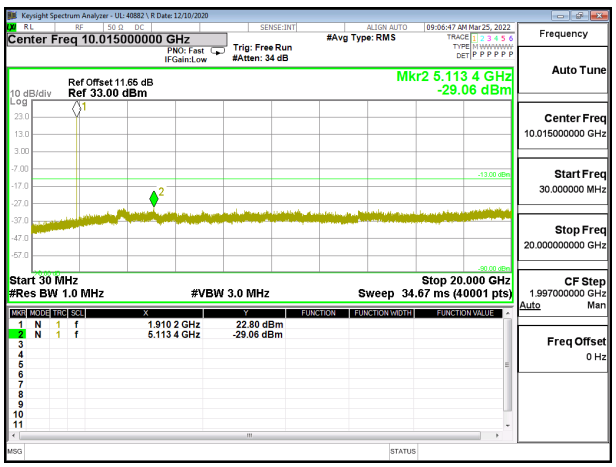
LTE25 3MHz 16QAM LOW Ch RB1-0



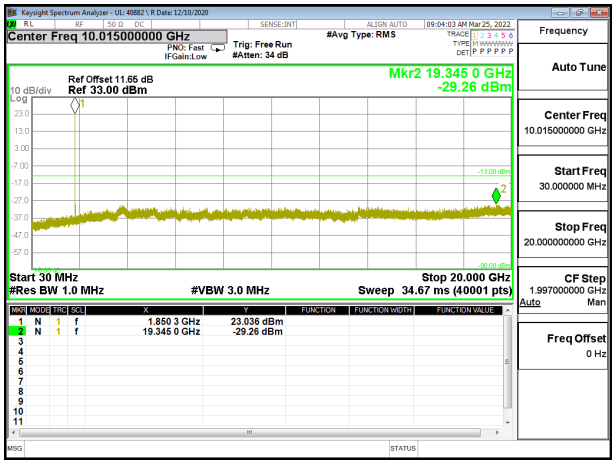
LTE25 3MHz 16QAM HIGH Ch RB1-0



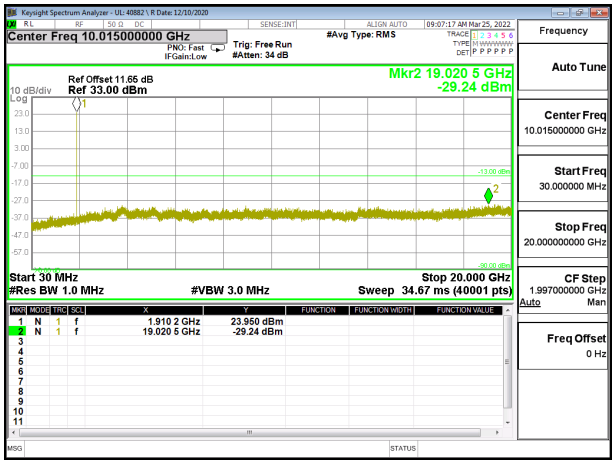
LTE25 5MHz QPSK LOW Ch RB1-0



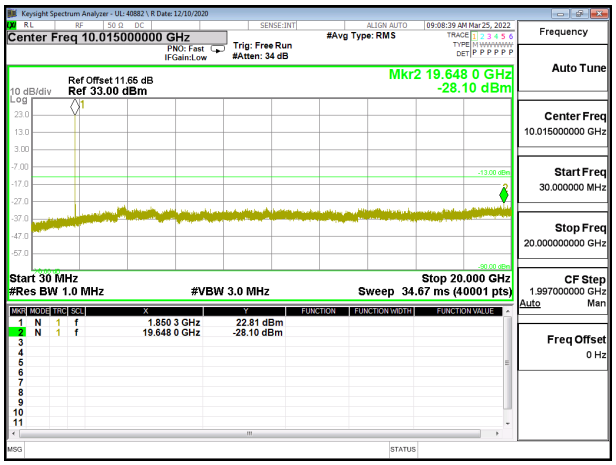
LTE25 5MHz QPSK HIGH Ch RB1-0



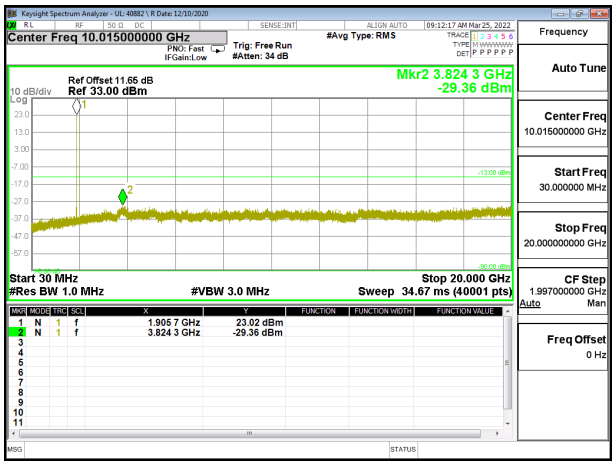
LTE25 5MHz 16QAM LOW Ch RB1-0



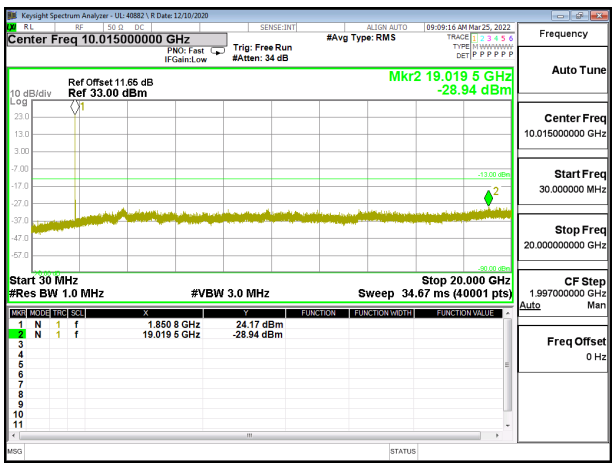
LTE25 5MHz 16QAM HIGH Ch RB1-0



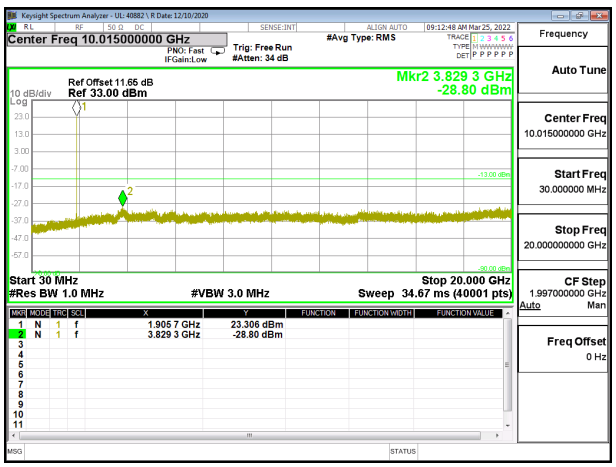
LTE25 10MHz QPSK LOW Ch RB1-0



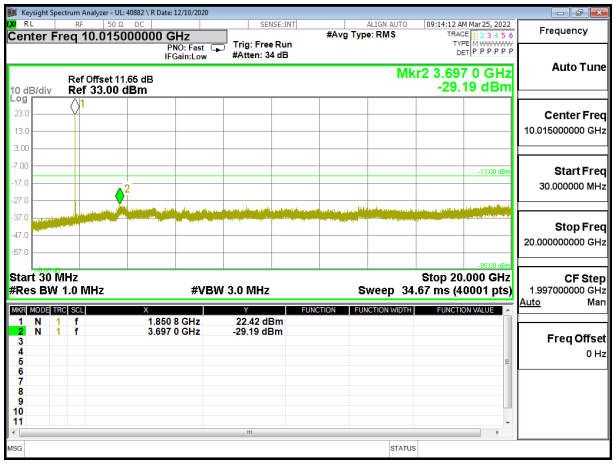
LTE25 10MHz QPSK HIGH Ch RB1-0



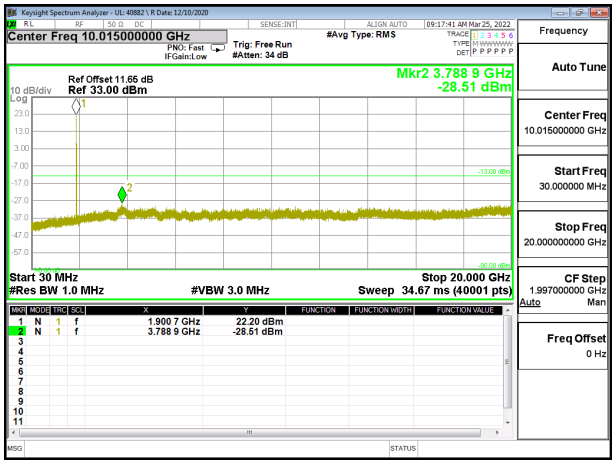
LTE25 10MHz 16QAM LOW Ch RB1-0



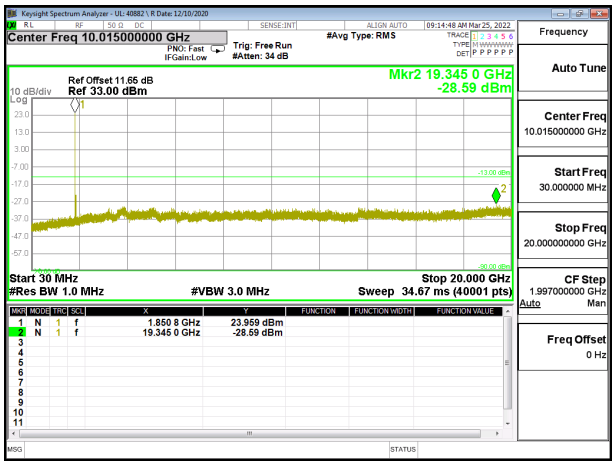
LTE25 10MHz 16QAM HIGH Ch RB1-0



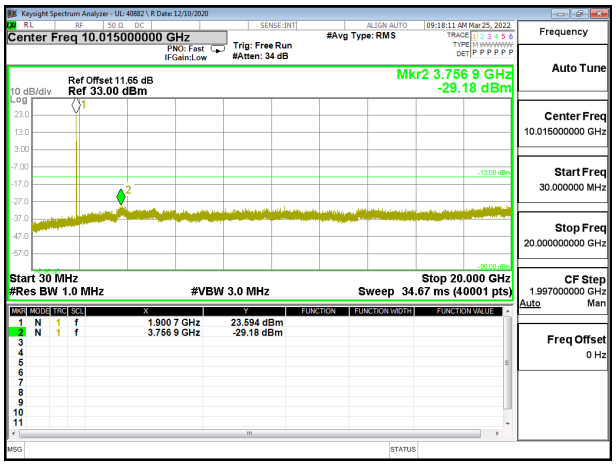
LTE25 15MHz QPSK LOW Ch RB1-0



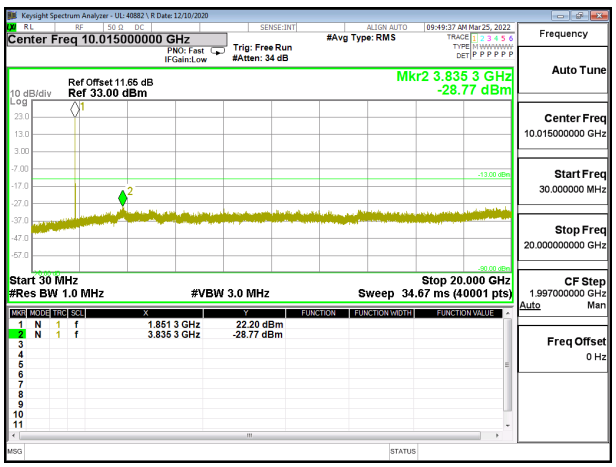
LTE25 15MHz QPSK HIGH Ch RB1-0



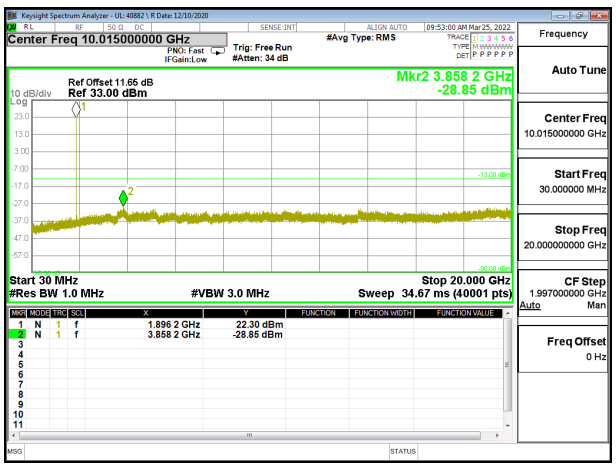
LTE25 15MHz 16QAM LOW Ch RB1-0



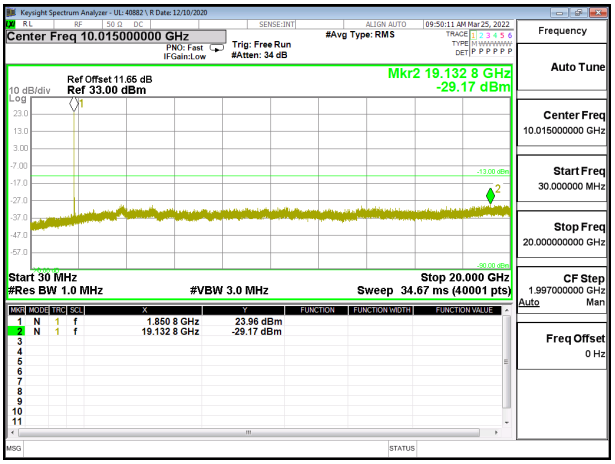
LTE25 15MHz 16QAM HIGH Ch RB1-0



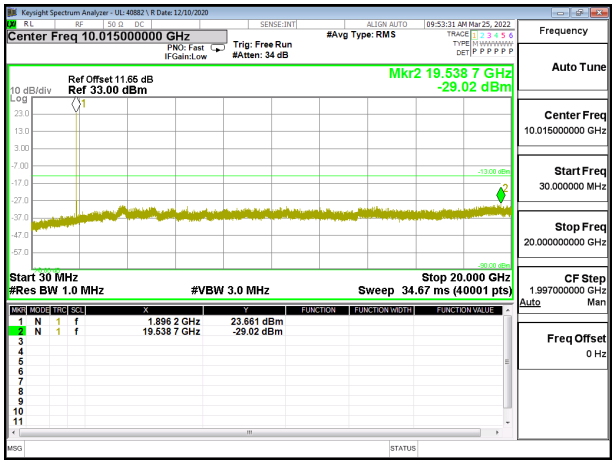
LTE25 20MHz QPSK LOW Ch RB1-0



LTE25 20MHz QPSK HIGH Ch RB1-0



LTE25 20MHz 16QAM LOW Ch RB1-0

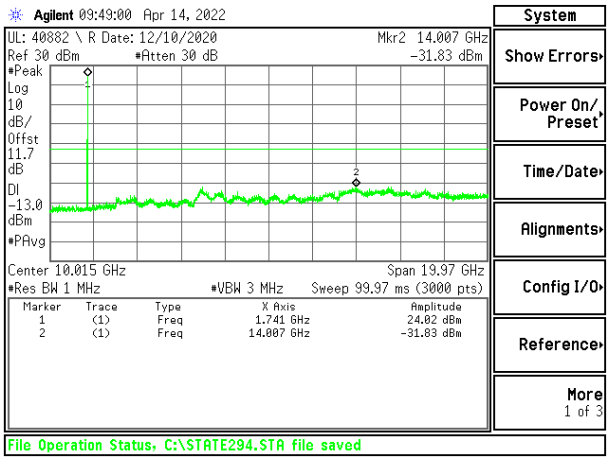


LTE25 20MHz 16QAM HIGH Ch RB1-0

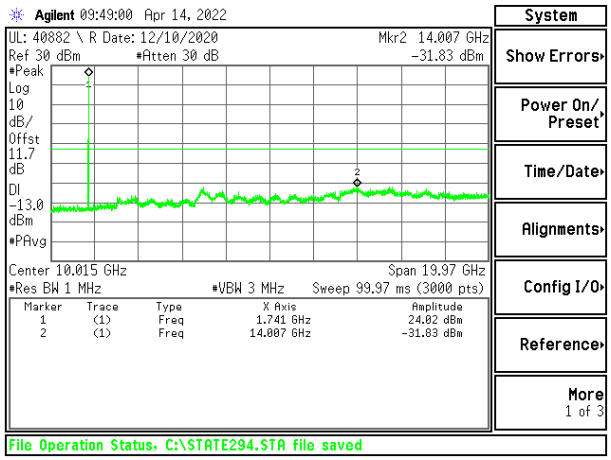
10.3.2. LTE66

LIMITS

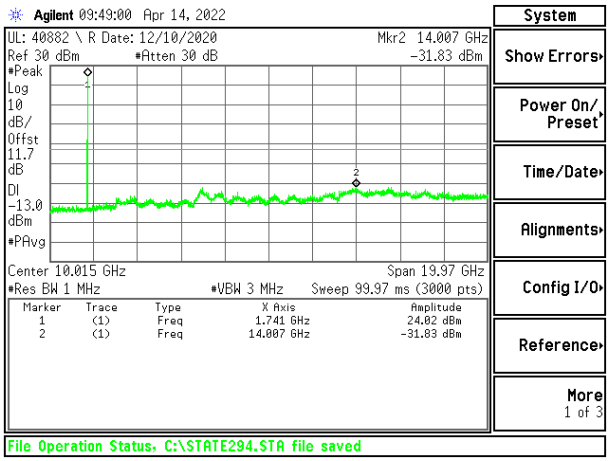
FCC: §27.53(h)
The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



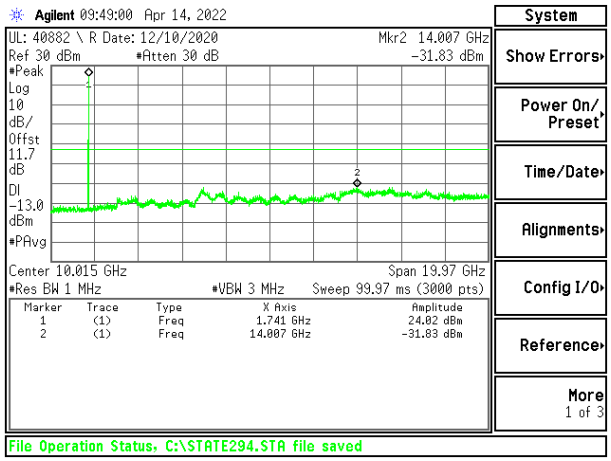
LTE66 1.4MHz QPSK LOW Ch RB1-0



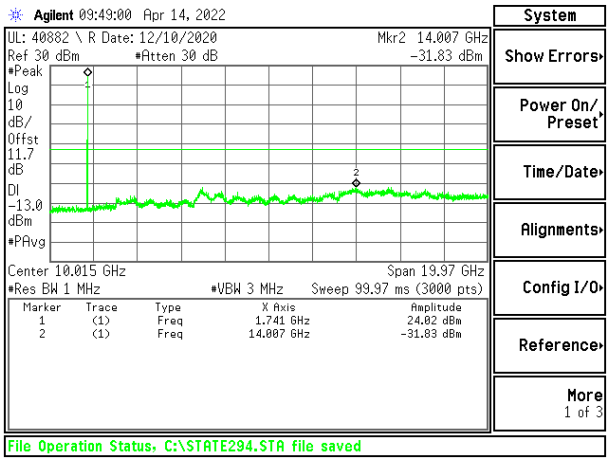
LTE66 1.4MHz QPSK MID Ch RB1-0



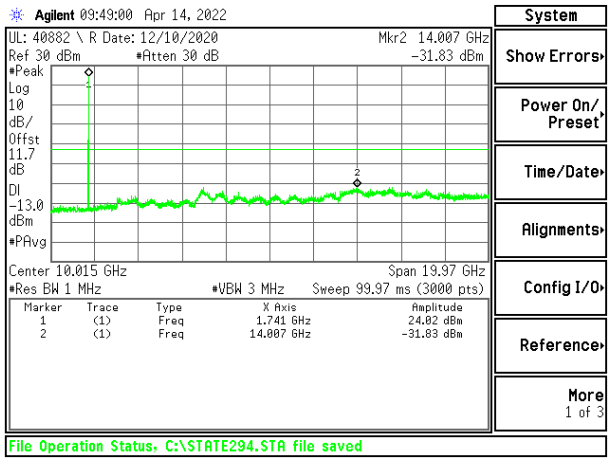
LTE66 1.4MHz QPSK HIGH Ch RB1-0



LTE66 1.4MHz 16QAM LOW Ch RB1-0



LTE66 1.4MHz 16QAM MID Ch RB1-0



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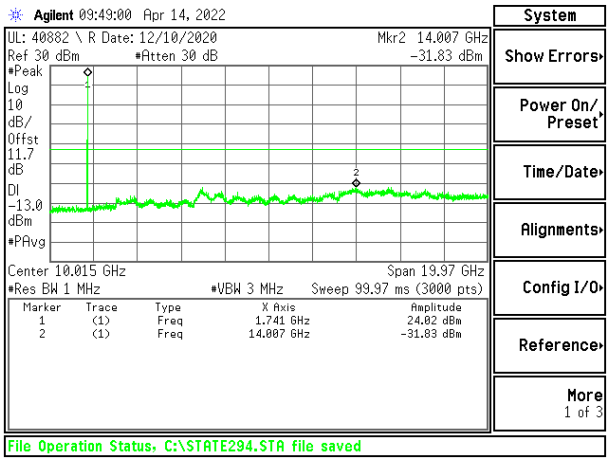
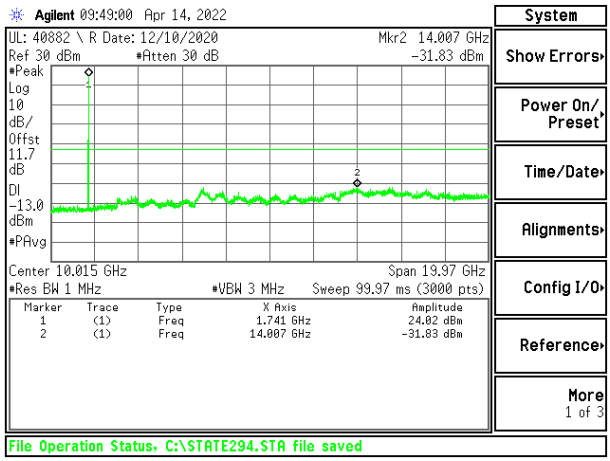


LTE66 3MHz QPSK LOW Ch RB1-0



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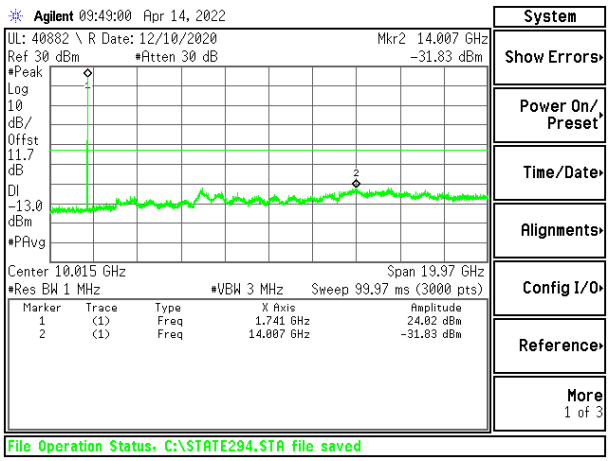

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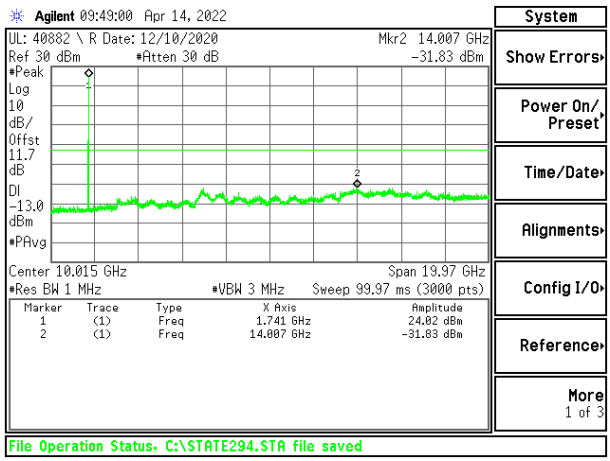

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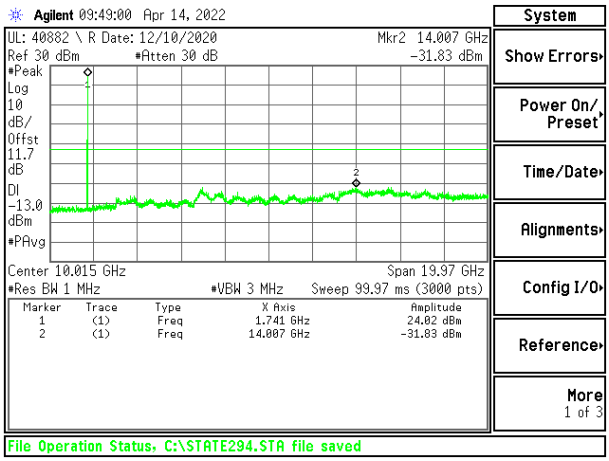
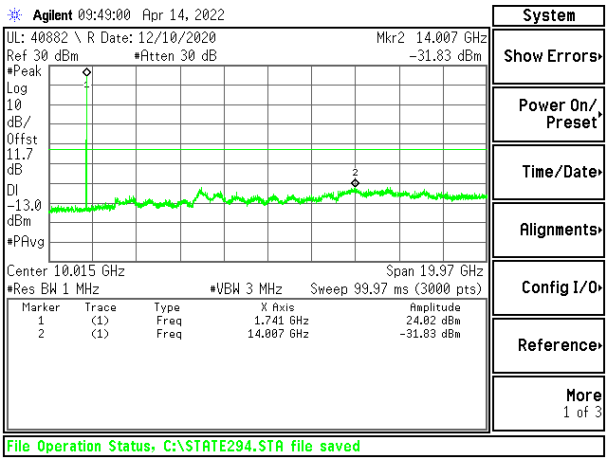


LTE66 3MHz 16QAM MID Ch RB1-0



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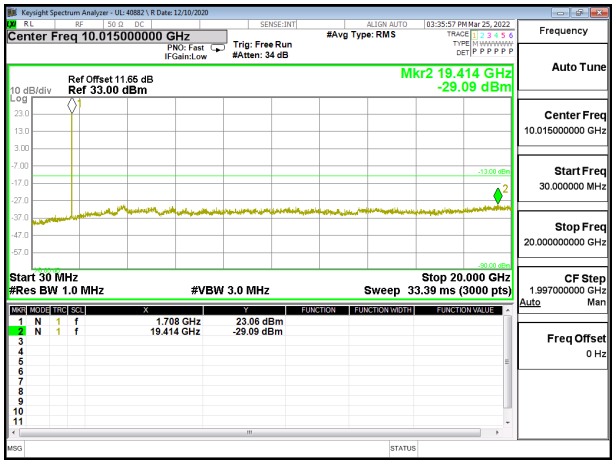
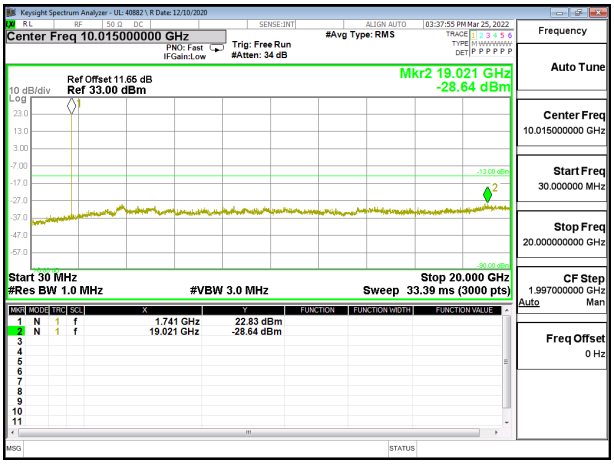


LTE66 5MHz QPSK LOW Ch RB1-0



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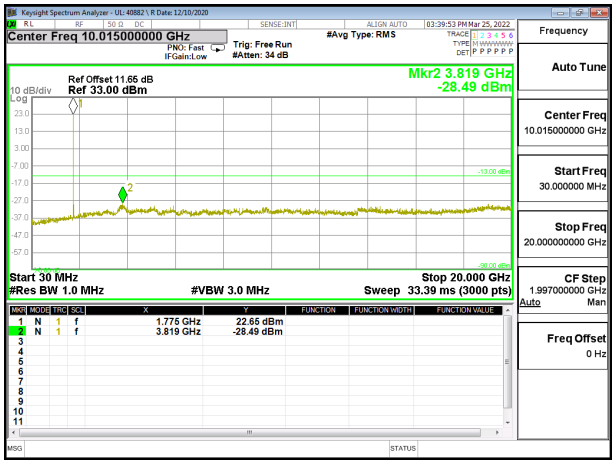

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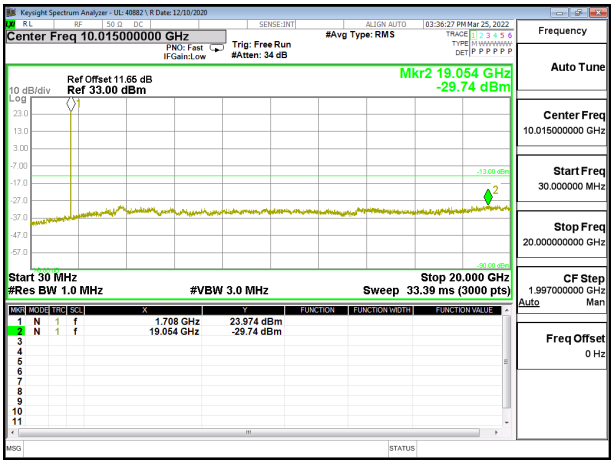

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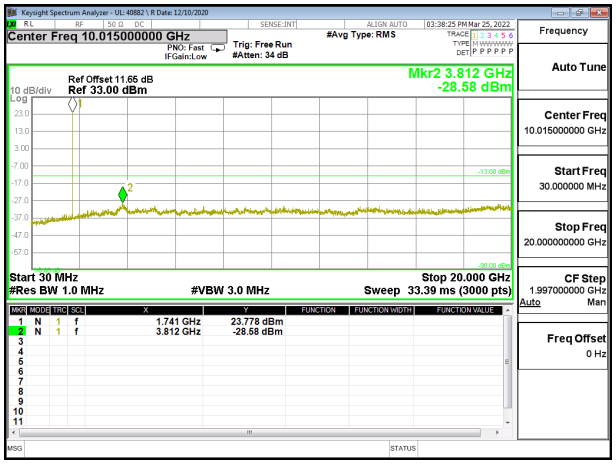

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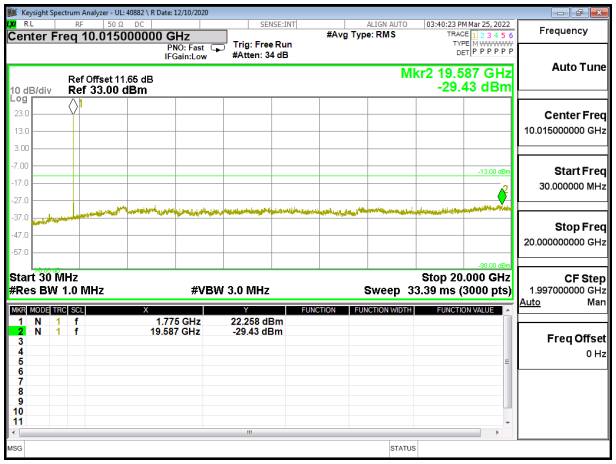

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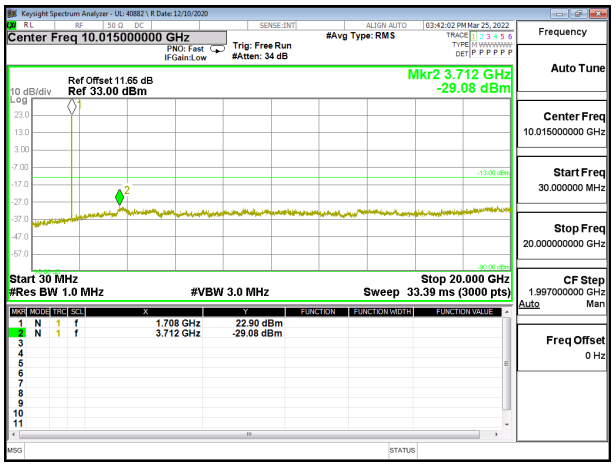
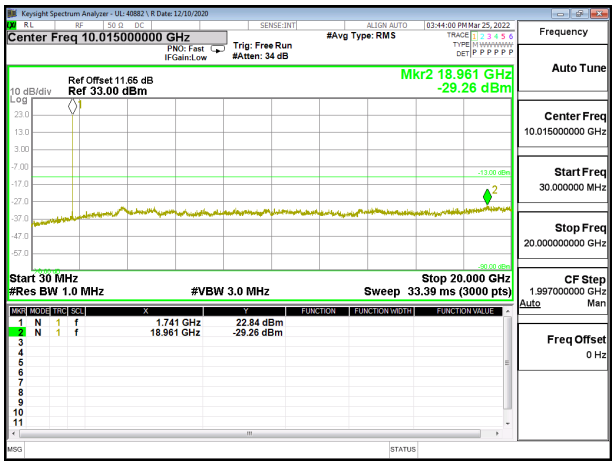


LTE66 10MHz QPSK LOW Ch RB1-0



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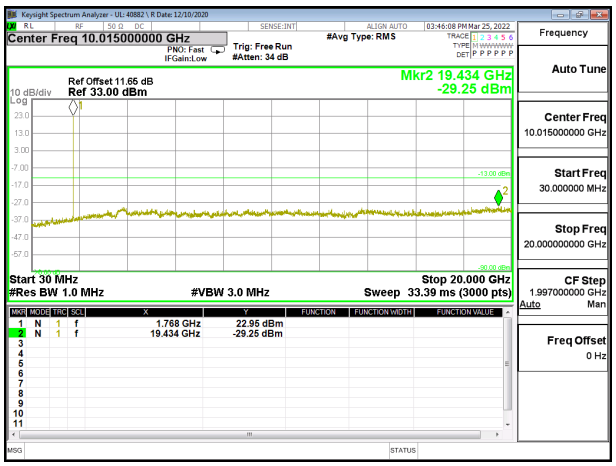

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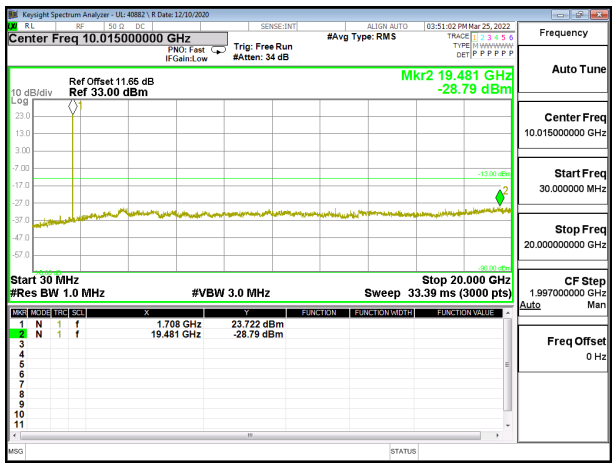

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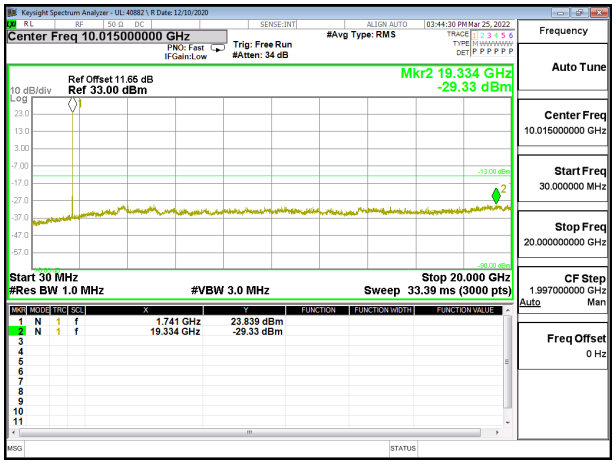
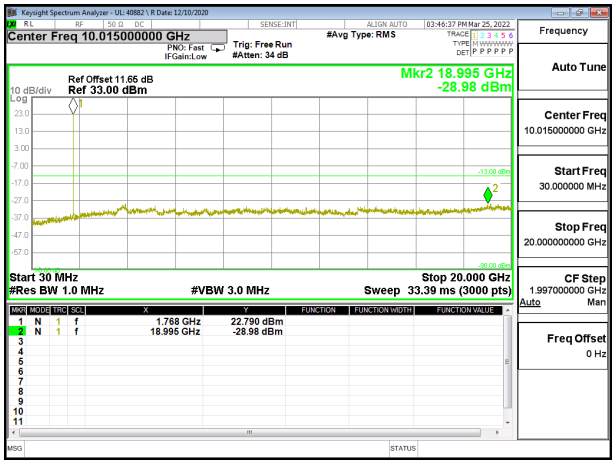
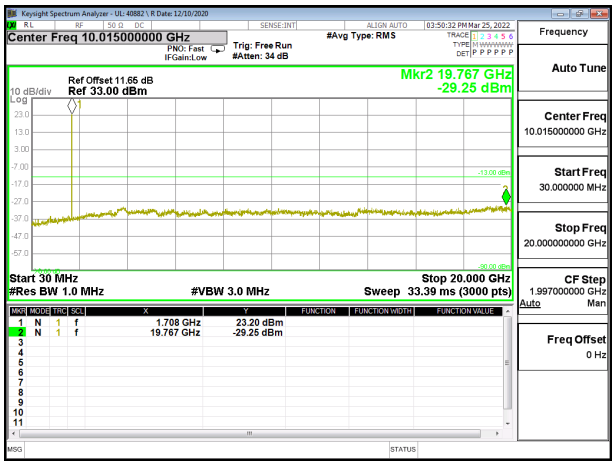


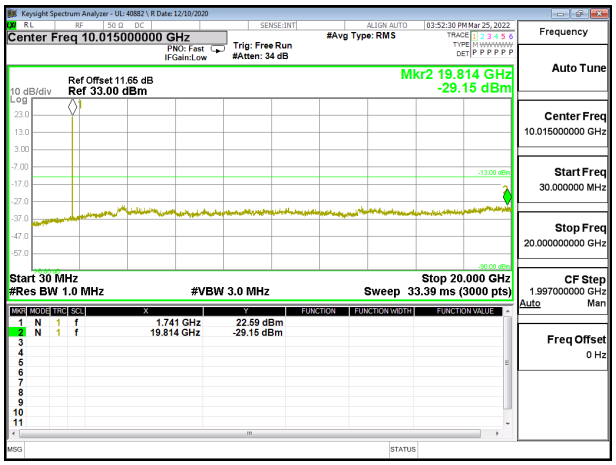
LTE66 10MHz 16QAM MID Ch RB1-0



LTE66 10MHz 16QAM HIGH Ch RB1-0



LTE66 15MHz QPSK LOW Ch RB1-0



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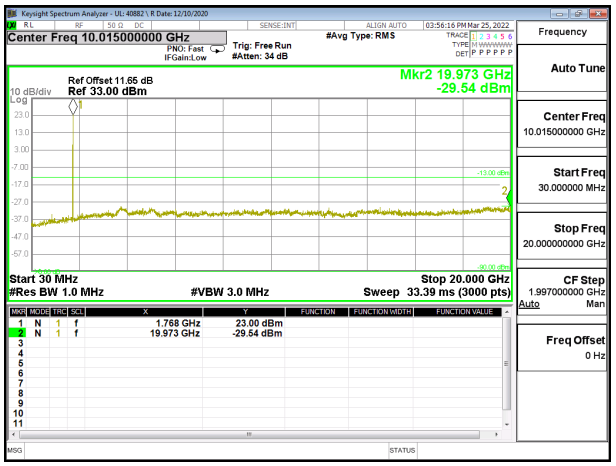
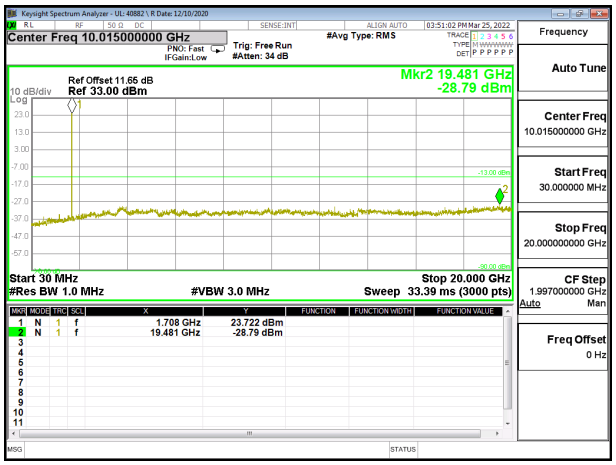
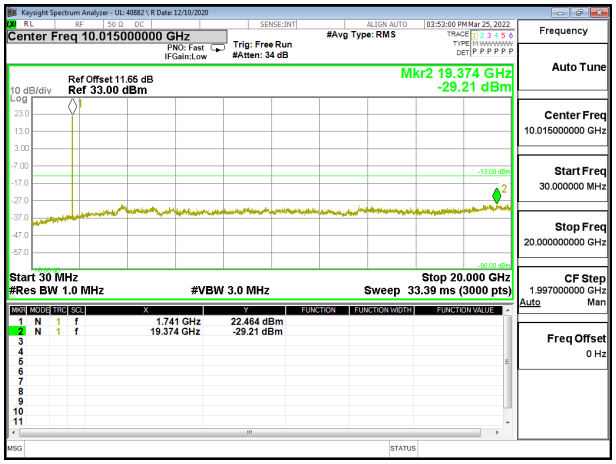


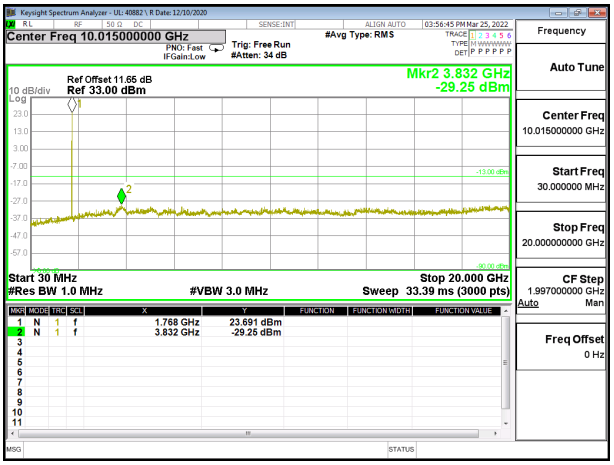
LTE66 15MHz QPSK HIGH Ch RB1-0



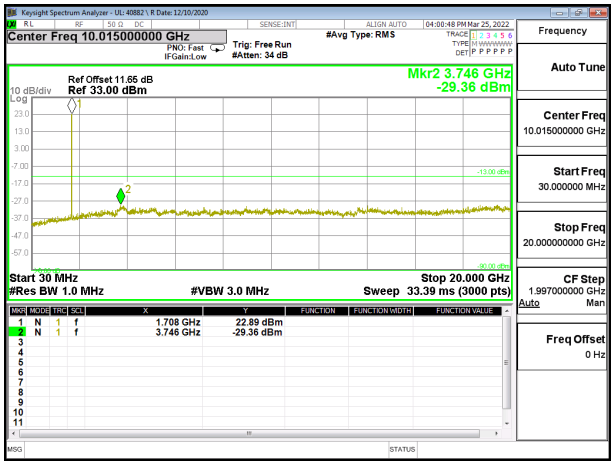
LTE66 15MHz 16QAM LOW Ch RB1-0



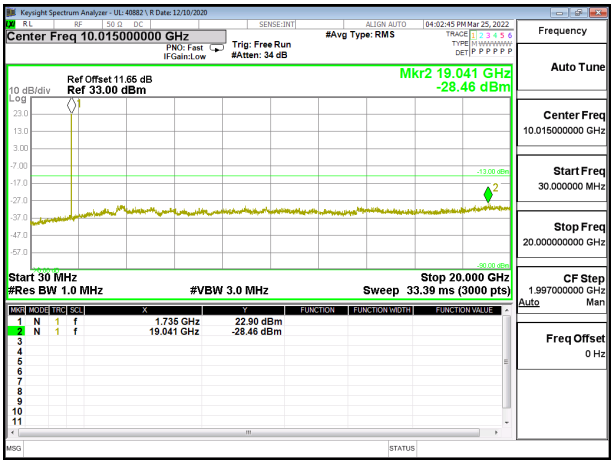
LTE66 15MHz 16QAM MID Ch RB1-0



LTE66 15MHz 16QAM HIGH Ch RB1-0



LTE66 20MHz QPSK LOW Ch RB1-0



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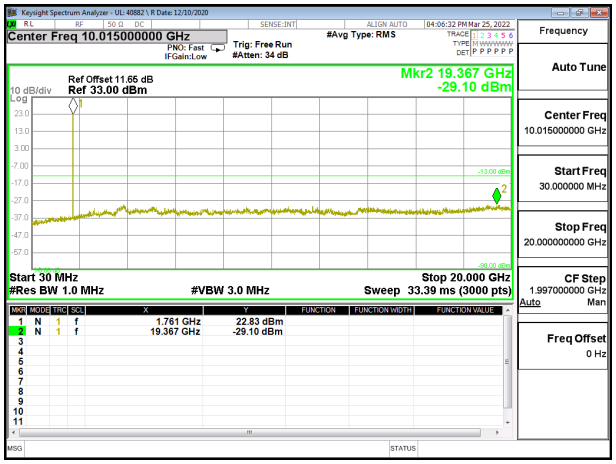

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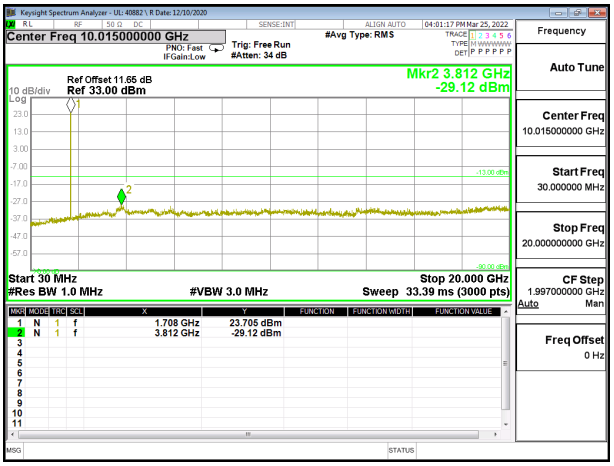

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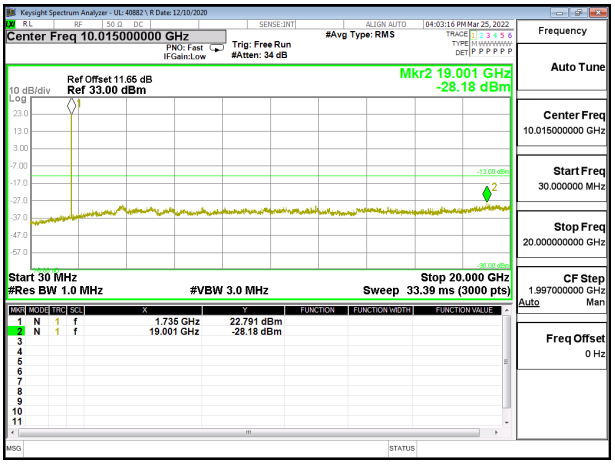
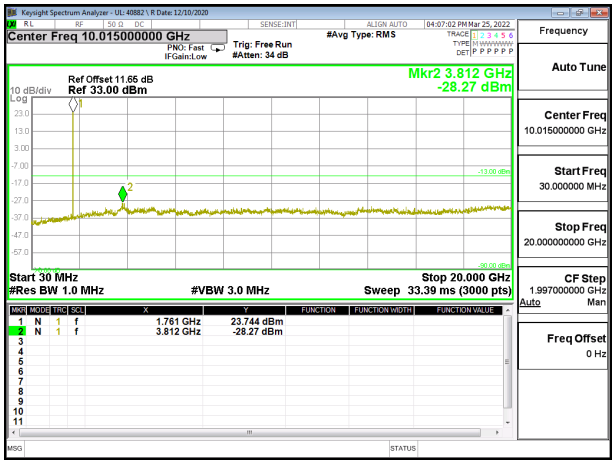


LTE66 20MHz 16QAM MID Ch RB1-0



LTE66 20MHz 16QAM HIGH Ch RB1-0

10.4. FREQUENCY STABILITY

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

(vii) Temp. = −30°C to +50°C

(viii) Voltage = (85% - 115%)

Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.

End Voltage, 3.2VDC.

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

10.4.1. LTE25

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:	27465/40882	Test Date:	2022-04-15

QPSK (20MHz)

Limit		1850	1915	Delta (Hz) LOW	Delta (Hz) HIGH
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.0000	1905.0000		
Extreme (50C)		1850.0000	1905.0000	-0.8800	-0.2
Extreme (40C)		1850.0000	1905.0000	-0.2100	-1.9
Extreme (30C)		1850.0000	1905.0000	-0.8300	0.7
Extreme (10C)		1850.0000	1905.0000	-0.2700	-1.0
Extreme (0C)		1850.0000	1905.0000	0.4800	-1.3
Extreme (-10C)		1850.0000	1905.0000	-0.8000	-1.1
Extreme (-20C)		1850.0000	1905.0000	1.6600	-1.6
Extreme (-30C)		1850.0000	1905.0000	1.3800	-1.1
20C	End Point	1850.0000	1905.0000	-0.1400	-2.1

10.4.2. LTE66

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:	27465/40882	Test Date:	2022-04-15

QPSK (20MHz)

Limit		1710	1780	Delta (Hz) LOW	Delta (Hz) HIGH
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.0000	1780.0000		
Extreme (50C)		1710.0000	1780.0000	-0.9400	-0.2
Extreme (40C)		1710.0000	1780.0000	2.8500	-2.3
Extreme (30C)		1710.0000	1780.0000	0.2600	-3.1
Extreme (10C)		1710.0000	1780.0000	-0.4500	-0.1
Extreme (0C)		1710.0000	1780.0000	0.9400	-2.9
Extreme (-10C)		1710.0000	1780.0000	1.5300	0.4
Extreme (-20C)		1710.0000	1780.0000	0.8600	-0.3
Extreme (-30C)		1710.0000	1780.0000	1.2900	-0.3
20C	End Point	1710.0000	1780.0000	-1.0900	-0.1

10.5. PEAK TO AVERAGE RATIO

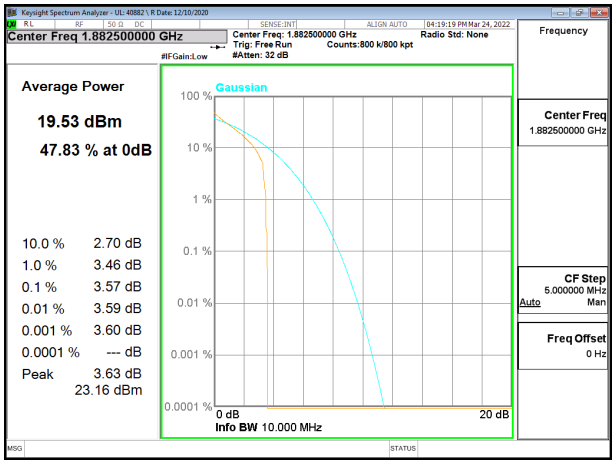
LIMIT

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.

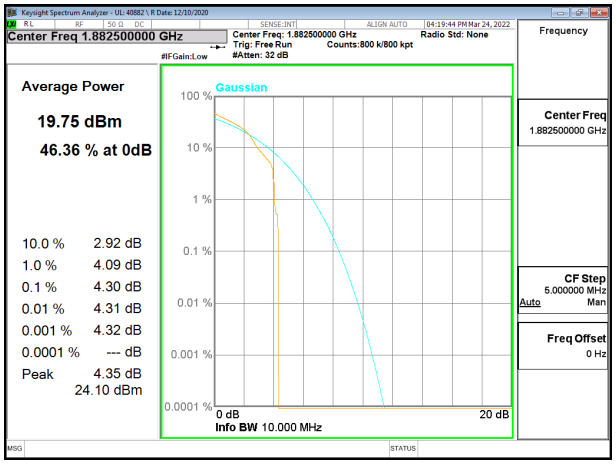
RESULTS

Antenna 1 was used to measure as the worst case; 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.

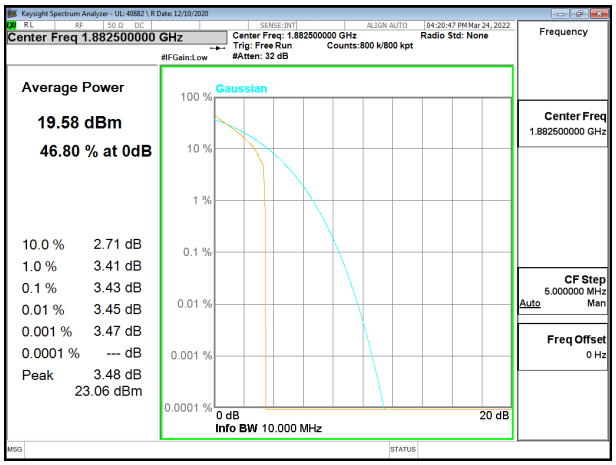
10.5.1. LTE25



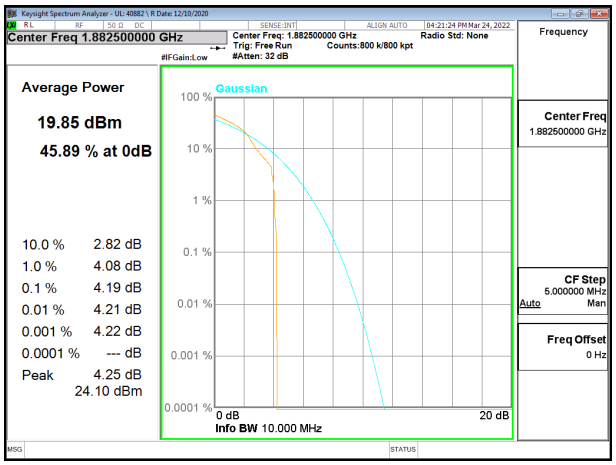
LTE25 1.4MHz QPSK MID Ch RB6-0



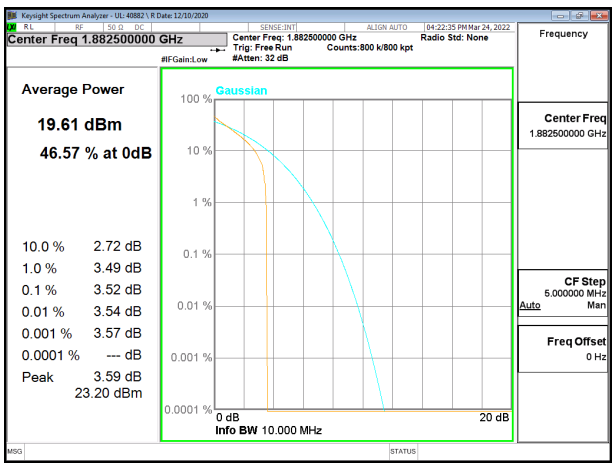
LTE25 1.4MHz 16QAM MID Ch RB6-0



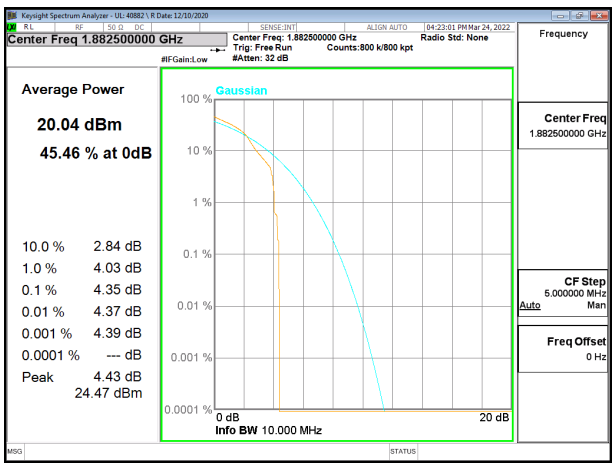
LTE25 3MHz QPSK MID Ch RB15-0



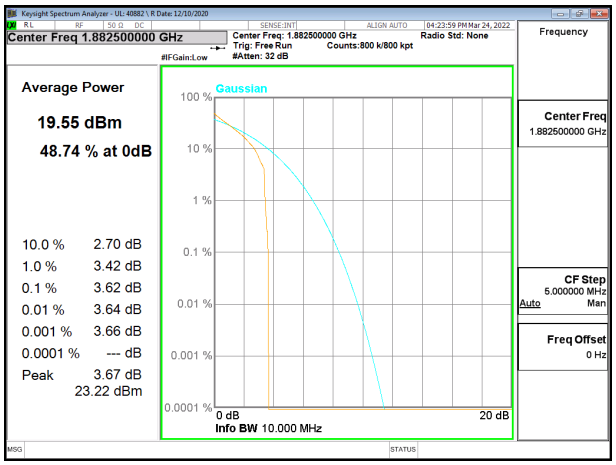
LTE25 3MHz 16QAM MID Ch RB15-0



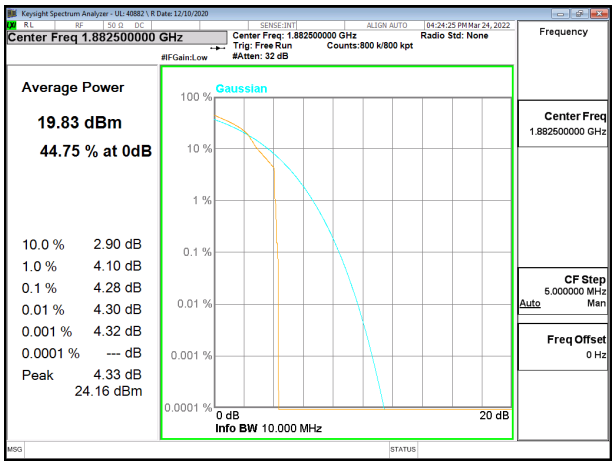
LTE25 5MHz QPSK MID Ch RB25-0



LTE25 5MHz 16QAM MID Ch RB25-0



LTE25 10MHz QPSK MID Ch RB50-0

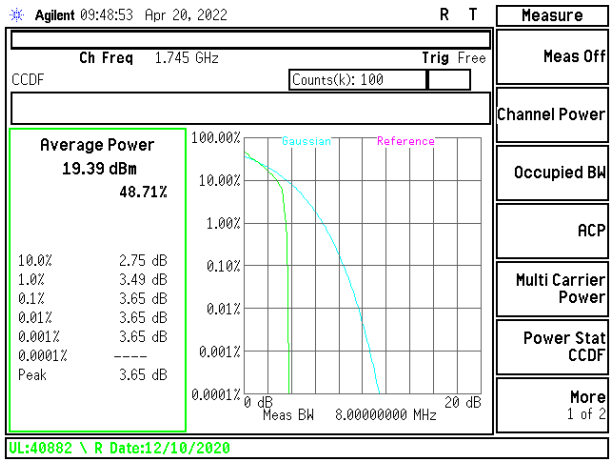


LTE25 10MHz 16QAM MID Ch RB50-0

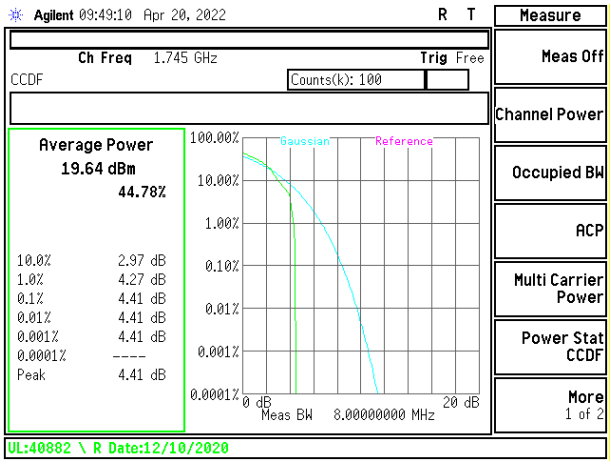
LTE Band and BW:	QPSK Mid Channel:	16QAM Mid Channel:
Band 25 15MHz	20.38dBm – 19.6dBm = 0.78dB	20.34dBm – 20.0dBm = 0.34dB
Band 25 20MHz	20.40dBm – 19.6dBm = 0.80dB	20.47dBm – 20.0dBm = 0.47dB

Note: Due to limitations of the test equipment PAR testing of frequencies with BWs greater than 10MHz were done with a Wideband power meter. Testing was performed in accordance with ANCI:C63.26-2015, where PAPR (dB) = P_{pk} (Meas. Peak Power) – P_{avg} (Meas. Avg Power).

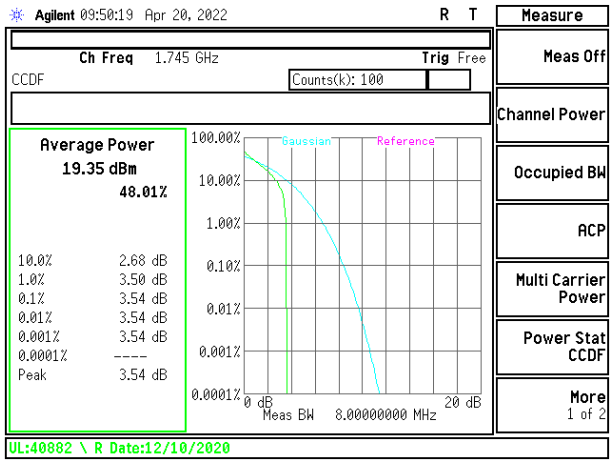
10.5.2. LTE66



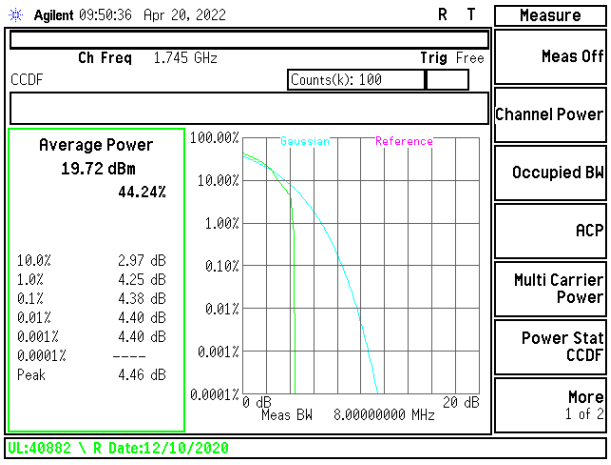
LTE66 1.4MHz QPSK MID Ch RB6-0



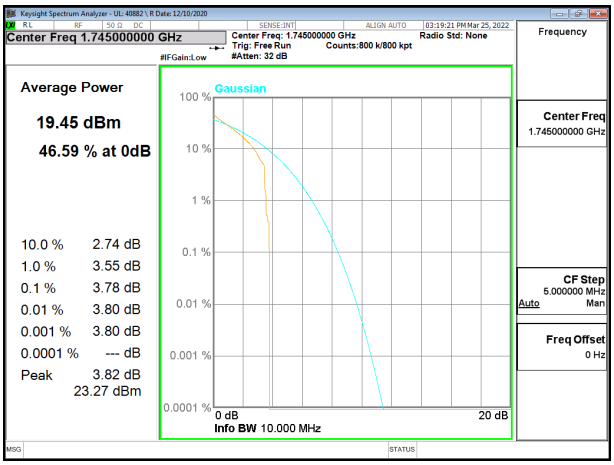
LTE66 1.4MHz 16QAM MID Ch RB6-0



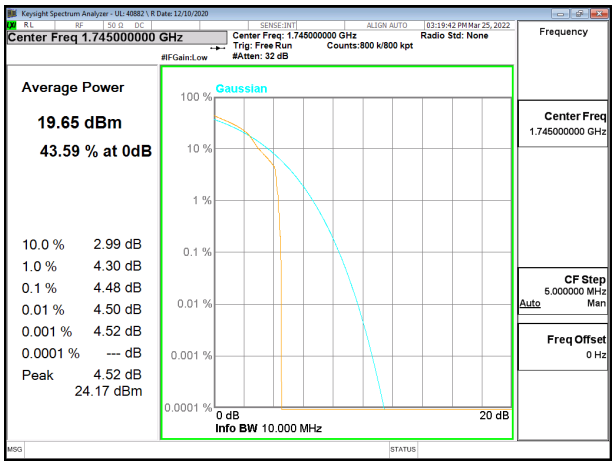
LTE66 3MHz QPSK MID Ch RB15-0



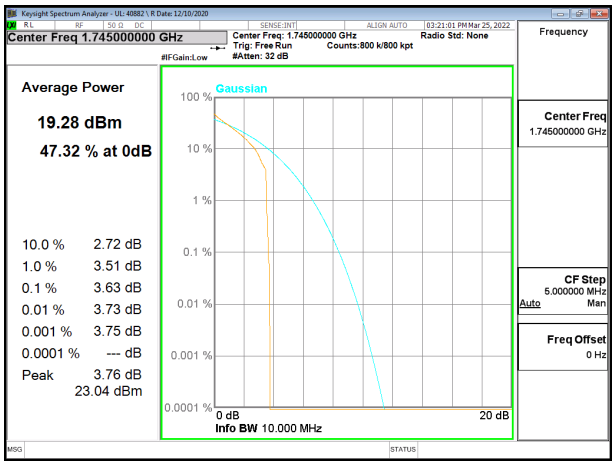
LTE66 3MHz 16QAM MID Ch RB15-0



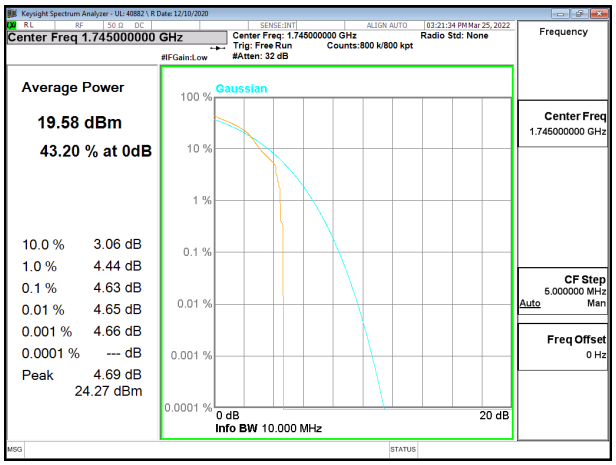
LTE66 5MHz QPSK MID Ch RB25-0



LTE66 5MHz 16QAM MID Ch RB25-0



LTE66 10MHz QPSK MID Ch RB50-0



LTE66 10MHz 16QAM MID Ch RB50-0

LTE Band and BW:	QPSK Mid Channel:	16QAM Mid Channel:
Band 66 15MHz	20.09dBm – 19.4dBm = 0.69dB	20.10dBm – 19.4dBm = 0.70dB
Band 66 20MHz	20.17dBm – 19.7dBm = 0.47dB	20.26dBm – 20.0dBm = 0.26dB

Note: Due to limitations of the test equipment PAR testing of frequencies with BWs greater than 10MHz were done with a Wideband power meter. Testing was performed in accordance with ANCI:C63.26-2015, where PAPR (dB) = P_{pk} (Meas. Peak Power) – P_{avg} (Meas. Avg Power).

11. RADIATED TEST RESULTS

11.1. 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.

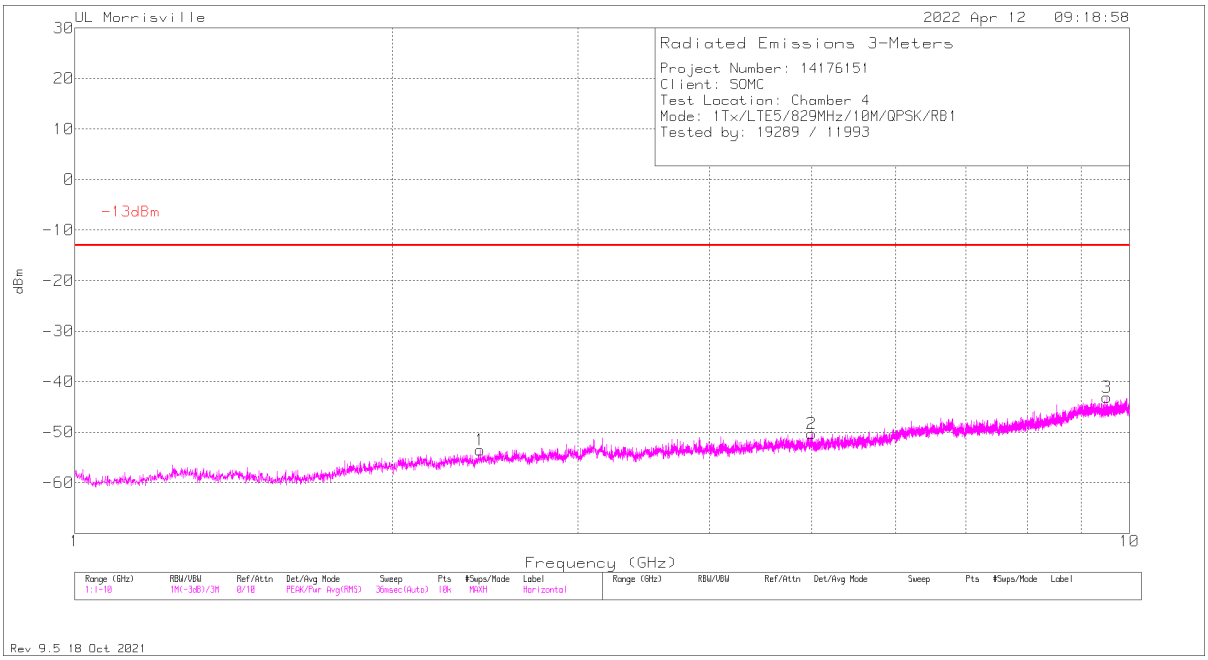
RESULTS

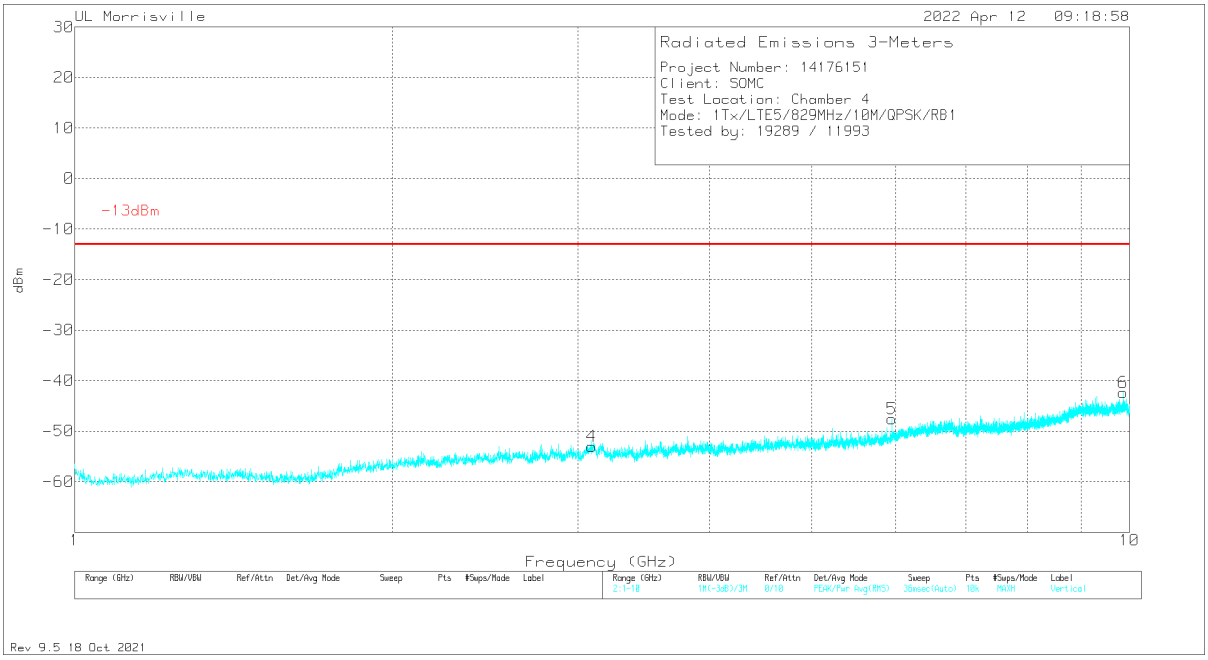
11.1.1. LTE5

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.

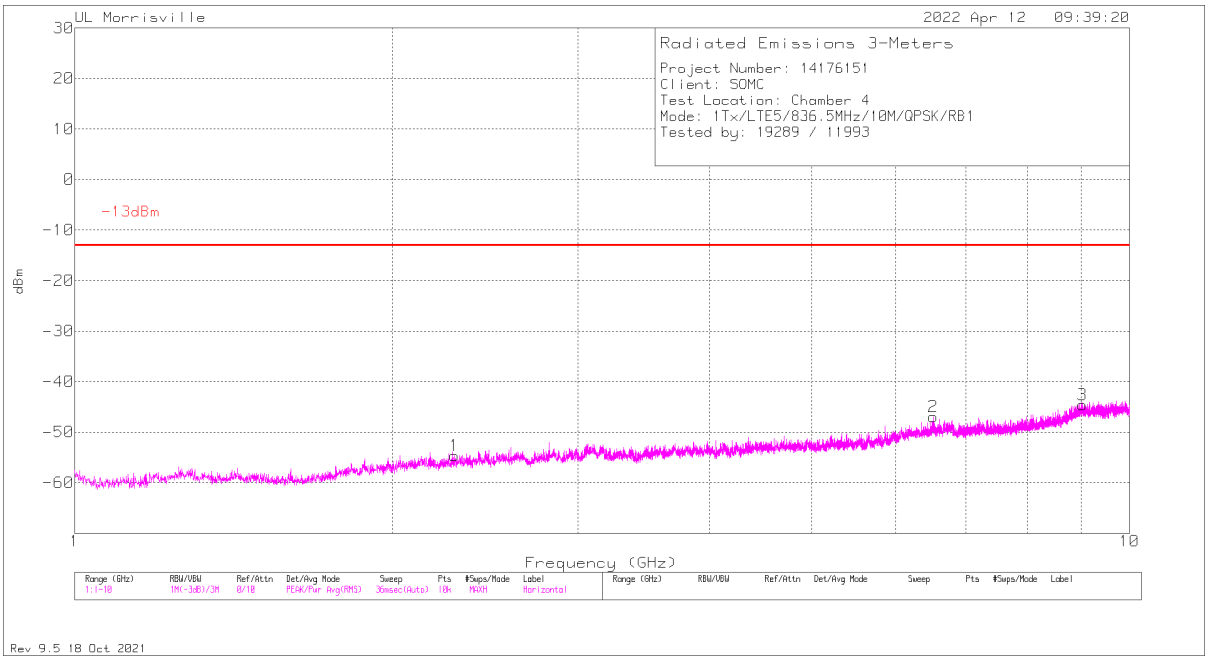
QPSK LTE5 (10MHz)

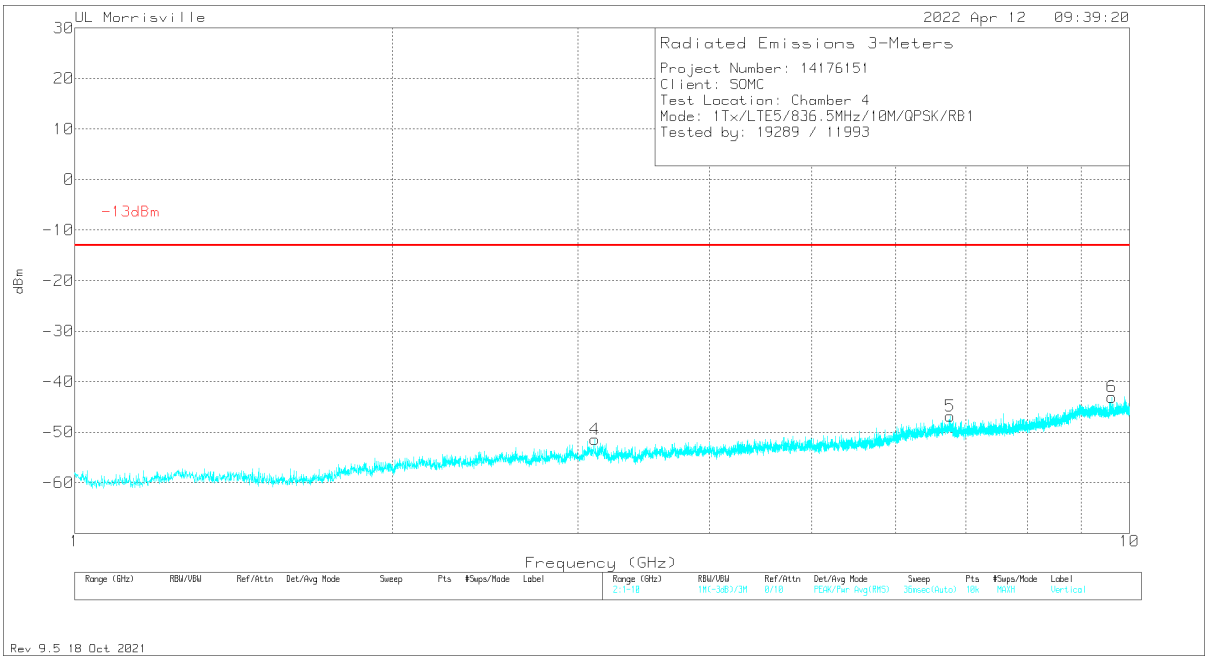




Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading dBm	-13dBm	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.4229	-61.15	Pk	32	-36.6	.4	11.8	-53.55	-13	-40.55	0-360	100	H
4	3.0934	-63.2	Pk	33.8	-36	.6	11.8	-53	-13	-40	0-360	300	V
2	4.9942	-63.48	Pk	34	-33	.4	11.8	-50.28	-13	-37.28	0-360	100	H
5	5.9518	-63.65	Pk	35	-31.3	.6	11.8	-47.55	-13	-34.55	0-360	300	V
3	9.523	-65.48	Pk	36.6	-26.8	.8	11.8	-43.08	-13	-30.08	0-360	100	H
6	9.8686	-64.79	Pk	37	-27.1	.7	11.8	-42.39	-13	-29.39	0-360	300	V

Pk - Peak detector





Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AT0069 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter (dB)	CF (dB)	Corrected Reading dBm	-13dBm	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.2924	-61.96	Pk	31.8	-36.7	.4	11.8	-54.66	-13	-41.66	0-360	200	H
4	3.1132	-61.55	Pk	33.8	-36	.5	11.8	-51.45	-13	-38.45	0-360	300	V
2	6.5143	-64.9	Pk	35.4	-29.9	.7	11.8	-46.9	-13	-33.9	0-360	200	H
5	6.7654	-65.07	Pk	35.5	-29.8	.7	11.8	-46.87	-13	-33.87	0-360	300	V
3	9.0244	-66.33	Pk	36.1	-26.6	.5	11.8	-44.53	-13	-31.53	0-360	100	H
6	9.6256	-65.63	Pk	36.7	-26.8	.9	11.8	-43.03	-13	-30.03	0-360	300	V

Pk - Peak detector