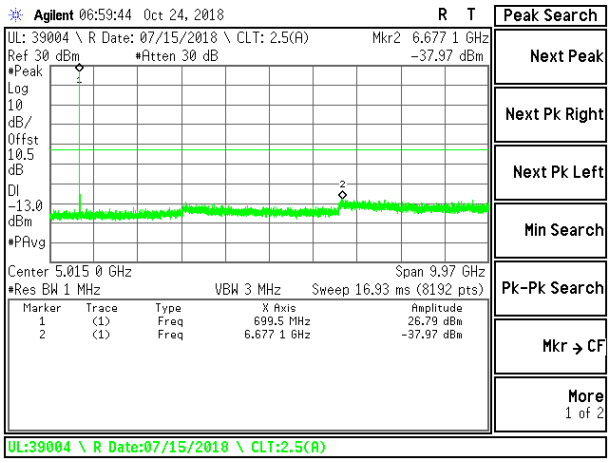
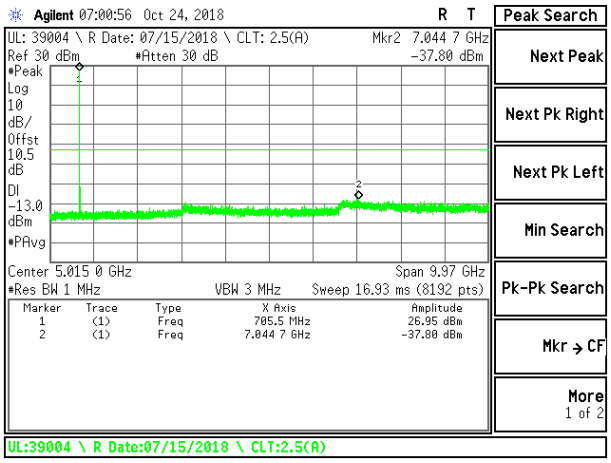
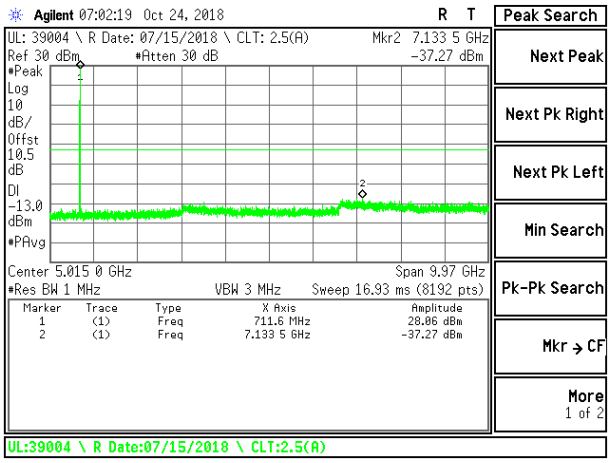


LTE B12 5MHz QPSK Low Channel RB1-0



LTE B12 5MHz QPSK Mid Channel RB1-0



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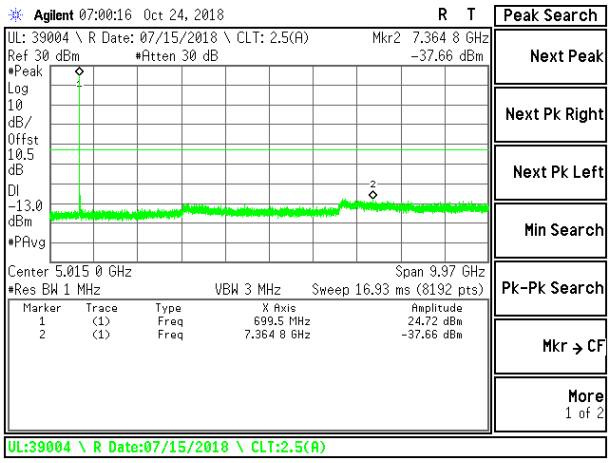
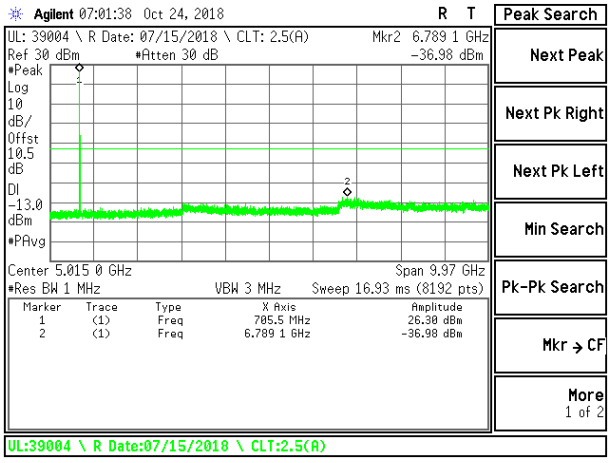
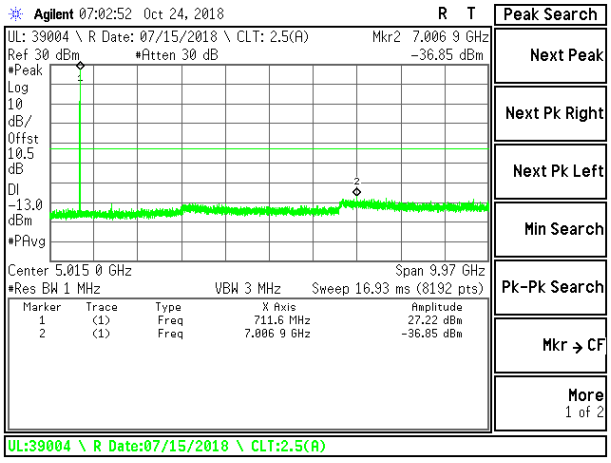


LTE B12 5MHz 16QAM Low Channel RB1-0



LTE B12 5MHz 16QAM Mid Channel RB1-0



LTE B12 5MHz 16QAM High Channel RB1-0

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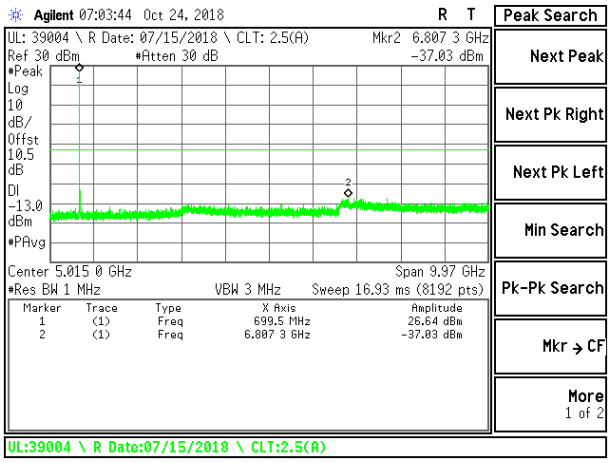
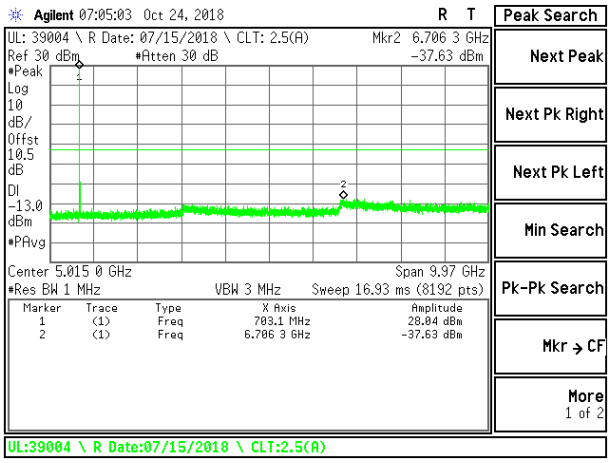


LTE B12 10MHz QPSK Low Channel RB1-0



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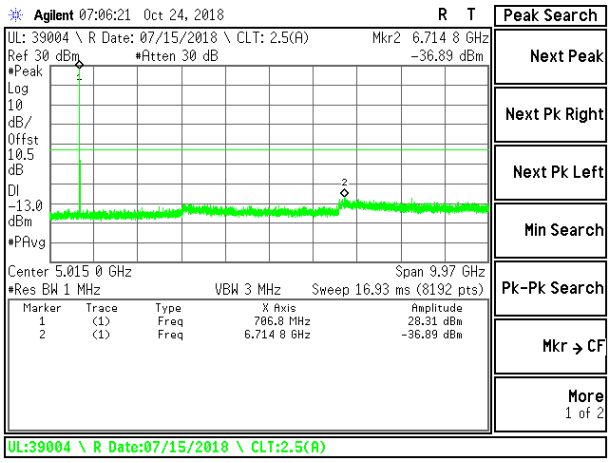
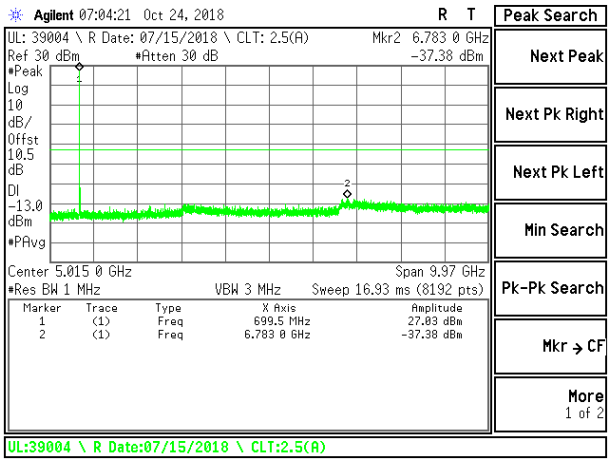
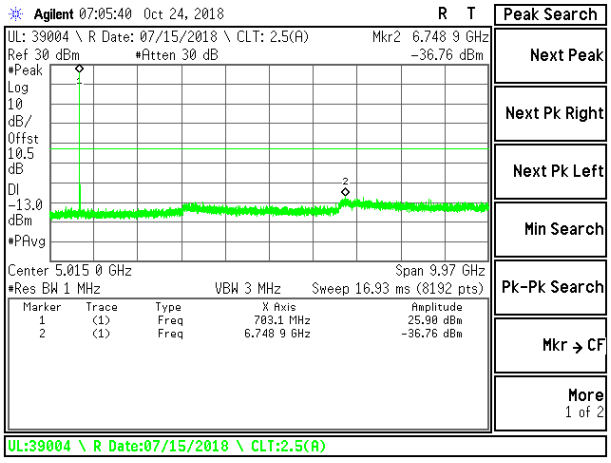


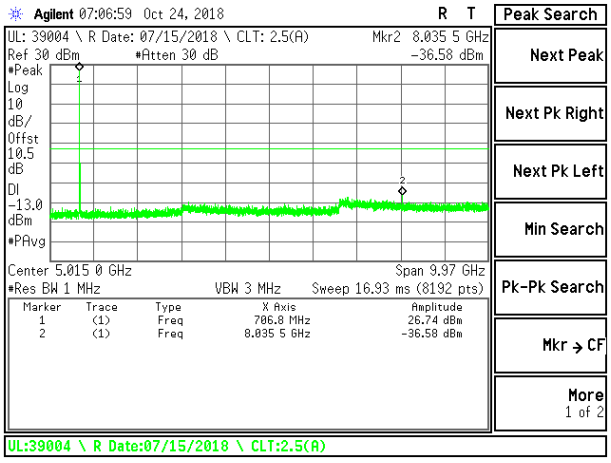
LTE B12 10MHz QPSK High Channel RB1-0



LTE B12 10MHz 16QAM Low Channel RB1-0



LTE B12 10MHz 16QAM Mid Channel RB1-0



LTE B12 10MHz 16QAM High Channel RB1-0

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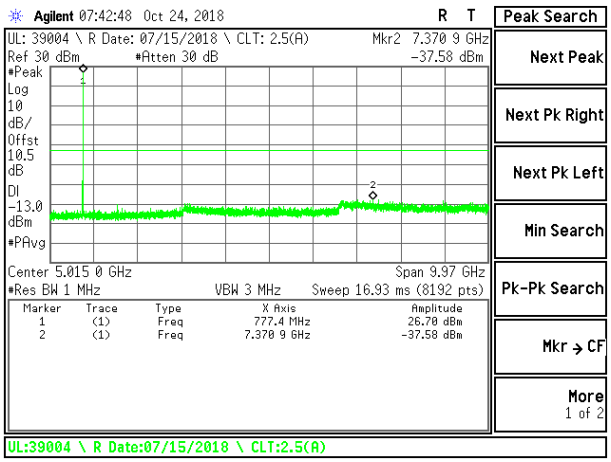
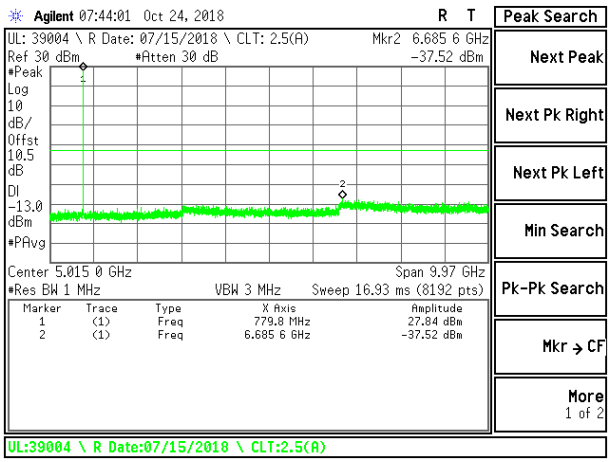
8.3.11. LTE BAND 13



LTE B13 5MHz QPSK Low Channel RB1-0



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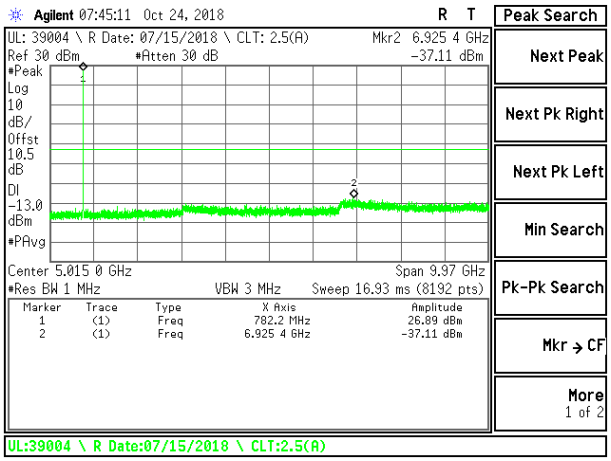
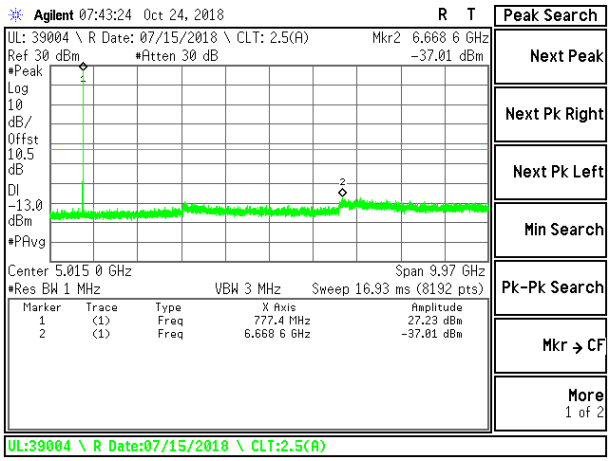
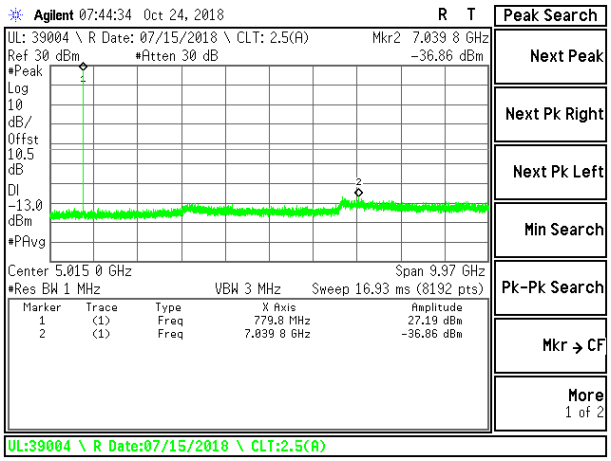


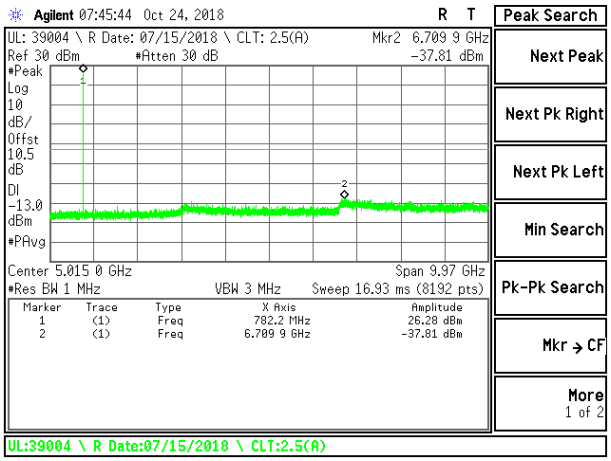
LTE B13 5MHz QPSK High Channel RB1-0



LTE B13 5MHz 16QAM Low Channel RB1-0



LTE B13 5MHz 16QAM Mid Channel RB1-0



LTE B13 5MHz 16QAM High Channel RB1-0

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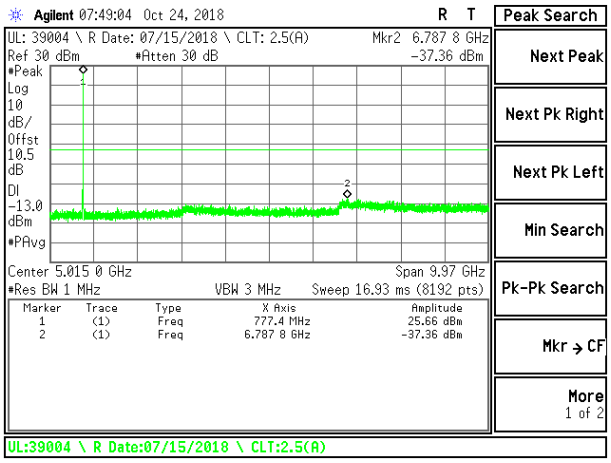
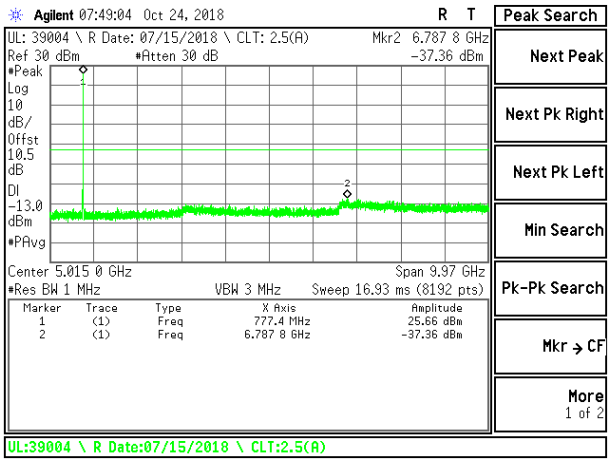
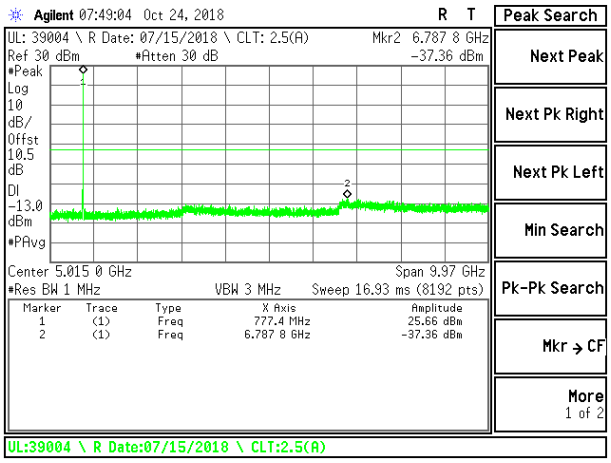


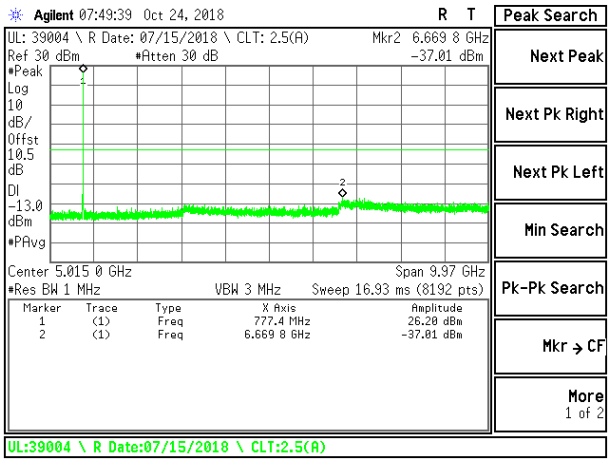
LTE B13 10MHz QPSK Low Channel RB1-0



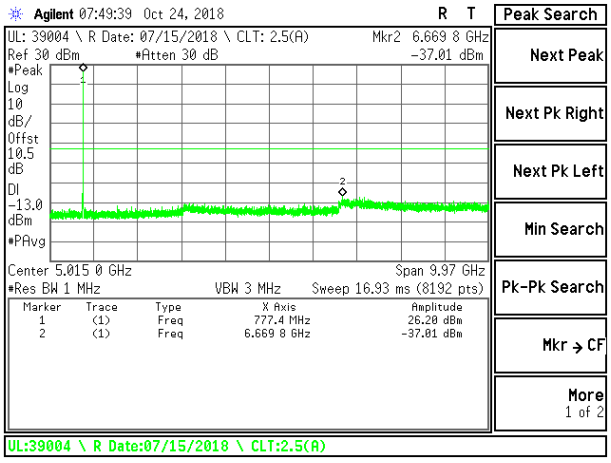
LTE B13 10MHz QPSK Mid Channel RB1-0



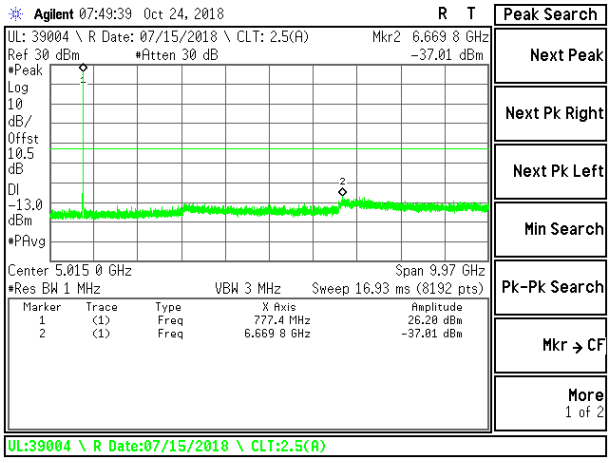
LTE B13 10MHz QPSK High Channel RB1-0



LTE B13 10MHz 16QAM Low Channel RB1-0



LTE B13 10MHz 16QAM Mid Channel RB1-0



LTE B13 10MHz 16QAM High Channel RB1-0

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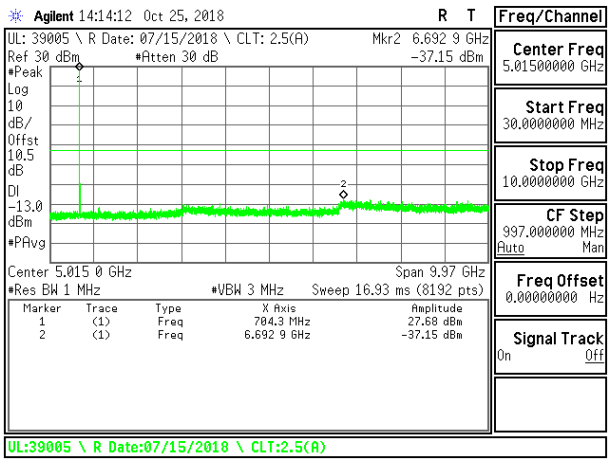
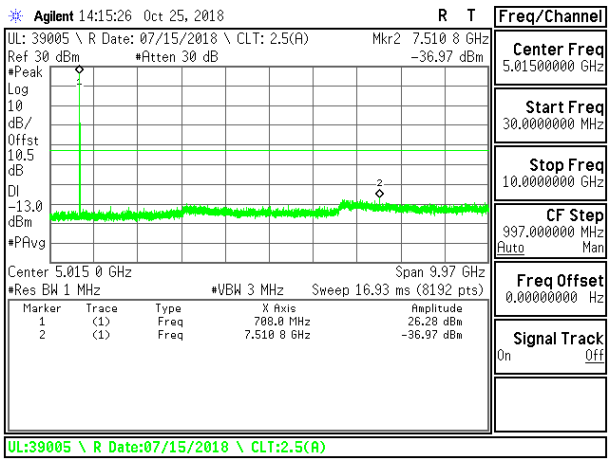
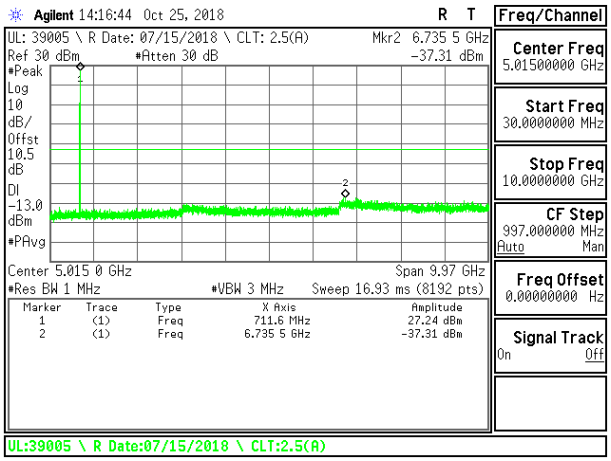
8.3.12. LTE BAND 17



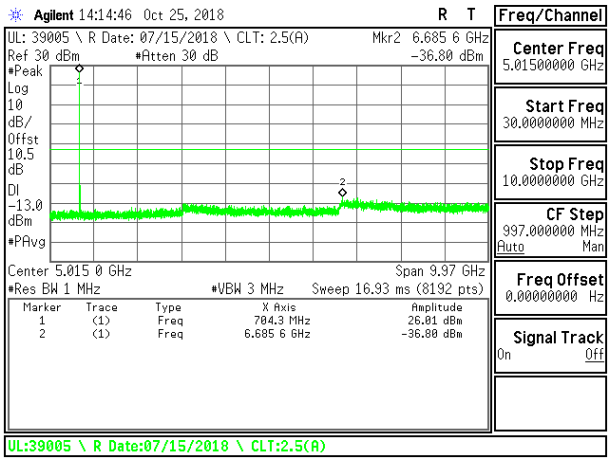
LTE B17 5MHz QPSK Low Channel RB1-0



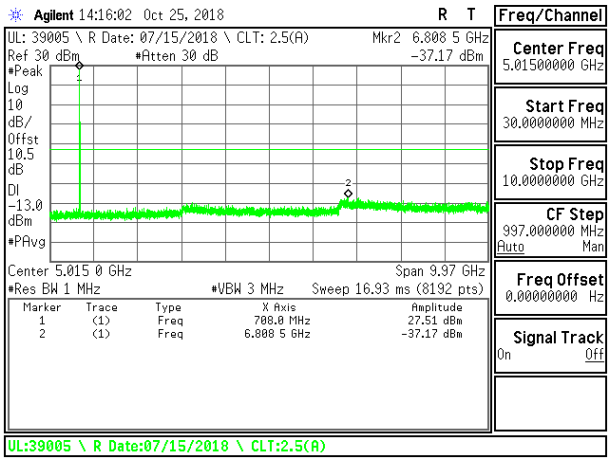
LTE B17 5MHz QPSK Mid Channel RB1-0



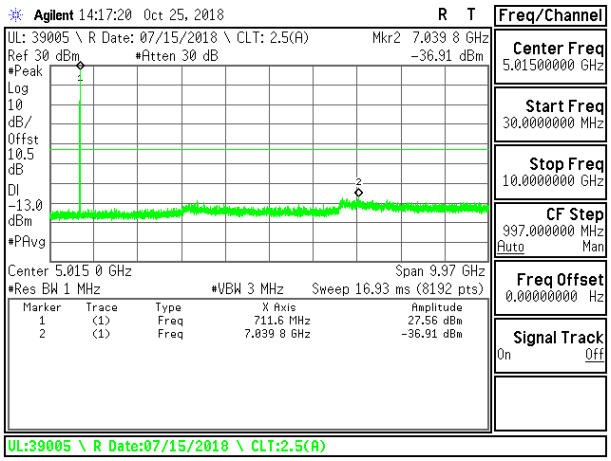
LTE B17 5MHz QPSK High Channel RB1-0



LTE B17 5MHz 16QAM Low Channel RB1-0



LTE B17 5MHz 16QAM Mid Channel RB1-0



LTE B17 5MHz 16QAM High Channel RB1-0

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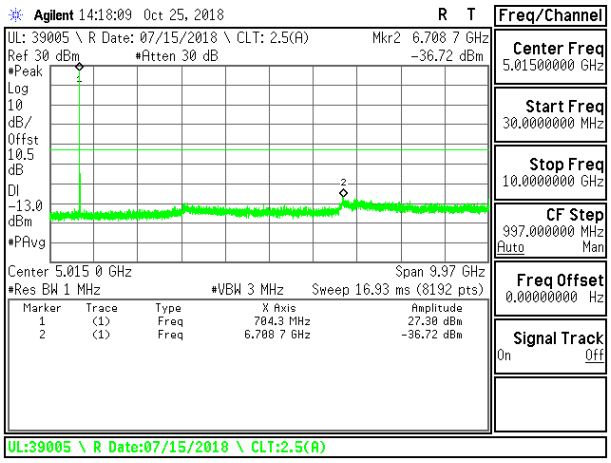
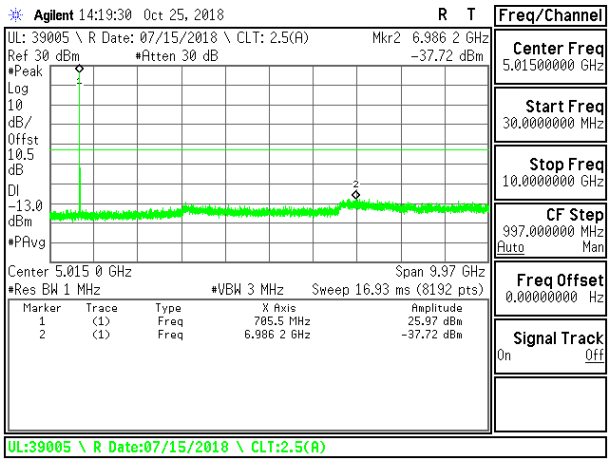
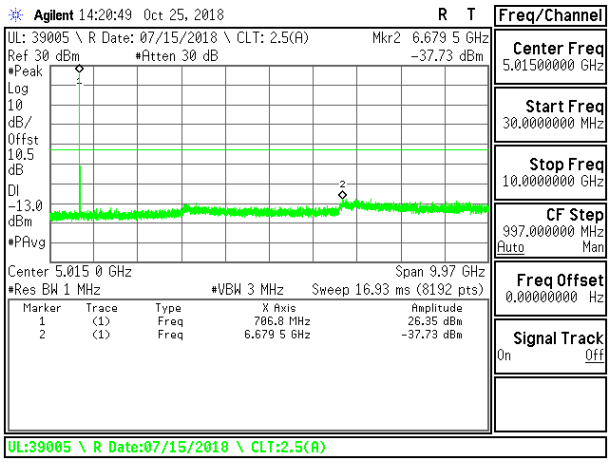


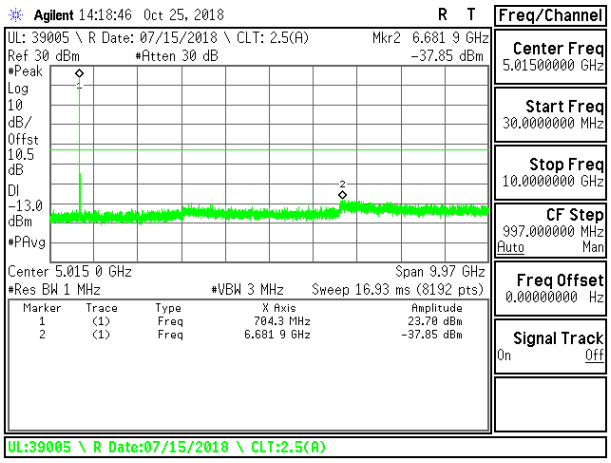
LTE B17 10MHz QPSK Low Channel RB1-0



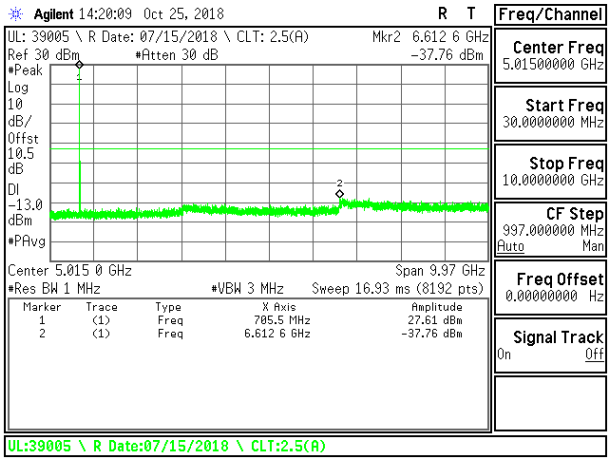
LTE B17 10MHz QPSK Mid Channel RB1-0



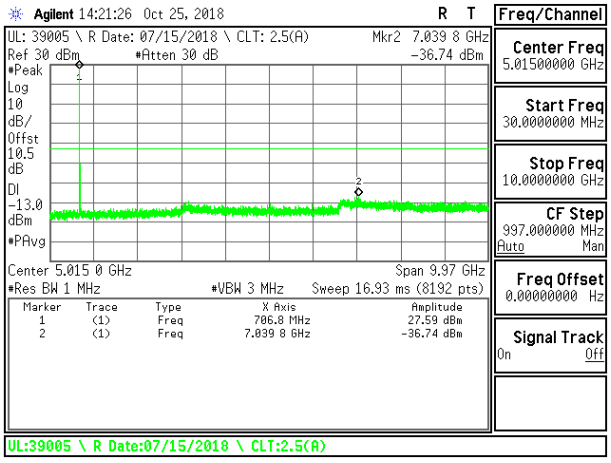
LTE B17 10MHz QPSK High Channel RB1-0



LTE B17 10MHz 16QAM Low Channel RB1-0



LTE B17 10MHz 16QAM Mid Channel RB1-0



LTE B17 10MHz 16QAM High Channel RB1-0

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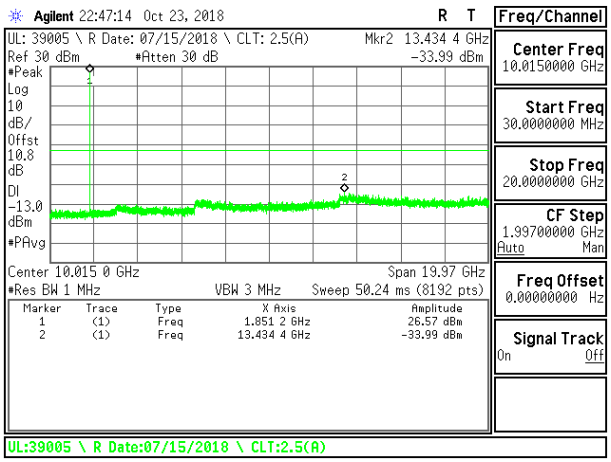
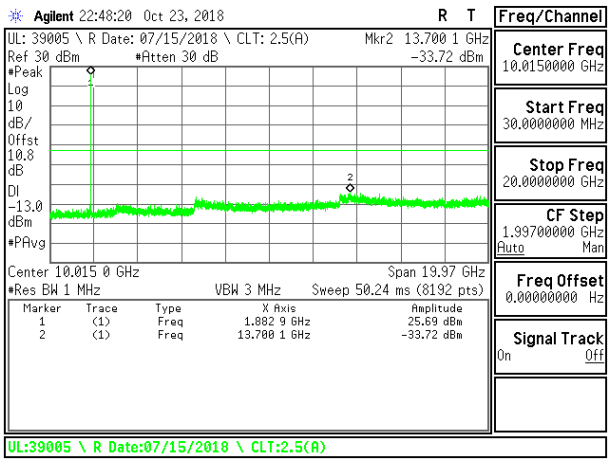
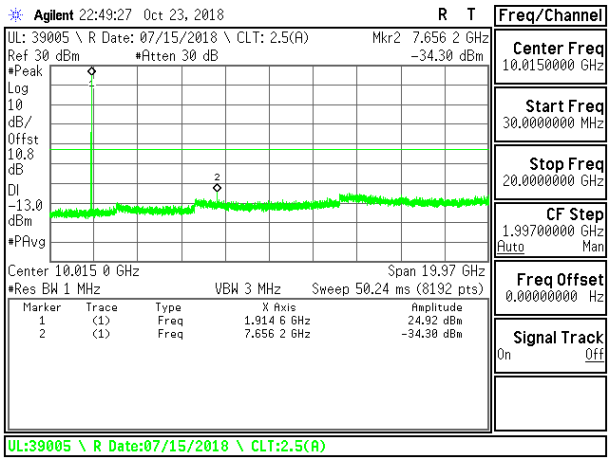
8.3.13. LTE BAND 25



LTE B25 1.4MHz QPSK Low Channel RB1-0



LTE B25 1.4MHz QPSK Mid Channel RB1-0



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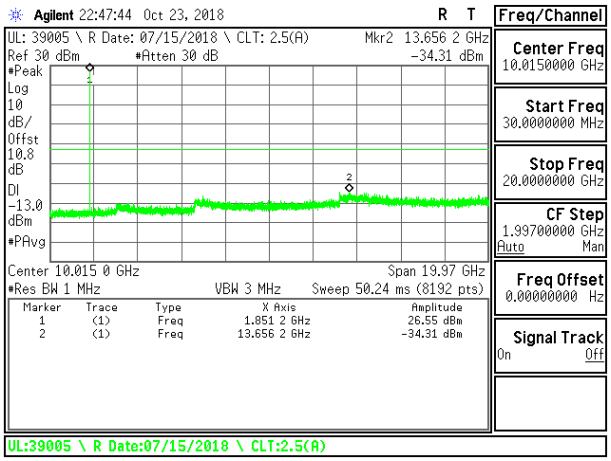
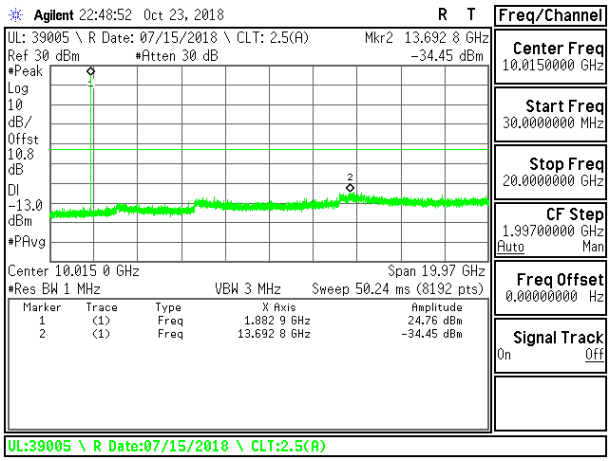
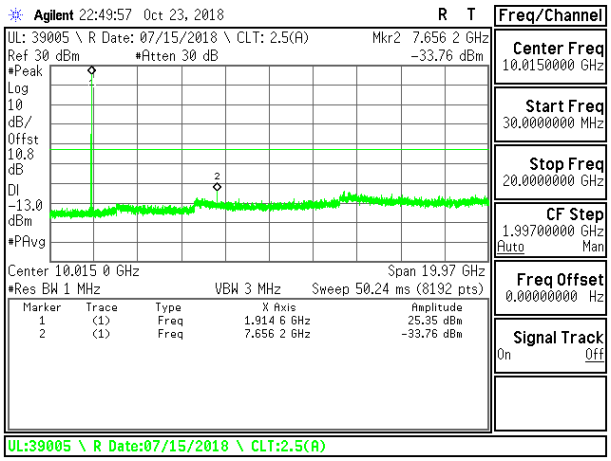


LTE B25 1.4MHz 16QAM Low Channel RB1-0



LTE B25 1.4MHz 16QAM Mid Channel RB1-0



LTE B25 1.4MHz 16QAM High Channel RB1-0

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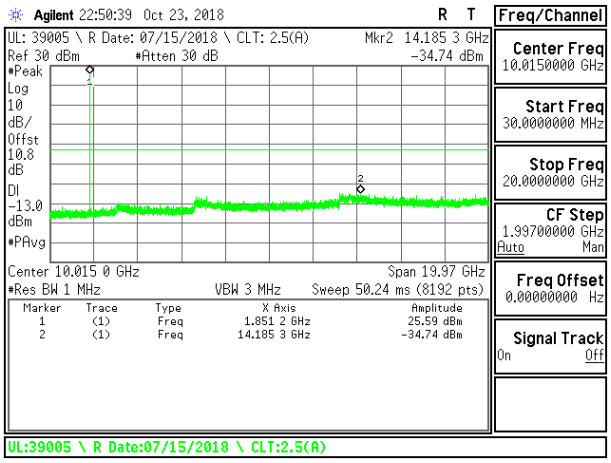
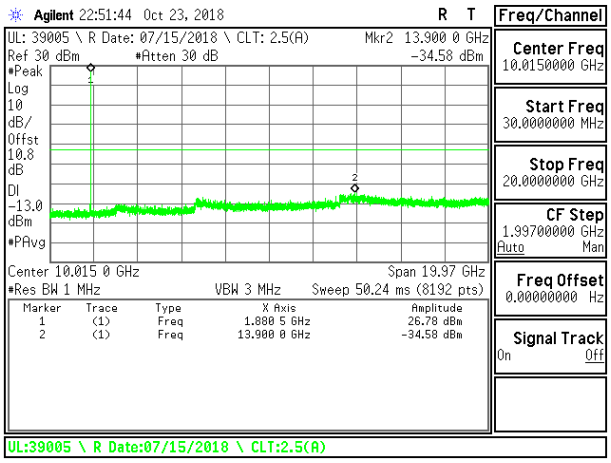
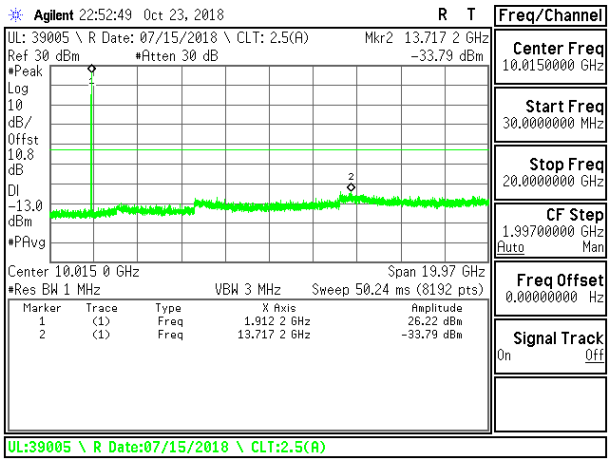


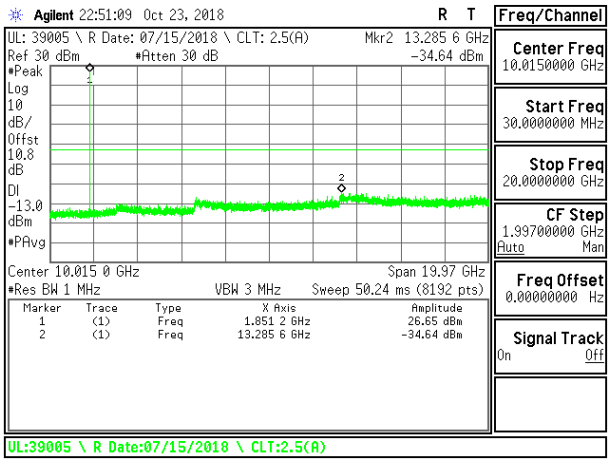
LTE B25 3MHz QPSK Low Channel RB1-0



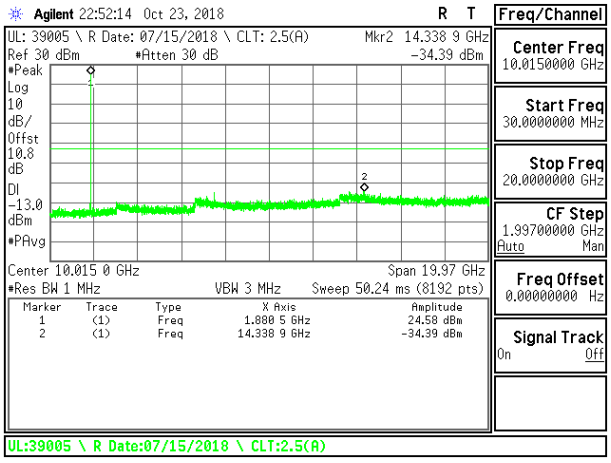
LTE B25 3MHz QPSK Mid Channel RB1-0



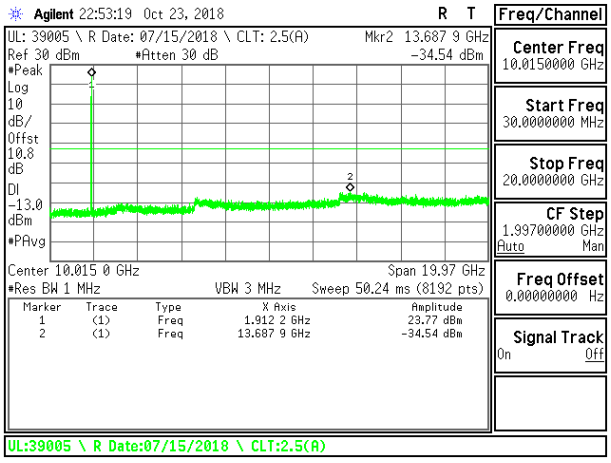
LTE B25 3MHz QPSK High Channel RB1-0



LTE B25 3MHz 16QAM Low Channel RB1-0



LTE B25 3MHz 16QAM Mid Channel RB1-0



LTE B25 3MHz 16QAM High Channel RB1-0

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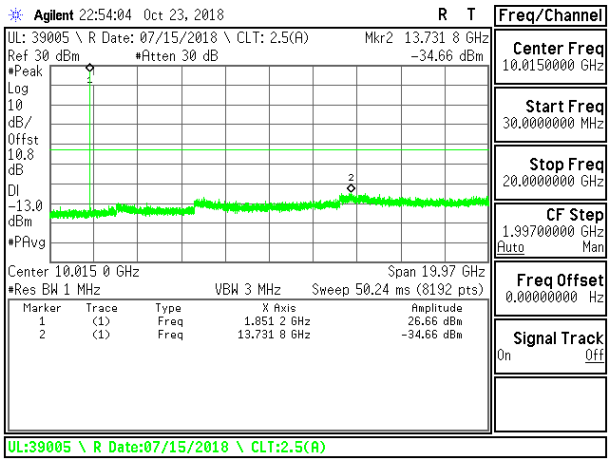
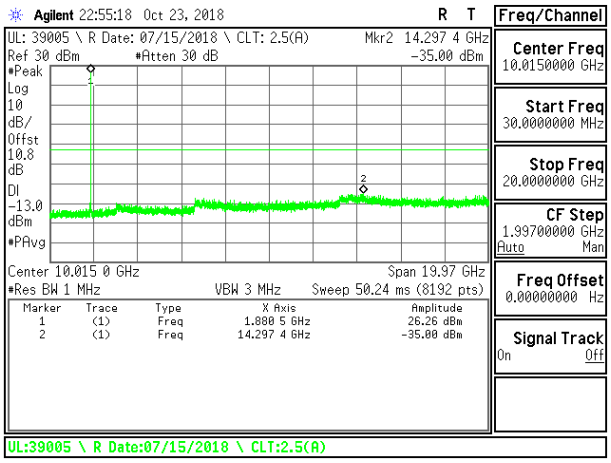
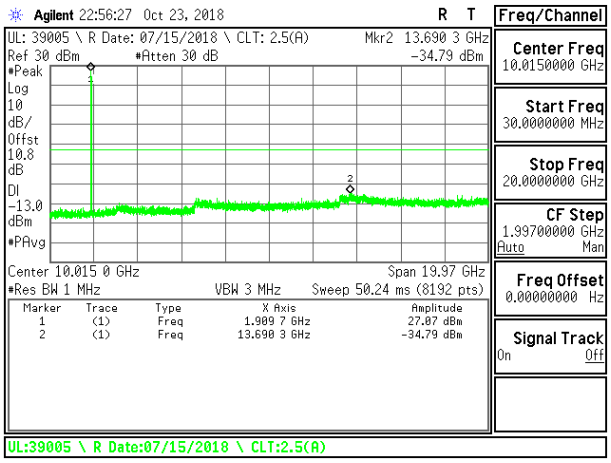


LTE B25 5MHz QPSK Low Channel RB1-0



LTE B25 5MHz QPSK Mid Channel RB1-0



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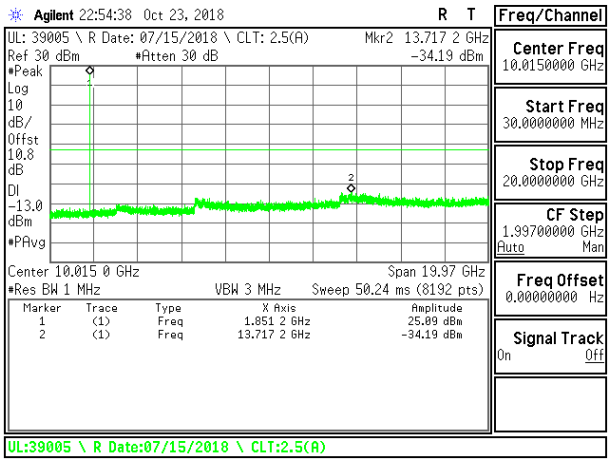
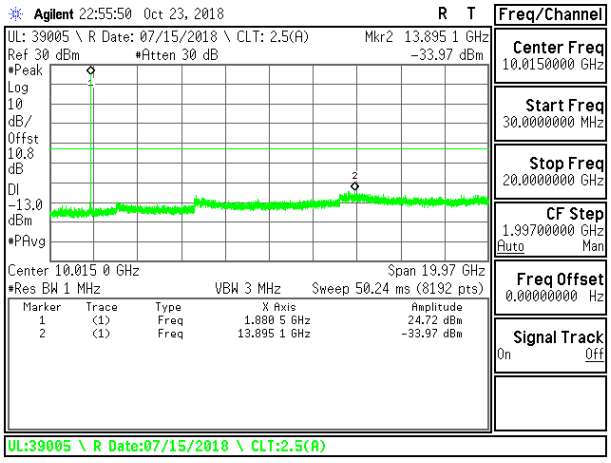
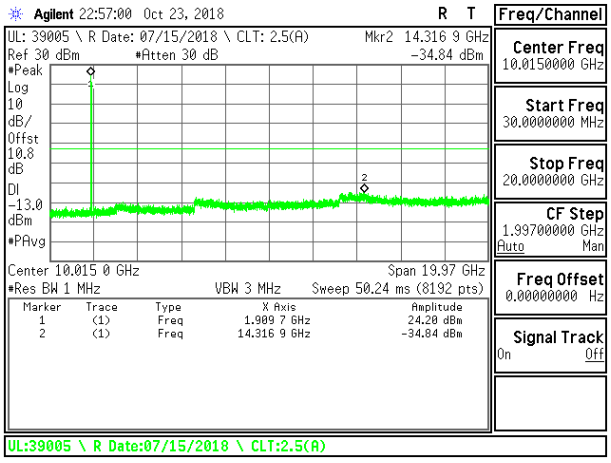


LTE B25 5MHz 16QAM Low Channel RB1-0



LTE B25 5MHz 16QAM Mid Channel RB1-0



LTE B25 5MHz 16QAM High Channel RB1-0

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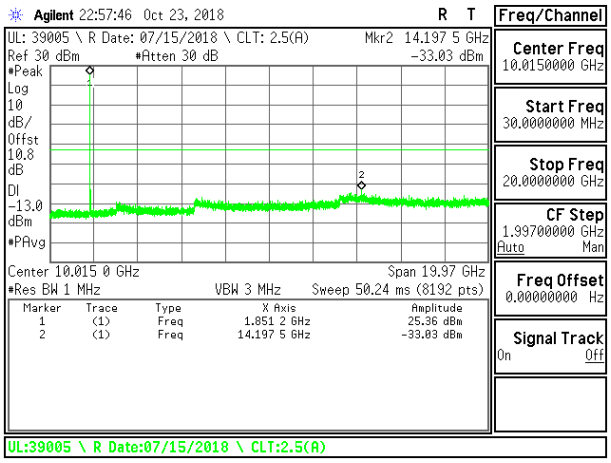
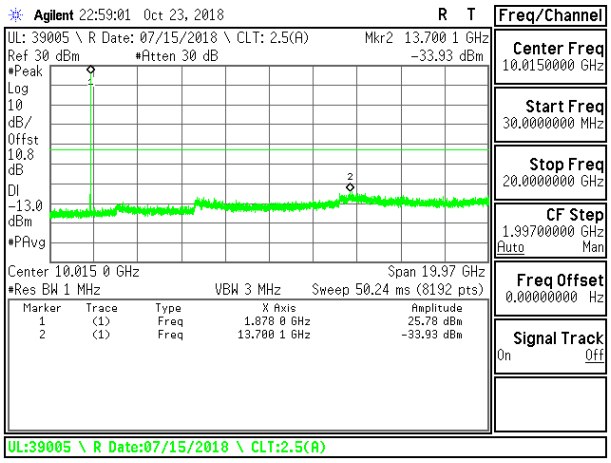


LTE B25 10MHz QPSK Low Channel RB1-0



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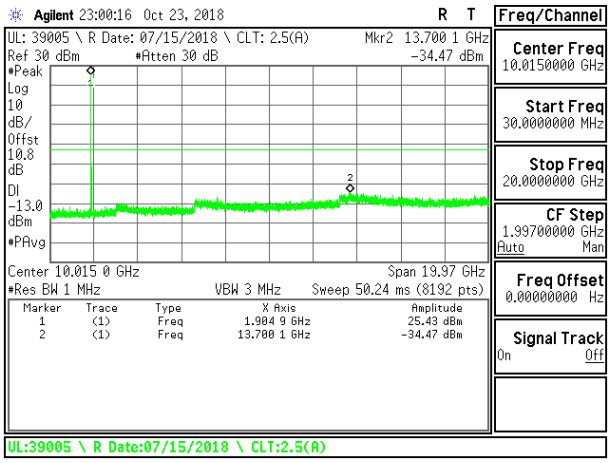
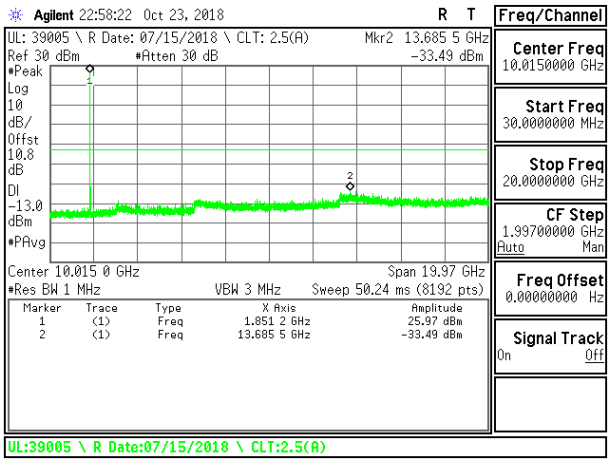
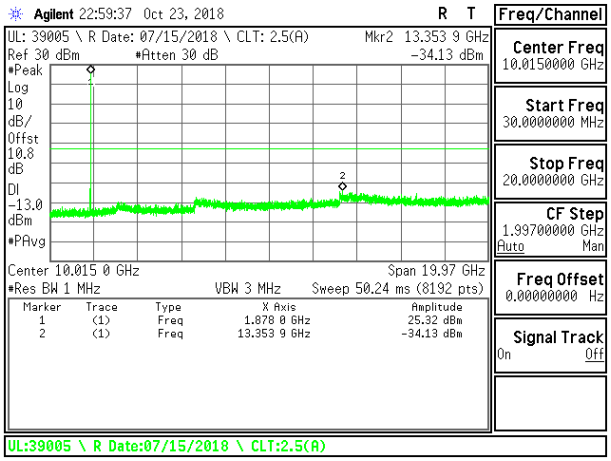


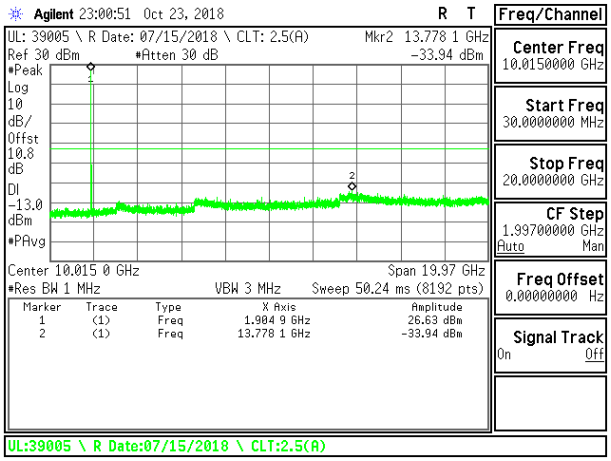
LTE B25 10MHz QPSK High Channel RB1-0



LTE B25 10MHz 16QAM Low Channel RB1-0



LTE B25 10MHz 16QAM Mid Channel RB1-0



LTE B25 10MHz 16QAM High Channel RB1-0

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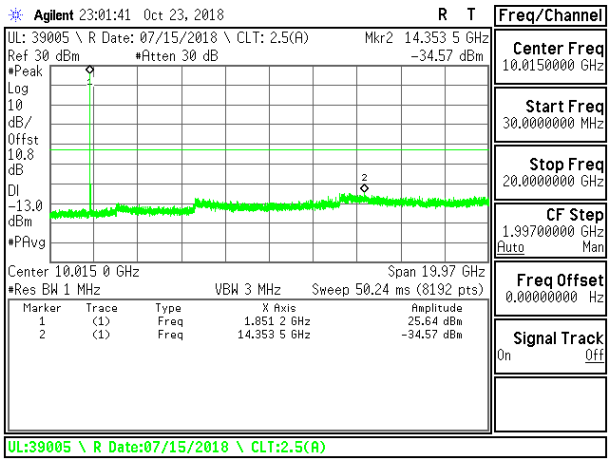
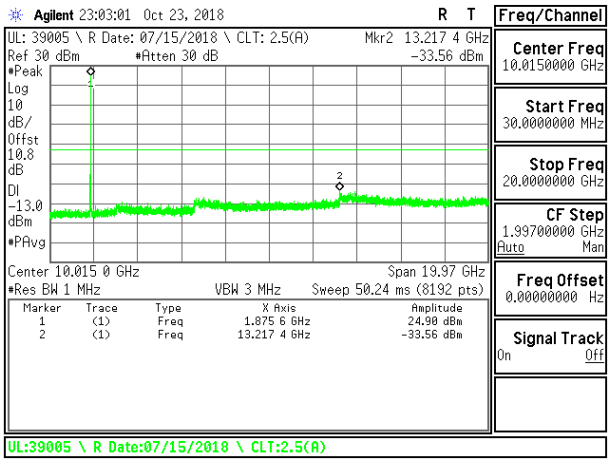


LTE B25 15MHz QPSK Low Channel RB1-0



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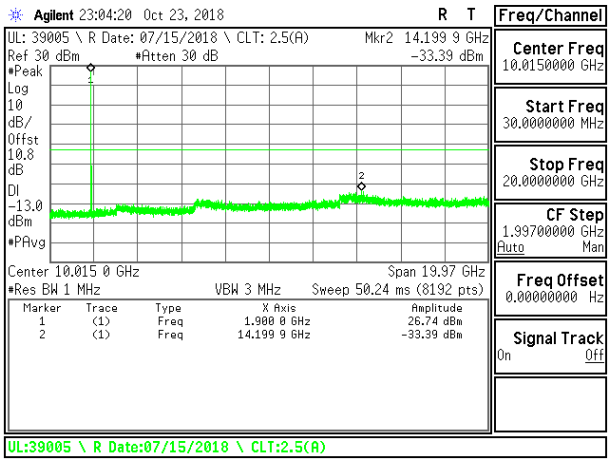
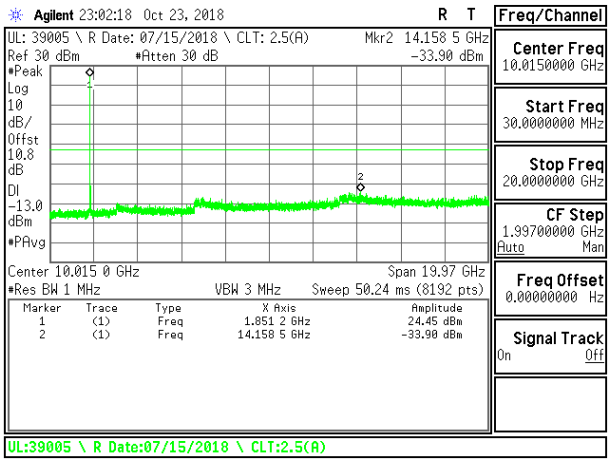
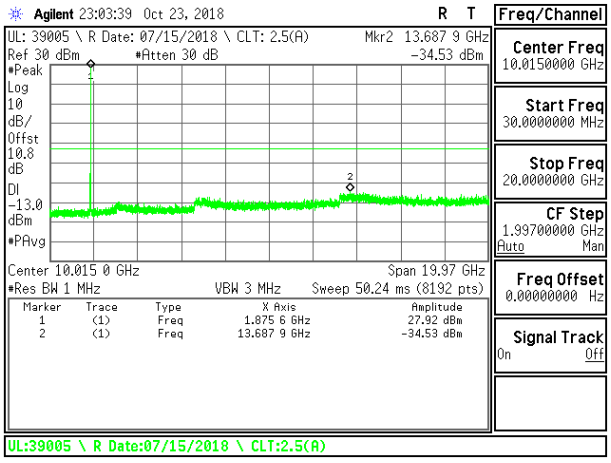


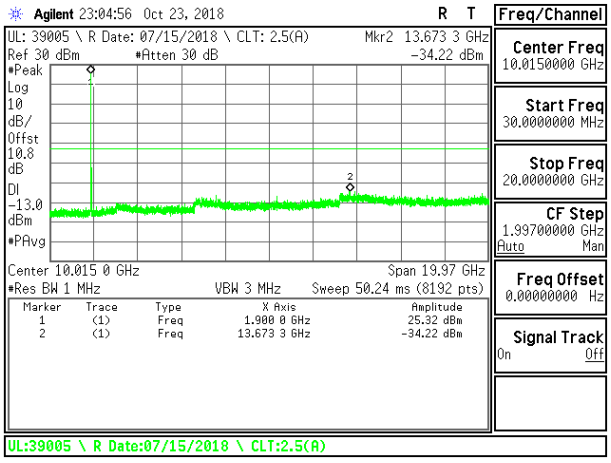
LTE B25 15MHz QPSK High Channel RB1-0



LTE B25 15MHz 16QAM Low Channel RB1-0



LTE B25 15MHz 16QAM Mid Channel RB1-0



LTE B25 15MHz 16QAM High Channel RB1-0

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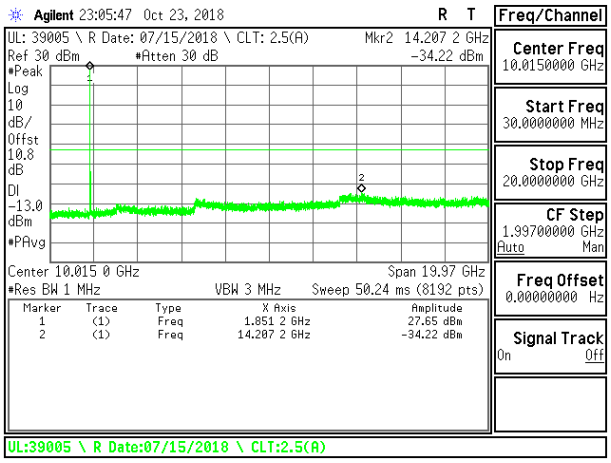

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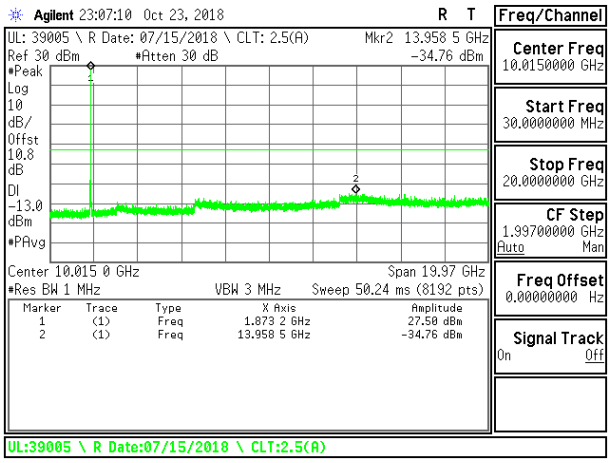

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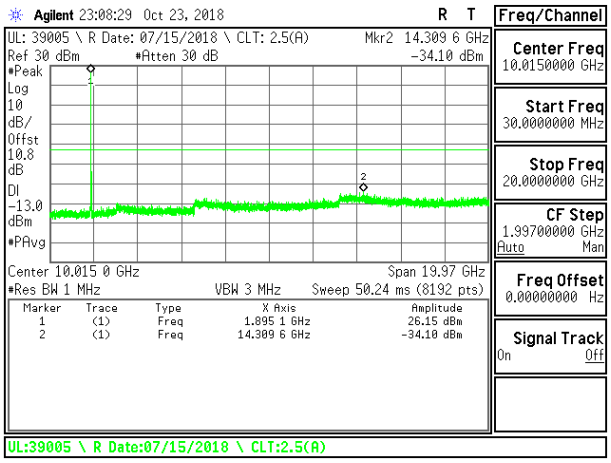

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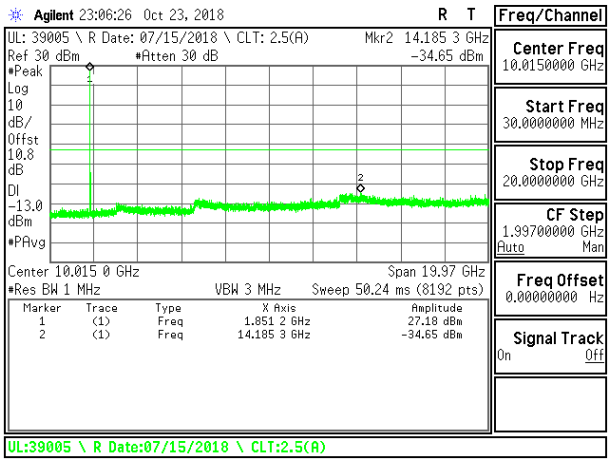

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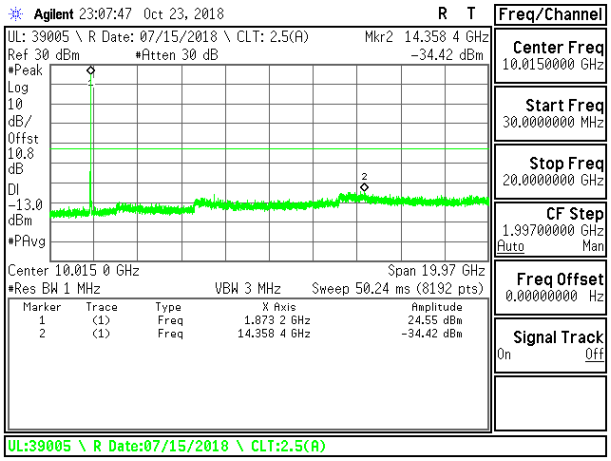
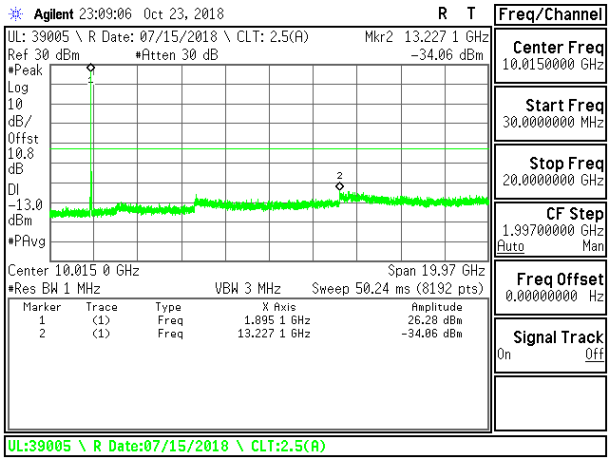


LTE B25 20MHz 16QAM Mid Channel RB1-0



LTE B25 20MHz 16QAM High Channel RB1-0

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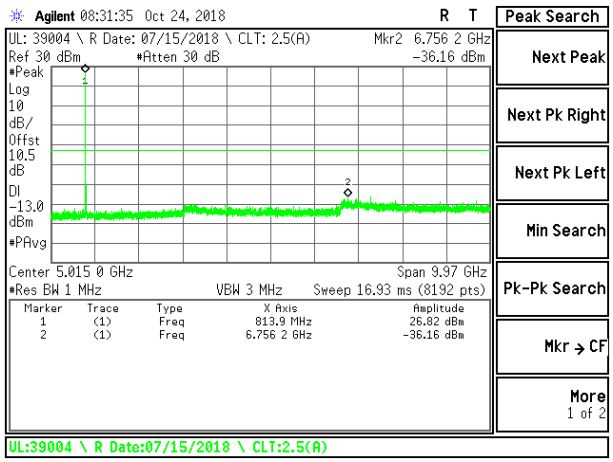
8.3.14. LTE BAND 26



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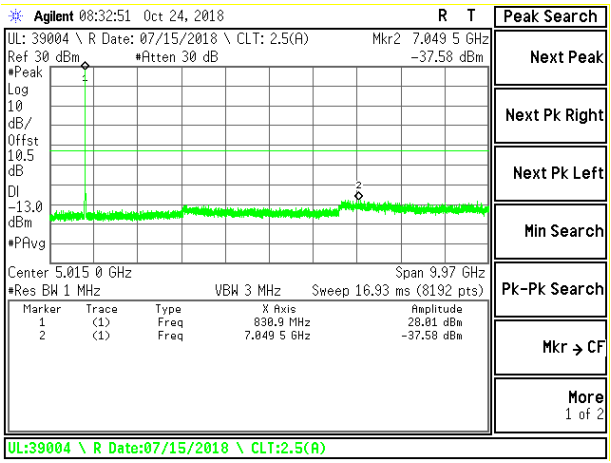

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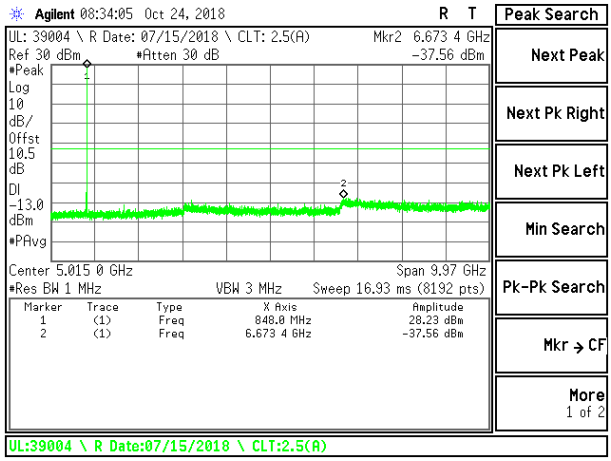
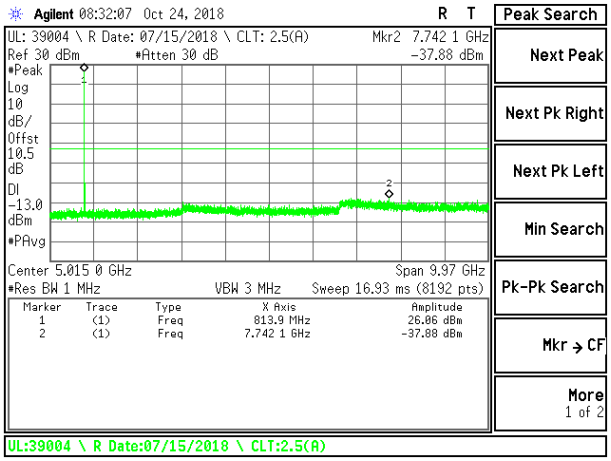
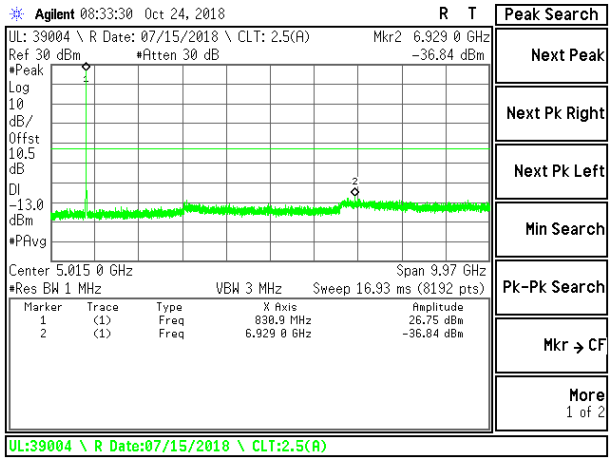


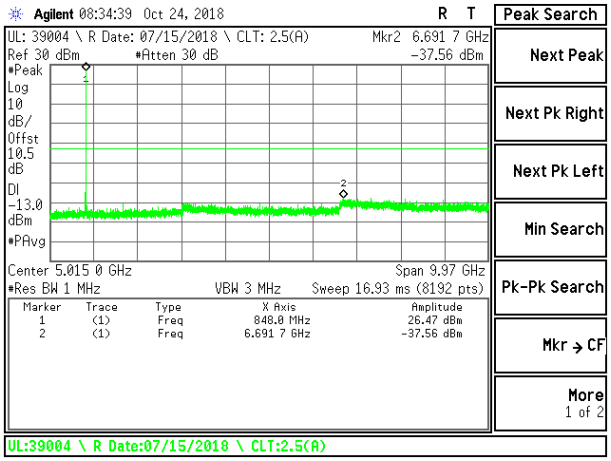
LTE B26 1.4MHz QPSK High Channel RB1-0



LTE B26 1.4MHz 16QAM Low Channel RB1-0



LTE B26 1.4MHz 16QAM Mid Channel RB1-0



LTE B26 1.4MHz 16QAM High Channel RB1-0

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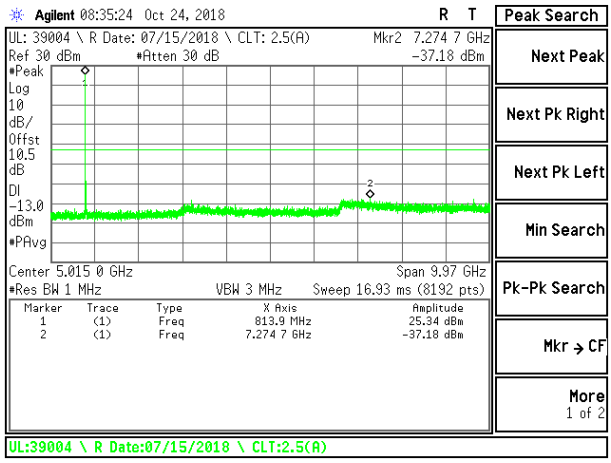

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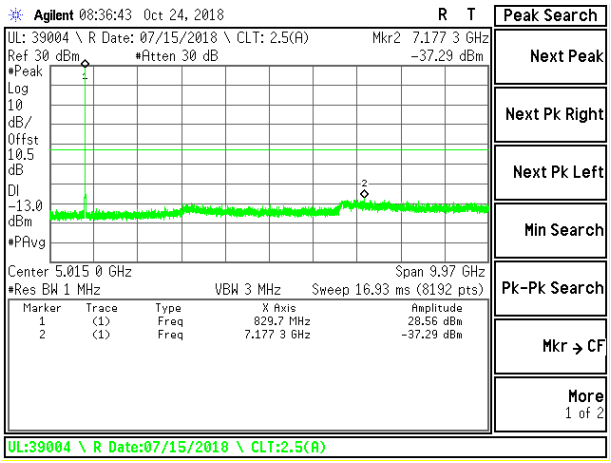
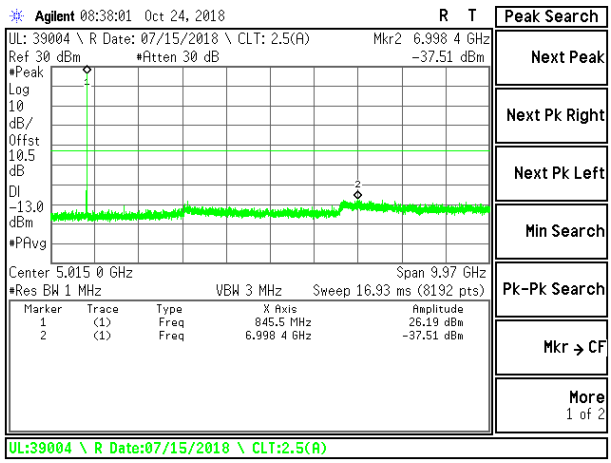
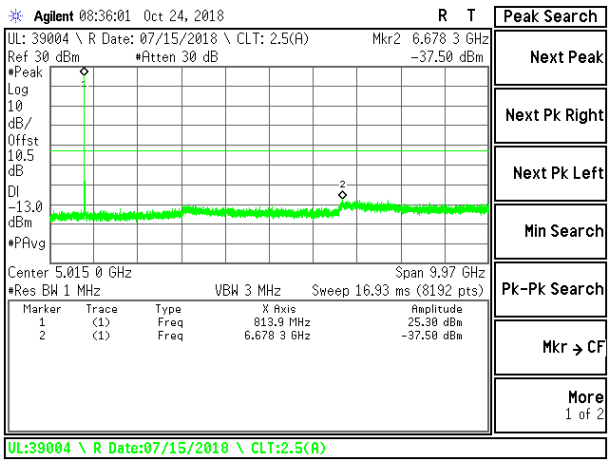


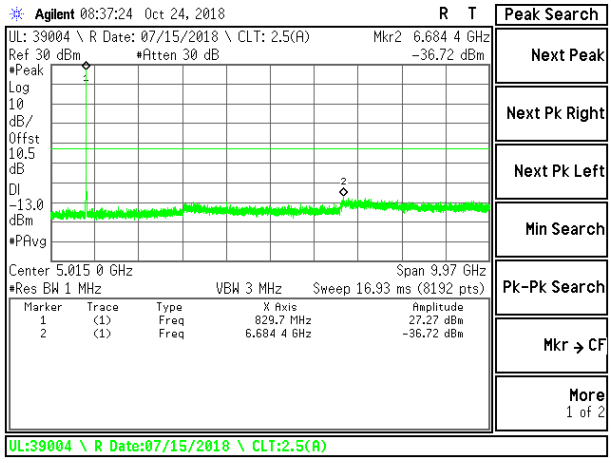
LTE B26 3MHz QPSK Mid Channel RB1-0



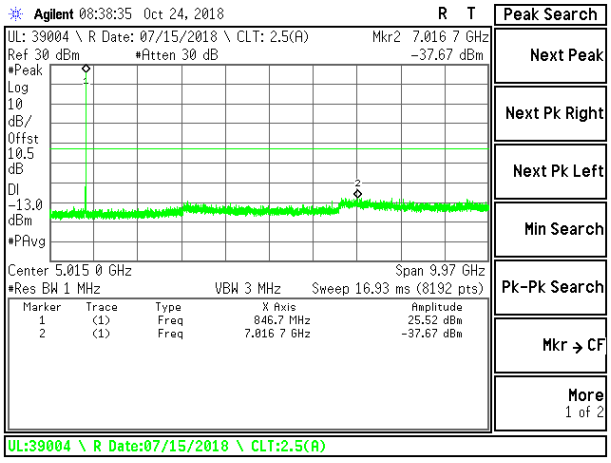
LTE B26 3MHz QPSK High Channel RB1-0



LTE B26 3MHz 16QAM Low Channel RB1-0



LTE B26 3MHz 16QAM Mid Channel RB1-0



LTE B26 3MHz 16QAM High Channel RB1-0

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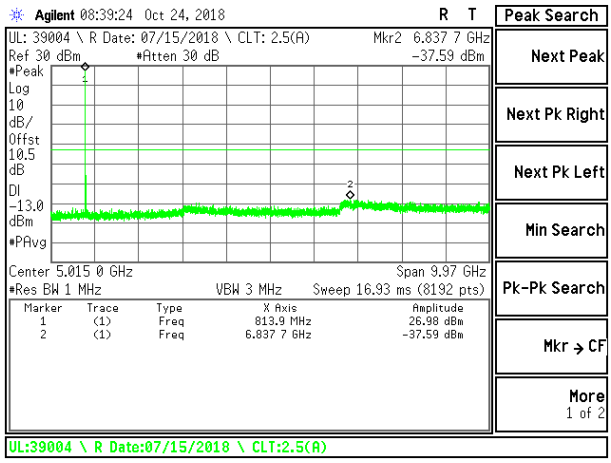
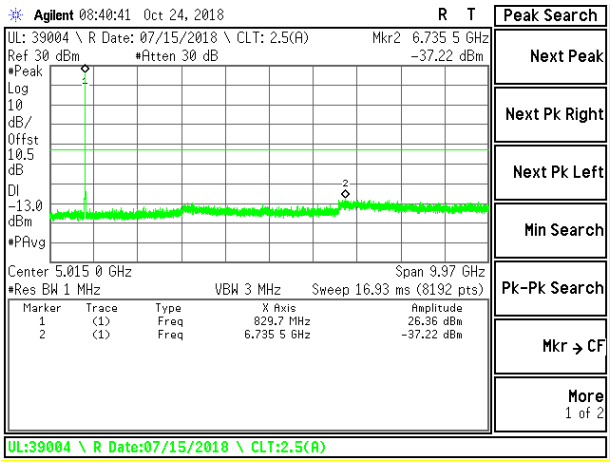
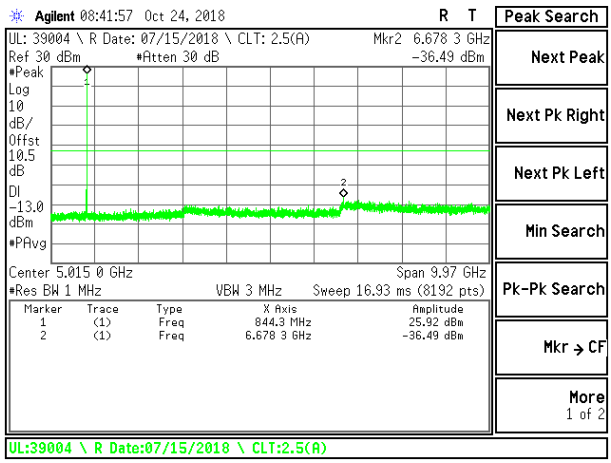


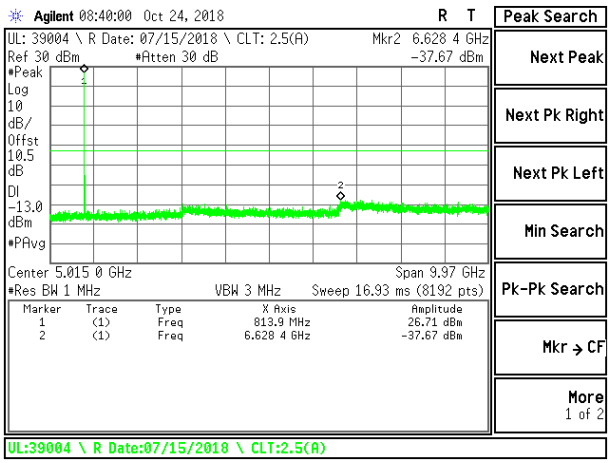
LTE B26 5MHz QPSK Low Channel RB1-0



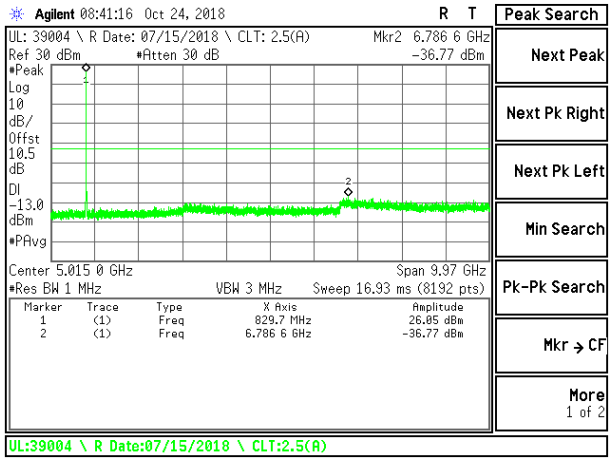
LTE B26 5MHz QPSK Mid Channel RB1-0



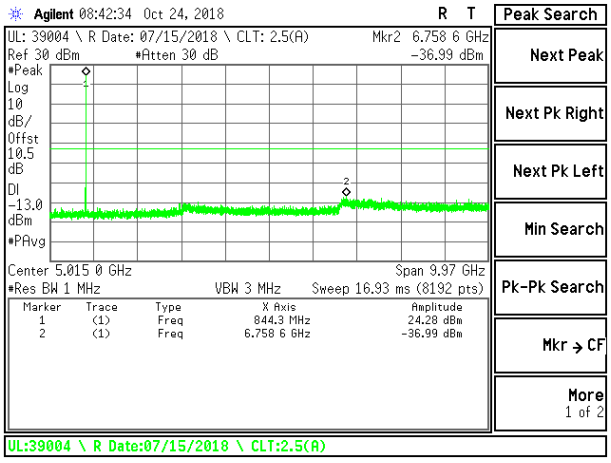
LTE B26 5MHz QPSK High Channel RB1-0



LTE B26 5MHz 16QAM Low Channel RB1-0



LTE B26 5MHz 16QAM Mid Channel RB1-0



LTE B26 5MHz 16QAM High Channel RB1-0

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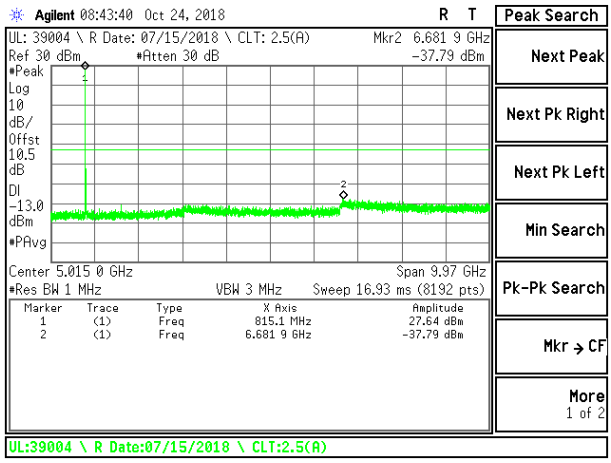
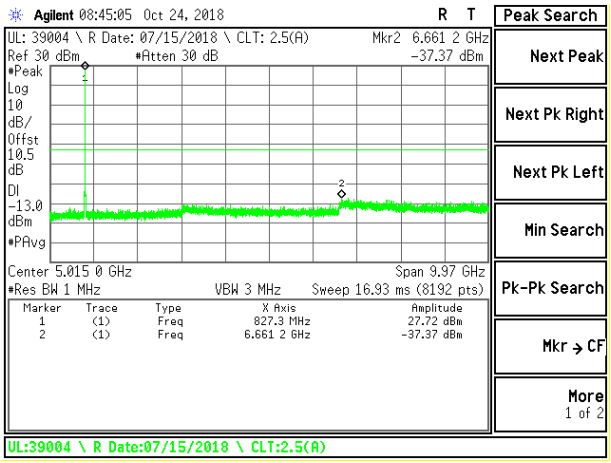
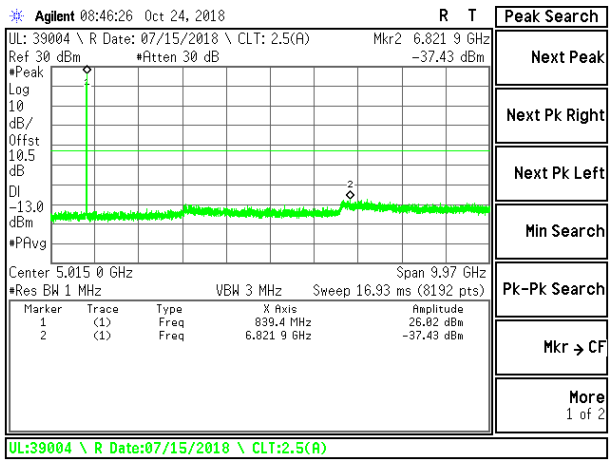


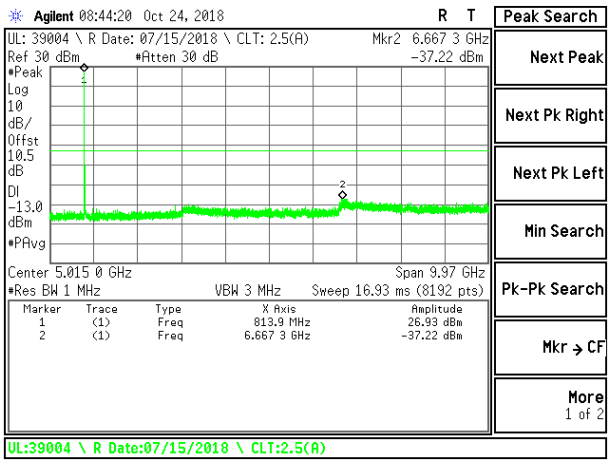
LTE B26 10MHz QPSK Low Channel RB1-0



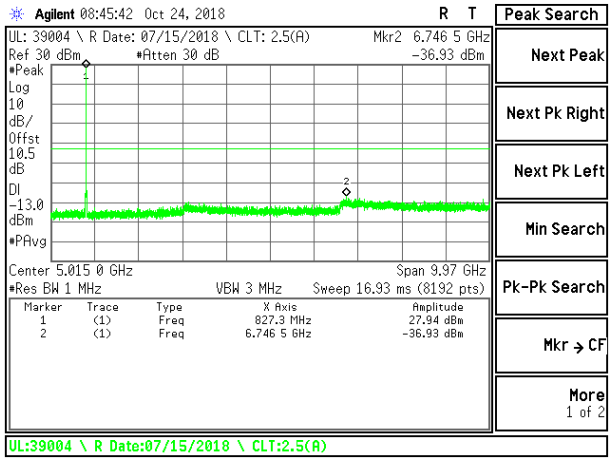
LTE B26 10MHz QPSK Mid Channel RB1-0



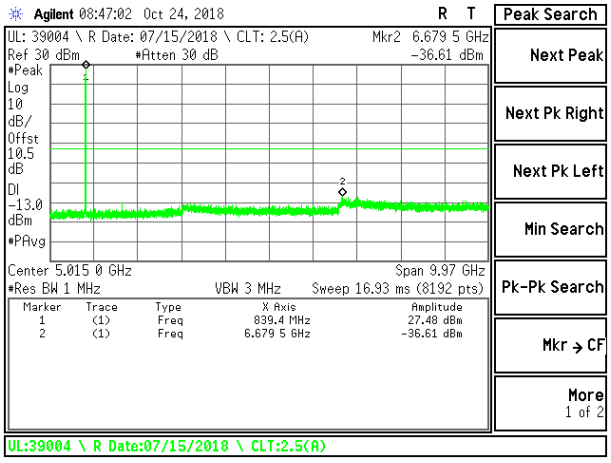
LTE B26 10MHz QPSK High Channel RB1-0



LTE B26 10MHz 16QAM Low Channel RB1-0



LTE B26 10MHz 16QAM Mid Channel RB1-0



LTE B26 10MHz 16QAM High Channel RB1-0

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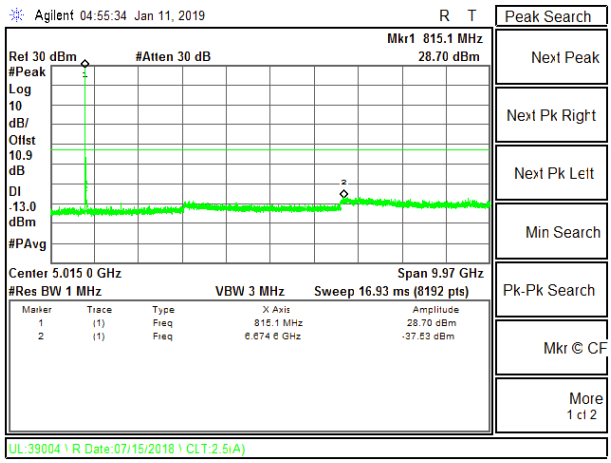
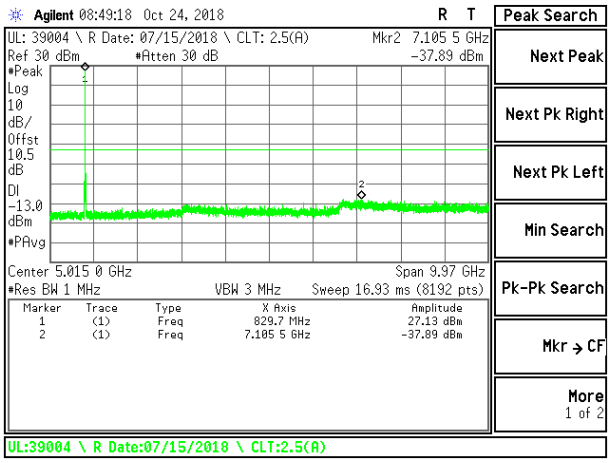


LTE B26 15MHz QPSK Low Channel RB1-0



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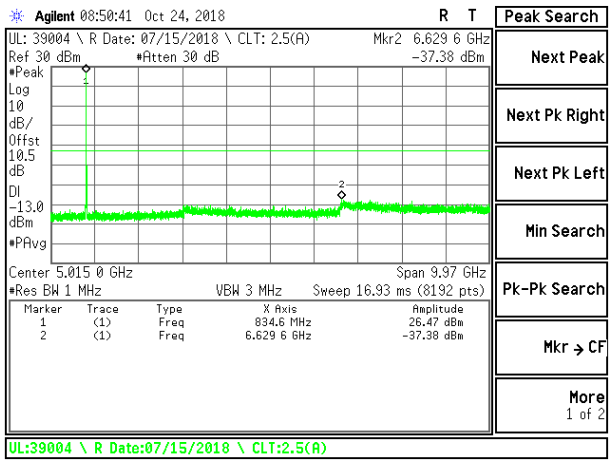
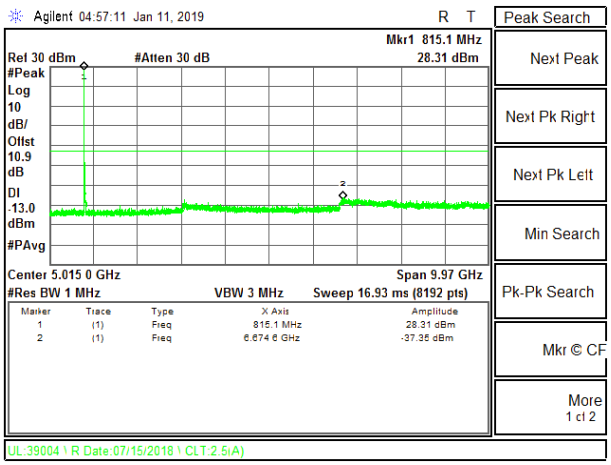
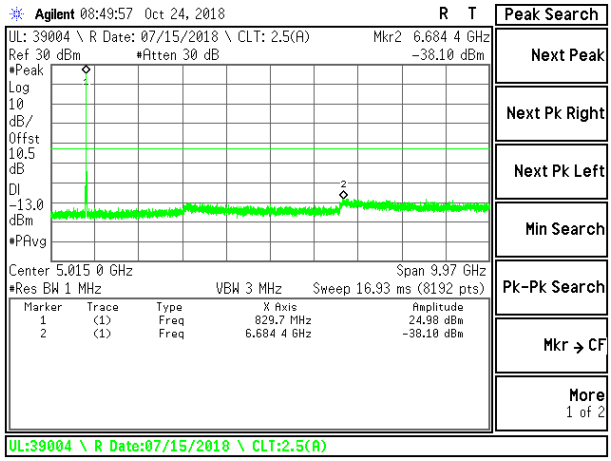


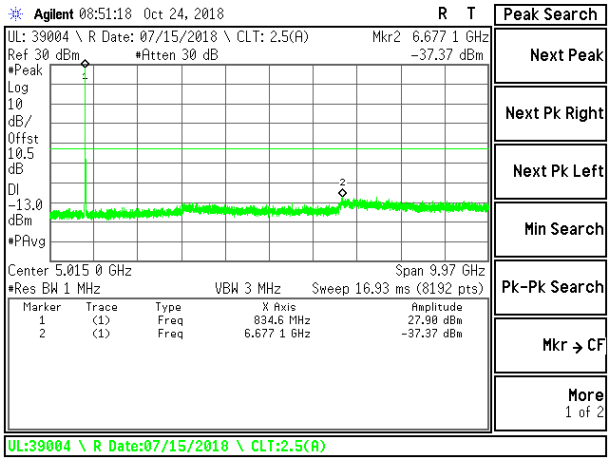
LTE B26 15MHz QPSK High Channel RB1-0



LTE B26 15MHz 16QAM Low Channel RB1-0



LTE B26 15MHz 16QAM Mid Channel RB1-0



LTE B26 15MHz 16QAM High Channel RB1-0

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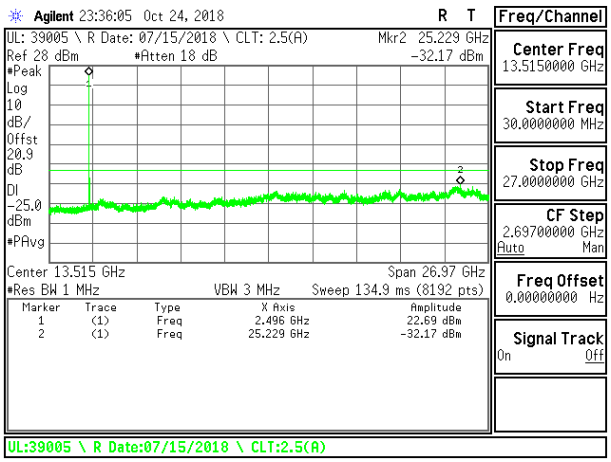
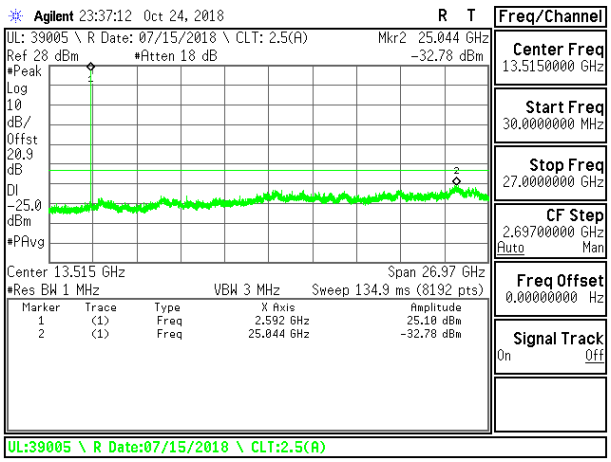
8.3.15. LTE BAND 41



LTE B41 5MHz QPSK Low Channel RB1-0



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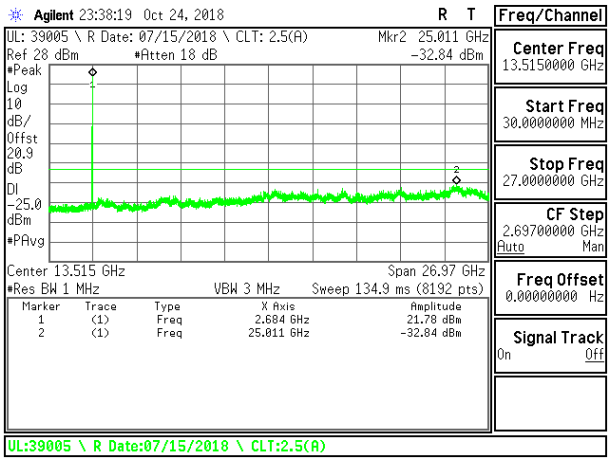

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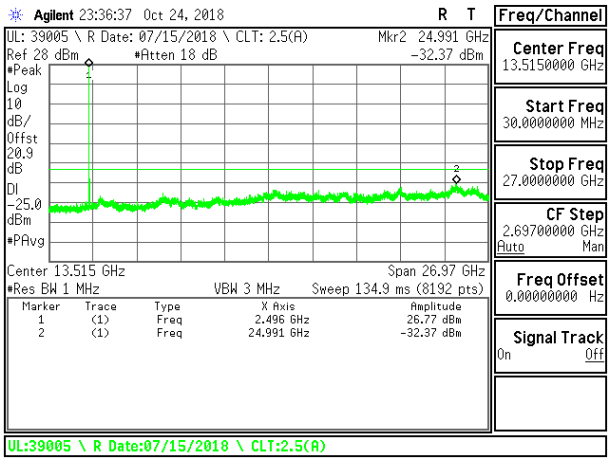
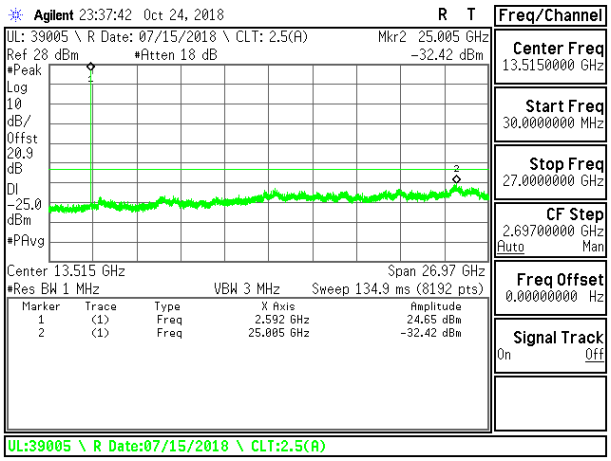
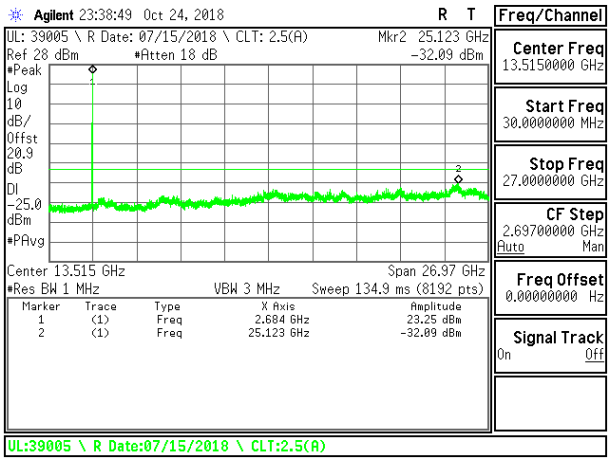


LTE B41 5MHz 16QAM Low Channel RB1-0



LTE B41 5MHz 16QAM Mid Channel RB1-0



LTE B41 5MHz 16QAM High Channel RB1-0

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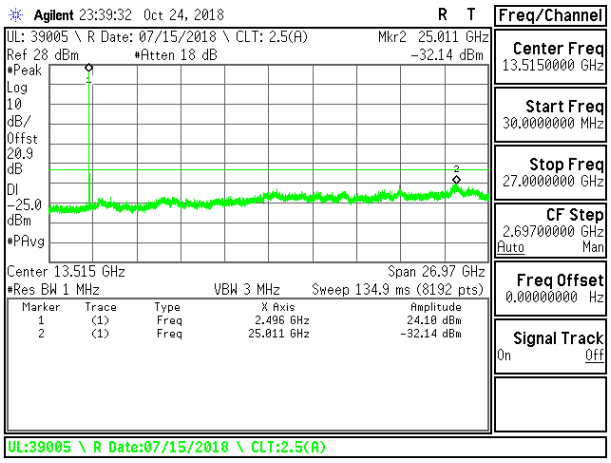
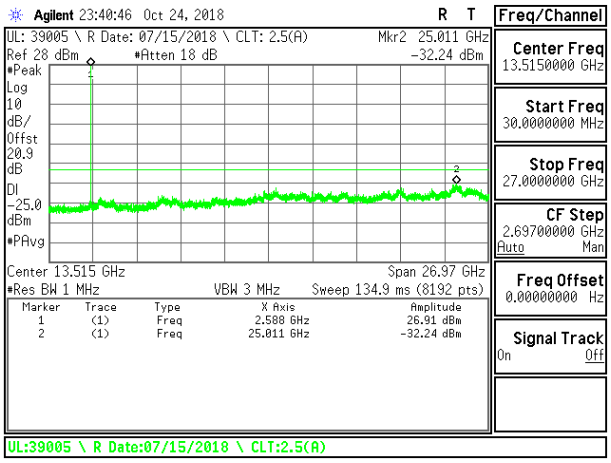
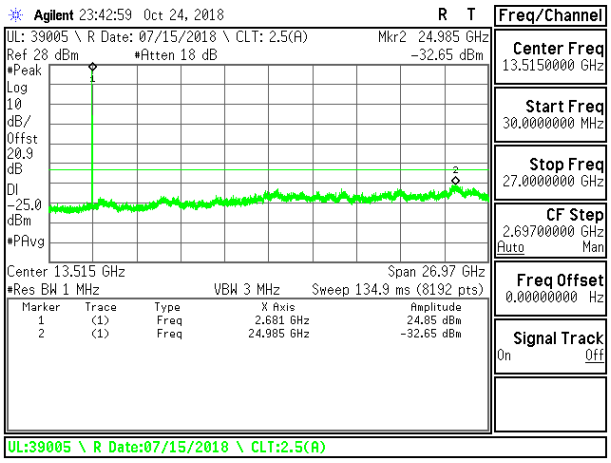


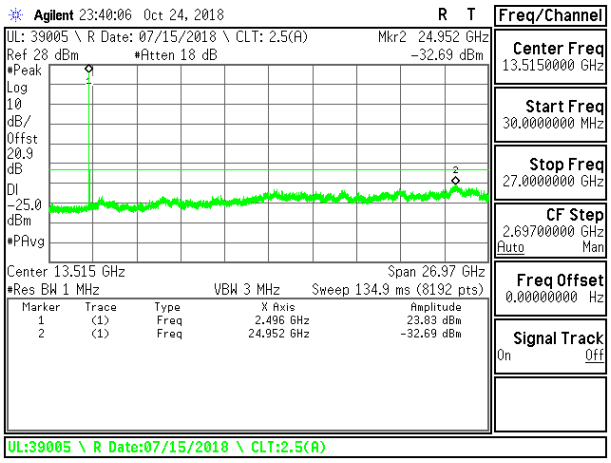
LTE B41 10MHz QPSK Low Channel RB1-0



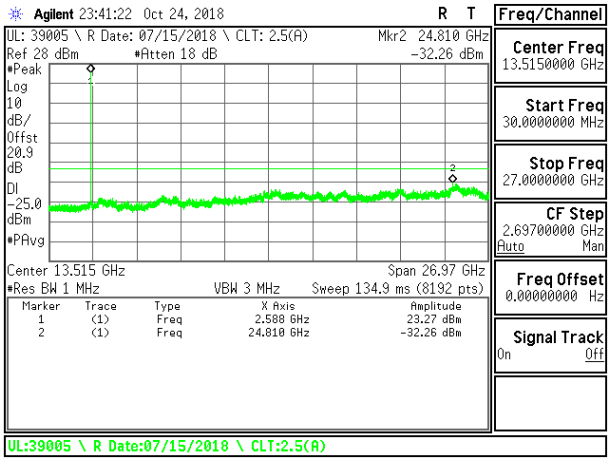
LTE B41 10MHz QPSK Mid Channel RB1-0



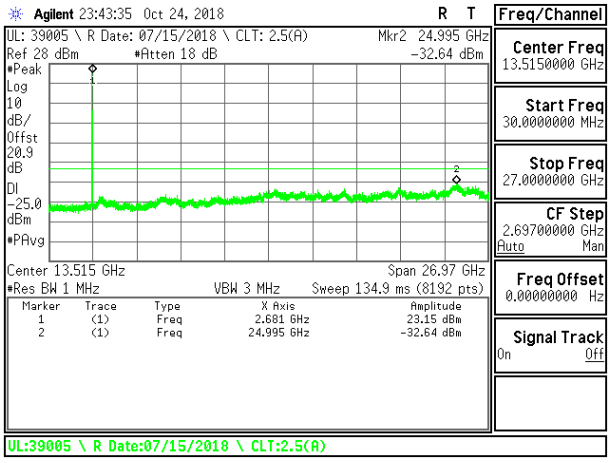
LTE B41 10MHz QPSK High Channel RB1-0



LTE B41 10MHz 16QAM Low Channel RB1-0



LTE B41 10MHz 16QAM Mid Channel RB1-0



LTE B41 10MHz 16QAM High Channel RB1-0

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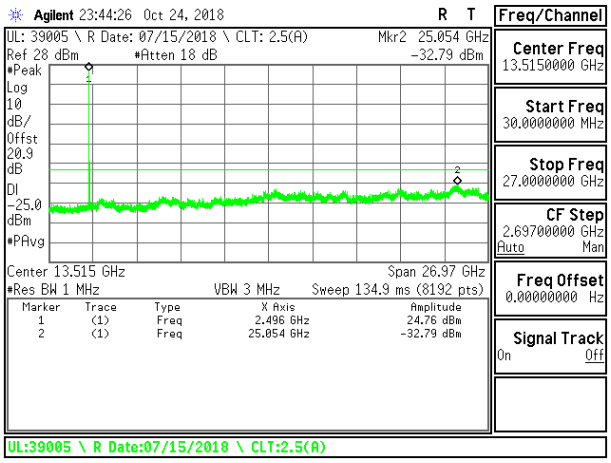
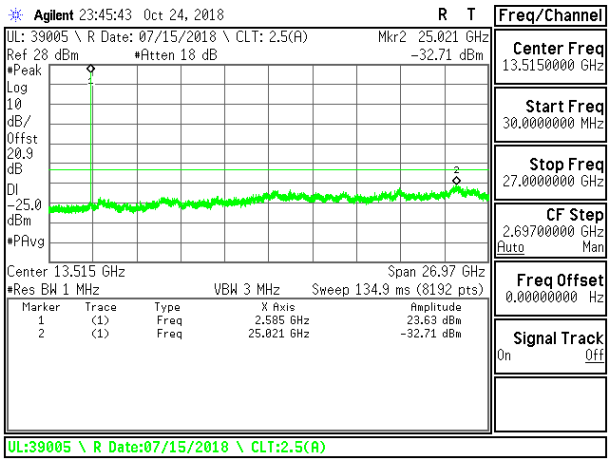
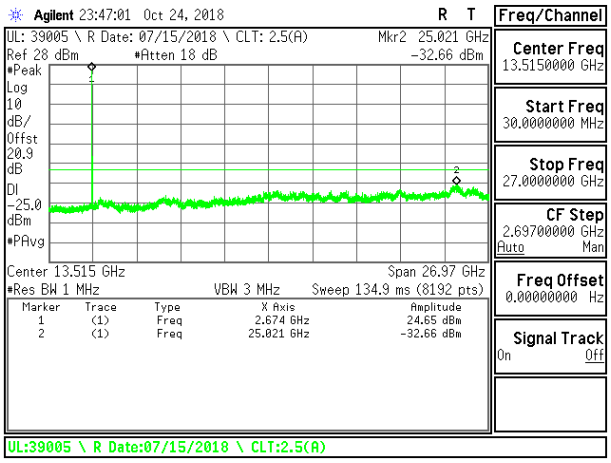


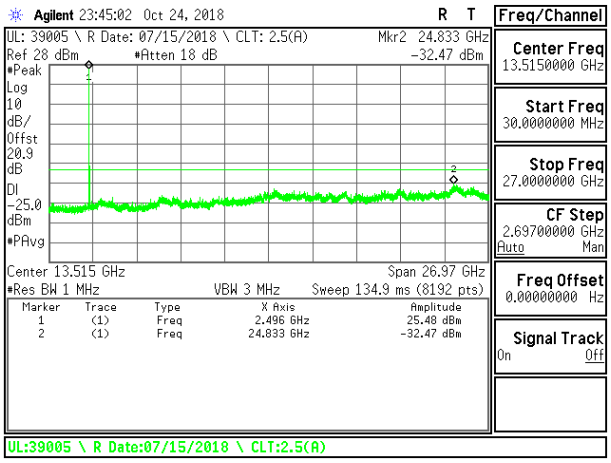
LTE B41 15MHz QPSK Low Channel RB1-0



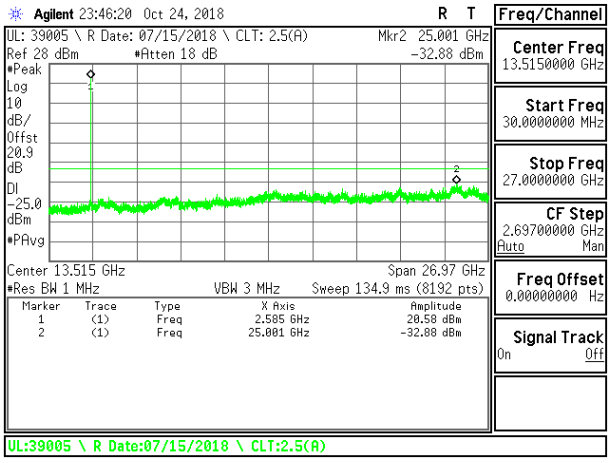
LTE B41 15MHz QPSK Mid Channel RB1-0



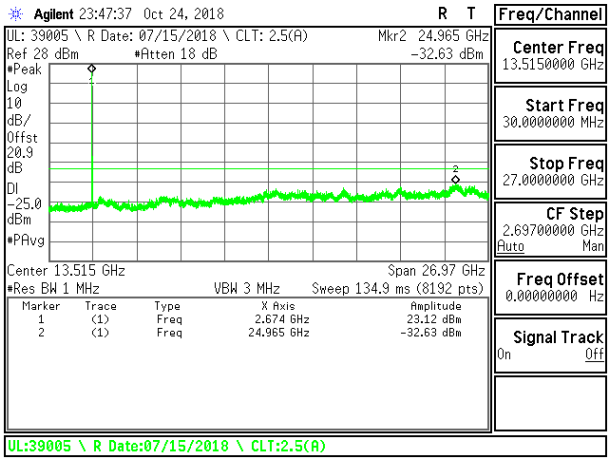
LTE B41 15MHz QPSK High Channel RB1-0



LTE B41 15MHz 16QAM Low Channel RB1-0



LTE B41 15MHz 16QAM Mid Channel RB1-0



LTE B41 15MHz 16QAM High Channel RB1-0

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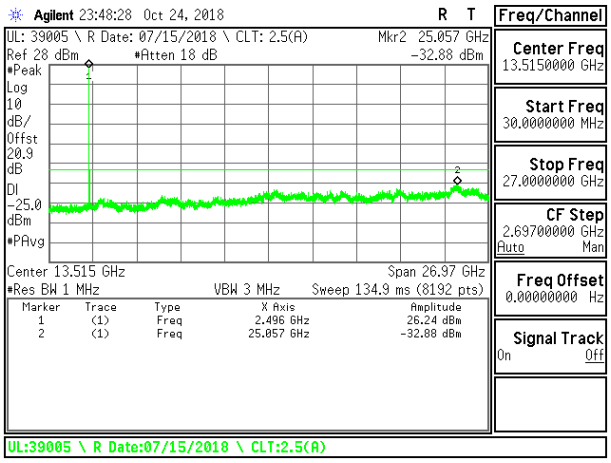
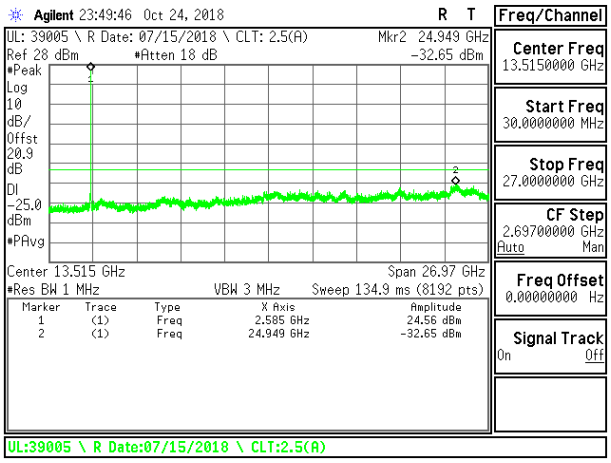
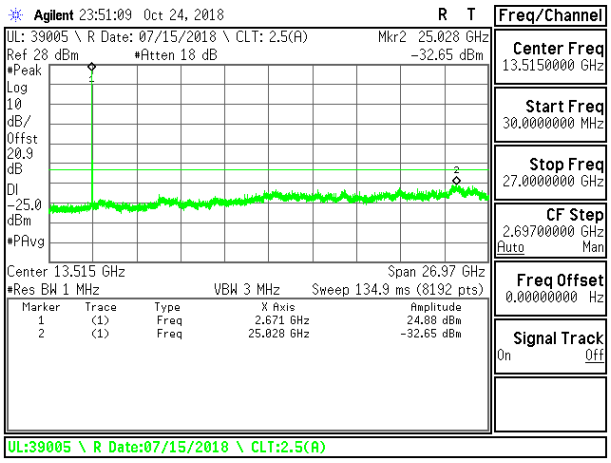


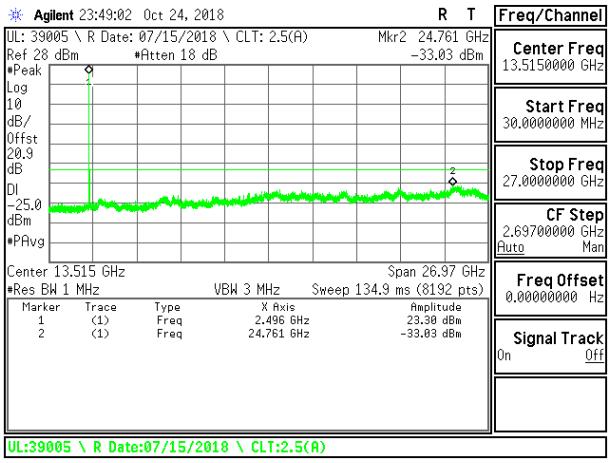
LTE B41 20MHz QPSK Low Channel RB1-0



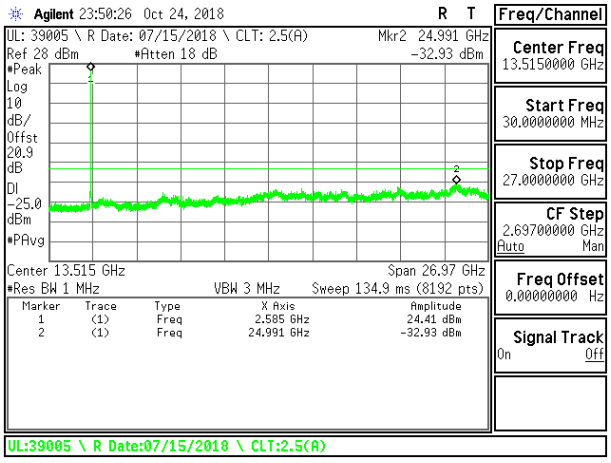
LTE B41 20MHz QPSK Mid Channel RB1-0



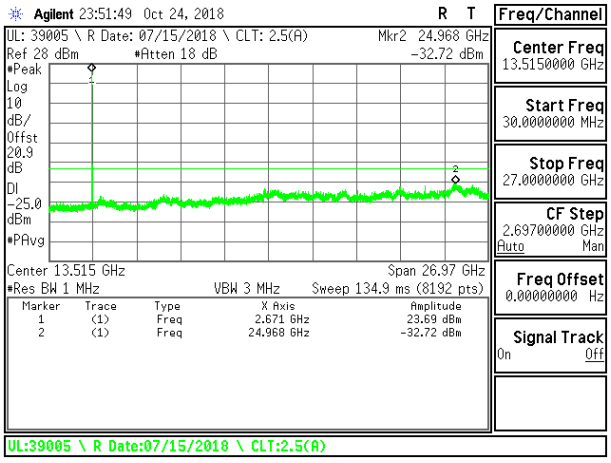
LTE B41 20MHz QPSK High Channel RB1-0



LTE B41 20MHz 16QAM Low Channel RB1-0



LTE B41 20MHz 16QAM Mid Channel RB1-0



LTE B41 20MHz 16QAM High Channel RB1-0

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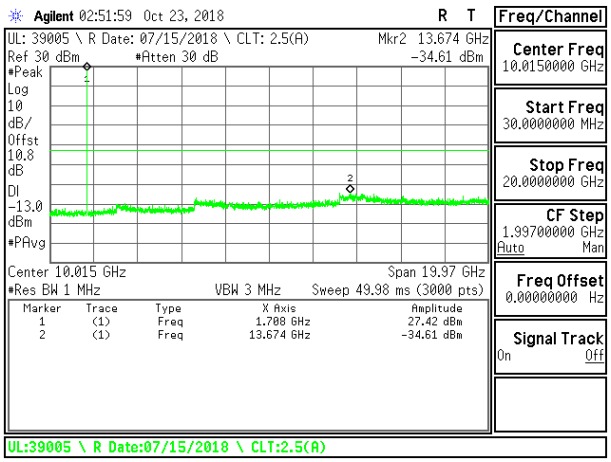
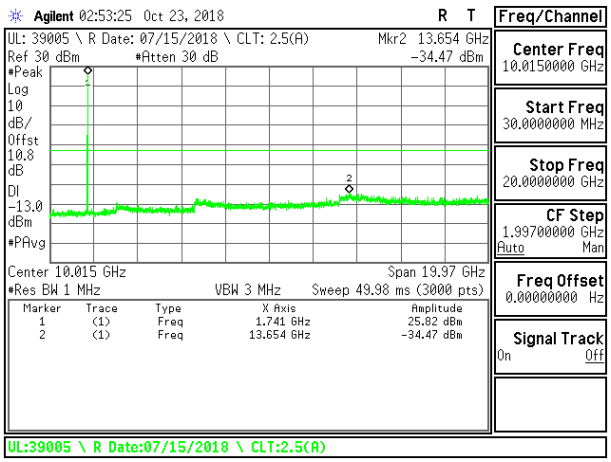
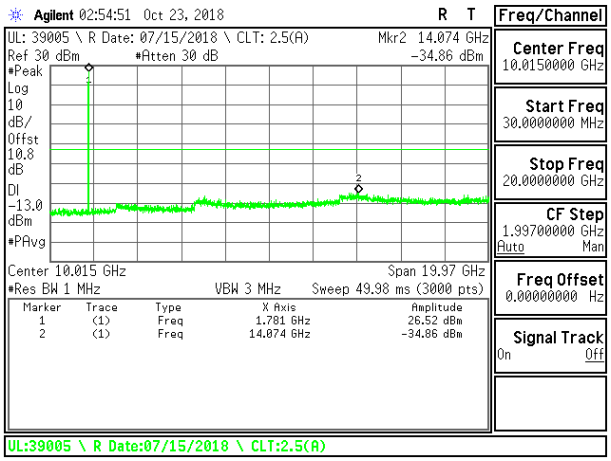
8.3.16. LTE BAND 66



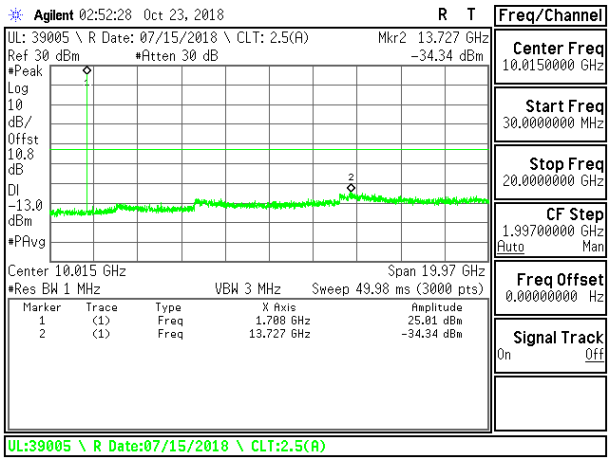
LTE B66 1.4MHz QPSK Low Channel RB1-0



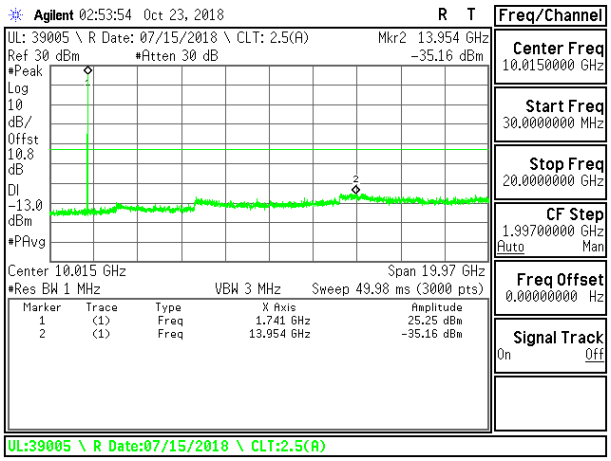
LTE B66 1.4MHz QPSK Mid Channel RB1-0



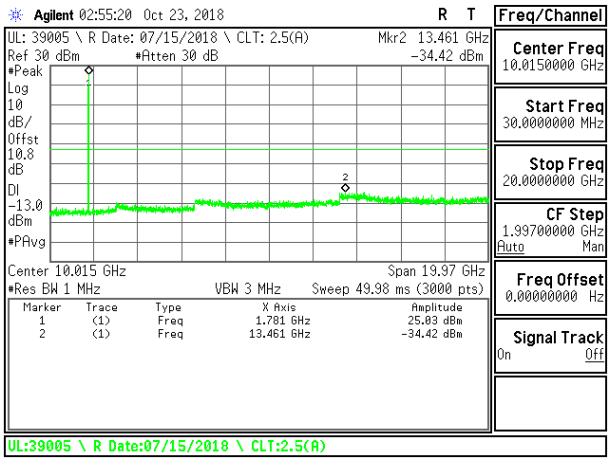
LTE B66 1.4MHz QPSK High Channel RB1-0



LTE B66 1.4MHz 16QAM Low Channel RB1-0



LTE B66 1.4MHz 16QAM Mid Channel RB1-0



LTE B66 1.4MHz 16QAM High Channel RB1-0

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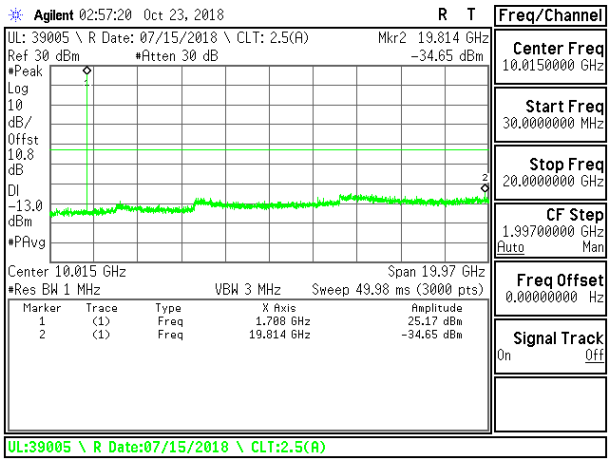
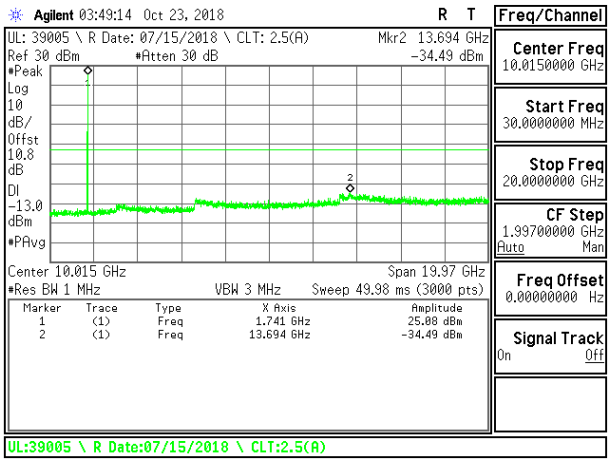
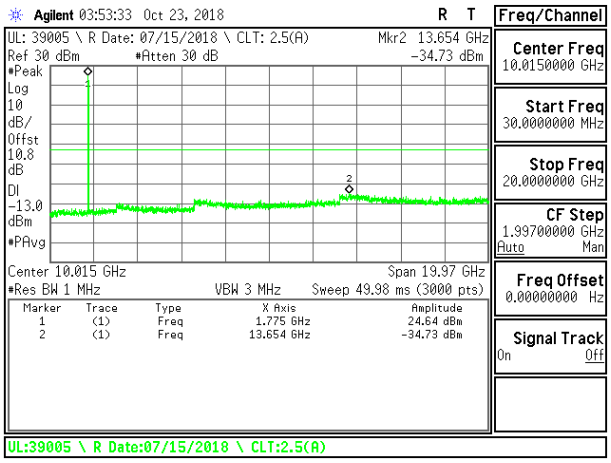


LTE B66 3MHz QPSK Low Channel RB1-0



LTE B66 3MHz QPSK Mid Channel RB1-0



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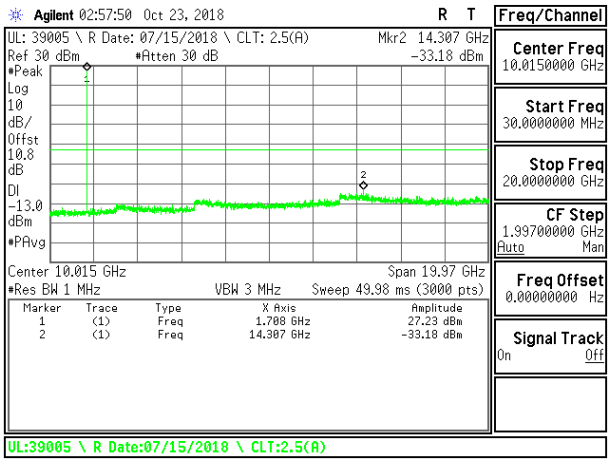
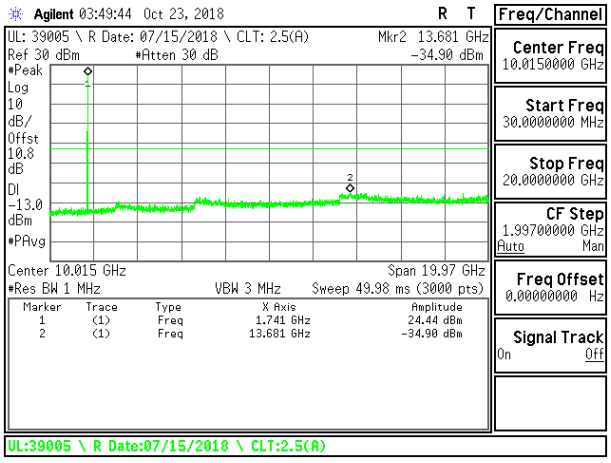
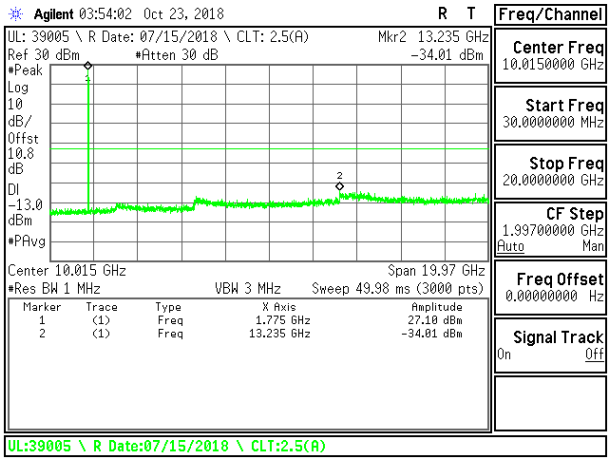


LTE B66 3MHz 16QAM Low Channel RB1-0



LTE B66 3MHz 16QAM Mid Channel RB1-0



LTE B66 3MHz 16QAM High Channel RB1-0

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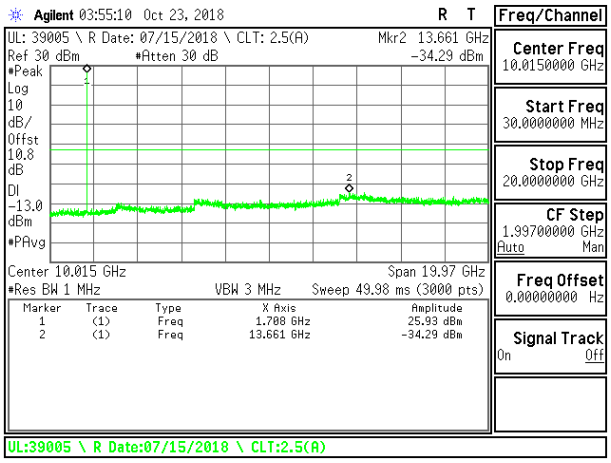
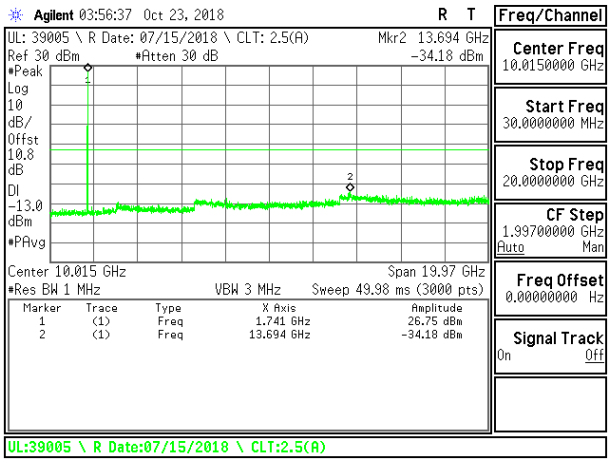
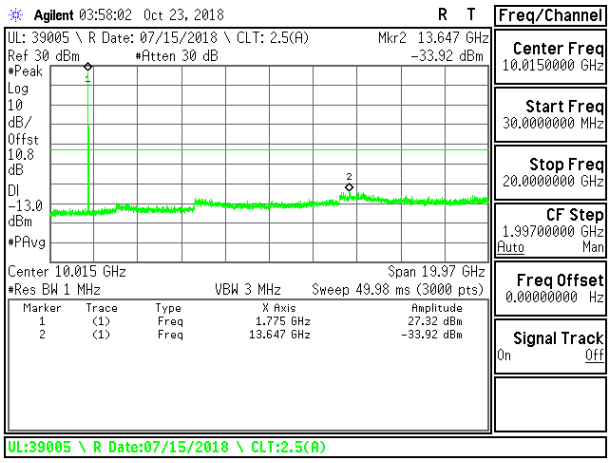


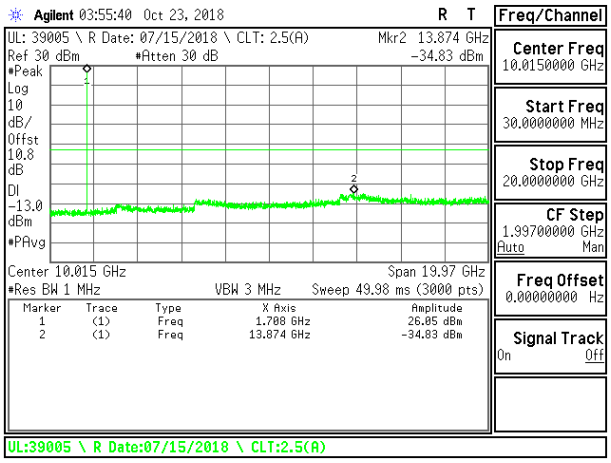
LTE B66 5MHz QPSK Low Channel RB1-0



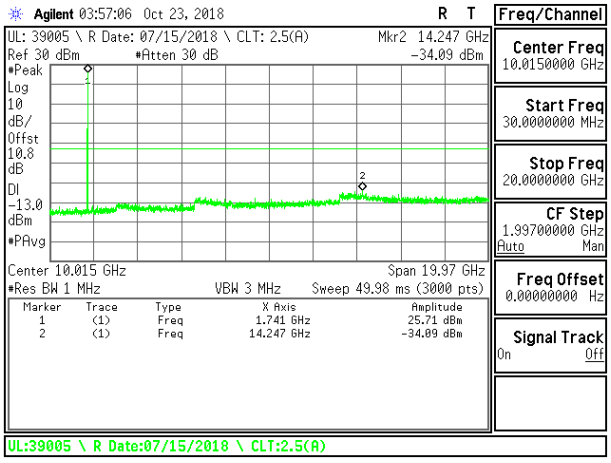
LTE B66 5MHz QPSK Mid Channel RB1-0



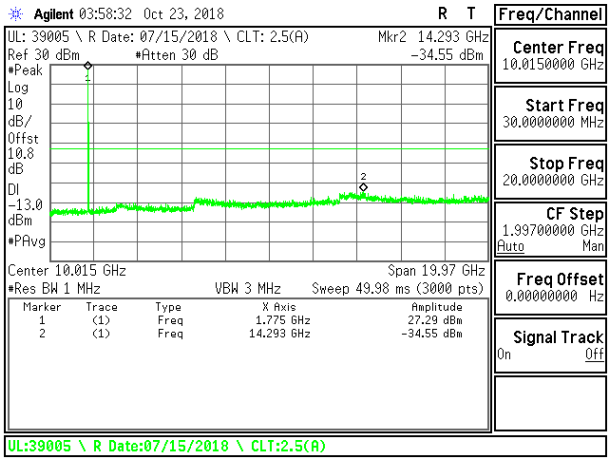
LTE B66 5MHz QPSK High Channel RB1-0



LTE B66 5MHz 16QAM Low Channel RB1-0



LTE B66 5MHz 16QAM Mid Channel RB1-0



LTE B66 5MHz 16QAM High Channel RB1-0

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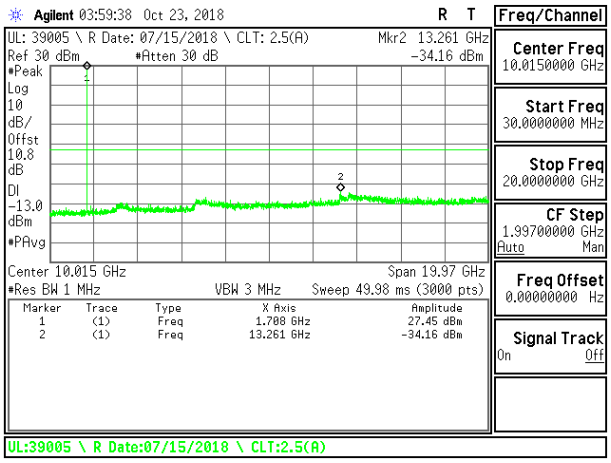
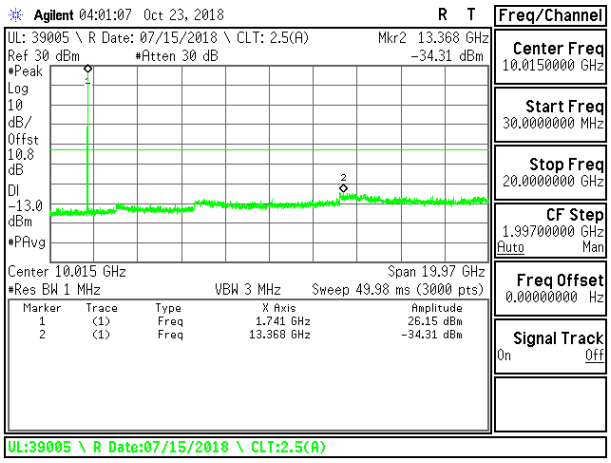
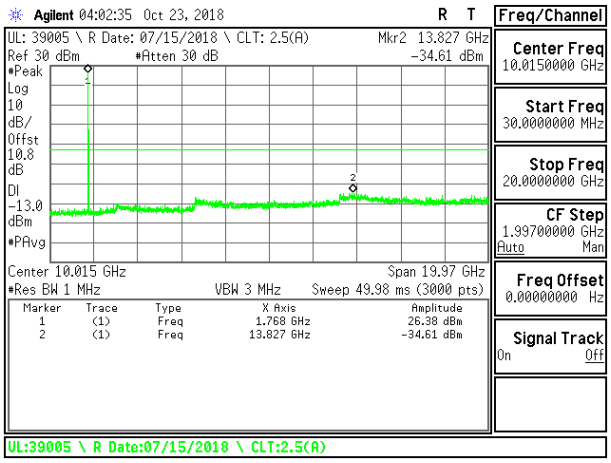


LTE B66 10MHz QPSK Low Channel RB1-0



LTE B66 10MHz QPSK Mid Channel RB1-0



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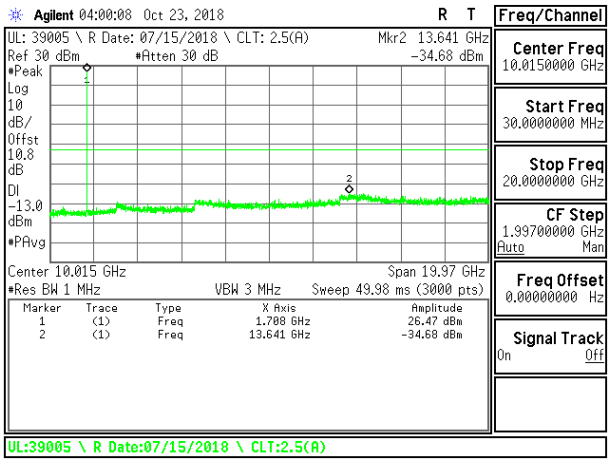
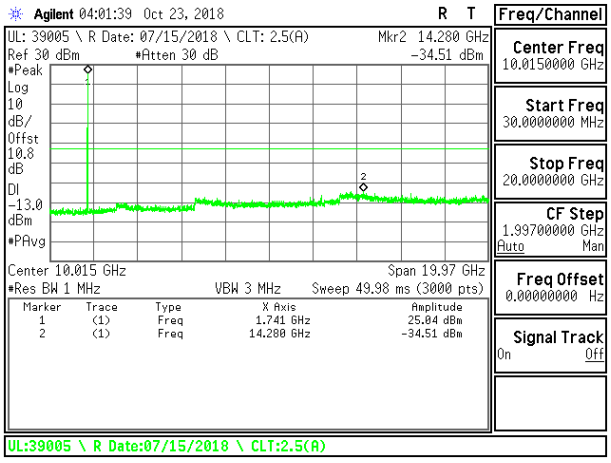
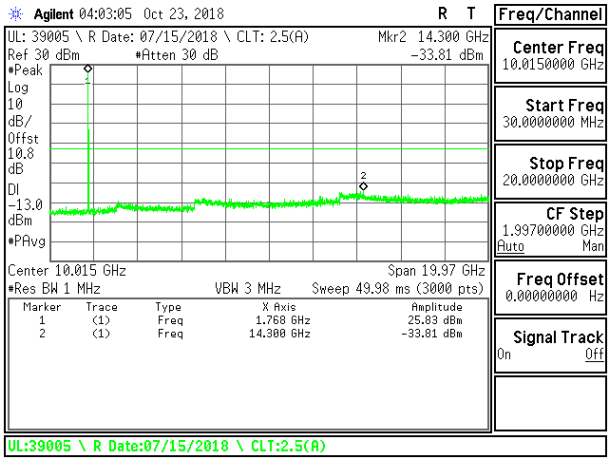


LTE B66 10MHz 16QAM Low Channel RB1-0



LTE B66 10MHz 16QAM Mid Channel RB1-0



LTE B66 10MHz 16QAM High Channel RB1-0

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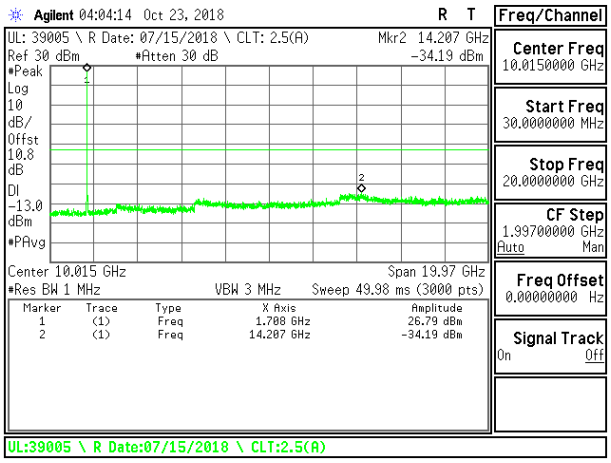
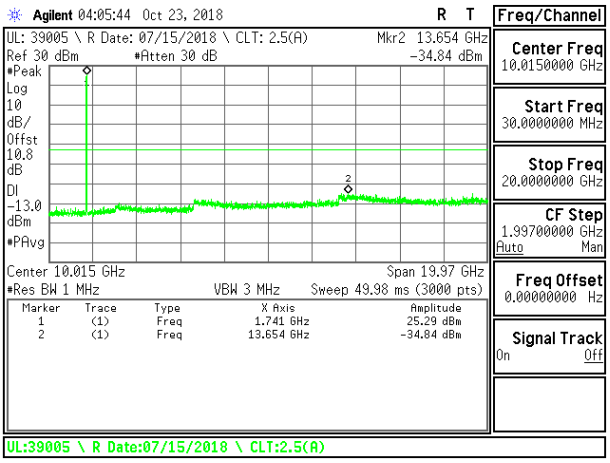
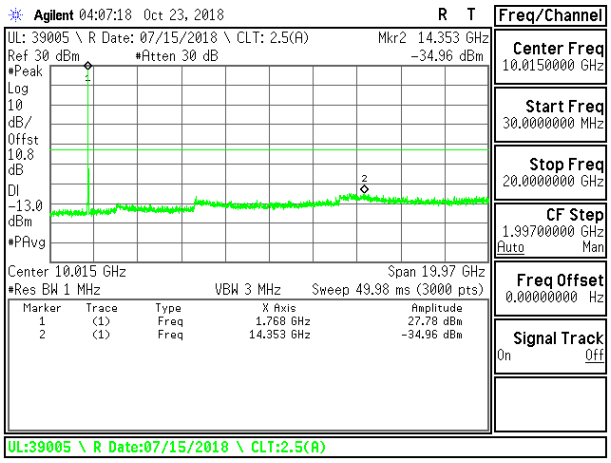


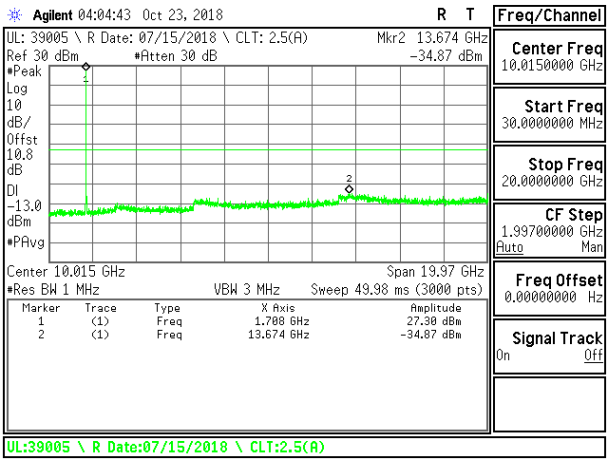
LTE B66 15MHz QPSK Low Channel RB1-0



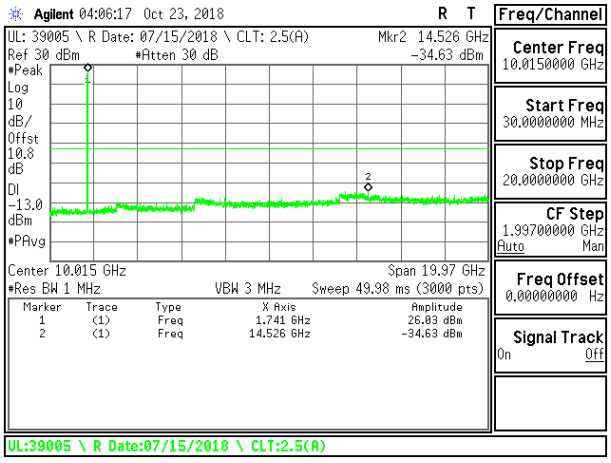
LTE B66 15MHz QPSK Mid Channel RB1-0



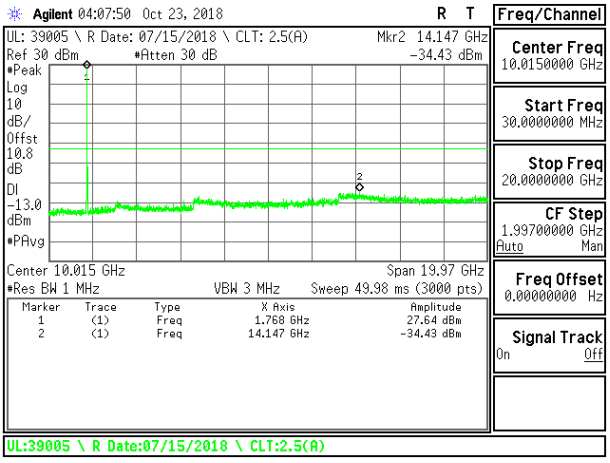
LTE B66 15MHz QPSK High Channel RB1-0



LTE B66 15MHz 16QAM Low Channel RB1-0



LTE B66 15MHz 16QAM Mid Channel RB1-0



LTE B66 15MHz 16QAM High Channel RB1-0

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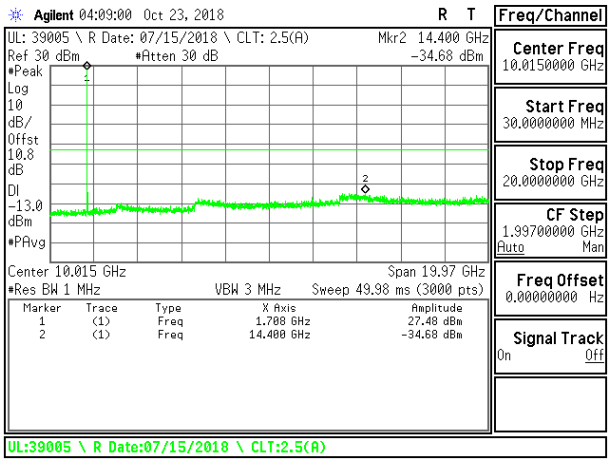
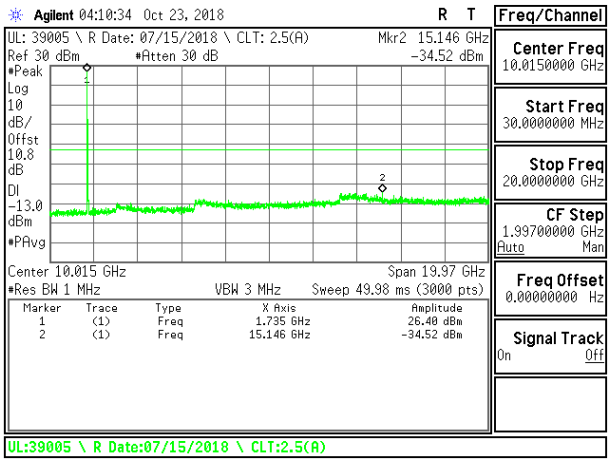
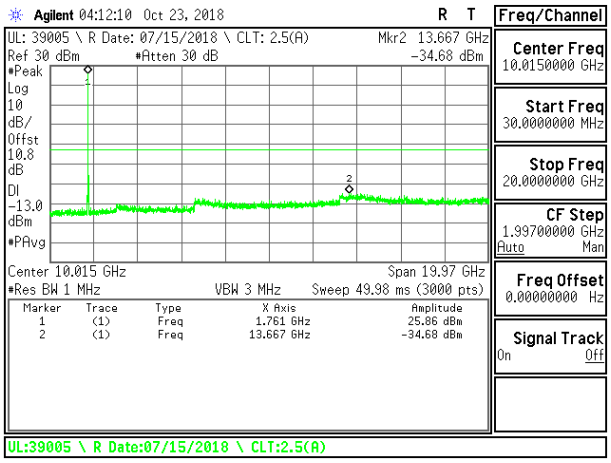


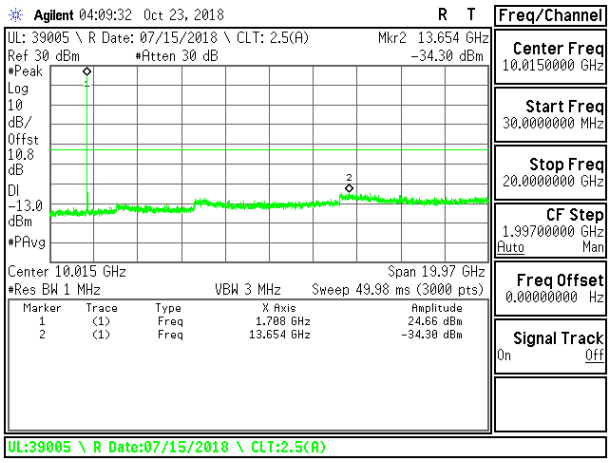
LTE B66 20MHz QPSK Low Channel RB1-0



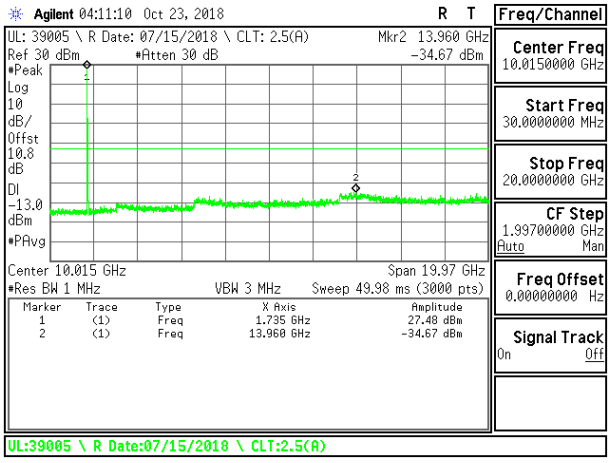
LTE B66 20MHz QPSK Mid Channel RB1-0



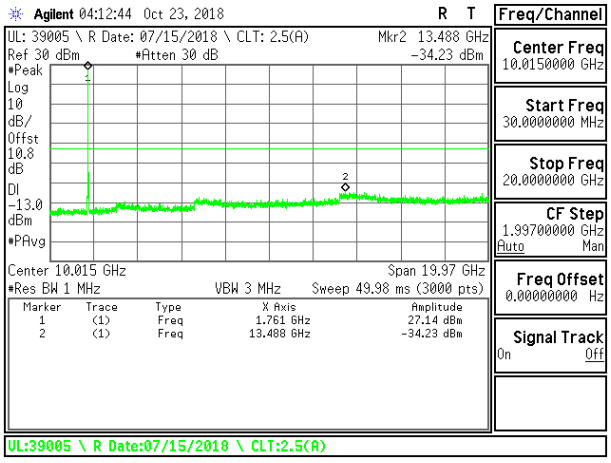
LTE B66 20MHz QPSK High Channel RB1-0



LTE B66 20MHz 16QAM Low Channel RB1-0



LTE B66 20MHz 16QAM Mid Channel RB1-0



LTE B66 20MHz 16QAM High Channel RB1-0

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8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54 and §90.213

LIMITS

FCC: §22.355, §90.213
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

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

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

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

  Low voltage, 3.3VDC, Normal, 3.85VDC and High voltage, 4.43VDC.
  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).

MODES TESTED

- GSM 850
- GSM 1900
- WCDMA Band 5
- WCDMA Band 2
- WCDMA Band 4
- LTE Band 2
- LTE Band 4
- LTE Band 5
- LTE Band 7
- LTE Band 12
- LTE Band 13
- LTE Band 17
- LTE Band 25
- LTE Band 26
- LTE Band 41
- LTE Band 66

RESULTS

See the following pages.

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8.4.1. GSM

ID:	39004	Date:	11/1/18

GPRS 850MHz

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.0475	848.9518		
Extreme (50C)		824.0474	848.9518	-16.9	-0.020
Extreme (40C)		824.0474	848.9518	-17.9	-0.021
Extreme (30C)		824.0474	848.9518	-16.8	-0.020
Extreme (10C)		824.0474	848.9518	-18.0	-0.022
Extreme (0C)		824.0474	848.9518	-18.3	-0.022
Extreme (-10C)		824.0474	848.9518	-18.5	-0.022
Extreme (-20C)		824.0474	848.9518	-19.0	-0.023
Extreme (-30C)		824.0474	848.9518	-17.9	-0.021
20C	15%	824.0474	848.9518	-18.6	-0.022
	-15%	824.0474	848.9518	-18.0	-0.022
	End Point	824.0474	848.9518	-19.6	-0.023

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GPRS 1900MHz

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1850.0609	1909.9392		
Extreme (50C)		1850.0609	1909.9392	-7.9	-0.004
Extreme (40C)		1850.0609	1909.9392	-8.6	-0.005
Extreme (30C)		1850.0609	1909.9392	-8.5	-0.005
Extreme (10C)		1850.0609	1909.9392	-9.1	-0.005
Extreme (0C)		1850.0609	1909.9392	-11.0	-0.006
Extreme (-10C)		1850.0609	1909.9392	-9.9	-0.005
Extreme (-20C)		1850.0609	1909.9392	-10.9	-0.006
Extreme (-30C)		1850.0609	1909.9392	-11.0	-0.006
20C	15%	1850.0609	1909.9392	-12.0	-0.006
	-15%	1850.0609	1909.9392	-11.9	-0.006
	End Point	1850.0609	1909.9392	-11.5	-0.006

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8.4.2. WCDMA

ID:	39004	Date:	11/2/18

UMTS REL99 BAND 5

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	824.0189	848.9701		
Extreme (50C)		824.0189	848.9701	3.0	0.0036
Extreme (40C)		824.0189	848.9701	2.7	0.0032
Extreme (30C)		824.0189	848.9701	2.9	0.0035
Extreme (10C)		824.0189	848.9701	2.4	0.0029
Extreme (0C)		824.0189	848.9701	2.8	0.0033
Extreme (-10C)		824.0189	848.9701	2.6	0.0031
Extreme (-20C)		824.0189	848.9701	2.5	0.0030
Extreme (-30C)		824.0189	848.9701	2.4	0.0029
20C	15%	824.0189	848.9701	2.5	0.0030
	-15%	824.0189	848.9701	2.7	0.0032
	End Point	824.0189	848.9701	2.6	0.0031

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UMTS REL99 BAND 2

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.0092	1909.9799		
Extreme (50C)		1850.0092	1909.9799	5.1	0.0027
Extreme (40C)		1850.0092	1909.9799	4.9	0.0026
Extreme (30C)		1850.0092	1909.9799	5.2	0.0028
Extreme (10C)		1850.0092	1909.9799	4.6	0.0024
Extreme (0C)		1850.0092	1909.9799	3.9	0.0021
Extreme (-10C)		1850.0092	1909.9799	3.6	0.0019
Extreme (-20C)		1850.0092	1909.9799	4.0	0.0021
Extreme (-30C)		1850.0092	1909.9799	3.8	0.0020
20C	15%	1850.0092	1909.9799	4.7	0.0025
	-15%	1850.0092	1909.9799	4.2	0.0022
	End Point	1850.0092	1909.9799	3.9	0.0020

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UMTS REL99 BAND 4

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.0165	1754.9872		
Extreme (50C)		1710.0165	1754.9872	6.2	0.0036
Extreme (40C)		1710.0165	1754.9872	5.4	0.0031
Extreme (30C)		1710.0165	1754.9872	5.8	0.0033
Extreme (10C)		1710.0165	1754.9872	6.0	0.0035
Extreme (0C)		1710.0165	1754.9872	5.0	0.0029
Extreme (-10C)		1710.0165	1754.9872	5.6	0.0032
Extreme (-20C)		1710.0165	1754.9872	5.4	0.0031
Extreme (-30C)		1710.0165	1754.9872	5.9	0.0034
20C	15%	1710.0165	1754.9872	6.1	0.0035
	-15%	1710.0165	1754.9872	5.6	0.0032
	End Point	1710.0165	1754.9872	5.7	0.0033

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8.4.3. LTE BAND 2

ID:	43575 OS	Date:	11/7/18

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	1850.3270	1909.1650		
Extreme (50C)		1850.3270	1909.1650	-6.1	-0.003
Extreme (40C)		1850.3270	1909.1650	-8.2	-0.004
Extreme (30C)		1850.3270	1909.1650	-6.9	-0.004
Extreme (10C)		1850.3270	1909.1650	-6.4	-0.003
Extreme (0C)		1850.3270	1909.1650	6.7	0.004
Extreme (-10C)		1850.3270	1909.1650	7.7	0.004
Extreme (-20C)		1850.3270	1909.1650	-8.5	-0.005
Extreme (-30C)		1850.3270	1909.1650	-7.7	-0.004
20C	15%	1850.3270	1909.1650	-7.2	-0.004
	-15%	1850.3270	1909.1650	-6.0	-0.003
	End Point	1850.3270	1909.1650	-4.6	-0.002

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8.4.4. LTE BAND 4

ID:	43575 OS	Date:	11/7/18

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	1710.3570	1754.6310		
Extreme (50C)		1710.3570	1754.6310	-8.4	-0.005
Extreme (40C)		1710.3570	1754.6310	-7.2	-0.004
Extreme (30C)		1710.3570	1754.6310	-7.3	-0.004
Extreme (10C)		1710.3570	1754.6310	-5.1	-0.003
Extreme (0C)		1710.3570	1754.6310	7.2	0.004
Extreme (-10C)		1710.3570	1754.6310	7.0	0.004
Extreme (-20C)		1710.3570	1754.6310	-7.2	-0.004
Extreme (-30C)		1710.3570	1754.6310	-5.6	-0.003
20C	15%	1710.3570	1754.6310	-6.6	-0.004
	-15%	1710.3570	1754.6310	-5.1	-0.003
	End Point	1710.3570	1754.6310	-5.9	-0.003

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8.4.5. LTE BAND 5

ID:	43575 OS	Date:	11/7/18

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	824.3040	848.6820		
Extreme (50C)		824.3040	848.6820	3.7	0.004
Extreme (40C)		824.3040	848.6820	4.0	0.005
Extreme (30C)		824.3040	848.6820	3.1	0.004
Extreme (10C)		824.3040	848.6820	3.9	0.005
Extreme (0C)		824.3040	848.6820	4.4	0.005
Extreme (-10C)		824.3040	848.6820	5.6	0.007
Extreme (-20C)		824.3040	848.6820	3.1	0.004
Extreme (-30C)		824.3040	848.6820	-3.4	-0.004
20C	15%	824.3040	848.6820	-3.9	-0.005
	-15%	824.3040	848.6820	4.0	0.005
	End Point	824.3040	848.6820	3.8	0.004

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8.4.6. LTE BAND 7

ID:	39004	Date:	11/7/18

QPSK, (20MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2500.8400	2569.1640		
Extreme (50C)		2500.8400	2569.1640	7.1	0.003
Extreme (40C)		2500.8400	2569.1640	7.2	0.003
Extreme (30C)		2500.8400	2569.1640	6.0	0.002
Extreme (10C)		2500.8400	2569.1640	8.0	0.003
Extreme (0C)		2500.8400	2569.1640	9.0	0.004
Extreme (-10C)		2500.8400	2569.1640	5.0	0.002
Extreme (-20C)		2500.8400	2569.1640	7.0	0.003
Extreme (-30C)		2500.8400	2569.1640	4.0	0.002
20C	15%	2500.8400	2569.1640	6.0	0.002
	-15%	2500.8400	2569.1640	7.0	0.003
	End Point	2500.8400	2569.1640	-5.0	-0.002

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8.4.7. LTE BAND 12

ID:	43575 OS	Date:	11/7/18

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	699.3186	715.7000		
Extreme (50C)		699.3186	715.7000	7.3	0.01
Extreme (40C)		699.3186	715.7000	-11.8	-0.02
Extreme (30C)		699.3186	715.7000	11.4	0.02
Extreme (10C)		699.3186	715.7000	-5.5	-0.01
Extreme (0C)		699.3186	715.7000	8.2	0.01
Extreme (-10C)		699.3186	715.7000	7.0	0.01
Extreme (-20C)		699.3186	715.7000	7.4	0.01
Extreme (-30C)		699.3186	715.7000	6.3	0.01
20C	15%	699.3186	715.7000	-3.6	-0.01
	-15%	699.3186	715.7000	4.4	0.01
	End Point	699.3186	715.7000	4.5	0.01

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8.4.8. LTE BAND 13

ID:	43575 OS	Date:	11/7/18

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	777.0330	786.9780		
Extreme (50C)		777.0330	786.9780	7.6	0.010
Extreme (40C)		777.0330	786.9780	-9.1	-0.012
Extreme (30C)		777.0330	786.9780	-4.3	-0.006
Extreme (10C)		777.0330	786.9780	-4.2	-0.005
Extreme (0C)		777.0330	786.9780	4.7	0.006
Extreme (-10C)		777.0330	786.9780	4.4	0.006
Extreme (-20C)		777.0330	786.9780	-6.0	-0.008
Extreme (-30C)		777.0330	786.9780	5.7	0.007
20C	15%	777.0330	786.9780	5.0	0.006
	-15%	777.0330	786.9780	3.7	0.005
	End Point	777.0330	786.9780	-2.9	-0.004

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8.4.9. LTE BAND 17

ID:	43575 OS	Date:	11/7/18

QPSK, (10MHz BANDWIDTH)

Limit		704	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	704.4200	715.5840		
Extreme (50C)		704.4200	715.5840	-8.9	-0.013
Extreme (40C)		704.4200	715.5840	14.3	0.020
Extreme (30C)		704.4200	715.5840	5.1	0.007
Extreme (10C)		704.4200	715.5840	-4.9	-0.007
Extreme (0C)		704.4200	715.5840	7.4	0.010
Extreme (-10C)		704.4200	715.5840	-15.7	-0.022
Extreme (-20C)		704.4200	715.5840	14.6	0.021
Extreme (-30C)		704.4200	715.5840	3.5	0.005
20C	15%	704.4200	715.5840	-3.2	-0.005
	-15%	704.4200	715.5840	3.0	0.004
	End Point	704.4200	715.5840	3.5	0.005

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8.4.10. LTE BAND 25

ID:	43575 OS	Date:	11/9/18

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	1850.8280	1914.1560		
Extreme (50C)		1850.8280	1914.1560	-11.4	-0.006
Extreme (40C)		1850.8280	1914.1560	-9.6	-0.005
Extreme (30C)		1850.8280	1914.1560	-7.2	-0.004
Extreme (10C)		1850.8280	1914.1560	-5.7	-0.003
Extreme (0C)		1850.8280	1914.1560	-6.7	-0.004
Extreme (-10C)		1850.8280	1914.1560	5.0	0.003
Extreme (-20C)		1850.8280	1914.1560	-6.3	-0.003
Extreme (-30C)		1850.8280	1914.1560	-6.6	-0.004
20C	15%	1850.8280	1914.1560	-7.0	-0.004
	-15%	1850.8280	1914.1560	-7.1	-0.004
	End Point	1850.8280	1914.1560	-7.5	-0.004

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8.4.11. LTE BAND 26 (FCC PART 90S)

ID:	43575 OS	Date:	11/7/18

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	814.0030	823.9670		
Extreme (50C)		814.0030	823.9670	5.5	0.007
Extreme (40C)		814.0030	823.9670	-3.9	-0.005
Extreme (30C)		814.0030	823.9670	-4.7	-0.006
Extreme (10C)		814.0030	823.9670	-4.9	-0.006
Extreme (0C)		814.0030	823.9670	4.9	0.006
Extreme (-10C)		814.0030	823.9670	4.4	0.005
Extreme (-20C)		814.0030	823.9670	-3.8	-0.005
Extreme (-30C)		814.0030	823.9670	4.6	0.006
20C	15%	814.0030	823.9670	3.7	0.005
	-15%	814.0030	823.9670	3.8	0.005
	End Point	814.0030	823.9670	-3.9	-0.005

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8.4.12. LTE BAND 26 (FCC PART 22)

ID:	43575 OS	Date:	11/7/18

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	824.3660	848.4150		
Extreme (50C)		824.3660	848.4150	-8.1	-0.010
Extreme (40C)		824.3660	848.4150	-4.5	-0.005
Extreme (30C)		824.3660	848.4150	3.6	0.004
Extreme (10C)		824.3660	848.4150	4.3	0.005
Extreme (0C)		824.3660	848.4150	4.9	0.006
Extreme (-10C)		824.3660	848.4150	4.4	0.005
Extreme (-20C)		824.3660	848.4150	-3.7	-0.004
Extreme (-30C)		824.3660	848.4150	-3.9	-0.005
20C	15%	824.3660	848.4150	-3.4	-0.004
	-15%	824.3660	848.4150	4.0	0.005
	End Point	824.3660	848.4150	3.7	0.004

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8.4.13. LTE BAND 41 (FCC)

ID:	43575 OS	Date:	11/7/18

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	2496.8840	2689.1040		
Extreme (50C)		2496.8840	2689.1040	-9.8	-0.004
Extreme (40C)		2496.8840	2689.1040	-8.8	-0.003
Extreme (30C)		2496.8840	2689.1040	-7.5	-0.003
Extreme (10C)		2496.8840	2689.1040	7.0	0.003
Extreme (0C)		2496.8840	2689.1040	-7.6	-0.003
Extreme (-10C)		2496.8840	2689.1040	7.6	0.003
Extreme (-20C)		2496.8840	2689.1040	-8.8	-0.003
Extreme (-30C)		2496.8840	2689.1040	-10.8	-0.004
20C	15%	2496.8840	2689.1040	-9.0	-0.003
	-15%	2496.8840	2689.1040	-9.2	-0.004
	End Point	2496.8840	2689.1040	-10.3	-0.004

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8.4.14. LTE BAND 66

ID:	43575 OS	Date:	11/7/18

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	1710.8280	1779.1760		
Extreme (50C)		1710.8280	1779.1760	-7.1	-0.004
Extreme (40C)		1710.8280	1779.1760	-7.3	-0.004
Extreme (30C)		1710.8280	1779.1760	-5.0	-0.003
Extreme (10C)		1710.8280	1779.1760	-5.9	-0.003
Extreme (0C)		1710.8280	1779.1760	8.7	0.005
Extreme (-10C)		1710.8280	1779.1760	5.6	0.003
Extreme (-20C)		1710.8280	1779.1760	-5.1	-0.003
Extreme (-30C)		1710.8280	1779.1760	-6.3	-0.004
20C	15%	1710.8280	1779.1760	-5.6	-0.003
	-15%	1710.8280	1779.1760	-3.8	-0.002
	End Point	1710.8280	1779.1760	-5.7	-0.003

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8.5. PEAK TO AVERAGE RATIO

LIMITS

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

LAT 1 antenna was used to measure as the worst case. The results from all CCDF plots are passed with 13dB peak-to-average power ratio criteria.

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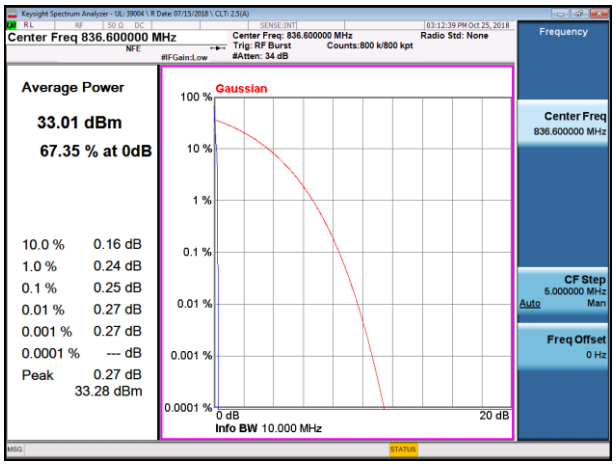
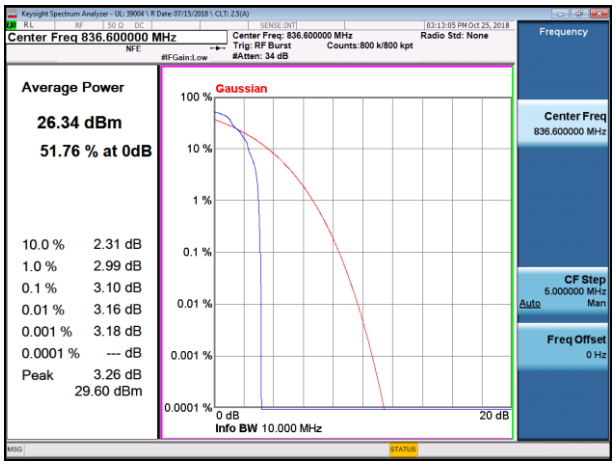
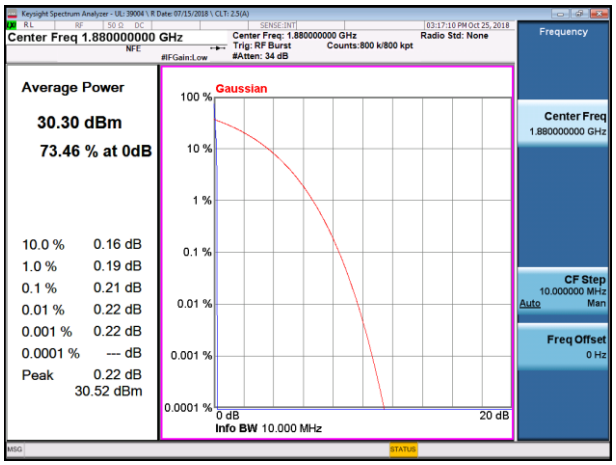
8.5.1. GSM



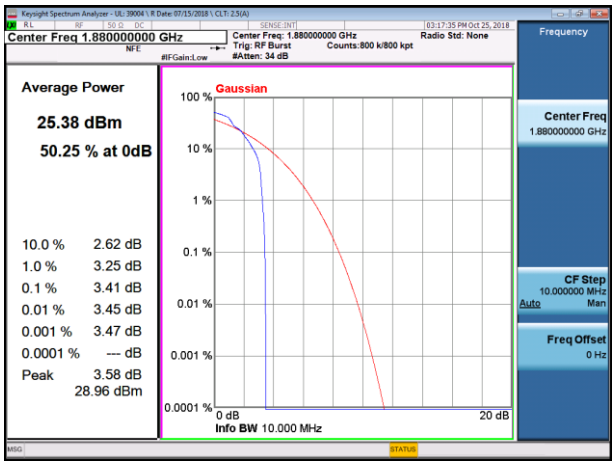
GSM 850MHz GPRS MID Channel



GSM 850MHz EGPRS MID Channel



GSM 1900MHz GPRS MID Channel



GSM 1900MHz EGPRS MID Channel

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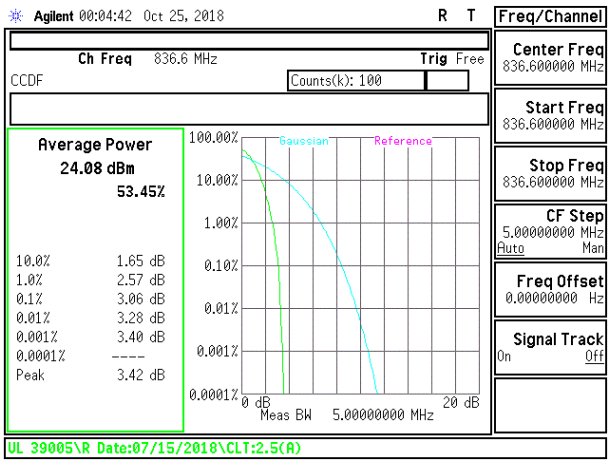
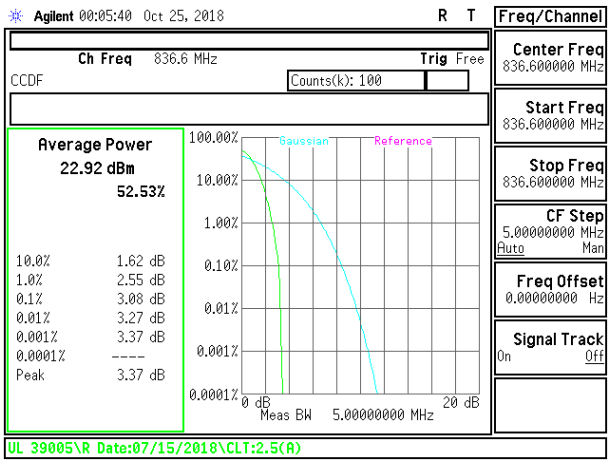
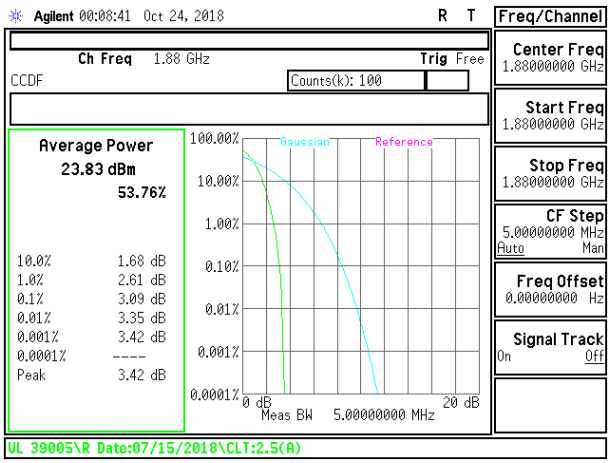
8.5.2. WCDMA



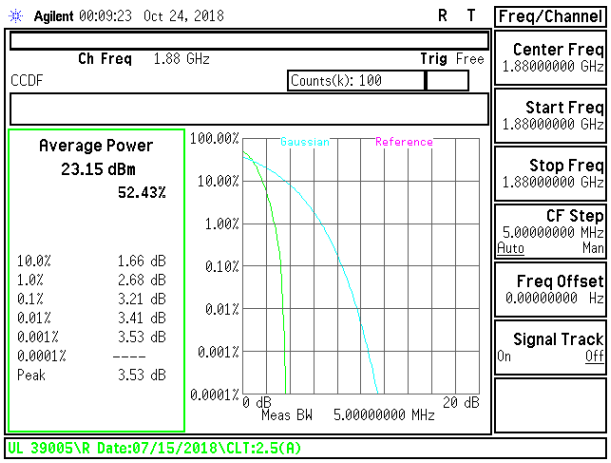
WCDMA BAND5 Rel99 MID Channel



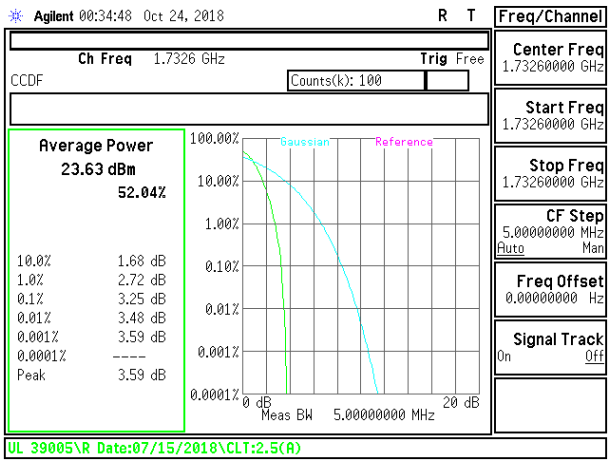
WCDMA BAND5 HSDPA MID Channel



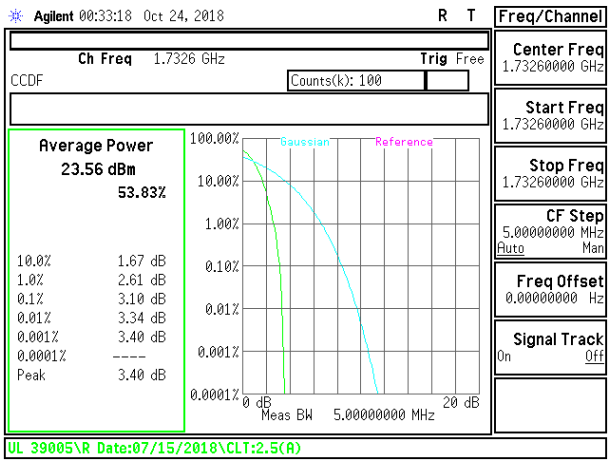
WCDMA BAND2 Rel99 MID Channel



WCDMA BAND2 HSDPA MID Channel



WCDMA BAND4 Rel99 MID Channel



WCDMA BAND4 HSDPA MID Channel

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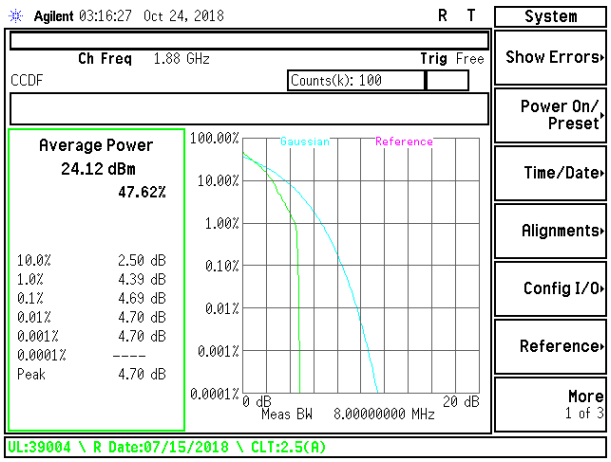
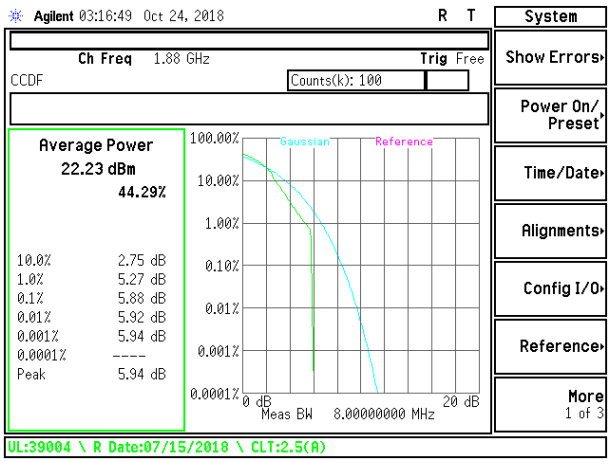
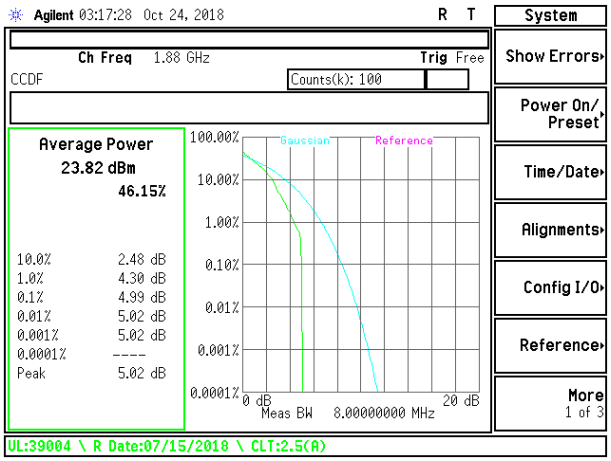
8.5.3. LTE BAND 2



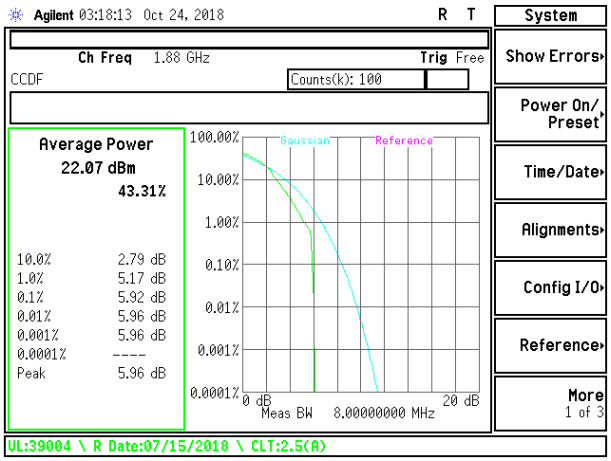
LTE B2 1.4MHz QPSK Mid Channel



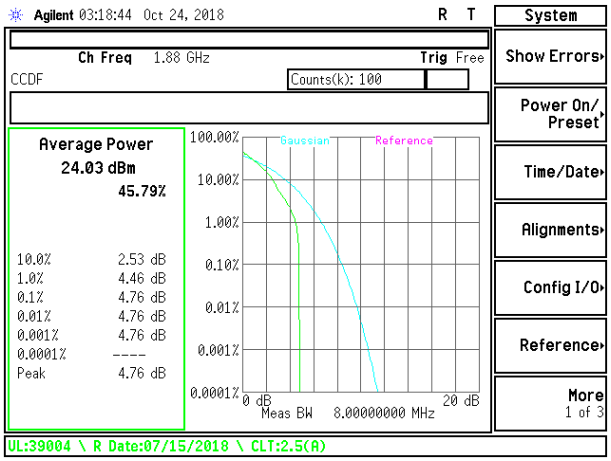
LTE B2 1.4MHz 16QAM Mid Channel



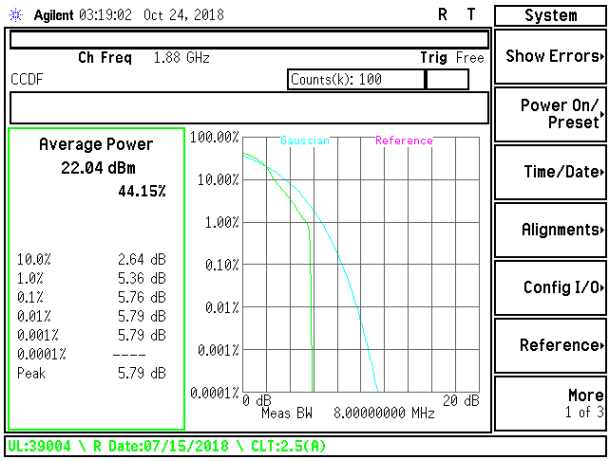
LTE B2 3MHz QPSK Mid Channel



LTE B2 3MHz 16QAM Mid Channel



LTE B2 5MHz QPSK Mid Channel



LTE B2 5MHz 16QAM Mid Channel

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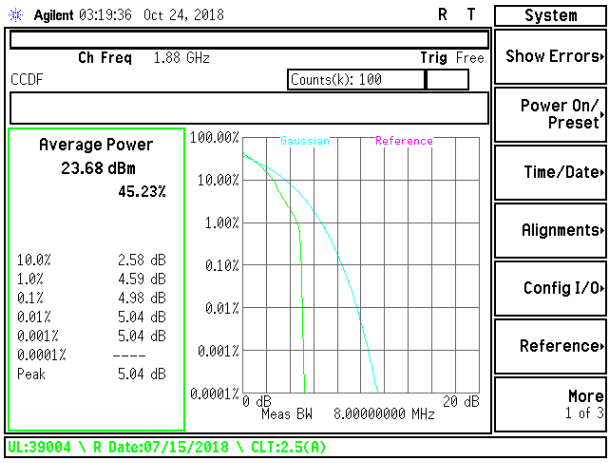
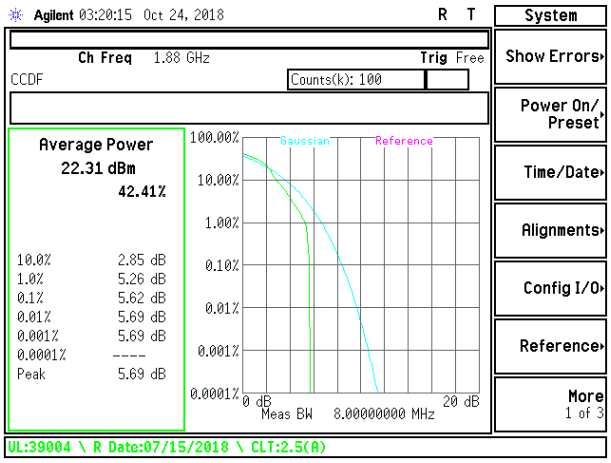
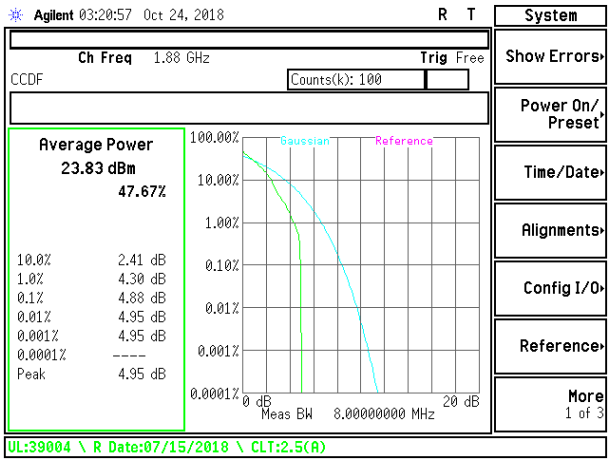


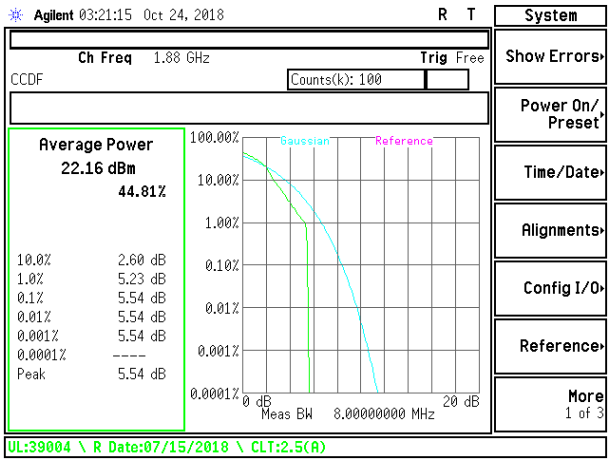
LTE B2 10MHz QPSK Mid Channel



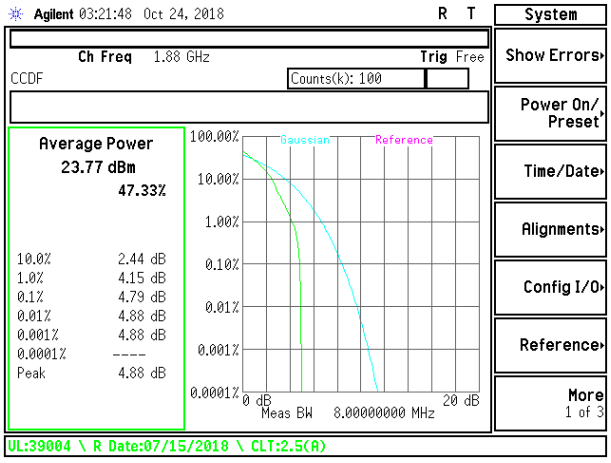
LTE B2 10MHz 16QAM Mid Channel



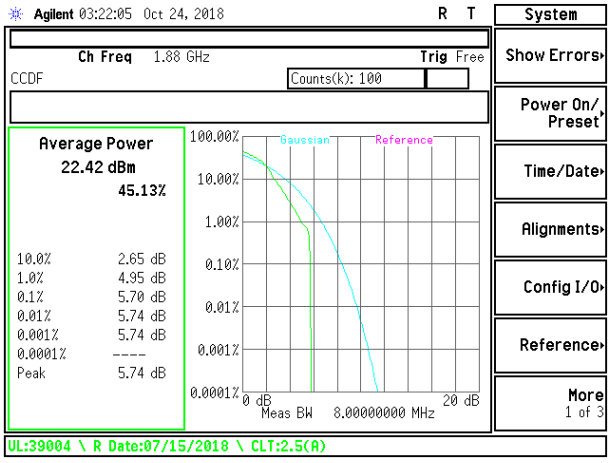
LTE B2 15MHz QPSK Mid Channel



LTE B2 15MHz 16QAM Mid Channel



LTE B2 20MHz QPSK Mid Channel



LTE B2 20MHz 16QAM Mid Channel

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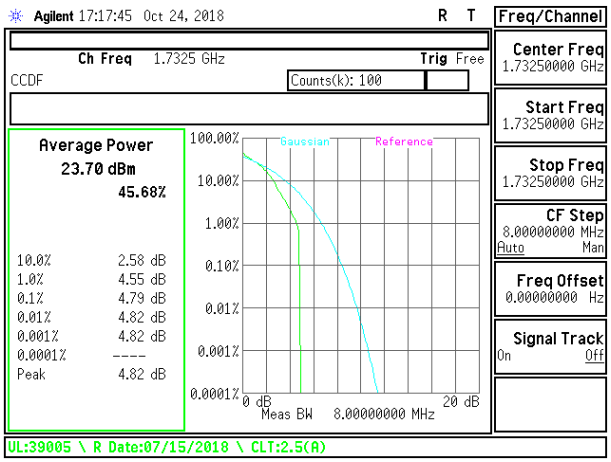
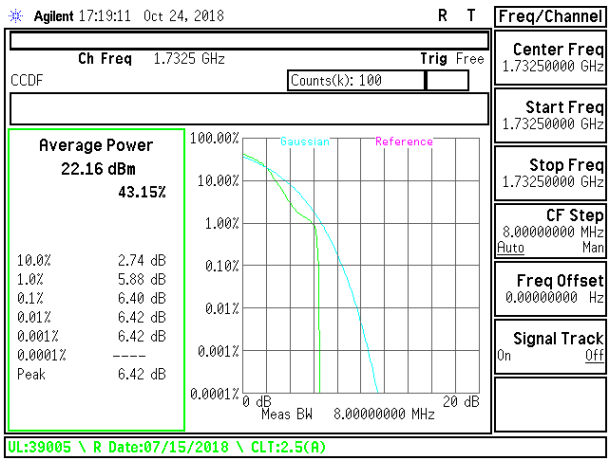
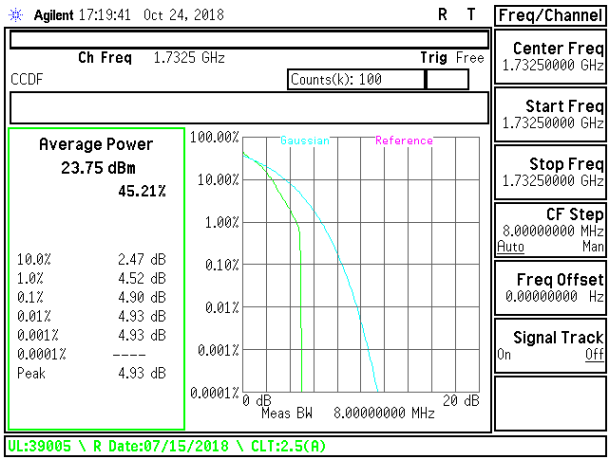
8.5.4. LTE BAND 4



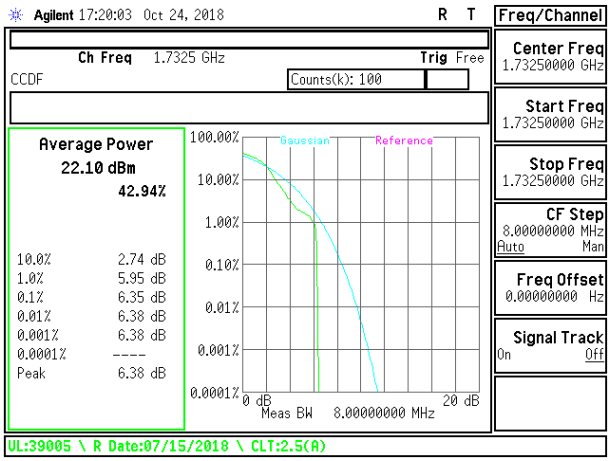
LTE B4 1.4MHz QPSK Mid Channel



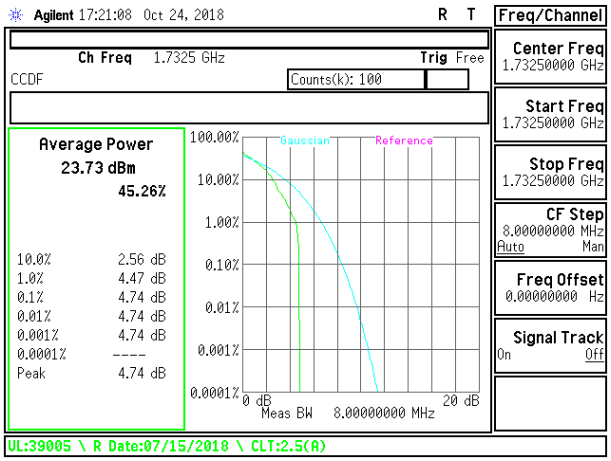
LTE B4 1.4MHz 16QAM Mid Channel



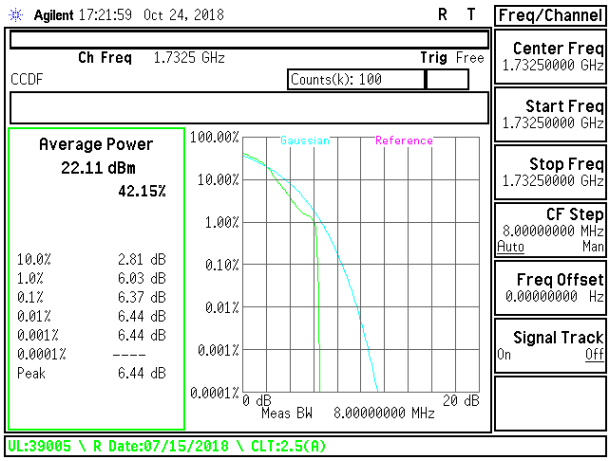
LTE B4 3MHz QPSK Mid Channel



LTE B4 3MHz 16QAM Mid Channel



LTE B4 5MHz QPSK Mid Channel



LTE B4 5MHz 16QAM Mid Channel

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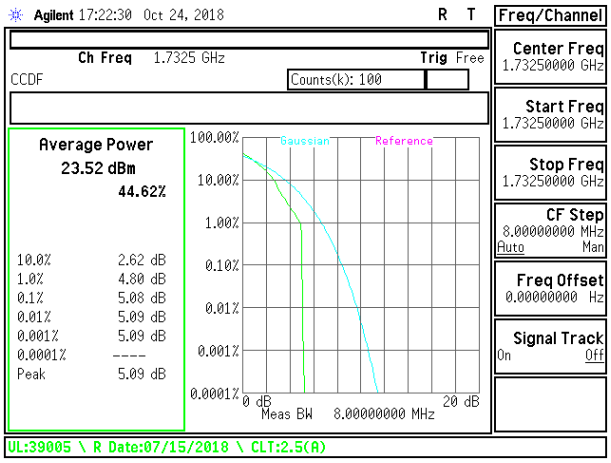
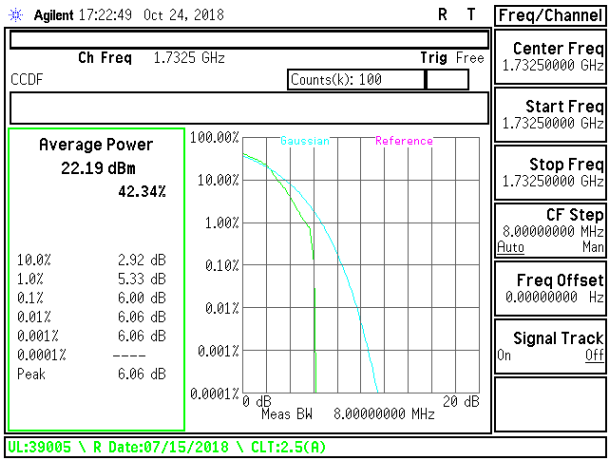
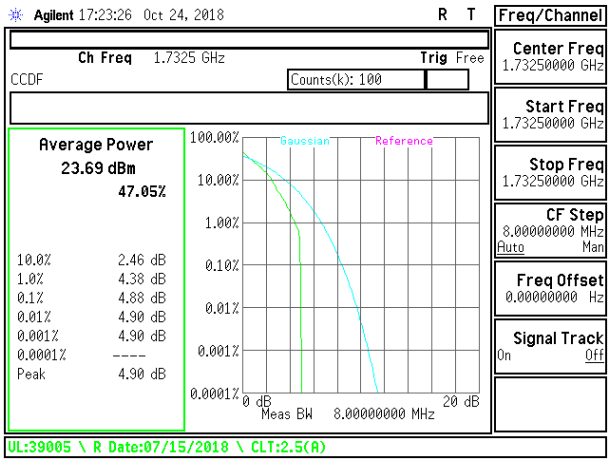


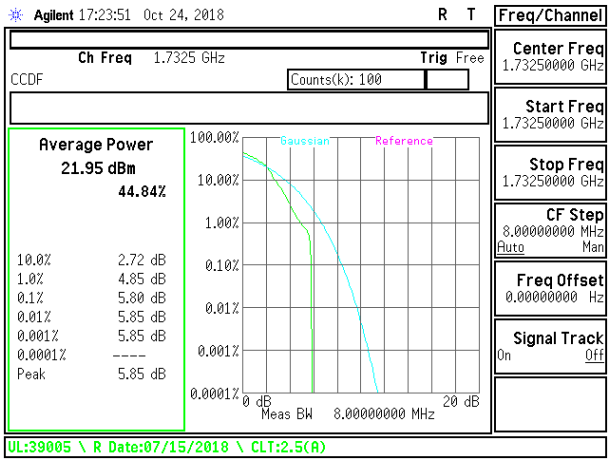
LTE B4 10MHz QPSK Mid Channel



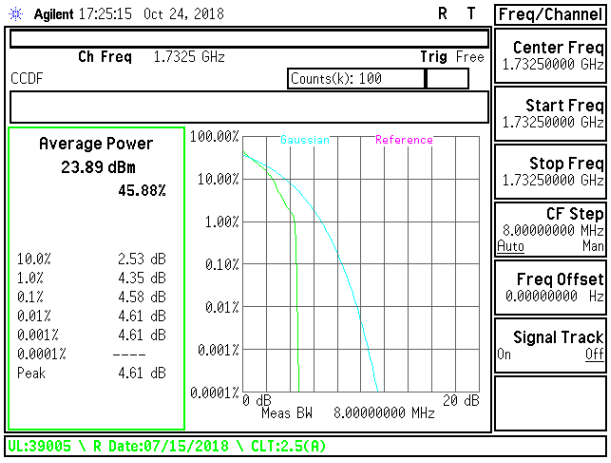
LTE B4 10MHz 16QAM Mid Channel



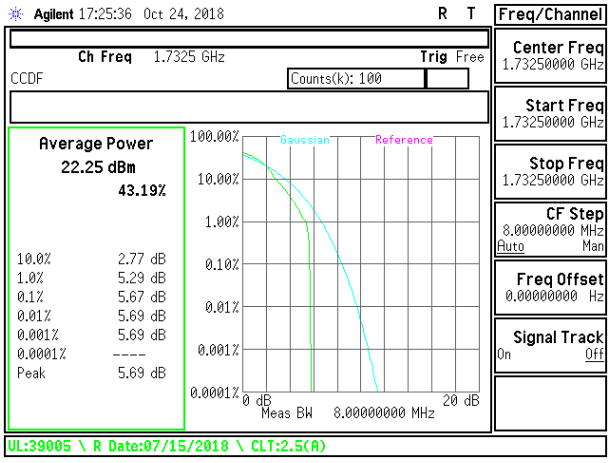
LTE B4 15MHz QPSK Mid Channel



LTE B4 15MHz 16QAM Mid Channel



LTE B4 20MHz QPSK Mid Channel



LTE B4 20MHz 16QAM Mid Channel

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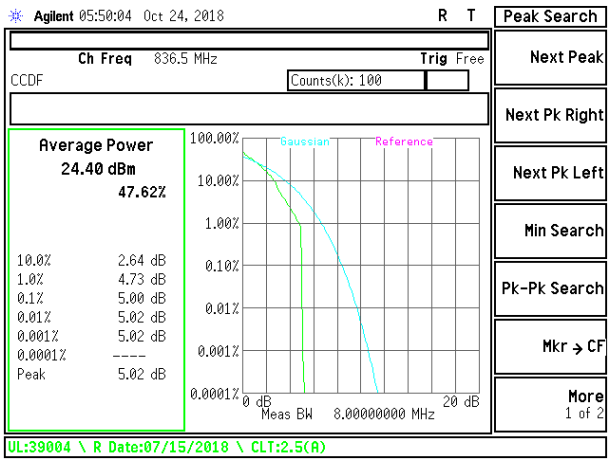
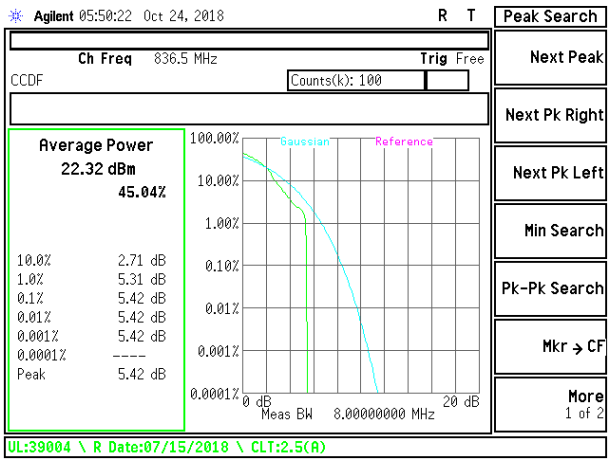
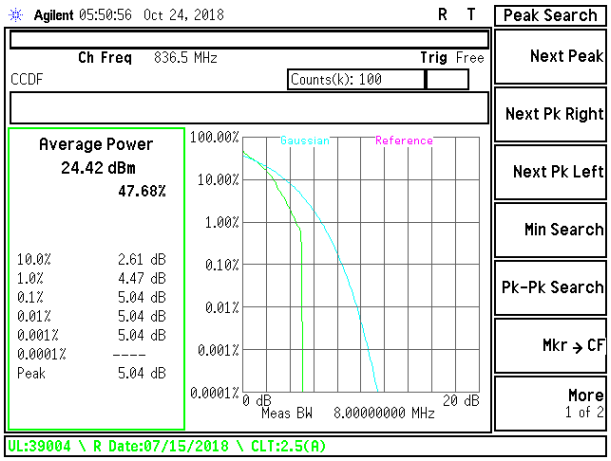
8.5.5. LTE BAND 5



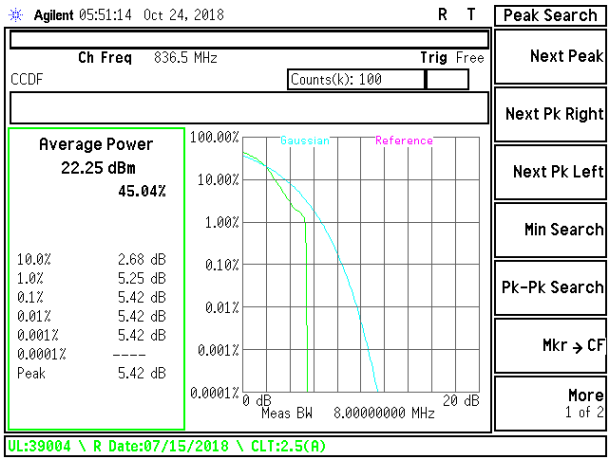
LTE B5 1.4MHz QPSK Mid Channel



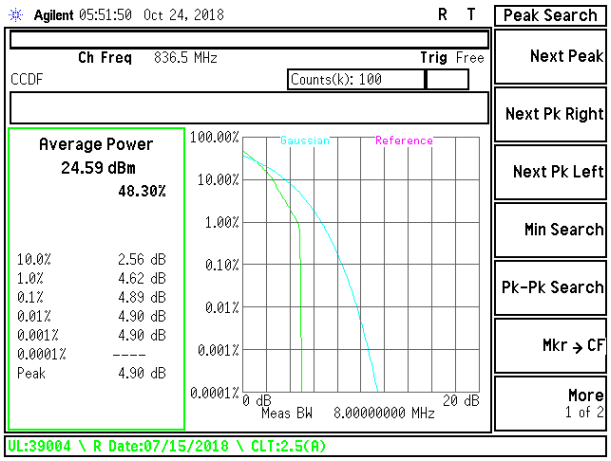
LTE B5 1.4MHz 16QAM Mid Channel



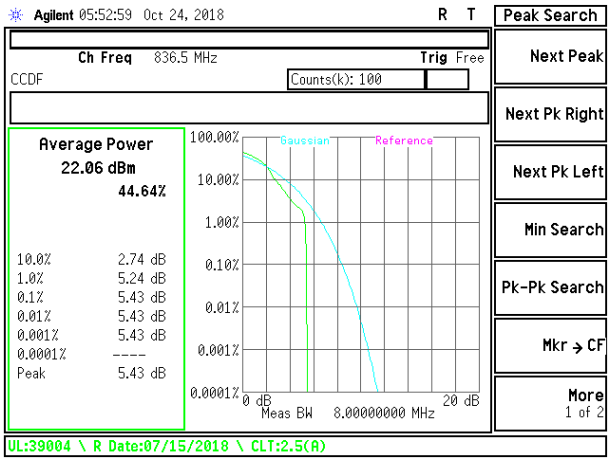
LTE B5 3MHz QPSK Mid Channel



LTE B5 3MHz 16QAM Mid Channel



LTE B5 5MHz QPSK Mid Channel



LTE B5 5MHz 16QAM Mid Channel

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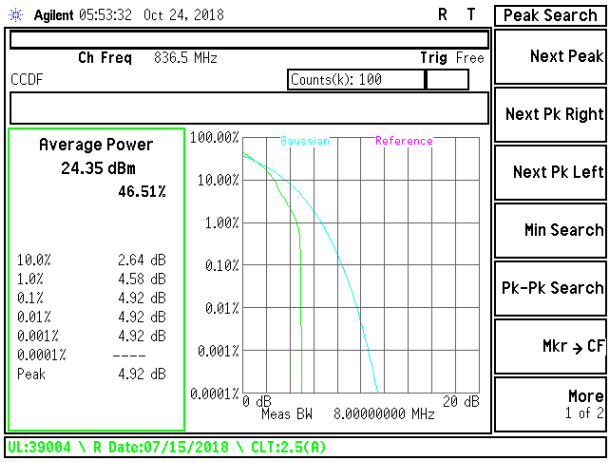
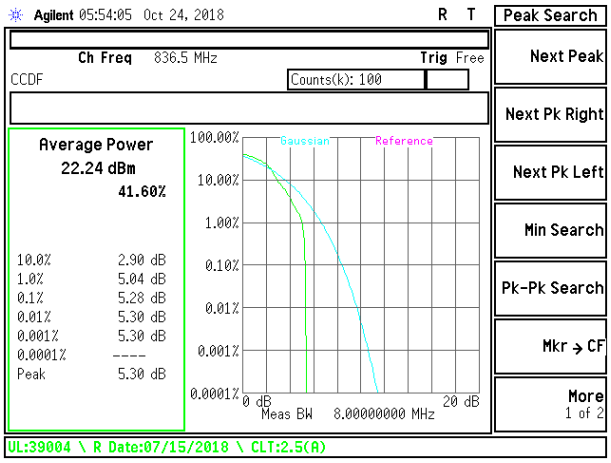


LTE B5 10MHz QPSK Mid Channel



LTE B5 10MHz 16QAM Mid Channel

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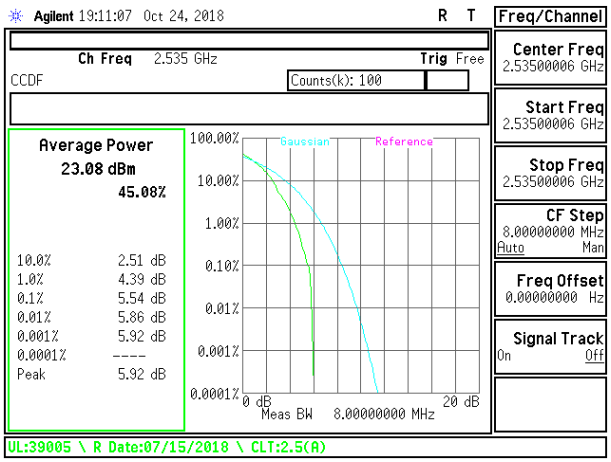
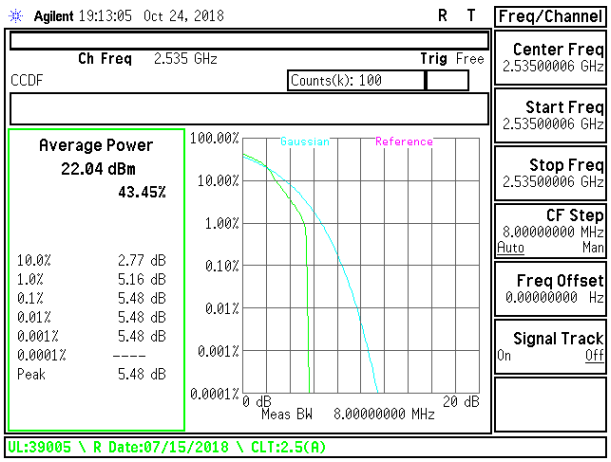
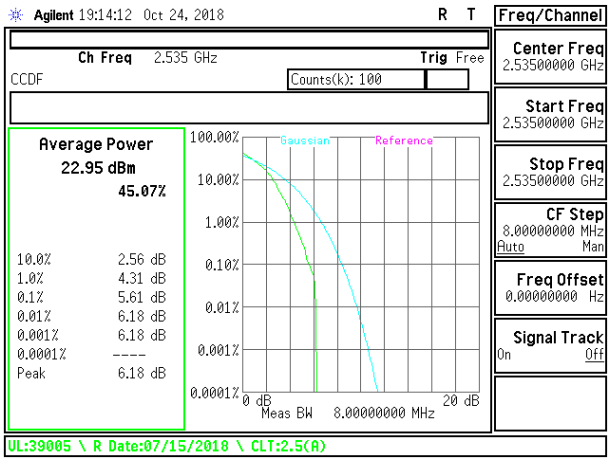
8.5.6. LTE BAND 7



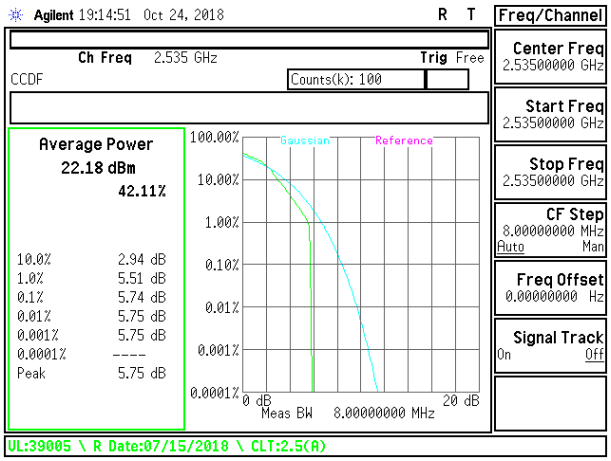
LTE B7 5MHz QPSK Mid Channel



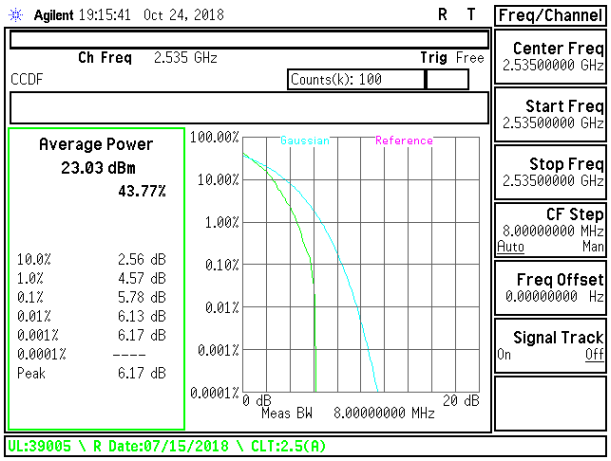
LTE B7 5MHz 16QAM Mid Channel



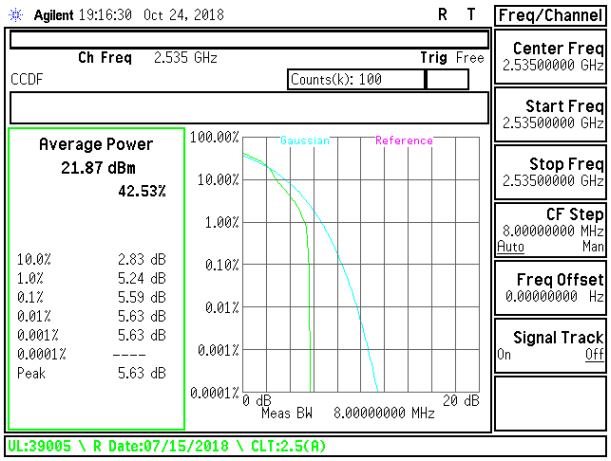
LTE B7 10MHz QPSK Mid Channel



LTE B7 10MHz 16QAM Mid Channel



LTE B7 15MHz QPSK Mid Channel



LTE B7 15MHz 16QAM Mid Channel

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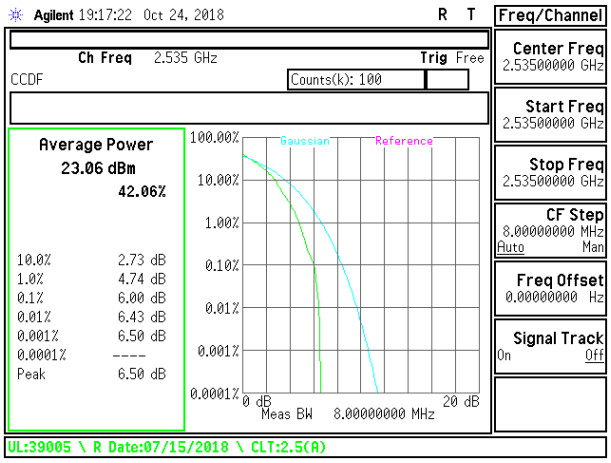
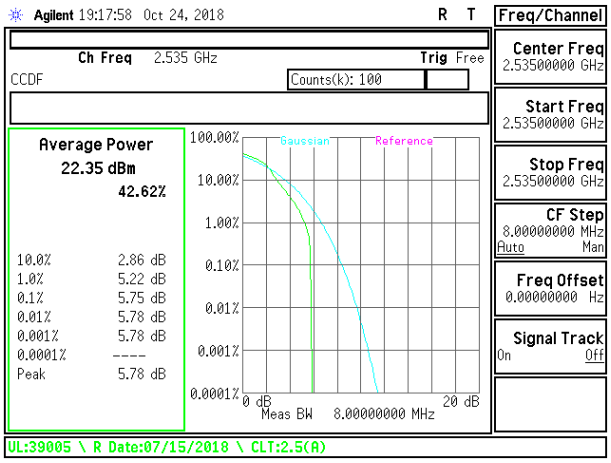


LTE B7 20MHz QPSK Mid Channel



LTE B7 20MHz 16QAM Mid Channel

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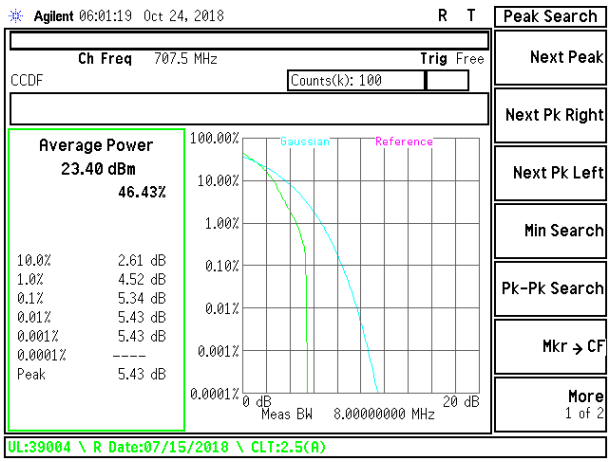
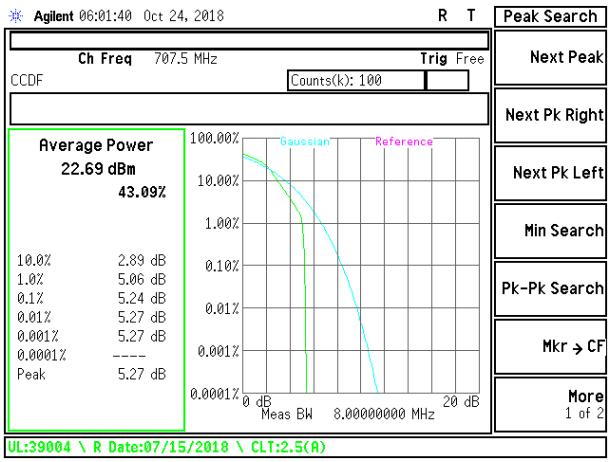
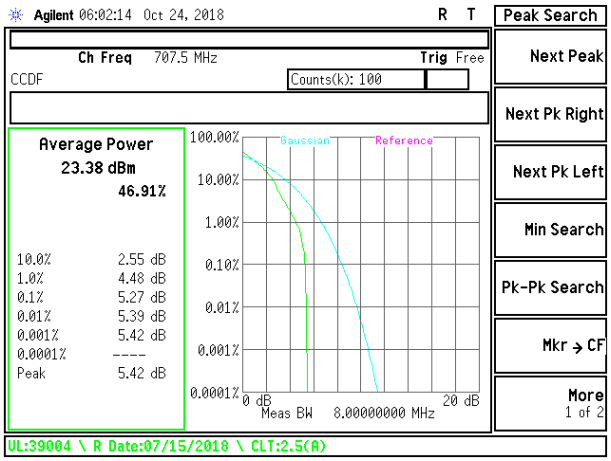
8.5.7. LTE BAND 12



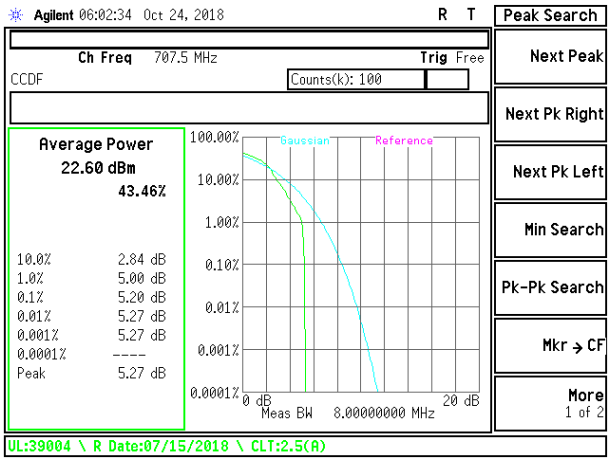
LTE B12 1.4MHz QPSK Mid Channel



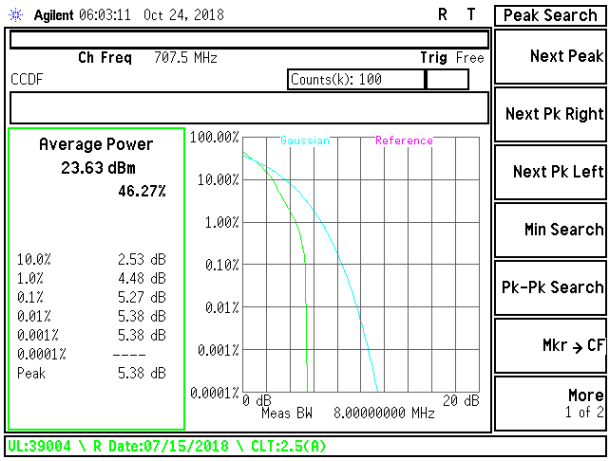
LTE B12 1.4MHz 16QAM Mid Channel



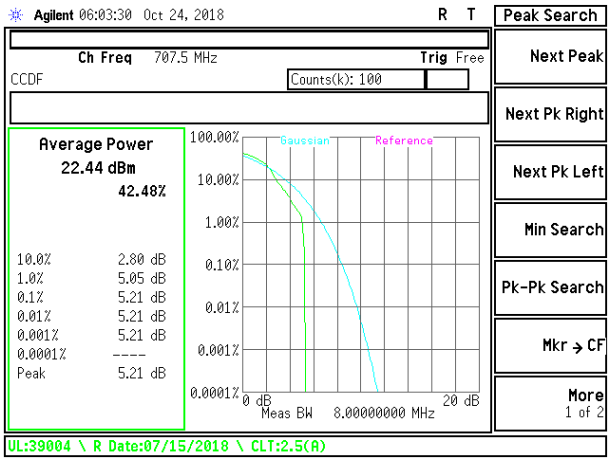
LTE B12 3MHz QPSK Mid Channel



LTE B12 3MHz 16QAM Mid Channel



LTE B12 5MHz QPSK Mid Channel



LTE B12 5MHz 16QAM Mid Channel

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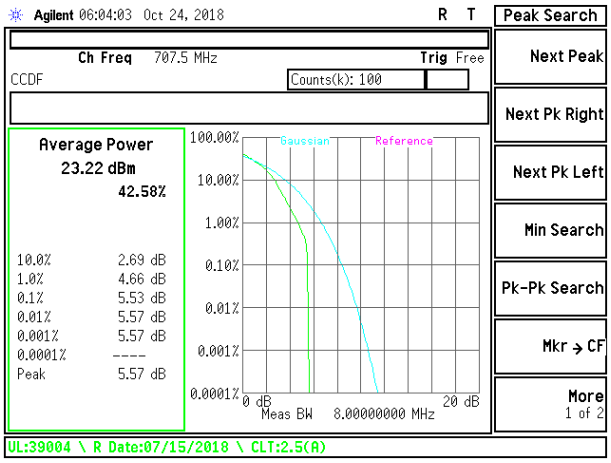
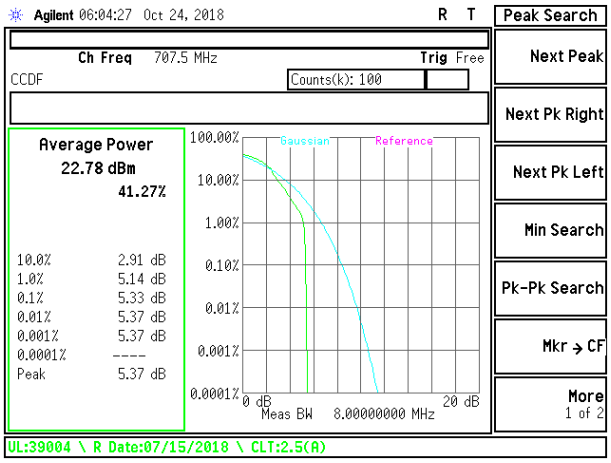


LTE B12 10MHz QPSK Mid Channel



LTE B12 10MHz 16QAM Mid Channel

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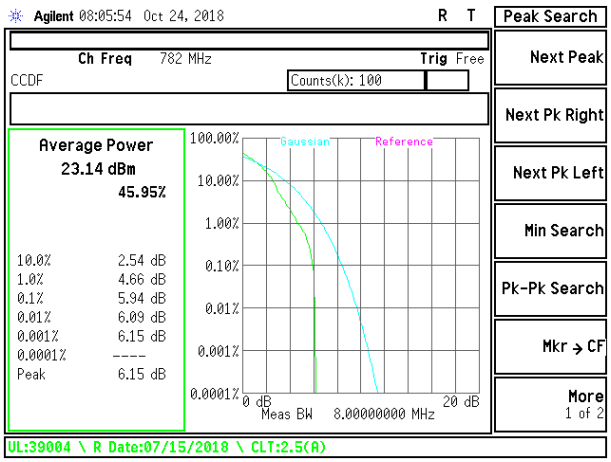
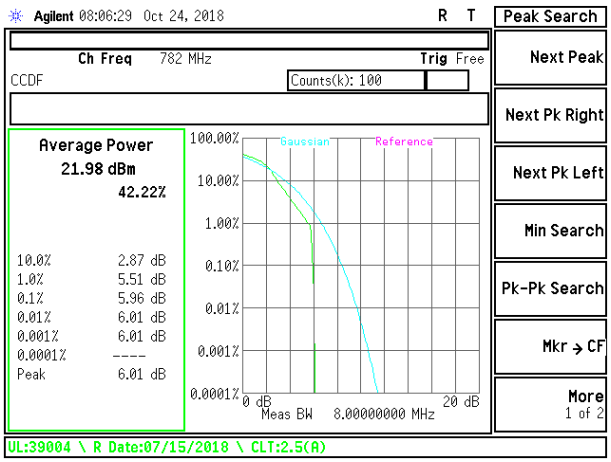
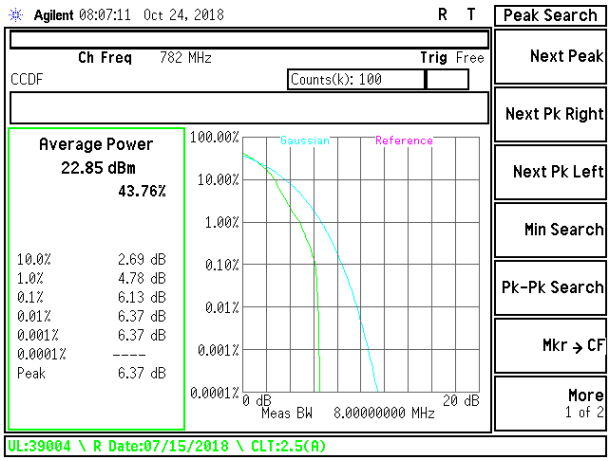
8.5.8. LTE BAND 13



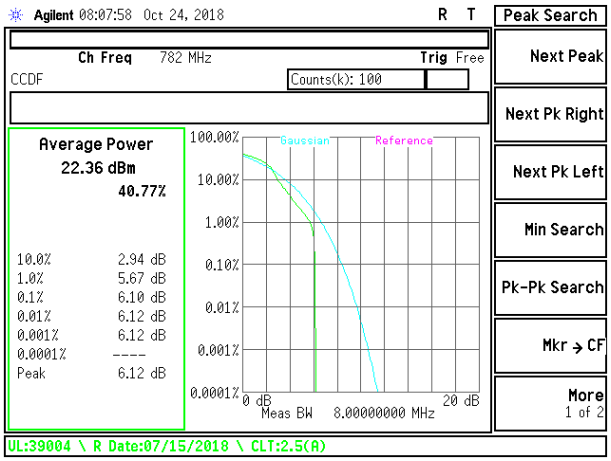
LTE B13 5MHz QPSK Mid Channel



LTE B13 5MHz 16QAM Mid Channel



LTE B13 10MHz QPSK Mid Channel



LTE B13 10MHz 16QAM Mid Channel

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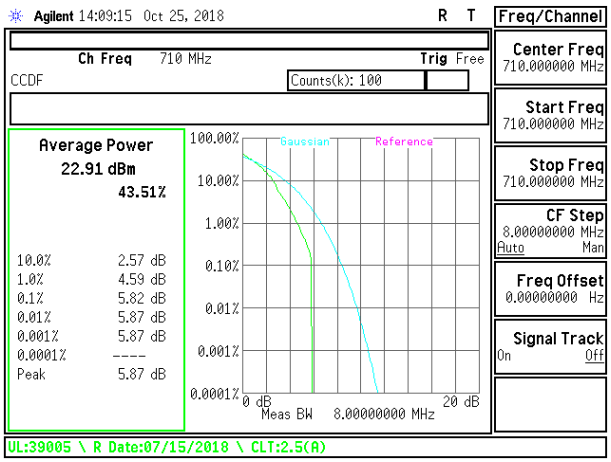
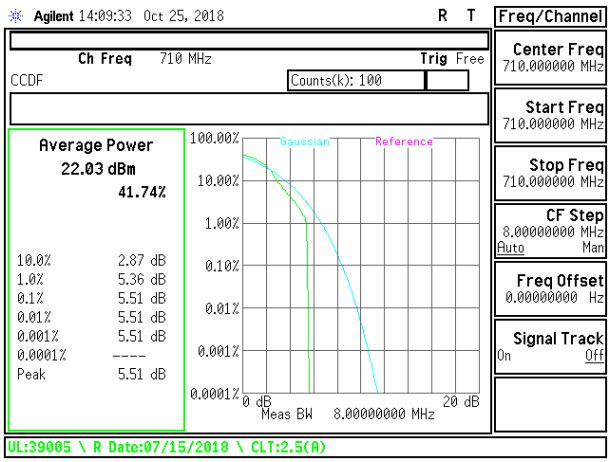
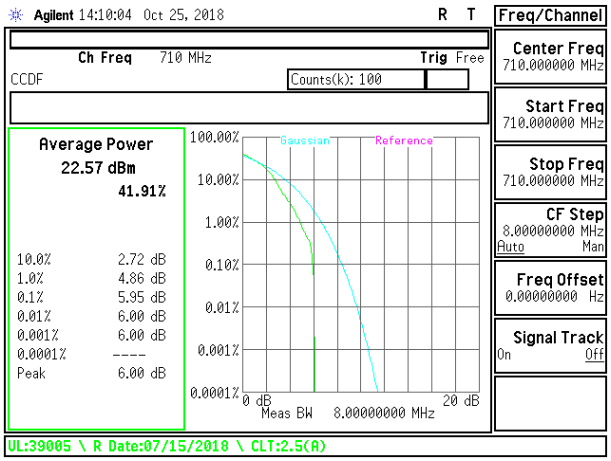
8.5.9. LTE BAND 17



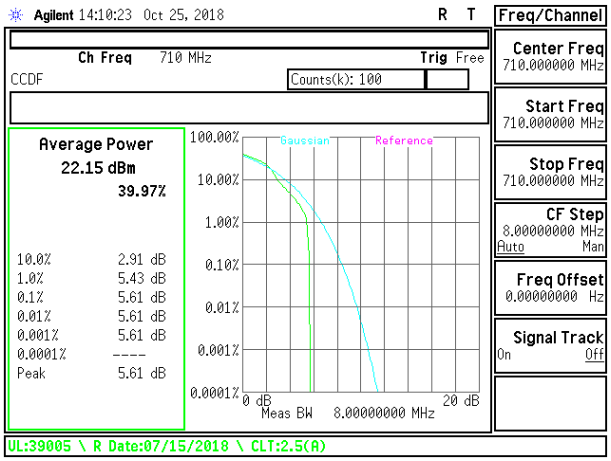
LTE B17 5MHz QPSK Mid Channel



LTE B17 5MHz 16QAM Mid Channel



LTE B17 10MHz QPSK Mid Channel



LTE B17 10MHz 16QAM Mid Channel

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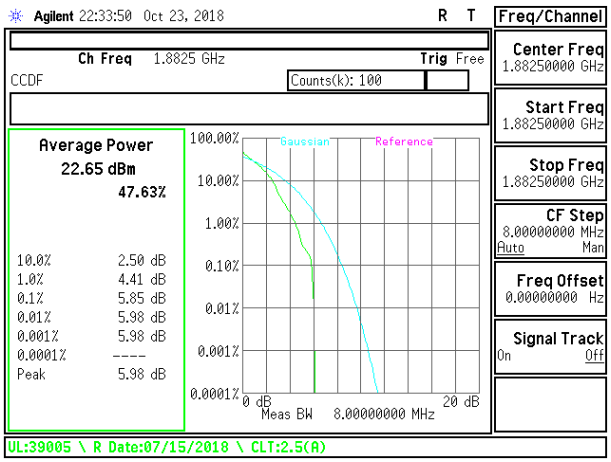
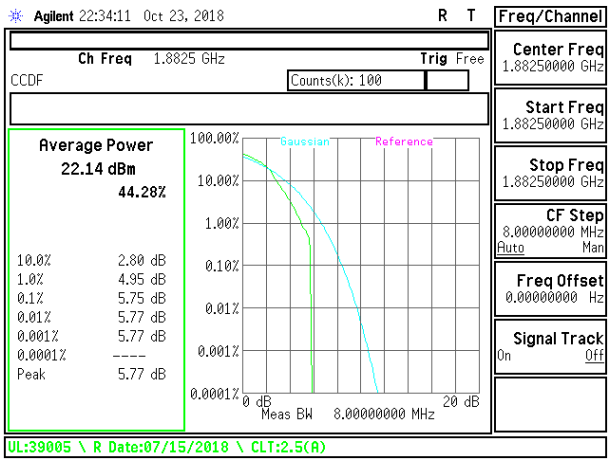
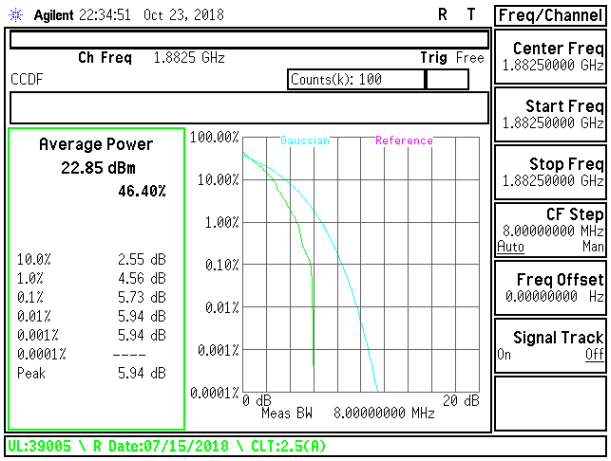
8.5.10. LTE BAND 25



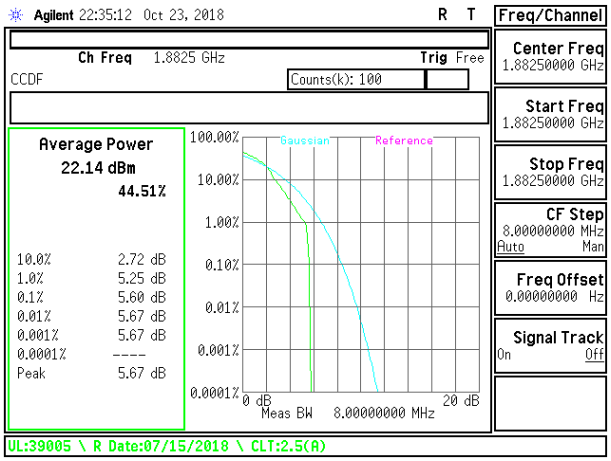
LTE B25 1.4MHz QPSK Mid Channel



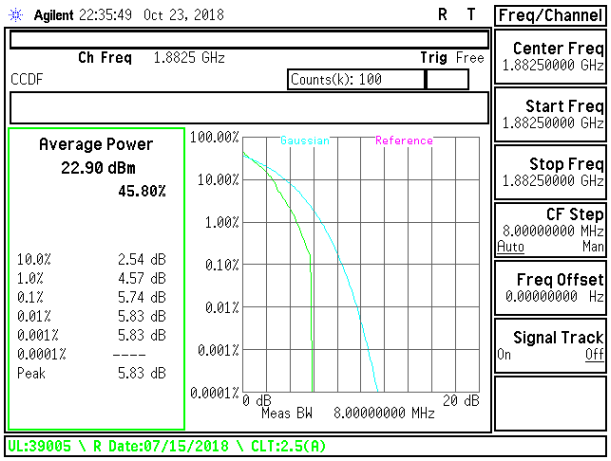
LTE B25 1.4MHz 16QAM Mid Channel



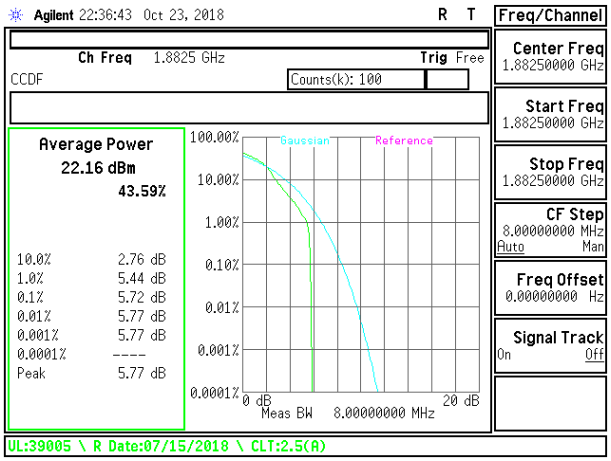
LTE B25 3MHz QPSK Mid Channel



LTE B25 3MHz 16QAM Mid Channel



LTE B25 5MHz QPSK Mid Channel



LTE B25 5MHz 16QAM Mid Channel

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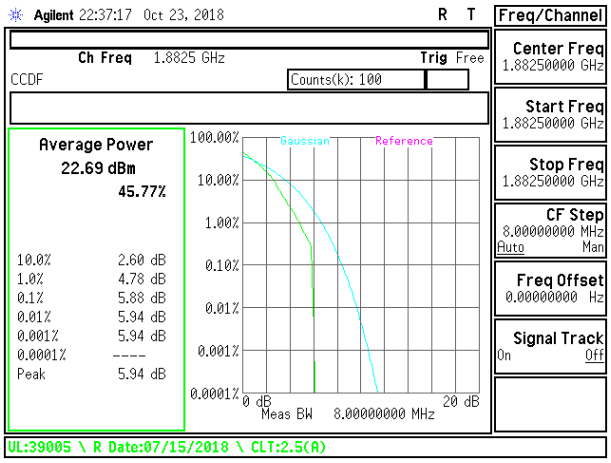
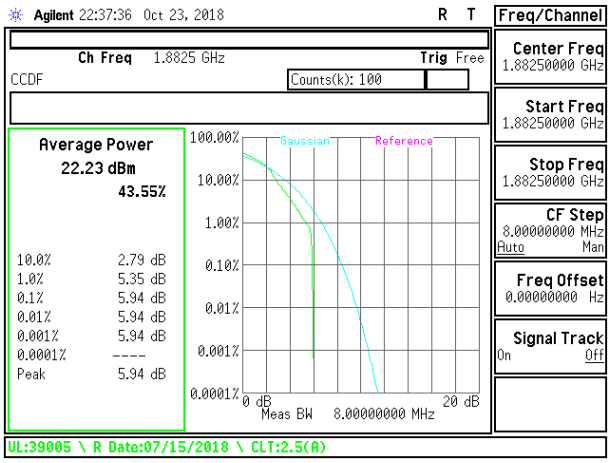
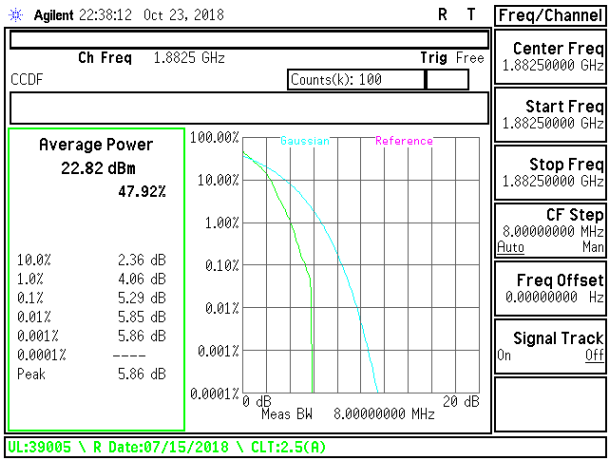


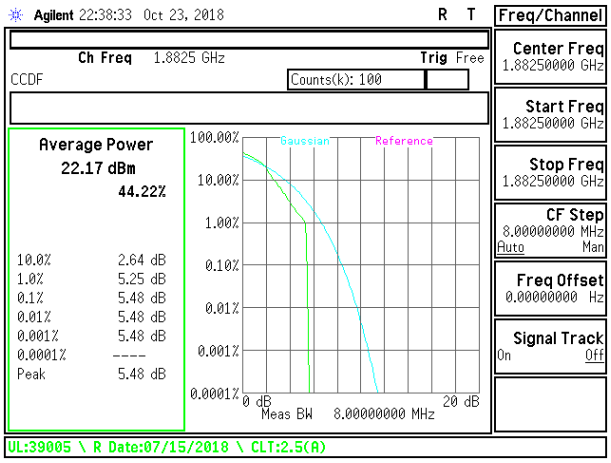
LTE B25 10MHz QPSK Mid Channel



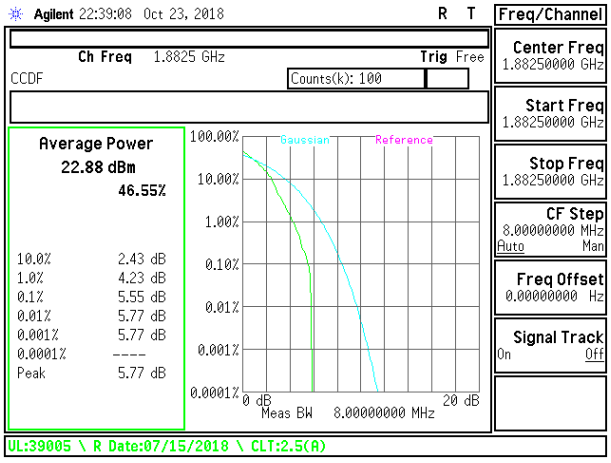
LTE B25 10MHz 16QAM Mid Channel



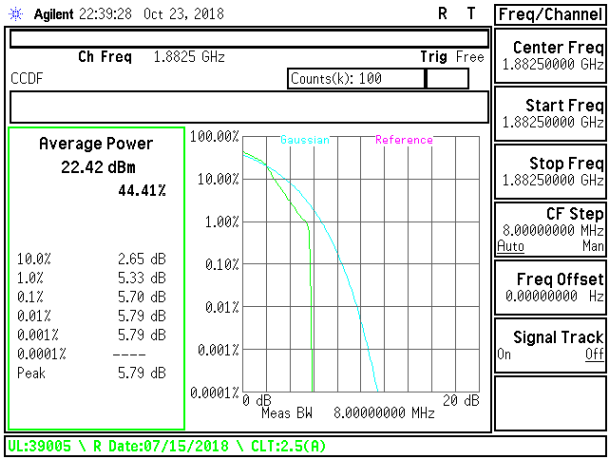
LTE B25 15MHz QPSK Mid Channel



LTE B25 15MHz 16QAM Mid Channel



LTE B25 20MHz QPSK Mid Channel



LTE B25 20MHz 16QAM Mid Channel

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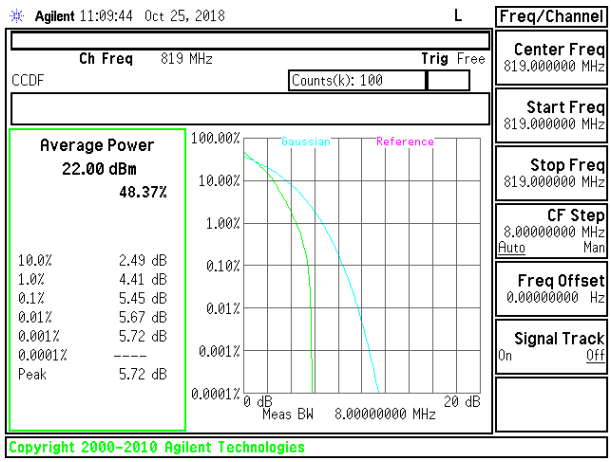
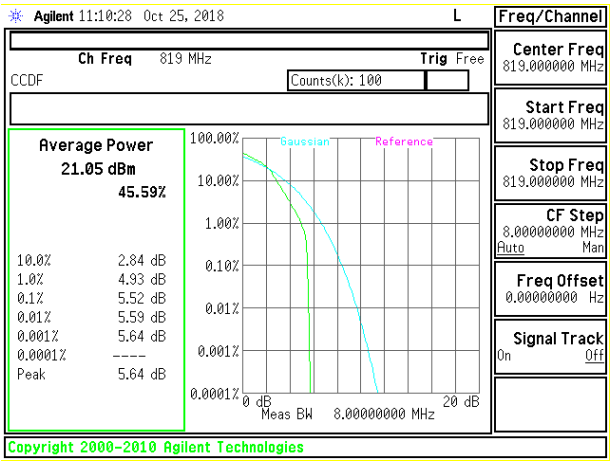
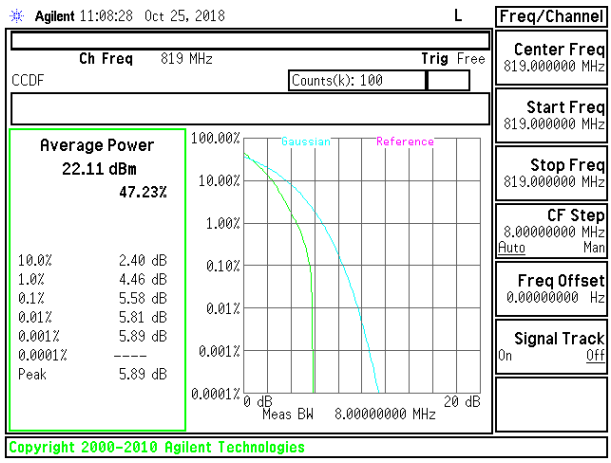
8.5.11. LTE BAND 26 (FCC PART 90S)



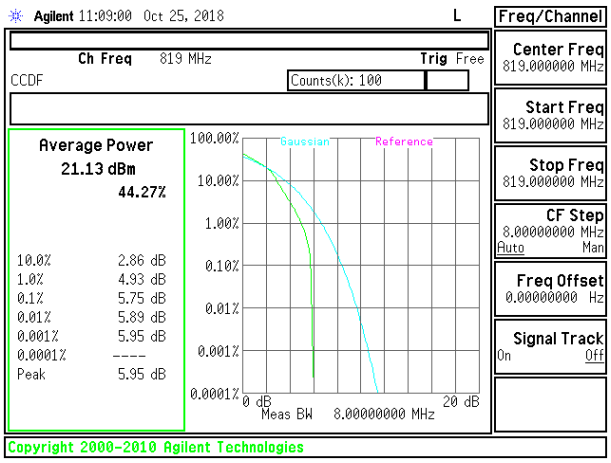
LTE B26 1.4MHz QPSK Mid Channel



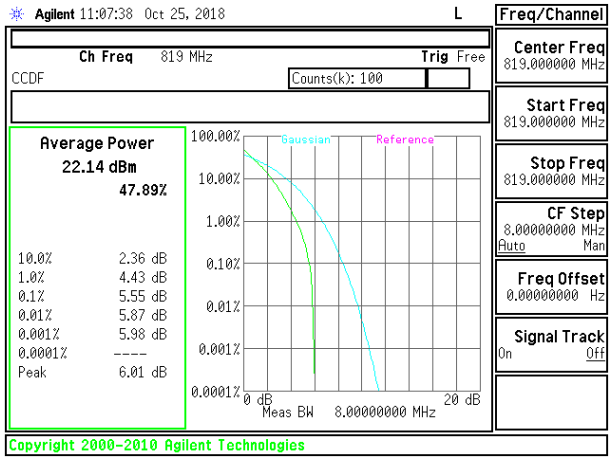
LTE B26 1.4MHz 16QAM Mid Channel



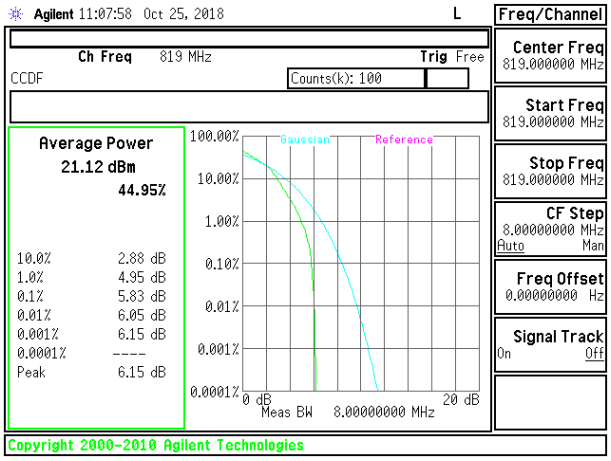
LTE B26 3MHz QPSK Mid Channel



LTE B26 3MHz 16QAM Mid Channel



LTE B26 5MHz QPSK Mid Channel



LTE B26 5MHz 16QAM Mid Channel

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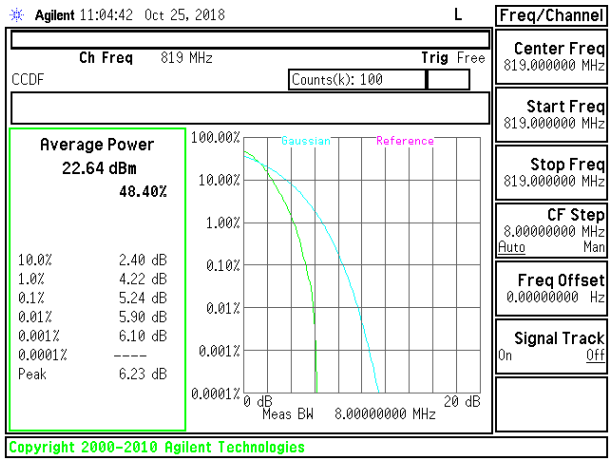
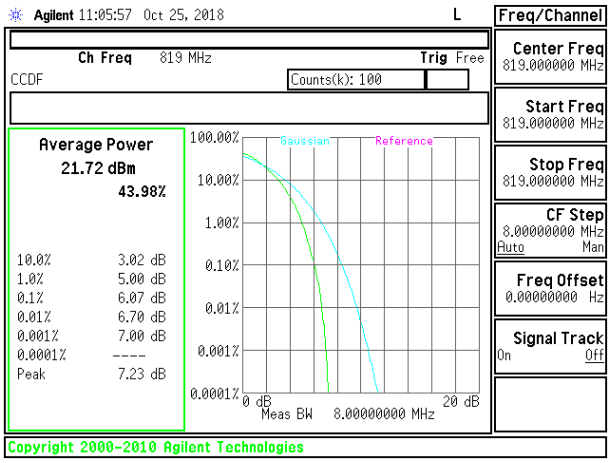
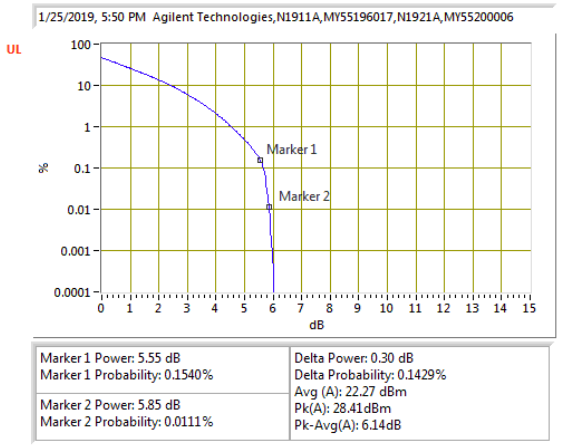


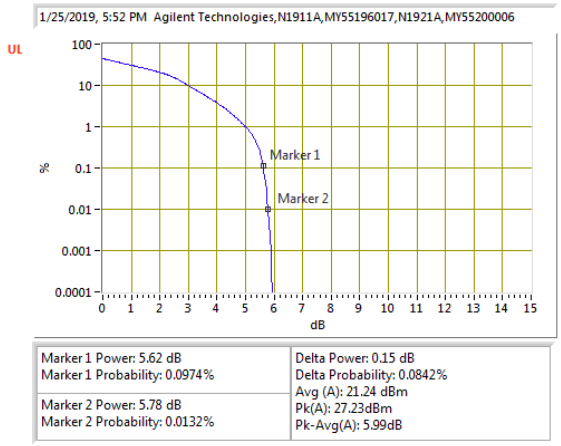
LTE B26 10MHz QPSK Mid Channel



LTE B26 10MHz 16QAM Mid Channel



LTE B26 15MHz QPSK Mid Channel



LTE B26 15MHz 16QAM Mid Channel

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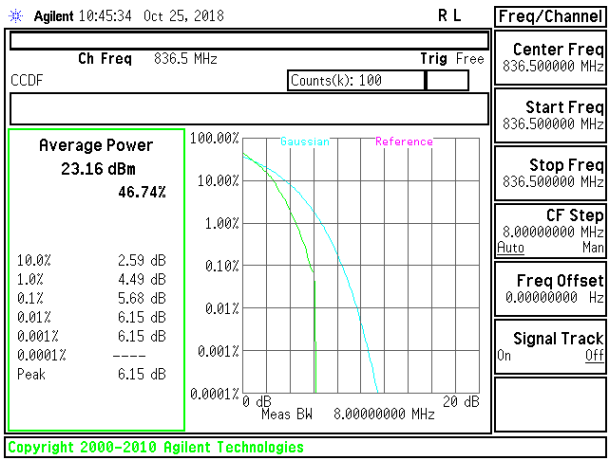
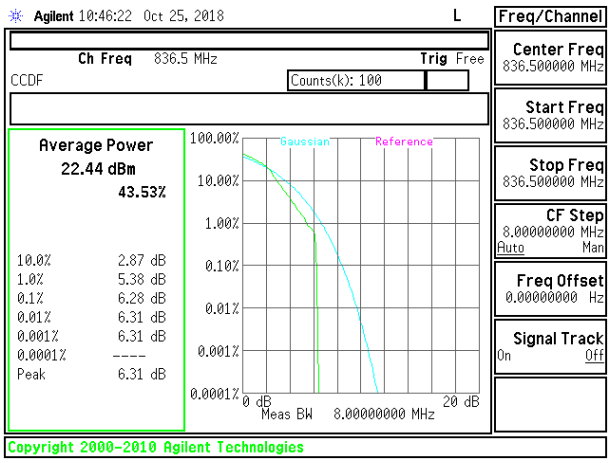
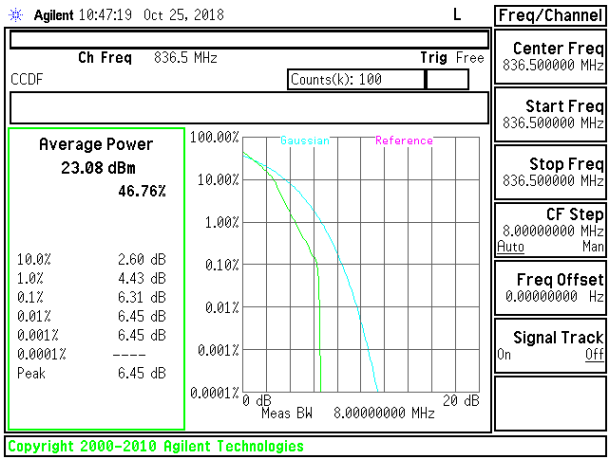
8.5.12. LTE BAND 26 (FCC PART 22)



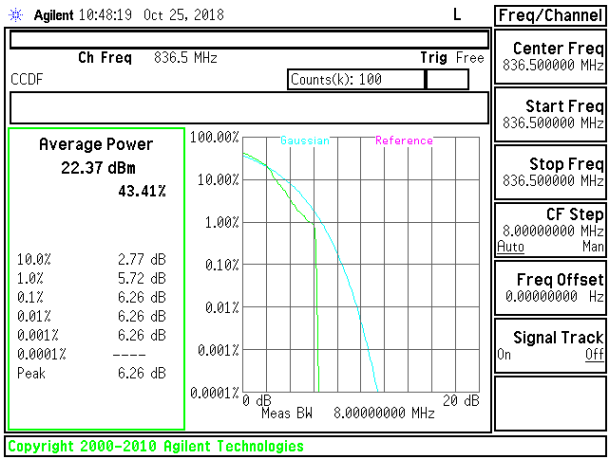
LTE B26 1.4MHz QPSK Mid Channel



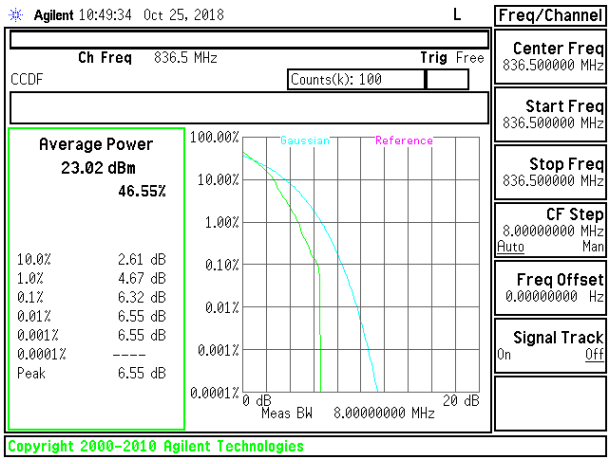
LTE B26 1.4MHz 16QAM Mid Channel



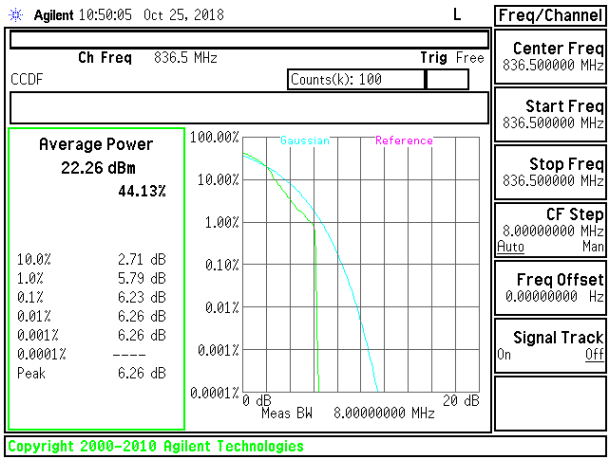
LTE B26 3MHz QPSK Mid Channel



LTE B26 3MHz 16QAM Mid Channel



LTE B26 5MHz QPSK Mid Channel



LTE B26 5MHz 16QAM Mid Channel

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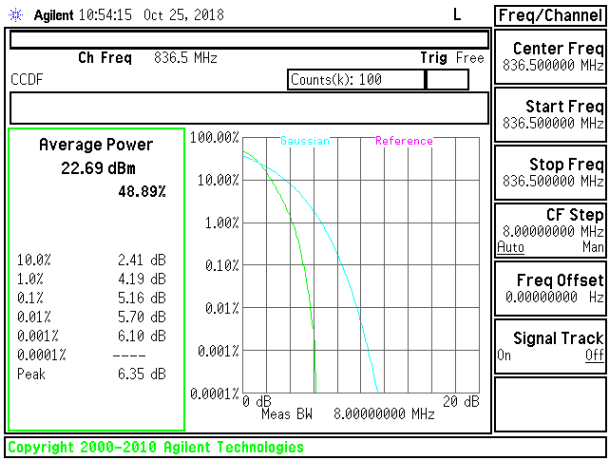
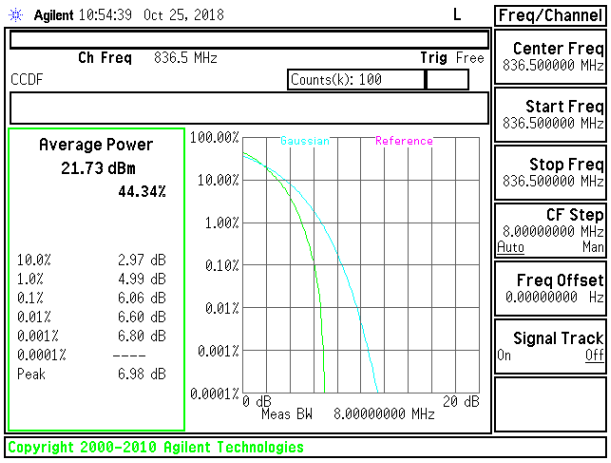
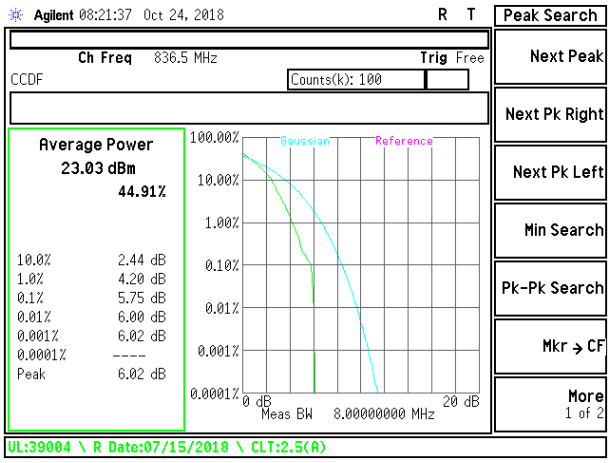


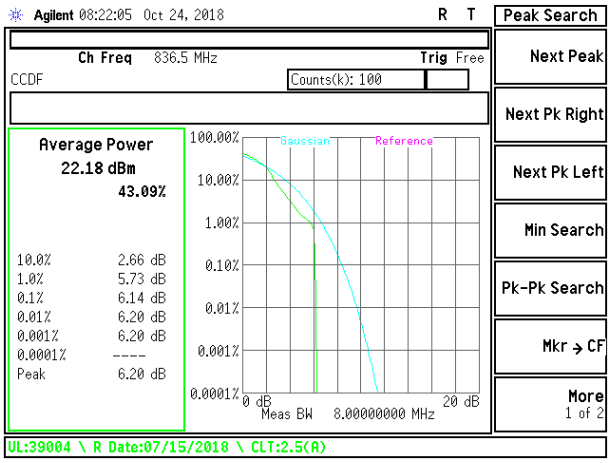
LTE B26 10MHz QPSK Mid Channel



LTE B26 10MHz 16QAM Mid Channel



LTE B26 15MHz QPSK Mid Channel



LTE B26 15MHz 16QAM Mid Channel

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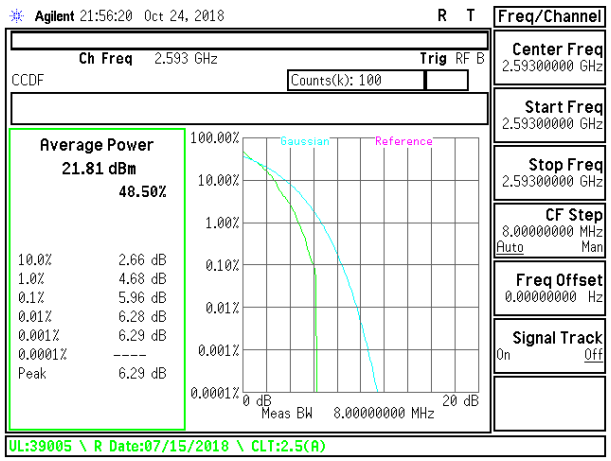
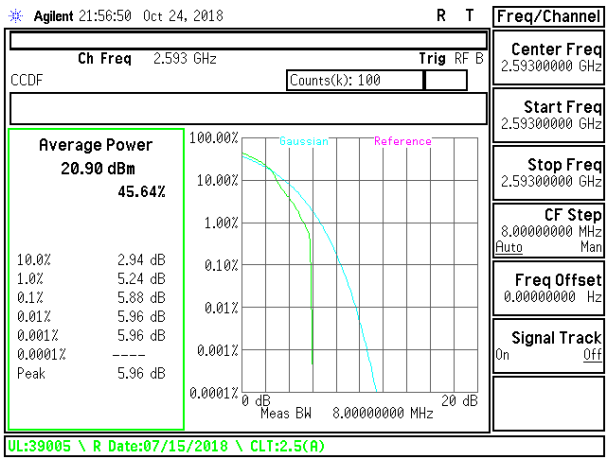
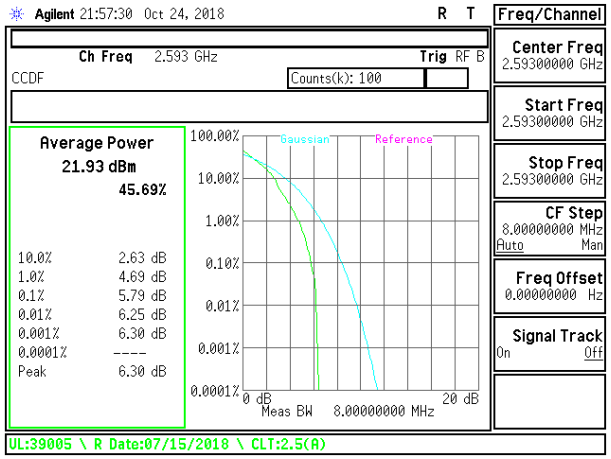
8.5.13. LTE BAND 41



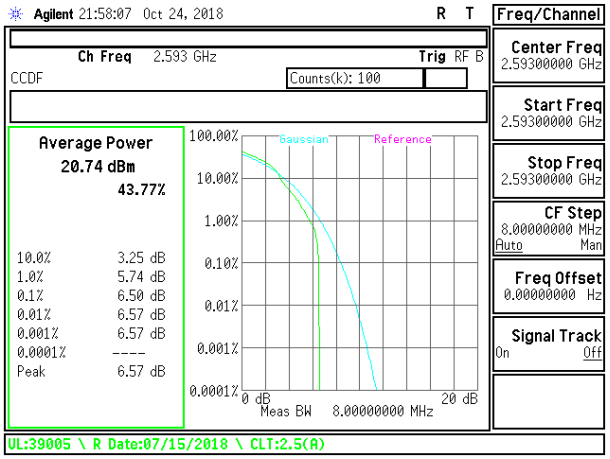
LTE B41 5MHz QPSK Middle Channel



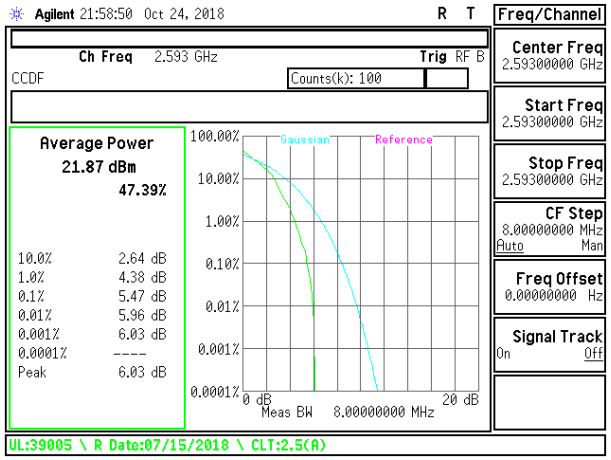
LTE B41 5MHz 16QAM Middle Channel



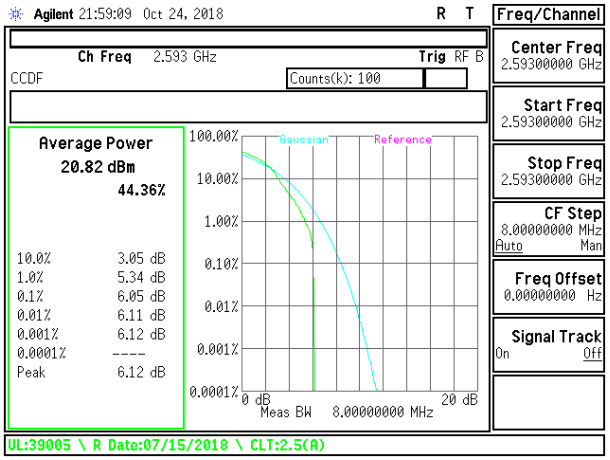
LTE B41 10MHz QPSK Middle Channel



LTE B41 10MHz 16QAM Middle Channel



LTE B41 15MHz QPSK Middle Channel



LTE B41 15MHz 16QAM Middle Channel

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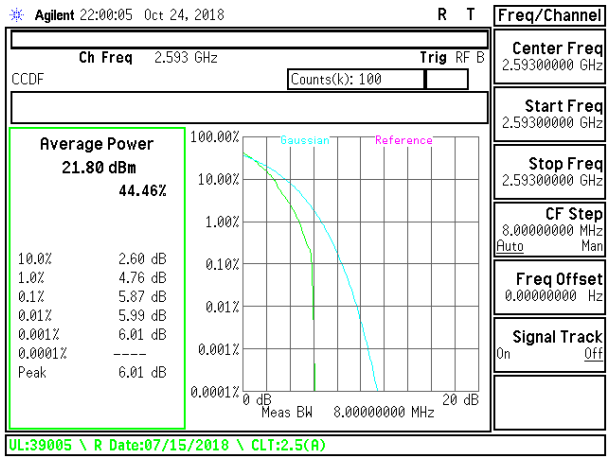
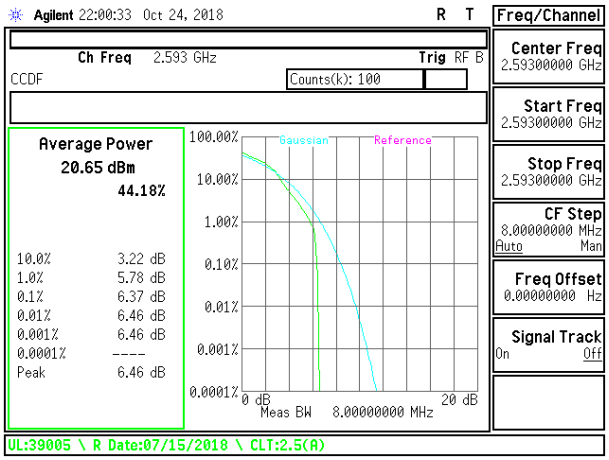


LTE B41 20MHz QPSK Middle Channel



LTE B41 20MHz 16QAM Middle Channel

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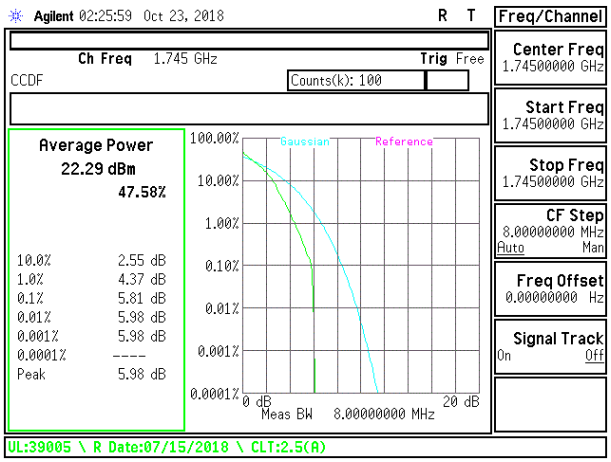
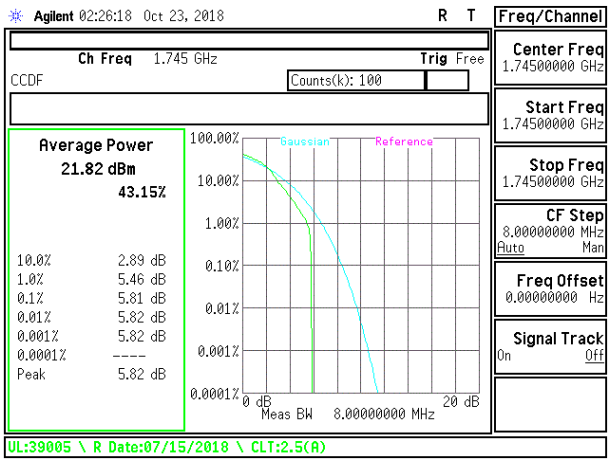
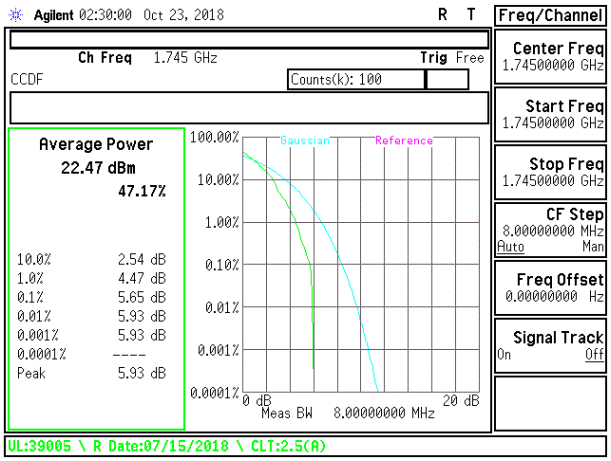
8.5.14. LTE BAND 66



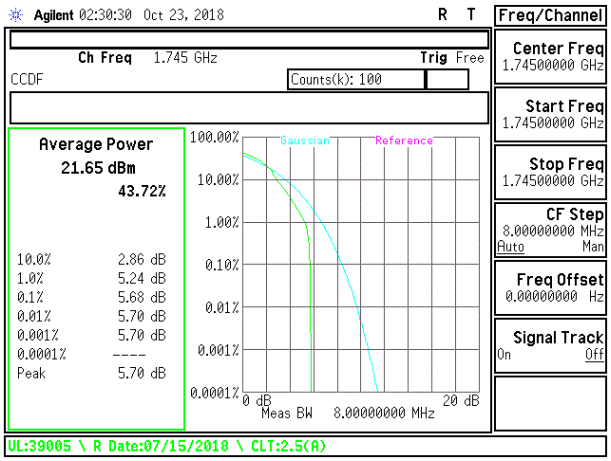
LTE B66 1.4MHz QPSK Mid Channel



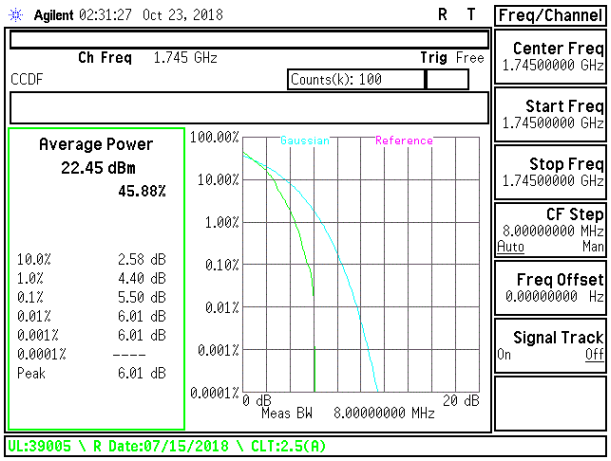
LTE B66 1.4MHz 16QAM Mid Channel



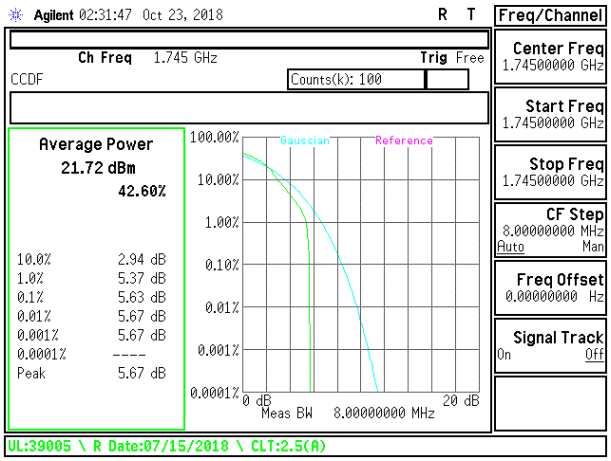
LTE B66 3MHz QPSK Mid Channel



LTE B66 3MHz 16QAM Mid Channel



LTE B66 5MHz QPSK Mid Channel



LTE B66 5MHz 16QAM Mid Channel

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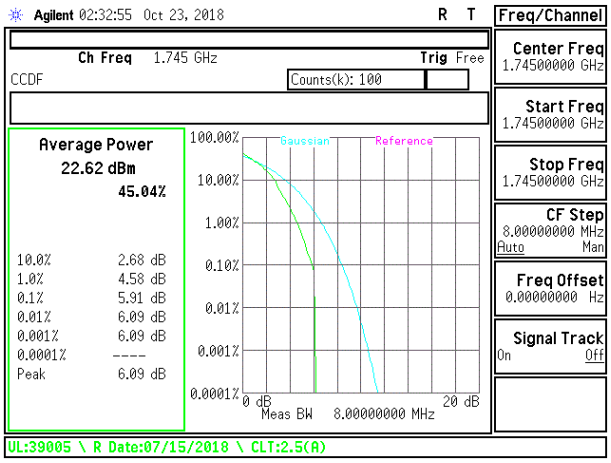
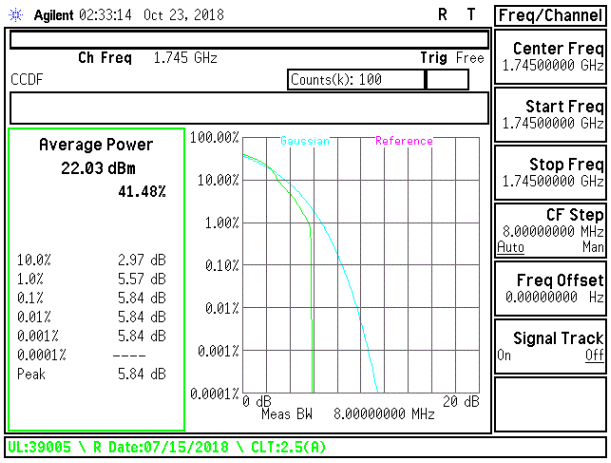
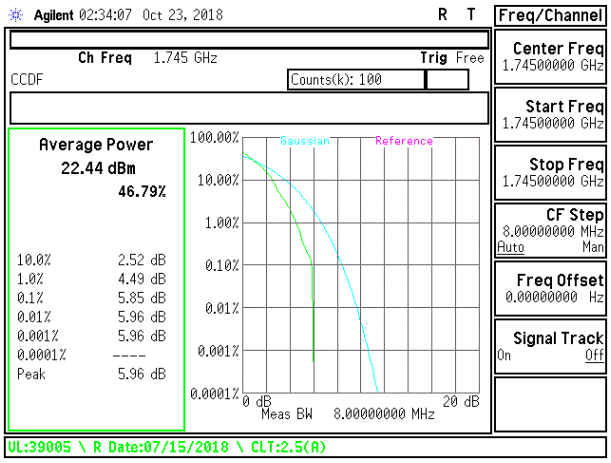


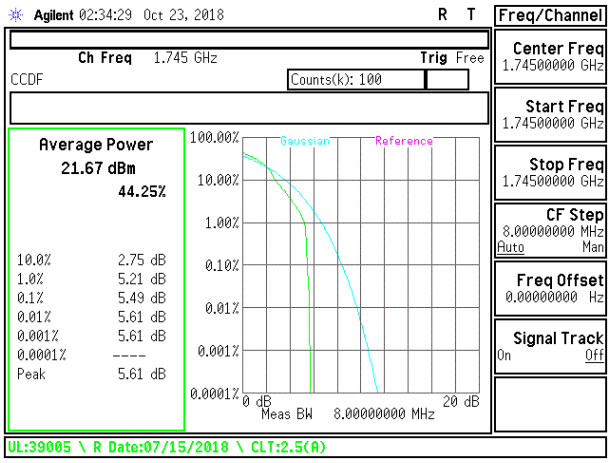
LTE B66 10MHz QPSK Mid Channel



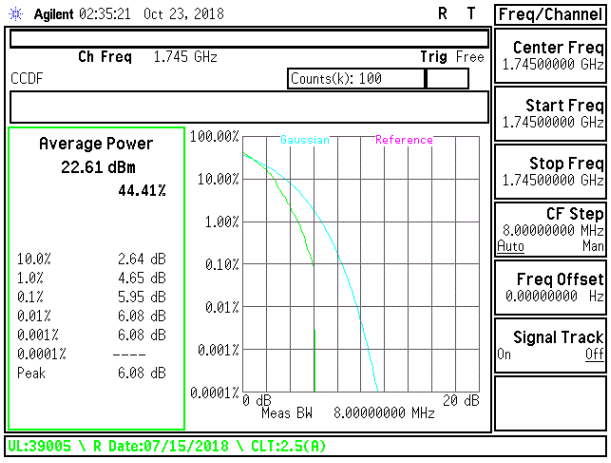
LTE B66 10MHz 16QAM Mid Channel



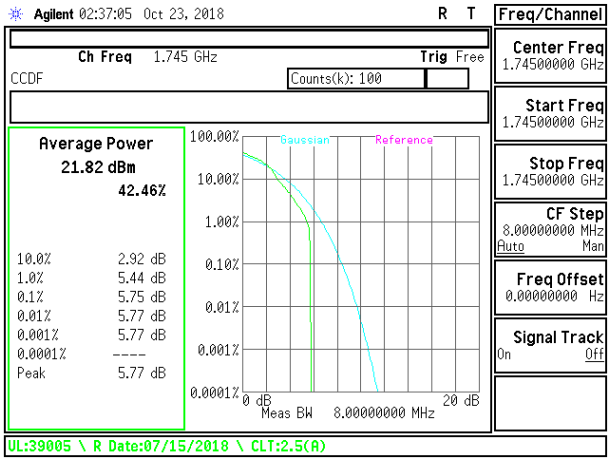
LTE B66 15MHz QPSK Mid Channel



LTE B66 15MHz 16QAM Mid Channel



LTE B66 20MHz QPSK Mid Channel



LTE B66 20MHz 16QAM Mid Channel

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9. RADIATED TEST RESULTS

9.1. EFFECTIVE RADIATED POWER ERP/EIRP

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, §27.53 and §90.691

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50(c) - (10) Portable stations (hand-held devices) are limited to 3 watts ERP; (LTE B12)

27.50(d) - (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.(Band 66)

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.2.17; PSA setting reference to 971168 D01 v02r02

For peak power measurement with a PSA:

a) Set the RBW ≥ OBW; b) Set VBW ≥ 3 × RBW; c) Set span ≥ 2 x RBW; d) Sweep time = auto couple; e) Detector = peak; f) Ensure that the number of measurement points ≥ span/RBW; g) Trace mode = max hold;

For average power measurement with a PSA:

a) Set span to at least 1.5 times the OBW; b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz; c) Set VBW ≥ 3 x RBW; d) Set number of points in sweep ≥ 2 × span / RBW; e) Sweep time = auto-couple; f) Detector = RMS (power averaging); g) Use free run trigger If burst duty cycle ≥ 98; h) Use trigger to capture bursts If burst duty cycle < 98; i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode. j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function.

MODES TESTED

GSM, WCMDA, and LTE

Note: This testing was performed to confirm that the measured radiated powers were consistent with the calculated ERP/EIRP test data given device-to-device variations in output power and the measurement uncertainties associated with the radiated tests. Measured ERP/EIRP test results are for reference only. Please refer to Section 5.2 for the final ERP/EIRP results.

TEST RESULTS

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GSM

Band	Mode	Channel	f(MHz)	ERP/EIRP	
				dBm	mW
GSM 850	GPRS	128	824.2	30.24	1056.82
		190	836.6	30.50	1122.02
		251	848.8	29.90	977.24
	EGPRS	128	824.2	28.17	656.15
		190	836.6	28.42	695.02
		251	848.8	27.78	599.79
GSM 1900	GPRS	512	1850.2	29.58	907.82
		661	1880.0	30.45	1109.17
		810	1909.8	30.81	1205.04
	EGPRS	512	1850.2	27.60	575.44
		661	1880.0	26.74	472.06
		810	1909.8	28.30	676.08

WCDMA

Band	Mode	Channel	f(MHz)	ERP/EIRP	
				dBm	mW
Band 2	REL99	9262	1852.4	24.31	269.77
		9400	1880	25.13	325.84
		9538	1907.6	23.10	204.17
	HSDPA	9262	1852.4	23.72	235.50
		9400	1880.0	25.41	347.54
		9538	1907.6	23.27	212.32
Band 5	REL99	4132	826.4	19.19	82.99
		4183	836.6	19.42	87.50
		4233	846.6	19.36	86.30
	HSDPA	4132	826.4	19.00	79.43
		4183	836.6	19.46	88.31
		4233	846.6	19.29	84.92
Band 4	REL99	1312	1712.4	22.81	190.99
		1413	1732.6	22.25	167.88
		1513	1752.6	24.54	284.45
	HSDPA	1312	1712.4	22.95	197.24
		1413	1732.6	22.54	179.47
		1513	1752.6	24.67	293.09

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LTE Band 2

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	mW
20	QPSK	1/0	1860	24.27	267.30
		1/0	1880	23.23	210.38
		1/0	1900	24.17	261.22
	16QAM	1/0	1860	21.83	152.41
		1/0	1880	21.52	141.91
		1/0	1900	22.36	172.19
15	QPSK	1/0	1857.5	24.84	304.79
		1/0	1880	25.74	374.97
		1/0	1902.5	26.04	401.79
3	16QAM	1/0	1851.5	22.20	165.96
		1/0	1880	24.10	257.04
		1/0	1908.5	23.84	242.10

LTE Band 4

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	mW
20	QPSK	1/0	1720	21.99	158.12
		1/0	1732.5	20.89	122.74
		1/0	1745	22.84	192.31
	16QAM	1/0	1720	20.23	105.44
		1/0	1732.5	19.31	85.31
		1/0	1745	20.78	119.67
5	QPSK	1/0	1712.5	21.89	154.53
		1/0	1732.5	21.60	144.54
		1/0	1752.5	24.19	262.42
15	16QAM	1/0	1717.5	19.85	96.61
		1/0	1732.5	20.95	124.45
		1/0	1747.5	21.96	157.04

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LTE Band 5

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	mW
10	QPSK	1/0	829	18.32	67.92
		1/0	836.5	18.58	72.11
		1/0	844	19.19	82.99
	16QAM	1/0	829	18.32	67.92
		1/0	836.5	18.58	72.11
		1/0	844	18.52	71.12
3	QPSK	1/0	825.5	18.30	67.61
		1/0	836.5	18.40	69.18
		1/0	847.5	19.09	81.10
	16QAM	1/0	825.5	18.29	67.45
		1/0	836.5	18.17	65.61
		1/0	847.5	18.45	69.98

LTE Band 7

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	mW
20	QPSK	1/0	2510	24.08	255.86
		1/0	2535	23.42	219.79
		1/0	2560	23.40	218.78
	16QAM	1/0	2510	21.81	151.71
		1/0	2535	21.35	136.46
		1/0	2560	21.12	129.42
15	QPSK	1/0	2507.5	23.47	222.33
		1/0	2535	24.25	266.07
		1/0	2562.5	24.03	252.93
	16QAM	1/0	2507.5	21.16	130.62
		1/0	2535	21.90	154.88
		1/0	2562.5	21.51	141.58

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LTE Band 12

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	mW
10	QPSK	1/0	704	22.07	161.06
		1/0	707.5	21.29	134.59
		1/0	711	20.32	107.65
	16QAM	1/0	704	21.31	135.21
		1/0	707.5	20.38	109.14
		1/0	711	19.80	95.50
5	QPSK	1/0	701.5	20.27	106.41
		1/0	707.5	21.40	138.04
		1/0	713.5	22.71	186.64
	16QAM	1/0	701.5	19.50	89.13
		1/0	707.5	20.47	111.43
		1/0	713.5	22.11	162.55

LTE Band 13

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	mW
10	QPSK				
		1/0	782	20.73	118.30
	16QAM				
		1/0	782	19.35	86.10
5	QPSK	1/0	779.5	20.87	122.18
		1/0	782	20.53	112.98
		1/0	784.5	20.10	102.33
	16QAM	1/0	779.5	19.19	82.99
		1/0	782	18.83	76.38
		1/0	784.5	18.34	68.23

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LTE Band 17

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	mW
10	QPSK	1/0	709	22.17	164.82
		1/0	710	21.90	154.88
		1/0	711	22.54	179.47
	16QAM	1/0	709	21.39	137.72
		1/0	710	21.24	133.05
		1/0	711	21.90	154.88
5	QPSK	1/0	706.5	20.05	101.16
		1/0	710	22.09	161.81
		1/0	713.5	20.05	101.16
	16QAM	1/0	706.5	19.40	87.10
		1/0	710	21.37	137.09
		1/0	713.5	19.55	90.16

LTE Band 25

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	mW
20	QPSK	1/0	1860	21.05	127.35
		1/0	1882.5	21.17	130.92
		1/0	1905	22.42	174.58
	16QAM	1/0	1860	20.71	117.76
		1/0	1882.5	20.36	108.64
		1/0	1905	21.57	143.55
15	QPSK	1/0	1857.5	23.07	202.77
		1/0	1882.5	22.16	164.44
		1/0	1907.5	22.26	168.27
3	16QAM	1/0	1851.5	21.50	141.25
		1/0	1882.5	21.65	146.22
		1/0	1913.5	22.87	193.64

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LTE Band 26 (FCC PART 90S)

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	mW
15	QPSK				
		1/0	821.5	19.67	92.68
	16QAM				
		1/0	821.5	17.90	61.66
10	QPSK				
		1/0	819	20.56	113.76
	16QAM				
		1/0	819	18.29	67.45

LTE Band 26 (FCC PART 22)

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	mW
15	QPSK	1/0	831.5	18.91	77.80
		1/0	836.5	19.93	98.40
		1/0	841.5	21.86	153.46
	16QAM	1/0	831.5	16.51	44.77
		1/0	836.5	17.53	56.62
		1/0	841.5	19.46	88.31
3	QPSK	1/0	815.5	18.08	64.27
		1/0	831.5	18.80	75.86
		1/0	847.5	19.17	82.60
5	16QAM	1/0	816.5	17.30	53.70
		1/0	831.5	18.63	72.95
		1/0	846.5	18.14	65.16

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LTE Band 41

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	mW
20	QPSK	1/0	2506	21.10	128.82
		1/0	2593	21.34	136.14
		1/0	2680	21.14	130.02
	16QAM	1/0	2506	20.52	112.72
		1/0	2593	20.48	111.69
		1/0	2680	20.11	102.57
15	QPSK	1/0	2503.5	21	125.89
		1/0	2593	20.34	108.14
		1/0	2682.5	18.34	68.23
10	16QAM	1/0	2501	19.08	80.91
		1/0	2593	18.78	75.51
		1/0	2685	17.16	52.00

LTE Band 66

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	mW
20	QPSK	1/0	1720	22.04	159.96
		1/0	1745	22.85	192.75
		1/0	1770	23.53	225.42
	16QAM	1/0	1720	20.48	111.69
		1/0	1745	21.24	133.05
		1/0	1770	22.63	183.23
15	QPSK	1/0	1717.5	20.56	113.76
		1/0	1745	21.56	143.22
		1/0	1772.5	22.96	197.70
15	16QAM	1/0	1717.5	19.74	94.19
		1/0	1745	20.77	119.40
		1/0	1772.5	22.20	165.96

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