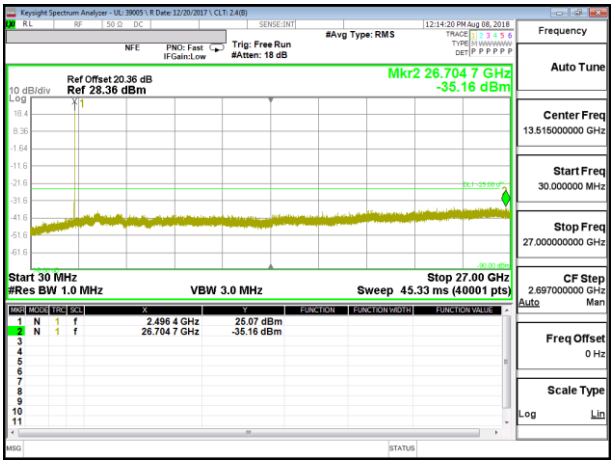
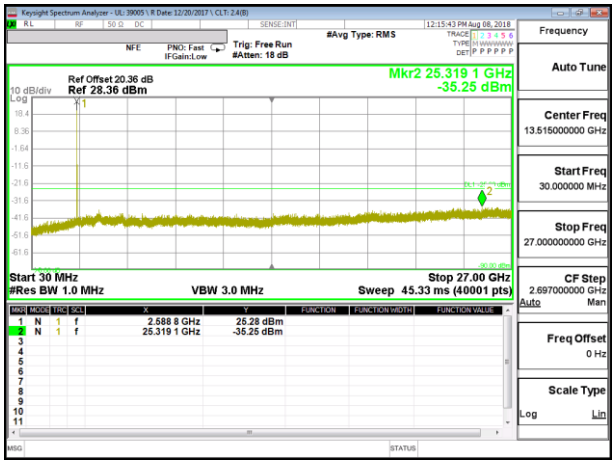


LTE B41 10MHz QPSK Low Channel RB1-0



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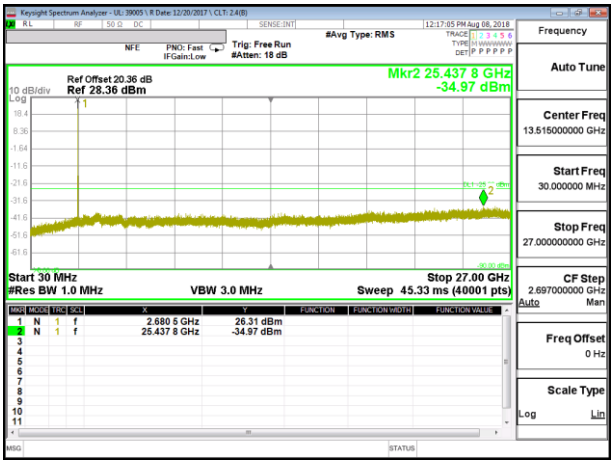

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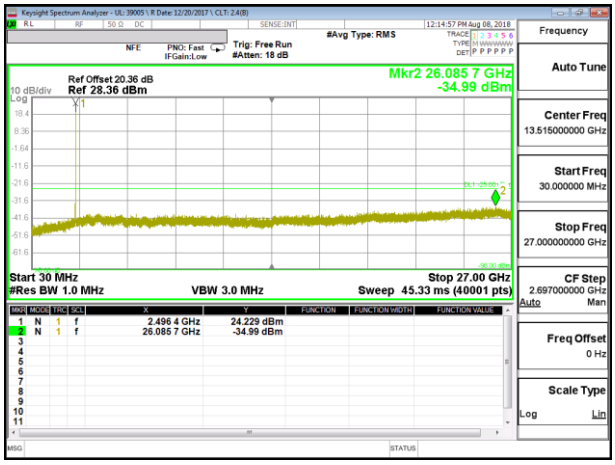
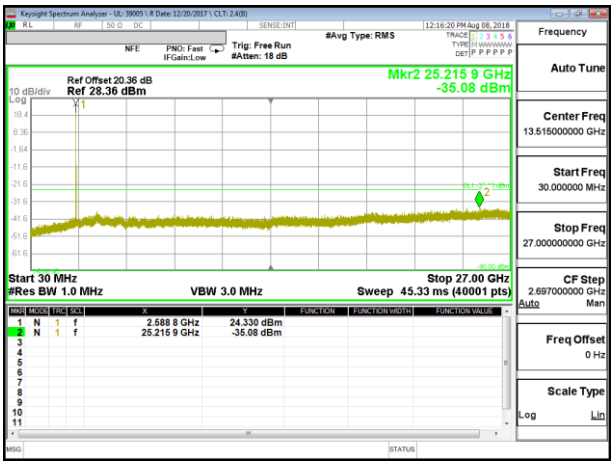


LTE B41 10MHz 16QAM Low Channel RB1-0



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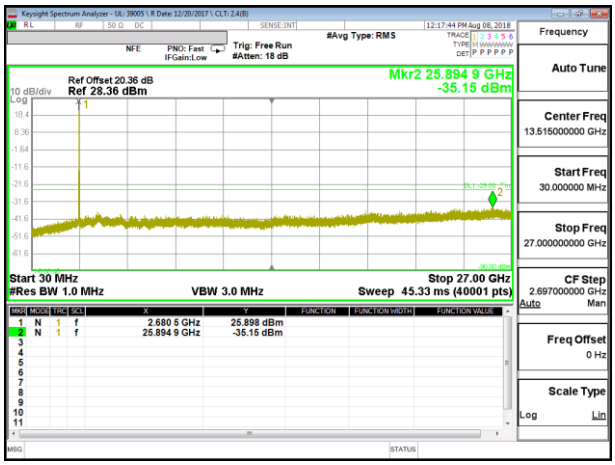

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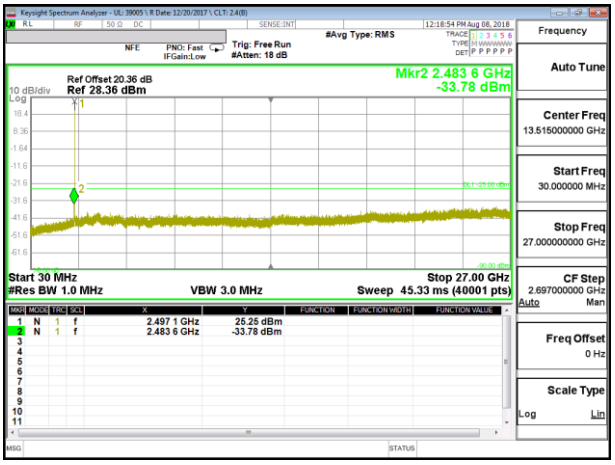
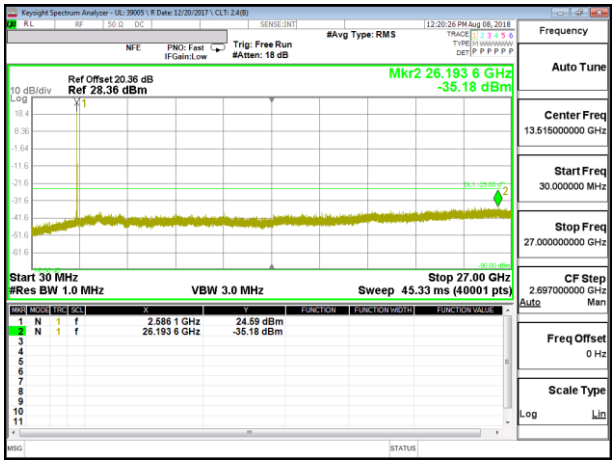


LTE B41 15MHz QPSK Low Channel RB1-0



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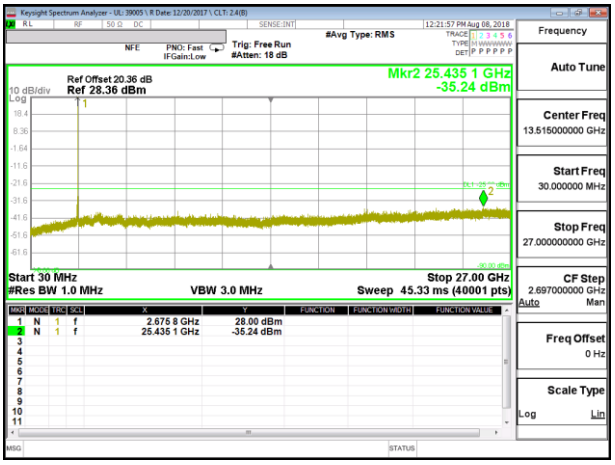

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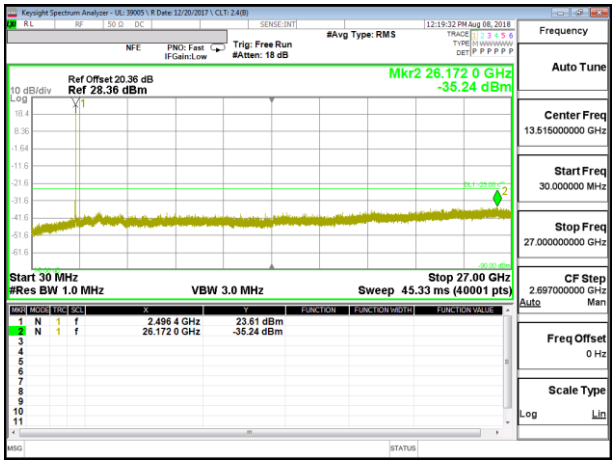

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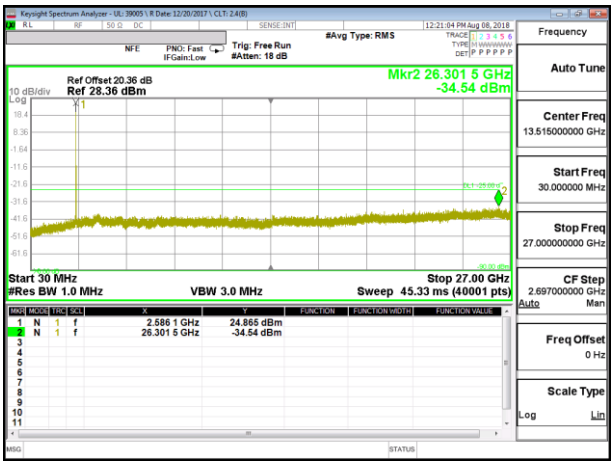

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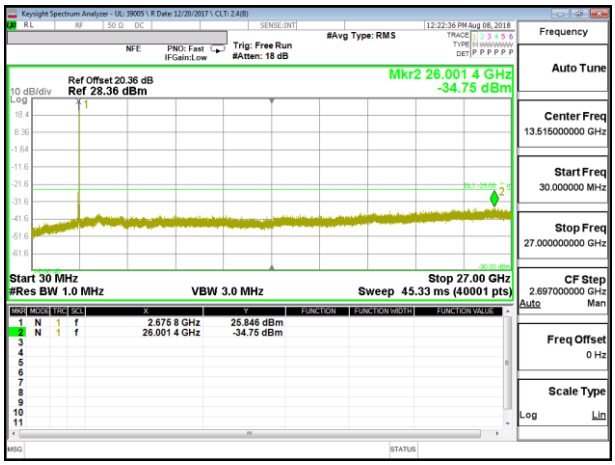

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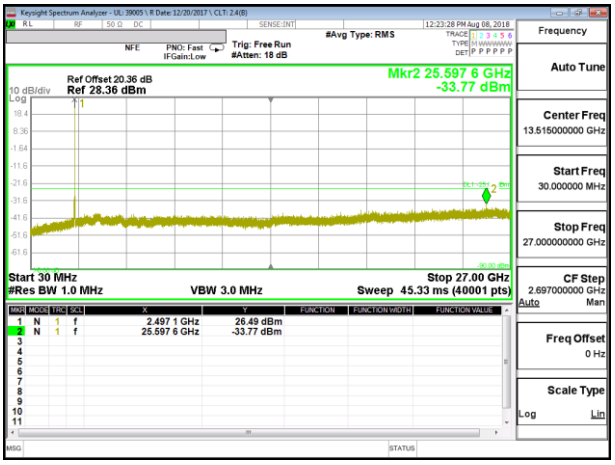

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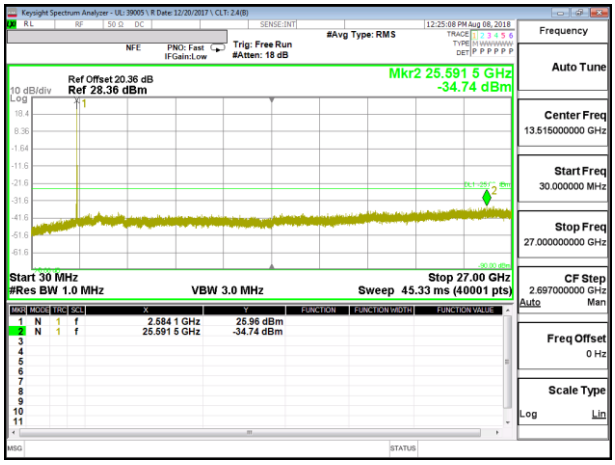

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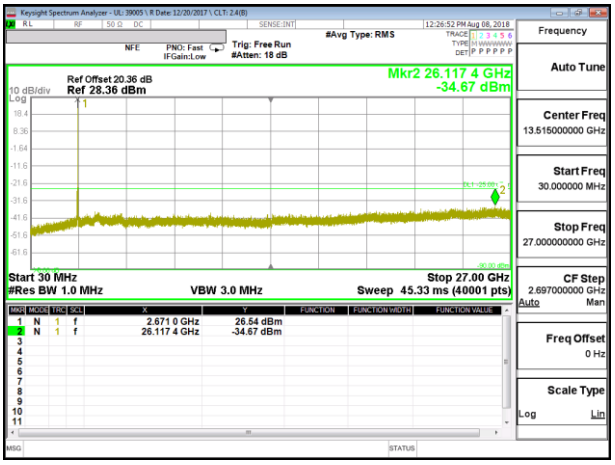

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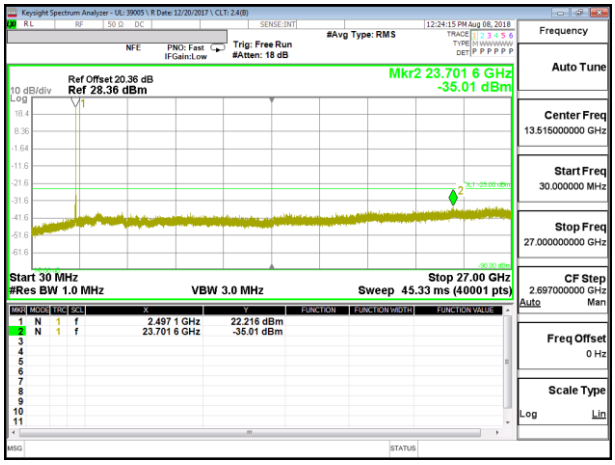

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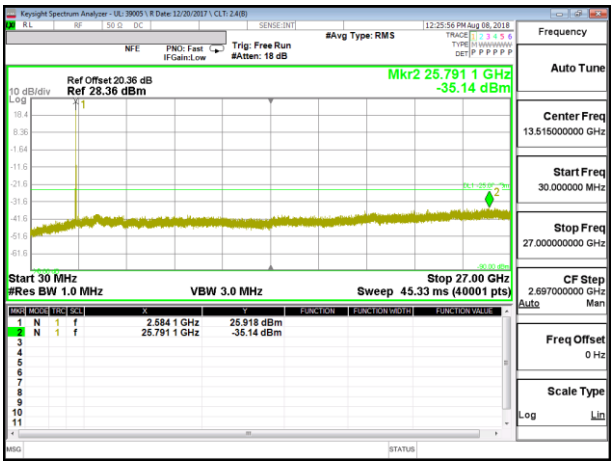

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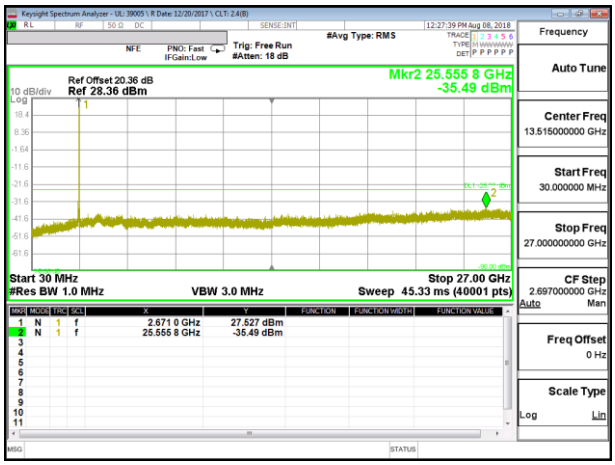
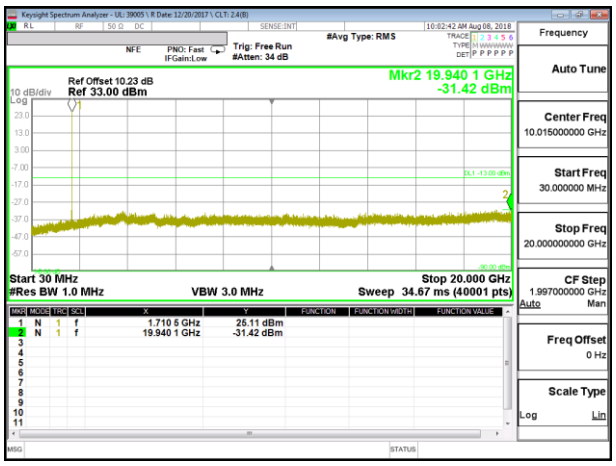
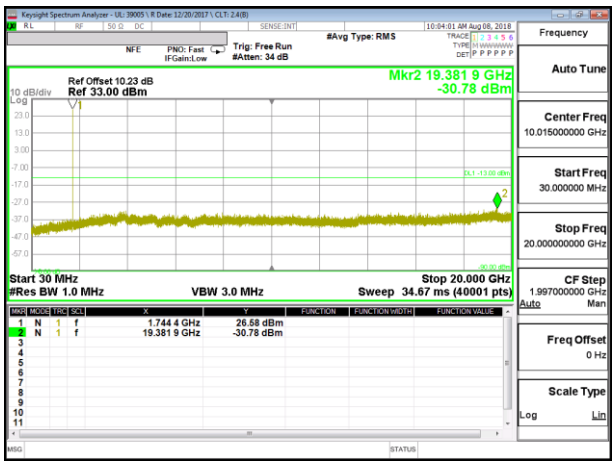


LTE B41 20MHz 16QAM High Channel RB1-0

10.3.11. LTE BAND 66



LTE B66 1.4MHz QPSK Low Channel RB1-0



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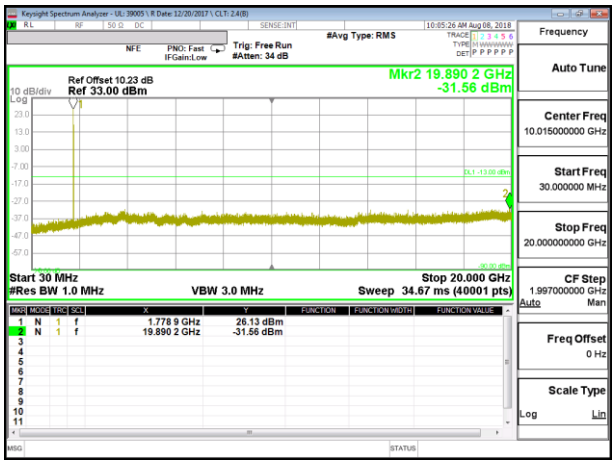

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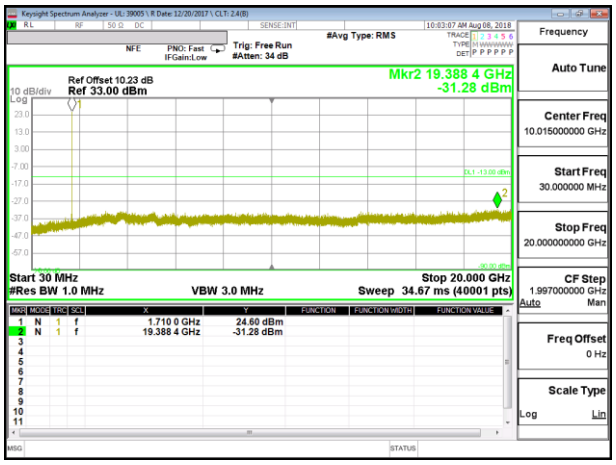

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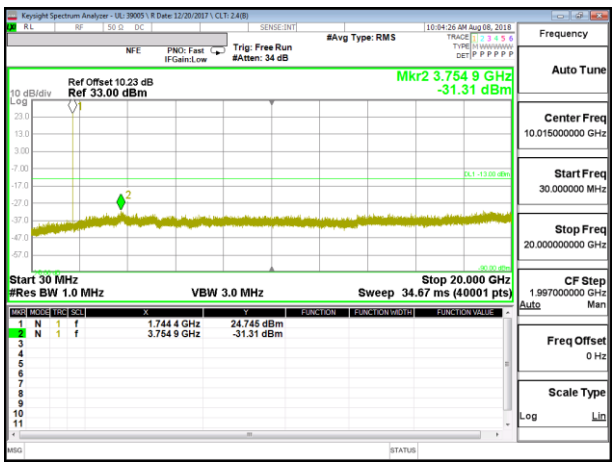

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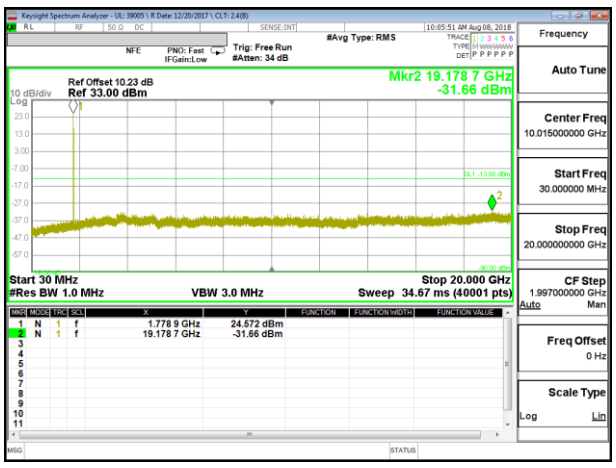
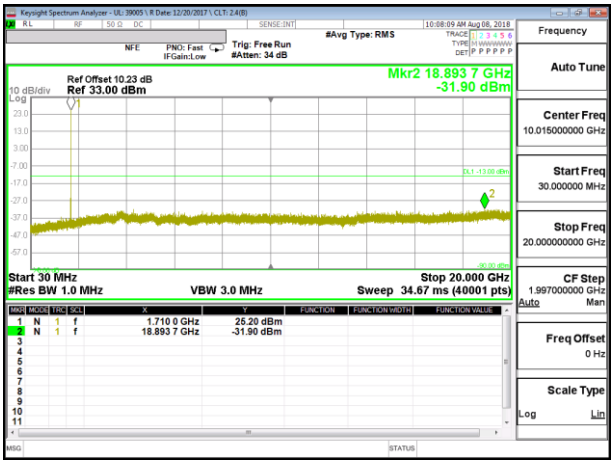
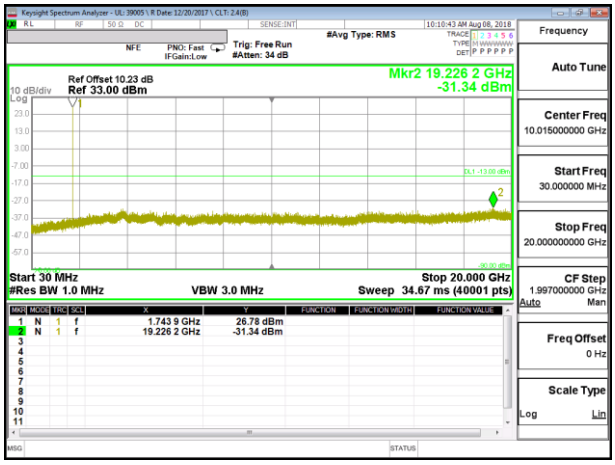


LTE B66 1.4MHz 16QAM High Channel RB1-0



LTE B66 3MHz QPSK Low Channel RB1-0



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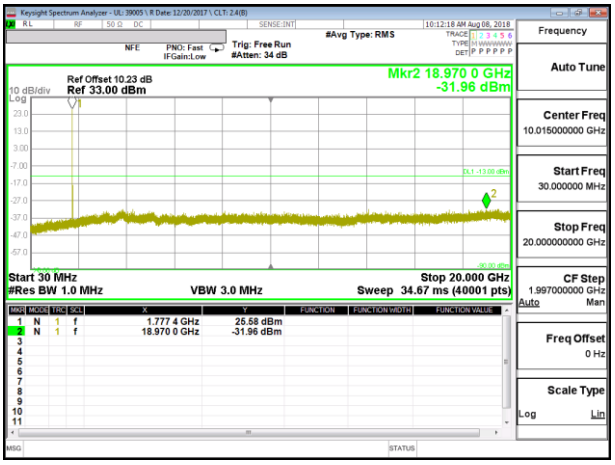

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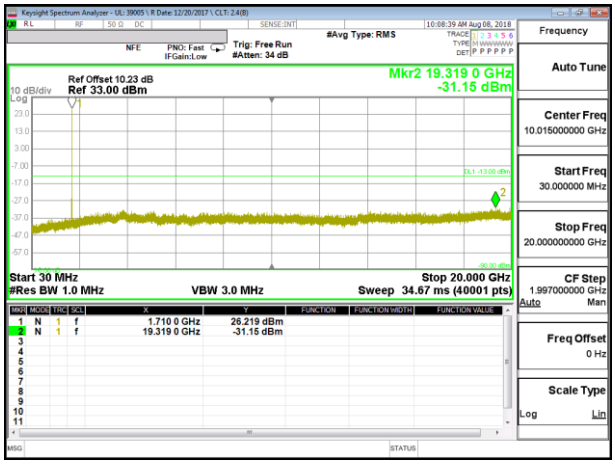

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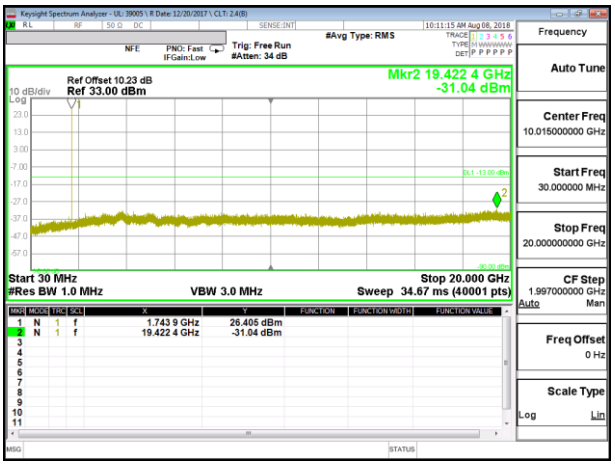

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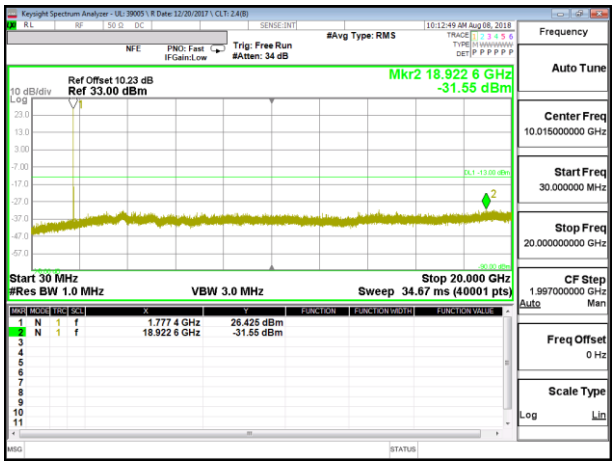

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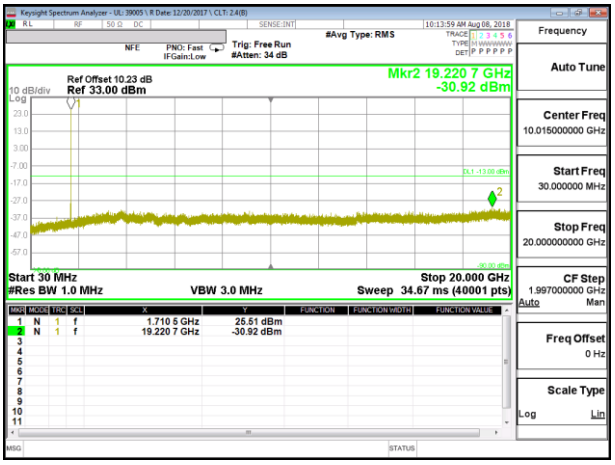
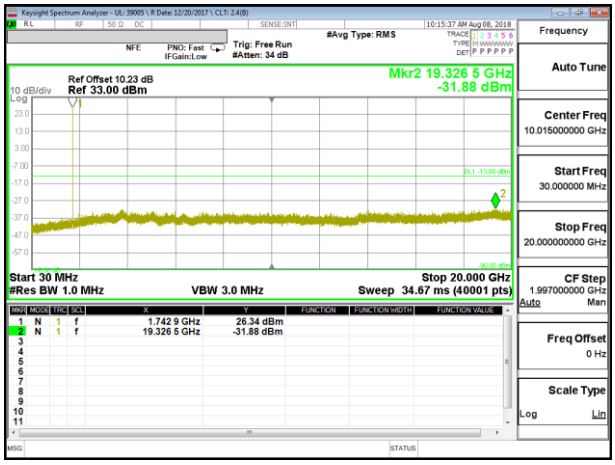


LTE B66 5MHz QPSK Low Channel RB1-0



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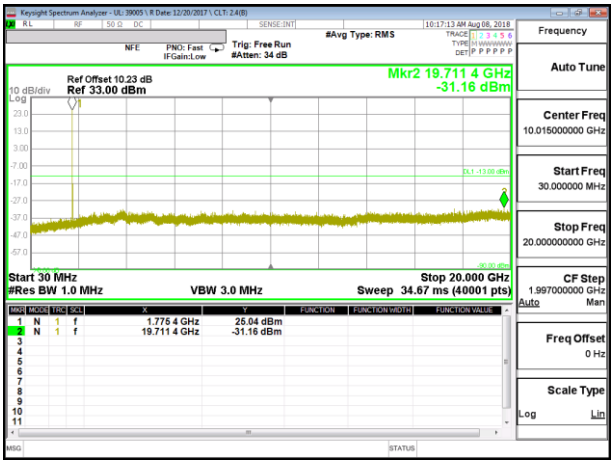

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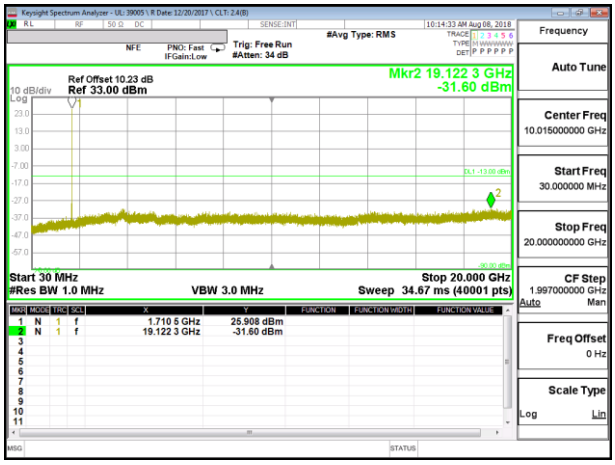

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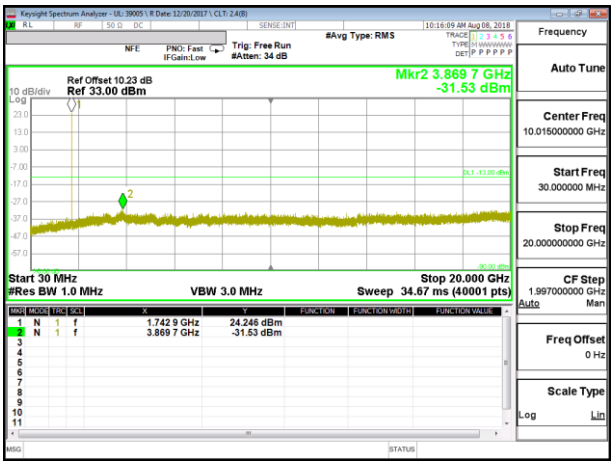

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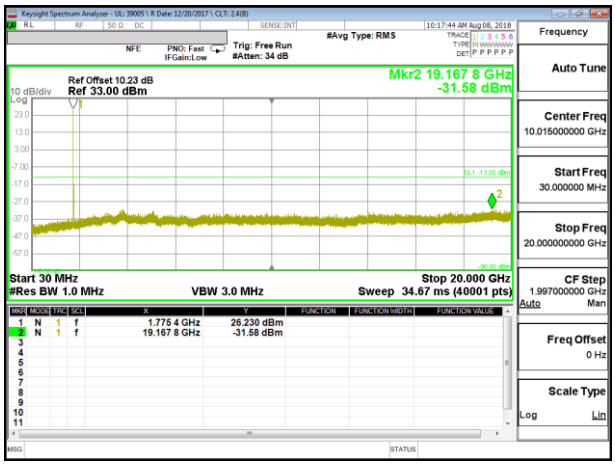

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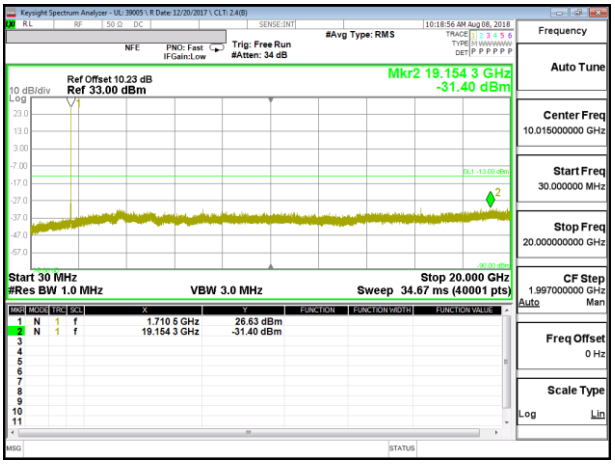
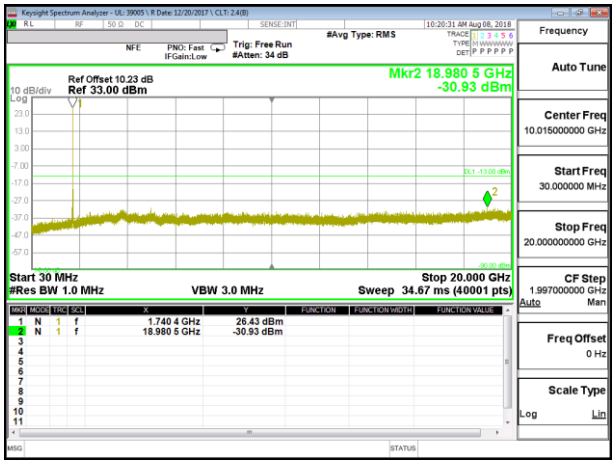


LTE B66 10MHz QPSK Low Channel RB1-0



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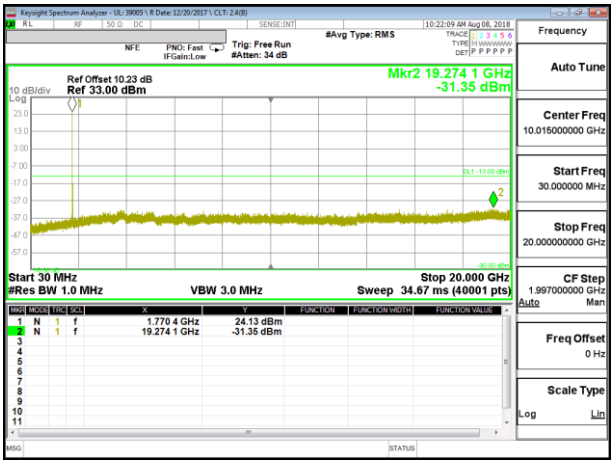
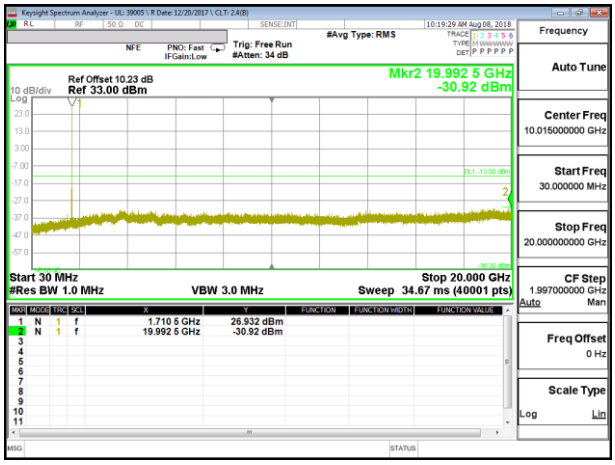
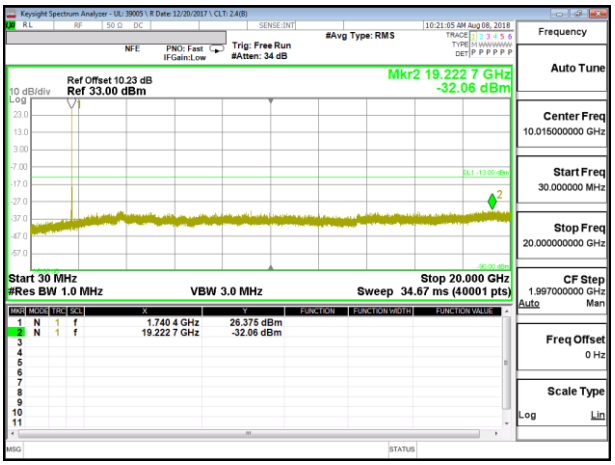


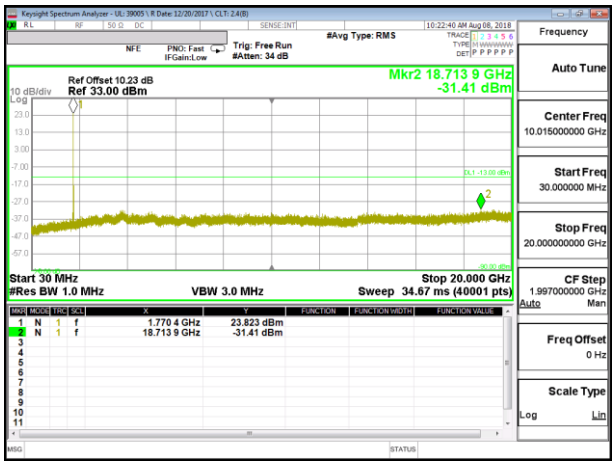
LTE B66 10MHz QPSK High Channel RB1-0



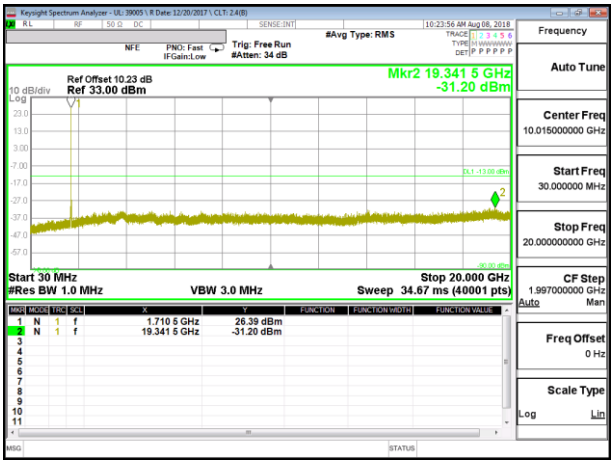
LTE B66 10MHz 16QAM Low Channel RB1-0



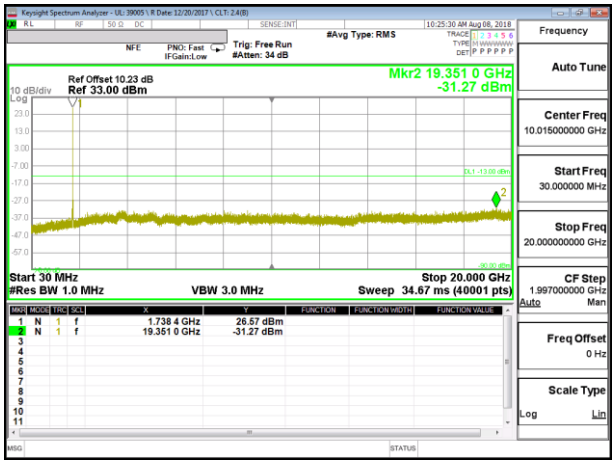
LTE B66 10MHz 16QAM Mid Channel RB1-0



LTE B66 10MHz 16QAM High Channel RB1-0



LTE B66 15MHz QPSK Low Channel RB1-0



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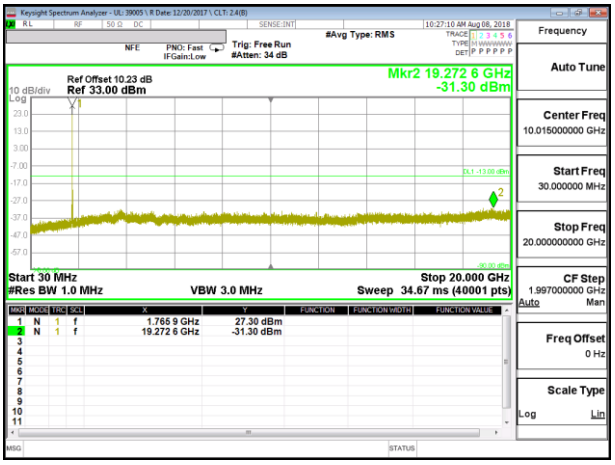
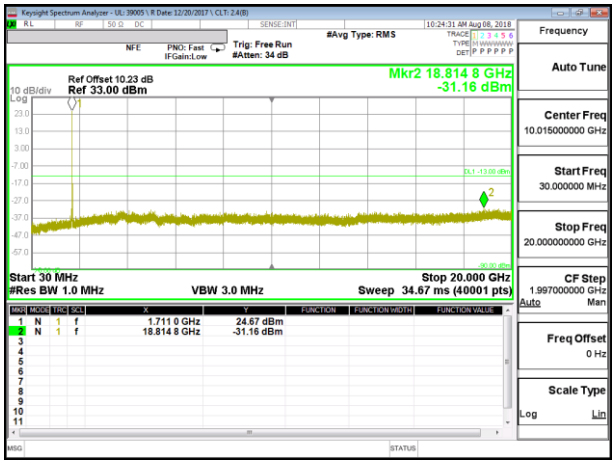
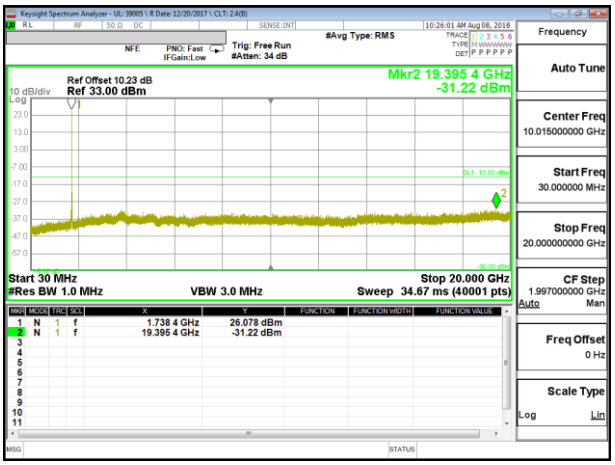


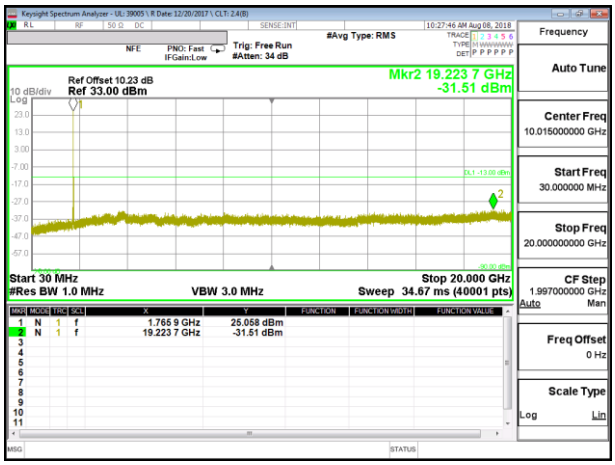
LTE B66 15MHz QPSK High Channel RB1-0



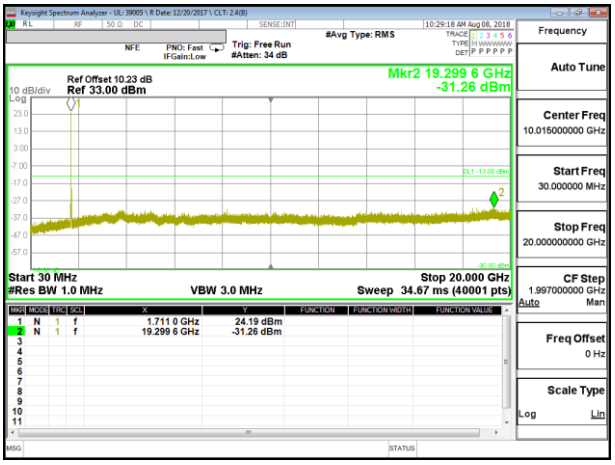
LTE B66 15MHz 16QAM Low Channel RB1-0



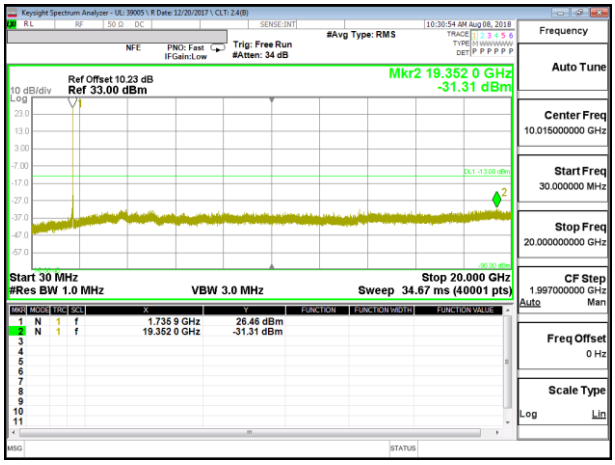
LTE B66 15MHz 16QAM Mid Channel RB1-0



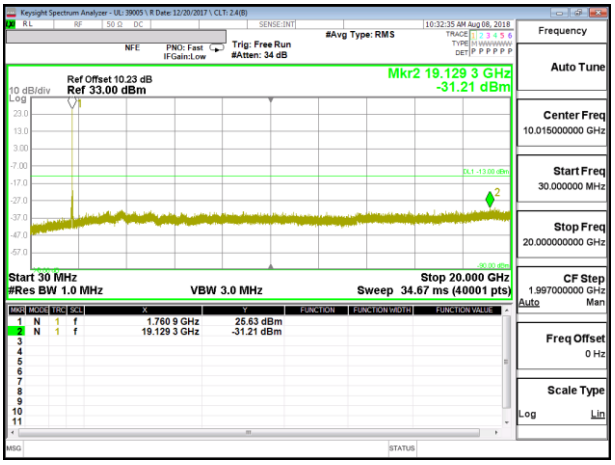
LTE B66 15MHz 16QAM High Channel RB1-0



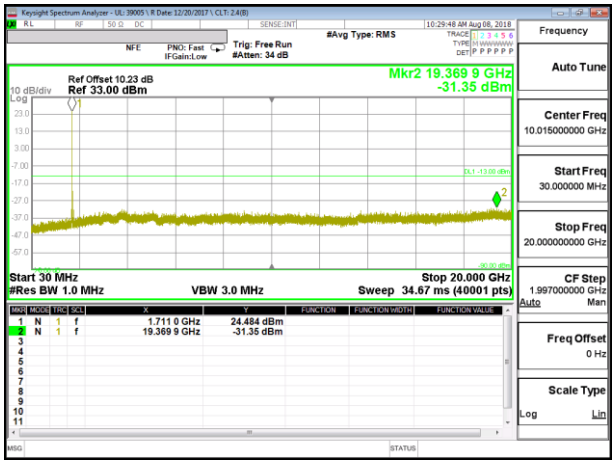
LTE B66 20MHz QPSK Low Channel RB1-0



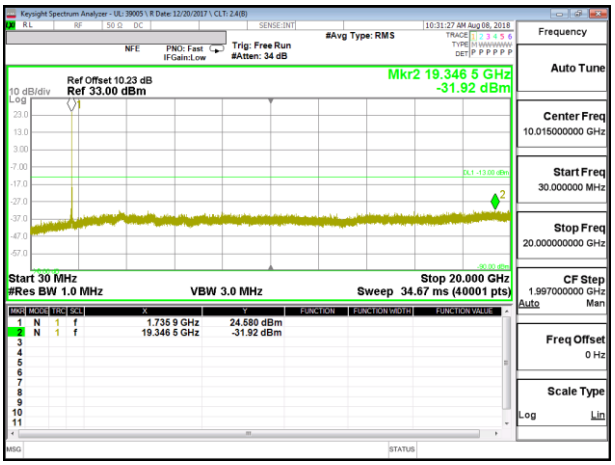
LTE B66 20MHz QPSK Mid Channel RB1-0



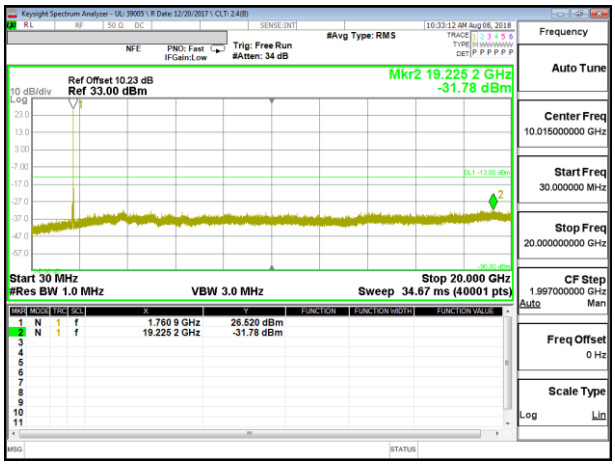
LTE B66 20MHz QPSK High Channel RB1-0



LTE B66 20MHz 16QAM Low Channel RB1-0



LTE B66 20MHz 16QAM Mid Channel RB1-0



LTE B66 20MHz 16QAM High Channel RB1-0

10.4. 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
- WCDM Band 5
- WCDM Band 2
- WCDM Band 4
- LTE Band 2
- LTE Band 4
- LTE Band 5
- LTE Band 12
- LTE Band 13
- LTE Band 17
- LTE Band 41
- LTE Band 66

RESULTS

10.4.1. GSM 850MHz

ID:	39004	Date:	8/10/18

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		824.0638	848.9481		
Extreme (50C)		824.0638	848.9481	-14.0	-0.017
Extreme (40C)		824.0638	848.9481	-15.7	-0.019
Extreme (30C)		824.0638	848.9481	-16.8	-0.020
Extreme (10C)	Normal	824.0638	848.9481	-15.6	-0.019
Extreme (0C)		824.0638	848.9481	-19.9	-0.024
Extreme (-10C)		824.0638	848.9481	-14.7	-0.018
Extreme (-20C)		824.0638	848.9481	-14.2	-0.017
Extreme (-30C)		824.0638	848.9481	-13.8	-0.016
20C	15%	824.0638	848.9481	-15.2	-0.018
	-15%	824.0638	848.9481	-15.1	-0.018
	End Point	824.0638	848.9481	-15.0	-0.018

10.4.2. GSM 1900MHz

ID:	39004	Date:	8/10/18

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		1850.0680	1909.9270		
Extreme (50C)		1850.0680	1909.9270	15.0	0.008
Extreme (40C)		1850.0680	1909.9270	15.3	0.008
Extreme (30C)		1850.0680	1909.9270	14.6	0.008
Extreme (10C)	Normal	1850.0680	1909.9270	15.2	0.008
Extreme (0C)		1850.0680	1909.9270	17.6	0.009
Extreme (-10C)		1850.0680	1909.9270	16.8	0.009
Extreme (-20C)		1850.0680	1909.9270	17.2	0.009
Extreme (-30C)		1850.0680	1909.9270	17.3	0.009
20C	15%	1850.0680	1909.9270	16.6	0.009
	-15%	1850.0680	1909.9270	16.8	0.009
	End Point	1850.0680	1909.9270	17.2	0.009

10.4.3. WCDMA BAND 5

ID:	39004	Date:	8/10/18

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		824.1010	848.9030		
Extreme (50C)		824.1010	848.9030	-2.8	-0.0033
Extreme (40C)		824.1010	848.9030	-3.3	-0.0039
Extreme (30C)		824.1010	848.9030	-3.2	-0.0038
Extreme (10C)	Normal	824.1010	848.9030	-3.4	-0.0041
Extreme (0C)		824.1010	848.9030	-3.5	-0.0042
Extreme (-10C)		824.1010	848.9030	-3.1	-0.0037
Extreme (-20C)		824.1010	848.9030	-2.6	-0.0031
Extreme (-30C)		824.1010	848.9030	-3.1	-0.0037
20C	15%	824.1010	848.9030	-3.0	-0.0035
	-15%	824.1010	848.9030	-3.7	-0.0044
	End Point	824.1010	848.9030	-3.2	-0.0039

10.4.4. WCDMA BAND 2

ID:	39004	Date:	8/10/18

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		1850.1260	1909.8650		
Extreme (50C)		1850.1260	1909.8650	-4.0	-0.0021
Extreme (40C)		1850.1260	1909.8650	-3.9	-0.0021
Extreme (30C)		1850.1260	1909.8650	-4.2	-0.0022
Extreme (10C)	Normal	1850.1260	1909.8650	-3.4	-0.0018
Extreme (0C)		1850.1260	1909.8650	-3.2	-0.0017
Extreme (-10C)		1850.1260	1909.8650	-3.5	-0.0019
Extreme (-20C)		1850.1260	1909.8650	-4.2	-0.0023
Extreme (-30C)		1850.1260	1909.8650	-4.1	-0.0022
20C	15%	1850.1260	1909.8650	-3.8	-0.0020
	-15%	1850.1260	1909.8650	-3.5	-0.0018
	End Point	1850.1260	1909.8650	-3.5	-0.0018

10.4.5. WCDMA BAND 4

ID:	39004	Date:	8/10/18

Limit		1710	1755		
Condition		F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		1710.1290	1754.8780		
Extreme (50C)		1710.1290	1754.8780	-4.9	-0.0028
Extreme (40C)		1710.1290	1754.8780	-5.0	-0.0029
Extreme (30C)		1710.1290	1754.8780	-4.6	-0.0026
Extreme (10C)	Normal	1710.1290	1754.8780	-5.2	-0.0030
Extreme (0C)		1710.1290	1754.8780	-5.2	-0.0030
Extreme (-10C)		1710.1290	1754.8780	-4.9	-0.0028
Extreme (-20C)		1710.1290	1754.8780	-4.7	-0.0027
Extreme (-30C)		1710.1290	1754.8780	-5.6	-0.0032
20C	15%	1710.1290	1754.8780	-6.2	-0.0036
	-15%	1710.1290	1754.8780	-5.7	-0.0033
	End Point	1710.1290	1754.8780	-5.8	-0.0033

10.4.6. LTE BAND 2

ID:	39004	Date:	8/10/18

Limit		1850	1910		
Condition		F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		1850.8400	1909.1650		
Extreme (50C)		1850.8400	1909.1650	8.5	0.004
Extreme (40C)		1850.8400	1909.1650	8.4	0.004
Extreme (30C)		1850.8400	1909.1650	6.9	0.004
Extreme (10C)	Normal	1850.8400	1909.1650	5.9	0.003
Extreme (0C)		1850.8400	1909.1650	6.3	0.003
Extreme (-10C)		1850.8400	1909.1650	8.0	0.004
Extreme (-20C)		1850.8400	1909.1650	6.8	0.004
Extreme (-30C)		1850.8400	1909.1650	6.6	0.003
20C	15%	1850.8400	1909.1650	6.5	0.003
	-15%	1850.8400	1909.1650	5.9	0.003
	End Point	1850.8400	1909.1650	7.7	0.004

10.4.7. LTE BAND 4

ID:	39004	Date:	8/10/18

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.8450	1754.1500		
Extreme (50C)		1710.8450	1754.1500	6.8	0.004
Extreme (40C)		1710.8450	1754.1500	5.9	0.003
Extreme (30C)		1710.8450	1754.1500	6.3	0.004
Extreme (10C)		1710.8450	1754.1500	5.8	0.003
Extreme (0C)		1710.8450	1754.1500	6.2	0.004
Extreme (-10C)		1710.8450	1754.1500	5.3	0.003
Extreme (-20C)		1710.8450	1754.1500	6.5	0.004
Extreme (-30C)		1710.8450	1754.1500	7.5	0.004
20C	15%	1710.8450	1754.1500	7.2	0.004
	-15%	1710.8450	1754.1500	6.5	0.004
	End Point	1710.8450	1754.1500	6.0	0.003

10.4.8. LTE BAND 5

ID:	39004	Date:	8/10/18

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	824.2940	848.6960		
Extreme (50C)		824.2940	848.6960	3.7	0.004
Extreme (40C)		824.2940	848.6960	3.2	0.004
Extreme (30C)		824.2940	848.6960	3.2	0.004
Extreme (10C)		824.2940	848.6960	4.2	0.005
Extreme (0C)		824.2940	848.6960	3.2	0.004
Extreme (-10C)		824.2940	848.6960	3.6	0.004
Extreme (-20C)		824.2940	848.6960	2.6	0.003
Extreme (-30C)		824.2940	848.6960	4.2	0.005
20C	15%	824.2940	848.6960	4.0	0.005
	-15%	824.2940	848.6960	3.8	0.004
	End Point	824.2940	848.6960	3.3	0.004

10.4.9. LTE BAND 12

ID:	39004	Date:	8/10/18

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	699.3200	715.7000		
Extreme (50C)		699.3200	715.7000	-2.0	0.00
Extreme (40C)		699.3200	715.7000	-2.0	0.00
Extreme (30C)		699.3200	715.7000	2.2	0.00
Extreme (10C)		699.3200	715.7000	-3.3	0.00
Extreme (0C)		699.3200	715.7000	-1.8	0.00
Extreme (-10C)		699.3200	715.7000	-1.9	0.00
Extreme (-20C)		699.3200	715.7000	2.3	0.00
Extreme (-30C)		699.3200	715.7000	2.6	0.00
20C	15%	699.3200	715.7000	2.6	0.00
	-15%	699.3200	715.7000	-2.3	0.00
	End Point	699.3200	715.7000	-3.3	0.00

10.4.10. LTE BAND 13

ID:	39005	Date:	8/13/18

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	777.1480	786.8430		
Extreme (50C)		777.1480	786.8430	3.8	0.005
Extreme (40C)		777.1480	786.8430	3.4	0.004
Extreme (30C)		777.1480	786.8430	3.2	0.004
Extreme (10C)		777.1480	786.8430	2.6	0.003
Extreme (0C)		777.1480	786.8430	2.6	0.003
Extreme (-10C)		777.1480	786.8430	2.9	0.004
Extreme (-20C)		777.1480	786.8430	3.0	0.004
Extreme (-30C)		777.1480	786.8430	3.6	0.005
20C	15%	777.1480	786.8430	3.8	0.005
	-15%	777.1480	786.8430	2.9	0.004
	End Point	777.1480	786.8430	2.3	0.003

10.4.11. LTE BAND 17

ID:	39005	Date:	8/13/18

Limit		704	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		704.4110	715.5860		
Extreme (50C)		704.4110	715.5860	2.5	0.003
Extreme (40C)		704.4110	715.5860	3.2	0.004
Extreme (30C)		704.4110	715.5860	2.3	0.003
Extreme (10C)	Normal	704.4110	715.5860	2.2	0.003
Extreme (0C)		704.4110	715.5860	3.2	0.005
Extreme (-10C)		704.4110	715.5860	2.5	0.003
Extreme (-20C)		704.4110	715.5860	2.5	0.003
Extreme (-30C)		704.4110	715.5860	3.0	0.004
	15%	704.4110	715.5860	3.1	0.004
20C	-15%	704.4110	715.5860	2.3	0.003
	End Point	704.4110	715.5860	4.1	0.006

10.4.12. LTE BAND 41

ID:	39005	Date:	8/13/18

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)		2496.8160	2689.1840		
Extreme (50C)		2496.8160	2689.1840	-5.9	-0.002
Extreme (40C)		2496.8160	2689.1840	-7.5	-0.003
Extreme (30C)		2496.8160	2689.1840	-8.6	-0.003
Extreme (10C)	Normal	2496.8160	2689.1840	-8.2	-0.003
Extreme (0C)		2496.8160	2689.1840	-6.5	-0.002
Extreme (-10C)		2496.8160	2689.1840	-5.2	-0.002
Extreme (-20C)		2496.8160	2689.1840	-5.8	-0.002
Extreme (-30C)		2496.8160	2689.1840	-5.4	-0.002
	15%	2496.8160	2689.1840	-7.2	-0.003
20C	-15%	2496.8160	2689.1840	-7.5	-0.003
	End Point	2496.8160	2689.1840	-6.9	-0.003

10.4.13. LTE BAND 66

ID:	39005	Date:	8/13/18

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.8560	1779.1600		
Extreme (50C)		1710.8560	1779.1600	6.5	0.004
Extreme (40C)		1710.8560	1779.1600	5.3	0.003
Extreme (30C)		1710.8560	1779.1600	5.3	0.003
Extreme (10C)		1710.8560	1779.1600	5.0	0.003
Extreme (0C)		1710.8560	1779.1600	5.3	0.003
Extreme (-10C)		1710.8560	1779.1600	5.0	0.003
Extreme (-20C)		1710.8560	1779.1600	6.2	0.004
Extreme (-30C)		1710.8560	1779.1600	4.9	0.003
20C	15%	1710.8560	1779.1600	6.3	0.004
	-15%	1710.8560	1779.1600	5.3	0.003
	End Point	1710.8560	1779.1600	7.4	0.004

10.1. PEAK TO AVERAGE RATIO

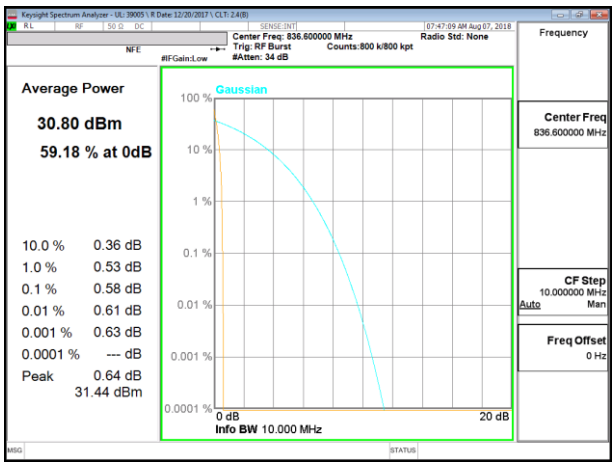
LIMIT

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

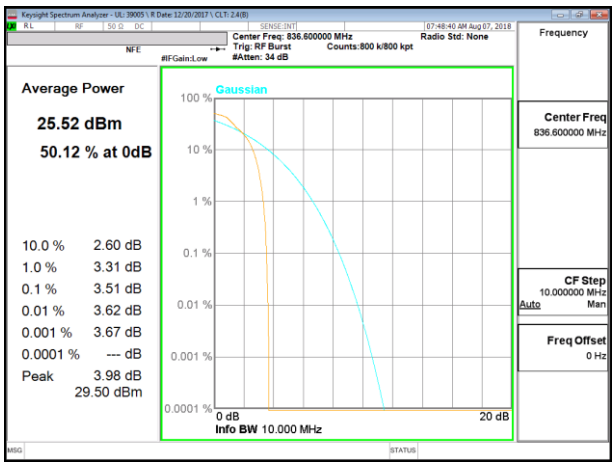
RESULT

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

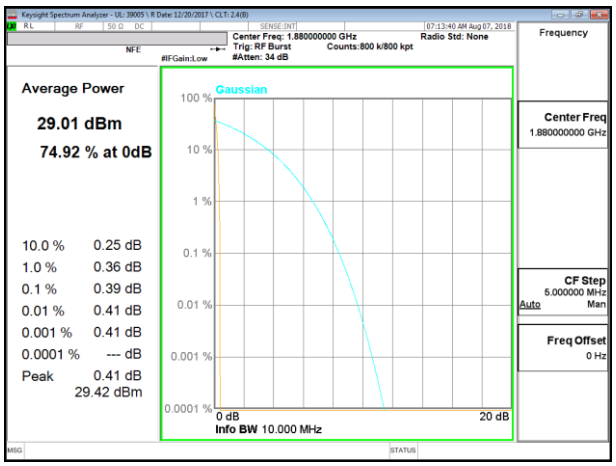
10.1.1. GSM



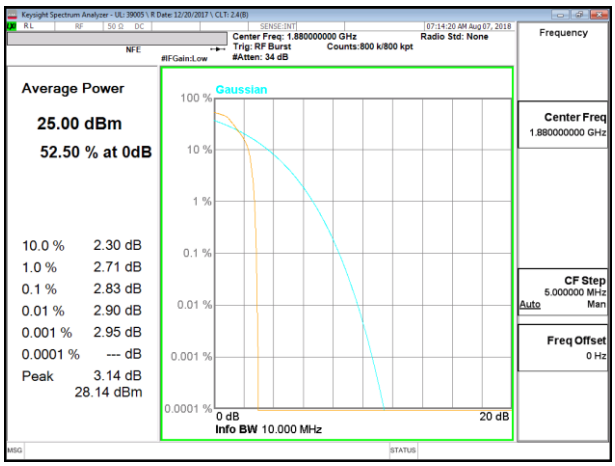
GSM 850MHz GPRS MID Channel



GSM 850MHz EGPRS MID Channel

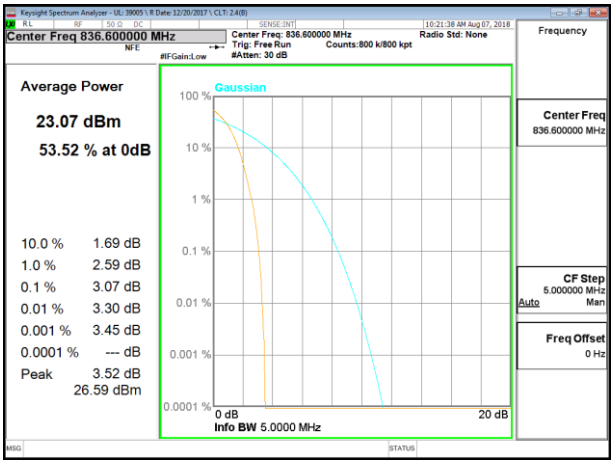


GSM 1900MHz GPRS MID Channel

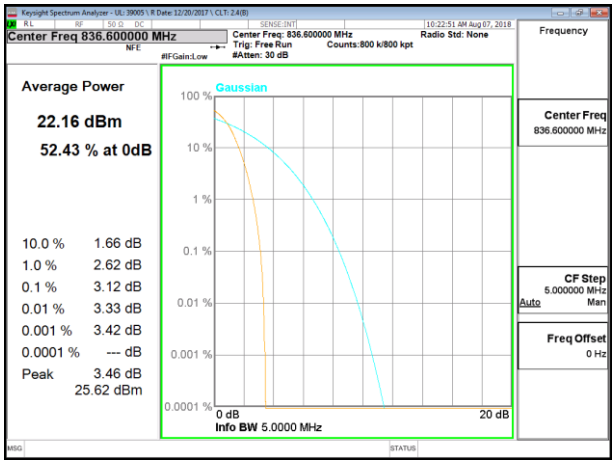


GSM 1900MHz EGPRS MID Channel

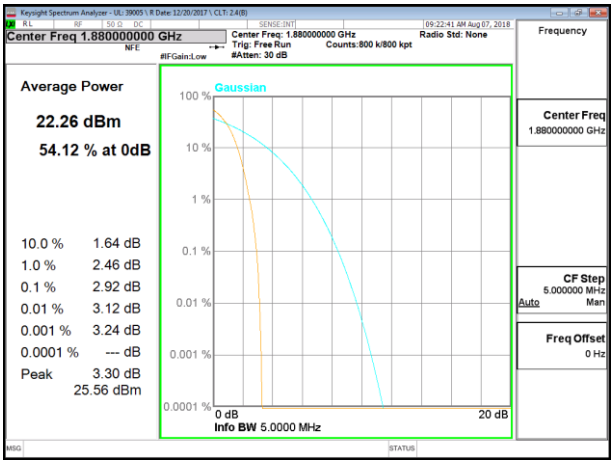
10.1.2. WCDMA



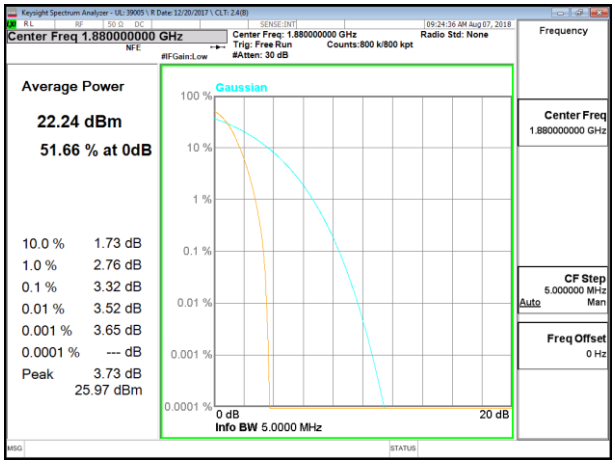
WCDMA BAND5 Rel99 MID Channel



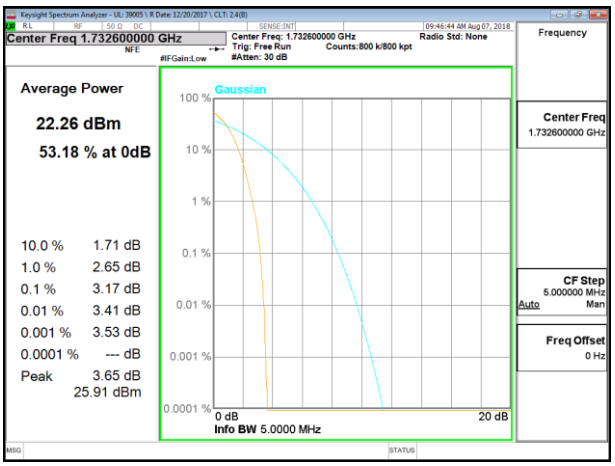
WCDMA BAND5 HSDPA MID Channel



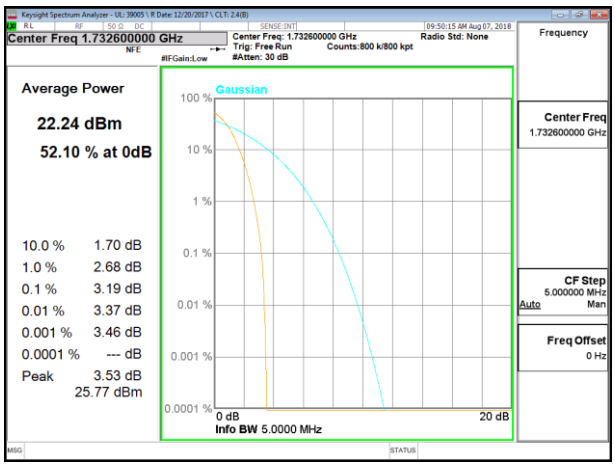
WCDMA BAND2 Rel99 MID Channel



WCDMA BAND2 HSDPA MID Channel



WCDMA BAND4 Rel99 MID Channel



WCDMA BAND4 HSDPA MID Channel