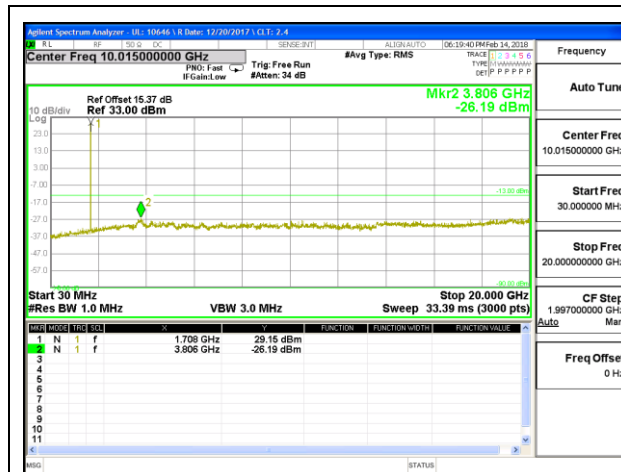
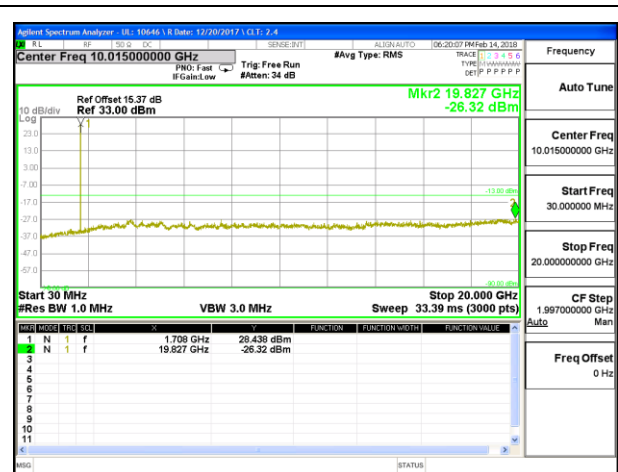
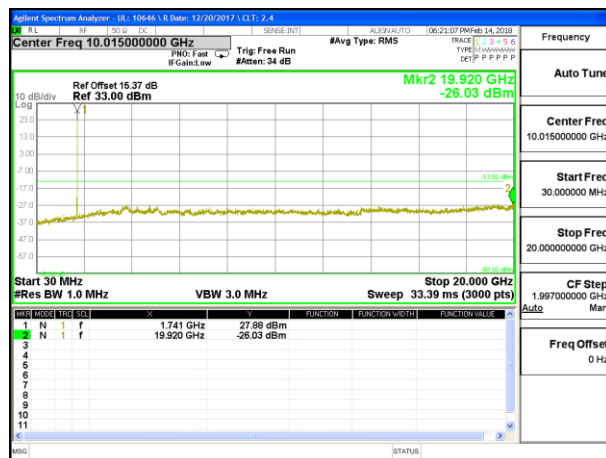




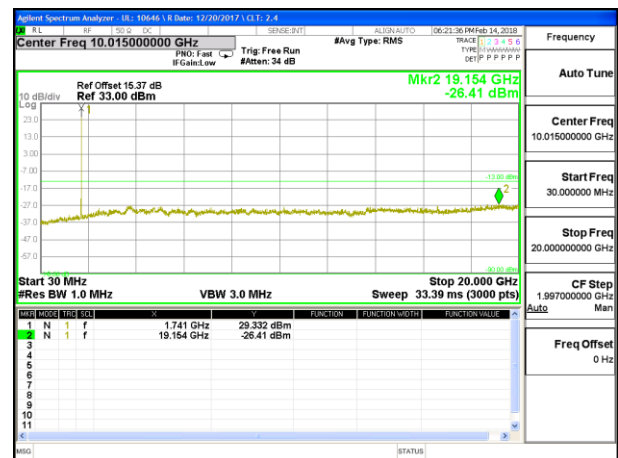
LTE B66 10MHz QPSK Low Channel RB1-0



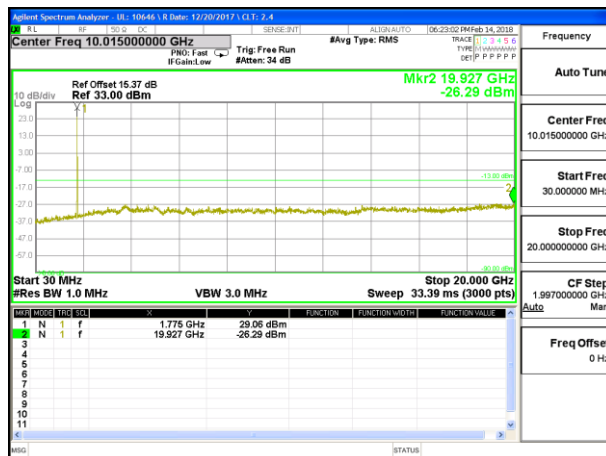
LTE B66 10MHz 16QAM Low Channel RB1-0



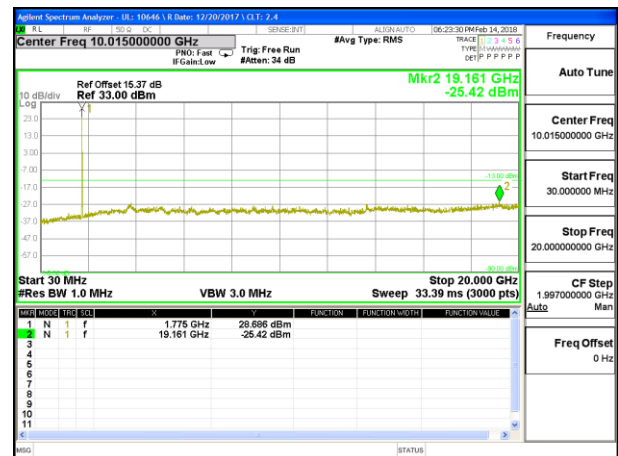
LTE B66 10MHz QPSK Middle Channel RB1-0



LTE B66 10MHz 16QAM Middle Channel RB1-0

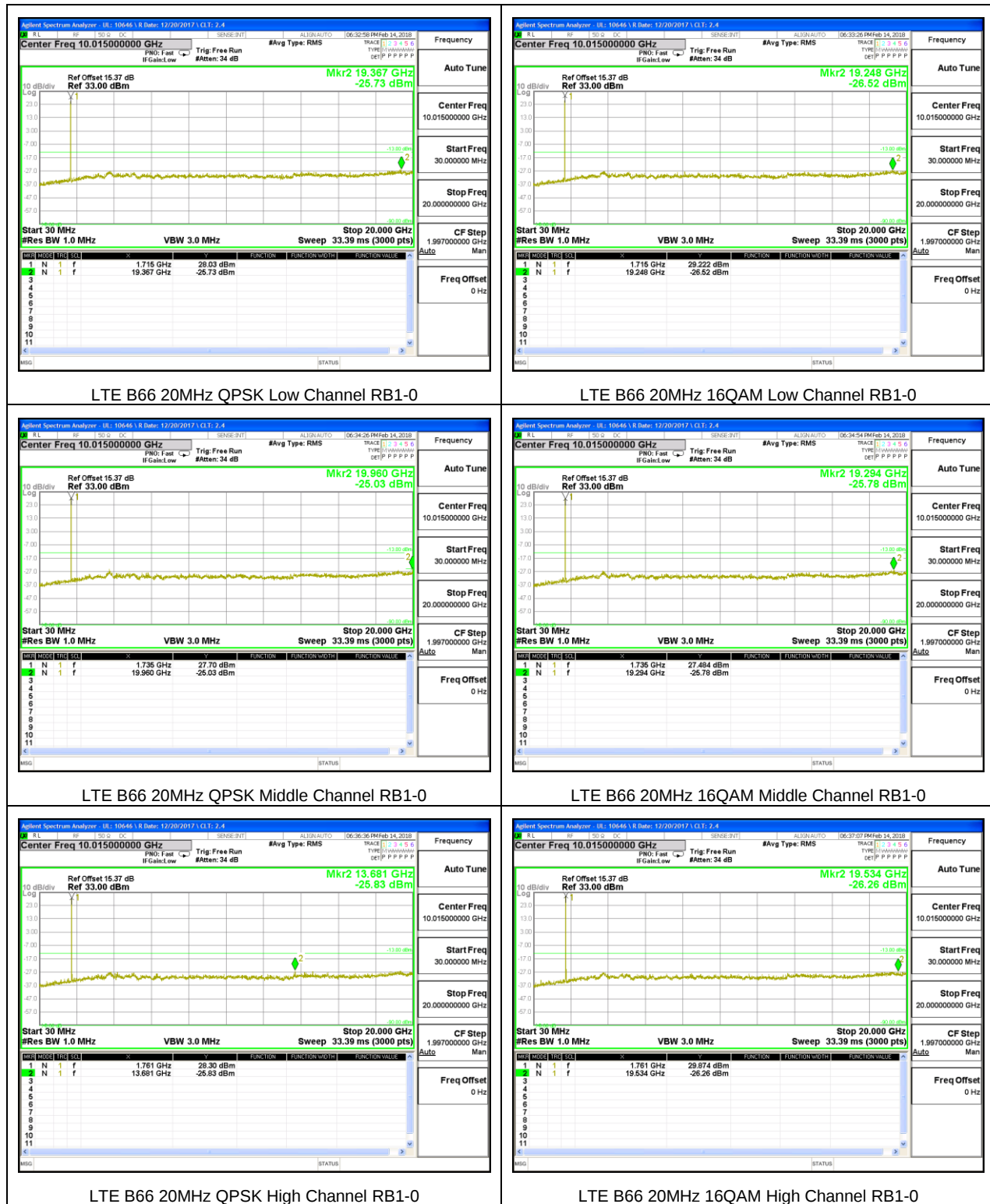


LTE B66 10MHz QPSK High Channel RB1-0

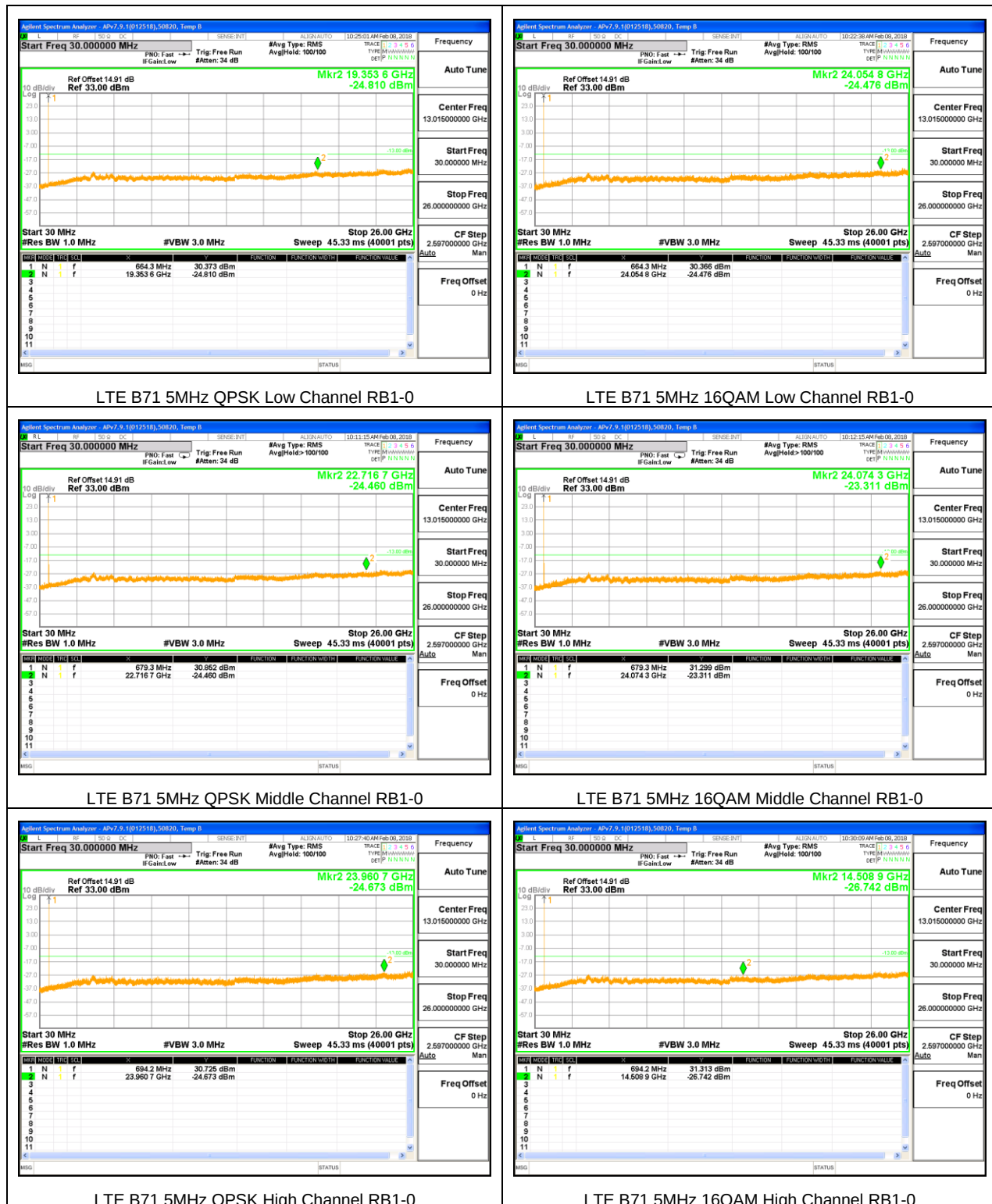


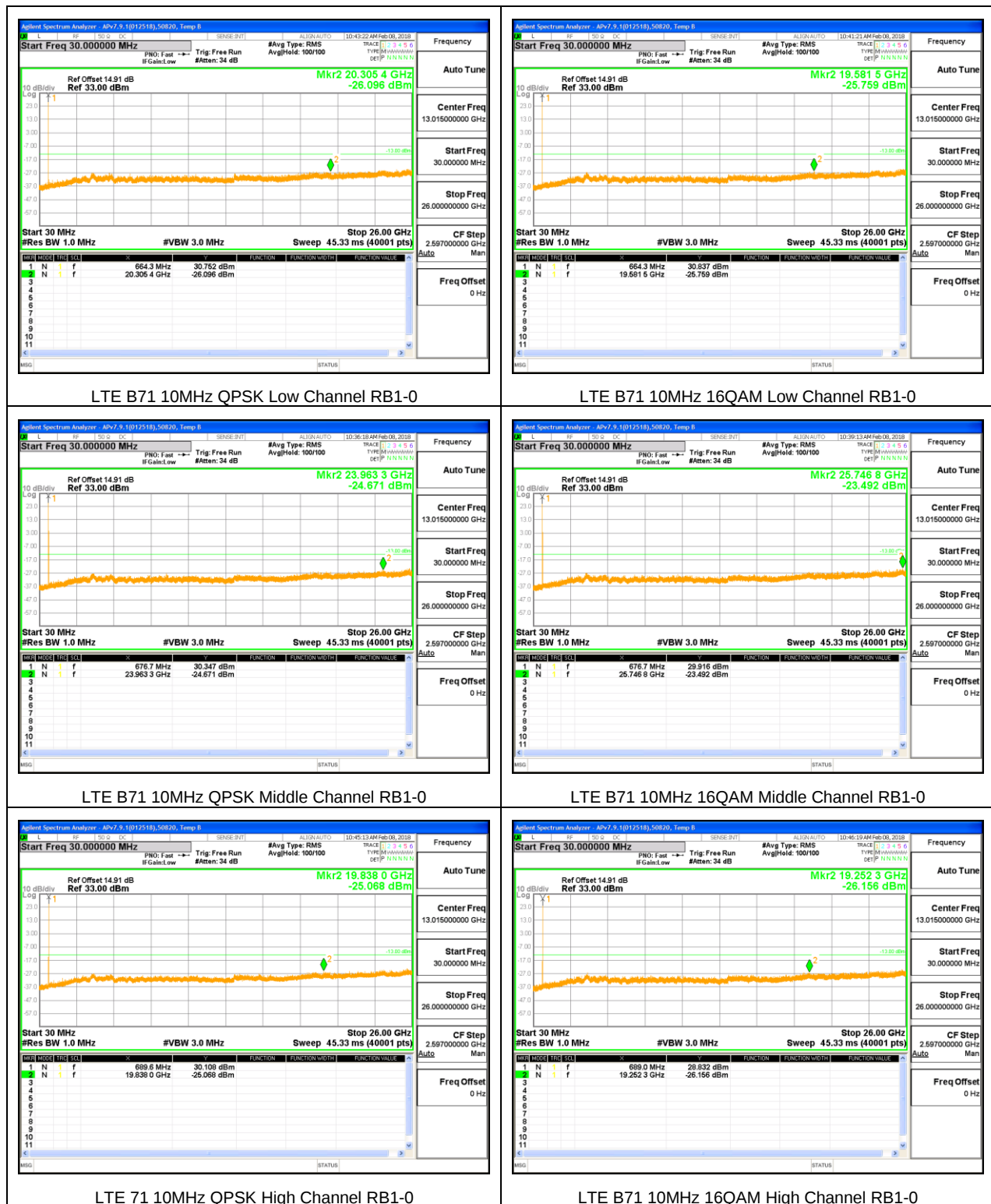
LTE B66 10MHz 16QAM High Channel RB1-0

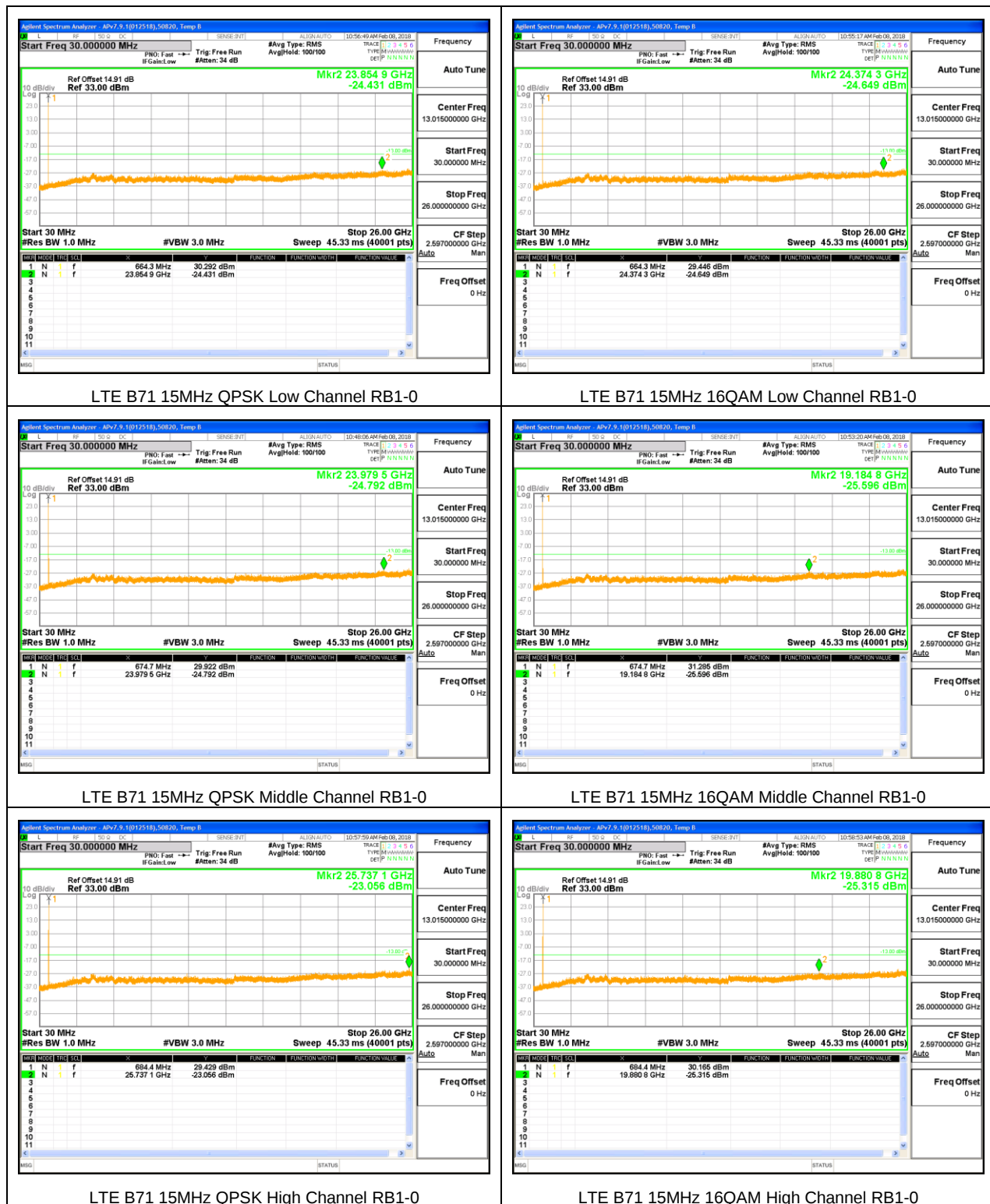


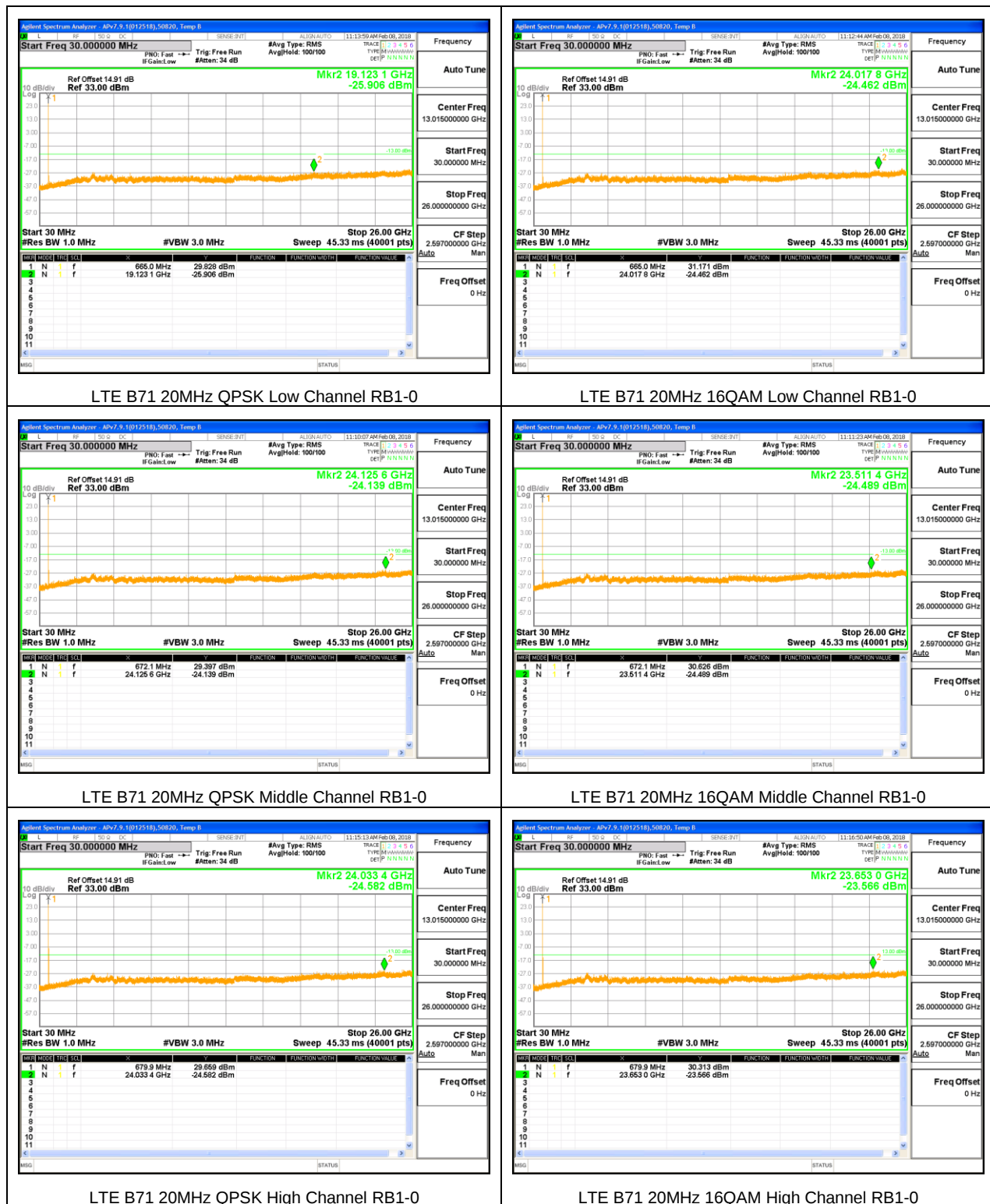


8.3.13. ANT 1, LTE BAND 71









8.4. FREQUENCY STABILITY

RULE PART(S)

§2.1055, §22.355, §24.235, §27.54, §90.213 and §90.539

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: §90.539

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

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 $+50^{\circ}\text{C}$
- Voltage = (85% - 115%)
Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
End Voltage, 3.2VDC.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE Band 2
- LTE Band 5
- LTE Band 7
- LTE Band 12
- LTE Band 13
- LTE Band 14
- LTE Band 17

- LTE Band 25
- LTE Band 26
- LTE Band 30
- LTE Band 41
- LTE Band 66
- LTE Band 71

RESULTS

See the following pages.

8.4.1. LTE BAND 2

ID:	12491	Date:	3/13/18
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QPSK, (20MHz BANDWIDTH)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1851.0028	1909.3342		
Extreme (50C)		1851.0029	1909.3343	35.2	0.019
Extreme (40C)		1851.0028	1909.3342	-34.0	-0.018
Extreme (30C)		1851.0028	1909.3342	-53.5	-0.028
Extreme (10C)		1851.0027	1909.3341	-115.7	-0.062
Extreme (0C)		1851.0029	1909.3343	56.7	0.030
Extreme (-10C)		1851.0029	1909.3343	43.9	0.023
Extreme (-20C)		1851.0028	1909.3343	28.1	0.015
Extreme (-30C)		1851.0028	1909.3343	27.0	0.014
20C	15%	1851.0028	1909.3342	-40.6	-0.022
	-15%	1851.0028	1909.3342	-44.2	-0.024
	End Point	1851.0028	1909.3342	-42.4	-0.023

8.4.2. LTE BAND 5

ID:	12491	Date:	3/13/18
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QPSK, (10MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.9045	848.8125		
Extreme (50C)		824.9045	848.8125	30.0	0.036
Extreme (40C)		824.9045	848.8125	32.2	0.038
Extreme (30C)		824.9046	848.8125	63.4	0.076
Extreme (10C)		824.9045	848.8125	39.2	0.047
Extreme (0C)		824.9046	848.8125	58.2	0.070
Extreme (-10C)		824.9045	848.8125	18.1	0.022
Extreme (-20C)		824.9045	848.8125	14.5	0.017
Extreme (-30C)		824.9045	848.8125	28.0	0.033
20C	15%	824.9046	848.8125	44.2	0.053
	-15%	824.9046	848.8125	45.1	0.054
	End Point	824.9046	848.8125	45.7	0.055

8.4.3. LTE BAND 7

ID:	12491	Date:	3/13/18
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QPSK, (20MHz BANDWIDTH)

Limit		2500	2570	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2500.3493	2566.5345		
Extreme (50C)		2500.3493	2566.5345	20.7	0.008
Extreme (40C)		2500.3493	2566.5345	45.7	0.018
Extreme (30C)		2500.3493	2566.5345	24.8	0.010
Extreme (10C)		2500.3493	2566.5346	70.1	0.028
Extreme (0C)		2500.3493	2566.5345	54.4	0.021
Extreme (-10C)		2500.3493	2566.5345	30.6	0.012
Extreme (-20C)		2500.3493	2566.5345	34.5	0.014
Extreme (-30C)		2500.3493	2566.5345	20.7	0.008
20C	15%	2500.3493	2566.5345	30.1	0.012
	-15%	2500.3493	2566.5345	31.3	0.012
	End Point	2500.3493	2566.5345	33.2	0.013

8.4.4. LTE BAND 12

ID:	12491	Date:	3/13/18
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QPSK, (10MHz BANDWIDTH)

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	699.5368	715.5109		
Extreme (50C)		699.5369	715.5109	42.9	0.061
Extreme (40C)		699.5368	715.5108	-48.0	-0.068
Extreme (30C)		699.5367	715.5108	-65.6	-0.093
Extreme (10C)		699.5368	715.5109	9.4	0.013
Extreme (0C)		699.5367	715.5108	-65.2	-0.092
Extreme (-10C)		699.5368	715.5108	-28.9	-0.041
Extreme (-20C)		699.5369	715.5109	38.7	0.055
Extreme (-30C)		699.5368	715.5109	19.1	0.027
20C	15%	699.5368	715.5108	-33.8	-0.048
	-15%	699.5368	715.5108	-30.3	-0.043
	End Point	699.5368	715.5108	-35.4	-0.050

8.4.5. LTE BAND 13

ID:	12491	Date:	3/13/18
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QPSK, (10MHz BANDWIDTH)

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	777.1201	786.8402		
Extreme (50C)		777.1200	786.8401	-76.1	-0.097
Extreme (40C)		777.1201	786.8402	-17.3	-0.022
Extreme (30C)		777.1201	786.8402	12.9	0.016
Extreme (10C)		777.1201	786.8402	14.3	0.018
Extreme (0C)		777.1202	786.8403	70.8	0.091
Extreme (-10C)		777.1200	786.8401	-57.9	-0.074
Extreme (-20C)		777.1201	786.8402	31.7	0.041
Extreme (-30C)		777.1201	786.8402	46.3	0.059
20C	15%	777.1201	786.8402	13.9	0.018
	-15%	777.1201	786.8402	14.0	0.018
	End Point	777.1201	786.8402	13.9	0.018

8.4.6. LTE BAND 14

ID:	12491	Date:	3/13/18
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QPSK, (10MHz BANDWIDTH)

Limit		788	798	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	788.1113	797.8750		
Extreme (50C)		788.1113	797.8749	-34.2	-0.043
Extreme (40C)		788.1113	797.8750	34.2	0.043
Extreme (30C)		788.1112	797.8749	-40.0	-0.050
Extreme (10C)		788.1113	797.8750	28.5	0.036
Extreme (0C)		788.1113	797.8750	21.7	0.027
Extreme (-10C)		788.1113	797.8750	19.1	0.024
Extreme (-20C)		788.1113	797.8750	16.8	0.021
Extreme (-30C)		788.1113	797.8750	11.0	0.014
20C	15%	788.1113	797.8750	17.2	0.022
	-15%	788.1113	797.8750	18.4	0.023
	End Point	788.1113	797.8750	19.3	0.024

8.4.7. LTE BAND 17

ID:	10646	Date:	5/30/18
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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	704.3340	715.6786		
Extreme (50C)		704.3340	715.6786	42.9	0.060
Extreme (40C)		704.3339	715.6785	-48.0	-0.068
Extreme (30C)		704.3339	715.6785	-65.6	-0.092
Extreme (10C)		704.3340	715.6786	9.4	0.013
Extreme (0C)		704.3339	715.6785	-65.2	-0.092
Extreme (-10C)		704.3340	715.6786	-28.9	-0.041
Extreme (-20C)		704.3340	715.6786	38.7	0.054
Extreme (-30C)		704.3340	715.6786	19.1	0.027
20C	15%	704.3340	715.6786	-33.8	-0.048
	-15%	704.3340	715.6786	-30.3	-0.043
	End Point	704.3340	715.6786	-35.4	-0.050

8.4.8. LTE BAND 25

ID:	10646	Date:	5/30/18
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QPSK, (20MHz BANDWIDTH)

Limit		1850	1915	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.8451	1914.1770		
Extreme (50C)		1850.8451	1914.1770	35.2	0.019
Extreme (40C)		1850.8451	1914.1769	-34.0	-0.018
Extreme (30C)		1850.8450	1914.1769	-53.5	-0.028
Extreme (10C)		1850.8450	1914.1768	-115.7	-0.061
Extreme (0C)		1850.8451	1914.1770	56.7	0.030
Extreme (-10C)		1850.8451	1914.1770	43.9	0.023
Extreme (-20C)		1850.8451	1914.1770	28.1	0.015
Extreme (-30C)		1850.8451	1914.1770	27.0	0.014
20C	15%	1850.8450	1914.1769	-40.6	-0.022
	-15%	1850.8450	1914.1769	-44.2	-0.023
	End Point	1850.8450	1914.1769	-42.4	-0.023

8.4.9. LTE BAND 26 (PART 90S)

ID:	12491	Date:	3/13/18
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QPSK, (15MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.6352	823.6800		
Extreme (50C)		824.6352	823.6800	-32.0	-0.038
Extreme (40C)		824.6353	823.6801	44.0	0.053
Extreme (30C)		824.6352	823.6800	-45.3	-0.054
Extreme (10C)		824.6353	823.6801	52.8	0.063
Extreme (0C)		824.6353	823.6801	25.8	0.031
Extreme (-10C)		824.6352	823.6801	14.3	0.017
Extreme (-20C)		824.6352	823.6801	15.2	0.018
Extreme (-30C)		824.6352	823.6800	-55.1	-0.066
20C	15%	824.6352	823.6800	0.8	0.001
	-15%	824.6353	823.6801	21.3	0.025
	End Point	824.6353	823.6801	21.6	0.026

8.4.10. LTE BAND 30

ID:	12491	Date:	3/13/18
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QPSK, (10MHz BANDWIDTH)

Limit		2305	2315	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2305.4951	2314.5838		
Extreme (50C)		2305.4951	2314.5838	27.4	0.012
Extreme (40C)		2305.4951	2314.5838	22.6	0.010
Extreme (30C)		2305.4951	2314.5838	38.1	0.016
Extreme (10C)		2305.4951	2314.5838	35.5	0.015
Extreme (0C)		2305.4951	2314.5838	42.9	0.019
Extreme (-10C)		2305.4950	2314.5837	-57.1	-0.025
Extreme (-20C)		2305.4951	2314.5838	40.3	0.017
Extreme (-30C)		2305.4950	2314.5837	-27.2	-0.012
20C	15%	2305.4951	2314.5838	55.4	0.024
	-15%	2305.4951	2314.5838	56.3	0.024
	End Point	2305.4951	2314.5838	53.5	0.023

8.4.11. LTE BAND 41

ID:	12492	Date:	3/14/18
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QPSK, (20MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2496.5737	2689.4002		
Extreme (50C)		2496.5737	2689.4002	35.2	0.014
Extreme (40C)		2496.5736	2689.4001	-54.6	-0.021
Extreme (30C)		2496.5737	2689.4002	45.8	0.018
Extreme (10C)		2496.5737	2689.4002	35.9	0.014
Extreme (0C)		2496.5736	2689.4002	-27.7	-0.011
Extreme (-10C)		2496.5737	2689.4002	26.1	0.010
Extreme (-20C)		2496.5737	2689.4002	28.8	0.011
Extreme (-30C)		2496.5737	2689.4002	29.9	0.012
20C	15%	2496.5737	2689.4002	40.1	0.015
	-15%	2496.5737	2689.4002	41.6	0.016
	End Point	2496.5737	2689.4002	41.2	0.016

8.4.12. LTE BAND 66

ID:	12491	Date:	3/13/18
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QPSK, (20MHz BANDWIDTH)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1711.0121	1779.0121		
Extreme (50C)		1711.0121	1779.0121	14.1	0.008
Extreme (40C)		1711.0121	1779.0121	31.1	0.018
Extreme (30C)		1711.0121	1779.0121	38.8	0.022
Extreme (10C)		1711.0122	1779.0121	74.1	0.042
Extreme (0C)		1711.0121	1779.0121	31.0	0.018
Extreme (-10C)		1711.0121	1779.0121	32.8	0.019
Extreme (-20C)		1711.0121	1779.0121	33.4	0.019
Extreme (-30C)		1711.0121	1779.0120	-30.4	-0.017
20C	15%	1711.0122	1779.0121	52.6	0.030
	-15%	1711.0122	1779.0121	53.4	0.031
	End Point	1711.0122	1779.0121	53.2	0.030

8.4.13. LTE BAND 71

ID:	12492	Date:	3/14/18	Unit:	1306
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QPSK, (20MHz BANDWIDTH)

Limit		663	698	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	663.0093	679.5516		
Extreme (50C)		663.0093	679.5516	13.2	0.019
Extreme (40C)		663.0093	679.5516	9.3	0.014
Extreme (30C)		663.0093	679.5516	7.3	0.011
Extreme (10C)		663.0093	679.5516	9.7	0.014
Extreme (0C)		663.0093	679.5516	8.2	0.012
Extreme (-10C)		663.0093	679.5516	8.2	0.012
Extreme (-20C)		663.0093	679.5516	13.9	0.020
Extreme (-30C)		663.0093	679.5516	15.1	0.022
20C	15%	663.0093	679.5516	8.1	0.012
	-15%	663.0093	679.5516	8.5	0.012
	End Point	663.0093	679.5516	9.2	0.014

8.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

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

MODES TESTED

- LTE Band 2
- LTE Band 5
- LTE Band 7
- LTE Band 12
- LTE Band 13
- LTE Band 14
- LTE Band 17
- LTE Band 25
- LTE Band 26
- LTE Band 30
- LTE Band 41
- LTE Band 66
- LTE Band 71

RESULT

Antenna 1 was used to measure as the worst case; full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

ID:	50820	Date:	3/8/18
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8.5.1. LTE BAND 2





8.5.2. LTE BAND 5

