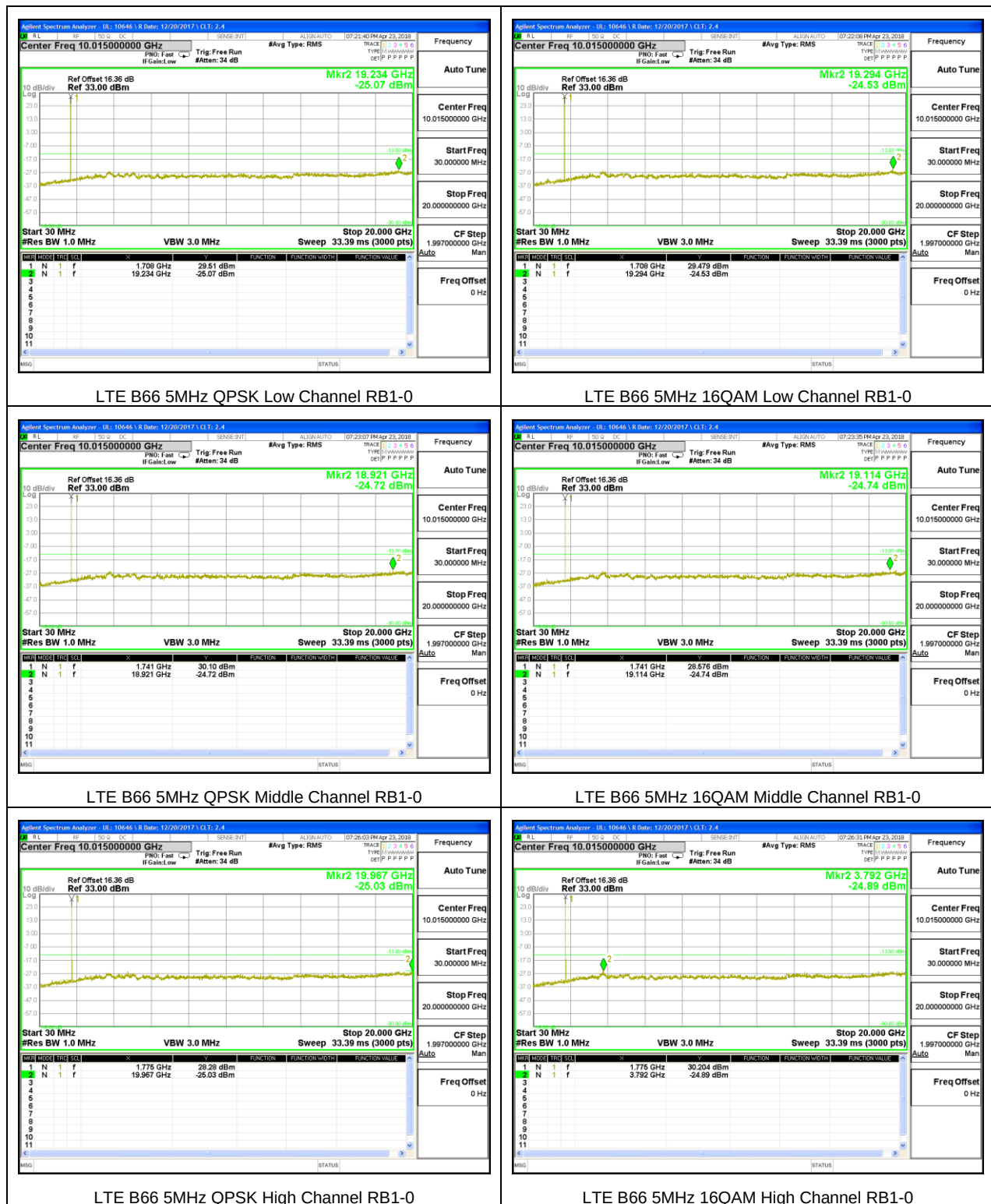
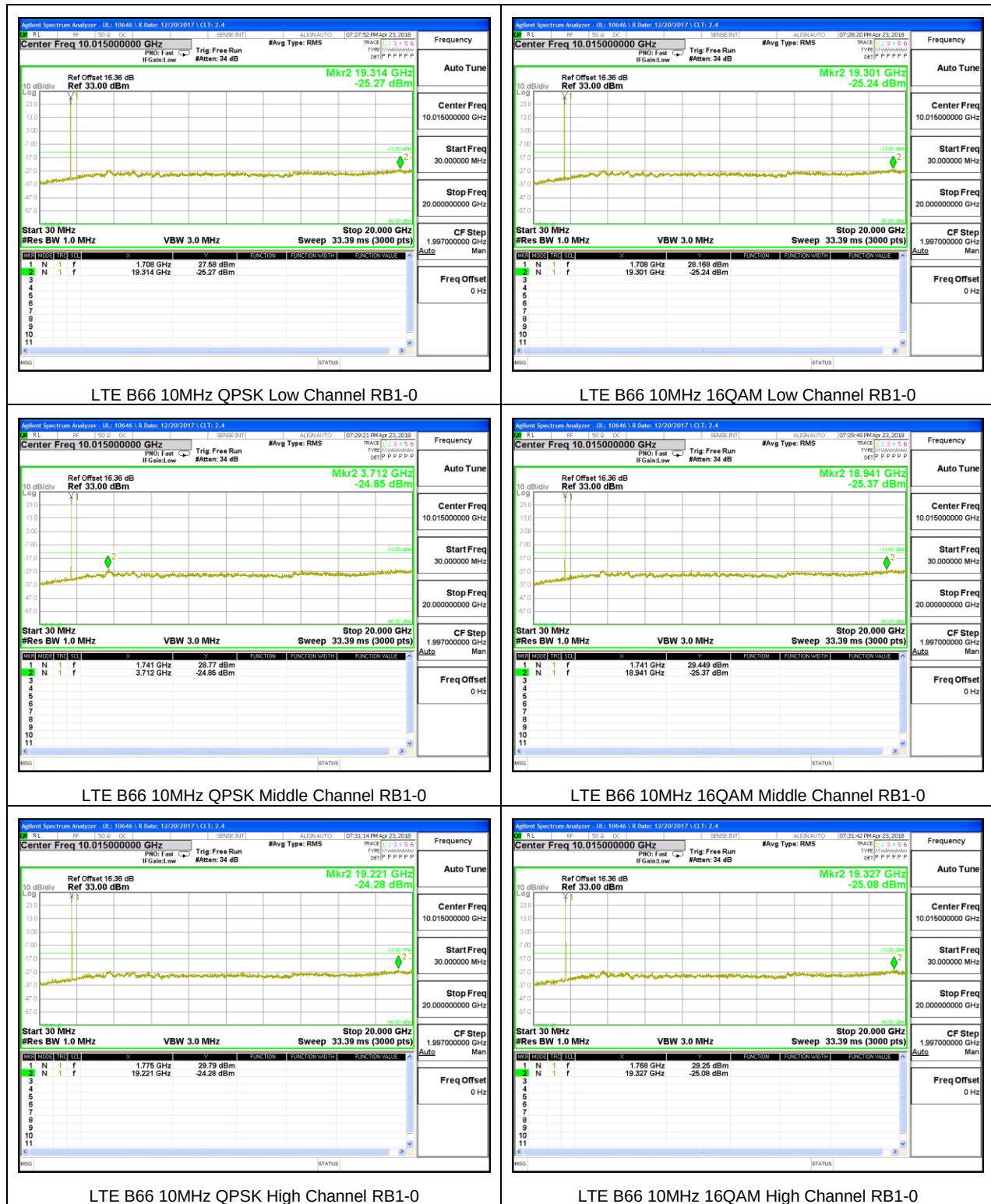




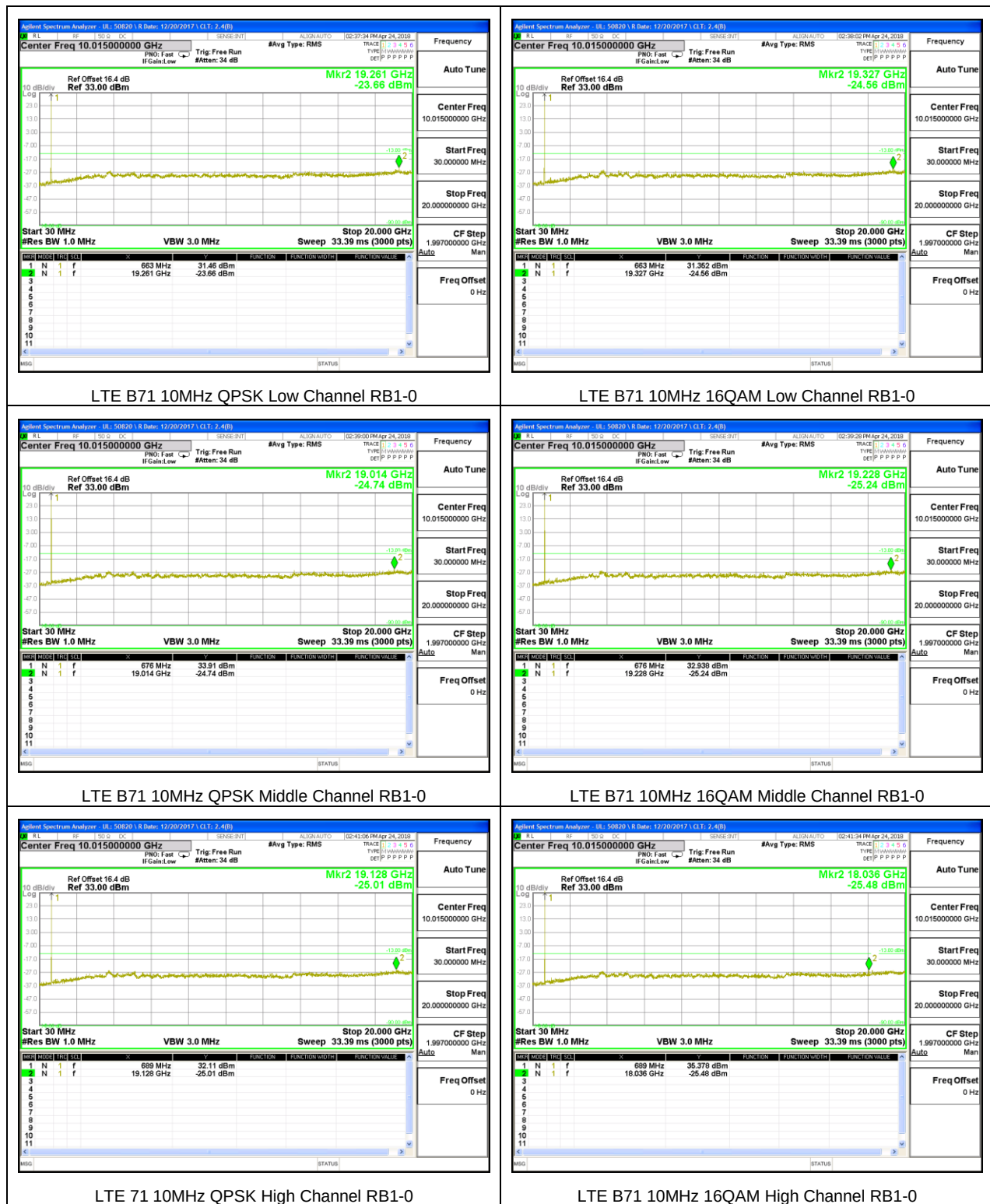






8.3.13. ANT 1, LTE BAND 71









8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §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, 2.72VDC.

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:	12482	Date:	3/23/18
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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	1850.7262	1909.2472		
Extreme (50C)		1850.7262	1909.2472	-38.8	-0.021
Extreme (40C)		1850.7263	1909.2473	68.2	0.036
Extreme (30C)		1850.7263	1909.2473	56.4	0.030
Extreme (10C)		1850.7263	1909.2473	51.5	0.027
Extreme (0C)		1850.7263	1909.2473	53.4	0.028
Extreme (-10C)		1850.7262	1909.2472	40.0	0.021
Extreme (-20C)		1850.7262	1909.2472	26.7	0.014
Extreme (-30C)		1850.7261	1909.2471	-53.2	-0.028
20C	15%	1850.7263	1909.2473	52.2	0.028
	-15%	1850.7262	1909.2472	49.7	0.026
	End Point	1850.7263	1909.2473	55.2	0.029

8.4.2. LTE BAND 5

ID:	12482	Date:	3/23/18
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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	824.2192	848.7957		
Extreme (50C)		824.2192	848.7957	45.6	0.055
Extreme (40C)		824.2191	848.7956	-54.4	-0.065
Extreme (30C)		824.2192	848.7957	42.4	0.051
Extreme (10C)		824.2192	848.7957	39.0	0.047
Extreme (0C)		824.2192	848.7957	47.0	0.056
Extreme (-10C)		824.2192	848.7957	23.5	0.028
Extreme (-20C)		824.2192	848.7957	13.5	0.016
Extreme (-30C)		824.2192	848.7957	-22.2	-0.026
20C	15%	824.2192	848.7957	40.1	0.048
	-15%	824.2192	848.7957	37.5	0.045
	End Point	824.2192	848.7957	42.4	0.051

8.4.3. LTE BAND 7

ID:	12482	Date:	3/23/18
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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	2500.7572	2569.2432		
Extreme (50C)		2500.7572	2569.2432	21.5	0.008
Extreme (40C)		2500.7572	2569.2432	24.1	0.009
Extreme (30C)		2500.7572	2569.2432	28.0	0.011
Extreme (10C)		2500.7572	2569.2432	29.1	0.011
Extreme (0C)		2500.7572	2569.2432	32.8	0.013
Extreme (-10C)		2500.7572	2569.2432	-39.1	-0.015
Extreme (-20C)		2500.7572	2569.2432	49.1	0.019
Extreme (-30C)		2500.7572	2569.2432	44.2	0.017
20C	15%	2500.7572	2569.2432	28.6	0.011
	-15%	2500.7572	2569.2432	27.1	0.011
	End Point	2500.7572	2569.2432	29.0	0.011

8.4.4. LTE BAND 12

ID:	12482	Date:	3/23/18
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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	699.2471	715.7866		
Extreme (50C)		699.2472	715.7867	52.2	0.074
Extreme (40C)		699.2472	715.7867	60.3	0.085
Extreme (30C)		699.2470	715.7865	-52.1	-0.074
Extreme (10C)		699.2471	715.7866	-38.6	-0.055
Extreme (0C)		699.2471	715.7866	40.5	0.057
Extreme (-10C)		699.2471	715.7866	-38.1	-0.054
Extreme (-20C)		699.2471	715.7866	11.9	0.017
Extreme (-30C)		699.2471	715.7866	16.6	0.023
20C	15%	699.2471	715.7866	-42.4	-0.060
	-15%	699.2471	715.7866	-40.8	-0.058
	End Point	699.2471	715.7866	-44.1	-0.062

8.4.5. LTE BAND 13

ID:	12482	Date:	3/23/18
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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	777.2422	786.7751		
Extreme (50C)		777.2423	786.7752	57.0	0.073
Extreme (40C)		777.2423	786.7752	51.4	0.066
Extreme (30C)		777.2422	786.7751	-42.4	-0.054
Extreme (10C)		777.2422	786.7751	-48.7	-0.062
Extreme (0C)		777.2422	786.7751	42.6	0.054
Extreme (-10C)		777.2422	786.7751	-34.5	-0.044
Extreme (-20C)		777.2422	786.7751	19.2	0.025
Extreme (-30C)		777.2422	786.7751	15.7	0.020
20C	15%	777.2422	786.7751	-45.1	-0.058
	-15%	777.2422	786.7751	-42.3	-0.054
	End Point	777.2422	786.7751	-44.5	-0.057

8.4.6. LTE BAND 14

ID:	12482	Date:	3/23/18
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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	788.2277	797.7752		
Extreme (50C)		788.2277	797.7752	-38.8	-0.049
Extreme (40C)		788.2277	797.7752	37.5	0.047
Extreme (30C)		788.2277	797.7752	-26.2	-0.033
Extreme (10C)		788.2277	797.7752	-20.9	-0.026
Extreme (0C)		788.2277	797.7752	23.0	0.029
Extreme (-10C)		788.2277	797.7752	-29.7	-0.037
Extreme (-20C)		788.2277	797.7752	7.6	0.010
Extreme (-30C)		788.2277	797.7752	7.3	0.009
20C	15%	788.2277	797.7752	-23.5	-0.030
	-15%	788.2277	797.7752	-24.7	-0.031
	End Point	788.2277	797.7752	-25.2	-0.032

8.4.7. LTE BAND 17

ID:	12482	Date:	3/23/18
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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	704.2094	715.7949		
Extreme (50C)		704.2095	715.7950	52.2	0.074
Extreme (40C)		704.2095	715.7950	60.3	0.085
Extreme (30C)		704.2093	715.7948	-52.1	-0.073
Extreme (10C)		704.2094	715.7949	-38.6	-0.054
Extreme (0C)		704.2094	715.7949	40.5	0.057
Extreme (-10C)		704.2094	715.7949	-38.1	-0.054
Extreme (-20C)		704.2094	715.7949	11.9	0.017
Extreme (-30C)		704.2094	715.7949	16.6	0.023
20C	15%	704.2094	715.7949	-42.4	-0.060
	-15%	704.2094	715.7949	-40.8	-0.057
	End Point	704.2094	715.7949	-44.1	-0.062

8.4.8. LTE BAND 25

ID:	12482	Date:	3/23/18
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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	1850.7634	1914.2754		
Extreme (50C)		1850.7634	1914.2754	-38.8	-0.021
Extreme (40C)		1850.7635	1914.2755	68.2	0.036
Extreme (30C)		1850.7635	1914.2755	56.4	0.030
Extreme (10C)		1850.7635	1914.2755	51.5	0.027
Extreme (0C)		1850.7635	1914.2755	53.4	0.028
Extreme (-10C)		1850.7634	1914.2754	40.0	0.021
Extreme (-20C)		1850.7634	1914.2754	26.7	0.014
Extreme (-30C)		1850.7633	1914.2753	-53.2	-0.028
20C	15%	1850.7635	1914.2755	52.2	0.028
	-15%	1850.7634	1914.2754	49.7	0.026
	End Point	1850.7635	1914.2755	55.2	0.029

8.4.9. LTE BAND 26 (PART 90)

ID:	12482	Date:	3/23/18
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QPSK, (10MHz BANDWIDTH)

Limit		814	824	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	814.1908	823.7884		
Extreme (50C)		814.1908	823.7884	45.6	0.056
Extreme (40C)		814.1907	823.7883	-54.4	-0.066
Extreme (30C)		814.1908	823.7884	42.4	0.052
Extreme (10C)		814.1908	823.7884	39.0	0.048
Extreme (0C)		814.1908	823.7884	47.0	0.057
Extreme (-10C)		814.1908	823.7884	23.5	0.029
Extreme (-20C)		814.1908	823.7884	13.5	0.016
Extreme (-30C)		814.1908	823.7884	-22.2	-0.027
20C	15%	814.1908	823.7884	40.1	0.049
	-15%	814.1908	823.7884	37.5	0.046
	End Point	814.1908	823.7884	42.4	0.052

8.4.10. LTE BAND 30

ID:	12482	Date:	3/23/18
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QPSK, (10MHz BANDWIDTH)

Limit		2305	2315	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2305.2369	2314.7652		
Extreme (50C)		2305.2369	2314.7652	-32.3	-0.014
Extreme (40C)		2305.2369	2314.7652	-34.2	-0.015
Extreme (30C)		2305.2370	2314.7653	64.3	0.028
Extreme (10C)		2305.2370	2314.7653	59.3	0.026
Extreme (0C)		2305.2370	2314.7653	71.8	0.031
Extreme (-10C)		2305.2369	2314.7652	39.6	0.017
Extreme (-20C)		2305.2369	2314.7652	38.9	0.017
Extreme (-30C)		2305.2370	2314.7653	51.0	0.022
20C	15%	2305.2370	2314.7653	61.2	0.026
	-15%	2305.2370	2314.7653	58.7	0.025
	End Point	2305.2370	2314.7653	62.4	0.027

8.4.11. LTE BAND 41

ID:	44366	Date:	3/26/18
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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	2496.2853	2689.5878		
Extreme (50C)		2496.2853	2689.5878	-29.6	-0.011
Extreme (40C)		2496.2853	2689.5878	-30.9	-0.012
Extreme (30C)		2496.2854	2689.5879	53.1	0.020
Extreme (10C)		2496.2853	2689.5878	43.0	0.017
Extreme (0C)		2496.2853	2689.5878	-33.4	-0.013
Extreme (-10C)		2496.2853	2689.5878	13.7	0.005
Extreme (-20C)		2496.2853	2689.5878	-13.3	-0.005
Extreme (-30C)		2496.2853	2689.5878	12.6	0.005
20C	15%	2496.2853	2689.5878	44.5	0.017
	-15%	2496.2853	2689.5878	42.7	0.016
	End Point	2496.2853	2689.5878	43.3	0.017

8.4.12. LTE BAND 66

ID:	12482	Date:	3/23/18
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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	1710.7508	1779.2649		
Extreme (50C)		1710.7508	1779.2649	17.4	0.010
Extreme (40C)		1710.7508	1779.2649	-18.2	-0.010
Extreme (30C)		1710.7508	1779.2649	41.7	0.024
Extreme (10C)		1710.7508	1779.2649	48.8	0.028
Extreme (0C)		1710.7508	1779.2649	30.8	0.018
Extreme (-10C)		1710.7508	1779.2649	34.0	0.019
Extreme (-20C)		1710.7508	1779.2649	10.9	0.006
Extreme (-30C)		1710.7508	1779.2649	13.5	0.008
20C	15%	1710.7508	1779.2649	45.1	0.026
	-15%	1710.7508	1779.2649	42.3	0.024
	End Point	1710.7508	1779.2649	44.7	0.026