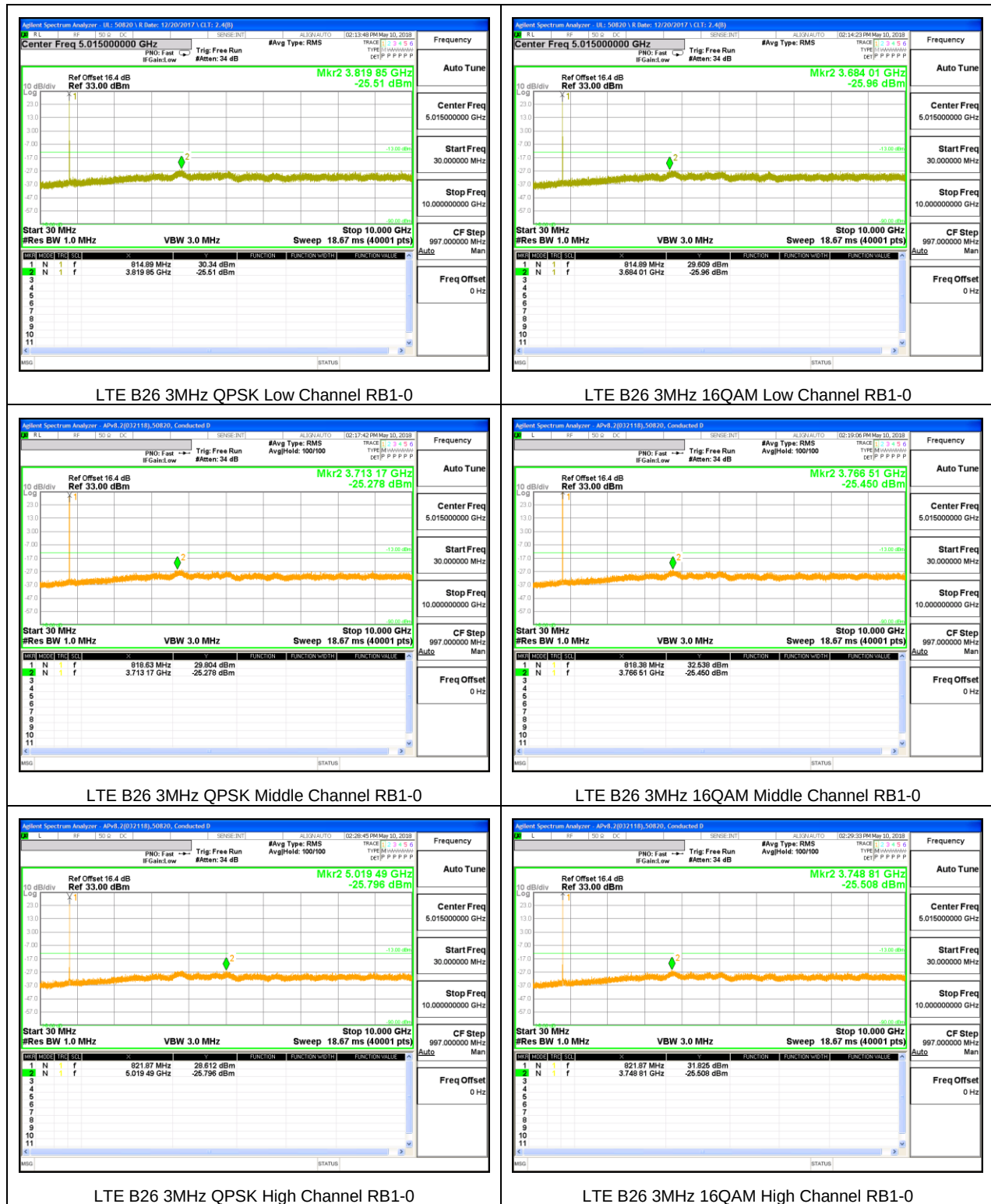
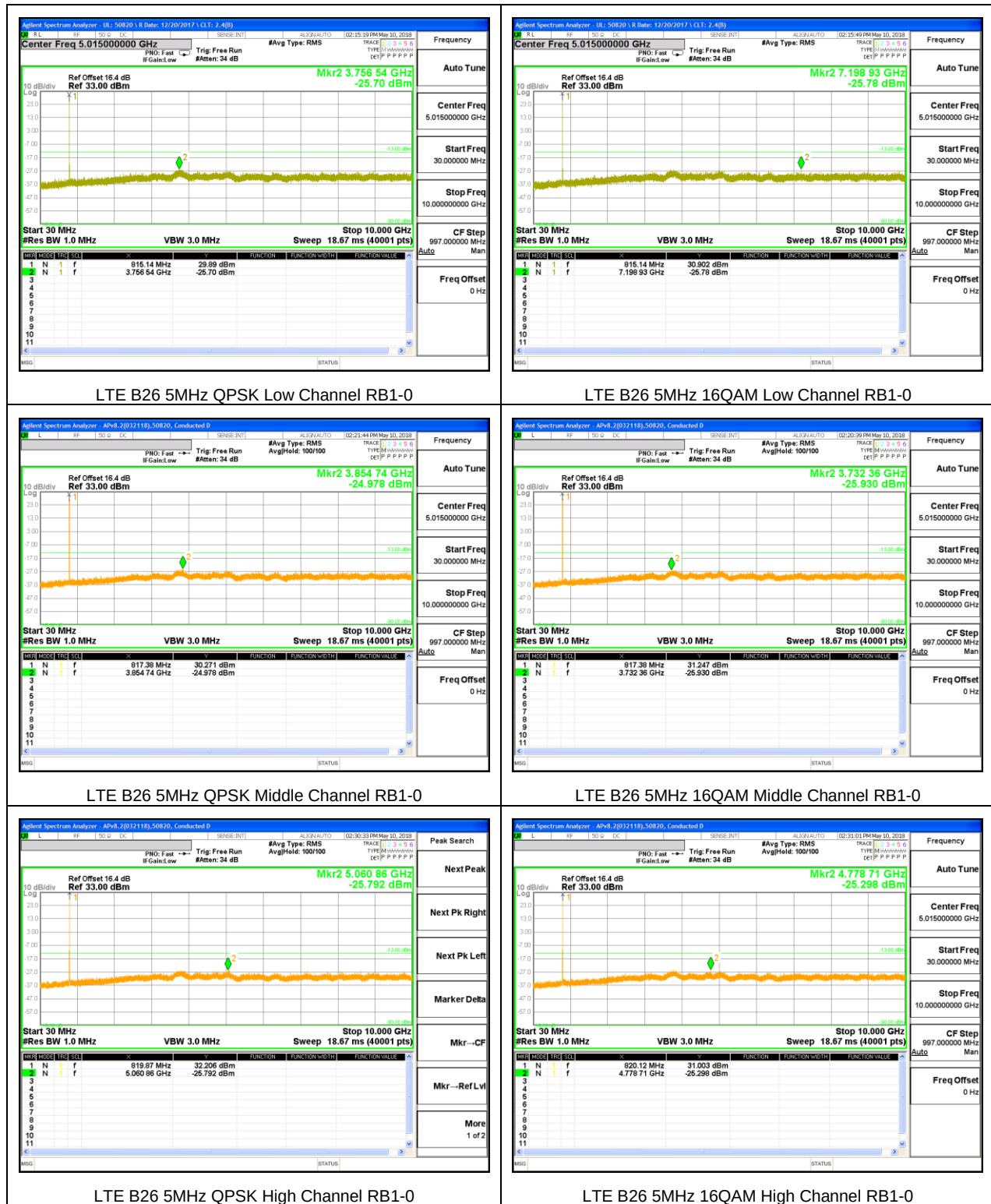
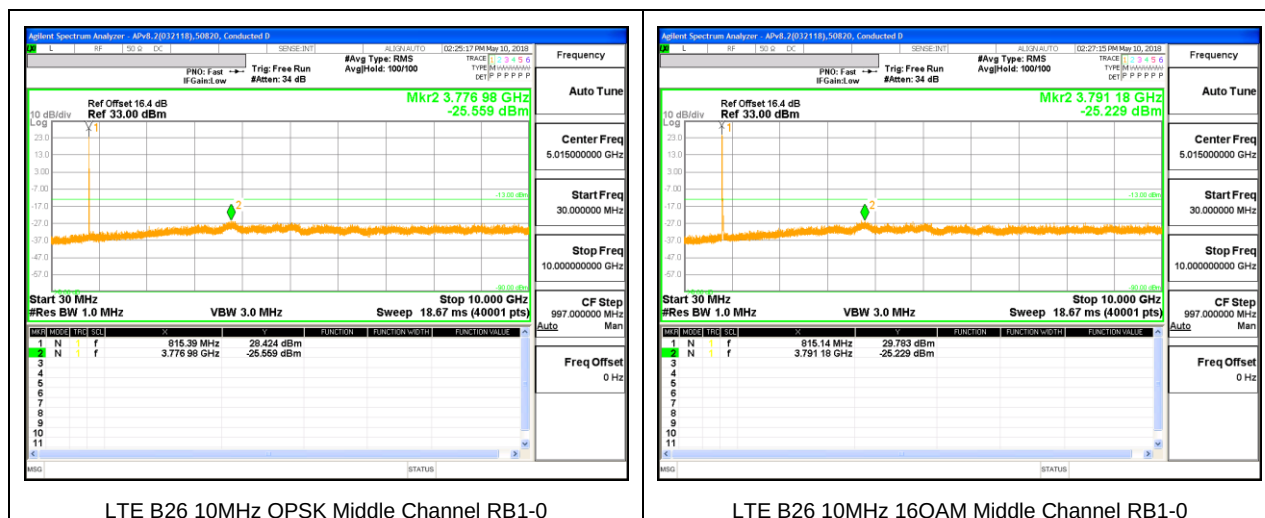




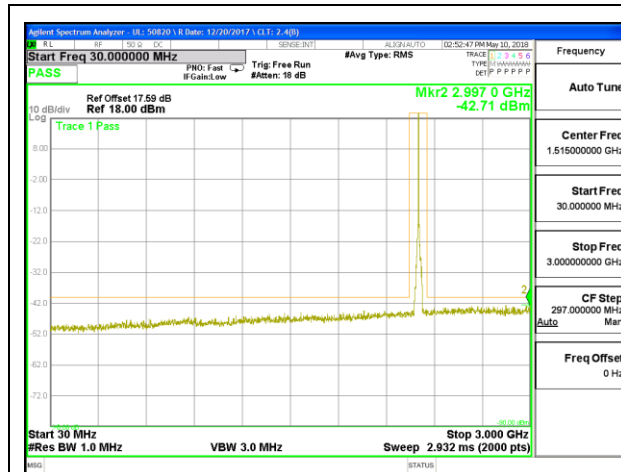




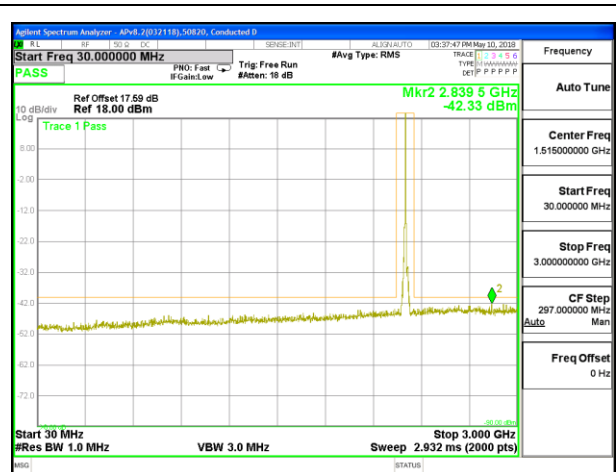
LTE B26 10MHz QPSK Middle Channel RB1-0

LTE B26 10MHz 16QAM Middle Channel RB1-0

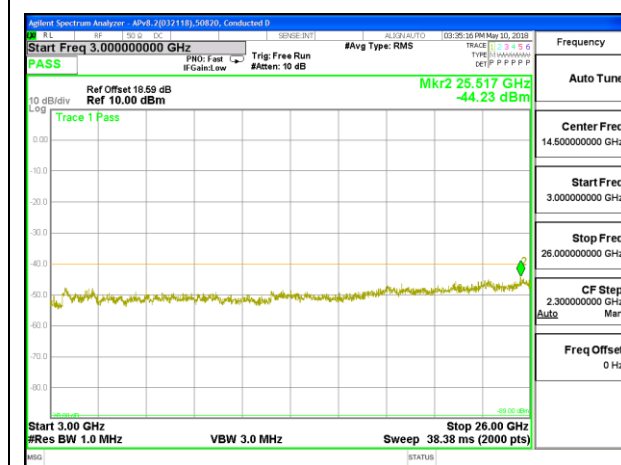
8.3.10. LTE BAND 30



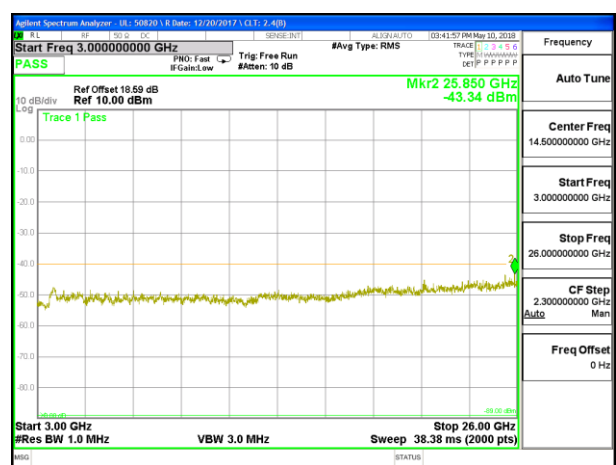
LTE B30 5MHz QPSK Low Channel RB1-0



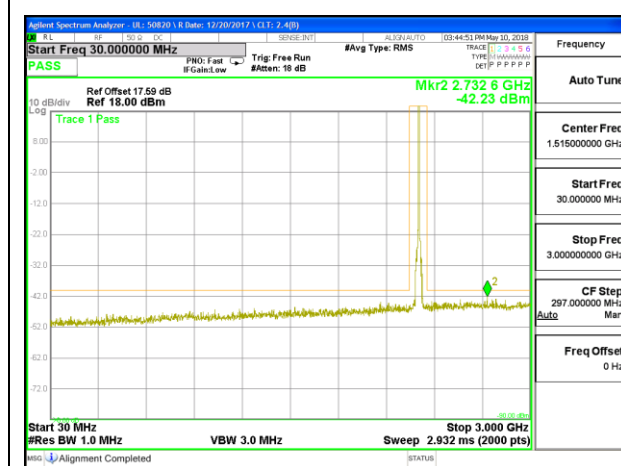
LTE B30 5MHz 16QAM Low Channel RB1-0



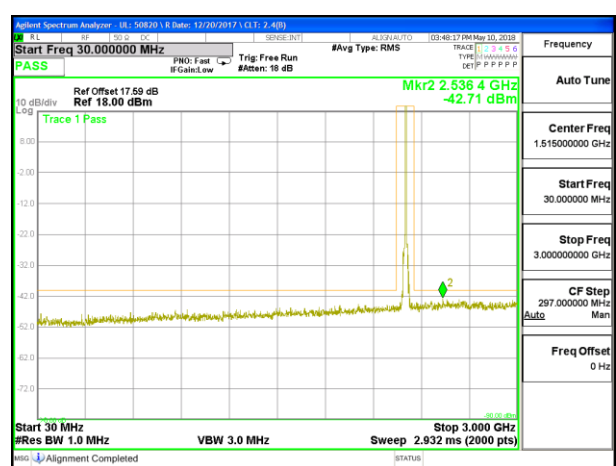
LTE B30 5MHz QPSK Low Channel RB1-0



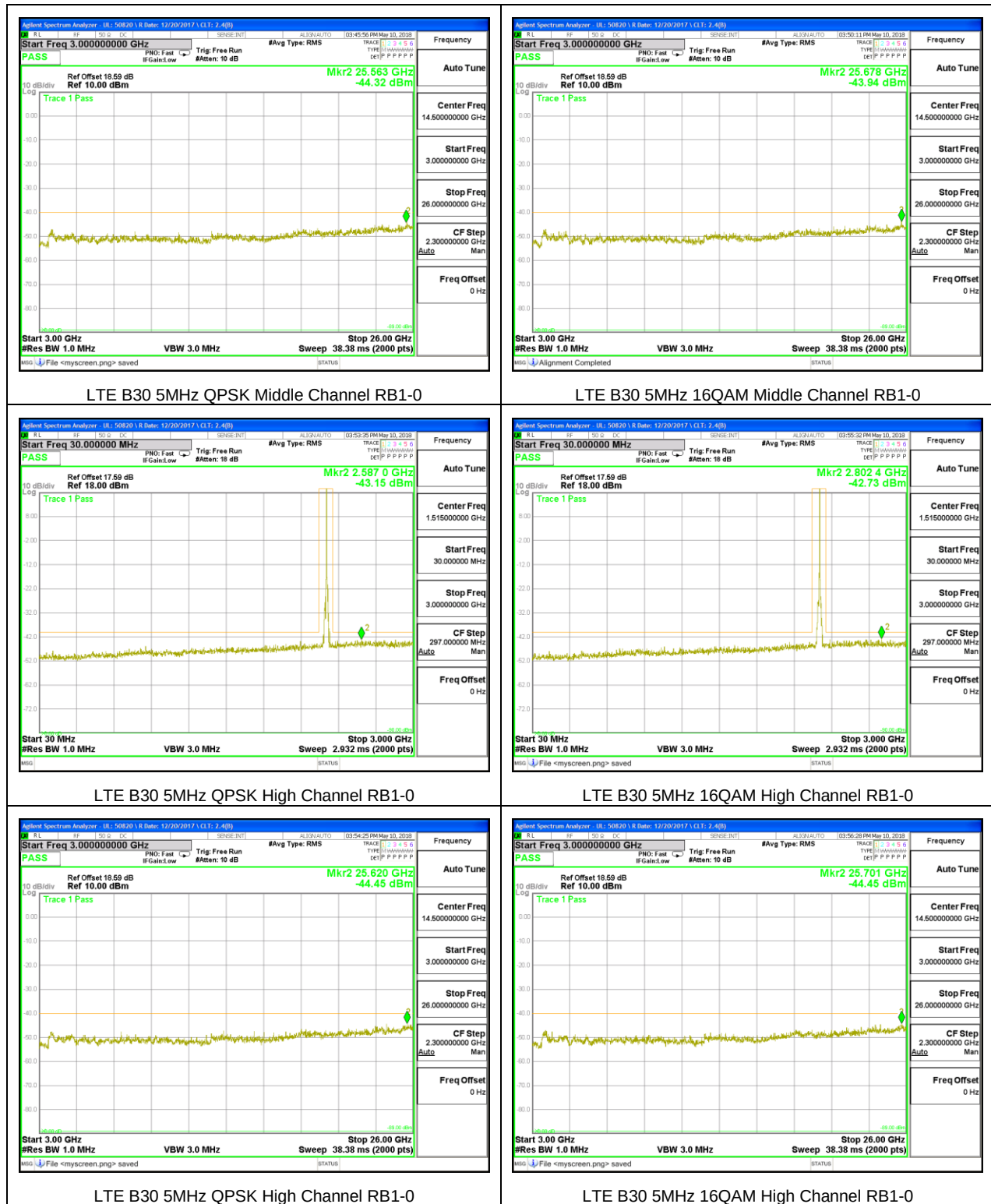
LTE B30 5MHz 16QAM Low Channel RB1-0

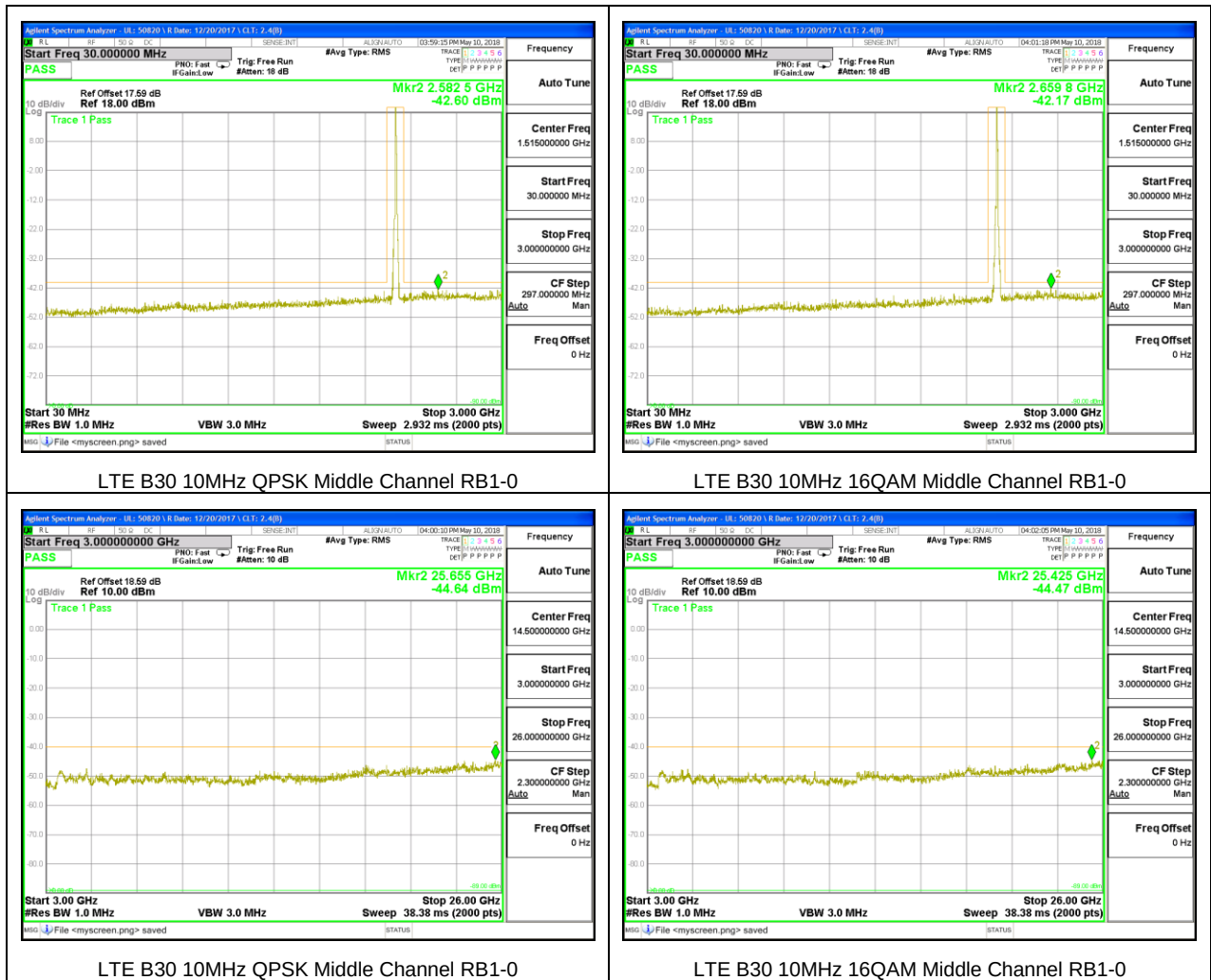


LTE B30 5MHz QPSK Middle Channel RB1-0

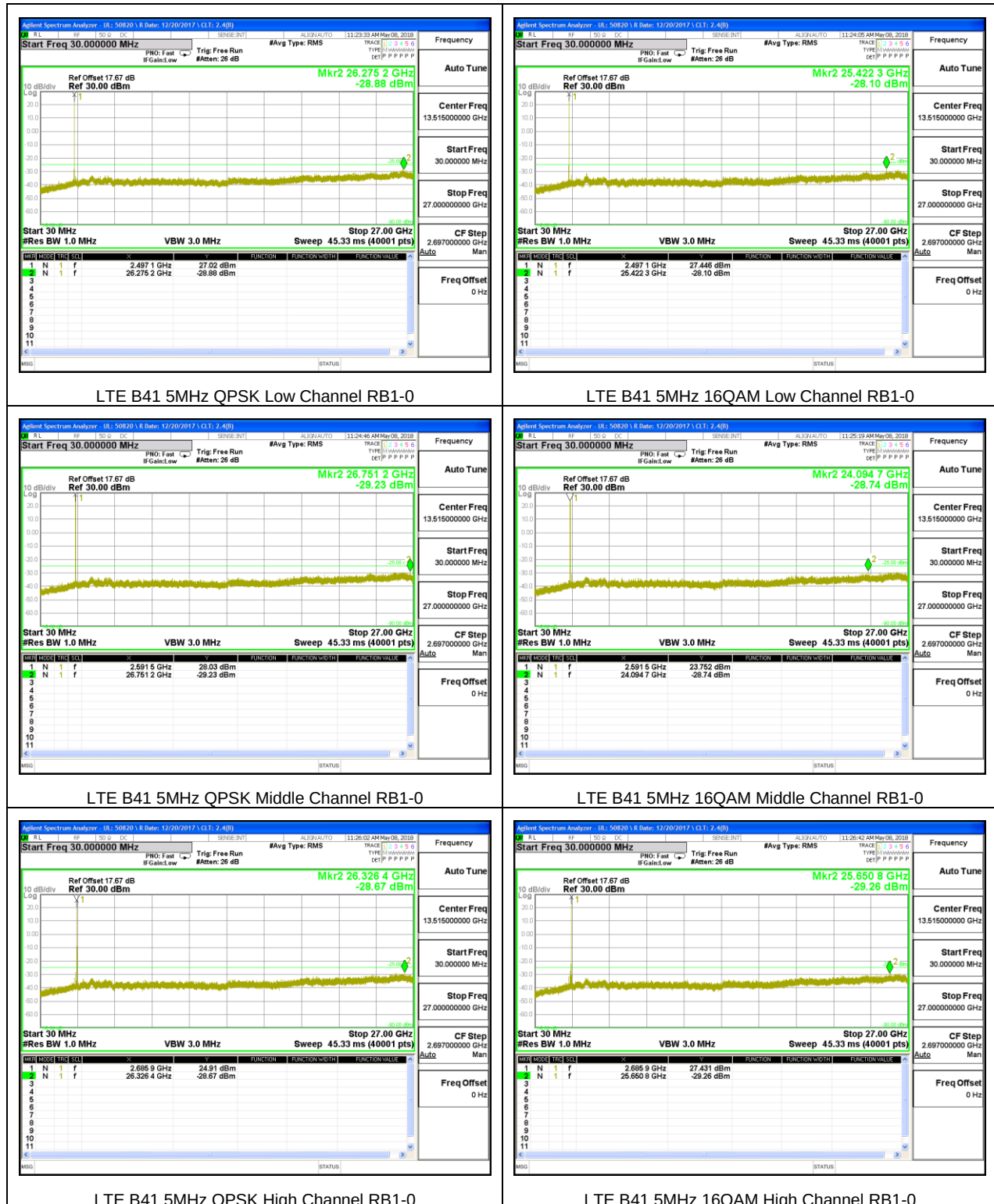


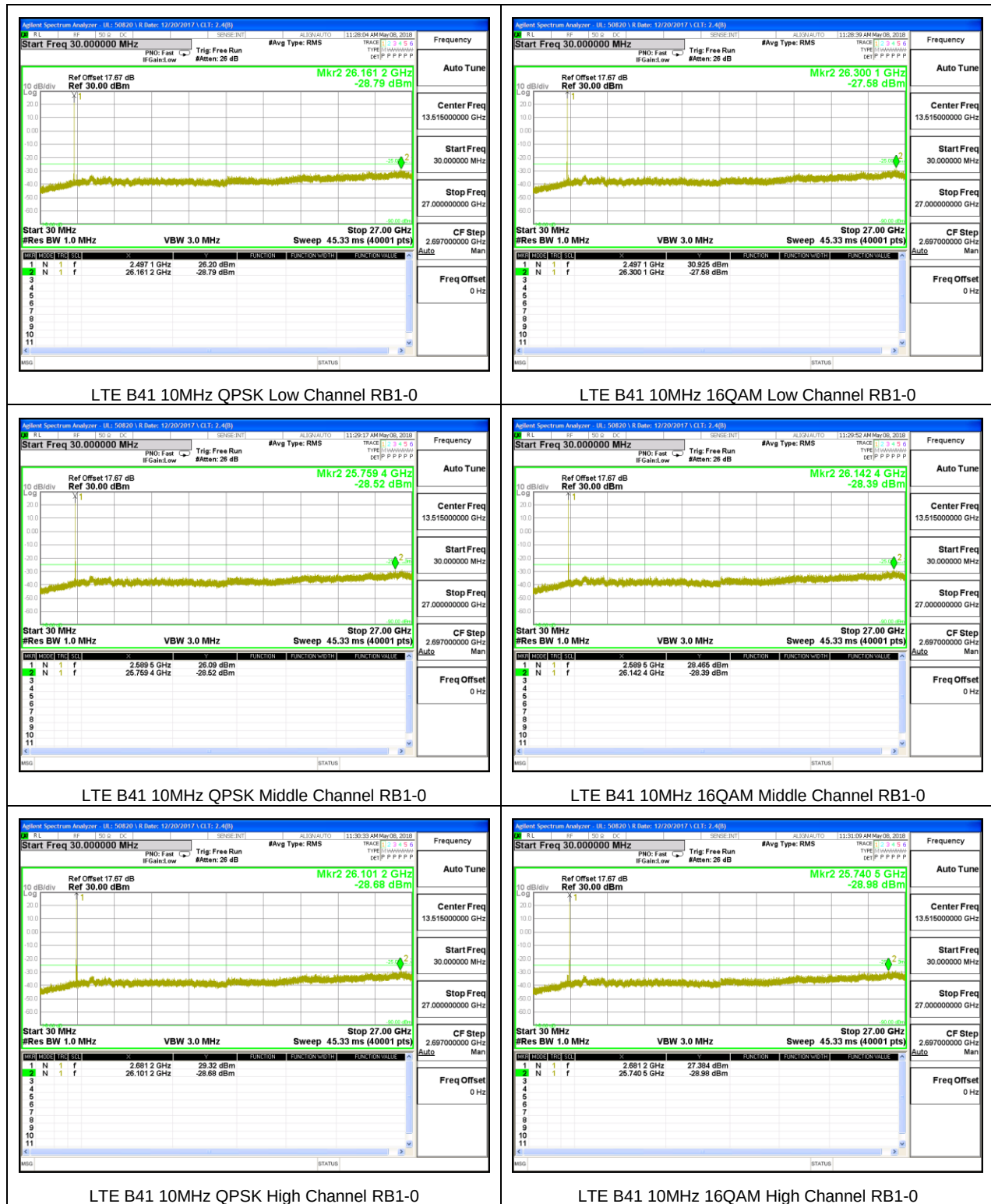
LTE B30 5MHz 16QAM Middle Channel RB1-0

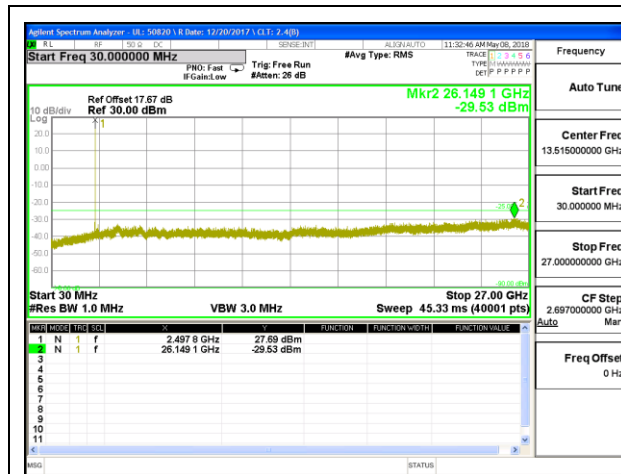




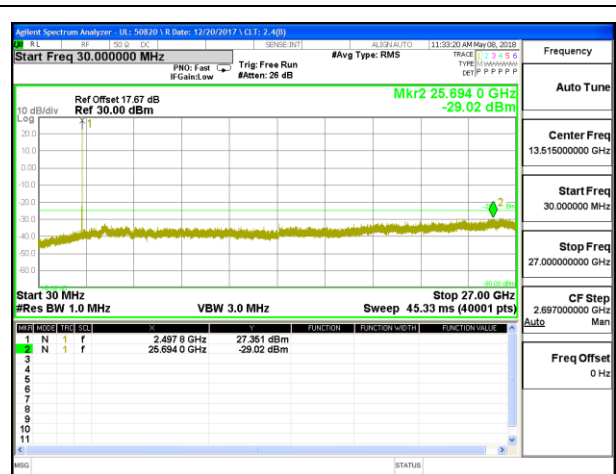
8.3.11. LTE BAND 41



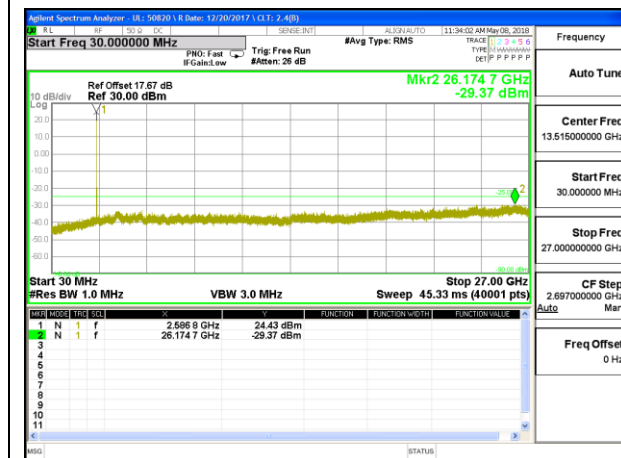




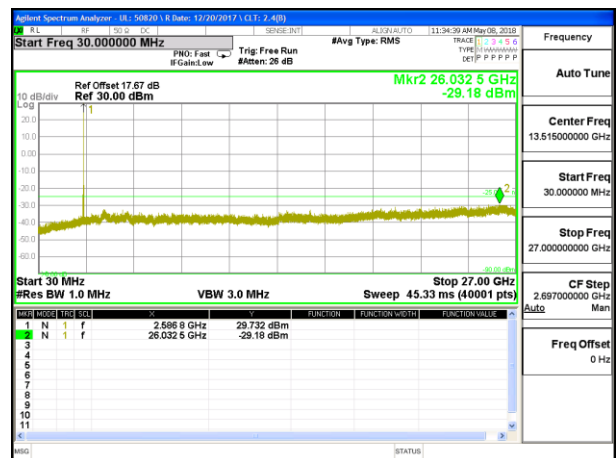
LTE B41 15MHz QPSK Low Channel RB1-0



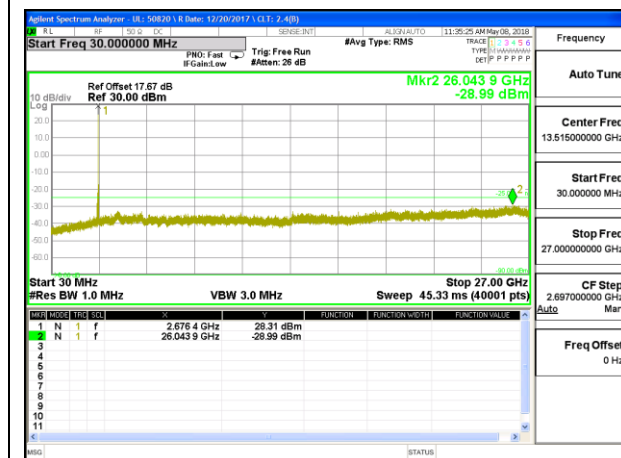
LTE B41 15MHz 16QAM Low Channel RB1-0



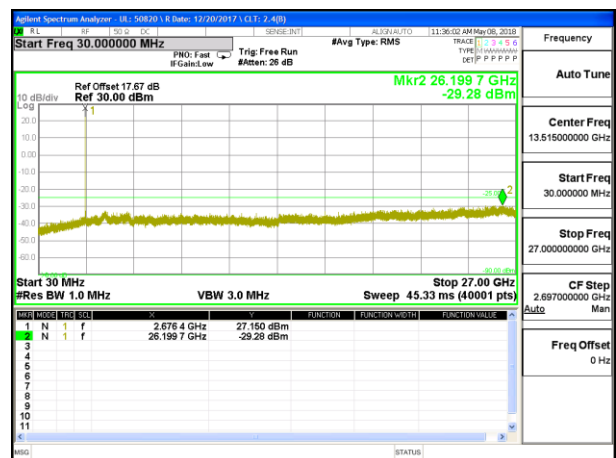
LTE B41 15MHz QPSK Middle Channel RB1-0



LTE B41 15MHz 16QAM Middle Channel RB1-0



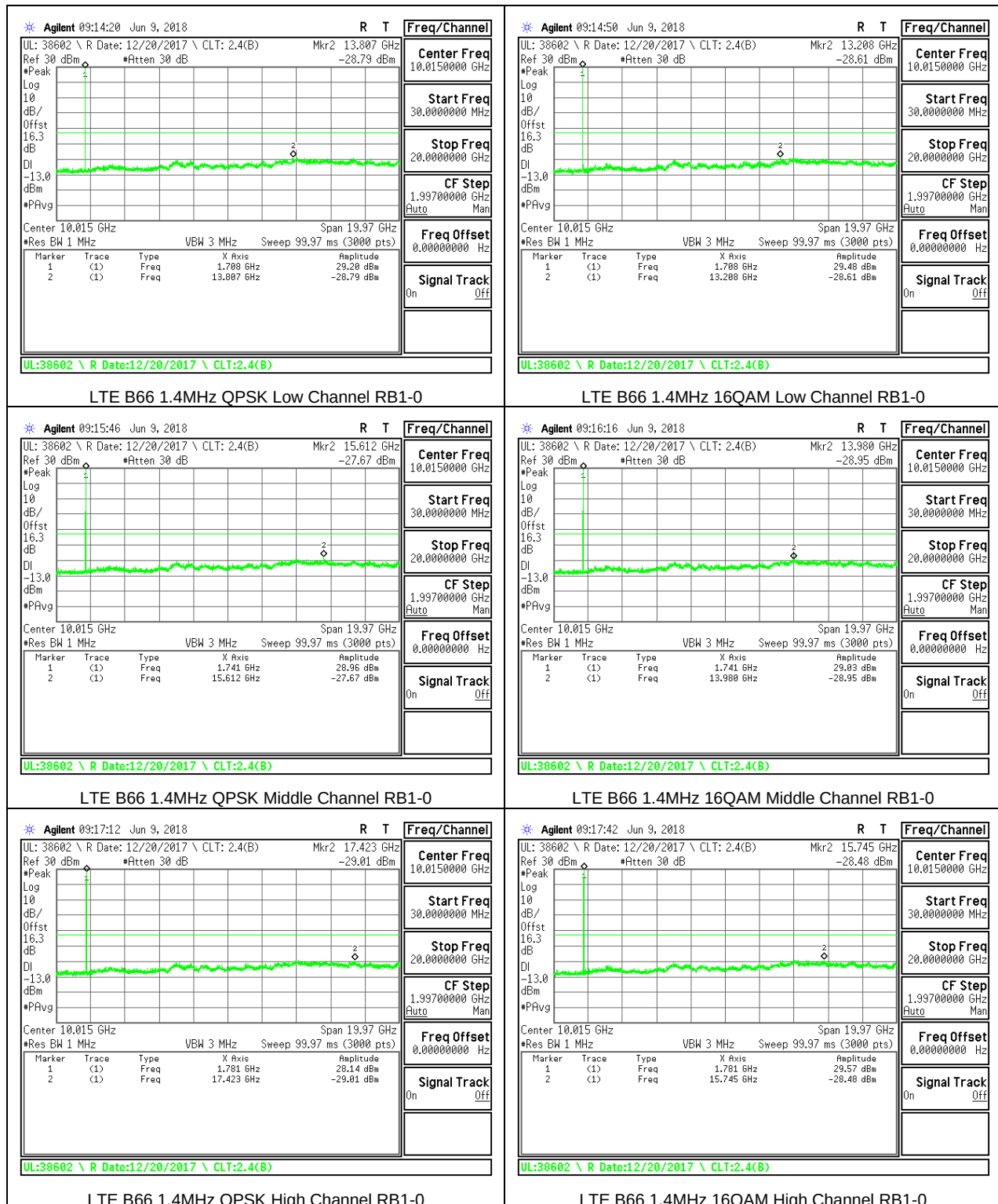
LTE B41 15MHz QPSK High Channel RB1-0

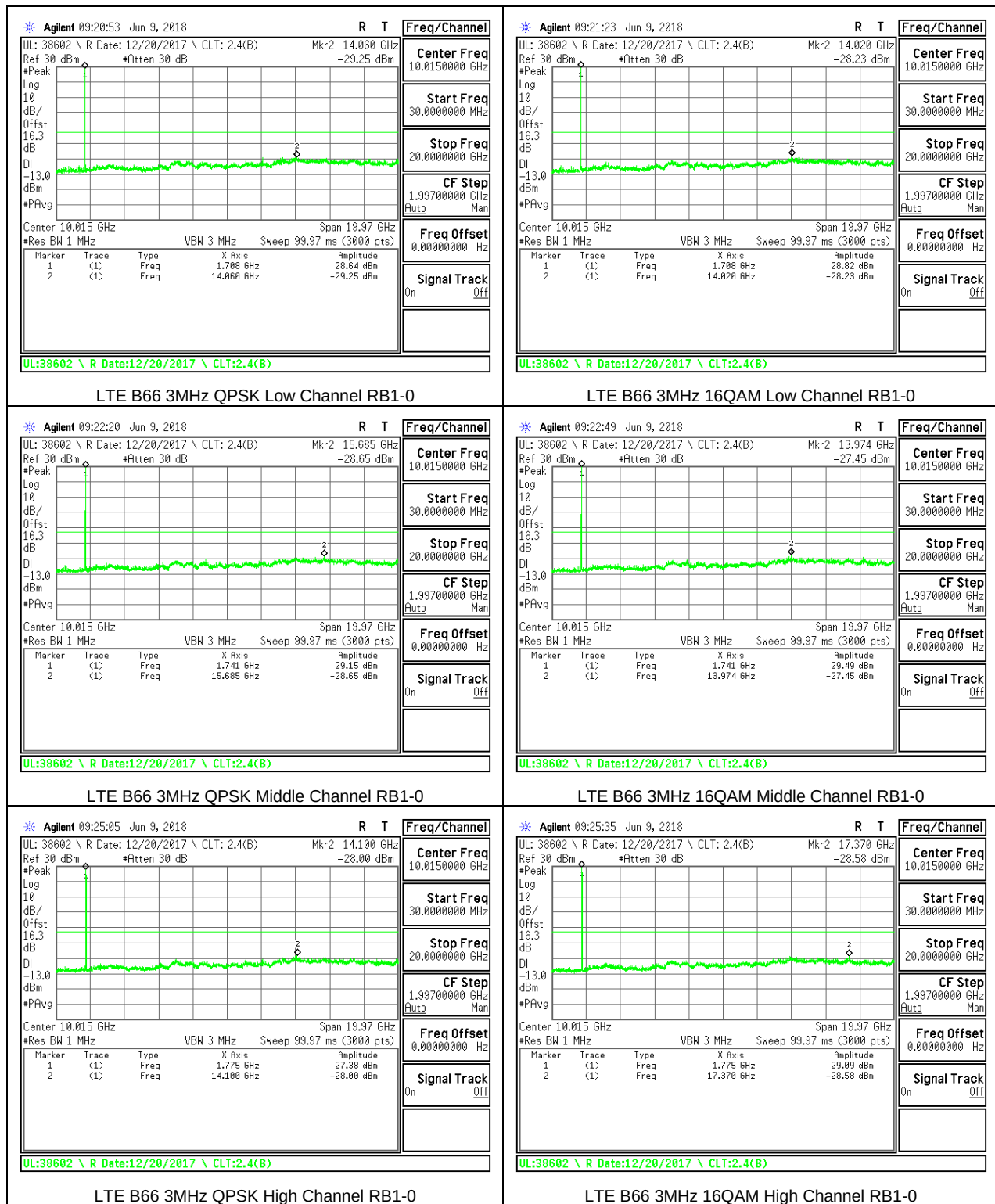


LTE B41 15MHz 16QAM High Channel RB1-0

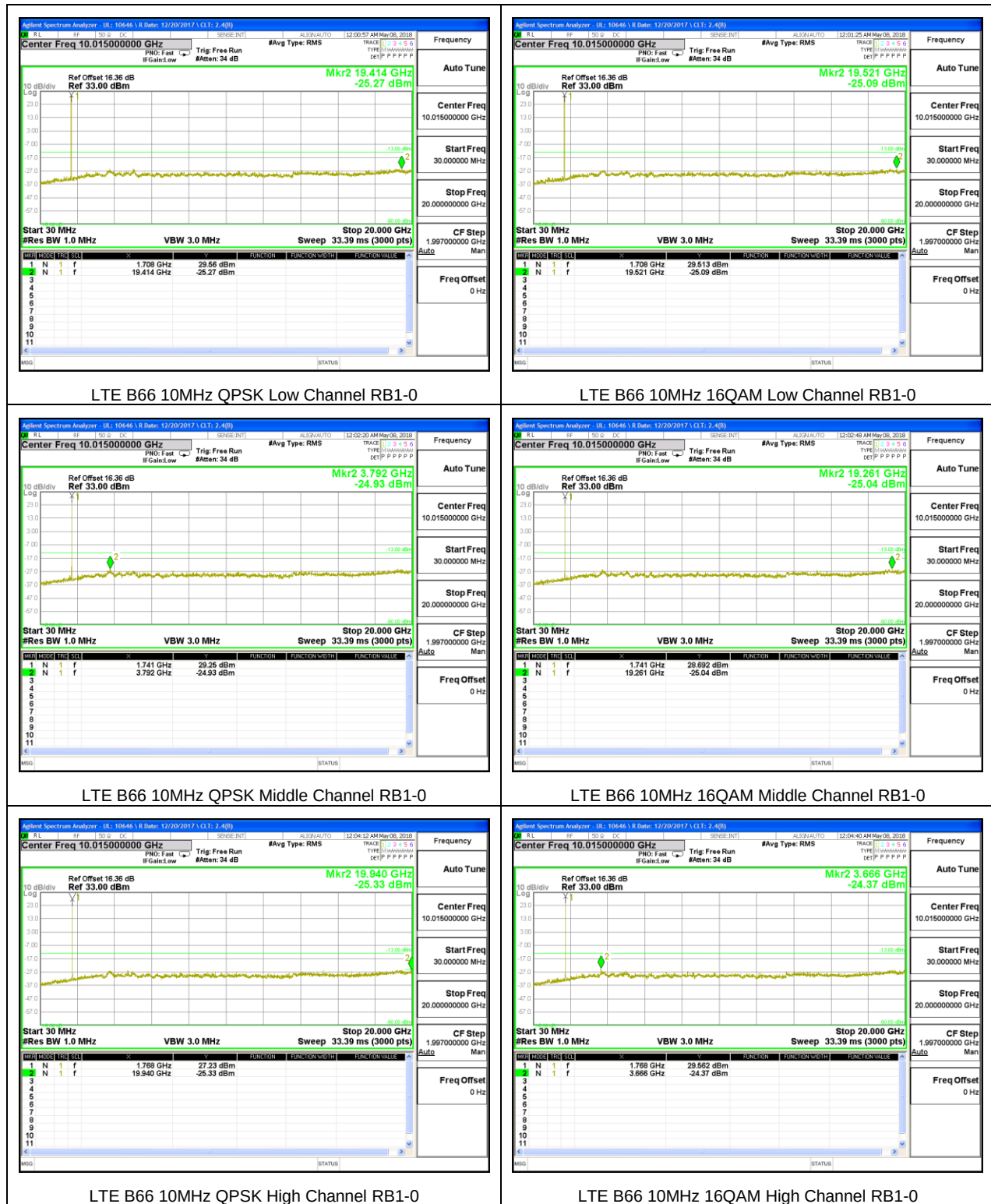


8.3.12. LTE BAND 66

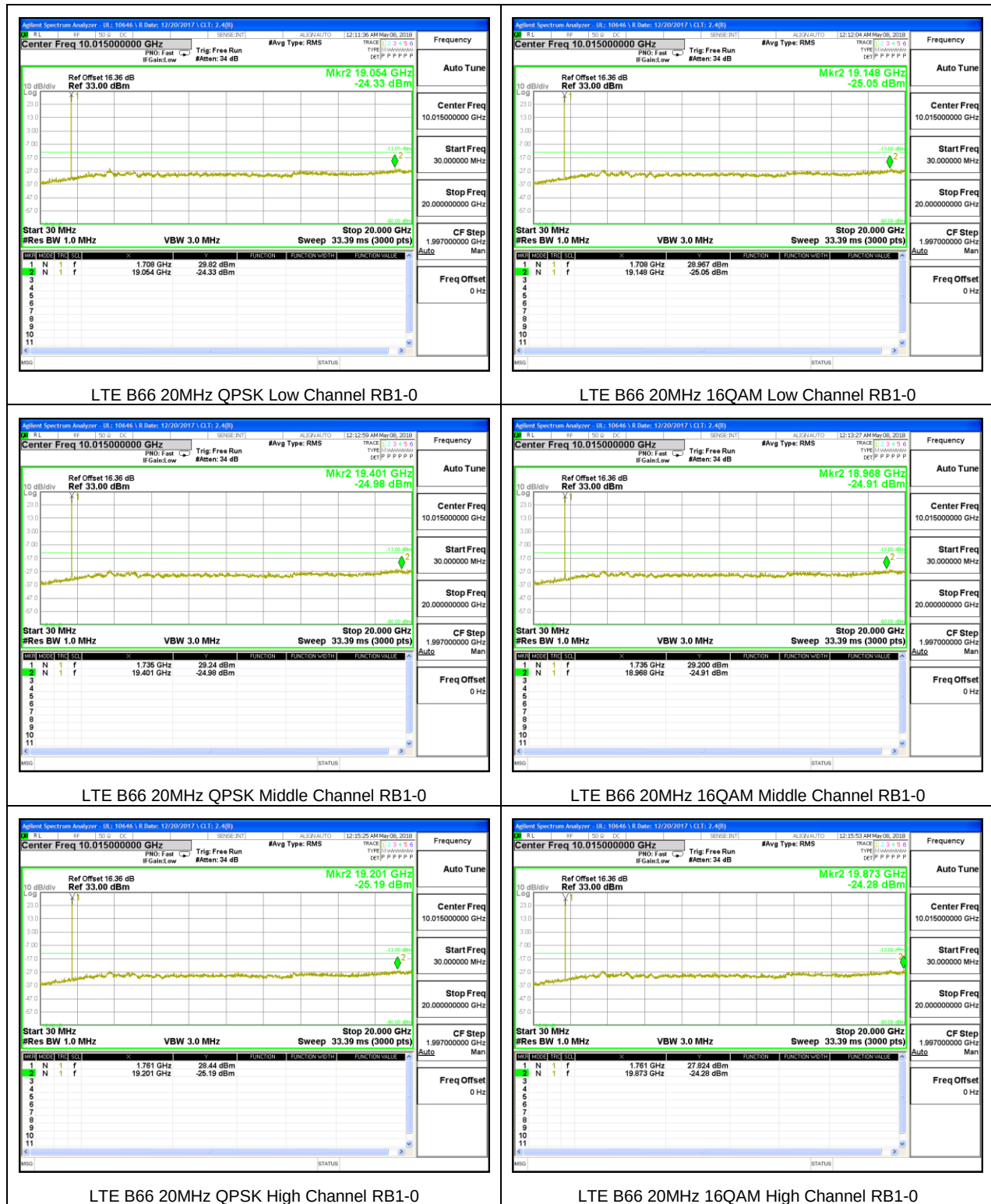












8.4. FREQUENCY STABILITY

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, 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

RESULTS

See the following pages.

8.4.1. LTE BAND 2

ID:	44410	Date:	2/22/18
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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	1850.8253	1909.1672		
Extreme (50C)		1850.8253	1909.1672	22.7	0.012
Extreme (40C)		1850.8253	1909.1672	24.1	0.013
Extreme (30C)		1850.8253	1909.1672	25.3	0.013
Extreme (10C)		1850.8253	1909.1672	20.7	0.011
Extreme (0C)		1850.8253	1909.1672	35.7	0.019
Extreme (-10C)		1850.8254	1909.1673	59.5	0.032
Extreme (-20C)		1850.8252	1909.1671	-50.9	-0.027
Extreme (-30C)		1850.8253	1909.1672	31.4	0.017
20C	15%	1850.8253	1909.1672	23.3	0.012
	-15%	1850.8253	1909.1672	27.9	0.015
	End Point	1850.8253	1909.1672	22.2	0.012

8.4.2. LTE BAND 5

ID:	44410	Date:	2/22/18
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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	824.3583	848.6334		
Extreme (50C)		824.3583	848.6334	-27.8	-0.033
Extreme (40C)		824.3583	848.6334	26.3	0.031
Extreme (30C)		824.3583	848.6334	32.5	0.039
Extreme (10C)		824.3583	848.6334	-38.4	-0.046
Extreme (0C)		824.3583	848.6334	19.5	0.023
Extreme (-10C)		824.3583	848.6334	10.7	0.013
Extreme (-20C)		824.3583	848.6334	9.3	0.011
Extreme (-30C)		824.3583	848.6334	14.0	0.017
20C	15%	824.3583	848.6334	-27.5	-0.033
	-15%	824.3583	848.6334	-38.6	-0.046
	End Point	824.3583	848.6334	28.3	0.034

8.4.3. LTE BAND 7

ID:	44410	Date:	2/22/18
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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	2500.8082	2569.1754		
Extreme (50C)		2500.8081	2569.1753	-67.6	-0.027
Extreme (40C)		2500.8081	2569.1753	-64.5	-0.025
Extreme (30C)		2500.8081	2569.1753	-58.5	-0.023
Extreme (10C)		2500.8082	2569.1754	-47.9	-0.019
Extreme (0C)		2500.8082	2569.1754	44.3	0.017
Extreme (-10C)		2500.8082	2569.1754	-48.6	-0.019
Extreme (-20C)		2500.8082	2569.1754	18.4	0.007
Extreme (-30C)		2500.8082	2569.1754	16.2	0.006
20C	15%	2500.8082	2569.1754	-14.2	-0.006
	-15%	2500.8082	2569.1754	-19.8	-0.008
	End Point	2500.8082	2569.1754	-18.0	-0.007

8.4.4. LTE BAND 12

ID:	44410	Date:	2/22/18
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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	699.3751	715.6254		
Extreme (50C)		699.3751	715.6254	8.0	0.011
Extreme (40C)		699.3751	715.6254	20.3	0.029
Extreme (30C)		699.3751	715.6254	19.7	0.028
Extreme (10C)		699.3751	715.6254	6.8	0.010
Extreme (0C)		699.3751	715.6254	9.7	0.014
Extreme (-10C)		699.3751	715.6254	16.6	0.023
Extreme (-20C)		699.3751	715.6254	9.9	0.014
Extreme (-30C)		699.3751	715.6254	11.6	0.016
20C	15%	699.3751	715.6254	-15.2	-0.022
	-15%	699.3751	715.6254	16.4	0.023
	End Point	699.3751	715.6254	21.0	0.030

8.4.5. LTE BAND 13

ID:	44410	Date:	2/22/18
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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	777.1005	786.8922		
Extreme (50C)		777.1005	786.8922	11.2	0.014
Extreme (40C)		777.1005	786.8922	10.3	0.013
Extreme (30C)		777.1005	786.8922	13.1	0.017
Extreme (10C)		777.1005	786.8922	16.4	0.021
Extreme (0C)		777.1005	786.8922	23.1	0.030
Extreme (-10C)		777.1005	786.8922	18.2	0.023
Extreme (-20C)		777.1005	786.8922	38.5	0.049
Extreme (-30C)		777.1005	786.8922	11.1	0.014
20C	15%	777.1005	786.8922	19.0	0.024
	-15%	777.1005	786.8922	23.5	0.030
	End Point	777.1005	786.8922	17.5	0.022

8.4.6. LTE BAND 14

ID:	44410	Date:	2/22/18
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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	788.1175	797.8874		
Extreme (50C)		788.1175	797.8874	10.2	0.013
Extreme (40C)		788.1175	797.8874	19.7	0.025
Extreme (30C)		788.1175	797.8874	21.9	0.028
Extreme (10C)		788.1175	797.8874	22.0	0.028
Extreme (0C)		788.1175	797.8874	18.5	0.023
Extreme (-10C)		788.1175	797.8874	-11.2	-0.014
Extreme (-20C)		788.1175	797.8874	12.3	0.016
Extreme (-30C)		788.1175	797.8874	10.9	0.014
20C	15%	788.1175	797.8874	10.3	0.013
	-15%	788.1175	797.8874	11.6	0.015
	End Point	788.1175	797.8874	17.5	0.022

8.4.7. LTE BAND 17

ID:	44410	Date:	2/22/18
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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	704.3353	715.6606		
Extreme (50C)		704.3353	715.6606	8.0	0.011
Extreme (40C)		704.3353	715.6606	20.3	0.029
Extreme (30C)		704.3353	715.6606	19.7	0.028
Extreme (10C)		704.3353	715.6606	6.8	0.010
Extreme (0C)		704.3353	715.6606	9.7	0.014
Extreme (-10C)		704.3353	715.6606	16.6	0.023
Extreme (-20C)		704.3353	715.6606	9.9	0.014
Extreme (-30C)		704.3353	715.6606	11.6	0.016
20C	15%	704.3353	715.6606	-15.2	-0.021
	-15%	704.3353	715.6606	16.4	0.023
	End Point	704.3353	715.6606	21.0	0.030

8.4.8. LTE BAND 25

ID:	44410	Date:	2/22/18
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Limit		1850	1915	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1850.8545	1914.1203		
Extreme (50C)		1850.8545	1914.1203	22.7	0.012
Extreme (40C)		1850.8545	1914.1203	24.1	0.013
Extreme (30C)		1850.8545	1914.1203	25.3	0.013
Extreme (10C)		1850.8545	1914.1203	20.7	0.011
Extreme (0C)		1850.8545	1914.1203	35.7	0.019
Extreme (-10C)		1850.8546	1914.1204	59.5	0.032
Extreme (-20C)		1850.8544	1914.1202	-50.9	-0.027
Extreme (-30C)		1850.8545	1914.1203	31.4	0.017
20C	15%	1850.8545	1914.1203	23.3	0.012
	-15%	1850.8545	1914.1203	27.9	0.015
	End Point	1850.8545	1914.1203	22.2	0.012

8.4.9. LTE BAND 26 (PART 90S)

ID:	44410	Date:	2/22/18
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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	814.3354	823.6695		
Extreme (50C)		814.3354	823.6695	-27.8	-0.034
Extreme (40C)		814.3354	823.6695	26.3	0.032
Extreme (30C)		814.3354	823.6695	32.5	0.040
Extreme (10C)		814.3354	823.6695	-38.4	-0.047
Extreme (0C)		814.3354	823.6695	19.5	0.024
Extreme (-10C)		814.3354	823.6695	10.7	0.013
Extreme (-20C)		814.3354	823.6695	9.3	0.011
Extreme (-30C)		814.3354	823.6695	14.0	0.017
20C	15%	814.3354	823.6695	-27.5	-0.034
	-15%	814.3354	823.6695	-38.6	-0.047
	End Point	814.3354	823.6695	28.3	0.035

8.4.10. LTE BAND 30

ID:	44410	Date:	2/22/18
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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	2305.1095	2314.8742		
Extreme (50C)		2305.1095	2314.8742	48.8	0.021
Extreme (40C)		2305.1095	2314.8742	41.1	0.018
Extreme (30C)		2305.1096	2314.8743	52.0	0.023
Extreme (10C)		2305.1096	2314.8743	53.0	0.023
Extreme (0C)		2305.1095	2314.8742	37.8	0.016
Extreme (-10C)		2305.1096	2314.8743	50.3	0.022
Extreme (-20C)		2305.1094	2314.8741	-61.4	-0.027
Extreme (-30C)		2305.1094	2314.8741	-50.4	-0.022
20C	15%	2305.1095	2314.8742	-40.5	-0.018
	-15%	2305.1095	2314.8742	35.3	0.015
	End Point	2305.1095	2314.8742	44.7	0.019

8.4.11. LTE BAND 41

ID:	44410	Date:	2/22/18
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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	2496.9174	2689.0678		
Extreme (50C)		2496.9175	2689.0679	56.7	0.022
Extreme (40C)		2496.9174	2689.0678	45.7	0.018
Extreme (30C)		2496.9174	2689.0678	31.5	0.012
Extreme (10C)		2496.9174	2689.0678	-41.5	-0.016
Extreme (0C)		2496.9175	2689.0679	51.1	0.020
Extreme (-10C)		2496.9174	2689.0678	-21.4	-0.008
Extreme (-20C)		2496.9174	2689.0678	22.8	0.009
Extreme (-30C)		2496.9174	2689.0678	-26.6	-0.010
20C	15%	2496.9174	2689.0678	28.8	0.011
	-15%	2496.9174	2689.0678	31.1	0.012
	End Point	2496.9174	2689.0678	33.5	0.013

8.4.12. LTE BAND 66

ID:	44410	Date:	2/22/18
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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	1710.8293	1779.1635		
Extreme (50C)		1710.8292	1779.1634	-52.4	-0.030
Extreme (40C)		1710.8293	1779.1635	-38.7	-0.022
Extreme (30C)		1710.8294	1779.1636	63.6	0.036
Extreme (10C)		1710.8292	1779.1634	-54.4	-0.031
Extreme (0C)		1710.8293	1779.1635	29.9	0.017
Extreme (-10C)		1710.8293	1779.1635	-16.8	-0.010
Extreme (-20C)		1710.8293	1779.1635	14.6	0.008
Extreme (-30C)		1710.8293	1779.1635	-14.0	-0.008
20C	15%	1710.8293	1779.1635	-26.7	-0.015
	-15%	1710.8293	1779.1635	29.6	0.017
	End Point	1710.8293	1779.1635	38.4	0.022

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

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:	39004	Date:	5/14/18
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8.5.1. LTE BAND 2

