

4. Occupied Bandwidth

4.1. Limit

CFR 47, Section FCC §2.1049 and IC RSS-Gen Issue 5 6.7.

4.2. Test Procedure

FCC

The test follows section 5.4.4 of ANSI C63.26-2015.

- a. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- b. The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d. Set the detection mode to peak, and the trace mode to max-hold.
- e. If the instrument does not have a 99 % OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5 % of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5 % of the total is reached and record that frequency as the upper OBW frequency. The 99 % power OBW can be determined by computing the difference between these two frequencies.
- f. The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

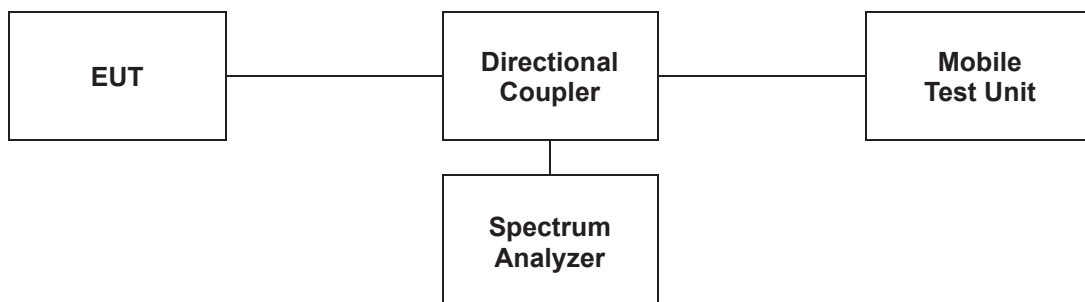
IC

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99 % emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99 % emission bandwidth).



4.3 Test Results

Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 % R.H.

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
5	1.4	824.7	1.094	1.094
		836.5	1.094	1.094
		848.3	1.094	1.094
	3	825.5	2.683	2.692
		836.5	2.692	2.692
		847.5	2.692	2.683
	5	826.5	4.501	4.501
		836.5	4.515	4.501
		846.5	4.515	4.501
	10	829.0	8.944	8.973
		836.5	8.944	8.915
		844.0	8.944	8.944

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
7	5	2 502.5	4.501	4.501
		2 535.0	4.530	4.515
		2 567.5	4.515	4.515
	10	2 505.0	8.944	8.944
		2 535.0	8.973	8.973
		2 565.0	8.944	8.944
	15	2 507.5	13.502	13.502
		2 535.0	13.502	13.502
		2 562.5	13.502	13.546
	20	2 510.0	17.945	17.887
		2 535.0	17.887	17.887
		2 560.0	17.887	17.945

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
12/17	1.4	699.7	1.103	1.098
		707.5	1.094	1.094
		715.3	1.094	1.103
	3	700.5	2.683	2.692
		707.5	2.692	2.692
		714.5	2.692	2.692
	5	701.5	4.515	4.515
		707.5	4.515	4.501
		713.5	4.515	4.530
	10	704.0	8.973	8.973
		707.5	8.973	8.973
		711.0	8.973	8.944

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
13	5	779.5	4.515	4.530
		782.0	4.501	4.501
		784.5	4.515	4.501
	10	782.0	8.915	8.944

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
25/2	1.4	1 850.7	1.103	1.094
		1 882.5	1.094	1.098
		1 914.3	1.098	1.103
	3	1 851.5	2.692	2.700
		1 882.5	2.692	2.692
		1 913.5	2.692	2.683
	5	1 852.5	4.515	4.515
		1 882.5	4.515	4.530
		1 912.5	4.515	4.501
	10	1 855.0	8.973	8.973
		1 882.5	8.973	8.944
		1 910.0	8.944	8.944
	15	1 857.5	13.589	13.546
		1 882.5	13.546	13.546
		1 907.5	13.546	13.546
	20	1 860.0	18.003	18.003
		1 882.5	17.945	17.945
		1 905.0	17.945	17.945

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
41_FCC	5	2 498.5	4.525	4.505
		2 593.0	4.505	4.515
		2 687.5	4.515	4.530
	10	2 501.0	8.944	8.944
		2 593.0	8.973	8.973
		2 685.0	8.944	8.944
	15	2 503.5	13.502	13.502
		2 593.0	13.502	13.502
		2 682.5	13.546	13.502
	20	2 506.0	17.887	17.887
		2 593.0	17.887	17.945
		2 680.0	17.887	17.945

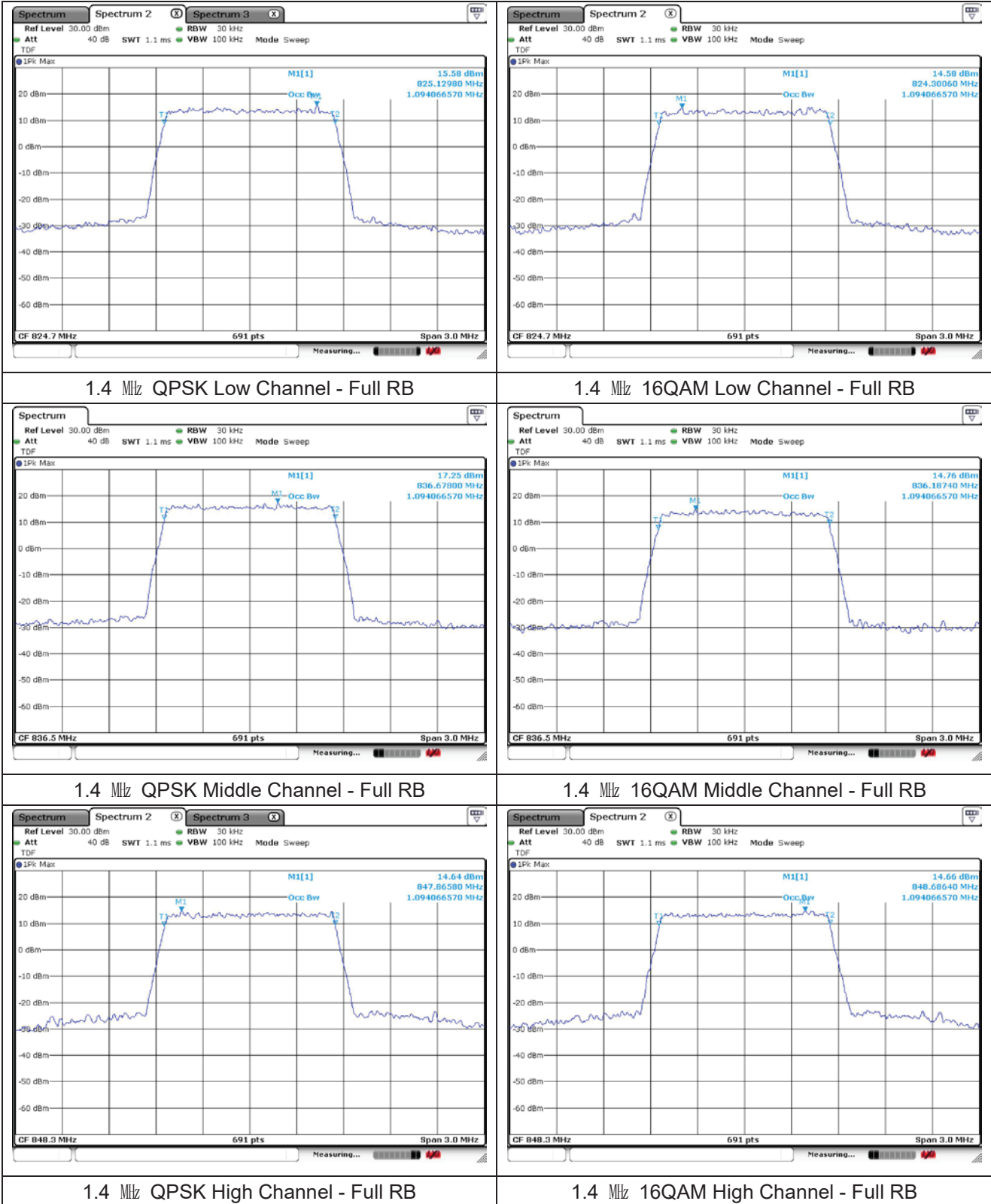
Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
41_IC	5	2 502.5	4.530	4.515
		2 595.0	4.501	4.515
		2 687.5	4.530	4.515
	10	2 505.0	8.973	8.915
		2 595.0	8.973	8.944
		2 685.0	8.944	8.944
	15	2 507.5	13.502	13.502
		2 595.0	13.459	13.502
		2 682.5	13.502	13.502
	20	2 510.0	17.945	17.945
		2 595.0	17.887	17.945
		2 680.0	17.887	17.887

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
66/4	1.4	1 710.7	1.098	1.094
		1 745.0	1.098	1.094
		1 779.3	1.098	1.098
	3	1 711.5	2.692	2.692
		1 745.0	2.692	2.692
		1 778.5	2.700	2.692
	5	1 712.5	4.515	4.515
		1 745.0	4.515	4.515
		1 777.5	4.515	4.515
	10	1 715.0	8.944	8.944
		1 745.0	8.973	8.973
		1 775.0	8.973	8.944
	15	1 717.5	13.502	13.502
		1 745.0	13.546	13.546
		1 772.5	13.502	13.459
20	1 720.0	17.887	17.887	
	1 745.0	17.945	18.003	
	1 770.0	17.887	17.829	

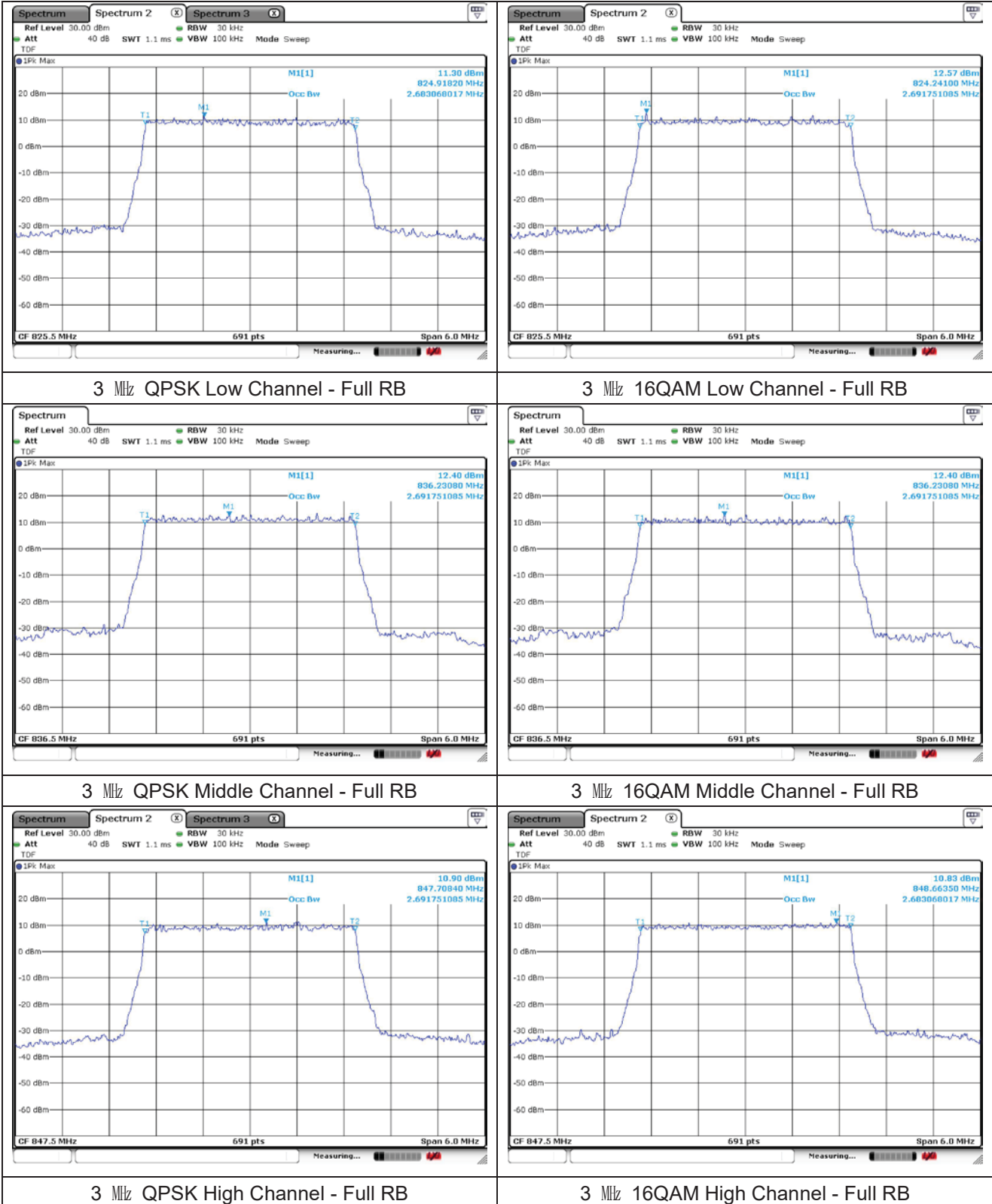
Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
71	5	665.5	4.501	4.515
		680.5	4.515	4.530
		695.5	4.515	4.515
	10	668.0	8.973	8.944
		680.5	8.944	8.944
		693.0	8.973	8.973
	15	670.5	13.502	13.459
		680.5	13.502	13.546
		690.5	13.502	13.459
	20	673.0	17.945	17.887
		680.5	17.945	18.003
		688.0	17.887	17.887

- Test plots

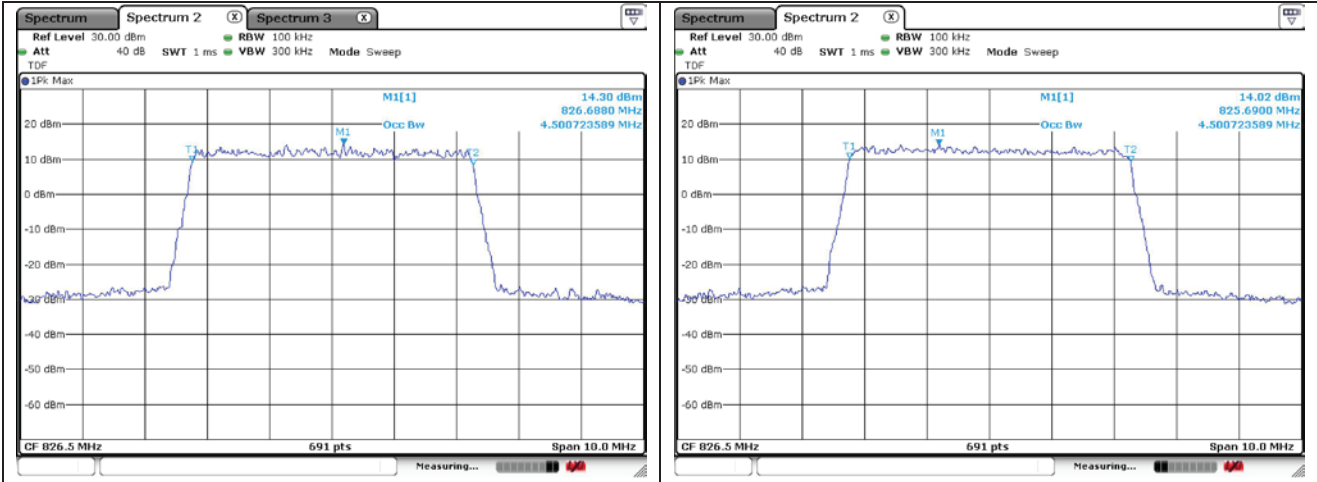
LTE band 5



LTE band 5

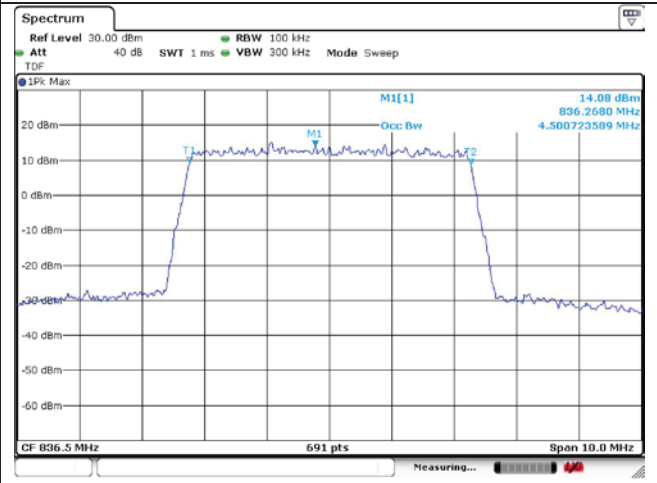
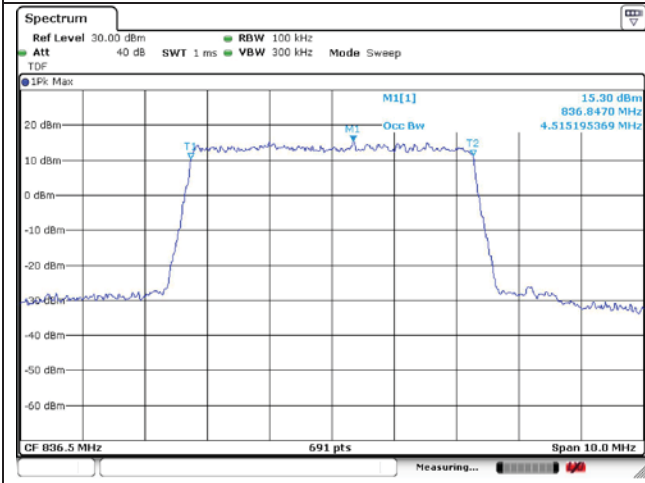


LTE band 5



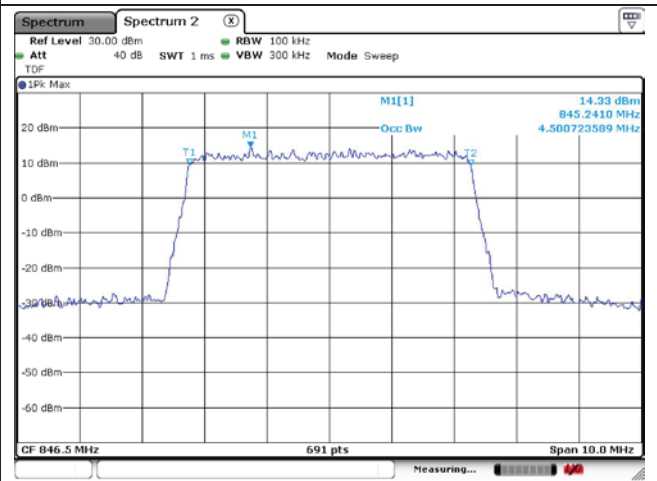
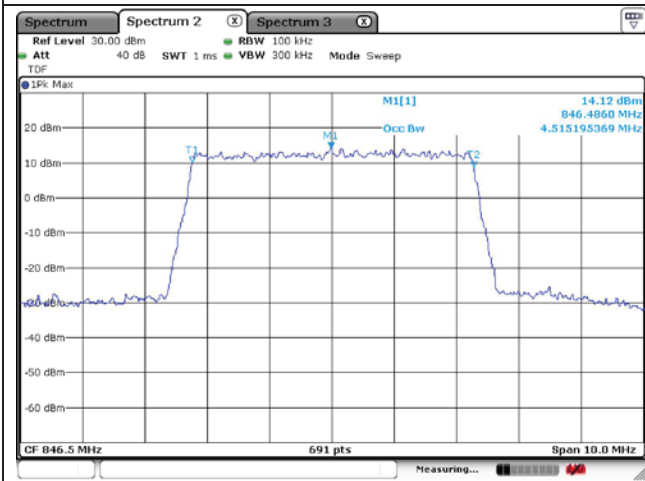
5 MHz QPSK Low Channel - Full RB

5 MHz 16QAM Low Channel - Full RB



5 MHz QPSK Middle Channel - Full RB

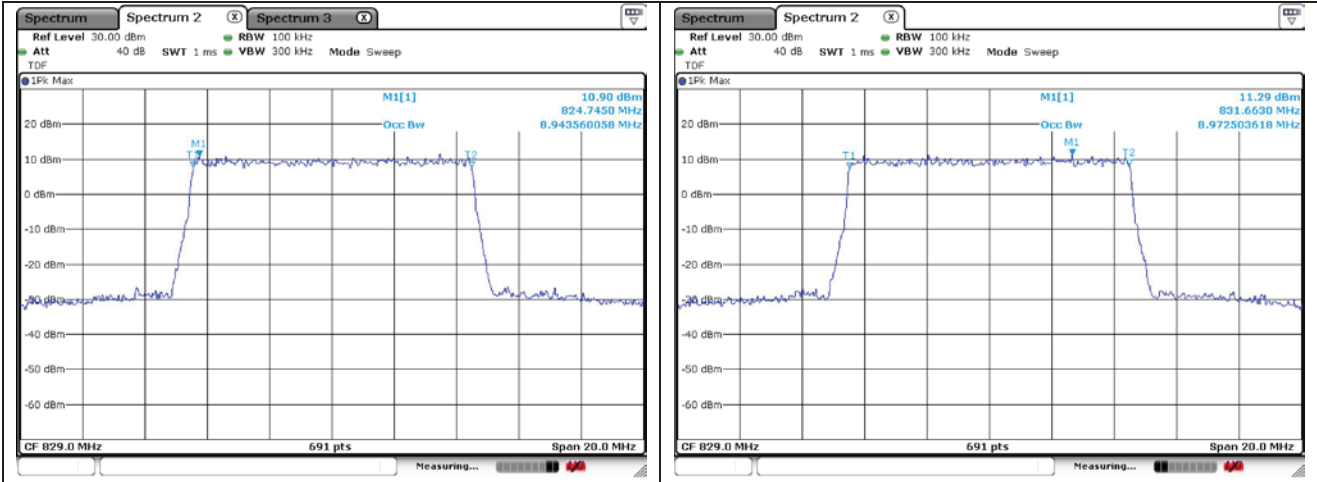
5 MHz 16QAM Middle Channel - Full RB



5 MHz QPSK High Channel - Full RB

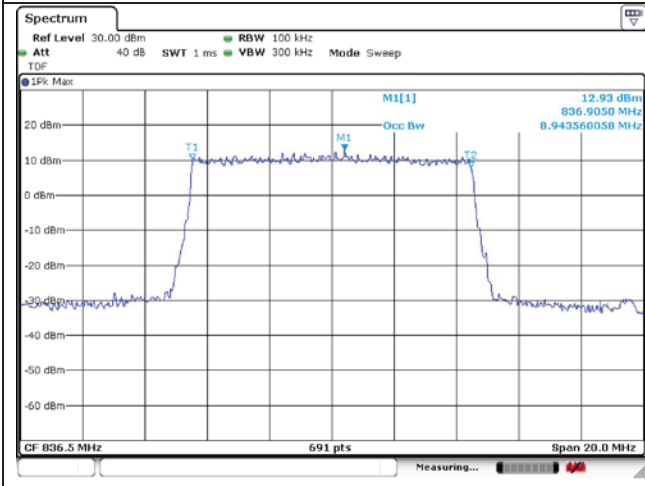
5 MHz 16QAM High Channel - Full RB

LTE band 5

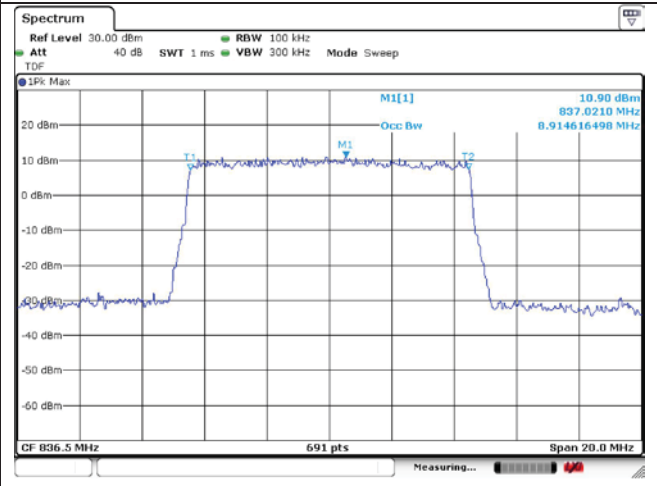


10 MHz QPSK Low Channel - Full RB

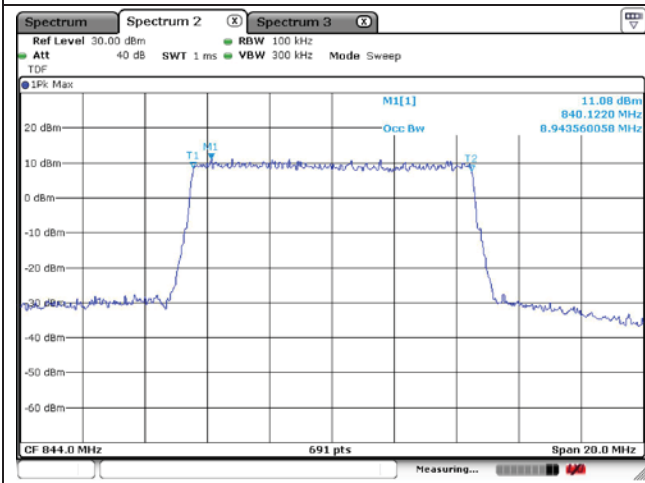
10 MHz 16QAM Low Channel - Full RB



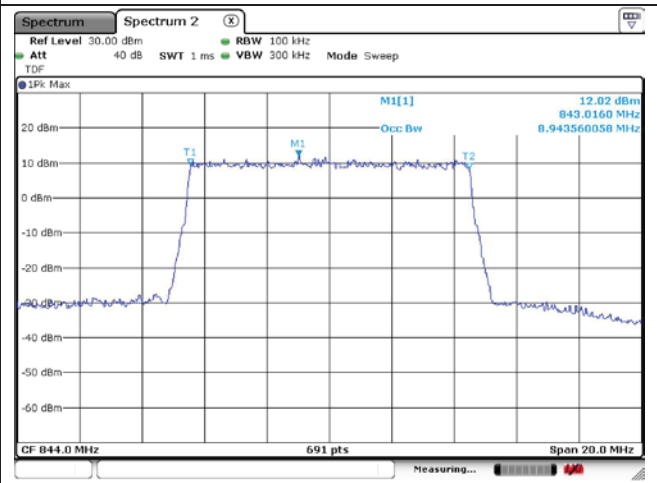
10 MHz QPSK Middle Channel - Full RB



10 MHz 16QAM Middle Channel - Full RB

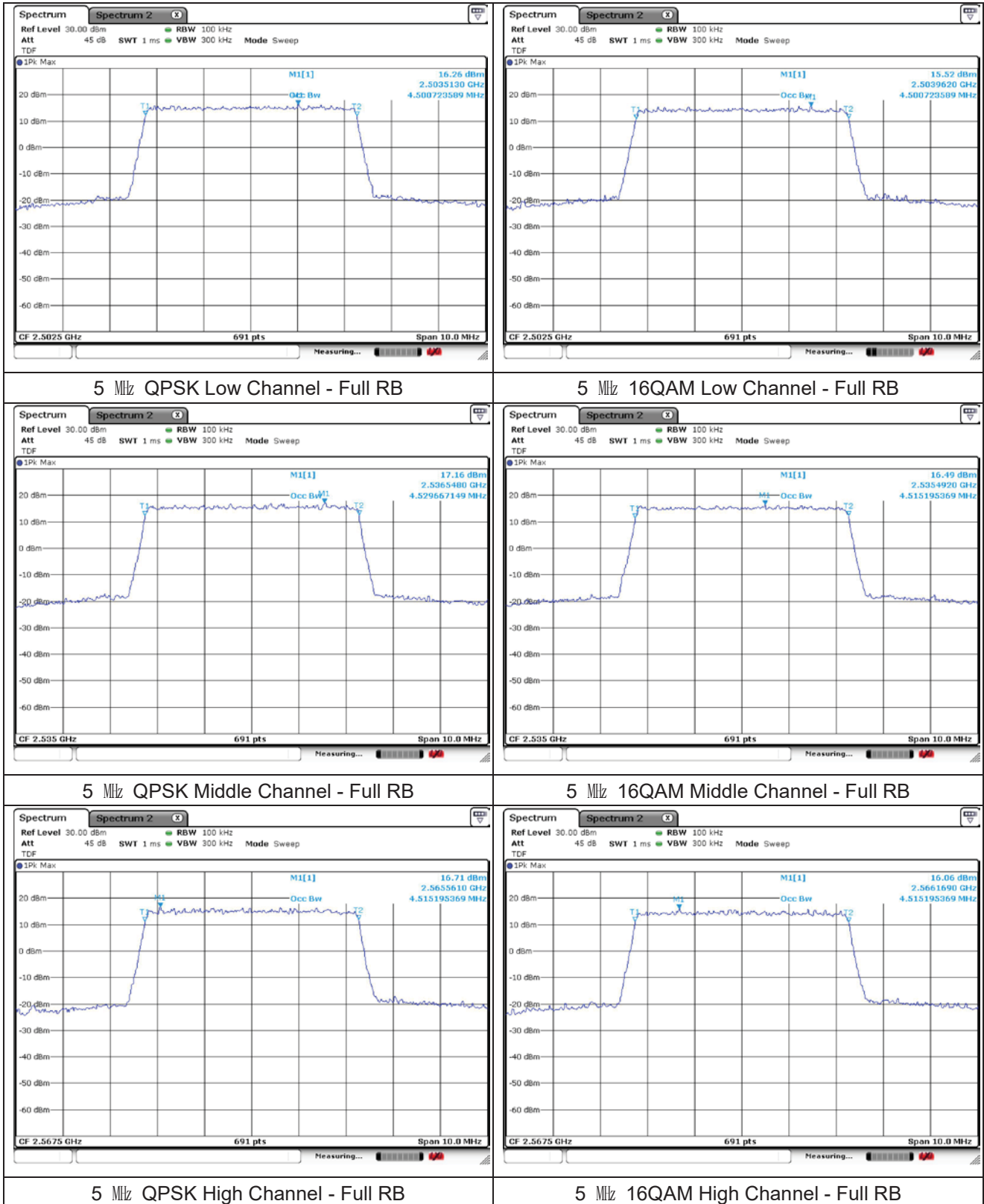


10 MHz QPSK High Channel - Full RB

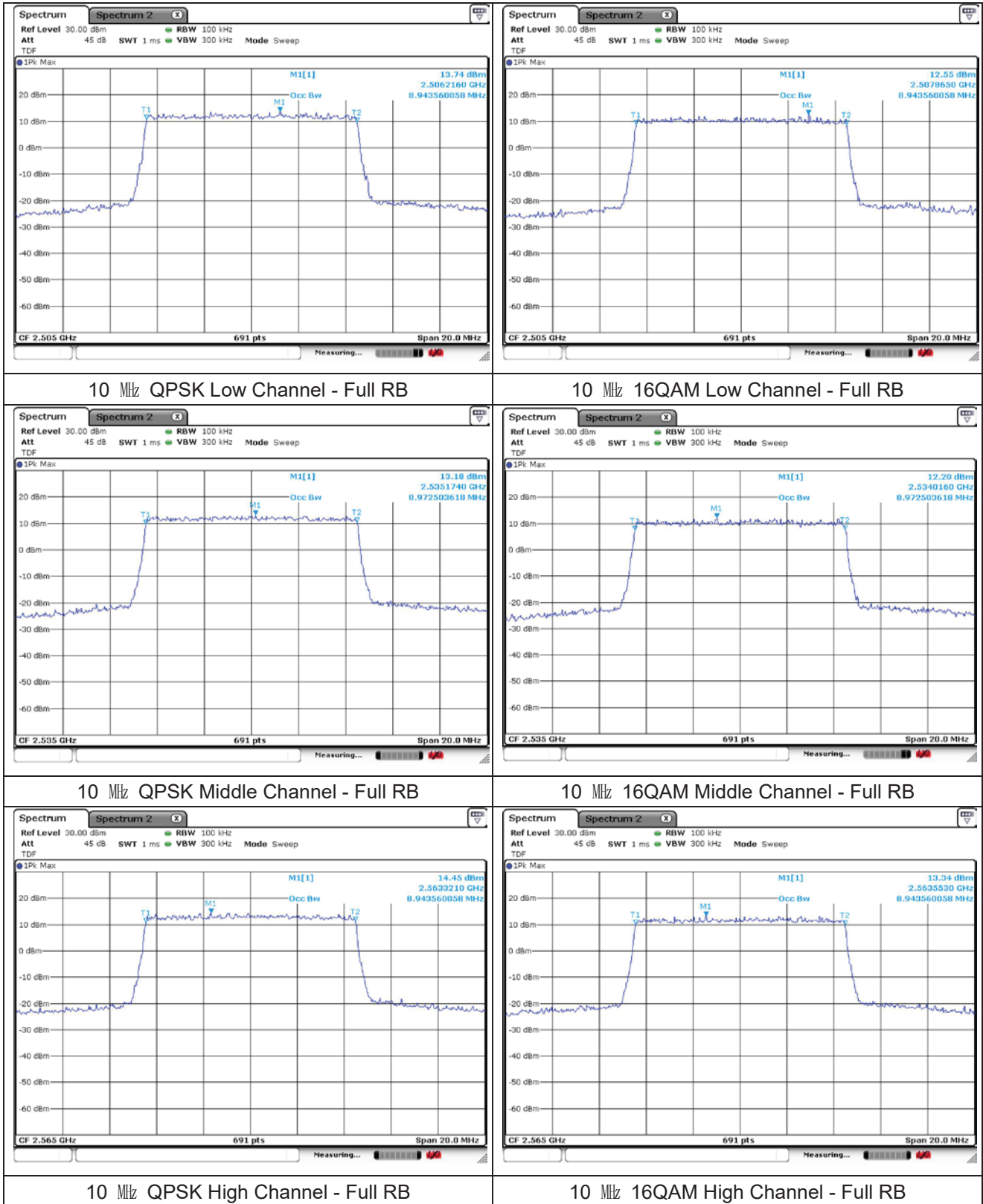


10 MHz 16QAM High Channel - Full RB

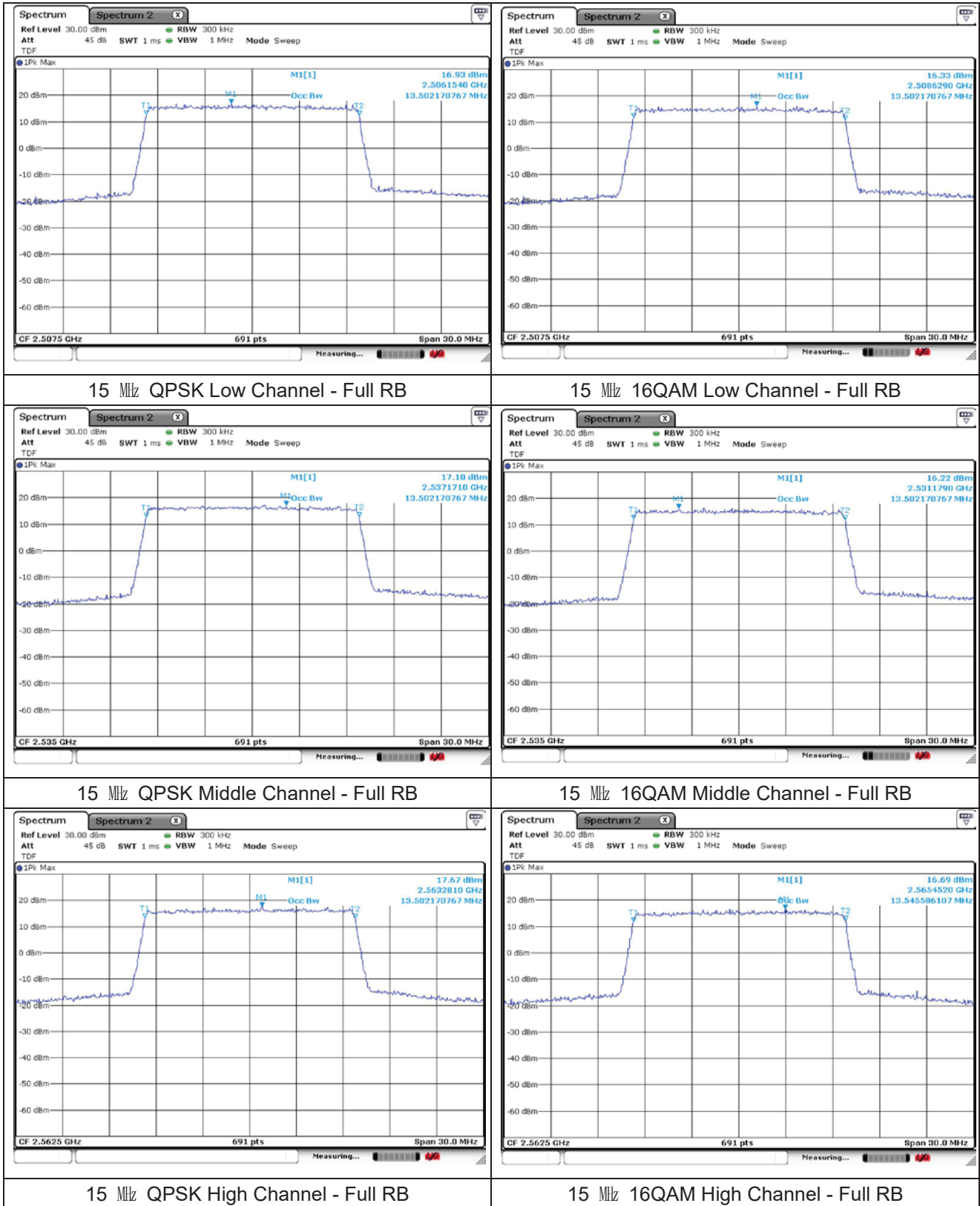
LTE band 7



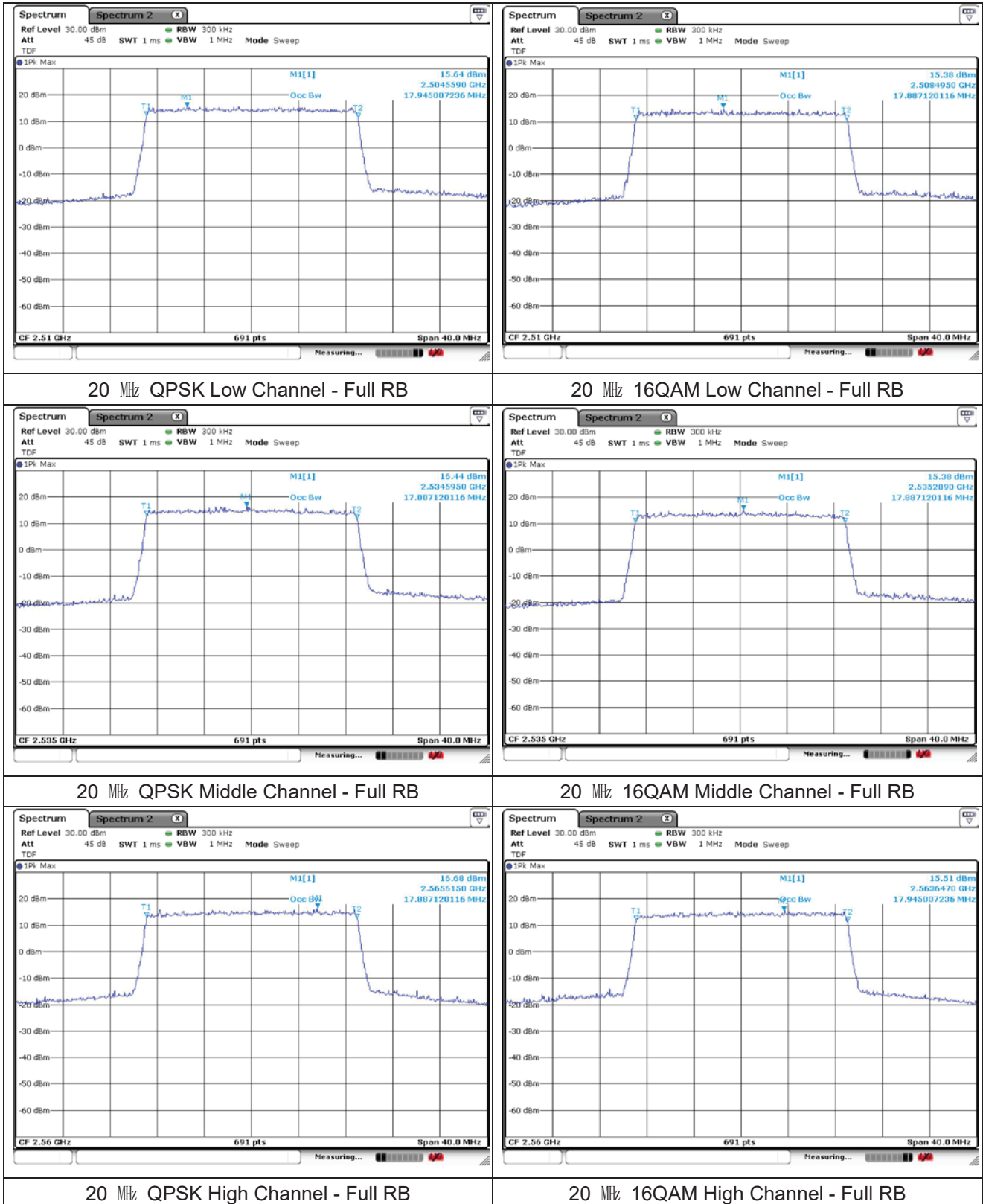
LTE band 7



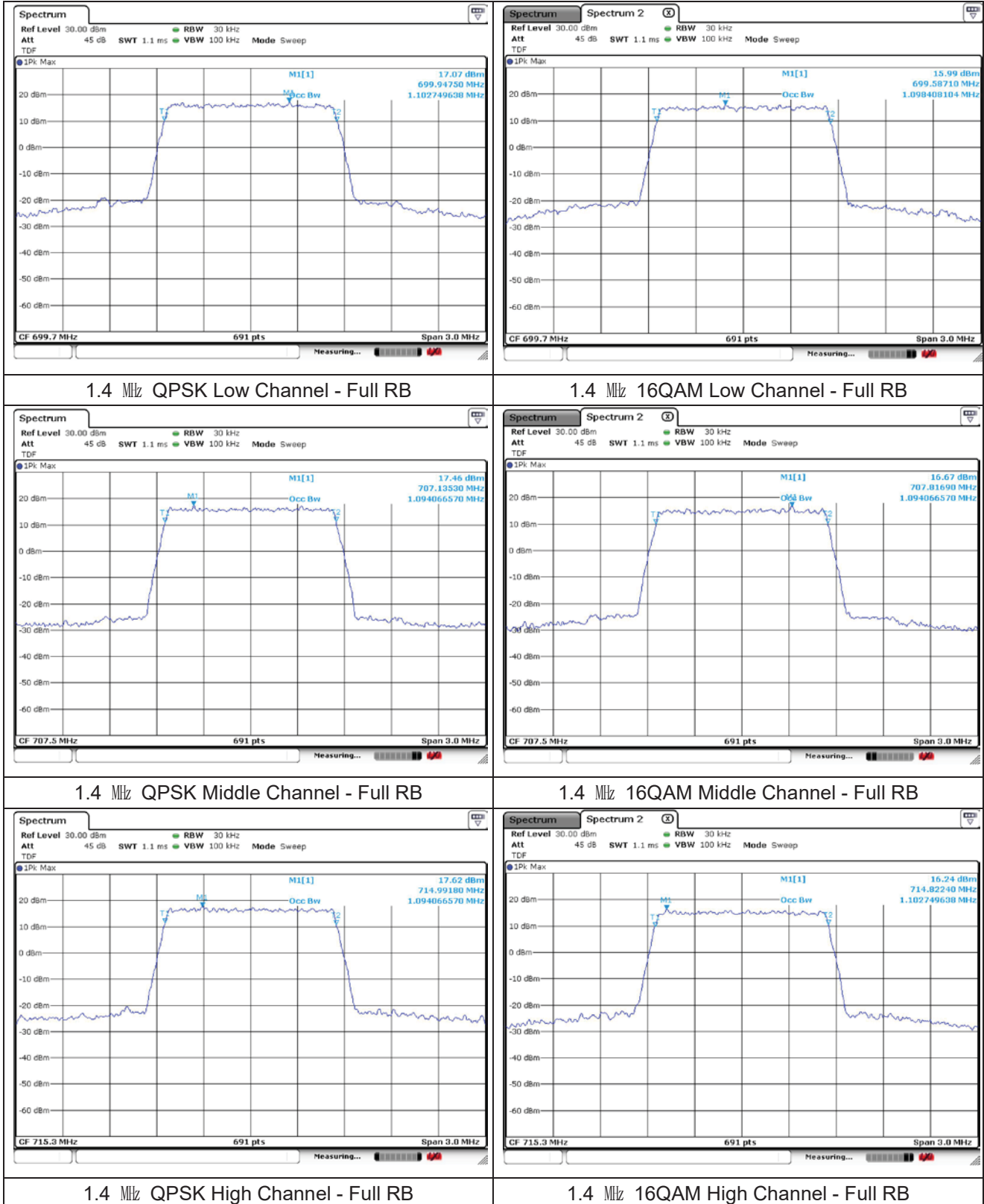
LTE band 7



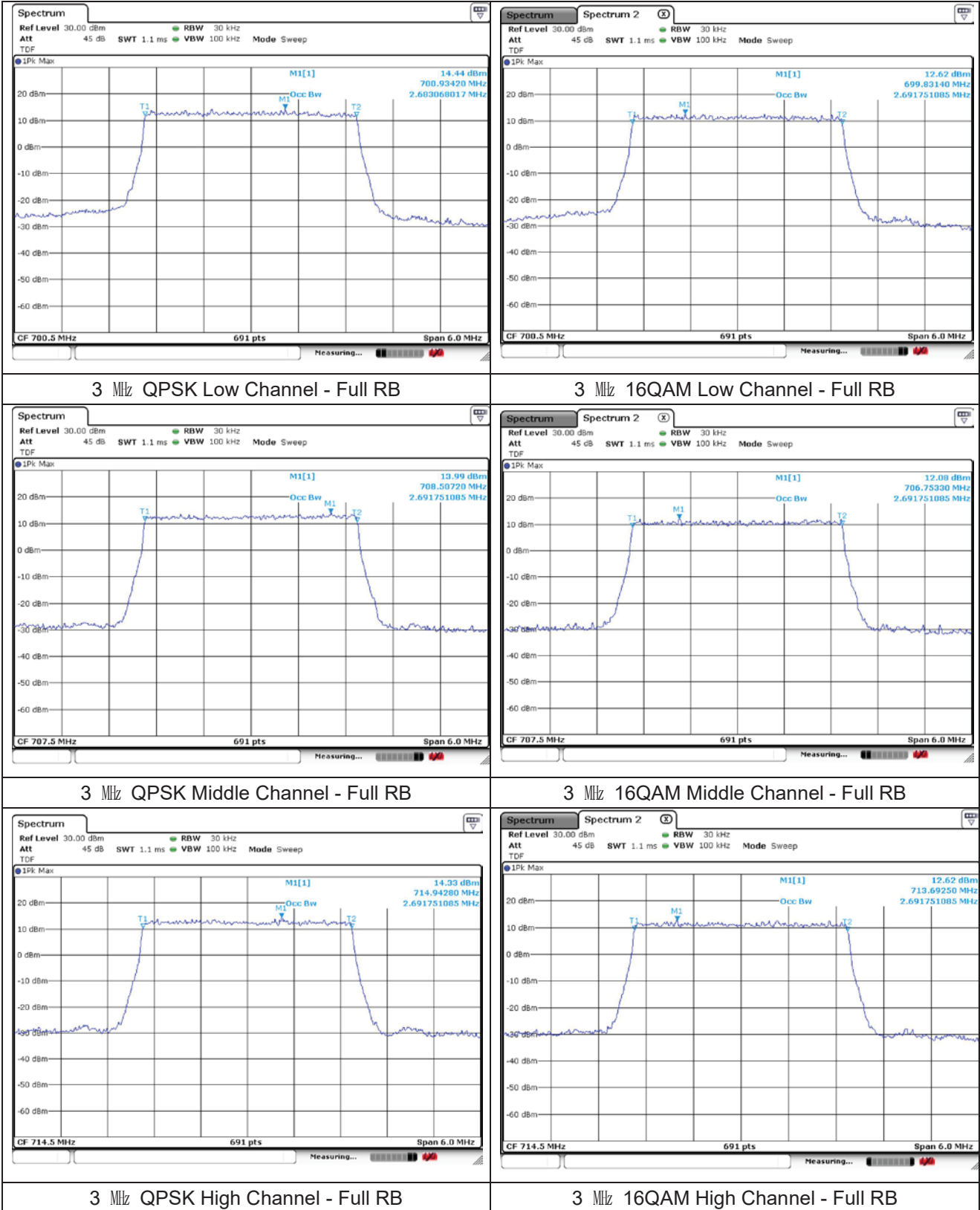
LTE band 7



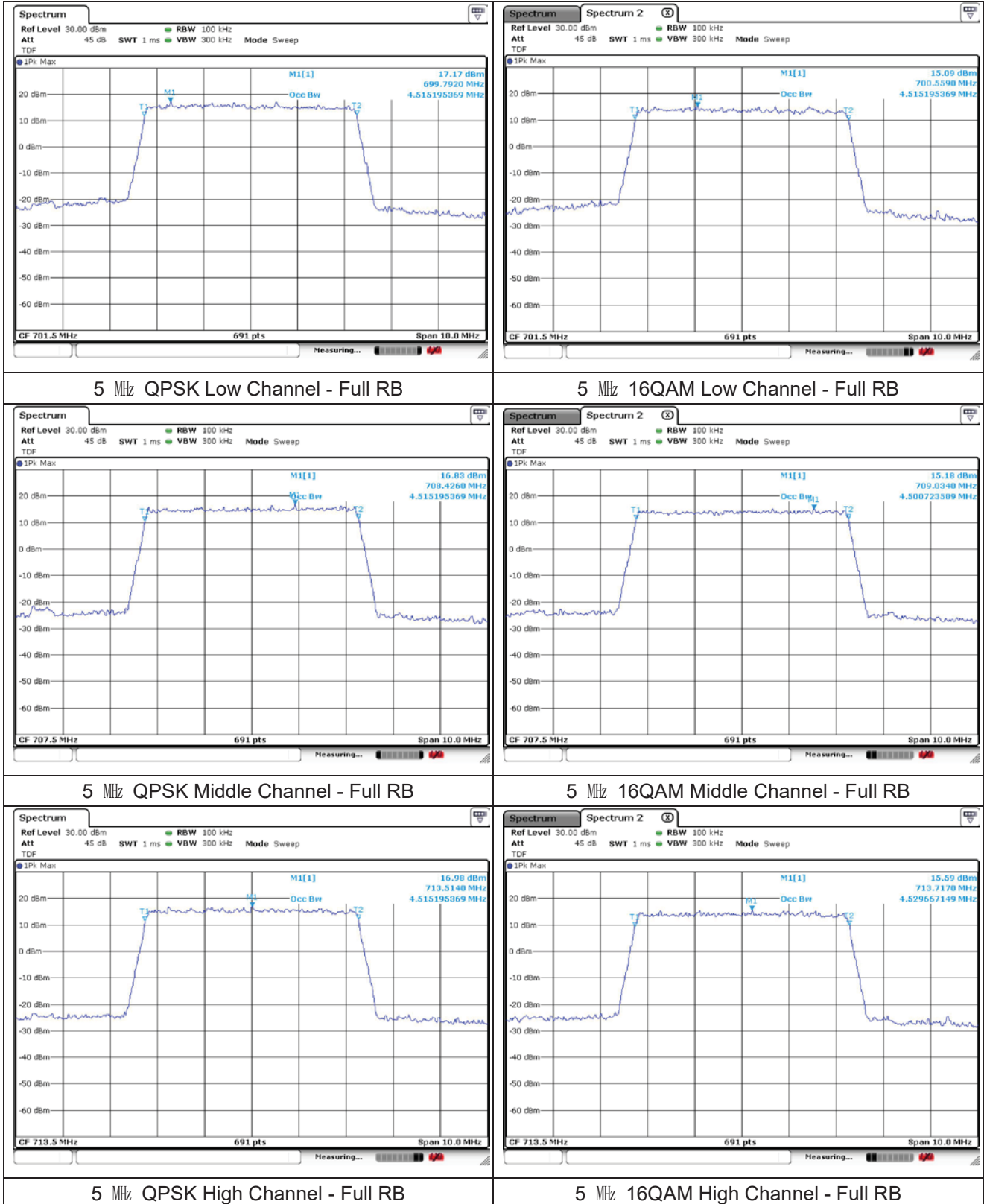
LTE band 12



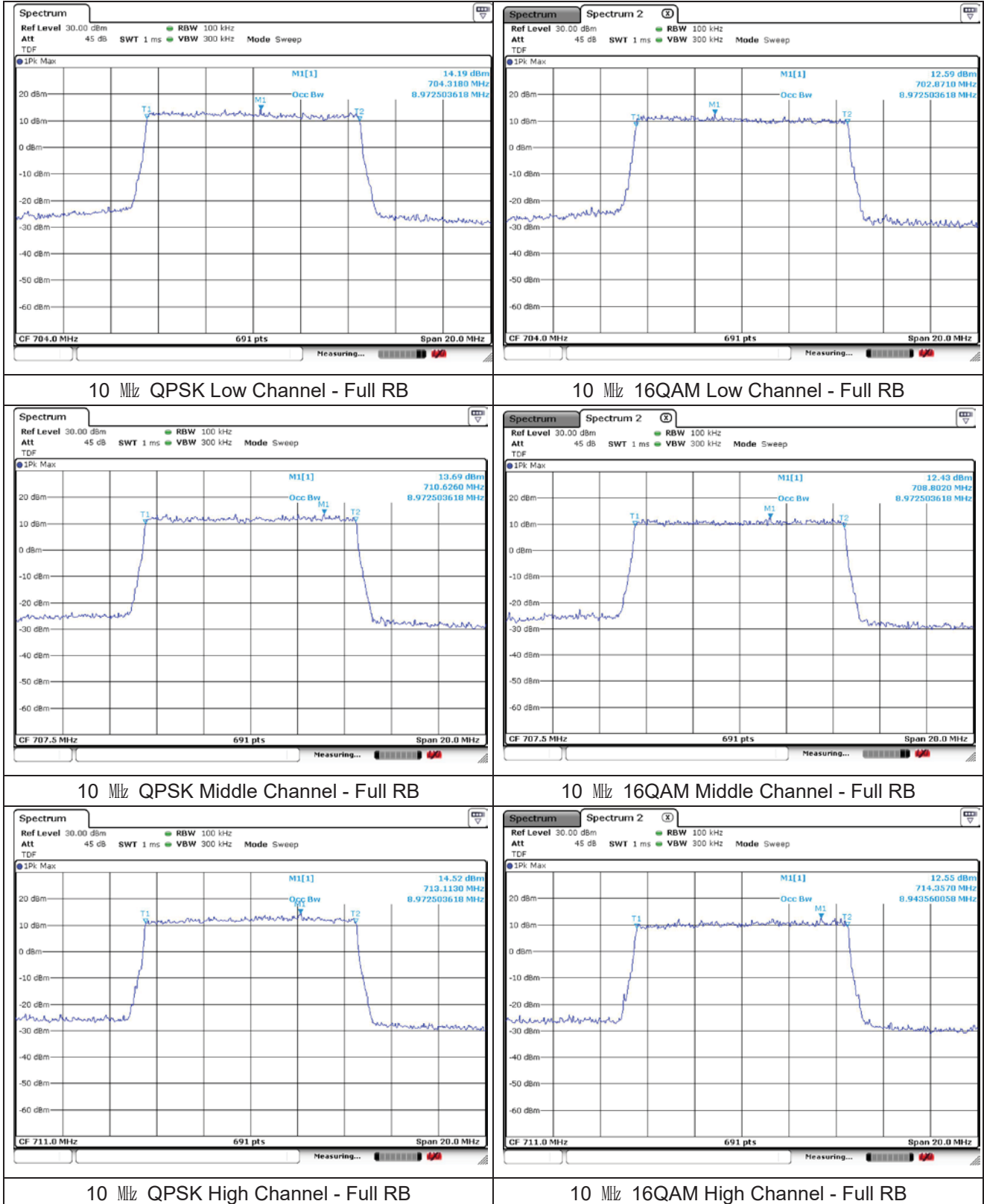
LTE band 12



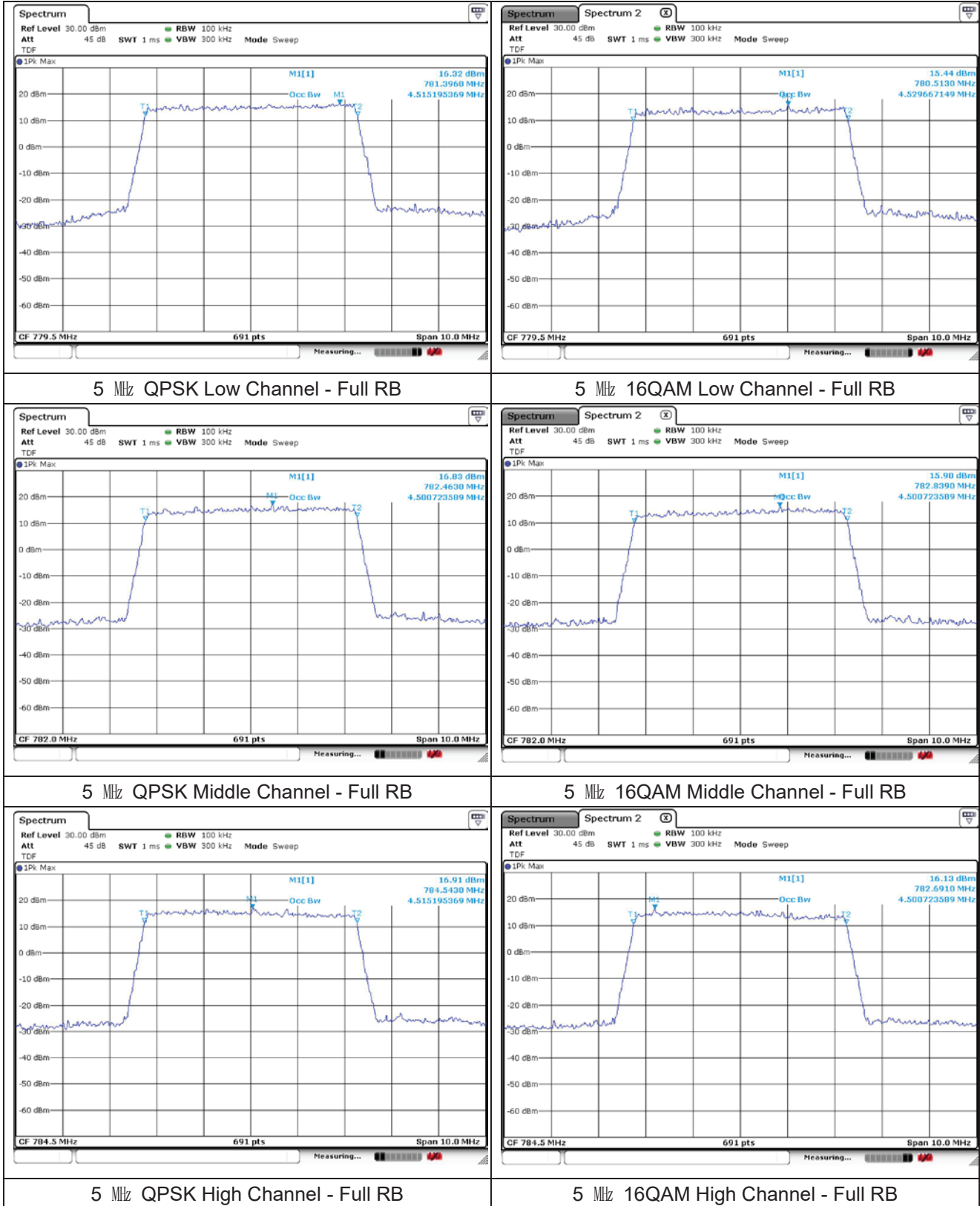
LTE band 12/17



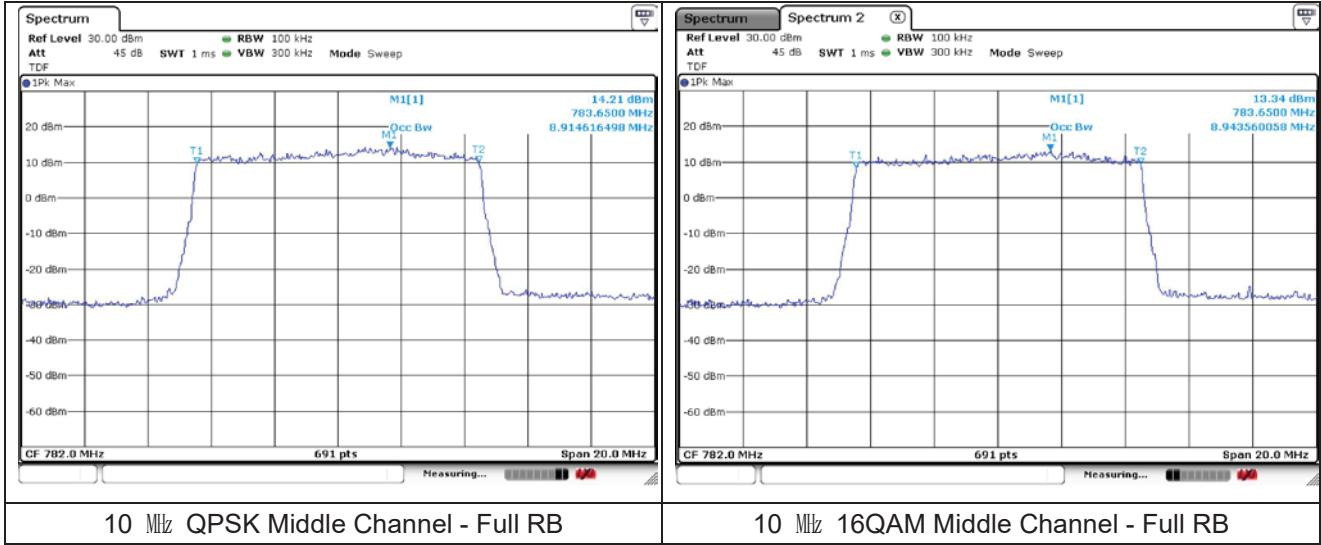
LTE band 12/17



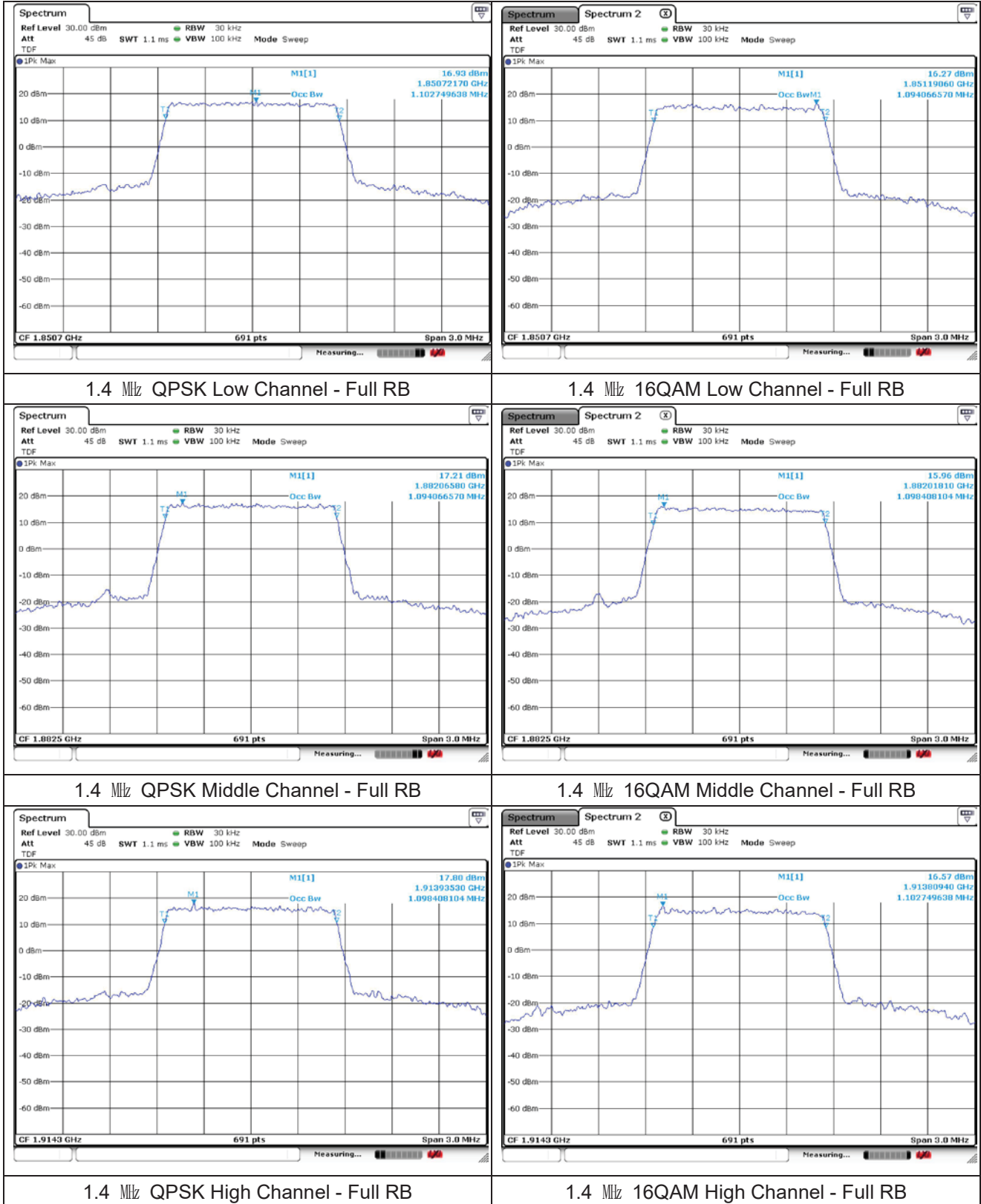
LTE band 13



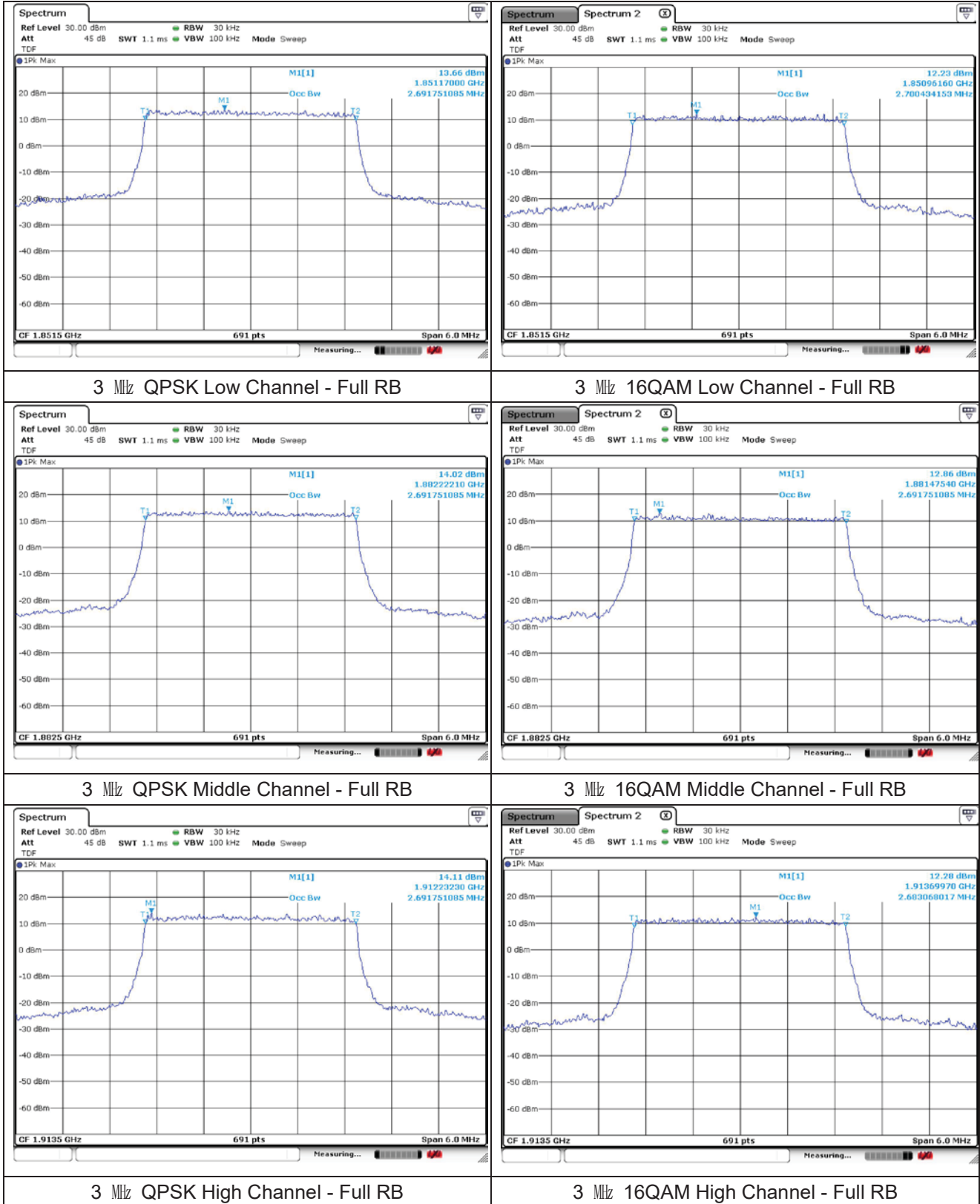
LTE band 13



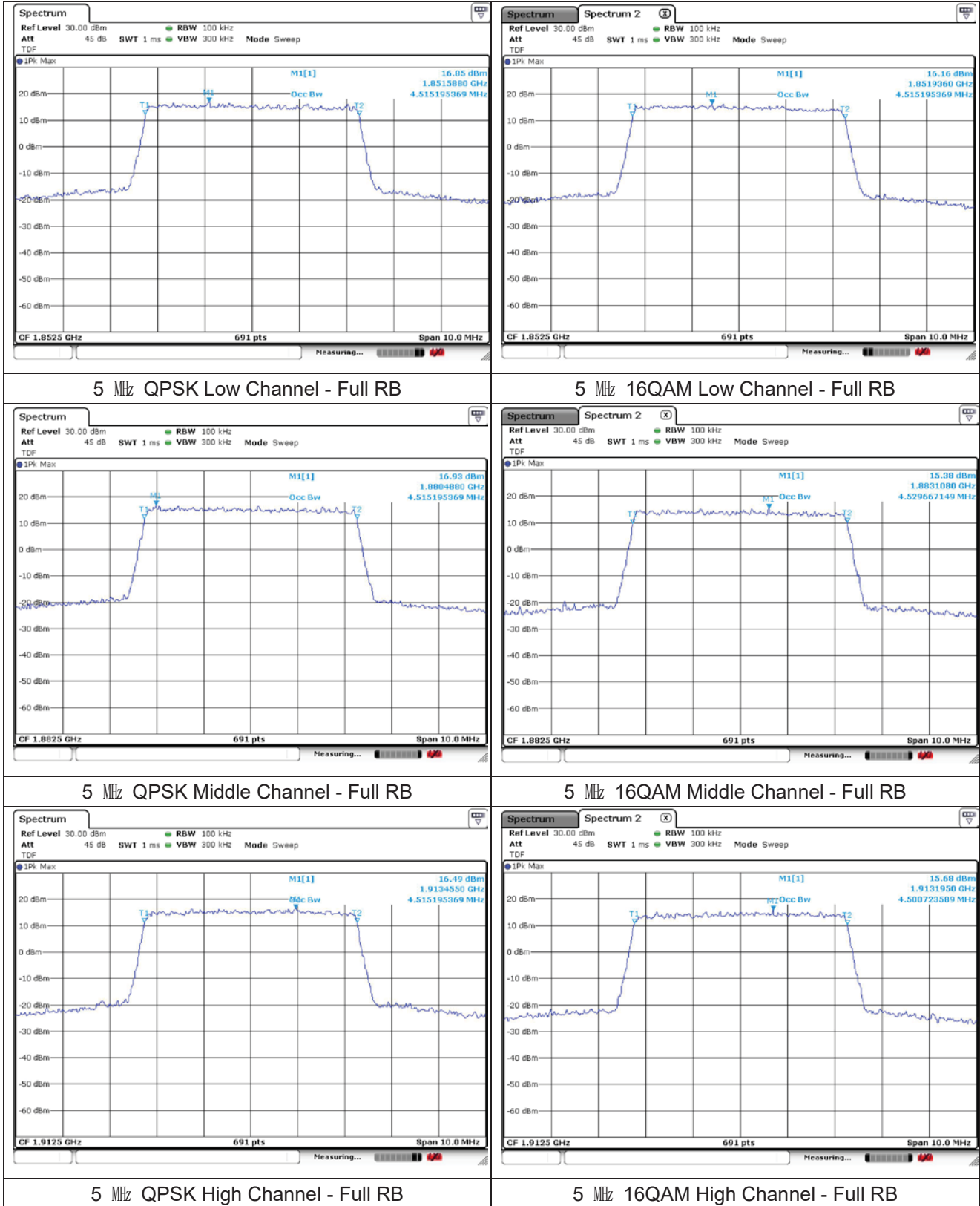
LTE band 25/2



LTE band 25/2



LTE band 25/2



LTE band 25/2

