

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 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).

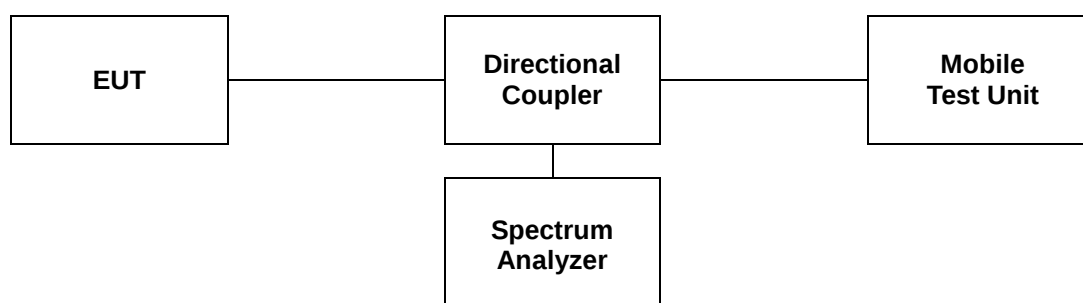
IC

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.

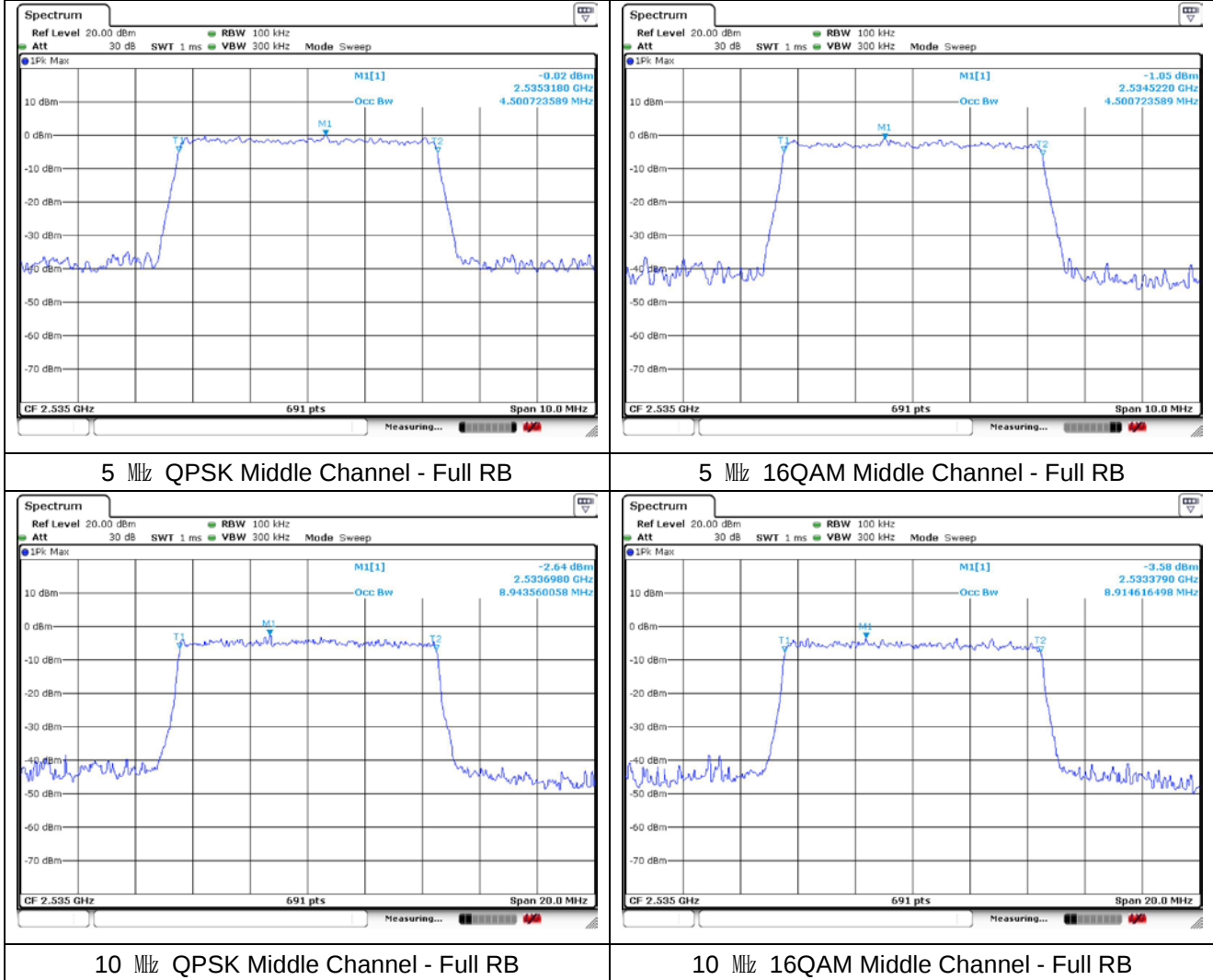
Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)			
			SIM 1		SIM 2	
			QPSK	16QAM	QPSK	16QAM
7	5	2 535.0	4.501	4.501	4.515	4.515
	10		8.944	8.915	8.944	8.973
	15		13.502	13.459	13.546	13.502
	20		17.887	17.945	17.945	18.003
12/17	1.4	707.5	1.094	1.094	1.094	1.094
	3		2.674	2.683	2.683	2.683
	5		4.501	4.486	4.501	4.501
	10		8.944	8.944	8.944	8.944
13	5	782.0	4.501	4.515	4.515	4.515
	10		8.944	8.915	8.944	8.944
25/2	1.4	1 882.5	1.094	1.094	1.094	1.098
	3		2.674	2.683	2.692	2.692
	5		4.501	4.501	4.530	4.501
	10		8.944	8.915	8.944	8.944
	15		13.502	13.502	13.502	13.502
	20		17.945	17.945	17.945	18.003
26/5 Part 22	1.4	836.5	1.094	1.094	1.094	1.094
	3		2.674	2.683	2.692	2.683
	5		4.501	4.501	4.515	4.501
	10		8.944	8.915	8.944	8.973
	15	831.5	13.502	13.459	13.502	13.502
26 Part 90	1.4	819.0	1.094	1.094	1.094	1.094
	3		2.674	2.683	2.692	2.692
	5		4.501	4.501	4.515	4.515
	10		8.944	8.915	8.944	8.944
	15	821.5	13.459	13.459	13.502	13.502
41 FCC	5	2 593.0	4.515	4.501	4.530	4.515
	10		8.915	8.915	8.944	8.944
	15		13.502	13.502	13.459	13.502
	20		17.887	17.945	17.887	17.887
41 IC	5	2 595.0	4.501	4.486	4.530	4.501
	10		8.915	8.915	8.944	8.973
	15		13.459	13.459	13.502	13.502
	20		17.887	17.887	17.887	17.887

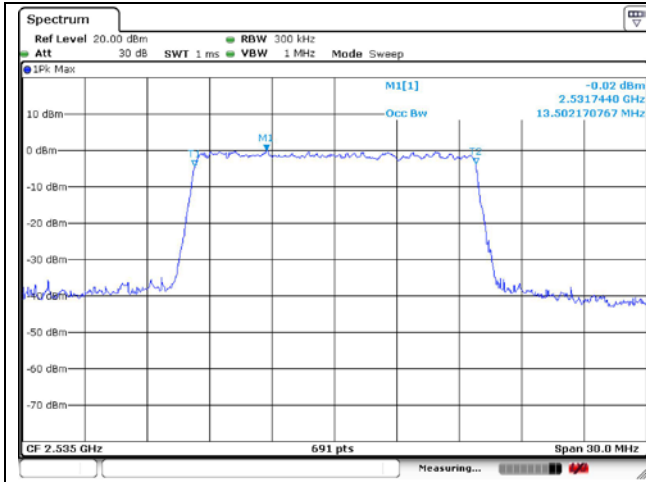
Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)			
			SIM 1		SIM 2	
			QPSK	16QAM	QPSK	16QAM
66/4	1.4	1 745.0	1.094	1.094	1.094	1.094
	3		2.674	2.683	2.683	2.692
	5		4.486	4.501	4.501	4.501
	10		8.944	8.944	8.944	8.944
	15		13.502	13.459	13.502	13.502
	20		17.887	17.945	17.945	17.887
71	5	680.5	4.525	4.496	4.525	4.496
	10		8.951	8.931	8.951	8.951
	15		13.487	13.487	13.546	13.487
	20		17.902	17.902	17.902	17.942

- Test plots

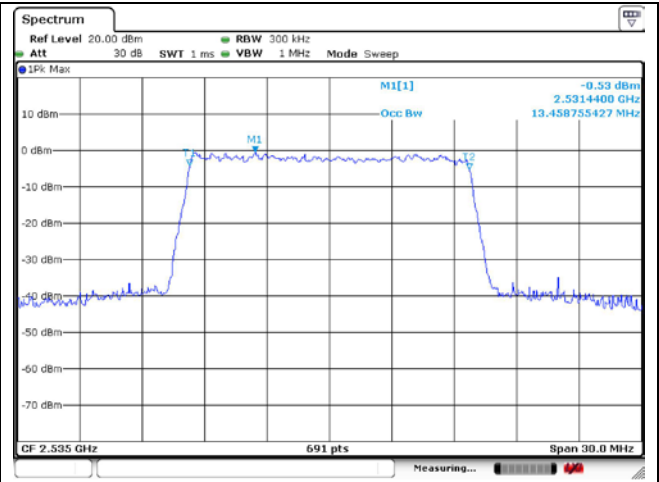
SIM 1

LTE band 7

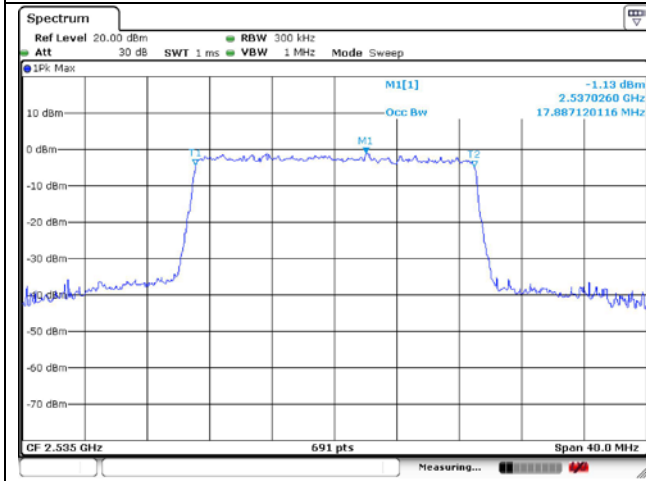




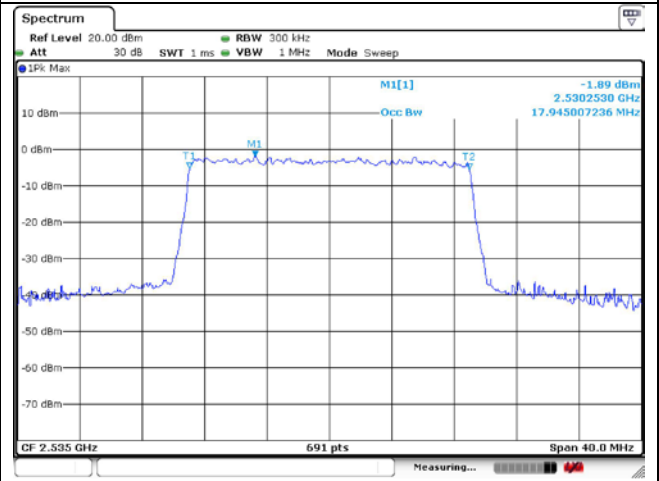
15 MHz QPSK Middle Channel - Full RB



15 MHz 16QAM Middle Channel - Full RB

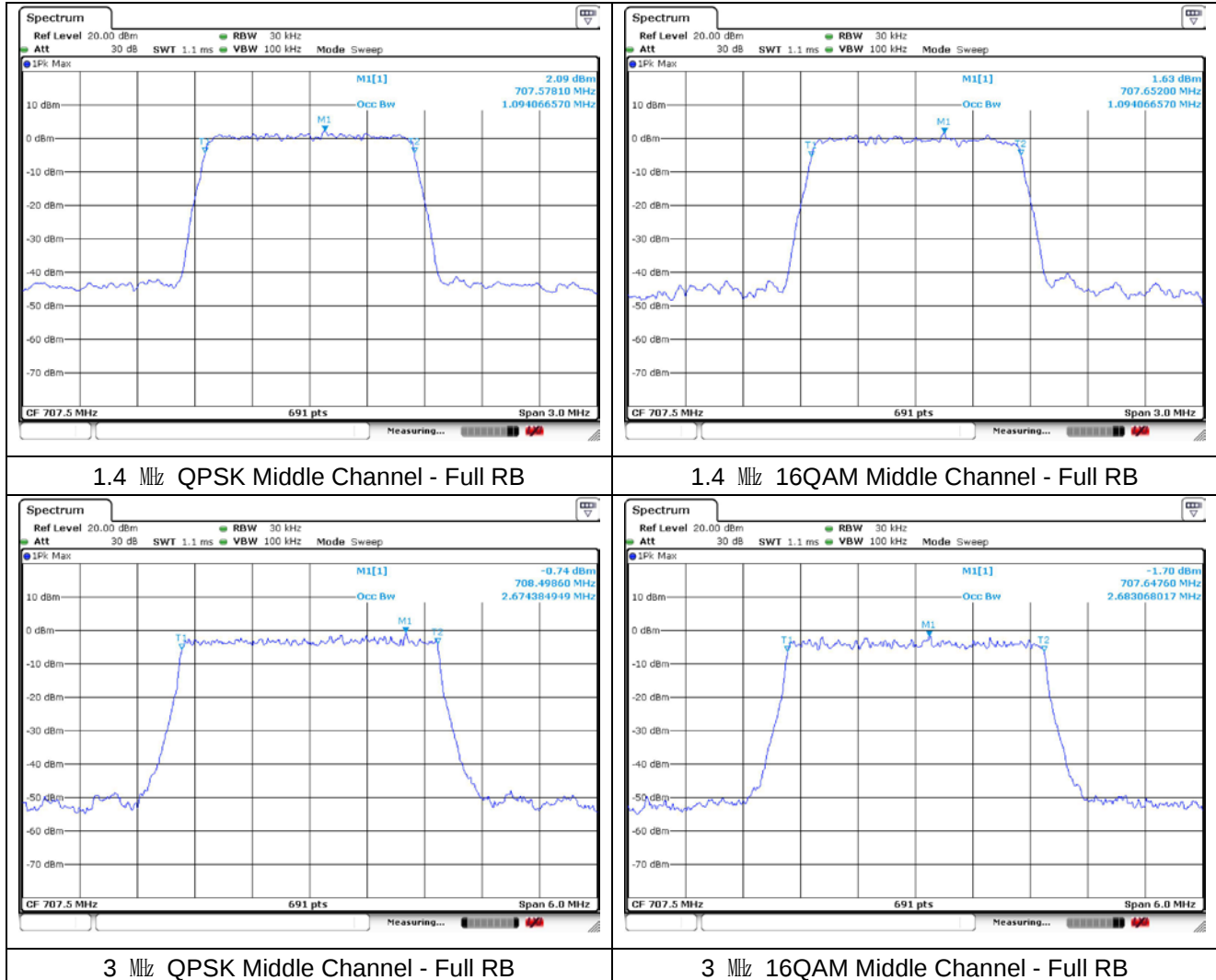


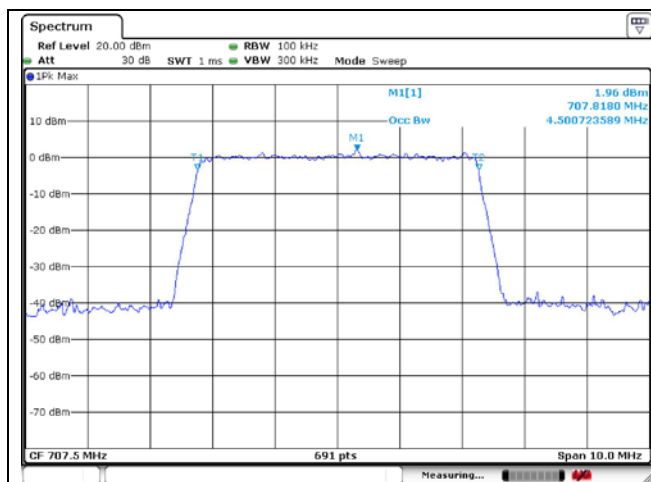
20 MHz QPSK Middle Channel - Full RB



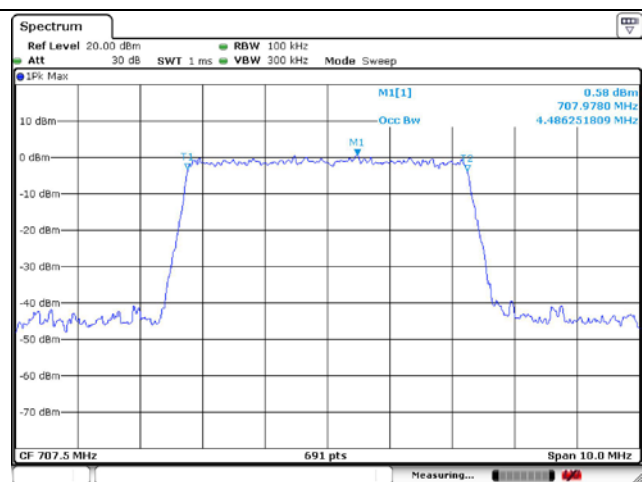
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LTE band 12/17

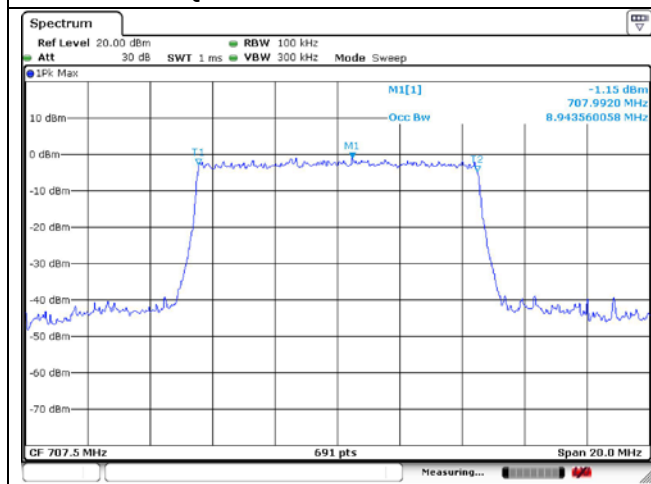




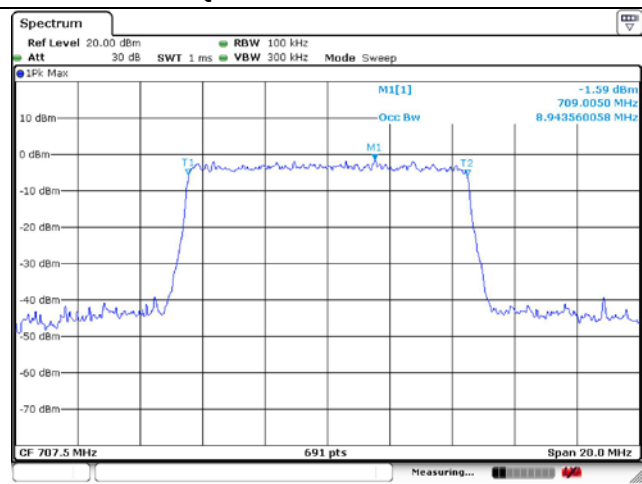
5 MHz QPSK Middle Channel - Full RB



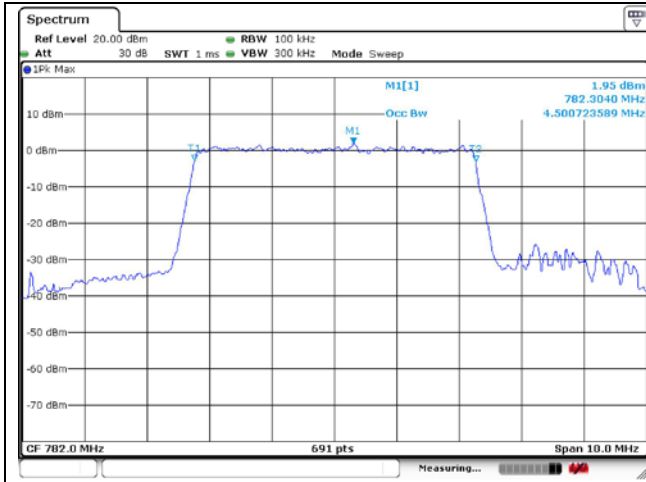
5 MHz 16QAM Middle Channel - Full RB



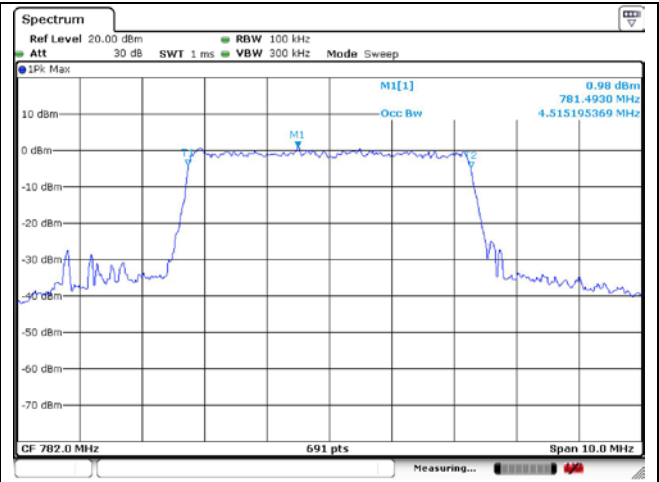
10 MHz QPSK Middle Channel - Full RB



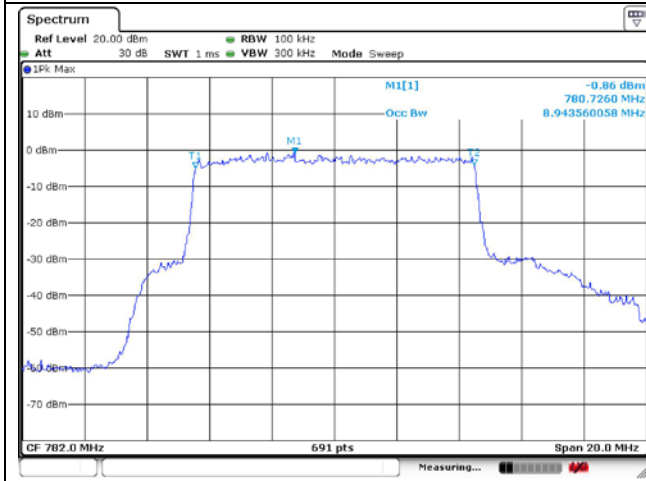
10 MHz 16QAM Middle Channel - Full RB

LTE band 13


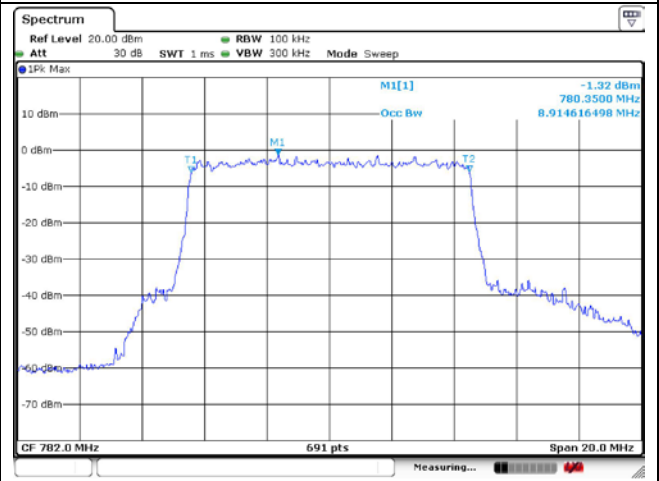
5 MHz QPSK Middle Channel - Full RB



5 MHz 16QAM Middle Channel - Full RB

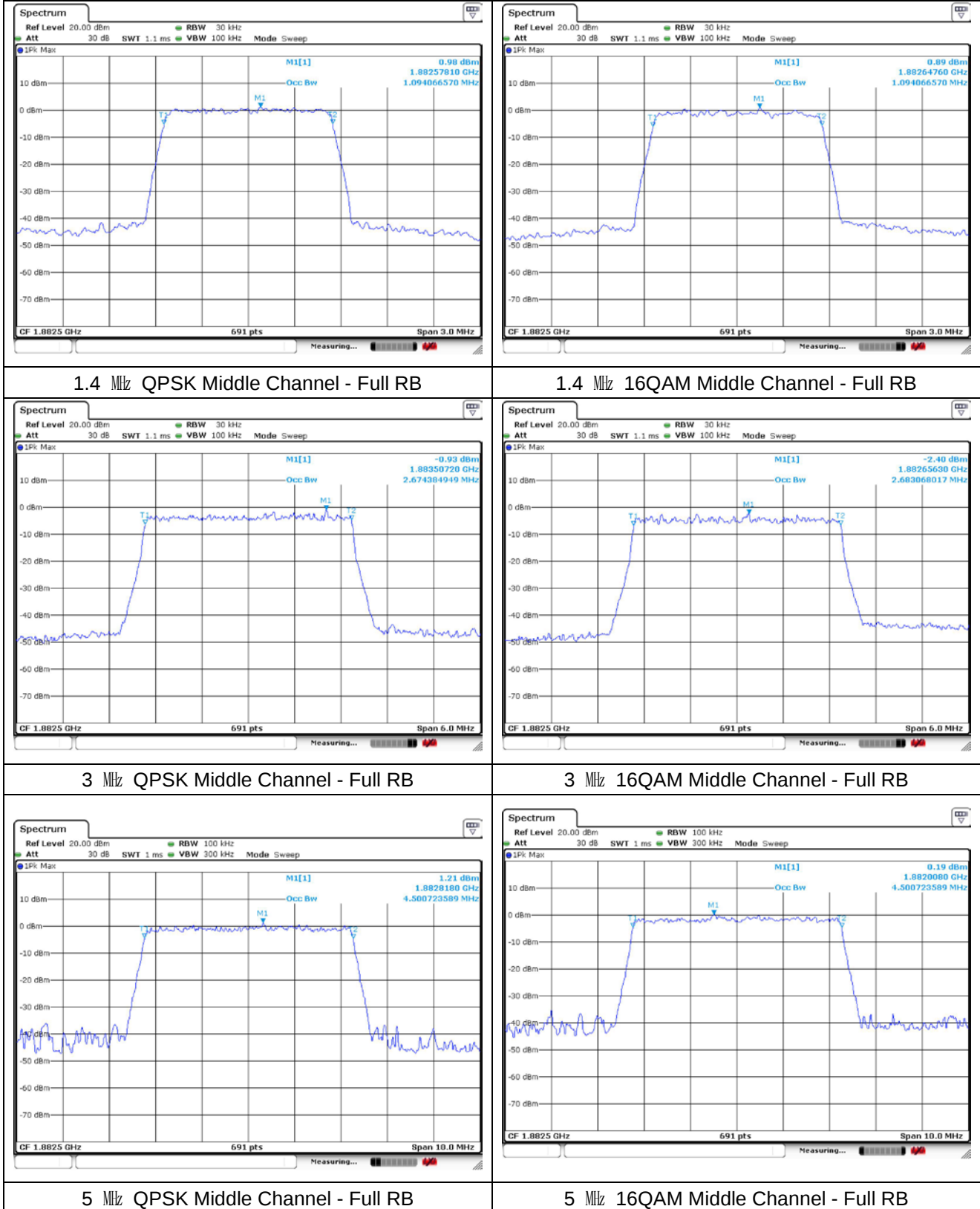


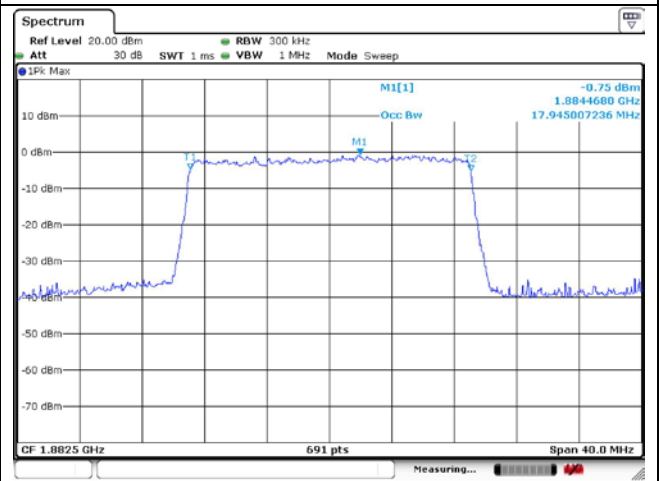
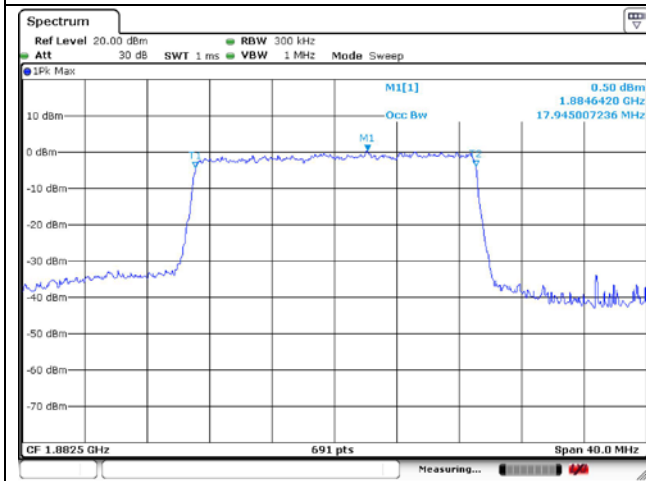
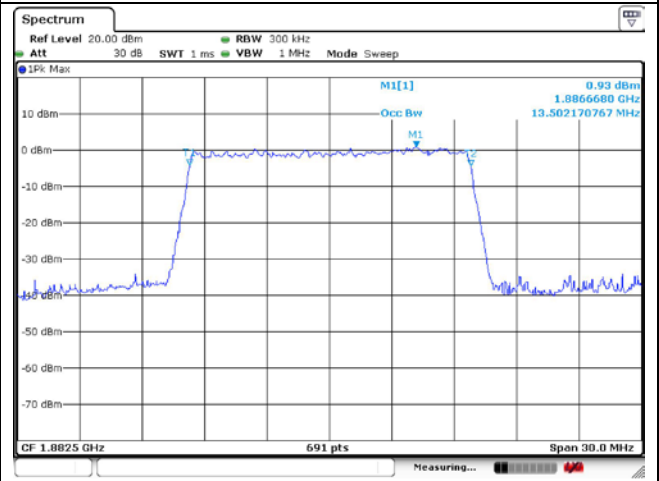
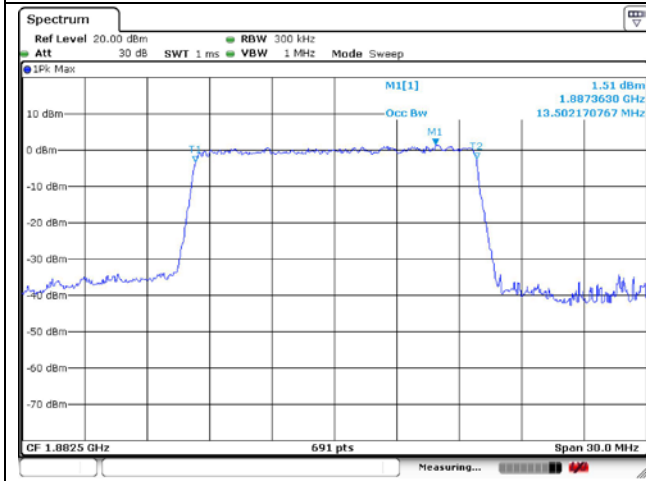
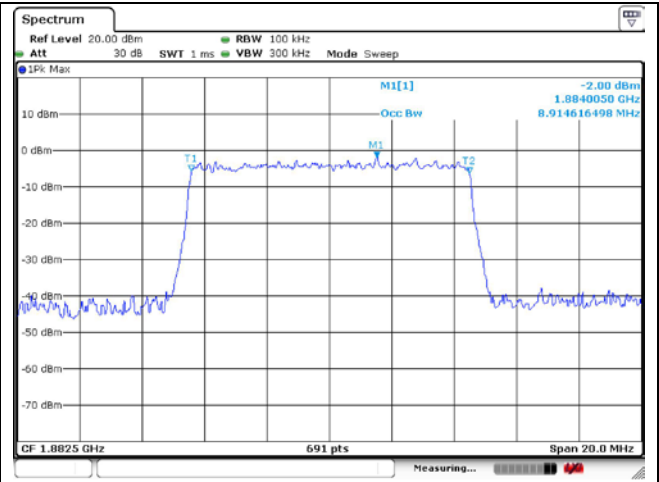
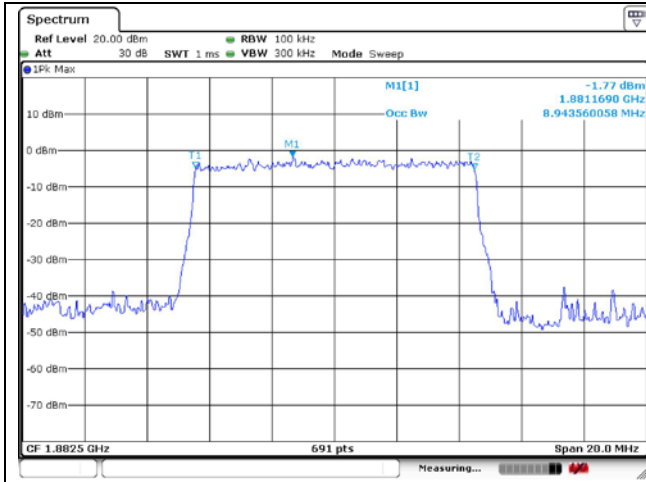
10 MHz QPSK Middle Channel - Full RB



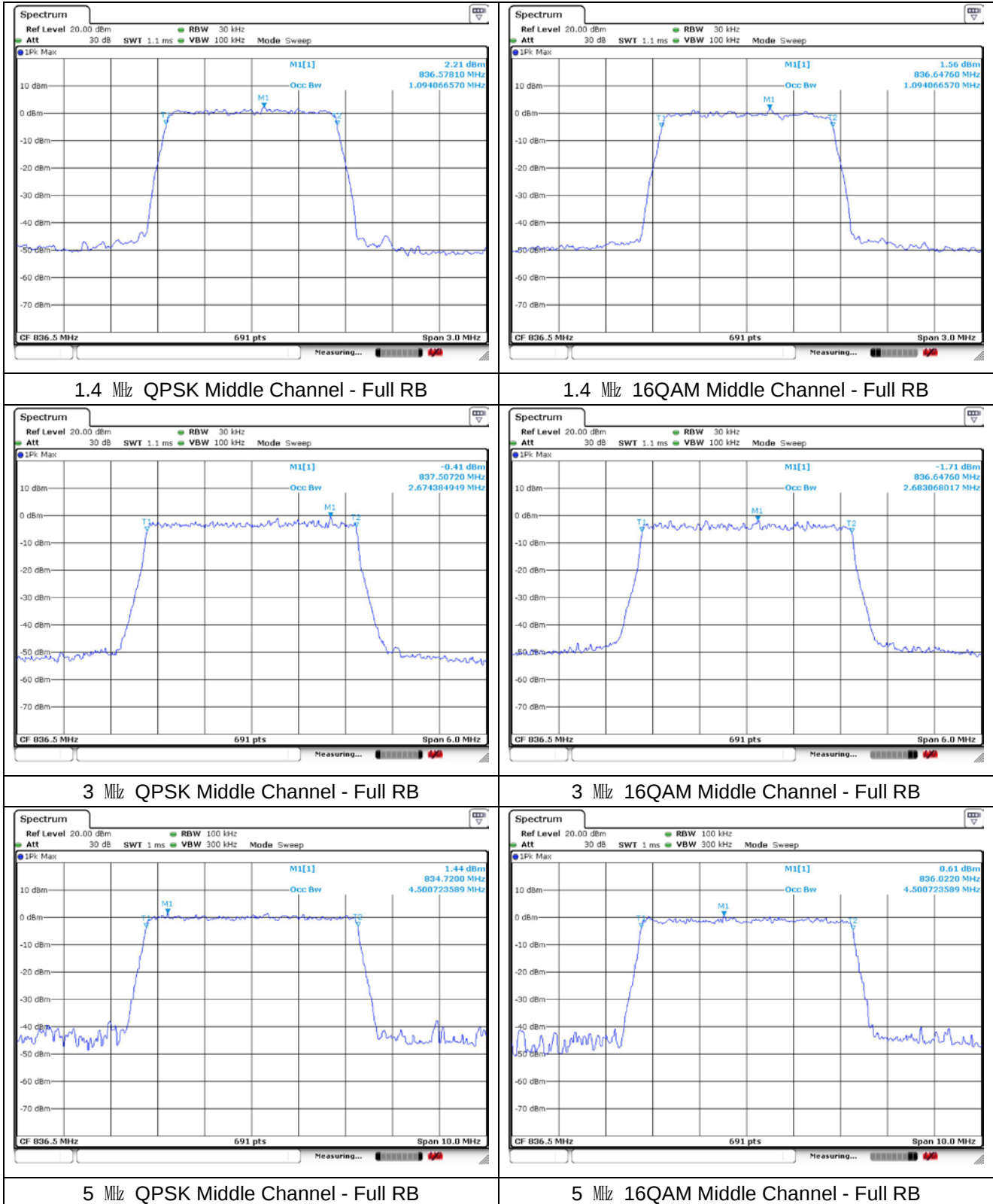
10 MHz 16QAM Middle Channel - Full RB

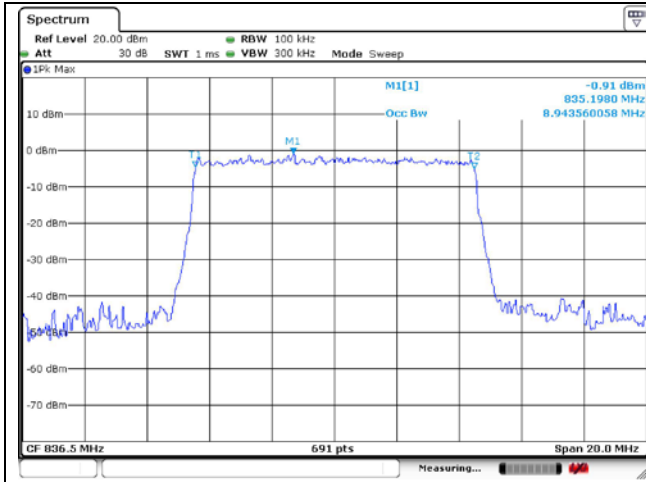
LTE band 25/2



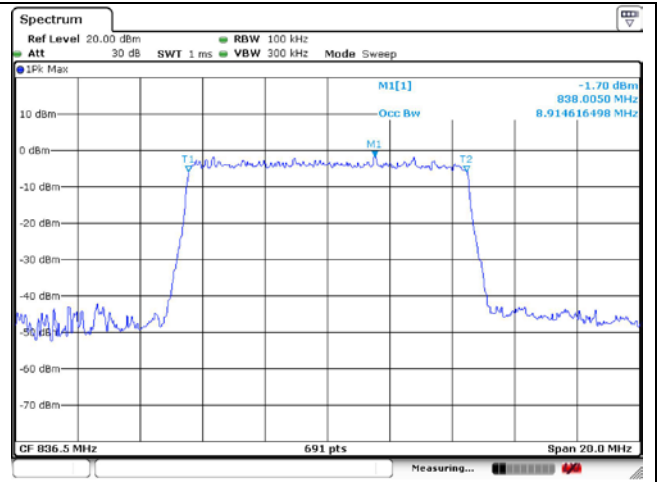


LTE band 26/5_Part 22

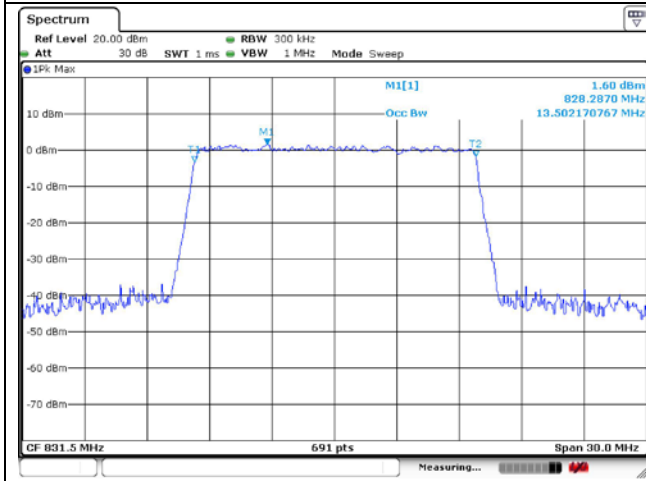




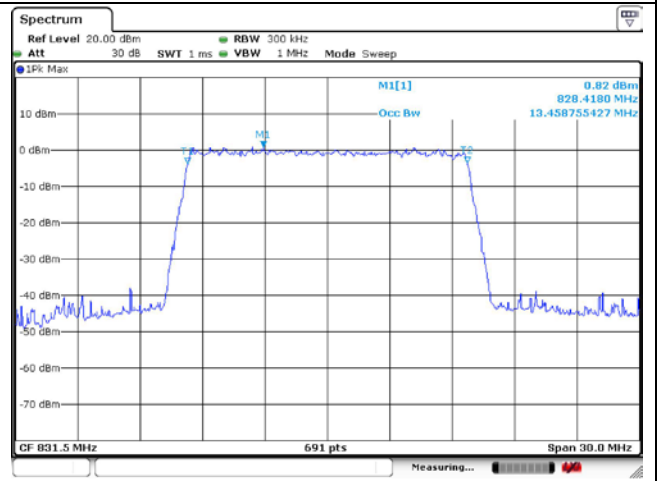
10 MHz QPSK Middle Channel - Full RB



10 MHz 16QAM Middle Channel - Full RB

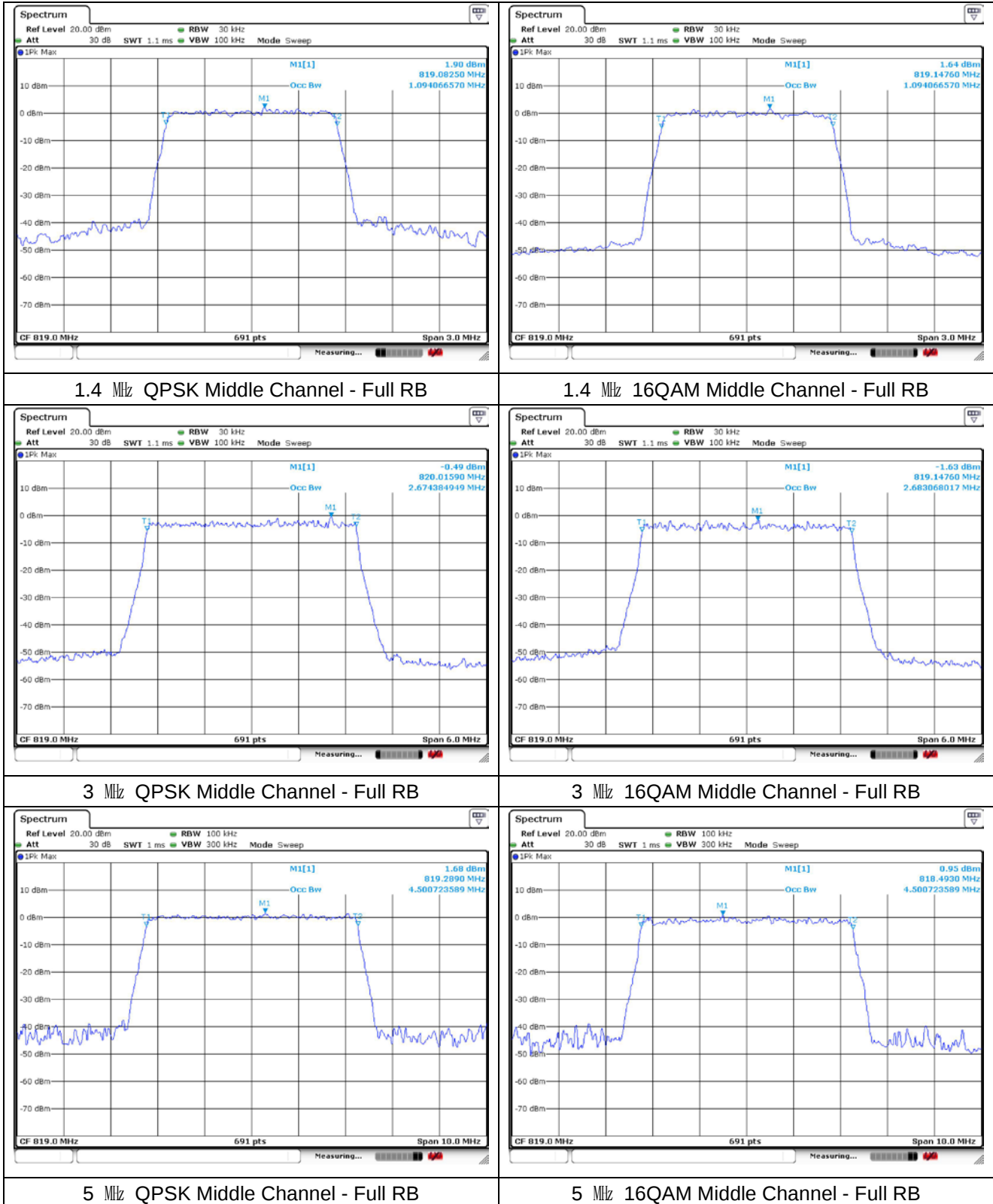


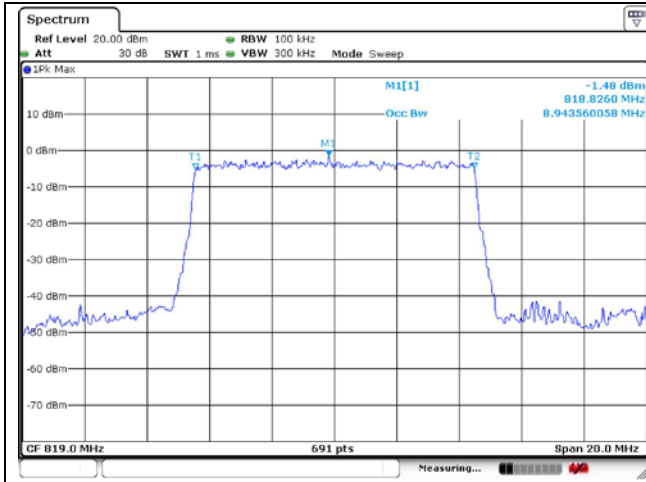
15 MHz QPSK Low Channel - Full RB



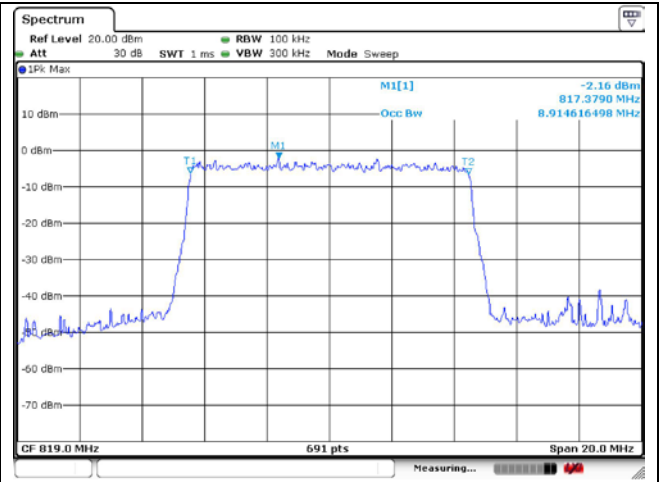
15 MHz 16QAM Low Channel - Full RB

LTE band 26 Part 20

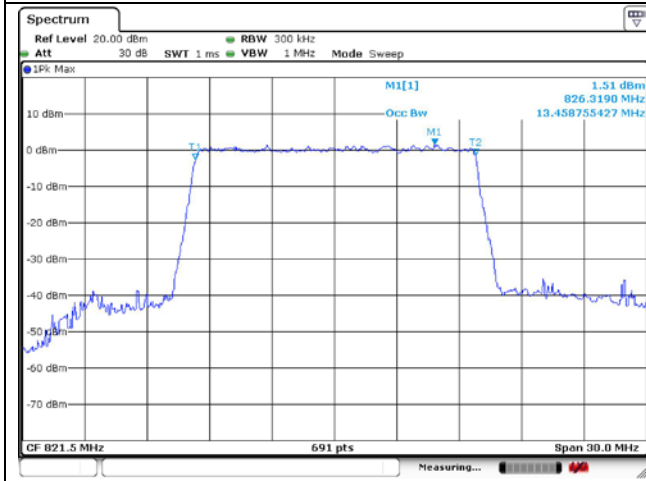




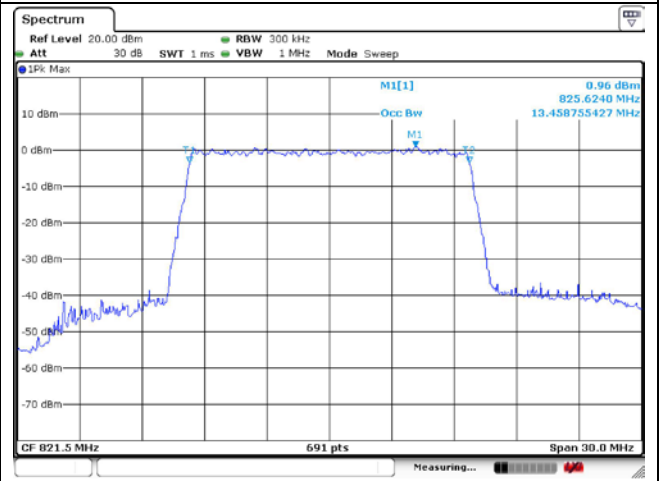
10 MHz QPSK Middle Channel - Full RB



10 MHz 16QAM Middle Channel - Full RB

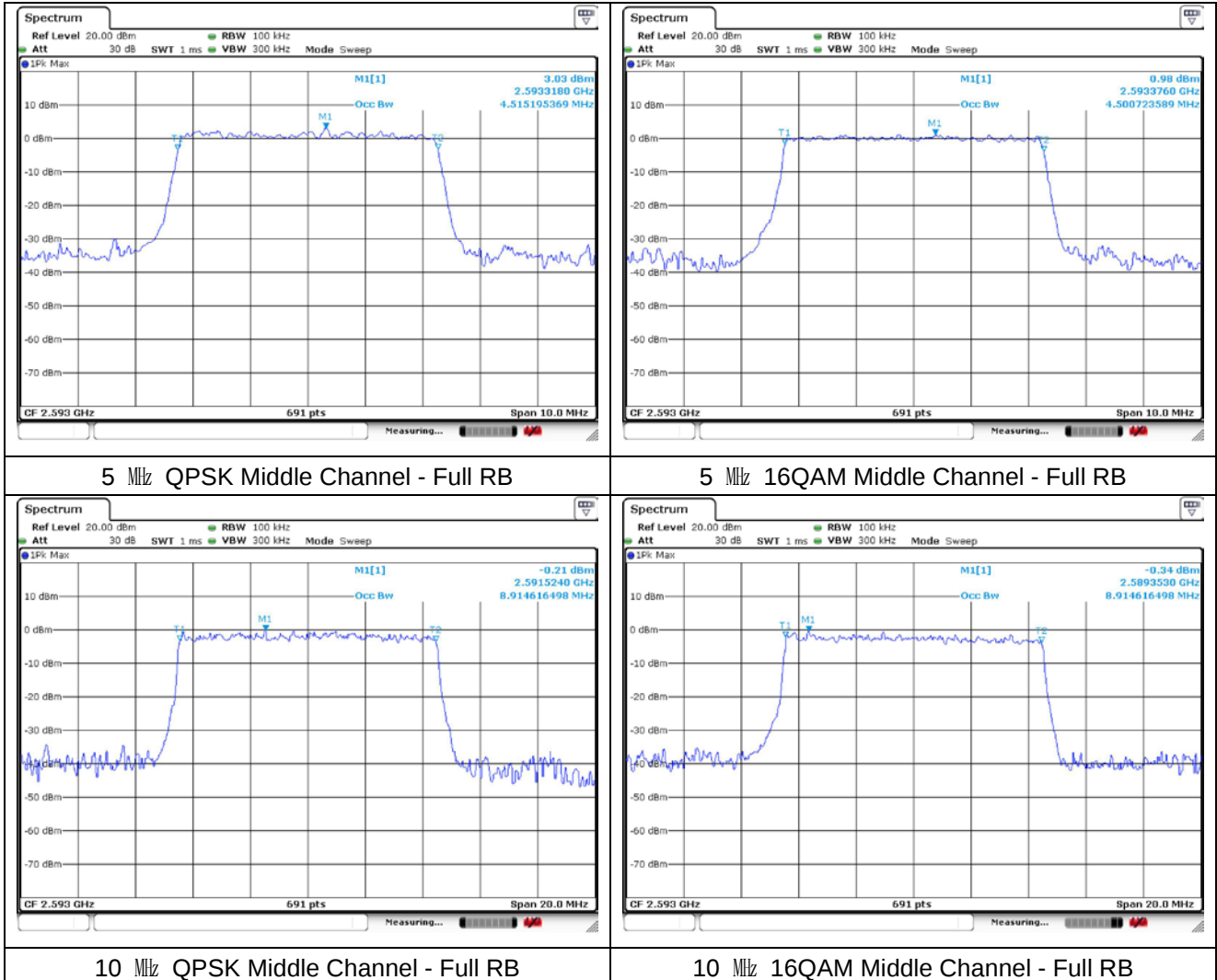


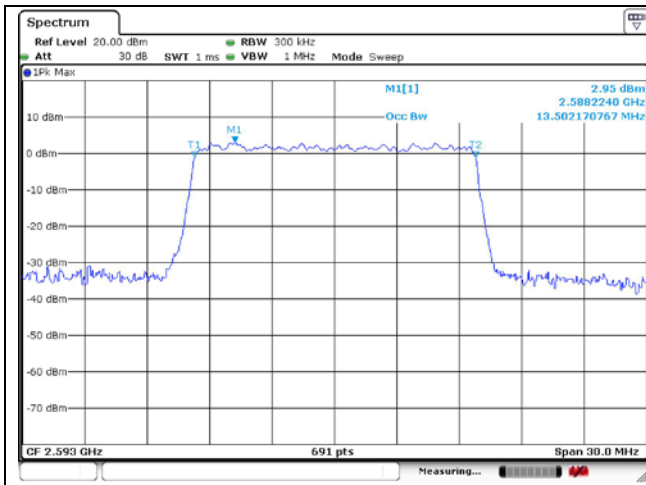
15 MHz QPSK Low Channel - Full RB



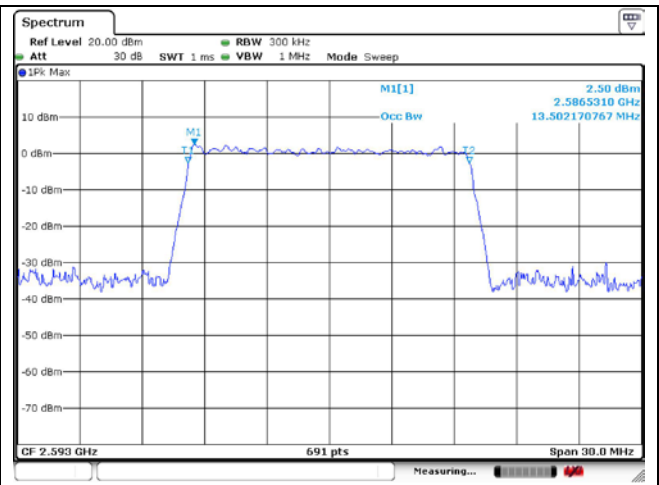
15 MHz 16QAM Low Channel - Full RB

LTE band 41_FCC

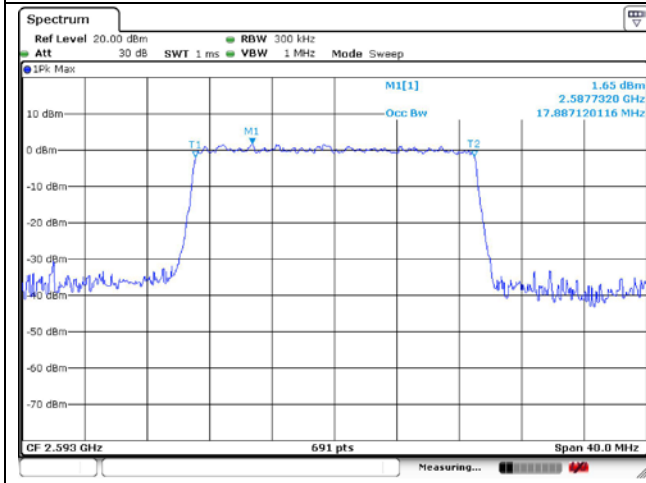




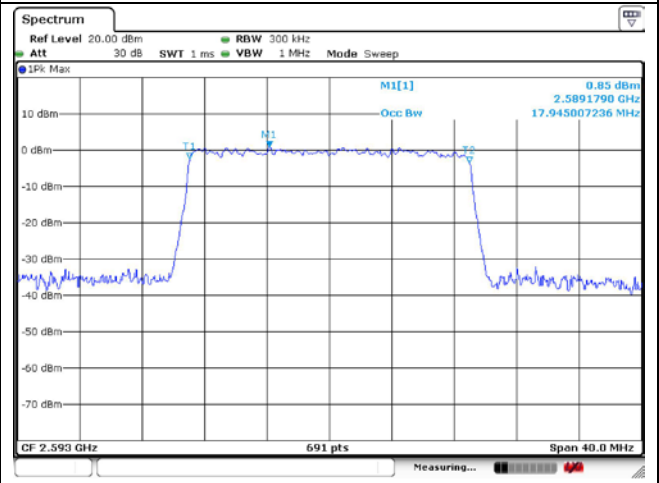
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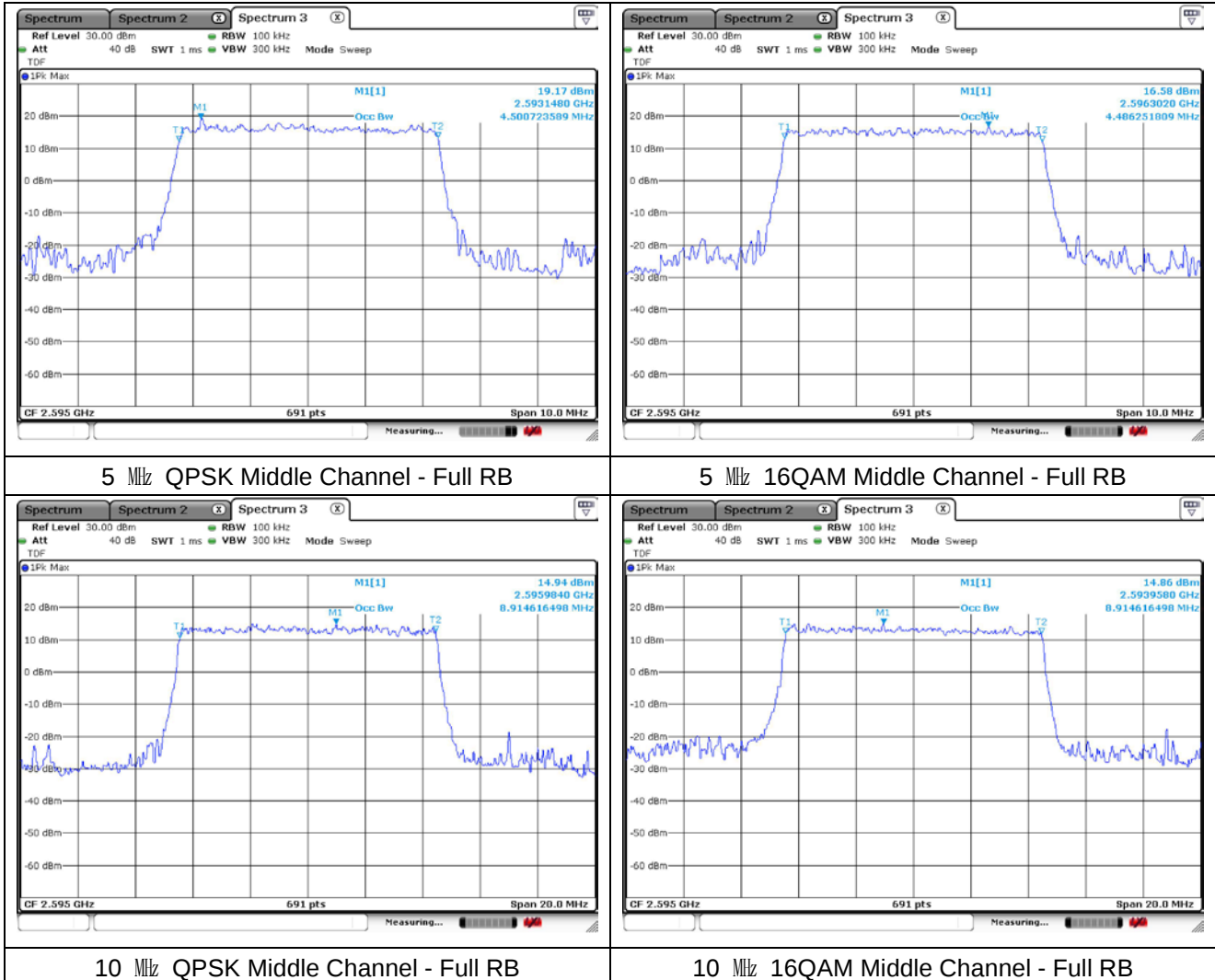
15 MHz 16QAM Middle Channel - Full RB

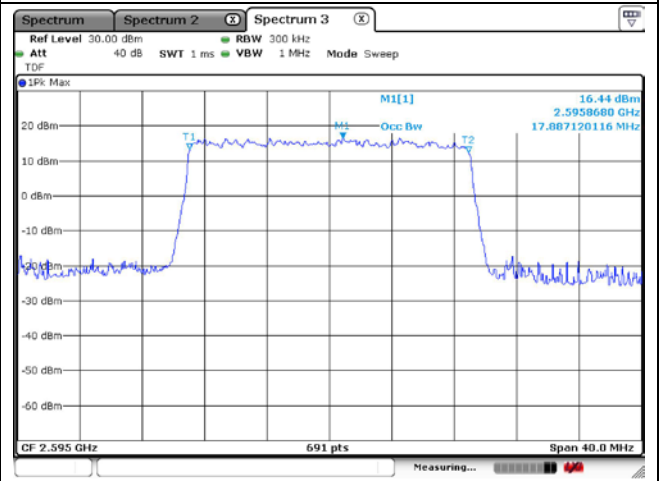
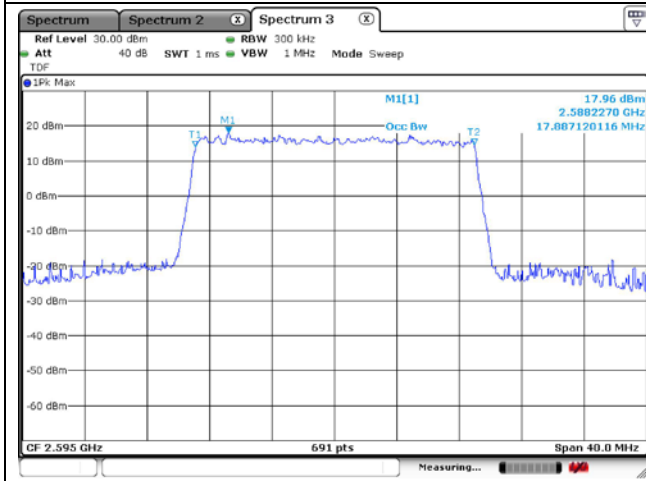
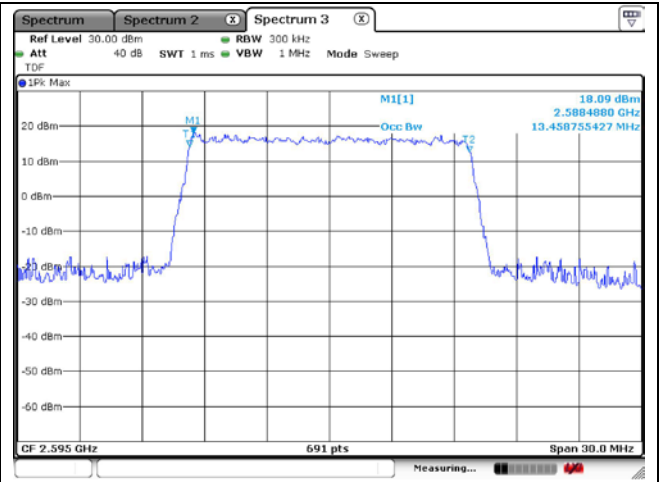
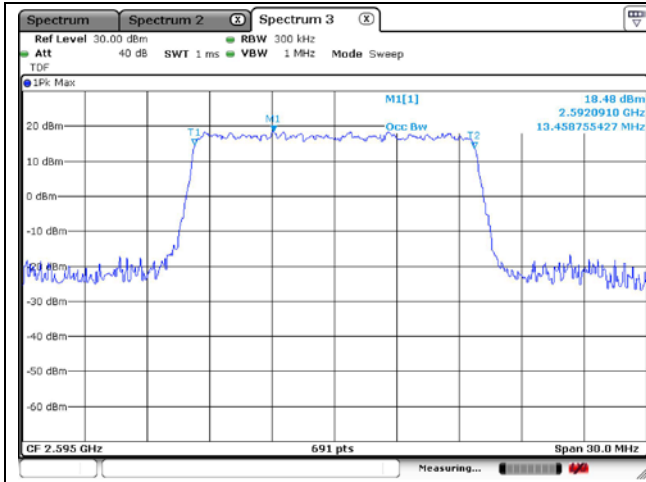


20 MHz QPSK Middle Channel - Full RB

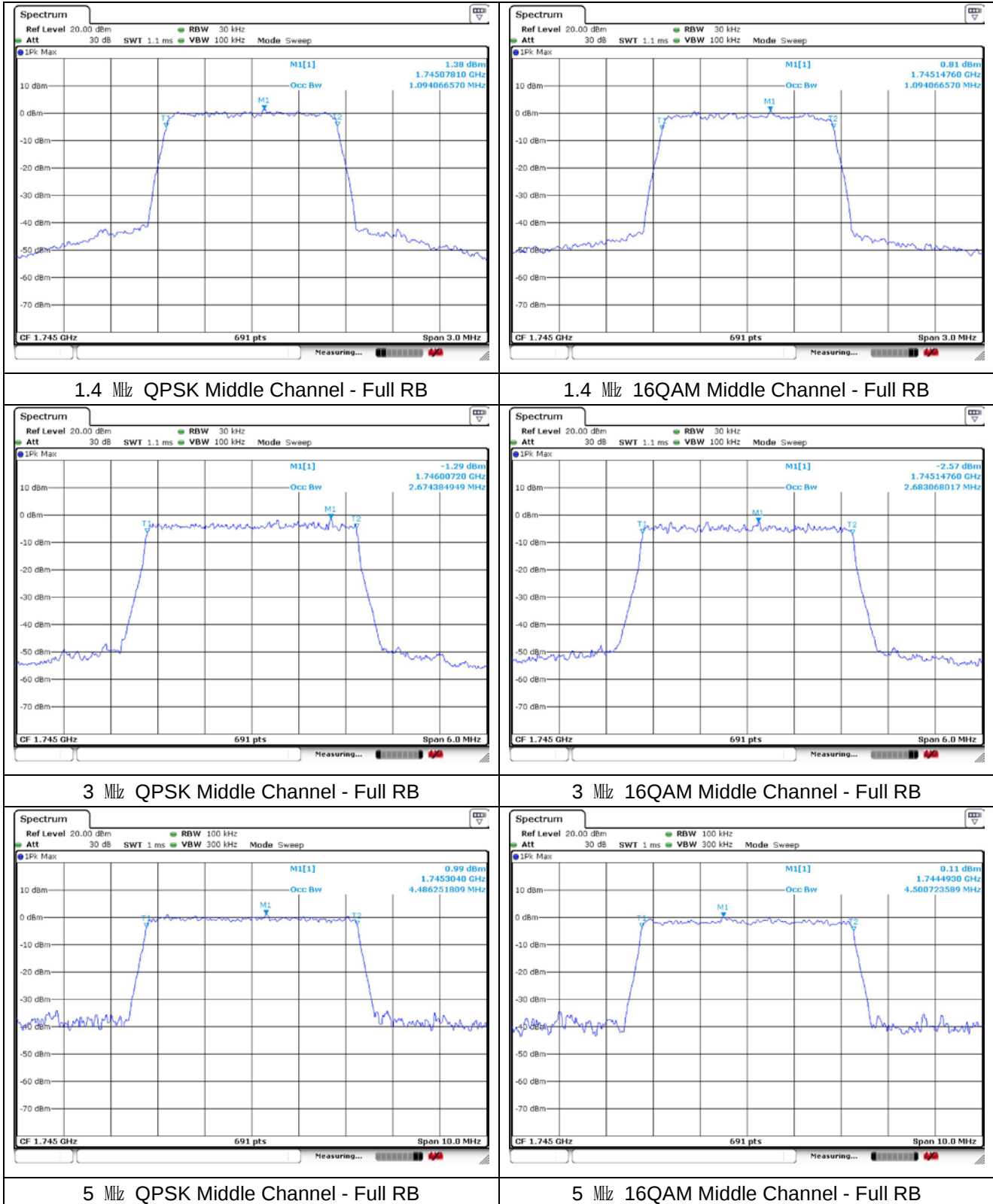


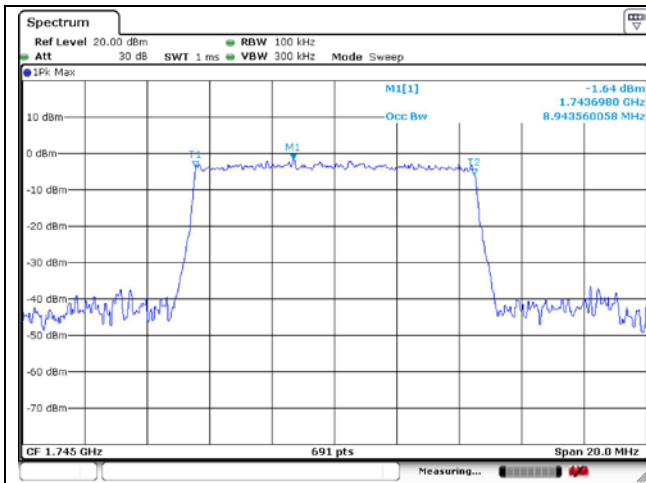
20 MHz 16QAM Middle Channel - Full RB

LTE band 41_IC


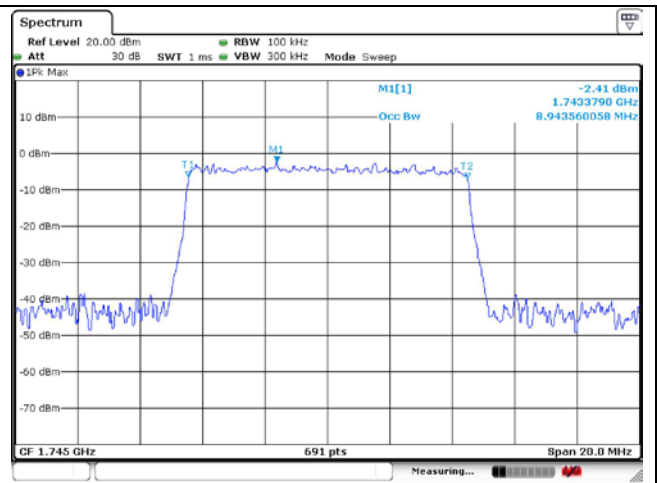


LTE band 66/4

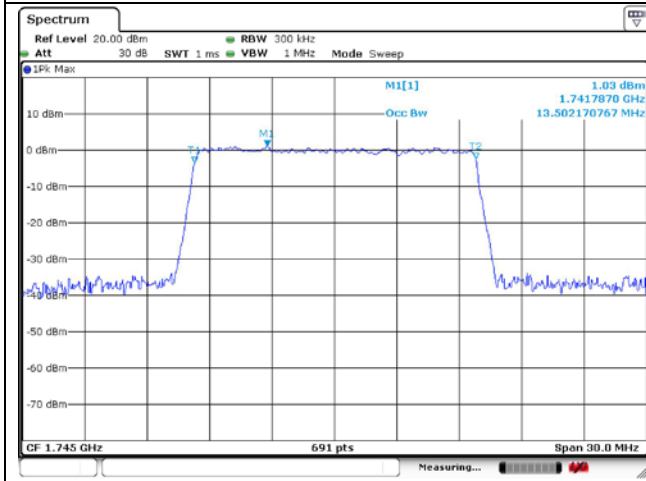




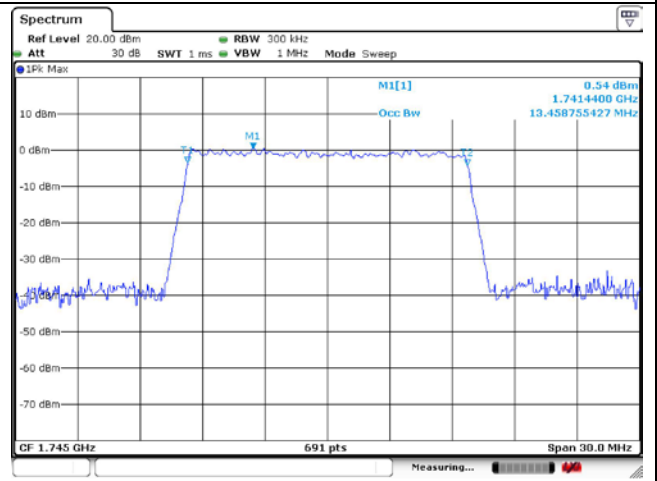
10 MHz QPSK Middle Channel - Full RB



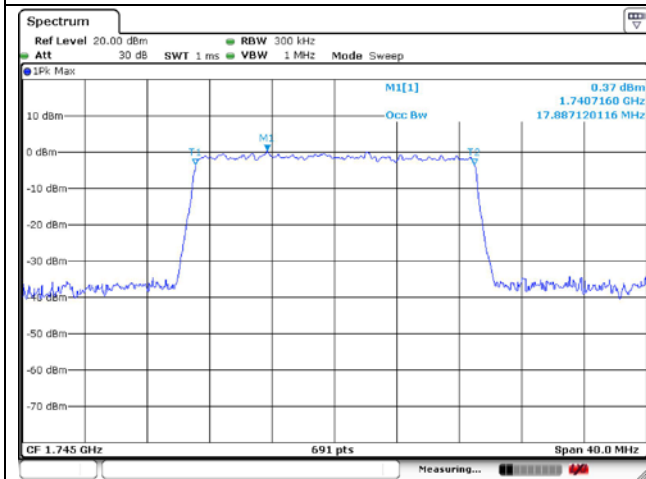
10 MHz 16QAM Middle Channel - Full RB



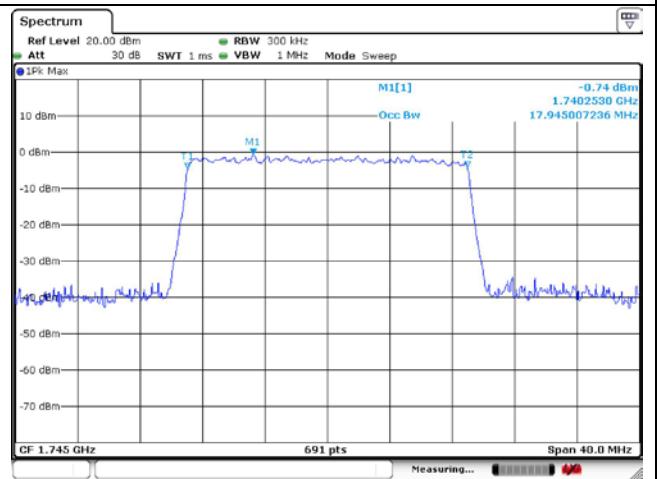
15 MHz QPSK Middle Channel - Full RB



15 MHz 16QAM Middle Channel - Full RB

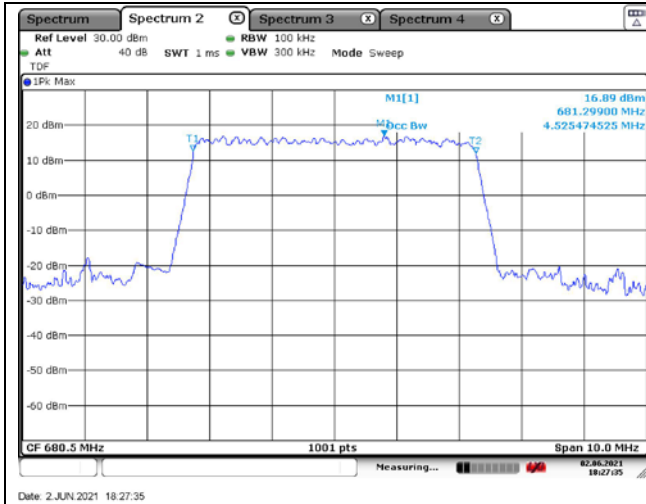


20 MHz QPSK Middle Channel - Full RB



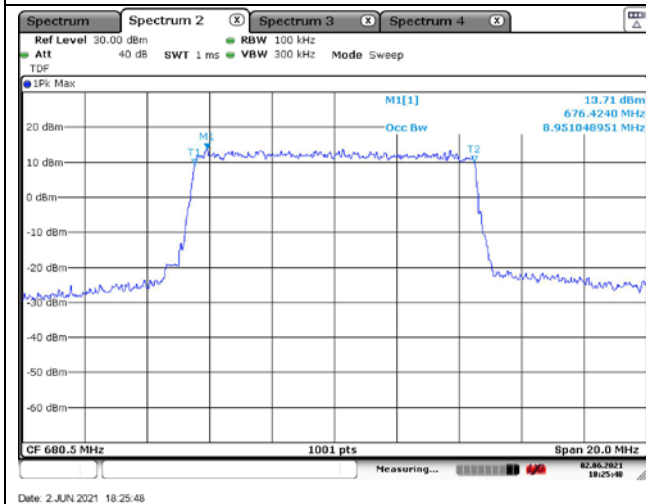
20 MHz 16QAM Middle Channel - Full RB

LTE band 71



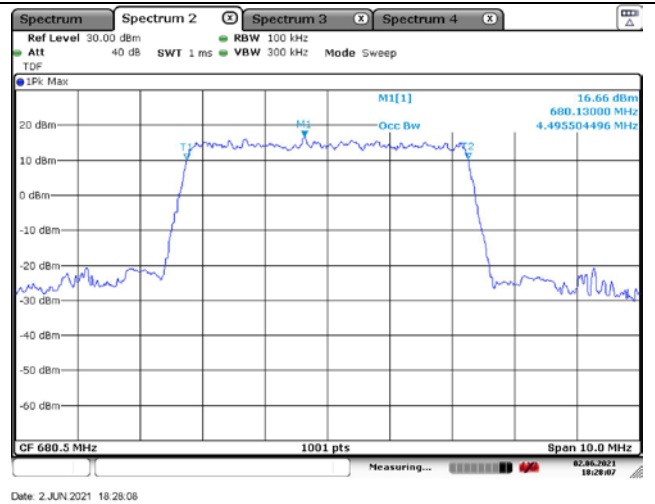
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5 MHz QPSK Middle Channel - Full RB



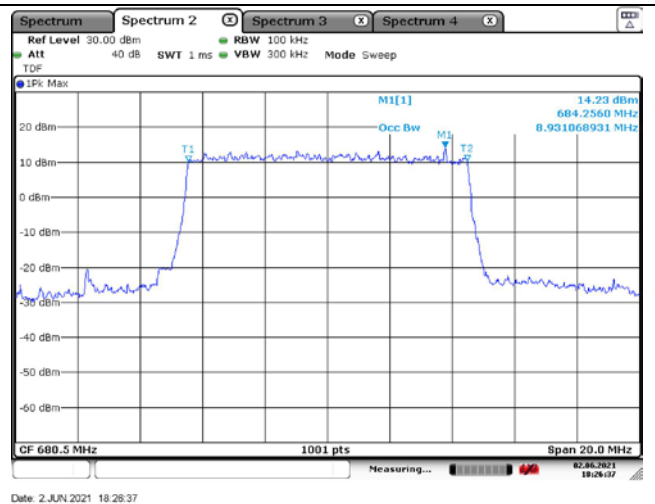
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10 MHz QPSK Middle Channel - Full RB



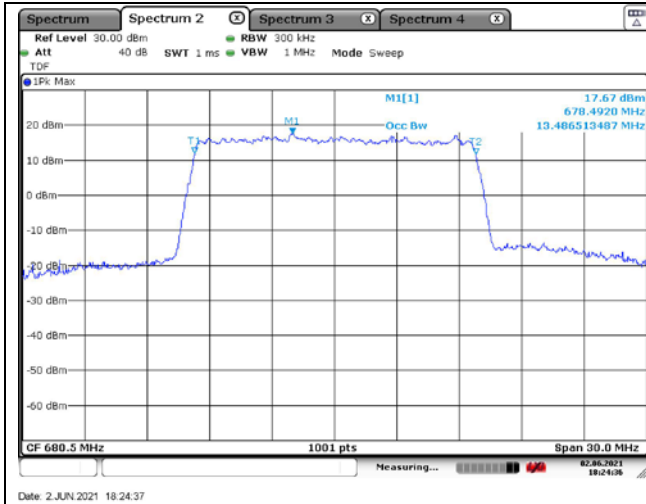
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5 MHz 16QAM Middle Channel - Full RB

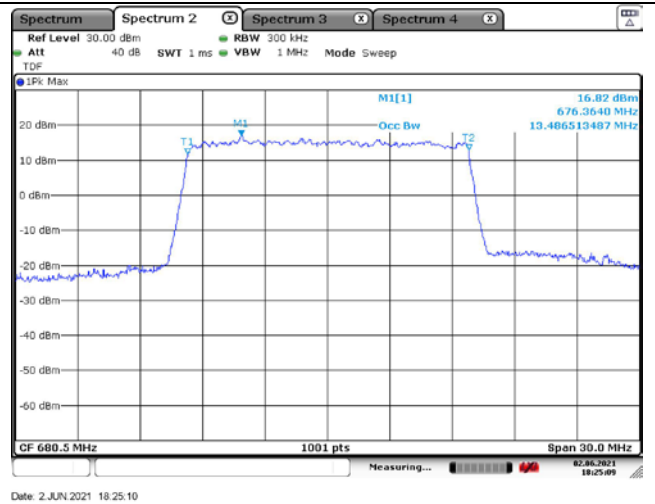


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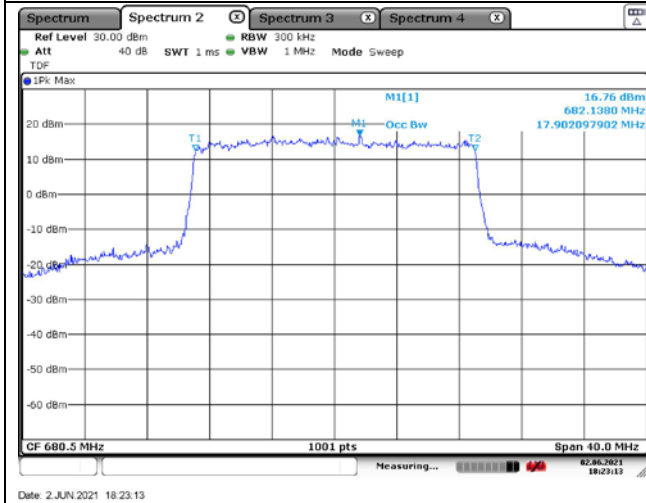
10 MHz 16QAM Middle Channel - Full RB



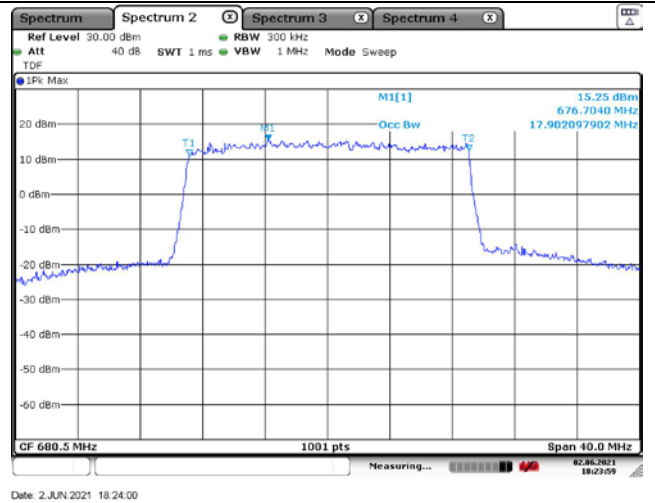
15 MHz QPSK Middle Channel - Full RB



15 MHz 16QAM Middle Channel - Full RB



20 MHz QPSK Middle Channel - Full RB



20 MHz 16QAM Middle Channel - Full RB