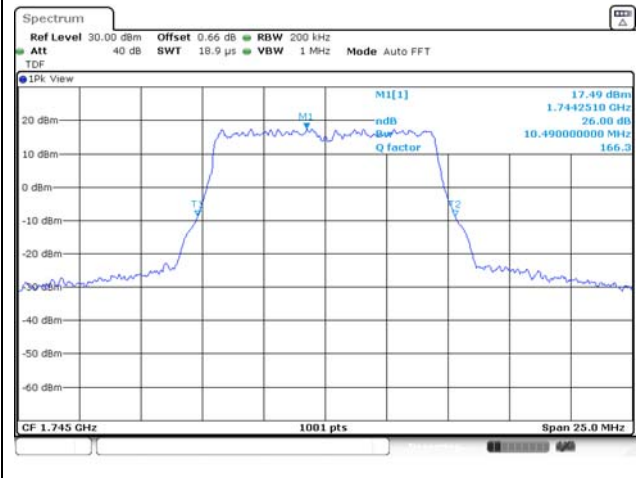
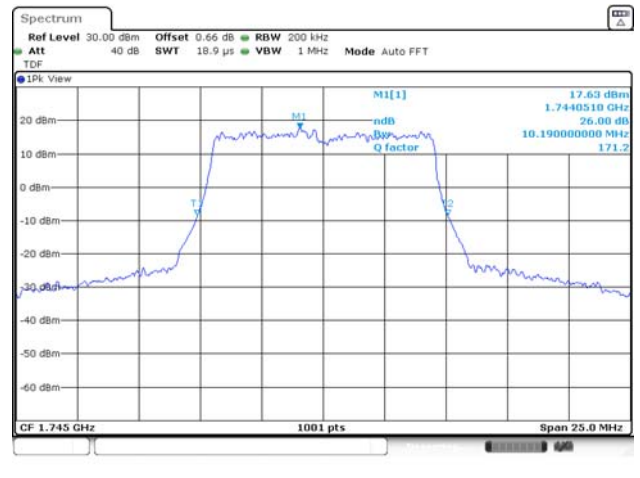


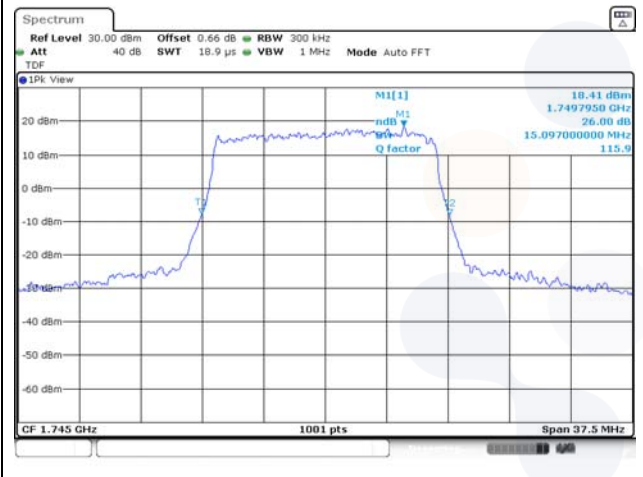
10M BW QPSK Mid ch.



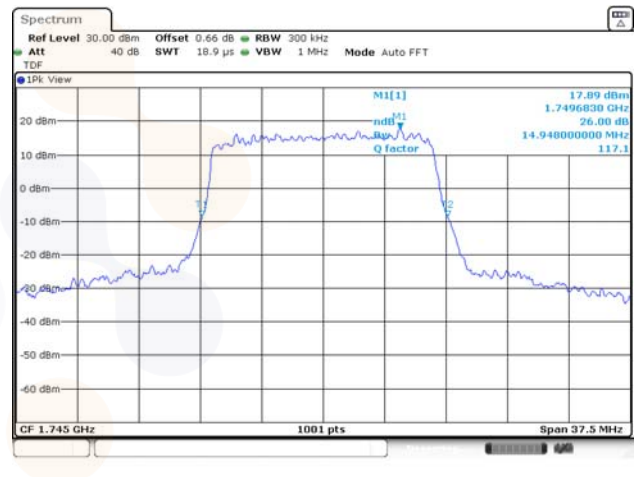
10M BW 16QAM Mid ch.



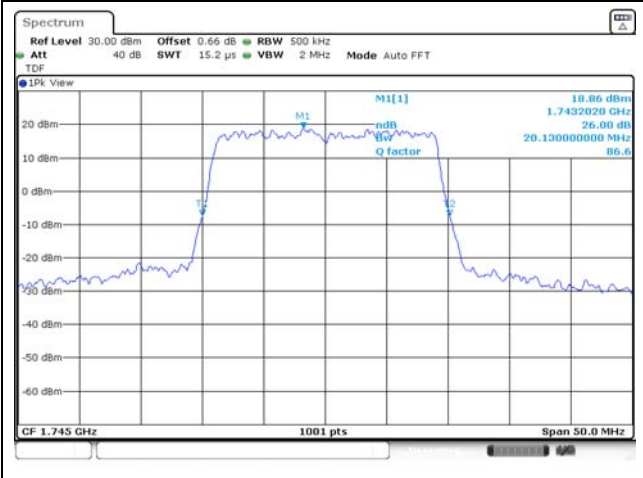
15M BW QPSK Mid ch.



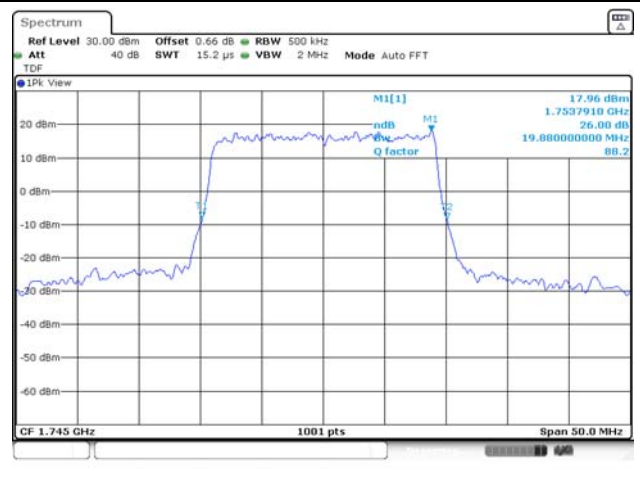
15M BW 16QAM Mid ch.



20M BW QPSK Mid ch.

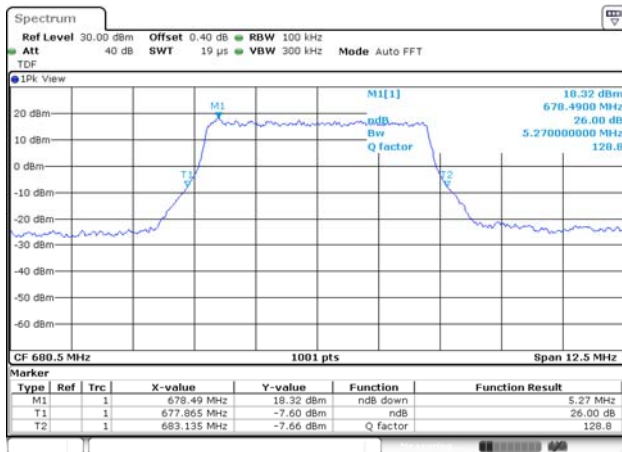


20M BW 16QAM Mid ch.

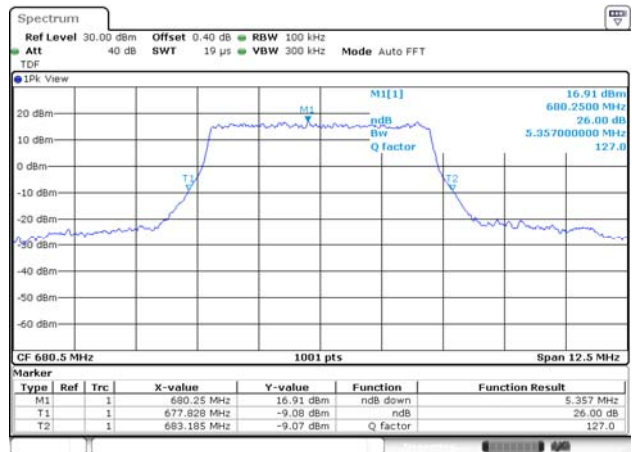


Test mode: LTE Band 71

5M BW QPSK Mid ch.



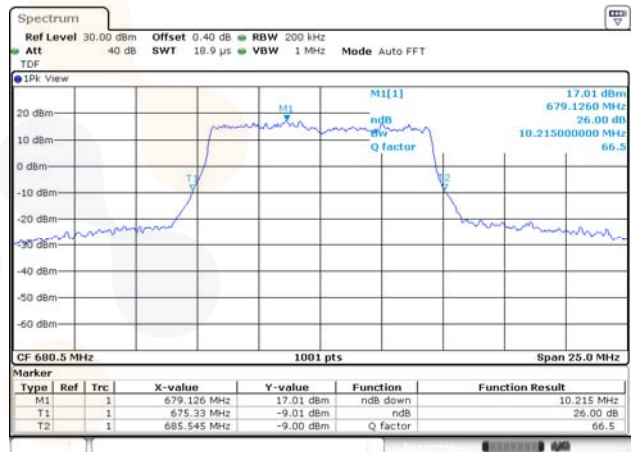
5M BW 16QAM Mid ch.



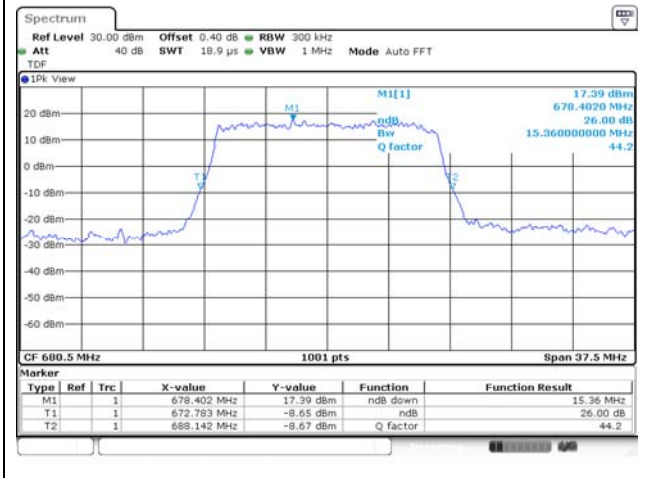
10M BW QPSK Mid ch.



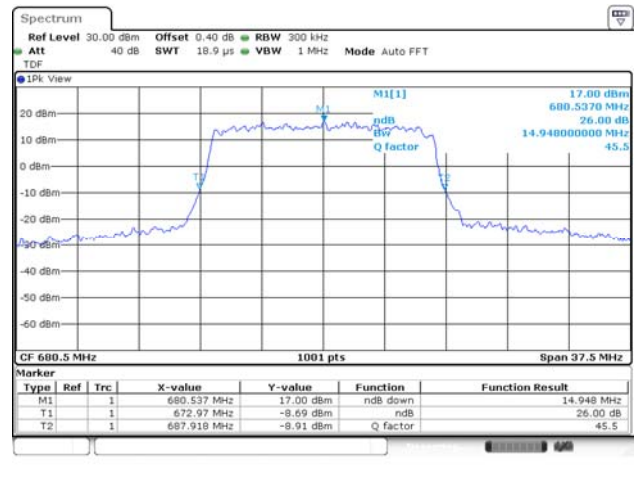
10M BW 16QAM Mid ch.



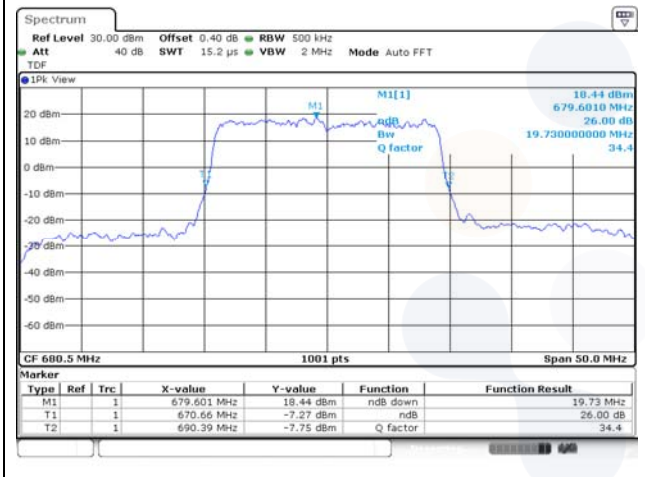
15M BW QPSK Mid ch.



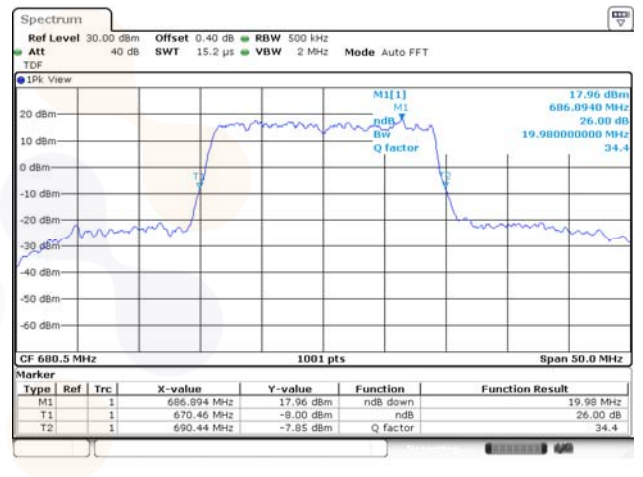
15M BW 16QAM Mid ch.



20M BW QPSK Mid ch.

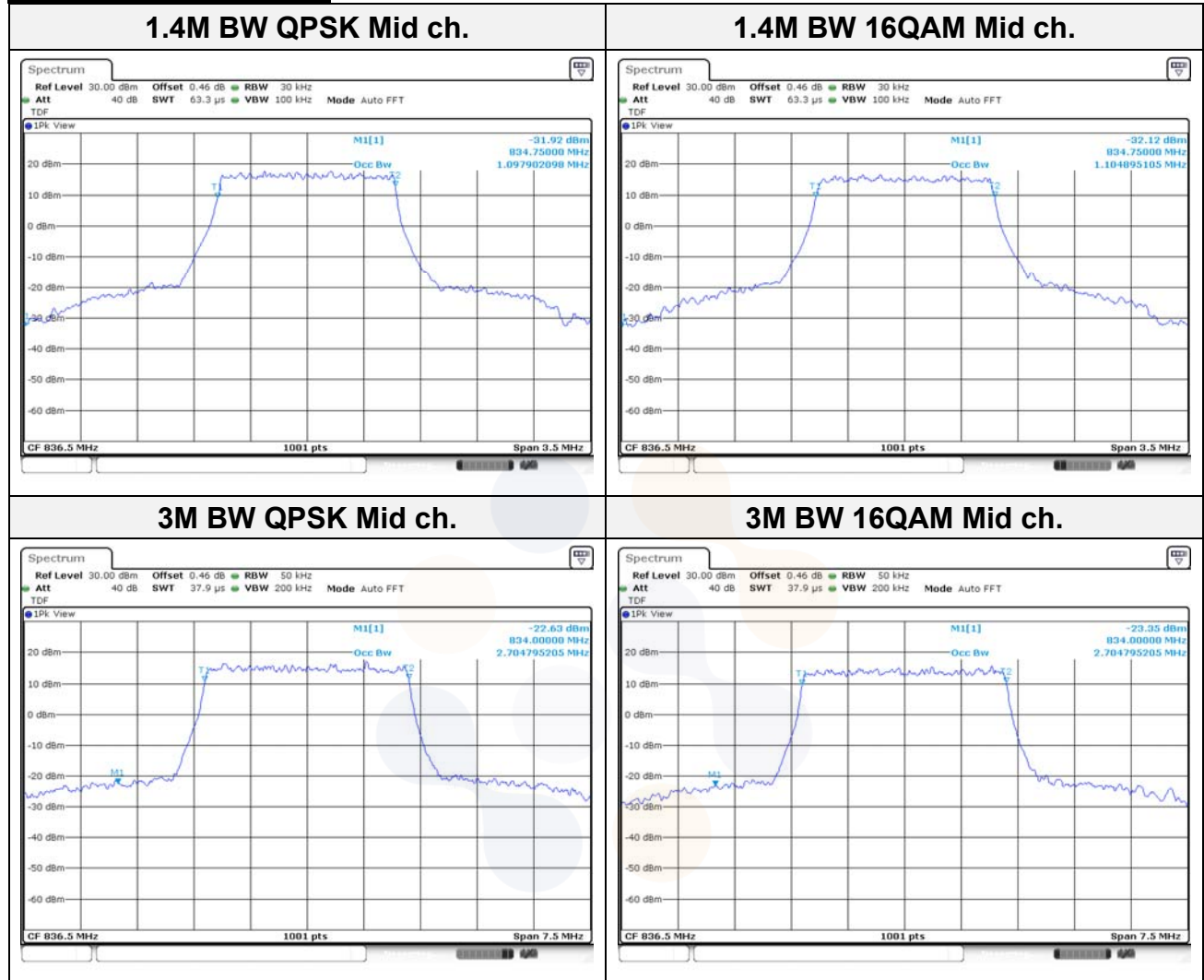


20M BW 16QAM Mid ch.

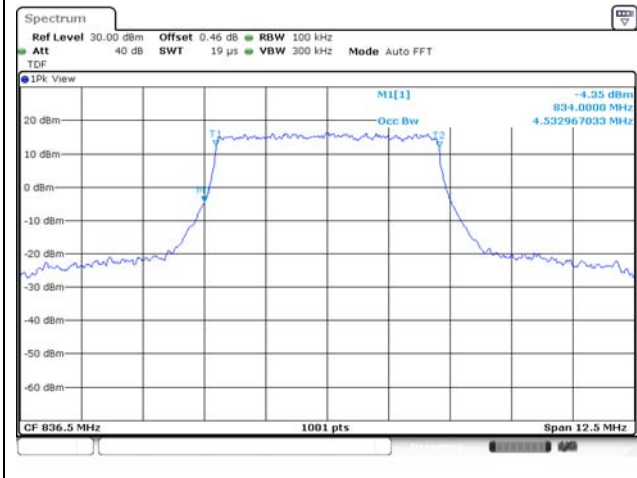


99% Occupied Bandwidth

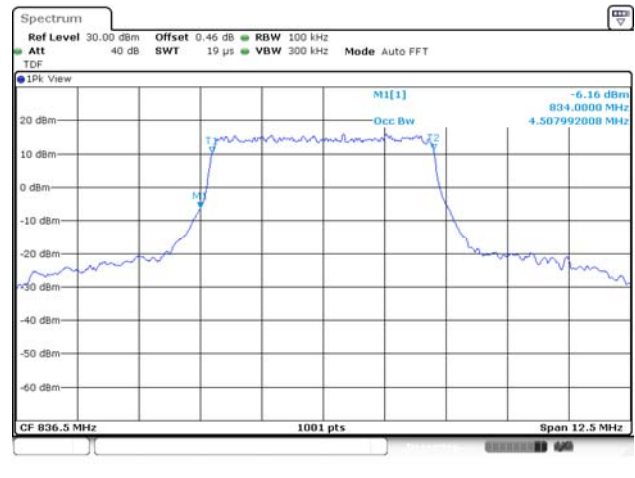
Test mode: LTE Band 5



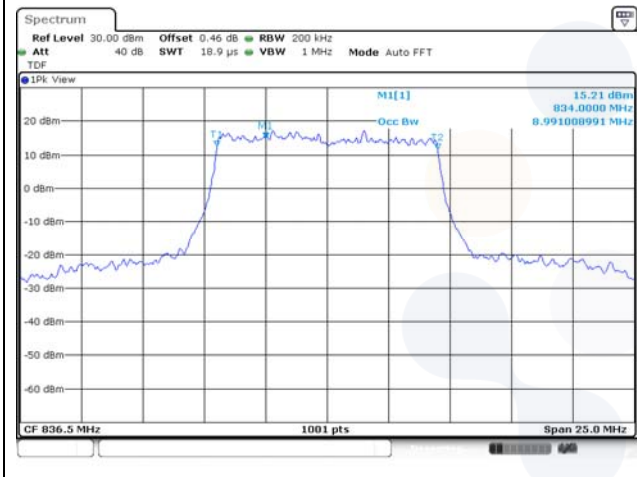
5M BW QPSK Mid ch.



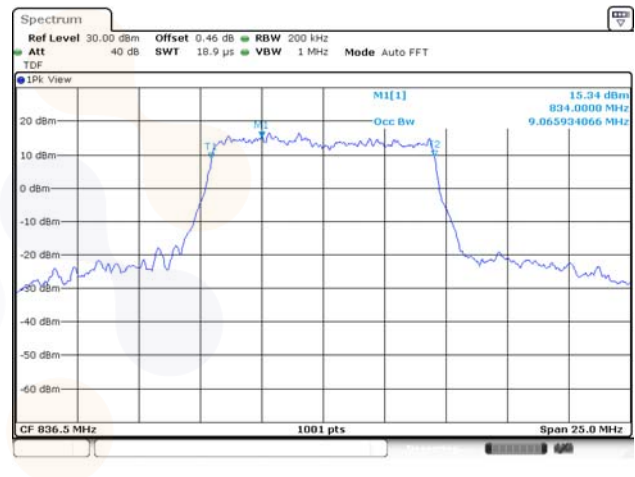
5M BW 16QAM Mid ch.



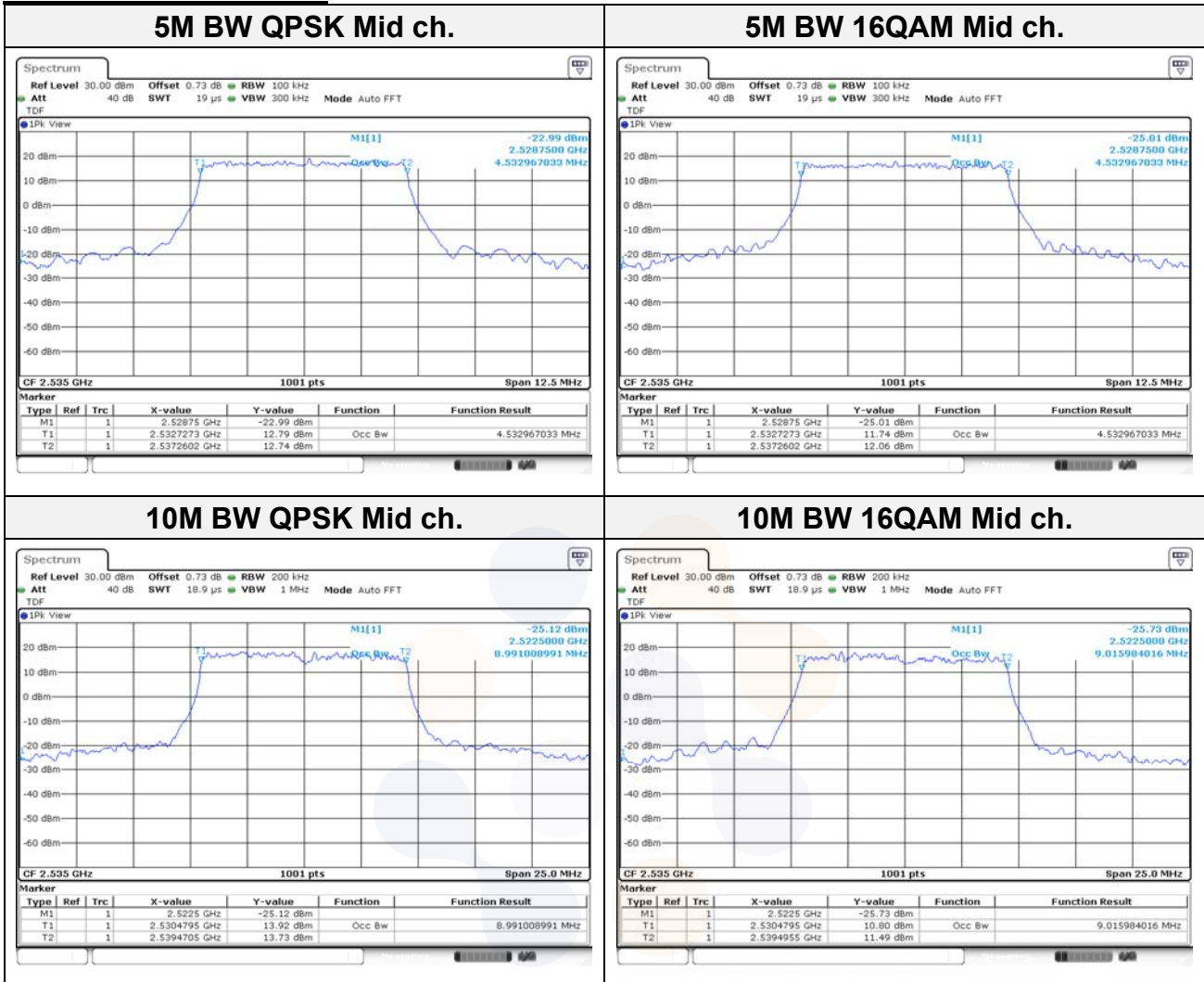
10M BW QPSK Mid ch.



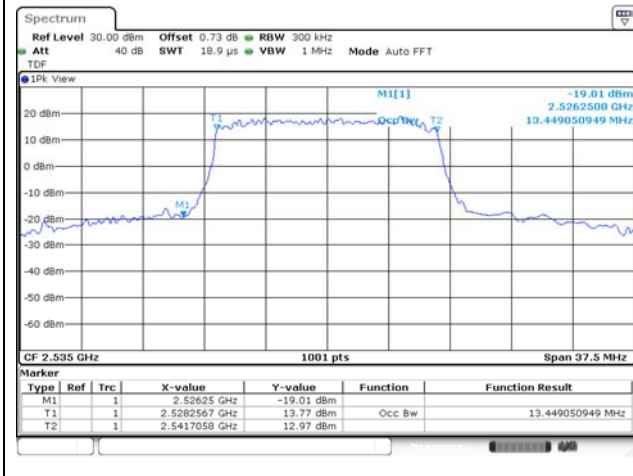
10M BW 16QAM Mid ch.



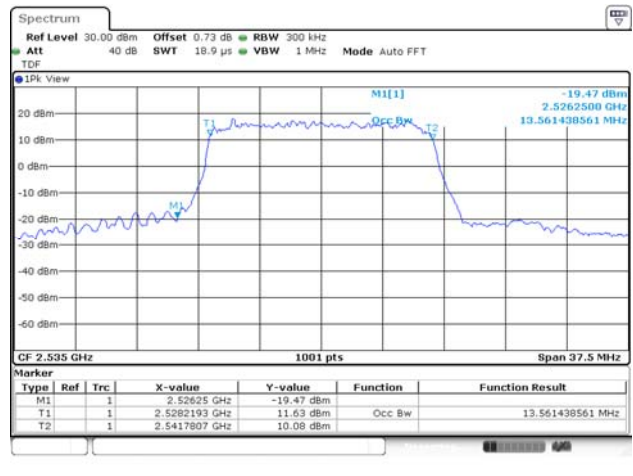
Test mode: LTE Band 7



15M BW QPSK Mid ch.



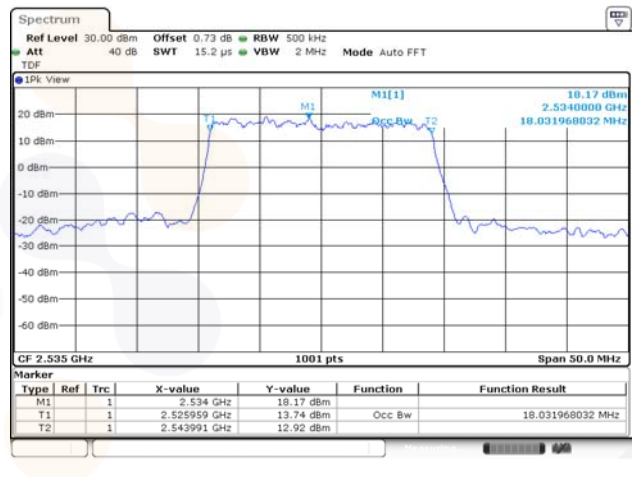
15M BW 16QAM Mid ch.



20M BW QPSK Mid ch.

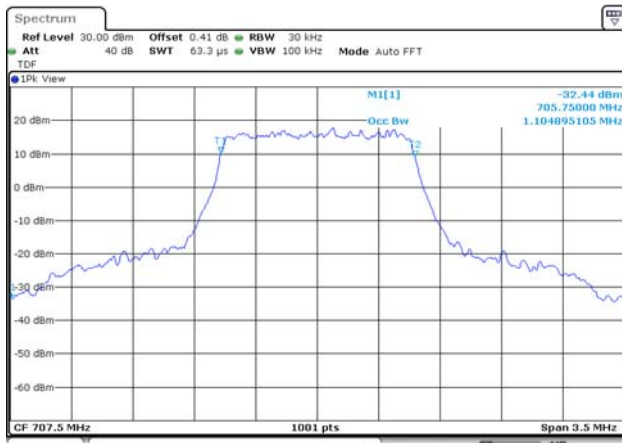


20M BW 16QAM Mid ch.

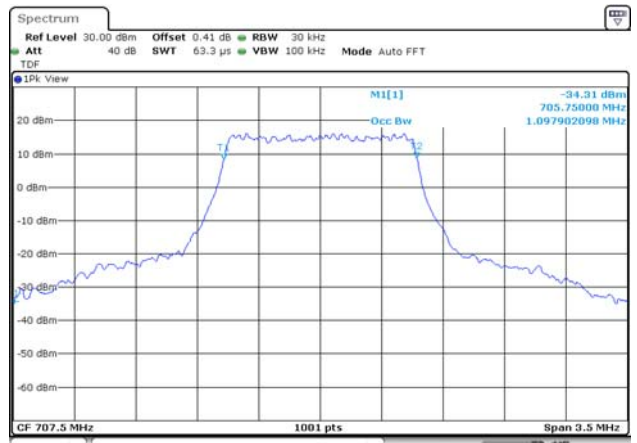


Test mode: LTE Band 12

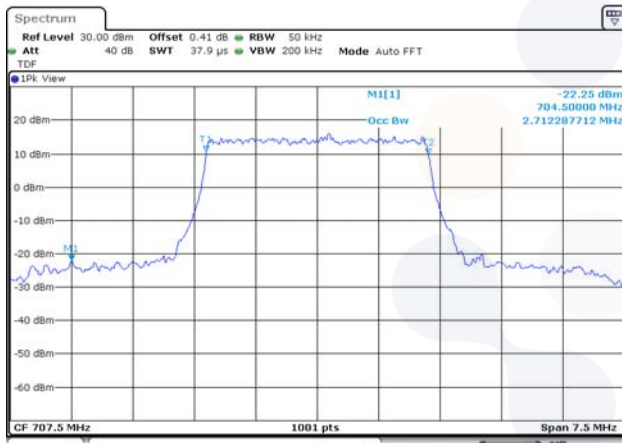
1.4M BW QPSK Mid ch.



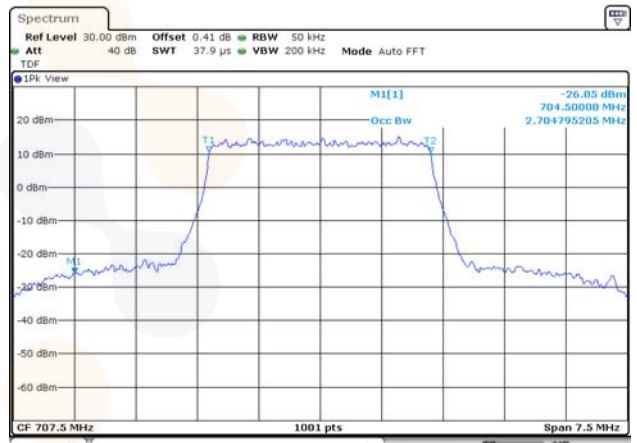
1.4M BW 16QAM Mid ch.



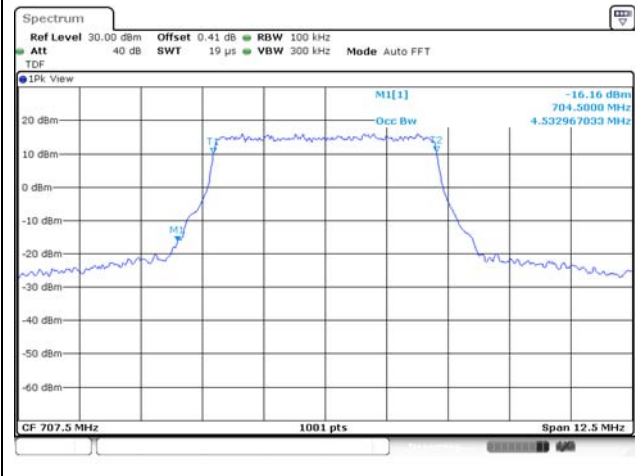
3M BW QPSK Mid ch.



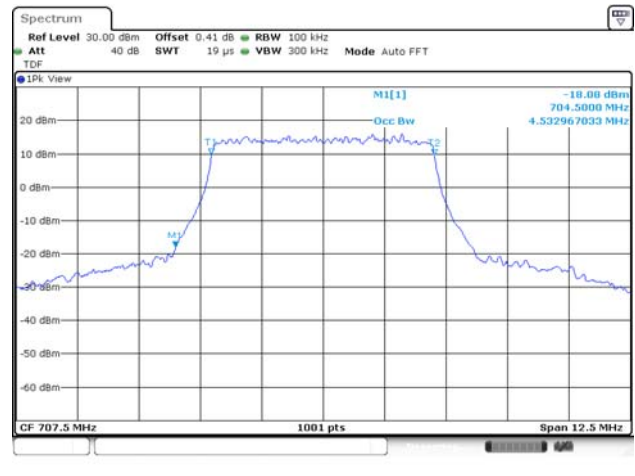
3M BW 16QAM Mid ch.



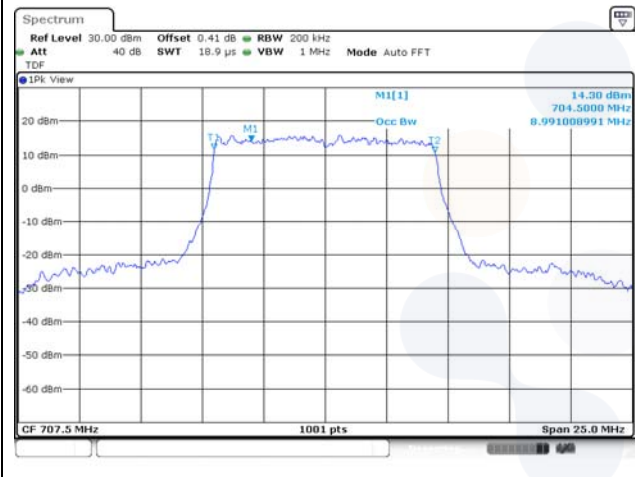
5M BW QPSK Mid ch.



5M BW 16QAM Mid ch.



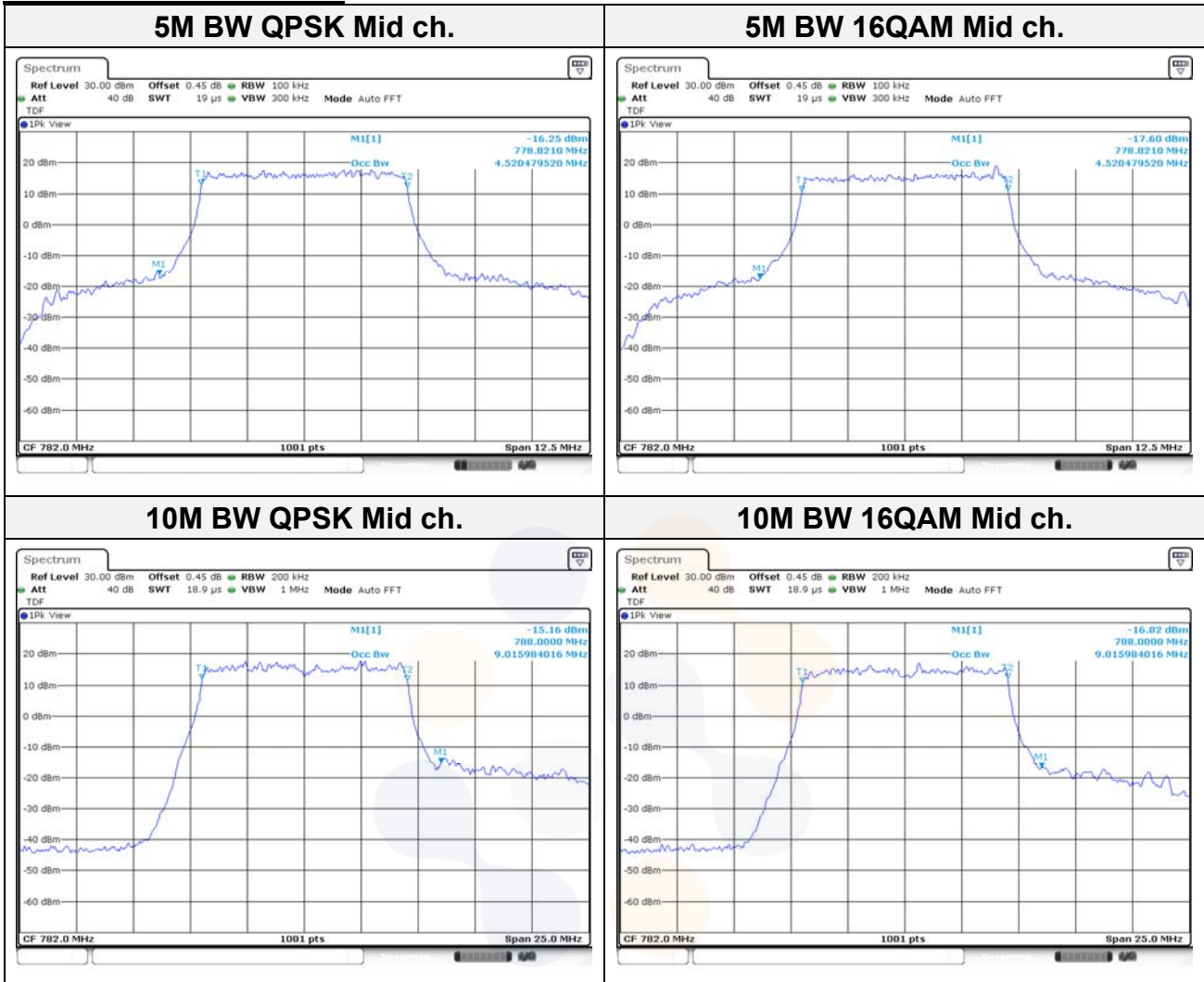
10M BW QPSK Mid ch.



10M BW 16QAM Mid ch.

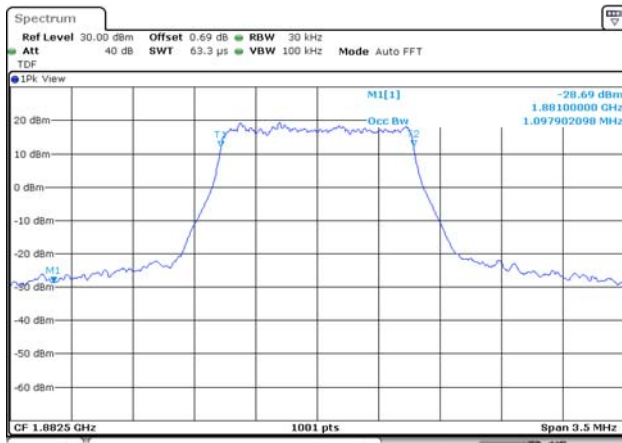


Test mode: LTE Band 13

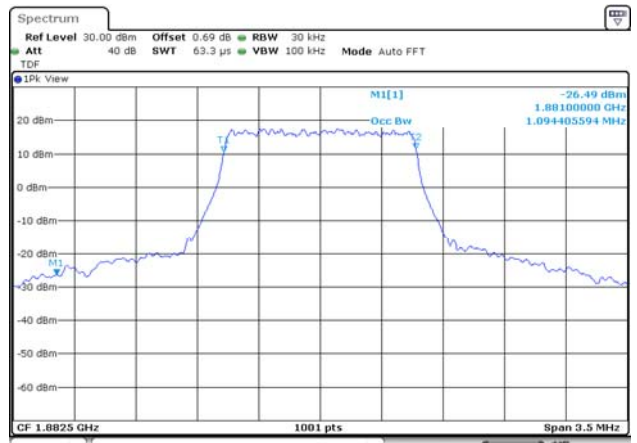


Test mode: LTE Band 25/2

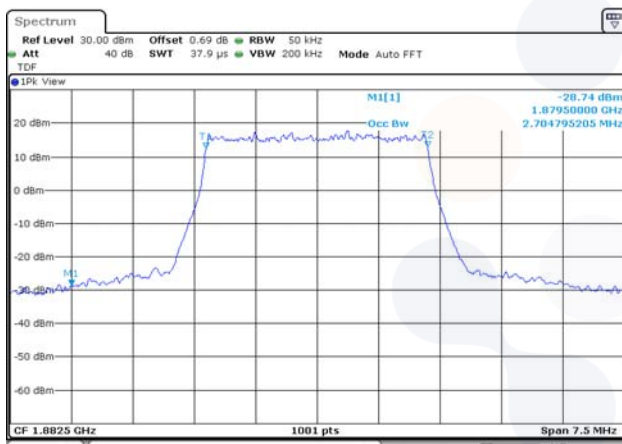
1.4M BW QPSK Mid ch.



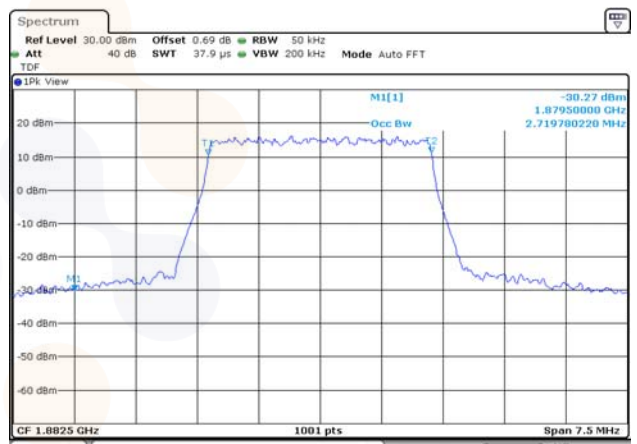
1.4M BW 16QAM Mid ch.



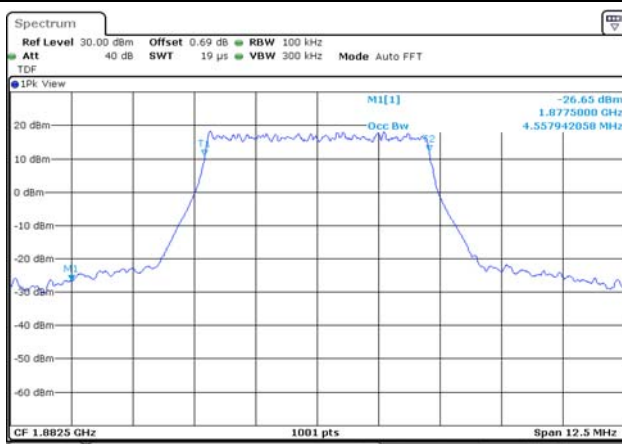
3M BW QPSK Mid ch.



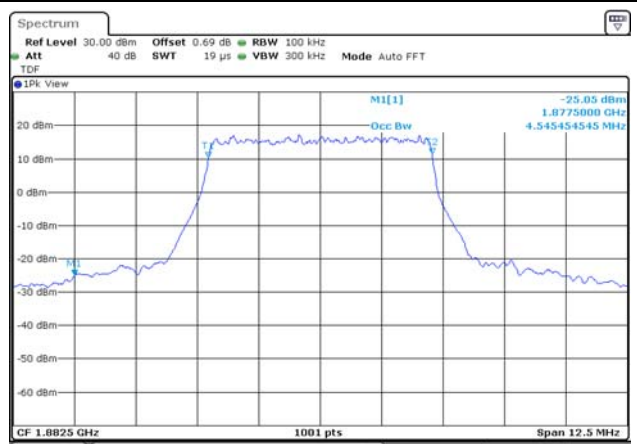
3M BW 16QAM Mid ch.



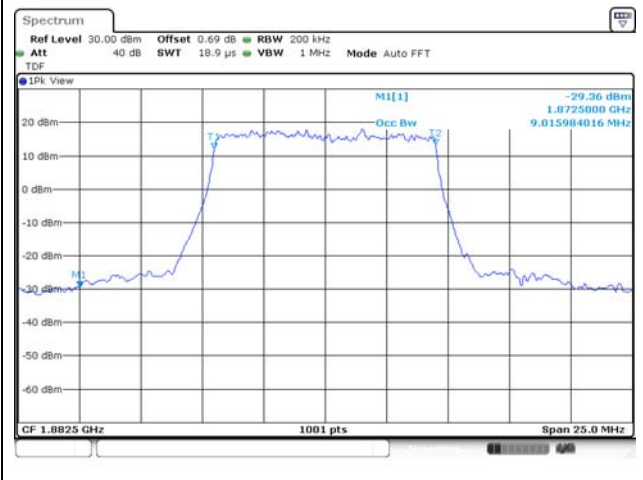
5M BW QPSK Mid ch.



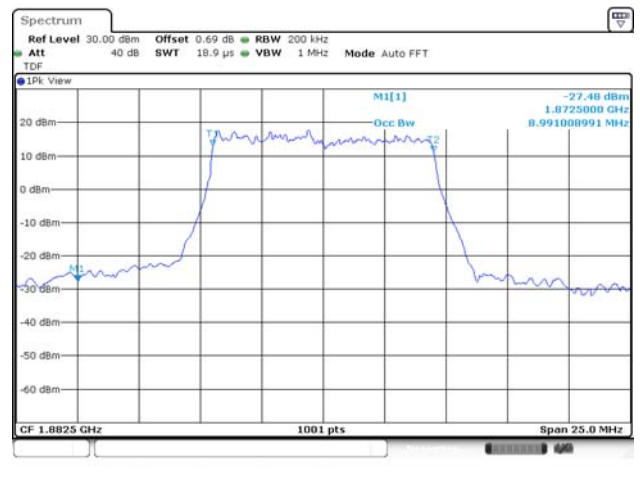
5M BW 16QAM Mid ch.



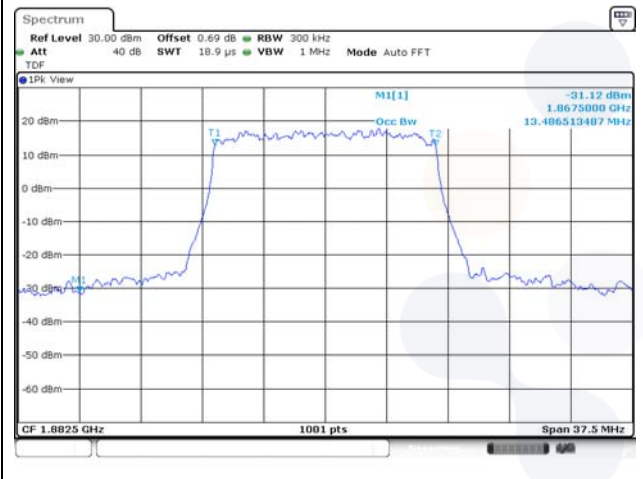
10M BW QPSK Mid ch.



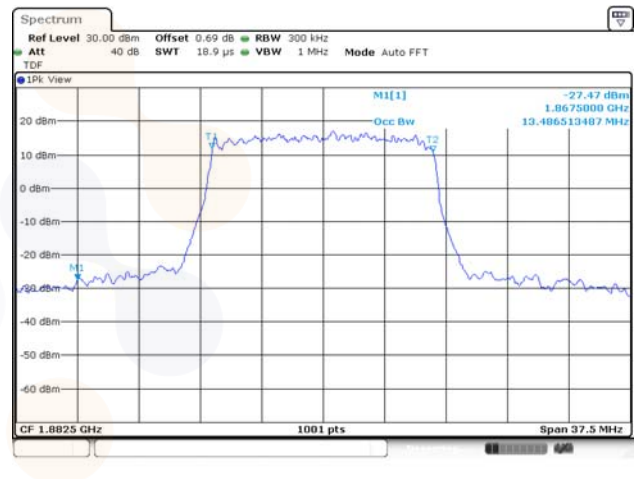
10M BW 16QAM Mid ch.



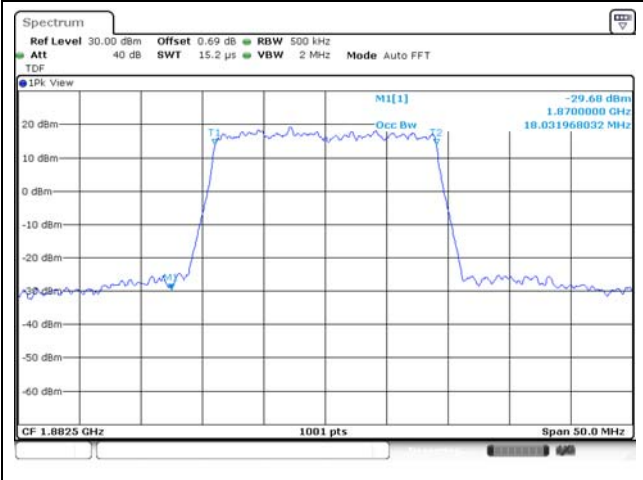
15M BW QPSK Mid ch.



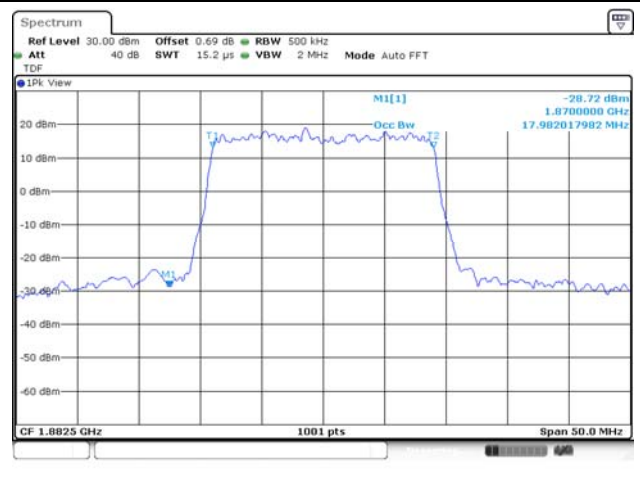
15M BW 16QAM Mid ch.



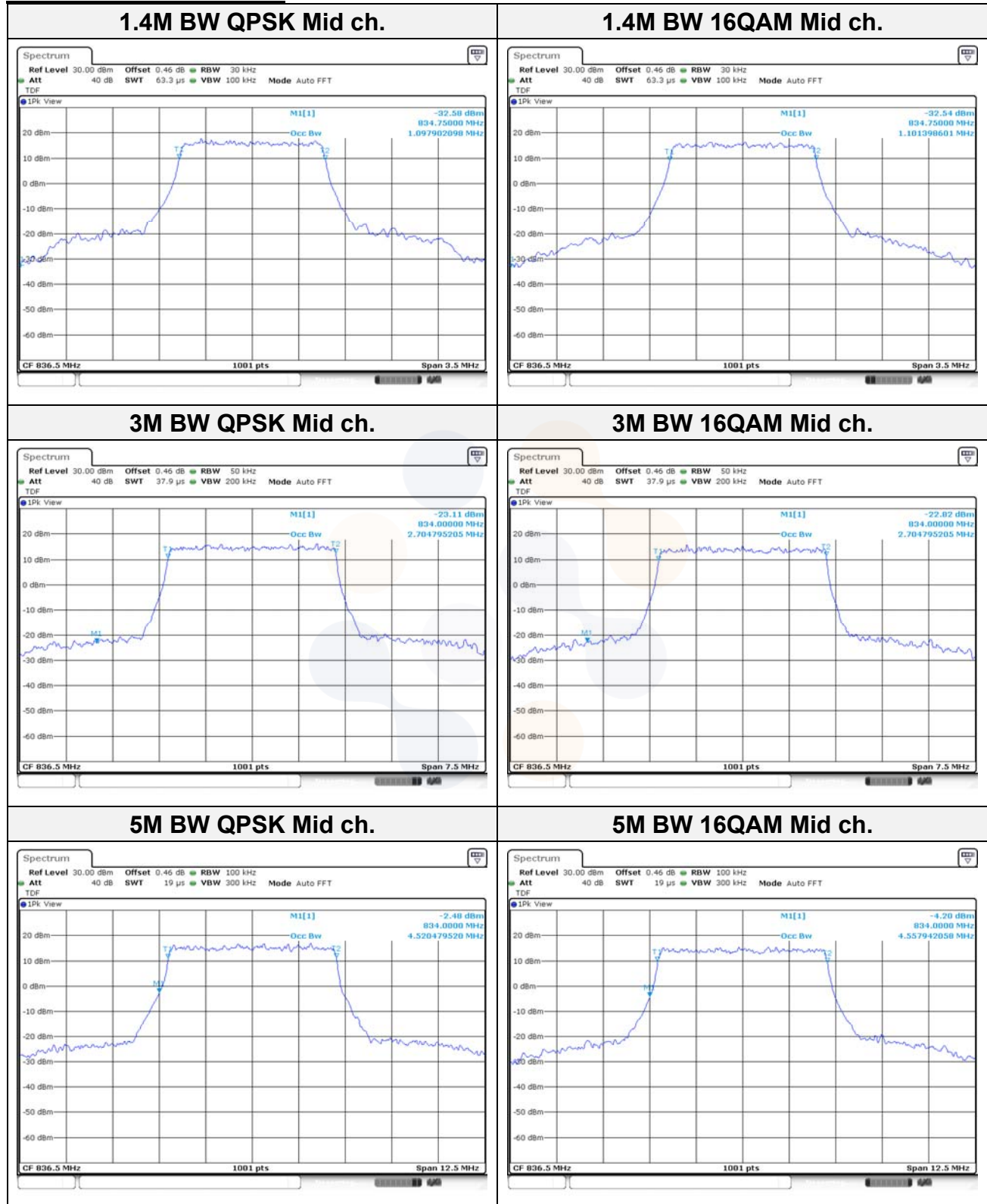
20M BW QPSK Mid ch.



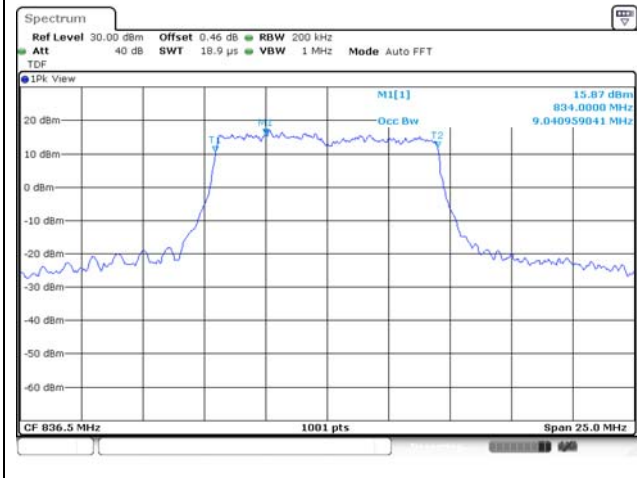
20M BW 16QAM Mid ch.



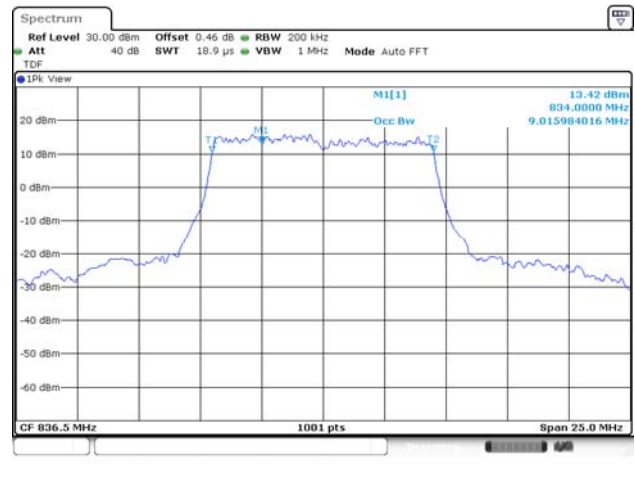
Test mode: LTE Band 26



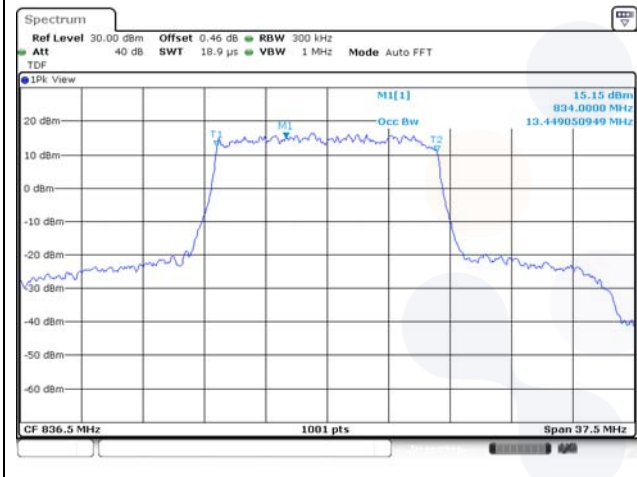
10M BW QPSK Mid ch.



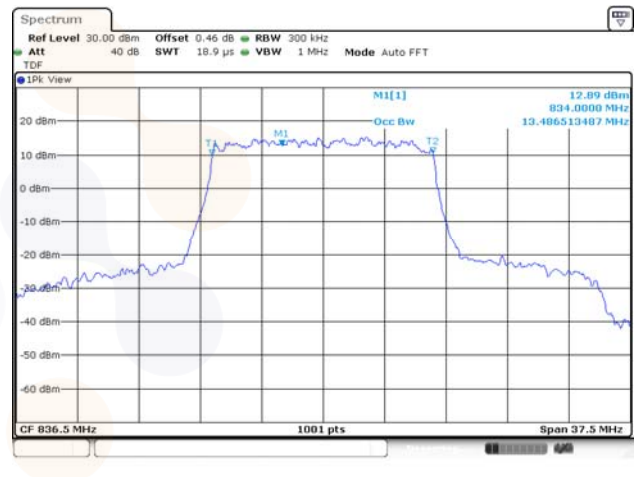
10M BW 16QAM Mid ch.



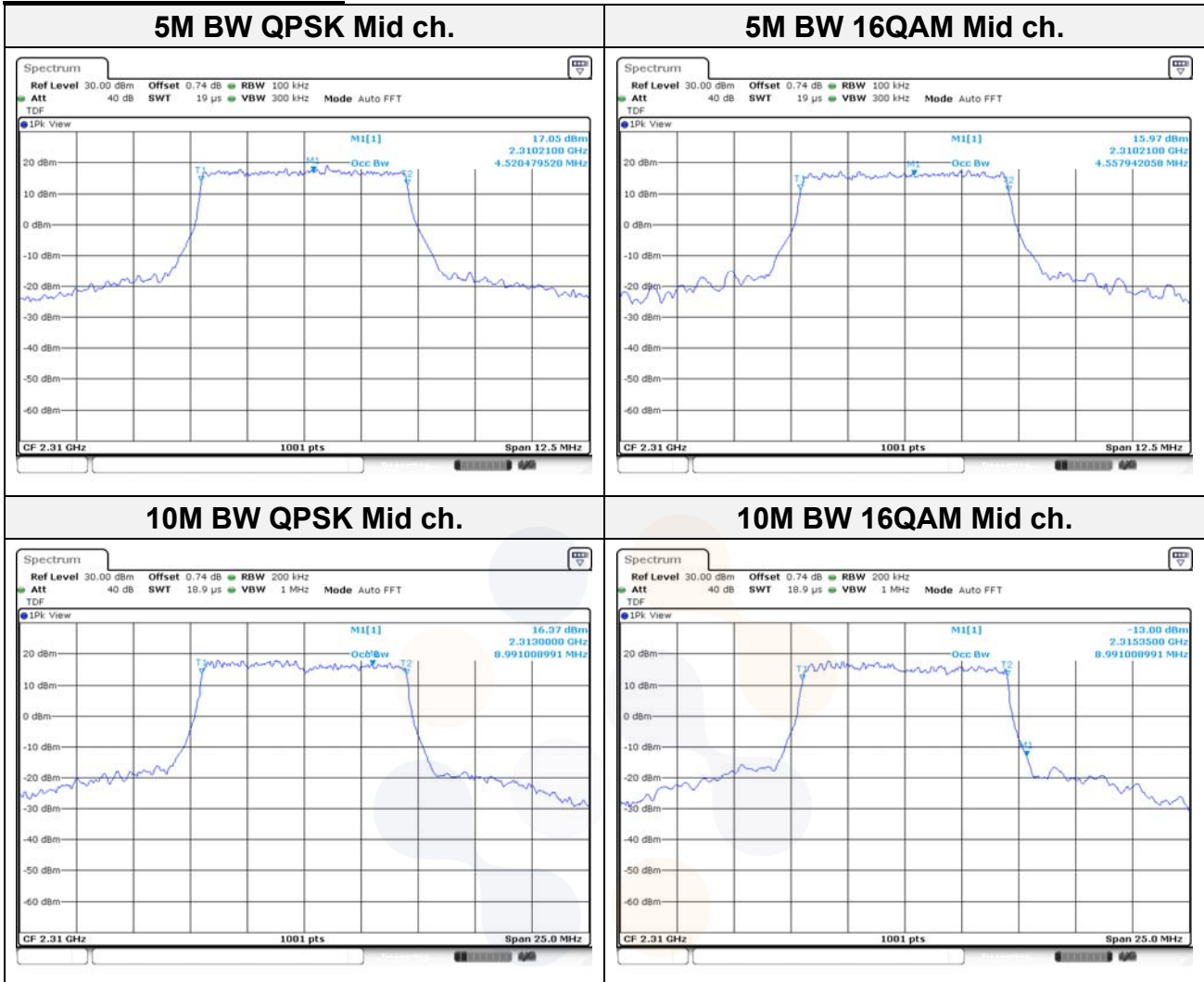
15M BW QPSK Mid ch.



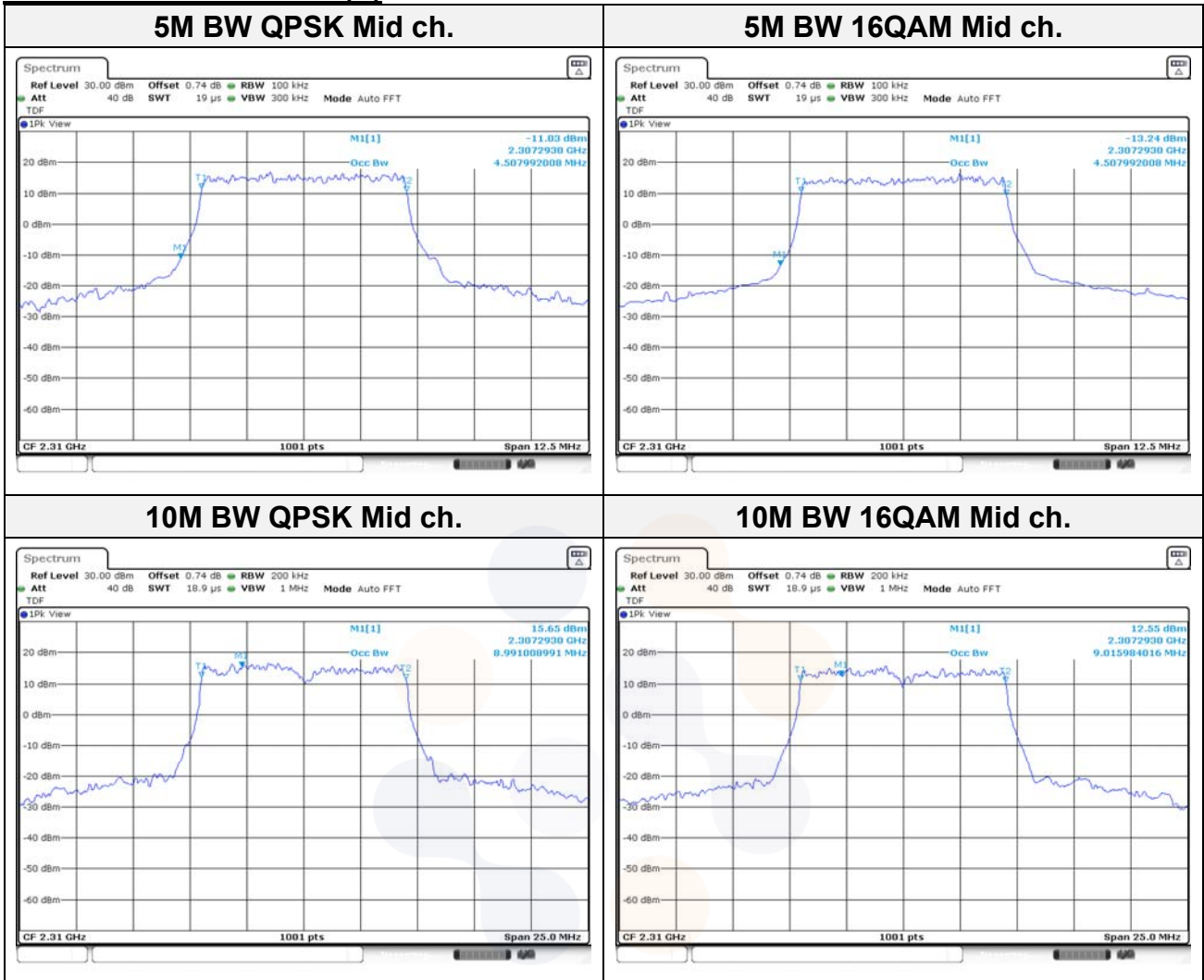
15M BW 16QAM Mid ch.



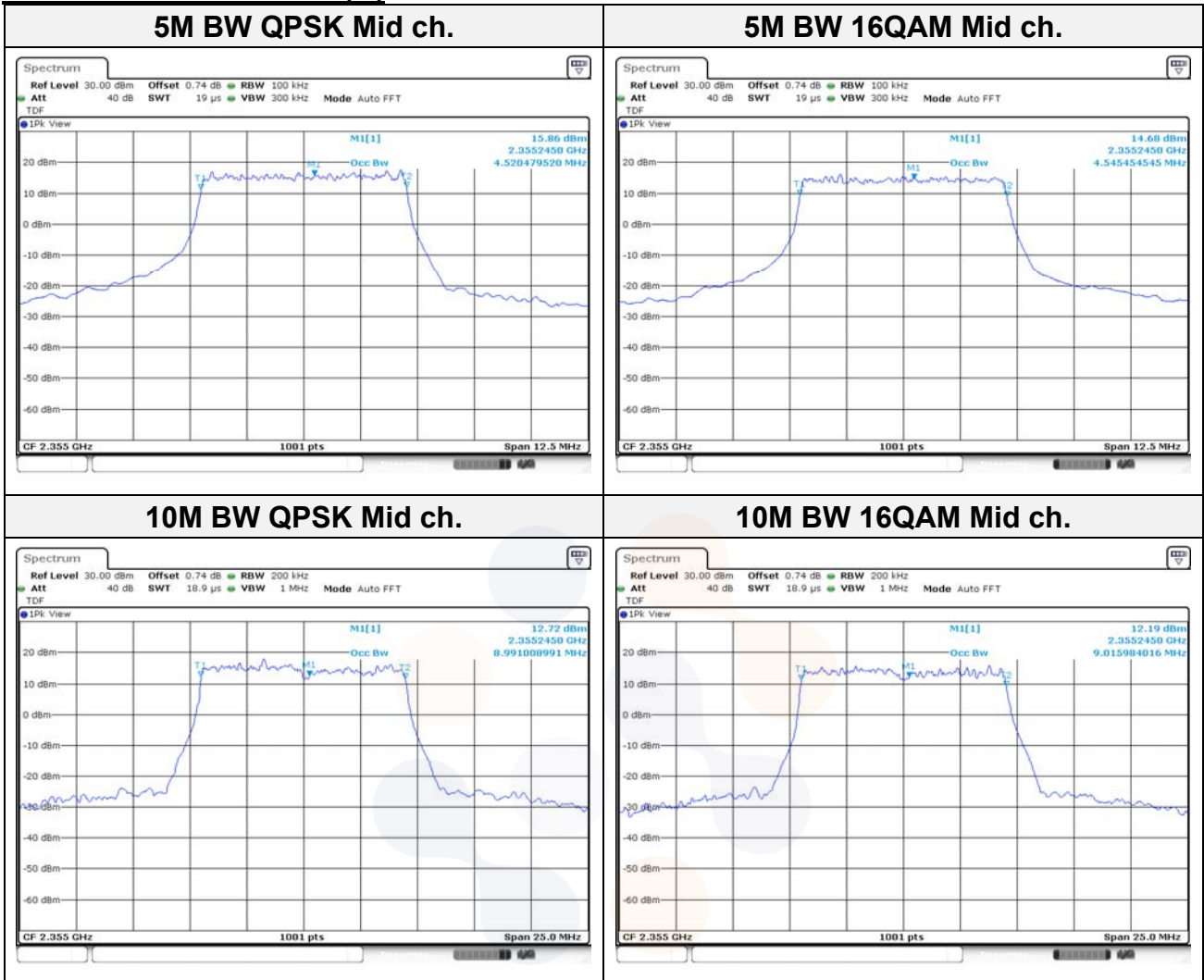
Test mode: LTE Band 30



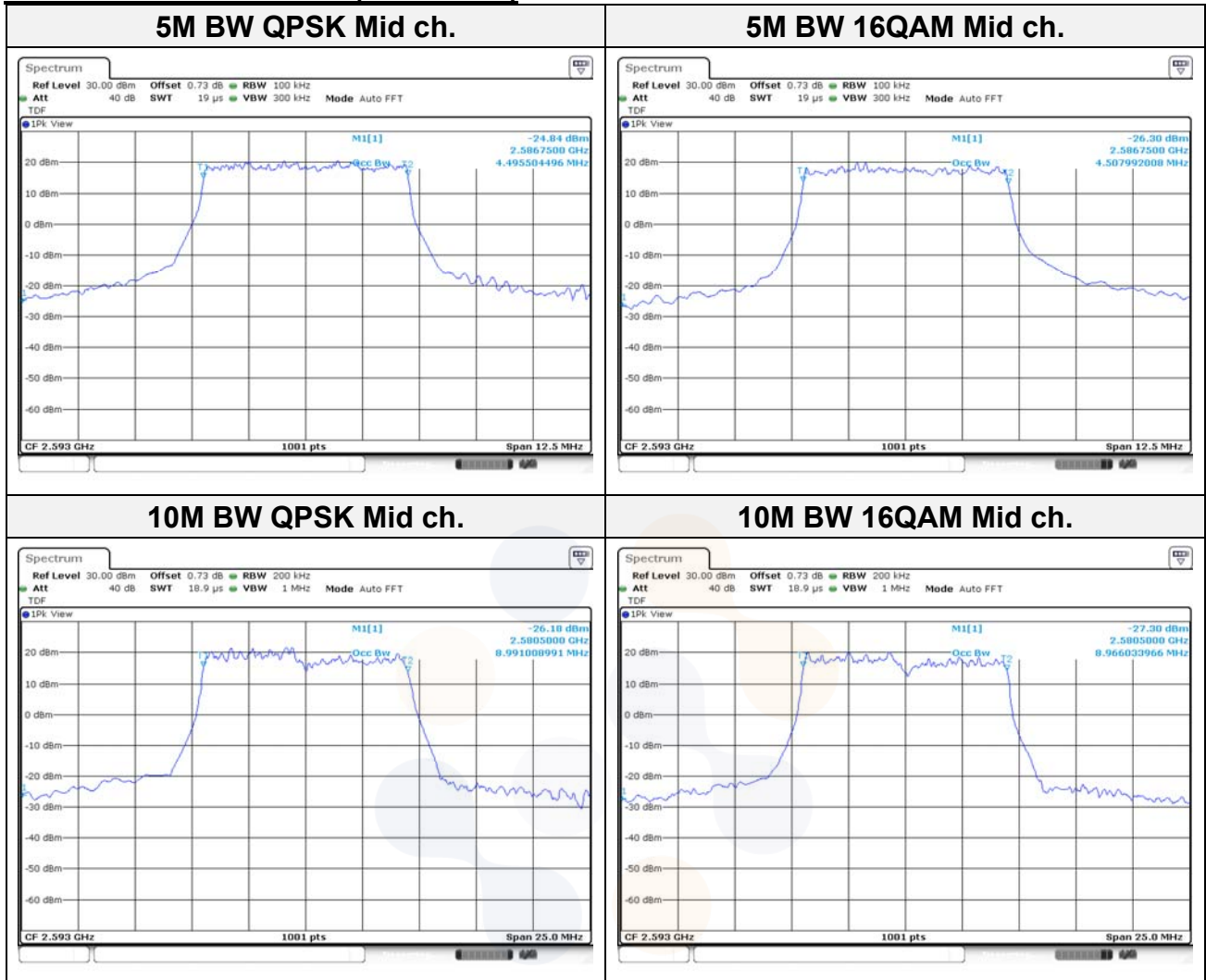
Test mode: LTE Band 40(L)



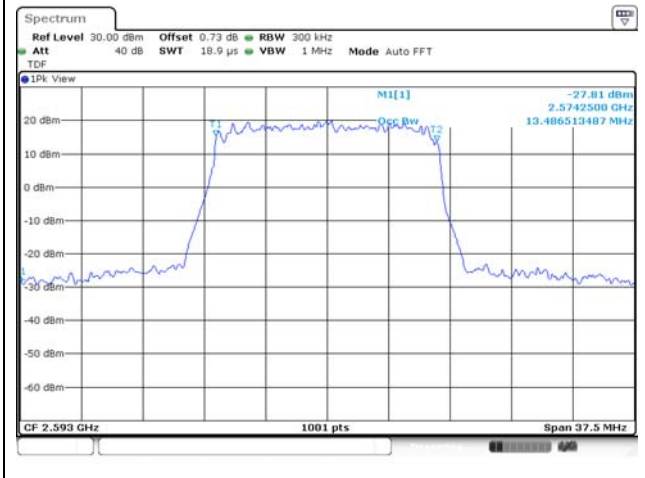
Test mode: LTE Band 40(U)



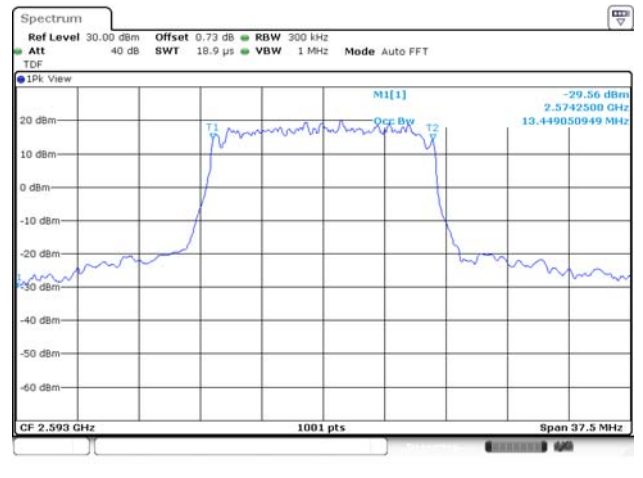
Test mode: LTE Band 41 (PC2 - FCC)



15M BW QPSK Mid ch.



15M BW 16QAM Mid ch.



20M BW QPSK Mid ch.

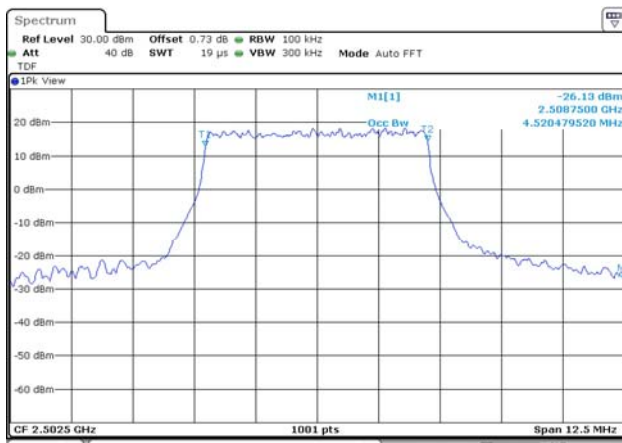


20M BW 16QAM Mid ch.

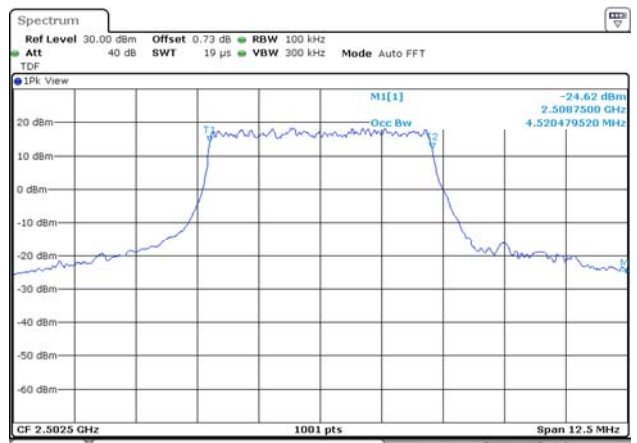


Test mode: LTE Band 41 (PC2 - IC)

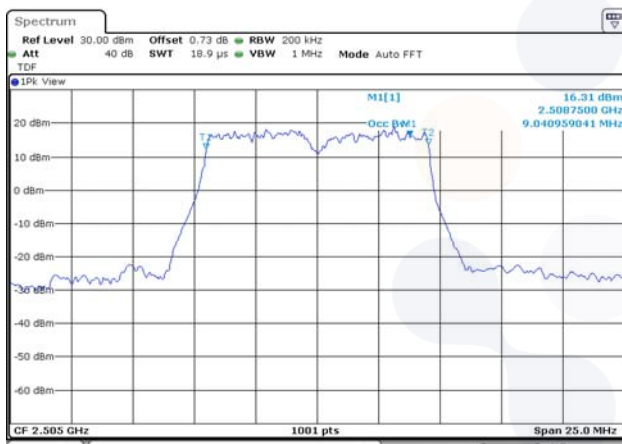
5M BW QPSK Low ch.



5M BW 16QAM Low ch.



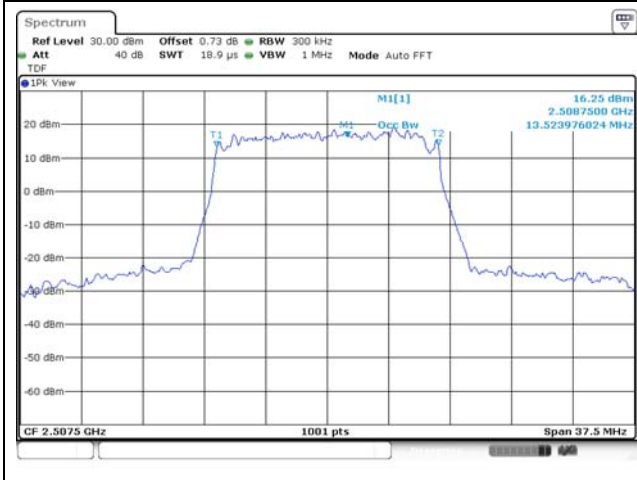
10M BW QPSK Low ch.



10M BW 16QAM Low ch.



15M BW QPSK Low ch.



15M BW 16QAM Low ch.



20M BW QPSK Low ch.



20M BW 16QAM Low ch.

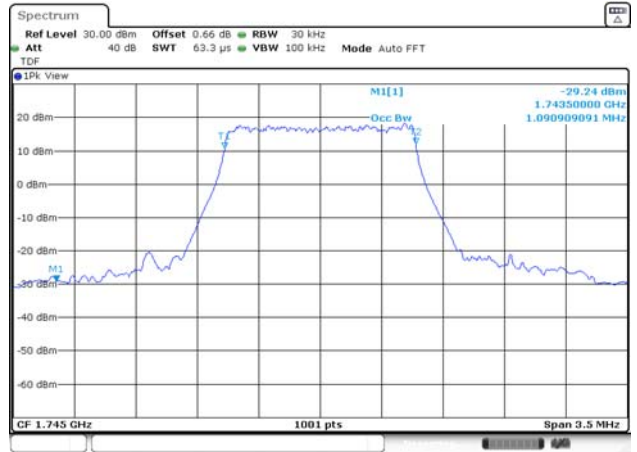


Test mode: LTE Band 66/4

1.4M BW QPSK Mid ch.



1.4M BW 16QAM Mid ch.



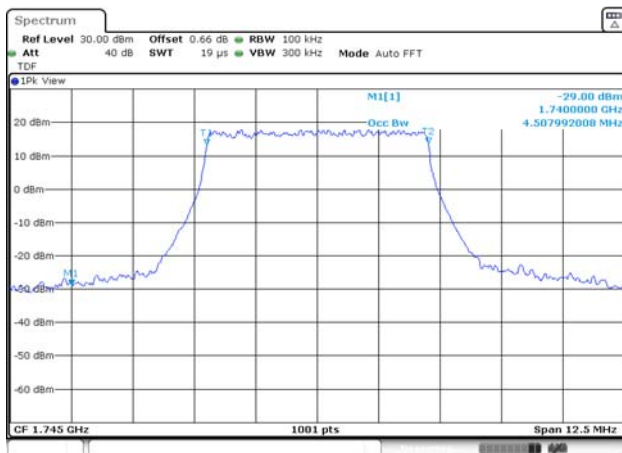
3M BW QPSK Mid ch.



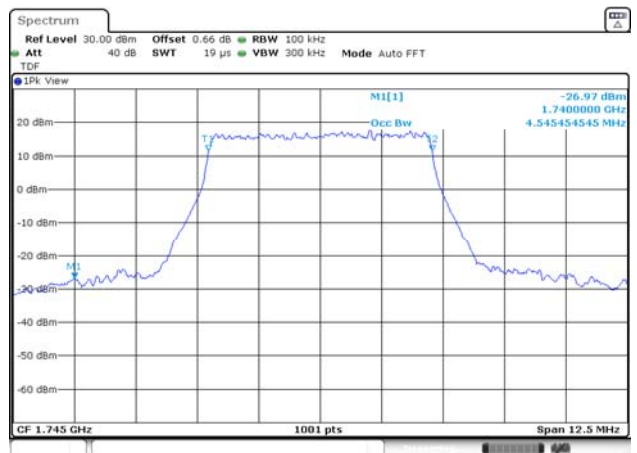
3M BW 16QAM Mid ch.



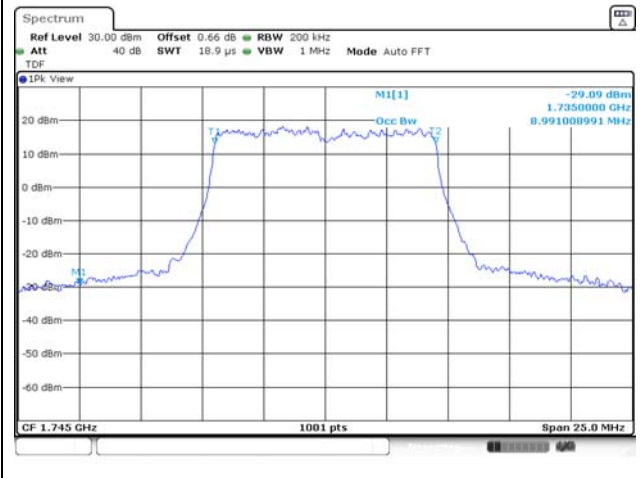
5M BW QPSK Mid ch.



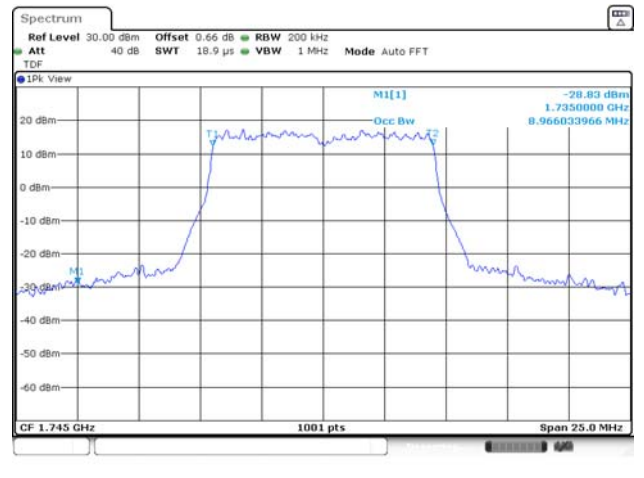
5M BW 16QAM Mid ch.



10M BW QPSK Mid ch.



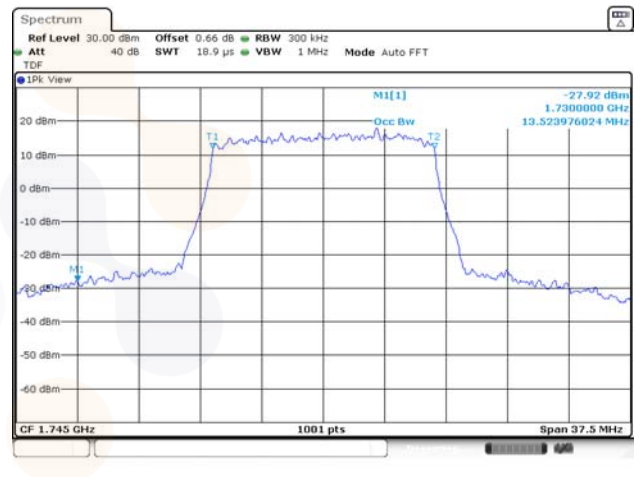
10M BW 16QAM Mid ch.



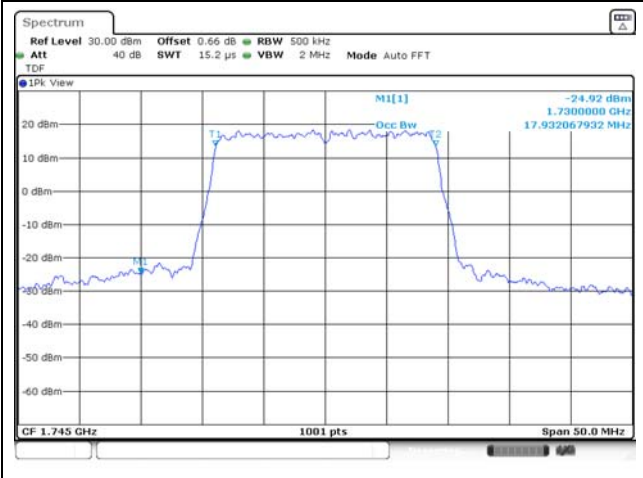
15M BW QPSK Mid ch.



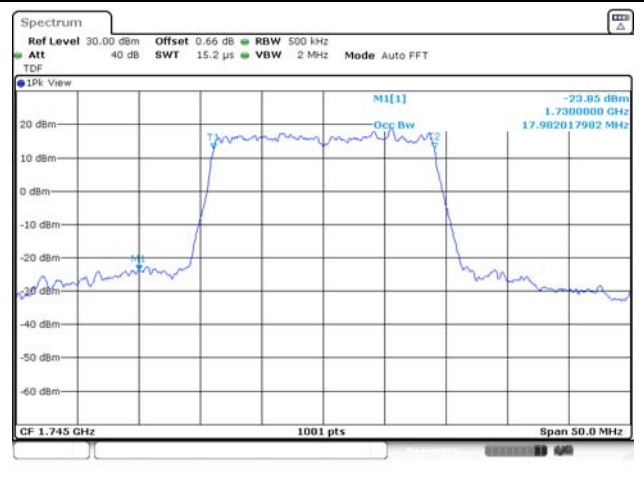
15M BW 16QAM Mid ch.



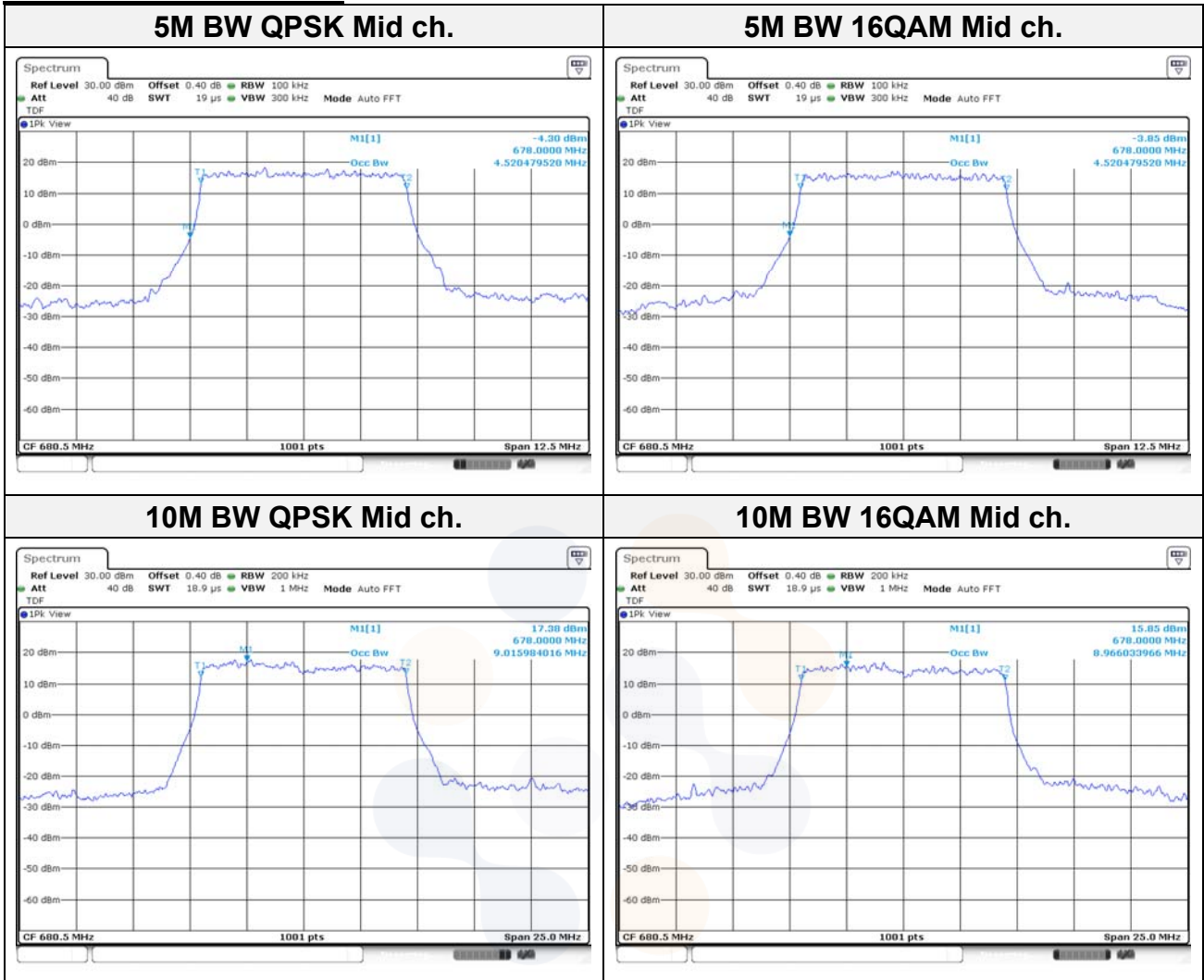
20M BW QPSK Mid ch.



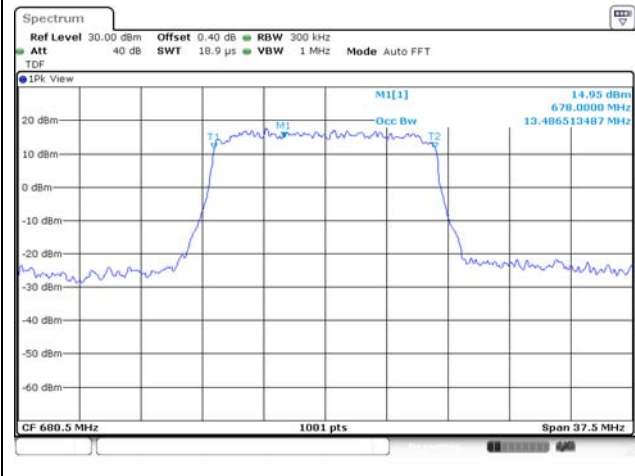
20M BW 16QAM Mid ch.



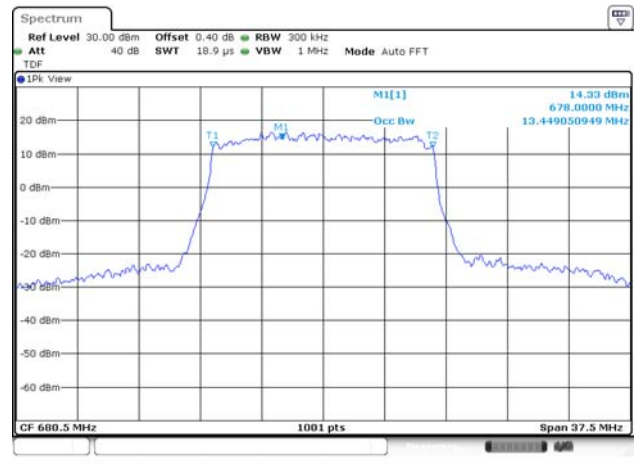
Test mode: LTE Band 71



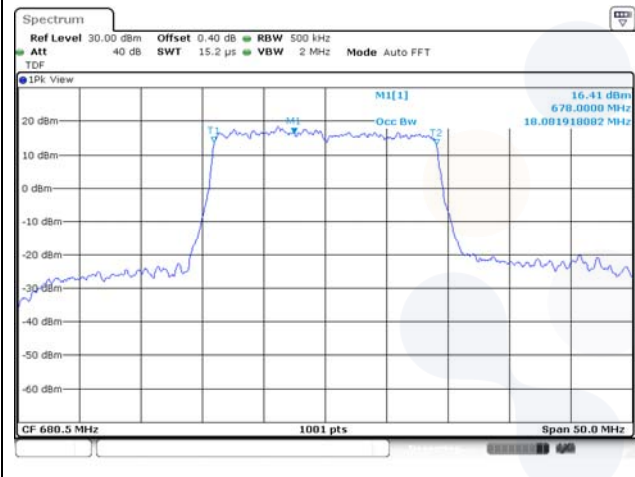
15M BW QPSK Mid ch.



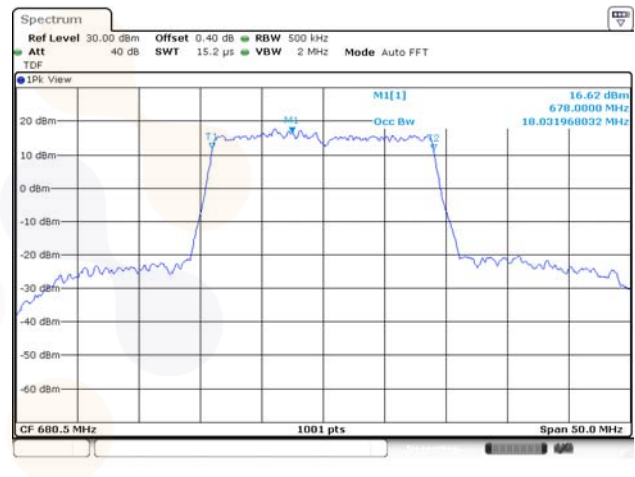
15M BW 16QAM Mid ch.



20M BW QPSK Mid ch.

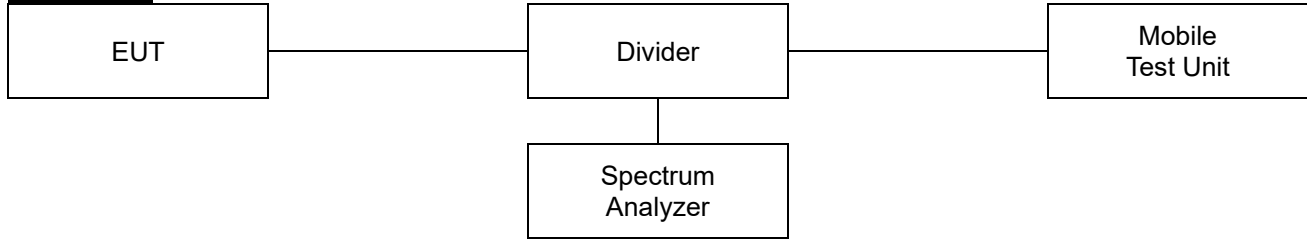


20M BW 16QAM Mid ch.



7.3. Band Edge Emissions at Antenna Terminal

Test setup



Limit

According to §22.917(a), §24.238(a) and RSS-132(5.5), RSS-133(6.5),

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P_{\text{[Watts]}})$ dB.

According to §27.53(a),

For operations in the 2305–2320 MHz band and the 2345–2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(4) For mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands:

(i) By a factor of not less than: $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log (P)$ dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than $61 + 10 \log (P)$ dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than $67 + 10 \log (P)$ dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2296 and 2300 MHz, $61 + 10 \log (P)$ dB on all frequencies between 2292 and 2296 MHz, $67 + 10 \log (P)$ dB on all frequencies between 2288 and 2292 MHz, and $70 + 10 \log (P)$ dB below 2288 MHz;

(iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2365 MHz, and not less than $70 + 10 \log (P)$ dB above 2365 MHz.

According to RSS-195(5.6),

The power of any emission outside the frequency range(s) in which the equipment operates shall be attenuated below the transmitter power, P(dB W), by the amount indicated in Table 2 and graphically represented in Figure 2, where p is the transmitter output power measured in watts.

Table2 – Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
< 2200	43 + 10 log (p)
2200 – 2288	70 + 10 log (p)
2288 -2292	67 + 10 log (p)
2292 - 2296	61 + 10 log (p)
2296 – 2300	55 + 10 log (p)
2300 – 2305	43 + 10 log (p)
2305 – 2320	43 + 10 log (p)
2320 – 2324	55 + 10 log (p)
2324 – 2328	61 + 10 log (p)
2328 – 2337	67 + 10 log (p)
2337 - 2341	61 + 10 log (p)
2341 – 2345	55 + 10 log (p)
2345 – 2360	43 + 10 log (p)
2360 – 2365	43 + 10 log (p)
2365 – 2395	70 + 10 log (p)
> 2395	43 + 10 log (p)

According to §27.53(c)(2),

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;
- (6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment

According to RSS-130(4.7)

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log p$ (watts), dB.

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746–758 MHz and 777-787 MHz shall also comply with the following restrictions:

- (a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 776-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P(dBW), by at least
 - (i) $76 + 10 \log p$ (watts), dB, for base and fixed equipment, and
 - (ii) $65 + 10 \log p$ (watts), dB, for mobile and portable equipment.
- (b) The e.i.r.p in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

According to §27.53(g), and RSS-130(4.7)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee’s frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10\log(P_{[Watts]})$ dB.

According to §27.53(h) and RSS-139(5.6),

The power of any emission outside a licensee’s frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log(P_{[Watts]})$ dB.

According to §27.53(m)(4),

The attenuation factor shall be not less than $40 + 10\log(P_{[Watts]})$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10\log(P_{[Watts]})$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10\log(P_{[Watts]})$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that $43 + 10\log(P_{[Watts]})$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10\log(P_{[Watts]})$ dB at or below 2490.5 MHz.

According to RSS-199 (5.6),

Table 5: Unwanted emission limits for subscriber equipment other than fixed subscriber equipment

Offset from the edge of the frequency block or frequency block group (MHz)	Unwanted emission limits
0-1	-10 dBm/(2% of OB*)
1-5	-10 dBm/MHz
5-X**	-13 dBm/MHz
$\geq X$	-25 dBm/MHz

*OB is the occupied bandwidth

** X is 6 MHz or the equipment occupied bandwidth, whichever is greater



In additions to complying with the limits in table 5, subscriber equipment other than fixed subscriber equipment shall not exceed -13 dBm/MHz on all frequencies between 2490.5 MHz and 2496 MHz, and -25 dBm/MHz at or below 2490.5 MHz.

Test procedure

971168 D01 v03r01 - Section 6
ANSI C63.26-2015 – Section 5.7

Test settings

- 1) Start frequency was set to 30 MHz and stop frequency was set to at least 10th the fundamental frequency.
- 2) Span was set large enough so as to capture all out of band emissions near the band edge.
- 3) Set the RBW > 1% of the emission bandwidth.
- 4) Set the VBW ≥ 3 x RBW.
- 5) Set the number of sweep points ≥ 2 x Span/RBW
- 6) Detector = RMS
- 7) Trace mode = trace average
- 8) Sweep time should be auto for peak detection. For RMS detection the sweep time should be set as follows:
 - a) If the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) x (symbol period) (e.g., by a factor of 10 x symbol period x number of points) Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
 - b) If the device cannot transmit continuously (duty cycle < 98%), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) x (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time
 - c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) x (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2%).
 - d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > ±2%), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) x (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.
- 9) Allow trace to fully stabilize.

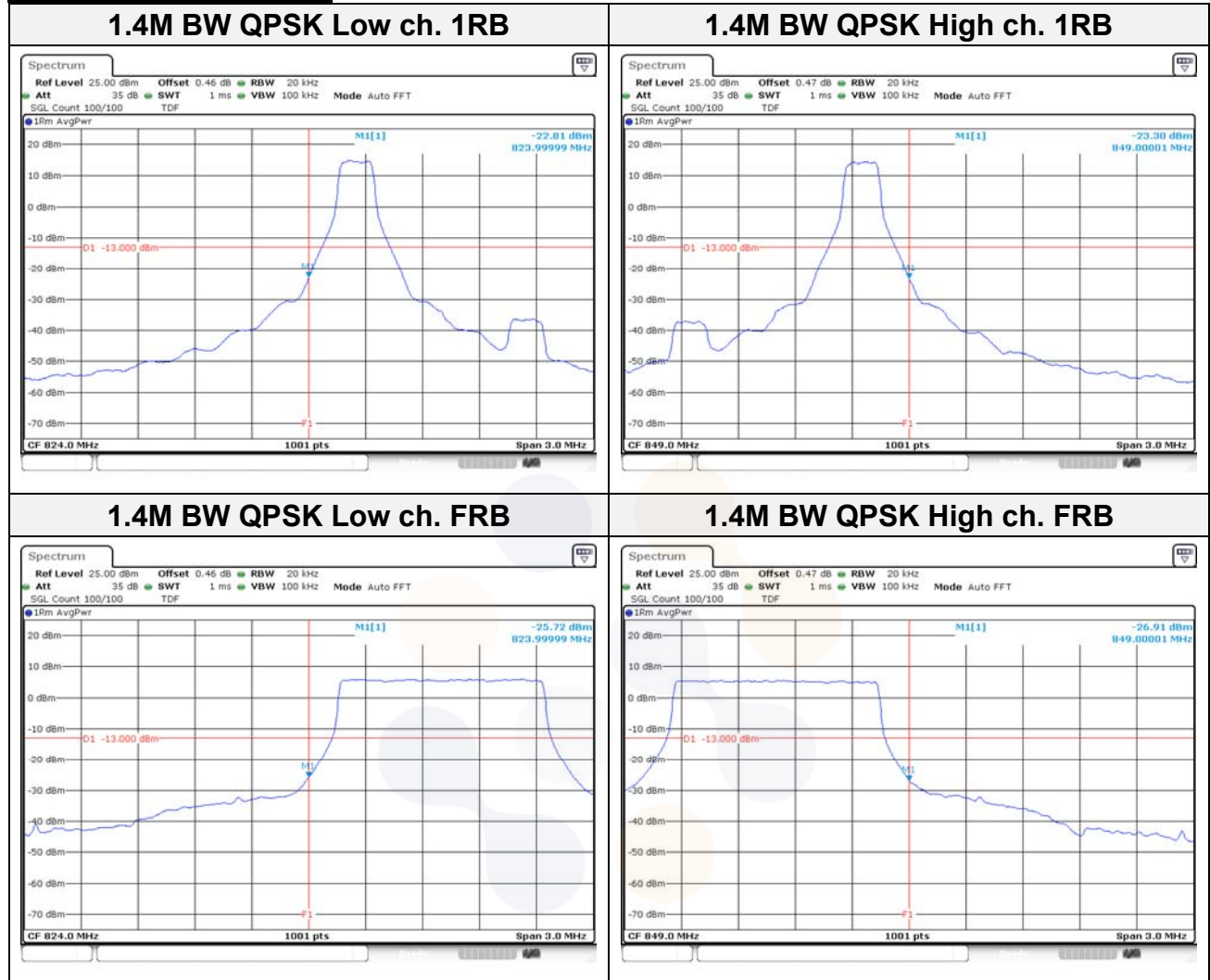
<p style="text-align: center;">Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p style="text-align: center;">Report No.: KR23-SRF0259-A Page (120) of (291)</p>	 
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Notes:

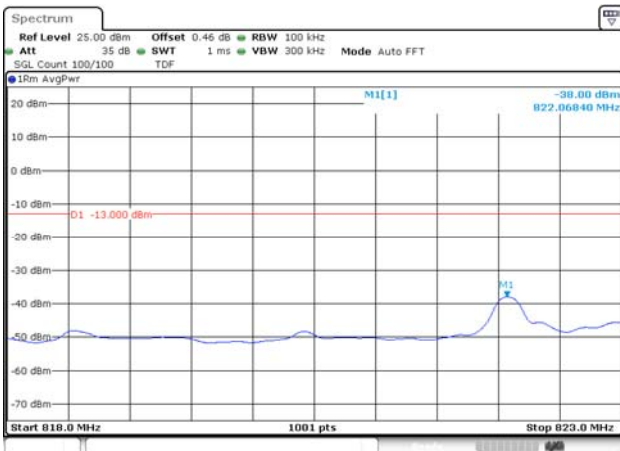
1. Per 22.917(b), 24.238(b), 27.53(a)(5), 27.53(h)(3) and RSS-132(5.5), RSS-133(6.5), RSS-139(5.6), RSS-195(5.6), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. however in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
2. Per 27.53(c)(5) and RSS-130(4.7), for operations in the 776-768 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.
3. Per 27.25(c)(6) and RSS-130(4.7), for operation in the 763-775 MHz and 793-805 MHz, the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
4. Per 27.25(g) and RSS-130(4.7), compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.
5. Per 27.53(m)(6) and RSS-199(5.6), in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz).
6. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.
7. For TDD bands, the band edge measurement was performed by using gate triggered such that the analyzer only sweeps when the device is transmitting at full power.

Test results

Test mode: LTE Band 5



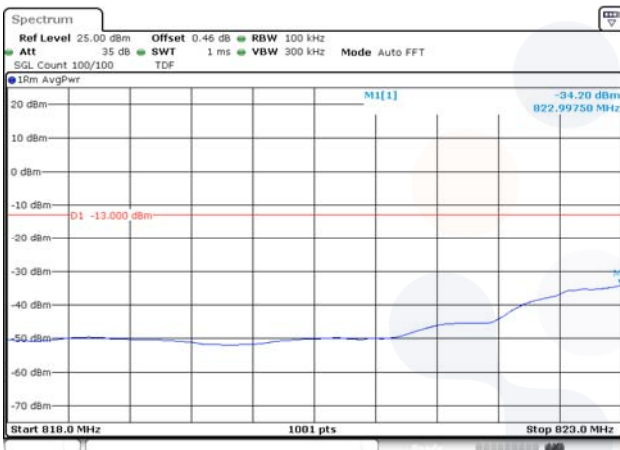
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1.4M BW QPSK Upper extended 1RB



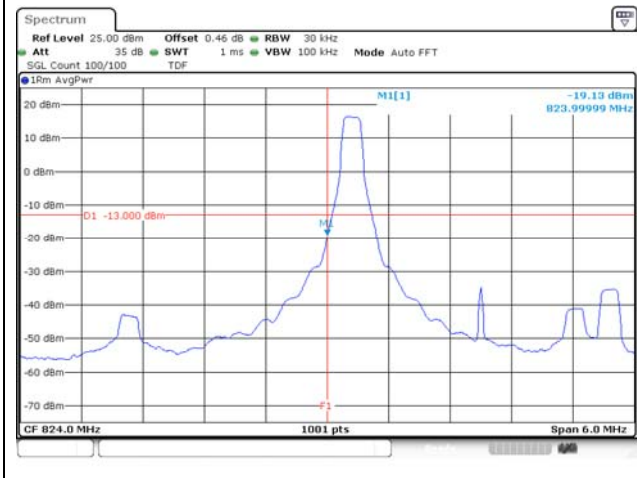
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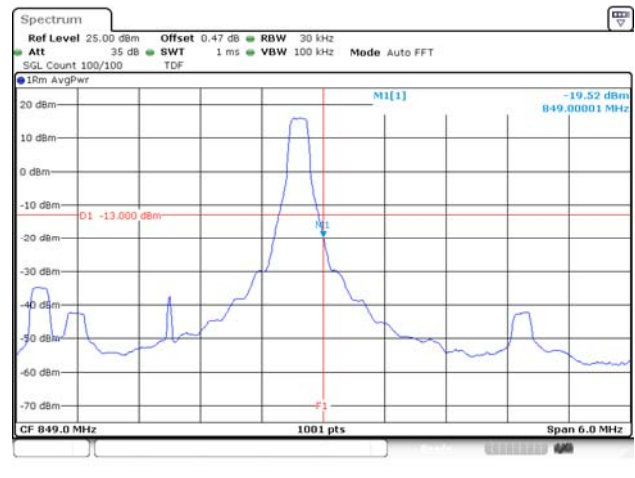
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3M BW QPSK Low ch. 1RB



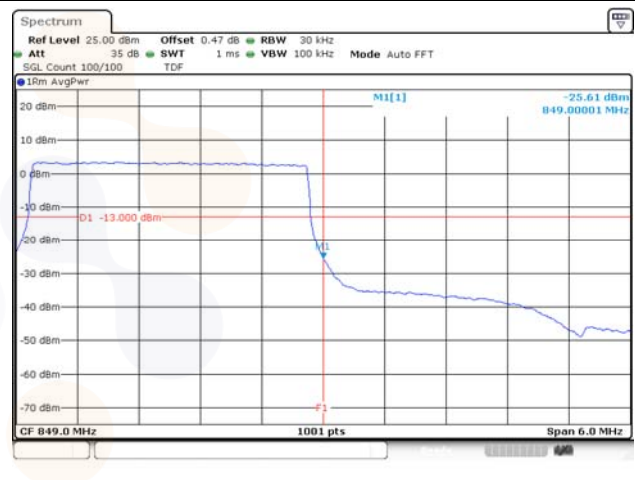
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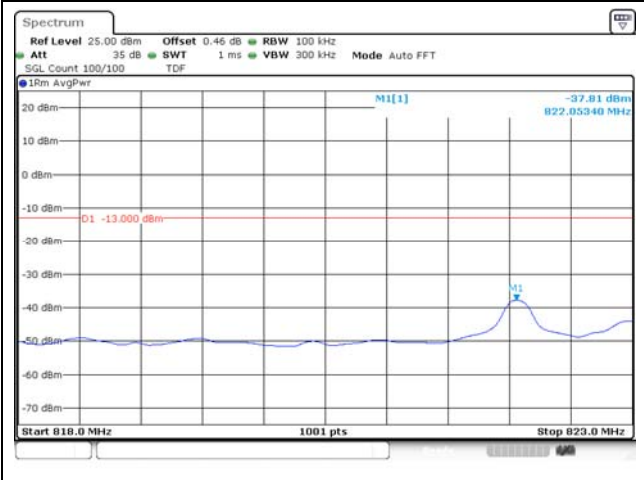
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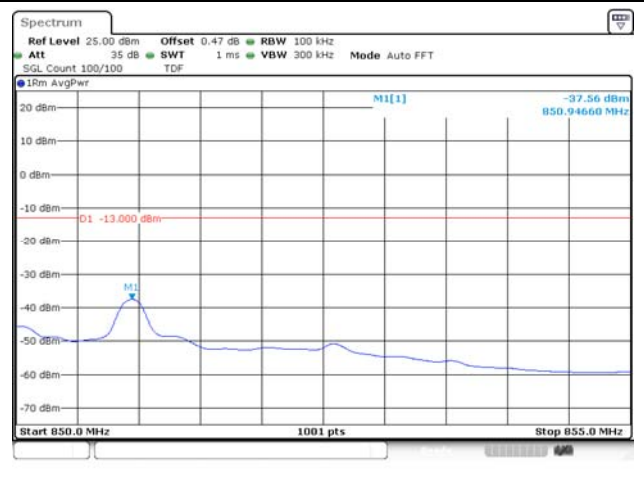
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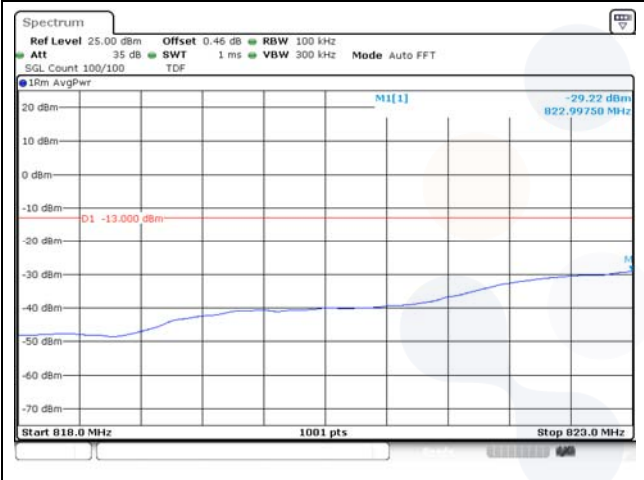
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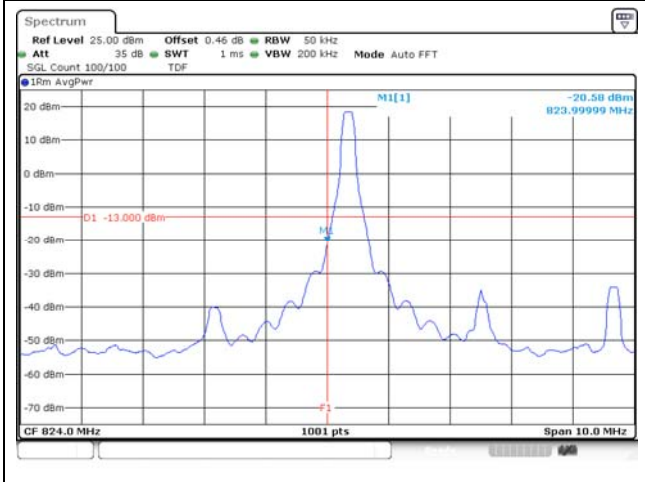
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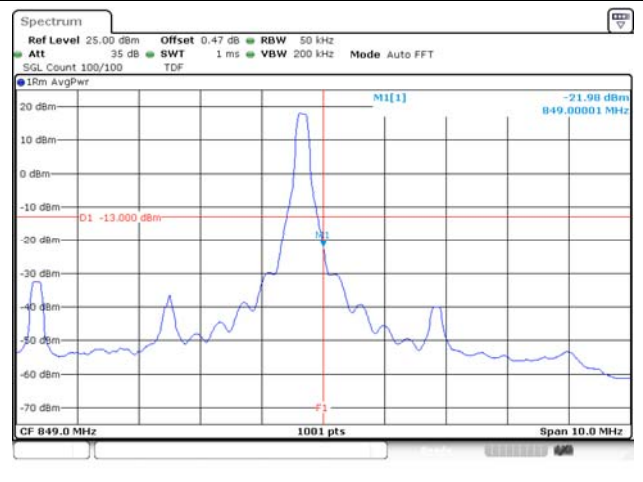
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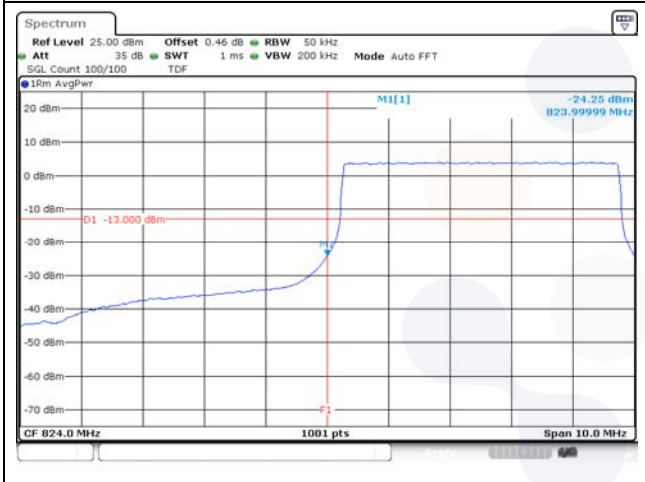
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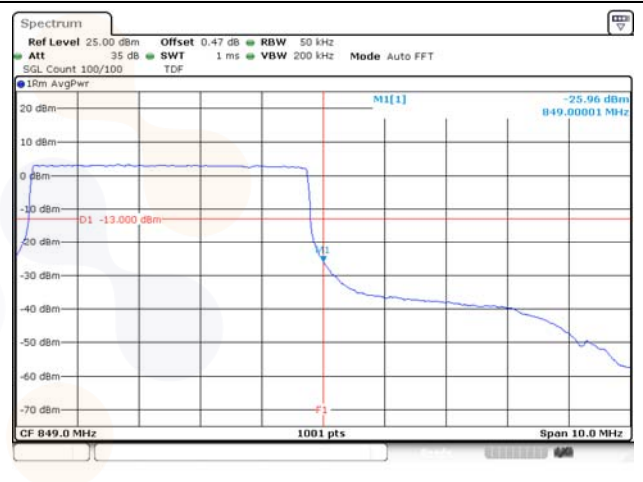
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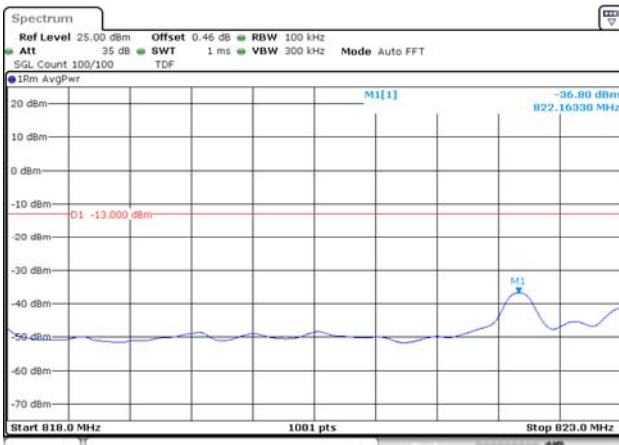
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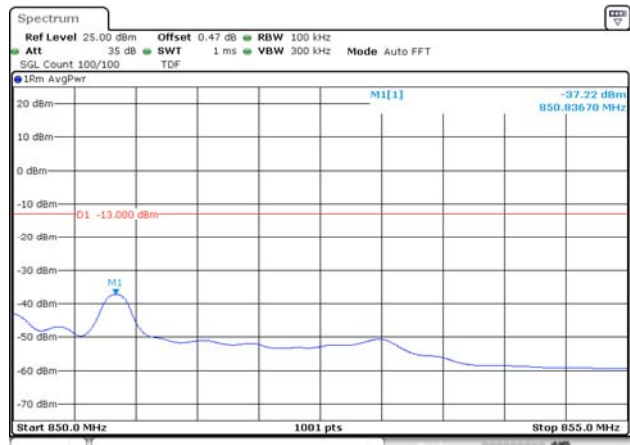
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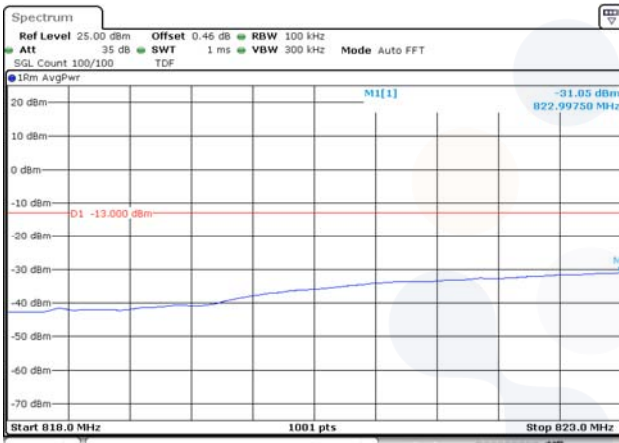
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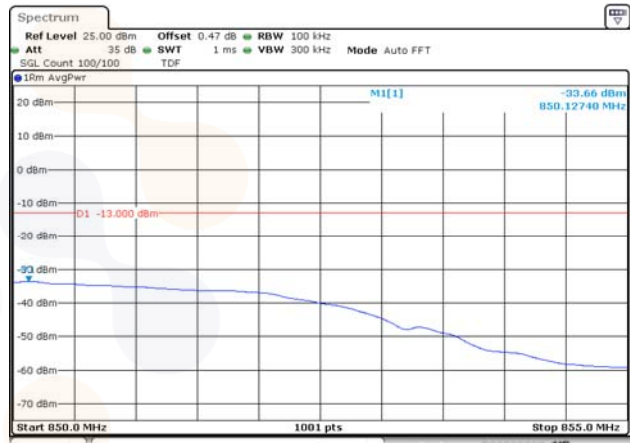
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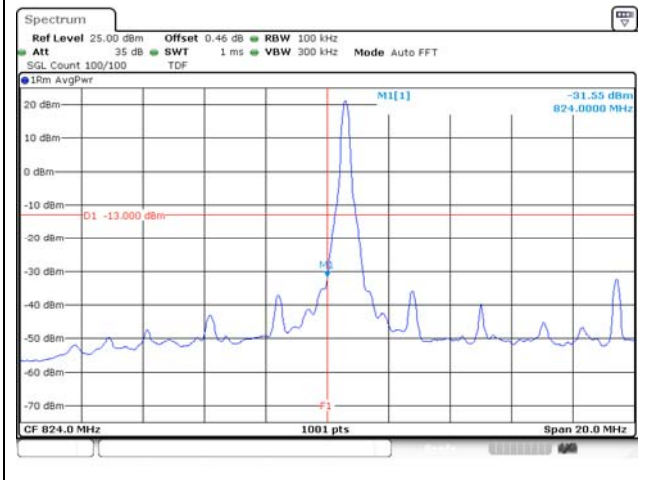
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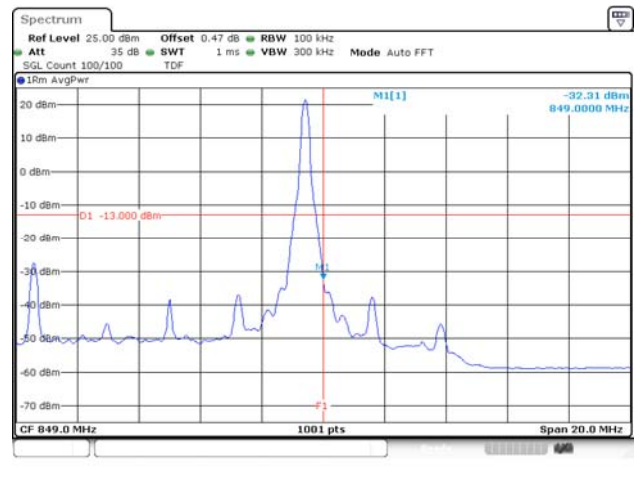
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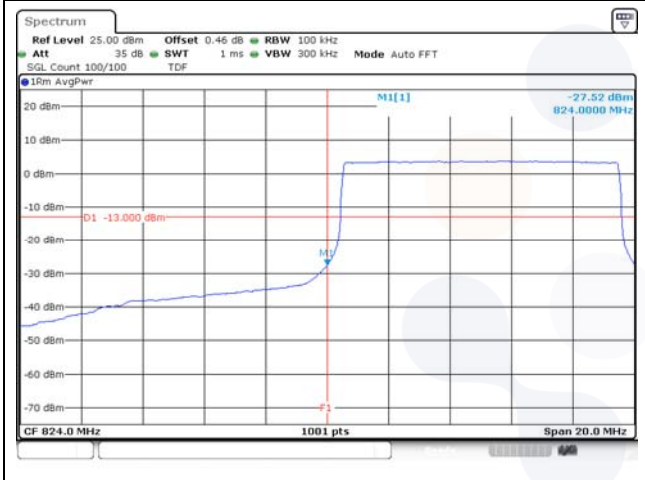
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10M BW QPSK High ch. 1RB



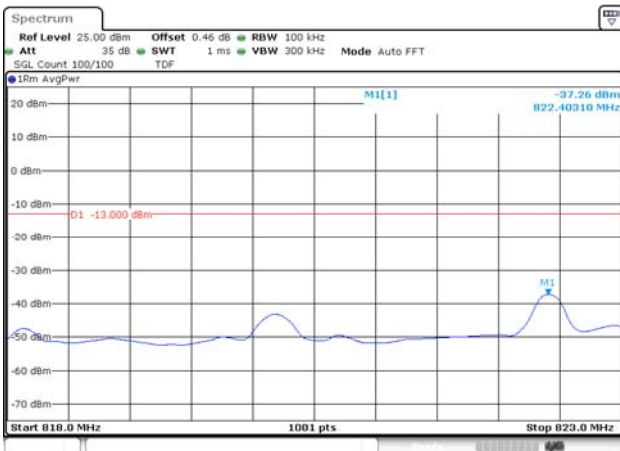
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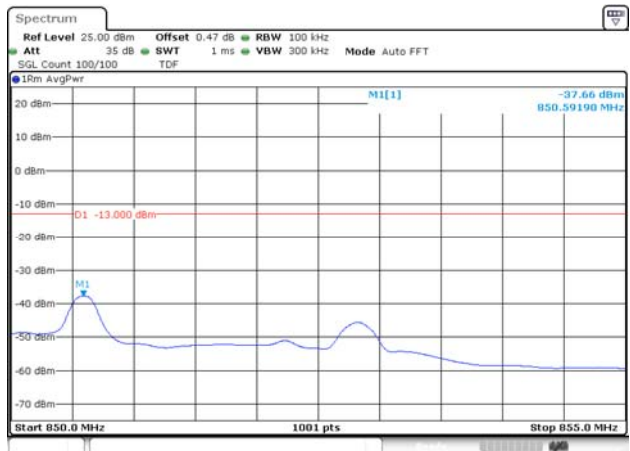
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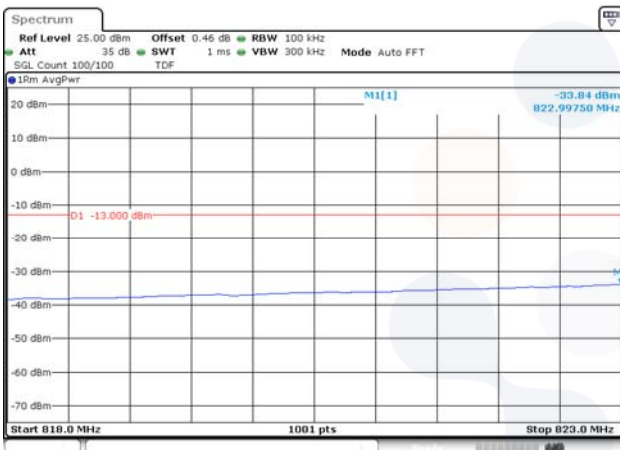
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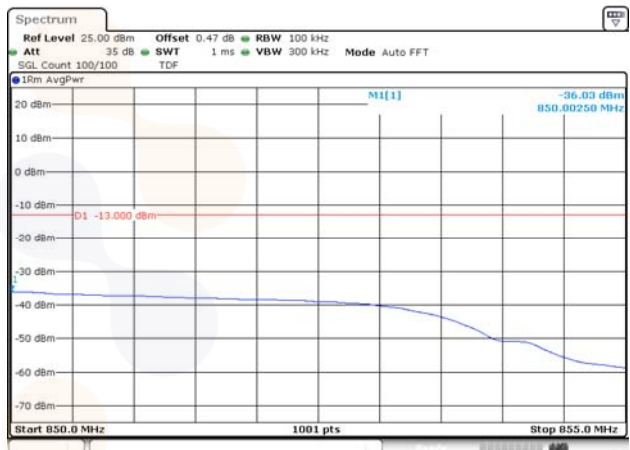
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10M BW QPSK Lower extended FRB

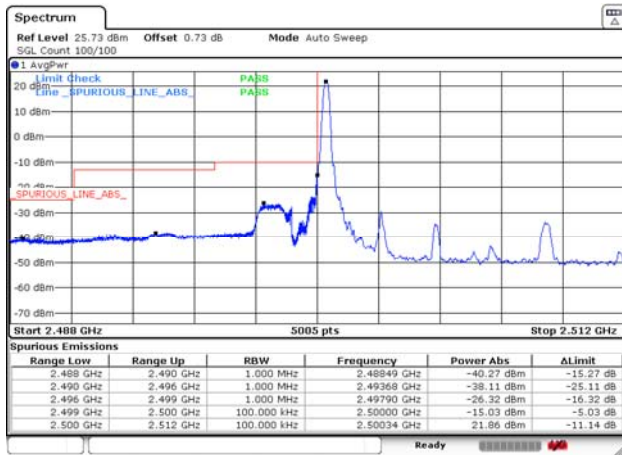


10M BW QPSK Upper extended FRB



Test mode: LTE Band 7

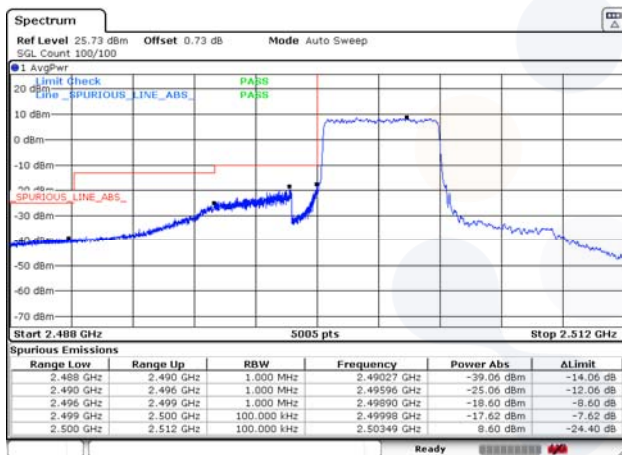
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5M BW QPSK High ch. 1RB



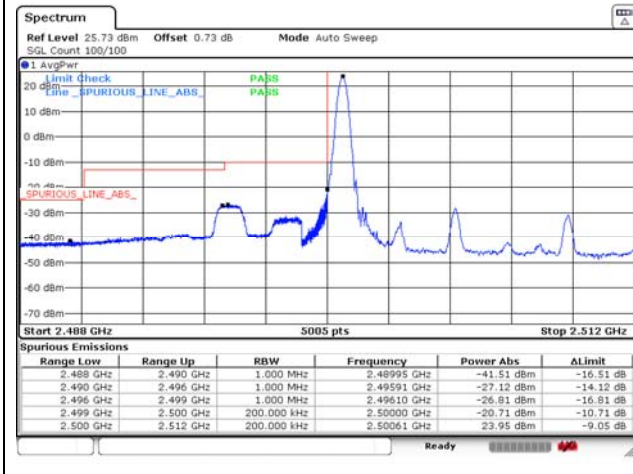
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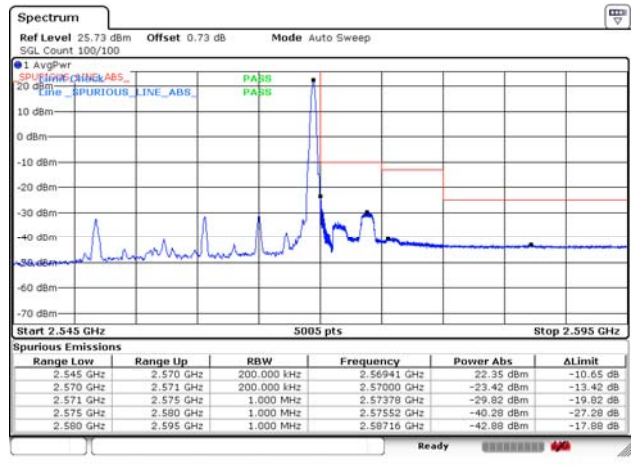
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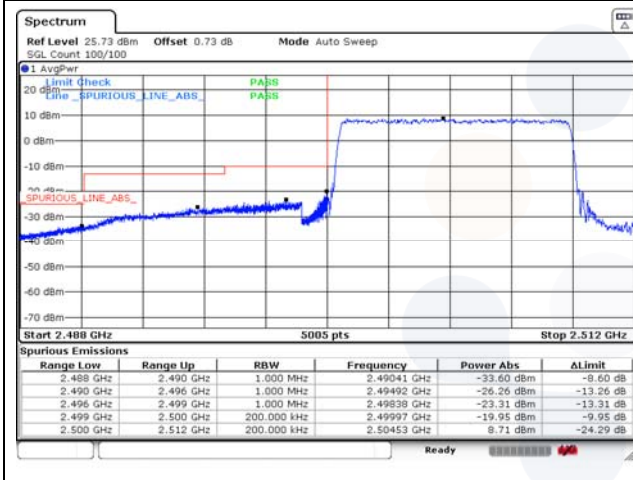
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10M BW QPSK High ch. 1RB



10M BW QPSK Low ch. FRB



10M BW QPSK High ch. FRB

