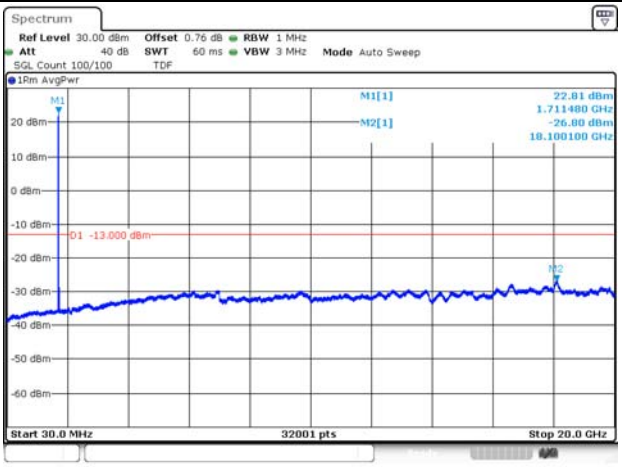
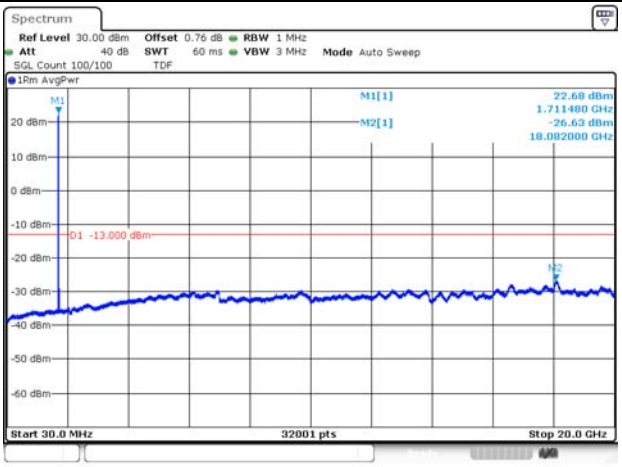
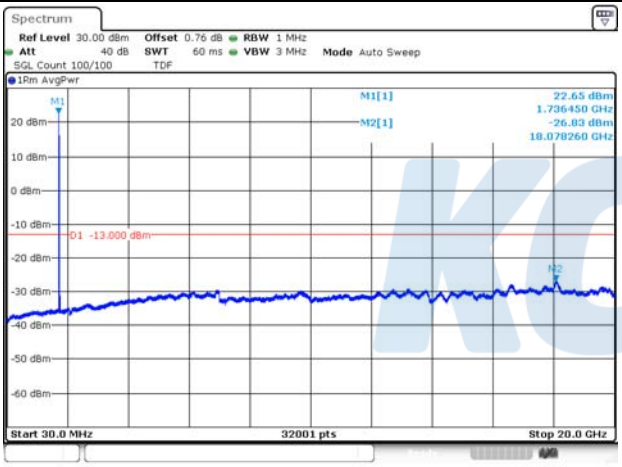
20M BW QPSK Low ch.



20M BW 16QAM Low ch.

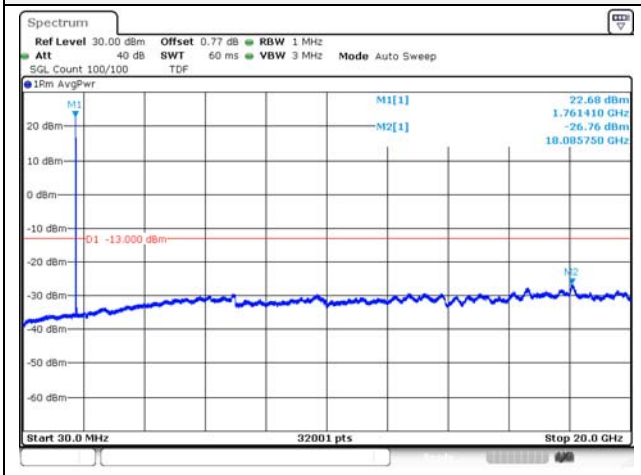


20M BW QPSK Mid ch.

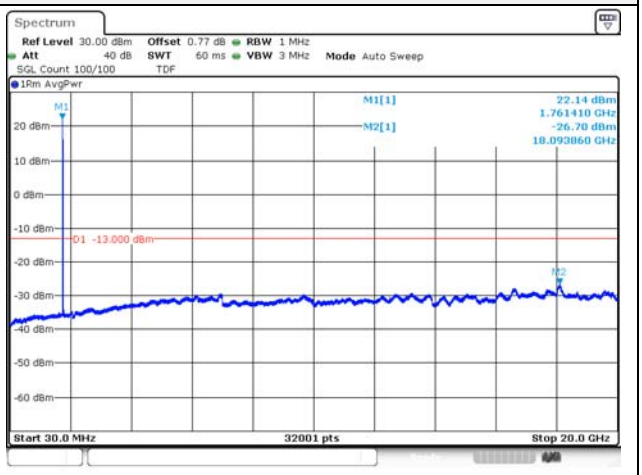


20M BW 16QAM Mid ch.

20M BW QPSK High ch.

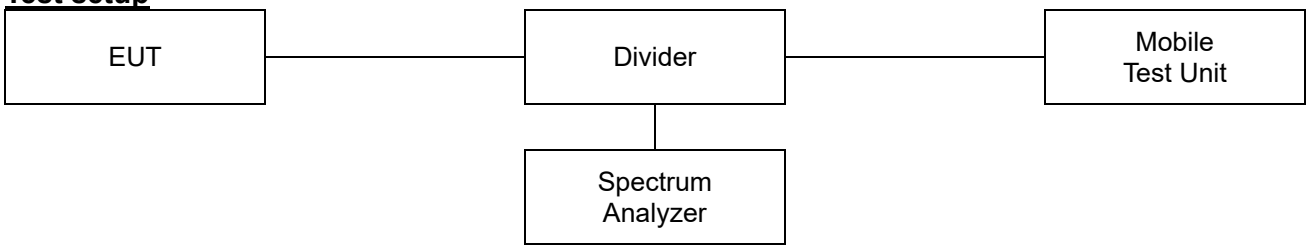


20M BW 16QAM High ch.



7.4. Band Edge Emissions at Antenna Terminal

Test setup



Limit

According to §22.917(a), §24.238(a), 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 + 10log($P_{[Watts]}$) ㏈.

According to §27.53(g), for operations in the 600 ㎒ band and the 698-746 ㎒ 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 + 10log($P_{[Watts]}$) ㏈.

According to §27.53(h), 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 + 10log($P_{[Watts]}$) ㏈.

According to §27.53(m)(4), the attenuation factor shall be not less than 40 + 10log($P_{[Watts]}$) ㏈ on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10log($P_{[Watts]}$) ㏈ on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10log($P_{[Watts]}$) ㏈ 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 + 10log($P_{[Watts]}$) ㏈ on all frequencies between 2490.5 ㎒ and 2496 ㎒ and 55 + 10log($P_{[Watts]}$) ㏈ at or below 2490.5 ㎒.

Test procedure

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Test settings

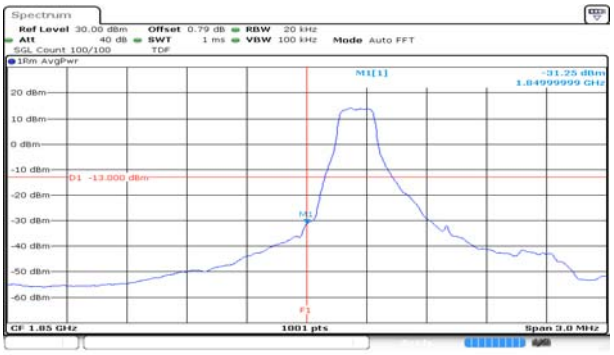
1) Start frequency was set to 30 ㎒ and stop frequency was set to at least 10th the fundamental frequency.
2) Span was set large enough so as to capture all out of band emissions near the band edge.
3) Set the RBW > 1% of the emission bandwidth.
4) Set the VBW ≥ 3 x RBW.
5) Set the number of sweep points ≥ 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) × (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) × (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 art necessary to ensure that the maximum power is measured.
9) Allow trace to fully stabilize.

Notes:

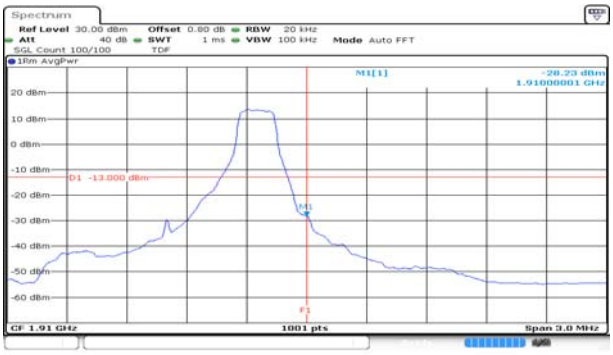
1. Per 22.917(b), 24.238(b), 27.53(h)(3), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 ㎒ or greater. however in the 1 ㎒ bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent 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 ㏈ below the transmitter power.
   resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 ㎑ segment.
2. Per 27.25(g), 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 ㎑ may be employed.
3. Per 27.53(m)(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 ㎒, 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 ㎒).
4. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.

Test mode: LTE Band 2

1.4M BW QPSK Low ch. 1RB



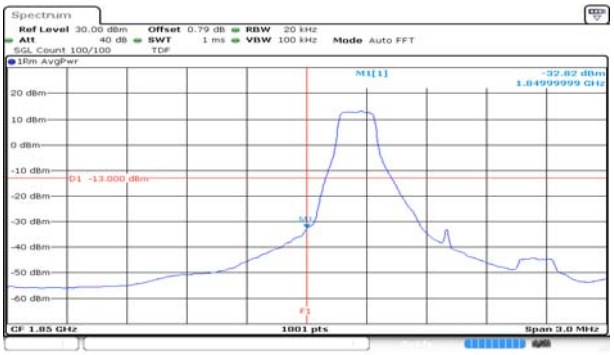
1.4M BW QPSK High ch. 1RB



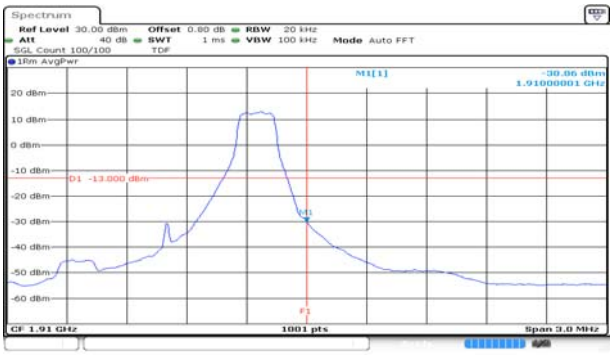
1.4M BW QPSK Low ch. FRB

1.4M BW QPSK High ch. FRB

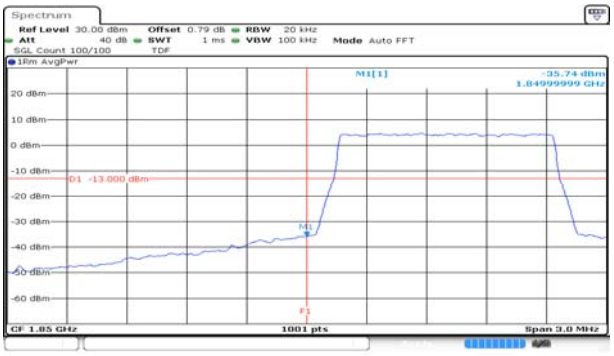
1.4M BW 16QAM Low ch. 1RB



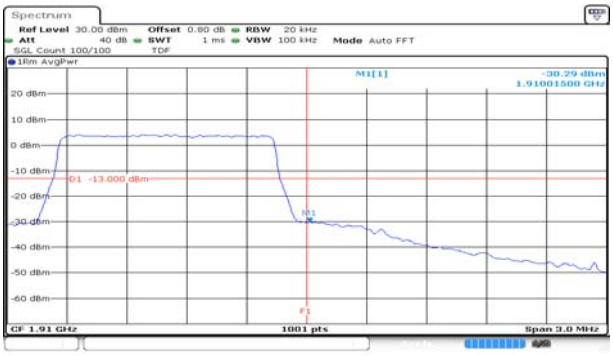
1.4M BW 16QAM High ch. 1RB

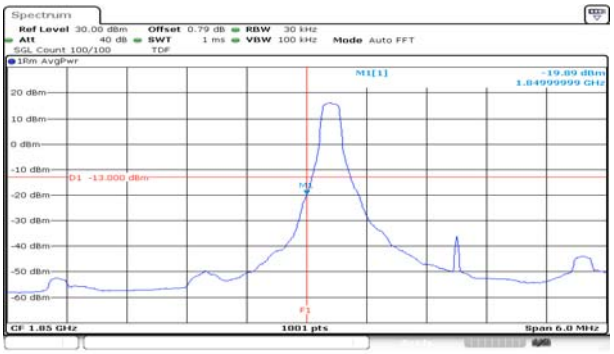
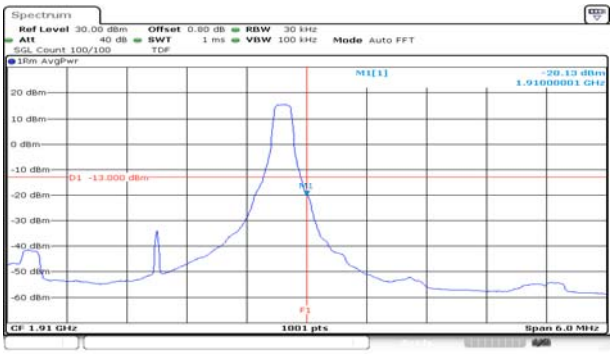
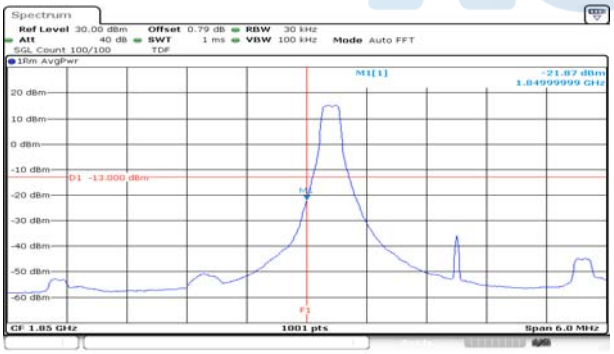
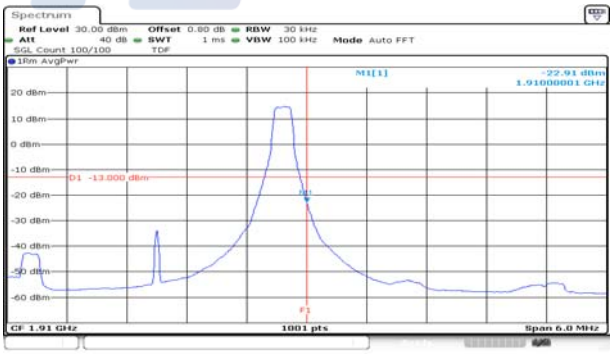
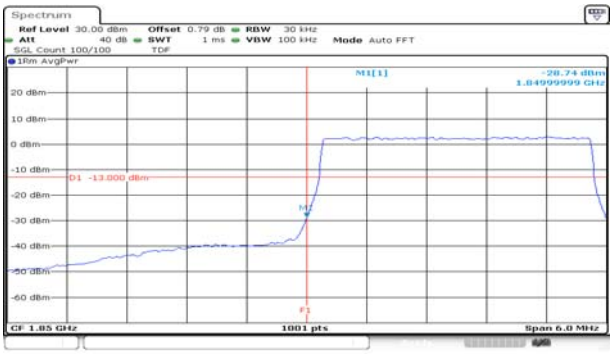


1.4M BW 16QAM Low ch. FRB

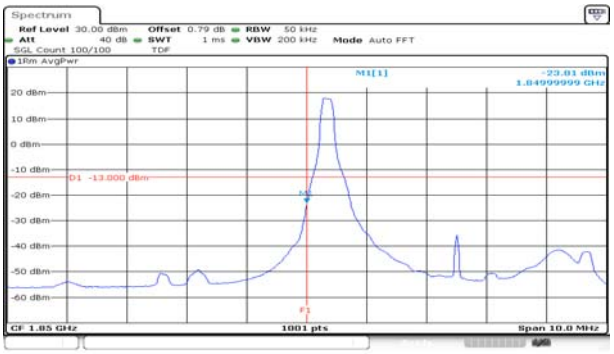


1.4M BW 16QAM High ch. FRB

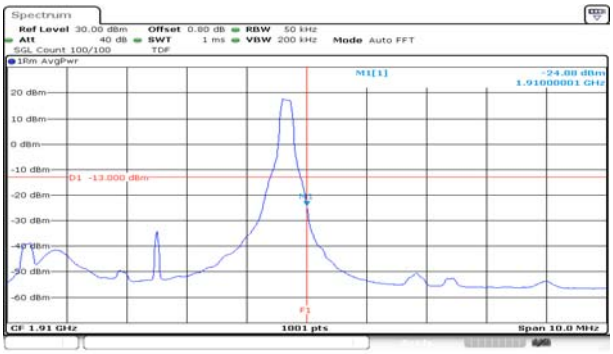


3M BW QPSK Low ch. 1RB	3M BW QPSK High ch. 1RB
	
3M BW QPSK Low ch. FRB	**3M BW QPSK High ch. FRB**
	
3M BW 16QAM Low ch. 1RB	**3M BW 16QAM High ch. 1RB**
	
3M BW 16QAM Low ch. FRB	**3M BW 16QAM High ch. FRB**
	

5M BW QPSK Low ch. 1RB



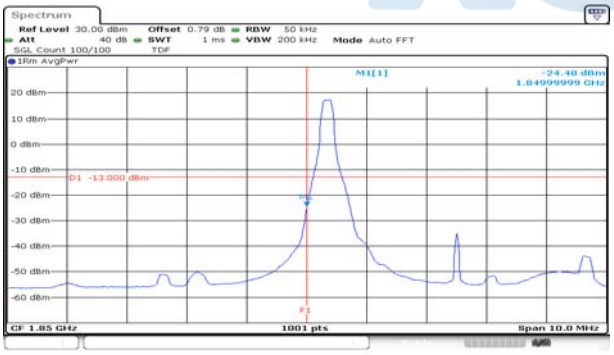
5M BW QPSK High ch. 1RB



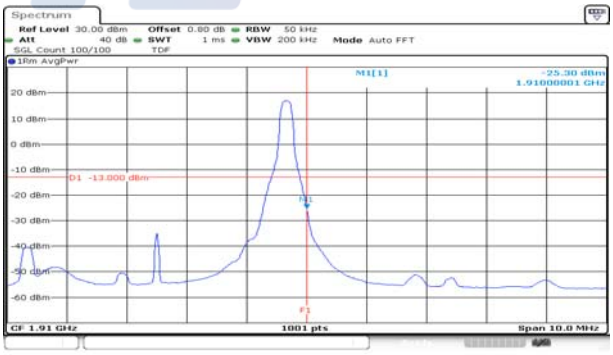
5M BW QPSK Low ch. FRB

5M BW QPSK High ch. FRB

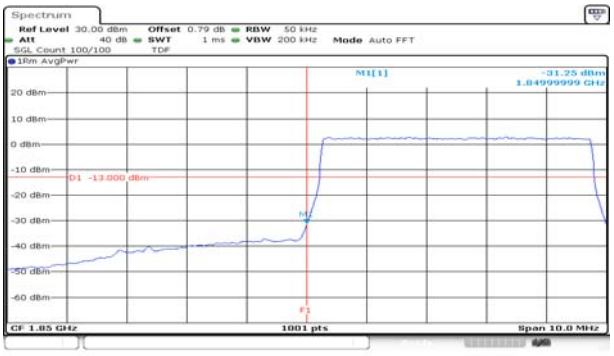
5M BW 16QAM Low ch. 1RB



5M BW 16QAM High ch. 1RB



5M BW 16QAM Low ch. FRB



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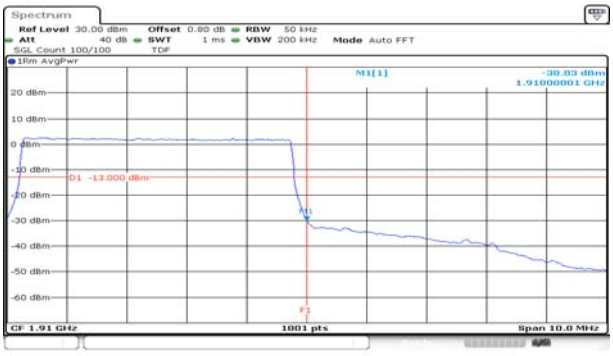
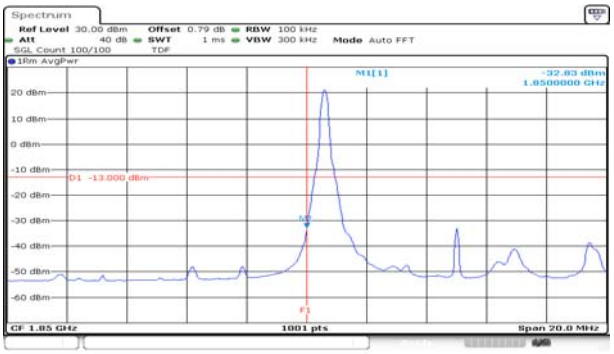
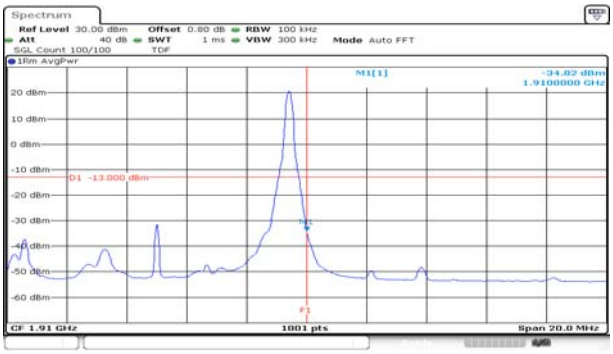


10M BW QPSK Low ch. 1RB



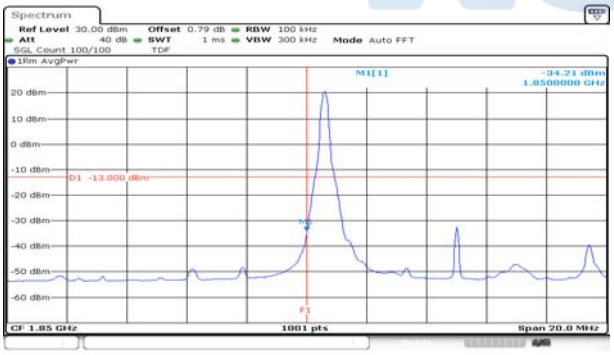
10M BW QPSK High ch. 1RB



10M BW QPSK Low ch. FRB

10M BW QPSK High ch. FRB

10M BW 16QAM Low ch. 1RB



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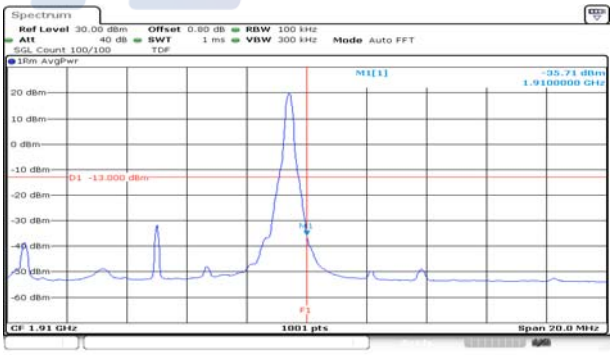
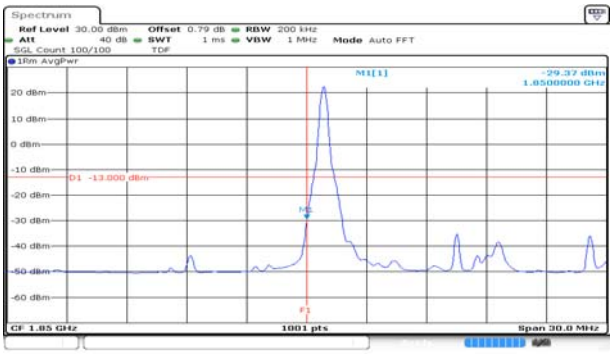


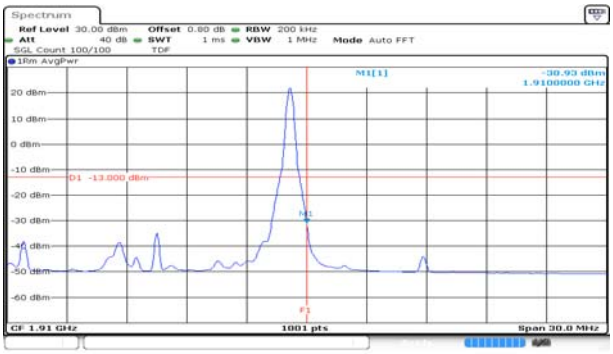
10M BW 16QAM Low ch. FRB

10M BW 16QAM High ch. FRB

15M BW QPSK Low ch. 1RB



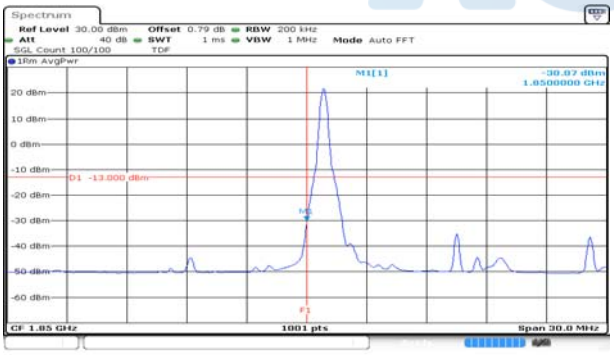
15M BW QPSK High ch. 1RB



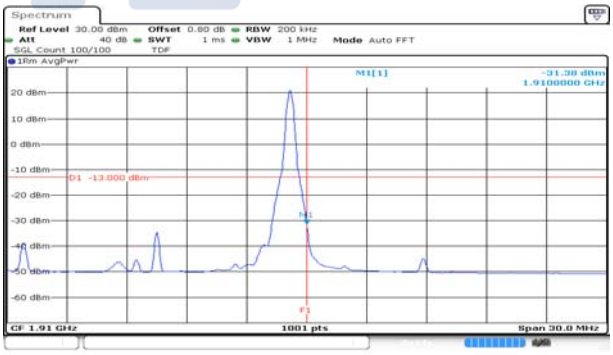
15M BW QPSK Low ch. FRB

15M BW QPSK High ch. FRB

15M BW 16QAM Low ch. 1RB



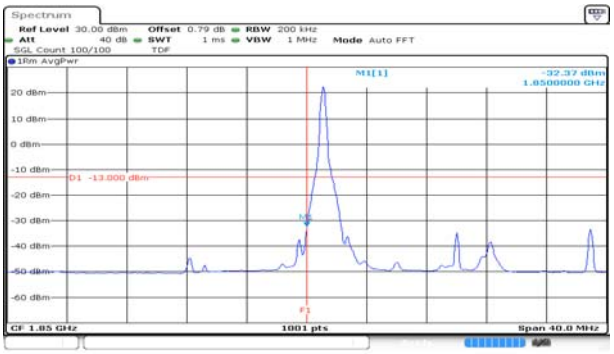
15M BW 16QAM High ch. 1RB



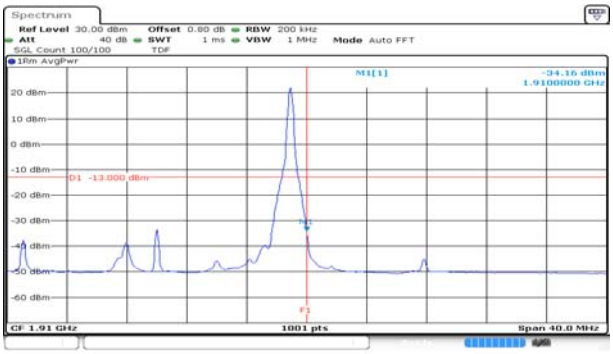
15M BW 16QAM Low ch. FRB

15M BW 16QAM High ch. FRB

20M BW QPSK Low ch. 1RB



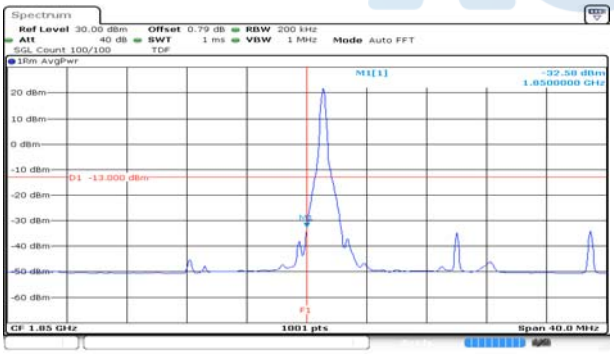
20M BW QPSK High ch. 1RB



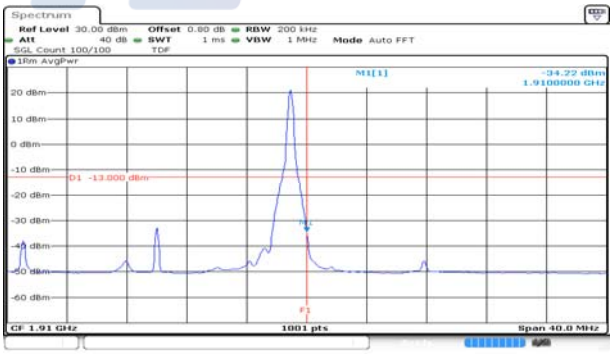
20M BW QPSK Low ch. FRB

20M BW QPSK High ch. FRB

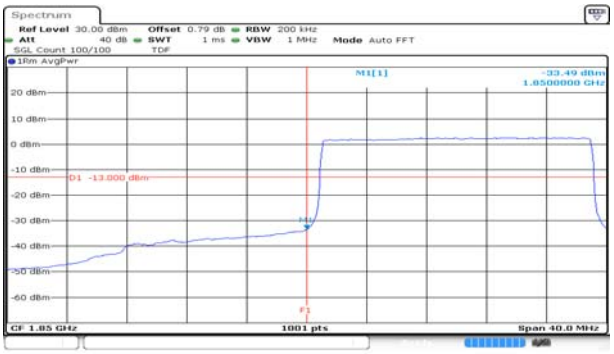
20M BW 16QAM Low ch. 1RB



20M BW 16QAM High ch. 1RB



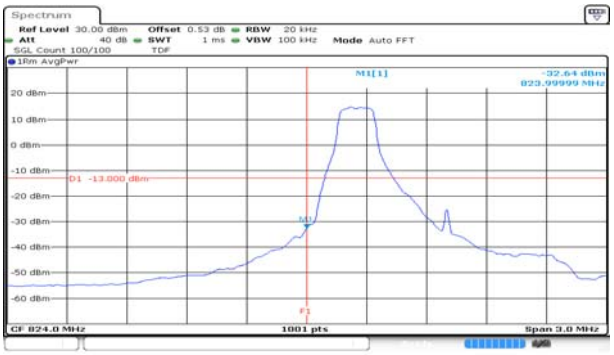
20M BW 16QAM Low ch. FRB



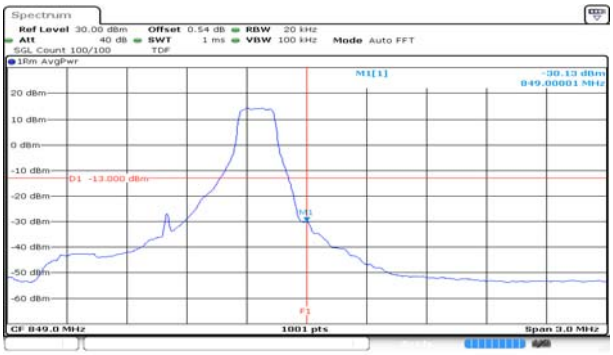
20M BW 16QAM High ch. FRB

Test mode: LTE Band 5

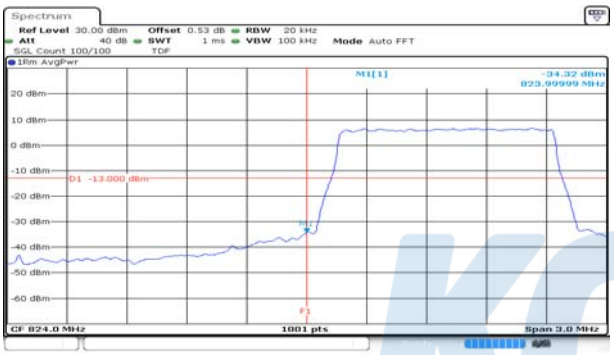
1.4M BW QPSK Low ch. 1RB



1.4M BW QPSK High ch. 1RB

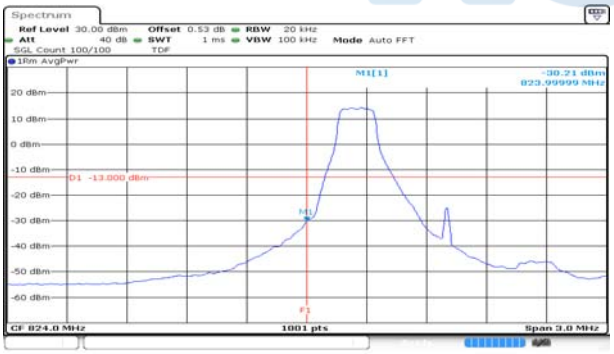


1.4M BW QPSK Low ch. FRB

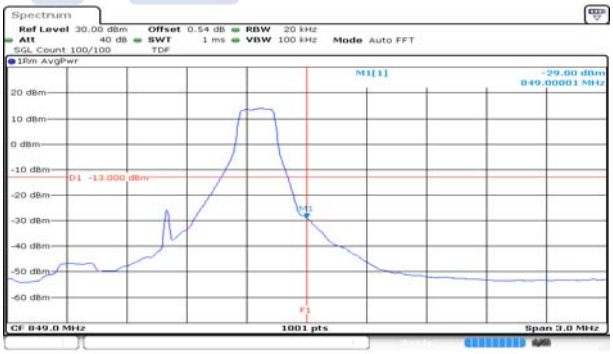


1.4M BW QPSK High ch. FRB

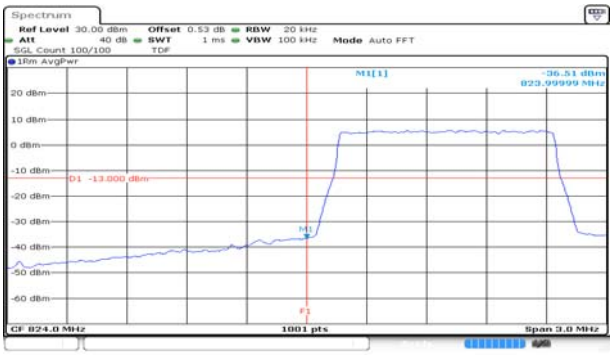
1.4M BW 16QAM Low ch. 1RB



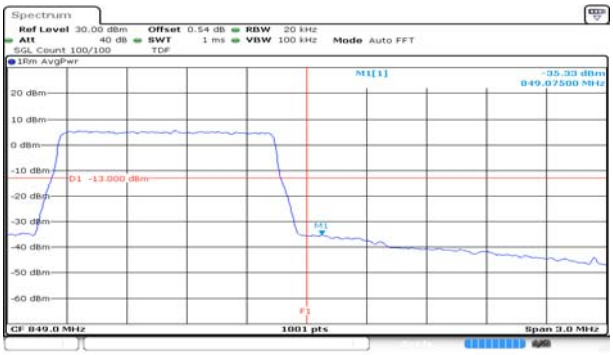
1.4M BW 16QAM High ch. 1RB



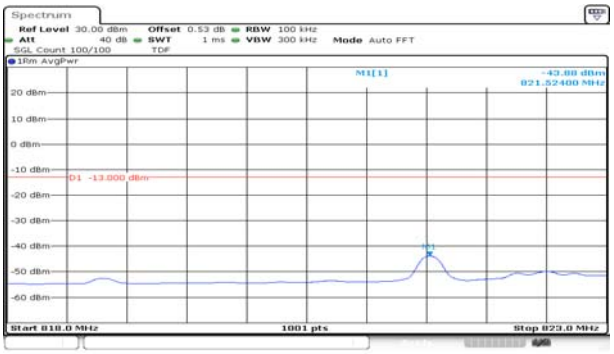
1.4M BW 16QAM Low ch. FRB



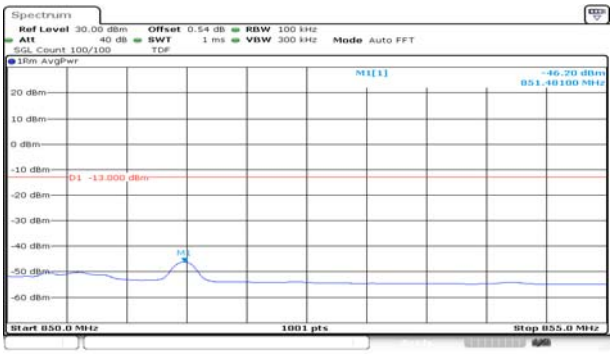
1.4M BW 16QAM High ch. FRB



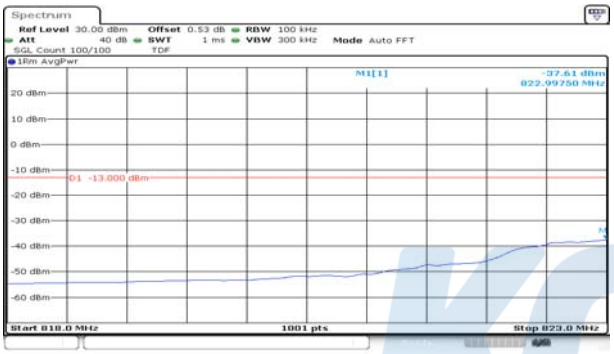
1.4M BW QPSK Lower extended 1RB



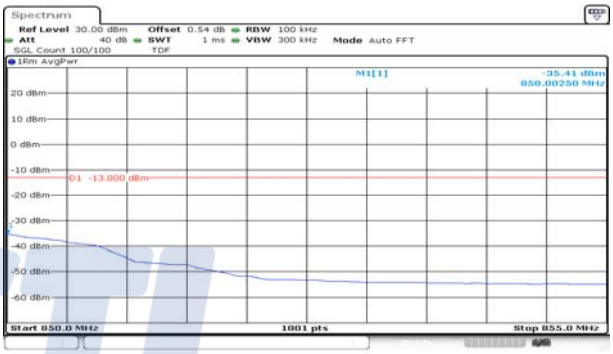
1.4M BW QPSK Upper extended 1RB



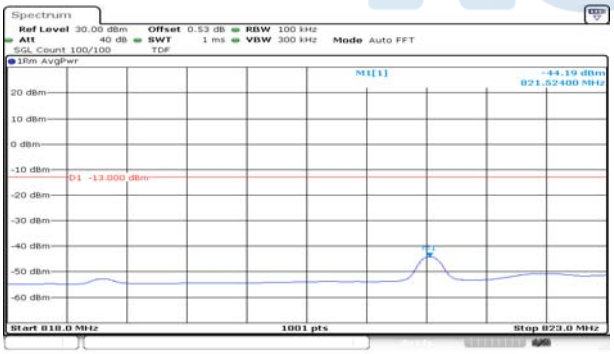
1.4M BW QPSK Lower extended FRB



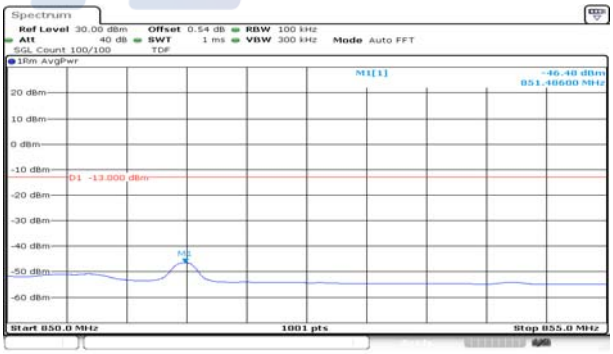
1.4M BW QPSK Upper extended FRB



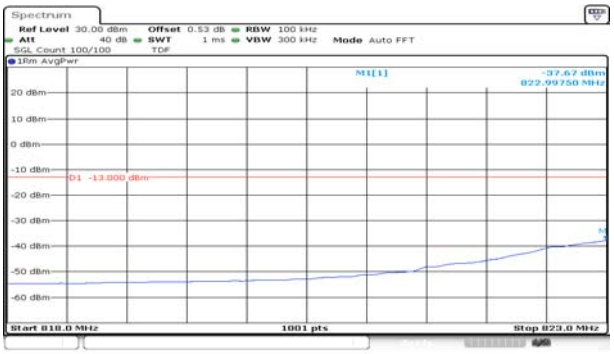
1.4M BW 16QAM Lower extended 1RB



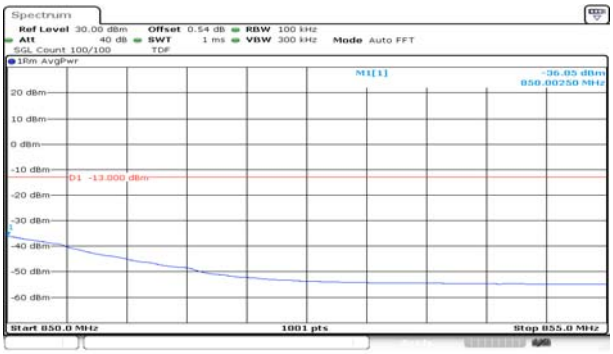
1.4M BW 16QAM Upper extended 1RB

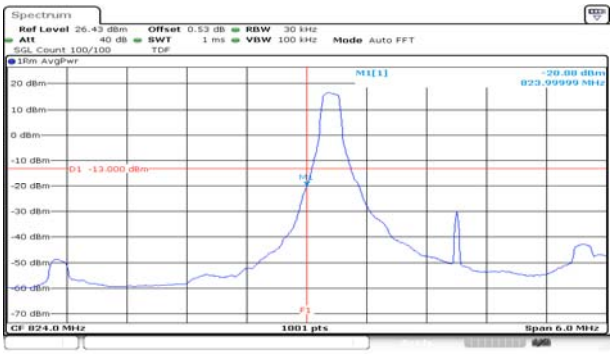
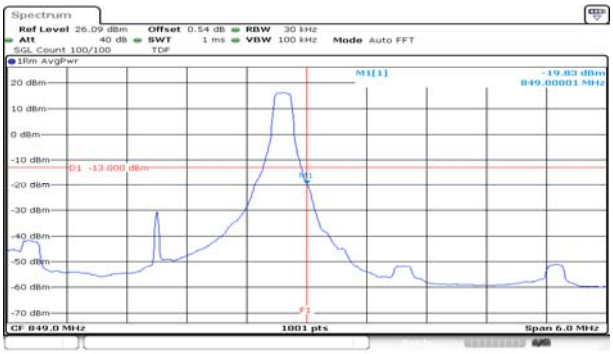
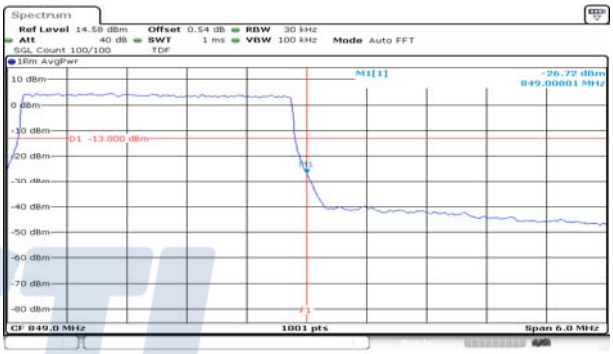
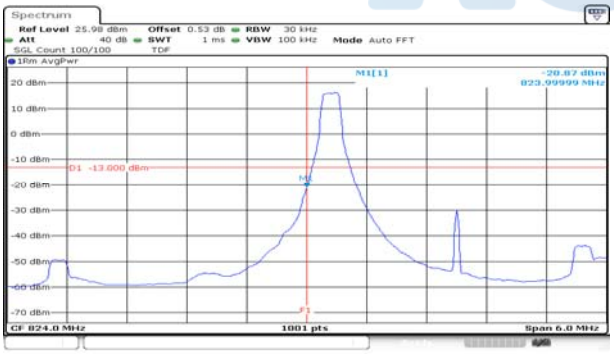
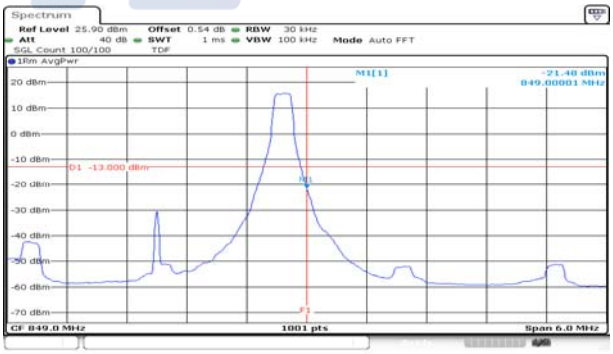
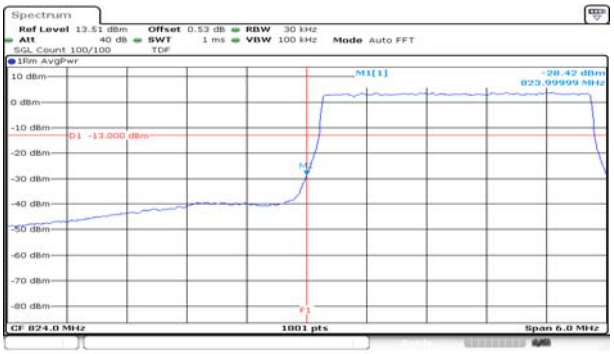
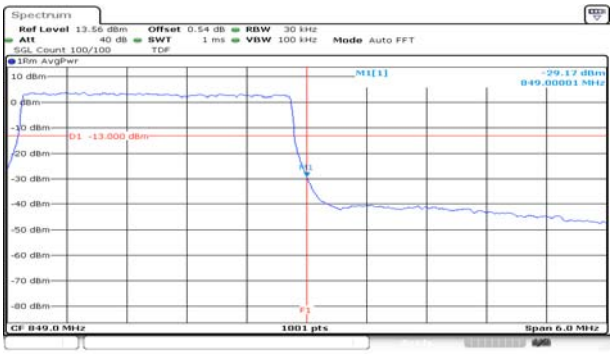


1.4M BW 16QAM Lower extended FRB

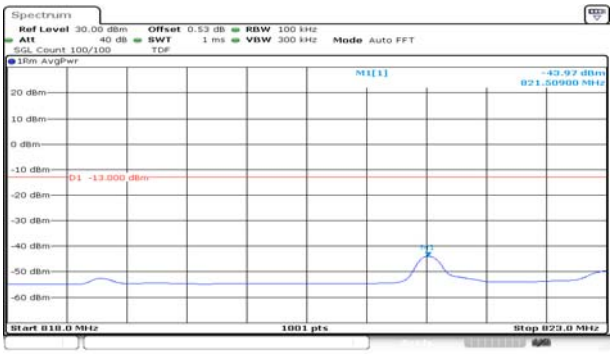


1.4M BW 16QAM Upper extended FRB

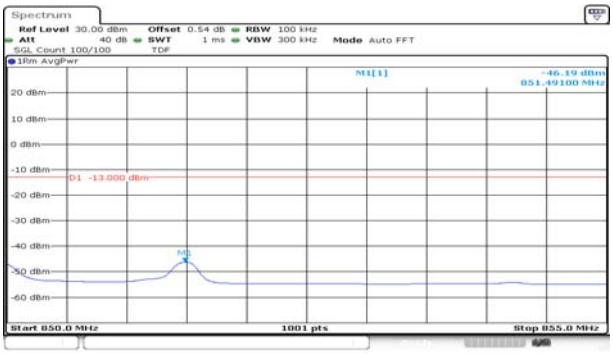


3M BW QPSK Low ch. 1RB	3M BW QPSK High ch. 1RB
	
3M BW QPSK Low ch. FRB	**3M BW QPSK High ch. FRB**
	
3M BW 16QAM Low ch. 1RB	**3M BW 16QAM High ch. 1RB**
	
3M BW 16QAM Low ch. FRB	**3M BW 16QAM High ch. FRB**
	

3M BW QPSK Lower extended 1RB

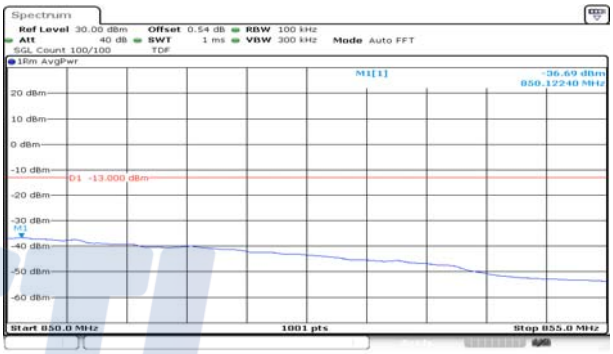


3M BW QPSK Upper extended 1RB

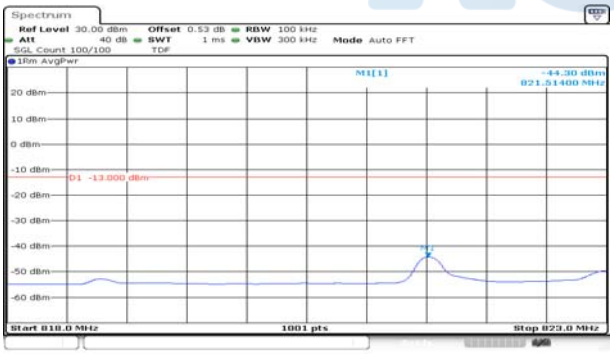


3M BW QPSK Lower extended FRB

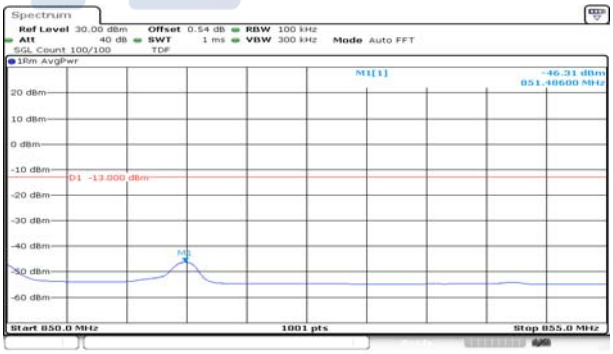
3M BW QPSK Upper extended FRB



3M BW 16QAM Lower extended 1RB



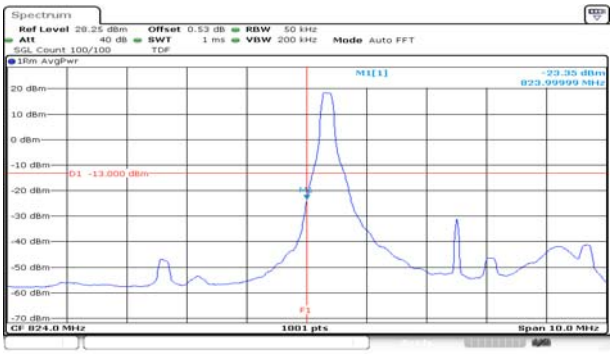
3M BW 16QAM Upper extended 1RB



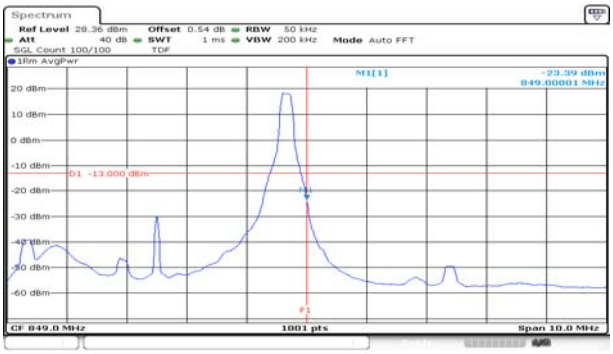
3M BW 16QAM Lower extended FRB

3M BW 16QAM Upper extended FRB

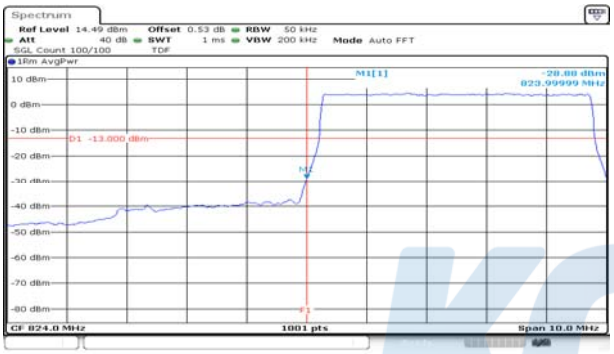
5M BW QPSK Low ch. 1RB



5M BW QPSK High ch. 1RB

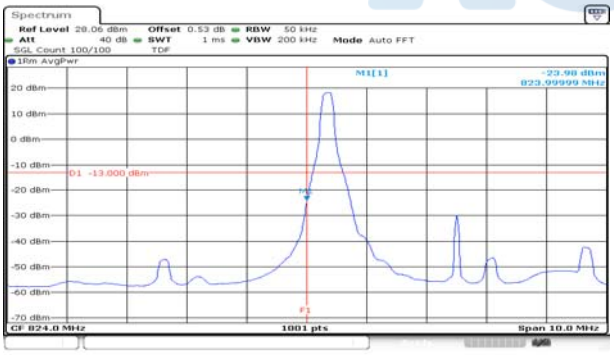


5M BW QPSK Low ch. FRB

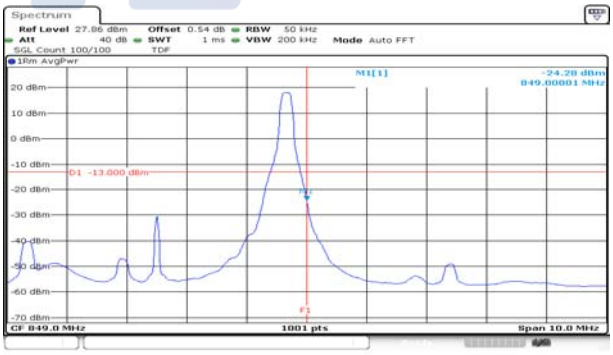


5M BW QPSK High ch. FRB

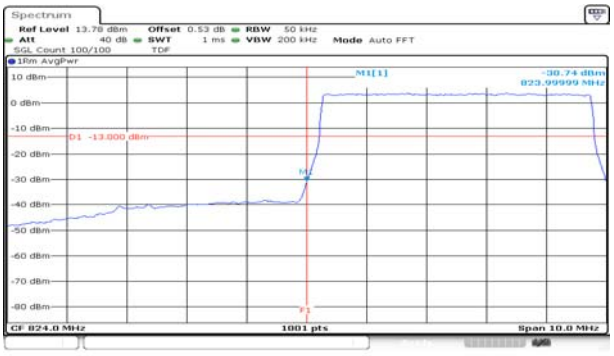
5M BW 16QAM Low ch. 1RB



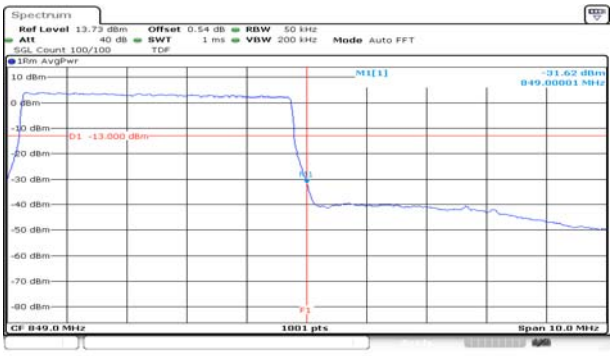
5M BW 16QAM High ch. 1RB



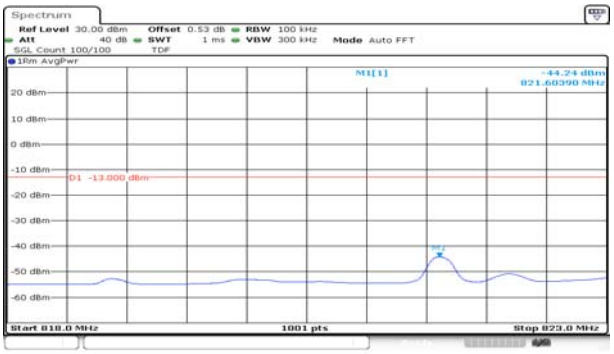
5M BW 16QAM Low ch. FRB



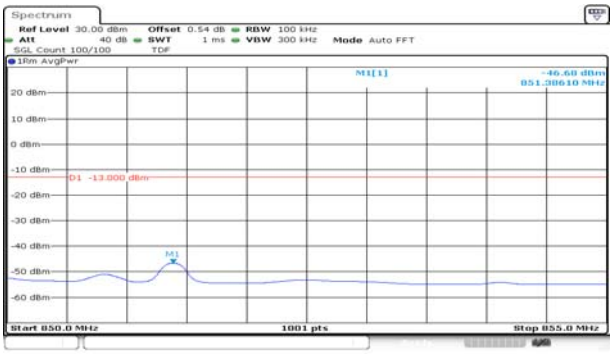
5M BW 16QAM High ch. FRB



5M BW QPSK Lower extended 1RB



5M BW QPSK Upper extended 1RB

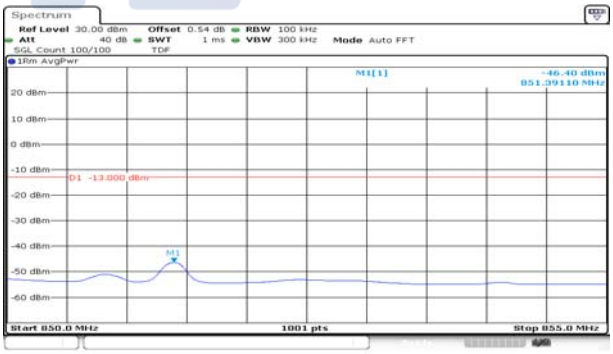


5M BW QPSK Lower extended FRB

5M BW QPSK Upper extended FRB

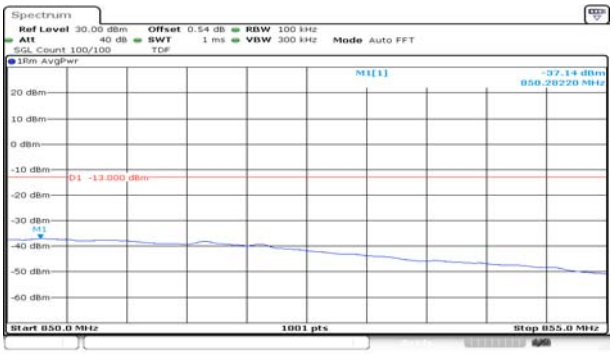
5M BW 16QAM Lower extended 1RB

5M BW 16QAM Upper extended 1RB

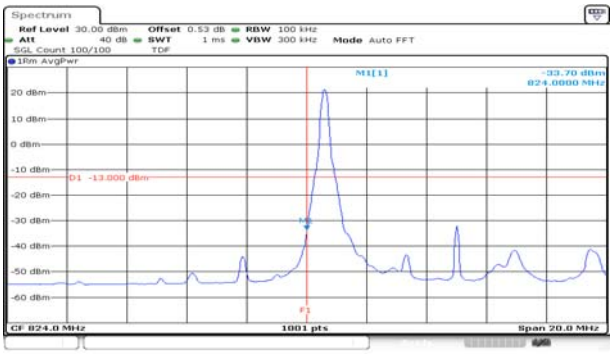


5M BW 16QAM Lower extended FRB

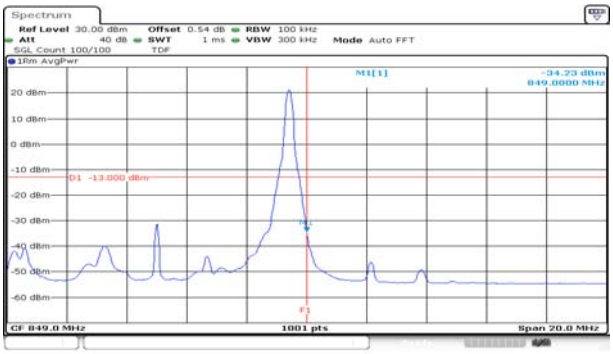
5M BW 16QAM Upper extended FRB



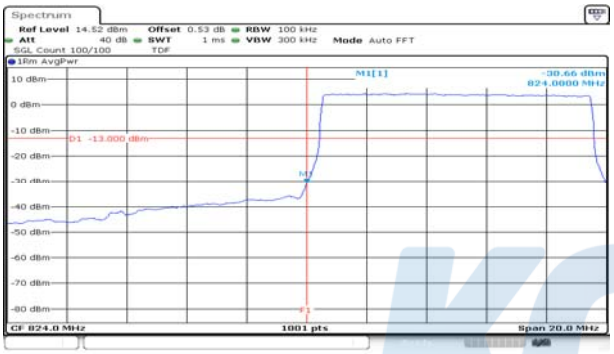
10M BW QPSK Low ch. 1RB



10M BW QPSK High ch. 1RB

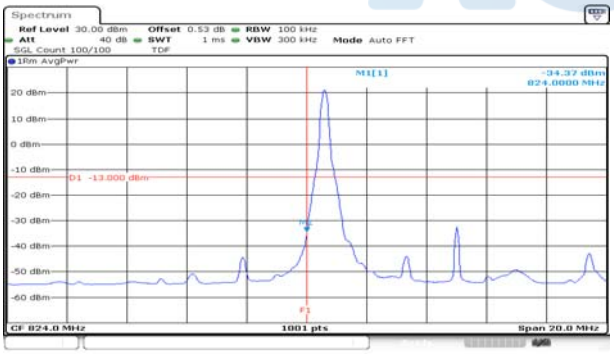


10M BW QPSK Low ch. FRB

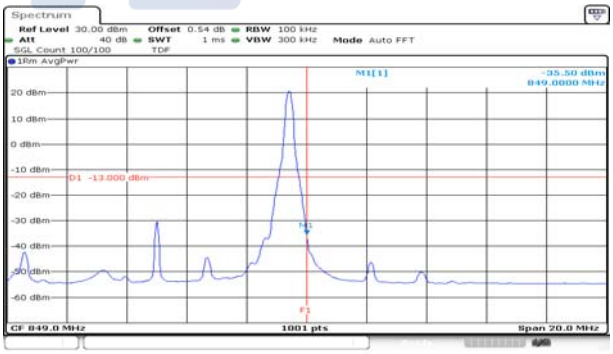


10M BW QPSK High ch. FRB

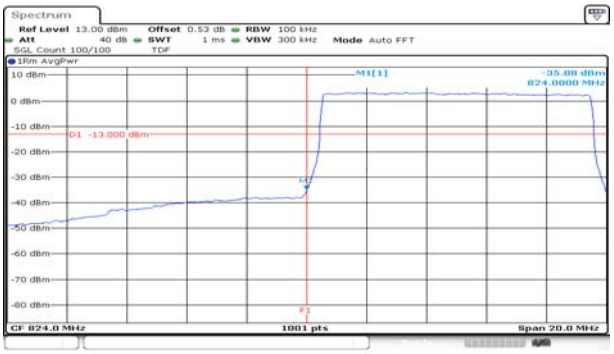
10M BW 16QAM Low ch. 1RB



10M BW 16QAM High ch. 1RB

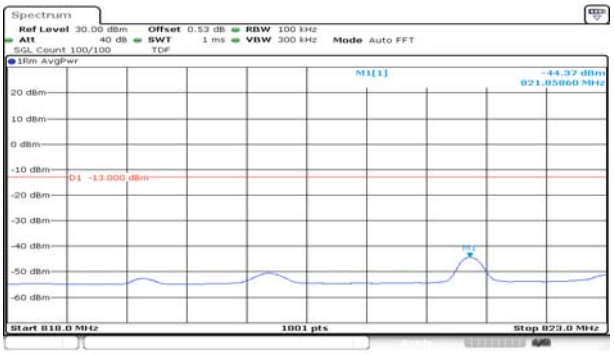


10M BW 16QAM Low ch. FRB

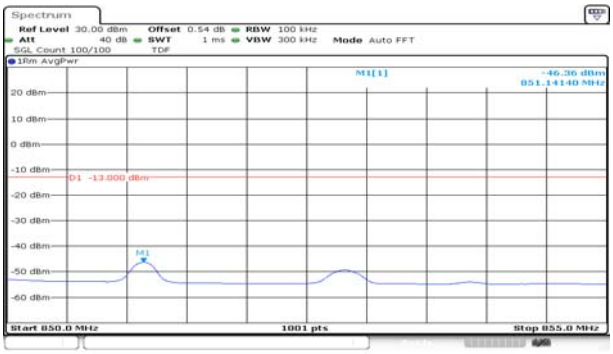


10M BW 16QAM High ch. FRB

10M BW QPSK Lower extended 1RB

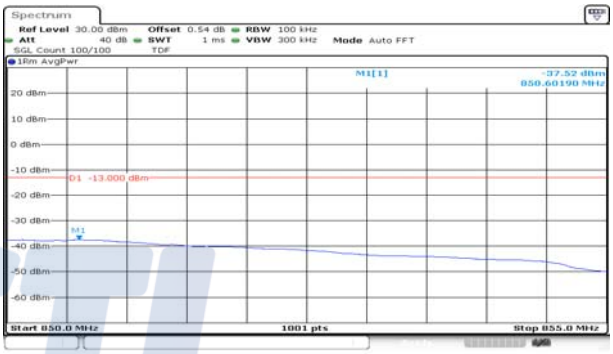


10M BW QPSK Upper extended 1RB



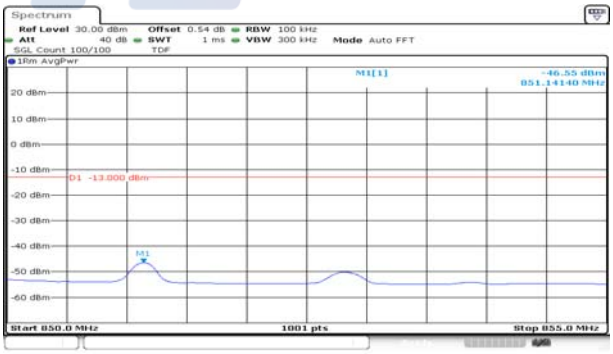
10M BW QPSK Lower extended FRB

10M BW QPSK Upper extended FRB

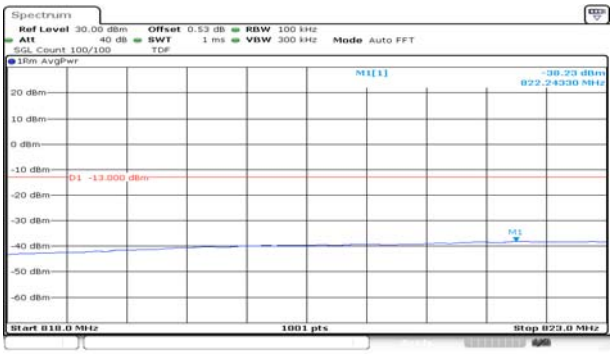


10M BW 16QAM Lower extended 1RB

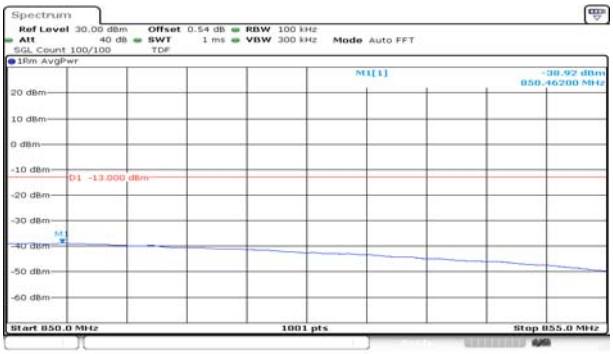
10M BW 16QAM Upper extended 1RB



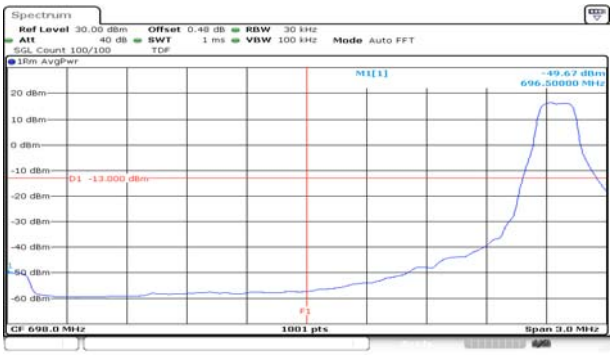
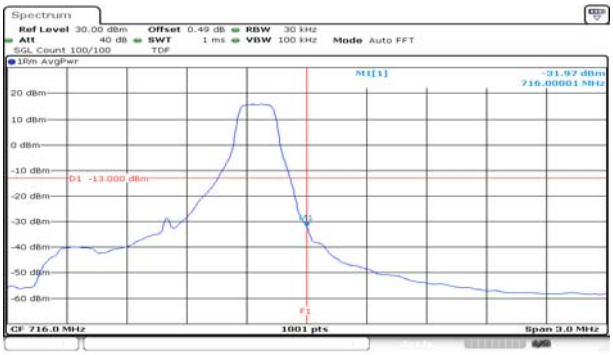
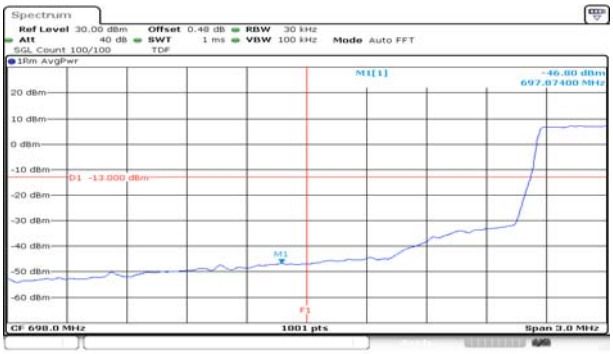
10M BW 16QAM Lower extended FRB



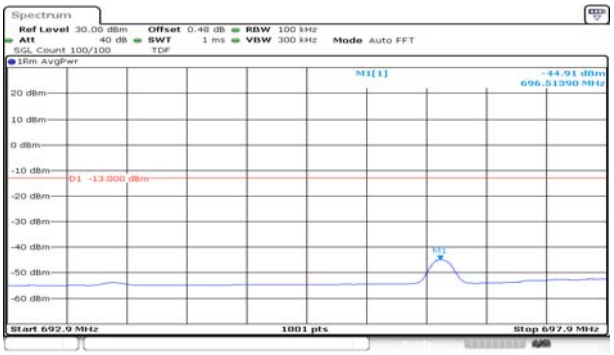
10M BW 16QAM Upper extended FRB



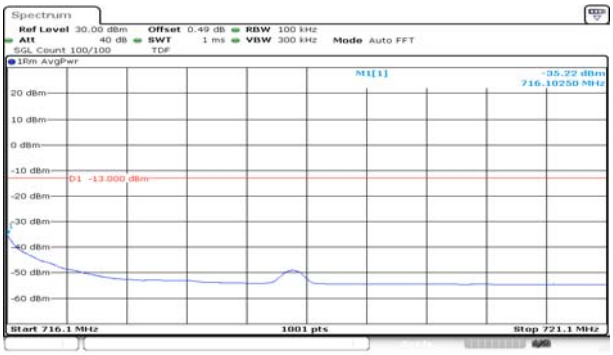
Test mode: LTE Band 12/17

1.4M BW QPSK Low ch. 1RB	1.4M BW QPSK High ch. 1RB
	
1.4M BW QPSK Low ch. FRB	**1.4M BW QPSK High ch. FRB**
	
1.4M BW 16QAM Low ch. 1RB	**1.4M BW 16QAM High ch. 1RB**
	
1.4M BW 16QAM Low ch. FRB	**1.4M BW 16QAM High ch. FRB**
	

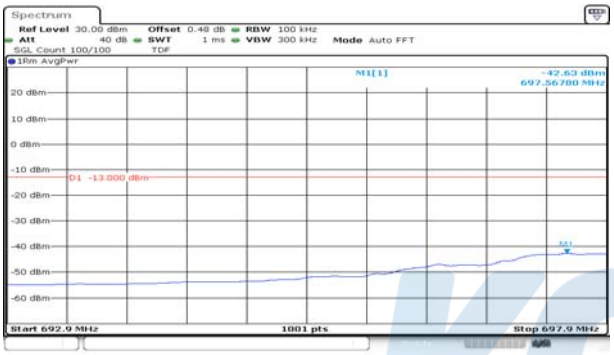
1.4M BW QPSK Lower extended 1RB



1.4M BW QPSK Upper extended 1RB

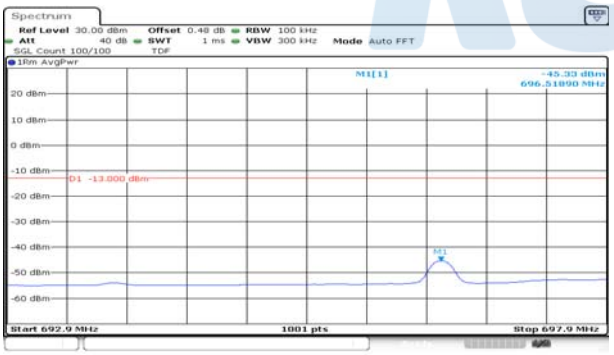


1.4M BW QPSK Lower extended FRB

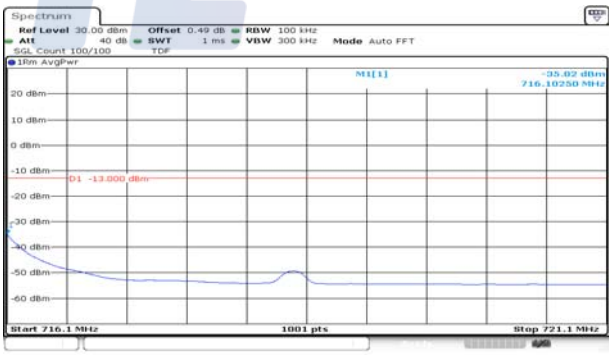


1.4M BW QPSK Upper extended FRB

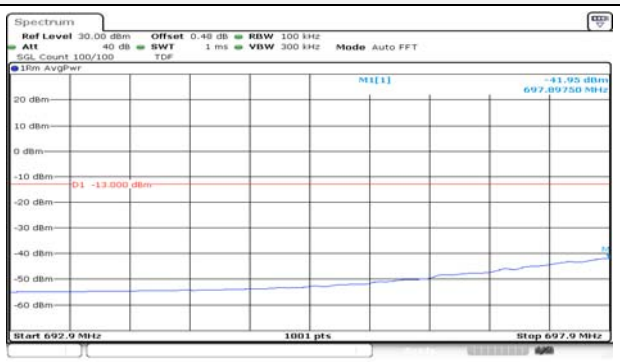
1.4M BW 16QAM Lower extended 1RB



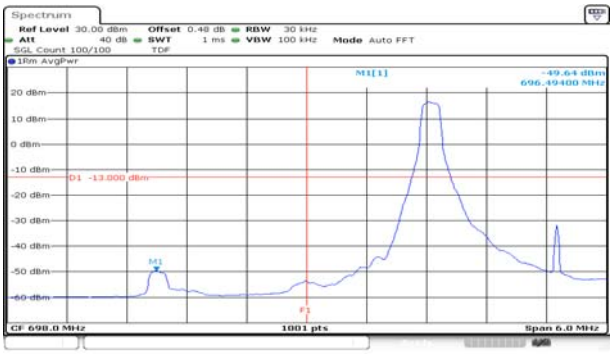
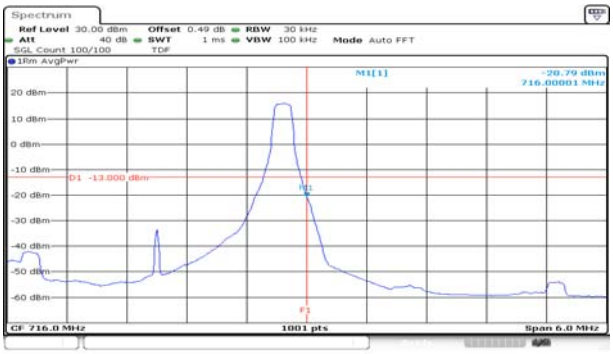
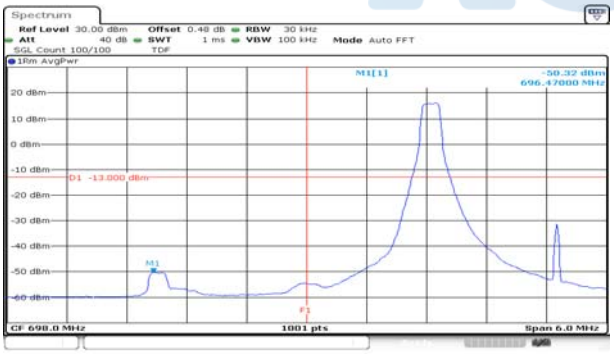
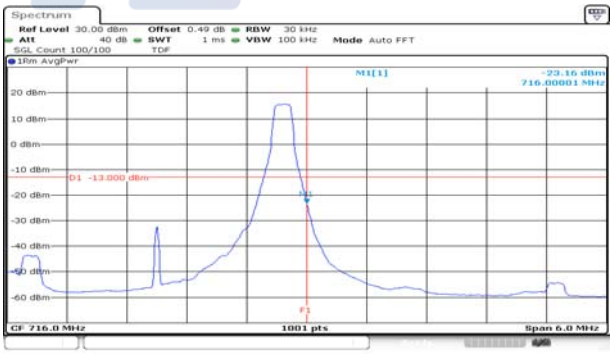
1.4M BW 16QAM Upper extended 1RB



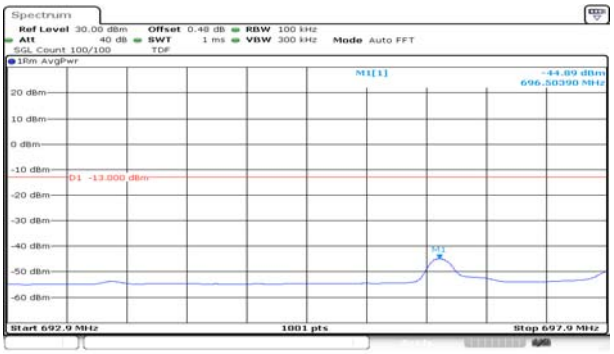
1.4M BW 16QAM Lower extended FRB



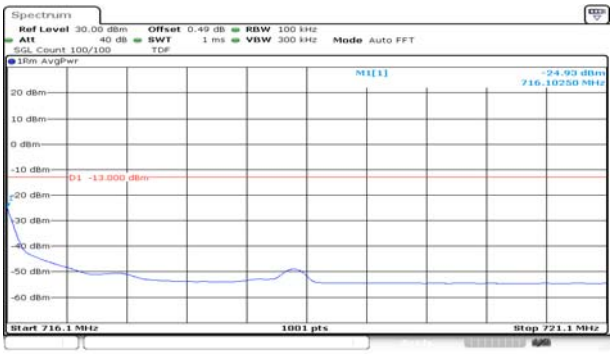
1.4M BW 16QAM Upper extended FRB

3M BW QPSK Low ch. 1RB	3M BW QPSK High ch. 1RB
	
3M BW QPSK Low ch. FRB	**3M BW QPSK High ch. FRB**
	
3M BW 16QAM Low ch. 1RB	**3M BW 16QAM High ch. 1RB**
	
3M BW 16QAM Low ch. FRB	**3M BW 16QAM High ch. FRB**
	

3M BW QPSK Lower extended 1RB



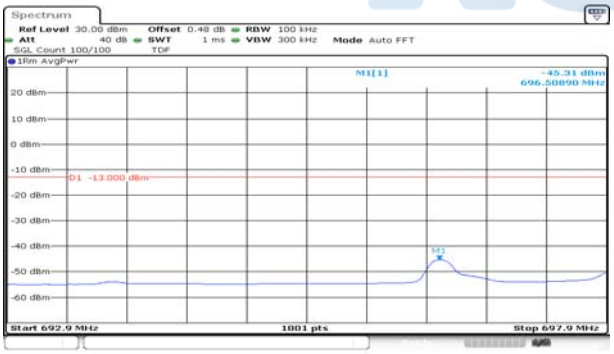
3M BW QPSK Upper extended 1RB



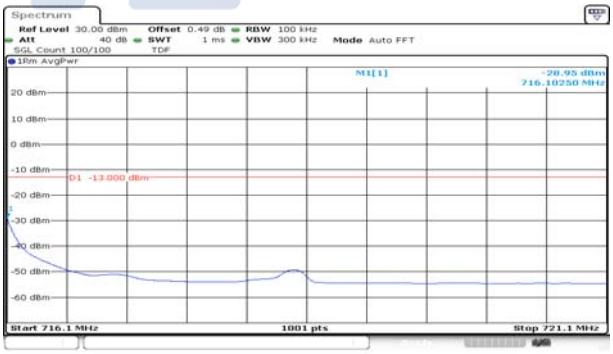
3M BW QPSK Lower extended FRB

3M BW QPSK Upper extended FRB

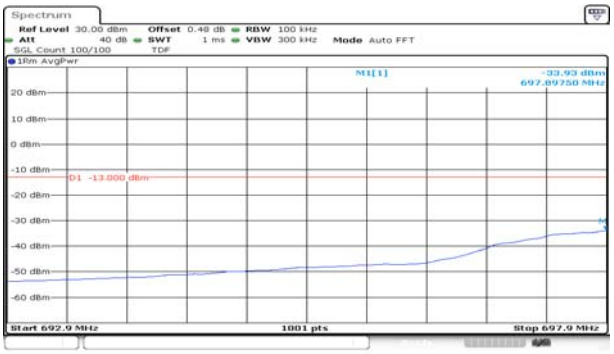
3M BW 16QAM Lower extended 1RB



3M BW 16QAM Upper extended 1RB

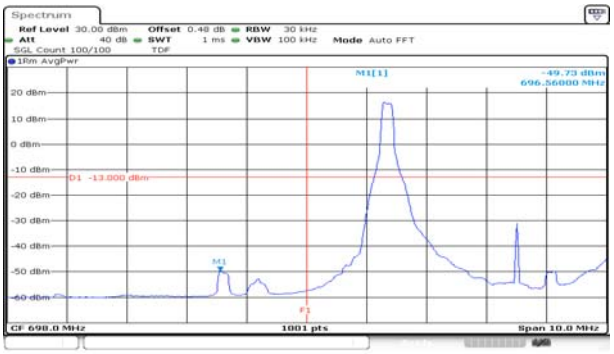


3M BW 16QAM Lower extended FRB

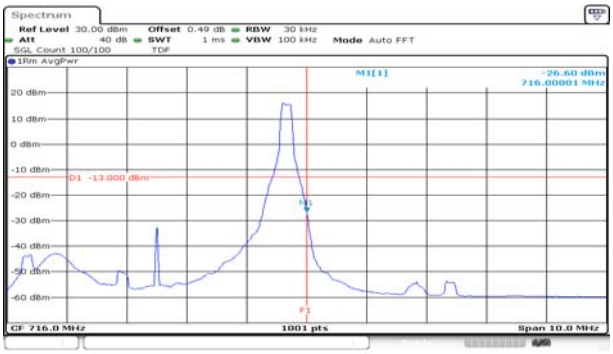


3M BW 16QAM Upper extended FRB

5M BW QPSK Low ch. 1RB



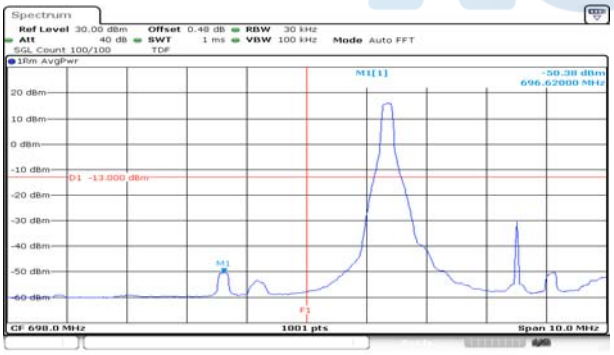
5M BW QPSK High ch. 1RB



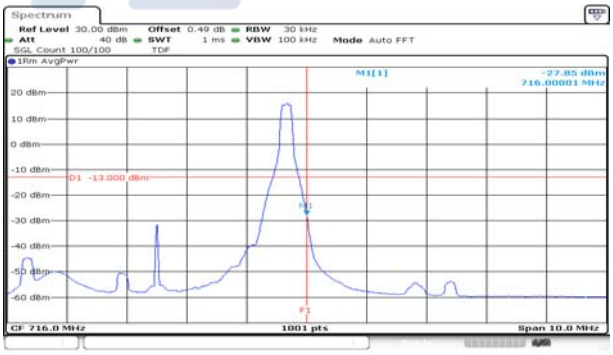
5M BW QPSK Low ch. FRB

5M BW QPSK High ch. FRB

5M BW 16QAM Low ch. 1RB

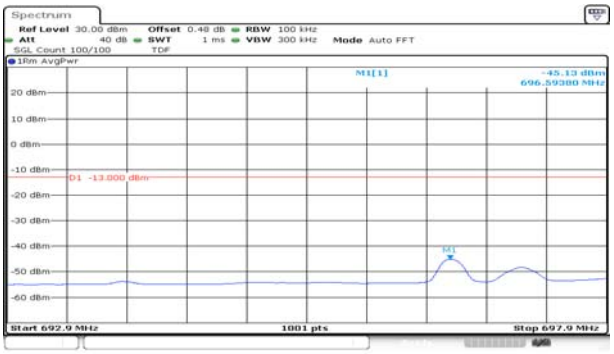
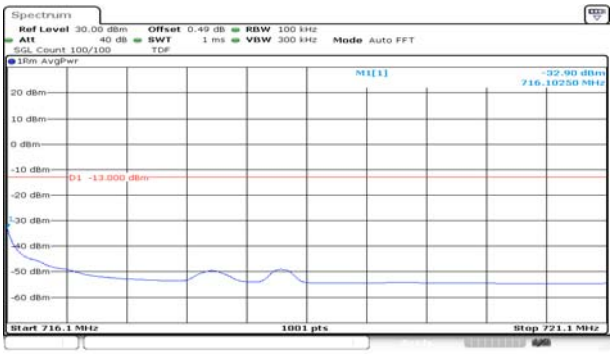
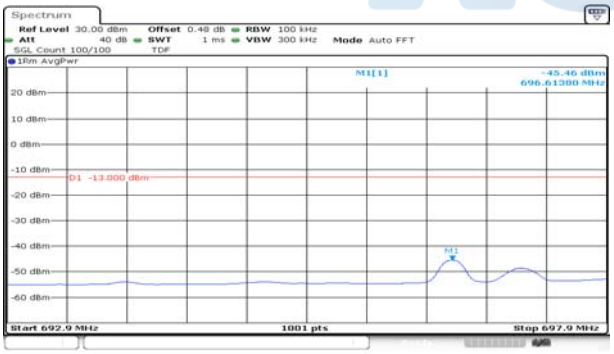
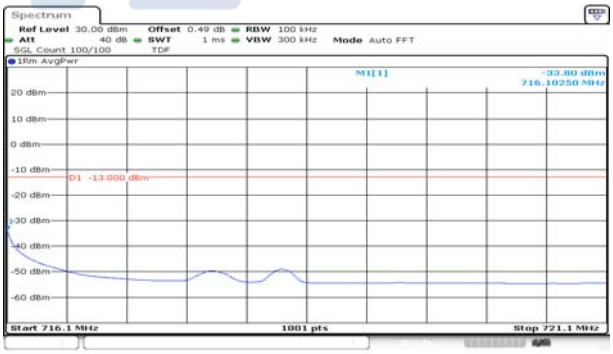
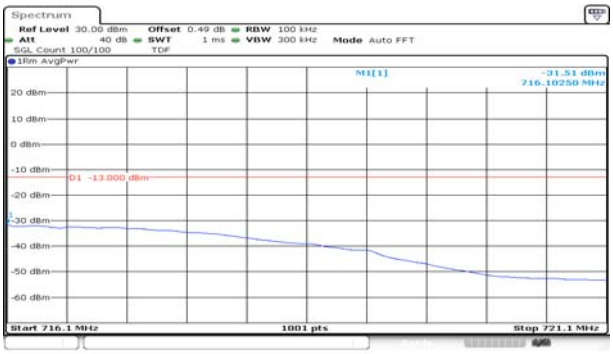


5M BW 16QAM High ch. 1RB

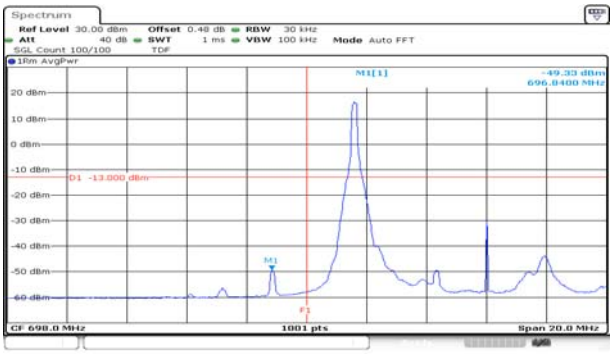


5M BW 16QAM Low ch. FRB

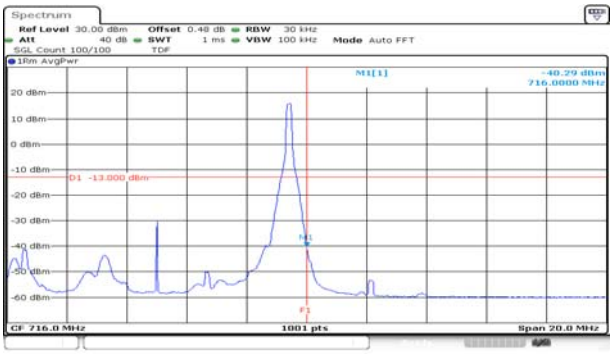
5M BW 16QAM High ch. FRB

5M BW QPSK Lower extended 1RB	5M BW QPSK Upper extended 1RB
	
5M BW QPSK Lower extended FRB	**5M BW QPSK Upper extended FRB**
	
5M BW 16QAM Lower extended 1RB	**5M BW 16QAM Upper extended 1RB**
	
5M BW 16QAM Lower extended FRB	**5M BW 16QAM Upper extended FRB**
	

10M BW QPSK Low ch. 1RB

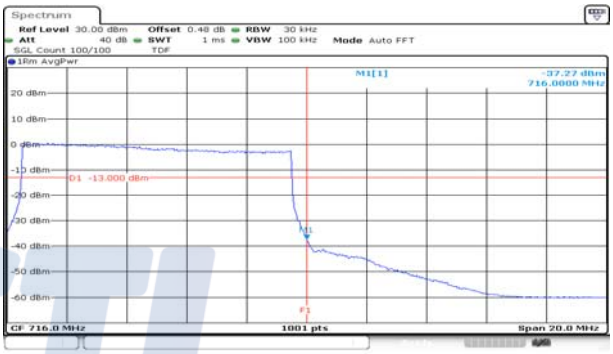


10M BW QPSK High ch. 1RB

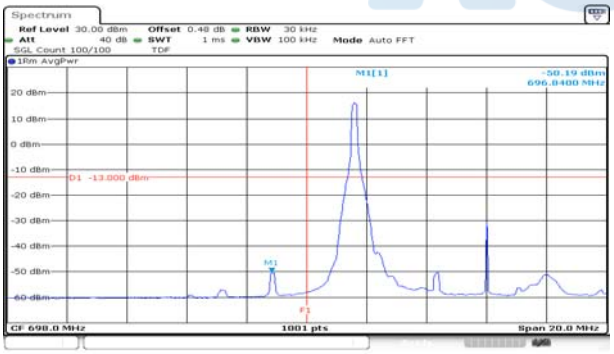


10M BW QPSK Low ch. FRB

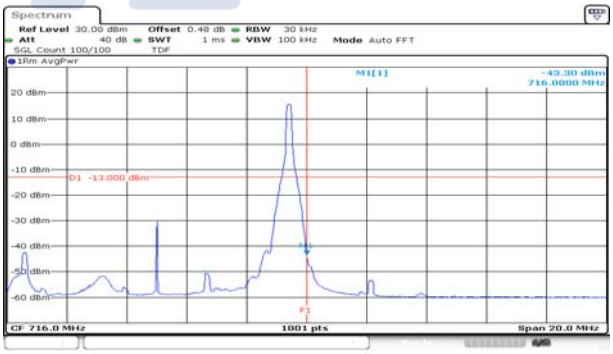
10M BW QPSK High ch. FRB



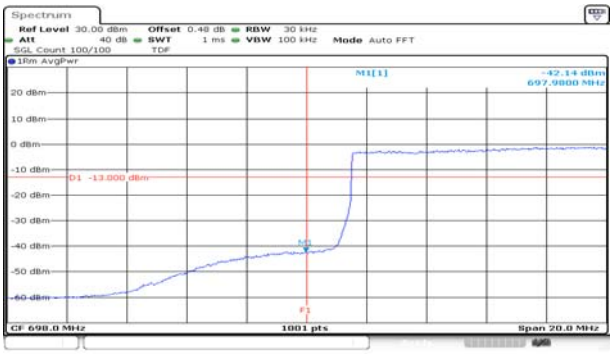
10M BW 16QAM Low ch. 1RB



10M BW 16QAM High ch. 1RB



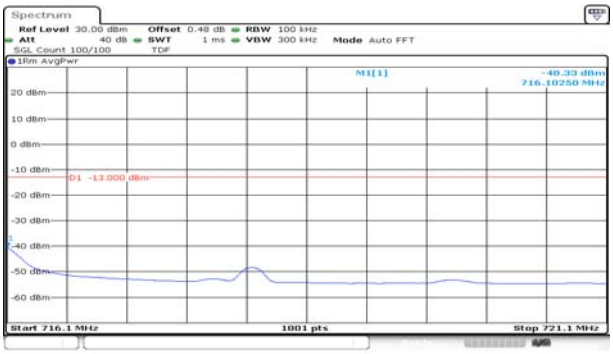
10M BW 16QAM Low ch. FRB



10M BW 16QAM High ch. FRB

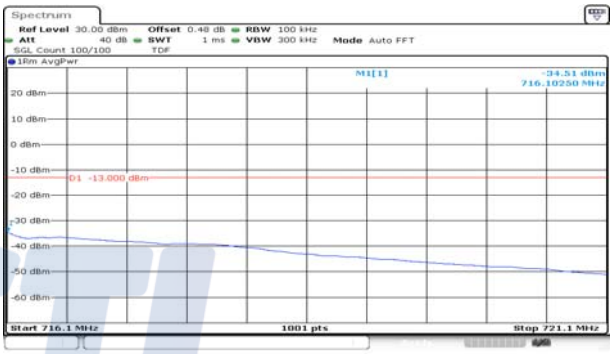
10M BW QPSK Lower extended 1RB

10M BW QPSK Upper extended 1RB



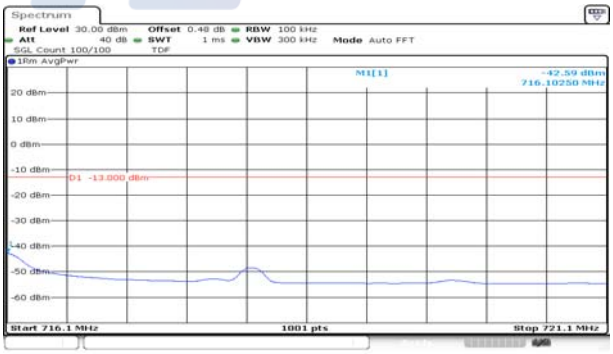
10M BW QPSK Lower extended FRB

10M BW QPSK Upper extended FRB



10M BW 16QAM Lower extended 1RB

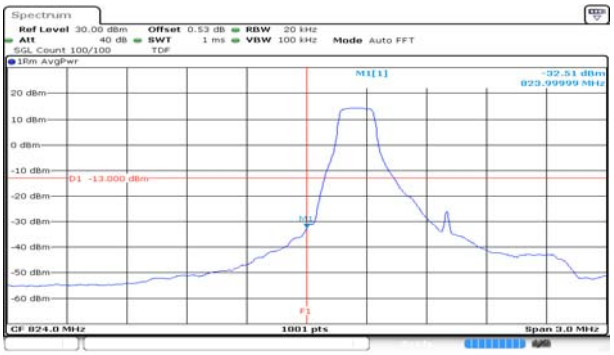
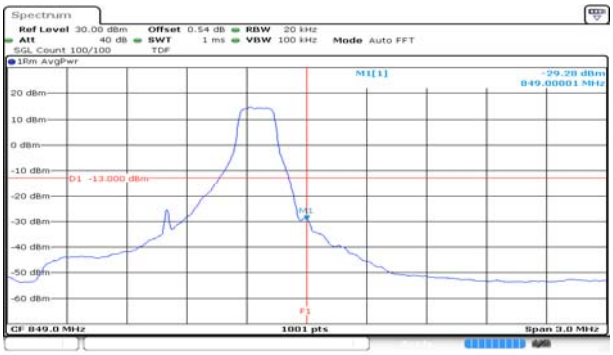
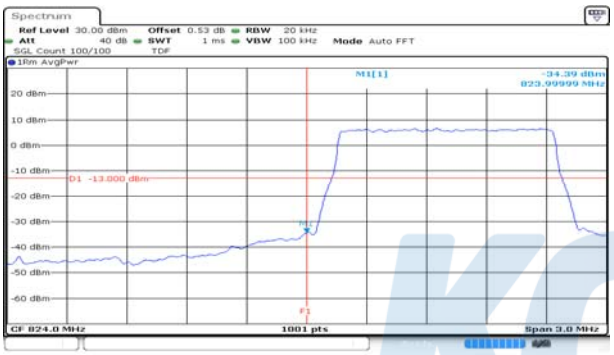
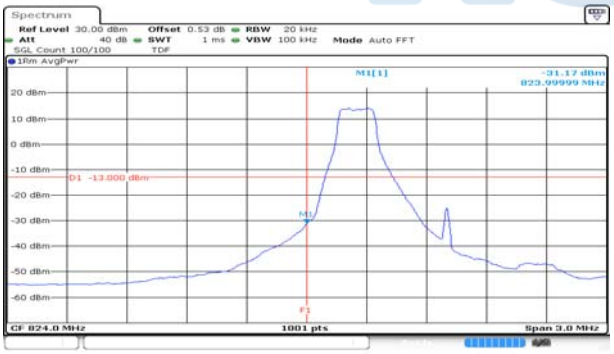
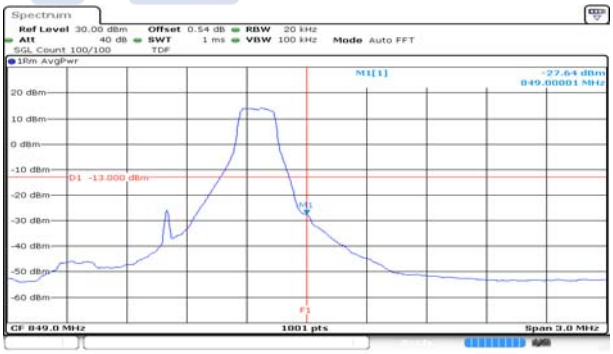
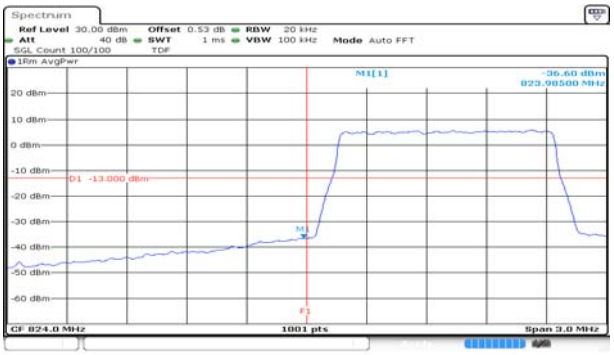
10M BW 16QAM Upper extended 1RB



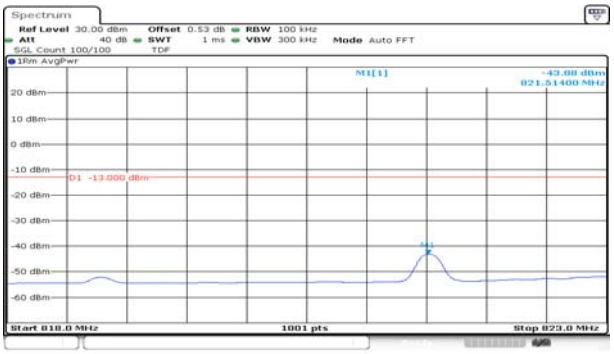
10M BW 16QAM Lower extended FRB

10M BW 16QAM Upper extended FRB

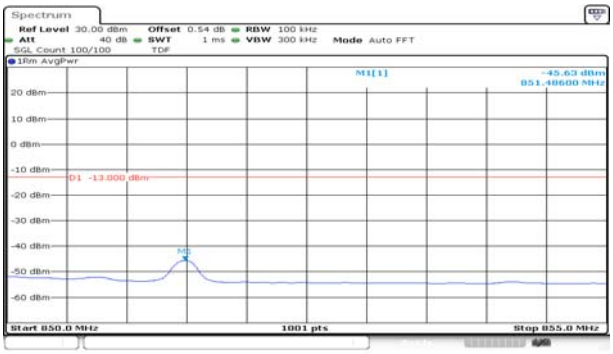
Test mode: LTE Band 26

1.4M BW QPSK Low ch. 1RB	1.4M BW QPSK High ch. 1RB
	
1.4M BW QPSK Low ch. FRB	**1.4M BW QPSK High ch. FRB**
	
1.4M BW 16QAM Low ch. 1RB	**1.4M BW 16QAM High ch. 1RB**
	
1.4M BW 16QAM Low ch. FRB	**1.4M BW 16QAM High ch. FRB**
	

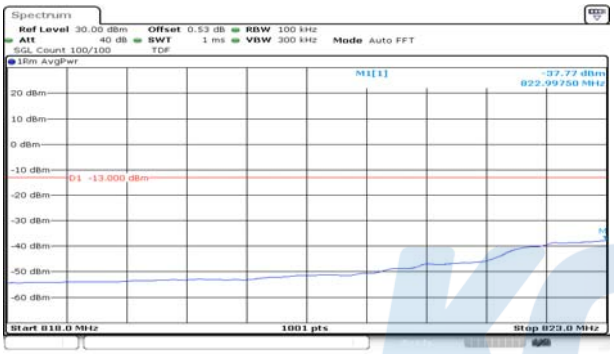
1.4M BW QPSK Lower extended 1RB



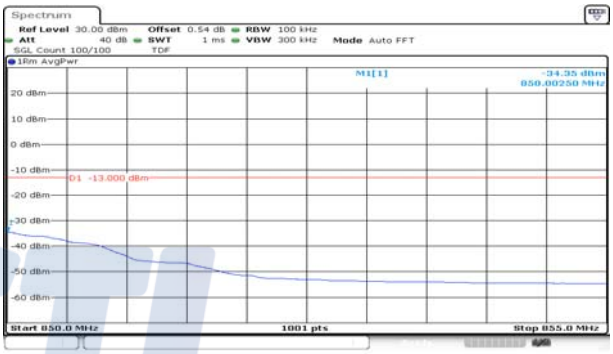
1.4M BW QPSK Upper extended 1RB



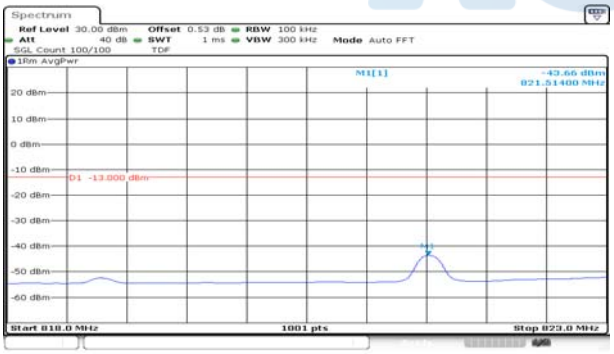
1.4M BW QPSK Lower extended FRB



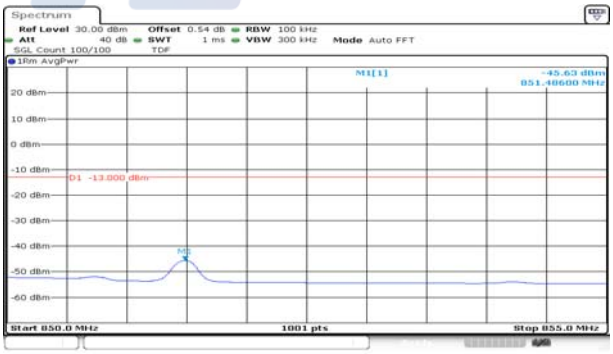
1.4M BW QPSK Upper extended FRB



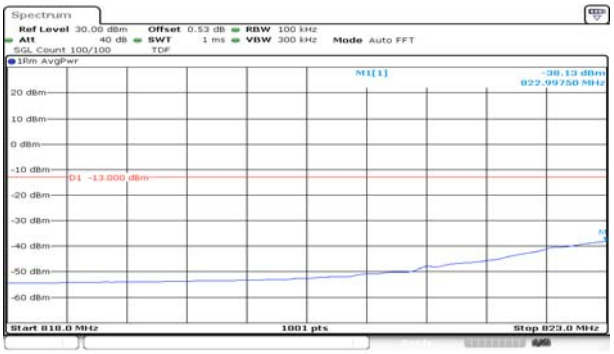
1.4M BW 16QAM Lower extended 1RB



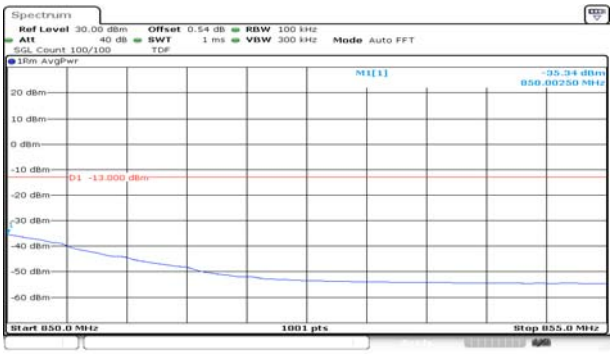
1.4M BW 16QAM Upper extended 1RB

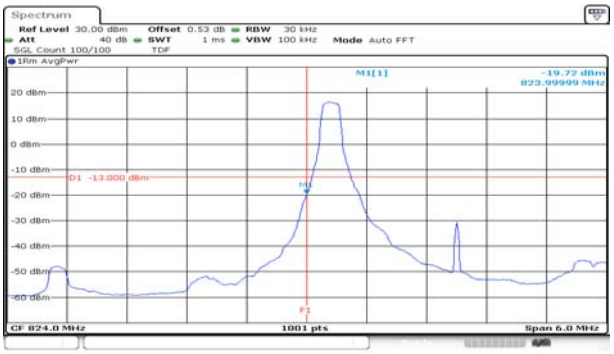
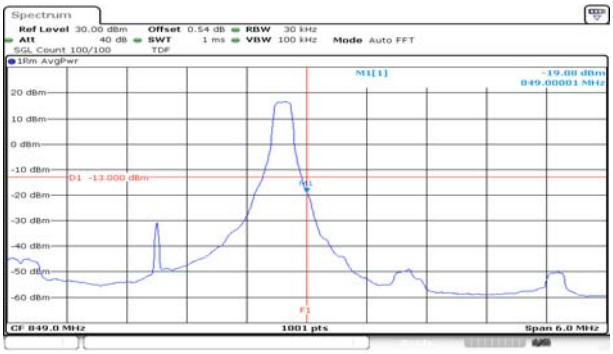
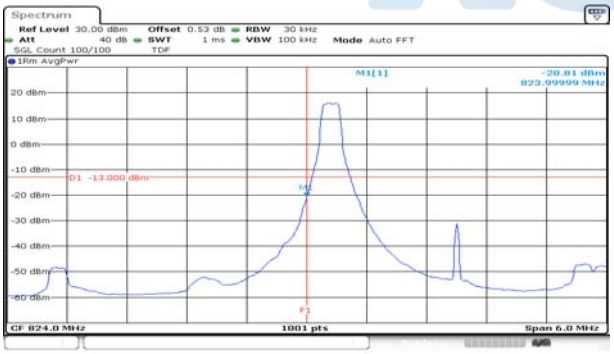
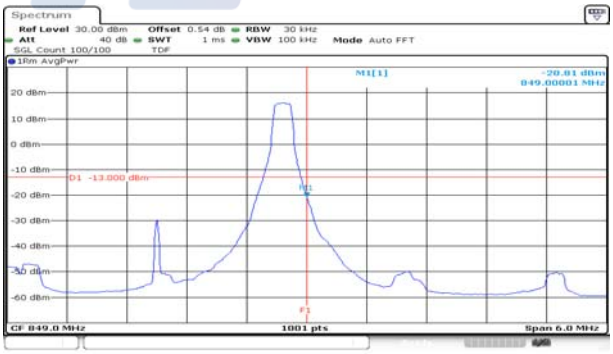
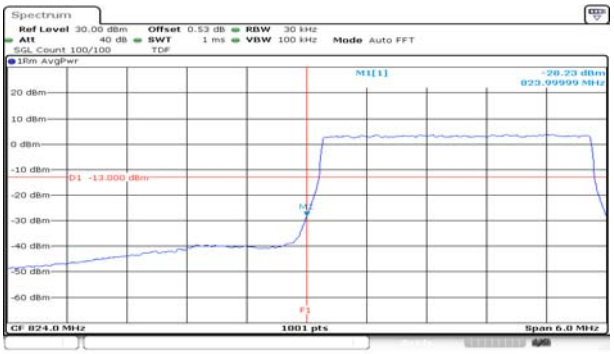
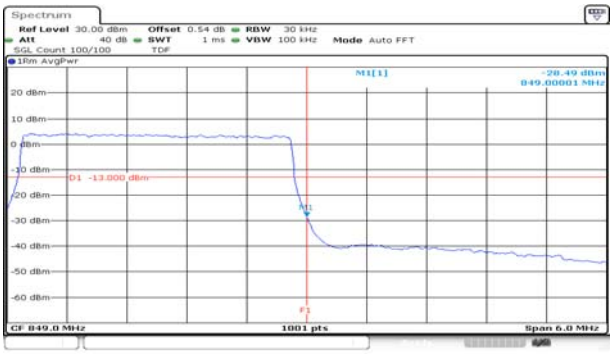


1.4M BW 16QAM Lower extended FRB

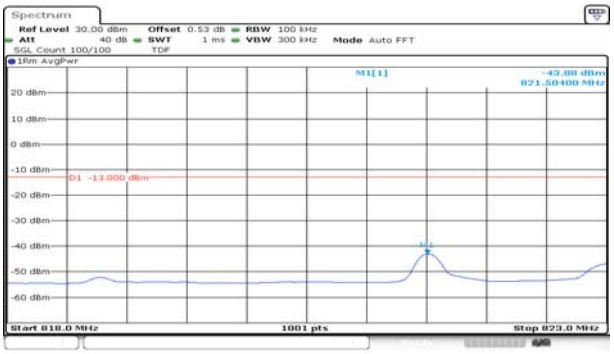


1.4M BW 16QAM Upper extended FRB

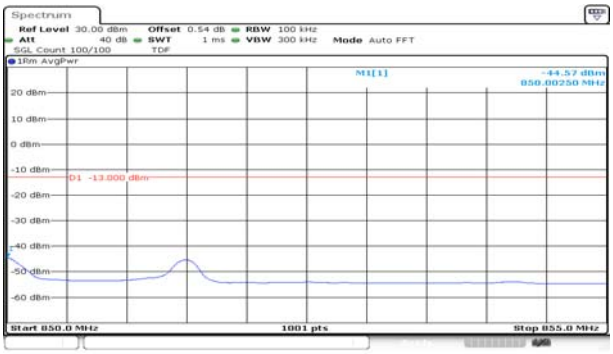


3M BW QPSK Low ch. 1RB	3M BW QPSK High ch. 1RB
	
3M BW QPSK Low ch. FRB	**3M BW QPSK High ch. FRB**
	
3M BW 16QAM Low ch. 1RB	**3M BW 16QAM High ch. 1RB**
	
3M BW 16QAM Low ch. FRB	**3M BW 16QAM High ch. FRB**
	

3M BW QPSK Lower extended 1RB



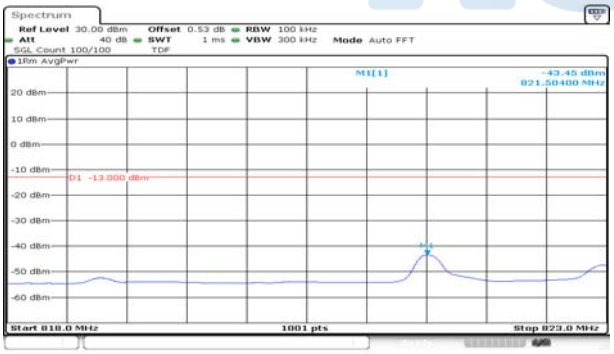
3M BW QPSK Upper extended 1RB



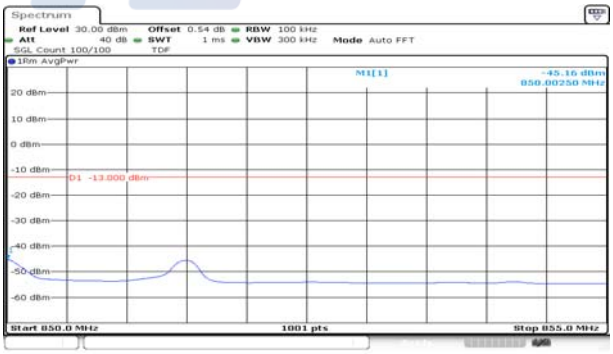
3M BW QPSK Lower extended FRB

3M BW QPSK Upper extended FRB

3M BW 16QAM Lower extended 1RB



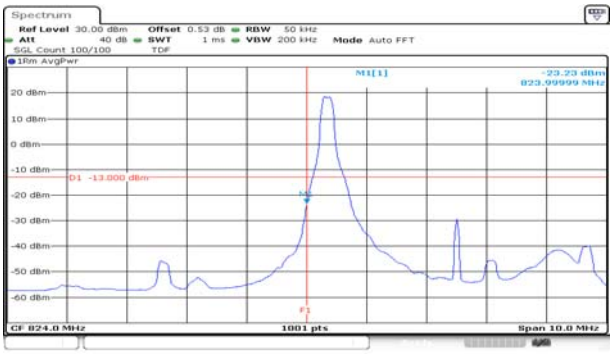
3M BW 16QAM Upper extended 1RB



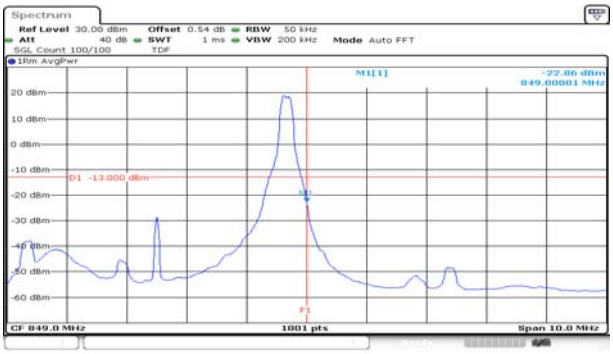
3M BW 16QAM Lower extended FRB

3M BW 16QAM Upper extended FRB

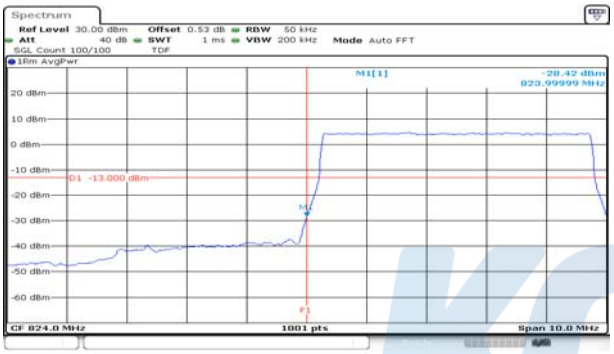
5M BW QPSK Low ch. 1RB



5M BW QPSK High ch. 1RB

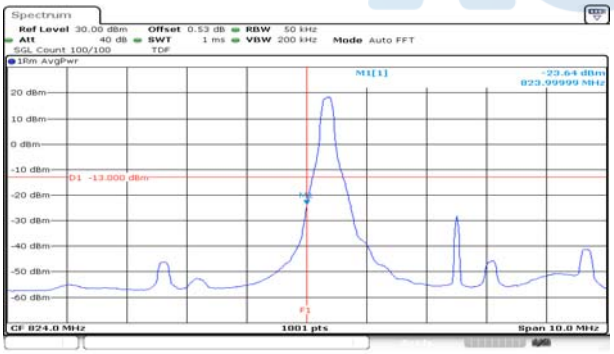


5M BW QPSK Low ch. FRB

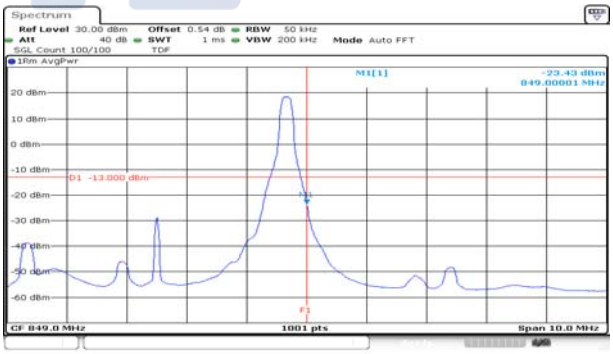


5M BW QPSK High ch. FRB

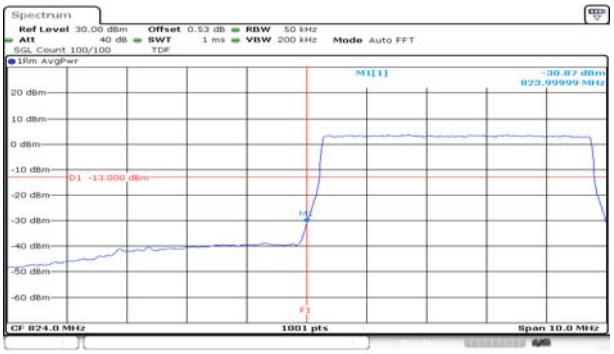
5M BW 16QAM Low ch. 1RB



5M BW 16QAM High ch. 1RB

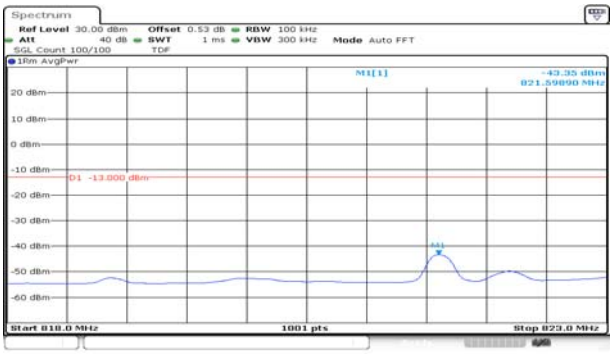


5M BW 16QAM Low ch. FRB

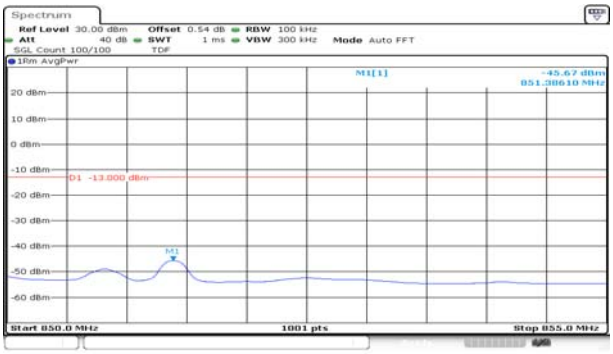


5M BW 16QAM High ch. FRB

5M BW QPSK Lower extended 1RB

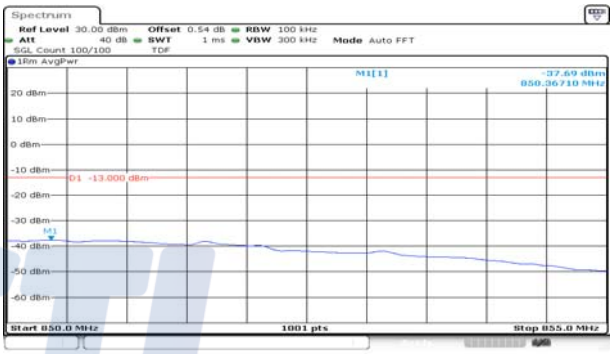


5M BW QPSK Upper extended 1RB



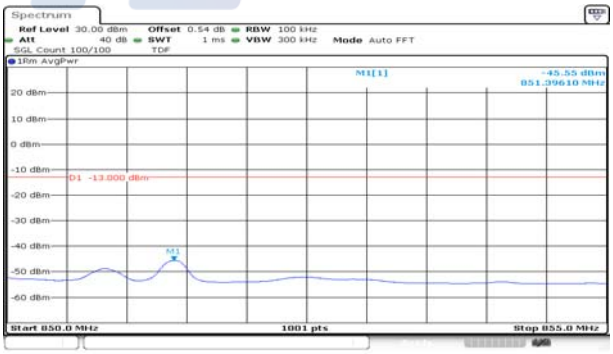
5M BW QPSK Lower extended FRB

5M BW QPSK Upper extended FRB



5M BW 16QAM Lower extended 1RB

5M BW 16QAM Upper extended 1RB



5M BW 16QAM Lower extended FRB

5M BW 16QAM Upper extended FRB