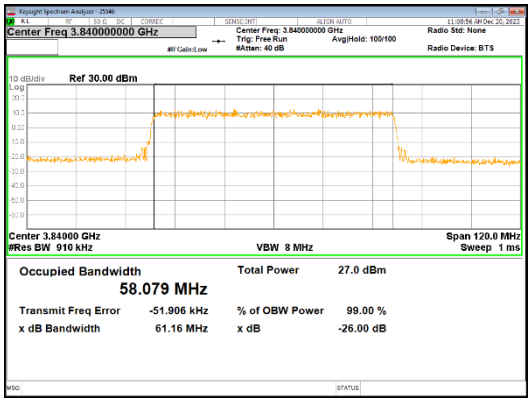
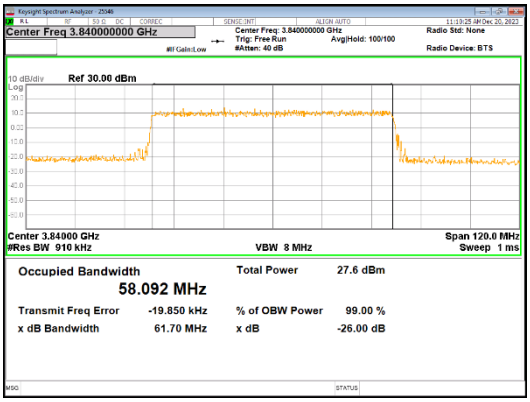
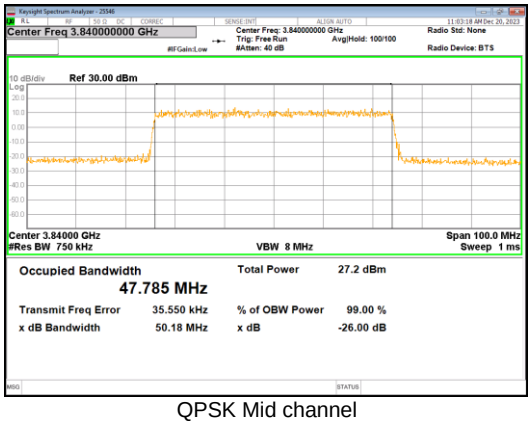
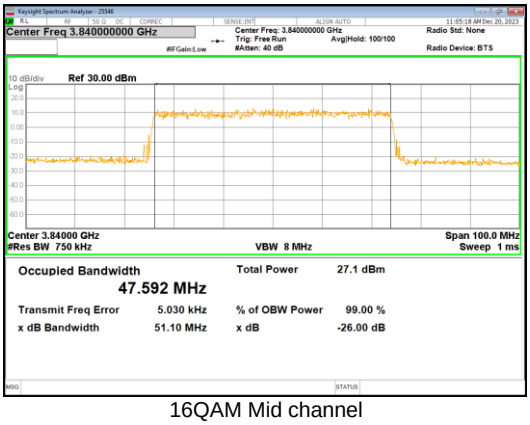
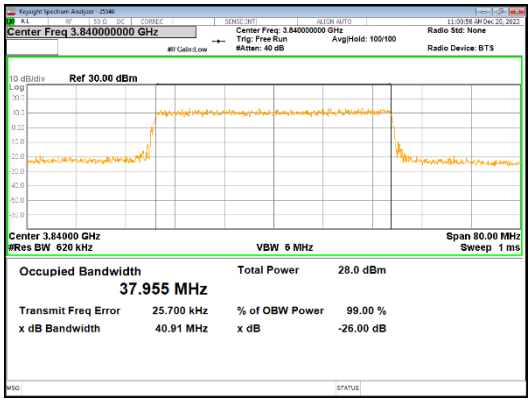
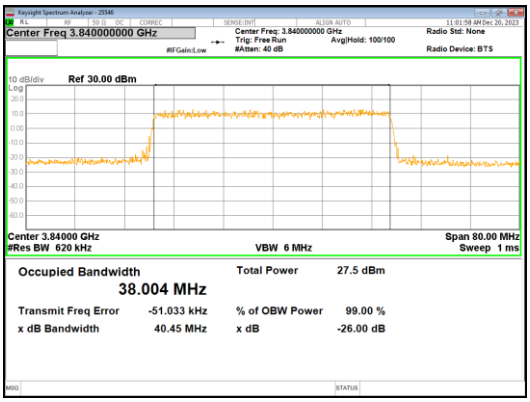
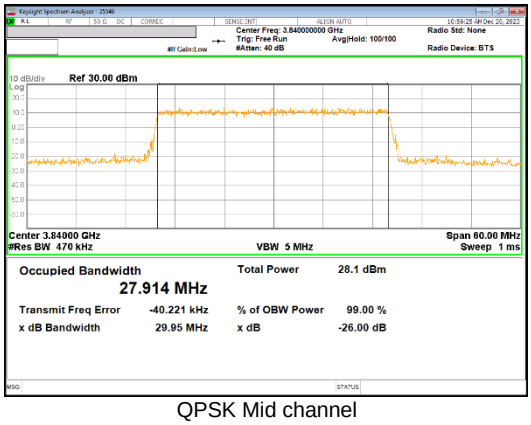
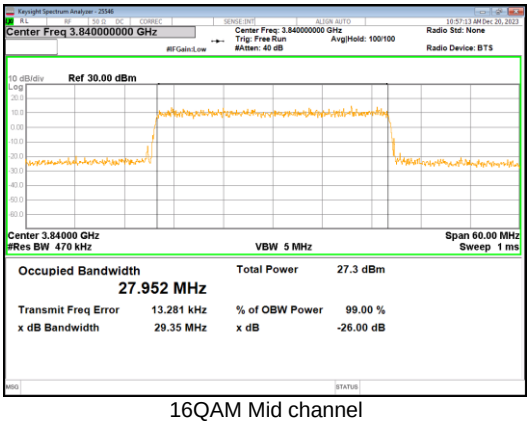
60MHz	 QPSK Mid channel	 16QAM Mid channel
50MHz	 QPSK Mid channel	 16QAM Mid channel
40MHz	 QPSK Mid channel	 16QAM Mid channel
30MHz	 QPSK Mid channel	 16QAM Mid channel

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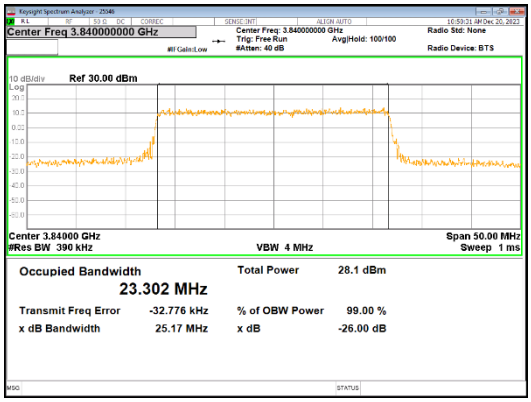
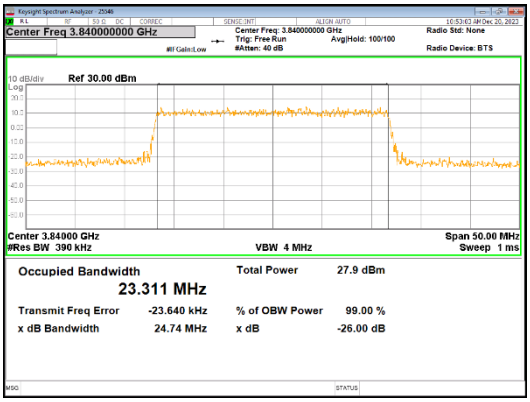
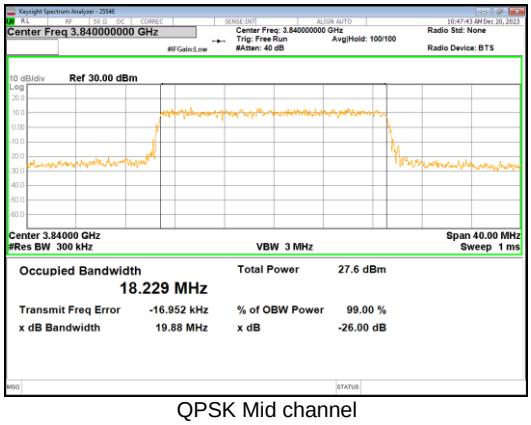
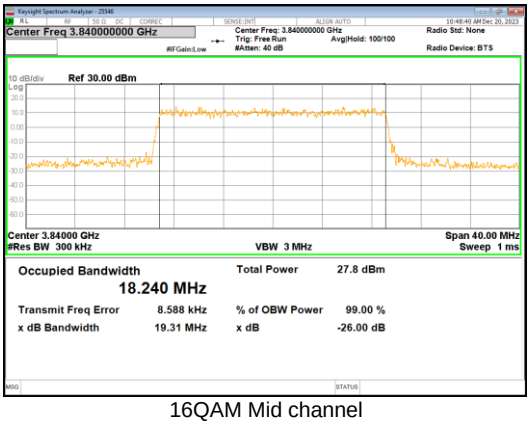
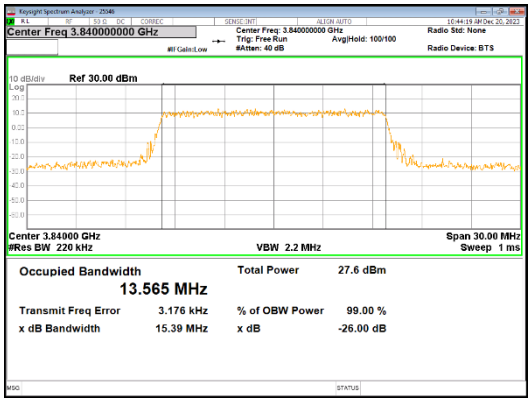
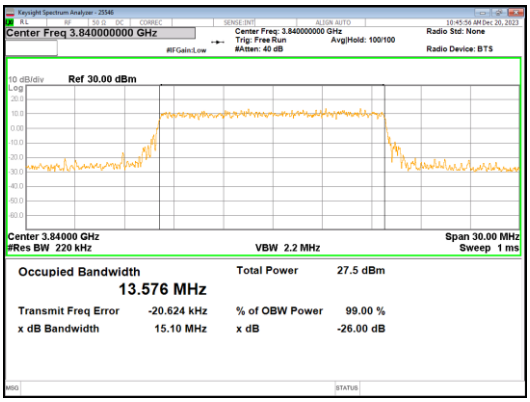
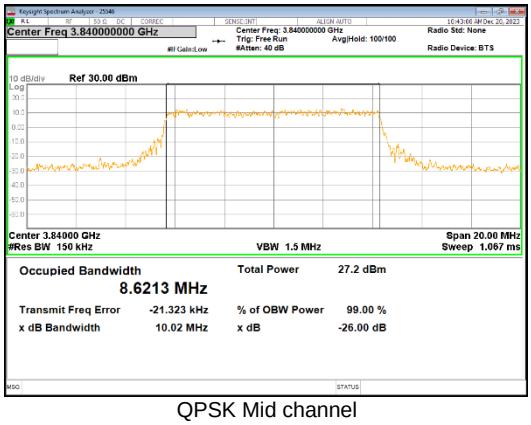
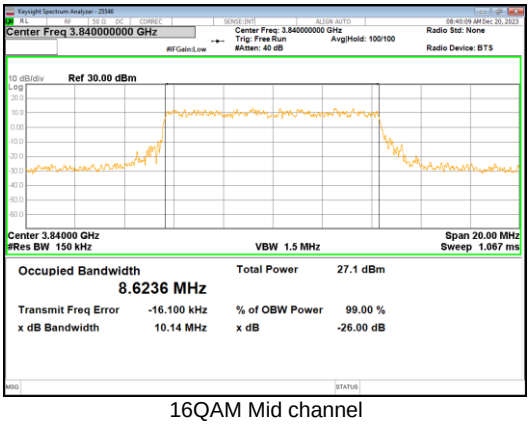
25MHz	 QPSK Mid channel	 16QAM Mid channel
20MHz	 QPSK Mid channel	 16QAM Mid channel
15MHz	 QPSK Mid channel	 16QAM Mid channel
10MHz	 QPSK Mid channel	 16QAM Mid channel

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8.4. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §27. 53

LIMITS

Part 27.53:
(c) 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:

(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;

(4) On all frequencies between 763-775 MHz and 793-806 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(g) 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) dB.

(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 + 10 $\log_{10}$ (P) dB.

(m) (4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) 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) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

(l)(2) For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. 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.

(n)(2) For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. 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.

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TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The transmitter output was connected to either CMW500 Test Set or E7515B Test set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

WCDMA/LTE/5G NR

a) Set the RBW = 1 - 1.5 % of OBW(Typically limited to a minimum RBW of 1% of the OBW)
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = Auto;
e) Detector = RMS;
f) Ensure that the number of measurement points ≥ 2*Span/RBW;
g) Trace Mode = Average (100);

NOTE1

For frequency range of 763-775 MHz and 793-806 MHz, 769-775 MHz and 799-805 MHz.(LTE Band 13)

a) Set the RBW = 6.2 kHz
b) Set VBW ≥ 3 × RBW;
c) Sweep time = 1 second ;
d) Detector = RMS;
e) Ensure that the number of measurement points ≥ 2*Span/RBW;
f) Trace Mode = Average;

NOTE2

Note that the spurious emissions outside of the channel include narrowband signals. These signals are all below the -13dBm / -25dBm limits. Although the measurement bandwidth is less than the reference bandwidth of 1MHz no addental correction is applied as ANSI C63.26 section 4.2.3 only requires the correction to be applied when the OBW of the emission being measured is wider than the measurement bandwidth (Where the OBW of the signal under measurement is less than the RBW of the measuring instrument, no bandwidth correction or integration will be required.) Plots for low and high channels show the level of the emission measured with the reduced bandwidth and the level of the same emission measured using the integration method over the 1MHz reference bandwidth are very close, indicating the emissions are narrowband.

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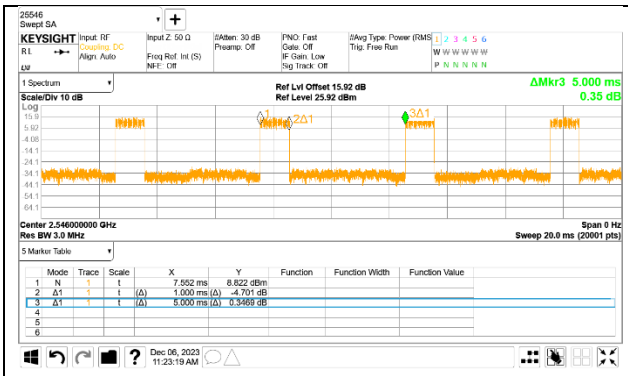
NOTE3

For Band-Edge extended:

CH BW (MHz)	RB Used (kHz)	CF for emissions more than 100kHz	CF for emissions more than 1MHz
1.4	15	+8.2 dB	+18.2 dB
3	30	+5.2 dB	+15.2 dB
5	51	+2.9 dB	+12.9 dB
10	100	N/A	+10.0 dB
15	150	N/A	+8.2 dB
20	200	N/A	+7.0 dB

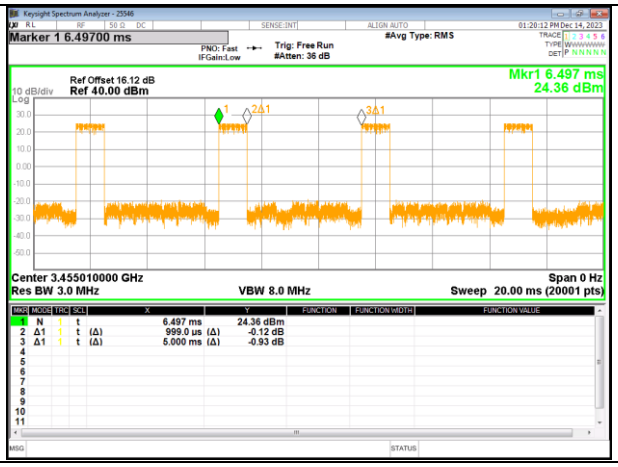
For the band edge value measured in [RB Used], even if [CF for emissions reference bandwidth 100kHz/1MHz] is applied, it is below -13dBm.

NOTE4



For 5G NR n41 (Gate trigger off):
RF Path Loss: 15.928 dB & DCF 7 dB: 10log(1/5)
Measure offset: 15.92 dB+7 dB = **22.92 dB**

For 5G NR n77 3450-3550 MHz(Gate trigger off):
RF Path Loss: 16.12 dB & DCF 7 dB: 10log(1/5)
Measure offset: 16.12 dB+7 dB = **23.12 dB**



For 5G NR n77 3700-3980 MHz(Gate trigger off):
RF Path Loss: 16.10 dB & DCF 7 dB: 10log(1/5)
Measure offset: 16.10 dB+7 dB = **23.10 dB**

NOTE5

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations (π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All Modes of operation were investigated and the worst case configuration results are reported in this section.

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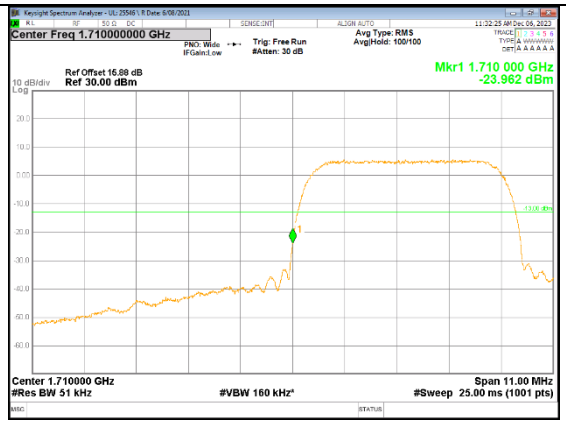
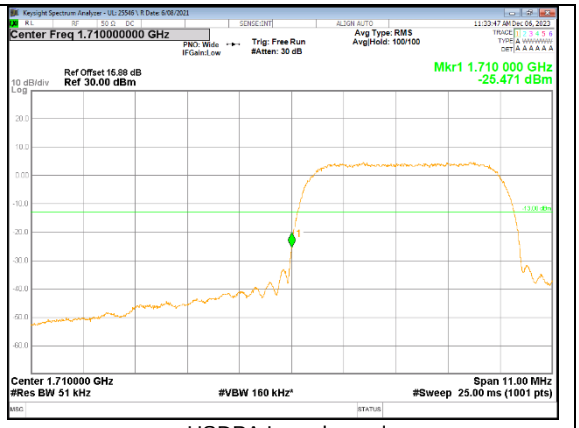
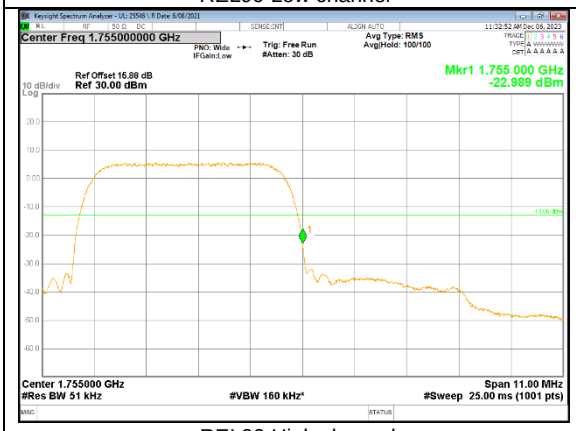
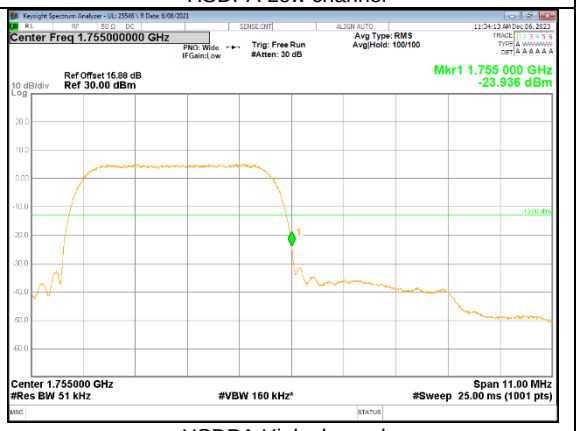
8.4.1. BAND EDGE RESULTS

WCDMA

Band 4	 REL99 Low channel	 HSDPA Low channel
	 REL99 High channel	 HSDPA High channel

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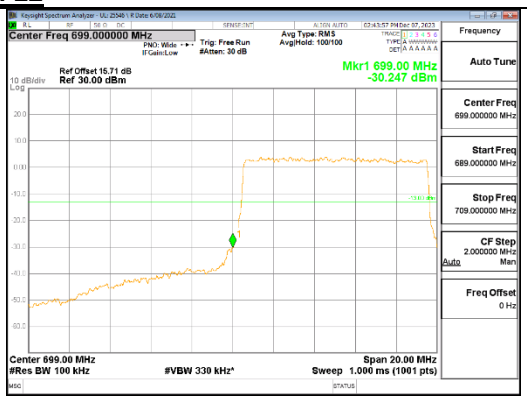
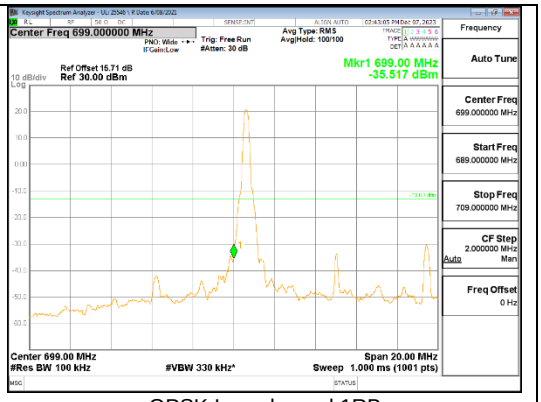
LTE Band 12

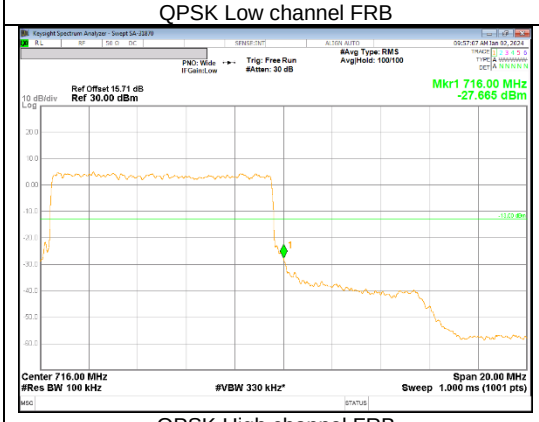
10MHz



QPSK Low channel FRB



QPSK Low channel 1RB



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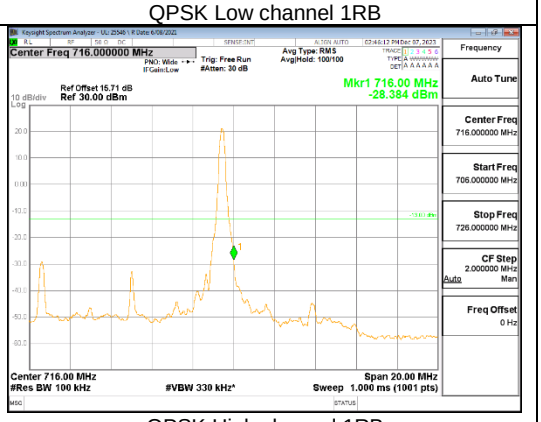

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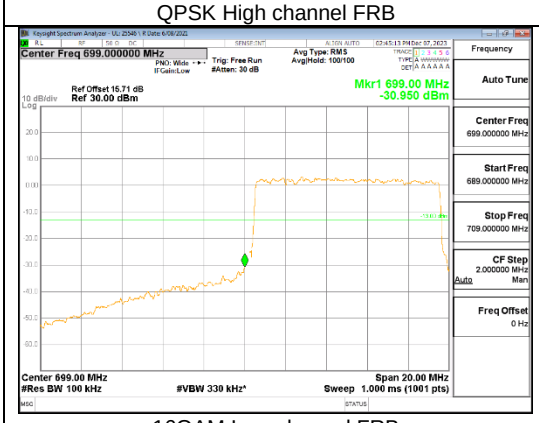
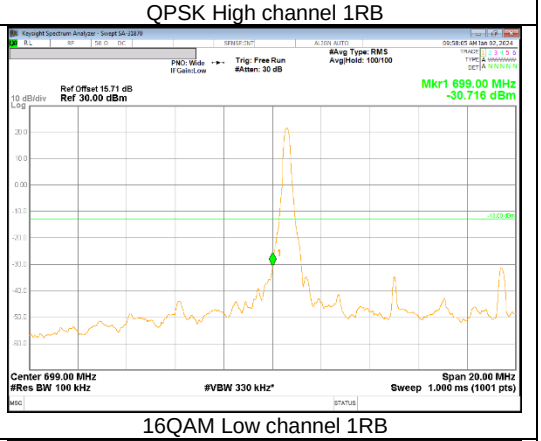
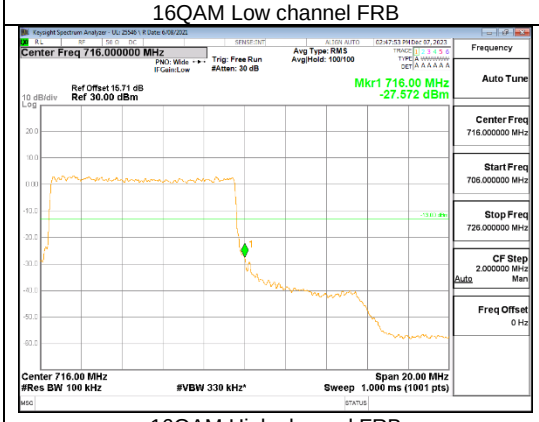


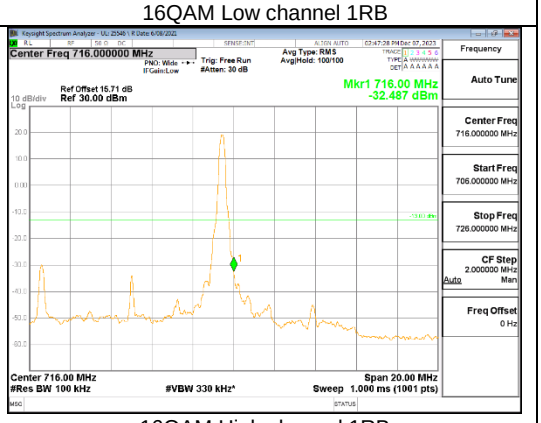
16QAM Low channel FRB



16QAM Low channel 1RB



16QAM High channel FRB



16QAM High channel 1RB

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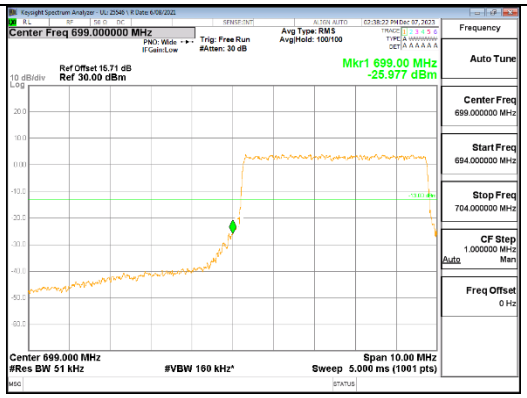
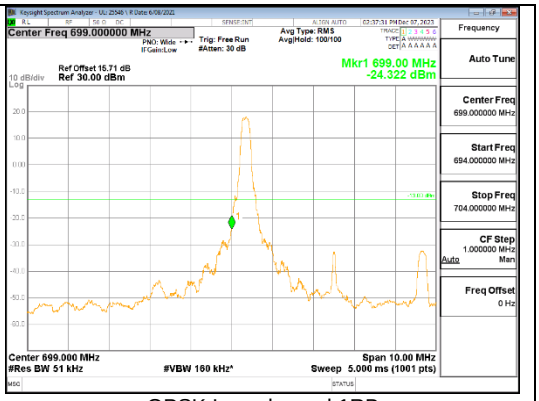
5MHz



QPSK Low channel FRB



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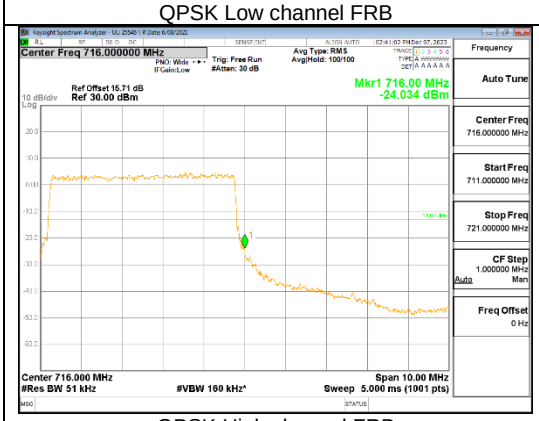
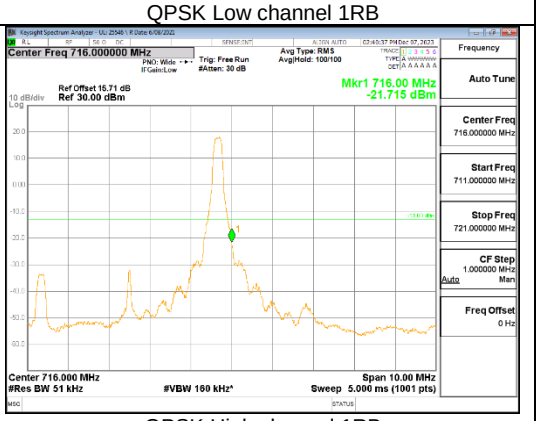


QPSK High channel FRB



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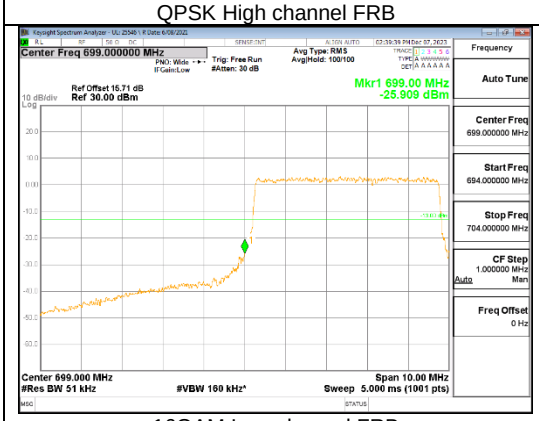
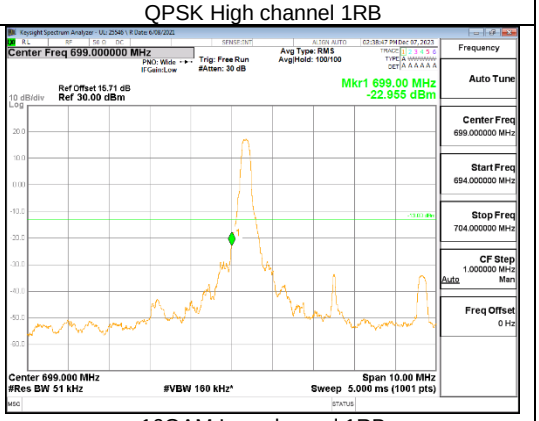


16QAM Low channel FRB



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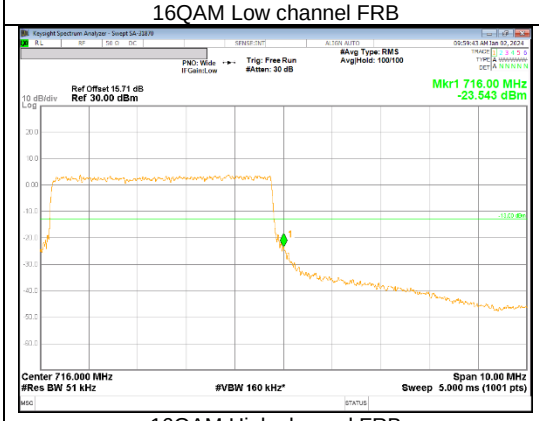
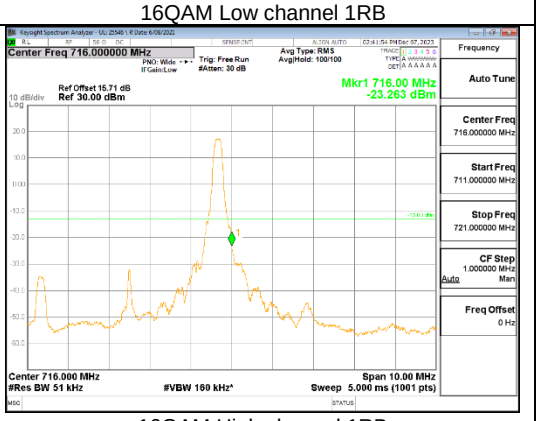


16QAM High channel FRB



16QAM High channel 1RB

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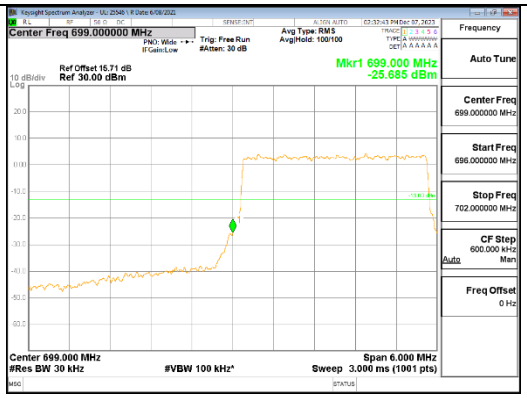
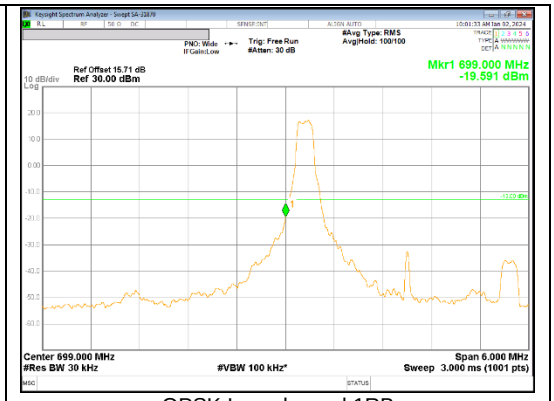
3MHz



QPSK Low channel FRB



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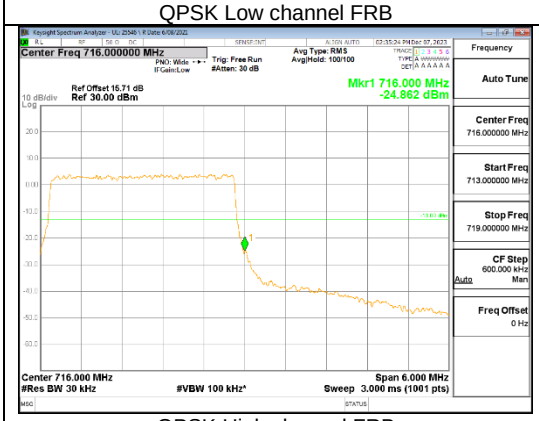

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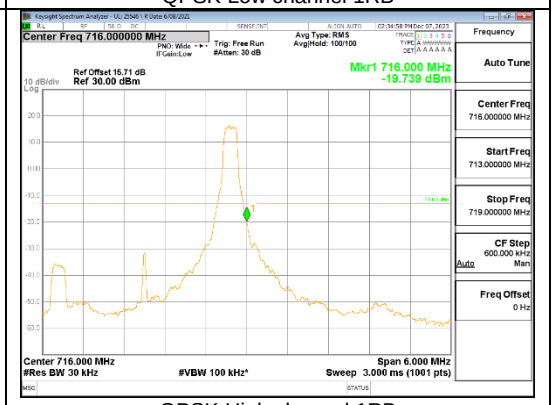

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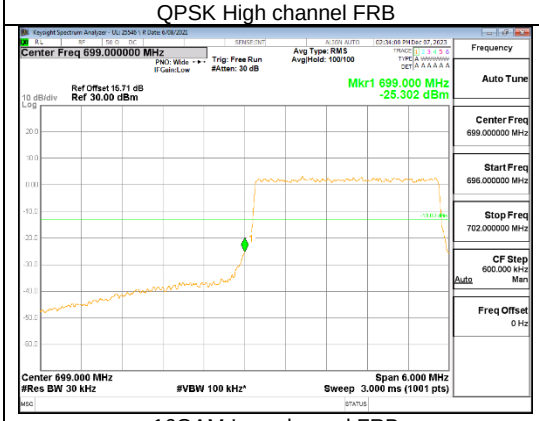

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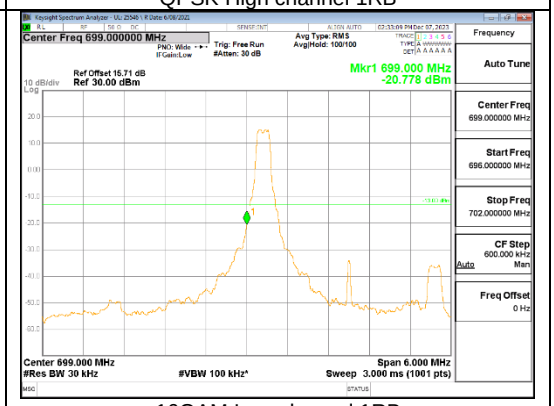

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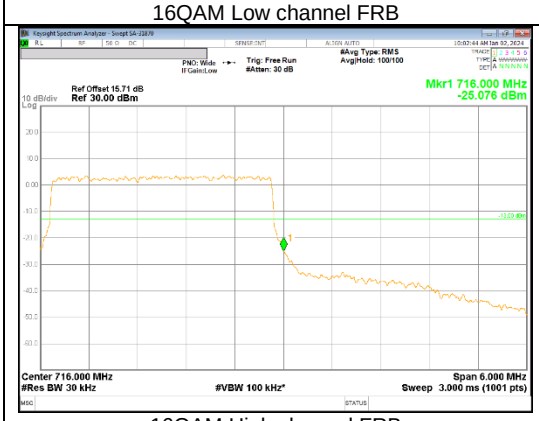

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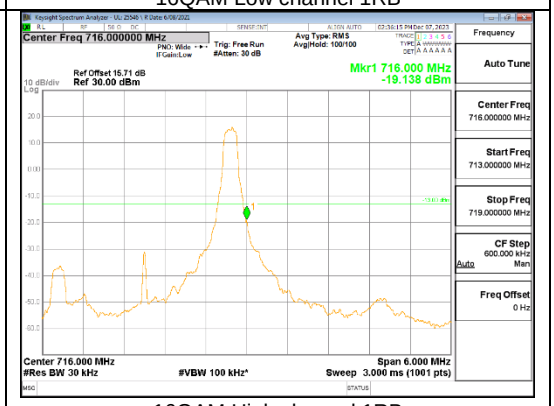

16QAM High channel 1RB

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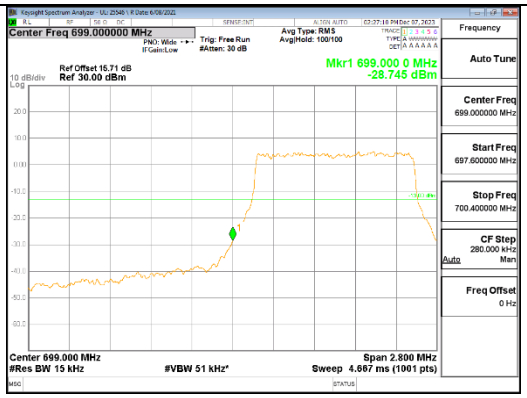
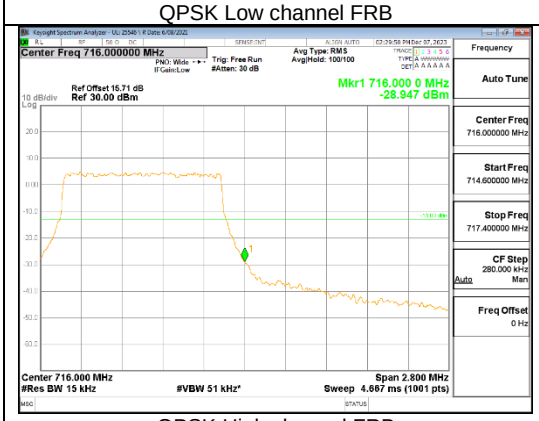
1.4MHz



QPSK Low channel FRB

QPSK Low channel 1RB



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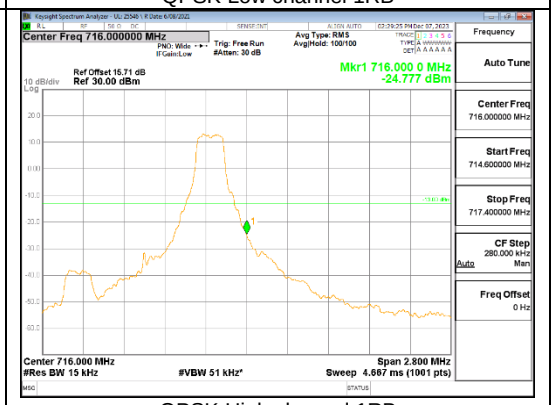
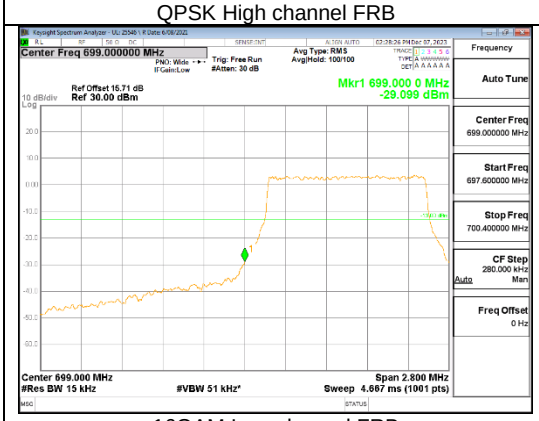


QPSK High channel 1RB



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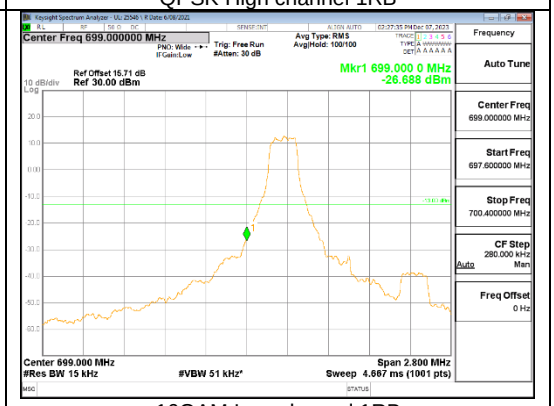

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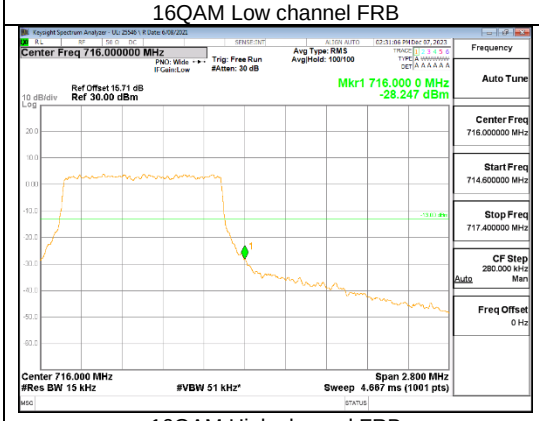
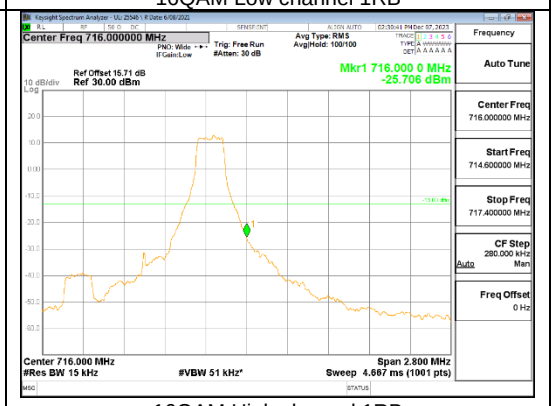


16QAM High channel FRB



16QAM High channel 1RB

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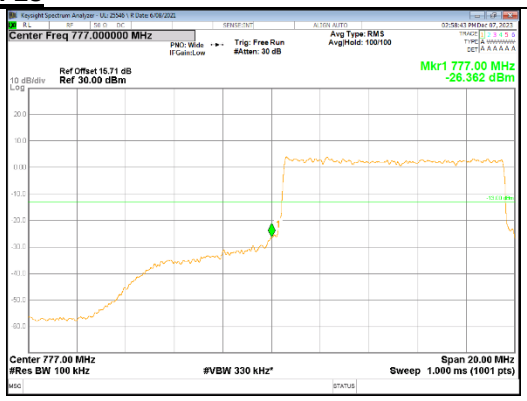
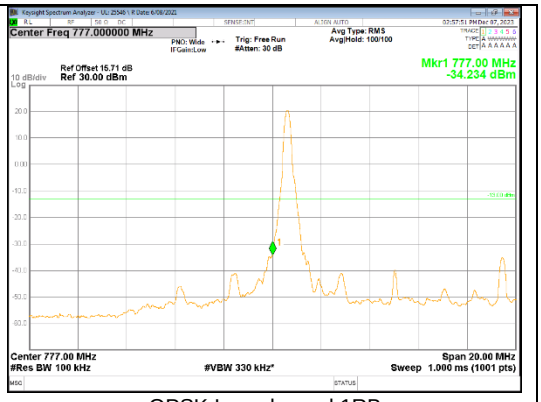
LTE Band 13

10MHz



QPSK Low channel FRB



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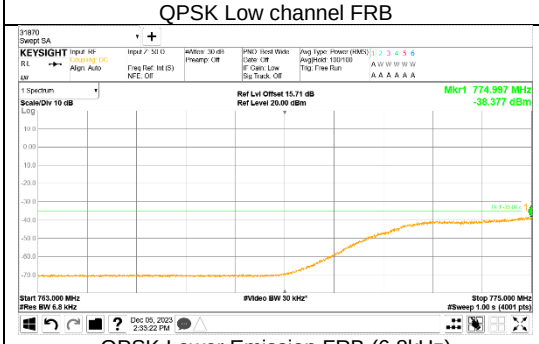
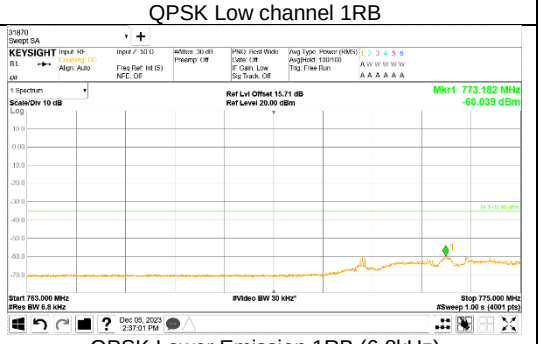
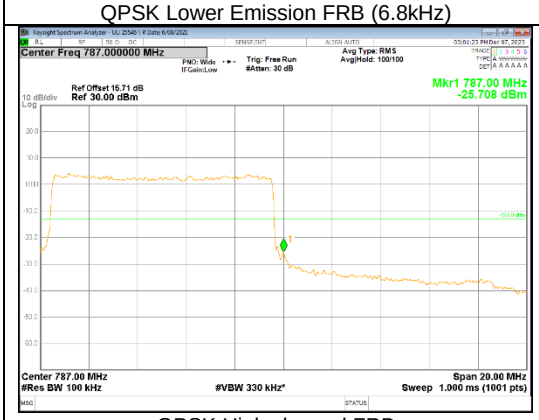


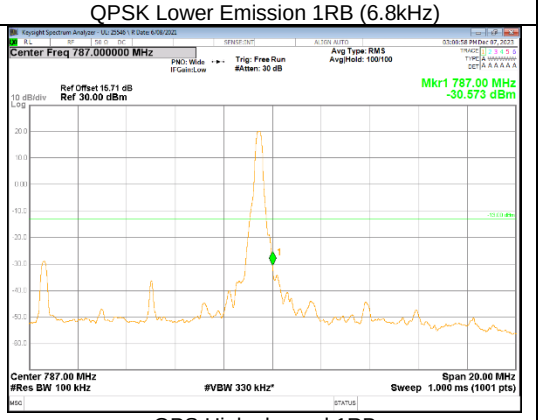
QPSK Lower Emission FRB (6.8kHz)



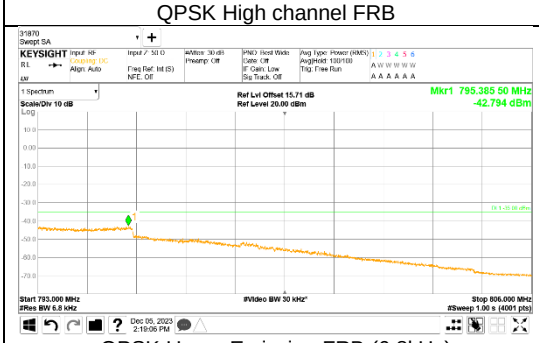
QPSK Lower Emission 1RB (6.8kHz)



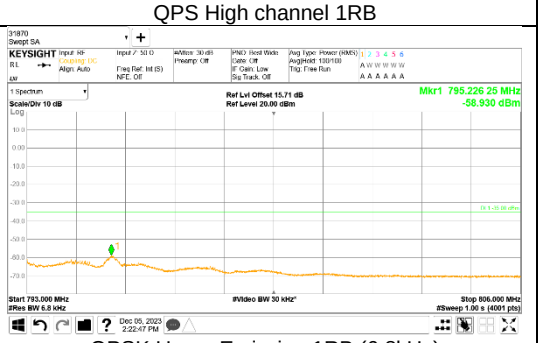
QPSK High channel FRB



QPS High channel 1RB



QPSK Upper Emission FRB (6.8kHz)



QPSK Upper Emission 1RB (6.8kHz)

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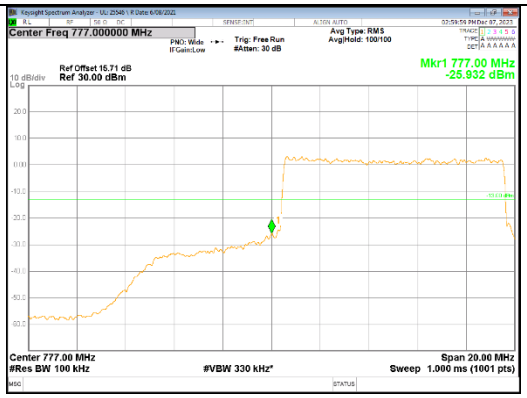
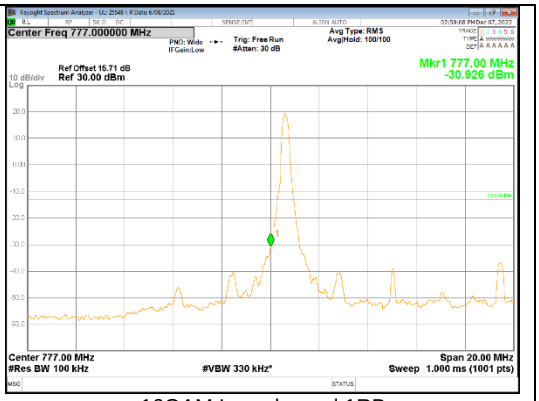
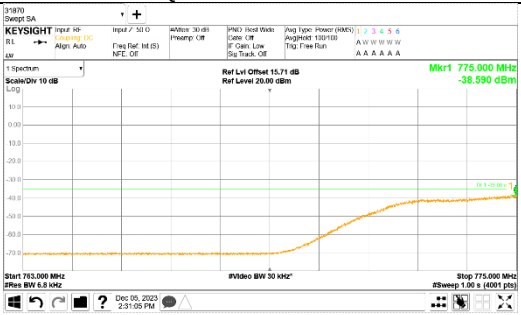
10MHz



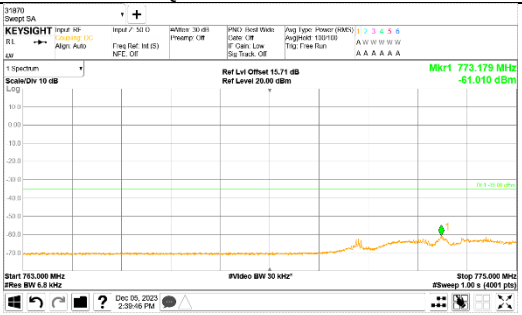
16QAM Low channel FRB



16QAM Low channel 1RB

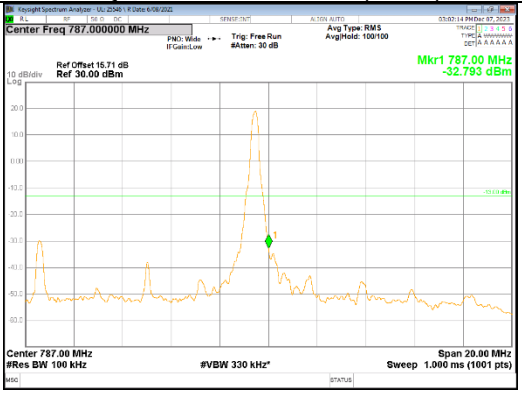


16QAM Lower Emission FRB (6.8kHz)

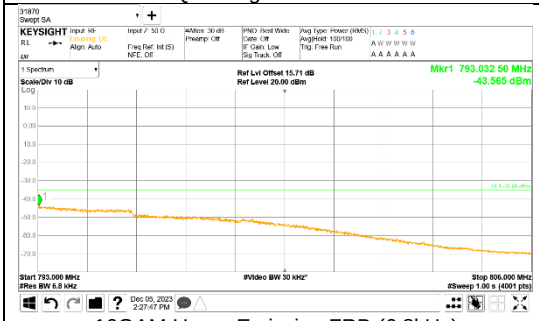


16QAM Lower Emission 1RB (6.8kHz)

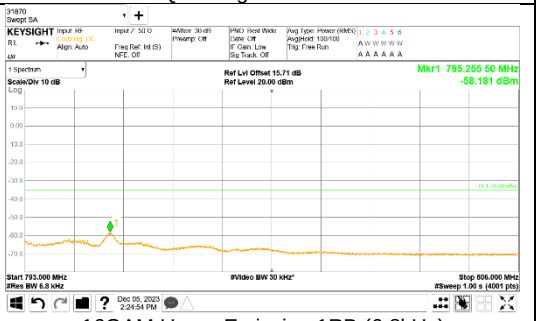
16QAM High channel FRB



16QAM High channel 1RB



16QAM Upper Emission FRB (6.8kHz)



16QAM Upper Emission 1RB (6.8kHz)

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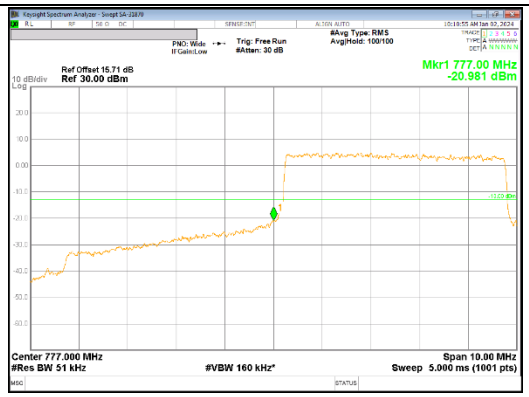
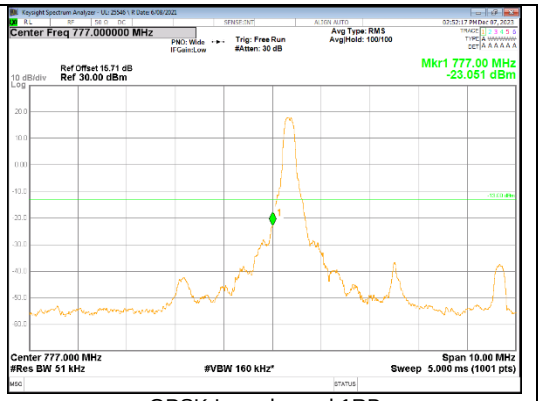
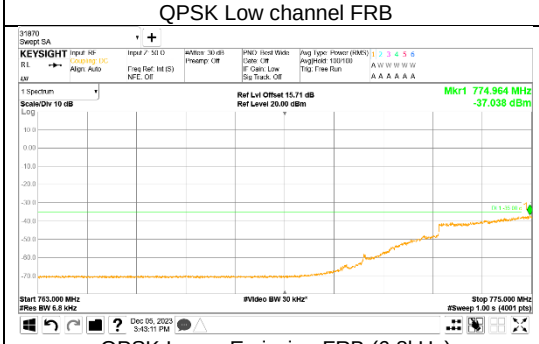
5MHz



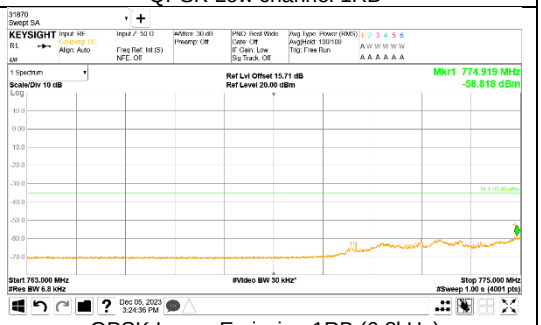
QPSK Low channel FRB



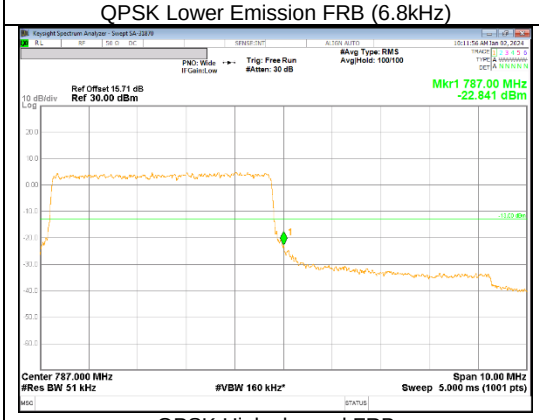
QPSK Low channel 1RB



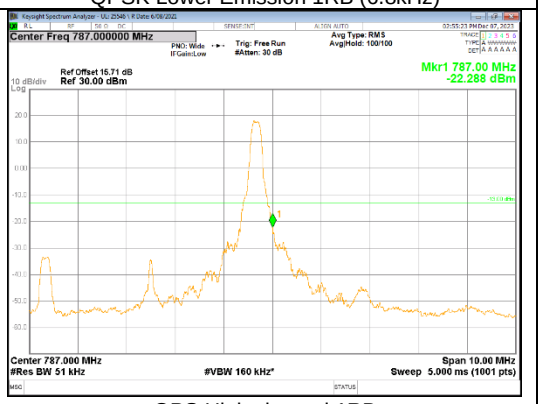
QPSK Lower Emission FRB (6.8kHz)



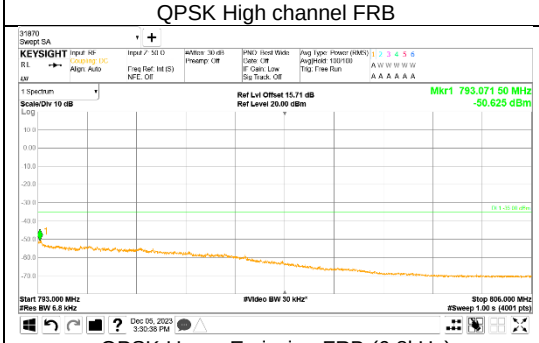
QPSK Lower Emission 1RB (6.8kHz)



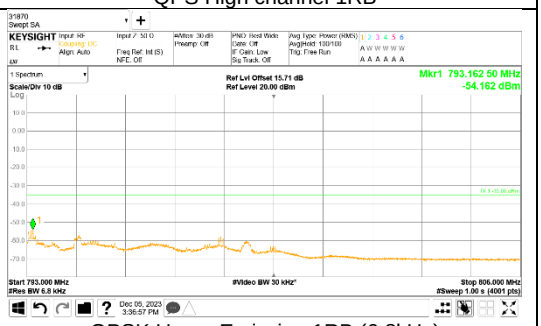
QPSK High channel FRB



QPS High channel 1RB



QPSK Upper Emission FRB (6.8kHz)



QPSK Upper Emission 1RB (6.8kHz)

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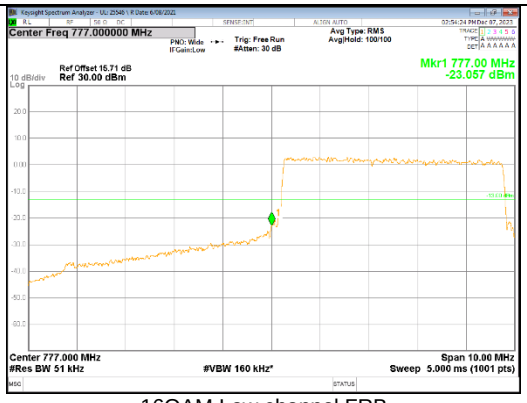
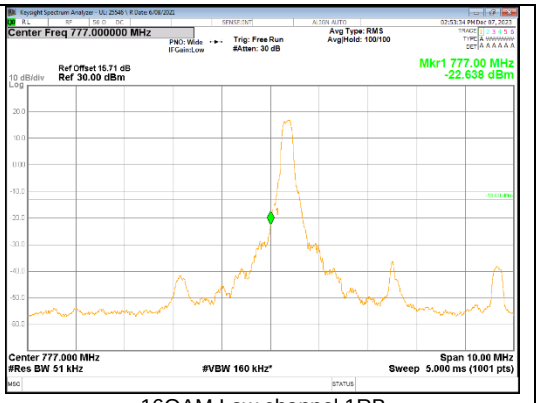
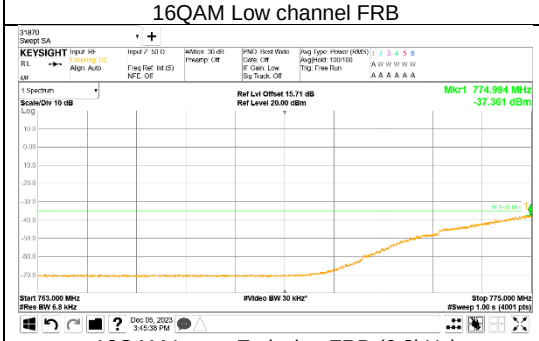
5MHz



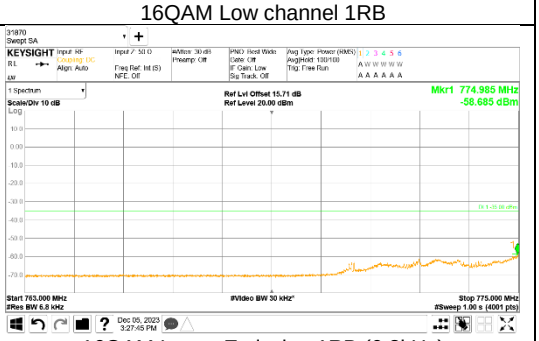
16QAM Low channel FRB



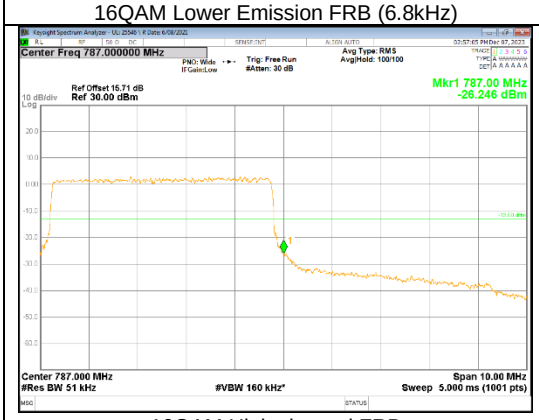
16QAM Low channel 1RB



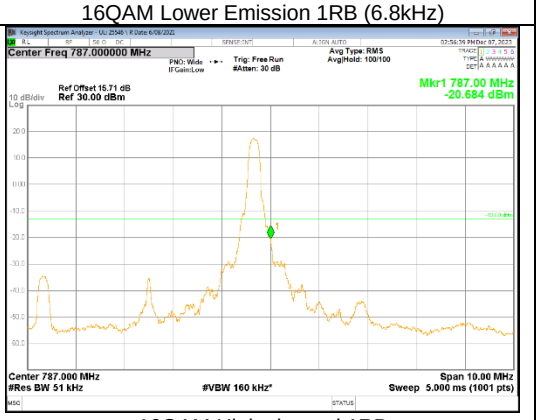
16QAM Lower Emission FRB (6.8kHz)



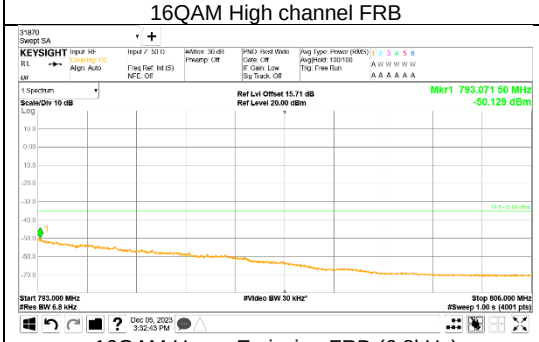
16QAM Lower Emission 1RB (6.8kHz)



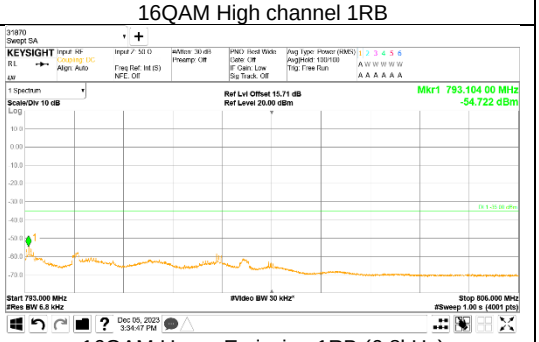
16QAM High channel FRB



16QAM High channel 1RB



16QAM Upper Emission FRB (6.8kHz)



16QAM Upper Emission 1RB (6.8kHz)

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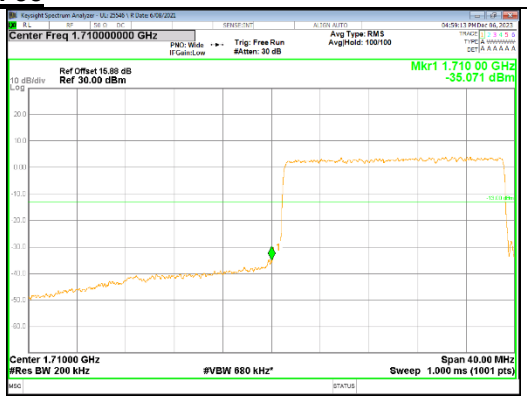
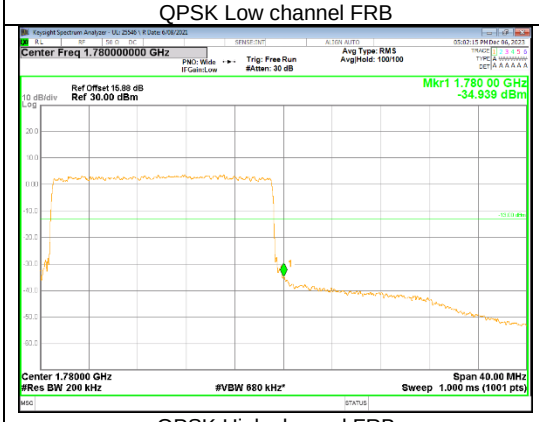
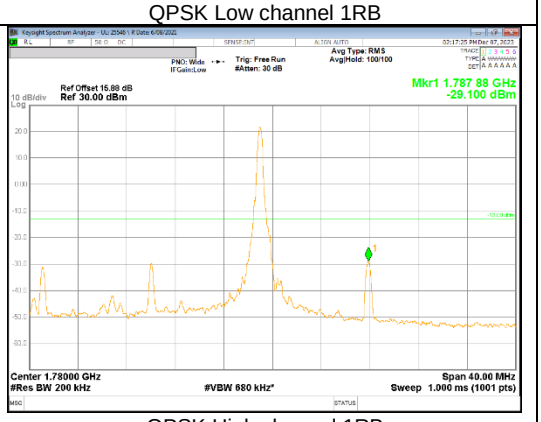
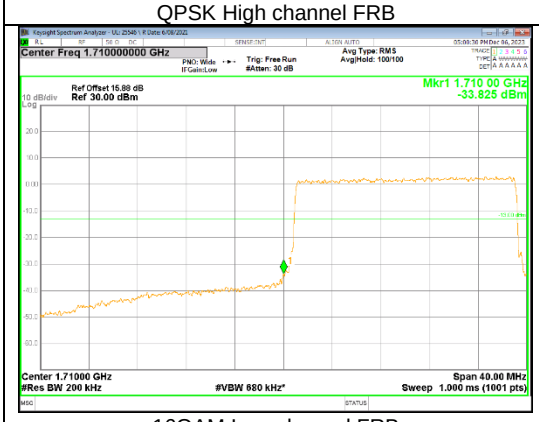
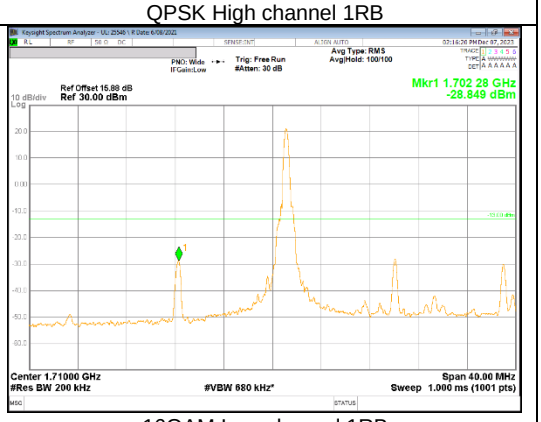
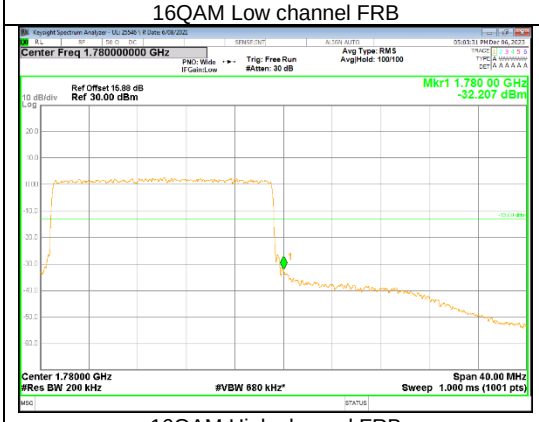
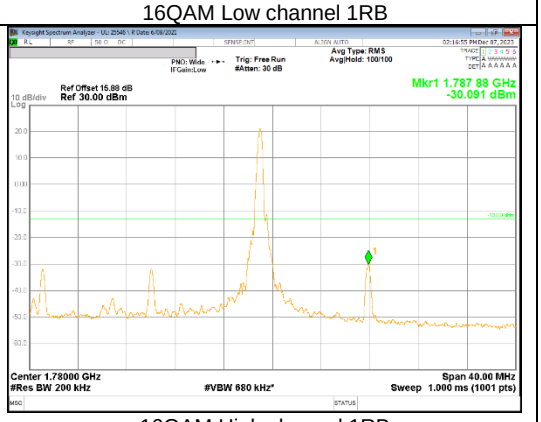
LTE Band 66

20MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB
	 QPSK High channel FRB	 QPSK High channel 1RB
	 16QAM Low channel FRB	 16QAM Low channel 1RB
	 16QAM High channel FRB	 16QAM High channel 1RB

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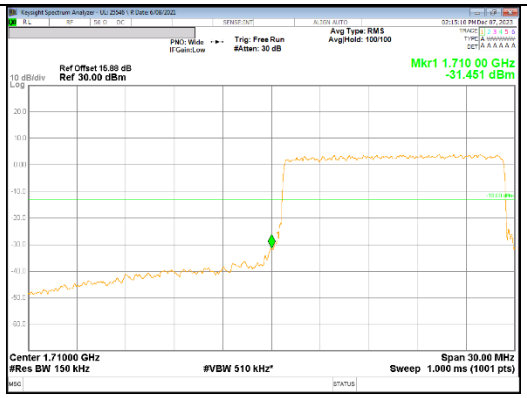
15MHz



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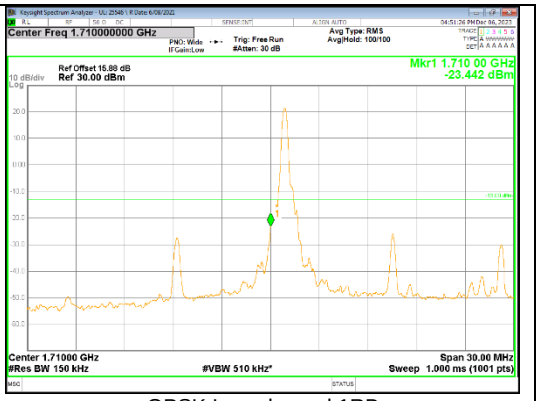

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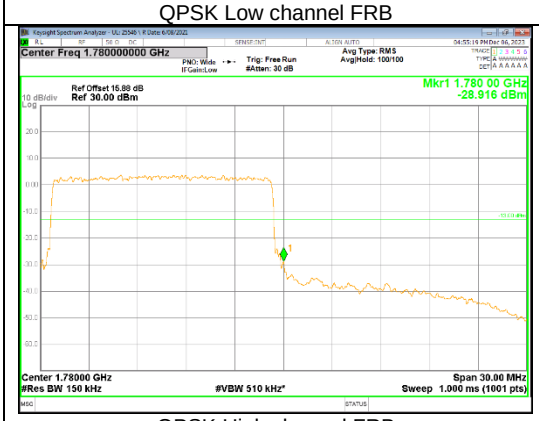

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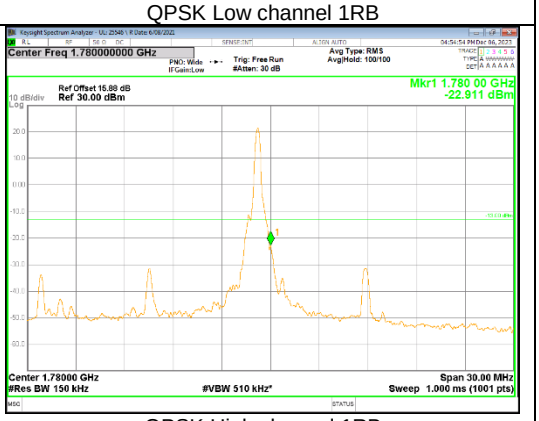

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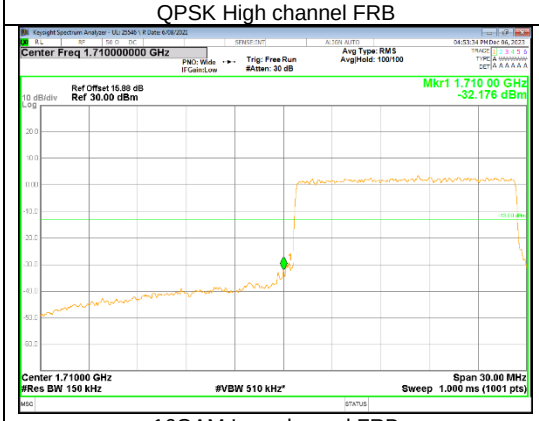

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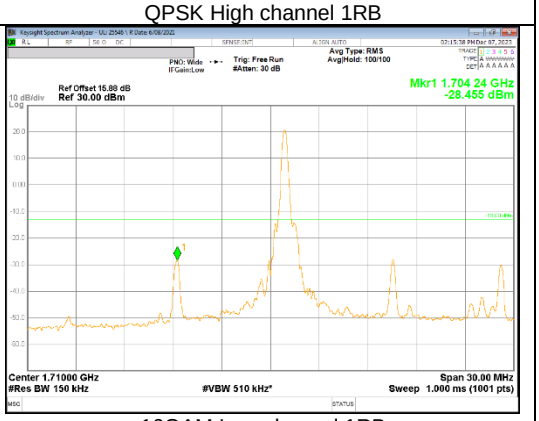

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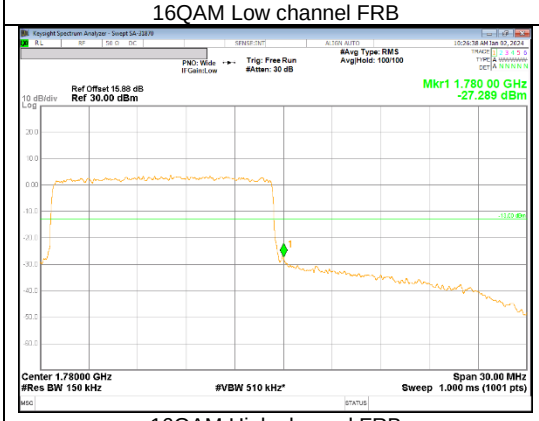

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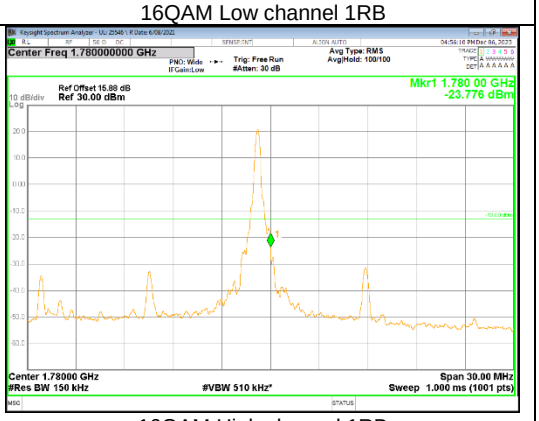

16QAM High channel 1RB

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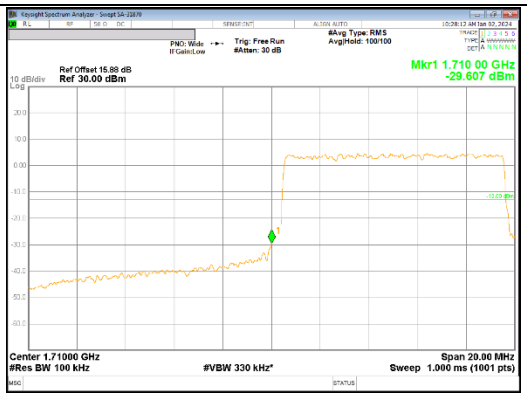
10MHz



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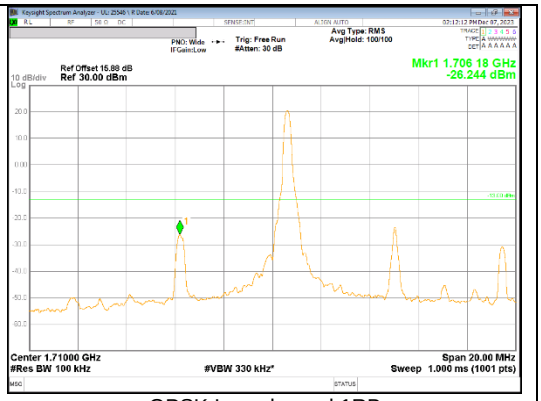

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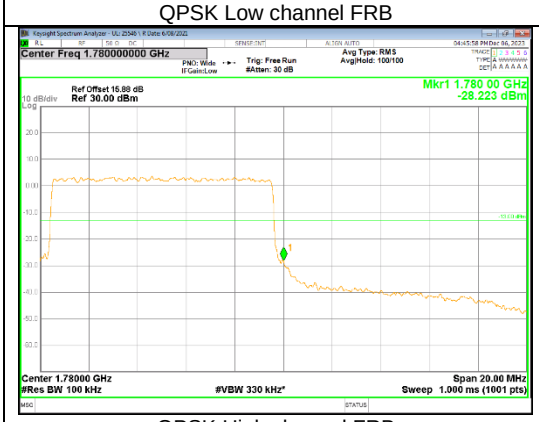

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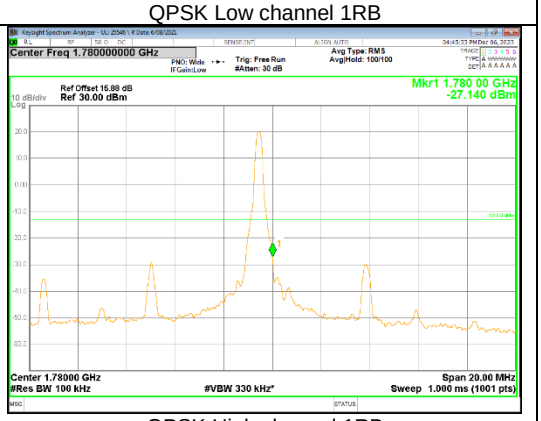

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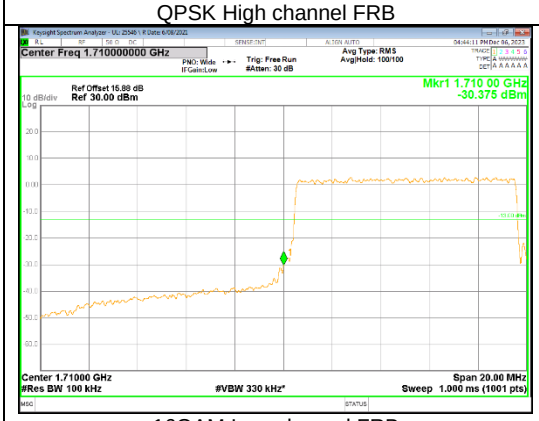

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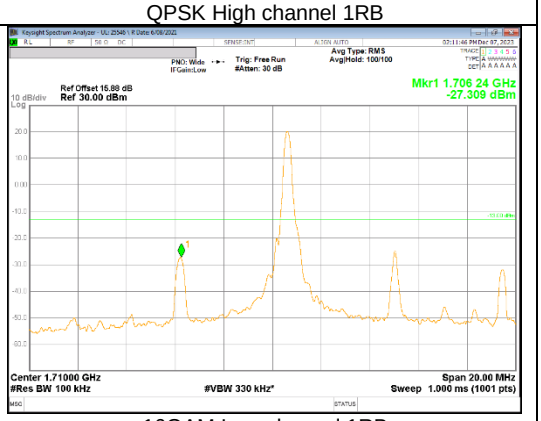

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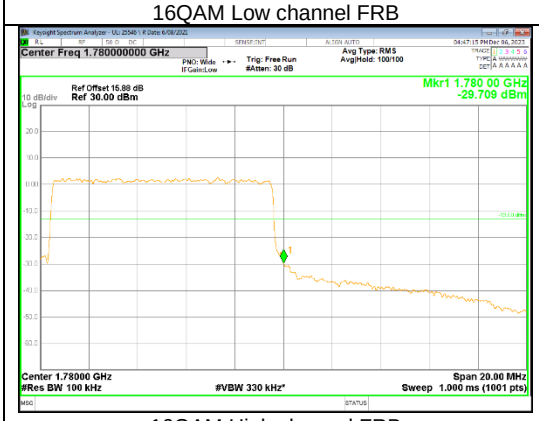

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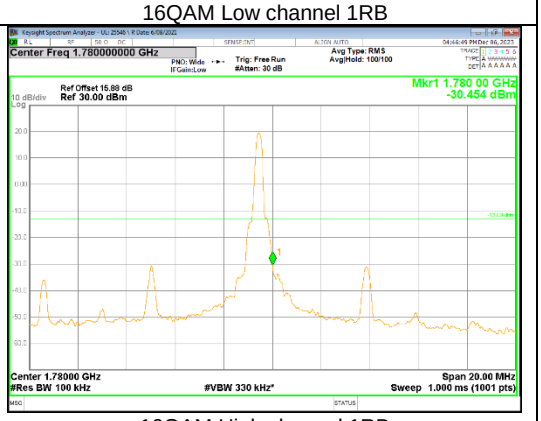

16QAM High channel 1RB

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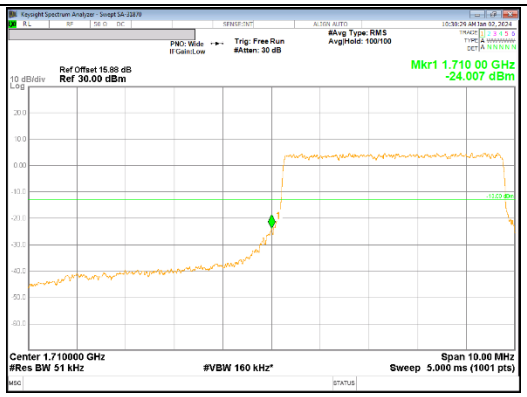
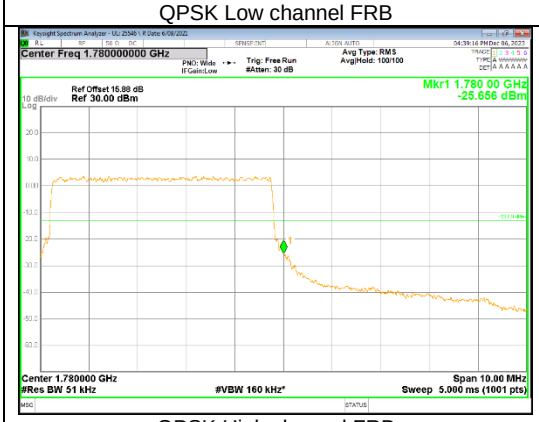
5MHz



QPSK Low channel FRB

QPSK Low channel 1RB



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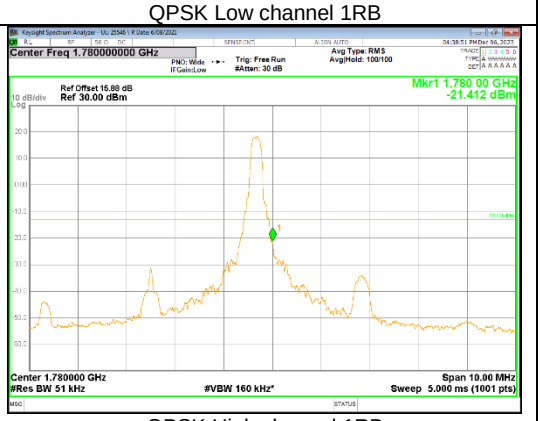

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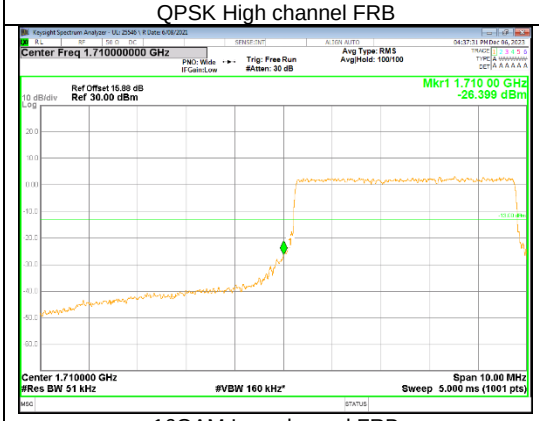

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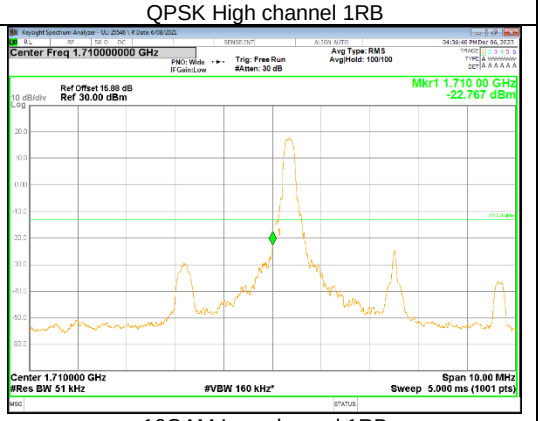

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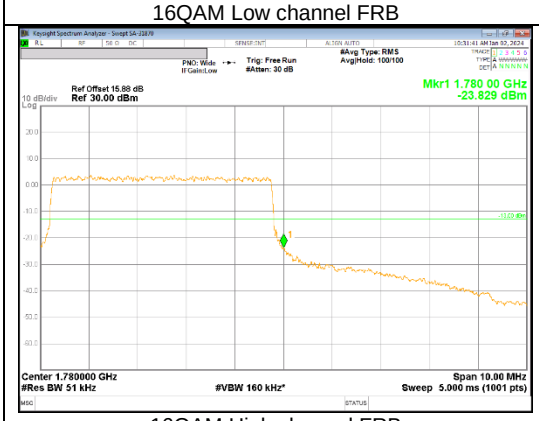

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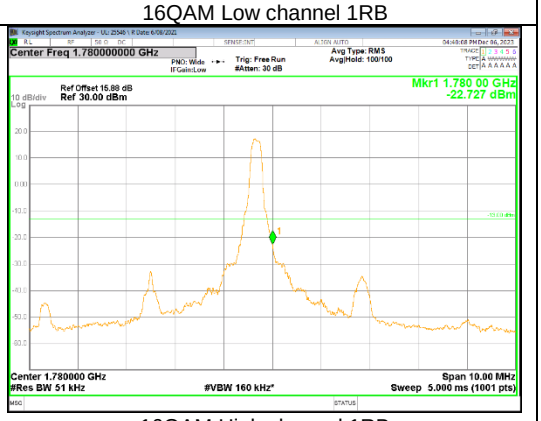

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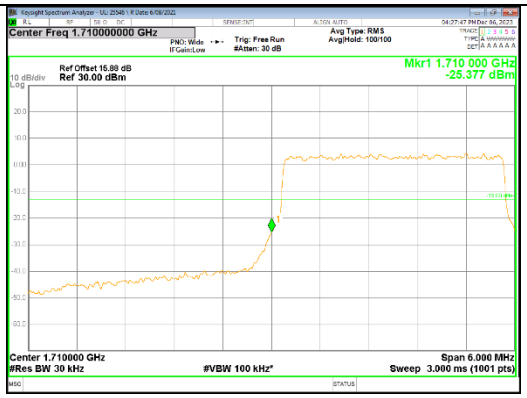
3MHz



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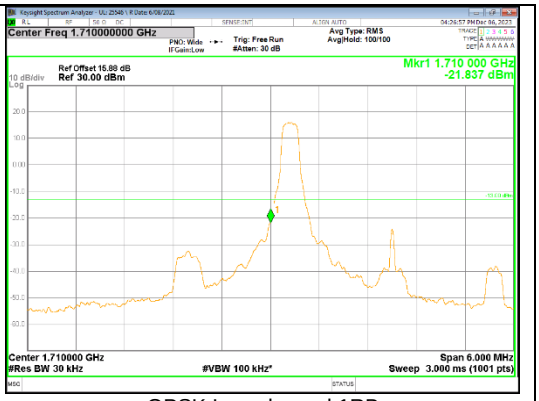

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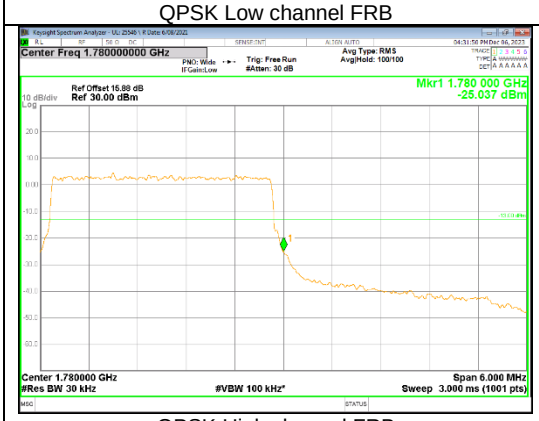

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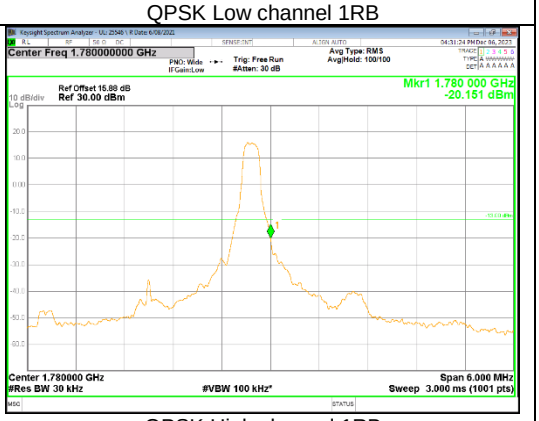

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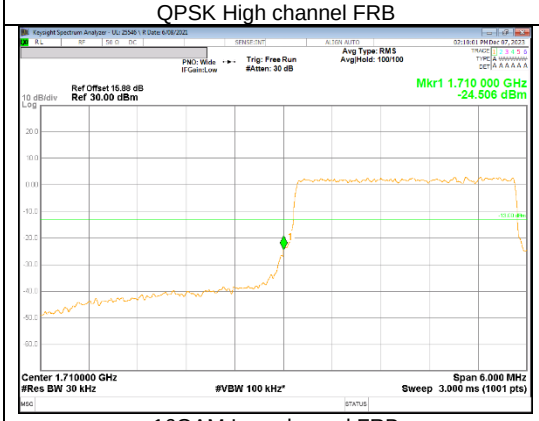

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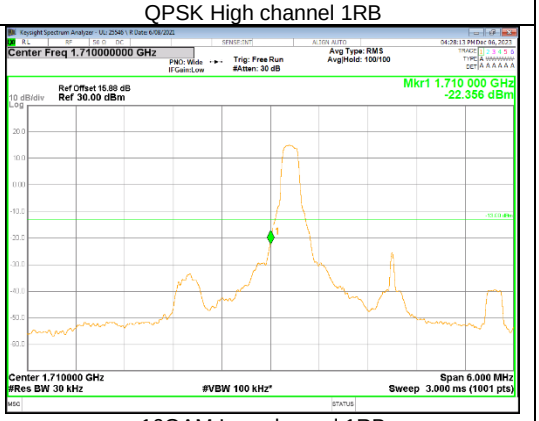

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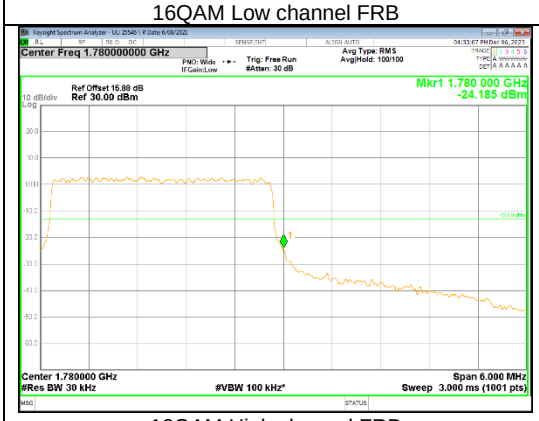

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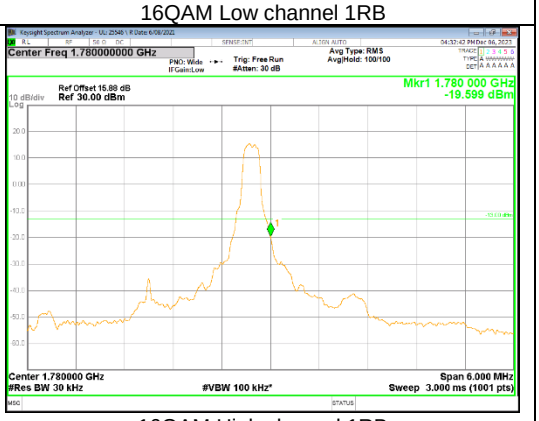

16QAM High channel 1RB

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