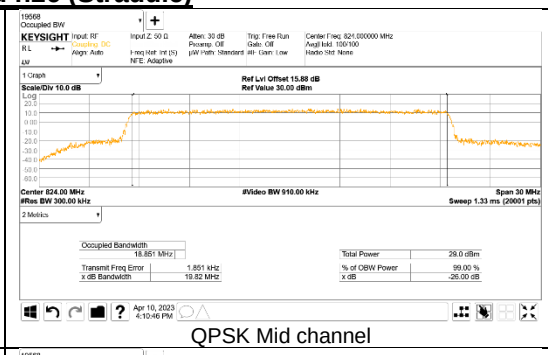
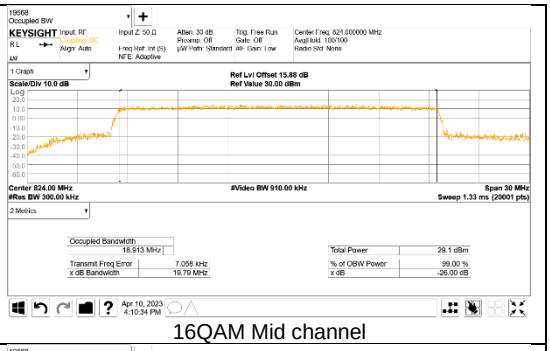
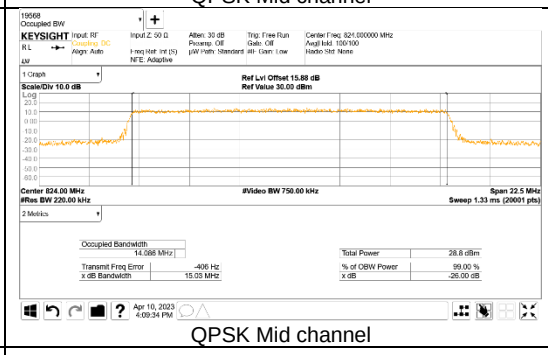
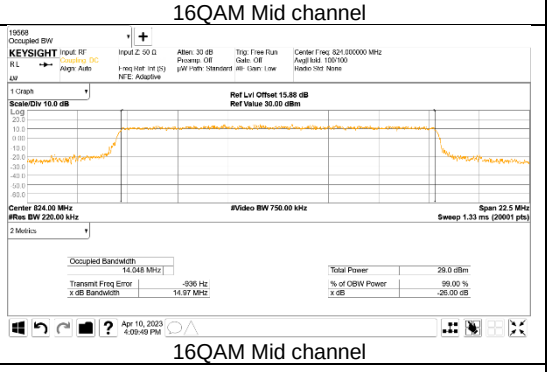
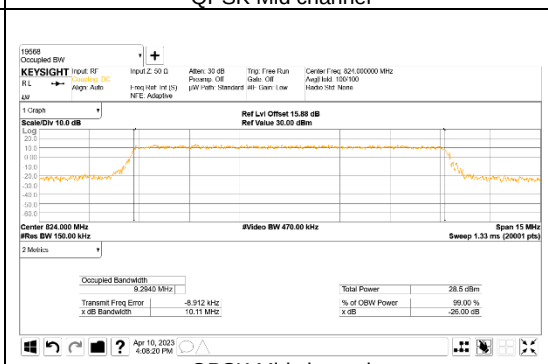
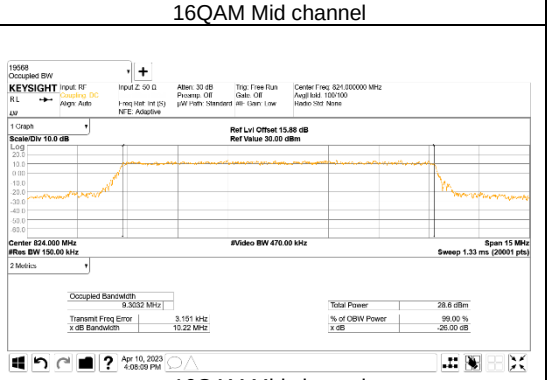
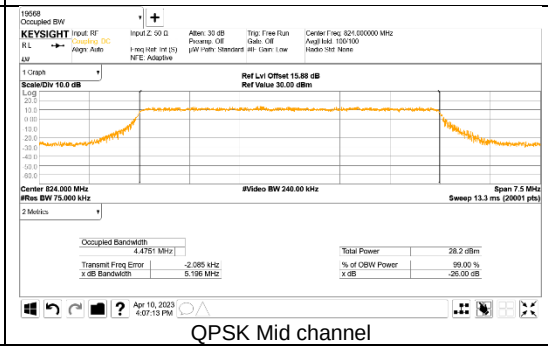
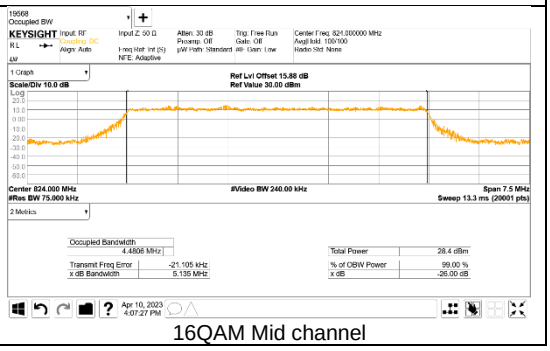
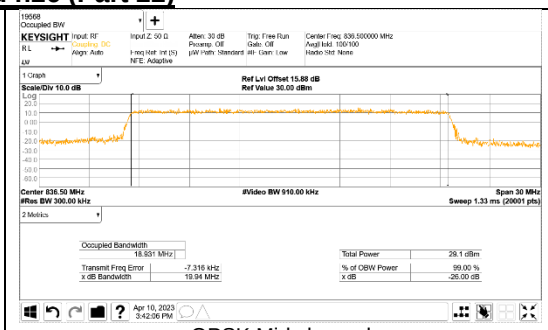
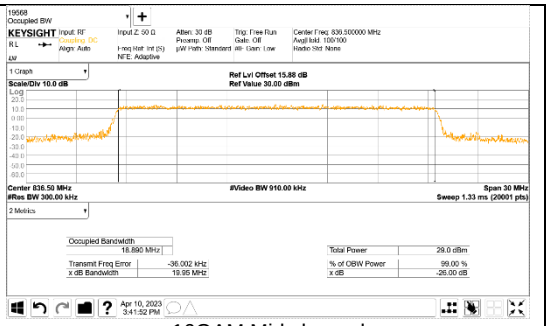
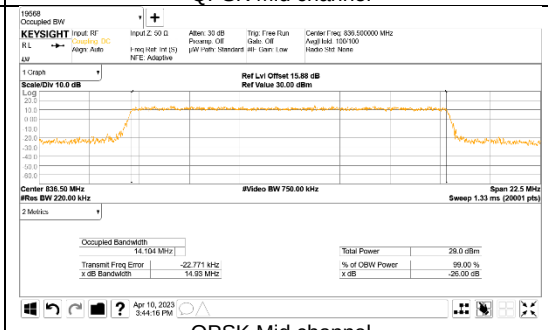
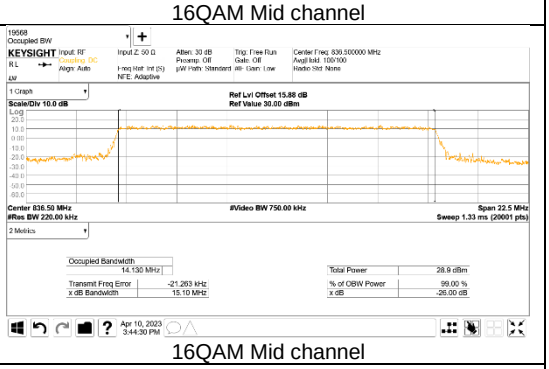
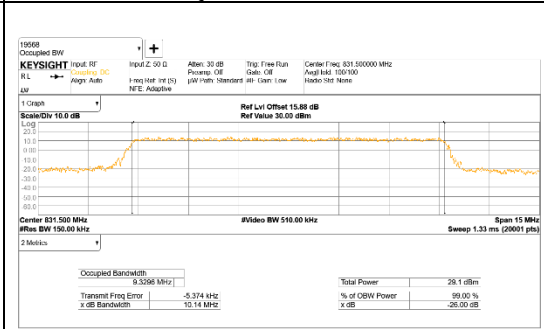
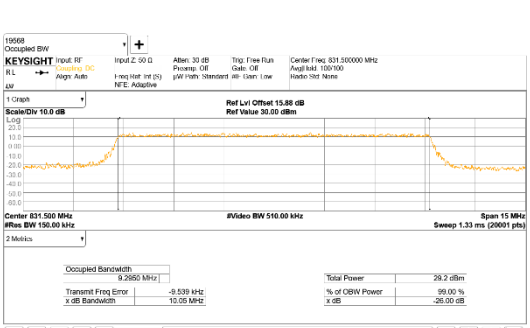
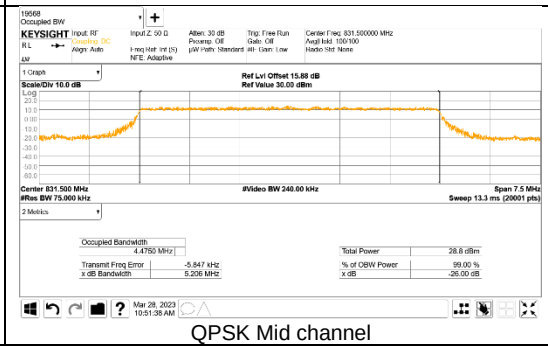
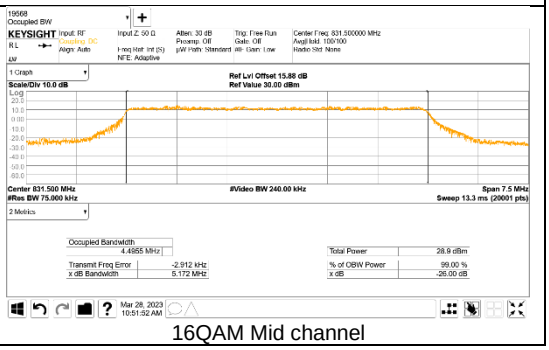
NR Band n26 (Straddle)

20MHz	 QPSK Mid channel	 16QAM Mid channel
15MHz	 QPSK Mid channel	 16QAM Mid channel
10MHz	 QPSK Mid channel	 16QAM Mid channel
5MHz	 QPSK Mid channel	 16QAM Mid channel

NR Band n26 (Part 22)

20MHz	 QPSK Mid channel	 16QAM Mid channel
15MHz	 QPSK Mid channel	 16QAM Mid channel
10MHz	 QPSK Mid channel	 16QAM Mid channel
5MHz	 QPSK Mid channel	 16QAM Mid channel

8.4. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359, §22.917, §90.543 and 90.691

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

Part 90.543:
(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.
(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.
(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.
(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

Part 90.691:
(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

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.

GSM

a) Set the RBW = 1 - 5% of OBW(GSM850 – 8.2KHz)
b) Set VBW ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = 1S ;
e) Detector = RMS;
f) Ensure that the number of measurement points ≥ 2*Span/RBW;
g) Trace mode = Average(100);
h) Add duty cycle correction factor (9dB)

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);

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_22/90(05)
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NOTE1

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.

NOTE2

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.

NOTE3

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.

RESULTS

See the following pages.

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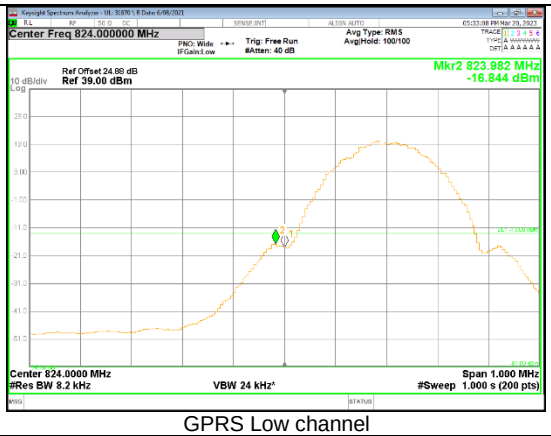
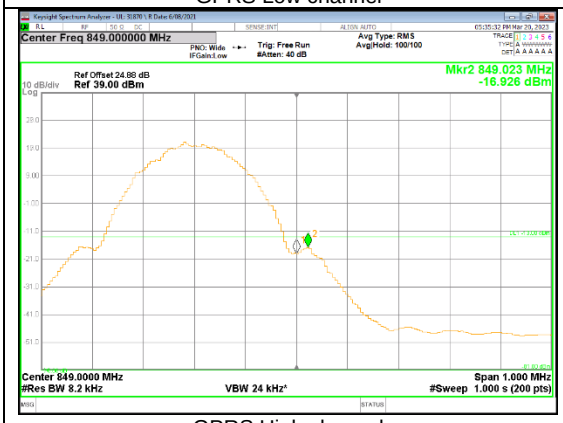
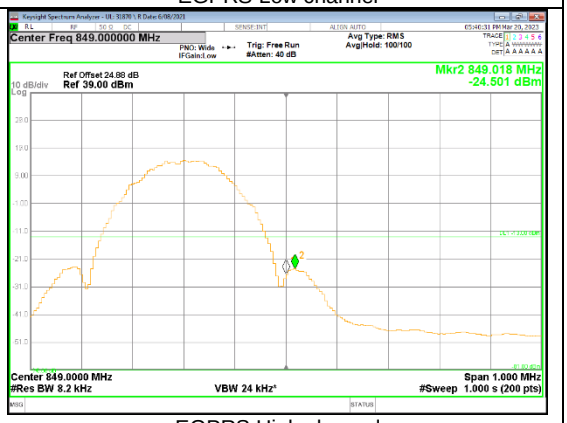
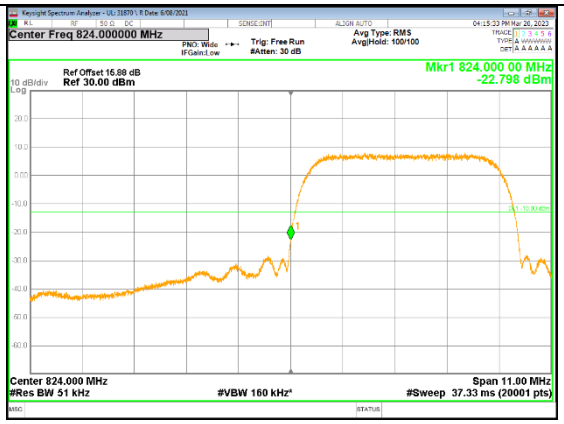
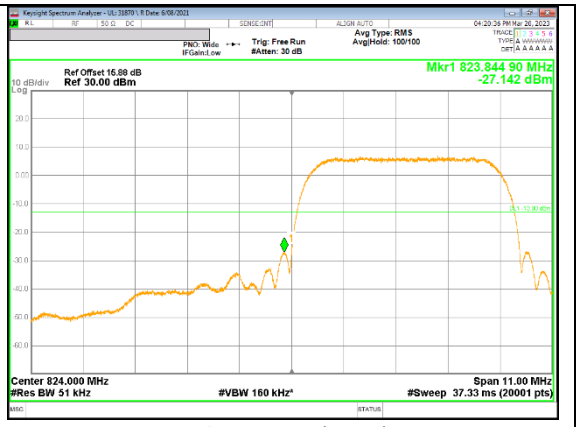
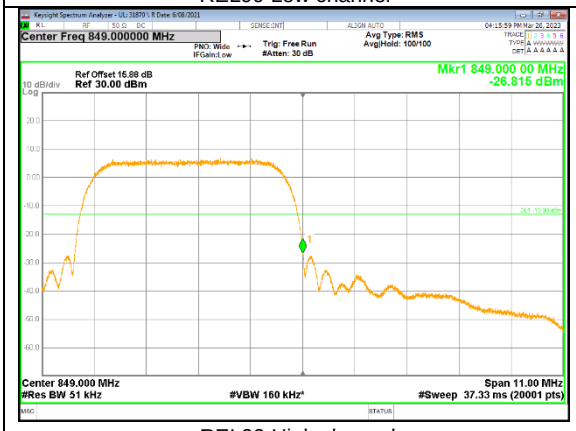
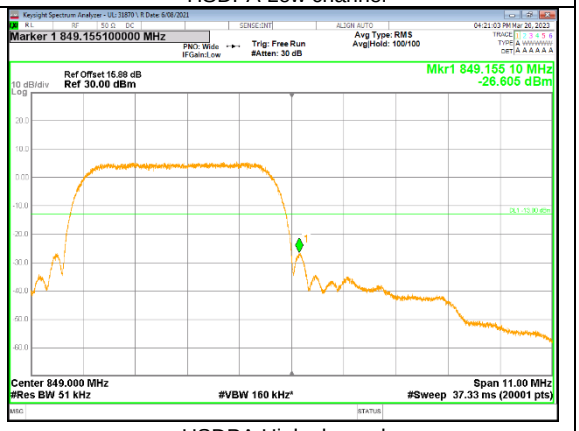
8.4.1. BAND EDGE RESULT

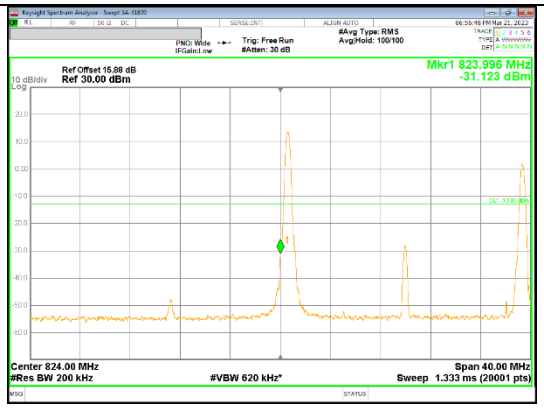
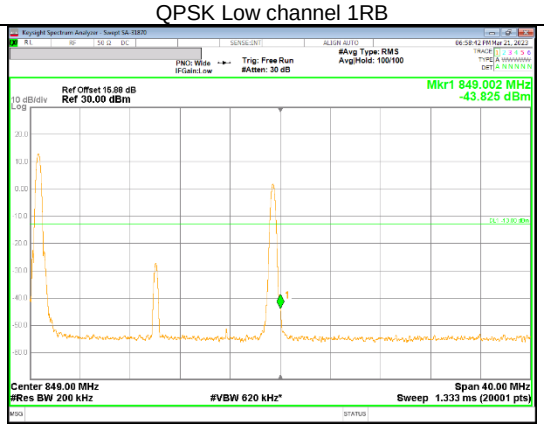
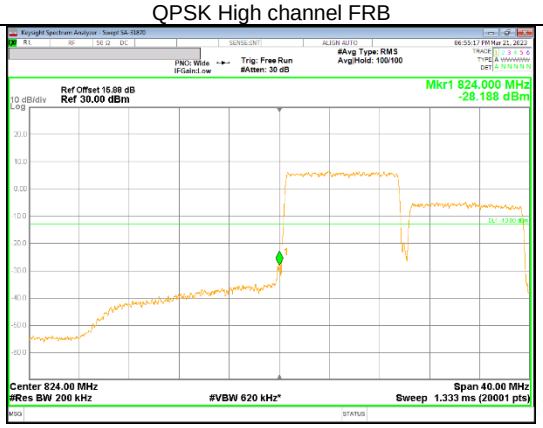
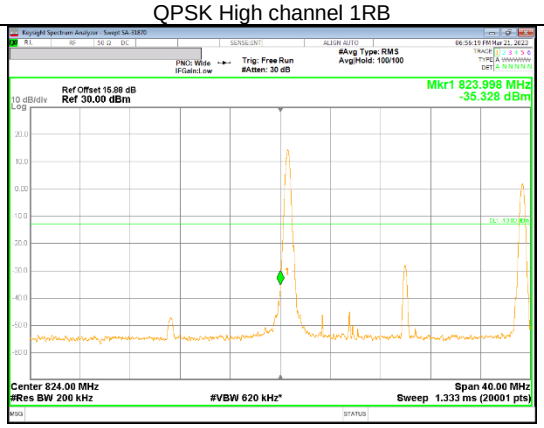
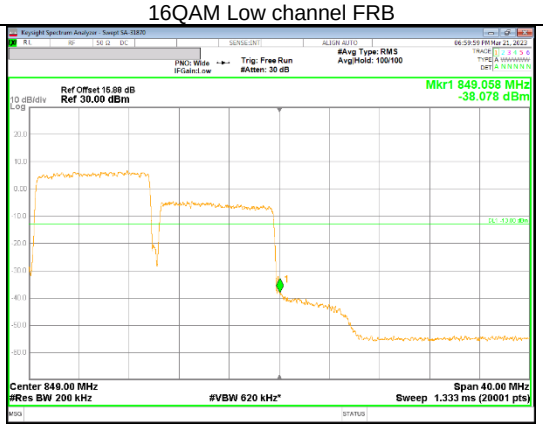
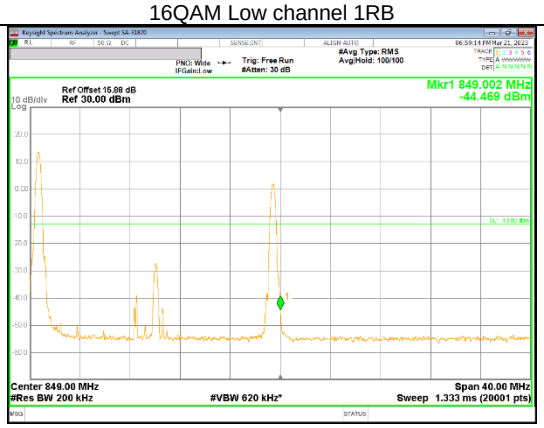
GSM

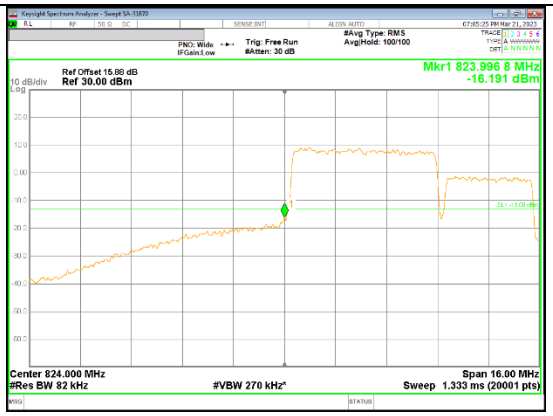
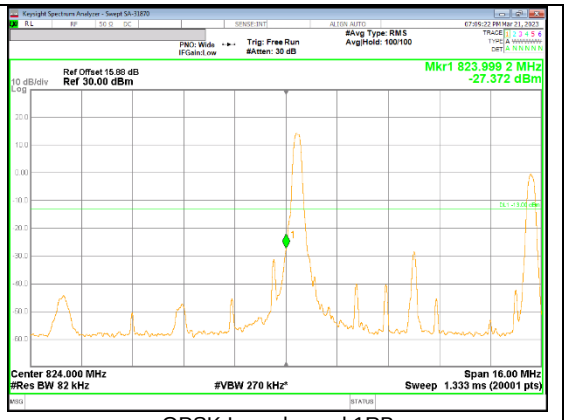
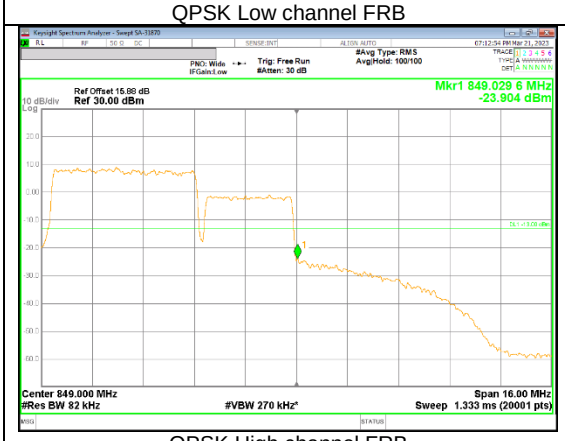
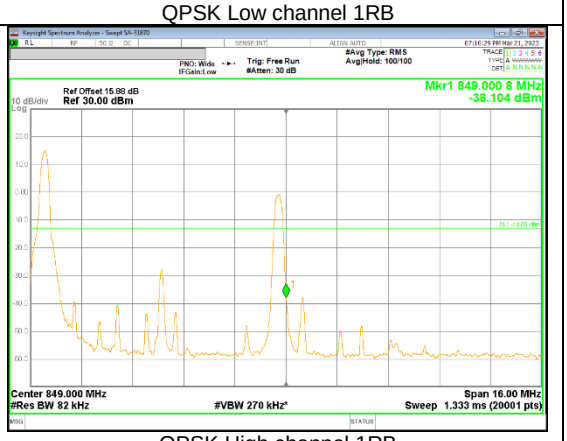
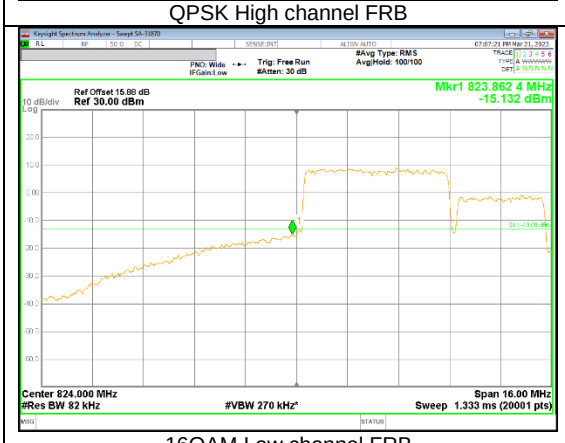
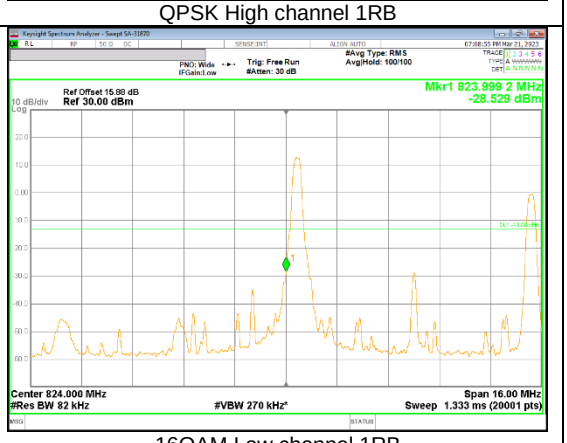
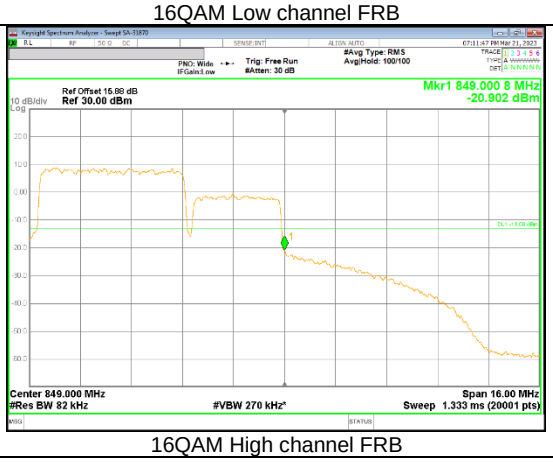
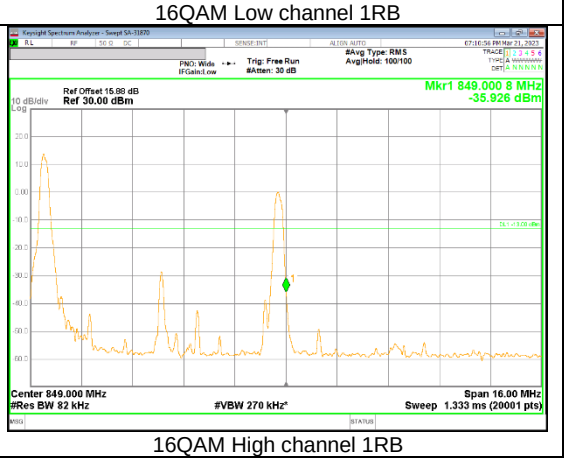
GSM 850	 GPRS Low channel	 EGPRS Low channel
	 GPRS High channel	 EGPRS High channel

WCDMA

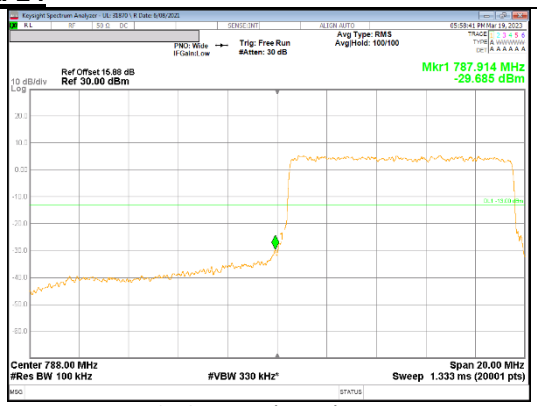
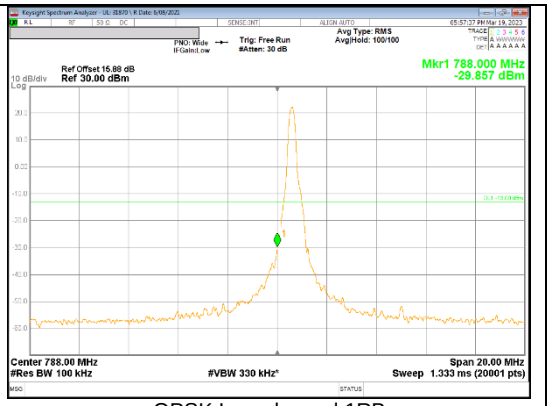
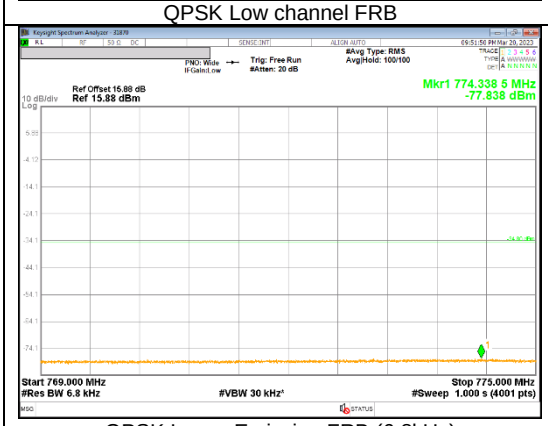
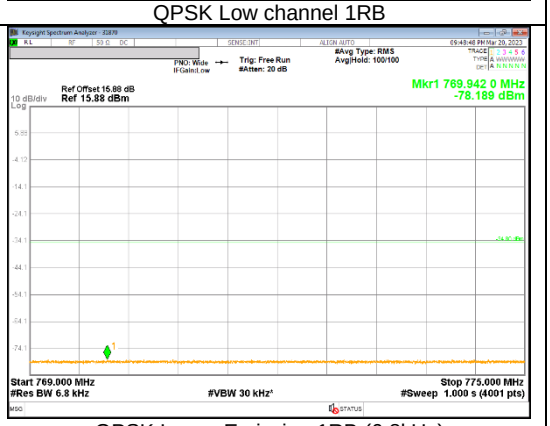
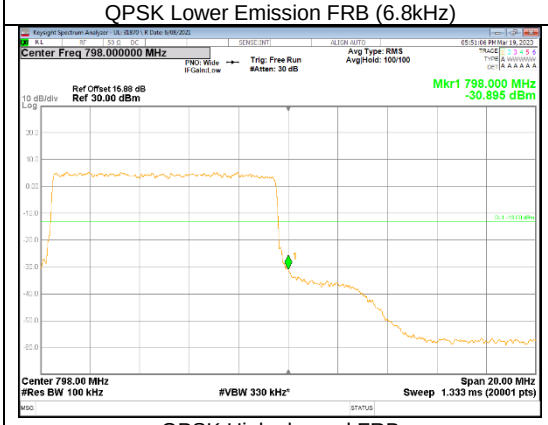
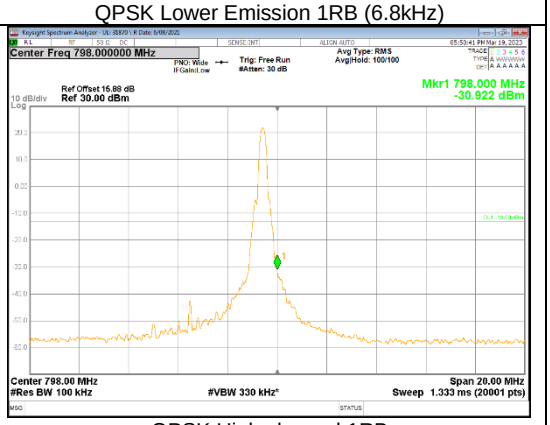
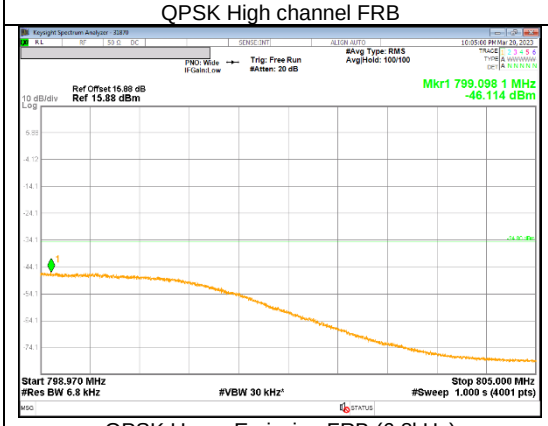
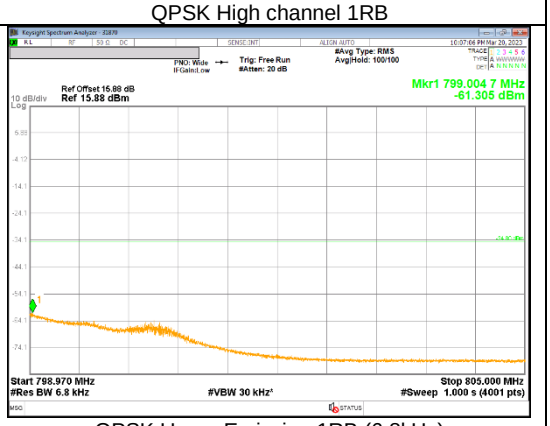
Band 5	 REL99 Low channel	 HSDPA Low channel
	 REL99 High channel	 HSDPA High channel

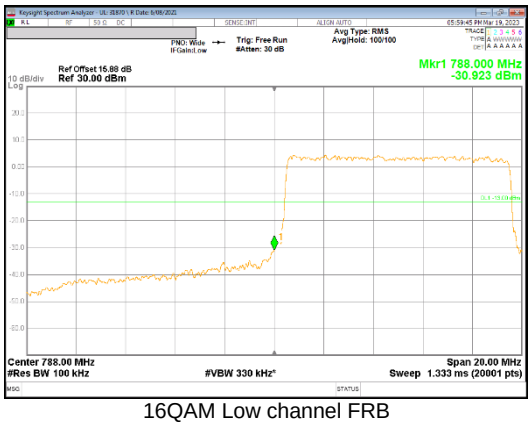
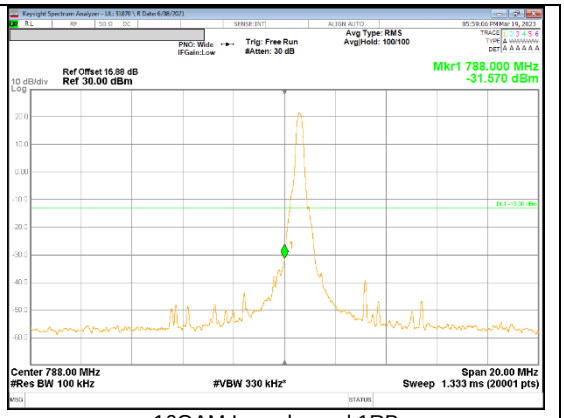
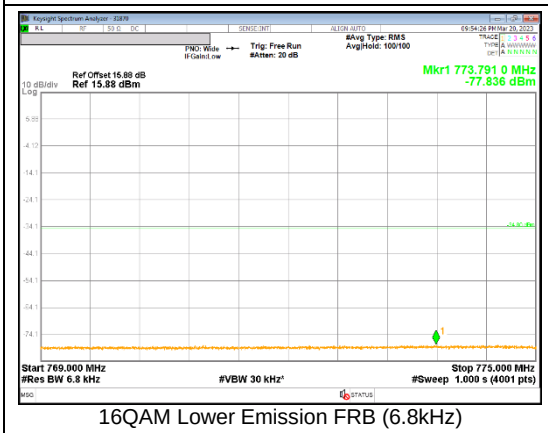
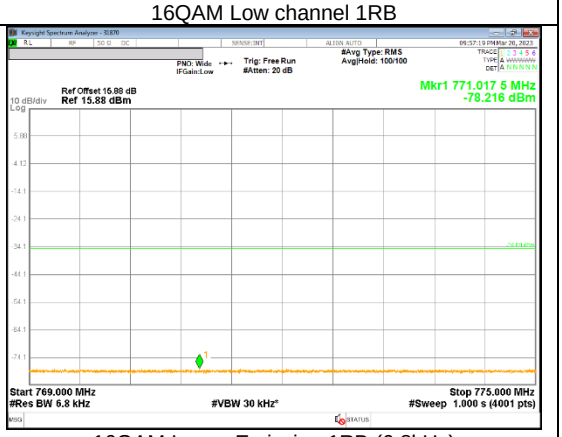
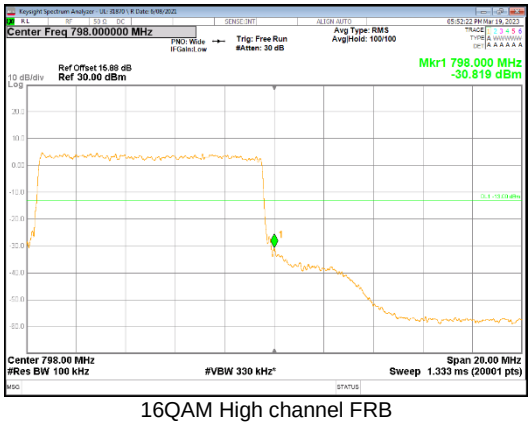
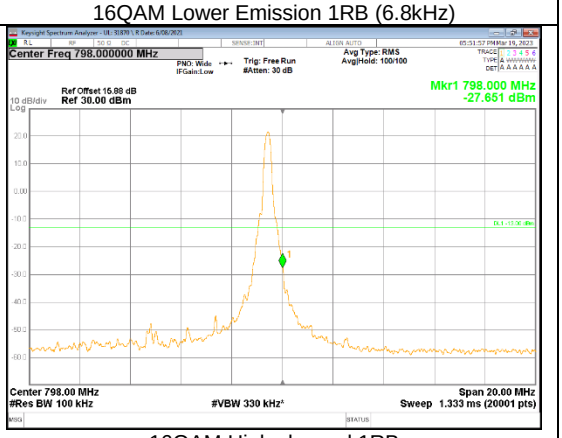
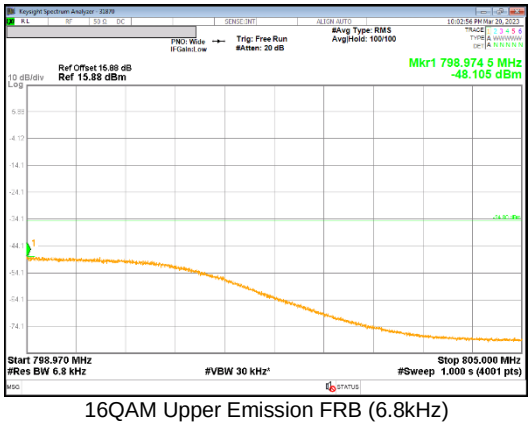
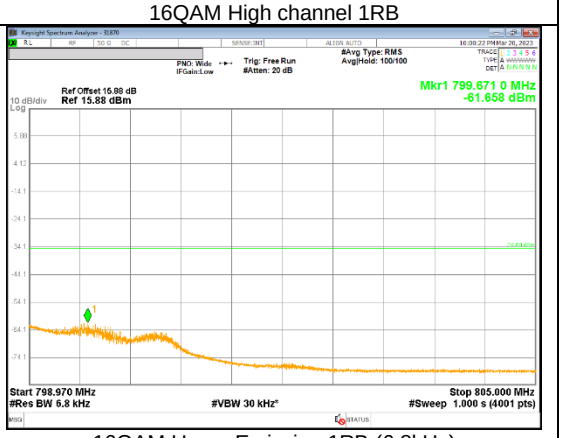
LTE Band 5B (UL CA)

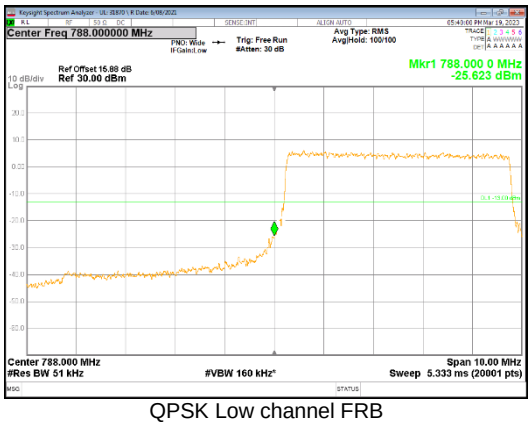
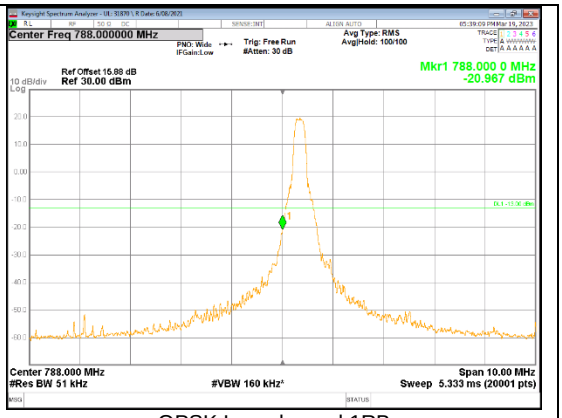
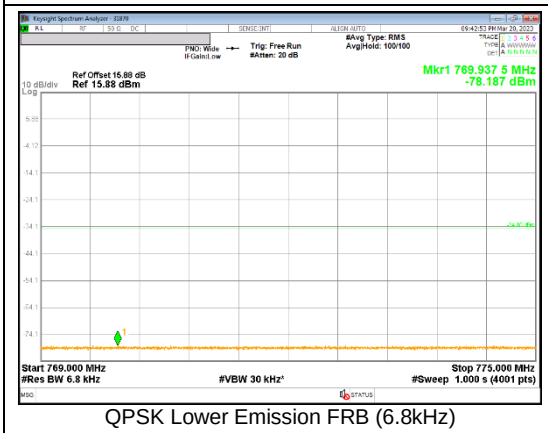
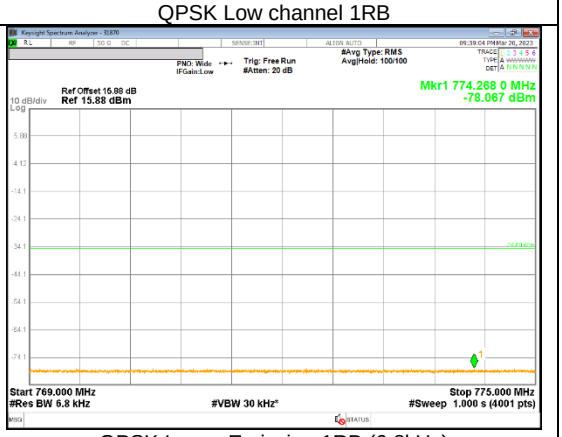
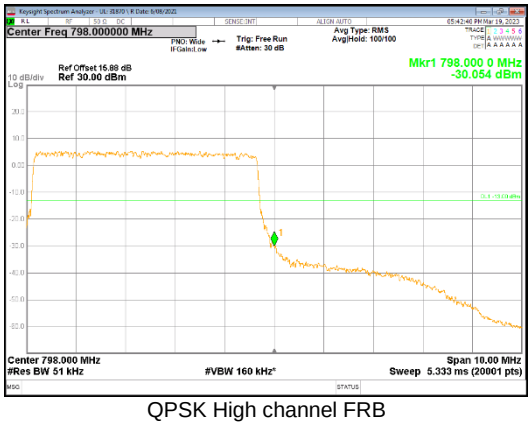
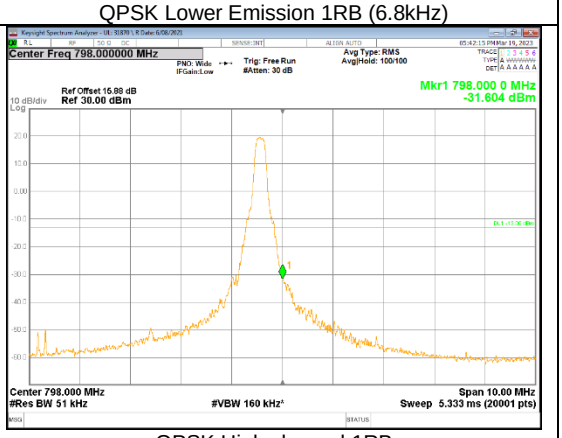
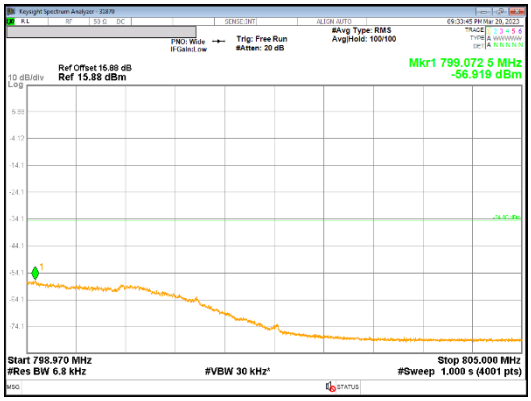
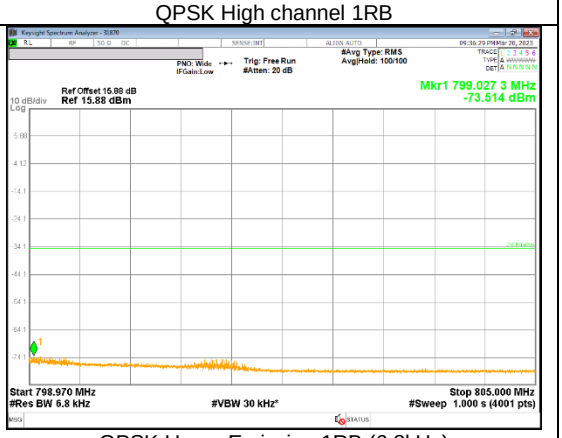
20MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB
	 QPSK High channel FRB	 QPSK High channel 1RB
	 16QAM Low channel FRB	 16QAM Low channel 1RB
	 16QAM High channel FRB	 16QAM High channel 1RB

8MHz	 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

LTE Band 14

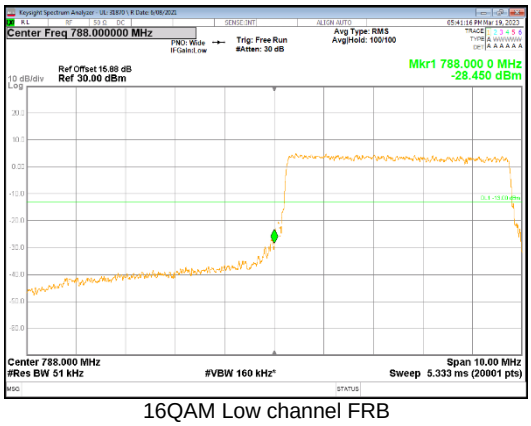
LTE Band 14 10MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB
	 QPSK Lower Emission FRB (6.8kHz)	 QPSK Lower Emission 1RB (6.8kHz)
	 QPSK High channel FRB	 QPSK High channel 1RB
	 QPSK Upper Emission FRB (6.8kHz)	 QPSK Upper Emission 1RB (6.8kHz)

LTE Band 14 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)

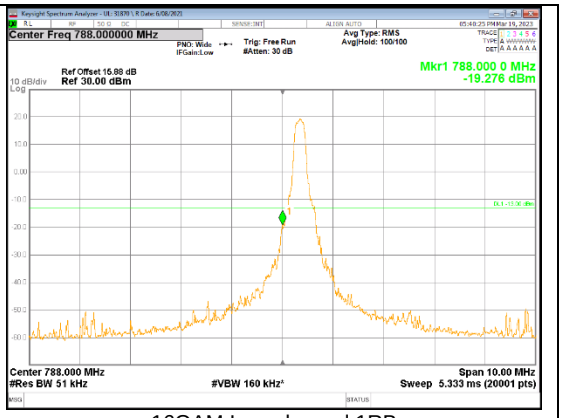
LTE Band 14 5MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB
	 QPSK Lower Emission FRB (6.8kHz)	 QPSK Lower Emission 1RB (6.8kHz)
	 QPSK High channel FRB	 QPSK High channel 1RB
	 QPSK Upper Emission FRB (6.8kHz)	 QPSK Upper Emission 1RB (6.8kHz)

LTE Band 14

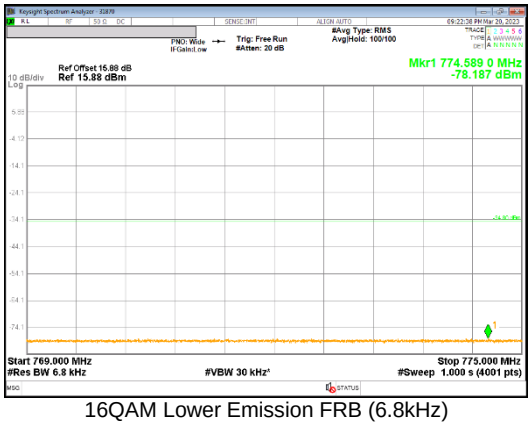
5MHz



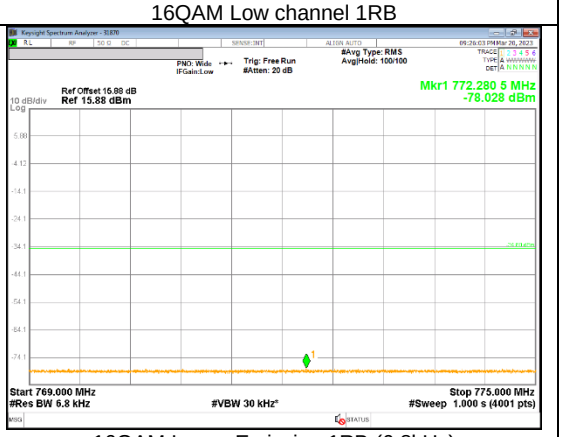
16QAM Low channel FRB



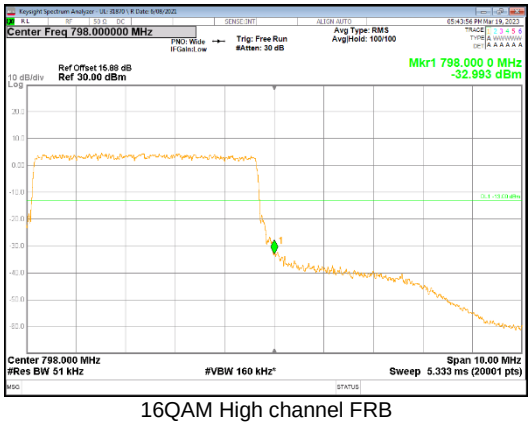
16QAM Low channel 1RB



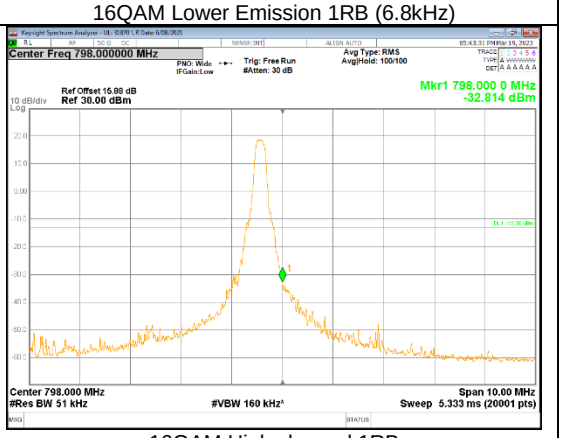
16QAM Lower Emission FRB (6.8kHz)



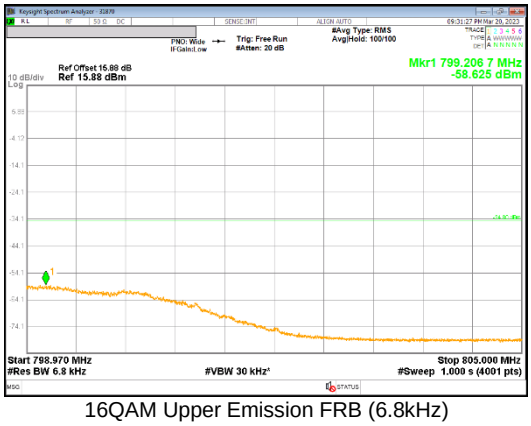
16QAM Lower Emission 1RB (6.8kHz)



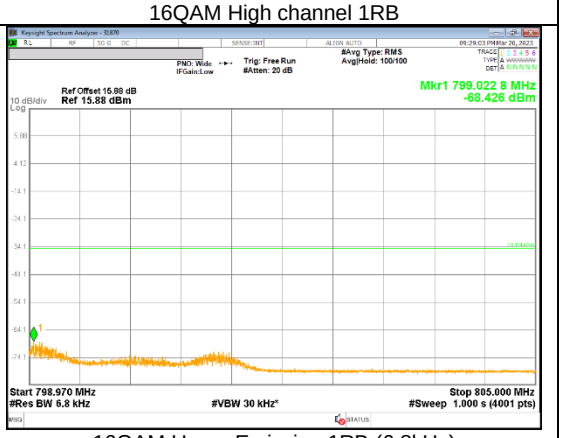
16QAM High channel FRB



16QAM High channel 1RB

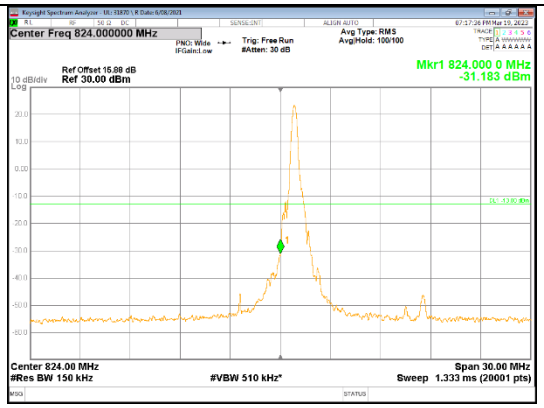
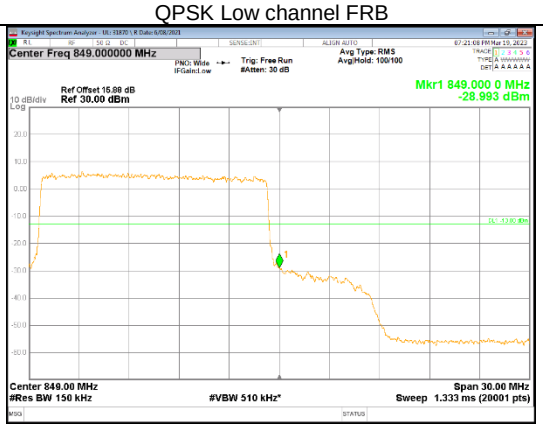
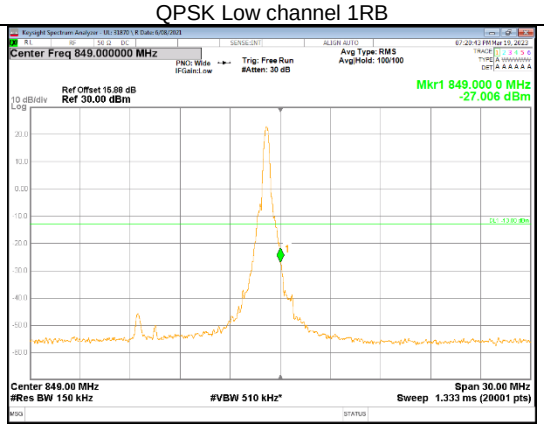
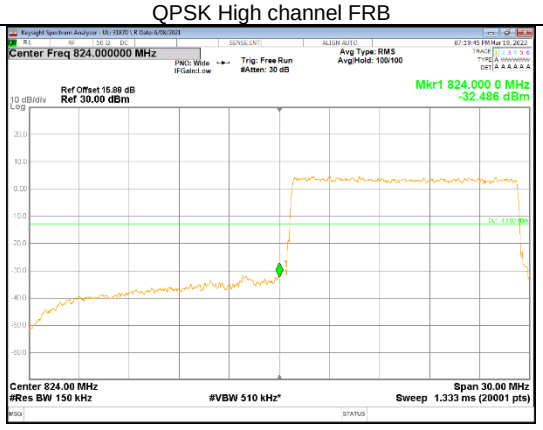
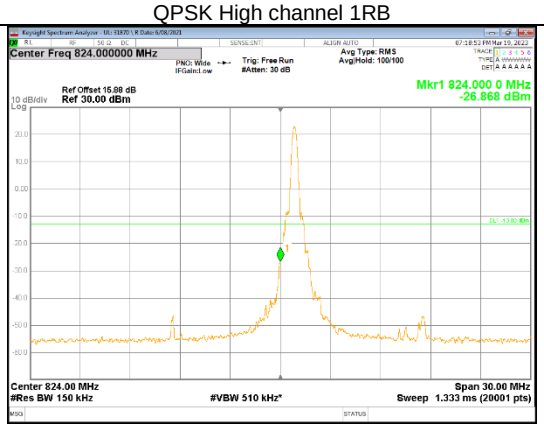
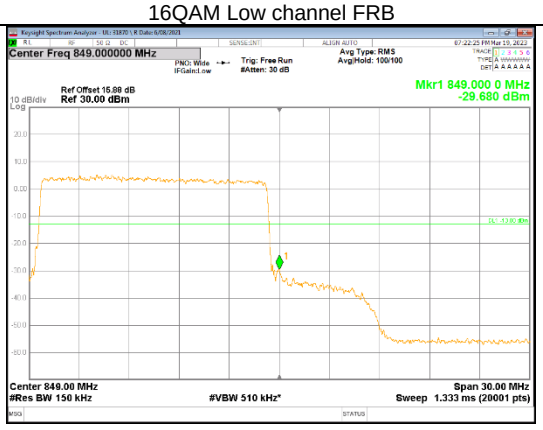
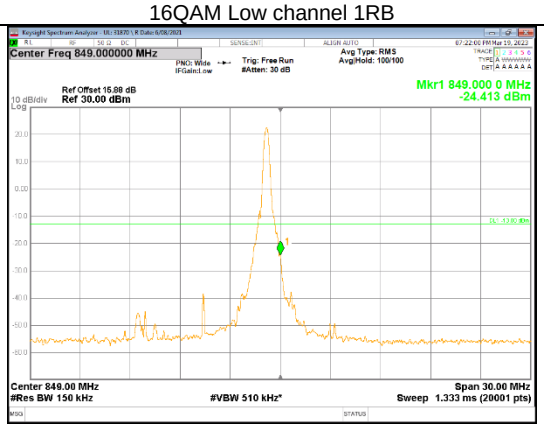


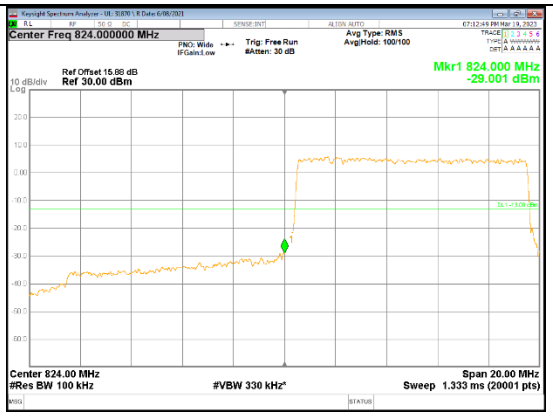
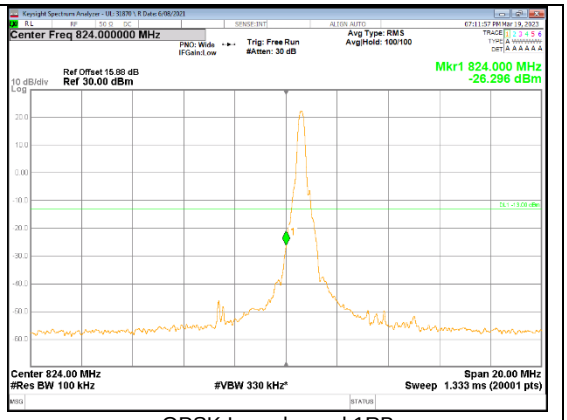
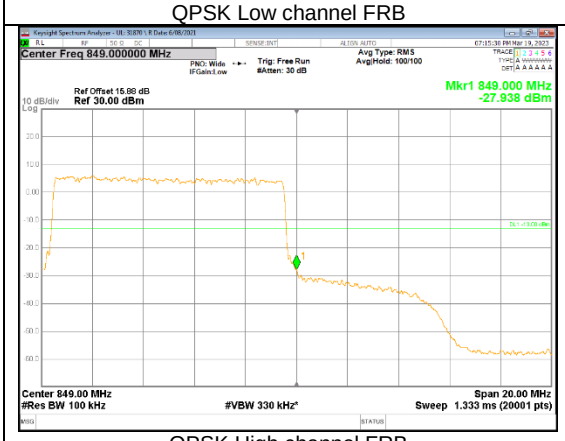
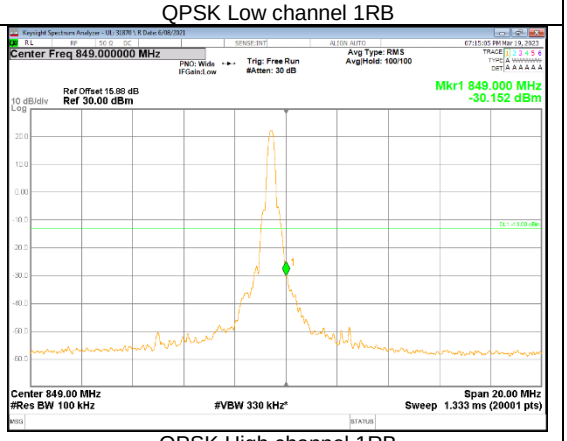
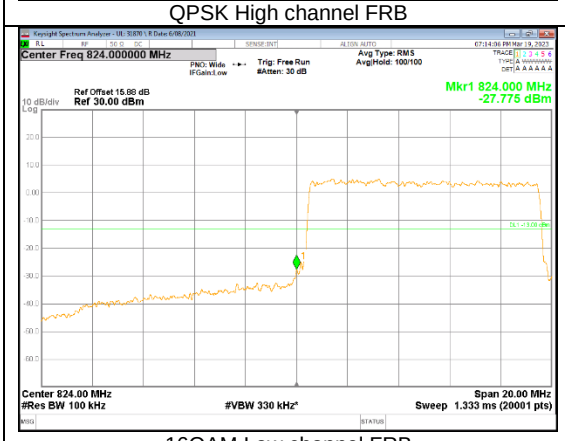
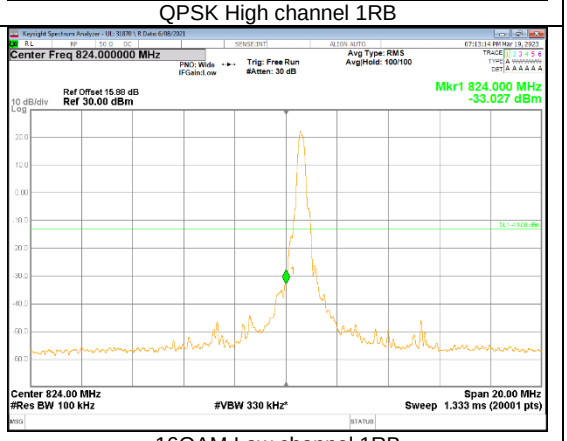
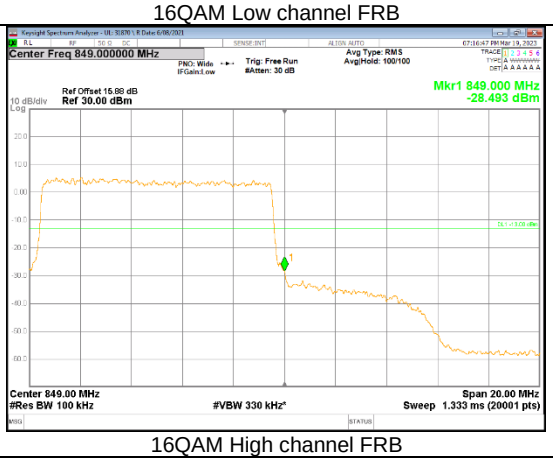
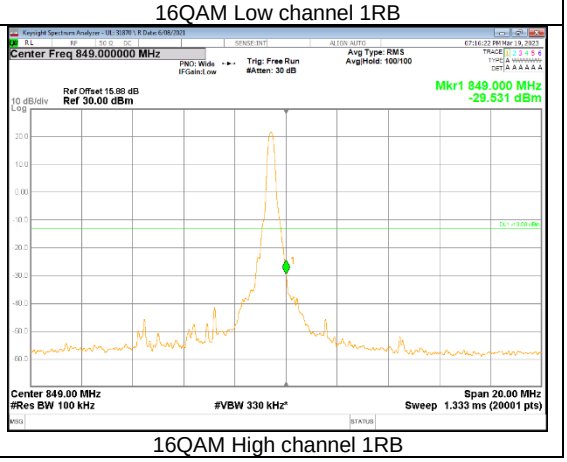
16QAM Upper Emission FRB (6.8kHz)

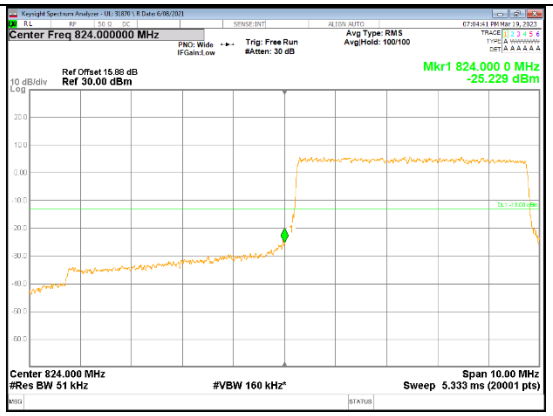
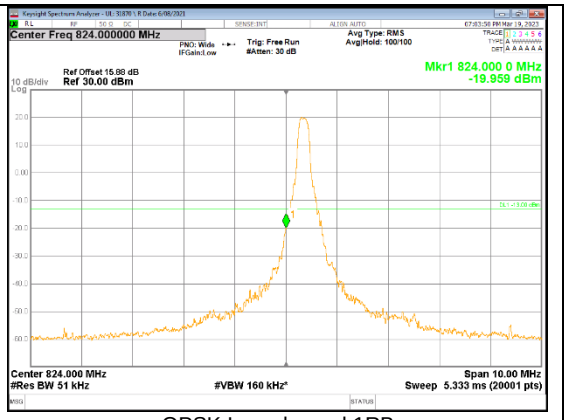
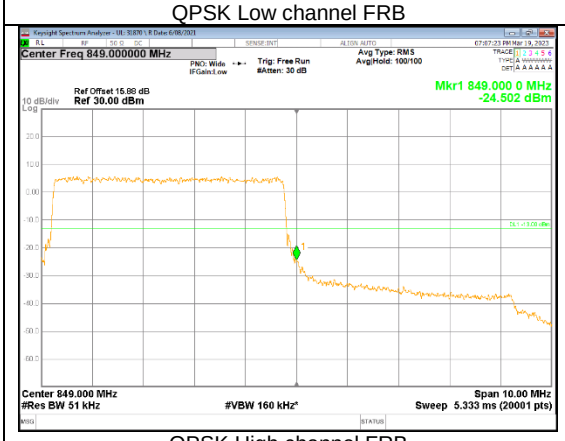
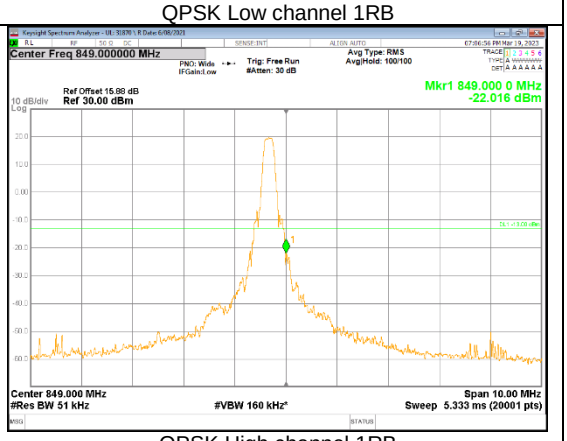
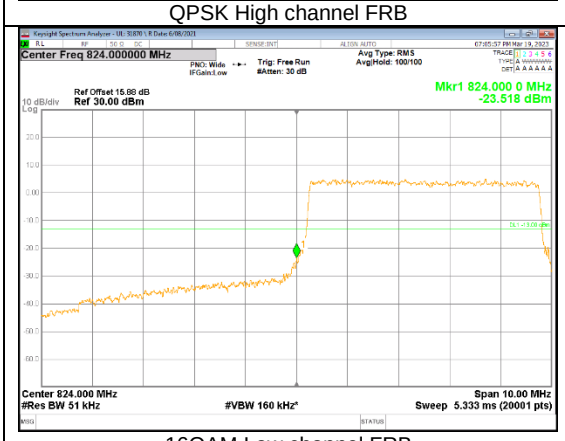
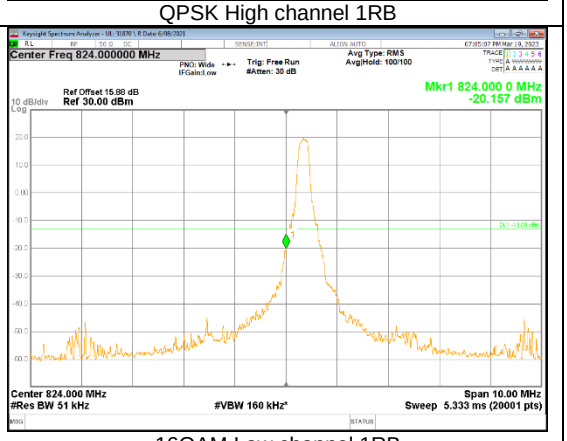
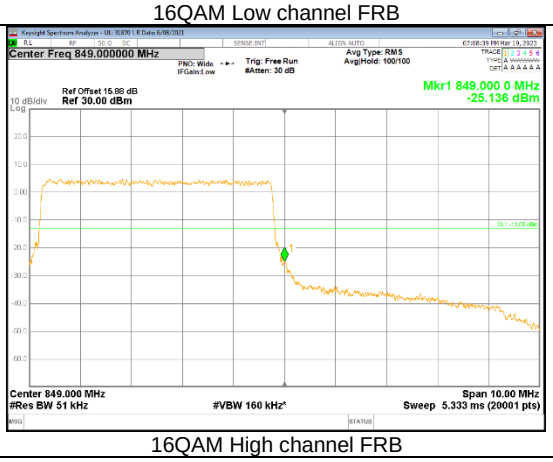
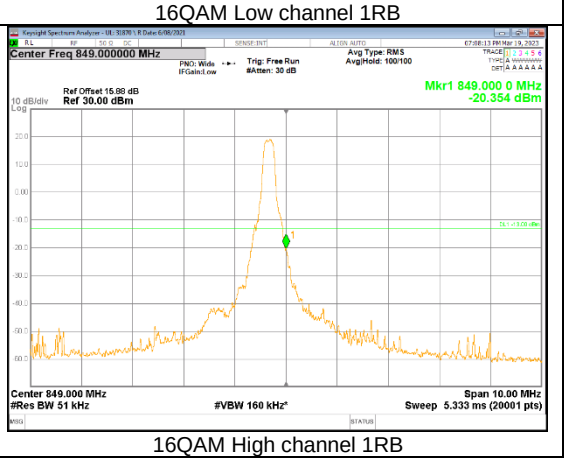


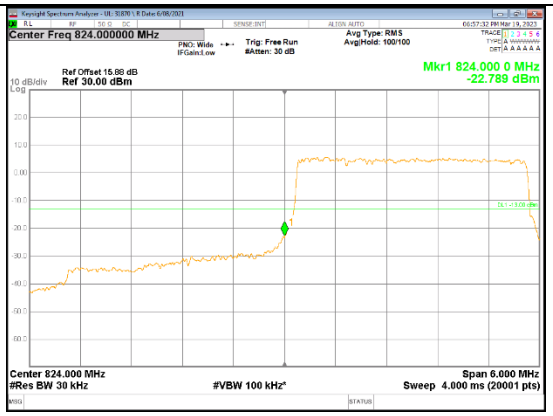
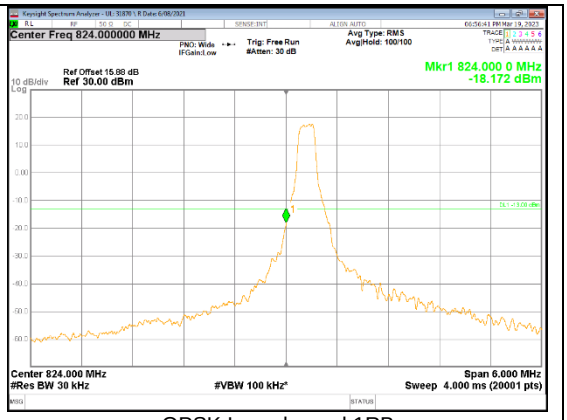
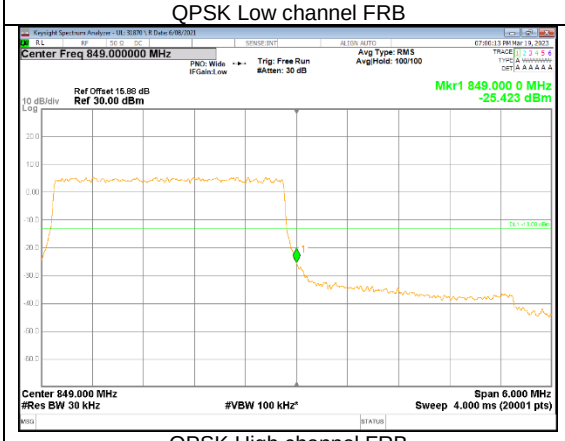
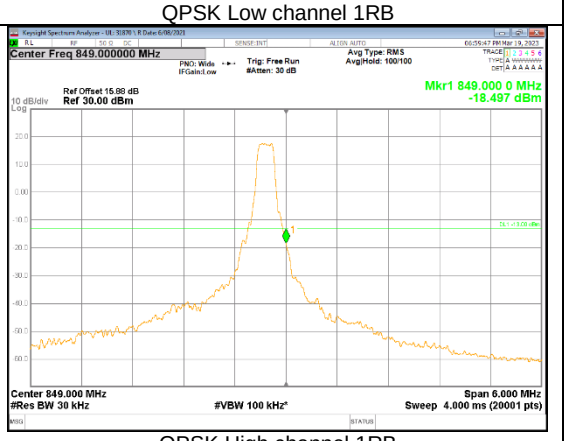
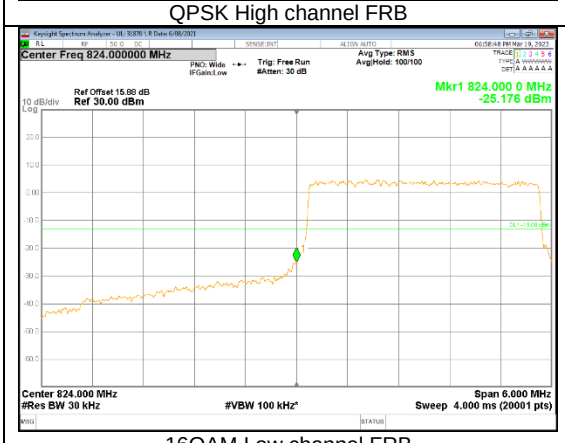
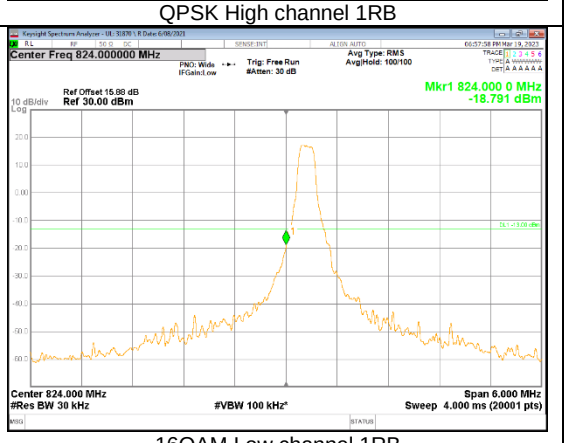
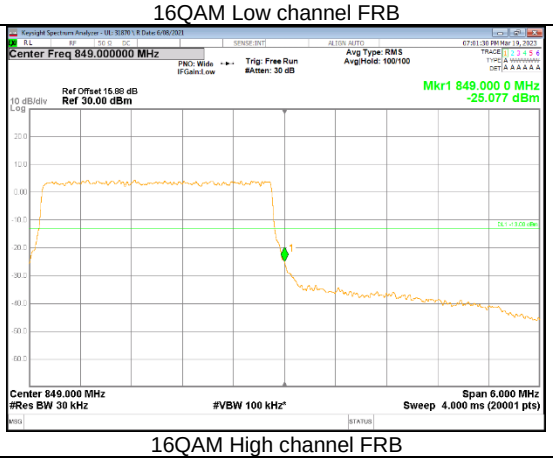
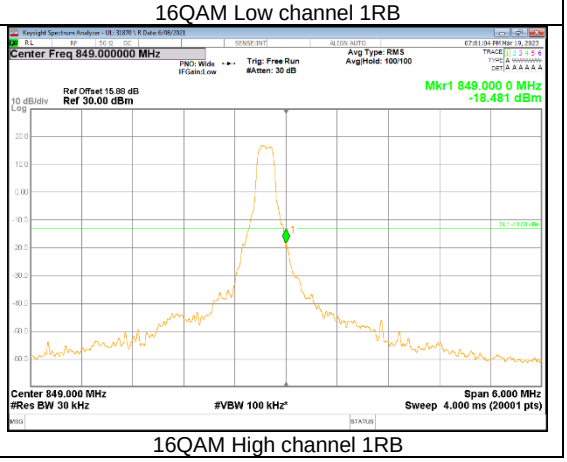
16QAM Upper Emission 1RB (6.8kHz)

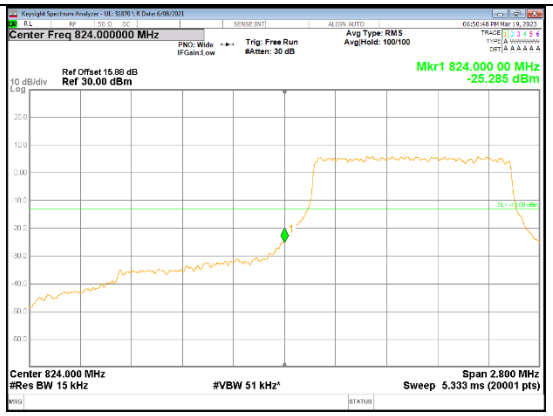
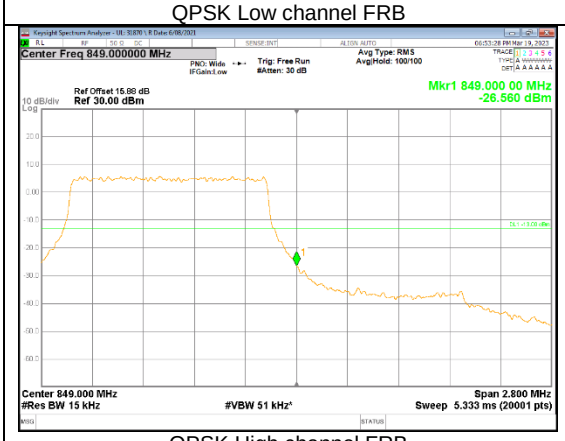
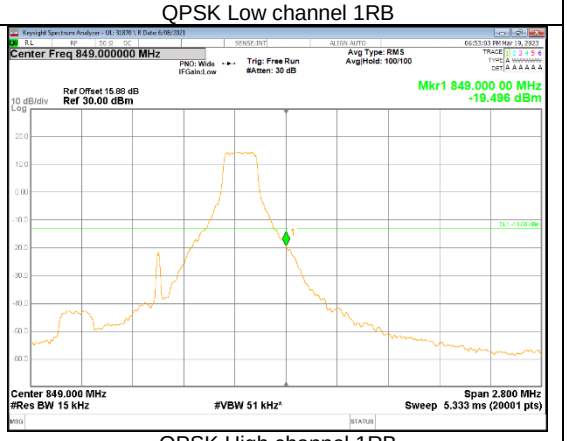
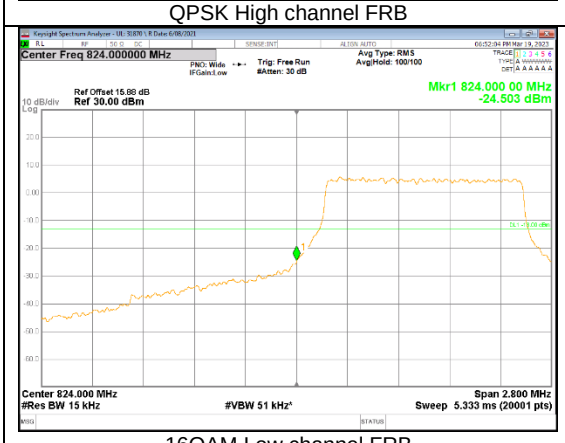
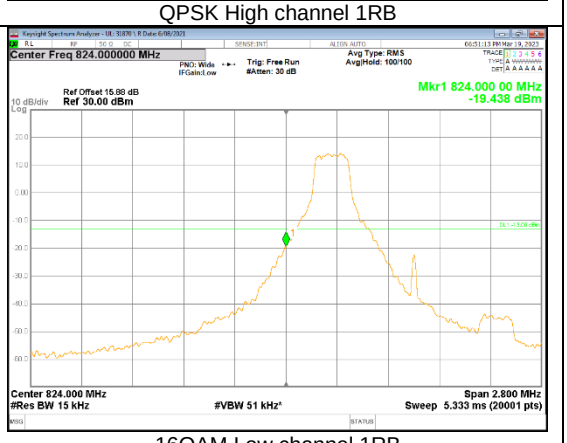
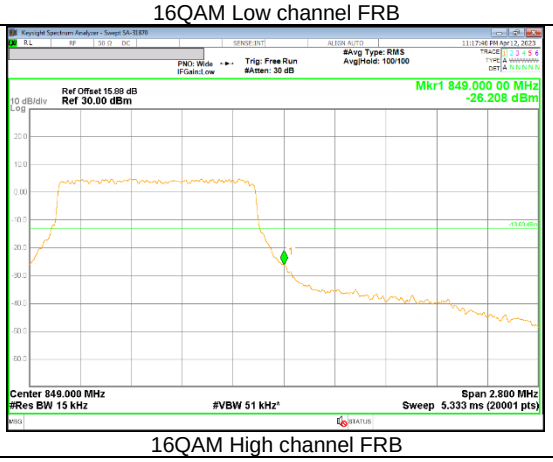
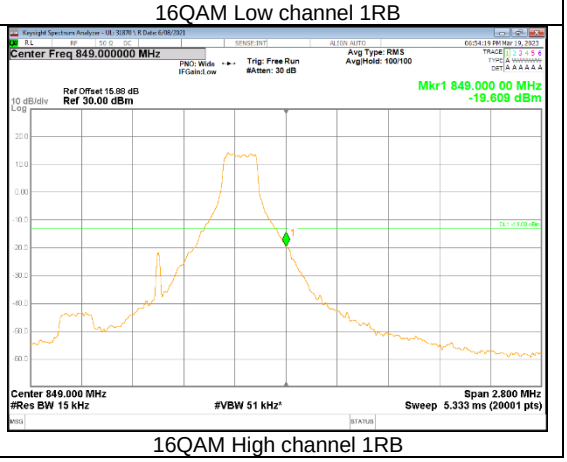
LTE Band 26 (Part 22)

15MHz	 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

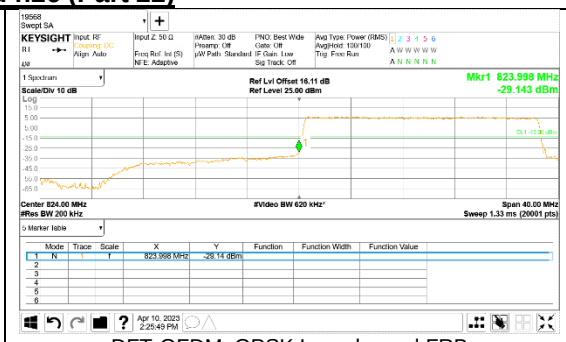
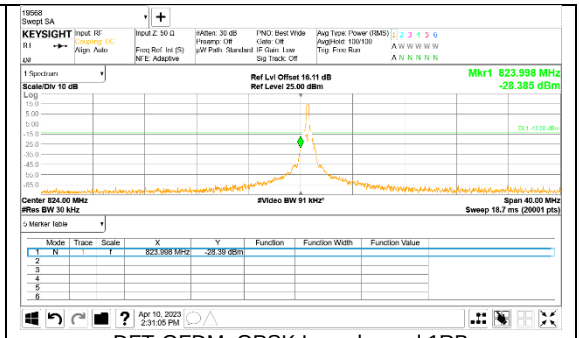
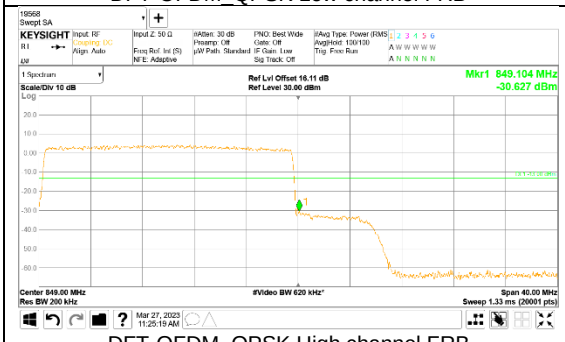
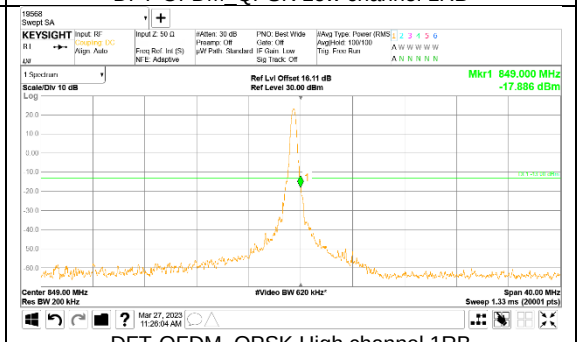
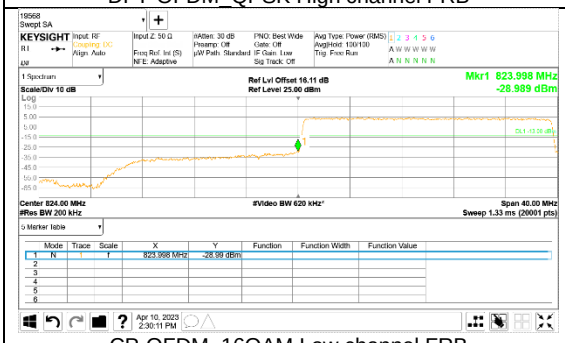
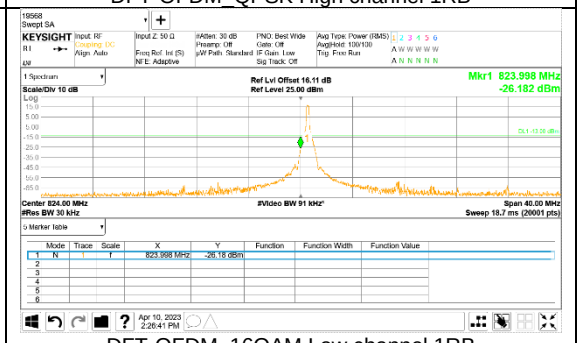
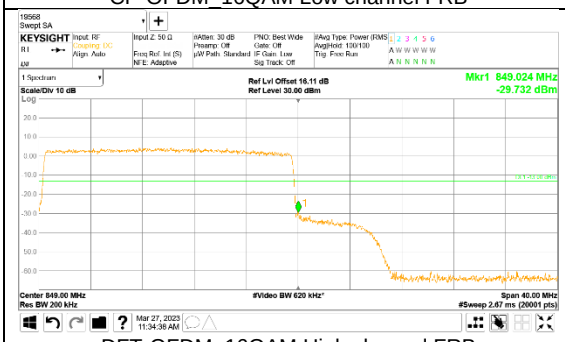
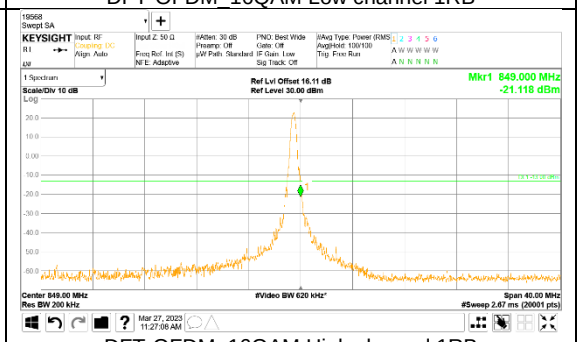
10MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB
	 QPSK High channel FRB	 QPSK High channel 1RB
	 16QAM Low channel FRB	 16QAM Low channel 1RB
	 16QAM High channel FRB	 16QAM High channel 1RB

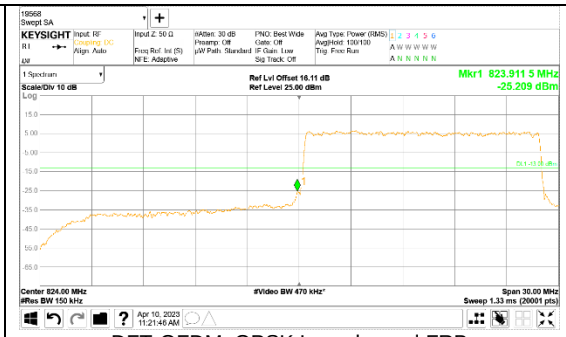
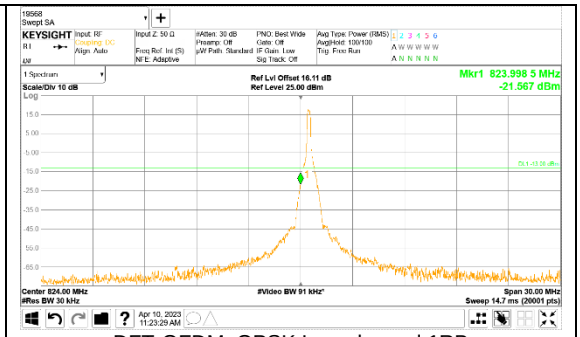
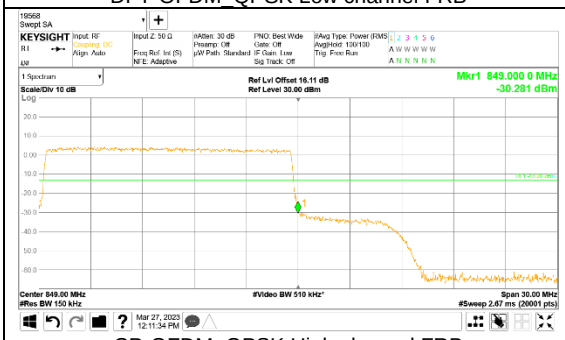
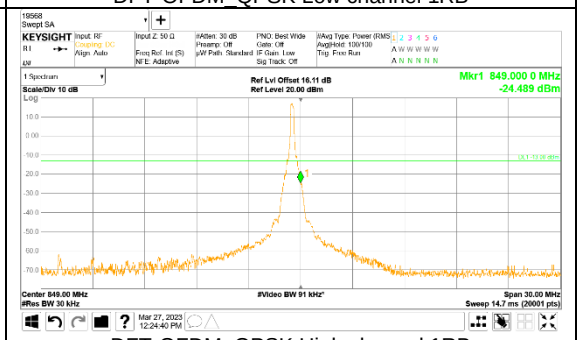
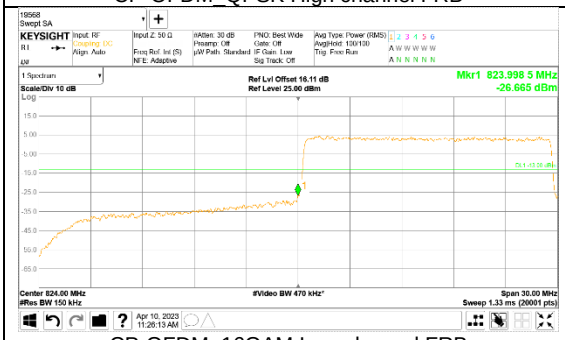
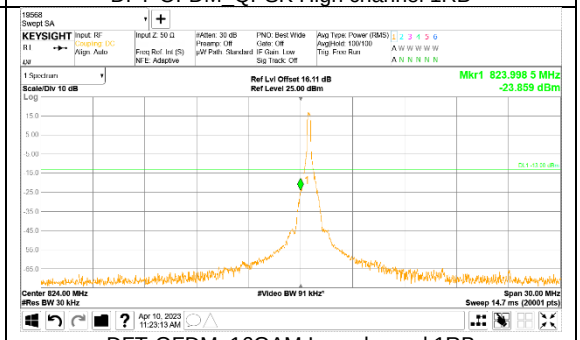
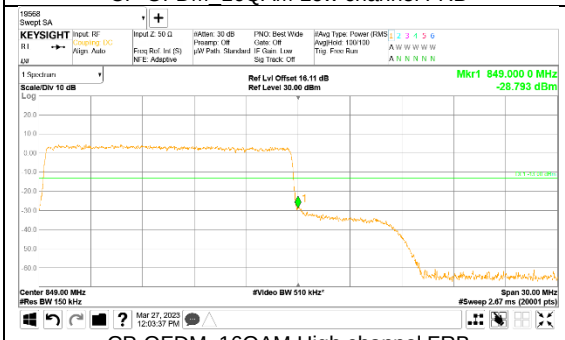
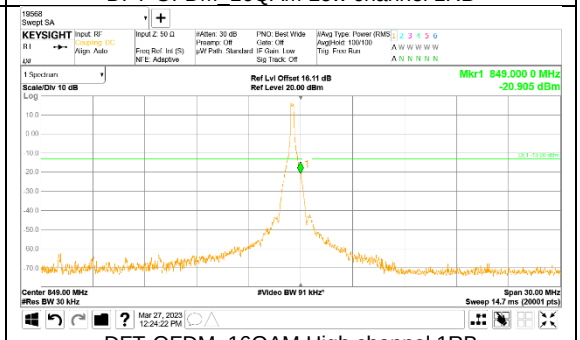
5MHz	 QPSK Low channel FRB	 QPSK Low channel 1RB
	 QPSK High channel FRB	 QPSK High channel 1RB
	 16QAM Low channel FRB	 16QAM Low channel 1RB
	 16QAM High channel FRB	 16QAM High channel 1RB

3MHz	 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

1.4MHz	 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

NR Band n26 (Part 22)

20MHz	 DFT-OFDM_QPSK Low channel FRB	 DFT-OFDM_QPSK Low channel 1RB
	 DFT-OFDM_QPSK High channel FRB	 DFT-OFDM_QPSK High channel 1RB
	 CP-OFDM_16QAM Low channel FRB	 DFT-OFDM_16QAM Low channel 1RB
	 DFT-OFDM_16QAM High channel FRB	 DFT-OFDM_16QAM High channel 1RB

15MHz	 DFT-OFDM_QPSK Low channel FRB	 DFT-OFDM_QPSK Low channel 1RB
	 CP-OFDM_QPSK High channel FRB	 DFT-OFDM_QPSK High channel 1RB
	 CP-OFDM_16QAM Low channel FRB	 DFT-OFDM_16QAM Low channel 1RB
	 CP-OFDM_16QAM High channel FRB	 DFT-OFDM_16QAM High channel 1RB

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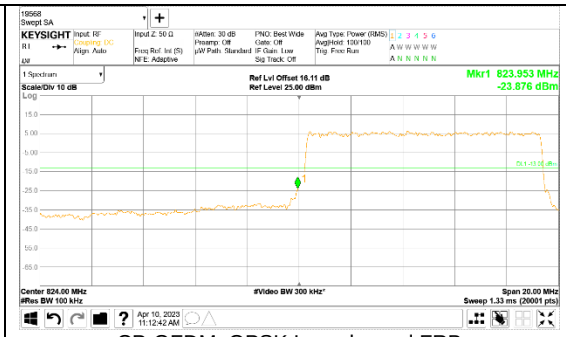
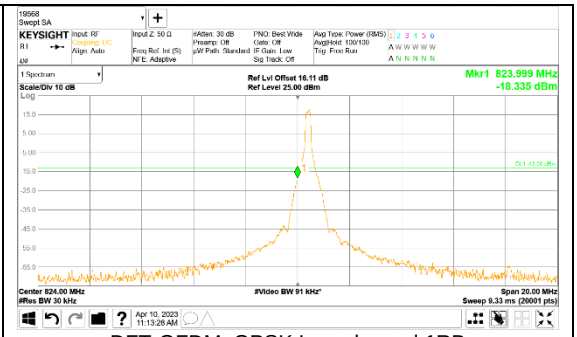
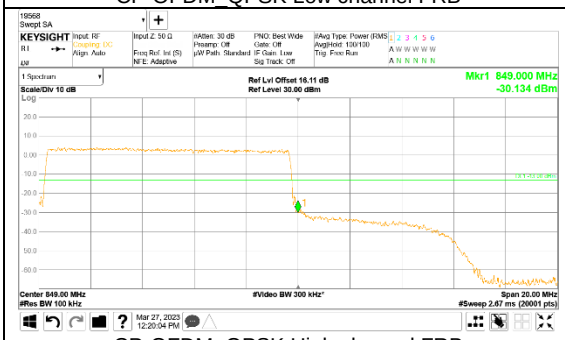
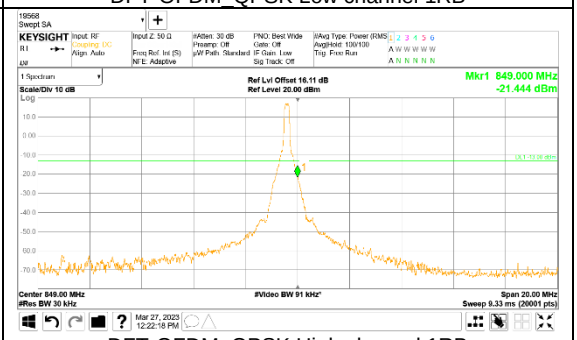
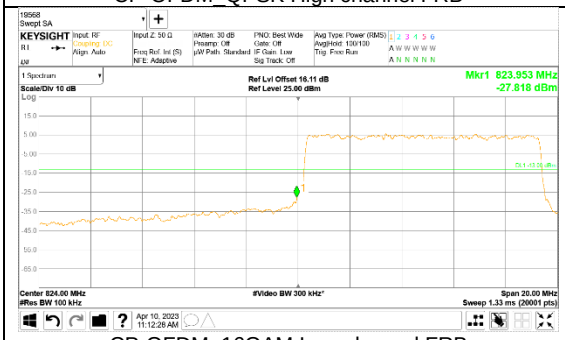
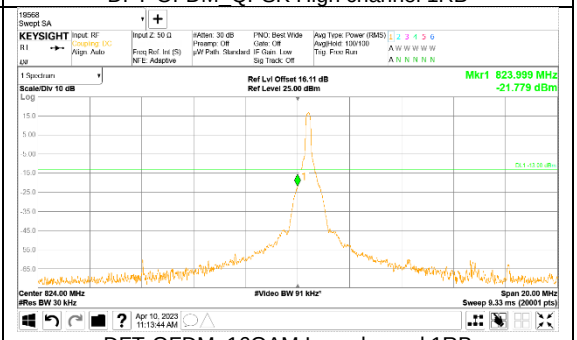
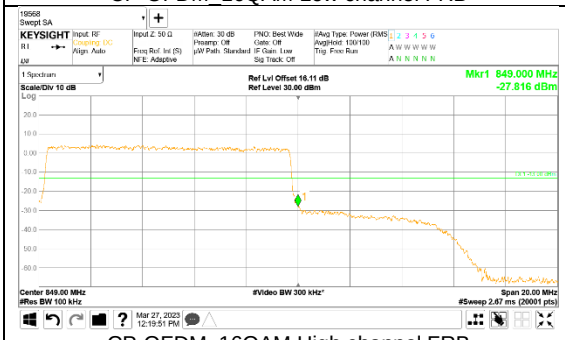
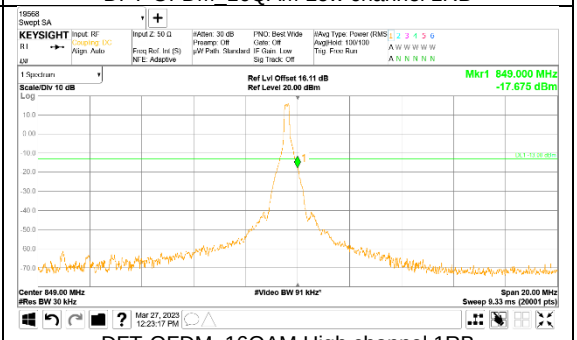
10MHz	 CP-OFDM_QPSK Low channel FRB	 DFT-OFDM_QPSK Low channel 1RB
	 CP-OFDM_QPSK High channel FRB	 DFT-OFDM_QPSK High channel 1RB
	 CP-OFDM_16QAM Low channel FRB	 DFT-OFDM_16QAM Low channel 1RB
	 CP-OFDM_16QAM High channel FRB	 DFT-OFDM_16QAM High channel 1RB

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