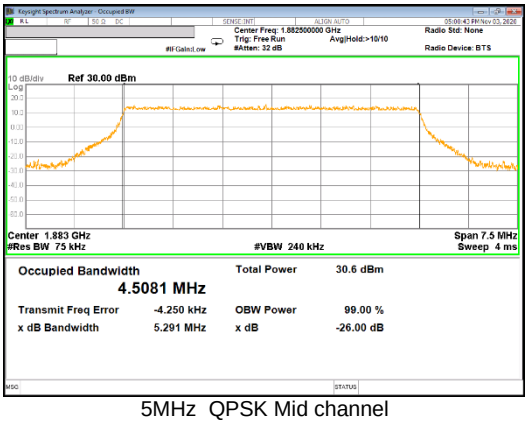
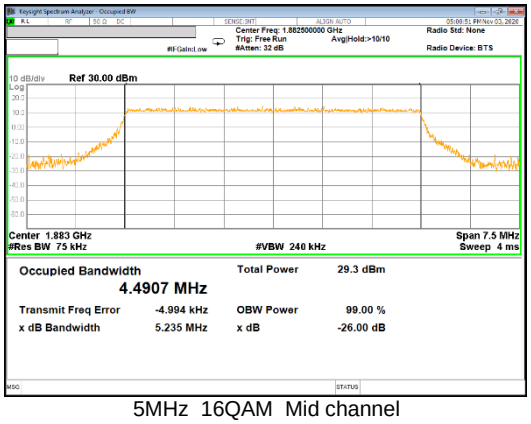
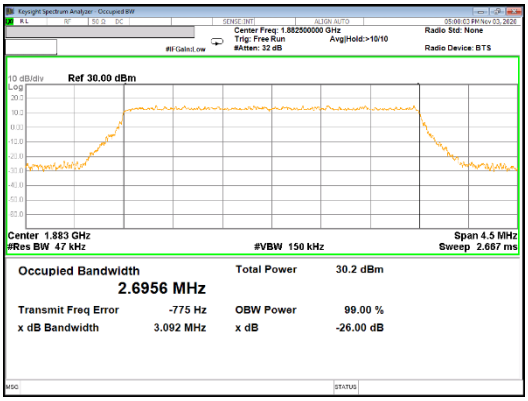
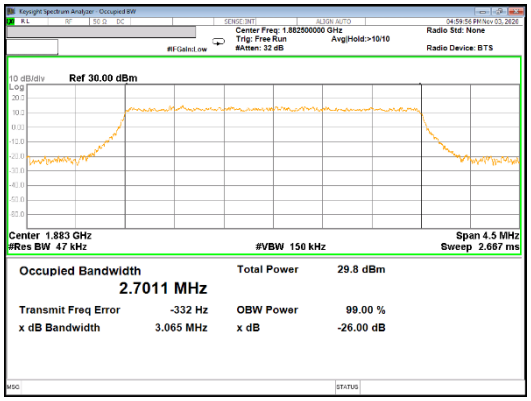
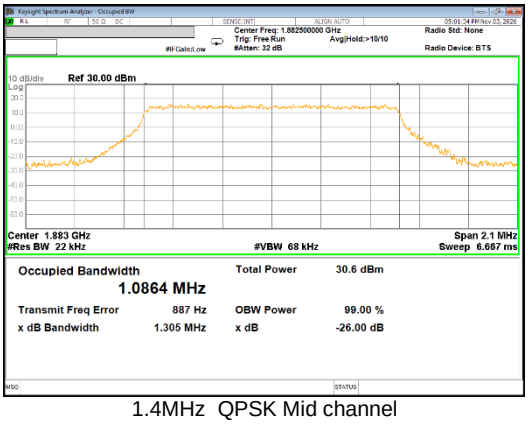
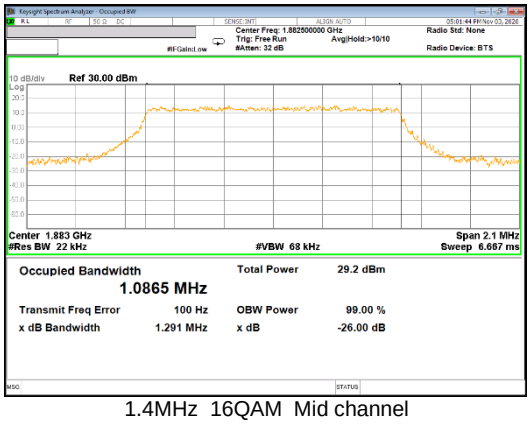
Band 25 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
Band 25 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel
Band 25 1.4MHz	 1.4MHz QPSK Mid channel	 1.4MHz 16QAM Mid channel

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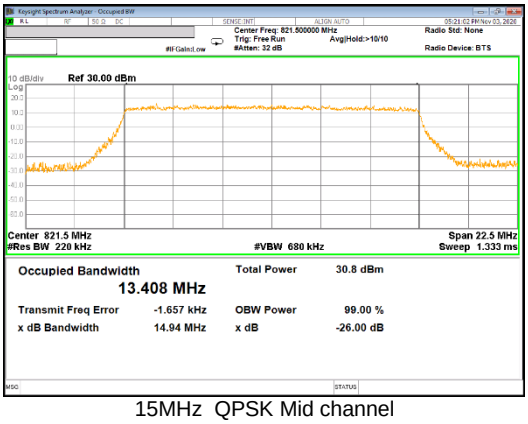
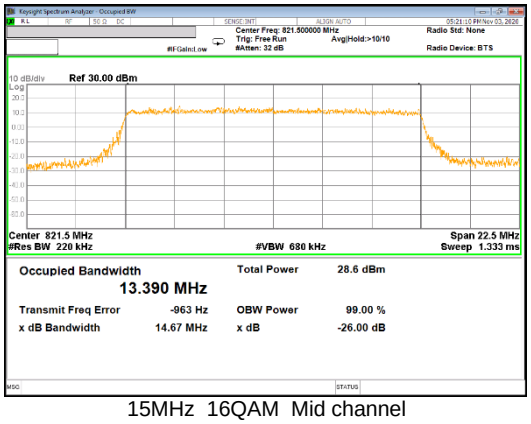
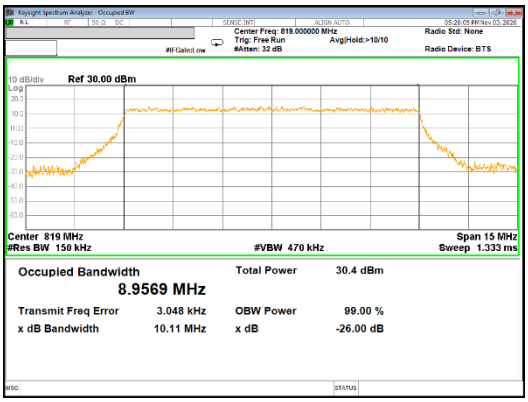
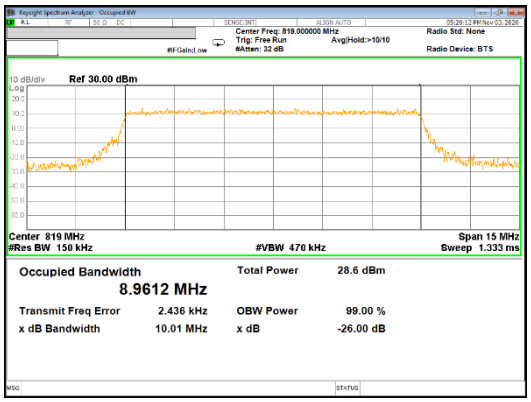
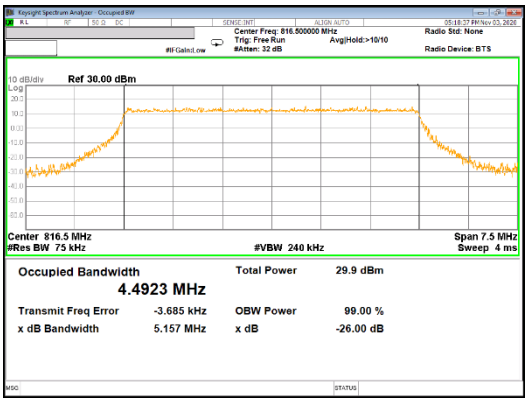
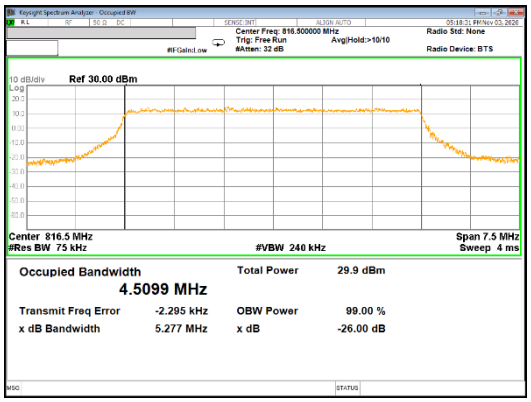
LTE Band 26 (Part90)

Band 26 15MHz	 15MHz QPSK Mid channel	 15MHz 16QAM Mid channel
Band 26 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
Band 26 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel

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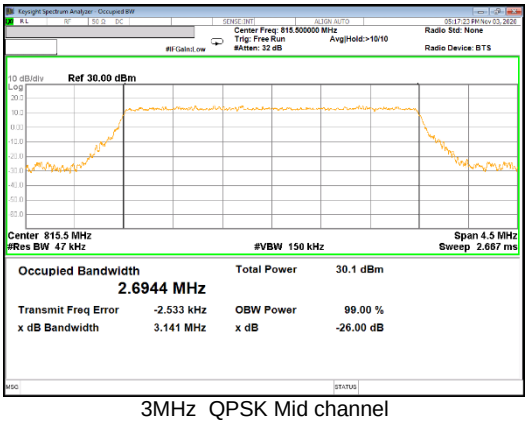
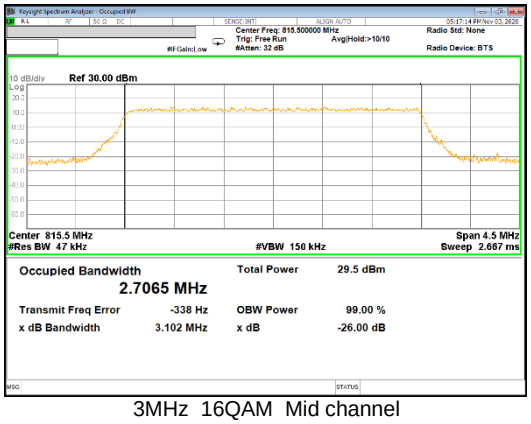
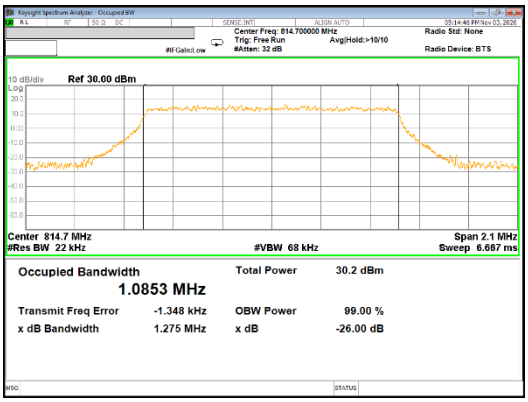
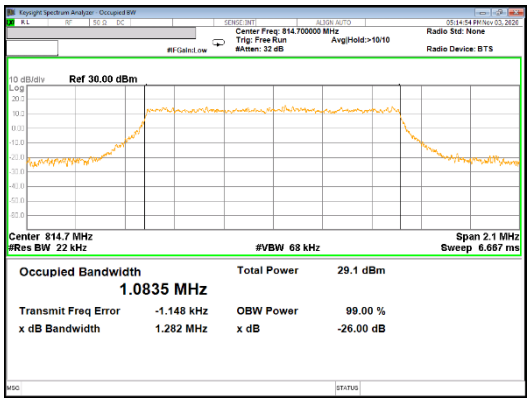
Band 26 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel
Band 26 1.4MHz	 1.4MHz QPSK Mid channel	 1.4MHz 16QAM Mid channel

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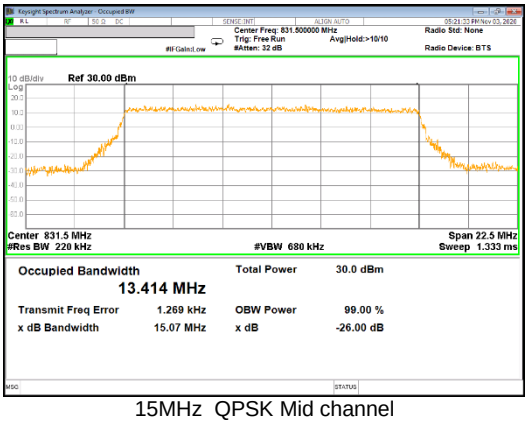
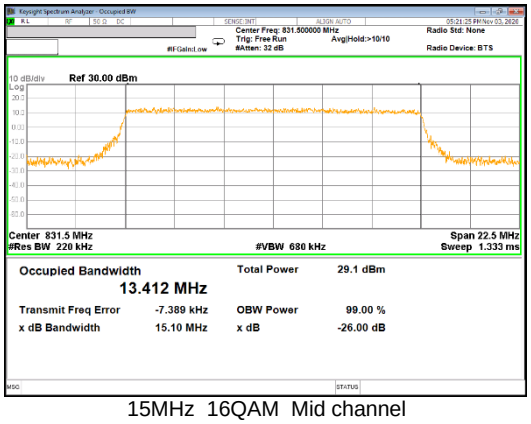
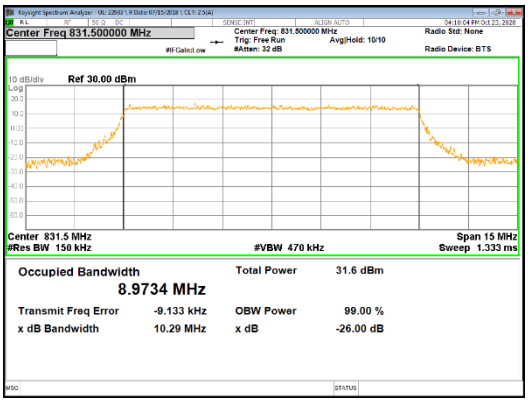
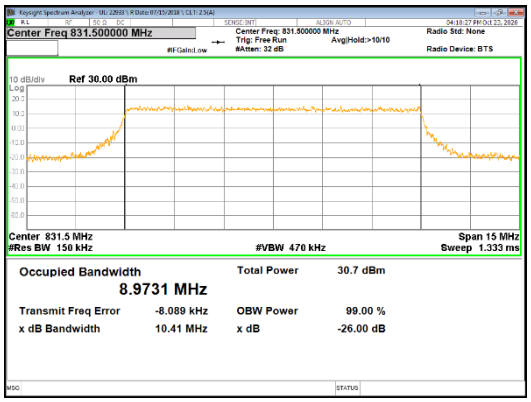
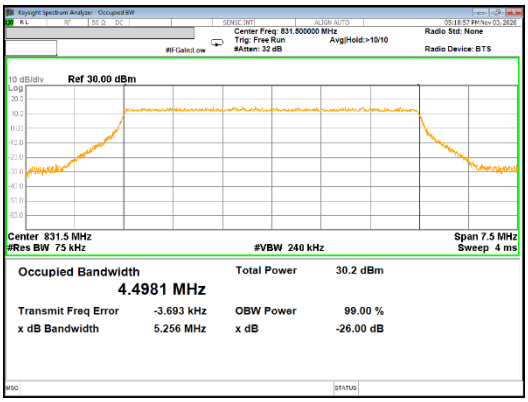
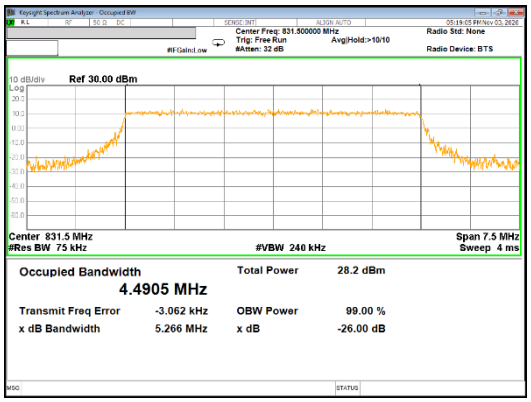
LTE Band 26 (Part22)

Band 26 15MHz	 15MHz QPSK Mid channel	 15MHz 16QAM Mid channel
Band 26 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
Band 26 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel

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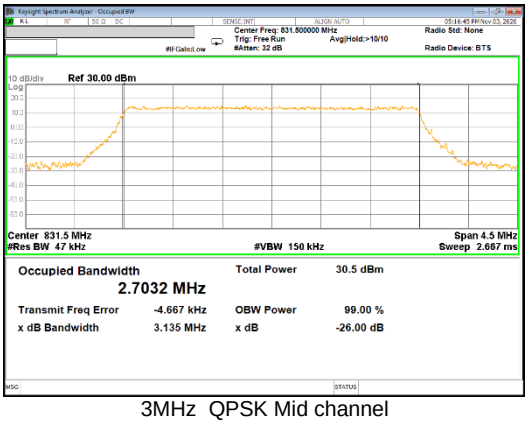
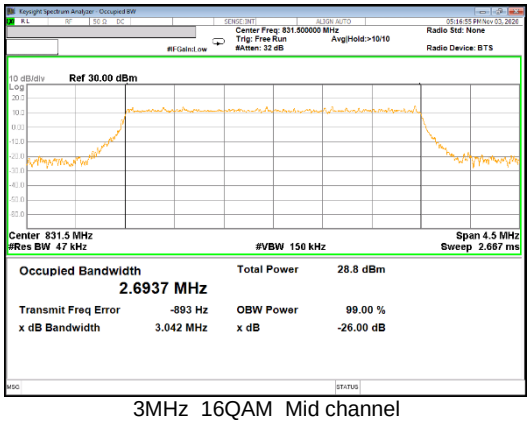
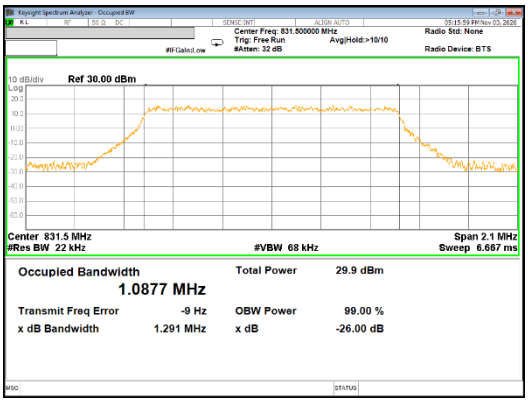
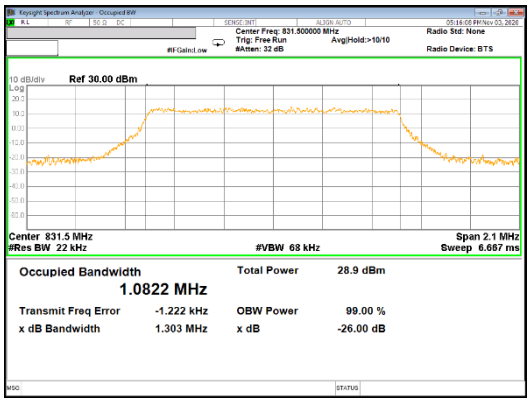
Band 26 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel
Band 26 1.4MHz	 1.4MHz QPSK Mid channel	 1.4MHz 16QAM Mid channel

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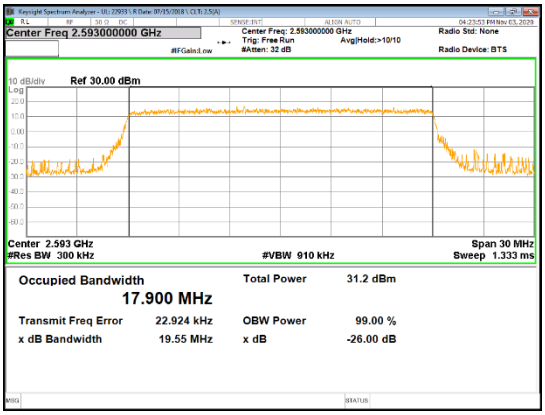
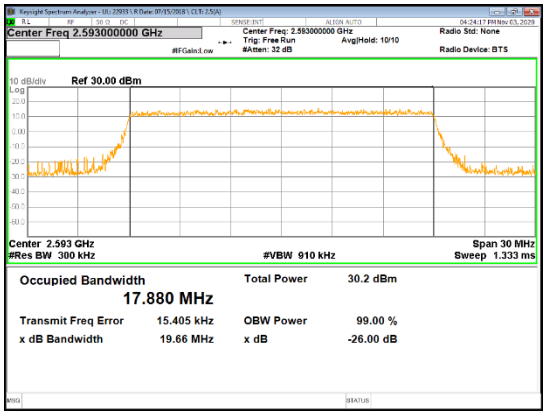
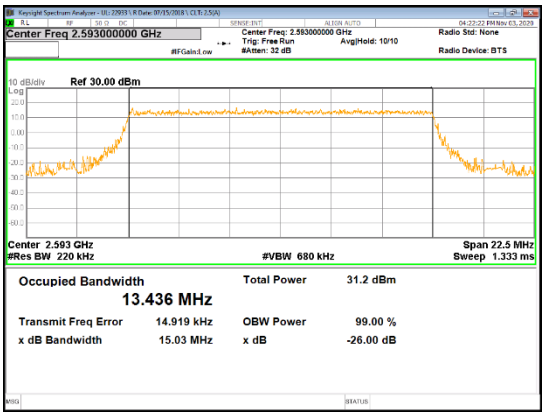
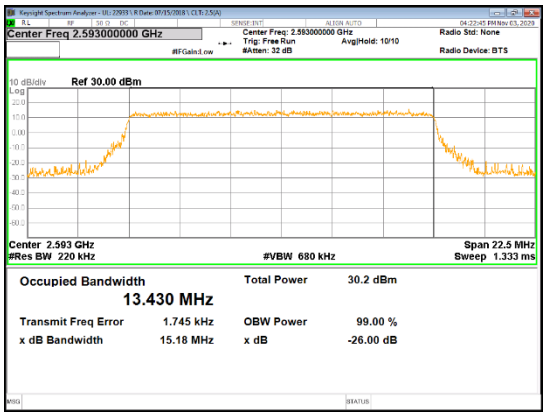
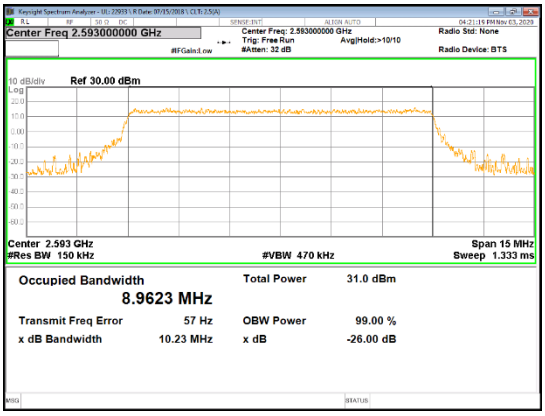
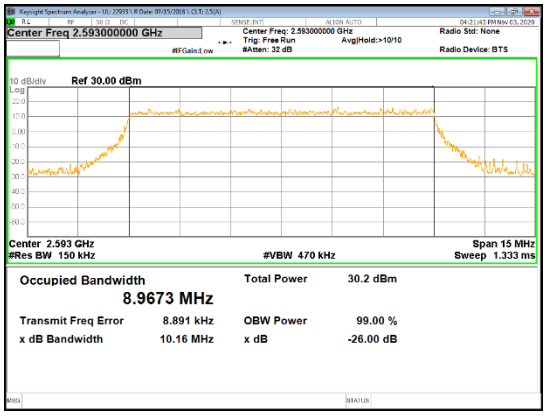
LTE Band 41(PC2)

Band 41 20MHz	 20MHz QPSK Mid channel	 20MHz 16QAM Mid channel
Band 41 15MHz	 15MHz QPSK Mid channel	 15MHz 16QAM Mid channel
Band 41 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel

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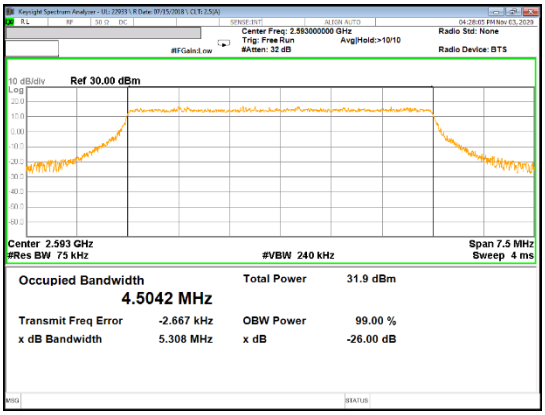
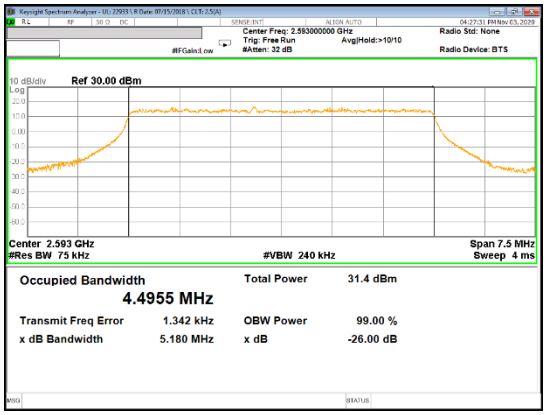
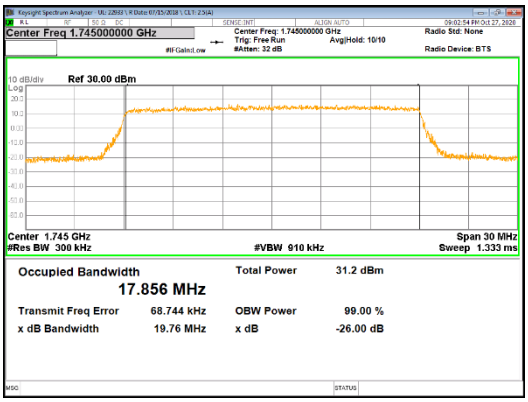
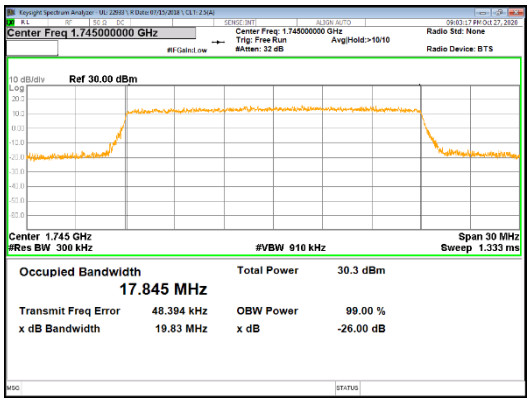
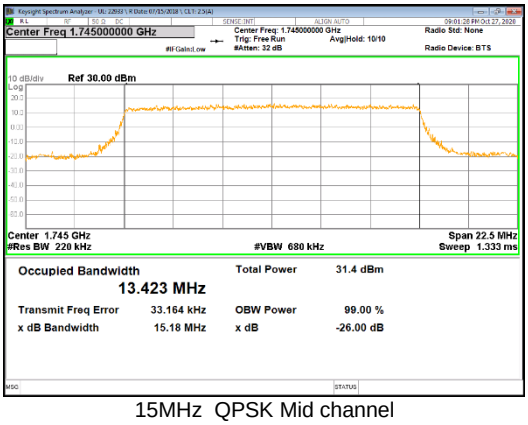
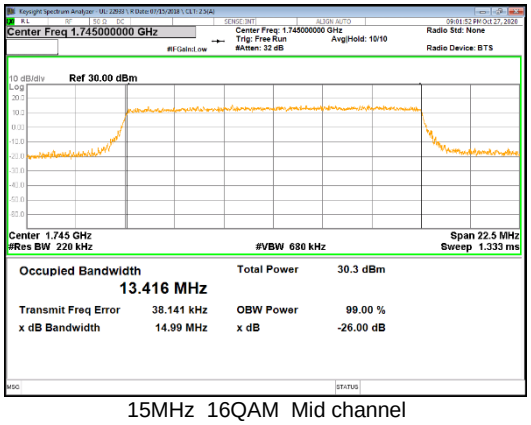
Band 41 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel

LTE Band 66

Band 66 20MHz	 20MHz QPSK Mid channel	 20MHz 16QAM Mid channel
Band 66 15MHz	 15MHz QPSK Mid channel	 15MHz 16QAM Mid channel

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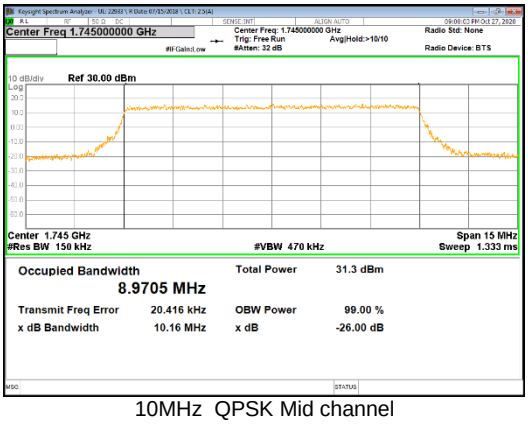
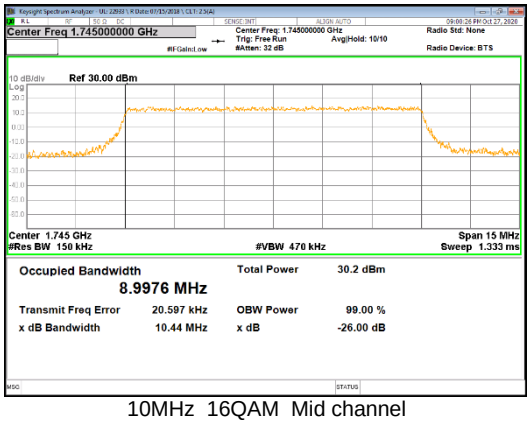
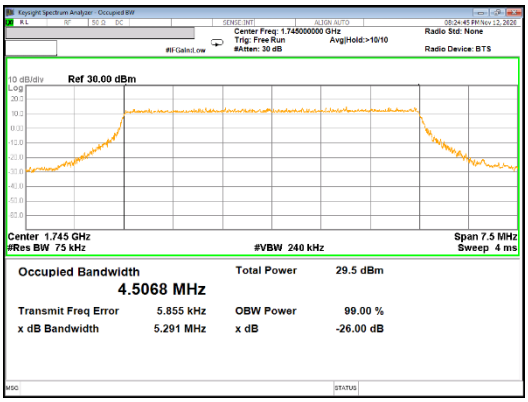
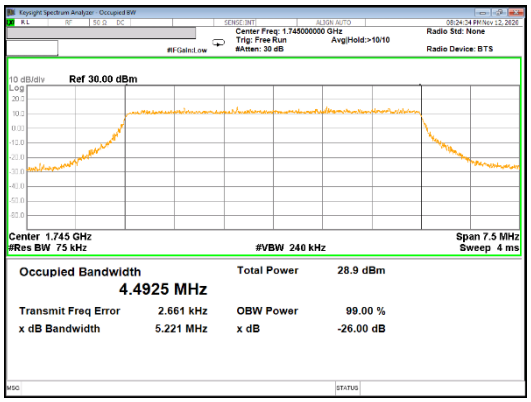
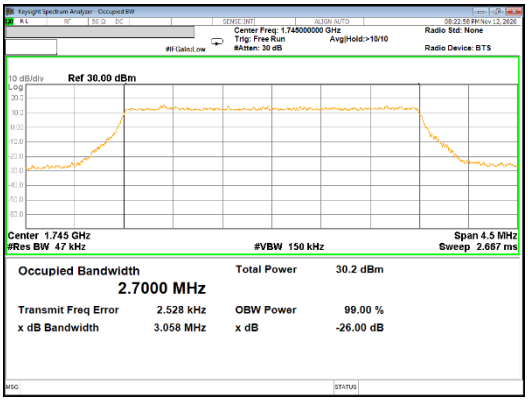
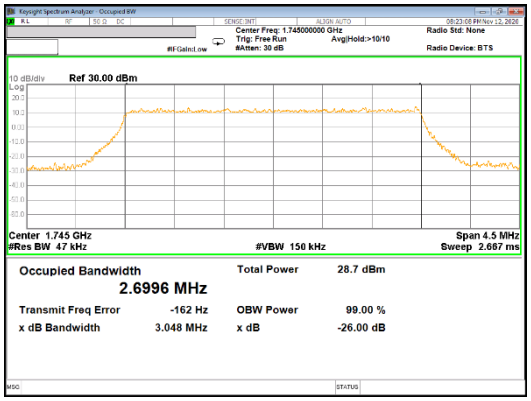
Band 66 10MHz	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
Band 66 5MHz	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
Band 66 3MHz	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel

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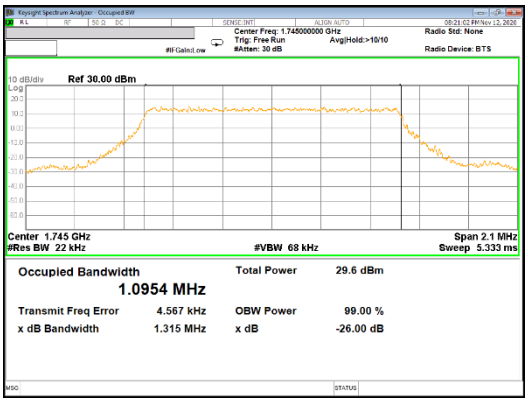
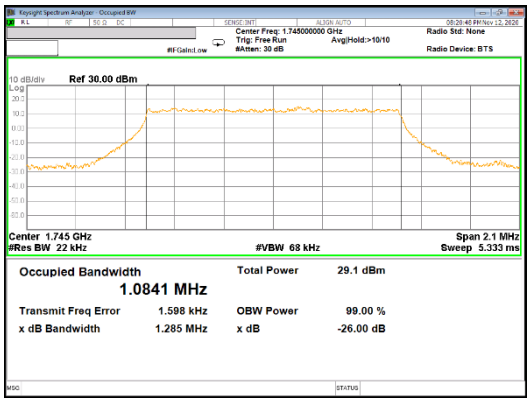
Band 66 1.4MHz	 1.4MHz QPSK Mid channel	 1.4MHz 16QAM Mid channel

LTE Band 2

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

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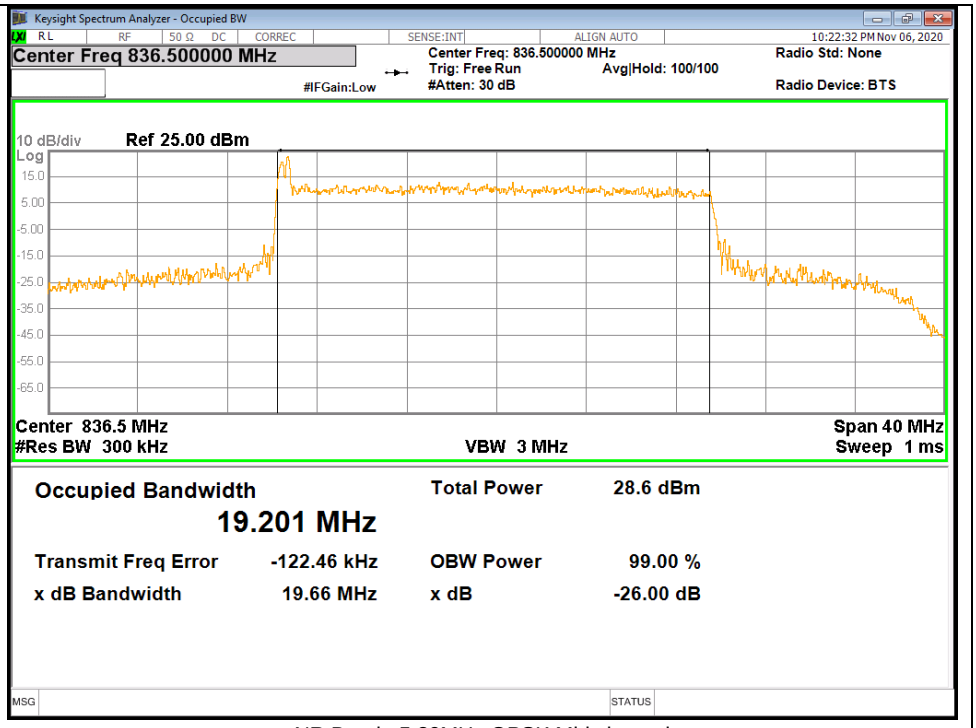
NR Band n5

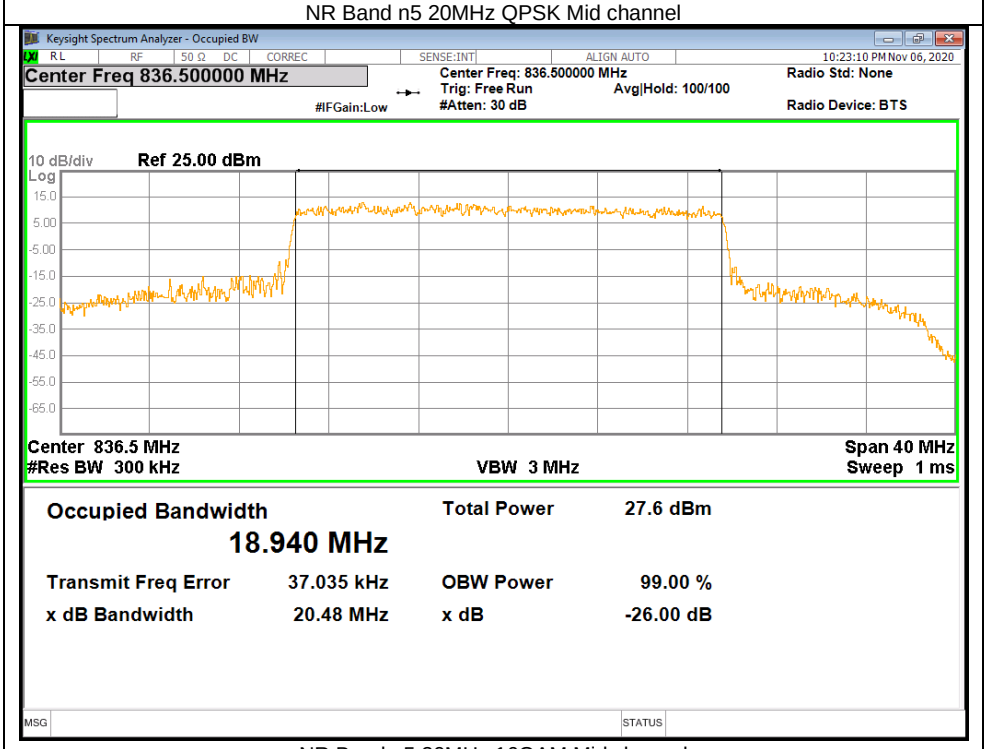
NR Band n5

20 MHz

CP-OFDM



NR Band n5 20MHz QPSK Mid channel



NR Band n5 20MHz 16QAM Mid channel

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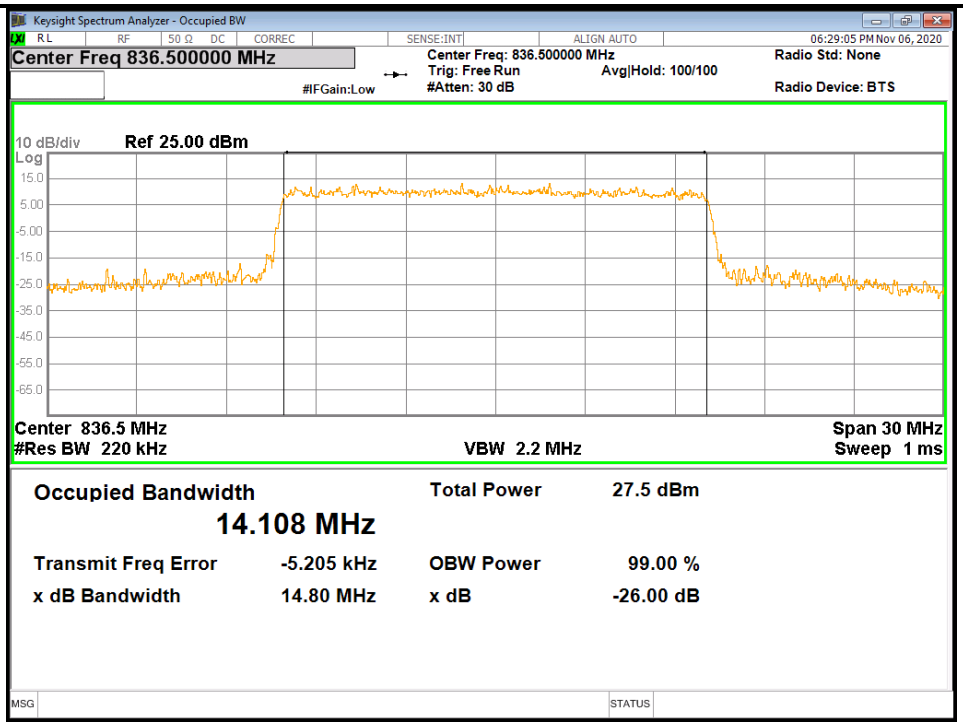
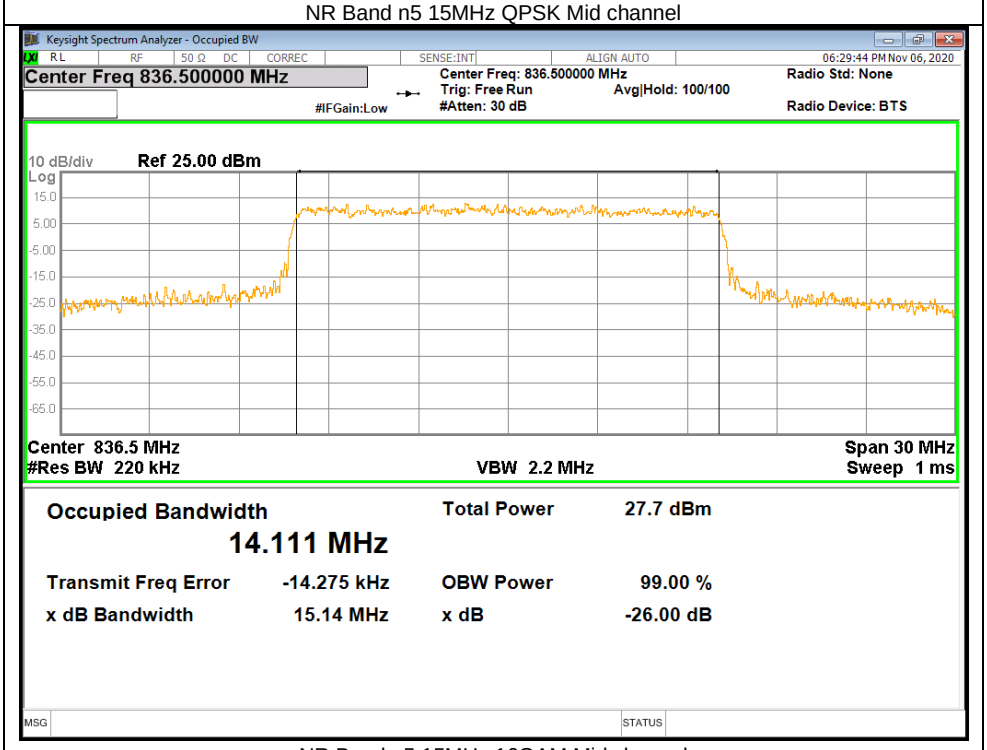
NR Band n5

15 MHz

CP-OFDM



NR Band n5 15MHz QPSK Mid channel



NR Band n5 15MHz 16QAM Mid channel

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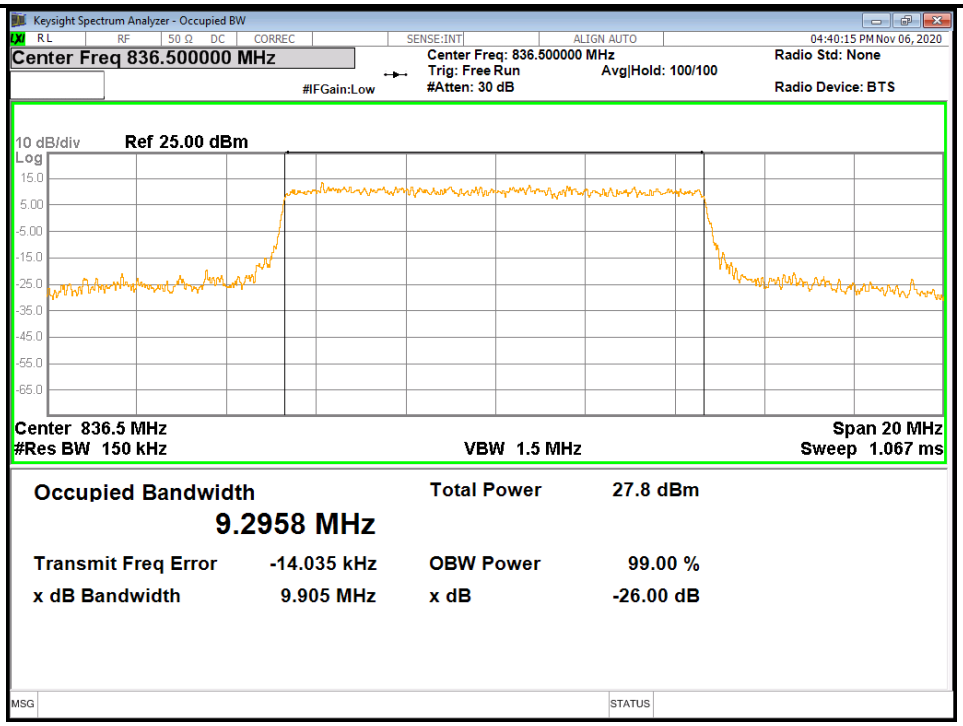
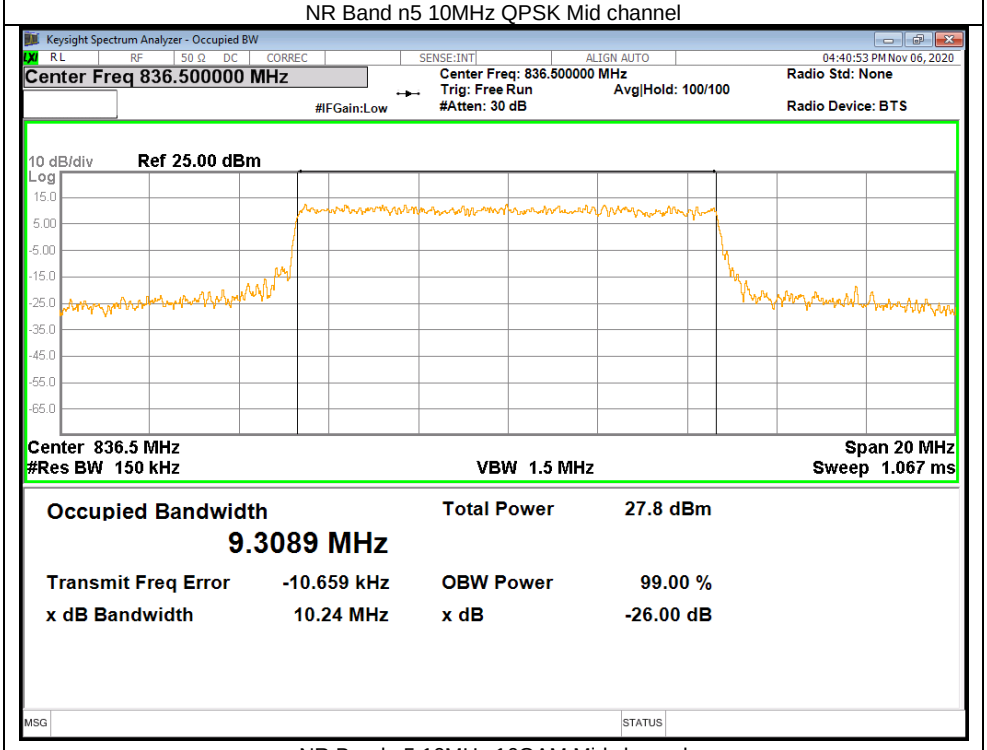
NR Band n5

10 MHz

CP-OFDM



NR Band n5 10MHz QPSK Mid channel



NR Band n5 10MHz 16QAM Mid channel

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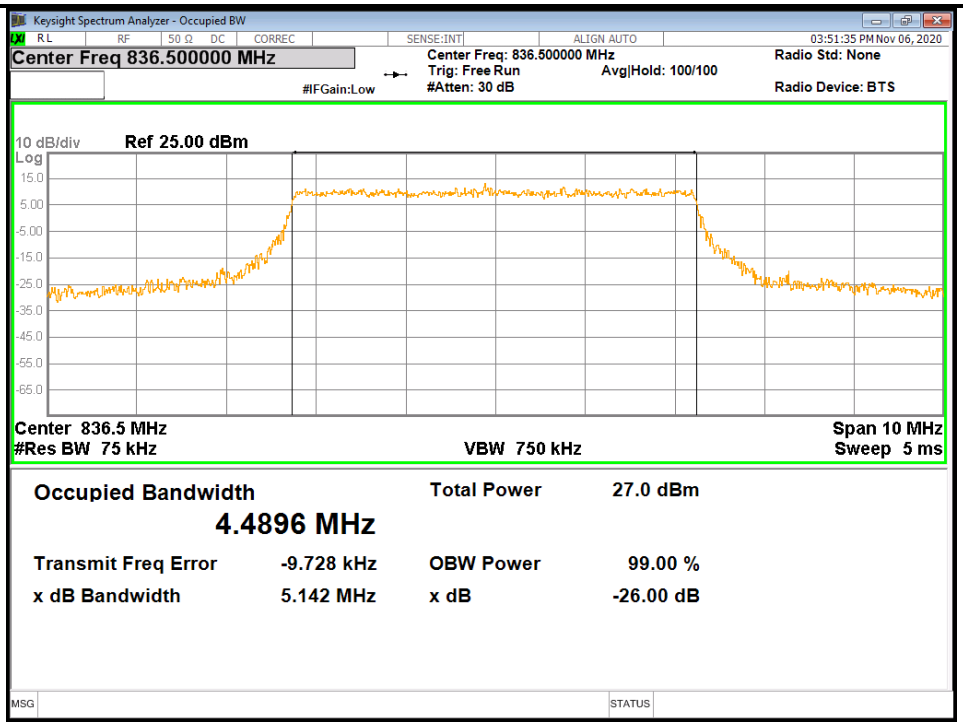
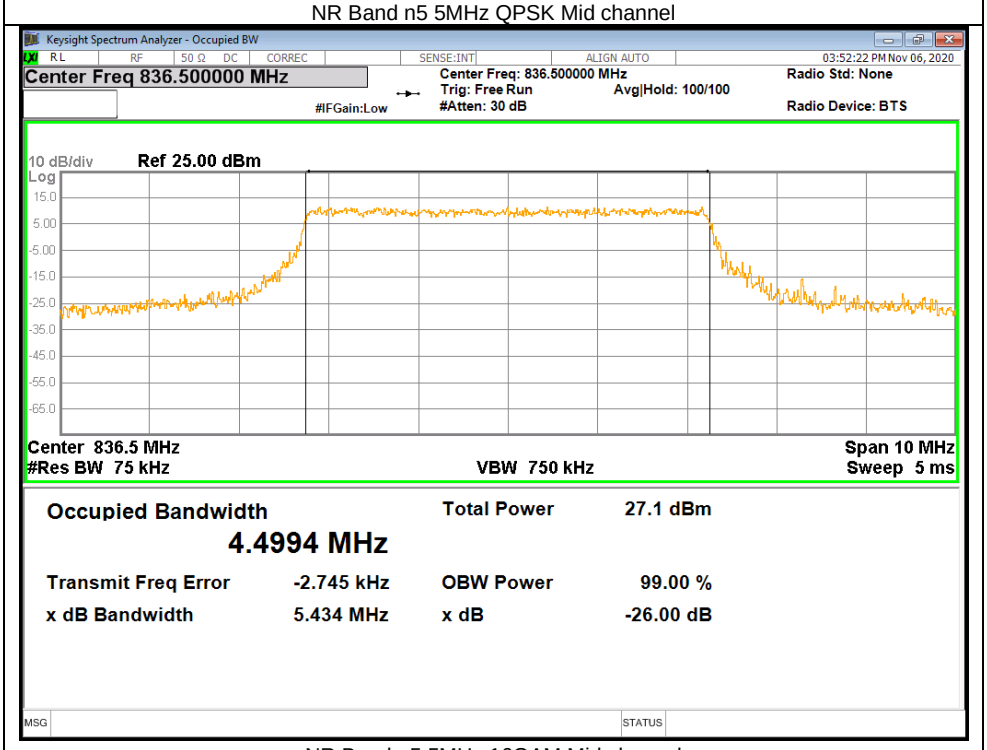
NR Band n5

5 MHz

CP-OFDM



NR Band n5 5MHz QPSK Mid channel



NR Band n5 5MHz 16QAM Mid channel

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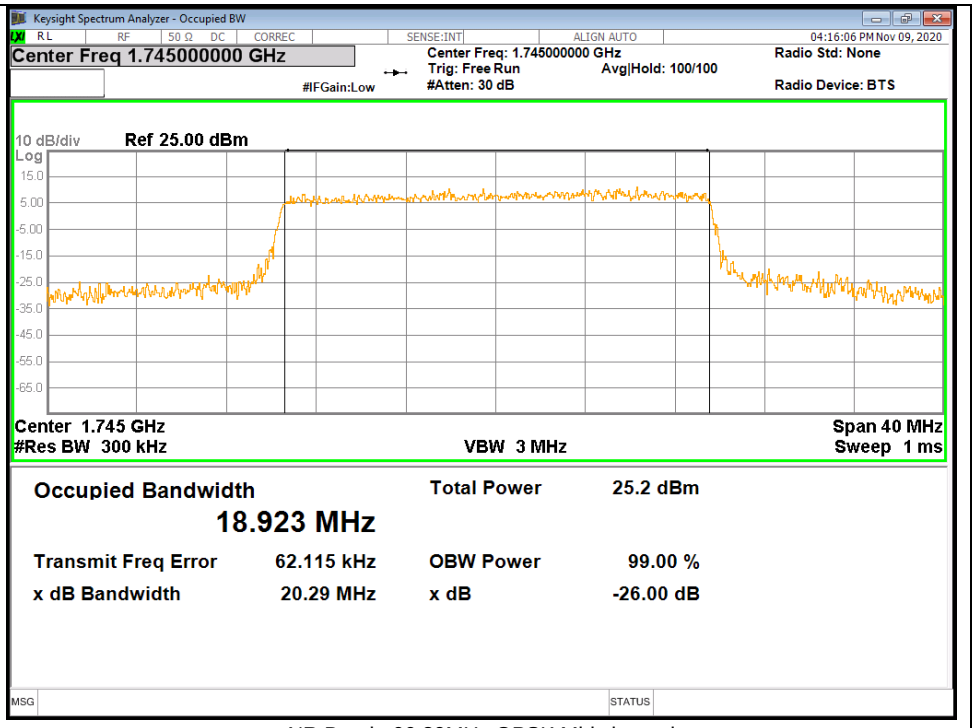
NR Band n66

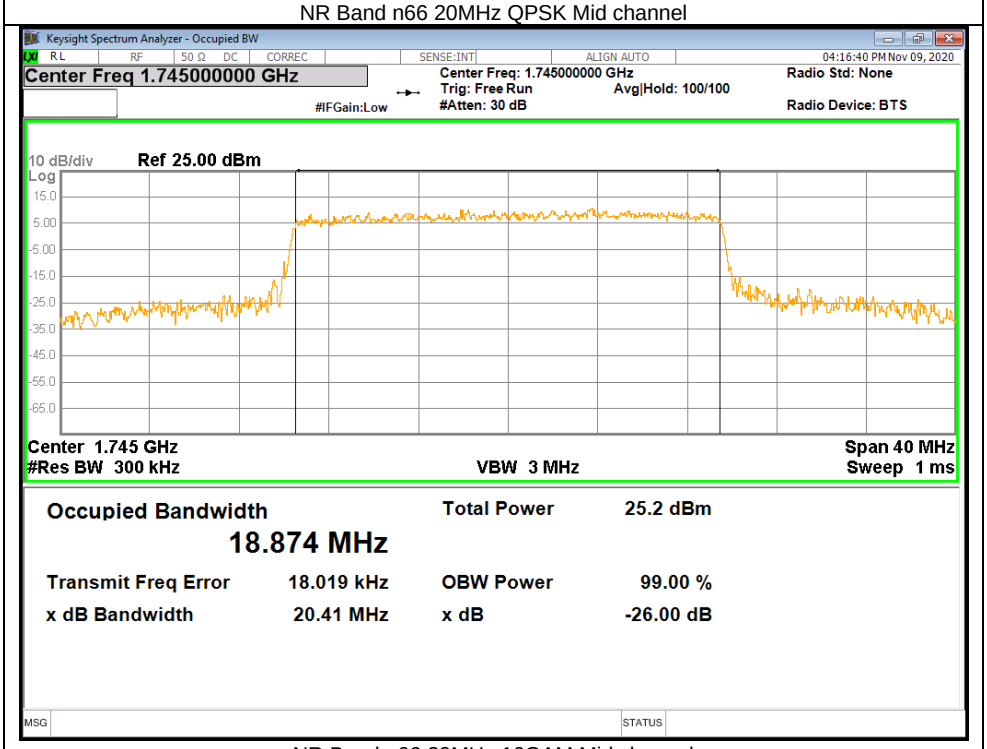
NR Band n66

20 MHz

CP-OFDM



NR Band n66 20MHz QPSK Mid channel



NR Band n66 20MHz 16QAM Mid channel

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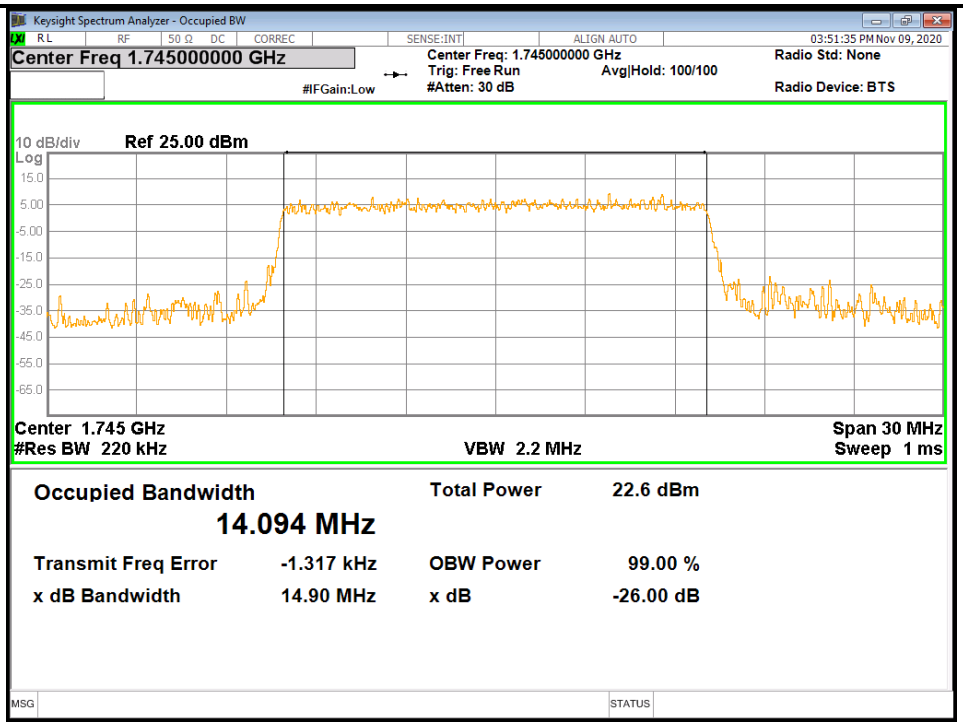
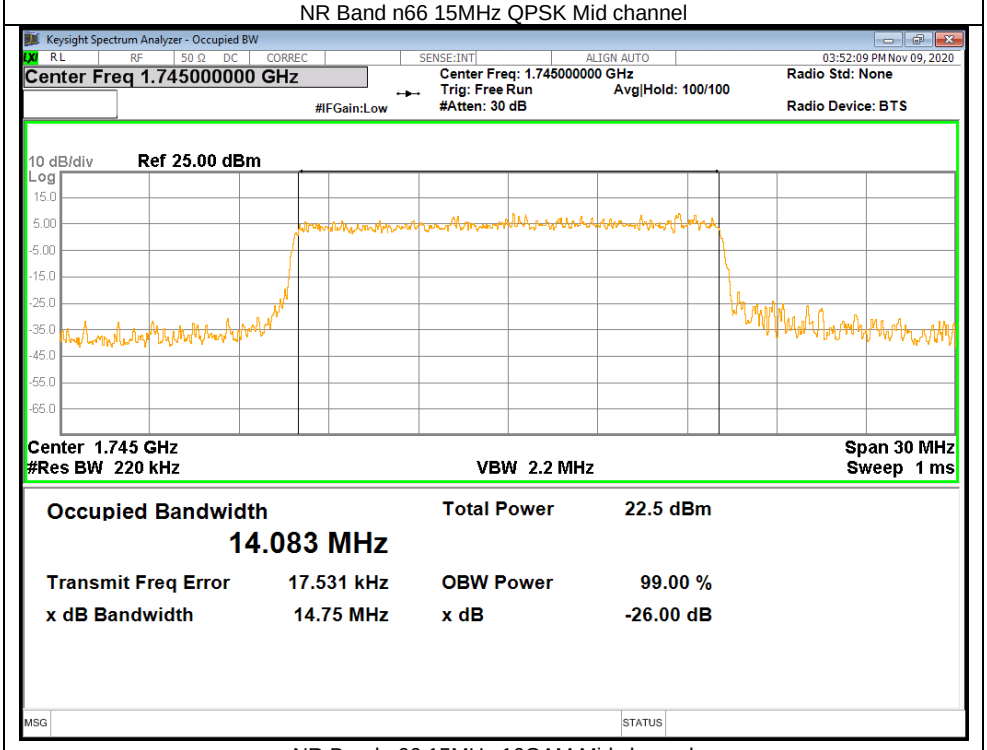
NR Band n66

15 MHz

CP-OFDM



NR Band n66 15MHz QPSK Mid channel



NR Band n66 15MHz 16QAM Mid channel

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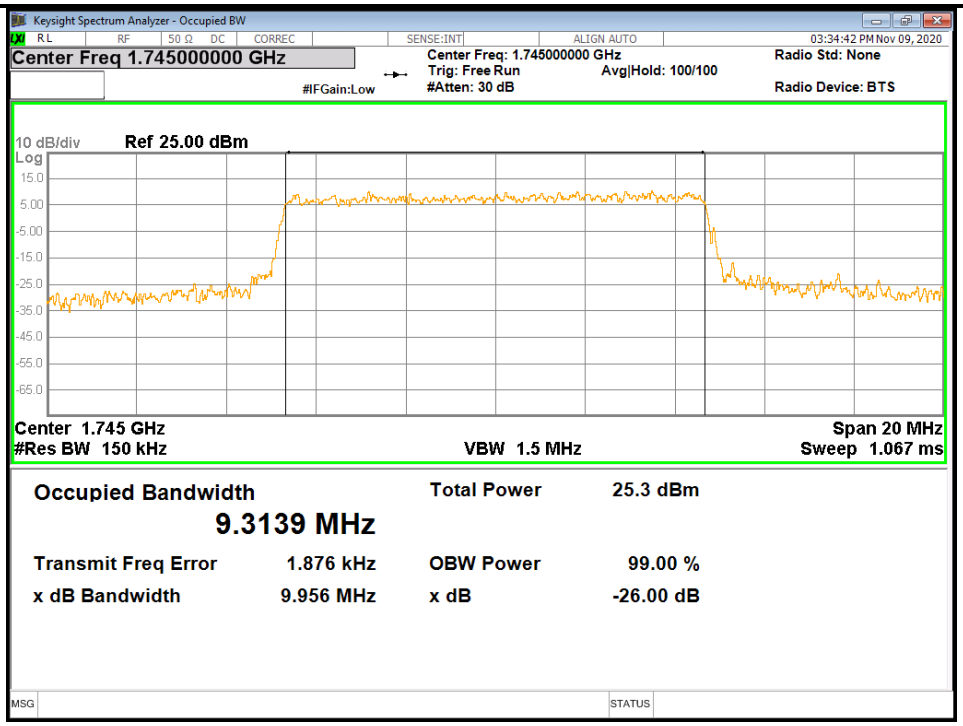
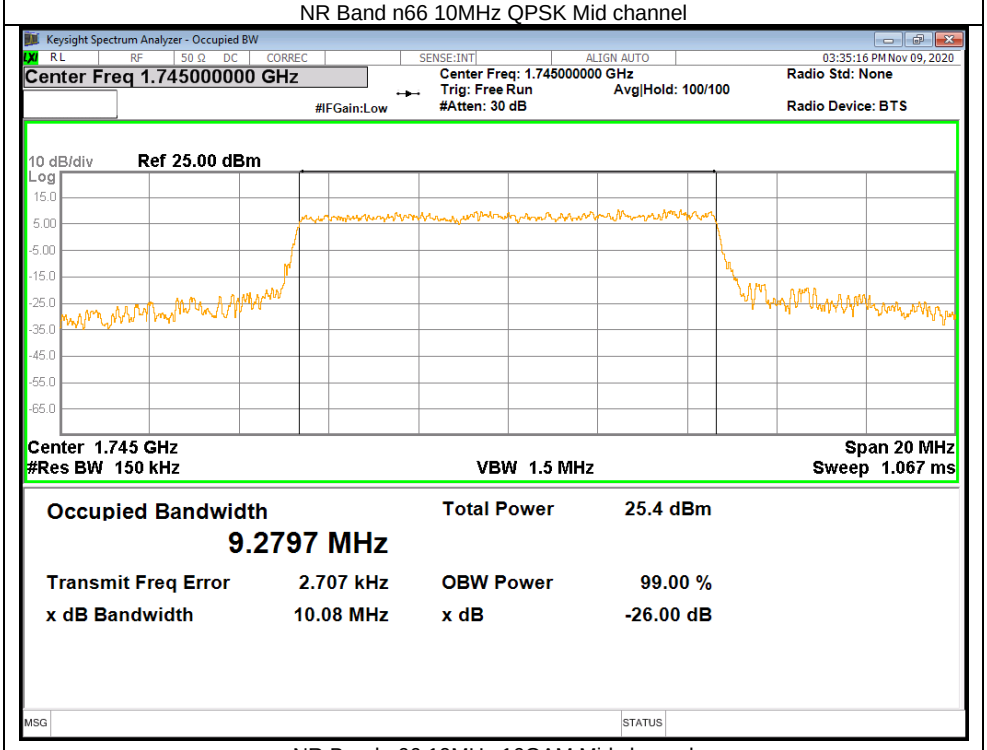
NR Band n66

10 MHz

CP-OFDM



NR Band n66 10MHz QPSK Mid channel



NR Band n66 10MHz 16QAM Mid channel

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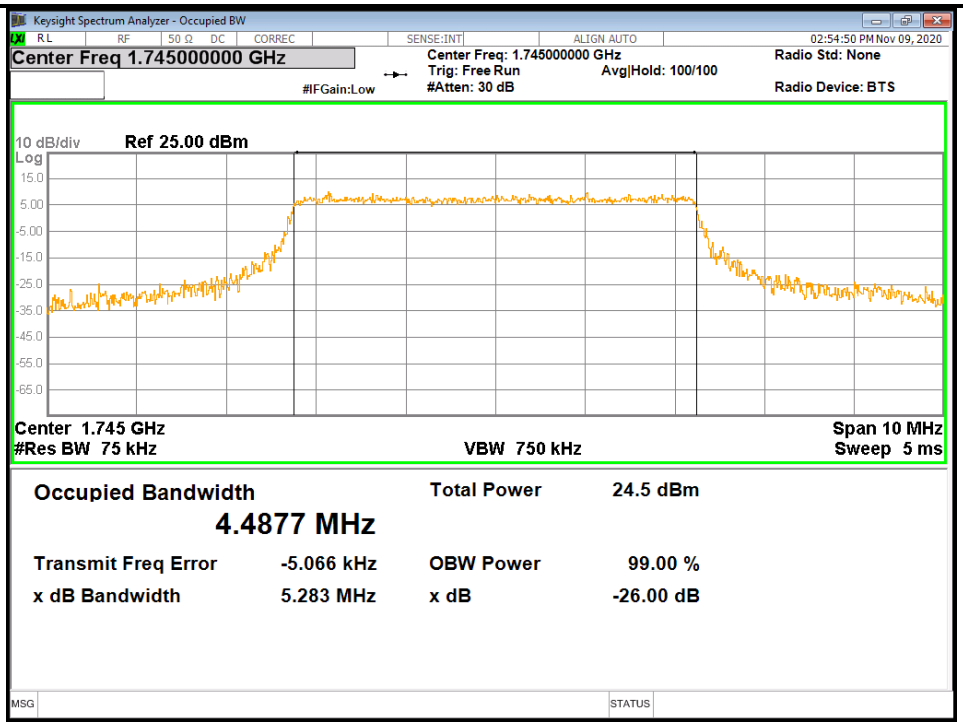
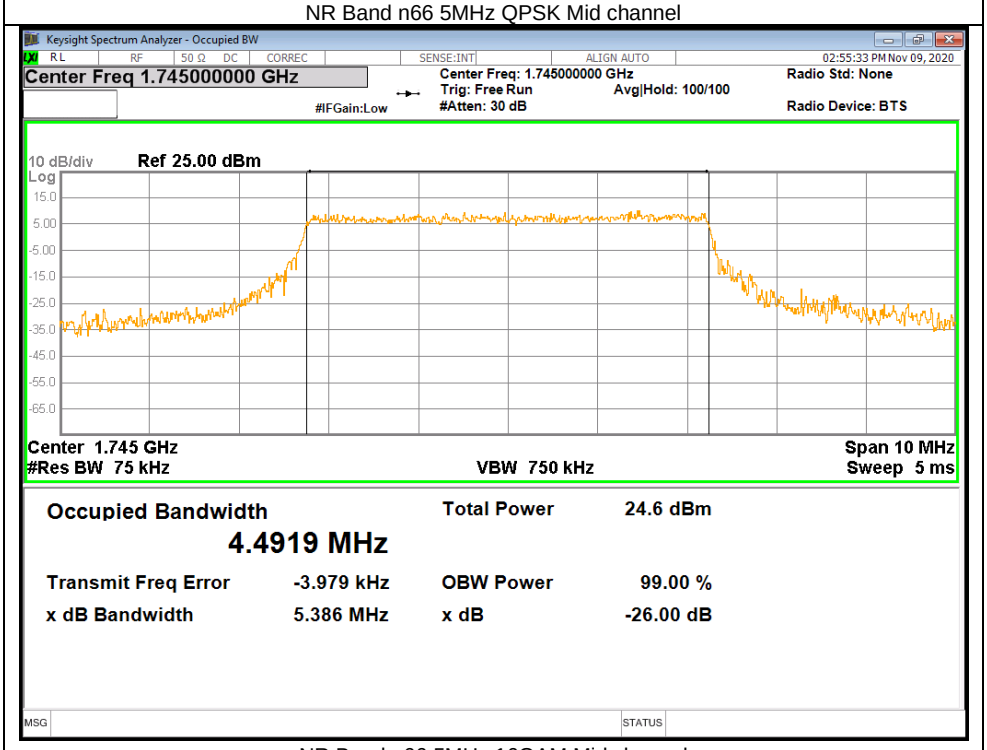
NR Band n66

5 MHz

CP-OFDM



NR Band n66 5MHz QPSK Mid channel



NR Band n66 5MHz 16QAM Mid channel

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9.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359, §22.917, §24.238, §27. 53 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 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.

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.

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TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01
The transmitter output was connected to a CMW500 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, GSM1900 – 9.1KHz)
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);

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NOTE1: For frequency range of 763-775 MHz and 793-806 MHz.(LTE Band 13)

a) Set the RBW = 6.2kHz

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 additional 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.

NOTE3

5G NR: All Waveforms (CP-OFDM vs DFT-s OFDM) 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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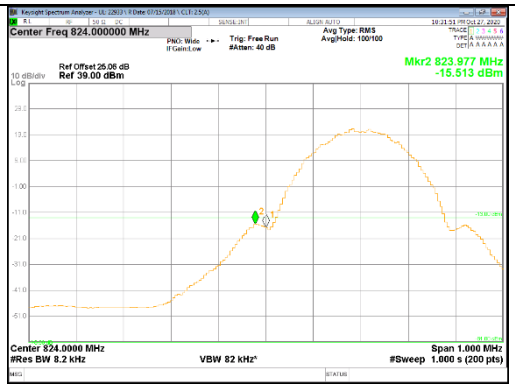
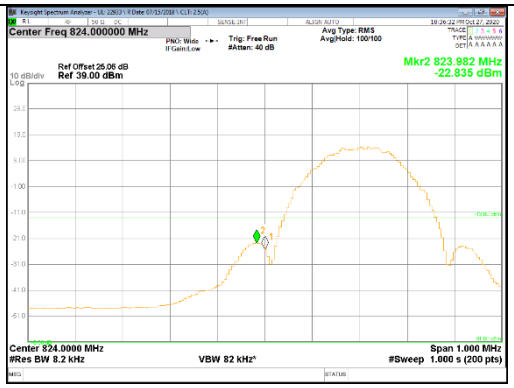
9.2.1. BAND EDGE RESULT

GSM

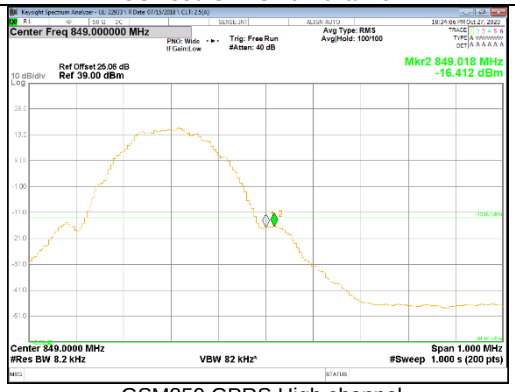
GSM 850



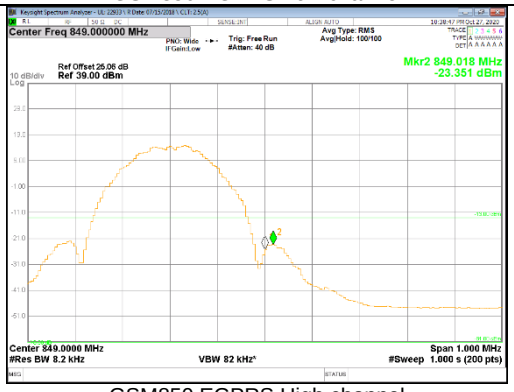
GSM850 GPRS Low channel



GSM850 EGPRS Low channel

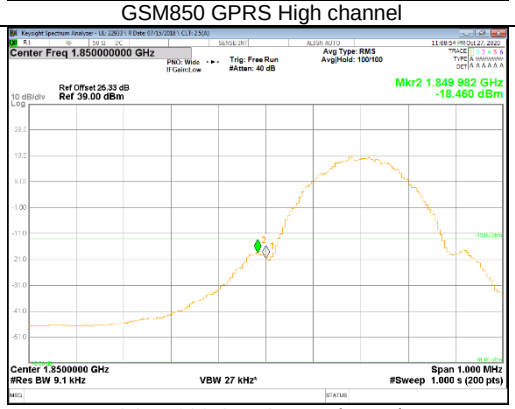


GSM850 GPRS High channel

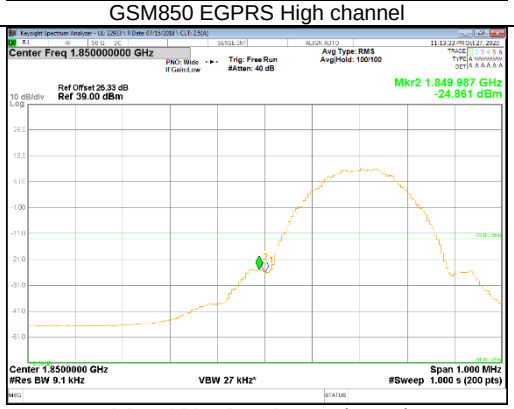


GSM850 EGPRS High channel

GSM 1900

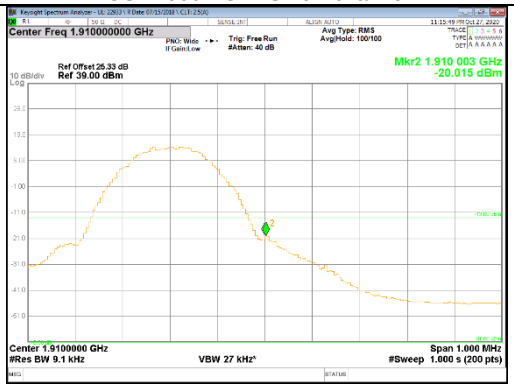


GSM1900 GPRS Low channel



GSM1900 EGPRS Low channel

GSM1900 GPRS High channel



GSM1900 EGPRS High channel

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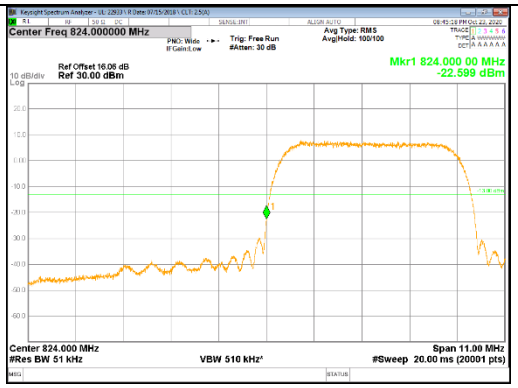
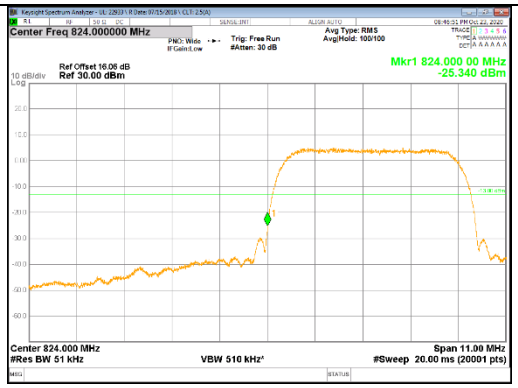
WCDMA

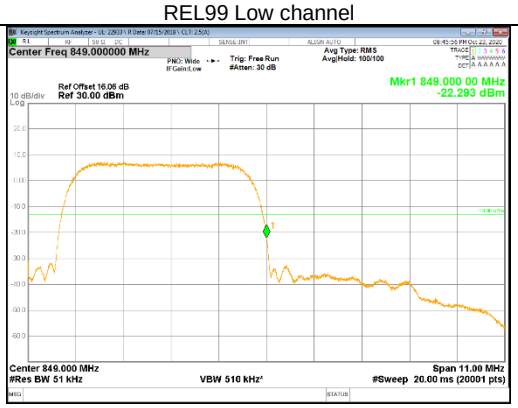
Band 5



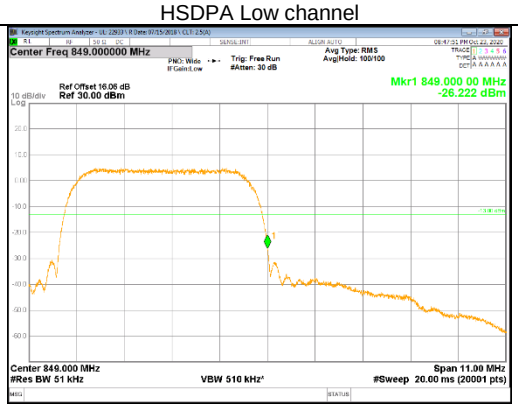
REL99 Low channel



HSDPA Low channel

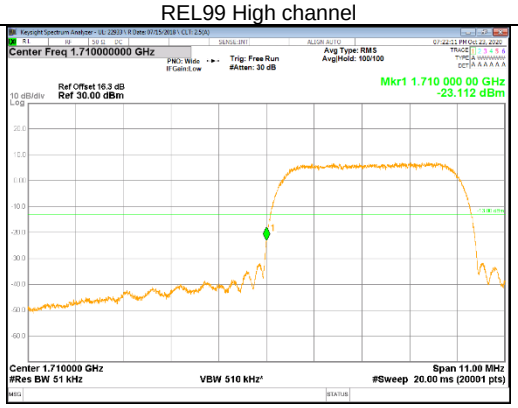


REL99 High channel

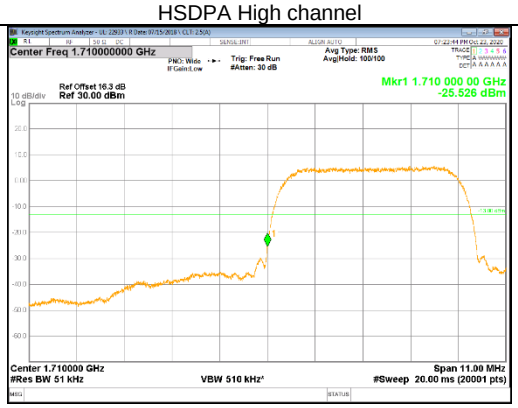


HSDPA High channel

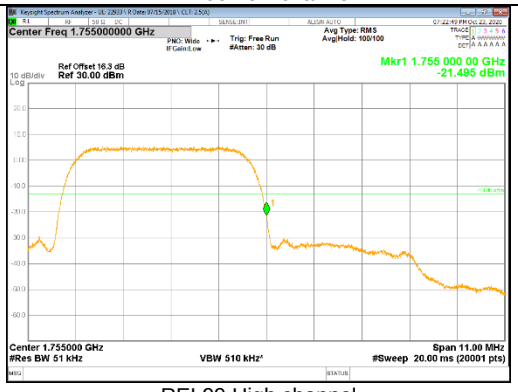
Band 4



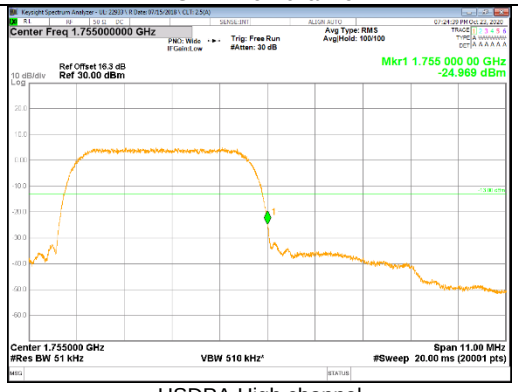
REL99 Low channel



HSDPA Low channel



REL99 High channel



HSDPA High channel

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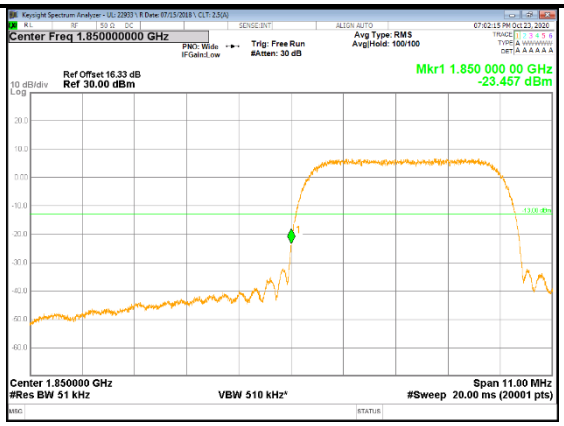
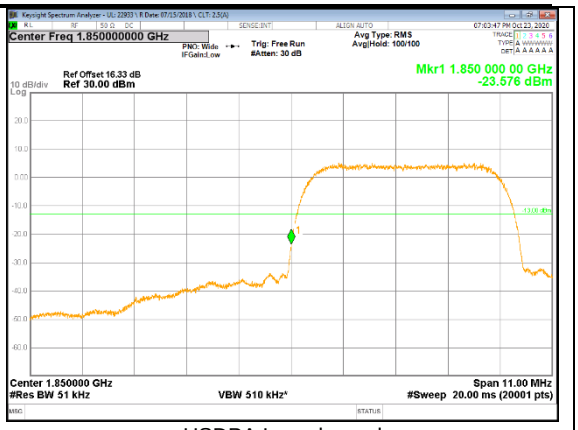
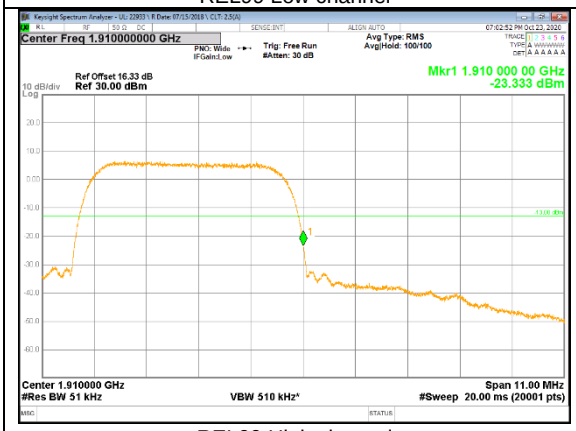
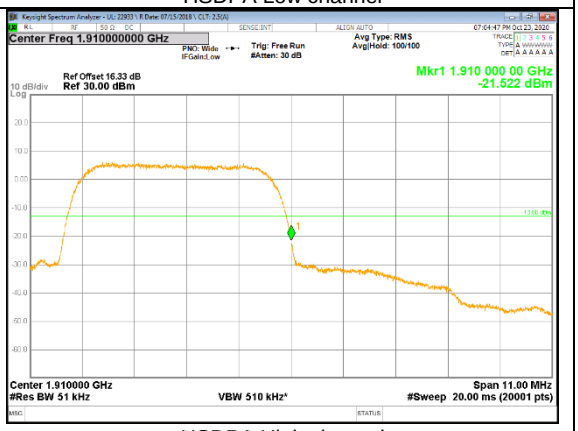
Band 2	 REL99 Low channel	 HSDPA Low channel
	 REL99 High channel	 HSDPA High channel

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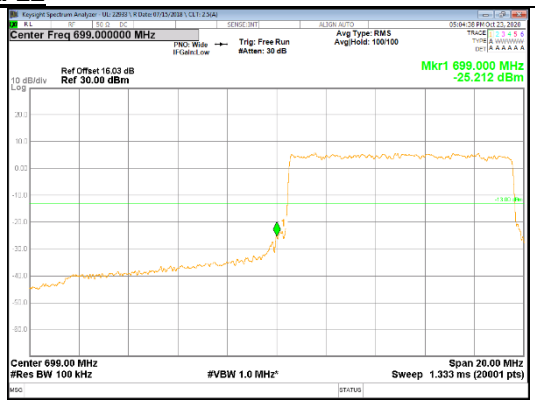
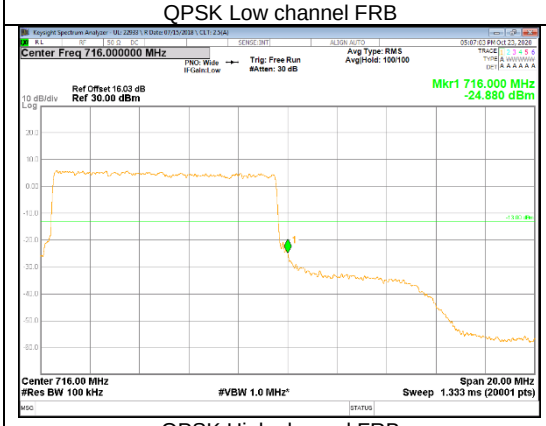
LTE Band 12



QPSK Low channel FRB

QPSK Low channel 1RB



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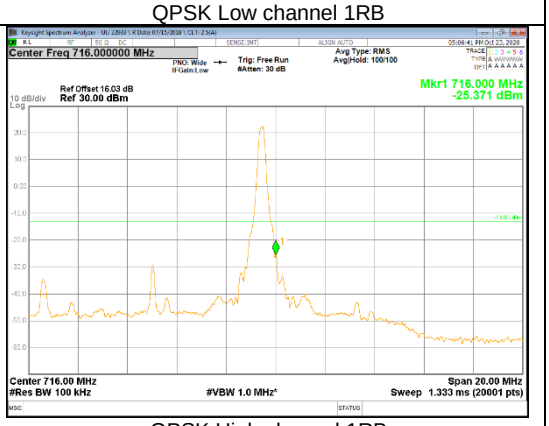
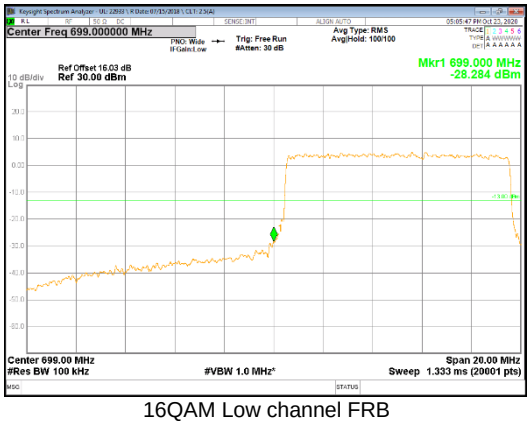


QPSK High channel 1RB

Band 12

10MHz



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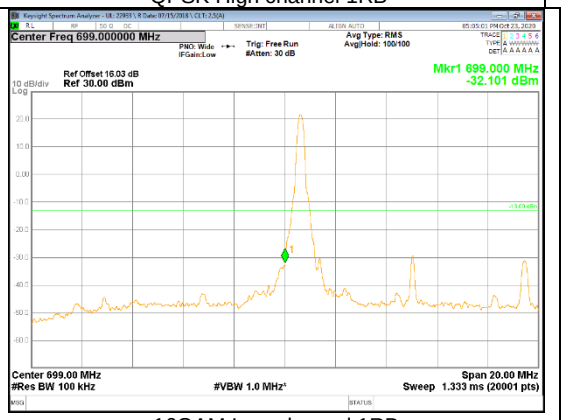

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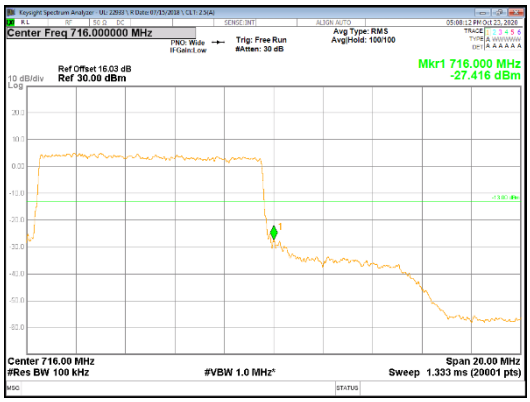
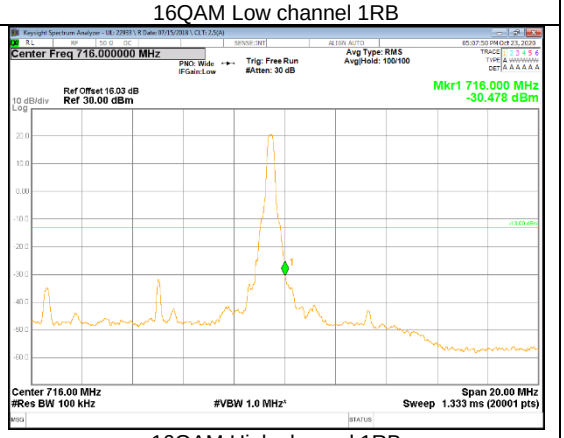


16QAM High channel FRB



16QAM High channel 1RB

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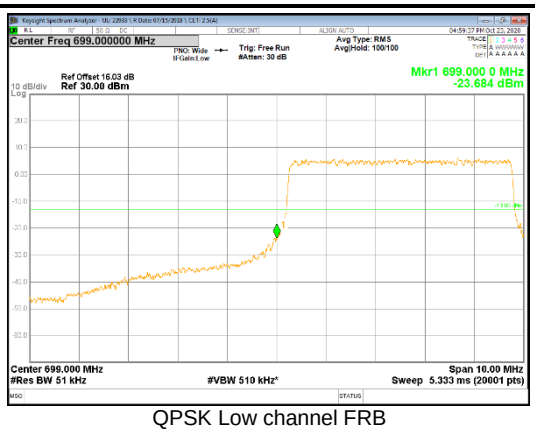
Band 12

5MHz



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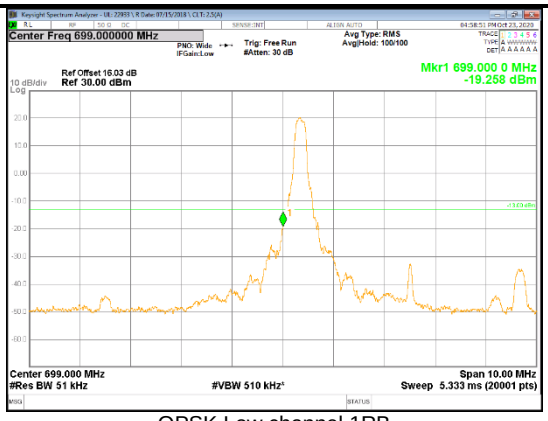

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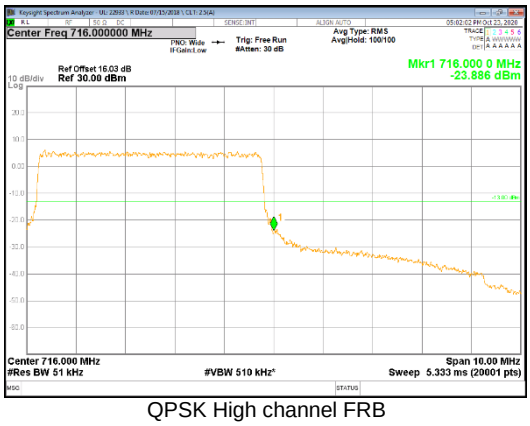

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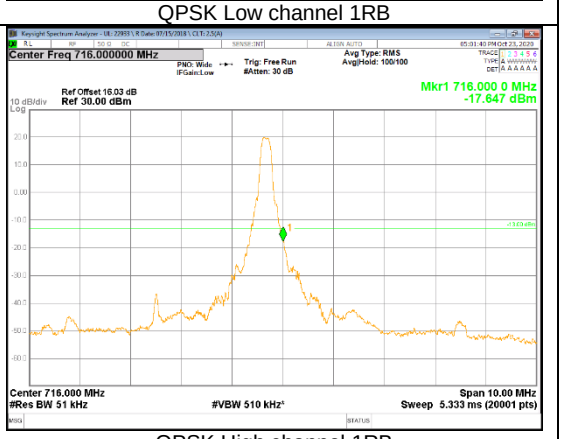

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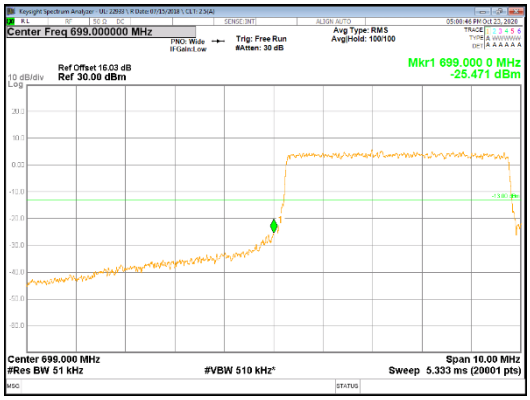

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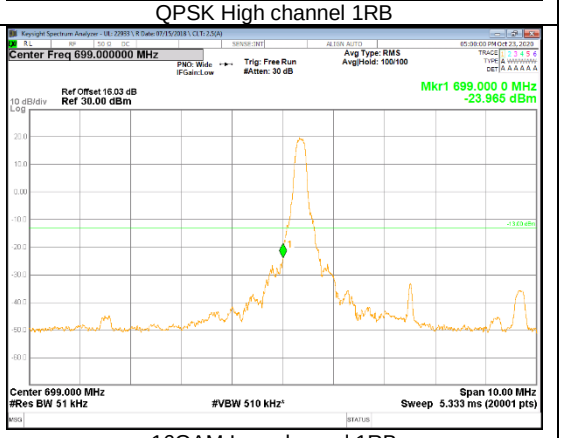

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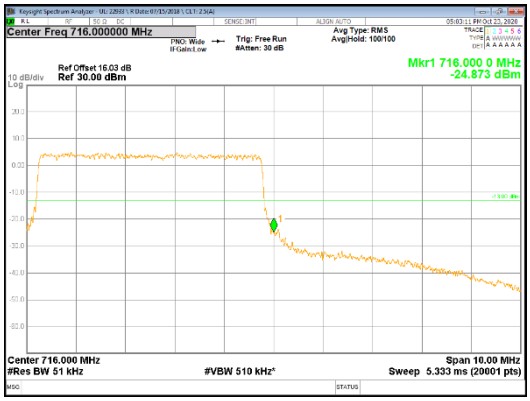

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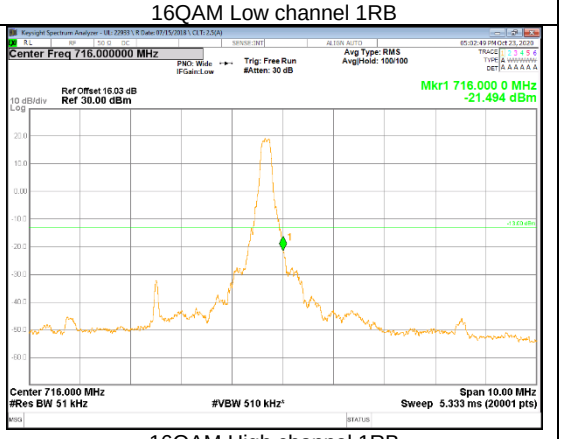

16QAM High channel 1RB

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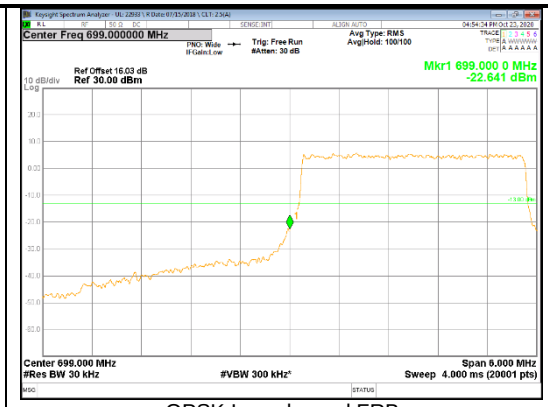
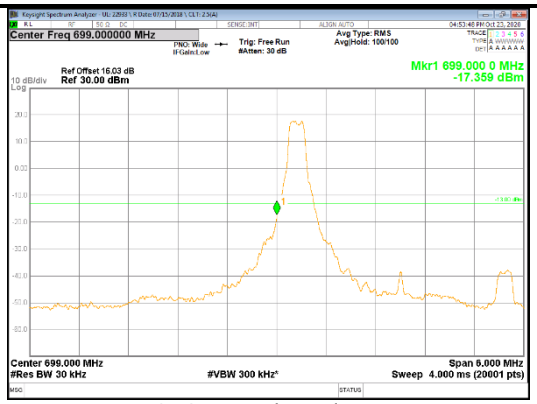
Band 12

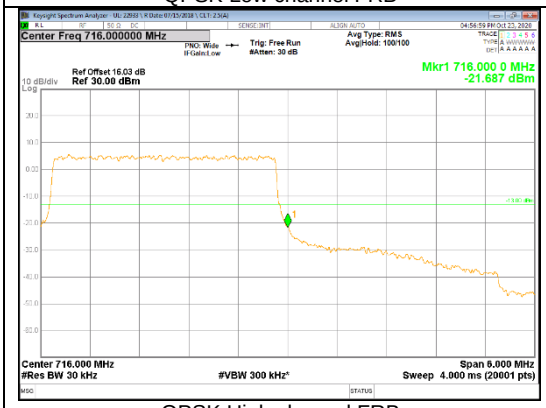
3MHz



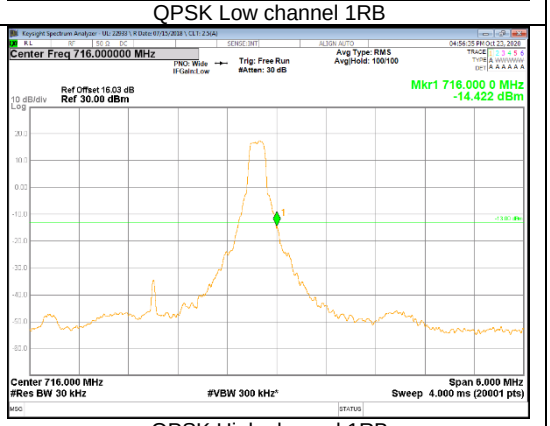
QPSK Low channel FRB



QPSK Low channel 1RB



QPSK High channel FRB



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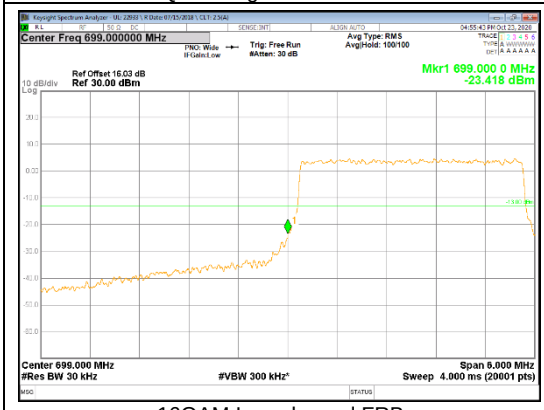
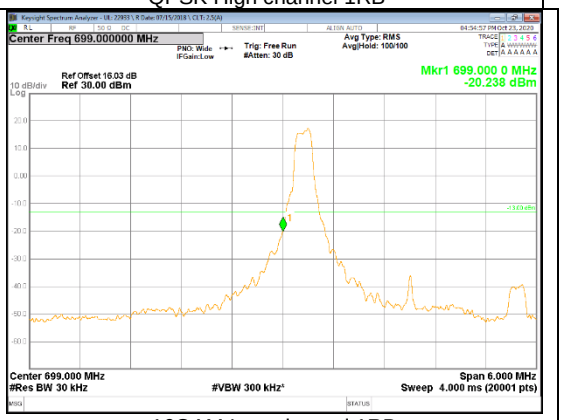


16QAM Low channel FRB



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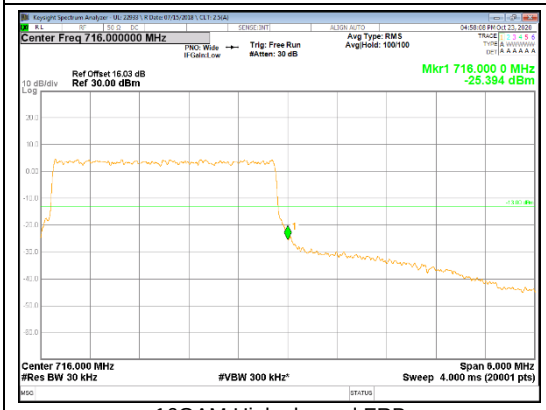

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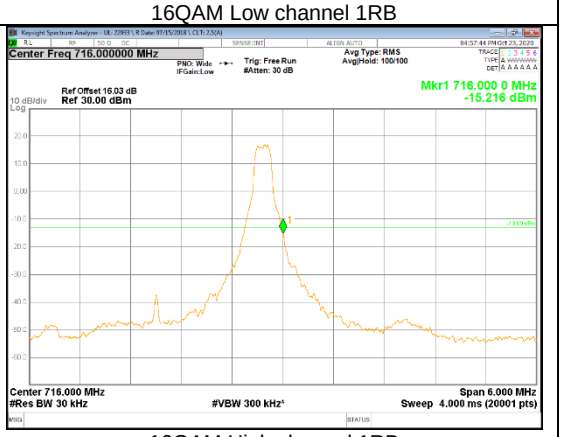

16QAM High channel 1RB

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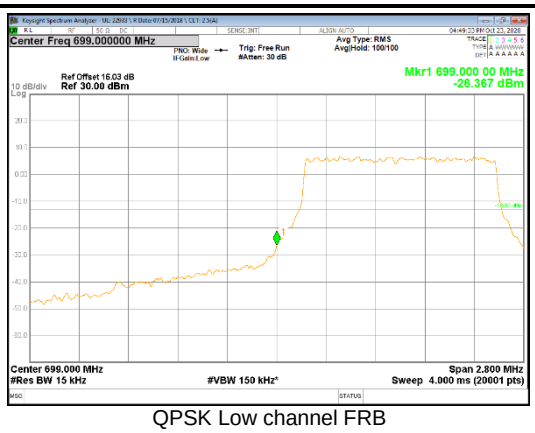
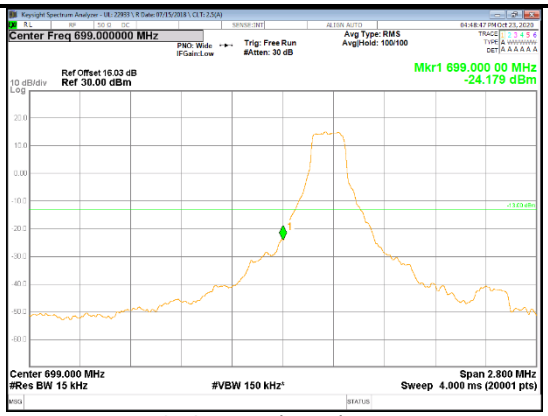
Band 12

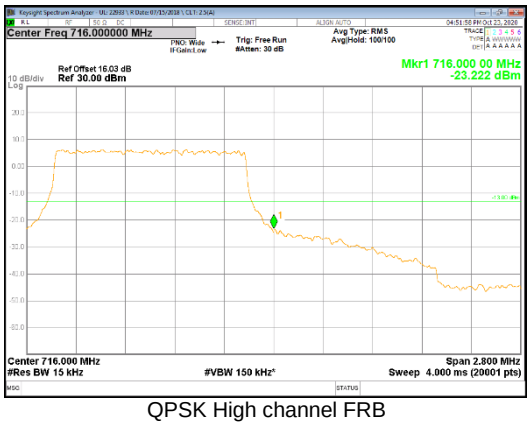
1.4MHz



QPSK Low channel FRB



QPSK Low channel 1RB



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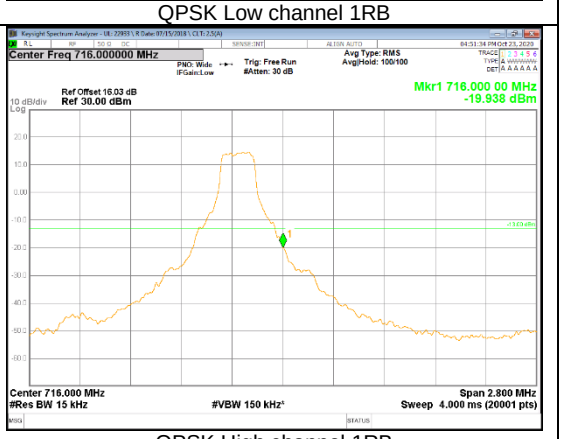
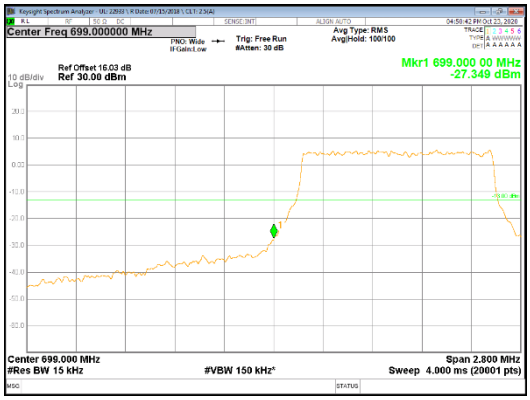
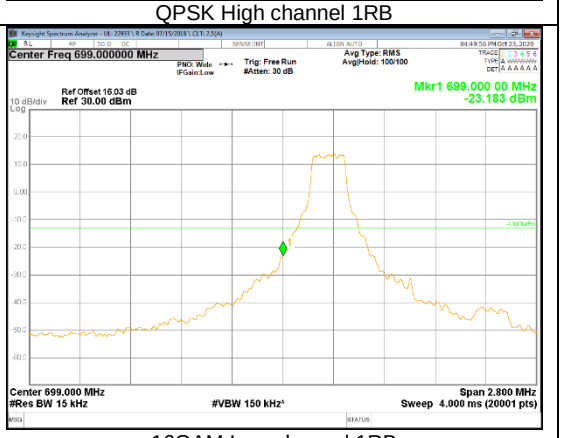


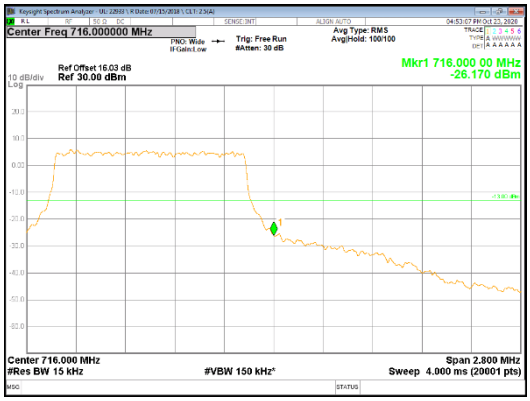
QPSK High channel 1RB



16QAM Low channel FRB



16QAM Low channel 1RB



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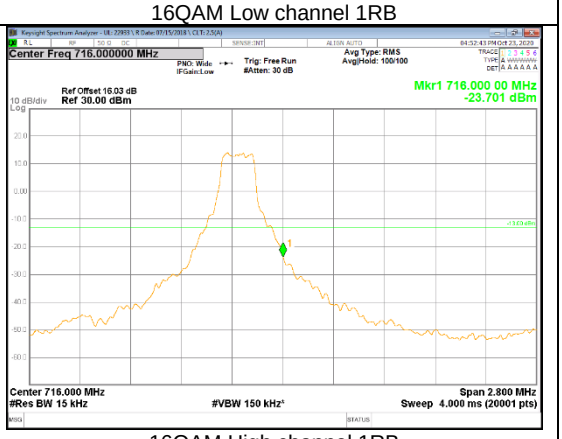

16QAM High channel 1RB

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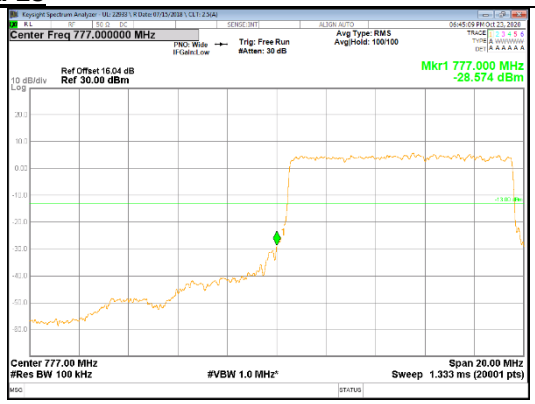
LTE Band 13

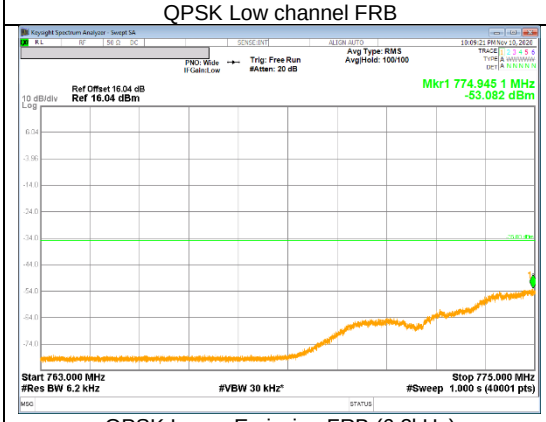
Band 13

10MHz

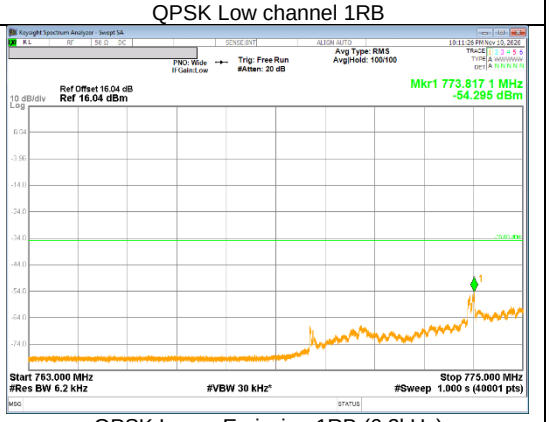


QPSK Low channel FRB

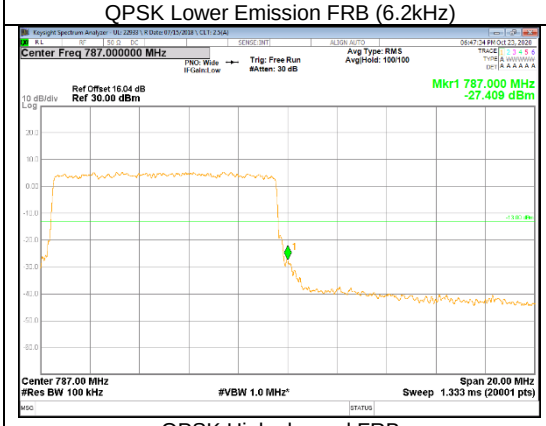
QPSK Low channel 1RB



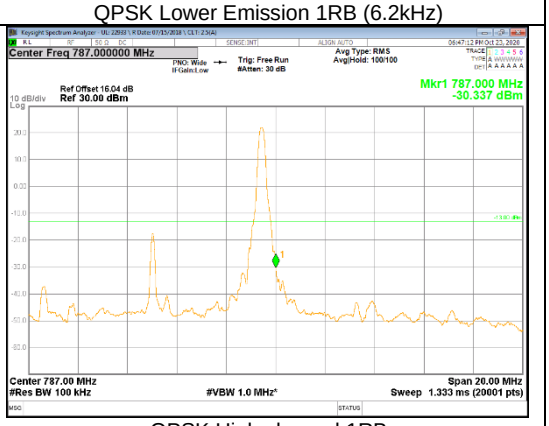
QPSK Lower Emission FRB (6.2kHz)



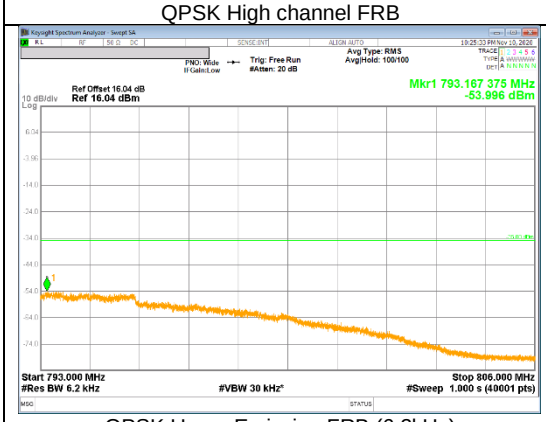
QPSK Lower Emission 1RB (6.2kHz)



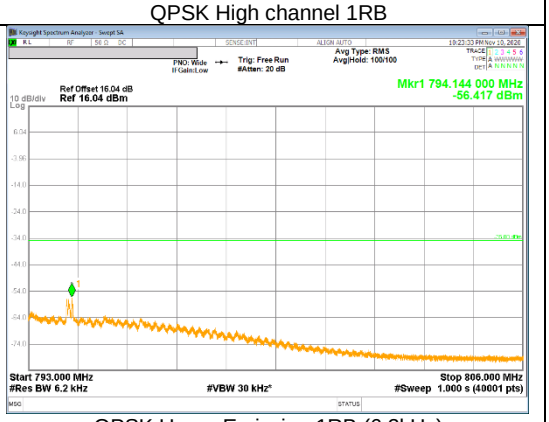
QPSK High channel FRB



QPSK High channel 1RB



QPSK Upper Emission FRB (6.2kHz)



QPSK Upper Emission 1RB (6.2kHz)

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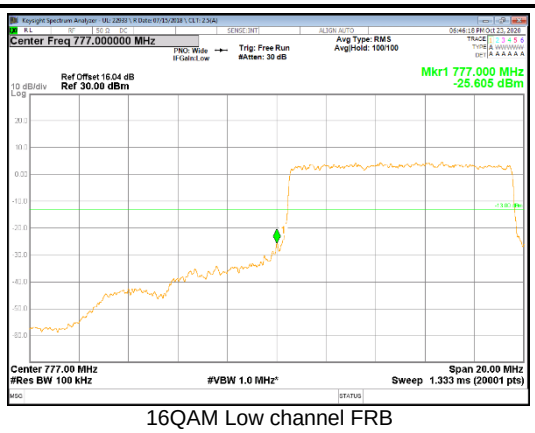
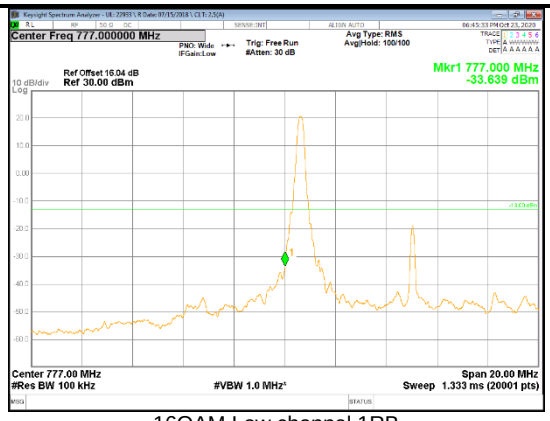
Band 13

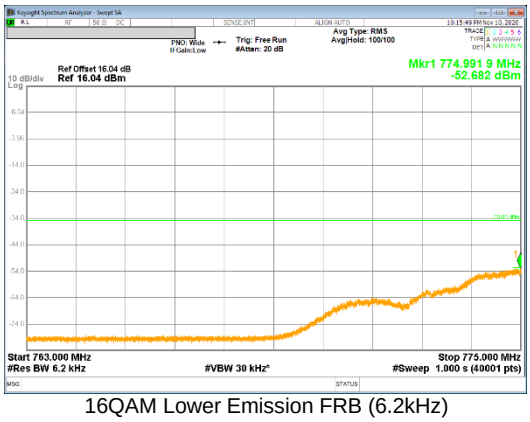
10MHz



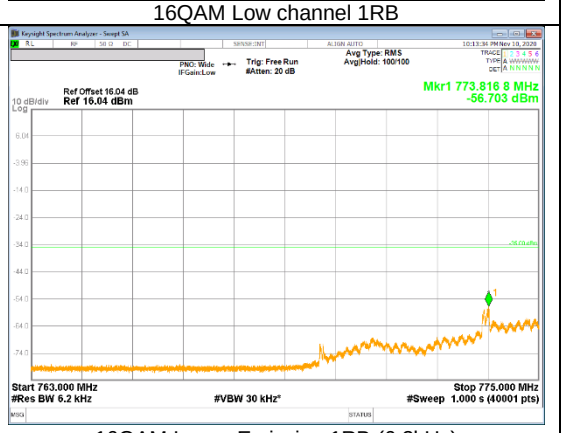
16QAM Low channel FRB



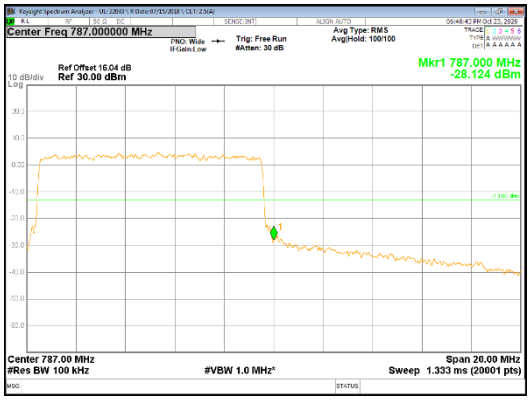
16QAM Low channel 1RB



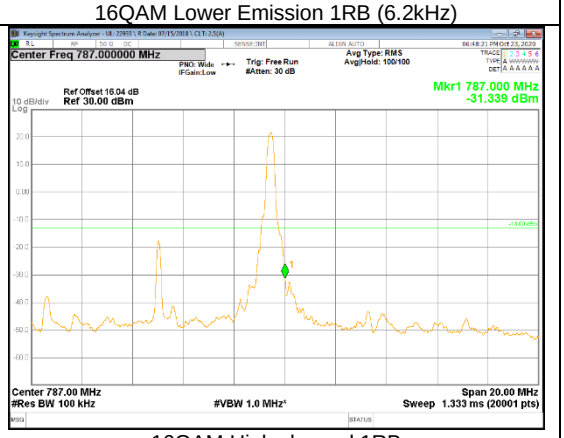
16QAM Lower Emission FRB (6.2kHz)



16QAM Lower Emission 1RB (6.2kHz)



16QAM High channel FRB



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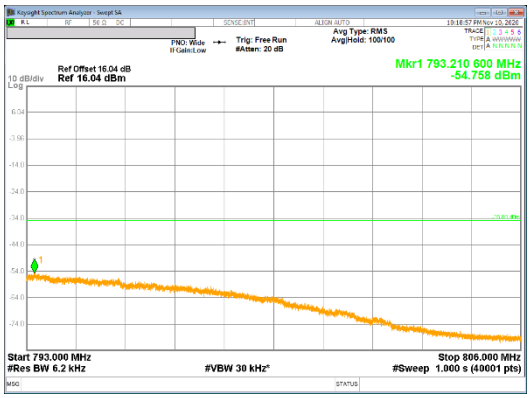
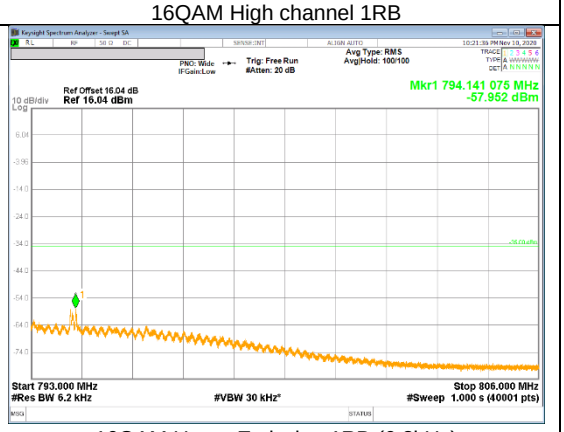


16QAM Upper Emission FRB (6.2kHz)



16QAM Upper Emission 1RB (6.2kHz)

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