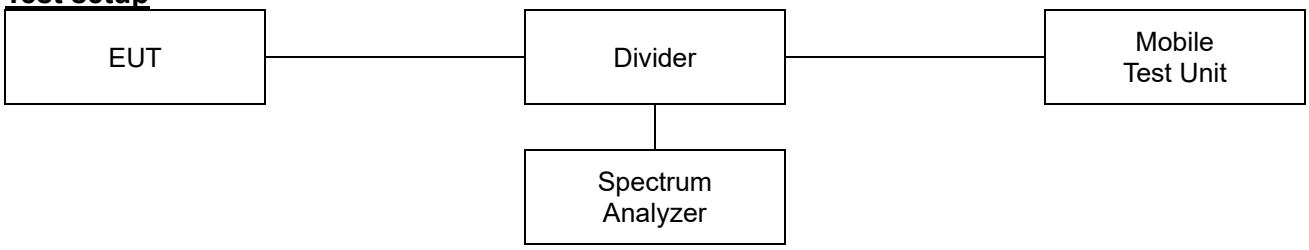
7.3. Band Edge Emissions at Antenna Terminal

Test setup



Limit

According to §27.53(c)(2),

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

(1) On any frequency outside the 746–758 ㎒ band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) ㏈;

(2) On any frequency outside the 776–788 ㎒ band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) ㏈;

(3) On all frequencies between 763–775 ㎒ and 793–805 ㎒, by a factor not less than 76 + 10 log (P) ㏈ in a 6.25 ㎑ band segment, for base and fixed stations;

(4) On all frequencies between 763–775 ㎒ and 793–805 ㎒, by a factor not less than 65 + 10 log (P) ㏈ in a 6.25 ㎑ band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater. However, in the 100 ㎑ bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 ㎑ may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 ㎑ segment

According to §27.53(g),

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

According to §27.53(h),

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

Test procedure

971168 D01 v03r01 - Section 6

ANSI C63.26-2015 – Section 5.7

Test settings

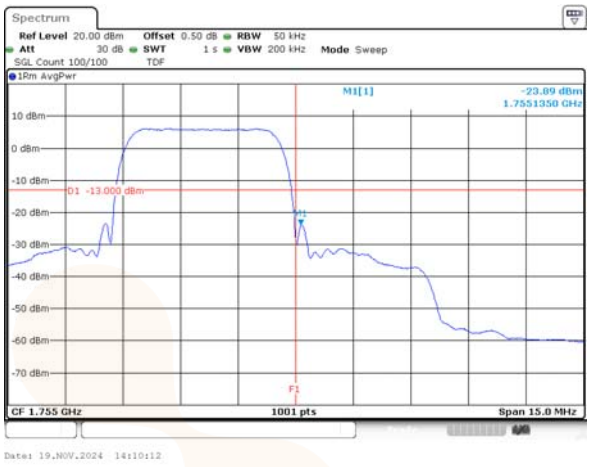
1) Start and stop frequency were set such that the band edge would be placed in the center of the plot
2) Span was set large enough so as to capture all out of band emissions near the band edge.
3) Set the RBW > 1% of the emission bandwidth.
4) Set the VBW ≥ 3 x RBW.
5) Set the number of sweep points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

Notes:

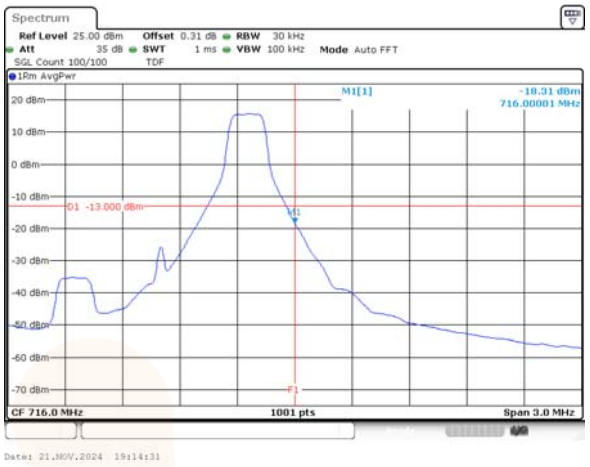
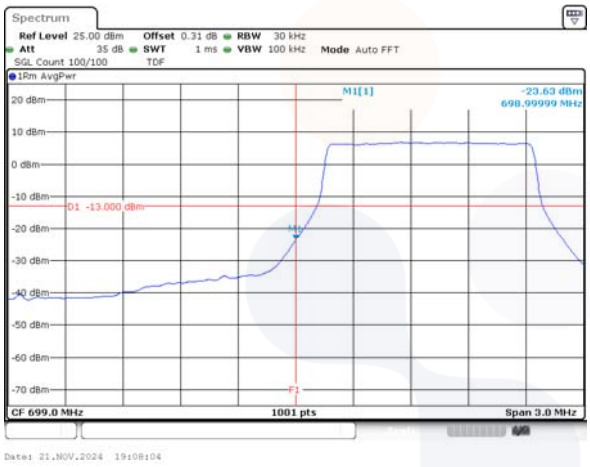
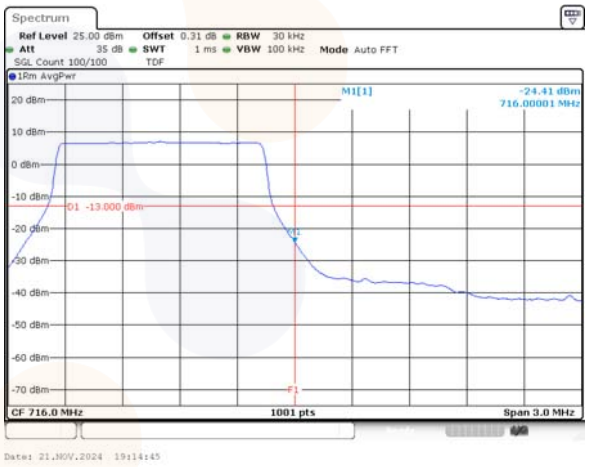
1. Per 27.53(c)(5), for operations in the 776-768 ㎒ band, in the 100 ㎑ bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 ㎑ may be employed.
2. Per 27.53(c)(6), for operation in the 763-775 ㎒ and 793-805 ㎒, the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 ㎑ segment.
3. Per 27.53(g), compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 ㎑ may be employed.
4. Per 27.53(h)(3), compliance with these rules 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 frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 ㏈ below the transmitter power.
5. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.
6. The measurement bandwidth is less than the reference bandwidth of 1㎒ no additional correction to be 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 emission measured with the reduced bandwidth and the level of the same emission measured using the integration method over the 1㎒ reference bandwidth are very close, indicating the emissions are narrowband.

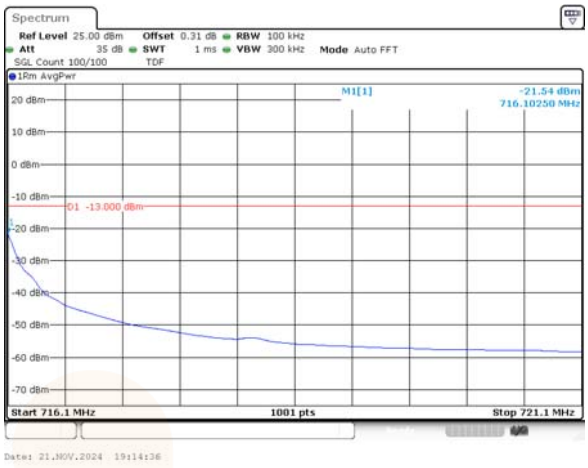
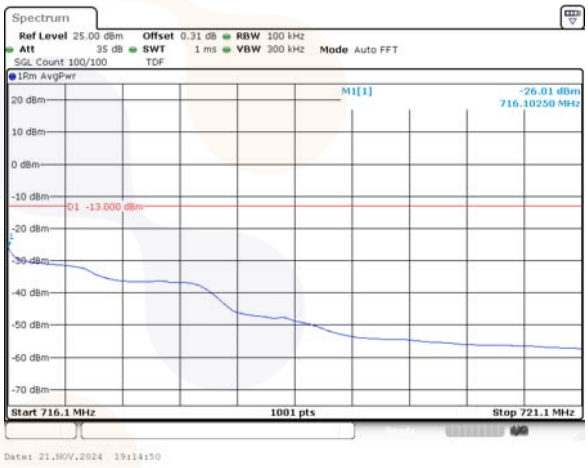
Test results

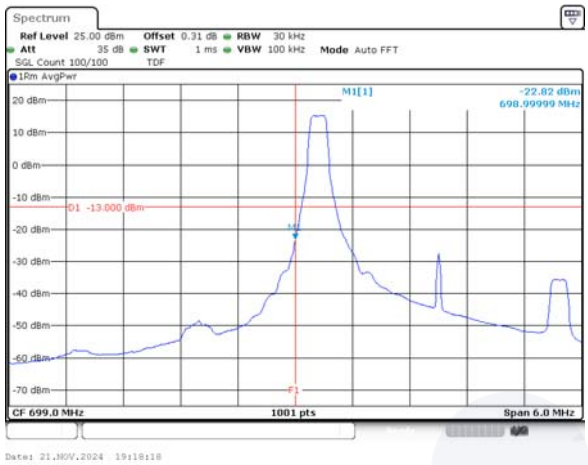
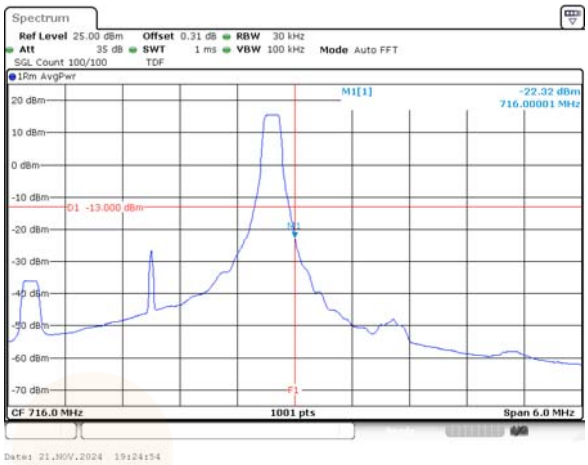
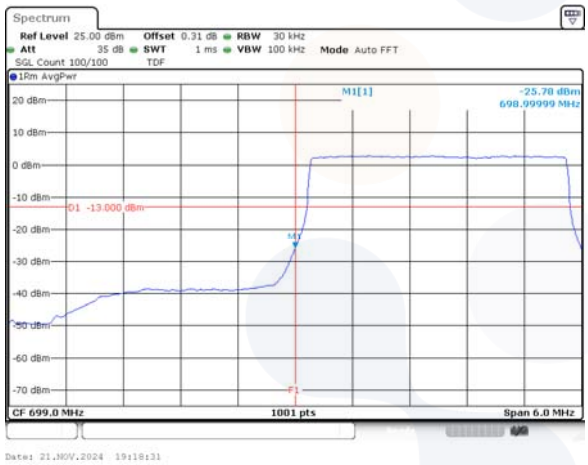
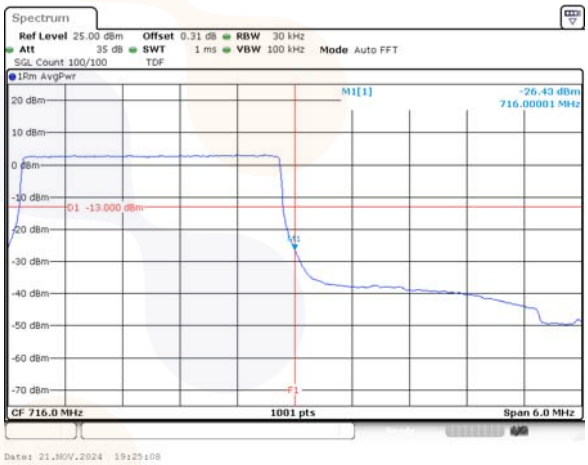
Test mode: WCDMA 1700

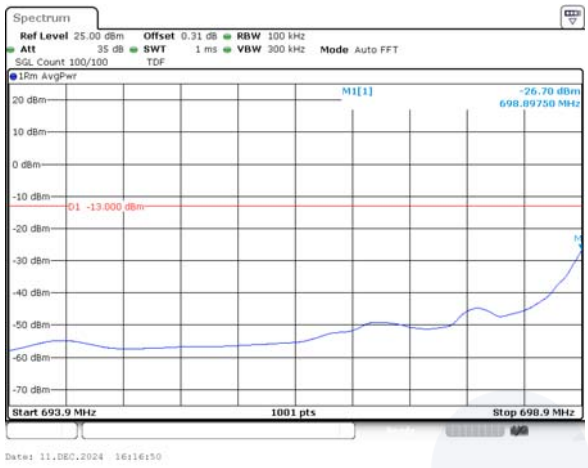
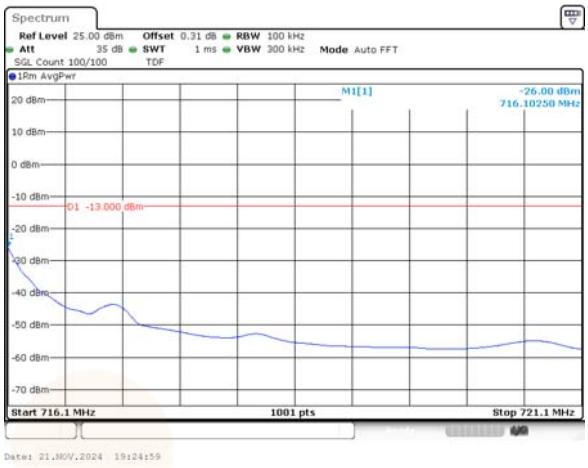
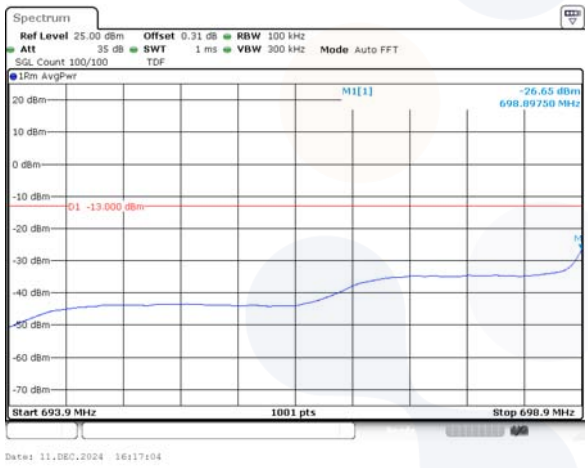
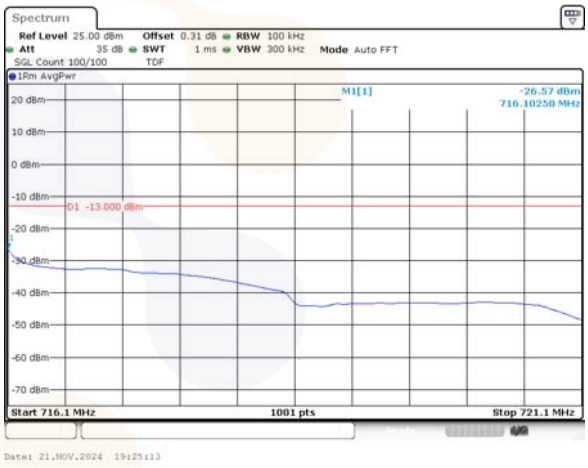
RMC	
Low channel	High channel
	

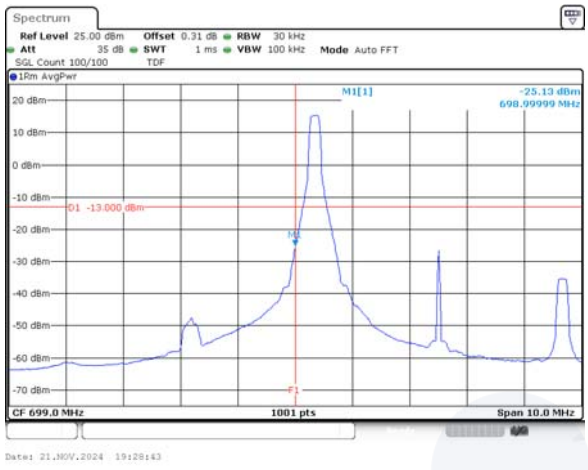
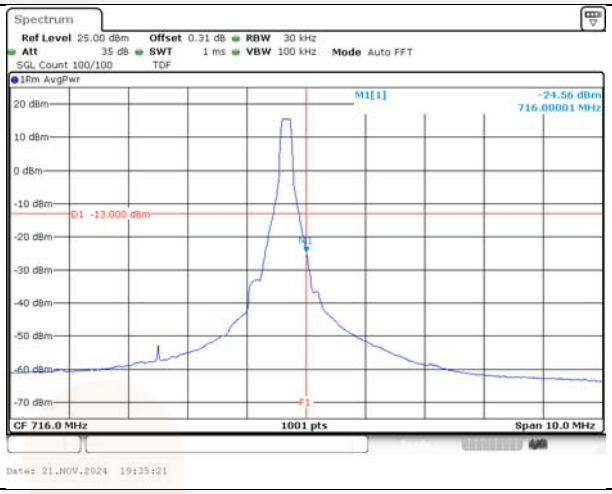
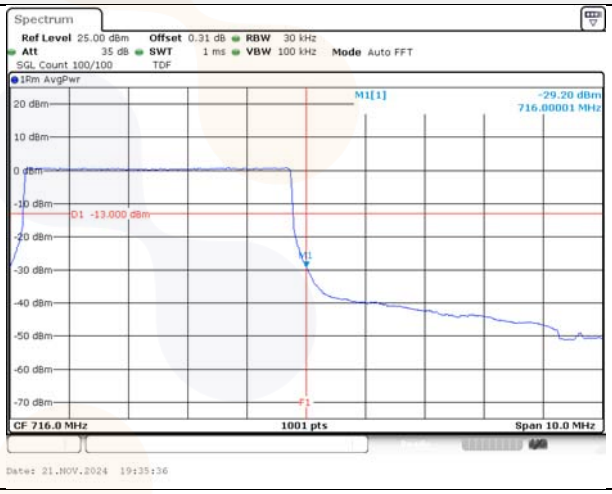
Test mode: LTE B12/17

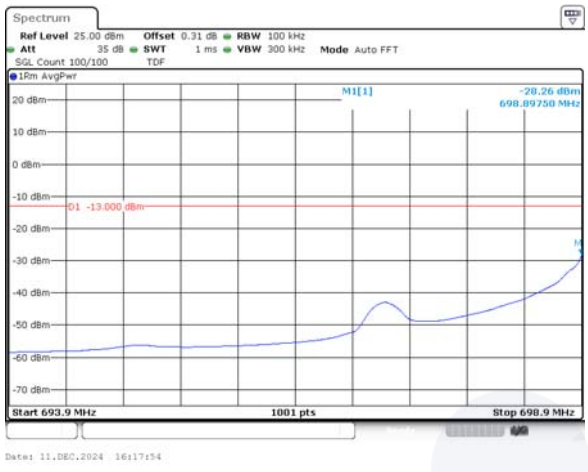
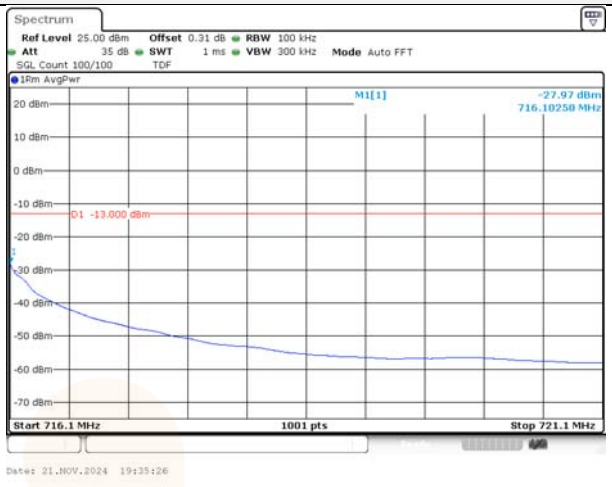
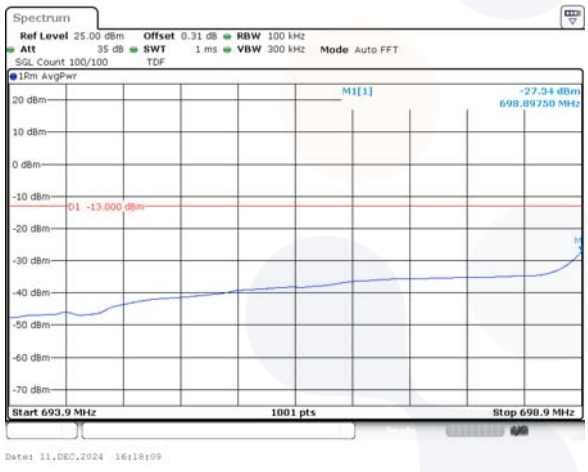
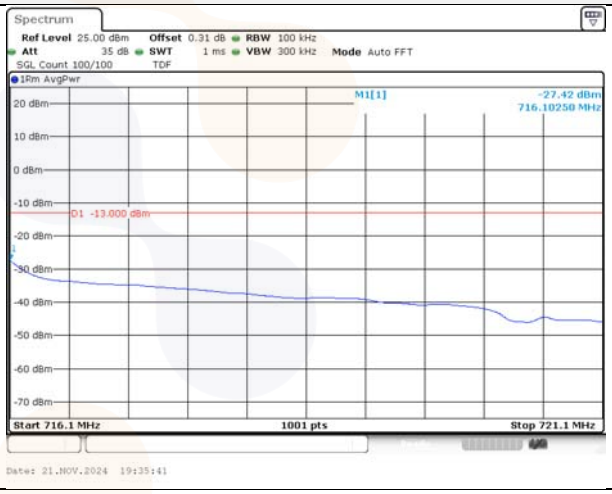
1.4M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

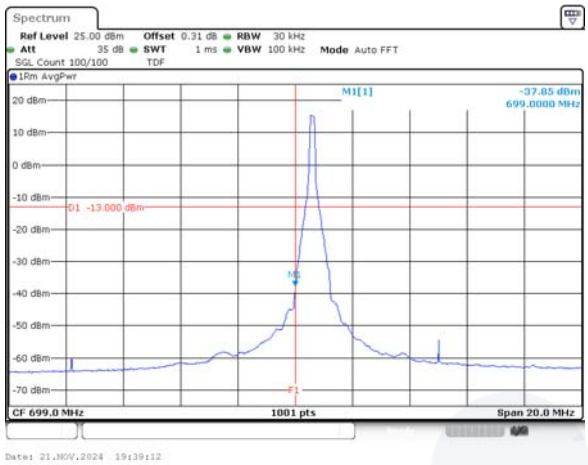
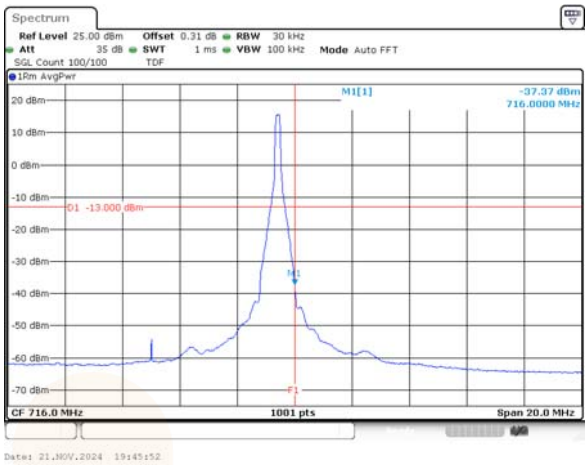
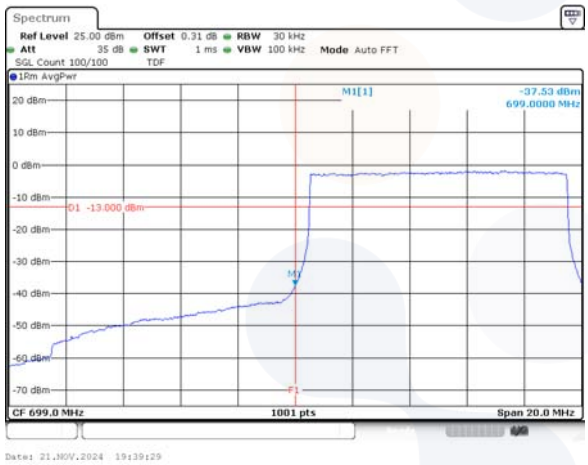
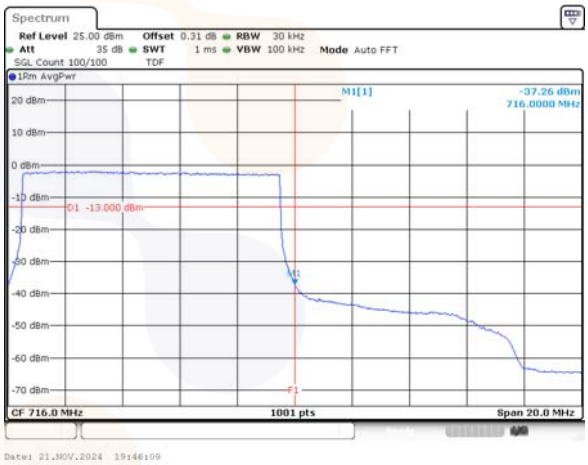
1.4M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

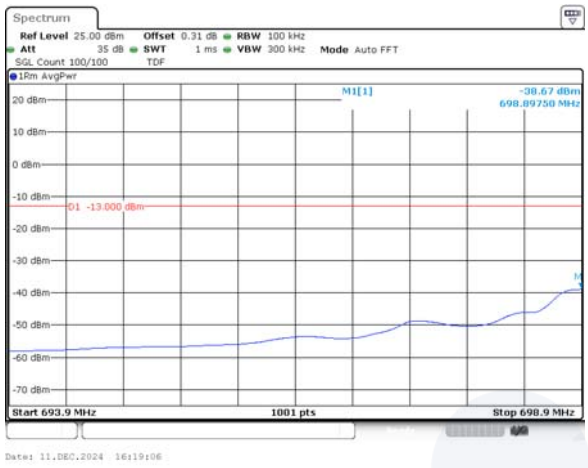
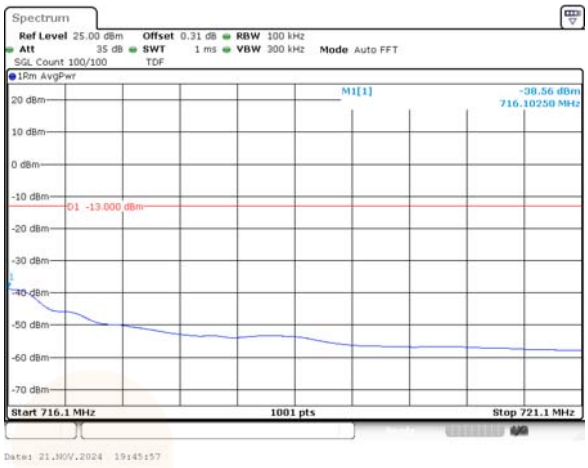
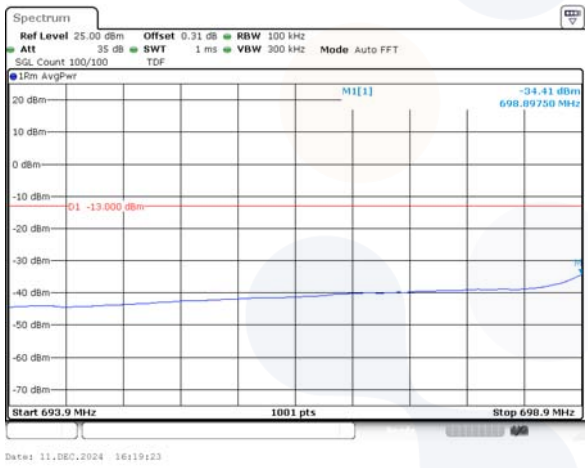
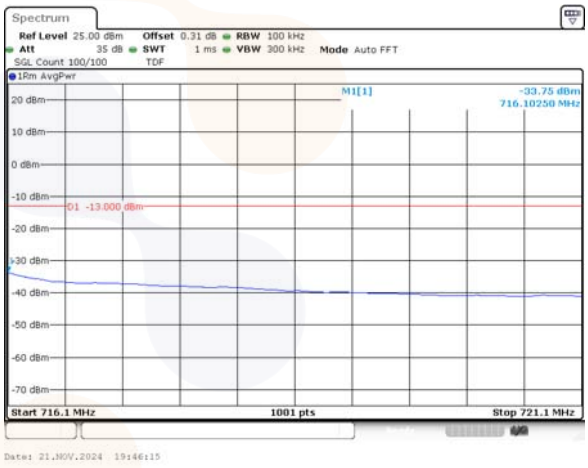
3M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

3M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

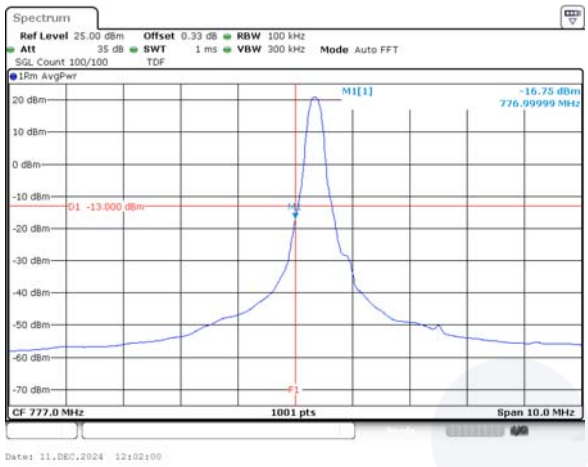
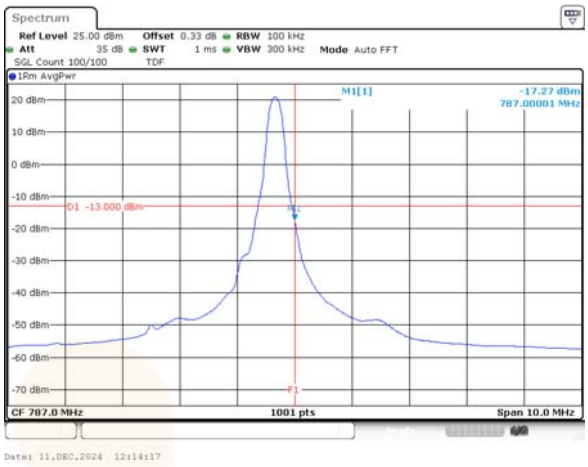
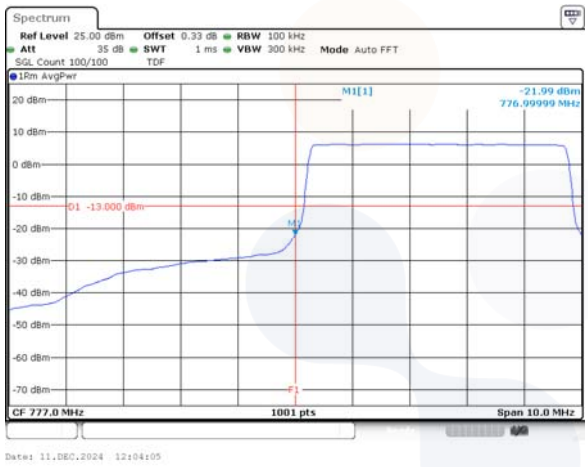
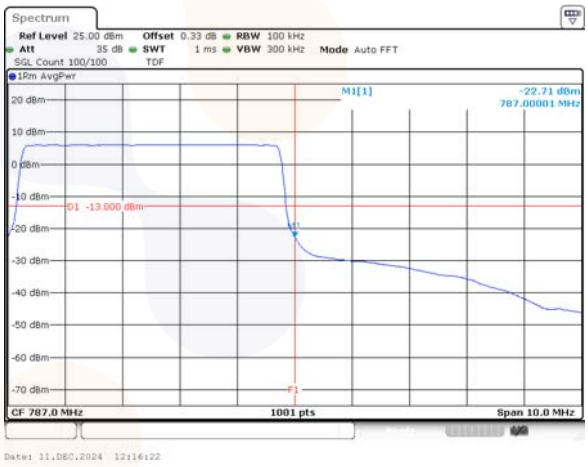
5M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

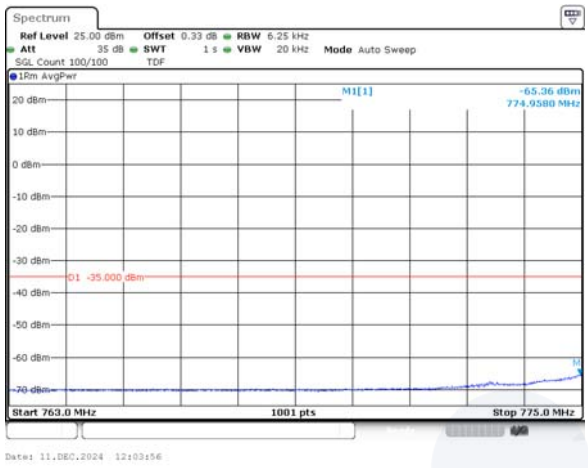
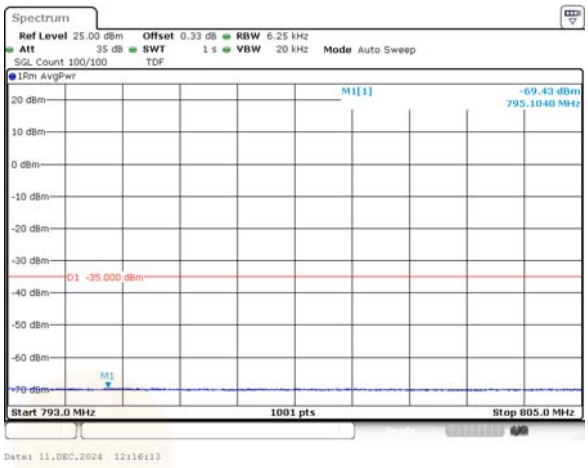
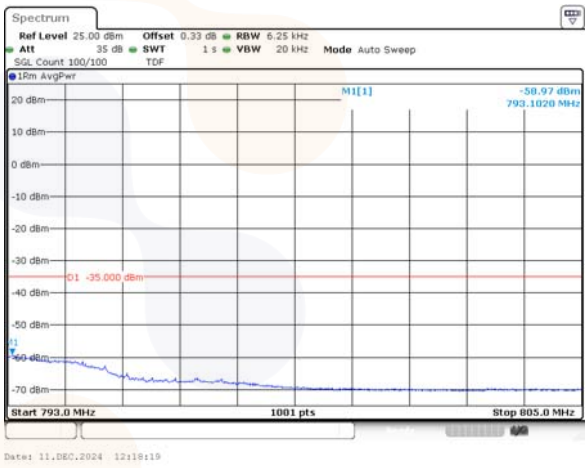
5M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

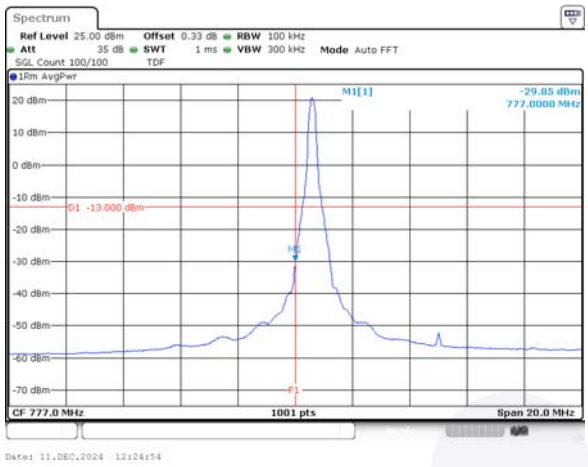
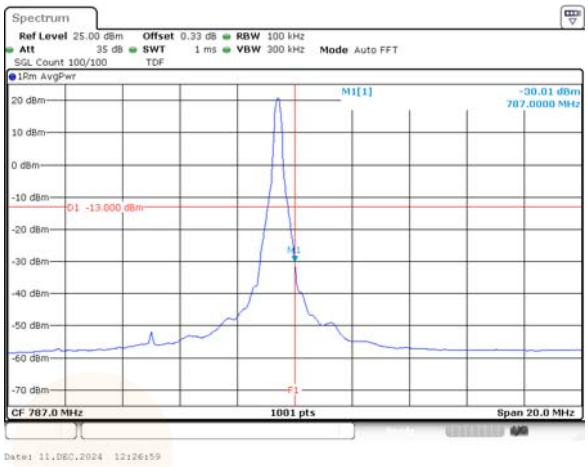
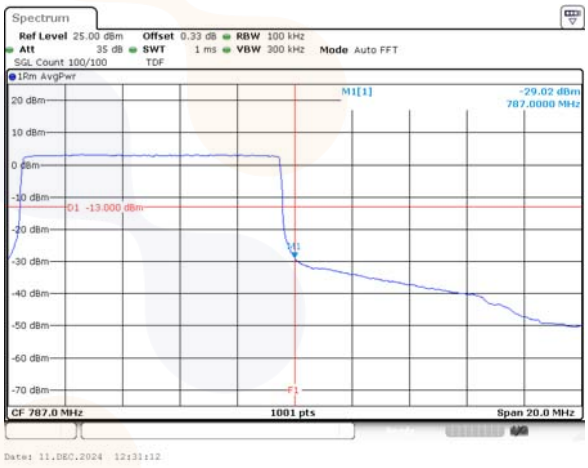
10M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

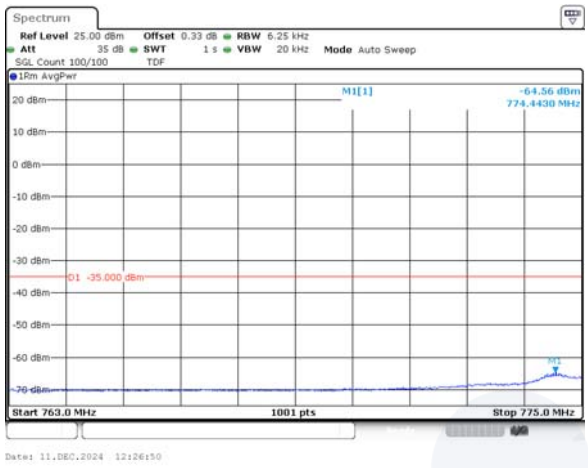
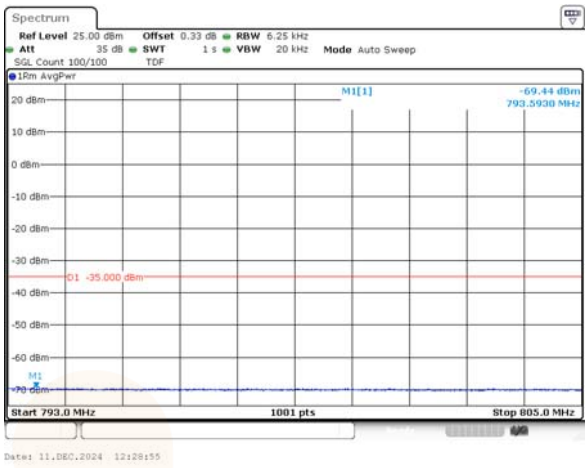
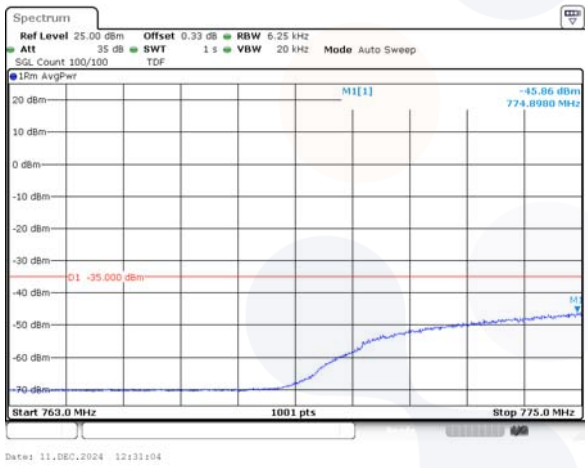
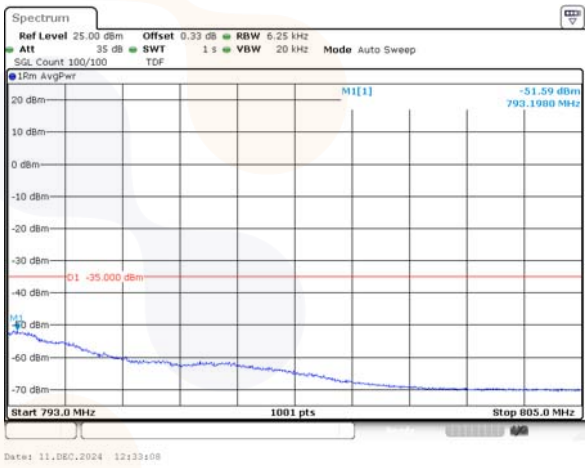
10M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

Test mode: LTE B13

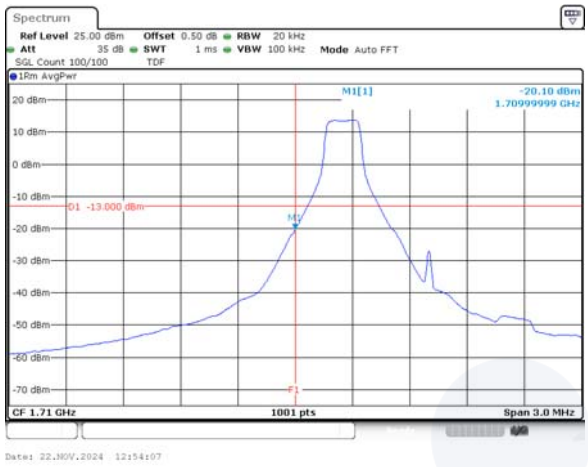
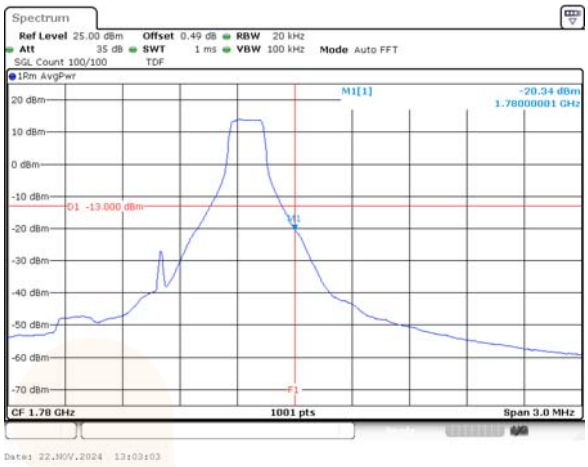
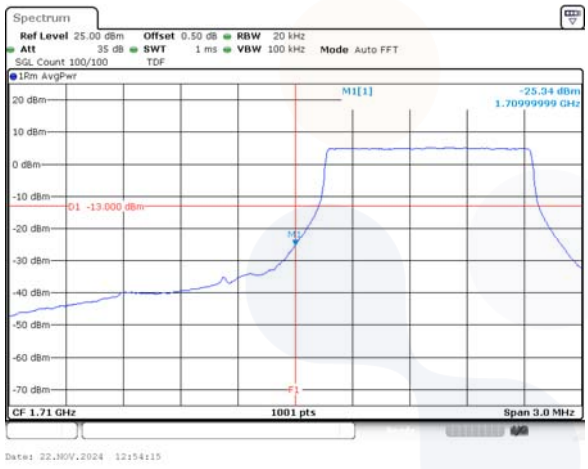
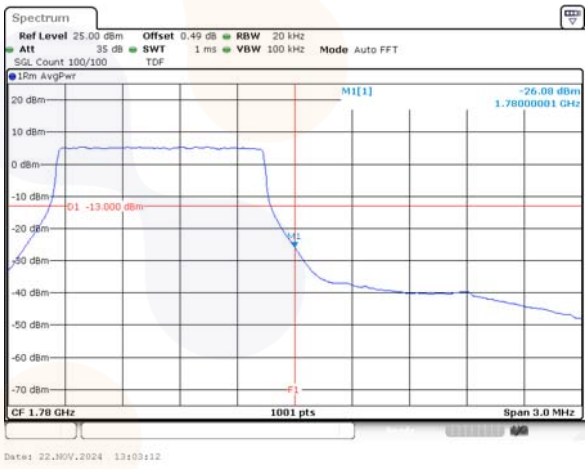
5M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

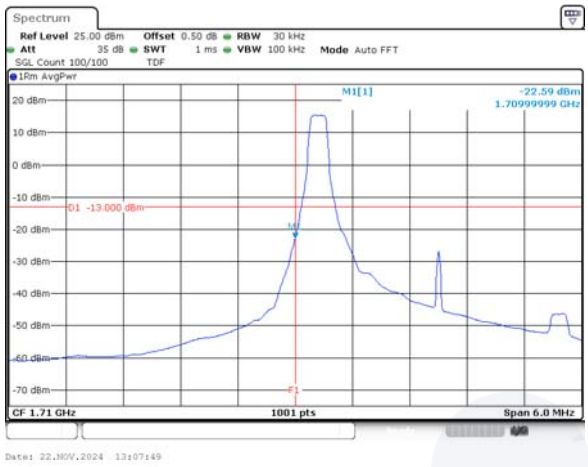
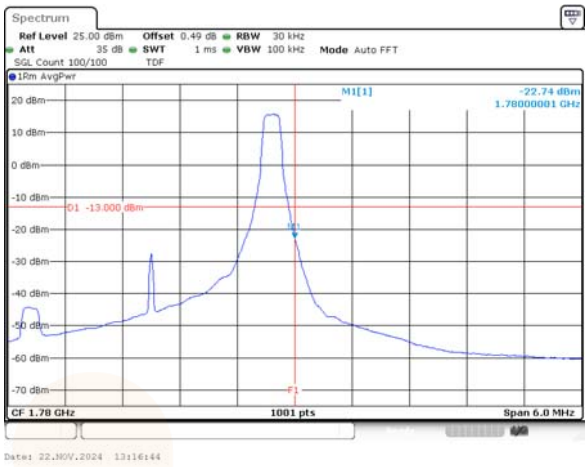
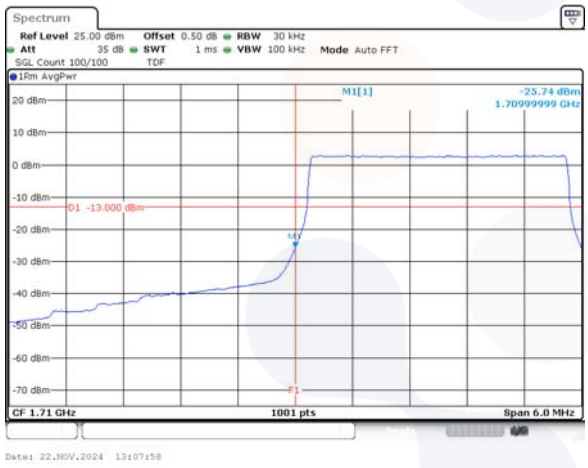
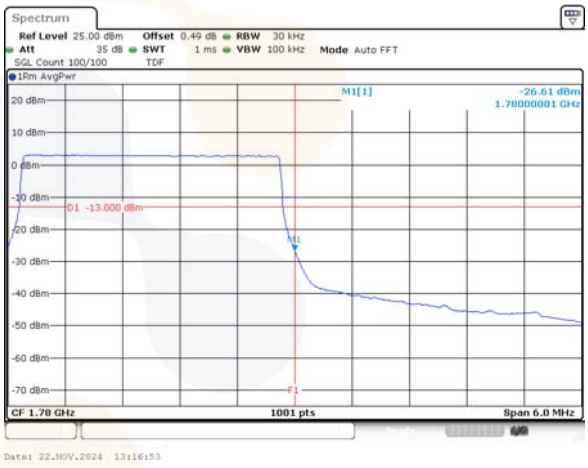
5M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

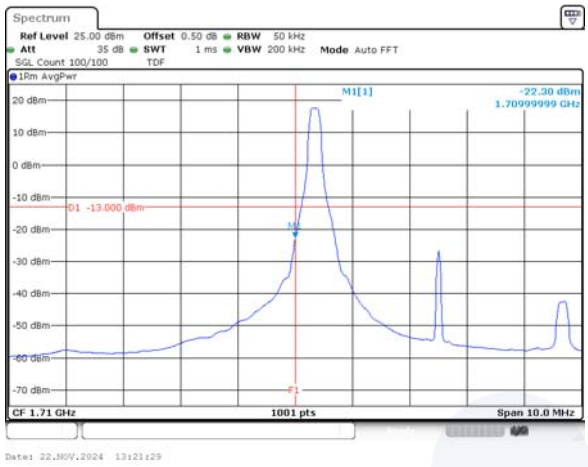
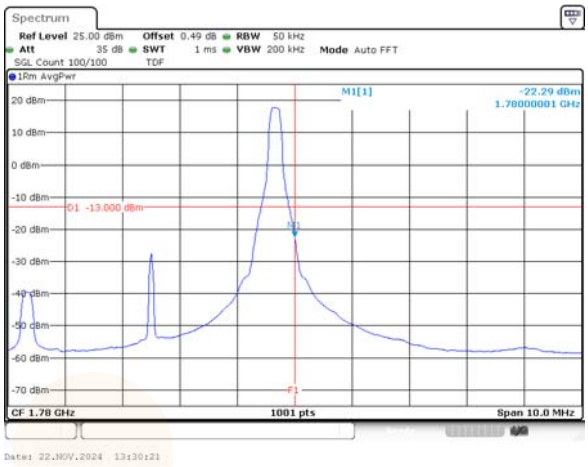
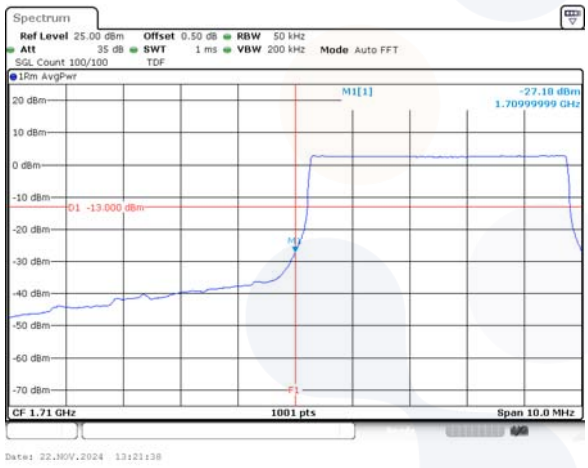
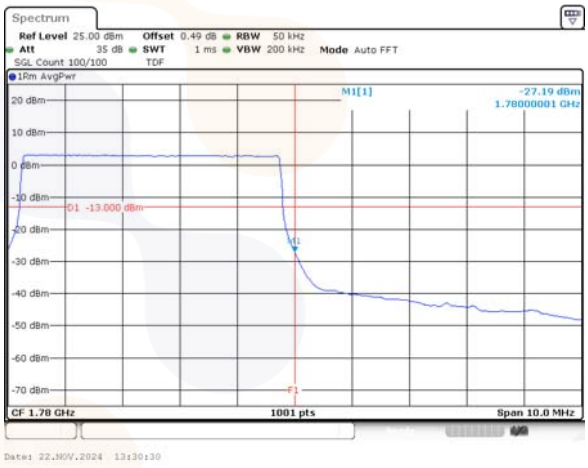
10M BW QPSK	
Middle channel Lower 1RB	**Middle channel Upper 1RB**
	
Middle channel Lower FRB	**Middle channel Upper FRB**
	

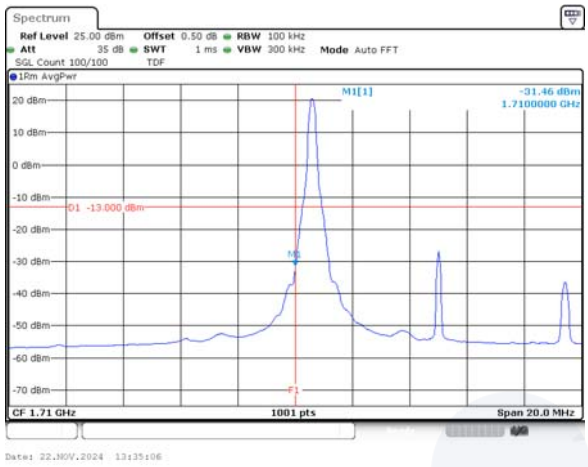
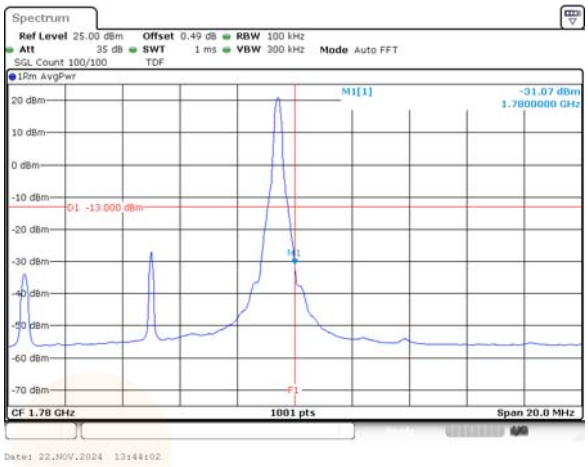
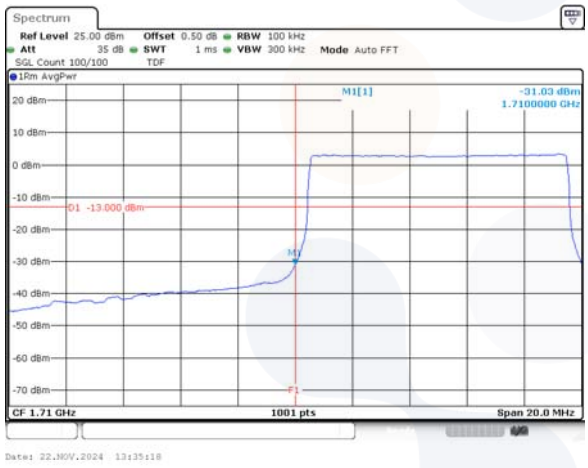
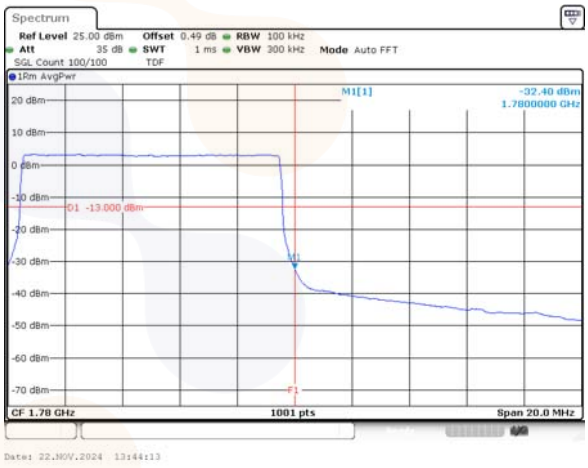
10M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

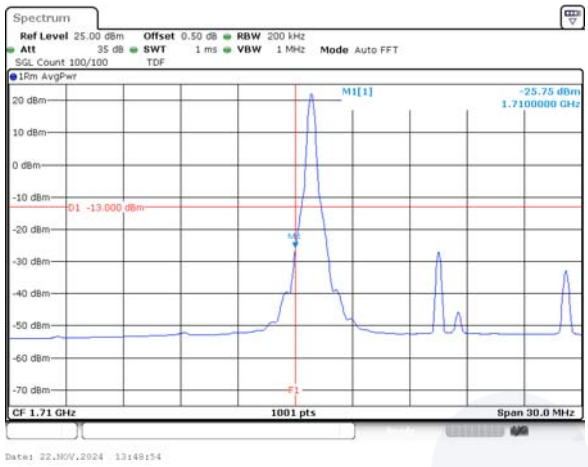
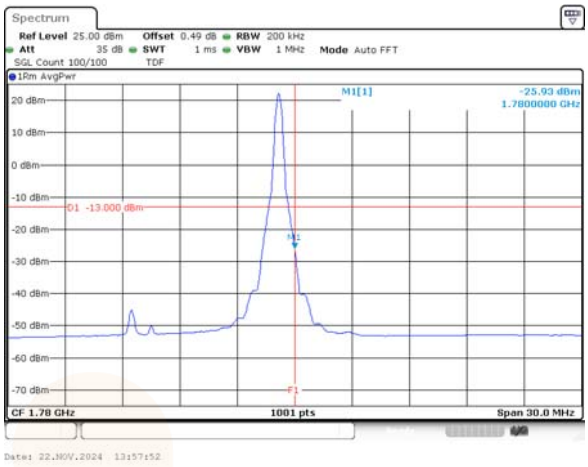
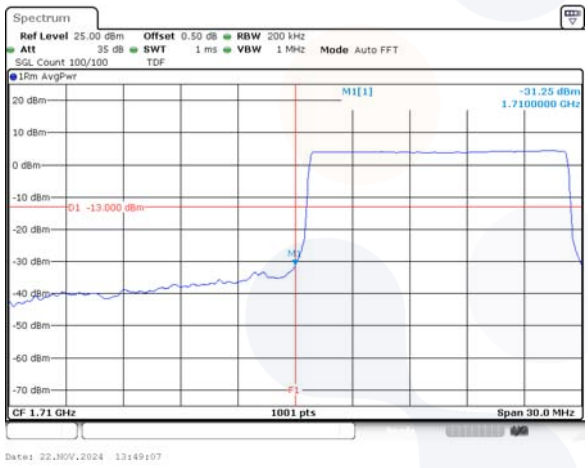
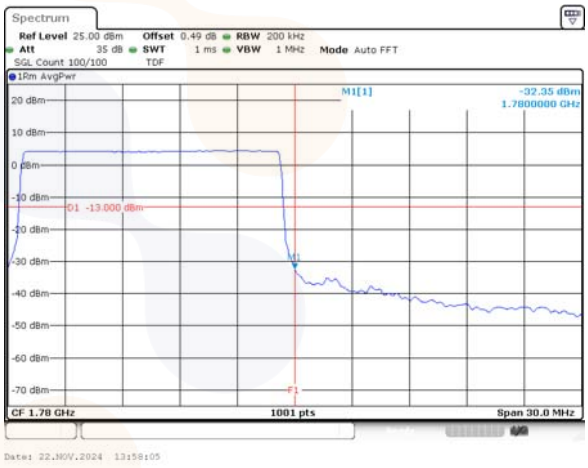
Test mode: LTE B66/4

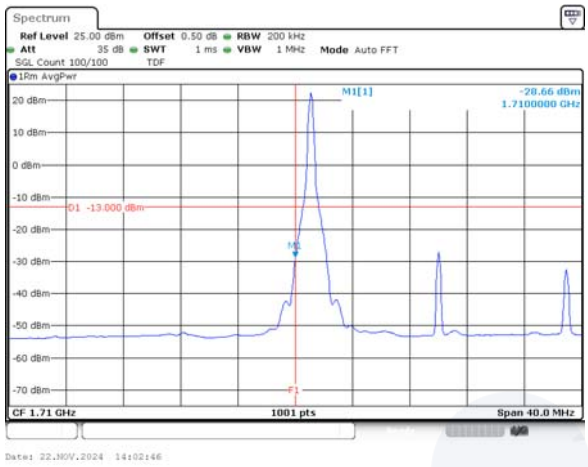
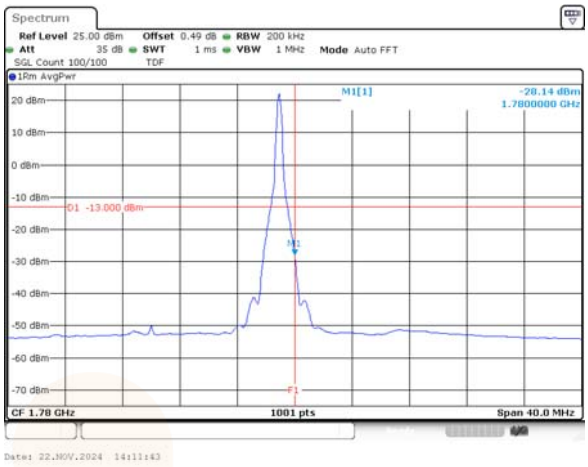
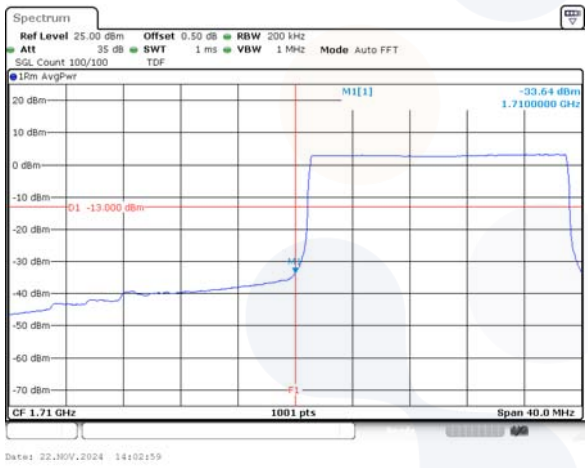
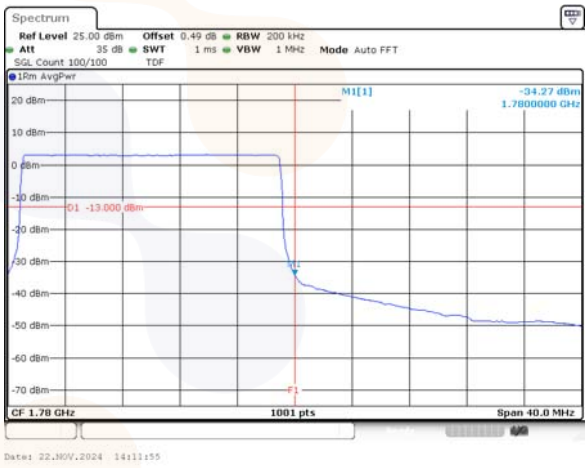
1.4M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

3M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

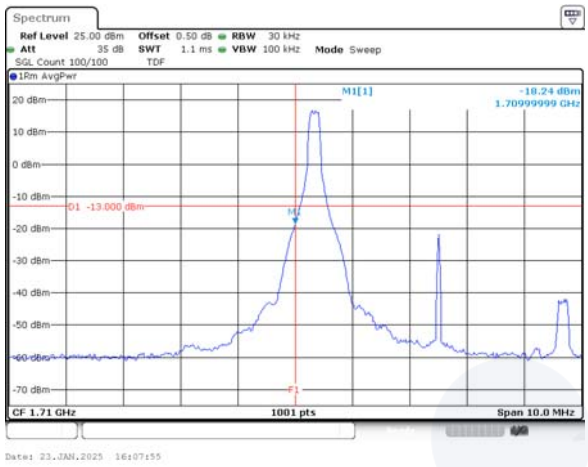
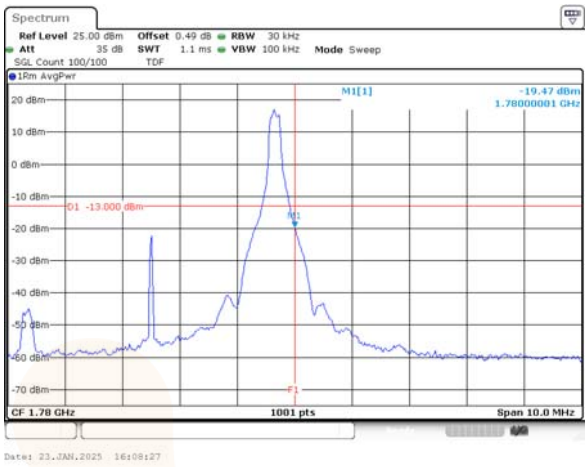
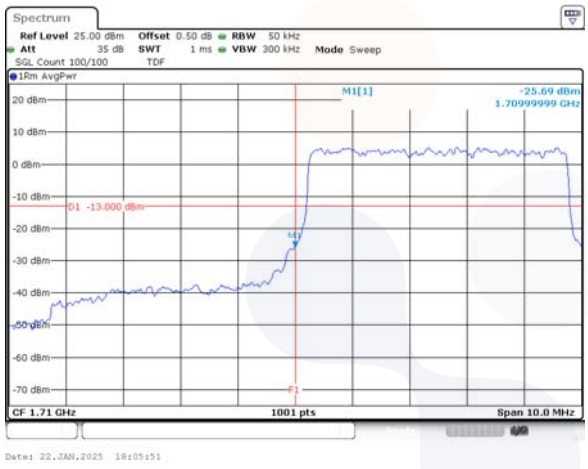
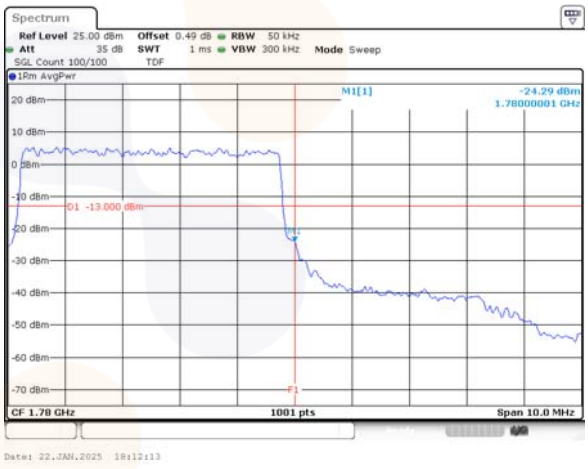
5M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

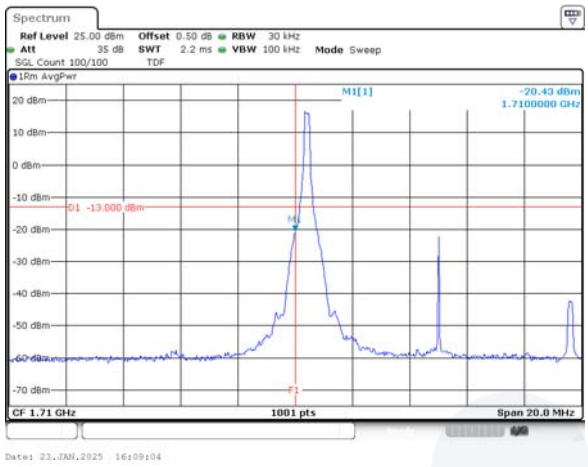
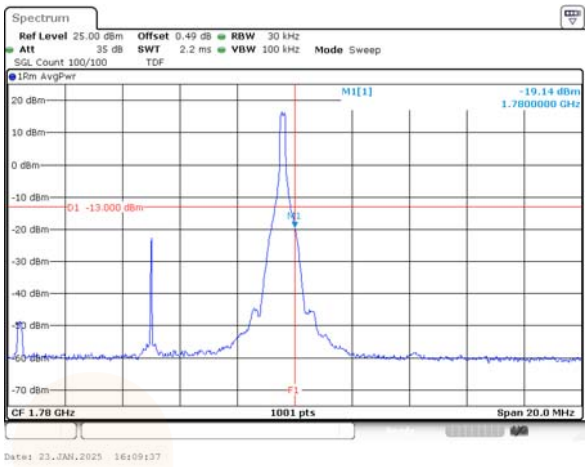
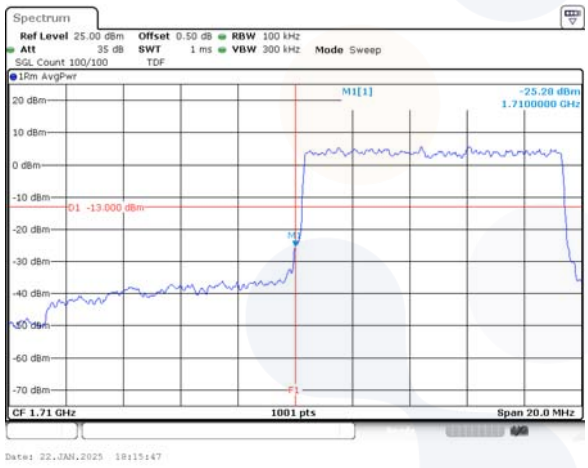
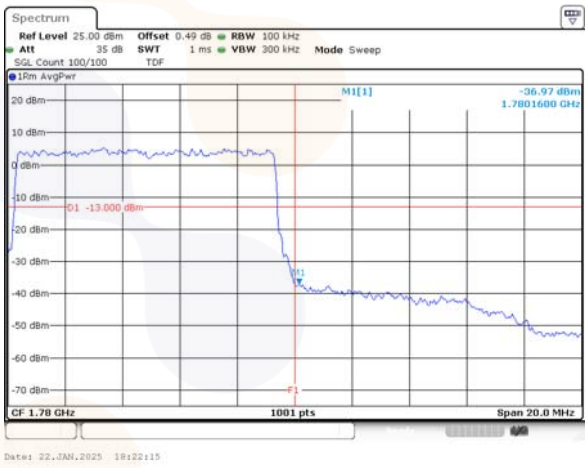
10M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

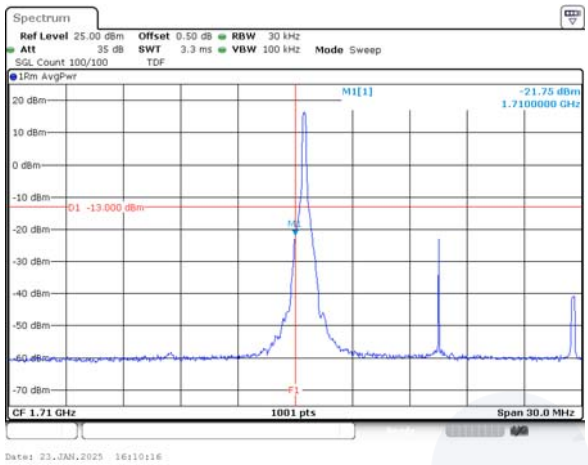
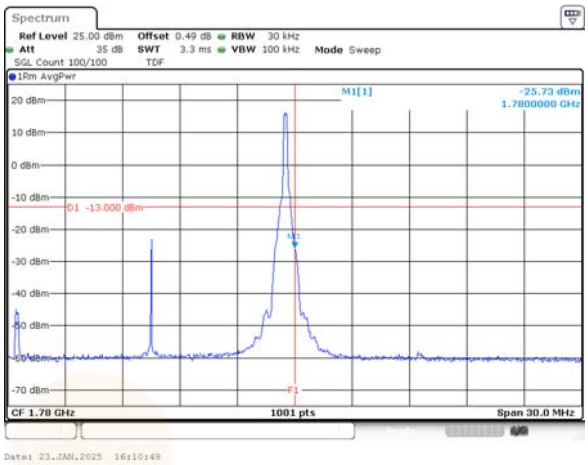
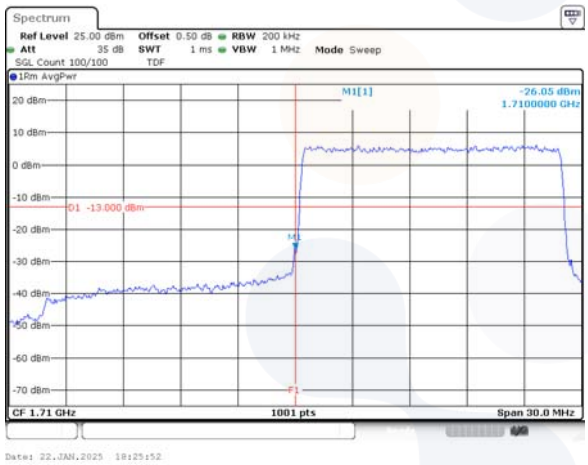
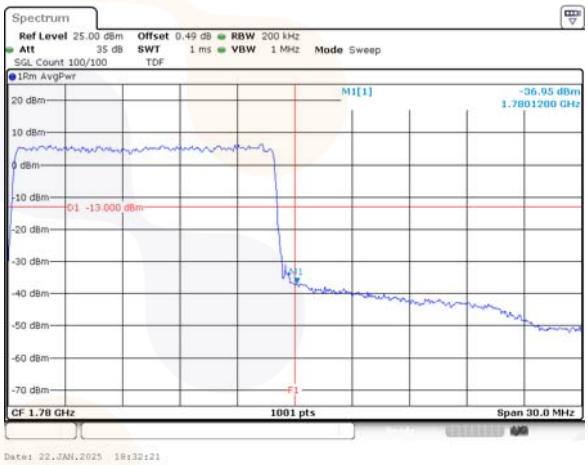
15M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

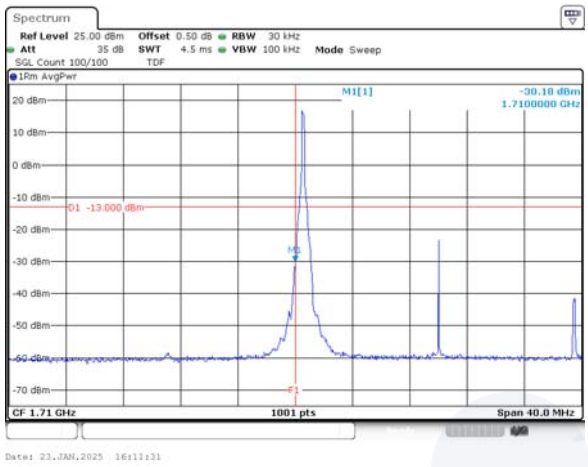
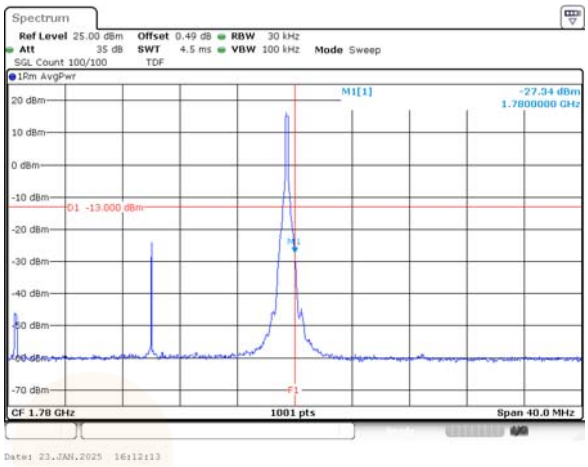
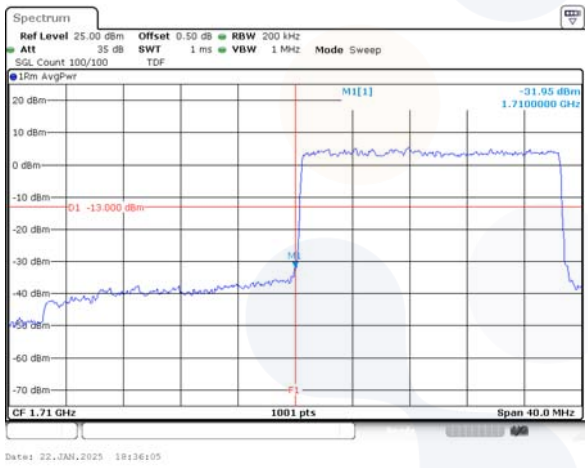
20M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

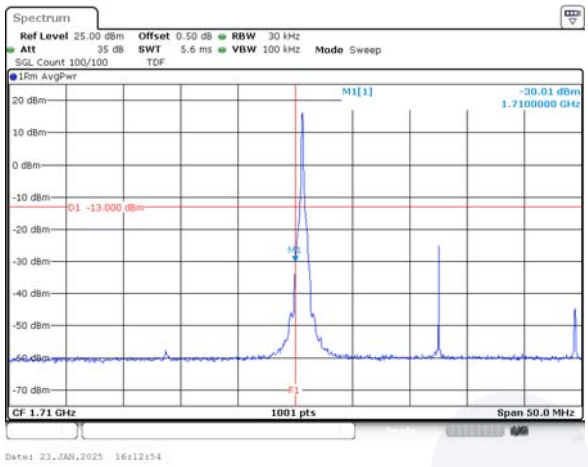
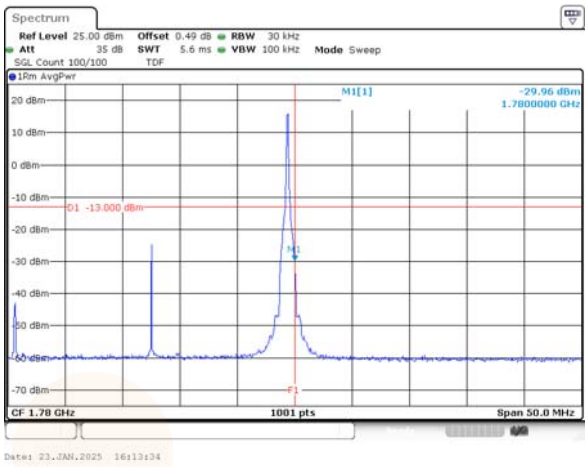
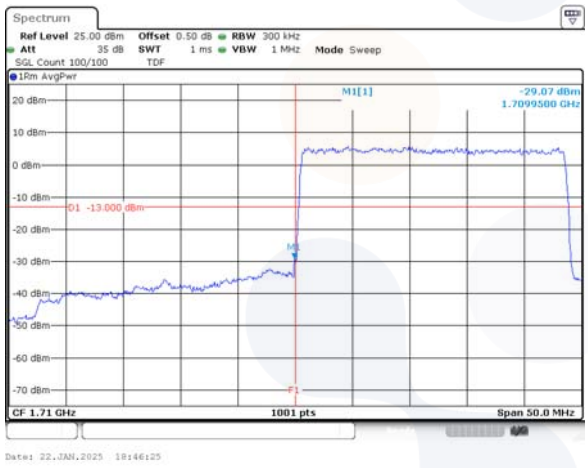
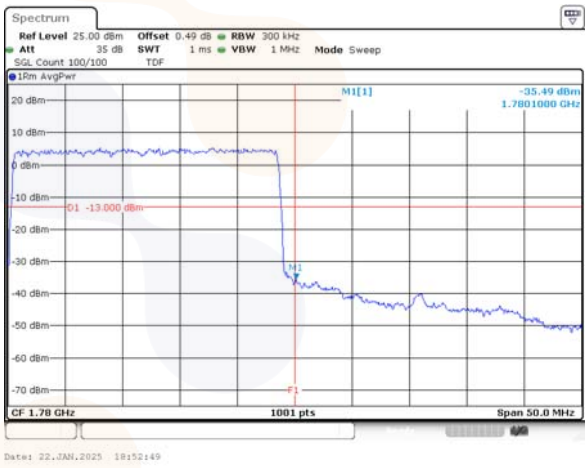
Test mode: 5G NR n66 DFT-s OFDM

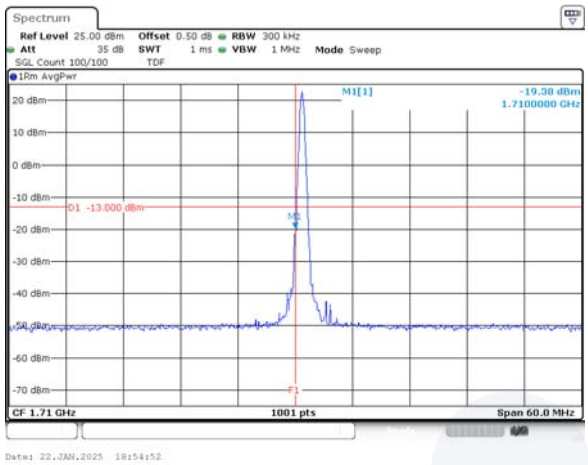
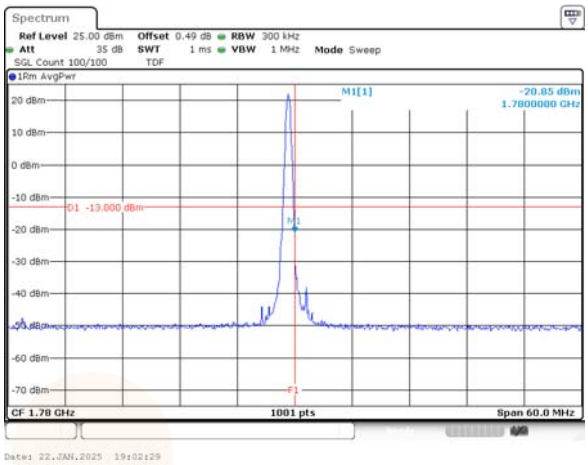
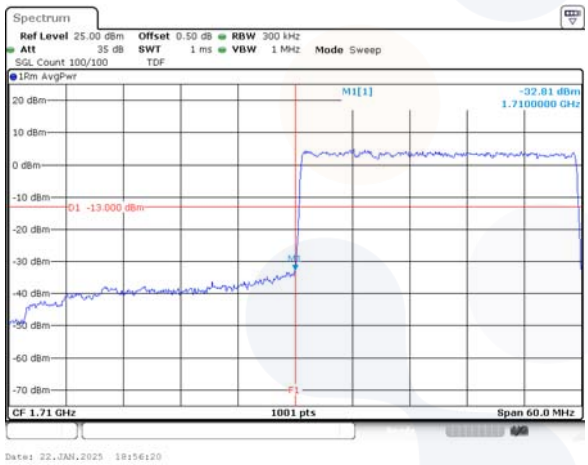
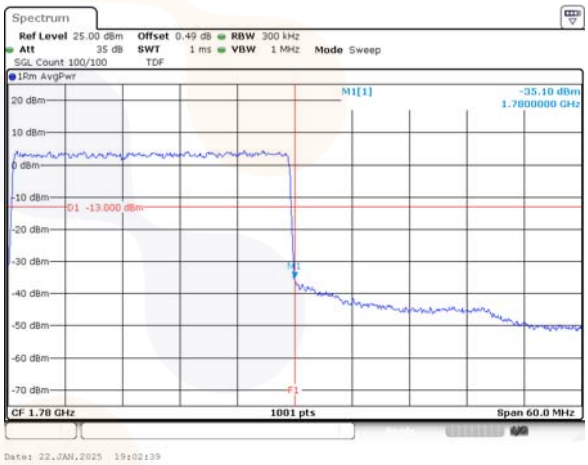
5M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

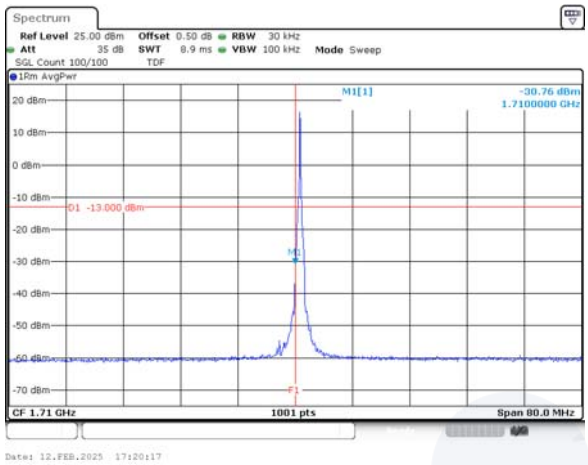
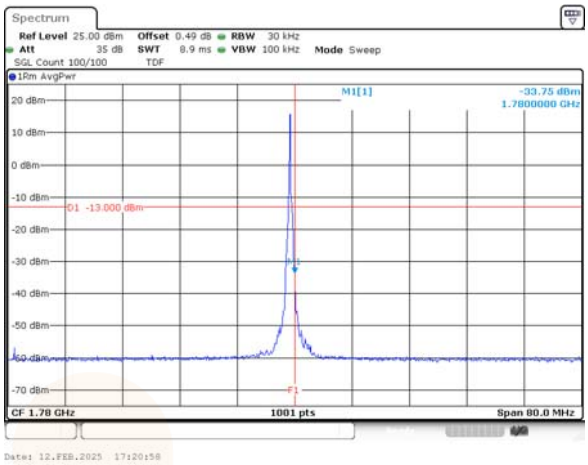
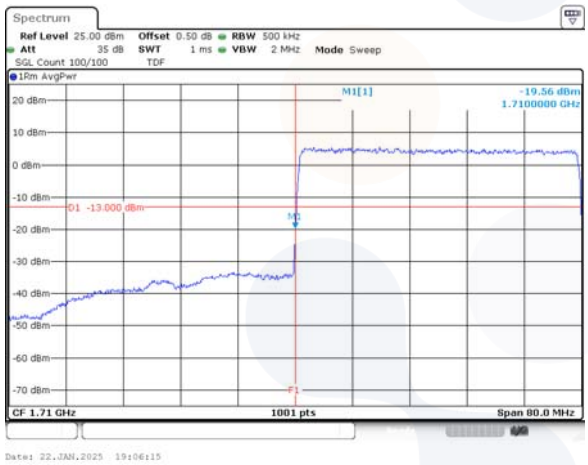
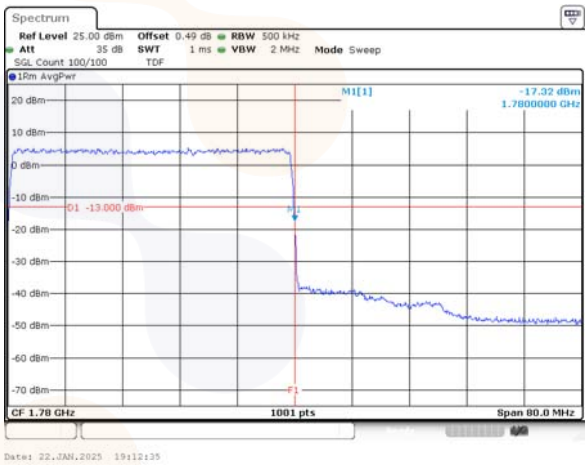
10M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

15M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

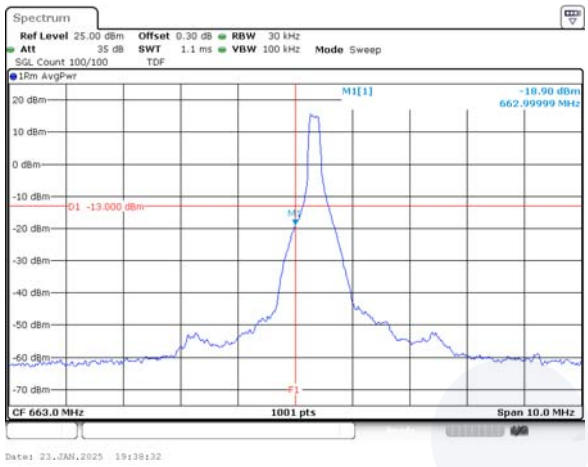
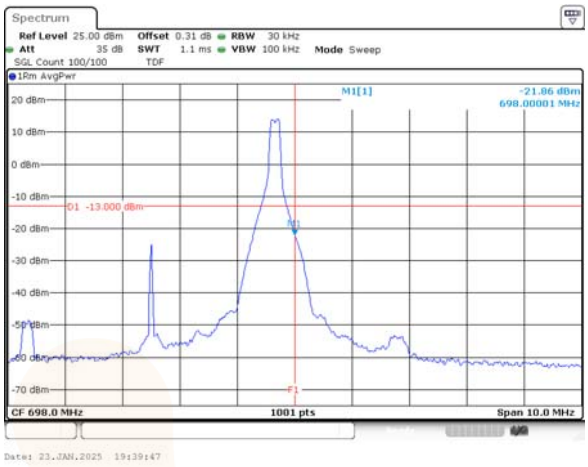
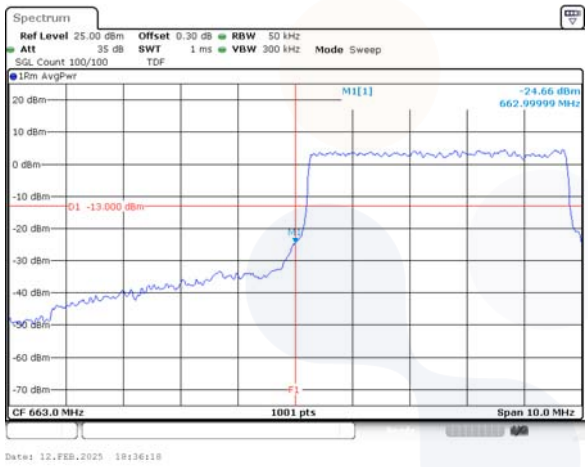
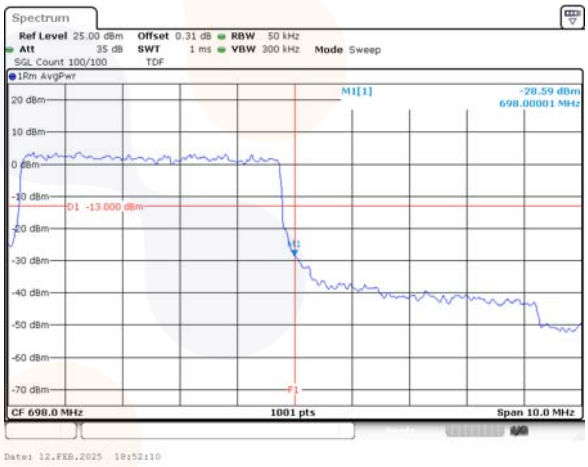
20M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

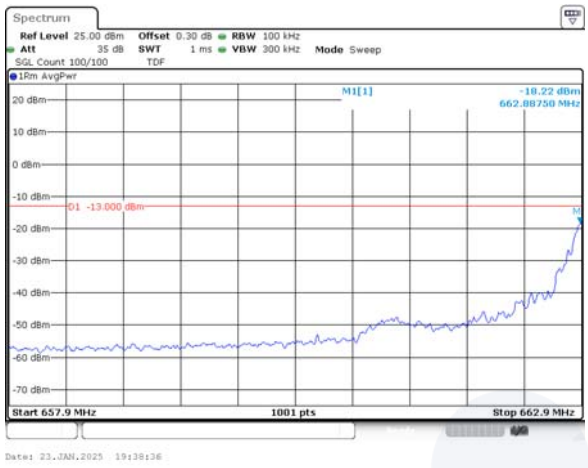
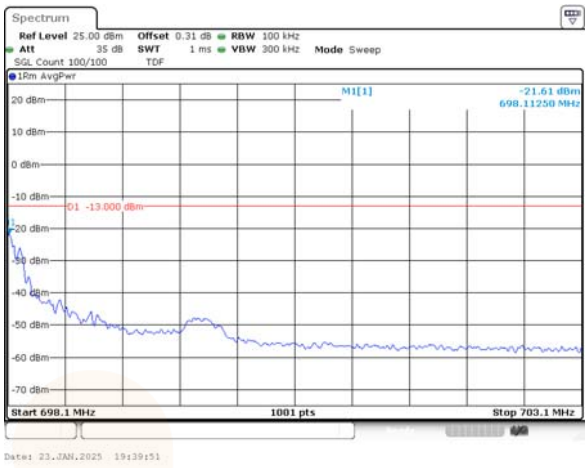
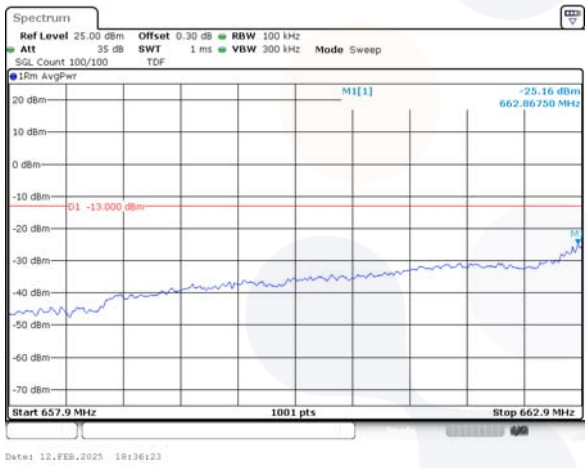
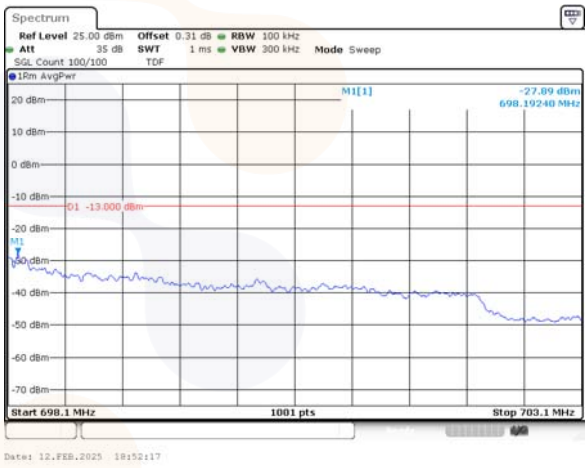
25M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

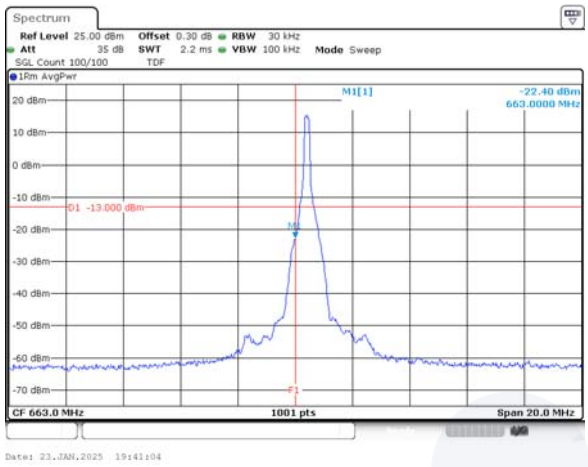
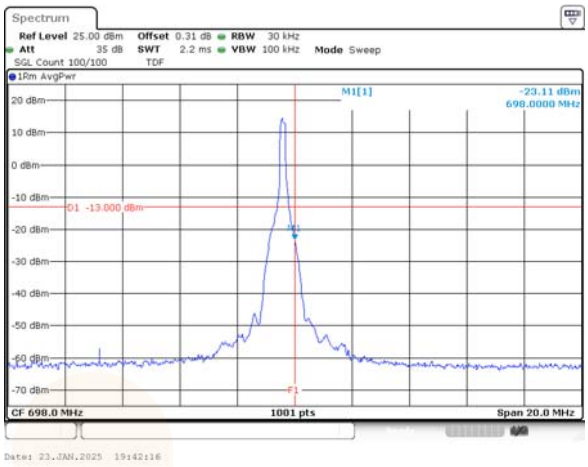
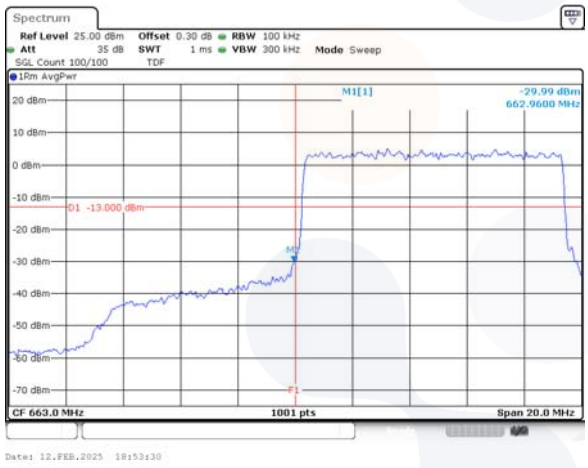
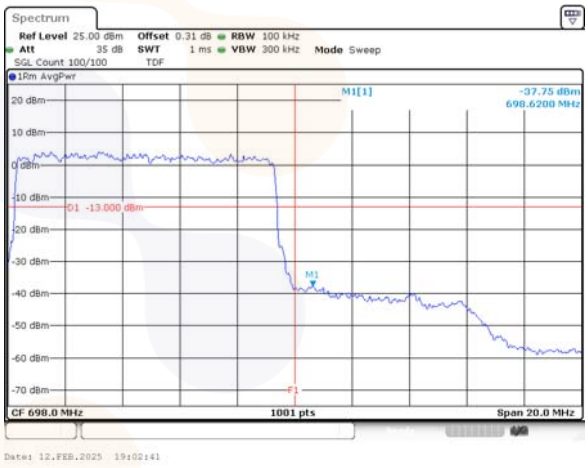
30M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

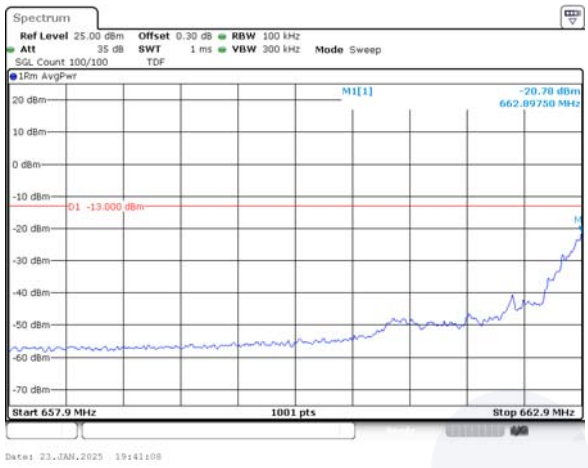
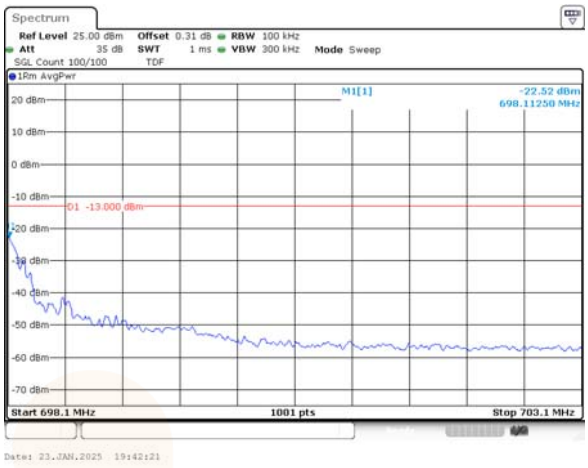
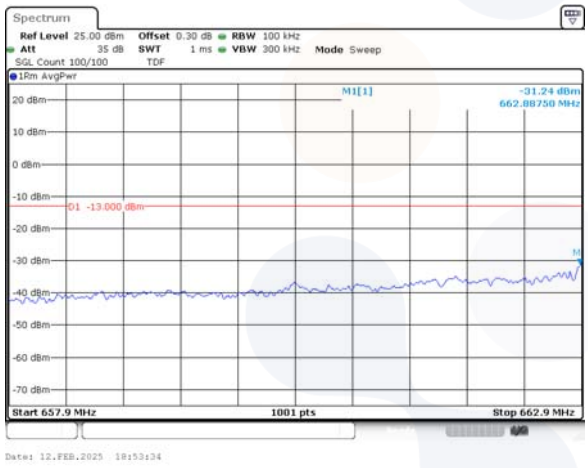
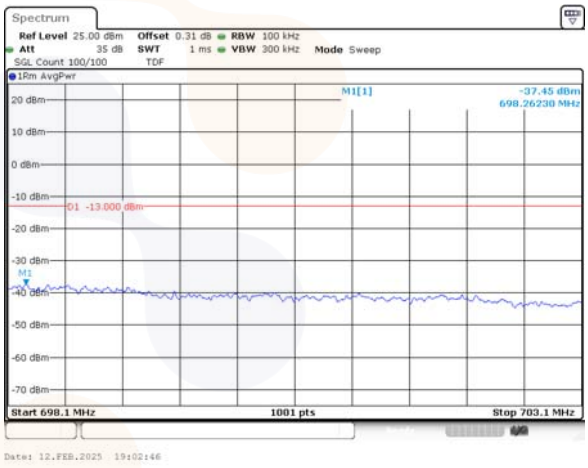
40M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

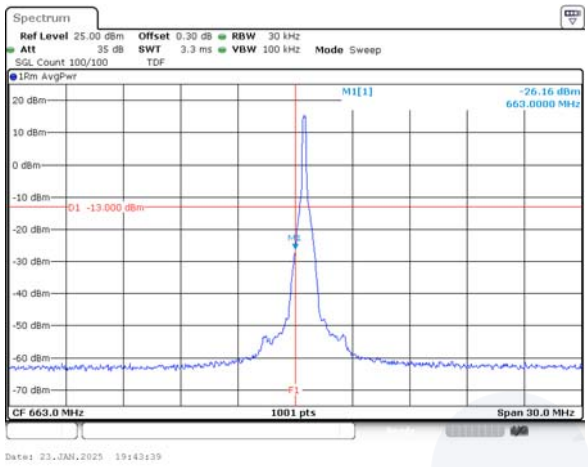
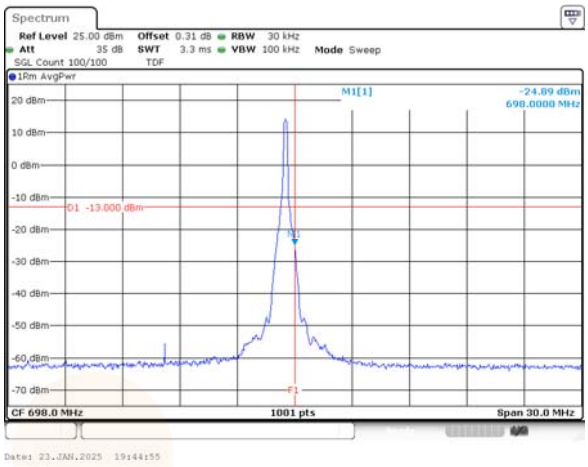
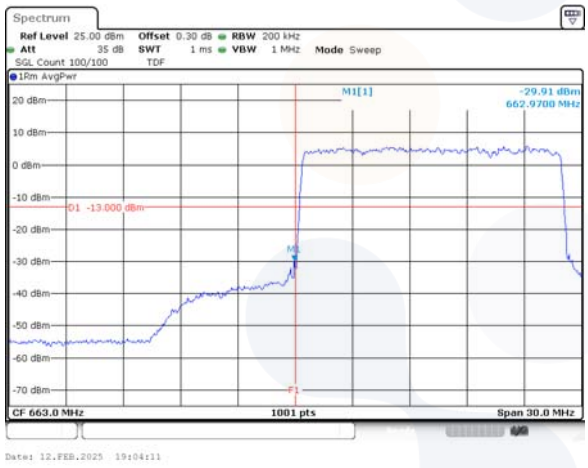
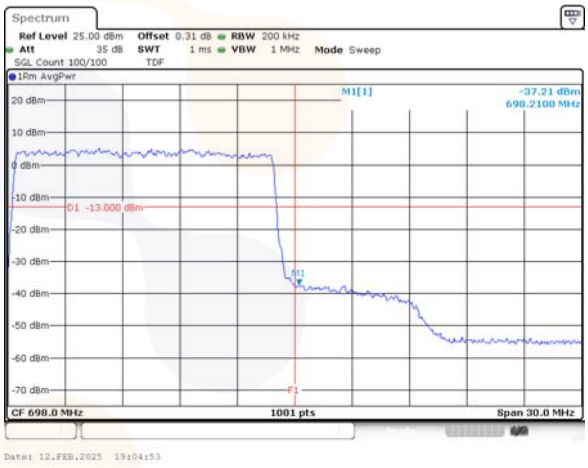
Test mode: 5G NR n71 DFT-s OFDM

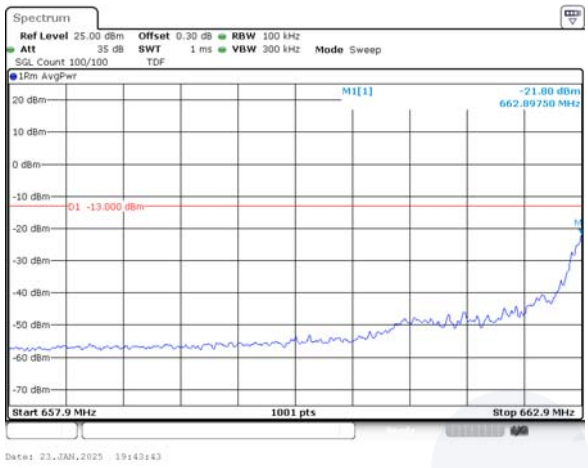
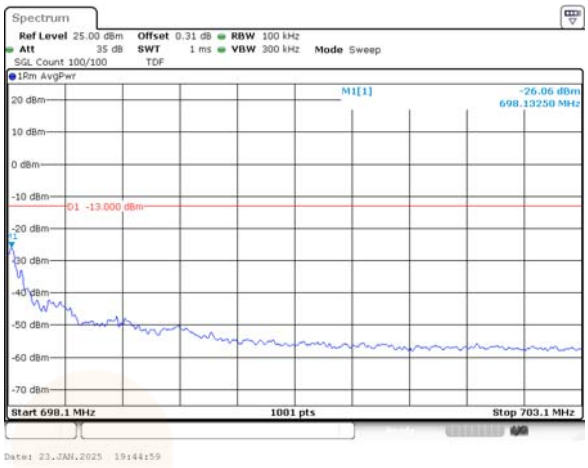
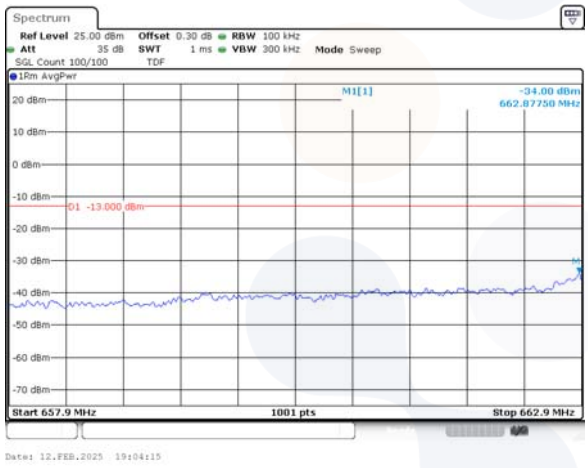
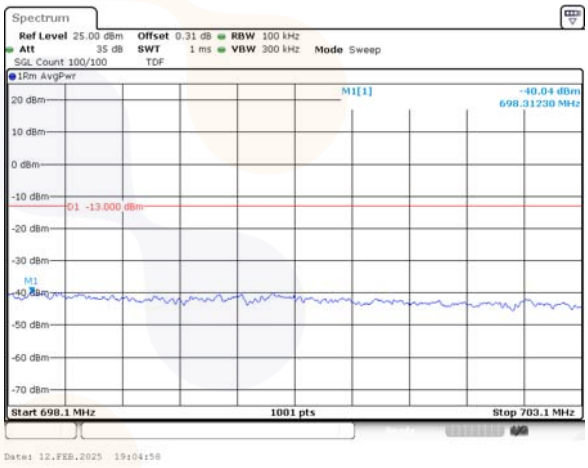
5M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

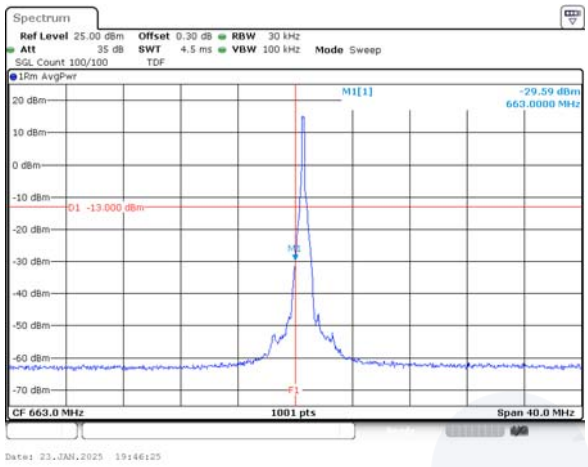
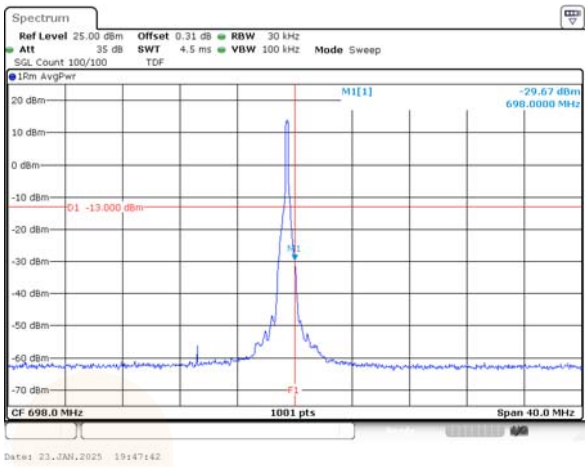
5M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

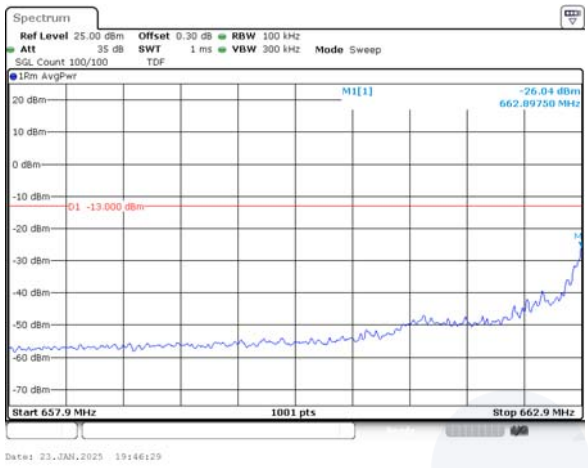
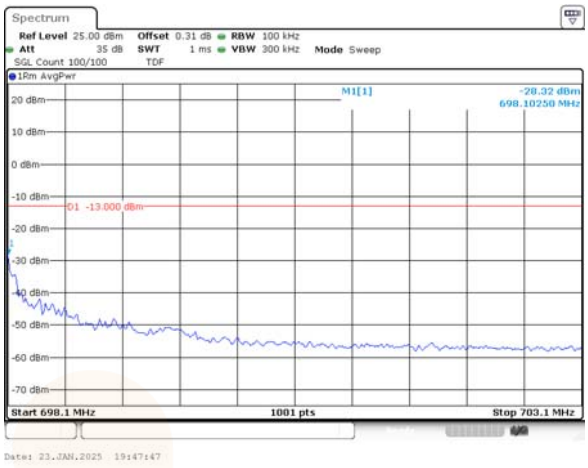
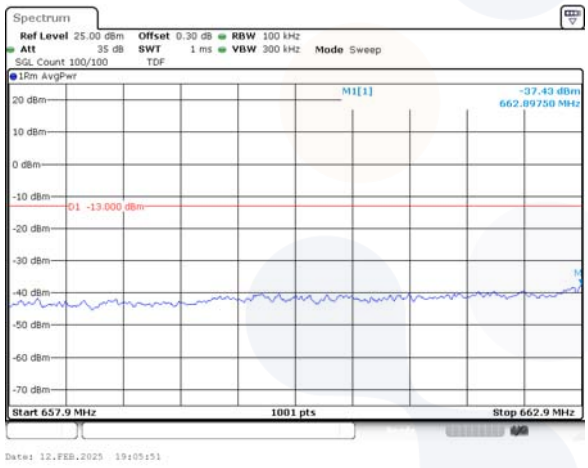
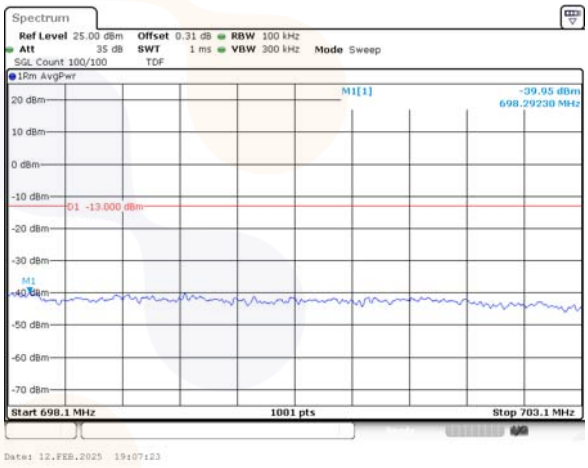
10M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

10M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

15M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

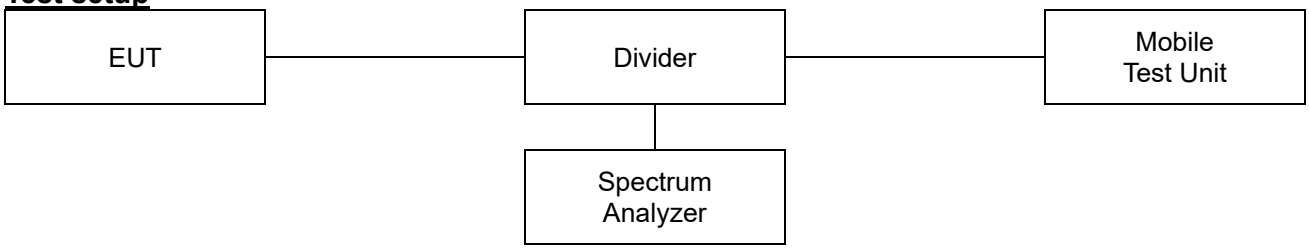
15M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

20M BW QPSK	
Low channel 1RB	**High channel 1RB**
	
Low channel FRB	**High channel FRB**
	

20M BW QPSK	
Lower extended 1RB	**Upper extended 1RB**
	
Lower extended FRB	**Upper extended FRB**
	

7.4. Spurious Emissions at Antenna Terminal

Test setup



Limit

According to §27.53(c)(2),

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

(1) On any frequency outside the 746–758 ㎒ band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) ㏈;

(2) On any frequency outside the 776–788 ㎒ band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) ㏈;

(3) On all frequencies between 763–775 ㎒ and 793–805 ㎒, by a factor not less than 76 + 10 log (P) ㏈ in a 6.25 ㎑ band segment, for base and fixed stations;

(4) On all frequencies between 763–775 ㎒ and 793–805 ㎒, by a factor not less than 65 + 10 log (P) ㏈ in a 6.25 ㎑ band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater. However, in the 100 ㎑ bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 ㎑ may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 ㎑ segment

According to §27.53(g),

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

According to §27.53(h),

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

Test procedure

971168 D01 v03r01 - Section 6
ANSI 63.26-2015 – Section 5.7

Test settings

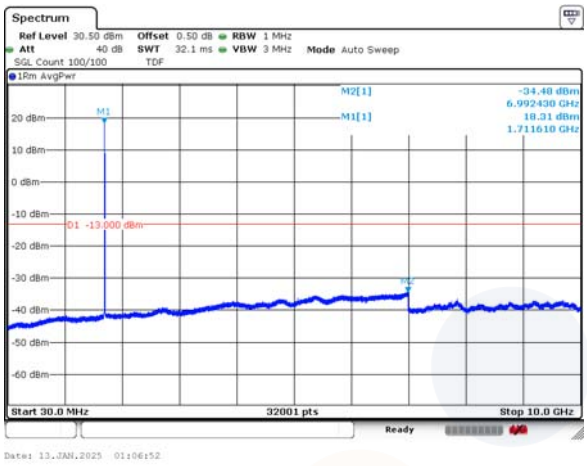
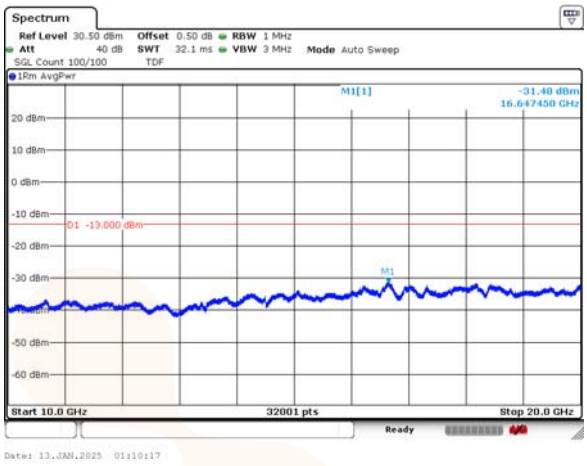
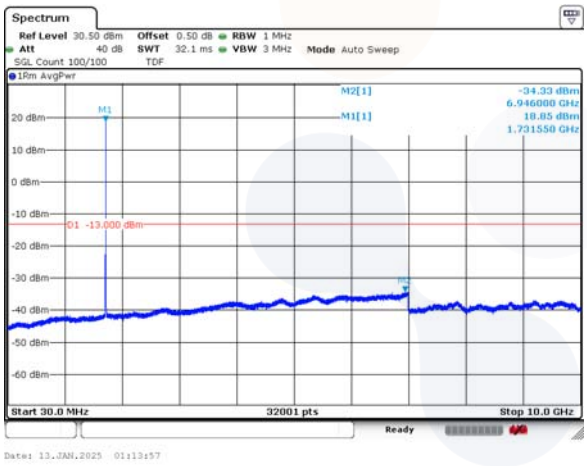
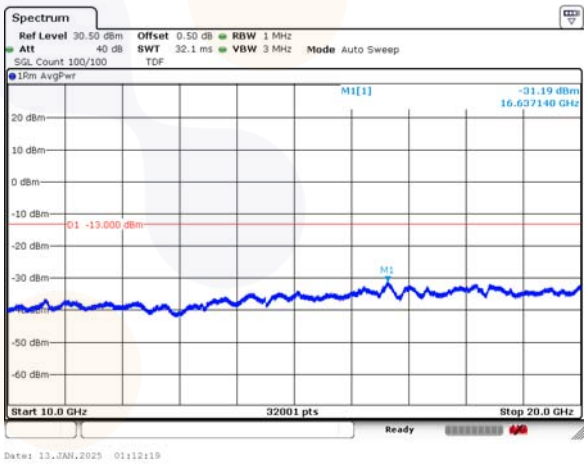
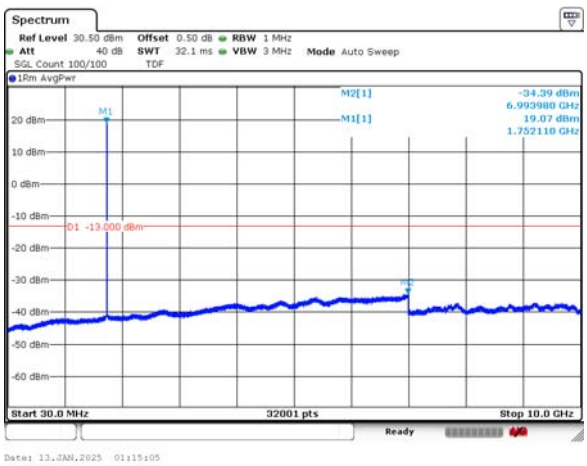
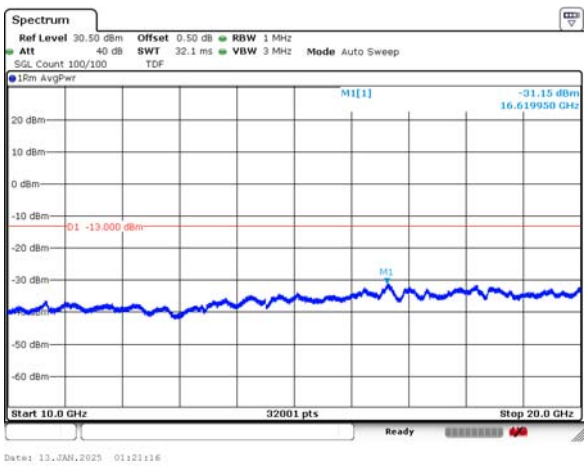
1) Start frequency was set to 30 ㎒ and stop frequency was set to at least 10th the fundamental frequency.
2) Detector = RMS
3) Sweep time = auto couple.
4) Trace mode = trace average
5) Allow trace to fully stabilize.
6) Please see test notes below RBW and VBW settings.

Notes:

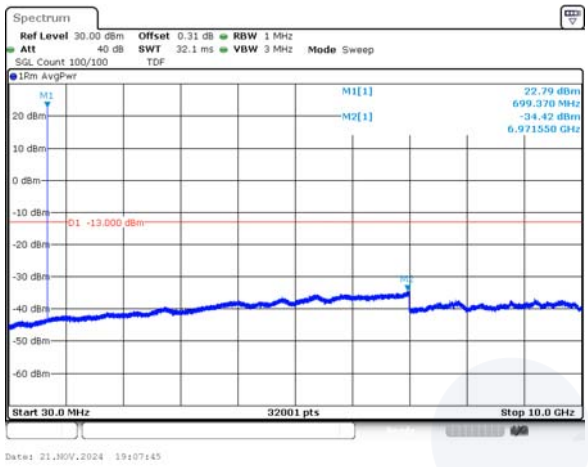
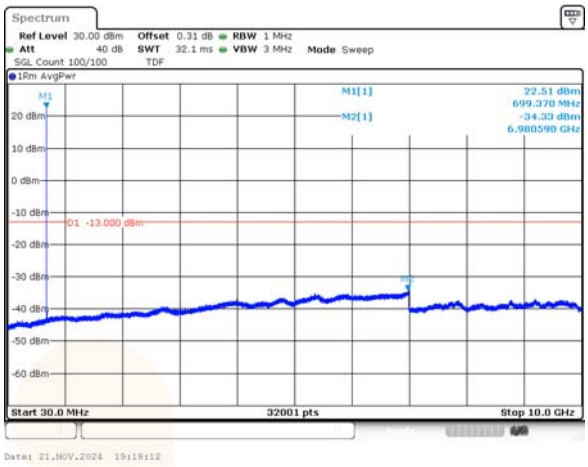
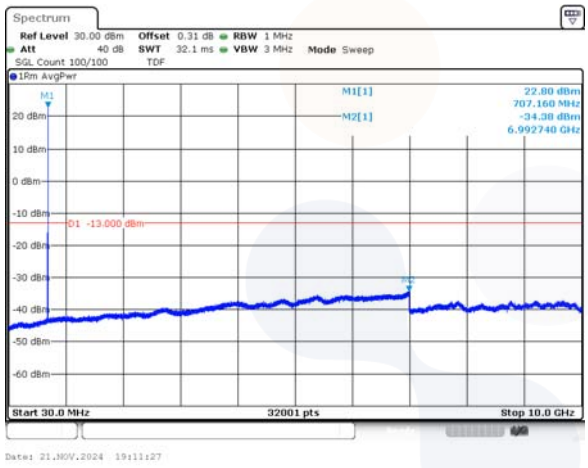
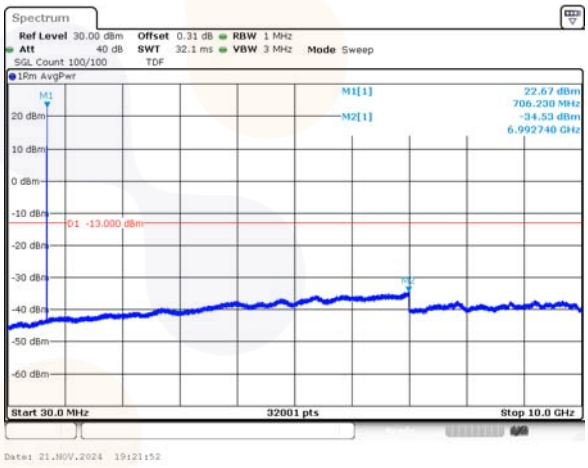
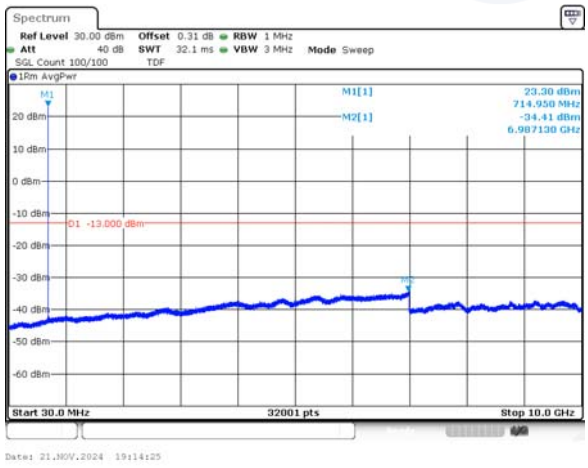
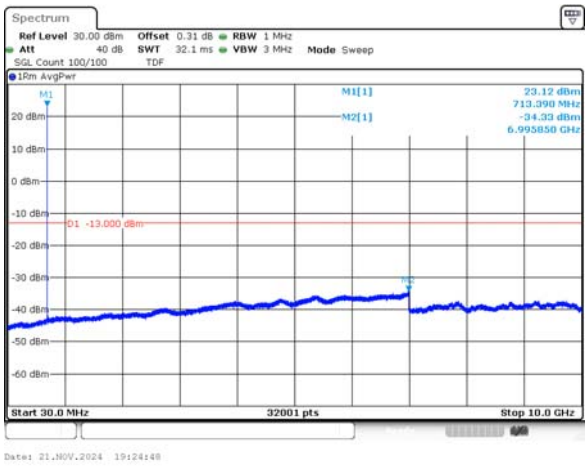
1. Per 27.53(c), 27.53(g), 27.53(h)(3), compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater for frequencies less than 1 ㎓ and 1 ㎒ or greater for frequencies greater than 1 ㎓.
   The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 ㏈ below the transmitter power.
2. All modes of operation were investigated and the worst-case configuration results are reported.

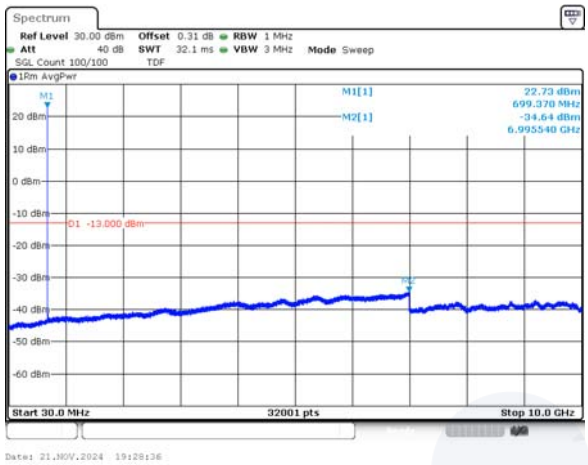
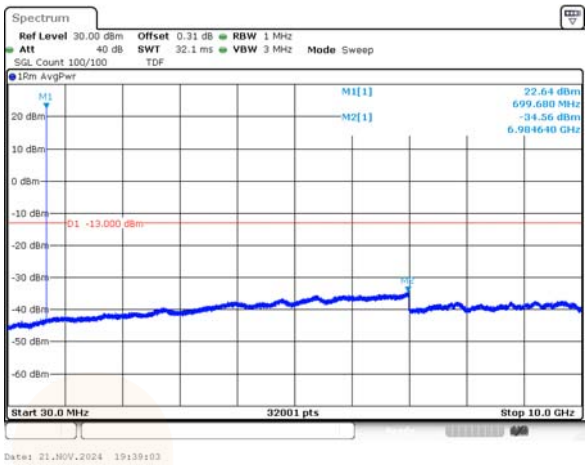
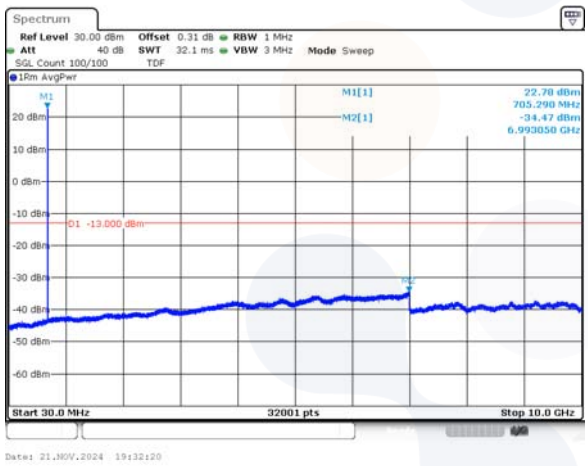
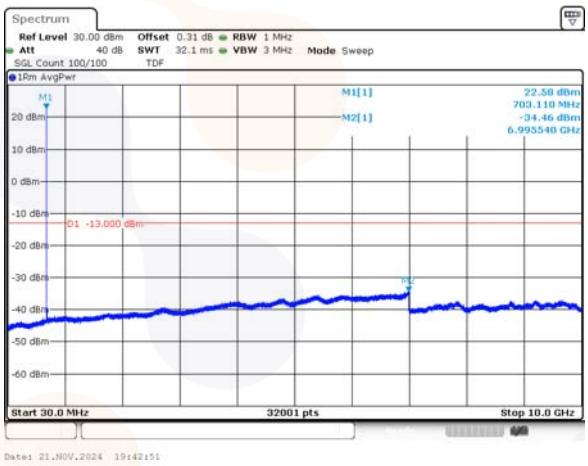
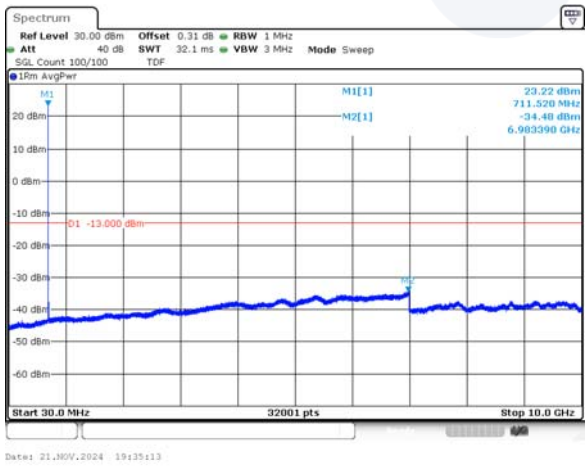
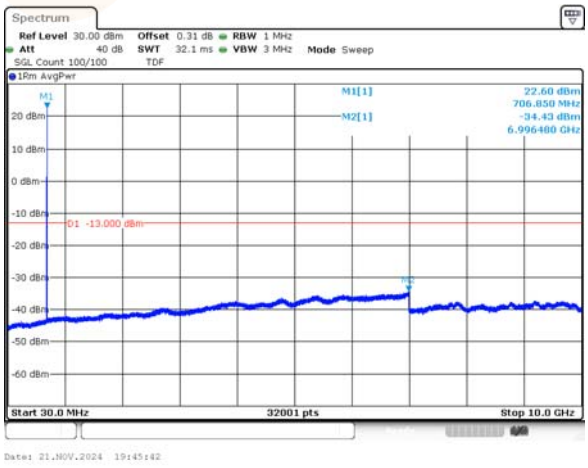
Test results

Test mode: WCDMA 1700

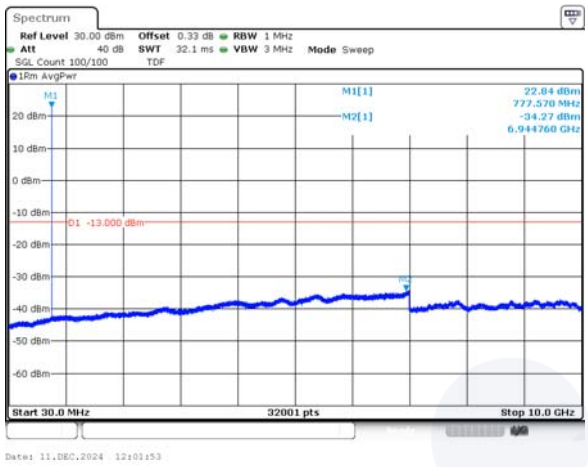
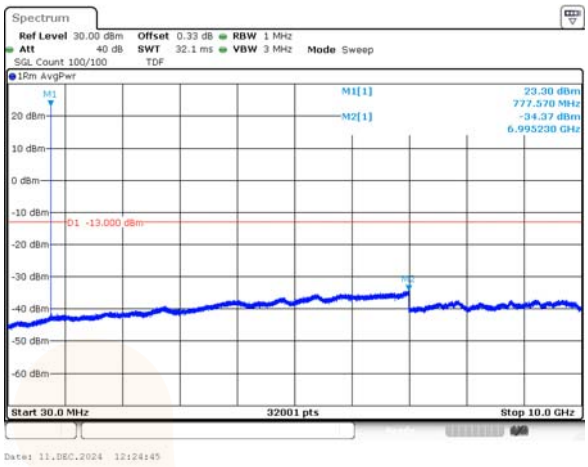
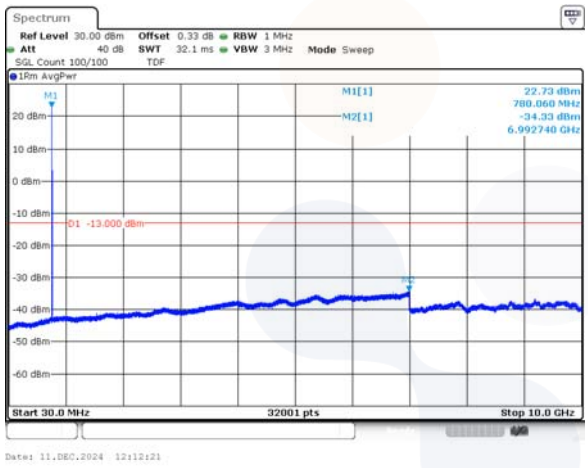
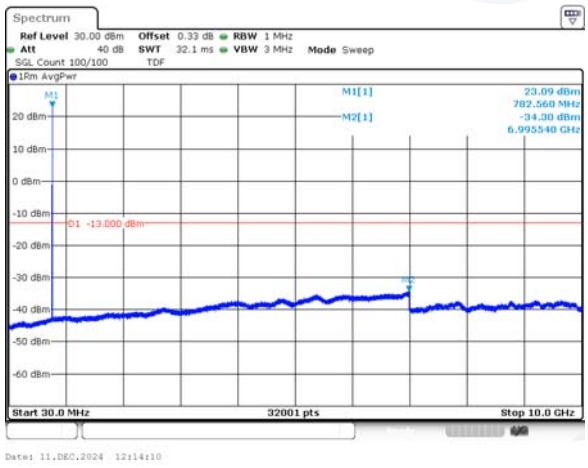
RMC	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**
	

Test mode: LTE B12/17

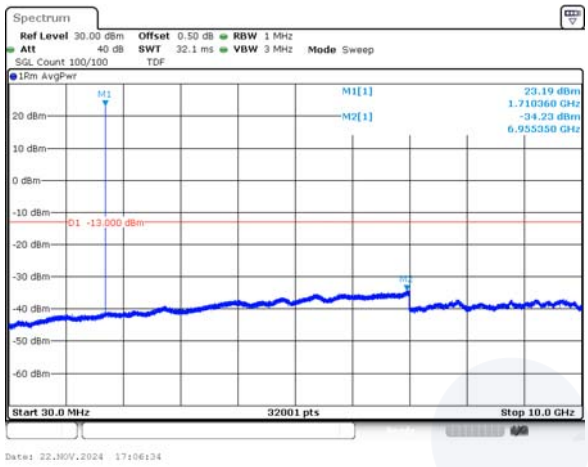
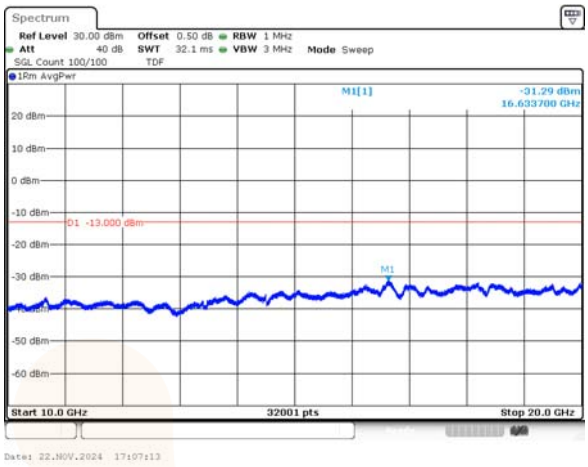
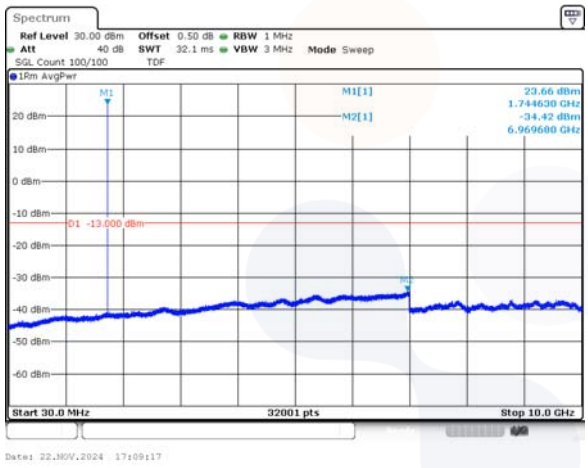
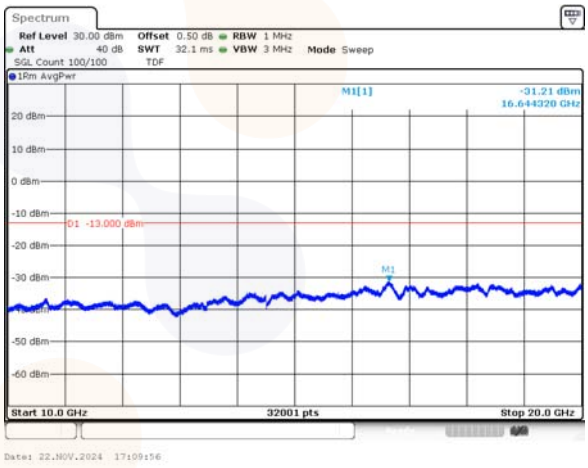
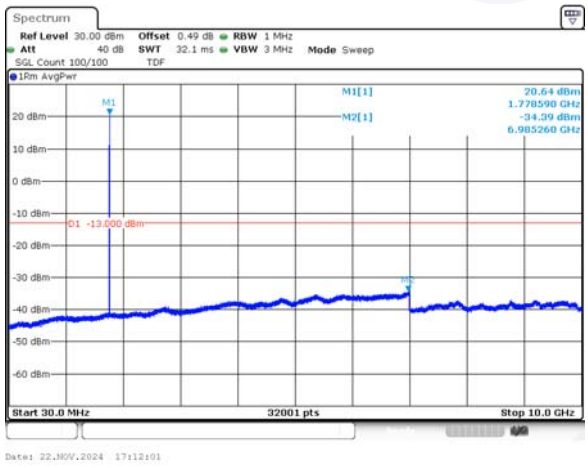
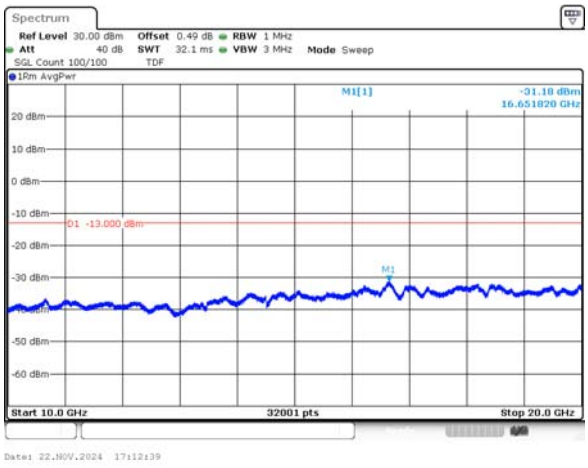
1.4M BW QPSK	3M BW QPSK
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (30 ㎒ ~ 10 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (30 ㎒ ~ 10 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (30 ㎒ ~ 10 ㎓)**
	

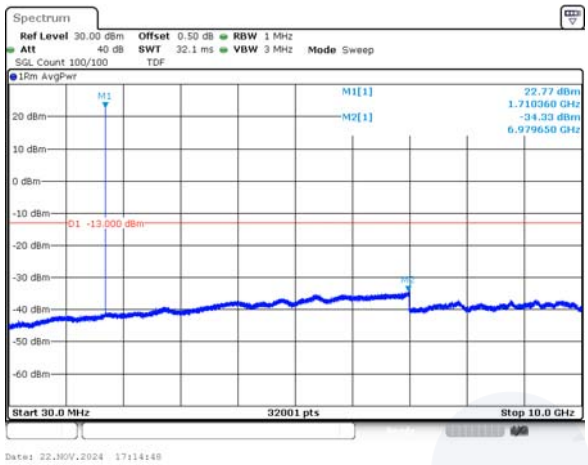
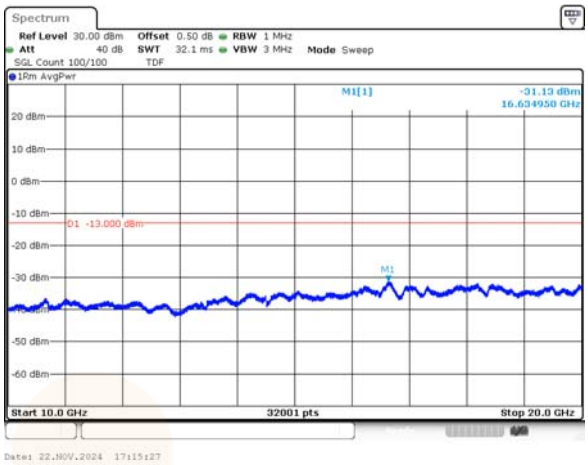
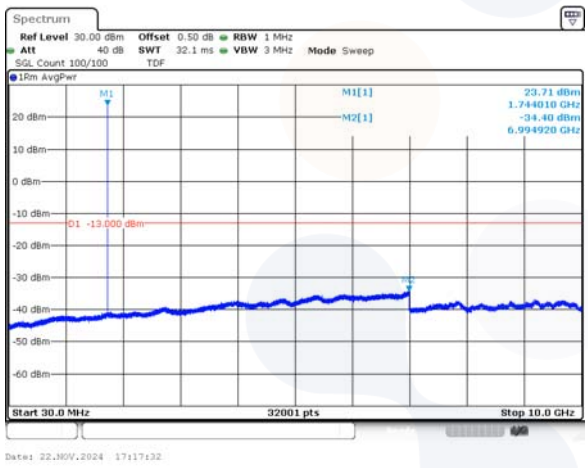
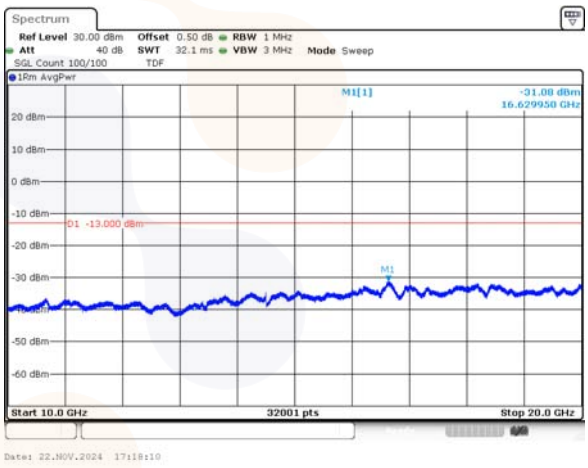
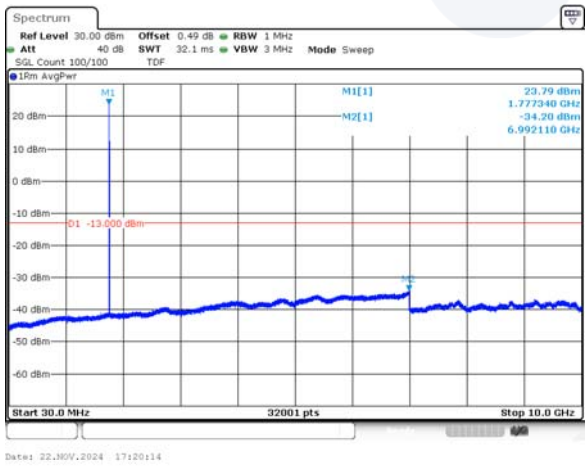
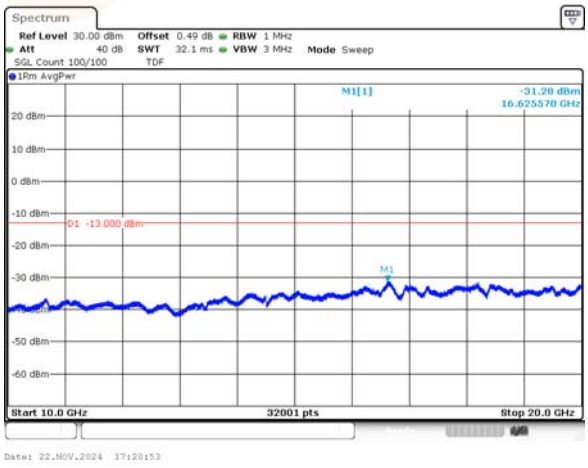
5M BW QPSK	10M BW QPSK
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (30 ㎒ ~ 10 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (30 ㎒ ~ 10 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (30 ㎒ ~ 10 ㎓)**
	

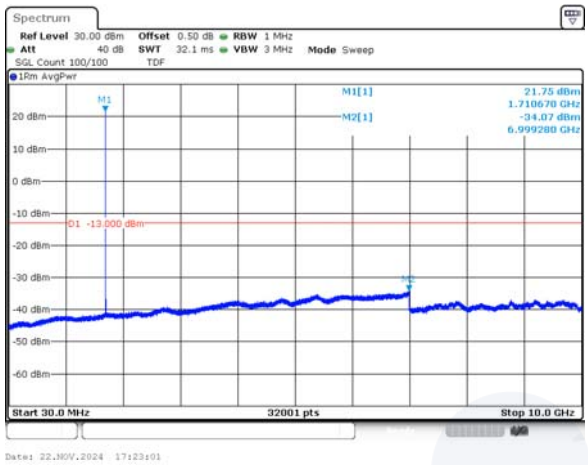
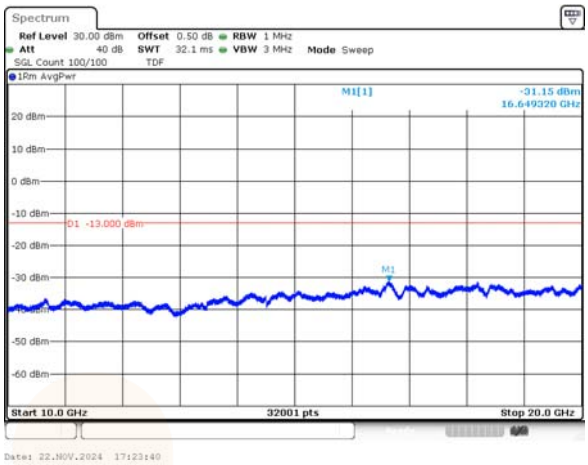
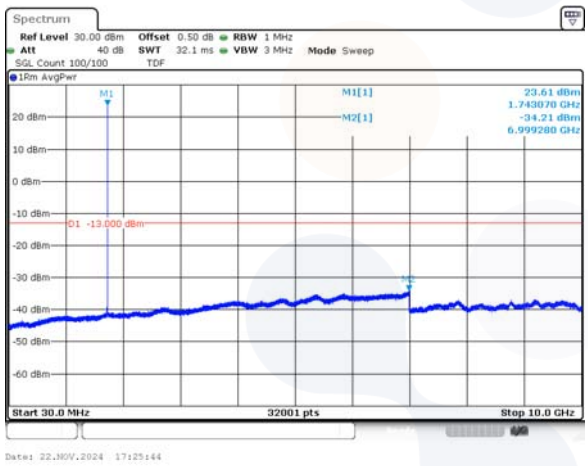
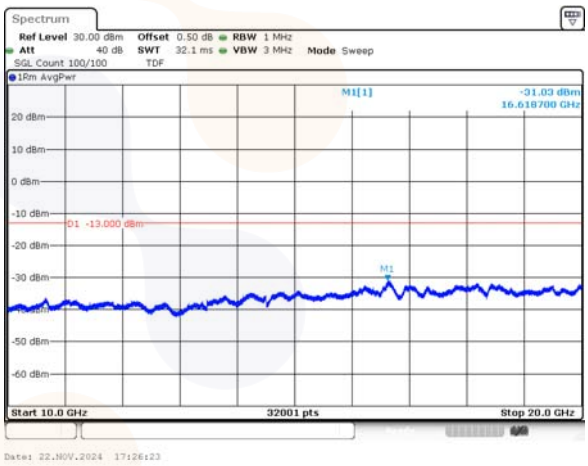
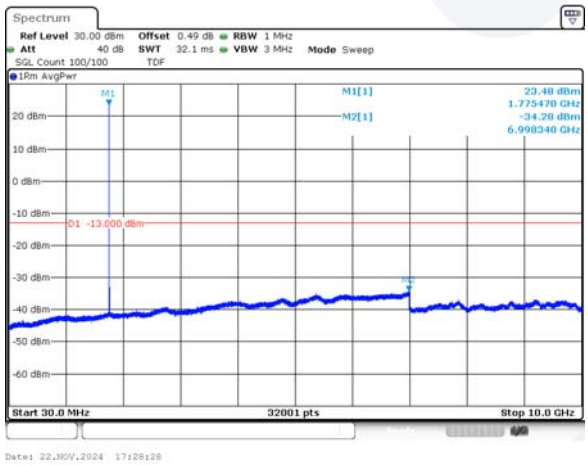
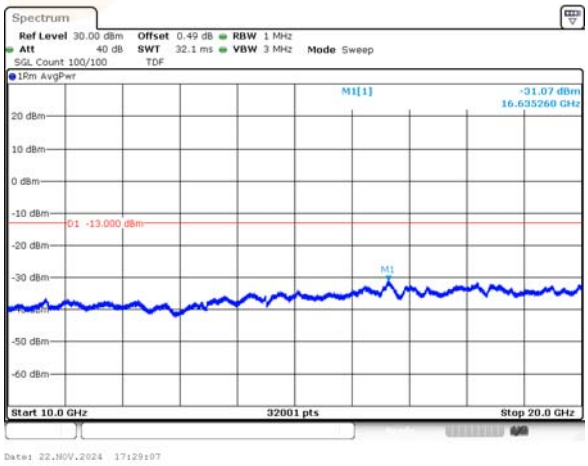
Test mode: LTE B13

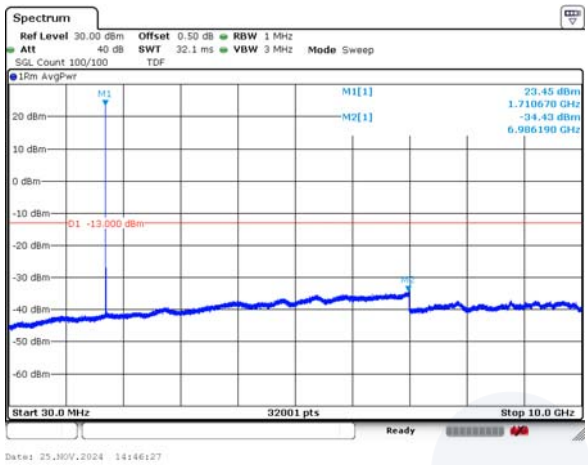
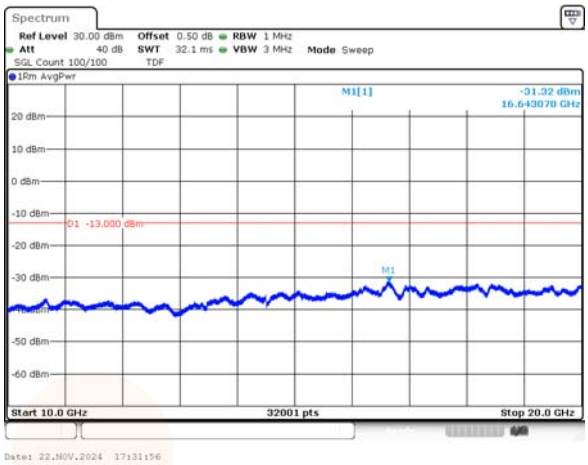
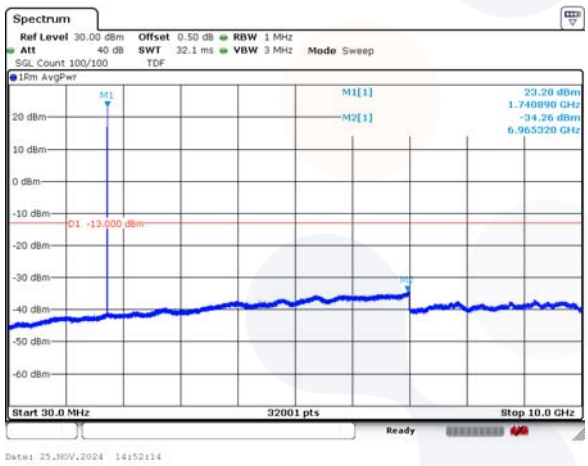
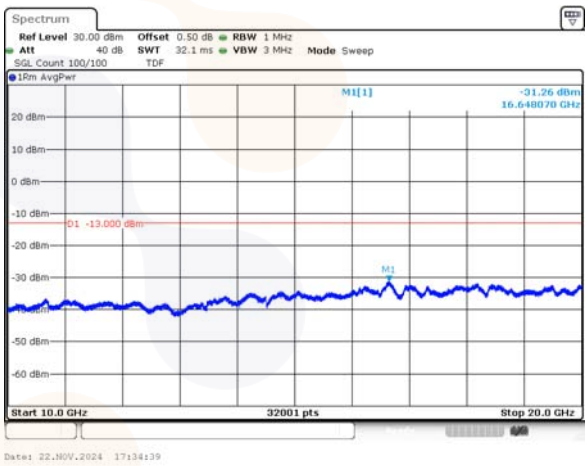
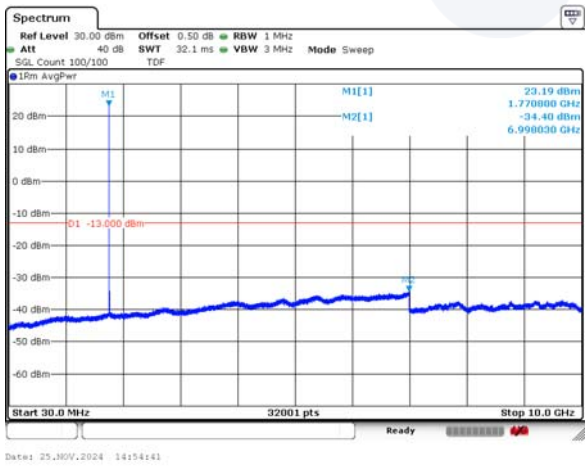
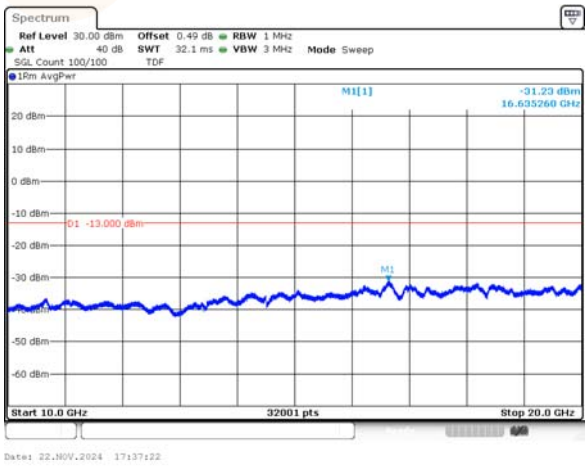
5M BW QPSK	10M BW QPSK
Low channel (30 ㎒ ~ 10 ㎓)	**Middle channel (30 ㎒ ~ 10 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**-**
	Blank
High channel (30 ㎒ ~ 10 ㎓)	**-**
	Blank

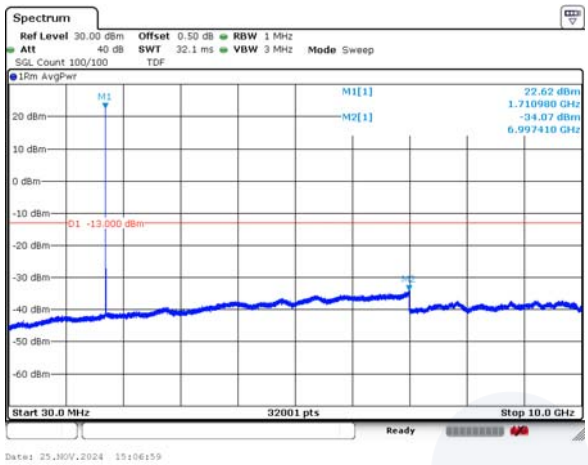
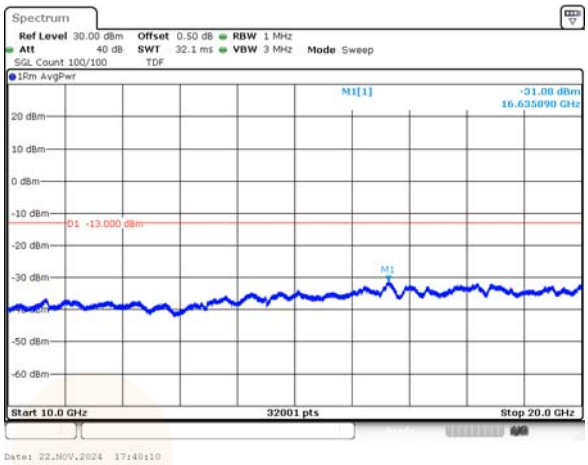
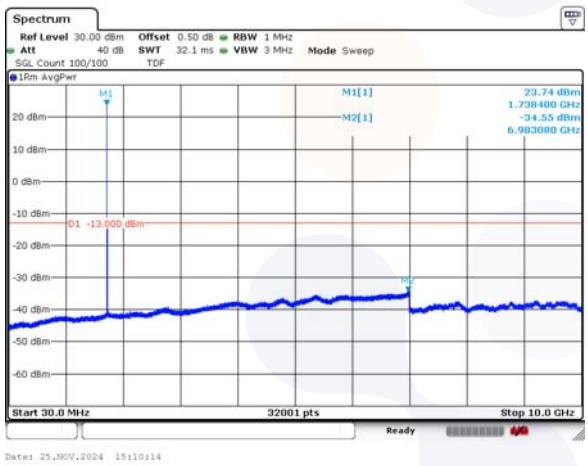
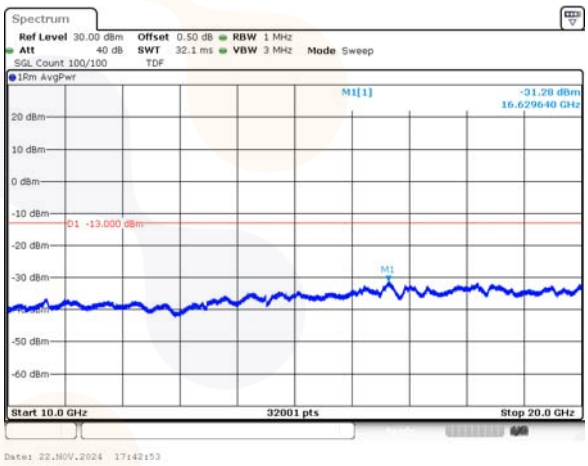
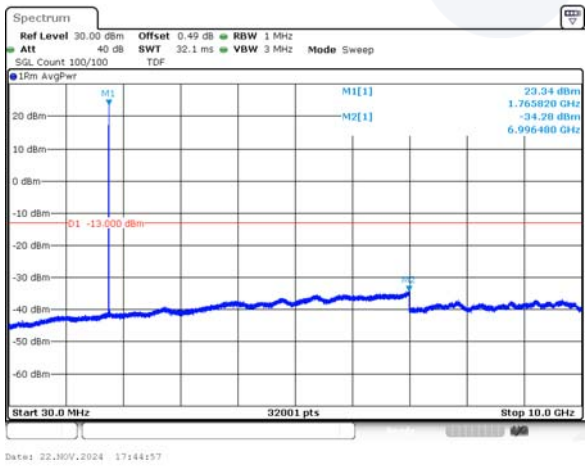
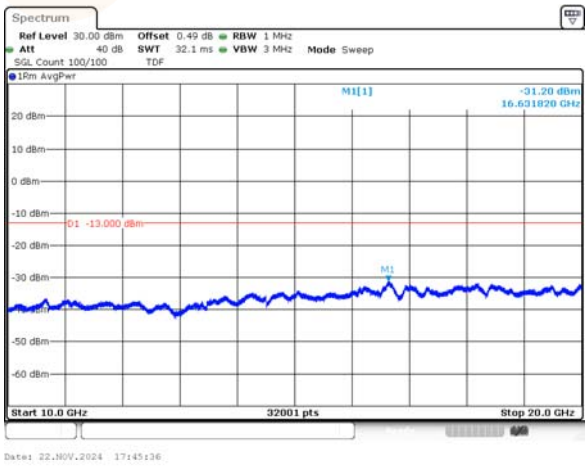
Test mode: LTE B66/4

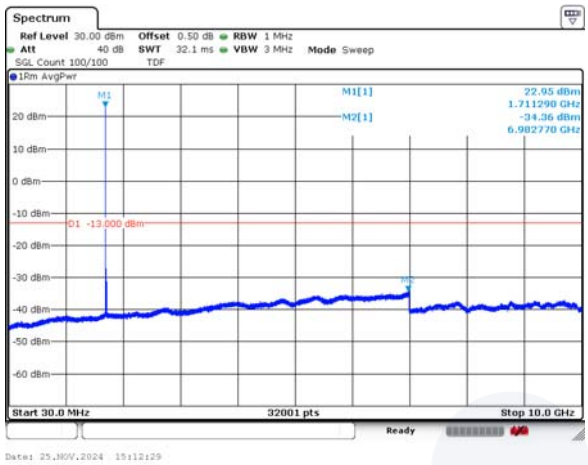
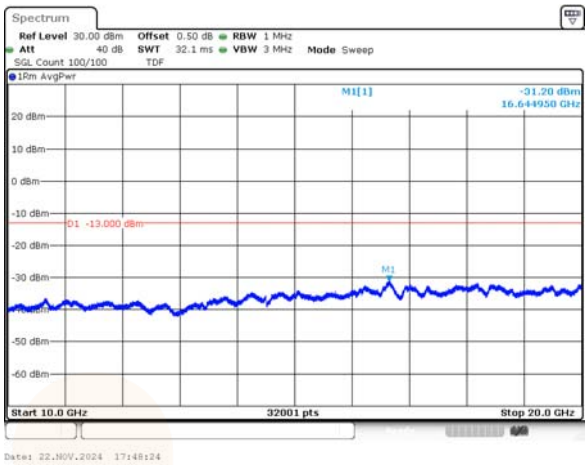
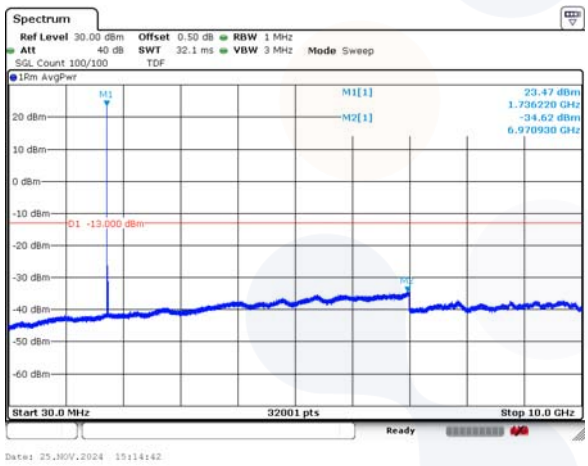
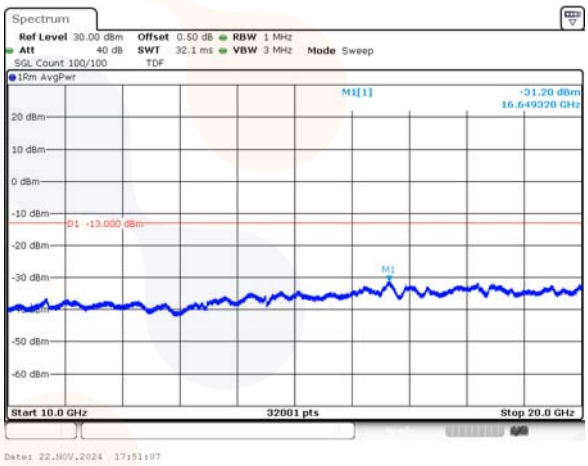
1.4M BW QPSK	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**
	

3M BW QPSK	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**
	

5M BW QPSK	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**
	

10M BW QPSK	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**
	

15M BW QPSK	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**
	

20M BW QPSK	
Low channel (30 ㎒ ~ 10 ㎓)	**Low channel (10 ㎓ ~ 20 ㎓)**
	
Middle channel (30 ㎒ ~ 10 ㎓)	**Middle channel (10 ㎓ ~ 20 ㎓)**
	
High channel (30 ㎒ ~ 10 ㎓)	**High channel (10 ㎓ ~ 20 ㎓)**