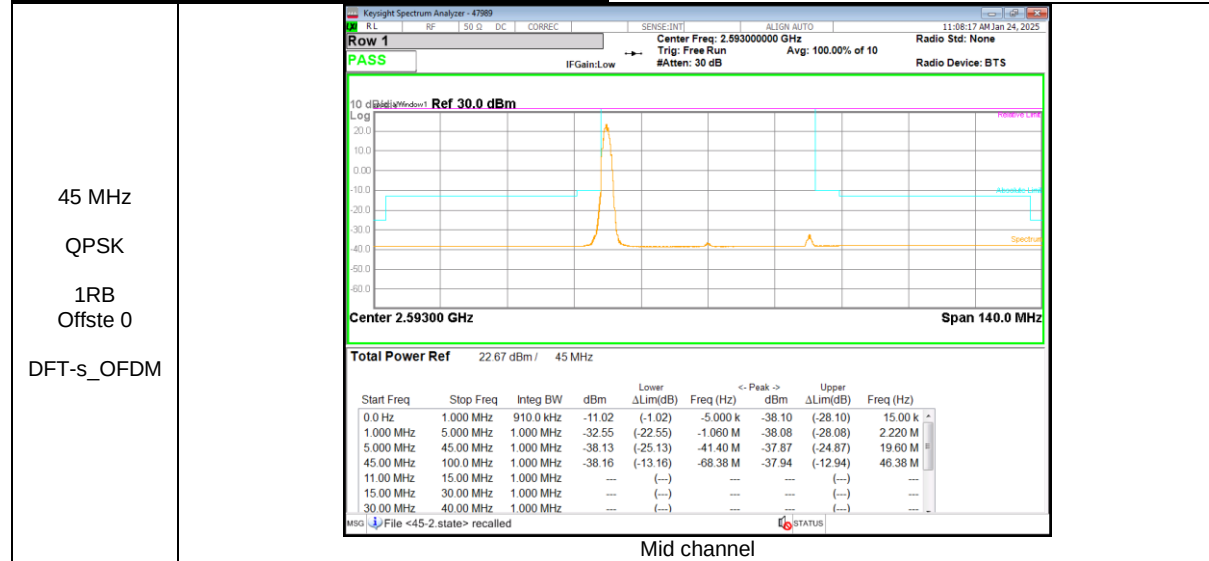




NR Band n41 (PC2) 1 RB (Worst Case) (ANT B)



8.5. CONDUCTED SPURIOUS EMISSIONS

RULE PART(S)

FCC: §27.53

LIMITS

§27.53:

(a) (4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log (P)$ dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than $61 + 10 \log (P)$ dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than $67 + 10 \log (P)$ dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2296 and 2300 MHz, $61 + 10 \log (P)$ dB on all frequencies between 2292 and 2296 MHz, $67 + 10 \log (P)$ dB on all frequencies between 2288 and 2292 MHz, and $70 + 10 \log (P)$ dB below 2288 MHz;

(iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2365 MHz, and not less than $70 + 10 \log (P)$ dB above 2365 MHz.

(c)(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.

(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 than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

(l)(2) For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(n)(2) For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold Mode using a peak detector to ensure that the worst-case emissions were caught.

- a) Set the RBW = 100 kHz for emission below 1 GHz and 1 MHz for emissions above 1 GHz
(Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW $\geq 3 \times$ RBW;
- c) Set span ≥ 1.5 times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace Mode = average(WCDMA, LTE FDD, 5G NR FDD), Max hold(LTE TDD, 5G NR TDD);

NOTE1

UMTS: It was tested at REL 99 as worst case (the highest output power and density).

LTE: It was tested at 1RB QPSK as worst case (the highest output power and density).

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

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.

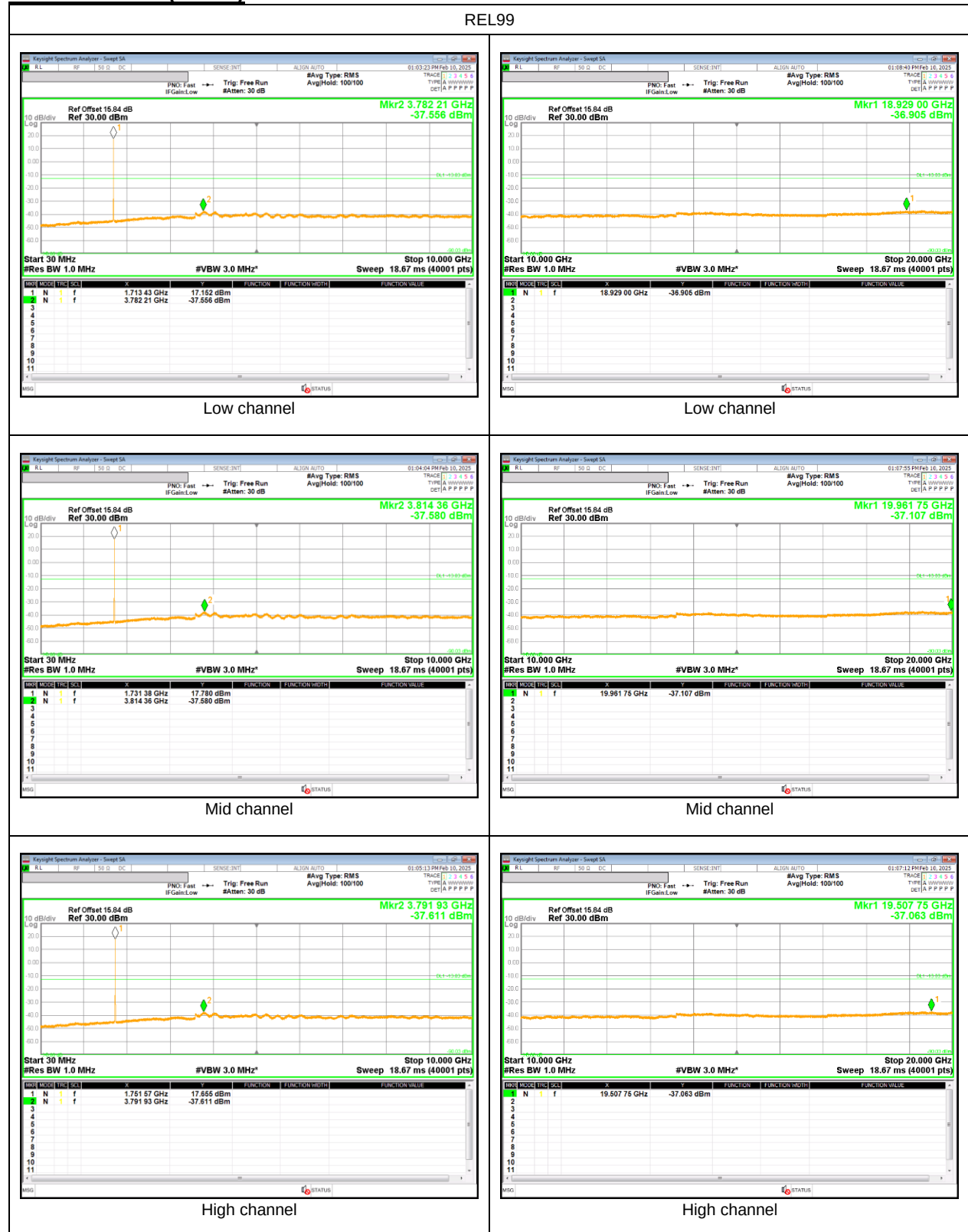
RESULTS

See the following pages.

8.5.1. OUT OF BAND EMISSIONS RESULT

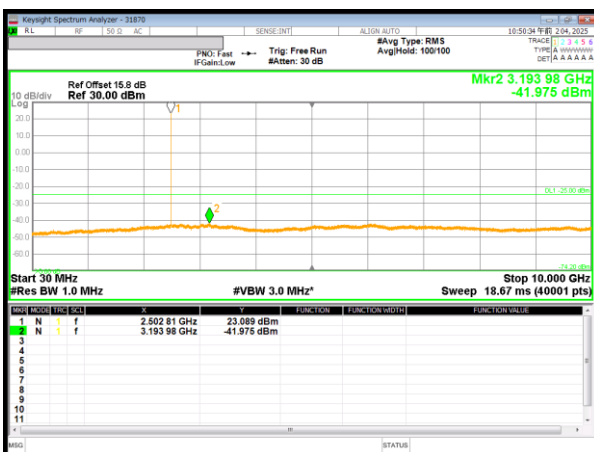
WCDMA Band 4 (ANT B)

REL99

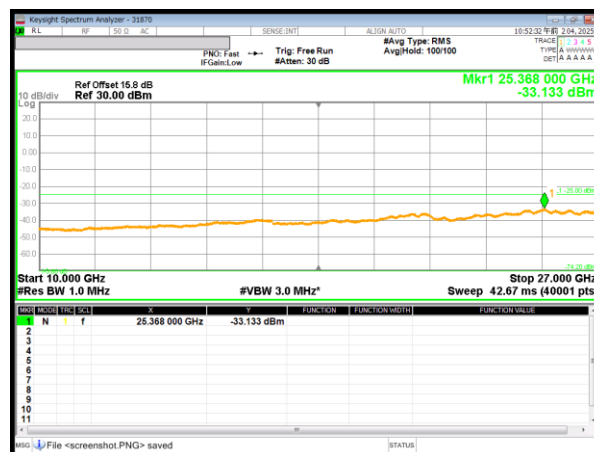


LTE Band 7 (ANT B)

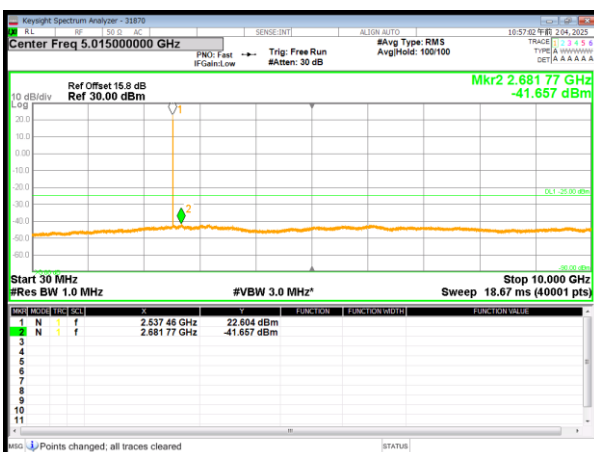
5 MHz QPSK



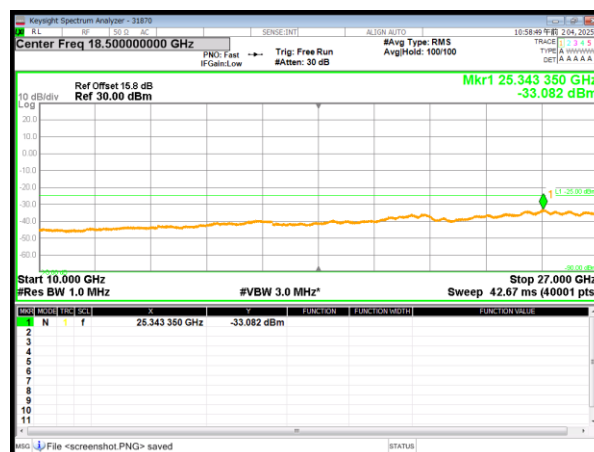
Low channel



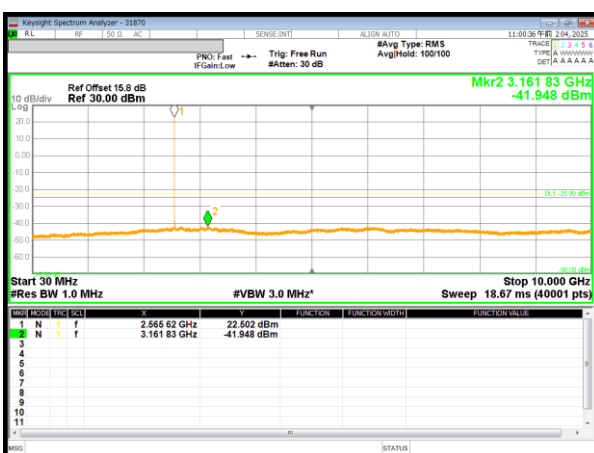
Low channel



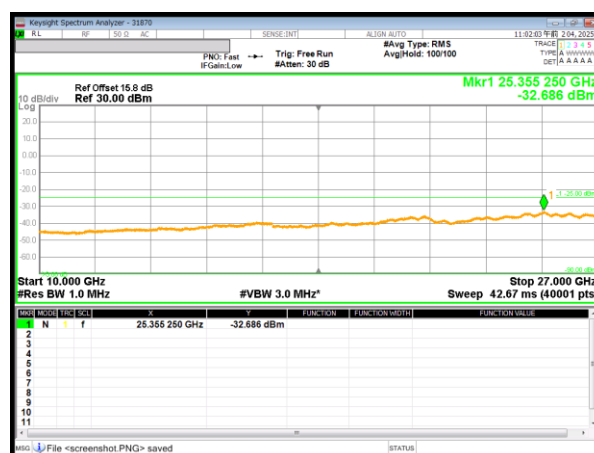
Mid channel



Mid channel



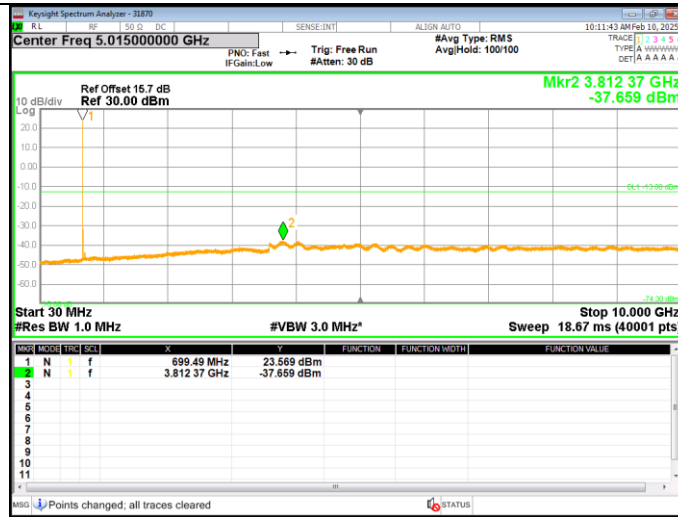
High channel



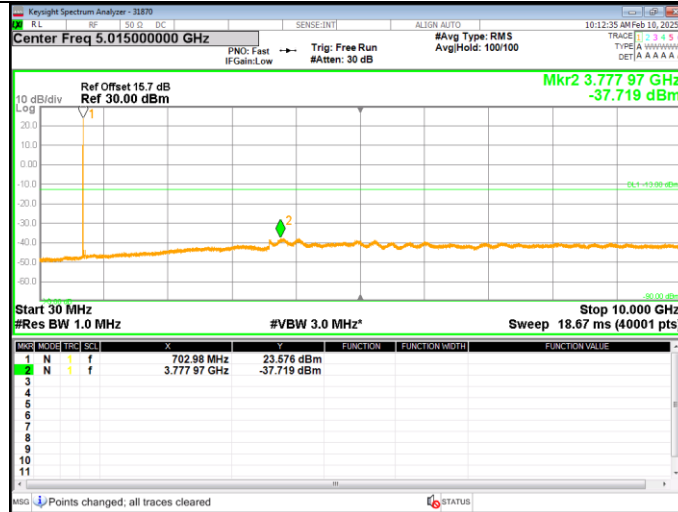
High channel

LTE Band 12 (ANT A)

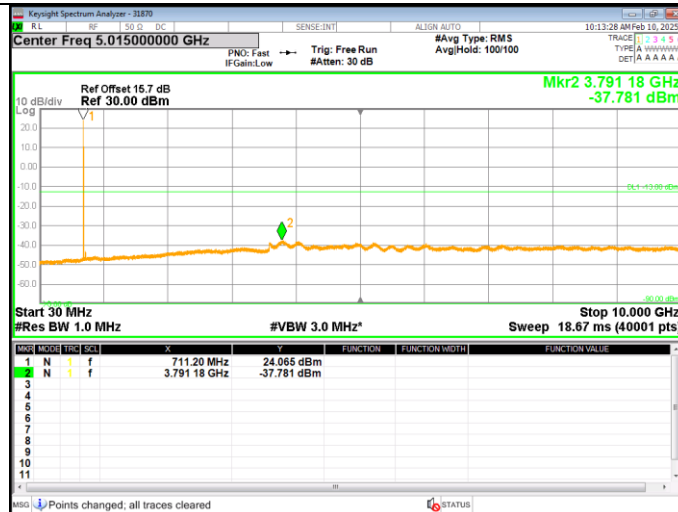
10 MHz QPSK



Low channel



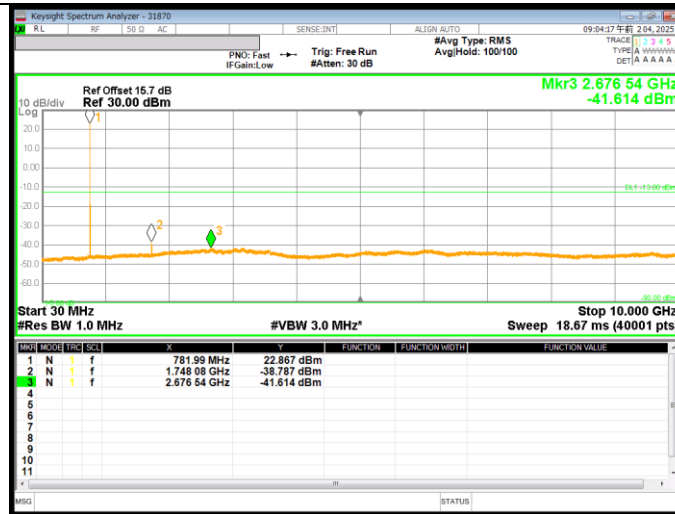
Mid channel



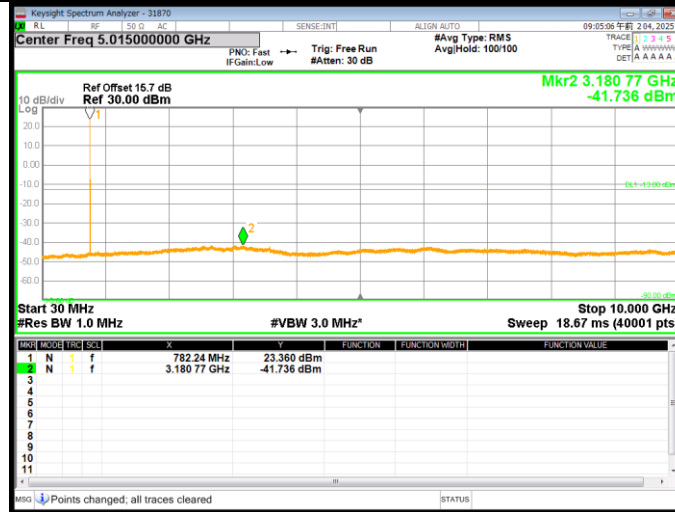
High channel

LTE Band 13 (ANT E)

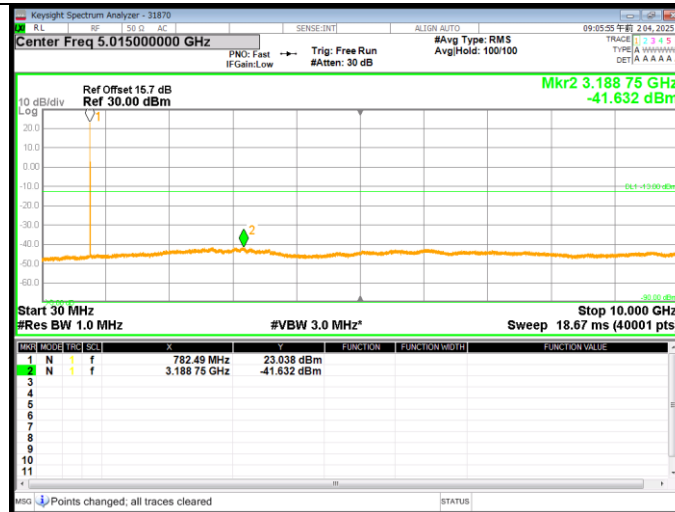
5 MHz QPSK



Low channel



Mid channel



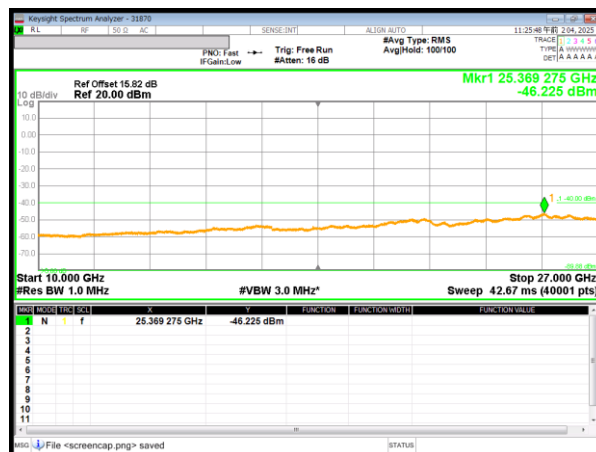
High channel

LTE Band 30 (ANT A)

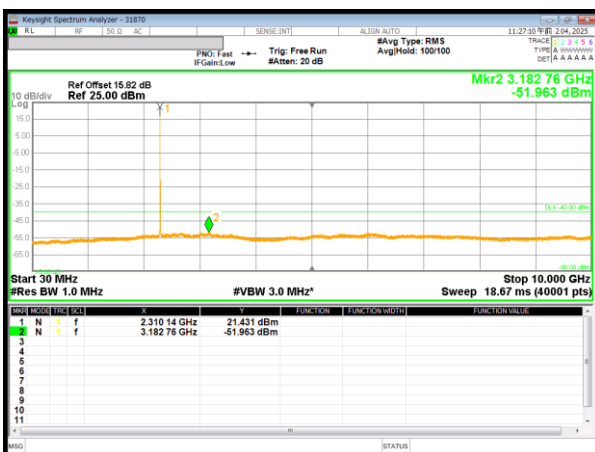
5 MHz QPSK



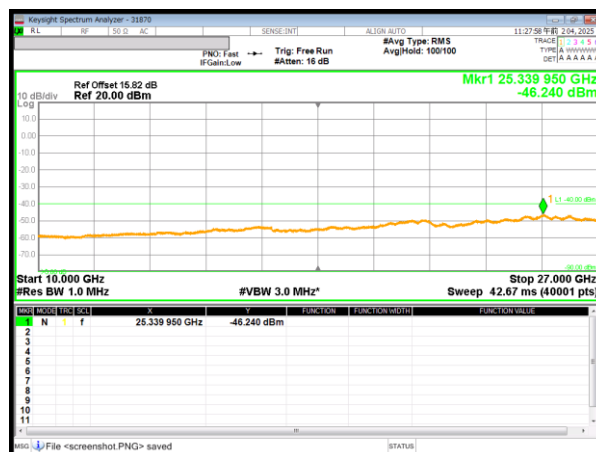
Low channel



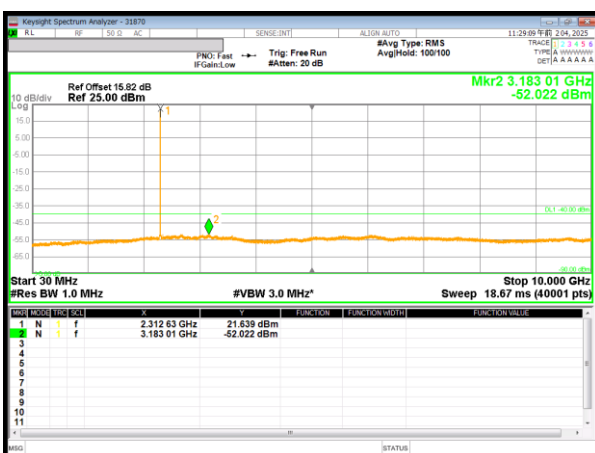
Low channel



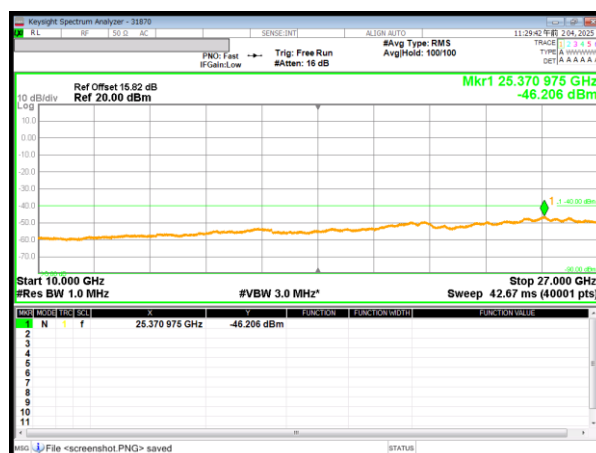
Mid channel



Mid channel



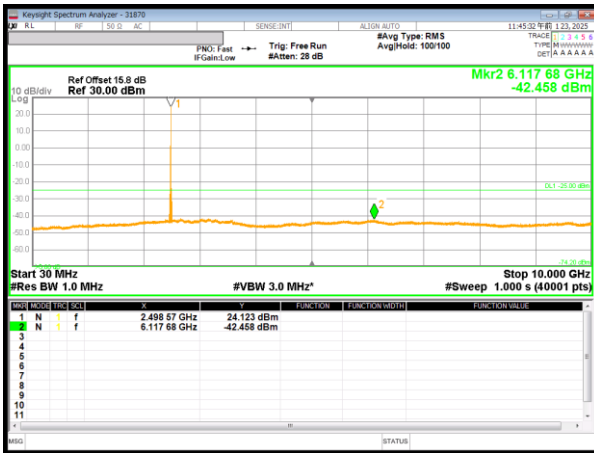
High channel



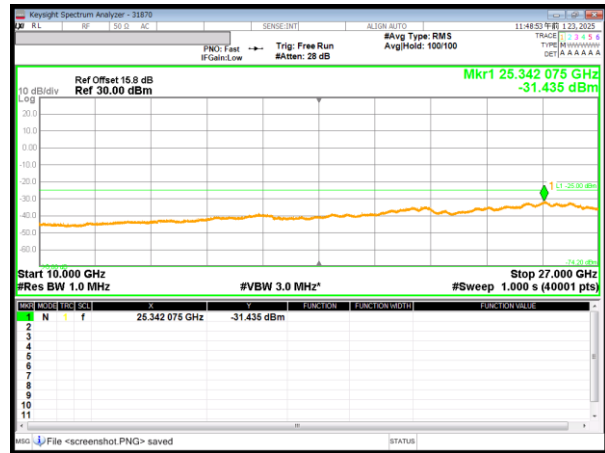
High channel

LTE Band 41(PC3) (ANT F)

5 MHz QPSK



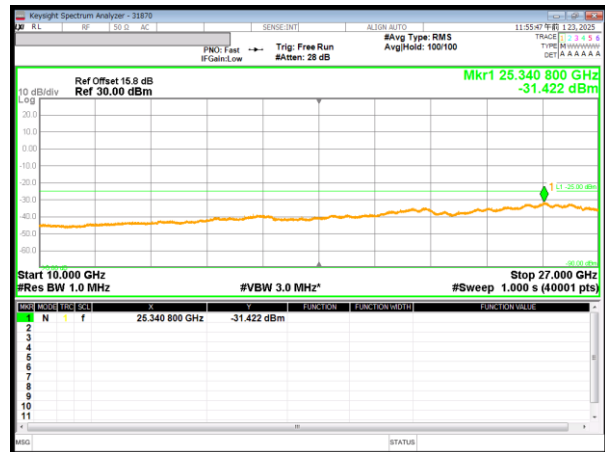
Low channel



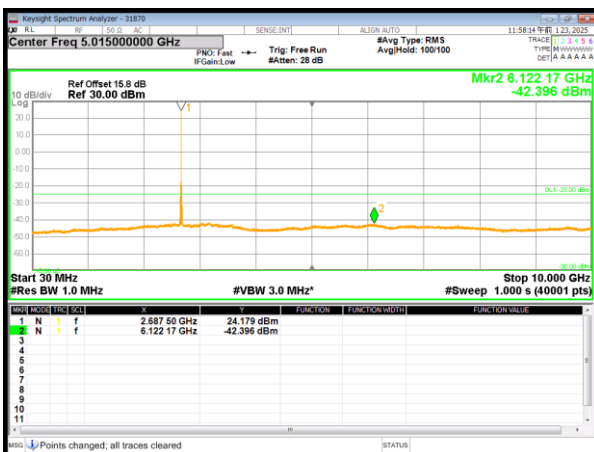
Low channel



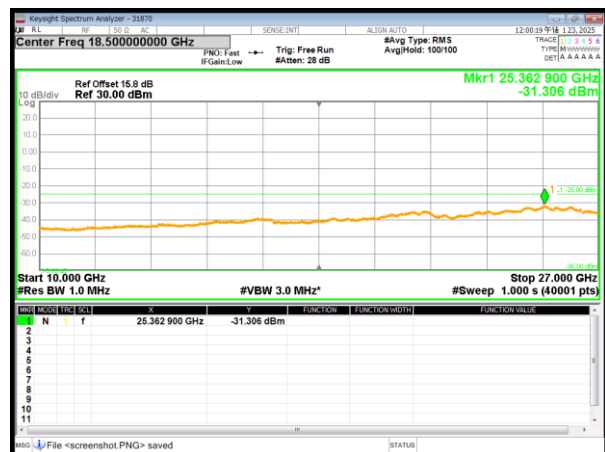
Mid channel



Mid channel



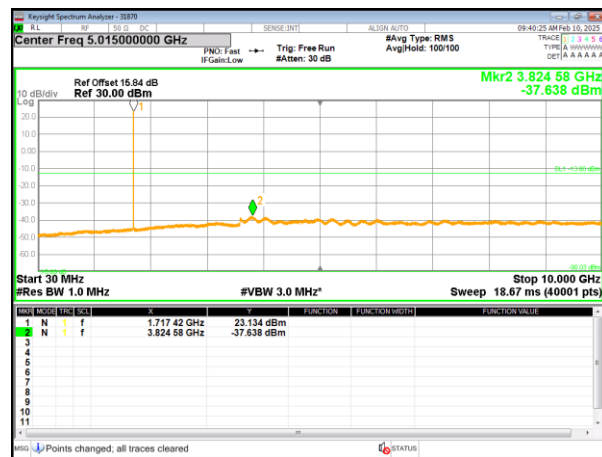
High channel



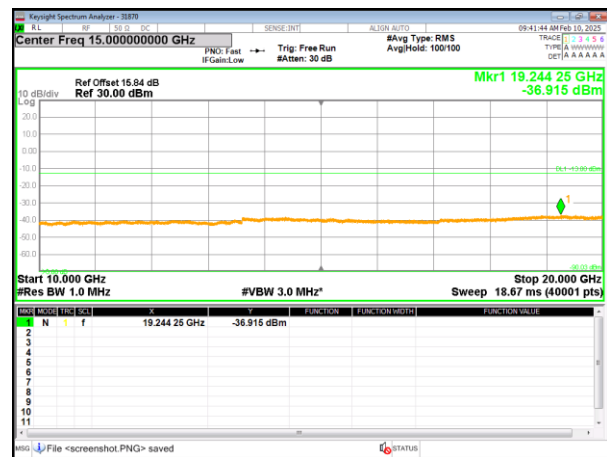
High channel

LTE Band 66 (ANT A)

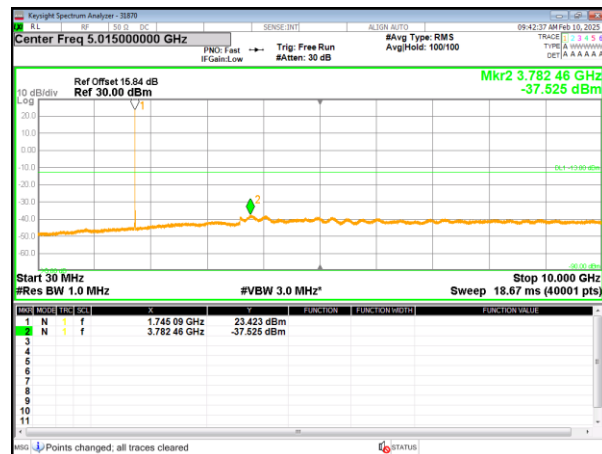
15 MHz QPSK



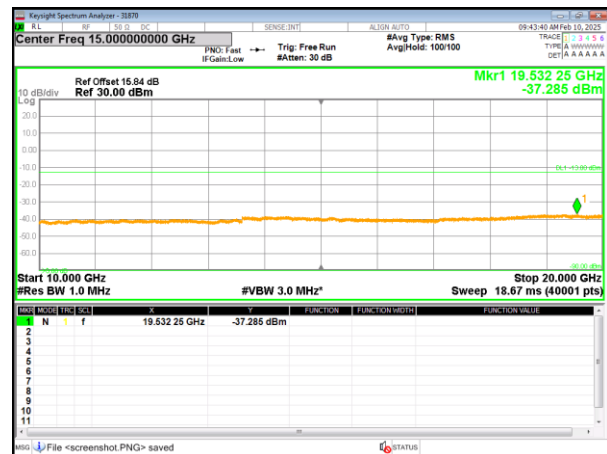
Low channel



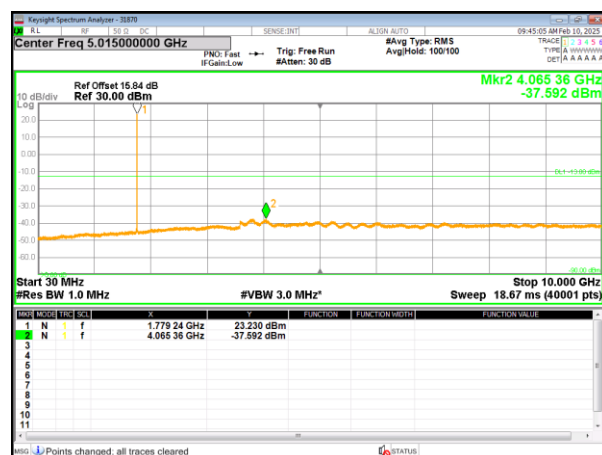
Low channel



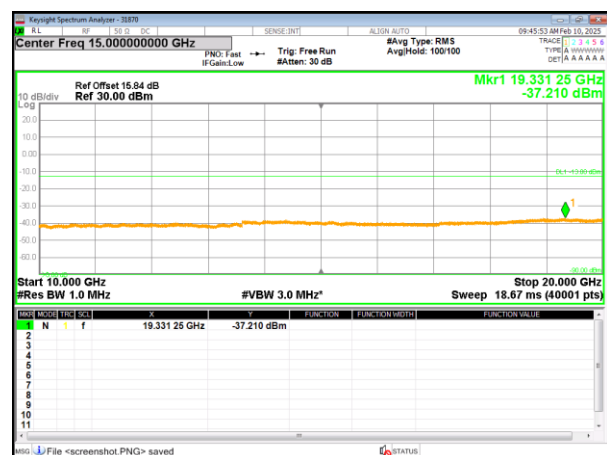
Mid channel



Mid channel



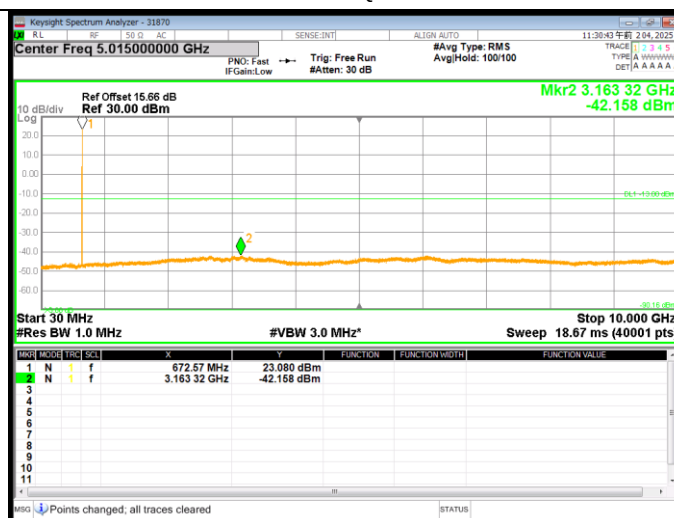
High channel



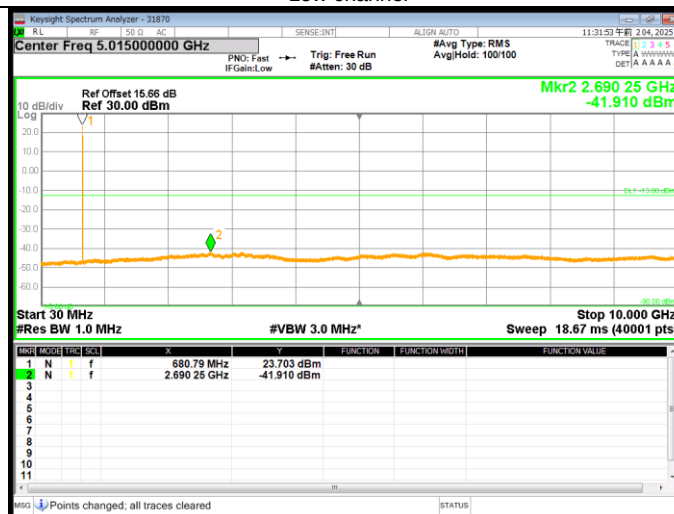
High channel

LTE Band 71 (ANT A)

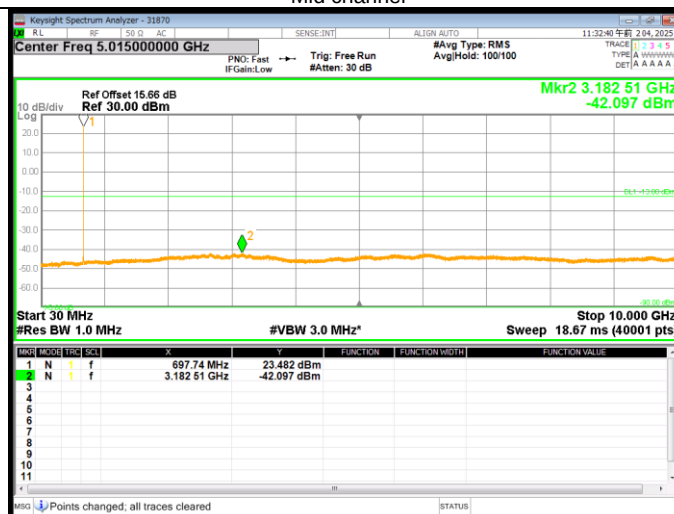
10 MHz QPSK



Low channel



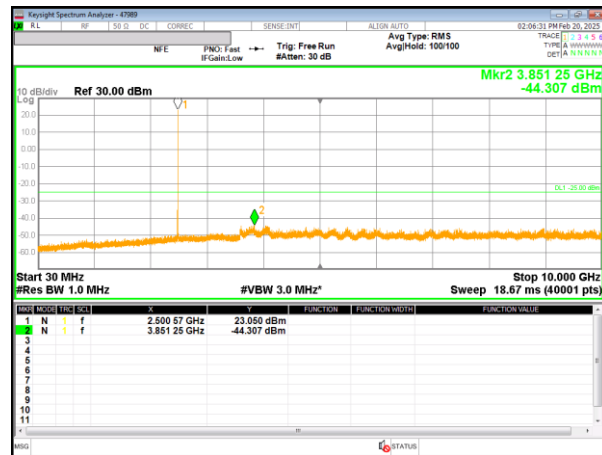
Mid channel



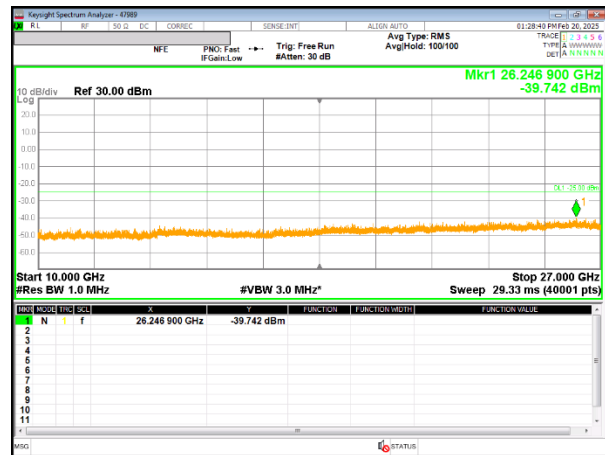
High channel

NR Band n7 (ANT B)

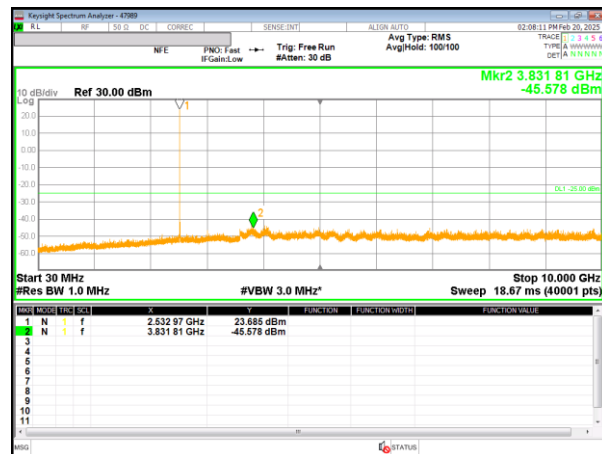
5 MHz QPSK DFT-s_OFDM



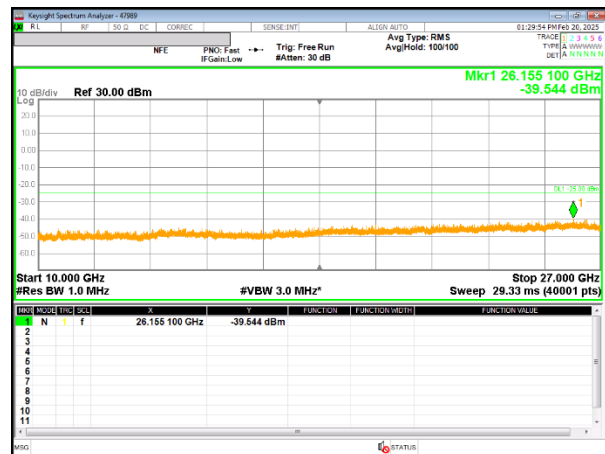
Low channel



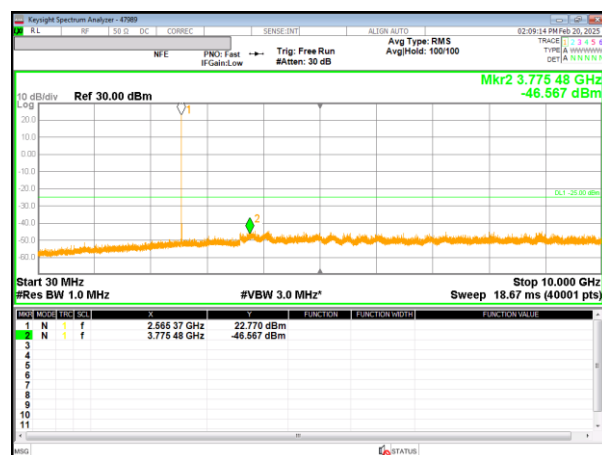
Low channel



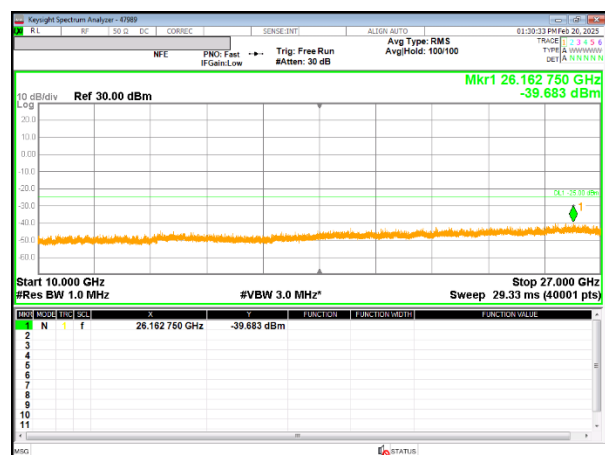
Mid channel



Mid channel



High channel



High channel

NR Band n12 (ANT E)

10 MHz QPSK DFT-s_OFDM

KeySight Spectrum Analyzer - 47989

RL RF 50 D AC CORREC SENSE:INT1 ALIGN:ALTO 01:38:55 午 211.2025

PNO: Fast Trig: Free Run Avg Type: RMS
IF Gain: Low #Atten: 30 dB AvgHold: 100/100

Ref 30.00 dBm

Mkr2 2.684 76 GHz
-41.584 dBm

Start 30 MHz Stop 10.000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz* Sweep 18.67 ms (40001 pts)

MO	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		704.22 MHz	21.581 dBm			
2	N	f		2.684 76 GHz	-41.584 dBm			

Low channel

KeySight Spectrum Analyzer - 47989

RL RF 50 D AC CORREC SENSE:INT1 ALIGN:ALTO 01:38:24 午 211.2025

PNO: Fast Trig: Free Run Avg Type: RMS
IF Gain: Low #Atten: 30 dB AvgHold: 100/100

Ref 30.00 dBm

Mkr2 2.689 00 GHz
-41.713 dBm

Start 30 MHz Stop 10.000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz* Sweep 18.67 ms (40001 pts)

MO	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		707.71 MHz	22.684 dBm			
2	N	f		2.689 00 GHz	-41.713 dBm			

Mid channel

KeySight Spectrum Analyzer - 47989

RL RF 50 D AC CORREC SENSE:INT1 ALIGN:ALTO 01:38:57 午 211.2025

PNO: Fast Trig: Free Run Avg Type: RMS
IF Gain: Low #Atten: 30 dB AvgHold: 100/100

Ref 30.00 dBm

Mkr2 3.167 56 GHz
-41.331 dBm

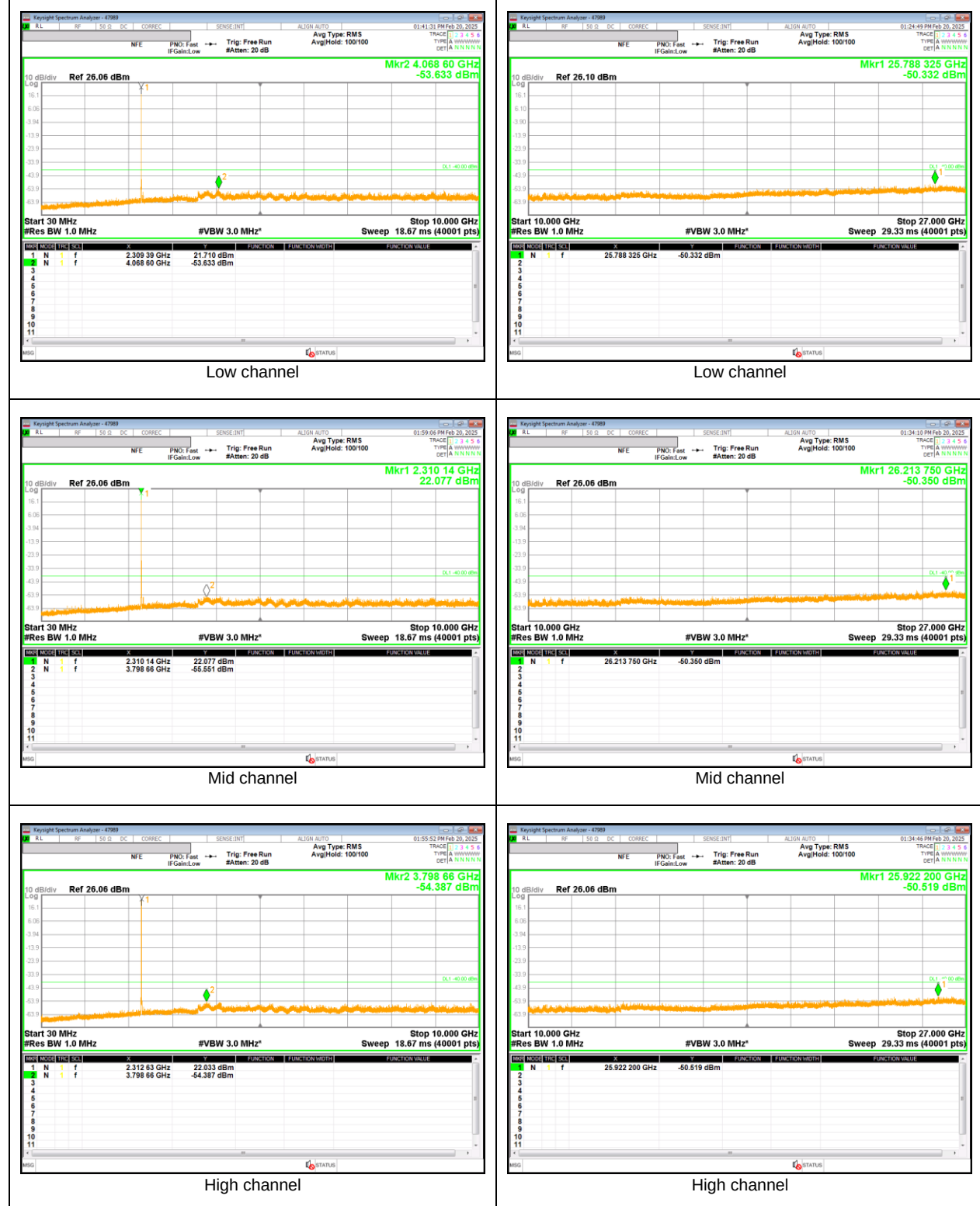
Start 30 MHz Stop 10.000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz* Sweep 18.67 ms (40001 pts)

MO	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		711.20 MHz	21.912 dBm			
2	N	f		3.167 56 GHz	-41.331 dBm			

High channel

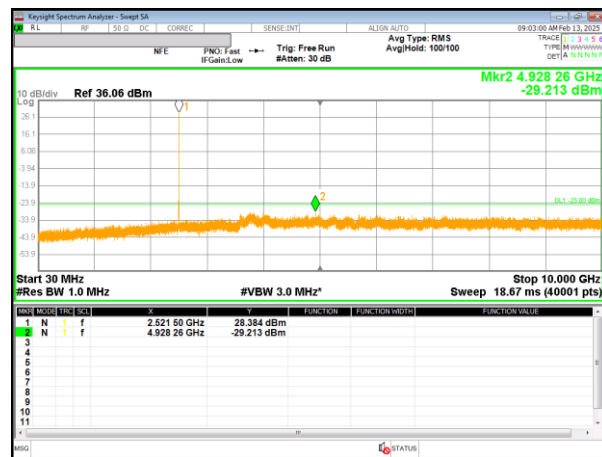
NR Band n30 (ANT A)

5 MHz BPSK DFT-s_OFDM

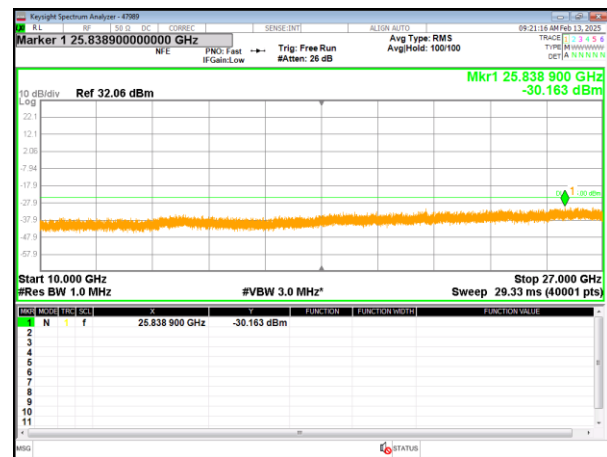


NR Band n41 (PC2) (ANT B)

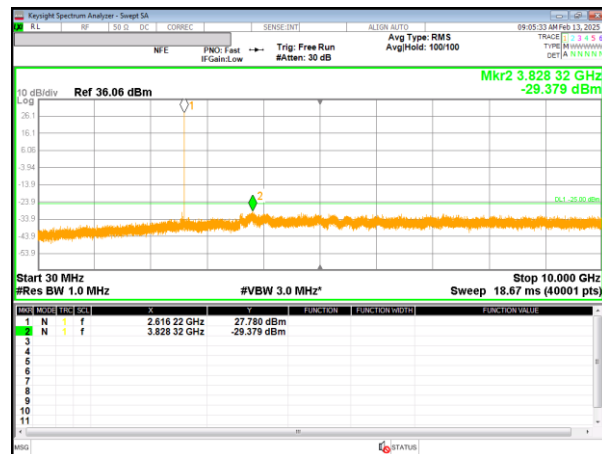
50 MHz QPSK DFT-s_OFDM



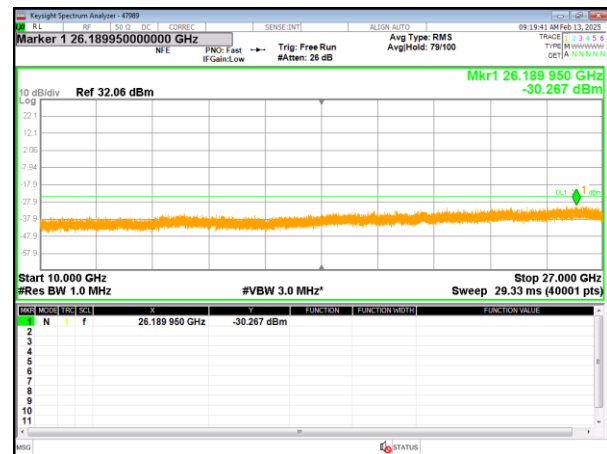
Low channel



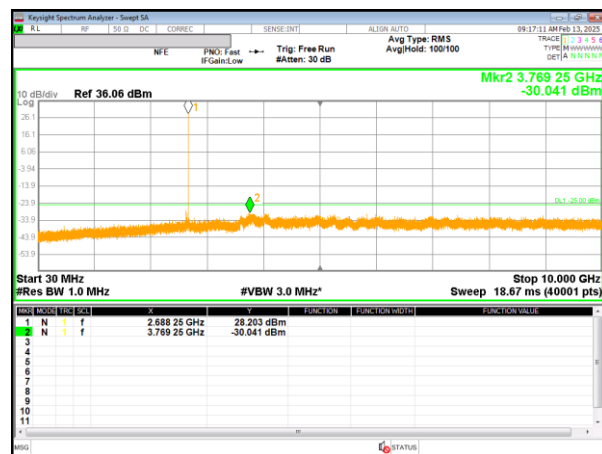
Low channel



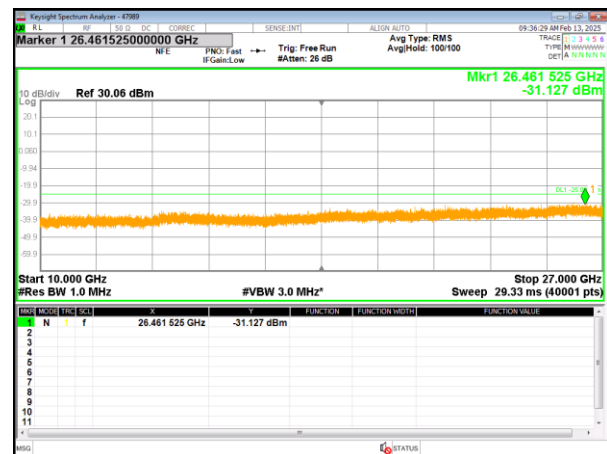
Mid channel



Mid channel



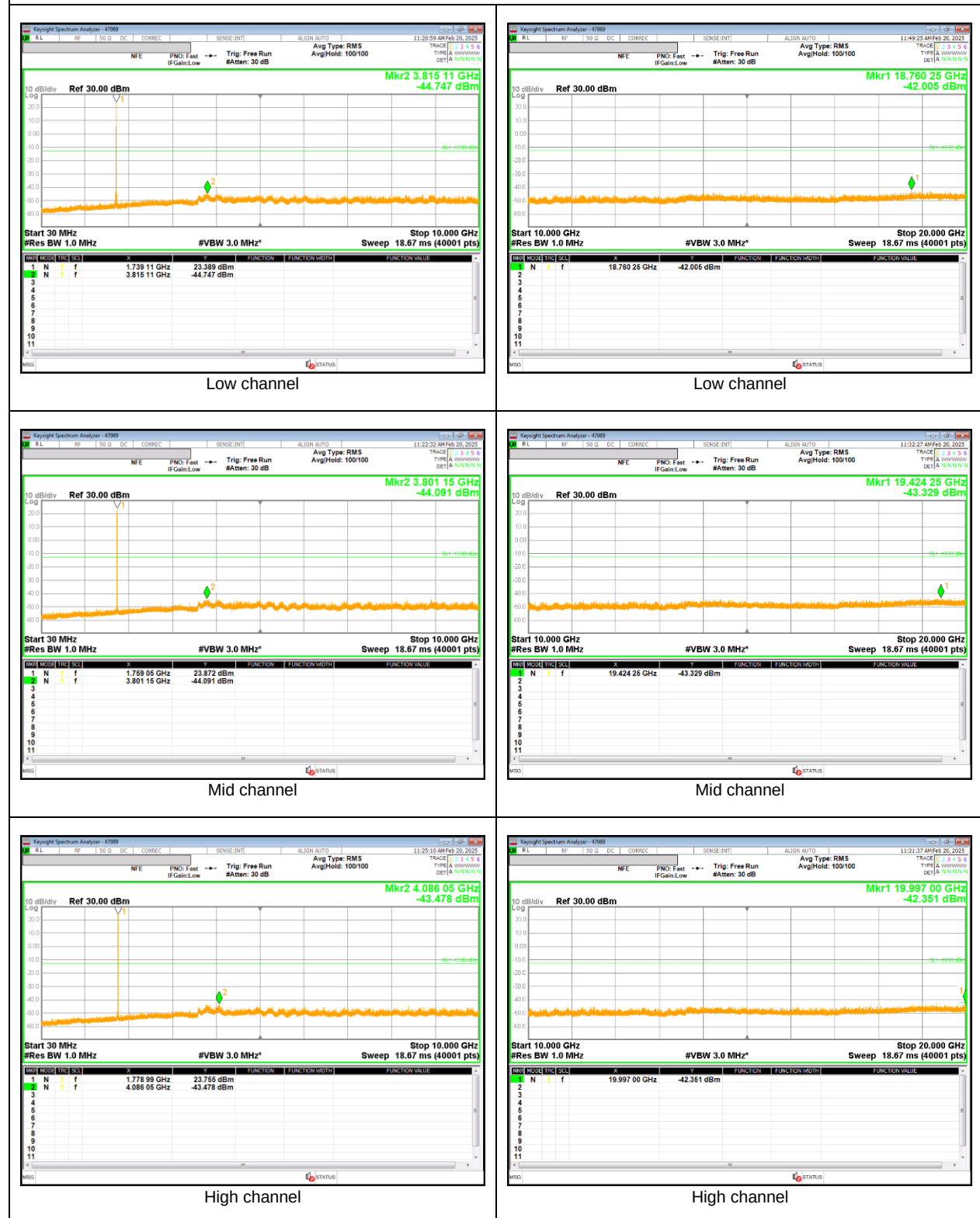
High channel



High channel

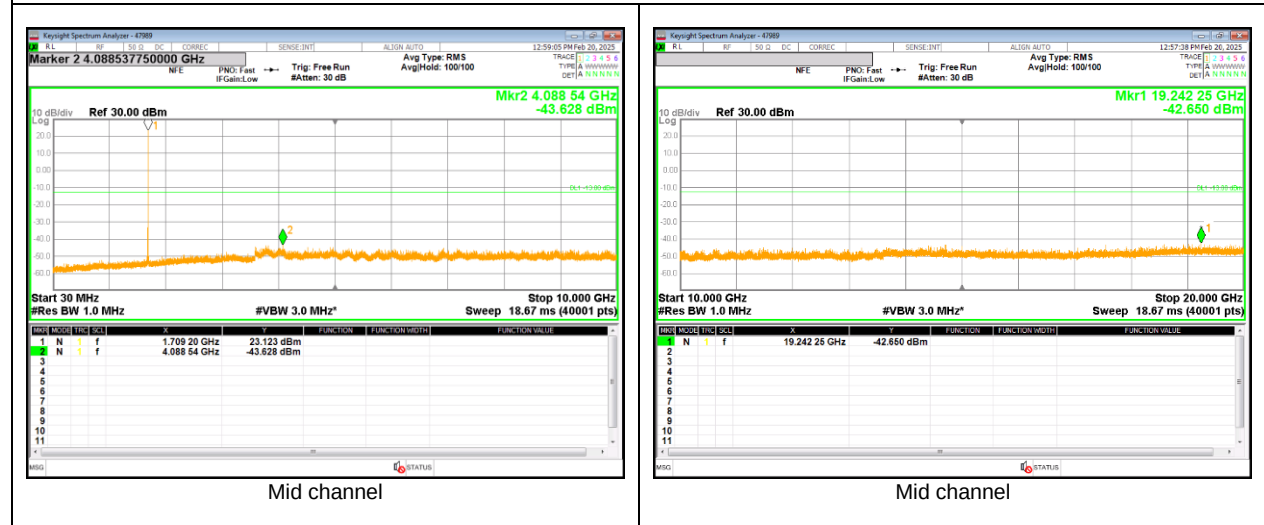
NR Band n66 (ANT A)

30 MHz BPSK DFT-s_OFDM



NR Band n70 (ANT A)

15 MHz BPSK DFT-s_OFDM



NR Band n71 (ANT E)



NR Band n77 (PC2, 3450-3550 MHz) (ANT F)

50 MHz QPSK DFT-s_OFDM

