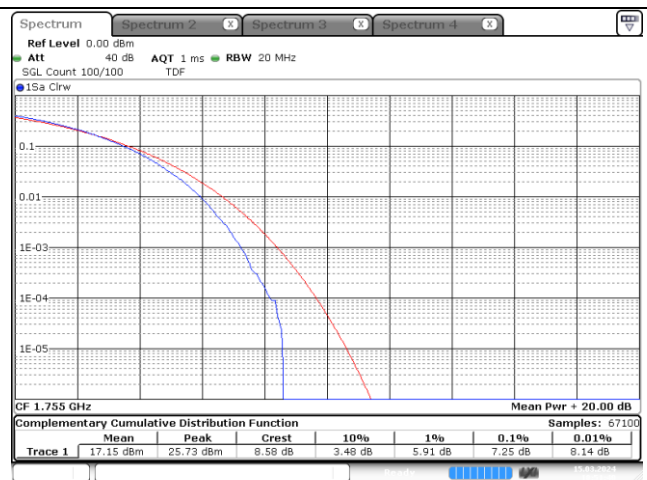
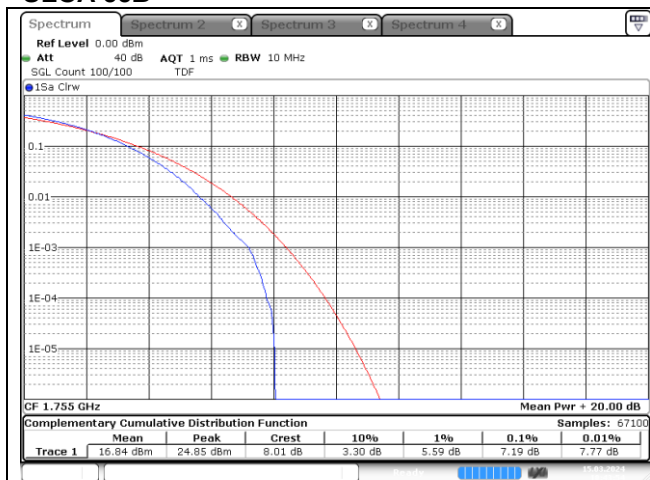
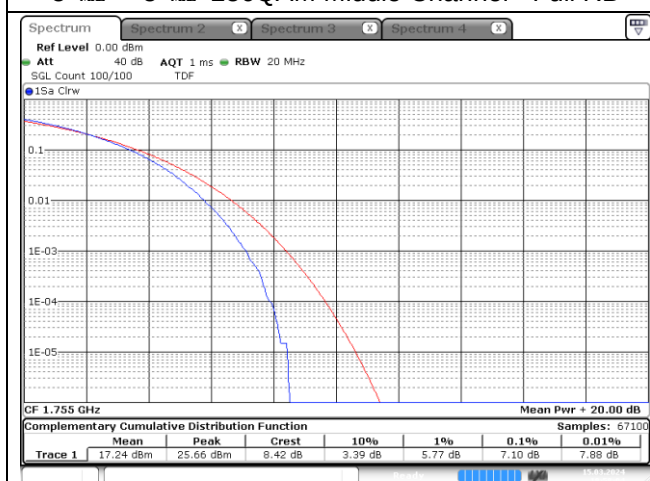


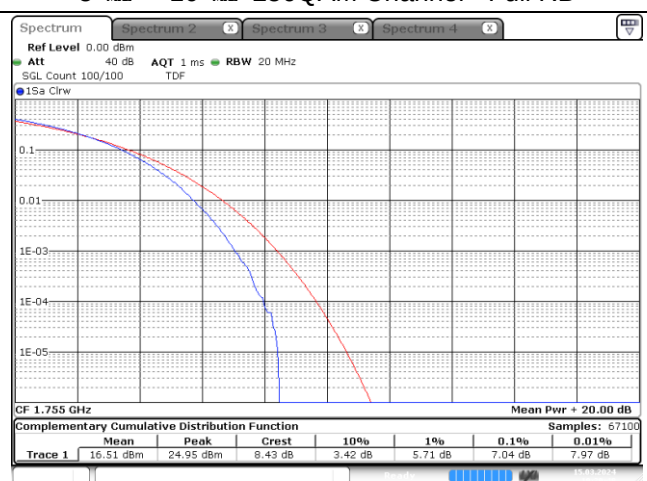
ULCA 66B



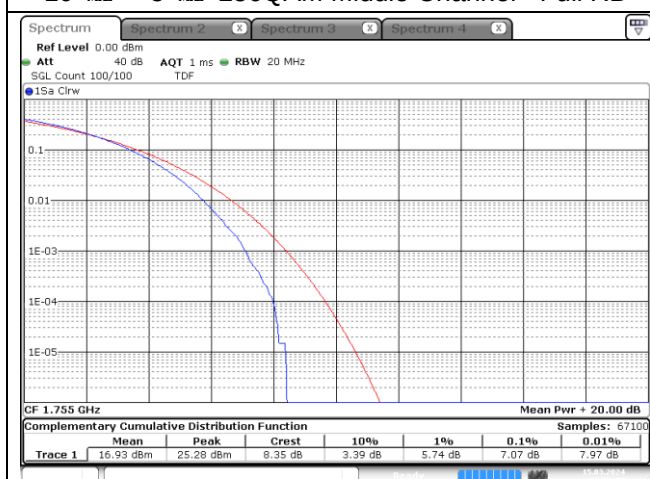
5 MHz + 5 MHz 256QAM Middle Channel - Full RB



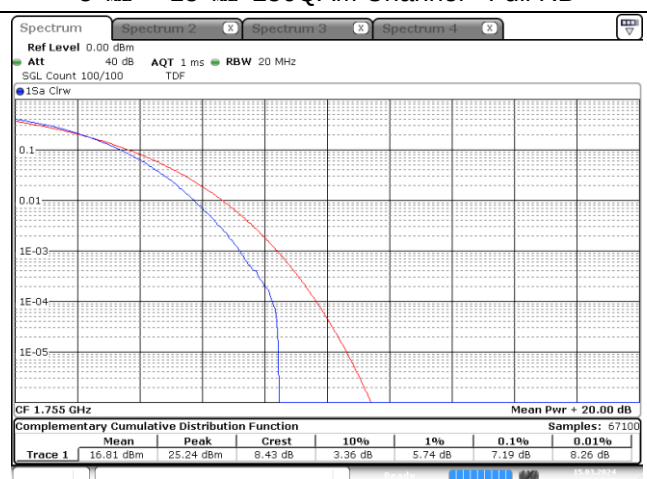
5 MHz + 10 MHz 256QAM Channel - Full RB



10 MHz + 5 MHz 256QAM Middle Channel - Full RB



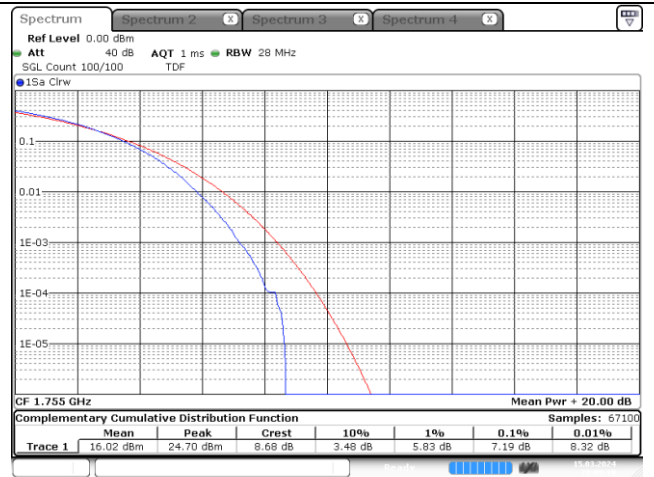
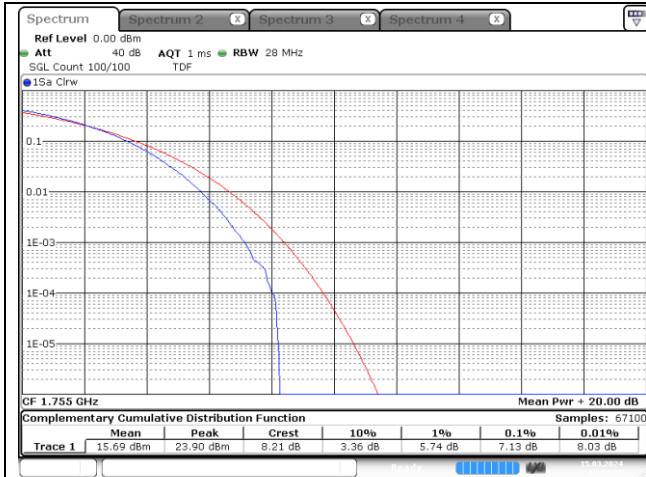
5 MHz + 15 MHz 256QAM Channel - Full RB



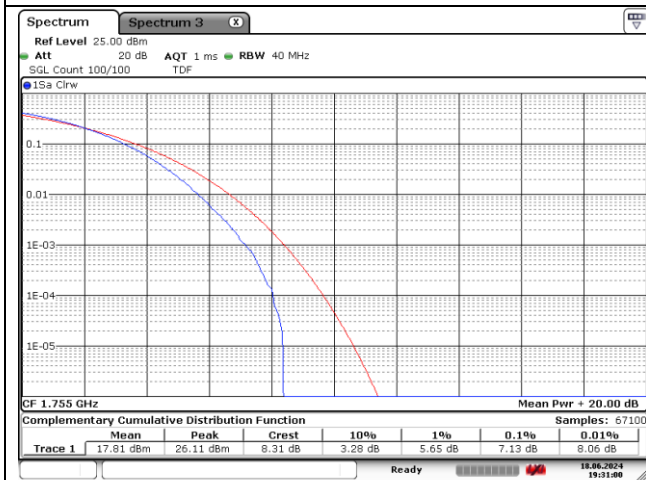
15 MHz + 5 MHz 256QAM Channel - Full RB

10 MHz + 10 MHz 256QAM Channel - Full RB

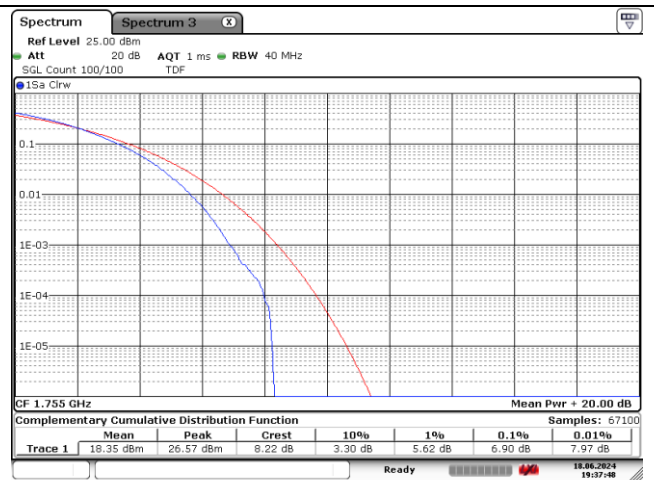
ULCA 66C



10 MHz + 15 MHz 256QAM Middle Channel - Full RB



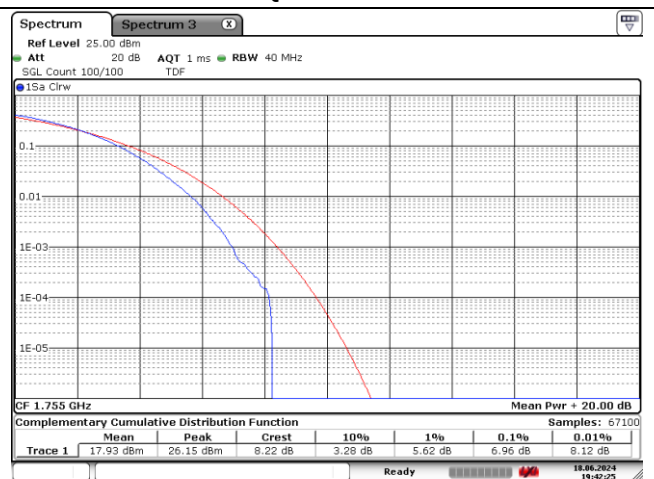
15 MHz + 10 MHz 256QAM Middle Channel - Full RB



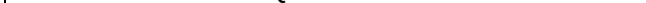
10 MHz + 20 MHz 256QAM Middle Channel - Full RB



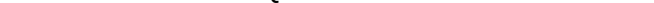
20 MHz + 10 MHz 256QAM Middle Channel - Full RB



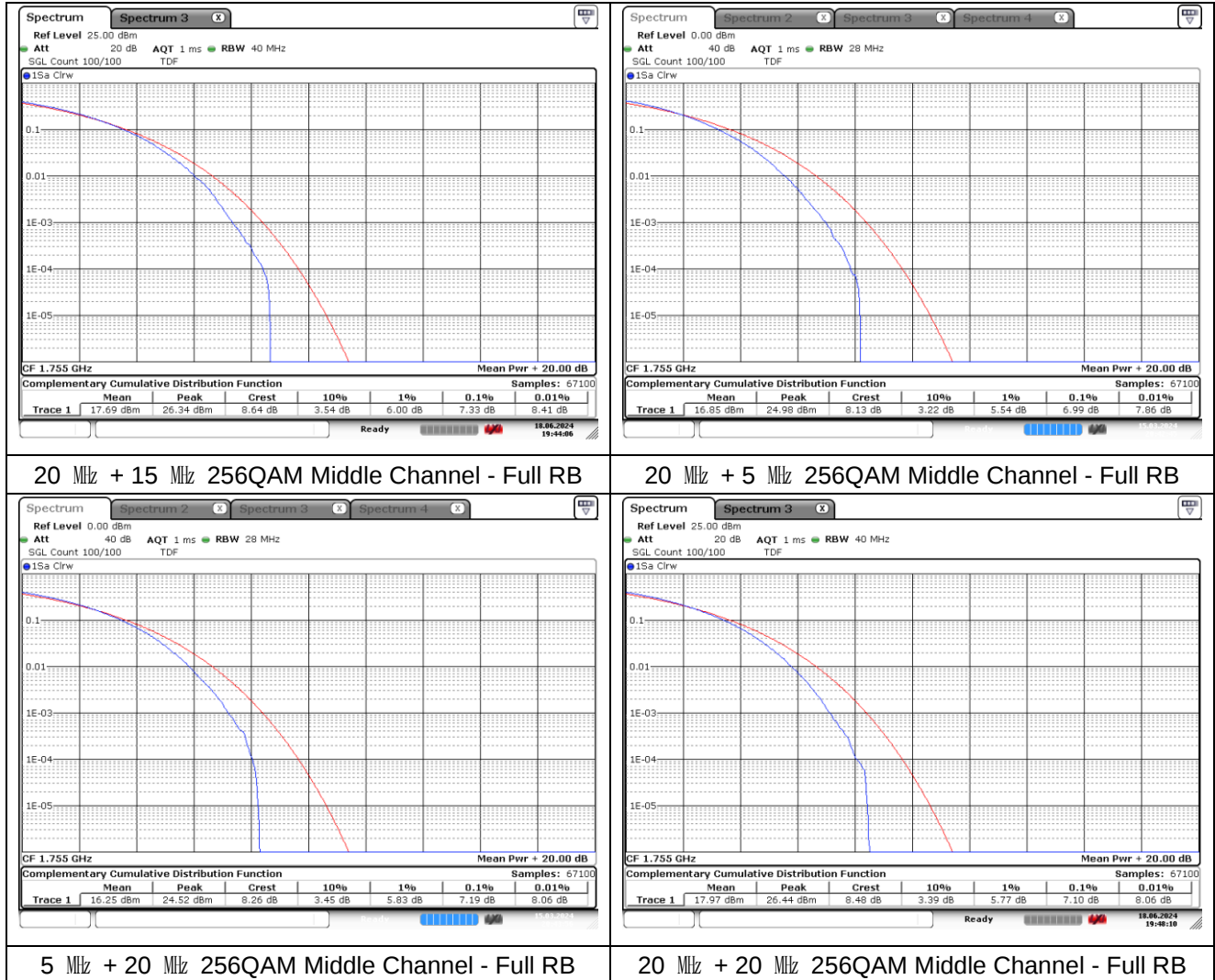
15 MHz + 15 MHz 256QAM Middle Channel - Full RB



15 MHz + 20 MHz 256QAM Middle Channel - Full RB



ULCA 66C



6. Spurious Emissions at Antenna Terminal

6.1. Limit

- §22.917(a), 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.
- §24.238(a), 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.
- §27.53(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.
- §27.53(g), 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.
- §27.53(h)(1), for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 bands, 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.
- §27.53(m)(4), for mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log_{10} (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log_{10} (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log_{10} (P)$ 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 $43 + 10 \log_{10} (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log_{10} (P)$ 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.
- §90.543(e), For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
 - (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
 - (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.
 - (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.
 - (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
 - (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

- §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:

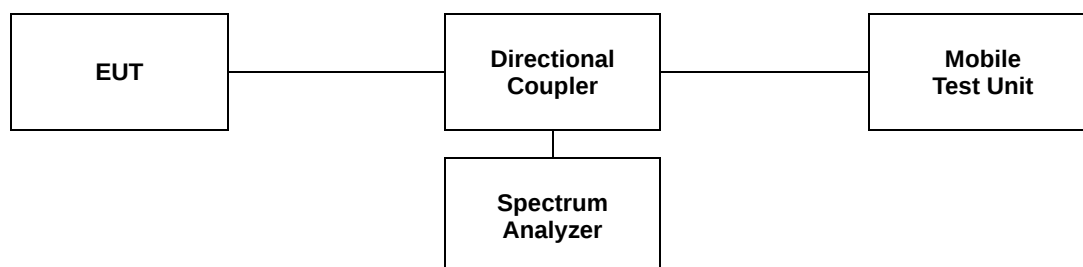
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f / 6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the 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 $43 + 10 \log_{10}(P)$ 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.

6.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

1. Start frequency was set to 9 kHz and stop frequency was set to at least 10* the fundamental frequency.
2. Detector = RMS.
3. Trace mode = Max hold.
4. Sweep time = Auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 9 kHz to 27 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as TDF function.



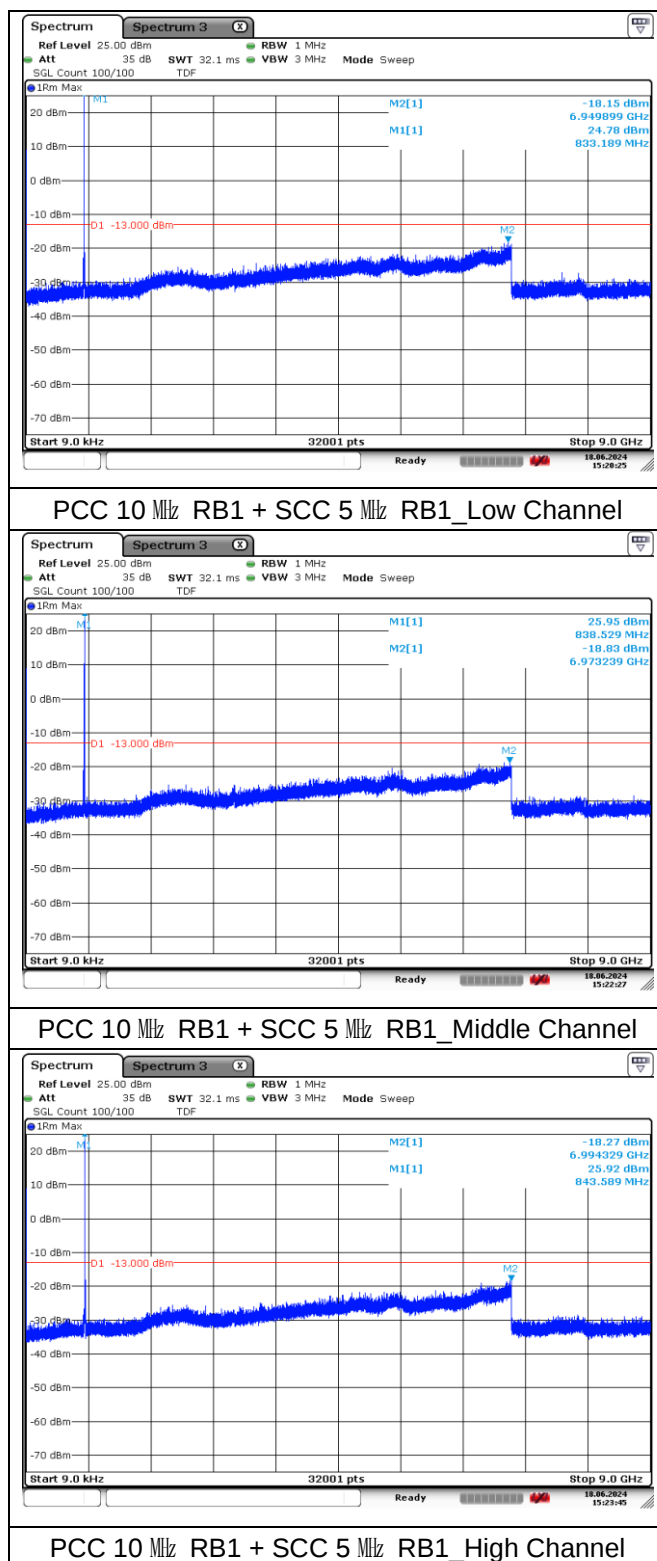
Note;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz 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 employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

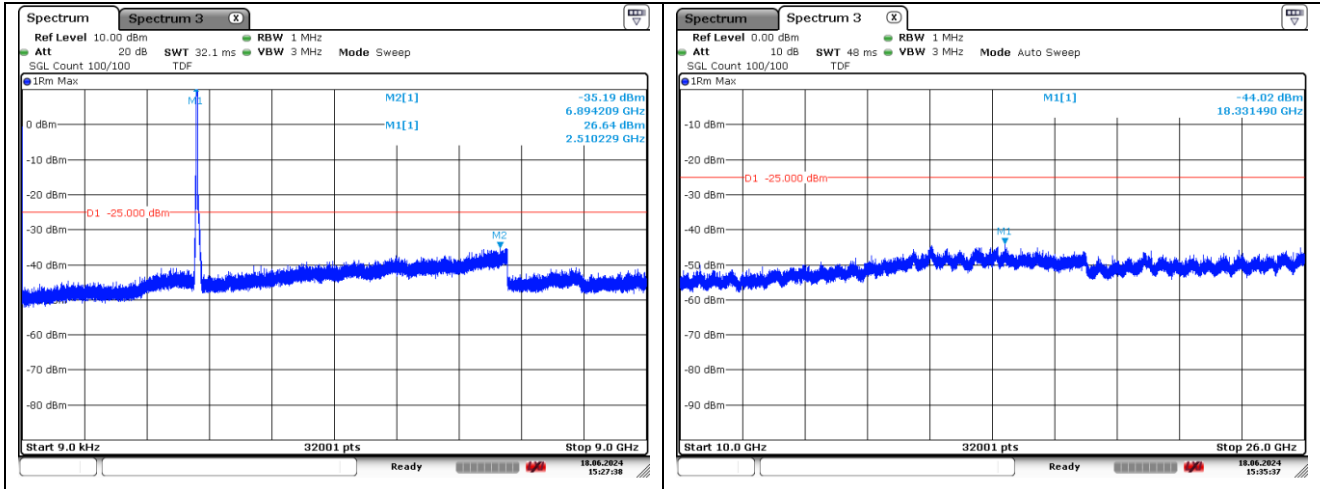
6.3. Test Results

Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
 Relative humidity : 47 % R.H.

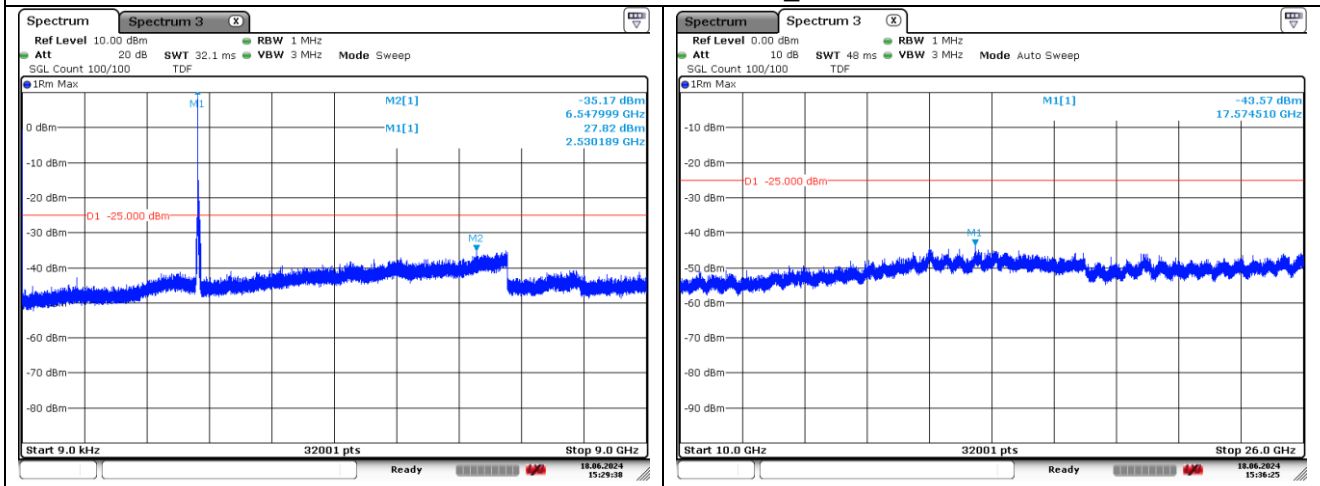
- Test plots ULCA 5B



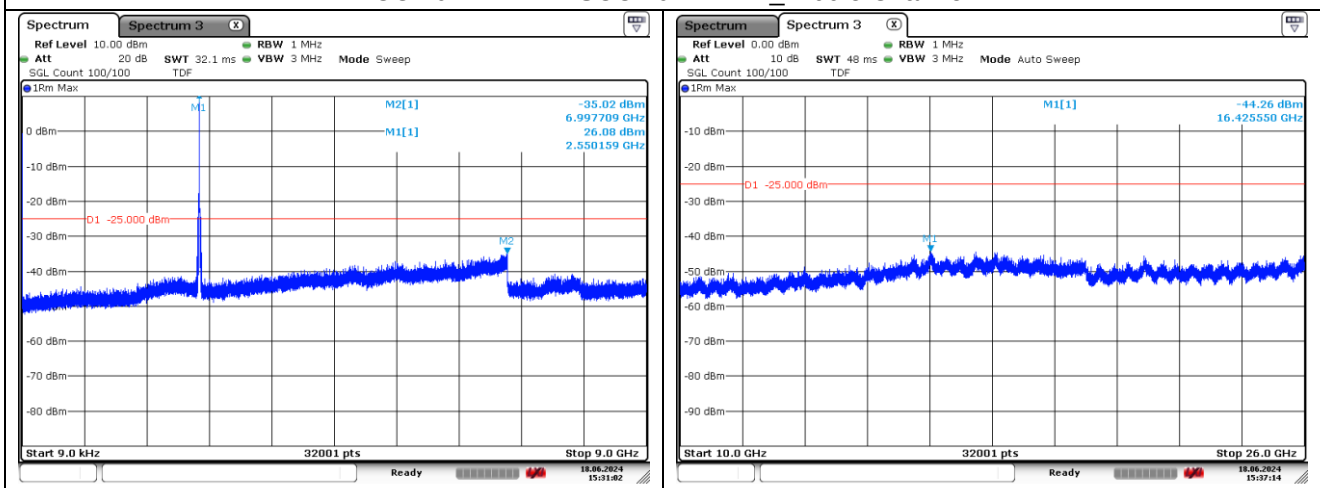
ULCA 7C



PCC 20 MHz RB1 + SCC 10 MHz RB1_Low Channel

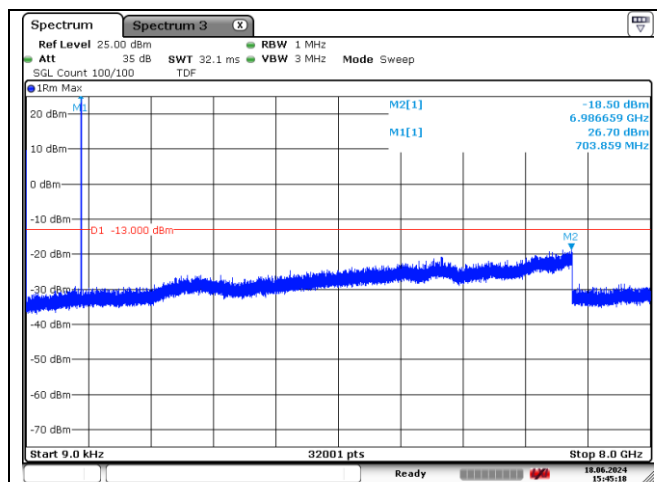


PCC 20 MHz RB1 + SCC 10 MHz RB1_Middle Channel

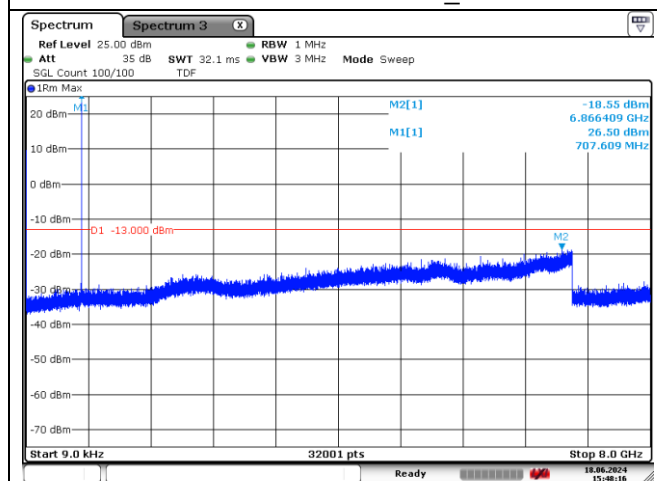


PCC 20 MHz RB1 + SCC 10 MHz RB1_High Channel

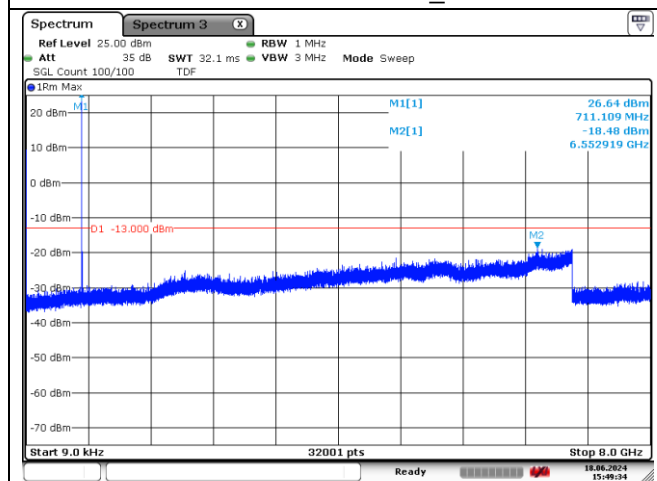
ULCA 12B



PCC 5 MHz RB1 + SCC 5 MHz RB1_Low Channel

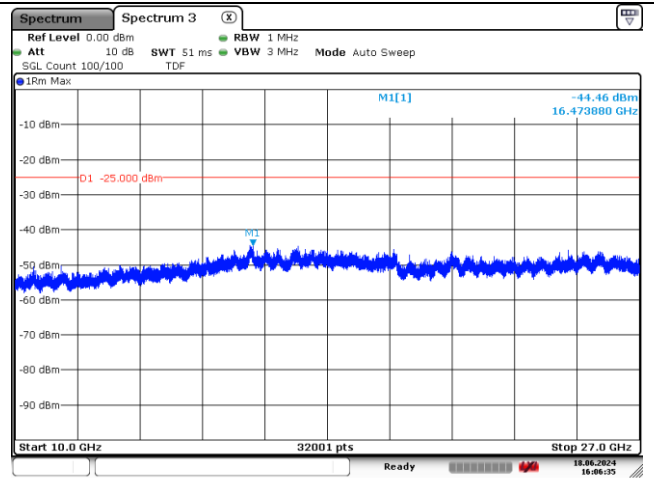
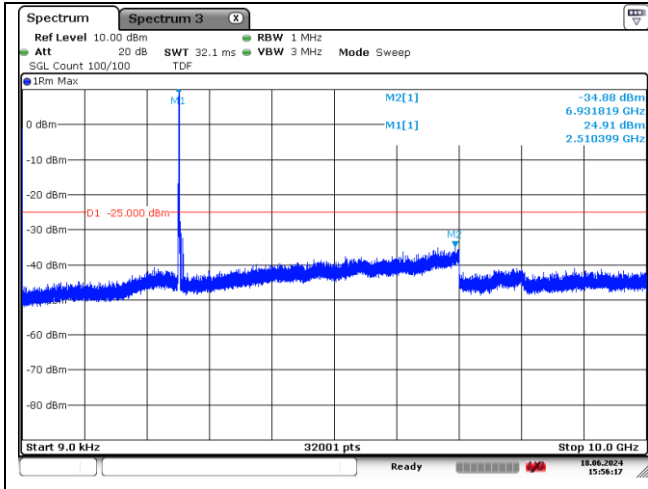


PCC 5 MHz RB1 + SCC 5 MHz RB1_Middle Channel

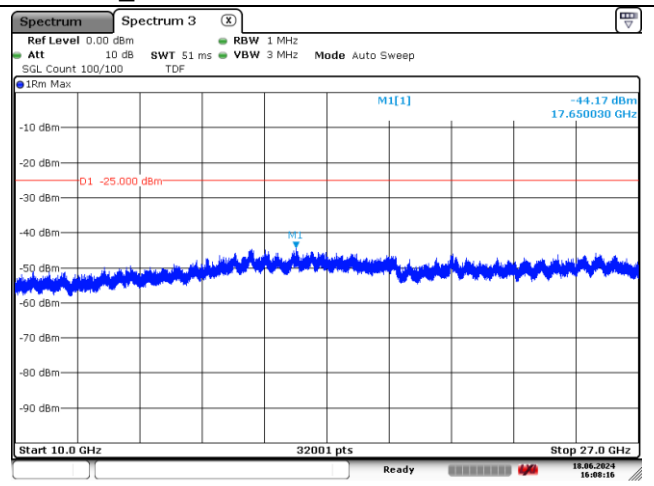
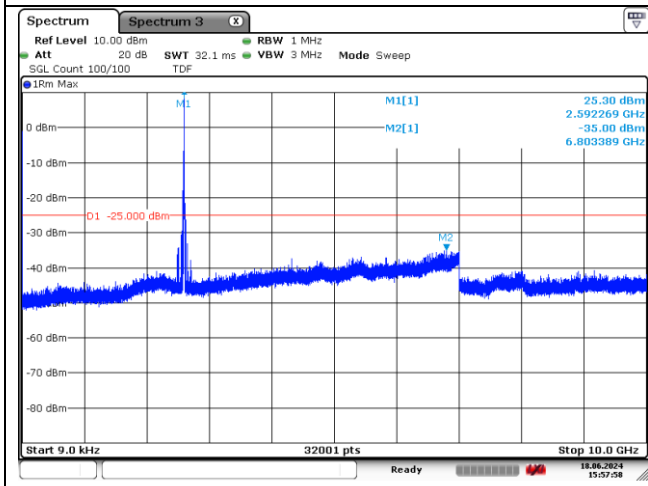


PCC 5 MHz RB1 + SCC 5 MHz RB1_High Channel

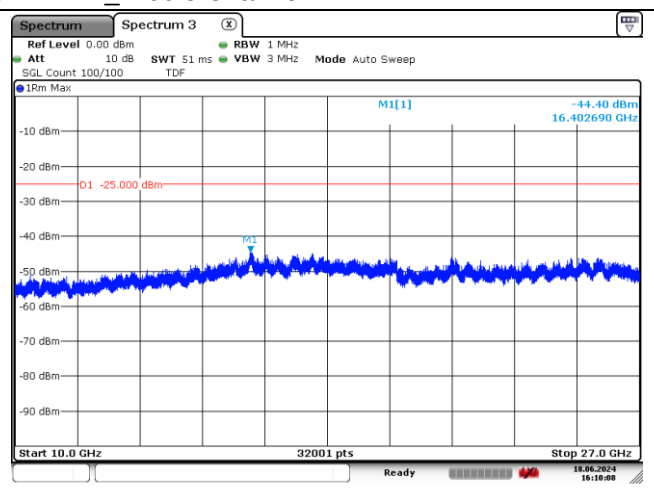
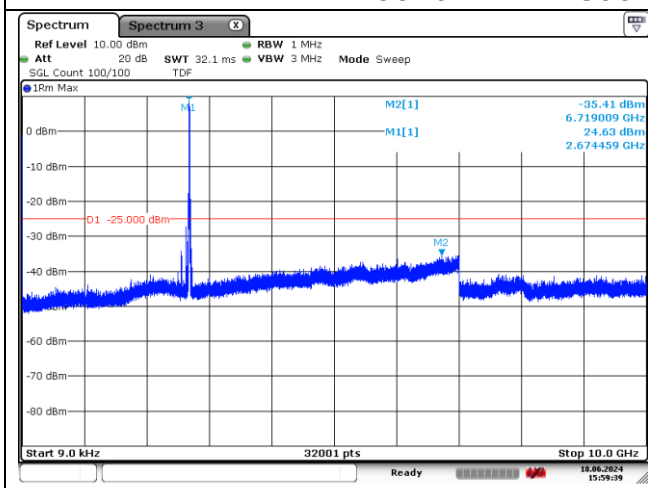
ULCA 41C



PCC 15 MHz RB1 + SCC 15 MHz RB1_Low Channel

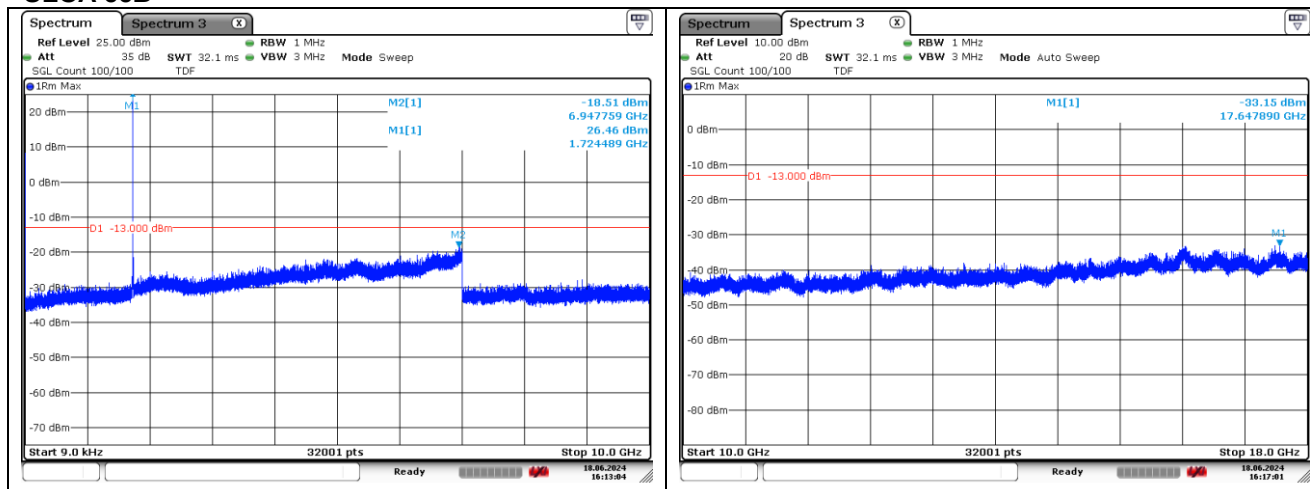


PCC 15 MHz RB1 + SCC 15 MHz RB1_Middle Channel

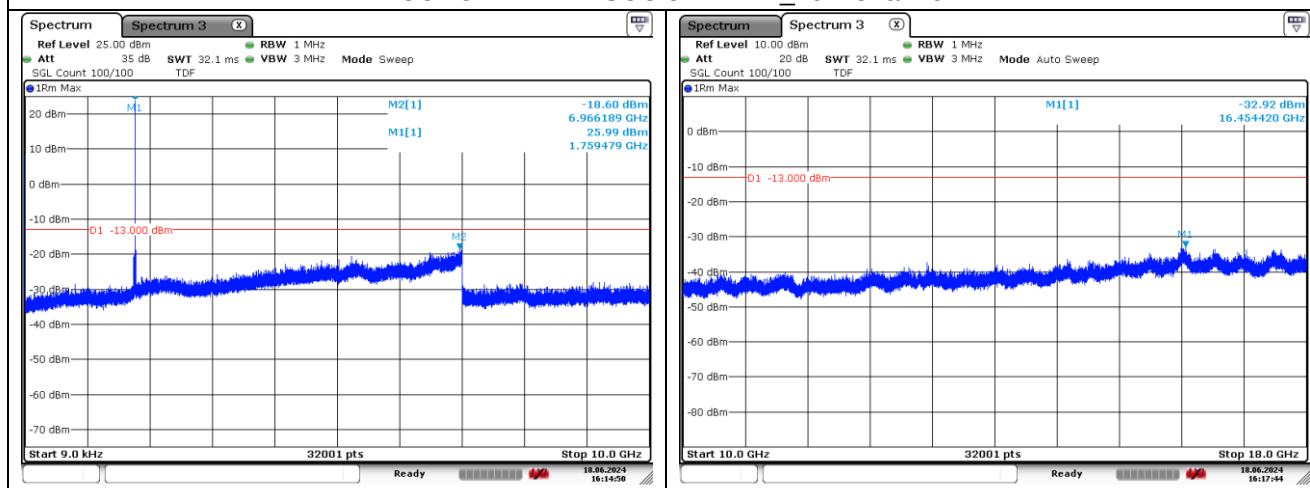


PCC 15 MHz RB1 + SCC 15 MHz RB1_High Channel

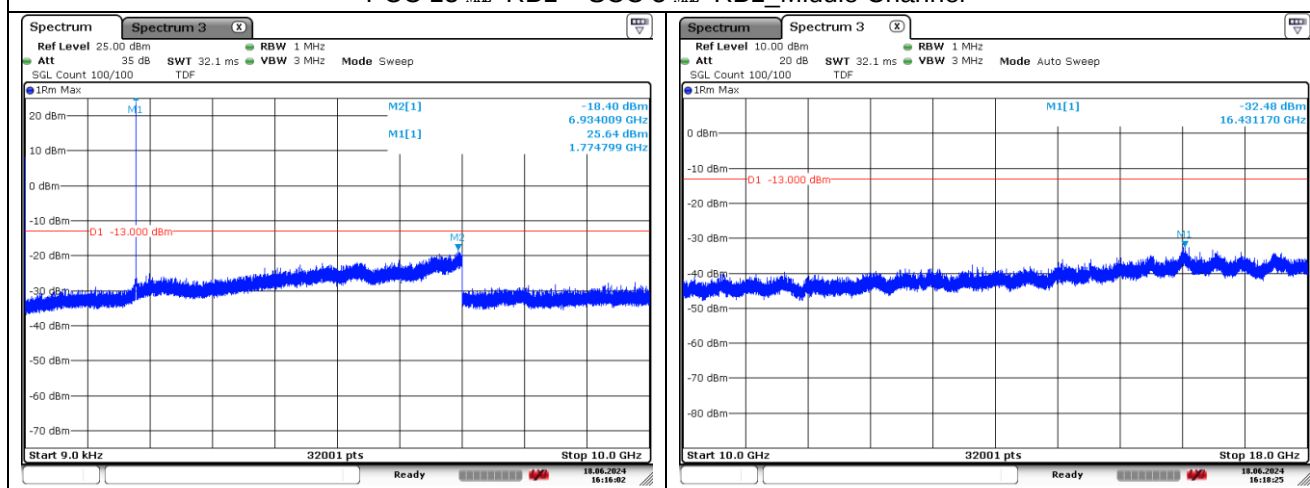
ULCA 66B



PCC 15 MHz RB1 + SCC 5 MHz RB1_Low Channel

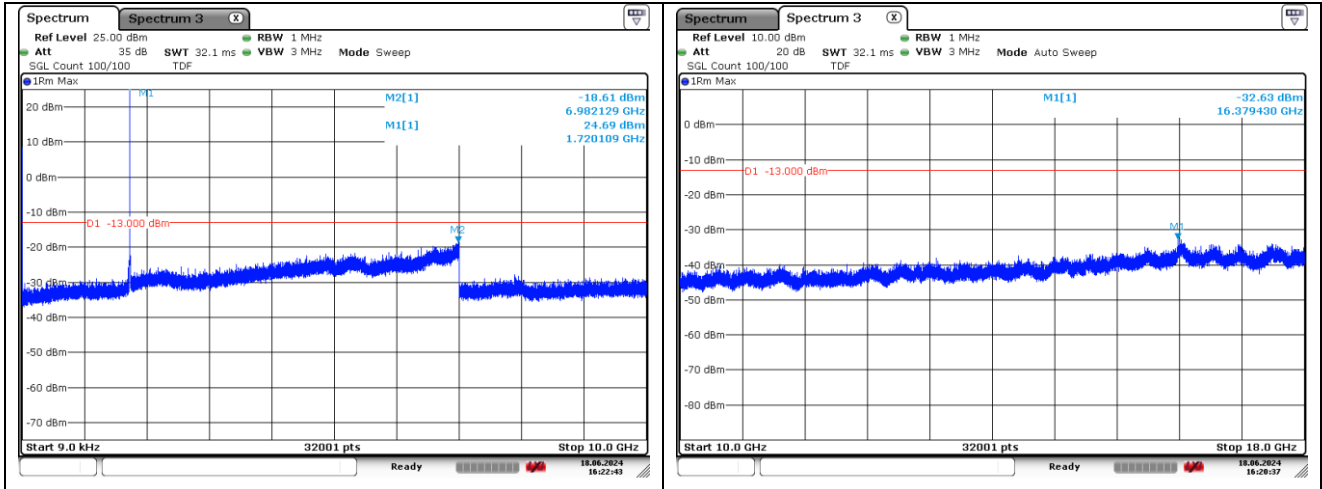


PCC 15 MHz RB1 + SCC 5 MHz RB1_Middle Channel

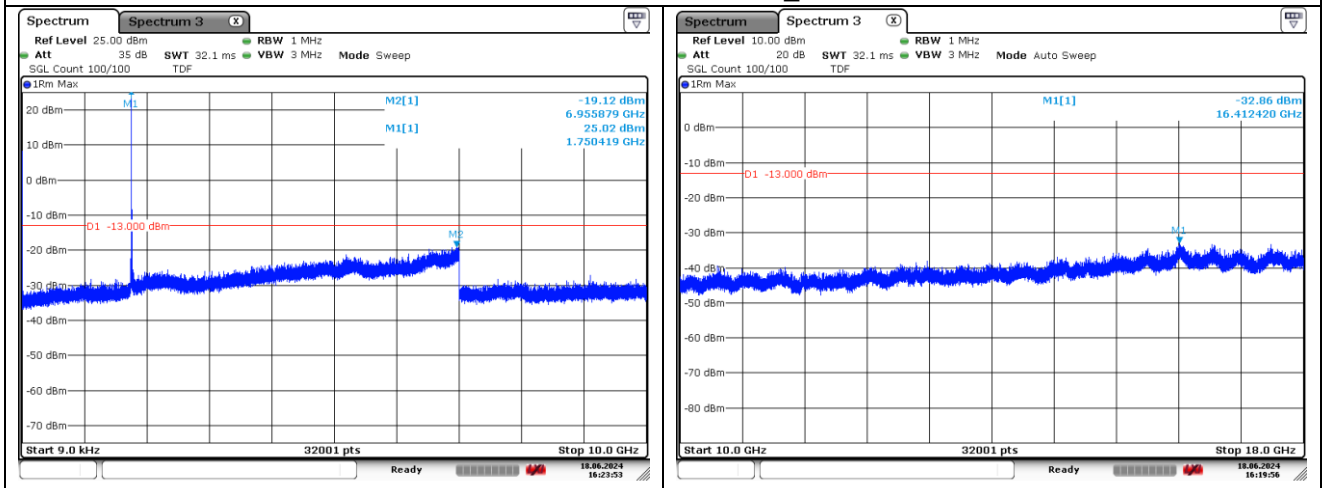


PCC 15 MHz RB1 + SCC 5 MHz RB1_High Channel

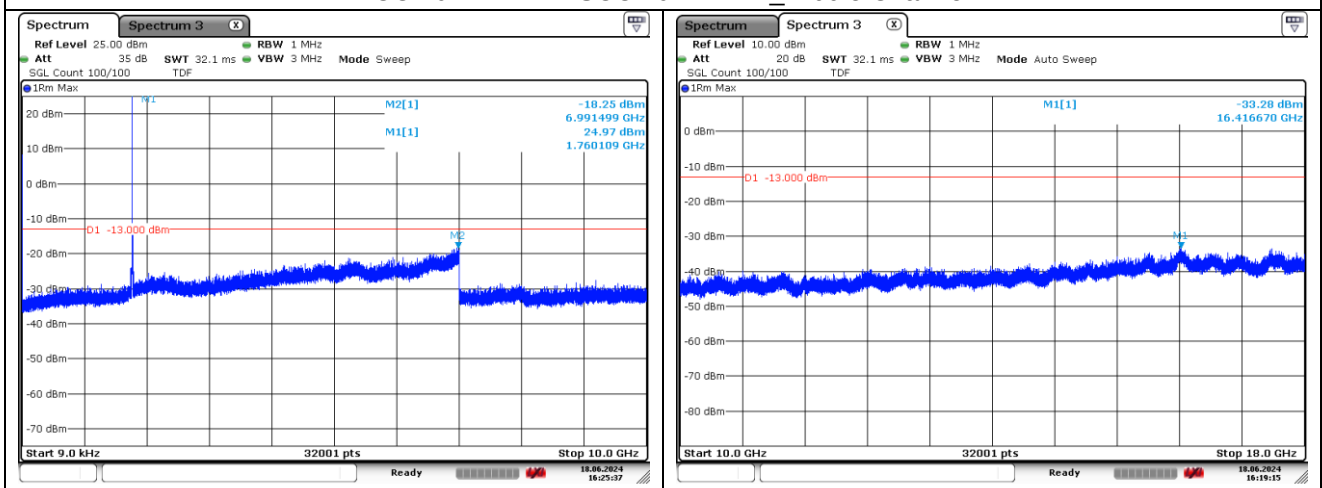
ULCA 66C



PCC 20 MHz RB1 + SCC 10 MHz RB1_Low Channel



PCC 20 MHz RB1 + SCC 10 MHz RB1_Middle Channel



PCC 20 MHz RB1 + SCC 10 MHz RB1_High Channel

7. Band Edge and Emission Mask

7.1. Limit

- §22.917(a), 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.
- §24.238(a), 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.
- §27.53(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.
- §27.53(c)(4), On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations
- §27.53(g), 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.
- §27.53(h)(1), for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 bands, 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.
- §27.53(m)(4), for mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log_{10} (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log_{10} (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log_{10} (P)$ 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 $43 + 10 \log_{10} (P)$ dB on all frequencies between 2 490.5 MHz and 2 496 MHz and $55 + 10 \log_{10} (P)$ dB at or below 2 490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2 495 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.
- §90.543(e), For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
 - (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
 - (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.
 - (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.
 - (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
 - (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

- §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:

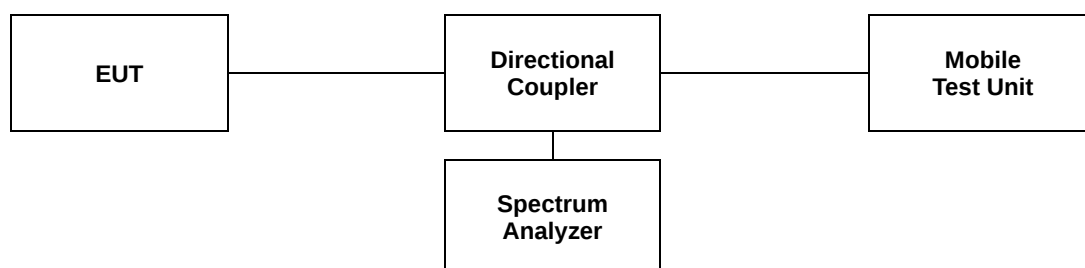
(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10} (f / 6.1)$ decibels or $50 + 10 \log_{10} (P)$ decibels or 80 decibels, whichever is 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 $43 + 10 \log_{10} (P)$ 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.

7.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

- a. Span was set large enough so as to capture all out of band emissions near the band edge.
- b. $RBW \geq 1\%$ of OBW
- c. $VBW \geq 3 \times RBW$.
- d. Detector = RMS.
- e. Trace mode = Average.
- f. Sweep time = Auto.
- g. The trace was allowed to stabilize.
- h. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.

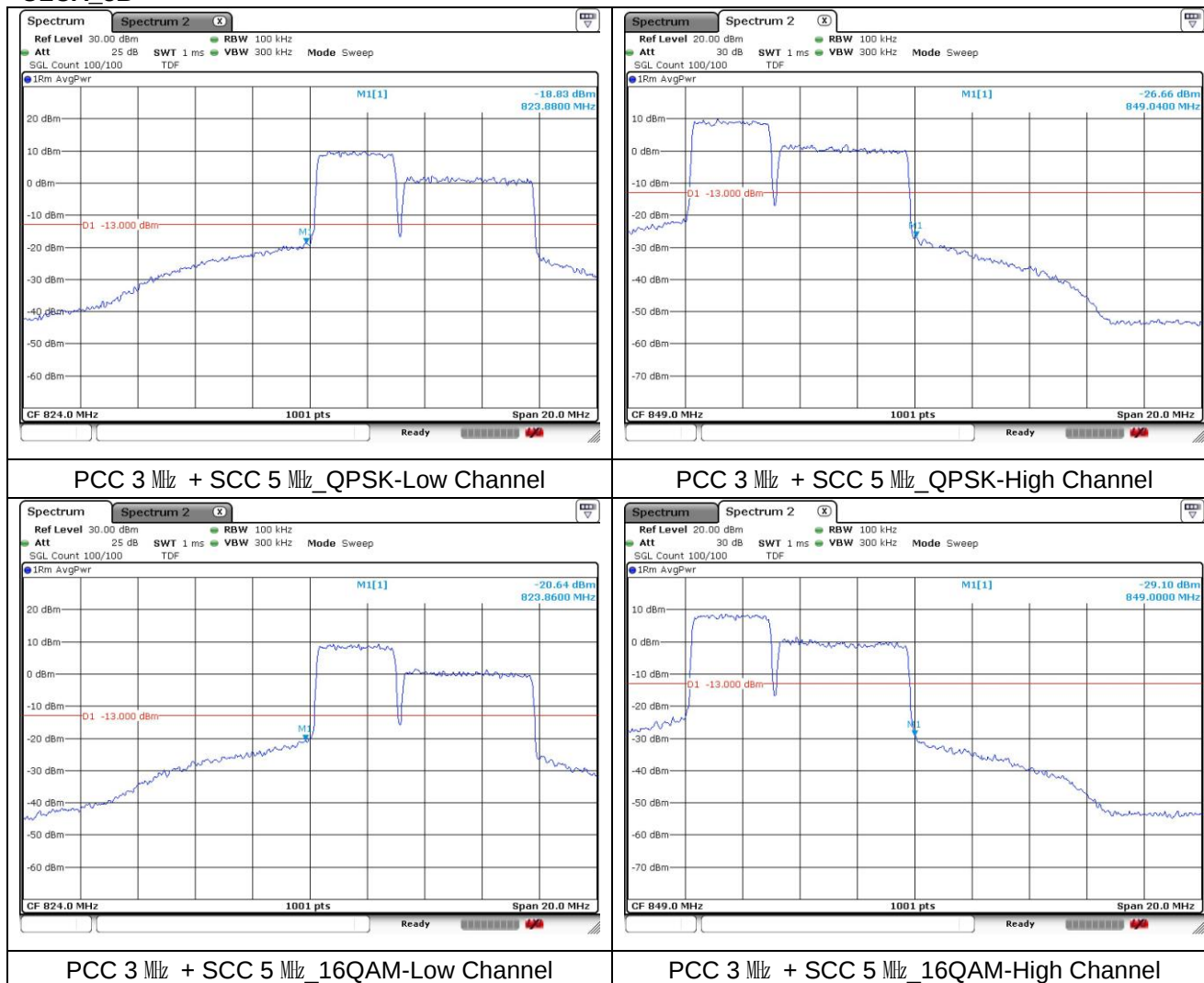


7.3. Test Results

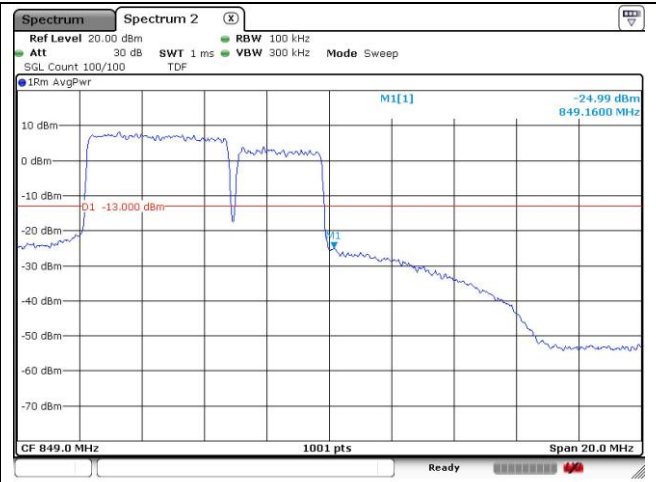
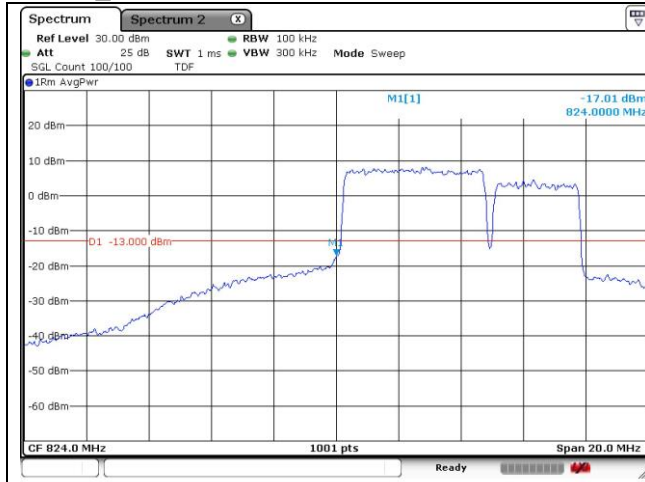
Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
 Relative humidity : 47 % R.H.

- Test plots

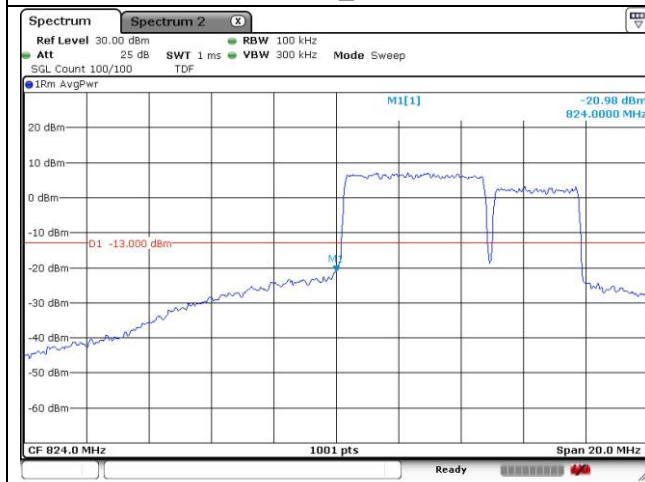
ULCA 5B



ULCA 5B



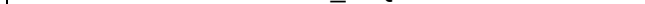
PCC 5 MHz + SCC 3 MHz_QPSK-Low Channel



PCC 5 MHz + SCC 3 MHz_QPSK-High Channel



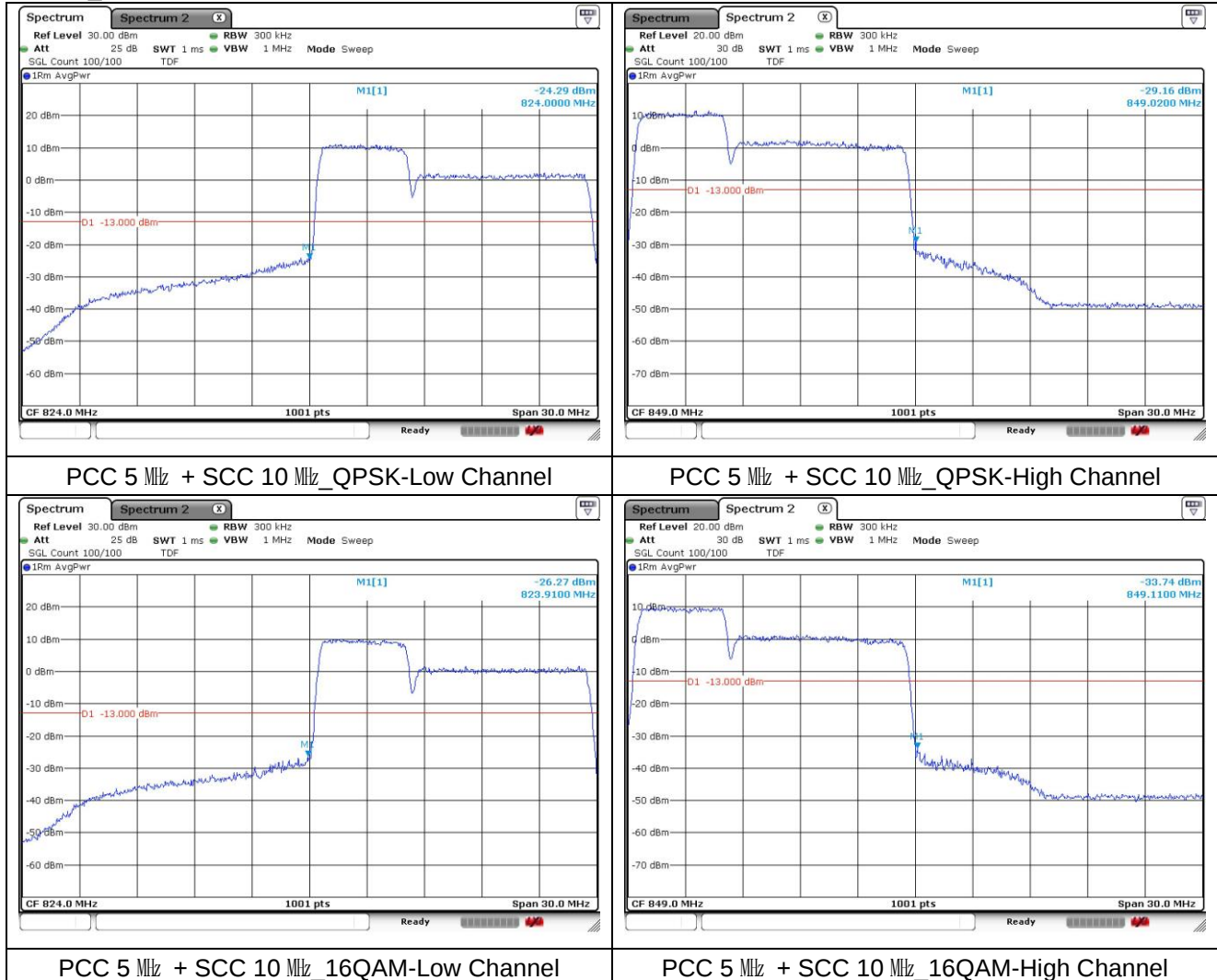
PCC 5 MHz + SCC 3 MHz_16QAM-Low Channel



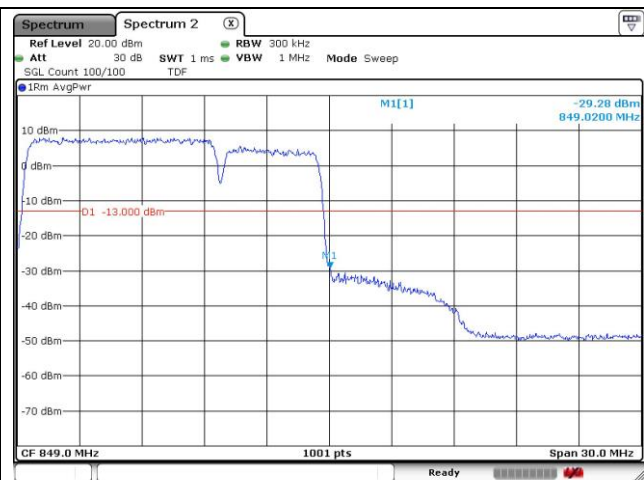
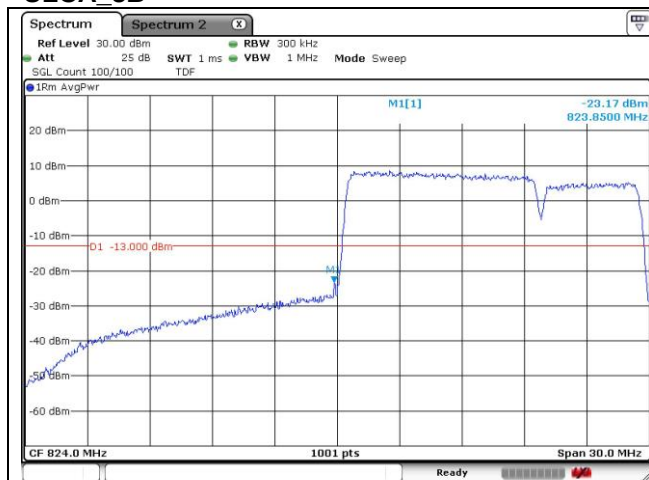
PCC 5 MHz + SCC 3 MHz_16QAM-High Channel



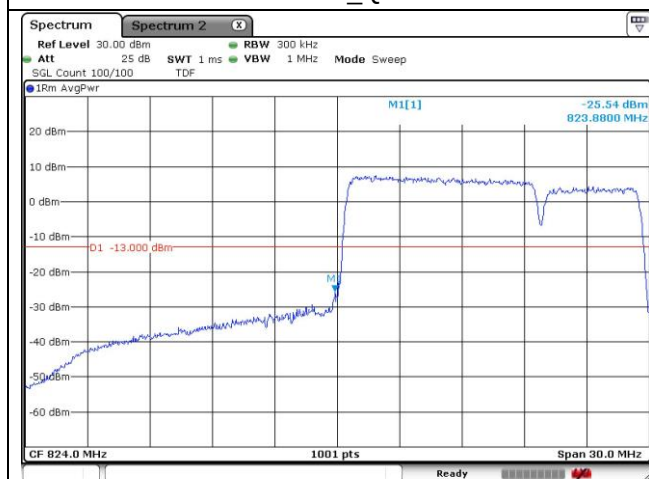
ULCA_5B



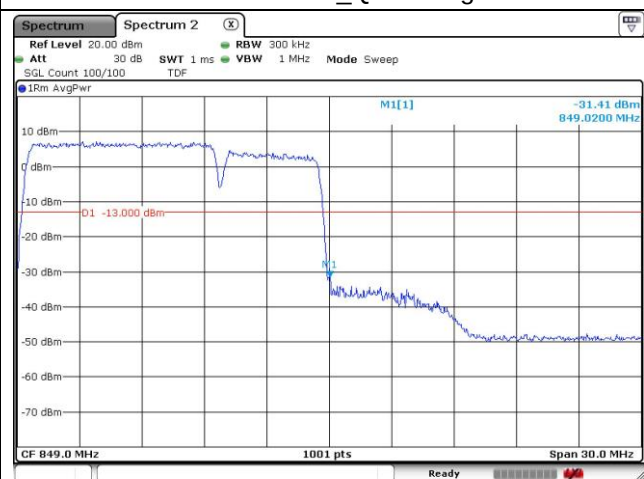
ULCA_5B



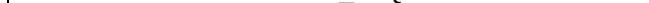
PCC 10 MHz + SCC 5 MHz_QPSK-Low Channel



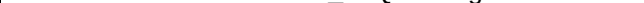
PCC 10 MHz + SCC 5 MHz_QPSK-High Channel



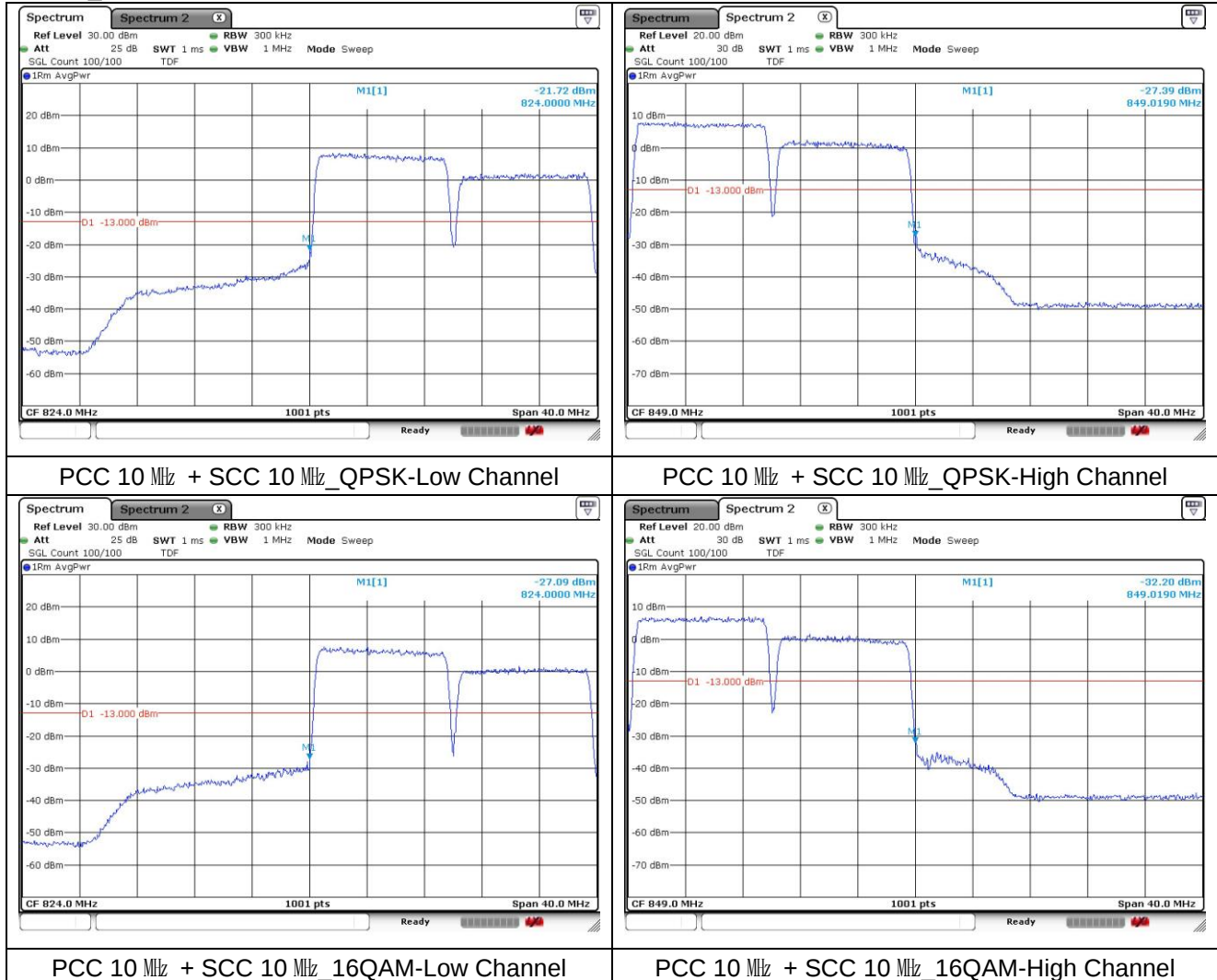
PCC 10 MHz + SCC 5 MHz_16QAM-Low Channel



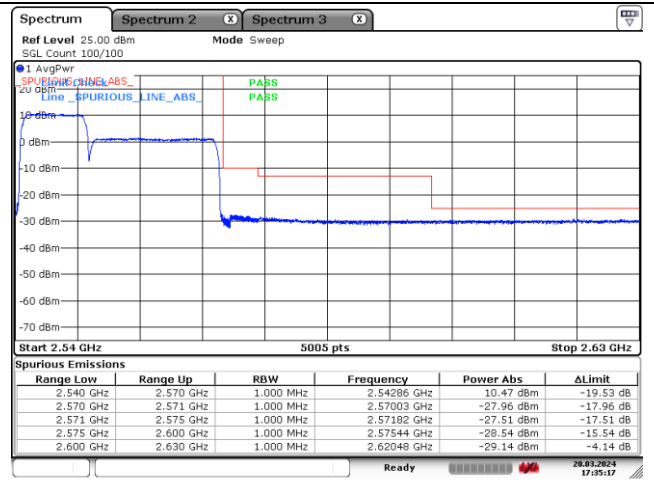
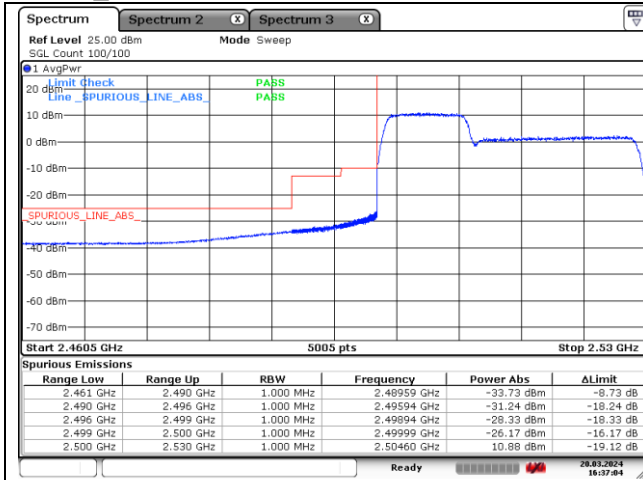
PCC 10 MHz + SCC 5 MHz_16QAM-High Channel



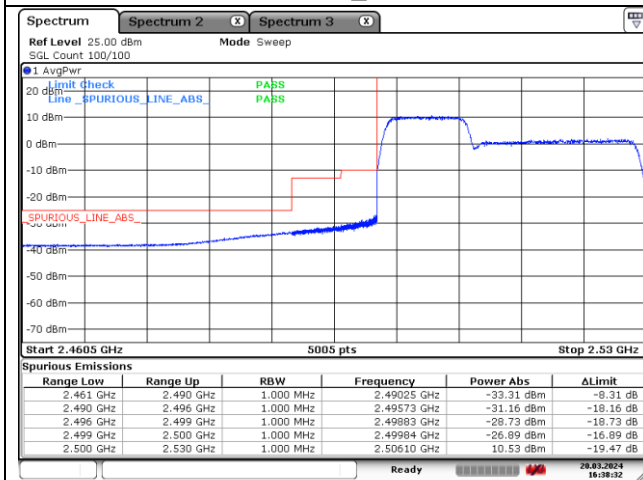
ULCA_5B



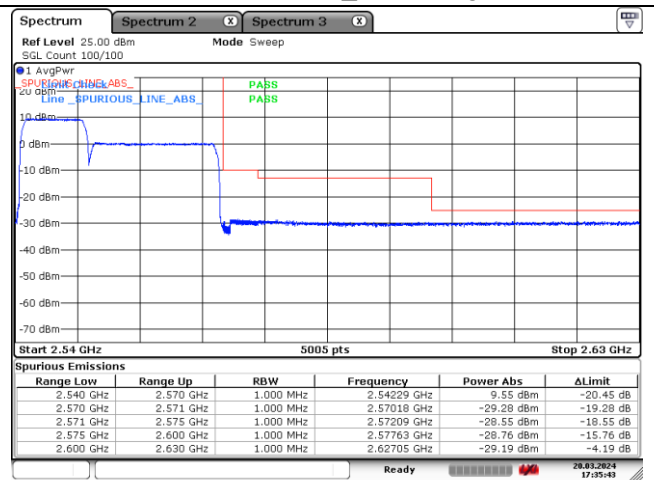
ULCA_7C



PCC 10 MHz + SCC 20 MHz_QPSK-Low Channel



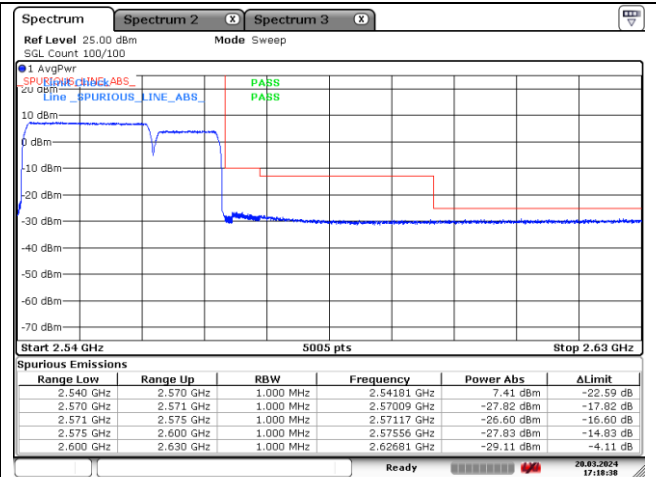
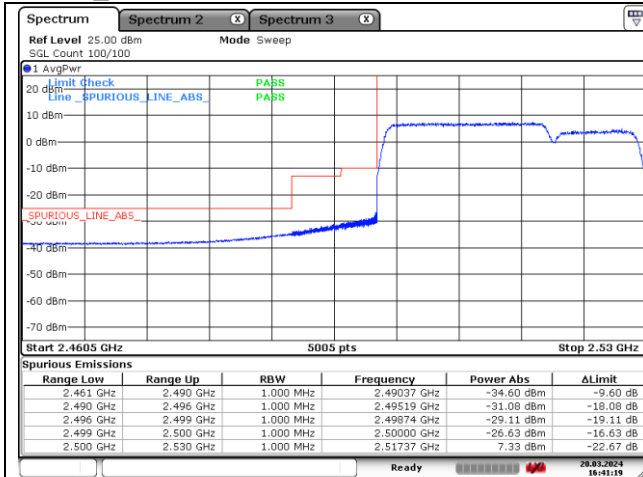
PCC 10 MHz + SCC 20 MHz_QPSK-High Channel



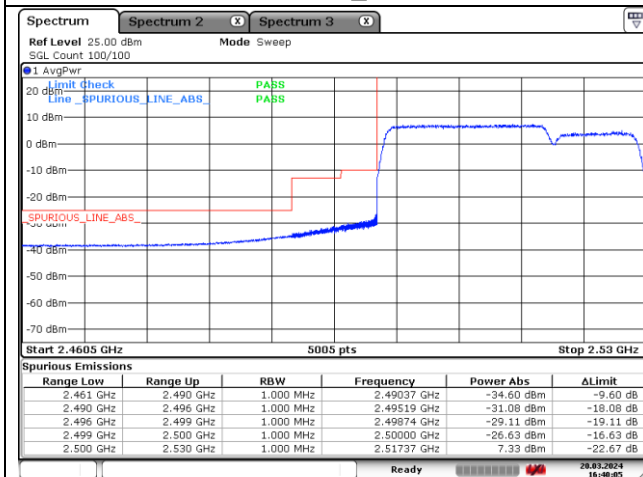
PCC 10 MHz + SCC 20 MHz_16QAM-Low Channel

PCC 10 MHz + SCC 20 MHz_16QAM-High Channel

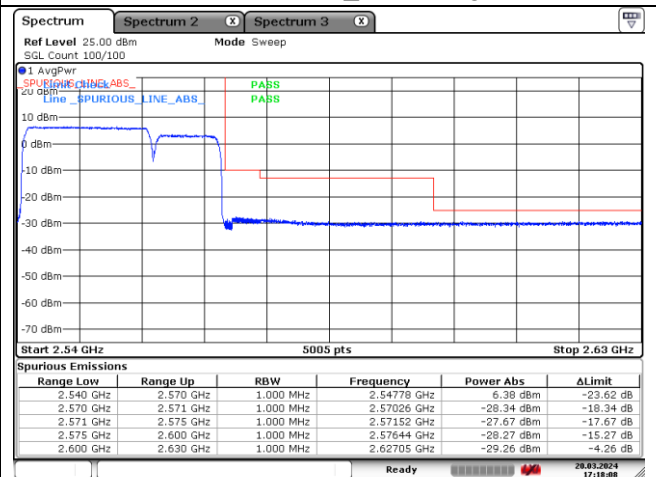
ULCA_7C



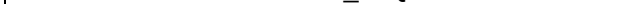
PCC 20 MHz + SCC 10 MHz_QPSK-Low Channel



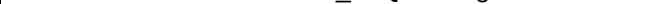
PCC 20 MHz + SCC 10 MHz_QPSK-High Channel



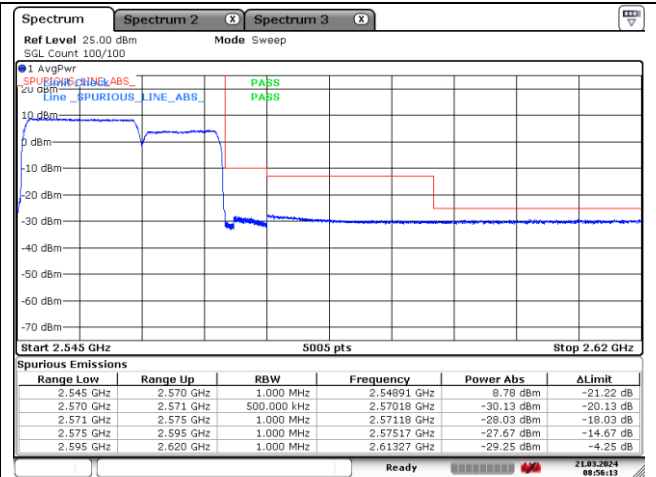
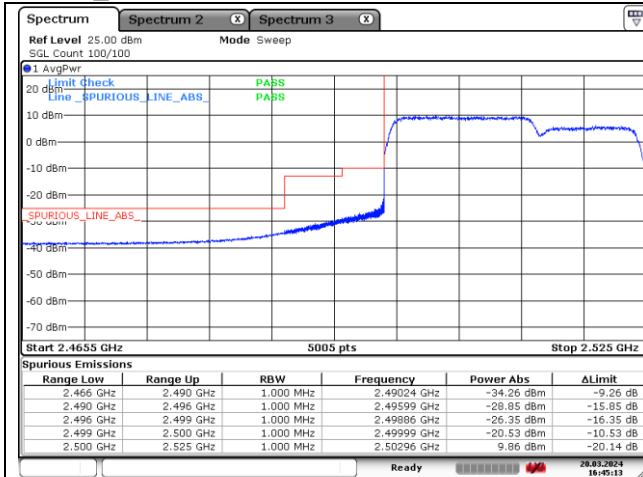
PCC 20 MHz + SCC 10 MHz_16QAM-Low Channel



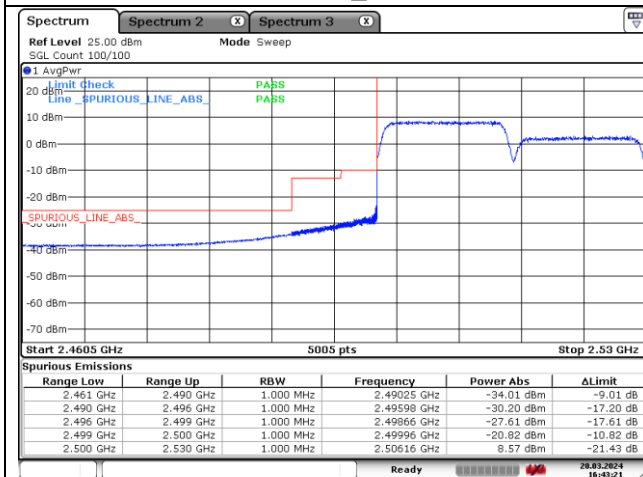
PCC 20 MHz + SCC 10 MHz_16QAM-High Channel



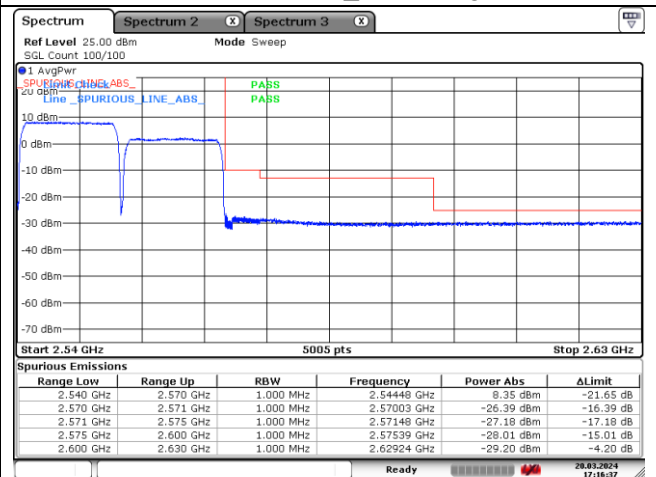
ULCA_7C



PCC 15 MHz + SCC 15 MHz_QPSK-Low Channel



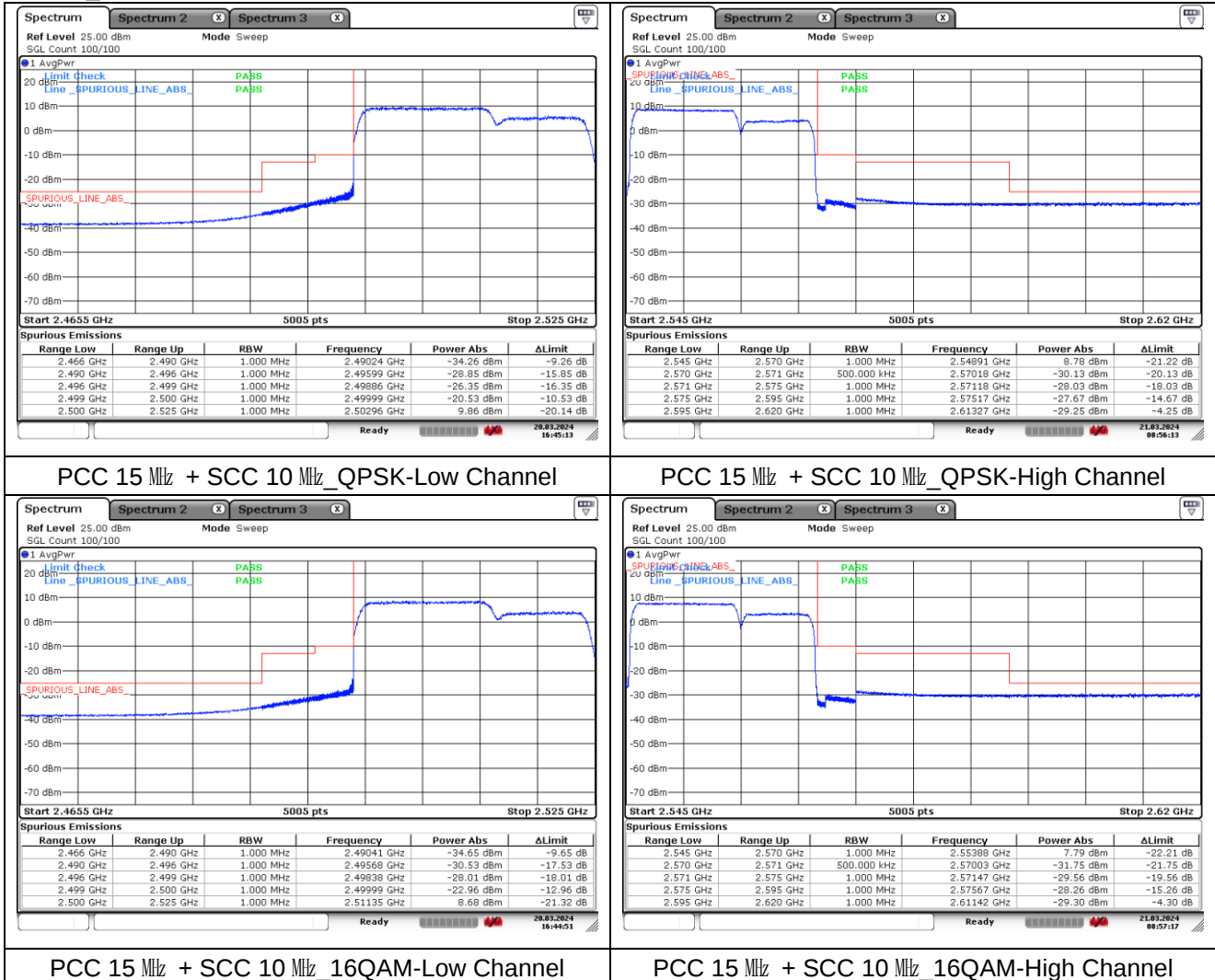
PCC 15 MHz + SCC 15 MHz_QPSK-High Channel



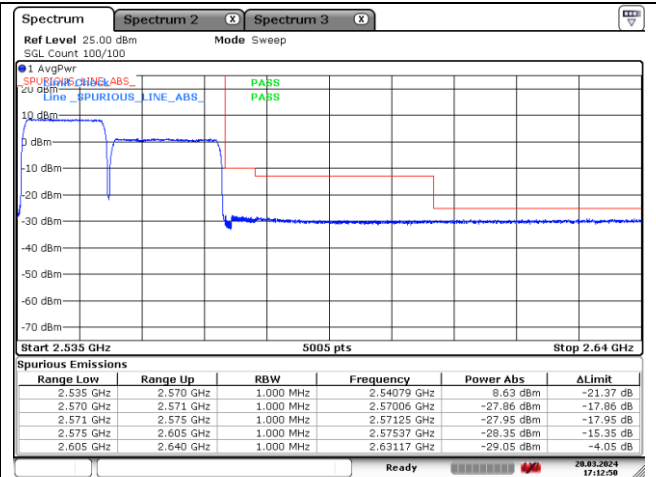
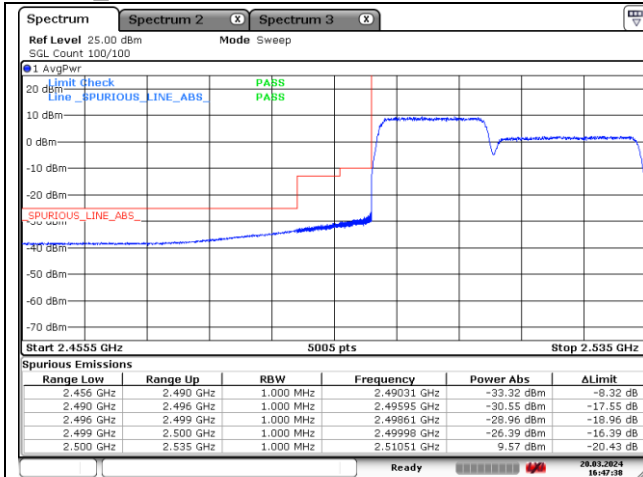
PCC 15 MHz + SCC 15 MHz_16QAM-Low Channel

PCC 15 MHz + SCC 15 MHz_16QAM-High Channel

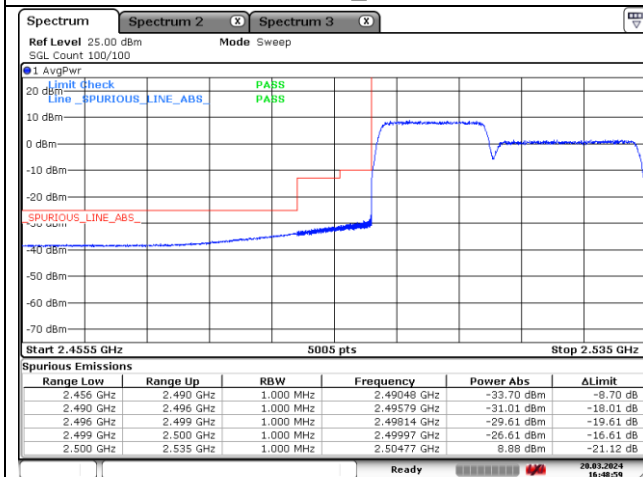
ULCA_7C



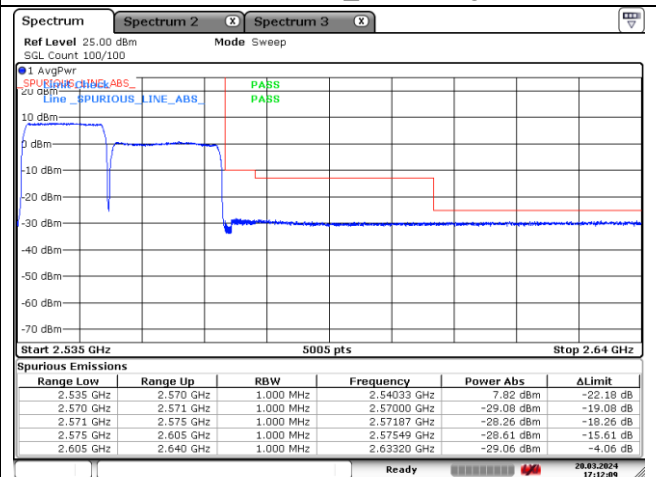
ULCA_7C



PCC 15 MHz + SCC 20 MHz_QPSK-Low Channel



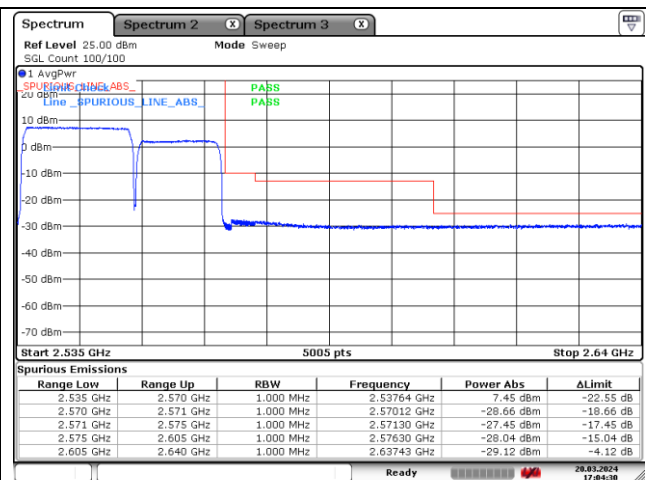
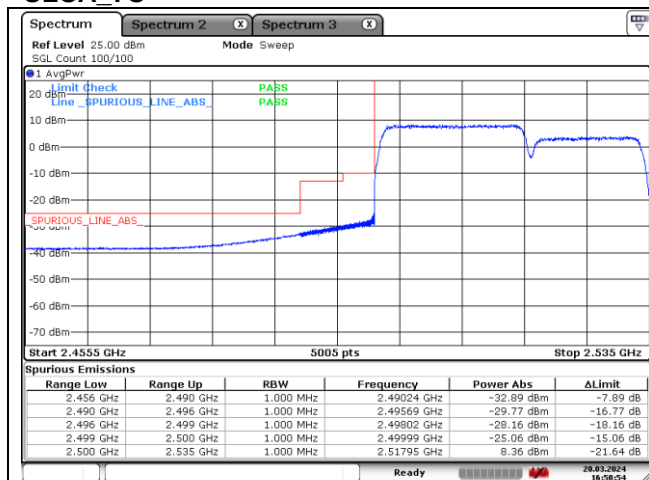
PCC 15 MHz + SCC 20 MHz_QPSK-High Channel



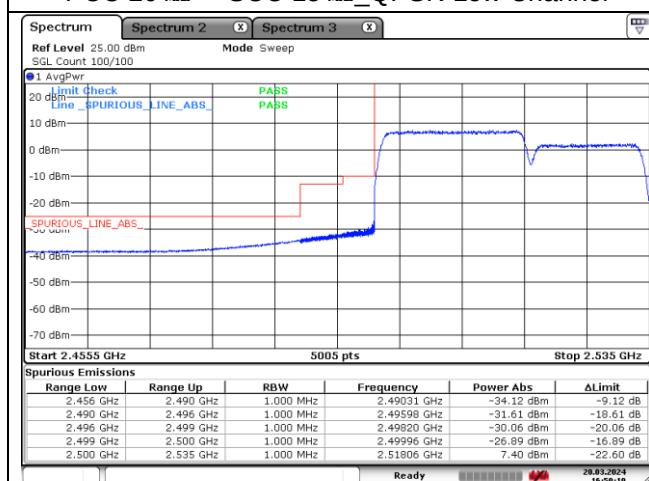
PCC 15 MHz + SCC 20 MHz_16QAM-Low Channel

PCC 15 MHz + SCC 20 MHz_16QAM-High Channel

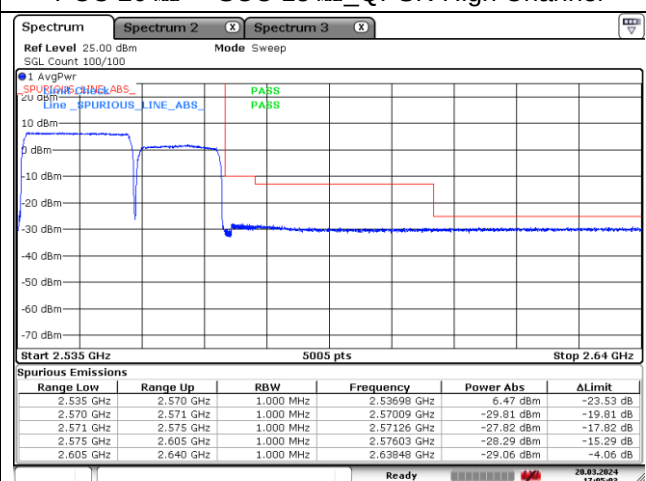
ULCA_7C



PCC 20 MHz + SCC 15 MHz_QPSK-Low Channel



PCC 20 MHz + SCC 15 MHz_QPSK-High Channel



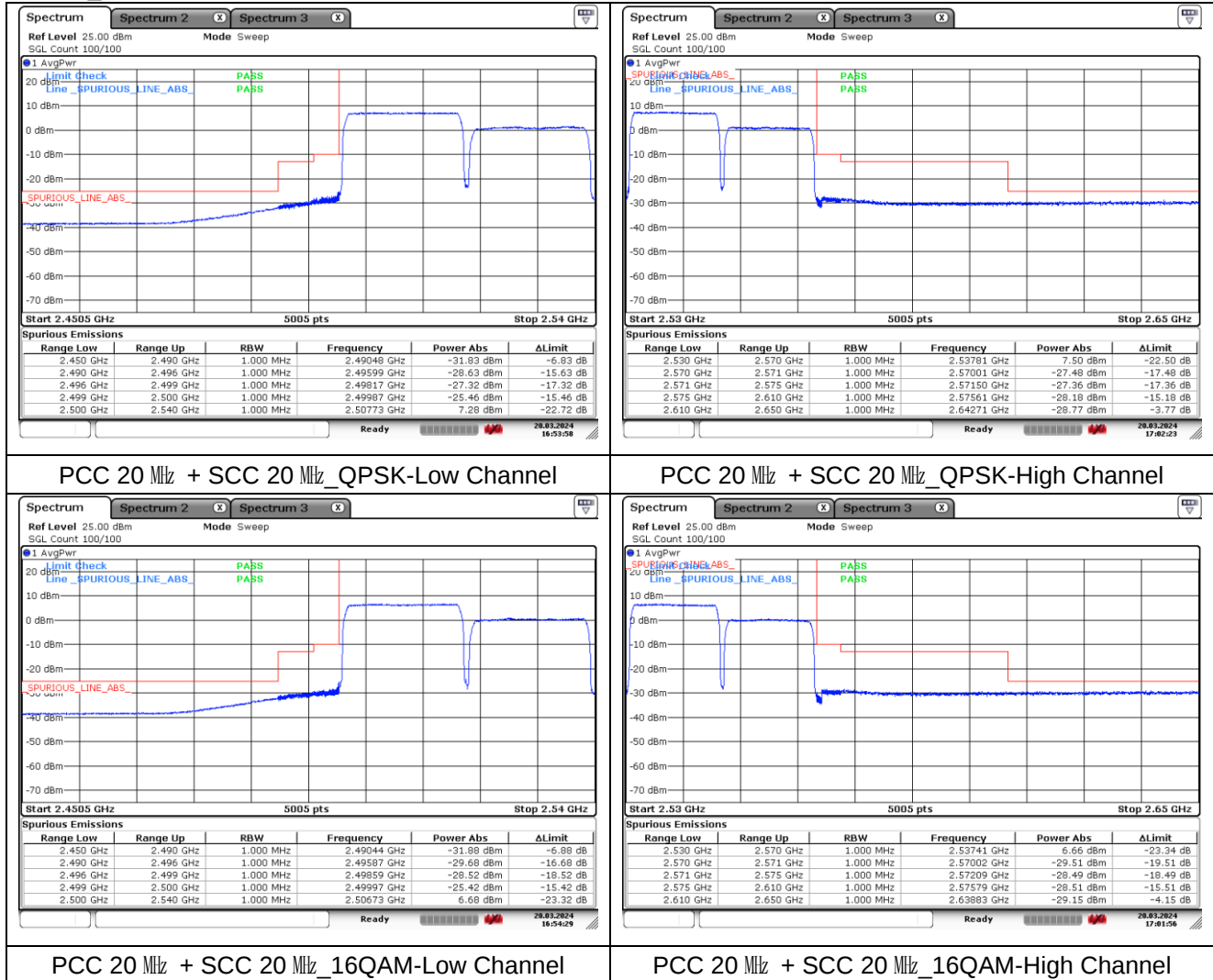
PCC 20 MHz + SCC 15 MHz_16QAM-Low Channel



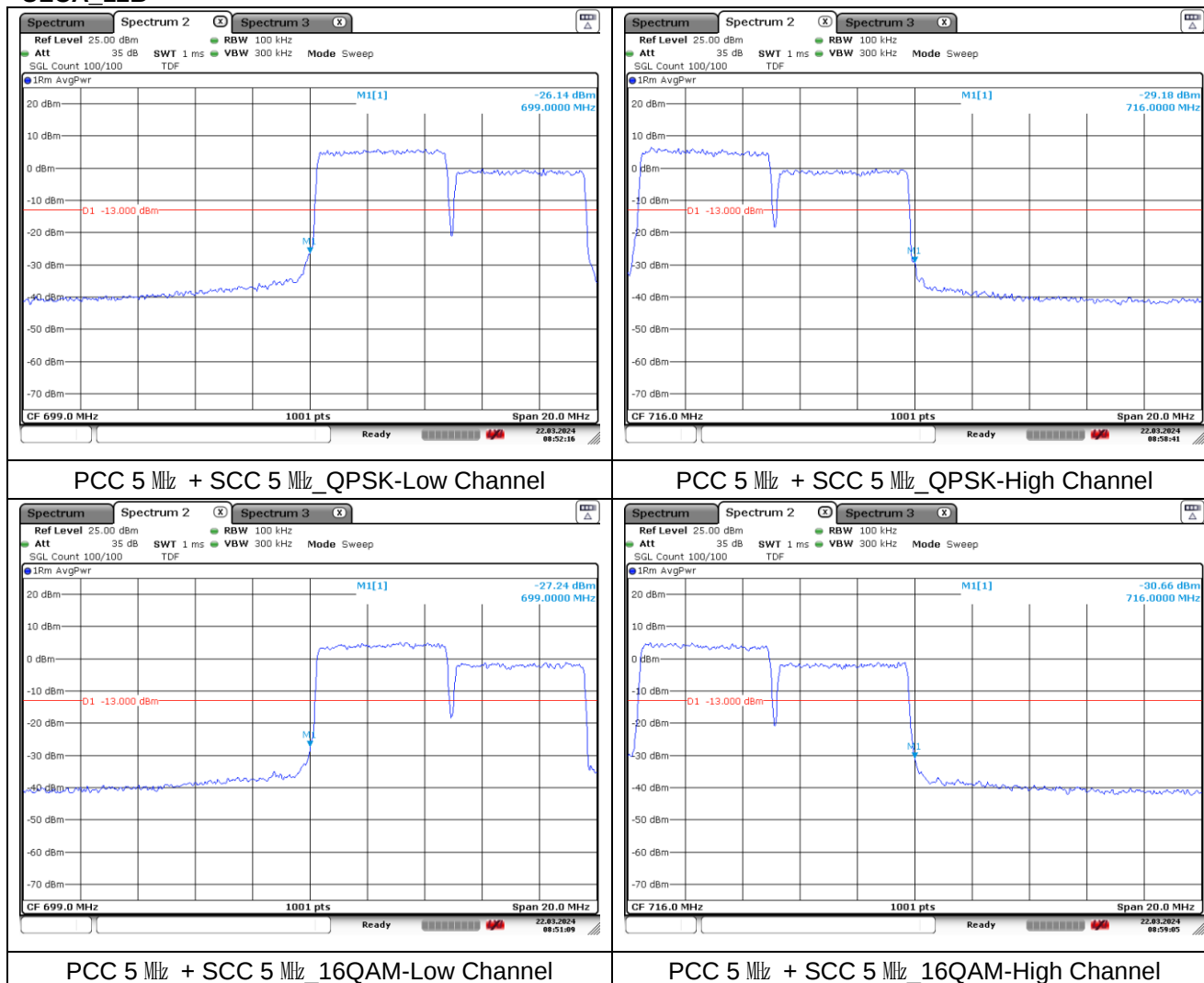
PCC 20 MHz + SCC 15 MHz_16QAM-High Channel



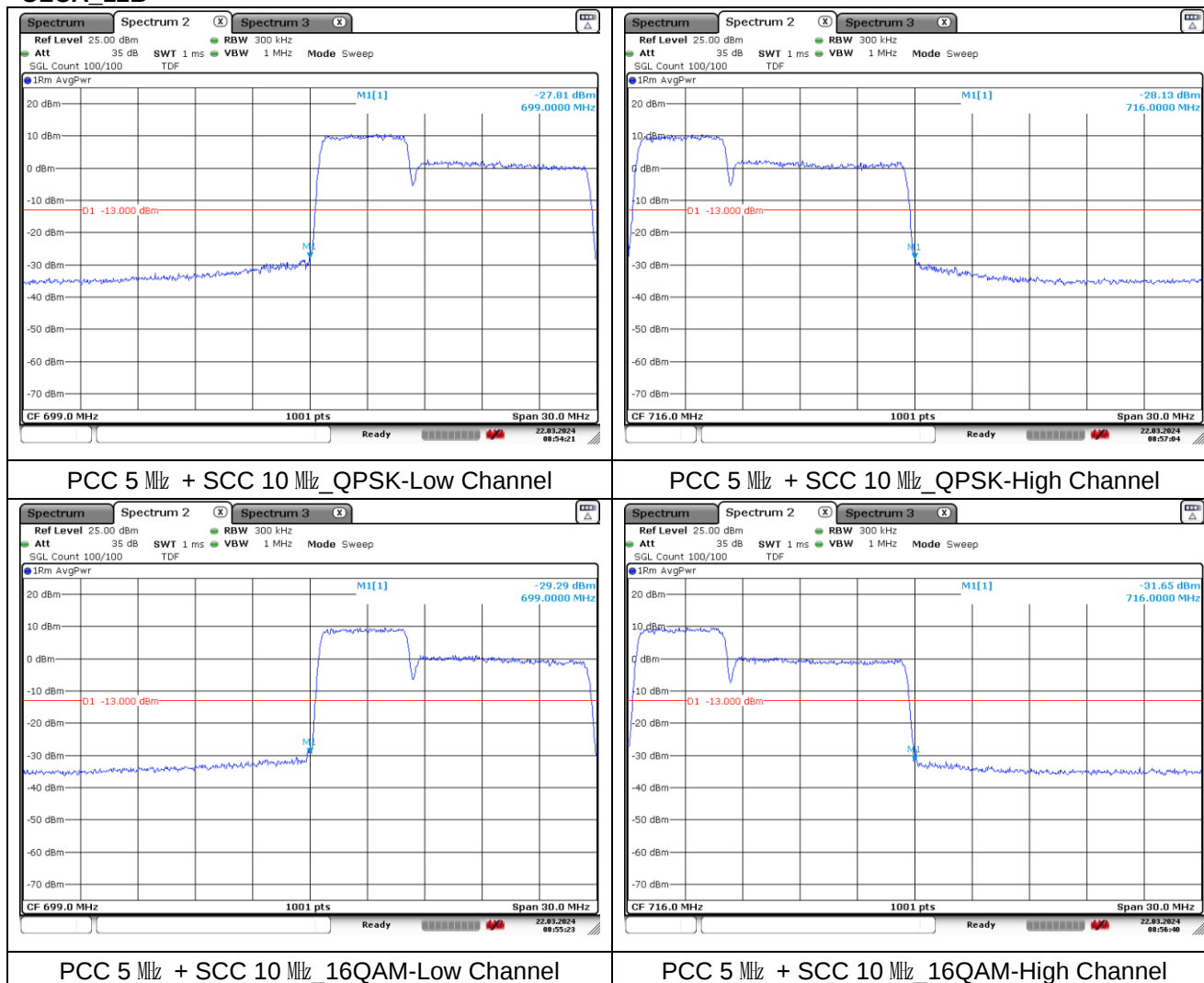
ULCA_7C



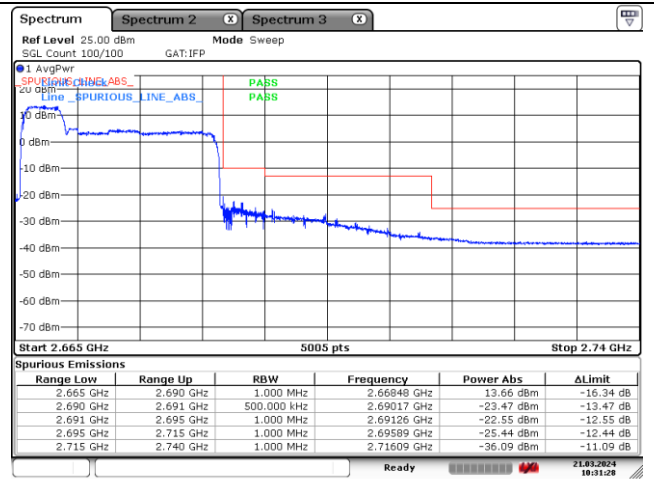
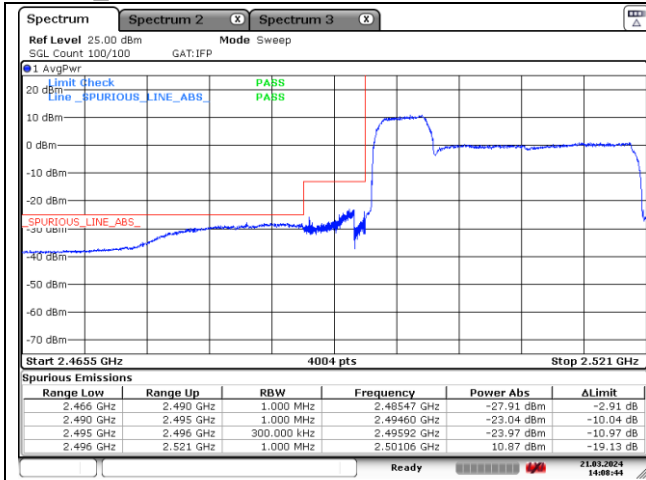
ULCA 12B



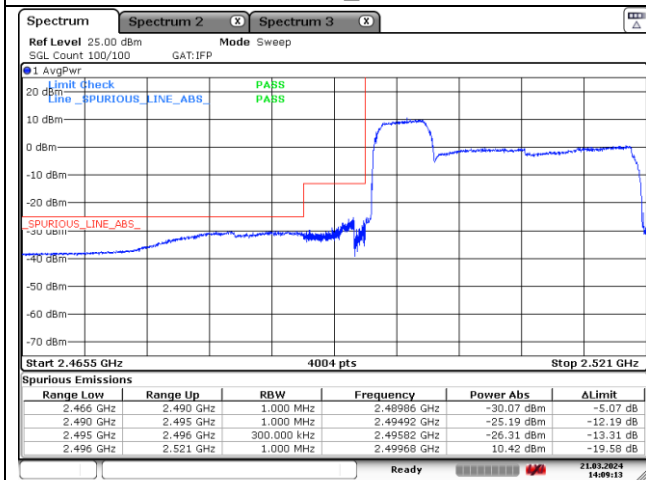
ULCA 12B



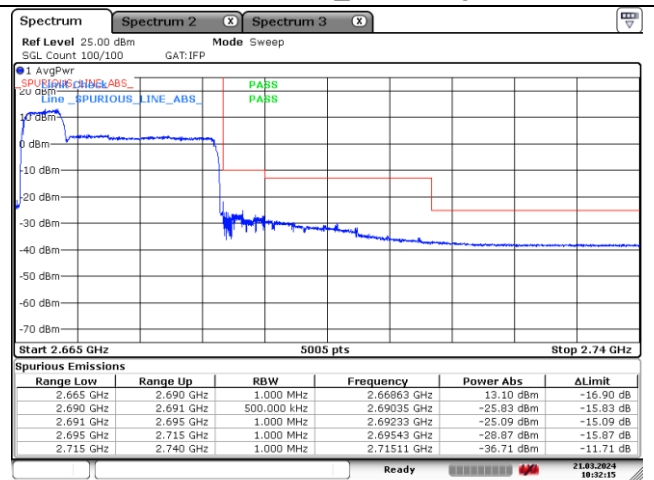
ULCA 41C



PCC 5 MHz + SCC 20 MHz_QPSK-Low Channel



PCC 5 MHz + SCC 20 MHz_QPSK-High Channel



PCC 5 MHz + SCC 20 MHz_16QAM-Low Channel

PCC 5 MHz + SCC 20 MHz_16QAM-High Channel

