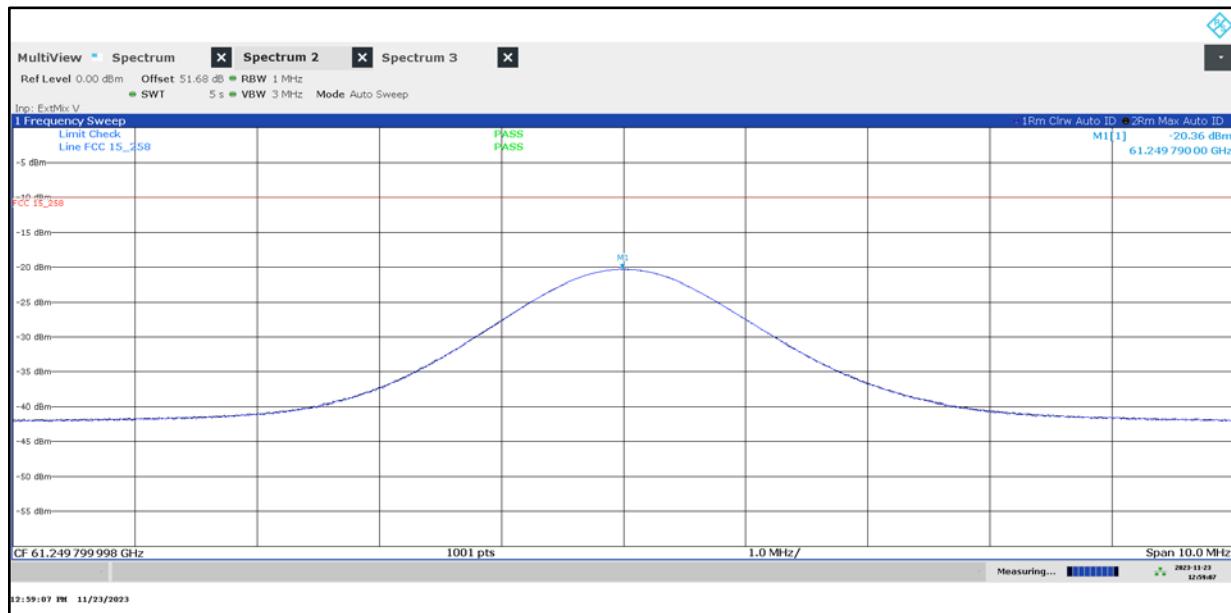
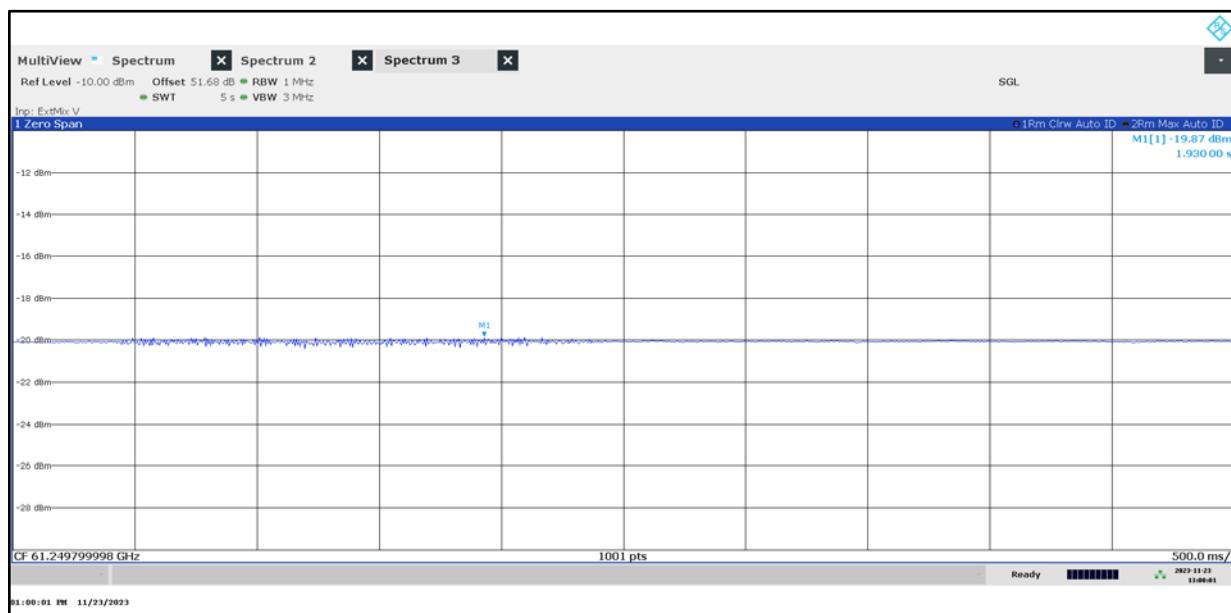
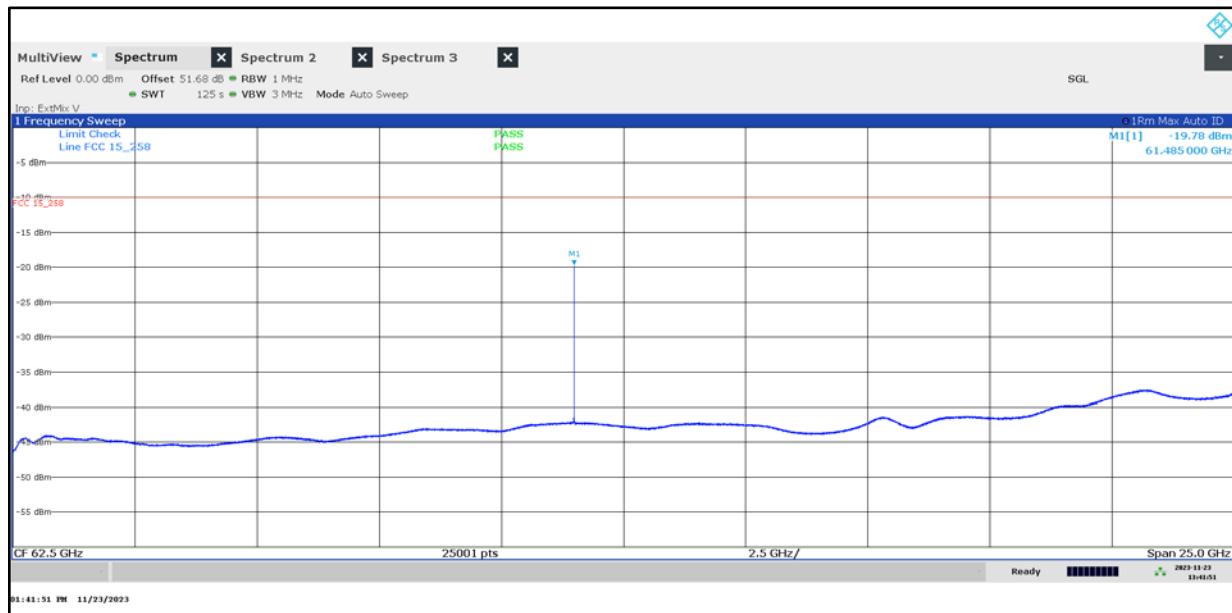
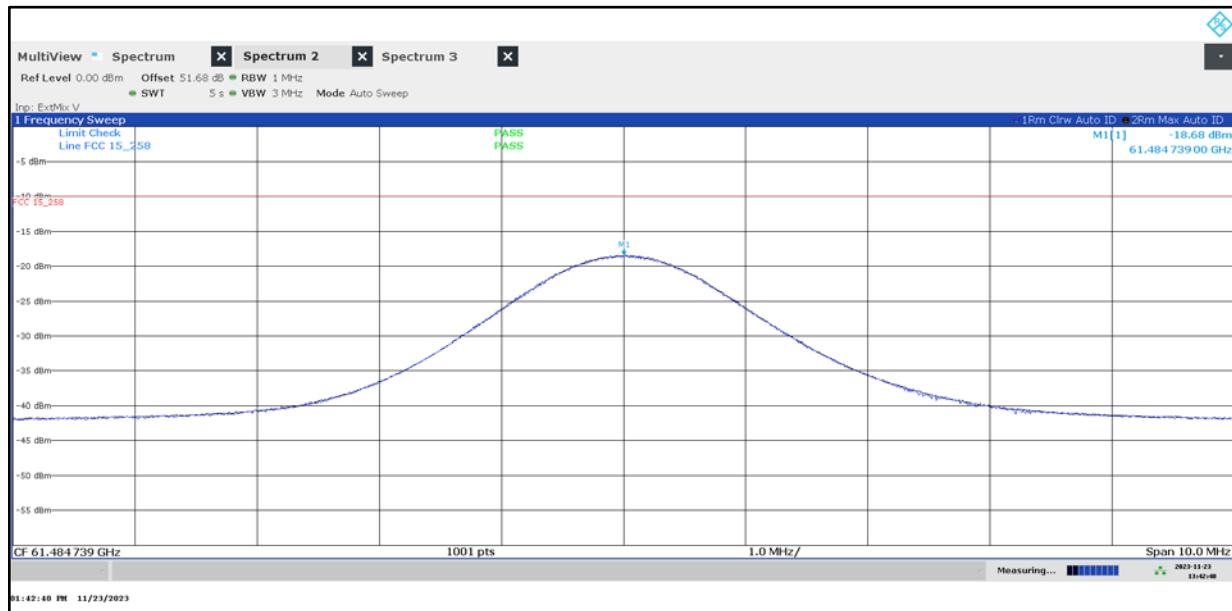


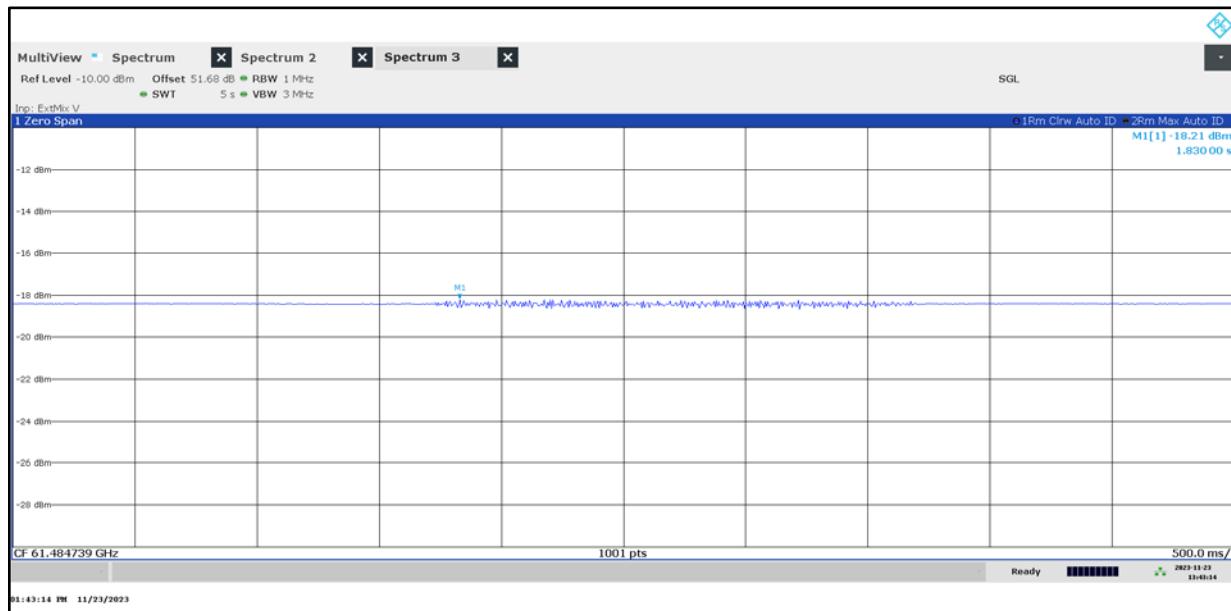
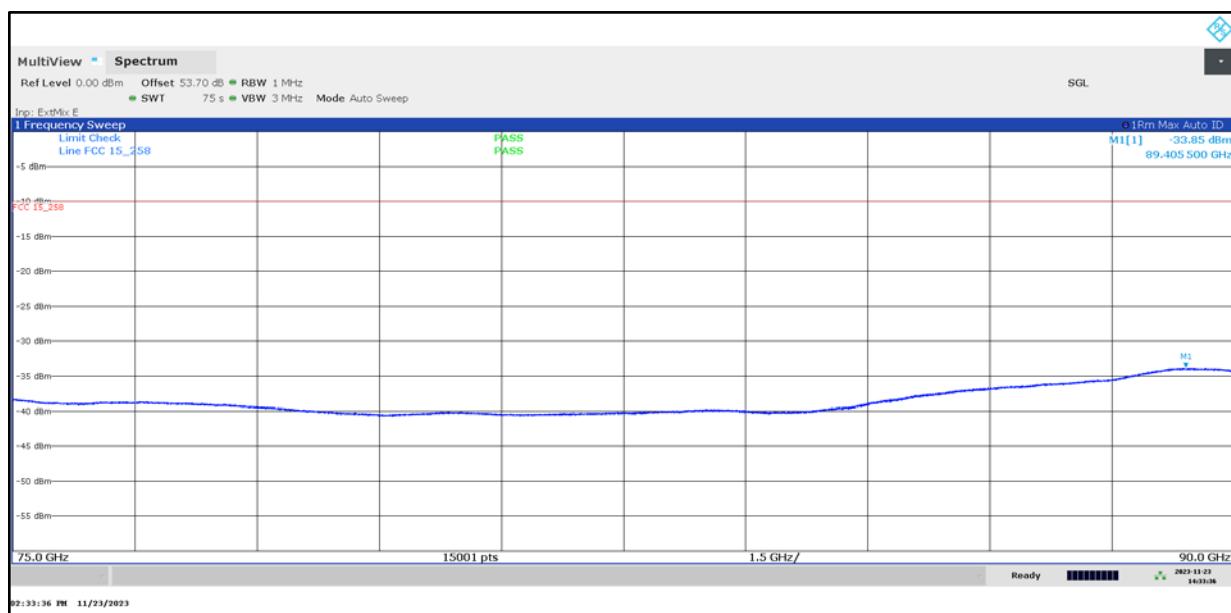
Plot 49: 61 GHz, stop mode, middle frequency spurious emission with 10 MHz span

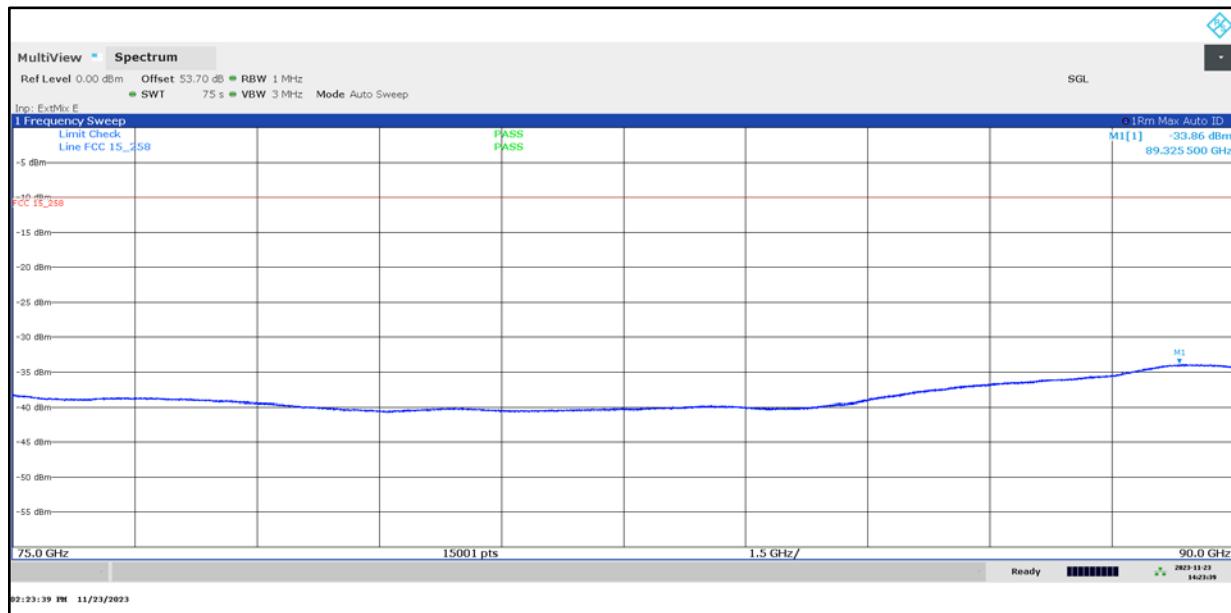
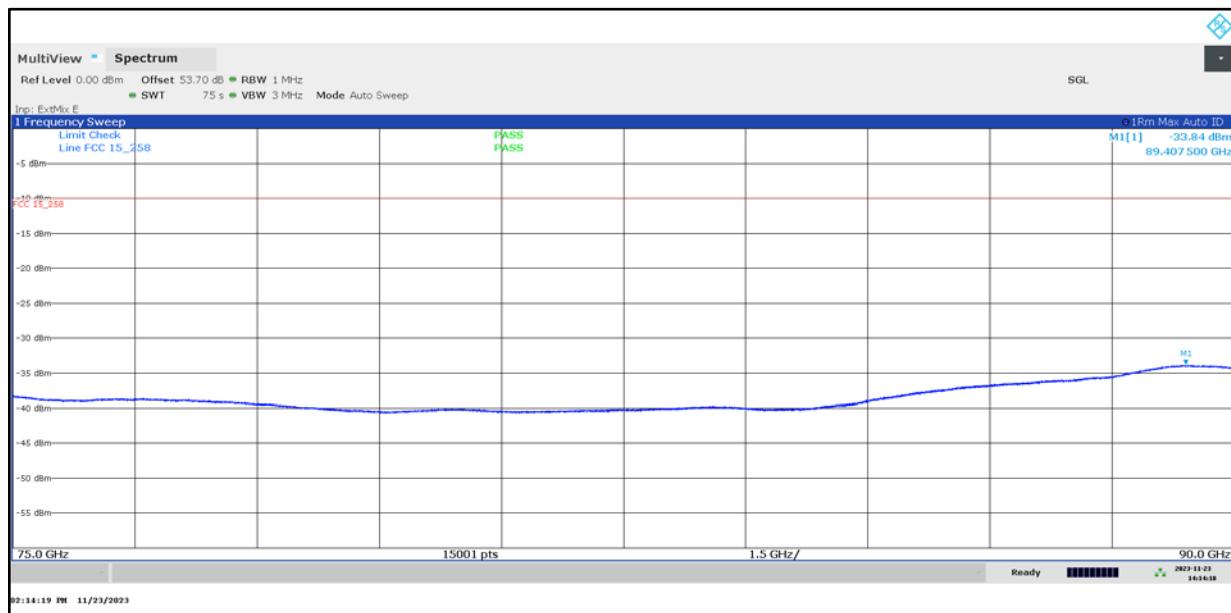


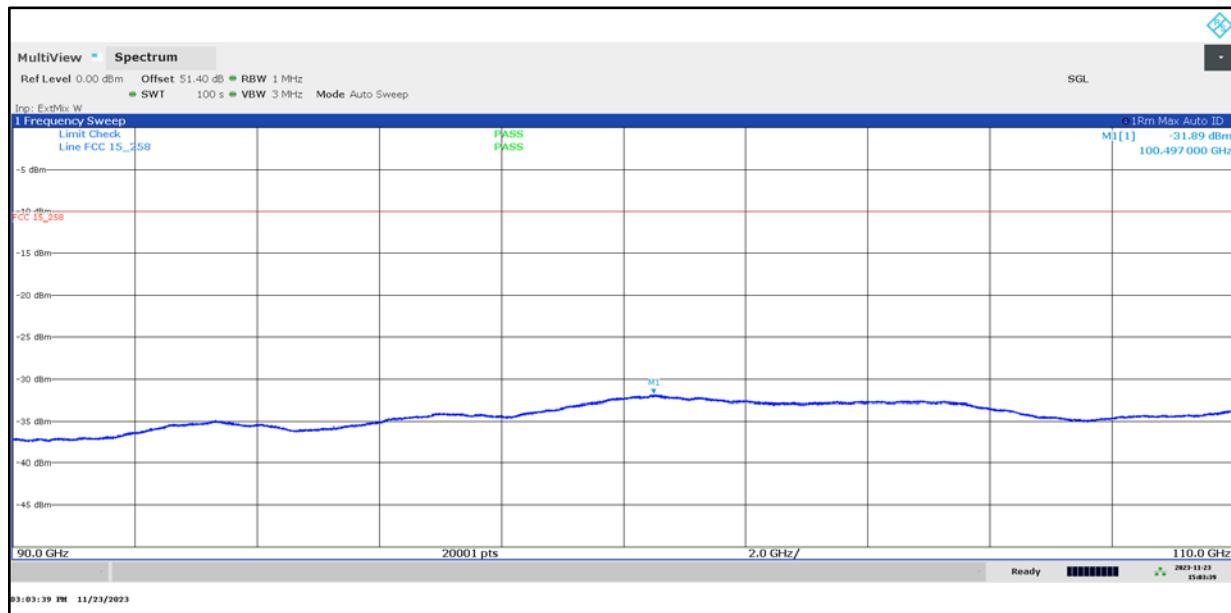
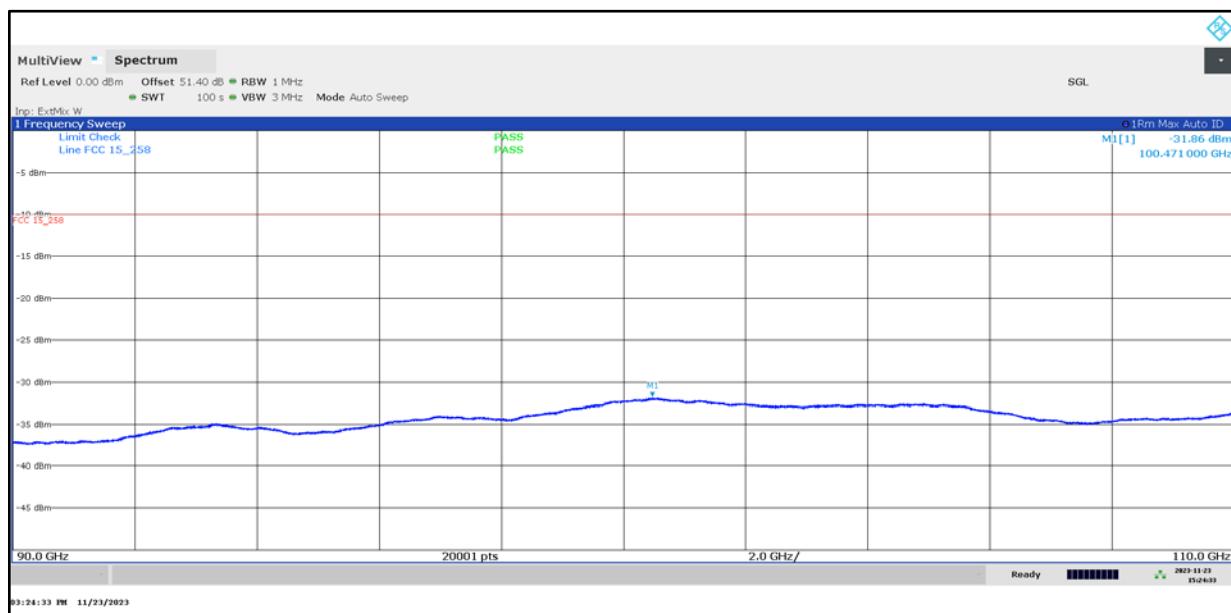
Plot 50: 61 GHz, stop mode, middle frequency spurious emission with zero span

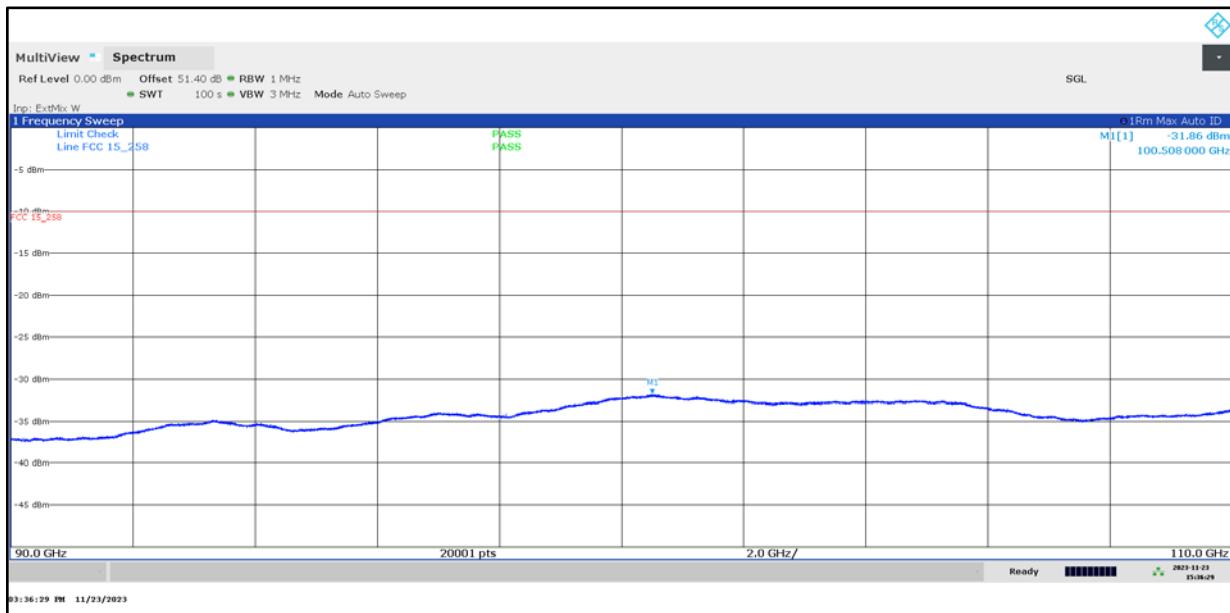
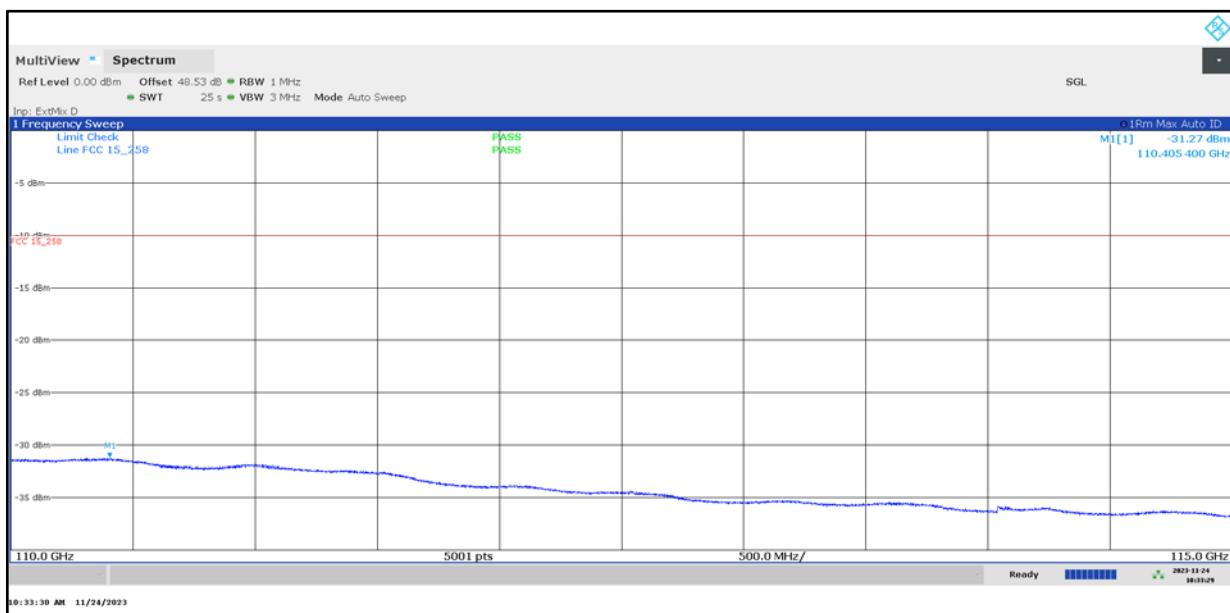


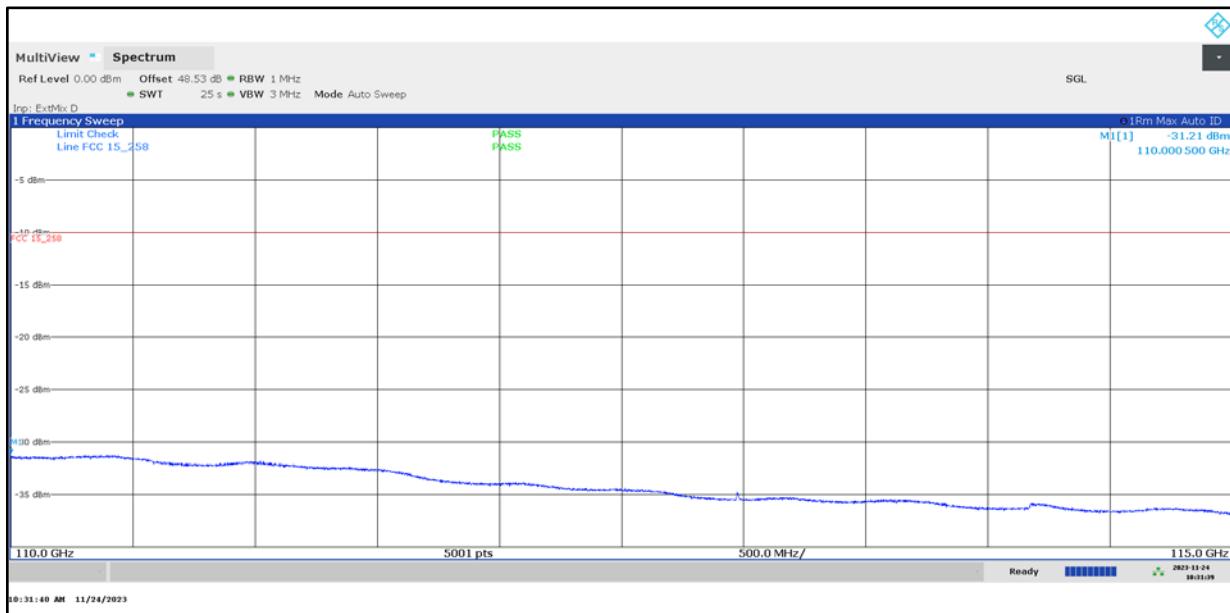
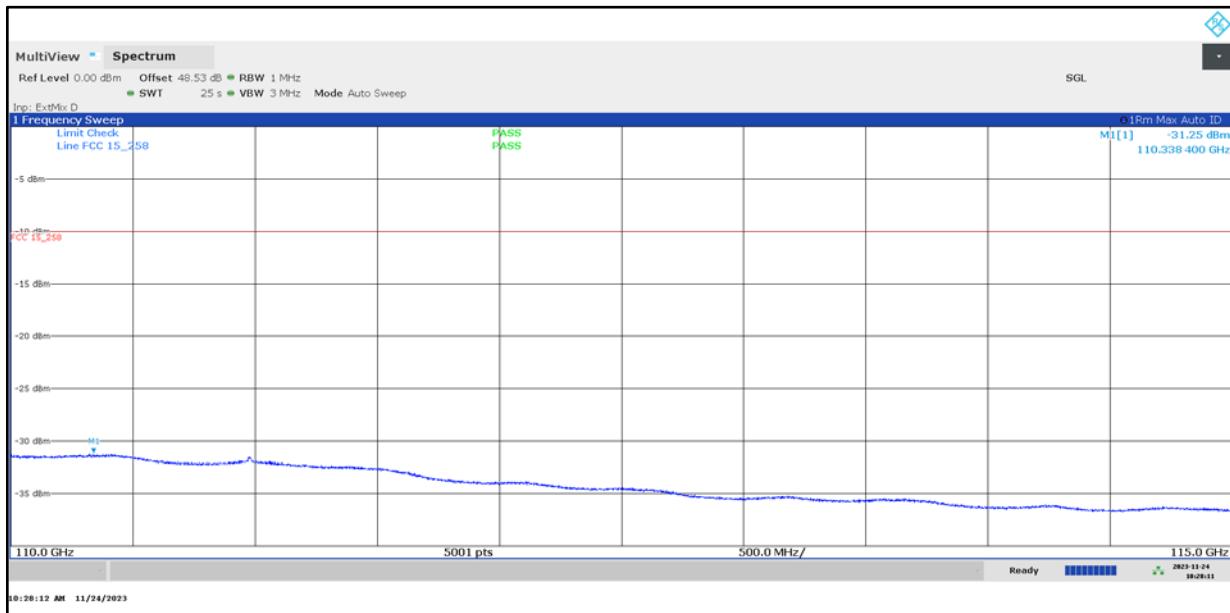
Plot 51: 50 GHz – 75 GHz, stop mode, high frequency

Plot 52: 61 GHz, stop mode, high frequency spurious emission with 10 MHz span


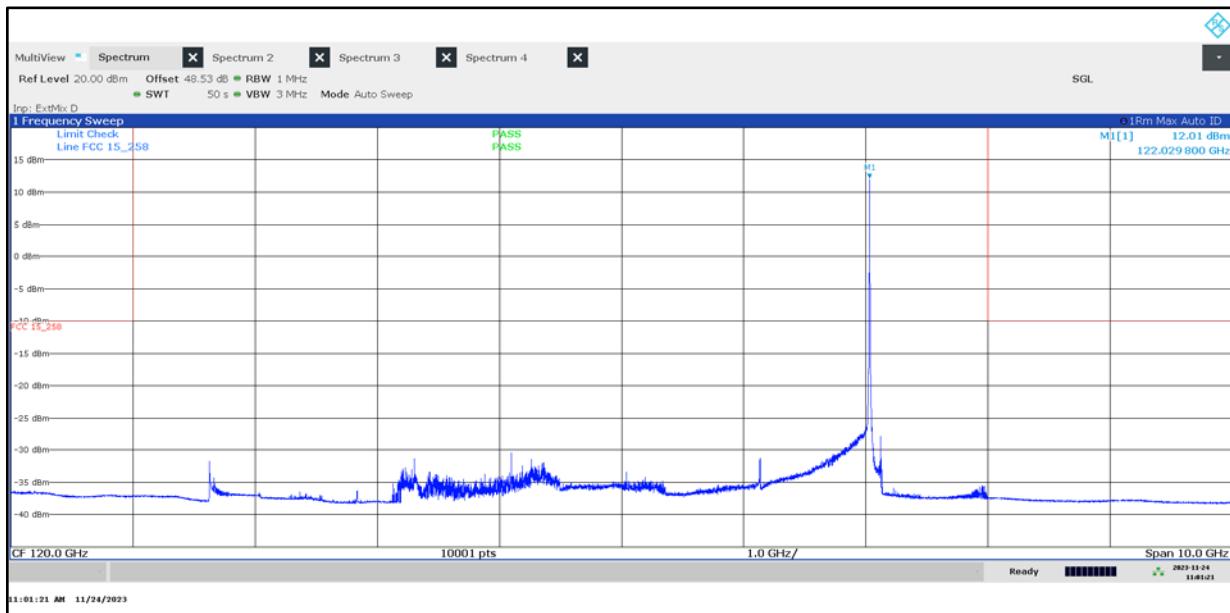
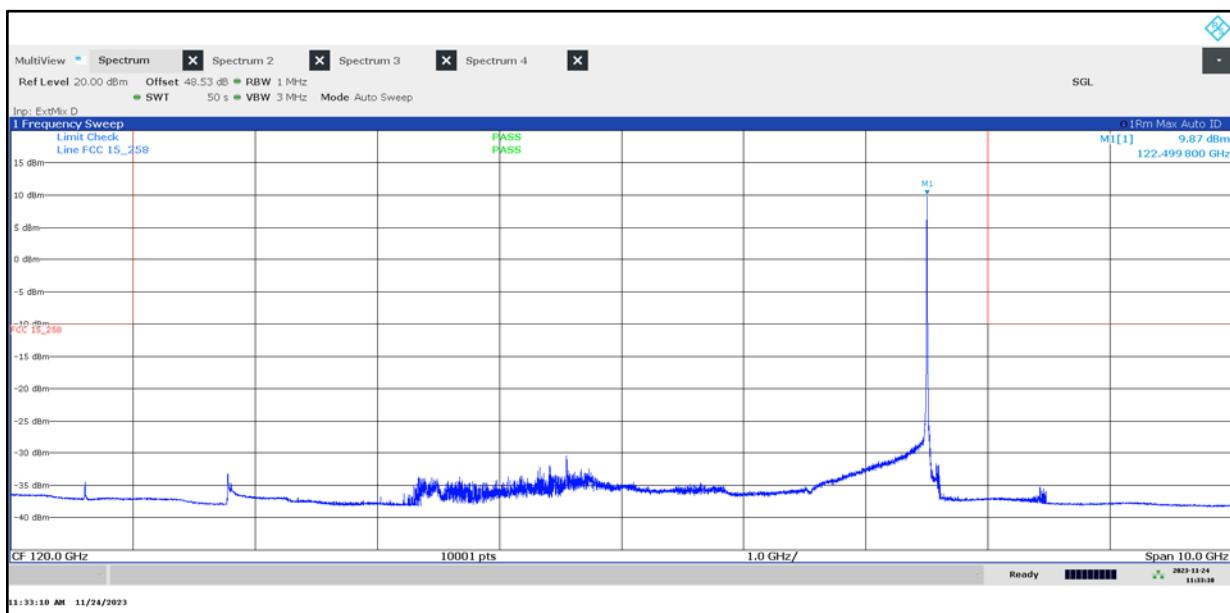
Plot 53: 61 GHz, stop mode, high frequency spurious emission with zero span

Plot 54: 75 GHz – 90 GHz, stop mode, low frequency


Plot 55: 75 GHz – 90 GHz, stop mode, middle frequency

Plot 56: 75 GHz – 90 GHz, stop mode, high frequency


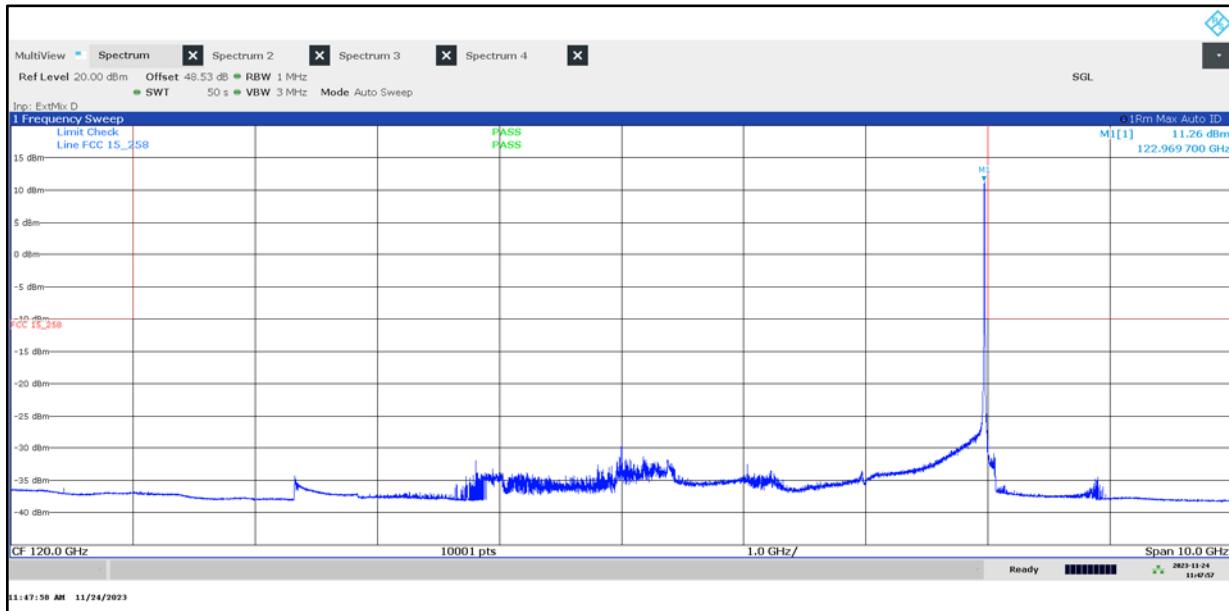
Plot 57: 90 GHz – 110 GHz, stop mode, low frequency

Plot 58: 90 GHz – 110 GHz, stop mode, middle frequency


Plot 59: 90 GHz – 110 GHz, stop mode, high frequency

Plot 60: 110 GHz – 115 GHz, stop mode, low frequency


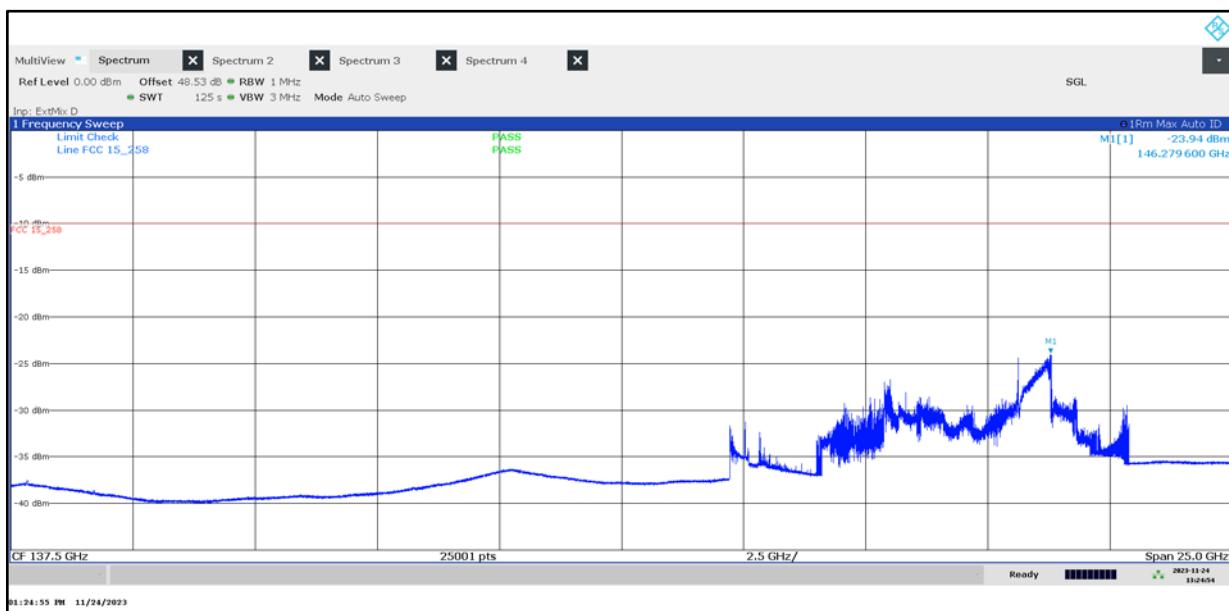
Plot 61: 110 GHz – 115 GHz, stop mode, middle frequency

Plot 62: 110 GHz – 115 GHz, stop mode, high frequency


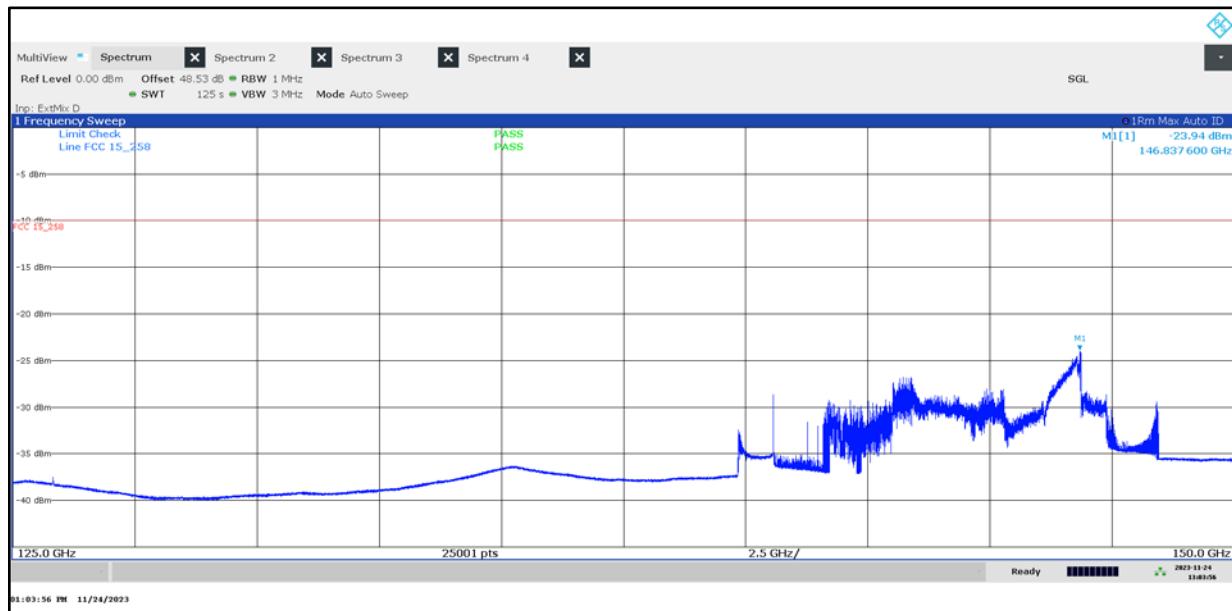
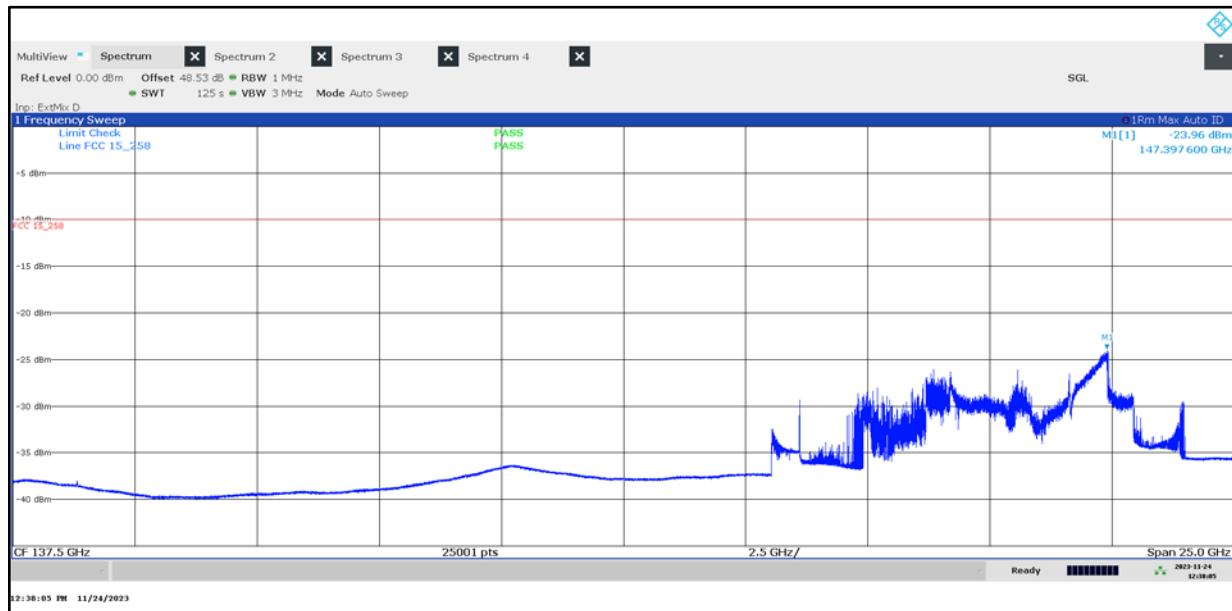
Plot 63: 115 GHz – 125 GHz, stop mode, low frequency

Plot 64: 115 GHz – 125 GHz, stop mode, middle frequency


Plot 65: 115 GHz – 125 GHz, stop mode, high frequency

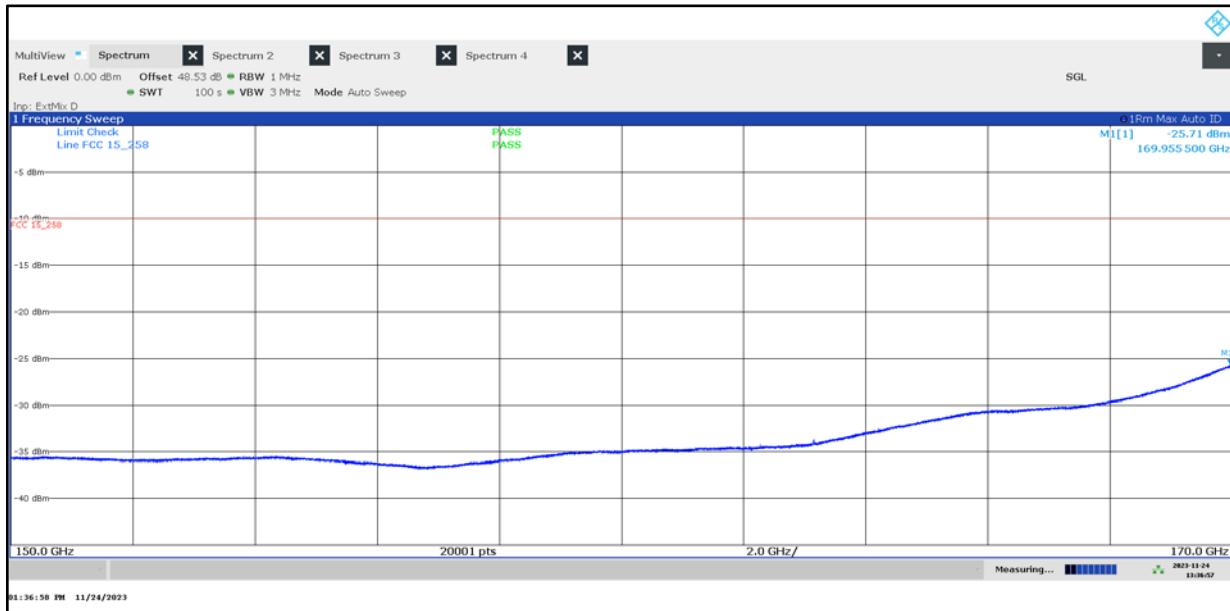


Plot 66: 125 GHz – 150 GHz, stop mode, low frequency

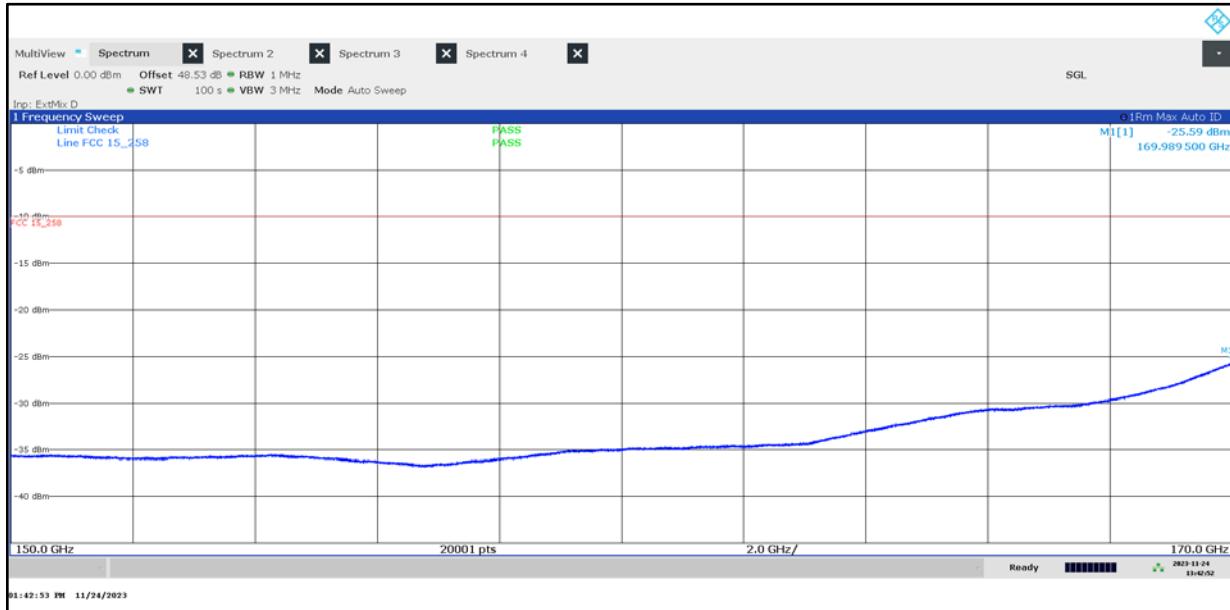


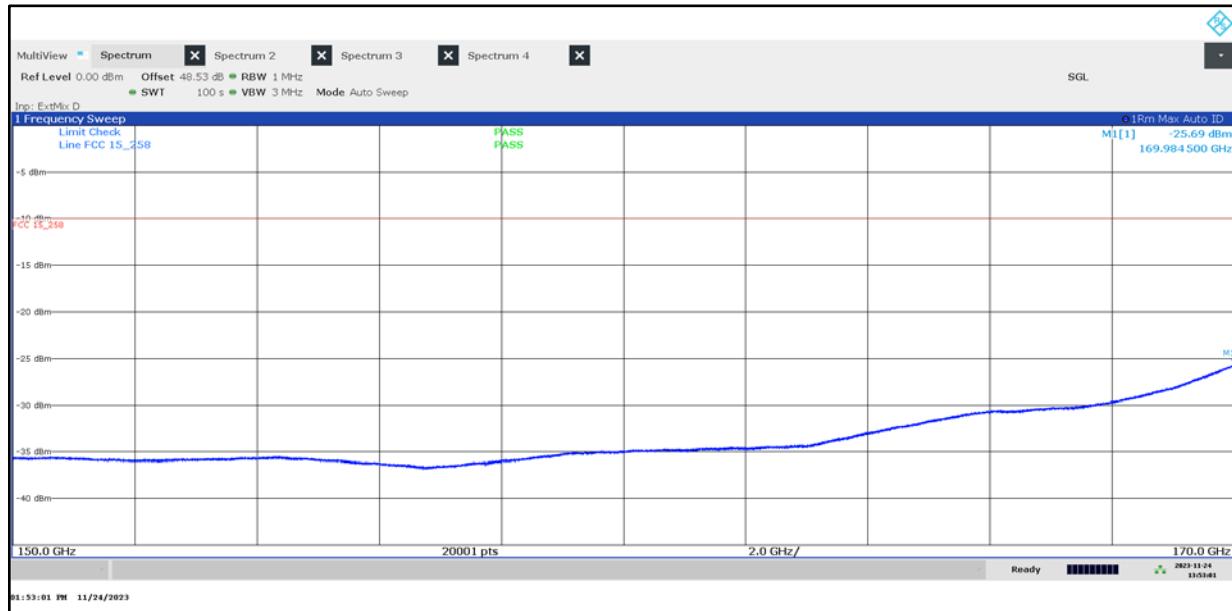
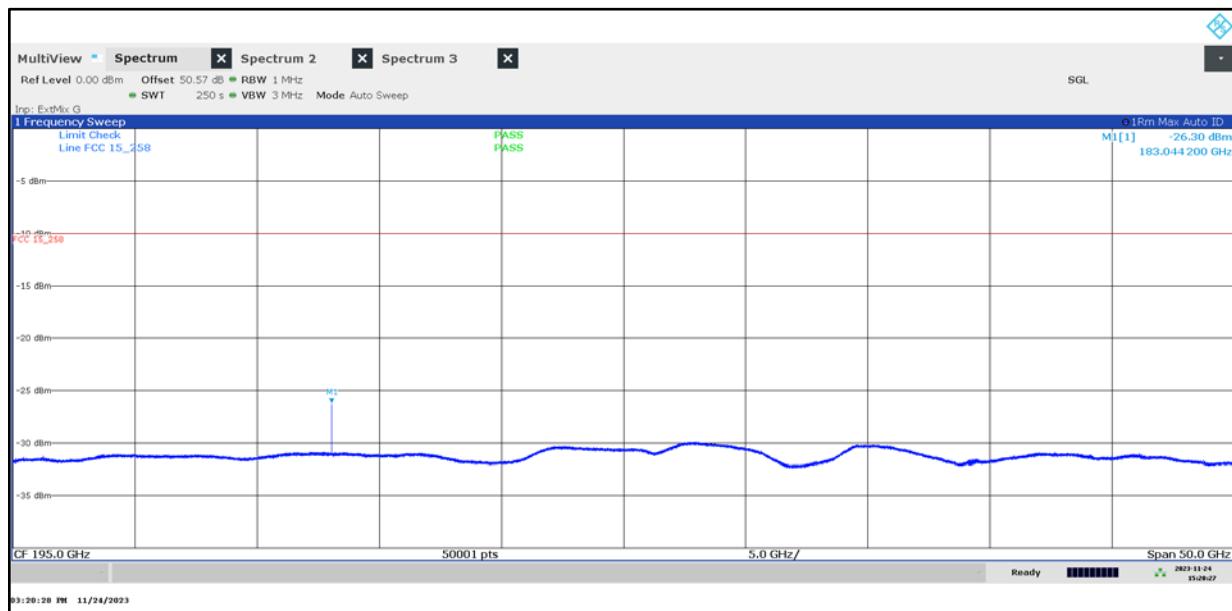
Plot 67: 125 GHz – 150 GHz, stop mode, middle frequency

Plot 68: 125 GHz – 150 GHz, stop mode, high frequency


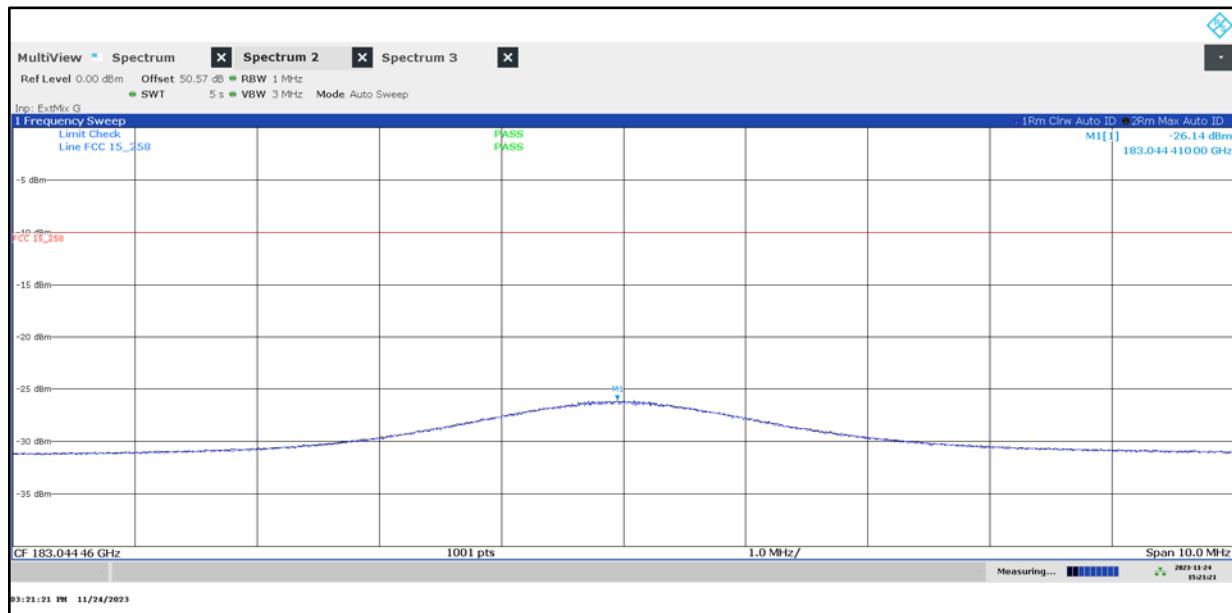
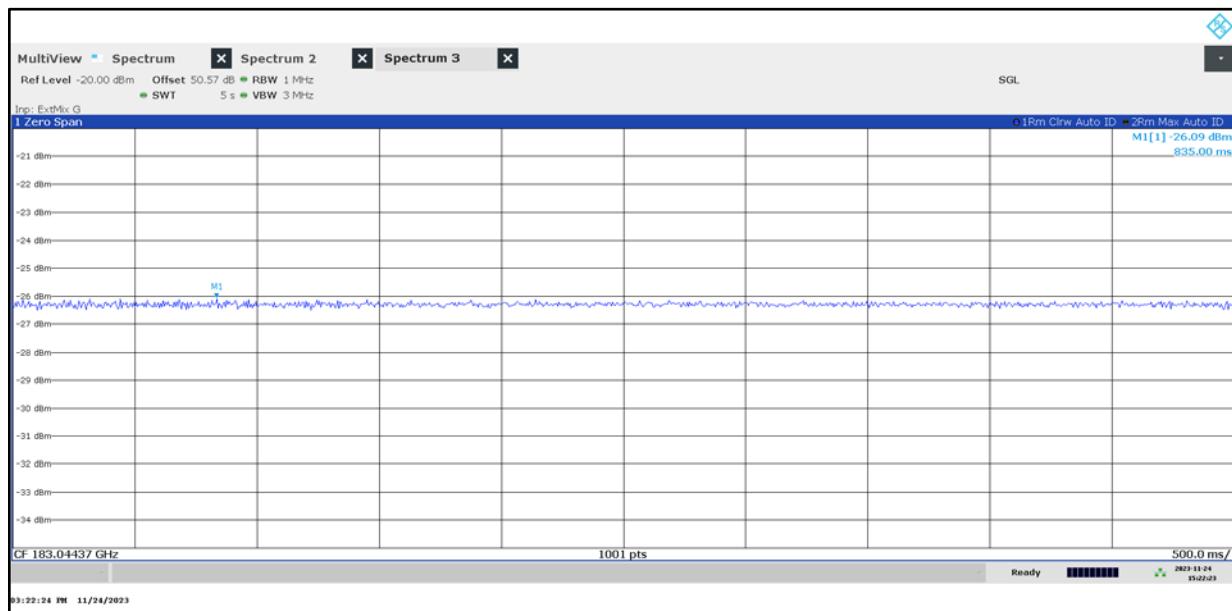
Plot 69: 150 GHz – 170 GHz, stop mode, low frequency

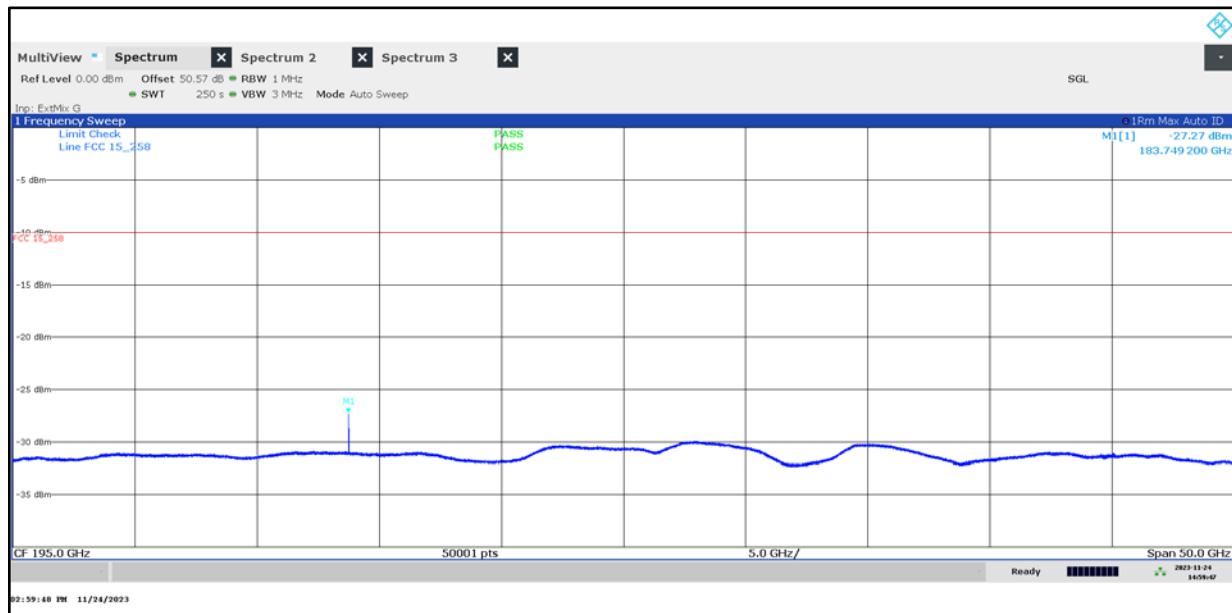
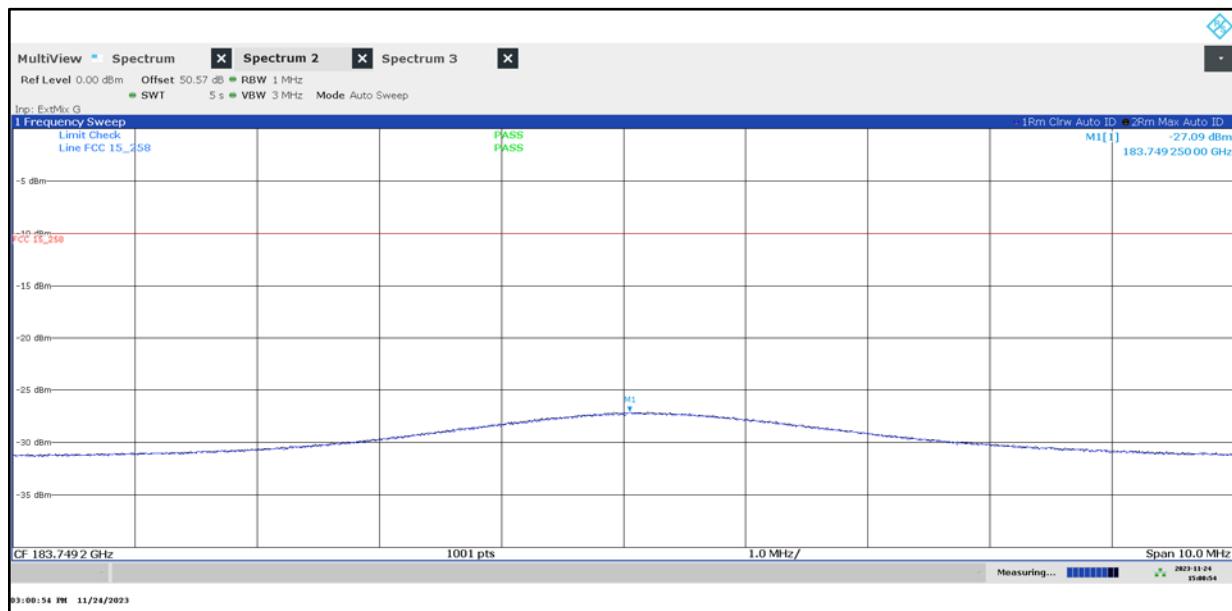


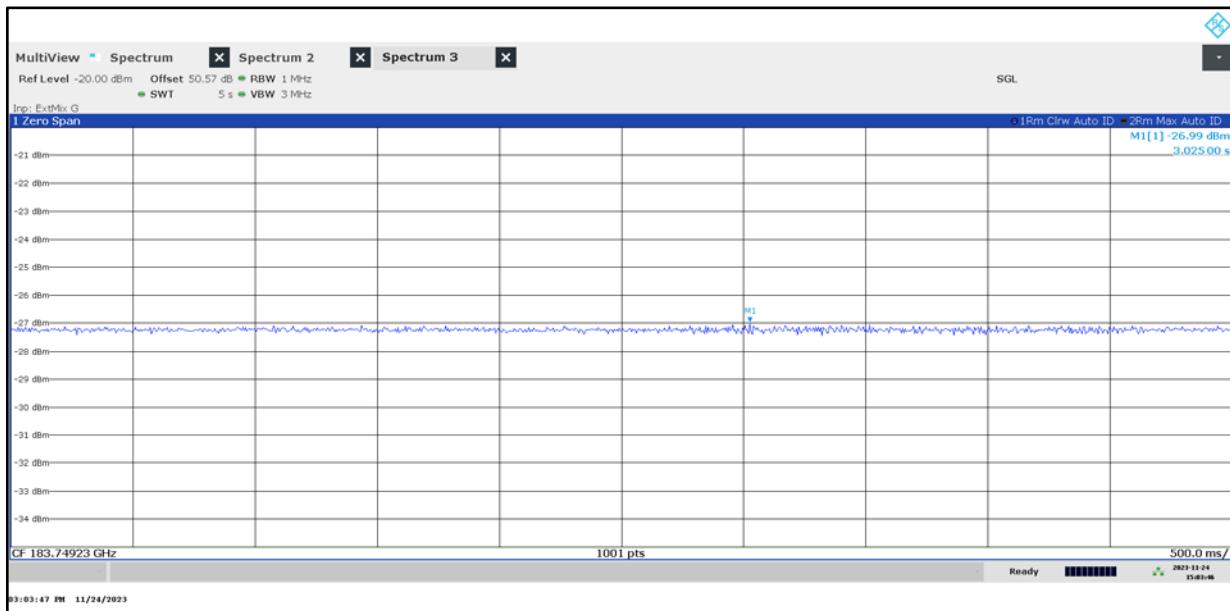
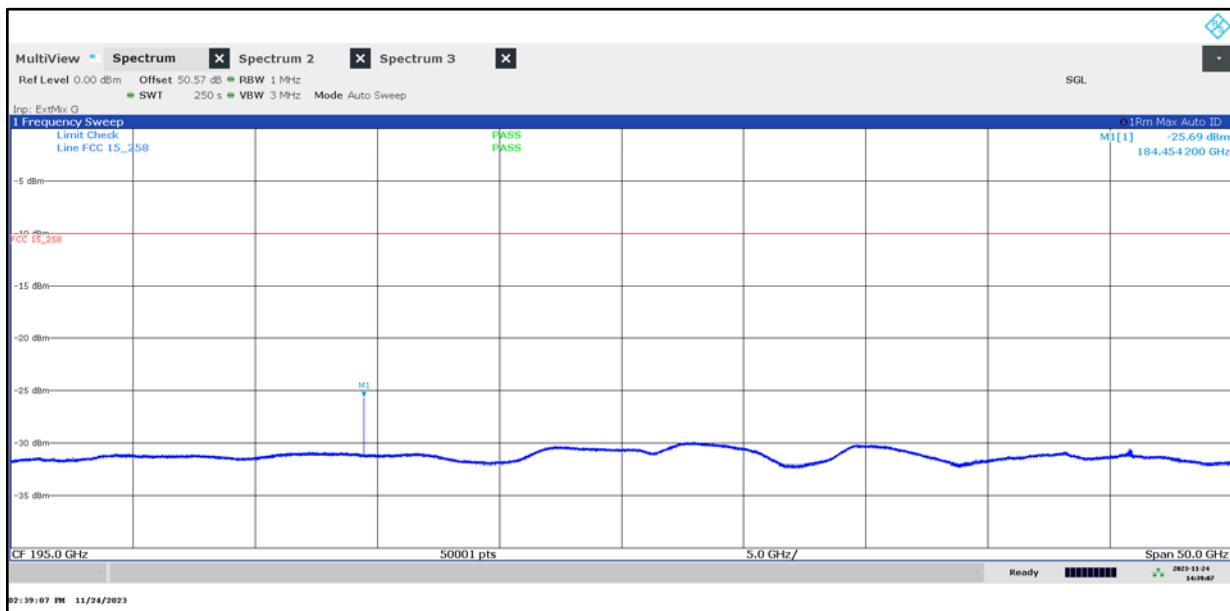
Plot 70: 150 GHz – 170 GHz, stop mode, middle frequency

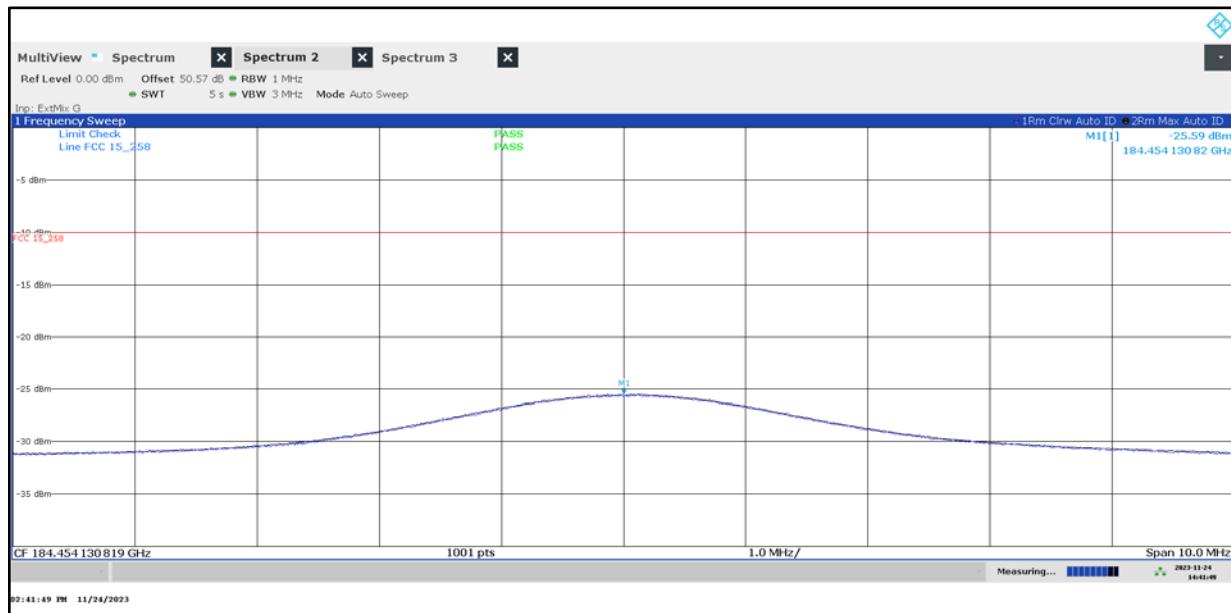
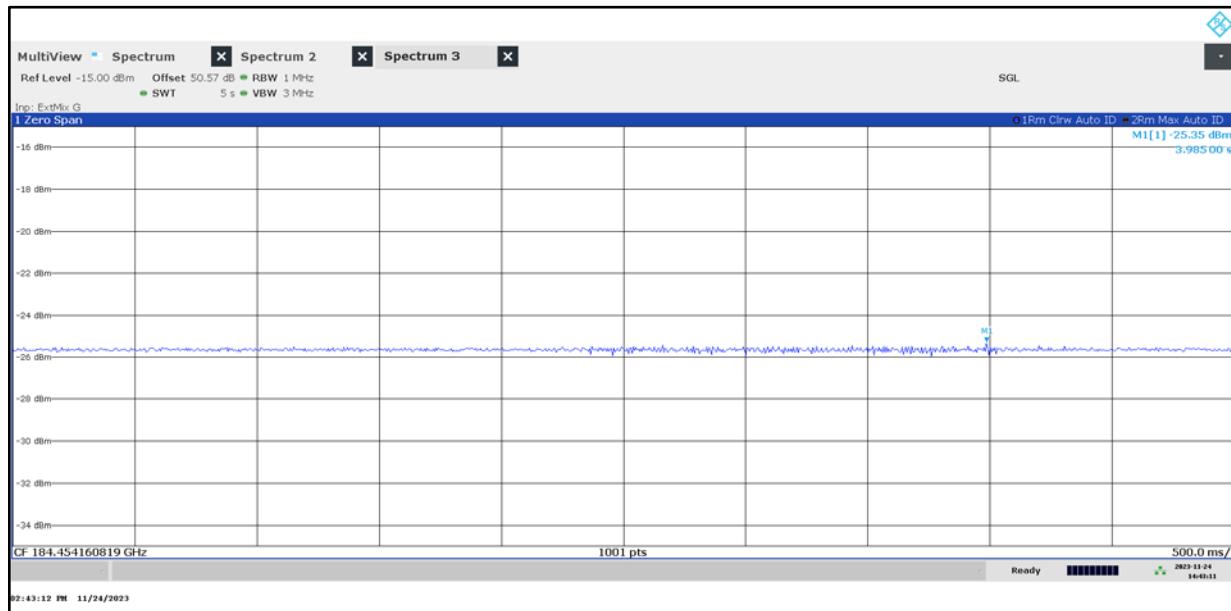


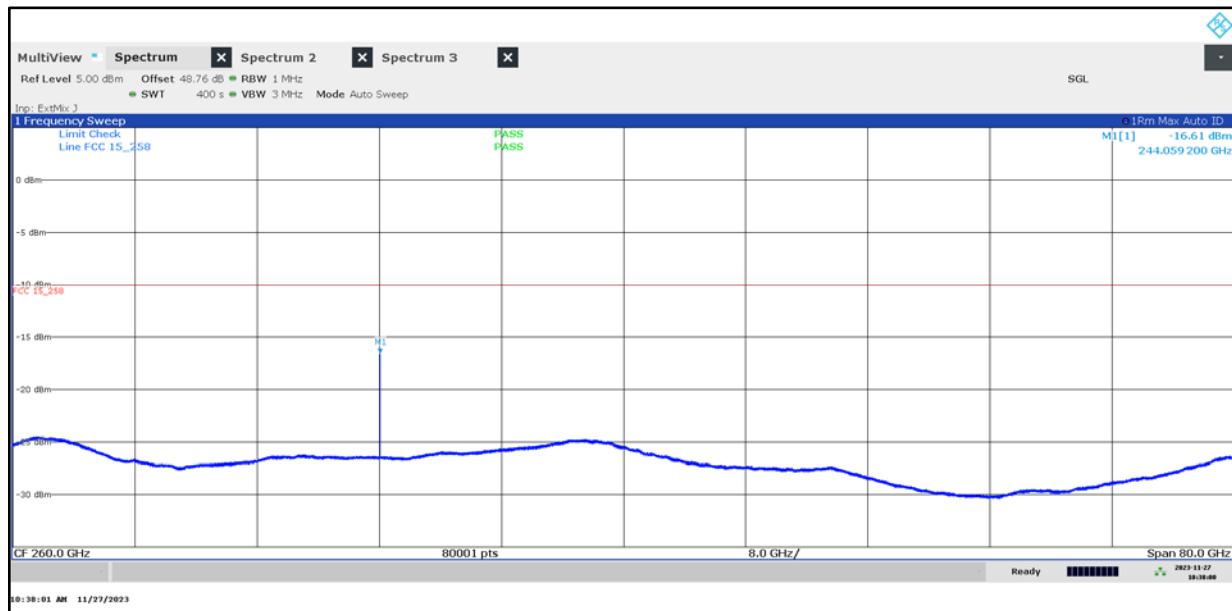
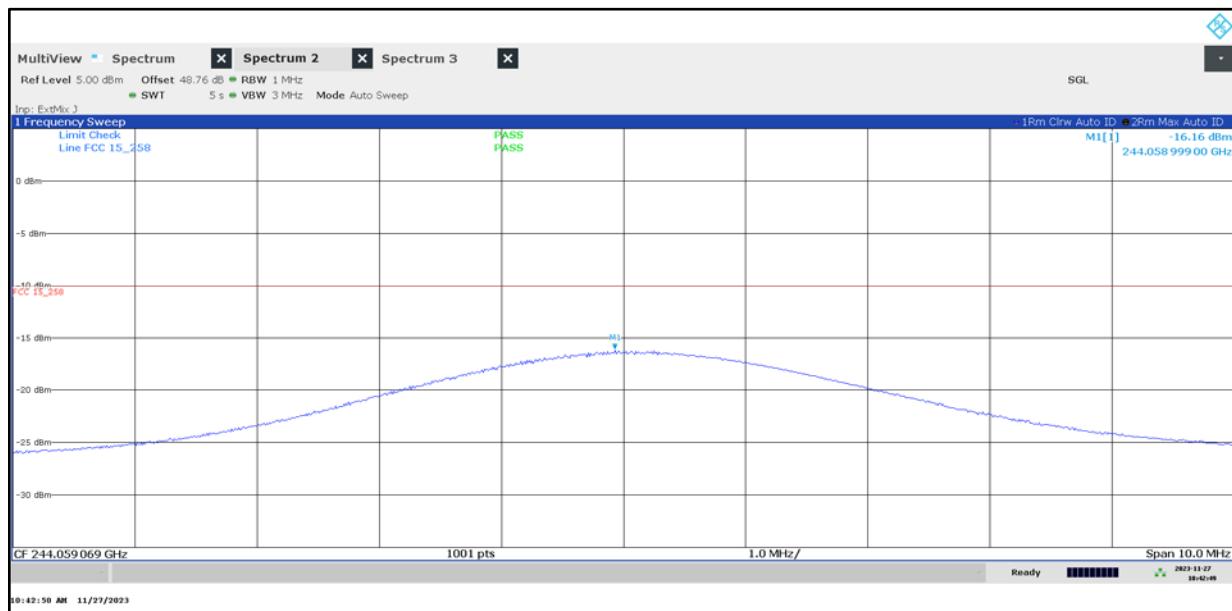
Plot 71: 150 GHz – 170 GHz, stop mode, high frequency

Plot 72: 170 GHz – 220 GHz, stop mode, low frequency


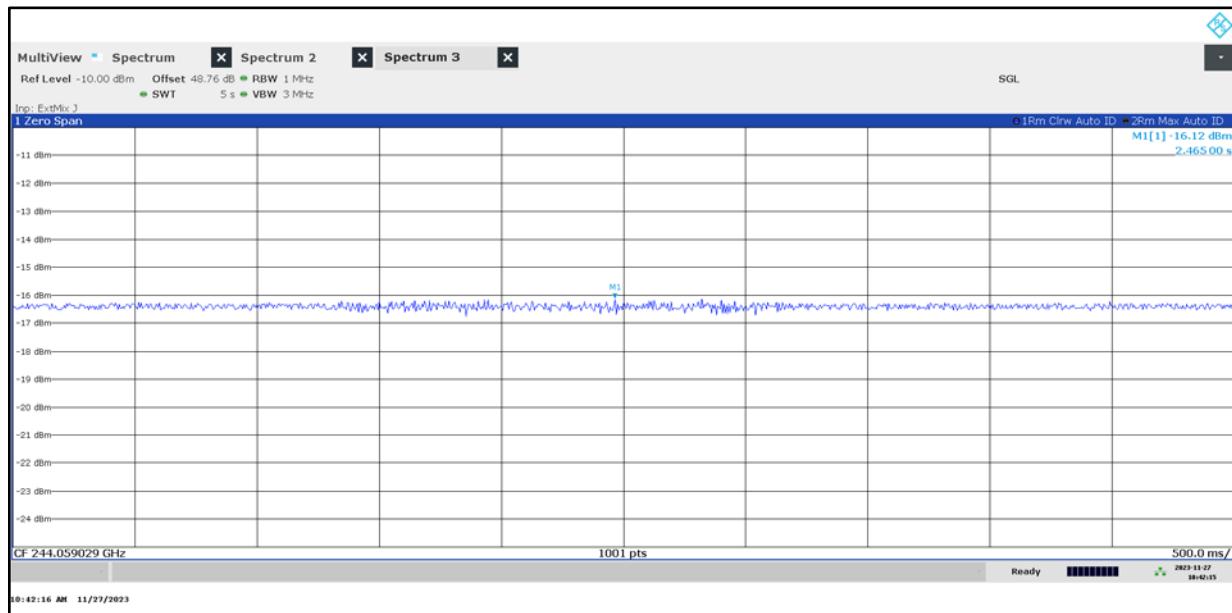
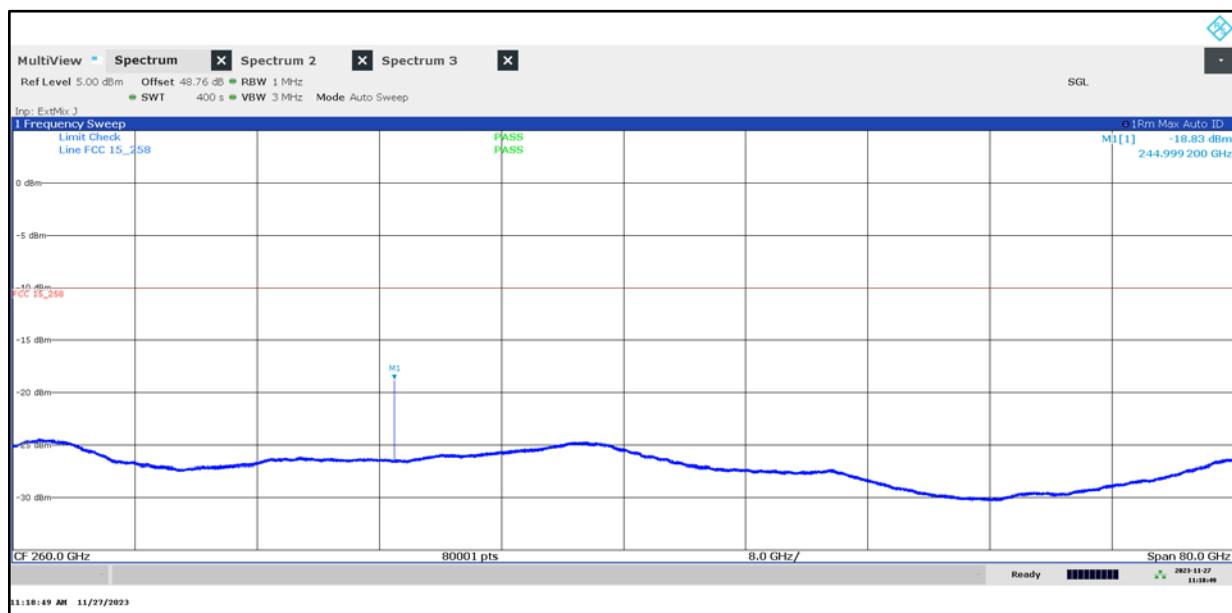
Plot 73: 183 GHz, stop mode, low frequency spurious emission 10MHz span

Plot 74: 183 GHz, stop mode, low frequency spurious emission zero span


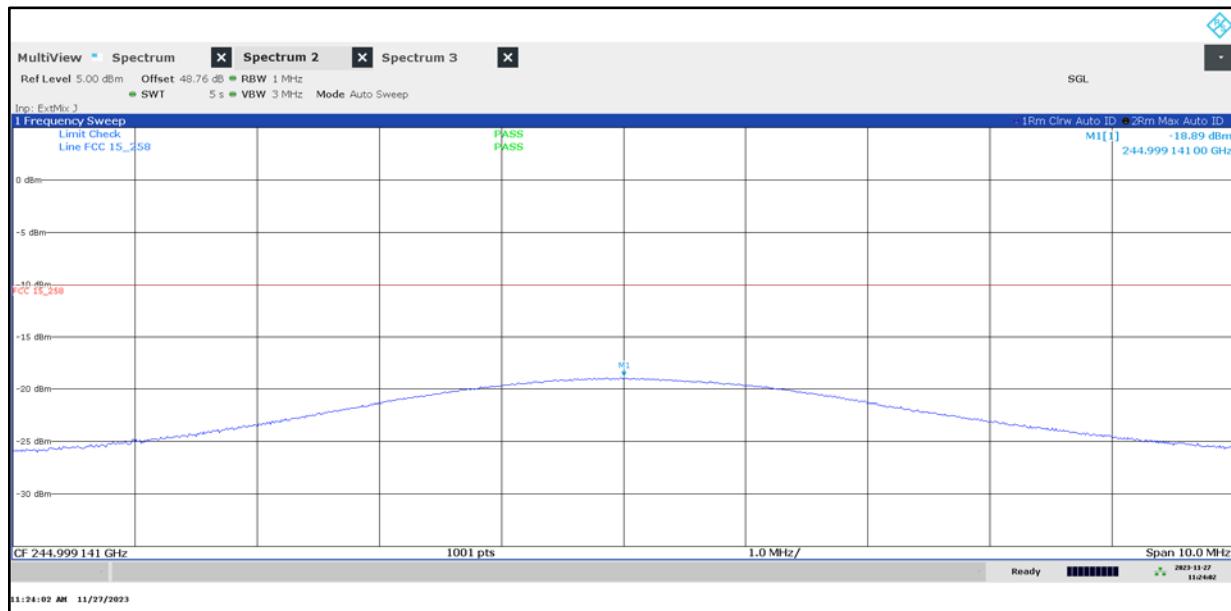
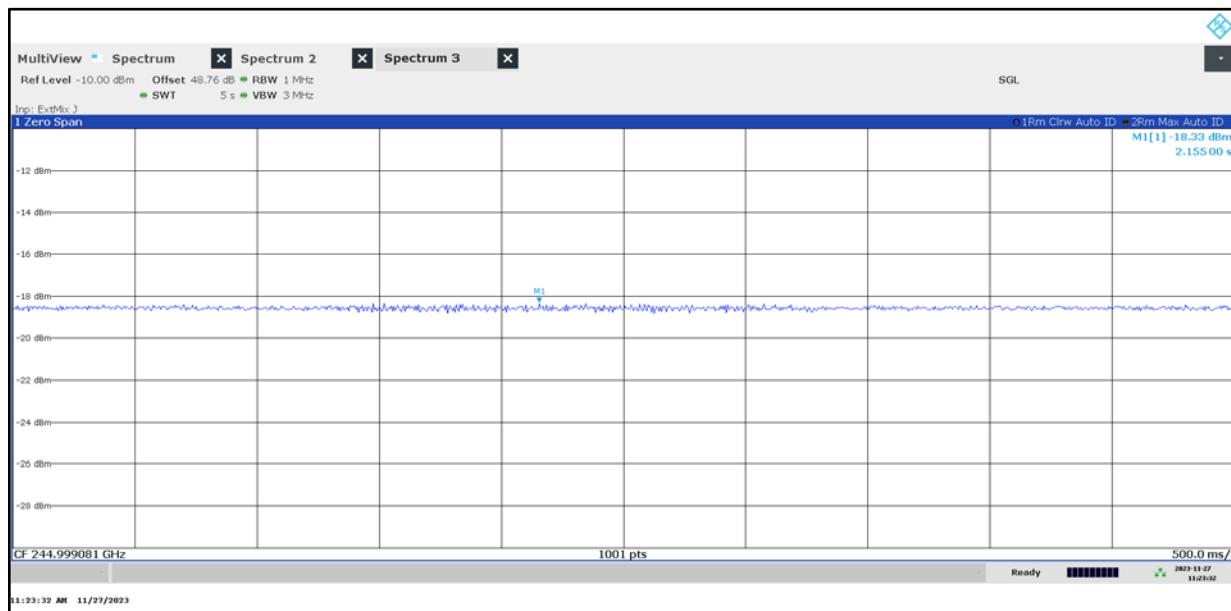
Plot 75: 170 GHz – 220 GHz, stop mode, middle frequency

Plot 76: 183 GHz, stop mode, middle frequency spurious emission 10MHz span


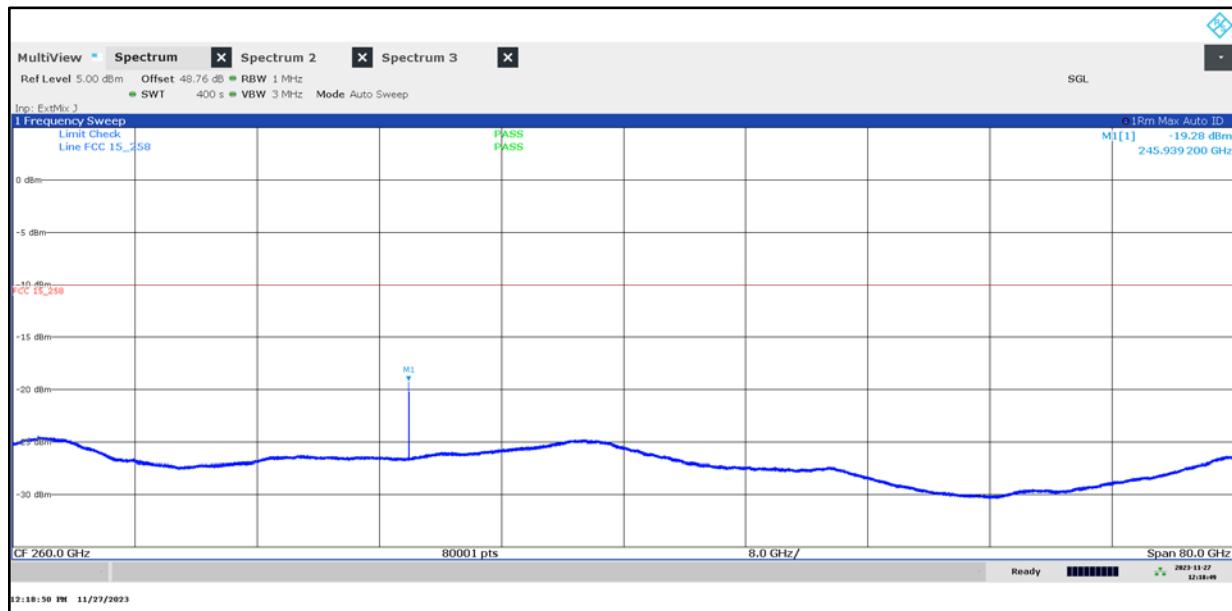
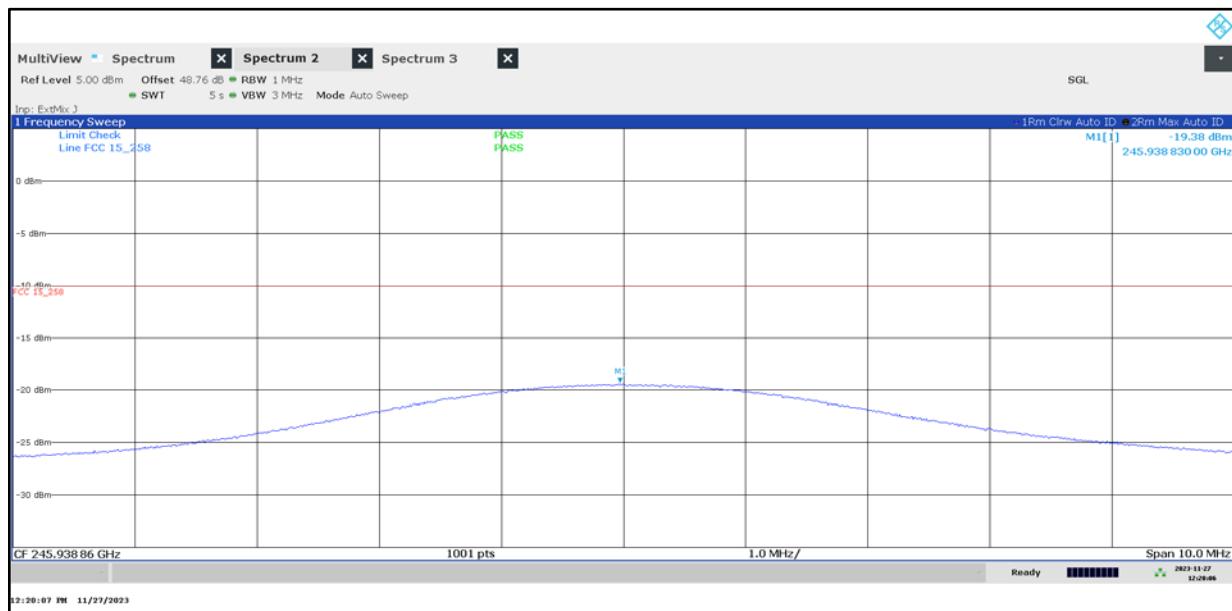
Plot 77: 183 GHz, stop mode, middle frequency spurious emission zero span

Plot 78: 170 GHz – 220 GHz, stop mode, high frequency


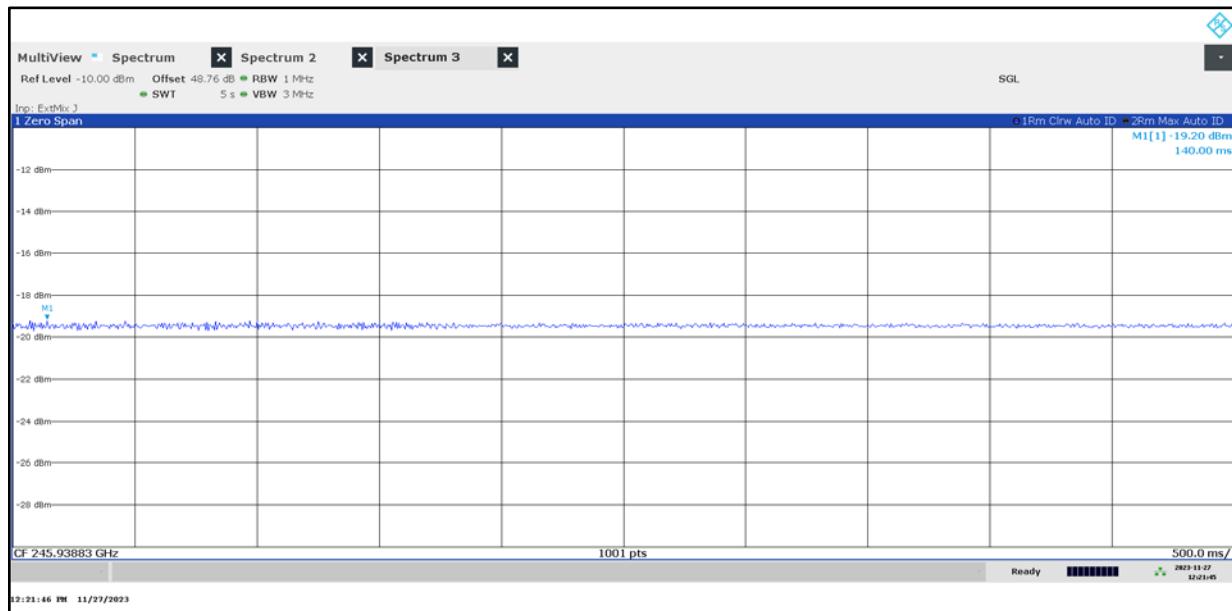
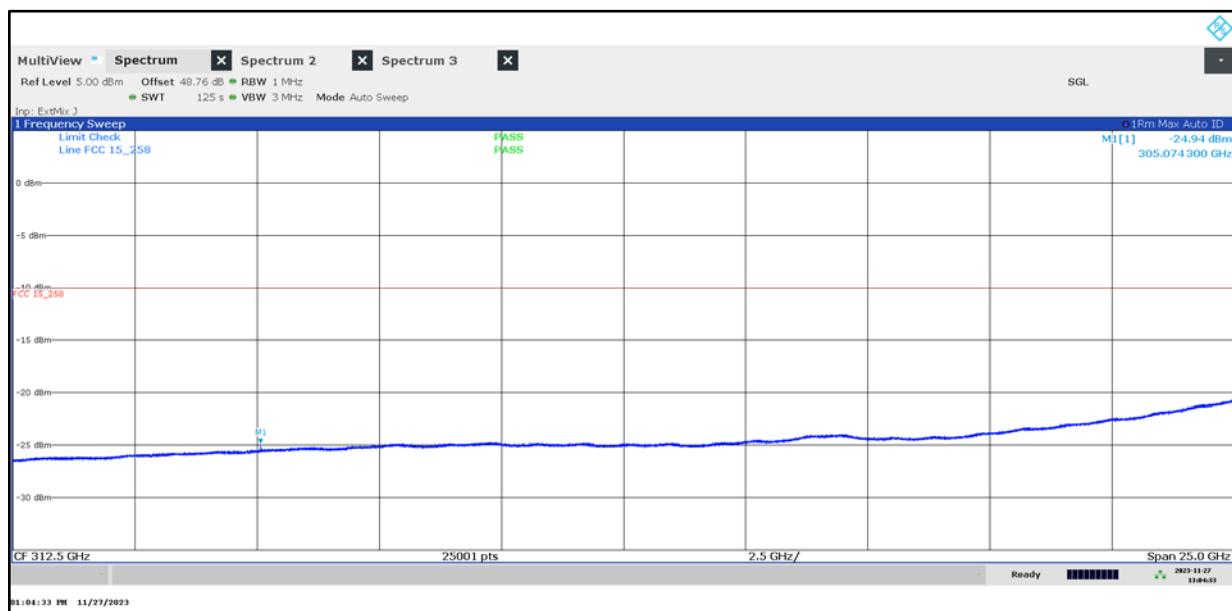
Plot 79: 184 GHz, stop mode, high frequency spurious emission 10MHz span

Plot 80: 184 GHz, stop mode, high frequency spurious emission 10MHz span


Plot 81: 220 GHz – 300 GHz, stop mode, low frequency

Plot 82: 244 GHz, stop mode, low frequency spurious emission 10MHz span


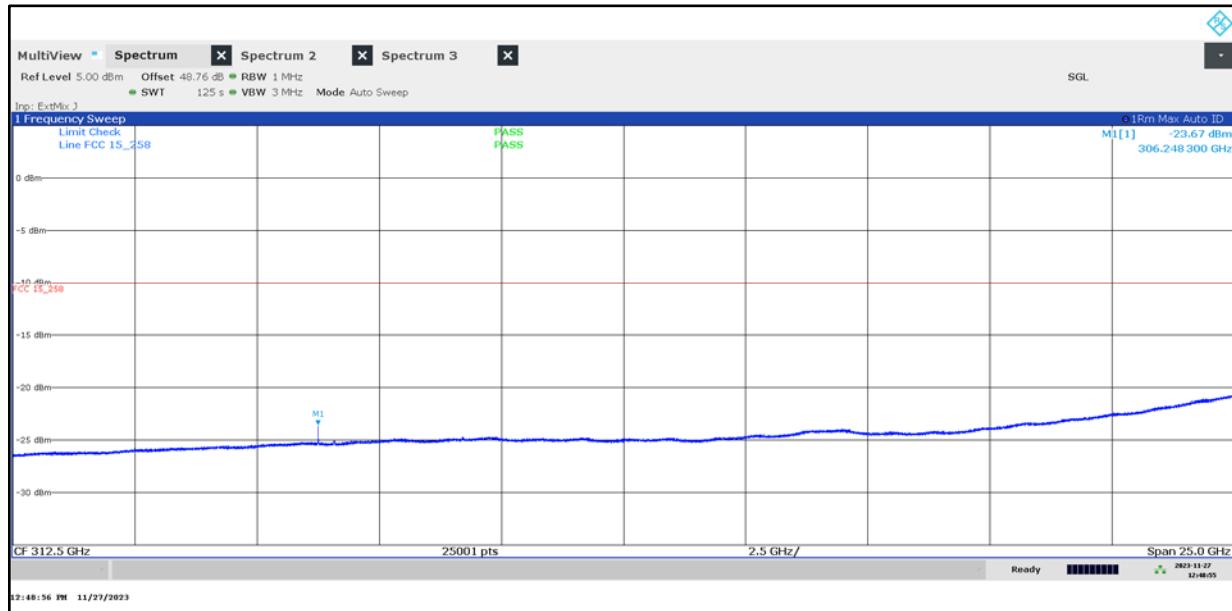
Plot 83: 244 GHz, stop mode, low frequency spurious emission zero span

Plot 84: 220 GHz – 300 GHz, stop mode, middle frequency


Plot 85: 244 GHz, stop mode, middle frequency spurious emission 10MHz span

Plot 86: 244 GHz, stop mode, middle frequency spurious emission zero span


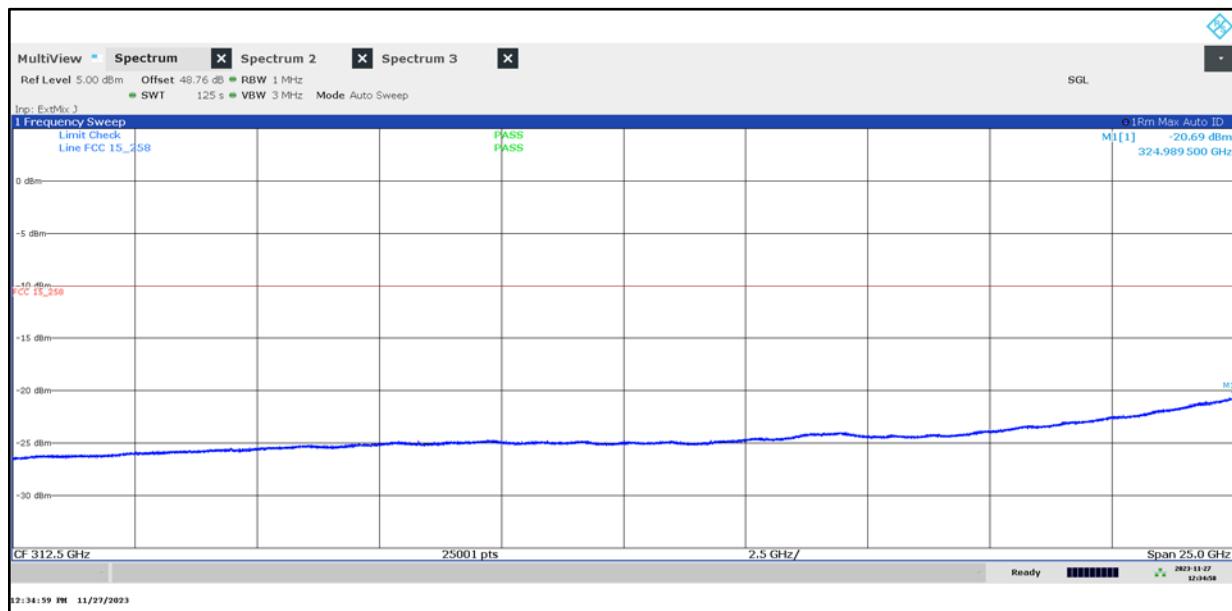
Plot 87: 220 GHz – 300 GHz, stop mode, high frequency

Plot 88: 245 GHz, stop mode, high frequency spurious emission 10MHz span


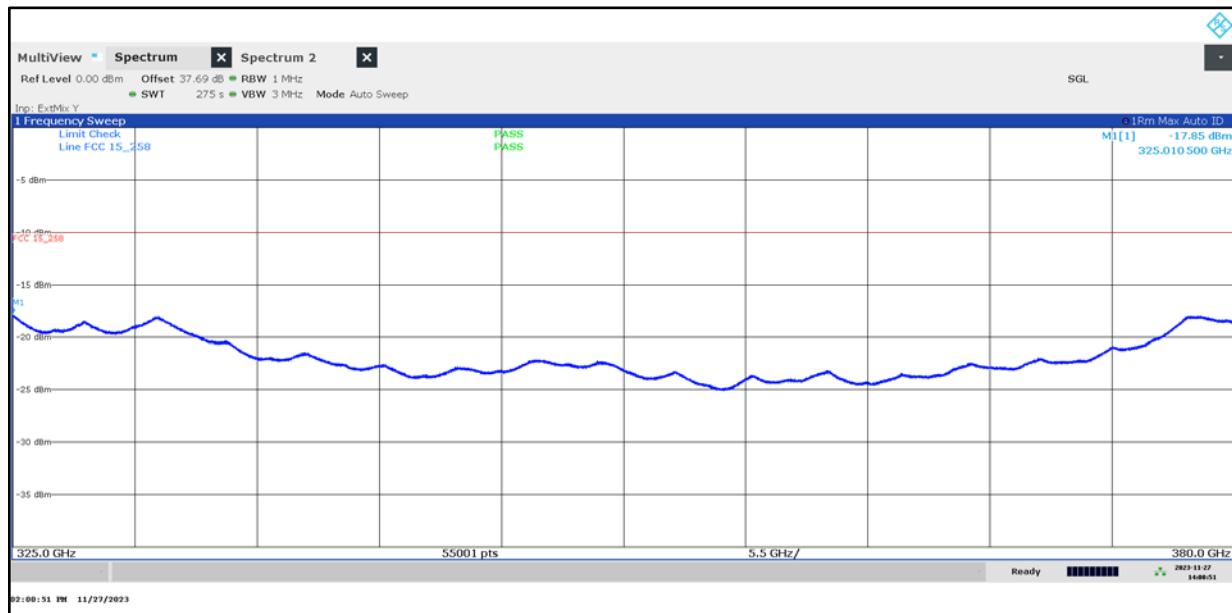
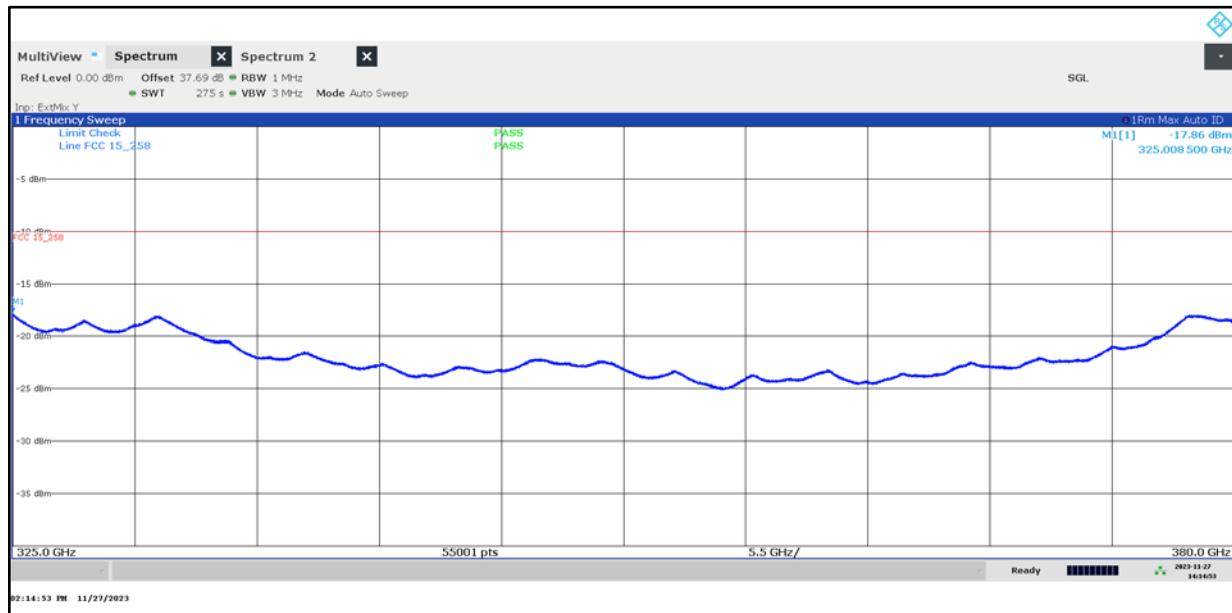
Plot 89: 245 GHz, stop mode, high frequency spurious emission zero span

Plot 90: 300 GHz – 325 GHz, stop mode, low frequency


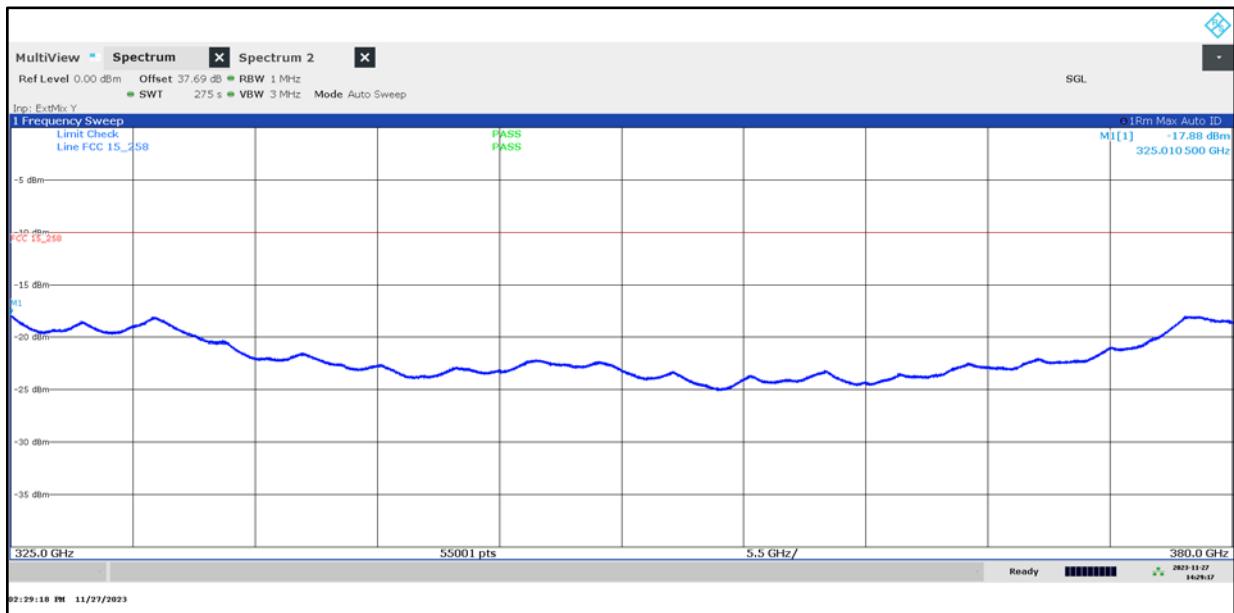
Plot 91: 300 GHz – 325 GHz, stop mode, middle frequency



Plot 92: 300 GHz – 325 GHz, stop mode, high frequency



Plot 93: 325 GHz – 380 GHz, stop mode, low frequency

Plot 94: 325 GHz – 380 GHz, stop mode, middle frequency


Plot 95: 325 GHz – 380 GHz, stop mode, high frequency

12.4 Frequency Stability

Description:

§15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

§15.258 (d)

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

Limits:

FCC
CFR Part 15.258
The occupied bandwidth from intentional radiators operated within the specified frequency band shall comply with the following:
Frequency range
116 GHz – 123 GHz

Measurement:

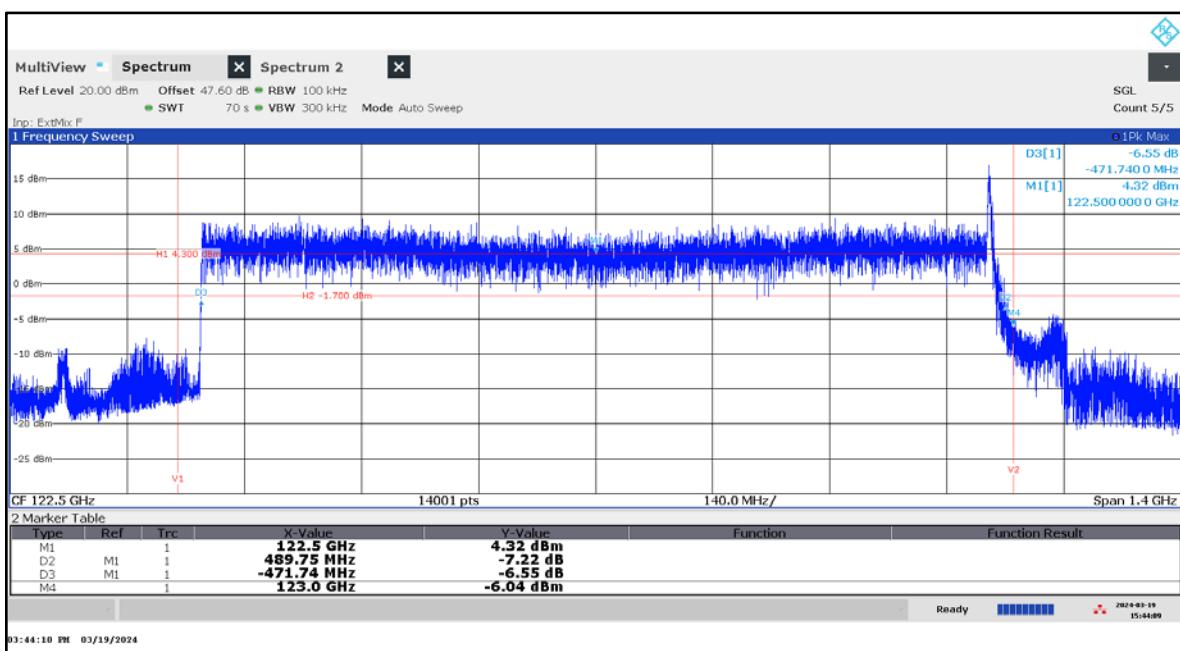
Measurement parameter	
Detector:	Pos-Peak
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Trace-Mode:	Max Hold

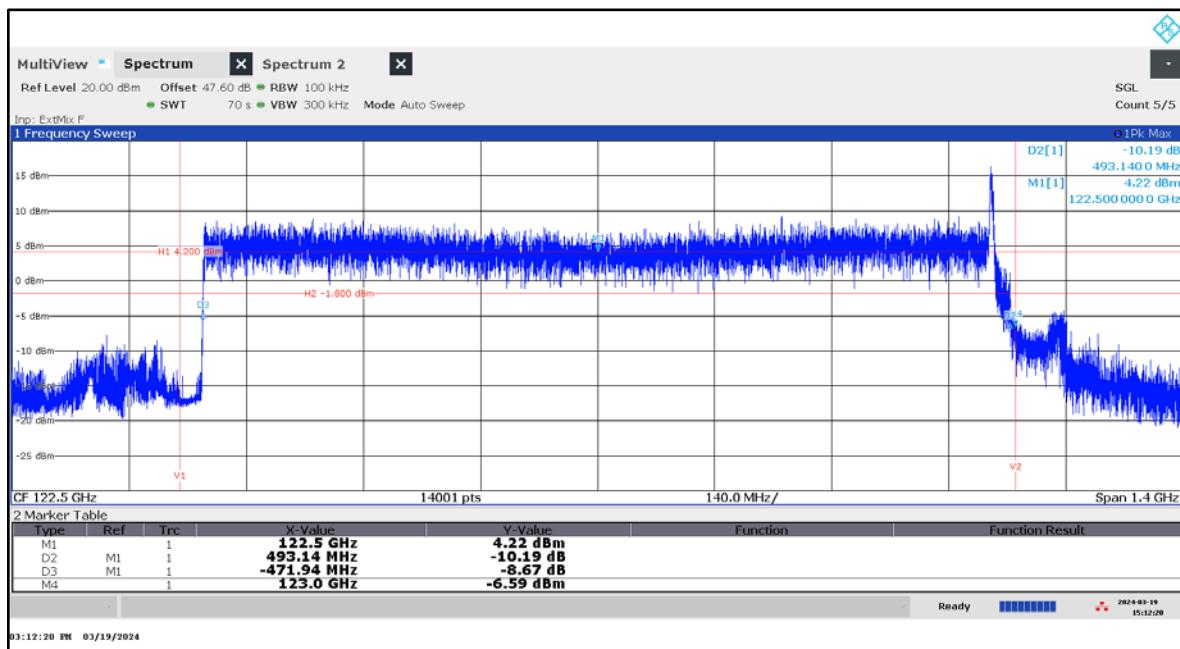
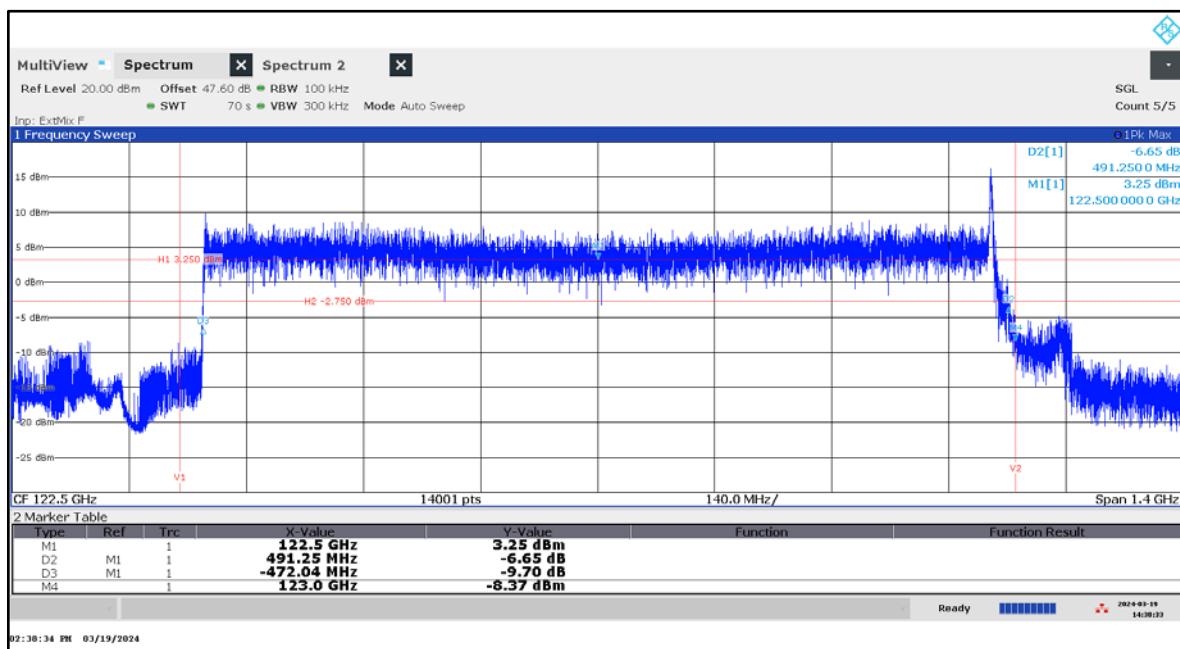
Note:

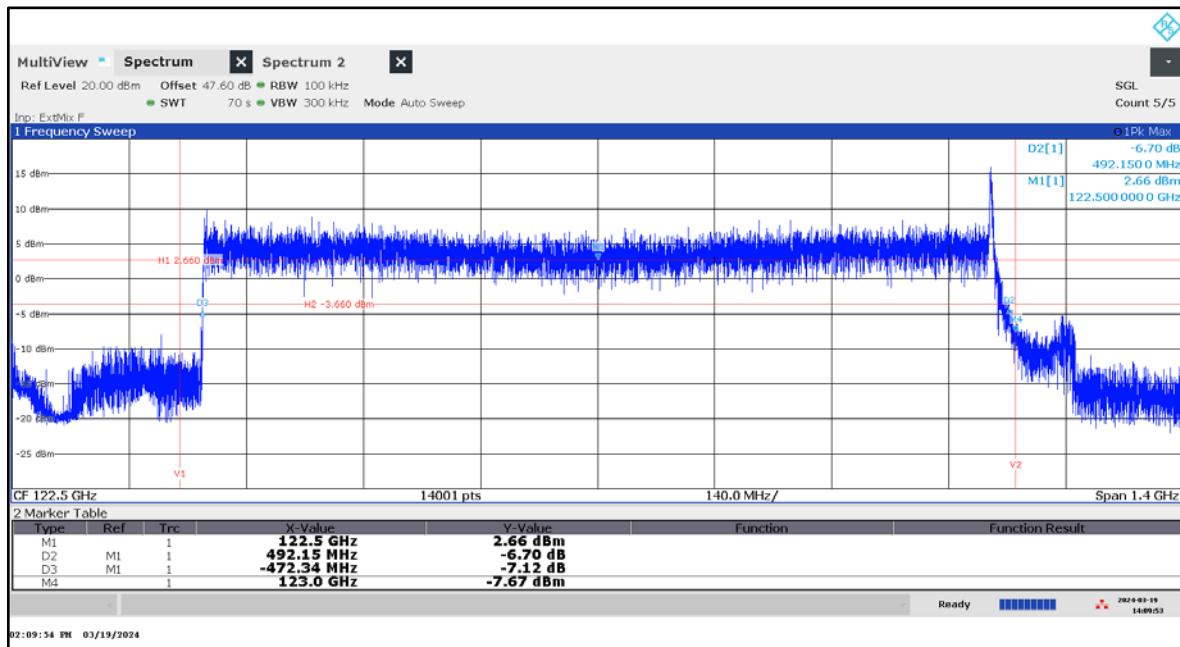
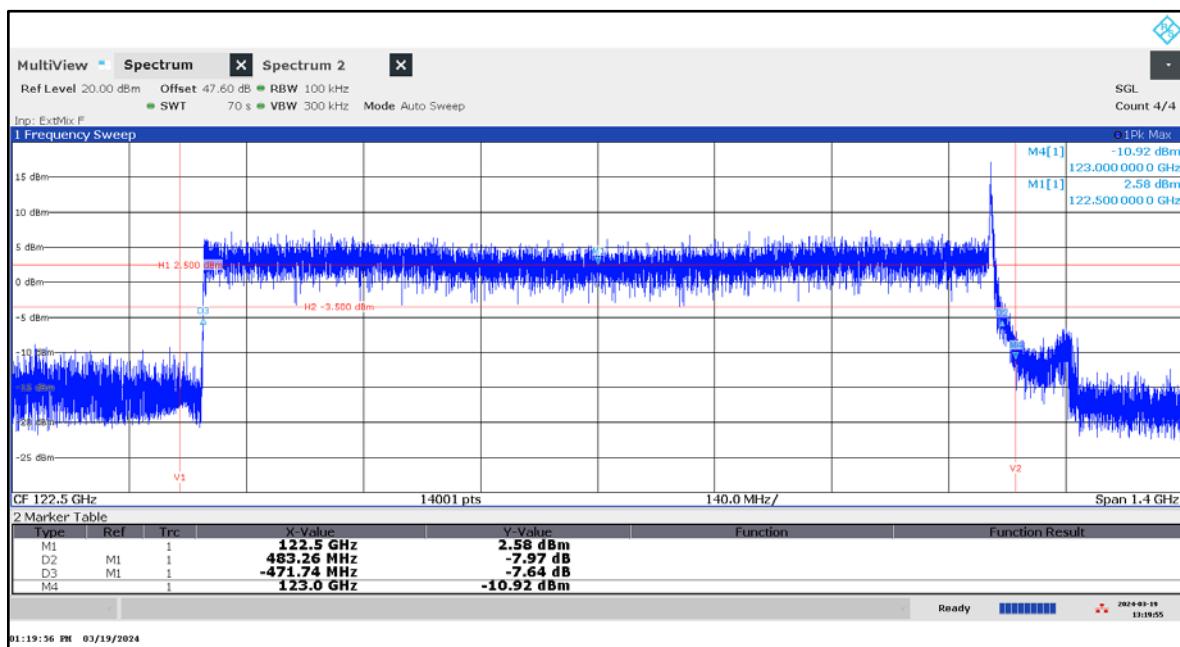
- Bandwidth measured regarding to chapter 12.1

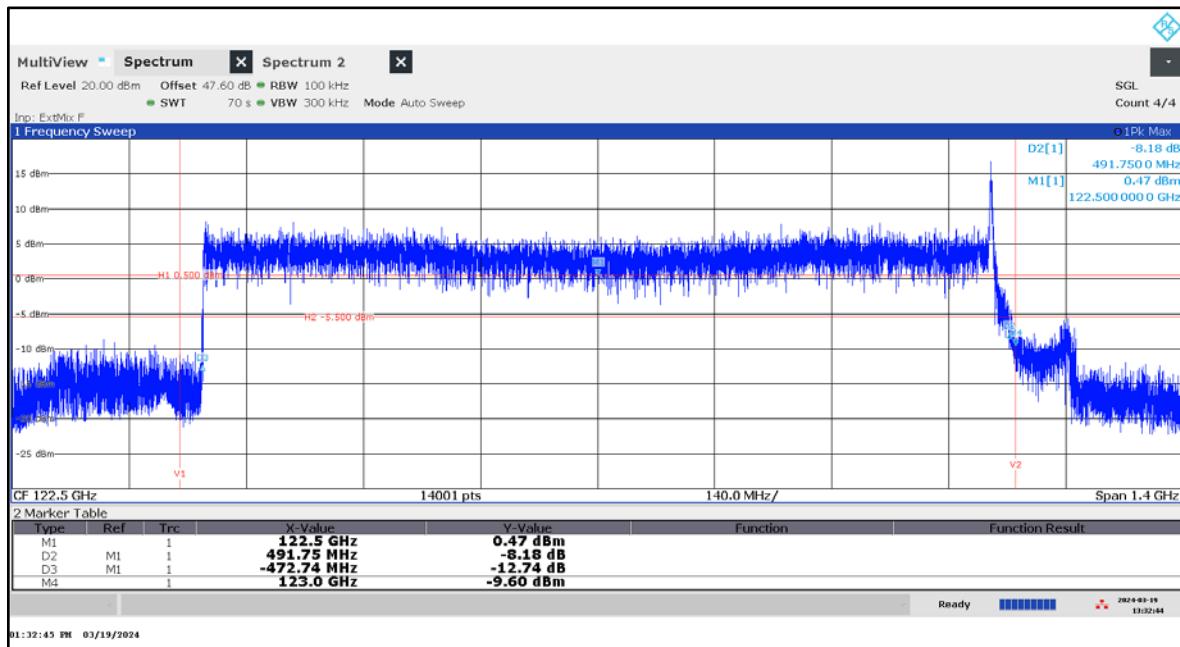
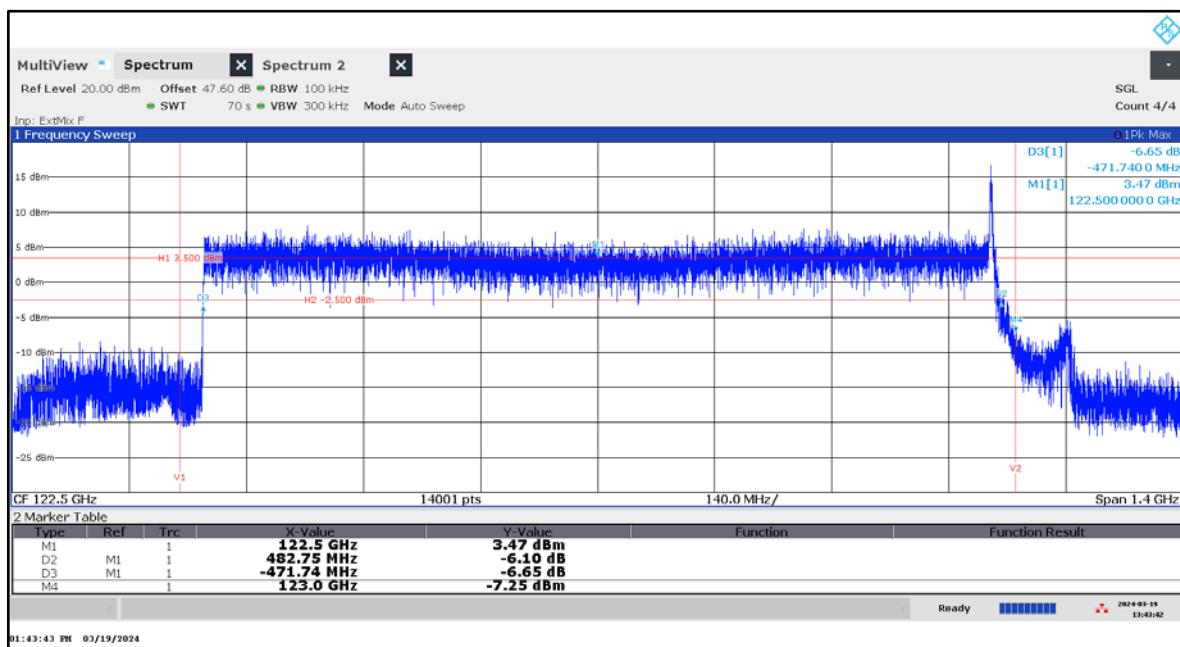
Measurement results:

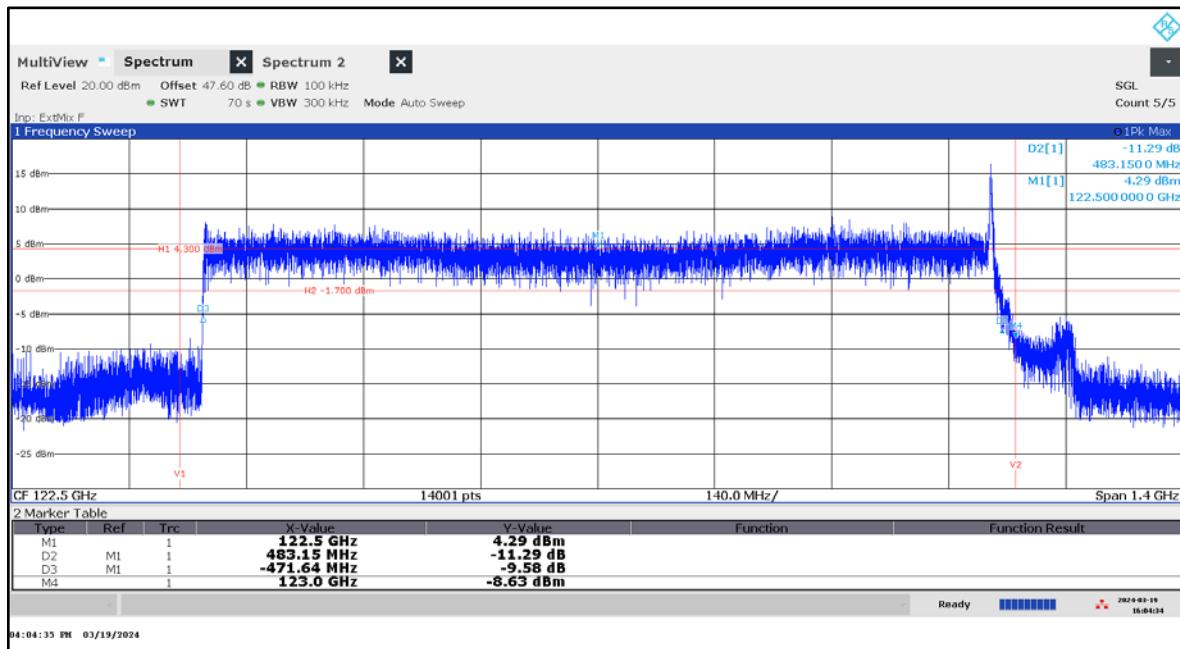
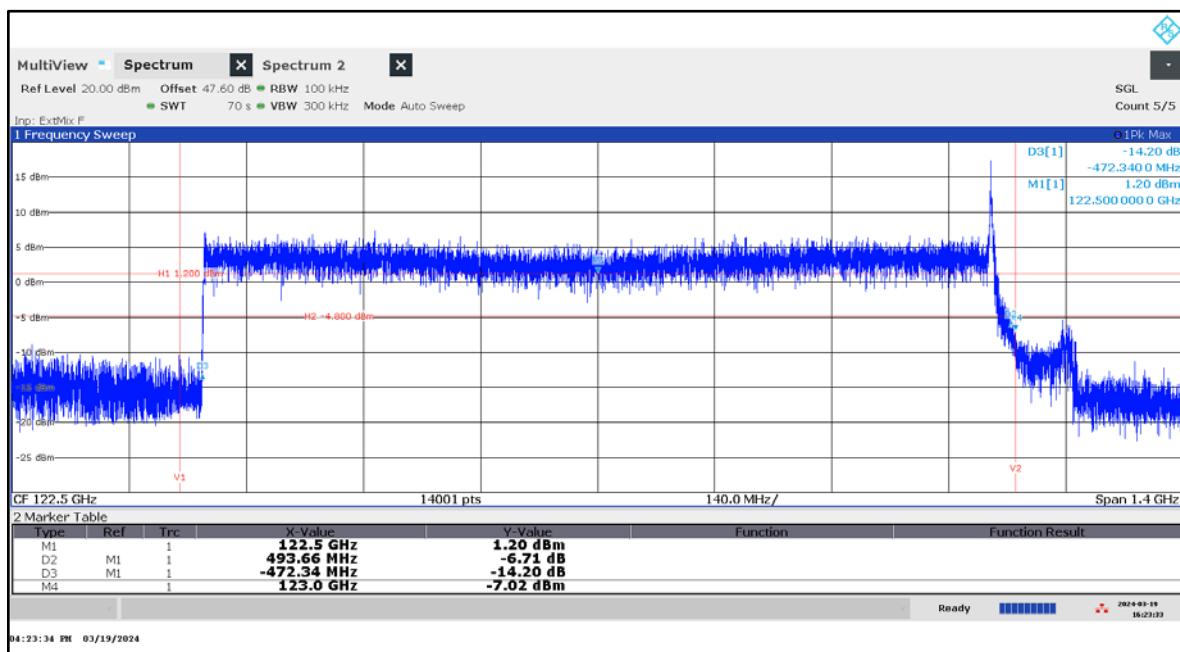
Test condition	Frequency f_L [GHz]	Frequency f_H [GHz]	Bandwidth [GHz]
-20 °C / V_{nom}	122.0283	122.9897	0.9614
-10 °C / V_{nom}	122.0281	122.9931	0.9650
0 °C / V_{nom}	122.0280	122.9912	0.9632
10 °C / V_{nom}	122.0277	122.9922	0.9645
20 °C / V_{nom}	122.0283	122.9832	0.9549
20 °C / V_{min}	122.0273	122.9917	0.9644
20 °C / V_{max}	122.0283	122.9827	0.9544
30 °C / V_{nom}	122.0284	122.9831	0.9547
40 °C / V_{nom}	122.0277	122.9936	0.9659
50 °C / V_{nom}	122.0285	122.9924	0.9639

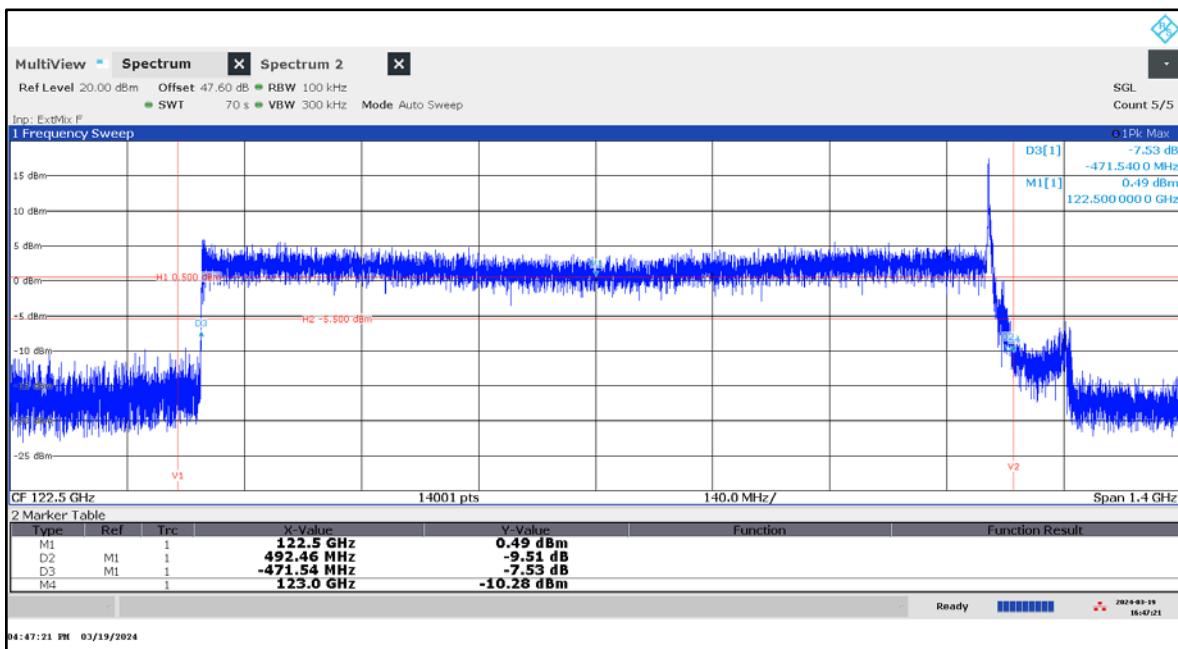
Plot 96: Frequency Stability for T = -20°C and V_{nom} 

Plot 97: Frequency Stability for T = -10°C and V_{nom}

Plot 98: Frequency Stability for T = 0°C and V_{nom}


Plot 99: Frequency Stability for T = 10°C and V_{nom}

Plot 100: Frequency Stability for T = 20°C and V_{nom}


Plot 101: Frequency Stability for T = 20°C and V_{min}

Plot 102: Frequency Stability for T = 20°C and V_{max}


Plot 103: Frequency Stability for T = 30°C and V_{nom}

Plot 104: Frequency Stability for T = 40°C and V_{nom}


Plot 105: Frequency Stability for T = 50°C and V_{nom}


12.5 Conducted emissions < 30 MHz (AC power line)

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Limits and provisions:

§15.207(a):

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

§15.207(c):

Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Measurement:

Parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Measurement results:

The device only employs battery power for operation (as declared by manufacturer).

Verdict: Not applicable

13 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N₀	Carrier to noise-density ratio, expressed in dB-Hz

14 Document history

Version	Applied changes	Date of release
-/-	Initial release - DRAFT	2024-05-07

END OF TEST REPORT