

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 12.5 kHz, GMSK, 8000 bps

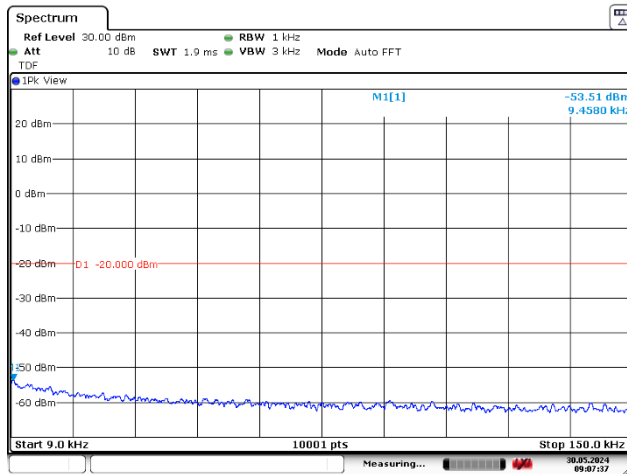


Figure 80: 9 – 150 kHz

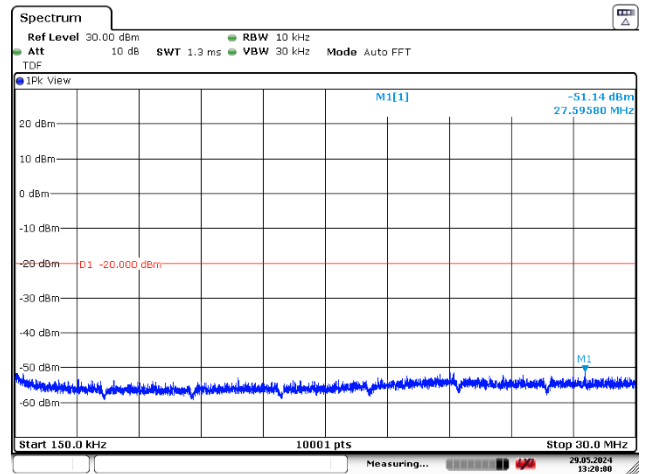


Figure 81: 150 kHz – 30 MHz

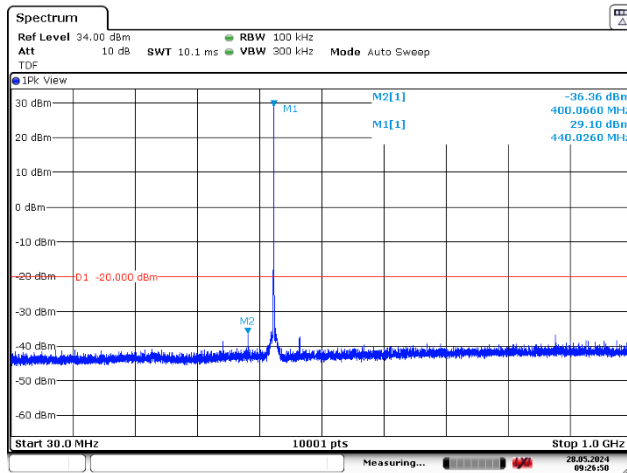


Figure 82: 30 – 1000 MHz

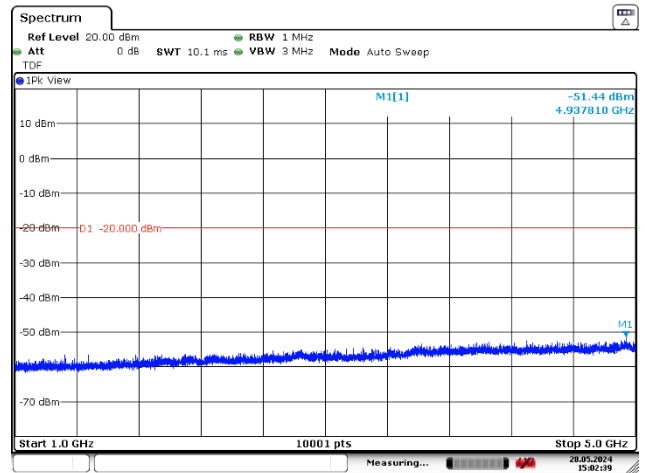


Figure 83: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 12.5 kHz, GMSK, 9600 bps

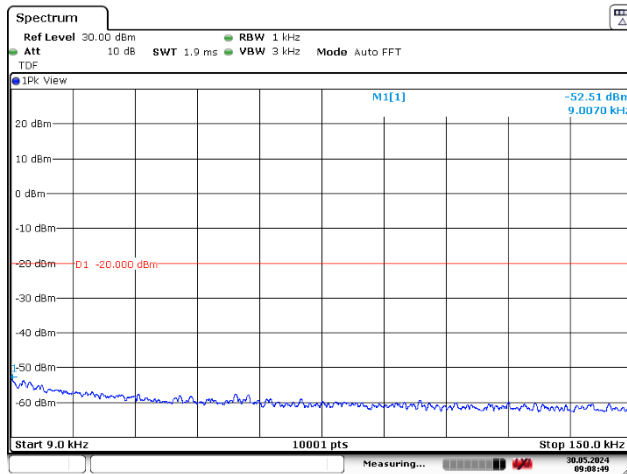


Figure 84: 9 – 150 kHz

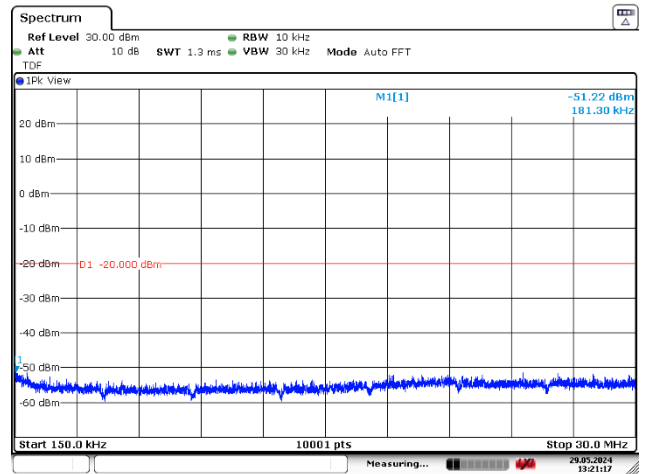


Figure 85: 150 kHz – 30 MHz

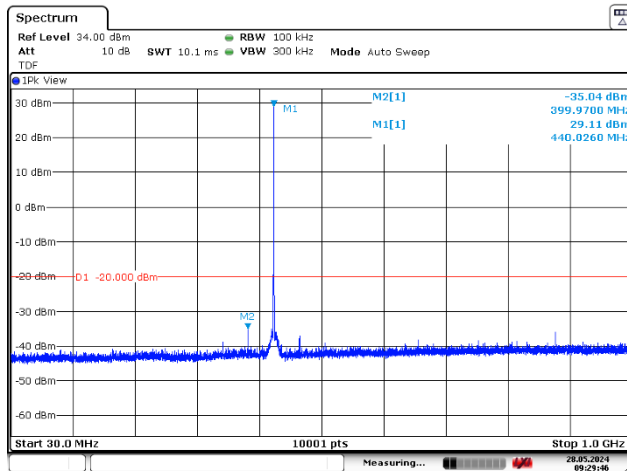


Figure 86: 30 – 1000 MHz

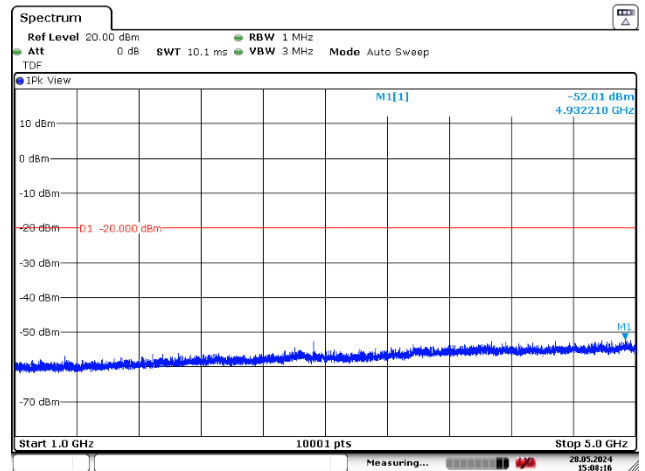


Figure 87: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 12.5 kHz, 4FSK, 9600 bps

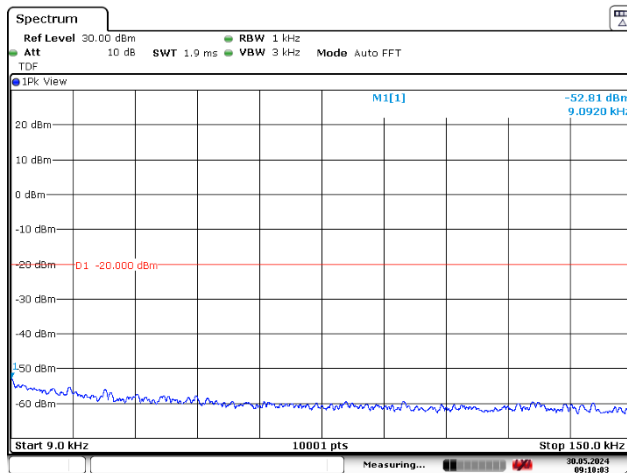


Figure 88: 9 – 150 kHz

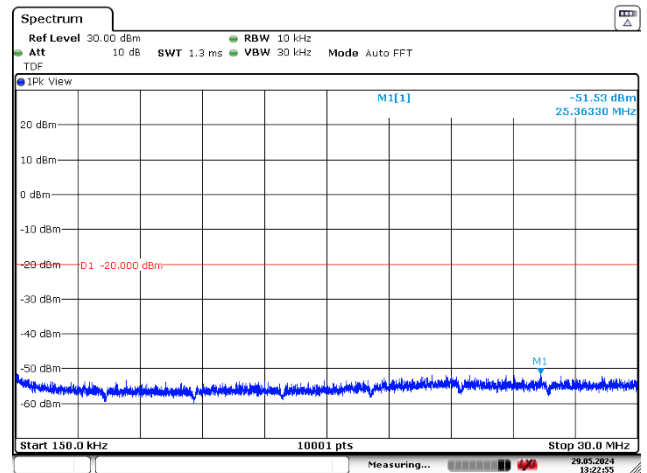


Figure 89: 150 kHz – 30 MHz

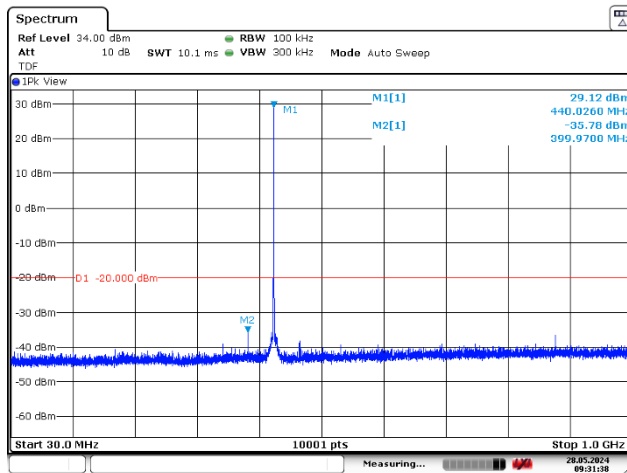


Figure 90: 30 – 1000 MHz

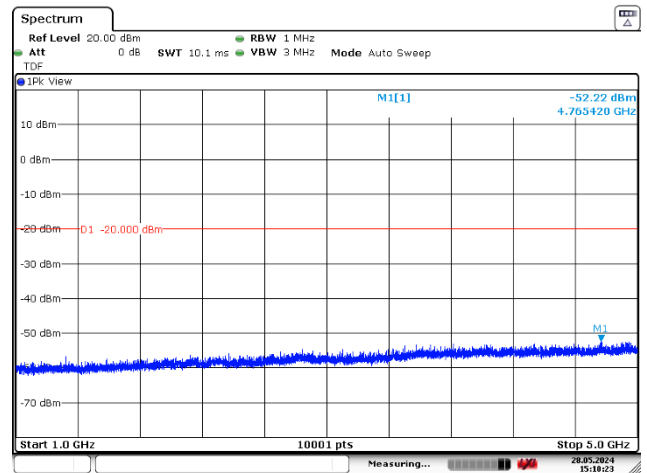


Figure 91: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 25 kHz, GMSK, 4800 bps

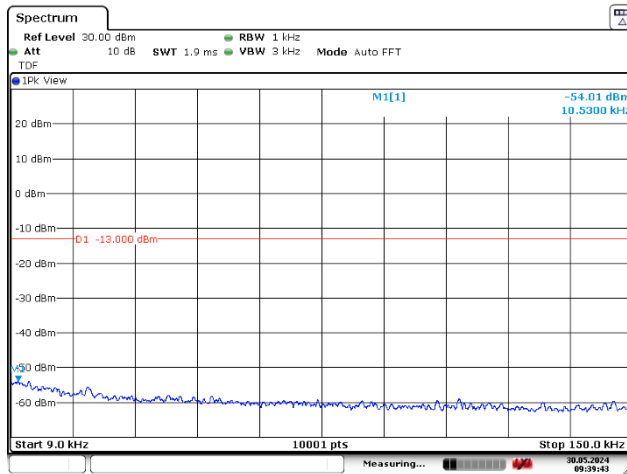


Figure 92: 9 – 150 kHz

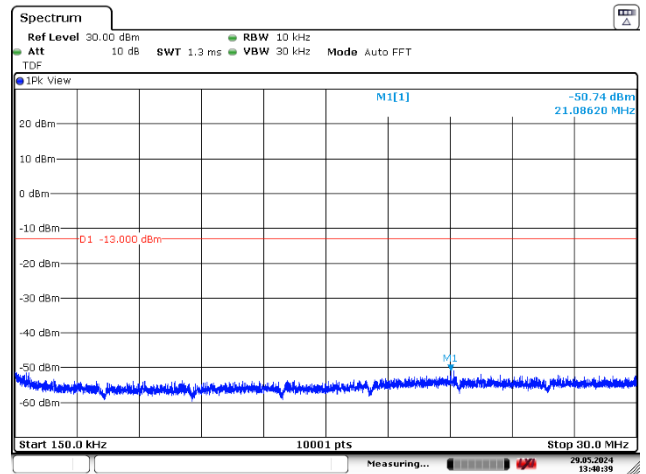


Figure 93: 150 kHz – 30 MHz

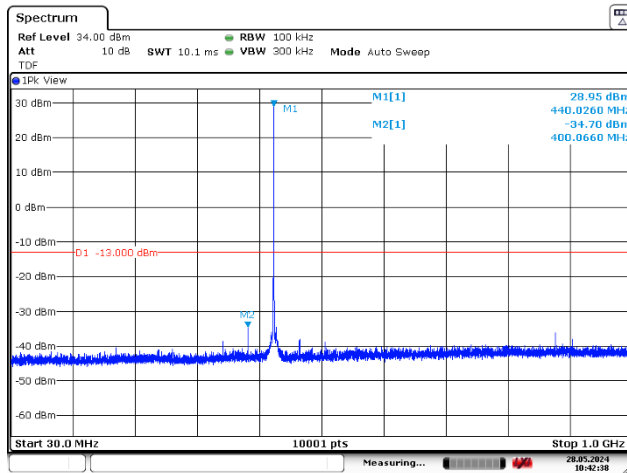


Figure 94: 30 – 1000 MHz

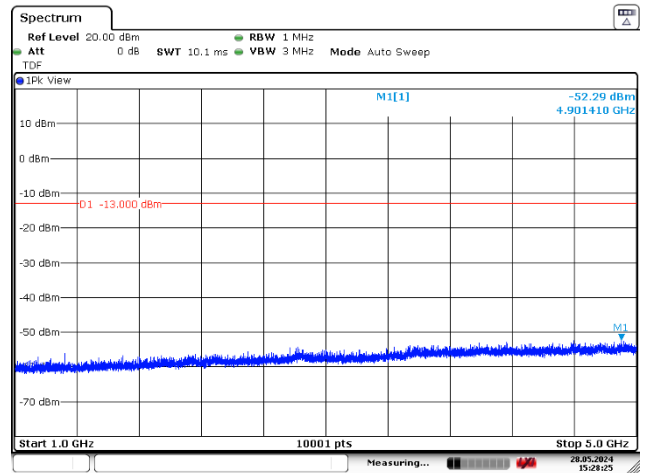


Figure 95: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 25 kHz, GMSK, 9600 bps

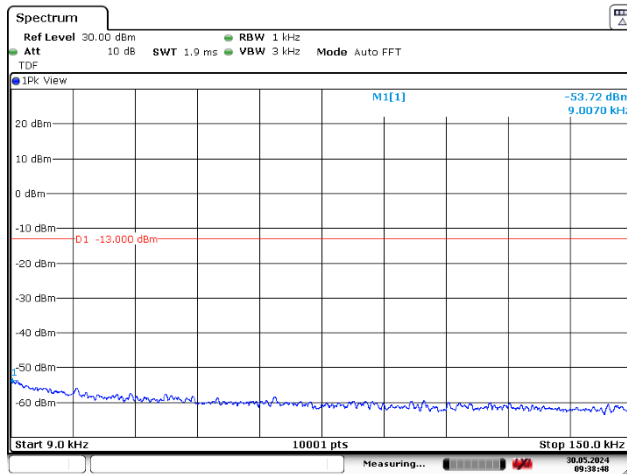


Figure 96: 9 – 150 kHz

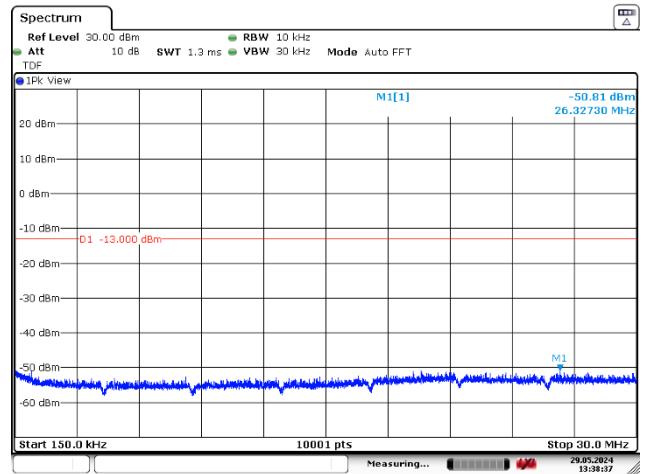


Figure 97: 150 kHz – 30 MHz

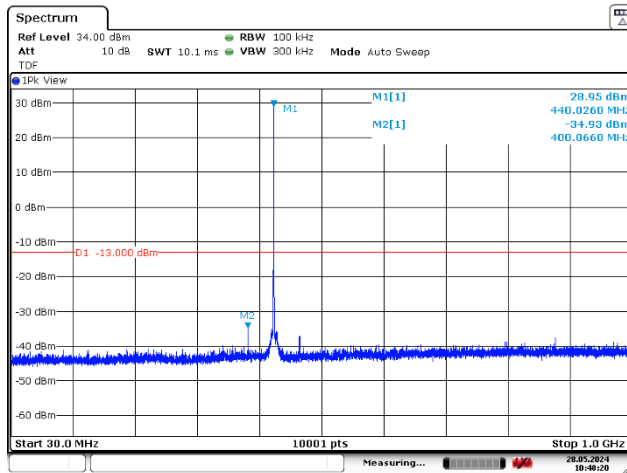


Figure 98: 30 – 1000 MHz

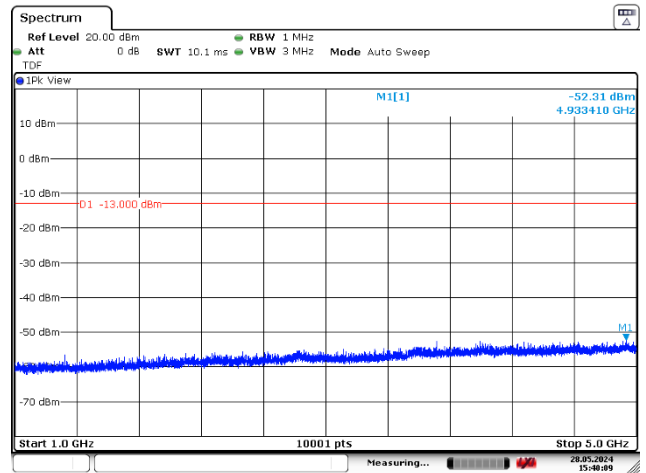


Figure 99: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 25 kHz, GMSK, 16000 bps

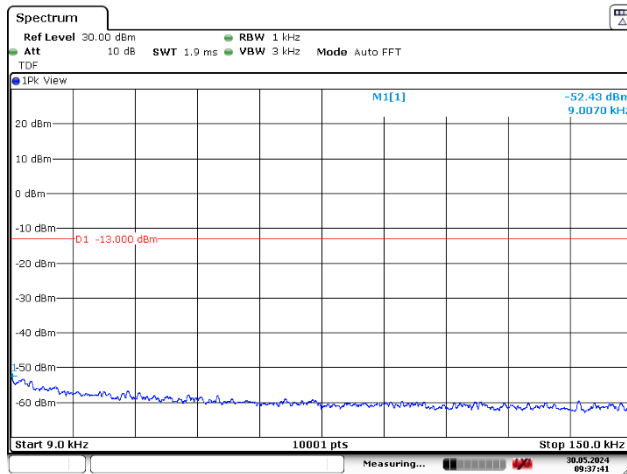


Figure 100: 9 – 150 kHz

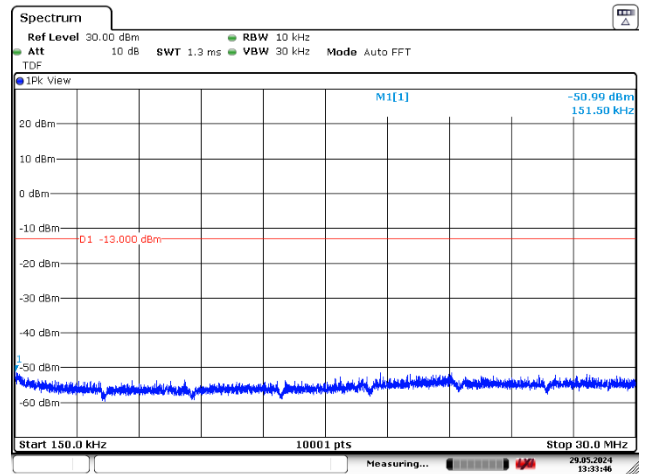


Figure 101: 150 kHz – 30 MHz

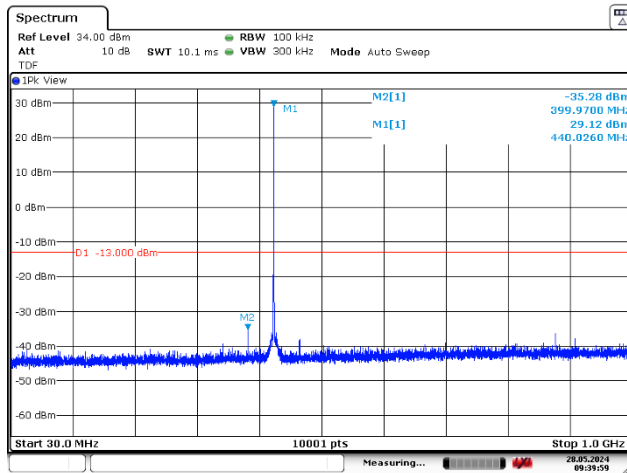


Figure 102: 30 – 1000 MHz

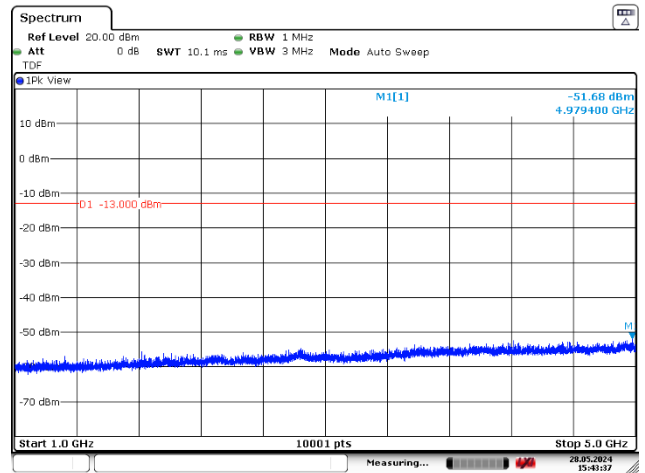


Figure 103: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 25 kHz, GMSK, 19200 bps

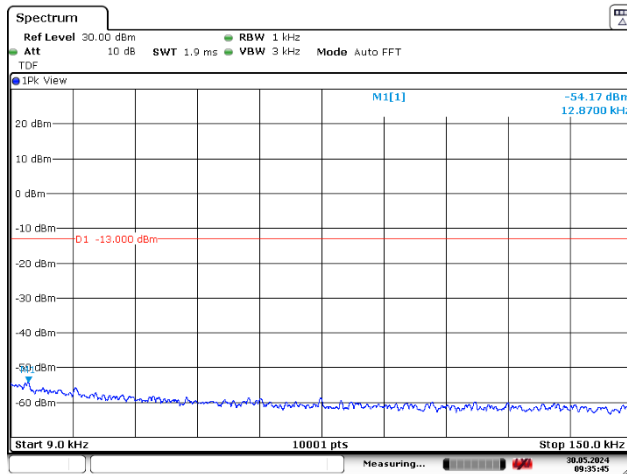


Figure 104: 9 – 150 kHz

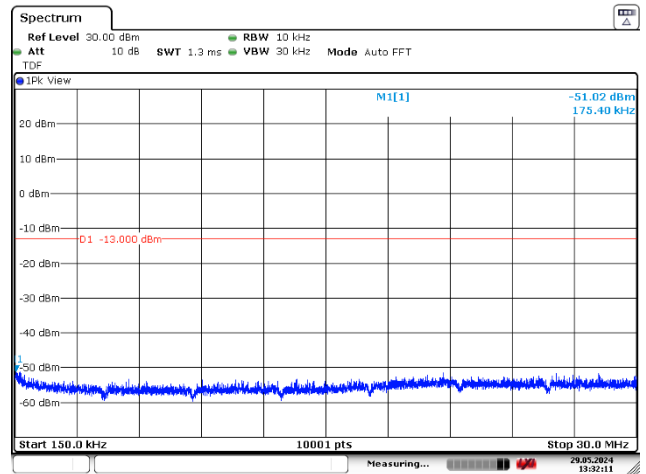


Figure 105: 150 kHz – 30 MHz

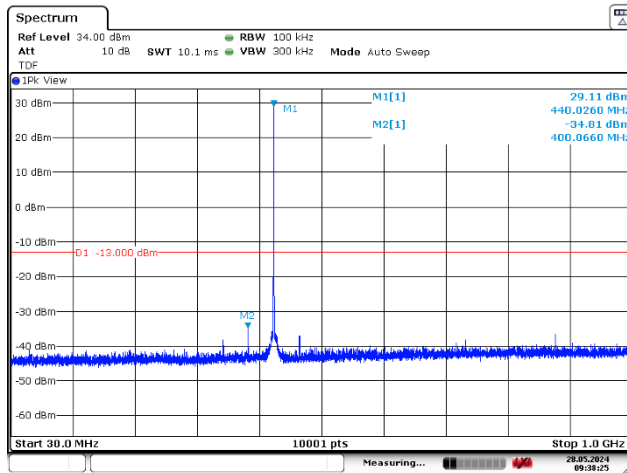


Figure 106: 30 – 1000 MHz

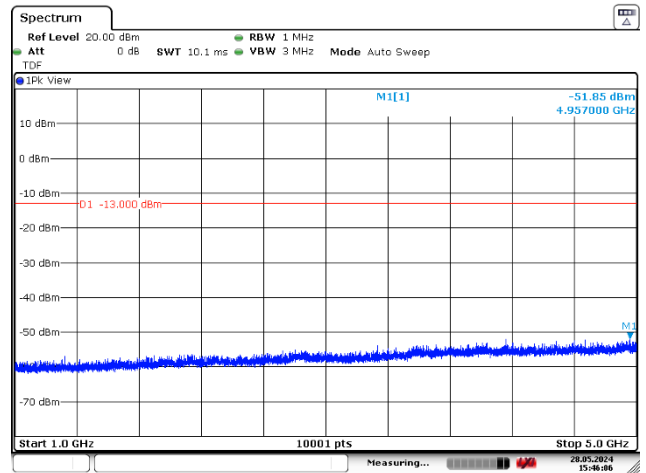


Figure 107: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 440.0 MHz, 25 kHz, 4FSK, 19200 bps

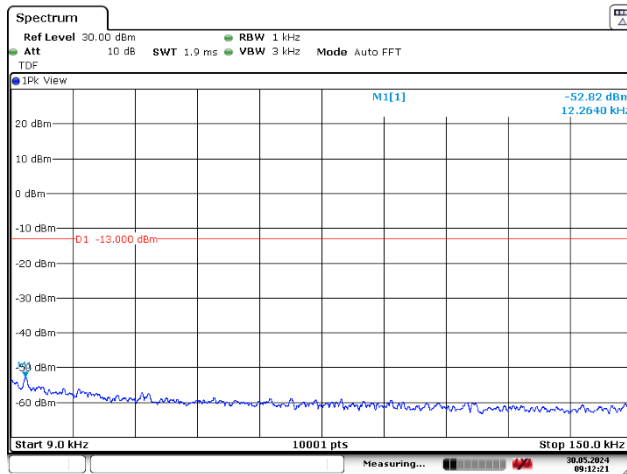


Figure 108: 9 – 150 kHz

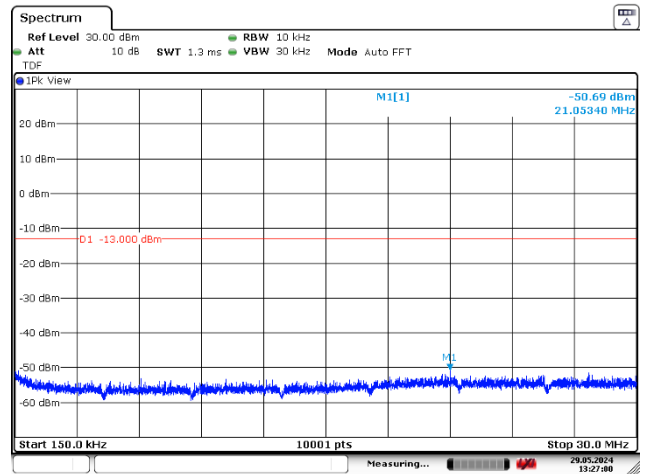


Figure 109: 150 kHz – 30 MHz

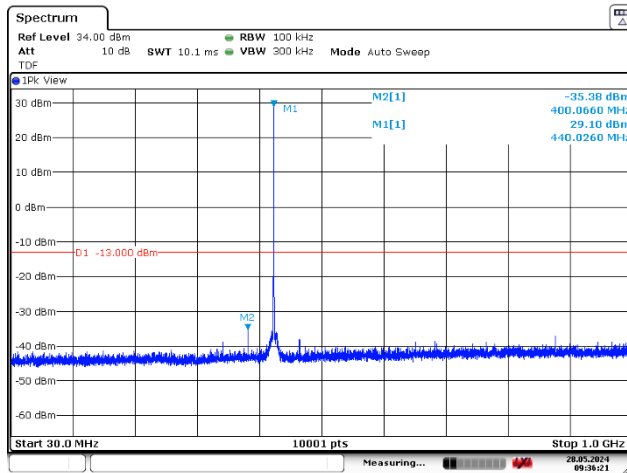


Figure 110: 30 – 1000 MHz

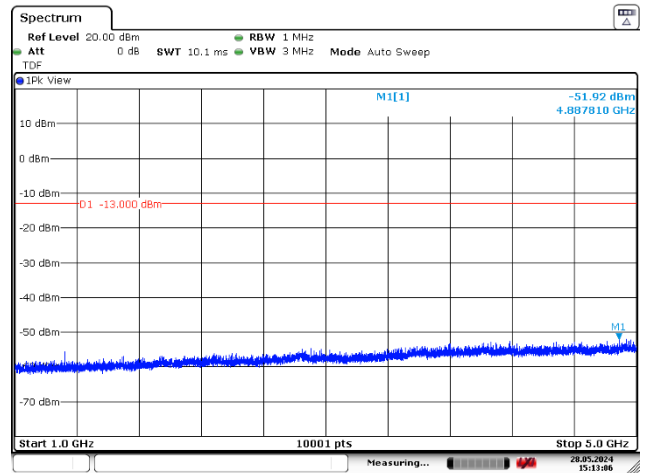


Figure 111: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 12.5 kHz, GMSK, 4800 bps

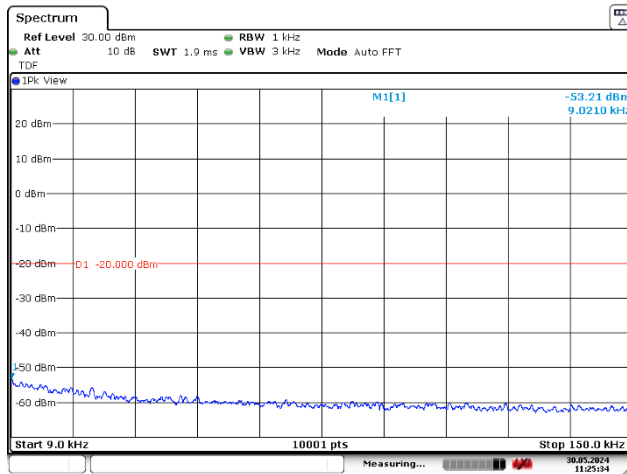


Figure 112: 9 – 150 kHz

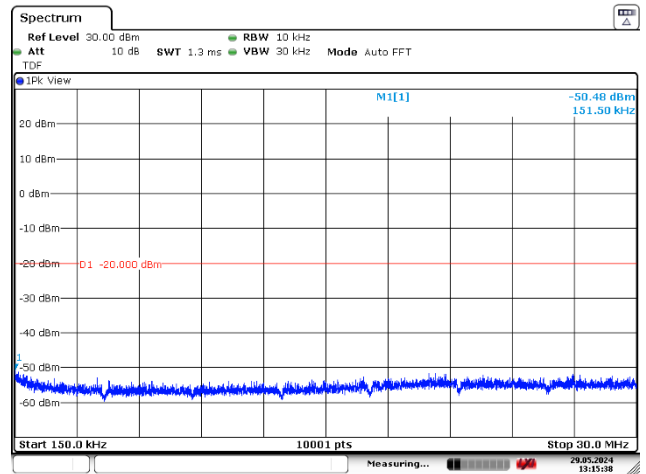


Figure 113: 150 kHz – 30 MHz

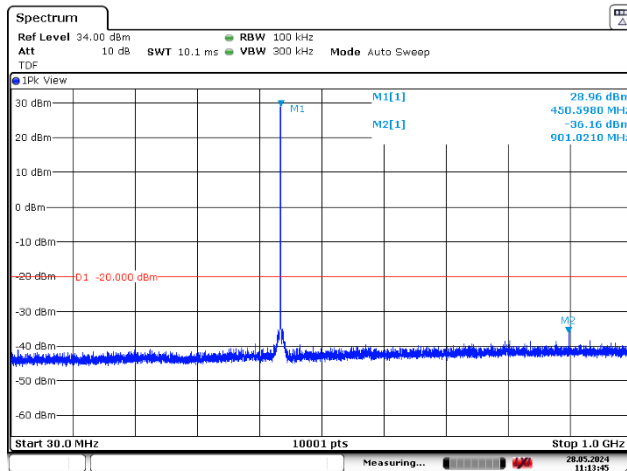


Figure 114: 30 – 1000 MHz

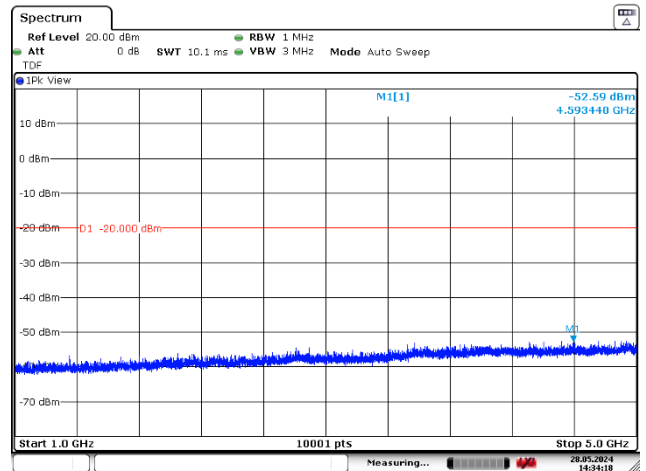


Figure 115: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 12.5 kHz, GMSK, 8000 bps

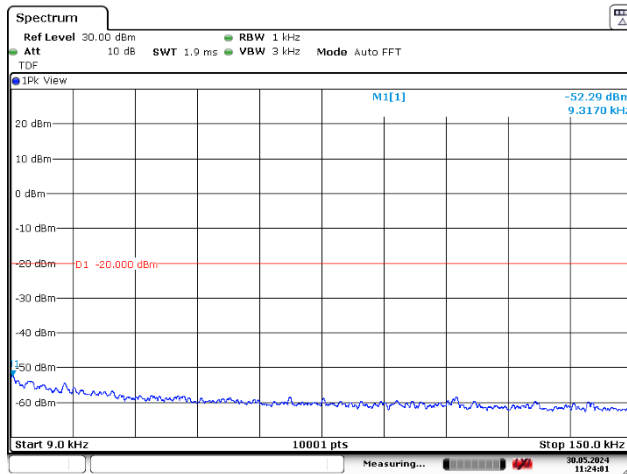


Figure 116: 9 – 150 kHz

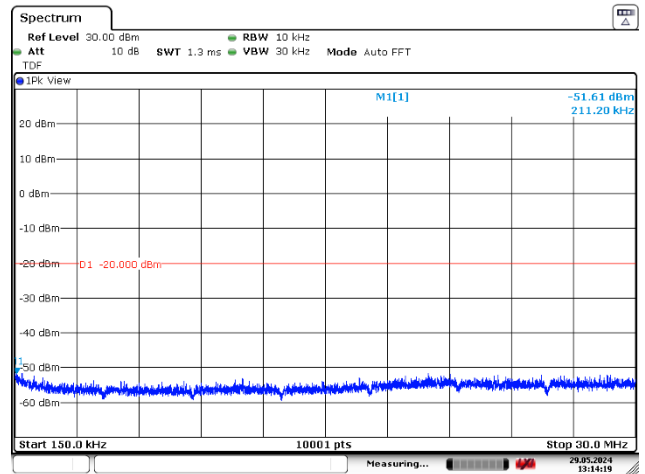


Figure 117: 150 kHz – 30 MHz

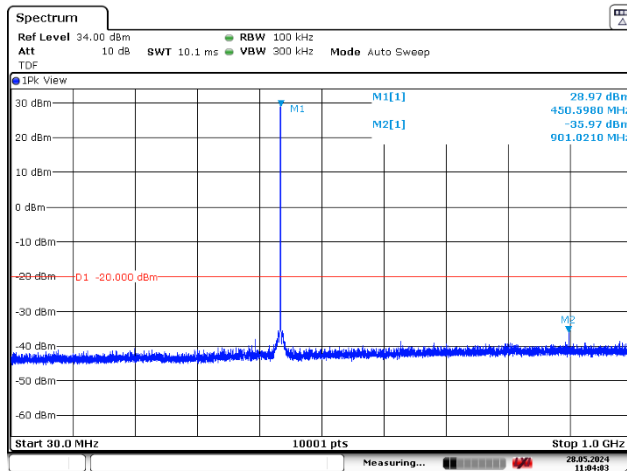


Figure 118: 30 – 1000 MHz

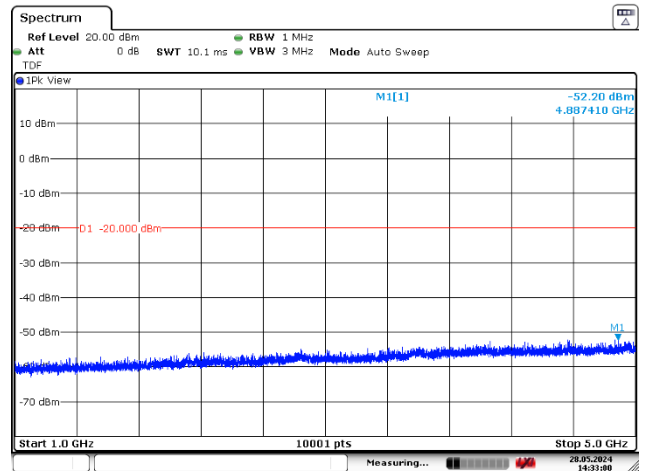


Figure 119: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 12.5 kHz, GMSK, 9600 bps

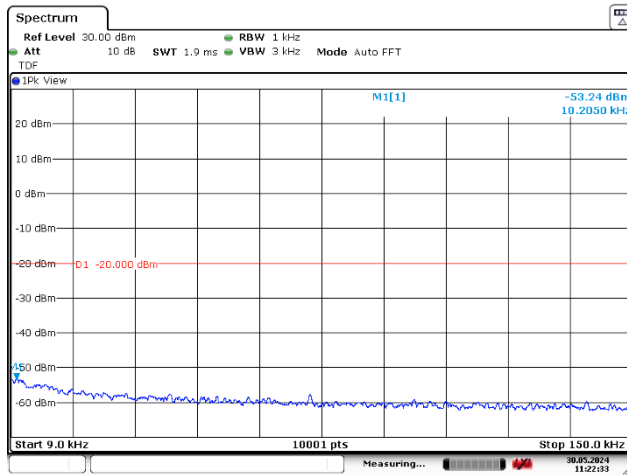


Figure 120: 9 – 150 kHz

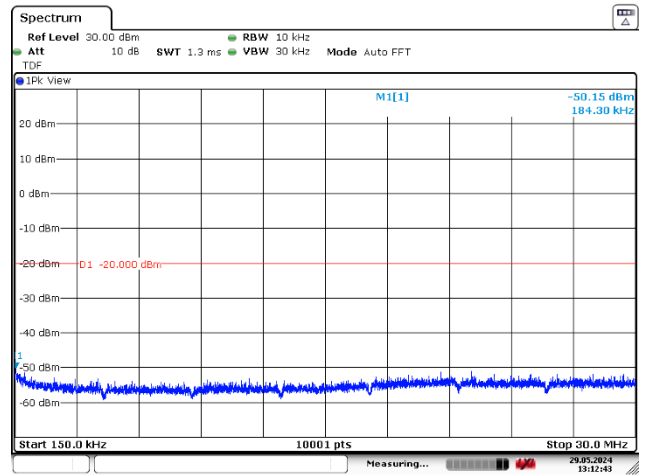


Figure 121: 150 kHz – 30 MHz

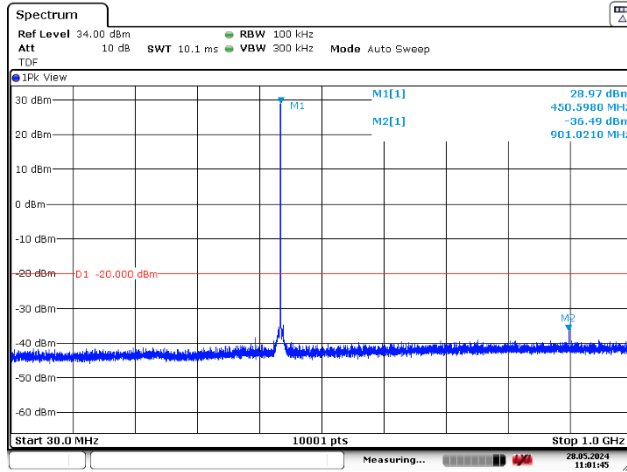


Figure 122: 30 – 1000 MHz

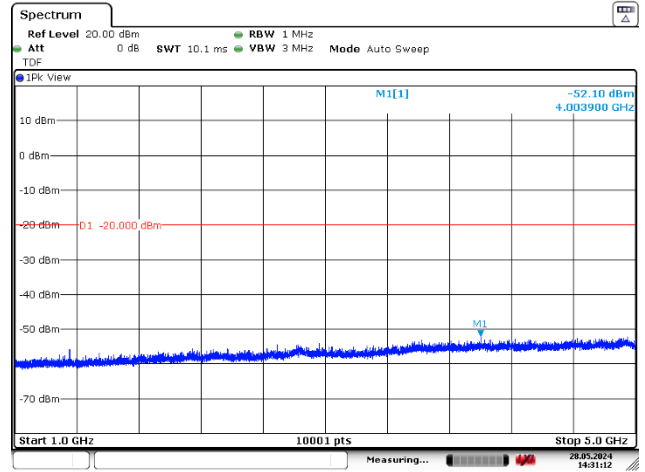


Figure 123: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 12.5 kHz, 4FSK, 9600 bps

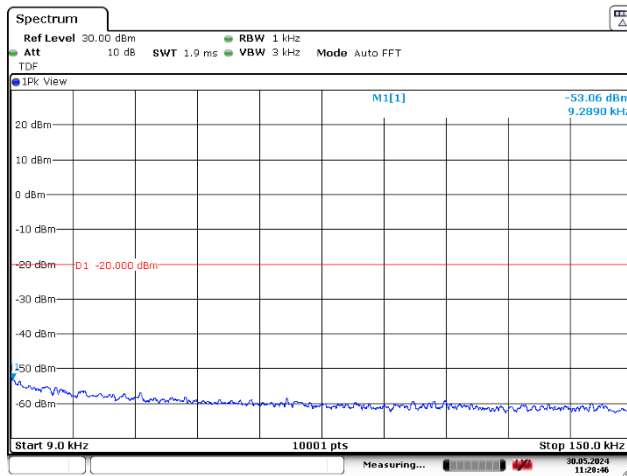


Figure 124: 9 – 150 kHz

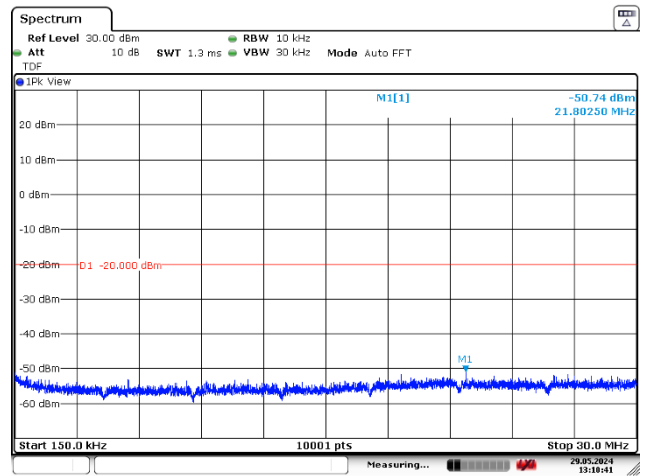


Figure 125: 150 kHz – 30 MHz

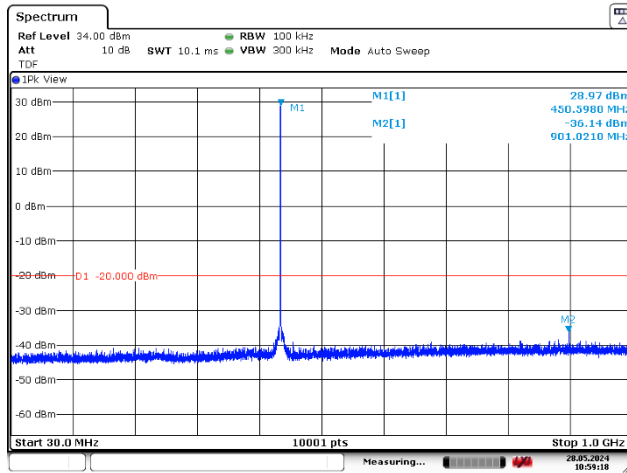


Figure 126: 30 – 1000 MHz

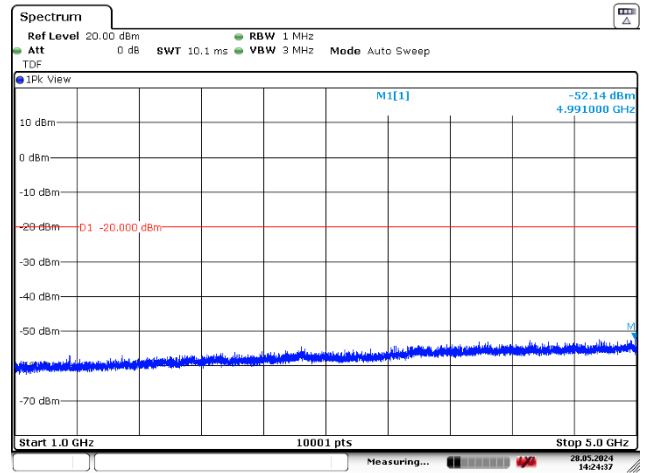


Figure 127: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 25 kHz, GMSK, 4800 bps

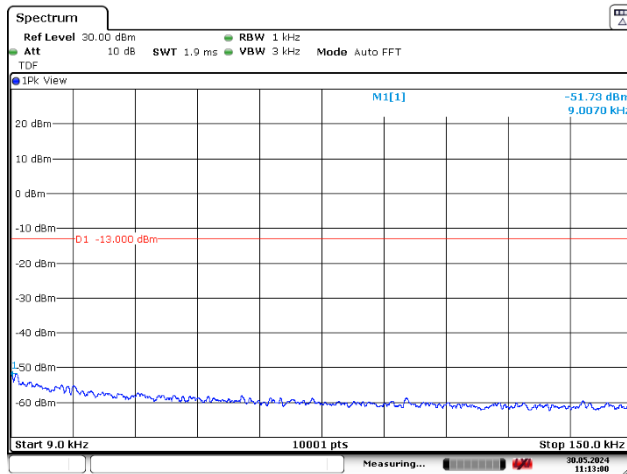


Figure 128: 9 – 150 kHz

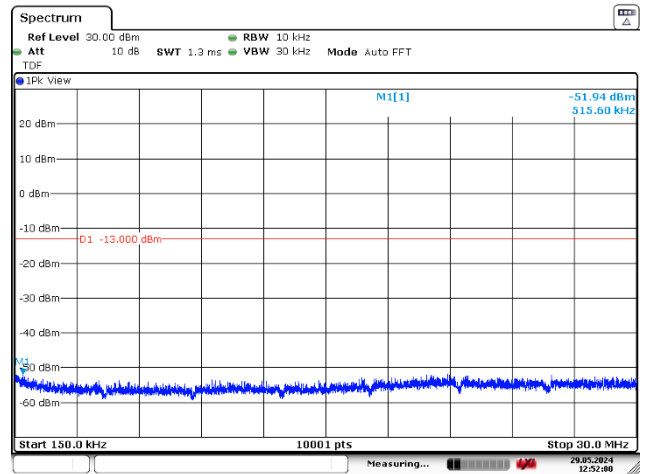


Figure 129: 150 kHz – 30 MHz

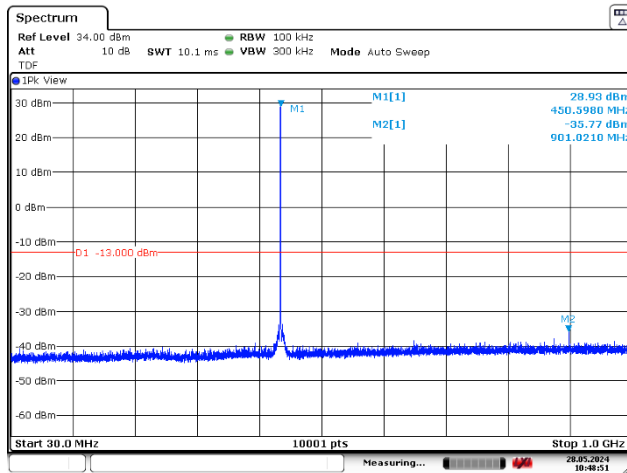


Figure 130: 30 – 1000 MHz

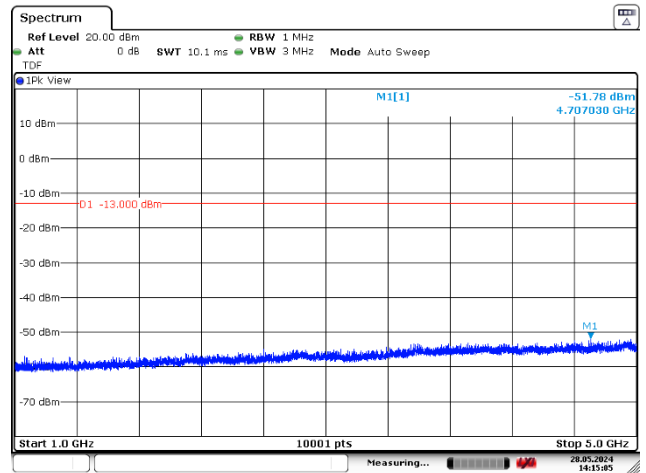


Figure 131: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 25 kHz, GMSK, 9600 bps

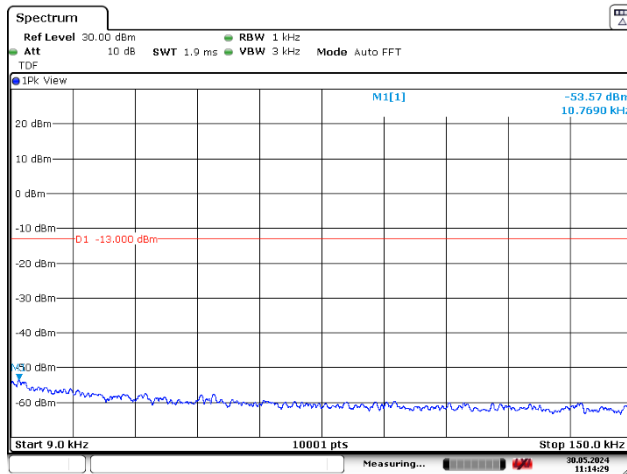


Figure 132: 9 – 150 kHz

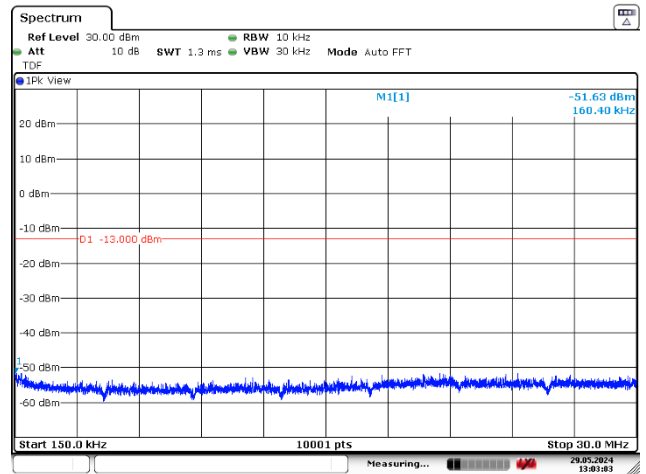


Figure 133: 150 kHz – 30 MHz

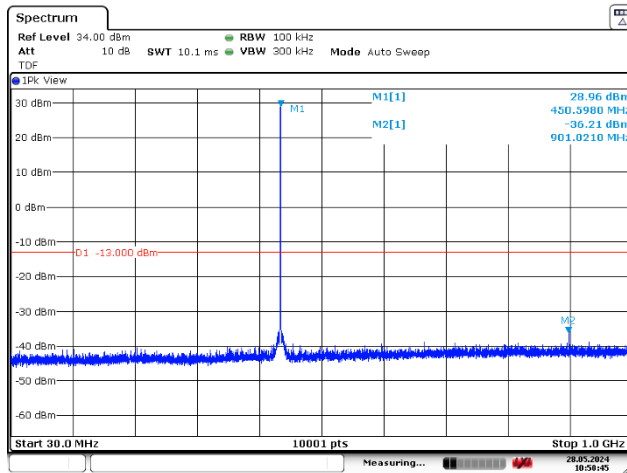


Figure 134: 30 – 1000 MHz

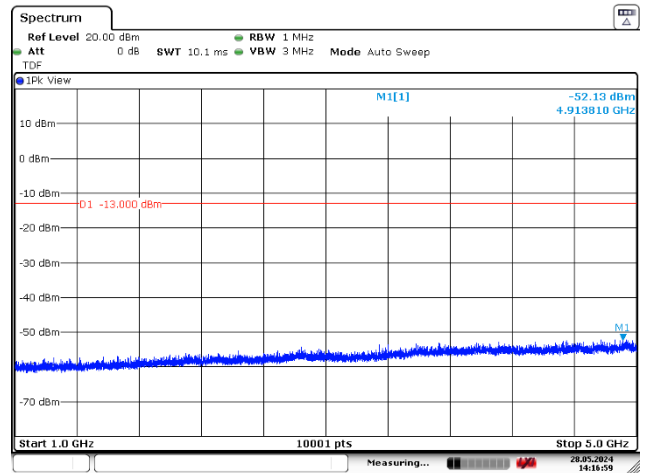


Figure 135: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 25 kHz, GMSK, 16000 bps

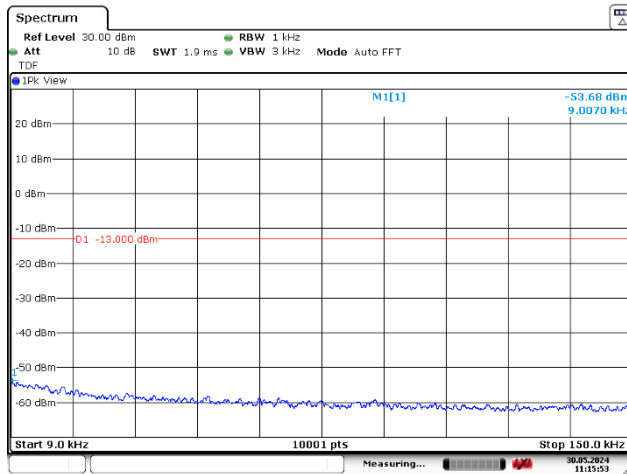


Figure 136: 9 – 150 kHz

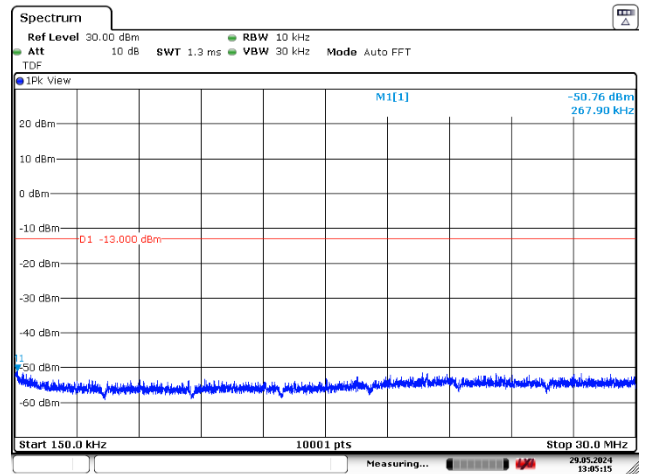


Figure 137: 150 kHz – 30 MHz

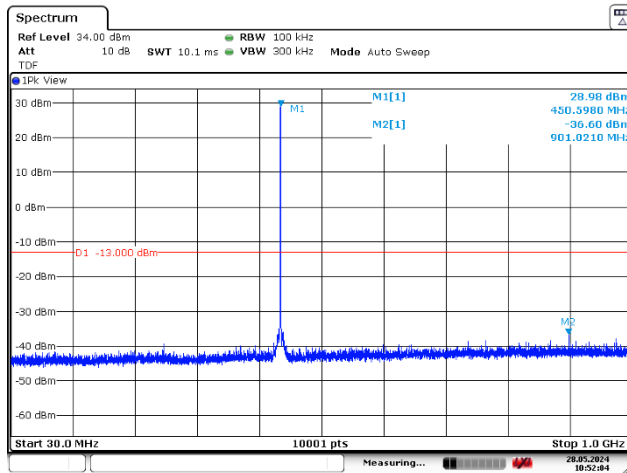


Figure 138: 30 – 1000 MHz

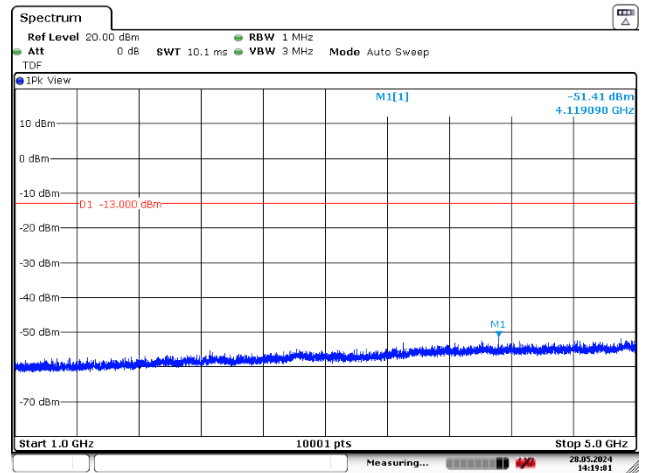


Figure 139: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 25 kHz, GMSK, 19200 bps

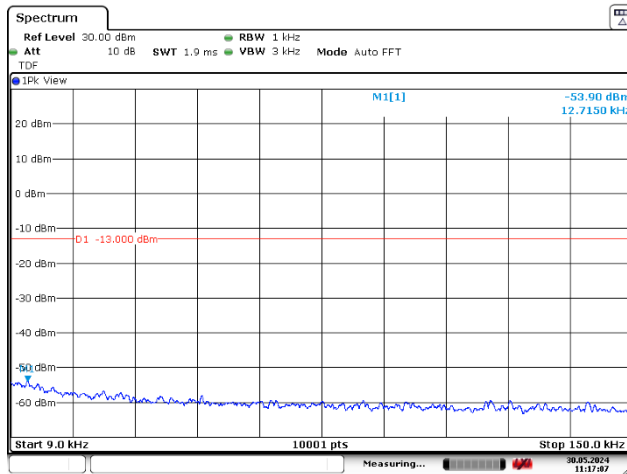


Figure 140: 9 – 150 kHz

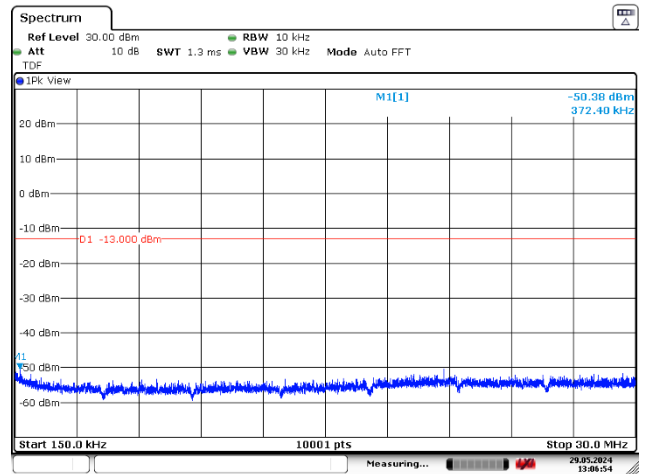


Figure 141: 150 kHz – 30 MHz

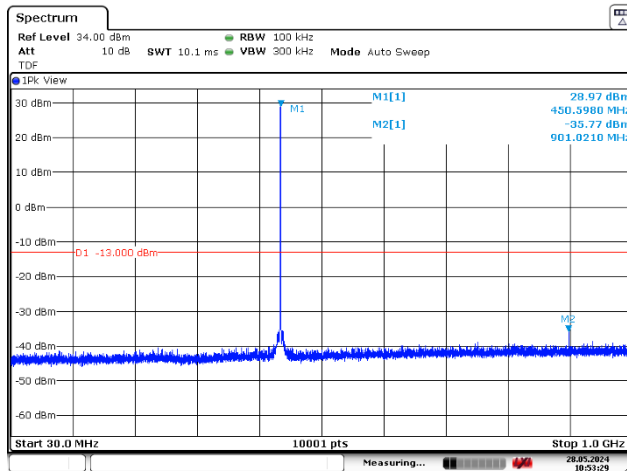


Figure 142: 30 – 1000 MHz

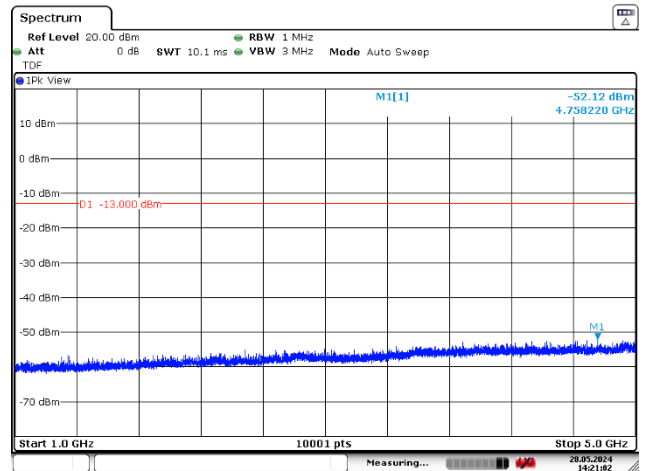


Figure 143: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 450.5 MHz, 25 kHz, 4FSK, 19200 bps

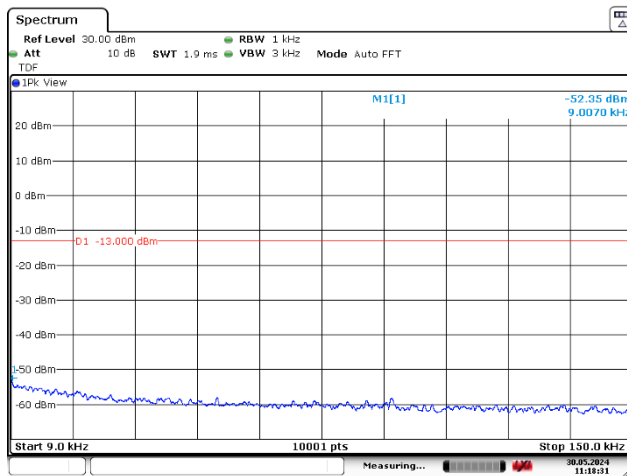


Figure 144: 9 – 150 kHz

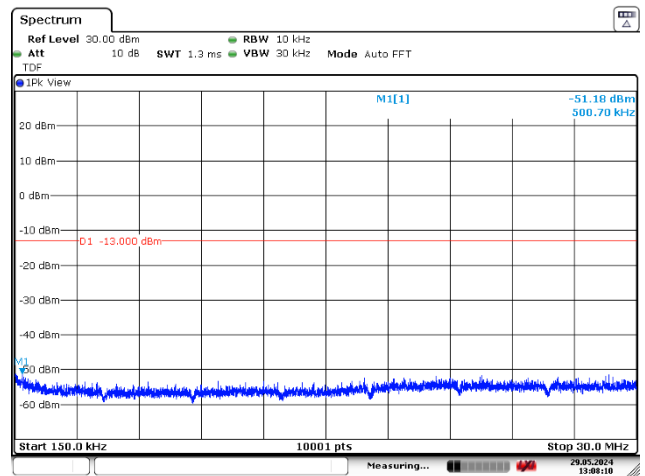


Figure 145: 150 kHz – 30 MHz

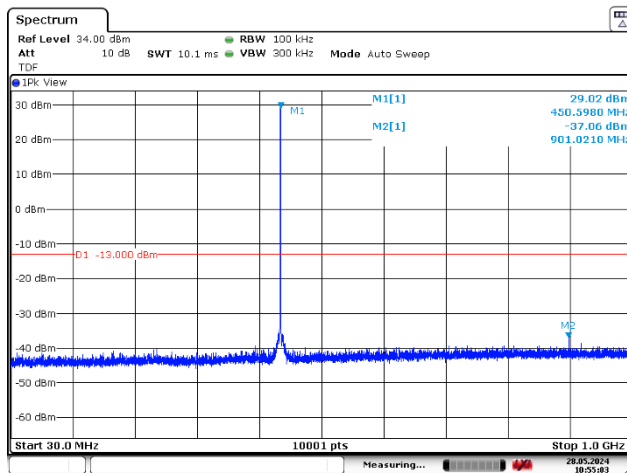


Figure 146: 30 – 1000 MHz

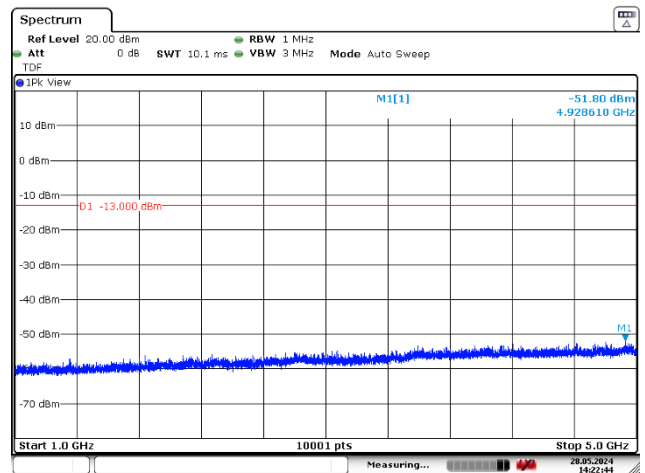


Figure 147: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 12.5 kHz, GMSK, 4800 bps

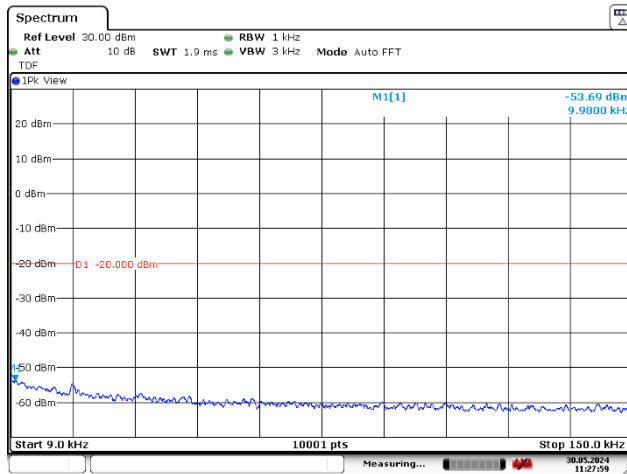


Figure 148: 9 – 150 kHz

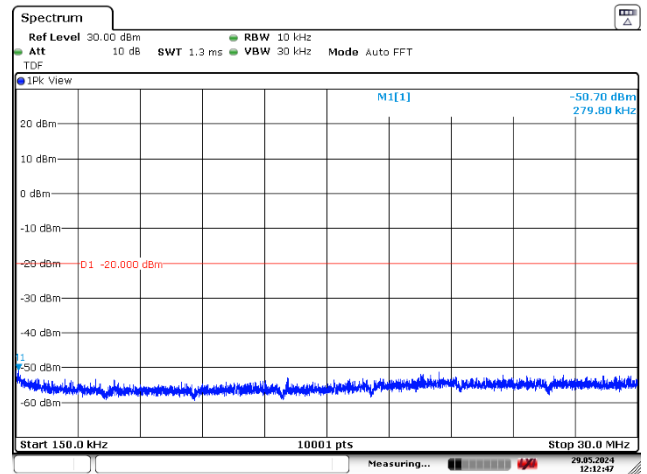


Figure 149: 150 kHz – 30 MHz

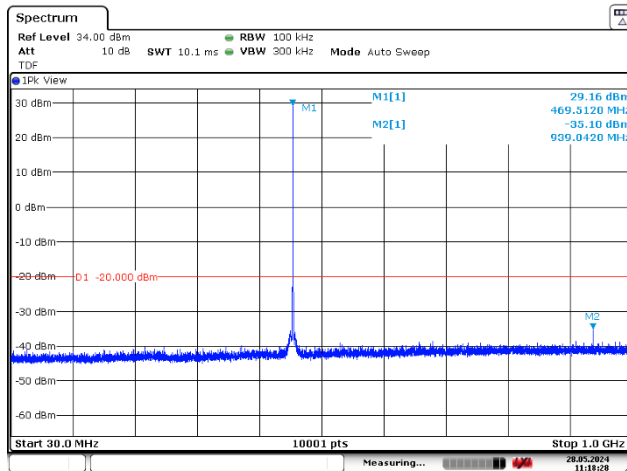


Figure 150: 30 – 1000 MHz

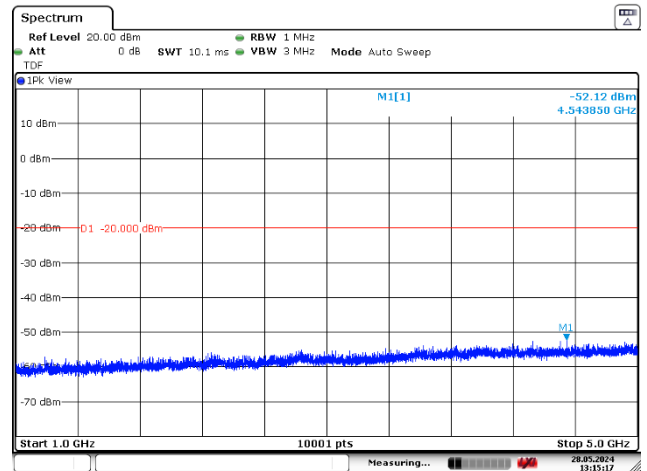


Figure 151: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 12.5 kHz, GMSK, 8000 bps

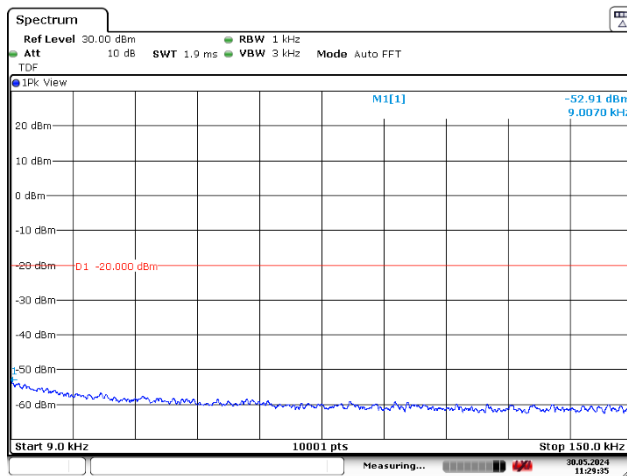


Figure 152: 9 – 150 kHz

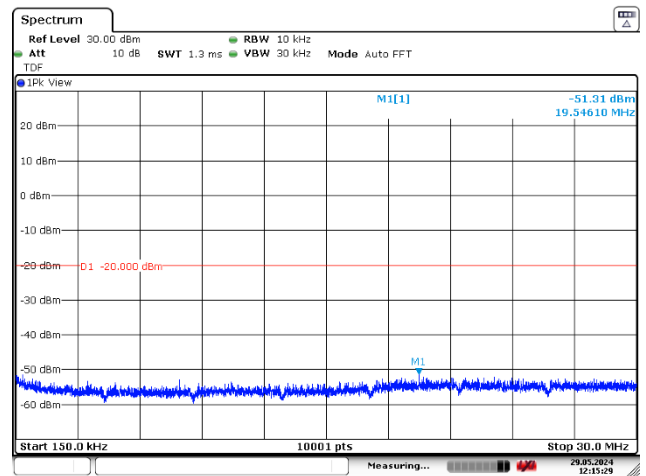


Figure 153: 150 kHz – 30 MHz

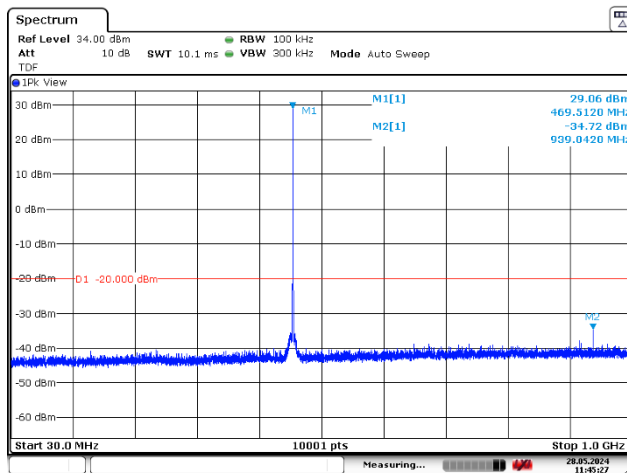


Figure 154: 30 – 1000 MHz

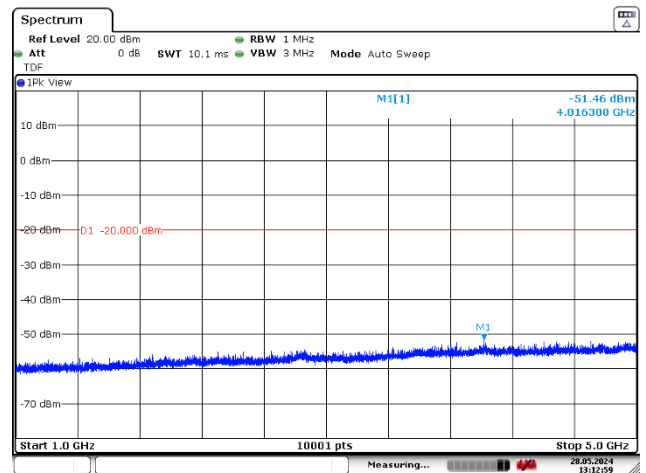


Figure 155: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 12.5 kHz, GMSK, 9600 bps

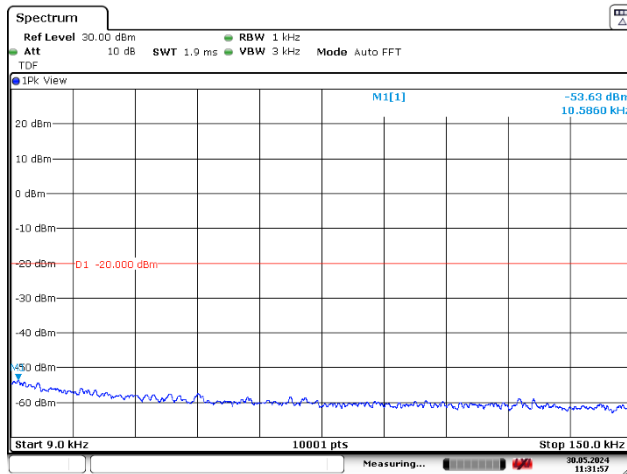


Figure 156: 9 – 150 kHz

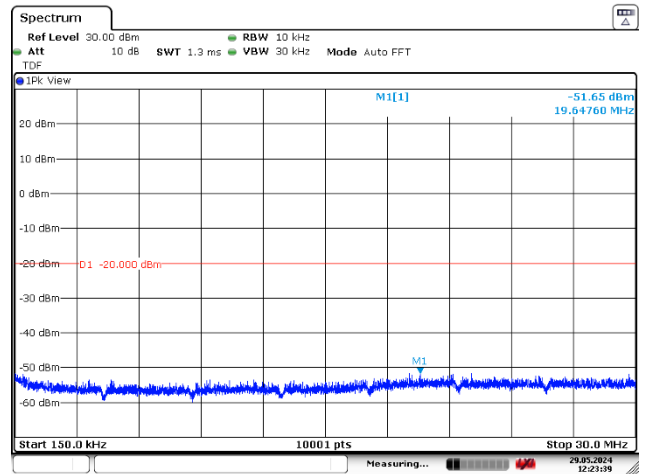


Figure 157: 150 kHz – 30 MHz

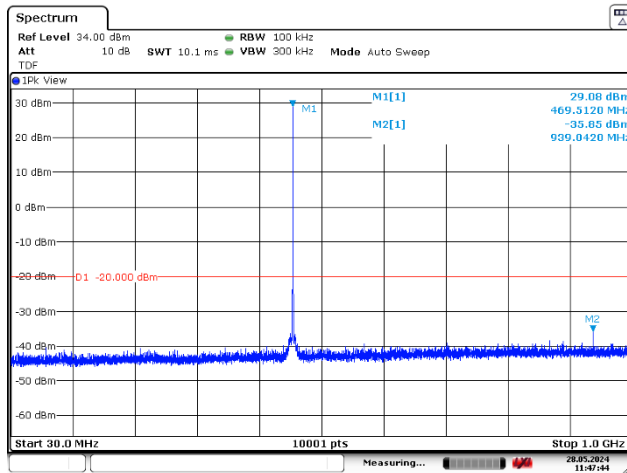


Figure 158: 30 – 1000 MHz

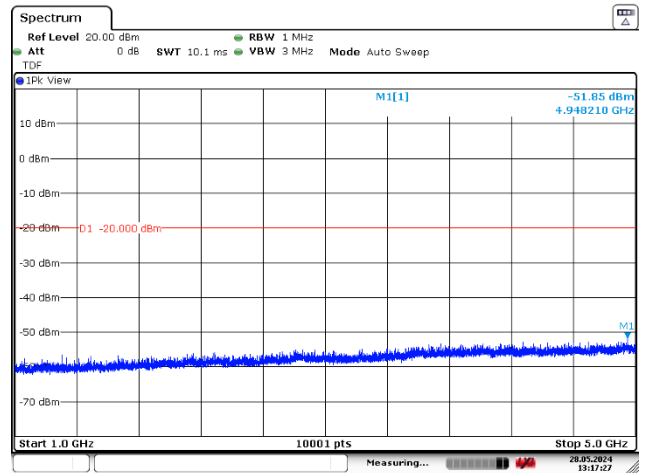


Figure 159: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 12.5 kHz, 4FSK, 9600 bps

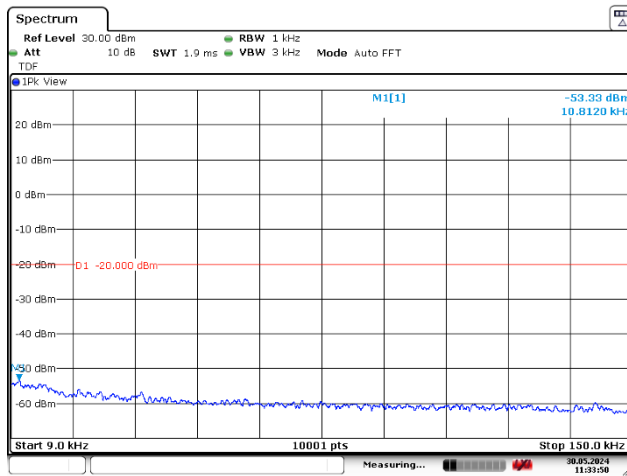


Figure 160: 9 – 150 kHz

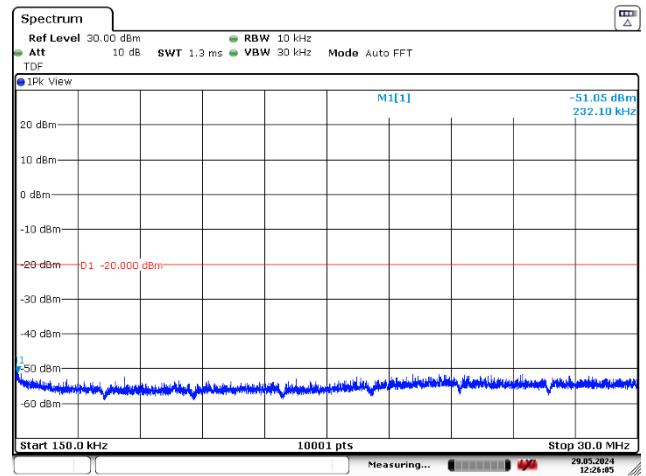


Figure 161: 150 kHz – 30 MHz

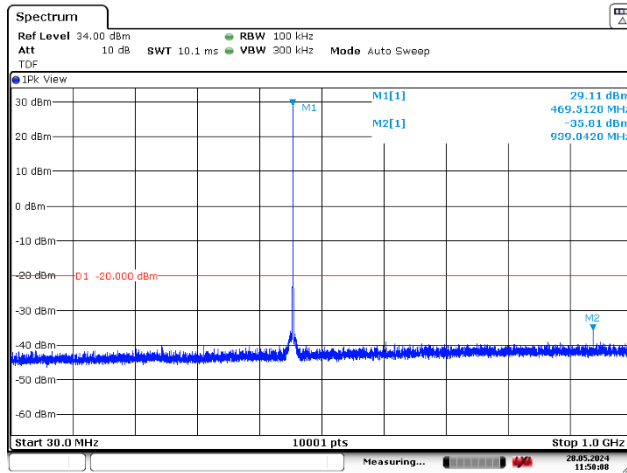


Figure 162: 30 – 1000 MHz

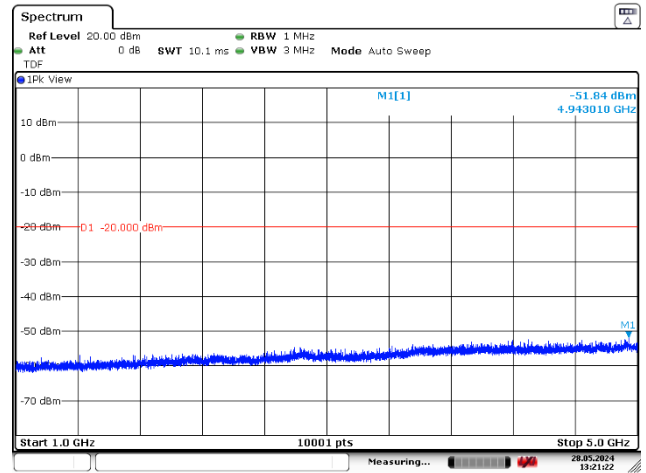


Figure 163: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 25 kHz, GMSK, 4800 bps

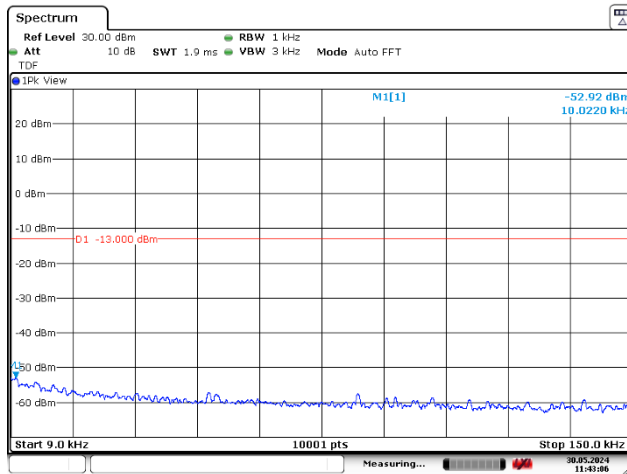


Figure 164: 9 – 150 kHz

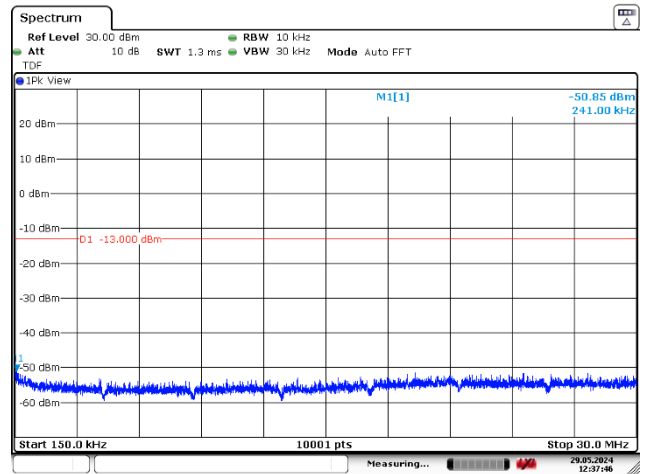


Figure 165: 150 kHz – 30 MHz

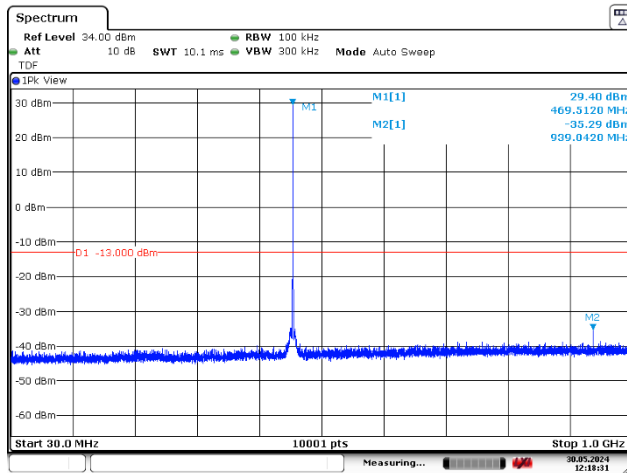


Figure 166: 30 – 1000 MHz

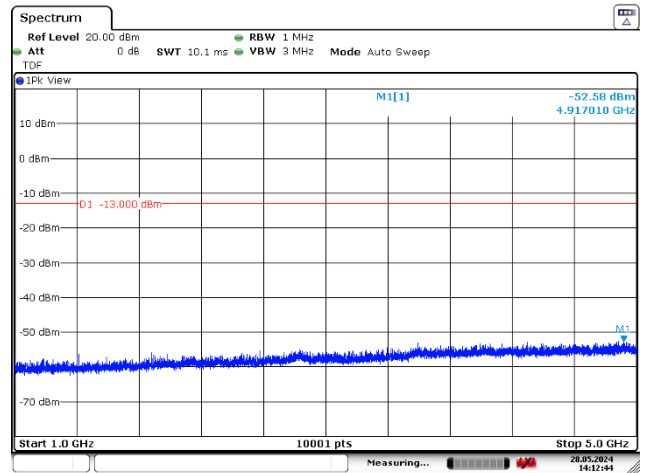


Figure 167: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 25 kHz, GMSK, 9600 bps

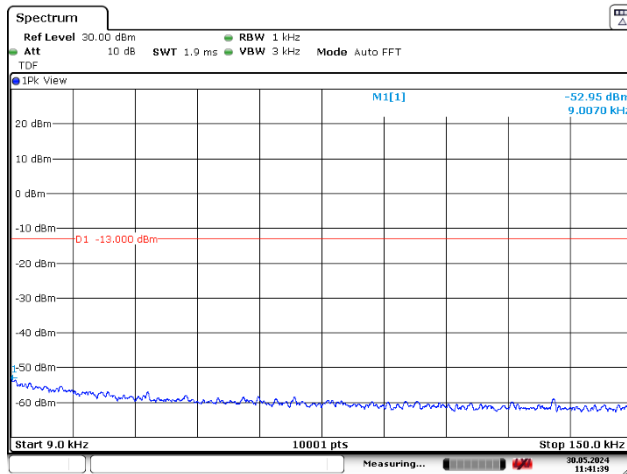


Figure 168: 9 – 150 kHz

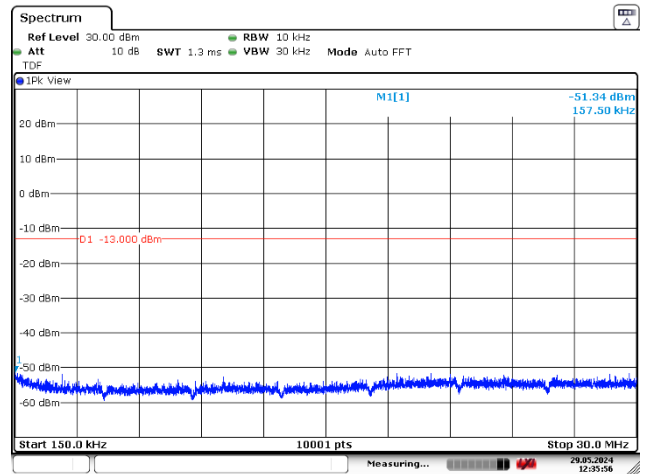


Figure 169: 150 kHz – 30 MHz

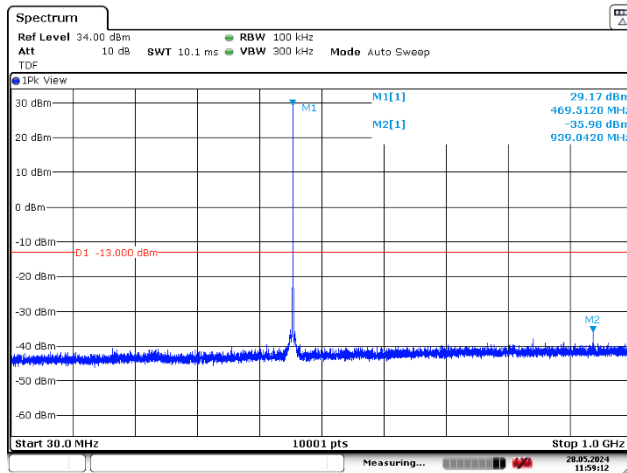


Figure 170: 30 – 1000 MHz

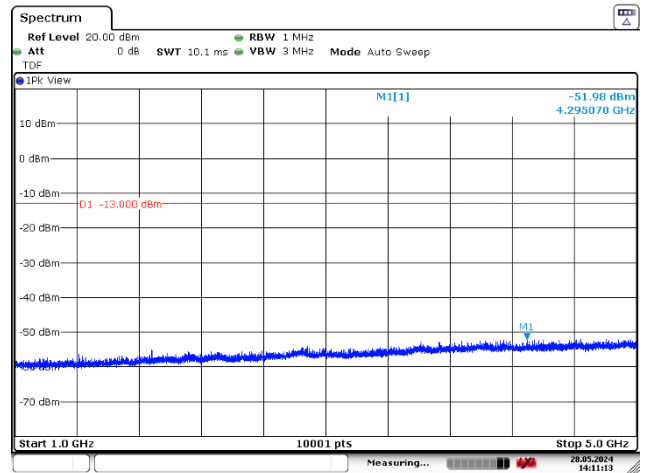


Figure 171: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 25 kHz, GMSK, 16000 bps

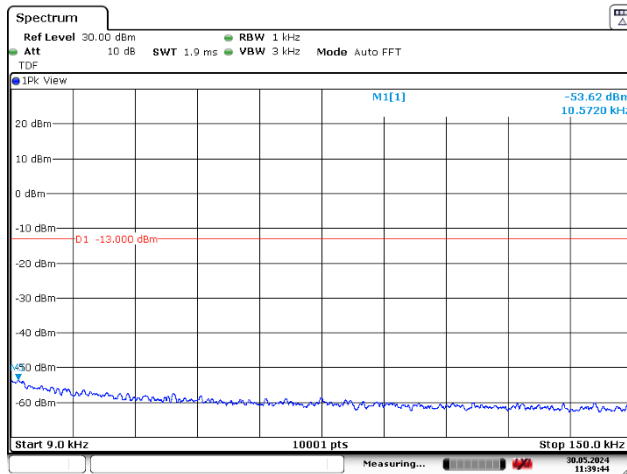


Figure 172: 9 – 150 kHz

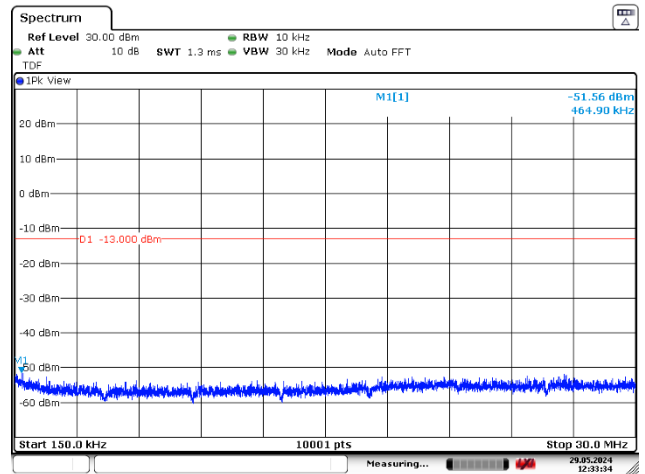


Figure 173: 150 kHz – 30 MHz

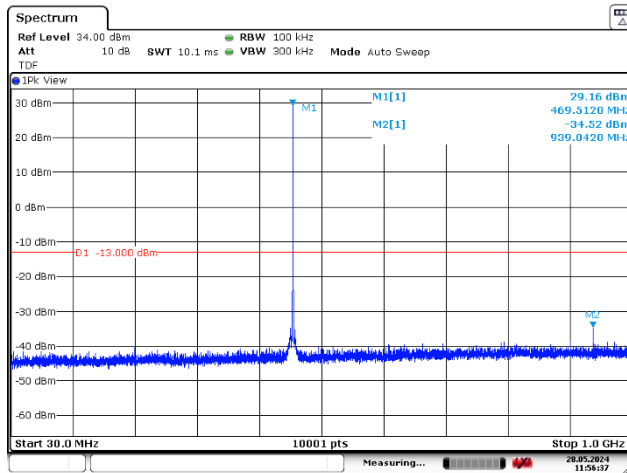


Figure 174: 30 – 1000 MHz

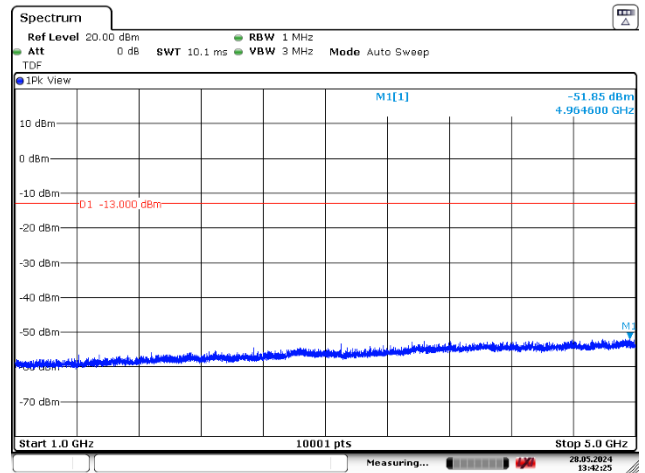


Figure 175: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 25 kHz, GMSK, 19200 bps

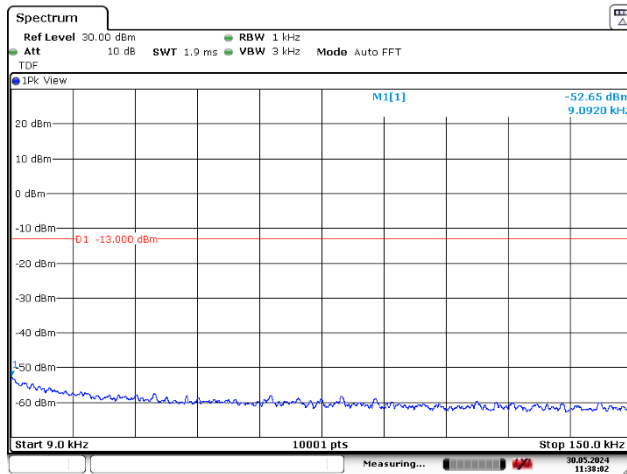


Figure 176: 9 – 150 kHz

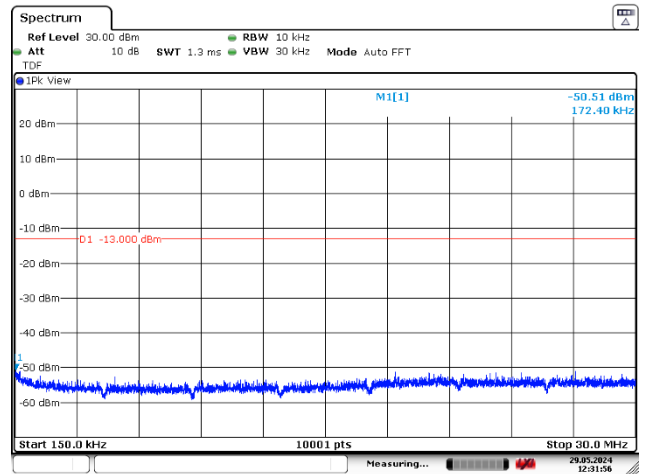


Figure 177: 150 kHz – 30 MHz

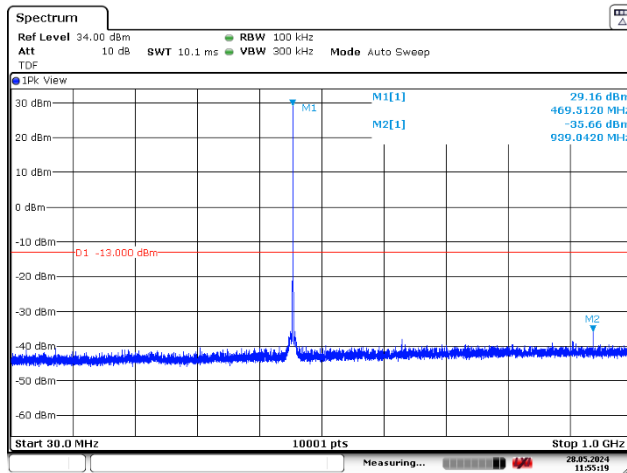


Figure 178: 30 – 1000 MHz

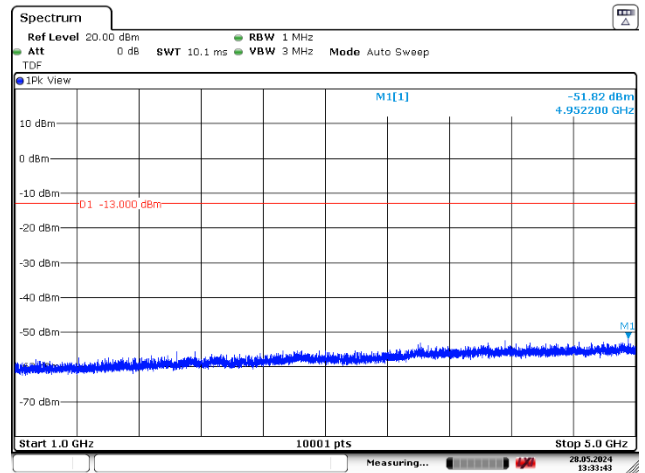


Figure 179: 1 – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions TX 469.5 MHz, 25 kHz, 4FSK, 19200 bps

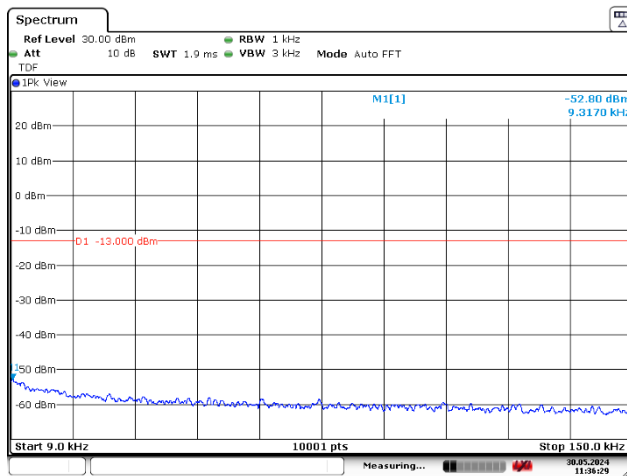


Figure 180: 9 – 150 kHz

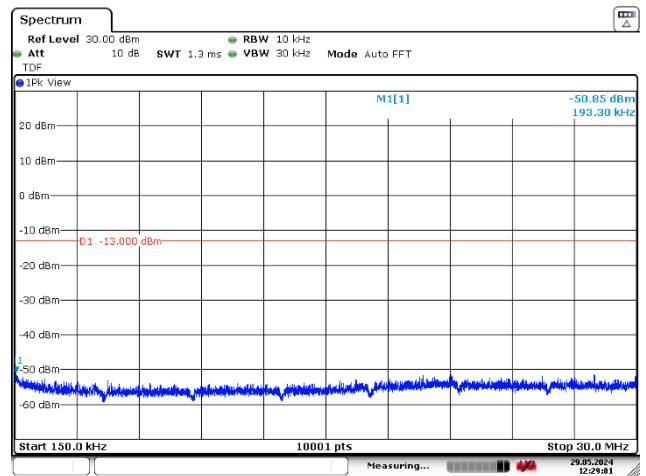


Figure 181: 150 kHz – 30 MHz

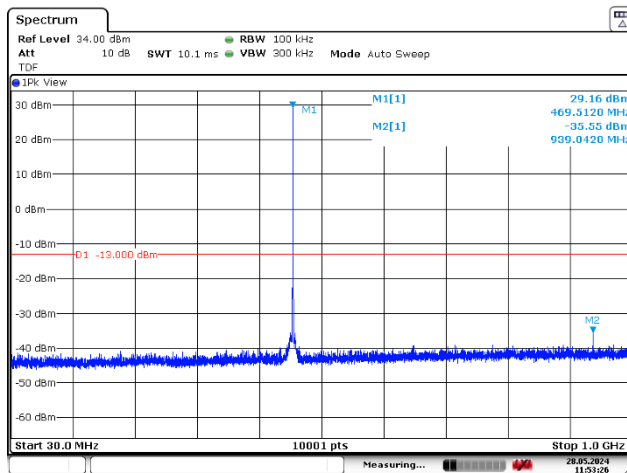


Figure 182: 30 – 1000 MHz

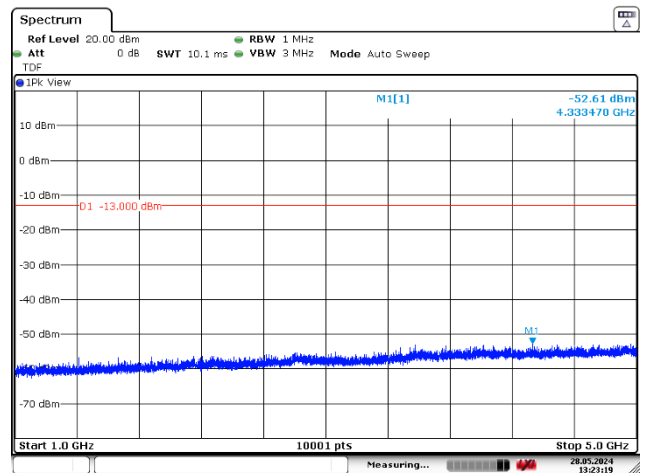


Figure 183: 1 – 5 GHz

Spurious emissions (radiated) 9 kHz – 5 GHz

Standard: ANSI C63.26 (2015)
Tested by: LAS HEM
Date: 14 May 2024 15 May 2024
Temperature: 23 °C 23 °C
Humidity: 38 %RH 32 %RH

Measurement uncertainty: ± 5.29 dB Level of confidence 95.45 % (k = 2)
Test result: **PASS**

FCC Rule: 90.210

RSS-119 5.8

For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows: on any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth; at least $43 + 10 \log (P)$ dB.

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows: on any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: at least $50 + 10 \log (P)$ or 70 dB, whichever is the lesser attenuation.

Frequency Band (MHz)	Channel Bandwidth (kHz)	Authorized Bandwidth (kHz)	Limit (dBm)
410-470	12.5	11.25	-20
	25	20	-13

Test plan

The test was performed in a semi-anechoic chamber. The EUT was placed on a non-conductive 1.5 m high table standing on a turntable. The distance between the EUT and the measurement antenna was 3 m. In order to find the maximum levels of the disturbance radiation the angle of the turntable, and the height of the measuring antenna were varied during the tests. The test was performed with the measurement antenna in both horizontal and vertical polarizations.

The EUT is tested in different combinations of modulation, channel bandwidth, TX frequency, and EUT orientation. If emissions near the limit are detected with any combination, other combinations are investigated as well. The antenna connector was terminated with a 50Ω load.



Photograph 1: X-, Y-, and Z-orientations

Spurious emissions (radiated) 9 kHz – 5 GHz
Table 9: EUT settings during the test

Frequency	Modulation	Ch. Width	Data rate	Channel	Orientation
9 k – 30 M	GMSK	12.5	9600	LOW 1	X
	4FSK	12.5	9600	LOW 2	Y
	GMSK	25	19200	MID	Z
	4FSK	25	19200	HIGH 1	X
	GMSK	12.5	9600	HIGH 2	Y
30 – 1000 M	4FSK	12.5	9600	LOW 1	Z
	GMSK	25	19200	LOW 2	X
	4FSK	25	19200	MID	Y
	GMSK	12.5	9600	HIGH 1	Z
	4FSK	12.5	9600	HIGH 2	X
1 – 5 G	GMSK	25	19200	LOW 1	Y
	4FSK	25	19200	LOW 2	Z
	GMSK	12.5	9600	MID	X
	4FSK	12.5	9600	HIGH 1	Y
	GMSK	25	19200	HIGH 2	Z

Spurious emissions (radiated) 9 kHz – 5 GHz

Test results

Table 10: Spurious emissions (radiated) QuasiPeak results

Frequency (MHz)	QuasiPeak (dBm)	Limit (dBm)	Margin (dB)	Settings
42.157500	-80.21	-20.00	60.21	TX LOW1 12.5 kHz 4FSK Z

Table 11: Spurious emissions (radiated) QuasiPeak result details

Frequency (MHz)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Settings
42.157500	1000.0	120.000	100.0	V	67.0	-86.2	TX LOW1 12.5 kHz 4FSK Z

Correction factor (dB) in the final result tables contains the sum of the attenuations of the system. (Antenna + cables). QuasiPeak measured values include the correction factor.

Spurious emissions (radiated) 9 kHz – 5 GHz

9 kHz – 30 MHz

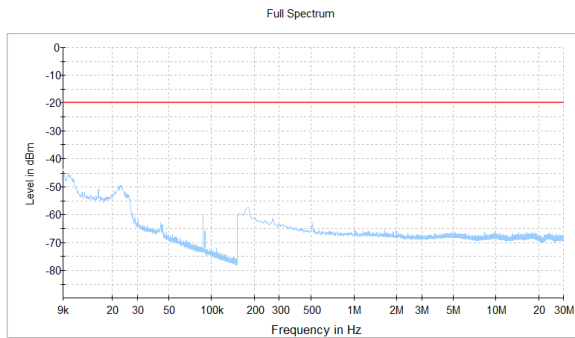


Figure 184: TX 410.0 MHz, 12.5 kHz, GMSK, X

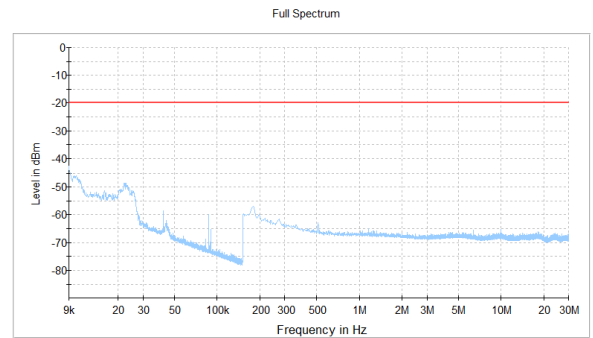


Figure 185: TX 429.5 MHz, 12.5 kHz, 4FSK, Y

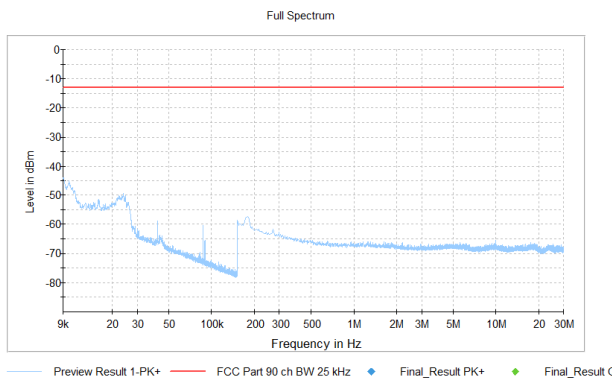


Figure 186: TX 440.0 MHz, 25 kHz, GMSK, Z

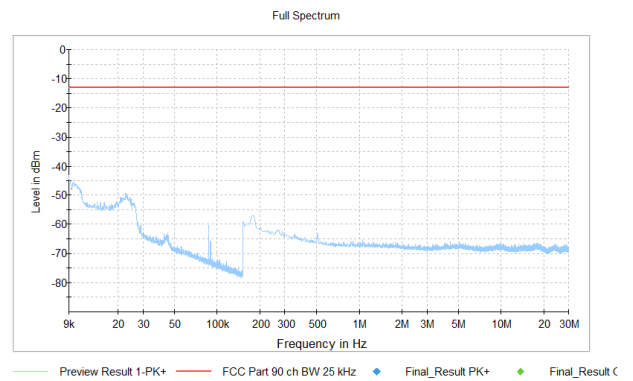


Figure 187: TX 450.5 MHz, 25 kHz, 4FSK, X

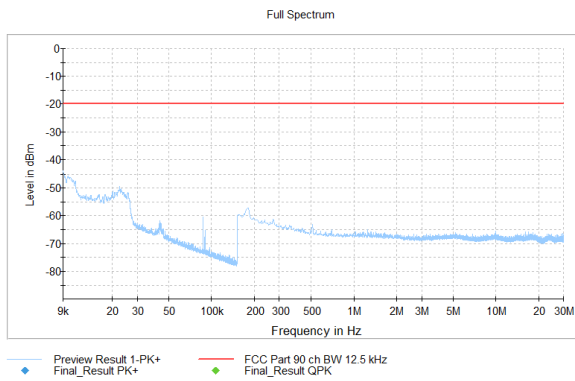


Figure 188: TX 469.5 MHz, 12.5 kHz, 4FSK, Y

Spurious emissions (radiated) 9 kHz – 5 GHz

30 MHz – 1 GHz

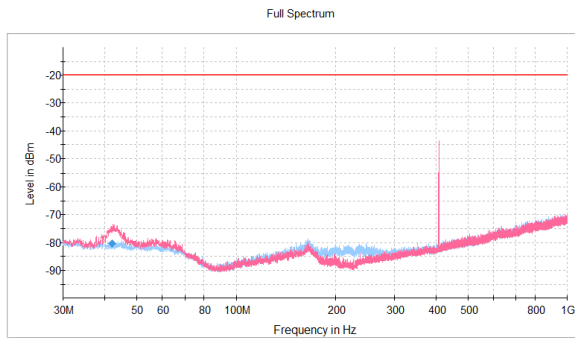


Figure 189: TX 410.0 MHz, 12.5 kHz, 4FSK, Z

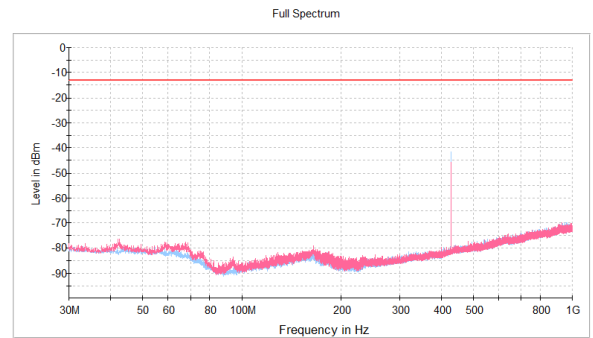


Figure 190: TX 429.5 MHz, 25 kHz, GMSK, X

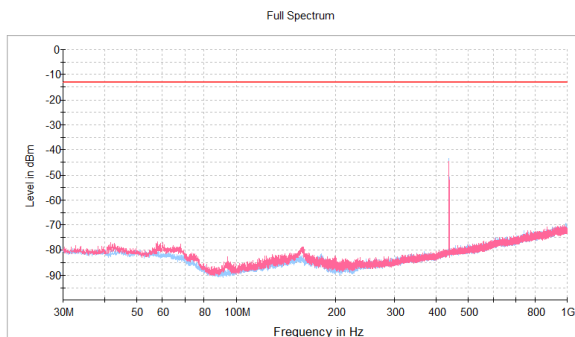


Figure 191: TX 440.0 MHz, 25 kHz, 4FSK, Y

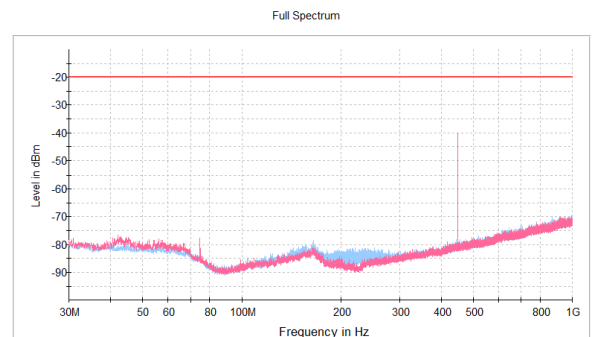


Figure 192: TX 450.5 MHz, 12.5 kHz, GMSK, Z

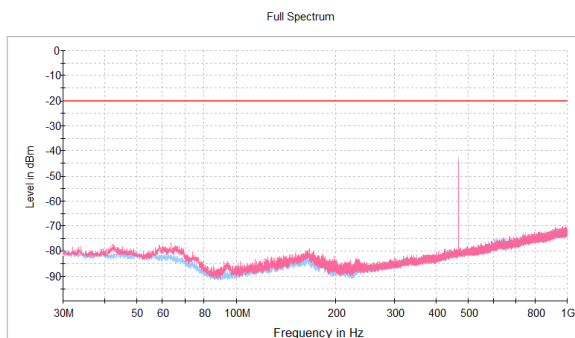


Figure 193: TX 469.5 MHz, 12.5 kHz, GMSK, X

Spurious emissions (radiated) 9 kHz – 5 GHz

1 GHz – 5 GHz

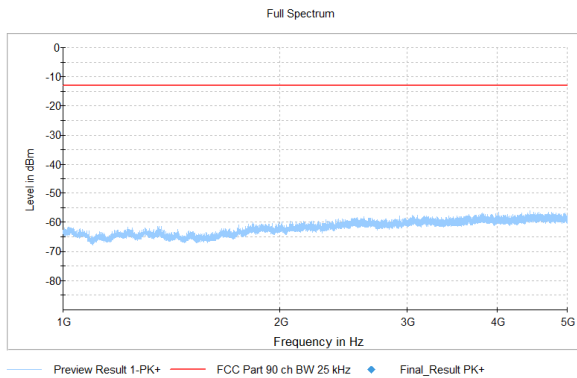


Figure 194: TX 410.0 MHz, 25 kHz, GMSK, Y

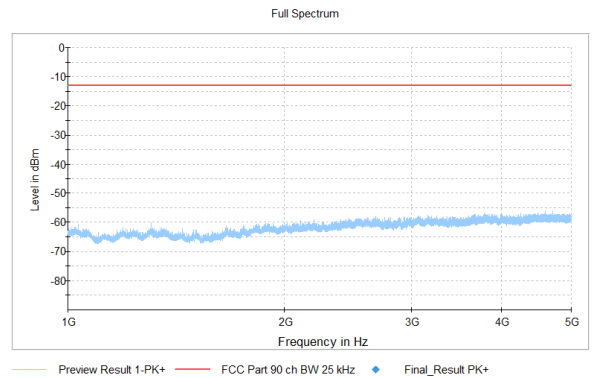


Figure 195: TX 429.5 MHz, 25 kHz, 4FSK, Z

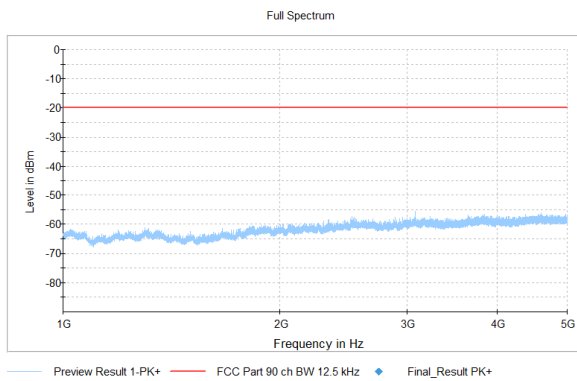


Figure 196: TX 440.0 MHz, 12.5 kHz, GMSK, X

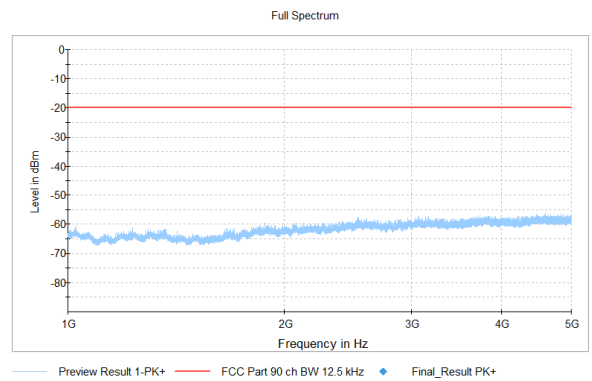


Figure 197: TX 450.5 MHz, 12.5 kHz, 4FSK, Y

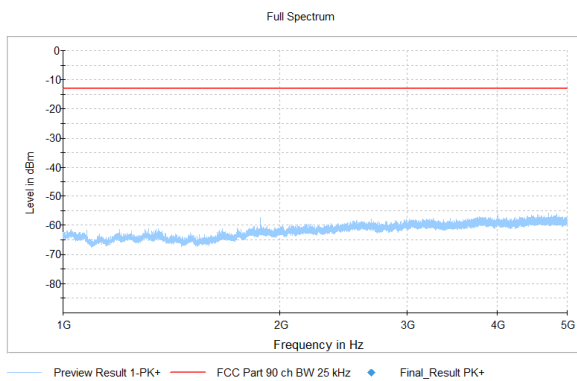


Figure 198: TX 469.5 MHz, 25 kHz, GMSK, Y

TEST EQUIPMENT

EQUIPMENT	MANUFACTURER	TYPE	INV OR SERIAL	PREV CALIB	NEXT CALIB
ANTENNA	EMCO	3117, emi 1-18GHz	inv. 7293	2022-06-16	2024-06-16
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv:8013	2022-10-25	2024-10-25
ANTENNA	SCHWARZBECK	VULB 9168	inv. 8911	2022-11-29	2024-11-29
ANTENNA MAST	MATURO	TAM 4.0E	inv. 10181	NCR	NCR
ATTENUATOR	PASTERNAK	PE 7004-4 (4dB)	inv. 10126	2024-02-16	2025-02-16
ATTENUATOR	NARDA	AF-N-6-5-10 (10dB)	sn. A103	2023-01-04	2025-01-04
ATTENUATOR	NARDA	757 C – 20 dB	sn. A111	2023-07-13	2025-07-13
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2023-12-15	2024-12-15
FILTER	WAINWRIGHT	HP, WHKX1.0/15G-10SS	inv:8267	2023-01-09	2025-01-09
FILTER	WAINWRIGHT	WHK0.6/13G-10SS	inv. 9562	2023-07-13	2025-07-13
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv. 10183	NCR	NCR
CABLE	SUHNER	SUCOFLEX 126E 1-18GHz	inv. C137	2024-04-05	2025-04-05
CABLE	-	FB3AirC	inv. C155	-	-
CABLE	SUHNER	SUCOTEST	inv. C051	1)	
CABLE	SUHNER	SUCOTEST	inv. C120	2023-07-13	2025-07-13
COAX CHAIN K5 EMI < 1GHz	-	C053+FP3AirC+C138	-	2024-03-28	2025-03-28
COAX CHAIN K5 EMI 1GHz-26.5GHz	-	C135+C149	-	2024-03-28	2025-03-28
POWER SUPPLY	DELTA	SM 130-25D	inv. 10406	NCR	NCR
POWER SUPPLY	THANDAR	PL330TP	inv. 9787	NCR	NCR
RF PREAMPLIFIER	CIAO	CA118-3123	inv. 10278	2023-09-15	2024-09-15
SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSV40	inv. 9093	2023-06-16	2024-06-19
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv. 10517	2023-10-30	2024-10-30
TEMPERATURE/ HUMIDITY METER	VAISALA	HMT 333	inv:8638	2023-09-08	2024-09-08
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	NCR
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	NCR

1) The equipment was calibrated for this test case

NCR = No Calibration Required

END OF TEST REPORT