

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 90 AND ISED CANADA REQUIREMENTS

Equipment Under Test: Radio module

Model: SATEL-TR489

Type: SATEL-TA43

Manufacturer: Satel Oy
Meriniitynkatu 17
FI-24100, Salo
Finland

Customer: Satel Oy
Meriniitynkatu 17
FI-24100, Salo
Finland

FCC Rule Part: 90
IC Rule Part: RSS-119, Issue 12, May 2015
KDB: 971168 D01 Power Meas License Digital Systems
v03r01
Measurement Guidance for Certification of
Licensed Digital Transmitters
(April 9, 2018)

Partial testing, see page 6 SUMMARY OF TESTING

Date: 16 February 2026

Issued by: 
Pekka Kälviäinen
Testing Engineer

Date: 16 February 2026

Checked by: 
Rauno Repo
Senior EMC Specialist

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GENERAL REMARKS

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

RELEASE HISTORY

Version	Changes	Issued
1.0	Initial release	23 October 2025
1.1	Fixes	16 February 2026

PRODUCT DESCRIPTION

Equipment Under Test

Trade mark: Satel
Model: SATEL-TR489
Type: SATEL-TA43
Serial no: 2533001027 (sample 1), 2533001029 (sample 2)
FCC ID: MRBSATEL-TA43
IC: 2422A-SATELTA43

General Description

The equipment under test is a radio module using 403-473 / 869.4-869.65 / 902-928 MHz bands. This test report contains the results for 400 MHz radio.

Classification

Fixed device ☒
Mobile Device (Human body distance > 20cm) ☒
Portable Device (Human body distance < 20cm) ☐

Modifications Incorporated in the EUT

No modifications.

Ports and cables

Cable / Port	Description
Serial port RS232	Device configuration and data communication. Unshielded
DC input port	3.8 – 5.5 VDC (4.6 V used during testing)
Antenna port	50Ω TNC (female)

Specifications

Frequency: 406.1-430 MHz and 450-470 MHz
Channel width: 12.5 kHz, 25 kHz
Channel spacing: 12.5 kHz, 25 kHz
Modulation: 4FSK
Carrier power: 0.1, 0.2, 0.5, 1 W

Mechanical Size of the EUT

Height: 6.7 mm Width: 36 mm Length: 57 mm Weight: 0.02 kg

Peripherals

Peripheral	Description / Usage
Test PC	Device configuration and monitoring with programs supplied by customer.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§90.205 / RSS-119 4.1	Transmitter output power	PASS
§90.210 / RSS-119 5.8	Spurious emissions (conducted)	PASS
§90.210 / RSS-119 5.8	Spurious emissions (radiated)	PASS

The decision rule applied for the tests results stated in this test report is according to the requirements of section 1.3 of ANSI C63.26-2015.

EUT Test Conditions

The EUT was in continuous transmit mode during all the tests. The EUT was configured into the wanted channel using software provided by the manufacturer. During the tests the EUT was mounted on an evaluation kit provided by the manufacturer (model M3-TR3 Evaluation kit).

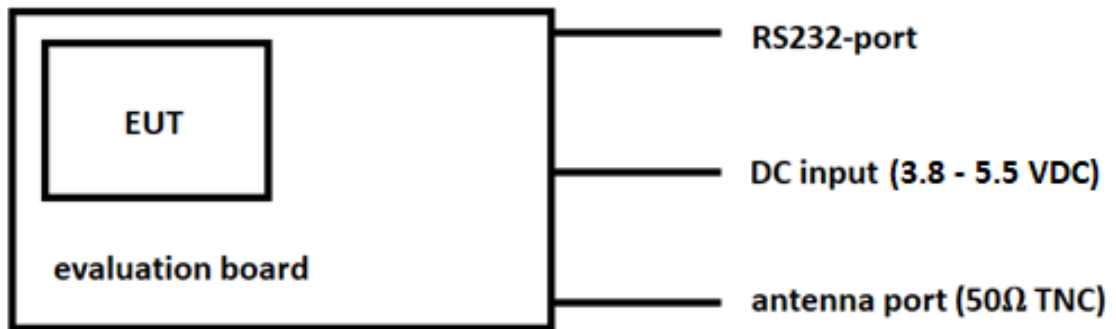


Figure 1: Test setup block diagram

Table 1: Test frequencies

Channel	Frequency (MHz)
Bottom	410.0
Middle 1	429.5
Middle 2	450.5
Top	469.5

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISED CAB identifier: T004	SGS Fimko Ltd Karakaarenkuja 4 FI-02610 ESPOO FINLAND
Test Site:	☐ K10LAB, ISED Canada registration number: 8708A-1 ☒ K5LAB, ISED Canada registration number: 8708A-2 ☐ T10LAB

TEST RESULTS

Transmitter output power

Standard:	ANSI C63.26-2015
Tested by:	PKA
Date:	7 October 2025
Temperature:	22 °C
Humidity:	22 %RH
Barometric pressure	1033 hPa
Measurement uncertainty:	± 0.470 dB, level of confidence 95.45 % (k = 2)
Test result:	PASS

The output power shall be within ± 1 dB of the manufacturer's rated power listed in the equipment specifications.

The test was performed with a spectrum analyser with following settings:

Span:	200 kHz
RBW:	30 kHz
VBW:	100 kHz
Sweep points:	32001
Sweep time:	Auto
Detector:	Positive

Test results
Table 2. Rated output power 100 mW (20.00 dBm), sample 2

Frequency [MHz]	Channel Width [kHz]	Measured [dBm]	Result
410.0	12.5	19.20	PASS
	25.0	19.19	PASS
429.5	12.5	19.87	PASS
	25.0	19.87	PASS
450.5	12.5	19.66	PASS
	25.0	19.65	PASS
469.5	12.5	19.93	PASS
	25.0	19.92	PASS

Table 3. Rated output power 200 mW (23.00 dBm), sample 2

Frequency [MHz]	Channel Width [kHz]	Measured [dBm]	Result
410.0	12.5	22.27	PASS
	25.0	22.28	PASS
429.5	12.5	22.78	PASS
	25.0	22.77	PASS
450.5	12.5	22.53	PASS
	25.0	22.53	PASS
469.5	12.5	22.90	PASS
	25.0	22.90	PASS

Measurement figures with 1000 mW output power and 12.5 kHz channel width

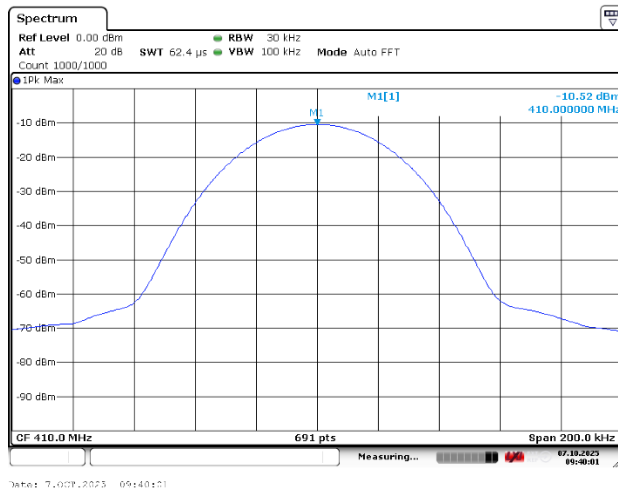


Figure 2: 410.0 MHz

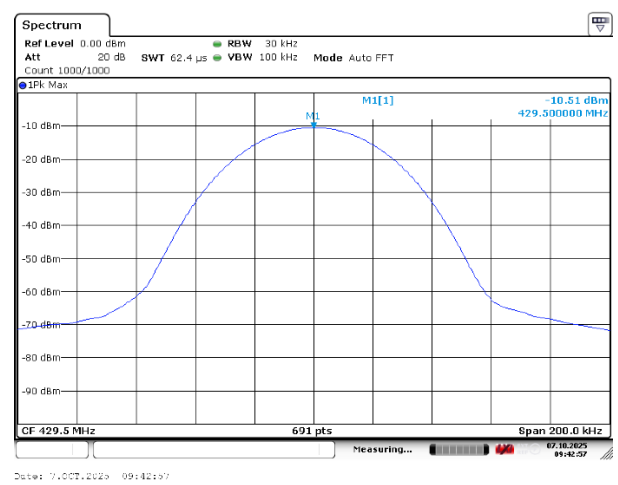


Figure 3: 429.5 MHz

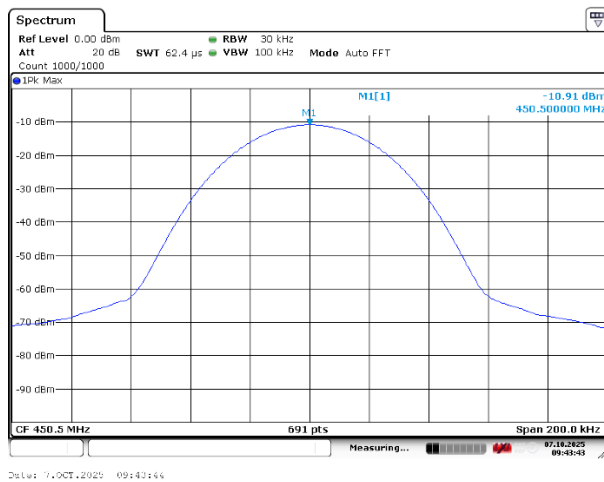


Figure 4: 450.5 MHz

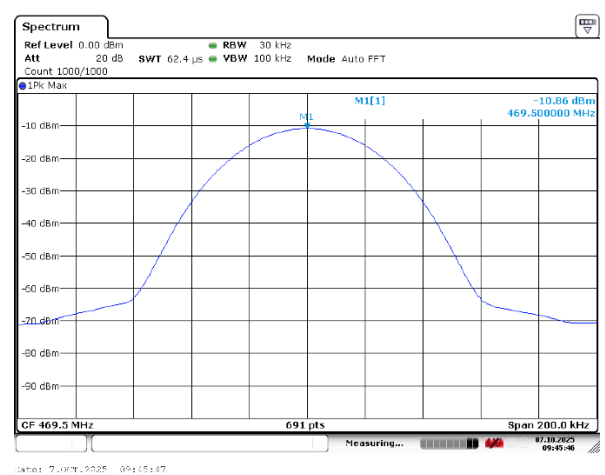


Figure 5: 469.5 MHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

Standard: ANSI C63.26-2015
Tested by: PKA, HEM
Date: 8 October 2025 and 13 February 2026
Temperature: 22 °C
Humidity: 25 %RH
Barometric pressure: 1033 hPa
Measurement uncertainty: ± 2.90 dB, level of confidence 95.45 % (k = 2)
Test result: **PASS**

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.

All factors (attenuators and cables) are added to the results in the screen captures of the spectrum analyzer.

Frequency Band (MHz)	Channel Bandwidth (kHz)	Authorized Bandwidth (kHz)	Limit (dBm)
406.1-430 and 450-470	12.5	11.25	-20
	25	20	-13

The test was performed at maximum power level.

Test Results, sample 2

Frequency (MHz)	Channel Width (kHz)	Result
410.0	12.5	PASS
410.0	25.0	PASS
429.5	12.5	PASS
429.5	25.0	PASS
450.5	12.5	PASS
450.5	25.0	PASS
469.5	12.5	PASS
469.5	25.0	PASS

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 410.0 MHz, channel width 12.5 kHz

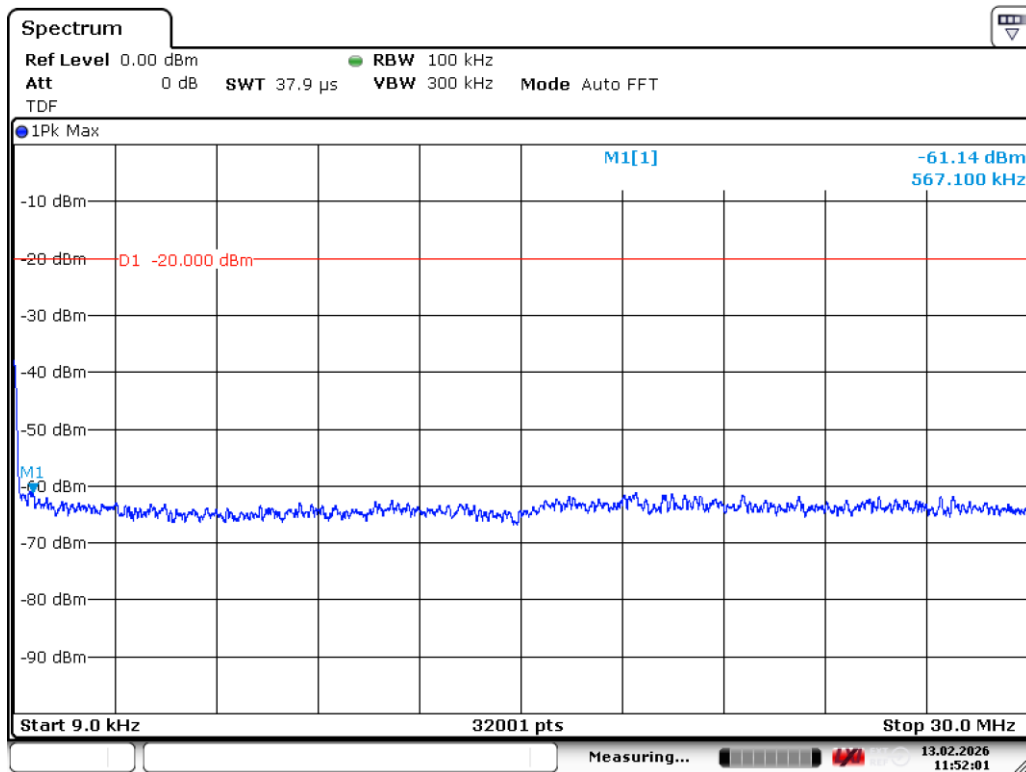
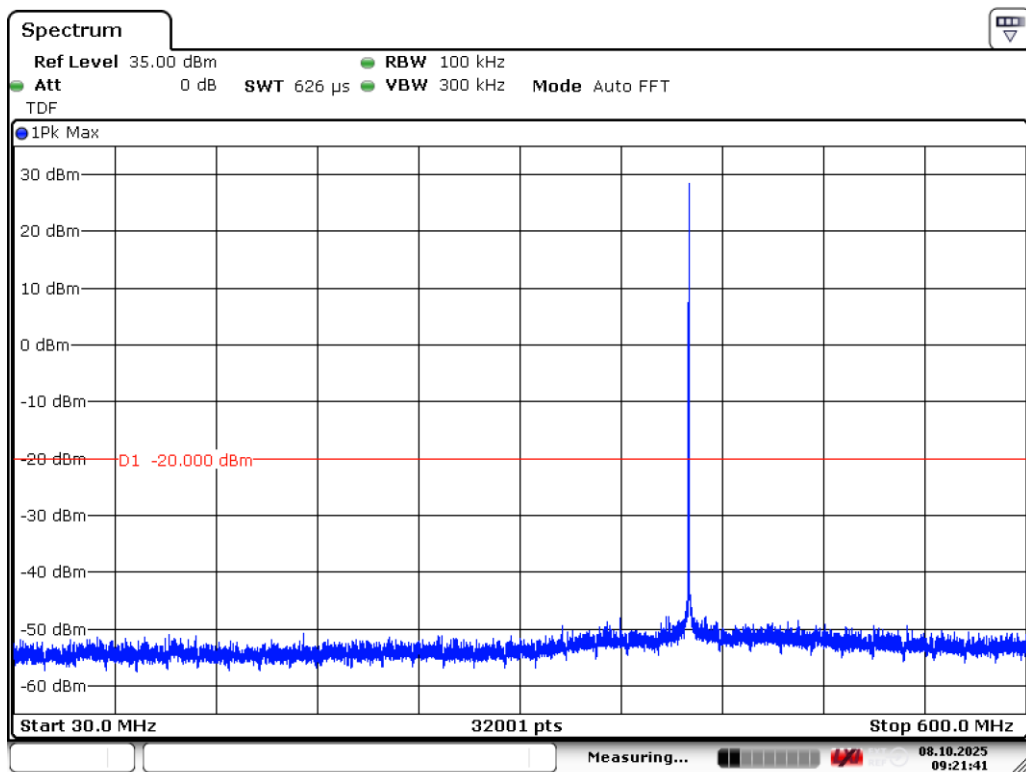


Figure 6: 410MHz, 12.5kHz, 9kHz – 30MHz



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Figure 7: 410MHz, 12.5kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz

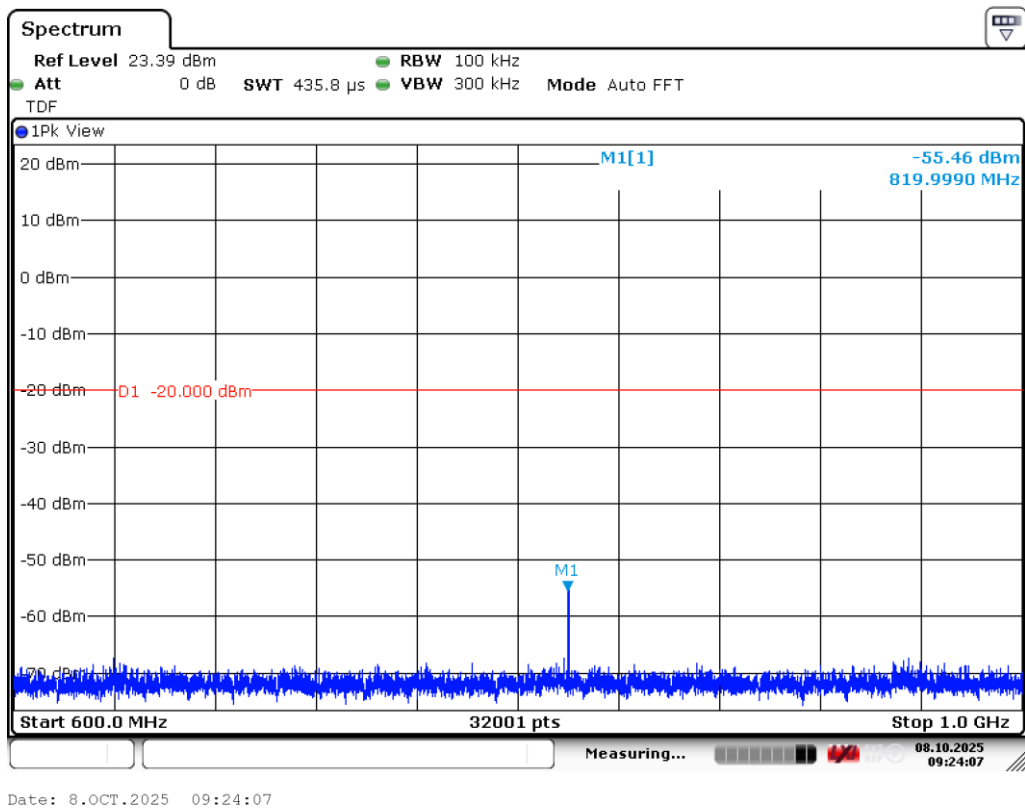


Figure 8: 410MHz, 12.5kHz, 600 – 1000MHz

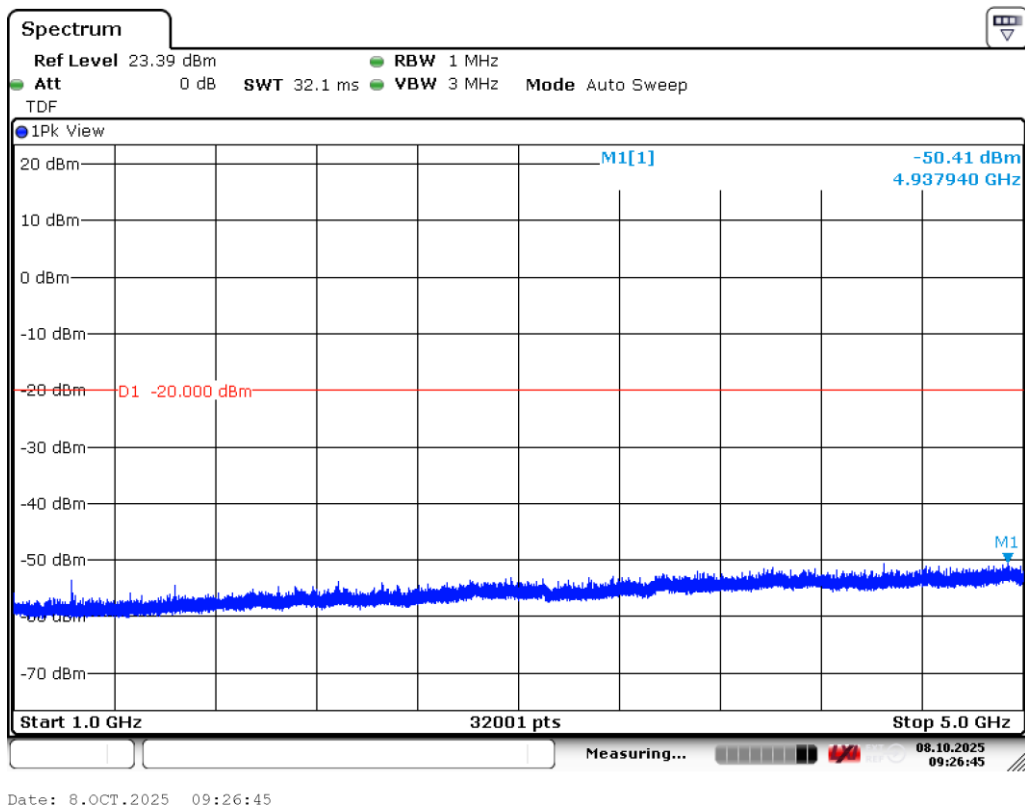


Figure 9: 410MHz, 12.5kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 429.5 MHz, channel width 12.5 kHz

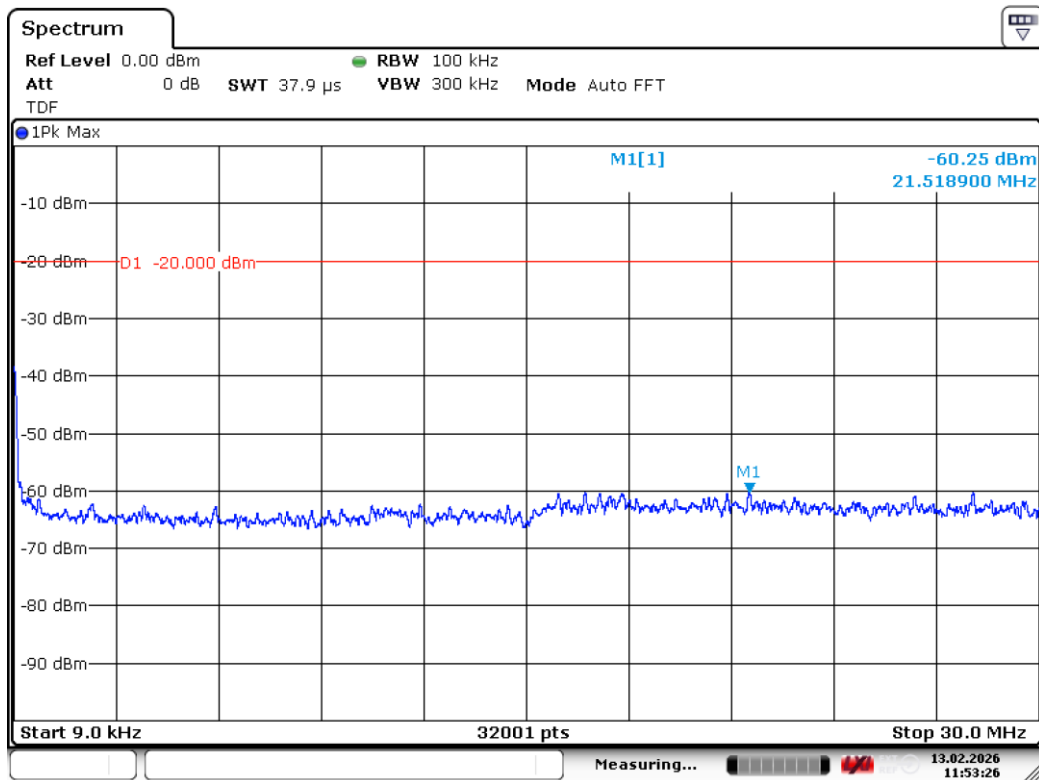
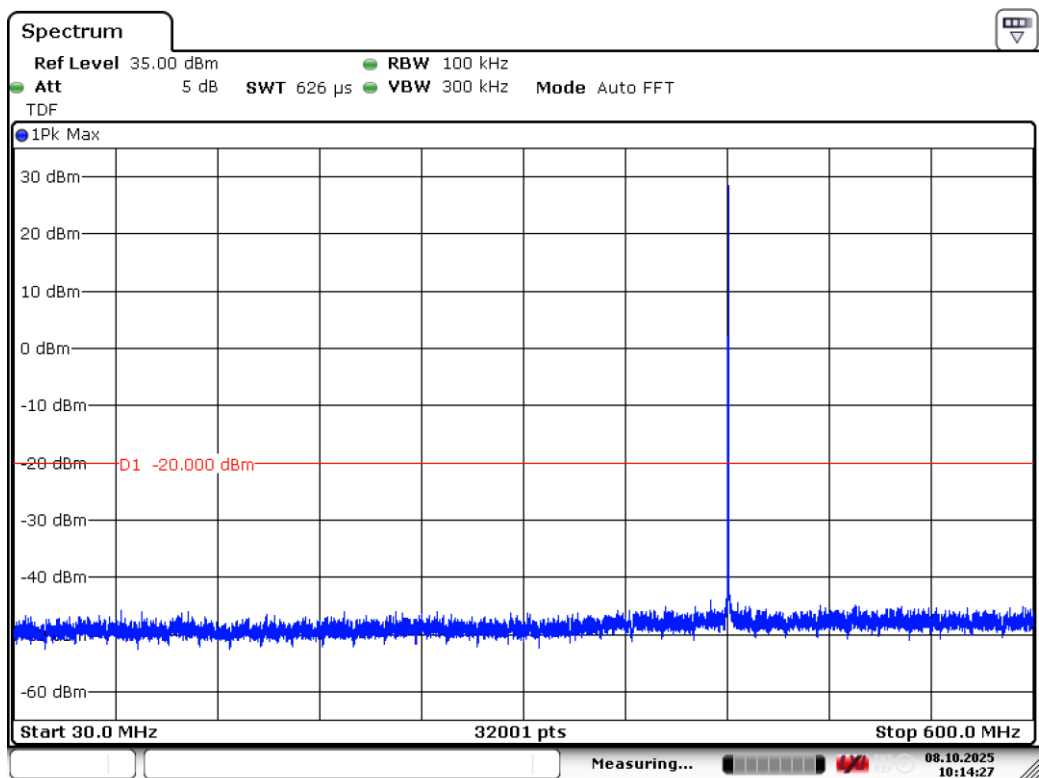


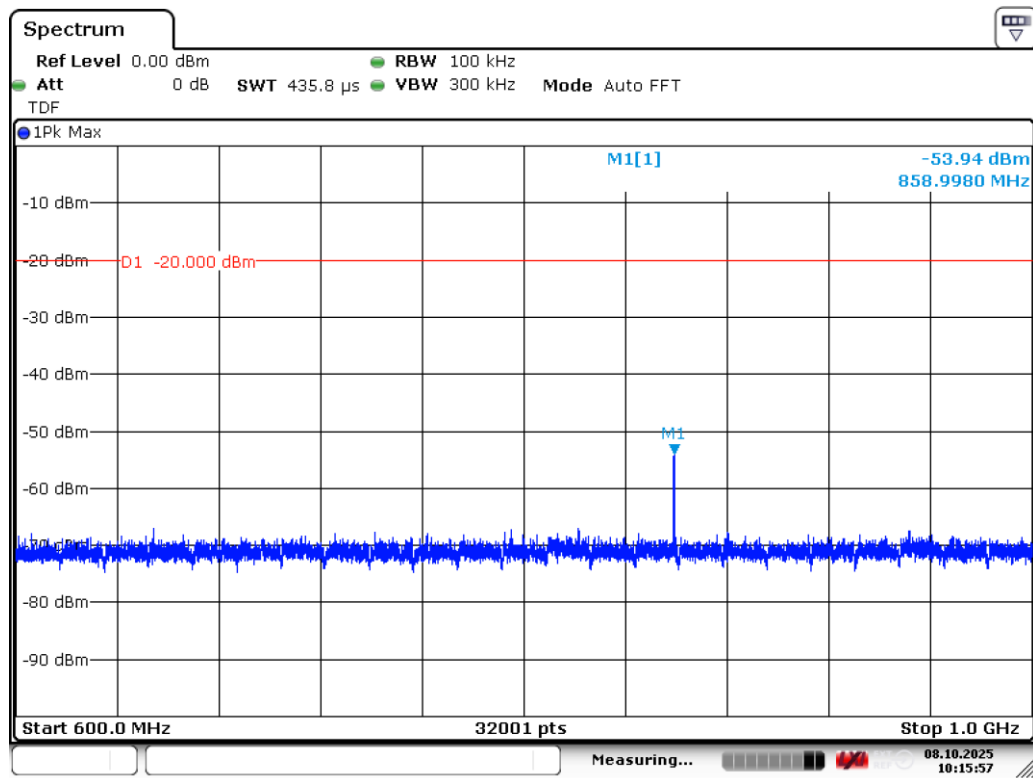
Figure 10: 429.5MHz, 12.5kHz, 9kHz – 30MHz



Date: 8.OCT.2025 10:14:27

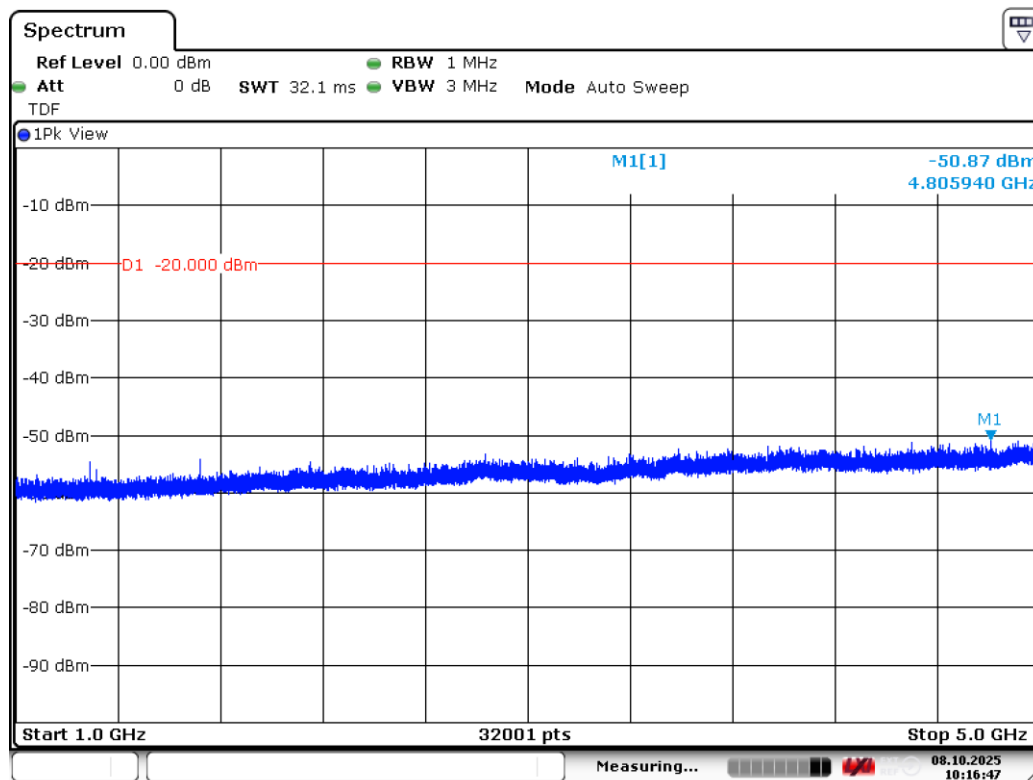
Figure 11: 429.5MHz, 12.5kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz



Date: 8.OCT.2025 10:15:57

Figure 12: 429.5MHz, 12.5kHz, 600 – 1000MHz



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Figure 13: 429.5MHz, 12.5kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 450.5 MHz, channel width 12.5 kHz

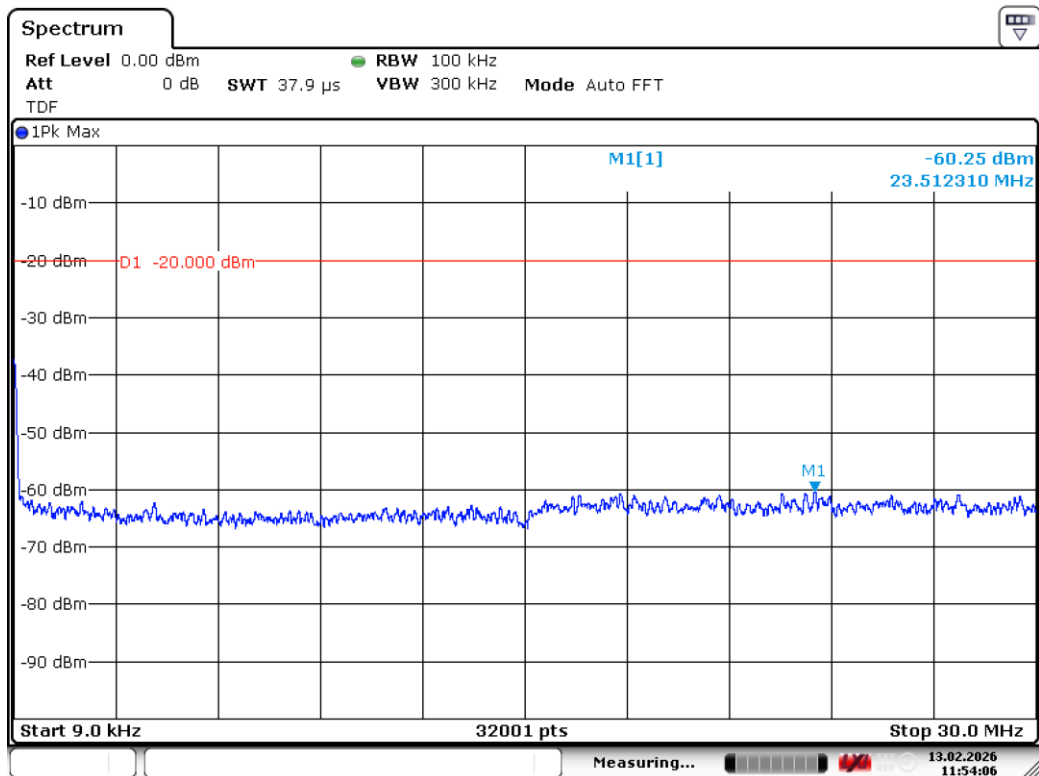
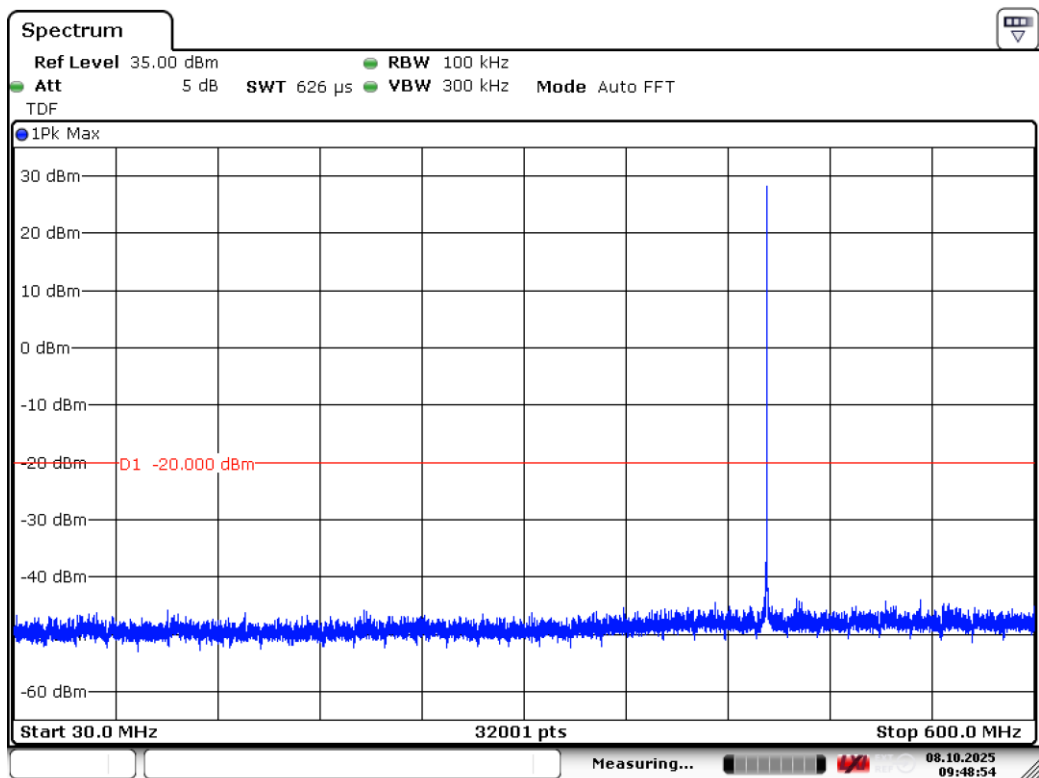


Figure 14: 450.5MHz, 12.5kHz, 9kHz – 30MHz



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Figure 15: 450.5MHz, 12.5kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz

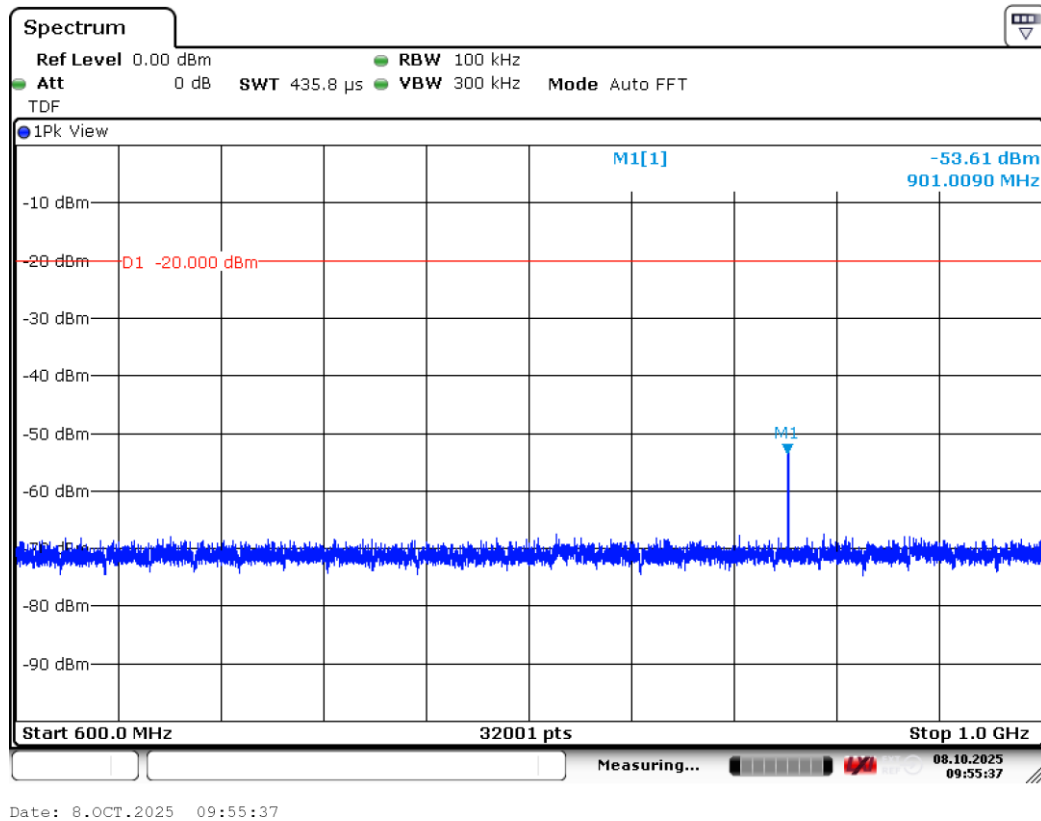


Figure 16: 450.5MHz, 12.5kHz, 600 – 1000MHz

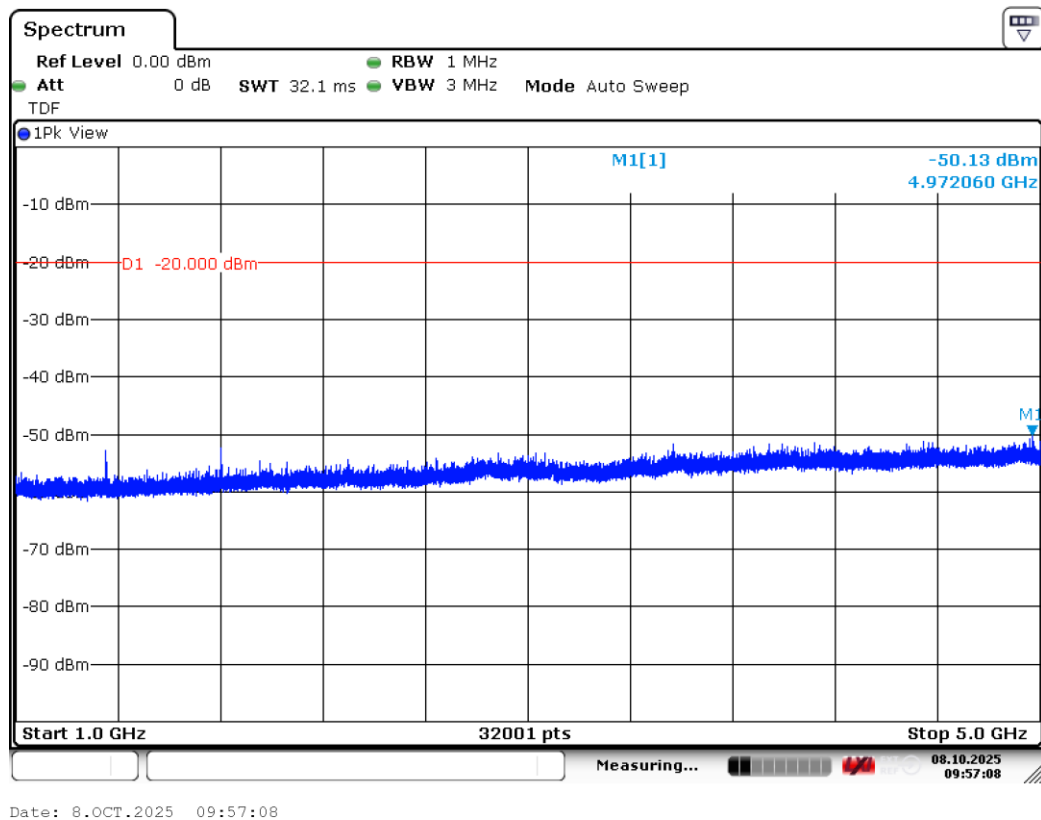


Figure 17: 450.5MHz, 12.5kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 469.5 MHz, channel width 12.5 kHz

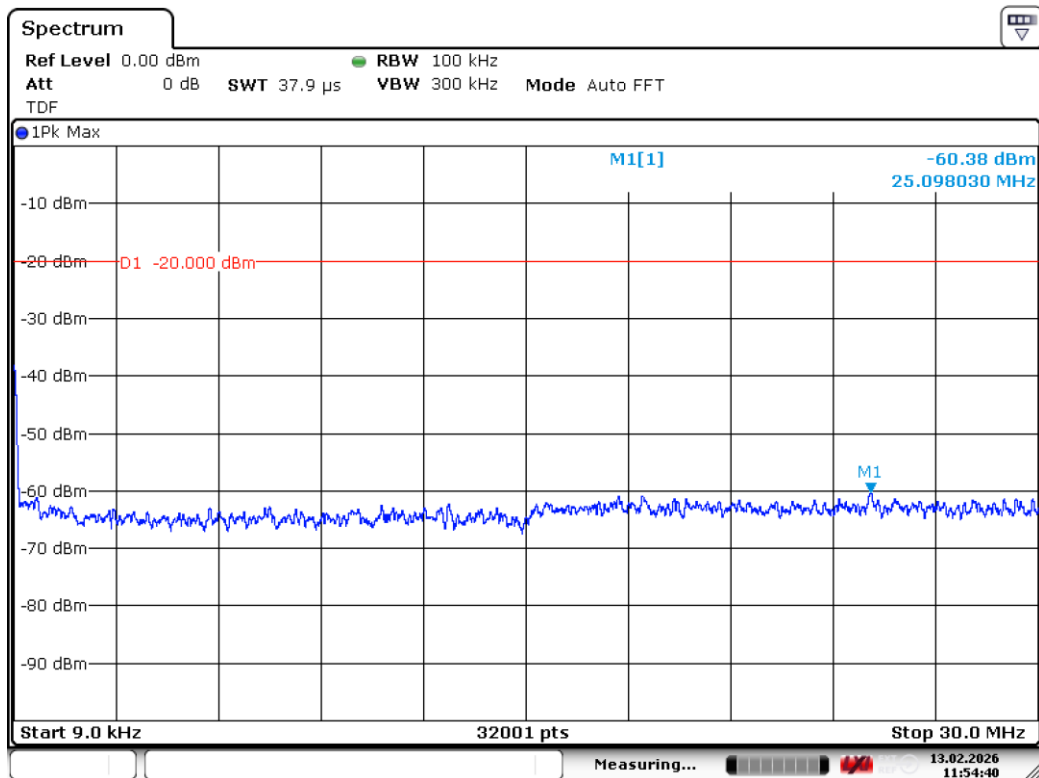
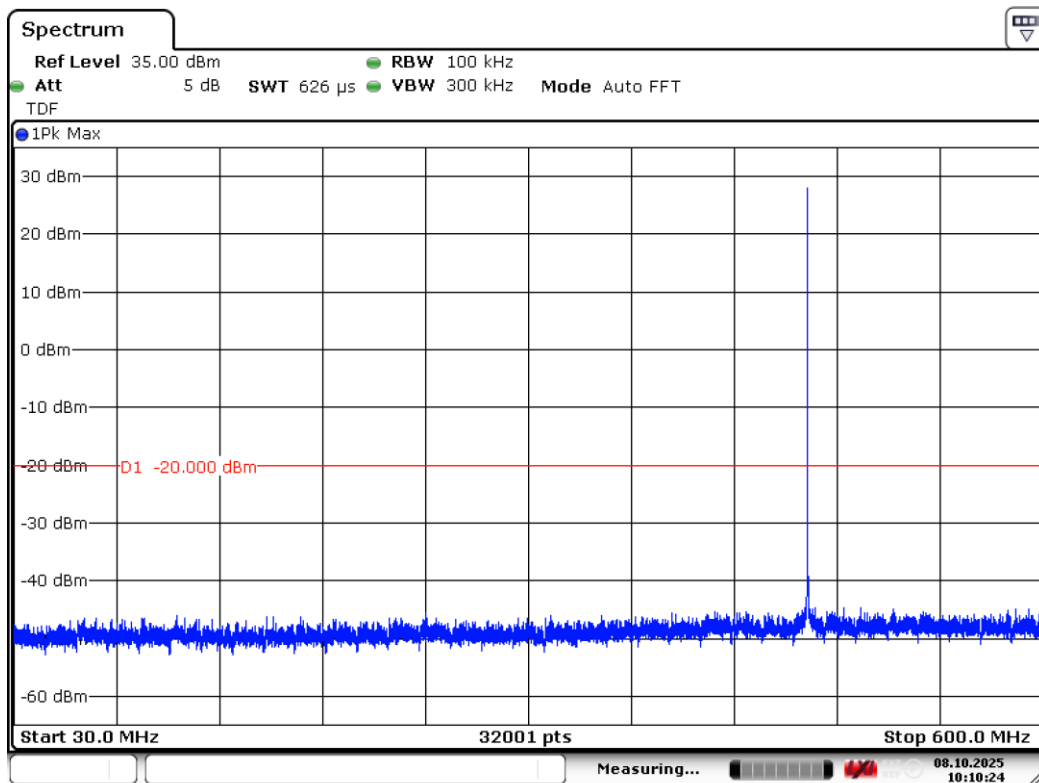


Figure 18: 469.5MHz, 12.5kHz, 9kHz – 30MHz



Date: 8.OCT.2025 10:10:24

Figure 19: 469.5MHz, 12.5kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz

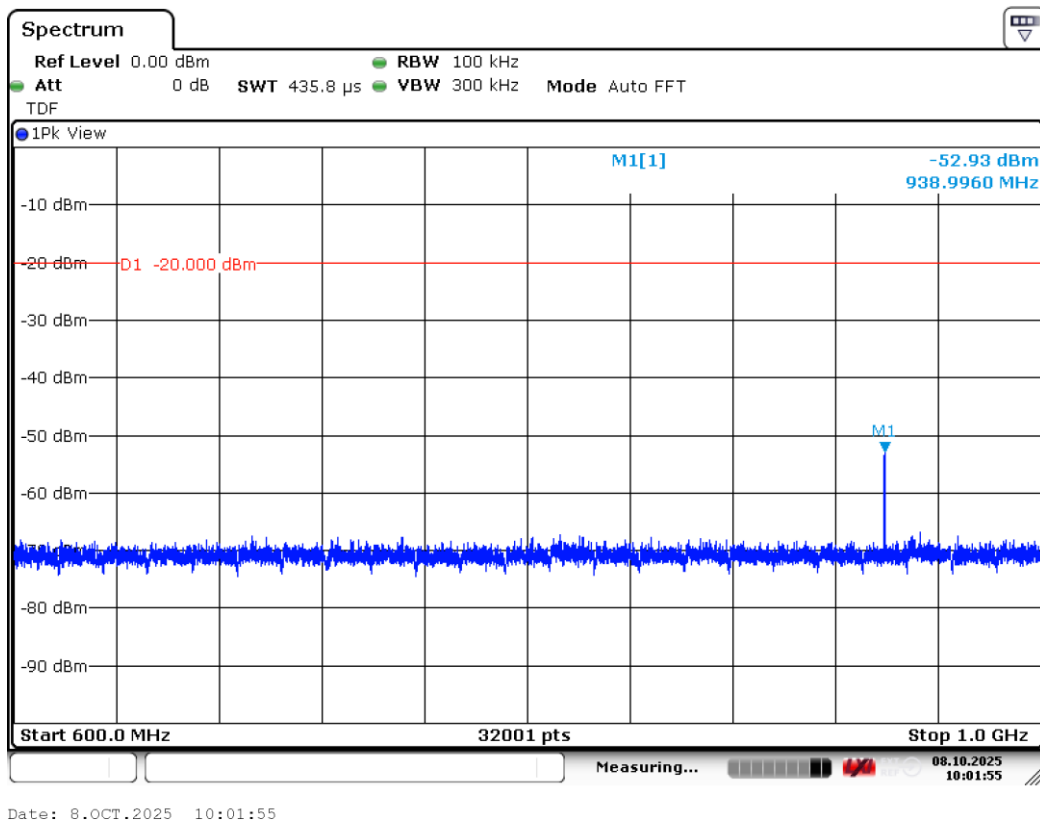


Figure 20: 469.5MHz, 12.5kHz, 600 – 1000MHz

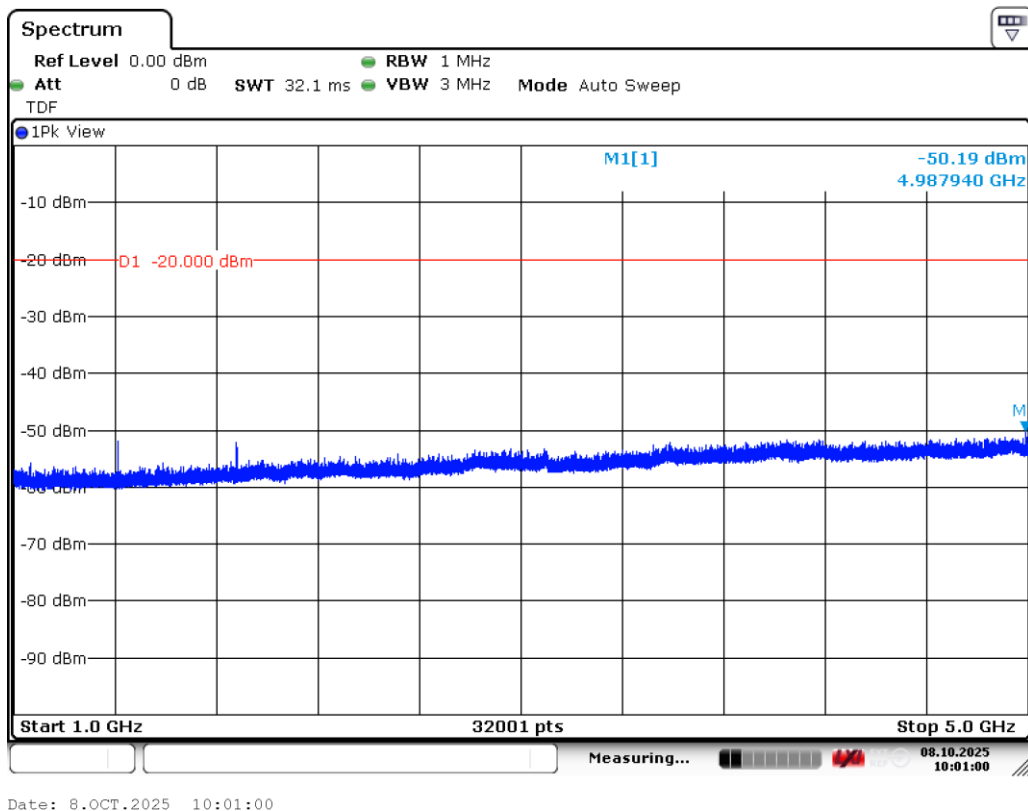


Figure 21: 469.5MHz, 12.5kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 410.0 MHz, channel width 25 kHz

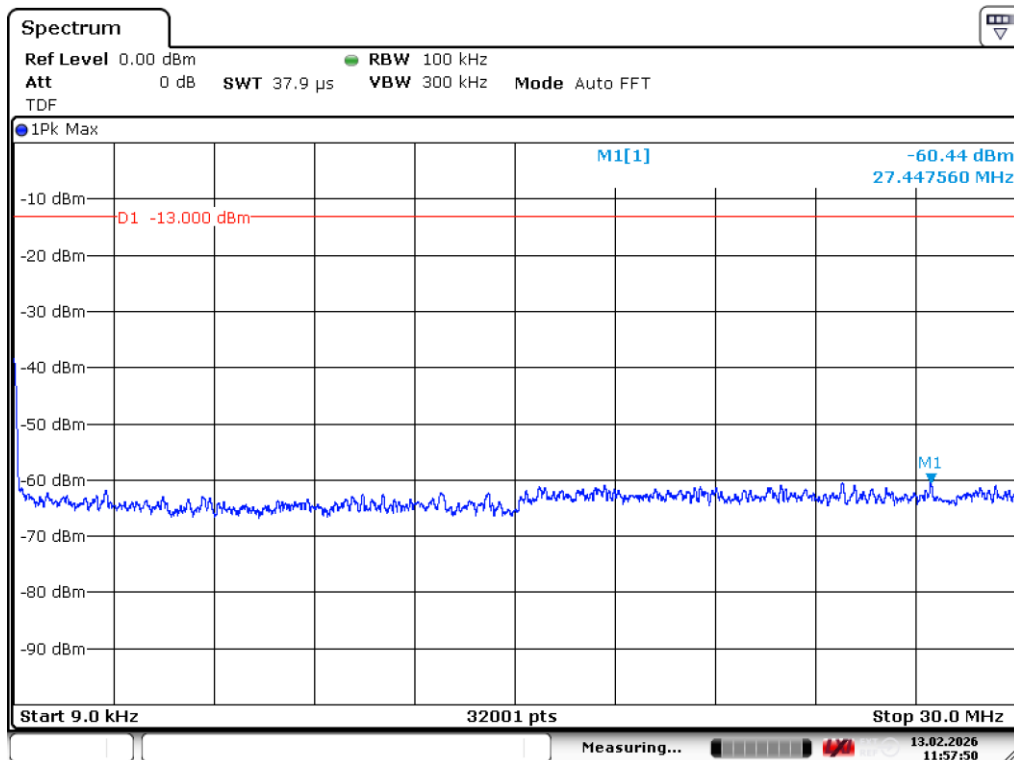
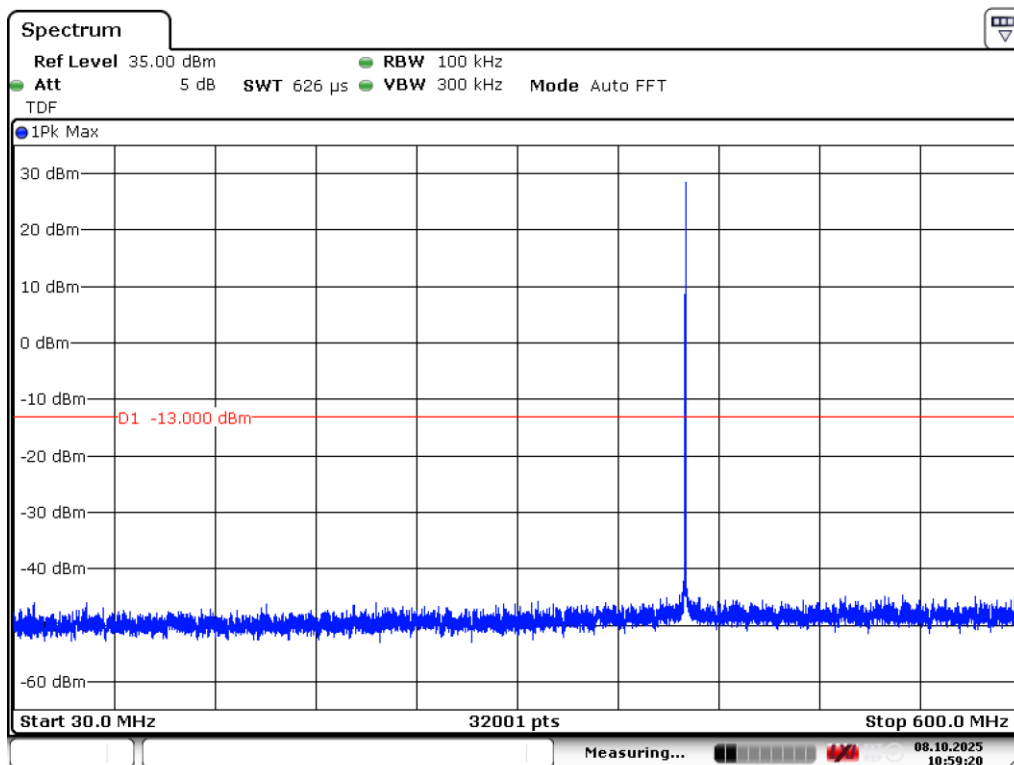


Figure 22: 410MHz, 25kHz, 9kHz – 30MHz



Date: 8.OCT.2025 10:59:20

Figure 23: 410MHz, 25kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz

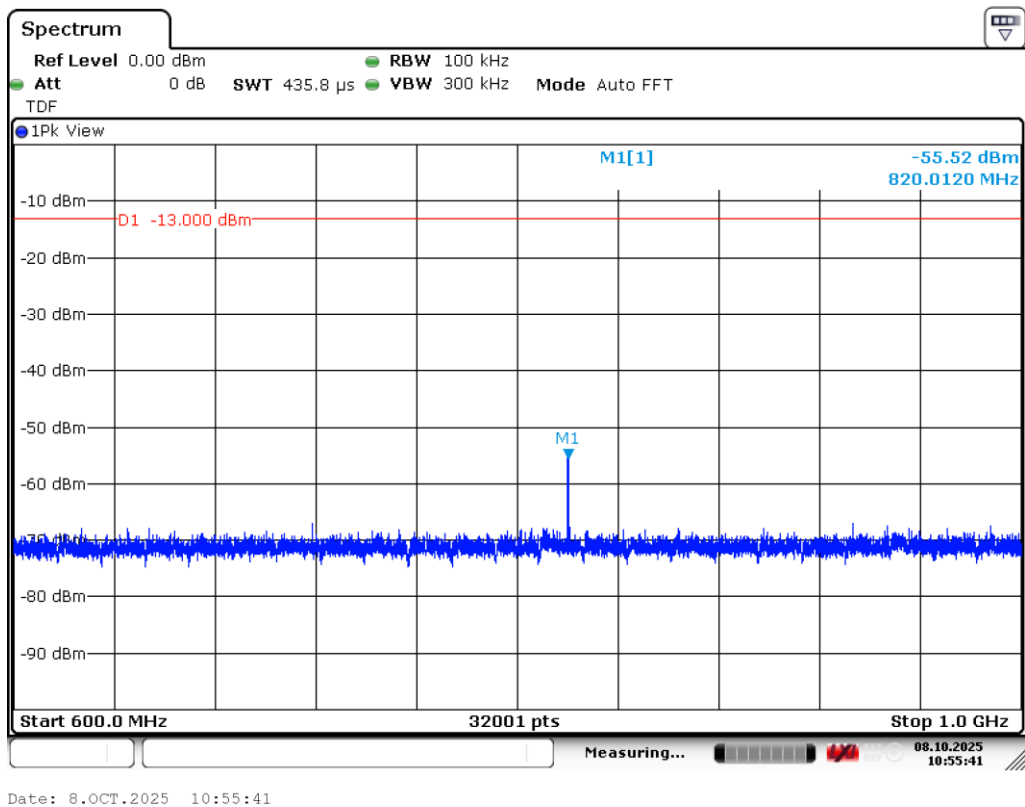


Figure 24: 410MHz, 25kHz, 600 – 1000MHz

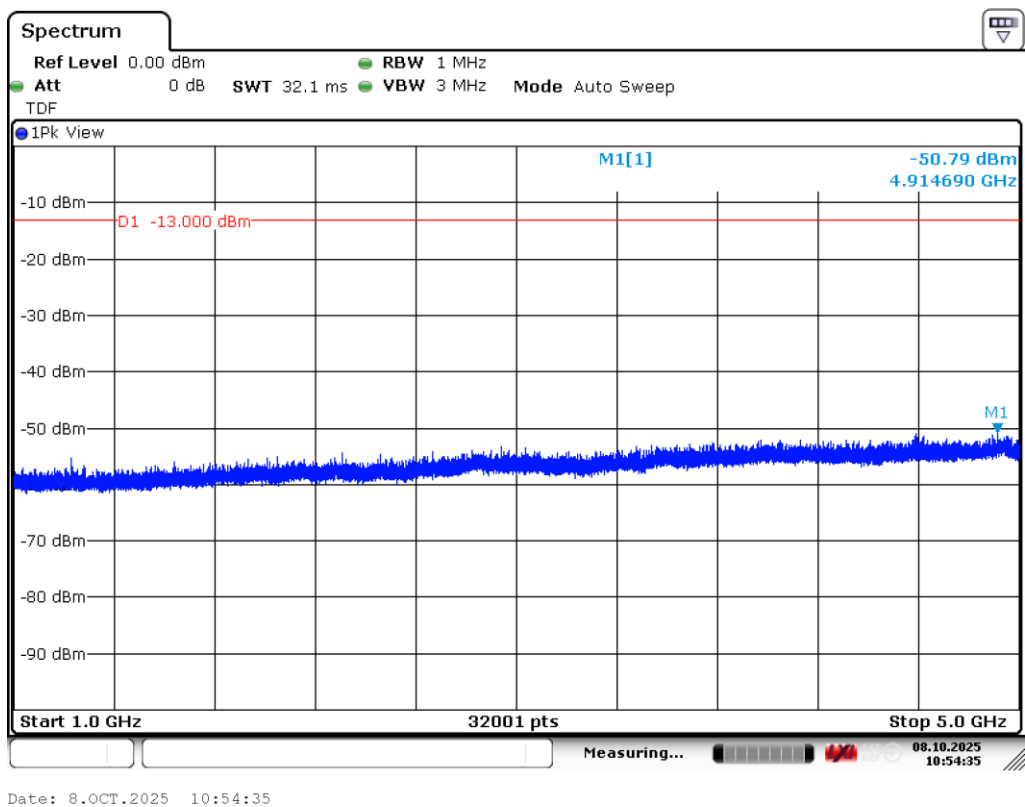


Figure 25: 410MHz, 25kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 429.5 MHz, channel width 25 kHz

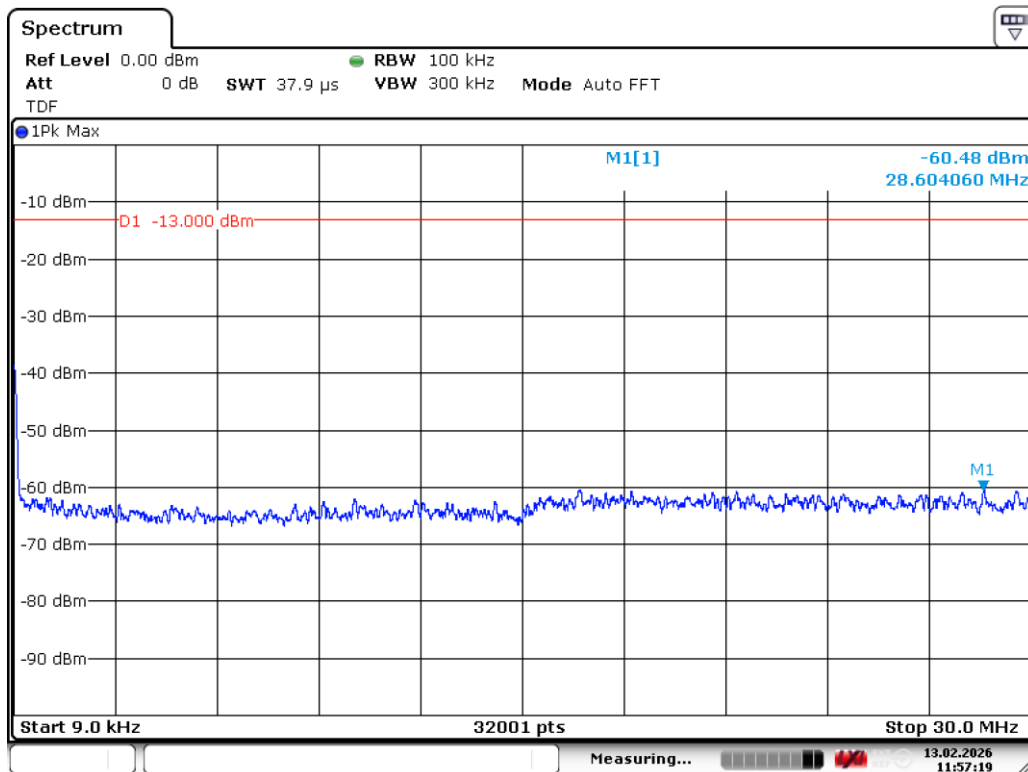
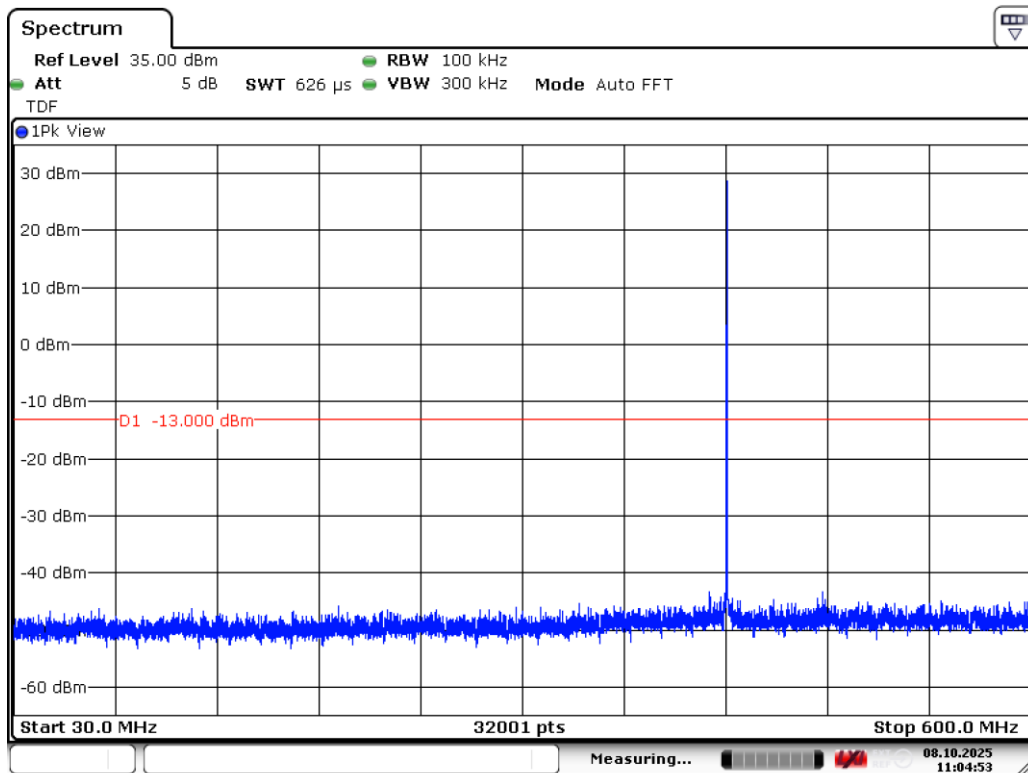


Figure 26: 429.5MHz, 25kHz, 9kHz – 30MHz



Date: 8.OCT.2025 11:04:53

Figure 27: 429.5MHz, 25kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz

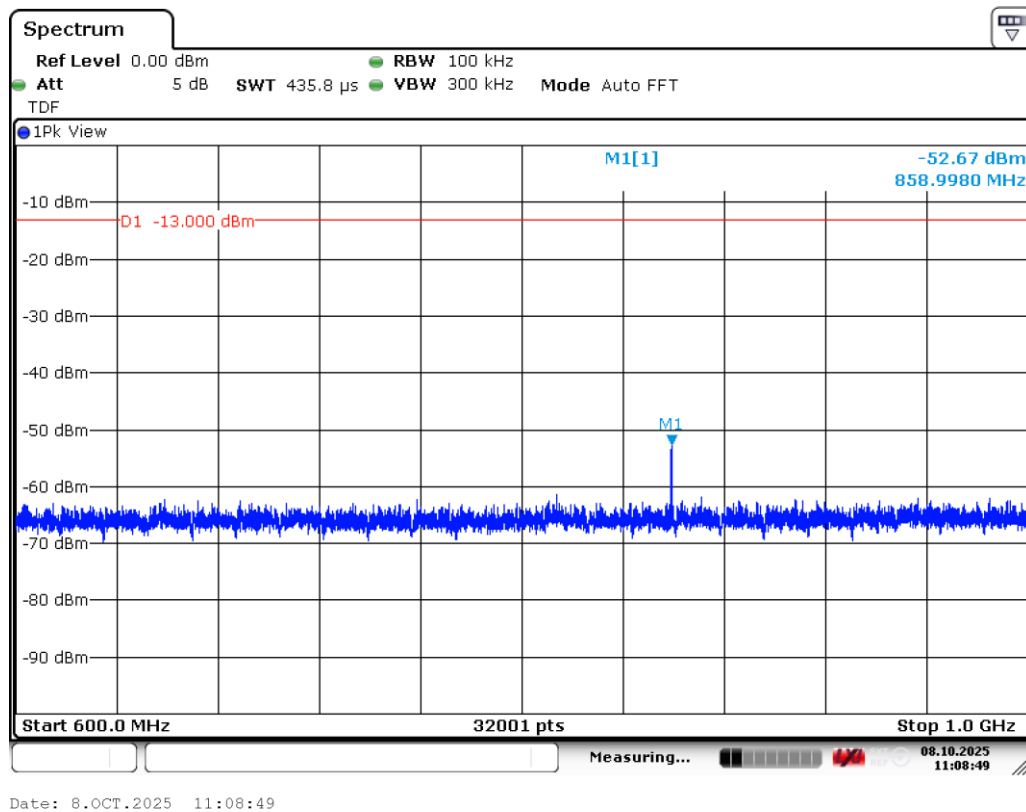


Figure 28: 429.5MHz, 25kHz, 600 – 1000MHz

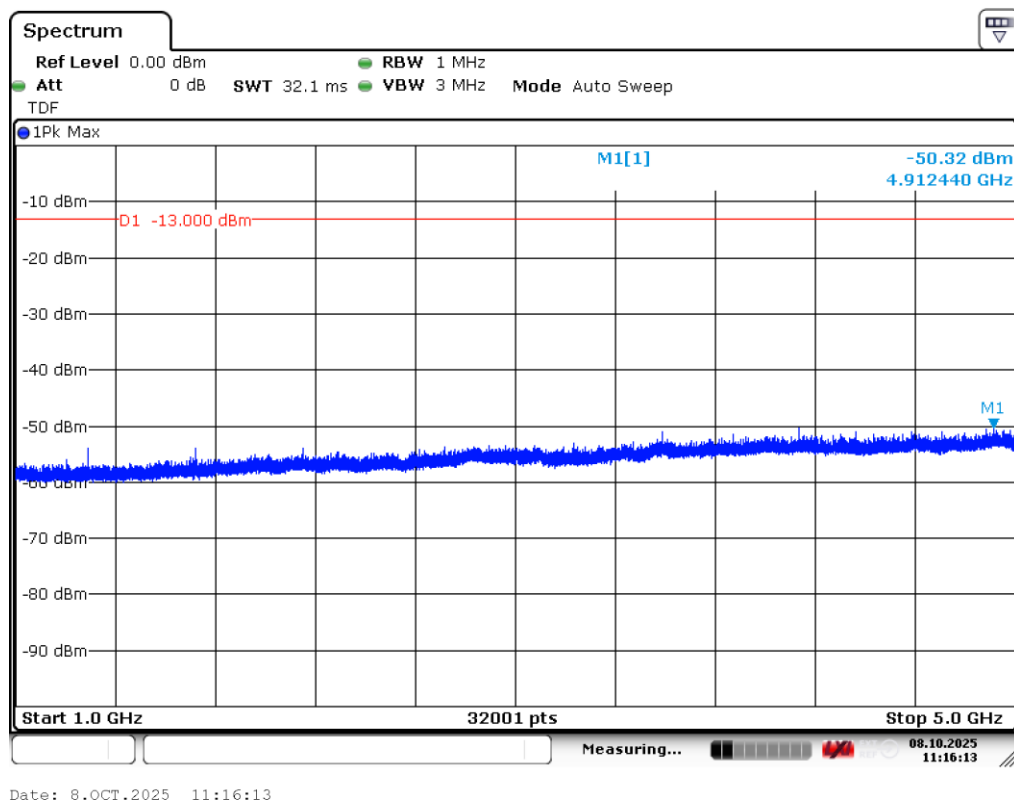


Figure 29: 429.5MHz, 25kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 450.5 MHz, channel width 25 kHz

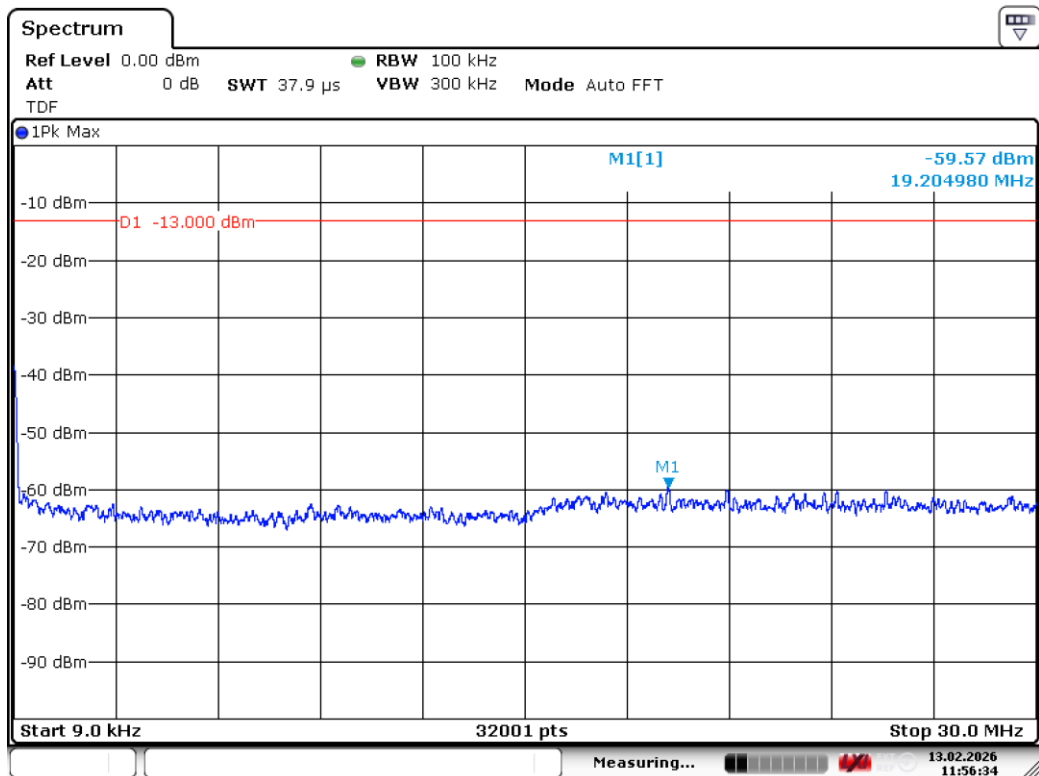


Figure 30: 450.5MHz, 25kHz, 9kHz – 30MHz

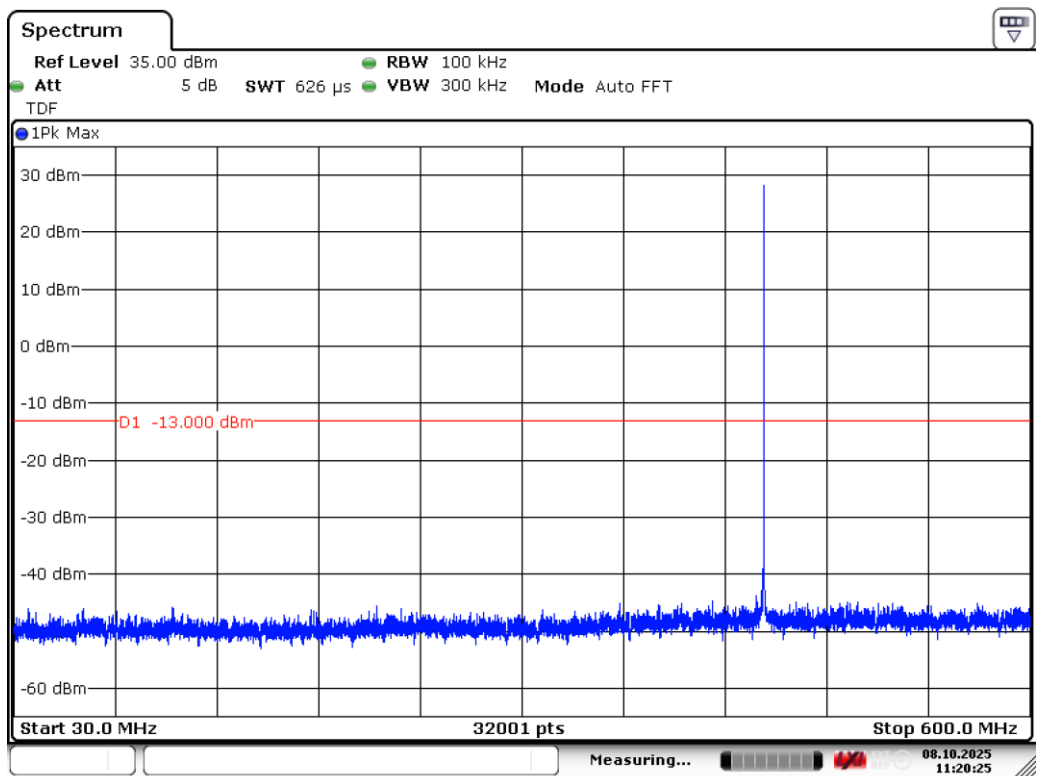
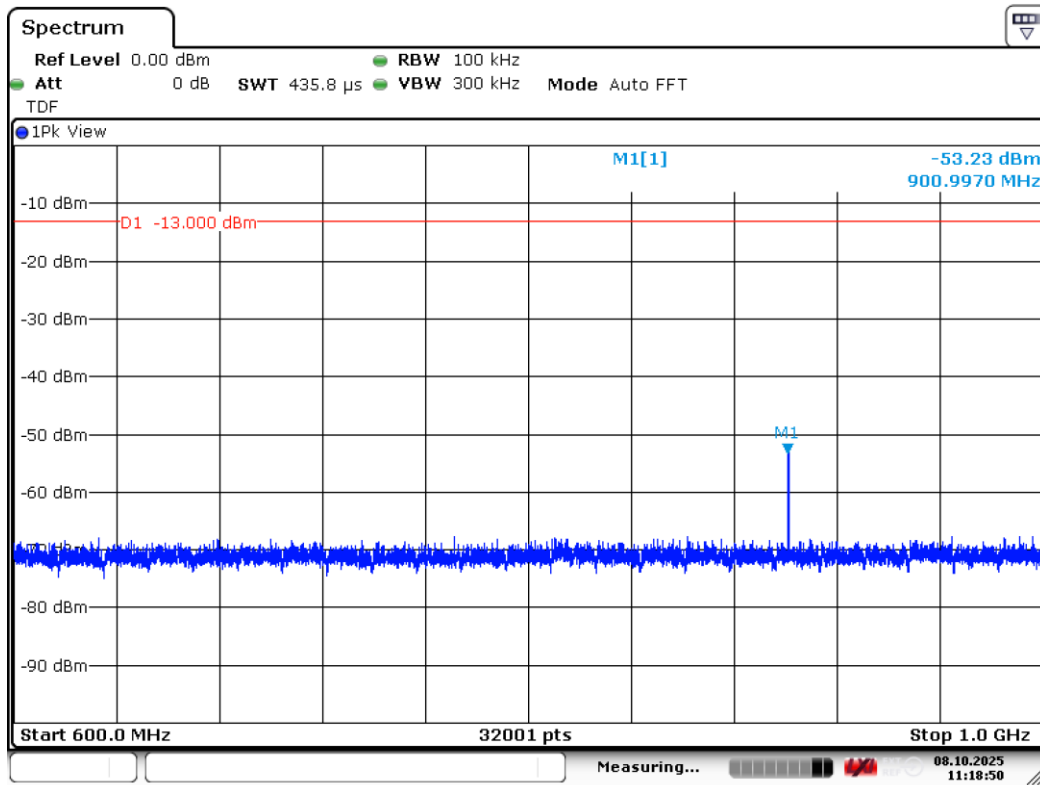


Figure 31: 450.5MHz, 25kHz, 30 – 600MHz

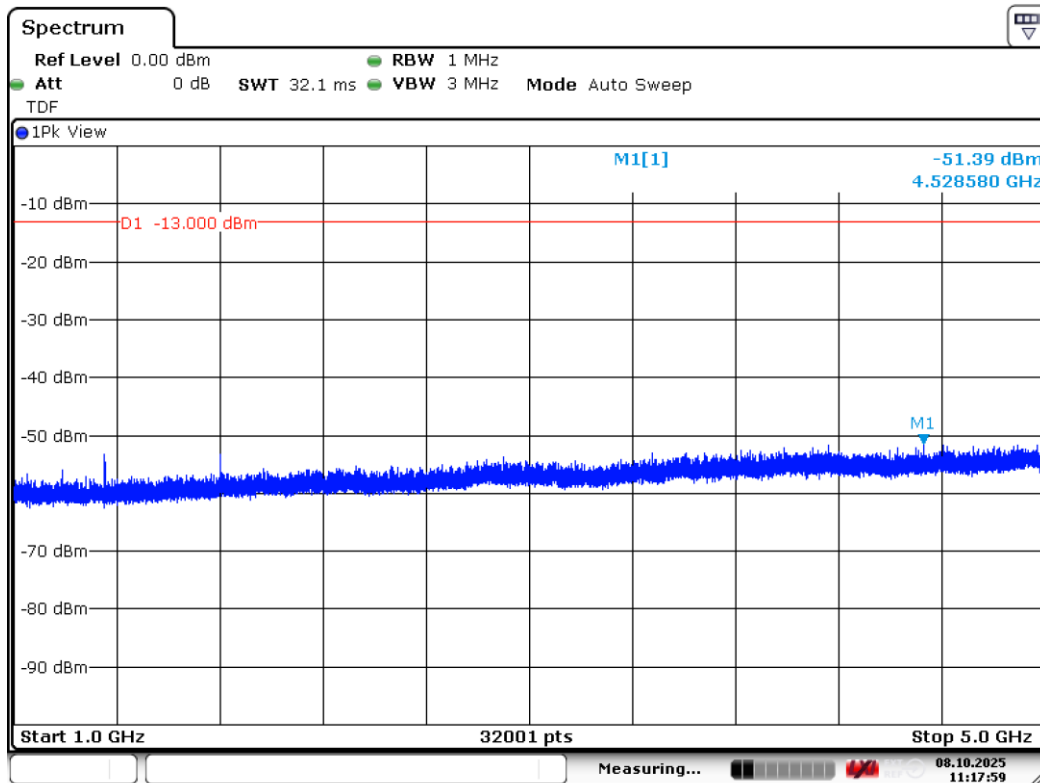
Date: 8.OCT.2025 11:20:25

Spurious emissions (conducted) 9 kHz – 5 GHz



Date: 8.OCT.2025 11:18:50

Figure 32: 450.5MHz, 25kHz, 600 – 1000MHz



Date: 8.OCT.2025 11:17:59

Figure 33: 450.5MHz, 25kHz, 1 – 5GHz

Spurious emissions (conducted) 9 kHz – 5 GHz

TX 469.5 MHz, channel width 25 kHz

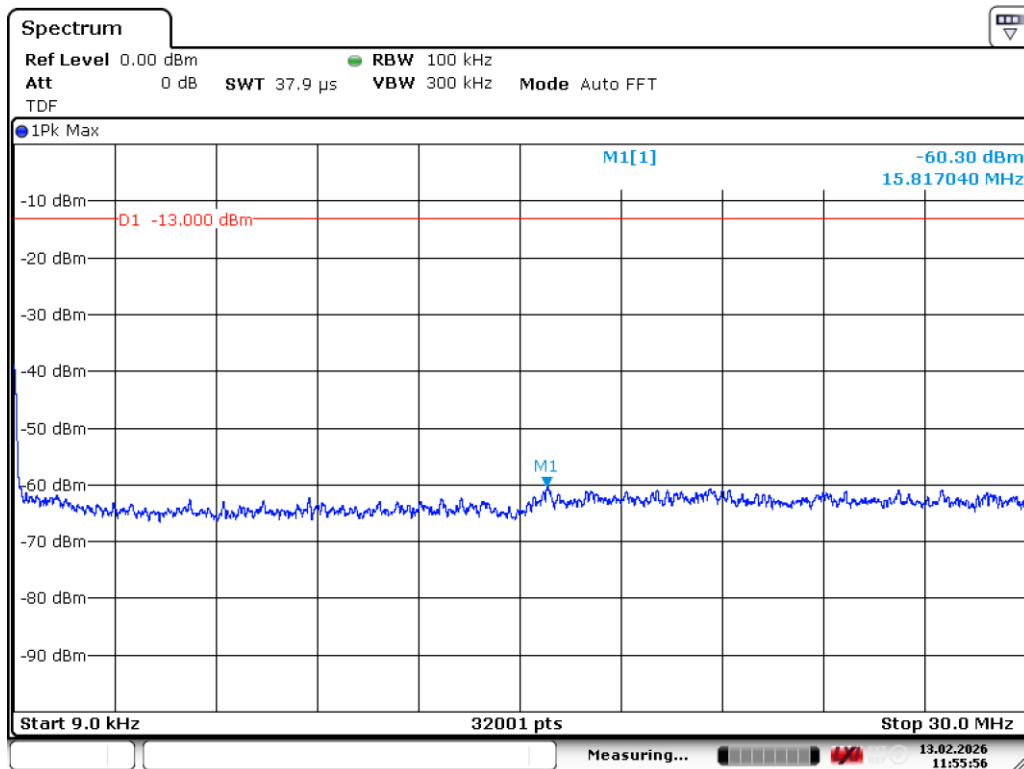
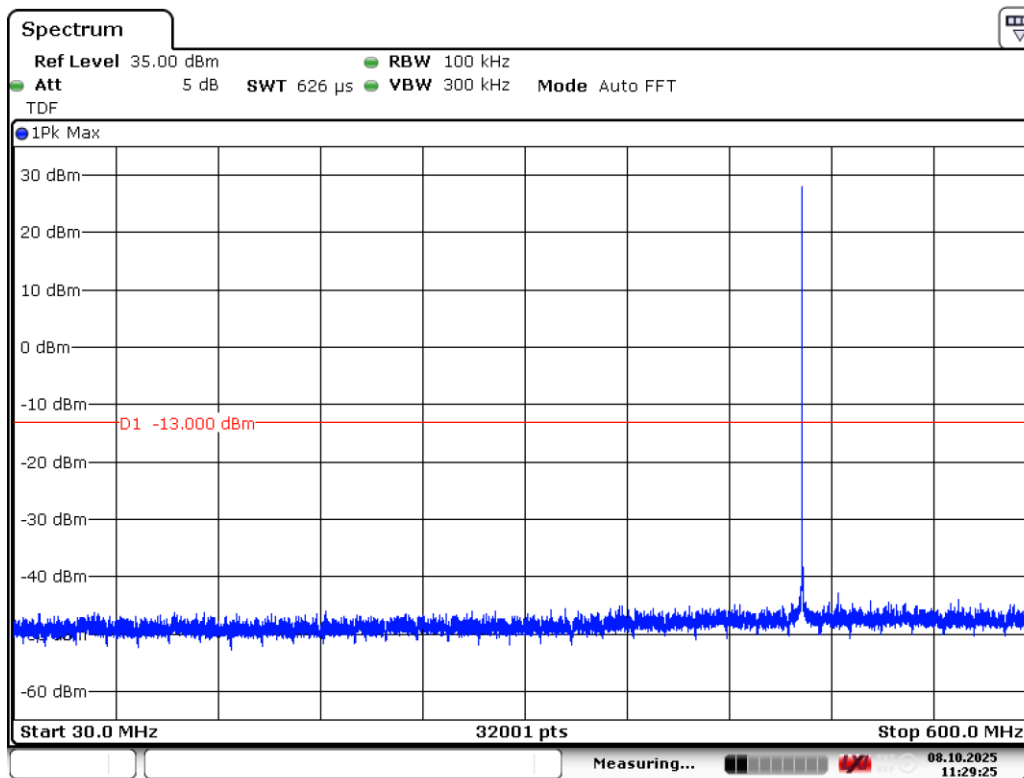


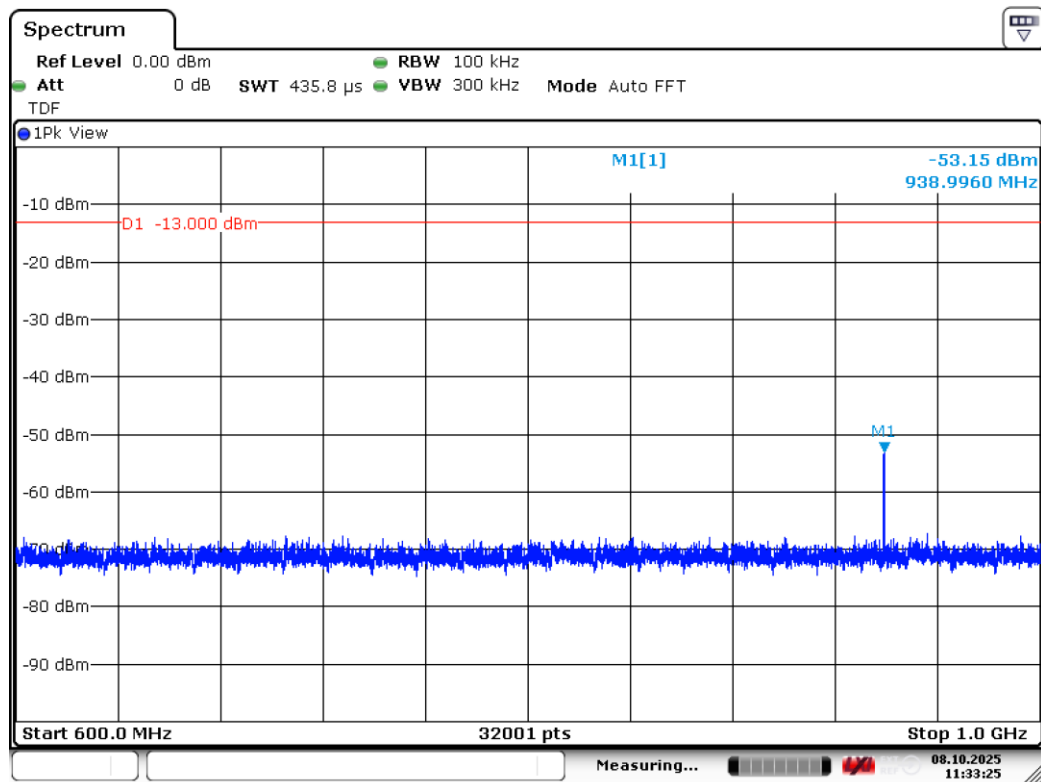
Figure 34: 469.5MHz, 25kHz, 9kHz – 30MHz



Date: 8.OCT.2025 11:29:25

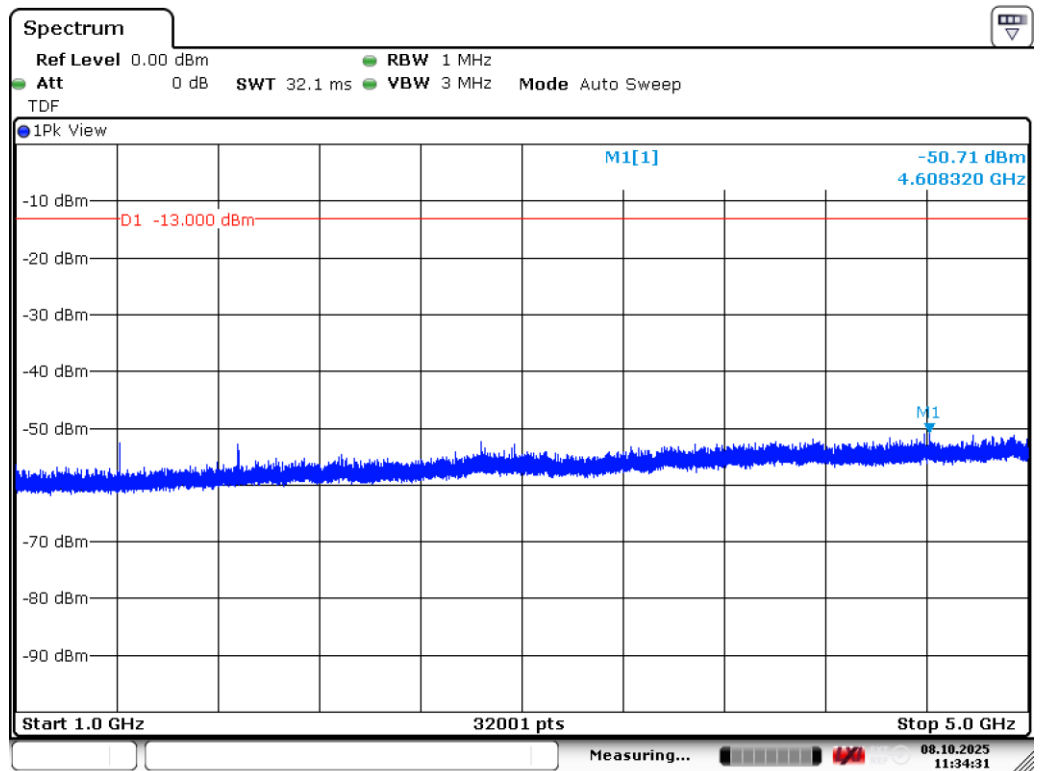
Figure 35: 469.5MHz, 25kHz, 30 – 600MHz

Spurious emissions (conducted) 9 kHz – 5 GHz



Date: 8.OCT.2025 11:33:25

Figure 36: 469.5MHz, 25kHz, 600 – 1000MHz



Date: 8.OCT.2025 11:34:31

Figure 37: 469.5MHz, 25kHz, 1 – 5GHz

Spurious emissions (radiated) 9 kHz – 5 GHz

Spurious emissions (radiated) 9 kHz – 5 GHz

Standard: ANSI C63.26-2015
Tested by: PKA, LAS
Date: 29 and 30 September 2025
Temperature: 23 °C
Humidity: 33 %RH
Barometric pressure: 1032 hPa
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)
406.1-430 and 450-470	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 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 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 50 Ω load.

Frequency	Channel	Channel width [kHz]	Orientation	Result
9 kHz – 30 MHz	bottom	12.5	X	PASS
	middle 1	25	Y	PASS
	middle 2	12.5	Z	PASS
	top	25	X	PASS
30 – 1000 MHz	bottom	25	Y	PASS
	middle 1	12.5	Z	PASS
	middle 2	25	X	PASS
	top	12.5	Y	PASS
1 – 5 GHz	bottom	12.5	Z	PASS
	middle 1	25	X	PASS
	middle 2	12.5	Y	PASS
	top	25	Z	PASS

sample 1

Test Results, 9 kHz – 30 MHz

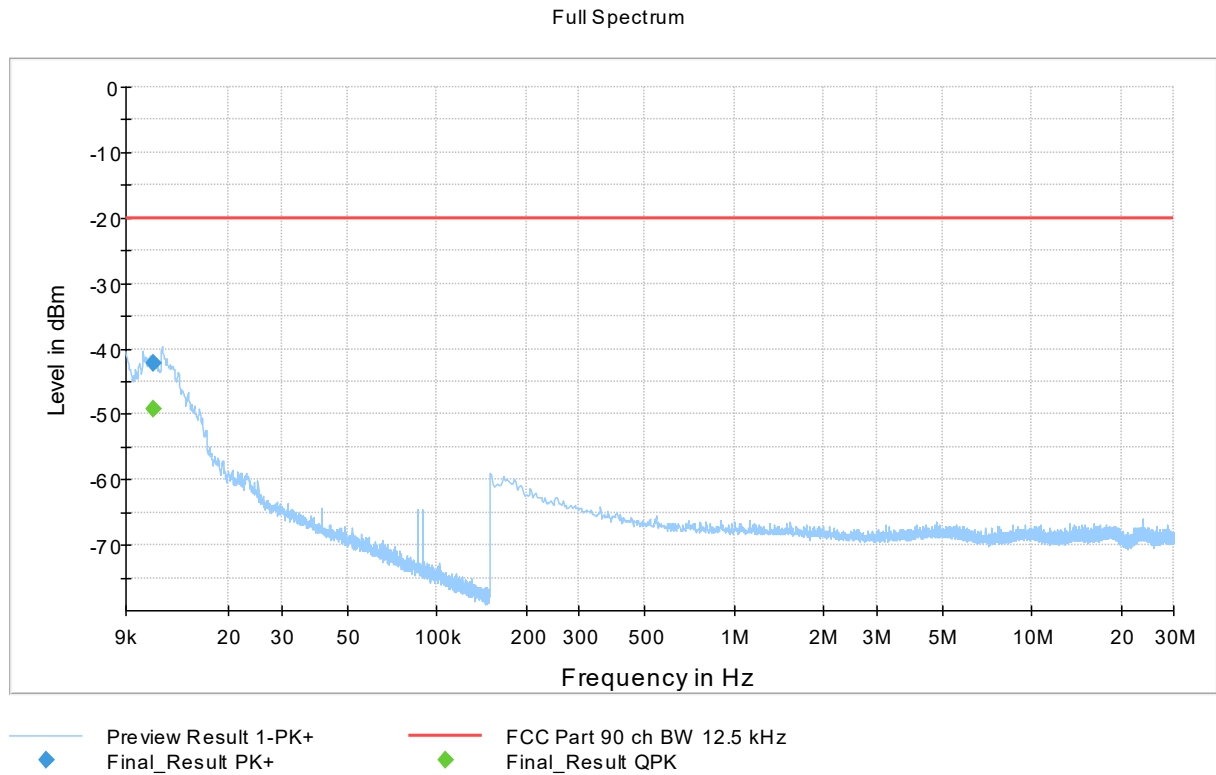


Figure 38: TX 410.0 MHz

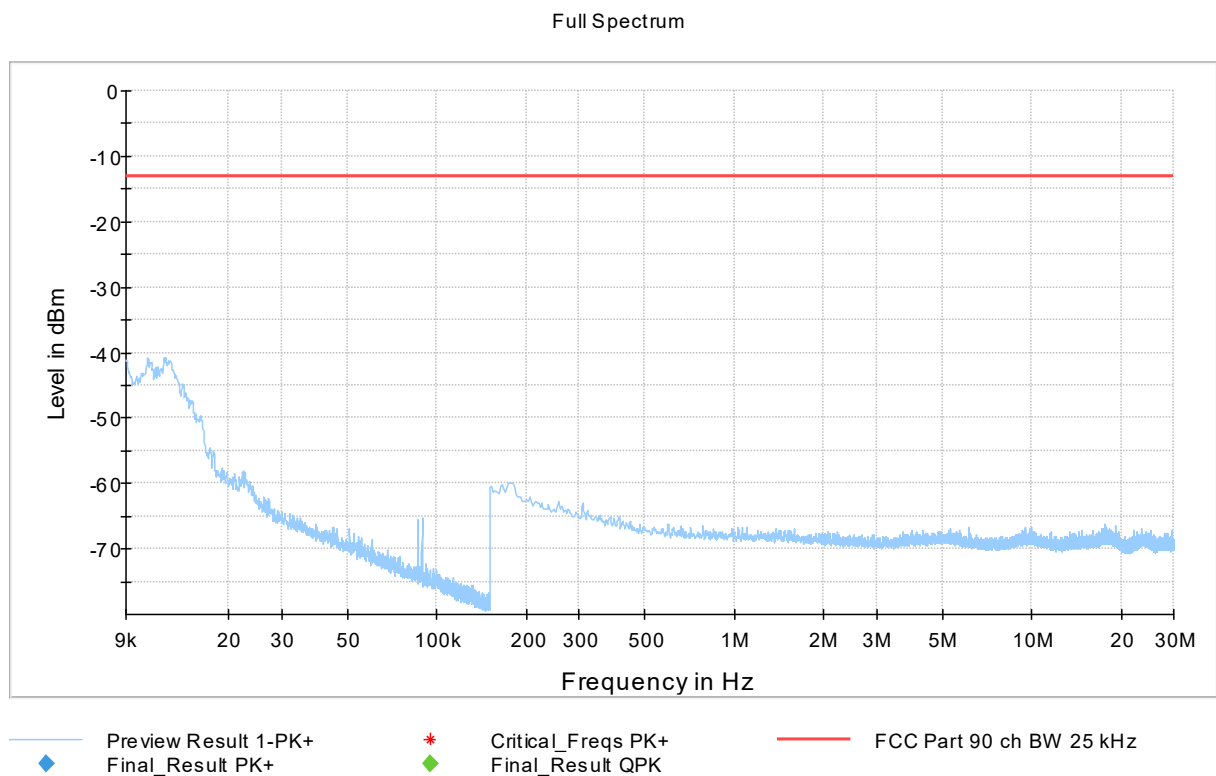


Figure 39: TX 429.5 MHz

Spurious emissions (radiated) 9 kHz – 5 GHz

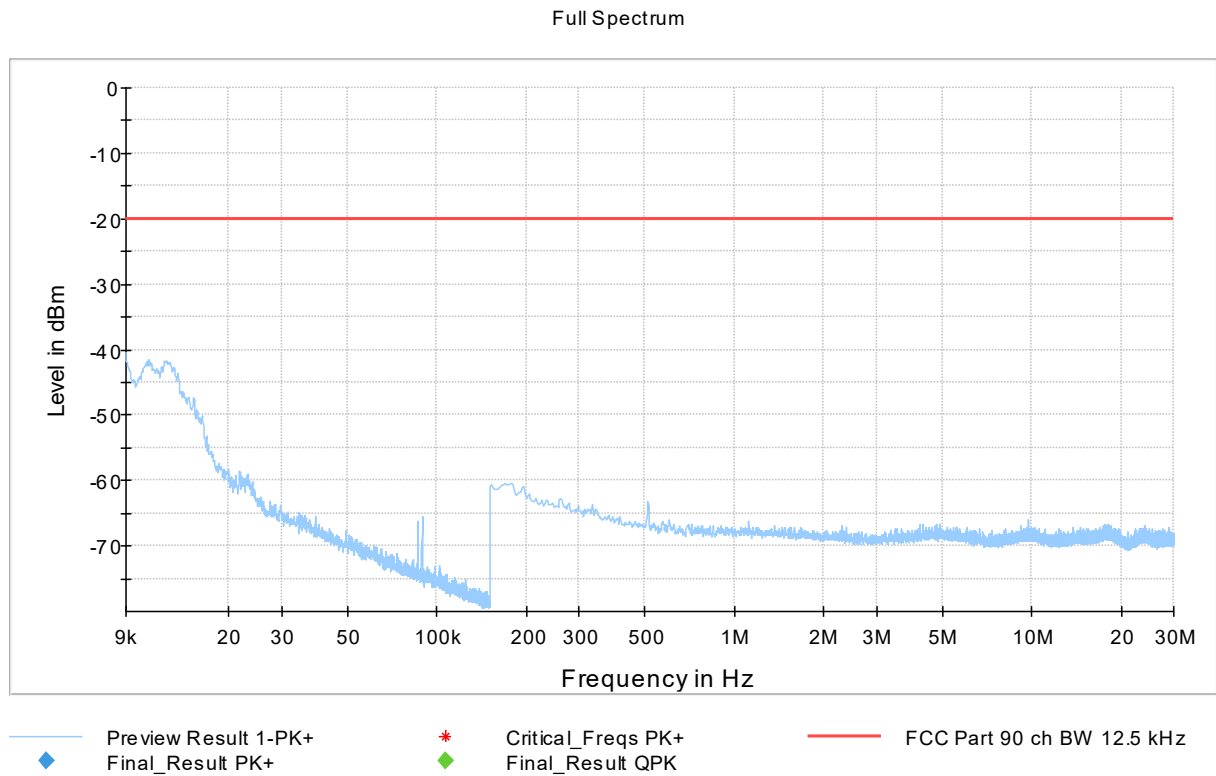


Figure 40: TX 450.5 MHz

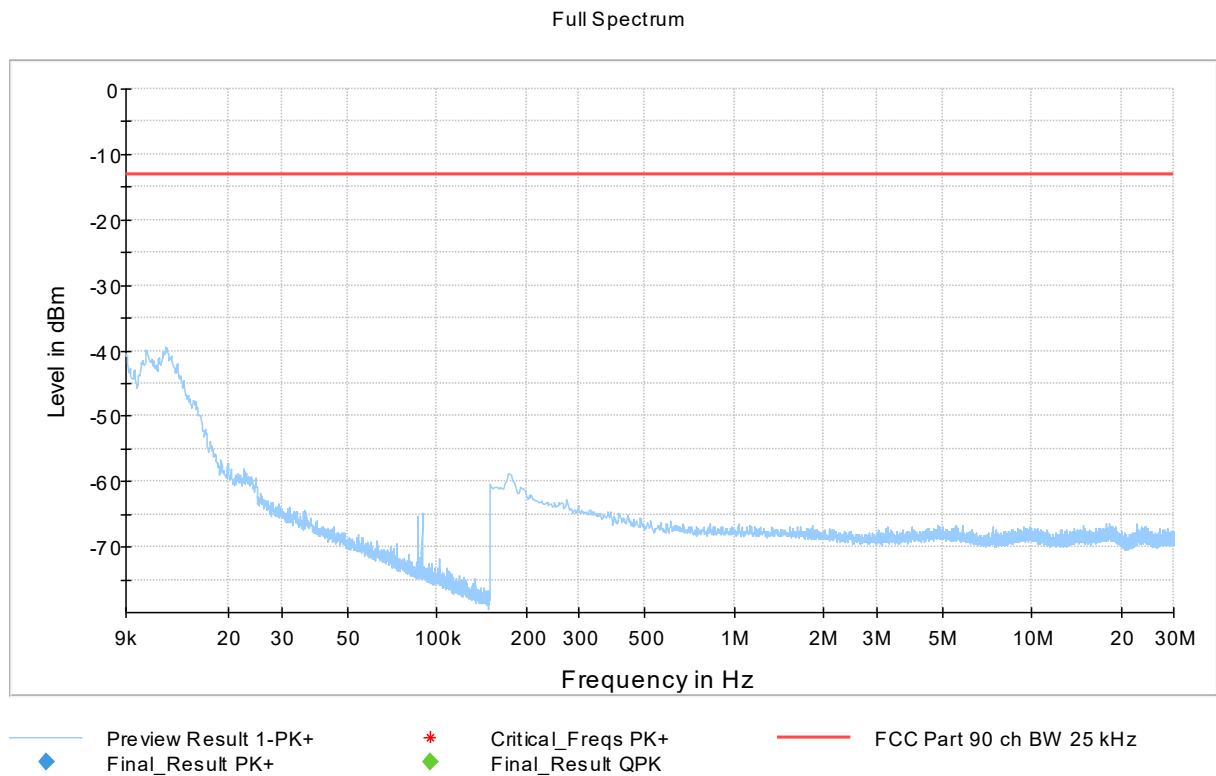


Figure 41: TX 469.5 MHz

Spurious emissions (radiated) 9 kHz – 5 GHz

Test Results, 30 – 1000 MHz

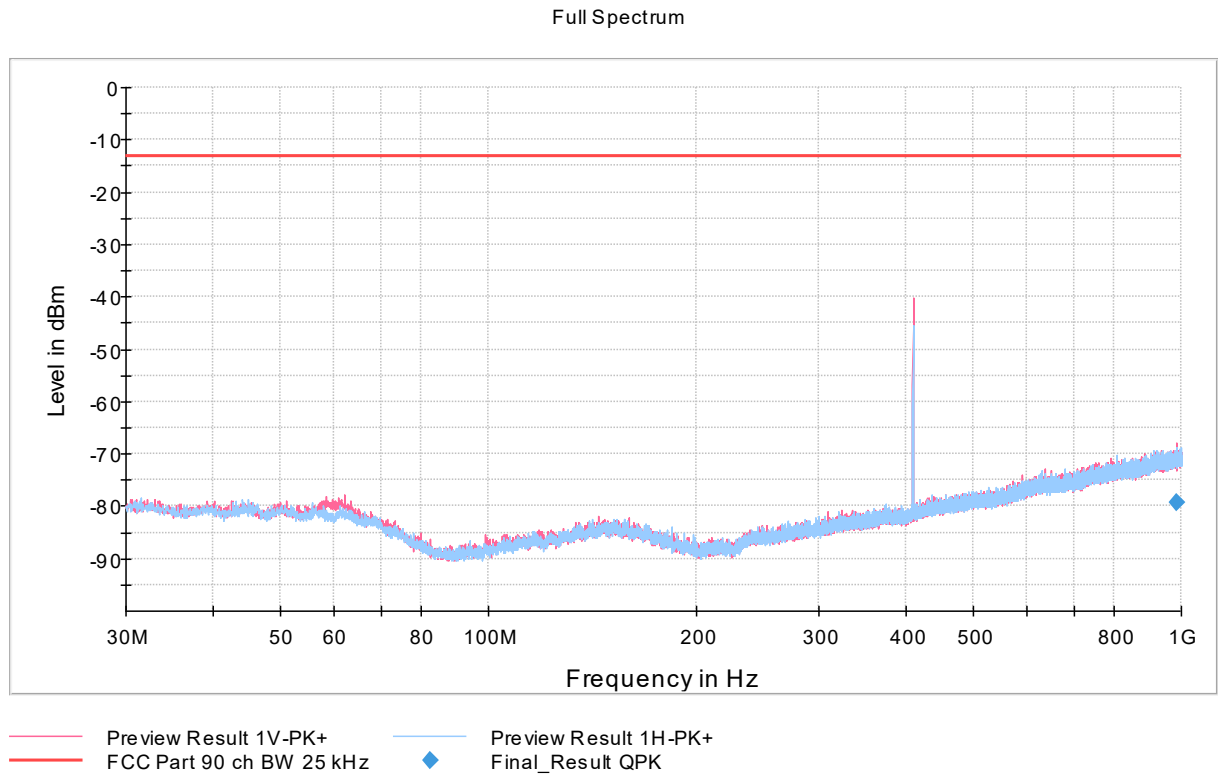


Figure 42: TX 410.0 MHz

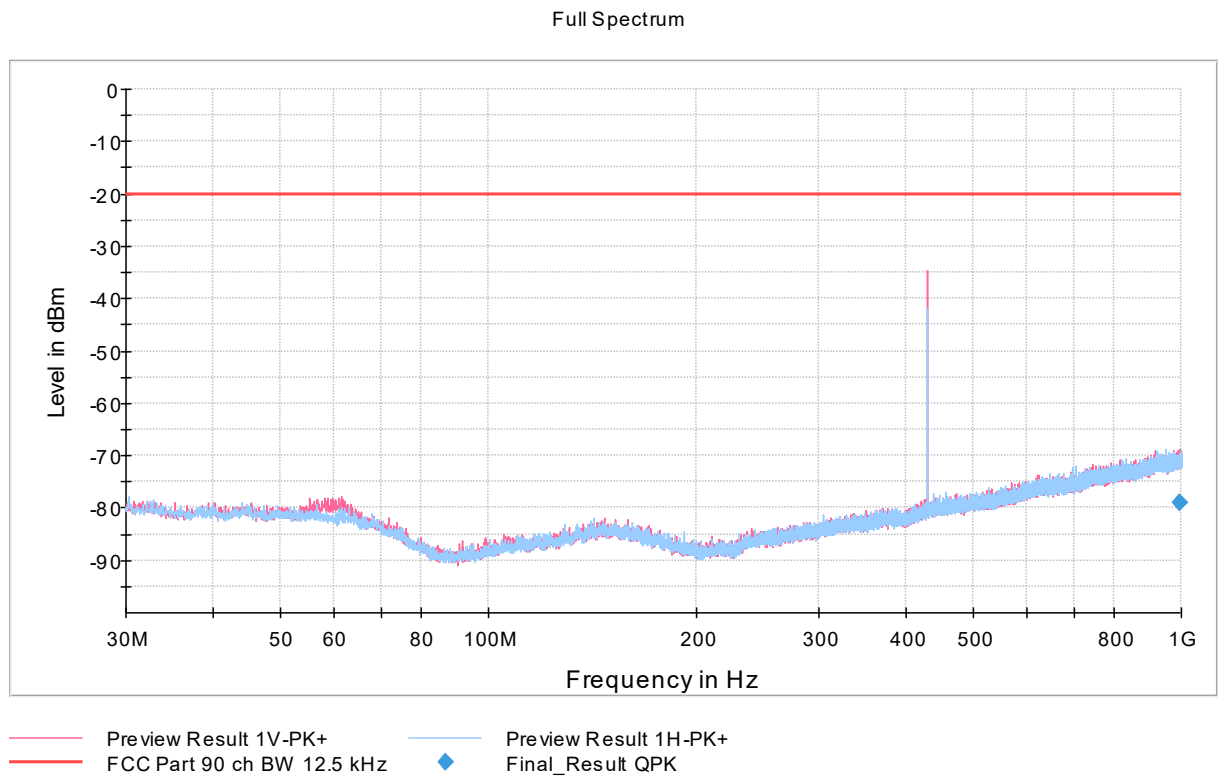


Figure 43: TX 429.5 MHz

Spurious emissions (radiated) 9 kHz – 5 GHz

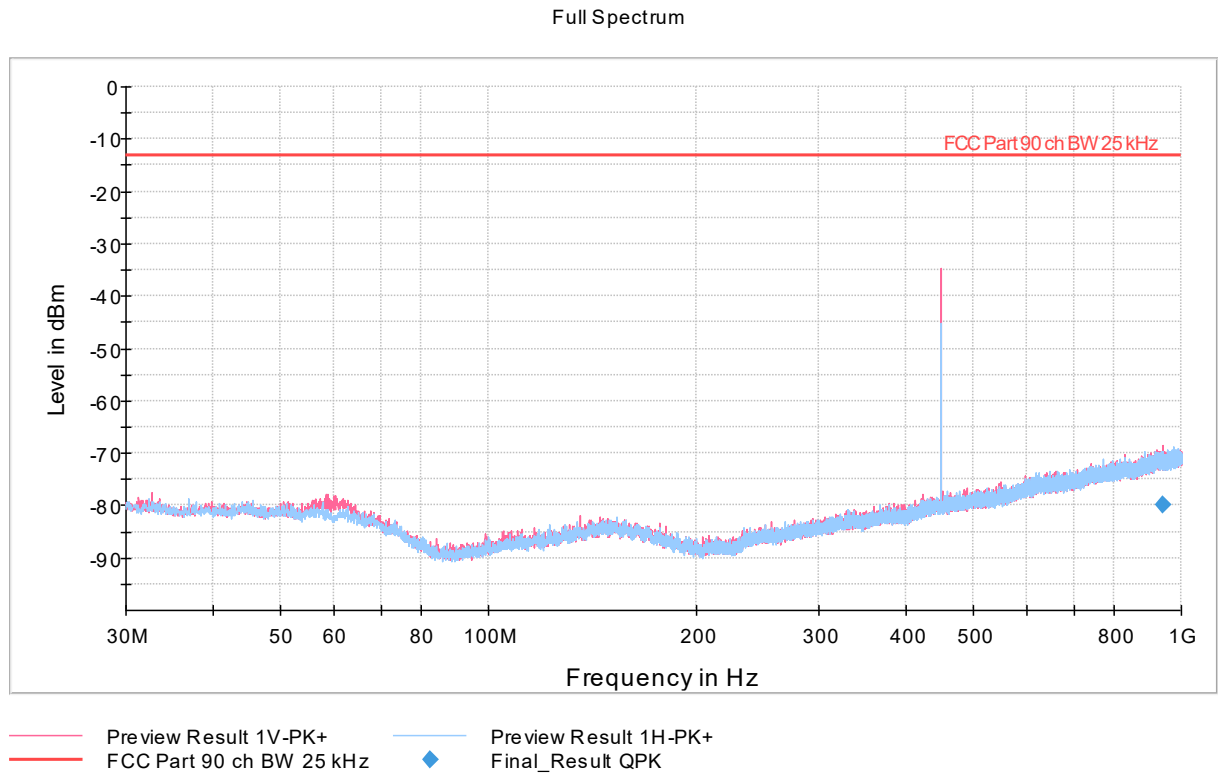


Figure 44: TX 450.5 MHz

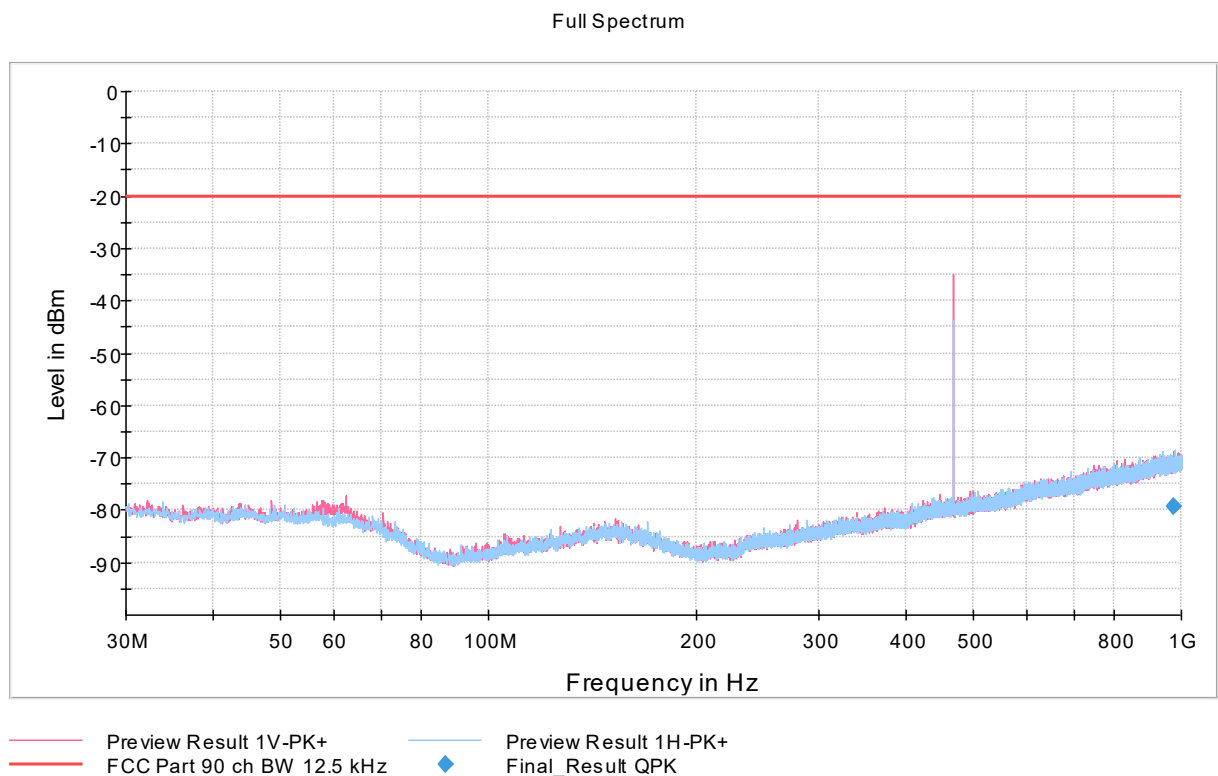


Figure 45: TX 469.5 MHz

Test Results, 1 – 5 GHz

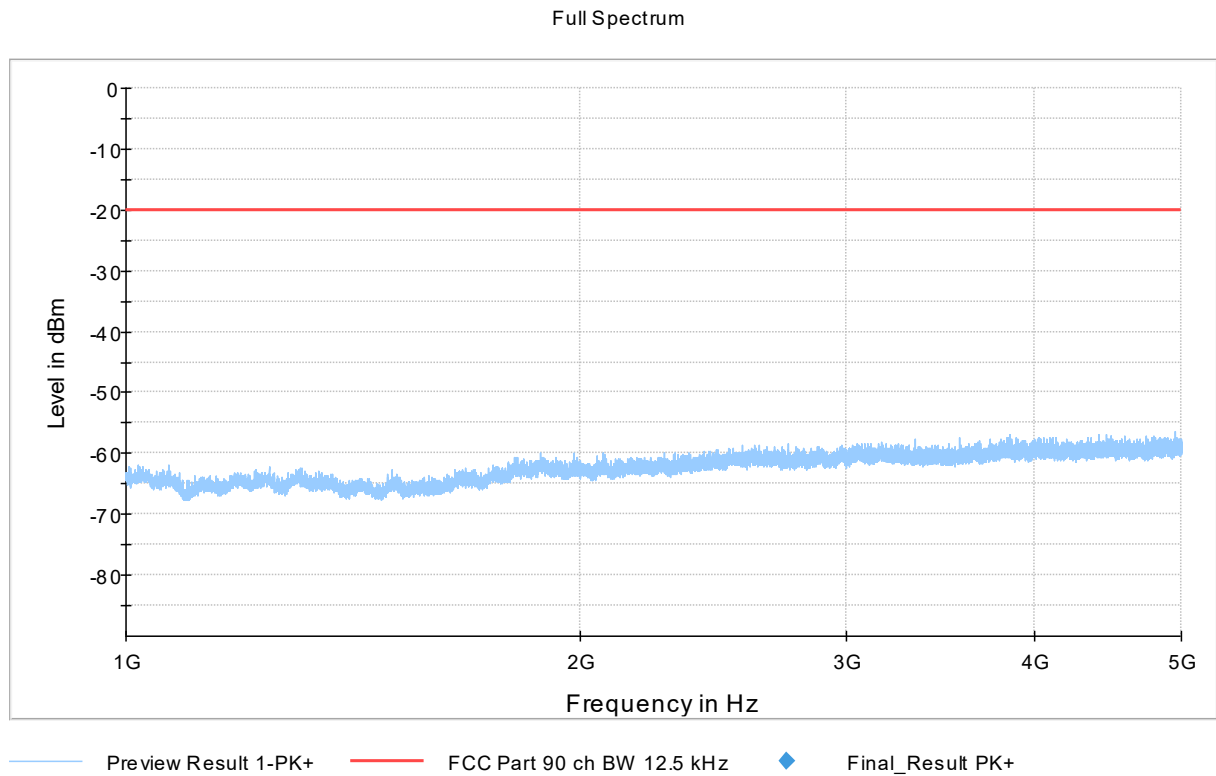


Figure 46: TX 410.0 MHz

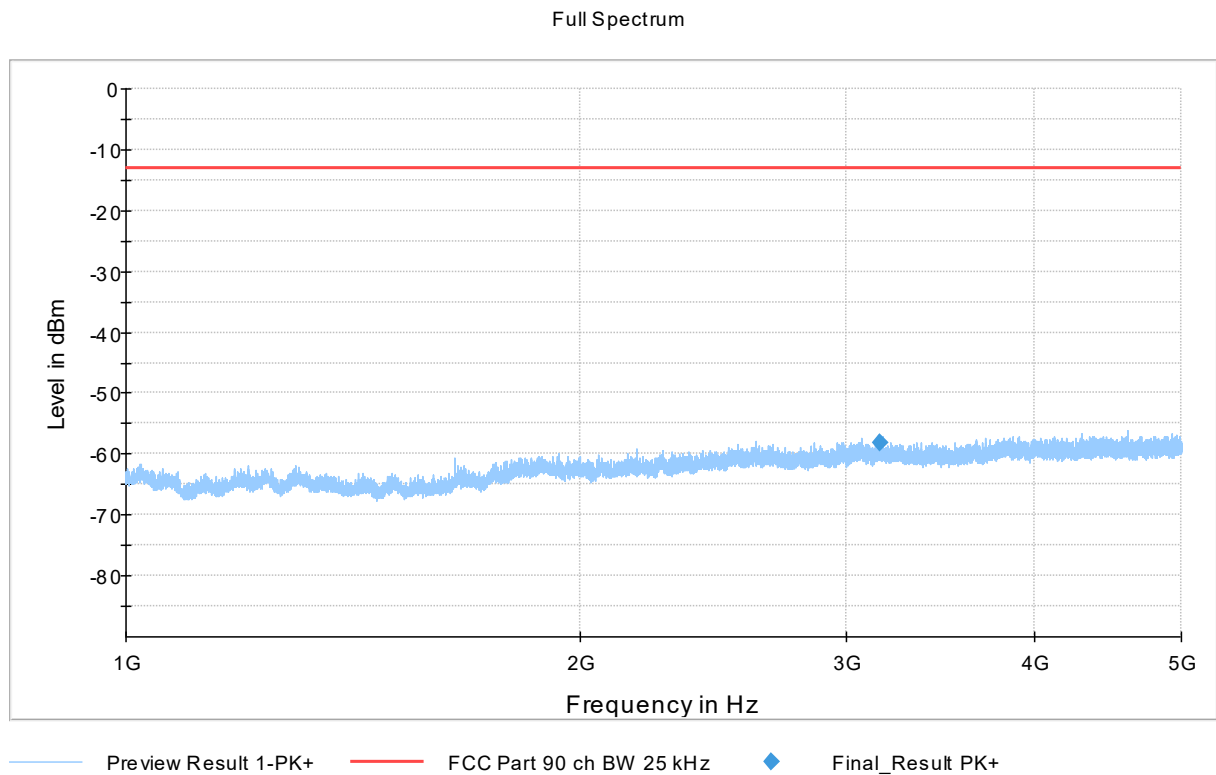


Figure 47: TX 429.5 MHz

Spurious emissions (radiated) 9 kHz – 5 GHz

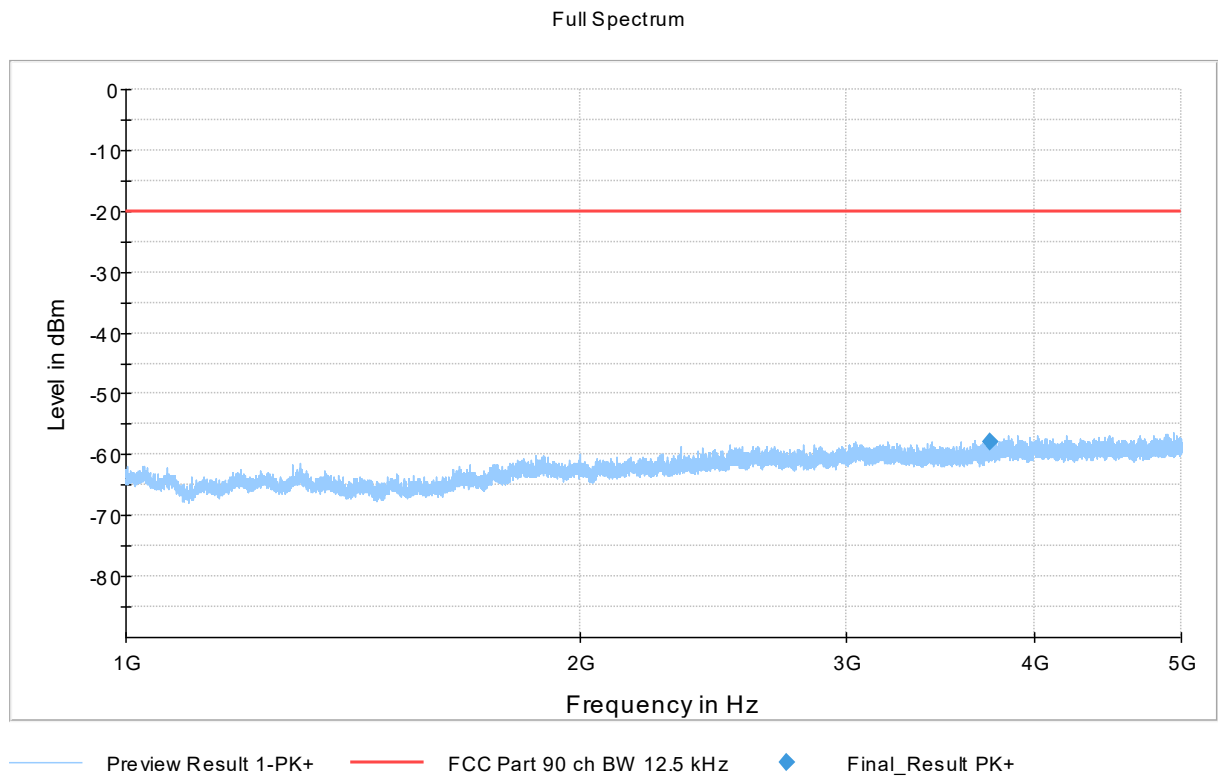


Figure 48: TX 450.5 MHz

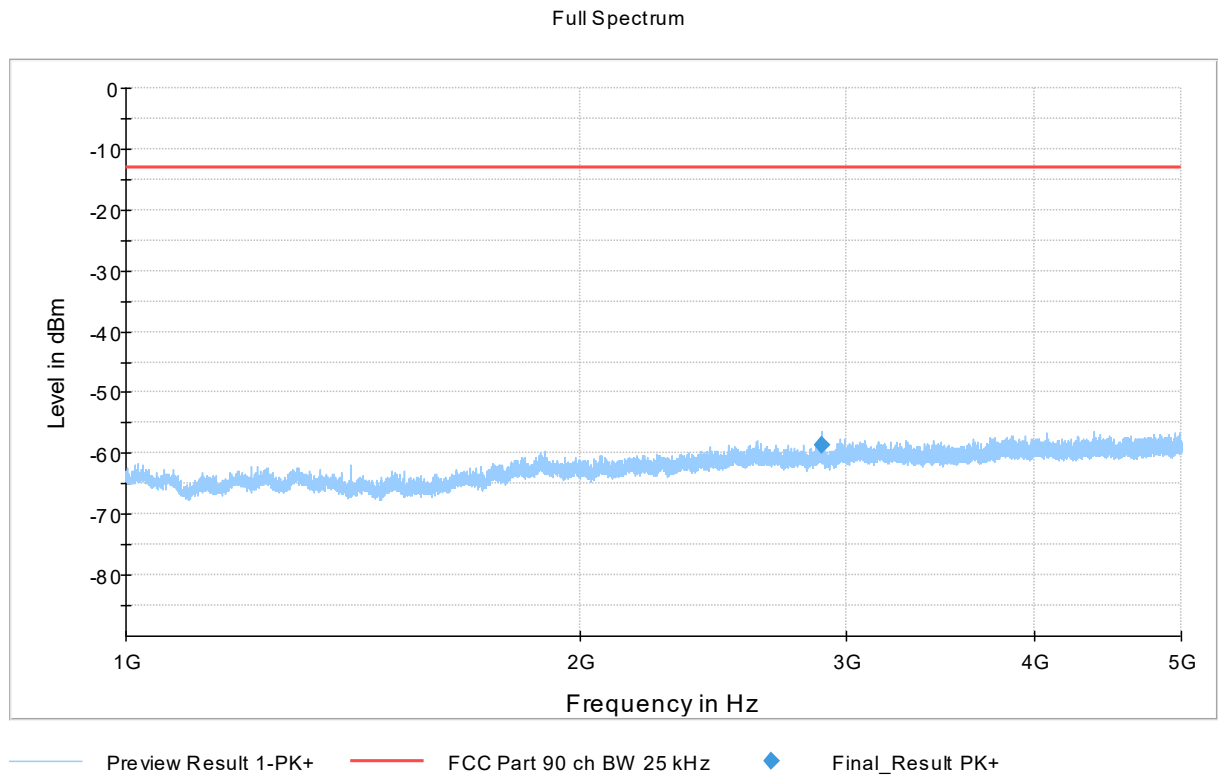


Figure 49: TX 469.5 MHz

TEST EQUIPMENT

EQUIPMENT	MANUFACTURER	TYPE	INV OR SERIAL	PREV CALIB	NEXT CALIB
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	NCR
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	NCR
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	NCR
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	NCR
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv:8013	2024-11-18	2025-11-18
ANTENNA	SCHWARZBECK	VULB 9168	inv:8911	2024-12-11	2026-12-11
ANTENNA	EMCO	3117, 1-18GHz	inv:7293	2024-06-28	2026-06-28
ATTENUATOR	PASTERNAK	PE 7004-4 (4dB)	inv:10126	2024-12-11	2026-12-11
RF PREAMPLIFIER	CIAO	CA118-3123	inv:10278	2025-09-11	2026-09-11
COAX CHAIN K5 EMI < 1GHz	-	C053+FP3AirC+C138A	sn:-	2025-03-26	2026-03-26
COAX CHAIN K5 EMI 1GHz-26.5GHz	-	C135+C149	sn:-	2025-03-26	2026-03-26
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2025-06-12	2026-06-11
SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSV40	inv:9093	2025-06-09	2026-06-08
FILTER	WAINWRIGHT	HP, WHK0.6/13G-10SS	inv:9562	2024-12-11	2026-12-11

NCR = No Calibration Required

END OF TEST REPORT