

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C 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: 15.247
IC Rule Part: RSS-247, Issue 4, 2025
RSS-GEN Issue 5 Amendment 2, 2021

KDB: 558074 D01 15.247 Meas Guidance v05r02
Guidance for Compliance Measurements on Digital
Transmission Systems, Frequency Hopping Spread
Spectrum System, and Hybrid System Devices
Operating Under §15.247 of the FCC rules
(April 2, 2019)

Partial testing, see page 7 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 900 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

Operating Frequency Range (OFR): 902-928 MHz
Channels: 110
Channel separation: 230.4 kHz
Transmission technique: FHSS
Modulation: GMSK

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 with programs supplied by customer.
Whip Antenna	McGill Microwave Systems, MM-ANT-NM-915-6DBI (6 dBi nominal gain). Reference antenna used during testing, supplied by customer.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.247(b)(2) / RSS-247 6.2.2.2 AS/NZS 4268:2017	Transmitter Output Power	PASS
§15.247(d) / RSS-247 6.6	Unwanted Emissions (radiated)	PASS
§15.247(d) / RSS-247 6.6	Unwanted Emissions (conducted)	PASS

The decision rule applied for the tests results stated in this test report is according to the requirements of section 1.4 of ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.

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). During the AC Power-Line Conducted Emissions the EUT was connected to a peripheral AC/DC adapter, and the input voltage was 120 V, 60 Hz. The radiated tests were performed with two different reference antennas provided by the customer.

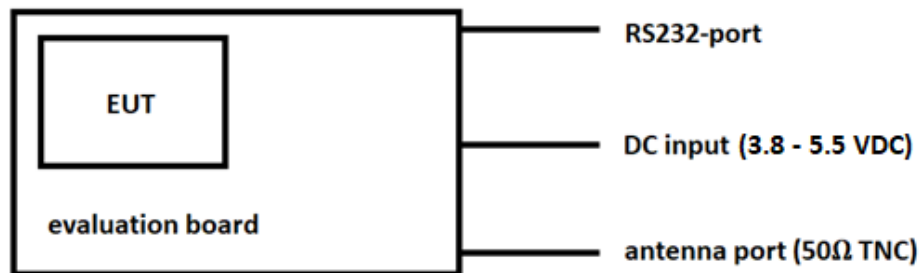


Figure 1: Test setup block diagram

Table 1: Test frequencies

Channel	Frequency (MHz)
Bottom	902.2464
Middle	914.9184
Top	927.8208

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 C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
Tested by: PKA
Date: 9 October 2025
Temperature: 23 °C
Humidity: 27%RH
Barometric pressure: 1022 hPa
Test Result: **PASS**

For frequency hopping systems operating in the 902-928 MHz band, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels.

Test results

Table 2: Transmitter Output Power test results, sample 2

Channel	Measured [dBm]	Attenuation *) [dB]	Output Power [dBm]	Output Power [W]	Result
Bottom	-11.33	-40.34	29.01	0.796	PASS
Middle	-11.34	-40.34	29.00	0.794	PASS
Top	-11.50	-40.38	28.88	0.773	PASS

*) Attenuation includes the total attenuation of cable and attenuators.

Transmitter Output Power

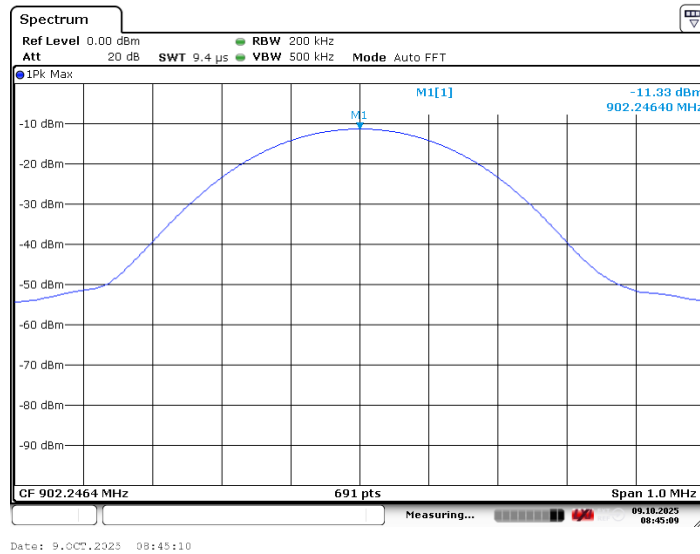


Figure 2: Transmitter Output Power, bottom channel

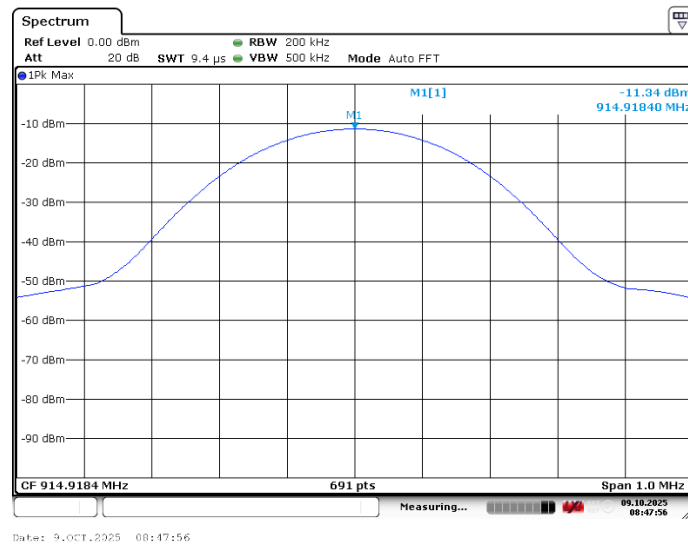


Figure 3: Transmitter Output Power, middle channel

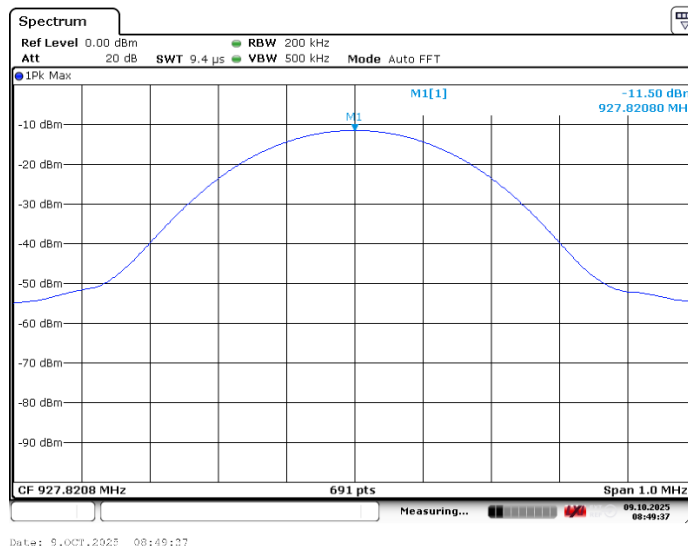


Figure 4: Transmitter Output Power, top channel

Unwanted Emissions (radiated)

Standard:	ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024		
Tested by:	PKA		
Date:	1 October 2025		
Temperature:	23 °C		
Humidity:	42 %RH		
Barometric pressure:	1032 hPa		
Measurement uncertainty:	± 4.51 dB	Level of confidence 95 % (k = 2)	
Test Result:	PASS		

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Exploratory measurements are performed in order to find the orientation that produces the highest emissions. The final measurements are performed with the worst orientation.

Sample 1

Test results, 9 kHz – 30 MHz

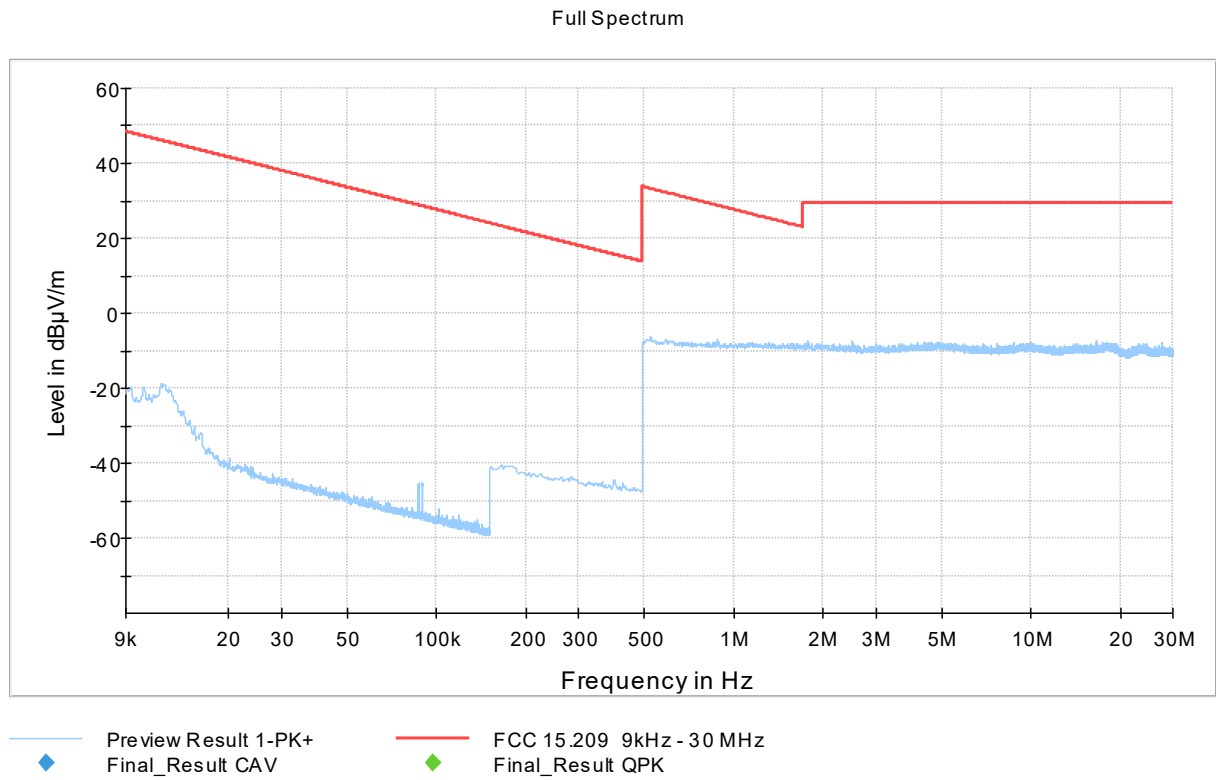


Figure 5: TX middle channel

Test results, 30 MHz – 1 GHz

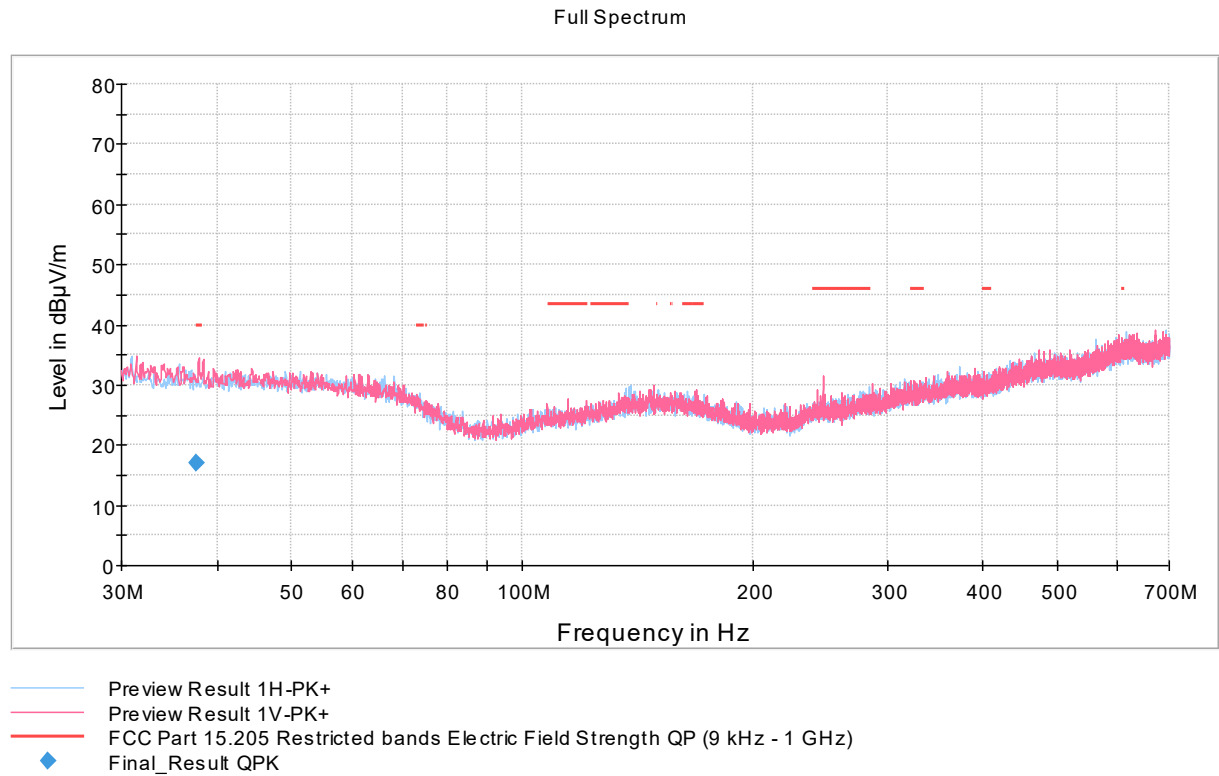


Figure 6: TX bottom channel (30-700 MHz)

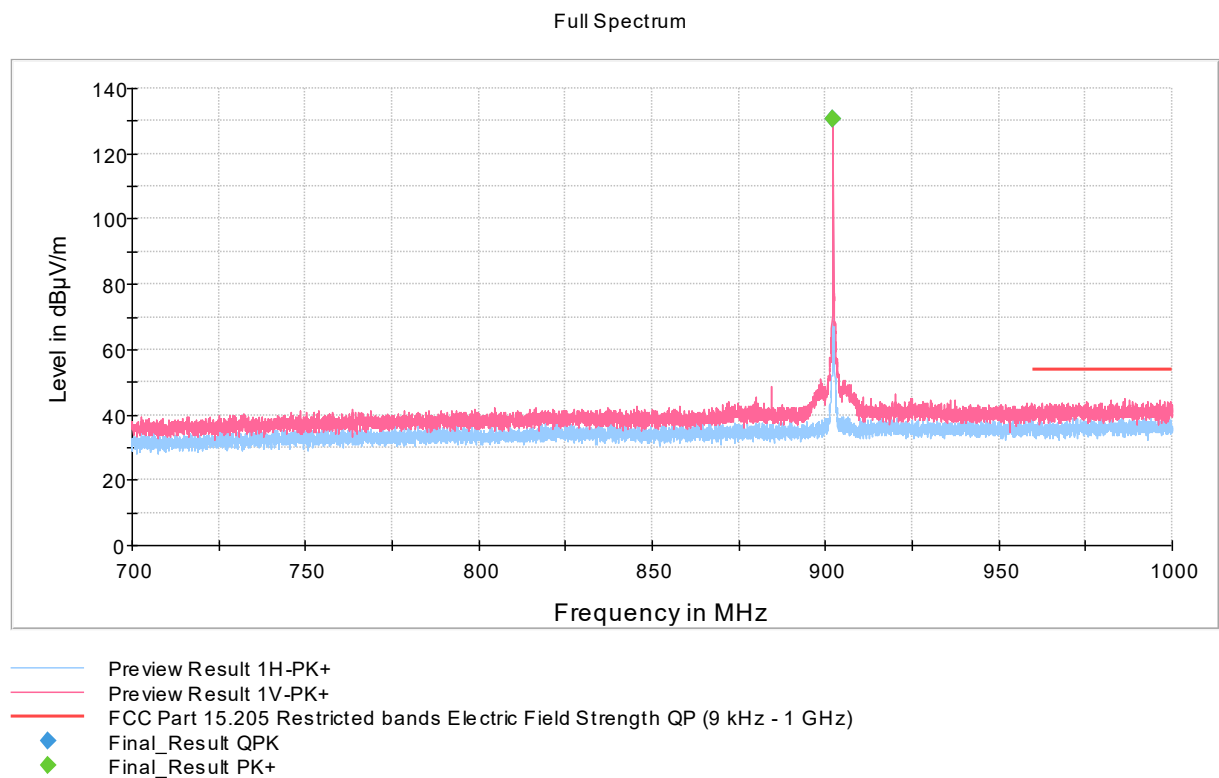


Figure 7: TX bottom channel (700-1000 MHz)

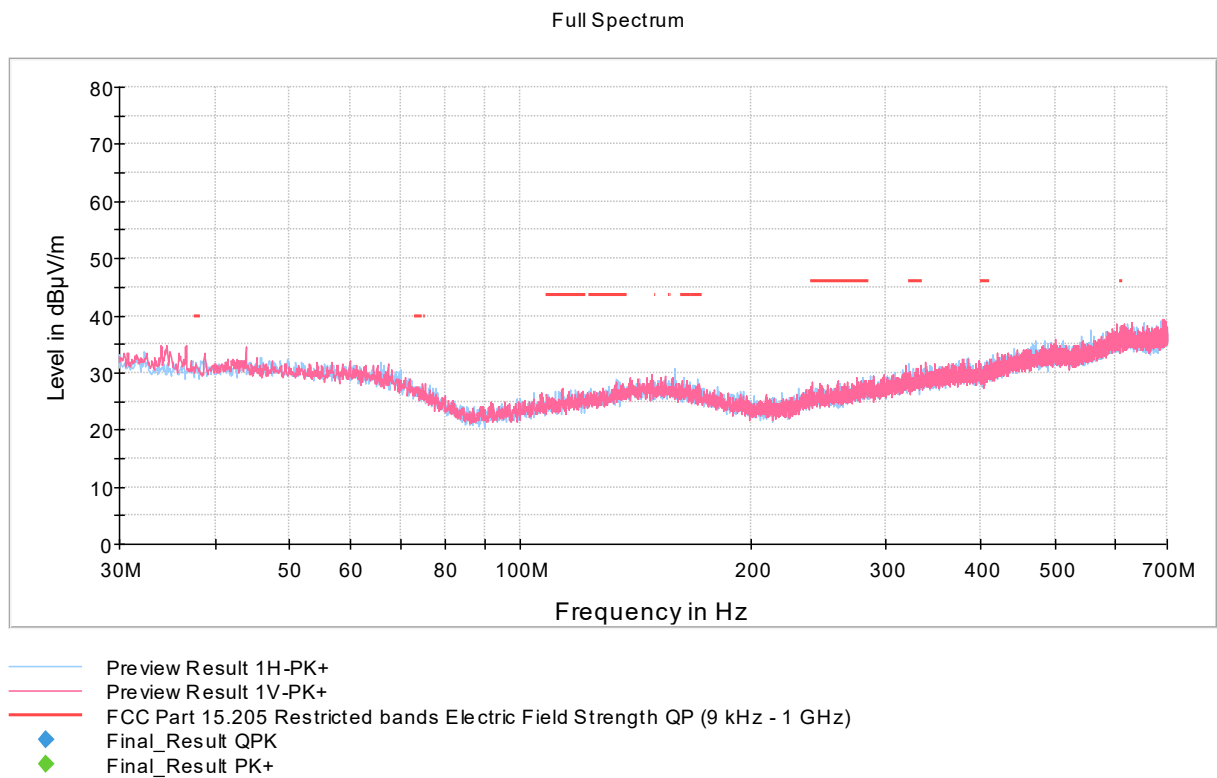


Figure 8: TX middle channel (30-700 MHz)

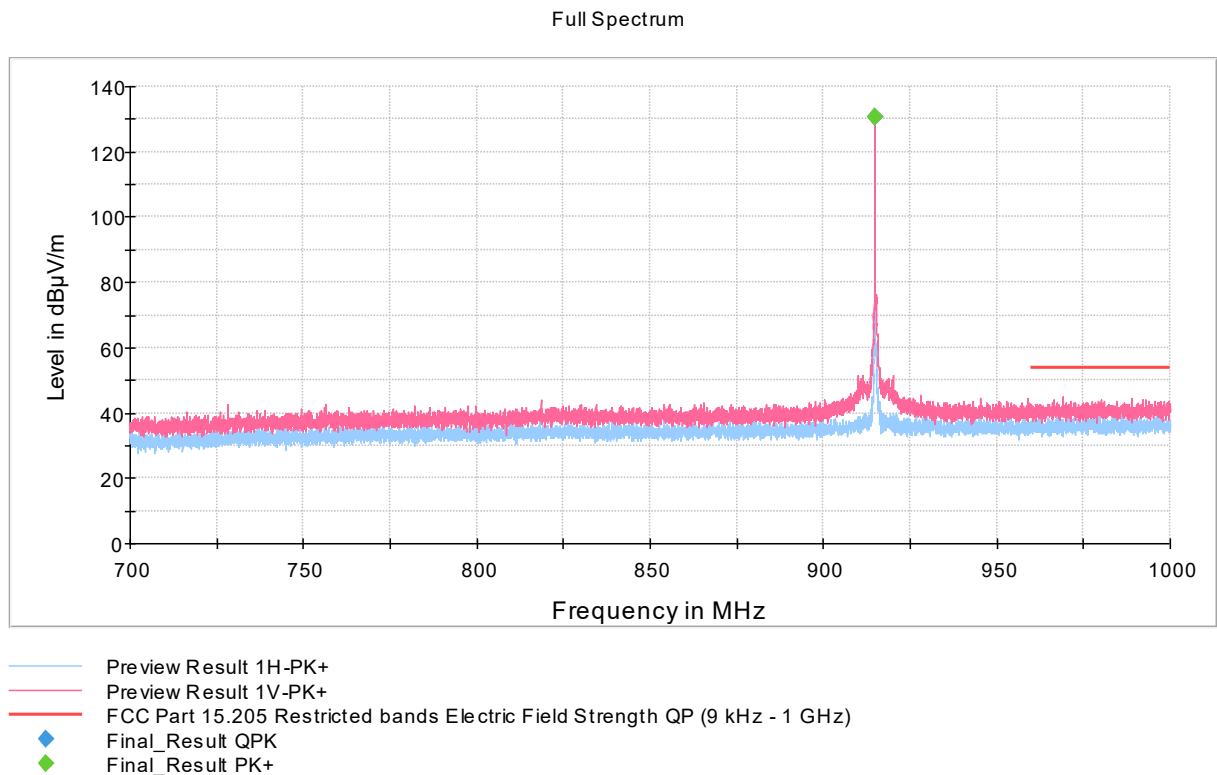


Figure 9: TX middle channel (700-1000 MHz)

Unwanted Emissions (radiated)

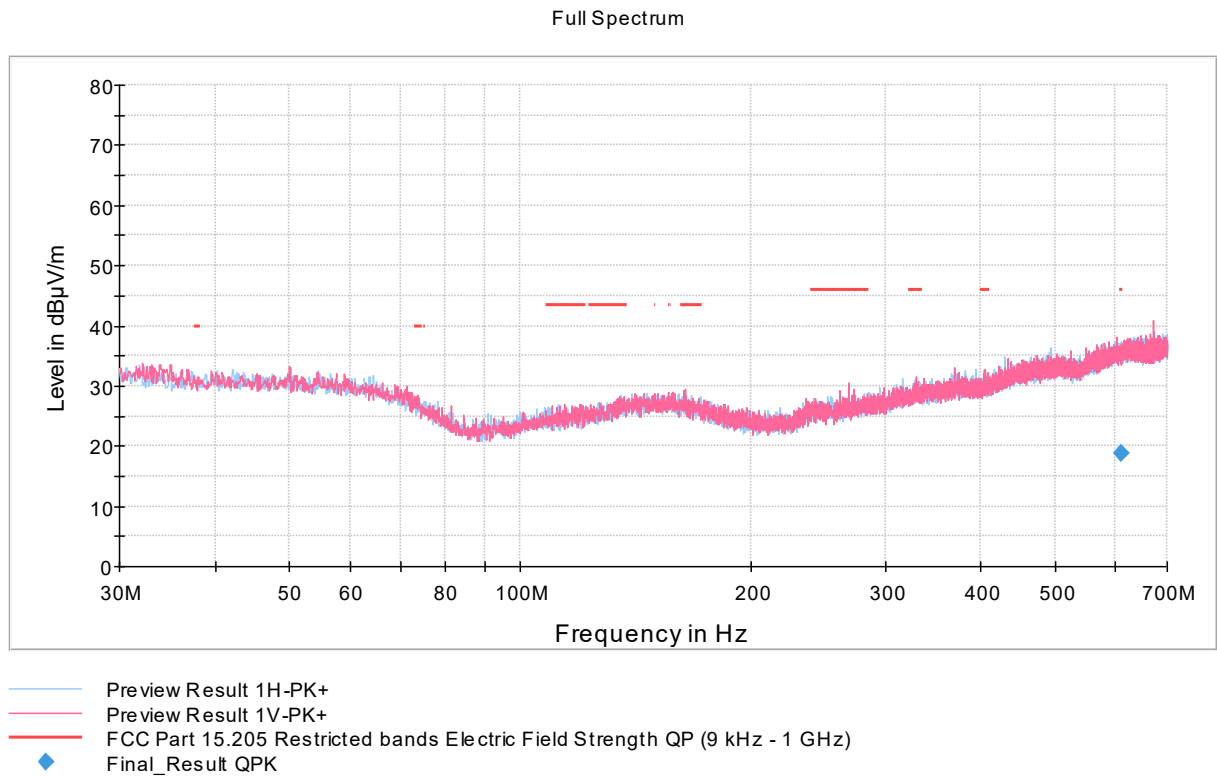


Figure 10: TX top channel (30-700 MHz)

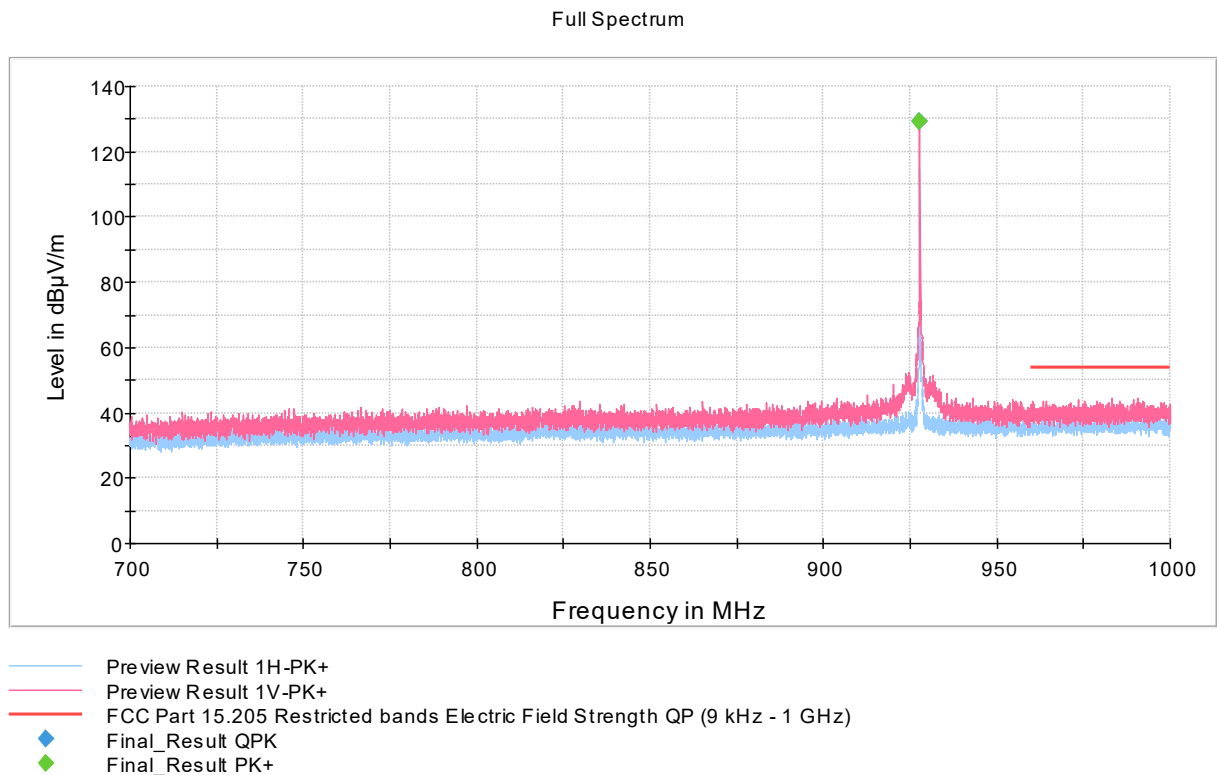


Figure 11: TX top channel (700-1000 MHz)

Test results, 1 – 10 GHz

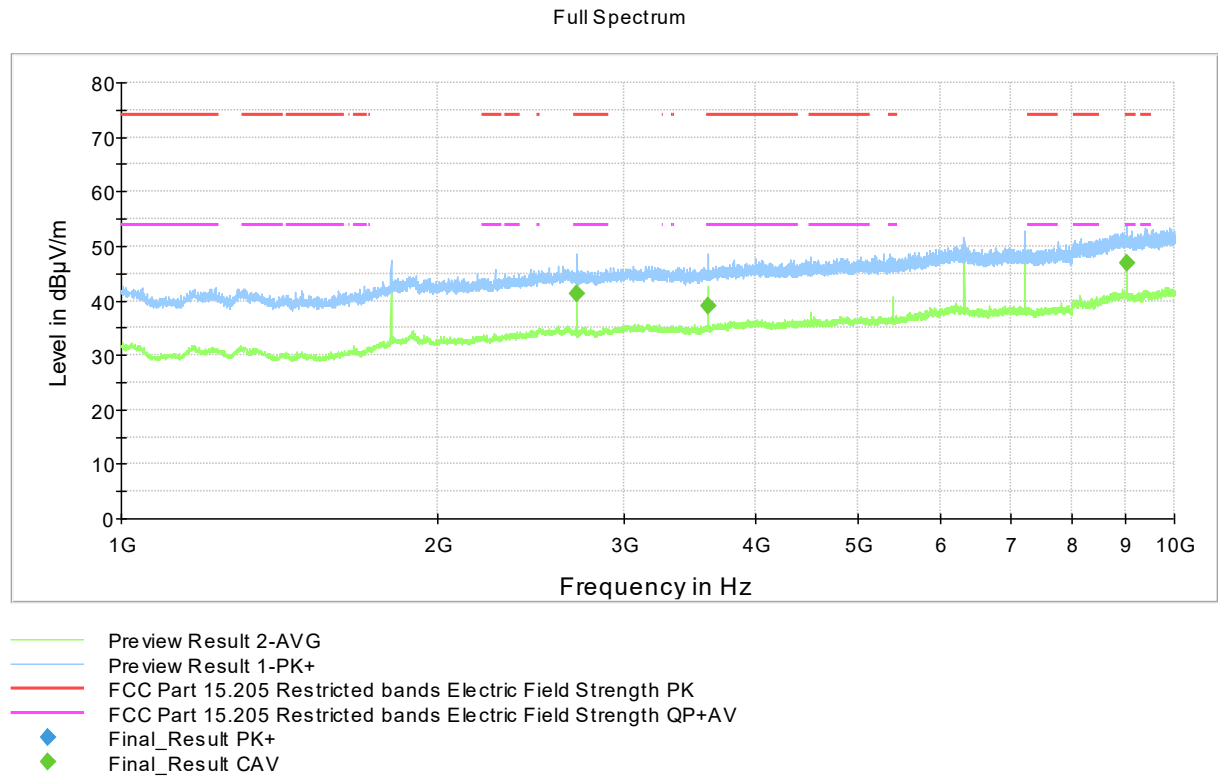


Figure 12: TX bottom channel (1.0-10 GHz)

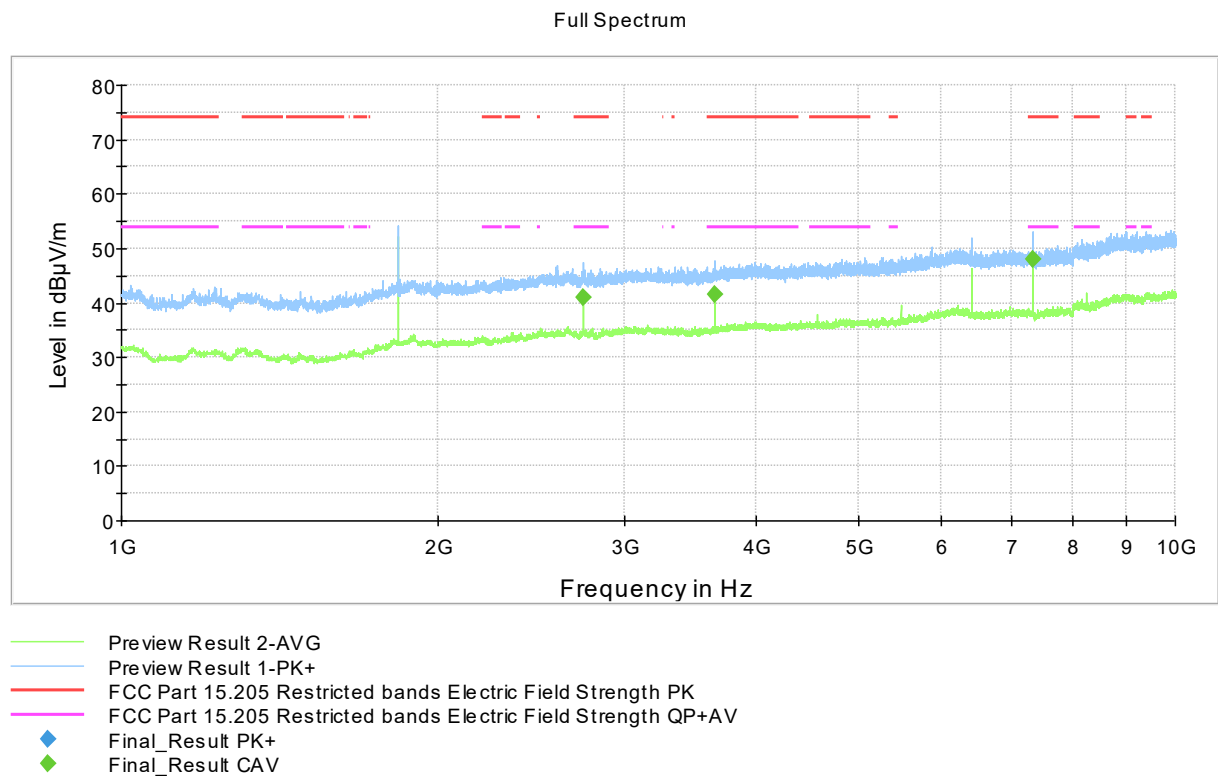


Figure 13: TX middle channel (1.0-10 GHz)

Unwanted Emissions (radiated)

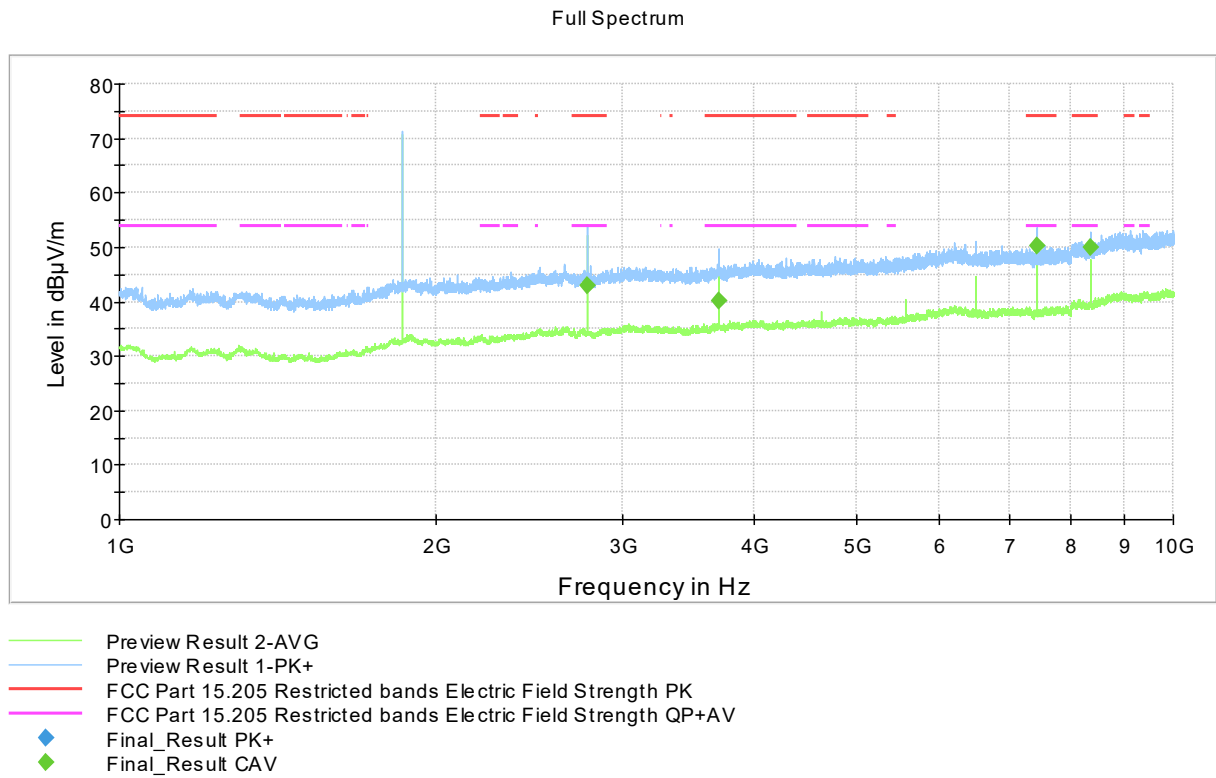


Figure 14: TX top channel (1.0-10 GHz)

Unwanted Emissions (radiated)

Table 3: Final measurements from the worst frequencies, bottom channel

Frequency (MHz)	QuasiPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.606000	16.99	---	40.00	23.01	1000.0	120.000	109.0	V	0.0	17.1
2706.800000	---	41.22	54.00	12.78	1000.0	1000.000	204.0	H	141.0	10.5
3608.900000	---	39.08	54.00	14.92	1000.0	1000.000	327.0	H	103.0	12.0
9022.400000	---	46.84	54.00	7.16	1000.0	1000.000	166.0	V	129.0	20.4
	Peak (dBc)		Limit (dBc)	Margin (dB)						
1804.15 *)	83.11		20	63.11						
6315.85	78.90		20	58.90						
7218.10	78.18		20	58.18						

*) Fundamental – spurious = 130.47 – 47.36 = 83.11 dBc

Outside the restricted band emission attenuated more than 20 dBc

Table 4: Final measurements from the worst frequencies, middle channel

Frequency (MHz)	QuasiPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2744.850000	---	40.85	54.00	13.15	1000.0	1000.000	165.0	H	145.0	11.0
3659.700000	---	41.47	54.00	12.53	1000.0	1000.000	127.0	V	180.0	12.3
7319.350000	---	48.14	54.00	5.86	1000.0	1000.000	186.0	H	131.0	17.5
	Peak (dBc)		Limit (dBc)	Margin (dB)						
1829.80 **)	76.32		20	56.32						

**) Fundamental – spurious = 130.50 – 54.18 = 76.32 dBc

Outside the restricted band emission attenuated more than 20 dBc

Table 5: Final measurements from the worst frequencies, top channel

Frequency (MHz)	QuasiPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
609.807000	18.68	---	46.02	27.34	1000.0	120.000	194.0	H	178.0	28.1
2783.550000	---	43.04	54.00	10.96	1000.0	1000.000	128.0	V	63.0	10.9
3711.250000	---	40.04	54.00	13.96	1000.0	1000.000	146.0	V	71.0	12.4
7422.650000	---	50.30	54.00	3.70	1000.0	1000.000	166.0	H	131.0	17.3
8350.300000	---	49.97	54.00	4.03	1000.0	1000.000	191.0	V	123.0	18.8
	Peak (dBc)		Limit (dBc)	Margin (dB)						
1855.45 ***)	57.68	---	20	37.68	1000.0	1000.000				

***) Fundamental – spurious = 129.01 – 71.33 = 57.68 dBc

Outside the restricted band emission attenuated more than 20 dBc

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).

The result value is the measured value corrected with the correction factor.

Band-Edge Measurement and Unwanted Emissions (conducted)

Unwanted Emissions (conducted)

Standard:	ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
Tested by:	HEM
Date:	13 February 2026
Temperature:	23 °C
Humidity:	20%RH
Barometric pressure:	1022 hPa
Measurement uncertainty:	± 2.87 dB, level of confidence 95 % (k = 2)
Test Result:	PASS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in §15.209(a) is not required.

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

Band-Edge Measurement and Unwanted Emissions (conducted)

Test results

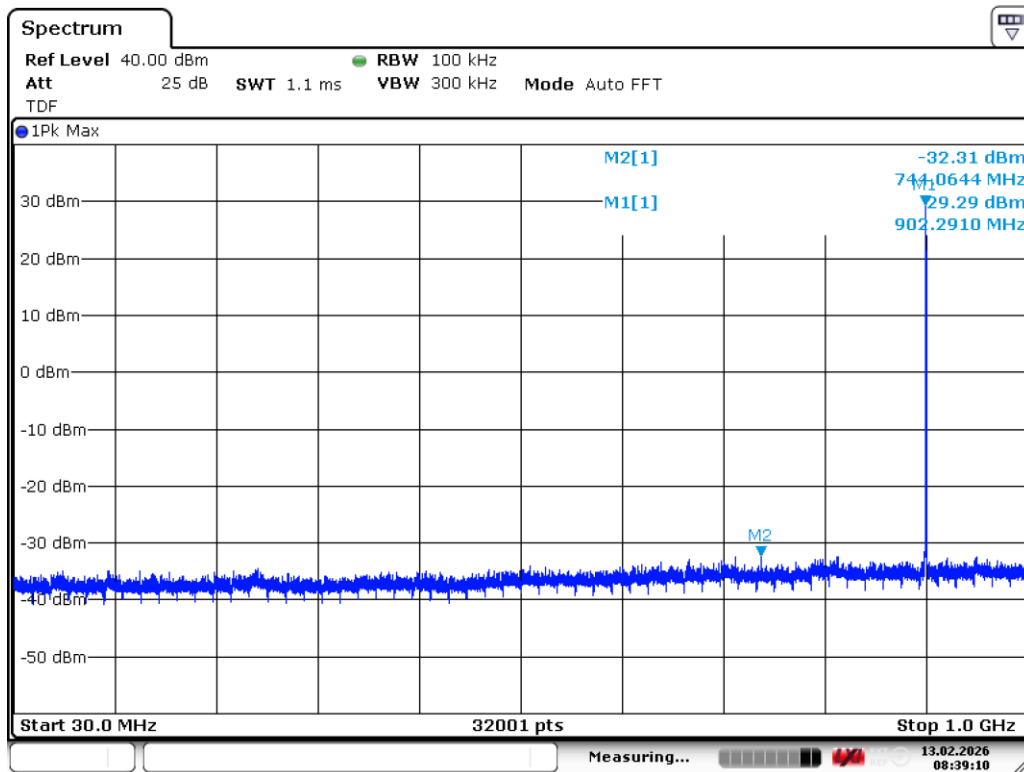


Figure 15: 30 -1000 MHz, bottom channel

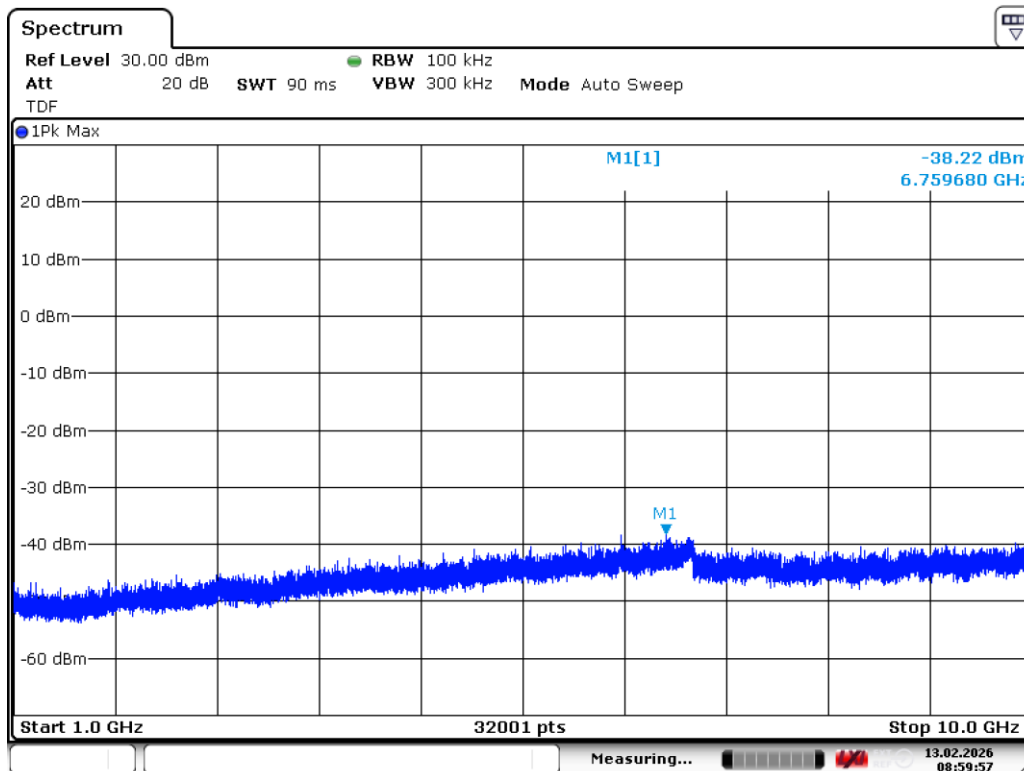


Figure 16: 1 – 10 GHz, bottom channel

Band-Edge Measurement and Unwanted Emissions (conducted)

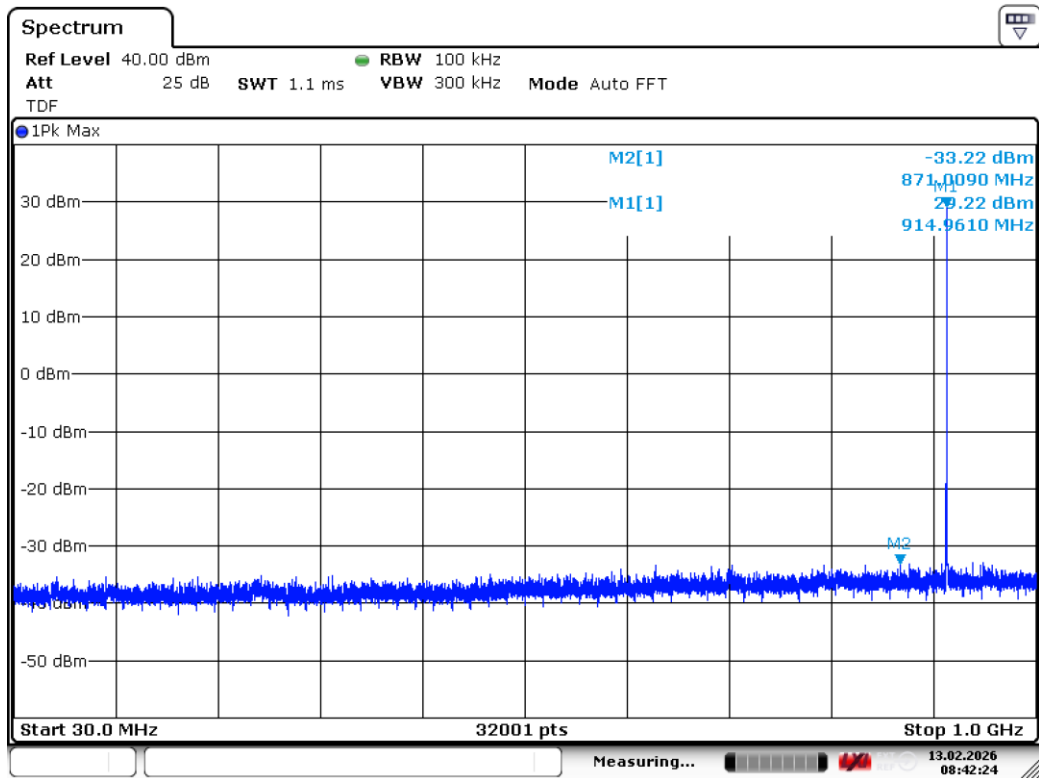


Figure 17: 30 – 1000 MHz, middle channel

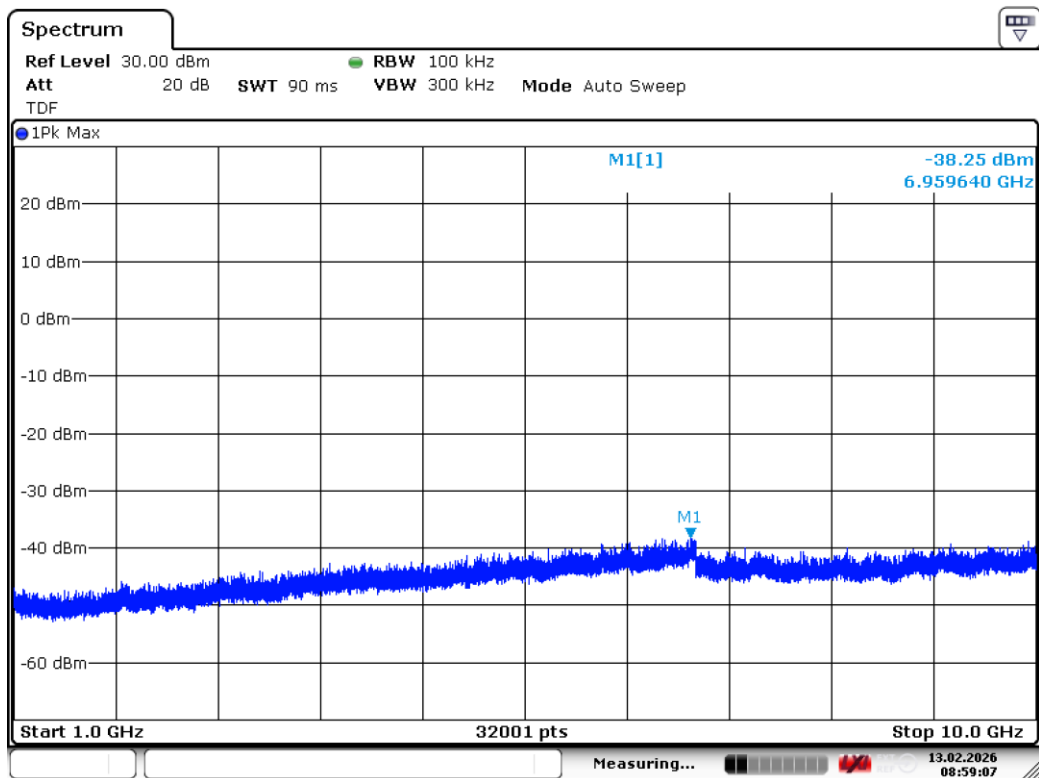


Figure 18: 1 – 10 GHz, middle channel

Band-Edge Measurement and Unwanted Emissions (conducted)

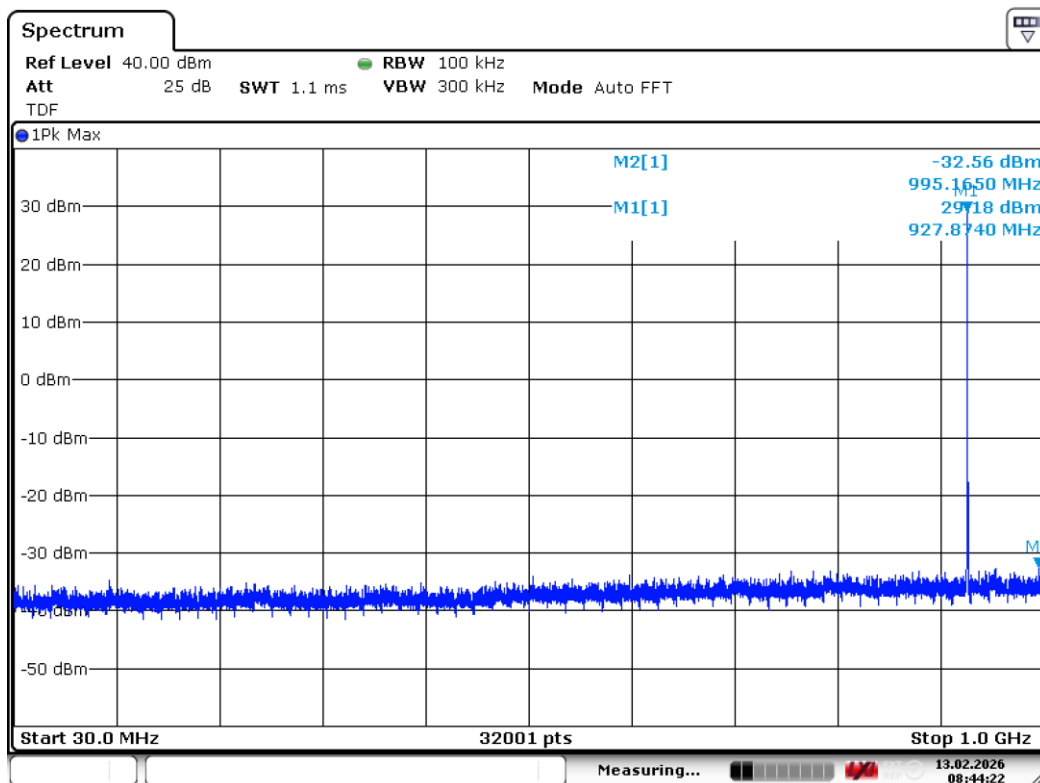


Figure 19: 30 – 1000 MHz, top channel

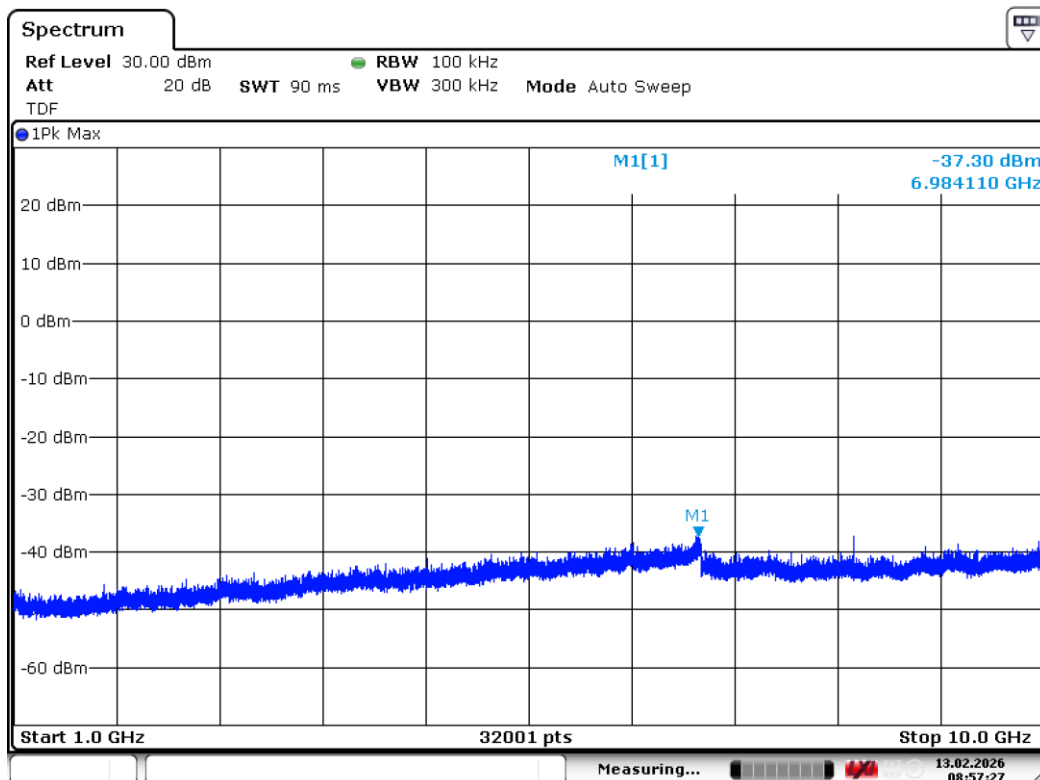


Figure 20: 1 – 10 GHz, top channel

TEST EQUIPMENT

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
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, WHKX1.0/15G-10SS	inv:8267	2024-12-10	2026-12-10

NCR = No Calibration Required

END OF REPORT