

Test Report

Test report no.: 23109352-40489-1

Date of issue: 2024-10-28

Test result: The test item - **passed** - and complies with the listed standards.

Applicant

ELPRO-BUCHS AG

Manufacturer

ELPRO-BUCHS AG

Test Item

ECOLOG-PRO Radio Module

Radio Frequency Testing according to:

Title 47

FCC Regulations Subpart 15C

§15.249

Tested by
(name, function, signature)

Piotr Sardyko
Lab Manager RF


signature

Approved by
(name, function, signature)

Andreas Bender
Deputy Managing Director


signature

Applicant and Test item details	
Applicant	ELPRO-BUCHS AG Langaeuistrasse 45, 9470 Buchs SG, Switzerland
Manufacturer	ELPRO-BUCHS AG Langaeuistrasse 45, 9470 Buchs SG, Switzerland
Test item description	ECOLOG-PRO Radio Module 915 MHz
Model/Type reference	ECOLOG-PRO Radio Module
FCC ID	Z45-ECOPROR9

Disclaimer and Notes

The content of this report relates to the mentioned test sample(s) only.
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Within this test report, a ☒ point / ☐ comma is used as a decimal separator.
If otherwise, a detailed note is added adjected to its use.

Decision rule:
Decision rule based on simple acceptance without guard bands, binary statement, based on mutually agreed
uncertainty tolerances with expansion factor k=2.

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2 GENERAL INFORMATION

2.1 Administrative details

Testing laboratory	IBL-Lab GmbH Heinrich-Hertz-Allee 7 66386 St. Ingbert / Germany Fon: +49 6894 38938-0 Fax: +49 6894 38938-99 URL: https://ib-lenhardt.com/ E-Mail: info@ib-lenhardt.com
Accreditation / Designation	The testing laboratory is accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025:2018. Scope of testing and registration number: - Attachment to the accreditation certificate D-PL-21375-01-00 - Electronics - Electromagnetic Compatibility - Radio - Electromagnetic Compatibility and Telecommunication (FCC requirements) - Telecommunication (TC) and Electromagnetic Compatibility (EMC) for Canadian Standards - Automotive EMC Website DAkkS: https://www.dakks.de/ The Deutsche Akkreditierungsstelle GmbH (DAkkS) is also a signatory to the ILAC Mutual Recognition Arrangement. - Designations - FCC Testing Laboratory Designation No. DE0024 - ISED Company Number 27156 - Testing Laboratory CAB Identifier DE0020 Kraftfahrt-Bundesamt KBA-P 00120-23
Testing location	IBL-Lab GmbH Heinrich-Hertz-Allee 7 66386 St. Ingbert / Germany
Date of receipt of test samples	2024-06-24
Start – End of tests	2024-08-16

2.2 Possible verdicts of the results

Test sample meets the requirements	P (PASS) – the measured value is below the acceptance limit, AL = TL
Test sample does not meet the requirements	F (FAIL) – the measured value is above the acceptance limit, AL = TL
Test case does not apply to the test sample	N/A (Not applicable)
Test case not performed	N/P (Not performed)

2.3 Observations

No additional observations other than the reported observations within this test report have been made.

2.4 Opinions and Interpretations

No appropriate opinions or interpretations according ISO/IEC 17025:2017 clause 7.8.7 are within this test report.

2.5 Revision History

-0 Initial Version

-1:

- the result table for Chapter 1 and 3 in Annex A was corrected
- value of max RFS of carrier was added to Chapter 7.3. in test report
- antenna gain value was added to subchapter 5.2.
- new comments were added to EUT photos in Annex B

This test report 23109352-40489-1 replaces the previous test report 23109352-40489-0.

2.6 Further documents

List of further applicable documents belonging to the present test report:

Measurement plots: 23109352-40489-1_Annex A

EUT photographs: 23109352-40489-1_Annex B

Test setup photographs: 23109352-40489-1_Annex C

2.7 Formula for determination of correction values (E_C)

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

E_C = Electrical field – corrected value

E_R = Receiver reading

M = Margin

L_T = Limit

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

G_A = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

2.8 Software/Firmware used for measurements

All measurements were done directly with spectrum analyzer or SW R&S EMC32.

In some measurements (please see test equipment list for each test) R&S ESW 26 was used (please see chapter 8).

(Instrument) Firmware Version: **1.70**

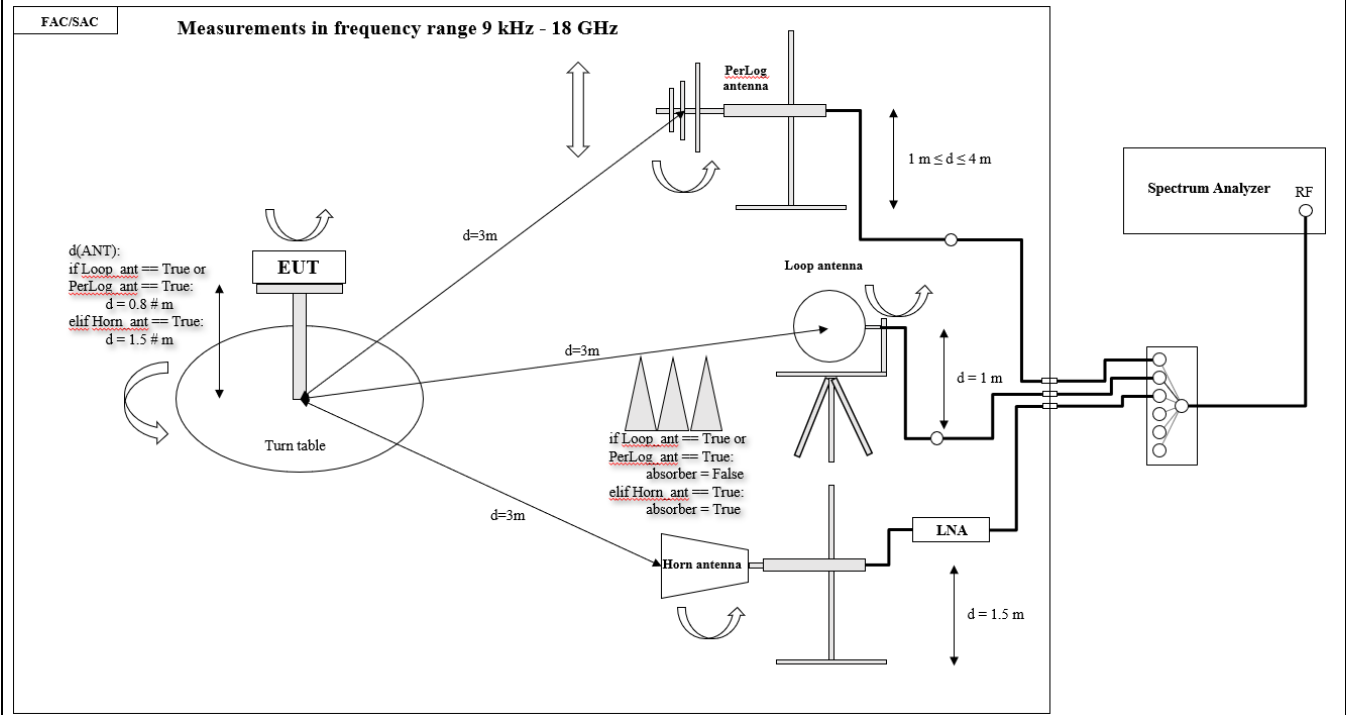
In some measurements (please see test equipment list for each test) R&S FSW 50 was used (please see chapter 8).

(Instrument) Firmware Version: **4.61**

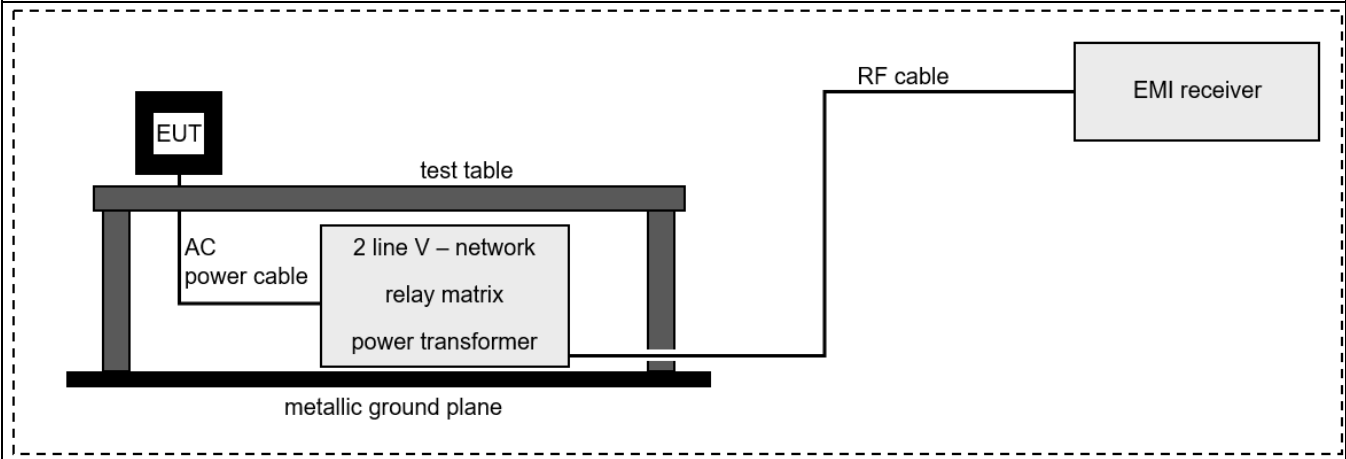
In some measurements SW R&S EMC32 was used.

Version: **11.10.00**

Block diagram 1:



Block diagram 2 (conducted emissions measurements):



3 ENVIRONMENTAL & TEST CONDITIONS

3.1 Environmental conditions of lab	
Temperature	20°C ± 5°C
Relative humidity	25-75 % R.H.
Barometric Pressure	860-1060 mbar
Power supply	Battery and External power supply

4 TEST STANDARDS AND REFERENCES

Test standard (accredited)	
FCC CFR Title 47 Part 15 Subpart C:2016	---
ANSI C63.10: 2013	---

Test standard (not accredited)	
None	

Reference	Description
none	---

5 EQUIPMENT UNDER TEST (EUT)

5.1 Product Description*

ECOLOG-PRO Radio Module 915 MHz.

*: declared by the applicant

5.2 Technical Data of Equipment*

Frequency band:	[Tx and Rx: 902-928] MHz
Number of channels:	1 Rx / Tx channels: 915 MHz
Channel bandwidth:	370 kHz
Channel tested:	f: 915 MHz
Modulation type:	GFSK
RF mode:	TX/RX
Antenna Type:	external, one
Antenna Gain:	1.2 dBi
Antenna connector:	RP-SMA
Equipment type:	Production model
Temperature range:	Tmin: -40 °C, Tmax: 85 °C
Type of power source:	AC/DC 6V
Test source voltage:	Vmin: 5.4 VDC, Vnom: 6 VDC, Vmax: 6.6 VDC. For radio module itself supply voltage is: 1.8 VDC – 3.6 VDC.

*: declared by the applicant

5.3 Test Item (Equipment Under Test) Description*

Short designation	EUT Model	EUT Description	Serial number / designation	Hardware status	Software status
EUT A	ECOLOG-PRO (6V AC/DC)	ECOLOG-PRO Radio Module 915 MHz	PF7A308	V02	V1.1.0 (together with firmware update 2.0.1)
	ANT-916-CW-HW	Antenna 915 MHz	-	-	-

*: declared by the applicant

5.4 Auxiliary Equipment (AE) Description*

AE short designation	AE Name (if available)	AE Description	Serial number (if available)	Software (if used)
AE1	Dell Latitude E7470	Laptop	-	ELPRO BUCHS AG ConfigToll (see photo in Annex B)
AE2	FW8002.1/06	Power supply for EUT A	-	-
AE3	DIR-100	Router	MAC ID: 14D64D80A32A	F/W Ver.: 1.13
AE4	-	LAN cables	-	-

AE5	RJ45	USB to Gigabit Adapter	MAC: 0C3796683949	FW: U2001
AE6	Dell 90W	Power supply for Laptop	-	-

*: declared by the applicant

5.5 Operating Modes Description*

EUT operating mode no.	Description of operating modes	Additional information
op. 1	PN9 mode	Continuous modulated mode

*: declared by the applicant

5.6 Set-ups Description

set. 1	EUT A + AE 1 + AE 2 + AE 3 + AE 4 + AE 5	Radiated tests. Conducted emissions test No 1.
set. 2	EUT A + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + AE 6	Conducted emissions test No 2.

*: declared by the applicant

5.7 Test conditions

Temperature, [°C]		Voltage, [V]	
Tnom	20 ± 5	Vnom	6
Tmax	-	Vmax	-
Tmin	-	Vmin	-

5.8 Additional Information

Test items differences	-
Additional application considerations to test a component or sub-assembly	The radio module was tested not separately, but es a part of ECOLOG-PRO RBR host device. Thus, supply voltage 5.4 – 6.6 VDC was used.

6 SUMMARY OF TEST RESULTS

Test specification
FCC 15.249

Section	§15.247 Spec Clause	Test Description	Set-up	Operating mode	Verdict
7.1	§15.249	General Limit - Radiated field strength emissions, 9 kHz – 12.75 GHz	1	1	Pass
7.2	§15.249	Occupied bandwidth	1	1	Pass
7.3	§15.205	Band Edge Emissions / Radiated field strength of carrier	1	1	Pass
7.4	§15.207	Conducted emissions	1,2	1	Pass
7.5	§15.203	Antenna requirement	-	-	Pass

Notes
None

Comments and observations
None

7 TEST RESULTS

7.1 General Limit - Radiated field strength emissions, 9 kHz – 12.75 GHz

Test equipment

Frequency range 9 kHz – 30 MHz

Measurement in a semianechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done with software R&S EMC 32 V11.00.

Radiated: A1, C1, R1, SW2

Frequency range 30 MHz – 1 GHz

Measurement in a semianechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done with software R&S EMC 32 V11.00.

Radiated: A2, C1, R1, SW2

Frequency range 1 GHz – 12.75 GHz

Measurement in a fully anechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done directly with spectrum analyzer.

Radiated: A3, Amp2, C1, R1, F3, F4, SW2

Description

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2013.

The measurement antenna was situated in 3 m distance to the EUT.

RBW for frequency range 9 kHz- 30 MHz: 200 Hz, 9 kHz.

RBW for frequency range 30 MHz- 1 GHz: 120 kHz.

RBW for frequency range 1 GHz- 5 GHz: 1 MHz.

See photos in Annex C for test Set-up and block diagram in Chapter 2.9.

Limits

Part 15 Subpart C §15.209(a):

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

Part 15 Subpart C §15.249(a):		
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
Results: please see measurement plots in annex A		
Verdict: Pass		

7.2 Occupied bandwidth

Test equipment (Please see Chapter 8 for exact information of test equipment)

Radiated: R3

Description

This is a radiated measurement with test fixture.

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2013.

Please see measurement plots in Annex A for spectrum analyzer settings.

See photos in Annex C for test Set-up.

Measurement information

The resolution bandwidth (RBW) is in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) is 3x RBW.

Results: please see measurement plots in annex A

Verdict: Pass

7.3 Band Edge Emissions / Radiated field strength of carrier

Test equipment (Please see Chapter 8 for exact information of test equipment)

Measurement in a semianechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done with software R&S EMC 32 V11.00.

Radiated: A2, C1, R1, SW2

Description

This is a radiated measurement.

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2013.

Please see measurement plots in Annex A for spectrum analyzer settings.

See photos in Annex C for test Set-up.

Results: please see measurement plots in annex A.

Max RFS of carrier is 93.86 dBuV/m @ 3m.

Verdict: Pass

7.4 Conducted emissions

Test equipment (Please see Chapter 8 for exact information of test equipment)

Radiated: R1, L1, C5, SW2

Description

Test setup

- The EUT is set up according to its intended use, as described in the user manual or as defined by the manufacturer.
- In case of floor standing equipment, it is placed in the middle of the turn table.
In case of tabletop equipment it is placed on a non-conductive table with a height of 80 cm.
- Additional equipment, cables, ... necessary for testing, are positioned like under normal operation.
- Interface cables, e.g. power supply, network, ... are connected to the connection box in the turn table.
- EUT is powered on and set into operation.

Pre-scan

- The EMI-receiver/spectrum analyser performs a positive-peak/max-hold sweep (=worst-case). Data is transferred to EMI-software and recorded. EMI-software will show the maximum level of all single sweeps as the final result for the pre-scan.

Final measurement

- Significant emissions found during the pre-scan will be maximized by the EMI-software based on evaluated data during the pre-scan.
- Final measurement will be performed with measuring equipment settings as defined in the applicable test standards (e.g. ANSI C63.4).
- Plot of the pre-scan with frequencies of identified emissions including levels, correction factors, and settings of measuring equipment is recorded.

Detailed requirements can be found in e.g. ANSI C63.4

Please see test set-up photos in Annex C and block diagram 2 in Chapter 2.9.

Limits

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.

Please see FCC Title 47 § 15.207 for more details.

Test Results

Set-up / Op.	Line	Verdict
1 / 1	L1	Pass
1 / 1	N	Pass
2 / 1	L1	Pass

2 / 1	N	Pass
All Readings were done with Quasi-Peak and Average detector.		
Comment:	---	

Verdict	- PASS -	For plots please see Annex A to current report
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7.5 Antenna requirement according to FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. **The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.**

The EUT is using an antenna with **RP-SMA** connector.

Verdict	- PASS -
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8 MEASUREMENT EQUIPMENT

No	Equipment	Type	Manufacturer	Serial No.	Int. No.	Last Calibration	Next Calibration
Antennas (A):							
1.	Active Loop Antenna	HFH2-Z2E	Rohde & Schwarz	100108	LAB000108	2023-05-05	2026-05-05
2.	Ultrabroadband antenna	HL562E	Rohde & Schwarz	102005	LAB000150	2022-12-22	2025-12-22
3.	Double-Ridged Waveguide Horn Antenna	HF-907	Rohde & Schwarz	102899	LAB000151	2023-05-05	2026-05-05
4.	Rod Antenna	-	-	-	LAB000290	-	-
5.	Horn Antenna (2.6 GHz – 3.95 GHz)	PE9863/SF-10	Pasternack	-	LAB000312	2021-01-13	-
6.	Horn Antenna (3.95 GHz – 5.85 GHz)	PE9861/SF-10	Pasternack	-	LAB000264	2020-09-29	-
7.	Horn Antenna (10 GHz – 15 GHz)	PE9855 SF-20	Pasternack	-	LAB000263	2020-09-29	-
8.	Horn Antenna (12.4 GHz – 18 GHz)	62-HA20-A-SMF	TTE Europe	-	LAB000282	2020-09-29	-
9.	Horn Antenna (17.6 GHz – 26.7 GHz)	20240-20	Flann Microwave Ltd	266402	LAB000127	2020-06-29	-
10.	Horn Antenna (26.4 GHz – 40.1 GHz)	22240-20	Flann Microwave Ltd	270447	LAB000129	2020-06-29	-
11.	Horn Antenna (33 GHz – 50.1 GHz)	23240-20	Flann Microwave Ltd	273430	LAB000132	2020-07-01	-
12.	Horn Antenna (49.9 GHz – 75.8 GHz)	25240-20	Flann Microwave Ltd	272860	LAB000133	2020-07-01	-
13.	Horn Antenna (60.5 GHz – 91.5 GHz)	26240-20	Flann Microwave Ltd	273417	LAB000135	2020-07-01	-
14.	Horn Antenna (73.8 GHz – 114 GHz)	27240-20	Flann Microwave Ltd	273368	LAB000138	2020-07-01	-
15.	Horn Antenna (114 GHz – 173 GHz)	29240-20	Flann Microwave Ltd	273382	LAB000139	2020-07-01	-
16.	Horn Antenna (145 GHz – 220 GHz)	30240-20	Flann Microwave Ltd	273390	LAB000178	2020-08-01	-
17.	Horn Antenna (217 GHz – 330 GHz)	32240-20	Flann Microwave Ltd	273469	LAB000152	2020-08-01	-
18.	Horn Antenna (49.9 GHz – 75.8 GHz)	25240-20	Flann Microwave Ltd	272861	LAB000134	2020-07-01	-
19.	Horn Antenna (60.5 GHz – 91.5 GHz)	26240-20	Flann Microwave Ltd	273418	LAB000136	2020-08-01	-
Amplifiers (Amp)*:							
1.	Pre-Amplifier	BBV 9718 C	Schwarzbeck Mess-Elektronik OHG	84	LAB000169	-	-
2.	Low noise amplifier	BZ-01000900-111550-202320	B&Z Technologies	24336	LAB000296	-	-
3.	Low noise amplifier	BZ-08001800-180855-202020	B&Z Technologies	22105	LAB000297	-	-
4.	Low noise amplifier	BZ-18004000-270845-252525	B&Z Technologies	22449	LAB000298	-	-
Attenuator (Att)*:							
1.	Attenuator	25081-20 (49.9 GHz - 75.8 GHz)	Flann Microwave Ltd	234411	LAB000229	-	-

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2.	Attenuator	27081-20 (73.8 GHz – 112 GHz)	Flann Microwave Ltd	270004	LAB000230	-	-
RF Cables (Cab)*:							
1.	Coaxial cable	LU7-022-1000	Rosenberger	33	LAB000153	-	-
2.	Coaxial cable	LU7-022-1000	Rosenberger	34	LAB000153	-	-
3.	Coaxial cable	SF101/1.5m	Huber & Suhner	503987/1	LAB000165	-	-
Chambers (C):							
1.	Semi/Fully Anecoic Chamber	SAC5	Albatross Projects GmbH	20168.PRB	LAB000235	2022-01-31	2025-01-31
2.	Climatic chamber	T-65/50	CTS GmbH	204002	LAB000110	2024-05-12	2025-05-12
3.	Shielding Cover	CMU-Z11	Rohde & Schwarz	100876	LAB000039	-	-
4.	Climatic chamber	T-70/350	CTS GmbH	194027	LAB000066	2024-07-01	2025-07-01
5.	Shielded room	Sputnik 1 (Schirmkabine)	Albatross Projects GmbH	-	LAB000257	-	-
Corner Reflector (CR):							
1.	Trihedral Corner Reflector	SAJ-080-S1	ERAVANT	04756-01	LAB000201	-	-
Directional coupler (DC):							
1.	Directional coupler	CPL-5230-10-SMA-79	Midwest Microwave	-	LAB000672	-	-
Distance meter (DM):							
1.	Laser distance meter	GLM 50 C	Bosch	-	-	-	-
2.	Laser distance meter	GLM 120 C	Bosch	-	-	-	-
Filter (F)*:							
1.	High-pass filter (84 GHz – 110 GHz)	10-WHPF-84.5-UG387	TTE	-	LAB000299	-	-
2.	High-pass filter (7 GHz – 23 GHz)	HPF 7-23	AtlantRF	-	LAB000444	-	-
3.	High-pass filter (3.3 GHz – 12.75 GHz)	HPF 3.3-11	AtlantRF	-	LAB000382	-	-
4.	High-pass filter (1.3 GHz – 12.75 GHz)	H1G713G1	Microwave Circuits Inc	46291	LAB000443	-	-
5.	High-pass filter (1.3 GHz – 12.75 GHz)	H1G713G1	Microwave Circuits Inc	1896-01	LAB000670	-	-
6.	Bandstop filter (30MHz – 3GHz for 900 MHz Band)	WRCG876/960- 847/989-50/8SS	Wainwright Instruments GmbH	-	LAB000671	-	-
Harmonic mixers (H):							
1.	Harmonic Mixer	FS-Z60	Rohde & Schwarz	101350	LAB000375	2024-04-11	2025-04-11
2.	Harmonic Mixer	FS-Z75	Rohde & Schwarz	102015	LAB000112	2024-05-01	2025-05-01
3.	Harmonic Mixer	FS-Z90	Rohde & Schwarz	102020	LAB000113	2024-04-06	2025-04-06
4.	Harmonic Mixer	FS-Z110	Rohde & Schwarz	102000	LAB000114	2024-05-02	2025-05-02
5.	Harmonic Mixer	FS-Z170	Rohde & Schwarz	100996	LAB000126	2024-05-07	2025-05-07
6.	Harmonic Mixer	FS-Z220	Rohde & Schwarz	101039	LAB000116	2024-04-03	2025-04-03
7.	Harmonic Mixer	FS-Z325	Rohde & Schwarz	101015	LAB000117	2024-04-16	2025-04-16
LISN (L):							
1.	Two-line V-Network	ENV216	Rohde & Schwarz	102597	LAB000220	-	2024-09-07
2.	Two-line V-Network	ENV216	Rohde & Schwarz	102598	LAB000217	2024-06-06	2025-06-06
Multimeters (M):							
1.	Multimeter	U1242B	Keysight	MY59240021	LAB000187	2024-06-20	2026-06-20
2.	Multimeter	U1242B	Keysight	MY59160026	LAB000018	2023-09-20	2024-09-20
Multipliers (Mp):							
1.	Multiplier	SMZ75	Rohde & Schwarz	101307	-	2018-03-15	-
2.	Multiplier	SMZ110	Rohde & Schwarz	100001	-	2020-05-09	-
Power Supply (P):							
1.	Power Supply	PS 2042-10 B	Elektro-Automatic GmbH	2878350263	LAB000190	-	-

2.	Power Supply	PS 2042-10 B	Elektro-Automatic GmbH	2878350322	LAB000192	-	-
3.	Power Supply	E3640A	Agilent	MY40005693	LAB000036	-	-
Power meters (PM):							
1.	Power meter	NRP-Z81	Rohde & Schwarz	106194	LAB000120	2024-05-22	2025-05-22
2.	Power meter	NRP110T	Rohde & Schwarz	101151	LAB000119	2024-05-24	2025-05-24
Receivers and Spectrum analyzers (R):							
1.	Test Receiver, SAC5	ESW-26	Rohde & Schwarz	101517	LAB000363	2024-01-22	2025-01-22
2.	Test Receiver	ESW-26	Rohde & Schwarz	101481	LAB000236	2023-07-09	2025-07-09
3.	Spectrum Analyzer 1 Hz – 50 GHz	FSW-50	Rohde & Schwarz	101450	LAB000111	2024-07-19	2025-07-19
4.	Spectrum Analyzer 2 Hz – 43 GHz	FSW-43	Rohde & Schwarz	101391	LAB000289	2024-06-04	2025-06-04
Signal Generators (SG):							
1.	Signal generator 8 kHz – 50 GHz	SMA100B	Rohde & Schwarz	103838	LAB000118	2024-06-28	2025-06-28
2.	Vector Signal Generator	SMW200A	Rohde & Schwarz	109775	LAB000870	2023-10-18	2026-10-18
3.	Signal generator 100 kHz – 20 GHz	SMB100A	Rohde & Schwarz	178175	LAB000276	2024-04-03	2025-04-03
Software (SW):							
No	Type	Name	Manufacturer	Version	Int. No.	Build	Rev
1.	Software	R&S Power Viewer	Rohde & Schwarz	11.3, 3.2.2020	-	7338	3230
2.	Software	R&S EMC32	Rohde & Schwarz	11.20	-	-	-
3.	Software	R&S Elektra EMC test software	Rohde & Schwarz	13.00	-	-	-

* The gain values of Amp and attenuation values of Cab and Att are remeasured annually internal.

9 MEASUREMENT UNCERTAINTIES

Test case	Measurement uncertainty*
Radiated field strength	$\leq \pm 6 \text{ dB}$
Occupied bandwidth	$\pm 100 \text{ kHz}$
Time domain measurement	$\pm 2.32 \text{ ms}$
DC and low frequency voltages	$\pm 3 \%$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 3 \%$

*) The indicated expanded measurement uncertainty corresponds to the standard measurement uncertainty for the measurement results multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %.

END OF THE REPORT

Annex A

Measurement plots

part of / in addition to

Test report no.: 23109352-40489-1

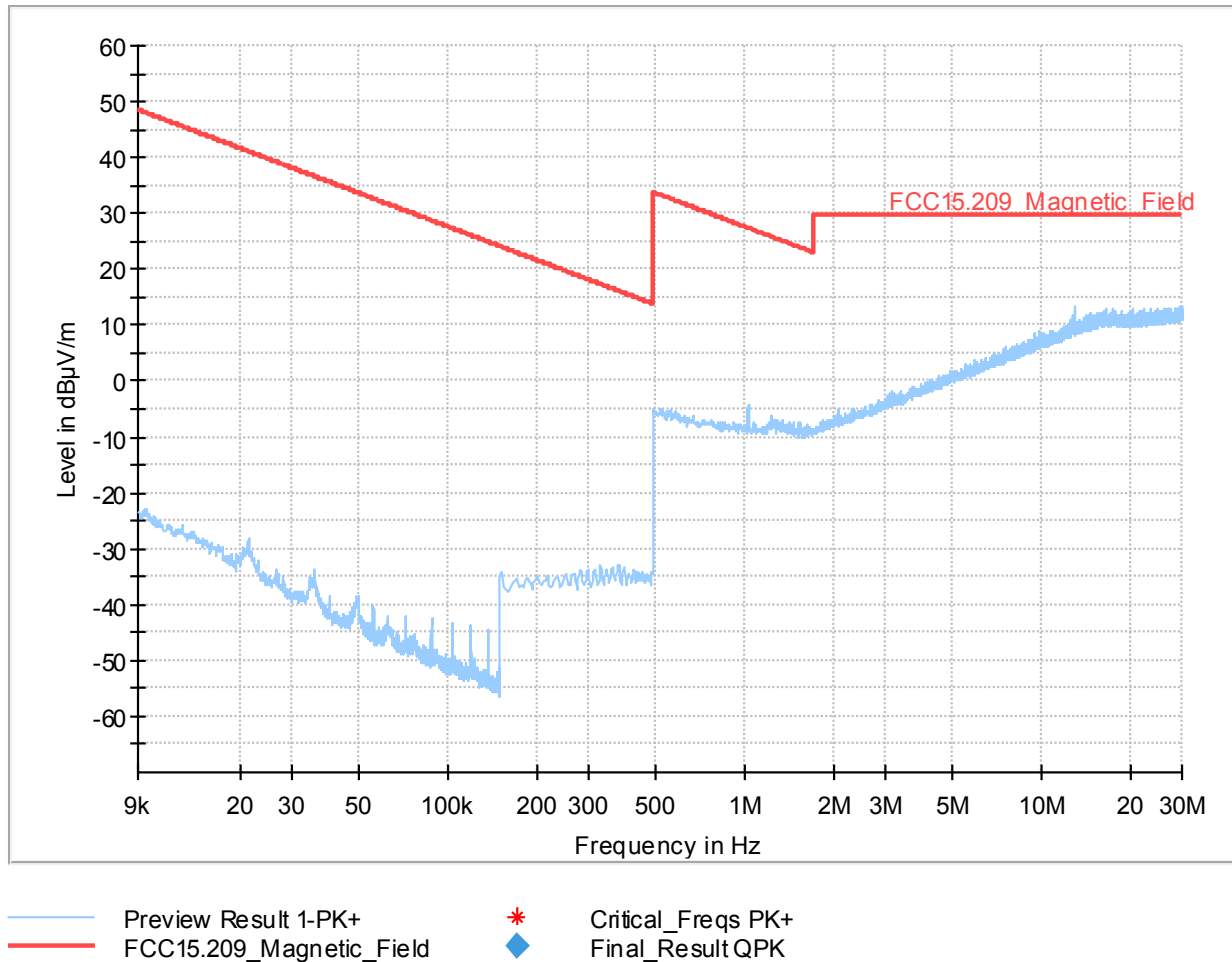
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1 General Limit - Radiated field strength emissions, 9 kHz – 12.75 GHz

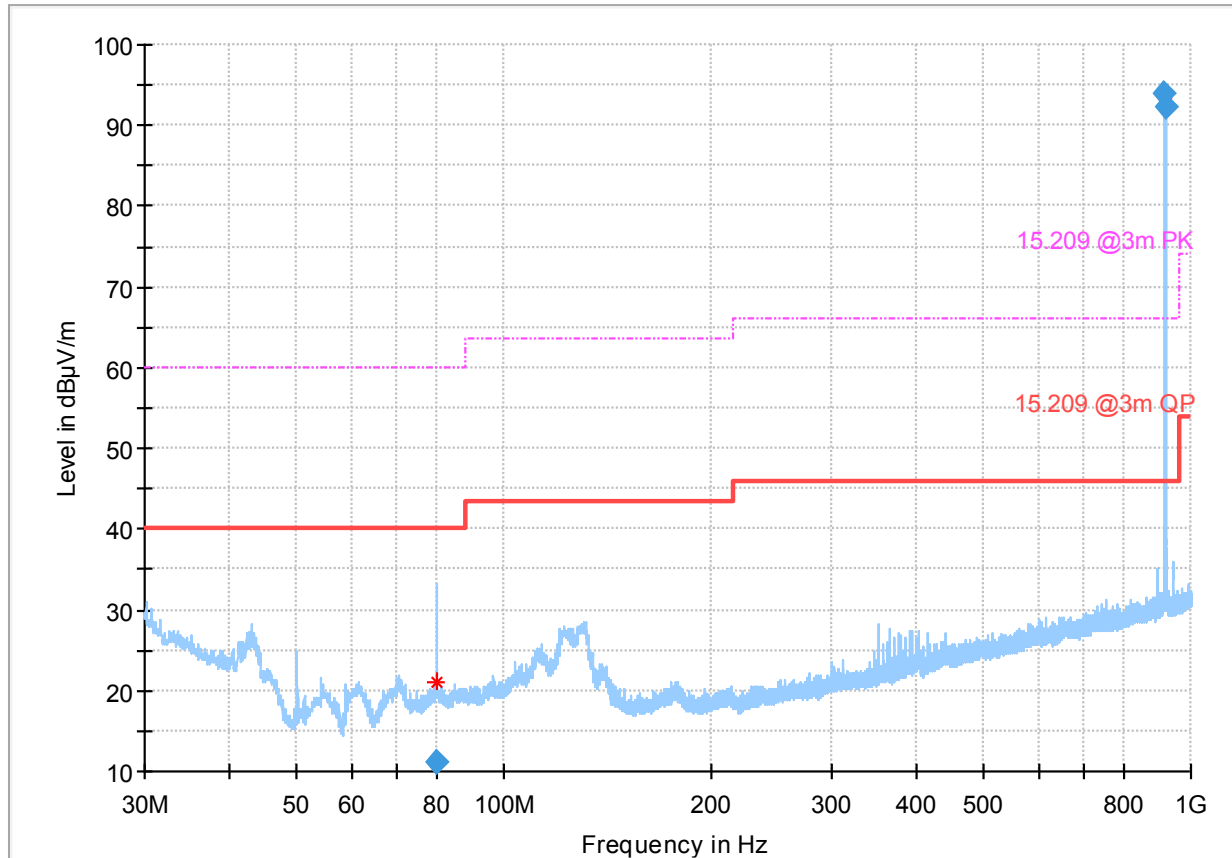
1.1 Radiated field strength measurements ($f < 30$ MHz)

1.1.1 Set-up 1, 9 kHz – 30 MHz, Op. 1, lying + staying



1.2 Radiated field strength measurements (30 MHz < f < 1000 MHz)

1.2.1 Set-up 1, Op. 1, lying

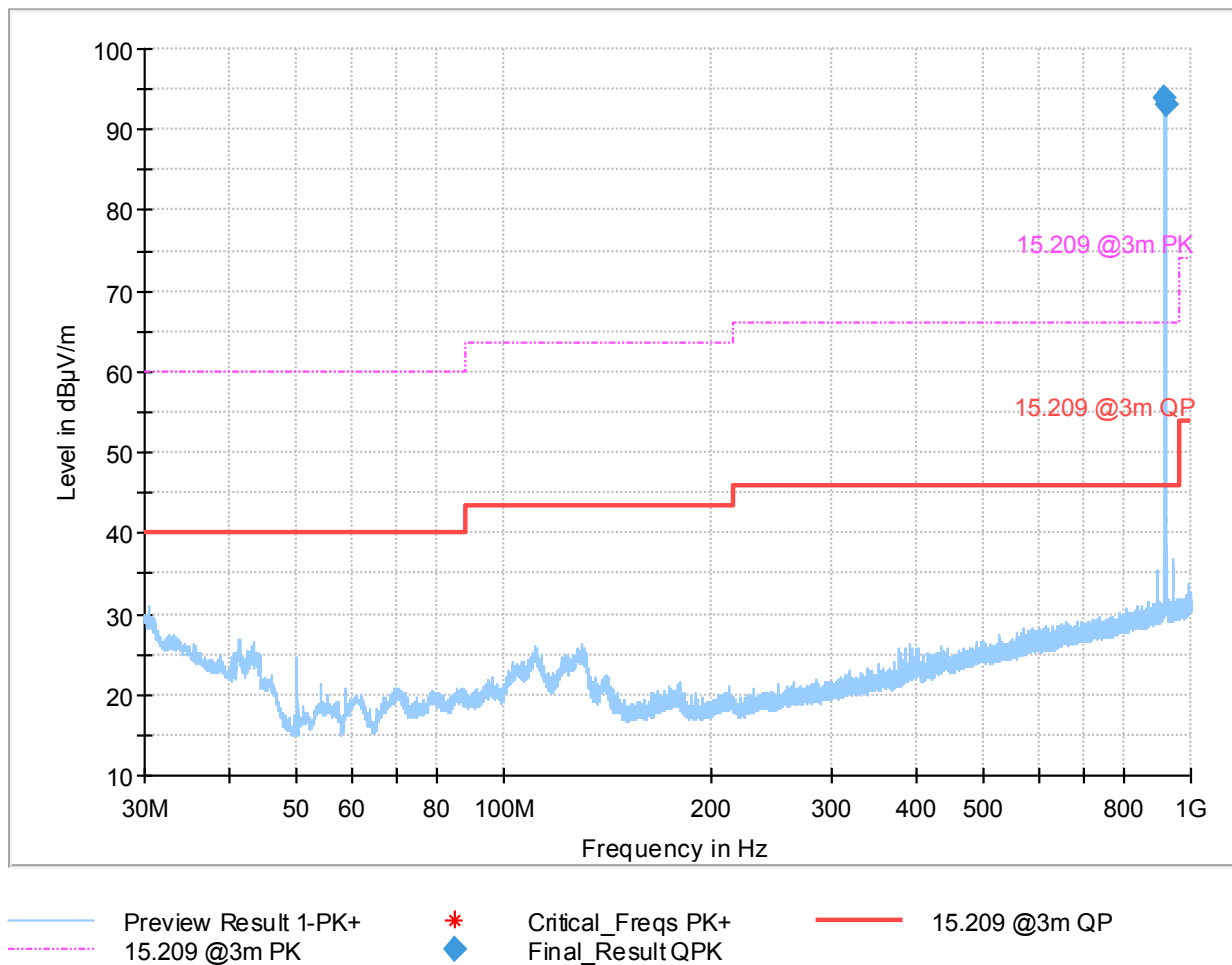


— Preview Result 1-PK+ 15.209 @3m PK
— 15.209 @3m PK
* Critical_Freqs PK+ Final_Result QPK
◆ Final_Result QPK
— 15.209 @3m QP

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
79.970000	11.07	40.00	28.93	100.0	120.000	155.0	V	-2.0
917.425000	93.81	94.00	0.19	100.0	120.000	100.0	H	57.0
917.745000	92.28	94.00	1.72	100.0	120.000	103.0	H	54.0

1.2.2 Set-up 1, Op. 1, staying

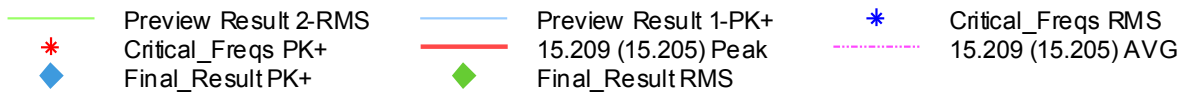
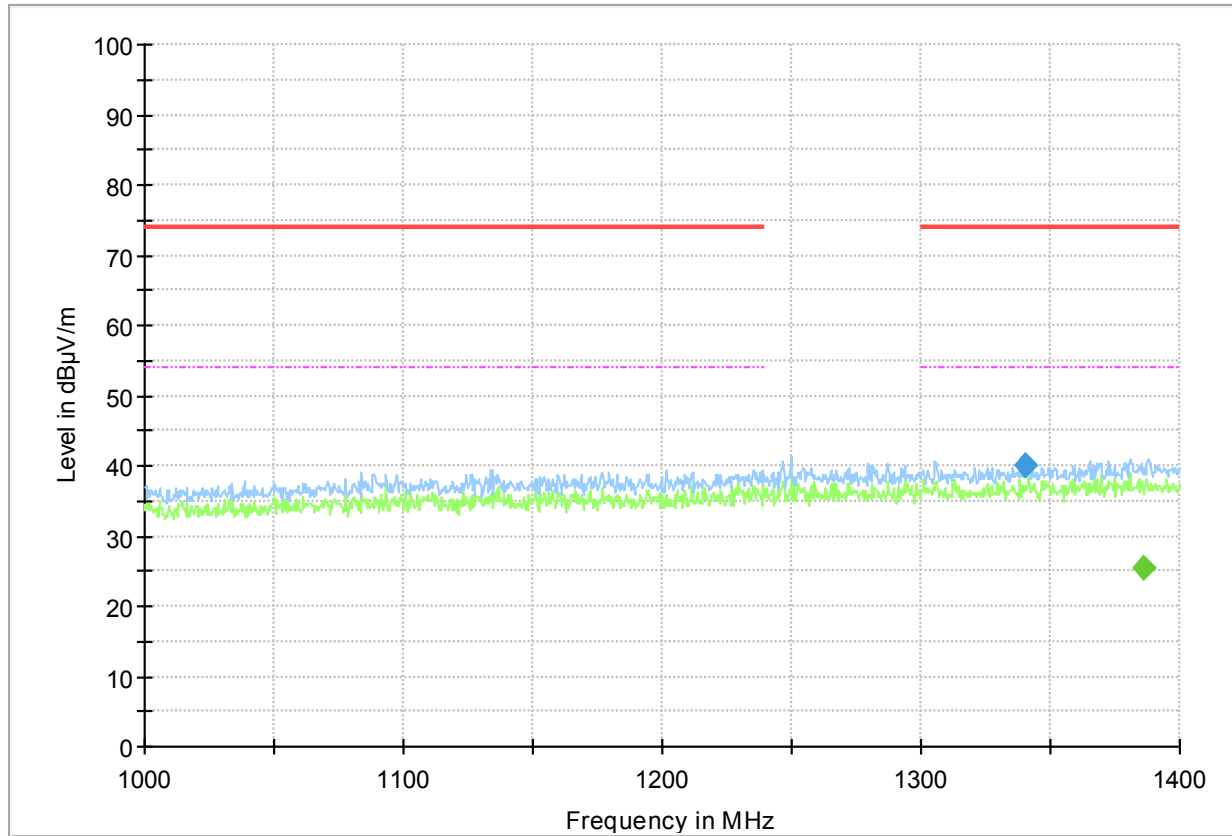


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
917.425000	93.86	94	0.14	100.0	120.000	100.0	V	34.0
917.745000	93.11	94	0.89	100.0	120.000	104.0	V	33.0

1.3 Radiated field strength measurements (1 GHz < f < 12.75 GHz)

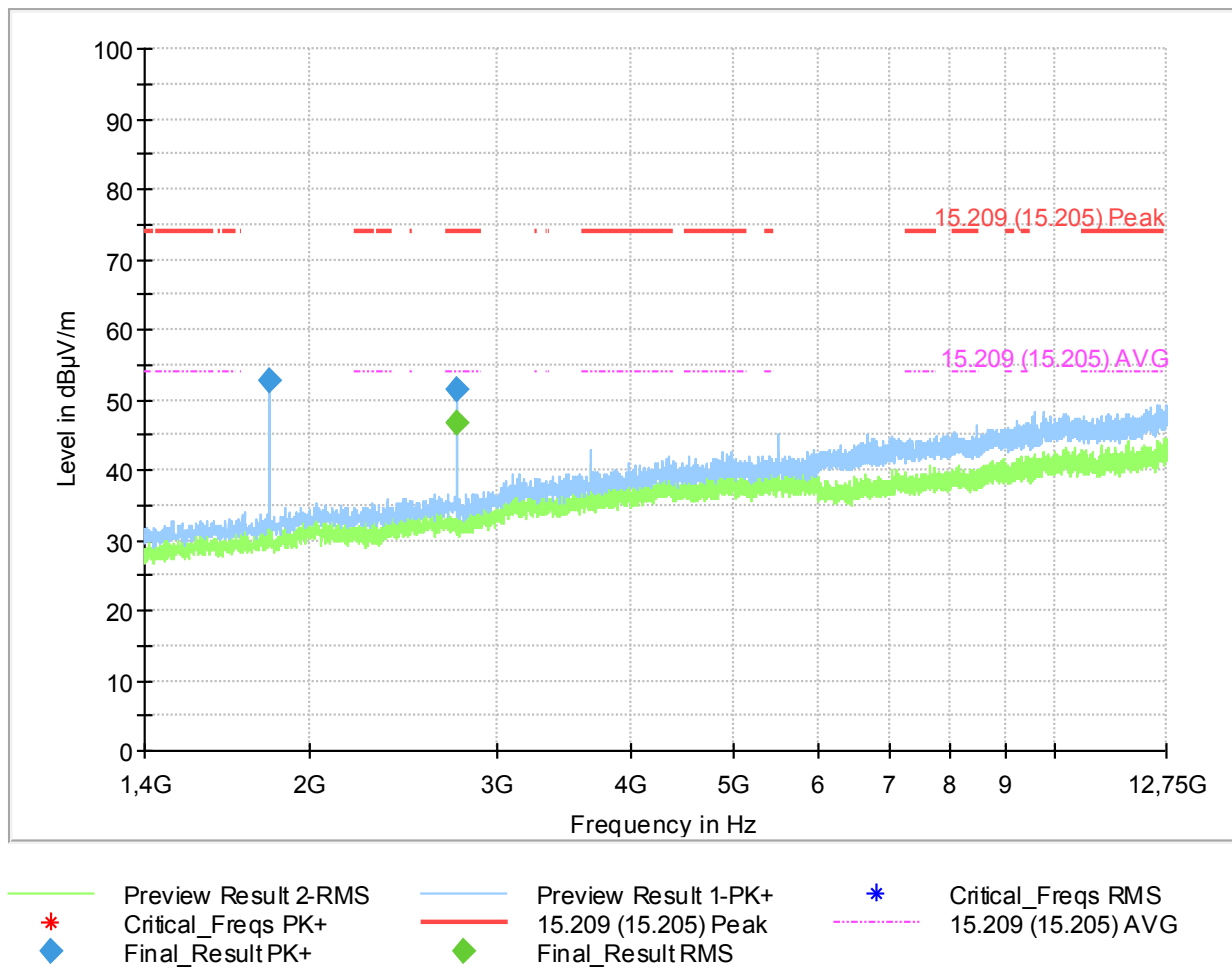
1.3.1 Set-up 1, Op. 1, lying + staying, 1 GHz – 1.4 GHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1340.350000	39.98	---	74.00	34.02	1000.0	1000.000	150.0	V
1385.800000	---	25.32	54.00	28.68	1000.0	1000.000	150.0	V

1.3.2 Set-up 1, Op. 1, lying + staying, 1.4 GHz – 12.75 GHz

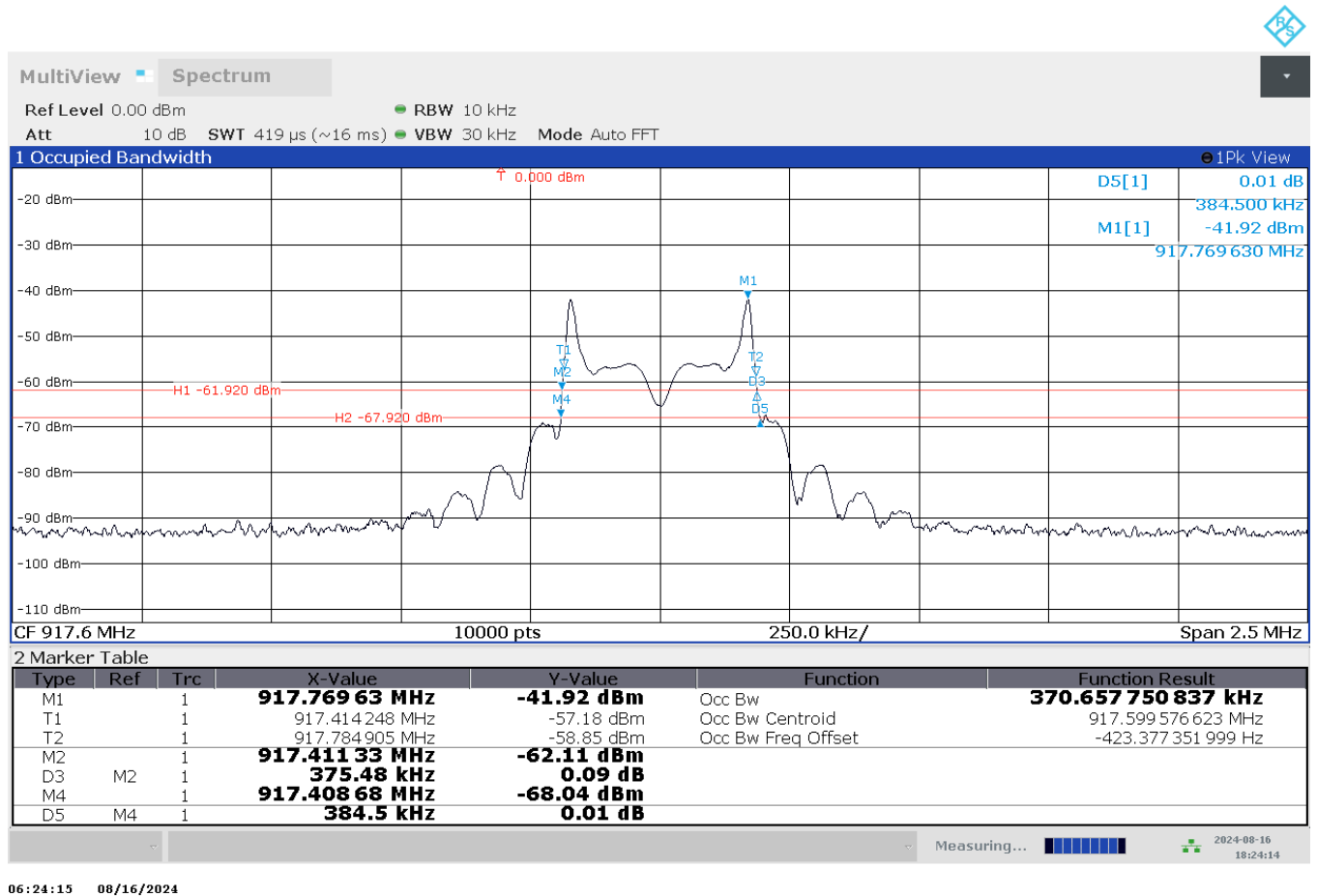


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1834.700000	52.58	---	---	---	1000.0	1000.000	150.0	H
2752.400000	51.41	---	74.00	22.59	1000.0	1000.000	150.0	V
2752.400000	---	46.75	54.00	7.25	1000.0	1000.000	150.0	V

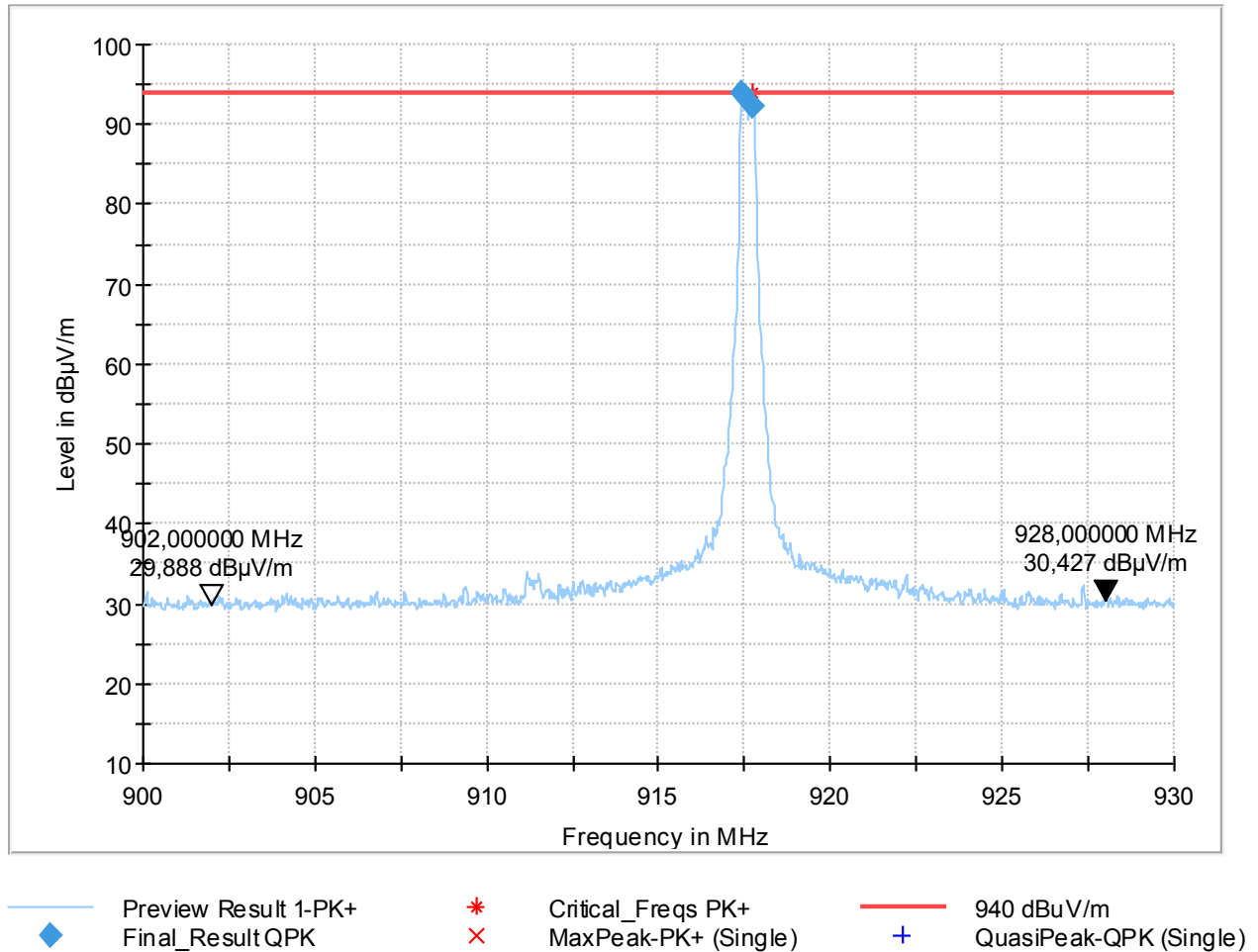
2 Occupied Bandwidth

2.1 Set-up 1, Op. 1



3 Band Edge Emissions / Radiated field strength of carrier

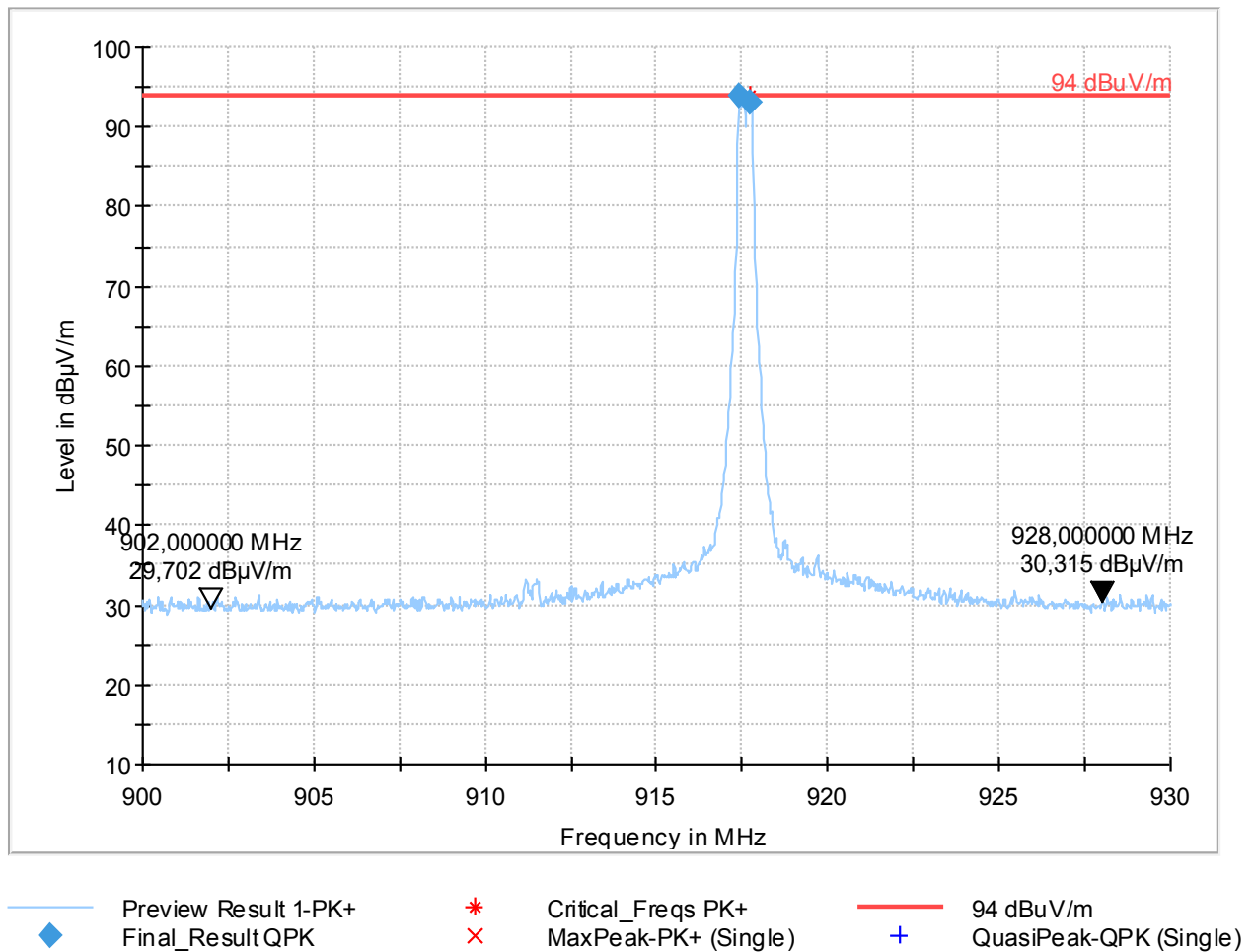
3.1 Set-up 1, Op. 1, lying



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
917.425000	93.81	94.00	0.19	100.0	120.000	100.0	H	57.0
917.745000	92.28	94.00	1.72	100.0	120.000	103.0	H	54.0

3.2 Set-up 1, Op. 1, staying



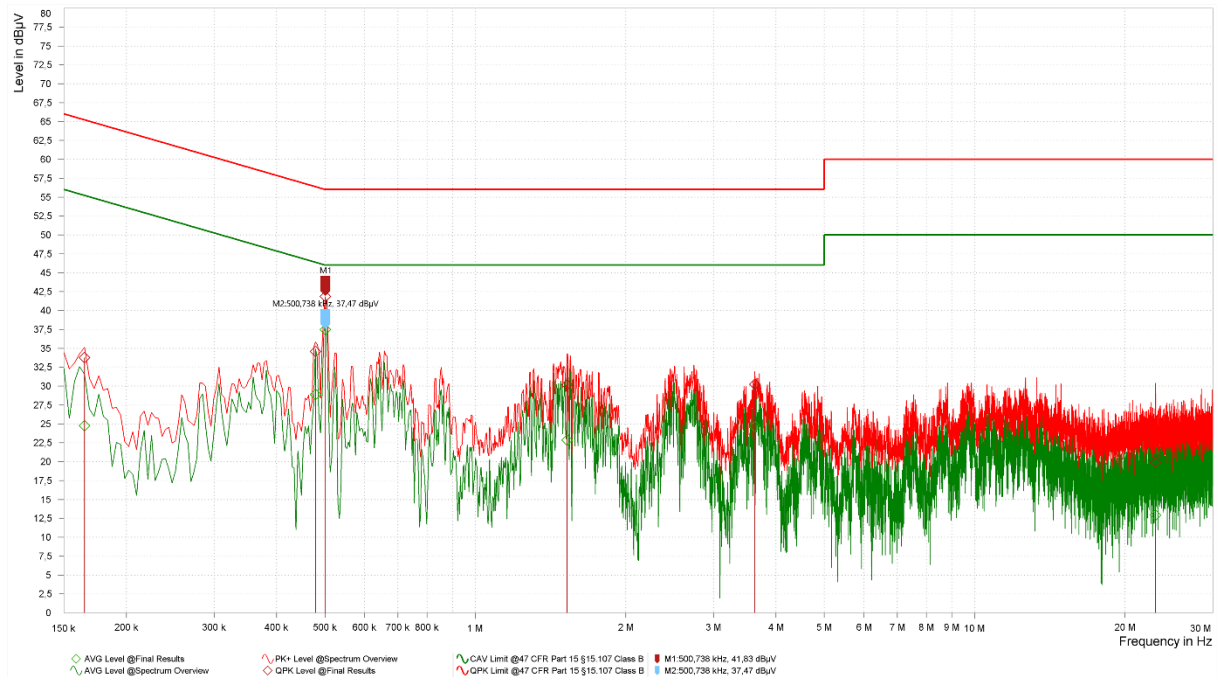
Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
917.425000	93.86	94	0.14	100.0	120.000	100.0	V	34.0
917.745000	93.11	94	0.89	100.0	120.000	104.0	V	33.0

4 Conducted emission

4.1 Set-up 1, Op. 1, L1

Spectrum Overview

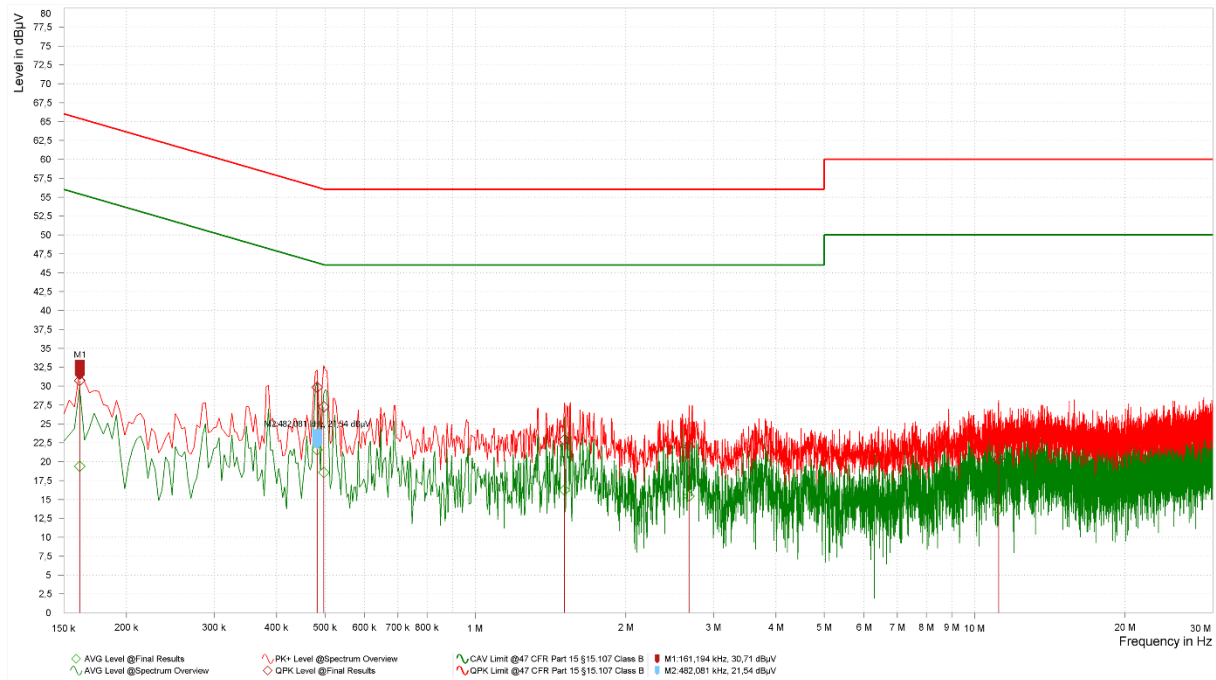


EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0,165	33,74	65,21	31,47	24,72	55,21	30,49	10,10	L1	9,000	15,000
1	0,478	34,56	56,37	21,81	28,86	46,37	17,51	10,17	L1	9,000	15,000
1	0,501	41,83	56,00	14,17	37,47	46,00	8,53	10,18	L1	9,000	15,000
1	1,527	30,14	56,00	25,86	22,81	46,00	23,19	9,92	L1	9,000	15,000
1	3,628	30,21	56,00	25,79	24,64	46,00	21,36	9,97	L1	9,000	15,000
1	23,041	19,91	60,00	40,09	12,89	50,00	37,11	10,48	L1	9,000	15,000

4.2 Set-up 1, Op. 1, N

Spectrum Overview

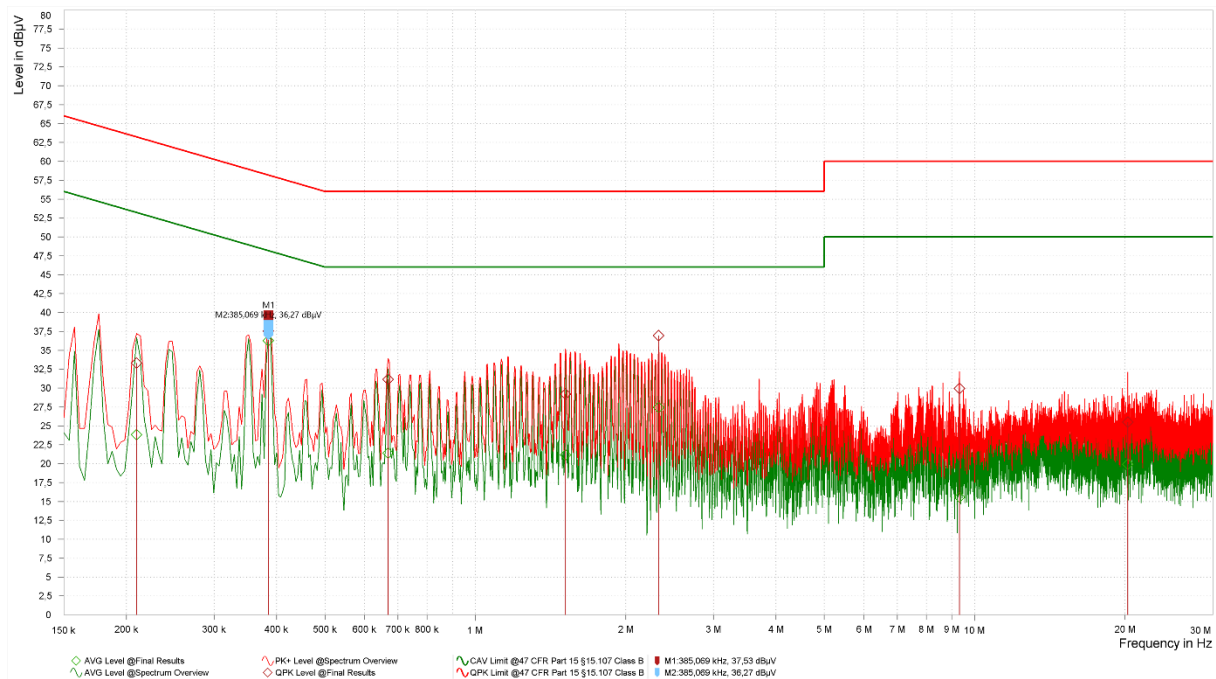


EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0,161	30,71	65,40	34,69	19,37	55,40	36,03	10,02	N	9,000	15,000
1	0,482	29,83	56,30	26,47	21,54	46,30	24,77	10,17	N	9,000	15,000
1	0,497	27,24	56,05	28,81	18,57	46,05	27,48	10,18	N	9,000	15,000
1	1,508	22,86	56,00	33,14	16,22	46,00	29,78	9,93	N	9,000	15,000
1	2,680	21,98	56,00	34,02	15,41	46,00	30,59	9,93	N	9,000	15,000
1	11,168	20,35	60,00	39,65	13,72	50,00	36,28	10,26	N	9,000	15,000

4.3 Set-up 2, Op. 1, L1

Spectrum Overview

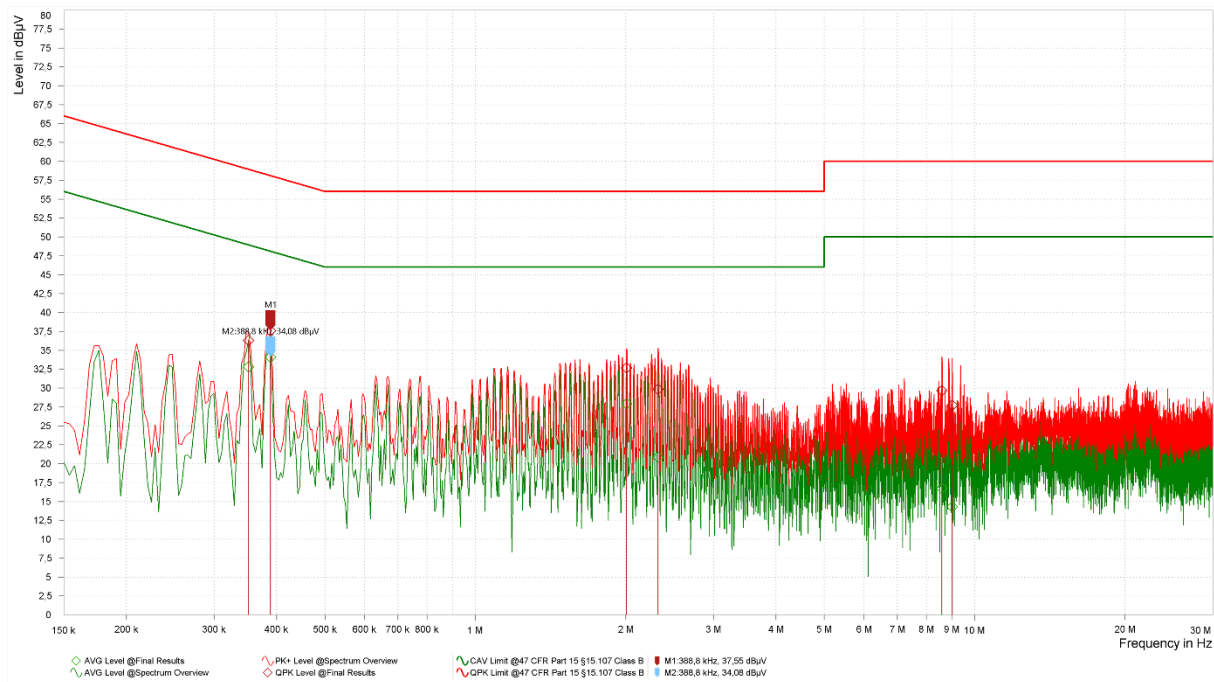


EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBμV]	QPK Limit [dBμV]	QPK Margin [dB]	AVG Level [dBμV]	AVG: CAV Limit [dBμV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0,210	33,27	63,22	29,95	23,82	53,22	29,40	9,87	L1	9,000	15,000
1	0,385	37,53	58,17	20,64	36,27	48,17	11,90	10,13	L1	9,000	15,000
1	0,669	31,12	56,00	24,88	21,38	46,00	24,62	10,11	L1	9,000	15,000
1	1,516	29,20	56,00	26,80	21,14	46,00	24,86	9,92	L1	9,000	15,000
1	2,329	36,93	56,00	19,07	27,41	46,00	18,59	9,92	L1	9,000	15,000
1	9,321	29,92	60,00	30,08	15,55	50,00	34,45	10,16	L1	9,000	15,000
1	20,261	25,49	60,00	34,51	19,88	50,00	30,12	10,44	L1	9,000	15,000

4.4 Set-up 2, Op. 1, N

Spectrum Overview



EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0,351	36,30	58,93	22,63	32,80	48,93	16,12	10,07	N	9,000	15,000
1	0,389	37,55	58,09	20,54	34,08	48,09	14,01	10,14	N	9,000	15,000
1	2,008	32,64	56,00	23,36	27,92	46,00	18,08	9,92	N	9,000	15,000
1	2,322	29,83	56,00	26,17	20,86	46,00	25,14	9,92	N	9,000	15,000
1	8,601	29,65	60,00	30,35	16,72	50,00	33,28	10,16	N	9,000	15,000
1	9,015	27,69	60,00	32,31	14,26	50,00	35,74	10,17	N	9,000	15,000