


Test Report

Electromagnetic Compatibility (EMC)

HELEM2111000483-7



TESTS ACCORDING TO FCC PART 15 B AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Base station 4G with 915 MHz SRD
Model:	Base Station 4G
Trademark:	
Manufacturer:	Quanturi Oy Lars Sonckin kaari 10 FI-02600 Espoo FINLAND
Customer:	Quanturi Oy Lars Sonckin kaari 10 FI-02600 Espoo FINLAND
FCC Rule Part:	FCC CFR 47 Part 15 Subpart B, Class B
IC Rule Part:	ICES-003 Issue 7, Class B

Date: 21 November 2022
Issued by: 
Rauno Repo
Senior EMC Specialist


Date: 21 November 2022
Checked by: 
Henri Mäki
Testing Engineer

TABLE OF CONTENTS

TABLE OF CONTENTS	2
GENERAL REMARKS	3
Disclaimer	3
RELEASE HISTORY	4
PRODUCT DESCRIPTION	5
Equipment Under Test (EUT)	5
General description	5
Samples and modifications.....	5
Ports and cables	5
Peripherals	5
TEST CONDITION.....	6
EUT Test Conditions During EMC-Testing.....	6
Operation modes	6
Emission Measurement Uncertainty	6
SUMMARY OF TESTING	7
EMISSION TESTS.....	8
Conducted Emissions In The Frequency Range 150 kHz - 30 MHz	8
Radiated Emissions In The Frequency Range 9 kHz – 10 GHz.....	10
TEST EQUIPMENT	17

GENERAL REMARKS

Disclaimer

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>

Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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	21 November 2022

PRODUCT DESCRIPTION

Equipment Under Test (EUT)

EUT information	
Trademark	Quanturi
Model	Base Station 4G
Type	Base Station 4G with 915 MHz SRD
Serial number	-
Power supply	Powered with an external AC/DC power supply: TDC Power Products Co., Ltd. Model No: SA9A-120-2100W -Input: 100-120 V ~60 Hz 1 A -Output: 12.0 VDC 2.1 A
EUT Highest operation freq.	SRD radio 927 MHz
Hardware Version (if any)	-
Software Version (if any)	-
Cellular radio module:	QUECTEL EG21-G
FCC ID:	XMR201906EG21G
IC:	10224A-201906EG21G
Cellular antenna:	Teltonika 003R-00296 +5 dBi
SRD radio module:	ON Semiconductor AX8052F143-D
FCC ID:	-
IC:	-
SRD antenna:	Siretta Delta 22B (installed inside the enclosure) +3 dBi
Mechanical size of the EUT (mm)	Height: 330 mm Width: 60 mm Length: 155 mm
Parallel models	-

The EUT was tested as a tabletop unit.

General description

Base Station receives data from the probes or/and then forward it to the cloud through the 4G connection and then reply to the probes. According to the manufacturer 4G or SRD are not operating at the same time. This test report contains the test results when the EUT is in SRD receiving mode.

Samples and modifications

No.	Name	Description
1	Sample 1	Test sample supplied by the customer. Tested with 120 VAC / 60 Hz.

Würth ferrite 74271131 was on the power cable about 20 cm from the EUT.

Ports and cables

None.

Peripherals

None.

TEST CONDITION

EUT Test Conditions During EMC-Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. The EUT was set to receiver mode.

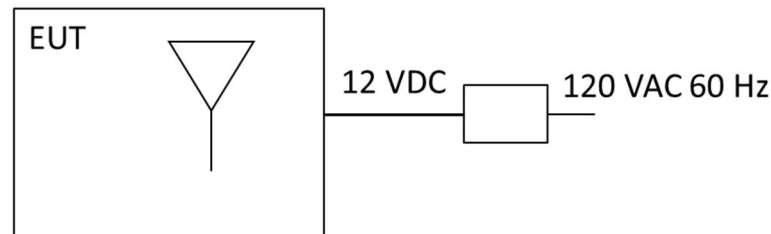


Figure 1: Test setup block diagram

Operation modes

During the tests the EUT was in the following operation modes:

Mode	Description
1	EUT in SRD RX mode.

Table 1: Test RX frequencies

Channel	Frequency (MHz)
Low	903
Mid	915
High	927

Emission Measurement Uncertainty

The uncertainties comply with CISPR 16-4-2 ed.2 requirements ($U_{lab} < U_{cispr}$).

Summary of Testing

SUMMARY OF TESTING

Test Specification	Description of Test	Result
FCC CFR 47 15/B §15.107, ICES-003 3.2.1	Conducted emissions, Class B	PASS
FCC CFR 47 15/B §15.109, ICES 003 3.2.2	Radiated Emissions, Class B	PASS

Decision rule used for the emission tests are defined in standard CISPR 16-4-2 / EN 55016-4-2 clause 4.2

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISED CAB identifier: T004	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	<input type="checkbox"/> K10LAB, ISED Canada registration number: 8708A-1 <input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: 8708A-2 <input type="checkbox"/> T10LAB

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

EMISSION TESTS

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Standard: ANSI C63.4 (2014)
Tested by: RRE
Date: 18 November 2022
Humidity: 30 – 60 %
Temperature: 22 ± 3 °C
Barometric pressure: 860 – 1 060 mbar
Measurement uncertainty: ± 2.9 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.107(a)

ICES-003: 3.2.1

Test Plan

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors from the phase(s) and neutral lines of the power supply cable.

The EUT was working as described in the section “EUT Test Conditions”.

Class B 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.

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Test results

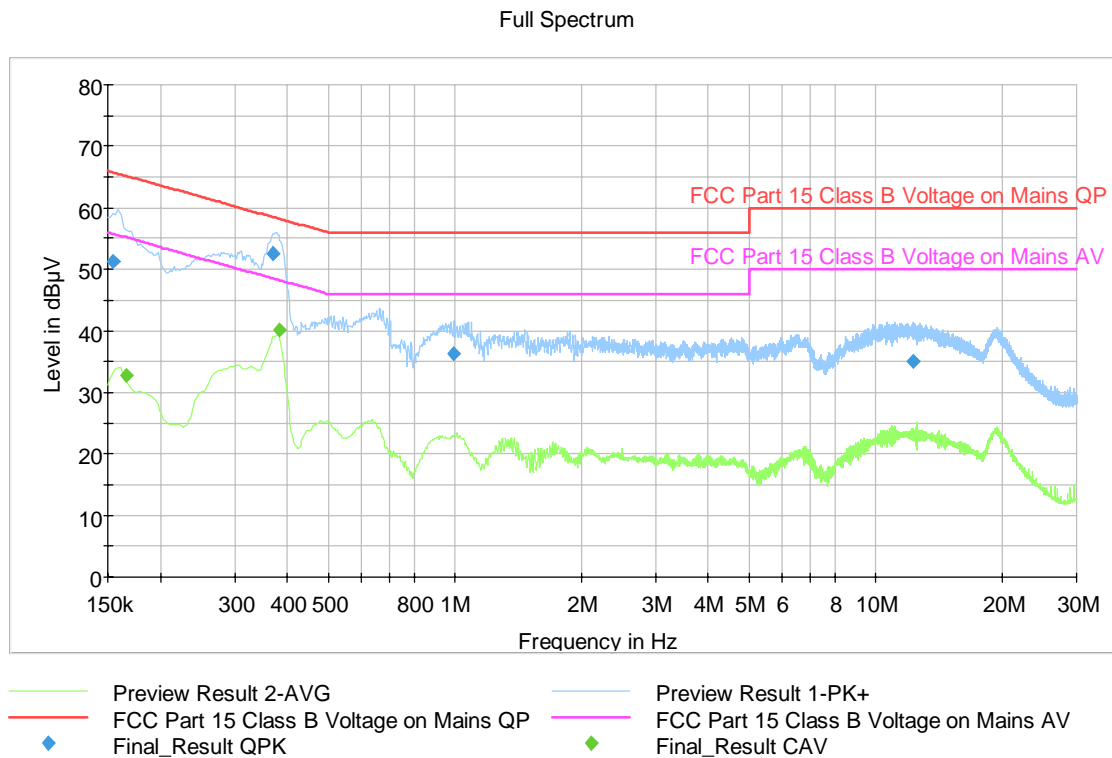


Figure 2: The measured results (RX 915 MHz)

Final measurements from the worst frequencies

Table 2: Final results

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154000	51.31	---	65.78	14.47	15x1000.0	9.000	L1	9.7
0.166000	---	32.74	55.16	22.42	15x1000.0	9.000	N	9.7
0.370000	52.65	---	58.50	5.85	15x1000.0	9.000	L1	9.7
0.382500	---	40.15	48.23	8.08	15x1000.0	9.000	L1	9.7
0.992750	36.24	---	56.00	19.76	15x1000.0	9.000	N	9.8
12.259250	35.00	---	60.00	25.00	15x1000.0	9.000	N	10.3

Correction factor (dB) in the final result tables contains the sum of the transducers (cables + transient limiter + LISN).

QuasiPeak and Average values are the measured values corrected with the correction factor.

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Standard:	ANSI C63.4 (2014)
Tested by:	RRE
Date:	14 November 2022 18 November 2022
Humidity:	30 – 60 %
Temperature:	22 ± 3 °C
Barometric pressure:	860 – 1 060 mbar
Measurement uncertainty:	± 4.9 dB (30 – 200 MHz) Level of confidence 95 % (k = 2). ± 4.1 dB (200 – 1 000 MHz) ± 4.3 dB (1 – 18 GHz)

FCC Rule: 15.109(a)

ICES-003: 3.2.2

Test plan

The radiated emission measurements were done within a semi anechoic screened chamber. Additional floor absorbers were used on the floor between the EUT and receiving antenna in radiated emission test above 1 GHz. The EUT was placed on a table 0.8 m above the reflecting ground plane. The measurement distance was 3 meters. The worst interferences were determined during measurements by rotating the turntable and adjusting the antenna height. The measurements were done in horizontal and vertical antenna polarizations.

The EUT was working as described in the section “EUT Test Conditions”.

The EUT was tested in its usage position.

Radiated measurement settings

Preliminary testing:

Turntable movement:	30 ° step
Turntable position:	0 ° to 330°
Antenna movement:	1.5 m step
Antenna height:	1.0 m to 4.0 m
Antenna polarization:	Vertical and horizontal

Final testing:

Turntable movement:	Continuous
Turntable position:	± 15 °
Antenna movement:	Continuous
Antenna height:	± 0.75 m
Antenna polarization:	Vertical and horizontal

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Measured Quasi-Peak Values In The Frequency Range 9 kHz - 10 GHz

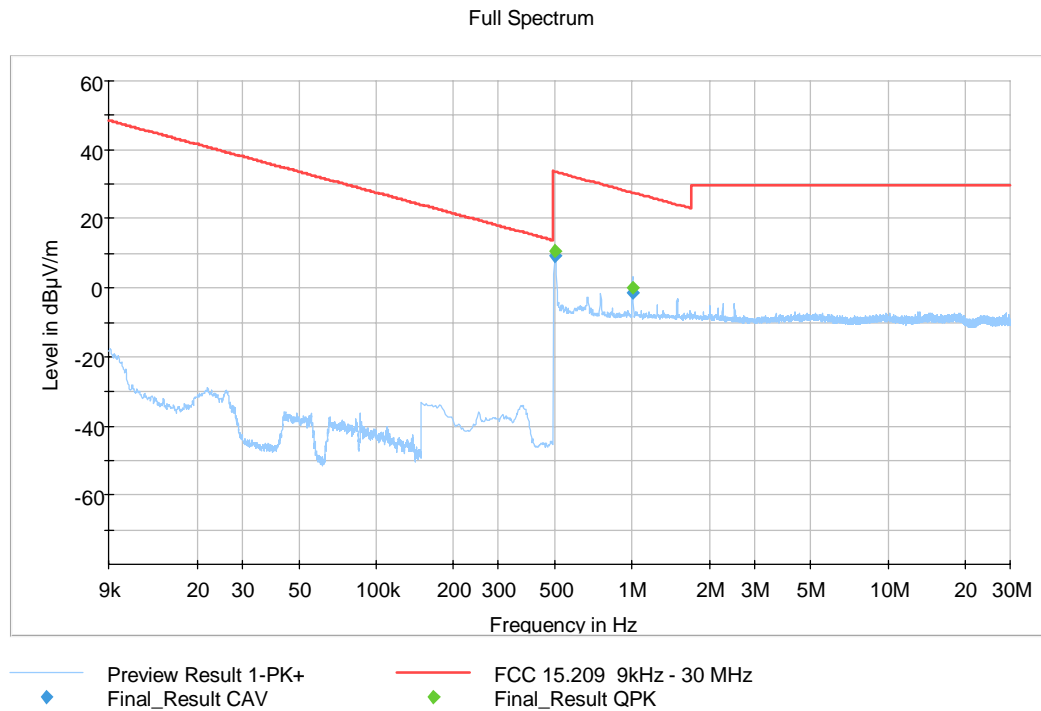


Figure 3: Measured results (Low)

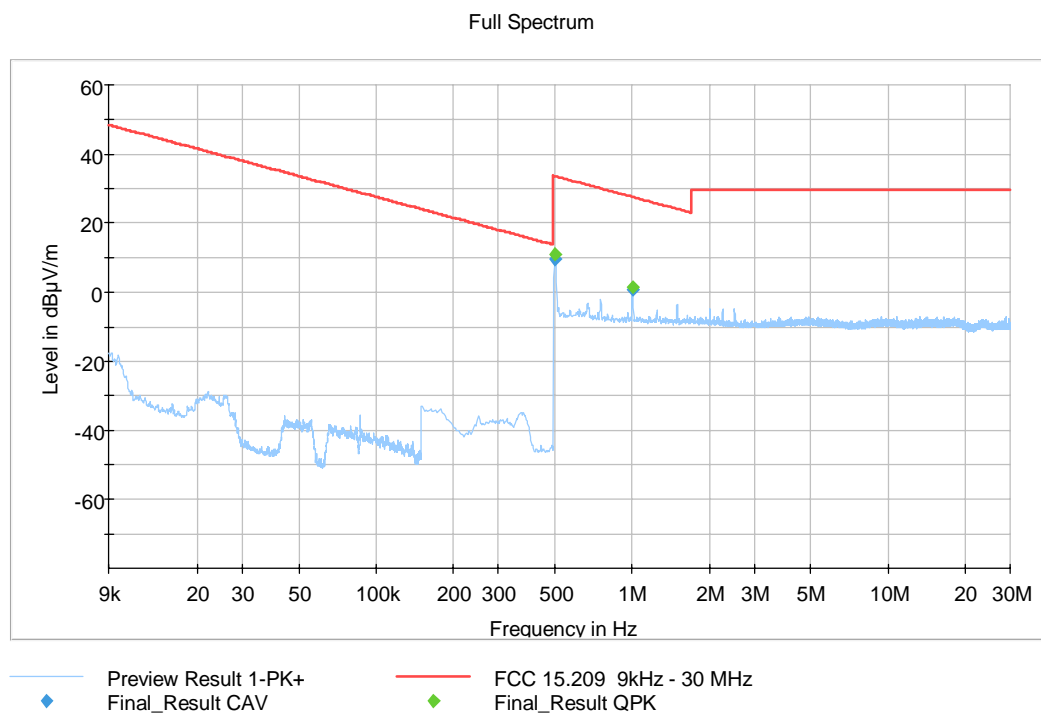


Figure 4: Measured results (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

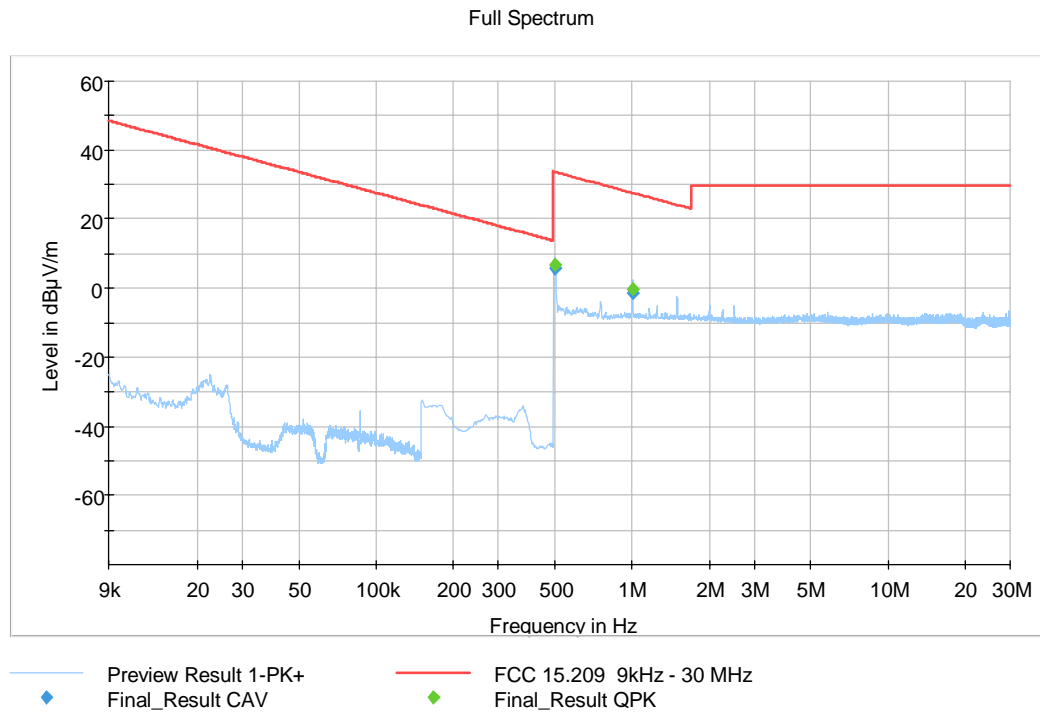


Figure 5: Measured results (High)

Final measurements from the worst frequencies

Table 3: Final quasi-peak results

Frequency (MHz)	Average (dBμV/m)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Angle deg	Azimuth (deg)	Corr. (dB/m)	Comment
0.500000	---	10.61	33.63	23.02	15x1000.0	9.000	90.0	165.0	-20.4	Low
0.500000	9.07	---	33.63	24.56	15x1000.0	9.000	90.0	165.0	-20.4	Low
1.002250	---	0.15	27.60	27.45	15x1000.0	9.000	90.0	151.0	-20.5	Low
1.002250	-1.40	---	27.60	29.00	15x1000.0	9.000	90.0	151.0	-20.5	Low
0.500000	9.40	---	33.63	24.23	15x1000.0	9.000	90.0	183.0	-20.4	Mid
0.500000	---	10.85	33.63	22.78	15x1000.0	9.000	90.0	183.0	-20.4	Mid
1.004000	0.65	---	27.59	26.94	15x1000.0	9.000	90.0	180.0	-20.5	Mid
1.004000	---	1.41	27.59	26.18	15x1000.0	9.000	90.0	180.0	-20.5	Mid
0.500000	---	6.81	33.63	26.82	15x1000.0	9.000	90.0	180.0	-20.4	High
0.500000	5.57	---	33.63	28.06	15x1000.0	9.000	90.0	180.0	-20.4	High
1.004000	---	-0.23	27.59	27.82	15x1000.0	9.000	90.0	149.0	-20.5	High
1.004000	-1.36	---	27.59	28.95	15x1000.0	9.000	90.0	149.0	-20.5	High

Correction factor (dB) in the final result tables contains the sum of the transducers (antenna + cables). Result values are measured values corrected with the correction factor.

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Measured Peak and Average Values In The Frequency Range 30 MHz - 1 GHz

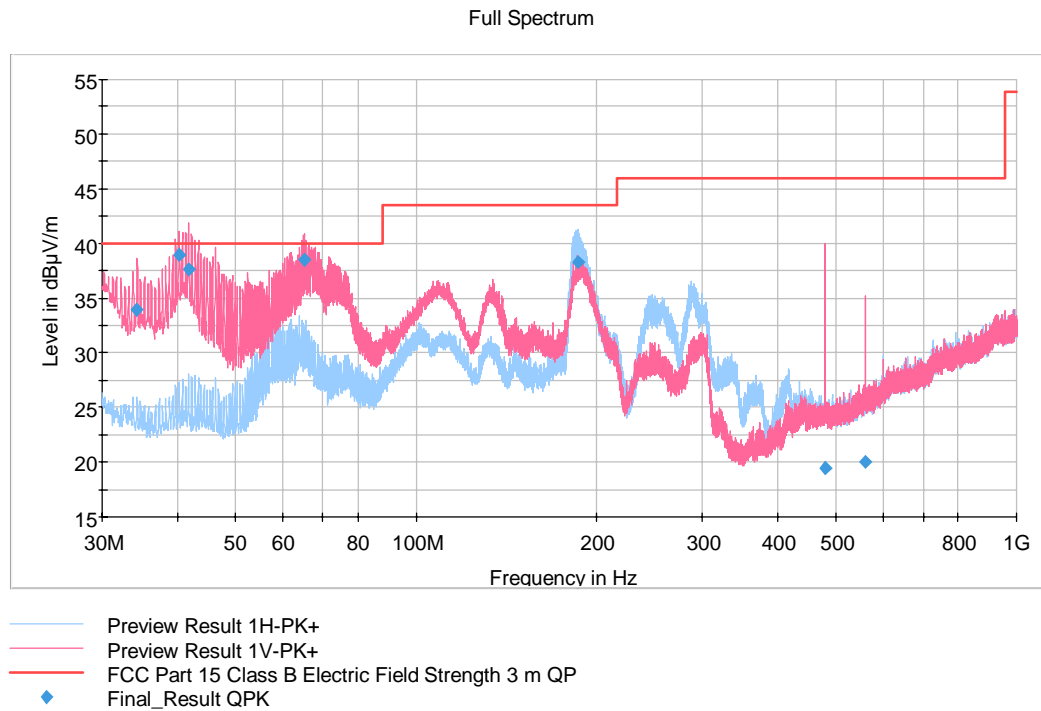


Figure 6: Measured results (Low)

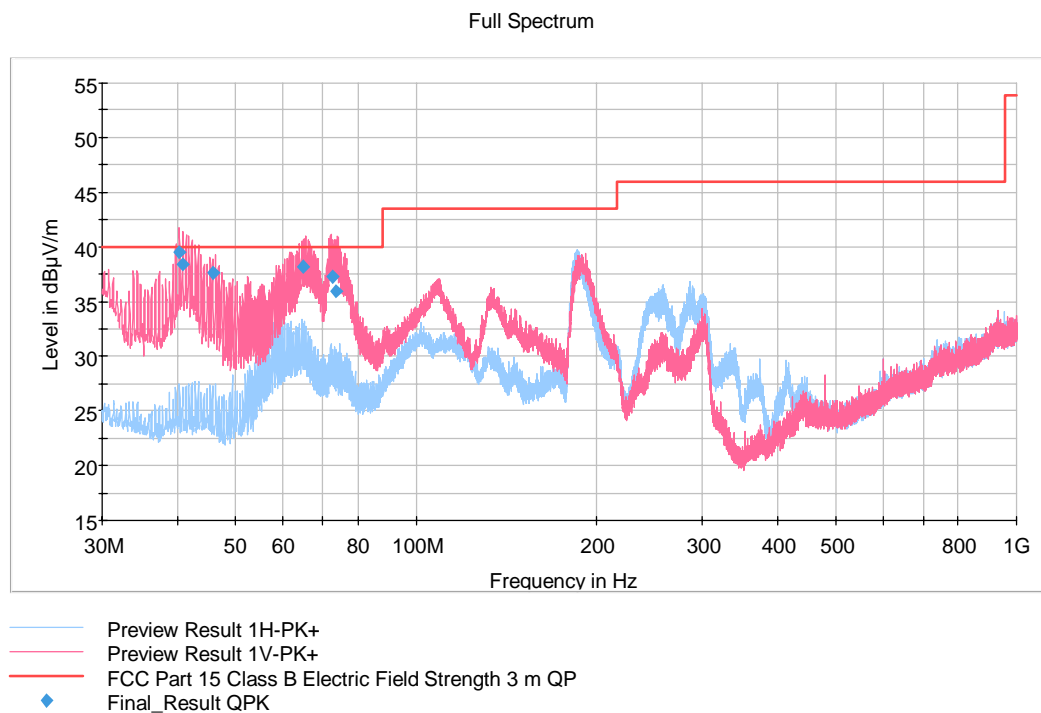


Figure 7: Measured results (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz



Figure 8: Measured results (High)

Final measurements from the worst frequencies

Table 4: Final results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
34.260000	33.98	40.00	6.02	15x1000.0	120.000	108.0	V	51.0	16.5	Low
40.280000	38.98	40.00	1.02	15x1000.0	120.000	100.0	V	37.0	17.2	Low
41.760000	37.57	40.00	2.43	15x1000.0	120.000	100.0	V	117.0	17.3	Low
64.990000	38.49	40.00	1.51	15x1000.0	120.000	100.0	V	262.0	17.2	Low
185.930000	38.28	43.50	5.22	15x1000.0	120.000	218.0	H	100.0	16.3	Low
480.020000	19.46	46.00	26.54	15x1000.0	120.000	187.0	V	195.0	24.0	Low
560.070000	19.98	46.00	26.02	15x1000.0	120.000	200.0	V	171.0	25.6	Low
40.310000	39.48	40.00	0.52	15x1000.0	120.000	100.0	V	38.0	17.2	Mid
40.800000	38.40	40.00	1.60	15x1000.0	120.000	108.0	V	83.0	17.2	Mid
45.810000	37.63	40.00	2.37	15x1000.0	120.000	108.0	V	293.0	17.7	Mid
64.960000	38.14	40.00	1.86	15x1000.0	120.000	100.0	V	232.0	17.2	Mid
72.510000	37.33	40.00	2.67	15x1000.0	120.000	116.0	V	229.0	15.6	Mid
73.640000	36.00	40.00	4.00	15x1000.0	120.000	100.0	V	255.0	15.2	Mid
34.280000	34.95	40.00	5.05	15x1000.0	120.000	116.0	V	39.0	16.5	High
40.290000	38.72	40.00	1.28	15x1000.0	120.000	100.0	V	95.0	17.2	High
41.810000	38.48	40.00	1.52	15x1000.0	120.000	100.0	V	107.0	17.3	High
41.820000	38.29	40.00	1.71	15x1000.0	120.000	115.0	V	75.0	17.3	High
65.010000	38.69	40.00	1.31	15x1000.0	120.000	108.0	V	279.0	17.2	High
72.120000	39.37	40.00	0.63	15x1000.0	120.000	100.0	V	315.0	15.7	High

Correction factor (dB) in the final result tables contains the sum of the transducers (antenna + cables).

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

Measured Peak and Average Values In The Frequency Range 1 GHz – 10 GHz

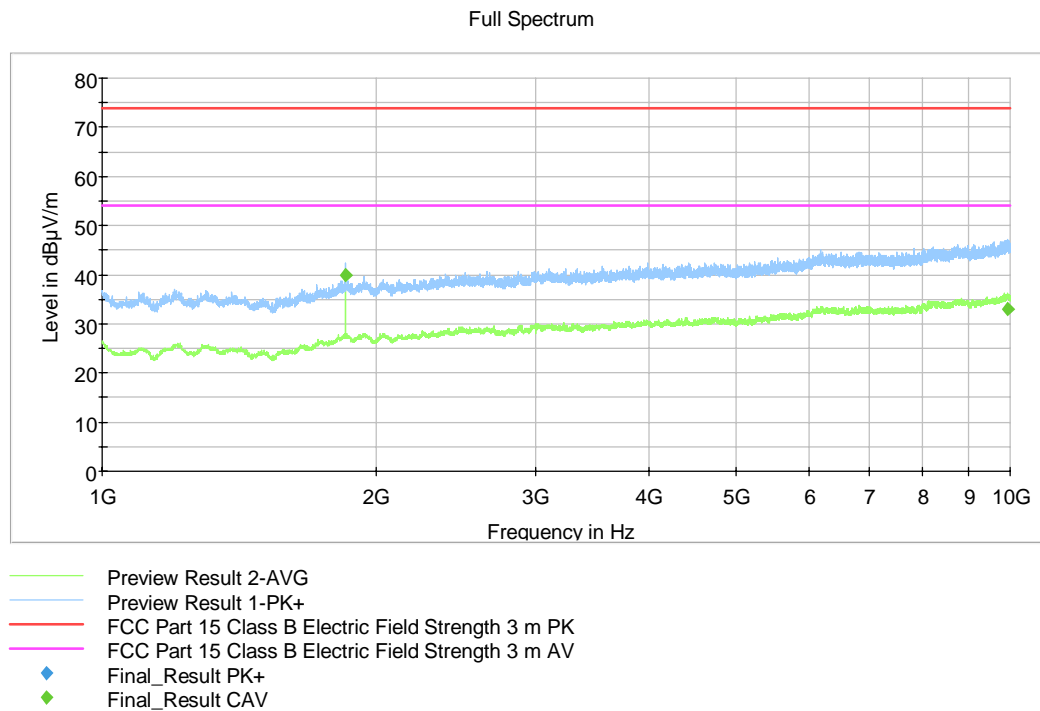


Figure 9: Measured results (Low)

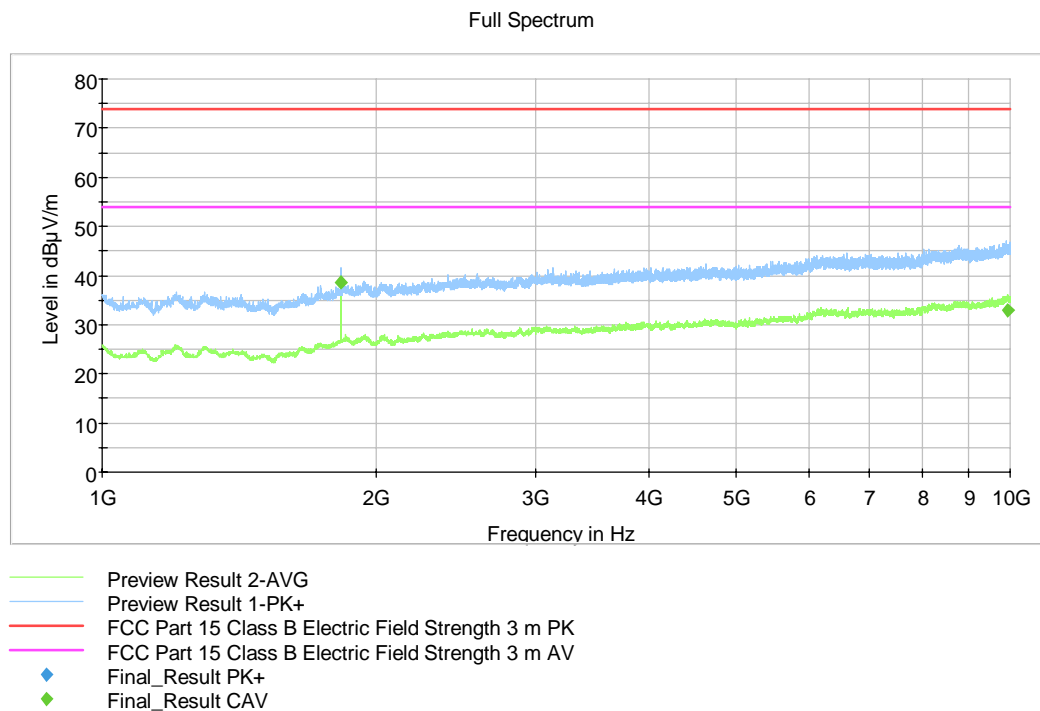


Figure 10: Measured results (Mid)

Radiated Emissions In The Frequency Range 9 kHz – 10 GHz

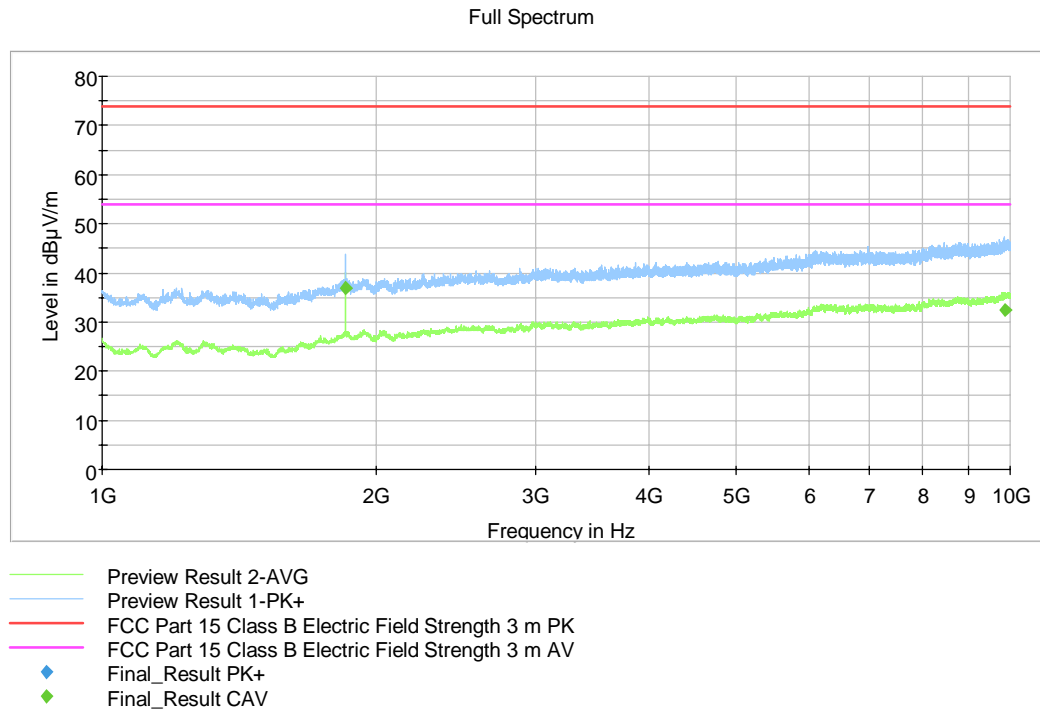


Figure 11: Measured results (High)

Final measurements from the worst frequencies

Table 5: Final peak and average measurement from the worst frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1853.850000	---	39.98	53.90	13.92	15x1000.0	1000.000	196.0	H	215.0	2.8	Low
9950.350000	---	33.02	53.90	20.88	15x1000.0	1000.000	100.0	V	2.0	14.9	Low
1829.800000	---	38.73	53.90	15.17	15x1000.0	1000.000	201.0	H	214.0	2.3	Mid
9936.350000	---	32.94	53.90	20.96	15x1000.0	1000.000	185.0	V	84.0	14.8	Mid
1853.850000	---	36.97	53.90	16.93	15x1000.0	1000.000	184.0	H	206.0	2.8	High
9865.750000	---	32.54	53.90	21.36	15x1000.0	1000.000	170.0	V	3.0	14.8	High

Correction factor (dB) in the final result tables contains the sum of the transducers (antenna + amplifier + cables).

TEST EQUIPMENT

Conducted Emissions

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	NCR
LISN	ROHDE & SCHWARZ	ENV216	inv:9611	2022-02-02	2023-02-02
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2022-06-20	2023-06-20
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv:7826	NCR	NCR
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv:10517	2022-10-27	2023-10-27

Radiated Emissions

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv:7826	NCR	NCR
RF PREAMPLIFIER	CIAO	CA118-3123	inv:10278	2022-09-21	2023-09-21
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv:10517	2022-10-27	2023-10-27
ANTENNA	EMCO	3117, emi 1-18GHz	inv:7293	2022-06-16	2024-06-16
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	NCR
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	NCR
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	NCR
ATTENUATOR	PASTERNAK	PE 7004-4 (4dB)	inv:10126	2021-03-30	2023-03-30
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	NCR
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2022-06-20	2023-06-20
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv:8013	2022-10-25	2024-10-25
ANTENNA	SCHWARZBECK	VULB 9168	inv:10682	2022-07-26	2024-07-26

NCR = No calibration required

END OF REPORT