Test Report

Electromagnetic Compatibility (EMC)

HELEM2206000300-1

TESTS ACCORDING TO FCC PART 15 B AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Hublet Smart Docking Station
Model:	Hublet-M2
Customer:	Hublet Oy Itälahdenkatu 22 B 00210 Helsinki Finland
FCC Rule Part: IC Rule Part:	FCC CFR 47 Part 15 Subpart B, Class B ICES-003 Issue 7, Class B

Date:	30 September 2022	Date:	4 October 2022
Issued by:	Lauri Sippola Testing Engineer	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	30 September 2022

PRODUCT DESCRIPTION

Equipment Under Test (EUT)

EUT information	
General Product Description	Hublet Smart Docking Station
Model	Hublet-M2
Serial number	-
Power input port type	AC (L, N, PE)
Rated voltage	100-120 VAC
Rated current	3.0 A
Rated frequency	60 Hz
Rated power	-
EUT Highest operation freq.	-
Hardware Version (if any)	-
Software Version (if any)	-
Mechanical size of the EUT	59 x 126 x 59 cm
Parallel models	-
Radio module or chip	Integrated in Rasberry Pi (FCC ID: 2ABCB-RPI4B)

The EUT was tested as a floor standing unit.

General description

Tablet docking station contains a power supply, PCB, Rasberry Pi single board computer and a barcode scanner and RFID card reader and has slots for either 3 or 6 tablets. The docking station uses a 5 V internal voltage to power a tablet locking mechanism, indicator LED lights and the Rasberry Pi computer through the PCB. Tablet locking/release and the lights are controlled by the computer.

The RFID reader (reading either 125 kHz or 13.56 MHz RFID tag) or barcode scanner are connected to the Rasperry Pi computer via USB 3.0, and they are used to read information from the customers, e.g. a library card, and the information is processed in the Rasberry Pi. The information can be sent to either the Hublet docking station owner's information network or Hublet cloud service via either WLAN connection or Ethernet/LAN connection, depending on how the owner wants the dock connected. Through the interaction and information gotten from the server a tablet may be unlocked from the dock for the customer to use.

Samples and modifications

No.	Name	Description
1	Sample 1	Normal sample

Ports and cables

Cable / Port	Description
AC mains	L, N, PE 1 m
Ethernet	Unshielded, 2.5 m

Peripherals

Peripheral	Description / Usage
Test PC	Device configuration
WiFi router	WiFi connection

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. Wifi communication link was established between the EUT and peripheral router. RFID reader was transmitting continuously.

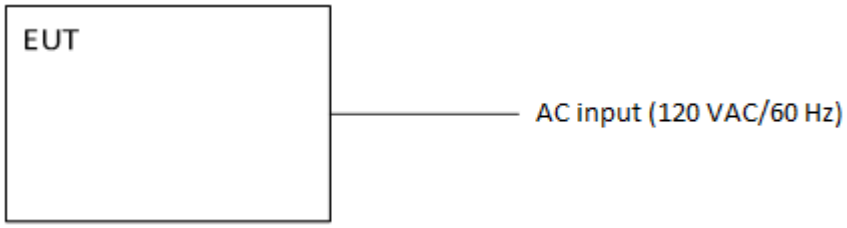

Figure 1: Test setup block diagram

Operation modes

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

Mode	Description
1	Normal operation mode after power on.

Emission Measurement Uncertainty

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

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:	☐ K10LAB, ISED Canada registration number: **8708A-1** ☒ K5LAB, ISED Canada registration number: **8708A-2** ☐ T10LAB

EMISSION TESTS

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Standard:	ANSI C63.4	(2014)
Tested by:	LAS	
Date:	28 July 2022	
Humidity:	47 %	
Temperature:	24 °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.

Test results

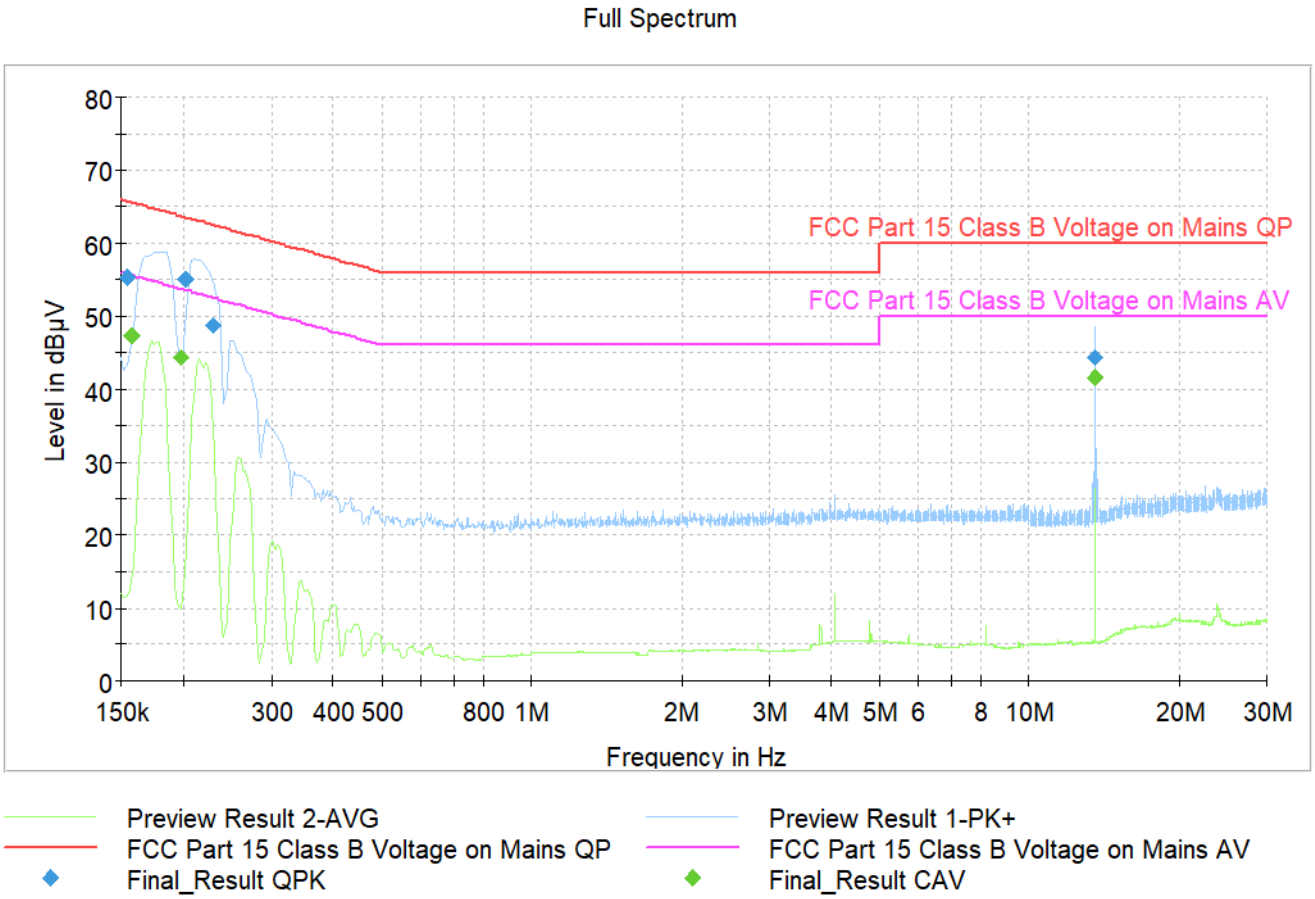

Figure 2: The measured results

Final measurements from the worst frequencies

Table 1: Final quasi-peak results

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	55.27	15x1000.0	9.000	N	9.7	10.51	65.78
0.202250	55.03	15x1000.0	9.000	N	9.7	8.49	63.52
0.230250	48.86	15x1000.0	9.000	L1	9.7	13.58	62.44
13.558500	44.26	15x1000.0	9.000	N	10.4	15.74	60.00

Table 2: Final average results

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	47.21	15x1000.0	9.000	L1	9.7	8.36	55.57
0.198250	44.27	15x1000.0	9.000	L1	9.7	9.41	53.68
13.558500	41.49	15x1000.0	9.000	N	10.4	8.51	50.00

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 30 MHz - 18 GHz.

Standard:	ANSI C63.4 (2014)	
Tested by:	LAS	
Date:	19 July 2022	
Humidity:	45 %	
Temperature:	23.9 °C	
Barometric pressure:	860 – 1 060 mbar	
Measurement uncertainty:	± 4.9 dB (30 – 200 MHz) ± 4.1 dB (200 – 1 000 MHz) ± 4.3 dB (1 – 18 GHz)	Level of confidence 95 % (k = 2).

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 tested as a floor-standing unit. 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 supply voltage to the turntable was fed through the filter.

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

Radiated measurement settings

Preliminary testing:

Turntable movement:	30 ° step
Turntable position:	15 ° to 345°
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:	± 30 °
Antenna movement:	Continuous
Antenna height:	± 1.50 m
Antenna polarization:	Vertical and horizontal

Measured Quasi-Peak Values In The Frequency Range 30 MHz - 1000 MHz.

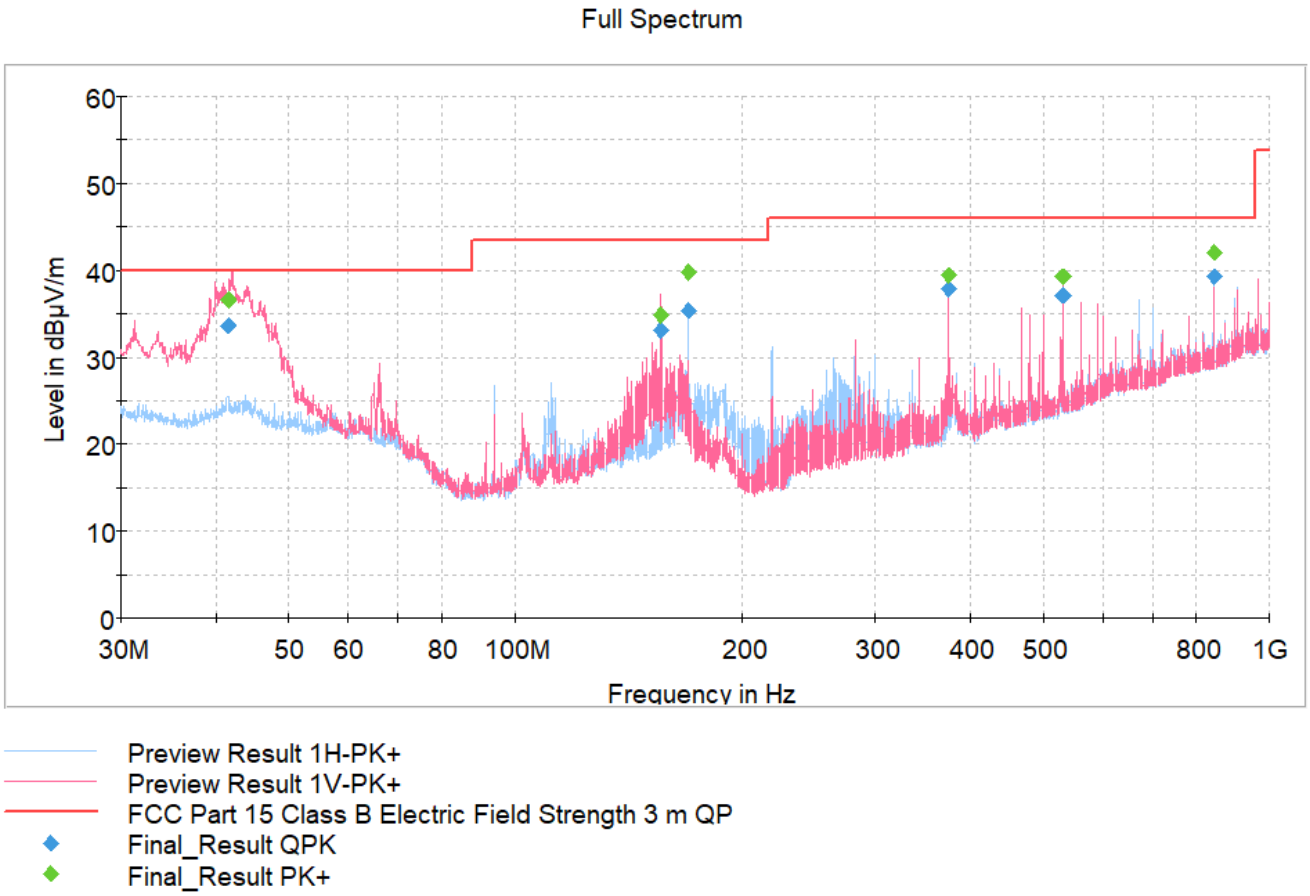

Figure 3: Measured results

Final measurements from the worst frequencies

Table 3: Final quasi-peak results

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
41.520000	33.67	15x1000.0	120.000	100.0	V	243.0	17.3	6.33	40.00
156.260000	33.10	15x1000.0	120.000	100.0	V	195.0	18.6	10.40	43.50
169.390000	35.39	15x1000.0	120.000	199.0	H	177.0	17.9	8.11	43.50
375.000000	37.82	15x1000.0	120.000	108.0	V	69.0	21.5	8.18	46.00
531.250000	37.07	15x1000.0	120.000	100.0	V	225.0	24.8	8.93	46.00
843.770000	39.19	15x1000.0	120.000	100.0	H	292.0	30.3	6.81	46.00

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

QuasiPeak values are measured values corrected with the correction factor.

Measured Peak and Average Values In The Frequency Range 1 GHz - 9 GHz.

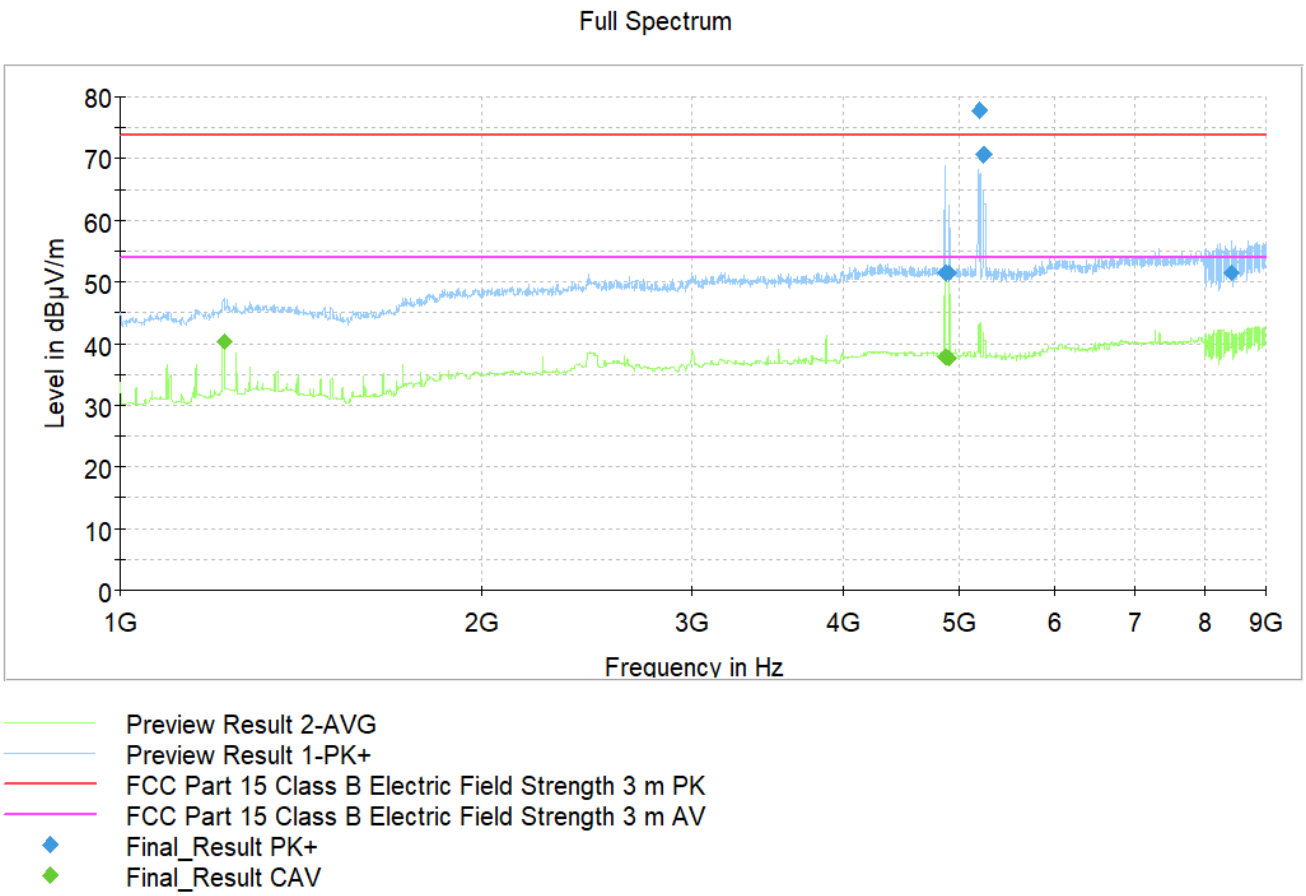

Figure 4: Measured results

Final measurements from the worst frequencies

Table 4: Final results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Mar-gin (dB)	Limit (dBµV/m)
1218.775000	---	40.25	15x1000.0	1000.000	103.0	V	331.0	9.9	13.65	53.90
4862.775000	51.49	---	15x1000.0	1000.000	228.0	V	34.0	16.5	22.41	73.90
4869.375000	---	37.83	15x1000.0	1000.000	165.0	V	43.0	16.5	16.07	53.90
4899.375000	---	37.76	15x1000.0	1000.000	292.0	V	169.0	16.5	16.14	53.90
4902.175000	51.62	---	15x1000.0	1000.000	288.0	V	186.0	16.5	22.28	73.90
5239.025000	70.70	---	15x1000.0	1000.000	315.0	V	242.0	16.9	3.20	73.90
8419.425000	51.48	---	15x1000.0	1000.000	384.0	H	262.0	21.5	22.42	73.90

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

Measured Peak and Average Values In The Frequency Range 9 GHz – 18 GHz.

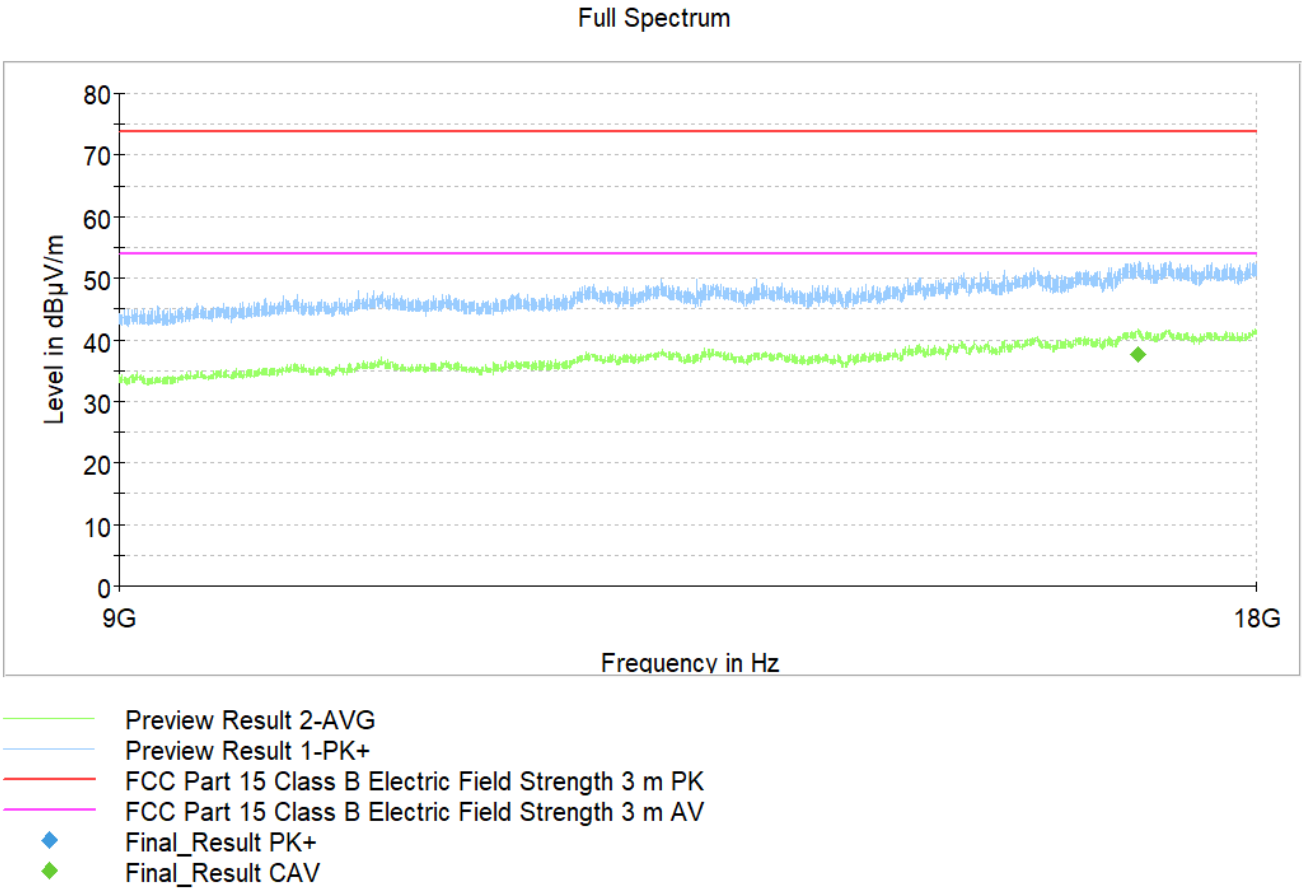

Figure 5: Measured results

Final measurements from the worst frequencies

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

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Mar-gin	Limit (dBµV/m)
16741.650000	---	37.55	15x1000.0	1000.000	286.0	V	344.0	23.7	16.35	53.90

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

TEST EQUIPMENT

Radiated emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ANTENNA	SCHWARZBECK	VULB 9168	inv. 8911	2020-11-04	2022-11-04
ANTENNA	EMCO	3117, emi 1-18GHz	inv. 7293	2022-06-12	2024-06-16
ANTENNA MAST	MATURO	TAM 4.0E	inv. 10181	NA	NA
ATTENUATOR	PASTERNACK	PE 7004-4 (4dB)	inv. 10126	2021-03-30	2023-03-30
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2022-06-20	2023-06-20
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv. 10183	NA	NA
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv. 7826	-	-
RF PREAMPLIFIER	CIAO	CA118-3123	inv. 10278	2022-09-21	2023-09-21
TEMPERATURE/ HUMIDITY SENSOR	EDS	OW-ENV-TH, K5 SAC	inv. 10517	2021-10-22	2022-10-22
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
TURNTABLE	MATURO	DS430 UPGRADED	inv. 10182	NA	NA

Conducted emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv. 10679	2022-06-20	2023-06-20
ISN	TESEQ	ISN T8-Cat6	inv. 10492	2022-05-30	2023-05-30
LISN	ROHDE & SCHWARZ	ENV216	inv. 9611	2022-02-02	2023-02-02
PASSIVE VOLTAGE PROBE	SCHAFFNER	CVP 2200	inv. 7946	2017-12-13	-
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
POWER SUPPLY	CALIFORNIA INSTR.	5001 iX Series II	inv. 7826	-	-

NCR = No calibration required

END OF REPORT